



RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 444

October 5, 1945.

sponsored by:
Sperry Gyroscope Co., Inc.

Type No. 1B44

ATR Gas Switching Tube - Fixed Tuned - S_g Band

GENERAL CHARACTERISTICS

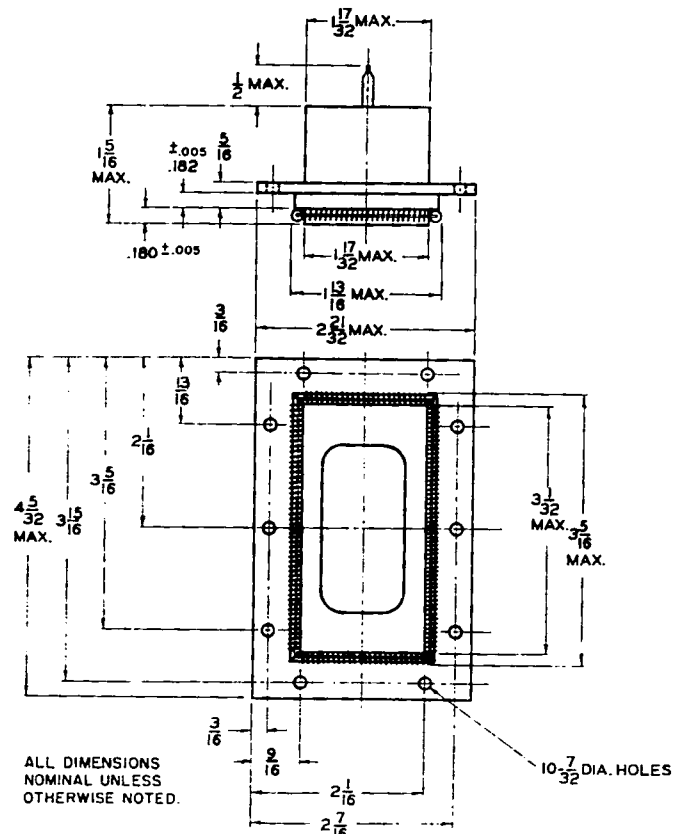
Rating - Transmitter Peak Power 20 KW min.

ELECTRICAL

- a) Resonant frequency 2750 Mc. $\pm \frac{1}{2}\%$
b) Loaded Q Q_L -----4.5 Max.
c) Tuning Susceptance (B/Y₀) $\pm .05$
d) Equivalent Conductance (G/Y₀) ---0.1 Max.

MECHANICAL

Ionizable Medium Argon
Permissible mounting position Any
Maximum Dimension See outline drawing
Ambient temperature -50 to + 100°C







RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 444

October 5, 1945

sponsored by:
Sperry Gyroscope Co., Inc.

RMA TYPE 1B57

ATR Gas Switching Tube - Fixed Tuned - S_a Band

GENERAL CHARACTERISTICS

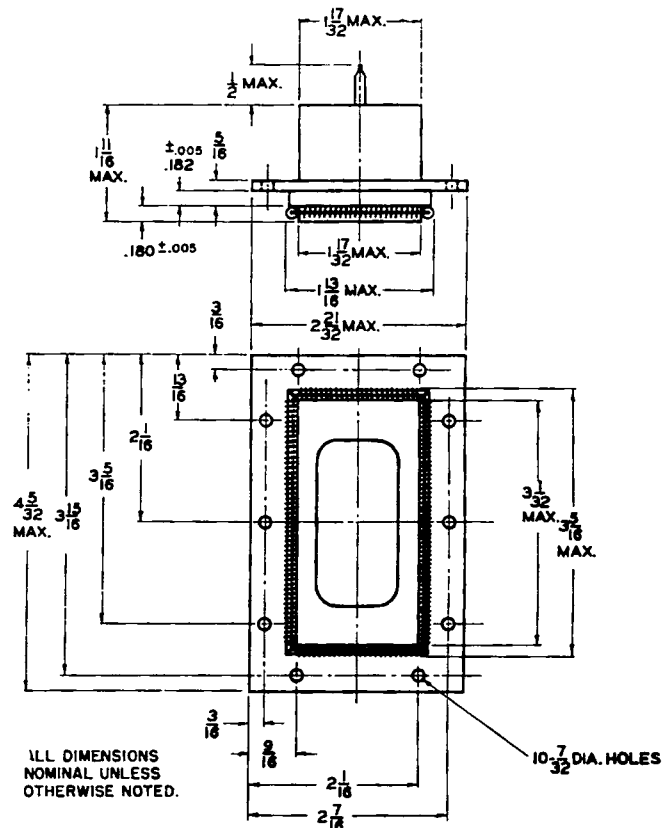
Rating - Transmitter Peak Power 20 KW Min.

ELECTRICAL

- | | |
|---------------------------|----------------------------------|
| a) Resonant frequency | 3325 Mc. $\pm \frac{1}{2}\%$ |
| b) Loaded Q | Q_L -----4.5 Max. |
| c) Tuning Susceptance | (B/Y _o) $\pm .05$ |
| d) Equivalent Conductance | (G/Y _o) ----0.1 Max. |

MECHANICAL

Ionizable Medium	Argon
Permissible mounting position	Any
Maximum Dimension	See outline drawing
Ambient temperature	-50 to + 100° C.





RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 444

October 5, 1945

RMA Type 1B58

sponsored by:
Sperry Gyroscope Co., Inc.

Band Pass TR Tube

GENERAL CHARACTERISTICS

ELECTRICAL

Center Frequency	f2	10.7 cm
Band Pass Range (V.S.W.R. 1.65 max.)		10 to 11.3 cm

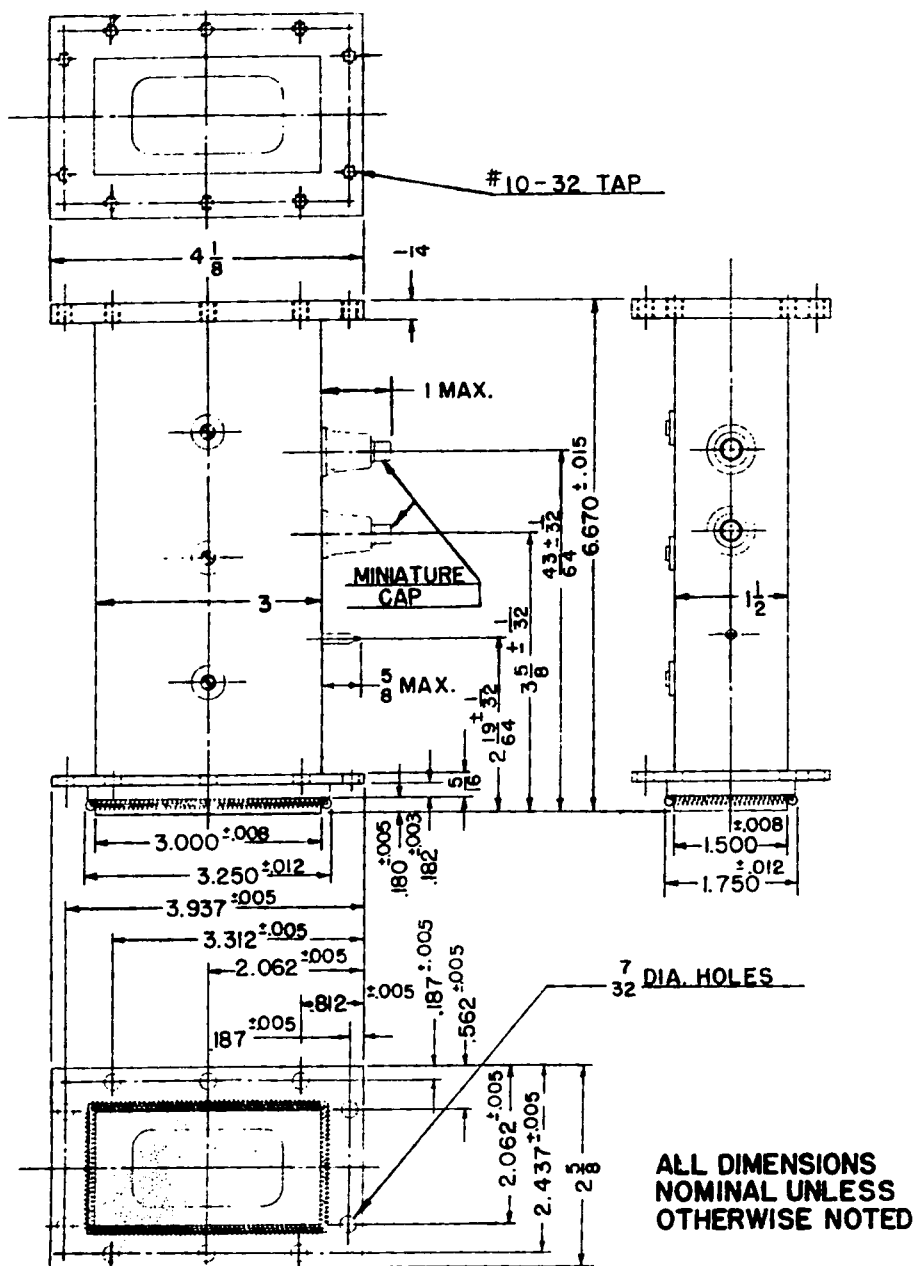
MECHANICAL

Ionizable Medium	Argon and water vapor
No. of electrodes	3, plus entrant and exit windows.
No. of Keep alive electrodes	2
Dimensions	See outline drawing
Mounting position	Any

MAXIMUM RATINGS

Transmitter Average Power	1000 watts	
Insertion Loss	f2	To be specified
* Keep alive firing time	T	5 sec.
Keep alive arc drop		To be specified
* Keep alive Interaction	f2	.1 DB
* Leakage energy		.4 ergs
Recovery time		To be specified

* Method of measuring to be specified.





RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 442

October 5, 1945

RMA TYPE 2J64

sponsor:
Sperry Gyroscope Co., Inc.

Magnetron

GENERAL CHARACTERISTICS

Electrical

Filament or Cathode	Coated Unipotential
Voltage	6.3 volts
Current	1.3 amp
Frequency	1.4 kMc

Typical Operation

Field Strength	900 gauss
Pulse Duration	2 usec
Repetition Rate	26000 per sec
Anode Voltage	3000 volts
Anode Current	52 mamps
Peak Power Output	600 watts

Maximum Ratings (for specified duty cycle)

Peak Anode Voltage	5000 volts
Peak Anode Current	1.5 amps
Anode Dissipation	180 watts
Duty Cycle	.052
Anode Temperature	100°C

Tube shall not be operated longer than 5.2 usecs
in any 100 usec interval.

Cooling: Forced air

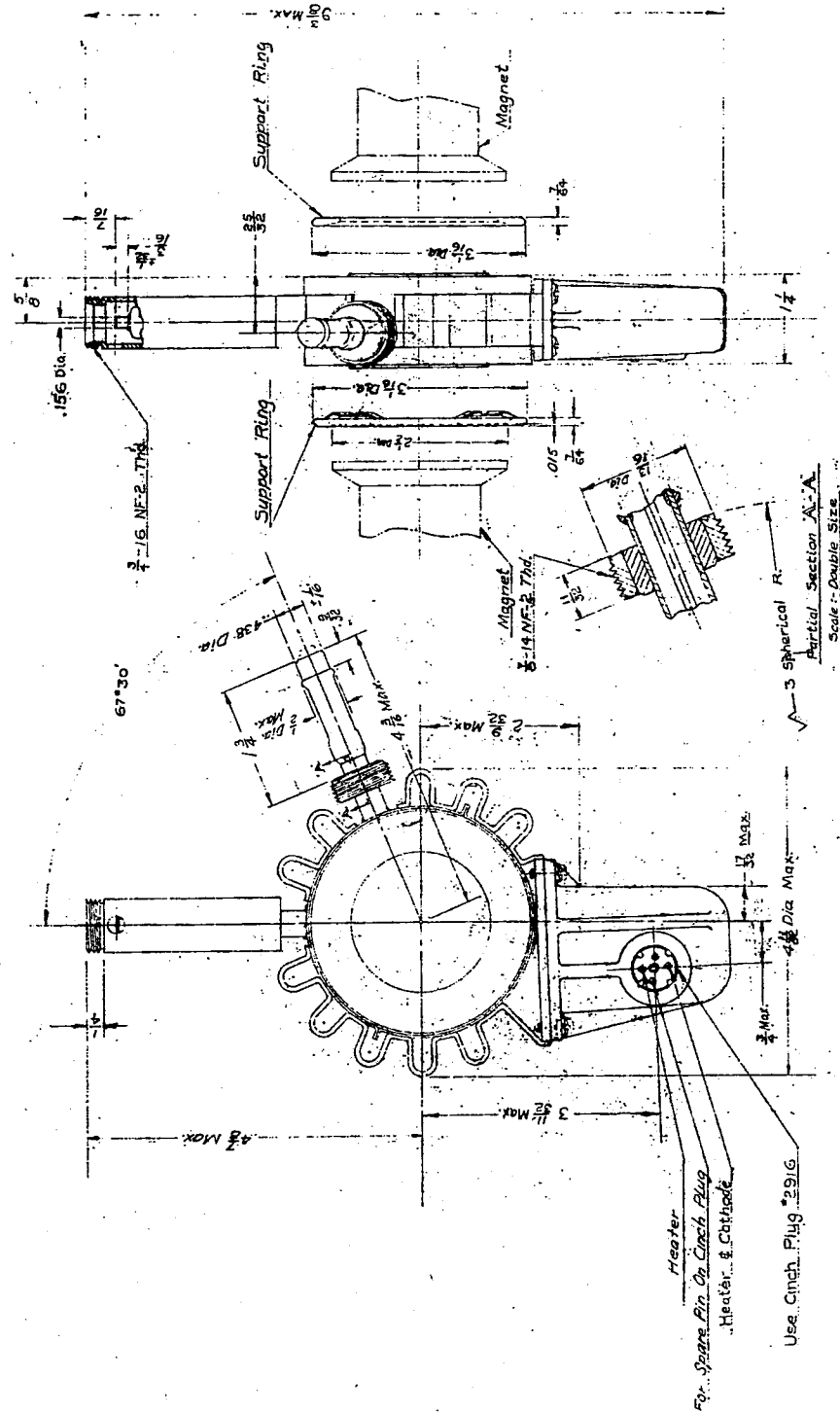


RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 442

October 5, 1945

RMA TYPE 2J64
(Continued)





RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

Release No. 443

October 5, 1945

sponsor:
Sperry Gyroscope Co., Inc.

Type 2K31
Velocity Modulation Amplifier/Oscillator

General Characteristics

Electrical

Cathode	Indirectly Heated
Heater Voltage (A.C. or D.C.)	6.3 volts
Heater Current	1.3 amperes

Tentative Maximum Ratings

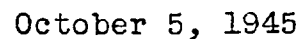
Acceleration Voltage	2000 volts
Beam Current	60 milliamperes
Control Grid Voltage	50 volts (positive)
Control Grid Current	25 milliamperes
Beam Power Input	100 watts
Forced air cooling should be used for beam power inputs exceeding 20 watts	

Typical Operation

Acceleration Voltage	430 volts	1800 volts
Beam Current	20 milliamperes	50 milliamperes
Output	30-75 milliwatts	3 watts
Load Resistance	70 ohms.	
Tuning Range	9.0 cm to 11.0 cm	

Mechanical

Maximum Overall Height	5 1/4 inches
Tube Body Diameter	1 3/4 inches
Maximum Diameter	3 1/16 inches
Envelope	special construction metal and glass
Base	intermediate shell octal 8 pin
Base Connection	see outline drawing
Permissible Mounting Position	any
Approximate Weight	11 ounces





2K34 KLYSTRON

VELOCITY MODULATION OSCILLATOR/BUFFER

The type 2K34 Sperry klystron is a super-high frequency, velocity modulation tube designed for use as a combination self-controlled oscillator and buffer amplifier. A buffer stage is an integral part of the tube and is electron coupled to the oscillator portion of the tube. Inclusion of this buffer stage permits the use of a variable load without appreciably affecting the operating frequency of the tube.

The tube utilizes three resonant cavities which are an integral part of the tube structure. An electrostatically focused electron gun projects an electron beam through these three resonators. One

coaxial output terminal, designed for use with Sperry SKL (3/32 thread) fittings, is coupled to each of the second and third resonators. The first two resonators are used as the oscillator portion of the tube and are inductively coupled by an internal feedback loop. The third resonator is electron coupled to the oscillator portion of the tube and serves to isolate the oscillator from the load.

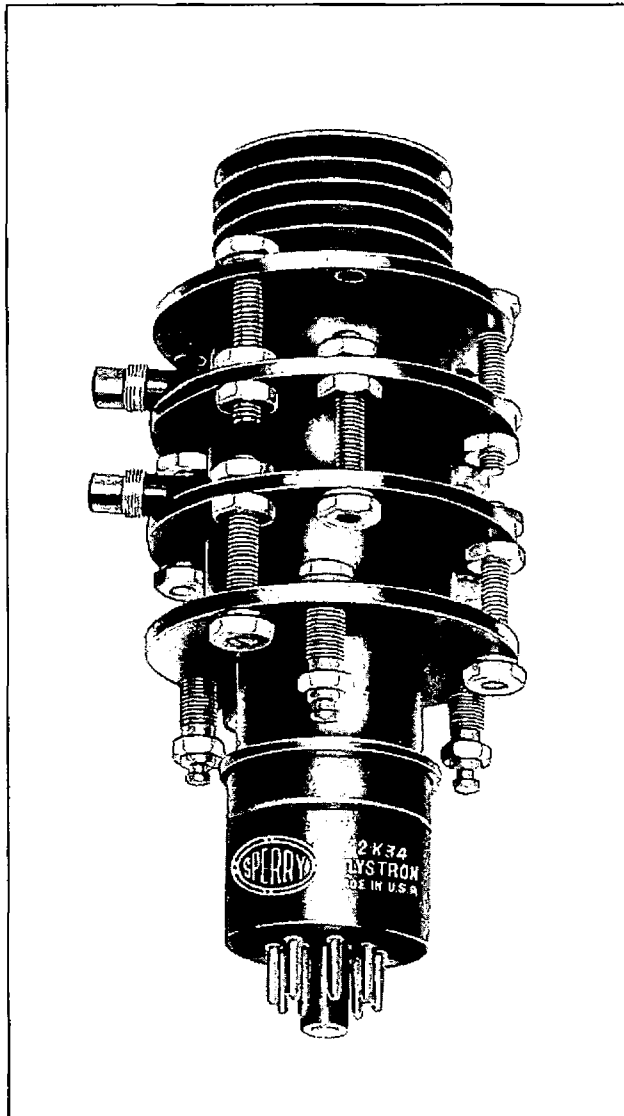
The velocity of the electrons in the electron beam is modified by the radio-frequency voltage developed at the grids of the input resonator. Electron bunching occurs in the drift space between the first and second resonators. The second resonator extracts a portion of the radio-frequency energy from the electron bunches in this velocity-modulated beam. A portion of this energy is fed back to the input resonator in the proper phase to maintain the oscillations. The feedback loop is an internal part of the tube. The first resonator has no external radio-frequency terminal. If desired, radio-frequency power from the oscillator section can be supplied to an external load through the coaxial output terminal on the second resonator.

If the radio-frequency output of the oscillator section is fed directly to a variable load, the frequency of the oscillator will vary slightly as the load is varied. In cases where frequency modulation of this sort is not desired, the output should be taken from the buffer stage. This will practically eliminate this type of modulation since variation in load will have practically no effect on the operating frequency of the tube.

This tube is designed for operation on any selected fixed frequency within the stated tuning range. Threaded, thermal compensating, tuning screws are included as part of the structure so that the tube may be set at the desired frequency.

GENERAL DATA (Tentative)

Frequency Range	2730 to 3330 megacycles
R-f Power Output (minimum; unmodulated)*	
Oscillator Section	18 watts
Buffer Section	16 watts
Heater (a-c or d-c)	
Voltage	6.3 volts
Current	1.5 amperes
Beam**	
Voltage	3000 max. volts
Current	150 max. milliamperes
Input Power	450 max. watts
Control Electrode	
Voltage	0 to -200 max. volts (never positive)
Current	3 max. milliamperes



Weight 21 ounces

Heater-Cathode Voltage ± 45 max. volts

Cooling Forced air cooling is recommended for all beam power inputs above twenty watts. In any case, sufficient forced air should be supplied to keep the envelope temperature below 100°C. At the maximum ratings, about fifty cubic feet of forced air per minute will be required. The stream of forced air should be directed between the tuning flanges and between the cooling fins.

MEDIUM

Base ~~9-pin~~ shell, octal, 8 pin

Mounting Position - Any

Output Terminal Fittings
(Not supplied with tube)

	Sperry Cat. No.		JAN Type No.
Straight plug	50-1200	similar to	UG-275/U
Right Angle plug	50-1201	similar to	UG-276/U
Plug to Type N jack adapter	50-1202	similar to	UG-131/U
Coaxial cable for fittings	50-1203	similar to	RG-5/U RG-21/U (attenuating)

Typical Operation

Heater Voltage	6.3 volts
Heater Current	1.5 ~~1.5~~ amperes
Beam Voltage	1900 volts
Beam Current	75 milliamperes
Control Electrode Voltage	-45 volts
Heater-Cathode Potential	0 volts
R-f Output Power	14 watts

* This minimum r-f output power is obtainable within the maximum rated operating conditions at any frequency within the published range of the tube when the load is adjusted to produce the best output power. These output powers cannot be obtained from both sections simultaneously, and apply only to the independent use of either output condition.

** Absolute maximum values, not design center values.

INSTALLATION

METAL ENVELOPE - The metal portion of the tube envelope is operated at ground potential in most klystron applications. This is the most convenient method because it allows any tuning adjustments on the klystron to be made without danger of electrical shock. In this type of operation, the positive side of the beam electrode power supply is operated at ground potential and the negative terminal of this power supply is connected to the cathode circuit of the klystron.

CATHODE - The cathode of this tube is connected to a separate base pin connection. In most application it should be connected either directly to one side of the heater at the tube socket, or to the electrical midpoint of the heater transformer winding. A common lead throughout the circuit for the connections to the cathode and to one side of the heater should not be used. This arrangement would introduce modulation into the beam voltage circuit when alternating current

is used for the heater supply. In cases where the cathode is not directly connected to the heater, the potential difference between them should be not more than 45 volts. The control electrode and beam circuit returns should be made to the cathode connection on the tube socket and not to some related point in the heater circuit.

CONTROL ELECTRODE - For simplicity of operation, the control electrode is frequently connected to the cathode at the tube socket, but it may be connected to a low impedance voltage supply for control of the beam focusing and the beam current. In no case should the tube be operated with the control electrode not connected to the circuit, or with the control electrode operated at a potential which is positive with respect to the cathode.

POWER SUPPLIES - The beam and control electrode power supplies should be free of hum or ripple voltage if a radio-frequency output is desired without amplitude and frequency modulation. Hum, or other modulation on the control electrode, produces an amplitude modulation of the output and also enough frequency modulation to be objectionable if only amplitude modulation is desired. Any low frequency variation of the beam voltage produces mainly frequency modulation of the output, although some amplitude modulation is also present if the voltage swings are large enough. The amount of power supply hum or ripple voltage that can be tolerated depends upon both the particular application and upon the operating voltage. At the 1900 volt operating condition that is quoted under "Typical Operation", about 10 kilocycles per second per volt of frequency modulation is obtained for small variations in the beam voltage. The modulation sensitivity is inversely proportional to the operating beam voltage so that at higher beam voltages this modulation sensitivity is less and at lower beam voltages it is greater than the quoted value. Electronically regulated power supplies are therefore recommended for these applications. The output voltage of the power supplies should be adjustable over a range of several hundred volts, so that the operating voltages for the tube may be adjusted to obtain the best output power for a selected operating frequency. While the oscillator portion of the tube will operate with a beam voltage as low as 500 volts, an appreciable output will not be attained with a beam voltage much under 1000 volts.

When the beam electrode of this tube is operated at ground potential, the cathode, the control electrode, and the heater circuits must be insulated for four times the beam voltage plus 1000 volts. This requirement applies to the heater transformer insulation and to any control electrode supply that may be used.

OPERATION

PRECAUTIONS

1. Allow heater to warm up for 30 seconds before turning on other voltages.
2. The application of beam voltage must not precede the application of any of the other voltages.
3. Klystron beam voltages are dangerous. Turn off power supplies and discharge capacitors before handling klystron circuits.

STARTING - After the tube has been installed in accordance with the above instructions and has the proper voltages applied, the first step is to get it into operation on the proper frequency and with maximum output.

RESONATOR TUNING PROCEDURE - The resonators are tuned by varying the distance between each pair of tuning rings by means of three tuning screws. One end of each screw is threaded into one of the rings and is held by a locknut. The other end passes through the other ring and is held by two nuts, one on each side of the ring. The tuning ring is moved by loosening the nut on the side in the direction of the motion desired and tightening the opposing nut. It must be recognized that the complete published tuning range of the system is covered by about a 0.060 inch displacement between each pair of rings. This displacement is made by approximately two turns of the three tuning nuts on each ring. The tuning rings must also be kept reasonably parallel to maintain proper positioning of the vane grids. Therefore, no one tuning nut should be turned more than a quarter turn in the desired direction without turning the other two comparable nuts on the same tuning ring. The total number of turns of any one nut should be limited to less than two turns in order to stay within the tuning range.

Connect an r-f indicating device, such as a crystal detector and milliammeter, to the output of the second (middle) resonator to detect the presence of oscillation. The crystal detector should be connected to the tube through from 5 to 20 db of lossy line to prevent damage to the crystal. In order to start oscillation, it is recommended that the beam voltage be swung back and forth approximately 100 volts about the chosen beam voltage (1000-3000 volts, depending on the output power desired!). This can easily be done by connecting a 110 volt 60 cycle source in series with the beam voltage supply as shown in Figure 3. Now tune the second resonator, first oneway and then the other, until the tube starts to oscillate as indicated by a reading on the milliammeter.



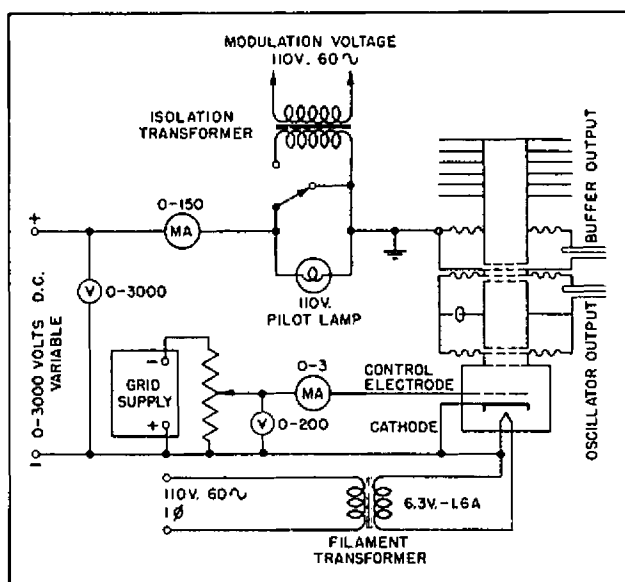
OSCILLATOR TUNING - After oscillation is detected, disconnect the 60 cycle modulating voltage and retune the second resonator slightly for best output. The retuning necessary should require less than a quarter turn of any one tuning nut. Now measure the frequency of oscillation with any convenient wave meter. Retune to the frequency desired by varying both the first and second resonators. If the desired frequency is higher than the measured frequency, the resonator grid spacings and therefore the tuning ring spacings must be widened. If the desired frequency is lower, the spacings must be narrowed. It is desirable that these resonators be adjusted alternately so that they do not get out of tune with each other and cause loss of oscillation.

After the frequency of the oscillator section

has been established on the desired frequency, the output stage should be peaked. If the buffer stage is used, the crystal detector or other r-f indicating device is shifted to the third resonator and the output is peaked by tuning the third resonator for a maximum and then alternately tuning the second and third resonators until maximum output is obtained. It is possible that this peaking operation may shift the frequency of the oscillator section slightly. Therefore, the frequency should be checked with an absorption type wavemeter at the output of the buffer (third) resonator. If the frequency has shifted beyond the required tolerance it will be necessary to retune the oscillator section to bring it back on frequency and repeak the second and third resonators as outlined in this section. Care in the tuning of the three resonators will give maximum output on the desired frequency. It must be noted at this point that the recommended procedure as outlined has been predicated on a fixed beam voltage. Any change in beam voltage will cause a frequency shift in the oscillator section of the tube and a consequent detuning of the output voltage. Therefore, when re-starting the tube, the beam voltage must be brought up to the same value as used in the original tuning of the tube.

RESONATOR PRETUNING - The procedure outlined above has been based on the assumption that the resonators were not initially too badly out of tune. If, for any reason, the resonators have been detuned, it is recommended that they be pretuned before starting the outline procedure. This pretuning may be done as follows:

Apply a signal from a signal generator to the second resonator. Tune the second resonator for a dip in output. Then tune the first resonator until a rise appears in the output of the signal generator, indicating resonance. The third resonator may be tuned directly with the signal generator for a dip in the output. If no signal generator is available, the resonators can be pretuned roughly by adjusting the spacing of the three pairs of tuning rings until they are approximately 0.660 inches apart, measuring from the inner faces of each pair of rings. The resonators should now be close enough in tune to follow the procedure given for putting the tube in operation.



SIMPLIFIED CIRCUIT DIAGRAM

FIGURE 3

Inquiries regarding service information, operation, or performance of klystron tubes should be directed to Field Service Engineering Department, Sperry Gyroscope Company, Inc., Great Neck, New York. Do not return klystrons before making this contact.



2K35 KLYSTRON
VELOCITY MODULATION CASCADE AMPLIFIER

General Characteristics

The type 2K35 klystron is a super high frequency velocity modulation tube designed for use as a cascade amplifier. The tube has three resonant cavities which are integral parts of the tube structure. Each of the resonant cavities has a coaxial terminal which is designed for use with Sperry SKL (3/8-32 thread) fittings. The electron gun is of the electrostatically focused type which requires no external focusing fields.

Electrical Data

Heater Voltage (ac or dc)	6.3 volts
Heater Current	1.5 amperes
Maximum Frequency	3330 Mc/sec
Minimum Frequency	2730 Mc/sec

Maximum Ratings (C.W. Operation)

For operation at the maximum ratings of the tube, air cooling of at least 50 cubic feet per minute is recommended. In any case, sufficient air cooling should be provided to keep the shell temperature below 100° Centigrade.

Beam Voltage	3000 volts
Beam Current	150 milliamperes



2K35 Klystron
Velocity Modulation Cascade Amplifier

Page 2

Shell Dissipation	450 watts
Control Electrode Voltage	0 to -200 volts (never positive)
Control Electrode Current	3 milliamperes
Heater-Cathode Voltage (Peak)	±45 volts
Shell (resonator and other parts) Temperature	100°C

Mechanical Information

Type of Cathode	Coated, Unipotential
Base	Shortened Medium Shell, Octal, 8-pin
Physical Specifications	(See outline drawing)
Base Connections	(See outline drawing)
Mounting Position	Any
Cooling Data	(See Maximum Ratings)

Typical Operation (C.W. Operation)

Frequency	3000	3000	Mc/sec
Heater Voltage	6.3	6.3	volts
Heater Current	1.5	1.5	amperes
Beam Voltage	1500	2625	volts
Beam Current	75	150	milliamperes
Control Electrode Voltage	0	0	volts

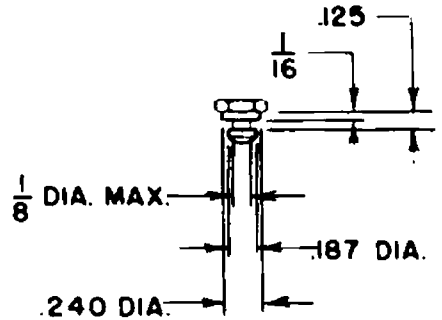
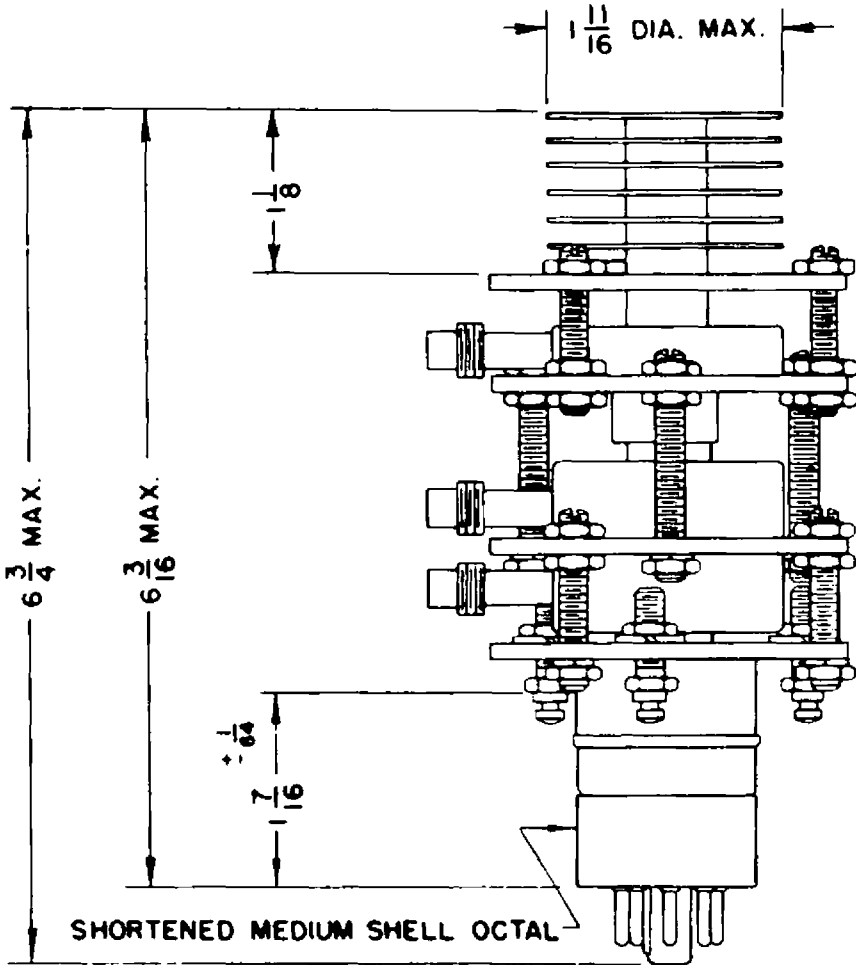


2K35 Klystron
Velocity Modulation Cascade Amplifier

Page 3

Heater-Cathode Voltage	0	0	volts
R-F Input Power (Drive)	5	30	milliwatts
R-F Output Power	5	30	watts
Power Gain	30	30	db
Efficiency	4.4	7.6	per cent

TYPE 2K35 SPERRY KLYSTRON

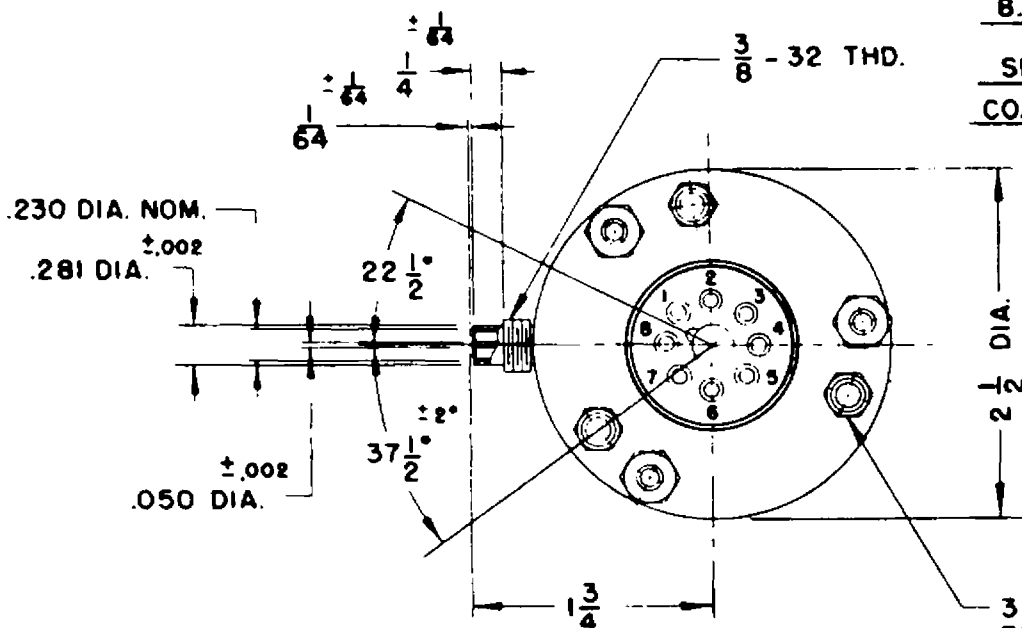


DETAIL OF MOUNTING PIN

BASE CONNECTIONS

1. I.C. (INTERNAL CONNECTION)
2. HEATER
3. I.C.
4. I.C.
5. CONTROL ELECTRODE
6. I.C.
7. HEATER
8. CATHODE

SHELL - BEAM ELECTRODE
COAXIAL TERMINALS - R-F
CONNECTIONS



3- MOUNTING PINS
EQUALLY SPACED
ON 2.093 DIA.

ALL DIMENSIONS IN INCHES
NOMINAL UNLESS OTHERWISE NOTED



RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

RMA TYPES

Release No. 452

November 10, 1945

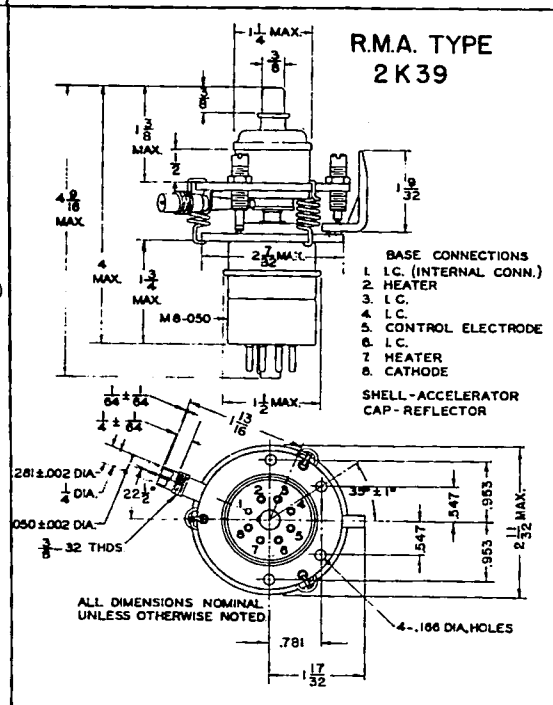
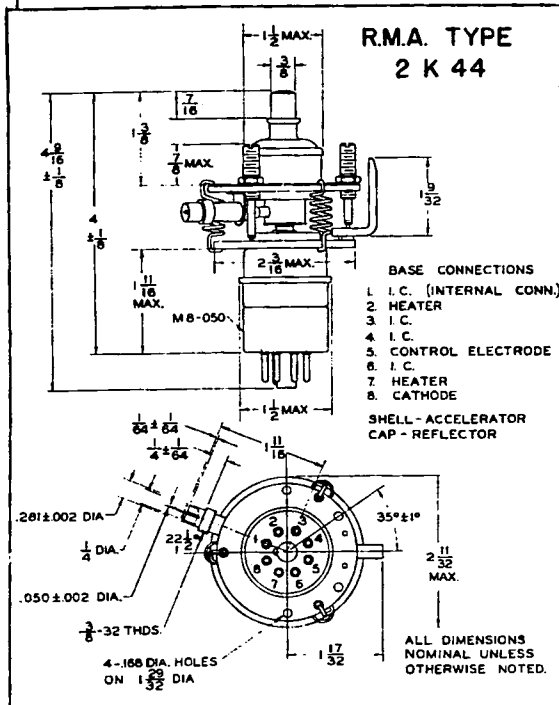
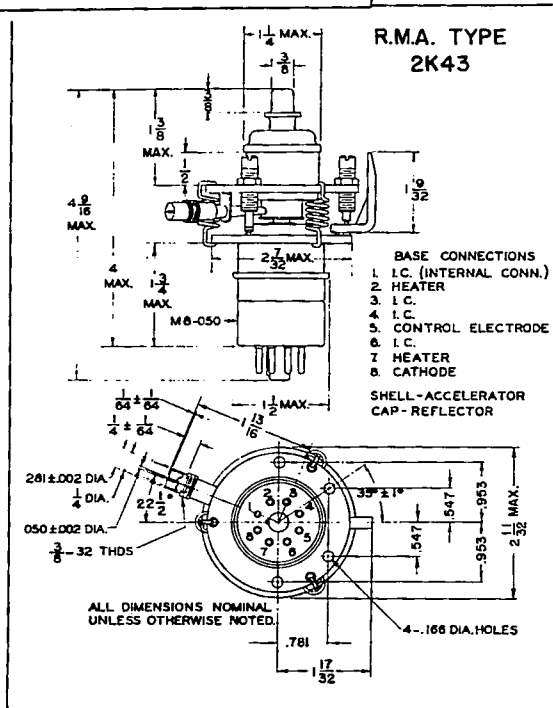
sponsored by:
Sperry Gyroscope Co., Inc.

2K41
2K42
2K43
2K44
2K39

Type Designation		2K41	2K42	2K43	2K44	2K39
Reservation No.		5159	5160	5161	5162	5133
<u>Maximum Ratings</u>						
Acceleration voltage	Volts d-c	1250	1250	1250	1250	1250
Beam current	Ma	60	60	60	60	60
Beam power input	Watts	75	75	75	75	75
Control electrode voltage	Volts d-c	± 50 to -200	± 30 to -200	± 30 to -200	± 30 to -200	± 30 to -200
Control electrode current	Ma	25	15	15	15	15
Reflector voltage (Referred to cathode)	Volts	-750	-750	-750	-750	-750
Reflector current, normally zero	Ma	2	2	2	2	2
Mechanical tuning range	Mc	2660 to 3310	3300 to 4200	4200 to 5700	5700 to 7500	7500 to 10300
Electronic tuning range (Depends on mode)	Mc	10	15	20	30	40
Temperature stability (-10°C to +40°C)	Mc	6	5	5	5	5
R.F. Power Output minimum over band, into best load	Milliwatts	250	250	250	250	250

Tube dimensions.

See outline drawings.

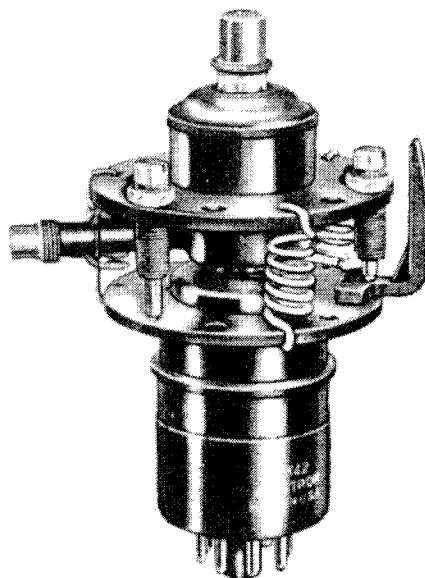


SPERRY

MICROWAVE TUBES

3300-4200 MC

2K42 Reflex Oscillator Klystron



Standard oscillator for general use

- Long-life vernier tuning
- Low cost; medium power
- Convenient modulation

Description

Reflex oscillator klystron operating over a frequency range of 3300 to 4200 Mc and producing 250 mW (min.) and 750 mW (typical) at 1250-v beam voltage.

Applications

Medium-power oscillator for signal generator purposes; local oscillator for microwave receivers; low-power transmitting tube for communication and radar systems.

Features

Simple tuning, and adequate output power; integral cavity and tuner; Sperry SKL coaxial output fitting.

Note 1: The full tuning range is covered by approximately one complete turn of the strut screws. To adjust the frequency, successively turn each screw an equal amount (not more than a quarter turn) and recheck frequency before proceeding. Turning the struts unequally or more than a half turn may seriously damage the grids or diaphragm. The usable frequency range shifts toward the lower frequencies as the beam voltage is decreased.

General Characteristics

Frequency Range ¹	3300 to 4200 Mc
Vernier Tuning Range ²	
Minimum at 3300 Mc	300 Mc
Minimum at 4200 Mc	200 Mc
Output Power	1/4 to 1 w
Heater Voltage (a-c or d-c)	6.3 v
Heater Current	1 amp
Electronic-tuning Bandwidth ³	10 to 20 Mc

Maximum Ratings

Beam Voltage	1250 v
Beam Current	60 mA
Input Beam Power	75 w
Reflector Voltage	0 to -750 v
Control-electrode Voltage	+30 to -200 v
Control-electrode Current	15 mA
Heater-cathode Voltage	±45 v
Operating Temperature	
Shell	100° C
Base	75° C

Note 2: The vernier tuning range is limited by the mechanical motion of the vernier tuning lever.

Note 3: Varies with operating mode. The electronic-tuning bandwidth is the frequency difference between the half-power points of the reflector-voltage modulation characteristic.

SPERRY

ELECTRONIC
TUBE
DIVISION

SPERRY RAND CORPORATION
GAINESVILLE, FLORIDA

Mechanical Specifications

Cathode Type	Oxide coated
Cooling	Forced air
Weight	
Tube Only	8 oz
With Model 12 Tuner	12 oz
Tuner	Integral part of the tube, designed for use with Sperry Model 12 tuner
Base Connections	See outline drawing
Physical Dimensions	See outline drawing
Mounting Position	Any

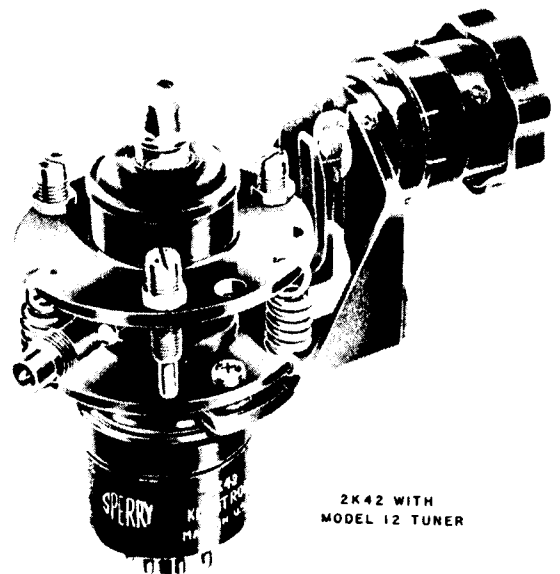
Typical Operation

Frequency	3750 Mc
Output Power	750 mW
Load Impedance	optimum
Beam Voltage ⁴	1250 v
Beam Current	50 mA
Reflector	
Voltage	—600 v
Control-electrode	
Voltage	0 v
Heater Voltage	6.3 v
Heater Current	1 A

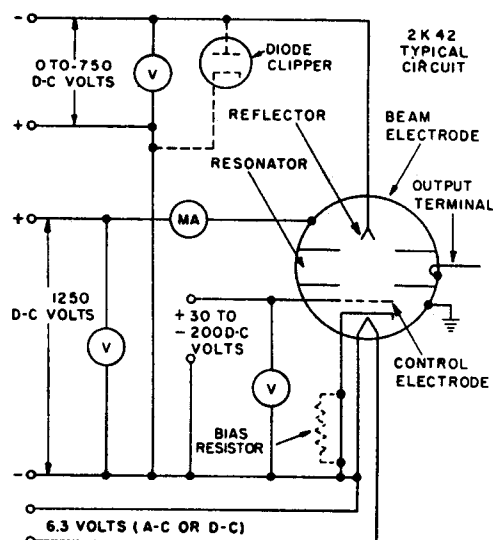
Suggested Output Fittings (Not Supplied With Tube)

Description	JAN Type No.
Straight Plug	UG-275/U
Right-angle Plug	UG-276/U
Plug to Type N Jack Adapter	UG-131/U
Coaxial Cable for Fittings	RG-5/U, RG-5A/U, RG-5B/U, RG-21/U (attenuating), RG-21A/U (attenuating)

Note 4: The tube shell (beam positive) is normally operated at ground potential and special precautions must be observed if the cathode is grounded.



2K42 WITH
MODEL 12 TUNER





2K57*

REFLEX KLYSTRON

GENERAL CHARACTERISTICS

The 2K57 klystron is a velocity modulation tube of the reflex type, designed especially for use as a microwave radio relay transmitting tube. The resonant cavity and the tuner are both integral parts of the tube. The electron gun is electrostatically focused and requires no external focusing field.

The output power of the tube is fed through an iris coupling into a section of waveguide attached to the tube. This section of waveguide and a 3-5/8" diameter flange are an integral part of the tube, and they are designed to fit the choke joints used on standard RG-49/U (2"x 1") waveguide. Under the typical operating conditions described for the -300 volt reflector voltage mode, the input impedance of a matched 2"x 1" waveguide will provide nearly an optimum load for the tube. No additional matching devices are required for satisfactory operation. The integral plunger-type tuning mechanism covers the full frequency range of the 2K57.

Forced air cooling is recommended for all beam power inputs above ten watts. In any case sufficient forced air should be supplied to keep the envelope temperature below 100°C. At the maximum ratings of the tube, air cooling of about 15 cubic feet per minute will be required. The stream of forced air should be directed at the tube body.

ELECTRICAL DATA

Heater Voltage (a-c or d-c)	6.3 volts
Heater Current	1.5 amperes
Frequency	
Minimum	4320 megacycles
Maximum	5120 megacycles
R-F Output Characteristic (700v beam voltage)	
Reflector Voltage Mode	-300 volts -700 volts
R-F Output Power	1.0 to 1.8 w. 1.0 to 2.2 w.
Electronic Tuning Bandwidth	20 to 30 mc. 8 to 15 mc.

- - - - -

* This tube is now obsolete and has been superseded by RMA types 5817 and 5818.



MAXIMUM RATINGS (absolute maximum)

Beam Voltage	750 volts
Beam Current	75 milliamperes
Beam Power Input	45 watts
Reflector Voltage	0 to -1000 volts
Reflector Current (normally zero)	2 milliamperes
Heater-Cathode Voltage (peak)	±45 volts

MECHANICAL INFORMATION

Type of Cathode	Oxide coated, unipotential
Base	Shortened medium shell, octal, 8-pin (B8-11)
Physical Specifications	(See outline drawing)
Base Connections	(See outline drawing)
Mounting Position	Any
Weight	24 ounces (approx.)
Cap	Small, C1-1
R-F Output	For use with waveguide RG-49/U (2" x 1"), mates with Choke Flange UG-148A/U or Cover Flange UG-149A/U
Temperature Stability (-10° to +40°C)	2.5 megacycles
Tuner	Integral part of the tube (Range 300 mc min.)
Ground Connection	8-32 Machine screw on the side of the tube body

TYPICAL OPERATION (-300 volt reflector voltage mode)

Frequency	4840	5000	5085	megacycles
Heater Voltage	6.3	6.3	6.3	volts
Heater Current	1.5	1.5	1.5	amperes
Beam Voltage	700	700	700	volts
Beam Current	60	60	60	milliamperes
Reflector Voltage	-285	-320	-325	volts
R-F Output Power (best load)	1.5	1.7	1.4	watts
R-F Output Power (matched load)	1.2	1.7	1.2	watts
Bandwidth* (between 3 db power points)	27		27	megacycles
Modulation Sensitivity**	0.25		0.4	megacycles/volt

* For the matched load operating condition.
 ** At the center of the reflector voltage mode.



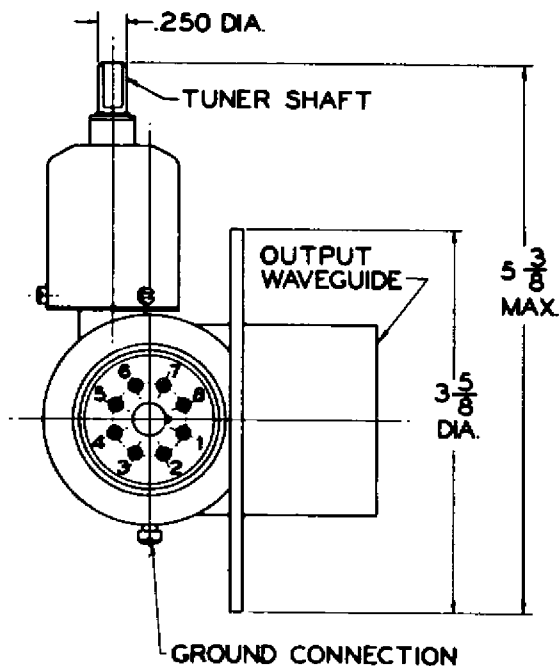
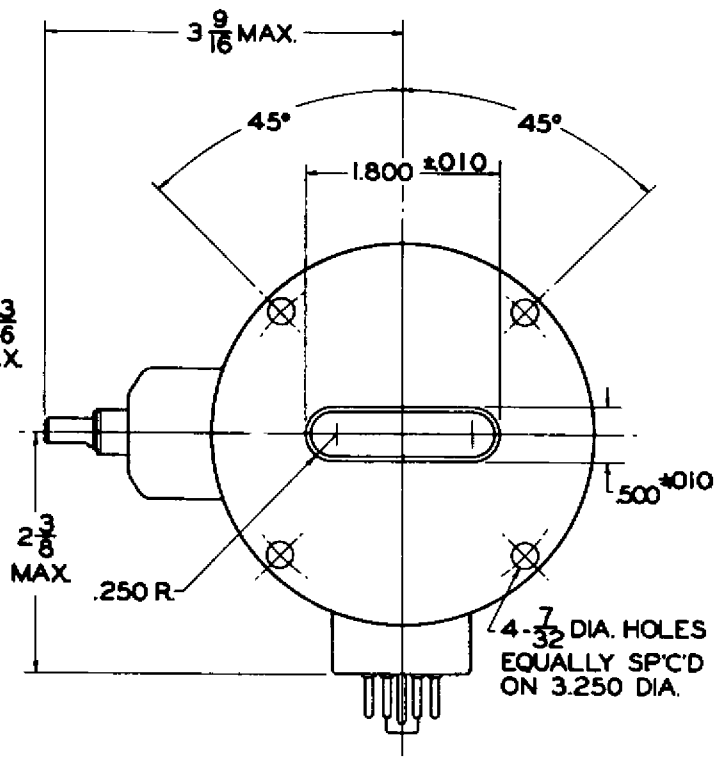
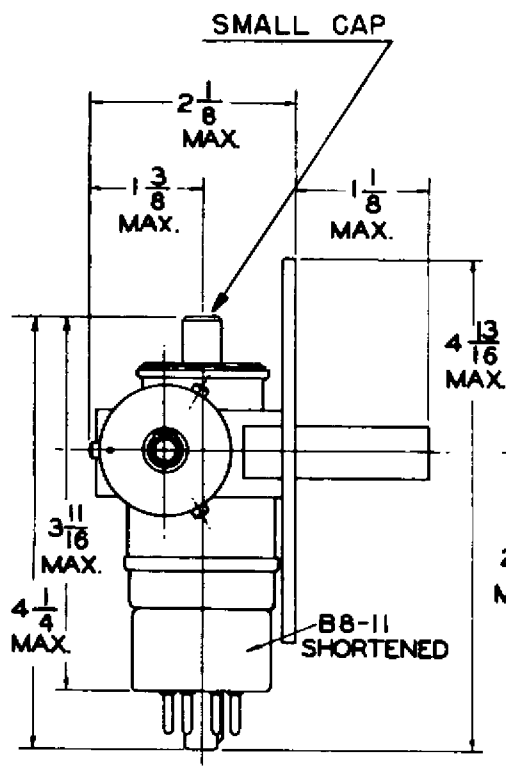
TYPICAL OPERATION (-700 volt reflector voltage mode)

Frequency	4820	4960	5090	megacycles
Heater Voltage	6.3	6.3	6.3	volts
Heater Current	1.5	1.5	1.5	amperes
Beam Voltage	700	700	700	volts
Beam Current	60	60	60	milliamperes
Reflector Voltage	-600	-745	-810	volts
R-F Output Power (best load)	2.2	2.1	1.1	watts
R-F Output Power (matched load)	2.2	1.7		watts
Bandwidth* (between 3 db power points)	15	12		megacycles
Modulation Sensitivity**	.09	.11		megacycles/volt

- - - - -

* For the matched load operating condition.

** At the center of the reflector voltage mode.



RMA TYPE 2K57

BASE CONNECTIONS

1. INTERNAL CONN. (I.C.)
2. HEATER
3. I.C.
4. I.C.
5. I.C.
6. I.C.
7. HEATER
8. CATHODE

SHELL-BEAM ELECTRODE
CAP - REFLECTOR

ALL DIMENSIONS NOMINAL UNLESS
OTHERWISE NOTED



RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT

RMA TYPES

Release No. 452

3K23
3K21
3K22
3K30

November 10, 1945

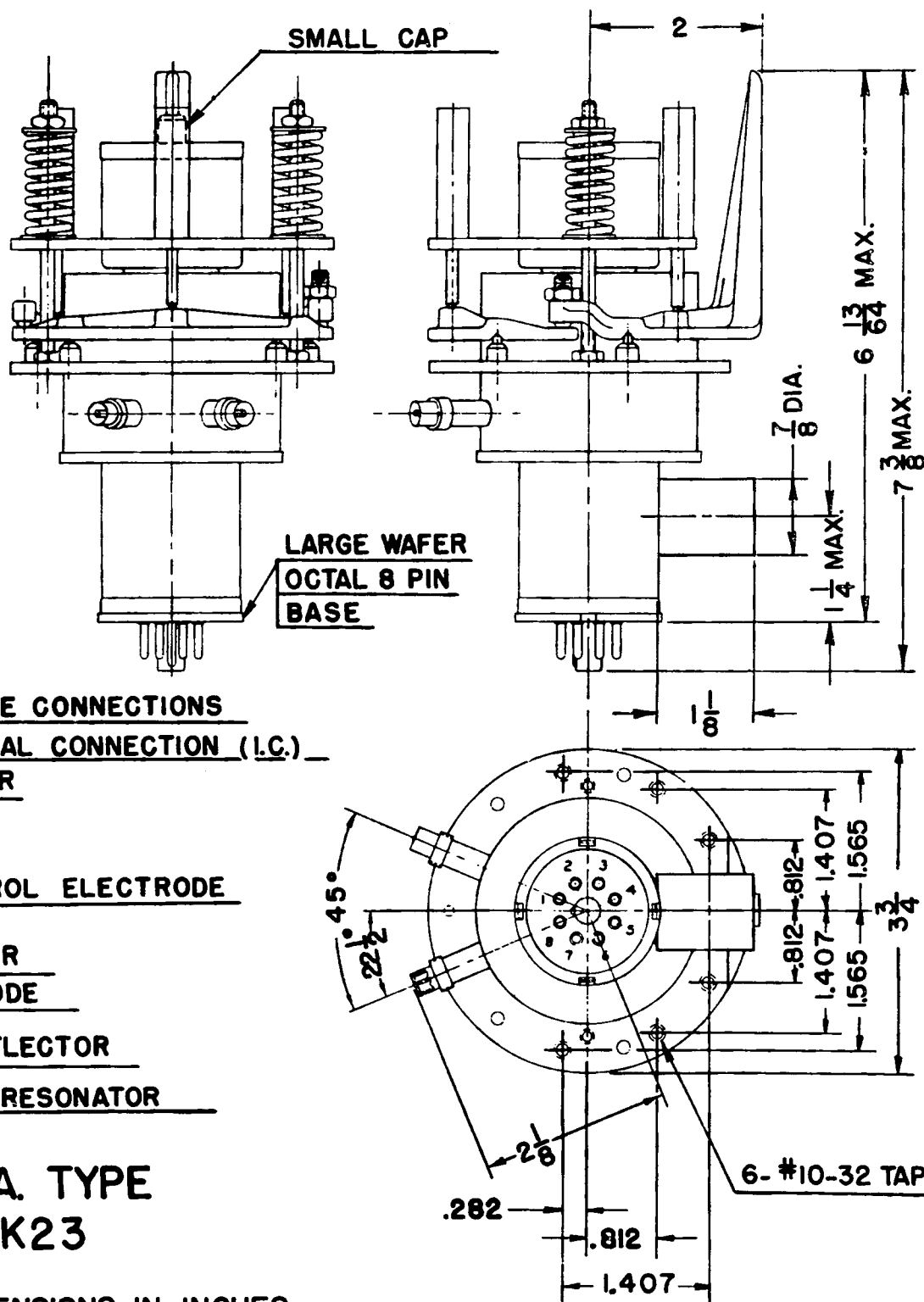
sponsored by:
Sperry Gyroscope Co., Inc.

Type Designation		3K23	3K21	3K22	3K30
Reservation No.		5213	5157	5158	5217
Type Tube		Reflex	2-cavity	2-ca.	2-cavity
Maximum Ratings					
Acceleration voltage	Volts d-c	1000	3000	3000	3000
Beam current	Ma	90	150	150	150
Beam power input	Watts	80	450	450	450
Control electrode voltage	Volts d-c	20 to -200V.	0 to -200	0 to -200	0 to -200
Control electrode current	Ma	4.0	3.0	3.0	3.0
Reflector voltage (referred to cathode)	Volts	-1500	----	----	----
Reflector current, normally zero	Ma	2	----	----	----
Mechanical tuning range	Mc	950 to 1150	2300 to 2725	3330 to 4000	2700 to 3330
Electronic tuning range (Depends on mode)	Mc	a) 4 b) 10	10	10	10
Temperature stability (-10°C to +40°C)	Mc	1	----	----	----
R.F. Power Output maximum		1 - 5	20-40	20-40	20-40
Tube dimensions		See outline drawings.			

a) high power mode
b) low power mode

ALL DIMENSIONS
NOMINAL UNLESS
OTHERWISE NOTED.

June 20, 1947



**RADIO MANUFACTURERS ASSOCIATION
ENGINEERING DEPARTMENT**



TYPE 3K27

RMA DATA BUREAU
90 WEST STREET
NEW YORK 6, N. Y.

REFLEX KLYSTRON

Release No. 589

July 2, 1947

sponsor:

Sperry Gyroscope Co., Inc.

General Characteristics

Ultra high frequency reflex klystron oscillator. Integral cavity with full range integral tuning lever designed to be used with a Model 14 tuner. Electrostatic focused electron gun requiring no external focusing fields.

Electrical Data

Heater Voltage (ac or dc)	6.3 volts
Heater Current	1.5 amperes
Maximum Frequency	960 Mc/sec
Minimum Frequency	750 Mc/sec

Maximum Ratings (C. W. Operation)

For operation at the maximum ratings of the tube, air cooling of at least 50 cubic feet per minute is recommended. In any case, sufficient air cooling should be provided to keep the shell temperature below 100° Centigrade.

Resonator Voltage	1000 volts
Resonator current	90 milliamperes
Resonator Dissipation (Note 1)	80 watts
Control Electrode Voltage	-200 to +20 volts
Control Electrode Current	4 milliamperes
Reflector Voltage	-1500 volts
Reflector Current	2 milliamperes
Heater-Cathode Voltage (Peak)	+ 45 volts
Shell (resonator and other parts) Temperature	100° C.

Mechanical Information

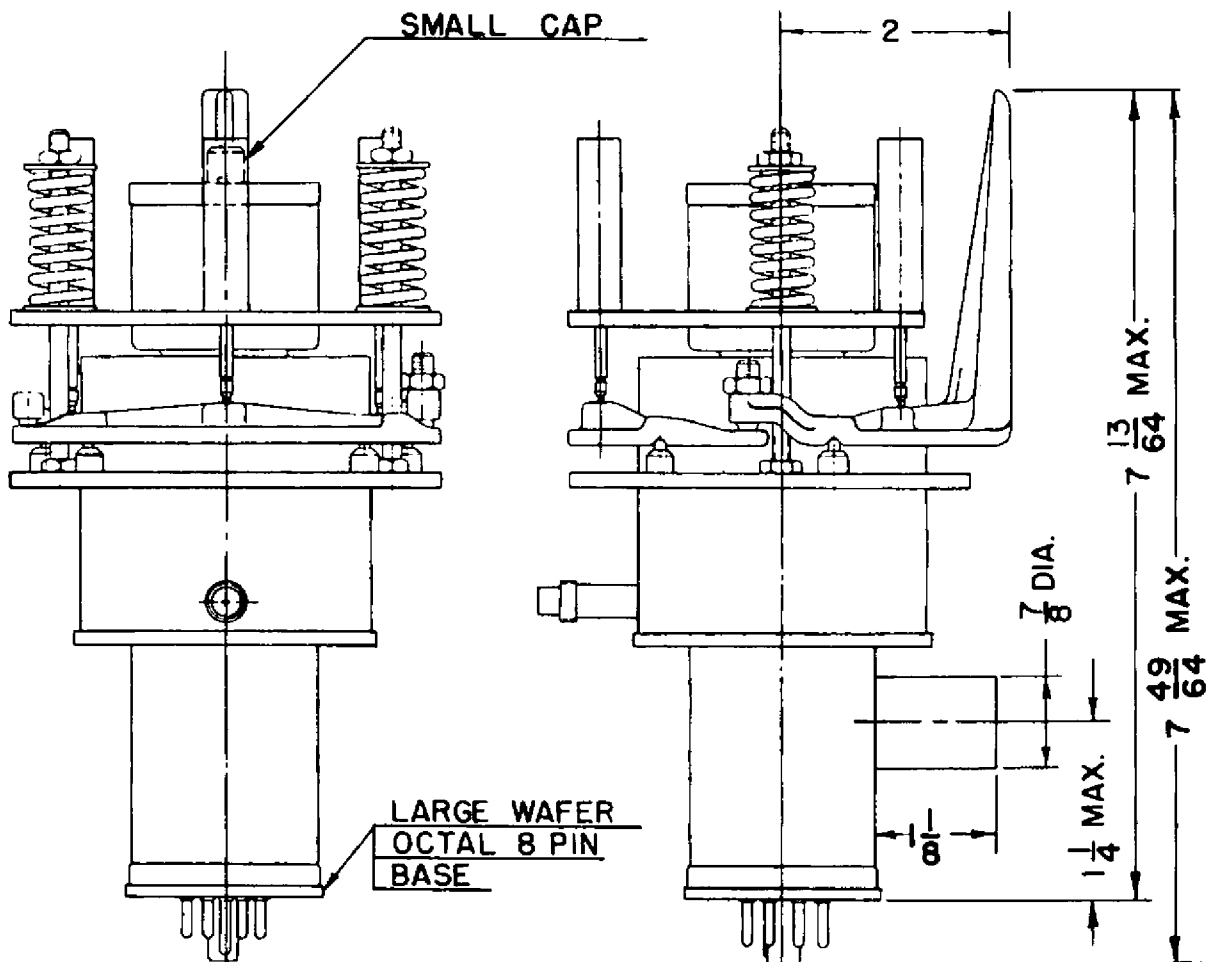
Type of Cathode	Coated, Unipotential
Base	Large wafer octal, 8-pin
Physical Specifications	(See outline drawing)
Base connections	(See outline drawing)
Mounting position	Any
Cooling Data	(See Note 1)

Typical Operation (C. W. Operation)

Frequency	960 Mc/sec
Resonator Voltage	1000 volts
Resonator Current	60 milliamperes
Reflector Voltage (adjusted for maximum output power)	1300 volts
Reflector Current	0 milliamperes
Control Electrode Voltage	0 volts
Control Electrode Current	0 milliamperes
Output Power	1 to 3 watts
Efficiency	1.6 to 5%
Bandwidth between 3 db points	3 to 5 Mc/sec

(Manufacturer's Designation SRL-1)

July 2, 1947

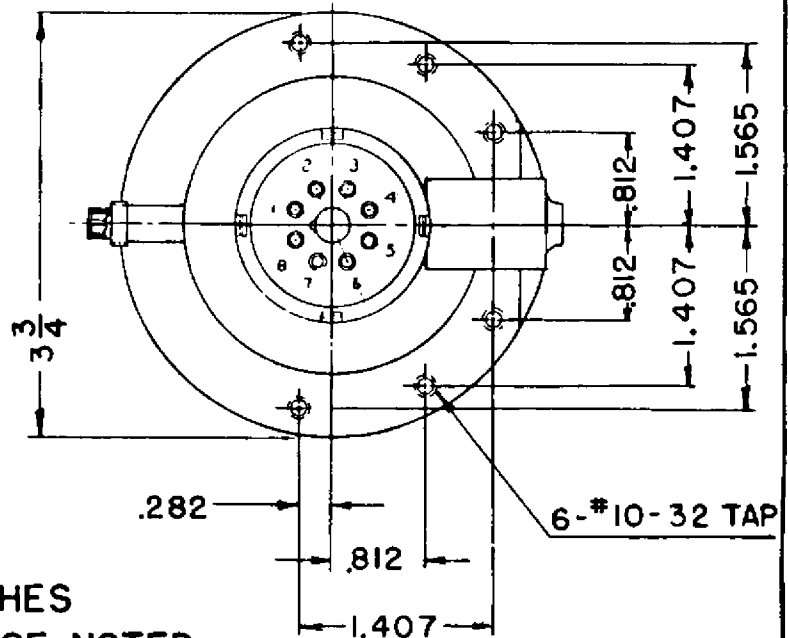
BASE CONNECTIONS

1. INTERNAL CONNECTION (I.C.)
2. HEATER
3. I.C.
4. I.C.
5. CONTROL ELECTRODE
6. I.C.
7. HEATER
8. CATHODE

CAP - REFLECTOR
SHELL - RESONATOR

R.M.A. TYPE
3K27

ALL DIMENSIONS IN INCHES
NOMINAL UNLESS OTHERWISE NOTED.





5817
REFLEX KLYSTRON

GENERAL CHARACTERISTICS

The 5817 klystron oscillator is a velocity modulation tube of the reflex type, designed especially for use as a microwave radio-relay transmitting tube. A special feature of the tube is the uniformity of the reflector voltage modulation sensitivity obtained when the tube is operated as shown under "Typical Operation". The resonant cavity and the tuner are both integral parts of the tube. The electron gun is electrostatically focused and requires no external focusing field.

The output power of the tube is fed through an iris coupling into a section of waveguide attached to the tube. This section of waveguide and a 3-5/8" diameter flange are an integral part of the tube, and they are designed to fit the choke joints used on standard RG-49/U (2" x 1") waveguide. The integral plunger-type tuning mechanism covers the full frequency range of the tube with single shaft control. The published tuning range of the tube is covered with approximately ten complete revolutions of the tuner shaft. The operating frequency of the tube is increased by counterclockwise rotation of the tuner shaft, and conversely, the operating frequency is decreased by clockwise rotation of the tuner shaft.

For operation at the maximum ratings of the tube, air cooling of at least 50 cubic feet per minute is recommended. In any case, sufficient air cooling should be provided to keep the envelope temperature below 100°C. The temperature of the base and reflector electrode insulator should not exceed 75°C.

ELECTRICAL DATA

Heater Voltage (a-c or d-c)	6.3 volts
Heater Current	1.5 amperes
Maximum Frequency	5000 mc/sec
Minimum Frequency	4800 mc/sec

MAXIMUM RATINGS

Beam Voltage	1000 volts
Beam Current	125 milliamperes
Beam Power Input	125 watts
Reflector Voltage	0 to -1000 volts
Reflector Current	2 milliamperes
Heater-Cathode Voltage (Peak)	±45 volts



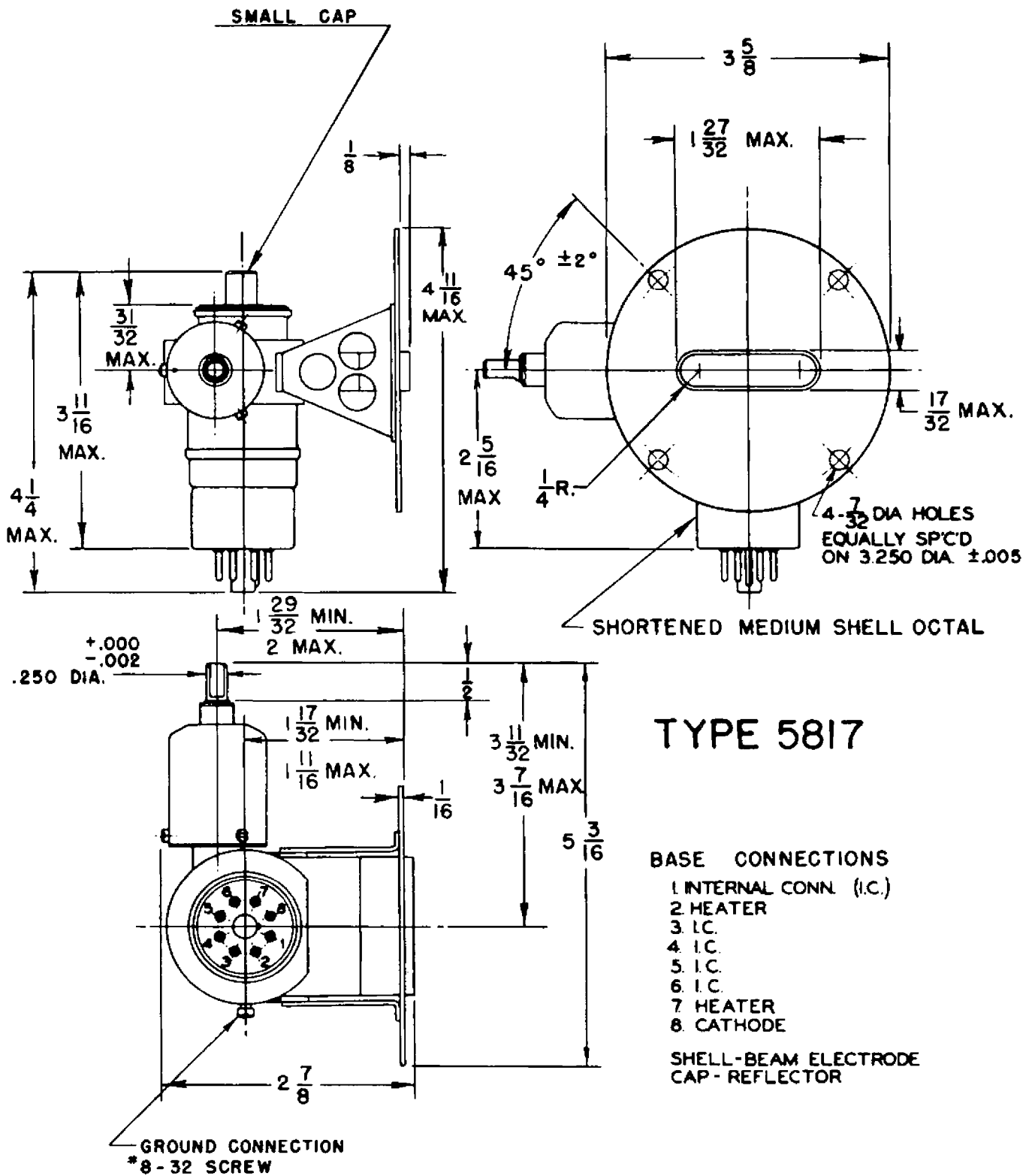
MECHANICAL INFORMATION

Type of Cathode	Coated, unipotential
Base	Shortened medium shell, octal, 8-pin
Physical Specifications	(See outline drawing)
Base Connections	(See outline drawing)
Mounting Position	Any
Weight	18 ounces
Cap	Small, Cl-1
R-f Output	For use with waveguide RG-49/U (2"x1") output, mates with Choke Flange UG-148A/U or Cover Flange UG-149A/U
Temperature Coefficient	±50 kc/°C
Tuner	Integral part of the tube
Ground Connection	8-32 Machine screw on the side of the tube body

TYPICAL OPERATION (C-W OPERATION) MATCHED LOAD*

Frequency	4800	4900	5000	megacycles
Heater Voltage	6.3	6.3	6.3	volts
Heater Current	1.5	1.5	1.5	amperes
Beam Voltage	750	750	750	volts
Beam Current	65	65	65	milliamperes
Reflector Voltage (adjusted for max. output power)	-280	-305	-330	volts
Output Power	1.6	1.5	1.6	watts
Bandwidth (between 3 db power points)	38	37	35	megacycles
Modulation Sensitivity	.30	.29	.28	megacycles per volt

* VSWR of load = 1.06 max.



ALL DIMENSIONS IN INCHES NOMINAL
UNLESS OTHERWISE NOTED.



5818 REFLEX KLYSTRON

GENERAL CHARACTERISTICS

The 5818 klystron oscillator is a velocity modulation tube of the reflex type, designed especially for use as a microwave radio-relay transmitting tube. A special feature of the tube is the uniformity of the reflector voltage modulation sensitivity obtained when the tube is operated as shown under "Typical Operation". The resonant cavity and the tuner are both integral parts of the tube. The electron gun is electrostatically focused and requires no external focusing field.

The output power of the tube is fed through an iris coupling into a section of waveguide attached to the tube. This section of waveguide and a 3-5/8" diameter flange are an integral part of the tube, and they are designed to fit the choke joints used on standard RG-49/U (2"xl") waveguide. The integral plunger-type tuning mechanism covers the full frequency range of the tube with single shaft control. The published tuning range of the tube is covered with approximately ten complete revolutions of the tuner shaft. The operating frequency of the tube is increased by counter-clockwise rotation of the tuner shaft, and conversely, the operating frequency is decreased by clockwise rotation of the tuner shaft.

For operation at the maximum ratings of the tube, air cooling of at least 50 cubic feet per minute is recommended. In any case, sufficient air cooling should be provided to keep the envelope temperature below 100°C. The temperature of the base and reflector electrode insulator should not exceed 75°C.

ELECTRICAL DATA

Heater Voltage (a-c or d-c)	6.3 volts
Heater Current	1.5 amperes
Maximum Frequency	5200 mc/sec
Minimum Frequency	5000 mc/sec

MAXIMUM RATINGS

Beam Voltage	1000 volts
Beam Current	125 milliamperes
Beam Power Input	125 watts
Reflector Voltage	0 to -1000 volts
Reflector Current	2 milliamperes
Heater-Cathode Voltage (Peak)	±45 volts



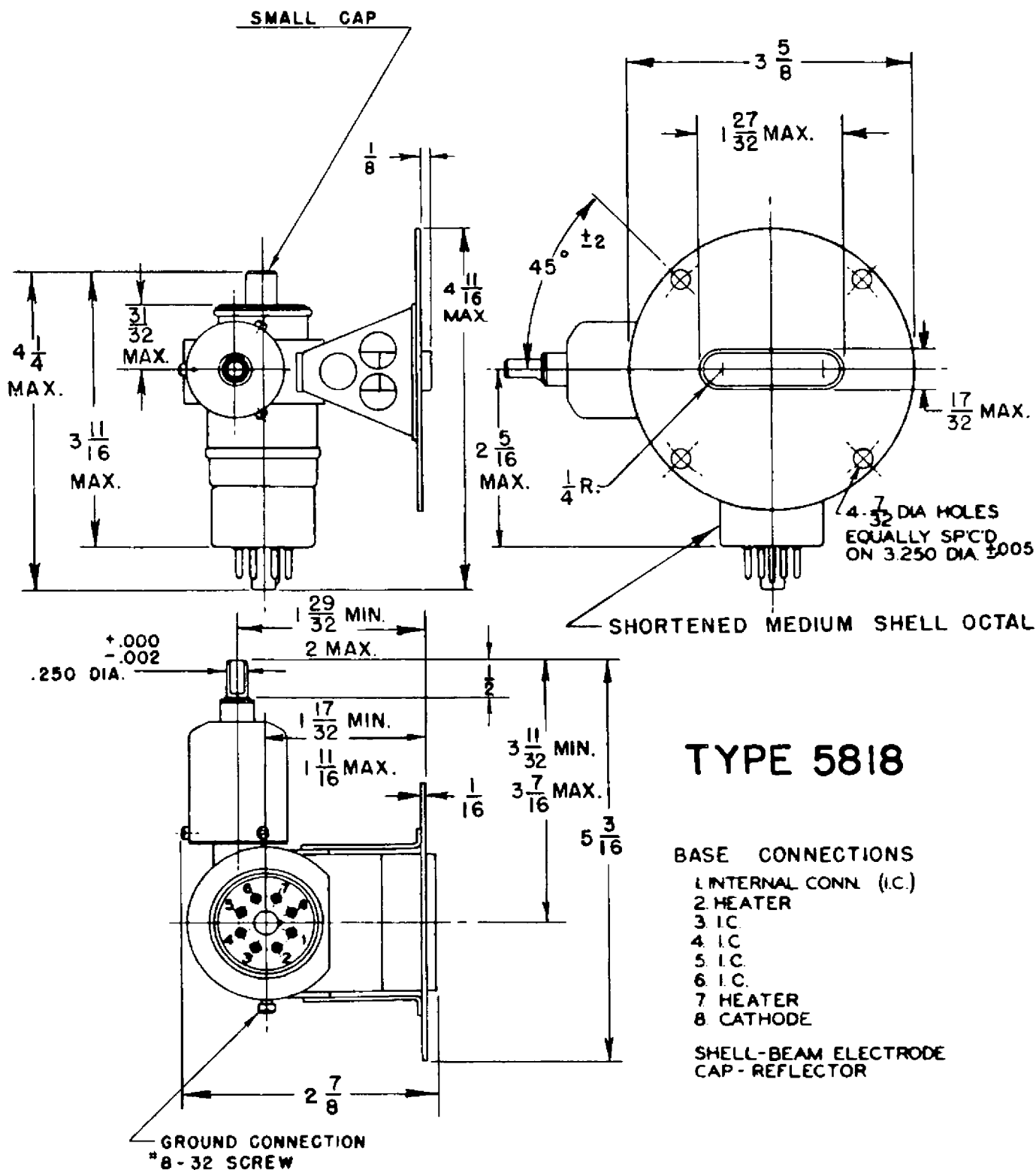
MECHANICAL INFORMATION

Type of Cathode Base	Coated, unipotential Shortened medium shell, octal, 8-pin
Physical Specifications	(See outline drawing)
Base Connections	(See outline drawing)
Mounting Position	Any
Weight	18 ounces
Cap	Small, C1-1
R-f Output	For use with waveguide RG-49/U (2" x 1") out- put, mates with Choke Flange UG-148A/U or Cover Flange UG-149A/U
Temperature Coefficient	± 50 kc/°C
Tuner	Integral part of the tube
Ground Connection	8-32 Machine screw on the side of the tube body

TYPICAL OPERATION (C-W OPERATION) MATCHED LOAD*

Frequency	5000	5100	5200	megacycles
Heater Voltage	6.3	6.3	6.3	volts
Heater Current	1.5	1.5	1.5	amperes
Beam Voltage	750	750	750	volts
Beam Current	65	65	65	milliamperes
Reflector Voltage (ad- justed for max. output power)	-280	-305	-325	volts
Output Power	1.6	1.7	1.6	watts
Bandwidth (between 3db power points)	37	35	34	megacycles
Modulation Sensitivity	.30	.28	.29	megacycles per volt

* VSWR of load = 1.06 max.



ALL DIMENSIONS IN INCHES NOMINAL
UNLESS OTHERWISE NOTED.



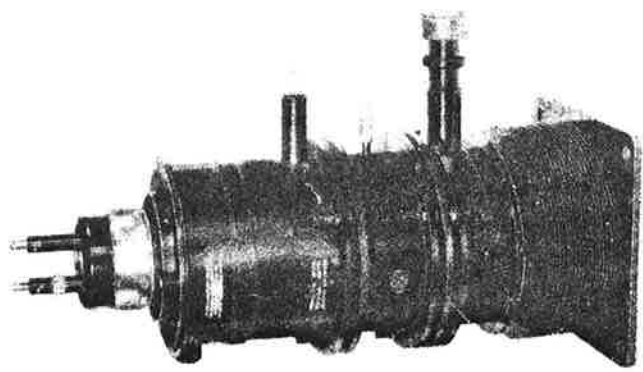
960-1215
MC

SAL-39 CASCADE AMPLIFIER KLYSTRON

DESCRIPTION - Pulsed klystron amplifier with output power of 20 kw (peak) at 960 to 1215 mc.

APPLICATIONS - Designed for pulsed microwave service including navigational aids, distance measuring equipment, beacons and pulsed communications systems with duty cycles of 12% or less.

FEATURES - Integral resonant cavities and tuners; BNC r-f input and monitor fittings; 7/8-inch coaxial r-f output coupling; thermally compensated for changes in ambient temperature and duty cycle.



GENERAL CHARACTERISTICS

Frequency Range	960 to 1215 mc
Heater Voltage (a-c or d-c)	5 v
Heating Time	5 minutes
Heater Current	43 amp
Heater Starting Current ¹ (max.)	70 amp
Cathode Gun Capacity (approx.)	30 μ f
Half-Power Bandwidth (Optimum Drive)	1 %
Half-Power Bandwidth (Underdriven)	0.6 %

GUARANTEED SPECIFICATIONS

Beam Voltage	20 kv
Duty Cycle	1 %
R-F Input Power (max.)	120 w
R-F Output Power (min.)	17.6 kw

TYPICAL PULSE OPERATION

Frequency	1100	1100	mc
Beam Voltage	10	17	kv
Beam Current	3	6.6	amp
Heater Voltage (a-c or d-c)	5	5	v
Heater Current	43	43	amp
R-F Input Power	40	100	w
R-F Output Power	9	21	kw
Duty Cycle	6	1	%
Pulse Length	2.5	2.5	μ sec
Cooling (forced air)	300	220	cfm

Note 1: The heater starting current must be limited by some means such as a high reactance transformer.

MAXIMUM PULSE RATINGS

Pulse Length	10	μ sec
Duty Cycle ²	12	%
Beam Voltage (peak) ³	20	kv
Beam Current (peak)	8.5	amp
Average Beam Power	2400	w
Average R-F Output Power	300	w
Operating Temperature		
Tube Body	100	$^{\circ}$ C
Cooling Fin Assembly	125	$^{\circ}$ C

MECHANICAL SPECIFICATIONS

Cathode Type	Oxide coated, unipotential
Physical Dimensions	See outline drawing
Base Connections	See outline drawing
Mounting Position	Any
Weight (approx.)	30 pounds
R-F Connections	
Input and middle cavity	BNC type, bayonet to accommodate jack UG-88/U fitting
Output cavity	Coupling for 7/8-inch coaxial, RTMA, 50-ohm line
Cooling	For operation at the maximum ratings of the tube, forced air cooling of at least 220 cfm is recommended. In any case, sufficient air cooling should be provided to keep the envelope temperature below 100 $^{\circ}$ Centigrade.

Note 2: Short time (1 millisecond) duty cycle may equal 40%.

Note 3: Maximum average beam power must not be exceeded.

SPERRY GYROSCOPE COMPANY
DIVISION OF THE SPERRY CORPORATION • EXECUTIVE OFFICES: GREAT NECK, NEW YORK
NEW YORK • LOS ANGELES • SAN FRANCISCO • NEW ORLEANS • CLEVELAND • SEATTLE



TYPE SAL-39 KLYSTRON

