Bomac

MICROWAVE TUBES AND COMPONENTS

BOMAC LABORATORIES, INC. ★ BEVERLY, MASSACHUSETTS

BOMAC

5th November, 1964

CARDS HAVE BEEN TYPED FOR ALL SECTIONS – Except SILICON DIODES.

BOMAC

PRODUCT CATALOG

MICROWAVE TUBES AND COMPONENTS

BOMAC
laboratories, inc.

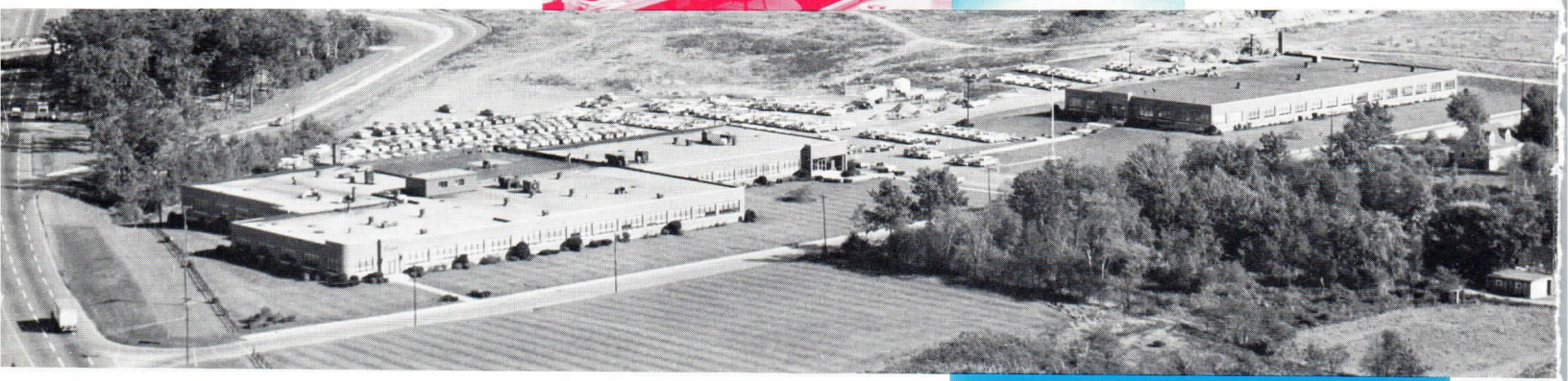
BOMAC

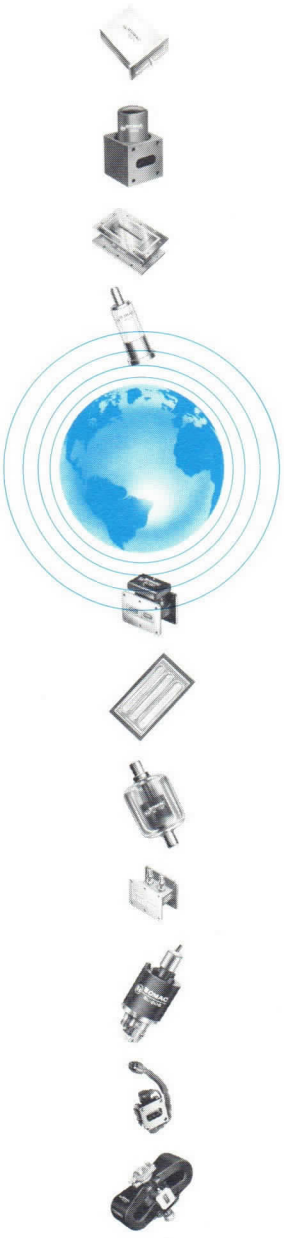
Since its founding in 1947, Bomac's climb to a position of prominence in the field of microwave has been swift and sure.

Today, Bomac employs over 800 people, and has over 110,000 square feet of manufacturing space.

On the staff are some of the country's leading microwave tube specialists whose achievement records are outstanding in the industry. Up-to-the-minute facilities include research and development laboratories, extensive areas for manufacturing and assembly, and the most advanced test equipment. Every tube is thoroughly tested to insure maximum uniformity and peak performance before it leaves the plant.

Bomac has been a pioneer in many tube developments, and is continually searching for and producing new and improved products. If you have a problem in engineering, development, or production of microwave tubes or components, Bomac has the experience and facilities to find the answer.





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Because of the space limitations of this short-form catalog, it has been impossible for us to include every model or type of tube or component offered by Bomac.

These products are available on order in any required quantity. Further, Bomac Laboratories is well equipped to design and manufacture many other items on special order to meet the customer's specifications.

A letter, wire, TWX, or phone call for information will receive prompt attention. See outside back cover for list of Bomac representatives.

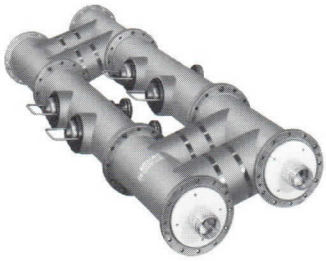
BOMAC laboratories, inc.

SALEM ROAD • BEVERLY, MASSACHUSETTS • WAlker 2-6000

A SUBSIDIARY OF VARIAN ASSOCIATES

UHF COMPONENTS

Need a single tube? Or 50,000?
Bomac can meet your needs!



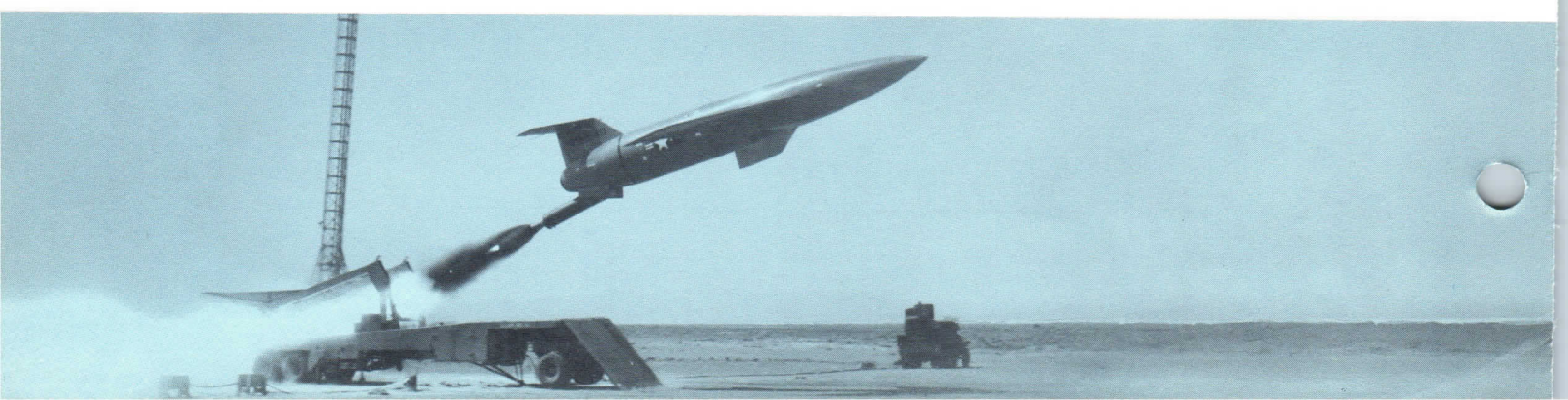
PRODUCT NO.	PRODUCT	FREQUENCY (MC)	LINE SIZE	FEATURE
BLP-013D	Monoplexer	225	⅞" Coaxial	P peak, 5 kw
BL-581	Duplexer	216–225	3⅛" Coaxial	P peak, 2.5 Mw
BL-549	Duplexer	300–500	3⅛" Coaxial	P peak, 2.5 Mw
BLP-009D	Duplexer, Branched Coax line	406–450	3⅛" Coaxial	P peak, 3 Mw max, P average, 5 kw max
BL-595	Duplexer	413	6⅛" Coaxial	P peak, 2.0 Mw, P average, 10 kw
BLP-024D	Duplexer	425	WR2100	P peak, 2.5 Mw, P average, 150 kw
BLP-036D	Duplexer	406–450	3⅛" Coaxial	P peak, 2.0 Mw, P average, 4 kw
BLP-010D	Monoplexer	406–450	⅞" Coaxial	P peak, 30 kw, P average, 50 watts
BLP-026H	Hybrid	300–480	3⅛" Coaxial	P peak, 1.0 Mw
BLP-29H	Hybrid	400–450	3⅛" Coaxial	P peak, 2.5 Mw
BL-596	Hybrid	400–450	⅞" Coaxial	P peak, 200 kw
BLP-004H	Hybrid	400–450	3⅛" Coaxial	P peak, 2.0 Mw
BLP-012H	Hybrid	425	Slabline	3 db coupling "N" and ⅞ coaxial fittings
BL-588	Receiver Protector	400–450	1⅝" Coaxial	P Peak, 40 kw
BL-597	Load, Dry	400–450	1⅝" Coaxial	P peak, 20 kw, P average, 20 w, VSWR 1.2 max.

L BAND

Bomac produces over 750 different types of microwave tubes and components.

L BAND
TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW)-MAX.	FEATURE
6633/BL-37A	1220–1365	1292	2000	Broadband TR pressurizable
BL-632	1250–1350	1300	6000	Broadband TR ceramic input window
BL-635	1215–1355	1285	450	Cell tube, for motorized tuning
BL-926	1220–1365	1292	2000	Broadband TR, has folded cylinder window and plug-in gaps
7166/BL-933	1215–1365	1292	2000	Broadband TR, 7" overall length
BL-959	409–417	413	65	For use with 6⅛" coaxial duplexer
BL-974	1220–1365	1292	2000	"hot-cold" TR, operating temp. ranges from −55° to +125° C, fixed tuned
1B40		1100	1	Electrodeless discharge



L BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
BL-628	1300	2000	Tuned in full height guide
BL-634	1285	2000	Tuned in full height guide
BL-637	1350	2000	Tuned in full height guide
BL-640	1300	2000	Tuned in full height guide
BL-640A	1300	2000	Tuned in full height guide, pressurizable
BL-646	1230	2000	High Q window, tuned in full height guide
BL-647	1340	2000	High Q window, tuned in full height guide
BL-648	1285	2000	High Q window, tuned in full height guide
BL-664	1300±5%	2000	Ceramic window
BL-664A	1300±5%	2000	Has flange suitable for pressurization
6962/BL-665	1285±5%	2000	Low Q double iris window, ½ height guide
BL-665A	1285±5%	2000	Has flange suitable for pressurization

L BAND Pre-TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) - MAX.	FEATURE
6605/BL-96A	1250–1350	1300	2000	Pressurizable, broadband
7152/BL-612	1250–1350	1300	3000	Ceramic window, broadband
BL-612A	1250–1350	1300	3000	Short recovery time, RT 30 μs (max)
BL-612B	1250–1350	1300	3000	Insertion loss 0.3db (max)
BL-920	1250–1350	1300	5000	Dual pre TR, has folded cylinder window
5939	1250–1350	1300	550	Used in pairs, dumbell type
5939A	1250–1350	1300	550	Additional mounting holes in flange
6260	1250–1350	1300	2000	Dumbell type
BLW-005	1250–1350	1300	5000	Folded cylinder

L BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) - MAX.	FEATURE
6634/BL-90	1250–1350	1300	5000	For use with sidewall couplers, bandpass, RT 150 μs
BL-618	1250–1350	1292	2000–5000	May be used for sidewall coupler, RT 150 μs
BL-927	1250–1350	1300	5000	Folded cylinder, 0.001 duty cycle
BL-935	1250–1350	1300	9000	For use with sidewall coupler

L BAND Crystal protector

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) - MAX.	FEATURE
BL-932	1270–1360	1315	10	Low power, broadband TR
BLS-509	1250–1350	1300	50	Min. firing power 20 watts (peak), 7 in. long
BL-923	1250–1350	1300	10	Broadband for use with pre-TR

L BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY (RANGE KMC)	LINE SIZE (WG)	FEATURE
BL-506	Duplexer, Branch Guide	1.180–1.220	3.41″ × 6.66″	P peak, 3 kw, UG 60A/U coaxial input and output
BL-591	Duplexer, Branch Guide	1.250–1.350	3.41″ × 6.66″	P peak, 1Mw, P average 3 kw, 1⅝″ coaxial input and output
BLP-005D	Duplexer, Branch Guide	1.250–1.350	3.41″ × 6.66″	P peak, 2 Mw

S BAND

Bomac's 85-man engineering staff is diversified enough to perform r&d in any of the varied fields of microwave

S BAND TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6637/BL-31		3300	50	Ruggedized TR, no tuner knob
6635/BL-57	2690–2710	2700	5	Tunable, integral cavity
6638/BL-99		3300	50	Positive ignitor operation
BL-602	2885 ± 5%	2885	20	Integral cavity
BL-603	2664–2964	2802	750	High Q windows
BL-696	2800–3330	3000	350	1000 Hr. fixed tuned
BL-902	2900–3200	3050	1200	High power ceramic window, broadband
BL-913	2600–3000	2800	1200	Ceramic window
BL-969	2600–3000	2800	750	Coaxial output TR, output window not used, type N output used
BL-975	2600–3000	2800	750	"Hot-cold" TR, operating temp. range: −55° to +125° C
1B27		3000	50	Cell type, tunable, 2 disc
1B55	3365–3740	3550	750	Broadband
1B58A	2600–3000	2800	750	Band pass, fixed tuned
1B62	2700–3300	3000	350	Cell type, fixed tuned
5853	2900–3200	3050	750	Broadband
5927	3100–3500	3300	750	Broadband
6117	2689–2939	2802	750	Broadband, pressurizable mounting
721B	2700–3300	3000	350	Cell type, fixed tuned

S BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
1B44	2750	750	Fixed tuned
1B52	3625	750	Fixed tuned
1B53	3479	750	Fixed tuned
1B56	2850	750	Fixed tuned
1B57	3325	750	Fixed tuned
5792	2950	750	Fixed tuned
5793	3050	750	Fixed tuned
5921	3200	750	Fixed tuned
5922	3400	750	Fixed tuned
6024	2800	750	Fixed tuned
BL-36	2800	750	Fixed tuned
BL-40	2850	750	Fixed tuned. R. T. = 15μs.

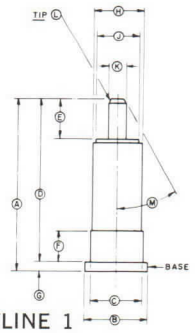
S BAND Microwave Mixer Diodes

FORWARD POLARITY	REVERSE POLARITY	MATCHED PAIR (4) FORWARD	MATCHED PAIR (4) FORWARD & REVERSE	REVERSIBLE POLARITY (3)	TEST FREQUENCY (MC)	MAX. CONVERSION LOSS (db)
1N21B	1N21BR	1N21BM	1N21BMR	1N416B	3060	6.5
1N21C	1N21CR	1N21CM	1N21CMR	1N416C	3060	5.5
1N21D	1N21DR	1N21DM	1N21DMR	1N416D	3060	5.0
1N21E	1N21ER	1N21EM	1N21EMR	1N416E	3060	—
1N21WE (5)	1N21WER	1N21WEM	1N21WEMR	1N21WE	3060	5.5

NOTES:

1. Normal polarity — The path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse polarity — The path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a minimum of 10 MSI.
6. As alternate design, base may have set screw. Dimension M = 10° to 45° from vertical.

REF.	DIMENSION
A	0.820 ± 0.020
B	0.294 ± 0.002
C	0.250 + 0.000 − 0.004
D	0.768 ± 0.015
E	0.187 Min. 0.190 Max.
F	0.196 ± 0.003
G	0.052 ± 0.005
H	0.240 Max.
J	0.205 ± 0.010
K	0.093 ± 0.001
L	0.015 — 0.030 Chamfer
M	30° — 45° From Vertical



OUTLINE 1

S BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
BL-41	2750	750	Fixed tuned — 15μs R. T.
BL-623	2800	1000	Fixed tuned-High Q
BL-630	2800	1000	Fixed tuned, window ¼ in. high approx. High Q.
BL-642	2800		
BL-660	2800	1000	
BL-963	2950	1 Mw	
BL-964	3050	1 Mw	
BL-946	2850	1000	Quartz wool window

S BAND Pre-TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
1B38	2650–2950	2800	750	Broadband
1B54	3300–3700	3500	750	Broadband

S BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6636/BL-87	2700–2900	2800	750	Broadband for use with sidewall couplers
BL-638	2900–3200	3050	750	
BL-652	3400–3700	3550	750	
BL-938	2700–2900	2800	10	Duty cycle 0.10

S BAND Dual TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VOLTS)	FEATURE
BL-346	2700–2900	750	28	BL87 with Shutter
BL-357	3400–3700	750	28	BL652 with Shutter

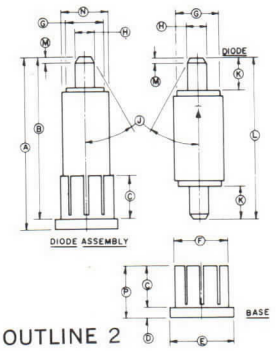
S BAND TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VOLTS)	FEATURE
6602/BL-329	3100–3500	750	28	5927 + Shutter
BL-345	2664–2964	750	28	1B58 + Shutter
BL-351	2900–3200	750	28	5853 + Shutter
BL-381	2900–3200	750	28	Shortened 1B58

S BAND Pressurizing Windows

PRODUCT NO.	FREQUENCY RANGE (KMC)	CENTER (MC)	VSWR (MAX.)	PEAK POWER (KW)	WAVE-GUIDE SIZE (RG)	MATES WITH (UG)	MOUNTING
BL-741	2.7–2.9	2800	1.20	750	48/U	53/U	Flange
BL-712	2.8–3.2	3000	1.20	1000	48/U	53/U	Flange
BL-713	2.6–3.7	3150	1.20	1000	48/U	54A/U	Flange
BL-124	2.675–2.925	2800	1.10	1000	48/U		Solder
BL-739	2.6–3.7	3100	1.30		48/U		Solder
BL-743		3300	1.10	1mw	48/U		Solder

MAX. OUTPUT NOISE RATIO (TIMES)	MAX. VSWR IN STD MIXER	POWER LEVEL (MW)	BURNOUT (ERGS)	CALC. OVERALL RECEIVER NOISE FIGURE	IF IMP. (OHMS)	STANDARD MIXER	OUTLINE NO.
2.0	—	0.5	2.0	10.3	200–800	JAN 124	1
1.5	—	0.5	2.0	8.3	200–800	JAN 124	1
1.3	1.5	0.5	2.0	7.34	350–450	JAN 124	1
	1.3	0.5	5.0	7.0	350–450	JAN 124	1
1.5	1.3	0.5	5.0	7.0	350–450	JAN 264	2



OUTLINE 2

REF.	DIMENSION
A	0.820 ± 0.020
B	0.768 ± 0.015
C	0.196 ± 0.003
D	0.053 Ref.
E	0.294 D ± 0.002
F	0.248 D ± 0.002
G	0.205 D ± 0.010
H	0.093 D ± 0.001
J	10° — 45° From Vert.
K	0.187 Min. 0.190 Max.
L	0.790 ± 0.018
M	0.015 — 0.030 Chamfer
N	0.240 D Max.
P	0.250 + 0.000 — 0.004

NOTES:

1. Overall noise figure calculated from formula N = CL (NiF + NR − 1) NiF is assumed as 1.5 db (30 mc/s1F)
2. Jan 124 coaxial mixer will soon be replaced with an equivalent waveguide mixer.
3. The reversible polarity cartridge types are electrically and mechanically identical to their fixed polarity counter parts and are directly interchangeable with the indicated fixed polarity types.
4. Matched pairs of Bomac mixer diodes are available and are matched to the following limits.
   If impedance 25 ohms
   Conversion Loss 0.3 db
   Current 5% max. Signal Loss to L.O. Feed Arm
5. 1N23WE & 1N21WE are environmentally tested under extreme conditions according to MIL-E-1/1117 & MIL-E-1/1115 JAN. Spec. Resp.

S BAND Carcinotron

PRODUCT NO.	FREQUENCY RANGE (MC)	MIN. PEAK POWER (WATTS)	MIN. AVERAGE POWER (WATTS)	OUTPUT MATES WITH	FEATURE
BL-857	2500–3300	180	180	UG45/U	Carcinotron Tunable

S BAND Crystal Protector

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-670	2700–2900	2800	10	Max. overall length 6.640″

S BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY (KMC)	LINE SIZE (WG)	FEATURE
BLP-061	Power Divider Variable	2.6–3.9	1½″ × 3″	P peak 2.7 Mw pressurized 2.2 Mw unpressurized
BL-584	Diplexer	2.72–2.98	1½″ × 3″	P peak 750 kw, insertion loss, .3db max., Isolation 25 db min.
BL-585	Diplexer	2.84–3.00	1½″ × 3″	P peak 750 kw, Insertion Loss .3 db max. Isolation 25 db min.
BL-520	Duplexer, Branch Guide	2.98–3.02	1½″ × 3″	P peak, 20 kw, UG46/U coaxial input and output
BLP-066	Directional Coupler, Crossguide	2.6–3.4	1½″ × 3″	Incident power 1.1 Mw coupling 20, 30, or 40 db; directivity, 15 db
BLP-071	Directional Coupler, Sidewall	2.6–3.4	1½″ × 3″	Incident power, 2.2 Mw coupling 20, 30, or 40 db; directivity, 20 db min.
BLP-076	Directional Coupler, Topwall	2.6–3.4	1½″ × 3″	Incident power, 1.1 Mw, coupling, 10 or 20 db; directivity, 40 db min.
BLP-057L	Waterload	2.6–3.4	1½″ × 3″	VSWR, 1.06 max., P peak 2.7 Mw pressurized, 1.2 Mw unpressurized
BLP-057LP	Waterload With Pulling Slug	2.6–3.4	1½″ × 3″	VSWR, 1.50 to 1.70 max.

Specify Bomac for maximum uniformity and peak performance

C BAND

C BAND TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6568/BL-28	5395–5905	5650	3000	Phase controlled ± 5°
6639/BL-46	5540–5560	5550	20	Tunable
BL-605	5370–5430	5400	100	Contact mounting seat
6906/BL-643	5393–5905	5650	5	Phase controlled ± 5° Tracks with 6905/BL-613
BL-972	5395–5905	5650	500	
BL-976	5395–5905	5650	300	"Hot-cold" TR, operating temp. range −55° to +125° C., broadband
5865	5395–5905	5650	300	
5925	5200–5530	5365	1000	
6624	5350–5450	5400	85	3 Element TR, contact type input mount

C BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
BL-52	5435	300	Fixed tuned
6455/BL-61	5640	300	Fixed tuned, contact mount flange
BL-83	5280	300	Fixed tuned, contact mount
BL-606	5400	100	Special mounting flange
6022	5365	1000	Fixed tuned
6081	5640	300	Fixed tuned
6591	5400	150	Contact mount flange

C BAND Pre-TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-954	5395–5755	5575	3000	Will not sustain ionization below 10 watts CW
BL-982	5400–5900	5650	40	Will not sustain ionization below 10 watts CW
BL-997	5250–5750	5500	1000	Dual pre-TR has folded cylinder window, 1½ in. long

C BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6640/BL-60	5400–5900	5650	700	
6641/BL-86	5150–5410	5280	1000	
6905/BL-613	5400–5900	5650	3000	Ceramic windows, phase control, tracks with TR6906/BL643
BL-644	5250–5310	5280	1000	
BL-957	5400–5900	5650	100	Ceramic input window, water cooled flange, high duty cycle 0.030

C BAND TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
6592/BL309	5200–5530	1000	28	
6594/BL-311	5395–5905	300	28	
BL-337	5395–5905	3000	28	Ceramic window
BL-350	5340–5450	300	28	Shutter circuit uses AN connector, Shortened ignitor.
BL-366	5395–5905	300	6	
BL-373	5250–5750	50	48	Phase control ±5°
BL-377	5395–5905	3000	28	Input flange has all 8 holes tapped to .190 — 32 NF 2B

C BAND Shutter (only)

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL	SHUTTER CIRCUIT VOLTAGE	FEATURE
BL-353	5395–5905	1 Watt	28	Low power switching only

C BAND Dual TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
BL-336	5400–5900	700	28	
BL-352	5400–5900	700	28	Has AN Connectors
7447/BL-352A	5400–5900	700	28	Contains 12 Struts Between Flanges, Terminal Board Incapsulated
BL-362	5400–5900	700	115 (ac) 60 ~	Built-in Power Rectifier

C BAND Microwave Cavities

PRODUCT NO.	FREQUENCY RANGE (MC)	QL	IL (db)	FEATURE
BL-467	5400–5900	1400	13 max cavity only	Direct reading tunable dual mode cavity with input transition and attenuator, output attenuators and crystal detectors, calibrated in 0.5 Mc increments
BL-476	5400–5900	1400	13 max	Same as above, but without input transition, attenuator or output crystal detectors

C BAND Pressurizing Windows

PRODUCT NO.	FREQUENCY RANGE (KMC)	CENTER (MC)	VSWR (MAX.)	PEAK POWER (KW)	WAVE-GUIDE SIZE (RG)	MOUNTING
BL-704	4.9–5.1	5000	1.15	100	49/U	Solder
BL-730	4.9–5.1	5000	1.15	100	49/U	Solder
BL-769	4.9–5.1	5000	1.15	100	49/U	Solder
BL-141	5.1–5.32	5210	1.10	100	49/U	Solder
BL-746	5.25–5.31	5280	1.05	500	49/U	Solder
BL-747		5975		250	50/U	Solder
BL-780	5.35–5.45	5400	1.12	750	49/U	Solder
BL-738	5.1–5.9	5500	1.25	100	49/U	Solder
BL-134	5.2–5.9	5550	1.20	75	59/U	Solder
BL-742	5.45–5.825	5637	1.12	750	49/U	Solder

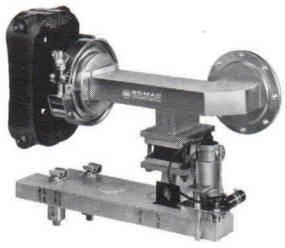
C BAND Magnetrons

PRODUCT NO.	FREQUENCY RANGE (MC)	MIN. PEAK POWER (WATTS)	MIN. AVERAGE POWER (WATTS)	OUTPUT MATES WITH	FEATURE
7088/BL-212	5400–5900	100	0.2	UG699/U	Tunable
BL-250	5400–5900	150	0.3	TNC	Tunable
BL-243	5400–5900	200	0.4	UG699/U	Tunable
BL-242	5400–5900	400	0.8	N	Tunable, pressurizing flange
BLM-008	5400–5900	400	0.8	TNC	Tunable
BLM-022	5400–5900	500	1.0	TNC	Tunable, high stability
BLM-026	5400–5900	500	1.0	TNC	Tunable
BLM-020	5400–5900	700	1.4	TNC	Tunable
BL-245	5400–5900	900	1.8	TNC	Tunable, high stability
7444/BL-230	5400–5900	1000	2.0	TNC	Tunable

C BAND Crystal Protector

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-971	5450–5825	5640	5	Broadband low noise figure
BL-973	5395–5755	5575	10	Choke flange on low power

C BAND Components



PRODUCT NO.	PRODUCT	FREQUENCY (KMC)	LINE SIZE (WG)	FEATURE
BLP-060	Power divider, variable	5.2–5.9	1″ × 2″	P Peak 1.7 Mw pressurized, .9 Mw unpressurized
BLP-087E	Diplexer	5.2–5.9	1″ × 2″	P peak 1.7 Mw pressurized, .9 Mw unpressurized; isolation 25 db min.
BLP-003D	R. F. package for AN/SPS-21	5.48–5.62	1″ × 2″	Noise figure 10.5db, includes: 2 diodes (1N23C), magnetron, (BL-244); klystron, TR (6115); (6639/BL-46) duplexer & mixer
BLP-048T	Transition to coaxial line	5.4–5.9	1″ × 2″	Includes Sm plug, VSWR 1.10 max.
BLP-049-T	Transition to coaxial line	5.2–6.0	1″ × 2″	Includes TNC plug, VSWR 1.10 max.
BLP-050T	Transition to coaxial line	5.2–5.9	1″ × 2″	Includes N jack, VSWR 1.10 max.
BLP-065	Directional coupler, Crossguide	5.2–5.9	1″ × 2″	Incident power, 470 Kw, coupling, 20, 30, or 40 db, directivity, 15 db min.
BLP-070	Directional coupler, Sidewall	5.2–5.9	1″ × 2″	Incident power, 940 Kw, coupling, 20, 30, or 40 db, directivity 20 db min.
BLP-075	Directional coupler, Topwall	5.2–5.9	1″ × 2″	Incident power, 470 Kw, coupling 10, or 20 db, directivity 40 db min.
BLP-056L	Waterload	5.2–5.9	1″ × 2″	VSWR, 1.06 max., P peak 1.7 Mw pressurized, .9 Mw unpressurized
BLP-056LP	Waterload with pulling slug	5.2–5.9	1″ × 2″	VSWR, 1.50 min. to 1.70 max.
BL-570	Waterload, ridge guide	4.95–10.5	D19 Ridge	VSWR, 1.20 max. through C, Xb, XI and X bands
BL-594	Duplexer, balanced	5.25–5.75	1″ × 2″	P peak, 1 Mw

Xb BAND

Need a single tube? Or 50,000?
Bomac can meet your needs!

Xb BAND TR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
1B50	6550	200	Tunable

Xb BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
1B51	6425	200	Fixed tuned

Xb BAND Pressurizing Windows

PRODUCT NO.	FREQUENCY RANGE (KMC)	CENTER	VSWR (MAX.)	PEAK POWER (KW)	WAVE-GUIDE SIZE (RG)	MOUNTING
BL-123	6.15–6.85	6500	1.30	100	50/U	Solder

Xb BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY RANGE (KMC)	LINE SIZE	FEATURE
BL-570	Waterload, ridge guide	4.95–10.5	D19 Ridge	VSWR, 1.20 max. through C, Xb, XI, band X bands.

Bomac produces over 750 different types of microwave tubes and components.

X BAND

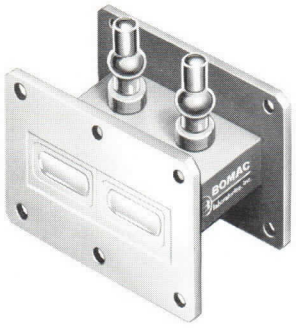
X BAND TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-9	8700–8900	8800	10	Fast recovery time
BL-10	9285–9335	9310	750	Crossed guide duplexer for high duty cycle
BL-20	9375±.1%	9375	20	Tunable, side arm ignitor
BL-29	9325–9425	9375	40	Crossed guide duplexer, fixed tuned
BL-47	9325–9425	9375	10	Crossed guide duplexer, for beacon application, low firing power
6378/BL-62	8490–9600	9375	30	No reservoir, miniaturized tunable
BL-80	8490–9578	9000	200	Tapped holes on input flange, clearance holes on output flange
BL-82	8490–9578	9000	250	Full RG-51/U flanges, no struts
6644/BL-95	8490–9578	9000	100	Short RT, 1.5 μs
BL-95A	8490–9578	9000	100	Short RT, 1.5 μs, extended temperature operation, no heater
1B63B	8490–9578	9000	200	1000 Hr. life
5863	8490–9578	9000	250	Bandpass for RG51/U guide, 5 element tube, input flange cut, Bell Lab. flanges
6035	8490–9578	9000	200	Fixed tuned, special mechanical dimensions
6164	8490–9560	9000	250	Controlled phase shift
6232	8490–9578	9000	250	For use in RG51/U guide; Bell Lab. input, X output
6368	8490–9578	9000	1000	Tuned for small guide
6795	8490–9578	9000	200	Miniaturized reversible contact type mounting, 3 elements Cell, 2 disc fixed tuned
724B	8541–9862	9300	75	
6645/BL-95H	8490–9578	9000	100	Extended temperature operation, heater mounted on tube
BL-611H	8490–9578	9000	200	Contains thermostat and heaters
BL-666	8490–9578	9000	200	Ignitors encapsulated, RT 9 to 14 μs
BL-909	9300–9450	9375	250	RT, 6 μs
7115/BL915	9000–9400	9200	40	Weather radar, 3 element, RT 10 μs
BL-916		8850	.5	Contains sweeping electrode
BL-919H	8490–9578	9000	100	Has heater and ceramic window
BL-921	8490–9578	9000	7 watts	Recovery RT 0.75 μs max.
BL-924	9250–9350	9300	.2	Crossed guide duplexer, RT 6 μs max.
BL-948	8490–9578	9000	100	Has phase control
BL-953	9300–10000	9650	7 watts	Recovery time 0.5 μs max.
BL-965	8500–9600	8900	10	For use on in-line crystal protection, used in RG/52 waveguide, "hot-cold," −55° C. to +85° C.
BL990	8490–9578	9000	250	VSWR 1.5 max., "hot-cold," −55° C. to +125° C.
BLT-001		9375	100	Has phase control ±5°
BLT-006	8750–8850	8800	1 watt	4 element TR with struts 1.070 in. long
BLT-011	9325–9425	9375	20	Min. firing power 100 mw (max.)
BLT-012		9245	100	−55° C. to +125° C. operation
BLT-058	8490–9578	9000	4	Operates at +125° C., has phase control
1B24A		9375	30	Tunable
1B63A	8490–9578	9000	200	Fixed tuned

X BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
6304/BL-43	9300	250	Contact type flange
BL-45	9375	250	Fixed tuned
BL-49	9430	250	
6629/BL-54	8800	250	Used with RG-51/U Guide
6630/BL-55	9375	250	Used with RG-51/U Guide
6393/BL-68	9300	250	Miniaturized
BL-69	8800	250	Miniaturized
BL-70	9375	250	Miniaturized, used with RG-51/U guide
BL-72	9600	250	
BL-73	9500	250	
BL-74	9550	250	
BL-75	9150	250	
BL-76	8900	250	
BL-77	8900	250	Used in half-height RG-52/U guide
6396	9300	250	Used in half-height RG-52/U guide

X BAND
Dual TR



PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6334/BL-27	8490–9578	9000	200	
6564/BL-71	8500–9600	9000	250	4 Element, used with RG-51/U guide
BL-78	8490–9578	9000	250	8–32 tapped flanges both ends
6642/BL-600	8490–9578	9000	250	RG-51/U input, RG-52/U output
6646/BL-604	8490–9578	9000	100	Rec. Time 1.5 μs (max.)
6647/BL-604H	8490–9578	9000	100	Has thermal control heaters
6648/BL-615	8490–9578	9000	200	Has special saddle type flange, supplied with gasket
BL-624	8500–9600	9000	200	11/64 inch thick flange, only 4 mounting holes
6805/BL-625	8490–9578	9000	200	Encapsulated ignitor, special saddle type flange
BL-631	8500–9600	9000	500	Has heavy flanges, to mate with choke flanges, RG-51/U guide in, RG-52/U guide out
BL-651H	8490–9578	9000	250	Supplied with heaters and thermostat, RT 3 μs
BL-668	8490–9578	9375	30	Dual 1B24, tunable
BL-669	8490–9578	9000	200	Encapsulated ignitor, controlled RT 9 to 14 μs
BL-682	8500–9600	9000	200	Output flange has 6 tapped holes; input flange has 6 clearance holes
BL-686	8500–9600	9050	40	RT, 50 μs 1 mu flat, 0.04 erg spike
BL-911	8490–9600	9000	250	Mounting flange has 2 holes instead of 4
BL-947	8490–9578	9000	100	Has phase control
BL-952	8490–9578	9000	500	Special input flange
BL-970	8490–9578	9000	300	Shortened tube (1.20 in. between flanges)
7381	8490–9610	9000	150	"hot — cold" TR, operating temp. range: —55° C. to +125° C.
BL-998	8500–9600	9000	500	Has phase control, special input flange
BLT-014	8490–9578	9000	200	Operates at +125° C., has phase control
6581	8500–9600	9050	250	5 element for large X guide
6796	8500–9600	9000	200	Short tube
6797	8500–9600	9000	200	Miniaturized for use in balanced duplexer

X BAND
Pre-TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-962	8500–9600	9000	250	Dual Pre TR tube used with short slot coupler with RG51/U input RG52/U output

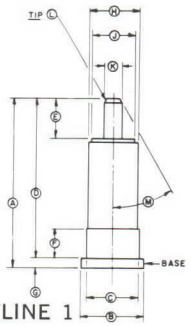
X BAND
Microwave Mixer Diodes

FORWARD POLARITY	REVERSE POLARITY	MATCHED PAIR (4) FORWARD	FORWARD & REVERSE	REVERSIBLE POLARITY(3)	TEST FREQUENCY (MC)	MAX. CONVERSION LOSS (db)
1N23B	1N23BR	1N23BM	1N23BMR	1N415B	9375	6.5
1N23C	1N23CR	1N23CM	1N23CMR	1N416C	9375	6.0
1N23D	1N23DR	1N23DM	1N23DMR	1N416D	9375	5.0
1N23E	1N23ER	1N23EM	1N23EMR	1N416E	9375	—
1N23WE(2)	1N23WER	1N23WEM	1N23WEMR	1N23WE	9375	6.0
1N149	1N149R	1N149M	1N149MR	1N149	9375	5.5
BL173	BL173R	BL173M	BL173MR	BL173	9375	5,5
BL169(5)	BL169R	BL169M	BL169MR	BL169	——	6.0

NOTES:

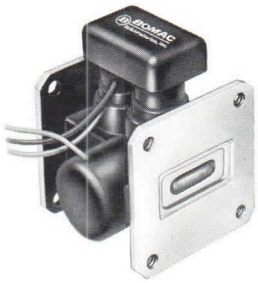
1. Polarity is indicated by the standard diode symbol:
   - A. Normal polarity is obtained with the base secured to the end opposite the symbol, which points toward the pin in the direction of easier (conventional) current flow.
   - B. Reverse polarity is obtained with the base secured to the other end of the cartridge. The arrow indicating direction of easier current flow then points toward the base.
2. Eccentricity between tip and base shall not exceed 0.0075.
3. Metal parts shall be gold plated, min. 10 MSI.
   Note: M and J alternate design permissible, 0.010 to 0.046 radius.

REF.	DIMENSION
A	0.820 ± 0.020
B	0.294 ± 0.002
C	0.250 + 0.000 — 0.004
D	0.768 ± 0.015
E	0.187 Min. 0.190 Max.
F	0.196 ± 0.003
G	0.052 ± 0.005
H	0.240 Max.
J	0.205 ± 0.010
K	0.093 ± 0.001
L	0.015 — 0.030 Chamfer
M	30° — 45° From Vertical



OUTLINE 1

X BAND
TR and Shutter

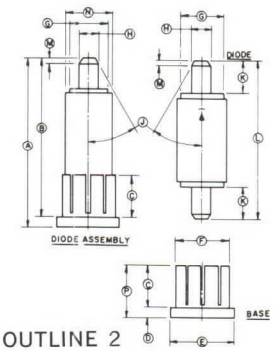


PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
6593/BL-310	8490–9578	250	28	
6615/BL-312	8490–9578	250	28	
6565/BL-313	8490–9600	30	14	Contains one 14 volt coil plus dropping resistor for 28 volt operation, tunable
6595/BL-316	8490–9600	30	3 (ac-dc)	60 ~ ac, tunable
6597/BL-320	8490–9578	250	6 (ac-dc)	
6616/BL-326	8490–9578	250	28	
BL-326H	8490–9578	250	28	Contains 28 volt heater and thermostat
BL-338H	8490–9578	100	28	Contains heater
BL-349	8490–9487	250	28	RT 7 μs at −55° C.
BL-356	8490–9578	250	28	Reversed ignitor, ignitor on right side facing tube output with shutter mechanism in upright direction
BL-359	8490–9578	200	28	RG-51/U input; RG-52/U output
BL-361	8490–9578	250	28	Contains input saddle flange, RT-1.5 μs
BL-363	8490–9578	4	28	BL-312 with ignitor moved to opposite side, has phase control
BL-367	8490–9578	250	28	Shutter and ignitor incapsulated, three lead wires for terminals
BL-367H	8490–9578	250	28	Has heater and thermostat
BL-368	8500–9600	200	28	Shutter and ignitor incapsulated, three lead wires in place of terminals
BL-371	9280–9320	10	28	Fast RT, low temp. operation
BL-372	8490–9578	10	28	
BL-375	9300–10,000	7 watts	14	
BL-385	8490–9578	250	28	One shutter only, ignitor on top of tube rather than on side
BL-388	8490–9578	250	28	Phase control, extended temp. −55° C. to +125 ° C.
BL-391	8500–9600	10	14	Single shutter, 20 db closed. Extended temp. −55° C. to +85° C.

X BAND
Dual TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
BL-307	8490–9578	250	28	
6596/BL-317	8490–9578	250	28	Tapped holes both flanges, ignitor lead extended through cap

MAX. OUTPUT NOISE RATIO (TIMES)	MAX. VSWR IN STD MIXER	POWER LEVEL (MW)	BURNOUT (ERGS)	CALC. OVERALL RECEIVER NOISE FIGURE (1)	IF IMP. (OHMS)	STANDARD MIXER	OUTLINE NO.
2.7	——	1.0	0.3	——	200–800	JAN 105	1
2.0	——	1.0	1.0	9.8	325–475	JAN 105	1
1.7	1.30	1.0	1.0	8.3	350–450	JAN 105	1
——	1.30	1.0	2.0	7.5	335–465	JAN 105	1
1.4	1.30	1.0	2.0	7.5	335–465	JAN 105	2
1.5	1.50	1.0	1.0	8.3	325–475	JAN 105	1
1.4	1.30	1.0	2.0	7.0	335–465	JAN 105	2
2.0	1.50	——	2.0	9.8	325–475	——	2



OUTLINE 2

REF.	DIMENSION
A	0.820 ± 0.020
B	0.768 ± 0.015
C	0.196 ± 0.003
D	0.053 Ref.
E	0.294 D ± 0.002
F	0.248 D ± 0.002
G	0.205 D ± 0.010
H	0.093 D ± 0.001
J	10° — 45° From Vert.
K	0.187 Min. 0.190 Max.
L	0.790 ± 0.018
M	0.015 — 0.030 Chamfer
N	0.240 D Max.
P	0.250 + 0.000 — 0.004

NOTES:

1. Overall noise figure calculated from formula N = CL (NiF + NR-1) NiF is assumed as 1.5 db (30 mc/s1F).
2. 1N23WE & 1N21WE are environmentally tested under extreme conditions according to MIL-E-1/1117 & MIL-E-1/1117 JAN. Spec. Resp.
3. The reversible polarity cartridge types are electrically and mechanically identical to their fixed polarity counter parts and are directly interchangeable with the indicated fixed polarity types.
4. Matched pairs of Bomac Lab. mixer diodes are available and are matched to the following limits:
   If impedance, 25 ohms
   Conversion, Loss 0.3 db
   Current 5% max. Signal loss to L.O. Feed arm.
5. BL169 diodes are specially designed for Doppler Radar Systems requiring relatively constant overall noise figures over large L.O. power levels. Freq. range 8600 mc-9700 mc.

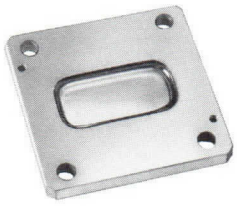
X BAND
Dual TR and Shutter

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
6599/BL-322	8490–9578	250	6 (ac-dc)	
6613/BL-324	8490–9578	250	28	Short ignitor to reduce overall length
6601/BL-327	8490–9578	250	28	RG 51/U Input; RG 52/U output
BL-335	8490–9578	250	28	Controlled recovery time leads encapsulated
BL-339H	8490–9578	100	28	Contains heater
BL-341	8490–9578	250	28	RG 51/U input RG 52/U output
BL-344	8490–9578	250	28	Saddle type input flange not for use with hybrids
6904/BL-348	8490–9578	250	28	Heavy flange construction
BL-354	8490–9578	250	28	Contains special terminal board
BL-360H	8490–9578	100	28	Tubulation on reverse side, contains heater
BL-374	8490–9578	250	28	Cadmium plated flanges
BL-387	8500–9600	500	28	
BL-389	8490–9578	250	28	Clearance holes on input flange, ignitor resistors encapsulated, 25 to 85° C. operating temperature

X BAND
Shutter (only)

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE (VDC)	FEATURE
6600/BL-323	8490–9600	1	3 (ac-dc)	May use 6 volt ac-dc supply with 5 watt, 5 ohm resistor in series, tunable
BL-325	8490–9578	1	28	
BL-334	9375	1	14	May be operated on 28 Vdc with a 100 ohm, 5 watt resistor in series
BL-364	9600–10,000	1	28	
BL-365	8490–9578	1	28	Dual
BL-384	8200–8600	1	28	
BL-390	9600–10,400	1	20–29	

X BAND
Pressurizing Windows



PRODUCT NO.	FREQUENCY RANGE (KMC)	CENTER (MC)	VSWR (MAX.)	PEAK POWER (KW)	WAVE-GUIDE SIZE (RG)	MATES WITH (UG)	MOUNTING
BL-119	8.7–8.9	8800	1.10	200	52/U	40/U	Flange
BL-132	8.49–9.578	9000	1.12	200	52/U	40A/U	Flange
BL-722	8.49–9.578	9000	1.12	200	51/U	52A/U	Flange
BL-710	8.5–9.6	9050	1.12	200	52/U	52A/U	Flange
BL-112	8.83–9.33	9080	1.10	200	52/U	40/U	Flange
BL-117	8.83–9.33	9080	1.10	200	52/U	40A/U	Flange
BL-122	8.645–9.555	9100	1.15	200	52/U	40A/U	Flange
BL-139	8.49–9.6	9100	1.15	250	51/U	52A/U	Flange
BL-106	8.55–9.95	9245	1.20		52/U	40/U	Flange
BL-105	9.15–9.6	9375	1.10	430	51/U	52/U	Flange
BL-145	9.15–9.6	9375	1.10	200	52/U	40A/U	Flange
BL-755	8.85–9.15	9000	1.20	100	52/U		Solder
BL-794	8.4–9.6	9000	1.20	200	52/U		Solder
BL-789	8.99–9.21	9100	1.10	150	52/U		Solder
BL-107	9.21–9.41	9310	1.10	100	51/U		Solder
BL-114	9.2–9.42	9310	1.10	150	52/U		Solder
BL-125	9.2–9.42	9310	1.10	150	52/U		Solder
BL-764	9.2–9.4	9375	1.10	150	52/U		Solder
BL-788	9.29–9.51	9400	1.10	150	52/U		Solder
BL-136	9.4–9.6	9500	1.20	150	52/U		Solder
BL-774	9.6–10.2	9800	1.10	150	52/U		Solder

X BAND
Magnetrons

PRODUCT NO.	FREQUENCY RANGE (MC)	MIN. PEAK POWER (WATTS)	MIN. AVERAGE POWER (WATTS)	OUTPUT MATES WITH	FEATURE
BLM-003	9000–9500	150	0.3	TNC	Tunable, high efficiency and stability
BLM-014	8500–9000	150	0.3	TNC	Tunable, high efficiency and stability
BLM-015	9000–9500	350	0.7	TNC	Tunable, high efficiency
7503/BLM-024	9300–9500	100	0.3	TNC	Tunable
7446/BL-233	9375 ± 30	800	0.8	UG40A/U	Fixed tuned, waveguide output
BLM-012	8900–9400	1000	2.0	TNC	Tunable
BLM-021	8900–9400	1000	2.0	UG40A/U	Tunable
5780	8500–9600	250Kw	83	UG52A	Tunable, high power

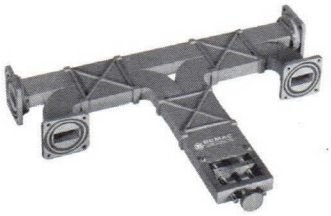
X BAND
Klystrons

PRODUCT NO.	TUNING	FREQUENCY RANGE (MC)	AVERAGE POWER (MW)	RESONATOR POTENTIAL (dc Volts)	FEATURE
BL-801	Tunable	8500–9600	30	300	3 pin base and reflector cap; external cavity tuning
6316/BL-800A	Tunable	8500–10,000	20	200	Moulded flexible leads to viking connector; operates into a 1.5:1.0 mismatch
6781/BL-803	Tunable	8500–10,000	20	200	Moulded flexible leads to viking connector; operates into a 1.5:1.0 mismatch
6780/BL-800	Tunable	8500–10,000	25	200	Moulded flexible leads to viking connector
BL-811	Fixed	8500–10,000	25	210	Moulded flexible leads to viking connector; temp. comp. 0.008 Mc/° C.
6310	Tunable	8500–10,000	70	300	3 pin base and reflector cap
6312	Tunable	8500–10,000	70	300	Moulded flexible leads
BL-806	Tunable	8500–10,000	300	500	3 pin base and reflector cap
BL-825	Tunable	8500–10,000	500	500	Moulded flexible leads
BL-807	Tunable	8500–10,500	120	350	Moulded flexible leads to viking connector
BL-818	Tunable	8500–10,500	120	350	Winchester connector M9P
BL-830	Tunable	8690–8790	15	250	3 pin base and reflector cap; external cavity tuning
BL-815	Fixed	9142–9152	30	200	Moulded flexible leads
BL-831	Fixed	9260	80	300	Moulded flexible leads
BL-832	Fixed	9340	80	300	Moulded flexible leads
BL-814	Tunable	10,400–12,300	200	400	3 pin base and reflector cap
BL-812	Tunable	8500–9600	60	300	External cavity tuning; moulded flexible leads, severe environmental
BL-829	Fixed	8000–9500	500	525	Exceptional frequency stability under vibration; moulded flexible leads, severe environmental
BL-802	Tunable	8800–9200	30	250	External cavity tuning; moulded flexible leads, severe environmental
BL-819	Tunable	9000–9200	60	300	External cavity tuning; moulded flexible leads, severe environmental
BL-820	Tunable	9050–9250	60	300	External cavity tuning; moulded flexible leads, severe environmental
BL-824	Tunable	9200–9500	60	300	External cavity tuning; moulded flexible leads, severe environmental

X BAND
Noise Source

PRODUCT NO.	FREQUENCY RANGE (KMC)	NOISE (db)	OPERATING CURRENT	RECOMMENDED MODE OF OPERATION
BL-721	8.400–12.500	15.28 ± .25	200 ma	DC
6357	8.200–12.400	15.28 ± .25	200 ma	DC

X BAND
Components



PRODUCT NO.	PRODUCT	FREQUENCY (KMC)	LINE SIZE	FEATURE
BLP-055L	Waterload	8.5–9.6	½″ × 1″	VSWR, 1.06 Max., P peak 400 Kw pressurized, 200 Kw unpressurized
BLP-055LP	Waterload With Pulling Slug	8.5–9.6	½″ × 1″	VSWR, 1.50 min. to 1.70 Max.
BL-570	Waterload, Ridge Guide	4.95–10.5	D19 Ridge	VSWR, 1.20 max. through C, Xb, XI, and X bands
BLP-044D	Duplexer, Balanced	8.490–9.578	½″ × 1″	P peak, 200 Kw Max.
BL-507	Duplexer, Balanced, Less Hybrid Arms	8.490–9.578	½″ × 1″	P peak, 250 Kw
BL-509	Duplexer, Balanced, Less Hybrid Arms	8.490–9.578	½″ × 1″	P peak, 250 Kw; includes 28 V shutter
BL-515	Duplexer, Balanced	8.490–9.578	½″ × 1″	P peak, 250 Kw; includes termination
BL-539	R. F. Package	8.5–9.7	½″ × 1″	P peak, 250 Kw; includes balanced Duplexer, balanced receiver mixer and balanced AFC mixer
BL-528	Antenna	9.2–9.4	½″ × 1″	VSWR, 1.2 max.
BL-543	Discriminator	9.150	½″ × 1″	Q, 1900–2400, P peak, 180 watts
BL-568	Filter	9.839–9.843	½″ × 1″	Insertion loss, 2.0 db max. 9.839–9.843, 45.0 db min. at 9.790
BLP-059	Power Divider, Variable	8.5–9.6	½″ × 1″	400 Kw pressurized, 200 Kw unpressurized
BLP-051E	Diplexer	8.5–9.6	½″ × 1″	Isolation, 25 db min.
BL-592	Noise Source	8.5–10.0	½″ × 1″	Excess noise ratio 14.5–15.0 db. Includes termination
BLP-045T	Transition To Coaxial Line	8.3.8.7	½″ × 1″	Includes TNC plug, VSWR, 1.10 max.
BLP-046T	Transition To Coaxial Line	8.7–9.1	½″ × 1″	Includes TNC plug, VSWR, 1.10 max.
BLP-047T	Transition To Coaxial Line	9.1–9.5	½″ × 1″	Includes TNC plug, VSWR, 1.10 max.

X BAND Components

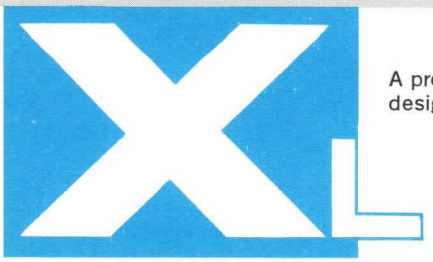
PRODUCT NO.	PRODUCT	FREQUENCY (KMC)	LINE SIZE	FEATURE
BLP-063	Directional Coupler Crossguide	8.5–9.6	½″ × 1″	Incident power, 100 Kw, coupling, 20, 30, or 40 db, Directivity, 15 db min.
BLP-068	Directional Coupler, Sidewall	8.5–9.6	½″ × 1″	Incident power, 200 Kw, coupling 20, 30, or 40 db, directivity, 20 db min.
BLP-073	Directional Coupler, Topwall	8.5–9.6	½″ × 1″	Incident power, 100 Kw, coupling, 10, or 20 db, directivity, 40 db min.

X BAND Microwave Cavities

PRODUCT NO.	FREQUENCY (MC)	QL	IL (db)	FEATURE
1Q22	9250	1900–2400	4–6	
1Q23	9280	1900–2400	4–6	
1Q24	9310	1900–2400	4–6	Transmission, copper body, aluminum mounting block temperature coefficient .015 Mc/° C.
5846	9280	2100	4–6	
6040	9308	2100	4–6	
6041	9312	2100	4–6	

The 1Q series shown above may be made to order in the frequency range of 9230 to 9330 and with a maximum QL of 3000 and a corresponding min. IL of 10 db. With relaxed temperature coefficient the frequency range may be expanded to cover 9000 to 10,000 mc.

1Q26A	9280	1000–1500	4–8	Small invar transmission cavity with temperature coefficient of .006 Mc/° C.
6301	9270	1000–1500	5–8	Small invar transmission cavity with temperature coefficient of .006 Mc/° C.
6452	9350	1500–2000	4–8	Small invar transmission cavity with temperature coefficient of .006 MC/° C.
BL-441	9280	2000–3000	4–8	Small invar transmission cavity with temperature coefficient of .006 Mc/° C.
BL-468	X-band	1950 Nominal	5–8	Transmission cavity six positions detent, fixed tuned up to 25 Mc separation. Temperature coefficient .009 Mc/° C.
BL-469	X-band	1200–2500	7–13	Dual mode six position detent, fixed tuned up to 100 Mc separation. Temperature coefficient .005 Mc/° C.
BL-436	6200	15,000	20 Max.	Tunable ± 30 Mc for D19 ridged waveguide systems, temperature coefficient .0125 Mc/° C.
BL-437	7300	15,000	20 Max.	Tunable ± 30 Mc for D19 ridged waveguide systems, temperature coefficient .0125 Mc/° C.
BL-438	8800	15,000	20 Max.	Tunable ± 30 Mc for D19 ridged waveguide systems, temperature coefficient .0125 Mc/° C.
BL-439	10,500	15,000	20 Max.	
BL-470	X-band	2000–2500	6 Max.	Reference cavity fixed tuned. VSWR 1.4 max. temperature coefficient .0038 Mc/° C. Controlled input and output reference plane location.
BL471	X-band	90,000 (approx.)	"Echo Box"	Dual frequency fixed tuned ring time in excess of 20 μsec. Difference in ring time between frequencies less than 3 μsec.
BL472	X-band	1000–1400	8–10	"Plug-In" transmission cavity for quick change of frequency over a 8500 to 9600 Mc range, temperature coefficient .006 Mc/° C.
BL-459	8800	1200–1800	8 Max.	Transmission cavity, fixed tuned, lightweight model temperature coefficient, .007Mc/°C.
BL-466	9790	6000	10 Max.	Dual mode discriminator, fixed tuned, small size peak-to-peak frequency difference 3–6 Mc
BL-435	9280–9355	1950 Nominal	5–8	Similar to BL-468. Six frequencies 15.0 Mc apart.
BL-414	11,000	2150	4–6	



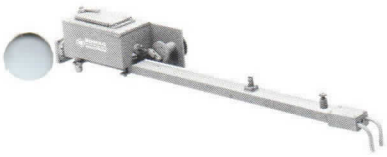
A problem in gas switching tube design? Ask Bomac!

BAND

XL BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY KMC	LINESIZE (WG)	FEATURE
BLP-083	Power divider, variable	8.5–9.6	⅝″ × 1¼″	P peak, 700 Kw pressurized, 350 Kw unpressurized

XL BAND Components



PRODUCT NO.	PRODUCT	FREQUENCY KMC	LINE SIZE (WG)	FEATURE
BLP-084E	Diplexer	8.5–9.6	5/8" × 1¼"	P peak, 700 Kw pressurized, 350 Kw unpressurized, isolation 25 db min.
BLP-064	Directional coupler, crossguide	8.5–9.6	5/8" × 1¼"	Incident power 175 Kw, coupling, 20, 30, or 40 db, directivity 15 db min.
BLP-069	Directional coupler, sidewall	8.5–9.6	5/8" × 1¼"	Incident power, 350 Kw, coupling, 20, 30, or 40 db, directivity, 20 db min.
BLP-074	Directional coupler, topwall	8.5–9.6	5/8" × 1¼"	Incident power, 175 Kw, coupling, 10, or 20 db, directivity, 40 db min.
BLP-085L	Waterload	8.5–9.6	5/8" × 1¼"	VSWR, 1.06 max., P peak, 700 Kw pressurized, 350 Kw unpressurized
BLP-085LP	Waterload with pulling slug	8.5–9.6	5/8" × 1¼"	VSWR, 1.50 min. to 1.70 max.
BL-570	Waterload, ridge guide	4.95–10.5	D19 Ridge	VSWR, 1.20 max. through C, Xb, X1, and X bands
BL-516	Duplexer, balanced less hybrid arms	8.5–9.6	5/8" × 1¼"	P peak, 250 Kw
BL-542	Duplexer, balanced	8.490–9.578	5/8" × 1¼" input ½" × 1" output	P peak, 200 Kw, includes 28 V shutter

Ku BAND

At Bomac, flexible production techniques permit single unit or volume production to the same high standards.

Ku BAND TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-16	16,200–16,800	16,500	40	Tunable, integral cavity
6649/BL-56	15,000–17,000	16,000	100	Bandpass, fixed tuned
BL-908	15,500–17,500	16,500	100	Fixed bandpass, tuned
BL-967	16,000–17,000	16,500	10	Cad. plated, ± 3° phase control, operating temperature 100° C.
BL-993	16,000–17,000	16,500	10	Crystal protector TR, — 37° C. to + 83°C. operating temperature

Ku BAND ATR

PRODUCT NO.	CENTER (MC)	POWER LEVEL (KW) MAX.	FEATURE
BL-15	16,500	40	Fixed tuned

Ku BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6560/BL-35	15,000–17,000	16,000	100	Bandpass
BL-667	15,675–17,325	16,500	100	
BL-907	15,500–17,500	16,500	100	Bandpass
BL-934	16,000–17,000	16,500	100	Cad. plated flanges
BL-934A	16,000–17,000	16,500	100	± 3° phase control

Ku BAND Microwave Cavities

PRODUCT NO.	FREQUENCY RANGE (MC)	QL	IL (db)	FEATURE
BL-473	Ku band	3200–4000	4.0 Max.	Transmission cavity weight, 4 oz. Temperature coefficient, .02 Mc/° C.
BL-474	16,280	5000–8000	15 Max.	Fixed tuned, dual-mode cavity Temperature coefficient, .02 Mc/° C.
BL-452	16,230–16,330	5000–8000	15 Max.	Tunable, dual-mode cavity with micrometer calibration. Temperature coefficient. .02 Mc/° C.

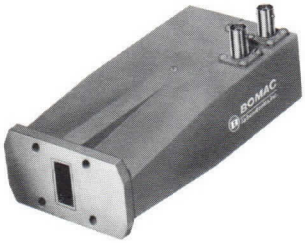
Ku BAND
Pressurizing Windows

PRODUCT NO.	FREQUENCY RANGE (KMC)	CENTER (MC)	VSWR (MAX.)	PEAK POWER (KW)	WAVEGUIDE SIZE (RG)	MOUNTING
BL-777	12.4–18.0	15,200	1.12	100	91/U	Flange
BL-144	15.84–16.16	16,000	1.08	100	91/U; 107/U	Flange
BL-133	15.0–17.0	16,000	1.15	75	91/U	Flange
BL-711	12.5–13.5	13,000	1.25	50	91/U	Solder
BL-707	13.45–13.55	13,500	1.10	50	91/U	Solder
BL-729	13.51–13.48	13,500	1.07	50	91/U	Solder
BL-731	13.45–13.55	13,500	1.10	50	91/U	Solder
BL-143	15.92–16.08	16,000	1.10	50	91/U	Solder
BL-754	16.0–16.2	16,100	1.10	80	91/U	Solder
BL-116	16.3–16.7	16,500	1.10	50	91/U	Solder

Ku BAND
Magnetrons

PRODUCT NO.	FREQUENCY RANGE (MC)	MIN. PEAK POWER	MIN. AVERAGE POWER (WATTS)	OUTPUT MATES WITH	FEATURE
BL-216	15,900–16,100	100KW	100	UG541/U	Fixed Tuned, Compact
BLM-027	16,000–16,400	500W	1.5	UG541/U	Tunable, Lightweight

Ku BAND
Components



PRODUCT NO.	PRODUCT	FREQUENCY RANGE (KMC)	LINE SIZE (WG)	FEATURE
BL-579	Noise source	12.4–18.0	.391″ × 702″	Excess noise ratio 14.5–15.0 db Includes termination.
BLP-062	Directional coupler, crossguide	16.0–17.0	.391″ × 702″	Incident power, 60 Kw coupling, 20, 30, or 40 db, directivity, 15 db Min.
BLP-067	Directional coupler, sidewall	16.0–17.0	.391″ × 702″	Incident power, 120 Kw, coupling, 20, 30, or 40 db, directivity, 20 db min.
BLP-072	Directional coupler, topwall	16.0–17.0	.391″ × 702″	Incident power, 60 Kw, coupling, 10, or 20 db, directivity 40 db min.
BLP-054L	Waterload	16.0–17.0	.391″ × 702″	VSWR, 1.06 max., P peak, 240 Kw pressurized 120 Kw unpressurized
BLP-054LP	Waterload with pulling slug	16.0–17.0	.391″ × 702″	VSWR, 1.50 min. to 1.70 max.
BLP-058	Power divider, variable	16.0–17.0	.391″ × 702″	P peak, 240 Kw pressurized, 120 Kw unpressurized
BL-557	R. F. package	15.9–16.9	.391″ × 702″	P peak, 100 Kw includes balanced duplexer, balanced receiver mixer and balanced AFC mixer
BLP-086E	Diplexer	16.0–17.0	.391″ × .702″	P peak, 240 Kw, pressurized, 120 Kw unpressurized; isolation, 25 db min.

Bomac products are used wherever radar serves

K BAND

K BAND
TR tubes

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
6282/BL-11	23,350–24,950	24,000	35	Bandpass, fixed tuned
6650/BL-67	23,630–24,500	23,984	100	No reservoir
BL-621	23,630–24,580	23,984	24	Miniaturized reservoir
BLT-002	23,350–24,950	24,000	40	Fast recovery time
1B26	23,630–24,580	23,984	24	Tunable

K BAND ATR

PRODUCT NO.	CENTER FREQUENCY (MC)	POWER LEVEL (KW) MAX.	FEATURE
BL-627	24,000	30	Reduced overall length, countersunk exhaust tube
BLA-001	24,000	40	Fast recovery time
1B36	24,000	30	Fixed tuned

K BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.
BL-645	23,200–24,800	24,000	30

K BAND Shutter (only)

PRODUCT NO.	FREQUENCY RANGE (MC)	POWER LEVEL (KW) MAX.	SHUTTER CIRCUIT VOLTAGE	FEATURE
6588/BL/315	23,750–24,250	1	14	14 volt coil with resistor for 28 volt operation

K BAND Magnetrons

PRODUCT NO.	FREQUENCY RANGE (MC)	MIN. PEAK POWER (KW)	MIN. AVERAGE POWER (WATTS)	OUTPUT MATES WITH	FEATURE
6551	23,800–24,270	40	24	UG596/U*	Fixed tuned
BLM-006	23,800–24,270	40	12	UG596/U*	Fixed tuned, very short pulse
					*Modified per Bomac Spec.

K BAND Pressurizing Windows

PRODUCT NO.	FERQUENCY RANGE (MC)	CENTER FREQUENCY (KMC)	VSWR (MAX.)	PEAK POWER (KW)	WAVEGUIDE SIZE (RG)	MOUNTING
BL-715	24,000	23.1–24.9	1.20	50	53/U	Solder

K BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY RANGE (KMC)	LINE SIZE (WG)	FEATURE
BLP-053L	Waterload	23.5–24.5	¼″ × ½″	VSWR, 1.06 max.
BLP-053LP	Waterload with pulling slug	23.5–24.5	¼″ × ½″	VSWR, 1.50 min. to 1.70 max.
BLP-027D	R. F. Package	23.7–24.3	¼″ × ½″	P Peak 38 to 50 Kw, includes duplexer, balanced receiver and AFC mixers

Every Bomac tube and component is 100% tested before shipment

Ka BAND

Ka BAND TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.	FEATURE
BL-639	33,500–35,500	34,500	20	Broadband TR
BL-904	33,700–35,700	34,700	20	Broadband TR
6545	33,814–35,906	34,860	100	Tunable

Ka BAND Dual TR

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER	POWER LEVEL (KW) MAX.
6685/BL-616	33,500–36,250	34,500	20

Ka BAND Pressurizing Windows

PRODUCT NO.	FREQUENCY RANGE (MC)	CENTER (KMC)	VSWR (MAX.)	PEAK POWER (KW)	WAVEGUIDE SIZE (RG)	MATES WITH (UG)	MOUNTING
BL-737	34,500	34.2–34.8	1.15	20	96/U	600/U	Solder
BL-760	34,900	34.6–35.2	1.15	20	96/U	600/U	Solder

Ka BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY RANGE (KMC)	LINE SIZE (WG)	POWER LEVEL (KW) MAX.	FEATURE
BL-527	Dual TR balanced duplexer with short slot hybrids	33.50–36.25	.112 x .224	20	Integral design with hybrids permanently attached

V BAND

Bomac maintains fully staffed engineering departments for research and development.

V BAND Magnetrons

PRODUCT NO.	FREQUENCY RANGE (MC)	MINIMUM PEAK POWER (KW)	MINIMUM AVERAGE POWER (W)	OUTPUT MATES WITH	FEATURE
BL-235	51,000–54,000	8	5.6	UG385/U*	Fixed tuned
BL-236	54,000–57,000	8	5.6	UG385/U*	Fixed tuned
BL-237	57,000–60,000	8	5.6	UG385/U*	Fixed tuned

*Modified per Bomac spec.

V BAND Components

PRODUCT NO.	PRODUCT	FREQUENCY RANGE (KMC)	LINE SIZE (WG)	FEATURE
BLP-052L	Waterload	69.0–71.0	.154″ × .228″	VSWR, 1.06 max.
BLP-052LP	Waterload with pulling slug	69.0–71.0	.154″ × .228″	VSWR, 1.50 min. to 1.70 max.

cell types

The electrical characteristics of cell type tubes largely depend upon the parameters of the cavity in which the tube is used. The test frequency shown is not the only usable frequency. The engineering department should be consulted for information about applications for other frequencies.

PRODUCT NO.	TEST FREQUENCIES	PEAK POWER LEVEL	FEATURE
6638/BL-99	3300	50 Kw	Positive ignitor operation
BL-8	2700–3400	50 Kw	Attenuator type
1B27	2600–3000	50 Kw	Tunable
6637/BL-31	3300	50 Kw	Tunable, ruggedized
BL-966	1215–1355	450 Kw	Tunable, special disc
6322/BL-25	1215–1355	450 Kw	Tunable
BL-635	1215–1355	450 Kw	Motorized tuning
BL-622	400–450	2 Mw	Fixed tuned, flange mount, 3⅛ coax.
BL-7309/693	400–450	2 Mw	" " " " 3⅛ coax.
BL-929	400–450	2 Mw	" " " " 3⅛ coax.
BL-930	400–450	20 Kw	" " " " 3⅛ coax.
7324/BL-931	400–450	2 Mw	Fixed tuned, plug-in mount, 3⅛ coax.
BL-931A	400–450	2 Mw	" " " " " 3⅛ coax.
BL-984	409–417	20 Kw	" " " " " 6⅛ coax.
BL-991	400–450	2 Mw	Fixed tuned, plug-in mount, 3⅛ coax.

cell types (cont'd)

PRODUCT NO.	TEST FREQUENCIES	POWER LEVEL	FEATURE
BL-994	400–450	20 Kw	Fixed tuned, plug-in mount, 3⅛ coax.
BL-995	400–450	2 Kw	" " " " " ⅞ coax.
BL-999	400–450	2 Kw	" " " " " ⅞ coax.
BLT-004	400–450	2 Mw	" " " " " 3⅛ coax.
BLT-005	400–450	2 Mw	" " " " " 3⅛ coax.
BLT-018	400–450	2 Kw	" " " " " ⅞ coax.
BLT-019	400–450	2 Mw	" " " " " 3⅛ coax. Metal reservoir
BLT-020	400–450	20 Kw	Fixed tuned, plug-in mount, 3⅛ coax.
BLT-021	400–450	20 Kw	" " " " " ⅞ coax.
BL-960A	400–450	10 Kw	" " " " " ⅞ coax.
BL-690	400–450	2 Mw	Tunable, plug-in mount, external cavity
BL-696	2800–3330	350 Kw	Fixed tuned
BL-959	409–417	2 Mw	Fixed tuned, plug-in mount, 6⅛ coax.

special devices

PRODUCT NO.	SPECIAL DEVICES
BL813	Thermal fuse switch (1 normally open circuit), cantilever spring-type construction
BLN-004	Transistorized ignitor Supply, Input — 28 V DC (nom). output 750 V at μA (nom) Miniaturized
BLN-008	Network switching tube, improved BL-148, coil housing, 0.054 greater dia. than BL-148
BLN-009	Ignitor supply, input 115 V — 60 cycle AC 800 V at 200 micro-amperes, (max.) output
5675	Pencil tube 3000 megacycles Cw, low Mu
5876	Pencil tube triode, 3000 megacycles Cw, high Mu

surge protectors

OUTLINE NO. 1

TUBE TYPE	BREAKDOWN (KV) MIN.	MAX.
BL-745	5	6
BL-752	5.5	6.5
BLN-005	6.5	7.5
BL-724	7.2	7.7
BL-717	8.5	10
BL-718	10.5	12
BL-787	11.5	12.6
BL-778	14	16
BLN-001	16	18
BL-700	18	20
BL-716	24	27
BLN-003	31	40
BL-146	32	35

OUTLINE NO. 2

TUBE TYPE	BREAKDOWN (KV) MIN.	MAX.
1B41	8.7	10.2
1B45	14.5	16.5
BL-735	16	18
BL-784	19	21
BL-785	23	25
BLN-010	39	45

OUTLINE NO. 3

TUBE TYPE	BREAKDOWN (KV) MIN.	MAX.
BL-744	1.5	2.5
BLN-006	2.3	3.0

OUTLINE NO. 4

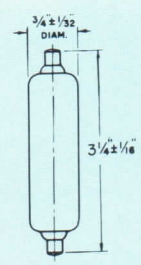
TUBE TYPE	BREAKDOWN (VOLTS) MIN.	MAX.
BL-779	200	300

OUTLINE NO. 5

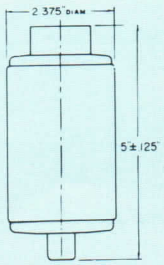
TUBE TYPE	BREAKDOWN (KV) MIN.	MAX.
1B31	6.8	9.9

OUTLINE NO. 6

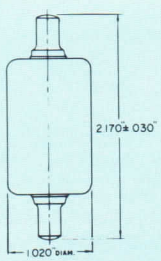
TUBE TYPE	BREAKDOWN (KV) MIN.	MAX.
1B22	2	3



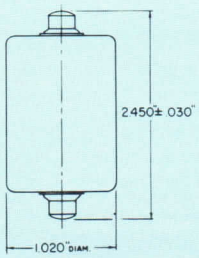
OUTLINE 1



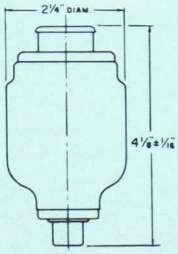
OUTLINE 2



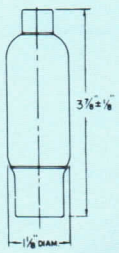
OUTLINE 3



OUTLINE 4



OUTLINE 5



OUTLINE 6

BOMAC laboratories, inc.

SALEM ROAD • BEVERLY, MASSACHUSETTS

A SUBSIDIARY OF VARIAN ASSOCIATES

The following information outlines recommended procedures for the procurement of Bomac products.

ORDERING

Orders for microwave tubes and related components are normally placed through the Bomac representative in your area, but may be placed directly with the factory. It is to your advantage to place orders through your Bomac representative . . . by so doing, you can take advantage of a complete local order service. The Bomac type number must be specified when possible.

SPECIFICATIONS

Bomac tubes are fully specified and copies of the Bomac test specifications, which are usually printed in the same format as used by government services (MIL-E-1), are available upon request. Proper system operation should not depend upon tube characteristics which are not covered by the tube specifications. Bomac guarantees only those characteristics covered in our specifications. If additional specification items are required for your application, please contact your Bomac field representative. Your specifications and/or drawings should be referenced on your order only if approved by Bomac.

MILITARY SPECIFICATIONS

Most Bomac tubes can be supplied fully tested in accordance with military test specifications. Detailed information gladly furnished.

SHIPPING

Air Express and Air Parcel Post is generally recommended for light weight shipments and will insure careful handling. Truck or rail handling are recommended for large shipments.

DELIVERY

Delivery schedules vary depending on the tube and quantity ordered. Prompt shipment from stock on orders for small quantities of most standard tube types is general practice. However, we recommend that you contact the nearest Bomac representative for delivery information at the time you place an order. Orders for large quantities require from 90 to 120 days lead time depending on tube type and size of order. Full information will be provided by your Bomac representative.

RETURNS

Items should be returned to the factory *only* after authorization has been obtained from the factory or your Bomac representative. In requesting authorization give the Bomac type number, serial number and complete information concerning the reason for return. Items which have exceeded the applicable warranty period should not be returned. When authorization is received the tube should be shipped to Salem Road, Beverly, Mass. prepaid. A copy of the authorization should be returned with the tube. Allow 30 days for testing and analysis. Adjustments on tubes with manufacturing defects are made on a pro-rata basis, provided the tube has been operated within published limits and is within the warranty period.

SERVICE

Your Bomac representative will be glad to provide whatever information and technical data you may require and is authorized to handle all sales and services required.

PRICES

All prices are net and are not subject to trade or other discounts. Quantity prices are offered on most standard production items. Multiple orders for a single tube type must be mailed simultaneously in order to qualify for quantity prices. Additional information on quantity pricing may be obtained from your Bomac representative.

TERMS

Payment terms are net 30 days. When credit can not be established shipment will be made C.O.D., shipping charges collect, or on receipt of advance payment. Prices are all f.o.b. shipping point. Inquiries and orders for export should be sent directly to our foreign representatives.

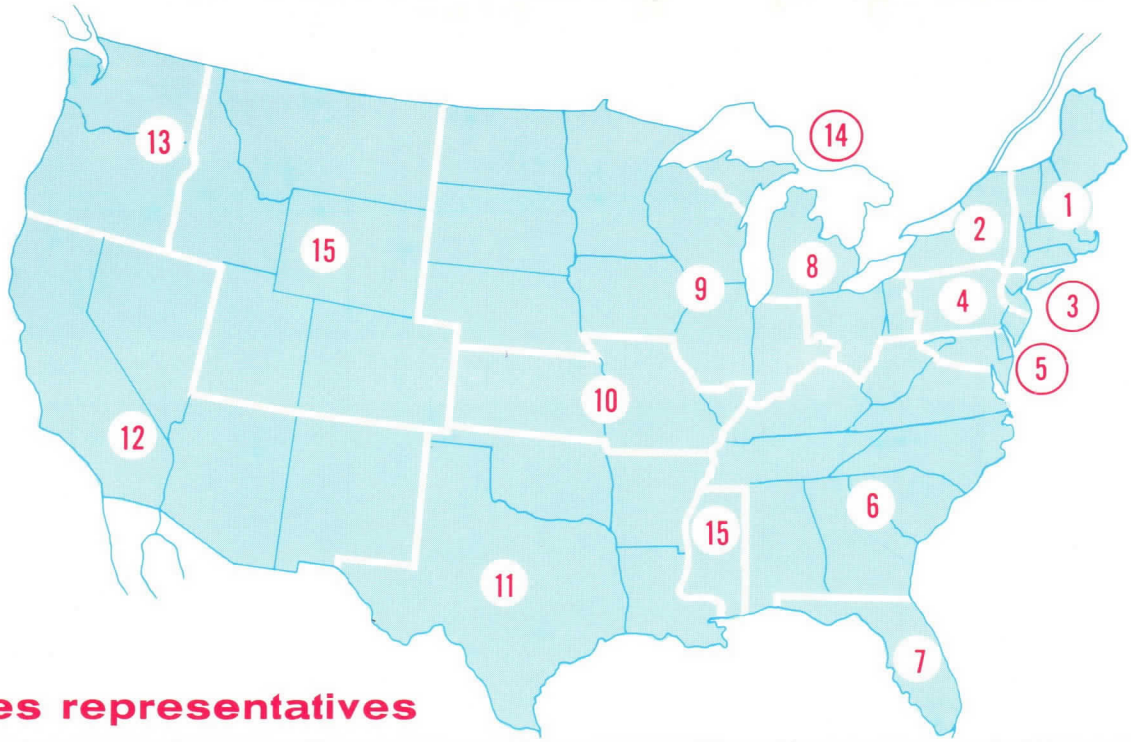
WARRANTIES

All Bomac products are fully tested before shipment and are warranted to perform satisfactorily. Should any product prove unsatisfactory, please contact your Bomac field representative.

APPLICATIONS ENGINEERING

A staff of engineers specially qualified in the application of microwave tubes to modern systems is available to assist you with your special applications problems. This service is offered not only to the designer of new systems, but to the manufacturer during production and to the end-user of Bomac products.

PRODUCT INDEX



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POUGHKEEPSIE, N.Y.
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BOMAC laboratories, inc.

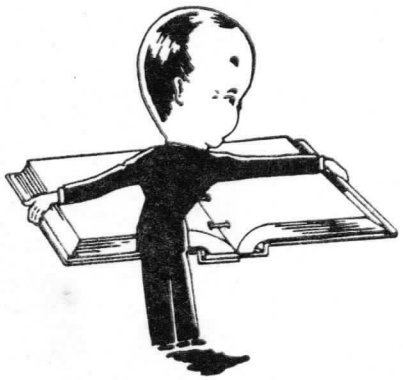
SALEM ROAD • BEVERLY, MASSACHUSETTS • WAlker 2-6000
A SUBSIDIARY OF VARIAN ASSOCIATES

PRINTED IN U.S.A. — 70M — 560

T.P.D.

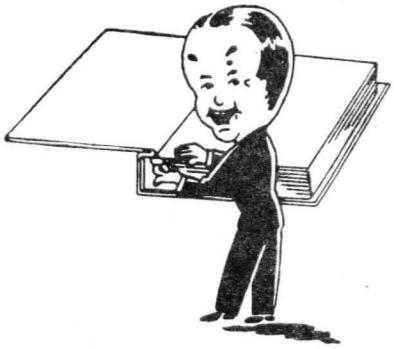
Received 13-9-61

How TO OPERATE THE HEINN AUTOMATIC B-VELOCITY BINDER



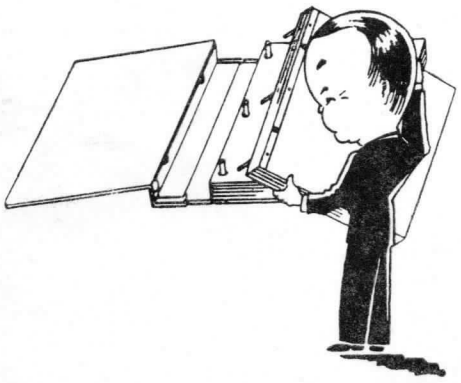
1

To Use Binder — Open to sheet required — Pull both top and bottom covers as illustrated, permitting sheets to lie flat.



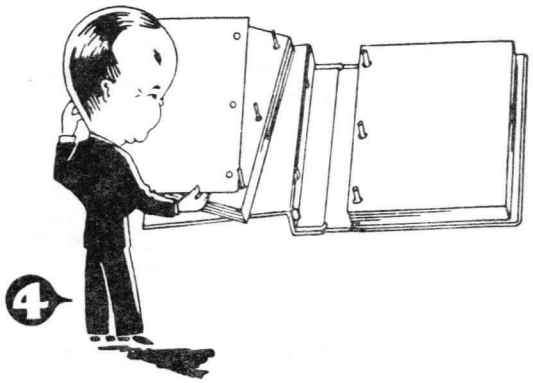
2

To Unlock Binder—Pull out lever on locking slide bar. The top cover and back will automatically fall back. To Lock Binder — Replace top cover and push in lever.



3

To Change Sheets—Separate sheets at desired place—lift posting bar with all sheets above page where change is to be made.



4

In Case of Further Changes — Turn to page where next change is to be made — remove the sheets to posting bar, then insert or remove. Expansion is automatically taken care of when sheets are added.

Form 1064

PULL OUT TO OPEN.
PUSH IN TO CLOSE.

Bomac
LABORATORIES, INC.
World-Wide Export Representative
MAURICE I. PARISIER & CO.
741-745 WASHINGTON ST. NEW YORK 14, N. Y.

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Bomac

MICROWAVE PRODUCTS

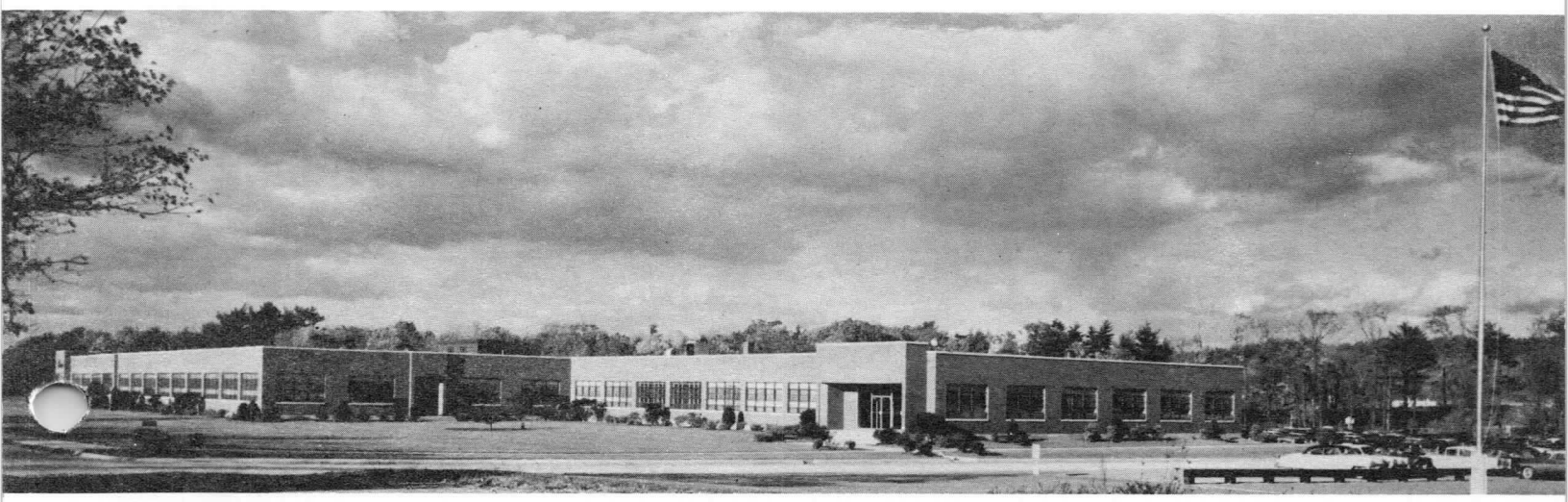
This catalog is designed for your convenience as a reference source in microwave tubes and components. Its pages are comparable to standard MIL type specifications used throughout the industry.

For obvious reasons the pages cannot be numbered or indexed, however, each product will carry its identification on the upper right hand corner showing product name, frequency band, product number and type.

In addition to enclosed products, Bomac manufactures many classified microwave tubes and components. Your inquiries are invited. If clearance is required you will be advised of the appropriate government agency to contact.

Bomac Laboratories, Inc. is one of the country's largest designers and manufacturers of microwave tubes and components. It offers a complete line of microwave products plus engineering and development service. Whatever your microwave problems, Bomac has the experience and facilities to find the answer.

For additional technical information please contact our nearest representative, who is also qualified to advise price and delivery on all Bomac products.



Bomac Laboratories Inc. BEVERLY, MASSACHUSETTS Telephone WAlker 2-6000

Bomac	GAS SWITCHING	L
	1B23	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 29, 1956

Dimensions: Per attached Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-800	-1000 Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 2)

Pack in sealed water-vapor proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size F			
4.9.19.1	*Vibration:	G=10, F=50; t=60; Note 3			
4.9.6	*Glass Strain:				
4.18.1	Ignitor Firing Time:	Ebb= -800Vdc; R= 3.25 megohms	t :	---	5.0 sec.
4.18.2	Ignitor Voltage Drop:	Iz=100μAdc	Ez :	375	525Vdc
4.18.3	*Ignitor Oscillation:	Note 4	Iz :	---	70μAdc
4.18.7	Tuning:	Note 3	F :	936.5	955.5Mc
4.18.4.3	Insertion Loss:	F= 950Mc Note 3, 5	Li :	---	1.6 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi :	---	0.2 db
4.18.23	High Level Protection:	Note 6	P :	---	100%
4.18.22	Water Vapor Content:	Note 7	$Po2/Po1$:	---	0.55
4.11	Life Test:	Iz=200μAdc; Group C; Note 8	t :	500	---hrs.
4.11.4	Life Test End Point:	Ignitor Interaction; Water Vapor Content	ΔLi :	---	0.2 db
			Po2/Po1	---	0.8

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (Megohms)}$$

where Ri = Total series resistance
Ebb = Open Circuit Supply Voltage
Ei = Average (center) Ignitor Voltage Drop
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 3: This measurement shall be made with the tube mounted in test cavity per drawing 162-JAN or approved equivalent.

Note 4: No tube shall require more than the stated maximum ignitor current to prevent relaxation oscillations when tested in the standard test circuit.

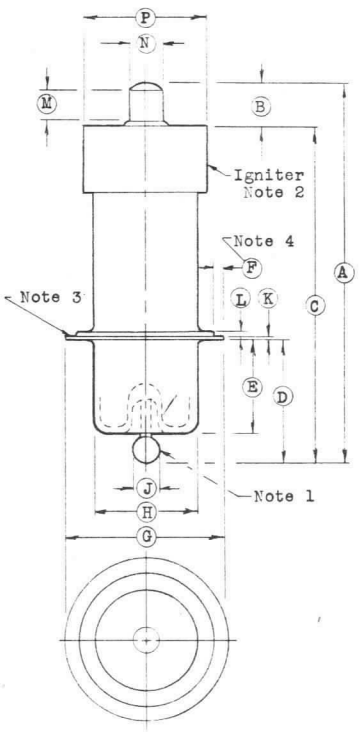
Note 5: With the cavity calibrator in position the cavity shall be tuned to resonance and the relative transmitted power level noted. With the tube inserted, the cavity shall then be tuned to resonance and the transmitted power noted. The db loss in transmitted power due to the insertion of the tube shall not be more than the specified amount.

Note 6: When the tube is fired by the application of high power in cavity per drawing 162-JAN or approved equivalent which is at resonance, the transmitted power obtained shall be less than that of a standard tube filled with pure hydrogen to a pressure of 25 millimeters of mercury. The power level at the input shall be sufficient to fire the rf gap of the tube and to insure that the measurement is being made on the flat part of the "power in gap vs leakage power" characteristic. If the main discharge gap does not fire it is caused to be fired by a short application of ignitor voltage.

Note 7: With the tube operating as outlined in Note 6 a small portion of the tube envelope shall be cooled by the application of solid CO_2. The ratio of the minimum reading of the output meter (Po2) to that obtained before the application of solid CO_2 (Po1) shall be less than the given value, and the Final reading shall be less than the initial one.

Note 8: The specified life is based on ignitor life only. This will be reduced if the tube is operated under full rated rf conditions.

Ref.	Dimensions
A **	2 51/64±3/16
B **	5/16
C	2 31/64±3/16
D	15/16±1/32
E	23/32±1/16
F	3/64 Min.
G *	1 1/8±1/64 Dia.
H *	3/4±1/16
J *	.187±.002
K **	.008
L **	1/32
M *	.220 Min.
N *	.250±.004
P *	.930 Max. .896 Min.



Note 1:-
The H-F electrode shall be concentric with the disc electrode within .018

Note 2:-
The base shall be concentric with the disc electrode within .040

Note 3:-
Contact disc external surfaces and H-F electrode shall be gold plated Min. 10 msi or silver plated 15 msi on external surfaces (edges of disc need be plated)

Note 4:-
Contact portion of disc measured radially which must be free from splits or tears, must be smooth and must be perceptably flat

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 20, 1956

Dimensions: Per Attached Outline

Ratings:	Min.	Max.
Transmitter po	---	1.0 kw
Open Circuit Ignitor Supply Voltage	+300	--- Vdc
Ignitor Current	150	450 μAdc
Altitude	---	10,000 ft.

Pack in sealed moisture resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size A		
4.9.19.1	*Vibration:	G=10; F=50; t=60; Note 2		
4.9.20.5	**Shock:	G=100; Note 2		
4.18.1	Ignitor Firing Time (1):	Ebb=+300Vdc	t :---	1.0 sec.
4.18.1	*Ignitor Firing Time (2):	Ebb=+300Vdc; R=0.47Meg; Notes 3, 7	t :---	1.0 sec.
4.18.2	Ignitor Voltage Drop:	Iz=250μAdc	Eid :130	250Vdc
4.18.7	Tuning:	Notes 4, 5	F :1075	1095Mc.
4.18.4.1	*Insertion Loss:	F=1153Mc; Note 4	Li :---	1.0db
4.18.9	Leakage Power:	Note 6	P :---	100%
4.18.15	*Recovery Time:	Iz=250μAdc po=800Watts; tp=1.0μs; prr=400; F=1100±5%Mc; Note 4	t :---	50μs
4.18.17.1	*Temperature Cycling:		Cycles: 10	---
4.11	Life Test:	Ebb=+350Vdc R=0.47Meg; Group A	t :500	--- hrs.
4.11.4	Life Test End Point:	Firing Time Recovery Time	t :--- t :---	1.0 sec. 75μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Mount per drawing 187-JAN.

Note 3: The tube shall be tested in complete darkness after being kept there continuously for a minimum of 72 hours.

Note 4: Cavity per drawing 187-JAN

Note 5: Set initially at F= 1153 Mc.

Note 6: When the tube is fired in cavity per drawing 187-JAN, which is at resonance, by the application of high power, the leakage obtained shall be less than that of a standard tube filled with pure argon to a pressure of 35 millimeters of mercury.

Note 7: The specified voltage shall be applied through the specified limiting resistor connected to the ignitor by a wire less than one inch long. The limiting resistor must be kept more than one half inch from the nearest ground panel during test.

Note 1:- Contact area must be free from glass.

Note 2:- Contact area must be free from glass and must be flat within .005.

Note 3:- External metal surfaces must be clean and free from tarnish.

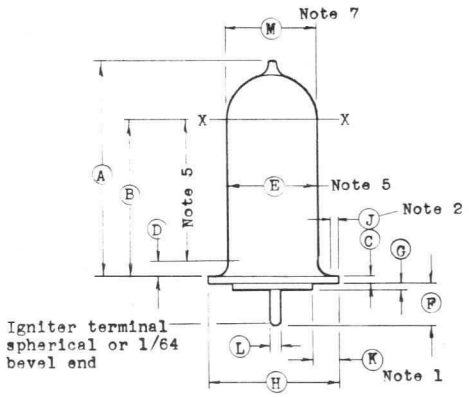
Note 4:- Eccentricity of bulb with respect to mounting plate shall not exceed .015 when measured in the plane X-X. This includes allowance for tilt of bulb with respect to mounting plate. This requirement be considered met if, when the tube is seated in gage, the bulb does not touch the gage wall.

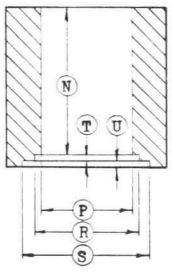
Note 5:- Bulb diameter tolerances apply for portion of length indicated.

Note 6:- End of electrode shall be concentric with mounting disk within 1/64.

Note 7:- This dimension applies to portion of bulb above plane X-X.

Note 8:- The gage shall be chromium plated or the wearing surfaces shall be hardened to withstand wear. The gage shall be considered unsatisfactory when the dimensions have changed .0005.





Gage

Ref.	Dimension
A	1½ Max.
B	3/4 Min.
C	.030±.005
D	1/8 Max.
E	.470±.015
F	1/4±1/64
G	1/16 Max.
H	.750+.002-.008 Dia.
J	1/16 Min. Note 2
K	1/8 Min. Note 1
L	.050±.005 Dia.
M	.500 Dia. Max. Note 7
N	.749±.001
P	.501 Dia. Max.
R	.6272 Dia. Max.
S	.7522 Dia. Max.
T	.1252 Max.
U	.0335 Max.

Bomac	GAS SWITCHING	L
	5939A	Pre TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Application: Pre-TR when used in pairs (Note 2)

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	10	---kw

Mounting: Clamp between two gaskets to flanges UB-368/U (female) and UB-369/U (male) or UG-417/U and UG-418/U soldered to RG-69/U or RG-103/U waveguide.

Test Conditions: See Mounting; See attached drawing of 5939A Test Circuits, dated 10-5-54.

Marking: Note 3

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Note 4	---	---
4.5	Holding Period:	t_h=168 hours (min.)	---	---
4.9.6	Glass Strain			
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	Vibration:	Note 5	---	---
------	Resonant Frequency:	σ=1.05max; Note 6	Fo:1280	1292Mc.
-----	*Voltage Standing Wave Ratio:	F= 1250Mc F= 1300 F=1350Mc; σ'=1.05 max; Note 2, 7	σ:--- σ:--- σ:---	1.4 1.2 1.4
------	Insertion Loss (1):	F=1286±1%Mc σ'=1.05max; Note 8	Li:---	0.3 db
-----	*Insertion Loss (2):	F=1250Mc.; F=1300; F=1350 Mc; σ=1.05 max; Notes 2, 7	Li:--- Li:--- Li:---	0.6db 0.5db 0.6 db
-----	*High Level Operation:	F=1286 ± 1% Mc; po=550±5%kw; tp=4µsec±15; prr=300±10%; σ'=1.1 max.	Δt:---	110°C
-----	*Arc Loss:	F=1286±1%Mc; po=550±5%kw; tp=4.0µsec±15%us; prr=300±10%; σ'=1.1 max; Note 9	--- Δ Li:---	--- 0.30 db
-----	*Leakage Energy:	F=1286±1%Mc; po=550±5% kw; tp=4.0µsec±15% prr=300±10%; σ'=1.1 max; Note 10	---	.026 Joules
-----	Recovery Time:	F=1286±1% Mc; po=550±5% kw; tp=4.0µsec±15%; prr=300±10% σ'=1.1 max; Note 11	t: ---	36µs
4.18.15.1	**Recovery Time:	po=550±5 kw; F=1250±1%Mc; F=1350±1%Mc; tp=4.0 µsec±15%; prr=300±10%; σ'=1.1 max.;	t:---	36µsec
-----	Temperature Cycle:	Cycles=1; Note 12	---	---
4.18.17.3	Temperature Cycle Life	Note 12	Cycles:10	---

Ref.	Test	Conditions	Min.	Max.
4.18.17.3	Temperature Cycle Life	Note 12	Cycles:10	---
-----	Life Test:	F=1286±1%Mc; po=550±5%kw; tp=3.0±15%us; prr=400±10%; Group C; σ'=1.1 max; Note 9	t:500	---hrs.
-----	Life Test End Point:	Recovery Time: Leakage Energy	t:--- ---	45µs .032 Joules

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: For pair of windows, separation between centerlines is 2 15/16±1/16.

Note 3: Tubes shall be marked "Bomac Type 5939A" unless other marking is requested and authorized by the procuring agency.

Note 4: Application for Qualification Approval should be made in accordance with the Inspection Manual for Use in Conjunction with Joint Army-Navy Specification JAN-1A, with the exception that the request for Qualification Approval should be addressed to Director, Evans Signal Laboratory, Attn: Chief, Thermionics Branch.

Note 5: Windows must meet all requirements of this specification subsequent to the vibration test.

Note 6: See 5939A Test Circuits. Each window tested separately. Resonant frequency corresponds to minimum standing wave produced by the window. The resonant frequency may be measured by any equivalent method.

Note 7: See 5939A Test Circuits. Windows are tested in pairs.

Note 8: See 5939A Test Circuits. Each window tested separately.

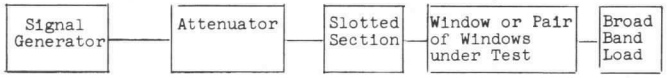
Note 9: See 5939A Test Circuits. Branch line open (without attenuator and bolometer mount). Temperature rise shall not exceed specified value after reaching equilibrium. There shall be no evidence of sparking.

Note 10: See 5939A Test Circuits.
Leakage Energy per pulse is defined as the average integrated leakage power divided by the pulse repetition rate.

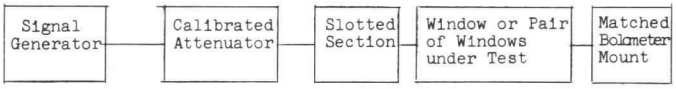
Note 11: See 5939A Test Circuits.
The loss of signal at the specified time after the pulse shall not be greater than 3db in excess of the loss when the tube is in the unfired state.

Note 12: The window shall be exposed to temperature changes from room temperature to -20°C to room temperature to +150°C to room temperature. Following this test, the window must comply with the requirements of the Arc Loss test.

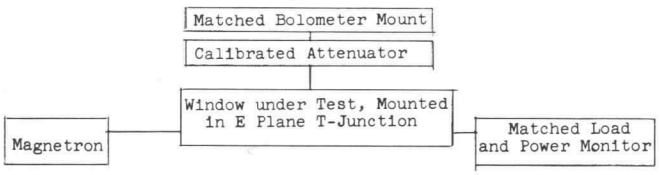
(over)



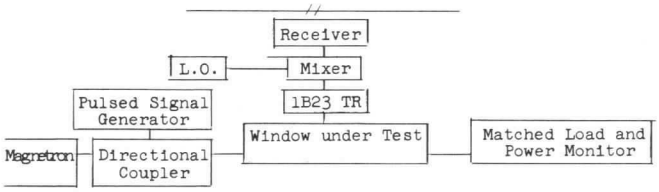
Resonant Frequency & VSWR



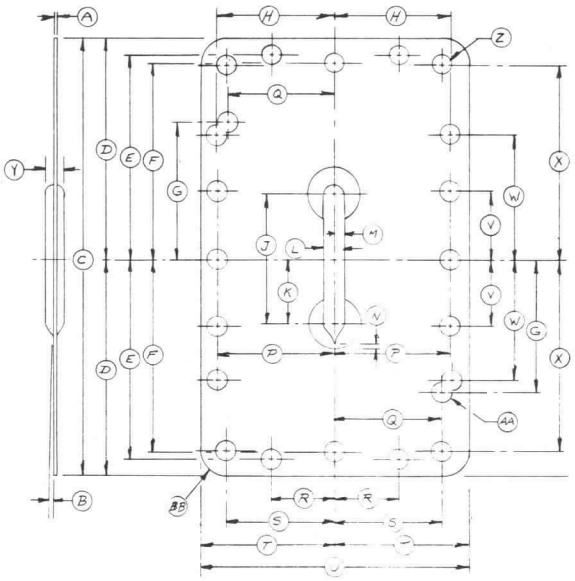
Insertion Loss (1 & 2)



Arc Loss, Leakage Energy, Life Test



Recovery Time



REF	DIMENSION	REF	DIMENSION
A	0.063±.004	P*	2.281±.015
B*	0.047 Max. Bow	Q*	2.094±.015
C	8.500±.015	R*	1.250±.015
D	4.250±.015	S*	2.125 ±.015
E*	3.937±.015	T*	2.625±.015
F*	3.906±.015	U*	5.250±.015
G*	2.608	V*	1.301
H*	2.310±.015	W*	2.375±.015
J	2.500 Ref.	X*	3.749
K	1.250 Ref.	Y*	0.375 Dia. Ref.
L	0.400 Ref.	Z	0.375±.008 (20) Holes
M	0.200 Ref.	AA	0.330 +.003-.001 (2) Holes
N	0.062 Min.	BB**	0.500±.015 Rad.

Bomac	GAS SWITCHING	L
	6605/BL96	Pre TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MARCH 29, 1956

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat
See Note 2.

Ratings:	Min.	Max.
Transmitter po	---	2000 kw
Duty Cycle	---	0.002

Test Conditions: See Mounting

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.7	** Moisture Vaporproof Pack:	--------	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.6	Glass Strain:	Omit	---	---
----	** Insertion:	Note 3	---	---
----	** Vibration:	F = 50±2cps; Total Excursion = 0.08±0.005in; t = 2 min; Note 4	---	---
4.18.17.3	Temperature Cycle:	Note 5	Cycles: 1	---
4.18.17.3	Temperature Cycle Life:	2 per month; Note 5	Cycles: 50	---
4.18.4.2	* Insertion Loss:	F = 1300±1%Mc.	Li : ---	0.4db
4.18.18	Voltage Standing Wave Ratio:	* F = 1250Mc. F = 1265 F = 1300 F = 1335 * F = 1350Mc; σ' = 1.05 max.	σ : --- σ : --- σ : --- σ : --- σ : ---	1.4 1.2 1.2 1.2 1.4
4.18.9	Average Leakage Power (1):	F = 1300±1%Mc; po = 500±5%kw; tp = 4.0μs; prr = 250; σ' = 1.1 max.	Po : 3	50mW
4.18.9	** Average Leakage Power (2):	F = 1300±1%Mc; po = 2000 kw; Du = 0.001; σ' = 1.1 max.	Po : 10	50mW
4.18.15.1	* Recovery Time (1):	See Average Leakage Power (1)	t : ---	15μs
4.18.15.1	** Recovery Time (2):	See Average Leakage Power (2)	t : ---	45μs
4.18.19	** High Level V. S. W. R. :	See Average Leakage Power (1)	σ : ---	1.2
4.18.28	Arc Loss (1):	See Average Leakage Power (1)	---	0.2db
4.18.28	** Arc Loss (2):	See Average Leakage Power (2):	---	0.2db
4.11	Life Test (1):	F = 1300±1%Mc; po = 500±5%kw; tp = 4.0μs; prr = 250; σ' = 1.1max; 2 per month	t : 500	---hrs
4.11	** Life Test (2):	See Average Leakage Power (2)	t : 500	---hrs

Ref.	Test	Conditions	Min.	Max.
4.11.4	Life Test (1) End Point:	Recovery Time (1); Arc Loss (1)	t : ---	15μs 0.5db
4.11.4	** Life Test (2) End Point:	Recovery Time (2); Arc Loss (2)	t : ---	45μs 0.5db

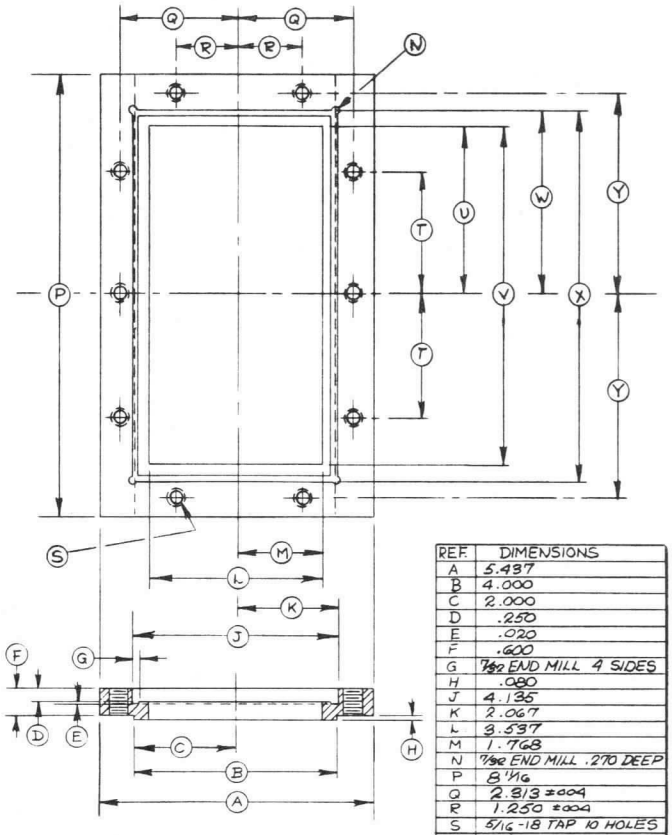
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A suitable gasket shall be bolted between the tube and mounting seat. Tubes shall be supplied with gaskets mounted on them.

Note 3: The tube with gasket attached shall be capable of being inserted and removed from its seat a minimum of 15 times without any deterioration in the electrical characteristics of the tube.

Note 4: Tubes shall satisfy all applicable requirements of this specification after the vibration test.

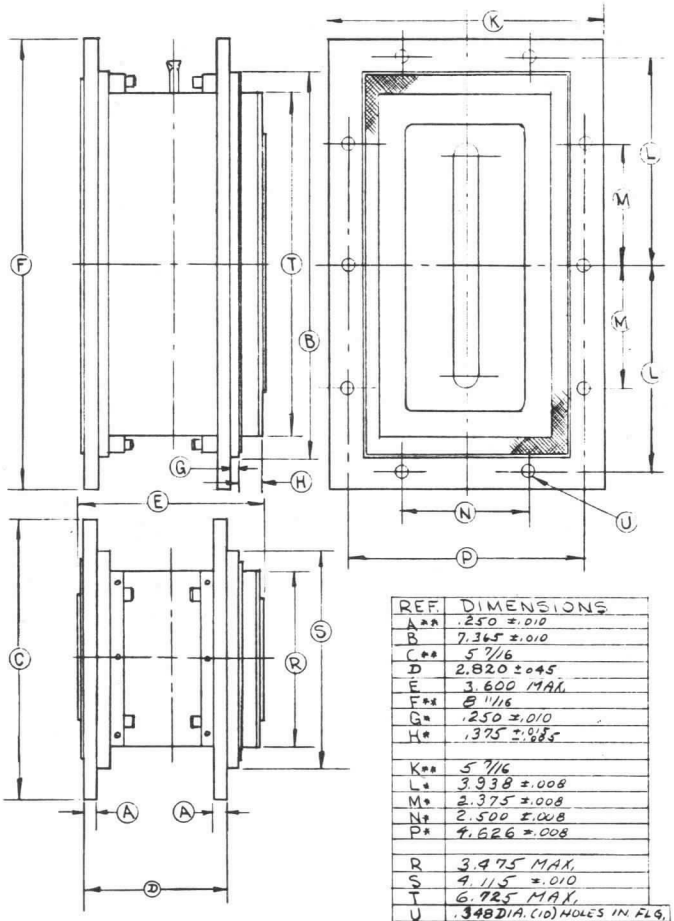
Note 5: Tubes shall satisfy the Arc Loss (1) test after Temperature Cycling.



FINISH ALL OVER

REF.	DIMENSIONS
A	5.437
B	4.000
C	2.000
D	.250
E	.020
F	.600
G	7/32 END MILL 4 SIDES
H	.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 END MILL .270 DEEP
P	8 1/16
Q	2.813 ±.004
R	1.250 ±.004
S	5/16-18 TAP 10 HOLES
T	2.975 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	9.938 ±.004

(over)



REF.	DIMENSIONS
A**	.250 ±.010
B	7.365 ±.010
C**	5 7/16
D	2.820 ±.045
E	3.600 MAX.
F**	8 11/16
G*	.250 ±.010
H*	.375 +.015 −.005
K**	5 7/16
L*	3.938 ±.008
M*	2.375 ±.008
N*	2.500 ±.008
P*	4.626 ±.008
R	3.475 MAX.
S	4.115 ±.010
T	6.725 MAX.
U	.348 DIA. (10) HOLES IN FLG.
	5/16-18 N.C. (10) HOLES OUT. FLG.

Bomac	GAS SWITCHING	L
	6605/BL96A	Pre-TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 12, 1957

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat
See Note 2.

Ratings:	Min.	Max.
Transmitter po	---	2000 kw
Duty Cycle	---	0.002
Weight (approx.)	---	5 lbs.

Test Conditions: See Mounting

Ref.	Test	Conditions		Min.	Max.
4.9.7	**Moisture Vapor proof Pack:	------		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
-------	*Glass Strain:	Note 6		---	---
4.9.13	**Pressurization	P=10 lbs. gauge; Note 5		---	---
------	**Insertion:	Note 3		---	---
4.18.33	*Vibration:	F=50cps; G=10; t=15 min; Note 4			
4.18.33	**Vibration:	F=50 cps; G=10; t=60min; Note 4			
4.18.17.3	Temperature Cycle:	------	Cycles : 1		---
4.18.17.3	Temperature Cycle Life:	2 per month;	Cycles : 10		---
4.18.4.2	*Insertion Loss:	F= 1300±1%Mc.	Li : ---		0.4 db
4.18.18	Voltage Standing Wave Ratio:	*F= 1250Mc. ±0.1%	σ : ---		1.4
		F= 1265 Mc. ±0.1%	σ : ---		1.2
		F= 1300 Mc. ±0.1%	σ : ---		1.2
		F= 1335 Mc. ±0.1%	σ : ---		1.2
		*F= 1350Mc; ±0.1%	σ : ---		1.4
		σ́ =1.05 max.			
4.18.9	Average Leakage Power(1):	F= 1300±5%Mc; po=500±5%kw; tp=4.0μs; prr=250; σ́ =1.1 max.	Po : 3		50 mW
4.18.9	**Average Leakage Power(2):	F= 1300±5%Mc; po=2000 kw±5%; Du=0.001; σ́ =1.1 max.	Po : 10		50 mW
4.18.15.1	*Recovery Time (1):	See Average Leakage Power (1)	t : ---		15 μs
4.18.15.1	**Recovery Time (2):	See Average Leakage Power (2)	t : ---		45 μs
4.18.19	**High Level V.S.W.R.:	See Average Leakage Power (1)	σ : ---		1.2
4.18.28	Arc Loss (1):	See Average Leakage Power (1)		---	0.2 db
4.18.28	**Arc Loss (2):	See Average Leakage Power (2);		---	0.2 db
4.11	Life Test (1):	F= 1300±5%Mc; po=500±5%kw; tp=4.0μs; prr=250; σ́ =1.1max.; 2 per month	t : 500		---hrs.
4.11	**Life Test (2):	See Average Leakage Power (2)	t : 500		---hrs.

Ref.	Test	Conditions		Min.	Max.
4.11.4	Life Test (1) End Point:	Recovery Time (1); Arc Loss (1)	t : ---	---	15μs 0.5 db
4.11.4	**Life Test (2) End Point:	Recovery Time (2); Arc Loss (2)	t : ---	---	45μs 0.5 db

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: A suitable gasket shall be bolted between the tube and mounting seat. Tubes shall be supplied with gaskets mounted on them.

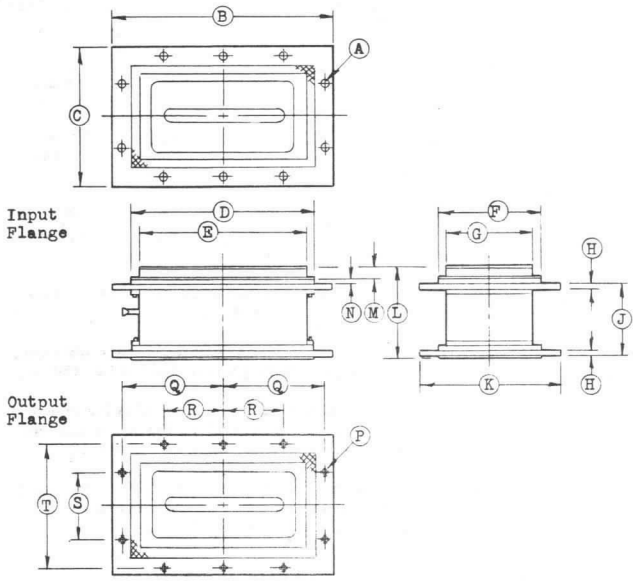
Note 3: The tube with gasket attached shall be capable of being inserted and removed from its seat a minimum of 15 times without any deterioration in the electrical characteristics of the tube.

Note 4: The tube shall be vibrated in a plane perpendicular to the input window plane. After this test the tube shall satisfy all other electrical tests of this specification.

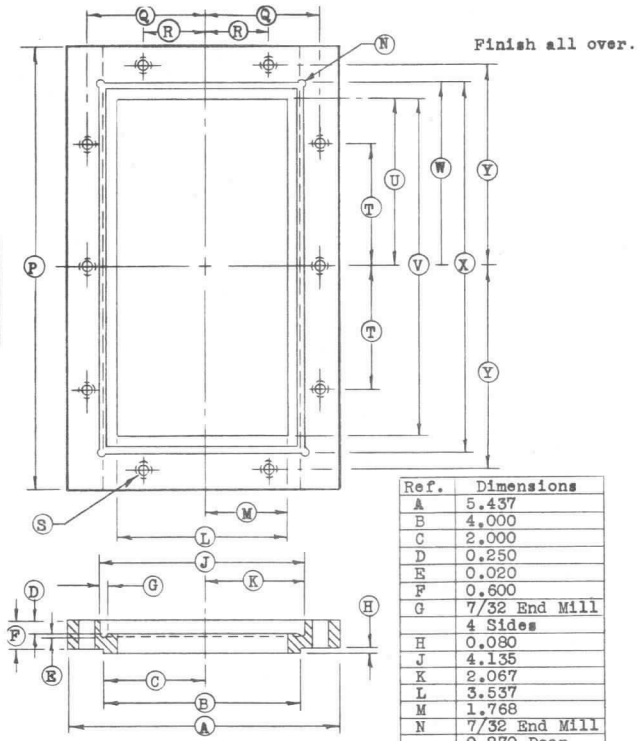
Note 5: This test shall be performed by immersing the test mount seat and tube input flange to a depth at least 3 inches in water. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

Note 6: The tube shall be placed into boiling water from an ambient temperature not exceeding 25°C. The water shall be maintained at 100°C while the tube is immersed. After a 3 minute immersion period the tube shall be exposed to the ambient temperature condition for 3 minutes. This cycle will then be repeated. There shall then be no indication of any glass cracks upon the completion of this test. The tube shall pass the firing time test after being subjected to this glass strain test.

(over)



Ref.	Dimension	Ref.	Dimension
A	0.348 Dia. 10 Holes	K**	5 7/16
B**	8 11/16	L	3.600 Max.
C**	5 7/16	M*	0.375 +.015 -.005
D	7.365 ±.010	N*	0.250 ±.010
E	6.725 Max.	P	5/16-18NC 10 Holes
F	4.115 ±.010	Q*	3.938 ±.008
G	3.475 Max.	R*	2.375 ±.008
H**	0.250 ±.010	S*	2.500 ±.008
J	2.820 ±.045	T*	4.626 ±.008



Finish all over.

This Mounting Seat used on the following tubes:-

6605	BL- 96	BL-665
6628	BL- 96A	BL-665A
6632	BL-612	BL-688
6633		BL-688A
6962	BL-632	BL-664A
BL-18		
BL-18A	BL-640	
BL-37	BL-640A	
BL-37A	BL-664	

Ref.	Dimensions
A	5.437
B	4.000
C	2.000
D	0.250
E	0.020
F	0.600
G	7/32 End Mill
	4 Sides
H	0.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill
	0.270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap
	10 Holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.938 ±.004

Bomac	GAS SWITCHING	L
	6322/BL25	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 6, 1955

Dimension: Per Outline

Ratings	I_z	Open circuit Ignitor voltage
Absolute:	μAdc	Vdc
Maximum	200	-1000
Minimum	100	-750

Recommended Ignitor Operating Current 150 μAdc Note 11

Pack in sealed moisture resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3. 1	Qualification Approval:	Required for JAN Marking		
4. 9. 18. 1. 8	Carton Drop:	Package Group I Carton Size G		
4. 9. 19. 1	** Vibration:	F=1285±1%Mc Note 1, Note 2		
4. 9. 8	Salt Spray	Omit		
4. 9. 6	*Glass Strain			
4. 18. 1	Ignitor Firing Time:	Ebb=675 Vdc; Ri=2. 0 meg	t : ---	5. 0 sec
4. 18. 2	Ignitor Voltage	Iiz100 μAdc	Eid: 300	450 Vdc
4. 18. 3	*Ignitor Oscillation		Ii : ---	50 μAdc
4. 18. 6	Tuning Range	Note 1, Note 3	F : 1215	1355Mc
4. 18. 6	** Tuning Range	Note 1, Note 3 and Note 8	F : 1215	1355Mc
4. 18. 13. 1	*Loaded Q	F=1285±1%Mc Note 1	QL: 175	250
4. 18. 4. 3	Insertion Loss	F=1285±1%Mc Note 1	Li: ---	1. 0db
4. 18. 5. 1	Ignitor Interaction:	Iz=100μAdc	Li: ---	0. 1db
4. 18. 10	Spike Leakage Energy	Note 4, Note 5	Ws: ---	35 erg
4. 18. 11	Flat Leakage Power	Note 4, Note 5	pf : ---	90 mw
4. 18. 15. 1	*Recovery Time	Note 6	t : ---	25 μsec
4. 18. 14. 1	*Frequency-Temperature Effect	Note 1; F=1285 Mc ± 1%	F : 0	-10 Mc
4. 18. 17. 3	*Temperature Cycle Life Test	Note 7	Cycles: 12	---
4. 11	Life Test	Note 6 and Note 9 Group C	t : 500	---hrs
4. 11. 4	Life Test End Point	Voltage Drop	Eid: ---	500 Vdc
		Ignitor Interaction	Li : ---	0. 3 db
		Insertion Loss	Li : ---	1. 0 db
		Recovery Time	t : ---	40. 0 μsec
		Spike Leakage	Ws: ---	0. 5 erg

Note 1: The tube shall be mounted in a cavity as per Drawing SC-D-30769.

Note 2: The tube and cavity shall be vibrated in the direction of the keep-alive axis for 12 hours at 2. 0G with an amplitude of motion of 0. 040 inches. After this, the tuning shall not have changed more than 1. 0 megacycle from its initial value and the tube shall satisfy all other electrical tests of this specification.

Note 3: The tuning screw is to turn 1/2 turn from its stop position before the 1215 megacycle position is reached. A minimum rotation of 7 turns of the tuning screw to cover the specified tuning range is required. The cones shall not touch when the tuning knob is tuned through its entire range, as shown by an electrical continuity test.

Note 4: The tube shall be mounted in a cavity or per Drawing SC-D-30769, and tested as shown in Fig. 1. The loaded Q of the cavity will be between 175 and 225, with a matched termination on the output of the cavity. A phase shifter will be inserted in the test line preceding the T. R. cavity, and adjusted for maximum leakage at each pulse width.

Note 5: Test conditions shall be po=4-6 Kw at the input to the cavity; F=1285±2% Mc; tp1=4 μsec, nominal; tp2=1. 0 μsec, nominal; prr=250 pps; σ1=1. 15; Ii=100μAdc.

Note 6: The T. R. Tube will be mounted in a cavity or per Drawing SC-D-30768. The loaded Q of the cavity will be between 120 and 140, with a matched termination on the output, with the cavity shunt mounted on the waveguide. po=450 Kw ± 10%; F=1285±2% Mc; tp=4 μsec, nominal; prr=250 pps; σ1=1. 15; Ii=100 μAdc.

Note 7: With the tube clamped in cavity per Drawing SC-D-30769, it shall withstand 12 temperature cycles of -40°C to +100°C and shall be allowed to come to equilibrium at room temperature in going from one extreme to the other. Not less than 24 hours after the temperature test, the tube must pass the leakage power test. A minimum of 2 tubes per month will be tested.

Note 8: The tuner shall be cycled through the specified tuning range a minimum of 10 times before the tuning range is checked.

Note 9: The TR tube will be mounted as specified for the recovery time measurement, except that the output of the cavity will be terminated by a 50 ohm matched load.

Note 10: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

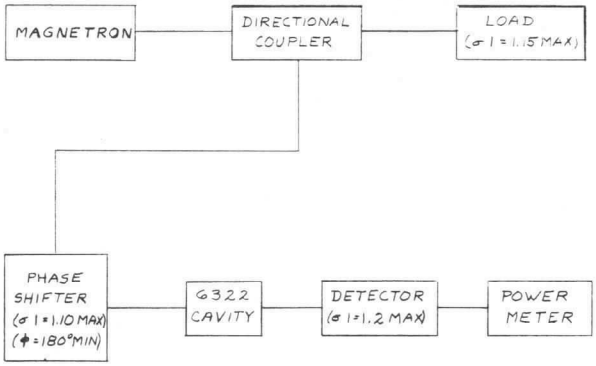
Note 11: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance

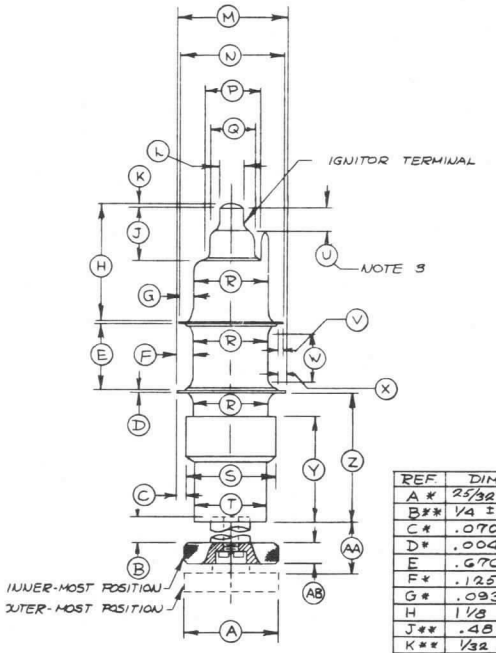
$$\text{Series resistance (Ri)} = \frac{\text{Ebb-Ei (megohms)}}{150}$$

Where Ri - Total Resistance
Ebb - Open circuit supply voltage
Ei - Average (center) ignitor voltage drop

At least 0. 5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)





REF	DIMENSIONS
A *	25/32 MAX.
B**	1/4 ± 1/64
C*	.070 MIN.
D*	.004 APPROX.
E	.670 +.005 −.000
F*	.125 MIN.
G*	.093 MIN.
H	1 1/8 +1/8 − 0
J**	.489
K**	1/32 APPROX.
L**	.250 ±.002
M	1.062 ±.008
N	1.000 ±.005
P**	.500
Q**	.436
R**	3/4 ± 1/32
S**	7/8 MAX.
T**	43/64
U**	1/4 ± 1/64
V	.040 MIN.
W*	9/16
X	.070 MIN.
Y*	1 3/32 MAX.
Z	1 6/16 ± 1/16
AA*	1/2 MAX (SEE NOTE 4)
AB**	3/16

NOTES:-
1. CONTACT DISKS SHALL BE CONCENTRIC WITH RESPECT TO EACH OTHER WITHIN 1/64
2. CONTACT DISKS SHALL BE GOLD PLATED (QMS) OR SILVER PLATED (SMS)
3. SEAL OFF PIP SHALL NOT EXTEND BEYOND INDICATED LINE.
4. APPLIES WHEN TUNING SCREW IS AT ITS EXTREME OUTER POSITION

Bomac	GAS SWITCHING	L
	6632/BL18A	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 14, 1957

Ratings:	Max.	Min.
Transmitter po:	2000	--- kw
Ignitor Voltage:	---	-750 Vdc
Ignitor Current:	200	100 μAdc
TA	+100	-40°C
Altitude	---	--- ft.
Weight (approx.)	8.5	--- lbs.

Recommended Ignitor Operating Current 150μAdc (Note 7)

Dimensions: Per Outline

Mounting: Note 2

Ref.	Test	Conditions	Min.	Max.
4.9.7	**Moisture-Vapor proof pack:			
4.9.18.1.8	Carton Drop:	To be specified		
4.18.32	**Frequency-Vibration Effect:	Note 3		
4.18.33	**Vibration:	G=2.0; Note 4		
------	*Glass Strain:	Note 9		
4.9.13	**Pressurization:	P=10 lbs. gauge; Note 8		
4.18.6	Tuning Range:	F= 1215Mc to 1355Mc; Turns:	8	---
4.18.4.1	Insertion Loss (1):	F= 1285Mc±1%	Li : ---	.7 db
4.18.4.1	*Insertion Loss (2):	F= 1215Mc±1% Note 5	Li : ---	.7 db
4.18.4.1	*Insertion Loss (3):	F= 1355Mc±1% Note 5	Li : ---	.7 db
4.18.5	Ignitor Interaction:	Ii=100 μAdc	ΔLi : ---	0.3 db
4.18.3	*Ignitor Oscillation:		Ii : ---	70 μAdc
4.18.1	Ignitor Ignition Time:	Ebb= 750Vdc; R=4.5 Meg.	t : ---	5 sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid : 200	450Vdc
4.18.13.1	**Loaded Q:	F= 1285Mc±0.1%	QL: 20	---
------	**Insertion:	Note 6		
4.18.15.1	Recovery Time(1):	po=500kw; Du=.001; tp=4μs±0.4μs F= 1285Mc±5%; Ii=100μAdc	t : ---	15μs
4.18.15.1	**Recovery Time(2):	po=2.0Mw; Du=.001; tp=4μs±0.4μs F= 1285Mc±5%; Ii=100μAdc	t : ---	45 μs
4.18.11	Flat Leakage Power(1):	po=500kw(min) F= 1285±5%Mc, tp1=4.0±0.40μs; tp2=1.0±0.10μs; prr=250; Ii=100μAdc	pf : ---	75mw
4.18.11	**Flat Leakage Power(2):	po=2.0Mw; F= 1285±5%Mc; tp1=4.0±0.4μs; tp2=1.0±0.1μs; prr=250; Ii=100μAdc	pf : ---	75mw
4.18.10	Spike Leakage Energy(1):	See Flat Leakage (1)	Ws : ---	0.4 erg
4.18.10	**Spike Leakage Energy (2):	See Flat Leakage (2)	Ws : ---	0.4 erg
4.18.17.1	Temperature Cycle:		Cycle : 1	---
4.18.17.2	Temperature Cycle Life Test:	2 per month	Cycles : 10	---
4.11	Life Test(1):	2 per month See Recovery Time (1); Ebb=-700Vdc; Ri=2.5 meg.	t : 500	--- hrs.
4.11	**Life Test(2):	See Recovery Time (2); Ebb=-700Vdc; Ri=2.5 meg.	t : 500	---hrs.
4.11.4	Life Test (1) End Point:	Recovery Time (1)	t : ---	15μs
		Spike Leakage Energy (1)	Ws : ---	0.5 erg
		Insertion Loss	Li : ---	1.0 db
		Ignitor Voltage Drop	Eid : ---	600Vdc
4.11.4	**Life Test (2) End Point:	Recovery Time (2)	t : ---	45μsec
		Spike Leakage Energy (2)	Ws : ---	0.5 erg

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The tube shall be mounted in seat as shown in accompanying drawing

Note 3: **The tube shall be vibrated in the direction of the keep-alive axis for one (1) hour at 2.0 G with an amplitude of motion of 0.040 inches. After this the tuning should not have changed more than 3.0 Mc from its initial value, and the tube shall satisfy all other electrical tests of this specification.**

Note 4: **The tube shall be vibrated in a plane perpendicular to the keep-alive axis for one (1) hour at 2.0G with an amplitude of motion of 0.040 inches. After this the tube shall satisfy all other electrical tests of the specification.**

Note 5: **The tuning cones shall not touch when the tube is tuned throughout its frequency range, as evidenced by an undue increase in insertion loss.**

Note 6: **The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.**

Note 7: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

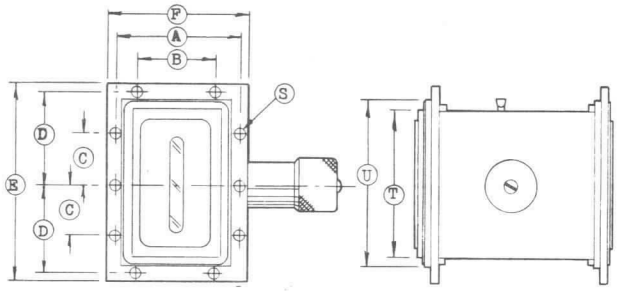
where Ri=Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

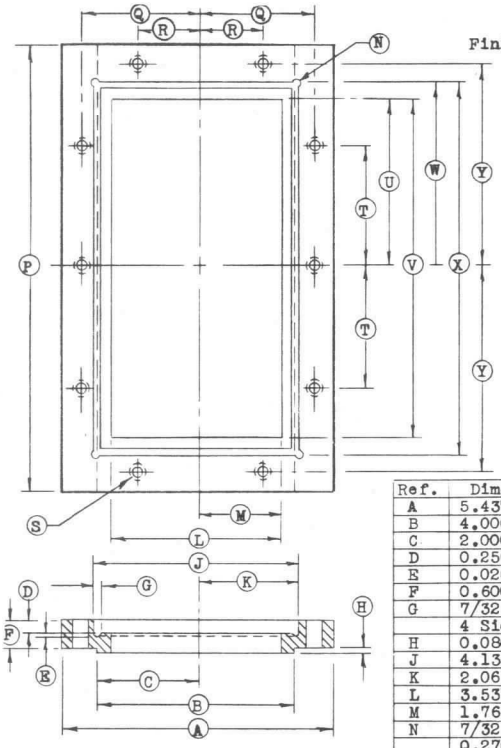
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 8: This test shall be performed by immersing the test mount and tube input flange to a depth of at least 3 inches in water. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

(over)

Note 9: The tube shall be placed into boiling water from an ambient temperature not to exceed 25°C. The water shall be maintained at 100°C while the tube is immersed. After 3 minutes immersion period the tube shall be exposed to the ambient temperature condition for 3 minutes. This cycle will then be repeated. There shall be no indication of any glass cracks upon completion of this test. The tube shall pass the firing time test after being subjected to this glass strain test.



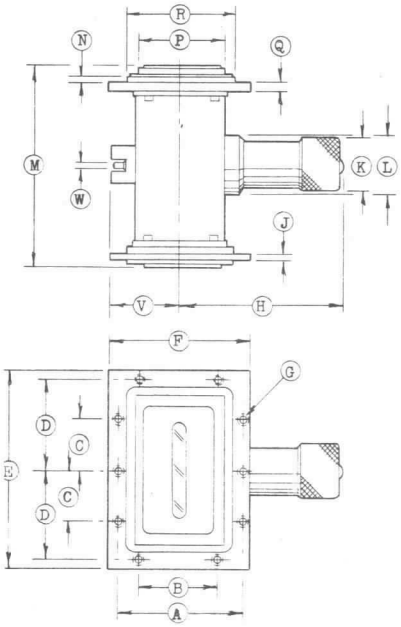


Finish all over.

Ref.	Dimensions
A	5.437
B	4.000
C	2.000
D	0.250
E	0.020
F	0.600
G	7/32 End Mill
	4 Sides
H	0.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill
	0.270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap
	10 Holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.938 ±.004

This Mounting Seat used on the following tubes:-

6605	BL- 96	BL-665
6628	BL- 96A	BL-665A
6632	BL-612	BL-688
6633		BL-688A
6962	BL-632	BL-664A
BL-18		
BL-18A	BL-640	
BL-37	BL-640A	
BL-37A	BL-664	



Ref.	Dimension
A*	4.626 ±.008
B*	2.500 ±.008
C*	2.375 ±.008
D*	3.938 ±.008
E**	8 11/16
F**	5 7/16
G	5/16-18NC
	10 Holes
H	6 1/4 Max.
J**	0.250 ±.010
K**	1 5/8
L**	2.000 ±.010
M	6.615 ±.040
N*	0.250 ±.010
P*	3.475 Max.
Q**	0.250 ±.010
R*	4.115 ±.005
S	S(.348) Dr.
	10 Holes
T	6.725 Max.
U*	7.365 ±.005
W	0.250 Dia. Nom.
V	2 25/32 Max.

Bomac	GAS SWITCHING	L
	6628/BL38	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 2, 1955

Application: This tube is designed to be used with another BL-38 mounted opposite to it in half-height L-Band waveguide (I. D. =6. 500. x 1. 625 in.). Resonant Frequency of single tube is 1222 Mc. of pair is 1285 Mc.

Dimensions: Per Outline

Mounting: See attached drawings of Tube Mounting, See Note 2

Ratings:	Min.	Max.
Transmitter po	---	2. 0 Mw
Duty Cycle	---	0. 002

Test Conditions: See Mounting.

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3. 1	Qualification Approval:	Required for JAN Marking	---	---
4. 5	Holding Period:	t=168 hours	---	---
4. 9. 18. 1. 8	Carton Drop:	To be specified	---	---
4. 9. 6	Glass Strain:	Omit	---	---
4. 18. 17. 3	Temperature Cycle:	----	Cycles: 1	---
4. 18. 17. 3	Temperature Cycle Life Test:	2 per month	Cycles: 50	---
---	** Vibration:	F= 50±2cps; Total Excursion ±0. 08±0. 005in; t=2 min; Note 4	---	---
4. 18. 13. 2	** Loaded Q:	F=1285±0. 1%Mc; Note 5	QL: ---	5. 0
4. 18. 25	Tuning Susceptance:	F= 1222±0. 1%Mc; Note 6	B/Yo: ---	±0. 05
4. 18. 26	* Equivalent Conductance:	F= 1222±0. 1%Mc; Note 6	G/Yo: ---	0. 05
----	* Band Width:	F= 1215Mc. to F= 1335 Mc. ; Note 5	Li : 10	---db
4. 18. 27	Firing Time:	F= 1222±1%Mc; po=500±5%kw; tp=4. 0±0. 15µs; prr=250; Note 6	t : ---	5. 0sec.
4. 18. 28	Arc Loss:	See Firing Time	---	0. 3db
4. 18. 19	** High Level V. S. W. R. :	F= 1285±1%Mc; po=50±10%kw; tp=4. 0±0. 15µs; prr=250; σ'=1. 05max; Note 5	σ: ---	1. 15
----	* Recovery Time:	To be specified	t : To be specified	
4. 11	Life Test:	F= 1285±1%Mc; po=500±5%kw; Du=. 001; 2 per month; Note 5	t : 500	---hrs
4. 11	** Life Test:	F= 1285±1%Mc; po=2. 0±5%Mw; Du=. 001; Note 5	t : 500	---hrs.
4. 11. 4	Life Test End Point:	Tuning Susceptance; Equivalent Conductance; Arc Loss; Recovery Time	B/Yo : --- ; G/Yo : --- ; --- ; t : To be specified	±0. 05 ; 0. 1 ; 0. 4db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

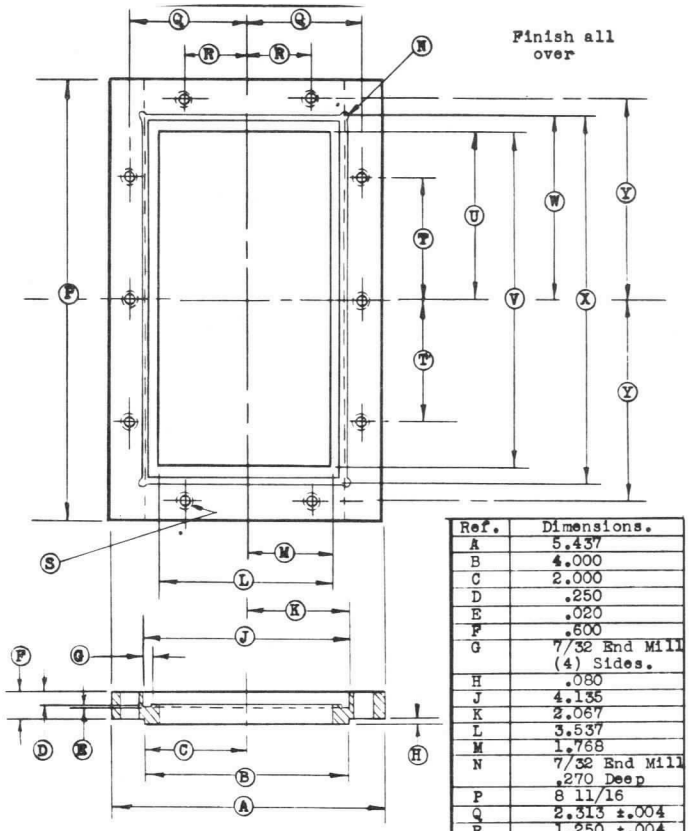
Note 2: A gasket is to be bolted between the tube and the mounting seat. One gasket will be supplied with each tube.

Note 3: On evidence of satisfactory quality, the inspector may limit this test to ten tubes per month when the tube is in continuous production. If two or more tubes fail in this test, the test conditions shall revert to design test requirements.

Note 4: Vibrate in a plane normal to the tuning diaphragm. The tube shall satisfy all requirements of this specification after the vibration test.

Note 5: Two tubes tested as a pair.

Note 6: Each tube tested separately.

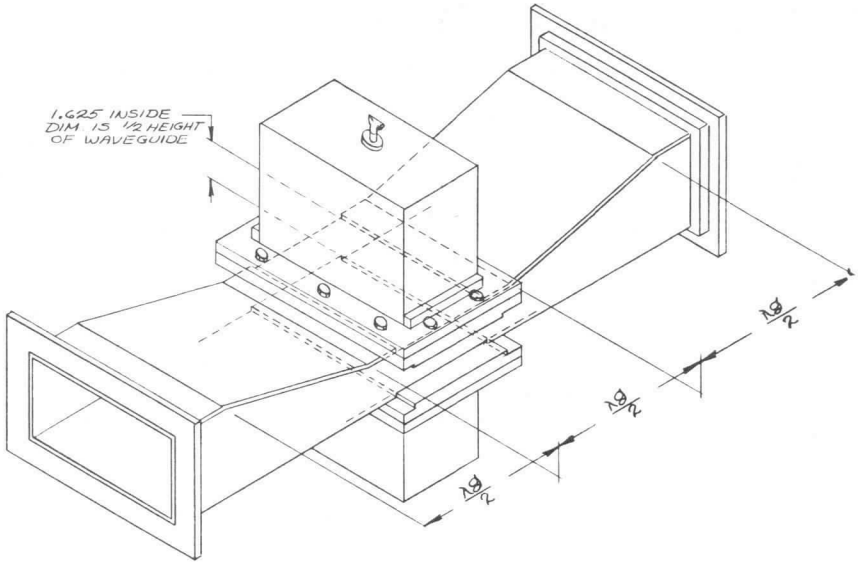


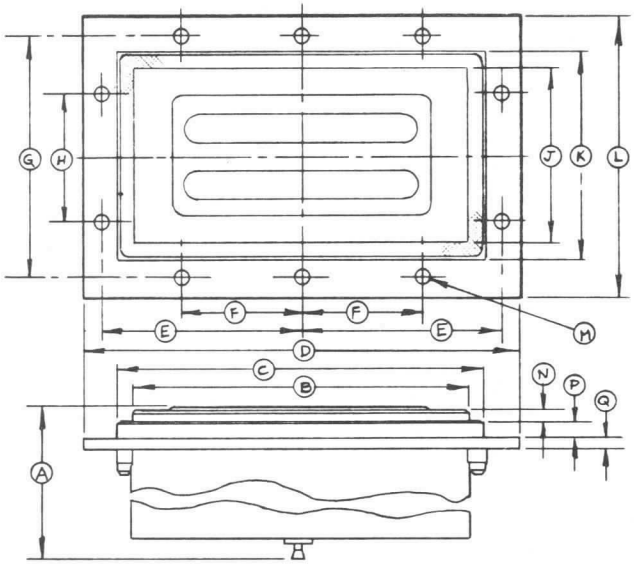
Ref.	Dimensions.
A	5.437
B	4.000
C	2.000
D	.250
E	.020
F	.600
G	7/32 End Mill (4) Sides.
H	.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill .270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap (10) holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692

Ref.	Dimensions
X	7.385
Y	3.938 ±.004

USED ON FOLLOWING:
6632/BL-18
6633/BL-37
6628/BL-86
BL-38A, BL-632, BL-665, BL-612

(over)





REF.	DIMENSIONS
A**♦	6.125 MAX.
B	6.725 MAX.
C*♥	7.365 ±.010
D*♦	8.11/16
E	3.938 ±.008
F*♦	2.375 ±.008
G♥	4.626 ±.008
H*	2.500 ±.008
J	3.475 MAX.
K*♣	4.115 ±.010
L*	5.7/16
M*	S(.318) DRILL 10 HOLES
N*	.375 +.015 -.005
P*	.250 ±.010
Q*♣	.250 ±.010

NOTE:- USED FOR FOLLOWING

GG28	BL-98
BL-38	BL-G40
BL-38A	BL-GG5

Bomac	GAS SWITCHING	L
	6633/BL37	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat
See Note 2.

Ratings:	Min.	Max.
Transmitter po	---	2000 kw
Duty Cycle	---	0.002
Open Circuit Ignitor Voltage	-750	---- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 4)

Test Conditions: See Mounting

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.7	**Moisture Vapor-proof Pack:	-----	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.6	Glass Strain:	Omit	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.33	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=2 min; Note 3	---	---
4.18.1	Ignitor Ignition Time:	Ebb=-750 Vdc; Ri=4.5 meg	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc	Eid:200	450 Vdc
4.18.4.2	*Insertion Loss:	F=1292±1% Mc	Li:---	0.7db
4.18.5.1	*Ignitor Interaction:	Ii=100μAdc	△Li:---	0.3db
4.18.18	Voltage Standing Wave Ratio:	F= 1220 Mc.	σ:---	1.4
		F= 1255	σ:---	1.4
		F= 1292	σ:---	1.4
		F= 1325	σ:---	1.4
		F= 1365 Mc.	σ:---	1.4
4.18.10	Spike Leakage Energy (1):	F= 1292±1%Mc; po=500±5%kw; tp1=4.0±0.15μs; tp2=1.0±0.15μs; prr=250; Ii=100μAdc	Ws:---	0.40erg
4.18.10	**Spike Leakage Energy (2):	F= 1292±1%Mc; po=2000kw; tp1=4.0±0.15μs; tp2=1.0±0.15μs; prr=250; Ii=100μAdc	Ws:---	0.40erg
4.18.11	Flat Leakage Power (1):	See Spike Leakage Energy (1)	pf:---	75mw
4.18.11	** Flat Leakage Power (2):	See Spike Leakage Energy (2)	pf:---	75mw
4.18.15.1	*Recovery Time (1):	F= 1292±1%Mc; po=500±5%kw; tp=4.0±0.15μs; prr=250; Ii=100 μAdc	t:---	15μs
4.18.15.1	**Recovery Time (2):	F= 1292±1%Mc; po=2000kw; Du=0.001; Ii=100μAdc	t:---	45μs
4.11	Life Test (1):	See Recovery Time (1); 2 per month Ebb=-700Vdc;Ri=2.5 meg.	t:500	---hrs
4.11	**Life Test (2):	See Recovery Time (2)	t:500	---hrs
4.11.4	Life Test (1) End Point:	Ignitor Voltage Drop;	Eid:---	600Vdc
		Insertion Loss;	Li:---	1.0db
		Spike Leakage Energy (1);	Ws:---	0.50erg
		Recovery Time (1)	t:---	15 μs
4.11.4	**Life Test (2) End Point:	Spike Leakage Energy (2);	Ws:---	0.50erg
		Recovery Time (2)	t:---	45 μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A suitable gasket shall be bolted between the tube and mounting seat. Tubes shall be supplied with gaskets mounted on them.

Note 3: Tubes shall satisfy all applicable requirements of this specification after the vibration test.

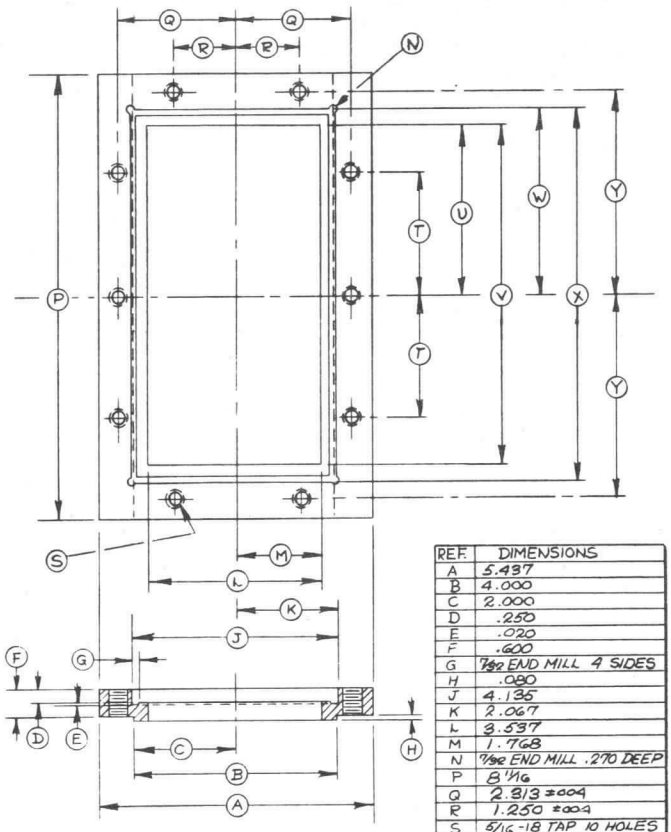
Note 4: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{(megohms)}$$

Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

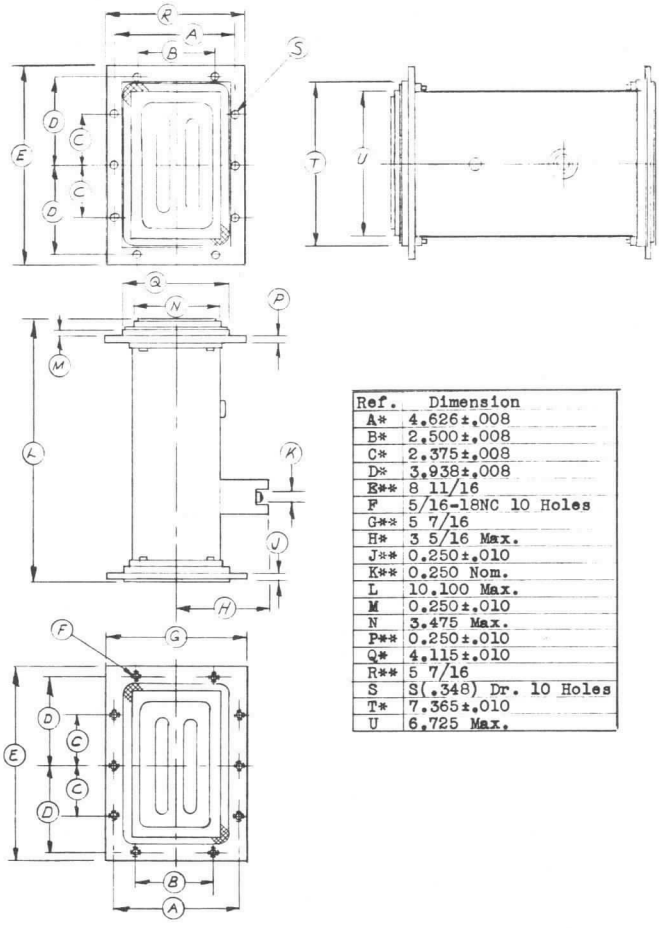
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)



FINISH ALL OVER

REF.	DIMENSIONS
A	5.437
B	4.000
C	2.000
D	.250
E	.020
F	.600
G	7/32 END MILL 4 SIDES
H	.090
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 END MILL .270 DEEP
P	8 1/16
Q	2.813 ±004
R	1.250 ±004
S	5/16-18 TAP 10 HOLES
T	2.375 ±004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.998 ±004



Ref.	Dimension
A*	4.626±.008
B*	2.500±.008
C*	2.375±.008
D*	3.938±.008
E**	8 11/16
F	5/16-18NC 10 Holes
G**	5 7/16
H*	3 5/16 Max.
J**	0.250±.010
K**	0.250 Nom.
L	10.100 Max.
M	0.250±.010
N	3.475 Max.
P**	0.250±.010
Q*	4.115±.010
R**	5 7/16
S	S(.348) Dr. 10 Holes
T*	7.365±.010
U	6.725 Max.

Bomac	GAS SWITCHING	L
	BL612	Pre-TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MARCH 29, 1956

Description: Pre-TR Tube

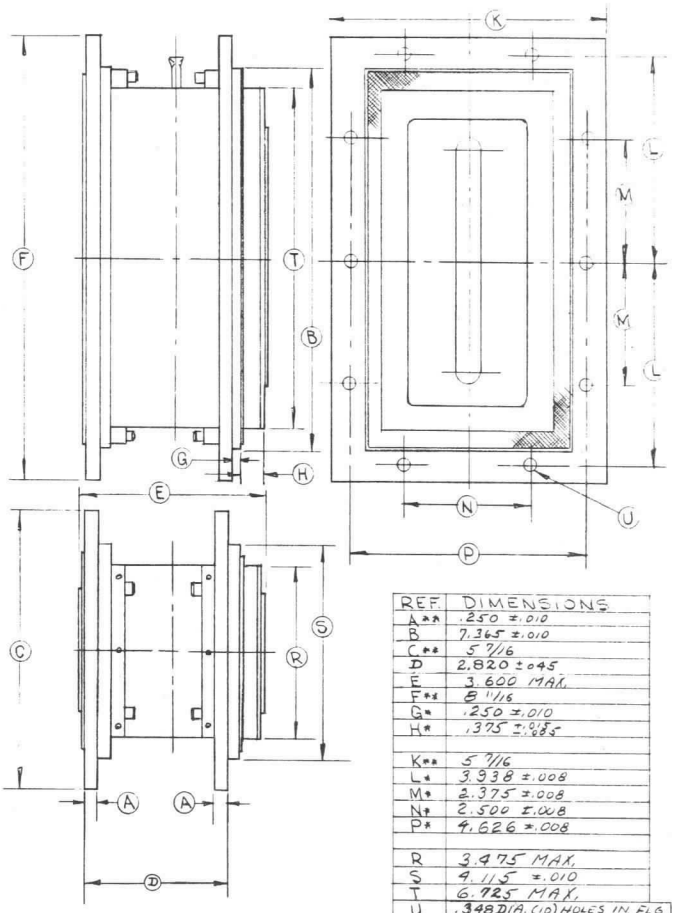
Ratings:	Transmitter po	Du
Maximum	3000 kw	.002

Dimensions: Per Outline

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.19.2	**Vibration:	F=50 G=10 t=60		
	**Insertion:	Note 1		
4.9.6	*Glass Strain:	Omit		
4.18.18	Voltage Standing Wave Ratio:	σ=1.05		
		*F=1250Mc.	σ : ---	1.4
		F=1265	σ : ---	1.4
		F=1300	σ : ---	1.3
		F=1335	σ : ---	1.4
		*F=1350	σ : ---	1.4
4.18.4.1	*Insertion Loss:	F=1300Mc±1%	Li : ---	0.4db
4.18.9	Average Leakage Power (1):	F=1300Mc±1% po=2000kw±10% σ=1.1max. tp=4.0μsec. prr=250pps	P : 10	50mw
4.18.9	**Average Leakage Power (2):	Leakage power (1) except po=3000kw Du=.002	P : 10	50mw
4.18.28	Arc Loss(1):	Leakage Power (1)	---	0.2db
4.18.28	**Arc Loss(2):	Leakage Power(2)	---	0.2db
4.18.19	**High Level VSWR:	Leakage Power (1)		1.2
4.18.15.1	*Recovery Time(1):	Leakage Power(1)	t : ---	45μsec
4.18.15.1	**Recovery Time(2):	Leakage Power(2)	t : ---	45μsec
4.11	Life Test(1):	F=1300±1%Mc po=2000±10%kw tp=4.0μsec; prr=250; σ=1.1max.	t : 500	---hrs.
4.11	**Life Test (2):	Leakage Power(2)	t : 500	---hrs.
4.11.4	Life Test(1) End Points:	Recovery time(1) Arc Loss (1)	t : --- ---	45μsec 0.5db
4.11.4	**Life Test(2) End Points:	Recovery Time(2) Arc Loss (2)	t : --- ---	45μsec 0.5db

Note 1: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration to the tubes electrical characteristics.

Note 2: The tube shall be mounted in the proper seat.



REF.	DIMENSIONS
A**	.250 ±.010
B	7.365 ±.010
C**	5 7/16
D	2.820 ±.045
E	3.600 MAX.
F**	8 1/16
G*	.250 ±.010
H*	.375 +.005 -.015
K**	5 7/16
L*	3.938 ±.008
M*	2.375 ±.008
N*	2.500 ±.008
P*	4.626 ±.008
R	3.475 MAX.
S	4.115 ±.010
T	6.725 MAX.
U	.348 DIA. (10) HOLES IN FLG. 5/16-18 N.C. (10) HOLES OPT. FLG

Bomac	GAS SWITCHING	L
	BL632	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 8, 1957

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat Note 2

Ratings:	Min.	Max.
Transmitter po	---	6000 kw
Duty Cycle	---	0.001
Open Circuit Ignitor Voltage	-750	--- Vdc
Ignitor Current	100	200μAdc
Weight (approx.)	---	9.25 lbs.

Recommended Ignitor Operating Current 150μAdc (Note 4)

Test Conditions: See Mounting, Note 5

Ref.	Test	Conditions		Min.	Max.
4.9.7	**Moisture Vapor-proof Pack:	------		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
---	*Glass Strain:	Note 6		---	---
4.9.13	**Pressurization:	P=10 lbs. gauge; Note 7		---	---
4.18.17.1	Temperature Cycle:	------	Cycle: 1		---
4.18.17.2	Temperature Cycle Life Test:	2 per month	Cycles: 10		---
4.18.33	*Vibration:	F 50cps; G 10; t 15 min., Note 3			
4.18.33	**Vibration:	F 50cps; G 10; t 60 min.; Note 3			
4.18.1	Ignitor Ignition Time:	Ebb=-750Vdc; Ri=4.5 meg.	t :	---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	200	450Vdc
4.18.4.2	*Insertion Loss:	F= 1250Mc.	Li :	---	0.6 db
		F= 1285Mc.	Li :	---	0.6 db
		F= 1300Mc.	Li :	---	0.6 db
		F= 1315Mc.	Li :	---	0.6 db
		F= 1350Mc.	Li :	---	0.6 db
		Note 5			
4.18.5.1	*Ignitor Interaction:	Ii=100μAdc	ΔLi :	---	0.3 db
4.18.18	Voltage Standing Wave Ratio:	F= 1250 Mc.	σ :	---	1.4
		F= 1285Mc.	σ :	---	1.2
		F= 1300 Mc.	σ :	---	1.2
		F= 1315 Mc.	σ :	---	1.2
		F= 1350 Mc.	σ :	---	1.4
		σ= 1.07 max. Note 5			
4.18.19	**High Level VSWR:	F= 1300±5%Mc. po= 500kw; tp=4.0±0.15μs; prr=250; Ii=100μAdc	σ :	---	1.2
4.18.28	Arc Loss:	F= 1300±5%Mc. po=500 kw; du=0.001;	Loss :	---	0.3 db
4.18.10	Spike Leakage Energy (1):	F= 1300±5%Mc; po=500±5%kw; tp1=4.0±0.15μs; tp2=1.0±0.15μs; prr=250; Ii=100μAdc	Ws:	---	0.50erg
4.18.10	**Spike Leakage Energy (2):	F= 1300±10%Mc. po=6000 kw; tp1=4.0±0.15μs; tp2=1.0±0.15μs; prr=250; Ii=100μAdc	Ws :	---	0.50erg

Ref.	Test	Conditions		Min.	Max.
4.18.11	Flat Leakage Power (1):	See Spike Leakage Energy(1)	pf :	---	75 mw
4.18.11	**Flat Leakage Power (2):	See Spike Leakage Energy (2)	pf :	---	75 mw
4.18.9	**Leakage Power:	F= 1300±10%Mc. Po/Du po=6000kw; tp=4.0μs; prr=250	:	---	75 mw
4.18.15.1	*Recovery Time(1):	F= 1300±5%Mc; po=2000±5%kw; tp=3.0μs; prr=330; Ii=100μAdc	t :	---	50μs
4.18.15.1	**Recovery Time(2):	F= 1300±10%Mc; po=6000kw; tp=4.0μs; prr=250; Ii=100μAdc	t :	---	100μs
4.11	Life Test(1):	See Recovery Time (1); 2 per month Ebb=-700Vdc; Ri=2.5meg	t :	500	---hrs
4.11	**Life Test(2):	See Recovery Time (2)	t :	500	---hrs
4.11.4	Life Test (1) End Point:	Ignitor Voltage Drop;	Eid :	---	600Vdc
		Insertion Loss;	Li :	---	1.0 db
		Spike Leakage Energy(1);	Ws :	---	0.50erg
		Recovery Time(1);	t :	---	75μs
		Arc Loss		---	0.7 db
4.11.4	**Life Test (2) End Point:	Spike Leakage Energy (2);	Ws :	---	0.50erg
		Recovery Time(2)	t :	---	150μs

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: A suitable gasket shall be bolted between the tube and mounting seat. Tubes shall be supplied with gaskets mounted on them.

Note 3: The tube shall be vibrated in a plane perpendicular to the keep-alive axis. After this the tube shall satisfy all other electrical tests of this specification.

Note 4: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{(megohms)}$$

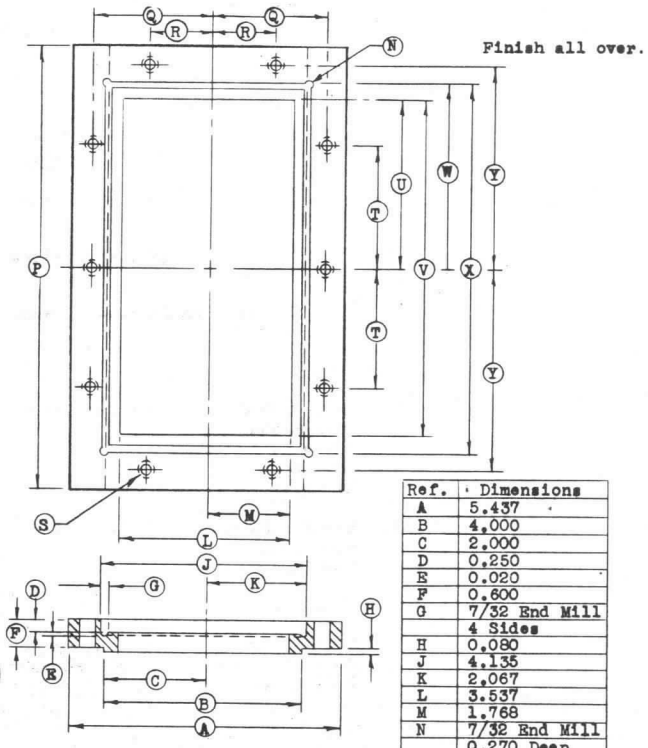
where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 5: Unless otherwise stated all frequencies are to be ±0.1%.

Note 6: The tube shall be placed into boiling water from an ambient temperature not exceeding 25°C. The water shall be maintained at 100°C, while the tube is immersed. After a 3 minute immersion period the tube shall be exposed to the ambient temperature condition for 3 minutes. This cycle will then be repeated. There shall be no indication of any glass cracks upon the completion of this test. The tube shall pass the firing time test after being subjected to this glass strain test.

Note 7: This test shall be performed by immersing the test mount seat and tube input flange to a depth of a least 3 inches in water. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

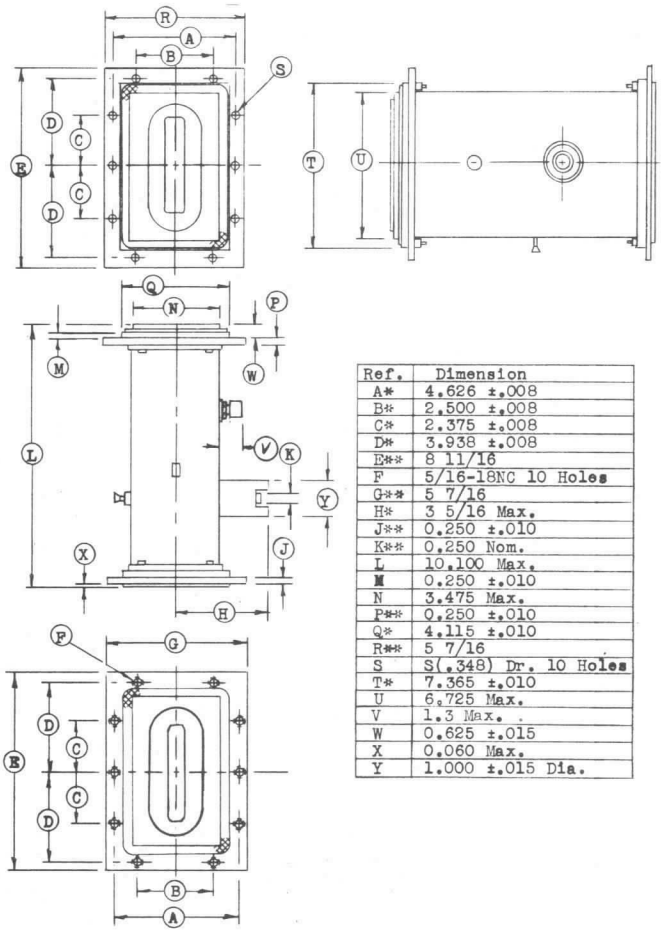
(over)



Ref.	Dimensions
A	5.437
B	4.000
C	2.000
D	0.250
E	0.020
F	0.600
G	7/32 End Mill 4 Sides
H	0.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill 0.270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap 10 Holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.938 ±.004

This Mounting Seat used on the following tubes:-

6605	BL- 96	BL-665
6628	BL- 96A	BL-665A
6632	BL-612	BL-688
6633		BL-688A
6962	BL-632	BL-664A
BL-18		
BL-18A	BL-640	
BL-37	BL-640A	
BL-37A	BL-664	



Ref.	Dimension
A*	4.626 ±.008
B*	2.500 ±.008
C*	2.375 ±.008
D*	3.938 ±.008
E**	8 11/16
F	5/16-18NC 10 Holes
G**	5 7/16
H*	3 5/16 Max.
J**	0.250 ±.010
K**	0.250 Nom.
L	10.100 Max.
M	0.250 ±.010
N	3.475 Max.
P**	0.250 ±.010
Q*	4.115 ±.010
R**	5 7/16
S	S(.348) Dr. 10 Holes
T*	7.365 ±.010
U	6.725 Max.
V	1.3 Max.
W	0.625 ±.015
X	0.060 Max.
Y	1.000 ±.015 Dia.

Bomac	GAS SWITCHING	L
	BL640	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 26, 1957

Note 1

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat
See Note 2.

Ratings:	Min.	Max.
Transmitter po	---	2.0 Mw
Duty Cycle	---	0.002
Weight (approx.)	---	5.75 lbs.

Test Conditions: See Mounting

Packing: To be specified.

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	*Glass Strain:	Note 3		---	---
4.18.17.1	Temperature Cycle:	------	Cycles :	1	---
4.18.17.2	Temperature Cycle Life Test:	2 per month	Cycles :	10	---
4.18.13.2	**Loaded Q:	F= 1300±0.1%Mc; Note 5	QL :	---	5.0
4.18.25	Tuning Susceptance:	F= 1300±0.1%Mc; Note 5	B/Yo :	---	±0.05
4.18.26	*Equivalent Conductance:	F= 1300±0.1%Mc; Note 5	G/Yo :	---	0.05
4.18.27	Firing Time:	F= 1300±5%Mc; po=500±5%kw; tp=4.0±0.15μs; prr=250; Note 5	t :	---	5.0 sec.
4.18.28	Arc Loss:	See Firing Time		---	0.3 db
4.18.33	*Vibration:	F= 50cps; G=10; t=15 min; Note 4		---	---
4.18.33	**Vibration:	F=50 cps; G=10; t=60 min; Note 4		---	---
4.18.19	**High Level VSWR:	F= 1300±5%Mc; po=50±10%kw; tp=4.0±0.15μs; prr=250; σ =1.05max.; Note 5	σ :	---	1.15
------	*Recovery Time:	To be specified	t :	To be specified	
4.11	Life Test:	F= 1300±5%Mc; po=2.0±5%Mw; Du=.001; Note 5	t :	500	---hrs.
4.11.4	Life Test End Point:	Tuning Susceptance;	B/Yo :	---	±0.05
		Equivalent Conductance;	G/Yo :	---	0.1
		Arc Loss;		---	0.4 db
		Recovery Time	t :	To be specified	

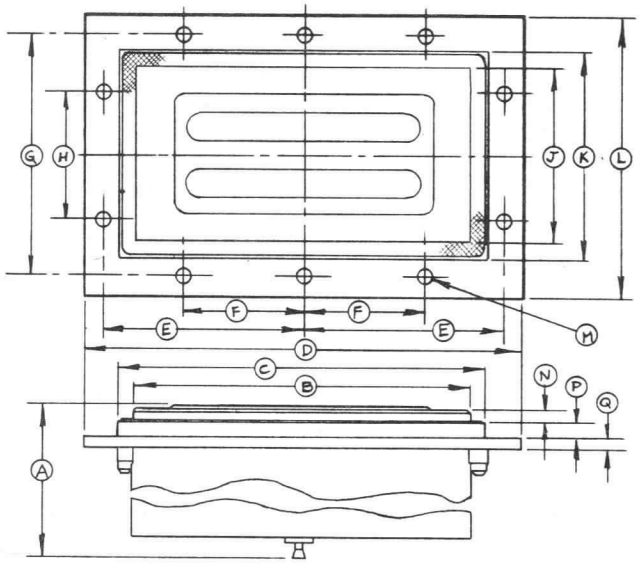
Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: A gasket is to be bolted between the tube and the mounting seat. One gasket will be supplied with each tube.

Note 3: The tube shall be placed into boiling water from an ambient temperature not exceeding 25°C. The water shall be maintained at 100°C while the tube is immersed. After a 3 minute immersion period the tube shall be exposed to the ambient temperature condition for 3 minutes. This cycle will then be repeated. There shall then be no indication of any glass cracks upon the completion of this test. The tube shall pass the firing time test after being subjected to this glass strain test.

Note 4: Vibrate in a plane normal to the tuning diaphragm. The tube shall satisfy all requirements of this specification after the vibration test.

Note 5: Tube mounted in a series tee seat, L-Band Waveguide (I.D. = 6.500 x 3.250 in.).



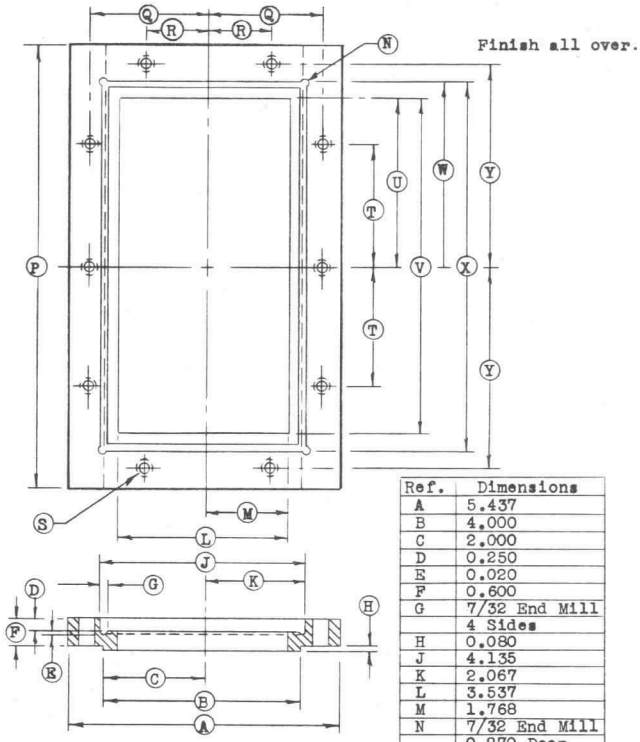
REF.	DIMENSIONS
A**	6.125 MAX.
B	6.725 MAX.
C**	7.365 ±.010
D**	8. 1/16
E	3.938 ±.008
F**	2.375 ±.008
G*	4.626 ±.008
H*	2.500 ±.008
J	3.475 MAX.
K**	4.118 ±.010
L*	5. 7/16
M*	5(.348) DRILL 10 HOLES
N*	.375 ±.015
P*	.250 ±.010
Q**	.250 ±.010

Outline used for following tubes:-

6628
6962
BL- 38
BL- 98
BL-640
BL-640A

BL-665
BL-665A

(over)



Finish all over.

Ref.	Dimensions
A	5.437
B	4.000
C	2.000
D	0.250
E	0.020
F	0.600
G	7/32 End Mill
	4 Sides
H	0.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill
	0.270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap
	10 Holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.938 ±.004

This Mounting Seat used on the following tubes:-

6605	BL- 96	BL-665
6628	BL- 96A	BL-665A
6632	BL-612	BL-688
6633		BL-688A
6962	BL-632	BL-664A
BL-18		
BL-18A	BL-640	
BL-37	BL-640A	
BL-37A	BL-664	

Bomac	GAS SWITCHING	L
	BL640A	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 14, 1957

Dimensions: Per Outline

Mounting: See attached drawing of Mounting Seat, See Note 2.

Ratings:	Min.	Max.
Transmitter po	---	2.0 Mw
Duty Cycle	---	0.002
Weight (approx.)	---	5.75 lbs.

Test Conditions: See Mounting

Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.6	Glass Strain:	Note 3	---	---
4.9.13	**Pressurization:	P=10 lbs. gauge, Note 6		
4.18.17.1	Temperature Cycle:	------ Cycles : 1		---
4.18.17.2	Temperature Cycle Life Test:	2 per month Cycles : 10		---
4.18.33	*Vibration:	F=50cps; G=10; t=15 min; Note 4	---	---
4.18.33	**Vibration:	F=50cps; G=10; t=60 min; Note 4	---	---
4.18.13.2	**Loaded Q:	F= 1300±0.1%Mc; QL: --- Note 5		5.0
4.18.25	Tuning Susceptance:	F= 1300±0.1%Mc; B/Yo : --- Note 5		±0.05
4.18.26	*Equivalent Conductance:	F= 1300±0.1%Mc; G/Yo : --- Note 5		0.05
4.18.27	Firing Time:	F= 1300±5%Mc; po=500±5%kw; tp=4.0±0.15μs; prr=250; Note 5	t : ---	5.0 sec.
4.18.28	Arc Loss:	See Firing Time	---	0.3 db
4.18.19	**High Level VSWR:	F= 1300±5%Mc; po=500±10%kw; tp=4.0±0.15μs; prr=250; σ =1.05 max; Note 5	σ : ---	1.15
------	*Recovery Time:	To be specified	t : To be specified	
4.11	Life Test:	F= 1300±5%Mc; po=2.0±5%Mw; Du=.001; Note 5	t : 500	--- hrs.
4.11.4	Life Test End Point:	Tuning Susceptance; B/Yo : ---		±0.05
		Equivalent Conductance; G/Yo : ---		0.1
		Arc Loss;	---	0.4 db
		Recovery Time	t : To be specified	

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

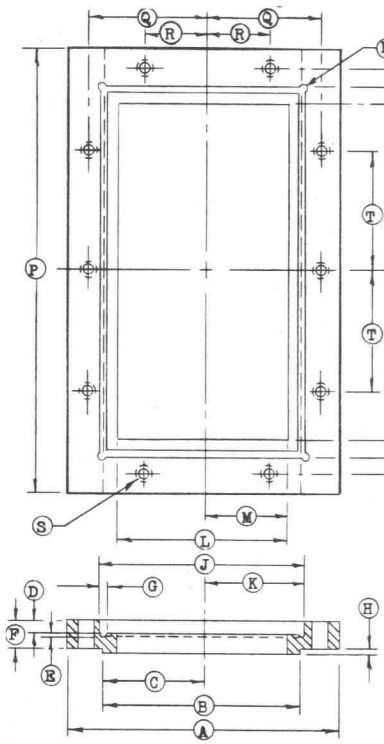
Note 2: A gasket is to be bolted between the tube and the mounting seat. One gasket will be supplied with each tube.

Note 3: The tube shall be placed into boiling water from an ambient temperature not to exceed 25°C. The water shall be maintained at 100°C while the tube is immersed. After 3 minutes immersion period the tube shall be exposed to the ambient temperature condition for 3 minutes. This cycle will then be repeated. There shall be no indication of any glass cracks upon completion of this test. The tube shall pass the firing time test after being subjected to this glass strain test.

Note 4: Vibrate in a plane normal to the tuning diaphragm. The tube shall satisfy all requirements of this specification after the vibration test.

Note 5: Tube mounted in a series tee seat, L-Band Waveguide (I.D. = 6.500 x 3.250 in.)

Note 6: This test shall be performed by immersing the test mount seat and tube input flange to a depth of at least 3 inches in water. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

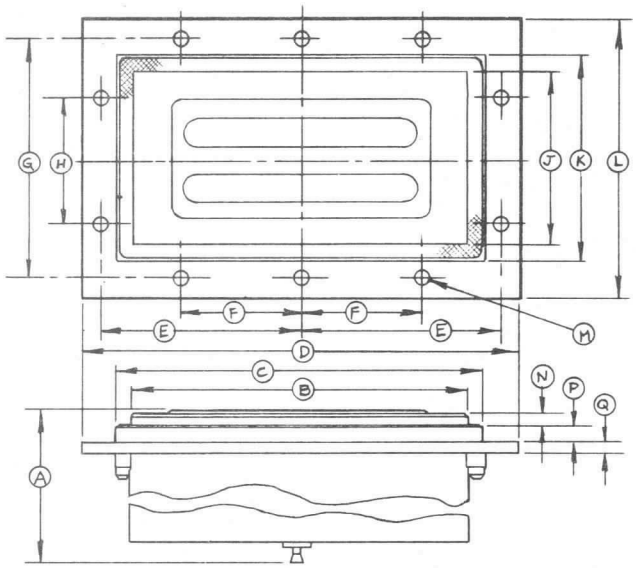


Ref.	Dimensions
A	5.437
B	4.000
C	2.000
D	0.250
E	0.020
F	0.600
G	7/32 End Mill
	4 Sides
H	0.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill
	0.270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap
	10 Holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692
X	7.385
Y	3.938 ±.004

This Mounting Seat used on the following tubes:-

6605	BL- 96	BL-665
6628	BL- 96A	BL-665A
6632	BL-612	BL-688
6633		BL-688A
6962	BL-632	BL-664A
BL-18		
BL-18A	BL-640	
BL-37	BL-640A	
BL-37A	BL-664	

(over)



REF.	DIMENSIONS
A**	6.125 MAX.
B	6.725 MAX.
C**	7.365 ±.010
D**	8 1/16
E	3.938 ±.008
F**	2.375 ±.008
G*	4.626 ±.008
H*	2.500 ±.008
J	3.475 MAX.
K**	4.115 ±.010
L*	5 7/16
M*	5(.348) DRILL 10 HOLES
N*	.375 +.015 -.025
P*	.250 ±.010
Q**	.250 ±.010

Outline used for
following tubes:-

6628
6962
BL- 38
BL- 98
BL-640
BL-640A

BL-665
BL-665A

Bomac

GAS SWITCHING	L
BL665	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 6, 1956

Dimensions: As Per Outline

Ratings:	Transmitter po KW	Duty Cycle ---	Altitude ft.
Maximum:	2000	0.001	---
Minimum:	----	---	---

Mounting: Note 1

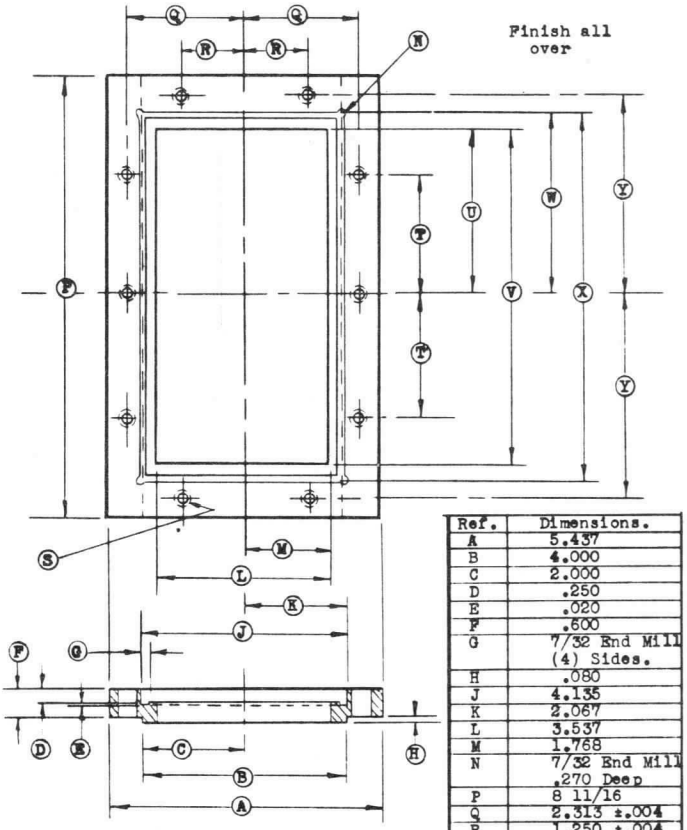
Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval	Required for JAN Marking		---	---
4.9.7	Moisture-Vapor-proof Pack:			---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.9.19.2	**Vibration:	F=50; G=10: t=60		---	---
---	**Insertion:	Note 2		---	---
4.18.13.2	**Loaded Q:	F=1285±0.1%Mc; Note 1	Q_L:	---	5.0
4.18.25	Tuning Susceptance:	F=1285±0.1%Mc; Note 1	B/Yo:	---	±0.05
4.18.26	*Equiv. Conductance:	F=1285±0.1%Mc; Note 1	G/Yo:	---	0.05
4.18.27	Firing Time:	po=500 kw±5% tp=4.0 us; prr=250; F=1285±5% Mc Note 1	t:	---	5.0 sec.
---	Recovery Time:	To be determined		---	---
4.18.28	Arc Loss:	See Firing Time	Loss:	---	0.3 db
4.18.19	**High Level VSWR:	po=500kw; σ'=1.05 max; F=1285±5% Mc. Note 1	σ	---	1.15
---	Temperature Cycle:	Note 3	Cycles:	1	---
4.18.17.3	**Temperature Cycle Life Test:		Cycles:	20	---
4.11	Life Test:	2 per month: po=2000kw; Du=0.001; σ'=1.2 max; F=1285 Mc±5%	t:	500	---hrs.
4.11.4	Life Test End Point:	Tuning Susceptance	B/Yo:	---	±0.05
		Equivalent Conductance	G/Yo:	---	0.1
		Arc Loss	Loss:	---	0.4 db

Note 1: The tube shall be mounted in a seat as shown in accompanying drawing. The seat shall be mounted in half-height guide as shown in accompanying drawing.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical charactertistics.

Note 3: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to minus 40°C to plus 100°C to room temperature. The temperature maybe allowed to com to equilibrium at room temperature in going from minus 40°C to plus 100°C. At the conclusion of the cycle the tube shall pass the Firing Time test. This test may be performed before the final finishing operation.

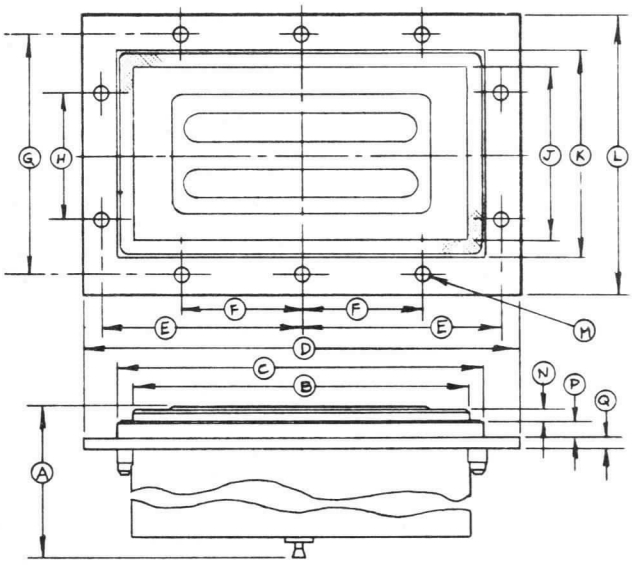
Note 4: References and notations are from Military Specification Electron Tubes. MIL-E-1C 3 October 1955.



Ref.	Dimensions.
A	5.437
B	4.000
C	2.000
D	.250
E	.020
F	.600
G	7/32 End Mill (4) Sides.
H	.080
J	4.135
K	2.067
L	3.537
M	1.768
N	7/32 End Mill .270 Deep
P	8 11/16
Q	2.313 ±.004
R	1.250 ±.004
S	5/16-18 Tap (10) holes
T	2.375 ±.004
U	3.393
V	6.787
W	3.692

Ref.	Dimensions
X	7.385
Y	3.938 ±.004

USED ON FOLLOWING:
6632/BL-18
6633/BL-37
6628/BL-86
BL-38A, BL-632, BL-665, BL-612

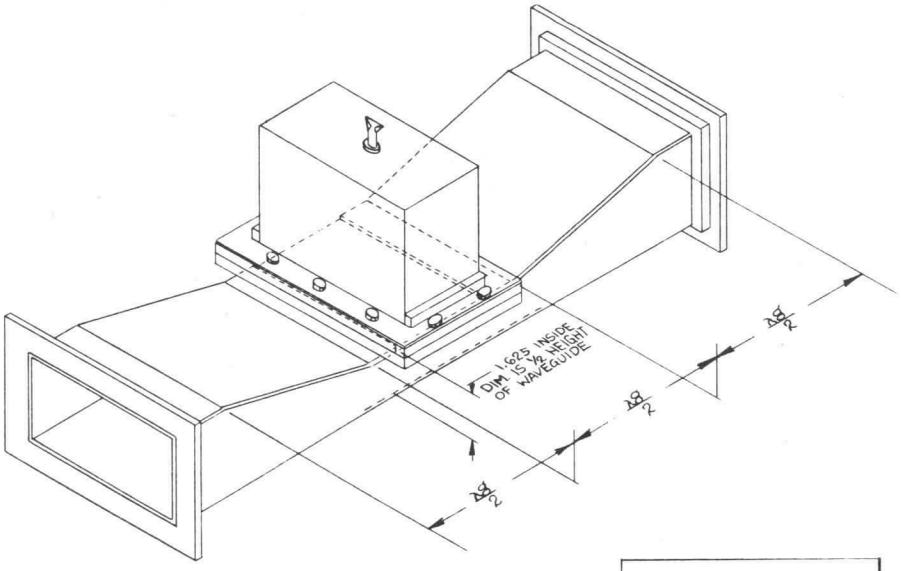


REF.	DIMENSIONS
A**	6.125 MAX.
B	6.725 MAX.
C**	7.365 ±.010
D**	8. 1/16
E	3.938 ±.008
F**	2.375 ±.008
G*	4.626 ±.008
H*	2.500 ±.008
J	3.475 MAX.
K**	4.115 ±.010
L*	5. 7/16
M*	5(.348) DRILL 10 HOLES
N*	.375 ±.015
P*	.250 ±.010
Q**	.250 ±.010

NOTE:-USED FOR FOLLOWING

6628	BL-98
BL-38	BL-640
BL-38A	BL-665

(over)



"L" BAND ATR MOUNTED
IN HALF HEIGHT WAVEGUIDE

Bomac	GAS SWITCHING	S
	1B38	Pre-TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	100	--- kw
Altitude	---	10,000 ft.

Test Conditions: Note 6

Packed in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		
4.9.19.2	**Vibration:	G=10		
4.9.6	*Glass Strain:			
4.18.18	*Voltage Standing Wave Ratio:	σ'=1.05max.; F= 2800±0.5%Mc;	σ :---	1.10
4.18.18	*Voltage Standing Wave Ratio:	F= 2690Mc; F= 2910Mc; σ'=1.05max.	σ :--- σ :---	1.20 1.20
4.18.4.1	*Insertion Loss:	F= 2800±3%Mc; σ'=1.05 max.	Li :---	0.20 db
4.18.9	Leakage Energy:	F= 2800±3%Mc; po=200kw±10%; tp=1.0μs; prr=1000; σ'=1.1max; Note 3	Joules: 0.8×10^{-4}	15×10^{-4}
4.18.28	Arc Loss:	F= 2800±3%Mc; po=50 kw; tp=1.0μs; prr=1000; σ'=1.0 max.	Loss :---	0.8 db
4.18.19	**High Level V.S.W.R.:	Arc Loss	σ :---	1.2
4.18.15.1	*Recovery Time:	Test Circuit U po=750kw; F= 2800±3%Mc; Du=.004; Note 4, 7	t :---	15μs
4.18.17.1	Temperature Cycle:	Note 5	Cycle :1	---
4.18.17.3	Temperature Cycle Life Test:	Group C	Cycle :---	10
------	Temperature Cycle Life Test End Point:	Arc Loss; Recovery Time	Loss:--- t :---	0.9 db 20 μs
4.11	Life Test:	po=750 kw; F= 2800±3%Mc; tp=1.0μs; prr=400; Group C	t :500	---hrs.
4.11.4	Life Test End Points:	Recovery Time; Arc Loss	t :--- Loss:---	30μs 0.9 db

Note 1: References and notations are from Military Specification, Electron Tubes, 3 October 1955.

Note 2: Tube mount per drawing 220-JAN.

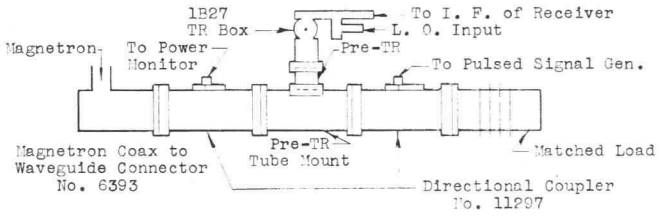
Note 3: The leakage energy in ergs is defined as the average power divided by the pulse repetition rate. 10^7 ergs=1joule.

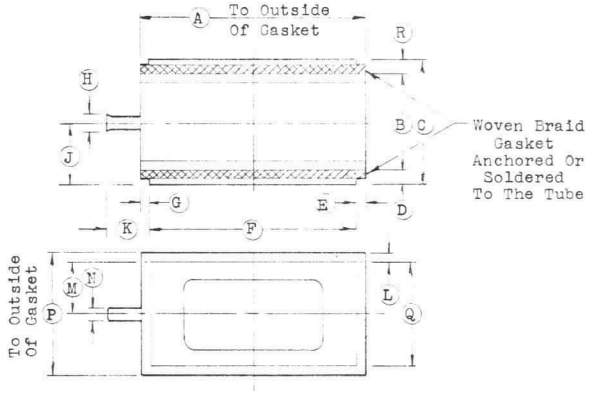
Note 4: See Test Circuit "U".
The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3.0 db in excess of the loss at 800 to 1000μs after the pulse. There shall be no arcing between the tube and contact gasket at the specified power level. To supply additional protection to the crystal, use either a fast recovery time 1B27 as shown in test circuit or isolate the mixer from the pre-TR by 10 db of lossy cable.

Note 5: Test each tube for compliance with Arc Loss requirements following this test.

Note 6: Low level measurements to be performed using test mount per drawing 220-JAN.

Note 7: See MIL-E-123/B for type and dimensions of gasket to be used.





Silver Plate 100 MSI or Equivalent

Ref.	Dimension
A	3.223 Max.
B*	1.375±.010
C**	1.715±.040
D*	0.170±.015
E*	0.109+.000-.015
F*	3.000±.010
G*	0.109+.000-.015
H*	1/4 Max.
J**	7/8±1/8
K	1/2 Max.
L*	0.109+.000-.015
M**	0.750±.015
N**	3/16 Max. Dia.
P	1.723 Max.
Q*	1.500±.010
R*	0.170±.015

Bomac	GAS SWITCHING	S
	1B44	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10;			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F = 2750±0.1%Mc. Note 6	B/Yo:	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F = 2750±0.1%Mc. Note 6	G/Yo:	---	0.05
4.18.27	Firing Time:	po=50kw; t_p=1.0±10%μs; prr=1000±10%; F = 2750±3%Mc; Note 3	t:	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss:	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; t_p=1.0±10%μs; prr=1000±10%; σ = 1.05 max. F = 2800Mc±5%	σ:	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles:	1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles:	10	---
4.11	Life Test:	po=750 kw (min.) Du=0.0008; σ = 1.20 (max.) F = 2800Mc±5%; Group C Note 4	t:	1000	--- hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/yo:	---	0.1
		Tuning Susceptance:	B/Yo:	-0.05	0.05

Note 1: References and notations are from Military Specification Electron Tubes, dated 3 October 1955. MIL-E-1C.

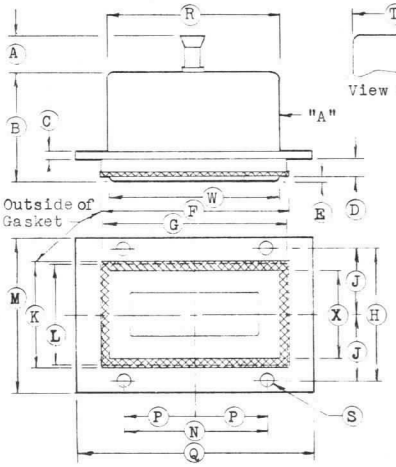
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

Bomac	GAS SWITCHING	S
	1B52	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.13.1.8	Carton Drop:	(d) Package Group 1; Carton Size N	---	---
4.9.19.2	**Vibration:	G=10		
4.9.8	**Salt Spray Corrosion:	Omit		
4.9.6	*Glass Strain:	------	---	---
4.18.13.2	** Loaded Q:	Note 6	QL: ---	5.5
4.18.25	Tuning Susceptance:	F = 3625±0.1%Mc. Note 6	B/Yo : -0.05	+0.05
4.18.26	*Equivalent Conductance:	F = 3625±0.1%Mc. Note 6	G/Yo : ---	0.05
4.18.27	Firing Time:	po=50kw; tp=1.0±10%μs; prr=1000±10%; F = 3625±3%Mc; Note 3	t : ---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss: ---	0.3 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ́ =1.05 max. F = 3367Mc±5%	σ : ---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles: 1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles : 10	---
4.11	Life Test:	po=750kw(min.) Du=0.0008; σ́ =1.20 (max.) F = 3367Mc5%; Group C; Note 4	t : 1000	---hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo : ---	0.1
		Tuning Susceptance:	B/Yo : -0.05	+0.05

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

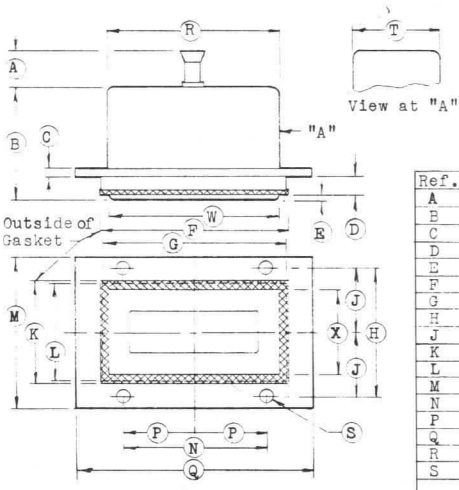
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia.
	4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44 5792 BL- 40
1B52 5793 BL- 41
1B53 5921 BL-630
1B56 5922 BL-660
1B57 6024
ATR-387 ATR-387A

Bomac	GAS SWITCHING	S
	1B53	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F= 3479±0.1%Mc Note 6	B/Yo :	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F= 3479±0.1Mc Note 6	G/Yo :	---	0.05
4.18.27	Firing Time:	po=50kw; tp=1.0±10%μs; prr=1000±10%; F= 3479±3%Mc; Note 3	t :	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss :	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ' =1.05 max. F= 3367Mc±5%	σ :	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles :	1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles :	10	---
4.11	Life Test:	po=750 kw (min.) Du=0.0008; σ' =1.20 (max.); F= 3367Mc±5%; Group C; Note 4	t :	1000	--- hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo :	---	0.1
		Tuning Susceptance:	B/Yo :	-0.05	0.05

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

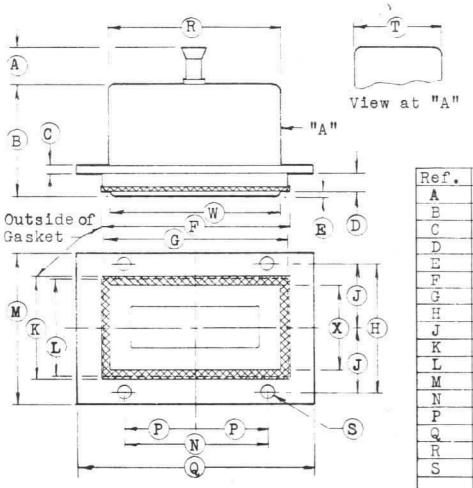
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44 5792 BL- 40
1B52 5793 BL- 41
1B53 5921 BL-630
1B56 5922 BL-660
1B57 6024
ATR-387 ATR-387A

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 25, 1956

Dimensions: Per Outline

Mounting: Per drawing 220-JAN

Ratings:	Min.	Max.
Transmitter po	100	--- kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

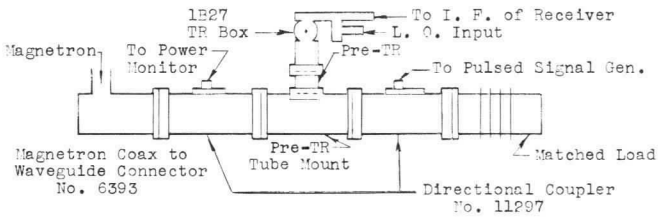
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		
4.9.19.2	**Vibration:	G=10		
4.9.6	*Glass Strain:			
4.18.18	*Voltage Standing Wave Ratio:	F= 3550±0.5%Mc σ :--- $\acute{\sigma}$ =1.05Max.;		1.10
4.18.18	*Voltage Standing Wave Ratio:	F= 3400±0.5%Mc. σ :--- F= 3700±0.5%Mc; $\acute{\sigma}$ =1.05max.		1.20
4.18.4.1	*Insertion Loss:	F= 3550±0.5%Mc; Li :--- $\acute{\sigma}$ =1.05max.		0.20db
4.18.9	Leakage Energy:	F= 3550±5%Mc; Joules: 0.8×10^{-4} 15×10^{-4} po=200kw±10%; tp=1.0μs; prr=1000; $\acute{\sigma}$ =1.1max; Notes 2, 3		
4.18.28	Arc Loss:	F= 3550±5%Mc; Loss: --- po=50kw; tp=1.0μs; prr=1000; $\acute{\sigma}$ =1.1 max.		0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	Arc Loss σ :---		1.2
4.18.15.1	*Recovery Time:	F= 3550±5%Mc. t :--- po=750kw; Du=0.0004; Note 3		15μs
4.18.17.1	Temperature Cycle:	Note 4 Cycles :1.0		---
4.18.17.3	Temperature Cycle Life Test:	Group C Cycles :---		10
------	Temperature Cycle Life Test End Point:	Arc Loss; Loss :--- Recovery Time t :---		0.9 db 20μs
4.11	Life Test:	F= 3550±5%Mc; t :500 tp=1.0μs; po=750kw; prr=400; Group C		---hrs.
4.11.4	Life Test End Point:	Recovery Time; t :--- Arc Loss; Loss :---		30μs 0.9 db

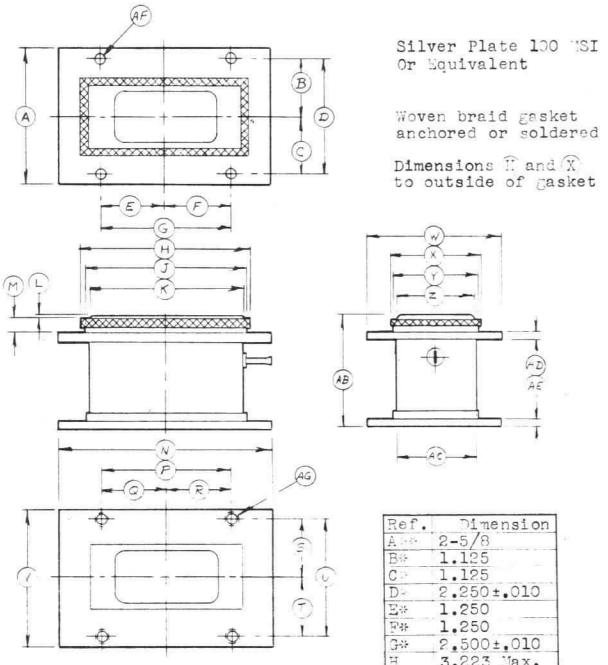
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The leakage energy in ergs is defined as the average power divided by the pulse repetition rate.

Note 3: See Test Circuit "U"
The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3.0 db in excess of the loss at 800 to 1000 μs after the pulse. There shall be no arcing between the tube and contact gasket at the specified power level. To supply additional protection to the crystal, use either a fast recovery time 1B27 as shown in Test Circuit or isolate the mixer from the pre-TR by 10 db of lossy cable.

Note 4: Test each tube for compliance with Arc Loss requirements following this test.





Ref.	Dimension
A**	2-5/8
B*	1.125
C*	1.125
D*	2.250±.010
E*	1.250
F*	1.250
G*	2.500±.010
H	3.223 Max.
J*	3.218±.015
K	3.000±.008
L	0.065±.015
M	0.297±.010
N**	4-1/8
P*	2.500±.010
Q*	1.250
R*	1.250
S*	1.125
T*	1.125
U*	2.250±.010
V**	2-5/8
W**	2-5/8

Ref.	Dimension
X	1.723 Max.
Y*	1.718±.015
Z*	1.500±.008
AB	2.060±.020
AC*	1.500
AD**	1/8
AE**	1/8
AF	Drill 7/32 Dia. 4 holes
AG	#10-32NC 4 Holes

Bomac	GAS SWITCHING	S
	1B55	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 27, 1956

Dimensions: Per Outline

Mounting: Mount per drawing, 153-JAN Issue E

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Ignitor Open Circuit Supply Voltage	-500	-700 Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 8)

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain			---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V		---	---
4.9.19.2	**Vibration:	10G; t=60 F=50			
4.9.13	Pressurization:	P=50psia; Note 6			
4.9.13	*Pressurization:	P=50psia; Note 7			
------	*Insertion:	Note 2			
4.18.18	Voltage Standing Wave Ratio:	σ́ =1.05max.;			
		*F= 3365±.1%Mc.	σ : ---		1.65
		F1=3390±.1%	σ : ---		1.4
		*F= 3415±.1%	σ : ---		1.4
		*F= 3440±.1%	σ : ---		1.4
		*F= 3465±.1%	σ : ---		1.4
		*F= 3490±.1%	σ : ---		1.4
4.18.18	**Voltage Standing Wave Ratio: (Cont.)**	*F= 3515±.1%	σ : ---		1.4
		F2=3550±.1%	σ : ---		1.4
		*F= 3575±.1%	σ : ---		1.4
		*F= 3600±.1%	σ : ---		1.4
		*F= 3625±.1%	σ : ---		1.4
		*F= 3650±.1%	σ : ---		1.4
		*F= 3675±.1%	σ : ---		1.4
		F3=3710±.1%	σ : ---		1.4
		*F= 3740±.1%Mc.	σ : ---		1.65
4.18.4.2	*Insertion Loss:	F=F2; Iz=0μAdc	Li : ---		0.7 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi : ---		0.3 db
4.18.1	†Ignitor Firing Time:	Ebb= -600Vdc; Ri=1.6±1%Megs.	t : ---		5 sec.
4.18.2	Ignitor Voltage Drop:	Ebb= -600Vdc; Ri=1.6±1%Meg	Eid : -250		-400Vdc
4.18.11	Flat Leakage Power(1):	F=F2; po=200±10kw; σ́ =1.1max.; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	pf : ---		40.0mw
4.18.11	**Flat Leakage Power (2):	F=F2; po=10kw±10%; σ́ =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	pf : ---		40.0 mw
4.18.10	Spike Leakage Energy (1):	F=F2; po=200±10kw; σ́ =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	Ws : ---		0.3 ergs
4.18.10	**Spike Leakage Energy (2):	F=F2; po=10kw±10%; σ́ =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	Ws : ---		0.3 ergs

4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw;
		tp=1.0±.15μs;
		prr=1000pps;
		F=F2; Note 4
			σ : ---		1.15

Ref.	Test	Conditions		Min.	Max.
4.18.15.1	*Recovery Time:	po=750kw; F=F2; Du=.0008; Iz=200μAdc; Note 3	t : ---		15 μs
4.18.17.1	Temperature Cycle:		Cycles : 1		---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles : 10		---
4.11	Life Test:	po=750±10%; Du=.0008; F=F2±5%; Ebb= -600Vdc; Ri=1.6Megs; Group C; Note 5	t : 500		--- hrs.
4.11.4	Life Test End Point:	Recovery Time;	t : ---		30μs
		Flat Leakage Power;	pf : ---		40.0mw
		Spike Leakage Energy; and	Ws : ---		0.3 erg
		Insertion Loss	Li : ---		1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000μs after the pulse.

Note 4: With a load standing wave ratio of less than 1.05 the voltage standing wave ratio produced by the tube shall be less than the amount specified.

Note 5: The ignitor current shall not be adjusted during life test. Life test end points shall be measured using a fixed voltage and resistor.

Note 6: Mount the tube as per drawing 208-JAN. This test shall be performed by immersing the seat and tube flange to a depth of at least 3 inches in water which has been heated to 45°C±5°C. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

Note 7: The tube shall be mounted per drawing 208-JAN and the complete assembly cycled once from -55°C to +100°C. After the temperature has again reached room temperature, the pressure shall not have changed more than one-quarter of a pound as indicated by a gauge permanently connected into the system.

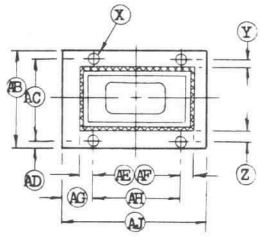
Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (Megohms)}$$

where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)



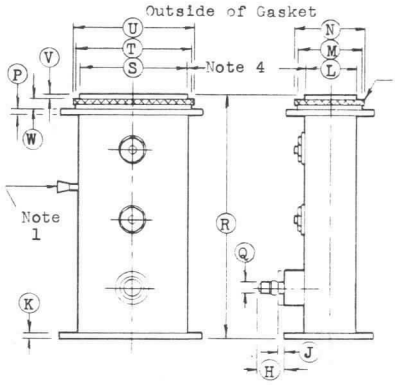
Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.

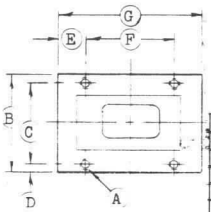
Note 2:- Woven braid gasket anchored or soldered to the tube.

Note 4:- Edges may be rounded.

Note 5:- Rhodium flash over silver plating optional.

Note 6:- Gasket per drawing 189-JAN.





Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/8
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.733 Max.
P**	1/8
Q*	0.250
R	4.228±.030
S	3.008 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.297±.020
X*	7/32 Dia. 4 Holes
Y*	Within .015 of
Z*	each other
AB**	2 5/8
AC*	2.250±.010
AD*	3/16

Ref.	Dimension
AE*	Within .015 of
AF*	each other
AG*	13/16
AH*	2.500±.010
AJ**	4 1/8

Bomac	GAS SWITCHING	S
	1B56	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group I; Carton Size N	---	---
4.9.19.2	**Vibration:	G=10		
4.9.8	**Salt Spray Corrosion:	Omit		
4.9.6	*Glass Strain:	------	---	---
4.13.13.2	**Loaded Q:	Note 6	QL: ---	5.5
4.18.25	Tuning Susceptance:	F= 2850±0.1%Mc. Note 6	B/Yo : -0.05	+0.05
4.18.26	*Equivalent conductance:	F= 2850±0.1%Mc. Note 6	G/Yo : ---	0.05
4.18.27	Firing Time:	po=50 kw; tp=1.0±10%μs; prr=1000±10%; F= 2850±3%Mc; Note 3	t : ---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss: ---	0.3 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ = 1.05 max. F= 2800Mc±5%	σ : ---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles : 1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles : 10	---
4.11	Life Test:	po=750kw(min.) Du=0.0008; σ = 1.20 (max.); F= 2800Mc±5%; Group C; Note 4	t : 1000	--- hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo : ---	0.1
		Tuning Susceptance:	B/Yo : -0.05	+0.05

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated October 1955.

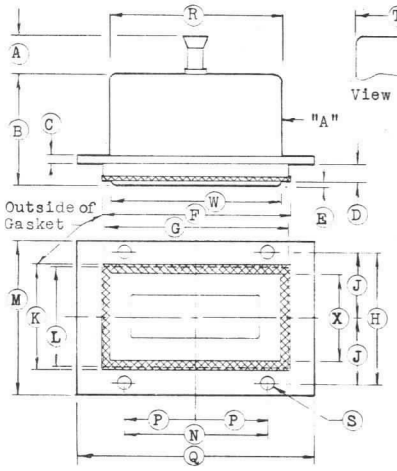
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F= 3325±0.1%Mc Note 6	B/Yo :	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F= 3325±0.1%Mc. Note 6	G/Yo :	---	0.05
4.18.27	Firing Time:	po=50kw; tp=1.0±10%μs; prr=1000±10%; F= 3325±3%Mc; Note 3	t :	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss :	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.6±10%μs; prr=1000±10%; σ́ = 1.05 max. F= 3367Mc±5%	σ́ :	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles :	1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles :	10	---
4.11	Life Test:	po=750kw(min) Du=0.0008; σ́ =1.20 (max.) F= 3367Mc±5%; Group C Note 4	t :	1000	--- hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo :	---	0.1
		Tuning Susceptance:	B/Yo :	-0.05	0.05

Note 1: References and notations are from Military Specification, Electron Tubes, dated 3 October 1955. MIL-E-1C.

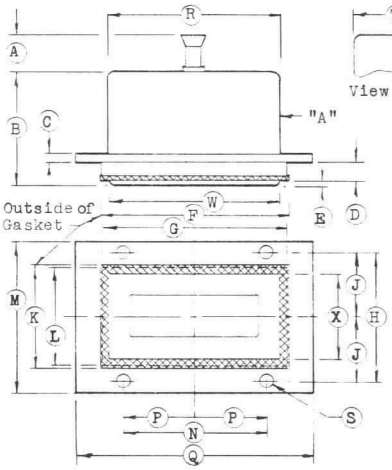
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The grop of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Note:- Gasket supplied per 189-JAN

Outline used for following tubes:-

1B44 5792 BL- 40
1B52 5793 BL- 41
1B53 5921 BL-630
1B56 5922 BL-660
1B57 6024
ATR-387 ATR-387A

Bomac	GAS SWITCHING	S
	1B58	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 21, 1956

Ratings: Transmitter po 10 kw (min) | Open Circuit Ignitor Supply Voltage -500 to -700 VDC | Alt. 10,000 ft.

*Dimensions: Per Outline

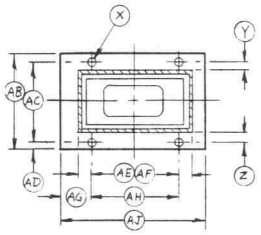
Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V	---	---
4.9.19.2	** Vibration:	10G		
-----	*Insertion:	Note 2		
4.18.18	Voltage Standing Wave Ratio:	σ=1.05max.;		
		*F= 2664Mc	σ: ---	1.65
		F1=2689	σ: ---	1.2
		*F= 2714	σ: ---	1.3
		*F= 2739	σ: ---	1.3
		*F= 2764	σ: ---	1.3
		*F= 2789	σ: ---	1.3
		F2=2802	σ: ---	1.2
		*F= 2839	σ: ---	1.3
		*F= 2864	σ: ---	1.3
		*F= 2889	σ: ---	1.3
		*F= 2914	σ: ---	1.3
		F3=2939	σ: ---	1.2
		*F= 2964	σ: ---	1.65
4.18.4.2	*Insertion Loss:	F=F2; Iz=0μAdc	Li: ---	0.5db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi: ---	0.3db
4.18.1	Ignitor Firing Time:	Ebb=600Vdc; Ri=1.6Meg	t: ---	5 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid: -250	-400Vdc
-----	Flat Leakage Energy:	F=F2; po=200±10kw; σ=1.1max.; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	Wi: ---	0.4erg
4.18.10	Spike Leakage Energy:		Ws: ---	0.3erg
4.18.19	** High Level Voltage Standing Wave Ratio:	po=50kw tp=1.0μs; prr=1000pps; F=F2	σ: ---	1.15
4.18.15.1	*Recovery Time:	po=750kw nom; F=F2; Du=.0008; Iz=200μAdc; Note 3	t: ---	15μs
4.11	Life Test:	po=750±10%(min) Du=.0008; F=F2; Iz=150-200μAdc; Group C	t: 500	---hrs.
4.11.4	Life Test End Point:	Recovery Time; Leakage Energy; Spike Leakage Energy; and Insertion Loss	t: --- Wi: --- Ws: --- Li: ---	30μs 0.4erg 0.3erg 1.2db

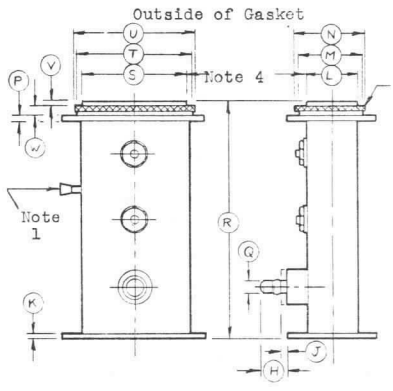
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

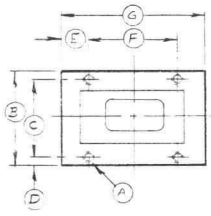
Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000μs after the pulse.



Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Gasket per drawing 189-JAN.





Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/3
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.723 Max.
P**	1/8
Q*	0.250
R	0.010±.030
S	3.005 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.287±.020
X*	7/32 Dia. 4 Holes
Y*	Within .015 of each other
Z*	
AB**	2 5/8
AC*	2.250±.010
AD*	3/16
AE*	Within .015 of each other
AF*	
AG*	13/16
AH**	2 5/8
AJ**	4 1/8

Bomac	GAS SWITCHING	S
	1B58A	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 20, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Ignitor Open Circuit Supply Voltage	-500	-700 Vdc
Ignitor Current	100	200μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 4)

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain:			---	---
4.9.18.1.8	Carton Drop:	(d); Package; Group 1; Carton Size V		---	---
4.9.19.2	**Vibration:	10G			
4.9.13	Pressurization:	P=50psia; Note 5		---	---
4.9.13	*Pressurization:	P=50psia; Note 6		---	---
------	*Insertion:	Note 2			
4.18.18	Voltage Standing Wave Ratio:	$\acute{\sigma}$ =1.05 max.			
		*F= 2664Mc.	σ : ---		1.65
		F1=2689	σ : ---		1.2
		*F= 2714	σ : ---		1.3
		*F= 2739	σ : ---		1.3
		*F= 2764	σ : ---		1.3
		*F= 2789	σ : ---		1.3
		F2=2802	σ : ---		1.2
		*F= 2839	σ : ---		1.3
		*F= 2864	σ : ---		1.3
		*F= 2889	σ : ---		1.3
4.18.18	Voltage Standing Wave Ratio: (Cont.)	*F= 2914	σ : ---		1.3
		F3=2939	σ : ---		1.2
		*F= 2964Mc. Note 7	σ : ---		1.65
4.18.4.2	*Insertion Loss:	F=F2; Iz=0μAdc	Li : ---		0.5 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi : ---		0.3 db
4.18.1	Ignitor Firing Time:	Ebb=-600Vdc; Ri=1.6Meg.	t : ---		5 sec.
4.18.2.	Ignitor Voltage Drop:	Iz=200μAdc	Eid : -250		-400Vdc
4.18.11	Flat Leakage Power:	F=F2; po=200±10kw; $\acute{\sigma}$ =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	pf : ---		40 mw
4.18.10	Spike Lekage Energy:		Ws : ---		0.3 erg
4.18.17.1	Temperature Cycle:				
4.18.17.2	Temperature Cycle Life:		Cycles : 10		---
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw; tp=1.0μs; prr=1000pps; F=F2	---		1.15
4.18.15.1	*Recovery Time:	po=750kw±10%(min.) F=F2; Du=.0008; Iz=200μAdc; Note 3	t : ---		15μs

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test:	po=750kw±10%(min.) Du=.0008; F=F2; Iz=150-200μAdc; Group C		500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t : ---		30μs
		Leakage Power;	pf : ---		40mw
		Spike Leakage Energy; and	Ws : ---		0.3 erg
		Insertion Loss	Li : ---		1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C. 3 October 1955.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800 to 1000μs after the pulse.

Note 4: The recommended ignitor operating current is for a tube with an average voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

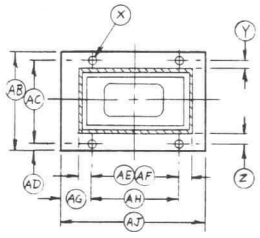
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 5: Mount the tube as per drawing 153-JAN. This test shall be performed by immersing the seat and tube flange to a depth of at least 3 inches in water which has been heated to 45°C ±5°C. The maximum allowable leak rate shall be one bubble per thirty seconds. Bubbles due to occluded air shall be disregarded.

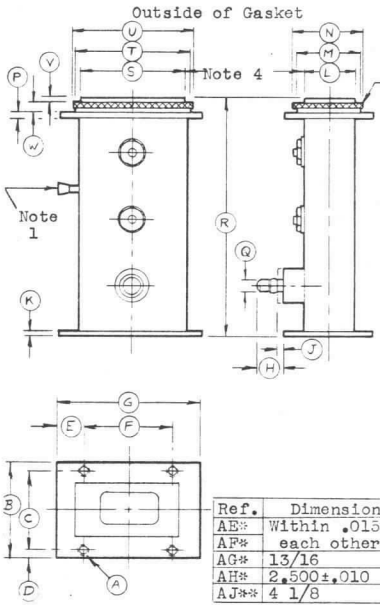
Note 6: The tube shall be mounted per drawing 153 JAN and the complete assembly cycled once from -55°C to +100°C. After the temperature has again reached room temperature, the pressure shall not have changed more than one-quarter of a pound as indicated by a gauge permanently connected into the system.

Note 7: Unless otherwise specified all frequencies are to be ±0.1%.

(over)



Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Gasket per drawing 189-JAN.



Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/8
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.723 Max.
P**	1/8
Q*	0.250
R	6.610±.030
S	3.008 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.297±.020
X*	7/32 Dia. 4 Holes
Y*	Within .015 of each other
Z*	Within .015 of each other
AB**	2 5/8
AC*	2.250±.010
AD*	3/16

Ref.	Dimension
AE*	Within .015 of each other
AF*	
AG*	13/16
AH*	2.500±.010
AJ**	4 1/8

Bomac	GAS SWITCHING	S
	721B	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	---	100 w
Ignitor Open Circuit Supply Voltage	-800	-1000 Vdc

Pack in sealed moisture-resistant bag. If opaque bag is used, the bag shall be marked with the type designation.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.9.18.1.8	Drop:	To be specified			
------	*Seal Test:	Notes 2, 3			
------	**Finish:	Note 4			
4.9.19.1	*Vibration:	G=2.5; Detail C; Notes 2, 5			
4.9.19.2	**Vibration:	F= 50; G=10; t=120; Notes 2, 5	ΔF:	---	1 Mc.
	Tuning (1):	F= 3090Mc(nom) Notes 2, 6	ΔF:	---	±0.5%
	*Tuning (2):	F= 3330Mc, Detail B F= 3135Mc, Detail C F= 2800Mc, Detail D Note 2, 7	ΔF:	--- --- ---	±1.0% ±1.0% ±1.0%
------	**Temperature Drift:	Detail B T=0°C to 100°C Notes 2, 8	ΔF:	---	±20Mc.
4.18.20.1	**Intrinsic Q(1):	Detail C Notes 2, 9	Qo:	2500	---
4.18.20.1	Intrinsic Q(2):	Notes 2, 10	Qo:	2500	---
------	Ignitor Interaction:	Note 11	ΔQ:	---	150
4.18.21.1	**Intrinsic P(1):	po=4 watts Note 2	Pj:	7	30 V-A
4.18.21.2	**Intrinsic P (2):	po=4 watts Notes 2, 12	Pj:	7	30 V-A
4.18.22	Water Vapor Content:	Note 13	ΔPj/Pj:	.4	.7
4.18.1	Ignitor Striking Voltage:	Ez=750Vdc Notes 2, 14	t:	---	5 sec.
------	Ignitor Current:	Notes 2, 15	Iz:	60	110μAdc
4.18.15.1	**Recovery Time:	F= 2800 to 3330Mc.; po=50kw±10%; tp=1.0±10%μs; prr=1000±10%; σ = 1.2; Note 16	t:	---	7μsec
4.11	Life Test:	Iz=200μAdc; Group B	t:	750	---hrs.
4.11.4	Life Test End Point:	Recovery Time; Water Vapor Content	t: ΔPj/Pj:	--- .2	30μsec. ---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: See JAN-721B specification for test cavities and test circuits.

Note 3: On evidence of satisfactory quality, the inspector may limit this test to 10 tubes per month. The tube and cavity shall be subjected to 12 temperature cycles from 0°C to 100°C and may be allowed to come to equilibrium at room temperature in going from one extreme to the other. Time for each cycle shall not exceed 2 1/2 hours. The tube shall then pass the Ignitor Current Tests 24 hours after cycling. The tube shall not be returned to stock at the conclusion of this test.

Note 4: Gold or silver plate on external parts of discs only, edges of discs need not be plated. Silver: 15MS1; Gold: 10MS1.

Note 5: There shall be no evidence of ignitor short as indicated by a neon lamp short indicator during vibration. The resonant frequency shall not change by more than the value specified.

Note 6: The tube shall be tested on a relative basis. The tube shall be capable of being tuned to resonance as indicated by a pronounced peak in the output within the range of the provided tuning adjustment which shall not exceed the limits specified. Frequency shall be adjusted to be consistant with Tuning (2).

Note 7: The tube shall resonate at the specified wavelength of the cavity within the limits specified. The input and output coupling shall be adjusted as for intrinsic Q test, Note 9.

Note 8: The tube and cavity shall be caused to resonate when placed within a housing maintained at 0°C. The temperature shall be raised to 100°C and the tube and cavity again caused to resonate. The tube and cavity shall then be returned to a temperature of 0°C and again adjusted to resonance by varying the oscillator frequency. In neither case shall the resonant frequencies at the temperature end points differ by more than the amounts specified. The resonant frequency shall decrease with increase of temperature.

Note 9: This test to be made by a Service Laboratory approved method.

Note 10: On evidence of satisfactory quality, the inspector may limit this test to a design test when the tube is in continuous production. The tube shall be tested and relative basis under the conditions outlined in Note 6, by comparing the reading of the output meter at resonance with the reading for a tube whose intrinsic Q is known. The test cavity must be isolated from the oscillator by a matched attenuator with at least 10 db of attenuation.

Note 11: On evidence of satisfactory quality, the inspector may limit this test to a design test when the tube is in continuous production. The tube and circuit are tuned to resonance under the conditions outlined for Intrinsic Q (1) by noting the effect on the output meter reading when the ignitor discharge is effected. Without any change in the tuning adjustment, the observed output shall not abruptly decrease by an amount greater than that corresponding to the limit specified as a result of the application of the ignitor voltage.

Note 12: The tube shall be tested on a relative basis under conditions outlined in Note 6 by comparing the reading of the output meter when the tube gap is fired to acceptance limits established by tests made on standard tubes with known Pj values. The acceptance limits are determined from the observed output reading having known Intrinsic Pj values within the test limits on the assumption that the readings of this meter are directly proportional to the values of Intrinsic Pj.

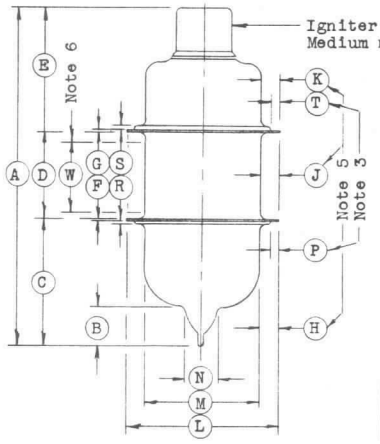
Note 13: This test shall be conducted under the conditions of Note 12. A small portion of the tube shall be cooled by the application of solid CO_2. The relative Pj value shall then drop to give a ratio within the specified limits.

Note 14: With the supply voltage adjusted to 750 volts under normal load conditions, the tube shall fire before the time limit specified is reached. This test shall be made at least 7 days after pumping and at least 24 hours after any discharge has been excited within the tube.

Note 15: The current shall be within the limits specified and shall maintain a constant value.

Note 16: The cavity shall be tuned to resonance at the simulated signal frequency. The loss in the signal in the tube at 7μs following the pulse shall not be more than 3 db in excess of the loss at 800 to 1000μs. after the pulse, The ignitor current shall be 100μA and a 1/2 megohm resistor shall be placed at the ignitor terminal in series with the negative ignitor voltage line.

(over)



Ref.	Dimension
A**	3 21/64 Max.
B**	3/8
C*	1 1/4 Max.
D	.825+.005-.000
E*	1 3/16±1/16
F**	0.010 Approx.
G**	0.010 Approx.
H*	9/64 Min.
J*	9/64 Min.
K*	9/64 Min.
L*	1 1/2±1/64 Dia. of Discs
M**	1 1/8 Dia. of Glass Bodies
N**	5/16 Dia.
P	5/64 Min.
R**	1/32
S**	1/32
T	5/64 Min.
W*	45/64

Note 1:- Discs shall be concentric with respect to each other within 0.010".

Note 2:- Igniter terminal shall be concentric with respect to nearest disc contact within 1/16.

Note 3:- The contact portions of discs measured radially which must be free from splits or tears, must be smooth, and must be flat to extent controlled by dimension "D".

**Note 4:- Plate external portions of discs, gold 10 MSI min. or silver 15 MSI min. plating may be omitted from edges of discs.

Note 5:- Applies to all points around tube except fillets formed at seal with contact discs.

Note 6:- Dimension "J" applies for this distance located centrally between discs.

Bomac	GAS SWITCHING	S
	5792	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F = 2950±0.1%Mc; Note 6	B/Yo:	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F = 2950±0.1%Mc Note 6	G/Yo:	---	0.05
4.18.27	Firing Time:	po=50kw; tp=1.0±10%μs; prr=1000±10%; F = 2950±3%Mc; Note 3	t:	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss:	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ́ = 1.05 max. F = 3000Mc±5%	σ:	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles:	1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles:	10	---
4.11	Life Test:	po=750kw(min.) Du=0.0008; σ́=1.20(max.) F = 3000Mc±5%; Group C, Note 4	t:	1000	--- hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo:	---	0.1
		Tuning Susceptance:	B/Yo:	-0.05	0.05

Note 1: References and notations are from Military Specification, Electron Tubes, dated 3 October 1955. MIL-E-1C.

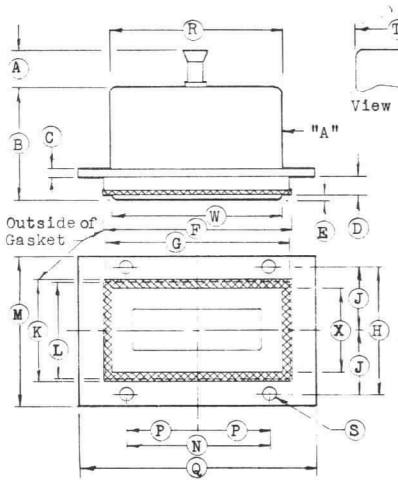
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

Bomac	GAS SWITCHING	S
	5793	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	-------		---	---
4.18.18.2	**Loaded Q:	Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F=3050±0.1%Mc. Note 6	B/Yo :	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F=3050±0.1%Mc. Note 6	G/Yo :	---	0.05
4.18.27	Firing Time:	po=50kw; tp=1.0±10% μs; prr=1000±10%; F=3050±3%Mc; Note 3	t :	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss :	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ= 1.05 max. F= 3000Mc±5%	σ :	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles :	1	---
4.18.17.3	Temperature Cycle Test:	Group C Note 2	Cycles :	10	---
4.11	Life Test:	po=750kw(min.) Du=0.0008; σ =1.20(max.); F= 3000Mc±5% Group C Note 4	t :	1000	---hrs.
4.11.4	Life Test End Point:	Equivalent Conductance;	G/Yo :	---	0.1
		Tuning Susceptance;	B/Yo :	-0.05	0.05

Note 1: References and notations are from Military Specification, Electron Tubes, dated 3 October 1955. MIL-E-1C.

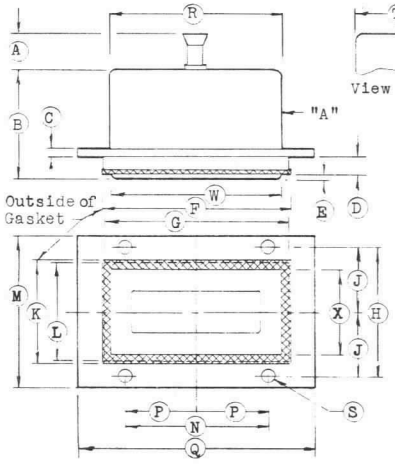
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792 and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount Per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.216±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 25, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Open Circuit Ignitor Supply Voltage	-500	-700 Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150 μAdc (Note 5)

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V	---	---
4.9.19.2	**Vibration:	10 G		
------	*Insertion:	Note 2		
4.18.18	Voltage Standing Wave Ratio:	σ' =1.05max; F1= 2900Mc; F2= 3050Mc; F3= 3200Mc;	σ : ---	1.40
4.18.18	**Voltage Standing Wave Ratio:	σ' =1.05; Note 4	σ : ---	1.90
4.18.18	*Insertion Loss:	F=F2; Iz=0μAdc	Li : ---	0.7 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi : ---	0.3 db
4.18.1	Ignitor Firing Time:		t : ---	5 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid : -250	-400 Vdc
4.18.9	Flat Leakage Energy:	F=F2; po=200±10kw; σ' =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000 pps; Iz=200μAdc.	Wi : ---	0.4 erg
4.18.10	Spike Leakage Energy:		Ws : ---	0.3 erg
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw; tp=1.0μs; prr=1000pps; F=F2	σ : ---	1.15
4.18.15.1	*Recovery Time:	po=750kw nom; F=F2; Du=.0008; Iz=200μAdc; Note 3	t : ---	15μs
4.11	Life Test:	po=750±10%(min.) Du=.0008; F=F2; Iz=150-200μAdc; Group C	t : 500	--- hrs.
4.11.4	Life Test End Point:	Recovery Time; Leakage Energy; Spike Leakage Energy; and Insertion Loss	t : --- Wi : --- Ws : --- Li : ---	30μs 0.4 erg 0.3 erg 1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000μs after the pulse.

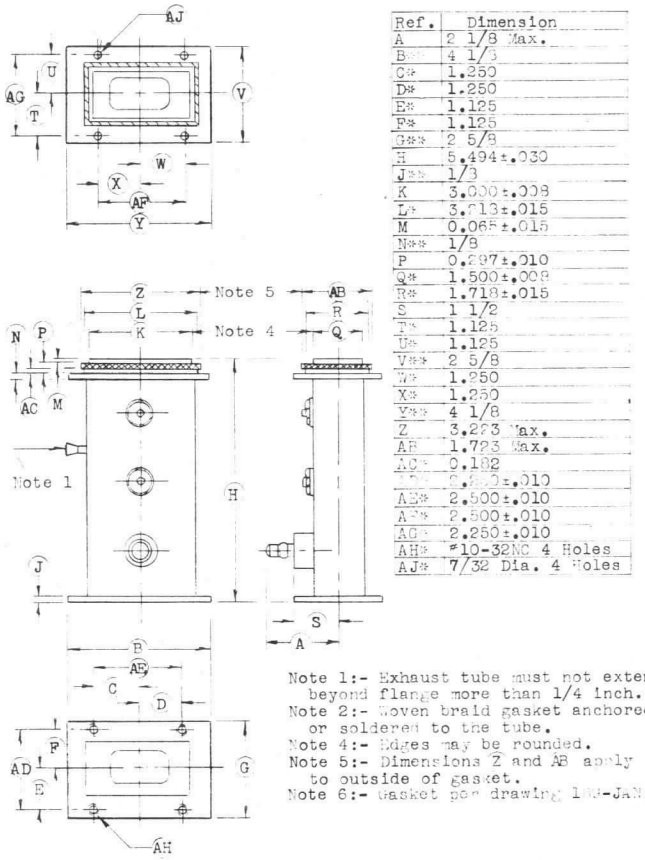
Note 4: The input standing wave ratio shall be measured at intervals of 30Mc. from (F1-30)Mc. to (F3+30)Mc. At no frequency in this internal shall the VSWR be greater than the amount specified.

Note 5: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop.

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Ref.	Dimension
A	2 1/8 Max.
B*	4 1/8
C*	1.250
D*	1.250
E*	1.125
F*	1.125
G**	2 5/8
H	5.494±.030
J**	1/8
K	3.000±.008
L*	3.813±.015
M	0.065±.015
N**	1/8
P	0.297±.010
Q*	1.500±.008
R*	1.718±.015
S	1 1/2
T*	1.125
U*	1.125
V**	2 5/8
W*	1.250
X*	1.250
Y**	4 1/8
Z	3.273 Max.
AB	1.723 Max.
AC*	0.182
AD*	2.500±.010
AE*	2.500±.010
AF*	2.500±.010
AG*	2.250±.010
AH*	#10-32NC 4 Holes
AJ*	7/32 Dia. 4 Holes

Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Dimensions Z and AB apply to outside of gasket.
Note 6:- Gasket per drawing 1[illegible]-JAN.

Bomac	GAS SWITCHING	S
	5921	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 20, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

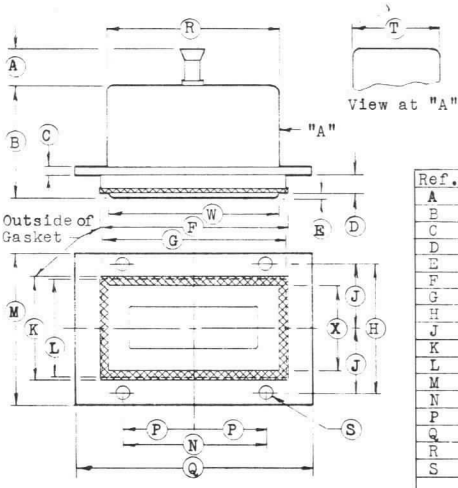
Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	G=10			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.19.3	*Bump:	25°; Note 3			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	F_o = 3200Mc. Note 4	QL:	---	5.5
4.18.25	Tuning Susceptance:	F= 3200±0.1%Mc. Note 4	B/Yo:	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F= 3200±0.1%Mc; Note 4	G/Yo:	---	0.05
4.18.27	Firing Time:	po=20kw; Du=.001; F= 3350±3%Mc; Note 2	t:	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss:	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; $\acute{\sigma}$ =1.05 max; F= 3300±33Mc.	σ:	---	1.15
4.18.17.1	Temperature Cycle:		Cycles:	1	---
4.18.17.3	Temperature Cycle Test:	Group C	Cycles:	10	---
4.11	Life Test:	po=750kw(min.); Du=0.001; $\acute{\sigma}$ =1.20(max.); F= 3425±25Mc; Group D	t:	1000	---hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo:	---	0.1
		Tuning Susceptance:	B/Yo:	-0.05	0.05
		Firing Time	t:	---	10

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

Note 2: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 3: The tube should not be hit directly with the hammer. An anvil as shown on drawing 188-JAN may be used.

Note 4: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	

ATR-387 ATR-387A

Bomac	GAS SWITCHING	S
	5922	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 20, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

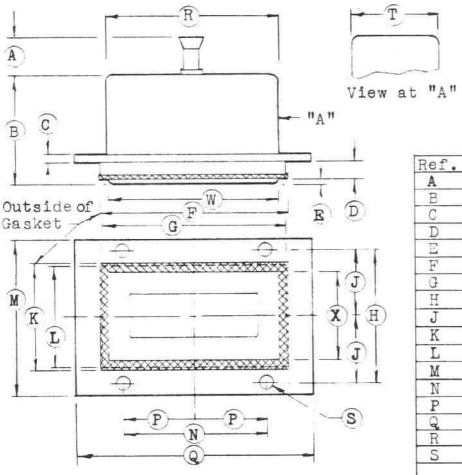
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N	---	---
4.9.19.2	**Vibration:	G=10		
4.9.8	**Salt Spray Corrosion:	Omit		
4.9.19.3	*Bump:	25°; Note 3		
4.9.6	*Glass Strain:	------	---	---
4.18.13.2	Loaded Q:	F_o = 3400Mc. Note 4 QL:	---	5.5
4.18.25	Tuning Susceptance:	F= 3400±0.1%Mc. B/Yo : Note 4	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F= 3400±0.1%Mc. G/Yo : Note 4	---	0.05
4.18.27	Firing Time:	po=20 kw; Du=0.001; F= 3350±3%Mc; Note 2 t :	---	10 sec.
4.18.28	Arc Loss:	See Firing Time Loss:	---	0.8 db
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%µs; prr=1000±10%; σ =1.05 max; F= 3300±33Mc. σ :	---	1.15
4.18.17.1	Temperature Cycle:	Cycles :	1	---
4.18.17.3	Temperature Cycle Test:	Group C Cycles :	10	---
4.11	Life Test:	po=750 kw(min.) Du=0.001; σ =1.20 (max.); F= 3425±25Mc; Group D t :	1000	---hrs.
4.11.4	Life Test: End Point:	Equivalent Conductance: G/Yo :	---	0.1
		Tuning Susceptance: B/Yo :	-0.05	0.05
		Firing Time t :	---	10

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

Note 2: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 3: The tube should not be hit directly with the hammer. An anvil as shown on drawing 188-JAN may be used.

Note 4: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 27, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	100	--- kw
Ignitor Open Circuit Supply Voltage	-500	-700 Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 8)

Pack in sealed water-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:		---	---
4.9.8	Salt Spray Corrosion:	Omit	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V	---	---
4.9.19.2	**Vibration:			
4.9.19.3	*Bump:	25°; Note 3		
4.18.18	Voltage Standing Wave Ratio:	$\acute{\sigma}$=1.05 max.; F1=3100Mc; F2=3300 F3=3500	σ :--- σ :--- σ :---	1.60 1.40 1.60
4.18.18	**Voltage Standing Wave Ratio:	$\acute{\sigma}$=1.05max; Note 4	σ :---	1.90
4.18.4.2	*Insertion Loss:	F=F2; Iz=0μAdc	Li :---	0.7 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi :---	0.3 db
4.18.1	Ignitor Firing Time:	Note 5	t :---	5 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid :-250	-400 Vdc
4.18.11	Flat Leakage Power:	F=F2; po=200±10kw; $\acute{\sigma}$=1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000 pps; Iz=200μAdc	pf :---	50 mw
4.18.10	Spike Leakage Energy:	Leakage Energy	Ws :---	0.3 erg
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw tp=1.0μs; prr=1000pps; F=F2; Note 6	σ :---	1.15
4.18.15.1	*Recovery Time:	po=750kw; F=3425±25Mc. tp=1.0μs; prr=1000; Iz=200μAdc; Notes 2, 7	t :---	15μs
4.11	Life Test:	po=750±10%kw tp=1.0μs; prr=1000; F=3425±25Mc; Iz=150-200μAdc; Group D	t :500	---hrs.
4.11.4	Life Test End Point:	Recovery Time; Flat Leakage Power; Spike Leakage Energy; and Insertion Loss	t :--- pf :--- Ws :--- Li :---	30 μs 50 mw 0.3 erg 1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000μs after the pulse.

Note 3: Anvil per drawing 188-JAN.

Note 4: The input standing wave ratio shall be measured at intervals of 30Mc from (F1-30)Mc. to (F3+30) Mc. At no frequency in the interval shall the VSWR be greater than the amount specified.

Note 5: The ignitor power supply shall have an open circuit voltage of 600 Vdc negative with respect to the tube body. The ignitor series resistance shall be 1.60 megohms. The ignitor must fire within the specified time after application of voltage.

Note 6: With a load standing wave ratio of less than 1.05 the voltage standing wave ratio produced by the tube shall be less than the amount specified.

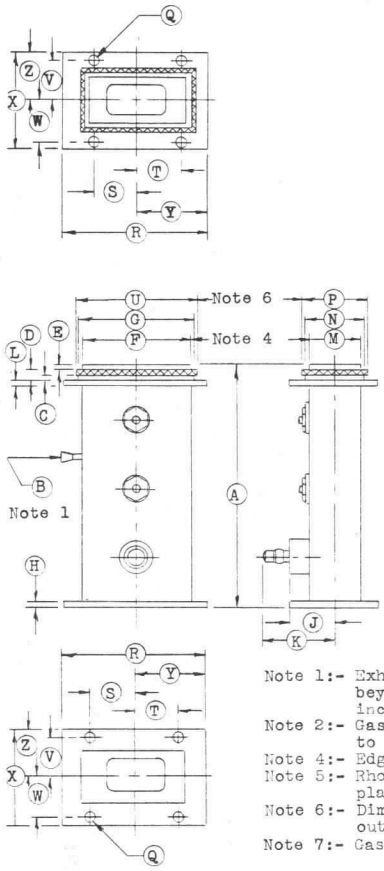
Note 7: The recovery time shall be measured after thirty minutes of operation under the conditions specified.

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri = Total series resistance
Ebb= Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Ref.	Dimension
A	4.858±.030
B	1/4 Max.
C*	0.182±.005
D	0.297±.020
E	0.065±.015
F	3.000±.008
G*	3.218±.015
H**	1/8±1/64
J	1 1/2 Max.
K*	2 1/8 Max.
L**	1/8±1/64
M*	1.500±.008
N*	1.718±.015
P	1.723 Max.
Q	7/32 Dia. 4 Holes
R**	4 1/8±1/64
S*	1.250±.005
T*	1.250±.005
U	3.223 Max.
V*	1.125±.005
W*	1.125±.005
X**	2 5/8±1/64
Y*	2 1/16±1/64
Z*	1 5/16±1/64

Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Gasket anchored or soldered to tube.
Note 4:- Edges may be rounded.
Note 5:- Rhodium flash over silver plating optional.
Note 6:- Dimensions (P) and (U) apply to outside of gasket.
Note 7:- Gasket per drawing 189-JAN.

Bomac	GAS SWITCHING	S
	6024	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 19, 1956

Dimensions: Per Outline

Mounting: Per 153 JAN

Ratings:	Min.	Max.
Transmitter po:	20	--- Kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size N		---	---
4.9.19.2	**Vibration:	F=50; G=10; t=60			
4.9.8	**Salt Spray Corrosion:	Omit			
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	F=2800±.1%Mc Note 6	QL:	---	5.5
4.18.25	Tuning Susceptance:	F= 2800±0.1%Mc Note 6	B/Yo :	-0.05	+0.05
4.18.26	*Equivalent Conductance:	F= 2800±0.1%Mc. Note 6	G/Yo :	---	0.05
4.18.27	Firing Time:	po=50 kw; tp=1.0±10%μs; prr=1000±10%; F= 2750±3%Mc; Note 3	t :	---	10 sec.
4.18.29	Gas Content:		Vx :	750	2500Vdc
4.18.19	**High Level Voltage Standing Wave Ratio:	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ́ =1.05 max. F= 2800Mc±5%	σ :	---	1.15
4.18.17.1	Temperature Cycle:	Note 5	Cycles :	1	---
4.18.17.3	Temperature Cycle Test:	Group C Notes 2, 5	Cycles :	10	---
4.11	Life Test:	po=750 kw(min.) Du=0.0008; σ́ =1.20 (max.); F= 2800Mc±5%; Group C; Note 4	t :	1000	---hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/Yo :	---	0.1
		Tuning Susceptance:	B/Yo :	-0.05	0.05

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

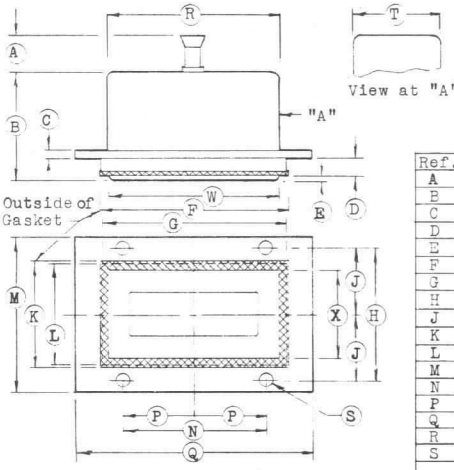
Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A or 5793, made during the same two weeks period will be evidence that all the group meet this requirement.

Note 3: This tube shall be mounted as Per 153 JAN and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: The group of tubes 1B44, 1B52, 1B53, 1B56, 1B57, 5792, and 5793 shall be life tested as one composite type with the provisions of Par. 4.11.3 applying to this composite group.

Note 5: The tube shall be exposed to one cycle of gradual temperature variation from room temperature to -40°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to +100°C. At the conclusion of the cycle the tube shall pass the firing time test. This test may be performed before the final finishing operation.

Note 6: Mount per drawing 153 JAN.



Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 27, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Ignitor Open Circuit Supply Voltage	-500	-700 Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 5)

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number must be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.5	Holding Period:	t=168 hours			
4.9.6	*Glass Strain:				
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V			
4.9.19.2	**Vibration:	10 G			
------	**Insertion:	Note 1			
4.18.18	Voltage Standing Wave Ratio:	$\acute{\sigma}$ =1.05max.; F1=2689Mc. F2= 2802Mc. F3=2939Mc.	σ : ---		1.20
4.18.18	**Voltage Standing Wave Ratio:	$\acute{\sigma}$=1.05; Note 2	σ : ---		1.65
4.18.4.2	*Insertion Loss:	F=F2 Iz=0μAdc	Li : ---		0.5 db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi : ---		0.3 db
4.18.1	Ignitor Firing Time:		t : ---		5 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc		-250	-400Vdc
4.18.9	Flat Leakage Energy:	F=F2;Po=200±10kw; $\acute{\sigma}$ =1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc.	Wi : ---		0.4 erg
4.18.10	Spike Leakage Energy:		Ws : ---		0.3 erg
4.18.19	**High Level Voltage Standing Wave Ratio:	Po=50kw; tp=1.0μs; prr=1000pps; F=F2	σ : ---		1.15
4.18.15.1	*Recovery Time:	po=750 kw nom; F=F2; tp=1.0μs; prr=1000 pps; Iz=200μAdc; Note 3	t : ---		15μs
4.11	Life Test:	po=750kw±10%(min.); Du=.0008; F=F2; Iz=150-200μAdc; Group C	t : 500		---hrs.
4.11.4	Life Test End Point:	Recovery Time; Leakage Energy; Spike Leakage Energy; and Insertion Loss	t : --- Wi : --- Ws : --- Li : ---		30 μs 0.4 erg 0.3 erg 1.2 db

Note 1: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 2: The input standing wave ratio shall be measured at intervals of 30Mc. from (F1-30)Mc to (F3+30)Mc. At no frequency in this interval shall the VSWR be greater than the amount specified.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800 to 1000μs after the pulse.

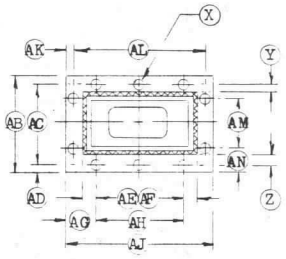
Note 4: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

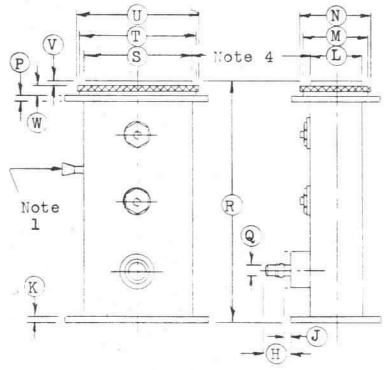
Note 5: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

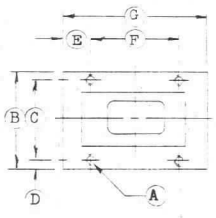
$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Eid}}{150} \text{ (megohms)}$$

where Ri=Total series resistance
Ebb = Open circuit supply voltage
Eid = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.







Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/8
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.723 Max.
P**	1/8
Q*	0.250
R	6.610±.030
S	3.008 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.297±.020
X*	7/32 Dia. 10 Holes
Y*	Within .015 of
Z*	each other
AB**	2 5/8
AC*	2.250±.010
AD*	3/16
AE*	Within .015 of
AF*	each other
AG*	13/16
AH*	2.500±.010
AJ**	4 1/8
AK*	3/16
AL*	3.750±.010
AM*	1.500±.010
AN*	9/16

Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Rhodium flash over silver plating optional.
Note 6:- Dimensions (N) and (U) to outside of gasket.
Note 7:- Gasket per drawing 189-JAN.

Bomac	GAS SWITCHING	S
	6635/BL57	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 29, 1954

Dimensions: Per Outline

Ratings:	Open Circuit Ignitor Voltage	Ignitor Current	Frequency Range	Ambient Temperature
Min.:	-700Vdc	100μAdc	2390Mc.	-55°C
Max.:	-1000Vdc	200μAdc	2710Mc.	+100°C

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168hours	---	---
4.9.18.1.8	Carton Drop:		---	---
4.9.19.2	*Vibration:	G=10; Note 1	---	---
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid:415	525Vdc
4.18.1	Ignitor Ignition Time:	Ebb=675Vdc; Ii=100μAdc	t:---	5sec.
4.18.3	*Ignitor Oscillation:	Note 2	---	---
4.18.6	Tuning Range:	Note 3	F:2390	2710Mc.
4.18.4.1	**Insertion Loss:	F=2700±10Mc.; Note 4	Li:---	To be specified
4.18.5.1	*Ignitor Interaction:	Note 5	Δ Li:---	0.3db
4.18.10	*Spike Leakage Energy:	F=2700±10Mc.; po=4kw (min.); tp1=0.5±0.05μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc	Ws:---	0.3erg
4.18.11	*Flat Leakage Power:	See Spike Leakage Energy	pf:---	50mw
4.18.15.1	*Recovery Time:	F=2700±10Mc.; po=2kw (min.); tp1=0.5±0.05μs; prr=1000; Ii=100μAdc	t:---	2μs
4.18.14.1	**Frequency Temperature Effect:	F=2400±10Mc.	Δ F: 0	-10Mc.
4.9.10	Temperature Cycle:		Cycles: 1	---
4.9.10	*Temperature Cycle:	Temperature Range = -55°C to +100°C	Cycles: 5	---
4.11	Life Test:	Ii=200μAdc; Group C	t:200	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:---	3μs
		Spike Leakage Energy;	Ws:---	0.35erg
		Flat Leakage Power	pf:---	60mw

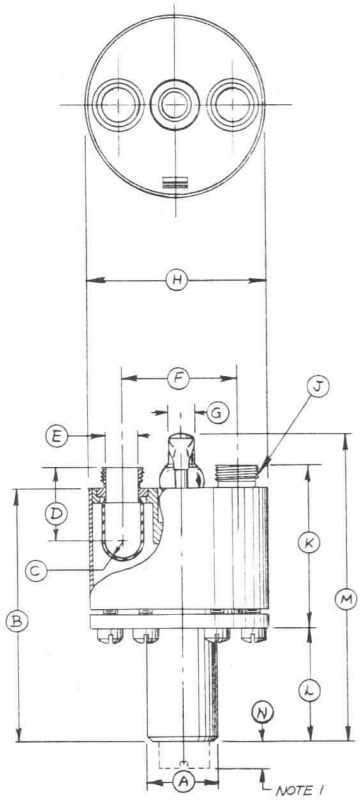
Note 1: There shall be no evidence of shorts of the ignitor electrodes as indicated by a short indicator during vibration.

Note 2: No tube shall require more than 50μAdc ignitor current to prevent relaxation oscillation of the ignitor current.

Note 3: The tube shall cover a tuning range from less than 2390Mc. to more than 2710Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range. As the tuning screw is turned through its complete range the transmitted power shall show only one peak.

Note 4: The Insertion Loss specified refers to the db loss of power incurred in a transmission line due to the insertion of the tube plus its loops.

Note 5: Tests shall be made at 2700±10Mc. with Ii=100μAdc. The attenuation shall not vary more than the amount specified with the ignitor current switched on and off.



NOTE:-
1. APPLIES WHEN TUNING SCREW IS AT ITS EXTREME OUTER POSITION

REF.	DIMENSIONS
A**	.680 DIA
B	2 1/2 ± 1/16
C	.189 R MIN
D	.466
E	.312 D ±002
F*	1.114
G**	.250 DIA. NOM
H*	1.750 DIA ±010
J	7/16 - 20 NF-
K	1 23/32 ± 1/32
L*	1 3/32 ± 1/32
M*	3 7/32 APPROX.
N	5/16 MAX.

Bomac	GAS SWITCHING	S
	6637/BL31	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MARCH 10, 1955

Dimensions: Per Outline

Ratings:	Open Circuit Ignitor Voltage	Ignitor Current
Min.:	-750 Vdc	100 μa
Max.:	-1000Vdc	200 μa

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.6	*Glass Strain:			
4.18.1	Ignitor Ignition Time:	Ebb=675 Vdc; Ii=200μAdc	t : ---	5sec
4.18.6	Tuning Range:	Note 2		
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid : 415	525Vdc
4.18.3	*Ignitor Oscillation:	Note 3		
4.18.9	Peak Leakage Power:	Ii=100μAdc; Note 4	Po/Du : ---	25mw
4.18.15.2	**Recovery Time:	po=50kw; tp=0.5μs; prr=1000; F= 3300±0.5%Mc; Ii=100μAdc; Note 5	t : ---	5μs
4.11	Life Test:	Ii=200μAdc; Group D	t : 200	---hrs
4.11.4	Life Test End Point:	Recovery Time	t : ---	20μs

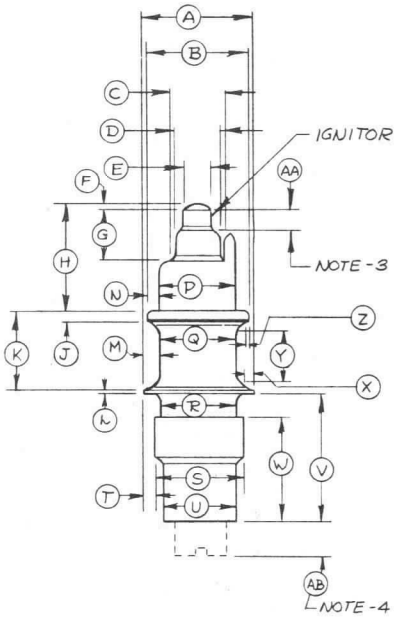
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: See MIL-E specification for type 1B27 for equipment. The Tube shall cover a tuning range from less than 2600 Mc to more than 3000 Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range. As the tuning screw is turned through its complete range, the transmitted power shall show only one dip.

Note 3: No tube shall require more than 50 μAdc ignitor current to prevent relaxation oscillation of the ignitor current.

Note 4: The leakage power shall be measured after a shelf life of 7 days. This test shall be made using 0.5μs pulses at a repetition rate of 1000 pulses per second. The peak RF power shall be 5 kw, and the frequency shall be 3300±0.5%Mc. The peak leakage power shall be averaged over the pulse length.

Note 5: The loss of signal in the tube at the specified time after the transmitter pulse shall not be greater than 3 db in excess of the loss at 800 to 1000 μs after the pulse.



REF.	DIMENSIONS
A	1.062 ±.008
B	1.000 ±.005
C**	.500
D**	.436
E**	.250 ±.002
F**	1/32 APPROX
G**	.489
H	1 1/32 +1/8 -0
J*	.105 ±.015
K	.771 ±.015
L*	.004 APPROX
M*	.125 MIN
N*	.093 MIN
P**	3/4 ± 1/32
Q**	3/4 ± 1/32
R**	3/4 ± 1/32
S**	7/8 MAX
T*	.070 MIN
U**	43/64
V	1 1/4 +1/8 -0
W*	1 1/32 MAX
X	.070 MIN
Y*	7/16
Z	.040 MIN
AA**	1/4 ± 1/64
AB*	9/16 MAX

NOTES:-
1. CONTACT DISKS SHALL BE CONCENTRIC WITH RESPECT TO EACH OTHER WITHIN 1/64.
2. CONTACT DISKS SHALL BE SILVER PLATED
3. SEAL OFF PIP SHALL NOT EXTEND BEYOND INDICATED LINE.
4. APPLIES WHEN TUNING SCREW IS AT ITS EXTREME OUTER POSITION.

Bomac	GAS SWITCHING	S
	6638/BL99	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 9, 1954

Dimensions: Per Outline

Ratings:	Open Circuit Ignitor Voltage	Ignitor Current
Min.:	+750Vdc	100μa
Max.:	+1000Vdc	200μa

Ref.(Note 1)	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.6	*Glass Strain:	-----	---	---
4.18.1	Ignitor Ignition Time:	Ebb=+675Vdc; Ii=200μAdc	t:---	5sec
4.18.6	Tuning Range:	Notes 2, 3	---	---
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid:200	350Vdc
4.18.3	*Ignitor Oscillation:	Note 4	---	---
4.18.9	Peak Leakage Power:	Ii=100μAdc; Notes 2, 5	Po/Du:---	25mw
4.18.15.2	**Recovery Time:	po=50kw; tp=0.5μs; prr=1000; F= 3300±0.5%Mc; Ii=100μAdc; Notes 2, 6	t:---	5μs
4.11	Life Test:	Ii=200μAdc; Group D	t:200	---hrs
4.11.4	Life Test End Point:	Recovery Time	t:---	20μs

Note 1: See Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: See MIL-E-1, TR Tube JAN-1B27, for equipment.

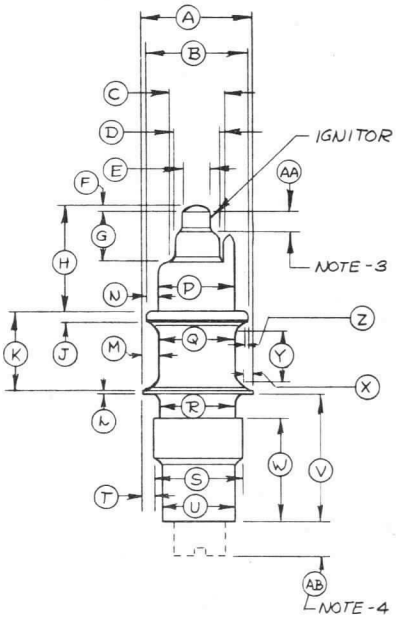
Note 3: The tube shall cover a tuning range from less than 2600Mc to more than 3000Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range. As the tuning screw is turned through its complete

Note 3: (Conc.) range the transmitted power shall show only one dip.

Note 4: No tube shall require more than 50μAdc ignitor current to prevent relaxation oscillation of the ignitor current.

Note 5: The leakage power shall be measured after a shelf life of 7 days. This test shall be made using 0.5μs pulses at a repetition rate of 1000 pulses per second. The peak RF power shall be 5kw, and the frequency shall be 3300±0.5%Mc. The peak leakage power shall be averaged over the pulse length.

Note 6: The loss of signal in the tube at the specified time after the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.



REF.	DIMENSIONS
A	1.062 ±.008
B	1.000 ±.005
C**	.500
D**	.496
E**	.250 ±.002
F**	1/32 APPROX
G**	.489
H	1 1/32 +1/8 -0
J*	.105 ±.015
K	.771 ±.015
L*	.004 APPROX
M*	.125 MIN
N*	.093 MIN
P**	3/4 ± 1/32
Q**	3/4 ± 1/32
R*	3/4 ± 1/32
S**	7/8 MAX
T*	.070 MIN
U**	43/64
V	1 1/4 +1/8 -0
W*	1 1/32 MAX
X	.070 MIN
Y*	7/16
Z	.040 MIN
AA**	1/4 ± 1/64
AB*	5/16 MAX

NOTES:-
1. CONTACT DISKS SHALL BE CONCENTRIC WITH RESPECT TO EACH OTHER WITHIN 1/64.
2. CONTACT DISKS SHALL BE SILVER PLATED.
3. SEAL OFF DIP SHALL NOT EXTEND BEYOND INDICATED LINE.
4. APPLIES WHEN TUNING SCREW IS AT ITS EXTREME OUTER POSITION.

Bomac	GAS SWITCHING	S
	BL40	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Ratings:	Min.	Max.
Transmitter po	20	750 kw
Altitude	10,000	--- ft

Dimensions: Per Outline
Mount per 153 JAN

Ref.	Test	Conditions	Min.	Max.
4.9.6	* Glass Strain	----------	---	----
4.18.13.2	** Loaded Q	----------	QL-	5.5
4.18.25	Tuning Susceptance:	F=FO±0.1% Note 1	B/YO-0.05	0.05
4.18.26	*Equivalent Conductance:	F=FO±0.1% Note 1	G/YO---	0.05
4.18.27	Firing Time Test:	po=50 kw; tp=1.0±10%us; prr=1000±10%; F=FO±3% Mc; Note 1 Note 4	t:--	10 sec.
4.18.28	Arc Loss:	See Firing Time	Loss:-	0.8db
4.18.19	** High Level Voltage Standing Wave Ratio:	po=20 kw; tp=1.0±10%us; prr=1000±10%; σ'=1.05 max. F=2800Mc±5%	σ :--	1.15
-------	*Recovery Time	po=500 kw; Note 5	t:---	15 us
4.18.17.1	Temperature	Note 2	-----	-----
4.18.17.3	Temperature Cycle Test:	Group D	Cycles:50	-----
4.11	Life Test:	po=750kw (min) Du=0.0005 σ''=1.20 (max.) F=2800 mc±5% Group D;Note 3	t: 500	----hrs.
4.11.4	Life Test End Point:	Equivalent Conductance:	G/YO---	0.1
		Tuning Susceptance:	B/YO-0.05	0.05
		Recovery Time	t:----	30 us

Note 1: BL-40
Fo=2850 Mc
Mount per drawing
153 JAN

Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A, 5793, BL-40 or BL-41 made during the same two weeks period will be evidence that all the group meet this requirement.

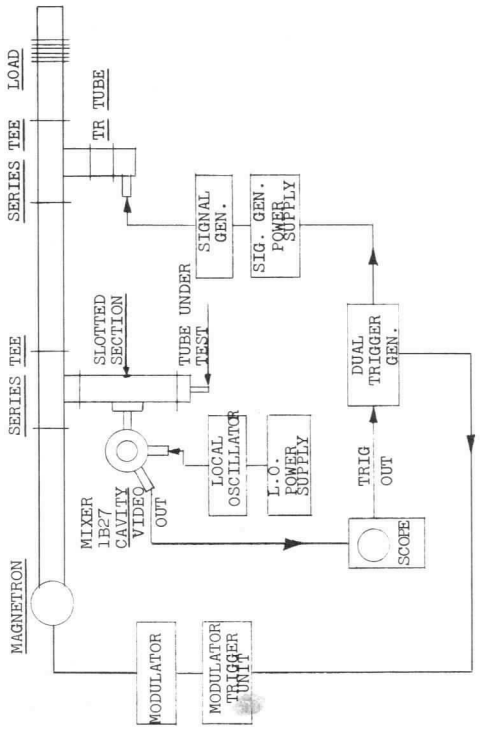
Note 3: Life test of BL-40 or BL-41 shall be evidence that both types meet the life test requirements.

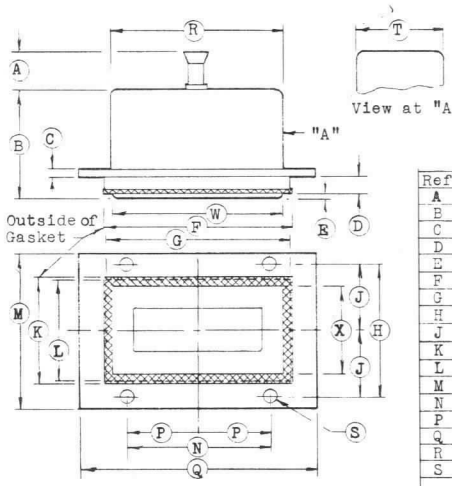
Note 4: This tube shall be mounted as in Note 1 and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 5: With the tube mounted as in the Test Circuit "P", measurement is made with line power of 500 kw; 1.0±.15 microsecond pulse width; at 1000±10%prr; Fo=2800 Mc ±3%. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than 0.05 λg. The probing signal shall be 2850 Mc±1% for BL-40.

TEST CIRCUIT "P"

S-Band Recovery Time--ATR Tubes





Note:- Gasket supplied per 189-JAN

Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia. 4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

Bomac	GAS SWITCHING	S
	BL41	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Ratings:	Min.	Max.
Transmitter po:	20	750 Kw
Altitude	10,000	--- ft

Dimensions: Per outline

Mount per 153 JAN

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain	----------	----	----
4.18.13.2	**Loaded Q	----------	QL--	5.5
4.18.25	Tuning Susceptance:	F=Fo±0.1% Note 1	B/Yo -0.05	0.05
4.18.26	*Equivalent Conductance	F=Fo±0.1% Note 1	G/Yo----	0.05
4.18.27	Firing Time Test	po=50kw; tp=1.0±10%us; prr=1000±10%; F=Fo±3%Mc; Note 1 Note 4	t:---	10 sec.
4.18.28	Arc Loss	See Firing Time	Loss:--	0.8db
4.18.19	**High Level Voltage Standing Wave Ratio	po=20kw; tp=1.0±10%us; prr=1000±10%; σ' =1.05 max. F=2800Mc±5%	σ' :---	1.15
-------	*Recovery Time	po=500Kw; Note 5	t:----	15 us
4.18.17.1	Temperature Cycle:	Note 2	-----	----
4.18.17.3	Temperature Cycle Test:	Group D	Cycles: 50	----
4.11	Life Test	po=750 kw (min) Du=0.0005 σ' =1.20 (max) F=2800 Mc±5% Group D; Note 3	t: 500	----hrs

4.11.4	Life Test End Point:	Equivalent Conductance:	G/yo--	0.1
		Tuning Susceptance:	B/Yo-0.05	0.05
		Recovery Time	t: ---	30 us

Note 1: BL-41
Fo=2750 Mc
Mount per drawing
153-JAN

Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A, 5793, BL-40, or BL-41 made during the same two weeks period will be evidence that all the group meet this requirement.

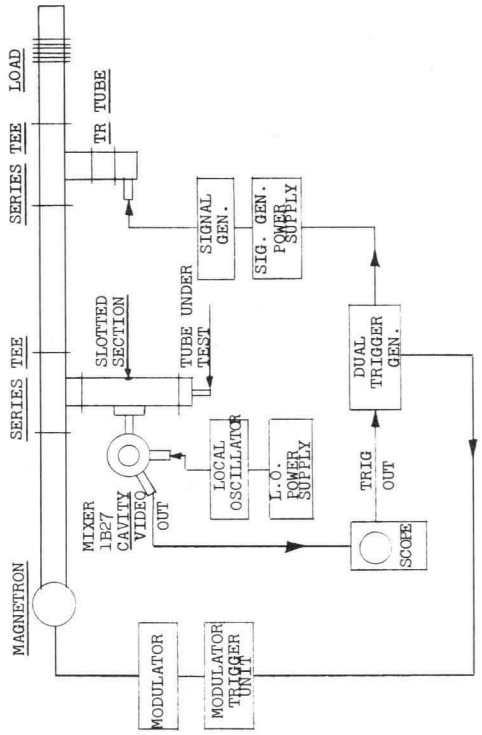
Note 3: Life test of BL-40 or BL-41 shall be evidence that both types meet the life test requirements.

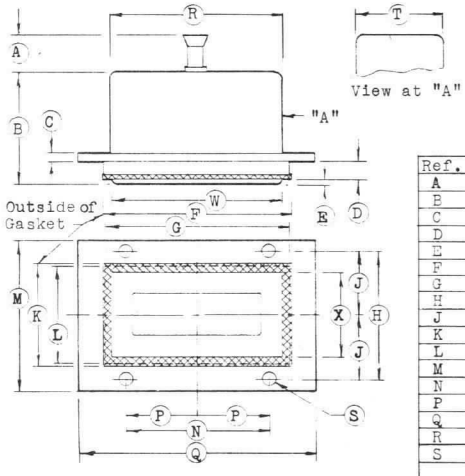
Note 4: This tube shall be mounted as in Note 1 and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 5: With the tube mounted as in test circuit "P", measurement is made with line power of 500 kw; 1.0±.15 microsecond pulse width; at 1000±10% prr; Fo=2800MC±3%. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than 0.05 λg. The probing signal shall be 2750Mc±1% for BL-41.

TEST CIRCUIT "P"

S-Band Recovery Time--ATR Tubes





Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia.
	4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Note:- Gasket supplied per 189-JAN

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

Bomac	GAS SWITCHING	S
	BL602	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 26, 1957

Dimensions: Per Outline

Ratings	Min.	Max.
Open Circuit Ignitor Voltage	-700	-1000 Vdc
Ignitor Current	100	200 μAdc
Ambient Temperature	-55	+100°C
Weight (approx.)		0.5 lbs.
Transmitter po	---	20 kw

Recommended Ignitor Operating Current 150μAdc (Note 7)

Packing: To be specified.

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:			---	---
4.9.19.2	*Vibration:	G=10; Note 2		---	---
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	415	525Vdc
4.18.1	Ignitor Ignition Time:	Ebb= 675Vdc; Ii=100μAdc	t :	---	5 sec.
4.18.3	*Ignitor Oscillation:	Note 3		---	---
4.18.6	Tuning Range:	Note 4	F :	2770	3000Mc.
4.18.4.1	**Insertion Loss:	F= 2885±0.1%Mc; Note 5	Li :	---	To be specified
4.18.5.1	*Ignitor Interaction:	Note 6	ΔLi :	---	0.3 db
4.18.10	*Spike Leakage Energy:	F= 2885±5%Mc po=4kw (min.); tp1=0.5±0.05μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc	Ws :	---	0.3erg
4.18.11	*Flat Leakage Power:	See Spike Leakage Energy	pf :	---	50mw
4.18.15.1	*Recovery Time:	F= 2885±5%Mc. po=2kw (min.); tp1=0.5±0.05μs; prr=1000; Ii=100μAdc	t :	---	2μs
4.18.14.1	**Frequency Temperature Effect:	F= 2800±0.1%Mc	ΔF :	0	-10Mc.
4.9.10	Temperature Cycle:		Cycles :	1	---
4.9.10	*Temperature Cycle:	Temperature Range =-55°C to +100°C	Cycles :	5	---
4.11	Life Test:	Ii=200μAdc; Group C	t :	200	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t :	---	3 μs
		Spike Leakage Energy;	Ws :	---	0.35erg
		Flat Leakage Power	pf :	---	60mw

Note 1: References and notations are from the latest issue of Military Specification Electron Tubes, MIL-E-1.

Note 2: There shall be no evidence of shorts of the ignitor electrodes as indicated by a short indicator during vibration.

Note 3: No tube shall require more than 50μAdc ignitor current to prevent relaxation oscillation of the ignitor current.

Note 4: The tube shall cover a tuning range from less than 2770 Mc. to more than 3000Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range. As the tuning screw is turned through its complete range the transmitted power shall show only one peak.

Note 5: The Insertion Loss specified refers to the db loss of power incurred in a transmission line due to the insertion of the tube plus its loops.

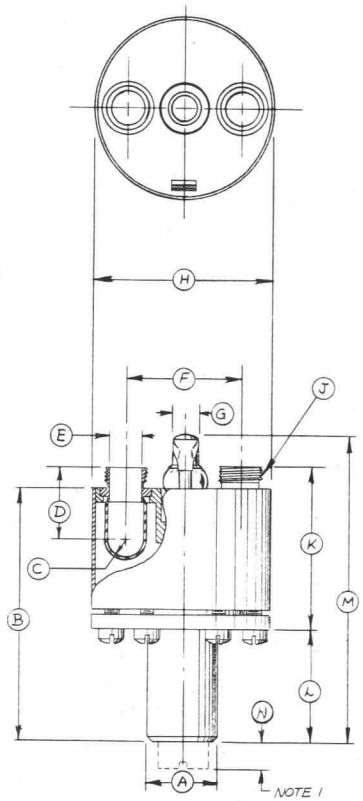
Note 6: Tests shall be made at 2885±0.1%Mc. with Ii=100μAdc. The attenuation shall not vary more than the amount specified with the ignitor current switched on and off.

Note 7: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei=Average (center) ignitor voltage drop.

At least 0.5 megohms of the total resistance should be located as close to the top cap as possible to prevent oscillation.



NOTE:-
1. APPLIES WHEN TUNING SCREW IS AT ITS EXTREME OUTER POSITION

REF	DIMENSIONS
A**	.680 DIA
B	2 1/2 ± 1/16
C	.189 R MIN
D	.466
E	.312 D ±002
F*	1.114
G**	.250 DIA. NOM
H*	1.750 DIA ±010
J	7/16 - 20 NF-
K	1 23/32 ± 1/32
L*	1 3/32 ± 1/32
M*	3 7/32 APPROX.
N	5/16 MAX

Bomac	GAS SWITCHING	S
	BL603	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Ratings: Transmitter po 10 kw (min) | Open Circuit Ignitor Supply Voltage -500 to -700 Vdc | Alt. 10,000 ft.

Dimensions: Per Outline

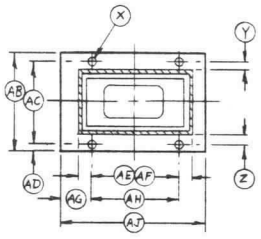
Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V	---	---
4.9.19.2	**Vibration:	10G		
------	*Insertion:	Note 2		
4.18.18	Voltage Standing Wave Ratio:	σ=1.05max.; *F= 2664Mc.	σ :---	1.65
		F1=2689	σ :---	1.2
		*F= 2714	σ :---	1.3
		*F= 2739	σ :---	1.3
		*F= 2764	σ :---	1.3
		*F= 2789	σ :---	1.3
		F2=2802	σ :---	1.2
		*F= 2839	σ :---	1.3
		*F= 2864	σ :---	1.3
		*F= 2889	σ :---	1.3
		*F= 2914	σ :---	1.3
		F3=2939	σ :---	1.2
		*F= 2964	σ :---	1.65
4.18.4.2	*Insertion Loss:	F=F2; Iz=0μAdc	Li :---	0.5db
4.18.5.1	* Ignitor Interaction:	Iz=200μAdc	ΔLi :---	0.3db
4.18.1	Ignitor Firing Time:	Ebb=600Vdc; Ri=1.6Meg	t :---	5sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid :-250	-400Vdc
------	Flat Leakage Energy:	F=F2; po=200±10kw; σ=1.1max.; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	Wi :---	0.4erg
4.18.10	Spike Leakage Energy:		Ws :---	0.3erg
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw tp=1.0μs; prr=1000pps; F=F2	σ :---	1.15
4.18.15.1	*Recovery Time:	po=750kw; nom; F=F2; Du=.0008; Iz=200μAdc; Note 3	t :---	15μs
4.11	Life Test:	po=750kw±10%(min); Du=.0008; F=F2; Iz=150-200μAdc; Group D	t :500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t :---	30μs
		Leakage Energy;	Wi :---	0.4erg
		Spike Leakage Energy; and Insertion Loss	Ws :---	0.3erg
			Li :---	1.2db

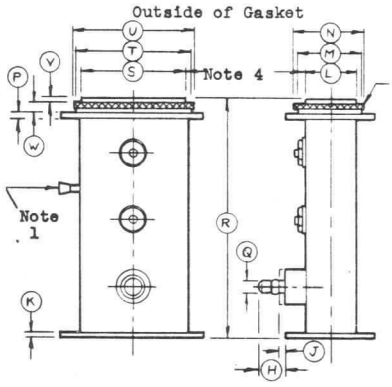
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1D, 3 October 1955.

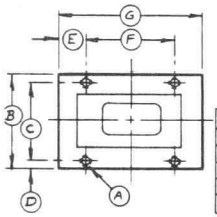
Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.



Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Gasket per drawing 189-JAN.





Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/8
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.723 Max.
P**	1/8
Q*	0.250
R	6.610±.030
S	3.008 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.297±.020
X*	7/32 Dia. 4 Holes
Y*	Within .015 of each other
Z*	
AB**	2 5/8
AC*	2.250±.010
AD*	3/16

Ref.	Dimension
AE*	Within .015 of each other
AF*	
AG*	13/16
AH*	2.500±.010
AJ**	4 1/8

Bomac	GAS SWITCHING	S
	BL654	TR

BOMAC LABORATORIES, INC. - BEVERLY. MASSACHUSETTS

MAY 18, 1956

Application: Phase Switching Tube

Dimensions: As per outline

Mounting: Notes 8, 9

Ratings:	Min.	Max.
Transmitter po	15	--- kw
Open Circuit Ignitor Voltage pulsed	---	-600 v
Ignitor Current, pulsed	---	1.0ma

Test Conditions: Note 10

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.5	Holding Period:	t=168 hours			
4.9.18.1.8	Carton Drop:				
4.9.19.2	**Vibration:				
	Ignitor Ignition Time:	To be specified			
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid	: 250	375Vdc
4.18.18	Voltage Standing Wave Ratio (1):	Ek=0			
		*F= 3366Mc.	σ	: 15	---
		F= 3400Mc.	σ	: 15	---
		*F= 3434Mc.	σ	: 15	---
4.18.18	Voltage Standing Wave Ratio (2):	Ik=0.4ma			
		*F= 3366Mc.	σ	: 15	---
		F= 3400Mc.	σ	: 15	---
		*F= 3434Mc.	σ	: 15	---
	Position of Short (1):	F= 3400Mc. Ik= 0 Note 1		±.0025"	
	Position of Short (2):	F= 3400Mc. Ik=0.4ma Note 2		±.0185"	
	Position of Short (3):	F= 3400Mc. EK=0 Po=70KW tp=1μsec.; prr=400 Note 3		±.0025"	
	Phase Shift (1):	Note 4		±.020"	
	Phase Shift (2):	Note 5		±.020"	
	Recovery Time:	F= 3400Mc. EK=0 Po=70KW tp=1μsec. prr=400; Note 6	t	: ---	10sec.
	Life Test:	Po=70KW tp=1μsec. prr=400;F=3425±3%Mc; ik=0.4 ma tp(k)=12μsec. prr=(k) 200	t	: 500hrs.	---
	Life Test End Point:	V.S.W.R. (2)	σ	: 15	---
		Phase Shift (1)		±.040"	
		Phase Shift (2)		±.040"	
		Recovery Time	t	: ---	15μsec.

Note 1: The position of short of the unfired tube shall be 3.201" from the input face of the input flange within the tolerance given. The temperature of the tube shall be 26±1°C during this measurement.

Note 2: The position of short of the fired gap shall be 2.105" from the input face of the input flange within the given tolerance.

Note 3: The position of short of the fired window shall be .087" from the input face of the input flange within the given tolerance.

Note 4: The shift in phase from position of short (1) to position of short (2) shall be 1/4↗ g within the specified tolerance.

Note 5: The shift in phase from position of short (2) to position of short (3) shall be 1/2↗g within the specified tolerance.

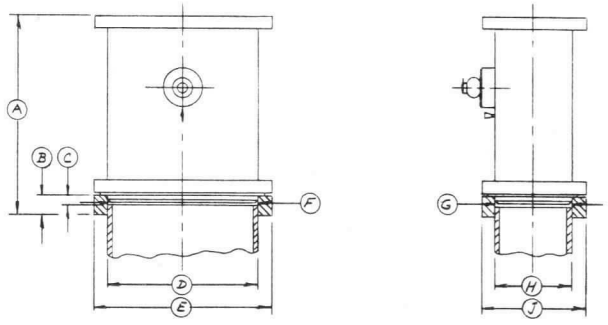
Note 6: The change in phase between the transmitter off and the specified time after the transmitter pulse shall not exceed .05↗g.

Note 7: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

Note 8: A suitable gasket shall be bolted between the tube flange and the tube seat. See attached drawing of Tube Seat, dated 5-16-56. One gasket shall be supplied with each tube.

Note 9: Sufficient pressure should be applied to the tube to insure "O" clearance between the tube flange and its mating flange.

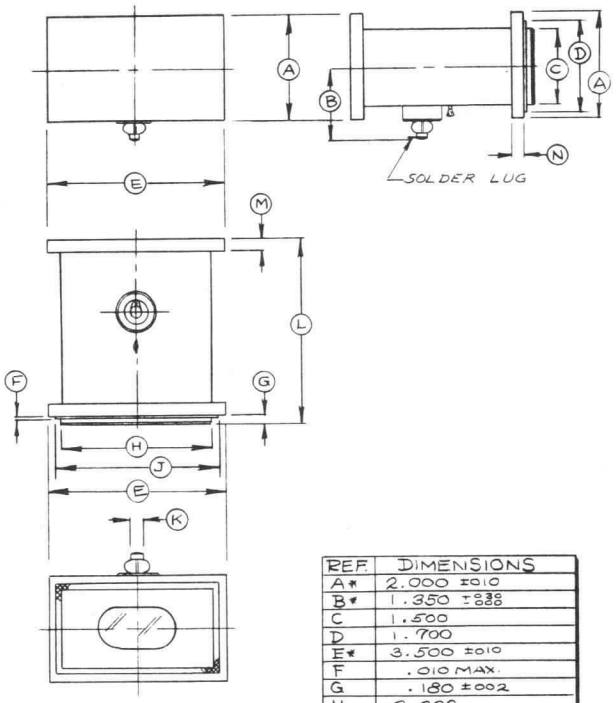
Note 10: The ignitor pulse shall have the following ratings, ek= -600v Max. ik=0.4ma; tp(k) =12μsec; prr (k)= 200 cycles. The transmitter ratings are as follows: po=70kw; tp=1μsec; prr=400 cycles.



REF.	DIMENSION	REF.	DIMENSION
A	3.850±.030	F	3.005 +.003 -.005
B	0.370±.010	G	1.505 +.003 -.005
C	0.186±.002	H	1.500
D	3.000	J	2.000
E	3.500		

TUBE CLAMPING OPTIONAL

(over)



REF.	DIMENSIONS
A*	2.000 ±010
B*	1.350 +.038 −.000
C	1.500
D	1.700
E*	3.500 ±010
F	.010 MAX.
G	.180 ±002
H	3.000
J	3.200
K	.250 DIA. NOM.
L	3.650 ±010
M**	.210 ±010
N**	.185 ±010

Bomac	GAS SWITCHING	S
	BL660	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 22, 1956

Ratings:	Min.	Max.
Transmitter po:	20	1000Kw
Altitude	---	10,000ft

Dimensions: Per outline

Mount per 153 JAN

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop	(d) Package Group 1 Carton Size N	---	---
4.9.19.2	**Vibration:	G=10	---	---
4.9.8	**Salt Spray Corrosion:	Omit	---	---
4.9.6	*Glass Strain	------	---	---
4.18.13.2	**Loaded Q	------	QL---	5.5
4.18.25	Tuning Susceptance:	F=Fo±0.1% Note 1	B/Yo-0.05	0.05
4.18.26	*Equivalent Conductance	F=Fo±0.1% Note 1	G/Yo---	0.05
4.18.27	Firing Time Test	po=50kw; tp=1.0±10%μs; prr=1000±10%; F=Fo±3%Mc; Note 1 Note 3	t:---	10 sec.
4.18.28	Arc Loss	See Firing Time	Loss:---	0.8db
4.18.19	**High Level Voltage Standing Wave Ratio	po=20kw; tp=1.0±10%μs; prr=1000±10%; σ'=1.05 max.; F=2800 Mc±5%	σ':---	1.15
------	*Recovery Time	po=500Kw; Note 4	t:---	15 μs
4.18.17.1	Temperature Cycle:	Note 2	---	---
4.18.17.3	Temperature Cycle Test:	Group D	Cycles:50	---
4.11	**Life Test	po=750 kw (min) Du=0.0005 σ'=1.20 (max) F=2800 Mc±5% Group D;	t:500	---hrs
4.11.4	Life Test End Point:	Equivalent Conductance: Tuning Susceptance: Recovery Time	G/yo--- B/Yo-0.05 t:---	0.1 0.05 30 μs

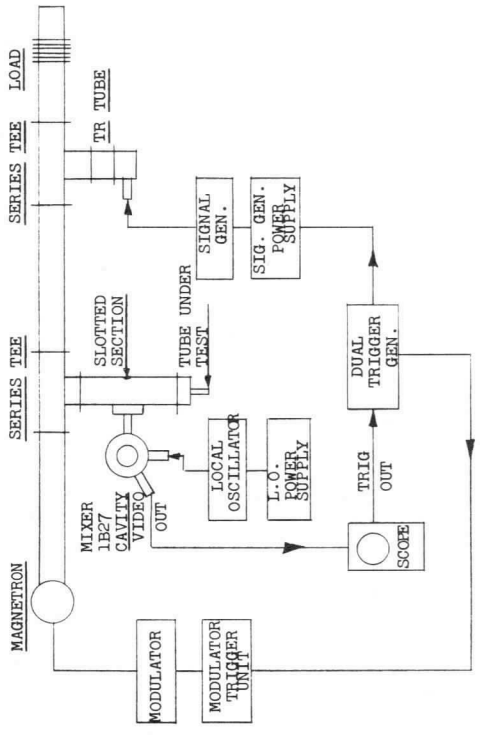
Note 1: BL-660
Fo=2800 Mc
Mount per drawing 153-JAN

Note 2: Satisfactory test on any one of 1B44, 1B52, 1B53, 1B56, 1B57, 5792, 6024, ATR387A, 5793, BL-40 BL-665 or BL-41 made during the same two weeks period will be evidence that all the group meet this requirement.

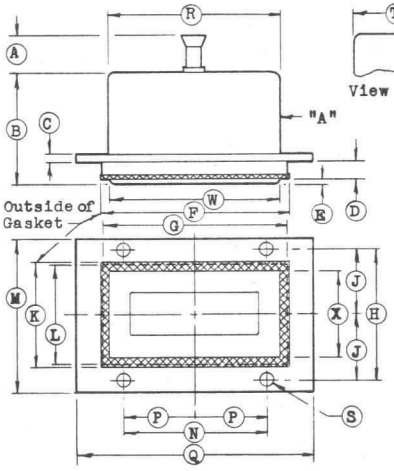
Note 3: This tube shall be mounted as in Note 1 and followed by a matched load. The tube shall fire within limit specified after application of rf power. This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: With the tube mounted as in test circuit "P" measurement is made with line power of 500 kw; 1.0±.15 microsecond pulse width; at 1000±10% prr; Fo=2800MC±3%. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than 0.05λg. The probing signal shall be 2800 Mc±1% for BL-655.

S-Band Recovery Time--ATR Tubes



(over)



Ref.	Dimension
A	5/8 Max.
B	1-7/8 Max.
C	1/8±1/64
D	0.297±.020
E	0.065±.015
F	3.223 Max.
G	3.218±.015
H	2.250±.010
J	1.125±.005
K	1.723 Max.
L	1.718±.015
M	2-5/8±1/64
N	2.500±.010
P	1.250±.005
Q	4-1/8±1/64
R	3.000±.015
S	7/32±1/64 Dia.
	4 Holes
T	1-1/2±1/64
W	3.000±.010
X	1.500±.010

Note:- Gasket supplied per 189-JAN.

Outline used for following tubes:-

1B44	5792	BL- 40
1B52	5793	BL- 41
1B53	5921	BL-630
1B56	5922	BL-660
1B57	6024	
ATR-387	ATR-387A	

Bomac

GAS SWITCHING	S
BL670	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 18, 1956

Ratings:	Open Circuit Ignitor Supply Voltage -500 to -700 VDC	Alt. 10,000 ft. (Max.)
Transmitter po	100kw(Max.)	
*Dimensions:	Per Outline	

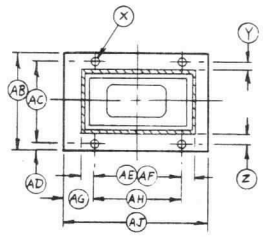
Packed in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size V	---	---
4.9.19.2	**Vibration:	10G		
-----	*Insertion:	Note 2		
4.18.18	Voltage Standing Wave Ratio:	δ1.05max.; F1=2700 MC±1%	---	1.3
		*F=2714 MC±1%	δ:---	1.3
		*F=2739 MC±1%	δ:---	1.3
		*F=2764 MC±1%	δ:---	1.3
		*F=2789 MC±1%	δ:---	1.3
		F2=2802 MC±1%	δ:---	1.3
		*F=2839 MC±1%	δ:---	1.3
		*F=2864 MC±1%	δ:---	1.3
		*F=2889 MC±1%	δ:---	1.3
		F=2900 MC±1%	δ:---	1.3
4.18.4.2	*Insertion Loss:	F=2800 MC±1% Iz=0μAdc	Li:---	0.3db
-----	Minimum Firing Power		---,	50mw
4.18.5.1	*Ignitor Interaction	Iz=200μAdc	ΔLi :---	0.3db
4.18.1	Ignitor Firing Time:	Ebb=600Vdc; Ri=1.6Meg	t :---	.1 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid:-250	-400Vdc
-----	Flat Leakage Energy	F=2800 MC±1% po=4.0KW±10KW; δ=1.1 max.; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000pps; Iz=200μAdc	Wi:---	0.4erg
4.18.10	Spike Leakage Energy:		Ws:---	0.3erg
4.18.19				
4.18.15.1	*Recovery Time:	po=4KW nom; F=2800MC±1% Du=.0008; Iz=200μAdc; Note 3	t :---	10us
4.11	Life Test:	po=4.0 KW ±10% (min) Du=.0008; F=2800 MC±1% Iz=150-200μAdc; Group C	t :500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t :---	20us
		Leakage Energy;	Wi:---	0.4erg
		Spike Leakage Energy;	Ws:---	0.3erg
		and Insertion Loss	Li:---	1.2db

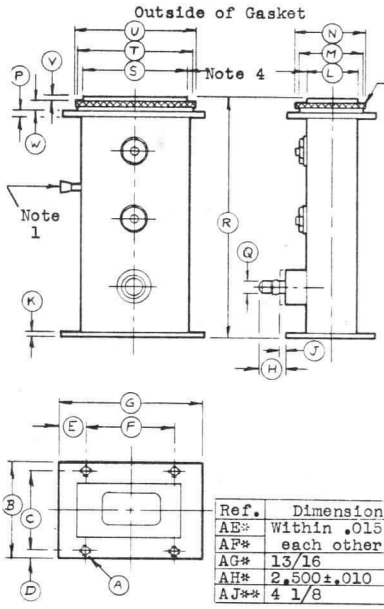
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000us after the pulse.



Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 4:- Edges may be rounded.
Note 5:- Gasket per drawing 189-JAN.



Ref.	Dimension
A*	#10-32NC-1B 4 Holes
B**	2 5/8
C*	2.250±.010
D*	3/16
E*	13/16
F*	2.500±.010
G**	4 1/8
H	13/16 Max.
J	3/16 Max.
K**	1/8
L*	1.508 Max.
M*	1.718±.015
N	1.723 Max.
P**	1/8
Q*	0.250
R	6.610±.030
S	3.008 Max.
T*	3.218±.015
U	3.223 Max.
V	0.065±.015
W	0.297±.020
X*	7/32 Dia. 4 Holes
Y*	Within .015 of
Z*	each other
AB**	2 5/8
AC*	2.250±.010
AD*	3/16

Ref.	Dimension
AE*	Within .015 of
AF*	each other
AG*	13/16
AH*	2.500±.010
AJ**	4 1/8

Bomac	GAS SWITCHING	C
	5865/TR361	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 27, 1954

Dimensions: Per Outline

Ratings:	**Min.**	**Max.**
Transmitter po	4.0	--- kw
Open Circuit Ignitor Voltage	-700	--- Vdc

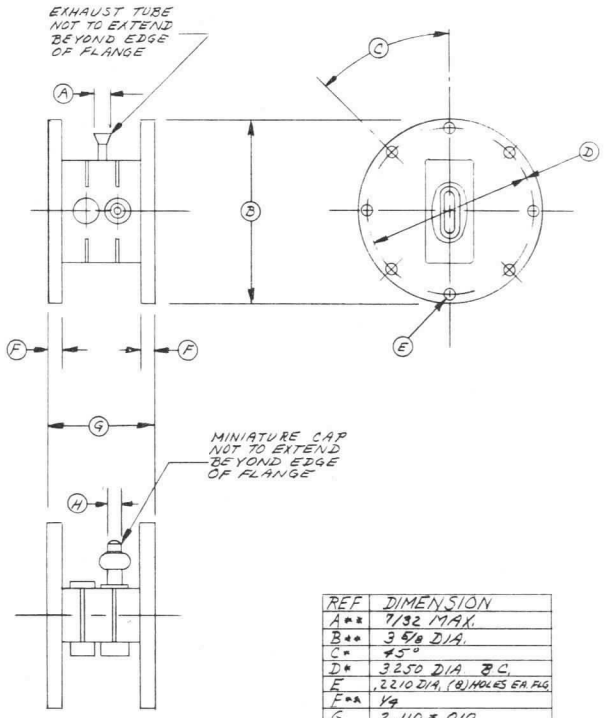
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	**Vibration:	F= 50±2cps; Total Excursion =0.08±0.0051n; t=2min; Note 2		
4.18.18	Voltage Standing Wave Ratio:	F= 5395Mc.	σ:---	1.9
		F= 5450	σ:---	1.4
		F= 5650	σ:---	1.4
		F= 5825	σ:---	1.4
		F= 5905Mc;	σ:---	1.9
		σ=1.05max.		
4.18.4.2	Insertion Loss:	F= 5650±1%Mc; Ii=0μAdc	Li:---	0.8db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	⊿ Li:---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t:---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid:200	400Vdc
	Power:	po=70±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ=1.10max.		
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.25erg
4.18.15.1	*Recovery Time:	F= 5650±1%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t:---	10μs
4.18.28	Arc Loss:	F= 5650±1%Mc; po=4kw; tp=1.0±0.15μs; prr=1000	---	0.8db
4.18.31	Position of Short:	F= 5650±1%Mc; po=70±10%kw; tp=1.0±0.15μs; prr=1000; Note 3	0.070	0.1001n
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test:	F= 5650±5%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Group C	t:500	---hrs
4.11.4	Life Test End Point:	Insertion Loss;	Li:---	0.8db
		Flat Leakage Power;	pf:---	100mw
		Spike Leakage Energy;	Ws:---	0.30erg
		Recovery Time	t:---	20μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Vibrate in a plane normal to the ignitor electrode. The ignitor electrode shall not short to the tube body during vibration. Tubes shall satisfy all requirements of this specification after the vibration test.

Note 3: When the metal short is replaced by the tube the shift in the position of V.S.W. minimum, away from the magnetron, shall be within the specified limits.



REF	DIMENSION
A**	7/32 MAX.
B**	3 5/8 DIA.
C*	45°
D*	3250 DIA B.C.
E	.2210 DIA. (8) HOLES EA FLG.
F**	V4
G	2.110 ± .010
H**	.250 DIA.

Bomac	GAS SWITCHING	C
	5925/TR331	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 30, 1953

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	4.0	---kw
Ignitor Open Circuit Supply Voltage	-700	---Vdc
Ignitor Current	100	200μAdc

Recommended Ignitor Operating Current 150μAdc Note 6

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:			---	---
------	**Vibration:	F= 50cps; G=10; Note 2		---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5200Mc	σ :	---	1.9
		F= 5280Mc	σ :	---	1.4
		F= 5365Mc	σ :	---	1.4
		F= 5450 Mc	σ :	---	1.4
		F= 5530Mc	σ :	---	1.9
		σ′=1.05max.			
4.18.4.2	Insertion Loss:	F= 5365Mc	Li :	---	0.8db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	Li :	---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg ohm	t :	---	5sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	200	400Vdc
4.18.11	Flat Leakage Power:	F= 5365±1%Mc; Po=70±10%kw; tp1=1.0±0.15μsec; tp2=0.5±0.15μsec; prr=1000; Ii=100μAdc; σ′=1.10max.	pf :	---	70mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.25erg
4.18.31	Position of Short:	F= 5365±1%Mc; po=70±10%kw; tp=1.0±0.15μsec; prr=1000; Note 3		---	±0.015 in
4.18.28	Arc Loss:	F= 5365±1%Mc; po=4kw; tp=1.0±0.15μsec; prr=1000;		---	0.8db
4.18.15.1	*Recovery Time:	F= 5365±1%Mc. po=1.0±10%Meg w tp=1.0±0.15μsec; prr=1000; Ii=100μAdc; Note 4	t :	---	9.0μsec
4.18.17.1	Temperature Cycle:	Note 5		---	---
4.11	Life Test:	F= 5365±5%Mc; po=1000±10%kw; tp=1.0±0.15μsec; prr=1000; Ebb=-700Vdc; Ri=2.7Meg.ohm Group D	t :	500	---hrs.
4.11.4	Life Test End Point:	Insertion Loss	Li :	---	0.8db
		Flat Leakage Power;	pf :	---	100mw
		Spike Leakage Energy	Ws :	---	0.3erg
		Recovery Time	t :	---	20μsec

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B 2 May 1952.

Note 2: There shall be no evidence of shorts between keep-alive electrodes as indicated by a short indicator during vibration.

Note 3: With a metal plate shorting the line the position of the SWV minimum shall be determined. The metal plate shall be replaced by the tube and the position of the SWV minimum of the flat portion of the pulse shall be measured and shall be .085 inches further from the magnetron within the limits specified.

Note 4: The loss of signal in the tube at the specified time after the pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.

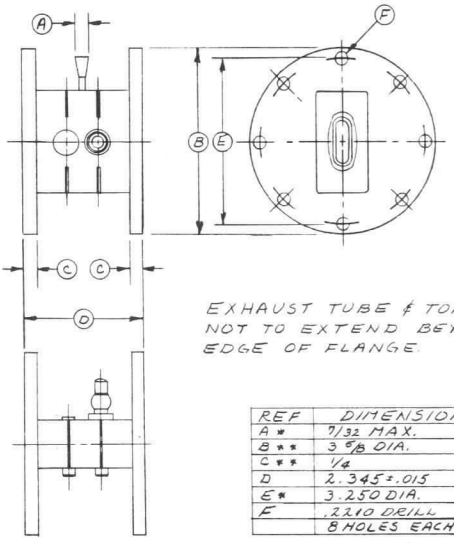
Note 5: Test all tubes only once by exposing to temperature changes from room temperature to -40°C to +100°C to room temperature.

Note 6: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei(megohms)}}{150}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



EXHAUST TUBE & TOP CAP NOT TO EXTEND BEYOND EDGE OF FLANGE

REF	DIMENSION
A **	7/32 MAX.
B **	3 5/8 DIA.
C **	1/4
D	2.345±.015
E *	3.250 DIA.
F	.2210 DRILL
	8 HOLES EACH FLANGE

Bomac	GAS SWITCHING	C
	6022/ATR332	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 28, 1956

Application: To be used with RG-49/U waveguide

Dimensions: Per Outline

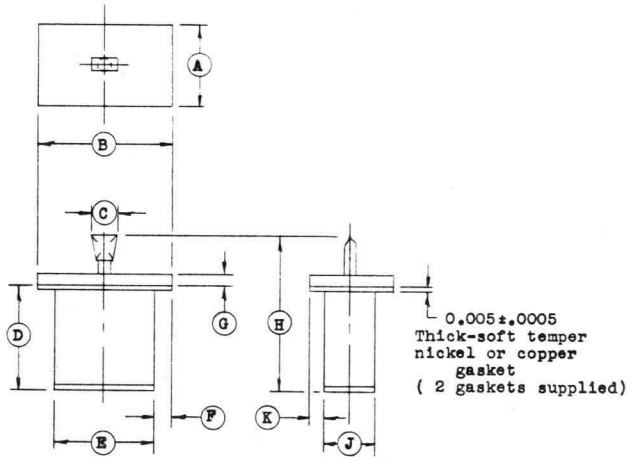
Ratings:	Min.	Max.
Transmitter po	100	--- kw

Pack in sealed water-proof transparent bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	**Vibration:	F=50cps; G=10; t=60 sec; Note 2		
4.9.8.	**Salt Spray Corrosion:	Omit	---	---
4.9.6	*Glass Strain:	-------	---	---
4.18.13.2	**Loaded Q:	F= 5365Mc. QL:	---	7.0
4.18.25	Tuning Susceptance:	F= 5365±0.1%Mc. B/Yo :	---	±0.06
4.18.26	*Equivalent Conductance:	F= 5365±0.1%Mc. G/Yo :	---	0.1
4.18.27	*Firing Time:	F= 5365±4% po=70kw; tp=1.0μs; prr=1000 t :	---	10 sec.
4.18.28	Arc Loss:	See Firing Time	---	0.7 db
4.18.19	**High Level V.S.W.R.:	F= 5365±1%Mc. po=70kw(min.); tp=1.0±0.1μs; prr=1000; σ' =<1.05 σ :	---	1.10
4.18.17.1	Temperature Cycle:	Cycles :	1	---
4.11	Life Test:	F= 5365±5%Mc; po=1000kw(min.); tp=1.0±0.1μs; prr=1000; Group C t :	1000	---hrs.
4.11.4	Life Test End Point:	Arc Loss;	---	0.7 db
		Equivalent Conductance; G/Yo :	---	0.1

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Vibrate in the plane normal to the tuning diaphragm. The tube must satisfy all requirements of this specification subsequent to the vibration test.



Ref.	Dimensions
A	1.400 ±.005
B	2.400 ±.005
C*	7/32 Max.
D	2.088 ±.014
E*	2.000 ±.010
F	0.200 ±.005
G	0.125 ±.008
H*	2.750 Max.
J*	1.000 ±.010
K	0.200 ±.005

Bomac	GAS SWITCHING	C
	6081/ATR408	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 25, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Altitude	---	10,000 ft.

Pack in sealed water-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

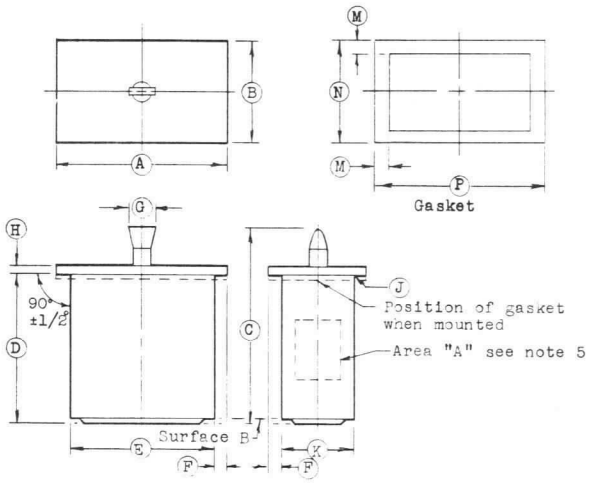
Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.9.18.1.8	*Carton Drop:	(d) Package Group (1) Carton Size (K)			
4.9.6	*Glass Strain:				
4.9.8	Salt Spray Corrosion:	Omit			
4.5	Holding Period:	t=168 hours			
4.9.19.2	**Vibration:	F= 50; G=10; t=60; No Voltages			
4.18.13.2	**Loaded Q:	E_o= 5640Mc.	QL:	---	7.0
4.18.25	Tuning Susceptance:	F=F_o±0.1%Mc.	B/Yo :	---	±0.06
4.18.26	*Equivalent Conductance:	F=F_o±0.1%Mc.	G/Yo :	---	0.1
4.18.27	†Firing Time:	po=20kw; tp=1.0μs; prr=1000; F=F_o±4%	t :	---	10 sec.
4.18.28	Arc Loss:	Note 3	Loss :	---	0.3 db
4.18.19	**High Level Standing Wave Ratio:	F=F_o; po=70kw(min.) tp=1.0μs; prr=1000; σ =1.03(max.)	σ :	---	1.10
------	Temperature Cycle:	Firing Time Note 4	Cycles :	1	---
4.18.17.3	Temperature Cycle Life Test:	Group D	Cycles :	10	---
4.11	Life Test:	F=F_o±4%Mc; po=300kw±10kw; Du=0.001; σ =1.2(max.); Group D	t :	500	---hrs.
4.11.4	Life Test End Point:	Arc Loss at 20kw; Du=0.001; tp=1.0μsec; F=F_o±4%Mc.	Loss:	---	1.0db
		Equivalent Conductance	G/Yo :	---	0.1

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube mount must be designed to avoid interference from a toroidal mode over the operating range of the tube. For this purpose a shorting contact or capacitive shunt may be included in the mount centered in Area "A" as shown on the outline drawing.

Note 3: This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 4: Test all tubes only once by exposing to temperature changes from room temperature to -40° to +100°C. to room temperature. The temperature may be allowed to come to room temperature in going from -40° to +100°C. This test may be made during the holding period but not less than 24 hours before the arc loss test.



Ref.	Dimension	Ref.	Dimension
A	2.400±.005	F	0.132 Min. Note 3
B	1.400±.005	G*	3/8 Max.
C*	2-3/4 Max.	H*	0.125±.008
D	2.083±.014	J*	0.040 Max. R. All Sides
E	2.000±.015	K	1.000±.015
M**	0.150±.005	P**	2.400±.005
N**	1.400±.005		

**Note 1:- The tubulation shall fall within a circle of 1/2 dia. max. located about the center of the flange.

**Note 2:- Silver plate 100 "SI or equivalent.

Note 3:- Applies at all edges of window face of tube at surface "B".

*Note 4:- Centerlines of window shall coincide with corresponding centerlines of the body within .010 measured in plane of window.

Note 5:- Area "A" centrally located on barrel.

*Note 6:- Gasket is .003±.0005 thick soft temper nickel or copper, 2 supplied with tube but not mounted.

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 27, 1957

Dimensions: Per Outline

Mounting: See Attached drawing of Tube Seat

Ratings:	Min.	Max.
Transmitter po		300 kw

Test Conditions: See Mounting,

Packing: To be specified.

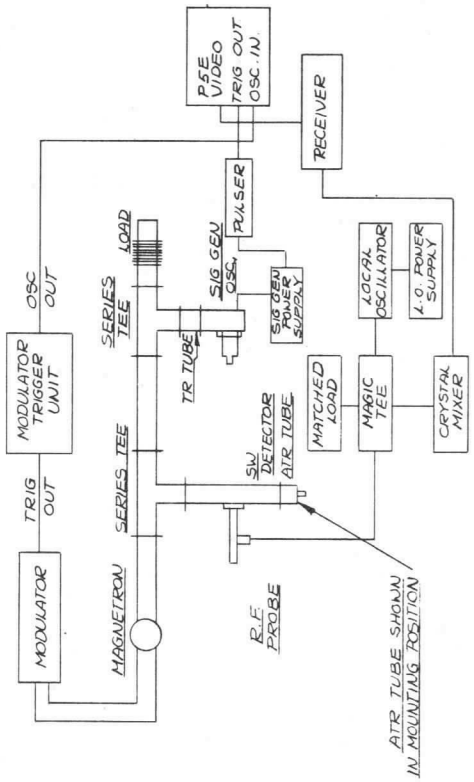
Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t= 168 hours	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton N	---	---
4.9.6	Glass Strain:	------	---	---
4.9.19.2	**Vibration:	F=50±2cps; Total Excursion =0.08±0.005 in; t=60; Note 3	---	---
4.18.13.2	**Loaded Q:	F_o = 5640±0.1%Mc.	QL: ---	7.00
4.18.25	Tuning Susceptance:	F_o = 5640±0.1%Mc.	B/Yo: ---	-0.06+0.06
4.18.26	*Equivalent Conductance:	F_o = 5640±0.1%Mc.	G/Yo:---	0.1
4.18.27	Firing Time:	F= 5640±1%Mc po=20 kw; tp=1.0±0.1μsec; prr=1000	t :---	10 sec
4.18.28	Arc Loss:	See Firing Time	---	0.8 db
------	*Recovery Time:	F= 5640±1%Mc. po=70±10%kw; tp=1.0±0.1μsec; prr=1000; Note 4	t :---	25μs
4.18.19	**High Level V.S.W.R.:	F= 5640±1%Mc; po=70±10%kw; tp=1.0±0.1μs; prr=1000; σ =1.03 max.	σ :---	1.10
4.18.17.3	Temperature Cycle:	------	Cycles :1	---
4.18.17.3	Temperature Cycle Life Test:	Group D	Cycles :50	---
4.11.4	Temperature Cycle Life End Point:	Firing Time	t :---	10 sec.
4.11	Life Test:	F= 5640±1%Mc. po=300±10%kw; tp=1.0±0.1μs; prr=1000; Group D	t :500	---hrs.
4.11.4	Life Test End Point:	Arc Loss		1.0 db
		Equivalent Conductance;	G/Yo :---	.15
		Tuning Susceptance;	B/Yo :---	±0.08
		Recovery Time	t :---	50μsec.

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be placed between the input face of the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: **Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.**

Note 4: **With the tube mounted as in Test Circuit "H", measurement is to be made with line power 70 kw at .001 Duty Cycle. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than .05 λ g. The probing signal shall be 5640M±1%.**



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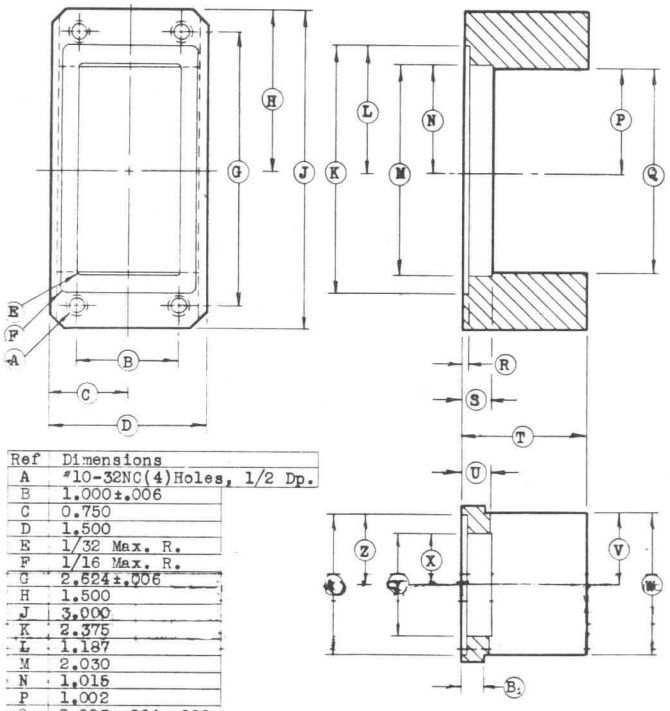
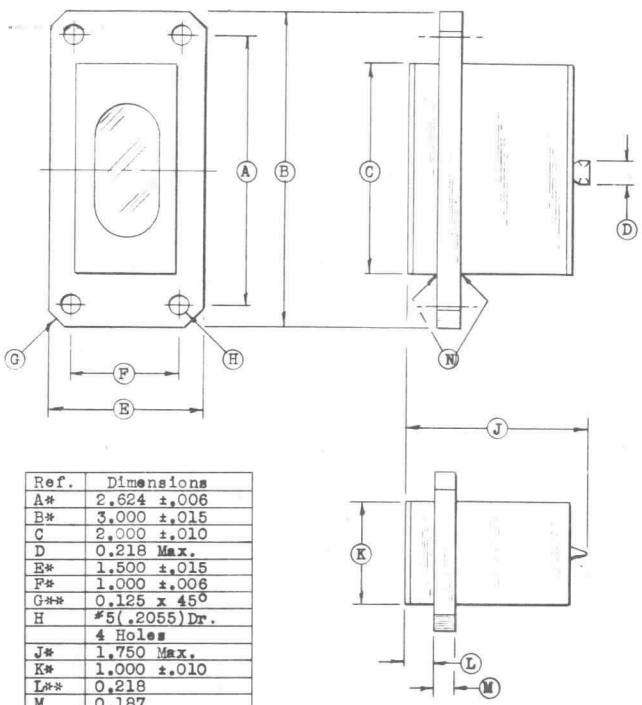


Ref	Dimensions
A	#10-32NC(4)Holes, 1/2 Dp.
B	1.000±.006
C	0.750
D	1.500
E	1/32 Max. R.
F	1/16 Max. R.
G	2.624±.006
H	1.500
J	3.000
K	2.375
L	1.187
M	2.030
N	1.015
P	1.002
Q	2.003+.004-.000
R	0.023±.002
S	0.233
T	1.154
U	0.218±.002
V	0.687
W	1.375+.000-.002
X	0.515
Y	1.030
Z	0.687
A_1	1.375
B_1	0.154±.001



Ref.	Dimensions
A*	2.624 ±.006
B*	3.000 ±.015
C	2.000 ±.010
D	0.218 Max.
E*	1.500 ±.015
F*	1.000 ±.006
G**	0.125 x 45°
H	#5(.2055)Dr.
	4 Holes
J*	1.750 Max.
K*	1.000 ±.010
L**	0.218
M	0.187
N	0.030 Rad. Max.

Bomac	GAS SWITCHING	C
	6568/BL28	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings;	Min.	Max.	Nom.
Transmitter po	.008	3000	---kw
Ignitor Open Circuit Supply Voltage	-700	----	---Vdc
TA	- 40	+ 65	°C
Pressurization	----	45 gage	---psi
Ignitor Current	100	200	μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 9)

Ref.	Test	Conditions	Min.	Max.
3.1	Type Approval:	Required for JAN Marking		
4.5	Holding Period:	t=168 hrs.		
4.9.18.1.8	Carton Drop:			
4.9.19.2	**Vibration:	F=50;G=10; Note 2		
4.18.18	Voltage Standing Wave Ratio:	σ′= 1.10 max. F_o= 5395 Mc F1= 5450 F2= 5650 F3= 5825 F4= 5905	σ:--- σ:--- σ:--- σ:--- σ:---	1.9 1.4 1.4 1.4 1.9
4.18.4.2	Insertion Loss:	F=F2; I1=100 uAdc	Li:--	1.0db
4.18.1	Ignitor Firing Time:	Ebb=-700 Vdc;	t;---	5.0sec
4.18.2	Ignitor Voltage Drop:	I1=100 μAdc	Eid:200	400 Vdc
4.18.11	Flat Leakage Power (1):	F=F2±10%; po=10 kw σ′=1.10 max. Ii=100μAdc tp1=1.0±0.15 μsec tp2=0.5±0.15 μsec prr=1000 pps. Note 8	pf:---	70 mw
4.18.10	Spike Leakage Energy (1):	Flat Leakage Power (1) Note 8	Ws:---	0.25erg
4.18.11	**Flat Leakage Power (2):	F=F2±10%; po=3Mw σ′=1.10max. Ii=100μAdc tp1=3.0±0.2 μsec tp2=1.0±0.15 μsec prr=500 pps Note 8	pf:---	100mw
4.18.10 **	Spike Leakage Energy (2):	**Flat Leakage Power (2) Note 8	Ws:---	0.25erg
4.18.28	Arc Loss:	po=10kw; F=F2±10%; tp=1.0±0.15μsec prr=1000 pps. Note 7	---	0.5db
4.18.31	Position of Short (1):	Arc Loss Note 3	0.095	0.115in.
4.18.31	Position of Short (2):	100 kw Note 3	0.080	0.100in.
-----	Phase Shift Tolerance:	Note 4 at F1, F2, and F3	---	±5degrees
4.18.15.1	*Recovery Time(1):	po=1Mw; Ii=100μAdc F=F2±10%; tp=1.0±0.15μsec; prr=1000 pps	t:---	6 μs
4.18.15.1	**Recovery Time(2):	po=3MW;I1=100μAdc F=F2±10% tp=3.0±0.3 μs; prr=500 pps	t:---	10 μs
4.18.15.1	**Recovery Time(3):	po=3MW;I1=100μAdc F=F2±10%; tp=0.3±0.05 μs prr=900 pps	t:---	7 μs
4.18.17.1	Temperature Cycle:			
4.11	Life Test (1):	po=1 MW; Ebb=-700Vdc;R1=2.7 meg. F=F2±10% tp=3.0±0.3 μs prr=500pps; Group D	500	--hrs.

Ref.	Test	Conditions	Min.	Max.
4.11.4	Life Test (1) End Point:	Recovery Time (1)	t:---	8.0 μs
		Flat Leakage Power (1)	pf:---	70 mw
		Spike Leakage Energy (1)	Ws:---	0.3 erg
		Insertion Loss, Ii=100 μAdc	Li:---	1.0 db
		Ignitor Voltage Drop	Eid:--	500 Vdc
		Phase Shift Tolerance		±5 degrees
4.11.4	**Life Test (2) End Point:	Recovery Time (2)	t:---	12 μs

Note 1: References and notations are from Military Specifications, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: There shall be no evidence of shorts between keep-alive electrode and body as indicated by a short indicator during vibration.

Note 3: Position of short to be measured as shown in Test Circuit "O", Procedure I, the VSW minimum of the flat portion of the pulse shall be within the tube measured from the input flange face further from the magnetron and within the limits specified.

Note 4: Transmission phase shift to be measured as shown in Test Circuit "N". Phase shift center to be specified. Tolerance of Phase Shift Center is ±5 degrees.

Note 5: Tests indicated with a double asterisk shall be conducted using a balanced hybrid ring duplexer. These tests are type approval tests.

Note 6: A 1N23B crystal shall be protected by this TR tube for po from 0 to 3 megawatts. (t_p=3.0 μsec; prr=500 pss)

Note 7: Arc loss measurement is to be performed as shown in Test Circuit "O", Procedure I.

Note 8: Flat leakage power and spike leakage energy is to be measured as shown in Test Circuit "O", Procedure II.

Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

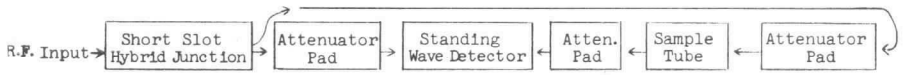
$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)

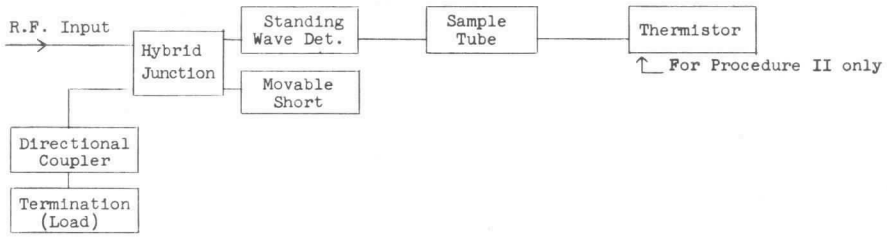
BLOCK DIAGRAM TRANSMISSION PHASE SHIFT MEASUREMENT



Procedure

(1) With dummy tube in place of sample, adjust attenuators until the voltage standing wave ratio is a maximum.
(2) Observe position of the V.S.W. minimum in the slotted section.
(3) Insert sample tube.
(4) Observe new position of V.S.W. minimum and calculate phase shift on basis of guided wavelength.

BLOCK DIAGRAM FOR POSITION OF SHORT, ARC-LOSS, AND LEAKAGE POWER MEASUREMENTS



PROCEDURE I

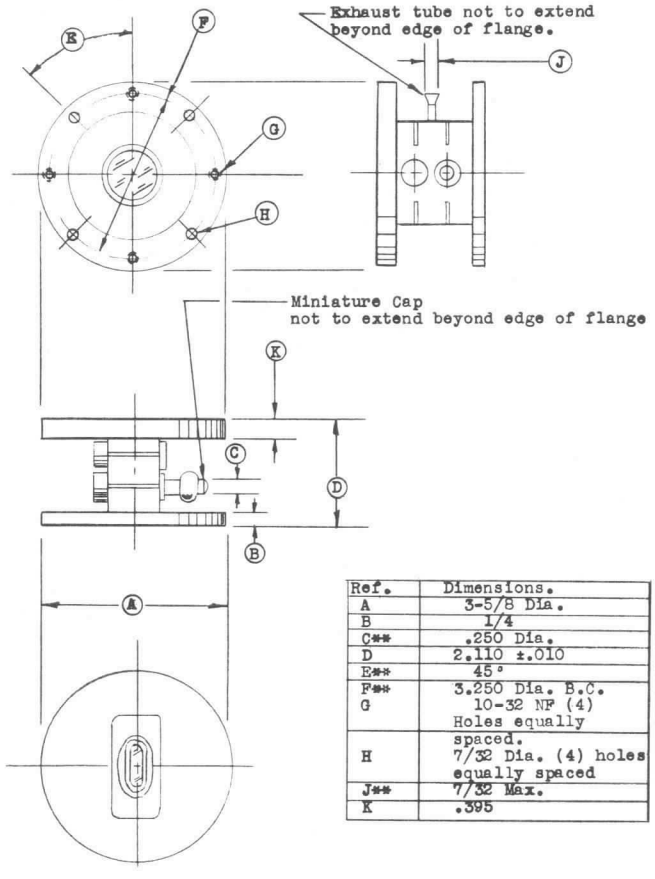
Position of short and arc-loss:

(1) With a shorting plate in place of sample, adjust movable short for maximum power into load. Observe this power at the dir. coupler.
(2) Observe position of voltage minimum in slotted section.
(3) Insert sample tube.
(4) Observe new position of voltage minimum. The shift in the voltage minimum is the position of short.
(5) Observe new power level at the dir. coupler and calculate arc-loss.

PROCEDURE II

Spike leakage energy and flat leakage power:

(1) Terminate the sample tube with a thermistor and measure the leakage power for two different R.F. pulse widths.
(2) Calculate spike leakage energy and flat leakage power as per MIL-E-1C, paragraphs 4.18.10 and 4.18.11.



Ref.	Dimensions.
A	3-5/8 Dia.
B	1/4
C**	.250 Dia.
D	2.110 ±.010
E**	45°
F**	3.250 Dia. B.C.
G	10-32 NF (4) Holes equally
H	spaced. 7/32 Dia. (4) holes equally spaced
J**	7/32 Max.
K	.395

Bomac	GAS SWITCHING	C
	6591	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
APRIL 27, 1956

Dimensions: Per Outline

Mounting: See Attached drawing of Tube Seat
Note 2

Ratings:	Min.	Max.
Transmitter po	4.0	150 kw

Test Conditions: See Mounting, Test Circuit

Packing: To be specified.

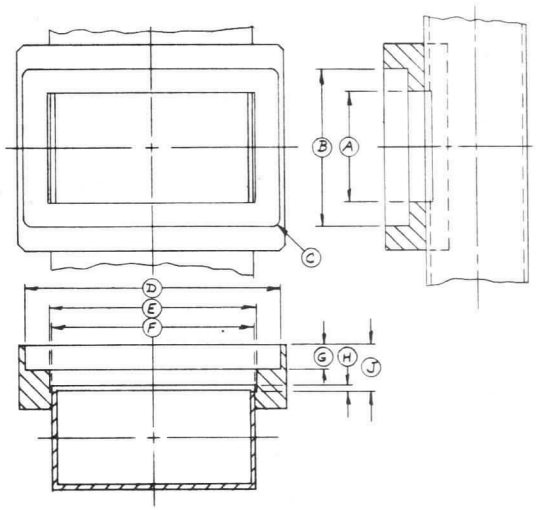
Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton K		---	---
4.9.19.2	**Vibration:	F=50±2cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3		---	---
4.18.13.2	**Loaded Q:	F_o= 5400±0.1%Mc.	QL:	---	8.00
4.18.25	Tuning Susceptance:	F_o= 5400±0.1%Mc.	B/Yo:	---	-0.06+0.06
4.18.26	*Equivalent Conductance:	F_o= 5400±0.1%Mc.	G/Yo:	---	0.1
4.18.27	*Firing Time:	F= 5400±1%Mc. po=10kw; tp=1.0±0.1μsec; prr=1000	t :	---	10 sec
4.18.28	Arc Loss:	See Firing Time		---	0.8db
------	*Recovery Time:	F= 5400±1%Mc. po=30±10%kw; tp=1.0±0.1μsec; prr=1000; Note 4	t :	---	25μs
4.18.19	**High Level V.S.W.R.:	F= 5400±1%Mc; po=50±10%kw; tp=1.0±0.1μs; prr=1000; σ =1.03 max.	σ :	---	1.12
4.18.17.3	Temperature Cycle:	------	Cycles :	1	---
4.18.17.3	Temperature Cycle Life Test:	Group C	Cycles :	50	---
4.11.4	Temperature Cycle Life End Point:	Firing Time	t :	---	10 sec.
4.11	Life Test:	F= 5400±1%Mc. po=85±10%kw; tp=1.0±0.1μs; prr=1000; Group D	t :	500	---hrs.
4.11.4	Life Test End Point:	Arc Loss			1.0db
		Equivalent Conductance	G/Yo :	---	.15
		Tuning Susceptance;	B/Yo :	---	±0.80
		Recovery Time	t :	---	50μsec

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E1C, 5 Oct. 1955.

Note 2: A suitable gasket shall be placed between the input face of the tube and the tube seat. One gasket will be supplied with each tube.

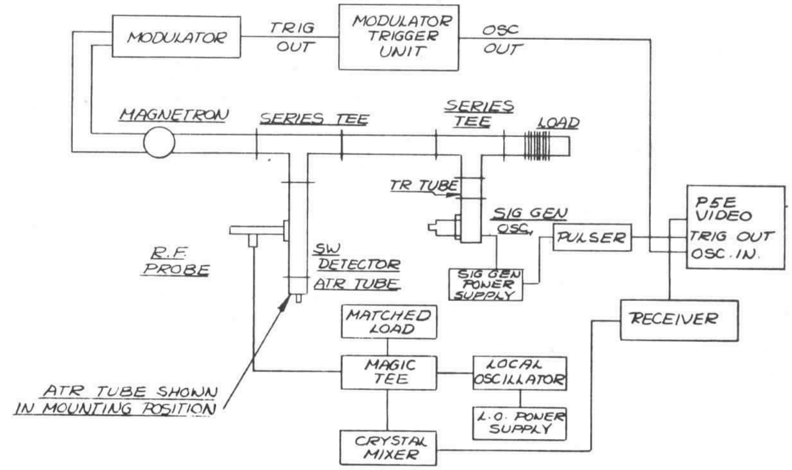
Note 3: Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.

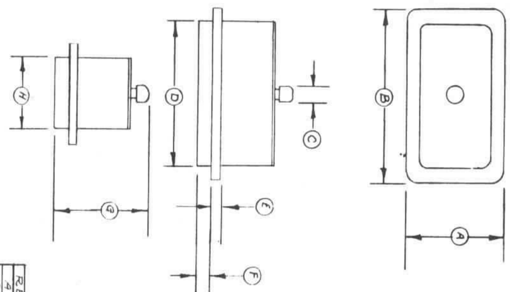
Note 4: With the tube mounted as in Test Circuit "H", measurement is to be made with line power 30kw at .001 Duty Cycle. The distance between the position of the minimum in the unfired condition and the position of the minimum after the specified time interval after the magnetron pulse shall be less than .05λg. The probing signal shall be 5400M±1%.



REF	DIMENSION
A	1.015
B	1.532±.003
C	.062 R.
D	2.532±.003
E	2.030
F	2.000 REF.
G	.235
H	.079
J	.422

(over)





REF.	DIMENSIONS
A *	1.520 ±.004
B *	2.520 ±.004
C	.375 MAX.
D	2.000
E**	.125
F	.312
G *	1.500 MAX.
H	1.000

Bomac	GAS SWITCHING	C
	6624	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 15, 1956

Dimensions: Per Outline

Mounting: See attached drawing of Tube Seat
See Note 2

Ratings:	Min.	Max.
Transmitter po	4.0	kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 uAdc

Recommended Ignitor Operating Current 150 μAdc (Note 4)

Test Conditions: See Mounting

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0 Meg	t:---	5.0 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc	Eid:-200	-400 Vdc
4.18.4.2	Insertion Loss:	F=5400 Mc. Ii=0μAdc	Li:---	.7 db
4.18.5.1	Ignitor Interaction:	I=100 μAdc	△Li: ---	0.3 db
4.18.18	Voltage Standing Wave Ratio:	F=5350Mc. F=5400Mc. F=5450Mc. ó=1.05 Max.	ó:--- ó:--- ó:---	1.4 1.4 1.4
4.18.10	Spike Leakage Energy:	F=5400±1%Mc; po=30±10%kw; tp1=1.0±0.1us; tp2=0.5±0.05us; prr=1000; Ii=100μAdc	Ws:---	0.30 erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:---	50mw
1.18.15.1	*Recovery Time:	F=5400±1%Mc; po=85±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100 μAdc	t:---	15us
4.18.19	**High Level VSWR:	F=5400±1%Mc; po=40 ±10%kw tp=1.0±0.1μs; prr=1000	ó:---	1.10
4.18.28	*Arc Loss:	F=5400±1%Mc; po=4.0kw min; tp=1.0±.1 μs prr=1000	---	.8 db
4.11.	Life Test:	F=5400±1%Mc; po=85±10%kw; tp=1.0±0.1us; prr=1000; Ii=±00μAdc Group C	t:---	500 hrs.
4.11.4	Life Test End Point:	Insertion Loss Spike Leakage Energy; Flat Leakage	Li:--- Ws:---	1.0 0.35 erg

Ref.	Test	Conditions	Min.	Max.
4.11.4		Power; Recovery Time	pf: --- t: ---	70 mw 25 usec

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be bolted between the input face of the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: Vibrate in a plane normal to the ignitor electrode. The ignitor electrode shall not short to the tube body during this test. Tube shall satisfy all applicable requirements of this specification after vibration.

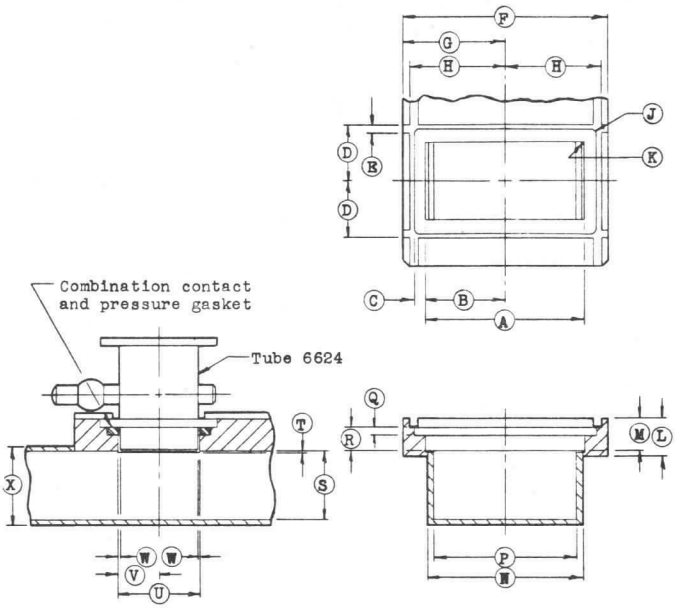
Note 4: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (meg ohms)}$$

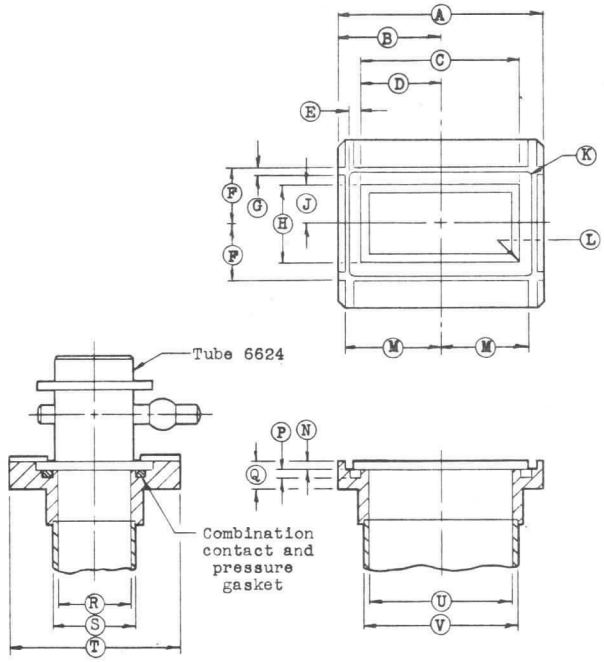
Where Ri=Total series resistance
Where Ri=Total series resistance
Ebb=Open Circuit Supply Voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

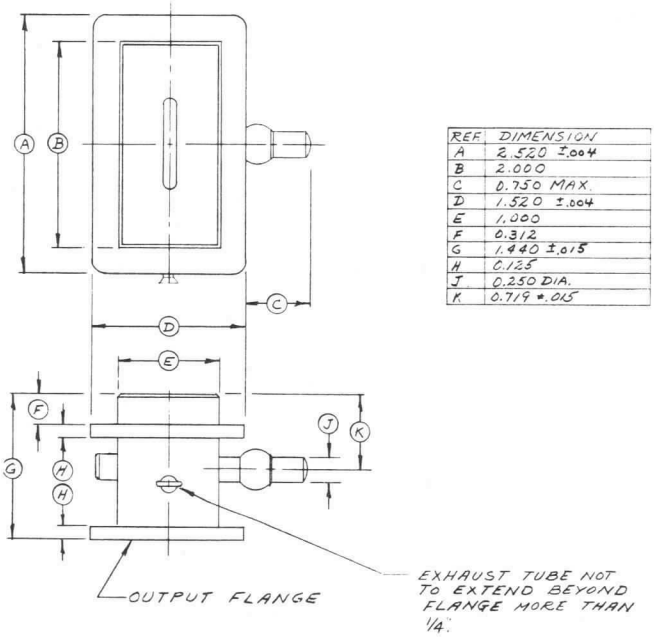
(over)



Ref.	Dimension	Ref.	Dimension
A	2.030±.005	M	0.424±.005
B	1.0150±.0025	N	2.000±.005
C	0.189±.002 Typ.	P	1.872±.005
D	0.7625+.0025-.0000	Q	0.110±.002
E	0.120±.010 Typ.	R	0.312±.002
F	2.650±.005	S	0.872±.005
G	1.325±.005	T	0.010+.005-.000
H	1.2625+.0025-.0000	U	1.030±.005
J	0.093±.002 Rad.	V	0.5150±.0025
K	0.005 Rad. Max.	W	0.015±.002
L	0.500±.010	X	1.000±.005



Ref.	Dimension	Ref.	Dimension
A	2.650±.005	K	0.093±.002 Rad. Typ.
B	1.325±.005	L	.005 Rad. Max. Typ.
C	2.025±.005	M	1.2625+.0025-.0000
D	1.010+.005-.000	N	0.110±.005
E	0.192±.002 Typ.	P	0.110±.002
F	0.7625+.0025-.0000	Q	0.360±.010
G	0.120±.010 Typ.	R	0.872±.005
H	1.025±.005	S	1.000±.005
J	0.510+.005-.000	T	2.170±.010
V	2.000±.005	U	1.872±.005



REF	DIMENSION
A	2.520 ±.004
B	2.000
C	0.750 MAX.
D	1.520 ±.004
E	1.000
F	0.312
G	1.440 ±.015
H	0.125
J	0.250 DIA.
K	0.719 ±.015

CADMIUM PLATED FINISH

Bomac	GAS SWITCHING	C
	6639/BL46	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 31, 1954

Dimensions: Per Outline

Ratings:	Transmitter po	Open Circuit Ignitor Voltage	Ignitor Current	Ambient Temperature
Min.:	5kw	-600Vdc	100μAdc	-40°C
Max.:	20kw	-750Vdc	200μAdc	+100°C

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.8	**Salt-Spray:	Note 2		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
-----	**Vibration(1):	Note 3		---	---
4.9.19.2	**Vibration(2):	Amplitude =0.040 in; t=60sec; G=2.0; Note 4		---	---
4.18.6	Tuning Range:	Note 5		---	---
4.18.4.1	Insertion Loss:	F=5550±10Mc	Li:	---	1.2db
4.18.5.1	Ignitor Interaction:	I1=100μAdc	Δ Li:	---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=650Vdc; R1=3.25Meg	t:	---	5.0sec
4.18.2	Ignitor Voltage Drop:	I1=100μAdc	Eid:	200	350Vdc
4.18.3	*Ignitor Oscillation:	-----	I1:	---	60μAdc
4.18.9	Leakage Power:	F=5550±10Mc; po=15±5kw; tp=0.2±.05μs; prr=1500±10%; I1=100μAdc	Po/Du:	---	60mw
4.18.13.1	**Loaded Q:	-----	QL:	---	325
4.18.14.1	**Frequency Temperature Effect:	F=5550±10Mc	Δ F:	0	-40Mc
4.18.15.1	*Recovery Time:	F=5550±10Mc; po=15±5kw; tp=0.2±.05μs; prr=1500±10%; I1=100μAdc	t:	---	1.5μs
4.18.16	*Pressure Operation:	30p.s.i. (abs.)		---	---
4.18.17.1	Temperature Cycle:	-----		---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles:	50	---
4.11	Life Test:	I1=200μAdc; Group D	t:	500	---hrs
4.11.4	Life Test End Point:	Leakage Power; Recovery Time; Insertion Loss; Ignitor Voltage Drop	Po/Du:	---	60mw
			t:	---	2.5μs
			Li:	---	1.5db
			Eid:	---	500Vdc

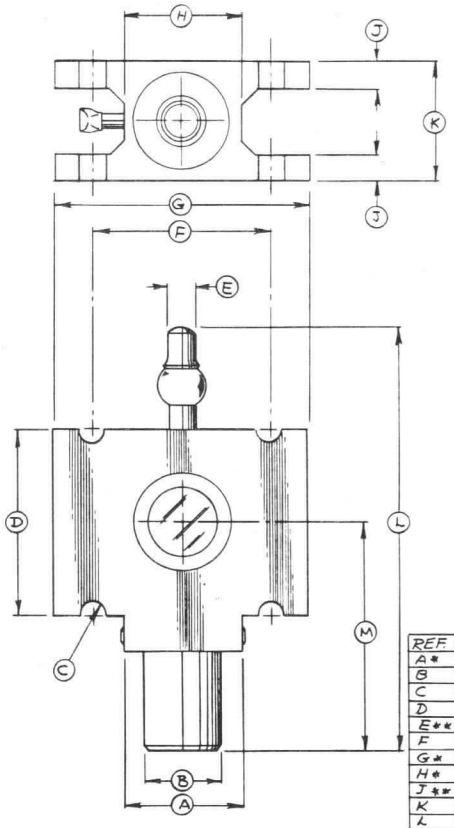
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Shall be capable of withstanding a 48 hour, 20 percent solution, salt spray test, at 35 degrees centigrade, without change mechanically or electrically.

Note 3: Tune to 5550±10Mc, then vibrate in direction of ignitor axis, per paragraph 4.9.19.2, MIL-E-1B, for 12 hours at 2.0G with an amplitude of motion of 0.040 inches. After this, the tuning shall not have changed more than 3 Mc from its initial value and the tube shall satisfy all other electrical tests of this specification.

Note 4: The tube shall be vibrated in a plane perpendicular to the ignitor axis and there shall be no evidence of shorting between the ignitor electrode and adjacent cone.

Note 5: The tube shall cover a minimum tuning range of from less than 5450Mc. to more than 5650Mc. No tube shall require less than 2 complete turns of the tuning screw to cover this range.



REF	DIMENSIONS
A*	1 1/8
B	29/32 DIA
C	#7 (.201) DR (4) HOLES
D	1.812
E**	.250 DIA. NOM.
F	1.750
G*	2 1/2
H*	1 1/8
J**	1/4
K	1.063
L	4" MAX.
M**	2 3/8 MAX
N	

Bomac	GAS SWITCHING	C
	BL605	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1955

Note 1

Dimensions: Per Outline

Mounting: See attached drawing of Tube Seat
See Note 2

Ratings:	Min.	Max.
Transmitter po	10	100 kw
Open circuit ignitor voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current	150 μAdc (Note 5)	

Test Conditions: See Mounting

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 Hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3	---	---
4.18.17.1	Temperature Cycle:	----	---	---
4.18.1	Ignitor Ignition Time:	Ebb=-700 Vdc; Ri=4.0 Meg	t:--	5.0sec
4.18.2	Ignitor Voltage Drop:	I1=100 μAdc	Eid:200	400Vdc
4.18.4.2	Insertion Loss:	F=5370 Mc. F=5400 Mc. F=5430 Mc.	Li:-- Li:-- Li:--	0.7db 0.7db 0.7db
4.18.5.1	Ignitor Interaction	I=100 μAdc	ΔLi:--	0.2db
4.18.18	Voltage Standing Wave Ratio:	F=5370 Mc. F=5400 Mc. F=5430 Mc.	σ:-- σ:-- σ:--	1.4 1.4 1.4
4.18.31	Position Of Short	F=5400 po=90±10%Kw tp=1.0±0.1us prr=1000 I1=100μadc Note 4	---	±0.010
4.18.10	Spike Leakage	F=5400±1%Mc; po=90±10%Kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; I1=100μAdc	Ws:--	0.30erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:--	50mw
1.18.15.1	*Recovery Time:	F=5400±1%Mc; po=90±10%Kw; tp=1.0±0.1μs; prr=1000; I1=100μAdc	t:---	10us
4.18.19	**High Level V.S.W.R.:	F=5400±1%Mc; po=50±10%Kw; tp=1.0±0.1μs; prr=1000	σ:---	1.10
4.18.28	Arc Loss:	F=5400±1%Mc; po=20kw min; tp=1.0±0.1μs; prr=1000	---	0.8db
4.11	Life Test:	F=5400±5%Mc; po=90±10%kw; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc;Ri=2.7 meg. Group D	t:500	--hrs.
4.11.4	Life Test End Point:	Insertion Loss at F=5400Mc; Spike Leakage Energy; Flat Leakage Power; Recovery Time	Li:-- Ws:-- pf:-- t:---	0.9db 0.30erg 75mw 15us

Note 1: References and notations are from Military Specifications; Electron Tubes, MIL-E-1

Note 2: A suitable gasket shall be bolted between the input face of the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: Vibrate in a plane normal to the ignitor electrode. The ignitor electrode shall not short to the tube body during this test. Tubes shall satisfy all applicable requirements of this specification after vibration.

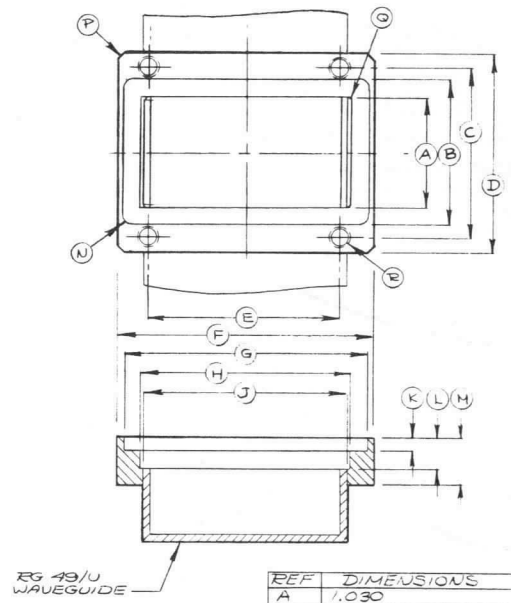
Note 4: The position of short shall be 0.280 ahead of the front face of the input flange, within the limits specified.

Note 5: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

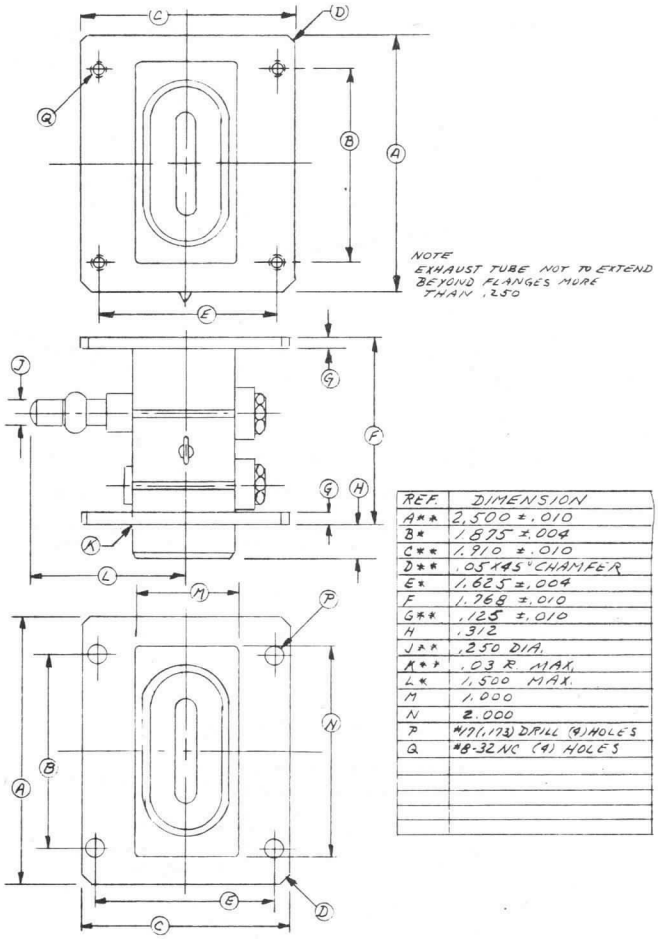
where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSIONS
A	1.030
B	1.410 ±.010
C	1.625 ±004
D	1.910 ±.010
E	1.875 ±004
F	2.500 ±.010
G	2.410 ±.010
H	2.030
J	2.002 ±883
K	.110 ±002
L	.927
M	.500 ±.010
N	.045 R MAX
P	.05 x 45° CHAMFER
Q	.03 R
R	#8-32 NC (2) HOLES

(over)



REF.	DIMENSION
A**	2.500 ±.010
B*	1.875 ±.004
C**	1.910 ±.010
D**	.05 X 45° CHAMFER
E*	1.625 ±.004
F	1.768 ±.010
G**	.125 ±.010
H	.312
J**	.250 DIA.
K**	.03 R MAX.
L*	1.500 MAX.
M	1.000
N	2.000
P	#7 (.173) DRILL (4) HOLES
Q	#8-32 NC (4) HOLES

Bomac	GAS SWITCHING	C
	BL606	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

NOVEMBER 26, 1954

Dimensions: Per Outline

Mounting:
See Note 2.

Ratings:	Min.	Max.
Transmitter po	10	100 kw

Test Conditions: See Mounting

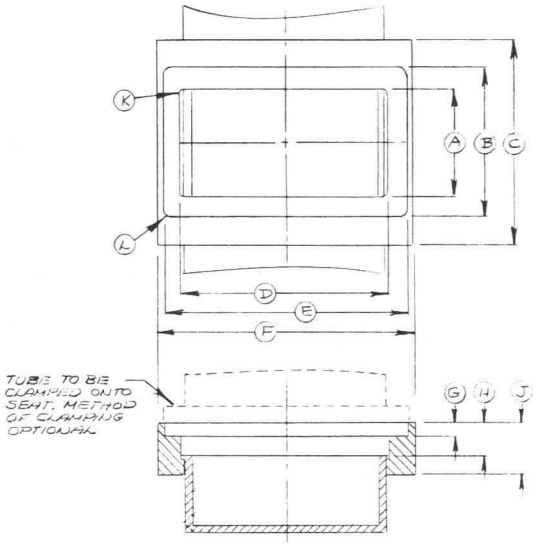
Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	** Vibration:	F= 50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3	---	---
4.18.17.3	Temperature Cycle:	-----	Cycles: 1	---
4.18.13.2	** Loaded Q:	F_o= 5400±0.1%Mc	QL: ---	7.0
4.18.25	Tuning Susceptance:	F_o= 5400±0.1%Mc	B/Yo: ---	±0.06
4.18.26	* Equivalent Conductance:	F_o= 5400±0.1%Mc	G/Yo: ---	0.1
4.18.19	** High Level V. S. W. R.:	F= 5400±1%Mc; po=50±10% kw; tp=1.0±0.1μs; prr=1000	σ: ---	1.10
4.18.27	✗ Firing Time:	F= 5400±1%Mc; po=20 kw min; tp=1.0±0.1μs; prr=1000	t: ---	10sec.
4.18.28	Arc Loss:	See Firing Time	----	0.8db
4.11	Life Test:	F= 5400±5%Mc; po=90±10%kw; tp=1.0±0.1us; prr=1000; Group D	t: 500	---hrs.
4.11.4	Life Test End Point:	Equivalent Conductance; G/Yo: --- Arc Loss ---		0.1 1.0db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

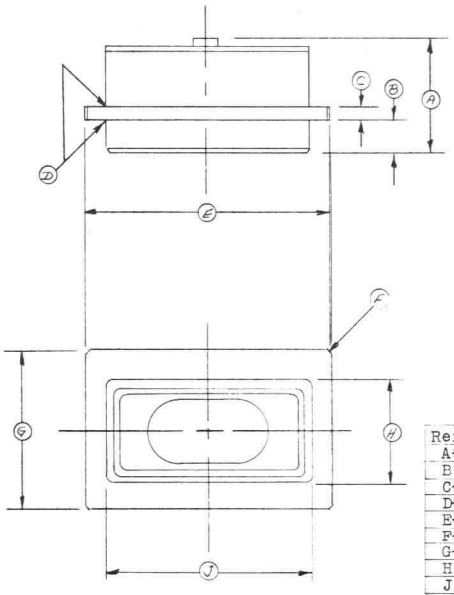
Note 2: A suitable gasket shall be placed between the input face of the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.



REF	DIMENSIONS
A	1.030
B	1.410 ±010
C	1.992
D	2.030
E	2.410 ±010
F	2.500 ±010
G	.110 ±002
H	.312 ±002
J	.500 ±010
K	.03R MAX
L	.045R MAX

NOTE C, F, & J DIMENSIONS ARE OPTIONAL



Ref.	Dimension
A*	1.250 Max.
B	0.312
C**	0.125±.010
D**	1/32 Rad. Max.
E*	2.404±.004
F**	1/32 x 45° Chamfer
G*	1.520±.004
H	1.000
J	2.000

Bomac	GAS SWITCHING	C
	BL643	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	---	5.0 kw
Open Circuit Ignitor Voltage	-700	--- Vdc

Packing: To be specified

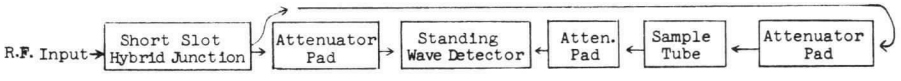
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	**Vibration:	F=50±20cps; Total Excursion =0.08±0.005 in; t=2min; Note 2		
4.18.18	Voltage Standing Wave Ratio:	F=5395Mc.	σ :---	2.0
		F=5450	σ :---	1.5
		F=5650	σ :---	1.5
		F=5825	σ :---	1.5
		F=5905Mc; $\hat{\sigma}$=1.05max.	σ :---	2.0
4.18.4.2	Insertion Loss:	F=5650±1%Mc; Ii=0μAdc	Li :---	0.8db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi :---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t :---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :200	400Vdc
	Phase Shift:	F=5450Mc; λg=6.74	Ψ :-56	-66°
		F=5650Mc; λg=6.40	Ψ :-2	-12°
		F=5825Mc; λg=6.12 Note 8	Ψ :+34	+44°
4.18.11	Flat Leakage Power:	F=5650±1%Mc; po=5.0±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; $\hat{\sigma}$=1.10max.	pf :---	85mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :---	0.40erg
4.18.15.1	*Recovery Time:	F=5650±1%Mc; po=5.0±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t :---	2.0μs
4.18.28	Arc Loss:	F=5650±1%Mc; po=4kw; tp=1.0±0.15μs; prr=1000	---	0.9db
4.18.31	Position of Short:		To be specified	
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test:	Ebb=-700Vdc; Ii=100μAdc; Group C	t :500	---hrs.
4.11.4	Life Test End Point:	Insertion Loss;	Li :---	0.9db
		Flat Leakage Power;	pf :---	120mw
		Spike Leakage Energy;	Ws :---	0.5erg
		Recovery Time	t :---	4μs

Note 1: **References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.**

Note 2: **Vibrate in a plane normal to the ignitor electrode. The ignitor electrode shall not short to the tube body during vibration. Tubes shall satisfy all requirements of this specification after the vibration test.**

Note 3: **Phase Shift to be measured as shown in Test Circuit "N". Positive phase shift will be in direction of tube under test with respect to VSW detector.**

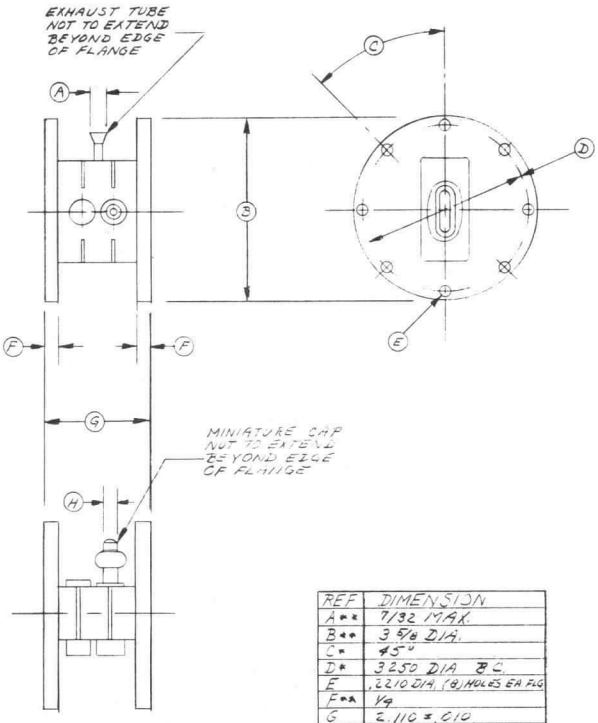
BLOCK DIAGRAM TRANSMISSION PHASE SHIFT MEASUREMENT



Procedure

(1) With dummy tube in place of sample, adjust attenuators until the voltage standing wave ratio is a maximum.
(2) Observe position of the V.S.W. minimum in the slotted section,
(3) Insert sample tube.
(4) Observe new position of V.S.W. minimum and calculate phase shift on basis of guided wavelength.

(over)



REF	DIMENSION
A**	7/32 MAX.
B**	3 5/8 DIA.
C*	45°
D*	3250 DIA ⌀ C
E	.2210 DIA. (8) HOLES EA FLG
F**	1/4
G	2.110 ± .010
H**	.250 DIA.

Bomac	GAS SWITCHING	X
	BL20	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 3, 1956

Dimensions: Per attached outline

Ratings:	Min.	Max.
Transmitter po	4	100 kw
Ignitor Current	100	200 μAdc
Amb. Temperature	-55	+100°C

Recommended Ignitor operating current 150 μAdc (Note 2)

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.9.18	Drop:				
	*Vibration (1):	Notes 3, 4			
4.18.33	*Vibration (2):	t=60 sec.; G=2.0; Amp. 0.04 in. Note 5		---	---
-----	Attenuation Ignition Time:	po=0; Note 6	t:	---	180 sec.
4.18.4.1	Insertion Loss:	F=9375, ±0.1%Mc. Note 7	Li:	0.85	1.50 db
-----	Attenuation:	F=9375 Mc±0.1% Ik=750uA Note 8	Attenuation:	30db	---
-----	*Attenuation:	F=9000 Mc ±0.1% Ik=750 uA Note 8	Attenuation:	30 db	---
-----	*Attenuation:	F=9600 Mc ±0.1% Ik=750 uA Note 8	Attenuation:	28db	---
-----	Attenuation:	F=9375 Mc±0.1% Ik=750 uA Note 6, 9	Attenuation:	25db	---
4.18.6	Tuning Range:	Note 10	F:	9000	9600 Mc
4.18.2	Ignitor Voltage Drop:	I_z=100μAdc	E_z:	200	375
4.18.5.1	Ignitor Interaction:	I_z=100μAdc	ΔLi:	---	0.2db
-----	Attenuator Voltage Drop:	Ik=750 uA Note 20		325	450V
-----	Attenuator Extinction Voltage (1):	Note 11		200	--- Vdc
-----	Attenuator Extinc- Voltage (2):	Note 9, 11		200	--- Vdc
4.18.9	Leakage Power:	F=9375 Mc Ek=0: Po=30Kw Prr=1000 tp=0.5μs; Note 12	Peak Power:	---	30 mw
4.18.12	Attenuator Leakage Resistance:		Res:	30 meg	---
4.18.13	**Loaded Q:			---	350
4.18.14	**Temperature Frequency Effect;	Note 13	ΔF:	---	-20 Mc
4.18.15.1	Recovery Time:	F=9375 Mc Po=20 Kw Prr=1000 tp=0.5μs, Note 14	t:	---	4 Mscc.
4.18.16	*Pressure Operation:	Note 3, 15		---	---
-----	Temperature Cycle Test:	Note 16		---	---
4.11.3	Temperature Cycle Life Test:	Group C; Note 16	Cycles:	10 cyc.	---

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test (1):	F=9375 Po=20Kw (min) tp=0.5Ms Prr=2000 iK=750 mA Note 17	t:	50 hrs.	---
4.11	Life Test (2):	Note 18	t:	100 hrs.	---
4.11.4	Life Test End Point (1):	Leakage Power	Po/Du:	---	30 mw
		Insertion Loss	Li:	---	2.0 d5
		Recovery Time	t:	---	5.0 μs
		Low Level Attenuation: Attenuation		25	--- db
4.11.4	Life Test End Point (2):	Leakage Power	Po/Du:	---	30 mw
		Insertion Loss	Li:	---	2.0 db
		Recover Time	t:	---	3 μsec
		Low Level Attenuation: Attenuation		20	--- db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C,

Note 2: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri =Total series resistance
Ebb=Operen circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 3: On evidence of satisfactory quality, this test may be limited to 10 tubes per month when tube is in continuous production. If two or more tubes fail to meet this test, the test conditions shall revert to design test requirements.

Note 4: Tune to 9375 Mc ±0.1% then vibrate in the direction of the cone axis with simple harmonic motion for 12 hours at 2.0G with an amplitude of motion of 0.040 inches. After this the tuning shall not have changed more than 5 Mc from its initial value.

Note 5: The tube shall be vibrated with simple harmonic motion in a plane perpendicular to the cone axis and there shall be no evidence of shorting between the attenuator electrode and the adjacent cone.

Note 6: This test shall be made not less than 24 hours after any previous discharge. With a -450 volts dc applied to the attenuator electrode through 250,000 ohms it shall fire within the specified time.

Note 7: The insertion loss shall be measured by a transmission method in which the tube is placed between a match generator and a matched detector.

Note 8: The low-level attenuation shall be measured by a transmission method using a matched oscillator and a matched load. The tube shall be caused to resonate at the specified frequencies. The specified attenuation shall not include insertion loss.

Note 9: For the test the tube shall be operated at a minimum of 85°C ambient temperature. The tube shall have been maintained at a minimum of 85°C for the minimum period of one hour preceding this test.

Note 10: The tube shall cover a minimum tuning range of from less than 9000 Mc to more than 9600 Mc. The tuning screw shall be cycled from stop to stop before the electrical tests are performed

Note 11: The attenuator extinction voltage shall be determined by reducing the magnitude of Ek from that required to maintain Ik=0.75 ma to that at which the attenuation, as measured under the conditions of Note 7, is less than 0.1 db.

Note 12: The leakage power shall be measured after a shelf life of 7 days. The tube shall be tuned to resonate at 9375 ±1%.

(over)

Note 13: The tube shall be tuned to resonance at 0°C ambient temperature. The ambient temperature shall be gradually raised to ±100°C and the resonant frequency of the tube shall not change by more than the specified amount with no adjustment of the tuning mechanism.

Note 14: The tube shall be tuned to resonance at the signal frequency. The loss of signal in the tube 4 u sec after the pulse shall not be more than 3 db in excess of the loss 100 u sec follow the pulse.

Note 15: With the tube clamped between chokes, an air pressure of 45 psi shall be applied to both sides for 30 minutes. Reduce the pressure to atmospheric and repeat the cycle 5 times. The tube shall meet all the tests subsequent to this operation.

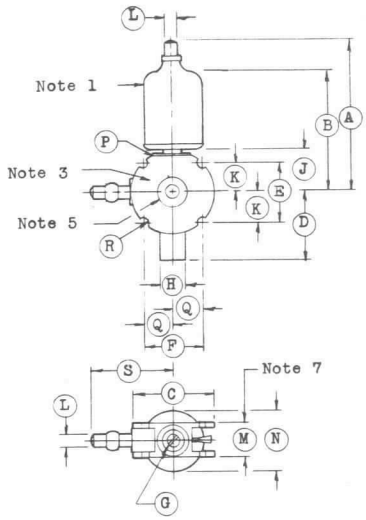
Note 16: Test all tubes only once by exposing to temperature changes fron room temperature to -55° C +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -55°C to +100°C. Tubes shall subsequently be capable of passing all other electrical tests.

Note 17: A minimum of 5% of a production run of tubes, or one tube, whichever is the greater number, shall be life tested at room temperature. The life test shall be conducted with the tubes subjected simultaneously to a high level rf pulse and to an attenuator current pulse.

The attenuator current shall be provided by an attenuator circuit which shall be such as to produce a current pulse having the following characteristics when the output of the circuit is applied to a load consisting of a 0.5 megohm non-inductive resistor: tr=1 u sec min, 5 usec Max; tp=500 u sec; prr=1000 pulses/sec; Du=50±5%. Throughout the life test, the attenuator circuit output pulse amplitude shall be maintained at the voltage required to produce a peak attenuator current of 0.75 ma or at 450 volts, whichever voltage is smaller in magnitude. No dc voltage is to be applied to the tube at any time after the initial characteristics have been determined and before the completion of the life test.

Note 18: A minimum of 5% of a production run of tubes, or one tube, whichever is the greater number, shall be life tested in a minimum ambient temperature of 85°C. The conditions of the test, other than ambient temperature, shall be as specified in Note 16. All measurements of characteristics of the tubes shall be made while the tube temperature is a minimum of 85°C.

Note 19: Attenuator voltage negative with respect to body.



Ref.	Dimension
A*	3 1/4 Max.
B**	2 7/8 Max.
C*	1.760 Max. Dia.
D*	1 27/64 Max.
E**	1.280 ±.005
F**	1.220 ±.005
G	3/64 ±1/64 Slot
H*	0.530 ±.003
J*	15/16 Min.
K	0.640 ±.003
L*	0.250 ±.005
M	0.612 ±.003
N*	1 3/16 Max.
P	9/16 Flat
Q	0.610 ±.003
R	0.090 ±.004 Rad.
	4 Slots
S*	1 11/16 Max.

Notes:-

1. Reservoir shall be glass or approved equivalent.
2. Maximum projection of reservoir lies within a cylinder of 1 1/4 dia. with axis co-linear with tube axis.
3. Body face to be silver plated 15 MSI.
4. Solder fillets permissible on peripheral surface near seal-off tip and electrode terminal. Slots must be free of solder.
5. No part of iris assembly shall extend beyond the body surface.
6. Exhaust tubulation not to extend beyond periphery.
7. Applies for area between periphery of this section of tube and concentric circle of 1/4 max.

Bomac	GAS SWITCHING	X
	BL29	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings:

	Min.	Max.
Transmitter po	1	100 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 12)

Test Conditions: See Attached drawing of Test Circuit "K"

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=2 min; Note 2	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9325 Mc.	σ:---	1.9
		F= 9375 Mc.	σ:---	1.4
		F= 9425 Mc. Note 3	σ:---	1.9
4.18.4.2	Insertion Loss:	F= 9325 Mc.	Li:---	1.3db
		F= 9375 Mc.	Li:---	1.0db
		F= 9425 Mc.	Li:---	1.3db
		Ii=0 μAdc; Note 4		
4.18.5.1	*Ignitor Interaction:	Ii=100 μAdc	ΔLi:---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5 Meg.	t:---	5.0 sec
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc	Eid:200	375Vdc
4.18.13.1	**Loaded Q:	F= 9375Mc; Note 5	QL:---	30
------	*Isolation:	F= 9325Mc.	To be specified	
		F= 9375Mc.	12	---db
		F= 9425Mc.; Note 6	To be specified	
4.18.11	Flat Leakage Power:	F= 9375Mc.; po=40±10%kw; tpl=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc; Note 7	pf:---	80mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.25erg
4.18.28	Arc Loss:	F= 9375Mc; po=1.0kw min; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Note 8	---	0.8db
4.18.15.1	*Recovery Time:	F= 9375Mc.; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Note 9	t:---	6μs
4.18.19	**High Level VSWR:	F= 9375Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 10	σ:To be specified	
4.18.17.1	Temperature Cycle:	------	---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles:50	---
4.11	Life Test:	F= 9375±5%Mc.; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8 Meg. Group D; Note 11	t:500	---hrs

Ref.	Test	Conditions	Min.	Max.
4.11.4	Life Test End Point:	Recovery Time;	t:---	10μs
		Flat Leakage Power;	pf:---	100mw
		Spike Leakage Energy;	Ws:---	0.3erg
		Insertion Loss, F= 9375Mc	Li:---	1.2db

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: During this test the ignitor electrode shall not short to the tube body. Subsequent to this test the tube shall pass all electrical and mechanical requirements of this specification.

Note 3: See Test Circuit "K".
A low level signal in arm A; a low level load, σ=1.05max on arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 4: See Test Circuit "K".
A low level load, σ=1.05max., on arms M and L. A low level signal fed into arm A is detected at Arm R.

Note 5: See Test Circuit "K".
A low level signal in arm A; a low level load, σ=1.05max., on arms M and L; a low level load, σ=1.05max., or a matched detector at arm R.

Note 6: Arm M should be the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 7: See Test Circuit "K".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.05max., on arm L; Leakage Power detected at R.

Note 8: See Test Circuit "K".
Transmitter po in arm M is detected at arm A. A low level load, σ=1.05max., on arms R and L. An appropriate section of waveguide is substituted for the duplexer in order to determine the Arc Loss of the tube.

Note 9: See Test Circuit "K".
Transmitter po in arm M; a low level load, σ=1.05max., on arm L; a simulated echo followed by a high level load, σ=1.07max., on arm A; detector on arm R.

Note 10: See Test Circuit "K".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.05max., on arms R and L. Then the V.S.W.R. looking into arm M shall be within the limit specified.

Note 11: See Test Circuit "K".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A.

Note 12: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

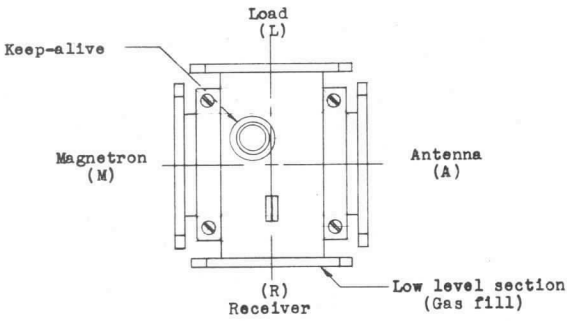
$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

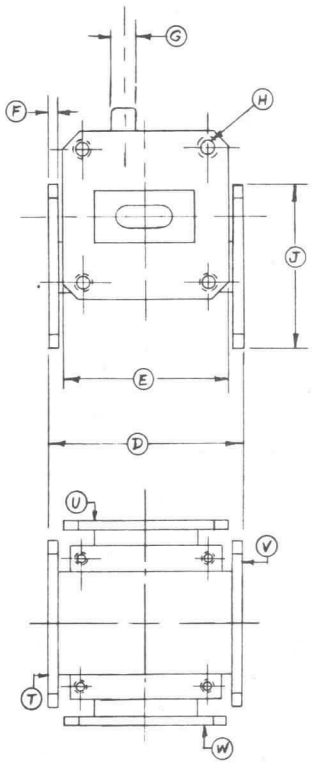
Where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

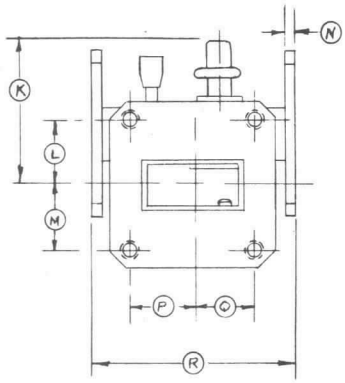
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)

Test Circuit "K"







NOTE 1

#8-32 TAP 4 HOLES IN FLANGES U, V, & W #18 (.1695) DRILL 4 HOLES IN FLANGE T

REFERENCE	DIMENSIONS
D	1.920 ±.010
E *	1.625 ± .015
F *	.093 ± .010
G **	.250 DIA.
H	SEE NOTE 1
J *	1.625 ± .015
K	1 1/2 MAX.
L *	.640 ± .002
M *	.640 ± .002
N *	.093 ± .010
P *	.610 ± .002
Q *	.610 ± .002
R	1.960 ± .010
T	MAGNETRON
U	RECEIVER
V	ANTENNA
W	LOAD

Bomac	GAS SWITCHING	X
	BL47	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	2.8	10,000 w
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current	150 uAdc	(Note 14)

Test Conditions: See attached drawing of Test Circuit "K"

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=2 min; Note 2	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9325 Mc. / F= 9375 Mc. / F= 9425 Mc; Note 3	o:--- / o:--- / o:---	1.9 / 1.4 / 1.9
4.18.4.2	Insertion Loss:	F= 9325 Mc. / F= 9375 Mc. / F= 9425 Mc; I1=0 μAdc; Note 4	Li:--- / Li:--- / Li:---	1.3 db / 1.0 db / 1.3 db
4.18.5.1	*Ignitor Interaction:	I1=100 μAdc	ΔLi:---	0.2 db
4.18.1	Ignitor Ignition Time	Ebb=-700 Vdc; Ri=5.5 Meg.	t:---	5.0 sec
4.18.2	Ignitor Voltage Drop:	I1=100 μAdc	Ei d:200	450Vdc
4.18.13.1	**Loaded Q:	F= 9375Mc; Note 5	QL:---	30
-----	*Isolation:	F= 9325Mc. / F= 9375Mc. / F= 9425Mc.; Note 6	To be specified / 12 / To be specified	---db
4.18.9	*Peak Leakage Power:	F= 9310Mc.; po=2.8w; tp = 1.0±0.1μs; prr=1000; Ii=100μAdc; Note 7	Po/Du:---	130 mw
4.18.28	Arc Loss:	F= 9310Mc; po=2.8w; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Note 8	---	0.6db
4.18.15.1	*Recovery Time:	F= 9310Mc.; po=2.8w; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Note 9	t:---	20μs
4.18.19	**High Level VSWR:	F= 9310Mc; po=2.8w; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Note 10	σ : To be specified	
-----	Minimum Firing Power:	F= 9310Mc; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Notes 7, 11	po:---	2.8w
-----	Tube Firing:	F= 9310Mc; po=2.8w; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; Notes 7, 12	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles:50	---
4.11	Life Test:	F= 9310±5%Mc.; po=10kw min; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.5 Meg. Group D; Note 13	t:500	---hrs
4.11.4	Life Test End Point:	To be specified	To be specified	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: During this test the ignitor electrode shall not short to the tube body. Subsequent to this test the tube shall pass all electrical and mechanical requirements of this specification.

Note 3: See Test Circuit
A low level signal in arm A; a low level load, σ=1.05max., on arms M, R and L. Then the V. S. W. R. looking into arm A shall be within the limits specified.

Note 4: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal fed into arm A is detected at Arm R.

Note 5: See Test Circuit
A low level signal in arm A; a low level load, σ=1.05max., on arms M and L; a low level load, σ=1.05max., or a matched detector at arm R.

Note 6: Arm M should be the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 7: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.05max., on arm L; a suitable power measuring device at R.

Note 8: See Test Circuit
Transmitter po in arm M is detected at arm A. A low level load, σ=1.05max., on arms R and L. An appropriate section of waveguide is substituted for the duplexer in order to determine the Arc Loss of the tube.

Note 9: See Test Circuit
Transmitter po in arm M; a low level load, σ=1.05max., on arm L; a simulated echo followed by a high level load, σ=1.07max., on arm A; detector on arm R.

Note 10: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.05max., on arms R and L. Then the V. S. W. R. looking into arm M shall be within the limit specified.

Note 11: The line power at which the tube fires shall be within the limit specified.

Note 12: The tube must fire with each transmitted pulse.

Note 13: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A.

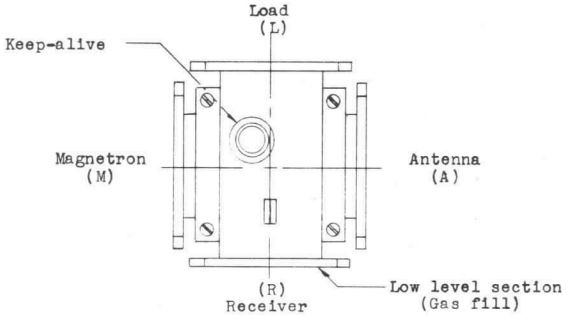
(over)

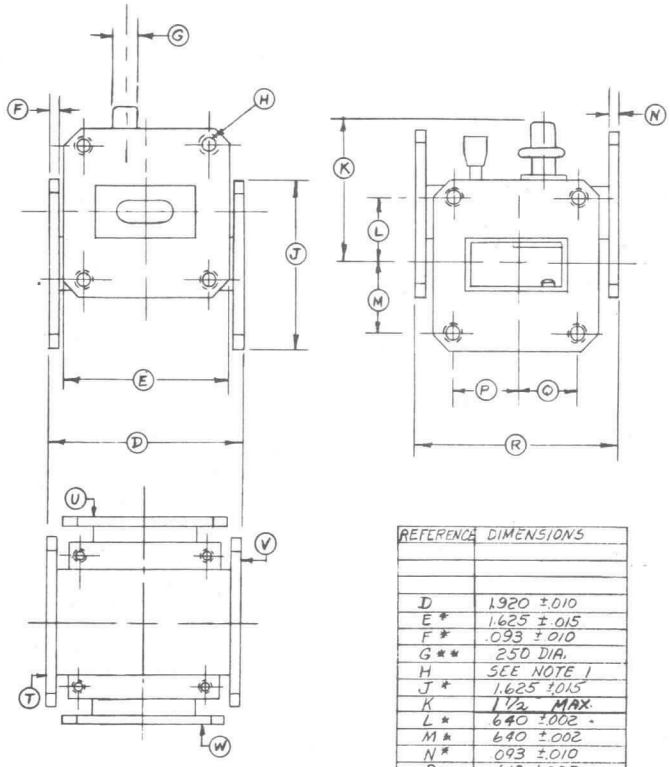
Note 14: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.





NOTE 1
#8-32 TAP 4 HOLES IN FLANGES U, V, & W #18 (.1695) DRILL 4 HOLES IN FLANGE T

REFERENCE	DIMENSIONS
D	1.920 ±.010
E *	1.625 ±.015
F *	.093 ±.010
G **	.250 DIA.
H	SEE NOTE 1
J *	1.625 ±.015
K	1 1/2 MAX.
L *	.640 ±.002
M *	.640 ±.002
N *	.093 ±.010
P *	.610 ±.002
Q *	.610 ±.002
R	1.960 ±.010
T	MAGNETRON
U	RECEIVER
V	ANTENNA
W	LOAD

Bomac	GAS SWITCHING	X
	BL69	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

Application: To be used with RG-51/U waveguide

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5	250 kw

Test Conditions: Note 2; See Test Circuit "H"

Pack in sealed water-vapor-proof transparent bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size E	---	---
4.9.6	*Glass Strain:	------	---	---
-----	**Vibration:	F= 50±2cps; Total Excursion =0.08±0.005in; t=2 min; Note 3	---	---
4.18.17.3	Temperature Cycle:	-----	Cycles: 1	---
4.18.17.3	Temperature Cycle Life:	Group D; Note 4	Cycles: 50	---
4.18.13.2	**Loaded Q:	F_o= 8800±0.1%Mc.	QL: ---	8.0
4.18.25	Tuning Susceptance:	F_o=8800±0.1%Mc.	B/Yo: ---	±0.06
4.18.26	*Equivalent Conductance:	F_o= 8800±0.1%Mc.	G/Yo: ---	0.1
4.18.19	**High-Level V.S.W.R.:	F= 8800±1%Mc; po=20±10%kw; tp=1.0±0.1µs; prr=1000; σ<1.03	σ: ---	1.10
4.18.27	*Firing Time:	F= 8800±1%Mc; po=4.0kw min; tp=0.5±0.05µs; prr=1000	t: ---	10sec.
4.18.28	Arc Loss:	See Firing Time	---	0.8db
-----	*Recovery Time:	F= 8800±1%Mc; po=50±10%kw; tp=1.0±0.1µs; prr=1000; Note 5	t: ---	8.0µs
4.11	Life Test:	F= 8800±5%Mc; po=200kw min.; tp=1.0±0.1µs; prr=1000; Group D; Note 4	t: 500	---hrs
4.11.4	Life Test End Point:	Tuning Susceptance;	B/Yo: ---	±0.08
		Equivalent Conductance;	G/Yo: ---	0.1
		Arc Loss;	---	1.0db
		Recovery Time	t: ---	15µs

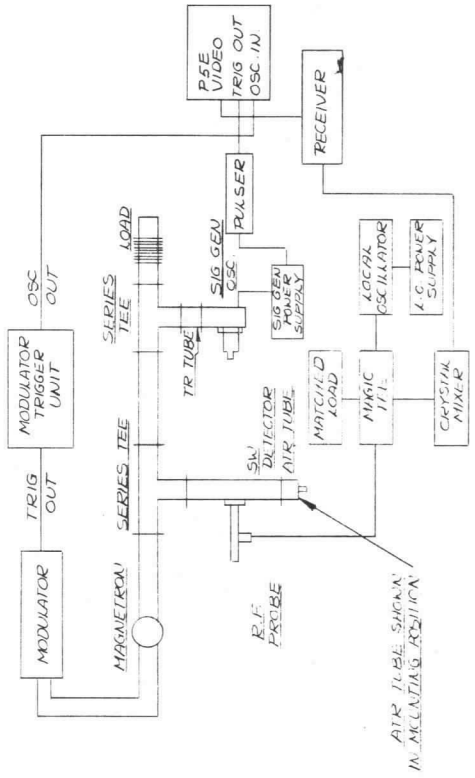
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated 9-30-54. A suitable gasket shall be clamped between the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.

Note 4: A temperature cycle life test or an RF life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

Note 5: See Test Circuit
Delay the low level signal the specified time after the magnetron pulse and note the position of its V.S.W. minimum. With the tube completely recovered the position of V.S.W. minimum shall not shift more than 0.05λg away from the magnetron.



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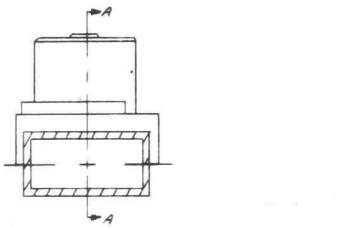
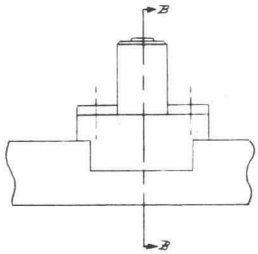
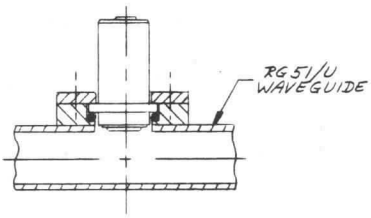
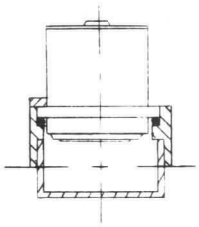


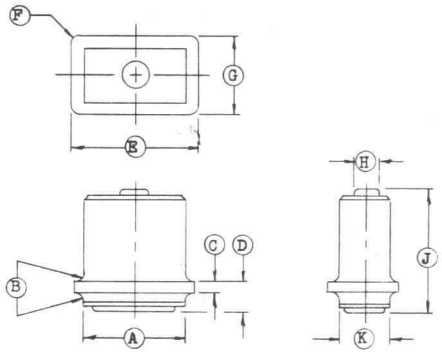




SECTION A-A OF SEAT
SHOWING TUBE IN POSITION



SECTION B-B OF SEAT
SHOWING TUBE IN POSITION



Ref.	Dimension
A	1.000
B**	0.030 Rad. Max.
C*	0.0965+.003-.002
D	0.279±.003
E	1.200±.003
F**	0.070-0.080 Rad.
G	0.700±.003
H**	0.250 Dia. Max.
J*	1.250 Max.
K	0.500

Outline used for following tubes:-

6369	BL- 68	BL- 77
6393	BL- 69	6890/BL-650
6396	BL- 70	
	BL- 76	

NOTES:-
1. DESIGN OF HOLDER OPTIONAL
2. TUBE HELD FIRMLY IN PLACE BY SCREW CLAMP
3. BOTTOM OF TUBE IS TO BE APPROX. FLUSH (±.004) WITH INSIDE SURFACE OF WAVEGUIDE

Bomac	GAS SWITCHING	X
	BL70	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

Application: To be used with RG-51/U waveguide

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5	250 kw

Test Conditions: Note 2;

Pack in sealed water-vapor-proof transparent bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size E	---	---
4.9.6	*Glass Strain:	------	---	---
-----	**Vibration:	F= 50±2cps; Total Excursion =0.08±0.005in; t=2 min; Note 3	---	---
4.18.17.3	Temperature Cycle:	------- Cycles : 1		---
4.18.17.3	Temperature Cycle Life:	Group D; Cycles : 50 Note 4		---
4.18.13.2	**Loaded Q:	F_o= 9375±0.1%Mc. QL: ---		8.0
4.18.25	Tuning Susceptance:	F_o= 9375±0.1%Mc. B/Yo : ---		±0.06
4.18.26	*Equivalent Conductance:	E_o= 9375±0.1%Mc. G/Yo : ---		0.1
4.18.19	**High-Level V.S.W.R.:	F= 9375±1%Mc; po=20±10%kw; tp=1.0±0.1μs; prr=1000; σ < 1.03	σ: ---	1.10
4.18.27	*Firing Time:	F= 9375±1%Mc; po=4.0kw min; tp=0.5±0.05μs; prr=1000	t: ---	10sec.
4.18.28	Arc Loss:	See Firing Time	---	0.8db
-----	*Recovery Time:	F= 9375±1%Mc; po=50±10%kw; tp=1.0±0.1μs; prr=1000; Note 5	t: ---	8.0μs
4.11	Life Test:	F= 9375±5%Mc; po=200kw min.; tp=1.0±0.1μs; prr=1000; Group D; Note 4	t: 500	---hrs
4.11.4	Life Test End Point:	Tuning Susceptance; B/Yo : ---		±0.08
		Equivalent Conductance; G/Yo : ---		0.1
		Arc Loss; ---		1.0db
		Recovery Time t : ---		15μs

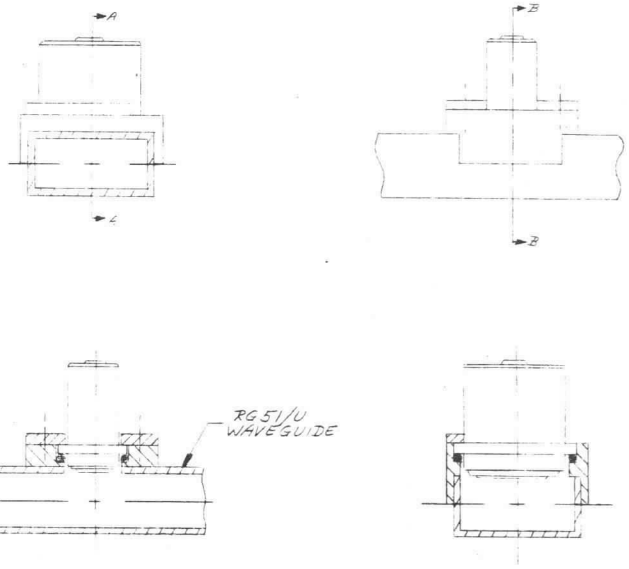
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated 9-30-54. A suitable gasket shall be clamped between the tube and the tube seat. One gasket will be supplied with each tube.

Note 3: Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.

Note 4: A temperature cycle life test or an RF life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

Note 5: See Test Circuit
Delay the low level signal the specified time after the magnetron pulse and note the position of its V.S.W. minimum. With the tube completely recovered the position of V.S.W. minimum shall not shift more than 0.05λg away from the magnetron.

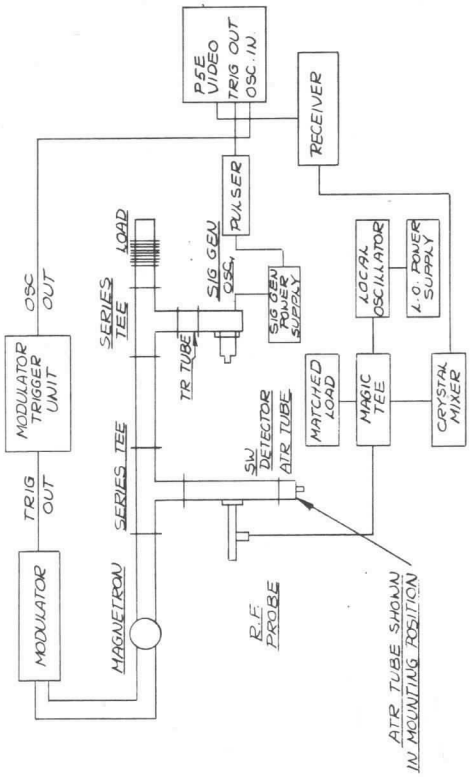


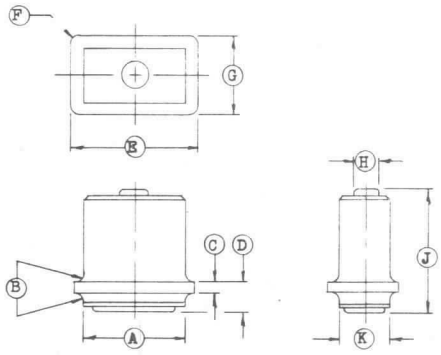
SECTION A-A OF SEAT SHOWING TUBE IN POSITION

SECTION B-B OF SEAT SHOWING TUBE IN POSITION

NOTES:-
1. DESIGN OF HOLDER OPTIONAL
2. TUBE HELD FIRMLY IN PLACE BY SCREW CLAMP
3. BOTTOM OF TUBE IS TO BE APPROX. FLUSH (±.004) WITH INSIDE SURFACE OF WAVEGUIDE

(over)





Ref.	Dimension
A	1.000
B**	0.030 Rad. Max.
C*	0.0965+.003-.002
D	0.279±.003
E	1.200±.003
F**	0.070-0.080 Rad.
G	0.700±.003
H**	0.250 Dia. Max.
J*	1.250 Max.
K	0.500

Outline used for following tubes:-

6369	BL- 68	BL- 77
6393	BL- 69	6890/BL-650
6396	BL- 70	
	BL- 76	

Bomac	GAS SWITCHING	X
	BL75	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 28, 1955

Application: To be used with RG-52/U waveguide

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5	250 kw

Test Conditions: Note 2; See Test Circuit "H"

Pack in sealed water-proof transparent bag or approved equivalent. If opaque bag is used, the Tube Type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size E		---	---
------	**Vibration:	F=50±2cps; Total Excursion =0.08±0.005in; t=2min; Note 3			
4.9.8	**Salt Spray Corrosion:	Omit		---	---
4.9.6	*Glass Strain:	--------		---	---
4.18.13.2	**Loaded Q:	F= 9150±0.1%Mc	QL :	---	6.5
4.18.25	Tuning Susceptance:	F= 9150±0.1%Mc	B/Yα	---	±0.06
4.18.26	*Equivalent Conductance:	F= 9150±0.1%Mc	G/Yα	---	0.1
4.18.27	†Firing Time:	F= 9150±1%Mc; po=4kw; tp=0.5±0.05μs; prr=1000	t :	---	10sec.
4.18.28	Arc Loss:	See Firing Time		---	.8db
------	*Recovery Time:	F= 9150±1%Mc; po=50±10%kw; tp=1.0±0.1μs; prr=1000; Note 4	t :	---	8.0μs
4.18.19	**High Level V.S.W.R.:	F= 9150±1%Mc; po=50±10%kw; tp=1.0±0.1μs; prr=1000; $\sigma < 1.03$	σ :	---	1.10
4.18.17.1	Temperature Cycle:	Note 5		---	---
4.18.17.3	Temperature Cycle Life Test:	Group B; Note 6	Cycles :	50	---
4.11	Life Test	F= 9150±5%Mc; po=200kw(min.); tp=1.0±0.1μs; prr=1000; Group C; Note 6	t :	500	---hrs
4.11.4	Life Test End Point:	Arc Loss;		---	1.0db
		Equivalent Conductance;	G/Yo :	---	0.1
		Tuning Susceptance;	B/Yo :	---	±0.08
		Recovery Time	t :	---	15μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

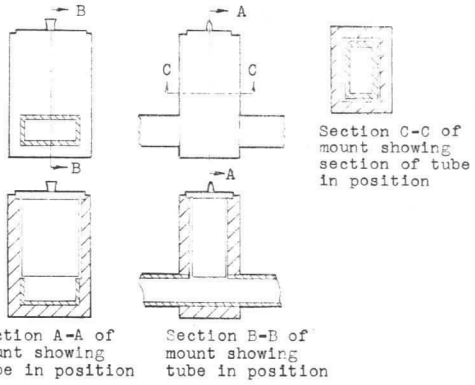
Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated 11-2-54, using a gasket per drawing 191 JAN. Two gaskest will be supplied with each tube.

Note 3: Vibrate in the plane normal to the tuning diaphram. The tube must satisfy all requirements of this specification subsequent to the vibration test.

Note 4: See Test Circuit
Note position of V.S.W. minimum when tube is in unfired condition. Delay the low level signal the specified time after the magnetron pulse and again note the position of its V.S.W. minimum. The shift in the position of minimum toward the magnetron shall not exceed $0.05\lambda g$.

Note 5: At the conclusion of this test, the tube shall pass the Firing Time test specified in Ref. 4.18.27

Note 6: A temperature cycle life test or an RF life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.



Section C-C of mount showing section of tube in position

Section A-A of mount showing tube in position

Section B-B of mount showing tube in position

Notes pertinent to tube mount.
1. Design of holder optional.
2. Tube held firmly in position by means of spring or screw clamps.
3. Bottom of tube is to be approx. flush (±.004 inches) with inside surface of wave guide.
4. .030 to .040 inch spacing all around tube.
5. Dotted lines apply to **group "B" only.**
6. Wave guide size for mount is RG51/U or RG52/U. When RG52/U is employed, pressurization is recommended to prevent pulse power breakdown at 250 kw.

This Tube Mount used for following tubes:-

Group "A"			Group "B"	
1B35A	BL- 45	BL- 73	1B37A	5883
6162	BL- 49	BL- 74	BL-610	6034
ATR-388	BL- 72	BL- 75	BL-609	
ATR-321	6033	5864		

(over)

**Note 1:- The tubulation shall fall within a circle 3/8 dia. max. located from centerlines of the flange.

**Note 2:- Silver plate 100 MSI min. or equivalent finish.

Note 3:- As an alternate, a rounded seal-off cap may be used.

Note 4:- Flat end plate optional.

*Note 5:- Centerlines of window shall coincide with corresponding centerlines of box within .015 measured in plane of window.

Note 6:- Slotted flange on group "A" only. Slot dimensions apply only on contact face of flange.

Note 7:- Dimension "K" to be measured a nominal 1/8" from ref. plane "A".

Note 8:- Dimension "L" to be measured a nominal 1/8" from window plane.

Note 9:- Ref. plane "A" to be normal to ref. plane "B".

Note 10:- Dimpled window optional.

*Note 11:- 2 gaskets per drawing 191-JAN supplied unmounted.

Note 12:- The assembly of the tube shall be rectangularly symmetrical about the centerline.

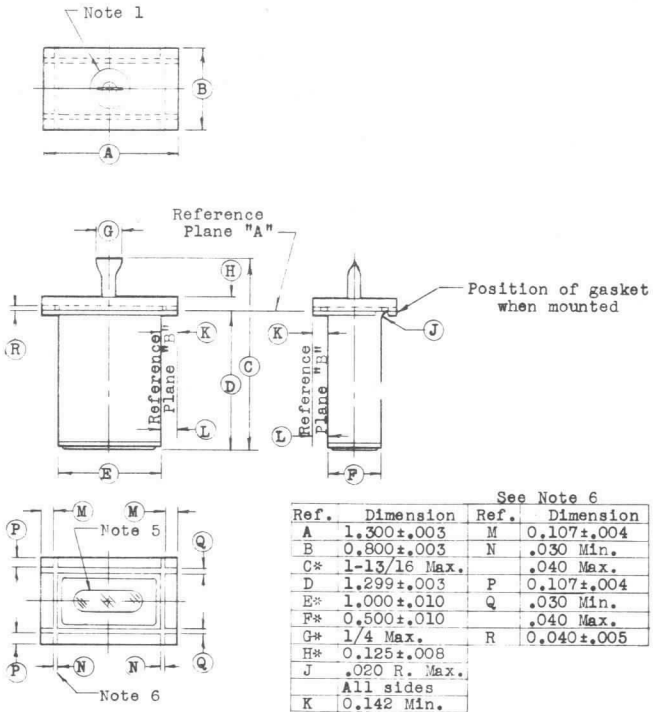
Note 13:- Dimension "D" shall be measured from reference plane "A" to 4 points located on bisecting axes of the window and midway between the edge of the window and tube sides.

Note 14:- Applies to 6033 and 6034 only. Bottom face of end plate shall be flat within .003 for its entire length.

This Outline used for following tubes:-

Group "A"		
1B35A	BL- 45	BL- 74
6033	BL- 49	BL- 75
6162	BL- 72	BL-609
ATR-388	BL- 73	5883

Group "B"	
1B37A	
6034	
BL-610	

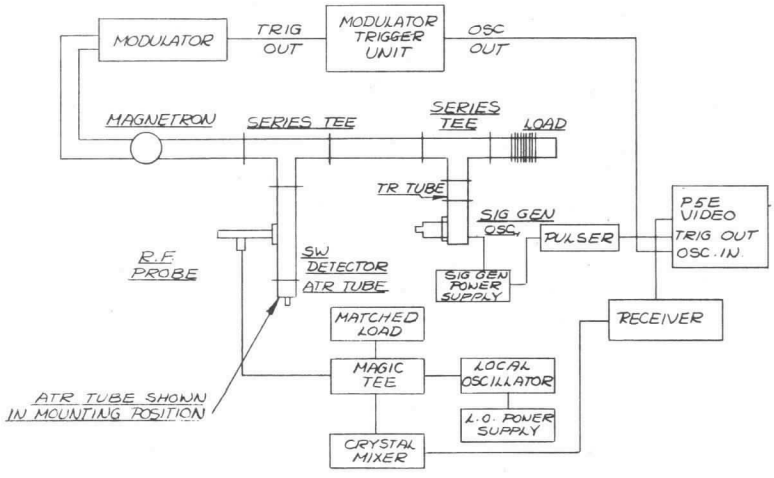


See Note 6

Ref.	Dimension	Ref.	Dimension
A	1.300±.003	M	0.107±.004
B	0.800±.003	N	.030 Min.
C*	1-13/16 Max.		.040 Max.
D	1.299±.003	P	0.107±.004
E*	1.000±.010	Q	.030 Min.
F*	0.500±.010		.040 Max.
G*	1/4 Max.	R	0.040±.005
H*	0.125±.008		
J	.020 R. Max.		
	All sides		
K	0.142 Min.		
L	0.138 Min.		

This Outline used for following tubes:-

1B35A	BL- 45	BL- 73	1B37A	6033
6162	BL- 49	BL- 74	BL-610	6034
ATR-388	BL- 72	BL- 75	BL-609	5883



Bomac	GAS SWITCHING	X
	BL76	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

Application: To be used with RG-52/U waveguide

Dimensions: Per Outline

Mounting: Note 2

Ratings:

	Min.	Max.
Transmitter po	5	250 kw

Test Conditions: Note 2; See Test Circuit

Pack in sealed water-vapor-proof transparent bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size E		---	---
4.9.6	*Glass Strain:	--------		---	---
--------	**Vibration:	F=50±2cps Total Excursion =0.08±0.005in; t=2 min; Note 3		---	---
4.18.17.3	Temperature Cycle:	--------	Cycles:1		---
4.18.17.3	Temperature Cycle Life:	Group D; Note 4	Cycles:50		---
4.18.13.2	**Loaded Q:	Fo= 8900±0.1%Mc.	QL:---		6.5
4.18.25	Tuning Susceptance:	Fo= 8900±0.1%Mc.	B/Yo:---		±0.06
4.18.26	*Equivalent Conductance:	Fo= 8900±0.1%Mc	G/Yo:---		0.1
4.18.19	**High-Level V.S.W.R.:	F= 8900±1%Mc; po=20±10%kw; tp=1.0±0.1µs; prr=1000; σ≤1.03	σ:---		1.10
4.18.27	*Firing Time:	F= 8900±1%Mc; po=4.0kw min; tp=0.5±0.05µs; prr=1000	t:---		10sec.
4.18.28	Arc Loss:	See Firing Time		---	0.8db
------	*Recovery Time:	F= 8900±1%Mc; po=50±10%kw; tp=1.0±0.1µs; prr=1000; Note 5	t:---		8.0µs
4.11	Life Test:	F= 8900±5%Mc; po=200kw min.; tp=1.0±0.1µs; prr=1000; Group D; Note 4	t:500		---hrs
4.11.4	Life Test End Point:	Tuning Susceptance;	B/Yo:---		±0.08
		Equivalent Conductance;	G/Yo:---		0.1
		Arc Loss;	---		1.0db
		Recovery Time	t:---		15µs

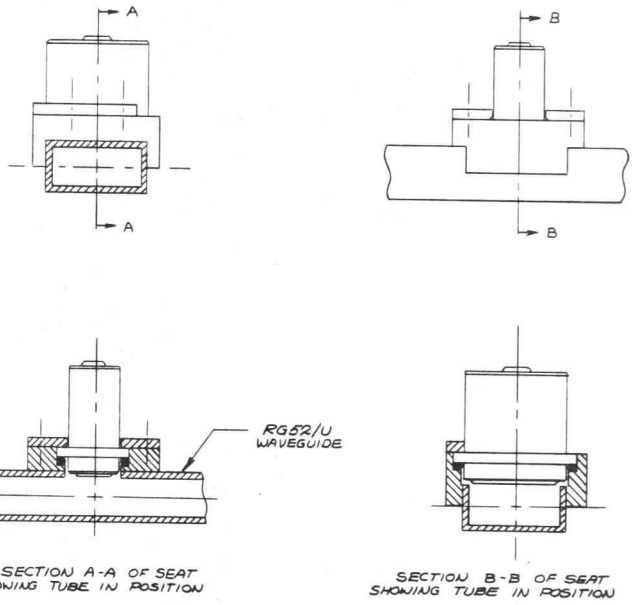
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated 7-2-54. A suitable gasket shall be clamped between the tube and the tube seat. One gasket will be supplied with each tube.

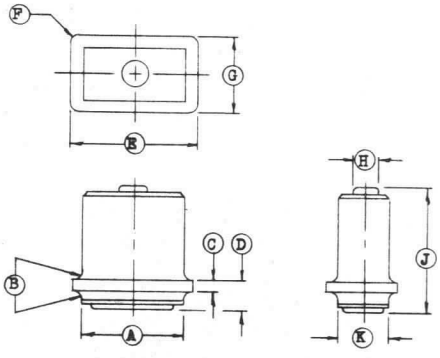
Note 3: Vibrate in a plane normal to the tuning diaphragm. Tubes shall satisfy all applicable requirements of this specification after vibration.

Note 4: A temperature cycle life test or an RF life test made, during the same four weeks period, on any of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

Note 5: See Test Circuit
Delay the low level signal the specified time after the magnetron pulse and note the position of its V.S.W. minimum. With the tube completely recovered the position of V.S.W. minimum shall not shift more than 0.05λg away from the magnetron.



NOTES:-
1. DESIGN OF HOLDER OPTIONAL
2. TUBE HELD FIRMLY IN PLACE BY SCREW CLAMP
3. BOTTOM OF TUBE IS TO BE APPROX. FLUSH (±.004) WITH INSIDE SURFACE OF WAVEGUIDE

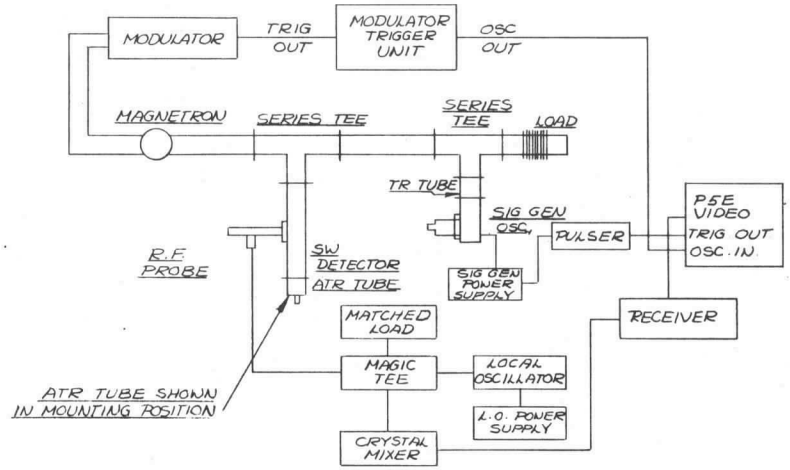


Ref.	Dimension
A	1.000
B**	0.030 Rad. Max.
C*	0.0965+.003-.002
D	0.279±.003
E	1.200±.003
F**	0.070-0.080 Rad.
G	0.700±.003
H**	0.250 Dia. Max.
J*	1.250 Max.
K	0.500

Outline used for following tubes:-

6369	BL- 68	BL- 77
6393	BL- 69	6890/BL-650
6396	BL- 70	
	BL- 76	

(over)


MODULATOR
TRIG OUT
MODULATOR TRIGGER UNIT
OSC OUT
MAGNETRON
SERIES TEE
SERIES TEE
LOAD
TR TUBE
SIG GEN OSC.
PULSER
P.S.E. VIDEO
TRIG OUT
OSC. IN
R.F. PROBE
SW DETECTOR ATR TUBE
SIG GEN POWER SUPPLY
MATCHED LOAD
RECEIVER
MAGIC TEE
LOCAL OSCILLATOR
L.O. POWER SUPPLY
CRYSTAL MIXER
ATR TUBE SHOWN IN MOUNTING POSITION

Bomac	GAS SWITCHING	X
	BL77	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

Application: To be used with 1/2 height RG-52/U waveguide, I.D. = 0.200 x 0.900 in.

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5	250 kw

Test Conditions: Notes 2, 3;

Pack in sealed water-vapor-proof transparent bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size E	---	---
4.9.6	*Glass Strain:	-------	---	---
------	**Vibration:	F=50±2cps; Total Excursion = 0.08±0.005in; t=2min; Note 4		
4.18.17.3	Temperature Cycle:	-------- Cycles:1		---
4.18.17.3	Temperature Cycle Life Test:	Group D; Note 5 Cycles:50		---
4.18.13.2	**Loaded Q:	Fo=8900±0.1%Mc. QL:---		6.5
4.18.25	Tuning Susceptance:	Fo=8900±0.1%Mc. B/Yo:---		±0.06
4.18.26	*Equivalent Conductance:	Fo=8900±0.1%Mc. G/Yo:---		0.1
4.18.19	**High-Level V.S.W.R.:	F= 8900±1%Mc. po=20±10%kw; tp=1.0±0.1μs; prr=1000; σ<1.03 σ:---		1.10
4.18.27	*Firing Time:	F= 8900±1%Mc; po=4.0kw min; tp=0.5±0.05μs; prr=1000 t:---		10sec.
4.18.28	Arc Loss:	See Firing Time; Note 6 ---		1.6db
------	*Recovery Time:	F= 8900±1%Mc. po=50±10%kw; tp=1.0±0.1μs; prr=1000; Note 7 t:---		8.0μs
4.11	Life Test:	F= 8900±5%Mc; po=200kw (min.); tp=1.0±0.1μs; prr=1000; Group D; Note 5 t:500		---hrs.
4.11.4	Life Test End Point:	Tuning Susceptance; B/Yo:--- Equivalent Conductance; G/Yo:--- Arc Loss; --- Recovery Time t:---		±0.08 0.1 2.0db 15μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The tube is to be mounted per attached drawing of Tube Seat Mounting, dated 7-13-54. A suitable gasket is to be clamped between the tube and the tube seat. One gasket will be supplied with each tube.

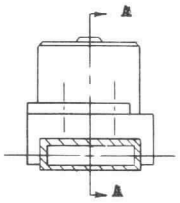
Note 3: With the exception of Recovery Time, all electrical tests including Life Test are to be made with the tube mounted in 1/2 height RG-52/U waveguide, I.D. = 0.200 x 0.900 in.

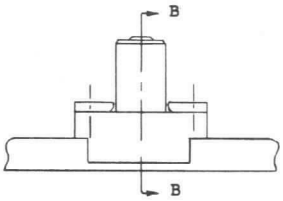
Note 4: Vibrate in a plane normal to the tuning diaphragm. The tube shall satisfy all applicable requirements of this specification after vibration.

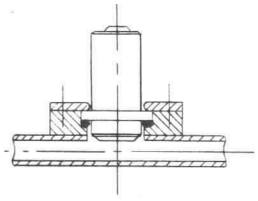
Note 5: A temperature cycle life test or an RF life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

Note 6: The Arc Loss of one tube in 1/2 height waveguide is approximately equal to the Arc Loss of 2 tubes mounted directly opposite each other in full size waveguide.

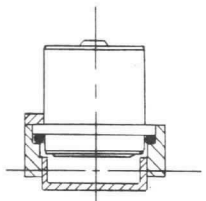
Note 7: See Test Circuit "H".
Delay the low level signal the specified time after the magnetron pulse and then note the position of its V.S.W. minimum. With the tube completely recovered the position of V.S.W. minimum shall not shift more than 0.05λg away from the magnetron.







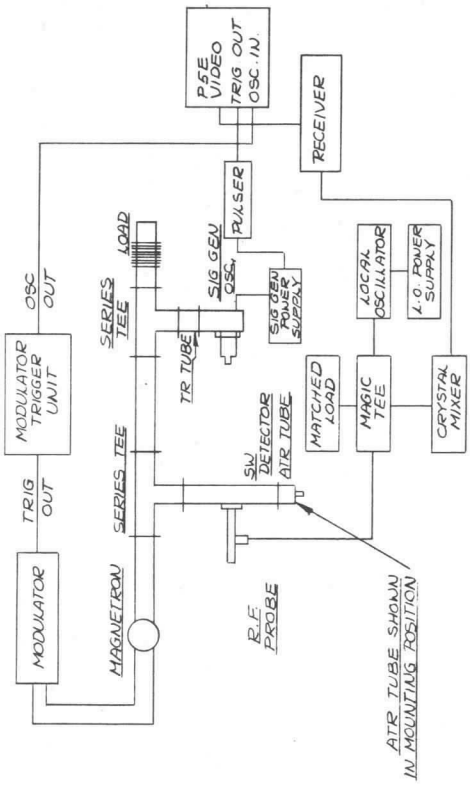
Section A-A of mount showing tube in position

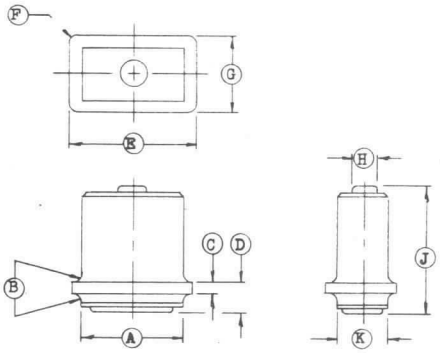


Section B-B of mount showing tube in position

NOTES
1. Design of Holder optional
2. Tube held firmly in place by screw clamp
3. Bottom of tube is to be approx. flush (±.004) with inside surface of waveguide.
4. Tube used with half height guide I.D. - .200 ±.003 x .900 ±.003.

(over)





Ref.	Dimension
A	1.000
B**	0.030 Rad. Max.
C*	0.0965+.003-.002
D	0.279±.003
E	1.200±.003
F**	0.070-0.080 Rad.
G	0.700±.003
H**	0.250 Dia. Max.
J*	1.250 Max.
K	0.500

Outline used for following tubes:-

6369	BL- 68	BL- 77
6393	BL- 69	6890/BL-650
6396	BL- 70	
	BL- 76	

Bomac	GAS SWITCHING	X
	BL79	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 26, 1955

Application: Designed for use in 1/2 height RG-52/U waveguide, I.D. = 0.200 x 0.900 in.

Dimensions: Per Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-750	-1000 Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 9)

Pack in sealed water-vapor-proof bag. If opaque bag is used the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size J	----	---
4.18.14.1	Frequency Temperature Effect:	F= 8490 Mc.	ΔF/°C:0	-100kc
		F= 9050 Mc.	ΔF/°C:0	-100kc
		F= 9610 Mc; T= +25°C to T= +100°C; Note 2	ΔF/°C:0	-100kc
4.18.16	*Pressure Operation:	45 p.s.i.a	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles:50	---
4.18.32	**Frequency Vibration Effect (1):	F= 9050 Mc; Cycles=1; F=5 cps to F=18 cps; Total Excursion =0.500±0.005 in; t=2 min; Notes 2, 3	ΔF:---	±0.5Mc.
4.18.32	**Frequency Vibration Effect (2):	F= 9050Mc; Cycles =1; F=18cps to F=1000cps; G=16; t=5min; Notes 2, 3	ΔF:---	±0.5Mc.
4.18.1	Ignitor Ignition Time:	Ebb=-750Vdc; R1=5.5Meg	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	I1=100uAdc	Eid:200	400Vdc
4.18.3	*Ignitor Oscillation:	------	I1:---	60μAdc
4.18.4.1	Insertion Loss(1):	F= 9375±0.1%Mc; Note 2	Li:---	1.50db
4.18.4.1	*Insertion Loss(2):	F= 8490Mc;	---	---
		F= 9610Mc; Notes 2, 4	---	---
4.18.5.1	Ignitor Interaction:	I1=100μAdc	ΔLi:---	0.2db
4.18.6	Tuning Range:	Notes 2, 5	---	---
4.18.31.1	Loaded Q:	F= 8490Mc.	QL:---	210
		F= 9050Mc.	QL:---	210
		F= 9610Mc.; Note 2	QL:---	210
------	Minimum Firing Power:	F= 9375±1%Mc; tp=0.5±0.05μs; prr=1000; I1=100uAdc; Notes 6, 7	pi:---	100mw
4.18.9	Leakage Power:	F= 9375±1%Mc; po=10±10%kw; tp=0.5±0.05μs; prr=1000; I1=100uAdc; Note 6	Po/Du:---	30mw
4.18.15.1	**Recovery Time:	F= 9375±1%Mc; po=10±10%kw; tp=0.5±0.05μs; prr=1000; I1=100μAdc; Note 6	t:---	10μs
4.11	Life Test:	F= 9375±1.0%Mc; po=30kw(min.); tp=1.0±0.1μs; prr=1000; Group D; Note 6	t:500	---hrs
4.11.4	Life Test End Point:	Insertion Loss(1);	Li:---	2.0db
		Ignitor Interaction;	ΔLi:---	0.5db
		Minimum Firing Power, Note 8;	pi:---	100mw
		Leakage Power;	Po/Du:---	35mw
		Ignitor Voltage Drop	Eid:---	500Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: Tested in ½ height RG-52/U waveguide, I.D.=0.200 x 0.900 in.

Note 3: The resonant frequency of the tube shall not shift more than the amount specified during or after vibration. The ignitor electrode shall not short to the tube body during vibration. Tubes shall satisfy all applicable requirements of this specification after vibration.

Note 4: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder.

Note 5: The tube shall cover a minimum tuning range of from less than 8490Mc. to more than 9610Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range.

Note 6: Test in full size RG-52/U waveguide.

Note 7: The incident power necessary to fire the tube shall not be greater than the amount specified. An abrupt decrease in Leakage Power shall be evidence that the tube has fired.

Note 8: This test performed at the end of 100 hours operation only.

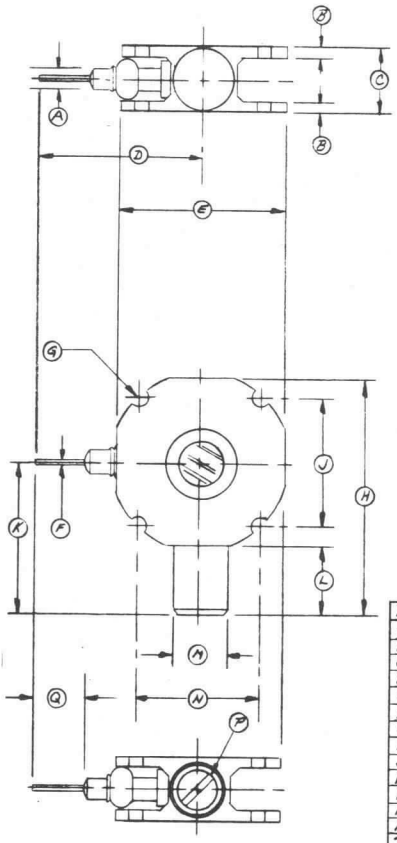
Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (R1)} = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where R1=Total series Resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)



REF	DIMENSION
A**	.250 DIA. ±.005
B**	.087 ±.015
C	.612
D*	1 ¼ MAX.
E**	1.625 ±.015
F**	.040 DIA. NOM.
G	.090 R. (4) SLOTS
H	2 3/8 MAX.
J*	1.280
K*	1 ½ MAX.
L*	1 1/16 MAX.
M*	.535 MAX.
N*	1.220
P**	3/64 ø X 1 1/16 SLOT
Q	1/4 MIN.

Bomac | **GAS SWITCHING** | **X** | **BL82** | **TR**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 31, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	4	250 kw
Open Circuit Ignitor Voltage	-650	--- Vdc
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current	150 μAdc (Note 4)	

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hrs.	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K	---	---
----	**Vibration:	F=50±2cps; Total Excursion = 0.08±0.005 in; t=2 min; Note 2	---	---
4.18.18	Voltage Standing Wave Ratio:	σ'= 1.05 max;		
		F = 8490 Mc.	σ:--	1.9
		F = 8565	σ:--	1.6
		*F = 8650	σ:--	1.6
		*F = 8740	σ:--	1.6
		*F = 8830	σ:--	1.6
		*F = 8920	σ:--	1.6
		F = 9000	σ:--	1.6
		*F = 9090	σ:--	1.6
		*F = 9180	σ:--	1.6
		*F = 9280	σ:--	1.6
		*F = 9380	σ:--	1.6
		F = 9487	σ:--	1.6
		F = 9578 Mc; Ii= 100 μAdc	σ:--	1.9
4.18.4.2	Insertion Loss	F = 9000 Mc; Ii= 0 μAdc	Li:--	0.7db
4.18.5.1	Ignitor Interaction:	Ii= 100 μAdc	ΔLi:--	0.3 db
4.18.1	***Ignitor Ignition Time:**	**Ebb=-700Vdc; Ri=5.5Meg.**	**t:---**	**5.0sec.**
4.18.2	**Ignitor Voltage Drop:**	**Ii=100μAdc**	**Eid:200**	**375Vdc**
4.18.11	**Flat Leakage Power:**	**F= 9000Mc; po=40±10%kw; tp1=1.0±0.15us; tp2=0.5±0.15us; prr=1000; Ii=100μAdc; σ'=1.10max.**	**pf:---**	**30mw**
4.18.10	**Spike Leakage Energy:**	**See Flat Leakage Power**	**Ws:---**	**0.15erg**
4.18.31	**Position of Short:**	F= 9000 Mc; po=40±10%kw; tp=1.0±0.15μs; prr=1000; σ'=1.10max.; **Note 3**	---	±0.007in.
4.18.28	***Arc Loss:**	**F= 9000Mc; po=4kw; tp=1.0±0.15μs; prr=1000**	---	0.8db
4.18.15.1	***Recovery Time:**	**F= 9000Mc.; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc**	**t:---**	**8μs.**
4.11	**Life Test:**	**F= 9000Mc; po=200kw(min); tp=1.0±0.15μs; prr=1000;** Ebb=-700Vdc;Ri=2.5 meg; **Group D**	**t:500**	**---hrs.**
4.11.4	**Life Test End Point:**	**Recovery Time; Flat Leakage Power; Spike Leakage Energy; Insertion Loss**	**t:--- pf:--- Ws:--- Li:---**	**18μs 30mw 0.20erg 0.9db**

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: Vibrate in a plane perpendicular to the ignitor axis. During this test the ignitor electrode shall not short to the tube body. Tubes shall meet all requirements of this specification after the vibration test.

Note 3: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.032 inch further from the magnetron within the limits specified.

Note 4: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

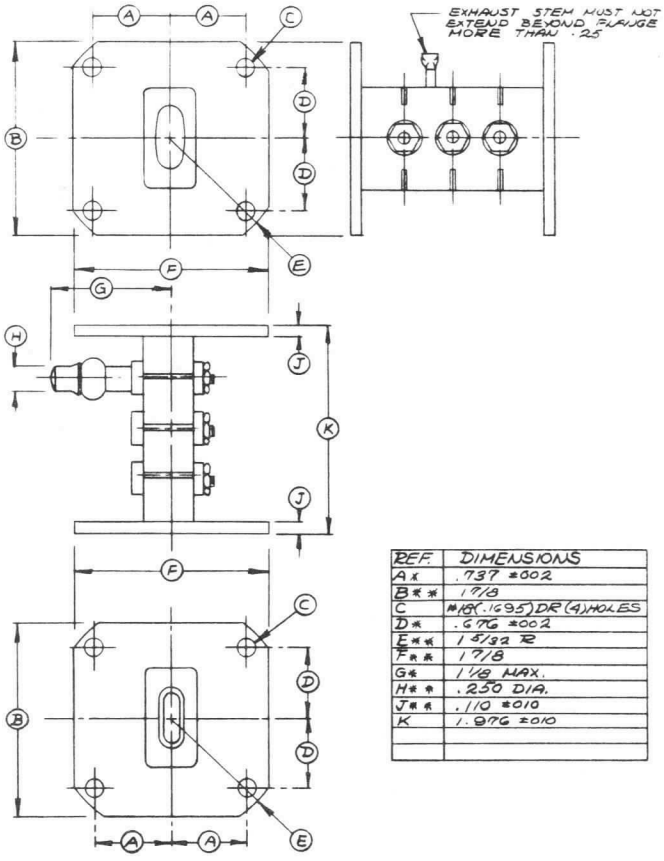
$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 5: All low level frequency measurements are to be made within ±0.1% of the values specified.

Note 6: All high level frequency measurements are to be made within ±5% of the values specified.



REF.	DIMENSIONS
A*	.737 ±002
B**	1 7/8
C	#8X(.1695)DR(4)HOLES
D*	.676 ±002
E**	1 5/32 R
F**	1 7/8
G*	1 1/8 MAX.
H**	.250 DIA.
J**	.110 ±010
K	1.976 ±010

Bomac	GAS SWITCHING	X
	BL611H	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 7, 1957

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	4.0	---	--- kw
Open Circuit Ignitor Voltage	-650	---	--- Vdc
Altitude	---	10,000	--- ft.
Heater Circuit Wattage	---	---	25 w
Heater Circuit Voltage	---	---	115 Vac
Heater Circuit Voltage Frequency	F 380	1000	--- cps
Thermostat Contact Current	---	2	--- Aac
Thermostat Cut In Temperature	4	---	--- °C
Thermostat Cut Out Temperature	---	50	--- °C
Ambient Temp. Range (non operational)	-60	+50	--- °C
Ignitor Current	100	200	--- μAdc

Recommended Ignitor Operating Current 150μAdc Note 8

Pack in sealed water proof bag. If opaque bag is used the tube type number must be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t= 168 hours	---	---
4.9.18.18	Carton Drop:	(d) Package Group 1; Carton Size K	---	---
4.9.19.2	**Vibration:	G=10 Note 2	---	---
------	*Thermostat Operation:	T= -55°C; Note 3	T : 4.0	50°C
------	Heater Current:	Vac= 115	---	0.250 Aac
4.18.18	Voltage Standing Wave Ratio:	$\acute{\sigma}$ =1.05max.;		
		F= 8490Mc;	σ : ---	1.9
		F1=8565	σ : ---	1.4
		*F= 8650	σ : ---	1.4
		*F= 8740	σ : ---	1.4
		*F= 8830	σ : ---	1.4
		*F= 8920	σ : ---	1.4
		F2=9000	σ : ---	1.4
		*F= 9090	σ : ---	1.4
		*F= 9180	σ : ---	1.4
		*F= 9280	σ : ---	1.4
		*F= 9380	σ : ---	1.4
		F3=9487	σ : ---	1.4
		F= 9578Mc; Note 9	σ : ---	1.9
4.18.4.2	Insertion Loss:	F=F2; Ii=0μAdc	Li : ---	0.7 db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi : ---	0.2 db
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Ri=5.5Meg.	t : ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 4	Eid : 200	375Vdc
4.18.11	Flat Leakage Power:	F=F2±5% po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; $\acute{\sigma}$=1.10max.	pf : ---	40 mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws : ---	0.2erg
4.18.31	Position of Short:	F=F2±5% po=40±10%kw; tp=1.0±0.15μs; prr=1000; $\acute{\sigma}$=1.10max; Note 5	---	±.0070 in.

Ref.	Test	Conditions	Min.	Max.
4.18.28	Arc Loss:	F=F2;±5% po=4.0kw; tp=1.0±0.15μs; prr=1000;	---	0.8 db
4.18.15.1	Recovery Time:	F=F2;±5% po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 6	t : ---	10μs
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test:	F=F2;±5% po=200kw; tp=1.0±0.15μs; prr=1000; Iz=100μAdc; Group C; Note 7	t : 500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t : ---	20 μs
		Flat Leakage Power;	pf : ---	50 mw
		Spike Leakage Energy;	Ws : ---	0.25erg
		Insertion Loss	Li : ---	0.7db

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The keep-alive electrode shall not short to the body during this test. There shall be no intermittent operation of the thermostat contacts.

Note 3: The tube having 10 inches of waveguide extending from each flange shall be placed in a frigid chamber -55°C. The thermostat should operate within the limits specified.

Note 4: With the ignitor circuit as in Figure 46 of MIL-E-1C, the ignitor voltage drop shall be measured after the tube fires with a high resistance voltmeter, 20,000 ohmsper volt or greater, and shall be within the limits specified.

Note 5: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.065 inch further from the magnetron, within the limits specified.

Note 6: The recovery time shall be measured after thirty minutes of operation under the conditions specified.

Note 7: This test shall be conducted with the TR tubes mounted in a ratrace duplexer under the conditions specified. There shall be no arcing across the front face of the window during this test.

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei=Average (center) ignitor voltage drop.

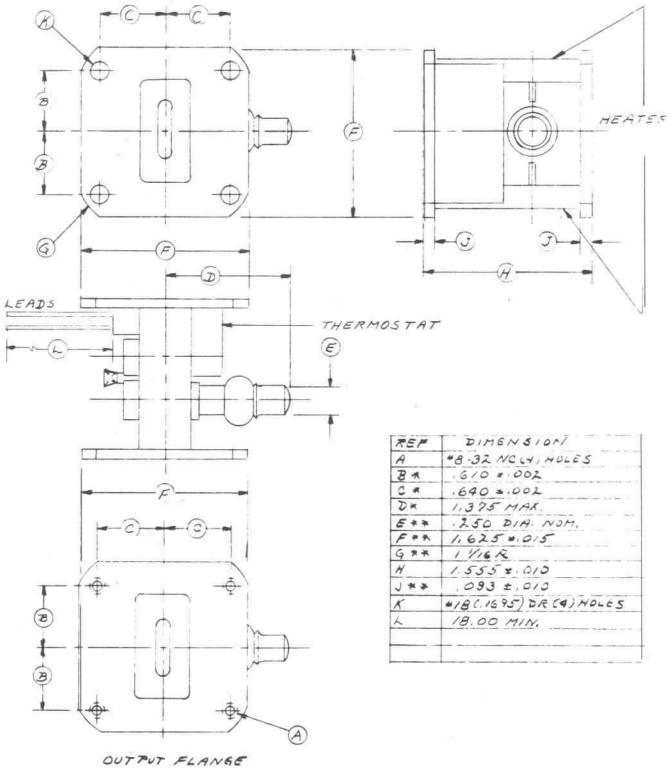
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 9: All frequencies are to be measured within 0.1% of the value specified, unless otherwise noted.

(over)

HEATERS, THERMOSTAT & EXHAUST STEM NOT TO EXCEED BEYOND FLANGES.

CLEARANCE MUST BE MAINTAINED FOR SOCKET HEAD SCREWS.



REF	DIMENSION
A	#8-32 NC-4H, HOLES
B *	.610 ± .002
C *	.690 ± .002
D *	1.375 MAX.
E **	.250 DIA. NOM.
F **	1.625 ± .015
G **	1 1/16 R.
H	1.555 ± .010
J **	.093 ± .010
K	#18 (.1695) DR. (4) HOLES
L	18.00 MIN.

Bomac	GAS SWITCHING	X
	6616/BL326	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 6, 1957

Dimensions: Per Outline.

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-700	---	--- Vdc
Shutter Circuit Voltage	17	30	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 Ohms
Pull In Current	78	---	--- mAdc
Holding Current	60	160	--- mAdc

Test Conditions: Notes 2, 3

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hrs.	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	*Vibration:	Cycles=1; F= 5 cps to F=500 cps.; G= 15; Shutter Current =60 mAdc; t=5 min. (min.); Note 4	---	---
4.18.18	Voltage Standing Wave Ratio:	σ'=1.05 max.;		
		F= 8490 Mc.	σ: ---	1.9
		F= 8565	σ: ---	1.4
		*F= 8650	σ: ---	1.4
		*F= 8740	σ: ---	1.4
		*F= 8830	σ: ---	1.4
		*F= 8920	σ: ---	1.4
		F= 9000	σ: ---	1.4
		*F= 9090	σ: ---	1.4
		*F= 9180	σ: ---	1.4
		*F= 9280	σ: ---	1.4
		*F= 9380	σ: ---	1.4
		F= 9487	σ: ---	1.4
		F= 9578Mc.	σ: ---	1.9
4.18.4.2	Insertion Loss (1):	F= 9000Mc; Ii=0μAdc	Li: ---	0.7db
4.18.4.2	*Insertion Loss (2):	Shutters Closed;		
		F= 8490Mc	Li: 40	---db
		F= 8565	Li: 40	---db
		F= 9000	Li: 40	---db
		F= 9487	Li: 40	---db
		F= 9578Mc	Li: 40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	△Li: ---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t: ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid: 200	375 Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ'=1.10max.	pf: ---	40mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws: ---	0.30erg
4.18.31	Position of Short:	F= 9000Mc; po=40±10%kw; tp=1.0±0.15μs; prr=1000; σ'=1.10 max.; Note 5	---	±0.007in.
4.18.28	Arc Loss:	F= 9000Mc; po=4 kw; tp=1.0±0.15μs; prr=1000	---	0.8db
4.18.15.1	*Recovery Time:	F= 9000Mc.; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t: ---	10μs
4.18.17.1	Temperature Cycle:	-----	---	---
-----	Shutter Current:	Shutter Voltage =28Vdc	I: 127	156mAdc
-----	Pull In Current:	-----	I: ---	75mAdc
-----	*Holding Current:	Note 6	I: ---	60mAdc
4.11	Life Test (1):	cps=10max.; Group D; Note 7	Cycles: 50,000	---
4.11	Life Test (2):	F=9000 Mc; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Group D	t: 500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t: ---	20μs
		Flat Leakage Power;	pf: ---	50mw
		Spike Leakage Energy;	Ws: ---	0.35erg
		Insertion Loss (1)	Li: ---	0.7db
		Insertion Loss (2) at F=9000Mc.	Li: 40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The shutters of the 6616(BL-326) provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

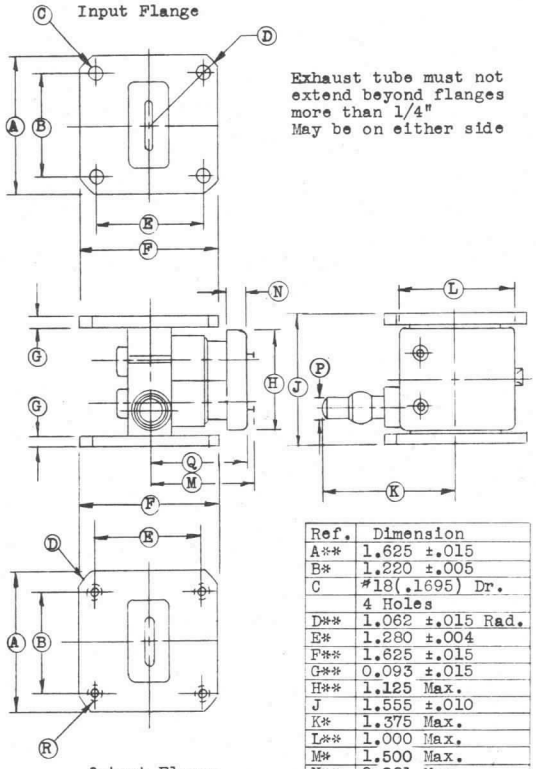
Note 4: Vibrate along a line parallel to the axes of the shutters. Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.065 inch further from the magnetron within the limits specified.

Note 6: The current required to hold the shutters open shall be within specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 7: 17-30 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

(over)



Ref.	Dimension
A**	1.625 ±.015
B*	1.220 ±.005
C	#18(.1695) Dr.
	4 Holes
D**	1.062 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.093 ±.015
H**	1.125 Max.
J	1.555 ±.010
K*	1.375 Max.
L**	1.000 Max.
M*	1.500 Max.
N**	0.281 Max.
P**	0.250 Nom.
Q*	1.375 Max.
R	#8-32NC 4 Holes

Bomac	GAS SWITCHING	K_u
	BL15	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 17, 1955

Dimensions: Per Outline

Application: To be used with RG-91/U waveguide.

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5.0kw	---

Test Conditions: Note 2

Pack in sealed water proof transparent bag or equivalent. If opaque bag is used, the Tube Type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:				
------	**Vibration:	F=50±2cps; G=10; t= 60sec. Note 3		---	---
4.9.8	**Salt Spray Corrosion:	Omit		---	---
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	F=16,500Mc	QL:	---	9.0
4.18.25	Tuning Susceptance:	F=16,500Mc Note 6	B/Yo :	-0.06	+0.06
4.18.36	*Equivalent Conductance:	F=16,500Mc Note 6	G/Yo :	---	0.1
4.18.27	*Firing Time:	F=16,500Mc±5% po=4kw; tp=0.5±0.05μs; prr=1000	t :	---	10sec.
4.18.28	Arc Loss:	See Firing Time		---	0.8db
4.18.19	**High Level V.S.W.R.:	F=16,500Mc±5% po=20kw; tp=1.0±0.1μs; prr=1000; σ=≤1.03	σ :	---	1.10
4.18.17.1	Temperature Cycle:	Note 4			
4.18.17.3	Temperature Cycle Life Test:	Group C; Note 5	Cycles :	10	---
4.11	Life Test:	F=16,500Mc±5% po=70kw; tp=1.0±0.1μs; prr=1000; Group C; Note 5	t :	500	---hrs.
4.11.4	Life Test End Point:	Arc Loss		---	1.0db
		Equivalent Conductance;	G/Yo :	---	0.1
		Tuning Susceptance	B/Yo :	---	±0.08

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

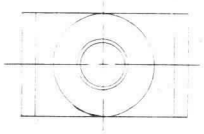
Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated 5-1 -55.

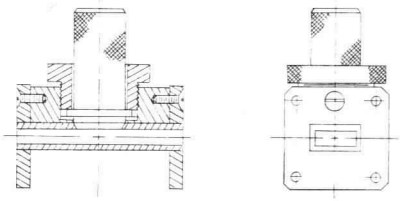
Note 3: Vibrate in the plane normal to the tuning diaphragm. The tube must satisfy all requirements of this specification subsequent to the vibration test.

Note 4: At the conclusion of this test, the tube shall pass the Firing Time Test specified in Ref. 4.18.27

Note 5: A temperature cycle life test or an R.F. life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

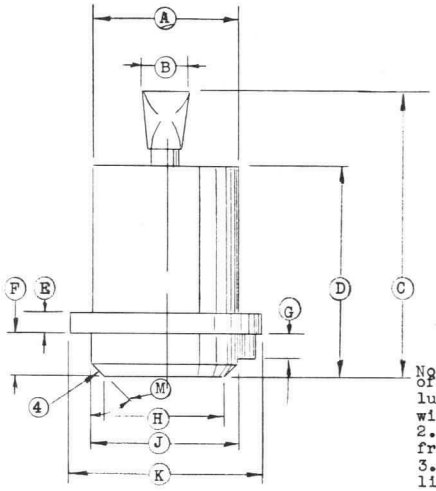
Note 6: All frequencies to be measured within 0.1% of value specified, unless otherwise noted.

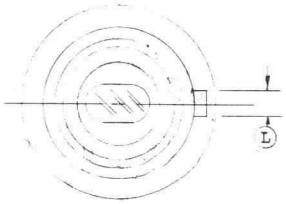




Notes:

1. Design of holder optional
2. Tube held firmly in position by means of clamping ring
3. Bottom of tube is to be approximately flush with inside surface of waveguide





Note: -1. Center lines of window and locating lug shall coincide within 5 .
2. Bevel shall be free from non-conducting finssh
3. Mounting contact shall limited to the beveled surface .
4. Corrosion resistance material, or silver plate or equivalent. All other metal surfaces shall be protected by a corrosion resistance finish.

Ref.	Dimensions.
A**	.710 ±.010
B*	1/4 Max.
C	1.500 Max.
D*	1.000 ±.030
E*	.090 ±.010
F**	.205 ±.010
G	.125 ±.010
H*	.625 ±.005
J	.725 ±.005
K	.945 ±.010
L	.125 ±.005
M	40°±2°

Bomac	GAS SWITCHING	Ku
	BL16	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 6, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-750	-1000Vdc
Ignitor Current	100	200μAdc

Recommended Ignitor Operating Current 150μAdc Note 11

Pack in sealed water-vapor-proof bag. If an opaque is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	*Vibration:	Note 2		---	---
4.18.1	Ignitor Ignition Time:	Ebb=-750; Ri=2.5meg.	t :	---	5sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	300	450Vdc
4.18.4.2	Insertion Loss(1) Insertion Loss(2)	F= 16,500Mc. Note 3	Li :	0.85	1.75db
4.18.5.1	Ignitor Inter-action:	F= 16,500Mc.	ΔLi :	---	.2db
4.18.3	Ignitor Oscillation:	Note 4	Ii :	---	60μAdc
4.18.9	Leakage Power:	F= 16,500Mc. po=40kw; tp=0.2μsec at 4000pps; or tp=0.8μsec at 1000pps; Ii=100μAdc; Note 5	Po/Du :	---	40mw
	**Frequency Temperature:	0°C to 100°C F= 16,500Mc; Note 10	ΔF :	-10Mc	-40Mc.
4.18.15.1	**Recovery Time:	F= 16,500± po=40kw; tp=0.2μsec at 4000pps; or tp=0.8μs at 1000pps; Ii=100μAdc; Note 8	t :	---	4μsec.
	*Pressure Test:	45psi (abs) Note 9			
	Temperature Cycle:	Note 7			
4.11	Life Test:	F= 16,500 Po=40kw; tp=0.2μsec at 4000pps; tp=0.8μsec at 1000pps Ebb=-750; Ri=2.5meg. Group D	t :	500	---hrs.
4.11	Life Test End Point:	Ignitor Voltage Drop;	Eid :	---	600Vdc
		Insertion Loss(1);	Li :	---	2.5db
		Ignitor Inter-action;	ΔLi :	---	0.5db
		Leakage Power	Po/Du :	---	50mw

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Vibrate in a plane perpendicular to ignitor axis. There shall be no evidence of shorting between the ignitor electrode and adjacent cone.

Note 3: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder. The tube shall cover a minimum tuning range of from less than 16,300Mc to more than 16,700Mc. No tube shall require less than 3 turns of the tuning screw to cover this range.

Note 4: No tube shall require more than 60μAdc ignitor current to prevent relaxation oscillation of the keep-alive current.

Note 5: The leakage power shall be measured after a shelf life of 7 days. Leakage power shall be averaged over the pulse width. This test shall be made with a keep alive current of 100μAdc.

Note 7: Test all tubes only by exposing to temperature changes from room temperature to -40°C to 100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to 100°C. This test may be made during the holding period but not less than 24 hours before the leakage power test. Test ten tubes per month or 5% (whichever is less) a minimum of 10 cycles.

Note 8: The tube shall be tuned to resonate at the signal frequency. The loss of signal in the tube 4μsec. following the pulse shall not be more than 3db in excess of the loss 100μsec. following the pulse.

Note 9: With the tube clamped between chokes, an air pressure of 45lbs. per square inch absolute shall be applied to both sides for 1/2 hour; reduce the pressure to atmospheric and repeat the cycle 5 times. On evidence of satisfactory quality this test may be limited to ten tubes per month.

Note 10: The frequency drift shall be measured with no adjustment of the tuning mechanism.

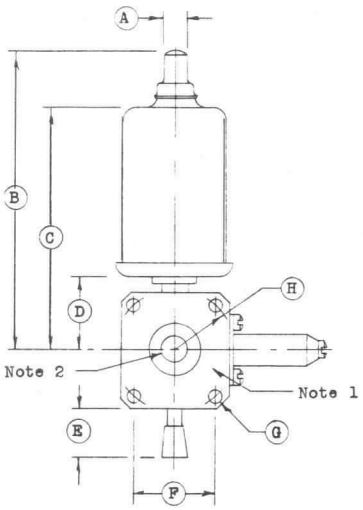
Note 11: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - E1}{150} \text{ (megohms)}$$

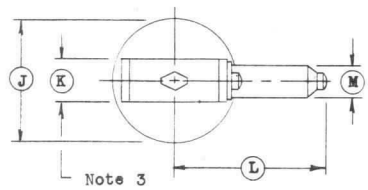
where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)



Ref.	Dimension
A**	0.250 Dia.
B*	3.000 Max.
C**	2 9/16 Max.
D*	21/32 Min.
E*	9/16 Max.
F*	0.800 ±.010
G	0.144 +.003 -.002
	4 Holes
H*	0.595 ±.003 Rad.
J*	1 1/4 Max.
K	0.408 - 0.417
L*	1 9/16 Max.
M*	0.310 ±.010



Note 1:- Two faces of the tube shall be silver plated. All other metal surfaces shall be protected by a corrosion resistant finish.

Note 2:- No part of the window assembly shall extend beyond the surface of the body.

Note 3:- Applies to area between periphery of this section of tube and concentric circle of 1/4" rad.

Bomac	GAS SWITCHING	K_u
	6649/BL56	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	1	100 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 µAdc
Recommended Ignitor Operating Current 150 µAdc (Note 4)		

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K	---	---
-----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 2	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.1	Ignitor Ignition Time:	Ebb=-700 Vdc; Ri=2.7 Meg	t:---	5.0sec.
4.18.2	Ignitor VoltageDrop:	Ii=100 µAdc	Eid:350	500Vdc
4.18.4.2	Insertion Loss:	F=16000 Mc; Ii=0 µAdc	Li:---	0.7db
4.18.5.1	Ignitor Interaction:	Ii=100 µAdc	ΔLi:---	0.2db
4.18.18	Voltage Standing	F= 15000 Mc.	σ:---	1.9
		F= 15060	σ:---	1.4
		*F= 15200	σ:---	1.4
		*F= 15400	σ:---	1.4
		*F= 15600	σ:---	1.4
		*F= 15800	σ:---	1.4
		F= 16000	σ:---	1.4
		*F= 16200	σ:---	1.4
		*F= 16400	σ:---	1.4
		*F= 16600	σ:---	1.4
4.18.18	Voltage Standing Wave Ratio (Cont.)	*F= 16800	σ:---	1.4
		F= 16940	σ:---	1.4
		F= 17000Mc; σ=1.05max.	σ:---	1.9
4.18.10	Spike Leakage Energy:	F= 16000Mc; po=80±10%kw; tp1=0.50±0.10µs; tp2=0.25±0.05µs; prr=3000; Ii=100µAdc	Ws:---	0.30erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:---	50mw
4.18.15.1	*Recovery Time:	F= 16000Mc; po=80±10%kw; tp=0.50±0.10µs; prr=3000; Ii=100µAdc	t:---	10µs
4.18.19	**High Level V.S.W.R.	F= 16000Mc; po=40±10%kw; tp=0.50±0.10µs; prr=3000	σ:---	1.2
4.18.28	*Arc Loss:	F= 16000Mc; po=20±10%kw; tp=0.50±0.10µs; prr=3000	---	0.8db
4.18.31	Position of Short:	F= 16000Mc; po=40±10%kw; tp=0.50±0.10µs; prr=3000; Note 3	.035	.055in
4.11	Life Test:	F= 16000Mc; po=80 kw min; tp=0.50±0.10µs; prr=3000; Ebb=-700Vdc; Ri=1.8 meg. Group D	t:500	---hrs.
4.11.4	Life Test End Point:	Insertion Loss;	Li:---	0.8db
		Spike Leakage Energy;	Ws:---	0.35erg
		Flat Leakage Power;	pf:---	60mw
		Recovery Time	t:---	20µs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Vibrate in a plane normal to the ignitor axis. The ignitor electrode shall not short to the tube body during this test. Subsequent to the test the tube shall satisfy all applicable requirements of this specification

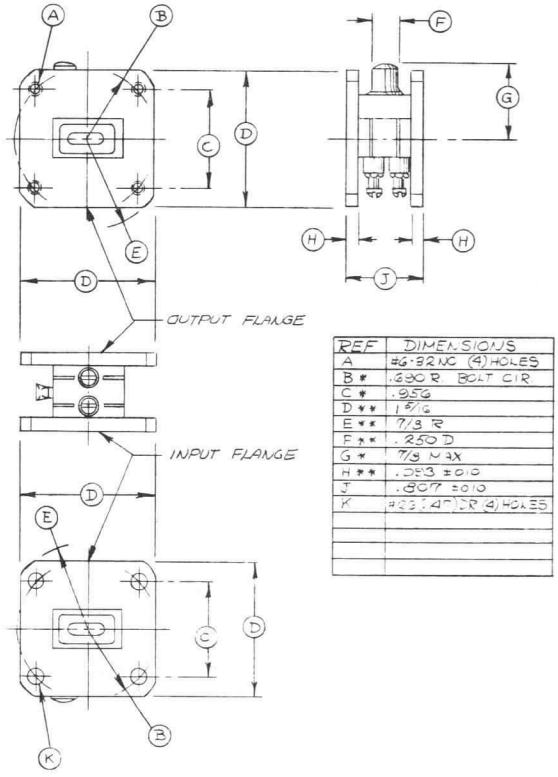
Note 3: When the shorting plate is replaced by the tube the shift in the position of the V.S.W. minimum away from the magnetron shall be within the limits specified.

Note 4: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (R1)} = \frac{\text{Ebb-Ei}}{150} \text{ (Megohms)}$$

Where R1=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSIONS
A	#6-32 NC (4) HOLES
B *	.690 R BOLT CIR
C *	.956
D **	1.5/16
E **	7/8 R
F **	.250 D
G *	7/8 MAX
H **	.093 ±.010
J	.807 ±.010
K	#25 (.149) DR (4) HOLES

NOTE: EXHAUST STEM NOT TO EXTEND BEYOND FLANGES. ETCH INPUT AND OUTPUT OF TUBE ON TOP CAP SPACER.

Bomac	GAS SWITCHING	K
	1B26	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-750	-1000Vdc
Ignitor Current	100	200μAdc

Recommended Ignitor Operating Current 150μAdc Note 9

Pack in sealed moisture-resistant bag. If opaque is used, type number must be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.13.1.8	Carton Drop:	To be specified		---	---
4.9.19.2	*Vibration:	Notes 2, 3		---	---
4.18.1	Ignitor Ignition Time:	Ebb=-650 Ri=2.0megohms	t :	---	5 sec.
4.18.4.2	Insertion Loss:	F=23,984±1%Mc. Note 4	Li :	0.85	1.75 db
4.18.5.1	Ignitor Inter-action	Ii=100μAdc Note 10	ΔLi :	---	0.2 db
------	Tuning Range:	Note 5			
4.18.3	*Ignitor Oscillation:		Ii :	---	60μAdc
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	325	450Vdc
4.18.9	Leakage Power:	F=23,984±1.0%Mc; po=8.0±10%kw; tp=0.25μsec; at 2000 pps or tp=0.5μsec at 1000pps; Ii=100μAdc Note 11	pf :	---	25 mw
------	**Frequency Temperature:	0°C to +100°C Ambient F=23,984±1.0%Mc; Note 6	ΔF :	-15	-65Mc.
4.18.15.1	**Recovery Time:	F= 23,984±0.5%Mc. po=8.0kw±10%kw; tp=.25μsec at 2000 pps or tp=.5μsec at 1000 pps; Ii=100μAdc; Note 7	t :	---	4.0μs
4.18.16	*Pressure Operation:	45 psi(abs)		---	---
4.18.17.1	Temperature Cycle:	Note 8	Cycle :	1.0	---
4.11	Life Test:	F= 23,984±1%Mc. po=24.0±10%kw; tp=0.5μsec±20%; prr=1000±10%; Ebb=-800; Ri=2.3 megohms Group B	t :	500	---hrs.
------	Temperature Cycle Life Test:	Note 8 Group B	Cycle :	50	---
------	Temperature Cycle End Point:	Keep-alive Ignition Time	tk :		5 sec.
4.11.4	Life Test End Point:	Leakage Power	pf :	---	35 mw
		Insertion Loss	Li :	---	2.5 db
		Keep-alive-Inter action	ΔLi :		0.5 db
		Keep-alive Voltage Drop	Eid :	---	600 Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: On evidence of satisfactory quality the inspector may limit this test to ten tubes per month when the tube is in continuous production. If one or more tubes fail to meet this test, the test conditions shall revert to Design Test requirements.

Note 3: Tune to 23,984±0.5%Mc then vibrate in direction of tuner axis for 12 hours at 2.0G with an amplitude of motion of 0.040". After this, the tuning shall not have changed more than 20 Mc. from its initial value and the tube shall satisfy all other electrical test of this specification.

Note 4: The insertion loss shall be measured by a transmission method in which the tube is placed between a matched generator and detector. The frequency of the signal generator shall be within the limits of 23,984Mc±1%. As the tuning screw is turned through the complete range, the transmitted power shall show only one peak.

Note 5: The tube shall cover a minimum tuning range of from less than 23,630Mc. to more than 24,580. No tube shall require less than 2- 1/2 complete turns of the tuning screw to cover this range. The tuning screw shall be cycled from stop to stop before electrical tests are performed.

Note 6: The frequency drift shall be measured with no adjustment of the tuning mechanism.

Note 7: The signal frequency shall be 23,984±1/2%Mc and the tube shall be tuned to resonate at the signal frequency. The loss of the signal in the tube 4μsec. following the pulse shall not be more than 3 db in excess of the loss 100μsec. following the pulse.

Note 8: Test the tube by exposing to temperature changes from room temperature to -40°C to 100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to 100°C. This test may be made during the holding period but not less than 24 hours before the leakage power test.

Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance}(Ri) = \frac{Ebb - Ei}{150} \quad \text{(megohms)}$$

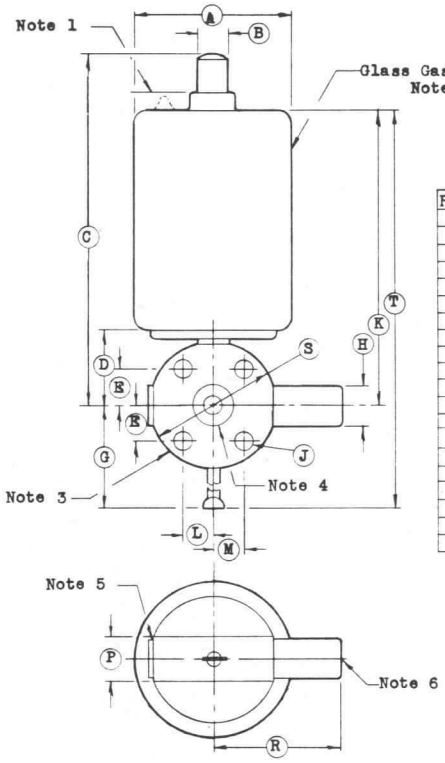
where Ri = Total series resistance
Ebb= Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 10: This test shall be made under conditions as specified in Note 4. With Ignitor Current of 100μA, the insertion loss shall not increase by more than the specified amount over quiescent insertion loss.

Note 11: The leakage power shall be measured after a shelf life of 7 days. This test shall be made using the method and procedure of Radiation Laboratory Report No. 600.

(over)



Ref.	Dimensions
A	1-1/4 Max.
B*	.250±.005
C	2-3/4 Max.
D	17/32 Min.
E	.287±.002
G	13/16 Max.
H*	.310±.005
J	.120±.002
K*	2-5/16 Max.
L	.241±.002
M	.241±.002
P	.359 Min.
	.365 Max.
R*	1-1/8 Max.
S*	1.009 Max.
	.999 Min.
T**	3-9/16 Max.

Note 1:-
Glass seal-off tip when only a glass reservoir is used, shall not extend above this line and shall be within the periphery of the glass reservoir.

Note 2:-
Max. projection of the reservoir lies within a cylinder of 1-1/2 diameter with axis co-linear with tube axis.

Note 3:-
Body shall be clean and free from paint.

Note 4:-
No part of the iris assembly shall extend beyond the surface of the copper body. The flat surfaces of the body shall have a machine finish free from excessive tool marks and shall be parallel to each other within .001 inches.

Note 5:-
Solder fillets permissible on peripheral surface near seal-off tip and electrode terminal.

Note 6:-
Head of screw may extend outside of barrel if within "R".

Bomac	GAS SWITCHING	K
	1B36	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Dimensions: Per Outline

Application: To be used with waveguide size RG 53

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	4.0 kw	---

Test Conditions: Note 2

Pack in sealed water proof transparent bag or equivalent. If opaque bag is used, the Tube Type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.9.18.1.8	Carton Drop:				
------	**Vibration:	F=50±2cps; G=10; t=60 sec; Note 3		---	---
4.9.8	**Salt Spray Corrosion:	Omit		---	---
4.9.6	*Glass Strain:	------		---	---
4.18.13.2	**Loaded Q:	F=24,000Mc;	QL:	---	7.5
4.18.25	Tuning Susceptance:	F= 24,000Mc; Note 6	B/Yo:	-0.06	+0.06
4.18.36	*Equivalent Conductance:	F=24,000Mc. Note 6	G/Yo:	---	0.1
4.18.30	**Mode Purity (Standing Wave Over Band):	F=24,000Mc Note 7	σ:	7	---
4.18.27	*Firing Time:	F=24,000±1.0%Mc; po=4kw;(max.); prr=1000±10%; Note 8 tp=0.5±0.05μs	t:	---	10 sec.
4.18.28	Arc Loss:	po=1kw; Note 8		---	0.7 db
4.18.19	**High Level V.S.W.R.:	F=24,000±1%Mc; po=10kw(min.); tp=0.5±0.05μs; prr=1000±10%; σ=1.05; Note 9	σ:	---	1.10
4.18.17.1	Temperature Cycle:	Note 4			
4.18.17.3	Temperature Cycle Life Test:	Group B; Note 5	Cycles:	10	---
4.11	**Life Test:	F=24.0 Kc Mc±5% po=30kw; tp=0.5μ sec. prr=1000; Group D; Note 5	t:	1000	---hrs.
------	Temperature Cycle End Point:	Firing Time;Note 8	t:	---	10 sec.
4.11.4	Life Test End Point:	Arc Loss;		---	1.0 db
		Equivalent Conductance;	G/Yo:	---	0.1
		Tuning Susceptance;	B/Yo:	---	±0.06

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube is to be mounted per attached drawing of Tube Mounting, dated - 5-5 .

Note 3: Vibrate in the plane normal to the tuning diaphragm. The tube must satisfy all requirements of this specification subsequent to the vibration test.

Note 4: At the conclusion of this test, the tube shall pass the Firing Time Test specified in Ref. 4.18.27.

Note 5: A temperature cycle life test or an R.F. life test made, during the same four weeks period, on any one of similar groups of tubes with the same gas fill and approximate physical dimensions will be evidence that all of the said groups meet these requirements.

Note 6: All frequencies to be measured within 0.1% of value specified, unless otherwise noted.

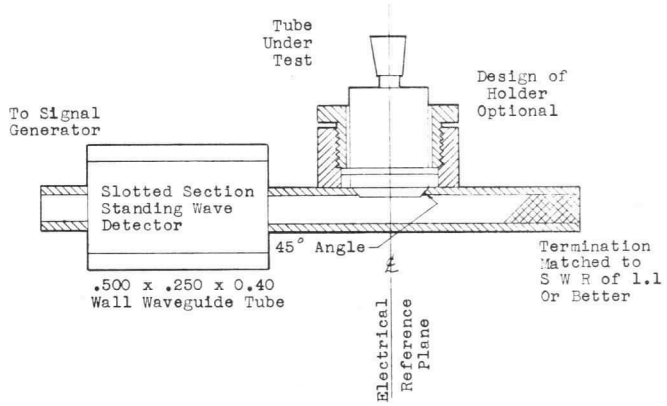
Note 7: Tube shall be mounted as in Note 2. No appreciable energy shall be excited in the tube in other than the desired H_{11} mode. As evidence of this, the reflected power may correspond to a standing wave ratio greater than 7 in voltage over the frequency range. from F+500Mc to F-500Mc.

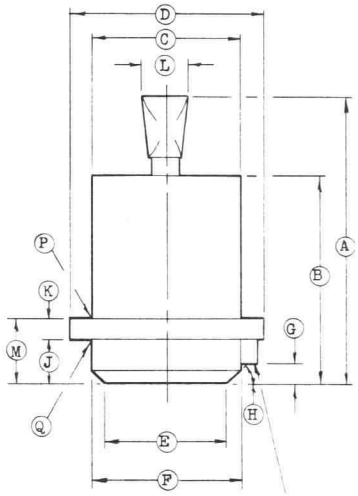
Note 8: The tube shall be mounted as in Note 2 and followed by a matched load. With the line energized by pulsed RF Power, the tube shall fire within 10 seconds after application of power. The power loss in the arc (PL) shall be less than 160 peak watts.

$$\frac{P}{P-PL} = \frac{1000}{1000-160} = 1.18 \quad (0.7db)$$

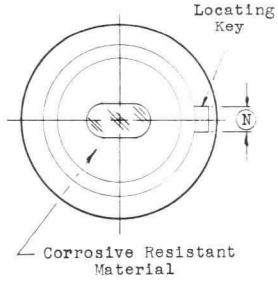
This test shall be performed at least 7 days after pumping and at least 24 hours after any previous discharge.

Note 9: This test may be made at low levels by simulating the arc by a metallic short in intimate contact with the inside of the window.





Ref.	Dimension
A*	1.000 Max.
B	.650 Min. .770 Max.
C	.480±.010 Dia.
D	.640±.010 Dia.
E	.420±.003 Dia.
F	.490±.005 Dia.
G	.050 Min. .080 Max.
H	50°±2°
J	.130 Min.
K*	.040 Min.
L*	1/4 Max.
M*	.250 Max.
N*	.115±.005
P**	1/32 Max. Rad.
Q**	1/64 Max. Rad.



*Note 1:- Center lines of locating key and long axis of windows shall coincide within 5°.

*Note 2:- 0.480, 0.490, and 0.640 Dia's. shall be concentric with respect to 0.420 Dia. within 1/64.

**Note 3:- Bevel shall be silver plated 50 msi (Min.) or equivalent and shall be free from burrs or scratches. Mounting contact shall be limited to beveled surface. All other metal surfaces shall be protected from corrosion.

Note 4:- There are to be no sharp edges on the tube face.

Bomac	GAS SWITCHING	K
	6282/BL11	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 18, 1955

Dimensions: Per Outline

Mounting: UG-210/U Input, UG-210/U Output

Ratings:	Min.	Max.
Transmitter po	4.0	--- kw
Open Circuit Ignitor Voltage	-750	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 9)

Test Condition: See Test Circuit "E", dated 8-13-54

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking of Tubes:	Note 2	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:	-----	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	*Vibration (1):	Cycles=1; F=10 cps to F=55 cps; Total Excursion =0.060 in; t=60 sec; Note 3	---	---
-----	**Vibration (2):	Cycles =1; F=5 cps to F=500 cps; Total Excursion =0.010 in; t=600 sec; Note 3	---	---
------	**Vibration(3):	Cycles=5; F=10cps to F=55cps; Total Excursion =0.060in; t=15min.; Note 3	---	---
4.9.20.5	**Shock:	G=15; 6 blows in each of 3 perpendicular planes; Note 4	---	---
4.18.1	Ignitor Ignition Time:	Ebb=-750Vdc; Ri=3.9Meg.	t:---	5sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid:325	475Vdc
4.18.4.2	Insertion Loss:	F= 24.00kMc; Ii=100μAdc	Li:---	0.8db
4.18.18	Voltage Standing Wave Ratio:	*F= 23.35kMc	σ:---	1.9
		F= 23.50	σ:---	1.4
		F= 23.70	σ:---	1.2
		F= 24.00	σ:---	1.2
		F= 24.30	σ:---	1.2
		F= 24.75	σ:---	1.4
		*F= 24.95kMc; σ= 1.07max.	σ:---	1.9
4.18.18	**Voltage Standing Wave Ratio:	F= 23.85kMc	σ:---	1.2
		F= 24.15	σ:---	1.2
		F= 24.50	σ:---	1.3
		F= 24.85kMc; σ=1.07max.	σ:---	1.7
------	*Phase Shift:	F= 23.75±0.05% kMc	d:-.031	-.049in
		F= 24.00±0.05% kMc	d:-.014	-.032in
		F= 24.25±0.05% kMc	d:+.003	-.015in
		Note 5		
4.18.11	Flat Leakage Power:	F= 24.00±1%kMc; po=30±5kw; tpl=0.5±0.1μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc; σ=1.10max.; Note 6	pf:---	40mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.2erg
4.18.28	Arc Loss:	F= 24.00±1%kMc; po=30±5kw; tp=0.25±0.05μs; prr=1000; Ii=100μAdc; σ=1.10max.; Note 6	---	0.8db
4.18.15.1	**Recovery Time:	F= 24.00±1%kMc; po=30±5kw; tp=0.5±0.1μs; prr=1000; Ii=100μAdc; σ=1.10max.	t:---	4.0μs
4.18.31	Position of Short:	F= 24.00±1%kMc; po=30±5kw; tp=0.5±0.1μs; prr=1000; σ=1.10max.; Note 7	.0215	.0265in
------	*Minimum Firing Power:	tp=0.5±0.1μs; prr=1000; Ii=100μAdc; σ=1.10max.; Note 8	po:---	0.5w
4.18.17.1	Temperature Cycle:	T=-55°C to T=+100°C	---	---
4.11	Life Test:	F= 24.00±1%kMc; po=30±5kw; tp=0.5±0.1μs; prr=1000; Ebb=-700Vdc; Ri=1.7 meg. Group C; σ=1.10max.; Note 6	t:500	---hrs
4.11.4	Life Test End Point:	Insertion Loss;	Li:---	1.0db
		Flat Leakage Power;	pf:---	50mw
		Spike Leakage Energy;	Ws:---	0.2erg
		Recovery Time	t:---	10μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Tubes shall be marked 6282(BL-11).

Note 3: Vibrate in a plane normal to the ignitor axis. The ignitor electrode shall not short to the tube body during this test. Tubes shall satisfy all requirements of this specification after the vibration test.

Note 4: Tubes shall satisfy all requirements of this specification after the Shock Test.

Note 5: See Test Circuit "E". Bolt reference insert to flange A, and measure the position of V.S.W. minimum. Replace insert with tube and again measure the position of V.S.W. minimum. The resultant phase shift shall be within the specified limit. Repeat procedure at the remaining frequencies. The reference insert is a section of RG-53/U waveguide terminated with cover flanges UG-211/U, having an overall length of 0.990±.001 in. Negative d indicates a phase shift toward the generator.

Note 6: Tube mounted in a "rat-race". There shall be no arcing across the input face of the window during this test.

Note 7: When the metal short is replaced by the tube the shift in the position of V.S.W. minimum, away from the magnetron, shall be within the specified limit.

Note 8: Tube mounted in a "rat-race". The magnetron power is increased until the tube fires. The firing point may be determined by visual observation or by an abrupt decrease of leakage power as measured by a thermistor bridge or equivalent power measuring instrument. The peak power incident on the tube at the firing point shall be less than the specified value.

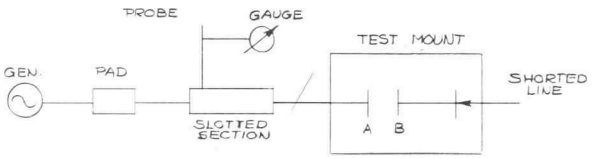
Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

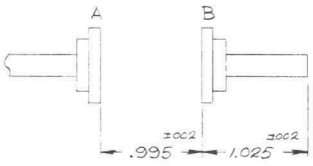
$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

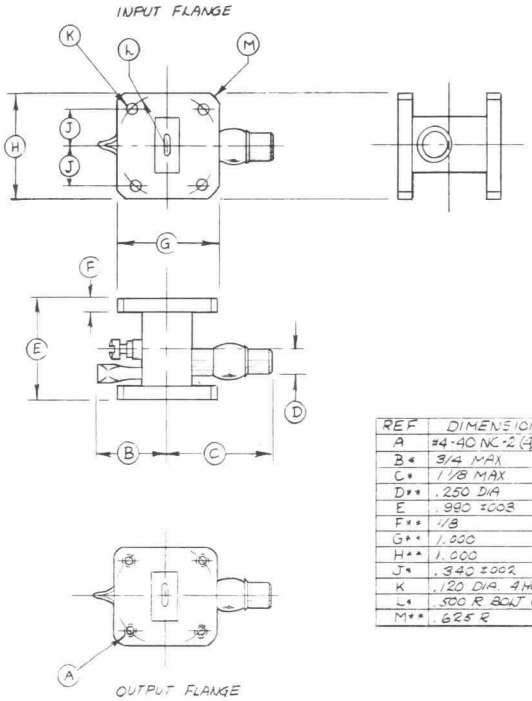
(over)





DETAIL OF TEST MOUNT

A : 3" CHOKE FLANGE UG 210/U



OUTPUT FLANGE

REF	DIMENSIONS
A	#4-40 NC-2 (4) HOLES
B *	3/4 MAX
C *	1 1/8 MAX
D **	.250 DIA
E	.990 ±.003
F **	1/8
G **	1.000
H **	1.000
J *	.340 ±.002
K	.120 DIA. 4 HOLES
L *	.500 R BOLT CIRCLE
M **	.625 R

NOTE:-
CONTACT SURFACES OF INPUT & OUTPUT FLANGES TO BE CADMIUM PLATED
ALL OTHER METALLIC SURFACES TO BE PAINTED BLACK

Bomac	GAS SWITCHING	K
	6650/BL67	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 16, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-750	1000Vdc
Ignitor Current	100	200μAdc

Recommended Ignitor Operating Current 150μAdc Note 9

Pack in sealed moisture-resistant bag. If opaque bag is used, type number must be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	*Vibration:	Note 2, 3			
4.18.1	Ignitor Ignition Time:	Ebb=-650 Ri=2.0megohms	t :	---	5sec.
4.18.4.2	Insertion Loss:	F= 23,984±1%Mc Note 4	Li :	0.85	1.75db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi :	---	0.2db
------	Tuning Range:	Note 5			
4.18.3	Ignitor Oscillation:		Ii :	---	60μAdc
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	300	425Vdc
4.18.9	Leakage Power:	F= 23,984±1.0%Mc; po=8.0±10%kw; tp=0.25μsec; at 2000pps or tp=0.5μsec at 1000 pps; Ii=100μAdc	pf :	---	25mw
------	**Frequency Temperature:	0°C to +100°C Ambient; F= 23,984±1.0%Mc; Note 6	ΔF :	-15	-65Mc
4.18.15.1	**Recovery Time:	F= 23,984±0.5%Mc po=8.0kw±10%kw; tp=.25μsec at 2000pps or tp=.5μsec at 1000pps; Ii=100μAdc; Note 7	t :	---	4.0μs
4.18.16	*Pressure Operation:	45psi(abs)		---	---
4.18.17.1	Temperature Cycle:	Note 8	Cycle :	1.0	---
4.11	Life Test:	F= 23,984±1%Mc po=24.0±10%kw; tp=0.50μsec; prr=1000; Ebb=-800; Ri=2.3 megohms Group D	t :	200	---hrs.
------	Temperature Cycle Life Test:	Note 8 Group D	Cycle :	50	---
------	Temperature Cycle End Point:	Keep-alive Ignition Time	tk :		5sec.

Ref.	Test	Conditions		Min.	Max.
4.11.4	Life Test End Point:	Leakage Power	pf :	---	35mw
		Insertion Loss	Li :	---	2.5db
		Keep-alive-Inter-action	ΔLi :		0.5db
		Keep Alive Voltage Drop	Eid :		600Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: On evidence of satisfactory quality the inspector may limit this test to ten tubes per month when the tube is in continuous production. If one or more tubes fail to meet this test, the test conditions shall revert to Design Test requirements.

Note 3: Tune tube to 23,984Mc±.5% then vibrate in direction of tuner axis for 12 hours at 2.0G with an amplitude of motion of 0.040". After this, the tuning shall not have changes more than 20Mc from its initial value and the tube shall satisfy all other electrical tests of this specification.

Note 4: The insertion loss shall be measured by a transmission method in which the tube is placed between a matched generator and detector. The frequency of the signal generator shall be within the limits of 23,984Mc±1%. As the tuning screw is turned through the complete range, the transmitted power shall show only one peak.

Note 5: The tube shall cover a minimum tuning range of from less than 23630Mc to more than 24,580. No tube shall require less than 2-1/2 complete turns of the tuning screw to cover this range. The tuning screw shall be cycles from stop to stop before electrical test are performed.

Note 6: The frequency drift shall be measured with no adjustment of the tuning mechanism.

Note 7: The signal frequency shall be 23,984±1/2%Mc and the tube shall be tuned to resonate at the signal frequency. The loss of signal in the tube 4μsec. following the pulse shall not be more than 3db in excess of the loss 100μsec. following the pulse.

Note 8: Test the tube by exposing to temperature changes from room temperature to -40°C to 100°C to room temperature. The temperature may be allowed to come to equilibration at room temperature in going from -40°C to 100°C. This test may be made during the holding period but not less than 24 hours before the leakage power test.

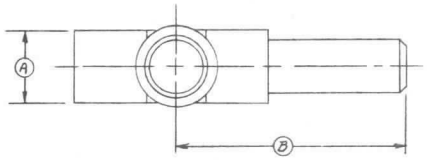
Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

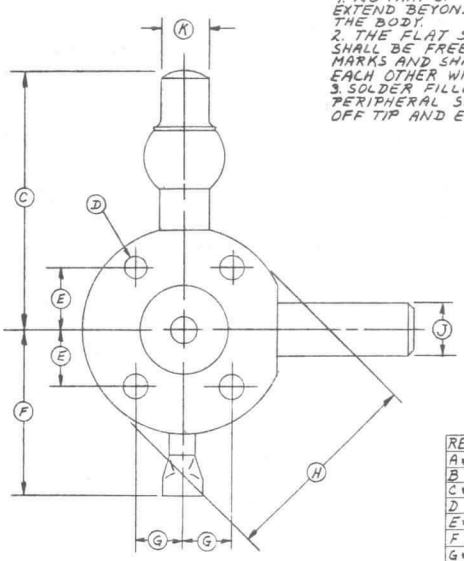
Where Ri= Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor Voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)



NOTES
1. NO PART OF THE IRIS ASSEM. SHALL EXTEND BEYOND THE SURFACE OF THE BODY.
2. THE FLAT SURFACES OF THE BODY SHALL BE FREE OF EXCESSIVE TOOL MARKS AND SHALL BE PARALLEL TO EACH OTHER WITHIN .001.
3. SOLDER FILLETS PERMISSIBLE ON PERIPHERAL SURFACE NEAR SEAL OFF TIP AND ELECTRODE TERMINAL.



REF.	DIMENSIONS
A**	.365 MAX. .359 MIN.
B	1 1/8 MAX.
C*	1.281 MAX.
D	.120 D. ± .002 (4) HOLES
E*	.287 ± .002
F	1 3/16 MAX.
G*	.241 ± .002
H	1.004
J**	.310 D.
K*	.250 D.

Bomac	GAS SWITCHING	K
	BL621	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Open Circuit Ignitor Voltage	-750	1000Vdc
Ignitor Current	100	200μAdc

Recommended Ignitor Operating Current 150μAdc Note 9

Pack in sealed moisture-resistant bag. If opaque bag is used, type number must be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.9.19.2	*Vibration(1):	G=9; F=10 to 60cps; t=60sec; Note 2, 3		---	---
4.9.19 2	*Vibration(2)	G=5; F=60 to 500cps; t=60sec; Note 2, 3		---	---
4.9.19.2	*Vibration(3):	G=3; F=500to 3000cps; t=60sec; Note 2, 3		---	---
4.9.20.5	*Shock:	G=125; t=3 millisecond		---	---
4.18.1	Ignitor Ignition Time:	Ebb=-650 Ri=2.0megohms	t :	---	5sec.
4.18.4.2	Insertion Loss:	F= 23,984±1%Mc Note 4	Li :	0.85	1.75db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi :	---	0.2db
------	Tuning Range:	Note 5			
4.18.3	*Ignitor Oscillation:		Ii :	---	60μAdc
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	300	425 Vdc
4.18.9	Leakage Power:	F= 23,984±1.0%Mc; po=8.0±10%kw; tp=0.25μsec; at 2000 pps or tp=0.5μsec at 1000pps; Ii=100μAdc	pf :	---	25mw
------	**Frequency Temperature:	0°C to +100°C Ambient; F= 23,984±1.0%Mc; Note 6	ΔF :	-15	-65Mc
4.18.15.1	**Recovery Time:	F= 23,984±0.5%Mc po=8.0kw±10%kw; tp=.25μsec at 2000pps or tp=.5μsec at 1000pps; Ii=100μAdc; Note 7	t :	---	4.0μs
4.18.16	*Pressure Operation:	45psi(abs)		---	---
4.18.17.1	Temperature Cycle:	Note 8	Cycle :	1.0	---
4.11	Life Test:	F= 23,984±1%Mc; po=24.0±10%kw; tp=0.50μsec; prr=1000; Ebb=-800; Ri=2.3megohms Group D	t :	200	---hrs.
------	Temperature Cycle Life Test:	Note 8 Group C	Cycle :	10	---
------	Temperature Cycle End Point:	Keep-alive Ignition Time	tk :		5sec.
4.11.4	Life Test End Point:	Leakage Power	pf :	---	35mw
		Insertion Loss	Li :	---	2.5db
		Keep-alive-Interaction	ΔLi :		0.5db
		Keep-alive Voltage Drop	Eid :		600Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: On evidence of satisfactory quality the inspector may limit this test to ten tubes per month when the tube is in continuous production. If one or more tubes fail to meet this test, the test conditions shall revert to Design Test requirements.

Note 3: The keep-alive electrode shall not short to the body during this test.

Note 4: The insertion loss shall be measured by a transmission method in which the tube is placed between a matched generator and detector. The frequency of the signal generator shall be within the limits of 23,984Mc±1%. As the tuning screw is turned through the complete range, the transmitted power shall show only one peak.

Note 5: The tube shall cover a minimum tuning range of from less than 23630Mc to more than 24,580. No tube shall require less than 2-1/2 complete turns of the tuning screw to cover this range. The tuning screw shall be cycled from stop to stop before electrical test are performed.

Note 6: The frequency drift shall be measured with no adjustment of the tuning mechanism.

Note 7: The signal frequency shall be 23,984±1/2%Mc and the tube shall be tuned to resonate at the signal frequency. The loss of signal in the tube 4μsec. following the pulse shall not be more than 3db in excess of the loss 100μsec. following the pulse.

Note 8: Test the tube by exposing to temperature changes from room temperature to -40°C to 100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -40°C to 100°C. This test may be made during the holding period but not less than 24 hours before the leakage power test.

Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

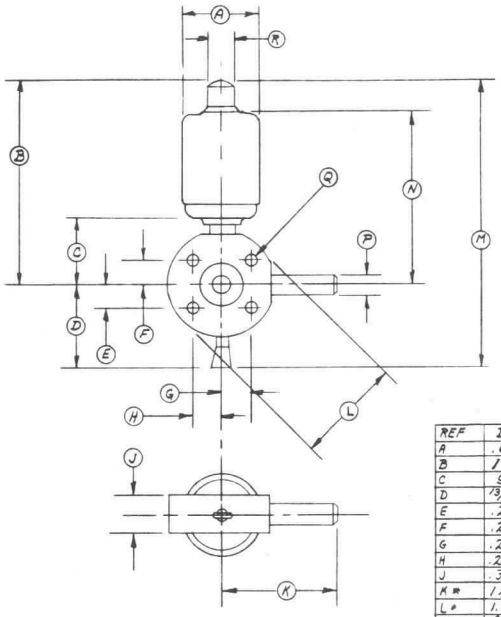
Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei= Average (center) ignitor Voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)

MAX. PROJECTION OF RESERVOIR LIES WITHIN A CYLINDER OF .650 DIA. WITH AXIS CO-LINEAR WITH TUBE AXIS

SOLDER FILLETS PERMISSABLE ON PERIPHERAL SURFACE NEAR SEAL OFF TIP AND ELECTRODE TERMINAL



REF	DIMENSIONS
A	.625 DIA. MAX.
B	1 3/4 MAX.
C	9/16 MIN.
D	13/16 MAX.
E	.287 ± .002
F	.287 ± .002
G	.241 ± .002
H	.241 ± .002
J	.359 - .365
K *	1 1/8 MAX.
L *	1.009 - .993 DIA.
M	2 9/16 MAX.
N	1 1/2 MAX.
P *	.310 ± .005
Q	.120 DIA. ± .002 (4) HOLES
R *	.250 ± .005

NO PART OF THE IRIS ASSEMBLY SHALL EXTEND BEYOND THE SURFACE OF THE BODY. THE FLAT SURFACES OF THE BODY SHALL BE FREE OF EXCESSIVE TOOL MARKS AND SHALL BE PARALLEL TO EACH OTHER WITHIN .001

Bomac	GAS SWITCHING	K
	BL627	ATR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 17, 1955

Application: To be used with RG-53/U waveguide

Ratings:	Min.	Max.
Transmitter po	4.0 kw	---

Dimensions: As per outline

Mounting: Note 2

Note: Pack in sealed moisture resistant transparent bag or approved equivalent. If opaque bag is used, the type number shall be stamped thereon.

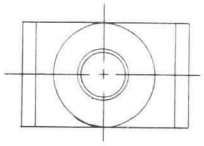
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.18.1.8	Carton Drop:			
-----	** Vibration:	F=50; G=10; t=60 Note 3		
4.9.8	Salt Spray Corrosion:	Omit		
4.9.6	* Glass Strain:			
4.18.13.2	** Loaded Q:	F=24,000Mc Note 4	QL: ---	7.5
4.18.25	Tuning Susceptance:	F=24,000Mc Note 4	B/Yo: -0.06	∕ 0.06
4.18.36	* Equivalent Conductance:	F=24,000Mc Note 4	G/Yo: ---	0.10
4.18.27	⁎ Firing Time:	F=24,000±5%Mc po=4.0±10%kw tp=0.5±0.05μsec prr=1000	t: ---	10 sec.
4.18.28	Arc Loss:	See Firing Time	---	0.7 db
4.18.19	** High Level VSWR:	F=24,000±5%Mc po=10±10%kw tp=0.5±0.05μsec prr=1000 σ'=1.05 max.	σ: ---	1.10
4.13.17.1	Temperature Cycle Test:			
4.13.17.3	Temperature Cycle Life Test:	Group C	Cycles: 10	---
-----	Temperature Cycle End Point:	Firing Time	t: ---	10 sec
4.11	** Life Test:	Group D; F=24,000Mc po=30 kw tp=0.5 μsec prr=1000 pps σ'=1.2 max.	t: 1000	---hrs
4.11.4	Life Test End Point:	Arc Loss:	---	1.0 db
		Tuning Susceptance:	B/Yo: -0.06	∕ 0.06
		Equivalent Conductance:	G/Yo: ---	0.10

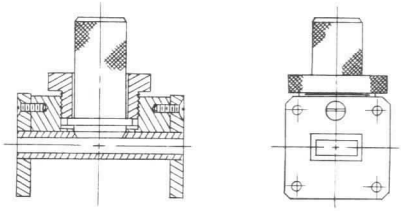
Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The tube is to be mounted per attached drawing of Tube Mounting dated 5-17-55.

Note 3: Vibrate in the plane normal to the tuning diaphram. The tube must satisfy all requirements of this specification subsequent to the vibration test.

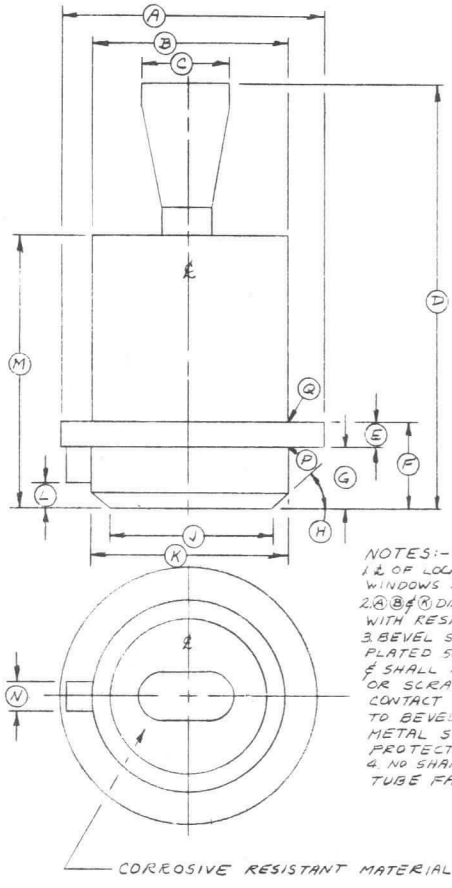
Note 4: All frequencies to be measured within 0.1% of value specified unless otherwise noted.





Notes:

1. Design of holder optional
2. Tube held firmly in position by means of clamping ring
3. Bottom of tube is to be approximately flush with inside surface of waveguide



REF.	DIMENSION
A	.640±.010 DIA.
B	.480±.010 DIA.
C*	.250 MAX.
D*	.945 MAX.
E*	.040 MIN.
F*	.250 MAX.
G	.130 MIN.
H	50°±2°
J	.420+.003 DIA.
K	.490 DIA.
L	.050 MIN. .080 MAX.
M*	.650 MIN. .770 MAX.
N*	.115
P**	1/64 MAX. RAD.
Q**	1/32 MAX. RAD.

NOTES:-
1. ℄ OF LOCATING KEY℄ LONG AXIS OF WINDOWS SHALL COINCIDE WITHIN 5.°
2. Ⓐ Ⓑ ℄ Ⓚ DIA'S. SHALL BE CONCENTRIC WITH RESPECT TO Ⓙ DIA. WITHIN 1/64.
3. BEVEL SHALL BE SILVER PLATED 50MSI (MIN) OR EQUIVALENT ℄ SHALL BE FREE FROM BURRS OR SCRATCHES. MOUNTING CONTACT SHALL BE LIMITED TO BEVEL SURFACES. ALL OTHER METAL SURFACES SHALL BE PROTECTED FROM CORROSION
4. NO SHARP EDGES ON THE TUBE FACE

Bomac	GAS SWITCHING	K_A
	BL639	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 1, 1957

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	4.0	--- kw
Open Circuit Ignitor Voltage	-750	--- Vdc
Ignitor Current	100	200 μAdc.
Weight (approx.)	---	2 ounces

Recommended Ignitor Operating Current 150μAdc (Note 5)

Packing: To be specified.

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain:	------		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	Vibration (1):	Cycles=1; F= 10 cps to F= 55 cps; Total Excursion =0.060 in; t=60 sec; Note 3		---	---
4.18.1	Ignitor Ignition Time:	Ebb=-750Vdc; Ri=3.9Meg.	t :	---	5 sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	325	475Vdc
4.18.4.2	Insertion Loss:	F= 34.50±0.5%kMc Ii=100μAdc	Li :	---	1.0 db
4.18.18	Voltage Standing Wave Ratio:	F= 33.50±0.5%kMc.	σ :	---	1.9
		F= 33.75±0.5%kMc.	σ :	---	1.2
		F= 34.50±0.5%kMc.	σ :	---	1.2
		F= 35.25±0.5%kMc.	σ :	---	1.2
		F= 35.50±0.5%kMc. σ=1.07 max.	σ :	---	1.9
4.18.11	Flat Leakage Power:	F= 35.0 ±5%kMc; po=20±5kw±10%; tp1=0.5±0.1μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc; σ=1.10 max.	pf :	---	40mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.25erg
4.18.28	Arc Loss:	F= 35.0±5%kMc; po=10±10%kw; tp=0.25±0.05μs; prr=1000; Ii=100μAdc; σ=1.10 max.;		---	0.8 db
4.18.15.1	*Recovery Time:	F= 35.0±5%kMc; po=20±10%kw; tp=0.5±0.1μs; prr=1000; Ii=100μAdc; σ=1.10max.	t :	---	5.0μs
4.18.31	*Position of Short:	F= 35.0±5%kMc; po=20±10%kw; tp=0.5±0.1μs; prr=1000; σ=1.10max;	To be specified		
------	*Minimum Firing Power:	tp=0.5±0.1μs; prr=1000; Ii=100μAdc; σ=1.10max.; Note 4	po :	---	0.5w
4.18.17.1	Temperature Cycle:		Cycle :	1	---
4.18.17.2	Temperature Cycle Life Test:	Group D	Cycles :	10	---
4.11	Life Test:	F= 35.0±5%kMc; po=20kw±10%; tp=0.5±0.1μs; prr=1000; Ii=100μAdc; Group D; σ=1.10max.	t :	500	---hrs
4.11.4	Life Test End Point:	Insertion Loss;	Li :	---	1.2 db
		Flat Leakage Power;	pf :	---	60 mw
		Spike Leakage Energy;	Ws :	---	0.3erg
		Recovery Time	t :	---	10μs

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The tube is to be mounted between two choke flanges type UG600/U. Both flanges must have clearance holes of 0.116 dia.

Note 3: Vibrate in a plane normal to the ignitor axis. The ignitor electrode shall not short to the tube body during this test. Tubes shall satisfy all requirements of this specification after the vibration test.

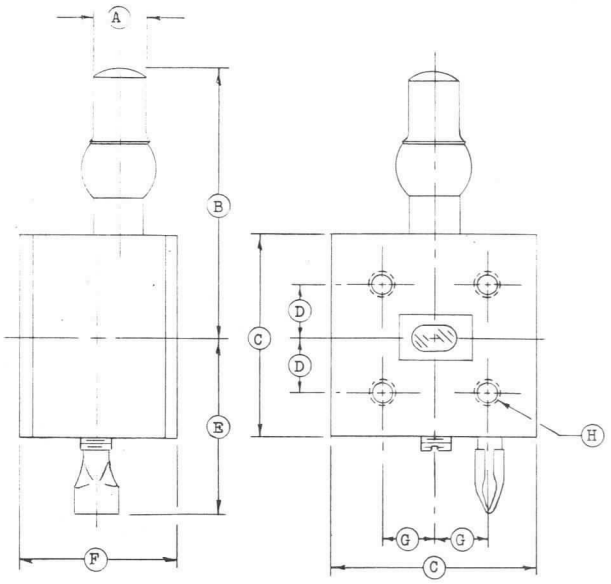
Note 4: The magnetron power is increased until the tube fires. The firing point may be determined by visual observation or by an abrupt decrease of leakage power as measured by a thermistor bridge or equivalent power measuring instrument. The peak power incident on the tube at the firing point shall be less than the specified value.

Note 5: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Ref.	Dimension
A	0.250 Dia. Nom.
B	1.281 Max.
C	1.000 ±.015
D	0.265 ±.002
E	0.828 Max.
F	0.705 ±.005
G	0.250 ±.002
H	#4-40NC-2
	0.125 Min. Deep
	4 Holes Each Flg.

Bomac	DUAL	S
	6636/BL87	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MARCH 10, 1955

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	10	---kw
Open Circuit Ignitor Voltage	- 500	-700Vdc

Test Conditions: Notes 2, 3; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3. 1	Qualification Approval:	Required for JAN Marking	---	---
4. 5	Holding Period:	$t_=$168 hours	---	---
4. 9. 6	*Glass Strain:	-----	---	---
4. 9. 18. 1. 8	Carton Drop:	To be specified	---	---
-----	** Vibration:	$F_=$ 50±2cps; Total Excursion =0. 08±0. 005in; $t_=$2min; Note 4	---	---
4. 18. 18	Voltage Standing Wave Ratio (1):	$F_=$ 2700Mc. $F_=$ 2800Mc. $F_=$ 2900Mc. ; Note 5	σ: --- σ: --- σ :---	1. 2 1. 2 1. 2
4. 18. 18	**Voltage Standing Wave Ratio (2):	Notes 5, 6	σ: ---	1. 2
4. 18. 4. 2	*Duplexer Loss:	$F_=$ 2700Mc. $F_=$ 2800Mc. $F_=$ 2900Mc. ; $I_{i=}$0μAdc; Note 7	Li : --- Li : --- Li : ---	0. 6db 0. 6db 0. 6db
4. 18. 5. 1	*Ignitor Interaction:	$I_{i=}$200μAdc on each electrode; Note 7	△ Li : ---	0. 3db
-----	*Isolation:	$F_=$ 2700Mc. $F_=$ 2800Mc. $F_=$ 2900Mc. Note 8	20 20 20	---db ---db ---db
4. 18. 1	Ignitor Ignition Time:	$E_{bb=}$-500Vdc; $R_{i=}$2. 0 Meg; Note 9	t : ---	5. 0sec.
4. 18. 2	Ignitor Voltage Drop:	$I_{i=}$200μAdc; Note 9	Ei d: 200	400Vdc
4. 18. 11	Flat Leakage Power:	$F_=$ 2800Mc; $p_{o=}$200±10kw; $t_{p1=}$1. 0±0. 15μs; $t_{p2=}$0. 5±0. 15μs; $p_{rr=}$1000; $I_{i=}$200μAdc on each electrode; Note 10	pf : ---	20mw
4. 18. 10	Spike Leakage Energy:	See Flat Leakage Power	Ws: ---	0. 1erg
4. 18. 28	*Arc Loss:	$F_=$ 2800Mc; $p_{o=}$50±10%kw; $t_{p=}$1. 0±0. 1μs; $p_{rr=}$1000; Note 11	---	0. 8db
4. 18. 15. 1	*Recovery Time:	$F_=$ 2800Mc; $p_{o=}$750kw nom; $D_{u=}$. 0008 $I_{i=}$200μAdc on each electrode; Note 12	t : ---	15μs
4. 18. 19	**High Level VSWR:	$F_=$ 2800Mc; $p_{o=}$50±10%kw; $t_{p=}$1. 0±0. 15μs; $p_{rr=}$1000; Note 13	σ: ---	1. 15
4. 11	Life Test:	$F_=$ 2800Mc; $p_{o=}$750±10%kw (min); $D_{u=}$. 0008 $I_{i=}$150-200μAdc on each electrode; Group D; Note 14	t : 500	---hrs.
4. 11. 4	Life Test End Point:	Recovery Time; Flat Leakage Power; Spike Leakage Energy; Duplexer Loss; $F_=$ 2800Mc.	t : --- pf : Ws: --- Li : ---	30μs 20mw . 15erg 0. 8db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 10-20-54. Two gaskets shall be furnished with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V. S. W. R. of less than 1. 12, an even Power Split within ±0. 25 db, and a minimum of 27 db Directivity.

Note 4: Vibrate in a plane perpendicular to the ignitor axes. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attach a low level load, σ=1. 05max., to arms M, R and L. Then the V. S. W. R. looking into arm A shall be within the limits specified.

Note 6: The V. S. W. R. shall be measured at intervals of 25 Mc. from $F_=$ 2700Mc. to $F_=$ 2900Mc. At no frequency in this interval shall the V. S. W. R. be greater than the amount specified.

Note 7: See Test Circuit
A low level load, σ=1. 05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1. 05max., on all empty arms.

Note 9: Measured separately for each ignitor electrode.

Note 10: See Test Circuit
Transmitter po in arm M; a high level load, σ=1. 07max., on arm A; a low level load, σ=1. 07max., on arm L; Leakage Power detected at arm R.

Note 11: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1. 07max., on arm A.

Note 12: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1. 07max., at arm A; a low level load, σ=1. 07 max., on arm L; detector on arm R. The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.

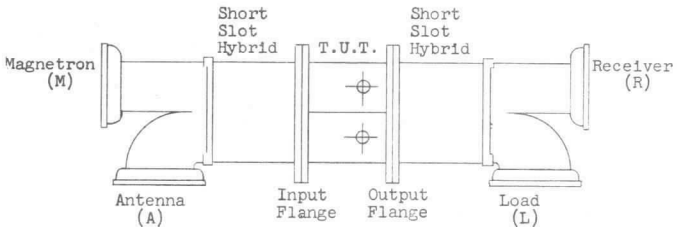
Note 13: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1. 07max., on arm A. The V. S. W. R. looking into arm M, shall be within the limit specified.

Note 14: See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1. 07max., on arm A.

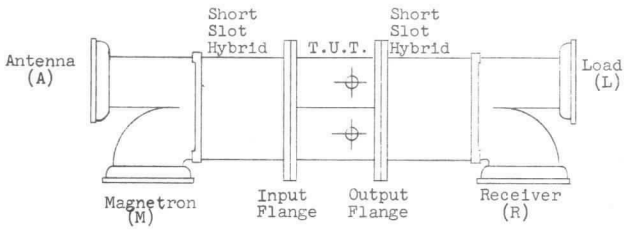
(over)

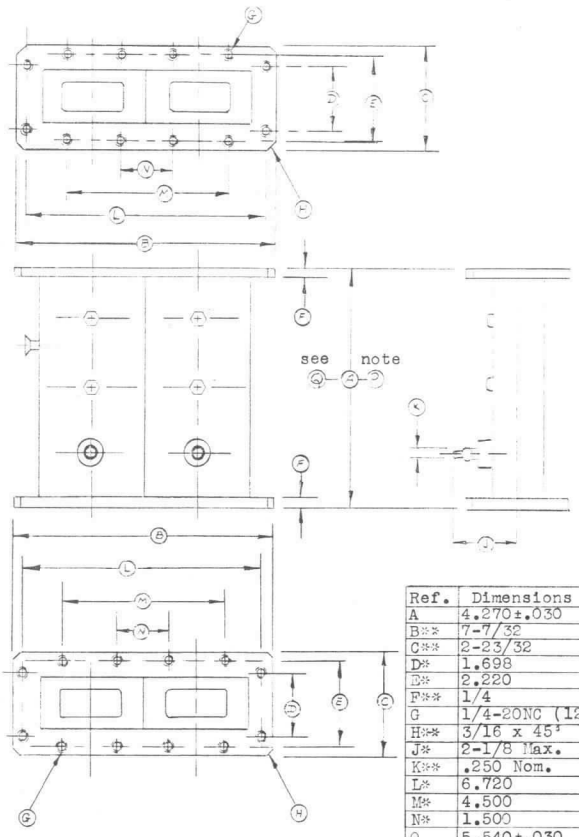
Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



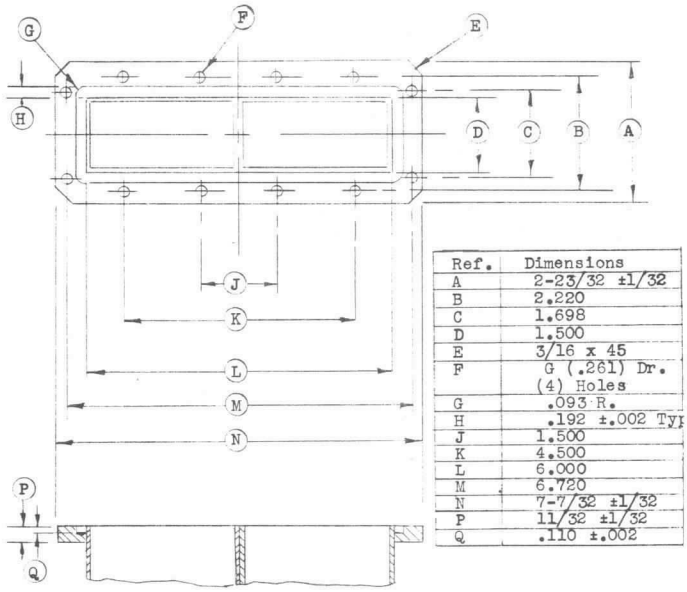
(2)





Ref.	Dimensions
A	4.270±.030
B**	7-7/32
C**	2-23/32
D*	1.698
E*	2.220
F**	1/4
G	1/4-20NC (12) Holes
H**	3/16 x 45°
J*	2-1/8 Max.
K**	.250 Nom.
L*	6.720
M*	4.500
N*	1.500
Q	5.540±.030
P	6.640±.030

Note:- Dimension A applies to BL-652 only.
Dimension P applies to 6636/BL-87 only.
Dimension Q applies to BL-638 only.



Ref.	Dimensions
A	2-23/32 ±1/32
B	2.220
C	1.698
D	1.500
E	3/16 x 45
F	G (.261) Dr. (4) Holes
G	.093 R.
H	.192 ±.002 Typ
J	1.500
K	4.500
L	6.000
M	6.720
N	7-7/32 ±1/32
P	11/32 ±1/32
Q	.110 ±.002

Note:
Used on the following:
BL-638
6636/BL-87

Bomac	DUAL	S
	BL638	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 9, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	10	--- kw
Open Circuit Ignitor Voltage	-500	-700 Vdc

Test Conditions: Notes 2, 3; See Test Circuit

Packing: To be specified.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain:	------		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.9.19.2	**Vibration:	F= 50±2cps; Total Excursion =0.08±0.005in; t=2 min; Note 4		---	---
------	*Insertion:	Note 11			
4.18.18	Voltage Standing Wave Ratio (1):	F1= 2900Mc. F2=3050Mc. F3=3200Mc. Note 5; σ'=1.05max.	σ :--- σ :--- σ :---		1.4 1.4 1.4
4.18.18	**Voltage Standing Wave Ratio (2):	Notes 5, 6 σ'=1.05	σ :---		1.9
4.18.4.2	*Duplexer Loss:	F= 2900Mc. F= 3050Mc. F= 3200Mc. Ii=0μAdc; Note 7	Li :--- Li :--- Li :---		0.6db 0.6db 0.6db
4.18.5.1	*Ignitor Interaction:	Ii=200μAdc on each electrode Note 7	ΔLi :---		0.3db
------	*Isolation:	F1=2900Mc. F2=3050Mc. F3=3200Mc. Note 8		20 20 20	---db ---db ---db
4.18.1	Ignitor Ignition Time:	Note 9	t :---		5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=200μAdc; Note 9	Eid :-250		-400Vdc
4.18.11	Flat Leakage Energy :	F=F2; po=200±10kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; σ' =1.1max.; Ii=200μAdc on each electrode; Note 10	Wi :---		0.4 erg
4.18.10	Spike Leakage Energy:	See Flat Leakage Energy	Ws :---		0.3 erg
4.18.15.1	*Recovery Time:	F= F2; po=750kw nom; Du=.0008; Ii=200μAdc on each electrode; Note 12	t :---		15μs

4.18.19	**High Level VSWR:	F=F2;
		po=50kw;
		tp=1.0μs;
		prr=1000;
		Note 13
			σ :---		1.15

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test:	F=F2; po=750±10%kw(min.) Du=.0008; Ii=150-200μAdc on each electrode; Group C; Note 14	t :	500	---hrs.
4.11.4	Life Test End Point:	Recovery Time; Flat Leakage Energy; Spike Leakage Energy; Duplexer Loss;	t :--- Wi : Ws :--- Li :---		30μs 0.4erg 0.3 erg 1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 10-20-54. Two gaskets shall be furnished with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25 db, and a minimum of 27db Directivity.

Note 4: Vibrate in a plane perpendicular to the ignitor axes. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R, and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 6: The V.S.W.R. shall be measured at intervals of 30Mc. from (F1-30)Mc. to (F3+30)Mc.. At no frequency in this interval shall the V.S.W.R. be greater than the amount specified.

Note 7: See Test Circuit
A low level load, σ =1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 9: Measured separately for each ignitor electrode.

Note 10: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 11: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 12: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R. The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.

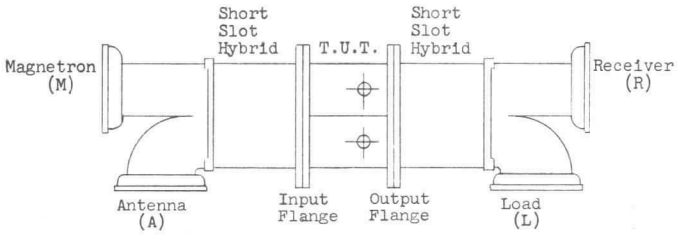
Note 13: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 14: See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

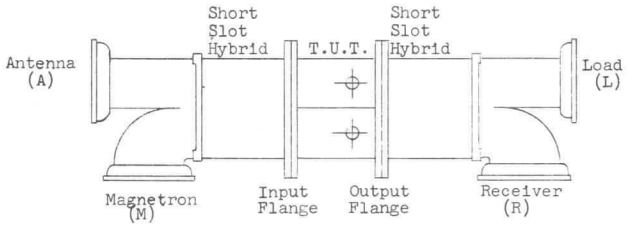
(over)

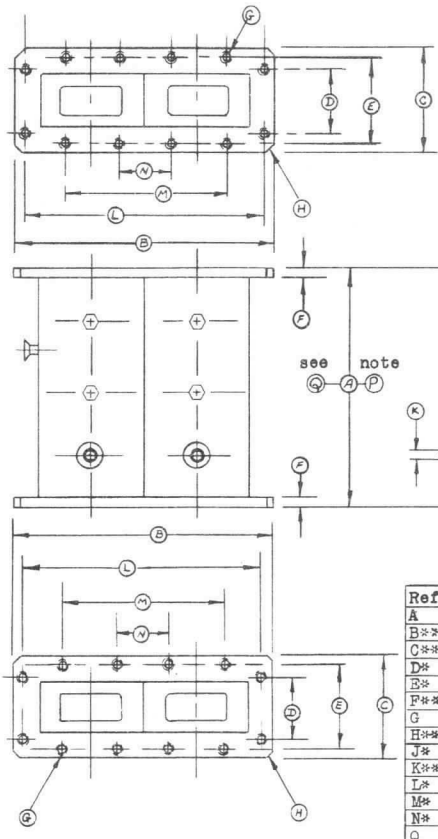
Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



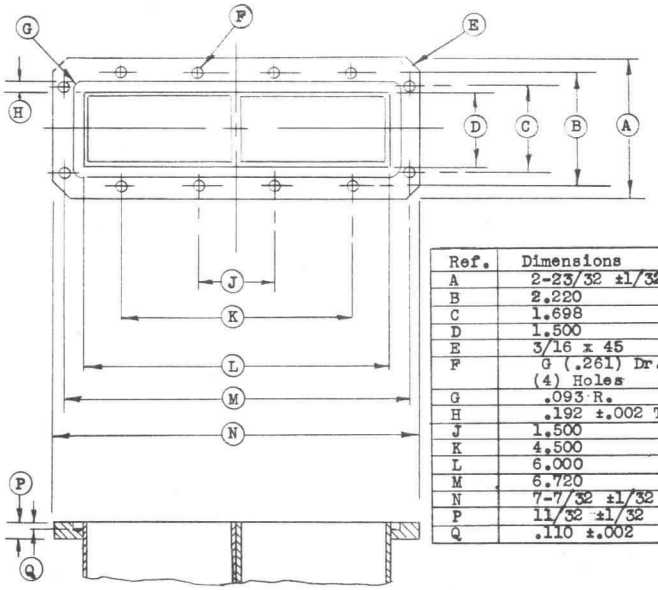
(2)





Ref.	Dimensions
A	4.270±.030
B**	7-7/32
C**	2-23/32
D*	1.698
E*	2.220
F**	1/4
G	1/4-20NC (12) Holes
H**	3/16 x 45°
J*	2-1/8 Max.
K**	.250 Nom.
L*	6.720
M*	4.500
N*	1.500
Q	5.540±.030
P	6.640±.030

Note:- Dimension A applies to BL-652 only.
Dimension P applies to 6636/BL-87 only.
Dimension Q applies to BL-638 only.



Ref.	Dimensions
A	2-23/32 ±1/32
B	2.220
C	1.698
D	1.500
E	3/16 x 45
F	G (.261) Dr. (4) Holes
G	.093 R.
H	.192 ±.002 Typ
J	1.500
K	4.500
L	6.000
M	6.720
N	7-7/32 ±1/32
P	11/32 ±1/32
Q	.110 ±.002

Note:
Used on the following:
BL-638
6636/BL-87
BL-346

Bomac	DUAL	S
	BL652	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 14, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	10	---kw
Open Circuit Ignitor Voltage	-500	-700Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft

Recommended Ignitor operating Current 150 μAdc (Note 15)

Test Conditions: Notes 2, 3; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.6	*Glass Strain:	-----	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	F=50±2cps; Total Excursion =0.08±0.005in; t=2min; Note 4	---	---
4.18.18	Voltage Standing Wave Ratio (1):	F=3400±0.1%Mc σ:---		1.4
		F=3550±0.1% σ:---		1.4
		F=3700±0.1%Mc σ:---		1.4
		Note 5		
4.18.18	**Voltage Standing Wave Ratio (2):	Notes 5, 6 σ:---		1.2
4.18.4.2	*Duplexer Loss:	F=3400±0.1%Mc; Li: --- F=3550±0.1% F=3700±0.1%Mc., Ii=0μAdc; Note 7		0.6db
4.18.5.1	*Ignitor Interaction:	Ii=200μAdc ΔLi: --- on each electrode; Note 7		0.3db
-----	*Isolation:	F=3400±0.1%Mc	15	---db
		F=3550±0.1%	15	---db
		F=3700±0.1%Mc	15	---db
		Note 8		
4.18.1	Ignitor Ignition Time:	Ebb=-500Vdc; t: --- Ri=2.0 Meg; Note 9		5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=200μAdc; Eid: 200 Note 9		400 Vdc
4.18.11	Flat Leakage Power:	F=3550±5%Mc.; pf: --- po=200±10kw; tp1=1.0±0.15μs; tp 2=0.5±0.15μs; prr=1000; Ii=200μAdc on each electrode; Note 10		20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power Ws:---		0.1erg
4.18.28	*Arc Loss:	F=3550±5%Mc.; --- po=50±10%kw; tp=1.0±0.1μs; prr=1000; Note 11		0.8db
4.18.15.1	*Recovery Time:	F=3550±5%Mc.; t: --- po=750kw nom; Du=.0008 Ii=200μAdc on each electrode; Note 12		15μs

Ref.	Test	Conditions	Min.	Max.
4.18.19	**High Level VSWR:	F=3550±5%Mc; σ: --- po=50±10%kw; tp=1.0±0.15μs; prr=1000; Note 13		1.15
4.11	Life Test:	F=3550±5%Mc; t: 500 po=750±10%kw (min); Du=.0008 Ii=150-200μAdc on each electrode; Group D; Note 14		---hrs.
4.11.4	Life Test End Point:	Recovery Time; t: ---		30μs
		Flat Leakage Power; pf: ---		20mw
		Spike Leakage Energy; Ws:---		15erg
		Duplexer Loss; Li:--- F=2800Mc.		0.8db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 10-20-54. Two gaskets shall be furnished with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 4: Vibrate in a plane perpendicular to the ignitor axes. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attach a low level load. σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 6: The V.S.W.R. shall be measured at intervals of 25 Mc. from F=3400Mc. to F=3700 Mc. At no frequency in this interval shall the V.S.W.R. be greater than the amount specified.

Note 7: See Test Circuit
A low level load, σ=1.05 max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 9: Measured separately for each ignitor electrode.

Note 10: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 11: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load. σ=1.07max., on arm A.

Note 12: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07 max., on arm L; detector on arm R. The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000μs after the pulse.

Note 13: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 14: See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

(over)

Note 15: The recommenced ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of required series resistance.

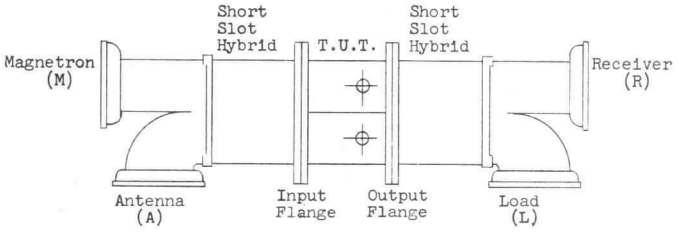
$$\text{Series Resistance (R)} = \frac{\text{Ebb-Eid}}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open Circuit supply voltage
Eid= Average (center) ignitor voltage drop.

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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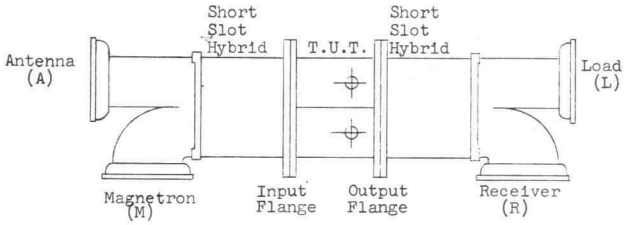
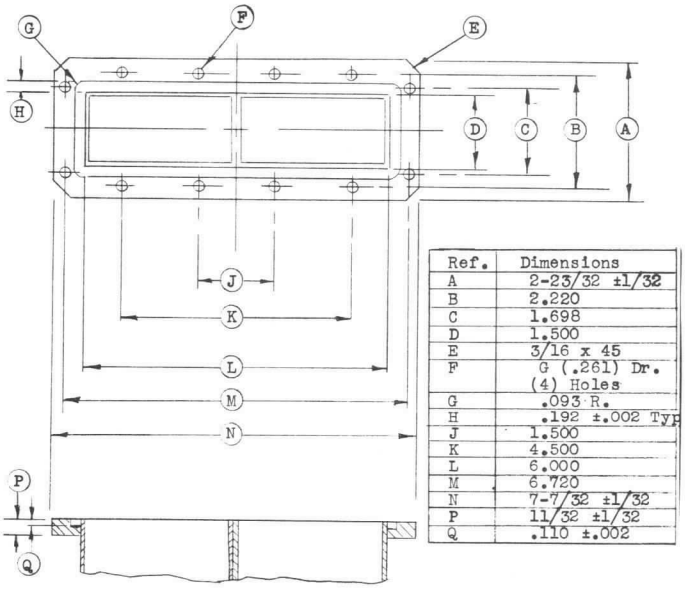
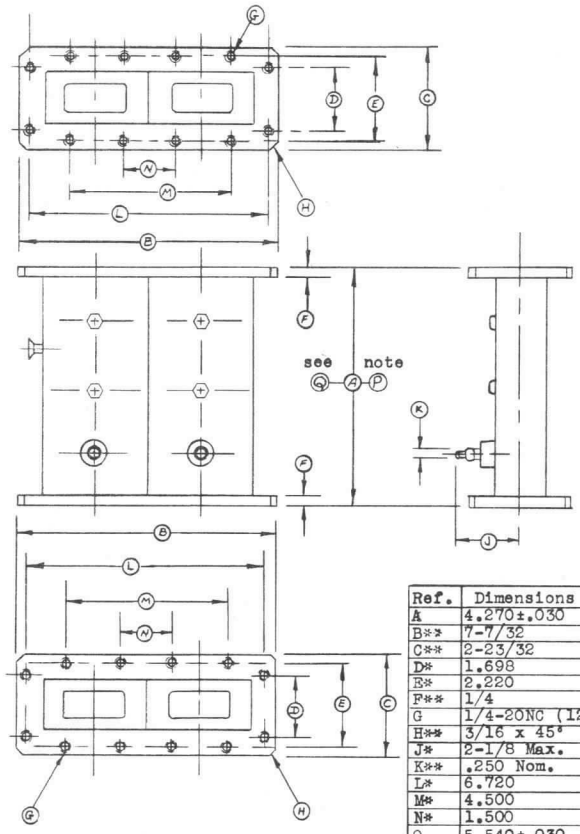




Ref.	Dimensions
A	2-23/32 ±1/32
B	2.220
C	1.698
D	1.500
E	3/16 x 45
F	G (.261) Dr. (4) Holes
G	.093 R.
H	.192 ±.002 Typ
J	1.500
K	4.500
L	6.000
M	6.720
N	7-7/32 ±1/32
P	11/32 ±1/32
Q	.110 ±.002

Note:
Used on the following:
BL-638
6636/BL-87
BL-346
BL-652



Ref.	Dimensions
A	4.270±.030
B**	7-7/32
C**	2-23/32
D*	1.698
E*	2.220
F**	1/4
G	1/4-20NC (12) Holes
H**	3/16 x 45°
J*	2-1/8 Max.
K**	.250 Nom.
L*	6.720
M*	4.500
N*	1.500
Q	5.540±.030
P	6.640±.030

Note:- Dimension A applies to BL-652 only.
Dimension P applies to 6636/BL-87 only.
Dimension Q applies to BL-638 only.

Bomac	DUAL	C
	6640/BL60	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1955

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5 kw	700 kw
Open Circuit Ignitor Voltage	-700 Vdc	---
Altitude	---	10,000 ft
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 uAdc (Note 17) (each electrode)

Test Conditions: Notes 2, 3; See Test Circuit

Packing: To Be Specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	*Vibration (1):	Cycles=1; F=25 to F=33 cps; G=10; t=60 sec; Notes 4, 5	---	---
----	**Vibration (2):	Cycles = 5; F=5 to F=25 cps; Total Excursion =0.320 in; t=15 min; Notes 4, 5	---	---
4.9.20.5	**Shock:	G=15; 6 blows in each of 3 perpendicular planes; Note 5	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5400Mc	σ:---	1.3
		F= 5450	σ:---	1.2
		*F= 5500	σ:---	1.2
		*F= 5550	σ:---	1.2
		*F= 5600	σ:---	1.2
		F= 5650	σ:---	1.2
		*F= 5700	σ:---	1.2
		*F= 5750	σ:---	1.2
		*F= 5800	σ:---	1.2
		F= 5850	σ:---	1.2
		F= 5900; Note 6	σ:---	1.3
4.18.4.2	Duplexer Loss (1):	F= 5400Mc	Li:---	1.0db
		F= 5450	Li:---	0.8db
		F= 5650	Li:---	0.8db
		F= 5850	Li:---	0.8db
		F= 5900; Ii=100μAdc on each electrode; Note 7	Li:---	1.0db
4.18.4.2	**Duplexer Loss (2):	F= 5400Mc	---	---
		F= 5450	---	---
		F= 5650	---	---
		F= 5850	---	---
		F= 5900; Ii=100μAdc on each electrode; Note 8	---	---
-----	Isolation:	F= 5400Mc	15	---db
		F= 5450	17	---db
		F= 5650	20	---db
		F= 5850	17	---db
		F= 5900; Ii=0μAdc; Note 9	15	---db
4.18.5.1	*Ignitor Interaction:	Ii=100uAdc on each electrode	ΔLi:---	0.2db
4.18.1	*Ignitor Ignition Time:	Ebb=700Vdc; R=4.0Meg; Note 10	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100uAdc; Note 10	Eid:200	400Vdc
4.18.11	Flat Leakage Power:	F= 5650Mc; po=70±10%kw; tp1=1.0±0.1us; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf:---	10mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss (1):	F= 5650Mc; po=5±10%kw; prr=1000; tp=1.0±0.1μs; Note 12	---	0.9db
4.18.28	*Arc Loss (2):	F= 5650Mc; po=40±10%kw; prr=1000; tp=1.0±0.1μs; Note 12	---	0.5db
4.18.15.1	*Recovery Time:	F= 5650Mc; po=625±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	t:---	12μs
4.18.19	**High Level VSWR:	F= 5650Mc; po=300±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	σ:---	1.2
4.18.31	Position of Short:	σ=1.10max.; F= 5650Mc; po=70±10%kw; tp=1.0±0.1μs; prr=1000; Note 15	---	±0.010in
4.11	Life Test:	F= 5650Mc; po=625±10%kw; (min.); tp=1.0±0.1μs; prr=1250; Ebb=-700Vdc; Ri=2.7 meg. each electrode; Group D; Note 16	t:500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:---	15μs
		Flat Leakage Power;	pf:---	20mw
		Spike Leakage Energy;	Ws:---	0.20erg
		Duplexer Loss, F= 5650Mc.	Li:---	1.0db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawings of Mating Flange, dated 2-1-55. Two gaskets will be supplied with each tube.

Note 3: Each Short Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25db, and a minimum of 27db Directivity.

Note 4: Vibrate once along each of two perpendicular lines, both lying in the plane perpendicular to the axes of the ignitor electrodes.

Note 5: During this test the ignitor electrodes shall not short to the tube body. Subsequent to tee test the tube shall meet all requirements of this specification.

Note 6: See Test Circuit
Attach a low level load, σ=1.05max., ot arms M, R, and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 7: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

(over)

Note 8: See Test Circuit
A low level load, σ=1.05max., on arm L; an adjustable short on arm M; a low level signal in arm A is detected at arm R. The Duplexer Loss shall not change more than ±0.2db with the short circuit at various phase positions in arm M.

Note 9: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and than at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

Note 11: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube at hybrid output; a power monitoring device followed by a high level load, σ=1.07max., at arm A.

Note 13: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., at arm L; detector at arm R.

Note 14: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07max., at arm A. The V.S.W.R. looking into arm M, should be within the limits specified.

Note 15: This test is to be performed on each half of the tube separately. With a metal plate shorting the line, the position of the V.S.W. minimum shall be determined. The metal plate shall be replaced by the tube and the position of the V.S.W. minimum of the flat portion of the pulse shall be measured and shall be 0.046 in. further from the magnetron within the limits specified.

Note 16: See Test Circuit '
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07max., at arm A.

Note 17: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

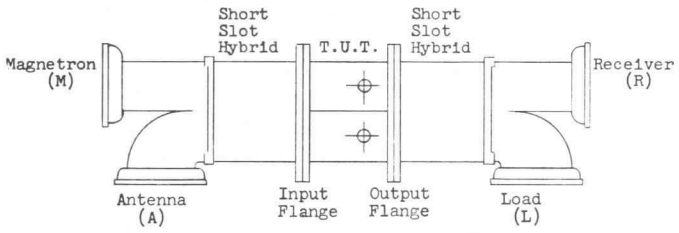
$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (Megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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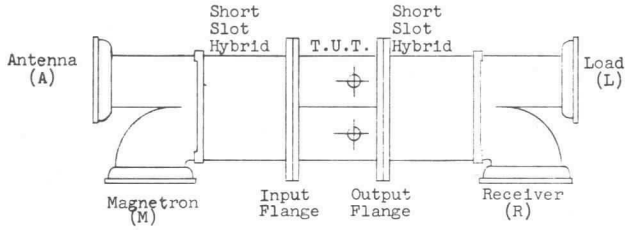
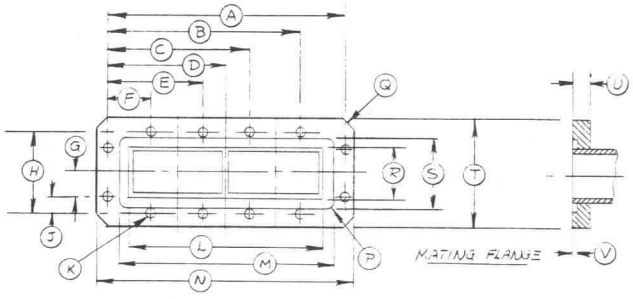
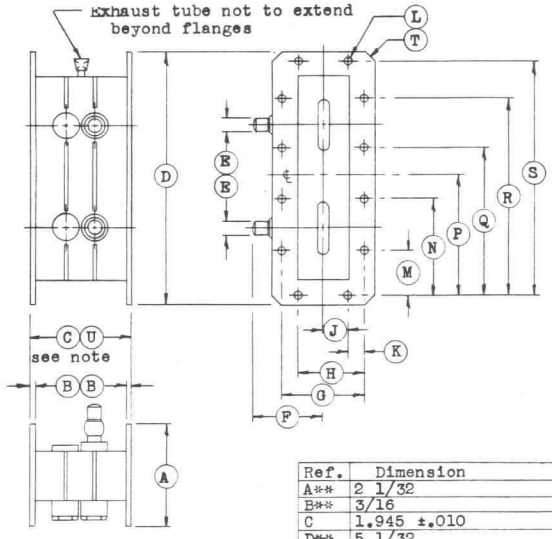




REF	DIMENSIONS	REF	DIMENSIONS
A	4.658 ±002	P	3/32 R
B	3.829 ±002	Q	3/16 x 45° CHAMFER
C	2.829 ±002	R	1.000
D	2.329 ±003	S	1.375
E	1.829 ±002	T	2 1/32
F	.829 ±002	U	.350 MIN
G	.600 ±003	V	.110 ±002
H	1.658 ±002		
J	.329 ±003		
K	13/64(.203) DR (12) HOLES		
L	4.000		
M	4.375		
N	5 1/32		



Ref.	Dimension
A**	2 1/32
B**	3/16
C	1.945 ±.010
D**	5 1/32
E**	0.250 Dia. Nom.
F*	1 13/16 Max.
G*	1.658 ±.002
H*	1.329 ±.002
J*	0.500 ±.003
K*	0.329 ±.003
L	#10-32NF 12 Holes Ea. Flg.
M*	0.829 ±.002
N*	1.829 ±.002
P*	2.329 ±.003
Q*	2.829 ±.002
R*	3.829 ±.002
S*	4.658 ±.002
T**	3/16 x 45° Chamfer
U	2.345 ±.015

Note:-

Dimension C applies to 6640/BL-60 only.

Dimension U applies to 6641/BL-86 and BL-644 only.

Bomac	DUAL	C
	6905/BL613	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
APRIL 2, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.	
Transmitter po	5	3000	kw
Open Circuit Ignitor Voltage	-700	---	Vdc
Ignitor Current	100	200	μAdc
Altitude	---	10,000	ft.
Recommended Ignitor Operating Current	---	150 μAdc	Note 15

Test Conditions: Notes 2, 3; See Test Circuit

Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop	To be specified	---	---
-----	*Vibration (1):	Cycles =1; F=25 to F=33 cps; G=10; t=60 sec; Notes 4,5	---	---
-----	Phase Shift Tolerance:	F=5450 Mc, λg=6.74	Ψ= -32	-42°
		F=5650 Mc, λg=6.40	Ψ= +11	+21°
		F 5825 Mc, λg=6.12	Ψ= +55	+65°
		Note 17		
4.18.18	Voltage Standing Wave Ratio:	F= 5400 Mc	σ: ---	1.3
		F= 5450	σ: ---	1.2
		*F= 5500	σ: ---	1.2
		*F= 5550	σ: ---	1.2
		*F= 5600	σ: ---	1.2
		F= 5650	σ: ---	1.2
		*F= 5700	σ: ---	1.2
		*F= 5750	σ: ---	1.2
		*F= 5800	σ: ---	1.2
		F= 5850	σ: ---	1.2
		F= 5900	σ: ---	1.3
		Note 6		
4.18.4.2	Duplexer Loss (1):	F= 5400 Mc	Li: ---	1.2 db
		F= 5450	Li: ---	1.0 db
		F= 5650	Li: ---	1.0 db
		F= 5850	Li: ---	1.0 db
		F= 5900	Li: ---	1.2 db
		Ii=100μAdc on each electrode; Note 7		
-----	*Isolation:	F= 5400 Mc	10	--- db
		F= 5450	10	--- db
		F= 5650	12	--- db
		F= 5850	10	--- db
		F= 5900; Ii=0μAdc; Note 9	10	--- db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc	t: ---	5.0sec.
		R= 4.0Meg; Note 10		
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 10	Eid: 200	400 Vdc
4.18.11	Flat Leakage Power:	F= 5650 Mc; ±10% po=70±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf: ---	10mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws: ---	0.1 erg
4.18.28	*Arc Loss (2):	F= 5650 Mc; ±10% po=40±10%kw; prr=1000; tp=1.0±0.1μs; Note 12	---	1.0 db
4.18.15.1	*Recovery Time (1):	F= 5650 Mc; ±10% po=1000±10%kw tp=1±0.1μsec prr=1000 Ii=100μAdc each electrode Note 13	t: ---	7 μsec
4.18.15.1	** Recovery Time (2):	F= 5650 Mc ±10% po=3000±10%kw tp=3.0±0.3μs; prr=500 Ii=100μAdc each electrode Note 13	t: ---	10 μs
4.18.15.1	** Recovery Time (3):	F= 5650 Mc ±10% po=3000±10%kw tp=0.3±0.05 μs prr=900 Ii=100μAdc on each electrode Note 13	t: ---	8 μs
4.18.19	** High Level VSWR:	F= 5650 Mc; ±10% po=300±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	σ: ---	1.2
4.11	Life Test (1):	F= 5650 Mc±10% po=1000±10%kw (min) tp=1.0±0.1μs prr=1000 Ebb=-700Vdc; Ri=2.7meg ohm (each electrode) Group D Note 16	t: 500	---hrs
4.11	** Life Test (2):	F= 5650 Mc±10% po=3000±10%kw tp=3.0±0.3 μsec prr=500 Ebb=-700Vdc: Ri=2.7 meg ohm (each electrode) Note 16	t: 500	hrs
4.11.4	Life Test End Point (1):	Recovery Time (1)	t: ---	10 μs
		Flat Leakage Power	pf: ---	20 mw
		Spike Leakage Energy	Ws: ---	0.20 erg
		Duplexer Loss: F= 5650 Mc	Li: ---	1.0 db
4.11.4	** Life Test End Point (2):	Recovery Time (2)	t: ---	15us

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange and Gasket, dated 8-3-54.

Note 3: Each Short Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ± 0.25db, and a minimum of 27 db Directivity.

Note 4: Vibrate once along each of two perpendicular lines, both lying in the plane perpendicular to the axes of the ignitor electrodes.

Note 5: During this test the ignitor electrodes shall not short to the tube body. Subsequent to the test the tube shall meet all requirements of this specification.

Note 6: See Test Circuit "A".
Attach a low level load, σ≤ 1.05 max., to arms M, R, and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 7: See Test Circuit "A".
A low level load, σ≤ 1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: All low level frequencies measurements are to be measured within 0.1% of the value specified.

(over)

Note 9: See Test Circuit "A".
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

Note 11: See Test Circuit "A".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit "A".
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube at hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., at arm A.

Note 13: See Test Circuit "A".
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07 max., at arm L; detector at arm R.

Note 14: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07 max., at arm A. The V.S.W.R. looking into arm M, should be within the limits specified.

Note 15: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

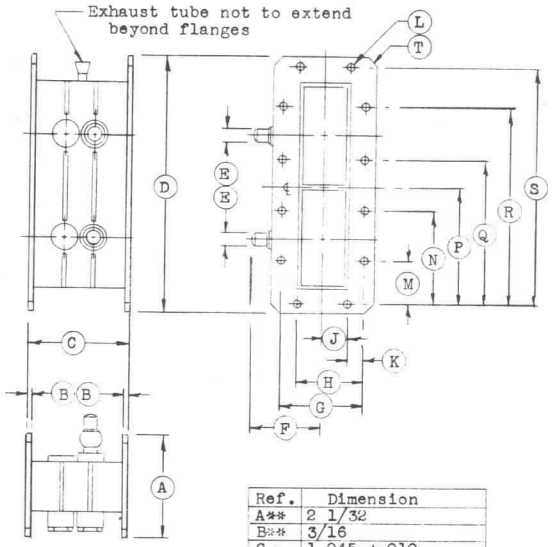
$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (meg ohms)}$$

Where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 meg ohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

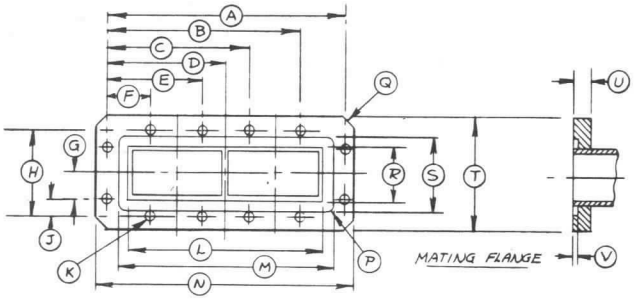
Note 16: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07 max., at arm A.

Note 17: Transmission phase shift to be measured as shown in Test Circuit "S". Criterion for measuring point will be λg rather than frequency.



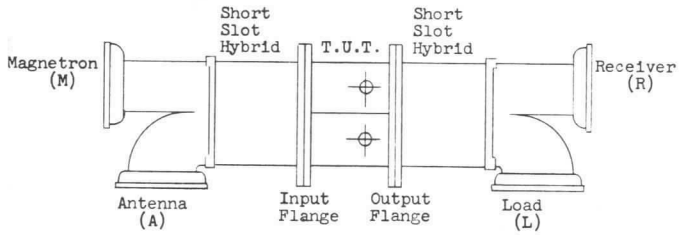
Ref.	Dimension
A**	2 1/32
B**	3/16
C	1.945 ±.010
D**	5 1/32
E**	0.250 Dia. Nom.
F*	1 13/16 Max.
G*	1.658 ±.002
H*	1.329 ±.002
J*	0.500 ±.003
K*	0.329 ±.003
L	#10-32NF 12 Holes Each Flange
M*	0.829 ±.002
N*	1.829 ±.002
P*	2.329 ±.003
Q*	2.829 ±.002
R*	3.829 ±.002
S*	4.658 ±.002
T**	3/16 x 45° Chamfer

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

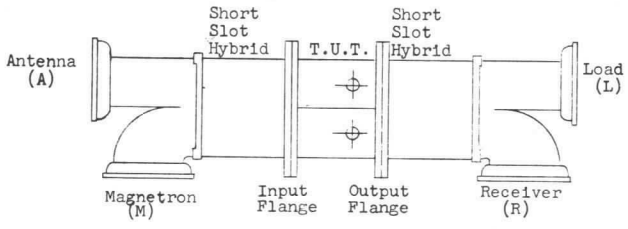


REF.	DIMENSIONS	REF.	DIMENSIONS
A	4.658 ±002	P	3/32 R
B	3.829 ±002	Q	3/16 X 45° CHAMFER
C	2.829 ±002	R	1.000
D	2.329 ±003	S	1.975
E	1.829 ±002	T	2 1/32
F	.829 ±002	U	.350 MIN
G	.600 ±003	V	.110 ±002
H	1.658 ±002		
J	.329 ±003		
K	13/64 (203) DR (12) HOLES		
L	4.000		
M	4.375		
N	5 1/32		

(1)



(2)



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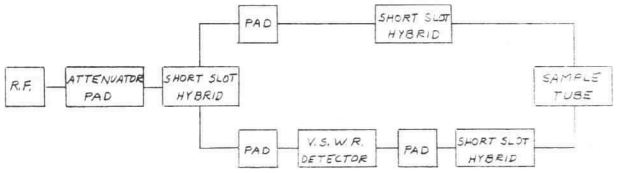
BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
APRIL 2, 1956

BLOCK DIAGRAM

TRANSMISSION PHASE SHIFT MEASUREMENT



Initial Procedure

1) Short Slot hybrids should have all free arms terminated in matched loads, σ=1.05 max.

2) With dummy tube in place of sample tube, adjust attenuators until the voltage standing wave ratio is at least 15 db.

3) Frequency set to proper point by reading λg from slotted line

Measurement Procedure

1) With dummy tube (straight section of waveguide equal in length to the BL-613) in position, measure position of minimum V. S. W.

2) Insert Sample tube

3) Observe new position of V. S. W. and calculate phase shift as follows

a) phase shift in cm = Δlcm

b) double = 2Δlcm

c) phase shift in degrees = $\frac{2\Delta l}{\lambda g} 360$

Bomac	DUAL	C
	BL352	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 4, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.	Nom.
Transmitter po	5	700	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Ignitor Current	100	200	---μAdc
Shutter Circuit Voltage	---	---	28Vdc
Shutter Circuit Resistance (25°C)	90	110	100 ohms
Pull in Current	220	---	---mAdc
Holding Current	110	320	---mAdc
Altitude	---	10,000	--- ft.

Test Conditions: Note 2, 3, 18, 19, See Test Circuit

Recommended Ignitor Operating Current 150μAdc Note 20

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t= 168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	**Vibration (1):	Cycles =1; F=25 to F=33 cps; G=10; t =60 sec; Notes 4, 5	---	---
------	**Vibration (2):	Cycles=5; F= 5 to F=25 cps; Total Excursion = 0.320 in; t=15 min; Notes 4, 5	---	---
------	**Vibration (3):	Cycles = 1; F=25 to 500 cps; G=15; Shutter Current= 110 mAdc; t =5min; Note 16	---	---
------	Shutter Current	Shutter Voltage = 28 Vdc	I:254	311 mAdc
------	Pull in Current:	------	I:---	220 mAdc
------	Holding Current:	Note 17	I:---	110 mAdc
4.18.18	Voltage Standing Wave Ratio:	F=5400Mc	σ:---	1.3
		F=5450	σ:---	1.2
		*F=5500	σ:---	1.2
		*F=5550	σ:---	1.2
		*F=5600	σ:---	1.2
		F=5650	σ:---	1.2
		*F=5700	σ:---	1.2
		*F=5750	σ:---	1.2
		*F=5800	σ:---	1.2
		F=5850	σ:---	1.2
		F=5900;Mc Notes 6, 21	σ:---	1.3
4.18.4.2	Duplexer Loss (1):	F=5400 Mc;	Li:---	1.0db
		F=5450	Li:---	0.8db
		F=5650	Li:---	0.8db
		F=5850	Li:---	0.8db
		F=5900; Ii=100μAdc on each electrode; Notes 7, 21	Li:---	1.0db
4.18.4.2	Duplexer Loss(2):	Shutters Closed; *F=5400Mc	Li:40	---db
		*F=5450	Li:40	---db
		F=5650	Li:40	---db
		*F=5850	Li:40	---db
		*F=5900 Notes 7	Li:40	---db
------	Isolation:	F=5400 Mc;	15	---db
		F=5450	17	---db
		F=5650	20	---db
		F=5850	17	---db
		F=5900; Ii: =0μAdc; Notes 8, 21	15	---db

Ref.	Test	Conditions	Min.	Max.
4.18.5.1	*Ignitor Interaction:	Ii: =100 μAdc on each electrode	ΔLi:---	0.2db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; R=4.0 Meg; Note 9	t:---	5.0 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc; Note 9	Eid:200	400Vdc
4.8.11.	Flat Leakage Power	F=5650 Mc±5% po =300±10%kw; tp1= 1.0±0.1 μs; tp2= 0.5±0.05μs; prr=1000; Ii=100 μAdc on each electrode; Note 10	pf:---	25mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.15 erg
4.18.28	*Arc Loss (1):	F=5650Mc ±5% po=5±10%kw; prr=1000; tp=1.0±0.1μs; Note 11	---	0.9 db
4.18.28	*Arc Loss (2):	F=5650Mc ±5% po=40±10%kw; prr=1000; tp=1.0±0.1μs; Note 11	---	0.5 db
4.18.15.1	*Recovery Time:	F=5650 Mc±5% po 300±10%kw; tp=1.0±0.1μs; prr 1000; Ii=100μAdc on each electrode; Note 12	t: ---	5.0μs
4.18.19	**High Level VSWR:	F=5650Mc±5% po=300±10% tp=1.0±0.1us; prr=1000; Ii=100μAdc on each electrode; Note 13	σ:---	1.2
4.18.31	Position of Short:	σ=1.10 max.; F=5650Mc±5% po=70±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	---	±0.010 in.
4.11	Life Test (1):	F=5650Mc±5% po=300kw±10%kw; (min.); tp=1.0±0.1μs; prr=1250; Ebb=-700Vdc; Ri=2.8 meg ohm on each electrode; Group D; Note 15	t: 500	---hrs
4.11	Life Test (2):	cps=10max; Group D; Note 22	Cycles:	50,000 ---
4.11.4	Life Test End Point: (1 and 2)	Recovery Time;	t:---	7μs
		Flat Leakage Power;	pf:---	50mw
		Spike Leakage Energy:	Ws:---	0.30erg
		Duplexer Loss, F=5650 Mc.	Li:---	1.0 db

(over)

Ref.	Test	Conditions	Min.	Max.
4.11.4	Life Test End Point: (1 and 2)	Duplexer Loss (2) F-5650 Mc.	Li ; 40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawings of Mating Flange, ' dated 2-1-55. Two gaskets will be supplied with each tube. See BLG-29 Gasket outline attached dated 8-31-56.

Note 3: Each Short Slot Hybrid Junction used, at all specified fre-qu quencies, should have a V. S. W. R. of less than 1. 12 an even Power Split within 0. 25 db, and a minimum of 27 db. Directivity.

Note 4: Vibrate once along each of two perpendicular lines, both lying in the plane perpendicular to the axes of the ignitor electrodes

Note 5: During this test the ignitor electrodes shall not short to the tube body. Subsequent to the test the tube shall meet all requirements of this specification.

Note 6: See Test Circuit
Attach a low level load, o-1. 05 max., on arms M, R. and L. Then the V. S. W. R. looking into arm A should be within the limits specified.

Note 7: See Test Circuit
A low level load, o-1. 05 max., on arms L., an adjustable short on arm M; a low level signal in arm A is detected at arm R. The duplexer loss shall not change more than -0. 2db with the short circuit at various phase positions in arm M.

Note 8: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, o-1. 05 max, on all empty arms.

Note 9: Measured separately for each ignitor electrode.

Note 10: See Test Circuit
Transmitter po in arm M; a high level load, o-1. 07 max., on arm A; a low level load, o-1. 07 max., on arm L; Leakage Power detected at arm R.

Note 11: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube at hybrid output; a power monitoring device followed by a high level load, o-1. 07 max., at arm A.

Note 12: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load o-1. 07 max., at arm A; a low level load, o-1. 07 max., at arm L; detector at arm R.

Note 13 See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, o-1. 07 max., at arm A. The V. S. W. R. looking into arm M, should be within the limits specified.

Note 14: This test is to be performed on each half of the tube separately. With a metal plate shorting the line, the position of the V. S. W. minimum shall be determined. The metal plate shall be replaced by the tube and the position of the V. S. W. minimum of the flat portion of the pulse shall be measured and shall be 0. 046 in. further from the magnetron within the limits specified specified.

Note 15: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, o-1. 07 max., at arm A.

Note 16: Vibrate along a line, parallel to the axes of the shutters. Duplexer loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry maybe substituted for the shutter tube. The modulation (Li), due to the vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of the specification after the vibration test.

Note 17: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G-15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 18: The shutters of the BL-352 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 19: Unless otherwise specified all low and high level tests are to be made with the shutters open.

Note 20: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

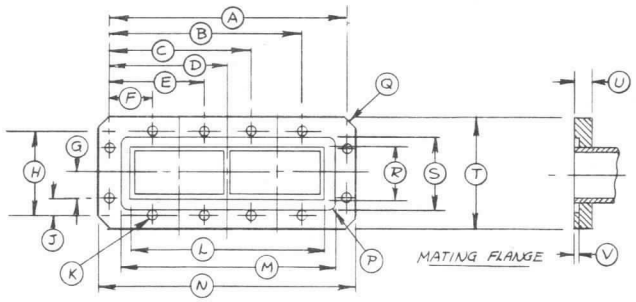
$$\text{Series Resistance (Ri)} = \frac{Ebb - Eid}{150} \text{ (meg ohms)}$$

where Ri = Total series resistance
Ebb = Open circuit supply voltage
Eid = Average (center) ignitor voltage drop

At least 0. 5 meg ohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 21: All frequencies are to be measured within 0. 1% of the value specified, unless otherwise noted.

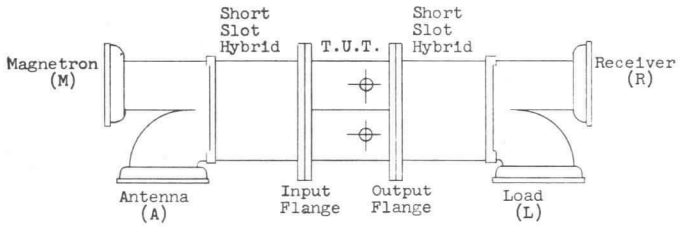
Note 22: 28 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.



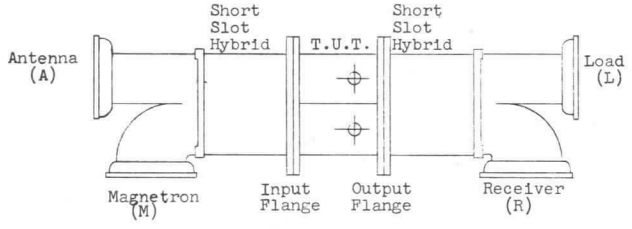
REF	DIMENSIONS	REF	DIMENSIONS
A	4.658 ±002	P	5/32 R
B	3.829 ±002	Q	3/16 x 45° CHAMFER
C	2.829 ±002	R	1.000
D	2.329 ±003	S	1.375
E	1.829 ±002	T	2 1/32
F	.829 ±002	U	.350 MIN
G	.600 ±003	V	.110 ±002
H	1.658 ±002		
J	.329 ±003		
K	13/64 (.203) DR (12) HOLES		
L	4.000		
M	4.375		
N	5 1/32		

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



(2)



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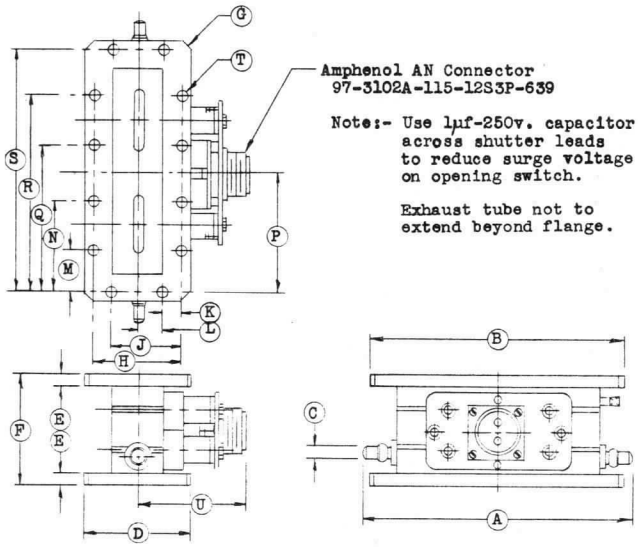
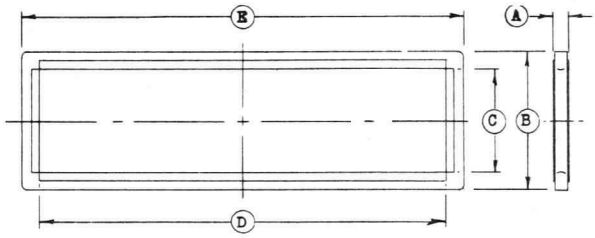
BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 4, 1956



Amphenol AN Connector
97-3102A-115-12S3P-639

Note:- Use 1μf-250v. capacitor across shutter leads to reduce surge voltage on opening switch.

Exhaust tube not to extend beyond flange.



Ref.	Dimension	Ref.	Dimension
A*	5 1/4 Max.	L*	0.500±.003
B**	5 1/32	M*	0.829±.002
C**	0.250 Dia. Nom.	N*	1.829±.002
D**	2 1/32	P*	2.329±.003
E**	3/16	Q*	2.829±.002
F	1.945±.010	R*	3.829±.002
G**	3/16 x 45° Chamfer	S*	4.658±.002
H*	1.658±.002	T	13/64 Dr. 12 Holes Each Flange
J*	1.329±.002		
K*	0.329±.003	U*	2 1/4 Max.

Ref.	Dimension
A*	0.152 Nom.
B	1.364 Max.
C	1.004 Min.
D	4.004 Min.
E	4.366 Max.

Bomac	DUAL	L
	BL644	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 27, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	5	1000 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ambient Temperature (Note 3)	-65	+100°C
Altitude	---	15,000 ft.
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 16)

Test Conditions: Notes 2, 4, See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	*Vibration (1):	Cycles=1; F=25 to F=33cps; G=10; t=60 sec; Notes 5, 6	---	---
------	**Vibration (2):	Cycles=5; F=5 to F=25 cps; Total Excursion =0.320 in; t=15 min; Notes 5, 6	---	---
4.9.20.5	**Shock:	G=15; 6 blows in each of 3 perpendicular planes; Note 6	---	---
4.18.16	*Pressure Operation:	60 p.s.i. (abs)	---	---
4.18.17.1	*Temperature Cycle:	T= -65°C to T= +100°C	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5220Mc F= 5250 F= 5280 F= 5310 F= 5340Mc; Note 7	σ :--- σ :--- σ :--- σ :--- σ :---	1.3 1.2 1.2 1.2 1.3
4.18.4.2	Duplexer Loss:	F= 5220Mc; F= 5250 F= 5280 F= 5310 F= 5340Mc; Ii=100μAdc on each electrode; Note 8	Li :--- Li :--- Li :--- Li :--- Li :---	1.0db 0.8db 0.8db 0.8db 1.0db
------	Isolation:	F= 5220Mc; F= 5250 F= 5280 F= 5310 F= 5340Mc; Ii=0μAdc; Note 9	14 15 20 15 14	---db ---db ---db ---db ---db
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Ri=4.0 Meg; Note 10	t :---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 10	200	400Vdc
4.18.11	Flat Leakage Power:	F= 5280Mc; po=70±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf :---	10mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :---	0.1 erg
4.18.28	*Arc Loss:	F= 5280Mc; po=5 kw; prr=1000; tp=1.0±0.1μs; Note 12	---	0.8db
4.18.15.1	*Recovery Time:	F= 5280Mc; po=625±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	---	12μs
4.18.19	**High Level VSWR:	F= 5280Mc; po=300±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	σ :---	1.2
4.11	Life Test:	F= 5280±5%Mc; po=625±10%kw; (min.) tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.7 meg. each electrode; Group D; Note 15	t :500	---hrs.
4.11.4	Life Test End Point:	Recovery Time; Flat Leakage Power; Spike Leakage Energy; Duplexer Loss, F= 5280Mc.	t :--- pf :--- Ws :--- Li :---	15μs 20mw 0.20erg 1.0db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-1-54. Two gaskets will be supplied with each tube.

Note 3: Tubes must satisfy all electrical requirements of this specification. Recovery Time excluded, when operated in the specified temperature range.

Note 4: Each Short Sloy Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12 an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 5: Vibrate once along each of two perpendicular lines, both lying in the plane perpendicular to the axes of the ignitor electrodes.

Note 6: During this test the ignitor electrode shall not short to the tube body. Subsequent to the test the tube shall meet all requirements of this specification.

Note 7: See Test Circuit
Attach a low level load, σ=1.05 max, to arms M, R, and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 8: See Test Circuit
A low level load, σ=1.05 max., on arms M and L. A low level signal in arm A is detected at arm R.

(over)

Note 9: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05 max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

Note 11: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07 max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube at hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., at arm A.

Note 13: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07, max., at arm L; detector at arm R.

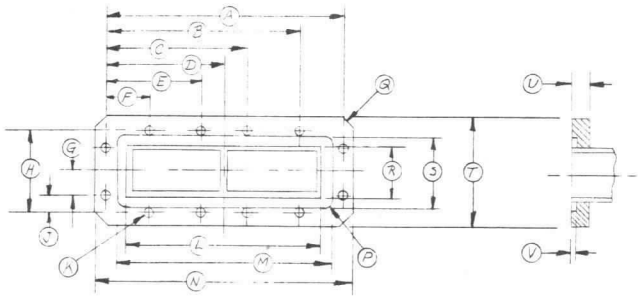
Note 14: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07max., at arm A. The V.S.W.R. looking into arm M shall be within the limit specified.

Note 15: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket at hybrid output; a high level load, σ=1.07max., at arm A.

Note 16: The recommended ignitor operating current is for a tube with and average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (Megohms)}$$

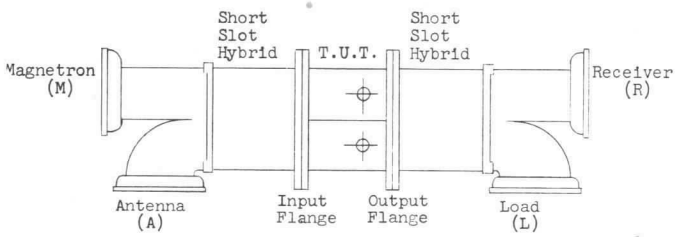
where Ri = Total Series Resistance
Ebb = Open Circuit Supply Voltage
Ei = Average (center) Ignitor Voltage Drop
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSION	REF	DIMENSION
A	4.658 ±.002	P	3/32 R
B	3.829 ±.002	Q	3/16 X 45° CHAMFER
C	2.829 ±.002	R	1.000
D	2.329 ±.003	S	1.375
E	1.829 ±.002	T	2 1/32
F	.829 ±.002	U	.350 MIN.
G	.500 ±.003	V	.110 ±.002
H	1.658 ±.002		
J	.329 ±.003		
K	13/64 (.203) DR. (12) HOLES		
L	4.000		
M	4.375		
N	5 1/32		

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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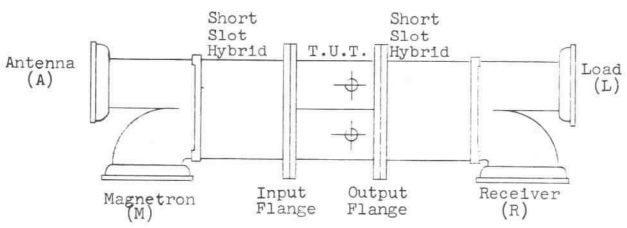

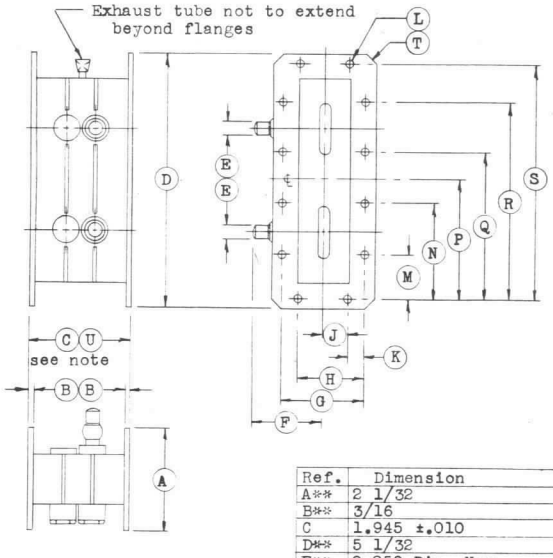

Note:-

Dimension C applies to 6640/BL-60 only.

Dimension U applies to 6641/BL-86 and BL-644 only.

Ref.	Dimension
A**	2 1/32
B**	3/16
C	1.945 ±.010
D**	5 1/32
E**	0.250 Dia. Nom.
F*	1 13/16 Max.
G*	1.658 ±.002
H*	1.329 ±.002
J*	0.500 ±.003
K*	0.329 ±.003
L	#10-32NF 12 Holes Ea. Flg.
M*	0.829 ±.002
N*	1.829 ±.002
P*	2.329 ±.003
Q*	2.829 ±.002
R*	3.829 ±.002
S*	4.658 ±.002
T**	3/16 x 45° Chamfer
U	2.345 ±.015

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	6796	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	4	200 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 16) (each electrode)

Test Conditions: Notes 2, 3; See Test Circuit

Pack in sealed water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K		---	---
4.9.6	*Glass Strain:				
4.9.19.2	**Vibration:	G=10; Note 4			
4.18.18	Voltage Standing Wave Ratio:	F=8500 Mc.	σ:	---	1.4
		*F=8565	σ:	---	1.2
		*F=8830	σ:	---	1.2
		F=9000	σ:	---	1.2
		*F=9180	σ:	---	1.2
		*F=9487	σ:	---	1.2
		F=9600 Mc. Notes 5, 14	σ:	---	1.4
4.18.4.2	Duplexer Loss:	F=8500 Mc.	Li:	---	1.2 db
		*F=8565	Li:	---	1.1 db
		*F=8830	Li:	---	1.1 db
		F=9000	Li:	---	1.1 db
		*F=9180	Li:	---	1.1 db
		*F=9487	Li:	---	1.1 db
		F=9600 Ii=100μAdc on each electrode; Notes 6, 14	Li:	---	1.2 db
-----	**Isolation:	F=8500 Mc.		10	--- db
		F=8565		15	--- db
		F=8830		15	--- db
		F=9000		15	--- db
		F=9180		15	--- db
		F=9487		15	--- db
		F=9600 Mc; Notes 7, 14 Ii=100 μAdc on each electrode		10	--- db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5 Meg; Note 8	t:	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid:	200	375Vdc
4.18.11	Flat Leakage Power:	*F=8500 ±0.5%Mc; F=9000±0.5%Mc; *F=9600±0.5%Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05 μs; prr=1000; Ii=100μAdc on each electrode; Note 9	pf:	---	15 mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:	---	0.15 erg
4.18.28	*Arc Loss:	F=9000Mc. ±0.5%Mc. Loss: po=40±10%kw; tr=1.0±0.1μs; prr=1000; Note 10		---	1.2 db
4.18.17.1	Temperature Cycle:		Cycles:	1	---
4.18.17.2	Temperature Cycle Life:	Group C	Cycles:	10	---
4.18.16	*Pressurization:	50 psia min; Note 15			
4.18.15.1	*Recovery Time:	F=9000Mc. ±5%; po=200±10%kw; tp=1.0±.05μs; prr=1000; Ii=100μAdc on each electrode Note 11	t:	---	7.0μs
4.18.19	**High Level V.S.W.R.	F=8500 Mc.; F=9000 F=9600Mc.; po=20±10%kw; tp=1.0±0.05μs; prr=1000; Ii=100μAdc on each electrode Notes 12, 14	σ:	---	1.2
4.11	Life Test:	F=9000Mc. ±5%; po=200±10%kw (min.); tp=1.0±0.05 μs; Du=0.001; Ii=100μAdc on each electrode; Group D; Note 13	t:	500	--- hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:	---	20 μs
		Flat Leakage Power (F=9000±0.5% Mc.)	pf:	---	20 mw
		Spike Leakage Energy (F=9000±0.5% Mc.)	Ws:	---	0.20 erg
		Duplexer Loss, F=9000 Mc.	Li:	---	1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-10-54. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a VSWR of less than 1.10 an even Power Split within ±0.25 db, and a minimum of 25 db Directivity.

Note 4: The ignitor electrodes shall not short to the tube body during vibration. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attached a low level load, σ=1.07 max., to arms M, R and L. Then the VSWR looking into arm A shall be within the limits specified.

Note 6: See Test Circuit
A low level load, σ=1.07 max., on arm L; an adjustable short on arm M; a low level signal in arm A and a detector at Arm R. Duplexer loss is the difference in signal strength in db as measured between arms A and R, the adjustable short is adjusted for minimum power in the receiver arm of the duplexer at each frequency.

Note 7: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.07 max., on all empty arms.

(over)

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07 max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 10: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., on arm A.

Note 11: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07 max., on arm L; detector on arm R. This measurement to be made after at least 30 minutes of operation at the conditions specified.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A. The VSWR looking into arm M, shall be within the limit specified.

Note 13: See Circuit
Use only one hybrid. Transmitter po in M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

Note 14: Unless otherwise specified all frequencies have a tolerance of ±0.1%.

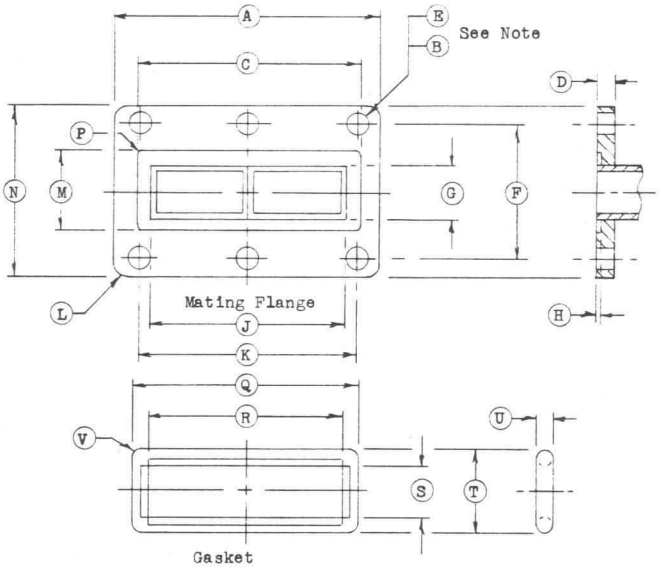
Note 15: The input section of the duplexer with the tube mounted shall show no loss of pressure over a period of two hours.

Note 16: The recommended ignitor operating current is for a tube with an average voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

where Ri=Total series resistance
Ebb=Opern circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Ref.	Dimension	Ref.	Dimension
A	2.575±.015	K	2.170±.006
B	#18(.1695) Dr.	L	0.120 R. Approx.
	6 Holes	M	0.753+.005-.000
C	2.203+.005-.000	N	1.625±.015
D	0.220±.010	P	3/64 Rad.
E	#8-32NC Tap	Q	2.162 Max.
	6 Holes	R	1.959 Min.
F	1.280±.004	S	0.508 Min.
G	0.500±.003	T	0.709 Max.
H	0.070±.001	U	0.110 Typ.
J	1.950±.004	V	3/64 Rad. Typ.

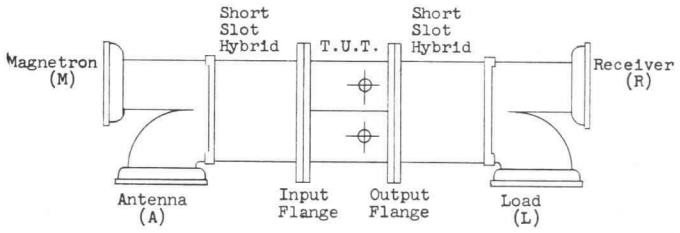
Two (2) gaskets to be supplied with each tube.

Note:-Dimension (B) applies to input and output flanges of all tubes except 6796, where dimension (E) applies to the input flange only.

Outline used for following tubes:- BL-78, BL-307, 6599/BL-322, 6613/BL-324, 6796

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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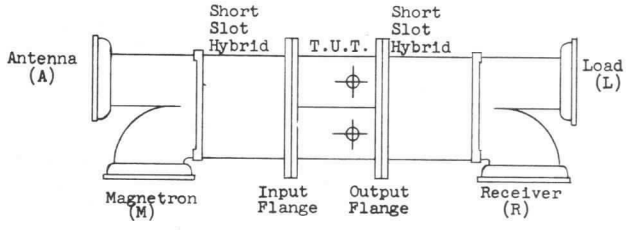
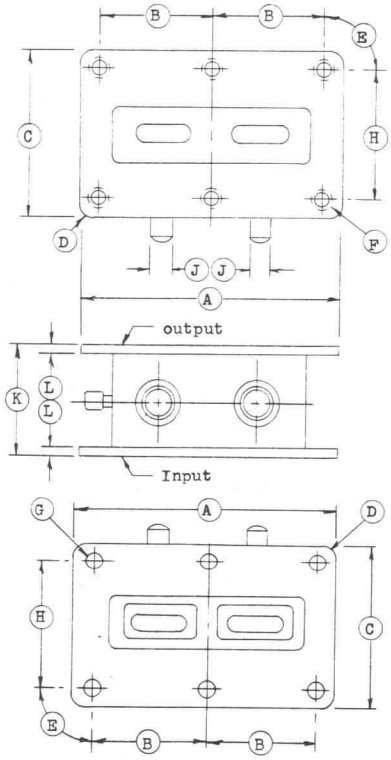




Notes:-
1. Exhaust tube must not extend beyond flanges more than 1/4 inches.
2. Ignitor terminals must not extend beyond flanges more than 7/16 inches.

Ref.	Dimension
A	2.575 ±.015
B	1.085 ±.004
C	1.625 ±.015
D	1/8 Rad.
E	90°
F	#8-32 NC
	6 Holes
G	#18(.1695) Dia.
	6 Holes
H	1.280 ±.004
J	0.250 Dia.
K	1.063 ±.010
L	11/64 Max.

Bomac	DUAL	X
	6646/BL604	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	1	100 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μ Adc

Recommended Ignitor Operating Current 150 μ ADC (Note 14) (each electrode)

Test Conditions: Notes 2, 3; see Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be Specified	---	---
---	**Vibration:	F=50±2cps; Total Excursion =0.08±0.005 in; t=5 min; Note 4		
4.18.18	Voltage Standing Wave Ratio	F=8490Mc	σ:---	1.4
		F=8565	σ:---	1.2
		*F=8655	σ:---	1.2
		*F=8745	σ:---	1.2
		*F=8835	σ:---	1.2
		*F=8925	σ:---	1.2
		F=9000	σ:---	1.2
		*F=9087	σ:---	1.2
		*F=9187	σ:---	1.2
		*F=9287	σ:---	1.2
		*F=9387	σ:---	1.2
		F=9487	σ:---	1.2
		F=9578Mc; Note 5, 15	σ:---	1.4
4.18.4.2	*Duplexer Loss:	F= 8490Mc	Li:---	1.2db
		F= 8565	Li:---	1.0db
		F= 9000	Li:---	1.0db
		F= 9487	Li:---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 6,15	Li:---	1.2db
-----	*Isolation:	F= 8490Mc	14.0	---db
		F= 8565	16.0	---db
		F= 9000	18.0	---db
		F= 9487	16.0	---db
		F= 9578Mc; Note 7,15	14.0	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0 Meg; Note 8	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid:200	375 Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; ±5% po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 9,	pf:---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; ±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 10,	---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; ±5% po=100±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 11,	t:---	1.5μs
4.18.19	**High Level V.S.W.R.:	F= 9000Mc±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	σ:---	1.2
4.11	Life Test:	F= 9000Mc;±5% po=100±10%kw(min); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc;Ri=2.8meg. each electrode; Group D; Note 13	t:500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:---	3.0μs
		Flat Leakage Power;	pf:---	20mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss, F= 9000Mc.	Li:---	1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-10-54. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within±0.25 db, and a minimum of 27 db Directivity.

Note 4: Vibrate in plane normal to ignitor axes. The ignitor electrodes shall not short to the tube body during vibration. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 6: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 7: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 10: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 11: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, should be within the limits specified.

Note 13: See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 14: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. It is further recommended that the following formula be used to determine the value of the required series resistance.
Ebb=open circuit supply voltage
Ei=average (center) ignitor voltage drop

$$\text{Series Resistance (R1)} = \frac{Ebb-Ei}{150} \text{ megohms}$$

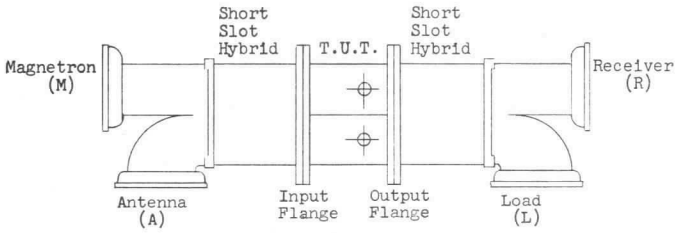
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap.

Note 15: All frequencies are to be measured within 0.1% of value specified.

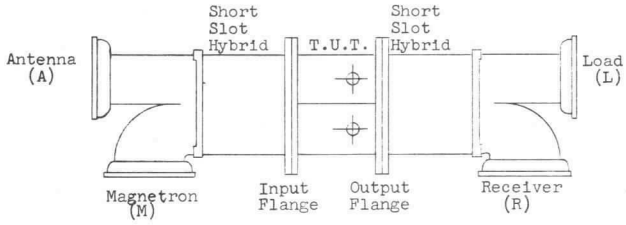
(over)

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

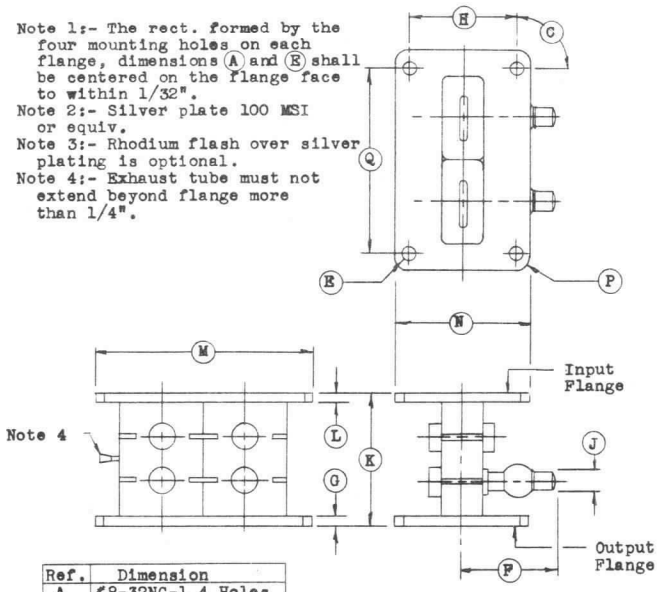
(1)



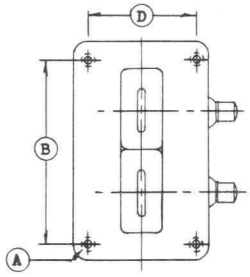
(2)

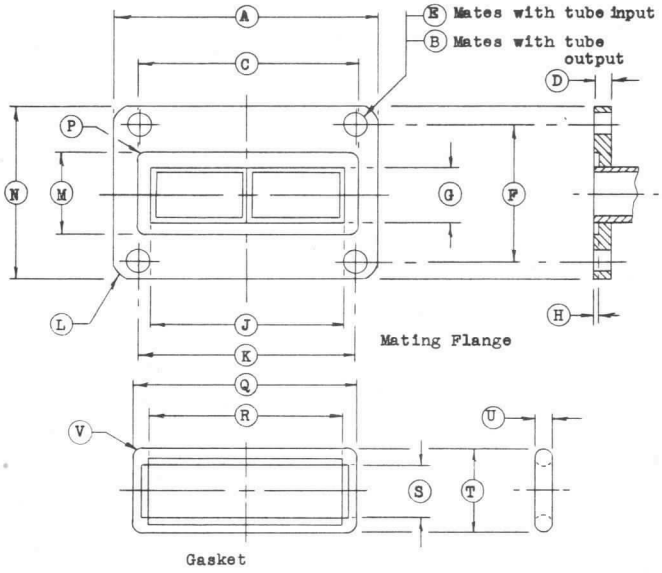


Note 1:- The rect. formed by the four mounting holes on each flange, dimensions (A) and (E) shall be centered on the flange face to within 1/32".
Note 2:- Silver plate 100 MSI or equiv.
Note 3:- Rhodium flash over silver plating is optional.
Note 4:- Exhaust tube must not extend beyond flange more than 1/4".



Ref.	Dimension
A	#8-32NC-1 4 Holes
B*	2.170±.005
C	90° ±5°
D*	1.280±.004
E	#18(.1695) 4 Holes
F*	1 3/8 Max.
G**	0.083 Min.
H*	1.280±.004
J**	0.250 Dia.
K	1.555±.010
L**	0.083 Min.
M**	2.575±.015
N**	1.625±.015
P**	1/8 Rad.
Q*	2.170±.005





Ref.	Dimension	Ref.	Dimension
A	2.575±.015	K	2.170±.006
B	#18(.1695) Dr. 4 Holes	L	0.120 R. Approx.
		M	0.753+.005-.000
C	2.203+.005-.000	N	1.625±.015
D	0.220±.010	P	3/ 64 Rad.
E	#8-32 Tap 4 Holes	Q	2.162 Max.
		R	1.959 Min.
F	1.280±.004	S	0.508 Min.
G	0.500±.003	T	0.709 Max.
H	0.070±.001	U	0.110 Typ.
J	1.950±.004	V	3/ 64 Rad. Typ.

Two (2) gaskets to be supplied with each tube.

Note:- Outline used for following tubes

6334, 6646, 6647, BL-27, BL-604, BL-604H, BL-339

Bomac | DUAL | X | 6647/BL604H | TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
FEBRUARY 28, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.	Nom.
Transmitter po	1.0	100	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Ignitor Current	100	200	---μAdc
Heater Circuit Wattage	---	---	25W
Heater Circuit Voltage	---	---	115Vac
Heater Circuit Voltage Frequency	F:380	1000	---cps
Thermostat Contact Current	---	2	---Aac
Thermostat Cut In Temperature	4	---	---°C
Thermostat Cut Out Temperature	---	+40	---°C
Ambient Temp. Range	-60	+85	---°C

Recommended Ignitor Operating Current 150μAdc each electrode (Note 14)

Test Conditions: Notes 2, 3; see Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	*Vibration:	F=5 to 500cps 10G t=5 min.; Note 4	---	---
------	*Shock:	G=15; Note 16	---	---
------	**Humdity:	t=72 hours Note 17	---	---
------	*Thermostat Operation:	T=-55°C Note 18	T:4.0	40°C
------	Heater Current	Vac=115	If :---	0.250Aac
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc	σ :---	1.4
		F= 8565	σ :---	1.2
		*F= 8655	σ :---	1.2
		*F= 8745	σ :---	1.2
		*F= 8835	σ :---	1.2
		*F= 8925	σ :---	1.2
		F= 9000	σ :---	1.2
		*F= 9087	σ :---	1.2
		*F= 9187	σ :---	1.2
		*F= 9287	σ :---	1.2
		*F= 9387	σ :---	1.2
		F= 9487	σ :---	1.2
		F= 9578Mc; Note 5, 15	σ :---	1.4
4.18.4.2	*Duplexer Loss:	F= 8490Mc	Li :---	1.2db
		F= 8565	Li :---	1.0db
		F= 9000	Li :---	1.0db
		F= 9487	Li :---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 6, 15	Li :---	1.2db
------	*Isolation:	F= 8490Mc	14.0	---db
		F= 8565	16.0	---db
		F= 9000	18.0	---db
		F= 9487	16.0	---db
		F= 9578Mc; Note 7, 15	14.0	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 8	t :---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid :200	375Vdc
4.18.11	Flat Leakage Power	F=9000Mc;±5% po=40±10%kw; tpl=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 9,	pf :---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws: ---	0.1erg
4.18.28	* Arc Loss:	F=9000Mc;±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 10	---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc;±5% po=100±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 11	t :---	1.5μs
4.18.19	**High Level V.S.W.R.:	F= 9000Mc±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	σ :---	1.2
4.11	Life Test:	F= 9000Mc;±5% po=100±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc, Ri=2.8Meg. each electrode; Group D; Note 13	t :500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t :---	3.0μs
		Flat Leakage Power;	pf :---	20mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss, F= 9000Mc.	Li :---	1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-10-54. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even power split within ±0.25 db, and a minimum of 27db Directivity.

Note 4: Vibrate in plane normal to ignitor axes. The ignitor electrodes shall not short to the tube body during vibration. Tubes shall meet all requirements of this specification after the vibration test.

Note 5: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 6: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 7: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

(over)

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 10: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 11: See Test Circuit
Transmitter po in arm M; simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on L; detector on arm R.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.
The V.S.W.R. looking into arm M, should be within the limits specified.

Note 13: See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 14: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. It is further recommended that the following formula be used to determine the value of the required series resistance.

Ebb=Open circuit supply voltage
Ei=average (center) ignitor voltage drop

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ megohms}$$

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap.

Note 15: All frequencies are to be measured within 0.1% of value specified.

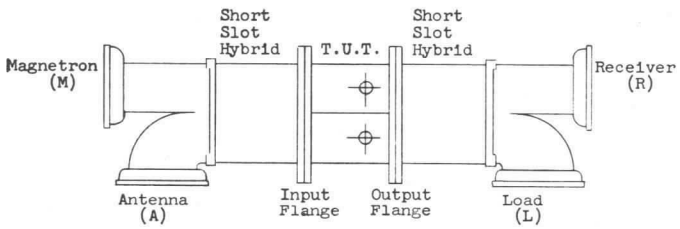
Note 16: The tube shall be subjected to 18 impact shocks of 15G, each shock impulse having a time duration of 6±1 milliseconds. The shock shall be applied in the following direction:
(a) Vertically, 3 shocks in each direction
(b) Parallel to the major horizontal axis, 3 shocks in each direction
(c) Parallel to the minor horizontal axis, 3 shocks in each direction

Note 17: The tube shall be placed in a chamber having a temperature and relative humidity of 55°C and 90% respectively. The test conditions shall be maintained for 72 hours. At the conclusion of this period, the tube shall operate without degradation of the limits specified.

Note 18: The tube having 10 inches of waveguide extending from each flange shall be placed in a frigid chamber -55°C. The thermostat should operate within the limits specified.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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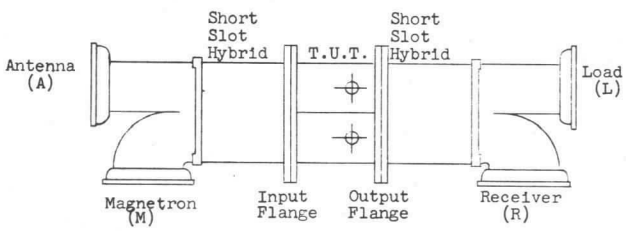
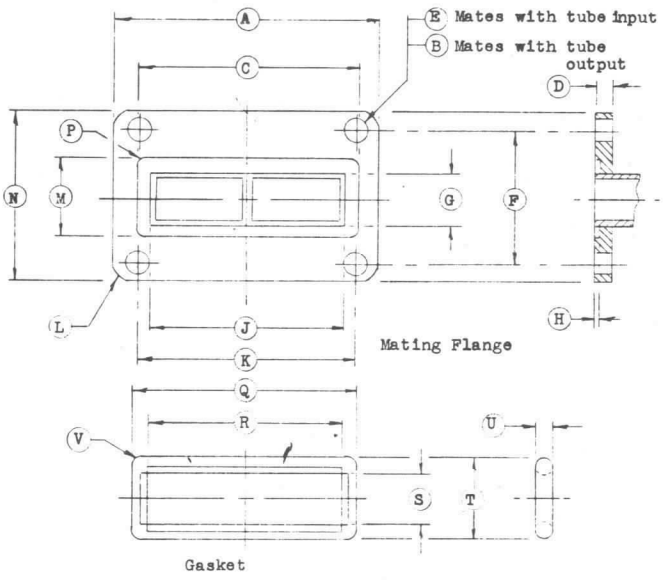




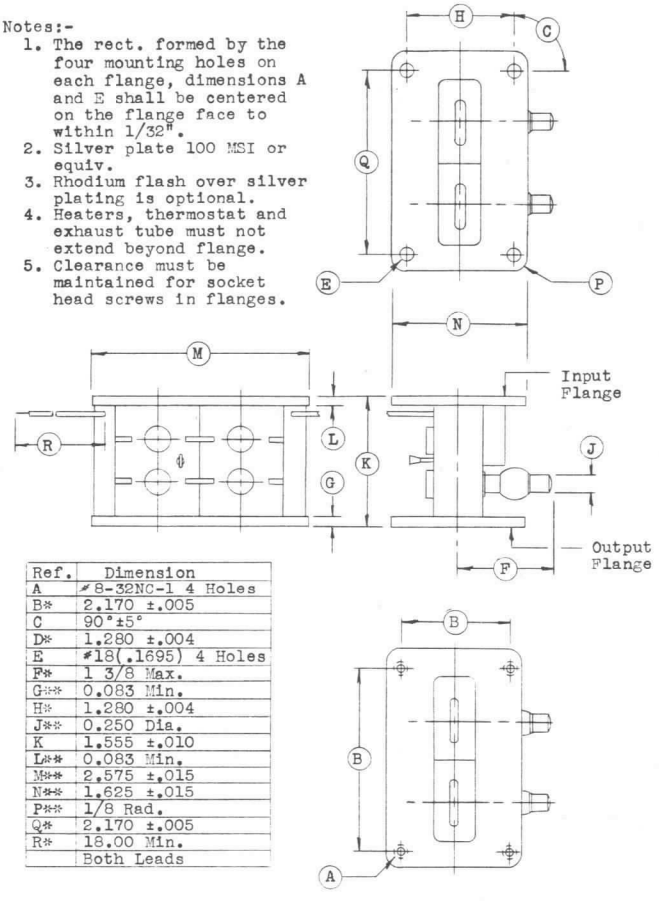
Ref.	Dimension	Ref.	Dimension
A	2.575±.015	K	2.170±.006
B	#18(.1695) Dr. 4 Holes	L	0.120 R. Approx.
		M	0.753+.005-.000
C	2.203+.005-.000	N	1.625±.015
D	0.220±.010	P	3/ 64 Rad.
E	#8-32 Tap 4 Holes	Q	2.162 Max.
		R	1.959 Min.
F	1.280±.004	S	0.508 Min.
G	0.500±.003	T	0.709 Max.
H	0.070±.001	U	0.110 Typ.
J	1.950±.004	V	3/ 64 Rad. Typ.

Two (2) gaskets to be supplied with each tube.

Note:- Outline used for following tubes

6334, 6646, 6647, BL-27, BL-604, BL-604H, BL-339

Notes:-
1. The rect. formed by the four mounting holes on each flange, dimensions A and E shall be centered on the flange face to within 1/32".
2. Silver plate 100 MSI or equiv.
3. Rhodium flash over silver plating is optional.
4. Heaters, thermostat and exhaust tube must not extend beyond flange.
5. Clearance must be maintained for socket head screws in flanges.



Ref.	Dimension
A	#8-32NC-1 4 Holes
B*	2.170 ±.005
C	90°±5°
D*	1.280 ±.004
E	#18(.1695) 4 Holes
F*	1 3/8 Max.
G**	0.083 Min.
H*	1.280 ±.004
J**	0.250 Dia.
K	1.555 ±.010
L**	0.083 Min.
M**	2.575 ±.015
N**	1.625 ±.015
P**	1/8 Rad.
Q*	2.170 ±.005
R*	18.00 Min. Both Leads

Bomac	DUAL	X
	6648/BL615	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MAY 26, 1955

Dimensions: Per Outline

Mounting: See attached drawing of Tube Mounting.

Ratings:	Min.	Max.	
Transmitter po	4	---	kw
Open Circuit Ignitor Voltage	-650	---	Vdc
Ignitor Current	100	200	μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 9)(each electrode)

Test Conditions: See Mounting

Packing To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	**Vibration:	F=50±cps; Total Excursion =0.08±0.005 in; t=2 min; Note 3	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490 Mc.	σ:---	1.9
		F= 8565	σ:---	1.4
		*F= 8650	σ:---	1.4
		*F= 8740	σ:---	1.4
		*F= 8830	σ:---	1.4
		*F= 8920	σ:---	1.4
		F= 9000	σ:---	1.4
		*F= 9090	σ:---	1.4
		*F= 9180	σ:---	1.4
		*F= 9280	σ:---	1.4
		*F= 9380	σ:---	1.4
		F= 9487	σ:---	1.4
		F=9578 Mc; σ=1.05 max. Note 4	σ:---	1.9
4.18.4.2	Insertion Loss:	F= 9000Mc; Ii=0μAdc; Note 4	Li:----	0.7db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc; Note 4	ΔLi:---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg; Note 5	t:----	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 5	Eid: 200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ=1.10max; Note 6	pf :---	40mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.30erg
4.18.28	Arc Loss:	F= 9000Mc; po=4 kw; tp=1.0±0.15μs; prr=1000; Note 6	---	0.8db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 6	t:---	10μs
4.18.17.1	Temperature Cycle:	-----	---	---

Ref.	Test	Conditions	Min.	Max.
4.11	Life Test:	F= 9000Mc; po=200kw; tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc;Ri=2.8 meg. each electrode Group D; Note 7	t :500	---hrs.
4.11.4	Life Test End Point: (Note 8)	Recovery Time;	t :---	20μs
		Flat Leakage Power;	pf :---	50mw
		Spike Leakage Energy;	Ws:---	0.35erg
		Insertion Loss	---	0.7db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A gasket should be bolted between the input face of the tube and the tube seat. One gasket shall be supplied with each tube.

Note 3: Vibrate in a plane which is parallel to the ignitor axes and normal to the input face of the tube. The ignitor electrodes shall not short to the tube body during this test. Tubes shall meet all requirements of this specification after the vibration test.

Note 4: See attached drawing of Tube Mounting. "E" plane of incident power to be parallel with the plane of the input window of the tube. Each half of the 6648 (BL-615) is to be tested as a separate tube and each half shall satisfy the specified limit (s).

Note 5: Measured separately for each ignitor electrode.

Note 6: See attached drawing of Tube Mounting. "E" plane of incident power to be normal to the plane of the input window of the tube. Each half of the 6648 (BL-615) is to be tested as a separate tube and each half shall satisfy the specified limit.

Note 7: See attached drawing of Tube Mounting. "E" plane of incident power to be normal to the plane of the input window of the tube. Life Test only one-half of 6648 (BL-615) under the specified conditions.

Note 8: Applies to both halves of the 6648 (BL-615).

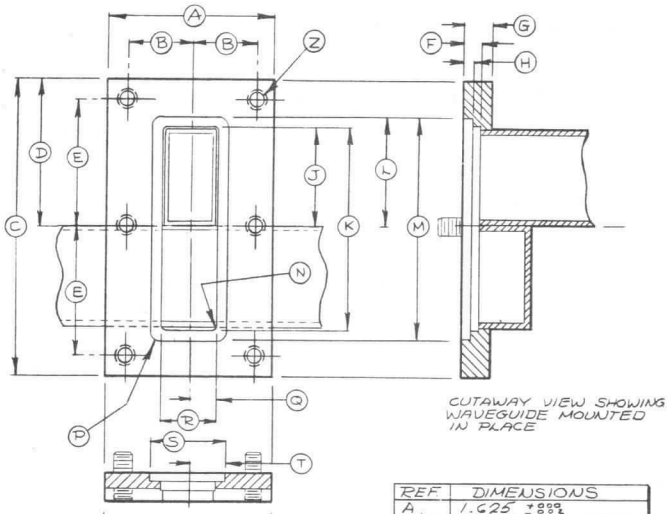
Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance}(R1) = \frac{Ebb - E1}{150} \text{ (megohms)}$$

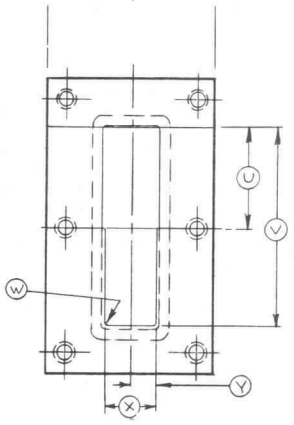
Where R1=Total series resistance
Ebb=Open circuit supply voltage
E1=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

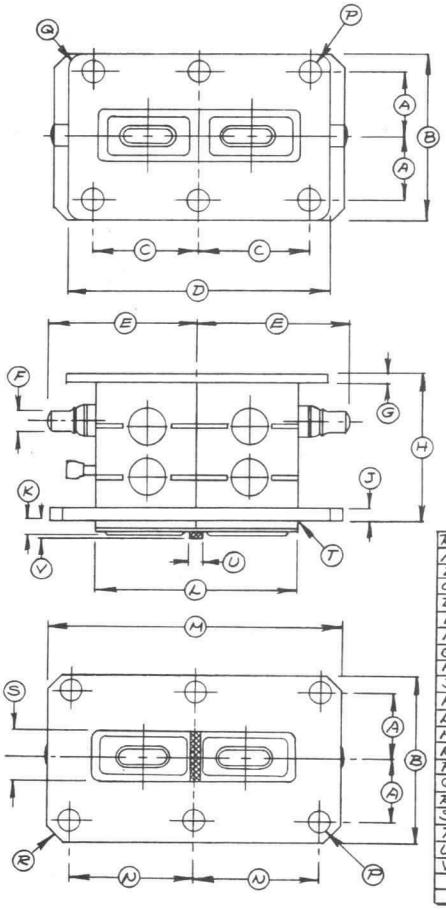
(over)



CUTAWAY VIEW SHOWING WAVEGUIDE MOUNTED IN PLACE



REF	DIMENSIONS
A	1.625 +.000 -.002
B	.640 ±.002
C	2.845 ±.010
D	1.423
E	1.220 ±.002
F	.135 +.005 -.000
G	.250
H	.070 ±.001
J	1.015 +.005 -.000
K	2.030
L	1.126 +.002 -.000
M	2.253
N	.030 R MAX (4) CORNERS
P	.046 R ±.002
Q	.265 +.005 -.000
R	.530
S	.753
T	.376 +.002 -.008
U	1.003 +.002 -.000
V	2.003 +.002 -.000
W	.015 R MAX (2) CORNERS
X	.509 +.002 -.000
Y	.252
Z	#8-32 NC (6) HOLES



REF	DIMENSIONS
A *	.640 ±.002
B **	1.625 ±.010
C *	1.085 ±.008
D **	2.5775 ±.010
E *	1.875 MAX.
F **	.250 DIA.
G **	.083 MIN.
H	1.438 ±.010
J **	.125 ±.010
K	.125
L	2.005
M **	2.845 ±.010
N *	1.220 ±.002
P	#17(.173) DR(12) HOLES
Q **	1/8 R
R **	.125 x 45° CHAMFER
S	.500
T	.030 R MAX.
U	.100 ±.010
V	.140 MAX.

Bomac	DUAL	X
	BL607	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
AUGUST 24, 1956

Dimensions: Per Outline

Application: Short Slot Hybrid Duplexer

Ratings:	Min.	Max.
Transmitter po	4	200 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	10,000	--- ft.

Recommended Ignitor Operating Current 150μAdc (Note 13) (each electrode)

Test Conditions: Notes 3; See Test Circuit

Pack in sealed water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking			
4.5	Holding Period:	t=168 hours			
4.9.6	*Glass Strain:				
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K			
4.9.19.2	**Vibration:	G=10; See Note 3			
4.18.18	Voltage Standing Wave Ratio, Low Power Level:	F= 8490Mc±0.1%	σ : ---		1.4
		*F= 8565Mc±0.1%	σ : ---		1.2
		*F= 8830Mc±0.1%	σ : ---		1.2
		F= 9000Mc±0.1%	σ : ---		1.2
		*F= 9180Mc±0.1%	σ : ---		1.2
		*F= 9487Mc±0.1%	σ : ---		1.2
		F= 9578Mc±0.1%	σ : ---		1.4
		See Notes 2, 4			
4.18.4.2	Duplexer Loss:	F= 8490Mc±0.1%	---		1.2db
		*F= 8565Mc±0.1%	---		1.1db
		*F= 8830Mc±0.1%	---		1.1db
		F= 9000Mc±0.1%	---		1.1db
4.18.4.2	Duplexer Loss: (Cont.)	*F= 9180Mc±0.1%	---		1.1db
		*F= 9487Mc±0.1%	---		1.1db
		F= 9578Mc±0.1%	---		1.2db
		Ii=100μAdc on each ignitor, See Note 5			
4.18.4.2	**Isolation:	F= 8490Mc±0.1%	10		---db
		F= 8565Mc±0.1%	15		---db
		F= 8830Mc±0.1%	15		---db
		F= 9000Mc±0.1%	15		---db
		F= 9180Mc±0.1%	15		---db
		F= 9487Mc±0.1%	15		---db
		F= 9578Mc±0.1%	10		---db
		Ii=100μAdc on each ignitor; See Note 6			
4.18.1	*Ignitor Ignition Time:	Ebb= -700Vdc	t : ---		5.0 sec.
		R =5.5Megohms			
		See Note 7			
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc;	Eid : 200		375Vdc
		See Note 7			
4.18.11	Flat Leakage Power:	*F= 8490Mc±0.5%	pf : ---		15mw
		F= 9000Mc±0.5%			
		*F= 9578Mc±0.5%			
		po=40±10%kw; prr=1000;			
		tp1=1.0μs±.15μs;			
		tp2=0.5μs±.05μs;			
		Ii=100μAdc on each ignitor			
		See Note 8			
4.18.10	Spike Leakage Energy:	*F= 8490Mc±0.5%	Ws : ---		.15erg
		F= 9000Mc±0.5%	Ws : ---		.15erg
		*F= 9578Mc±0.5%	Ws : ---		.15erg
		po=40±10%kw;			
		prr=1000;			
		tp1=1.0μs±.15μs;			
		tp2=0.5μs±.05μs;			
		Ii=100μAdc on each ignitor			
		See Note 8			

Ref.	Test	Conditions		Min.	Max.
4.18.28	*Arc Loss:	F= 9000Mc±0.5%	Loss : ---		1.2db
		po=4.0±10%kw;			
		prr=1000;			
		tp=1.0μs±.15μs;			
		See Note 9			
4.18.17.1	Temperature Cycle:		Cycles : 1		---
4.18.17.2	Temperature Cycle Life:	Group C	Cycles : 10		---
4.18.15.1	*Recovery Time:	F= 9000Mc±5%;	t : ---		7.0μs
		po=200±10%kw;			
		tp=1.0μs±.05μs;			
		prr=1000;			
		Ii=100μAdc on each ignitor; See Note 10			
4.18.19	**High Level VSWR:	F= 8490±0.1%Mc	σ : ---		1.2
		F= 9000±0.1%Mc			
		F= 9578±0.1%Mc			
		po=20kw±10%			
		tp1=1.0μs±.05μs;			
		prr=1000; Ii=100μAdc on each ignitor			
		See Note 11			
4.11	Life Test:	F= 9000±5%Mc;	t : 500		---hrs.
		po=200±10%kw min;			
		tp1=1.0μs±.05μs;			
		Du=0.001;			
		See Note 12			
		Ii=100μAdc on each ignitor			
		Group D			
4.11.4	Life Test End Point:	Recovery Time;	t : ---		20μs
		F=9000±0.5Mc			
		Flat Leakage Power;	pf : ---		20mw
		F=9000±0.5Mc			
		Spike Leakage Energy;	Ws: ---		0.20erg
		F=9000±0.5Mc			
		Duplexer Loss;	---		1.2db
		F=9000Mc±0.1Mc			

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12 an even Power Split within ±0.25db, and a minimum of 27db Directivity.

Note 3: Vibrate in plane normal to ignitor axes. The ignitor electrodes shall not short to the tube body during vibration.

Note 4: The low level VSWR shall be measured using Test Circuit

Note 5: See Test Circuit
The duplexer loss is defined as $10 \log \frac{\text{Power in Antenna}}{\text{Power in Receiver Arm}}$.

The adjustable short on the transmitter arm shall be adjusted for minimum power in the receiver arm of the duplexer at each frequency.

Note 6: See Test Circuit
The db isolation is defined as $10 \log \frac{\text{Power in Receiver Arm}}{\text{Power in Transmitter Arm}}$

Note 7: Ignitor ignition time and ignitor voltage drop shall be measured separately for each ignitor electrode.

Note 8: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 9: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 10: The measurement shall be made in test circuit "A" after at least 30 minutes of operation at the condition specified.

(over)

Note 11: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output, a high level load, σ=1.07 max., on arm A.

Note 13: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should, be used to determine the value of the required series resistance.

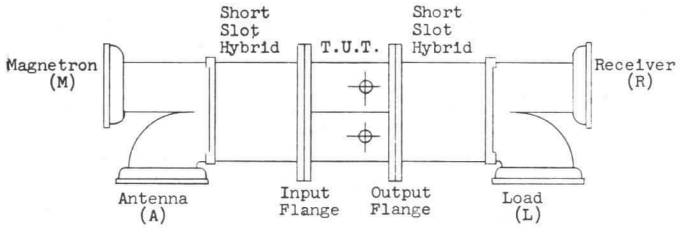
$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (Megohms)}$$

where Ri = total series resistance
Ebb=Open circuit supply voltage
Ei= Average (Center) ignitor voltage drop

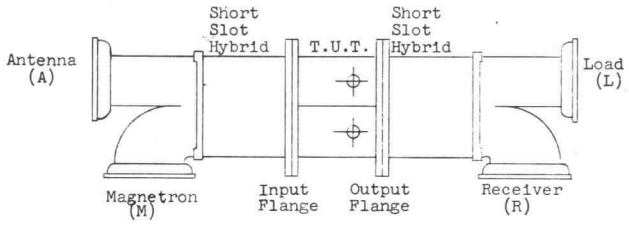
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)

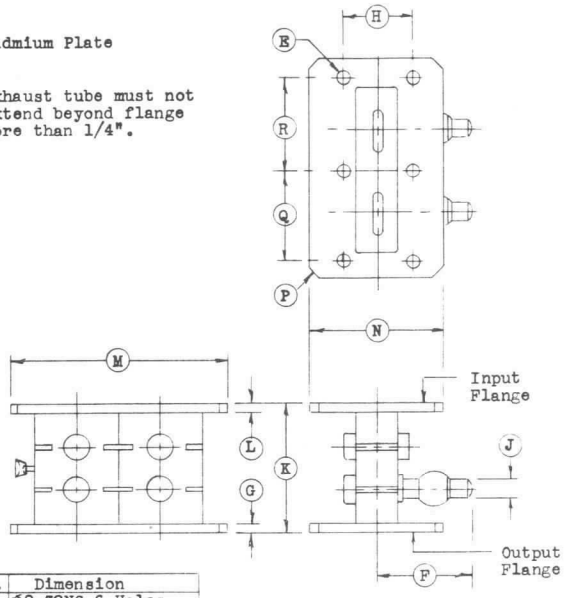


(2)

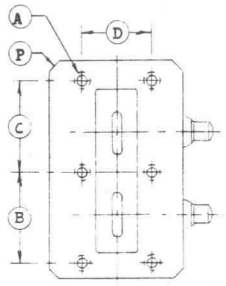


Cadmium Plate

Exhaust tube must not extend beyond flange more than 1/4".



Ref.	Dimension
A	#8-32NC 6 Holes
B*	1.085 ±.003
C*	1.085 ±.003
D*	0.816 ±.004
E	#18(.1695) 6 Holes
F*	1 3/8 Max.
G**	0.093 ±.010
H*	0.816 ±.004
J**	0.250 Dia.
K	1.555 ±.015
L**	0.093 ±.010
M**	2.575 ±.015
N**	1.625 ±.015
P**	1 1/16 Rad.
Q*	1.085 ±.003
R*	1.085 ±.003



Bomac	DUAL	X
	BL625	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 10, 1956

Dimensions: Per Outline

Mounting: See attached drawing of Tube Mounting
See Note 2.

Ratings:	Min.	Max.
Transmitter po	4	--- kw
Open Circuit Ignitor Voltage	-650	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150μAdc (Note 9) (each electrode)

Test Conditions: See Mounting

Packing To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	**Vibration:	F=50±cps; Total Excursion =0.08±0.005 in; t=2 min; Note 3		---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :	---	1.9
		F= 8565	σ :	---	1.4
		*F= 8650	σ :	---	1.4
		*F= 8740	σ :	---	1.4
		*F= 8830	σ :	---	1.4
		*F= 8920	σ :	---	1.4
		F= 9000	σ :	---	1.4
		*F= 9090	σ :	---	1.4
		*F= 9180	σ :	---	1.4
		*F= 9280	σ :	---	1.4
		*F= 9380	σ :	---	1.4
		F= 9487	σ :	---	1.4
		F= 9578Mc; σ =1.05max. : Note 4	σ :	---	1.9
4.18.4.2	Insertion Loss:	F= 9000Mc; Ii=0μAdc; Note 4	Li :	---	0.7 db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc; Note 4	ΔLi :	---	0.2 db
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Ri=5.5Meg; Note 5	t :	---	5.0 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 5	Eid :	200	375 Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ =1.10max; Note 6	pf :	---	40 mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.30 erg
4.18.28	Arc Loss:	F= 9000Mc; po=4kw; tp=1.0±0.15μs; prr=1000; Note 6		---	0.8 db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 6	t :	---	10 μs
4.18.17.1	Temperature Cycle:	------		---	---

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test:	F= 9000Mc; po=200kw; tp=1.0±0.15μs; prr=1000; Ebb= -700Vdc; Ri=2.8Meg; Group D; Note 7	t :	500	---hrs.
4.11.4	Life Test End Point: (Note 8)	Recovery Time;	t :	---	20 μs
		Flat Leakage Power;	pf :	---	50 mw
		Spike Leakage Energy;	Ws :	---	0.35 erg
		Insertion Loss		---	0.7 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between the input face of the tube and the tube seat. One gasket shall be supplied with each tube.

Note 3: Vibrate in a plane which is parallel to the ignitor áxes and normal to the input face of the tube. The ignitor electrodes shall not short to the tube body during this test. Tubes shall meet all requirements of this specification after the vibration test.

Note 4: See attached drawing of Tube Mounting. "E" plane of incident power to be parallel with the plane of the input window of the tube. Each half of the BL-625 is to be tested as a separate tube and each half shall satisfy the specified limit (s).

Note 5: Measured separately for each ignitor electrode.

Note 6: See attached drawing of Tube Mounting. "E" plane of incident power to be normal to the plane of the input window of the tube. Each half of the BL-625 is to be tested as a separate tube and each half shall satisfy the specified limit.

Note 7: See attached drawing of Tube Mounting. "E" plane of incident power to be normal to the plane of the input window of the tube. Life Test only one-half of BL-625 under the specified conditions.

Note 8: Applies to both halves of the BL-625.

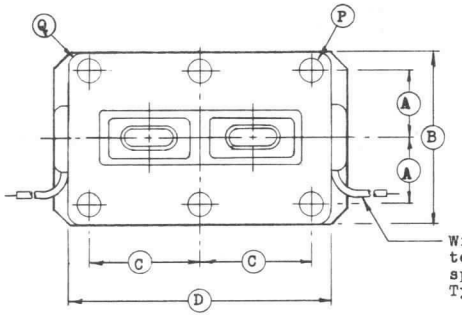
Note 9: **The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.**

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb} - \text{Ei}}{150} \quad \text{(megohms)}$$

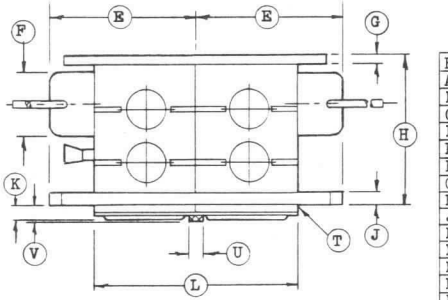
where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

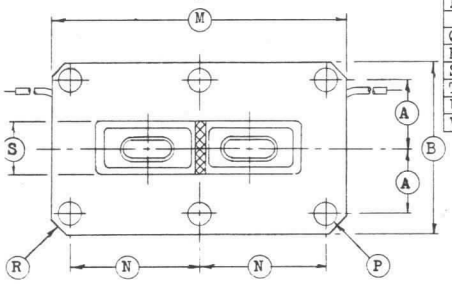
(over)

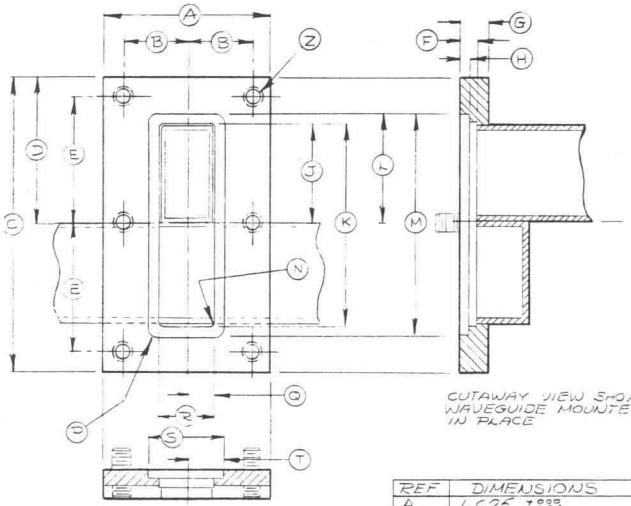


Wire #24(AWG) 19 strand teflon insulated wire spec. Mil-W-16878A-Type EE, 12" long

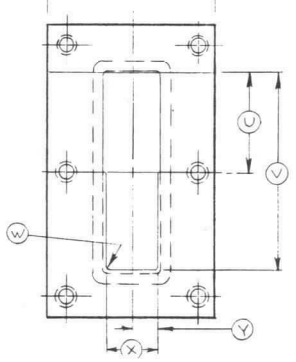


Ref.	Dimension
A*	0.640±.002
B**	1.625±.010
C*	1.085±.003
D**	2.575±.010
E*	1.500 Max.
F*	0.812 Max.
G**	0.083 Min.
H	1.438±.010
J**	0.125±.010
K	0.125
L	2.005
M**	2.845±.010
N*	1.220±.002
P	#17 (.173) Dr. 6 Holes Ea. Flg.
Q**	1/8 Rad.
R**	0.125 x 45° Cham.
S	0.500
T	0.030 Rad. Max.
U	0.100±.010
V	0.140 Max.





CUTAWAY VIEW SHOWING WAVEGUIDE MOUNTED IN PLACE



REF	DIMENSIONS
A	1.625 +.002 -.000
B	.640 ±.002
C	2.845 ±.010
D	1.423
E	1.220 ±.002
F	.135 +.005 -.000
G	.250
H	.070 ±.001
J	1.015 +.005 -.000
K	2.030
L	1.126 +.002 -.000
M	2.253
N	.030 R MAX (4) CORNERS
P	.046 R ±.002
Q	.265 +.005 -.000
R	.530
S	.753
T	.376 +.002 -.000
U	1.003 +.002 -.000
V	2.003 +.002 -.000
W	.015 R MAX (2) CORNERS
X	.504 +.002 -.000
Y	.252
Z	#8-32 NC (6) HOLES

Bomac	DUAL	K_u
	6560/BL35	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JULY 2, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	1	100 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc
Altitude	---	10,000 ft.

Recommended Ignitor Operating Current 150μAdc (Note 16) (Each electrode)

Test Conditions: Notes 2, 3; See Test Circuit

Pack in sealed water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain:				
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K		---	---
4.9.19.2	**Vibration:	G=10; Note 4		---	---
4.18.17.1	Temperature cycle:		Cycles :	1	---
4.18.18	Voltage Standing Wave Ratio:	F= 15000Mc.	σ :	---	1.4
		*F= 15060	σ :	---	1.2
		*F= 15400	σ :	---	1.2
		*F= 15800	σ :	---	1.2
		F= 16000	σ :	---	1.2
		*F= 16200	σ :	---	1.2
		*F= 16600	σ :	---	1.2
		*F= 16940	σ :	---	1.2
		F= 17000Mc; Notes 5, 14	σ :	---	1.4
4.18.4.2	Duplexer Loss:	F= 15000Mc.		---	1.4 db
		*F= 15060		---	1.2 db
		*F= 15400		---	1.2 db
		*F= 15800		---	1.2 db
		F= 16000		---	1.2 db
		*F= 16200		---	1.2 db
		*F= 16600		---	1.2 db
		*F= 16940		---	1.2 db
		F= 17000 Mc. Ii=100μAdc on each electrode; Notes 6, 14		---	1.4 db
------	**Isolation:	F= 15000Mc.		10	---db
		F= 15060		12	---db
		F= 15400		12	---db
		F= 15800		12	---db
		F= 16000		12	---db
		F= 16200		12	---db
		F= 16600		12	---db
		F= 16940		12	---db
		F= 17000 Ii=100μAdc on each electrode; Notes 7, 14		10	---db
4.18.1	*Ignitor Ignition Time:	Ebb= -700Vdc; Ri=2.7Meg; Note 8	t :	---	5.0Sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid :	300	475Vdc
4.18.11	Flat Leakage Power:	F= 16000Mc±3% po=20±10%kw; tp1=0.50±0.05μs; tp2=0.25±0.025μs; prr=3000; Ii=100μAdc on each electrode; Note 9	pf :	---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.1erg
4.18.28	*Arc Loss:	F= 16000Mc. ±3% po=20±5%kw; tp=0.50±0.05μs; prr=3000; Ii=100μAdc on each electrode; Note 10		---	0.8 db
4.18.17.2	Temperature Cycle Life:	Group C	Cycles :	10	---
4.18.16	*Pressurization:	Note 15		---	30psi gauge
4.18.15.1	*Recovery Time:	F= 16000Mc±5% po=90±10%kw; tp=0.50±0.05μs; prr=3000; Ii=100μAdc on each electrode; Note 11	t :	---	10μs
4.18.19	**High Level V.S.W.R.:	F= 16000Mc. ±3% po=20±10%kw; tp=0.50±0.05μs; prr=3000; Ii=100μAdc on each electrode; Note 12	σ :	---	1.2
4.11	Life Test:	F= 16000Mc±5%; po=90±10%kw(min.); tp=0.50±0.05μs; prr=3000; Ii=100μAdc on each electrode; Group D; Note 13	t :	500	---hrs.
4.11.4	Life Test End Point:	Recovery Time	t :	---	20μs
		Flat Leakage Power;	pf :	---	20mw
		Spike Leakage Energy;	Ws :	---	.15erg
		Duplexer Loss at F=16000Mc±0.1%	Li :	---	1.2 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange dated 6-29-56. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.10, an even Power Split within ±0.25db, and a minimum of 25db Directivity.

Note 4: The ignitor electrodes shall not short to the tube body during this test. Subsequent to the test the tube shall meet all requirements of this specification.

Note 5: See Test Circuit
Attach a low level load, σ=1.07 max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 6: See Test Circuit
A low level load σ=1.07max., on arm L; an adjustable short on arm M; a low level signal in arm A and a detector at arm R. Duplexer loss is the difference in signal strength in db as measured between arms A and R. The adjustable short is adjusted for minimum power in the receiver arm of the duplexer at each frequency.

Note 7: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M Keep a low level load, σ=1.05 max., on all empty arms.

(over)

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 10: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 11: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R. Measurements to be made after at least 30 minutes of operation at the conditions specified.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

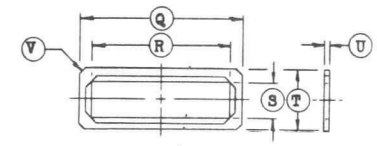
Note 13: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

Note 14: Unless otherwise specified all frequencies have a tolerance of ±0.1%.

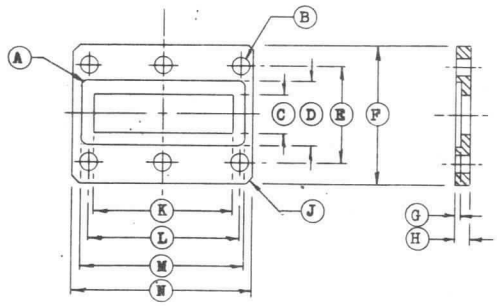
Note 15 The input section of the duplexer with the tube mounted shall show no loss of pressure over a period of two hours.

Note 16: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.
Series Resistance (Ri)$=\frac{Ebb-Ei}{150}$ (megohms)

where Ri = Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Gasket

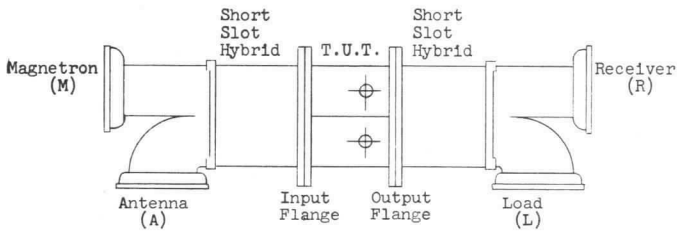


Mating Flange

Ref.	Dimension
A	1/16 Rad.
B	#26(.147) Dr. 6 Holes
C	0.394+.002-.000
D	0.656
E	0.956±.004
F	1 5/16
G	0.023±.001
H	3/32
J	7/8 Rad.
K	1.364+.002-.000
L	1.500±.004
M	1.625
N	1 3/4
Q	1 37/64
R	1.384±.005
S	0.431±.005
T	39/64
U	0.037±.005
V	1/32 x 45°

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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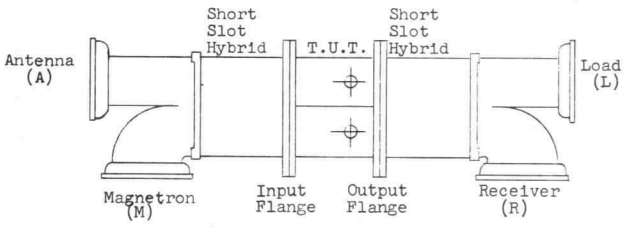
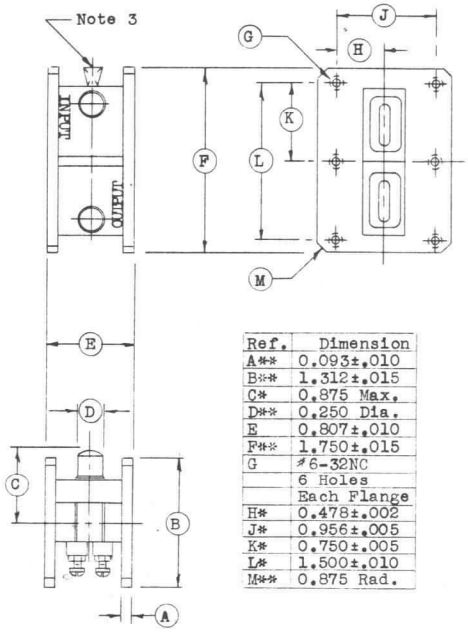




Ref.	Dimension
A**	0.093±.010
B**	1.312±.015
C*	0.875 Max.
D**	0.250 Dia.
E	0.807±.010
F**	1.750±.015
G	#6-32NC
	6 Holes
	Each Flange
H*	0.478±.002
J*	0.956±.005
K*	0.750±.005
L*	1.500±.010
M**	0.875 Rad.

Note 1:- Etch INPUT and OUTPUT of tube on top cap spacer.
Note 2:- Rhodium flash over silver plating is optional.
Note 3:- Exhaust tube not to extend beyond flanges.

Bomac	DUAL	K_a
	6685/BL616	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 11, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mountings: Note 2

Ratings:	Min.	Max.
Transmitter po	1	20 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150μAdc (Note 12)

Test Conditions: Notes 2, Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K	---	---
------	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3	---	---
4.18.17.1	Temperature Cycle:	------	---	---
4.18.18	Voltage Standing:	F=33.50KMC	σ : ---	1.3
		*F=33.80	σ : ---	1.3
		*F=34.10	σ : ---	1.3
		F=34.50	σ : ---	1.3
		*F=34.90	σ : ---	1.3
		*F=35.20	σ : ---	1.3
4.18.18	Voltage Standing: (Continued)	*F=35.70KMC	σ : ---	1.3
		F=36.25 Note 4	σ : ---	1.3
4.18.4.2	*Duplexer Loss:	F=33.50KMC	Li : ---	1.2 db
		F=34.00	Li : ---	1.0db
		F=34.50	Li : ---	1.0db
		F=35.50	Li : ---	1.0db
		F=36.25KMC Ii=0μAdc; Note 5	Li : ---	1.2db
4.18.5.1	*Ignitor Interaction:	Ii=100μAdc Note 5	ΔLi : ---	0.2 db
------	*Isolation:	F=33.50KMC	15	---db
		F=34.00	15	---db
		F=34.50	15	---db
		F=35.50	15	---db
		F=36.25KMC Note 6	15	---db
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Note 7	t : ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 7	Eid : 350	475Vdc
4.18.11	Flat Leakage Power:	F=34.50KMC po=20±10%kw; tp1=0.50±0.1μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc; Note 8	pf : ---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws : ---	0.1 erg
4.18.28	Arc Loss:	F=34.5 KMC po=5.0±5%kw; tp=0.50±0.1μs; prr=1000; Note 9	---	0.8db

Ref.	Test	Conditions	Min.	Max.
4.18.15.1	*Recovery Time:	F=34.5 KMC po=20±10%kw; tp=0.50±0.1μs; prr=1000; Ii=100μAdc; Note 10	t : ---	5 μs
4.11	Life Test:	F=34.5KMc; po=20 kw±10%kw(min.) tp=0.50±0.1μs; prr=1000; Ebb= -700Vdc; Group D; Note 11	t : 500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t : ---	10μs
		Flat Leakage Power;	pf : ---	25mw
		Spike Leakage Energy;	Ws : ---	.15 erg
		Duplexer Loss at F=34.5 KMC	Li : ---	1.0 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket should be bolted between each flange of the tube and its mating flange.

Note 3: Vibrate in a plane normal to the ignitor axes. The ignitor electrodes shall not short to the tube body during this test. Subsequent to the test the tube shall meet all requirements of this specification.

Note 4: See Test Circuit
Attach a low level load, σ=1.05 max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 5: See Test Circuit
A low level load, σ=1.05 max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 6: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05 max., on all empty arms.

Note 7: Series resistor Ri is encapsulated in the tube.

Note 8: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage power detected at arm R.

Note 9: See Test Circuit
Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., on arm A.

Note 10: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 11: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

Note 12: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

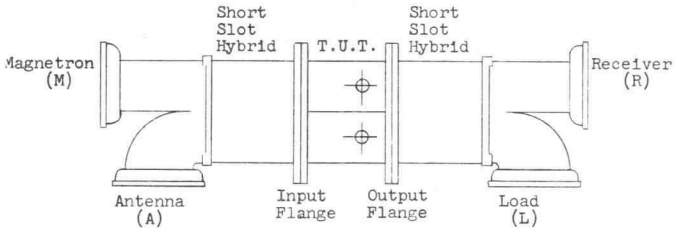
where Ri = Total series resistance
Ebb = Open Circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

(over)

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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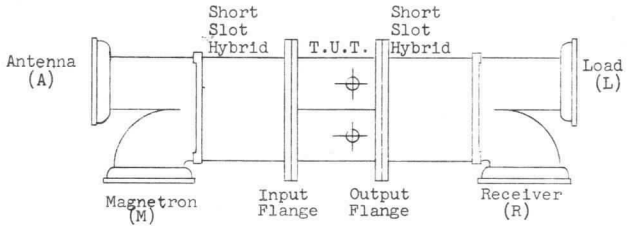
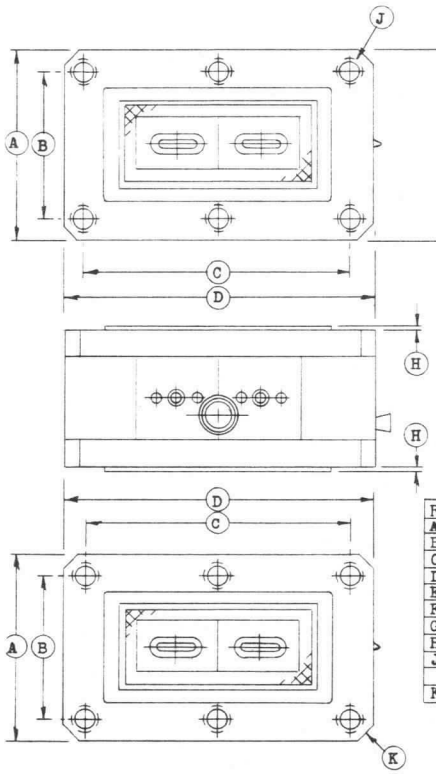




Note:- Exhaust tube not to extend beyond flanges more than .25

Ref.	Dimension
A**	27/32
B*	0.740 ±.004
C*	1.310 ±.004
D**	1 1/2
E**	0.125 ±.005
F*	0.125 ±.005
G	0.700 ±.005
H	1/32 Max.
J	#4-40NC
	6 Holes Eq. Flg.
K**	0.06 x 45° Chamfer

Bomac	DUAL	X
	6564/BL71	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 14, 1955

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	1	250 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current (each electrode)	150 μAdc	(Note 14)

Test Conditions: Notes 2, 3; See Test Circuit "A"

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 4		
4.18.18	Voltage Standing Wave Ratio:	F= 8500 Mc. F= 8800 F= 9000 F= 9300 F= 9600 Mc; Note 5	σ:--- σ:--- σ:--- σ:--- σ:---	1.2 1.2 1.2 1.2 1.2
4.18.4.2	*Duplexer Loss:	F= 8500 Mc. F= 8800 F= 9000 F= 9300 F= 9600 Mc; Ii=100 μAdc on each electrode; Note 6	Li:--- Li:--- Li:--- Li:--- Li:---	1.0 db 0.8 db 0.8 db 0.8 db 1.0 db
-------	*Isolation:	F= 8500Mc. F= 8800 F= 9000 F= 9300 F= 9600Mc; Note 7	15 15 15 15 15	---db ---db ---db ---db ---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 8	t :---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid: 200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 9	pf :---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 10	---	0.8db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 11	t :---	7.0μs
4.18.19	**High Level V.S.W.R.:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	σ :---	1.2
4.11	Life Test:	F= 9000Mc; po=200±10%kw (min); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8 meg. each electrode; Group D; Note 13	t : 500	---hrs
4.11.4	Life Test End Point:	Recovery Time; Flat Leakage Power; Spike Leakage Energy; Duplexer Loss, F= 9000Mc.	t :--- pf :--- Ws :--- Li :---	10μs 20mw .15erg 1.0db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: A suitable gasket shall be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 12-13-54. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 4: Vibrate in a plane normal to the ignitor axes. The ignitor electrodes shall not short to the tube body during vibration. Tubes shall meet all applicable requirements of this specification after the vibration test.

Note 5: See Test Circuit "A".
Attach a low level load, σ=1.05max., to arms M, R and L.
Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 6: See Test Circuit "A".
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 7: See Test Circuit "A".
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit "A".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 10: See Test Circuit "A".
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., on arm A.

Note 11: See Test Circuit "A".
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 12: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 13: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

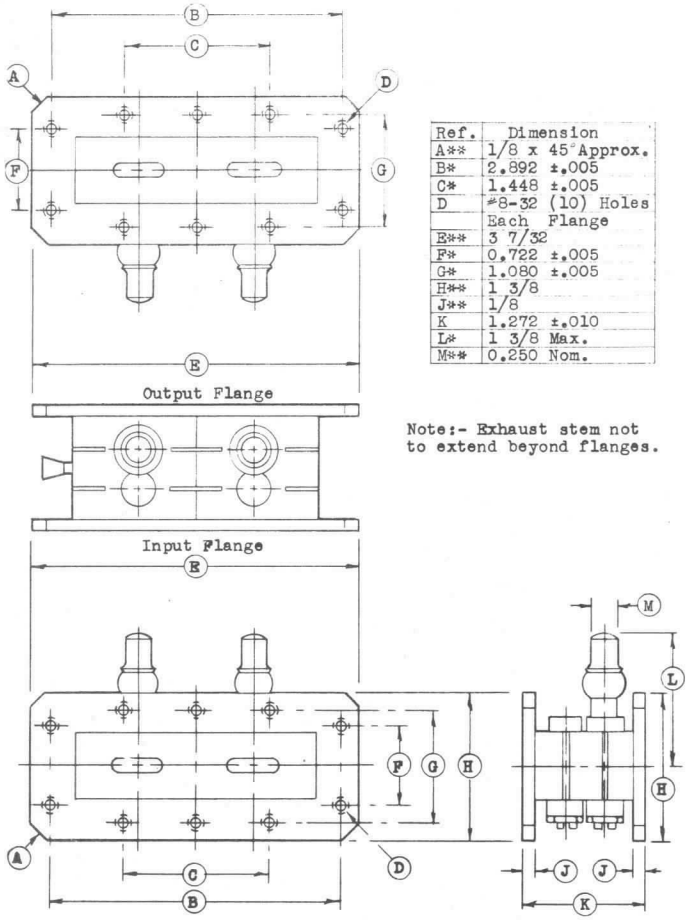
(over)

Note 14: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (R_1) = \frac{E_{bb} - E_1}{150} \text{ (megohms)}$$

Where R_1= Total series resistance
E_{bb}= Open circuit supply voltage
E_1= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



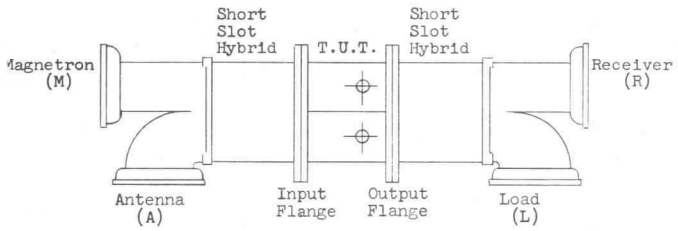
Ref.	Dimension
A**	1/8 x 45° Approx.
B*	2.892 ±.005
C*	1.448 ±.005
D	#8-32 (10) Holes Each Flange
E**	3 7/32
F*	0.722 ±.005
G*	1.080 ±.005
H**	1 3/8
J**	1/8
K	1.272 ±.010
L*	1 3/8 Max.
M**	0.250 Nom.

Note:- Exhaust stem not to extend beyond flanges.

TEST CIRCUIT "A"

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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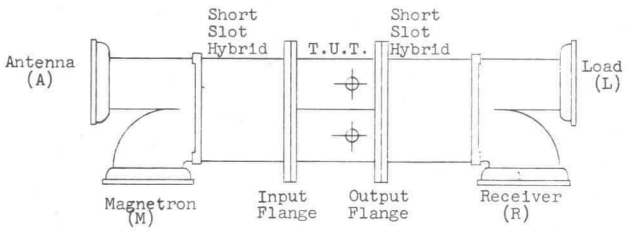
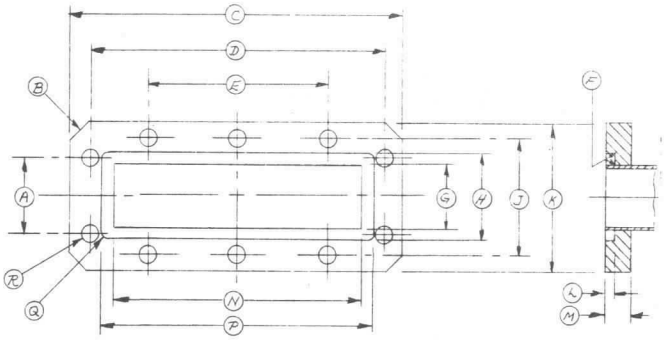




REF	DIMENSION
A	.722 ±.004
B	.120 x 45° CHAMFER OR 1/8 R.
C	3.210
D	2.892 ±.008
E	1.448 ±.008
F	.005 R. MAX
G	.628 ±.887
H	.872 ±.004
J	1.080 ±.004
K	1.380
L	.069 ±.002
M	.250
N	2.440 +.002 −.001
P	2.684 ±.004
Q	.096 ±.002 R.
R	#17(.173) DR. (10) HOLES

Bomac	SHUTTER	S
	BL345	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JULY 13, 1956

*Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	10	750	kw
Open Circuit Ignitor Voltage	-500	- 700	--- Vdc
Shutter Circuit Voltage	17	32	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 ohms
Pull In Current	78	---	---mAdc
Holding Current	60	160	---mAdc
Ignitor Current	100	200μAdc	
Altitude		10,000	ft.

Recommended Ignitor Operating Current 150μAdc (Note 6)

Test Conditions: Notes 4, 5

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.6	*Glass Strain:			---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size V		---	---
4.9.19.2	**Vibration:	10G; Note 9			
------	*Insertion:	Note 2			
4.18.18	Voltage Standing Wave Ratio:	$\dot{\sigma}$=1.05max.;			
		*F= 2664Mc	σ : ---		1.65
		F1=2689	σ : ---		1.2
		*F= 2714	σ : ---		1.3
		*F= 2739	σ : ---		1.3
		*F= 2764	σ : ---		1.3
		*F= 2789	σ : ---		1.3
		F2=2802	σ : ---		1.2
		*F= 2839	σ : ---		1.3
		*F= 2864	σ : ---		1.3
		*F= 2889	σ : ---		1.3
		*F= 2914	σ : ---		1.3
		F3=2939	σ : ---		1.2
		*F= 2964	σ : ---		1.65
4.18.4.2	*Insertion Loss (1):	F=F2; Iz=0μAdc	Li : ---		0.5db
4.18.4.2	*Insertion Loss (2):	Shutters Closed			
		F= 2664Mc	Li : 40		---db
		F= 2739	Li : 40		---db
		F= 2802	Li : 40		---db
		F= 2889	Li : 40		---db
		F= 2964Mc	Li : 40		---db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi : ---		0.3db
4.18.1	Ignitor Firing Time:	Ebb= 600Vdc; Ri=1.6 Meg.	t : ---		5 sec.
4.18.2	Ignitor Voltage Drop:	Iz=200μAdc	Eid : -250		-400Vdc
------	Flat Leakage Energy:	F=F2; po=200±10kw; $\dot{\sigma}$=1.1max; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000 pps; Iz=200μAdc	Wi : ---		0.4erg
4.18.10	Spike Leakage Energy:		Ws : ---		0.3 erg
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw tp=1.0μs; prr=1000pps; F=F2	σ : ---		1.15

Ref.	Test	Conditions		Min.	Max.
4.18.15.1	*Recovery Time:	po=750kw nom; F=F2; Du=.0008; Iz=200μAdc; Note 3	t : ---		15μs
------	Shutter Current:	Shutter Voltage =28 Vdc	I : 127		156mAdc
------	Pull In Current:	------	I : ---		75mAdc
------	Holding Current:	Note 7	I : ---		60mAdc
4.11	Life Test (1):	po=750±10% kw(min); Du=.0008; F=F2; Iz=150-200μAdc; Group C	t : 500		---hrs.
4.11	Life Test(2):	cps=10max; Group D; Note 8	Cycles : 50,000		---
4.11.4	Life Test (1) End Point:	Recovery Time;	t : ---		30μs
		Leakage Energy;	Wi : ---		0.4erg
		Spike Leakage Energy;	Ws : ---		0.3erg
		and Insertion Loss	Li : ---		1.2db
4.11.4	Life Test (2) End Point:	Insertion Loss	Li : ---		1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3 db in excess of the loss at 800-1000μs after the pulse.

Note 4: The shutters of the BL-345 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1 kw. They are not intended for application involving the switching of high power and should be open or closed whenever high power is incident on the tube.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

where Ri=Total series Resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

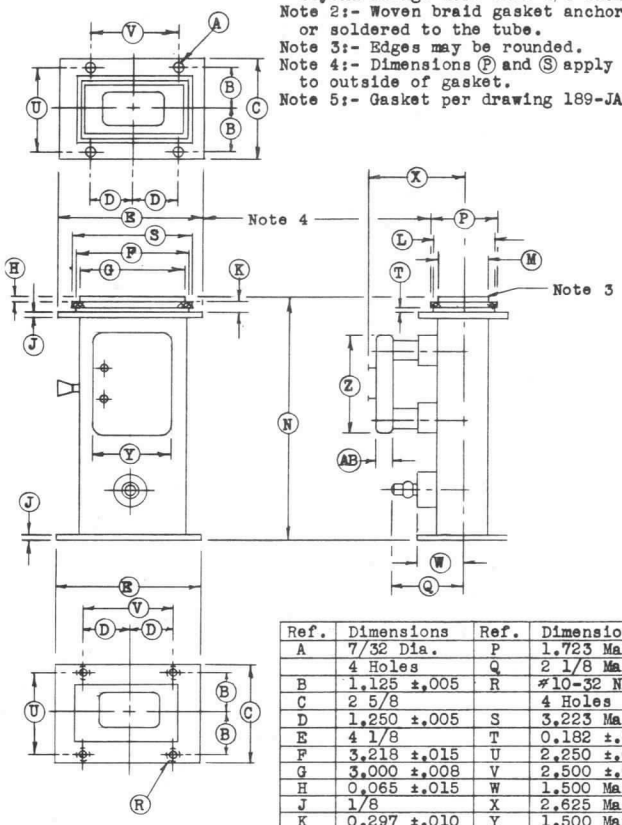
Note 7: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 8: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

Note 9; Shutter current during vibration test is 60mAdc.

(over)

Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 3:- Edges may be rounded.
Note 4:- Dimensions (P) and (S) apply to outside of gasket.
Note 5:- Gasket per drawing 189-JAN.



Ref.	Dimensions	Ref.	Dimensions
A	7/32 Dia.	P	1.723 Max.
	4 Holes	Q	2 1/8 Max.
B	1.125 ±.005	R	#10-32 NF
C	2 5/8		4 Holes
D	1.250 ±.005	S	3.223 Max.
E	4 1/8	T	0.182 ±.005
F	3.218 ±.015	U	2.250 ±.010
G	3.000 ±.008	V	2.500 ±.010
H	0.065 ±.015	W	1.500 Max.
J	1/8	X	2.625 Max.
K	0.297 ±.010	Y	1.500 Max.
L	1.718 ±.015	Z	2.500 Max.
M	1.500 ±.008	AB	0.375 Max.
N	6.610 ±.030		

Bomac	SHUTTER	S
	BL351	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 9, 1956

Dimensions: Per Outline

Ratings	Min.	Max.	Nom.
Transmitter po	10.0	---	---kw
Open Circuit Ignitor Voltage	-500	-700	---Vdc
Shutter Circuit Voltage	17	30	28 Vdc
Shutter Circuit Res (25°C)	180	220	200 ohms
Pull In Current	78	---	--- mAdc
Holding Current	60	160	--- mAdc
Altitude	---	---	10,000 ft.

Test Conditions: Notes 5, 6

Pack in sealed water-vapor-proof bag. If an opaque bag is used, the type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.5	Holding Period:	t=168 hours		
4.9.6	*Glass Strain:			
4.9.18.1.8	Carton Drop:	(d) Package Group (1); Carton Size V		
------	**Vibration:	Cycles = 1 F=5 to 500 cps; G=15; Shutter Current =60mAdc; t=5 min. Note 7		
4.9.19.2	**Vibration:	10G		
------	*Insertion:	Note 1		
4.18.18	Voltage Standing Wave Ratio:	σ=1.05 max.; F1= 2900Mc; F2= 3050Mc; F3= 3200Mc	σ :---	1.40
4.18.18	**Voltage Standing Wave Ratio:	σ=1.05; Note 2	σ :---	1.90
4.18.4.2	*Insertion Loss(1):	F=F2; Iz=0μAdc	Li :---	0.7db
4.18.4.2	*Insertion Loss(2):	Shutters Closed F=F1 F=F2 F=F3	 40 40 40	 ---db ---db ---db
4.18.5.1	*Ignitor Interaction:	Iz=200μAdc	ΔLi :---	0.3db
4.18.1	Ignitor Firing Time:		t :---	5 sec
4.18.2	Ignitor Voltage Drop:		Eid :-250	-400Vdc
------	Shutter Current:	Shutter Voltage =28Vdc	I :127	156mAdc
------	Pull In Current:	Note 10	I :---	78mAdc
------	*Holding Current:	Note 8	I :---	60mAdc
4.18.9	Flat Leakage Energy:	F=F2; Po=200±10kw; σ=1.1max.; tp1=1.0±.15μs; tp2=0.5±.15μs; prr=1000 pps; Iz=200μAdc	Wi :---	0.4erg
4.18.10	Spike Leakage Energy:		Ws :---	0.3erg
4.18.19	**High Level Voltage Standing Wave Ratio:	po=50kw; tp=1.0μs; prr=1000 pps; F=F2	σ :---	1.15

Ref.	Test	Conditions		Min.	Max.
4.18.15.1	*Recovery Time:	po= 750kw nom; F=F2; Du=.0008; Iz=200μAdc; Note 3	t :	---	15μs
4.11	Life Test(1):	cps=10max.; Group C Note 9	Cycles :	50,000	---
4.11	Life Test(2):	po=750kw±10%(min.); Du=.0008; F=F2; Iz=150-200μAdc; Group C	t :	500	---hrs
4.11.4	Life Test(1 and 2) End Point:	Recovery Time	t :	---	30μs
		Leakage Energy	Wi :	---	0.4erg
		Spike Leakage Energy	Ws :	---	0.3erg
		Insertion Loss(1)	Li :	---	1.2db
		Insertion Loss(2)	Li :	40	---db

Note 1: The tube shall be capable of being inserted and removed from its seat a minimum of 15 times with no deterioration in the tube's electrical characteristics.

Note 2: The input standing wave ratio shall be measured at intervals of 30Mc from (F3 + 30)Mc. At no frequency in this interval shall the VSWR be greater than the amount specified.

Note 3: The loss of signal in the tube at the specified time after the start of the transmitter pulse shall not be greater than 3db in excess of the loss at 800 to 1000 μs after the pulse.

Note 4: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 3 October 1955.

Note 5: The shutters of the BL-351 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 6: Unless otherwise specified all low and high level test are to be made with the tube shutters open.

Note 7: Vibrate along a line parallel to the axes of the shutters. Tubes shall meet all requirements of this specification after the vibration test.

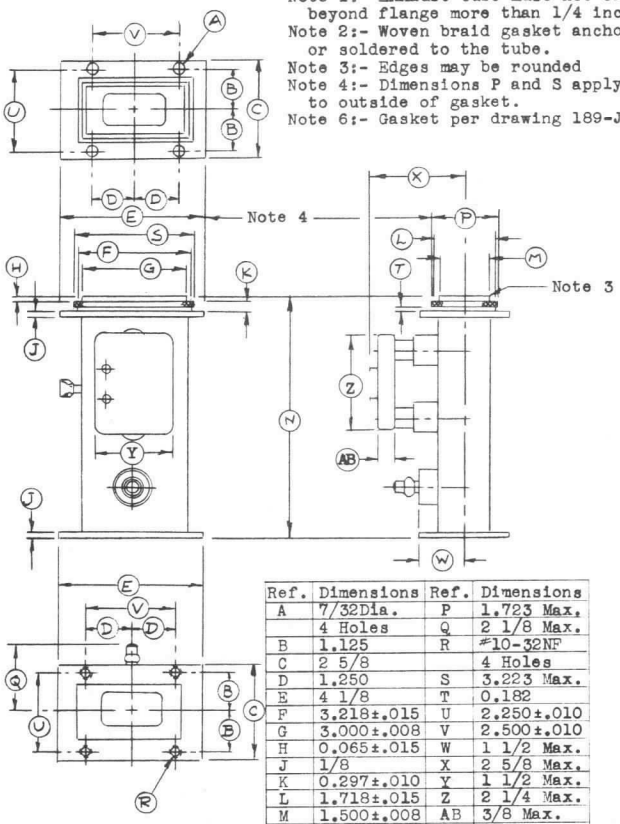
Note 8: The current required to hold the shutters open shall be within specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 9: 17-30 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

Note 10: Pull in current may be defined as the minimum current necessary to reliably open all shutters.

(over)

Note 1:- Exhaust tube must not extend beyond flange more than 1/4 inch.
Note 2:- Woven braid gasket anchored or soldered to the tube.
Note 3:- Edges may be rounded
Note 4:- Dimensions P and S apply to outside of gasket.
Note 6:- Gasket per drawing 189-JAN.



Ref.	Dimensions	Ref.	Dimensions
A	7/32Dia.	P	1.723 Max.
	4 Holes	Q	2 1/8 Max.
B	1.125	R	#10-32NF
C	2 5/8		4 Holes
D	1.250	S	3.223 Max.
E	4 1/8	T	0.182
F	3.218±.015	U	2.250±.010
G	3.000±.008	V	2.500±.010
H	0.065±.015	W	1 1/2 Max.
J	1/8	X	2 5/8 Max.
K	0.297±.010	Y	1 1/2 Max.
L	1.718±.015	Z	2 1/4 Max.
M	1.500±.008	AB	3/8 Max.
N	5.494±.030		

Bomac	SHUTTER	X
	6596/BL317	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

NOVEMBER 15, 1955

Application: Short Slot Hybrid Duplexer (Note 2)

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-1000	---	--- Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Resistance (25°C)	90	110	100 Ohms
Pull In Current	220	---	--- mAdc
Holding Current	110	320	--- mAdc

Test Conditions: Notes 3, 4; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be Specified	---	---
------	*Vibration:	Cycles =1; F= 75 cps to F= 500cps; G= 10; t= 5 min; Shutter Current= 110mAdc; Note 5	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ:---	1.4
		F= 8565	σ:---	1.2
		*F= 8655	σ:---	1.2
		*F= 8745	σ:---	1.2
		*F= 8835	σ:---	1.2
		*F= 8925	σ:---	1.2
		F= 9000	σ:---	1.2
		*F= 9087	σ:---	1.2
		*F= 9187	σ:---	1.2
		*F= 9287	σ:---	1.2
		*F= 9387	σ:---	1.2
		F= 9487	σ:---	1.2
		F= 9578Mc; Note 6	σ:---	1.4
4.18.4.2	*Duplexer Loss (1):	F= 8490Mc	Li:---	1.2db
		F= 8565	Li:---	1.0db
		F= 9000	Li:---	1.0db
		F= 9487	Li:---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 7	Li:---	1.2db
4.18.4.2	*Duplexer Loss (2):	F= 8490Mc	Li:60	---db
		F= 8565	Li:60	---db
		F= 9000	Li:60	---db
		F= 9487	Li:60	---db
		F= 9578Mc; Note 8	Li:60	---db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	18	---db
		F= 9000	20	---db
		F= 9487	18	---db
		F= 9578Mc; Note 9	15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-1000Vdc; Ri=5.1 Meg; Note 10	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 10	Eid:200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf:---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	---	0.6db
4.18.5.1	*Ignitor Interaction:	Ii=110μAdc on each electrode; Note 7	Δ Li:---	0.2db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	t:---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	σ:---	1.2
------	Shutter Current:	Shutter Voltage =28Vdc	I:254	311mAdc
------	Pull In Current:	--------	I:---	220mAdc
------	Holding Current:	Note 17	I:---	110mAdc
4.11	Life Test:	F= 9000Mc; po=200±10%kw (min); tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Group D; Note 15	t:500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:---	10μs
		Flat Leakage Power;	pf:---	20mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss(1), F= 9000Mc.	Li:---	1.2db
4.11	Shutter Life Test:	cps.=10max; Group D; Note 16	Cycles:50,000	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The shutters of the 6596 (BL-317) provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po≤1 kw. They are not intended for applications involving the switching of high power and should remain open during high power transmission.

Note 3: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange and Gasket, dated 9-21-54. Two gaskets shall be furnished with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ± 0.25 db, and a minimum of 27 db Directivity.

Note 5: Shutters Open. Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔL1), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

Note 6: Shutters Open. See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 7: Shutters Open. See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: Same as Note 7, except Shutters are closed.

Note 9: Shutters Open. See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

(over)

Note 11: Shutters Open. See Test Circuit
Transmitter po in arm M; a high **level load, σ=1.07max.,** on arm A; a low level load, σ=1.07max., on **arm L;** Leakage Power detected at arm R.

Note 12: Shutters Open. See Test Circuit
Use only one hybrid with its gasket. **Transmitter po in** arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

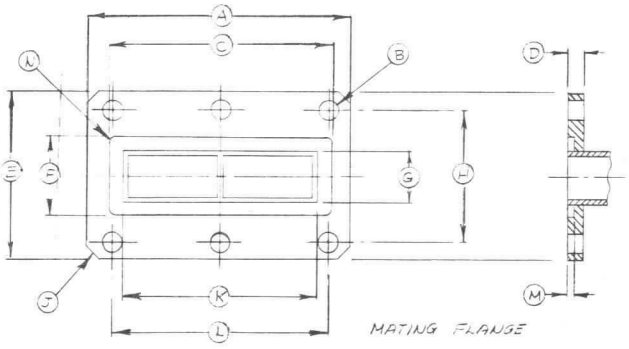
Note 13: Shutters Open. See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 14: Shutters Open. See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, should be within the limits specified.

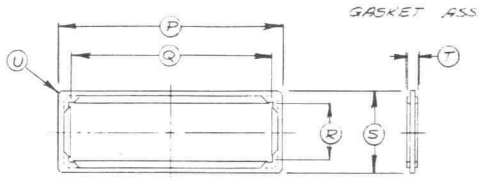
Note 15: Shutters Open. See Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 16: 28Vdc pulses are applied to the shutter circuit. **Each** time the shutters open,a low level signal goes **through** the tube and is registered by a counting circuit. **At** the end of this test the number of signals received should equal the number of pulses applied to the shutter coils. The tube must also satisfy the specified Life Test End Point.

Note 17: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.



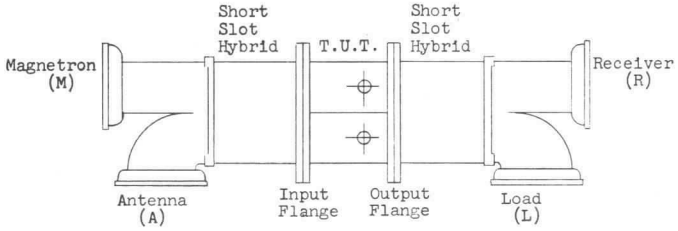
GASKET ASSEMBLY



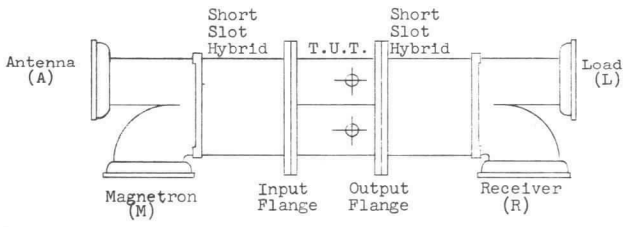
REF	DIMENSIONS	REF	DIMENSIONS
A	2.575 ±.015	Q	1.955 MIN
B	#8(.1695)DR(6) HOLES	R	.506 MIN
C	2.250 ±.005	S	.171 MAX
D	.240 ±.010	T	.037
E	1.625 ±.015	U	1/16 x 45°
F	.781 ±.005		
G	.500 ±.003		
H	1.280 ±.004		
J	1.120 R (APPROX)		
K	1.953 ±.004		
L	2.170 ±.006		
M	.023 ±.001		
N	1/16 R		
P	2.26 MAX		

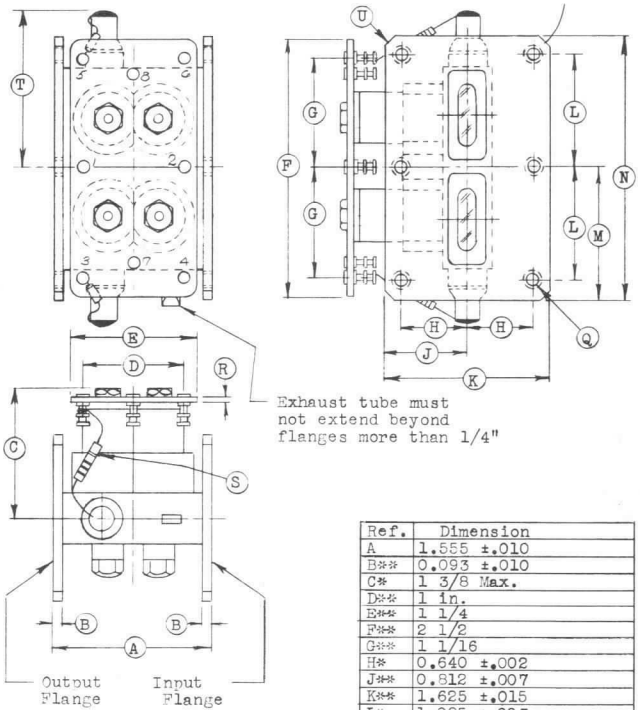
Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



(2)





Terminal Connections	
1+2	28 VDC
3+5	Ignitor Voltage

Ref.	Dimension
A	1.555 ±.010
B**	0.093 ±.010
C*	1 3/8 Max.
D**	1 in.
E**	1 1/4
F**	2 1/2
G**	1 1/16
H*	0.640 ±.002
J**	0.812 ±.007
K**	1.625 ±.015
L*	1.085 ±.003
M**	1.2875 ±.007
N**	2.575 ±.015
Q	#8-32NC 6 Holes Each Flange
R**	1/16
S	5.1 Meg 1/2 Watt ±5% Resistor JAN R-11
T*	1.500 Max.
U**	1/8 Rad.

Bomac	SHUTTER	X
	6601/BL327	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 20, 1956

Application: Short Slot Hybrid Duplexer (Note 2)

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	---	---	28Vdc
Shutter Circuit Resistance(25°C)	90	110	1000hms
Pull In Current	155	---	---mAdc
Holding Current	110	335	---mAdc
Ignitor Current	100	200	---μAdc
Recommended Ignitor Operating Current 150 μAdc (Note 18) (each electrode)			

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required For JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	*Vibration:	Cycles=1; F=5cps to F=500cps; G=15; Shutter Current= 110mAdc; t=5 min; Note 6	---	---
4.18.17.1	Temperature Cycle:	----	---	---
-----	Shutter Current:	Shutter Voltage=28Vdc	I:254	311mAdc
-----	Pull In Current:	-----	I:---	155mAdc
-----	*Holding Current:	Note 7	I:---	110 mAdc
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 8	t :---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid :200	375Vdc
4.18.4.2	*Duplexer Loss (1):	F= 8490Mc	Li :---	1.1db
		F= 8565	Li :---	0.9db
		F= 9000	Li :---	0.9db
		F= 9487	Li :---	0.9db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 9	Li :---	1.1db
4.18.4.2	Duplexer Loss (2):	Shutters Closed;		
		*F= 8490Mc	Li :40	---db
		*F= 8565	Li :40	---db
		F= 9000	Li :40	---db
		*F= 9487	Li :40	---db
		*F= 9578Mc; Note 9	Li :40	---db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	17	---db
		F= 9000	20	---db
		F= 9487	17	---db
		F= 9578Mc; Note 10	15	---db
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :---	1.4
		F= 8565	σ :---	1.2
		*F= 8655	σ :---	1.2
		*F= 8745	σ :---	1.2
		*F= 8835	σ :---	1.2
		*F= 8925	σ :---	1.2
		F= 9000	σ :---	1.2
		*F= 9087	σ :---	1.2
		*F= 9187	σ :---	1.2
		*F= 9287	σ :---	1.2
		*F= 9387	σ :---	1.2
		F= 9487	σ :---	1.2
		F= 9578Mc; Note 11	σ :---	1.4
4.18.10	Spike Leakage Energy:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 12	Ws :---	0.1erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf :---	20mw
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	t :---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	σ :---	1.2
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 15	---	0.4db
4.11	Life Test (1):	cps=10max; Group D; Note 16	Cycles :50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200±10%kw(min); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc;Ri=2.8meg each electrode; Group D; Note 17	t :500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Duplexer Loss (1), at F=9000 Mc;	Li:---	1.2db
		Duplexer Loss (2), at F=9000 Mc;	Li:40	---db
		Spike Leakage Energy;	Ws:---	.15erg
		Flat Leakage Power;	pf:---	20mw
		Recovery Time	t:---	10 μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The shutters of the BL-327 provide a convenient method of opening or shorting waveguide lines at low power levels, peak power input <1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: To be mounted between a hybrid of RG-51/U waveguide (high power side of duplexer) and a hybrid of RG-52/U waveguide (low power side of duplexer). A suitable gasket shall be bolted between each flange of the tube and its mating flange. See attached drawing of Input Mating Flange dated 12-6-54 and Output Mating Flange dated 12-6-54. Two gaskets shall be supplied with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25db, and a minimum of 27 db Directivity.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔL1), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after the vibration test. During vibration the tube shutters shall be held open by the specified Minimum Holding Current.

(over)

Note 7: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 8: Measured separately for each ignitor electrode.

Note 9: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 10: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 11: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 12: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 13: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A: a low level load, σ=1.07max., on arm L; detector on arm R.

Note 14: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 15: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 16: 28 Vdc pulses are applied to the shutter circuit. Each time the shutters open, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 17: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 18: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (R_1) = \frac{E_{bb} - E_1}{150} \text{ (megohms)}$$

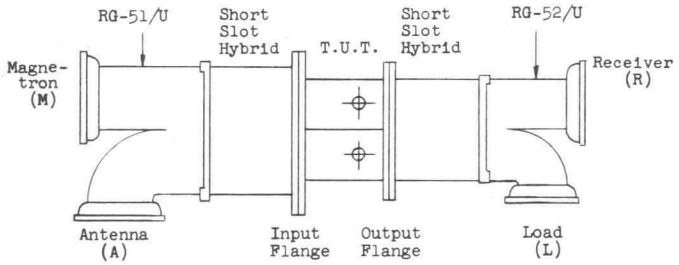
where R_1 = Total series resistance
E_{bb} = Open circuit supply voltage
E_1 = Average (Center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

TEST CIRCUIT "L"

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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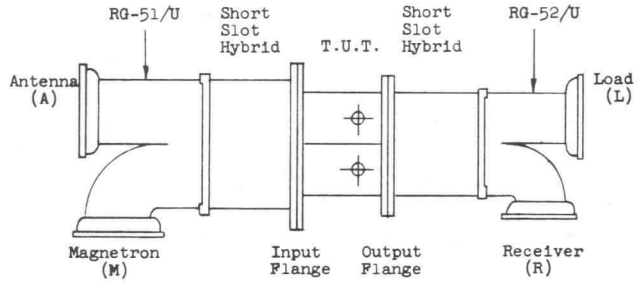
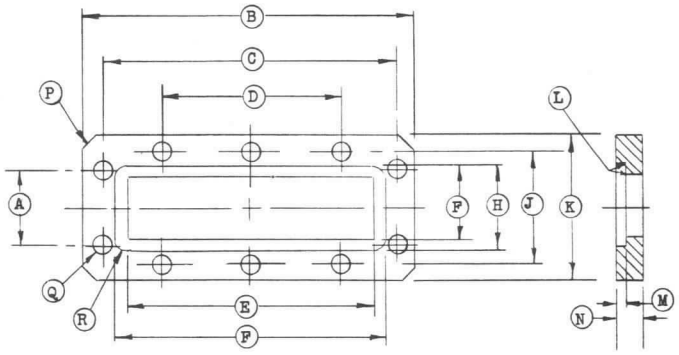
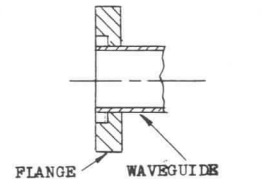




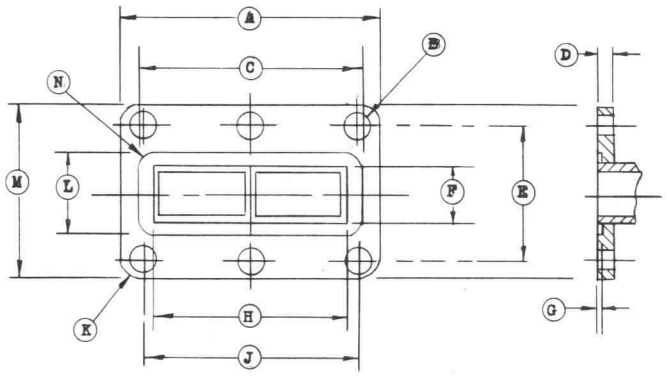
Ref.	Dimensions
A	.722 ±.004
B	3.210
C	2.892 ±.008
D	1.448 ±.008
E	2.440 +.005 −.007
F	2.684 ±.004
G	.628 +.007 −.005
H	.872 ±.004
J	1.080 ±.004
K	1.380
L	.005 R. Max.
M	.069 ±.002
N	.250
P	.120 x 45 chamfer or 1/8 R.
Q	# 17 (.173) Dr. (10) holes
R	.046 R. ±.002



Flange used for following
6601/BL-327
6642/BL-600
BL-335
BL-341
BL-631

(continued)

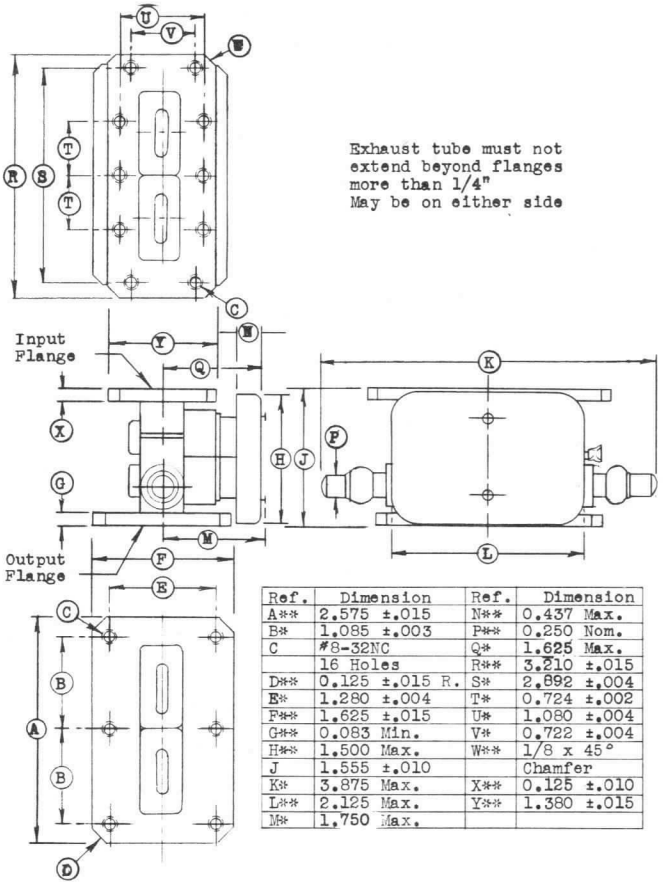
BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 20, 1956



Ref.	Dimensions
A	2.575 ±.015
B	#18 (.1695) Dr. (6) Holes
C	2.203 ±.005
D	.220 ±.010
E	1.280 ±.004
F	.500 ±.003
G	.070 ±.001
H	1.950 ±.004
J	2.170 ±.006
K	1-1/16 R.
L	.753 ±.005
M	1.625 ±.015
N	3/64 R.

FLANGE USED FOR:

6601/BL-327
6642/BL-600
BL-335
BL-341
BL-631



Ref.	Dimension	Ref.	Dimension
A**	2.575 ±.015	N**	0.437 Max.
B*	1.085 ±.003	P**	0.250 Nom.
C	#8-32NC 16 Holes	Q*	1.625 Max.
		R**	3.210 ±.015
D**	0.125 ±.015 R.	S*	2.892 ±.004
E*	1.280 ±.004	T*	0.724 ±.002
F**	1.625 ±.015	U*	1.080 ±.004
G**	0.083 Min.	V*	0.722 ±.004
H**	1.500 Max.	W**	1/8 x 45° Chamfer
J	1.555 ±.010		
K*	3.875 Max.	X**	0.125 ±.010
L**	2.125 Max.	Y**	1.380 ±.015
M*	1.750 Max.		

Bomac	SHUTTER	X
	6615/BL312	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.	
Transmitter po	1	250	---	kw
Open Circuit Ignitor Voltage	-700	---	---	Vdc
Shutter Circuit Voltage	---	---	28	Vdc
Shutter Circuit Res.(25°C)	180	220	200	Ohms
Pull In Current	110	---	---	mAdc
Holding Current	60	160	---	mAdc
Ignitor Current	100	200	---	μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 8)

Test Conditions: Notes 2, 3

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours.	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	*Vibration	Cycles=1; F=5 cps to F=500 cps; G=15; Shutter Current 60 mAdc; t=5 min.(min); Note 4	---	---
4.18.17.1	Temperature Cycle:	----	---	---
----	Shutter Current:	Shutter Voltage =28 Vdc	I:127	156mAdc
----	Pull In Current:	----	I:---	110mAdc
-----	*Holding Current:	Note 5	I:---	60mAdc
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid:200	375Vdc
4.18.4.2	Insertion Loss (1):	F= 9000Mc; Ii=0μAdc	Li:---	0.7db
4.18.4.2	Insertion Loss (2):	Shutters Closed;		
		*F= 8490Mc	Li:40	---db
		*F= 8565	Li:40	---db
		F= 9000	Li:40	---db
		*F= 9487	Li:40	---db
		*F= 9578Mc	Li:40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi:---	0.2db
4.18.18	Voltage Standing Wave Ratio:	σ'=1.05 max.;		
		F= 8490 Mc.	σ:---	1.9
		F= 8565	σ:---	1.4
		*F= 8650	σ:---	1.4
		*F= 8740	σ:---	1.4
		*F= 8830	σ:---	1.4
		*F= 8920	σ:---	1.4
		F= 9000	σ:---	1.4
		*F= 9090	σ:---	1.4
		*F= 9180	σ:---	1.4
		*F= 9280	σ:---	1.4
		*F= 9380	σ:---	1.4
		F= 9487	σ:---	1.4
		F= 9578Mc.	σ:---	1.9
4.18.10	Spike Leakage Energy:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ'=1.10max.	Ws:---	0.30erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:---	40mw
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t:---	10μs.
4.18.28	Arc Loss:	F= 9000Mc; po=4kw min; tp=1.0±0.15μs; prr=1000	---	0.8db
4.18.31	Position of Short:	F= 9000Mc; po=40±10%kw; tp=1.0±0.15μs; prr=1000; σ'=1.10max.; Note 6	---	±0.007in.
4.11	Life Test (1):	cps=10max.; Group D; Note 7	Cycles:50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200kw min; tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc; Ri=2.8 meg. Group D	t:500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Insertion Loss (1); Insertion Loss (2) at F= 9000Mc.; Spike Leakage Energy; Flat Leakage Power; Recovery Time	Li:--- / Li:40 / Ws:--- / pf:--- / t:---	0.7db / ---db / 0.35erg / 50mw / 20μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955

Note 2: The shutters of the 6615(BL-312) provide a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 4: The shutters shall be held open during vibration by the specified Minimum Holding Current. Vibrate along a line parallel to the axes of the shutters. Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔL1), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification, after vibration.

Note 5: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.065 inch further from the magnetron within the limits specified.

Note 7: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

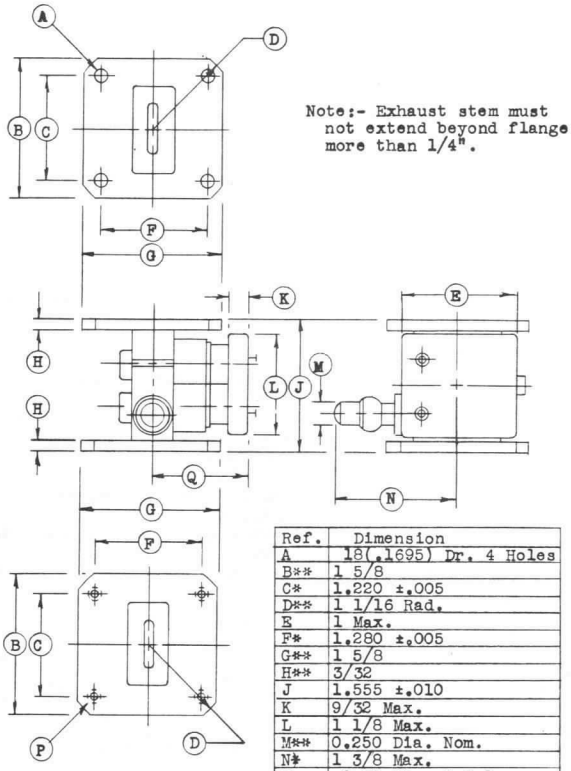
(over)

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Note:- Exhaust stem must not extend beyond flange more than 1/4".

Ref.	Dimension
A	18(.1695) Dr. 4 Holes
B**	1 5/8
C*	1.220 ±.005
D**	1 1/16 Rad.
E	1 Max.
F*	1.280 ±.005
G**	1 5/8
H**	3/32
J	1.555 ±.010
K	9/32 Max.
L	1 1/8 Max.
M**	0.250 Dia. Nom.
N*	1 3/8 Max.
P	8-32 NC 4 Holes
Q*	1 5/8 Max.

Bomac	SHUTTER	X
	6904/BL348	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 14, 1956

Application: Short Slot Hybrid Duplexer (Note 2)

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Resistance (25°C)	90	110	100 ohms
Pull In Current	220	---	---mAdc
Holding Current	110	320	---mAdc
Ignitor Current	100	200	---μAdc

Recommended Ignitor Operating Current 150μAdc (Note 18) (each electrode)

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit

Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	*Vibration:	Cycles=1; F=5 to 55cps, 0.080 in. (total); F=55 to 500 cps; G=15; Shutter Current=110mAdc; t=5 min; Note 6	---	---
------	Shutter Current:	Shutter Voltage =28 Vdc	I : 254	311mAdc
------	Pull In Current:	------	I : ---	220mAdc
------	*Holding Current:	Note 7	I : ---	110mAdc
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ : ---	1.4
		F= 8565	σ : ---	1.2
		*F= 8655	σ : ---	1.2
		*F= 8745	σ : ---	1.2
		*F= 8835	σ : ---	1.2
		*F= 8925	σ : ---	1.2
		F= 9000	σ : ---	1.2
		*F= 9087	σ : ---	1.2
		*F= 9187	σ : ---	1.2
		*F= 9287	σ : ---	1.2
		*F= 9387	σ : ---	1.2
		F= 9487	σ : ---	1.2
		F= 9578Mc; Note 8	σ : ---	1.4
4.18.4.2	*Duplexer Loss(1):	F= 8490Mc	Li : ---	1.2db
		F= 8565	Li : ---	1.0db
		F= 9000	Li : ---	1.0db
		F= 9487	Li : ---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 9	Li : ---	1.2db
4.18.4.2	Duplexer Loss(2):	Shutters Closed;		
		*F= 8490Mc	Li : 40	---db
		*F= 8565	Li : 40	---db
		F= 9000	Li : 40	---db
		*F= 9487	Li : 40	---db
		*F= 9578Mc; Note 9	Li : 40	---db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	18	---db
		F= 9000	20	---db
		F= 9487	18	---db
		F= 9578Mc; Note 10	15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 11	t : ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 11	Eid : 200	375Vdc

Ref.	Test	Conditions	Min.	Max.
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 12	pf : ---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws : ---	0.1 erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 13	---	0.6 db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	t : ---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 15	σ : ---	1.2
4.11	Life Test(1):	cps=10 max. Cycles Group D; Note 16	: 50,000	---
4.11	Life Test(2):	F= 9000Mc; po=200±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ebb= -700vdc; Ri=2.8 meg. each electrode; Group D; Note 17	t : 500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time	t : ---	10μs
		Flat Leakage Power;	pf : ---	20mw
		Spike Leakage Energy;	Ws : ---	.15 erg
		Duplexer Loss(1); at F= 9000Mc;	Li : ---	1.2db
		Duplexer Loss (2), at F= 9000Mc.	Li : 40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the BL-348 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: A suitable gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange. Two gaskets shall be furnished with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12 an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

(over)

Note 7: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 8: See Test Circuit
Attach a low level load, σ=1.05 max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 9: See Test Circuit
Allow level load, σ=1.05 max, on arms M and L. A low level signal in arm A is detected at arm R.

Note 10: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05 max., on all empty arms.

Note 11: Measured separately for each ignitor electrode.

Note 12: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07 max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 13: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 14: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07max. on arm L; detector on arm R.

Note 15: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 16: 28 Vdc pulses are applied to the shutter circuit. Each time the shutters open; a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 17: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

Note 18: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

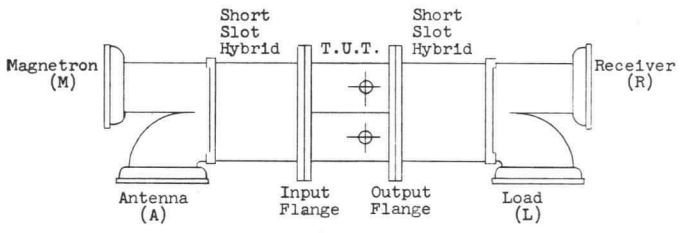
Series Resistance (Ri)=$\frac{Ebb-Ei}{150}$ (megohms)

where Ri=Total series resistance
Ebb=Open Circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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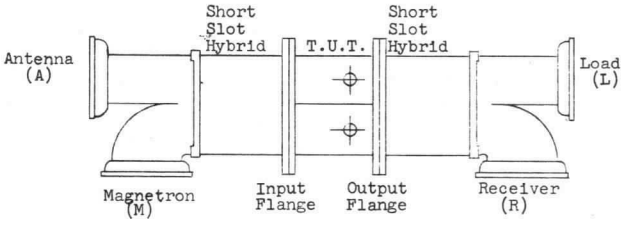
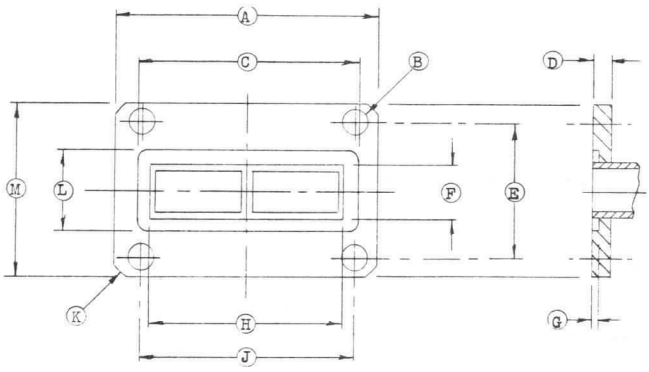
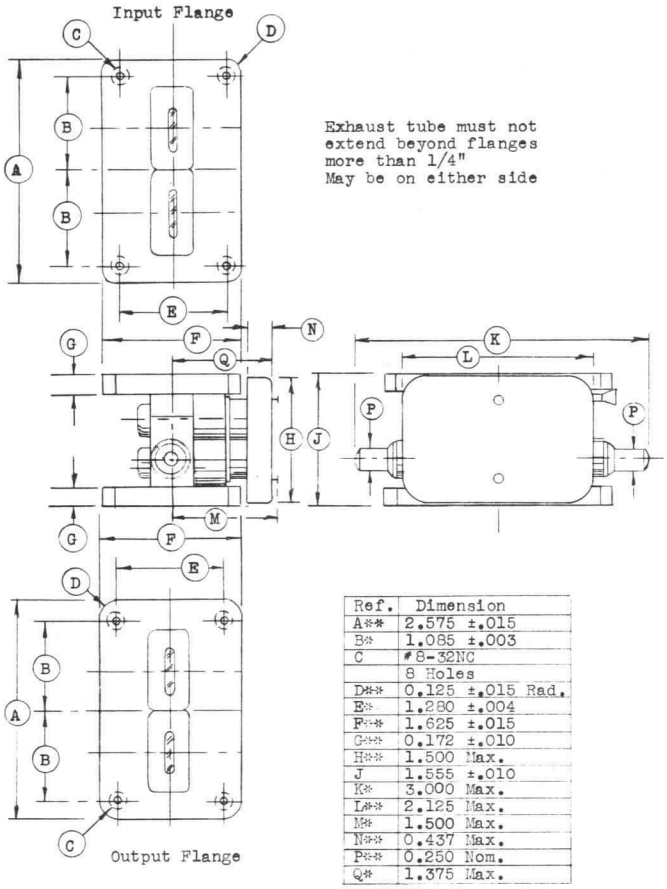




Ref.	Dimensions
A	2.575±.015
B	18(.1695) Dr. (4) Holes
C	2.203+.005-.000
D	.220±.010
E	1.280±.004
F	.500±.003
G	.070±.001
H	1.950±.004
J	2.170±.006
K	1 1/16 Rad.
L	.753+.005-.000
M	1.625±.015
N	3/64 Rad.



Exhaust tube must not extend beyond flanges more than 1/4"
May be on either side

Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#8-32NC 8 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.172 ±.010
H**	1.500 Max.
J	1.555 ±.010
K*	3.000 Max.
L**	2.125 Max.
M*	1.500 Max.
N**	0.437 Max.
P**	0.250 Nom.
Q*	1.375 Max.

Bomac	SHUTTER	X
	6600/BL323	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Shutter Circuit Voltage	---	---	3 V(ac-dc) Note 8
Shutter Circuit Resistance (25°C)	4.5	5.5	5.0 ohms
Pull In Current	500	---	---mAdc
Pull In Current	460	---	---mAac
Holding Current	135	600	---mAdc
Holding Current	460	---	---mAac

Test Conditions: Notes 2, 3,

Pack in sealed water-vapor-proof bag. If opaque bag is used the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size J	---	---
------	Shutter Current:	Shutter Voltage =3 Vdc;	I :545	670mAdc
		Shutter Voltage =3Vac	I :460	480mAac
------	Pull In Current:	------	I :---	500mAdc
			I :---	460mAac
------	*Holding Current:	------	I :---	135mAdc
			I :---	460mAac
4.18.4.1	Insertion Loss(1):	F= 9375±0.1%Mc.	Li :---	1.50db
4.18.4.1	*Insertion Loss(2):	F= 8490±0.1%Mc.	---	---
		F= 9600±0.1%Mc; Note 4	---	---
4.18.4.1	*Insertion Loss(3):	F= 8490Mc.	Li :40	---db
		F= 9045	Li :40	---db
		F= 9600Mc; Shutter Closed	Li :40	---db
4.18.6	Tuning Range:	Note 5	---	---
4.18.13.1	**Loaded Q:	F= 9375±0.1%Mc.	QL :---	350
4.18.14.1	**Frequency Temperature Effect:	F= 9375±0.1%Mc;	ΔF :---	-20Mc.
4.18.16	*Pressure Operation:	45 psi(abs.)	---	---
4.18.17.1	Temperature Cycle:	------	---	---
4.18.17.2	Temperature Cycle Life:	Group D Cycles	:50	---
4.11	Life Test(1):	cps. =10max.; Group D; Note 6 Cycles	:50,000	---
4.11	Life Test(2):	Continuous Holding Position; Group D	t :500	---hrs.
4.11.4	Life Test (1) End Point:	Insertion Loss (3)	Li :40	---db
4.11.4	Life Test (2) End Point:	Insertion Loss (1)	Li :---	2.0db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutter of the 6600/BL-323 provides a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1kw. The shutter is not intended for applications involving the switching of high power and should be open or closed whenever high power is incident on the tube.

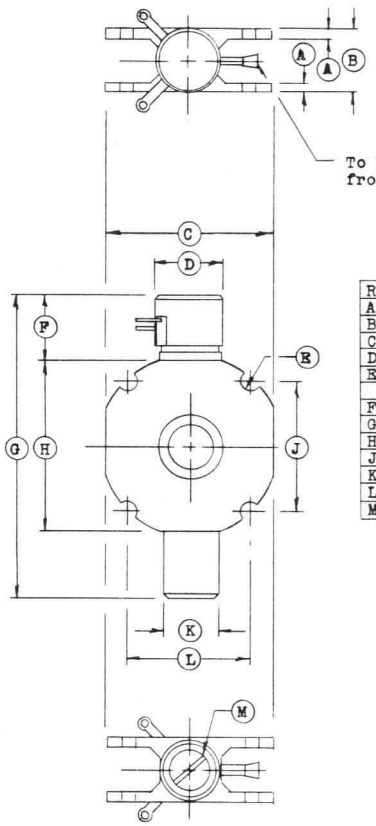
Note 3: Unless otherwise specified all low level and high level tests are to be made with the shutter of the 6600/BL-323 open.

Note 4: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder.

Note 5: The tube shall cover a minimum tuning range of from less than 8490Mc. to more than 9600Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range.

Note 6: 3 Vdc or 3 Vac pulses are applied to the shutter coil. Each time the shutter opens, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coil.

Note 7: This shutter may be operated using a 6 volt ac or dc supply provided a 5 ohm, 5 watt resistor is placed in series with the shutter coil.



Ref.	Dimension
A**	0.087 ±.015
B**	0.612
C*	1.625 ±.015
D*	0.690 ±.015
E	0.090 Rad. 4 Slots
F	3/4 Max.
G*	3.000 Max.
H**	1.625 ±.015
J*	1.280
K*	0.535 Max.
L*	1.220
M**	3/64 x 1/16 Slot

Bomac	SHUTTER	X
	BL307	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 29, 1956

Application: Short Slot Hybrid Duplexer (Note 2)

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Resistance (25°C)	90	110	100 Ohms
Pull In Current	220	---	---mAdc
Holding Current	110	320	---mAdc

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	**Vibration:	Cycles=1; F=5cps to F=500cps; G=15; Shutter Current= 110mAdc; t=5min; Note 6		---	---
------	Shutter Current:	Shutter Voltage =28Vdc	I :	254	311mAdc
------	Pull In Current:	--------	I :	---	220mAdc
------	Holding Current:	Note 7	I :	---	110mAdc
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :	---	1.4
		F= 8565	σ :	---	1.2
		*F= 8655	σ :	---	1.2
		*F= 8745	σ :	---	1.2
		*F= 8835	σ :	---	1.2
		*F= 8925	σ :	---	1.2
		F= 9000	σ :	---	1.2
		*F= 9087	σ :	---	1.2
		*F= 9187	σ :	---	1.2
		*F= 9287	σ :	---	1.2
		*F= 9387	σ :	---	1.2
		F= 9487	σ :	---	1.2
		F= 9578Mc; Note 8	σ :	---	1.4
4.18.4.2	*Duplexer Loss(1):	F= 8490Mc	Li :	---	1.2db
		F= 8565	Li :	---	1.0db
		F= 9000	Li :	---	1.0db
		F= 9487	Li :	---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 9	Li :	---	1.2db
4.18.4.2	Duplexer Loss(2):	Shutters Closed;			
		*F= 8490Mc	Li :	40	---db
		*F= 8565	Li :	40	---db
		F= 9000	Li :	40	---db
		*F= 9487	Li :	40	---db
		*F= 9578Mc; Note 9	Li :	40	---db
------	*Isolation:	F= 8490Mc		15	---db
		F= 8565		18	---db
		F= 9000		20	---db
		F= 9487		18	---db
		F= 9578Mc; Note 10		15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 11	t :	---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 11	Eid :	200	375Vdc

Ref.	Test	Conditions		Min.	Max.
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 12	pf :	---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 13		---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	t :	---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 15	σ :	---	1.2
4.11	Life Test (1):	cps=10max; Group D; Note 16	Cycles :	50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Group D; Note 17	t :	500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t :	---	10μs
		Flat Leakage Power;	pf :	---	20mw
		Spike Leakage Energy;	Ws :	---	.15erg
		Duplexer Loss(1); at F= 9000Mc;	Li :	---	1.2db
		Duplexer Loss(2), at F= 9000Mc.	Li :	40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the BL-307 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po≤1 kw. They are not intended for applications involving the switching of high power and should be open whenever high power is incident on the tube.

Note 3: A suitable gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange. Two gaskets shall be furnished with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12 an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

(over)

Note 7: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parrallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 8: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R, and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 9: See Test Circuit
Allow level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 10: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 11: Measured separately for each ignitor electrode.

Note 12: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 13: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 14: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

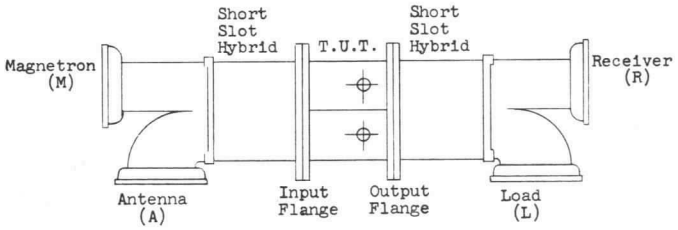
Note 15: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified

Note 16: 28Vdc pulses are applied to the shutter circuit. Each time the shutters open; a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 17: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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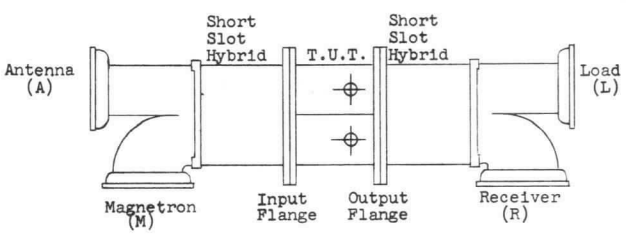
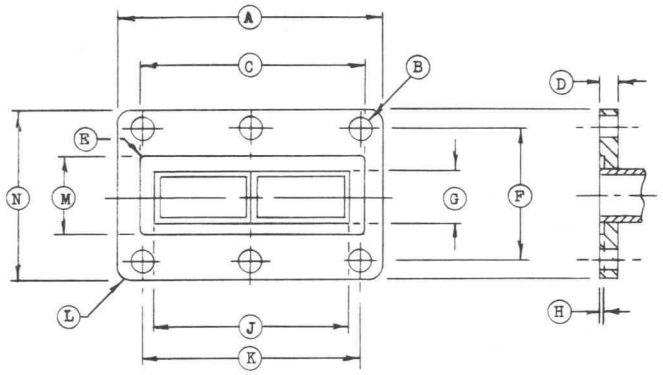
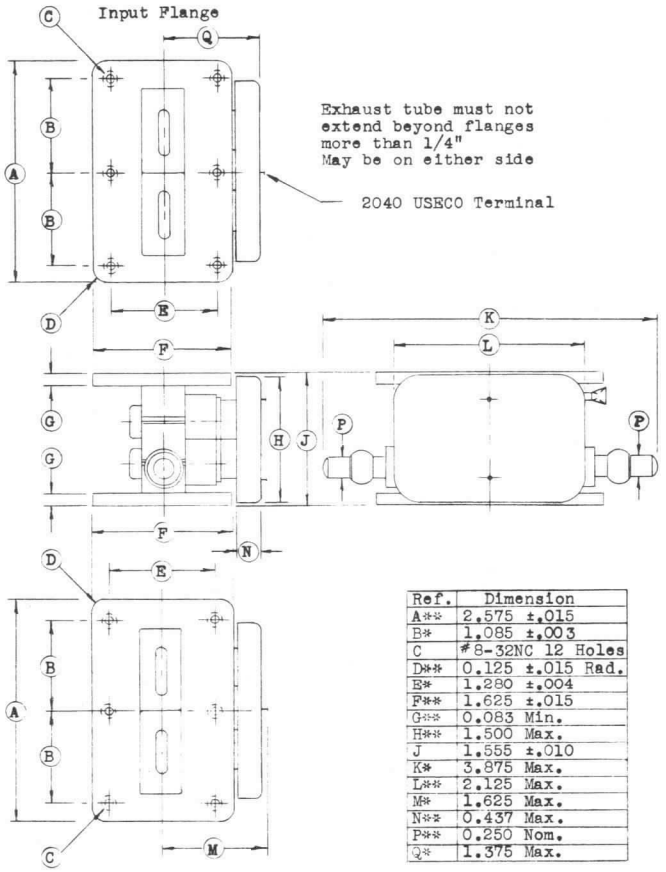




Ref.	Dimension
A	2.757 ±.015
B	#18(.1695) Dr.
	6 Holes
C	2.203 +.005 -.000
D	0.220 ±.010
E	3/64 Rad.
F	1.280 ±.004
G	0.500 ±.003
H	0.070 ±.001
J	1.950 ±.004
K	2.170 ±.006
L	0.120 Rad. Approx.
M	0.753 +.005 -.000
N	1.625 ±.015

This outline used for following tubes:-

BL-78, BL-307, 6599/BL-322, 6613/BL-324,
6601/BL-327, 6642/BL-600, BL-335,
BL-341, BL-631



Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#8-32NC 12 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.083 Min.
H**	1.500 Max.
J	1.555 ±.010
K*	3.875 Max.
L**	2.125 Max.
M*	1.625 Max.
N**	0.437 Max.
P**	0.250 Nom.
Q*	1.375 Max.

Bomac	SHUTTER	X
	BL339	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 11, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.	Nom.
Transmitter po	1.0	100	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Ignitor Current	100	200	---μAdc
Shutter Circuit Voltage	---	---	28Vdc
Shutter Circuit Resistance (25°C)	90	110	100 ohm
Pull In Current	220	---	---mAdc
Holding Current	110	320	---mAdc
Heater Circuit Wattage	---	---	25 W
Heater Circuit Voltage	---	---	115Vac
Heater Circuit Voltage Frequency	F:380	1000	---cps
Thermostat Contact Current	---	2	---Aac
Thermostat Cut In Temperature	4	---	---°C
Thermostat Cut Out Temperature	---	+50	---°C
Ambient Temp. Range	-60	+85	---°C

Recommended Ignitor Operation Current 150μAdc each electrode(Note 15)

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	*Vibration:	F=5 to 55 cps, 0.060 in. (total) F=55 to 500 cps, 10G; t=5 min; Note 6, 24	---	---
------	*Shock:	G=15; Note 18	---	---
------	**Humidity:	t=72 hours Note 19	---	---
------	Shutter Current:	Shutter Voltage =28 Vdc	I : 254	311mAdc
------	Pull In Current:	Note 23	I : ---	220mAdc
------	Holding Current:	Note 21	I : ---	110mAdc
------	*Thermostat Operation:	T= -55°C Note 20	T : 4.0	50°C
------	Heater Current:	Vac=115	If : ---	0.250 Aac
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ : ---	1.4
		F= 8565	σ : ---	1.2
		*F= 8655	σ : ---	1.2
		*F= 8745	σ : ---	1.2
		*F= 8835	σ : ---	1.2
		*F= 8925	σ : ---	1.2
		F= 9000	σ : ---	1.2
		*F= 9087	σ : ---	1.2
		*F= 9187	σ : ---	1.2
		*F= 9287	σ : ---	1.2
		*F= 9387	σ : ---	1.2
		F= 9487	σ : ---	1.2
		F= 9578Mc; Note 7, 17	σ : ---	1.4
4.18.4.2	*Duplexer Loss:	F= 8490Mc.	Li : ---	1.2db
		F= 8565	Li : ---	1.0db
		F= 9000	Li : ---	1.0db
		F= 9487	Li : ---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 8, 17	Li : ---	1.2db
------	*Isolation:	F= 8490Mc.	14.0	---db
		F= 8565	16.0	---db
		F= 9000	18.0	---db
		F= 9487	16.0	---db
		F= 9578Mc; Note 9, 17	14.0	---db

Ref.	Test	Conditions		Min.	Max.
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 10	t :	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 10	Eid :	200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc;±5% po40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf :	---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc;±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12		---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc;±5% po=100±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	t :	---	1.5μs
4.18.19	**High Level V.S.W.R:	F= 9000Mc±5% po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	σ :	---	1.2
4.11	Life Test(1):	cps=10 max; Group D; Note 22	Cycles :	50,000	---
4.11	Life Test(2):	F= 9000Mc;±5% po=100±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ebb= -700Vdc; Ri=2.8Meg. each electrode; Group D; Note 15	t :	500	---hrs.
4.11.4	Life Test(1) End Point:	Duplexer Loss(1)	Li :	40	---db
4.11.4	Life Test(2) End Point:	Recovery Time;	t :	---	3.0μs
		Flat Leakage Power;	pf :	---	20mw
		Spike Leakage Energy;	Ws :	---	.15erg
		Duplexer Loss, F= 9000Mc.	Li :	---	1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-10-54. Two gaskets shall be supplied with each tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25db, and a minimum of 27db Directivity.

Note 4: The shutters of the BL-339 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 5: Unless otherwise specified all low level tests are to be made with the tube shutters open.

(over)

Note 6: Vibrate in plane normal to ignitor axes. The ignitor electrodes shall not short to the tube body during vibration. Tubes shall meet all requirements of this specification after the vibration test.

Note 7: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 8: See Test Circuit
A low Level load σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 9: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

Note 11: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 13: See Test Circuit
Transmitter po in arm M; simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07max., on L; detector on arm R.

Note 14: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, should be within the limits specified.

Note 15: See Test Circuit
Use only one hybrid. Trasnmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 16: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. It is further recommended that the following formula be used to determine the value of the required series resistance.

Ebb= Open circuit supply voltage
Ei= average (center) ignitor voltage drop

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ Megohms}$$

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap.

Note 17: All frequencies are to be measured within 0.1% of value specified.

Note 18: The tube shall be subjected to 18 impact shocks of 15G; each shock impulse having a time duration of 6±1 milliseconds. The shock shall be applied in the following direction:
(a) Vertically, 3 shocks in each direction
(b) Parallel to the major horizontal axis, 3 shocks in each direction
(c) Parallel to the minor horizontal axis, 3 shocks in each direction

Note 19: The tube shall be placed in a chamber having a temperature and relative humidity of 55°C and 90% respectively. The test conditions shall be maintained for 72 hours. At the conclusion of this period, the tube shall operate without degradation of the limits specified.

Note 20: The tube having 10 inches of waveguide extending from each flange shall be placed in a frigid chamber -55°C. The thermostat should operate within the limits specified.

Note 21: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

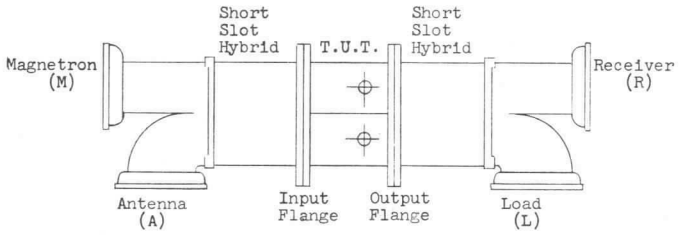
Note 22: 28 Vdc pulses are applied to the shutter curcuit. Each time the shutters open; a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 23: Pull in current may be defined as the minimum current necessary to reliably open all shutters.

Note 24: Shutter current should be 110mAdc during vibration.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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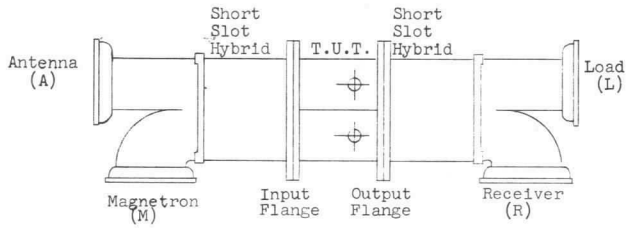
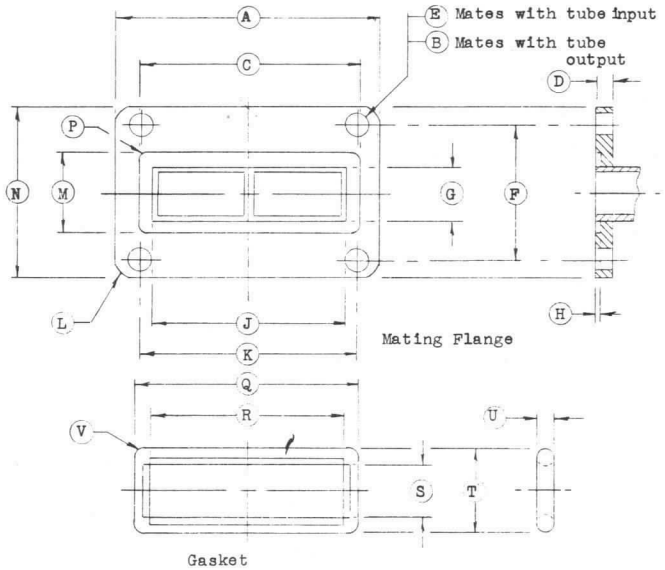




Ref.	Dimension	Ref.	Dimension
A	2.575±.015	K	2.170±.006
B	⌀18(.1695) Dr. 4 Holes	L	0.120 R. Approx.
		M	0.753+.005-.000
C	2.203+.005-.000	N	1.625±.015
D	0.220±.010	P	3/ 64 Rad.
E	#8-32 Tap 4 Holes	Q	2.162 Max.
		R	1.959 Min.
F	1.280±.004	S	0.508 Min.
G	0.500±.003	T	0.709 Max.
H	0.070±.001	U	0.110 Typ.
J	1.950±.004	V	3/ 64 Rad. Typ.

Two (2) gaskets to be supplied with each tube.

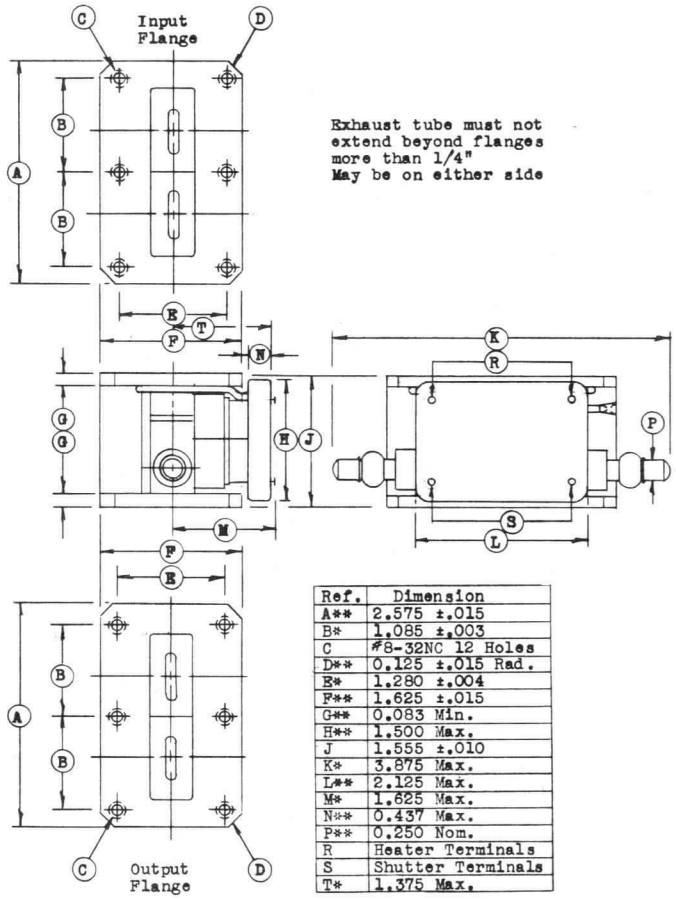
Note:- Outline used for following tubes

6334, 6646, 6647, BL-27, BL-604, BL-604H, BL-339

GS-2E-1.10.20.09

(continued)

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 11, 1956



Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#8-32NC 12 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.083 Min.
H**	1.500 Max.
J	1.555 ±.010
K*	3.875 Max.
L**	2.125 Max.
M*	1.625 Max.
N**	0.437 Max.
P**	0.250 Nom.
R	Heater Terminals
S	Shutter Terminals
T*	1.375 Max.

Bomac	SHUTTER	X
	BL347	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 3, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Open Circuit Ignitor Voltage	-500	---	---Vdc
Ignitor Current	100	200	---μAdc
Shutter Circuit Voltage	---	---	3V(ac-dc) Note 4
Shutter Circuit Resistance (25°C)	4.5	5.5	5.0 ohms
Pull In Current	500	---	---mAdc
Pull In Current	460	---	---mAac
Holding Current	135	600	---mAdc
Holding Current	460	---	---mAac

Test Conditions: Notes 2, 3

Pack in sealed water-vapor-proof bag. If opaque bag is used the tube typ number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size J		---	---
4.18.14.1	**Frequency Temperature Effect:	F= 9375±0.1%Mc;	ΔF :	0	-20Mc
4.18.16	*Pressure Operation:	45 psi (abs.)		---	---
4.18.17.1	Temperature Cycle:	------		---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles :	10	---
------	Shutter Current:	Shutter Voltage =3Vdc;	I :	545	670mAdc
		Shutter Voltage =3Vac;	I :	460	480mAac
------	Pull In Current:	------	I :	---	500mAdc
			I :	---	460mAac
------	*Holding Current:	------	I :	---	135mAdc
			I :	---	460mAac
4.18.1	Ignitor Ignition Time:	Ebb=-500Vdc; Ri=1.25Meg.	t :	---	5 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	200	400Vdc
4.18.3	*Ignitor Oscillation:	------	Ii :	---	60μAdc
4.18.4.1	Insertion Loss(1):	F= 9375±0.1%Mc.	Li :	---	1.50db
4.18.4.1	*Insertion Loss(2):	F= 8490±0.1%Mc;		---	---
		F= 9600±0.1%Mc;		---	---
		Note 5			
4.18.4.1	Insertion Loss(3):	*F= 8490Mc	Li :	40	---db
		F= 9045	Li :	40	---db
		*F= 9600Mc; Shutter Closed	Li :	40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi :	---	0.2db
4.18.6	Tuning Range:	Note 6		---	---
4.18.13.1	**Loaded Q:	------	QL :	---	350
4.18.9	Leakage Power:	F= 9375±1.0%Mc; po=10±10%kw; tp=0.5±0.05μs; prr=1000; Ii=100μAdc	Po/Du :	---	30mw

Ref.	Test	Conditions		Min.	Max.
4.18.15.1	*Recovery Time:	F= 9375±1.0%Mc; po=10±10%kw; tp=0.5±0.05μs; prr=1000; Ii=100μAdc	t :	---	4.0μs
4.11	Life Test (1):	cps=10 max.; Group D; Note 7	Cycles :	50,000	---
4.11	Life Test (2):	F= 9375±1.0%Mc; po=30kw (min.); tp=1.0±0.1μs; prr=1000; Ii=100 μAdc; Group D	t :	500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Ignitor Voltage Drop;	Eid :	---	450Vdc
		Insertion Loss(1);	Li :	---	2.0db
		Insertion Loss(3); at F= 9045Mc;	Li :	40	---db
		Ignitor Interaction;	ΔLi :	---	0.5db
		Leakage Power	Po/Du :	---	35mw

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutter of the BL-347 provides a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. The shutter is not intended for application involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low level and high level tests are to be made with the shutter of the BL-347 open.

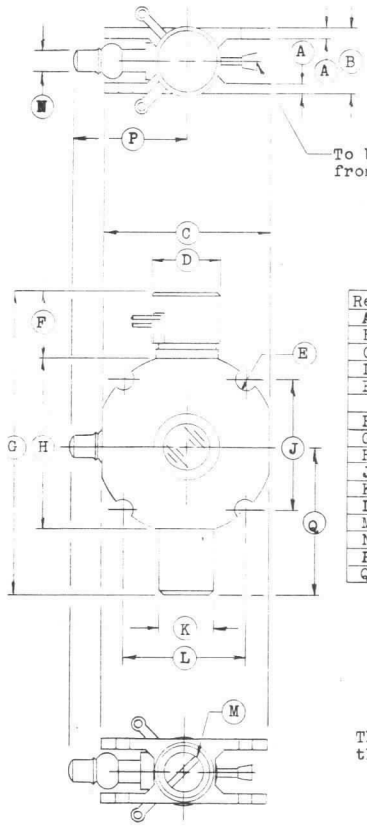
Note 4: This shutter may be operated using a 6 volt ac or dc supply provided a 5 ohm, 5 watt resistor is placed in series with the shutter coil.

Note 5: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder.

Note 6: The tube shall cover a minimum tuning range of from less than 8490Mc. to more than 9600Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range.

Note 7: 3V ac or dc pulses are applied to the shutter coil. Each time the shutter opens, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coil.

(over)



Ref.	Dimension
A**	0.087±.015
B**	0.612
C*	1.625±.015
D*	0.690±.015
E	0.090 Rad.
	4 Slots
F	3/4 Max.
G*	3.000 Max.
H**	1.625±.015
J*	1.280
K*	0.535 Max.
L*	1.220
M**	3/64 x 1/16 Slot
N**	0.250 Dia. Nom.
P*	1 3/8 Max.
Q*	1 7/16 Max.

This outline is used for
the following tubes:-

6565/BL-313
6595/BL-316 BL-347

Bomac	SHUTTER	X
	BL349	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
FEBRUARY 23, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-450	---	--- Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 Ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc
Ignitor Current	100	200	--- μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 8)

Test Conditions: Notes 2, 3

Packing: To be specified.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	(d); Package Group (1) Carton Size J		---	---
------	*Vibration:	Cycles=1; F=5 cps to F=500 cps; G=15; Shutter Current =60mAdc; t=5 min. (min.); Note 4		---	---
4.18.17.1	Temperature Cycle:	------		---	---
------	Shutter Current:	Shutter Voltage =28 Vdc	I :	127	156mAdc
------	Pull In Current:	------	I :	---	110mAdc
------	*Holding Current:	Note 5	I :	---	60mAdc
4.18.1	Ignitor Ignition Time:	Ebb=-450Vdc Ri=1.0meg.	t :	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :	200	400Vdc
4.18.4.2	Insertion Loss(1):	F= 9300 Ebb=-450	Li :	---	0.9db
4.18.4.2	Insertion Loss(2):	Shutters Closed;			
		*F= 8490Mc.	Li :	40	---db
		*F= 8565	Li :	40	---db
		F= 9000	Li :	40	---db
		*F= 9487	Li :	40	---db
		*F= 9578Mc.	Li :	40	---db
4.18.5.1	*Ignitor Oscillations:		Ii :	---	60μAdc
4.18.18	Voltage Standing Wave Ratio:	σ′=1.05max.;			
		F= 8565Mc;	σ :	---	1.4
		*F= 8650	σ :	---	1.4
		*F= 8740	σ :	---	1.4
		*F= 8830	σ :	---	1.4
		*F= 8920	σ :	---	1.4
		F= 9000	σ :	---	1.4
		*F= 9090	σ :	---	1.4
		*F= 9180	σ :	---	1.4
		*F= 9280	σ :	---	1.4
		*F= 9380	σ :	---	1.4
		F= 9487Mc.	σ :	---	1.4
4.18.10	Spike Leakage Energy:	F= 9375Mc±5% po=100±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ′=1.10max.	Ws :	---	0.30erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf :	---	40mw
4.18.15.1	*Recovery Time (1):	po=3.0kw F= 9000Mc± 5% tp=0.5μsec; prr=1000; Iz=100μAdc; T=0°C to 85°C	t :	---	4.0μsec
4.18.15.1	*Recovery Time (2):	po=3.0kw F= 9000Mc± 5% tp=0.5μsec; prr=1000; Iz=100μAdc; T=-55°C to 0°C	t :	---	7.0μsec
4.18.15.1	*Recovery Time (3):	F= 9000Mc±5% po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; T= 25°C, Note 9	t :	---	10μs.
4.18.28	Arc Loss:	F= 9000Mc± 5% po=4kw min; tp=1.0±0.15μs; prr=1000		---	0.8db
4.18.16	*Pressure Operation:	45psi (abs)			
4.18.17.2	Temperature Cycle Life:	Group D	Cycles :	50	---
4.11	Life Test(1):	cps=10max; Group D; Note 7	Cycles :	50,000	---
4.11	Life Test(2):	F= 9300Mc± 5% po=100kw min; tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc; Ri=2.8 meg. Group D Note 10	t :	500	---hrs.
4.11.4	Life Test: (1 and 2) End Point:	Insertion Loss(1);	Li :	---	0.9db
		Insertion Loss(2); at F= 9000Mc;	Li :	40	---db
		Spike Leakage Energy;	Ws :	---	0.35erg
		Flat Leakage Power;	pf :	---	50mw
		Recovery Time(1)	t :	---	8.0μs
		Recovery Time(2)	t :	---	10μsec.
		Voltage Drop	Eid :	---	450Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the BL-349 provide a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw.
They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 4: The shutters shall be held open during vibration by the specified Minimum Holding Current. Vibrate along a line parallel to the axes of the shutters. Insertion loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation(ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification, after vibration.

(over)

Note 5: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: The high altitude and high temperature requirements of Paragraph 3.2.19 (a) of MIL-E-5400 shall be 70,000 feet and 85°C instead of 50,000 ft. and 55°C. Input and output leads shall be potted and shall be 12 inches minimum length.

Note 7: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

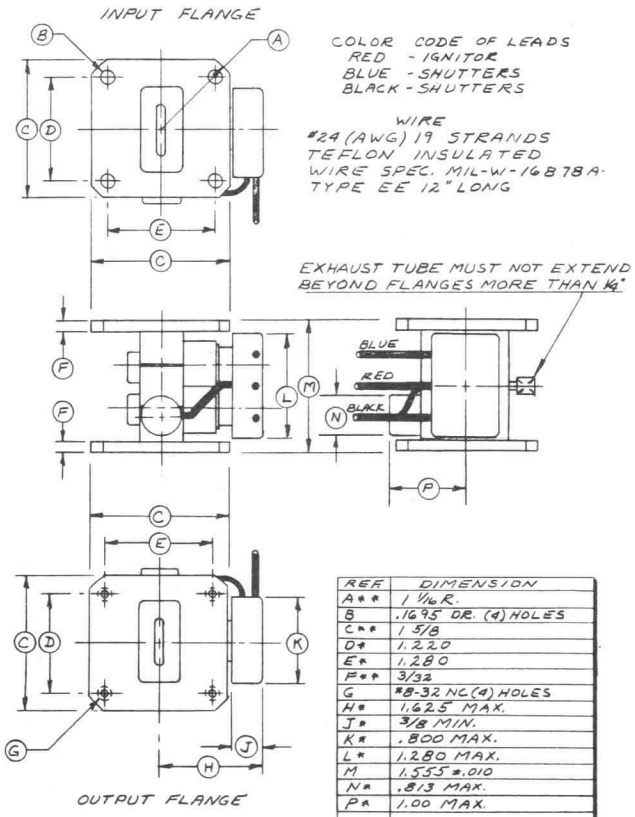
$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (meg ohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 9: The recovery time shall be measured after 30 minutes of operation under the conditions specified.

Note 10: This test shall be conducted with the TR tubes mounted in a rat-race duplexer under conditions specified. There shall be no arcing across the front face of the window during the test.



REF	DIMENSION
A**	1 1/16 R.
B	.1695 DR. (4) HOLES
C**	1 5/8
D*	1.220
E*	1.280
F**	3/32
G	#8-32 NC (4) HOLES
H*	1.625 MAX.
J*	3/8 MIN.
K*	.800 MAX.
L*	1.280 MAX.
M	1.555 ±.010
N*	.813 MAX.
P*	1.00 MAX.

Bomac	SHUTTER	X
	BL325	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 20, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Peak Power Input	---	1.0	--- kw
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 Ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	*Vibration:	Cycles = 1; F= 5 cps to F= 500cps.; G= 15; Shutter Current = 60 mAdc; t=5 min.; Note 3	---	---
-----	Shutter Current:	Shutter Voltage =28Vdc	I: 127	156mAdc
-----	Pull In Current:	-----	I: ---	110mAdc
-----	*Holding Current:	Note 4	I: ---	60mAdc
4.18.18	Voltage Standing Wave Ratio:	Shutters Open; F= 8490 Mc.	σ: ---	1.9
		F= 8565	σ: ---	1.4
		*F= 8650	σ: ---	1.4
		*F= 8740	σ: ---	1.4
		*F=8830	σ: ---	1.4
		*F=8920	σ: ---	1.4
		F=9000	σ: ---	1.4
		*F=9090	σ: ---	1.4
		*F=9180	σ: ---	1.4
		*F=9280	σ: ---	1.4
		*F=9380	σ: ---	1.4
		F=9487	σ: ---	1.4
		F=9578Mc.	σ: ---	1.9
4.18.4.2	Insertion Loss (1):	Shutters Open; F=9000±1%Mc;	L1: ---	0.7db
4.18.4.2	Insertion Loss (2):	Shutters Closed; *F=8490Mc	L1: 40	---db
		*F=8565	L1: 40	---db
		F=9000	L1: 40	---db
		*F=9487	L1: 40	---db
		*F=9578Mc	L1: 40	---db
4.11	Life Test:	cps=10 max; Cycles:50,000 Group D; Note 5		---
4.11.4	Life Test End Point:	Insertion Loss(1); L1: --- Insertion Loss(2) L1: 40 at F=9000Mc.		0.7db ---db

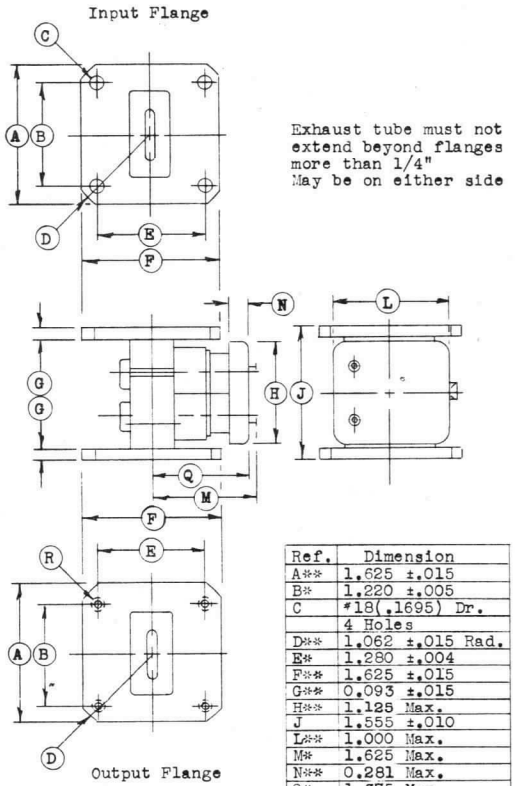
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The shutters of the BL-325 provide a convenient method of opening or shorting waveguide lines at low power levels, peak power input <1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Vibrate along a line parallel to the axes of the shutters. Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔL1), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after the vibration test.

Note 4: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 5: 28 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.



Ref.	Dimension
A**	1.625 ±.015
B*	1.220 ±.005
C	#18(.1695) Dr. 4 Holes
D**	1.062 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.093 ±.015
H**	1.125 Max.
J	1.555 ±.010
L**	1.000 Max.
M*	1.625 Max.
N**	0.281 Max.
Q*	1.375 Max.
R	#8-32NC 4 Holes

Bomac	SHUTTER	X
	BL334	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 9, 1956

Application: Note 2

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Shutter Circuit Voltage	---	---	14Vdc Note 9
Shutter Circuit Resistance (25°C)	90	110	100 Ohms
Pull In Current	130	---	--- mAdc
Holding Current	60	160	--- mAdc

Test Conditions: Notes 2, 3

Pack in sealed water-vapor-proof bag. If opaque bag is used the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Application:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop	(d);Package Group 1; Carton Size J	---	---
-----	*Vibration	Cycles-1; F=5cps to F=500cps; G=15; Shutter Current =60 mAdc; t=5min (min.); Note 4	---	---
4.18.14.1	**Frequency Temperature Effect:	F=9375±0.1%Mc;	F:0	-20Mc
4.18.16	*Pressure Operation:	45 psi (abs.)	---	---
4.18.17.1	Temperature Cycle:	------	---	---
4.18.17.2	Temperature Cycle:	Group D	Cycles: 10	---
-----	Shutter Current:	Shutter Voltage =14Vdc	I :---	156mAdc
-----	Pull In Current:	-----	I :---	130mAdc
-----	*Holding Current:	Note 5	I :---	60 mAdc
4.18.4.1	Insertion Loss (1):	F=9375±0.1%Mc.	L :---	1.50 db
4.18.4.1	*Insertion Loss (2):	F=8490±0.1%Mc; F=9600±0.1%Mc; Note 6	--- ---	--- ---
4.18.4.1	Insertion Loss (3):	*F=8490Mc F=9045 *F=9600Mc; Shutter Closed	Li:-40 Li: 40 Li: 40	---db ---db ---db
4.18.6	Tuning Range:	Note 7	---	---
4.18.13.1	**Loaded Q:	-----	QL:---	350
4.11	Life Test (1):	cps=10max.; Group D; Note 8	Cycles:50,000	---
4.11	Life Test (2):	Continuouse Holding Position; Group D	t:500	---hrs.
4.11.4	Life Test (1and 2) End Point:	Insertion Loss (1); Insertion Loss (3) at F=9045Mc;	Li:--- Li:---	2.0db ---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutter of the BL-334 provides a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. The shutter is not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low level tests are to be made with the shutter of the BL-334 open.

Note 4: Vibrate along a line parallel to the axis of the shutter. Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after vibration.

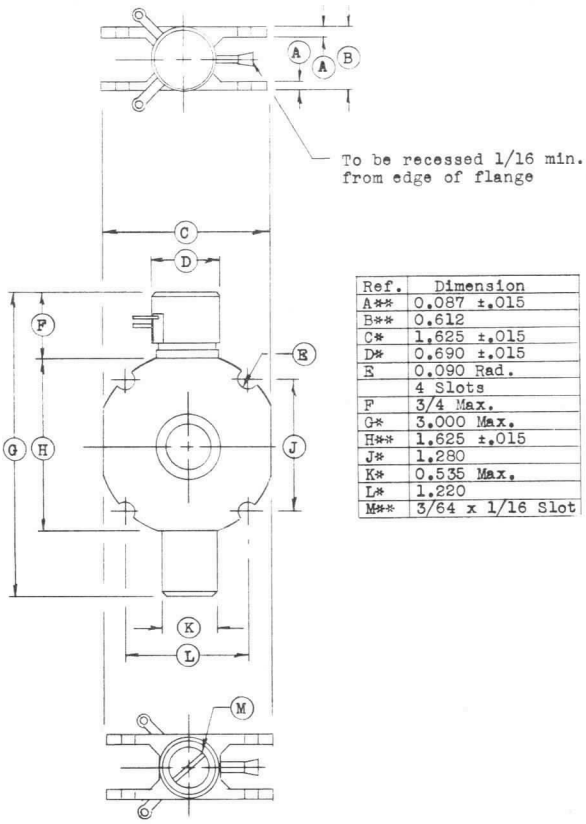
Note 5: The current required to hold the shutter open shall be within the specified limit when the tube is subjected to a hammer blow, G=15 directed along a line parallel to the axis of the shutter and against that side of the tube on which the tuning screw is mounted.

Note 6: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder.

Note 7: The tube shall cover a minimum tuning range of from less than 8490Mc. to more than 9600Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range.

Note 8: 14 Vdc pulses are applied to the shutter coil. Each time the shutter opens, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coil.

Note 9: This shutter may be operated using a 28 Vdc supply, provided a 100 ohm, 5 watt resistor is placed in series with the shutter coil.



Ref.	Dimension
A**	0.087 ±.015
B**	0.612
C*	1.625 ±.015
D*	0.690 ±.015
E	0.090 Rad.
	4 Slots
F	3/4 Max.
G*	3.000 Max.
H**	1.625 ±.015
J*	1.280
K*	0.535 Max.
L*	1.220
M**	3/64 x 1/16 Slot

Bomac	SHUTTER	K
	6588/BL315	

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
APRIL 5, 1955

Dimensions: Per Outline

Ratings:	Coil Voltage	Coil Resistance at 25°C
Min.:	---	90 ohms
Max.:	---	110 ohms
Nom.:	14 Vdc	100 ohms

Packing: To be Specified

Ref.(Note 1)	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking of Tubes:	Note 2	---	---
4.9.6	*Glass Strain:	-----	---	---
4.9.8	**Salt Spray Corrosion:	Note 3	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	*Vibration(1):	Cycles = 1; F= 10cps to F= 150cps; G= 15; t= 60 sec; Coil Voltage = 9.5 Vdc; Note 4	---	---
-----	**Vibration(2):	Cycles = 5; F= 5cps to F= 500cps; G= 5 or Total Excursion = 0.010 in.; t= 600 sec; Coil Voltage = 9.5 Vdc; Note 4	---	---
4.9.20.5	**Shock:	G= 15; 6 blows in each of 3 Perpendicular planes; Note 5	---	---
------	Insulation Breakdown:	Coil to Waveguide	500	---Vd
------	Pull In Voltage (1):	T=25°C	---	9.5Vdc
------	**Pull In Voltage (2):	T=100°C	---	9.5Vdc
------	Holding Voltage:	T=25°C	---	7.0Vdc
------	**Overvoltage:	Coil Voltage =18.2Vdc; T=+85°C; Note 6	t:30	---min
4.18.18	Voltage Standing Wave Ratio:	F= 23.7kMc to F= 24.3kMc; σ'=1.07	σ:---	1.2
4.18.4.2	Insertion Loss (1):	Shutter open; Note 7	Li:---	0.6db
4.18.4.2	Insertion Loss (2):	Shutter closed; Note 7	Li:30	---db
------	*Phase Shift:	F=23.75±0.05% kMc ⊿ d/⊿F:--- F=24.00±0.05% kMc --- F=24.25±0.05% kMc ⊿ d/⊿F:--- Note 8		0.8±0.6x 10^{-4}in/Mc --- 0.8±0.6x 10^{-4}in/Mc
4.18.17	Temperature Cycle:	Note 9	---	---
4.11	Life Test(1):	Shutter Operations; Group D	Cycles:5000	---
4.11	Life Test(2):	Continuous Holding Position; Group D	t:500	---hrs.
4.11.4	Life Test End Point (1 and 2):	Insertion Loss (1);	Li:---	0.6db
		Insertion Loss (2)	Li:30	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Tubes shall be marked BL-315.

Note 3: All metal parts shall withstand 50 hours of Salt Spray Test per Federal Specification QQ-M-151-A or United States Air Force Specification 41065-B Humidity Test, Method 31.

Note 4: Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (⊿Li), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section.

Note 5: Tubes shall meet all specifications after test.

Note 6: Subsequent to this test, the tube shall conform to all the electrical requirements and there shall be no evidence of any deterioration of the coil insulation.

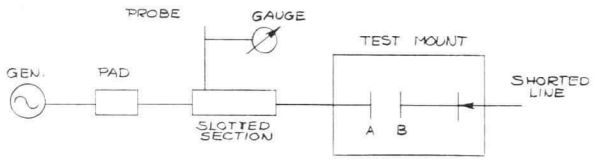
Note 7: Insertion Loss (db) = $10 \log_{10} \frac{\text{Transmitted Power}}{\text{Incident Power}}$

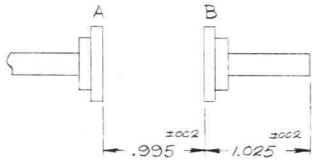
Note 8: The test shall be made with the arrangement shown in Test Circuit "E"*. The VSWR minimum is measured at each of the specified frequencies. The shift in VSWR minimum position due to the tube only, at the extreme frequencies as referred to F= 24.00 kMc, shall be within the limit specified. Shutter Open.

Note 9: Test all tubes only once by exposing to temperature changes from room temperature to -55°C to +100°C to room temperature. The temperature may be allowed to come to equilibrium at room temperature in going from -55°C to +100°C.

Note 10: The 6588 (BL-315) Shutter Tube provides a convenient method of opening or shorting waveguide lines at low power levels, transmitter po <1kw, and is not intended for high power applications.

* Test Circuit

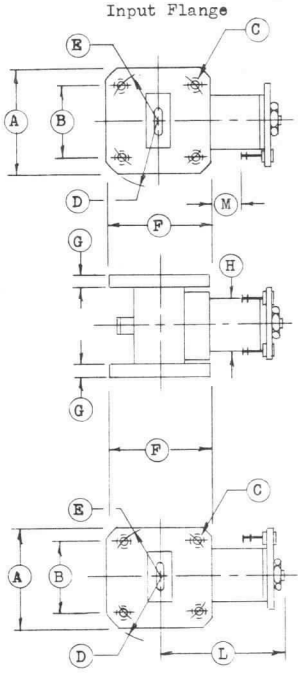


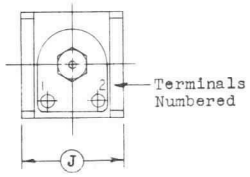


DETAIL OF TEST MOUNT

A-B- CHOKE FLANGE UG 210/U

(over)





Contact surfaces of input and output flanges to be silver plated and rhodium flashed. All other metallic surfaces to be painted black.

Exhaust stem not to extend beyond flanges, if used.

Ref.	Dimension
A**	1.000 ±.005
B*	0.680 ±.005
C	#4-40 Tap
	8 Holes
D**	0.625 ±.005 Rad.
E*	0.500 ±.005 B.C.
F**	1.000 ±.005
G**	0.125 ±.015
H*	0.510 Max. Dia.
J	0.990 ±.003
L*	1 1/4 Max.
M*	5/16 Min.

Bomac	SHUTTER	C
	6594/BL311	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 12, 1957

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	4.0	---	--- kw
Open Circuit Ignitor Voltage	-700	---	--- Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res (25°C)	180	220	200 Ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc
Ignitor Current	100	200	--- μAdc
Weight (approx.)		1 3/4 lbs.	

Recommended Ignitor Operating Current 150μAdc (Note 8)

Test Conditions: Notes 2, 3

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-------	**Vibration:	Cycles=1; F=5 cps to F=500 cps; G=15; Shutter Current= 60 mAdc; t=5 min; Note 4	---	---
-------	Shutter Current:	Shutter Voltage = 28 Vdc	127	156mAdc
-------	Pull In Current:	------	I :---	110mAdc
-------	*Holding Current:	Note 5	I :---	60mAdc
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t :---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :200	400Vdc
4.18.4.2	Insertion Loss (1):	F= 5650±1%Mc; Ii=0μAdc	Li :---	0.8db
4.18.4.2	Insertion Loss (2):	Shutters Closed;		
		*F= 5395Mc;	Li :40	---db
		*F= 5450	Li :40	---db
		F= 5650	Li :40	---db
		*F= 5825	Li :40	---db
		*F= 5905Mc.	Li :40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc.	ΔLi :---	0.2db
4.18.18	Voltage Standing Wave Ratio:	F= 5395Mc.	σ :---	1.9
		F= 5450	σ :---	1.4
		F= 5650	σ :---	1.4
		F= 5825	σ :---	1.4
		F= 5905Mc; σ=1.05Max.	σ :---	1.9
4.18.11	Flat Leakage Power:	F= 5650±1%Mc; po=70±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ=1.10max.	pf :---	70mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :---	0.30erg
4.18.15.1	*Recovery Time:	F= 5650±1%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t :---	10μs

Ref.	Test	Conditions	Min	Max.
4.18.28	Arc Loss:	F= 5650±1%Mc; po=4 kw; tp=1.0±0.15μs; prr=1000	---	0.8 db
4.18.31	Position of Short:	F= 5650±1%Mc; po=70±10%kw; tp=1.0±0.15μs; prr=1000; Note 6	0.070	0.100 in.
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test(1):	cps=10 max; Cycles :50,000 Group D; Note 7	---	
4.11	Life Test(2):	F=5650±5%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc; Ri=2.7 meg. Group D	t :500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Insertion Loss (1)	Li :---	0.8 db
		Insertion Loss (2) at F= 5650	Li :40	--- db
		Flat Leakage Power;	pf :---	100mw
		Spike Leakage Energy;	Ws :---	0.35erg
		Recovery Time	t :---	20 μs

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The shutters of the 6594/BL-311 provide a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 4: The shutters shall be held open during vibration by the specified Minimum Holding Current. Vibrate along a line paraell to the axes of the shutters. Insertion Loss test set up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after vibration.

Note 5: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: When the metal short is replaced by the tube the shift in the position of V.S.W. minimum, away from the magnetron, shall be within the specified limits.

Note 7: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

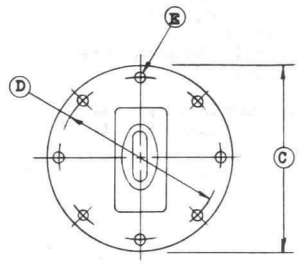
(over)

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (Megohms)}$$

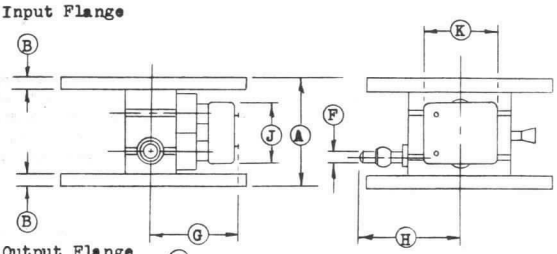
Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

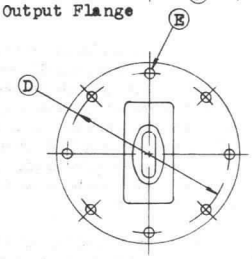


Note:-
Exhaust tube not to extend beyond flange.

Input Flange



Output Flange



Ref.	Dimension
A	2.110 ±.015
B	0.250 ±.015
C	3.625 ±.015 Dia.
D*	3.250 ±.005 Dia.
E	0.221 Drill
	8 Holes Ea. Flg.
F*	0.250 ±.005 Dia.
G	1.875 Max.
H	2.250 Max.
J	1.250 Max.
K	1.750 Max.

Bomac	SHUTTER	C
	BL337	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 25, 1957

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	.008	3000	--- kw
Ignitor Open Circuit Supply Voltage	-700	---	--- Vdc
TA	-40	+65	°C
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc
Pressurization	---	45 gage	--- psi
Ignitor Current	100	200 μAdc	

Recommended Ignitor Operating Current 150 μAdc (Note 9)

Test Conditions: Notes 13, 14

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours			
4.9.18.1.8	Carton Drop:				
4.9.19.2	**Vibration:	F=50; G=10; Note 2			
4.18.18	Voltage Standing Wave Ratio:	σ́ = 1.10 max.			
		F_o = 5395Mc	σ : ---		1.9
		F1 = 5450	σ : ---		1.4
		F2 = 5650	σ : ---		1.4
		F3 = 5825	σ : ---		1.4
		F4 = 5905	σ : ---		1.9
4.18.4.2	Insertion Loss (1):	F=F2; Ii=100μAdc	Li : ---		1.0 db
4.18.4.2	*Insertion Loss(2):	Shutters Closed;			
		F_o = 5395Mc	Li : 40		---db
		F1 = 5450	Li : 40		---db
		F2 = 5650	Li : 40		---db
		F3 = 5825	Li : 40		---db
		F4 = 5905	Li : 40		---db
4.18.1	Ignitor Firing Time:	Ebb=-700Vdc;	t : ---		5.0 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid : 200		400 Vdc
4.18.11	Flat Leakage Power (1):	F=F2±10%; po=10kw; σ́=1.10max; Ii=100μAdc; tp1=1.0±0.15μsec. tp2=0.5±0.15μsec. prr=1000 pps Note 8	pf : ---		70 mw
4.18.10	Spike Leakage Energy (1):	Flat Leakage Power (1) Note 8	Ws : ---		0.25 erg
4.18.11	**Flat Leakage Energy (2):	F=F2±10%; po=3Mw σ́=1.10max Ii=100μAdc; tp1=3.0±0.2μsec. tp2=1.0±0.15μsec prr=500 pps Note 8	pf : ---		100 mw
4.18.10	**Spike Leakage Energy (2):	**Flat Leakage Power (2) Note 8	Ws : ---		0.25 erg
4.18.28	Arc Loss:	po=10kw; F=F2±10%; tp=1.0±0.15μsec; prr=1000 pps Note 7	---		0.5 db
4.18.31	Position of Short (1):	Arc Loss Note 3		0.095	0.115 in.
4.18.31	Position of Short (2):	100 kw Note 3		0.080	0.100 in.
------	Phase Shift Tolerance:	Note 4 at F1, F2, F3	---		±5 degrees
4.18.15.1	*Recovery Time (1):	po=1Mw; Ii=100μAdc; F=F2±10%; tp=1.0±0.15μsec; prr=1000 pps	t : ---		0μs
4.18.15.1	**Recovery Time (2):	po=3Mw; Ii=100μAdc F=F2±10%; tp=3.0±0.3μs; prr=500 pps	t : ---		10μs
4.18.15.1	**Recovery Time (3):	po=3Mw; Ii=100μAdc; F=F2±10%; tp=0.3±0.05 μs; prr=900 pps	t : ---		7 μs
4.18.17.1	Temperature Cycle:				
------	Shutter Current:	Shutter Voltage =28Vdc	I : 127		156mAdc
------	Pull In Current:	-----	I : ---		110mAdc
------	Holding Current:	Note 10	I : ---		60mAdc
4.11	Life Test (1):	po=1Mw; Ebb=-700Vdc; Ri=2.7 Meg. F=F2±10% tp=3.0±0.3 μs; prr=500 pps; Group D		500	---hrs.
4.11	Life Test (2):	po=3Mw; Ebb=-700Vdc; Ri=2.7 Meg; F=F2±10%; tp=3.0±0.3μs; prr=500 pps; Group D		500	--- hrs.
4.11	Life Test (3):	cps=10max; Group D; Note 11	Cycles :	50,000	---
4.11.4	Life Test (1) End Point:	Recovery Time (1)	t : ---		8.0μs
		Flat Leakage Power (1)	pf : ---		70 mw
		Spike Leakage Energy (1)	Ws : ---		0.3 erg
		Insertion Loss, Ii=100μAdc	Li : ---		1.0 db
		Ignitor Voltage Drop	Eid : ---		500 Vdc
		Phase Shift Tolerance			±5 degrees
4.11.4	**Life Test (2) End Point:	Recovery Time (2)	t : ---		12μs
4.11.4	Life Test (3) End Point:	Insertion Loss (2)	Li : 40		---db

Note 1: References and notations are from Military Specifications, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: There shall be no evidence of shorts between keep-alive electrode and body as indicated by a short indicator during vibration.

Note 3: Position of short to be measured as shown in Test Circuit "O", Procedure I, the VSW minimum of the flat portion of the pulse shall be within the tube measured from the input flange face further from the magnetron and within the limits specified.

Note 4: Transmission phase shift to be measured as shown in Test Circuit "N". Phase shift center to be specified. Tolerance of Phase Shift Center is ±5 degrees.

Note 5: Tests indicated with a double asterisk shall be conducted using a balanced hybrid ring duplexer. These tests are type approval tests.

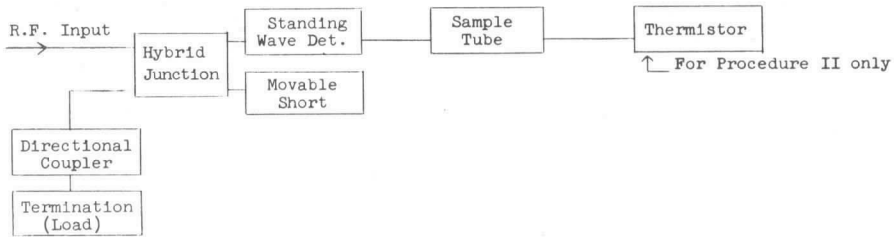
Note 6: A 1N23B crystal shall be protected by this TR tube for po from 0 to 3 megawatts. (tp=3.0μsec; prr=500 pps).

Note 7: Arc Loss measurement is to be performed as shown in Test Circuit "O", Procedure I.

Note 8: Flat Leakage power and spike leakage energy is to be measured as shown in Test Circuit "O", Procedure II.

(over)

BLOCK DIAGRAM FOR POSITION OF SHORT, ARC-LOSS, AND LEAKAGE POWER MEASUREMENTS



PROCEDURE I

Position of short and arc-loss:

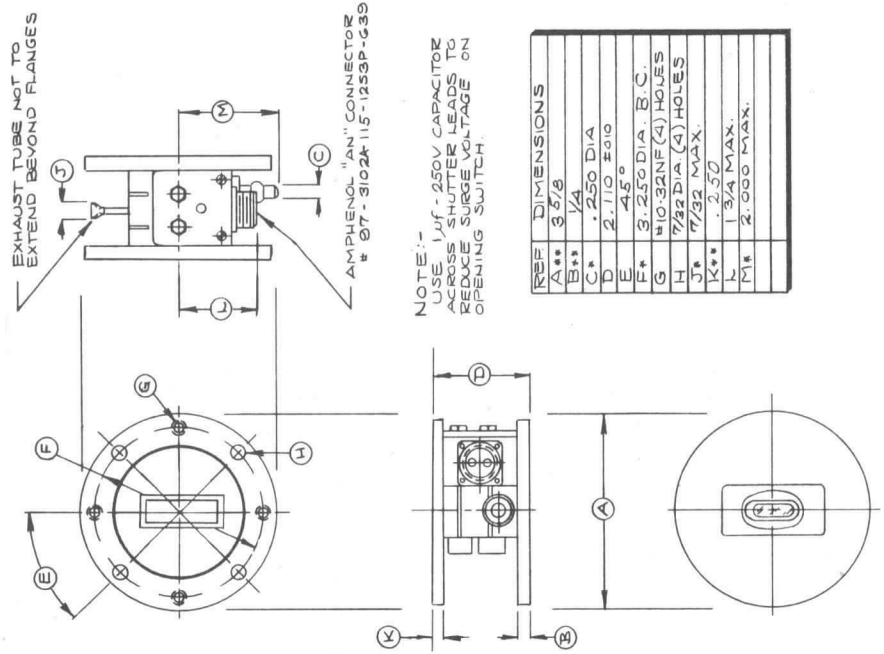
(1) With a shorting plate in place of sample, adjust movable short for maximum power into load. Observe this power at the dir. coupler.
(2) Observe position of voltage minimum in slotted section.
(3) Insert sample tube.
(4) Observe new position of voltage minimum. The shift in the voltage minimum is the position of short.
(5) Observe new power level at the dir. coupler and calculate arc-loss.

PROCEDURE II

Spike leakage energy and flat leakage power:

(1) Terminate the sample tube with a thermistor and measure the leakage power for two different R.F. pulse widths.
(2) Calculate spike leakage energy and flat leakage power as per MIL-E-1C, paragraphs 4.18.10 and 4.18.11.

TEST CIRCUIT "O"



Note 9: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance

$$\text{Series Resistance (ri)} = \frac{\text{Ebb-Ei}}{150} \text{ (megohms)}$$

where Ri = Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

Note 10: At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 11: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow G= 15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

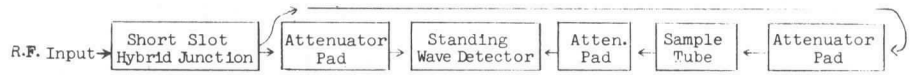
Note 12: 28 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

Note 13: Pull In Current may be defined as the minimum current necessary to reliably open all shutters.

Note 14: The shutters of the BL-337 provide a convenient method of opening or shorting waveguide lines at low power levels. transmitter po 1 kw.. They are not intended for applications involving the switching, of high power and should be open whenever high power is incident on the tube.

Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

BLOCK DIAGRAM TRANSMISSION PHASE SHIFT MEASUREMENT



Procedure

(1) With dummy tube in place of sample, adjust attenuators until the voltage standing wave ratio is a maximum.
(2) Observe position of the V.S.W. minimum in the slotted section.
(3) Insert sample tube.
(4) Observe new position of V.S.W. minimum and calculate phase shift on basis of guided wavelength.

TEST CIRCUIT "N"

Bomac	SHUTTER	C
	BL350	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 18, 1957

Dimensions: Per Outline

Description: TR and Shutter Tube, Band Pass.

Ratings:	Min.	Max.	Nom.
Transmitter po	4.0	---	--- kw
Open Circuit Ignitor Voltage	-700	---	--- Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res(25°C)	180	220	200 Ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc
Ignitor Current	100	200	--- μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 8)

Test Conditions: Notes 2, 3

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	Cycles=1; F=5 cps to F=500 cps; G=15; Shutter Current= 60 mAdc; t=5 min; Note 4	---	---
-----	Shutter Current:	Shutter Voltage= 28 Vdc	I: 127	156mAdc
-----	Pull In Current:	-----	I: ---	110mAdc
-----	*Holding Current:	Note 5	I: ---	60mAdc
4.18.1	Ignitor Ignition Time:	Ebb=700Vdc; Ri=5.5 Meg.	t: ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid: 200	400Vdc
4.18.4.2	Insertion Loss (1):	F=5650±1%Mc; Ii=0μAdc	Li: ---	0.8db
4.18.4.2	Insertion Loss (2):	Shutters Closed;		
		*F=5395Mc;	Li: 40	---db
		*F=5450	Li: 40	---db
		F=5650	Li: 40	---db
		*F=5825	Li: 40	---db
		*F=5905Mc.	Li: 40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc.	ΔLi: ---	0.2db
4.18.18	Voltage Standing Wave Ratio:	F=5395Mc.	σ: ---	1.9
		F=5450	σ: ---	1.4
		F=5650	σ: ---	1.4
		F=5825	σ: ---	1.4
		F=5905Mc σ=1.05Max.	σ: ---	1.9
4.18.11	Flat Leakage Power;	F=5650±1%Mc; po=70±10%kw; tp 1=1.0±0.15μs; tp 2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ=1.10max.	pf: ---	70mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.30erg
4.18.15.1	*Recovery Time:	F=5650±1%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t: ---	10μs

Ref.	Test	Conditions	Min.	Max.
4.18.28	Arc Loss:	F=5650±1%Mc; po=4kw; tp=1.0±0.15 μs; prr=1000	---	0.8 db
4.18.31	Position of Short:	F=5650±1%Mc; po=70±10%kw; tp=1.0±0.15 μs; prr=1000; Note 6	0.070	0.100 in.
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test (1):	cps=10 max; Group D; Note 7	Cycles: 50,000	---
4.11	Life Test (2):	F=5650±5%Mc; po=300±10%kw; tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc; Ri=2.7meg. Group D	t: 500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Insertion Loss (1)	Li: ---	0.8db
		Insertion Loss (2) at F=5650	Li: 40	---db
		Flat Leakage Power;	pf: ---	100mw
		Spike Leakage Energy;	Ws: ---	0.35erg
		Recovery Time	t: ---	20 μs

Note1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The shutters of the BL-350 provide a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 4: The shutters shall be held open during vibration by the specified Minimum Holding Current. Vibrate along a line parallel to the axes of the shutters. Insertion Loss test set up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after vibration.

Note 5: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: When the metal short is replaced by the tube the shift in the position of V.S.W. minimum, away from the magnetron, shall be within the specified limits.

Note 7: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

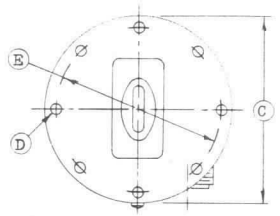
(over)

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (Megohms)}$$

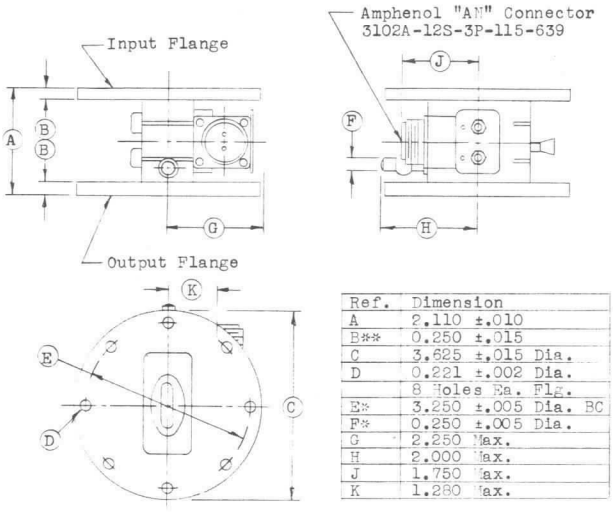
Where Ri=Total series resistance
Ebb =Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Note 1:- Use 1 µf 250V capacitor across shutter leads to reduce surge voltage on opening switch

Note 2:- Exhaust tube not to extend beyond flange.



Ref.	Dimension
A	2.110 ±.010
B**	0.250 ±.015
C	3.625 ±.015 Dia.
D	0.221 ±.002 Dia. 8 Holes Ea. Flg.
E*	3.250 ±.005 Dia. BC
F*	0.250 ±.005 Dia.
G	2.250 Max.
H	2.000 Max.
J	1.750 Max.
K	1.280 Max.

Bomac	SHUTTER	X
	6565/BL313	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 20, 1957

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Open Circuit Ignitor Voltage	-500	---	--- Vdc
Ignitor Current	100	200	--- μAdc
Shutter Circuit Voltage	---	---	14 Vdc
Shutter Circuit Resistance (25°C)	90	110	100 Ohms
Pull In Current	130	---	--- mAdc
Holding Current	60	160	--- mAdc

Test Conditions: Notes 2, 3

Pack in sealed water-vapor-proof bag. If opaque bag is used the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size J	---	---
-----	*Vibration:	Cycles= 1; F= 5cps to F= 500cps; G= 15; Shutter Current =60mAdc; t= 5 min. (min.); Note 4	---	---
4.18.14.1	**Frequency Temperature Effect:	F= 9375±0.1%Mc;	ΔF: 0	-20Mc
4.18.16	*Pressure Operation:	45 psi (abs.)	---	---
4.18.17.1	Temperature Cycle:	-----	---	---
4.18.17.2	Temperature Cycle Life:	Group D	Cycles: 50	---
-----	Shutter Current:	Shutter Voltage = 14Vdc	I: 127	156mAdc
-----	Pull In Current:	-----	I: ---	130mAdc
-----	*Holding Current:	Note 5	I: ---	60mAdc
4.18.1	Ignitor Ignition Time:	Ebb=-500Vdc; Ri=1.25Meg.	t: ---	5sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid: 200	400Vdc
4.18.3	*Ignitor Oscillation:	-----	Ii: ---	60μAdc
4.18.4.1	Insertion Loss (1):	F= 9375±0.1%Mc.	Li: ---	1.50db
4.18.4.1	*Insertion Loss (2):	F= 8490±0.1%Mc;	---	---
		F= 9600±0.1%Mc; Note 6	---	---
4.18.4.1	Insertion Loss (3):	*F= 8490Mc	Li: 40	---db
		F= 9045	Li: 40	---db
		*F= 9600Mc; Shutter Closed	Li: 40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi: ---	0.2db
4.18.6	Tuning Range:	Note 7	---	---
4.18.13.1	**Loaded Q:	-----	QL: ---	350

Ref.	Test	Conditions		Min.	Max.
4.18.9	Leakage Power:	F=9375±1.0%Mc; po=10±10%kw; tp=0.5±0.05μs; prr=1000; Ii=100μAdc	Po/Du:	---	30mw
4.18.15.1	**Recovery Time:	F=9375±1.0%Mc; po=10±10%kw; tp=0.5±0.5μs; prr=1000; Ii=100μAdc	t:	---	4.0 μs
4.11	Life Test (1):	cps=10max.; Group D; Note 8	Cycles:	50,000	---
4.11	Life Test (2):	F9375±1.0%Mc; po=30kw (min.); tp=1.0±0.1μs; prr=1000; Ii=100 μAdc; Group D	t:	500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Ignitor Voltage Drop;	Eid:	---	450Vdc
		Insertion Loss (1);	Li:	---	2.0db
		Insertion Loss (3) at F=9045Mc;	Li:	40	---db
		Ignitor Interaction;	ΔLi:	---	0.5db
		Leakage Power	Po/Du:	---	35mw

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E 1

Note 2: The shutter of the 6565 (BL-313) provides a convenient method of opening or shorting waveguide lines at low power levels, incident peak power less than 1 kw. The shutter is not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low level and high level tests are to be made with the shutter of the BL-313 open.

Note 4: Vibrate along a line parallel to the axis of the shutter. Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after vibration.

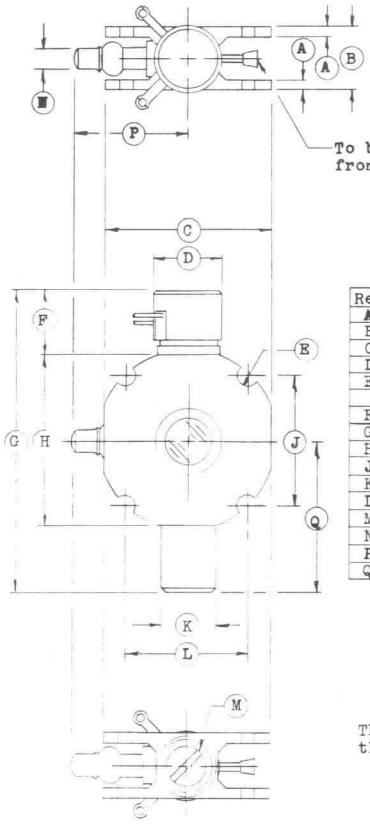
Note 5: The current required to hold the shutter open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axis of the shutter and against that side of the tube on which the tuning screw is mounted.

Note 6: This test is a check on the tuning mechanism of the tube. Ignore Insertion Loss section of the specified reference and apply remainder.

Note 7: The tube shall cover a minimum tuning range of from less than 8490Mc. to more than 9600Mc. No tube shall require less than 5 complete turns of the tuning screw to cover this range.

Note 8: 14 Vdc pulses are applied to the shutter coil. Each time the shutter opens, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coil.

(over)



Ref.	Dimension
A**	0.087±.015
B**	0.612
C*	1.625±.015
D*	0.690±.015
E	0.090 Rad.
	4 Slots
F	3/4 Max.
G*	3.000 Max.
H**	1.625±.015
J*	1.280
K*	Ø.535Max.
L*	1.220
M**	3/64 x 1/16 Slot
N**	0.250 Dia. Nom.
P*	1 3/8 Max.
Q*	1 7/16 Max.

This outline is used for
the following tubes:-

6565/BL-313
6595/BL-316 BL-347

Bomac | SHUTTER | X | 6593/BL310 | TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 14, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.	
Transmitter po	4	250	---	kw
Open Circuit Ignitor Voltage	-650	---	---	Vdc
Shutter Circuit Voltage	---	---	28	Vdc
Shutter Circuit Res. (25°C)	180	220	200	Ohms
Pull In Current	110	---	---	mAdc
Holding Current	60	160	---	mAdc
Ignitor Current	100	200μAdc		

Recommended Ignitor Operating Current 150 μAdc (Note 8)

Test Conditions: Notes 2, 3

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hrs.	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	*Vibration:	Cycles=1; F=5 cps to F=500 cps; G=15; Shutter Current =60 mAdc; t=5 min; Note 4	---	---
4.18.17.1	Temperature Cycle:	----	---	---
----	Shutter Current	Shutter Voltage =28 Vdc	I:127	156mAdc
----	Pull In Current	----	I:---	110mAdc
-----	*Holding Current:	Note 5	I :---	60mAdc
4.18.18	Voltage Standing Wave Ratio:	$\sigma' \leq$ 1.05 max.;		
		F= 8490 Mc.	σ:---	1.9
		F= 8565	σ:---	1.6
		*F= 8650	σ:---	1.6
		*F= 8740	σ:---	1.6
		*F= 8830	σ:---	1.6
		*F= 8920	σ:---	1.6
		F= 9000	σ:---	1.6
		*F= 9090	σ:---	1.6
		*F= 9180	σ:---	1.6
		*F= 9280	σ:---	1.6
		*F= 9380	σ:---	1.6
		F= 9487	σ:---	1.6
		F= 9578Mc; Ii=100μAdc	σ:---	1.9
4.18.4.2	Insertion Loss (1)	F= 9000Mc; Ii=0μAdc	Li :---	0.7db
4.18.4.2	Insertion Loss (2)	Shutters Closed;		
		*F= 8490 Mc	Li :40	---db
		*F= 8565	Li :40	---db
		F= 9000	Li :40	---db
		*F= 9487	Li :40	---db
		*F= 9578Mc	Li :40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	△ Li :---	0.3db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Ri=5.5Meg.	t :---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc	Eid :200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; $\sigma' \leq$ 1.10max.	pf :---	30mw

Ref.	Test	Conditions	Min.	Max.
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.30erg
4.18.31	Position of Short:	F= 9000Mc; po=40±10%kw; tp=1.0±0.15μs; prr=1000; $\sigma' \leq$ 1.10max.; Note 6	---	±0.007in.
4.18.28	*Arc Loss:	F= 9000Mc; po=4kw; tp=1.0±0.15μs; prr=1000	---	0.8db
4.18.15.1	*Recovery Time:	F= 9000Mc.; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc	t:---	8μs
4.11	Life Test (1):	cps=10max.; Group D; Note 7	Cycles:50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200kw (min); tp=1.0±0.15μs; prr=1000; Ebb=-700Vdc; Ri=2.5 meg Group D	t:500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t:---	18μs
		Flat Leakage Power;	pf:---	30mw
		Spike Leakage Energy;	Ws:---	0.35 erg
		Insertion Loss (1);	Li :---	0.9db
		Insertion Loss (2) at F= 9000Mc.	Li :40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The shutters of the 6593 (BL-310) provide a convenient method of opening or shorting waveguide lines at low power levels, peak power input <1kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 4: Vibrate along a line parallel to the axes of the shutters Insertion Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after the vibration test.

Note 5: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.032 inch further from the magnetron within limits specified.

Note 7: 28Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

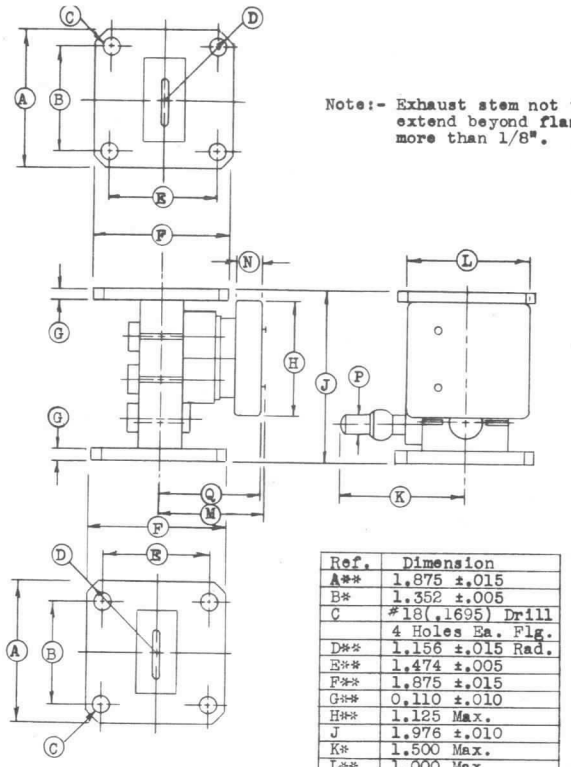
(over)

Note 8: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (R_1) = \frac{E_{bb} - E_1}{150} \text{ (megohms)}$$

where R_1=Total series resistance
E_{bb}=Open circuit supply voltage
E_1=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Note:- Exhaust stem not to extend beyond flange more than 1/8".

Ref.	Dimension
A**	1.875 ±.015
B*	1.352 ±.005
C	#18(.1695) Drill 4 Holes Eq. Flg.
D**	1.156 ±.015 Rad.
E**	1.474 ±.005
F**	1.875 ±.015
G**	0.110 ±.010
H**	1.125 Max.
J	1.976 ±.010
K*	1.500 Max.
L**	1.000 Max.
M*	1.500 Max.
N**	0.281 Max.
P**	0.250 Dia. Nom.
Q*	1.375 Max.

Bomac	SHUTTER	X
	6597/BL320	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.	Approx.
Transmitter po	1	250	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Altitude	---	10,000	---ft.
Shutter Operation (D.C.)			
Shutter Operation Current (Notes 2,3)	---	---	0.60Adc
Energy Dissipation,Coil (Notes 2,3)	---	---	1.80W
Energy Dissipation, System (Notes 2,3)	---	---	3.60W
Shutter Operation (A.C.)			
Shutter Operation Current (Note 4)	---	---	0.47Aac
Energy Dissipation per Coil (Note 4)	---	---	1.13W
Energy Dissipation in System (Note 4)	---	---	2.26W

Packing: To be specified

Ref. (Note 5)	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168hrs.	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	**Vibration:	G=10, Note 6	---	---
4.18.18	Voltage Standing Wave Ratio:	Shutters Open; σ=1.05max.;		
		F= 8490Mc.	σ:---	1.9
		F1= 8565	σ:---	1.4
		*F= 8650	σ:---	1.4
		*F= 8740	σ:---	1.4
		*F= 8830	σ:---	1.4
		*F= 8920	σ:---	1.4
		F2= 9000	σ:---	1.4
		*F= 9090	σ:---	1.4
		*F= 9180	σ:---	1.4
		*F= 9280	σ:---	1.4
		*F= 9380	σ:---	1.4
		F3= 9487	σ:---	1.4
		F= 9578Mc.	σ:---	1.9
4.18.4.2	Insertion Loss (1):	Shutters Open; F=F2 Ii=0μAdc	Li:---	0.7db
4.18.4.2	*Insertion Loss (2):	Shutters Closed;		
		F= 8490Mc	Li:40	---db
		F=F1	Li:40	---db
		F=F2	Li:40	---db
		F=F3	Li:40	---db
		F= 9578Mc; Ii=0μAdc	Li:40	---db
4.18.5.1	Ignitor Interaction:	Shutters Open; Ii=100μAdc	ΔLi:---	0.2db
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; R=5.5meg.	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 7	Eid:200	375Vdc
4.18.11	Flat Leakage Power:	Shutters Open; F=F2; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ=1.10max.	pf:---	40mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.30erg
4.18.31	Position of Short:	Shutters Open; F=F2; po=40±10%kw; tp=1.0±0.15μs; prr=1000; σ=1.10max.; Note 8	---	±0.007in.
4.18.28	Arc Loss:	Shutters Open; F=F2; po=4kw; tp=1.0±0.15μs; prr=1000	---	0.8db
4.18.15.1	*Recovery Time:	Shutters Open; F=F2; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 9	t:---	10μs
4.18.17.1	Temperature Cycle:	----	---	---
4.11	Life Test:	Shutters Open; F=F2; po=200kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Group D; Notes 10, 11	t:500	---hrs.
4.11.4	Life Test End Point:	Recovery Time;	t:---	20μs
		Flat Leakage Power;	pf:---	50mw
		Spike Leakage Energy;	Ws:---	0.35erg
		Insertion Loss(1)	Li:---	0.7db
4.11	Shutter Life Test:	Note 12; cps.=10max.; Group D	Cycles:50,000	---

Note 1: The shutters of the BL-320 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1kw. They are not intended for applications involving the switching of high power and should remain open during high power transmission.

Note 2: Ratings apply when 6Vdc is applied directly across the shutter coils.

Note 3: Approximately 0.60Adc is needed to open the shutters but only about 0.22Adc is necessary to hold them open. The latter condition may be obtained, once the shutters are open, by means of a relay inserted dropping resistor. For an illustration, see attached drawing of Test Circuit "D". The resultant Energy Dissipation per coil will be about 0.24W and for the system, 2 coils in series with a 17 ohm resistor, approximates 1.3W.

Note 4: Ratings apply when 6Vac is applied directly across the shutter coils.

Note 5: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 6: During this test the ignitor electrode should not short to the tube body and the shutters, which are held open, should not partially or fully close.

Note 7: With the ignitor circuit as in Figure 46 of MIL-E-1B, the ignitor voltage drop shall be measured after the tubes fires with a high resistance voltmeter, 20,000 ohms per volt or greater, and shall be within the limits specified.

Note 8: When the metal plate is replaced by the tube,the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.065 inch further from the magnetron within the limits specified.

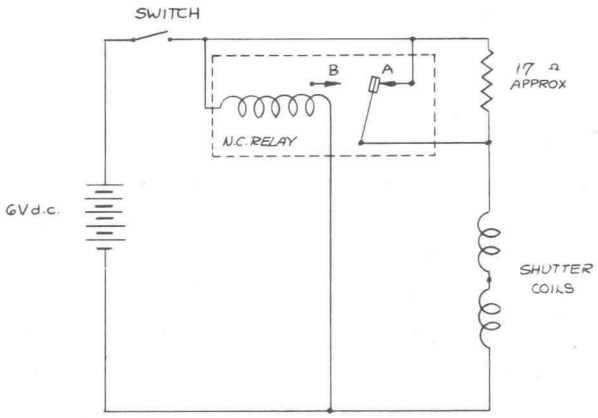
Note 9: The recovery time shall be measured after thirty minutes of operation under the conditions specified.

Note 10: This test shall be conducted with the TR tubes mounted in a rat-race duplexer under the conditions specified. There shall be no arcing across the front face of the window during this test.

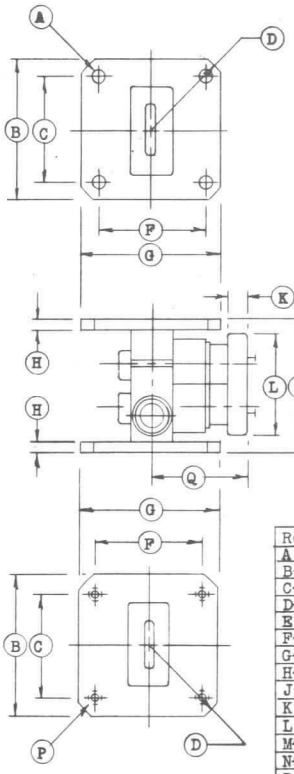
Note 11: 6Vdc is applied directly across the shutter coils during the specified time. The shutters should be in operating condition after this test.

Note 12: 6Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.

(over)



When the switch is open, the relay is not energized and the resistor, approximately 17 ohms, is shorted out of the circuit. When the switch is closed, the power supply voltage is applied across the shutter coils and relay. A slight delay in the relay circuit results in the shutters opening before the relay contact jumps from A to B. The dropping resistor is now in series with the shutter coils causing the operating current to drop to the desired holding current.



Note:- Exhaust stem must not extend beyond flange more than 1/4".

Ref.	Dimension
A	⌀18(.1695) Dr. 4 Holes
B**	1 5/8
C*	1.220 ±.005
D**	1 1/16 Rad.
E	1 Max.
F*	1.280 ±.005
G**	1 5/8
H**	3/32
J	1.555 ±.010
K	9/32 Max.
L	1 1/8 Max.
M**	0.250 Dia. Nom.
N*	1 3/8 Max.
P	⌀8-32 NC 4 Holes
Q*	1 5/8 Max.

Bomac	SHUTTER	X
	6599/BL322	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 9, 1956

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-700	---	--- Vdc
Shutter Circuit Voltage	---	---	6V(acdc
Shutter Circuit Resistance (25°)	4.5	5.5	5.0 ohm
Pull In Current	900	---	---mAd
Pull In Current	980	---	---mAa
Holding Current	440	1335	---mAd
Holding Current	To be specified		---mAa
Ignitor Current	100	200	---mAd

Recommended Ignitor Operating Current 150μAdc (Note 16) each electrode)

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit "A"

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	Shutter Current:	Shutter Voltage =6 Vdc	I :	1092	1335mAdc
------	Pull In Current:	------	I :	---	900mAdc
			I :	---	980mAac
------	Holding Current:		I :	---	440mAdc
			I :	---	To be specified
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :	---	1.4
		F= 8565	σ :	---	1.2
		*F= 8655	σ :	---	1.2
		*F= 8745	σ :	---	1.2
		*F= 8835	σ :	---	1.2
		*F= 8925	σ :	---	1.2
		F= 9000	σ :	---	1.2
		*F= 9087	σ :	---	1.2
		*F= 9187	σ :	---	1.2
		*F= 9287	σ :	---	1.2
		*F= 9387	σ :	---	1.2
		F= 9487	σ :	---	1.2
		F= 9578Mc; Note 6	σ :	---	1.4
4.18.4.2	*Duplexer Loss (1):	F= 8490Mc.	Li :	---	1.2db
		F= 8565	Li :	---	1.0db
		F= 9000	Li :	---	1.0db
		F= 9487	Li :	---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 7	Li :	---	1.2db
4.18.4.2	Duplexer Loss (2):	Shutters Closed;			
		*F= 8490Mc.	Li :	40	---db
		*F= 8565	Li :	40	---db
		F= 9000	Li :	40	---db
		*F= 9487	Li :	40	---db
		*F= 9578Mc; Note 7	Li :	40	---db
------	*Isolation:	F= 8490Mc.		15	---db
		F= 8565		18	---db
		F= 9000		20	---db
		F= 9487		18	---db
		F= 9578Mc; Note 8		15	---db
4.18.1	*Ignitor Ignition Time:	Ebb= -700Vdc; Ri=4.0Meg; Note 9	t :	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc Note 9	Eid :	200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 10	pf :	---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 11		---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 12	t :	---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 13	σ :	---	1.2
4.11	Life Test (1):	cps=10max; Group D; Note 14	Cycles :	50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200±10%kw(min.) tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8meg. each electrode; Group D; Note 15	t :	500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t :	---	10μs
		Flat Leakage Power;	pf :	---	20mw
		Spike Leakage Energy;	Ws :	---	.15erg
		Duplexer Loss (1), at F=9000Mc;	Li :	---	1.2db
		Duplexer Loss(2), at F= 9000Mc.	Li :	40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the 6599/ BL-322 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1 kw. They are not intended for applications involving the switching of high power and should be open or closed whenever high power is incident on the tube.

Note 3: A suitable gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating flange, dated 11-10-54. Two gaskets shall be furnished with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12 an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: See Test Circuit "A"
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 7: See Test Circuit "A"
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 8: See Test Circuit "A"
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 9: Measured separately for each ignitor electrode.

(over)

Note 10: See Test Circuit "A"
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max. on arm L; Leakage Power detected at arm R.

Note 11: See Test Circuit "A"
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 12: See Test Circuit "A"
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 13: See Test Circuit "A"
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ= 1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 14: 6Vdc or 6Vac pulses are applied to the shutter circuit. Each time the shutters open, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 15: See Test Circuit "A"
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

Note 16: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

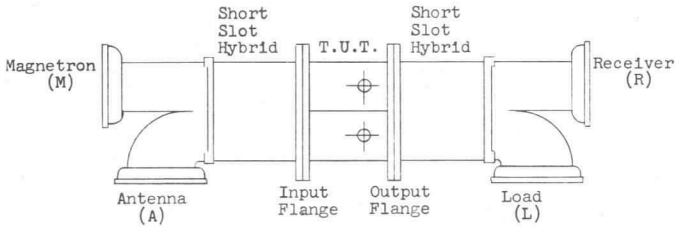
where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

TEST CIRCUIT "A"

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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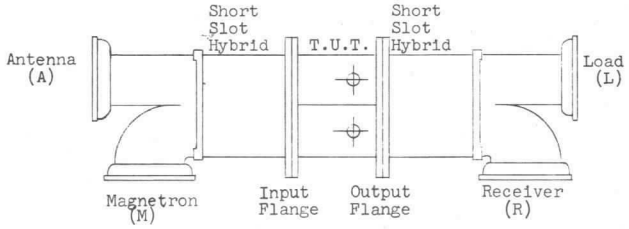
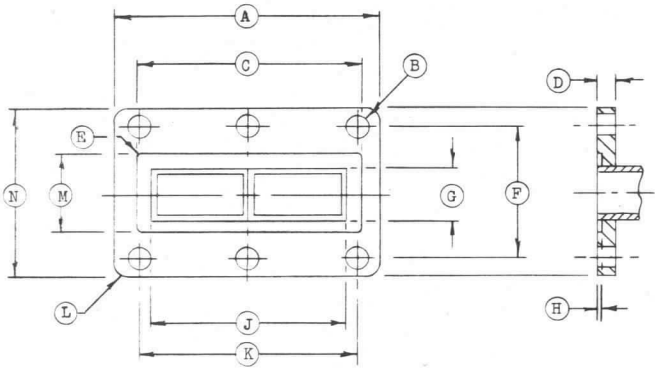




Ref.	Dimension
A	2.575 ±.015
B	#18(.1695) Dr. 6 Holes
C	2.203 +.005 -.000
D	0.220 ±.010
E	3/64 Rad.
F	1.280 ±.004
G	0.500 ±.003
H	0.070 ±.001
J	1.950 ±.004
K	2.170 ±.006
L	0.120 Rad. Approx.
M	0.753 +.005 -.000
N	1.625 ±.015

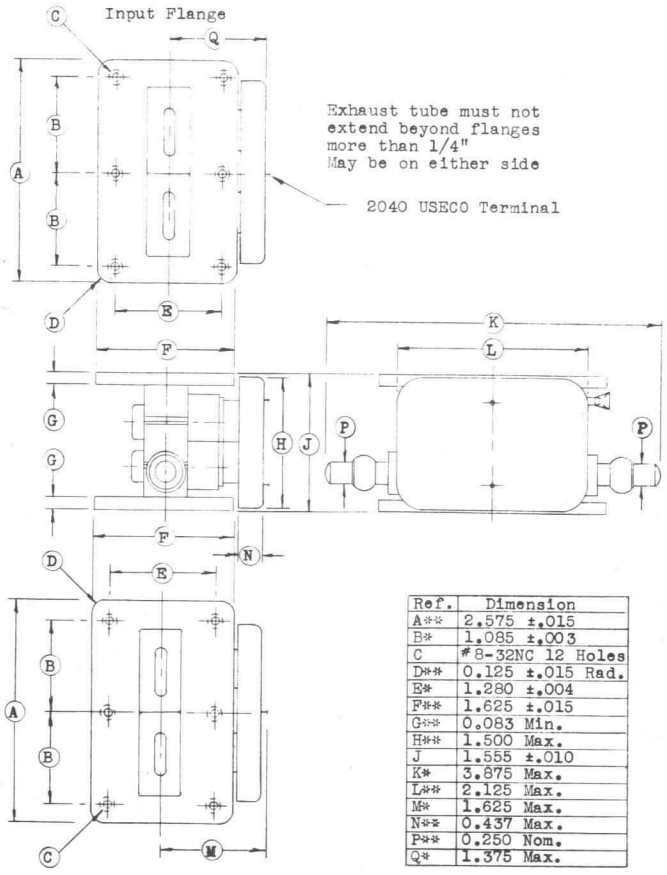
This outline used for following tubes:-

BL-78, BL-307, 6599/BL-322, BL-331, BL-655

6796, 6601/BL-327, 6642/BL-600, BL-335,

BL-341, BL-339H, BL-649, BL-651H, BL-686H

6647/ BL 604H, BL-360H



Output Flange

Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#8-32NC 12 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.083 Min.
H**	1.500 Max.
J	1.555 ±.010
K*	3.875 Max.
L**	2.125 Max.
M*	1.625 Max.
N**	0.437 Max.
P**	0.250 Nom.
Q*	1.375 Max.

Bomac	SHUTTER	X
	6613/BL324	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 5, 1957

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-700	---	--- Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Resistance (25°C)	90	110	100 Ohms
Pull In Current	220	---	--- mAdc
Holding Current	110	320	--- mAdc
Ignitor Current	100	200	--- μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 18) (each electrode)

Test Conditions: Notes 2, 3, 4, 5; See Test Circuit "A"

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	*Vibration:	Cycles=1; F=5cps to F=500cps; G=15; Shutter Current= 110 mAdc; t=5 min; Note 6	---	---
-----	Shutter Current:	Shutter Voltage =28Vdc	I:254	311mAdc
-----	Pull In Current:	-----	I:---	220mAdc
-----	*Holding Current:	Note 7	I:---	110mAdc
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :---	1.4
		F= 8565	σ :---	1.2
		*F= 8655	σ :---	1.2
		*F= 8745	σ :---	1.2
		*F= 8835	σ :---	1.2
		*F= 8925	σ :---	1.2
		F= 9000	σ :---	1.2
		*F= 9087	σ :---	1.2
		*F= 9187	σ :---	1.2
		*F= 9287	σ :---	1.2
		*F= 9387	σ :---	1.2
		F= 9487	σ :---	1.2
		F= 9578Mc; Note 8	σ :---	1.4
4.18.4.2	*Duplexer Loss(1):	F= 8490Mc	Li :---	1.2db
		F= 8565	Li :---	1.0db
		F= 9000	Li :---	1.0db
		F= 9487	Li :---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 9	Li :---	1.2db
4.18.4.2	Duplexer Loss (2):	Shutters Closed;		
		*F= 8490Mc	Li :40	---db
		*F= 8565	Li :40	---db
		F= 9000	Li :40	---db
		*F= 9487	Li :40	---db
		*F= 9578Mc; Note 9	Li :40	---db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	18	---db
		F= 9000	20	---db
		F= 9487	18	---db
		F= 9578Mc; Note 10	15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 11	t :---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 11	Eid :200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 12	pf :---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 13	---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	t :---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr= 1000; Note 15	σ :---	1.2
4.11	Life Test (1):	cps=10max; Group D; Note 16	Cycles :50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc;Ri=2.8 meg. each electrode; Group D; Note 17	t :500	---hrs.
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t:---	10 μs
		Flat Leakage Power;	pf:---	20 mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss (1), at F=9000 Mc;	Li:---	1.2db
		Duplexer Loss (2), at F=9000 Mc;	Li:40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: The shutters of the BL-324 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: A suitable gasket should be bolted between each flange of the tube and its mating flange. See attached drawing of Mating Flange, dated 11-10-54. Two gaskets shall be furnished with each tube.

Note 4: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25 db, and a minimum of 27 db Directivity.

Note 5: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 6: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

Note 7: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 8: See Test Circuit "A".
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

(over)

Note 9: See Test Circuit "A".
Allow level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 10: See Test Circuit "A".
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 11: Measured separately for each ignitor electrode.

Note 12: See Test Circuit "A".
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 13: See Test Circuit "A".
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07max., on arm A.

Note 14: See Test Circuit "A"
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., on arm L; detector on arm R.

Note 15: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified

Note 16: 28Vdc pulses are applied to the shutter circuit. Each time the shutters open; a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

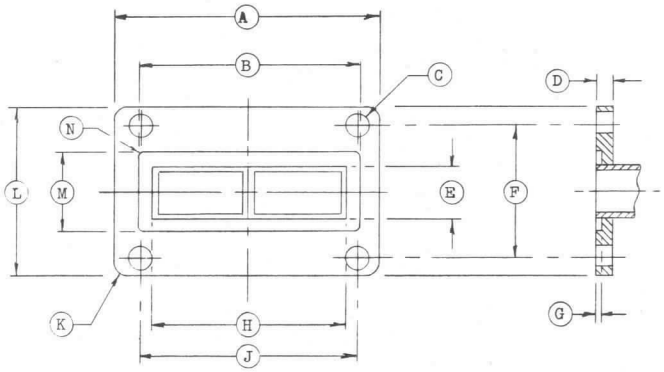
Note 17: See Test Circuit "A".
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 18: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance}(R1) = \frac{Ebb - E1}{150} \text{ (megohms)}$$

where R1=Total series resistance
Ebb=Open circuit supply voltage
E1=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



Ref.	Dimension
A	2.575 ±.015
B	2.203 +.005 -.000
C	#18 (.1695) Drill
	4 Holes
D	0.220 ±.010
E	0.500 ±.003
F	1.280 ±.004
G	0.070 ±.001
H	1.950 ±.004
J	2.170 ±.006
K	0.120 R. Approx.
L	0.753 +.005 -.000
M	1.625 ±.015
N	3/64 Rad.

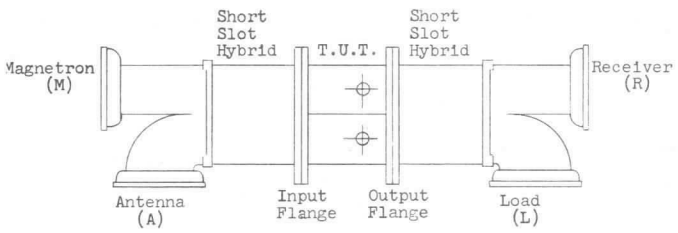
Note:- Outline used for following tubes

6334/BL-27, 6646/BL-604,
6613/BL-324, BL-631

TEST CIRCUIT "A"

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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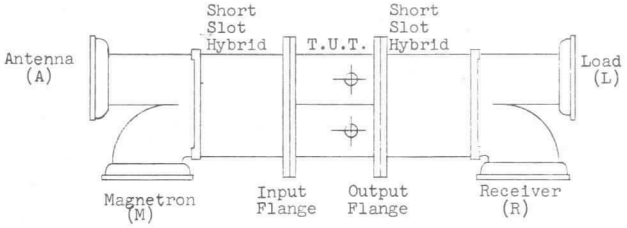
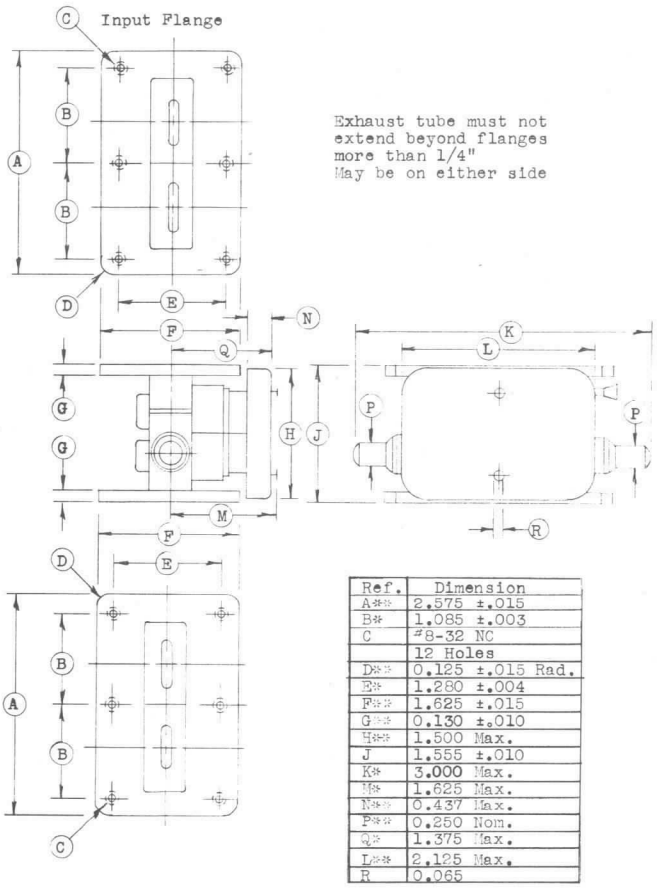




Exhaust tube must not extend beyond flanges more than 1/4" May be on either side

Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#8-32 NC
	12 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.130 ±.010
H**	1.500 Max.
J	1.555 ±.010
K*	3.000 Max.
M*	1.625 Max.
N**	0.437 Max.
P**	0.250 Nom.
Q*	1.375 Max.
L**	2.125 Max.
R	0.065

Bomac	SHUTTER	X
	BL338H	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 8, 1957

Dimensions: Per Outline 4

Ratings:	Min.	Max.	Nom.
Transmitter po	4.0	100	--- kw
Open Circuit Ignitor Voltage	-650	---	--- Vdc
Altitude	---	10,000	---ft.
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Res. (25°C)	180	220	200 ohms
Pull In Current	110	---	--- mAdc
Holding Current	60	160	--- mAdc
Heater Circuit Wattage	---	---	25w
Heater Circuit Voltage	---	---	115Vac
Heater Circuit Voltage Frequency	F 380	1000	---cps
Thermostat Contact Current	---	2	---Aac
Thermostat Cut In Temperature	4	---	---°C
Thermostat Cut Out Temperature	---	50	---°C
Ambient Temp. Range (non operational)	-60	+50	---°C
Ignitor Current	100	200	---μAdc

Recommended Ignitor Operating Current 150μAdc Note 10

Pack in sealed water proof bag. If opaque bag is used the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
4.5	Holding Period:	t=168 hours	---	---
4.9.18.18	Carton Drop:	(d) Package Group 1; Carton Size K	---	---
------	*Vibration:	F= 5 to 55cps; 0.035 in. (total); F=55 to 500cps, G=5; Note 2	---	---
-----	*Shock:	G=15; Note 3	---	---
------	**Humidity:	t=72 hours; Note 4	---	---
------	*Thermostat Operation:	T= -55°C; Note 5	T: 4.0	50°
------	Heater Current:	Vac=115	If : ---	0.250 Aac
4.18.18	Voltage Standing Wave Ratio:	σ́ =1.05max.;		
		F= 8490Mc;	σ : ---	1.9
		F1=8565	σ : ---	1.4
		*F= 8650	σ : ---	1.4
		*F= 8740	σ : ---	1.4
		*F= 8830	σ : ---	1.4
		*F= 8920	σ : ---	1.4
		F2=9000	σ : ---	1.4
		*F= 9090	σ : ---	1.4
		*F= 9180	σ : ---	1.4
		*F= 9280	σ : ---	1.4
		*F= 9380	σ : ---	1.4
		F3=9487	σ : ---	1.4
		F= 9578Mc; Note 11	σ : ---	1.9
------	Shutter Current:	Shutter Voltage =28 Vdc	I : 127	156mAd
------	Pull In Current:	------	I : ---	110mAdc
------	*Holding Current:	Note 13	I : ---	60mAdc
4.18.4.2	*Insertion Loss(1):	Shutters closed		
		Fo= 8490Mc.	Li : 40	---db
		F1= 8565	Li : 40	---db
		F2= 9000	Li : 40	---db
		F3= 9487	Li : 40	---db
		F4= 9578Mc.	Li : 40	---db
4.18.4.2	Insertion Loss(2):	F=F2; Ii=0μAdc	Li : ---	0.7db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc	ΔLi : ---	0.2db

Ref.	Test	Conditions	Min.	Max.
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Ri=5.5 Meg.	t : ---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 6	Eid : 200	375Vdc
4.18.11	Flat Leakage Power:	F=F2;±5% po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ́=1.10max.	pf : ---	60mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws : ---	0.2erg
4.18.31	Position of Short:	F=F2±5% po=40±10%kw; tp=1.0±0.15μs; prr=1000; σ́ =1.10max.; Note 7	---	±0.010 in
4.18.28	Arc Loss:	F=F2;±5% po=4.0kw; tp=1.0±0.15μs; prr=1000;	---	0.8db
4.18.15.1	Recovery Time:	F=F2;±5% po=100kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 8	t : ---	1.5μs
4.18.17.1	Temperature Cycle:	------	---	---
4.11	Life Test(1):	F=F2;±5% po=100kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Group D; Note 9	t : 500	---hrs.
4.11	Life Test(2):	cps=10 max.; Group D; Note 14	Cycles : 50,000	---
4.11.4	Life Test(1) End Point:	Recovery Time;	t : ---	3μs
		Flat Leakage Power;	pf : ---	80mw
		Spike Leakage Energy;	Ws : ---	0.25erg
		Insertion Loss	Li : ---	0.8 db
4.11.4	Life Test(2) End Point:	Insertion Loss	Li : 40	---db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The keep-alive electrode shall not short to the body during this test. There shall be no intermittent operation of the thermostat contacts.

Note 3: The tube shall be subjected to 18 impact shocks of 15G, each shock impulse having a time duration of 6±1 milliseconds. The shock shall be applied in the following direction.
(a) Vertically, 3 shocks in each direction.
(b) Parallel to the major horizontal axis, 3 shocks in each direction.
(c) Parallel to the minor horizontal axis, 3 shocks in each direction.
The difference in operation before and after the shock test shall not exceed the limits specified.

Note 4: The tube shall be placed in a chamber having a temperature and relative humidity of 55°C and 90% respectively. The test conditions shall be maintained for 72 hours. At the conclusion of this period, the tube shall operate without degradation of the limits specified.

(over)

Note 5: The tube having 10 inches of waveguide extending from each flange shall be placed in a frigid chamber -55°C. The thermostat should operate within the limits specified.

Note 6: With the ignitor circuit as in Figure 46 of MIL-E-1C, the ignitor voltage drop shall be measured after the tube fires with a high resistance voltmeter, 20,000 ohms per volt or greater, and shall be within the limits specified.

Note 7: When the metal plate is replaced by the tube, the position of the V.S.W. minimum of the flat portion of the pulse shall be 0.065 inch further from the magnetron, within the limits specified.

Note 8: The recovery time shall be measured after thirty minutes of operation under the conditions specified.

Note 9: This test shall be conducted with the TR tubes mounted in a ratrace duplexer under the conditions specified. There shall be no arcing across the front face of the window during this test.

Note 10: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

Series Resistance (Ri) $= \frac{Ebb - Ei}{150}$ (Megohms)

where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop.

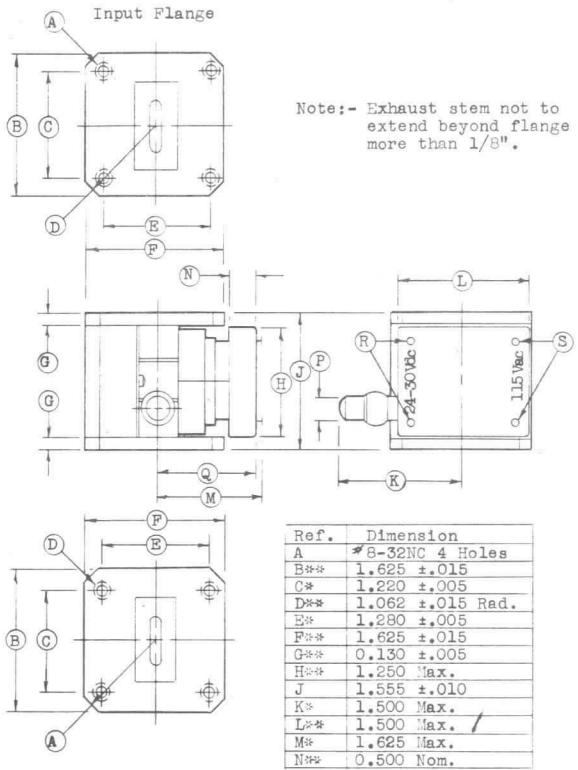
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Note 11: All frequencies are to be measured within 0.1% of the value specified, unless otherwise noted.

Note 12: The shutters of the BL-338 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po∠1 kw. They are not intended for applications involving the switching of high power and should be open or closed whenever high power is incident on the tube.

Note 13: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 14: 28 Vdc pulses are applied to the shutter coils. Each time the shutters open a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals registered should equal the number of pulses applied to the shutter coils.



Note:- Exhaust stem not to extend beyond flange more than 1/8".

Ref.	Dimension
A	#8-32NC 4 Holes
B**	1.625 ±.015
C*	1.220 ±.005
D**	1.062 ±.015 Rad.
E*	1.280 ±.005
F**	1.625 ±.015
G**	0.130 ±.005
H**	1.250 Max.
J	1.555 ±.010
K*	1.500 Max.
L**	1.500 Max.
M*	1.625 Max.
N**	0.500 Nom.
P**	0.250 Dia. Nom.
Q*	1.375 Max.
R	Shutter Terminals
	24 - 30 Vdc
S	Heater Terminals
	115 Vac

Bomac	SHUTTER	X
	BL344	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 13, 1956

Dimensions: Per Outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	---	---	28 Vdc
Shutter Circuit Resistance (25°)	90	110	100 ohm
Pull In Current	220	---	---mAdc
Holding Current	110	320	---mAdc

Test Conditions: Notes 2, 3, 4,

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
------	*Vibration:	Cycles=1; F=5 to 55cps, 0.080 in(total) F=55 to 500 cps; G=15; Shutter Current= 110mAdc; t=5 min; Note 5		---	---
------	Shutter Current:	Shutter Voltage =28 Vdc	I :	254	311mAdc
------	Pull In Current:	Note 10	I :	---	220mAdc
------	Holding Current:	Note 6	I :	---	110mAdc
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :	---	1.9
		F= 8565	σ :	---	1.4
		*F= 8650	σ :	---	1.4
		*F= 8740	σ :	---	1.4
		*F= 8830	σ :	---	1.4
		*F= 8920	σ :	---	1.4
		F= 9000	σ :	---	1.4
		*F= 9090	σ :	---	1.4
		*F= 9180	σ :	---	1.4
		*F= 9280	σ :	---	1.4
		*F= 9380	σ :	---	1.4
		F= 9487	σ :	---	1.4
		F= 9578Mc; Note 7	σ :	---	1.9
4.18.4.2	Insertion Loss(1):	F= 9000Mc; Ii=0μAdc; Note 7	Li :	---	0.7db
4.18.4.2	Insertion Loss(2):	F= 9000Mc; Shutters Closed	Li :	40	---db
4.18.5.1	Ignitor Interaction:	Ii=100μAdc Note 7	ΔLi :	---	0.2 db
4.18.1	*Ignitor Ignition Time:	Ebb= -700Vdc; Ri=5.5Meg; Note 8	t :	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 8	Eid :	200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=100μAdc; σ =1.10max.; Note 11	pf :	---	40 mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws :	---	0.30erg
4.18.28	Arc Loss:	F= 9000Mc; po=4.0kw; tp=1.0±0.15μs; prr=1000; Note 11		---	0.8db

Ref.	Test	Conditions		Min.	Max.
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.15μs; prr=1000; Ii=100μAdc; Note 11	t :	---	10μs
4.18.17.1	Temperature Cycle:	------		---	---
4.11	Life Test(1):	cps=10max.; Group D; Note 9	Cycles :	50,000	---
4.11	Life Test(2):	F= 9000Mc; po=200±10%kw(min.); tp=1.0±0.15μs; prr=1000; Ii=100μAdc on each electrode; Group D; Note 12	t :	500	---hrs.
4.11.4	Life Test(1) End Point:	Insertion Loss(2) Shutters Closed	Li :	40	---db
4.11.4	Life Test(2) End Point:	Recovery Time;	t :	---	20μs
		Flat Leakage Power;	pf :	---	50mw
		Spike Leakage Energy;	Ws :	---	0.35 erg
		Insertion Loss(1); at F= 9000Mc;	Li :	---	.7db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the BL-344 provide a convenient method of opening or shorting waveguide lines at low power levels, transmitter po < 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: A suitable gasket should be bolted between the input face of the tube and its tube seat. See attached drawing of Tube Mount. Two gaskets shall be supplied with each tube. Gasket type BL-G-24.

Note 4: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 5: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

Note 6: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 7: See attached drawing of Tube Mount. "E" plane of incident power to be parallel with the plane of the input window of the tube. Each half of the BL-344 is to be tested as a separate tube and each half shall satisfy the specified limits.

Note 8: Measured separately for each ignitor electrode.

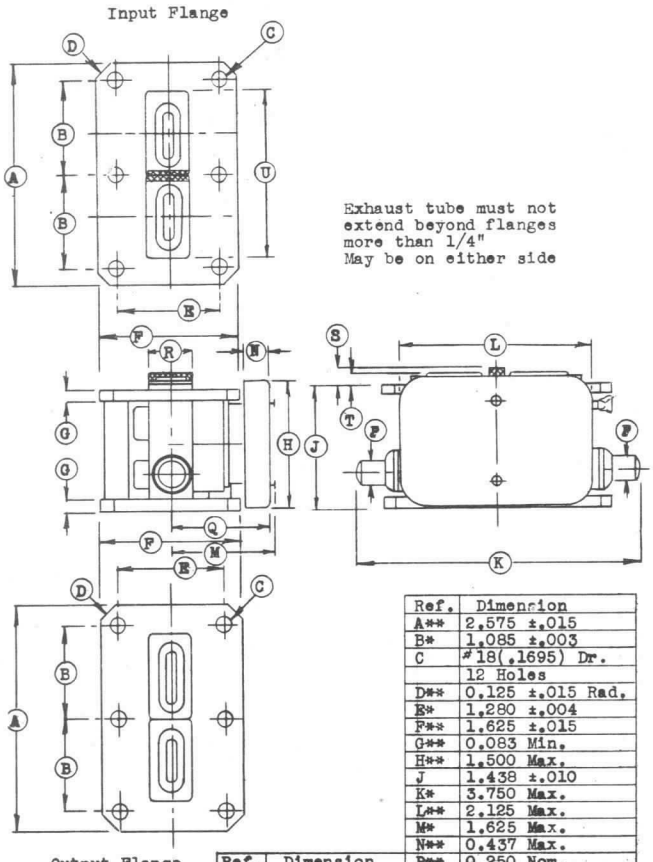
Note 9: 28 Vdc pulses are applied to the shutter circuit. Each time the shutters open; a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 10: Pull In Current may be defined as the minimum current necessary to reliably open all shutters.

(over)

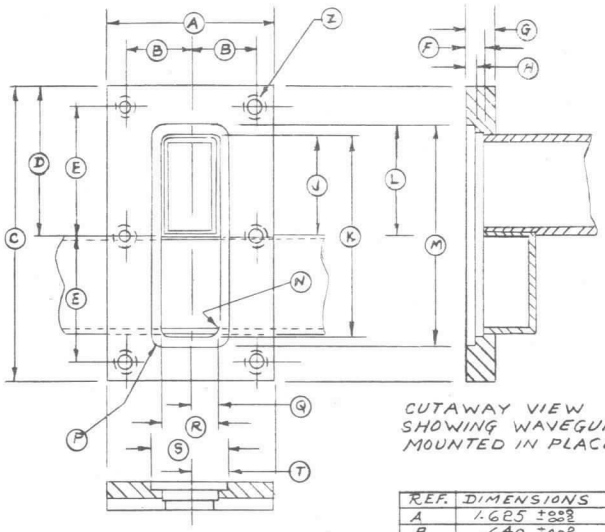
Note 11: See attached drawing of Tube Mount. "E" plane of incident power to be normal to the plane of the input window of the tube. Each half of the BL-344 is to be tested as a separate tube and each half shall satisfy the specified limit.

Note 12: **See attached drawing of Tube Mount. "E" plane of incident power to be normal to the plane of the input window of the tube. Life test only one-half of BL-344 under the specified conditions.**

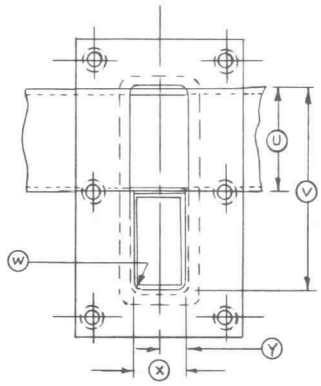


Ref.	Dimension
A**	2.575 ±.015
B*	1.085 ±.003
C	#18(.1695) Dr. 12 Holes
D**	0.125 ±.015 Rad.
E*	1.280 ±.004
F**	1.625 ±.015
G**	0.083 Min.
H**	1.500 Max.
J	1.438 ±.010
K*	3.750 Max.
L**	2.125 Max.
M*	1.625 Max.
N**	0.437 Max.
P**	0.250 Nom.
Q*	1.375 Max.
R*	0.510 Max.
S	0.140 Max.

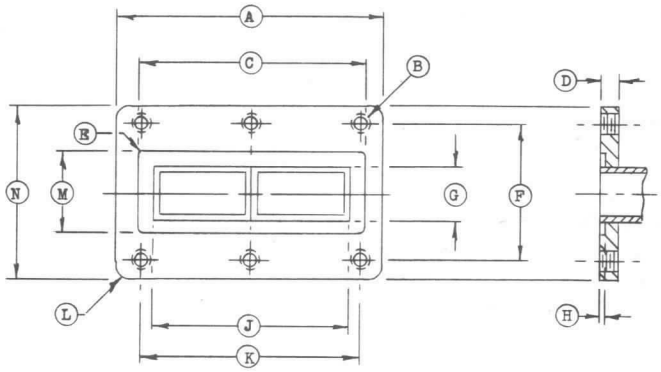
Ref.	Dimension
T	0.125 ±.005
U	1.960 Max.



CUTAWAY VIEW SHOWING WAVEGUIDE MOUNTED IN PLACE.



REF.	DIMENSIONS
A	1.625 +.002
B	.640 ±.002
C	2.575 ±.010
D	1.287
E	1.085 ±.003
F	.135 +.005 -.000
G	.250
H	.070 ±.001
J	.975 +.005 -.000
K	1.950 ±.004
L	1.102 ±.002
M	2.203 +.005 -.000
N	.030 R. MAX. (4) CORNERS
P	.046 R. ±.002
Q	.265 +.005 -.000
R	.530
S	.753 +.005 -.000
T	.377 +.002 -.000
U	.976 +.002 -.000
V	1.952 +.005 -.000
W	.015 R. MAX. (2) COR.
X	.504 +.002 -.000
Y	.252
Z	8-32 N.C.(6) HOLES



Ref.	Dimension
A	2.575 ±.015
B	#8-32NC Tap 6 Holes
C	2.203 +.005 -.000
D	0.220 ±.010
E	3/64 Radius
F	1.280 ±.004
G	0.500 ±.003
H	0.070 ±.001
J	1.950 ±.004
K	2.170 ±.006
L	0.120 Rad. Approx.
M	0.753 +.005 -.000
N	1.625 ±.015

REFERENCE CAVITIES

Bomac

REFERENCE CAVITY	
1Q22	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 19, 1955

Dimensions: Per Outline

Altitude Rating: 50,000 ft. max.

Test Conditions: Note 2

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1, Carton Size E; Note 3	Δ Fo:	---	±.10Mc
4.9.19.2	*Vibration:	G=10; Note 4	Δ Fo:	---	±.10Mc
4.9.20.5	*Shock Test:	G=50; t=6 ms; Note 5	Δ Fo:	---	±.10Mc
4.18.13.1	Loaded Q:	------	QL:	1900	2400
4.18.4.2	Insertion Loss:	F= Fo	Li:	4.0	6.0db
-----	Temperature Cycle (1):	Cycles=3; T=-40°C to T=+100°C; t=30min.; Note 6	1Q22 Fo: 1Q23 Fo: 1Q24 Fo: 5846 Fo: 6040 Fo: 6041 Fo:	9249.7 9279.7 9309.7 9279.7 9307.7 9311.7	9250.3Mc. 9280.3Mc. 9310.3Mc. 9280.3Mc. 9308.3Mc. 9312.3Mc.
-----	*Temperature Cycle (2):	Cycles=3; T=-40°C to T=+100°C; t=12hrs; Note 6	Fo:	See Temperature Cycle(1) limits	
-----	**Temperature Cycle (3):	Cycles=3; T=-55°C to T=+100°C; t=30min; Note 6	Fo:	See Temperature Cycle(1) limits	
-----	*Temperature Compensation (1):	T=+25°C to T=+100°C; Note 7	Δ Fo:	---	± 0.3Mc.
-----	**Temperature Compensation (2):	T=+25°C to T= 0°C;	Δ Fo:	---	±0.3Mc.
		T=+25°C to T=-25°C;	Δ Fo:	---	±0.7Mc.
		T=+25°C to T= -40°C;	Δ Fo:	---	±1.0Mc.
		T=+25°C to T=-55°C; Notes 7, 8	Δ Fo:	---	±1.2Mc.
-----	**Pressure Operation:	Atmospheric to 45p.s.i.(abs.);	Δ Fo:	---	± 0.15Mc.
		Atmospheric to 5 in. Hg(abs.); Note 9	Δ Fo:	---	±0.15Mc.
-----	*Off Resonance Insertion Loss:	F= 9800±100Mc;	Li:	30	---db
		F= 8850±100Mc.	Li:	30	---db
-----	*RF Glow Test:	Note 10		---	---
4.9.13	*Pressurizing:	45p.s.i.(abs.); Note 11		---	---
4.1.2	Design Tests:	Note 12	1Q22 Fo: 1Q23 Fo: 1Q24 Fo: 5846 Fo: 6040 Fo: 6041 Fo:	9249.5 9279.5 9309.5 9279.5 9307.5 9311.5	9250.5Mc. 9280.5Mc. 9310.5Mc. 9280.5Mc. 9308.5Mc. 9312.5Mc.
4.11	Life Test:	T=-55°C to T=+100°C; t=30min; Group B; Note 6	Cycles:	25	---
4.11.4	Life Test End Point: Resonant Frequency	RF Glow Test;	1Q22 Fo: 1Q23 Fo: 1Q24 Fo: 5846 Fo: 6040 Fo: 6041 Fo:	9249.5 9279.5 9309.5 9279.5 9307.5 9311.5	9250.5Mc. 9280.5Mc. 9310.5Mc. 9280.5Mc. 9308.5Mc. 9312.5Mc.

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the carton drop test shall not exceed the limits specified.

Note 4: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

Note 5: Insert $\frac{1}{2}$" thickness of 32-38 Durometer rubber between the hammer and anvil of the Taft Pierce machine. Angle of hammer to be approximately 60°. The difference in resonant frequency before and after the shock test shall not exceed the limits specified.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other The cavity shall be maintained at each of the extreme temperatures for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of each of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T=+25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 8: Δ Fo at -55°C may be obtained by extrapolation of data obtained at higher temperatures.

Note 9: The air pressure specified shall be applied to both windows of the tube for a period of one-half hour, after which the pressure shall be brought back to atmospheric. The difference in resonant frequency before and after each of the pressure operations shall not exceed the limits specified.

Note 10: The tube shall show a typical diffuse low-pressure glow discharge when placed in an RF field.

Note 11: This test is not applicable to Type 5846.

Note 12: Cavities which have successfully completed the production and design tests required by this specification may be shipped against orders providing that their final resonant frequencies are within the limits specified.

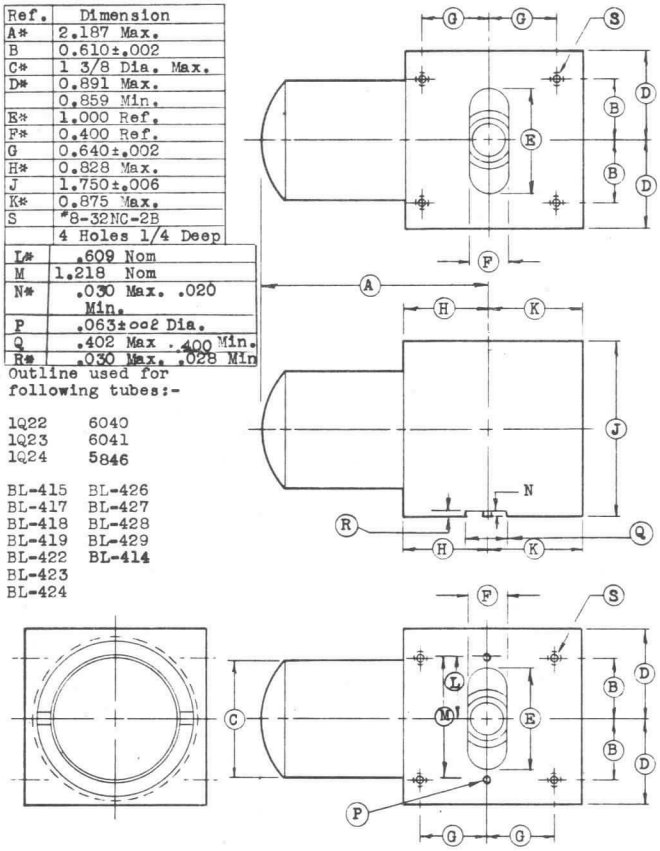
(over)

Ref.	Dimension
A*	2.187 Max.
B	0.610±.002
C*	1 3/8 Dia. Max.
D*	0.891 Max.
	0.859 Min.
E*	1.000 Ref.
F*	0.400 Ref.
G	0.640±.002
H*	0.828 Max.
J	1.750±.006
K*	0.875 Max.
S	#8-32NC-2B
	4 Holes 1/4 Deep
L*	.609 Nom
M	1.218 Nom
N*	.030 Max. .020 Min.
P	.063±.002 Dia.
Q	.402 Max. .400 Min.
R*	.030 Max. .028 Min

Outline used for following tubes:-

1Q22 6040
1Q23 6041
1Q24 5846

BL-415 BL-426
BL-417 BL-427
BL-418 BL-428
BL-419 BL-429
BL-422 BL-414
BL-423
BL-424



Note: L, M, N, P, Q, and R Apply only to 5846.

Bomac

REFERENCE CAVITY

1Q26A | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Dimensions: Per Outline

Altitude Ratings: 60,000 ft. max.

Test Conditions: Note 2. Ambient temperature range, -65 to +100°C

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	*Vibration:	F=0 to 50cps G=10; t=60sec; Note 3	ΔFo : ---	: ±0.1Mc
4.18.13.1	Loaded Q:	------	QL : 1000	1500
4.18.4.2	Insertion Loss:	F=Fo	Li : 5.0	8.0db
------	Resonant Frequency:	F=Fo Note 2, 4, 8	Fo : 9279.7	9280.3Mc.
------	*Temperature Compensation(1):	T=+25°C to T=+80°C Note 5	ΔFo : ---	±0.30Mc
------	*Temperature Compensation(2):	T=+25°C to F=-40°C Note 5	ΔFo : ---	±0.40Mc
	**Temperature Compensation(3):	T=+25°C to T=-55°C Note 5	ΔFo : ---	±0.50Mc
------	* *Atmospheric Pressure Test:	P=Atmospheric to 45psi (Abs) and 100mm of Hg	ΔFo : ---	±0.15Mc
4.11	**Life Test:(1)	T=-55°C to T= 100°C t=30 min; Note 6	Cycle : 25	---
4.11.4	Life Test End Point:	Resonant Frequency Life Test(1)	Fo :	±.3Mc
------	* Pulse Power Test:	tp=1μs; Prf=1000 F=Fo; Note 7, 8	po : 5	---kw

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

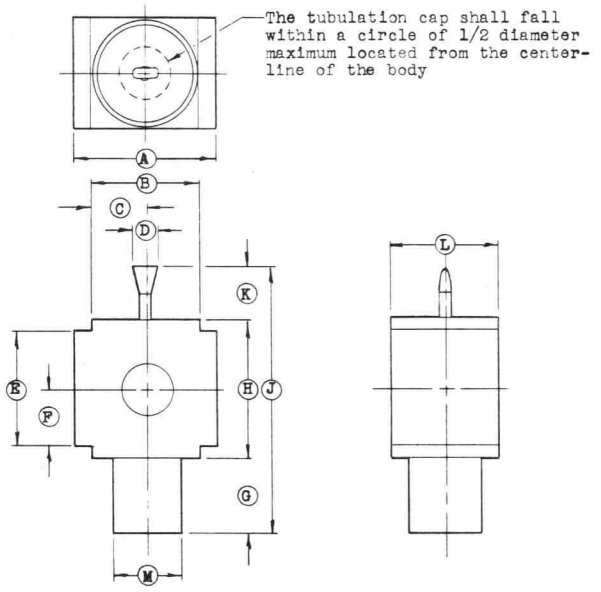
Note 4: Cavity should be adequately temperature cycled prior to this test to insure minimum permanent set in frequency.

Note 5: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T=+25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at the extreme temperature for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: The tube shall not exhibit any form of corona or breakdown with a pulse of peak power less than that specified applied to its input.

Note 8: Fo is the resonant frequency of the cavity when measured in a matched line (maximum VSWR 1.05) at an ambient room temperature.



Ref.	Dimension
A**	1 11/32±1/32
B*	1.050+.005-.010
C	0.525
D	1/4 Dia. Max.
E**	1.110+.005-.010
F*	0.555
G	0.750±.030
H	1 11/32±1/32
J*	2 21/32 Max.
K	1/2 Max. Sealoff
L**	1.062±.010
M**	0.685 Max.

Bomac

REFERENCE CAVITY

6301 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Dimensions: Per Outline

Altitude Ratings: 60,000 ft. max.

Test Conditions: Note 2. Ambient temperature range, -65 to +100°C

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	*Vibration:	F=0 to 50 cps G=10; t=60 sec; Note 3	Δ Fo: ---	±0.1Mc
4.18.13.1	Loaded Q:	-----	QL: 1000	1500
4.18.4.2	Insertion Loss:	F=Fo	Li : 5.0	8.0 db
-----	Resonant Frequency:	F=Fo Note 2, 4, 8	Fo : 9269.7	9270.3Mc
-----	*Temperature Compensation (1):	T=+25°C to T=+80°C Note 5	Δ Fo : ---	±0.30Mc
-----	*Temperature Compensation (2):	T=+25°C to F=-40°C Note 5	Δ Fo: ---	±0.40Mc
	**Temperature Compensation (3);	T=+25°C to T=-55°C Note 5	ΔFo: ---	±0.50Mc
-----	**Atmospheric Pressure Test:	P=Atmospheric to 45 psi (abs.) and 100 mm of Hg	Δ Fo: ---	±0.15Mc
4.11	**Life Test (1):	T=-55°C to T=100°C t=30 min; Note 6	Cycle : 25	---
4.11.4	Life Test End Point:	Resonant Frequency Life Test (1)	Fo:	±.3Mc
-----	*Pulse Power Test:	tp=1μs; Prf=1000 F=Fo; Note 7, 8	po : 5	---kw

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

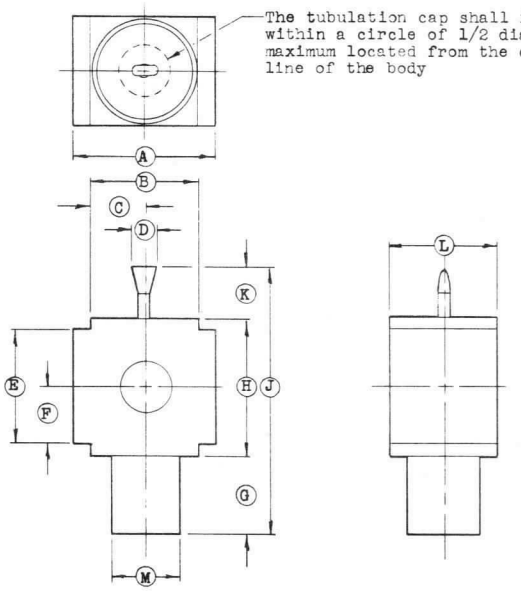
Note 4: Cavity should be adequately temperature cycled prior to this test to insure minimum permanent set in frequency.

Note 5: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T=+25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at the extreme temperature for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of the last two half cylces, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: The tube shall not exhibit any form of corona or breakdown with a pulse of peak power less than that specified applied to its input.

Note 8: Fo is the resonant frequency of the cavity when measured in a matched line (maximum VSWR 1.05) at an ambient room temperature.



Ref.	Dimension
A**	1 11/32±1/32
B*	1.050+.005-.010
C	0.525
D	1/4 Dia. Max.
E**	1.110+.005-.010
F*	0.555
G	0.750±.030
H	1 11/32±1/32
J*	2 21/32 Max.
K	1/2 Max. Sealoff
L**	1.062±.010
M**	0.685 Max.

Bomac

REFERENCE CAVITY

6452 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 18, 1956

Dimensions: Per Outline

Altitude Ratings: 60,000 ft. max.

Test Conditions: Note 2. Ambient temperature range, -65 to +100°C

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.9.19.2	*Vibration:	F=0 to 50 cps G=10; t=60 sec; Note 3	ΔFo :	---	±0.1Mc.
4.18.13.1	Loaded Q:	------	QL :	1500	2000
4.18.4.2	Insertion Loss:	F=Fo	Li :	4db	6.0db
------	Resonant Frequency:	F=Fo Note 2, 4, 8	Fo :	9349.7	9350.3Mc.
------	*Temperature Compensation(1):	T=+25°C to T=+80°C Note 5	ΔFo :	---	±0.40Mc.
------	*Temperature Compensation(2):	T=+25°C to F= -40°C Note 5	ΔFo :	---	±0.40Mc.
	**Temperature Compensation(3):	T=+25°C to T= -55°C Note 5	ΔFo :	---	±0.50Mc.
------	**Atmospheric Pressure Test:	P=Atmospheric 45 psi Abs. and 100 mm of Hg	ΔFo :	---	±0.15Mc.
4.11	**Life Test(1):	T=-55°C to T= 100°C t=30 min; Note 6	Cycle . :	25	---
4.11.4	Life Test End Point:	Resonant Frequency Life Test(1)	Fo :		±.3Mc.
------	*Pulse Power Test:	tp=1μs; Prf=1000 F=Fo; Note 7, 8	po :	5	---kw

Note 1: Reference and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

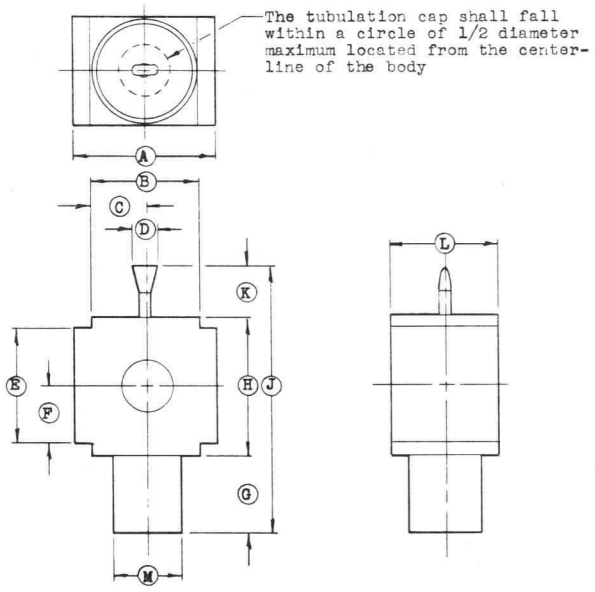
Note 4: Cavity should be adequately temperature cycled prior to this test to insure minimum permanent set in frequency.

Note 5: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T=+25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at the extreme temperature for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: The tube shall not exhibit any form of corona or breakdown with a pulse of peak power less than that specified applied to its input.

Note 8: Fo is the resonant frequency of the cavity when measured in a matched line (maximum VSWR 1.05) at an ambient room temperature.



Ref.	Dimension
A**	1 11/32±1/32
B*	1.050+.005-.010
C	0.525
D	1/4 Dia. Max.
E**	1.110+.005-.010
F*	0.555
G	0.750±.030
H	1 11/32±1/32
J*	2 21/32 Max.
K	1/2 Max. Sealoff
L**	1.062±.010
M**	0.685 Max.

Bomac

REFERENCE CAVITY

BL414 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 24, 1956

Dimensions: Per Outline

Altitude Rating: 50,000 ft. max.

Test Conditions: Note 2

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size E; Note 3	ΔFo : ---	±.10Mc
4.9.19.2	*Vibration:	G=10; Note 4	ΔFo : ---	±.10Mc
4.9.20.5	*Shock Test:	G=50; t=6 ms; Note 5	ΔFo : ---	±.10Mc
4.18.13.1	Loaded Q:	------	QL : 1900	2400
4.18.4.2	Insertion Loss:	F= Fo	Li : 4.0	6.0db
------	Temperature Cycle (1):	Cycles=3; T=-40°C to T=+100°C; t=30min; Note 6	F : 10,999.7	11,000.3 Mc.
------	*Temperature Cycle (2):	Cycles=3; T=-40°C to T=+100°C; t=12 hrs.; Note 6	F : 10,999.7	11,000.3 Mc.
------	**Temperature Cycle (3):	Cycles=3; T=-55°C to T=+100°C; t=30 min; Note 6	Fo: 10,999.7	11,000.3 Mc
------	*Temperature Compensation (1):	T=+25°C to T=+100°C; Note 7	ΔFo : ---	±0.3Mc.
------	**Temperature Compensation (2):	T=+25°C to T= 0°C;	ΔFo : ---	±0.3Mc
		T= +25°C to T= -25°C;	ΔFo : ---	±0.7Mc
		T=+25°C to T= +40°C;	ΔFo : ---	±1.0Mc
		T=+25°C to T=-55°C; Notes 7, 8	ΔFo : ---	±1.2Mc
------	**Pressure Operation:	Atmospheric to 45p.s.i.(abs);	ΔFo : ---	±0.15Mc
		Atmospheric to 5 in. Hg.(abs.); Note 9	ΔFo : ---	±0.15Mc
------	*Off Resonance Insertion Loss:	F= 10,500±100Mc;	Li : 30	---db
		F= 11,500±100Mc.	Li : 30	---db
------	†RF Glow Test:	Note 10	---	---
4.9.13	*Pressurizing:	45p.s.i.(abs.); Note 11	---	---
4.12	Design Tests:	Note 12	Fo: 10,999.5	11,000.5Mc
4.11	Life Test:	T=-55°C to T=+100°C; t=30 min; Group B; Note 6	Cycles : 25	---
4.11.4	Life Test End Point:	RF Glow Test; Resonant Frequency	Fo: 10,999.5	11,000.5 Mc.

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be test mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the carton drop test shall not exceed the limits specified.

Note 4: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

Note 5: Insert 1/2" thickness of 32-38 Durometer rubber between the hammer and anvil of the Taft Pierce machine. Angle of hammer to be approximately 60°. The difference in resonant frequency before and after the shock test shall not exceed the limits specified.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at each of the extreme temperatures for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of each of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T=+25°. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 8: ΔFo at -55°C may be obtained by extrapolation of data obtained at higher temperature.

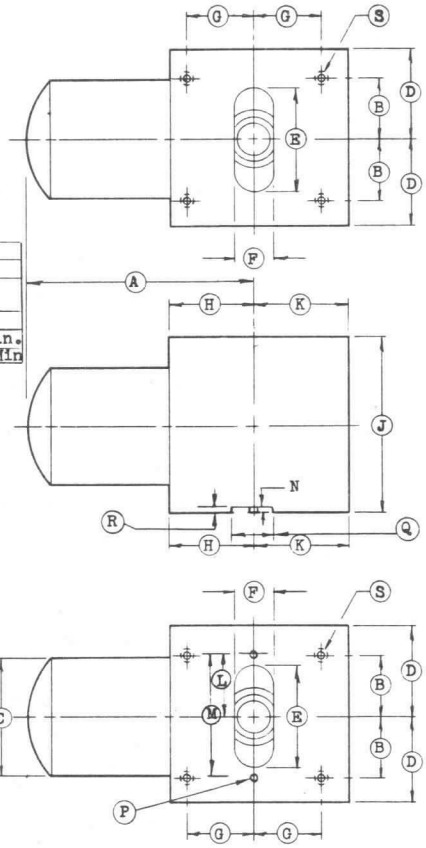
Note 9: The air pressure specified shall be applied to both windows of the tube for a period of one-half hour, after which the pressure shall be brought back to atmospheric. The difference in resonant frequency before and after each of the pressure operations shall not exceed the limits specified.

Note 10: The tube shall show a typical diffuse low-pressure glow discharge when placed in an RF field.

Note 11: Cavities which have successfully compledted the production and design tests required by this specification may be shipped against orders providing that their final resonant frequencies are within the limits specified.

(over)

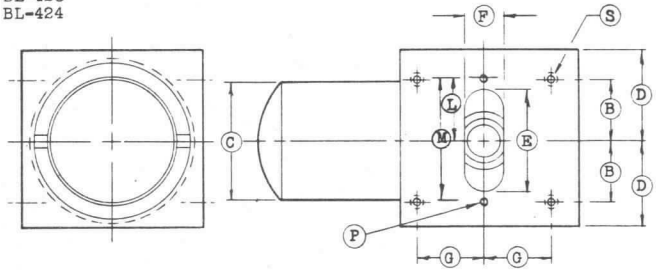
Ref.	Dimension
A*	2.187 Max.
B	0.610±.002
C*	1 3/8 Dia. Max.
D*	0.891 Max.
	0.859 Min.
E*	1.000 Ref.
F*	0.400 Ref.
G	0.640±.002
H*	0.828 Max.
J	1.750±.006
K*	0.875 Max.
S	#8-32NC-2B
	4 Holes 1/4 Deep
L*	.609 Nom
M	1.218 Nom
N*	.030 Max. .020 Min.
P	.063±.002 Dia.
Q	.402 Max. .400 Min.
R*	.030 Max. .028 Min



Outline used for following tubes:-

1Q22 6040
1Q23 6041
1Q24 5846

BL-415 BL-426
BL-417 BL-427
BL-418 BL-428
BL-419 BL-429
BL-422 **BL-414**
BL-423
BL-424



Note: L, M, N, P, Q, and R Apply only to 5846.

Bomac

REFERENCE CAVITY

BL415 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 10, 1956

Dimensions: Per Outline

Altitude Ratings: 50,000 ft. max.

Test Conditions: Note 2

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d) Package Group 1; Carton Size E; Note 3	ΔFo : ---	±.10Mc.
4.9.19.2	*Vibration:	G=10; Note 4	ΔFo : ---	±.10Mc.
4.9.20.5	*Shock Test:	G=50; t=6 ms; Note 5	ΔFo : ---	±.10Mc.
4.18.13.1	Loaded Q:	------	QL : 1900	2400
4.18.4.2	Insertion Loss:	F= Fo	Li : 4.0	6.0 db
------	Temperature Cycle (1):	Cycles=3; T= -40°C to T=+100°C; t=30min; Note 6	Fo: 9399.7	9400.3
------	*Temperature Cycle (2):	Cycles=3; T=-40°C to T=+100°C; t=12 hrs. Note 6	Fo: 9399.7	9400.3
------	**Temperature Cycle (3):	Cycles=3; T= -55°C to T= +100°C; t=30 min; Note 6	Fo: 9399.7	9400.3
------	*Temperature Compensation (1):	T= +25°C to T= +100°C; Note 7	ΔFo : ---	±0.3Mc.
------	**Temperature Compensation (2):	T=+25°C to T= 0°C;	ΔFo : ---	±0.3Mc.
		T= +25°C to T= -25°C;	ΔFo : ---	±0.7Mc.
		T= +25°C to T= -40°C;	ΔFo : ---	±1.0Mc.
		T= +25°C to T= -55°C; Notes 7, 8	ΔFo : ---	±1.2Mc.
------	**Pressure Operation:	Atmospheric 45p.s.i.(abs.);	ΔFo : ---	±0.15Mc.
		Atmospheric to 5 in. Hg (abs.); Note 9	ΔFo : ---	±0.15Mc.
------	*Off Resonance Insertion Loss:	F= 9800±100Mc.	Li : 30	---db
		F= 8850±100Mc.	Li : 30	---db
------	†RF Glow Test:	Note 10	---	---
4.9.13	*Pressurizing:	45p.s.i.(abs.);	---	---
4.12	Design Tests:	Note 11	Fo: 9399.5	9400.5Mc
4.11	Life Test:	T= -55°C to T=+100°C; t=30min; Group B; Note 6	Cycles : 25	---
4.11.4	Life Test End Point:	RF Glow Test; Resonant Frequency	--- Fo: 9399.5	--- 94005.Mc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1.05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the carton drop test shall not exceed the limits specified.

Note 4: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

Note 5: Insert 1/2" thickness of 32-38 Durometer rubber between the hammer and anvil of the Taft Pierce machine. Angle of hammer to be approximately 60°. The difference in resonant frequency before and after the shock test shall not exceed the limits specified.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at each of the extreme temperature for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of each of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibrium at T= +25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T= +25°C while resonant frequency measurements are being made at approximately 20°C temperature intervals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 8: ΔFo at -55°C may be obtained by extrapolation of data obtained at higher temperatures.

Note 9: The air pressure specified shall be applied to both windows of the tube for a period of one-half hour, after which the pressure shall be brought back to atmospheric. The difference in resonant frequency before and after each of the pressure operations shall not exceed the limits specified.

Note 10: The tube shall show a typical diffuse low-pressure glow discharge when placed in an RF field.

Note 11: Cavities which have successfully completed the production and design tests required by this specification may be shipped against orders providing that their final resonant frequencies are within the limits specified.

(over)

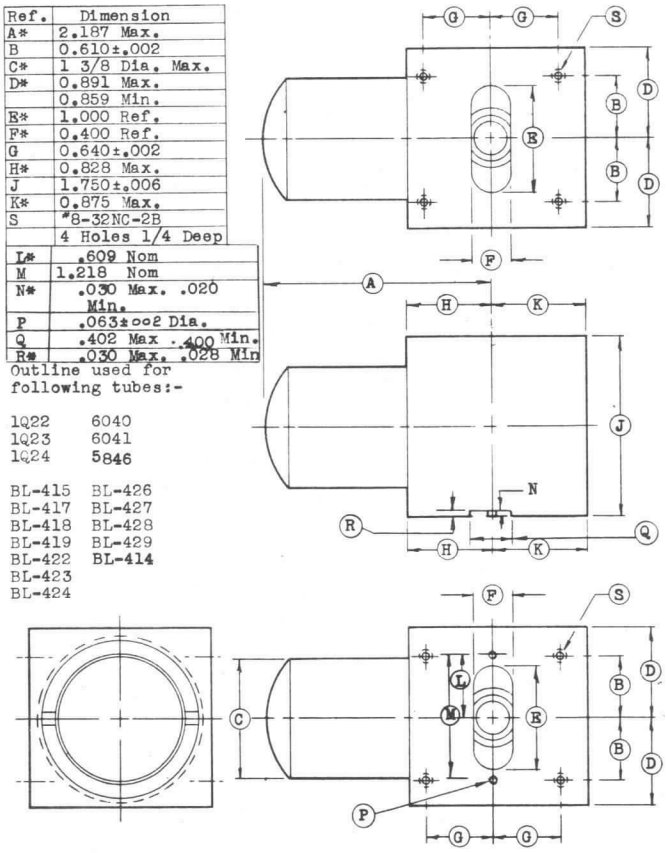
Ref.	Dimension
A*	2.187 Max.
B	0.610±.002
C*	1 3/8 Dia. Max.
D*	0.891 Max.
	0.859 Min.
E*	1.000 Ref.
F*	0.400 Ref.
G	0.640±.002
H*	0.828 Max.
J	1.750±.006
K*	0.875 Max.
S	#8-32NC-2B
	4 Holes 1/4 Deep

L*	.609 Nom
M	1.218 Nom
N*	.030 Max. .020 Min.
P	.063±.002 Dia.
Q	.402 Max . .400 Min.
R*	.030 Max. .028 Min

Outline used for following tubes:-

1Q22 6040
1Q23 6041
1Q24 5846

BL-415 BL-426
BL-417 BL-427
BL-418 BL-428
BL-419 BL-429
BL-422 BL-414
BL-423
BL-424



Note: L, M, N, P, Q, and R Apply only to 5846.

Bomac

REFERENCE CAVITY

BL422 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 10, 1956

Dimensions: Per Outline

Altitude Rating: 50, 000 ft. max.

Test Conditions: Note 2

Pack in water-vapor-proof bag. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3. 1	Qualification Approval:	Required for JAN Marking	---	---
4. 5	Holding Period:	t=168 hours	---	---
4. 9. 18. 1. 8	Carton Drop:	(d) Package Group 1; Carton Size E; Note 3	△Fo:---	±. 10Mc
4. 9. 19. 2	*Vibration:	G=10; Note 4	△ Fo:---	±. 10Mc
4. 9. 20. 5	*Shock Test:	G=50; t=6 ms; Note 5	△ Fo:---	±. 10Mc
4. 18. 13. 1	Loaded Q:	------	QL: 1900	2400
4. 18. 4. 2	Insertion Loss:	F=Fo	Li: 4. 0	6. 0db
-----	Temperature Cycle (1):	Cycles=3; T=-40°C to T=+100°C; t=30 min. ; Note 6	Fo:9269. 7	9270. 3Mc
-----	*Temperature Cycle (2):	Cycles=3; T=-40°C to T=+100°C; t=12 hours; Note 6	Fo:9269. 7	9270. 3Mc
-----	**Temperature Cycle (3):	Cycles=3; T=-55°C to T=+100°C; t=30 min; Note 6	Fo:9269. 7	9270. 3
-----	*Temperature Compensation (1):	T=+25°C to T=+100°C; Note 7	Fo:---	±0. 3Mc.
-----	**Temperature Compensation (2):	T=+25°C to T=0°C;	Fo:---	±0. 3Mc.
		T=+25°C to T=-25°C:	Fo:---	±0. 7Mc.
		T=+25°C to T=-40°C;	Fo:---	±1. 0Mc.
		T=+25°C to T=-55°C; Notes 7, 8	Fo:---	±1. 2Mc.
-----	**Pressure Operation Operation:	Atmospheric to 45 p. s. i. (abs.);	Fo:---	±0. 15Mc.
		Atmospheric to 5 in. Hg (abs.); Note 9	Fo:---	±0. 15Mc.
-----	*Off Resonance Insertion Loss:	F=9800±100Mc;	Li:30	---db
		F=8850±100Mc.	Li:30	---db
-----	RF Glow Test:	Note 10	---	---
4. 9. 13	*Pressurizing:	45 p. s. i. (abs.)	---	---
4. 1. 2.	Design Tests:	Note 11	Fo:9269. 5	9270. 5Mc
4. 11	Life Test:	T=-55°C to T=+100°C; t=30 min; Group B; Note 6	Cycles: 25	---
4. 11. 4	Life Test End Point:	RF Glow Test	---	---
		Resonant Frequency	Fo:9269. 5	9270. 5Mc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500, 000. The cavities shall be tested mounted between UG-40/U chokes in RG-52/U waveguide and with a voltage standing wave ratio less than 1. 05 due to the resistive match looking into each of the chokes between which the cavity is mounted.

Note 3: The difference in resonant frequency before and after the carton drop test shall not exceed the limits specified.

Note 4: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

Note 5: Insert 1/2" thickness of 32-38 Durometer rubber between the hammer and anvil of the Taft Pierce machine. Angle of hammer to be approximately 60°. The difference in resonant frequency before and after the shock test shall not exceed the limits specified.

Note 6: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at each of the extreme temperatures for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of each of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 7: After the temperature cycling described in Note 6, the cavity shall be brought to equilibrium at the specified extreme temperature for 30 minutes and then returned to equilibium at T=+25°C. Then it shall be brought to the specified extreme temperature again. Then allow to return to T=+25°C while resonant frequency measurements are being made at approximately 20°C temperature inter vals. At no temperature shall the resonant frequency differ from the value at room temperature by more than the specified amount.

Note 8: Fo at -55°C may be obtained by extrapolation of data obtained at higher temperatures.

Note 9: The air pressure specified shall be applied to both windows of the tube for a period of one-half hour, after which the pressure shall be brought back to atmospheric. The difference in resonant frequency before and after each of the pressure operations shall not exceed the limits specified.

Note 10: The tube shall show a typical diffuse low-pressure glow discharge when placed in an RF field.

Note 11: Cavities which have successfully completed the production and design tests required by this specification may be shipped against orders providing that their final resonant frequencies are within the limits specified.

(over)

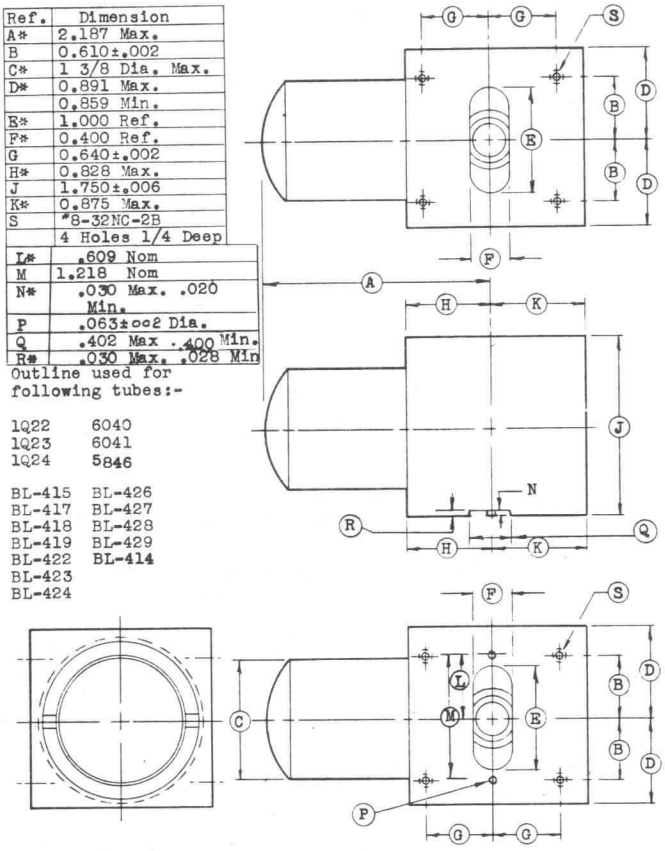
Ref.	Dimension
A*	2.187 Max.
B	0.610±.002
C*	1 3/8 Dia. Max.
D*	0.891 Max.
	0.859 Min.
E*	1.000 Ref.
F*	0.400 Ref.
G	0.640±.002
H*	0.828 Max.
J	1.750±.006
K*	0.875 Max.
S	#8-32NC-2B
	4 Holes 1/4 Deep

L*	.609 Nom
M	1.218 Nom
N*	.030 Max. .020 Min.
P	.063±.002 Dia.
Q	.402 Max . .400 Min.
R*	.030 Max. .028 Min

Outline used for following tubes:-

1Q22 6040
1Q23 6041
1Q24 5846

BL-415 BL-426
BL-417 BL-427
BL-418 BL-428
BL-419 BL-429
BL-422 BL-414
BL-423
BL-424



Note: L, M, N, P, Q, and R Apply only to 5846.

Bomac

MAGNETRON

BL50-BL50A-BL50B | **5.3 5.8mm**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 20, 1954

Dimensions: Per Outline

Ratings:		Min.	Max.
Heater Current	If:	---	30A
Peak Anode Current	ib:	---	10a
Peak Forward Anode Voltage	epy:	---	18kv
Peak Power Input	pi:	---	180kw
Average Power Input	pi:	---	200W
Duty Cycle	Du:	---	0.0015
Pulse Duration	tp:	---	0.25μs
Pulse Recurrence Rate	prr:	---	15,000pps

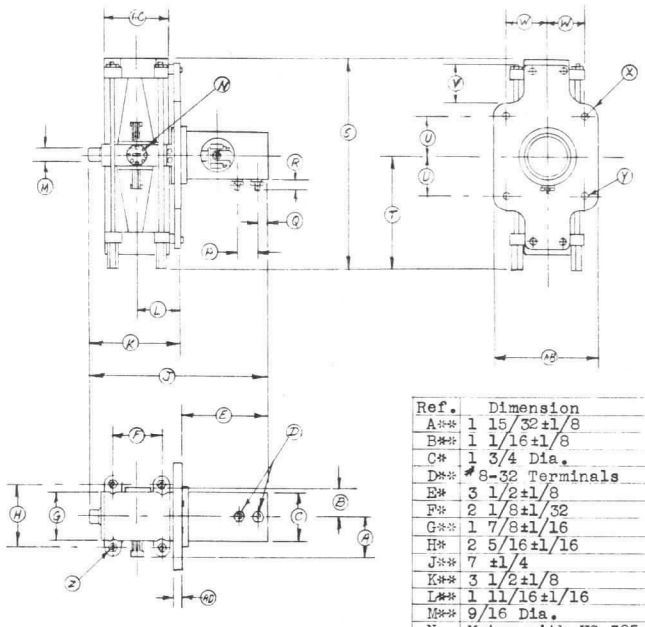
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.8	Electrode Insulation:	Omit	---	---
4.9.8	**Salt Spray:	Omit	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.10.8	Heater Current:	Ef=2.0V	If: 24A	30A
4.16.3	Oscillation:	Note 2	---	---
4.16.3.2	Heater Warm-up Time:	If=27A; Note 3	tk: ---	180sec.
4.16.3.3	Pulse Characteristics:	tp=0.08to 0.12μs; Du=.0004±.0001		
----	Peak Anode Current:	ib=7.0A	---	---
4.16.3.5	Pulse Voltage:	BL-50	epy: 12.5	15.5kv
		BL-50A	epy: 14.0	17.0kv
		BL-50B	epy: 12.5	15.5kv
4.16.3.6	Peak Power Output:	Method A	po: 5.0	---KW
4.10.7.3.1	Frequency:	BL-50	F: 51.5	55.5kMc
		BL-50A	F: 54.5	57.5kMc
		BL-50B	F: 56.5	60.0kMc

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The termination of the magnetron during this test shall be equivalent to a waveguide line with a VSWR not greater than 1.50.

Note 3: Starting Heater Current =27A. During high voltage pulsed operation, it is essential to immediately reduce the heater current to a minimum value to give maximum power output and stability with minimum back heating.



Ref.		Dimension
A**	1	15/32±1/8
B**	1	1/16±1/8
C*	1	3/4 Dia.
D**	#	8-32 Terminals
E*	3	1/2±1/8
F*	2	1/8±1/32
G**	1	7/8±1/16
H*	2	5/16±1/16
J**	7	±1/4
K**	3	1/2±1/8
L**	1	11/16±1/16
M**		9/16 Dia.
N		Mates with UG 385/U
P**		3/4±1/32
Q**		5/16±1/16
R**		3/8
S*	7	7/8±1/8
T**	4	1/4±1/8
U*		1.500±.010
V**	1	1/2 Nom.
W*		1.500±.010
X**		1/2±1/32 Rad.
Y		H(.266) Dr. 4 Holes
Z**	#	10-32NC 4 Holes
AB*		4±1/16
AC**	2	3/4±1/16
AD**		1/4

Bomac

MAGNETRON

BL218 - 219 - 220 | **5.3 5.8mm**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 11, 1957

Dimensions: Per Outline

Ratings:		Min.	Max.
Heater Current	If:	---	3.3 A
Peak Anode Current	ib:	---	10 a
Peak Forward Anode Voltage	epy:	---	18 kv
Peak Power Input	pi:	---	180 kw
Average Power Input	pi:	---	200 W
Duty Cycle	Du:	---	0.0015
Pulse Duration	tp:	---	0.25 μs
Pulse Recurrence Rate	prr:	---	15,000 pps

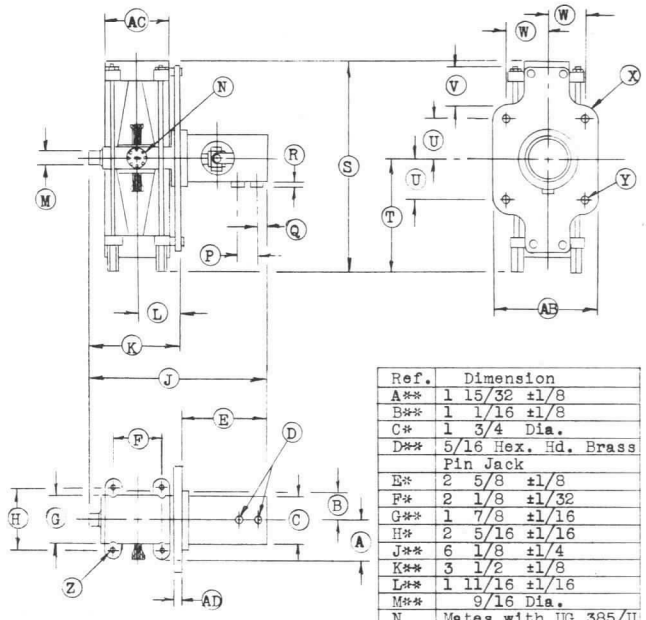
Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
4.8	Electrode Insulation:	Omit		---	---
4.9.8	**Salt Spray:	Omit		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.10.8	Heater Current:	Ef=6.3V	If:	2.7A	3.3A
4.16.3	Oscillation:	Note 2		---	---
4.16.3.2	Heater Warm-up Time:	If=3A; Note 3	tk:	---	180sec.
4.16.3.3	Pulse Characteristics:	tp=0.08to 0.12μs; Du=.0004±.0001			
----	Peak Anode Current:	ib=7.0A		---	---
4.16.3.5	Pulse Voltage:	BL-218	epy:	12.5	15.5kv
		BL-219	epy:	14.0	17.0kv
		BL-220	epy:	12.5	15.5kv
4.16.3.6	Peak Power Output:	Method A	po:	5.0	---KW
4.10.7.3.1	Frequency:	BL-218	F:	51.5	55.5kMc
		BL-219	F:	54.5	57.5kMc
		BL-220	F:	56.5	60.0kMc

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: The termination of the magnetron during this test shall be equivalent to a waveguide line with a VSWR not greater than 1.50.

Note 3: Starting Heater Current =3A. During high voltage pulsed operation, it is essential to immediately reduce the heater current to a minimum value to give maximum power output and stability with minimum back heating.



Ref.	Dimension
A**	1 15/32 ±1/8
B**	1 1/16 ±1/8
C*	1 3/4 Dia.
D**	5/16 Hex. Hd. Brass Pin Jack
E*	2 5/8 ±1/8
F*	2 1/8 ±1/32
G**	1 7/8 ±1/16
H*	2 5/16 ±1/16
J**	6 1/8 ±1/4
K**	3 1/2 ±1/8
L**	1 11/16 ±1/16
M**	9/16 Dia.
N	Mates with UG 385/U
P**	3/4 ±1/32
Q**	3/8 ±1/16
R**	1/4
S*	7 7/8 ±1/8
T**	4 1/4 ±1/8
U*	1.500 ±.010
V**	1 1/2 Nom.
W*	1.500 ±.010
X**	1/2 ±1/32 Rad.
Y	H(.266) Dr. 4 Holes
Z**	#10-32NC 4 Holes
AB*	4 ±1/16
AC**	2 3/4 ±1/16
AD**	1/4

This outline is used for the following tubes:-

BL-50 BL-218
BL-50A BL-219
BL-50B BL-220

Bomac

MAGNETRON

BL206 C

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 28, 1956

Description: Magnetron, pulse type, with permanent magnet, air cooled, tunable 5400-5900 Mc., 100 watt peak output.

Ratings	E_F	tk	ib	epy	Pi	Du	tp	prr	rrv	T. Body °C
Absolute	V		a	kv	W		μsec		kv/μs	
Maximum:	5.5	--	1.2	1.5	3.6	.002	2.0	4000	15	100°C
Minimum:	4.5	--		--	--	--	--	--	--	--
Note 1	Note 2									
Typical Operation										
1	5.0	--	.8	1.3			1.0	1000		
2	5.0	--	.8	1.3			1.0	2000		

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:				
4.5	Holding Period:	168 hours		---	---
4.9.2	Dimensions:	As per outline			
	**Altitude:	Note 10			
	**Shock:	Note 5			
	Heater Warm-Up Time:	Ef= 5.0	tk :	---	20 sec.
4.9.18	Carton Drop:	Required			
4.9.19.2	**Constant Acceleration:	Note 6			
	**Vibration:	Note 7			
	**Rotation:	Note 8 po=100W min.			±1.5 Mc.
4.10.8	Heater Current:	E_F=5.0V	If :	0.45	0.55A
	**Ambient Temperature:	Note 9		-60	+90°C
4.16.2	Cathode:	Unipotential oxide coated		---	---
4.16.3.2	Heater:	Ef=5.0V		---	---
4.16.3	Oscillation (1)	σ=1.10 max.		---	---
4.16.3.3	Pulse Characteristics:	tp=1.0±0.1μsec. Du=0.002; rrv=15kv/μs max;		---	---
4.16.3.4	Average Anode Current:	I_B =1.6mA Du=0.002;			
4.16.3.5	Pulse Voltage:	f= 5400 f= 5650 f= 5900 Mc.	epy :	1150	1450V
4.16.3.6	Power Output:	f= 5400 f= 5650 f= 5900 Mc. Note 11	po :	100	---W
4.16.3.7	RF Bandwidth:	Oscillation (1) σ=1.5min; Freq + phase ib=.6A and 1.0A	BW:	---	3.0 Mc
4.16.5	**Pulling Factor:	σ=1.5 min. Freq. + Phase	F :	---	12Mc
4.16.6	**Pushing Factor:	Note 3		---	15Mc/A
	**Stability:	Note 4 To be specified		---	---
	Life Test:	tp=1.0±0.1μs Du=0.002		250	---hrs
	Life Test End Point:	Osc. (1) f= 5650	Po :	75	---W
	**Temperature Coefficient:	40°C to 60°C	Mc/°C :	---	0.05Mc/°C
	**Thermal Equilibrium:	Note 12		---	1.0Mc.

Note 1: These ratings are interrelated, and it does not necessarily follow that combination of ratings can be obtained simultaneously

Note 2: The heater voltage may be applied simultaneously with the pulse voltage.

Note 3: The pushing factor is the frequency difference measured when the average anode current is varied from 1.5 to 1.7 mA.

Note 4: Stability shall be measured as the percentage of missing pulses during a period of observation. Missing pulses are defined as pulses having energy below 70% of the average pulse energy at the frequency of the normal mode.

Note 5: A linear shock acceleration of 10,000 G's shall be applied towards the end of the tube having a coaxial output and tuning mechanism along the longitudinal axis. Linear shock accelerations of 500 G's shall be applied in two radial directions 90 degrees apart. The tube shall operate satisfactorily and meet all other requirements of this specification after experiencing these accelerations.

Note 6: The tube shall operate satisfactorily under constant acceleration of 10,000 G's in the longitudinal plane and under constant acceleration of 1000 G's in the lateral plane.

Note 7: The tube shall be operated during vibration in each of 3 mutually perpendicular planes. Vibration shall be from 10 to 55 cps at .08 inch total excursion and from 55 to 2000 cps at a constant 12 gs. The time of vibration made in each plane shall be approximately 45 min. to cover the range from 55 to 2000 cps. The tuner locking screw shall be used to lock the tuner adjusting shaft at a particular frequency. The above procedure shall be made at tuner settings for approximately 5400, 5650, and 5900 Mc. During vibration the tube shall not exceed specified R.F. bandwidth.

Note 8: The tube shall be rotated about its longitudinal axis at 300 rpm with less than specified frequency shift and with specified power output.

Note 9: The tube shall give normal satisfactory operation and meet all other requirements of this specification at all ambient temperatures in the specified range.

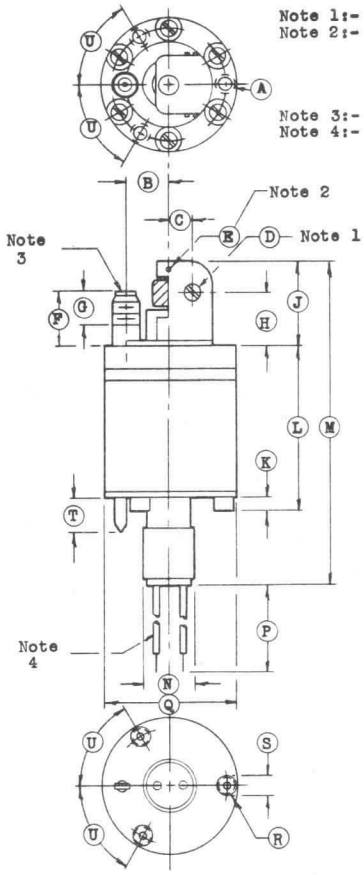
Note 10: The tube shall operate at altitudes up to 60,000 feet above sea level without degradation of performance.

Note 11: A directional coupler may be used to detect power within 10%.

Note 12: The tube shall at all times reach apparent thermal equilibrium within 5 minutes of continuous operation, and thereafter, with constant supply potentials and ambient temperature, and all adjustments and connections remaining fixed, the absolute value of the change in generated radio frequency shall not exceed the specified value over any interval of continuous operation up to 1 hour in duration.

Note 13: References and notation are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

(over)



Ref.	Dimension
A	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
B**	0.400±.025
C**	0.236±.010
D**	3/64 x 1/16 Slot
E*	#4-40 Hex. Set Screw
F**	0.520 Max.
G*	0.175 Min.
H**	0.540±.010
J*	0.870±.015
K**	0.150±.015
L	1.555±.030
M	3.250 Max.
N	0.500 Dia.
P	4.000 Min.
Q	1.260 Max.
R	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
S*	0.180 Dia.±.010
T	0.310 Max.
U**	60°±2

Bomac

MAGNETRON

BL209 C

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Dimensions: Per Outline

Ratings	Min.	Max.
Heater Voltage	Ef:4.5	5.5V
Peak Forward Anode Voltage	epy:---	1.5kv
Peak Anode Current	ib:---	1.3A
Peak Power Input	pi:---	1.95KW
Average Power Input	Pi:---	3.9W
Duty Cycle	Du:---	.002
Pulse Width	tp:---	1.0μs
Time of Rise of Voltage Pulse	trv:0.03	---μs
Pulse Recurrence Rate	prr:---	4000pps
Anode Temperature	T:---	90°C
Heater Warm-up Time	tk:---	120sec.
Packing Note 8		
Air Cooled		

Ref.	Test	Conditions		Min.	Max.
------	*Vibration:	Note 8		---	---
------	*Shock:	Note 8		---	---
4.10.8	Heater Current:	Ef=5.0V	If	:0.45	0.55A
------	**Oscillation:	Note 7			
------	Coupling:	Note 2			
4.16.3.2	Heater Warm-Up Time:	Ef=5.0	tk	:---	120sec.
4.16.3.3	Pulse Characteristics:	tp=0.9 to 1.1μs Du=.002		---	---
------	Average Anode Current:	Ib=1.6mAdc		---	---
4.16.3.5	Pulse Voltage:	F1= 5400Mc	epy	:1.0	1.5kv
		F2= 5650	epy	:1.0	1.5kv
		F3= 5900	epy	:1.0	1.5kv
------	Power Output:	F1, F2, F3 t=180sec. Note 3	Po	:0.2	---W
4.10.7.3.1	Frequency:		F	:5400	5900Mc
------	*Frequency Stability:	Note 4		---	---
------	**Frequency Drift:	Note 5		---	---
------	**Temperature:	Note 7		---	---
4.11	Life Test:	Group D; Note 6 tp=0.9 to 1.1μsec. Du=0.002	t	:250	---hrs.
4.11.4	Life Test End Point:		Po	:0.15	---W

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The output connector, located on one end of the tube, shall mate with an approved miniature or subminiature coaxial cable connector. The tube shall be fitted with a protective collar around the heater connection to allow pressurization of the high potential connection. This may be a smooth brass sleeve 1/2 inch in diameter and approximately 1/2 inch long.

Note 3: A directional coupler may be used to detect power within 10%.

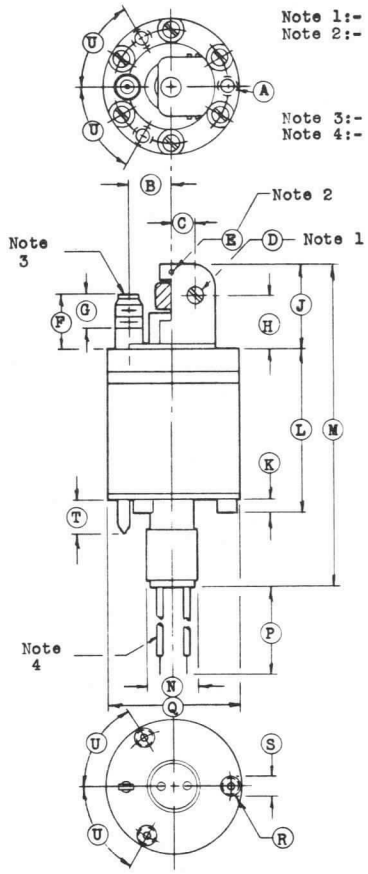
Note 4: The tube shall at all times reach apparent thermal equilibrium within 5 minutes of continuous operation, and thereafter. With constant supply potentials and ambient temperature and all adjustments and connections remaining fixed, the absolute value of the change in generated radio frequency shall not exceed 1 Mc over any interval of continuous operation up to 1 hour in duration.

Note 5: The absolute value of the rate of change of generated radio frequency with respect to ambient temperature shall at all times be less than .05 Mc/°C.

Note 6: Conditions for operation other noted to be specified.

Note 7: The tube shall be capable of giving normal satisfactory operation and meeting all the other requirements of this specification at all ambient temperatures in the range from -60°C through 90°C.

Note 8: To be specified.



Ref.	Dimension
A	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
B**	0.400±.025
C**	0.236±.010
D**	3/64 x 1/16 Slot
E*	#4-40 Hex. Set Screw
F**	0.520 Max.
G*	0.175 Min.
H**	0.540±.010
J*	0.870±.015
K**	0.150±.015
L	1.565±.030
M	3.250 Max.
N	0.500 Dia.
P	4.000 Min.
Q	1.260 Max.
R	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
S*	0.180 Dia.±.010
T	0.310 Max.
U**	60°±2

Bomac

MAGNETRON

BL212 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 28, 1956

Description: Magnetron, pulse type, with permanent magnet, air cooled, tunable 5400-5900 Mc, 100 watt peak output.

Ratings	E_F V	tk	ib a	epy kv	Pi W	Du	tp μsec	prr	rrv kv/μs	T Body °C
Absolute Maximum:	5.5	-	1.2	1.5	3.6	.002	2.0	4000	15	100°C
Minimum:	4.5	-		-	-	-	-	-	-	-
Note 1	Note 2									
Typical Operation										
1	5.0	-	.8	1.3			1.0	1000		
2	5.0	-	.8	1.3			1.0	2000		

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:			
4.5	Holding Period:	168 hours	---	---
4.9.2	Dimensions:	As per outline		
	**Altitude:	Note 10		
	**Shock	Note 5		
	Heater Warm-Up Time	Ef=5.0	tk:---	20sec.
4.9.18	Carton Drop:	Required		
4.9.19.2	** Constant Acceleration:	Note 6		
	** Vibration:	Note 7		
	**Rotation:	Note 8 po =100W min.		±1.5Mc
4.10.8	Heater Current:	E_F=5.0V	I_F 0.45	0.55A
	** Ambient Temperature	Note 9	-60	+90°C
4.16.2	Cathode:	Unipotential oxide coated	---	---
4.16.3.2	Heater	Ef-5.0V	---	---
4.16.3	Oscillation (1)	δ=1.10 max.	---	---
4.16.3.3	Pulse characteristics:	tp-1.0±0.1μsec Du-0.002 rrv-15kv/μs max.	---	---
4.16.3.4	Average Anode Current:	I_B=1.6mA Du=0.002		
4.16.3.5	Pulse Voltage:	f=5400 f=5650 Mc f=5900	epy:1150	1450V
4.16.3.6	Power Output:	f=5400 f=5650 f=5900 Note 11	po:100 100 100	---W --- ---
4.16.3.7	RF Bandwidth:	δ=1.5 min. Freq. & phase ib=.6-1.0	BW:---	3.0Mc
4.16.5	**Pulling Factor:	δ=1.5 min.	F:---	12Mc
4.16.6	**Pushing Factor:	Note 3	---	15Mc/A
	**Stability	To be specified.		

Ref.	Test	Conditions	Min.	Max.
	Life Test:	tp=1.0±0.1 μs Du=0.002	250	---hrs
	Life Test End Point:	Osc. (1) f=5650	Po:75	---W
	**Temperature Coefficient:	40°C to 60°C	Mc/°C:---	0.05Mc/°C
	**Thermal Equilibrium:	Note 12	---	1.0Mc

Note 1: These ratings are interrelated, and it does not necessarily follow that combinations of ratings can be obtained simultaneously.

Note 2: The heater voltage may be applied simultaneously with the pulse voltage.

Note 3: The pushing factor is the frequency difference measured when the peak anode current is varied from 0.75 to 0.85A.

Note 4: Stability shall be measured as the percentage of missing pulses during a period of observation. Missing pulses are defined as pulses having energy below 70% of the average pulse energy at the frequency of the normal mode.

Note 5: A shock of 60°hammer fall on the high impact machine for electronic device, shall be applied towards the end of the tube having the coaxial output and tuning mechanism along the longitudinal axis. A shock of a 30° hammer fall shall be applied in two radial directions 90 degrees apart. The tube shall operate satisfactorily and meet all other requirements of this specificationafter experiencing these accelerations.

Note 6: This tube shall operate satisfactorily under constant acceleration of 1,000 G's in the longitudinal plane and under constant acceleration of 500 G's in the lateral plane.

Note 7: The tube shall be subjected to vibration of 10 to 55 cps at .08 inches total excursion and 55 to 2000 cps at a constant acceleration of 12g in each of three mutually perpendicular planes. Total test time shall be approximately 45 minutes. The tube shall meet the R.F. bandwidth requirements of Osc (1) during this test.

Note 8: The tube shall be rotated about its longitudinal axis at 300 rpm with less than specified frequency shift and with specified power output.

Note 9: The tube shall give normal satisfactory operation and meet all other requirements of this specification at all ambient temperatures in the specified range.

Note 10: The tube shall operate at altitudes up to 60,000 feet above sea level without degradation of performance.

Note 11: A directional coupler may be used to detect power within 10%.

Note 12: The tube shall at all times reach apparent thermal equilibrium within 5 minutes of continuous operation, and thereafter, with constant supply potentials and ambient temperature, and all adjustments and connections remaining fixed, the absolute value of the change in generated radio frequency shall not exceed the specified value over any interval of continuous operation up to 1 hour in duration.

Note 13: References and notation are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

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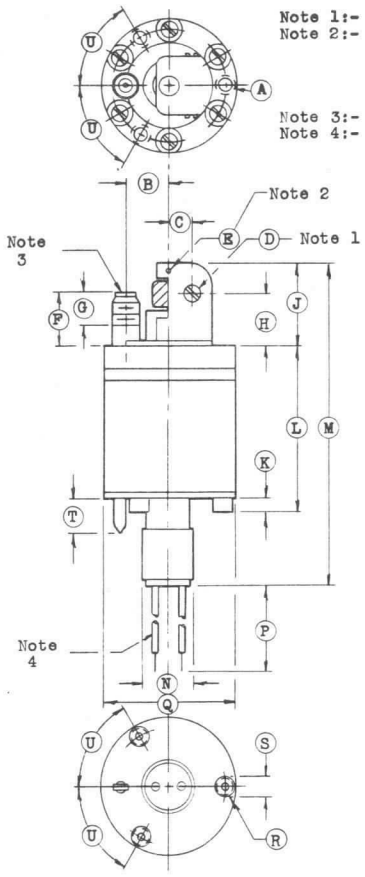


Note 1:- Tuning screw
Note 2:- Tuner lock, allen set screw (for locking tuning shaft if desired; only necessary under extreme conditions of shock and vibration).
Note 3:- Mates with UG 699/U
Note 4:- #20 strand copper wire, teflon coated.

Ref.	Dimension
A	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
B**	0.400±.025
C**	0.236±.010
D**	3/64 x 1/16 Slot
E*	#4-40 Hex. Set Screw
F**	0.520 Max.
G*	0.175 Min.
H**	0.540±.010
J*	0.870±.015
K**	0.150±.015
L	1.555±.030
M	3.250 Max.
N	0.500 Dia.
P	4.000 Min.
Q	1.260 Max.
R	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
S*	0.180 Dia.±.010
T	0.310 Max.
U**	60°±2

Bomac

MAGNETRON

BL215 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Dimension: Per Outline

Ratings	Min.	Max.
Heater Voltage	Ef: 4.5V	5.5V
Peak Forward Anode Voltage	epy:	2.5KV
Peak Anode Current	ib:	1.5A
Peak Power Input	po:	3.75KW
Duty Cycle	Du:	.002
Pulse Width	tp:	1.0μsec
Pulse Recurrence Rate	prr:	4000pps
Heater Warm Up Time	tk:	
Anode Temperature	T:	90°C
Altitude		60,000 ft.
Packing Note 2		

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.9.8	**Salt Spray Corrosion:	Omit	---	---
4.5	Holding Period:	168 hours	---	---
4.9.18	Carton Drop:		---	---
4.9.19.1	*Vibration(1):	Note 3	---	---
------	**Vibration(2):	t=30 min Note 4	---	---
------	**Vibration(3):	t=30 min Note 5	---	---
------	*Shock:	Note 6	---	---
------	**Acceleration Test:	Note 7		
------	**Rotation Test:	Note 8	---	---
4.10.8	Heater Current:	Ef=5.0V	If :	0.75A
4.16.3.2	Heater Warm Up Time:	Omit	---	---
4.16.3.3	Pulse Characteristics:	tp=0.25 to 1.0μsec Du=0.002; trv=0.025μs(max)	---	---
4.16.3.4	Average Anode Current:	Ib=1.1mA		
4.16.3.5	Pulse Voltage:		epy : 2.0	2.5KV
4.16.3.6	Peak Power Output:		po : 400	---W
4.10.7.3.2	Frequency:		F : 5400	5900Mc
------	Frequency Stability:	Note 9		
------	Frequency Drift:	Note 10		
------	Temperature:	Note 11		
------	Static Impedance:		SZ : 1500	3000 ohms
4.11	Life Test:	Group D tp=1.0 μsec Du=0.002	t : 250	hrs.
4.11.4	Life Test End Point:		po : 300W	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-10, 3 October 1955.

Note 2: To be specified.

Note 3: The tube shall be capable of operating satisfactorily when subjected to vibrations of from 10 to 55 c/s at 0.08 total excursion in each of 3 mutually perpendicular planes for a period of 2 minutes.

Note 4: The complete tube shall show no pronounced mechanical resonance nor erratic electrical operation when subjected to a resonant test of from 10 to 2000 c/s at 15 g in 3 mutually perpendicular planes. Over the range at 10 to 55cps the total excursion shall not exceed 0.080 inches regarding to acceleration requirement.

Note 5: The tube shall be capable of operating without erratic operation after being subjected to a resonant search test of from 10 to 2000 c/s at 30G. Over the range at 10 to 55cps the total excursion shall not exceed 0.080 inches regarding to acceleration requirements.

Note 6: The tube shall be able to withstand a linear shock acceleration of 1000 G in a longitudinal direction. The above shock shall be applied towards the end of the tube having the coaxial output and tuning mechanism. The tube shall stand a linear shock acceleration of 500 G in 2 radical directions 90° apart. The tube shall operate satisfactorily and meet all the other requirements of this specification after experiencing the above accelerations.

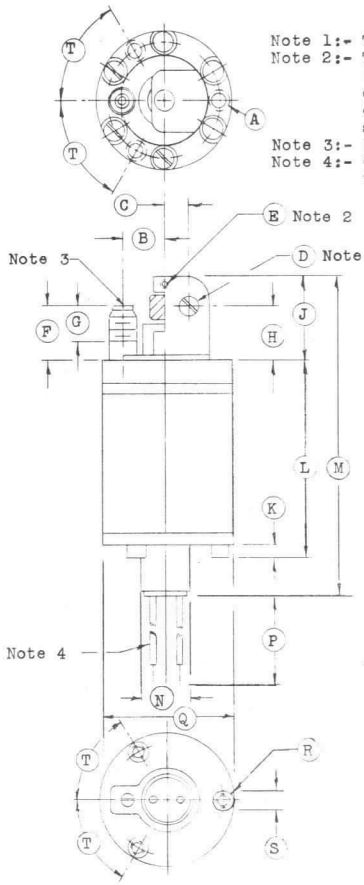
Note 7: The tubes shall be capable of operating satisfactorily under constant acceleration of 1000 G's in a longitudinal plane and under constant acceleration of 500 G's in the lateral plane.

Note 8: The tube shall be capable of withstanding rotation about its longitudinal axis at a rate of 300 rpm without a shift in frequency greater than plus or minus 1.5 megacycles and without degradation of the power output below 400 watts.

Note 9: The tube shall at all times reach apparent thermal equilibrium within 5 minutes of continous operation and thereafter, with constant supply potentials and ambient temperature, and all adjustments and connections remaining fixed, the absolute value of the change in generated radio frequency shall not exceed 1 Mc over any interval of continuous operation up to 1 hour in duration.

Note 10: The absolute value of the rate of change of generated radio frequency with respect to ambient temperature shall at all times be less than 0.05 mc/°C.

Note 11: The tube shall be capable of giving normal satisfactory operation and meeting all the other requirements of this specification at all ambient temperatures in the range from -60 through 90°C.



Note 1:- Tuning screw
Note 2:- Tuner lock, allen set screw (for locking tuning shaft if desired; only necessary under extreme conditions of shock and vibration).
Note 3:- Mates with UG 699/U
Note 4:- #20 strand copper wire, teflon coated.

Ref.	Dimension
A	#6-32NC 3 Holes
	0.125 min.dp equally
	spaced on 1.062 BC
B**	0.400±.025
C**	0.236±.010
D**	3/64 x 1/16 Slot
E*	#4-40 Hex Set Screw
F**	0.520 Max.
G*	0.175 Min.
H**	0.540±.010
J*	0.870±.015
K**	0.150±.015
L	2.000 Max.
M	3.250 Max.
N	0.500 Dia.
P	4.000 Min.
Q	1.260 Max.
R	#6-32NC 3 Holes
	0.125 min dp equally
	spaced on 1.062 BC
S*	0.180 ±.010 Dia.
T**	60° ±2

Bomac

MAGNETRON 5780 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 15, 1956

Dimensions: Per Attached

Ratings:	Ef V	tk	if a	Ib mA	ib a	epy kv	Pi W
Absolute							
Maximum:	22	--	16	--	36	40	600
Minimum:	--	180	--	--	18	--	---
		Note 2	Note 2	Note 3			
Typical Operation:							
1.	13	300	3.1	9.5	28	36	340
2.	14.5	300	3.4	4.9	25	36	175
3.	11.0	300	2.3	14.5	20	36	520

Ratings:	pi Mw	Du	tp	prr	rrv kv/μs	T Body °C.
Absolute						
Maximum:		0.001	0.30	4800	300	100
Minimum:		---	---	200	---	---
				Note 15	Notes 4 and 5	
Typical Operation:						
1.	---	0.00033	0.24	1330	200	---
2.	---	0.00020	0.20	1000	210	---
3.	---	0.00072	0.18	4000	160	---

Packing to be specified.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for Jan Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
------	*Shock:	No voltage, 50G;4 ms Notes 6 and 14		---	---
4.9.8	**Salt Spray Corrosion:	Not required		---	---
4.9.18	Carton Drop:	Required		---	---
4.9.19.2	*High Frequency Vibration:	No Voltage; t=60 F=50; G=10 Notes 7 and 14		---	---
4.10.8	Heater Current:	tk=180 min.; Ef=20.0V	If:	3.6	4.4 A
4.16.1	**Air Cooling:	TA=50°C. max.; Pi-PO=450W air=20 CFM min. See attached figure 4	T:	---	TA+50 °C
4.16.2	**Cathode:	Unipotential oxide coated		---	---
4.16.3	Oscillation (1):	If for test=3.2±5%A		---	---
4.16.3.2	Heater-Cathode Warm-up Time:	Note 2 tk=180 min.; Ef=20.0V		---	---
4.16.3.3	Pulse Characteristics:	tp=0.24±0.02μs Du=0.00033 max.; rrv=200±40 kv/μs Note 4		---	---
4.16.3.4	Average Anode Current:	IB=10mAdc		---	---
4.16.3.5	Pulse Voltage:	F=8500 Mc	epy:	32	34 kv
4.16.3.6	Power Output:	Method B; σ'=1.05 max.; t=30 minutes (max.); Note 9	Po:	85	--- W
4.16.3.7	RF Bandwidth:	σ'=1.5 min.; Bandwidth phase and frequency which produces worst spectrum	:	---	2.5/tp Mc
4.16.5	Pulling Factor:	σ'=1.5 minimum, Note 9	F:	---	16 Mc

Ref.	Test	Conditions		Min.	Max.
------	†Stability (1):	σ'=1.5 minimum Under least stable conditions of phase and frequency for any 5-minute max. period of a 30-minute period; Pulse energy level 70±5% Note 12	MP:	---	2.0 %
------	Frequency Limits, Upper:	Ib=6mAdc; σ'=1.05 max.; tuning at mechanical limit, Note 10	F:	9600	9620 Mc
	Frequency Limits, Lower:		F:	8440	8500 Mc
------	Backlash:	Same as conditions for Power Output, Notes 9 and 11	F:	---	20 Mc
------	†Spectrum Shape(1):	Same as conditions for RF Bandwidth, Note 13		6	--- db
------	**Phase of Sink:	F=9600; σ'=1.5 min.; Note 8		0.18	0.22λg
4.16.3	Oscillation (2)	If for test=2.3A±5%			
4.16.3.2	Heater-Cathode Warm-up Time:	tk=180 min.; Ef=20.0V Note 2		---	---
4.16.3.3	Pulse Characteristics:	tp=0.18±0.02 μs Du=0.00072 min. rrv=130±40 kv/μs Notes 4 and 5		---	---
4.16.3.4	Average Anode Current:	IB=16 mAdc			
4.16.3.6	Power Output:	Method B; σ'=1.05 max.; Note 9	Po:	85	W
	†Stability (2):	σ'=1.5 min.; Under least stable conditions of phase and frequency for any 5-minute max. period of a 30-minute period; Pulse energy level 50 ± 5%; Notes 12 and 16	MP:	---	2.0 %
4.11	Life Tests:	Group D; Hourly cycle as follows:	t:	250	--- hrs.

10 minutes at no voltage
3 minutes at Ef=20V, 400 c.p.s.
7 minutes at Ef=16V, 400 c.p.s.
20 minutes at Ib=16mA, Osc. (2)
20 minutes at Ib=11mA,
Du=0.00036 and tp=0.18±0.02 μs
If=3.2±5%A σ'=1,5±5% with phase varied through 180° at least five times during the pulsing part of the hourly cycle. Frequency shall be changed at the rate of approximately 100 Mc per hour, either continuously or in steps. t shall include all time during which heater is also operating.

(over)

Ref.	Test	Conditions	Min.	Max.
4.11.4	Life Test			
	End Point:	Oscillation (1)		
		Pulse Voltage	epy : 30.5	--- kv
		Power Output	Po : 65	--- W
		RF Bandwidth	F : ---	3/tp Mc
		Spectrum Shape	ML: 5	--- db
		Stability (1)	MP: ---	3 %
		Frequency Limits, Lower:	F : 8400	8510 Mc
		Frequency Limits, Upper:	F : 9540	9650
		Oscillation (2)		
		Power Output	Po : 65	--- W
		Stability (2)	MP: ---	3 %

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: Prior to the application of high voltage, the cathode shall be heated by applying (1) 16 volts for 12 minutes (this shall be typical equipment standby voltage) or (2) 20 volts for 3 minutes (this shall be the maximum voltage minimum time condition permissible). On the application of anode power, the heater voltage or current shall be dropped to the value specified herein. For various power inputs, Ef shall be adjusted (within 5 percent) according to the following formula:

$$Ef = 16.0 \sqrt{1 - \frac{Pi}{1200}} \text{ volts}$$

Note 3: This shall be the maximum instantaneous surge current. There shall be a suitable series impedance during starting time to limit surge current to this value. The cold resistance of the heater is approximately 0.5 ohm.

Note 4: The input circuit shall be designed so that the energy per pulse delivered to the tube, if arcing occurs, cannot greatly exceed the normal energy per pulse. Pulsers of the discharging network type may satisfy this requirement. The total input Capacitance of the tube and circuit shall be 15 μμf minimum.

Note 5: The rate of rise of voltage (rrv) shall be expressed in kilovolts per microsecond, defined as the steepest tangent to the leading edge of the voltage pulse above 80 percent amplitude when amplitude is defined as a horizontal line drawn tangent to the tope of the smooth peak.

Note 6: Shock Test.

(a) This test shall be performed on the Navy type, High Impact (Flyweight) Shock Machine for Electronic Devices. A resilient cushion (see Note 5(b)) shall be interposed between hammer and anvil of table and a suitable hammer angle shall be selected to produce a shock of an approximate cubic wave form and of the magnitude and duration specified herein (see Note 5 (c)). The mounting plate of the tube shall be bolted with brass bolts to either the table or to the standard angle bracket, depending upon the direction of the desired shock, using a 1-9/16 inch thick brass spacer between the tube mounting plate and table or angle bracket. The shock shall be measured on the brass spacer. The tube shall be given one shock in each of the following directions:

(1) Parallel to cathode axis, with cathode terminals pointing away from hammer.
(2) Perpendicular to both cathode axis and output waveguide axis.
(3) Perpendicular to cathode axis and parallel to the output waveguide axis.

(b) A resilient cushion consisting of a 9/32 inch thick rubber sheet of 30 Shore Durometer hardness, covering the entire anvil of the table, has been found to produce the shock duration specified herein under the given conditions of table load and shock magnitude.

(c) Because of the varying resilience of the tube on its mounting plate with different shock directions and the high ratio of tube to table weight, the hammer angle will vary with the tube orientation to produce the required magnitude of shock.

(d) Criteria for passing shock test. - After the shock test, the tube shall show no mechanical failure and shall meet initial test requirements.

Note 7: The tube shall be rigidly mounted by the mounting plate and vibrated perpendicular to cathode and output axis. The mounting plate shall be bolted with nonmagnetic bolts to the table using a nonmagnetic metallic spacer to maintain the required minimum 2-inch clearance between the magnets and other magnetic materials. After the vibration test, the tube shall show no mechanical failure and shall conform to the test requirements of Oscillation (1) specified herein.

Note 8: The phase of maximum loading to be coupled to the magnetron output shall be determined by the distance from the output flange at which a standing wave ratio minimum can occur, expressed in terms of a fraction of wavelength in the guide (λg).

Note 9: Requirements shall be satisfied over the entire tuning range.

Note 10: The tube shall be tuned to the extremes of the mechanical tuning range. The frequency limits shall be measured after the tube reaches temperature stabilization. The upper frequency limit condition may be considered met after 20 minutes of operation at the high frequency mechanical limit. The lower frequency limit condition may be considered met after 5 minutes of operation at the low frequency mechanical limit.

Note 11: The frequency obtained by turning the tuning mechanism to a given setting in one direction, shall be reproducible when returning to the same setting from the opposite direction to within the value specified herein.

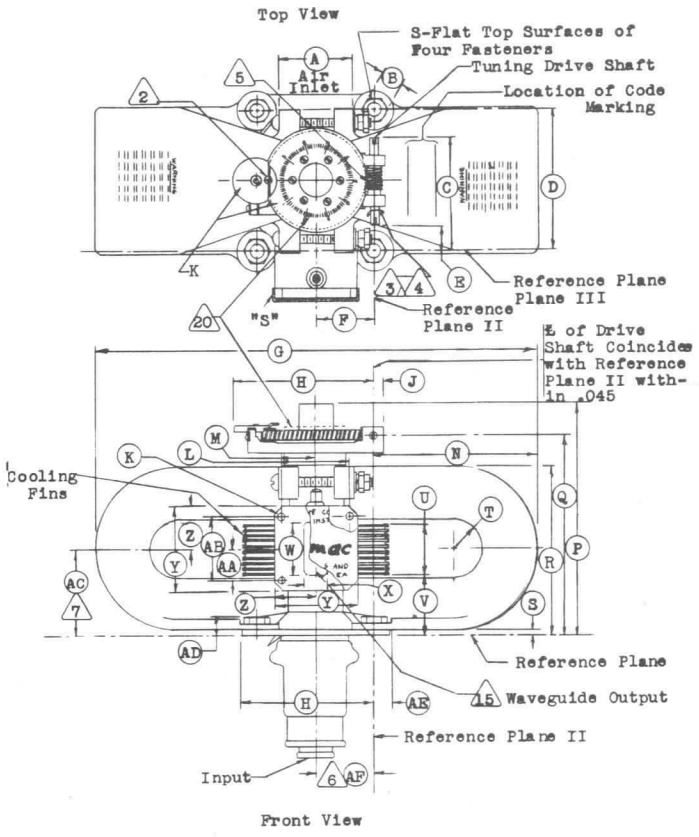
Note 12: Stability shall be measured in terms of the average number of output pulses missing, expressed as a percent to the number of input pulses applied during the period of observation. Missing pulses (MP), which are taken to include those due both to arcing and moding, shall be considered to be missing if the r.f. energy is less than the percentage specified herein of the normal pulse energy level at the wanted frequency.

Note 13: When observed on a spectrum analyzer a suitable spectrum is considered one in which the major lobe has a shape such that is slope does not change sign more than once for power levels greater than the minor lobe value specified herein. This shall be expressed as the difference in power levels in terms of db.

Note 14: On evidence of satisfactory quality, the Government inspector may limit this test to ten tubes per month if the production is continuous. Normal design testing shall be resumed if the defective product exceeds 6 percent.

Note 15: The duty cycle (Du) shall be obtained by applying pairs of pulses separated from each other by a value of 15 ± 1 μsec, with alternate pulses occurring at a nominal repetition rate of 2000 pulses per second (p.p.s.). This is comparable to a combined repetition rate of 4000 p.p.s.

Note 16: Stability (2) shall follow Stability (1).



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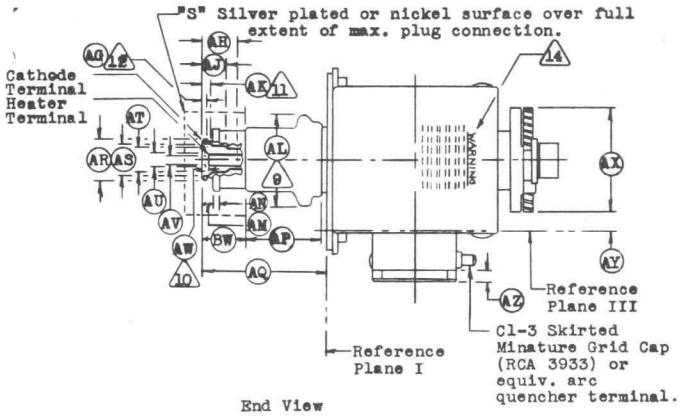
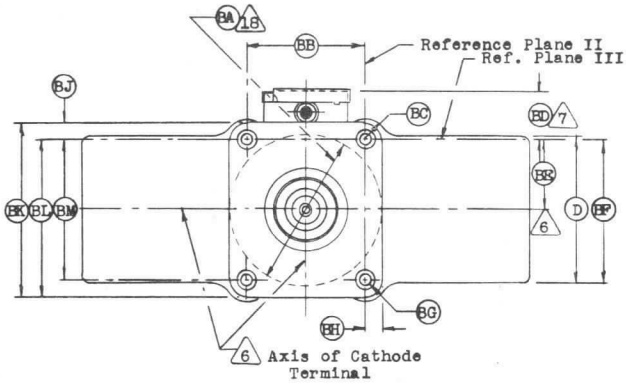


End View



Bottom View

Ref.	Dimension	Ref.	Dimension
A	1.625 ±.015	**AJ	0.516 Min.
B	0.500 ±.015	**AK	0.156 Max.
*C	2.390 ±.030	AL	2.250 Max.
**D	3.125 Max.	AM	0.250 ±.015
*E	0.515 ±.030	AN	0.125 ±.015
*F	1.250 ±.015	*AP	1.500 Min.
**G	10.00 Max.	*AQ	3.250 Max.
**H	3.250 Max.	*AR	0.830 +.008 -.005
*J	0.281 Max.	AS	0.610
K	0.164-32 Tap	**AT	0.540 +.005 -.008
	.250 Min. Scr.	AU	0.250 ±.015
	Penetration	AV	0.169 ±.005
	Class 2 Fit	AW	0.125 Min.
	4 Holes		0.187 Max.
L	1.474 ±.004	AX	2.187 ±.015
M	0.737 ±.005	AY	0.406 ±.015
*N	3.625 Max.	AZ	0.250 Flange ±.015
**P	5.000 Max.	BA	3.250 ±.015 Dia.
Q	4.309 ±.045	BB	2.500 ±.010
**R	3.812 Max.	BC	0.375 Rad. ±.015
S	0.031 Min.	BD	1.025 ±.025
T	0.625 Rad. ±.015	BE	1.500
U	1.509	**BF	3.250 Max.
V	1.343 ±.031	BG	0.281 ±.005 4 Holes
W	1.122	BH	0.375 ±.015
X	0.497	*BJ	0.500 Max.
Y	1.830 ±.005	**BK	4.000 Max.
Z	0.915 ±.003	*BL	3.500 Max.
AA	0.676 ±.005	BM	3.000 ±.010
AB	1.352 ±.004	*BN	0.156 ±.005
AC	1.875 ±.020	*BP	0.156 +.000 -.015
	To Centerline of	*BQ	0.438 ±.010
	Waveguide	*BR	0.187 +.015 -.000
AD	0.475 Max.	*BS	0.1875 +.002 -.001
**AE	0.625 Max.	*BT	0.040 +.005 -.000
AF	1.250 ±.005	*BU	0.125 ±.010
	To Axis of	BV	0.062 ±.015
	Cath. Term.	BW	0.937 ±.015
AG	0.125 ±.010		
**AH	0.750 Min.		

Bomac

5780		
(continued)		X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 15, 1956

Notes:-

1. A sleeve .195 I.D. x .406 O.D. x 1 inch long shall pass over ends of drive shaft as far as face of worm bracket.

2. The number on the geneva appearing through the hole in the geneva cover indicates complete revolutions of the gear from zero to six. The number on the gear is to be read directly opposite hole position in the geneva cover. The tube is so adjusted that with the geneva set at "0", the upper frequency limit occurs between 0.5 and 2.5 on the gear setting. To obtain the corredt value, it is necessary to operate the tube for at least 20 minutes under oscillation at full input per spec. A-714305.

3. The frequency increases when drive shaft is driven in direction indicated by arrow shown in top view.

4. Complete frequency range is covered in approximately 180 turns of drive shaft.

5. The tuning mechanism shall operate smoothly over the entire mechanical range when subjected to torque of 1 1/2 inch-pounds max. applied at the drive shaft. In equipment use, a peak static torque no greater than 3 inch-pounds shall be applied at the tube drive shaft. The gear and worm threads must be free from corrosion, paint and other imperfection.

6. The axis of the cathode terminal shall be within a radius of 3/64 of specified location. (Note 7 applies).

7. The limits on location of wave guide output and cathode terminal include angular as well as lateral deviations.

8 - Dimensions without limits are for equipment design purposes only and need not be chacked.

9 - Any portion of the assembly extending below reference plane I shall be within a 1 3/16 inch radius of the specified axis of the input.

10. These dimensions define the extremities of the cylindrical section given by the A dimension.

11. These dimensions define the extremities of the cylindrical section given by the B dimension.

12. No clamping neans to bear beyond this dimension.

13 - The heater terminal shall be concentric with the cathode terminal within .010.

14. Warning - Maintain minimum clearance of 2 incnes between this magnet and magnetic materials. (Magnets, steel tools, plates, etc.)

15. The opening of the wave guide shall be enclosed by a dust cover when tube is not in use.

16 - All metal surfaces covered by black finish except those marked 'S' and drive and stop mechanism (K).

17 - Exhaust tubulation cover shall not extend beyond plane defined by mounting plate edge.

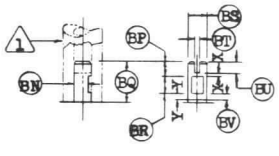
18. With the 3 1/4 Dia. resting on a plane surface, coincident with reference plane I, a .010 gauge 1/8 wide shall not enter and areas of the base-plate outside the 3 1/4 Dia. shall be within .010 of the plane surface.

19 - Dimensions with a single asterisk (*) denote design test. Dimensions with a double asterisk (**) denote qualification approval.

20. Geneva stop and R.H. brass machine screws are optional.

The .1875+.002-.001 dimension does not necessarily apply to the part of the tuning drive shaft between the slot and the keyway designated "X*X", and to the 1/16" wide strip adjacent to the keyway towards the middle of the shaft designated "Y-Y". These parts of the shaft may be slightly less than the .1875+.002-.001 dia. to obtain better deburring, but may not be larger than the .1875+.002-.001 diameter.

Detail of Tuning Drive Shaft



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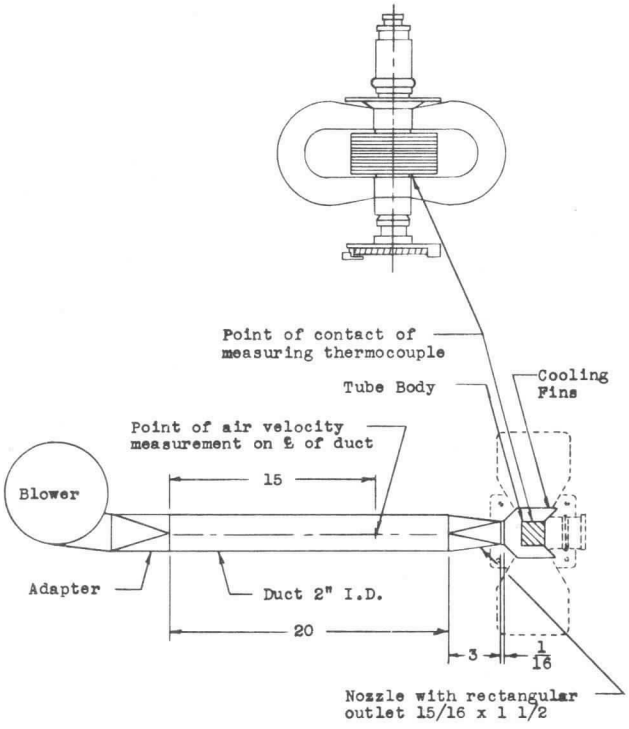


Cooling Arrangement of 5780

Description: Magnetron, 40 kw (min), 23800-24270 Mc, pulsed type, air cooled, integral magnet, unipotential cathode.

Bomac | **MAGNETRON** | **6551** | **K**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 6, 1956

Dependent Absolute Ratings

	ib a	pi kw	Du	tp μs
Maximum:	18	270	0.0007	0.5
Minimum:	10	---	---	0.1 Note 1

Caution: The dependent absolute ratings are interrelated, and it does not necessarily follow that combinations of ratings can be attained simultaneously. The provisions of MIL-E-1B 6.5 apply in the selection of the operating point.

Independent Absolute Ratings

	Ef V	eb kv	epy kv	tk sec	σ'
Maximum:	6.0	17	16	---	1.5
Minimum:	--- Note 2	--- Note 3	---	180	---

	Anode T °C	Bushing Pressurization psia	Bushing T °C	Output Pressurization psia
Maximum:	130	50	250	50
Minimum:	--- Notes 4, 13	10	--- Notes 4, 13	Note 5

The independent absolute ratings must not be exceeded if the specified life is to be obtained. These independent absolute ratings are limiting values beyond which the serviceability of any individual tube may be impaired.

Storage, Handling, and Installation

Input Bushing:	Note 6	Mounting Position:	Any, Note 8
Cooling:	Forced Air	Output Coupling:	Note 6
Mounting Support:	Note 6	Input Connections:	Note 6
Magnet Isolation:	Note 7	Vibration, Shock:	Note 9
		Weight:	7.5 pounds, approx

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.2	Dimensions:	Tube Outline Drawing		
3.7	Marking	USAF-6551		
4.5	Holding Period:	t=168 hours		
4.9.8	**Salt Spray Corrosion:	Omit		
4.9.12	**Low Pressure:	Omit F measurement 10 psi absolute		
4.9.13	Pressurizing:	40 psia min		
4.9.18.1.8	Carton Drop:			
4.9.19.1	*Low-frequency Vibration:	No voltage		
4.9.19.2	**High-frequency Vibration:	No voltage f=10-150; G=5; t=300 sec; Note 10		
---	**Shock Test:	Note 11; G=10		
4.10.8	Heater Current:	Ef=5.0V; tk=180 sec	If: 2.6	3.2 A
4.16.3	Oscillation (1)			
---	Standing Wave Ratio:	σ'=1.1 Max		
4.16.3.2	Heater Cathode Warmup Time:	tk=180 sec max at Ef=5.0±10%; Ef=0 for test; Note 8, 12		
4.16.3.3	Pulse Characteristics:	tp=0.135 to 0.165 μs Du=0.0006 trv=0.08-0.1 μs min Note 13, 14		
4.16.3.6	**Power Output:**		Po: 24	---W
---	**Peak Current:**	ib=15 a		
4.16.3.5	**Pulse Voltage:**		epy: 13	15kv
4.16.3.7	**RF Bandwidth:**	Note 13, 15	BW: ---	15Mc
4.10.7.3.1	**Fixed Tuned Frequency:	Anode T=120±5°C	F: 23750	24225Mc
4.10.7.3.1	**Fixed Tuned Frequency:	Anode T=40-60°C	F: 23800	24270Mc
4.16.5	*Pulling Factor:	Note 16	ΔF: ---	30Mc
4.16.7.2	*Load Stability:	σ'=1.5 Note 17, 18	Missing Pulses: ---	1%
4.11	Life Tests:	Note 8, Group D Note 19	T: 350	---hrs
4.11.4	Life Test End Point:	Note 20	Po: 19.2 BW: ---	---W 18.0Mc
		Note 17, 18	Missing Pulses: --- epy: ---	2% 16kv
4.9.14	**Temperature Coefficient:	Anode Temperature, Note 6, 60 to 100°C	ΔF/°C: ---	-0.6Mc/°C
4.9.15	**Low Temperature Operation:	Note 21		
4.9.16	**High Temperature Operation:			

Note 1: The rate of pulse voltage rise, the percentage of pulse voltage ripple, and the rate of pulse voltage fall should be those which result in proper starting and oscillation. The pulse characteristics listed under Oscillation 1 (4.16.3.3) are those which have been used in manufacturing processes and in life testing. The manufacturer must be consulted with regard to specific applications where suitable pulse characteristics may be required outside of these limits.

Note 2: The maximum value specified is for a non-oscillating condition. Heater surge current shall not exceed 12 amperes.

Note 3: This is the maximum voltage that can be applied to the cathode bushing at 500 mm Hg before breakdown takes place.

Note 4: The temperature is to be measured at the point indicated on the Electron Tube Drawing.

Note 5: Under mismatched load conditions, the waveguide must be pressurized to prevent breakdown.

Note 6: See Tube Outline drawing, dated 5-2-56.

Note 7: In handling and mounting the magnetron, care must be exercised to prevent demagnetization. Ferromagnetic materials or energized magnets shall not be brought within 2 inches of the tube.

Note 8: The tube shall be mounted with the cathode vertical during all tests except life test. The tube shall be mounted horizontal during life test.

Note 9: Reasonable care should be used in the storage, installation, and use of the tube to avoid imparting vibration or shock in excess of the values which it is designed to withstand.

Note 10: Vibration shall be along the X1, X2 and Y1 axes separately for periods of 5 minutes. In each plane, the frequency of vibration shall vary from minimum to the maximum and returned to minimum in the time specified.

Note 11: The magnetron shall be mounted on a test plate and dropped five times on each of three mutually perpendicular axes parallel to the reference planes shown on the Electron Tube Drawing. The shock pulse shall have a duration of approximately 11 milliseconds as measured at the quarter amplitude points of the acceleration shock wave.

Note 12: The heater voltage must be reduced to zero during operation after the application of high voltage.

Note 13: This test need be conducted only under one set of conditions within the limits stated for the oscillation specified.

(over)

Note 14: No spike or ripple shall exceed ±7% of the average peak value of voltage or current. Inverse voltage must not exceed 20% of the forward voltage. The negative amplitude of any post pulse voltage oscillations must not exceed 10% of the average peak value.

Note 15: Stability will not be measured under this test. The RF bandwidth shall be within the limits specified when a VSWR of 1.5/1.0 is introduced in the load at a distance of approximately 0.5 meters from the magnetron coupling flange, the phase being adjusted for operation in the sink.

Note 16: The pulling measurement shall be made in such a manner that thermal effects do not introduce appreciable errors.

Note 17: No more than the specified percentage of pulses shall result in r-f output pulses each having less than 70% of the amplitude of a normal pulse and within a frequency range of ±50 megacycles from the normal frequency of the individual tube. Satisfactory operation must be obtained for the last two minutes of a test interval not to exceed 5 minutes.

Note 18: Observations shall be made for load phase positions corresponding to maximum power and to minimum power.

Note 19: The VSWR shall be 1.5/1.0. The interpretation of the value of the VSWR as used by the manufacturer and as used by others shall be as defined in MIL-E-1B 4.16.5. The standing wave introducer shall be moved during the test so that operation is obtained for load phase positions corresponding

to maximum power output, minimum power output, maximum frequency, and minimum frequency. If automatically driven, the standing wave introducer shall be cycled continuously through a line length approximately one-half wave length long at a maximum rate of four cycles per hour; if manually moved, the standing wave introducer shall be cycled through the four load phase positions corresponding to maximum power, minimum power, maximum frequency, minimum frequency at least once during the specified life of the tube, spending approximately equal periods of time in each phase position. The application of voltages to the tube during life test will be done in accordance with the following cycle: (a) heater preheat 3 minutes, (b) high voltage applied 60 minutes, (c) no voltage 15 minutes. This cycle shall be repeated until the summation of high voltage applications equals the specified life.

Note 20: The tube shall pass all applicable production tests at the end of the specified life, with the condition that the criteria for acceptance be modified in accordance with the life test end points listed.

Note 21: With the exception of holding period, the only criterion for this test is that the tube shall exhibit normal operation 60 seconds after snap-on.

Note 22: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October, 1955.

1 Reference plane "A" is defined as a plane passing through the finished surface of the magnet.

2 Reference plane "B" is defined as a plane passing through the center of the output and perpendicular to reference plane "A".

3 Reference plane "C" is defined as a plane perpendicular to reference planes "A" and "B" at the face of the output.

4 This dimension refers to centerline of tube.

5 Center of cathode bushing may vary from true location by .125 (see note "9").

6 Guard used for shipping purposes only.

7 This surface must be flat within .010.

8 Includes angular as well as lateral deviations.

9 This dimension applies to location of mounting bolts with respect to reference plane "C".

10 This dimension applies either to head of magnet bolt or top of exhaust cap, or magnet coating.

11 Applies to flat on top of magnet.

12 Refers to size of coated magnet only.

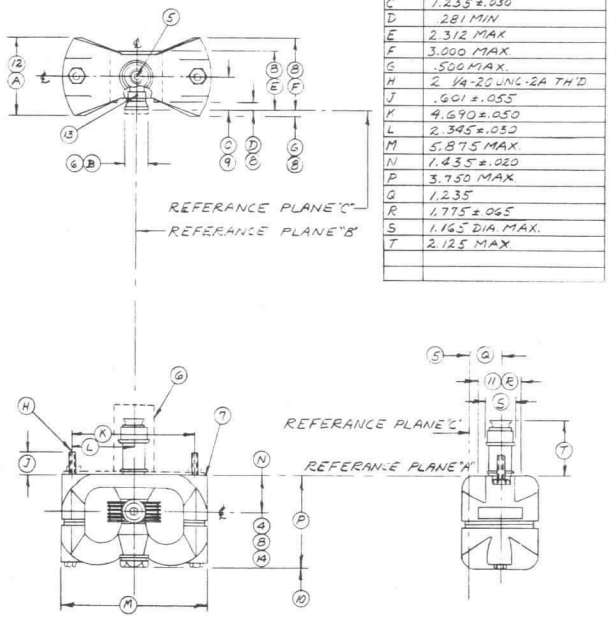
13 Temperature is taken from this point.

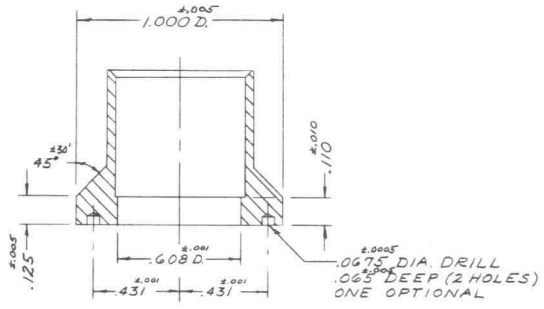
14 The centerline of the drilled hole in the output flange may vary vertically from the centerline of the tube by ± .007.

15 Allignment of the electric vector shall be perpendicular to reference plane "B".

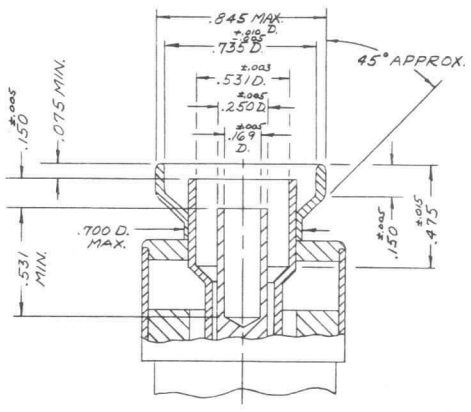
(1) INDICATES NOTE NUMBER
(A) INDICATES DIMENSION LETTER

REF	DIMENSION
A	3.187 MAX.
B	1.000
C	1.235±.030
D	.281 MIN
E	2.312 MAX
F	3.000 MAX.
G	.500 MAX.
H	2 1/4-20 UNC-2A TH'D.
J	.601±.055
K	4.690±.050
L	2.345±.030
M	5.875 MAX.
N	1.435±.020
P	3.750 MAX
Q	1.235
R	1.775±.065
S	1.165 DIA. MAX.
T	2.125 MAX.





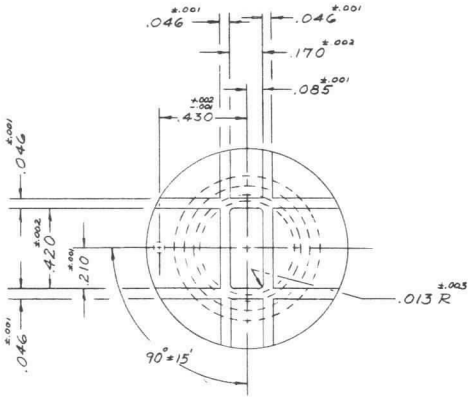
DETAIL OF OUTPUT FLANGE

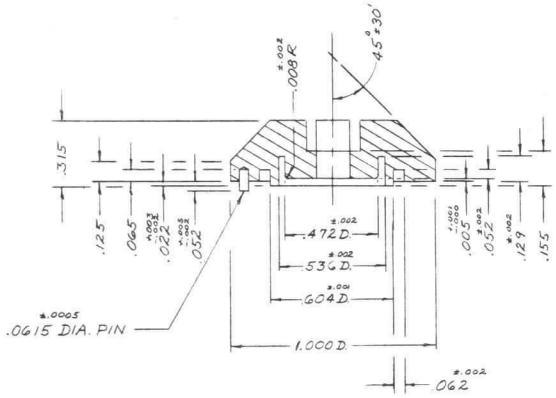


DETAIL OF HEATER CATHODE SOCKET

(continued)

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
JUNE 6, 1956





Bomac

REFLEX KLYSTRON

6780/BL800

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 4, 1956

Dimensions: Per Outline

Ratings:	Ef	Ers	Er	Ik
Units:	V	Vdc	Vdc	mAdc
Max.:	6.3±10%	350	0 to -1000	42
Test Con.:	6.3	200	-55 to -225	----

Ratings:	Tuner	Plate Temp.	Altitude
Units:		°C	ft.
Max.:		200	no limit
Test Con.:	Note 2,3		

**Cathode: Coated Unipotential Tuner: Lock-nut

Mounting: Output connector bolts to a UG-39/U or a UG-40/U flange attached to RG-52/U waveguide.

Mounting Position: Any Cooling: Conventional, Note 3

Base: Moulded flexible leads to Viking Connector

Pack in sealed moisture-resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t= 168 hours	---	---
4.9.18.1.5	Carton Drop:	To be specified	---	---
----	* Vibration (1):	F= 60±2cps; G= 10; t= 120 secs; Notes 4, 5	Ir: 0	10μAdc
----	** Vibration (2):	F= 50cps to F= 1000cps; G= 10; t= 5min; Notes 4, 6	---	---
4.9.20.5	*Shock:	G= 200; Note 6	---	---
4.10.8	*Heater Current	----	If:1.08	1.32A
4.10.6.7.1	*Total Reflector Current:	Notes 7, 8	Ir:---	3.0μAdc
4.10.4.6	Cathode Current:	F=9660±0.3%Mc; Er(Mode 6)max Po	Ik:---	23mAdc
4.10.7.3.2	Tuning Range	-----	F:8500	10,000Mc.
4.15.1	Power Output(1):	F=9000±0.3%Mc; Er(Mode 6)max Po	Po:10	----mW
4.15.1	Power Output(2):	F=9660±0.3%Mc; Er(Mode 6)max Po	Po:10	----mW
4.15.1	Power Output(3):	F=8500Mc to F=10,000Mc; Er(Mode 5) max Po; Ers=300Vdc	Po:25	----mW
4.10.5.4	Reflector Voltage(1):	See Power Output (1)	Er:-75	-135Vdc
4.10.5.4	Reflector Voltage(2):	See Power Output (2)	Er:-100	-160Vdc
4.15.3	*Electronic Tuning Range:	F=8940Mc. to F=9660Mc; Mode 6; 50%max Po; Note 9	ΔF:20	---Mc.
4.15.5	**Temperature Compensation:	F=9300±0.3%Mc; Er(Mode 6)max Po; TA=20° to 60°C; Note 10	----	-0.20Mc/°C
4.8	Electrode Insulation:	Tube cold 300 V min. dc	Rh-rs 2 Rk-rs 2 Rr-rs 2	---MEG ---MEG ---MEG
----	**Frequency Modulation:	F=9660+0.3%Mc; Er (Mode 6) max Po; Ef=5.7 to 7.0Vdc	ΔF:---	0.1Mc
4.10.1.1	*Emission:	Ef=6.3V; Ef=5.7V; Note 7	ΔIk/Ik:--	15%
4.11	Life Test:	See Power Output (1)	t:500	---hrs
4.11.4	Life Test End Point:	---- Total Reflector Current	ΔPo/Po:-- Ir:---	-20% 10μAdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: All oscillation tests shall be made with the tube rigidly connected to a UG-39/U or a UG-40/U flange on appropriate RG-52/U waveguide equipment. The load VSWR for the tube shall be less than 1.10.

Note 3: Forced air cooling is required above 10 watts resonator power input.

Note 4: Vibrate once along the 3.000 max. dimension and once along the 1.750 max. dimension.

Note 5: During vibration the reflector current shall be recorded with a Brush Model BL-202 recorder or equivalent. There shall be no reflector current bursts greater than the amount specified.

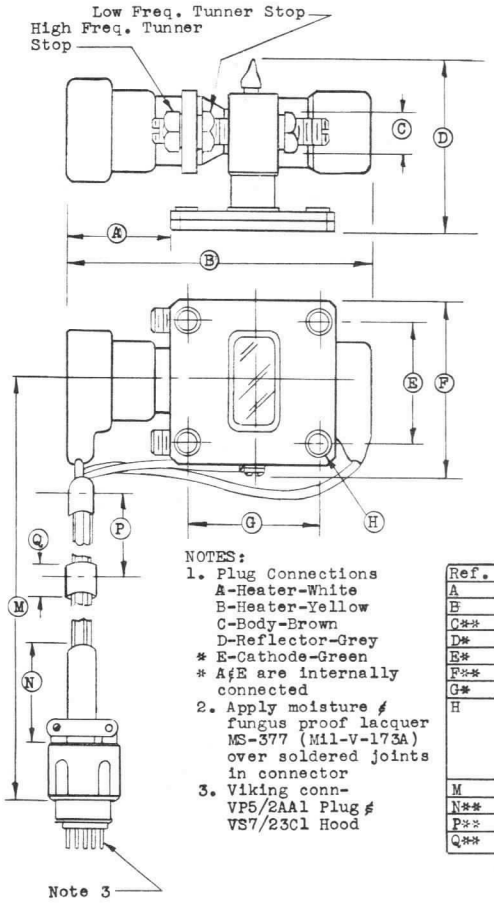
Note 6: Tubes shall satisfy the Power Output (1) requirements during this test.

Note 7: The tube shall not be oscillating during this test.

Note 8: The total reflector current shall not exceed the specified limit after two minutes with all voltage applied.

Note 9: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

Note 10: Temperature measured at tuner plate.



NOTES:
1. Plug Connections
   A-Heater-White
   B-Heater-Yellow
   C-Body-Brown
   D-Reflector-Grey
   * E-Cathode-Green
   * A&E are internally connected
2. Apply moisture & fungus proof lacquer MS-377 (Mil-V-173A) over soldered joints in connector
3. Viking conn- VP5/2AA1 Plug & VS7/2301 Hood

Ref.	Dimensions.
A	1.000 Max.
B	3.00 Max.
C**	.438
D*	1.750 Max.
E*	1.220 ±.004
F**	1.900 Max.
G*	1.280 ±.004
H	.219 Dia. (4) Holes. w/.185 D. removable inserts.
M	7.00 ±.25
N**	3.00 Approx.
P**	3.50 Approx.
Q**	.45 Approx.

Bomac

REFLEX KLYSTRON

6781/BL800A

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 4, 1956

Dimensions: Per Outline

Ratings:	Ef	Ers	Er	Ik
Units:	V	Vdc	Vdc	mAdc
Max.:	6.3±10%	350	0 to -1000	42
Test Con:	6.3	210	-55 to -225	---

Ratings:	Tuner Plate Temp.	Altitude
Units:	°C	ft.
Max.:	200	no limit
Test Cond.:	Note 2, 3	

**Cathode: Coated Unipotential Tuner: Lock-nut

Mounting: Output connector bolts to a UG-39/U or a UG-40/U flange attached to RG-52/U waveguide.

Mounting Position: Any Cooling: Conventional, Note 3

Base: Moulded flexible leads to Viking Connector

Pack in sealed moisture-resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.5	Carton Drop:	To be specified		---	---
------	*Vibration (1):	F=60±2cps; G=10; t=120secs; Notes 4, 5	Ir :	0	10μAdc
------	**Vibration (2):	F=50cps to F=1000cps; G=10; t=5 min.; Notes 4, 6		---	---
4.9.20.5	*Shock:	G=200; Note 6		---	---
4.10.8	*Heater Current	-------	If :	1.08	1.32A
4.10.6.7.1	*Total Reflector Current	Notes 7,8	Ir :	----	3.0μAdc
4.8	Electrode Insulation	Tube Cold 300 V Min. dc	Rh-rs Rk-rs Rr-rs	2 2 2	---MEG. ---MEG. ---MEG.
4.10.4.6	Cathode Current	F=9660±0.3%Mc; Er(Mode 6)max Po	Ik :	----	23mAdc
4.10.7.3.2	Tuning Range	-------	F:	8500	10,000Mc.
4.15.1	Power Output(1):	F=9000±0.3%Mc; Er(Mode 6)-125V Approx. V.S.W.R. 1.5 any phase	Po :	15	---mw
4.15.1	Power Output(2)	F=9660±0.3%Mc; Er(Mode 6)-125V Approx. V.S.W.R. 1.5 any phase	Po :	15	---mw
4.15.1	Power Output(3)	F=8500Mc to F=10,000Mc; Er(Mode 5)max. Po; Ers=300Vdc	Po :	35	---mw
4.10.5.4	Reflector Voltage(1):	See Power Output (1)	Er :	-75	-135Vdc
4.10.5.4	Reflector Voltage(2):	See Power Output (2)	Er :	-100	-165Vdc
4.15.3	*Electronic Tuning Range:	F=8940Mc. to F=9660Mc; Mode 6; 50% max.Po; Note 9	ΔF :	20	---Mc.
4.15.5	**Temperature Compensation	F=9300±0.3%Mc; Er(Mode 6) Po; TA=20° to 60°C; Note 10		---	-0.20Mc/° C

Ref.	Test	Conditions		Min.	Max.
---	**Frequency Modulation:	F=9660±0.3%Mc; Er (Mode 6) max Po; Ef=5.7 to 7.0Vdc	ΔF:	---	0.1Mc.
4.10.1.1	Emission:	Ef=6.3V; Ef=5.7V; Note 7	ΔIk/Ik:	--	15%
4.11	Life Test:	See Power Output (1)	t:	500	---hrs
4.11.4	Life Test End Point:	----- Total Reflector Current	ΔPo/Po:	--	-20%
			Ir:	--	10 μAdc

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: All oscillation tests shall be made with the tube rigidly connected to a UG-39/U or a UG-40/U flange on appropriate RG-52/U waveguide equipment. The load VSWR for the tube shall be less than 1.10.

Note 3: Forced air cooling is required above 10 watts resonator power input.

Note 4: Vibrate once along the 3.000 max. dimensions and once along the 1.750 max. dimension.

Note 5: During vibration the reflector current shall be recorded with a Brush Model BL-202 recorder or equivalent. There shall be no reflector current bursts greater than the amount specified.

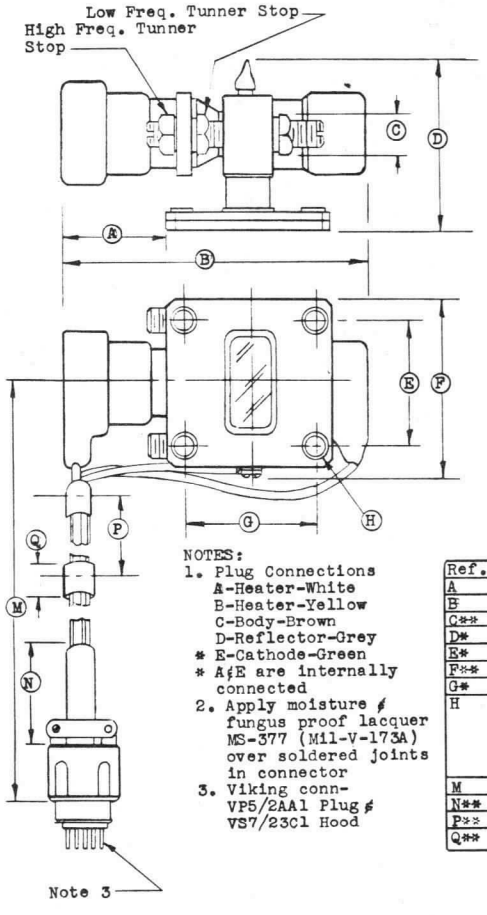
Note 6: Tubes shall satisfy the Power Output (1) requirements during this test.

Note 7: The tube shall not be oscillating during this test.

Note 8: The total reflector current shall not exceed the specified limit after two minutes with all voltages applied.

Note 9: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

Note 10: Temperature measured at tuner plate.



NOTES:
1. Plug Connections
   A-Heater-White
   B-Heater-Yellow
   C-Body-Brown
   D-Reflector-Grey
   * E-Cathode-Green
   * A&E are internally connected
2. Apply moisture & fungus proof lacquer MS-377 (Mil-V-173A) over soldered joints in connector
3. Viking conn- VP5/2AA1 Plug & VS7/23C1 Hood

Ref.	Dimensions.
A	1.000 Max.
B	3.00 Max.
C**	.438
D*	1.750 Max.
E*	1.220 ±.004
F**	1.900 Max.
G*	1.280 ±.004
H	.219 Dia. (4) Holes. w/.185 D. removable inserts.
M	7.00 ±.25
N**	3.00 Approx.
P**	3.50 Approx.
Q**	.45 Approx.

Bomac

REFLEX KLYSTRON

BL801 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 26, 1956

Dimensions: Per Outline

Ratings:	Ef	Ers	Er	Ik
Units:	V	Vdc	Vdc	mAdc
Max.:	6.3±10%	350	0 to -500	52
Test Con:	6.3	300	-55 to -150	----

Ratings:	Body Temp.	Altitude
Units:	°C	ft.
Max.:	200	no limit
Test Con:	Note 2, 3	

****Cathode:** Coated Unipotential Tuner: Single Screw and Locknut

Mounting: Output connector bolts to a UG-39/U or a UG-40/U flange attached to RG-52/U waveguide.

Mounting Position: Any Cooling: Conventional, Note 3

Connections: 3 pin base and miniature reflector cap

Pack in sealed moisture-resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.5	Carton Drop:	To be specified	---	---
----	*Vibration (1):	F=60±2cps; G=10; t=120 secs; Notes 4, 5	Ir : 0	10μAdc
----	** Vibration (2):	F=50 cps to F=1000cps; G=10; t=5 min; Notes 4, 6	△F---	1 Mc (p-p)
4.9.20.5	*Shock:	G=200; Note 6	---	---
4.10.8	*Heater Current:	----	If : 0.40	0.50A
4.10.6.7.1	*Total Reflector Current:	Notes 7, 8	Ir : ---	5.0uAdc
4.10.4.6	Cathode Current:	F=9600±0.3%Mc; Er (Mode 6 3/4) max. Po	Ik : ---	45mAdc
4.10.7.3.2	Tuning Range:	-----	F : 8500	9600Mc
4.15.1	Power Output (1):	F=9000±0.3%Mc; Er (Mode 6 3/4) max. Po	Po : 20	---mW
4.15.1	Power Output (2):	F=9600±0.3%Mc; Er (Mode 6 3/4) max. Po Ers=300V	Po : 20	---mW
4.15.1	Power Output (3):	F=8500Mc to F=9600Mc; Er (Mode 5) max Po; Ers=300Vdc	Po : 20	---mW
4.10.5.4	Reflector Voltage (1):	See Power Output (1)	Er : -75	-135Vdc
4.10.5.4	Reflector Voltage (2):	See Power Output (2)	Er : -100	-160Vdc
4.15.3	*Electronic Tuning Range:	F=8500 Mc. to F=9600 Mc; Mode 6 3/4 50% max Po; Note 9	△F: 30	---Mc
4.15.5	** Temperature Compensation:	F=9300±0.3%Mc; Er (Mode 6 3/4)max Po; TA=20° to 60°C; Note 10	---	-0.20 Mc/°C
4.8	Electrode Insulation	Tube Cold 300V Min. dc.	Rh - rs: 2 Rk - rs: 2 Rr - rs: 2	---MEG. ---MEG. ---MEG.
----	**Frequency Modulation:	F=9600 ±0.3%Mc; Er (Mode 6 3/4) max. Po; Ef=5.7 to 7.0 Vdc	F: ---	0.1Mc
4.10.1.1	Emission:	Ef=6.3V; Ef=5.7V; Note 7	Ik/Ik : --	15%
4.11	Life Test:	See Power Output (1)	t : 500	---hrs
4.11.4	Life Test End Point:	--- Total Reflector Current	Po/Po:-- Ir :--	-20% 10μAdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: All oscillation tests shall be made with the tube rigidly connected to a UG-39/U or a UG-40/U flange on appropriate RG-52/U waveguide equipment. The load VSWR for the tube shall be less than 1.10.

Note 3: Forced air cooling is required above 10 watts resonator power input.

Note 4: Vibrate once along the 3.000 max. dimension and once along the 1.750 max. dimension.

Note 5: During vibration the reflector current shall be recorded with a Brush Model BL-202 recorder or equivalent. There shall be no reflector current bursts greater than the amount specified.

Note 6: Tubes shall satisfy the Power Output (1) requirements during this test.

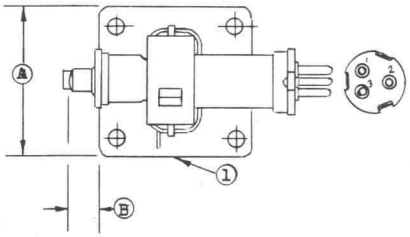
Note 7: The tube shall not be oscillating during this test.

Note 8: The total reflector current shall not exceed the specified limit after two minutes with all voltage applied.

Note 9: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

Note 10: Temperature measured at tube body.

(over)

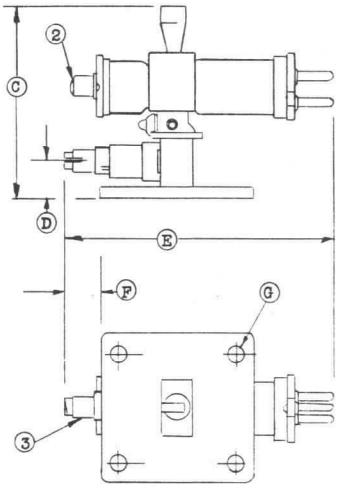


BASE CONNECTIONS
1. Heater } Internally
2. Cathode } Connected
3. Heater

① 1 5/8 Sq. flange mates with UG-39/U or equivalent

② Reflector Cap (C1-4)

③ Tuning Screw



Ref.	Dimensions.
A	1 5/8
B	.450 Max.
C	2.15 Max.
D	.375
E	3.00 Max.
F	.675 Max.
G	.219 Dia (4) Holes.

Bomac

REFLEX KLYSTRON

BL802

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 22, 1956

Dimensions: Per Outline

Ratings:	Ef	Ers Vdc	Er Vdc	Ik mAdc	F Mc.	Ehk Vdc	Alt. ft.	Temp. °C
Max.:	Note 13	350	-300	60	---	45	No limit	200°C
Test Cond.:	6.3±.2	250±2.5	-75 to-150	---	9050±10	---	---	25±5Ambient

**Cathode: Coated Unipotential — Yel H, Yel H, Grn K, Gry r, Body rs

Connections: No. 22 AWG Stranded Leads
12" Minimum Length

Pack in sealed moisture resistance bag. If opaque bag is used type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
------	Finish:	Note 14		
------	Insulation:	Note 15		
4.5	Holding Period:	t=168 hours		
4.9.18.1.8	*Carton Drop:	(d) Package Group 1 Carton Size N		
4.9.19	Vibration (1):	G=10; F=60 cps T=120 sec; Notes 3, 4	Ir : 0	10μAdc
4.9.19	*Vibration(2):	F=20 to 2000 cps; G=5; Notes 3 and 5	ΔF : ---	0.2Mc.
4.9.20.5	*Shock:	150G, 5 times in each of four directions; Notes 3 and 6	ΔF : ---	1 Mc.
------	*Acceleration Freq. Shift:	100G transverse to tube axis and plane of window; Note 3	ΔF : ---	1 Mc.
4.10.8	*Heater Current:	Note 9	If : ---	1.30A
4.10.6.7.1	Reflector Current:	Notes 8 and 9	Ir : ---	5μAdc
4.10.1.	†Emission:	Ef 6.3 volts and 5.7 volts; Note 16	ΔIk/Ik	--- -15%
4.10.4.6	Cathode Current:	F= any between 8800 and 9200Mc; Notes 2 and 7	Ik : ---	40mAdc
4.10.5.4	†Reflector Voltage:	F= 9200±10Mc. F= 8800±10Mc. Notes 2 and 7	Er : --- Er : -75	-150Vdc ---Vdc
4.10.7.3.2	Tunable Freq:	Note 2	F : 8800	9200Mc.
4.15.1	Power Output and Modulation Sensitivity:	ΔEr=+4.5±.1Vdc ΔEr=-4.5±.1Vdc Notes 2 and 7	ΔF : --- ΔF : --- Po : 4.0	3.5Mc. 3.5Mc. ---mW
4.15.4	Frequency Drift:	Notes 2, 7 and 10		
------	†Excess Noise Factor:	Note 11	$\frac{Pnx}{k+\Delta f}$: ---	1.5
4.15.7.2	Hysteresis:	Notes 2 and 7	Ratio : ---	.5
4.10.15	Heater Cathode Leakage:	Ehk=+44Vdc Ehk=-44Vdc	Ihk : --- Ihk : ---	100μAdc 100μAdc
------	Fast Start Test:	Notes 2, 7 and 10	Po : 4.5	---mW
------	Tuning Range:	Note 12	ΔF : 103.5	118.5Mc.
------	AFC Power:	Note 12	PAFC : 3	7mW
------	Crystal Current:	Note 12	Ic : 0.7	1.3ma

Ref.	Test	Conditions	Min.	Max.
4.11.6	Service Life Guarantee:		T : 2 years shelf life and/or 100 hrs. oper. Life.	

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: Tests shall be made in test cavity as shown in drawing (BL-802 Test Cavity), unless otherwise noted. All oscillation tests shall be made utilizing the 5 3/4 reflector voltage mode, which is the mode closest to, but less negative than -150 volts.

Note 3: This test shall be made in an appropriate test fixture in order to eliminate the effects of any external cavity in determining the performance of the vacuum tube. Oscillation frequency may be anywhere within the range of 8800 to 9200Mc.

Note 4: There shall be no reflector current bursts greater than the limits shown as recorded on a Brush Model BL-202 Recorder or equivalent.

Note 5: Motion shall be sinusoidal and transverse to the tube axis. The peak to peak value of frequency modulation shall be less than the value specified.

Note 6: Permanent frequency change shall not exceed the specified limit.

Note 7: Er set for peak of mode. 5.5±0.2 mW power extracted by loop coupler and 1±0.1 ma crystal current.

Note 8: Total reflector current shall be measured after application of voltages in the following sequencies: At T=0 seconds, 10±1 volt is applied to the filament. At T=10±0.5 seconds, filament voltage is transferred to normal Ef and reflector and anode voltages are applied. At T=13±0.5 seconds, reflector current shall not exceed 25 microamperes, and after T=26±0.5 seconds, reflector current shall not exceed the specified maximum.

After a period of six months shelf life, the klystron shall meet all the requirements of this specification except that the reflector current shall be measured after 1 minute of operation with normal test voltages applied.

Note 9: The tube need not be oscillating for this test.

Note 10: At any time from 0 to 5 minutes after application of voltages in, the sequence specified in Note 8 and at any ambient temperature from -40°C to +65°C the frequency shall not vary more than 7.5mc from the frequency measured after 5 minutes operation at 25±5 C. The reflector voltage shall be maintained constant at the value giving maximum power output in the 5 minutes, 25±5°C condition. The total change in frequency in any 30 second period between 0 time and 2 minutes after voltages are applied per Note 8 shall not be greater than 1.5 Mc. at any ambient temperature between -40°C and +65°C.

Note 10a: After application of voltages in the sequence specified in Note 8, and from T=13±0.5 seconds on, the power output shall be greater than the specified minimum.

(over)

Note 11: The overall noise factor of a crystal mixer and IF amplifier with no local oscillator noise contribution may be expressed as:

$$NF = Lc\,(F + tc - 1)$$

where Lc= conversion loss of the crystal
tc= apparent noise temperature of the crystal.
NF= noise factor of the IF amplifier

If the local oscillator contributes noise, the overall noise factor can be expressed as:

$$NF = \frac{Pnx}{(kt\,\Delta f)} + Lc(F+tc-1)$$

where Pnx is the total local oscillator noise contribution from the two noise side bands Δf wide and centered at the local oscillator frequency ↑ the IF center frequency. The excess noise factor is to be measured under the following conditions:

a. IF center 60Mc±1Mc.
b. IF bandwidth (Δf) 4-10Mc.
c. Klystron coupled directly to the mixer
d. 1ma rectified current from a JAN 1N23C crystal
e. Noise source generator impedance less than 1.1VSWR
f. A 5.5±0.5mW load on the klystron in addition to the power supplied to the mixer.

Note 12: With fine tuning probe inserted into the test cavity 0.160" ±0.001" (mid frequency probe position), tune klystron observing test conditions and notes 2 and 7.

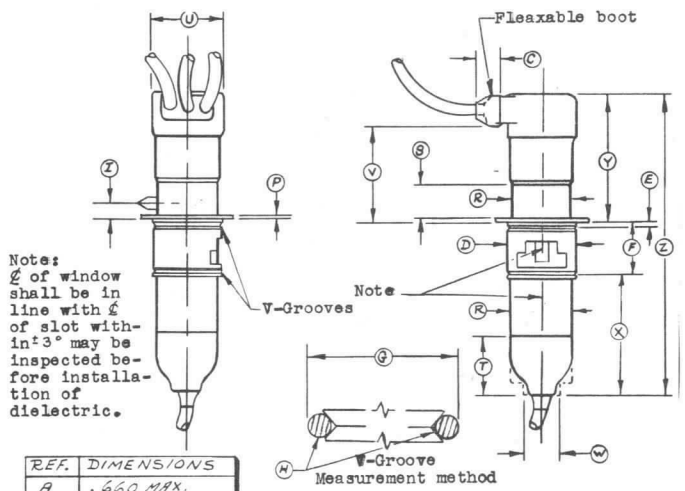
Between low frequency probe position (mid frequency probe position plus 0.039"±0.0003" insertion) and high frequency probe position (mid frequency probe position minus 0.0492" ±0.0003" insertion) the tuning range, AFC power, and crystal current shall be within the limits specified.

Note 13: Filament voltage: 7.0volts continuous, or 11 volts for a maximum of 11 seconds followed by 7.0 volts continuous.

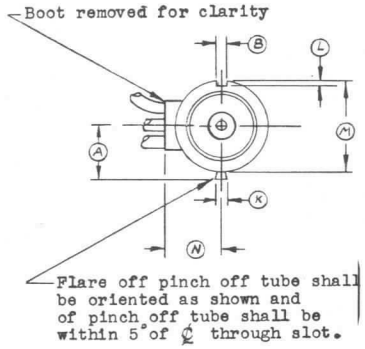
Note 14: Insulation material - Silicone rubber or equivalent. Cavity Area-Gold Plated except that window shall not be plated and tab may be coated with varnish per MIL-V-6894A.
Body Finish- Paint, high temperature silicone base enamel containing copper-H-Quinolinolate.

Note 15: There shall be no evidence of flashover or voltage breakdown with 1000 volts applied between insulating material and gold plated area.

Note 16: Tube shall not be oscillating during this test, and 30 minutes time with no voltage applied to the tube shall have elapsed since any previous application of heater voltage greater than 6.93 volts. $\Delta Ik/Ik$ equals the difference between Ik at 5.7 heater volts and Ik at 6.3 heater volts, divided by Ik at 6.3 heater volts, and is expressed as a percentage.



REF.	DIMENSIONS
A	.660 MAX.
B	.057
C	.70 MAX.
D	.680
E	.080 +.010 −.015
F	.505 ±.015
G	.762 ±.006
H	.050 ±.001 D. WIRE
I	.165 ±.035
K	.250 MAX.
L*	.095 +.010 −.005
M*	.938 ±.030
N**	.725 MAX.
P**	.035 ±.015
R**	.635 D. MAX.
S**	.250 MIN.
T**	.500 MIN.
U**	.750 D. MAX.
V**	.750 MIN.
W**	.400 D. MAX.
X**	1.11 MAX.
Y**	1.27 MAX.
Z**	3.00 MAX.



Bomac

REFLEX KLYSTRON

BL803

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 5, 1956

Dimensions: Per outline

Ratings:	Ef	Ers	Er	Ik
Units:	V	Vdc	Vdc	mAdc
Max.:	6.3±10%	350	0 to -1000	42
Test Con:	6.3	210	-55 to -225	---

Ratings:	Tuner Plate Temp.	Altitude
Units:	°C	ft.
Max.:	200	no limit
Test Con:	Note 2, 3	

**Cathode: Coated Unipotential Tuner: Single Screw
Mounting: Output connector bolts to a UG-39/U or a UG-40/U flange attached to RG-52/U waveguide.
Mounting: Position: Any Cooling: Conventional, Note 3
Base: Molded flexible leads to Viking Connector.

Pack in sealed moisture-resistant bag or approved equivalent. If opaque bag is used, the tube number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.5	Carton Drop:	To be specified	---	---
------	*Vibration(1):	F=60±2cps; G=10; t=120μsec; Notes 4, 5	Ir : 0	10μAdc
------	**Vibration(2):	F=50cps to F=1000cps; G=10; t=5 min.; Notes 4, 6	---	---
4.9.20.5	*Shock:	G=200; Note 6	---	---
4.10.8	*Heater Current:	--------	If : 1.08	1.32A
4.10.6.7.1	*Total Reflector Current:	Notes 7, 8	Ir : ---	3.0μAdc
4.10.4.6	Cathode Current:	F=9660±0.3%Mc; Er(Mode 6) max Po	Ik : ---	23mAdc
4.10.7.3.2	Tuning Range:	--------	F : 8500	10,000 Mc
4.15.1	Power Output(1):	F=9000±0.3%Mc; Er(Mode 6)-125V Approx. V.S.W.R. 1.5 any phase	Po : 15	---mw
4.15.1	Power Output(2):	F=9660±0.3%Mc; Er(Mode 6)-125V Approx. V.S.W.R. 1.5 any phase	Po : 15	---mw
4.15.1	Power Output(3):	F=8500Mc to F=10,000Mc; Er(Mode 5) max Po; Ers=300Vdc	Po : 35	---mw
4.10.5.4	Reflector Voltage (1):	See Power Output (1)	Er : -75	-135Vdc
4.10.5.4	Reflector Voltage (2):	See Power Output(2)	Er : -100	-165Vdc
4.15.3	*Electronic Tuning Range:	F=8940Mc. to F=9660Mc; Mode 6; 50% max. Po; Note 9	ΔF : 20	---Mc.
4.15.5	**Temperature Compensation:	F=9300±0.3%Mc; Er(mode 6) Po; TA=20° to 60°C; Note 10	---	-0.20Mdb/°C
------	**Frequency Modulation:	F=9660±0.3%Mc; Er (Mode 6) max. Po; Ef=5.7 to 7.0Vdc	ΔF : ---	0.1Mc.
4.10.1.1	Emission:	Ef=6.3V; Ef=5.7V; Note 7	ΔIk/Ik : ---	15%
4.11	Life Test:	See Power Output (1)	t : 500	---hrs.
4.11.4	Life Test End Point:	-------- Total Reflector Current	ΔPo/Po : --- Ir : ---	-20% 10μAdc

Note 1: References and notations are from Military Specification Electron Tubes, MILE-1C, 3 October 1955.

Note 2: All oscillation tests shall be made with the tube rigidly connected to a UG-39/U or a UG-40/U flange on appropriate RG-52/U waveguide equipment. The load VSWR for the tube shall be less than 1.10.

Note 3: Forced air cooling is required above 10 watts resonator power input.

Note 4: Vibrate once along the 3.000 max. dimensions and once along the 1.750 max. dimension.

Note 5: During vibration the reflector current shall be recorded with a Brush Model BL-202 recorder or equivalent. There shall be no reflector current bursts greater than the amount specified.

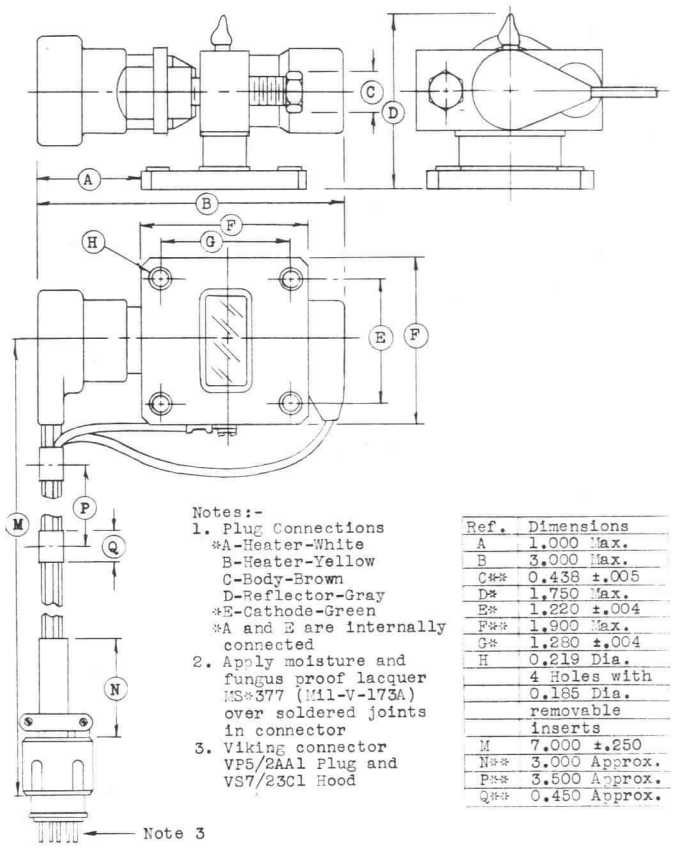
Note 6: Tubes shall satisfy the Power Output (1) requirements during this test.

Note 7: The tube shall not be oscillating during this test.

Note 8: The total reflector current shall not exceed the specified limit after two minutes with all voltages applied.

Note 9: The power output shall have no discontinuities between half-power points for either direction of reflector voltage change.

Note 10: Temperature measured at tuner plate.



Notes:-
1. Plug Connections
*A-Heater-White
B-Heater-Yellow
C-Body-Brown
D-Reflector-Gray
*E-Cathode-Green
*A and E are internally connected
2. Apply moisture and fungus proof lacquer MS*377 (Mil-V-173A) over soldered joints in connector
3. Viking connector VP5/2AA1 Plug and VS7/23C1 Hood

Ref.	Dimensions
A	1.000 Max.
B	3.000 Max.
C**	0.438 ±.005
D*	1.750 Max.
E*	1.220 ±.004
F**	1.900 Max.
G*	1.280 ±.004
H	0.219 Dia.
	4 Holes with 0.185 Dia. removable inserts
M	7.000 ±.250
N**	3.000 Approx.
P**	3.500 Approx.
Q**	0.450 Approx.

Bomac

SILICON DIODE

1N21B | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	--------	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc(min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc:---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr:---	2.0 times
4.14.3.6	Rectified Crystal Current:	--------	Io:0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.1	*Temperature:	Note 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.3	*Torque:	Note 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.4	*Axial Strain:	Note 4	Lc:--- Nr:---	7.5db 3.0 times

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

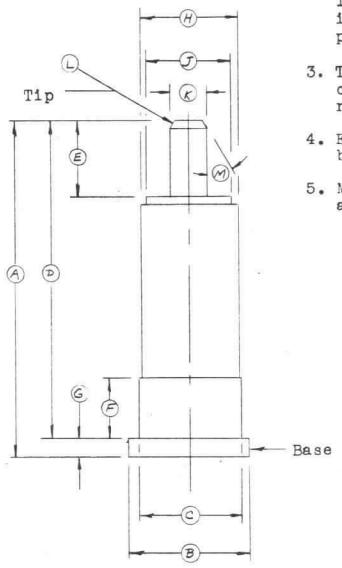
Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted, and the performance shall be within the limits specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N21BR | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 5	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F=3060±5Mc; pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc:---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F=3060±5Mc; pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr:---	2.0 times
4.14.3.6	Rectified Crystal Current:	--------	Io:0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.1	*Temperature:	Note 4	Lc:---	7.5db
4.14.4.1 con't			Nr:---	3.0 times
4.14.4.2	*Drop:	Height=30in.; Note 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.3	*Torque:	Note 4	Lc:--- Nr:---	7.5db 3.0 times
4.14.4.4	*Axial Strain:	Note 4	Lc:--- Nr:---	7.5db 3.0 times

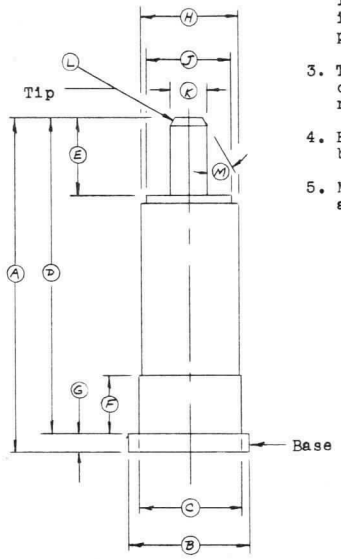
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted, and the performance shall be within the limits specified.

Note 5: Each 1N21BR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac

SILICON DIODE

1N21C | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	--------	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 Ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc:---	5.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr:---	1.5 times
4.14.3.6	Rectified Crystal Current:	--------	Io:0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc:--- Nr:---	6.5db 2.5 times
4.14.4.1	*Temperature:	Note 4	Lc:--- Nr:---	6.5db 2.5 times
4.14.4.2	*Drop:	Height=30in.; Note 4	Lc:--- Nr:---	6.5db 2.5 times
4.14.4.3	*Torque	Note 4	Lc:--- Nr:---	6.5db 2.5 times
4.14.4.4	*Axial Strain:	Note 4	Lc:--- Nr:---	6.5db 2.5 times

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

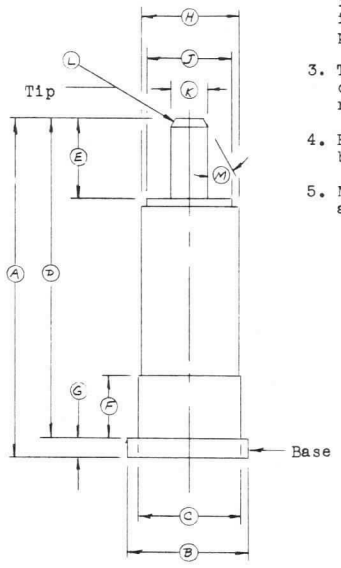
Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N21CR | S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 2		---	---
4.14.1	Handling Precautions:	--------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108		---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 3; RL=100±10 ohms; Zm=400+jo ohms; JAN Drawings 124, 125	Lc :	---	5.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 3; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr :	---	1.5 times
4.14.3.6	Rectified Crystal Current:	--------	Io :	0.4	---mAdc
------	*Immersion:	Notes 4, 5	Lc : Nr :	--- ---	6.5db 2.5 times
4.14.4.1	*Temperature:	Note 5	Lc : Nr :	--- ---	6.5db 2.5 times
4.14.4.2	*Drop:	Height=30in; Note 5	Lc : Nr :	--- ---	6.5db 2.5 times
4.14.4.3	*Torque:	Note 5	Lc : Nr :	--- ---	6.5db 2.5 times
4.14.4.4	*Axial Strain:	Note 5	Lc : Nr :	--- ---	6.5db 2.5 times

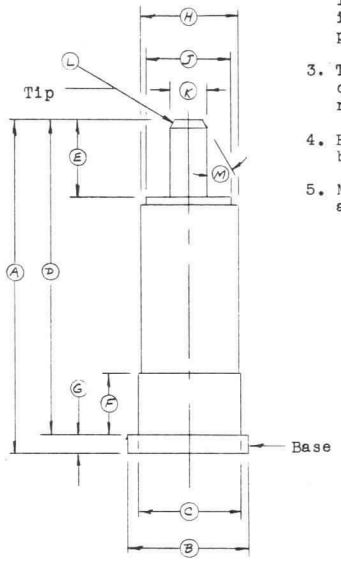
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each 1N21CR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.

Note 3: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac | SILICON DIODE | 1N21D | S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

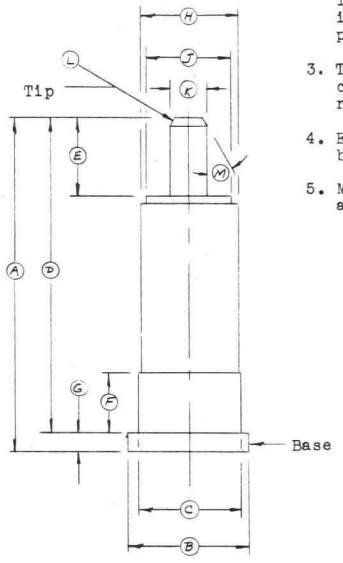
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	-------	---	---
4.14.1	Handling Precautions:	-------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc(min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc : ---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr : ---	1.3times
4.14.3.3	IF Impedance:	F= 3060±5Mc. Io=0.5mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 124, 125	Zif : 325	475
------	RF Impedance:	F= 3060±5Mc. Io=0.5mAdc; RL=100±10 ohms; JAN Drawings 124, 125	σ : ---	1.5
4.14.3.6	Rectified Crystal Current:	------	Io : 0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc : ---	6.0db
			Nr : ---	2.3times
4.14.4.1	*Temperature:	Note 4	Lc : ---	6.0db
			Nr : ---	2.3times
4.14.4.2	*Drop:	Height=30 in; Note 4	Lc : ---	6.0db
			Nr : ---	2.3times
4.14.4.3	*Torque:	Note 4	Lc : ---	6.0db
			Nr : ---	2.3times
4.14.4.4	*Axial Strain:	Note 4	Lc : ---	6.0db
			Nr : ---	2.3times

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.



Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac | **SILICON DIODE** | **1N21DM** | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	----	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	--------	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	If Impedance	F=3060±5Mc Io=0.5mAdc Fl=100±10ohms Fif=60cps JAN Drawings 124, 125	Zif: 325	475ohms
--------	R.F. Impedance	F=3060±5Mc Jo=0.5mAdc Rl=100±10ohms JAN Drawings 124, 125	σ:---	1.5
4.14.3.1.2	Conversion Loss (B):	F=3060±5Mc Pi=0.5mW, Note 2; RL=100±10ohms Zm=400±jo ohms; JAN Drawings 124, 125	Lc:---	5.0db
4.14.3.2.2	Output Noise Ratio (B): RL=100±10	F=3060±5Mc; Pi=0.5mW, Note 2; RL=100±10ohms; Rc=400ohms; JAN Drawings 114, 124, 125	Nr:---	1.3 times
4.14.3.6	Rectified Crystal Current:	--------	Io: 0.4	---mAdc
--------	*Immersion:	Notes 3, 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.1	*Temperature:	Note 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.2	*Drop:	Height=30in.; Note 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.3	*Torque	Note 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.4	*Axial Strain	Note 4	Lc:--- Nr:---	6.0db 2.3 times
--------	Matching	Note 5	Note 6	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

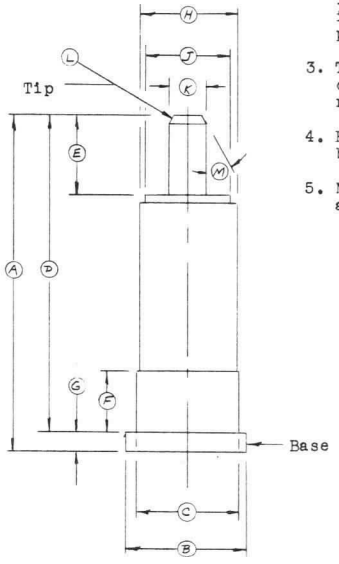
Note 5: Each crystal shall satisfy all requirements of this specification before matching.

Note 6: A pair of crystals consisting of two 1N21D rectifiers shall be considered matched when;

(a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.

(b) The VSWR of each crystal shall be less than 1.50.

(c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3db.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac

SILICON DIODE

1N21DMR | S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 16, 1957

Dimensions: Per Outline

Ratings:
Ambient Temperature
Altitude

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	--------	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.21	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance	F=3060±5Mc Pi=0.5mW, Note 2 Rl=100±10 ohms Fif=60cps JAN Drawings 124, 125	Zif:325	475ohms
--------	RF Impedance	F=3060±5Mc Pi=0.5mW, Note 2 Rl=100±10 ohms JAN Drawings 124, 125	σ:---	1.5
4.14.3.1.2	Conversion Loss (B):	F=3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc:---	5.0 db
4.14.3.2.2	Output Noise Ration (B):	F-3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr:---	1.3 times
4.14.3.6	Rectified Crystal Current:	--------	Io:0.4	---mAdc
--------	*Immersion:	Notes 3, 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.1	*Temperature:	Note 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.2	*Drop:	Height=30 in.; Note 4	Lc:--- Nr:---	60db 2.3 times
4.14.4.3	*Torque	Note 4	Lc:--- Nr:---	6.0db 2.3 times
4.14.4.4	*Axial Strain:	Note 4	Lc:--- Nr:---	6.0db 2.3 times
--------	Matching	Note 5	Note 6	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each crystal shall satisfy all requirements of this specification before matching.

Note 6: A pair of crystals consisting of a 1N21D and a 1N21DR crystal rectifier shall be considered matched when;

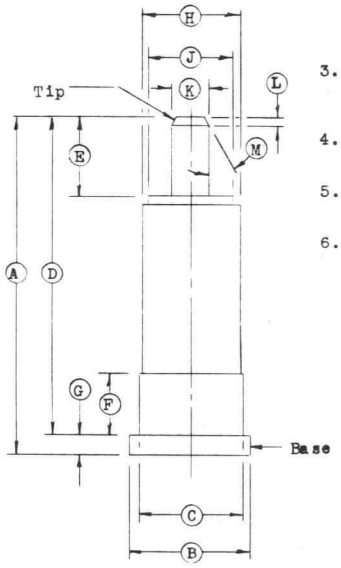
(a) The IF Impedance of one crystal matches the IF Impedance of the other within 25 ohms.

(b) The VSWR of each crystal shall be less than 1.50.

(c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3db.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.
6. As alternate design, base may have set screw.



Ref.	Dimension
A**	0.820 ±.020
B*	0.294 ±.002
C	0.250 +.000 -.004
D*	0.768 ±.015
E*	0.187 Min. .190 Max.
F*	0.196 ±.003
G*	0.052 ±.005
H*	0.240 Max.
J*	0.210 ±.015
K	0.093 ±.001
L*	0.015-0.030 Chamfer
M*	10° - 45° from vertical

This Outline is used for the following tubes:-

1N21D	1N23BM	1N23DRM
1N21DM	1N23CMR	1N23E
1N21DMR	1N23D	1N23ER
1N21DR	1N23DMR	
1N21E	1N23DR	

Bomac | **SILICON DIODE (R)** | **1N21DR** | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 10, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 2		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 3060±5Mc. Io=0.5mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 124, 125	Zif :	325	475
------	R.F. Impedance:	F= 3060±5Mc. Io=0.5mAdc RL=100±10 ohms; JAN Drawings 124, 125	σ :	---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 3; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc :	---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 3; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr	---	1.3times
4.14.3.6	Rectified Crystal Current:	------	Io :	0.4	---mAdc
------	*Immersion:	Notes 4, 5	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.1	*Temperature:	Note 5	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.2	*Drop:	Height=30in; Note 5	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.3	*Torque:	Note 5	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.4	*Axial Strain:	Note 5	Lc :	---	6.0db
			Nr :	---	2.3times

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each 1N21DR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.

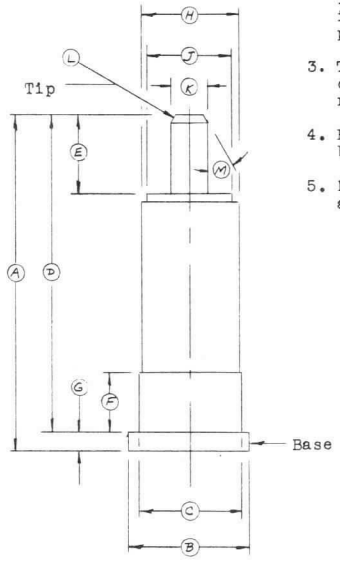
Note 3: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N23B | X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	---------		---	---
4.14.1	Handling Precautions:	---------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc(min.); JAN Drawing 108		---	---
4.14.3.1.2	Conversion Loss (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc:---		6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr:---		2.7 times
------	*Immersion:	Notes 3, 4	Lc:--- Nr:---		7.5db 3.7 times
4.14.4.1	*Temperature:	Note 4	Lc:--- Nr:---		7.5db 3.7 times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc:--- Nr:---		7.5db 3.7 times
4.14.4.3	*Torque:	Note 4	Lc:--- Nr:---		7.5db 3.7 times
4.14.4.4	*Axial Strain:	Note 4	Lc:--- Nr:---		7.5db 3.7 times

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

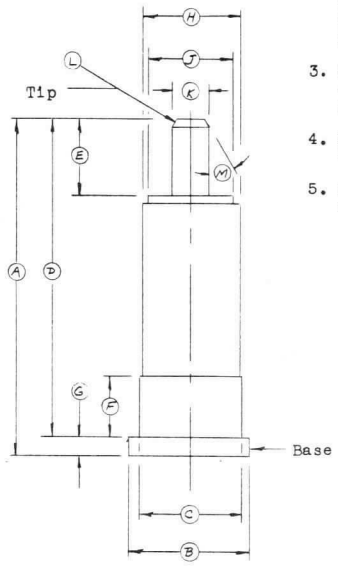
Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath of 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac | **SILICON DIODE** | **1N23BR** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 5	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc(min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc :---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :---	2.7times
------	*Immersion:	Notes 3, 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.1	*Temperature:	Note 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.3	*Torque:	Note 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.4	*Axial Strain:	Note 4	Lc :--- Nr :---	7.5db 3.7times

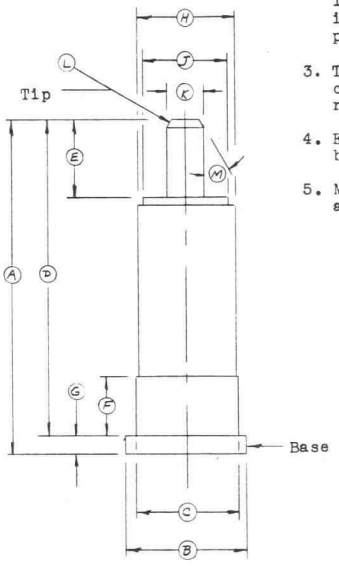
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath of 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N23BR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.



Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N23BM | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	------	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 9375±30Mc; Pi=1.0mW, Note 2 RL=100±10 ohms; Zm=400+jo ohms; JAN Drawings 105, 106	Lc :---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :---	2.7 times
------	*Immersion:	Notes 3, 4	Lc :--- Nr :---	7.5db 3.7 times
4.14.4.1	*Temperature	Note 4	Lc :--- Nr :---	7.5db 3.7 times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc :--- Nr :---	7.5db 3.7 times
4.14.4.3	*Torque:	Note 4	Lc :--- Nr :---	7.5db 3.7 times
4.14.4.4	*Axial Strain:	Note 4	Lc :--- Nr :---	7.5db 3.7 times
------	Matching:	Note 5	See Note 6	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

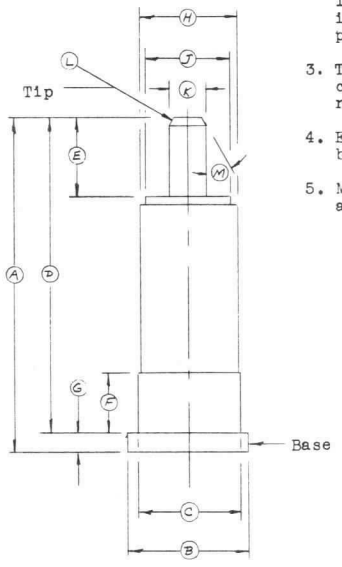
Note 5: Each crystal shall satisfy all requirements of this specification before matching.

Note 6: A pair of 1N23B crystal rectifiers shall be considered matched when
(a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.
(b) The VSWR of each crystal shall be less than 1.60

Note 6: (Cont.) (c) The Conversion Loss (B) of one crystal matches the Conversion Loss(B) of the other within 0.3db.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac | **SILICON DIODE** | **1N23C** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	**Min.**	**Max.**
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	--------	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif:325	475 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	ó:---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400+j0 ohms; JAN Drawings 105, 106	Lc:---	6.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr:---	2.0 times
------	Overall Noise Figure (Calc.):	Note 3	N:---	10db
------	*Immersion:	Notes 4, 5	N:---	11db
4.14.4.1	*Temperature:	Note 5	N:---	11db
4.14.4.2	*Drop:	Height=30in; Note 5	N:---	11db
4.14.4.3	*Torque:	Note 5	N:---	11db
4.14.4.4	*Axial Strain:	Note 5	N:---	11db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

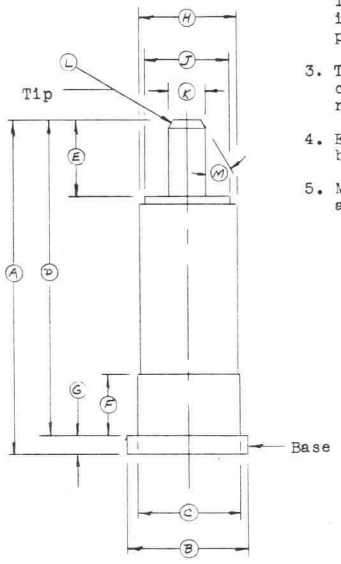
Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.5db.

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N23CR X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	----
3.7	Marking:	Note 2		---	---
4.14.1	Handling Precautions:	---------		---	---
5.1	Packaging And Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif :	325	475 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 3; RL=100±10 ohms; Zm=400+j0 ohms; JAN Drawings 105, 106	Lc :	---	6.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 3 RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :	---	2.0 times
------	Overall Noise Figure (Calc.):	Note 4	N :	---	10db
------	*Immersion:	Notes 5, 6	N :	---	11db
4.14.4.1	*Temperature:	Note 6	N :	---	11db
4.14.4.2	*Drop:	Height=30in; Note 6	N :	---	11db
4.14.4.3	*Torque:	Note 6	N :	---	11db
4.14.4.4	*Axial Strain:	Note 6	N :	---	11db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each 1N23CR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the 1N23CR crystal in such a manner as to be visible when the crystal rectifier is inserted in the crystal holder.

Note 3: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

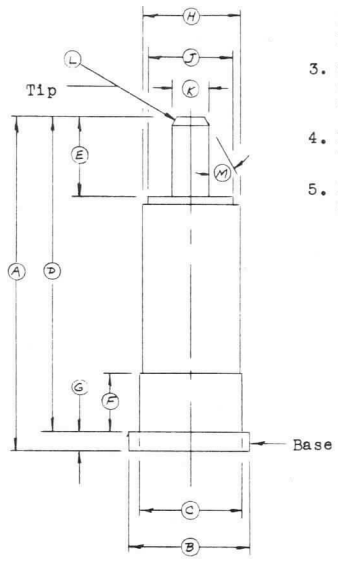
Note 4: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.5db.

Note 5: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 6: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 4. The calculated Noise Figure shall be within the limit specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N23CMR | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 2	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10ohms; Fif=60cps; JAN Drawings 105, 106	Zif : 325	475 ohms
-----	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10ohms; JAN Drawings 105, 106	σ: ---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 3; RL=100±10ohms; Zm=400-j0ohms; JAN Drawings 105, 106	Lc : ---	6.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 3 RL=100±10ohms; Rc=300ohms; JAN Drawings 103, 105, 106, 114	Nr : ---	2.0 times
------	Overall Noise Figure (Calc.):	Note 4	N : ---	10db
------	*Immersion:	Notes 5, 6	N : ---	11db
4.14.4.1	*Temperature:	Note 6	N : ---	11db
4.14.4.2	*Drop:	Height =30in; Note 6	N : ---	11db
4.14.4.3	*Torque:	Note 6	N : ---	11db
4.14.4.4	*Axial Strain:	Note 6	N : ---	11db
-------	Matching:	Note 7	see Note 8	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each 1N23CR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the 1N23CR crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.

Note 3: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1.

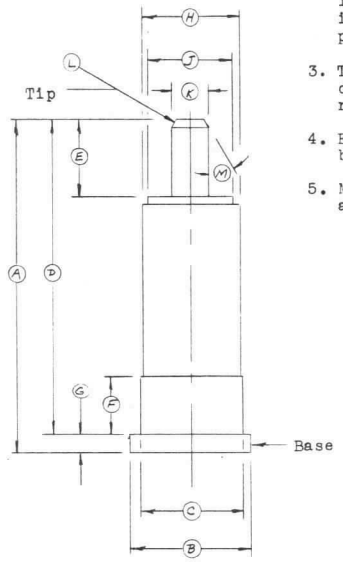
Note 4: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.5db.

Note 5: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 6: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) test shall be conducted and the Overall Noise Figure (N) calculated using the formula specified in Note 4. The calculated Noise Figure shall be within the limit specified.

Note 7: Each crystal shall satisfy all requirements of this specification before matching.

Note 8: A pair of crystals consisting of a 1N23C and a 1N23CR crystal rectifier shall be considered matched when
(a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.
(b) The VSWR of each crystal shall be less than 1.50.
(c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3 db.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac | SILICON DIODE | 1N23D | X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	---------	---	---
4.14.1	Handling Precautions:	---------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif :350	450 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ : ---	1.3
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±j0 ohms; JAN Drawings 105, 106	Lc : ---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr : ---	1.7 times
------	Overall Noise Figure (Calc.):	Note 3	N: ---	8.5db
------	*Immersion:	Notes 4, 5	N: ---	9.5db
4.14.4.1	*Temperature:	Note 5	N: ---	9.5db
4.14.4.2	*Drop:	Height=30in; Note 5	N: ---	9.5db
4.14.4.3	*Torque:	Note 5	N: ---	9.5db
4.14.4.4	*Axial Strain:	Note 5	N: ---	9.5db

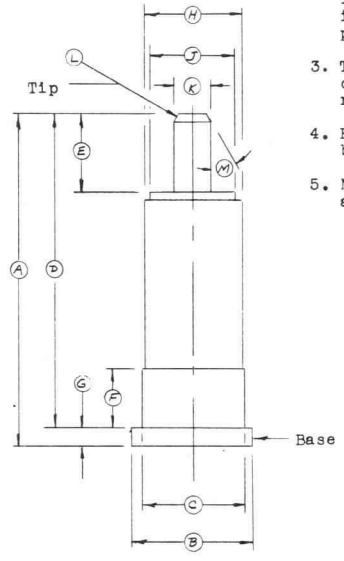
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.0db.

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac

SILICON DIODE

1N23DR | X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 1, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 2		---	---
4.14.1	Handling Precautions:	--------		---	---
5.1	Packaging And Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif :	350	450 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.3
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 3 RL=100±10 ohms; Zm=400+jo ohms; JAN Drawings 105, 106	Lc :	---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 3 RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :	---	1.7 times
------	Overall Noise Figure (Calc.):	Note 4	N :	---	8.5db
------	*Immersion:	Notes 5, 6	N :	---	9.5db
4.14.4.1	*Temperature:	Note 6	N :	---	9.5db
4.14.4.2	*Drop:	Height=30in; Note 6	N :	---	9.5db
4.14.4.3	*Torque:	Note 6	N :	---	9.5db
4.14.4.4	*Axial Strain:	Note 6	N :	---	9.5db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Each 1N23DR crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in such a manner as to be visible when the crystal is inserted in the crystal holder.

Note 3: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

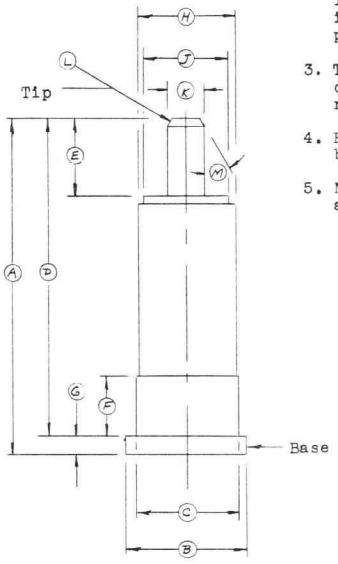
Note 4: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.5db.

Note 5: The crystal rectifiers shall be be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 6: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 4. The calculated Noise Figure shall be within the limit specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

1N23DMR X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Require for JAN Marking		---	---
3.7	Marking:	------		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging And Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif :	350	450 ohms
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.3
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc :	---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :	---	1.7times
------	Overall Noise Figure (Calc.):	Note 3	N :	---	8.5db
------	*Immersion:	Notes 4, 5	N :	---	9.5db
4.14.4.1	*Temperature:	Note 5	N :	---	9.5db
4.14.4.2	*Drop:	Height=30in; Note 5	N :	---	9.5db
4.14.4.3	*Torque:	Note 5	N :	---	9.5db
4.14.4.4	*Axial Strain:	Note 5	N :	---	9.5db
------	Matching:	Note 6		Note 7	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.0db.

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Note 6: Each crystal shall satisfy all requirements of this specification before matching.

Note 7: A pair of crystals consisting of a 1N23D and a 1N23DR crystal rectifier shall be considered matched when;

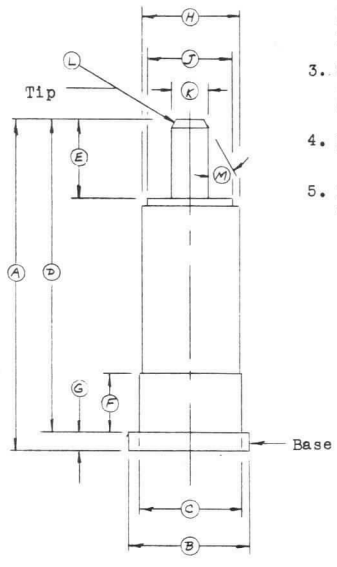
(a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.

(b) The VSWR of each crystal shall be less than 1.50.

(c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3 db.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac | **SILICON DIODE** | **1N23E** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 27, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	-------		---	---
4.14.1	Handling Precautions:	---------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E= 125Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io= 1.0mAdc; RL=100±10 ohms; Fif=60 cps; JAN Drawings 105, 106	Zif :	350	450
------	R.F. Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.3
------	Overall Noise Figure (Calc.);	Note 2	N :	---	7.5 db
------	*Immersion:	Notes 3, 4	N :	---	8.5 db
4.14.4.1	*Temperature:	Note 4	N :	---	8.5 db
4.14.4.2	*Drop:	Height =30 in; Note 4	N :	---	8.5 db
4.14.4.3	*Torque:	Note 4	N :	---	8.5 db
4.14.4.4.	*Axial Strain:	Note 4	N :	---	8.5 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1 latest issue.

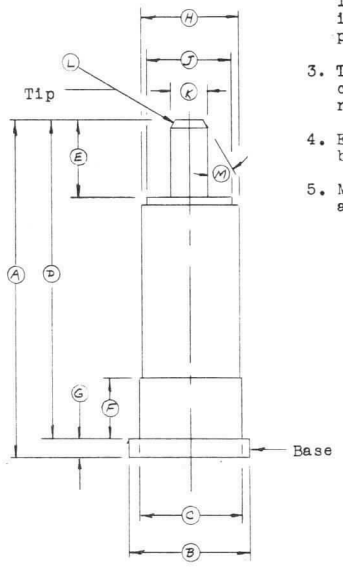
Note 2: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 1.5 db.

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test the Conversion Loss (B) and the Output Noise Figure (B) tests shall be conducted and the Overall Noise Figure (N) calculated using the formula specified in Note 2. The Calculated Noise Figure (N) shall be within the limit specified.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Bomac

SILICON DIODE

IN23ER | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 10, 1957

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.7	Marking:	Note 1		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc(min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60 cps; JAN Drawings 105, 106	Zif :	350	450
------	R.F. Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.3
------	Overall Noise Figure (Calc.):	Note 3	N:	---	7.5db
------	*Immersion:	Notes 4, 5	N :	---	8.5 db
4.14.4.1	*Temperature:	Note 5	N:	---	8.5 db
4.14.4.2	*Drop:	Height=30 in; Note 5	N:	---	8.5 db
4.14.4.3	*Torque:	Note 5, 6	N:	---	8.5 db
4.14.4.4	*Axial Strain:	Note 5	N:	---	8.5 db

Note 1: Each 1N23ER crystal rectifier shall be completely lettered in red including the word "reversed" which shall be marked on the body. A red dot shall be placed on the base of the crystal rectifier in each a manner as to be visible when the crystal is inserted in the crystal holder.

Note 2: References and notations are from Military Specification, Electron Tubes, MIL-E-1 latest issue.

Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 1.5 db.

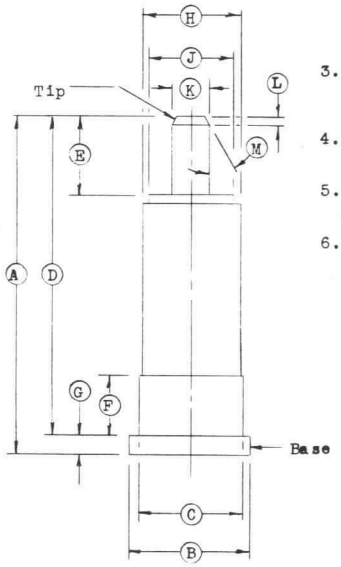
Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss (B) and the Output Noise Figure (B) tests shall be conducted and the Overall Noise Figure (N) calculated using the formula specified in Note 2. The Calculated Noise Figure (N) shall be within the limit specified.

Note 6: Torque applied to crystal with base off if base has set screw construction.

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.
6. As alternate design, base may have set screw.



Ref.	Dimension
A**	0.820 ±.020
B*	0.294 ±.002
C	0.250 +.000 -.004
D*	0.768 ±.015
E*	0.187 Min. .190 Max.
F*	0.196 ±.003
G*	0.052 ±.005
H*	0.240 Max.
J*	0.210 ±.015
K	0.093 ±.001
L*	0.015-0.030 Chamfer
M*	10° - 45° from vertical

This Outline is used for the following tubes:-

1N21D	1N23BM	1N23DRM
1N21DM	1N23CMR	1N23E
1N21DMR	1N23D	1N23ER
1N21DR	1N23DMR	
1N21E	1N23DR	

Bomac

SILICON DIODE

1N53 | **Ka**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	---	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	------	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=30Vdc (min.); JAN Drawing 108, 173	---	---
4.14.3.3	IF Impedance:	F= 34,860±140Mc; P/I=0.5±.02mAdc; Fif=60cps; JAN Drawing 174 Note 7	Zif : 400	800 ohms
------	RF Impedance:	F= 34,860±140Mc; P/I=0.5±.02mAdc; JAN Drawing 175 Note 8	σ : ---	1.6
4.14.3.1.2	Conversion Loss (B):	F= 34,860±140Mc; Pi=1.0mW; RL=100±10 ohms; Zm=500+ jo ohms; JAN Drawing 174; Notes 2, 5	Lc : ---	8.5 db
4.14.3.2.2	Output Noise Ratio (B):	F= 34,860±140Mc; P/I=0.5mAdc (min.) RL=100±10 ohms; Rc=300 ohms; JAN Drawing 175 Note 6	Nr : ---	2.5 times
------	*Immersion:	Conversion Loss(B);	Lc : ---	9.5 db
		Output Noise Ratio (B);	Nr : ---	3.5times
		IF Impedance; Notes 3, 7	Zif : 350	850 ohms
4.14.4.1	*Temperature:	Note 4		
4.14.4.2	Drop:	Height = 30 in; Note 4		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

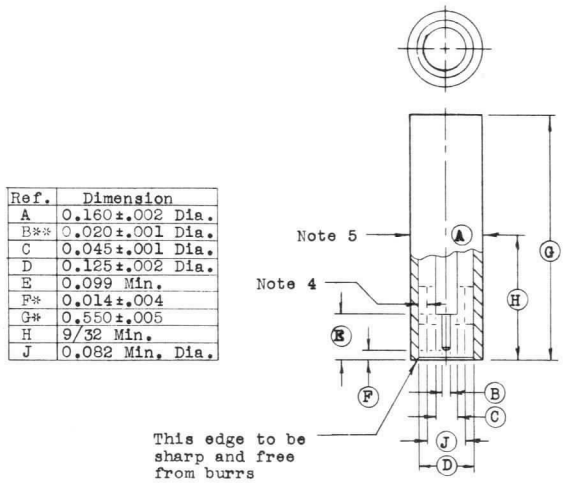
Note 4: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Note 5: With mixer terminated with load per attached drawing dated 6-15-56, the VSWR shall be less than 1.15.

Note 6: The plunger in the X-band noise-measuring apparatus per drawing 175 JAN shall be set at a position which delivers the maximum power as evidenced by maximum crystal current to an average crystal from a group of crystals that meet initial conversion loss, I-F Impedance and VSWR limits.

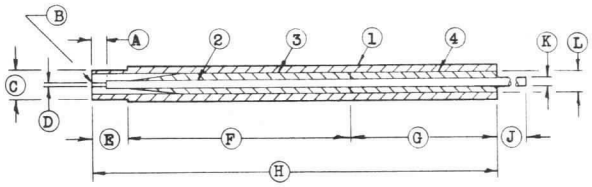
Note 7: When recheck measurements are made at locations other than the point of manufacture an addition of 50 ohms shall be allowed on the specified limits.

Note 8: When recheck measurements are made at locations other than the point of manufacture an addition tolerance of 0.2 in VSWR shall be allowed on the specified limits.



Ref.	Dimension
A	0.160±.002 Dia.
B**	0.020±.001 Dia.
C	0.045±.001 Dia.
D	0.125±.002 Dia.
E	0.099 Min.
F*	0.014±.004
G*	0.550±.005
H	9/32 Min.
J	0.082 Min. Dia.

Notes:-
1. Finish:
   All parts except inner conductor silver plated (.0001 Min.)
2. Polarity:
   Inner conductor - Cathode
   Outside shell - Anode
3. Axis of inner conductor and axis of outside diameter of outside shell must coincide within .002.
4. Space for matching transformer when used.
5. Outside diameter .160±.002 applies only to 9/32 length shown on outline sketch.



Ref.	Dimension	Ref.	Dimension
A	0.085±.005	F	1 1/2±1/64
B	End of part 2	G	1 1/64
	0.005x45 ±1/2	H	2 3/4±1/64
	Chamfer	J	2 Approx.
C	0.160±.002 Dia.	K	0.045±.001 Dia.
D	0.020±.005 Dia.	L	0.125±.001 Dia.
E	1/4±1/64		

Part 1. Sleeve - 3/16" O.D. Brass Tube. Inside Finish Smooth.
Part 2. Pin - #56(.0465") Dia. Drill Rod.
Part 3. Bushing - Soft Wood Slip Fit in Part 1; Snug Fit on Part 2. Tapered 9° at One End to Sharp Edge.
Part 4. Bushing - Moulded #7421 Durez.

Bomac

SILICON DIODE

1N78 | **Ku**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 20, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	---	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	------	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=50Vdc (min.); JAN Drawing 108, 104	---	---
4.14.3.3	IF Impedance:	F= 16,000±50Mc; P=1.0mw; RL=100±10 ohms; Fif=60cps to 1000cps; JAN Drawing 201 Note 2	Zif : 325	625 ohms
4.14.3.1.2	Conversion Loss (B):	F= 16,000±50Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=500+jo ohms; JAN Drawing 201 Note 5	Lc : ---	7.5 db
4.14.3.2.2	Output Noise Ratio (B):	F= 16,000±50Mc; P/I=0.5mAdc(min.); RL=100±10 ohms; Rc=300 ohms; JAN Drawings 105, 106, 114, 202	Nr : ---	2.5times
------	*Immersion:	Conversion Loss(B)	Lc : ---	8.5 db
		Output Noise Ratio (B)	Nr : ---	3.5times
		IF Impedance Note 3	Zif : 275	675 ohms
4.14.4.1	*Temperature:	Note 4		
4.14.4.2	*Drop:	Height=30 in; Note 4		

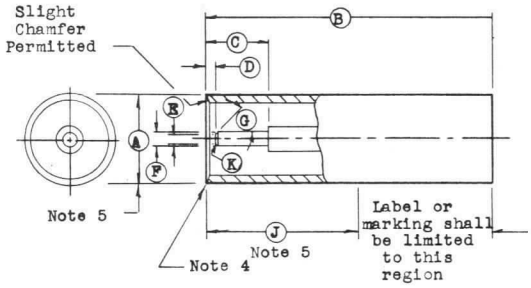
Note 1: References and notations are from Military Specification, Electron Tubes. MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test the Converstion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Note 5: Matched load, per drawing 201-JAN, shall have a maximum VSWR of 1.05: 1, and the mixer, per drawing 201-JAN, when terminated with the matched load, shall have a maximum VSWR of 1.10:1. The VSWR of the matched load may be measured by sliding it up and down within its outer conductor tubing, Part 2 of drawing 201-JAN, while observing the VSWR meter.



Ref.	Dimension	Ref.	Dimension
A	0.220 Max. 0.215 Min.	F	0.032±.001 Dia.
B*	3/4±1/64	G**	45°±3°
C	0.147 Min.	J*	13/32 Min.
D	0.028 Max. 0.011 Min.	K**	Alternate Shape
E**	0.012±.005 Dia.		0.012±.005 Rad.

Notes:-
**1. Finish:
.0002 tin plate over nickel flash, or .0001 silver plate, or .0001 gold plate.
2. Axis of center conductor not to deviate from axis of outer conductor referred to its outside diameter more than .004.
3. The polarity is such that sleeve is positive with respect to center conductor when current flows in the pass (forward) direction.
4. This edge to be sharp and free from burrs.
5. Outside dia. "dim.220-.215" applies to length 13/32 Min." as indicated.

Bomac

SILICON DIODE

1N149 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

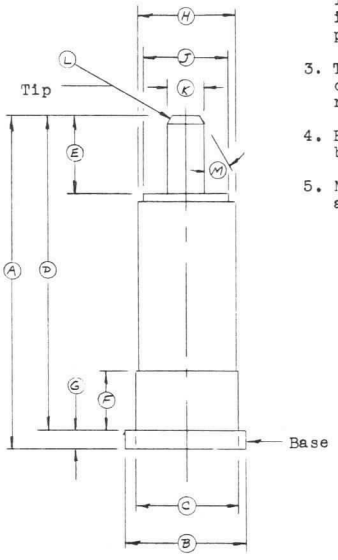
Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	------		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging And Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; Jan Drawings 105, 106	Zif :	325	475 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ :	---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc :	---	5.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms JAN Drawings 103, 105, 106, 114		---	1.5 times
------	*Immersion:	Notes 3, 4	Lc :	---	6.5db
			Nr :	---	2.5 times
4.14.4.1	*Temperature:	Note 4	Lc :	---	6.5db
			Nr	---	2.5 times
4.14.4.2	*Drop:	Height=30 inc; Note 4	Lc :	---	6.5db
			Nr	---	2.5times
4.14.4.3	*Torque:	Note 4	Lc :	---	6.5db
			Nr	---	2.5 times
4.14.4.4	*Axial Strain:	Note 4	Lc :	---	6.5db
			Nr :	---	2.5 times

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers, shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the performance shall be within the limits specified.



Ref.	Dimension
A**	.820±.020
B*	.294±.002
C	.250+.000-.004
D*	.768±.015
E*	.187 Min. .190 Max.
F*	.196±.003
G*	.052±.005
H*	.240 Max.
J*	.210±.015
K	.093±.001
L*	.015-.030 Chamfer
M*	30°-45° From Vertical

Notes:-

1. Normal Polarity - the path of easy current flow (conventional) is from base to pin. The base is positive with respect to the pin.
2. Reverse Polarity - the path of easy current flow (conventional) is from pin to base. The base is negative with respect to the pin.
3. Types with letters ending in MR consist of one normal and one reverse polarity diode.
4. Eccentricity between tip and base shall not exceed 0.0075.
5. Metal parts shall be gold plated a min. of 10 MSI.

Bomac — SILICON DIODE (R)

1N415B | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 14, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 5	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F=9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc :---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 9375±30Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN Drawings 103, 105, 106, 114	Nr :---	2.7times
------	*Immersion:	Notes 3, 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.1	*Temperature:	Note 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc--- Nr :---	7.5db 3.7times
4.14.4.3	*Torque:	Note 4	Lc :--- Nr :---	7.5db 3.7times
4.14.4.4	*Axial Strain:	Note 4	Lc :--- Nr :---	7.5db 3.7times

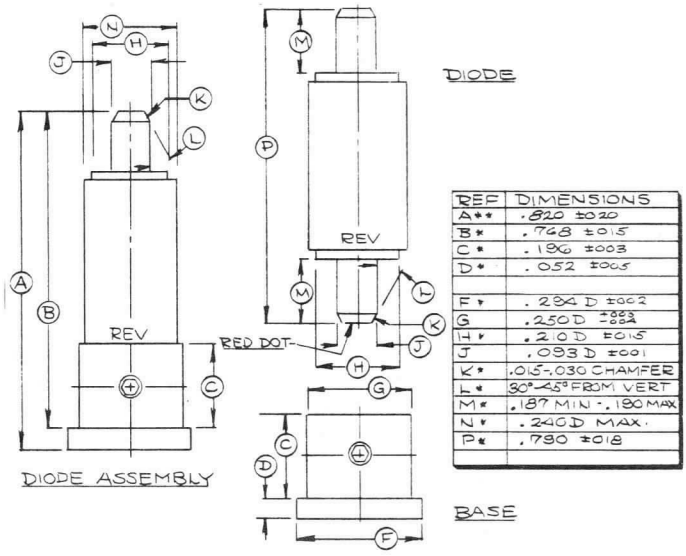
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath of 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N415B shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.284 D ±002
G	.250 D +.003 -.004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .180 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | **SILICON DIODE (R)** | **1N415C** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
SEPTEMBER 14, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 6	---	---
4.14.1	Handling Precautions:	----------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F= 9375 ±5 Mc; Io=1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN drawings 105, 106	Zif:325	475 ohm
---------	RF Impedance:	F=9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN drawings 105, 106	σ:---	1.5
4.14.3.1.2	Conversion Loss(B):	F=9375±5 Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400+jO ohms; JAN drawings 105, 106	Lc:---	6.0db
4.14.3.2.2	Output Noise Ratio (B):	F=9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; JAN drawings 103, 105, 106, 114	Nr:---	2.0 times
---------	Overall Noise Figure (Calc.):	Note 3	N: ---	10 db
---------	*Immersion:	Notes 4, 5	N: ---	11 db
4.14.4.1	*Temperature:	Note 5	N: ---	11 db
4.14.4.2	*Drop:	Height=30 in; Note 5	N: ---	11 db
4.14.4.3	*Torque:	Note 5	N: ---	11 db
4.14.4.4	*Axial Strain	Note 5	N: ---	11 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

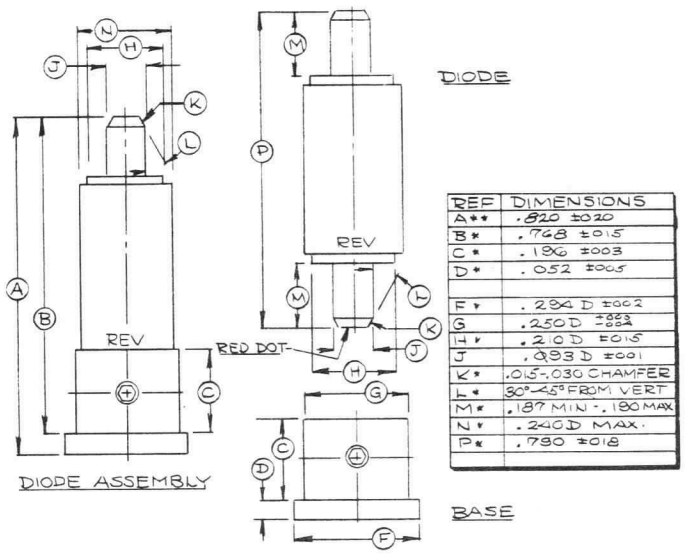
Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1.

Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc (Nif+Nr-1), where Nif is the assumed IF noise figure of 2.5 db.

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Note 6: Each 1N415C shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.294 D ±002
G	.250 D +.003 -.004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN -.190 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | **SILICON DIODE (R)** | **1N415D** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 14, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 6	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging And Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=90Vdc(min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F =9375±5Mc; Io =1.0mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 105, 106	Zif : 350	450 ohm
-----	RF Impedance:	F = 9375±5Mc; Io = 1.0mAdc; RL =100±10 ohms; JAN Drawings 105, 106	σ : ---	1.3
4.14.3.1.2	Conversion Loss (B):	F = 9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 105, 106	Lc : ---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F=9375±5Mc; Pi=1.0mW, Note 2; RL=100±10 ohms; Rc=300 ohms; Jan Drawings 103, 105, 106, 114	Nr : ---	1.7 times
-----	Overall Noise Figure (Calc.):	Note 3	N : ---	8.5db
-----	*Immersion:	Notes 4, 5	N : ---	9.5db
4.14.4.1	*Temperature:	Note 5	N : ---	9.5db
4.14.4.2	*Drop:	Height=30in. Note 5	N : ---	9.5db
4.14.4.3	*Torque:	Note 5	N : ---	9.5db
4.14.4.4	*Axial Strain:	Note 5	N : ---	9.5db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

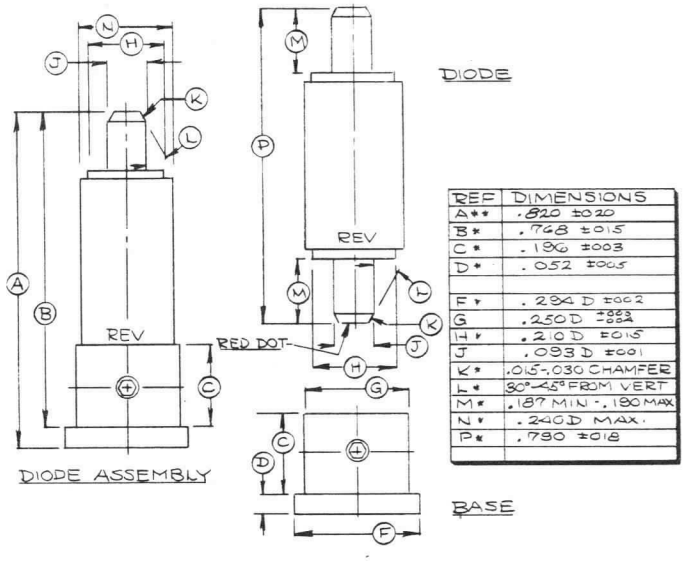
Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formula N=Lc(Nif+Nr-1), where Nif is the assumed IF noise figure of 2.0db.

Note 4: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 5: At the completion of this test the Conversion Loss(B) and the Output Noise Ratio(B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 3. The calculated Noise Figure shall be within the limit specified.

Note 6: Each 1N415D shall have a red dot placed on tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.294 D ±002
G	.250 D +.002 -.004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .190 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac

SILICON DIODE (R)

1N415E X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 27, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 5		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E= 125Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 9375±5Mc. Io=1.0mAdc; RL=100±10 ohms; Fif=60 cps; JAN Drawings 105, 106	Zif	:350	450 ohm
------	RF Impedance:	F= 9375±5Mc; Io=1.0mAdc; RL=100±10 ohms; JAN Drawings 105, 106	σ	:---	1.3
------	Overall Noise Figure (Calc.):	Note 2	N	:---	7.5 db
------	*Immersion:	Notes 3, 4	N	:---	8.5 db
4.14.4.1	*Temperature:	Note 4	N	:---	8.5 db
4.14.4.2	*Drop:	Height =30 in; Note 4	N	:---	8.5 db
4.14.4.3	*Torque:	Note 4	N	:---	8.5 db
4.14.4.4	*Axial Strain:	Note 4	N	:---	8.5 db

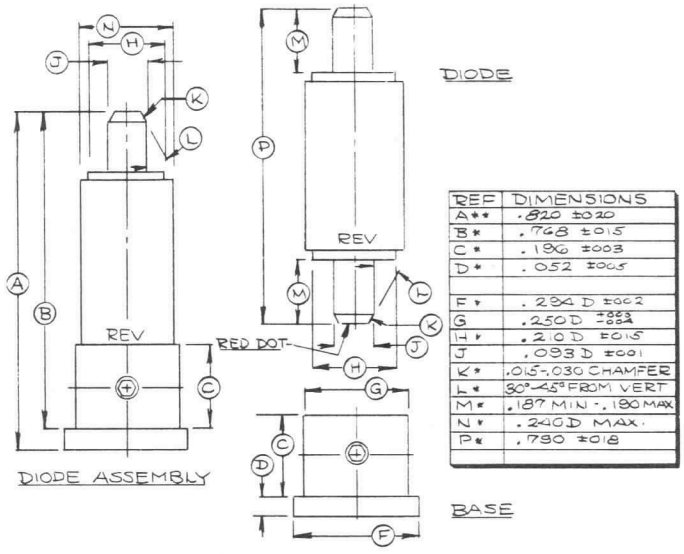
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1, latest issue.

Note 2: The Overall Noise Figure (N) shall be calculated from the values obtained in the Conversion Loss (B) and the Output Noise Ratio (B) tests using the formular N=Lc(Nif+Nr-1). where Nif is the assumed IF noise figure of 1.5 db.

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be tranferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test the Conversion Loss (B) and the Output Noise Ratio (B) tests shall be conducted, and the Overall Noise Figure (N) calculated using the formula specified in Note 2. The calculated Noise Figure shall be within the limit specified.

Note 5: Each 1N415E shall have a red dot placed on tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.284 D ±002
G	.250 D +.003 -.002
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN-.190 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | **SILICON DIODE (R)** | **1N416B** | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
OCTOBER 10, 1955

Dimensions: Per Outline

Ratings:	**Min.**	**Max.**
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 5	---	---
4.14.1	Handling Precautions:	--------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc : ---	6.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr : ---	2.0 times
4.14.3.6	Rectified Crystal Current:	--------	Io : 0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc : ---	7.5db
			Nr : ---	3.0times
4.14.4.1	*Temperature:	Note 4	Lc : ---	7.5db
			Nr : ---	3.0times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc : ---	7.5db
			Nr : ---	3.0times
4.14.4.3	*Torque:	Note 4	Lc : ---	7.5db
			Nr : ---	3.0times
4.14.4.4	*Axial Strain:	Note 4	Lc : ---	7.5db
			Nr : ---	3.0times

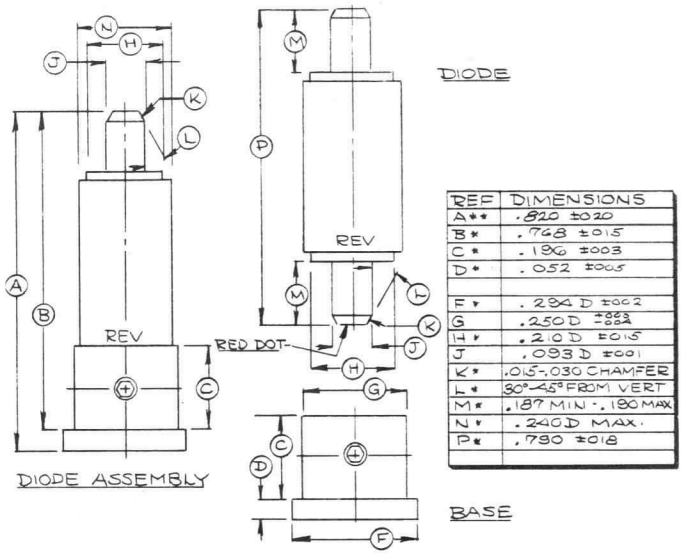
Note 1: References and notations are from Military Specification, Electron Tube, MIL-E-1B, 2 May 1952.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Output Noise Ratio (B) tests shall be conducted, and the performance shall be within the limits specified.

Note 5: Each 1N416B shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.294 D ±002
G	.250 D +.002 -.004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .190 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | SILICON DIODE (R) | 1N416BM | S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 10, 1956

Dimension: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 5		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc(min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 3060±5Mc. I_o=0.5mAdc; RL=100±10 ohms; Fif=60 cps; JAN Drawing 124, 125	Zif :	325	475 ohms
------	RF Impedance:	F= 3060±5Mc. I_o =0.5mAdc; RL=100±10 ohms; JAN Drawing 124, 125	σ :	---	1.7
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc :	---	6.5 db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr :	---	2.0 times
4.14.3.6	Rectified Crystal Current:	------	Io :	0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc :	---	7.5 db
			Nr :	---	3.0 times
4.14.4.1	*Temperature:	Note 4	Lc :	---	7.5 db
			Nr :	---	3.0 times
4.14.4.2	*Drop:	Height=30 in; Note 4	Lc :	---	7.5 db
			Nr :	---	3.0times
4.14.4.3	*Torque:	Note 4	Lc :	---	7.5 db
			Nr :	---	3.0 times
4.14.4.4	*Axial Strain:	Note 4	Lc :	---	7.5 db
			Nr :	---	3.0 times
------	Matching:	Note 6		Note 7	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N416B shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.

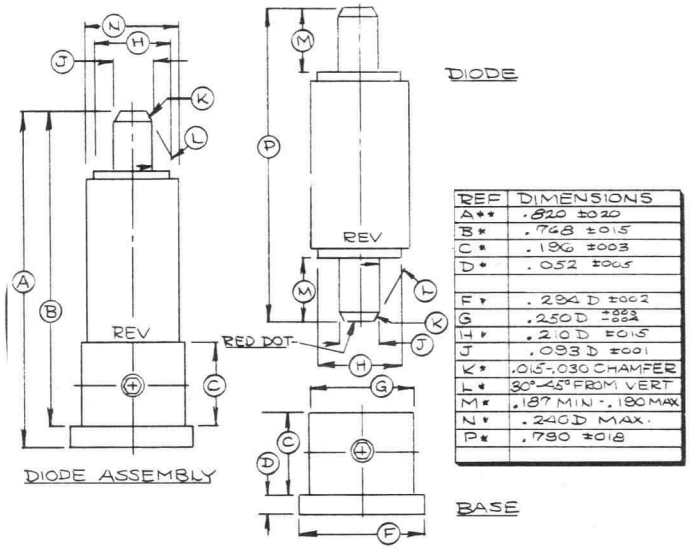
Note 6: Each crystal shall satisfy all requirements of this specification before matching.

Note 7: A pair of crystals consisting of two 1N416B rectifiers shall be considered matched when;

a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.

b) The VSWR of each crystal shall be below 1.70.

c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3 db.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C *	.196 ±003
D*	.052 ±005
F *	.284 D ±002
G	.250D +003 -004
H *	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN -.180 MAX
N *	.240D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | **SILICON DIODE (R)** | **1N416C** | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 10, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 5		---	---
4.14.1	Handling Precautions:	--------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108		---	---
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc :	---	5.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr :	---	1.5 times
4.14.3.6	Rectified Crystal Current:	--------	Io :	0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc : Nr :	--- ---	6.5db 2.5times
4.14.4.1	*Temperature:	Note 4	Lc : Nr :	--- ---	6.5db 2.5times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc : Nr :	--- ---	6.5db 2.5times
4.14.4.3	*Torque	Note 4	Lc : Nr :	--- ---	6.5db 2.5times
4.14.4.4	*Axial Strain:	Note 4	Lc : Nr :	--- ---	6.5db 2.5times

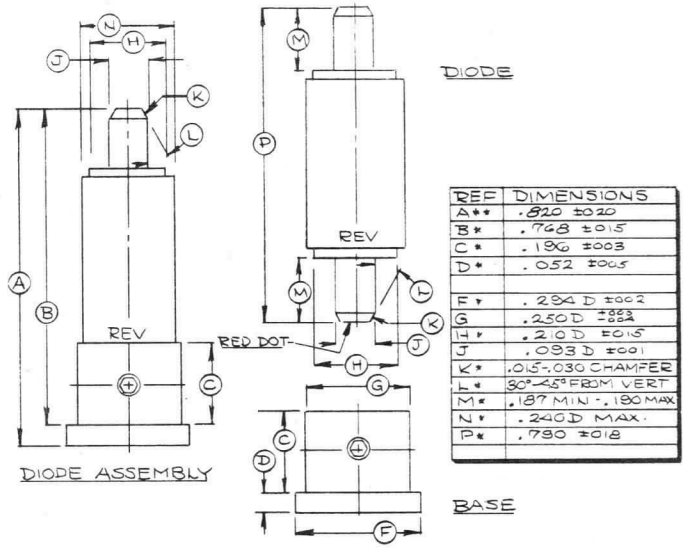
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1.

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N416C shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.284 D ±002
G	.250 D +003 -004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .180 MAX
N*	.240 D MAX.
P*	.780 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac

SILICON DIODE (R)

1N416CM | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 10, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
3.7	Marking:	Note 5	---	---
4.14.1	Handling Precautions:	------	---	---
5.1	Packaging and Packing:	(d); Package Group 5	---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108	---	---
4.14.3.3	IF Impedance:	F= 3060±5Mc Io=0.5mAdc RL= 100±10 ohms Fif=60 cps JAN Drawings 124, 125	Zif : 325	475
------	RF Impedance:	F= 3060±5Mc. Io=0.5mAdc RL=100±10 ohms JAN Drawings 124, 125	σ : ---	1.6
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc : ---	5.5db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc. Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr : ---	1.5 times
4.14.3.6	Rectified Crystal Current:	------	Io : 0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc : ---	6.5db
			Nr : ---	2.5times
4.14.4.1	*Temperature:	Note 4	Lc : ---	6.5db
			Nr : ---	2.5times
4.14.4.2	*Drop:	Height=30in; Note 4	Lc : ---	6.5db
			Nr : ---	2.5times
4.14.4.3	*Torque:	Note 4	Lc : ---	6.5db
			Nr : ---	2.5times
4.14.4.4	*Axial Strain:	Note 4	Lc : ---	6.5db
			Nr : ---	2.5times
------	Matching:	Note 6	Note 7	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N416C shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.

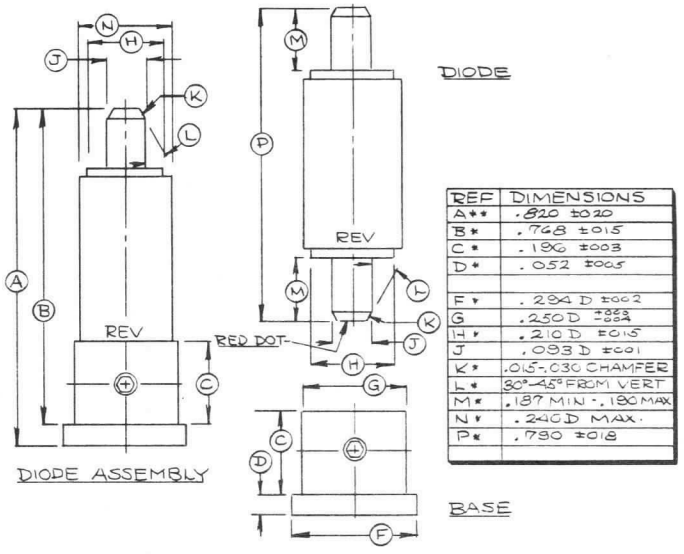
Note 6: Each crystal shall satisfy all requirements of this specification before matching.

Note 7: A pair of crystals consisting of two 1N416C rectifiers shall be considered matched when;

a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.

b) The VSWR of each crystal shall be below 1.60

c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.3 db.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.294 D ±002
G	.250 D +.353 -.354
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .190 MAX
N*	.240 D MAX.
P*	.790 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac | SILICON DIODE (R) | 1N416D | S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 5		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 3060±5Mc; Io=0.5mAdc; RL=100±10 ohms; Fif=60cps; JAN Drawings 124, 125	Zif :	325	475 ohms
------	RF Impedance:	F= 3060±5Mc; Io=0.5mAdc; RL=100±10 ohms; JAN Drawings 124, 125	σ :	---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc :	---	5.0db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings; 114, 124, 125	Nr :	---	1.3times
4.14.3.6	Rectified Crystal Current:	------	Io :	0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.1	*Temperature:	Note 4	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.2	*Drop:	Height=30 in; Note 4	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.3	*Torque:	Note 4	Lc :	---	6.0db
			Nr :	---	2.3times
4.14.4.4	*Axial Strain:	Note 4	Lc :	---	6.0db
			Nr :	---	2.3times

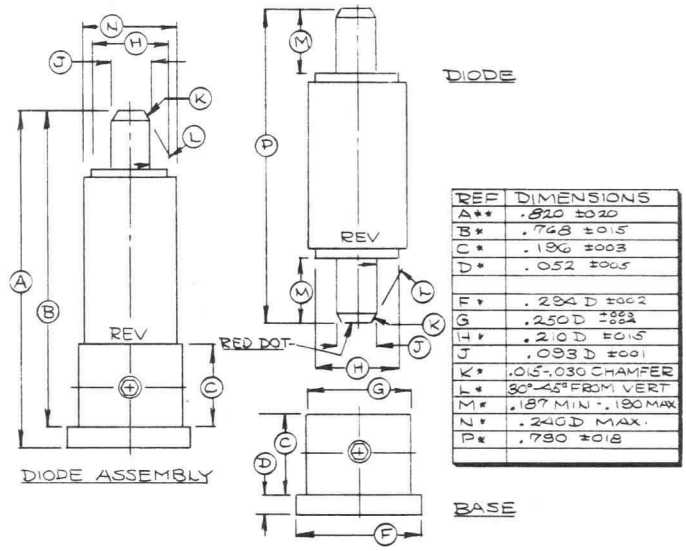
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: **Each 1N416D shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.**



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
E*	.284 D ±002
G	.250D +.003 -.004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .190 MAX
N*	.240D MAX.
P*	.780 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac — SILICON DIODE (R) — 1N416DM — S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 10, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Ambient Temperature	-40	+70°C
Altitude	---	Any

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
3.7	Marking:	Note 5		---	---
4.14.1	Handling Precautions:	------		---	---
5.1	Packaging and Packing:	(d); Package Group 5		---	---
4.14.2.1	Burnout by Dropping:	E=125 Vdc (min.); JAN Drawing 108		---	---
4.14.3.3	IF Impedance:	F= 3060±5Mc. I_o= 0.5mAdc R_L=100±10 ohms F_{if}= 60 cps JAN Drawings 124, 125	Zif :	325	475
------	RF Impedance:	F= 3060±5Mc I_o=0.5mAdc R_L=100±10 ohms JAN Drawings 124, 125	σ :	---	1.5
4.14.3.1.2	Conversion Loss (B):	F= 3060±5Mc. Pi=0.5mW, Note 2; RL=100±10 ohms; Zm=400±jo ohms; JAN Drawings 124, 125	Lc :	---	5.0 db
4.14.3.2.2	Output Noise Ratio (B):	F= 3060±5Mc; Pi=0.5mW, Note 2; RL=100±10 ohms; Rc=400 ohms; JAN Drawings 114, 124, 125	Nr :	---	1.3 times
4.14.3.6	Rectified Crystal Current:	------	Io :	0.4	---mAdc
------	*Immersion:	Notes 3, 4	Lc :	---	6.0 db
			Nr :	---	2.3 times
4.14.4.1	*Temperature:	Note 4	Lc :	---	6.0 db
			Nr :	---	2.3 times
4.14.4.2	*Drop:	Height=30 in. Note 4	Lc :	---	6.0 db
			Nr :	---	2.3 times
4.14.4.3	*Torque:	Note 4	Lc :	---	6.0 db
			Nr :	---	2.3 times
4.14.4.4	*Axial Strain:	Note 4	Lc :	---	6.0 db
			Nr :	---	2.3 times
------	Matching :	Note 6		Note 7	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The value of Pi, average input power, is determined by the rectified current of a calibrated group of crystals. See Ref. 4.14.3.1

Note 3: The crystal rectifiers shall be immersed for 15 minutes in a water bath at 40°C. At the conclusion of this period, they shall be transferred immediately to a water bath at 25°C and immersed for 15 minutes. The surface of the crystal rectifiers shall then be wiped dry and the required electrical tests shall be conducted within 1 hour.

Note 4: At the completion of this test, the Conversion Loss (B) and Noise Ratio (B) tests shall be conducted and the performance shall be within the limits specified.

Note 5: Each 1N416D shall have a red dot placed on one tip in such a manner as to be visible at the base end when the end cap is attached to end marked REV and the assembly is inserted in the crystal holder.

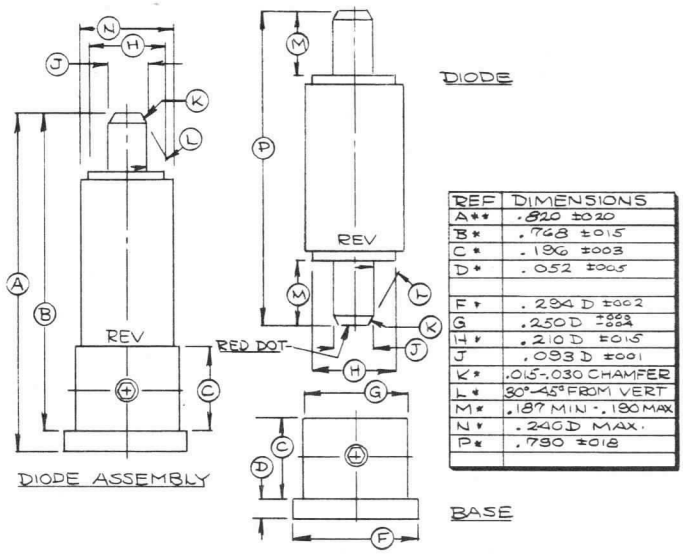
Note 6: Each crystal shall satisfy all requirements of this specification before matching.

Note 7: A pair of crystals consisting of two 1N416D rectifiers shall be considered matched when;

a) The IF Impedance of one crystal matches the IF Impedance of the other within 20 ohms.

b) The VSWR of each crystal is less than 1.5.

c) The Conversion Loss (B) of one crystal matches the Conversion Loss (B) of the other within 0.2 db.



REF	DIMENSIONS
A**	.820 ±020
B*	.768 ±015
C*	.196 ±003
D*	.052 ±005
F*	.284 D ±002
G	.250 D +003 -004
H*	.210 D ±015
J	.093 D ±001
K*	.015-.030 CHAMFER
L*	30°-45° FROM VERT
M*	.187 MIN - .190 MAX
N*	.240 D MAX.
P*	.780 ±018

NOTES:

I Polarity is indicated as follows:
- a. With the base secured to the contact pin at the unmarked end of the cartridge, the diode is of normal polarity. The path of easy current flow (conventional) is from base to pin.
- b. With the base secured to the contact pin marked with a red dot on the end of the pin and with the letters REV on the diode body, the cartridge is of reverse polarity. The path of easy current flow (conventional) is from pin to base.
- c. In either case the complete assembly meets the specified dimensions.

II Eccentricity between tip and base shall not exceed .0075.

III Metal parts shall be gold plated min. 10 MSI.

Bomac

PRESSURIZING WINDOW	
BL124	S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 21, 1955

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-48/U

Ratings:

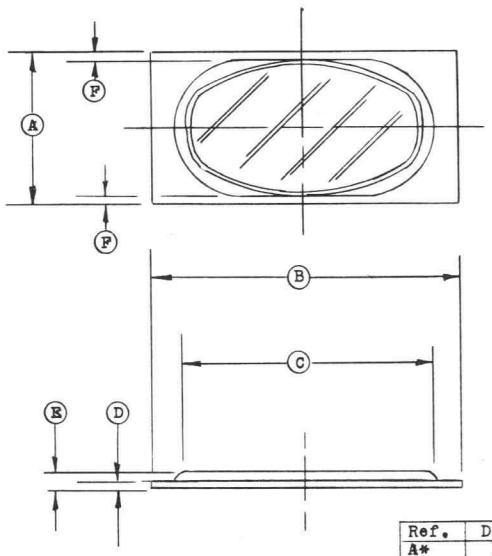
	Transmitter po	Pressure Differential
Min.:	-------	---------
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	--------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 2675Mc.	σ:---	1.10
		F= 2750	σ:---	1.07
		F= 2850	σ:---	1.07
		F= 2925Mc; σ'=1.02max.; Note 2	σ:---	1.10
4.18.4.2	*Insertion Loss:	F= 2800Mc; Note 2	Li:---	0.2db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions.
A*	1.500 ±?%
B*	3.000± ?%
C	2.600 Max.
D	.060
E*	.150 Max.
F	.080 Min.

Bomac

PRESSURIZING WINDOW

BL712 | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Dimensions: Per Outline

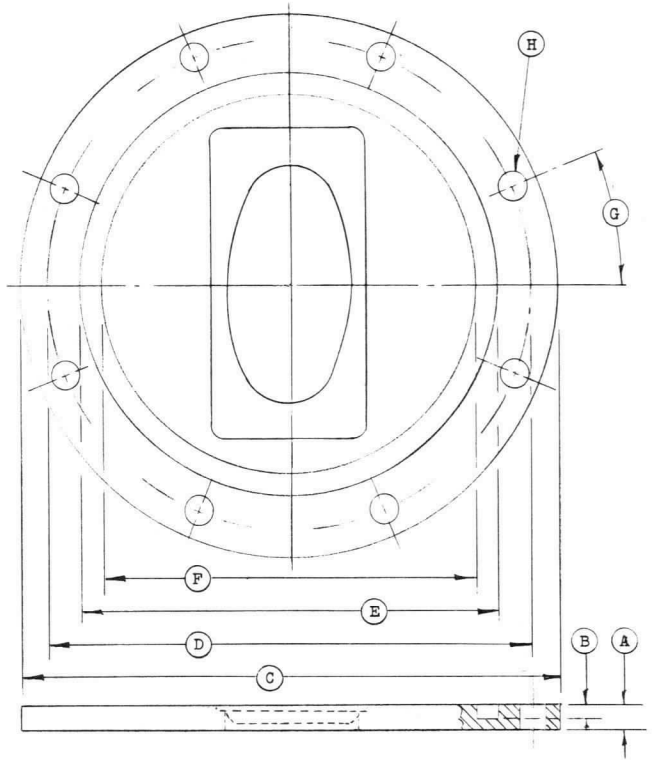
Mounting: Cover Flange UG53/U Waveguide: RG-48/U

Ratings:	Transmitter po	Pressure Differential
Min.:	-------	------
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 2800Mc.	σ : ---	1.2
		F= 3000Mc.	σ : ---	1.1
		F= 3200Mc.	σ : ---	1.2
		σ' =1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F= 3000Mc; Note 2	Li : ---	0.3db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 30October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.



Bomac

PRESSURIZING WINDOW

BL713 | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 8, 1955

Dimensions: Per Outline

Mounting: Choke Flange UG54A/U Waveguide: RG-48/U

Ratings:

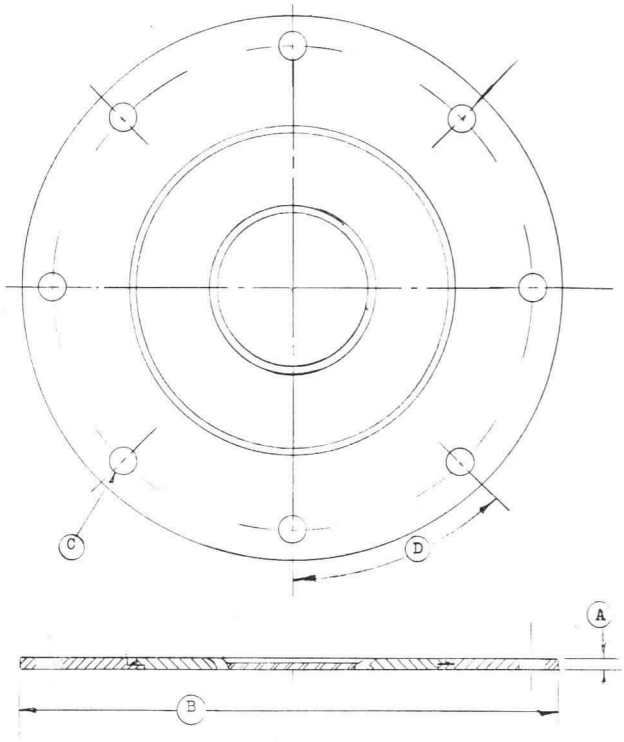
	Transmitter po	Pressure Differential
Min.:	---	---
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions		Min.	Max.
4.9.6	*Glass Strain:	---		---	---
4.18.18	Voltage Standing Wave Ratio:	F = 2600	σ :	---	1.2
		F = 2900	σ :	---	1.2
		F = 3150	σ :	---	1.1
		F = 3450	σ :	---	1.2
		F = 3700	σ :	---	1.2
		σ = 1.02 max. Note 2			
4.18.4.2	*Insertion Loss:	F = 3150Mc; Note 2	Li :	---	0.3db
------	Pressure Operation:	Note 3		---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	.100 ±.010
B	5.310 ±.010 Dia.
C*	.281 Dia. (8) holes on 4.750 B.C.
D*	45°

Bomac

PRESSURIZING WINDOW

BL741 | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Flange Waveguide: RG-48/U

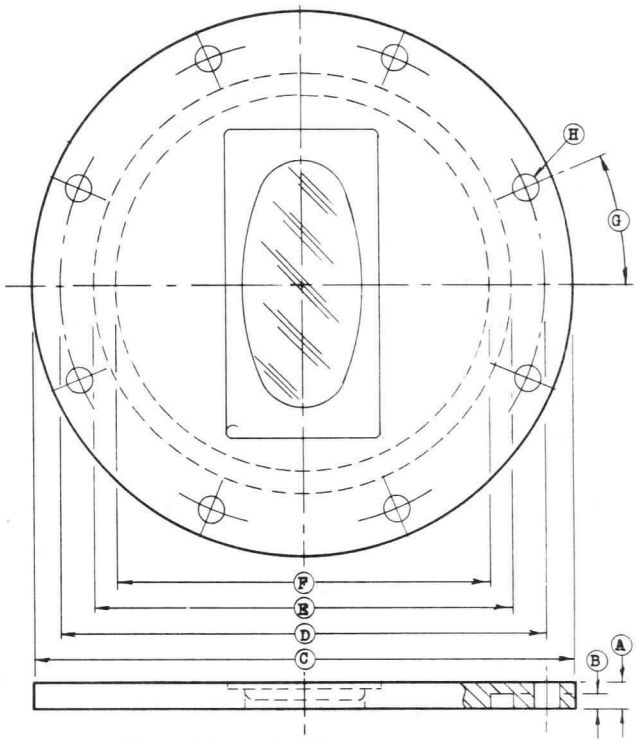
Ratings:	Transmitter po	Pressure Differential
Min.:	-----	------
Max.:	750 kw	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-----	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 2700 Mc;	σ : ---	1.20
		F= 2800	σ : ---	1.20
		F= 2900	σ : ---	1.20
		σ' =1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F= 2800Mc; Note 2	Li : ---	0.3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.si. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A*	0.250
B	0.165
C	5.312±.010 Dia.
D	4.750 Dia.
E	4.075 Dia.
F	3.625 Dia.
G	22°30'±1
H	9/32(.281) Dr.
	(8) Holes
	Equally Spaced

Bomac

PRESSURIZING WINDOW

BL134 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

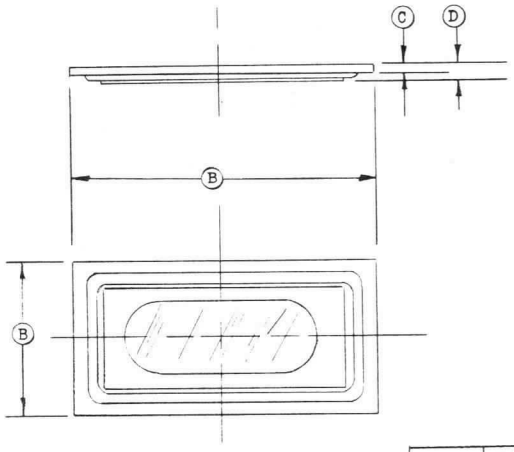
Ratings:	Transmitter po	Pressure Differential
Min.:	------	------
Max.:	To be specified	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5200 F= 5550 F= 5900 σ =1.02max.; Note 2	σ :--- σ :--- σ :---	1.20 1.20 1.20
4.18.4.2	*Insertion Loss:	F= 5550Mc; Note 2	Li :---	0.3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions
A*	.750
B*	1.500
C	.030
D	.075 Max.

KOVAR FINISH

Bomac

PRESSURIZING WINDOW

BL141 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 16, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-49/U

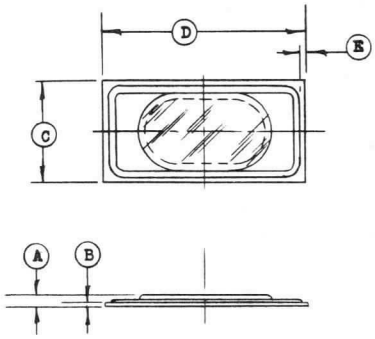
Ratings:	Transmitter po	Pressure Differential
Min.:	-----	-----
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions		Min.	Max.
4.9.6	*Glass Strain:	------		---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5100Mc	σ :	---	1.10
		F= 5150	σ :	---	1.07
		F= 5270	σ :	---	1.07
		F= 5320Mc; σ =1.02max.; Note 2	σ :	---	1.10
4.18.4.2	*Insertion Loss	F= 5210Mc; Note 2	Li :	---	0.2db
------	Pressure Operation:	Note 3		---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Kovar cleaned for soldering

Ref.	Dimensions.
A	.080 Max.
B	.030 ±.010
C*	1.000 ±.002
D*	2.000 ±.002
E	.070 Min. Typ.

Bomac

PRESSURIZING WINDOW

BL704 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 13, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-49/U

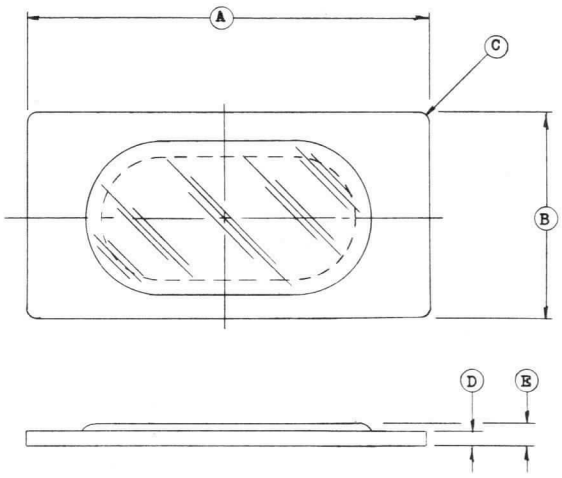
Ratings:	Transmitter po	Pressure Differential
Min.:	-------	-------
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-----	---	---
4.18.18	Voltage Standing Wave Ratio:	F = 4900Mc.	σ : ---	1.15
		F = 5000	σ : ---	1.10
		F = 5100	σ : ---	1.15
		σ' = 1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F = 5000Mc; Note 2	Li : ---	0.20db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	1.996
B	0.996
C	0.040 R ±.010
D	0.060
E	0.116 Max.

Bomac

PRESSURIZING WINDOW

BL742 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-49/U

Ratings:

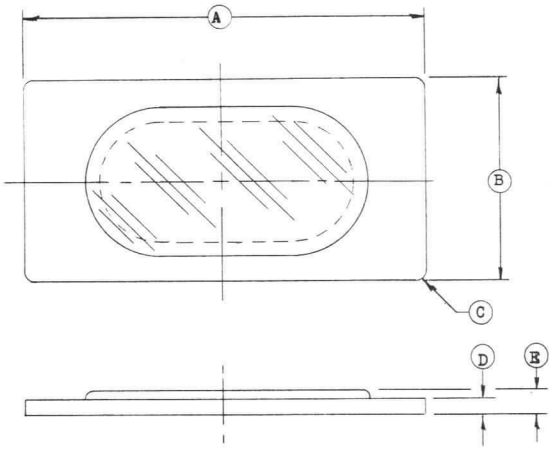
	Transmitter po	Pressure Differential
Min. :	------	-------
Max. :	750 kw	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain:	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F= 5450Mc.	σ : ---	1. 12
		F= 5575	σ : ---	1. 12
		F= 5700	σ : ---	1. 12
		F= 5825Mc.	σ : ---	1. 12
		σ' =1. 02max; Note 2		
4. 18. 4. 2	*Insertion Loss:	F= 5637Mc; Note 2	Li : ---	0. 3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Kovar Finish

Ref.	Dimension
A	2.000 ±.005
B	1.000 ±.005
C	3/32 Rad.
D	0.060 ±.005
E	0.100 Max.

Bomac

PRESSURIZING WINDOW

BL746 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 2, 1956

Dimensions: Per Outline

Mounting: Special Waveguide: RG-49/U

Ratings:

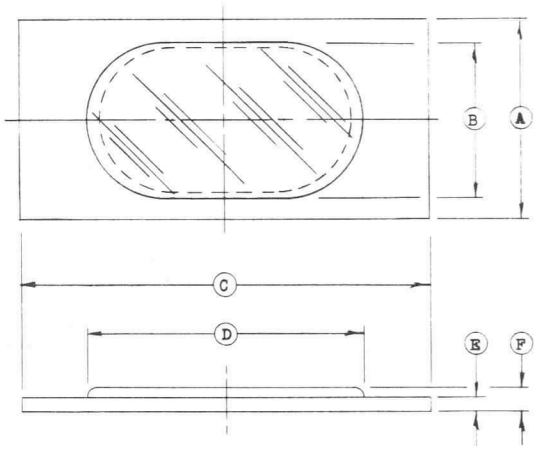
	Transmitter po	Pressure Differential
Min.:	-----	-----
Max.:	500 kw	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain:	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F= 5250Mc. σ :	---	1. 05
		F= 5280 σ :	---	1. 05
		F= 5310Mc. σ :	---	1. 05
		σ' = 1. 02 max.; Note 2		
4. 18. 4. 2	*Insertion Loss:	F= 5280Mc; Note 2	Li : ---	0. 30db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	1.000 ±.005
B	0.750 Ref.
C	1.872 ±.005
D	1.350 Ref.
E	0.060 ±.005
F	0.116 Max.

Bomac

PRESSURIZING WINDOW

BL107 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 17, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-51/U

Ratings:

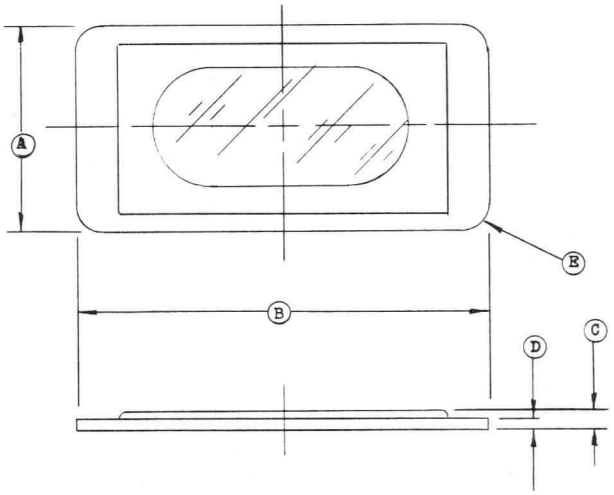
	Transmitter po	Pressure Differential
Min.:	-----	------
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-----	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9210Mc F= 9290 F= 9330 F= 9410Mc; σ'=1.02max.; Note 2	σ:--- σ:--- σ:--- σ:---	1.10 1.07 1.07 1.10
4.18.4.2	*Insertion Loss:	F= 9310Mc; Note 2	Li:---	0.2db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions.
A*	.625
B*	1.250
C	.060 Max.
D	.030
E	1/16 R. 4 corners

Bomac

PRESSURIZING WINDOW

BL112 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 13, 1955

Dimensions: Per Outline

Mounting: Choke Flanges, UG-40/U Waveguide: RG-52/U

Ratings:

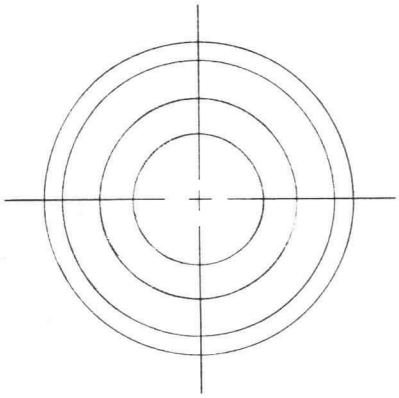
	Transmitter po	Pressure Differential
Min.:	------	---------
Max.:	To be specified	30 p.s.i.

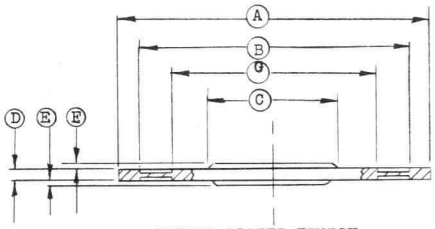
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8830Mc.	σ:---	1.10
		F= 8930	σ:---	1.07
		F= 9230	σ:---	1.07
		F= 9330Mc; σ=1.02max.; Note 2	σ:---	1.10
4.18.4.2	*Insertion Loss:	F= 9080Mc; Note 2	Li:---	0.2db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





SILVER PLATED FINISH

Ref.	Dimensions
A**	1.560 Dia.
B**	1.280 Dia.
C	3/4 Nom.
D*	.060
E	.025 Max.
G	.970 Dia.

Bomac

PRESSURIZING WINDOW

BL114 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 24, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-52/U

Ratings:	Transmitter po	Pressure Differential
Min.:	---	---
Max.:	To be specified	30 p.s.i.

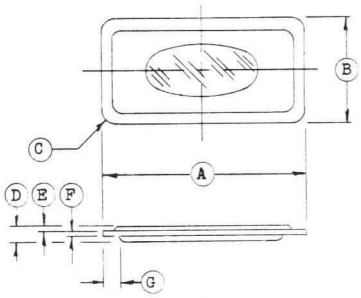
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9200Mc.	σ:---	1.10
		F= 9250	σ:---	1.07
		F= 9370	σ:---	1.07
		F= 9420Mc; σ'=1.02max.; Note 2	σ:---	1.10
4.18.4.2.	*Insertion Loss:	F= 9310Mc; Note 2	Li:---	0.10db
-------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.

Kovar Finish



Ref.	Dimension
A	1.000±.010
B	0.500±.010
C	1/64 Rad.
D	0.075 Max.
E	0.006±.003
F	0.030
G	1/32 Min. Glass Free Area

Bomac

PRESSURIZING WINDOW

BL117 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 23, 1954

Dimensions: Per Outline

Mounting: Choke Flanges, UG-40A/U Waveguide: RG-52/U

Ratings:

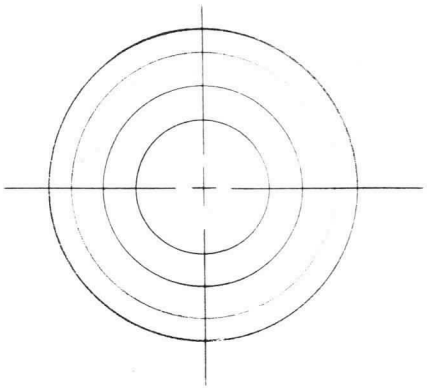
	Transmitter po	Pressure Differential
Min.:	-------	---------
Max.:	To be specified	30 p.s.i.

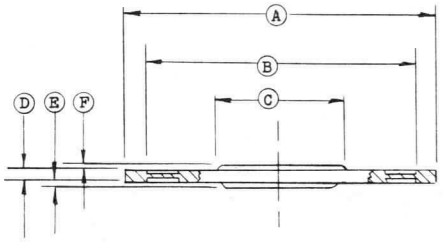
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8830Mc.	σ:---	1.10
		F= 8930	σ:---	1.07
		F= 9230	σ:---	1.07
		F= 9330Mc; σ'=1.02max.; Note 2	σ:---	1.10
4.18.4.2	*Insertion Loss:	F= 9080Mc; Note 2	Li:---	0.2db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





SILVER PLATED FINISH

Ref.	Dimensions.
A**	1.560 Dia.
B**	1.280 Dia.
C	3/4 Nom.
D*	.060
E	.010 Max.
F	.010 Max.

Bomac

PRESSURIZING WINDOW

BL119 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 13, 1955

Dimensions: Per Outline

Mounting: Choke Flanges, UG-40/U Waveguide: RG-52/U

Ratings:

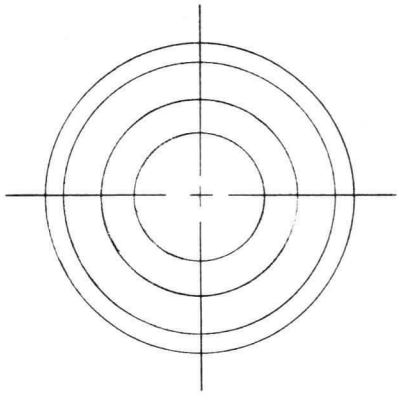
	Transmitter po	Pressure Differential
Min.:	---	---
Max.:	To be specified	30 p.s.i.

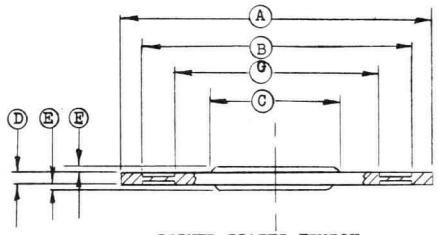
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8700Mc.	σ:---	1.10
		F= 8750	σ:---	1.07
		F= 8850	σ:---	1.07
		F= 8900Mc; σ'=1.02max.; Note 2	σ:---	1.10
4.18.4.2.	*Insertion Loss:	F= 8800Mc; Note 2	Li:---	0.2db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





SILVER PLATED FINISH

Ref.	Dimensions
A**	1.560 Dia.
B**	1.280 Dia.
C	3/4 Nom.
D*	.060
E	.025 Max.
G	.970 Dia.

Bomac

PRESSURIZING WINDOW

BL122 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

OCTOBER 21, 1954

Dimensions: Per Outline

Mounting: Choke Flanges, UG-40A/U Waveguide: RG-52/U

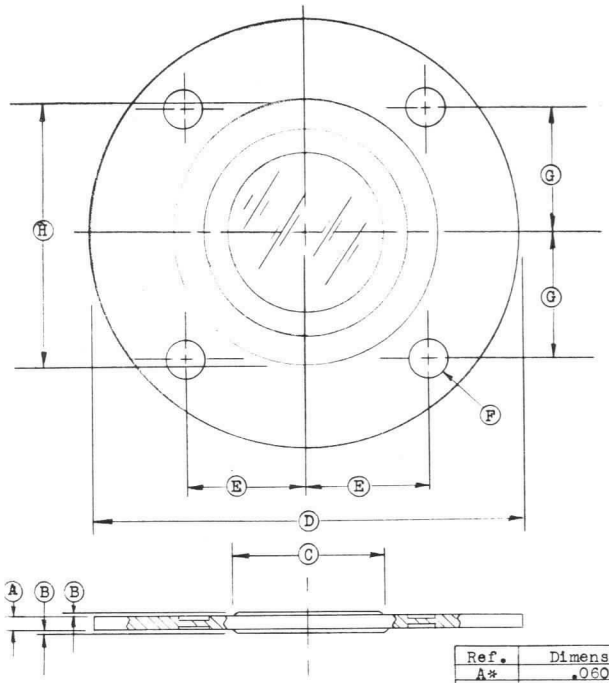
Ratings:	Transmitter po	Pressure Differential
Min.:	-----	-----
Max.:	To be specified	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain:	-----	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F= 8645 Mc. σ: F= 9555 Mc.; σ'=1. 02max.; Note 2	--- ---	1. 15 1. 15
4. 18. 4. 2	*Insertion Loss:	F= 9100 Mc; Note 2	Li : ---	0. 2db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



SILVER PLATED FINISH

Ref.	Dimensions
A*	.060
B	.010 Max.
C	3/4 Nom.
D	2.123 $\pm\frac{.003}{.000}$
E	.609
F	#16 (.177) Dr.(4)holes.
G*	.641
H	1.280

Bomac

PRESSURIZING WINDOW

BL125 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 24, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-52/U

Ratings: Transmitter po Pressure Differential
Min.: ------- ---------
Max.: To be specified 30 p.s.i.

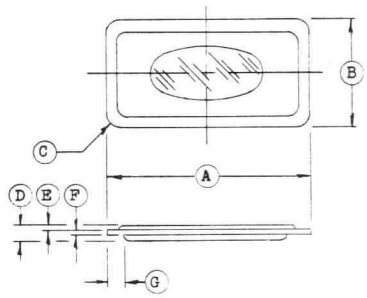
Ref.	Test	Conditions	Min.	Max.
4.9.6.	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9200Mc. F= 9250 F= 9370 F= 9420Mc; σ'=1.02max.; Note 2	σ:--- σ:--- σ:--- σ:---	1.10 1.07 1.07 1.10
4.18.4.2	*Insertion Loss:	F= 9310Mc; Note 2	Li:---	0.3db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.

Kovar Finish



Ref.	Dimension
A	1.000±.010
B	0.500±.010
C	1/64 Rad.
D	0.075 Max.
E	0.006±.003
F	0.030
G	1/32 Min. Glass
	Free Area

Bomac

PRESSURIZING WINDOW

BL126 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Special

Ratings:	Transmitter po	Pressure Differential
Min.:	------	------
Max.:	To be specified	50 p.s.i.

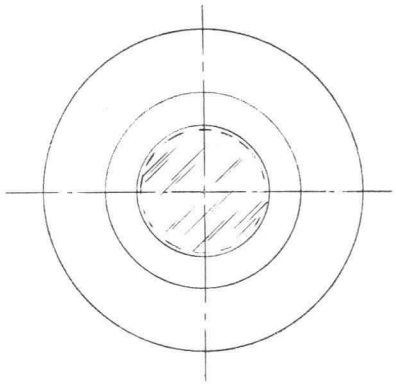
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9250Mc.	σ : ---	1.10
		F= 9327	σ : ---	1.10
		F= 9405	σ : ---	1.10
		σ' =1.02 max; Note 2		
4.18.4.2	*Insertion Loss:	F= 9327Mc; Note 2	Li : ---	0.3 db
------	Pressure Operation:	Note 3	---	---
------	*Temperature Cycle:	Note 4	Cycles: 1	---

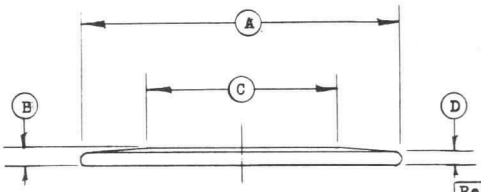
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 50 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.

Note 4: Cool in dry ice and acetone for 15 minutes and then place immediately in boiling water. The glass should not crack.





KOVAR FINISH

Ref.	Dimensions.
A*	1.560 D±.002
B	.050 ±.001
C	15/16 Dia.
D	.038 ±.002

Bomac

PRESSURIZING WINDOW

BL132 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 9, 1955

Dimensions: Per Outline

Mounting: Choke Flange UG 40A/U Waveguide: RG 52/U

Ratings:	Transmitter po	Pressure Differential
Min.:		---
Max.:	To be specified	30 psi

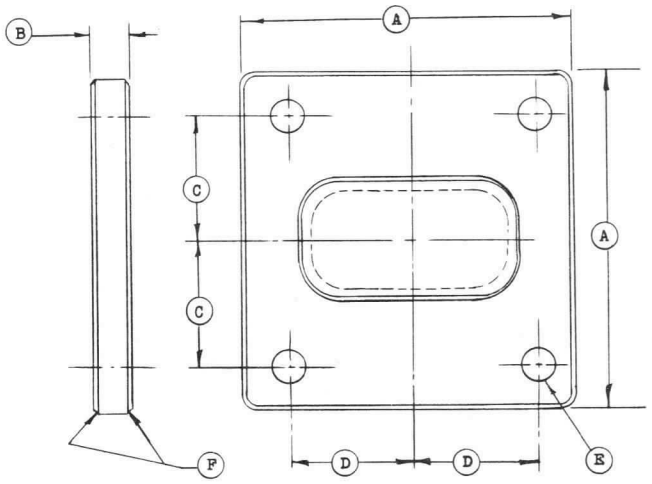
Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc	σ: ---	1.12
		F= 8565	σ: ---	1.09
		F= 9000	σ: ---	1.09
		F= 9487	σ: ---	1.09
		F= 9578Mc	σ: ---	1.12
		Note 2, 4		
4.18.4.2	*Insertion Loss:	F= 9000	Li: ---	0.2db
		Note 2		
------	Pressure Operation:	Note 3		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The face of the window bearing the mica to metal seal is made to look at the generator. There must be good electrical contact between the windows and its test mount.

Note 3: An air pressure differential of 30 psi shall be applied once to that side of the window bearing the mica to metal seal. The window will have no cracks as a result of this test.

Note 4: All frequencies to be measured within 0.1% of value specified.



Ref.	Dimensions.
A*	1.625 ±.015
B*	.166 ±015
C	.640
D	.610
E	19 (.166) Dr. (4) Holes.
F	Chamfered Edge

Bomac

PRESSURIZING WINDOW

BL136 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 3, 1956

Dimensions: Per Outline

Mounting: Solder

Waveguide: RG-52/U

Ratings:

	Transmitter po	Pressure Differential
Min.:	--------	----------
Max.:	To be specified	30 p. s. i.

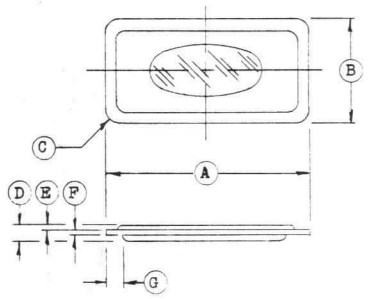
Ref.	Test	Conditions	Min.	Max.
4. 9. 6.	*Glass Strain:	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F=9400	6:---	1. 20
		F=9500	6:---	1. 20
		F=9600Mc	6:---	1. 20
		σ=1. 02max. ; Note 2		
4. 18. 4. 2	*Insertion Loss:	F=9500Mc; Note 2	Li:---	0. 3db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electeical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.

Kovar Finish



Ref.	Dimension
A	1.000±.010
B	0.500±.010
C	1/64 Rad.
D	0.075 Max.
E	0.006±.003
F	0.030
G	1/32 Min. Glass Free Area

Bomac

PRESSURIZING WINDOW

BL139 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Choke Waveguide: RG-51/U

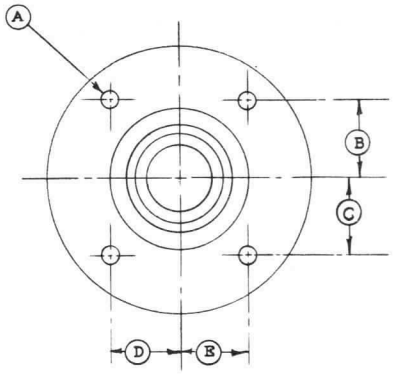
Ratings:	Transmitter po	Pressure Differential
Min.:	-----	------
Max.:	To be specified	30 p.s.i.

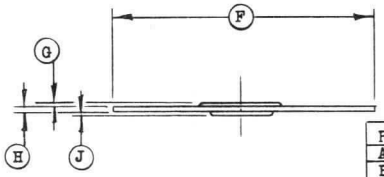
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :---	1.15
		F= 9100	σ :---	1.07
		F= 9600Mc.	σ :---	1.15
		$\acute{\sigma}$ =1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F= 9100Mc; Note 2	Li :---	0.3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





Ref.	Dimensions.
A	.187 $\pm^{.005}_{.000}$ D. 4 holes
B*	.737
C*	.737
D*	.676
E*	.676
F**	2.560 $\pm^{.005}_{.022}$ Dia.
G	.010 Max.
H	.010 Max.
J	.060

Bomac

PRESSURIZING WINDOW

BL145 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Choke Waveguide: RG-52/U

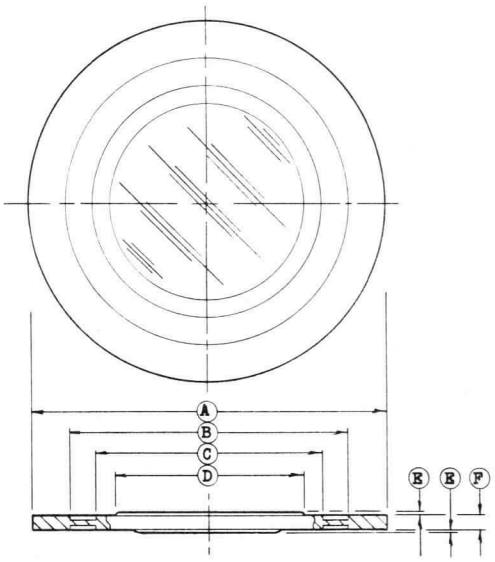
Ratings: Transmitter po Pressure Differential
Min.: ------ -------
Max.: To be specified 30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 9150Mc.	σ :---	1.10
		F= 9345	σ :---	1.07
		F= 9405	σ :---	1.07
		F= 9600	σ :---	1.10
		σ =1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F= 9375Mc; Note 2	Li :---	0.2 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions
A**	1.750 Dia.
B**	1.387 Dia.±.010
C	1.094 Dia.±.010
D	13/16 Dia. Nom.
E	0.010 Max.
F	0.060

Bomac

PRESSURIZING WINDOW

BL719 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

NOVEMBER 2, 1955

Dimensions: Per Outline

Mounting: Solder Waveguide: RG 52/U

Ratings: Transmitter po Pressure Differential

Min.: ---
Max.: To be specified 30 psi

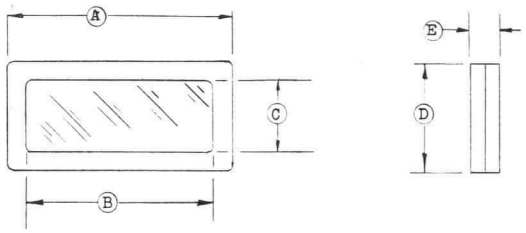
Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio:	F = 8200Mc.	σ : ---	1.08
		F = 9250	σ : ---	1.08
		F = 10300	σ : ---	1.08
		F = 12400	σ : ---	1.08
		Note 2, 4		
4.18.4.2	*Insertion Loss:	F = 9000	Li : ---	0.2db
		Note 2		
------	Pressure Operation:	Note 3		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: There must be good electrical contact between the windows and its test mount.

Note 3: An air pressure differential of 30 psi shall be applied once to the window. The window will have no cracks as a result of this test.

Note 4: All frequencies to be measured within 0.1% of value specified.



Ref.	Dimensions.
A	1.110
B	.900
C	.400
D	.600
E	.065

Bomac

PRESSURIZING WINDOW

BL123 | **X_b**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

SEPTEMBER 23, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-50/U

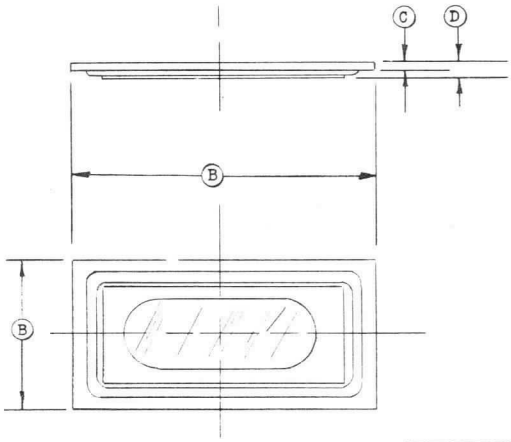
Ratings: Transmitter po Pressure Differential
Min.: ------ ------
Max.: To be specified 30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	-----	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 6150Mc.	σ:---	1.3
		F= 6500	σ:---	1.3
		F= 6850Mc; σ'=1.02max.; Note 2	σ:---	1.3
4.18.4.2.	*Insertion Loss:	F= 6500Mc; Note 2	Li:---	0.2db
--------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions
A*	.750
B*	1.500
C	.030
D	.075 Max.

KOVAR FINISH

Bomac

PRESSURIZING WINDOW

BL715 | **K**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1955

Dimensions: Per Outline

Mounting: Special

Waveguide: RG-53/U

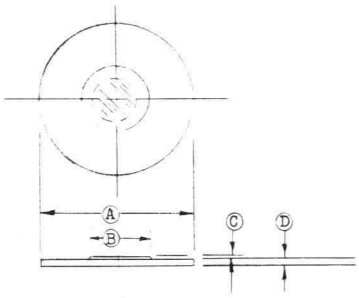
Ratings:	Transmitter po	Pressure Differential
Min:	---	---
Max:	To be specified	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6.	*Glass Strain:	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F=23. 1kmc F=24. 0kmc F=24. 9kmc σ=1. 02max. ; Note 2	σ:--- σ:--- σ:---	1. 20 1. 07 1. 20
4. 18. 4. 2	*Insertion Loss:	F=24. 0 Kmc; Note 2	Li:---	0. 3db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimensions.
A	.750 Dia.
B	.316 Dia. Ref.
C	.004 Max.
D	.030 ±.002

Bomac

PRESSURIZING WINDOW

BL116 | **K_u**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

NOVEMBER 16, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

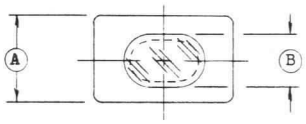
Ratings: Transmitter po Pressure Differential
Min.: ------ --------
Max.: To be specified 15 p.s.i.

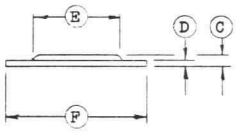
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 16,300Mc.	σ:---	1.10
		F= 16,400	σ:---	1.07
		F= 16,600	σ:---	1.07
		F= 16,700Mc; σ'=1.02max; Note 2	σ:---	1.10
4.18.4.2	*Insertion Loss:	F= 16,500Mc; Note 2	Li:---	0.2db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 15 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





Kovar Finish

Ref.	Dimension
A	0.385
B	9/32 Nom.
C	0.060 Max.
D*	0.030±.001
E	7/16 Nom.
F*	0.695

Bomac

PRESSURIZING WINDOW

BL143 | **K_u**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

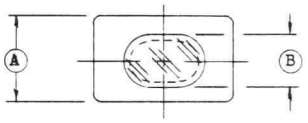
Ratings: Transmitter po Pressure Differential
Min.: ------- -------
Max.: 80 kw 15 p.s.i.

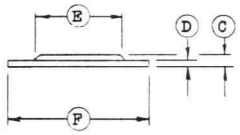
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 15,920Mc.	σ:---	1.10
		F= 16,000Mc.	σ:---	1.07
		F= 16,080Mc; σ'=1.02max.; Note 2	σ:---	1.10
4.18.4.2	*Insertion Loss:	F= 16,000Mc; Note 2	Li:---	0.2db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 15 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





Kovar Finish

Ref.	Dimension
A	0.385
B	9/32 Nom.
C	0.060 Max.
D*	0.030±.001
E	7/16 Nom.
F*	0.695

Bomac

PRESSURIZING WINDOW

BL144 K_u

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

NOVEMBER 18, 1954

Dimensions: Per Outline

Mounting: Choke Flanges, UG-541/U Waveguide: RG-91/U, RG-107/U

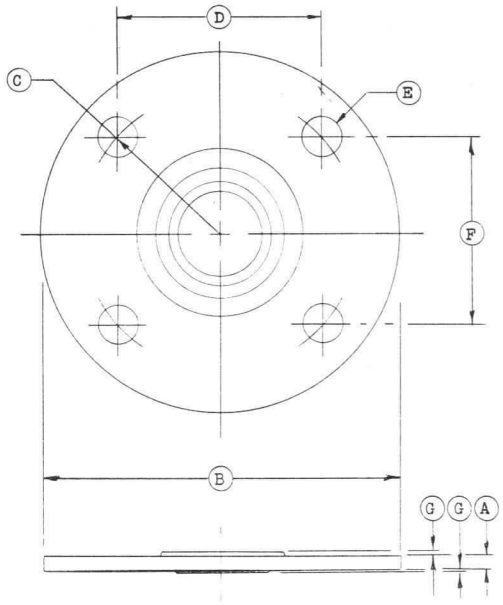
Ratings:,	Transmitter po	Pressure Differential
Min.:	----	-----
Max.:	100 kw	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain:	-----	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F= 15, 840Mc.	σ: ---	1. 08
		F= 16, 000Mc.	σ: ---	1. 08
		F= 16, 160Mc. ; σ'=1. 02max; Note 2	σ: ---	1. 08
4. 18. 4. 2	*Insertion Loss:	F= 16, 000Mc; Note 2	Li : ---	0. 2db
-----	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	0.060 ±.005
B**	1.750 ±.010 Dia.
C	0.690 Rad. B. C.
D*	0.995 Ref.
E	#28 (.141) Drill 4 Holes
F*	0.956 ±.005
G	0.005 Max.

Bomac

PRESSURIZING WINDOW

BL707 K_u

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

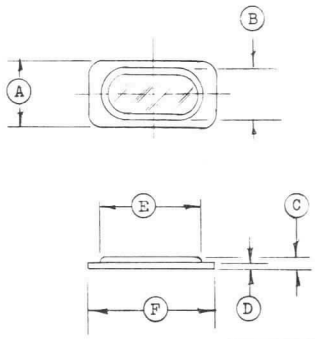
Ratings:	Transmitter po	Pressure Differential
Min.:	------	-------
Max.:	To be specified	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain:	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F= 13450Mc.	σ : ---	1. 10
		F= 13500	σ : ---	1. 10
		F= 13550Mc.	σ : ---	1. 10
		σ =1. 02max.; Note 2		
4. 18. 4. 2	*Insertion Loss:	F= 13500Mc; Note 2	Li : ---	0. 3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



KOVAR FINISH

Ref.	Dimension
A*	.310 ±.002
B	17/64 Nom.
C	.060 Max.
D*	.030 ±.002
E	1/2 Nom.
F*	.620 ±.002

Bomac

PRESSURIZING WINDOW

BL711 | **K_u**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 3, 1956

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

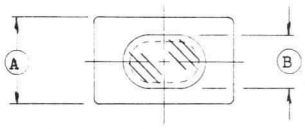
Ratings:	Transmitter po	Pressure Differential
Min. :	-------	----------
Max.:	To be specified	30 p. s. i.

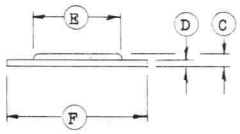
Ref.	Test	Conditions	Min.	Max.
4. 9. 6	*Glass Strain	------	---	---
4. 18. 18	Voltage Standing Wave Ratio:	F=12, 500Mc F=13, 000 F=13, 500 σ=1. 02 max. ; Note 2	σ:--- σ:--- σ:---	1. 25 1. 07 1. 25
4. 18. 4. 2	*Insertion Loss:	F=13, 000Mc; Note 2	Li: ---	0. 3db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





Kovar Finish

Ref.	Dimension
A	0.385 ±.005
B	9/32 Nom.
C	0.060 Max.
D*	0.030 ±.001
E	17/32 Nom.
F*	0.695 ±.005

Bomac

PRESSURIZING WINDOW

BL738 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 16, 1957

Dimensions: Per Outline

Description: Pressurizing Window

Mounting: Solder Waveguide: RG-49/U

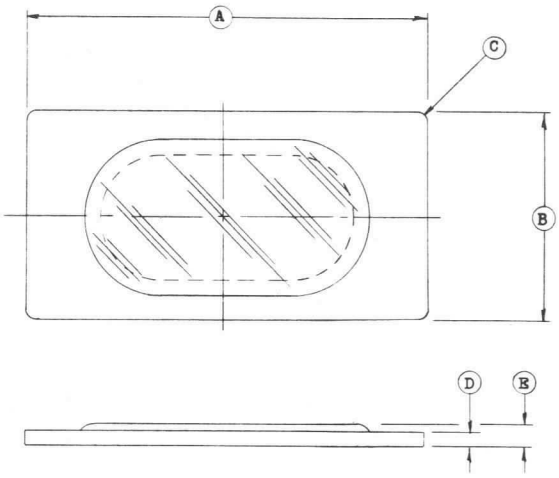
Ratings:	Transmitter po	Pressure Differential
Min.:	------	------
Max.:	To be specified	30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 5100Mc. F= 5500 F= 5900 $\acute{\sigma}$ =1.02 max.; Note 2	σ :--- σ :--- σ :---	1.25 1.25 1.25
4.18.4.2	*Insertion Loss:	F= 5500Mc; Note 2	Li :---	0.30db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	1.996
B	0.996
C	0.040 R ±.010
D	0.060
E	0.116 Max.

Bomac

PRESSURIZING WINDOW

BL722 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 1, 1957

Dimensions: Per Outline

Description: Mica Window — Waveguide: RG-51/U

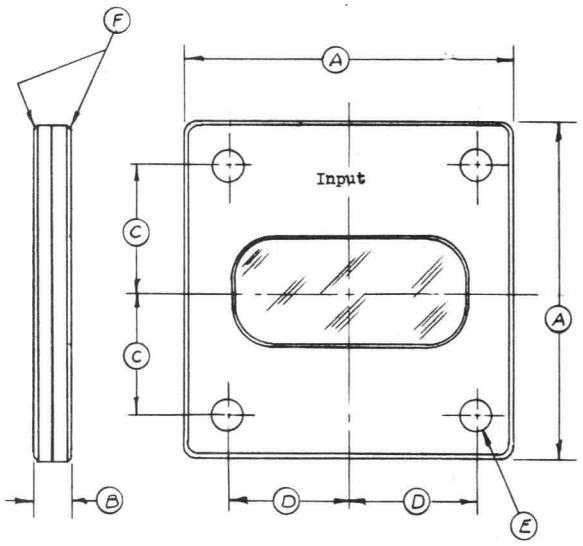
Ratings: Transmitter po — Pressure Differential
Min.: ------ — ------
Max.: To be specified — 30 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio:	F=8490Mc	σ: ---	1.12
		F=8565	σ: ---	1.10
		F=9000	σ: ---	1.10
		F=9487	σ: ---	1.10
		F=9578Mc; σ=1.02 max., Note 2	σ: ---	1.12
4.18.4.2	*Insertion Loss:	F=9000Mc; Note 2	Li:---	0.20db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: There must be good electrical contact between the window and its test mount. The window shall be mounted with input face toward the generator.

Note 3: An air pressure differential of 30 p.s.i. shall be applied to the input side of the window. The window must have no cracks as a result of this test.



REF.	DIMENSIONS
A	1.875 ±.015
B	.165 ±.015
C	.737 ±.002
D	.676 ±.002
E	#18 (.1695) DR (4 HOLES)
F	CHAMFERED EDGE

Bomac	PRESSURIZING WINDOW	
	BL751	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 6, 1957

Dimensions: Per Outline

Description: Mica Window Assembly   Waveguide: RG-52/U

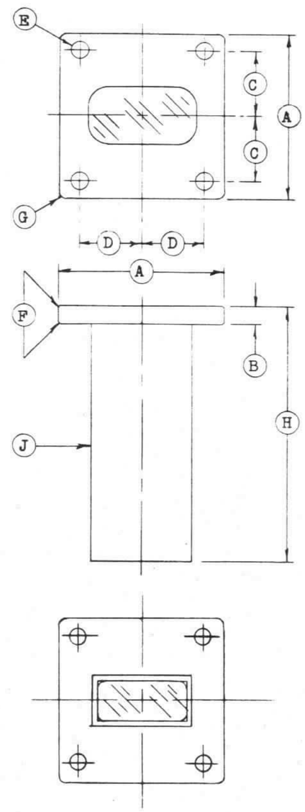
Ratings:	Transmitter po	Pressure Differential
Min:	------	------
Max:	To be specified	30 p. s. i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18.	Voltage Standing Wave Ratio:	F=8490Mc	σ: ---	1.12
		F=8565	σ: ---	1.10
		F=9000	σ: ---	1.10
		F=9487	σ: ---	1.10
		F=9578Mc; σ=1.02max., Note 2	σ: ---	1.12
4.18.4.2	*Insertion Loss:	F=9000Mc; Note 2	Li:---	0.20db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p. s. i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



Ref.	Dimension
A	1.625 ±.015
B	0.166 ±.015
C	0.640 ±.005
D	0.610 ±.005
E	7/32 (.218) Dr.
	4 Holes
F	0.010 x 45
	Chamfered Edge
G	0.062 ±.031 Rad.
H	2.500 ±.010
J	Steel Equivalent
	of RG 52/U
	Waveguide

Centerlines of guide and flange mounting holes shall be parallel within 1°.

Bomac

PRESSURIZING WINDOW

BL729 | K_u

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 25, 1957

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

Ratings;	Transmitter po	Pressure Differential
Min.:	------	-------
Max.:	To be specified	30 p.s.i.

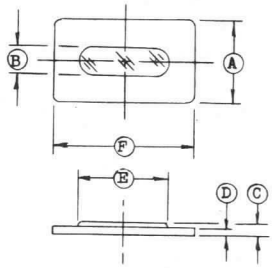
Ref.	Test	Conditions		Min.	Max.
4.9.6	*Glass Strain:	-------		---	---
4.18.18	Voltage Standing Wave Ratio:	F=13500 Mc ± 0.1% σ'=1.02max.; Notes 2, 4	σ:	---	1.07
4.18.4.2	*Insertion Loss:	F=13500Mc; ±0.1% Note 2	Li:	---	0.3 db
------	Pressure Operation:	Note 3		---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 30 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.

Note 4: At ±2000 mc from f=13,500 the signal must be attenuated a minimum of 3 db.



Ref.	Dimension
A*	0.385 ±.005
B	0.150 Nom.
C	0.060 Max.
D*	0.030 ±.005
E	0.437 Nom.
F*	0.695 ±.005

Kovar Finish

Bomac

PRESSURIZING WINDOW

BL754 K_u

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 6, 1957

Dimensions: Per Outline

Mounting: Solder Waveguide: RG-91/U

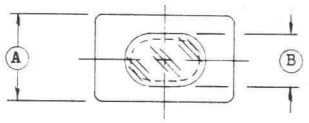
Ratings:	Transmitter po	Pressure Differential
Min.:	------	------
Max.:	80 Kw	15 p.s.i.

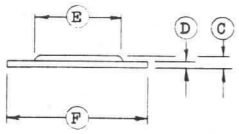
Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 16,000Mc.	σ :---	1.10
		F= 16,100Mc.	σ :---	1.07
		F= 16,200Mc.	σ :---	1.10
		σ́ =1.02max.; Note 2		
4.18.4.2	*Insertion Loss:	F= 16,100Mc; Note 2	Li :---	0.2 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 15 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.





Kovar Finish

Ref.	Dimension
A	0.385
B	9/32 Nom.
C	0.060 Max.
D*	0.030±.001
E	7/16 Nom.
F*	0.695

Bomac

PRESSURIZING WINDOW

BL737 K_A

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 1, 1957

Dimensions: Per Outline

Description: Pressurizing Window

Mounting: Solder Waveguide: RG-96/U

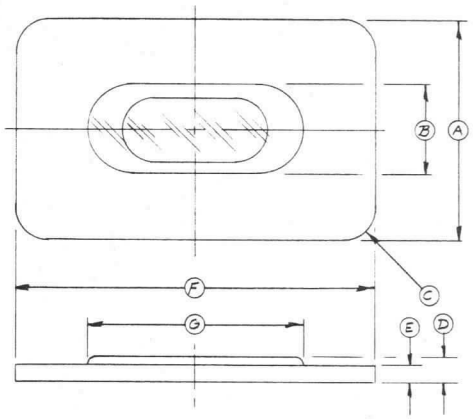
Ratings:	Transmitter po	Pressure Differential
Min.:	---	---
Max.:	To be specified	15 p.s.i.

Ref.	Test	Conditions	Min.	Max.
4.9.6	*Glass Strain:	------	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 34, 200Mc.	σ :---	1.15
		F= 34, 500Mc.	σ :---	1.07
		F= 34, 800 σ =1.02 max.; Note 2	σ :---	1.15
4.18.4.2	*Insertion Loss:	F= 34, 500Mc; Note 2	Li :---	0.3 db
------	Pressure Operation:	Note 3	---	---

Note 1: References and notations are from the latest issue Military Specification, Electron Tubes, MIL-E-1.

Note 2: That face of the window on which the glass to metal seal is made looks at the generator. There must be good electrical contact between the window and its test mount.

Note 3: An air pressure differential of 15 p.s.i. shall be applied once to each side of the window. The window must have no cracks as a result of this test.



KOVAR FINISH

REF.	DIMENSION
A	.214
B	3/32 NOM.
C	.030±.010R.
D	.030 MAX
E	.015
F	.354
G	7/32 NOM.

SPARK GAP
SURGE PROTECTORS

Bomac | **SPARK GAP** | **1B22**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 29, 1956

Description: Spark Gap Tube

Ratings	Fp	et	Ft	Es	ib	en	epy	Pulse Duration	Ib Note 1
Absolute	pps	kv	Mc	kVdc	a	kv	kv	μs	μAdc
Maximum:	1100	---	0.5	Note 4	75	---	2.7	0.75	75
Minimum:	300 Note 2	5.0	0.018	---	50	3.8 Note 3	--- Note 3	0.4 Note 9	---
Test Cond:	1100	5.0	0.2	---	65	---	---	0.75	55 Note 5

*Dimensions: As per Outline

Ref.	Test	Conditions	Min.	Max.
3.1	Type Approval Drop:	Required for JAN Marking		
4.9.19.1	**Vibration:	No voltage; 10G; F=50cps; t=60		
4.9.19.3	**Bump:	Angle = 10°		
	Start Voltage:	Note 6	Es : ---	2.4 kVdc
	Operation:	Note 7	Ebb : 2.0	3.0 kVdc
	Spark Distribution:	Ebb=2.1 kVdc; Note 8		

Note 1: Fp - Pulse Frequency in pulses per second.
Ft - Frequency of trigger voltage in megacycles.
et - Peak voltage of trigger pulse in positive direction.
en - Minimum peak voltage across any number of gaps in series for steady operation.
Es - Start voltage.

Note 2: Operating voltage must be reduced if higher pulse frequencies are used: eg maximum peak voltage is 2.5 kv at 1600 pps.

Note 3: Maximum peak voltage is on a per gap basis. By adding gaps in series, the operating range may be increased. Minimum peak voltages are the same for any number of gaps if proper trigger voltage and trigger coupling are provided.

Note 4: In two-tube circuits the design should provide for at least 2.5kVdc for starting to allow for increase in this characteristic during life. For circuits using more than two tubes, the starting voltage should be proportionately increased.

Note 5: Test shall be made in test circuit No. 1 or equivalent. The peak value of trigger voltage applied at 1100 pps shall be 5.0 kv ± 5%, as measured in the circuit without 1B22 tubes. It shall consist of a damped oscillatory wave with a decrement of 0.5 to 0.75 (ratio of amplitudes of successive positive waves). The maximum voltage amplitude shall be in the positive direction.

All test voltages shall be measured in terms of the dc supply which shall be continuously variable from 0 to 4000 volts.

Each tube shall be tested in the test set with a working standard which shall be placed in the ground position, and which is defined as follows:

Two tubes which, when tested as a pair in the test set, have a start voltage between 2.2 and 2.5 kVdc shall be set aside as standards. The tube in the ground position shall be used as a working standard and the other as a primary standard against which the working standard shall be checked periodically. These two tubes as a pair, shall satisfy the maximum and minimum operating voltage requirements. If, after having been used to test a number of production tubes, the working standard does not satisfy the above requirements, it shall be discarded and a new working standard chosen as specified.

Note 6: With the trigger voltages as specified, the d-c supply voltage shall be raised continuously from zero until the tubes operate intermittently as indicated by red flashes in the tubes or by the sudden dropping of the power supply voltage. The voltage at which this occurs shall be as specified. Tubes under test shall not have been operated for at least one hour prior to this test.

Note 7: The tube shall operate without intermittent arcing or irregular operation over the specified range.

With the trigger voltage as specified, the supply voltage shall be raised continuously to the upper limit of the range. The tube shall operate continuously for 10 seconds without arcing as evidenced by the operation of the protective relay in the power supply voltage. If a tube arcs, it shall be removed from the test circuit for a period of at least 15 minutes, after which period the above test may be repeated, only once, as a basis for acceptance.

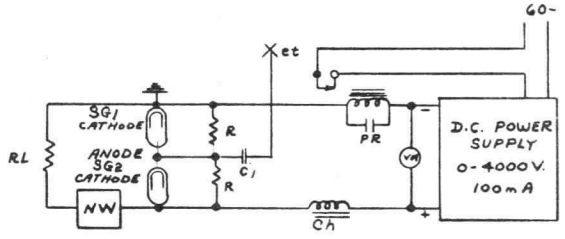
With the trigger voltage as specified, the tube shall be operated at 2.1 kVdc or more for at least 5 seconds. The d-c supply voltage shall then be reduced to the lower limit of the range and held at that point for 5 seconds. Irregular operation as evidenced by unsteadiness of the d-c supply voltage or noted by oscilloscopic means shall not occur during this 5-second interval.

Note 8: With the tube operating as specified, the distribution of the sparks shall be determined visually. The radial distribution of the sparks shall extend at least 90° around the anode, or the longitudinal distribution shall be such that the sparks travel substantially over the entire active length of the anode.

Note 9: Operation at pulse duration not greater than 2.25 μsec and at peak currents not greater than 70 amperes is permissible for continuous periods of not more than 3 hours, when such operation is preceded and followed by operation for much longer periods at a pulse duration of 0.75 microseconds, or less. If the total time of operation at greater than 0.75 microseconds exceeds 15% of the total operating time, the life of the tube will be materially shortened.

Note 10: References and notations are from Mility Specification Electron Tubes, MIL-E-1C 3 October 1955.

Ch - CHOKE 6 HENRIES ± 10% AT 75mAdc
C1 - 25 uuf. 10,000 V
et - TRIGGER VOLTAGE
NW - PULSE SHAPING NETWORK. 30 OHMS ± 5%.
0.75 us ± 10% PULSE LENGTH, 0.05 TO 0.1 us RATE OF RISE OF CURRENT.
R - 1 TO 3 MEGOHMS, 4000 Vdc.
RL - LOAD RESISTOR, 30 OHMS ± 5% 4000 Vdc, 150 WATTS, NON-INDUCTIVE.
PR - PROTECTIVE RELAY SET TO TRIP AT 150 mAdc.
SG1 - SPARK-GAP (1B-22) TUBE, WORKING STANDARD.
SG2 - SPARK-GAP (1B-22 TUBE, UNDER TEST
VM - dc VOLTMETER, 0-4000 V.



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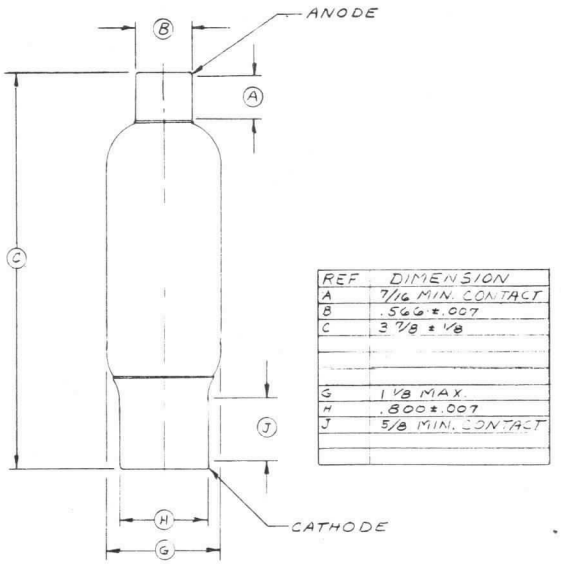


REF	DIMENSION
A	7/16 MIN. CONTACT
B	.566 ± .007
C	3 7/8 ± 1/8
G	1 1/8 MAX.
H	.800 ± .007
J	5/8 MIN. CONTACT

The terminals of the completed tube shall be capable of being inserted simultaneously into two coaxial cylinders. The cylinder for the large terminal being .820 dia x 5/8 long and the cylinder for the small terminal being .580 x 7/16 long.

Bomac

SPARK GAP

1B31

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 23, 1955

Description: Spark Gap Tube

		Note 1				Note 2		Note 3	Note 4
Ratings	ib	tp	prr	Ib	en	ex	et	Ft	Es
Absolute	a	μs	pps	mAdc	kv	kv	kv	Mc	KVdc
Maximum:	300	5	1600	0.150	--	4.6	10.0	0.5	---
Minimum:	30	0.25	200	---	7.3	---	5.0	0.1	---
Test Cond:	75	0.50	1000	0.075	---	---	8.0	0.2	---
*Dimension:	As per outline								Note 5

Ref.	Test	Conditions	Min.	Max.
4.9.19.2	**Vibration:	No voltages; 10G; F=50; t=120sec.		
------	Start Voltage:	Note 6	Es : ---	5.1KVdc
------	Operation:	Note 7	eb : 6.8	9.9kv

Note 1: The product of the pulse duration in seconds and pulse frequency in pulses per second (tp ppr) shall not exceed 0.001; the product of pulse frequency and peak current (t p ib) shall not exceed 120,000; the product of pulse duration and peak current (tp ib) shall not exceed 375×10^{-6} coulombs per pulse.

Note 2: Maximum peak voltage (ex) is on a per gap basis. By adding gaps in series the operating range may be increased. Minimum peak voltages (en) are the same for any number of gaps if proper trigger voltage and trigger coupling are provided.

The maximum peak voltage at high repetition rates and at high peak currents must be reduced. For example, at 1600 pps, or for peak currents of 300 amperes, the maximum peak voltage should not exceed 4.0kv per gap.

The values of en and ex specified in the Ratings are based upon a minimum value of 8.0kv for et, applied across A and B as shown in test circuit "T". With a different circuit, the minimum trigger voltage may have to be altered in order to obtain these values of en and ex.

Note 3: For operation at 1200-1600 pps the minimum of trigger frequency should be 0.2 megacycle.

Note 4: In two-tube circuits, design should provide for a starting voltage of at least 6.1KVdc to allow for increase in this characteristic during life. For circuits using more than two tubes, starting voltage should be proportionately increased.

Note 5: Tests shall be made in a circuit equivalent to that shown in Test Circuit "T". The peak value of the trigger voltage applied at 1000 pps shall be 8.0 kv 5% as measured in the circuit without the 1B31 tubes. It shall consist of a damped oscillatory wave with a decrement of 0.7 to 0.8 (ratio of amplitudes of successive positive waves.) The maximum voltage amplitude shall be in the positive direction.

The peak voltage (eb) shall be measured across two tubes in series as shown in Test Circuit "T" by means of a cathode ray oscilloscope or by a peak voltmeter. The start voltage (Es) shall be measured on the voltmeter connected across the continuously variable power supply. For convenience in checking the calibration of the oscillagraph or peak voltmeter the d-c power supply which has a nominal full load voltage of 7000 volts should have a maximum no lead voltage of at least 10,000 volts.

Each tube shall be tested in the test set with a working standard which shall be placed in the ground position and which is defined as follows:
Two tubes which, when tested as a pair in the test set, have a start voltage between 5.1 Kv and 5.7 Kv shall be set aside as standards. The tube in the ground position shall be used as a working standard and the other as a primary standard against which the working standard shall be checked periodically. These two tubes as a pair shall satisfy the maximum and minimum operating voltage requirements. If, after having been used to test a number of production tubes, the working standard does not satisfy the requirements specified above, it shall be discarded and a new working standard chosen as specified. A convenient means of obtaining tubes with high start voltages for use as standards is to build tubes with larger electrode diameter, keeping the electrode spacing and gas pressure the same as in the 1B31 tube.

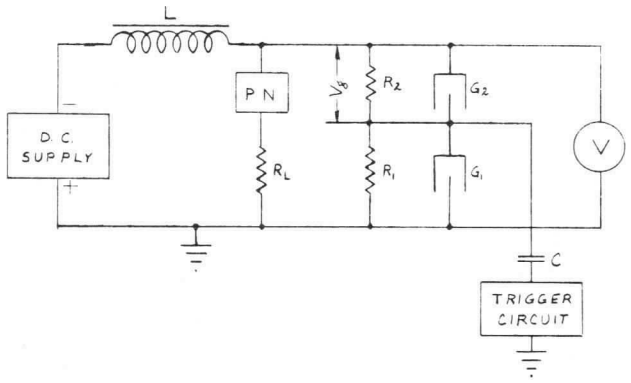
Note 6: With the trigger voltages as specified, the d-c supply voltage shall be raised continuously from zero until the tubes operate intermittently as indicated by the sudden dropping of the power supply voltage. The voltage at which this occurs shall be as specified. Tubes under test shall not have been operated for at least one hour prior to this test.

Note 7: The tube shall operate without intermittent arcing or irregular operation over the specified range. With trigger voltage as specified the supply voltage shall be raised continuously until the eb voltage reaches its upper limit and then held at that point for 10 seconds. Intermittent arcing as evidenced by the operation of the protective relay in the power supply circuit shall not occur during the 10 second interval.

With trigger voltages as specified the tube shall be operated at an eb voltage of 8.0kv for at least 10 seconds. The d-c supply voltage shall then be reduced until the eb voltage reaches its lower limit and then held at that point for 10 seconds. Irregular operation as noted by the cathode ray oscilloscope connected as shown in Test Circuit "T" shall not occur during this 10 second interval.

tp: Pulse duration in seconds
prr: Pulse frequency in pulses per second.
ib: Peak current flowing through gap.
en: Minimum peak voltage in kv across any number of gaps in series for steady operation.
ex: Maximum peak voltage in kv per gap
eb: Operating peak voltage in kv across any number of gaps in series.
et: Peak voltage of trigger pulse in positive direction
Ft: Frequency of trigger voltage in megacycles
Es: Start voltage

Note 8: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.



L	Charging Choke, 45 Henry
PN	1 μSec 50 OHM Pulse Network or .01 MFD Condenser
R_L	50 OHM load resistors
R_1 R_2	3 Meg OHM Resistors
G_2	Series Gap Under Test
G_1	Standard Series Gap
V	Peak Voltmeter
	Trigger Circuit, 100-300 KCS, Positive Voltage
C	60 μμf Condenser

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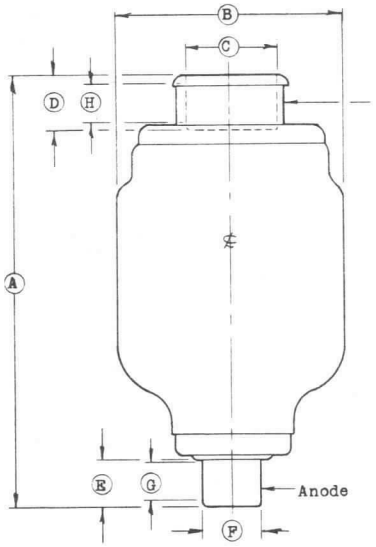
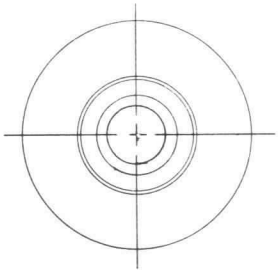


Note:-
The bulb shall not be eccentric by more than 3/64" and the contact surface of the terminals by more than 1/32" from centerline through the center of the anode and cathode terminals.

Ref.	Dimensions
A*	4 1/8±1/16
B*	2 1/4 Max.
C	0.884±.010
D	17/32 Max.
E	1/2 Max.
F*	0.566±.007
G	13/32 Min. Contact Area
H	11/32 Min. Contact Area
	Inside



Bomac

SPARK GAP

1B41

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Ratings: Absolute Max.	Duty Cycle	Pulse Width	Repetition Rate	Peak Current	Average Current
	.001	1μs	1000 pps	450 amps	210 mAdc
	.001	2μs	500 pps	320 amps	210 mAdc
	.001	5μs	200 pps	150 amps	130 mAdc

Ratings:

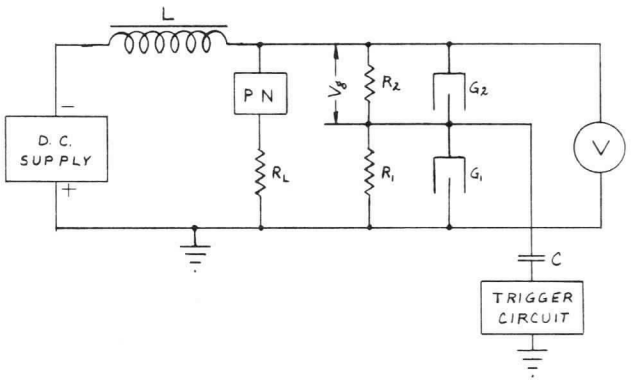
Usable Range	Initial Min.	Initial Max.	End of Life Min.	End of Life Max.
Note 2	13.0 kv	21.5 kv	13.0 kv	16.0 kv

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.5	Holding Period:	t=48 hours		
4.9.19.1	*Vibration:	No voltage		
4.9.19.2	**Vibration:	No voltage F= 50 cps; G=10; t=30 min.		
-----	Dynamic Breakdown Voltage:	Note 3	8.7	10.2 kVdc
4.11	Life Test:	Dynamic Breakdown Voltage; Group C	t :500	---hrs.
4.11.4	Life Test End Point:	Dynamic Voltage Breakdown	7.0	10.2 kVdc

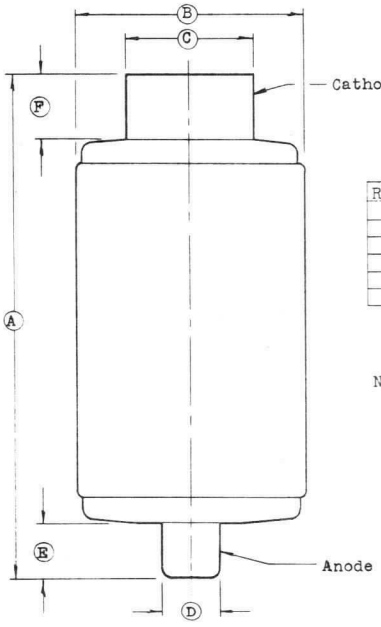
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: For three tubes in series operated at 2 μsec. 300 pps with adequate trigger voltages and with the voltages across the gaps reasonably well balanced at time of triggering. At the minimum of the usable range of voltage or above the gaps shall not fail to fire when triggered. At the maximum of the usable range or below the gaps shall not fire when not triggered.

Note 3: See Test Circuit "T"
The gap under test G2 shall be run in a two tube modulator circuit with a standard gap, G1. Adequate trigger voltage shall be provided at a repetition rate of 500 pps. The gap G1 shall have a breakdown voltage such that it will not break down until the voltage, across the gap G2 is between 15% and 30% above the maximum limit assuming G2 does not break down. The gaps shall be run near the bottom of the range for a minimum time of 2 minutes. The D.C. supply voltage shall then be raised and the top of the range measured. From the values of R_1 and R_2 and the capacitance in the circuit the voltage distribution shall be determined and the voltage calculated.



L	Charging Choke, 45 Henry
PN	1 μSec 50 OHM Pulse Network or .01 MFD Condenser
R_L	50 OHM load resistors
R_1 R_2	3 Meg. OHM Resistors
G_2	Series Gap Under Test
G_1	Standard Series Gap
V	Peak Voltmeter
	Trigger Circuit, 100-300 KCS, Positive Voltage
C	60 μμf Condenser



Ref.	Dimension
A	5" ±1/8
B*	2-3/8 Dia. Max.
C*	1.238+.025-.015 Dia.
D*	.566±.015
E*	9/16±1/32
F*	21/32±1/32

Note:-
Anode - Cathode eccentricity shall not exceed .010

Bomac

SPARK GAP

1B45

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Dimensions: Per Outline

Ratings: Absolute Max.	Duty Cycle	Pulse Width	Repetition Rate	Peak Current	Average Current
	.001	1μs	1000 pps	450 amps	210 mAdc
	.001	2μs	500 pps	320 amps	320 mAdc
	.001	5μs	200 pps	150 amps	150 mAdc

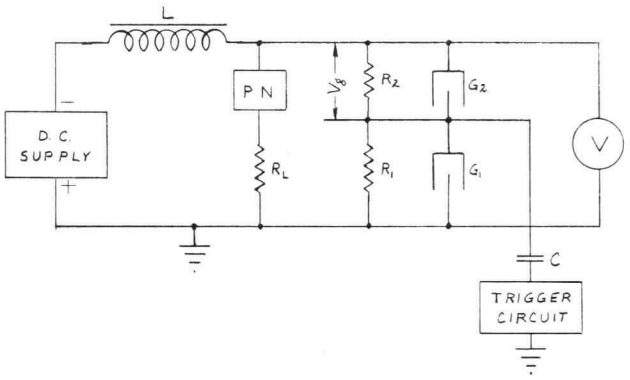
Ratings: Usable Range Note 2	Initial Min.	Initial Max.	End of Life Min.	End of Life Max.
	18.0kv	29.0 kv	18.0kv	24.0kv

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.5	Holding Period:	t=48 hours		
4.9.19.1	*Vibration:	No voltage		
4.9.19.2	**Vibration:	No voltage F=50cps; G=10; t=30min.		
------	Dynamic Breakdown Voltage:	Note 3	14.5	16.5 kVdc
4.11	Life Test:	Dynamic Breakdown Voltage; Group C	t :500	---hrs.
4.11.4	Life Test End Point	Dynamic Breakdown voltage	11.6	16.5 kVdc

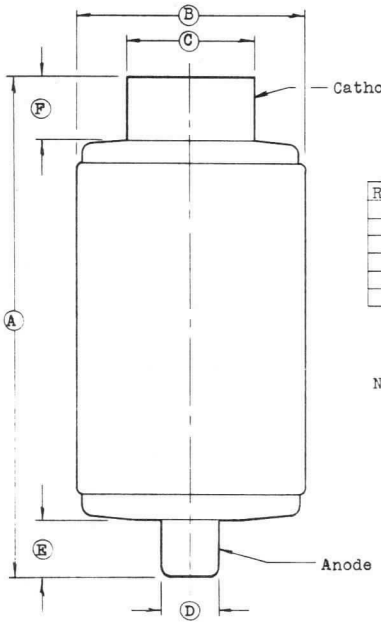
Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: For three tubes in series operated at 1μsec. 1150 pps. with adequate trigger voltages and with the voltage across the gaps reasonably well balanced at time of triggering. At the minimum of the usable range of voltage or above the gaps shall not fail to fire when triggered. At the maximum of the usable range or below the gaps shall not fire when not triggered.

Note 3: See Test Circuit "T"
The gap under test G2 shall be run in a two tube modulator circuit with a standard gap, G1. Adequate trigger voltage shall be provided at a repetition rate of 500 pps. The gap G1 shall have a breakdown voltage such that it will not break down until the voltage, across the gap G2 is between 15% and 30% above the maximum limit assuming G2 does not bread down. The gaps shall be run near the bottom of the range for a minimum time of 2 minutes. The D.C. supply voltage shall then be raised and the top of the range measure. From the value of R_1 and R_2 and the capacitance in the circuit the voltage distribution shall be determined and the voltage, calculated.



L	Charging Choke, 45 Henry
PN	1 μSec 50 OHM Pulse Network or .01 MFD Condenser
R_L	50 OHM load resistors
R_1 R_2	3 Meg OHM Resistors
G_2	Series Gap Under Test
G_1	Standard Series Gap
V	Peak Voltmeter
	Trigger Circuit, 100-300 KCS, Positive Voltage
C	60 μμf Condenser



Ref.	Dimension
A	5"±1/8
B*	2-3/8 Dia. Max.
C*	1.238+.025-.015 Dia.
D*	.566±.015
E*	9/16±1/32
F*	21/32±1/32

Note:-
Anode - Cathode eccentricity shall not exceed .010

Bomac

SPARK GAP

BL146

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 5, 1955

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position in Silicone Oil, Dow Corning DC-550, 100-150 centistokes.

Ratings:	Min.	Max.
Breakdown Voltage	32	--- kv
Hold-off Voltage	---	35 kv
Ambient Temperature	To be specified	+100°C
Ambient Pressure (In oil)	0.5	20 p.s.i.a.

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
------	Breakdown Voltage:	Notes 2, 3	epy :	32	---kv
------	Hold-off Voltage:	Notes 2, 3	epy :	---	35 kv
------	Breakdown Time:	epy=27kv; Notes 2, 4, 5	t :	---	0.4μs
------	De-ionization:	Notes 2, 6	Δepy :	---	2.0kv
------	Conduction Voltage Drop:	epy=30kv; Notes 2, 4	etd :	---	2.0kv
------	**Shelf Life Test:	t=5 years; Note 7		---	---
4.11	Life Test (1):	epy=30kv; Notes 2, 8	t :	500	---hrs.
4.11	Life Test (2):	epy=30kv; Notes 2, 4, 9	t :	12	---hrs.
4.11.4	Life Test (1 and 2) End Point:	--------			Note 10

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.

Note 4: After the specified epy is adjusted, the power shall be shut off and the load resistor removed from the circuit. The power is then applied instantaneously and the tube under test shall break down. The rise time of the instantaneous voltage pulse is to be specified. This test shall not be run for more than 2 seconds at a time to avoid overheating the spark gap tube.

Note 5: Breakdown Time is the time between the point on the applied voltage pulse which is equivalent to 32kv and the point at which breakdown occurs.

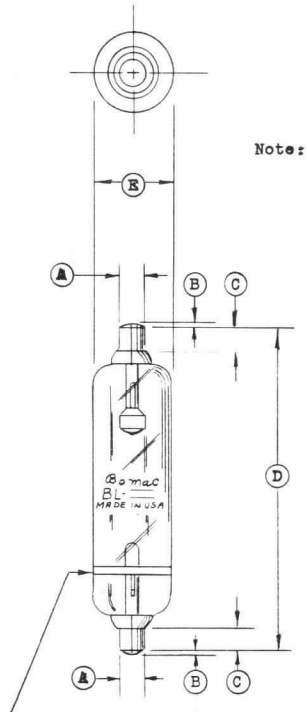
Note 6: Raise voltage until tube is just breaking down. Lower voltage until tube just does not break down. The difference between the peak voltage at which the tube just breaks down and the peak voltage at which the tube just stops breaking down shall be within the specified limit.

Note 7: Tubes shall satisfy all requirements of this specification after being stored for the specified time.

Note 8: Tubes shall not break down at any time during this test.

Note 9: During the first second of every 12 seconds the tube shall break down. During the remaining 11 seconds of every 12 seconds the tube shall be quiescent.

Note 10: Tubes shall satisfy all initial requirements of this specification after being subjected to Life Test 1 and 2.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL700

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 28, 1955

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	Min.	Max.
Breakdown Voltage	18.0	--- kw
Hold-Off Voltage	---	20.0 kv
Ambient Temperature	To be specified	+100°C

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
------	Breakdown Voltage:	Notes 2, 3	epy :	18.0	---kv
------	Hold-Off Voltage:	Notes 2, 3	epy :	---	20.0kv
------	Breakdown Time:	epy=15.0kv; Notes 2, 4, 5	t :	---	0.5μs
------	De-ionization:	Notes 2, 6	Δepy :	---	2.0kv
------	Conduction	epy=15.0kv; Notes 2, 4	etd :	---	2.0kv
------	**Shelf Life Test:	t=5 years; Note 7		---	---
4.11	Life Test (1):	epy=15.0kv; Notes 2, 8	t :	500	---hrs.
4.11	Life Test (2):	epy=15.0kv; Notes 2, 4, 9	t :	12	---hrs.
4.11.4	Life Test (1 and 2) End Point:	--------		Note 10	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.

Note 4: After the specified epy is adjusted, the power shall be shut off and the load resistor removed from the circuit. The power is then applied instantaneously and the tube under test shall break down. The rise time of the instantaneous voltage pulse is to be specified. This test shall not be run for more than 2 seconds at a time to avoid overheating the spark gap tube.

Note 5: Breakdown Time is the time between the point on the applied voltage pulse which is equivalent to 18kv and the point at which breakdown occurs.

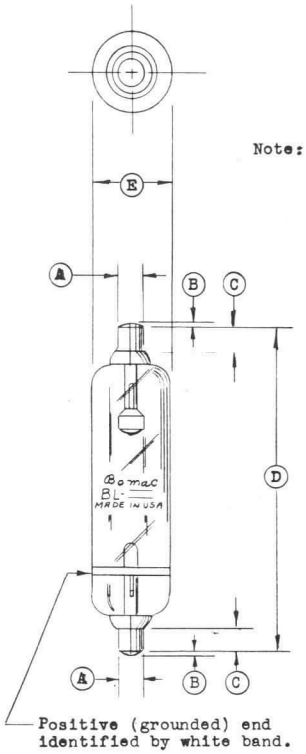
Note 6: Raise voltage until tube is just breaking down. Lower voltage until tube just does not break down. The difference between the peak voltage at which the tube just breaks down and the peak voltage at which the tube just stops breaking down shall be within the specified limit.

Note 7: Tubes shall satisfy all requirements of this specification after being stored for the specified time.

Note 8: Tubes shall not break down at any time during this test.

Note 9: During the first second of every 12 seconds the tube shall break down. During the remaining 11 seconds of every 12 seconds the tube shall be quiescent.

Note 10: Tubes shall satisfy all initial requirements of this specification after being subjected to Life Test 1 and 2.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL702

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 8, 1956

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position.

Ratings:	Min.	Max.
Breakdown Voltage	18.0	20.0 kv
Ambient Temperature	To be specified	+100°C

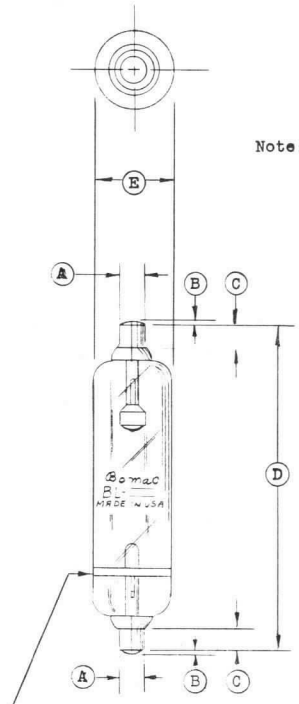
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
-----	Breakdown Voltage:	Notes 2, 3	epy:18.0	20.0kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL703

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 31, 1956

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position.

Ratings:	Min.	Max.
Breakdown Voltage	2.3	2.7 kv
Ambient Temperature	To be specified	-100°C

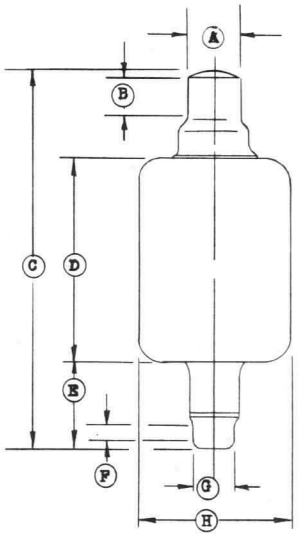
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t-168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy:2.3	2.7kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2us; trv-0.5us max.; prr=330±15pps. Bothe the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Note: Outline used for following tubes.

BL-121
BL-703
BL-142

Ref.	Dimensions
A	.250 Dia.
B	.185 Min. contact
C	1.812 ±.030
D	1.000 ±.025
E	.406 ±.025
F	.093 Min. contact
G	.203 Dia.
H	.750 Dia. ±.025

Bomac | **SPARK GAP** | **BL716**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	**Min.**	**Max.**
Breakdown Voltagw	24.0	27.0kv
Ambient Temperature	To be specified	+100°C

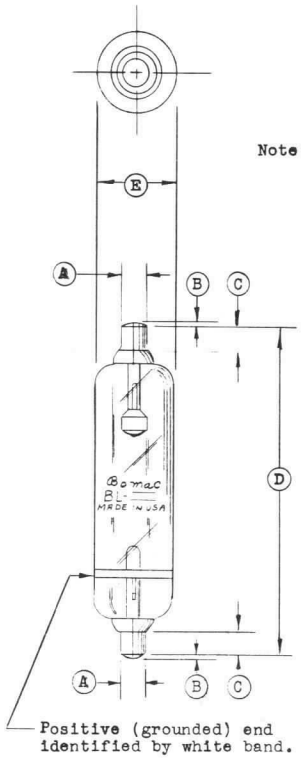
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy:24.0	27.0kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL717

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 8, 1956

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position.

Ratings:	Min.	Max.
Breakdown Voltage	8.50	10.0kv
Ambient Temperature	To be specified	+100°C

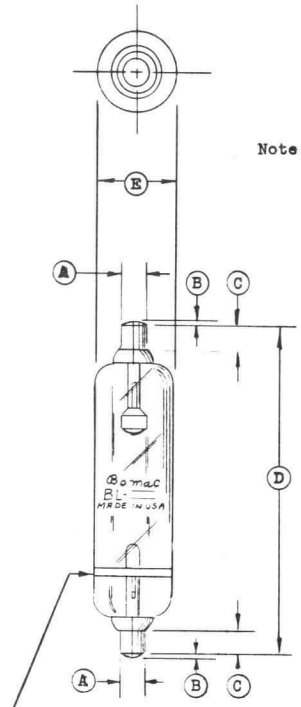
Packing: To be specified
+

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy: 8.50	10.0kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr-330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL718

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Application: Protective Device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	Min.	Max.
Breakdown Voltage	10.5	12.0kv
Ambient Temperature	To be specified	+100°C

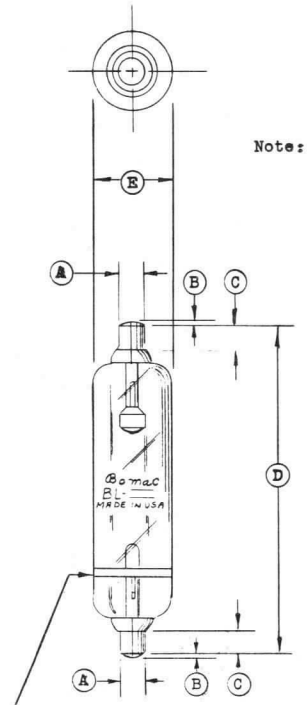
Packing: To be specifed

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy:10.5	12.0kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL724

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 6, 1956

Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	Min.	Max.
Breakdown Voltage	7.2	7.7kv
Ambient Temperature	To be specified	+100°C

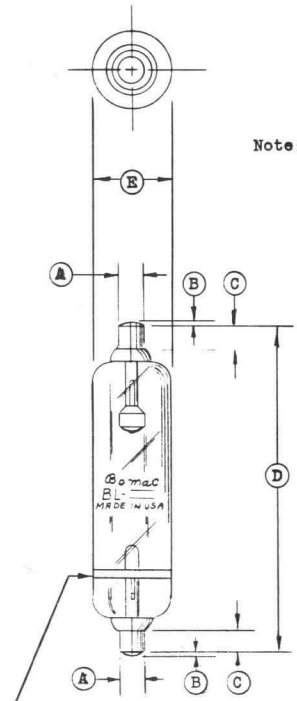
Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Note 2, 3	epy: 7.2	7.7kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Positive (grounded) end identified by white band.

Note:

Note: Outline used for following tubes.

BL-146	BL-724
BL-700	BL-717
BL-714	BL-702
BL-716	
BL-718	

Note: Dimension E on the BL-702 is 1/2"

Ref.	Dimensions
A**	.250 Dia.
B**	1/32 Max.
C**	.240 Min.
D	3-1/4 ±1/16
E*	3/4 Dia. ±1/32

Bomac

SPARK GAP

BL744

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 28, 1956

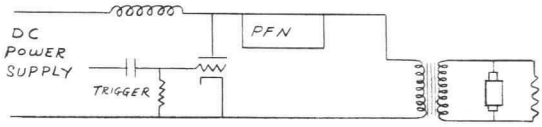
Application: Protective device for a Pulse Transformer

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	Min.	Max.
Breakdown Voltage	1.5	---kv
Hold-Off Voltage	---	2.5kv
Ambient Temperature	To be specified	+100°C

Packing: To be specified.



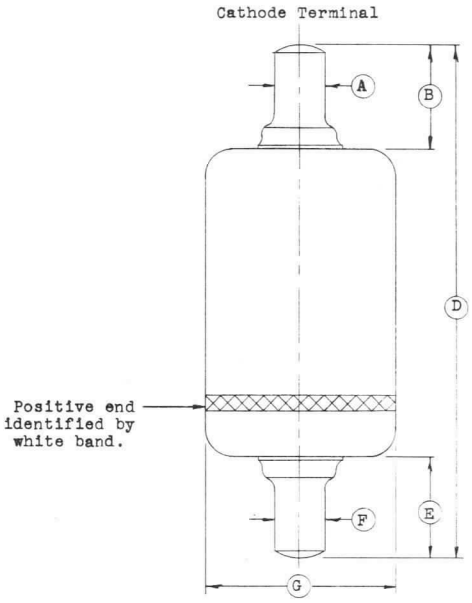
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy : 1.5	2.5kv
------	Conduction Voltage Drop:	epy=2.2kv; Notes 2, 4		

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested under the specified conditions in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows tp=0.5μs±10%, trv=0.5μsec, prr=3000. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuosly adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.

Note 4: After the specified epy is adjusted the power shall be shut off and the load resistor removed from the circuit. This simulates a magnetron that has not fired. The power is then applied instantaneously and the tube under test shall breakdown. The rise time of the instantaneous voltage pulse is to be specified. The test shall not be run for more than 2 seconds at a time to avoid overheating the spark gap tube.



Ref.	Dimension
A*	0.250 Dia.
B	0.500 Max.
D*	2 1/8 Max.
E	0.500 Max.
F	0.250 Dia.
G*	1.020 Dia. Max.

Bomac

SPARK GAP

SS501

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 2, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.
Breakdown Voltage	---	1900Vdc
Anode Current	---	25 mAdc (Note 2)
Frequency	---	10 pps

Test Condition Note 3; See Test Circuit "V".

Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.9.18.1.8	Drop:	To be specified		
4.9.19.1	*Vibration:	No Voltages G=10; t=30		
4.9.19.1	*Vibration:	No Voltages G=2.5; t=300		
4.10.22	Starting Voltage:	Note 4	Ez : ---	1300Vdc
------	†Frequency Range:	Ez=1650Vdc; F= 2 to 10 pps; Note 5		
------	Breakdown Voltage:	Note 6	Ez : 2000	---Vdc
4.9.16	*Heat Test:	T= +145°F	Normal Operation	
4.9.16	*Cold Test:	T= -35°F	Normal Operation	
4.11	Life Test:	Ez=1650Vdc; F=10pps; C=1μf; Group C	t : 300	---hrs.
4.11.4	Life Test End:		Note 7	

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Discharge of 1μf condenser at 1900Vdc.

Note 3: Test Circuit "V". Trigger potentials are supplied through an automobile ignition transformer or its equivalent, with secondary voltage of 20,000 to 30,000 volts. Connection to the tube is by means of a few turns of bare wire around the tube at the center of the U-bend, covering not over one inch. Keying supply: Primary of transformer supplied with voltage pulses, electronically or mechanically developed.

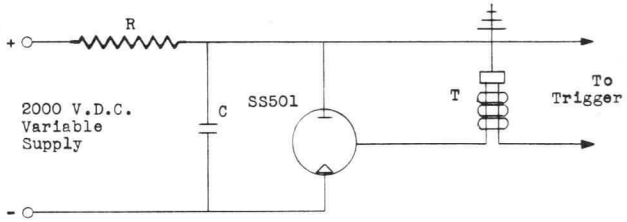
Note 4: Set voltage across discharge condenser to 1300Vdc; turn on trigger circuit; tube should fire.

Note 5: Set voltage across discharge condenser to 1650Vdc and adjust triggering circuit to 2 pps and 10pps. Tube should fire regularly at these speeds.

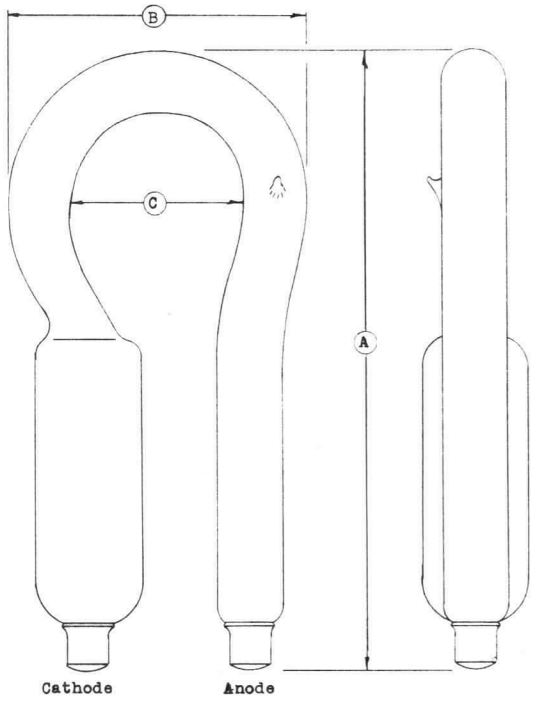
Note 6: With trigger circuit off, adjust voltage across discharge condenser to 2000 Vdc. Tube should not fire.

Note 7: Tube will not fire, shows a continous discharge or fire erratically.

Test Circuit "V"



C - 1 mfd
R - 20000Ω
T - Auto Ignition Transformer



Ref.	Dimension
A	6.187 Max.
B	2.625 Max.
C	1.125 Min.

Bomac

SPARK GAP

BL142

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 8, 1956

Dimensions: Per Outline

Mounting: To be mounted in any position.

Ratings:	Min.	Max.
Breakdown Voltage	3.0	4.0kv
Ambient Temperature	To be specified	+100°C

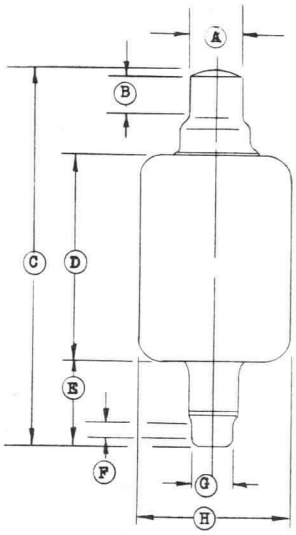
Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
------	Breakdown Voltage:	Notes 2, 3	epy: 3.0	4.0kv

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The tube shall be tested, under the specified conditions, in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows: tp=3.0±0.2μs; trv=0.5μs max.; prr=330±15pps. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 1200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.



Note: Outline used for following tubes.

BL-121
BL-703
BL-142

Ref.	Dimensions
A	.250 Dia.
B	.185 Min. contact
C	1.812 ±.030
D	1.000 ±.025
E	.406 ±.025
F	.093 Min. contact
G	.203 Dia.
H	.750 Dia. ±.025

Bomac

SPARK GAP

BL147

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 29, 1957

Dimensions: Per Outline

Mounting: To be mounted in any position

Ratings:	Min.	Max.
Breakdown Voltage	200	--- kv
Hold-Off Voltage	---	300
Ambient Temperature	To be specified	+100°C
Weight (approx.)	---	0.5 ounces

Packing: To be specified.

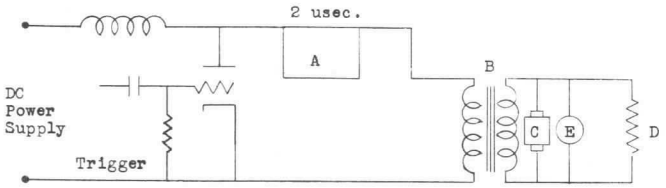
Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
------	Breakdown Voltage:	Notes 2, 3	epy :	200	300

Note 1: References and notations are from the latest issue of Military Specification Electron Tubes, MIL-E-1.

Note 2: The tube shall be tested under the specified conditions in parallel with the secondary of a pulse transformer operated from a line-type pulse modulator as follows tp=2.0μs±10%, trv=0.1μsec, prr=2000. Both the pulse transformer secondary and a load resistor in parallel with the tube under test shall have an impedance of approximately 200 ohms. The peak voltage across the secondary shall be continuously adjustable.

Note 3: The peak voltage at which the tube under test breaks down shall satisfy the specified limit.

Test Circuit



A. Sprague PFN 9-ES-2-1000-50P or equivalent

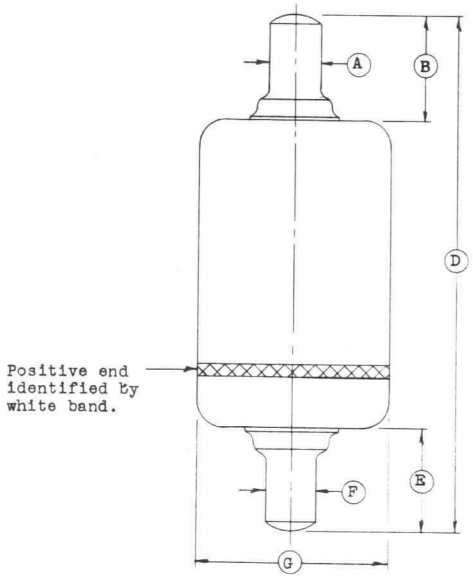
B. Raytheon Pulse Transformer 363-1258 G1-2, 1180-2000, or equivalent

C. BL-147 under test

D. 200Ω load resistance - non-inductive type

E. Jennings Peak Voltmeter or equivalent

Cathode Terminal



Anode Terminal

Ref.	Dimension
A*	0.250 Dia.
B	0.450 Max.
D*	2.450 Max.
E	0.450 Max.
F	0.250 Dia.
G*	1.020 Dia. Max.

Bomac

SPARK GAP

BL735

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

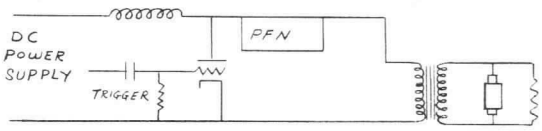
JUNE 25, 1956

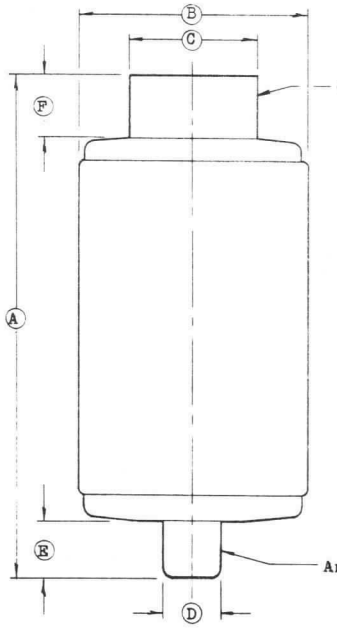
Dimensions: Per outline

Ratings	Min.	Max.
Breakdown Voltage	16.0	18.0 kv

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for Jan Marking	---	---
4.5	Holding Period:	t-168 hrs.	---	---
---	Breakdown Voltage	Note 2, 3	epy : 16.0	18.0kv
---	*Breakdown Time:	epy-14kv Note 2, 4, 5	t :	0.3us
---	Conduction Voltage Drop:	epy-15kv Note 2, 4	etd : ---	1.0kv
---	**Shelf Life Test:	t-5 yrs. Note 6	---	---
4.11	Life Test:	epy-15kv Note 2, 7	t : 500	hrs.
4.11	Life Test End Point:	---	Note 8	





Ref.	Dimension
A	5" ±1/8
B*	2-3/8 Dia. Max.
C*	1.238+.025-.015 Dia.
D*	.566±.015
E*	9/16±1/32
F*	21/32±1/32

Note:-
Anode - Cathode eccentricity shall not exceed .010

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1C 3 October 1955.

Note 2: The tube shall be tested under the specified conditions in parallel with the secondary of a pulse transformer operated from a line type pulse modulator as follows tp = 1.0 μsec ± 0.1 usec; trr = 0.5 μsec, max., prr = 360 ± 15 pps. The peak voltage across the primary shall be continuously adjustable. Refer to Test Circuit.

Note 3: The peak voltage of which the tube under tests breaks down shall satisfy the specified limit.

Note 4: After the specified epy is adjusted, the power shall be shut off and the load resistor removed from the circuit. This simulates a magnetron which does not fire. The voltage pulses rise to approximately 24.0 kv. The power is then applied instantaneously and the tube under test shall break down. The rise time of the instantaneous voltage pulse is to be specified. This test shall not be run for more than 2 seconds at a time to avoid overheating the spark gap tube.

Note 5: Breakdown time is the time between the point on the applied voltage pulse which is equivalent to 16.0 kv and the point at which breakdown occurs.

Note 6: Tubes shall satisfy all requirements of this specification after being stored for the specified time.

Note 7: Tubes shall not break down at any time during this test.

Note 8: Tubes shall satisfy all initial requirements of this specification after being subjected to the life test.

Bomac

TRAVELING WAVE

6651/BL850

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

APRIL 26, 1956

Dimensions: As Per Outline

Ratings:	Ef	Eb	Eh	Du	tp	Magnetic Field	tk	Ib	Ih	I_k	I_c
Absolute	V	kv	kv	---	µsec	Gauss	sec	A	A	A	A
Maximum	6.3 ±10%	8.2	8.2	.005	2.0		60	.50	.50	2.5	1.5
Typical Operation	6.3	5.5	4.7	.001	2.0	1000 Note 4	60 Note 2	.15	.15	1.1	.80

Mounting Position: Any

Connectors: BNC with 50 ohm Coax Cable

Envelope: Metal Capsule

Collector Dissipation: Cooling Note 3 50W max.

Helix Dissipation 15W max.

Pack in sealed moisture resistant bag or approved equivalent. If opaque bag is used, the tube type number shall be stamped thereon.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours		
4.10.8	*Heater Current:	Ef=6.3	1.9	2.3A
---	Heater Warm-up Time:	Note 2	tk :---	60sec.
---	Cathode Current:	Note 5	Ik :1.0	1.7A
---	Anode Current:	Note 5	Ib :---	0.25A
---	Helix Current:	Note 5	Ih :---	0.30A
---	Collector Current:	Note 5	Ic :0.9	1.20A
---	Power Output (1):	F=2700 Mc±1% Note 5	po :1.0	kw
---	Power Output (2): 3 db Power Points	F=2100 Mc±1% F=3300 Mc±1% Note 5		
---	Small Signal Power Gain:	F=3000 Mc±1% Note 5	35	db

Note 1: References and notations are from Military Specification, Electron Tubes MIL-E-1C, 3 October 1955.

Note 2: The heater voltage should be raised continuously from 0 volts to 6.3 volts over 60 seconds.

Note 3: A 15 cfm blower may be used if the power dissipation exceeds 10W.

Note 4: The magnetic field should be adjusted to give maximum power output.

Note 5: See Test Circuit
(1) Filament Voltage = 6.3, Pulse Width = 2.0 µsec., Duty Cycle = .001. Voltages measured with respect to the cathode.

(2) Set magnetic field at 1000 gauss.

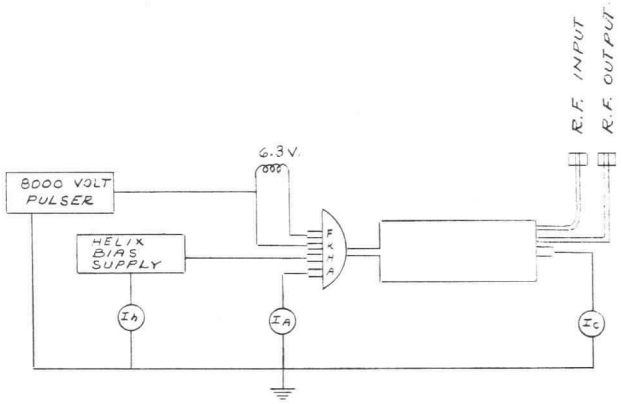
(3) Set anode voltage at approximately 5.5 Kv.

(4) Set helix voltage at approximately 4.7 Kv.

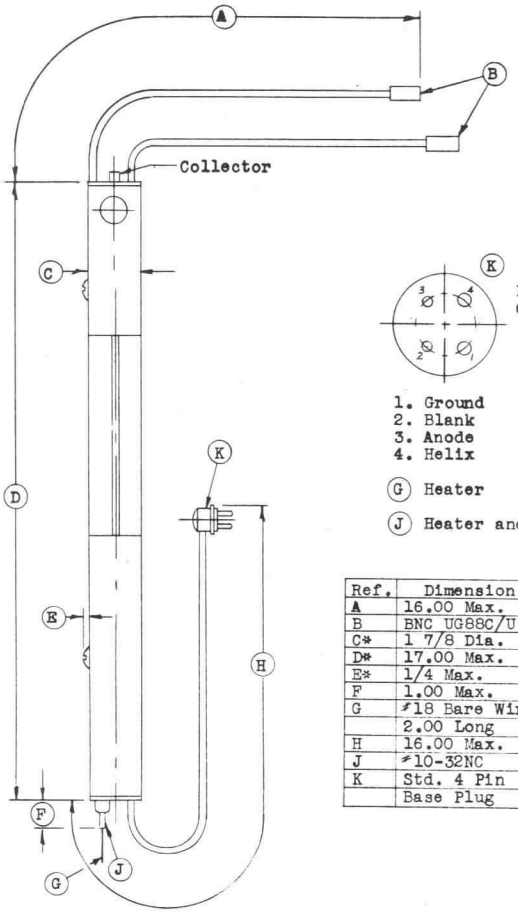
(5) Apply 0.5 peak watts at driving power at 3250 Mc.

(6) Adjust solenoid centering screws for maximum power output.

(7) Adjust the magnetic field, anode voltage and helix voltage for maximum power output.



A = Anode
H = Helix
K = Cathode
F = Filament
C = Collector



Base Plug Connections

1. Ground
2. Blank
3. Anode
4. Helix

(G) Heater

(J) Heater and Cathode

Ref.	Dimension
A	16.00 Max.
B	BNC UG88C/U
C*	1 7/8 Dia.
D*	17.00 Max.
E*	1/4 Max.
F	1.00 Max.
G	#18 Bare Wire
	2.00 Long
H	16.00 Max.
J	#10-32NC
K	Std. 4 Pin
	Base Plug

Bomac | **DUPLEXER** | **BL506** | **L**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 12, 1955

Dimensions: Per Outline

Mounting: See Outline drawing for connectors

Ratings:	Min.	Max.
Transmitter po	2	3 kw
Open Circuit Ignitor Voltage	-750	--- Vdc
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current 150 μAdc (Note 6)		

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified:	---	---
4.18.17.3	Temperature Cycle:	Note 2	Cycles: 1	---
4.18.1	*Ignitor Ignition Time:	Ebb=-750 Vdc; Ri=4.5 Meg	t:--	5 sec.
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc	Eid:200	450 Vdc
4.18.4.1	Duplexer Loss:	F= 1180 Mc. F= 1200 Mc. F= 1220 Mc; Note 3	Li:--- Li:--- Li:---	1.5 db 1.5 db 1.5 db
4.18.5.1	*Ignitor Interaction:	Ii=100 μAdc	ΔLi:---	0.3db
4.18.10	Spike Leakage Energy:	F=1200±1% Mc; po=3±1% kw; tp 1=4.0±0.15 μs; tp 2=1.0±0.15 μs; prr=1000; Ii=100 μAdc	Ws:---	0.3erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf :---	75mw
4.18.15.1	*Recovery Time:	F= 1200±1%Mc; po=3.0±1%kw; tp=0.2μs; prr=1000; Ii=100μAdc	t :---	3μs
4.18.27	⁄Firing Time:	F= 1200±1%Mc; po=3.0±1%kw; tp=0.2μs; prr=1000; Note 4	t :---	10sec.
4.18.28	High Level Duplexer Loss:	F= 1200±1%Mc; po=3.0±1%kw; tp=0.2 μs; prr=1000; Note 5	---	1.8db
4.11	Life Test:	See Recovery Time; Group D Ebb=-700Vdc; Ri=2.5 meg.	t :500	---hrs
4.11.4	Life Test End Point:	Duplexer Loss at F= 1200Mc; Spike Leakage Energy; Flat Leakage Power; Recovery Time	Li :--- Ws :--- pf :--- t :---	1.5db 0.3erg 75mw 3μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Cycle only the TR and ATR sections of the duplexer. After cycling the duplexer shall be reassembled. It shall then satisfy the Firing Time test specified in Ref. 4.18.27.

Note 3: Loss between Antenna and Receiver connectors of duplexer with respect to an equivalent length of coaxial line.

Note 4: Both the ATR and the TR sections of the duplexer shall be fired within the specified time.

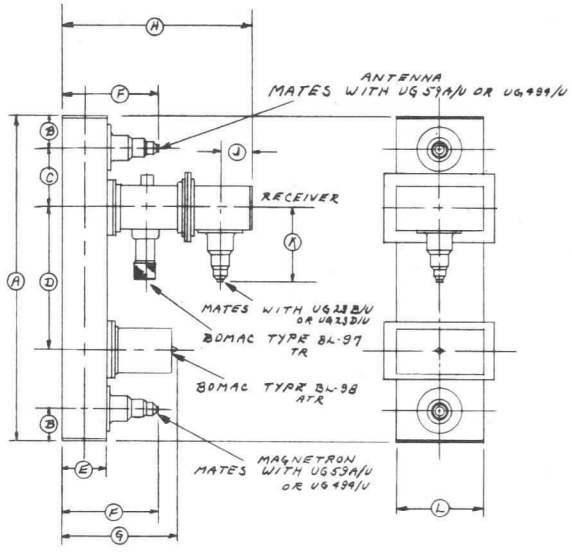
Note 5: The loss between the Magnetron and Antenna connectors with respect to an equivalent length of coaxial line.

Note 6: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSION
A	2.5 3/8 MAX.
B*	2.50 ±.020
C*	4.63 ±.020
D*	11.288 ±.020
E**	3.41 REF.
F**	7 3/8 MAX.
G*	9 1/2 MAX.
H	15 3/8 MAX.
J*	2.50 ±.020
K**	5 3/9 MAX.
L**	6.66 REF.

Bomac | **HYBRID** | **BL508** | **S**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
NOVEMBER 5, 1954

Dimensions: Per Outline

Mounting: Note 2

Ratings: Transmitter po
Min.: ---
Max.: 750kw

Test Conditions: Note 2; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio(1):	F= 2700Mc. to F= 2900Mc.; Note 3	σ:---	1.12
4.18.18	Voltage Standing Wave Ratio(2):	F= 2700Mc. to F= 2900Mc.; Note 4	σ:---	1.12
------	Directivity:	F= 2700Mc. to F= 2900Mc.; Note 5	27	---db
------	Power Division:	F= 2700Mc. to F= 2900Mc.; Note 6	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

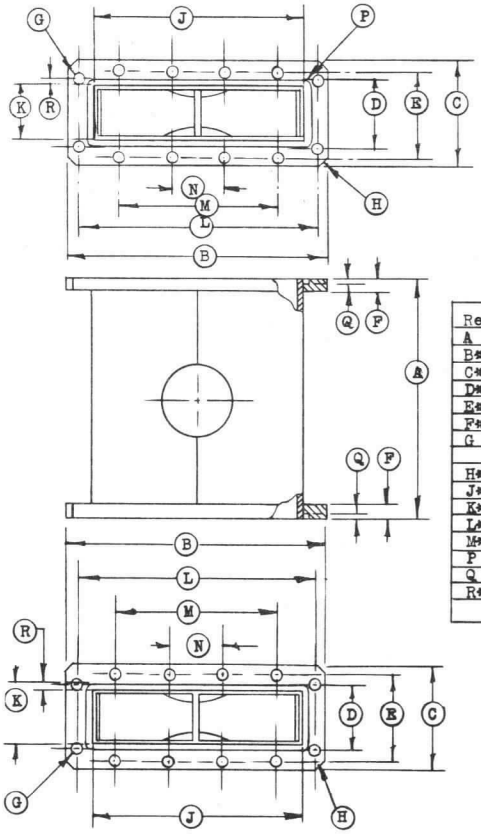
Note 2: A suitable gasket should be bolted between each flange. Two gaskets will be supplied with each Hybrid Junction.

Note 3: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

Note 4: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3 and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

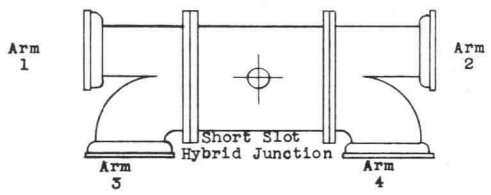
Note 5: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Keep a low level load, σ=1.02 max., on all empty arms.

Note 6: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 4 should equal the power through Arm 4 within ±0.25db.



Ref.	Dimensions.
A	6.800 ±.015
B**	7-7/32 ±1/32
C**	2-23/32 ±1/32
D*	1.698
E*	2.220
F**	11/32 ± 1/32
G	"G" (.261) Dr (12) holes.
H**	3/16 x 45
J*	6.000
K*	1.500
L*	6.720
M*	4.500
P	.093 R. Typ.
Q	.110 ±.002
R*	.192 ±.002

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.



Bomac

DUPLEXER

BL520 S

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 22, 1954

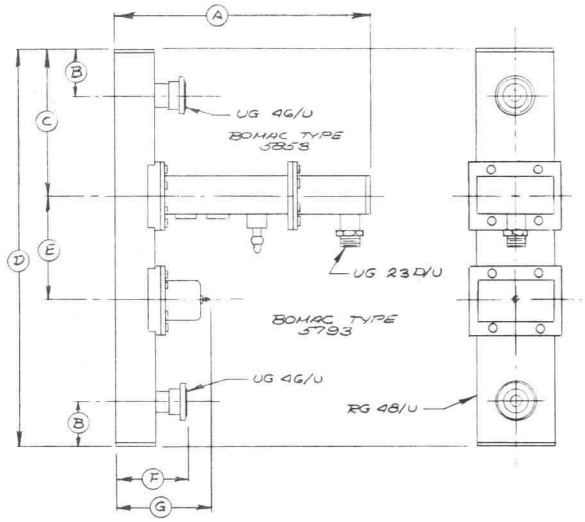
Dimensions: Per Outline

Mounting: See Outline drawing for connectors.

Ratings:	Min.	Max.
Transmitter po	10	20 kw
Open Circuit Ignitor Voltage	-500	-700 Vdc

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=168 hours		---	---
4.9.18.1.8	Carton Drop:	To be specified		---	---
4.18.17.3	Temperature Cycle:	--------	Cycles:	1	---
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg	t:	---	5sec.
4.18.2	Ignitor Voltage Drop:	Ii=200μAdc	Eid:	300	450Vdc
4.18.4.2	Duplexer Loss:	F= 2980Mc.	Li:	---	1.0db
		F= 3000Mc.	Li:	---	1.0db
		F= 3020Mc., Note 2	Li:	---	1.0db
4.18.5.1	*Ignitor Interaction:	Ii=200μAdc	⊿Li:	---	0.3db
4.18.10	Spike Leakage Energy:	F= 3000±1%Mc; po=20±1%kw; tp1=1.0±0.15μs; tp2=0.5±0.15μs; prr=1000; Ii=200μAdc	Ws:	---	0.3erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:	---	40mw
4.18.15.1	*Recovery Time:	F= 3000±1%Mc; po=20±1%kw; tp=1.0±0.15μs; prr=1000; Ii=200μAdc	t:	---	5μs
4.18.27	*Firing Time:	F= 3000±1%Mc; po=20±1%kw; tp=1.0±0.15μs; prr=1000; Note 3	t:	---	10sec.
4.18.28	High Level Duplexer Loss:	F= 3000±1%Mc; po=20±1%kw; tp=1.0±0.15μs; prr=1000; Note 4		---	1.6db
4.11	Life Test:	See Recovery Time; Group D	t:	500	---hrs
4.11.4	Life Test End Point:	Duplexer Loss at F= 3000Mc;	Li:	---	1.0db
		Spike Leakage Energy;	Ws:	---	0.3erg
		Flat Leakage Power;	pf:	---	40mw
		Recovery Time	t:	---	5μs



REF	DIMENSIONS
A	11" MAX
B *	7/8 ± 1/16
C *	4 7/8 ± 1/8
D	14 1/8 MAX
E *	4.100 ± .030
F *	2 21/32 ± 1/32
G *	3 3/4 MAX

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Loss between Antenna and Receiver connectors of duplexer with respect to an equivalent length of coaxial line.

Note 3: Both the ATR and the TR sections of the duplexer shall be fired within the specified time.

Note 4: The loss between the Magnetron and Antenna connectors with respect to an equivalent length of coaxial line.

Bomac	HYBRID	
	BL532	C

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 23, 1956

Dimensions: Per Outline

Mountings: Note 2

Ratings: Transmitter po
Min.: ---
Max.: 1.0 Mw

Test Conditions: Note 2; See Test Circuit "I", dated 8-25-54.

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 5200Mc. to F= 5900Mc; Note 3	σ : ---	1.12
4.18.18	Voltage Standing Wave Ratio (2):	F= 5200Mc. to F= 5900Mc; Note 4	σ : ---	1.12
------	Directivity:	F= 5200Mc F= 5550Mc F= 5900Mc. Note 5	25 25 25	---db ---db ---db
------	Power Division:	F= 5200Mc. to F= 5900Mc; Note 6	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be bolted between each flange of the Short Slot Hybrid Junction and its mating flange. Two gaskets will be supplied with each Hubrid Junction.

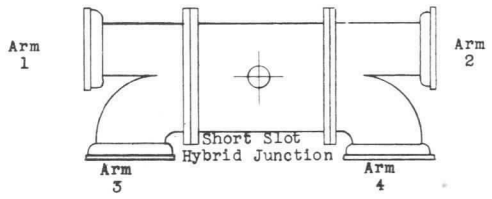
Note 3: See Test Circuit "I"
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

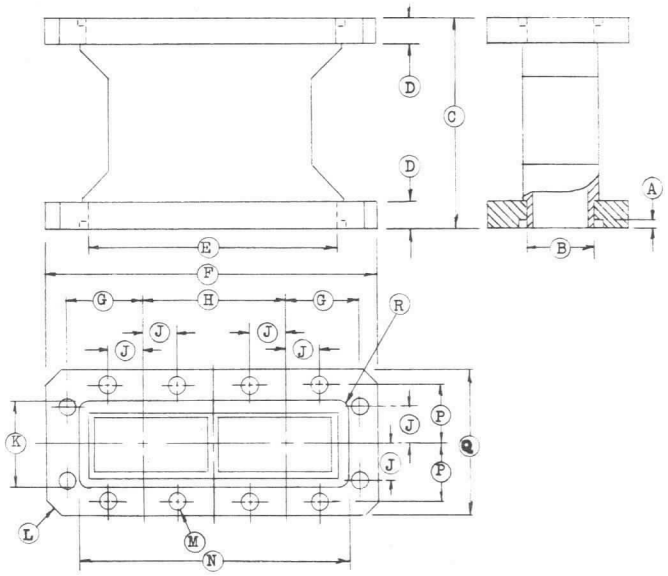
Note 4: See Test Circuit "I"
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3 and 4. Then the V.S. W.R. looking into Arm 1 shall be within the limit specified.

Note 5: See Test Circuit "I".
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on all empty arms to eliminate the effect of a residual V.S.W.R. that occurs with most fixed loads.

Note 6: See Test Circuit "I"
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref	Dimension	Ref	Dimension
A	1.110±.002	K	1.375
B	1.000±.002	L	0.187±.020x45
C	3.625		Chamfer
D	0.375±.020	M	#9(.196)Drill
E	4.002±.002		(12) Holes
F	5.031±.020	N	4.375
G	1.329±.001	P	0.829±.003
H	2.000±.003	Q	2.031±.020
J	0.500±.001	R	0.094±.020 R.

Bomac

GAS NOISE SOURCE

6357 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 6, 1956

Mounting: Waveguide Assembly RG-52/U

Ratings:	Min.	Max.
Anode Current	ib: 125	275 mAdc
Filament Current	if:	170 mAdc
Tube Dissipation	P:	17 W
Ambient Temp. Range	T: -40°	165° F

Test Conditions: Note see Starting and Operating Circuit

Packing: To be specified.

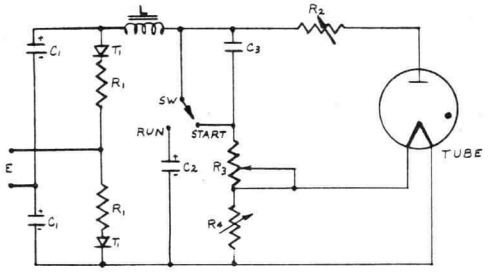
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours		
4.18.18	Voltage Standing Wave Ratio:	Fo=8400 Mc to 12500 Mc Note 2	σ:	1.13
-----	Noise Temperature:	T=290°K ≠	15.0	15.6 db
-----	Filament Current	Note 3 and 4		170mAdc
-----	Voltage Drop	E=115AC Note 4	Eid: ---	85 Vdc

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Voltage Standing Wave Ratio is to be read with the tube operating and mounted as per waveguide assembly. The average VSWR over the recommended transmission bandwidth of the guide is about 1.07 with a maximum of about 1.13. No tube shall exceed the requirements specified.

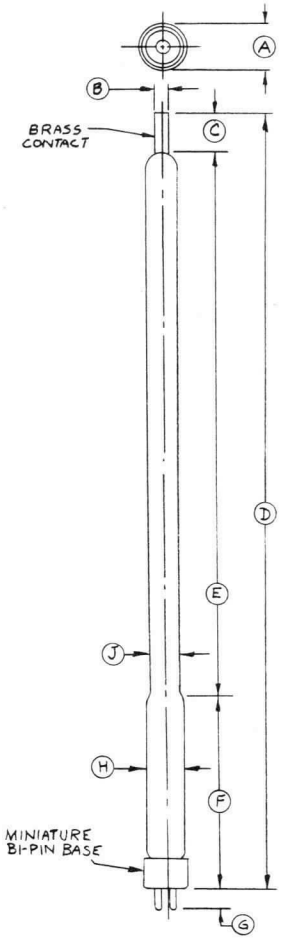
Note 3: This test to be performed in starting and operating circuit.

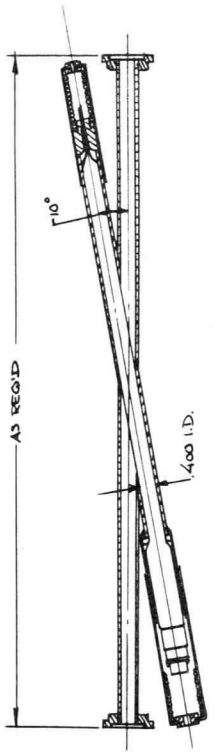
Note 4: The operating circuit should have sufficient series resistance to limit the current through the tube to the rated value after starting period.



SYMBOL DESIGNATION

E = 115V A.C.
C_1 & C_2 = 40 μF
C_3 = .006 μF
R_1 = 5 Ω
R_2 = 800 Ω
R_3 = 1000 Ω
R_4 = 200 Ω
L = 2HY
T_1 = Selenium Rectifier





REF.	DIMENSIONS
A	3/16 MAX.
B	3/16 DIA.
C	1/2 MAX
D	12 1/2 MAX.
E	8 5/8 MIN.
F	2 1/16 ± 1/16
G	.348 MIN.
H	1/2 MAX. DIA.
J	3/8 O.D.

Bomac | **DUPLEXER** | **BL507** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MAY 27, 1955

Dimensions: Per Outline

Mounting: Note 2

Ratings:	Min.	Max.
Transmitter po	1	250 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 13)(each electrode)

Test Conditions: Note 2, See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	**Vibration:	G=10; Note 3	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490 Mc.	σ:---	1.4
		F= 8565	σ:---	1.2
		*F= 8655	σ:---	1.2
		*F=8745	σ:---	1.2
		*F= 8835	σ:---	1.2
		*F= 8925	σ:---	1.2
		F= 9000	σ:---	1.2
		*F= 9087	σ:---	1.2
		*F= 9187	σ:---	1.2
		*F= 9287	σ:---	1.2
		*F= 9387	σ:---	1.2
		F= 9487	σ:---	1.2
		F= 9578 Mc; Note 4	σ:---	1.4
4.18.4.2	*Duplexer Loss:	F= 8490 Mc	Li:---	1.2db
		F= 8565	Li:---	1.0db
		F= 9000	Li:---	1.0db
		F= 9487	Li:---	1.0db
		F= 9578 Mc; Ii=100 μAdc on each electrode; Note 5	Li:---	1.2db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	18	---db
		F= 9000	20	---db
		F= 9487	18	---db
		F= 9578Mc; Note 6	15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 7	t:---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 7	Eid:200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 8	pf:---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 9	---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 10	t:---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 11	σ:---	1.2
4.11	Life Test:	F= 9000Mc; po=200±10%kw min; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8 meg. each electrode; Group D; Note 12	t:500	---hrs
4.11.4	Life Test End Point:	Recovery Time;	t:---	10μs
		Flat Leakage Power;	pf:---	20mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss, F= 9000Mc.	Li:---	1.2db

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A gasket should be bolted between each flange of the Short Slot Hybrid Duplexer and its mating flange. Two gaskets will be supplied with each tube.

Note 3: During this test the ignitor electrodes should not short to the tube body. Subsequent to the test, the tube shall meet all requirements of this specification.

Note 4: See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R, and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 5: See Test Circuit
A low level load, σ=1.05max., on arms M and L. Signal in arm A is detected at arm R.

Note 6: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 7: Measured separately for each ignitor electrode.

Note 8: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07max., on arm L; Leakage Power detected at arm R.

Note 9: See Test Circuit
No loads necessary on arms L and R. A suitable metal short is interchanged with the Short Slot Hybrid Duplexer at the junction of arms M and A. Transmitter po in arm M; a power monitoring device followed by a high level load, σ=1.07max., at arm A.

Note 10: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max., at arm L; detector at arm R.

Note 11: See Test Circuit
No loads necessary on arms L and R. Transmitter po in arm M; a high level load, σ=1.07max., at arm A. The V.S.W.R., looking into arm M, shall be within the limit specified.

Note 12: See Test Circuit
No loads necessary on arms L and R. Transmitter po in arm M; a high level load, σ=1.07max., at arm A.

Note 13: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance}(R_i) = \frac{E_{bb} - E_i}{150} \text{ (Megohms)}$$

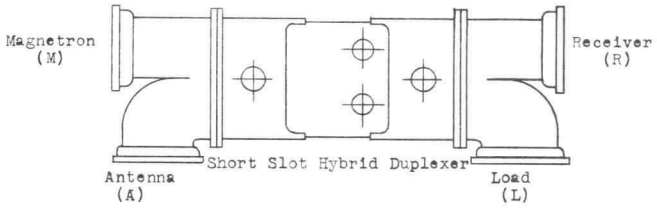
Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

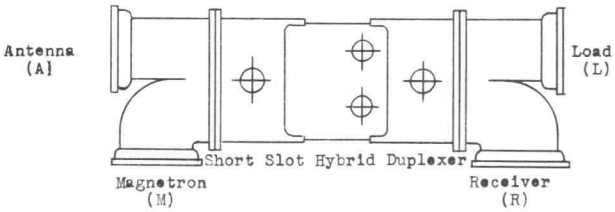
(over)

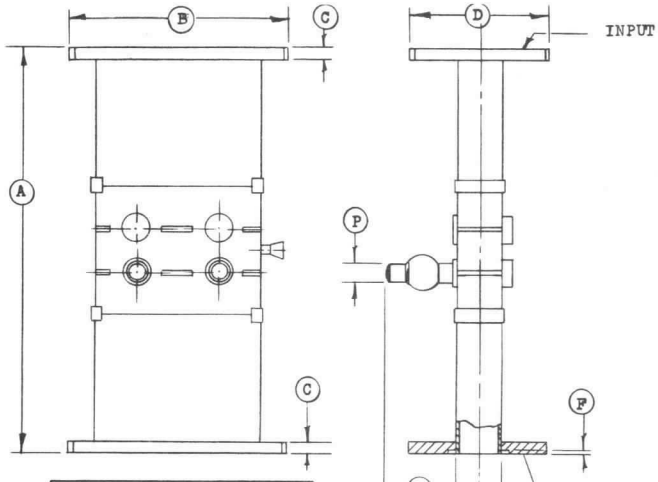
Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



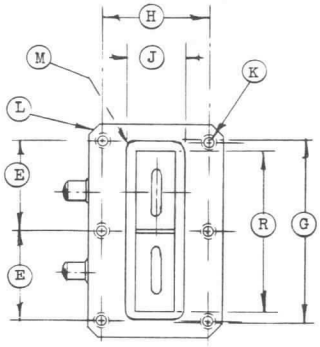
(2)





Ref.	Dimension
A	4.974 ±.015
B**	2.575 ±.015
C**	.220 ±.010
D**	1.625 ±.015
E*	1.085 ±.003
F	.070 ±.001 Typ.
G	2.204 ±.005
H*	1.280 ±.004
J	.754 ±.005
K Input	8-32 NC (6) holes
K Output	18 (.1695) (6) holes
L**	1/8 R.
M	3/64 R.
N*	1-3/8 Max.
P**	.250 Dia.
Q**	.500
R**	1.950

NOTE: Input and Output flange dimension the same except as indicated.



Bomac

HYBRID

BL514 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 7, 1955

Dimensions: Per Outline

Mountings: Note 2

Ratings: Transmitter po
Min.: ---
Max.: 250kw

Test Conditions: Note 2; See Test Circuit "I"

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 8490Mc. to F= 9578Mc.; Note 3	σ: ---	1.12
4.18.18	Voltage Standing Wave Ratio (2):	F= 8490Mc. to F= 9578Mc.; Note 4	σ: ---	1.12
-----	Directivity:	F= 8490Mc. F= 9000Mc. F= 9578Mc. Note 5	26 27 27	---db ---db ---db
-----	Power Division:	F= 8490Mc. to F= 9578Mc.; Note 6	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A suitable gasket shall be bolted between each flange of the Short Slot Hybrid Junction and its mating flange. Two gaskets will be supplied with each Hybrid Junction.

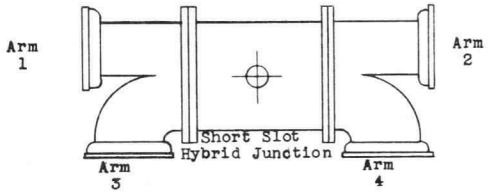
Note 3: See Test Circuit "I".
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

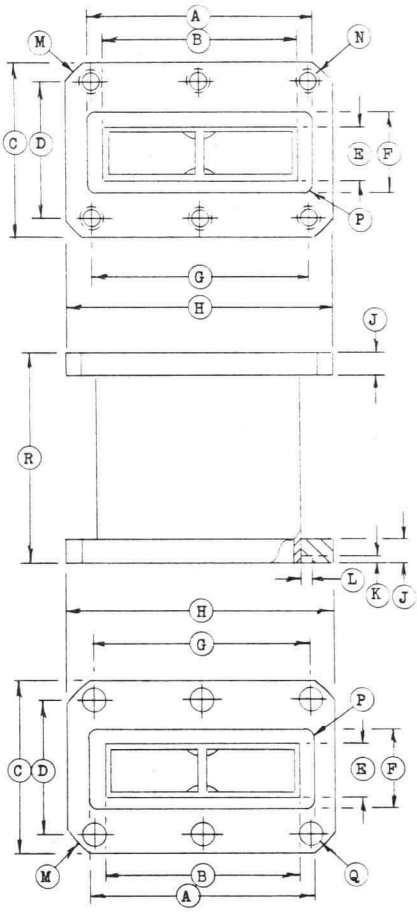
Note 4: See Test Circuit "I".
A low level signal in Arm 1; a low level load, σ≤1.02 max., on Arms 2, 3 and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

Note 5: See Test Circuit "I".
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on all empty arms to eliminate the effect of a residual V.S.W.R. that occurs with most fixed loads.

Note 6: See Test Circuit "I".
A low level signal in Arm 1; a low level load, σ≤1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ≤1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimension
A*	2.203 +.005 -.000
B*	1.950 ±.004
C**	1.625 ±.015
D*	1.280 ±.004
E*	0.500 ±.003
F*	0.753 +.005 -.000
G*	2.170 ±.006
H**	2.575 ±.015
J**	0.220 ±.010
K	0.070 ±.001
L	0.126 Ref.
M**	1.200 Rad. Approx
N	#8-32 NC 6 Holes
P*	3/64 Rad.
Q	#18(.1695) Drill 6 Holes
R	1.730 ±.010

Bomac	HYBRID	
	BL517	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
APRIL 20, 1955

Dimensions: Per Outline

Mounting: Note 2

Ratings:
Min.: ---
Max.: 250 kw

Test Conditions: Note 2; See Test Circuit "I" dated 8-25-54.

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 8490Mc.±0.1% to F= 9578Mc.±0.1% Note 3	σ: ---	1.12
4.18.18	Voltage Standing Wave Ratio (2):	F= 8490Mc.±0.1% to F= 9578Mc.±0.1% Note 4	σ: ---	1.12
-----	Directivity:	F= 8490Mc.±0.1%	26	---db
		F= 9000Mc.±0.1%	27	---db
		F= 9578Mc.±0.1% Note 5	27	---db
-----	Power Division:	F= 849[illegible]±0.1%	---	---
		F= 9[illegible]±0.1% Note 6		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: A suitable gasket shall be bolted between each flange of the Short Slot Hybrid Junction and its mating flange. Two gaskets will be supplied with each Hybrid Junction.

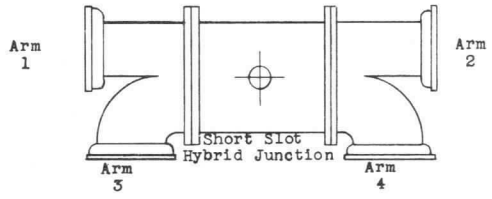
Note 3: See Test Circuit "I".
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

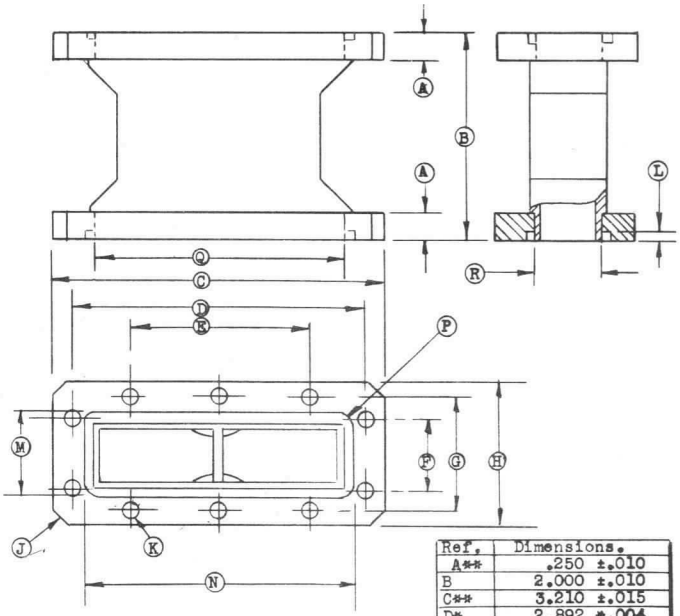
Note 4: See Test Circuit "I".
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3, and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limits specified.

Note 5: See Test Circuit "I".
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on empty arms to eliminate the effects of a residual V.S.W.R. that occur with most fixed loads.

Note 6: See Test Circuit "I".
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimensions.
Q	2.438 ±.002
R	.626 ±.002

Ref.	Dimensions.
A**	.250 ±.010
B	2.000 ±.010
C**	3.210 ±.015
D*	2.892 ±.004
E*	1.448 ±.004
F*	.722 ±.004
G*	1.080 ±.004
H**	1.380 ±.015
J	1-1/8 R.
K	17 (.173) Dr. (10) holes each flange
L	.069 ±.002
M	.872 ±.004
N	2.684 ±.004
P	.046 Rad.

Bomac

HYBRID

BL523 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 18, 1956

Dimensions: Per Outline

Mountings: Note 2

Ratings: Transmitter po
Min.: ---
Max.: 500 kw

Test Conditions: Note 2; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 8490Mc. to F= 9578Mc; Note 3	σ : ---	1.12
4.18.18	Voltage Standing Wave Ratio (2):	F= 8490Mc. to F= 9578Mc. Note 4	σ : ---	1.12
------	Directivity:	F= 8490Mc.	26	---db
		F= 9000Mc.	27	---db
		F= 9578Mc. Note 5	27	---db
------	Power Division:	F= 8490Mc. to F= 9578Mc; Note 6	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be bolted between each flange of the Short Slot Hybrid Junction and its mating flange. One gasket will be supplied with each Hybrid Junction.

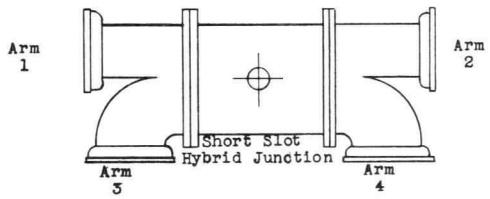
Note 3: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arms 2 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

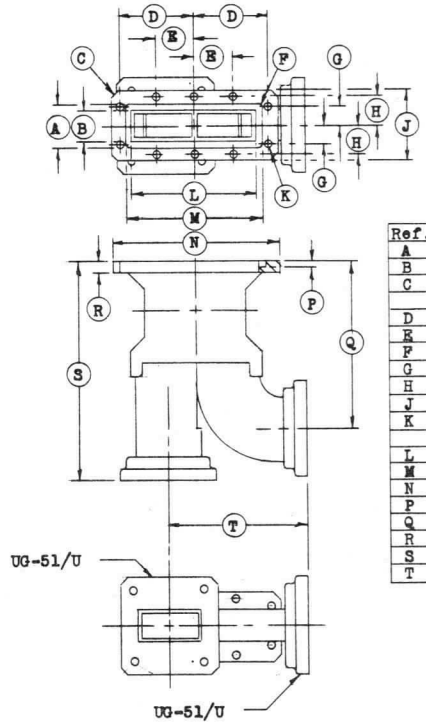
Note 4: See Test Circuit
A low level signal in Arm 1; a low level load σ=1.02max., on Arms 2, 3 and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

Note 5: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on all empty arms to eliminate the effect of a residual V.S.W.R. that occurs with most fixed loads.

Note 6: See Test Circuit
A low level signal in Arm 1; a low level load σ=1.02max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimension
A	0.872 ±.004
B	0.628 +.002 -.001
C	1 1/8 Rad. or 0.120 x 45° Chamfer
D	1.446 ±.002
E	0.724 ±.002
F	0.046 ±.002 Rad.
G	0.361 ±.002
H	0.540 ±.002
J	1.380 ±.005
K	#17(.173) Drill 10 Holes
L	2.440 ±.005
M	2.684 ±.004
N	3.210 ±.005
P	0.069 ±.002
Q	3.567 ±.031
R	0.250 ±.010
S	4.250 ±.031
T	3.007 ±.031

Bomac	HYBRID	
	BL533	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 2, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings: Transmitter po
Min.: ---
Max.: 250kw

Test Conditions: Note 2; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 8490Mc. to F= 9578Mc; Note 3	σ :---	1.15
4.18.18	Voltage Standing Wave Ratio (2):	F= 8490Mc. to F= 9578Mc; Note 4	σ :---	1.12
------	Directivity:	F= 8490Mc.	26	---db
		F= 9000Mc.	27	---db
		F= 9578Mc.	27	---db
		Note 5		
------	Power Division:	F= 8490	---	---
		F= 9578		
		Note 6		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket shall be bolted between the flange of the Short Slot Hybrid Junction and its mating flange. One gasket will be supplied with each Hybrid Junction.

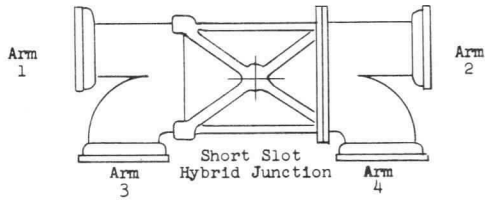
Note 3: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arm 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

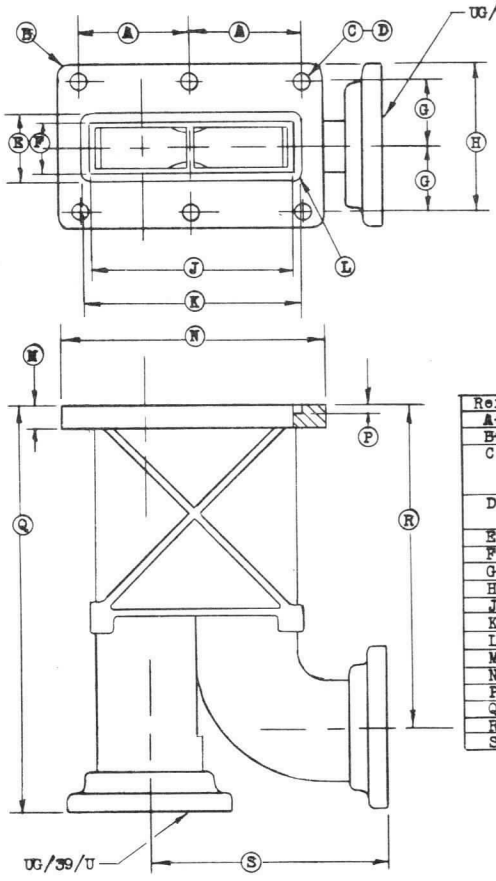
Note 4: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3 and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limits specified.

Note 5: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 2. Sliding loads are to be used on empty arms to eliminate the effects of a residual V.S.W.R. that occur with most fixed loads.

Note 6: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25db.

The Short Slot Hybrid Junction with Arms is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimensions.
A*	1.085 ±.003
B**	1/8 R.
C	Item A #18 (.1695) 6 holes.
D	Item B #8-32 NC (6) holes
E	.753 ±.003
F	.500 ±.003
G*	.640 ±.002
H**	1.625 ±.010
J	1.950 ±.003
K	2.203 ±.003
L	.046 R.
M**	.220
N**	2.575 ±.010
P	.070 ±.001
Q	3.675 ±.030
R*	2.860 ±.030
S*	2.325 ±.030

Bomac

HYBRID	
BL535	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 11, 1956

Dimensions: Per Outline

Ratings: Transmitter po
Min.: ---
Max.: 250 kw

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F=8490Mc. ±0.1% to F=9578Mc. ±0.1% Note 2	6:---	1.12
4.18.18	Voltage Standing Wave Ratio (2):	F=8490Mc. ±0.1% to F=9578Mc. ±0.1% Note 3	6:---	1.12
-----	Directivity:	F=8490Mc. ±0.1%	26	---db
		F=9000Mc. ±0.1%	27	---db
		F=9578Mc. ±0.1% Note 4	27	---db
-----	Power Division:	F=8490Mc ±0.1% F=9578Mc ±0.1% Note 5	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

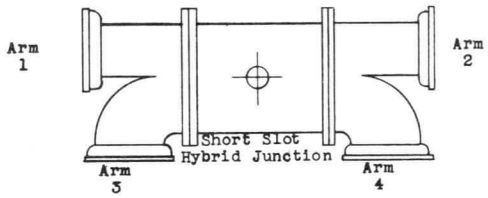
Note 2: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

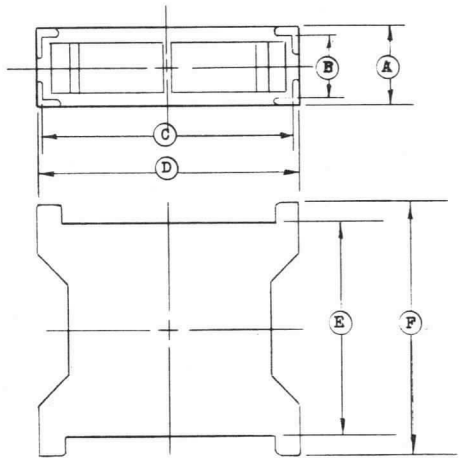
Note 3: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3, and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limits specified.

Note 4: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on empty arms to eliminate the effects of a residual V.S.W.R. that occur with most fixed loads.

Note 5: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimensions.
A*	.750
B	.628
C	2.438
D*	2.561
E	2.000
F	2.425 Max.

Bomac

HYBRID	
BL538	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JULY 11, 1956

Dimensions: Per Outline

Mounting: Note 2

Ratings: Transmitter po
Min: ---
Max.: 250 kw

Test Conditions: Note 2; See Test Circuit

Ref.	Test	Conditions	Min. n	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F=8490Mc. ±0.1% to F=9578Mc. ±0.1% Note 3	σ:---	1.12
4.18.18	Voltage Standing Wave Ratio (1):	F=8490Mc. ±0.1% to F=9578Mc. ±0.1% Note 4	σ:---	1.12
----	Directivity:	F=8490Mc. ±0.1%	26	---db
		F=9000Mc. ±0.1%	27	---db
		F=9578Mc. ±0.1% Note 5	27	---db
----	Power Division:	F=8490Mc±0.1% F=9578Mc±0.1% Note 6	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955

Note 2: A suitable gasket shall be bolted between each flange of the Short Slot Hybrid Junction and its mating flange. Two gaskets will be supplied with each Hybrid Junction.

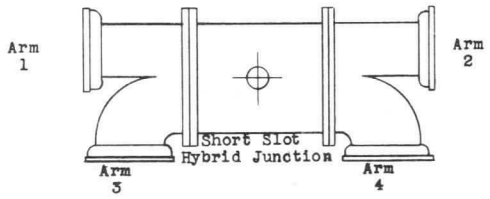
Note 3: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02 max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

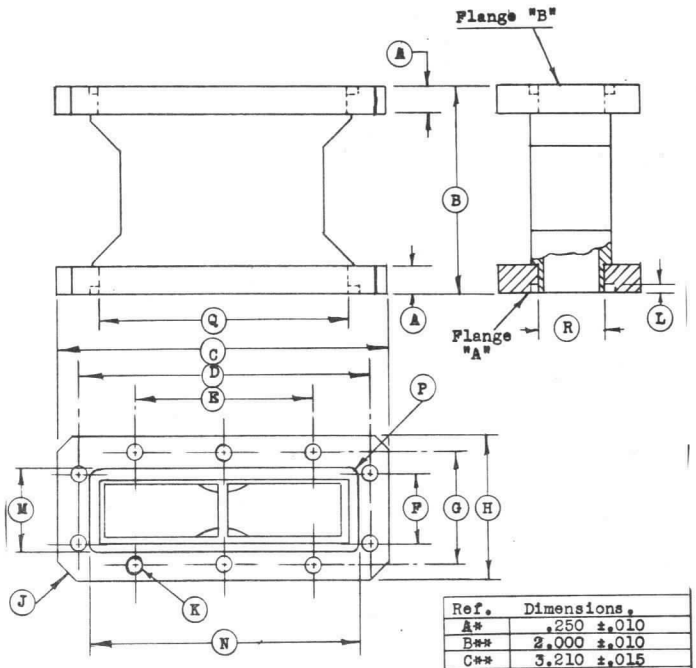
Note 4: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arms 2, 3, and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limits specified.

Note 5: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on empty arms to eliminate the effects of a residual V.S.W.R. that occur with most fixed loads.

Note 6: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02 max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02 max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimensions
M	.872 ±.004
N	2.684 ±.004
P	.046 R.
Q	2.438 ±.002
R	.626 ±.002

Ref.	Dimensions.
A*	.250 ±.010
B**	2.000 ±.010
C**	3.210 ±.015
D*	2.892 ±.004
E*	1.448 ±.004
F	.722 ±.004
G	1.080 ±.004
H*	1.380 ±.015
J**	1-1/8 R.
K	Flg. A 17 (.173) Dr. (10) holes. Flg. B 8-32NC (10) holes.
L	.069 ±.002

Bomac | **DUPLEXER** | **BL539** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 27, 1956

Dimensions: Per outline

Ratings:	Min.	Max.
Transmitter po	---	250 kw

Packing: To be specified.

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.18.18	Voltage Standing Wave Ratio:	F= 8500Mc	σ :---	1.4
		F= 8700	σ :---	1.4
		F= 8900	σ :---	1.4
		F= 9100	σ :---	1.4
		F= 9300	σ :---	1.4
		F= 9500	σ :---	1.4
		F= 9700	σ :---	1.4
		Note 2		
4.18.18	**High Level VSWR:	F= 8500	σ :---	1.2
		F= 9100	σ :---	1.2
		F= 9700	σ :---	1.2
		Note 3		
-------	Isolation(1):	F= 8500	15	---db
		F= 9100	20	---db
		F= 9700	15	---db
		Note 4		
------	Isolation(2):	F= 8500Mc	12	---db
		F= 9100Mc	20	---db
		F= 9700Mc	10	---db
		Note 5		
-------	Isolation(3):	F= 8500	25	---db
		F= 9100	35	---db
		F= 9700	20	---db
		Note 6		
4.18.28	*Arc Loss:	F= 9300±1%Mc po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 7	---	0.6db
4.18.15.1	Recovery Time:	F= 9300±1%Mc po=200±10%kw; tp=1.0±0.1μs; prr=1000; Note 8	t :---	7μs
------	Dual TR:	Note 9		
------	Local Oscillator:	Note 10		
------	Mixer Crystals (REC.):	Note 11		
------	Mixer Crystals (AFC):	Note 12		

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: VSWR measured looking into antenna arm (A) with balanced signal mixer loaded by 100 ohms. Crystal current sent to 0.5 to 0.8mAdc. A load σ=1.05max. attached to arm M.

Note 3: Transmitter po into arm M, a high level load, σ=1.07max., on arm A. The VSWR looking into arm M shall be within the limits specified.

Note 4: Measured between the antenna arm and the magnetron arm.

Note 5: Measured between the antenna arm and the local oscillator arm.

Note 6: Measured between the signal mixer arm and the AFC mixer arm.

Note 7: Use one hybrid with transmitter power going into arm M, a metal short on the hybrid output, a power monitoring device followed by a high level load, σ=1.07max. on arm A. After power is monitored replace hybrid with BL-539 assembly.

Note 8: Transmitter po in arm M, a simulated echo and high level load, σ=1.07max. at arm A.

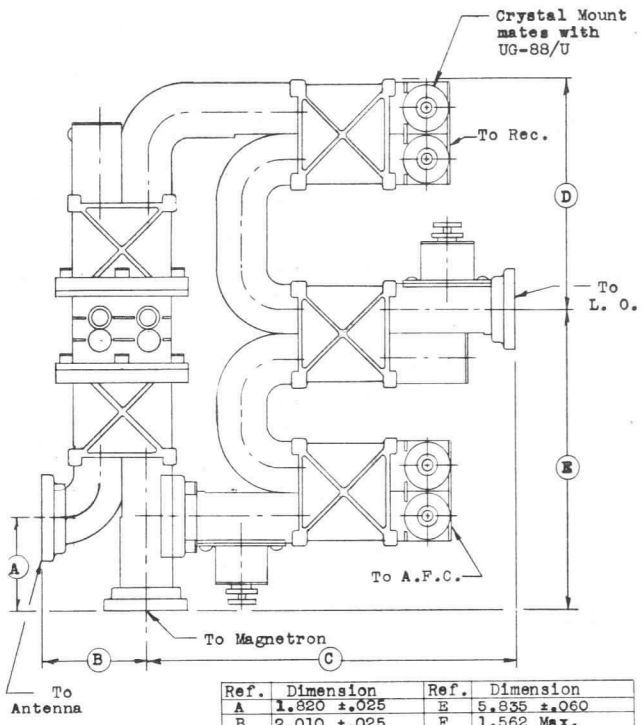
Note 9: Refer to Bomac specification 6334 (BL-27) for the Dual TR electrical characteristics.

Note 10: Refer to Bomac specification BL-800 for the local oscillator electrical characteristics. There shall be enough local oscillator power available to enable the AFC and signal mixers to operate at a crystal current of 0.8 ma.

Note 11: Refer to Bomac specifications 1N23D and 1N23DR for the receiver crystal characteristics.

With the 1N23D and 1N23DR inserted in the balanced mixers there should not be a variation in output crystal current ratio in excess of 10%.

Note 12: Refer to Bomac specification 1N415C for the AFC crystal characteristics.



Ref.	Dimension	Ref.	Dimension
A	1.820 ±.025	E	5.835 ±.060
B	2.010 ±.025	F	1.562 Max.
C	7.104 ±.040	G	0.828 Max.
D	4.562 Max.		

Bomac

DUPLEXER

BL542 X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 3, 1956

Dimensions: Per Outline

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	--- kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	17	30	28 Vdc
Shutter Circuit Resistance(25°C)	90	110	100 ohms
Pull In Current	155	---	---mAdc
Holding Current	110	335	---mAdc
Ignitor Current	100	200	---μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 17)(each electrode)

Test Conditions: Notes 2, 3, 4, ; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
------	**Vibration:	Cycles=1; F=5 to 55cps, 0.080 in(Total) F=55 to 500cps; G=15; Shutter Current = 110mAdc; t=5 min; Note 5	---	---
4.18.17.1	Temperature Cycles:	------	---	---
------	Shutter Current:	Shutter Voltage = 28Vdc	I : 254	311mAdc
------	Pull In Current:	------	I : ---	155mAdc
------	*Holding Current:	Note 6	I : ---	110mAdc
4.18.10	Spike Leakage Energy:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	Ws : ---	0.1erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf : ---	20mw
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 12	t : ---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 13	σ : ---	1.2
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 14	---	0.4db
4.11	Life Test(1):	cps=10max; Cycles : 50,000 --- Group D; Note 15		
4.11	Life Test(2):	F= 9000Mc; po=200±10%kw(min.); tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8Meg each electrode; Group D; Note 16	t : 500	---hrs.

Ref.	Test	Conditions		Min.	Max.
4.18.1	Ignitor Ignition Time:	Ebb= -700Vdc; Ri=4.0 Meg; Note 7	t :	---	5.0sec.
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 7	Eid :	200	375Vdc
4.18.4.2	*Duplexer Loss(1):	F= 8490Mc.	Li :	---	1.1db
		F= 8565	Li :	---	0.9db
		F= 9000	Li :	---	0.9db
		F= 9487	Li :	---	0.9db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 8	Li :	---	1.1db
4.18.4.2	Duplexer Loss(2):	Shutters Closed;			
		*F= 8490Mc.	Li :	40	---db
		*F= 8565	Li :	40	---db
		F= 9000	Li :	40	---db
		*F= 9487	Li :	40	---db
		*F= 9578Mc; Note 8	Li :	40	---db
------	*Isolation:	F= 8490Mc		15	---db
		F= 8565		17	---db
		F= 9000		20	---db
		F= 9487		17	---db
		F= 9578Mc; Note 9		15	---db
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ :	---	1.4
		F= 8565	σ :	---	1.2
		*F= 8655	σ :	---	1.2
		*F= 8745	σ :	---	1.2
		*F= 8835	σ :	---	1.2
		*F= 8925	σ :	---	1.2
		F= 9000	σ :	---	1.2
		*F= 9087	σ :	---	1.2
		*F= 9187	σ :	---	1.2
		*F= 9287	σ :	---	1.2
		*F= 9387	σ :	---	1.2
		F= 9487	σ :	---	1.2
		F= 9578Mc; Note 10	σ :	---	1.4
4.11.4	Life Test (1 and 2) End Point:	Duplexer Loss(1), at F=9000Mc;	Li :	---	1.2db
		Duplexer Loss (2); at F=9000Mc;	Li :	40	---db
		Spike Leakage Energy;	Ws :	---	.15erg
		Flat Leakage Power;	pf :	---	20mw
		Recovery Time	t :	---	10μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: The shutters of the BL-542 provide a convenient method of opening or shorting waveguide lines at low power levels, peak power input < 1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: Each Short-Slot Hybrid Junction used, at all specified frequencies, should have a V.S.W.R. of less than 1.12, an even Power Split within ±0.25 db, and a minimum of 27db Directivity.

Note 4: Unless otherwise specified all low and high level tests are to be made with the tube shutters open.

Note 5: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set-up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the shutter tube. The modulation (ΔLi), due to vibration, shall not be greater with the shutter tube in the line than with the waveguide section. Tubes shall meet all applicable requirements of this specification after the vibration test. During vibration the tube shutters shall be held open by the specified Minimum Holding Current.

(over)

Note 6: The current required to hold the shutters open shall be within the specified limit when the tube is subjected to a hammer blow G-15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 7: Measured separately for each ignitor electrode.

Note 8: See Test Circuit
A low level load, σ=1.05max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 9: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05max., on all empty arms.

Note 10:± See Test Circuit
Attach a low level load, σ=1.05max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 11: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07max., at arm A; a low level load, σ=1.07max. on arm L; detector on arm R.

Note 13: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A. The V.S.W.R. looking into arm M, shall be within the limit specified.

Note 14: See Test Circuit
Use only one hybrid with its gasket. Transmitter po in arm M; a metal short or tube on hybrid; output; a power monitoring device followed by a high level load, σ=1.07 max., on arm A.

Note 15: 28 Vdc pulses are applied to the shutter circuit. Each time the shutters open, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter coils.

Note 16: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07max., on arm A.

Note 17: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

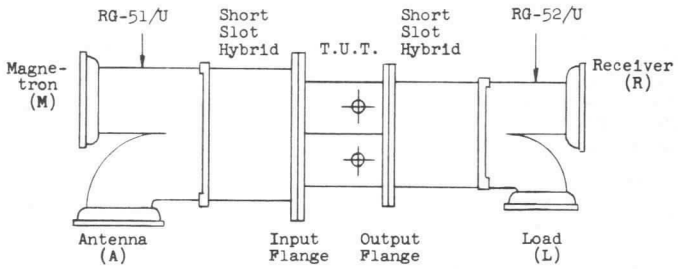
$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (Megohms)}$$

Where Ri = Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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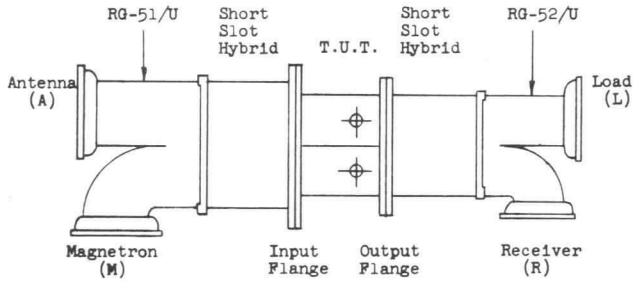
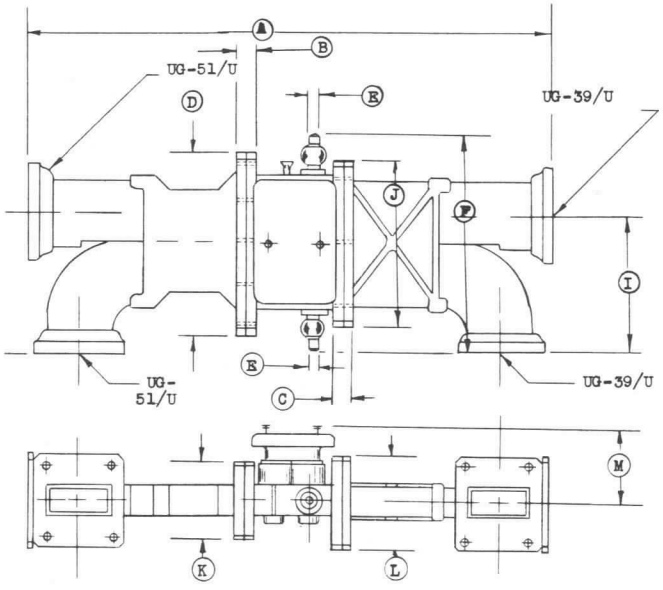




Ref.	Dimensions.
A	9.480 ±.070
B *	.375 ±.020
C *	.350 ±.020
D **	3.210 ±.015
E *	.250 Dia.
F	4" Max.
H	3.007 ±.031
I	2.325 ±.030
J **	2.575 ±.015
K **	1.380 ±.015
L **	1.625 ±.015
M *	1-7/8 Max.

Bomac	DISCRIMINATOR	
	BL543	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 15, 1956

Dimensions: As per attached outline

Ratings:	Min.	Max.
Transmitter po	---	180 watts peak

Test Conditions: Note 2

Packing: To be specified

Ref.	Test	Conditions		Min.	Max.
4.5	Holding Period:	t=168 hours		---	---
4.9.19.2	**Vibration:	G=10 up to 500 cps; Note 3	ΔFa : ΔFb :	--- ---	±0.10Mc. ±0.10Mc.
4.9.20.5	*Shock Test:	G=50 t=6 ms; Note 4	ΔFA : ΔFB :	--- ---	±0.10Mc. ±0.10Mc.
4.18.13.1	Loaded Q:	Note 9	QL :	1900	2400
------	Operating Frequency:	F=Fn= 9150Mc. Notes 2, 5	Fn :	---	1.5Mc.
	Mode Frequency Separation:	Notes 5, 6	FA=Fn+5 : FB=Fn-5 :	--- ---	±1.5Mc. ±1.5Mc.
------	RF Glow Test:	Note 10		---	---
------	*Temperature (1) Compensation:	Room Temperature to 100°C; Note 7, 9	ΔFA : ΔFB :	--- ---	±0.3Mc. ±0.3Mc.
------	*Temperature (2) Compensation:	Room Temperature to -55°C; Note 7, 9	ΔFA : ΔFB :	--- ---	±1.2Mc. ±1.2Mc.
------	Mixer Output Voltage:	180 Watts peak into type "N" input.	Fn : FA : FB :	0.3 1.0 1.0	0.4 v 1.5 v 1.5 v
4.11	Life Test:	Group B; T= -55°C to 100°C; t=30min; Notes 8, 9	cycles:	25	---
4.11.4	Life Test End Point:	RF Glow Test; Resonant Freq.	FA: FB :	--- ---	--- ±0.5Mc. ±0.5Mc.

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Electrical measurements on each cavity are to be made with a standard frequency source having an absolute accuracy of the order of 1 part in 500,000. The VSWR of the test line shall be less than 1.05. The cavities are to be final tuned in the H-plane Tee as shown in the Outline drawing dated 3-30-56.

Note 3: The difference in resonant frequency before and after the vibration test shall not exceed the limits specified.

Note 4: Insert 1/2" thickness of 32-38 Durometer rubber between the hammer and anvil of the Taft-Pierce machine. Angle of hammer to be approximately 60°. The difference in resonant frequency before and after the shock test shall not exceed the limits specified.

Note 5: Operating frequency is defined as the mid frequency point between two resonant peak frequencies.

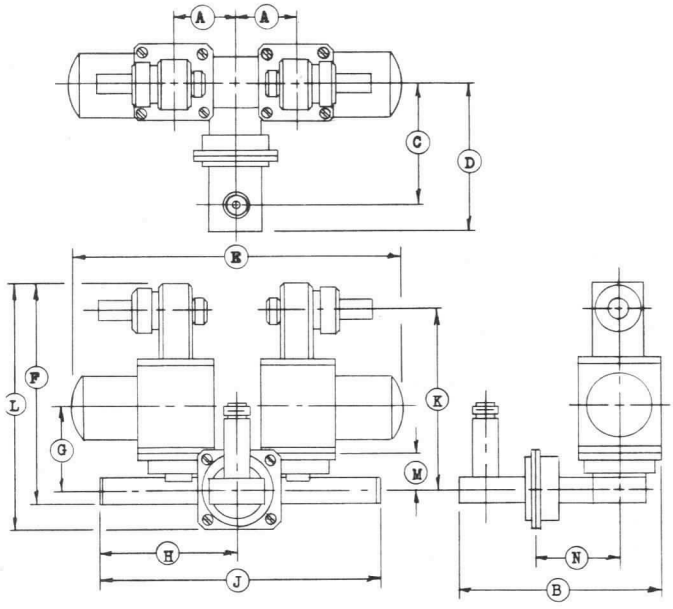
Note 6: Mode Frequency separation is defined as the frequency difference between center (operating) frequency and either of the two adjacent resonant frequency peaks designated as FA and FB.

Note 7: The cavities shall be brought to equilibrium at the specified extreme temperatures for 30 minutes and then returned to equilibrium at room temperature. Resonant frequency measurements shall be made at approximately 20°C temperature intervals after stabilizing at each temperature for at least 20 minutes while returning to room temperature. At no temperature shall the operating frequency differ from the value at room temperature by more than the specified amount.

Note 8: The cavity may be allowed to come to equilibrium at room temperature in passing from one extreme to the other. The cavity shall be maintained at each of the extreme temperature for the specified time during each cycle. When the tube has come to equilibrium at room temperature at the conclusion of each of the last two half cycles, the resonant frequency shall be measured and shall be within the specified limits.

Note 9: During these tests the cavities shall be detached from the discriminator plumbing. The test shall be performed on the cavities only.

Note 10: The tube shall show a typical diffused low-pressure glow discharge when placed in an RF field.



Ref.	Dimensions
A	1.250 Ref.
B	5 7/8 Max.
C	4.438 ±.030
D	5.000 Max.
E	6 7/8 Max.
F	4 3/8 Max.
G	1.625 Ref.
H	2.945 Max.
J	5.890 Max.
K	3.652 Ref.
L	4.937 Max.
M	0.750 Ref.
N	3.313

Bomac

GAS NOISE SOURCE

BL721 | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 6, 1956

Mounting: Waveguide Assembly RG-52/U

Ratings:	Min.	Max.
Anode Current	ib: 125	275mAdc
Filament Current	if:	170mAdc
Tube Dissipation	P:	17 W
Ambient Temp. Range	t: -40°	165°F

Test Conditions: Note See Starting and Operating Circuit

Packing: To be specified.

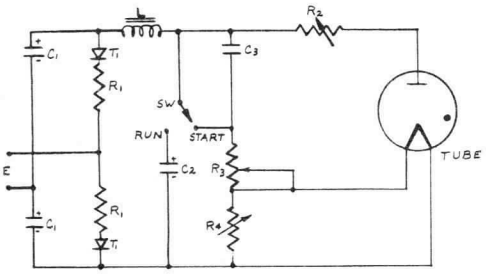
Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t= 168 hours		
4.18.18	Voltage Standing Wave Ratio:	Fo=8400 Mc to 12500 Mc Note 2	σ:	1.13
------	Noise Temperature:	T=290°K+	15.0	15.6db
------	Filament Current:	Note 3 and 4		170mAdc
------	Voltage Drop:	E= 115AC Note 4	Eid : ---	85Vdc

Note 1: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Voltage Standing wave ratio is to be read with the tube operating and mounted as per waveguide assembly. The average VSWR over the recommended transmission bandwidth of the guide is about 1.07 with a maximum of about 1.13. No tube shall exceed the requirements specified.

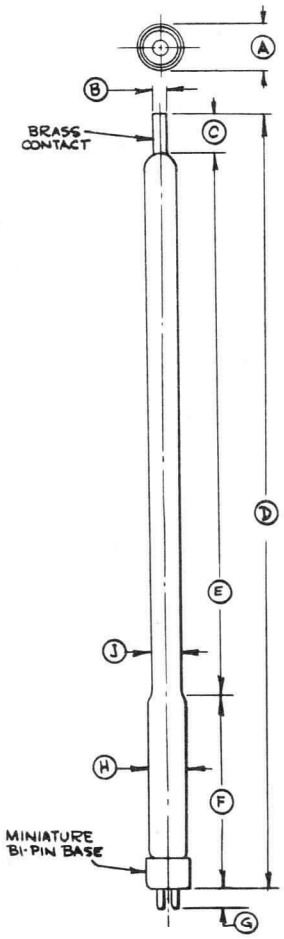
Note 3: This test to be performed in starting and operating circuit, the filament current should be set at 170 MA for operation.

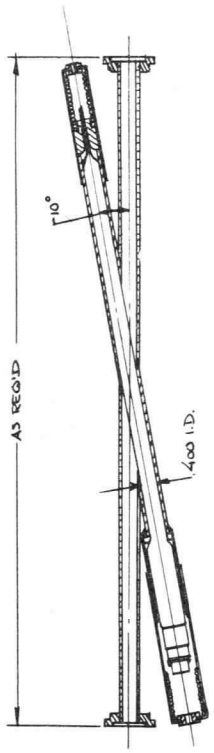
Note 4: The operating circuit should have sufficient series resistance to limit the current through the tube to the rated value after starting period. The filament current should be set for 170 MA for starting and the anode current set for 200 ma for operation.



SYMBOL DESIGNATION

E = 115V A.C.
C_1 & C_2 = 40 μF
C_3 = .006 μF
R_1 = 5 Ω
R_2 = 800 Ω
R_3 = 1000 Ω
R_4 = 200 Ω
L = 2HY
T_1 = Selenium Rectifier





REF.	DIMENSIONS
A	9/16 MAX.
B	3/16 DIA.
C	15/32 ± 1/32
D	11 3/4 ± 1/8
E	8 5/8 MIN.
F	2 1/16 ± 1/16
G	.348 MIN.
H	.500-.550 O.D.
J	3/8 O.D. ±.020

Bomac

HYBRID

BL525 | **K_u**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 16, 1955

Dimensions: Per Outline

Ratings: Transmitter po
Min.: ---
Max.: 70kw

Test Conditions: Note 2; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio (1):	F= 15KMC. to F= 17KMC; Note 2	σ: ---	1.15
4.18.18	Voltage Standing Wave Ratio (2):	F= 15KMC. to F= 17KMC; Note 3	σ: ---	1.12
------	Directivity:	F= 15KMC.	27	---db
		F= 16KMC.	27	---db
		F= 17KMC.	27	---db
		Note 4		
------	Power Division:	F= 15KMC. to F= 17KMC; Note 5	---	---

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

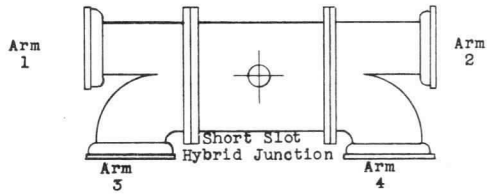
Note 2: See Test Circuit
A low level signal in Arm 1; a metal short replacing Arms 2 and 4 at Hybrid output; a low level load, σ=1.02max., on Arm 3. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

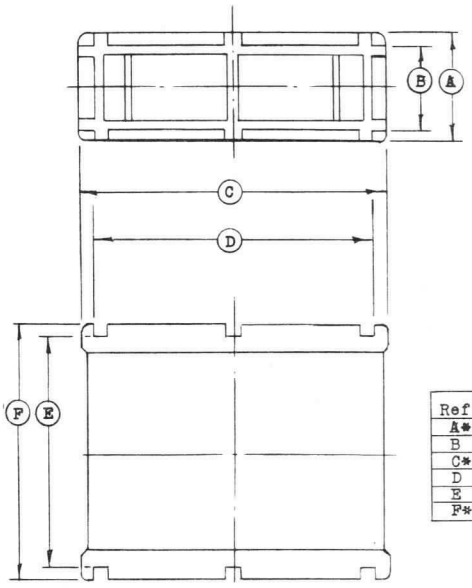
Note 3: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02max., on Arms 2, 3 and 4. Then the V.S.W.R. looking into Arm 1 shall be within the limit specified.

Note 4: See Test Circuit
Directivity is the db difference in power transmission between Arms 3 and 4, where Arm 3 is the specified attenuation down from Arm 4 when a low level signal is fed into Arm 1 and detected first at Arm 4 and then at Arm 3. Sliding loads are to be used on all empty arms to eliminate the effect of a residual V.S.W.R. that occurs with most fixed loads.

Note 5: See Test Circuit
A low level signal in Arm 1; a low level load, σ=1.02max., on Arm 3. A power measuring device is inter-changed with a low level load, σ=1.02max., on Arms 2 and 4. Then the power through Arm 2 shall equal the power through Arm 4 within ±0.25 db.

The Short Slot Hybrid Junction is a symmetrical device without any definite input or output and may be tested accordingly.





Ref.	Dimensions.
A*	.530 Max.
B	.395 ±.002
C*	1.500 Max.
D	1.366 ±.002
E	1.110
F*	1.250 Max.

Bomac	DUPLEXER	K_a
	BL527	TR

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MARCH 27, 1956

Application: Short Slot Hybrid Duplexer

Dimensions: Per Outline

Mountings: Note 2

Ratings:	Min.	Max.
Transmitter po	1	20 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150μAdc

Test Conditions: Notes 2, See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	(d); Package Group 1; Carton Size K	---	---
------	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 3	---	---
4.18.17.1	Temperature Cycle:	------	---	---
4.18.18	Voltage Standing:	F=33.50 KMC	σ : ---	1.3
		*F=33.80	σ : ---	1.3
		*F=34.10	σ : ---	1.3
		F=34.50	σ : ---	1.3
		*F=34.90	σ : ---	1.3
		*F=35.20	σ : ---	1.3
		*F=35.70 KMC	σ : ---	1.3
		F=36.25 Note 4	σ : ---	1.3
4.18.4.2	Duplexer Loss:	F=33.50 KMC	Li : ---	1.2 db
		F=34.00	Li : ---	1.0 db
		F=34.50	Li : ---	1.0 db
		F=35.50	Li : ---	1.0 db
		F=36.25 KMC Ii=0μAdc; Note 5	Li : ---	1.2 db
4.18.5.1	*Ignitor Interaction:	Ii=100μAdc Note 5	ΔLi : ---	0.2 db
------	Isolation:	F=33.50 KMC	15	---db
		F=34.00	15	---db
		F=34.50	15	---db
		F=35.50	15	---db
		F=36.25 KMC Note 6	15	---db
4.18.1	Ignitor Ignition Time:	Ebb=-700Vdc; Note 7	t : ---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 7	Eid : 350	475Vdc
4.18.11	Flat Leakage Power:	F=34.50 KMC po=20±10%kw; tp1=0.50±0.1μs; tp2=0.25±0.05μs; prr=1000; Ii=100μAdc; Note 8	pf : ---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws : ---	0.1erg

Ref.	Test	Conditions	Min.	Max.
4.18.28	Arc Loss:	F=34.5 KMC po=5.0±5%kw; tp=0.50±0.1μs; prr=1000; Note 10	---	0.8 db
4.18.15.1	*Recovery Time:	F=34.5 KMC po=20±10% kw; tp=0.50±0.1μs; prr=1000; Ii=100μAdc Note 11	t : ---	5 μs
4.11	Life Test:	F=34.5 Mc; po=20 kw±10%kw (min); tp=0.50±0.1μs; prr=1000; Ebb=-700 Vdc; Group D; Note 12	t: 500	---hrs
4.11.4	Life Test End Point:	Recovery Time;	t : ---	10μs
		Flat Leakage Power;	pf : ---	25mw
		Spike Leakage Energy;	Ws : ---	.15 erg
		Duplexer Loss at F=34.5 KMC	Li : ---	1.0 db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: A suitable gasket should be bolted between each flange of the tube and its mating flange.

Note 3: Vibrate in a plane normal to the ignitor axes. The ignitor electrodes shall not short to the tube body during this test. Subsequent to the test the tube shall meet all requirements of this specification.

Note 4: See Test Circuit
Attach a low level load, σ=1.05 max., to arms M, R and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

Note 5: See Test Circuit
A low level load, σ=1.05 max., on arms M and L. A low level signal in arm A is detected at arm R.

Note 6: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ=1.05 max., on all empty arms.

Note 7: Series resistor Ri is encapsulated in the tube.

Note 8: See Test Circuit
Transmitter po in arm M; a high level load, σ=1.07 max., on arm A; a low level load, σ=1.07 max., on arm L; Leakage power detected at arm R.

Note 9: See Test Circuit
Transmitter po in arm M; a metal short or tube on hybrid output; a power monitoring device followed by a high level load, σ=1.07 max., on arm A.

Note 11: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ=1.07 max., at arm A; a low level load, σ=1.07 max., on arm L; detector on arm R.

Note 12: See Test Circuit
Use only one hybrid. Transmitter po in arm M; tube and gasket on hybrid output; a high level load, σ=1.07 max., on arm A.

(over)

Note 13: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

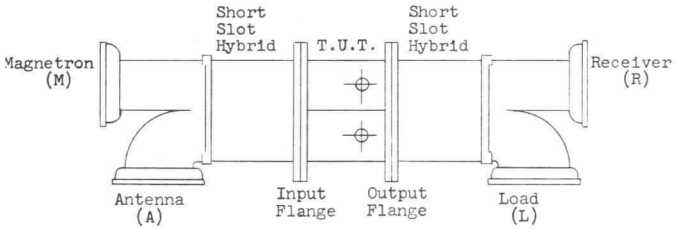
$$\text{Series Resistance (Ri)} = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri = Total series resistance
Ebb = Open circuit supply voltage
Ei = Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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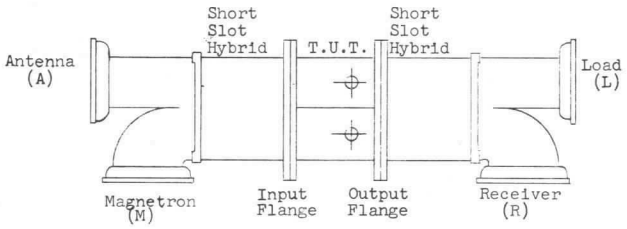
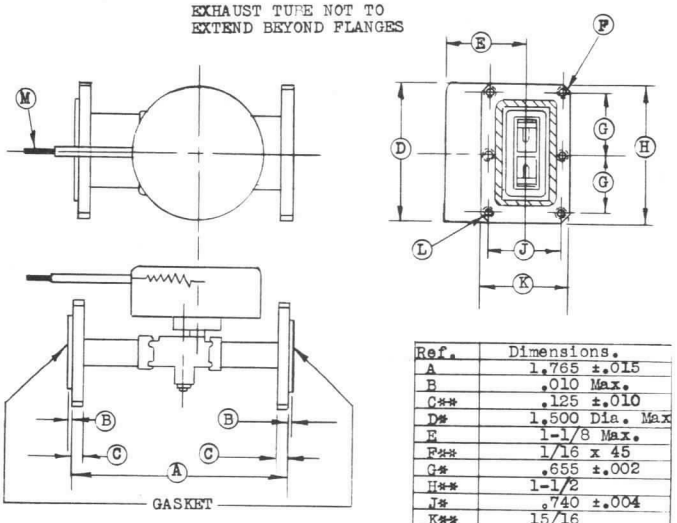




Gasket may be compressed so that the faces of mating flange and tube flange meet.

Ref.	Dimensions.
A	1.765 ±.015
B	.010 Max.
C**	.125 ±.010
D*	1.500 Dia. Max
E	1-1/8 Max.
F**	1/16 x 45
G*	.655 ±.002
H**	1-1/2
J*	.740 ±.004
K**	15/16
L	#4-40 NC
M	18" Min.
R1	2.2 Meg.

Bomac

RELAY
BL148

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS
MAY 29, 1956

Dimensions: As Per Outline

Description: Relay, Armature

Ratings:	Min.	Max.
Operating Voltage	Eb. 24. 0	30. 5 Vdc
Pull-in Voltage		14. 7 Vdc/20°C
Coil Resistance	R. 35. 1	42. 9 ohms/20°C
Operating Temp. (at 30. 5Vdc)	T	200°C
Contacts 1 and 5, 2 and 6		
Contact Current (at 50 Vdc)	Ic:	1. 6 A
Contact Resistance (at 1. 6A)	Rc:	. 25 ohms
Test Voltage	Et:	1000 vrms
Contacts 3 and 7		
Contact Current	ib:	90 a
	Ib:	3. 0 A
Operating Voltage	ep:	7. 5 kv
Contact Resistance (at 3. 0A)	Rc:	. 25 ohms

Pack: To be specified.

Ref.	Test	Conditions	Min.	Max.
3. 1	Qualification Approval:	Required for JAN Marking	---	---
------	*Vibration:	F=5 to 80 cps G=5 Note 2	---	---
------	Moisture Resistance:	Note 3	---	---
------	Immersion Test	Note 4	---	---
	Seal Test	T=4hr. Note 5	---	---
4. 6. 4	Insulation Resistance:	Note 6	R:100	megohms
4. 6. 3	Dielectric Strength		---	---
4. 6. 7	**Temperature Cycle:	Note 7	---	---
	Life Test	Note 8	t:2000	hrs

Note1: References and notations are from Military Specification, Relays, Armature for Electronic and Communication Equipment MIL-R 5757C 26 July 1955.

Note 2: The relay is to be vibrated in each of the three mutually perpendicular directions for 60 seconds. During the test contacts shall be observed for opening or closing. After vibration, the insulation resistance, pull in voltage, contact resistance shall be measured and relays shall be examined for evidence of loosening parts.

Note 3: The relay is to be placed in a humidity chamber with a relative humidity of 90 to 95% for 2 hours, at the completion of this test the relay shall meet all the initial requirements of this specification.

Note 4: Between contacts 3 and 7 a test voltage of 15 Kvdc shall be applied for a minimum duration of 30 seconds between contacts, and contacts and case when immersed in Dow Corning Type DC-550 silicone fluid. The relay contacts shall not breakdown.

Note 5: Relays shall be immersed in an air-free saturated solution of sodium chloride and shall be subjected to an absolute pressure equal to 2. 5 inches of mercury for 4 hours. The immersed relay shall be observed for evidence of leakage indicated by bubbles emanating from the case.

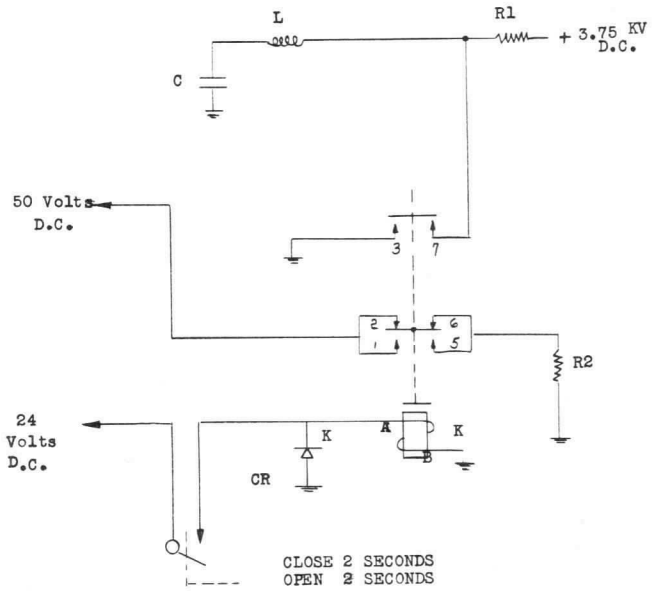
Note 6: The insulation resistance shall be measured between mutually insulated parts by means of a megohm bridge at a dc potential of 100 volts.

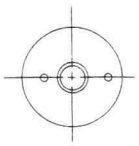
Note 7: The relays shall be placed in a chamber at 85° C for 30 minutes, then to 30°C for 15 minutes. The temperature is then reduced to -55°C for 30 minutes, then raised 30°for 15 minutes.

Note 8 The relay shall be capable of 50, 000 switching operation at full load. The full load switching test circuit is shown on page 5.

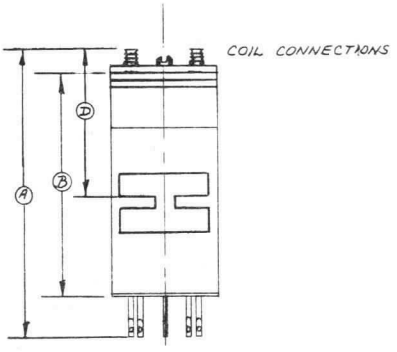
FULL LOAD SWITCHING TEST CIRCUIT "X"

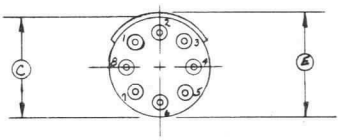
C: 0.005 MFD
CR: Surge suppression diode, S322-1068 P1 or equivalent
K: BL-148
L: 6 microhenry RF choke
R1: 10 to 25 megohm
R2: 31.2 ohms





REF	DIMENSION
A *	3" MAX.
B	2 1/4" MAX.
C**	1 5/64 MAX.
D	1 7/16 ± 1/64
E	1 3/64 MAX.





PIN 1 & 5 L.V. NORMALLY OPEN
PIN 2 & 6 L.V. NORMALLY CLOSED
PIN 3 & 7 H.V. NORMALLY OPEN
PIN 4 & 8 NO CONNECTION

Bomac | **DUPLEXER** | **6604/BL509** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 12, 1956

Application: Note 2

Dimensions: Per outline

Mounting: Note 3

Ratings:	Min.	Max.	Nom.
Transmitter po	1	250	---kw
Open Circuit Ignitor Voltage	-700	---	---Vdc
Shutter Circuit Voltage	---	---	28Vdc
Shutter Circuit Resistance (25°C)	90	110	1000hms
Pull In Current	220	---	---mAdc
Holding current	110	320	---mAdc
Ignitor Current	100	200μAdc	

Recommended Ignitor Operating Current 150μAdc (Note 17) (each electrode)

Test Conditions: Notes 2, 3, 4; See Test Circuit

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
----	Shutter Current:	Shutter Voltage = 28Vdc	I:254	311mAdc
----	Pull In Current:	----	I:---	220mAdc
----	*Holding Current:	Note 5	I:---	110 mAdc
----	*Vibration:	Cycles =1; F=5 cps to F=500 cps; G=15; Shutter Current =110mAdc; t=5 min. (min); Note 6	---	---
4.18.18	Voltage Standing Wave Ratio:	F= 8490Mc.	σ:---	1.4
		F= 8565	σ:---	1.2
		*F= 8655	σ:---	1.2
		*F= 8745	σ:---	1.2
		*F= 8835	σ:---	1.2
		*F= 8925	σ:---	1.2
		F= 9000	σ:---	1.2
		*F= 9087	σ:---	1.2
		*F= 9187	σ:---	1.2
		*F= 9287	σ:---	1.2
		*F= 9387	σ:---	1.2
		F= 9487	σ:---	1.2
		F= 9578Mc; Note 7	σ:---	1.4
4.18.4.2	*Duplexer Loss(1):	F= 8490Mc	Li:---	1.2db
		F= 8565	Li:---	1.0db
		F= 9000	Li:---	1.0db
		F= 9487	Li:---	1.0db
		F= 9578Mc; Ii=100μAdc on each electrode; Note 8	Li:---	1.2db
4.18.4.2	*Duplexer Loss(2):	Shutters Closed; F= 8490Mc	Li:40	---db
		F= 8565	Li:40	---db
		F= 9000	Li:40	---db
		F= 9487	Li:40	---db
		F= 9578Mc; Note 8	Li:40	---db
------	*Isolation:	F= 8490Mc	15	---db
		F= 8565	18	---db
		F= 9000	20	---db
		F= 9487	18	---db
		F= 9578Mc; Note 9	15	---db
4.18.1	*Ignitor Ignition Time:	Ebb=-700Vdc; Ri=4.0Meg; Note 10	t:---	5.0sec
4.18.2	Ignitor Voltage Drop:	Ii=100μAdc; Note 10	Eid:200	375Vdc

Ref.	Test	Conditions	Min.	Max.
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc on each electrode; Note 11	pf:---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	---	0.6db
4.18.15.1	*Recovery Time:	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 13	t:---	7.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc on each electrode; Note 14	σ:---	1.2
4.11	Life Test (1):	cps.=10max.; Group D; Note 15	Cycles:50,000	---
4.11	Life Test (2):	F= 9000Mc; po=200±10%kw min; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc;Ri=2.8 meg each electrode; Group D; Note 16	t:500	---hrs
4.11.4	Life Test (1 and 2) End Point:	Recovery Time;	t:---	10 μs
		Flat Leakage Power;	pf:---	20 mw
		Spike Leakage Energy;	Ws:---	.15 erg
		Duplexer Loss (1); F=9000Mc.	Li:---	1.2db

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: The shutter of the 6604/BL-509 provides a convenient method of opening or shorting waveguide lines at low power levels, transmitter po<1 kw. They are not intended for applications involving the switching of high power and should be either open or closed whenever high power is incident on the tube.

Note 3: A gasket should be bolted between each flange of the Short Slot Hybrid Duplexer and its mating flange. Two gaskets will be supplied with each tube.

Note 4: Unless otherwise specified, all low and high level tests are to be made with the tube shutters open.

Note 5: The current required to hold the shutter open shall be within the specified limit when the tube is subjected to a hammer blow, G=15, directed along a line parallel to the axes of the shutters and against that side of the tube which is directly opposite the side on which the shutter coils are mounted.

Note 6: Vibrate along a line parallel to the axes of the shutters. Duplexer Loss test set up shall be used with the unit under test mounted on the vibrator in such a manner that a standard waveguide section of similar geometry may be substituted for the duplexer. The modulation (ΔL1), due to vibration, shall not be greater with the duplexer in the line than with the waveguide section. Tubes shall meet all requirements of this specification after the vibration test.

Note 7: See Test Circuit
Attach a low level load, σ=1.05 max., to arms M, R, and L. Then the V.S.W.R. looking into arm A shall be within the limits specified.

(over)

Note 8: See Test Circuit
A low level load, σ≤1.05max., on arms M and L. Signal in arm A is detected at arm R.

Note 9: See Test Circuit
Isolation is the db difference in power transmission between arms R and M, where the detected power at arm M is the specified attenuation down from arm R when a low level signal is fed into arm A and detected first at arm R and then at arm M. Keep a low level load, σ≤1.05max., on all empty arms.

Note 10: Measured separately for each ignitor electrode.

Note 11: See Test Circuit
Transmitter po in arm M; a high level load, σ≤1.07max., on arm A; a low level load, σ≤1.07max., on arm L; Leakage Power detected at arm R.

Note 12: See Test Circuit
No loads necessary on arms L and R. A suitable metal short is interchanged with the Short Slot Hybrid Duplexer at the junction of arms M and A. Transmitter po in arm M;a power monitoring device followed by a high level load, σ≤1.07max., at arm A.

Note 13: See Test Circuit
Transmitter po in arm M; a simulated echo and high level load, σ≤1.07max., at arm A; a low level load, σ≤1.07max., at arm L; detector at arm R.

Note 14: See Test Circuit
No loads necessary on arms L and R. Transmitter po in arm M; a high level load, σ≤1.07max., at arm A. The V.S.W.R., looking into arm M, shall be within the limit specified.

Note 15: 28Vdc pulses are applied to the shutter circuit. Each time the shutters open, a low level signal goes through the tube and is registered by a counting circuit. At the end of this test the number of signals received should equal the number of pulses applied to the shutter circuit.

Note 16: See Test Circuit
No loads necessary on arms L and R. Transmitter po in arm M; a high level load, σ≤1.07max., at arm A.

Note 17: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

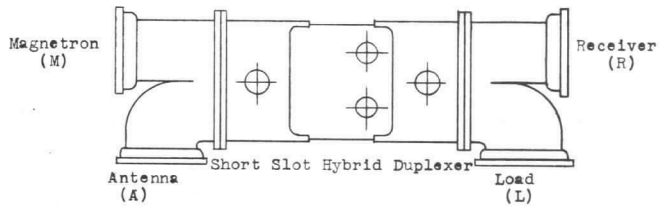
$$\text{Series Resistance (Ri)} = \frac{Ebb-Ei}{150} \text{ (megohms)}$$

where Ri= Total series resistance
Ebb= Open circuit supply voltage
Ei= Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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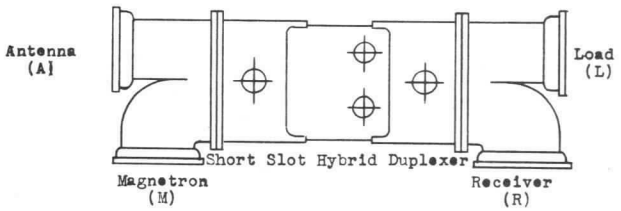
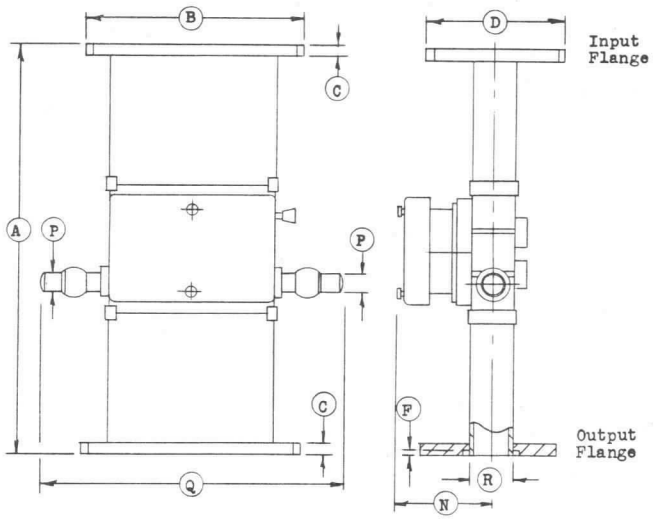
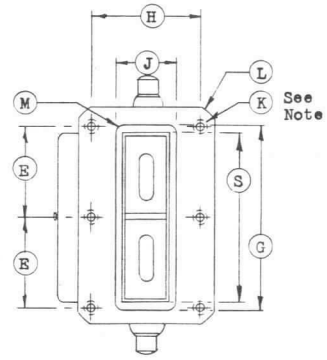




Ref.	Dimension
A	4.974 ±.015
B**	2.575 ±.015
C**	0.220 ±.010
D**	1.625 ±.015
E*	1.085 ±.003
F	0.070 ±.001 Typ.
G	2.204 ±.005
H*	1.280 ±.004
J	0.754 ±.005
K	#8-32 NC
	#18(.1695)
	6 Holes
L**	1 1/16 Rad.
M	3/64 Rad.
N*	1 7/8 Max.
P**	0.250 Dia.
Q*	4.000 Max.
R**	0.500 ±.005
S**	1.950 ±.005



Note:-
Input flange has tapped holes, Dimensions same as output.
Output flange has clearence holes.

Bomac

DUPLEXER

BL88 | **C**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 27, 1955

Dimensions: Per Outline

Mounting: The duplexer is to be mounted in such a manner that the resultant line arrangement is Magnetron, ATR, TR, Antenna.

Ratings:	Min.	Max.
Transmitter po	10	100 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Recommended Ignitor Operating Current 150 μAdc (Note 6)

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
-----	**Vibration:	F=50±2 cps; Total Excursion =0.08±0.005 in; t=5 min; Note 2	---	---
4.18.17.3	Temperature Cycle:	-----	Cycles: 1	---
4.18.1	*Ignitor Ignition Time:	Ebb=-700 Vdc; Ri=4.0 Meg.	t:---	5.0 sec
4.18.2	Ignitor Voltage Drop:	Ii=100 μAdc	Eid:200	400Vdc
4.18.4.2	Duplexer Loss:	F=5370 Mc. F=5400Mc. F=5430Mc. Note 3	Li:-- Li:-- Li:--	0.7 db 0.7 db 0.7 db
4.18.5.1	Ignitor Interaction:	Ii=100 μAdc; Note 3	ΔLi:--	0.2 db
4.18.18	Voltage Standing Wave Ratio:	F= 5370Mc. F= 5400Mc. F= 5430Mc.; Note 4	σ:--- σ:--- σ:---	1.5 1.5 1.5
4.18.10	Spike Leakage Energy:	F= 5400±1%Mc; po=90±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; Ii=100μAdc; See Mounting	Ws:---	0.30erg
4.18.11	Flat Leakage Power:	See Spike Leakage Energy	pf:---	50mw
4.18.15.1	*Recovery Time:	F= 5400±0.5%Mc; po=90±10%kw; tp=1.0±0.1μs; prr=1000; Ii=100μAdc; See Mounting	t:---	10μs
4.18.19	**High Level V.S.W.R.:	F= 5400±1%Mc; po=50±10%kw; tp=1.0±0.1μs; prr=1000; Note 5	σ:---	1.15
4.18.27	†Firing Time:	F= 5400±1%Mc; po=20kw min; tp=1.0±0.1μs; prr=1000; See Mounting	t:---	10sec.
4.18.28	Arc Loss:	See Firing Time	---	1.6db
4.11	Life Test:	F= 5400±5%Mc; po=90±10%kw; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.7 meg. Group D; See Mounting	t:500	---hrs
4.11.4	Life Test End Point:	Duplexer Loss at F= 5400Mc;	Li:---	1.0db
		Spike Leakage Energy;	Ws:---	0.30erg
		Flat Leakage Power;	pf:---	75mw
		Recovery Time	t:---	15μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1

Note 2: Vibrate in a plane normal to the Receiver flange. The ignitor electrode shall not short to the tube body during this test. Tubes shall satisfy all applicable requirements of this specification after vibration.

Note 3: See Mounting. A low level signal into the Antenna arm is detected at the Receiver arm.

Note 4: See Mounting. The V.S.W.R. looking into the Antenna arm shall be within the specified limits.

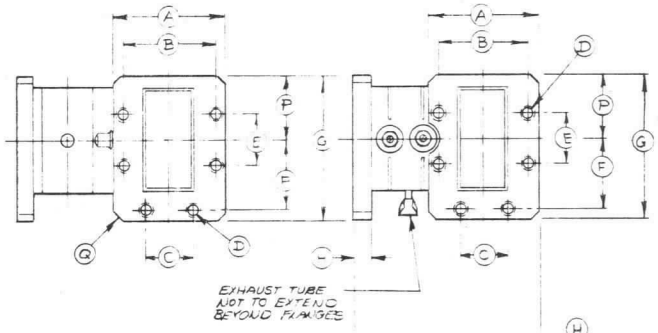
Note 5: See Mounting. The V.S.W.R. looking into the Magnetron arm shall be within the specified limit.

Note 6: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

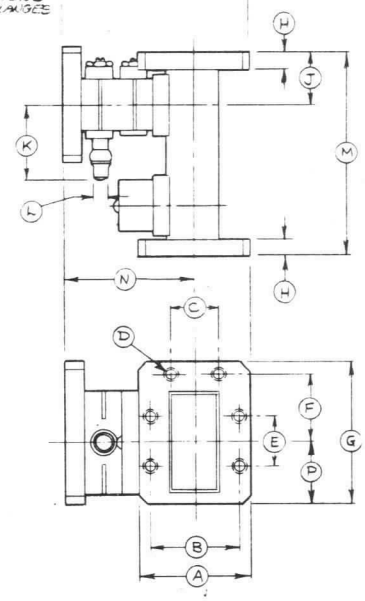
$$\text{Series Resistance } (Ri) = \frac{Ebb - Ei}{150} \text{ (megohms)}$$

Where Ri=Total series resistance
Ebb=Open circuit supply voltage
Ei=Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSIONS
A**	2.170 ±.010
B*	1.787
C*	1.000 ±.003
D	#10-32 NF (6) HOLES EA FL
E*	1.000 ±.003
F*	1.392 ±.003
G**	2.890 ±.010
H**	.218 TYP
J**	.827 ±.010
K*	1 1/8 MAX
L**	.250 NOM
M	3.875 ±.010
N	2.544
P*	1.250 ±.010
Q**	.050 X 45° CHAMFER



Bomac | **DUPLEXER** | **BL516** | **X**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 27, 1955

Dimensions: Per Outline

Ratings:	Min.	Max.
Transmitter po	1	250 kw
Open Circuit Ignitor Voltage	-700	--- Vdc
Altitude	---	10,000 ft
Ignitor Current	100	200 μAdc
Recommended Ignitor Operating Current	150 μAdc	(Note 14)(each electrode)

Packing: To be specified

Ref.(Note 2)	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking:	---	---
4.5	Holding Period:	t=168 hours	---	---
4.9.18.1.8	Carton Drop:	To be specified	---	---
4.9.19.2	**Vibration:	G=10; Note 3	---	---
4.18.18	Voltage Standing Wave Ratio:	F1=8500 Mc.	σ:---	1.2
		F2=8800	σ:---	1.2
		F3=9000	σ:---	1.2
		F4=9300	σ:---	1.2
		F5=9600; Note 4	σ:---	1.2
4.18.4.2	*Duplexer Loss:	F1=8500 Mc.	Li:---	1.0 db
		F2=8800	Li:---	0.8 db
		F3=9000	Li:---	0.8 db
		F4=9300	Li:---	0.8 db
		F5=9600; I1=100 μAdc on each electrode; Note 5	Li:---	1.0 db
-----	*Isolation:	F1=8500 Mc	15	--- db
		F2=8800	15	--- db
		F3=9000	15	--- db
		F4=9300	15	--- db
		F5=9600; I1=100 μAdc on each electrode; Note 6	15	--- db
4.18.1	*Ignitor Ignition Time:	Ebb= -700Vdc; R=4.0Meg; Note 7	t:---	5.0sec.
4.18.2	Ignitor Voltage Drop:	I1=100μAdc; Note 8	Eid:200	375Vdc
4.18.11	Flat Leakage Power:	F= 9000Mc; po=40±10%kw; tp1=1.0±0.1μs; tp2=0.5±0.05μs; prr=1000; I1=100μAdc on each electrode; Note 9	pf:---	20mw
4.18.10	Spike Leakage Energy:	See Flat Leakage Power	Ws:---	0.1erg
4.18.28	*Arc Loss:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 10	---	0.8db
4.18.15.1	*Recovery Time (1):	F= 9000Mc; po=200±10%kw; tp=1.0±0.1μs; prr=1000; I1=100μAdc on each electrode; Note 11	t:---	7.0μs
4.18.15.1	*Recovery Time (2):	F= 9000Mc; po=100±10%kw; tp=1.0±0.1μs; prr=1000; I1=100μAdc on each electrode; Note 11	t:---	4.0μs
4.18.19	**High Level VSWR:	F= 9000Mc; po=40±10%kw; tp=1.0±0.1μs; prr=1000; Note 12	σ:---	1.2

Ref.(Note 2)	Test	Conditions	Min.	Max.
4.11	Life Test:	F= 9000Mc; po=200±10%kw, min.; tp=1.0±0.1μs; prr=1000; Ebb=-700Vdc; Ri=2.8 meg. on each electrode; Note 13; Group D	t:500	---hrs.
4.11.4	Life Test End Point:	Recovery Time(1);	t:---	10μs
		Flat Leakage Power;	pf:---	20mw
		Spike Leakage Energy;	Ws:---	.15erg
		Duplexer Loss, F= 9000Mc.	Li:---	1.0db

Note 1: A gasket, per drawing attached, should be bolted between each flange of the Short Slot Hybrid Duplexer and its mating flange.

Note 2: References and notations are from Military Specification Electron Tubes, MIL-E-1

Note 3: During this test the ignitor electrodes should not short to the tube body.

Note 4: See Test Circuit "G".
Attach a low level load, σ=1.05 max., to arms M, R, and L. Then the V.S.W.R. looking into arm A should be within the limits specified.

Note 5: See Test Circuit "G".
The Duplexer Loss is the db loss in power incurred when the short-slot hybrid duplexer, with a low level load, σ=1.05 max., on arms M and L, is inserted in a transmission line. Signal in A is detected at R.

Note 6: See Test Circuit "G".
Isolation is the db difference in power transmission between arms R and M, where the detected power at M is the specified attenuation down from R when a low level signal is fed into A and detected first at R and then at M. Keep a low level load, σ=1.05 max., on all empty arms.

Note 7: Ignitor Ignition Time shall be measured separately for each ignitor electrode.

Note 8: Measured separately for each ignitor electrode. With the ignitor circuit as in Fig. 46 of MIL-E-1B, the ignitor voltage drop shall be measured after the tube fires, with a high resistance volt-meter, 20,000 ohms per volt or greater, and shall be within the limits specified.

Note 9: See Test Circuit "G".
Transmitter po in M; a high level load, σ=1.07 max., on A; a low level load, σ=1.07 max., on L; Leakage Power detected at R.

Note 10: See Test Circuit "G".
No loads necessary on L and R. A metal short is interchanged with the Short Slot Hybrid Duplexer at the junction of arms M and A. Transmitter po in M; a power monitoring device followed by a high level load, σ= 1.07 max., at A.

Note 11: See Test Circuit "G".
Transmitter po in M; simulated echo and high level load, σ=1.07 max., at A; a low level load, σ=1.07 max., at L; detector at R.

Note 12: See Test Circuit "G".
No loads necessary on L and R.Transmitter po in M; a high level load, σ=1.07 max., at A. The V.S.W.R., looking into arm M, should be within the limits specified.

Note 13: See Test Circuit "G"
No loads necessary on L and R. Transmitter po in M; a high level load, σ=1.07 max., at A.

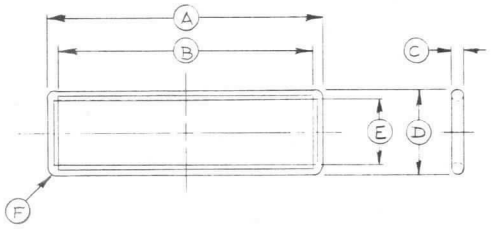
(over)

Note 14: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance } (R1) = \frac{Ebb - E1}{150} \text{ (megohms)}$$

where R1=Total series resistance
Ebb=Open circuit supply voltage
E1=Average (center) ignitor voltage drop

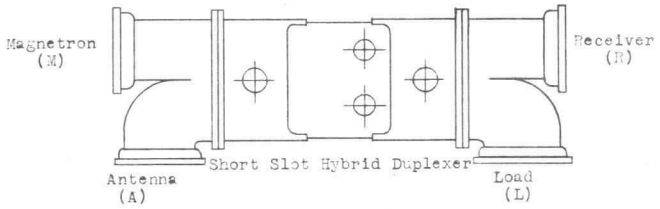
At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.



REF	DIMENSIONS
A	2.647 MAX
B	2.444 MIN
C	.110 TYP
D	.831 MAX
E	.630 MIN
F	3/64 R TYP

Because the short-slot hybrid duplexer is symmetrical, it may be set up for testing purposes either as 1 or 2 without any appreciable change in its electrical characteristics.

(1)



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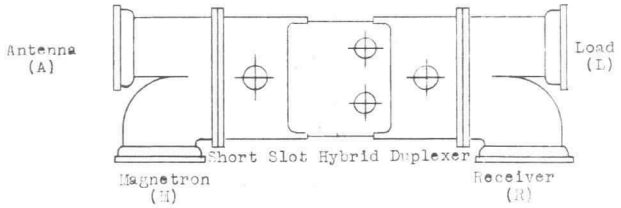
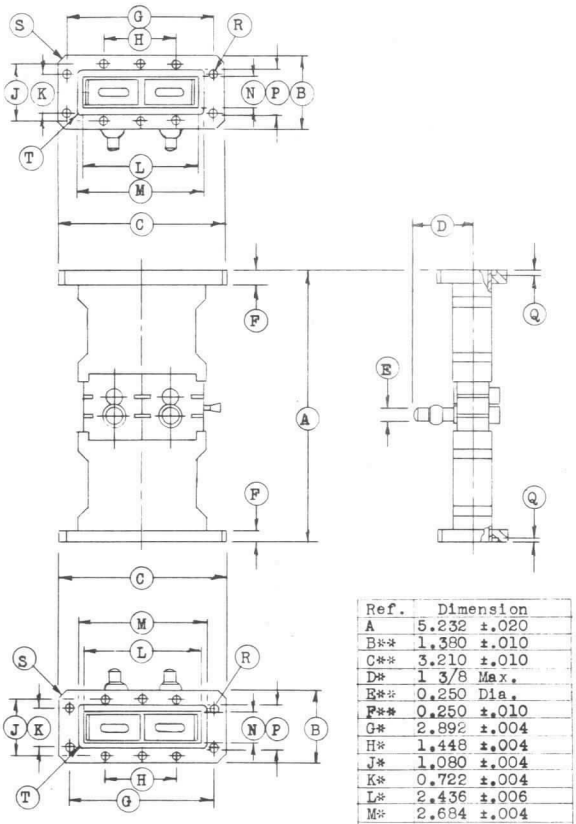




Ref.	Dimension
S*	1 1/8 Rad.
T*	0.046 Rad.

Ref.	Dimension
A	5.232 ±.020
B**	1.380 ±.010
C**	3.210 ±.010
D*	1 3/8 Max.
E**	0.250 Dia.
F**	0.250 ±.010
G*	2.892 ±.004
H*	1.448 ±.004
J*	1.080 ±.004
K*	0.722 ±.004
L*	2.436 ±.006
M*	2.684 ±.004
N*	0.625 ±.006
P*	0.872 ±.004
Q	0.069 ±.002
R	#17(.173) Drill 10 Holes

Bomac	HYBRID	
	BL564	X

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

FEBRUARY 1, 1957

Dimensions: Per Outline

Description: Hybrid Balanced Mixer

Packing To be specified.

Ref.	Test	Conditions	Min.	Max.
4.18.18	Voltage Standing Wave Ratio:	F= 8500±0.1%Mc	σ :---	1.5
		F= 8775±0.1%Mc	σ :---	1.5
		F= 9050±0.1%Mc	σ :---	1.5
		F= 9325±0.1%Mc	σ :---	1.5
		F= 9600±0.1%Mc	σ :---	1.5
		σ =1.05 max.		
		Note 2, 6		
------	Isolation:	F= 8500Mc±0.1%	Li : 10	--- db
		F= 9050Mc±0.1%	Li : 10	--- db
		F= 9600Mc±0.1%	Li : 10	--- db
		Note 3, 6		
------	Current Split:	F= 8500Mc±0.1%	I :---	±10%
		F= 8775Mc±0.1%	I :---	±10%
		F= 9050Mc±0.1%	I :---	±10%
		F= 9325Mc±0.1%	I :---	±10%
		F= 9600Mc±0.1%	I :---	±10%
		Note 4, 5		
------	Noise Figure:	To be specified		

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

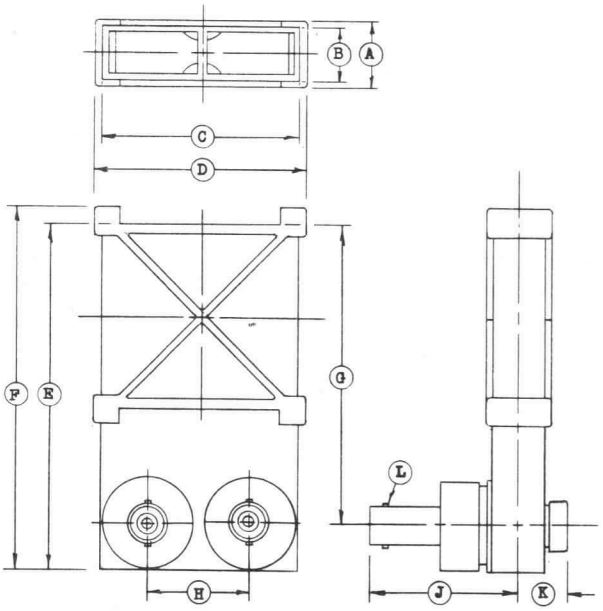
Note 2: The VSWR may be measured with either arm looking into the generator and a low level low with a VSWR σ=1.05 max. on the other arm.

Note 3: The isolation may be measured using either arm as the input.

Note 4: With each crystal terminated with 100 ohm D.C. load (including meter resistance), the power level is adjusted to obtain 0.5 ma output current from one crystal. The output current of the other crystal must then be within the stated limit.

Note 5: The crystals recommended for use in the BL-564 are Bomac 1N415DM.

Note 6: Each crystal should be loaded with a 100 ohm D C load.



Ref.	Dimension	Ref.	Dimension
A*	0.635 Max.	G	3.125 Ref.
B	0.504 ±.003	H	0.950 ±.015
C	1.950 ±.005	J	1.687 Max.
D*	2.072 Max.	K	0.500 Max.
E	3.345 ±.015	L	Mates with
F*	3.562 Max.		UG-88/U

Bomac

DUPLEXER

BL557 | **K_u**

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 18, 1956

Dimensions: Per Outline

Description: Mixer Duplexer Assembly

Ratings:	Min.	Max.
Transmitter po	---	100 kw
Duty Cycle		0.001
Open Circuit Ignitor Voltage	-700	--- Vdc
Ignitor Current	100	200 μAdc

Notes 6, 7, 8, 9

Recommended Ignitor Operating Current 150 μAdc (Note 10) (each electrode)

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		
4.18.2	Ignitor Voltage Drop:	I_i =100μAdc Note 11	Eid: 300	475Vdc
4.18.18	Voltage Standing Wave Ratio:	F_1=15900 Mc F_2=16400 F_3=16900 Note 2	σ: --- σ: --- σ: ---	1.4 1.4 1.4
4.18.18	**High Level VSWR:	F_1=15900 F_2=16400 F_3=16900 Note 3	σ: --- σ: --- σ: ---	1.4 1.4 1.4
-------	Isolation (1):	F_1=15900 F_2=16400 F_3=16900 Note 4	12 12 12	---db ---db ---db
4.18.28	*Arc Loss:	F=16000±5%Mc; po=20±10%kw; Du=0.001	---	0.8db
4.18.15.1	Recovery Time:	F=16000± 5%Mc po=90±10%kw; Du=0.001 Note 5	t: ---	10μs

Note 1: References and notations are from the latest issue of Military Specification, Electron Tubes, MIL-E-1.

Note 2: VSWR measured looking into antenna arm (A) with balanced signal mixer loaded by 100 ohms. A load σ=1.05 max., attached to arm M.

Note 3: Transmitter po into arm M, a high level load, σ= 1.07 max., on arm A. The VSWR looking into arm M shall be within the limits specified.

Note 4: Measured between the antenna arm and the magnetron arm.

Note 5: Transmitter po in arm M, a simulated echo and high level load, σ=1.07 max., at arm A.

Note 6: Refer to Bomac specification 6560 (BL-35) for Dual TR electrical characteristics.

Note 7: The local oscillator should have a power output rating of 40 milliwatts to enable the AFC and signal mixers to operate at a crystal current of 0.5 ma.

Note 8: Refer to 1N78A specifications for the crystal characteristics

Note 9: The AFC attenuation between the magnetron arm and AFC mixer is adjustable to insure proper mixer operation over an input power range of 50 to 100 kw peak.

Note 10: The recommended ignitor operating current is for a tube with an average ignitor voltage drop. The following formula should be used to determine the value of the required series resistance.

$$\text{Series Resistance (Ri)} = \frac{E_{bb}-E_i}{150} \text{ (megohms)}$$

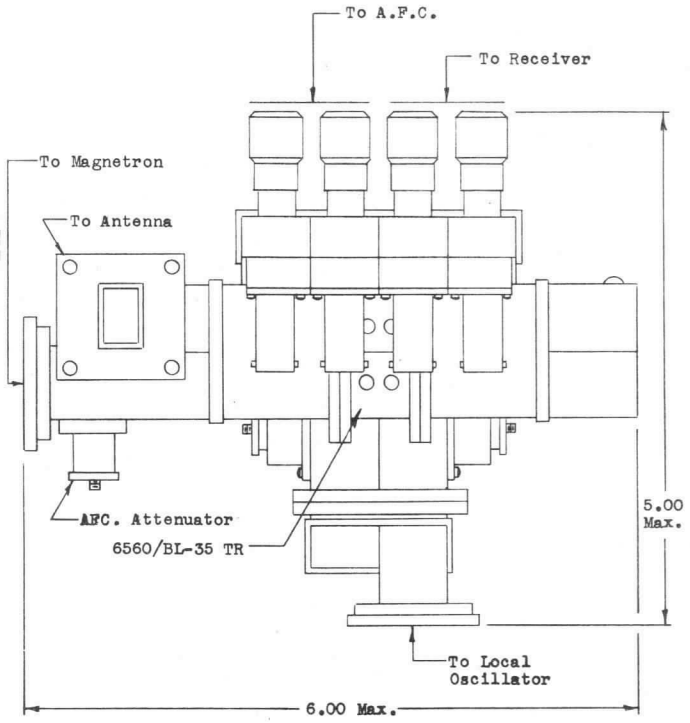
where R_i =Total Series Resistance

E_{bb} =Open circuit supply voltage

E_i =Average (center) ignitor voltage drop

At least 0.5 megohms of the total should be located as close as possible to the ignitor top cap to prevent oscillation.

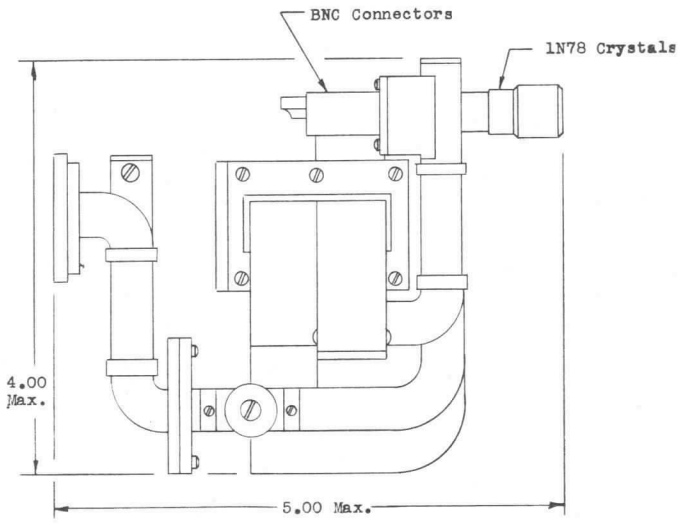
Note 11: Measured separately for each ignitor electrode.



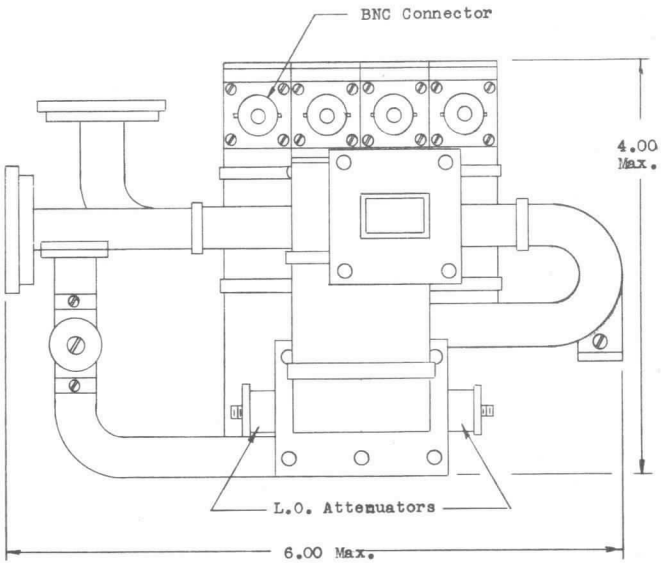
Note:- Flanges to Magnetron, Antenna, and Local Oscillator to mate with Cover Flange UG-419/U.

Top

(over)



Right Side



Front

Bomac

HYDROGEN THYRATRON

3C45

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 19, 1956

Mounting Position: Any
Clamping: Note 2
Cooling: Note 3

**Cathode: Coated Unipotential
**Envelope: T-12

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	800	---	---	Note 6
Max.:	6.3+5% -10%	3.0 Note 4	3.0 Note 5	---	---	200	---
Test Cond:	6.3	3.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	120	---	---
Max.:	35	45	---	750	---
	---	---	---	---	---
Test Cond:	---	---	120	---	2800

Ratings:	epy x prr x ib	TA °C	Alt. ft.
Units:	---		
Min.:	---	-50	---
Max.:	0.3×10^9	+90	10,000
	---	---	---

Test Cond. See Test Circuit

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size M		---	---
4.9.19.1	**Vibration (1):	No Voltages; F= 12 cps to F= 50 cps; Notes 7, 8		---	---
4.9.19.2	**Vibration(2):	F= 50cps; G=10; t=30 sec.(min.); Note 8			
4.9.19.3	*Bump:	Angle20°; Note 8		---	---
4.10.8	Heater Current:	------	If :	2.0	2.5Aac
------	†Instantaneous Starting:	epy=3000 v(min.); Notes 9, 10		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb :	---	300 Vdc
------	†Operation(1):	epy=4.0kv(min.); Notes 9, 12	egy :	---	130v
------	*Anode Delay Time:	Operation(1): t=120 sec; Note 13	tad :	---	0.6μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δtad :	---	0.15μs
------	*Time Jitter:	epy=1.5kv(max.); Notes 9, 15	tj :	---	0.02μs
------	**Operation(2):	t=5.0 hrs. TA=90°C; Note 9	egy :	---	130 v
------	Emission:	ik=35a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk :	---	150v
4.11	Life Test:	Notes 9, 17; Group B	t :	500	--- hrs.
4.11.4	Life Test End Point:	Operation (1); D C Anode Voltage; Time Jitter	egy :	---	140 v
			Ebb :	---	750 Vdc
				---	0.04μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Clamping is permissible on the bulb in the area up to 2 in. above the base of the tube only.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 3000v and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 1.5 kv during the first 25μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs(max.), grid pulse duration=2.0μs(min.). Impedance of drive circuit= 1500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=3.0kv under resonant charging conditions, dik/dt=750a/μs (min.), ib=35a, tp=0.5μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance = 1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 3000 v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 1500 within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

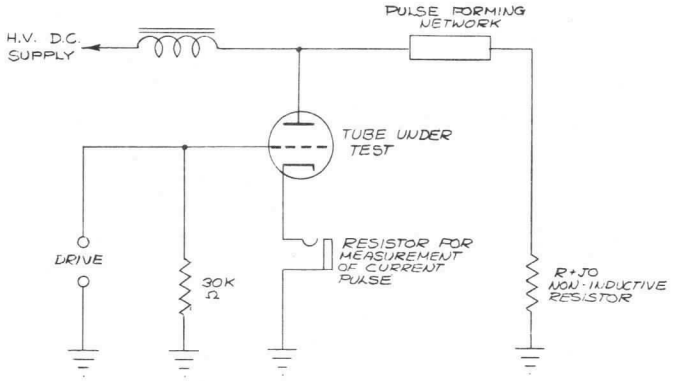
Note 14: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

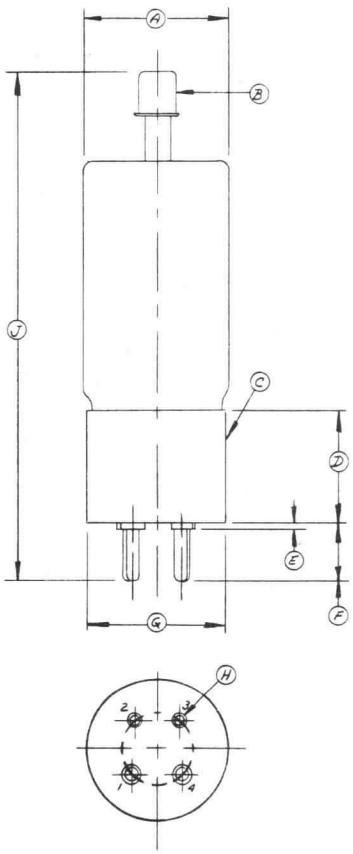
Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

(over)

Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.





REF	DIMENSION
A *	1.500 ± .032
B **	ANODE CONNECTION
	ANTI-CORONA CAP C-H
C **	MEDIUM 4 PIN LOW
	.055 PHENOLIC
D **	1.087 NOM.
E **	.065 MAX.
F **	.596 MAX.
G **	1.337 - 1.377
*&H PIN 1	TO HEATER
PIN 2	TO CATHODE
PIN 3	TO GRID
PIN 4	TO CATHODE
	AND HEATER
J	5 3/16 MAX.
	4 13/16 MIN

Bomac

HYDROGEN THYRATRON
4C35

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 11, 1956

Mounting Position: Any
Clamping: Note 2
Cooling: Note 3

**Cathode: Coated Unipotential
**Envelope: T-20

Ratings:	Ef	epy	epx	Ebb	Ecc	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	2500	---	---	Note 6
Max.:	6.3+5%	8.0	8.0	---	---	200	---
	--- -10%	Note 4	Note 5	---	---	---	---
Test Cond.	6.3	8.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	180	---	---
Max.:	90	100	---	1000	---
	---	---	---	---	---
Test Cond.	---	---	180	---	2800

Ratings:	epy x prr x ib	TA	Alt.
Units:	---	°C	ft.
Min.:	---	-50	---
Max.:	2.0×10^9	+90	10,000
	---	---	---

Test Cond.: See Test Circuit

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d) Package Group 1; Carton Size P		---	---
4.9.19.2	*Vibration(1):	No voltages; Note 8		---	---
4.9.20.3	**Vibration(2):	No voltages;			
4.9.19.3	*Bump:	Angle=20°; Note 8		---	---
4.9.20.5	**Shock:	Angle 24° Note 20		---	---
------	Shock Test End Points:	Operation(1) DC Anode Voltage Time Jitter	egy : --- Ebb : --- tj : ---		130v 1500Vdc 0.01μs
4.10.8	Heater Current:	------	If :	5.50	6.70Aac
------	*Instantaneous Starting:	epy=7000v(min.) Notes 9, 10		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb : ---		1500Vdc
------	*Operation(1):	epy=10.0kv(min.); t=300; Notes 9, 12	egy : ---		130v
------	*Anode Delay Time:	Operation(1); t=120 sec; Note 13	tad : ---		0.6μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δtad : ---		0.10μs
------	*Time Jitter:	epy=3.0kv(max.); Notes 9, 15	tj : ---		0.01μs
------	**Operation(2):	t=5.0 hrs; TA=90°C; Note 9	egy : ---		130v
------	Emission:	ik=90a(min.) prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk : ---		150v
4.11	Life Test:	Notes 9, 17 Group B	t :	500	---hrs.

Ref.	Test	Conditions		Min.	Max.
4.11.4	Life Test End Point:	Operation(1); Note 18 DC Anode Voltage;	egy : ---		140v
			Ebb : ---		2000Vdc
		Time Jitter;	tj : ---		0.02μs
		Anode Delay Time;	tad : ---		0.70μs
		Anode Delay Time Drift	Δtad : ---		0.10μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

Note 2: Clamping is permissible on the bulb in the area up to 2 1/2 in. above the base of the tube only, or at the base.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 7000v and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 2.5kv during the first 25μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5 μs(max.), grid pulse duration=2.0μs(min). Impedance of drive circuit = 1500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0kv under resonant charging conditions, dik/dt = 1000a/μs (min.), ib=90a, tp=0.5μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance = 1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 7000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3500v within 0.015 sec.). The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

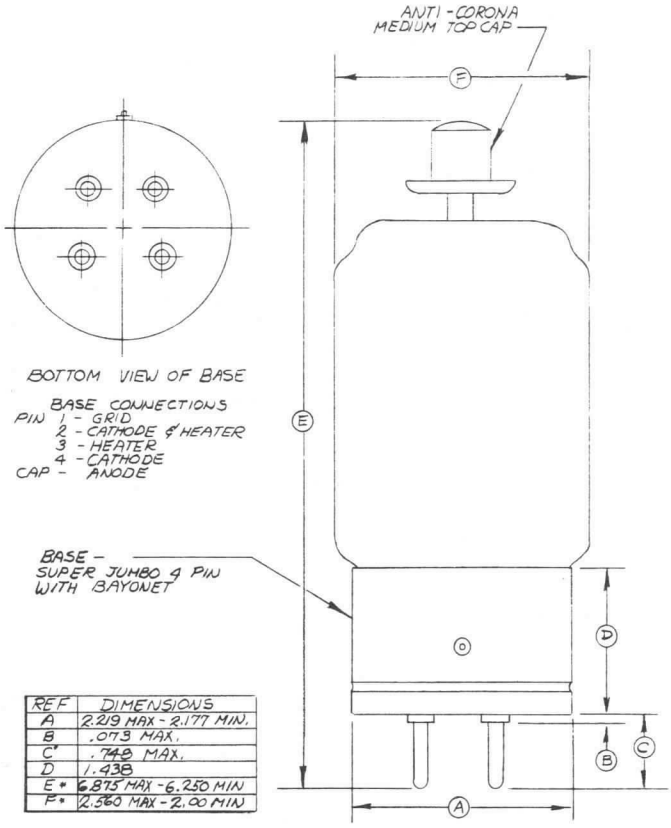
Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 14: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed one the Anode Delay Time test shall not exceed the specified value.

Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

(over)



BOTTOM VIEW OF BASE

BASE CONNECTIONS

PIN 1 - GRID
2 - CATHODE & HEATER
3 - HEATER
4 - CATHODE
CAP - ANODE

REF	DIMENSIONS
A	2.219 MAX - 2.177 MIN.
B	.073 MAX.
C	.748 MAX.
D	1.438
E *	6.875 MAX - 6.250 MIN
F *	2.360 MAX - 2.00 MIN

Bomac

HYDROGEN THYRATRON

4C35A

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MAY 6, 1955

Dimensions: Per Outline

Mounting Position: Any
Clamping: Note 2
Cooling: Note 3

**Cathode: Coated Unipotential
**Envelope: T-20

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	2500	---	---	Note 6
Max.:	6.3±5%	8.0	8.0	---	---	200	---
	---	Note 4	Note 5	---	---	---	---
Test Cond:	6.3	8.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	180	---	---
Max.:	90	100	---	1000	---
	---	---	---	---	---
Test Cond:	---	---	180	---	2800

Ratings:	epy x prr x ib	TA	Alt.
Units:	---	°C	ft.
Min.:	---	-50	---
Max.:	2.0×10^9	+90	10,000
	---	---	---

Test Cond: See Test Circuit

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for USAF Marking Note 20		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size P		---	---
4.9.19.1	**Vibration:	No Voltages; F= 12 cps to F= 50cps; Notes 7, 8		---	---
4.9.19.2	**Vibration (2)	F= 60cps G=10 t=30 sec. Note 8			
4.9.19.3	*Bump:	Angle=20°; Note 8		---	---
4.10.8	Heater Current:	------	If :	5.50	6.70Aac
------	Instantaneous Starting:	epy=7000v(min.); Notes 9, 10		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb :	---	1500Vdc
------	Operation(1):	epy=10.0kv(min.); Notes 9, 12	egy :	---	130v
------	*Anode Delay Time:	Operation (1); t=120 sec; Note 13	tad :	---	0.6μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δtad :	---	0.15μs
------	*Time Jitter:	epy=3.0kv(max.); Notes 9, 15	tj :	---	0.003μs
------	**Operation(2):	t=5.0hrs; TA=90°C; Note 9	egy :	---	130v
------	Emission:	ik=90a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk :	---	150v
4.11	Life Test:	Notes 9, 17; Group B	t :	500	---hrs.
4.11.4	Life Test End Point:	Operation(1); Note 18 DC Anode Voltage; Time Jitter	egy :	---	140v
			Ebb :	---	2000Vdc
			tj :	---	0.006μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Clamping is permissible on the bulb in the area up to 2 1/2 in. above the base of the tube only.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 7000v and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 2.5kv during the first 25μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min), time of rise=0.5μs(max.), grid pulse duration=2.0μs(min.). Impedance of drive circuit= 1500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0kv under resonant charging conditions, dik/dt= 1000a/μs (min.), ib=90a, tp=0.5μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance=1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 7000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3500v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 14: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

(over)

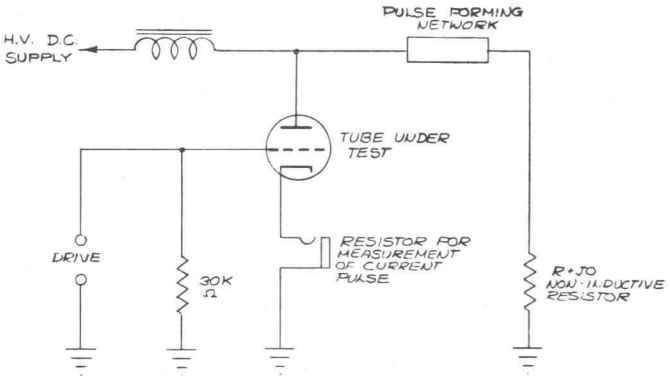
Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

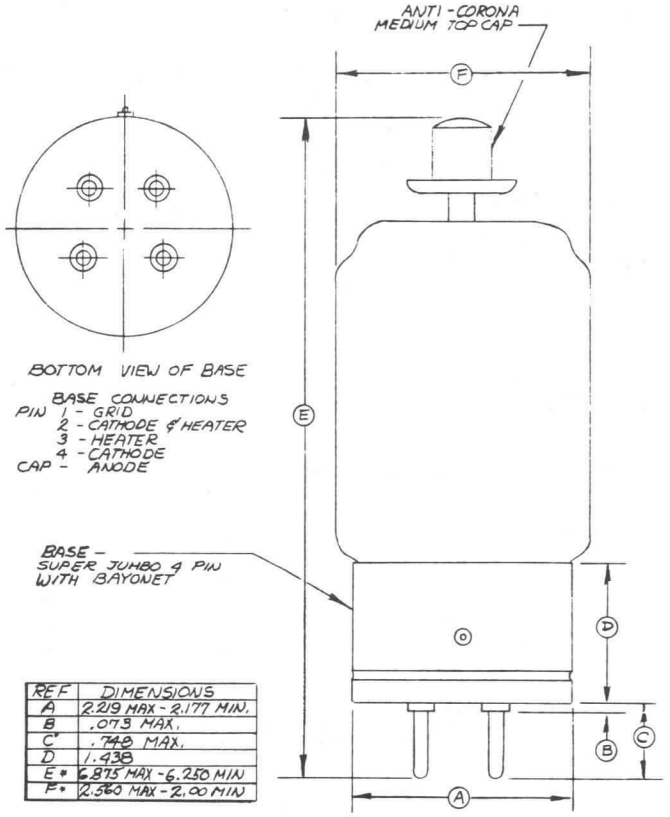
Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

Note 18: Each tube on life test shall be measured at the end of one hundred (100) hours of life for emission. If the emission reading exceeds 110v at this time, the tube shall be considered as a life test failure at one hundred (100) hours.

Note 19: Where equipment is designed to withstand shock and vibration, it is recommended that the anode connector be of the spring clip type. (National Co. type 12 or equivalent).

Note 20: Refer to MIL-E-1/806 USAF, 21 December 1954, Note 20.





REF	DIMENSIONS
A	2.219 MAX - 2.177 MIN.
B	.073 MAX.
C	.748 MAX.
D	1.438
E *	6.875 MAX - 6.250 MIN
F *	2.360 MAX - 2.00 MIN

Bomac

HYDROGEN THYRATRON

5C22/HT415

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 11, 1956

Mounting Position: Any
Clamping: Note 2
Cooling: Note 3

**Cathode: Coated Unipotential
**Envelope: T-20

Ratings:	Ef	epy	epx	Ebb	Ecc	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	4500	---	---	Note 6
Max.:	6.3±7.5%	16.0	16.0	---	---	200	---
	---	Note 4	Note 5	---	---	---	---
Test Cond:	6.3	16.0	---	---	0	---	150

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	300	---	---
Max.:	325	200	---	1500	---
Test Cond:	---	---	---	---	1000

Ratings:	epy x prr x ib	TA	Alt.
Units:	---------	°C	ft.
Min.:	----------	-50	---
Max.:	3.2×10^9	+90	10,000

Test Cond: See Test Circuit

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size T		---	---
4.9.19.2	*Vibration(1):	No voltages; Note 8		---	---
4.9.20.3	**Vibration(2):	No voltages Notes 7, 8			
4.9.19.3	*Bump:	Angle=20°; Note 8		---	---
4.9.20.5	**Shock:	Angle =13°; Note 20		---	---
4.10.8	Heater Current:	Ef=6.3Vac	If :	9.60	11.60Aac
------	*Instantaneous Starting:	epy=13.5kv(min.) t=300; Notes 9, 10, 22		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11, 23	Ebb :	---	2500Vdc
------	*Operation(1):	epy=18.0kv(min.); prr=800; tk=300; Notes 9, 12, 23	egy :	---	150 v
------	*Operation(1A):	Operation(1) Ef=6.80Vac; Note 21	egy :	---	150 v
------	*Anode Delay Time:	Operation(1); t=120sec; epy=150v; Notes 13, 24	tad :	---	0.065 μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δtad :	---	0.10μs
------	*Time Jitter:	epy=5.0kv(max.); Ef=6.30Vac; Notes 9, 15	tj :	---	0.005μs
------	**Operation(2):	t=5.0hrs. Ef=6.30±0.50Vac; TA=90°C; Note 9	egy :	---	150v
------	Emission:	Ef=6.30Vac; ik=325a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk :	---	175 v

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test:	Ef=6.30Vac; Notes 9, 17; Group C	t :	500	---hrs.
4.11.4	Life Test	Operation(1) and Operation (1A); Note 25; DC Anode Voltage egy=160v; Time Jitter; egy=160 v Anode Delay Time; egy=160 v Anode Delay Time Drift; egy=160 v	egy :	---	160 v
			Ebb :	---	4000Vdc
			tj :	---	0.010μs
			tad :	---	0.70μs
			Δtad :	---	0.10μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, dated 3 October 1955.

Note 2: Clamping is permissible on the bulb in the area up to 2 1/2 in. above the base of the tube only.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 13.5kv and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 5.0 kv during the first 25μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=200v (min.), time of rise=0.5μs(max.), grid pulse duration=2.0μs(min.). Impedance of drive circuit=500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy= 16.0kv under resonant charging conditions, dik/dt=1500a/μs(min.), ib=175a, tp=1.0μs±10%, prr=1000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs(min.), Driver Impedance=500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 13.5kv within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 7.0kv within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 14: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

(over)

Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs(max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

Note 18: Each tube on life test shall be measured at the end of one hundred (100) hours of life for emission. If the emission reading exceeds 110v at this time, the tube shall be considered as a life test failure at one hundred (100) hours.

Note 19: Where equipment is designed to withstand shock and vibration, it is recommended that the anode connector be of the spring clip type. (National Co. type 12 or equivalent).

Note 20: Use clamp as per 243-JAN drawing.

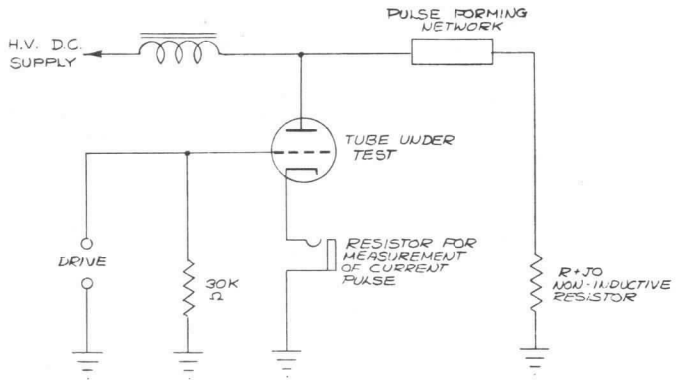
Note 21: This test shall not be performed on tubes without hydrogen reservoirs.

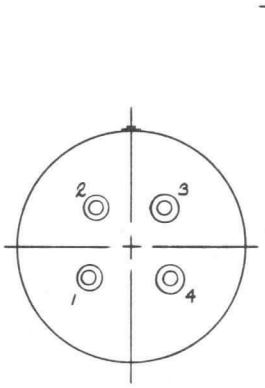
Note 22: For tubes with hydrogen reservoirs, this test shall be performed at Ef=6.80Vac. For tubes without hydrogen reservoirs, this test shall be performed at Ef=6.30Vac.

Note 23: For tubes with hydrogen reservoirs, this test shall be performed at Ef=5.80 Vac. For tubes without hydrogen reservoirs, this test shall be performed at Ef=6.30Vac.

Note 24: "On tubes without hydrogen reservoirs, this test shall be performed at Ef=6.30Vac, and on tubes with hydrogen reservoirs at Ef=5.80Vac or Ef=6.30 Vac.

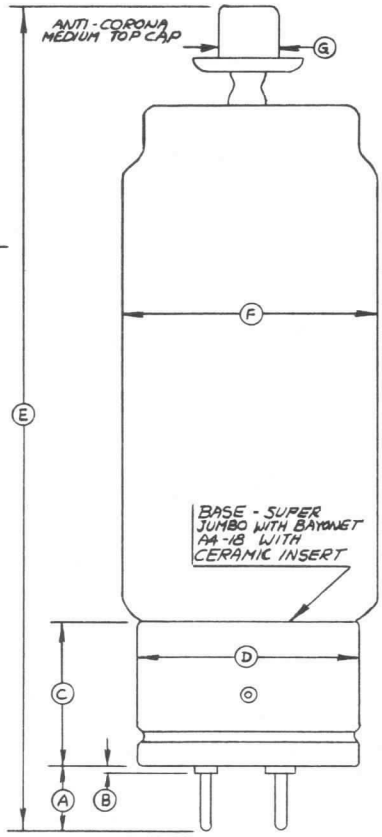
Note 25: For tubes With hydrogen reservoirs, anode heating shall not be cause for rejection on Operation (1) and Operation (1A) performed during periodic life test end point tests.





BOTTOM VIEW OF BASE

BASE CONNECTIONS
PIN 1. GRID
2. CATHODE & HEATER
3. HEATER
4. CATHODE
CAP - ANODE



REF.	DIMENSIONS
A	.748 MAX.
B	.073 MAX
C	1.438
D	2.219 MAX-2.177 MIN
E*	8.750 MAX-8.250 MIN
F*	2.560 MAX-2.000 MIN
G	.566 ±.007 DIA.

Bomac

HYDROGEN THYRATRON

E37A

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 19, 1955

Dimensions: Per Outline

Mounting Position: Any, (Note 15) **Cathode: Coated Unipotential
Clamping: Note 16 **Envelope:T-12
Cooling: Note 15

	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	2500	---	---	---
Max.:	6.3±5% -10%	8.0 Note 3	8.0 Note 1	---	---	200 ---	--- Note 2
Test Cond:	6.3	8.0	---	---	0	---	130

	ib	Alt.	Ib	tk	dik/dt	prr
Units:	a	ft.	mAdc	sec.	a/μs	pps
Min.:	---	---	---	180	---	---
Max.:	90 ---	10,000 ---	100 ---	--- ---	1000 ---	--- ---
Test Cond:	---	---	---	180	---	2800

	epy x prr x ib	TA
Units:	---	°C
Min.:	---	-50
Max.:	2.0 x 10^9 ---	+90 ---
Test Cond:	---	25±5; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size P	---	---
4.9.19.1	**Vibration(1):	No Voltages; F=12cps to F=50cps; Notes 4, 5	---	---
4.9.19.2	**Vibration(2):	F=60cps; G=10; t=30 sec (min.); Note 5	---	---
4.9.19.3	*Bump:	Angle=20°; Note 5	---	---
4.10.8	Heater Current:	------	If:5.50	6.70Aac
------	↗Instantaneous Starting:	epy=7000v(min.); Notes 6, 7	---	---
4.10.17.2	DC Anode Voltage:	Notes 6, 8	Ebb:---	1500Vdc
------	↗Operation (1):	epy=10.0kv(min.); Notes 6, 9	egy:---	130v
------	*Anode Delay Time:	Operation(1); t=120sec; Note 10	tad:---	0.6μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 11	Δtad:---	0.15μs
------	*Time Jitter:	epy=3.0kv(max.); Notes 6, 12	tj:---	0.02μs
------	**Operation(2):	t=5.0hrs; TA=90°C; Note 6	egy:---	130v
------	Emission:	ik=90a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 13	egk:---	150v
4.11	Life Test:	Notes 6,14,15; Group D	t:200	---hrs.
4.11.4	Life Test End Point:	Operation(1); DC Anode Voltage; Time Jitter	egy:--- Ebb:--- tj:---	140v 2000Vdc 0.04μs;

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 μs max. duration, shall not exceed 2.5kv during the first 25 μs after the pulse.

Note 2: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs (max.), grid pulse duration=2.0μs (min.). Impedance of drive circuit=1500 ohms (max.).

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 7000v and shall not be attained in less than 0.04 seconds.

Note 4: There shall be no pronounced resonance in the specified range.

Note 5: There shall be no evidence of shorts of any kind resulting from this test.

Note 6: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0kv under resonant charging conditions dik/dt=1000a/μs(min.), ib=90a, tp=0.5±10%μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance=1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Note 7: This shall be the first test after the holding period. The tube shall operate satisfactorily on push botton starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 7000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3500v within 0.015sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 8: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 9: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 10: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 11: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

Note 12: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 13: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

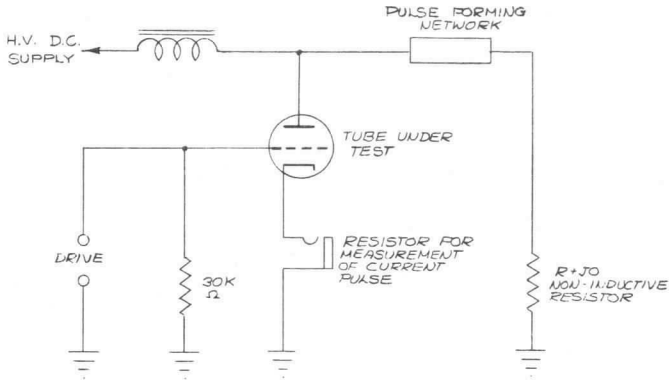
Note 14: Life Test shall be shut down every one-hundred (100) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

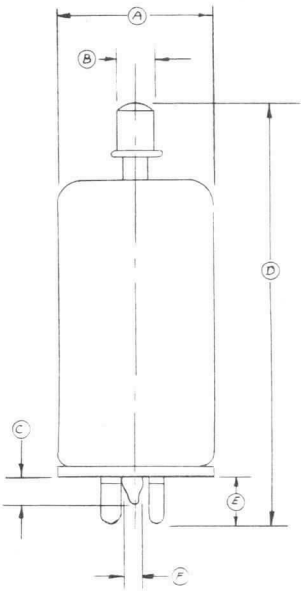
Note 15: The tube and socket shall be completely immersed in oil at a maximum ambient temperature of+90°C.

Note 16: Clamping is permissible on the bulb in the area up to 1 in. above the base of the tube only.

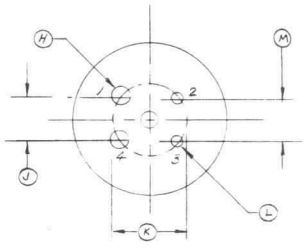
Note 17: References and notations are from Military Specification Electron Tubes, MIL-E-1B, 2 May 1952.

(over)





REF	DIMENSION
A	1.500 DIA ± .032
B	MED TOP CAP CAP
C	3/8 MAX
D	4.125 - 4.375
E	.596 MAX
F	.260 O.D MAX
G	
H	.156 DIA.
J	.468
K	.640 DIA.
L	.125 DIA.
M	.437



BOTTOM VIEW
BASE CONNECTIONS
PIN 1 TO HEATER
2 TO CATHODE
3 GRID
4 HEATER & CATHODE

TOP LEAD - ANODE

TO FIT INTO STD 4 PIN MEDIUM BASE WITH HOLE IN CENTER AS PER E-4-7 BASING

Bomac

HYDROGEN THYRATRON

1258

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 21, 1956

Mounting Position: Any

**Cathode: Coated Unipotential
**Envelope: T-6 1/2

Cooling: Note 2

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	---	300	---	---	Note 5
Max.:	6.3+5% -10%	1.0	1.0	---	---	200	---
	---	Note 3	Note 4	---	---	---	---
Test Cond:	6.3	1.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr	Ehk
Units:	a	mAdc	sec.	a/μs	pps	v
Min.:	---	---	120	---	---	-100
Max.:	20	50	---	400	---	+25
	---	---	---	---	---	---
Test Cond:	---	---	120	---	5000	---

Ratings:	epy x prr x ib	TA	Alt.
Units:	---	°C	ft.
Min.:	---	-50	---
Max.:	0.1×10^9	+90	10,000
	---	---	---

Test Cond: See Test Circuit

WARNING: Because of the nature of the pin material, extreme care should be exercised when inserting the tube in or withdrawing the tube from a socket. Pin straighteners should not be used. (This warning should accompany each tube.)

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size B		---	---
4.10.15	*Heater-Cathode Leakage:	Ehk= -100Vdc; +50 Vdc	Ihk :	---	20μAdc
4.9.20.3	**Vibration (1):	No Voltages		---	---
4.9.20.4	**Vibration (2):	No Voltages			
4.9.20.5	Shock:	Angle = 48°; Notes 6, 7		---	---
------	Post Shock Test End Points:	Notes 9, 12			
4.9.20.6	**Fatique:	No Voltages			
------	**Mechanical Resonance:	Note 8			
4.10.8	Heater Current:	------	If :		2.0Aac
------	†Instantaneous Starting:	epy=1000v(min.); Notes 9, 10		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb :	---	100Vdc
------	†Operation (1):	epy=1.3kv(min.); Notes 9, 12	egy :	---	130 v
------	*Anode Delay Time:	Operation (1): t=120 sec; Note 13	tad :	---	0.6μs
------	*Anode Delay Time Drift:	Anode Delay Time; Notes 9, 14	Δtad :	---	0.15μs
------	*Time Jitter:	epy=200v(max.) Notes 9, 15	tj :	---	0.01μs
------	**Operation (2):	t=5.0hrs. TA=100°C Note 9	egy :	---	130 v

Ref.	Test	Conditions		Min.	Max.
------	Emission:	ik=20a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs (max.) Note 16	egk :	---	200 v
4.11	Life Test:	Notes 9, 17; Group B	t :	500	--- hrs.
4.11.4	Life Test End Point:	Operation (1); D C Anode Voltage; Time Jitter	egy :	---	140 v
			Ebb :	---	250 Vdc
			tj :	---	0.02μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: There shall be no air blast directly on the bulb and no tightly fitting shield should be used which would impede free air circulation.

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 1000 v and shall not be attained in less than 0.04 seconds.

Note 4: In pulsed operation, the peak inverse voltage shall not exceed 500v during the first 25μs after the pulse.

Note 5: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs(max.), grid pulse duration=2.0μs (min.). Impedance of drive circuit= 1000 ohms (max.).

Note 6: Retainer shall be that which is specified in the 184-JAN drawing.

Note 7: For acceptance sampling procedure see paragraph 5.2 of inspection instructions for Electron Tubes.

Note 8: The tube mount shall exhibit no pronounced mechanical resonance below 100 cps.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy= 1.0kv under resonant charging conditions dik/dt=400a/μs(min.), ib=20a, tp=0.5μs, prr=5000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance=1000 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 1000 v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 500v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: No voltages shall be applied to the grid or anode of the tube under test for at least 10 minutes prior to performing this test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back, anode heating or corona discharge.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

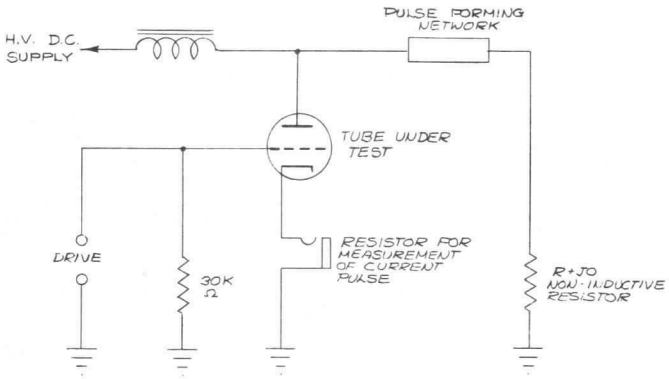
Note 14: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

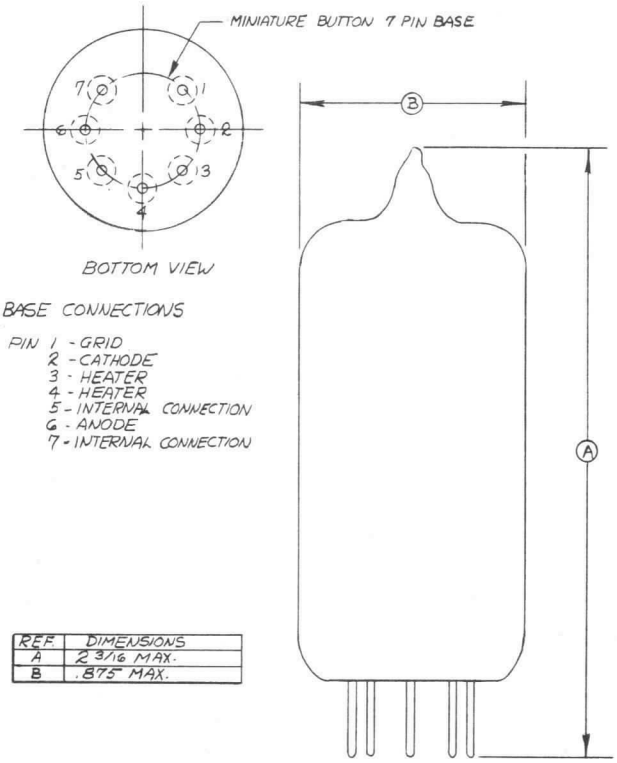
(over)

Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.





REF.	DIMENSIONS
A	2 3/16 MAX.
B	.875 MAX.

Bomac

HYDROGEN THYRATRON

5957/E37

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 10, 1955

Dimension: Per Outline

Mounting Position: Any, (Note 15) **Cathode: Coated Unipotential
Clamping: Note 16 **Envelope: T-12
Cooling: Note 15

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	2500	---	---	---
Max.:	6.3+5% -10%	8.0 Note 3	8.0 Note 1	---	---	200 ---	--- Note 2
Test Cond:	6.3	8.0	---	---	0	---	130

Ratings:	ib	Alt.	Ib	tk	dik/dt	prr
Units:	a	ft.	mAdc	sec.	a/μs	pps
Min.:	---	---	---	180	---	---
Max.:	90	10,000	100	---	1000	---
	---	---	---	---	---	---
Test Cond:	---	---	---	180	---	2800

Ratings:	epy x prr x ib	TA
Units:	----------	°C
Min.:	----------	-50
Max.:	2.0×10^9	+90
	----------	----
Test Cond:	----------	25±5; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size P	---	---
4.9.19.1	** Vibration (1):	No Voltages; F= 12cps to F= 50cps; Notes 4, 5	---	---
4.9.19.2	** Vibration (2):	F= 60cps; G= 10; t= 30 sec (min.); Note 5	---	---
4.9.19.3	* Bump:	Angle = 20°; Note 5	---	---
4.10.8	Heater Current:	-----	If : 5.50	6.70Aac
-----	† Instantaneous Starting:	epy=7000v(min.); Notes 6, 7	---	---
4.10.17.2	DC Anode Voltage:	Notes 6, 8	Ebb: ---	1500Vdc
-----	† Operation (1):	epy=10.0kv(min.); Notes 6, 9	egy: ---	130v
-----	* Anode Delay Time:	Operation (1); t=120sec; Note 10	tad: ---	0.6μs
-----	* Anode Delay Time Drift:	Anode Delay Time; Note 11	⊿tad : ---	0.15μs
-----	* Time Jitter:	epy=3.0kv(max.); Notes 6, 12	tj : ---	0.02μs
-----	** Operation (2):	t=5.0hrs; TA=90°C; Note 6	egy: ---	130v
-----	Emission:	ik=90a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 13	egk: ---	150v
4.11	Life Test:	Notes 6, 14, 15; Group D	t : 200	---hrs.
4.11.4	Life Test End Point:	Operation (1); DC Anode Voltage; Time Jitter	egy : --- Ebb : --- tj : ---	140v 2000Vdc 0.04μs

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 μs max. duration, shall not exceed 2.5kv during the first 25 μs after the pulse.

Note 2: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs (max.), grid pulse duration=2.0μs (min.). Impedance of drive circuit = 1500 ohms (max.).

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 7000v and shall not be attained in less than 0.04 seconds.

Note 4: There shall be no pronounced resonance in the specified range.

Note 5: There shall be no evidence of shorts of any kind resulting from this test.

Note 6: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0kv under resonant charging conditions dik/dt=1000a/μs (min.), ib=90a, tp=0.5±10%μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance=1500ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Note 7: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 7000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3500v within 0.015sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 8: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 9: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 10: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 11: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (⊿tad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

Note 12: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 13: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

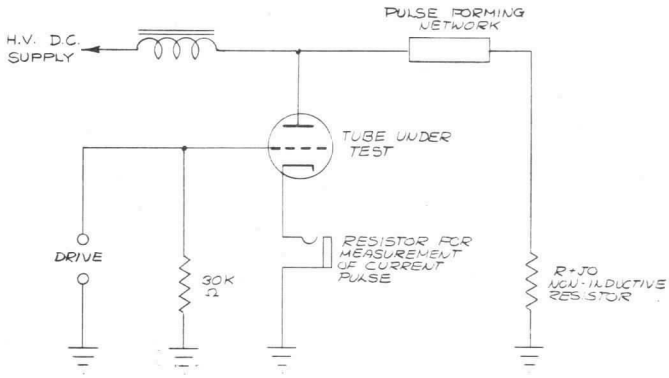
Note 14: Life Test shall be shut down every one-hundred (100) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

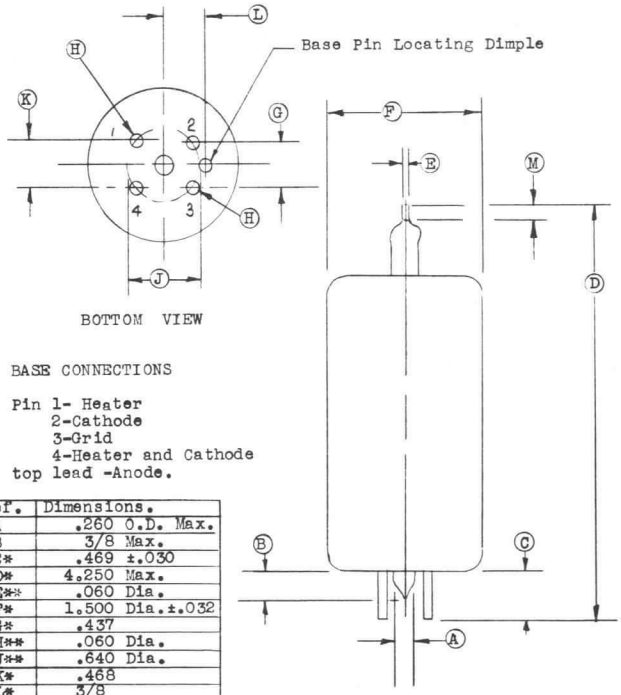
Note 15: The tube and socket shall be completely immersed in oil at a maximum ambient temperature of +90° C.

(over)

Note 16: Clamping is permissible on the bulb in the area up to 1 in. above the base of the tube only.

Note 17: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.





** BASE CONNECTIONS

Pin 1- Heater
2-Cathode
3-Grid
4-Heater and Cathode
top lead -Anode.

Ref.	Dimensions.
A	.260 O.D. Max.
B	3/8 Max.
C*	.469 ±.030
D*	4.250 Max.
E**	.060 Dia.
F*	1.500 Dia.±.032
G*	.437
H**	.060 Dia.
J**	.640 Dia.
K*	.468
L*	3/8
M	3/16 Min.

Bomac

HYDROGEN THYRATRON

5959/E41

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

MARCH 10, 1955

Dimensions: Per Outline

Mounting Position: Any
Clamping: Note 2
Cooling: Note 3

** Cathode: Coated Unipotential
** Envelope: T-12

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	3000	---	---	---
Max.:	6.3±10%	8.0	8.0	---	40	100	---
	---	Note 4	Note 5	---	---	---	Note 6
Test Cond:	6.3	8.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	120	---	---
Max.:	35	45	---	750	---
	---	---	---	---	---
Test Cond:	---	---	120	---	4000

Ratings:	epy x prr x ib	TA	Alt.
Units:	----------	°C	ft.
Min.:	----------	-55	---
Max.:	1.3×10^9	+90	10,000
	----------	---	---
Test Cond:	----------	25±5	---; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size G	---	---
4.9.19.1	** Vibration:	No Voltages; F= 12cps to F= 50cps; Notes 7, 8	---	---
4.9.19.3	* Bump:	Angle = 20°; Note 8	---	---
4.10.8	Heater Current:	-----	If : 2.00	2.50Aac
-----	⚡ Instantaneous Starting:	epy=6000v(min.); Notes 9, 10	---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb: ---	2000Vdc
-----	⚡ Operation (1):	epy=8.0kv(min.); Notes 9, 12	egy : ---	130v
-----	* Anode Delay Time:	Operation (1); t=120 sec; Note 13	tad : ---	0.6μs
-----	* Anode Delay Time Drift:	Anode Delay Time; Note 14	△tad : ---	0.15μs
-----	* Time Jitter:	epy=4.0kv(max.); Notes 9, 15	tj : ---	0.02μs
-----	** Operation (2):	t=5.0hrs; TA=90°C; Note 9	egy: ---	130v
-----	Emission:	ik=35a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk: ---	150v
4.11	Life Test:	Notes 9, 17; Group D	t : 500	---hrs.
4.11.4	Life Test End Point:	Operation (1); DC Anode Voltage; Time Jitter	egy: --- Ebb : --- tj : ---	140v 3000Vdc 0.04μs

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

Note 2: Clamping is permissible on the bulb in the area up to 1 in. above the base of the tube only.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 6000v and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 3.0kv during the first 25 μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs (max.), grid pulse duration=2.0μs (min.). Impedance of drive circuit = 1500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0kv under resonant charging conditions, dik/dt= 600a/μs (min.), ib=40a, tp=0.25μs, prr=4500pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.), Driver Impedance=1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 6000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3000v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

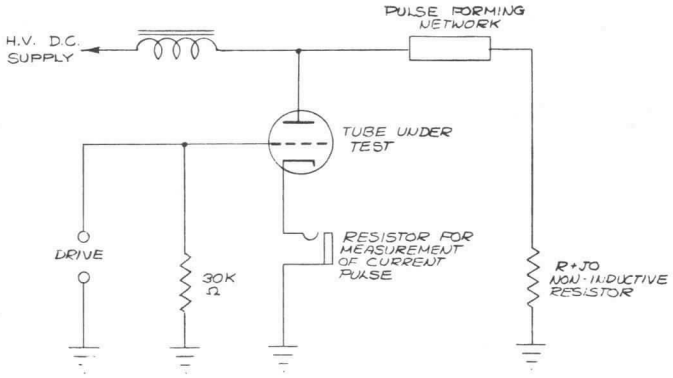
Note 14: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (△tad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

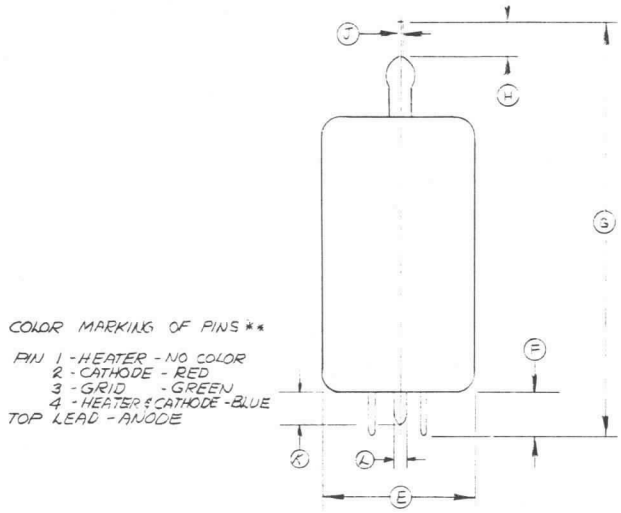
Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5 μs (max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

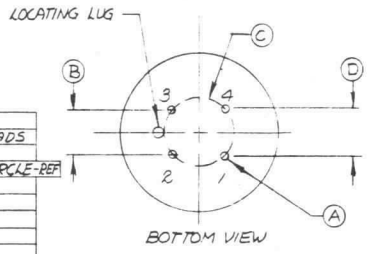
(over)





COLOR MARKING OF PINS **

PIN 1 - HEATER - NO COLOR
2 - CATHODE - RED
3 - GRID - GREEN
4 - HEATER & CATHODE - BLUE
TOP LEAD - ANODE



BOTTOM VIEW

REF	DIMENSIONS
A**	.060 DIA. OF LEADS
B*	.437 REF.
C*	.640 D BASE PIN CIRCLE-REF
D*	.468 REF.
E*	1.500 DIA 1.060
F	.312 MIN
G	4.094 MAX.
H	.185 MIN.
J**	.080 DIA. REF.
K	3/8 MAX.
L	.260 O.D. MAX.

Bomac

HYDROGEN THYRATRON

6130

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JUNE 21, 1956

Mounting: Position: Any
Clamping: Note 2
Cooling: Note 3

**Cathode: Coated Unipotential
**Envelope: T-12

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	800	---	---	Note 6
Max.:	6.3+5% -10%	3.0	3.0	---	---	200	---
	---	Note 4	Note 5	---	---	---	---
Test Cond:	6.3	3.0	---	---	0	---	130

Ratings:	ib	Ib	tk	dik/dt	prr
Units:	a	mAdc	sec.	a/μs	pps
Min.:	---	---	120	---	---
Max.:	35	45	---	750	---
	---	---	---	---	---
Test Cond:	---	---	120	---	2800

Ratings:	epy x prr x ib	TA	Alt.
Units:	---	°C	ft.
Min.:	---	-50	---
Max.:	0.3×10^9	+90	50,000
	---	---	---

Test Cond: See Test Circuit

Ref.	Test	Conditions		Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking		---	---
4.5	Holding Period:	t=96 hours		---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size J		---	---
4.9.19.1	**Vibration: (1)	No voltages; F= 12 cps to F= 50cps; Note 7, 8		---	---
4.9.19.2	**Vibration (2):	F=50cps; G=10; t=30 sec.(min.); Note 8			
4.9.19.3	*Bump:	Angle=20°; Note 8		---	---
4.10.8	Heater Current:	------	If :	2.0	2.5Aac
------	†Instantaneous Starting:	epy=3000v (min.); Notes 9, 10		---	---
4.10.17.2	DC Anode Voltage:	Notes 9, 11	Ebb :	---	300 Vdc
------	†Operation (1):	epy=4.0kv(min.); Notes 9, 12		---	130 v
------	*Anode Delay Time:	Operation (1); t=120 sec; Note 13	tad :	---	0.6 μs
------	*Anode Delay Time Drift:	Anode Delay Time; Note 14	Δtad :	---	0.15μs
------	*Time Jitter:	epy=1.5kv(max.); Notes 9, 15	tj :	---	0.02μs
------	**Operation (2):	t=5.0 hrs. TA=90°C; Note 9	egy :	---	130 v
------	*Operation (3):	t=5.0min. Notes 9, 18	egy :	---	130 v
------	**Operation (4):	t=5.0 hrs. Notes 9, 18	egy :	---	130 v
------	Emission:	ik=35a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 16	egk :	---	150 v

Ref.	Test	Conditions		Min.	Max.
4.11	Life Test:	Notes 9, 17; Group B	t :	500	---hrs.
4.11.4	Life Test End Point:	Operation (1); DC Anode Voltage;	egy :	---	140 v
			Ebb :	---	750 Vdc
		Time Jitter	tj :	---	0.04

Note 1: References and notations are from Military Specification, Electron Tubes, MIL-E-1C, 3 October 1955.

Note 2: Clamping is permissible on the bulb in the area up to 2 in. above the base of the tube only.

Note 3: Cooling of the anode lead is permissible. There shall be no air blast directly on the bulb.

Note 4: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 3000v and shall not be attained in less than 0.04 seconds.

Note 5: In pulsed operation, the peak inverse voltage, exclusive of a spike of 0.05μs max. duration, shall not exceed 1.5 kv during the first 25μs after the pulse.

Note 6: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs(max.), grid pulse duration=2.0μs(min.) Impedance of drive circuit= 1500 ohms (max.).

Note 7: There shall be no pronounced resonance in the specified range.

Note 8: There shall be no evidence of shorts of any kind resulting from this test.

Note 9: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=3.0kv under resonant charging conditions, dik/dt=750a/μs(min.), ib=35a, tp=0.5μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs (max.), tr=0.5μs (min.). Driver Impedance=1500 ohms (min.).

WARNING: These conditions are specified only tor the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions as the case may be.

Note 10: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 3000 v within 0.03 sec. (the filter in the rectifier shall be designed so that epy reaches at least 1500v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 11: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 12: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 13: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 14: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

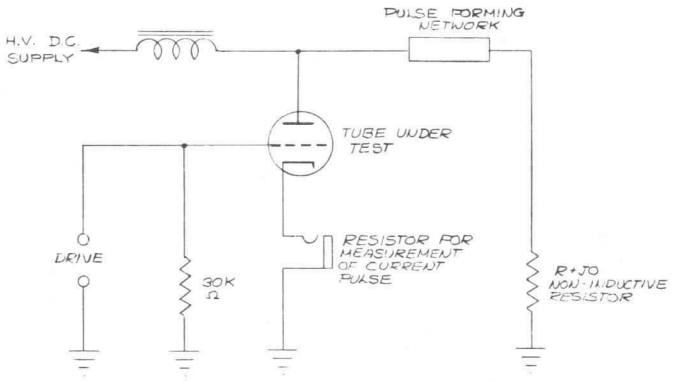
Note 15: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

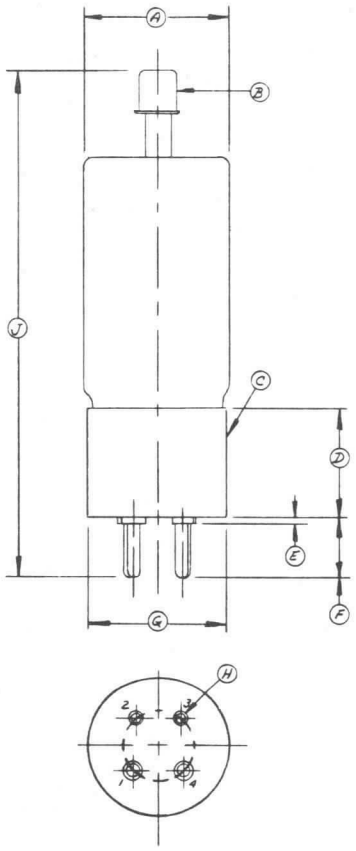
Note 16: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs(max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

(over)

Note 17: Life Test shall be shut down every ninety-six (96) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

Note 18: The tube shall operate satisfactorily in an evacuated chamber in which the pressure does not exceed 70mm Hg absolute.





REF.	DIMENSION
A **	1.500 ± .032
B **	ANODE CONNECTION
	ANTI-CORONA CAP CH
C **	MEDIUM 4 PIN LOW
	LOSS PRENOLIS
D **	1.087 NOM.
E **	.065 MAX.
F **	.596 MAX.
G **	1.337 - 1.377
##H PIN 1	TO HEATER
PIN 2	TO CATHODE
PIN 3	TO GRID
PIN 4	TO CATHODE
	AND HEATER
J	5 3/16 MAX.
	4 13/16 MIN.

Bomac

HYDROGEN THYRATRON

BL253

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

AUGUST 19, 1954

Application: Designed for pulsing service at high repetition rates, high voltages and high peak currents.

Dimensions: Per Outline
Mounting Position: Any
Clamping: Note 16
Cooling: Note 4

**Cathode: Coated Unipotential
**Envelope: T-8

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	800	---	---	---
Max.:	6.3+5% -10%	3.0 Note 3	3.0 Note 1	---	---	200 ---	--- Note 2
Test Cond:	6.3	3.0	---	---	0	---	130

Ratings:	ib	Alt.	Ib	tk	dik/dt	prr
Units:	a	ft.	mAdc	sec.	a/μs	pps
Min.:	---	---	---	120	---	---
Max.:	35 ---	10,000 ---	45 ---	--- ---	750 ---	--- ---
Test Cond:	---	---	---	120	---	2800

Ratings:	epy x prr x ib	TA
Units:	-----	°C
Min.:	-----	-50
Max.:	0.3×10^9 -----	+90 ----
Test Cond:	-----	----

Packing: To be specified

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	To be specified	---	---
4.9.19.1	**Vibration (1):	No Voltages; F= 12cps to F= 50cps; Notes 5, 6	---	---
4.9.19.2	**Vibration (2):	F= 50cps; G= 10; t= 30 sec(min.); Note 6	---	---
4.9.19.3	*Bump:	Angle = 20°; Note 6	---	---
4.10.8	Heater Current:	-----	If:2.0	2.5Aac
-----	†Instantaneous Starting:	epy=3000v(min.); Notes 7, 8	---	---
4.10.17.2	DC Anode Voltage:	Notes 7, 9	Ebb:---	300Vdc
-----	†Operation (1):	epy=4.0kv(min.); Notes 7, 10	egy:---	130v
-----	*Anode Delay Time:	Operation (1); t=120sec; Note 11	tad:---	0.6μs
-----	*Anode Delay Time Drift:	Anode Delay Time; Note 12	Δtad:---	0.15μs
-----	*Time Jitter:	epy=1.5kv(max.); Notes 7, 13	tj:---	0.02μs
-----	**Operation (2):	t=5.0hrs; TA=90°C; Note 7	egy:---	130v
-----	Emission:	ik=35a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 14	egk:---	150v
4.11	Life Test:	Notes 7, 15; Group D	t:200	---hrs.
4.11.4	Life Test End Point:	Operation(1); DC Anode Voltage; Time Jitter	egy:--- Ebb:--- tj:---	140v 750Vdc 0.04μs

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 μs max. duration, shall not exceed 1500 volts during the first 25 μs after the pulse.

Note 2: Driver pulse, measured at tube base with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs (max.), grid pulse duration =2.0μs(min.). Impedance of drive circuit =1500 ohms (max.).

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 3000 v and shall not be attained in less than 0.04 seconds.

Note 4: Cooling of the anode lead is permissible, but there shall be no air blast directly on the bulb.

Note 5: There shall be no pronounced resonance in the specified range.

Note 6: There shall be no evidence of shorts of any kind resulting from this test.

Note 7: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=3.0kv under resonant charging conditions, dik/dt=750a/μs(min.), ib=35a, tp=0.5±10%μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs(max.), tr=0.5μs(min.), Driver Impedance=1500ohms(min.).
WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltage and repetition rates for each test is specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Note 8: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 3000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 1500v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 9: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 10: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 11: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 12: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad valve observed on the Anode Delay Time test shall not exceed the specified value.

Note 13: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

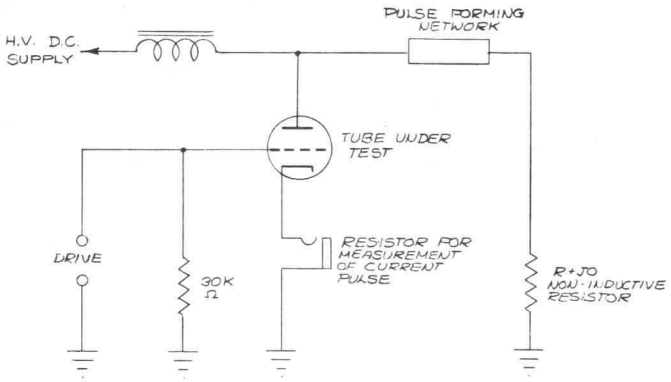
Note 14: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs(max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

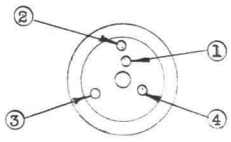
Note 15: Life test shall be operated with the tube in a horizontal position.

Note 16: Clamping is permissible on the bulb in the area up to 1½ in. above the base of the tube only.

Note 17: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

(over)





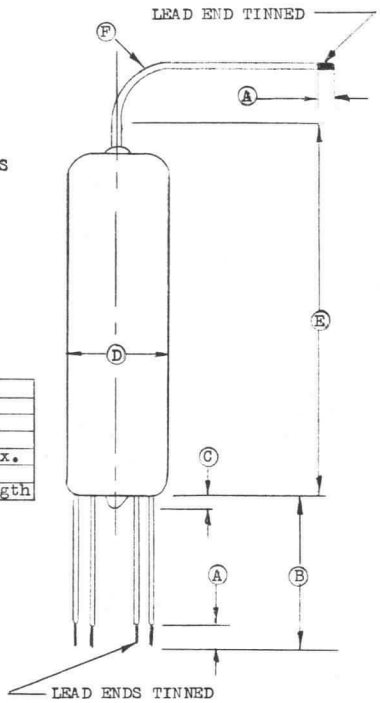
BOTTOM VIEW

COLOR CODED FIBER GLASS INSULATED LEADS.

1. Black - Heater
2. Blue - Heater and Cathode
3. Red - Cathode
4. Green - Grid

Top Lead- Anode

Ref.	Dimensions.
A	1/4 Min.
B	2-1/2 Min.
C	1/8 Max.
D*	1-1/16 Dia Max.
E*	3-5/8 Max.
F	1-3/4 Min length



Bomac

HYDROGEN THYRATRON

BL255/3C45W

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

DECEMBER 19, 1955

Dimensions: Per Outline
Mounting Position: Any
Clamping: Note 16
Cooling: Note 4

**Cathode: Coated Unipotential
**Envelope: T-12

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	800	---	---	---
Max.:	6.3+5% -10%	3.0 Note 3	3.0 Note 1	---	---	200 ---	--- Note 2
Test Cond:	6.3	3.0	---	---	0	---	130

Ratings:	ib	Alt.	Ib	tk	dik/dt	prr
Units:	a	ft.	mAdc	sec.	a/μs	pps
Min.:	---	---	---	120	---	---
Max.:	35	10,000	45	---	750	---
	---	---	---	---	---	---
Test Cond:	---	---	---	120	---	2800

Ratings:	epy x prr x ib	TA
Units:	-----	°C
Min.:	-----	-50
Max.:	0.3×10^9 -----	90 ----
Test Cond:	-----	----; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size M	---	---
-----	**Vibration:	No Voltages; Cycles=1; F_1= 20 cps to F_2= 2000 cps; G=20; t=15min.(min.); Notes 5, 6	---	---
4.9.19.3	*Bump:	Angle = 20°; Note 6	---	---
4.10.8	Heater Current:	-----	If:2.0	2.5Aac
-----	*Instantaneous Starting:	epy=3000v(min.); Notes 7, 8	---	---
4.10.17.2	DC Anode Voltage:	Notes 7, 9	Ebb:---	300Vdc
-----	*Operation (1):	epy=4.0kv(min.); Notes 7, 10	egy:---	130v
-----	*Anode Delay Time:	Operation (1); t=120sec; Note 11	tad:---	0.6μs
-----	*Anode Delay Time Drift:	Anode Delay Time; Note 12	Δ tad:---	0.15μs
-----	*Time Jitter:	epy=1.5kv(max.); Notes 7, 13	tj:---	0.02μs
-----	**Operation (2):	t=5.0hrs; TA=90°C; Note 7	egy:---	130v
-----	Emission:	ik=35a(min.); prr=60±10%pps; tp=5.0±10%μs; tr=0.5μs(max.); Note 14	egk:---	150v
4.11	Life Test:	Notes 7, 15; Group D	t:500	---hrs.
4.11.4	Life Test End Point:	Operation (1); DC Anode Voltage; Time Jitter	egy:--- Ebb:--- tj:---	140v 750Vdc 0.04μs

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 μs max. duration, shall not exceed 1500 volts during the first 25 μs after the pulse.

Note 2: Driver pulse, measured at tube base with thyratron grid disconnected; egy=175v(min.), time of rise=0.5μs (max.), grid pulse duration=2.0μs (min.). Impedance of drive circuit=1500 ohms (max.).

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 3000 v and shall not be attained in less than 0.04 seconds.

Note 4: Cooling of the anode lead is permissible, but there shall be no air blast directly on the bulb.

Note 5: Vibrate once along a line normal to the main axis of the tube. There shall be no pronounced resonance in the specified range.

Note 6: There shall be no evidence of shorts of any kind resulting from this test.

Note 7: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=3.0kv under resonant charging conditions, dik/dt=750a/μs(min.), ib=35a, tp=0.5±10%μs, prr=3000pps. The grid pulse characteristics shall be tp=2.0μs(max.), tr=0.5μs(min.), Driver Impedance=1500ohms(min.).
WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltage and repetition rates for each test is specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be.

Note 8: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from 0 to 3000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 1500v within 0.015 sec.). The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 9: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 10: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 11: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 12: During the interval between 3 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad valve observed on the Anode Delay Time test shall not exceed the specified value.

Note 13: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

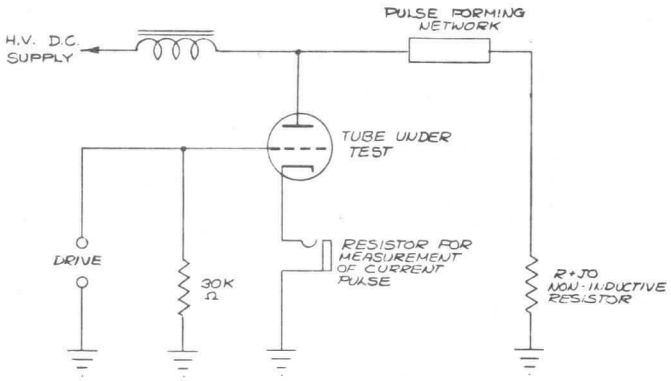
Note 14: The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5μs(max.) after the beginning of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

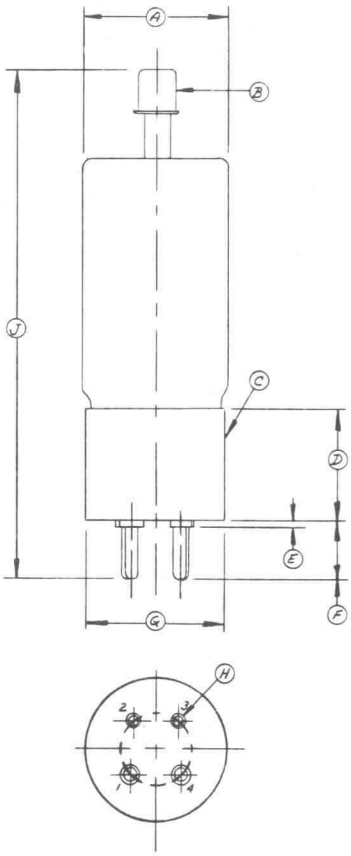
Note 15: Life Test shall be operated with the tube in a horizontal position and shall be shut down every ninety-six (96) hours for a sixty (60) minute interval.

Note 16: Clamping is permissible by the base and/or bulb in the area up to 2 in. above the top of the base only.

Note 17: References and notations are from Military Specification, Electron Tubes, MIL-E-1B, 2 May 1952.

(over)





REF	DIMENSION
A *	1.500 ± .032
B **	ANODE CONNECTION
	ANTI-CORONA CAP CH
C **	MEDIUM 4 PIN LOW
	4253 PHENOLIC
D **	1.087 NOM.
E **	.065 MAX.
F **	.596 MAX.
G **	1.337 - 1.377
##H PIN 1	TO HEATER
PIN 2	TO CATHODE
PIN 3	TO GRID
PIN 4	TO CATHODE
	AND HEATER
J	5 3/16 MAX.
	4 13/16 MIN

Bomac

HYDROGEN THYRATRON

BL262

BOMAC LABORATORIES, INC. - BEVERLY, MASSACHUSETTS

JANUARY 31, 1956

Dimensions: Per Outline

Mounting Position: Any, (Note 15) **Cathode: Coated Unipotential
Clamping: Note 16 **Envelope: T-12
Cooling: Note 15

Ratings:	Ef	epy	epx	Ebb	Ec	egx	egy
Units:	Vac	kv	kv	Vdc	Vdc	v	v
Min.:	---	---	5%epy	2500	---	---	---
Max.:	6.3+5% -10%	8.0 Note 3	8.0 Note 1	---	---	200 ---	--- Note 2
Test Cond:	6.3	8.0	---	---	0	---	130

Ratings:	ib	Alt.	Ib	tk	dik/dt	prr
Units:	a	ft.	mAdc	sec.	a/us	pps
Min:	---	---	---	180	---	---
Max.:	90 ---	10,000 ---	100 ---	---	1000 ---	---
Test Cond:	---	---	---	180	---	2800

Ratings:	epy x prr x ib	TA
Units:	---	°C
Min.:	---	-50
Max.:	2.0 x 10^9 ---	+90 ---
Test Cond:	---	25±5; See Test Circuit

Ref.	Test	Conditions	Min.	Max.
3.1	Qualification Approval:	Required for JAN Marking	---	---
4.5	Holding Period:	t=96 hours	---	---
4.9.18.1.6	Carton Drop:	(d); Package Group 1; Carton Size P		
4.9.19.1	**Vibration (1):	No Voltages; F=10cps to F=60cps; 9 g Notes 4, 5	---	---
4.9.19.2	**Vibration (2):	F=60 to 500 cps @ 5g F=500 to 1200 cps @ 3g T=30 sec (min); Note 5	---	---
-----	** Acceleration	G=40 Note 19	---	---
-----	* Shock	Note 5, 18	---	---
4.10.8	Heater Current:	-----	If : 5.50	6.70 Aac
-----	+ Instantaneous Starting:	epy=7000v(min.); Notes 6, 7	---	---
4.10.17.2	DC Anode Voltage:	Notes 6, 8	Ebb: ---	1500 Vdc
-----	+ Operation (1):	epy=10.0kv(min.); Notes 6, 9	egy: ---	130v
-----	*Anode Delay Time:	Operation (1); t=120 sec; Note 10	tad: ---	0.6µs
-----	*Anode Delay Time Drift:	Anode Delay Time: Note 11	Δtad: ---	0.15µs
-----	*Time Jitter:	epy=3.0kv (max.); Notes 6, 12	tj: ---	0.02µs
-----	**Operation (2):	t=5.0 hrs; TA=90°C; Note 6	egy: ---	130v
-----	Emission:	ik=90a(min.); prr=60 ±10%pps; tp=5.0±10%µs; tr=0.5µs (max.); Note 13	egk: ---	150v
4.11	Life Test	Notes 6, 14, 15; Group D	t : 200	---hrs
4.11.4	Life Test End Point:	Operation (1); DC Anode Voltage;	egy:--- Ebb:---	140v 2000Vdc

Note 1: In pulsed operation, the peak inverse voltage, exclusive of a spike of .05 µs max. duration, shall not exceed 2.5kv during the first 25 µs after the pulse.

Note 2: Driver pulse, measured at tube socket with thyratron grid disconnected; egy=175v(min.), time of rise =0.5µs (max.), grid pulse duration =2.0µs (min.). Impedance of drive circuit= 1500 ohms (max.).

Note 3: For instantaneous starting applications where plate voltage is applied instantaneously, the power supply filter design shall be such that the maximum permissible epy is 7000v and shall not be attained in less than 0.04 seconds.

Note 4: There shall be no pronounced resonance in the specified range.

Note 5: There shall be no evidence of shorts of any kind resulting from this test.

Note 6: The tube shall be tested in Test Circuit "J" as shown in attached drawing. Tests performed at repetition rates less than the resonant repetition rate shall be made with a hold-off diode in the charging circuit. The circuit constants shall be chosen so that at epy=8.0 kv under resonant charging conditions dik/dt=1000a/us(min.), ib=90a, tp=0.5±10%µs, prr=3000pps. The grid pulse characteristics shall by tp= 2.0us (max.), tr=0.5µs (min.), Driver Impedance=1500 ohms (min.).

WARNING: These conditions are specified only for the purpose of determining circuit constants. The actual operating voltages and repetition rate for each test are specified in the conventional manner under the particular conditions or under the general test conditions, as the case may be .

Note 7: This shall be the first test after the holding period. The tube shall operate satisfactorily on push button starting within 3 attempts when the anode voltage epy is applied to the tube under test in such a manner as to rise from o to 7000v within 0.03 sec. (The filter in the rectifier shall be designed so that epy reaches at least 3500v within 0.015 sec.) The intervals between successive attempts to instantaneously start the tube shall not be less than 10 seconds nor more than 30 seconds. Any tube failing to start within 3 attempts will be considered a failure.

Note 8: This test shall be conducted within 60 seconds after the Operation (1) test.

Note 9: The tube shall operate continuously for five minutes without evidence of arc-back or anode heating.

Note 10: Anode Delay Time (tad) - a time interval between the point on the rising portion of the grid pulse which is 26% of the maximum unloaded pulse amplitude and the point where anode conduction takes place.

Note 11: During the interval between 2 minutes and 7 minutes of the Anode Delay Time test, the change in anode delay time (Δtad) relative to the tad value observed on the Anode Delay Time test shall not exceed the specified value.

Note 12: The variation in firing time (tj) shall be measured at 50% of pulse amplitude and shall not be greater than the amount specified.

Note 13. The positive pulse shall be applied to the grid of the tube. Measure the voltage between grid and cathode 2.5µs (max.) after the begining of the current pulse. The average voltage shall not rise during the last four microseconds. Plate floating.

Note 14. Life Test shall be shut down every one-hundred (100) hours for a sixty (60) minute interval. Life Test shall be conducted with the tube in a horizontal position.

Note 15: The tube and socket shall be completely immersed in oil at a maximum ambient temperature of +90°C.

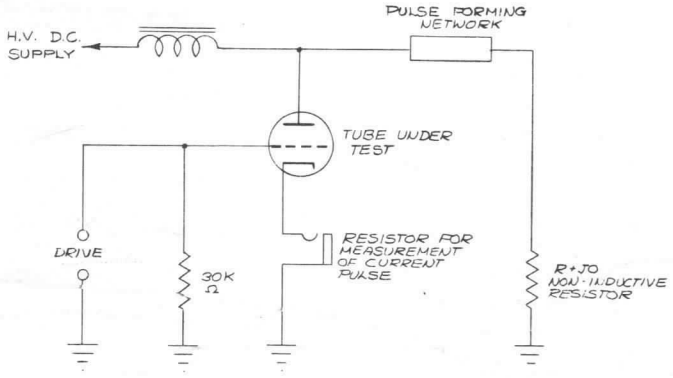
(over)

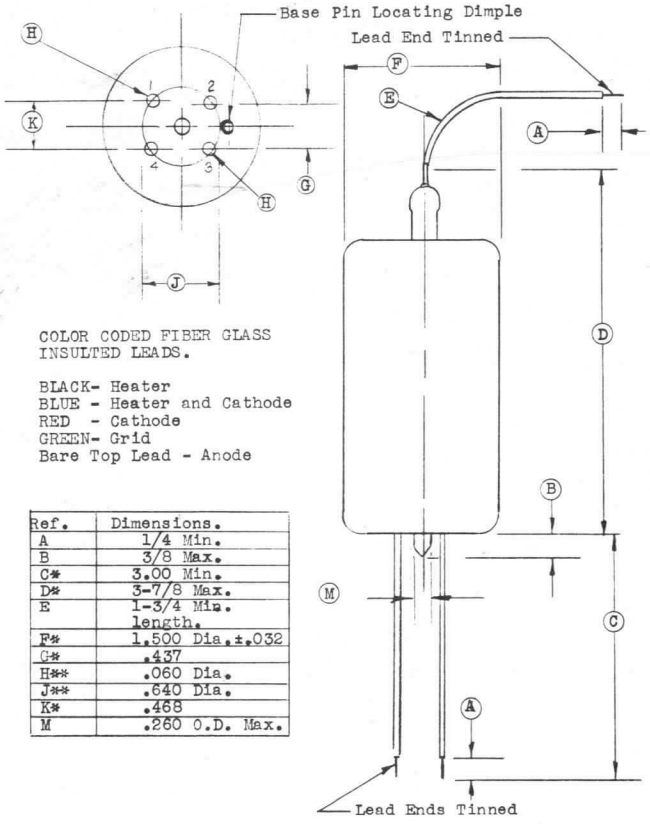
Note 16: Clamping is permissible on the bulb in the area up to 1 in. above the base of the tube only.

Note 17: References and notations are from Military Specification, Electron Tubes, MIL-1B, 2 May 1952.

Note 18: High impact shock of 60 g in any direction, shock wave to have a rise and decay time of .5 millisecond and duration of 3 ± 1 millisecond.

Note 19: Performance must be unaffected during and after sustained acceleration of 40 G in any direction.





COLOR CODED FIBER GLASS INSULTED LEADS.

BLACK- Heater
BLUE - Heater and Cathode
RED - Cathode
GREEN- Grid
Bare Top Lead - Anode

Ref.	Dimensions.
A	1/4 Min.
B	3/8 Max.
C*	3.00 Min.
D*	3-7/8 Max.
E	1-3/4 Min. length.
F*	1.500 Dia. ±.032
G*	.437
H**	.060 Dia.
J**	.640 Dia.
K*	.468
M	.260 O.D. Max.