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Massachusetts Institute of Technology

HANDBOOK OF
MAINTENANCE INSTRUCTIONS
for
RADIO FREQUENCY AMPLIFIER
AM-18 / APT

RESTRICTED
(For Official Use Only)

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Destruction of Abandoned Materiel in the Combat Zone

In case it should become necessary to prevent the capture of this equipment and when ordered to do so, DESTROY IT SO THAT NO PART OF IT CAN BE SALVAGED, RECOGNIZED, OR USED BY THE ENEMY. BURN ALL PAPERS AND BOOKS.

Means:—

1. Explosives, when provided.
2. Hammers, axes, sledges, machetes, or whatever heavy object is readily available.
3. Burning by means of incendiaries such as gasoline, oil, paper, or wood.
4. Grenades and shots from available arms.
5. Burying all debris or disposing of it in streams or other bodies of water, where possible and when time permits.

Procedure:—

1. Obliterate all identifying marks. Destroy nameplates and circuit labels.
2. Demolish all panels, castings, switch- and instrument-boards.
3. Destroy all controls, switches, relays, connections, and meters.
4. Rip out all wiring and cut interconnections of electrical equipment. Smash gas, oil and water-cooling systems in gas-engine generators, etc.
5. Smash every electrical or mechanical part, whether rotating, moving, or fixed.
6. Break up all operating instruments such as keys, phones, microphones, etc.
7. Destroy all classes of carrying cases, straps, containers, etc.
8. Bury or scatter all debris.

DESTROY EVERYTHING!



Unsatisfactory Report

For U. S. Army Air Force Personnel:

In the event of malfunctioning, unsatisfactory design, or unsatisfactory installation of any of the component units of this equipment, or if the material contained in this book is considered inadequate or erroneous, an Unsatisfactory Report, AAF Form No. 54, or a report in similar form, shall be submitted in accordance with the provisions of Army Air Force Regulation No. 15-54 listing:

1. Station and organization.
2. Nameplate data (type number or complete nomenclature if nameplate is not attached to the equipment).
3. Date and nature of failure.
4. Radio model and serial number.
5. Remedy used or proposed to prevent recurrence.
6. Handbook errors or inadequacies, if applicable.

For U. S. Navy Personnel:

Report of failure of any part of this equipment during its guaranteed life shall be made on Form N. Aer. 4112, "Report of Unsatisfactory or Defective Material," or a report in similar form, and forwarded in accordance with the latest instructions of the Bureau of Aeronautics. In addition to other distribution required, one copy shall be furnished to the inspector of Naval Materiel (location to be specified) and the Bureau of Ships. Such reports of failure shall include:

1. Reporting activity.
2. Nameplate data.
3. Date placed in service.
4. Part which failed.
5. Nature and cause of failure.
6. Replacement needed (yes—no).
7. Remedy used or proposed to prevent recurrence.

For British Personnel:

Form 1022 procedure shall be used when reporting failure of radio equipment.

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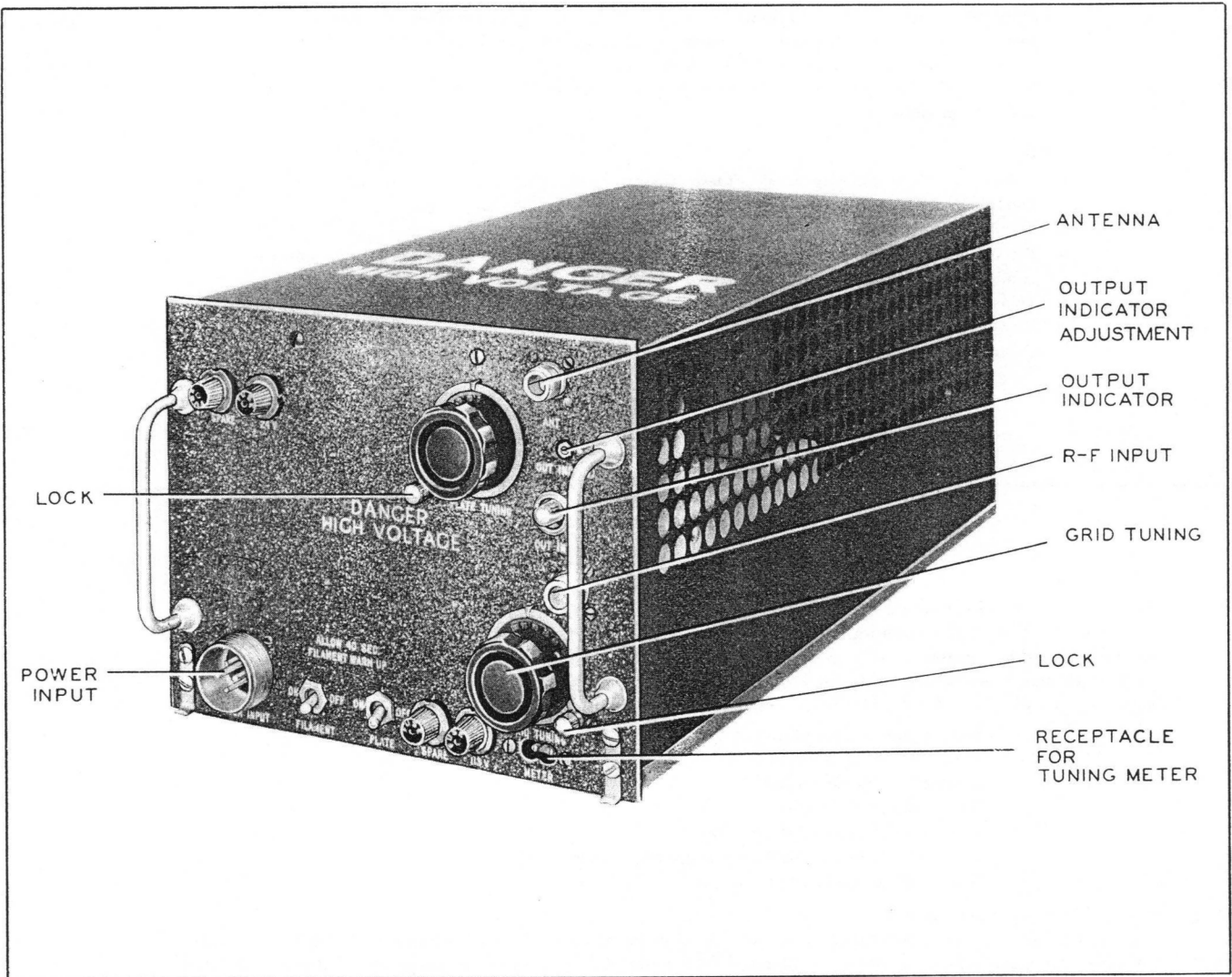


Figure 1-1. Radio Frequency Amplifier AM-18/APT—Panel View

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SAFETY NOTICE

This equipment employs high voltages which are dangerous and may be fatal if contacted by operating personnel. Exercise extreme caution at all times when working with this equipment.

SECTION I

GENERAL DESCRIPTION

1. GENERAL.

a. Radio Frequency Amplifier AM-18/APT is a high-power radio frequency amplifier designed for installation in aircraft. This equipment requires a radio frequency driver that operates within the correct frequency range and has a 50-ohm coaxial output. Any one of the following drivers may be used, Transmitting Equipment AN/APT-1, Radar Set AN/APT-3, or Radio Transmitting Equipment RC-183 (as modified by Technical Order No. 08-1-15, dated 1 July 1944).

b. The frequency range of Radio Frequency Amplifier AM-18/APT is from 140 to 210 megacycles; it may be adjusted to cover a maximum band width of 5 megacycles. The maximum power output is 50 watts at the low frequency end of its range and 100 watts at the high frequency end of its range when operated with 10 watts driving power.

c. This amplifier will operate satisfactorily on continuous duty at temperatures as low as -50°C (-58°F) and as high as $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$), however for a short period of time, not exceeding two hours, the amplifier may be operated at temperatures as high as $+71^{\circ}\text{C}$ ($+159.8^{\circ}\text{F}$). Unless otherwise specified on the name plate, the maximum operating altitude is 35,000 feet.

d. Power sources needed for operation of the radio frequency amplifier are 80 or 115 volts, 400 to 2600 cycles per second and 24-28 volts direct current. The a-c input is approximately 700 watts at 0.85 power factor. The current required from the d-c source is 0.5 ampere.

2. EQUIPMENT SUPPLIED.

The following equipment is supplied:

<i>Quantity</i>	<i>Name of Unit</i>	<i>Army-Navy Type Designation</i>	<i>Overall Dimensions (In Inches)</i>	<i>Weight (Pounds)</i>
1	Radio Frequency Amplifier	AM-18/APT	21 x 10 $\frac{1}{2}$ x 7 $\frac{5}{8}$	50
1	Mounting Base	MT-171/U	19 $\frac{11}{16}$ x 10 $\frac{1}{4}$	3.25
1	Plug	AN3108-22-4S	2 $\frac{1}{8}$ x 1 $\frac{9}{32}$ diameter	0.5
1	Adapter	AN3057-12	1 $\frac{3}{16}$ x 1 $\frac{9}{16}$ diameter	0.1
2	Radio Frequency Plug	UG-21/U	1 $\frac{5}{8}$ x $\frac{5}{8}$ diameter	0.5
2	Radio Frequency Adapter	UG-27/U	1 $\frac{3}{8}$ x 1 $\frac{1}{4}$ x 1 $\frac{1}{16}$	0.4
			Total Weight	54.75

3. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

The following equipment is required but not supplied:

<i>Quantity</i>	<i>Name of Unit</i>	<i>Army-Navy Type Designation</i>	<i>Required Characteristics</i>
As required	Radio Frequency Cable	RG-8/U or RG-31/U	Refer to cording diagrams, figures 2-2 and 2-3
As required	Power Wiring		

4. TEST EQUIPMENT.

The following test equipment is required for use with Radio Frequency Amplifier AM-18/APT and associated equipment:

<i>Quantity</i>	<i>Name of Unit</i>
1	Radio Frequency Wattmeter TS-118/AP
1	Test Set I-139-A
1	Frequency Meter TS-174/U or Frequency Meter TS-175()/U or General Radio 720A Frequency Meter or Monitor BC-1255-A

SECTION II

INSTALLATION AND ADJUSTMENT

1. INSTALLATION.

a. PRELIMINARY BENCH CHECK.

(1) Remove the amplifier from its housing as follows:

(a) Loosen the two thumb screws that hold the amplifier to the mounting.

(b) Remove the two screws in the top just behind the panel.

WARNING

High voltage—discharge capacitors before touching any parts inside of the case.

(c) Loosen the two screws at the rear.

(d) Withdraw the amplifier from the case.

(2) See that all vacuum tubes are in place.

(3) Set the "OUT. IND. ADJ." capacitor at or near minimum capacity, using a small screw driver.

(4) Inspect the rolo coils to see that they are free from dirt and corrosion and that the moving contacts are not more than a half turn apart.

(5) Replace the amplifier in its dust cover.

b. INSTALLATION.

(1) RADIO FREQUENCY AMPLIFIER AM-18/APT.

(a) Install Mounting Base MT-171/U so that the following conditions are met:

1. The interconnecting cable between the driver and amplifier is as short as possible and in no case longer than 2½ feet.

2. There is sufficient clearance around the equipment to allow good ventilation.

3. The front panel is accessible to the operator.

4. The equipment is as close to the power source and antenna as possible.

5. There is sufficient clearance to allow the amplifier to be secured to the mounting. (See fig. 8-1 an outline dimensional drawing of Radio Frequency Amplifier AM-18/APT and Mounting Base MT-171/U.)

(b) Secure the radio frequency amplifier to Mounting Base MT-171/U as follows:

1. Make sure the two horizontal pins at the rear of the mounting enter the chassis through the holes provided in the amplifier housing.

2. Tighten the two knurled thumb nuts at each side of the mounting over the lugs provided at the bottom of the front panel.

(2) CORDING.

(See figures 2-1 and 2-2.)

Note

In the following cording instructions it is assumed that the transmitter has first been connected according to instructions in the handbook of operating instructions for that equipment.

(a) ANTENNA CABLE.—Disconnect the plug from the "ANT." socket on the transmitter and connect it to the "ANT." socket on the amplifier.

(b) POWER CORD.—Connect plug AN3108-22-4S to the "POWER" socket on the amplifier panel. The other ends of the wires connected to this plug are to be connected to the power source. See figure 2-1 for identification of these wires.

(c) INTERCONNECTING CORD BETWEEN TRANSMITTER AND AMPLIFIER.—Cut Radio Frequency Cable RG-8/U to the proper length to reach from the "ANT" connector on the transmitter to the "R-F INPUT" connector on the amplifier and install Radio Frequency Plug UG-21/U on each end of the cable. (See fig. 2-3.) Connect one end to the "ANT." socket on the transmitter and the other end to the "R.F. INPUT" socket on the amplifier. This cord must be as short as possible—in no case longer than 2½ feet. (See fig. 2-2.)

Note

Do not disconnect the power wires from the transmitter.

(d) Make certain the following components on the front panel of the amplifier are in place and securely held (see fig. 2-2):

1. The "POWER" Plug (AN3108-22-4S) and the "ANT." and "R.F. INPUT" Plugs (Radio Frequency Plugs UG-21/U).

2. The 10-ampere "115V" a-c fuse and the 1-ampere "24V" d-c fuse. See that a "SPARE" fuse is provided for each.

3. The "OUT. IND." pilot lamp.

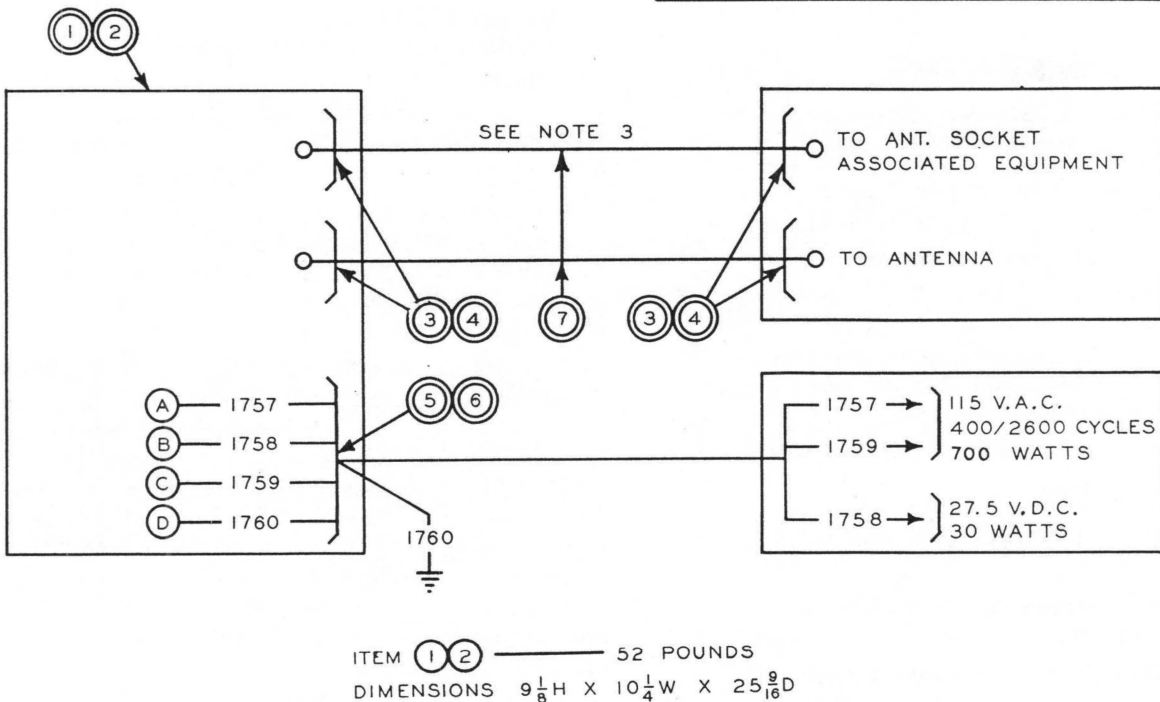
(e) See that there are no objects near the amplifier case which might obstruct the flow of air through the ventilating louvers.

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ITEM	EQUIPMENT	NO. REQ'D	NOMENCLATURE
* 1	RADIO FREQUENCY AMPLIFIER	1	SEE NOTE 2
* 2	MOUNTING	1	MT-171/U
* 3	RADIO FREQUENCY PLUG	4	UG-21/U
* 4	RADIO FREQUENCY ADAPTER	AS REQ'D	UG-27/U
* 5	PLUG	1	AN3108-22-4S
* 6	ADAPTER	1	AN3057-12
* 7	RADIO FREQUENCY CABLE	AS REQ'D	RG-8/U

* INDICATES GOVERNMENT FURNISHED EQUIPMENT

WIRE TABLE				
ALL WIRES TO BE PER SPEC. AN-J-C-48 UNLESS OTHERWISE SPECIFIED. WIRE SIZES MARKED + TO BE INDIVIDUALLY SHIELDED PER SPEC. 95-2727. ALLOWABLE VOLTAGE DROP TO BE IN ACCORDANCE WITH SPEC. 95-32310 UNLESS OTHERWISE SPECIFIED.				
REF. NOTE	WIRE NO.	MAXIMUM VOLTAGE IN WIRE	MAXIMUM ALLOWABLE RESISTANCE IN WIRE	WIRE SIZE
4+	1757	115 A-C	.08	AN-20
	1758	28 D-C	.09	AN-22
4+	1759	115 A-C	.08	AN-20
	1760	0	.02	AN-22



NOTES -1:

ALL TERMINAL STRIPS REQUIRED IN THE INSTALLATION OF THE WIRING SHALL BE MADE OF SUITABLE INSULATING MATERIAL AND WITH TERMINAL SPACING TO PROVIDE PROTECTION AGAINST VOLTAGE BREAKDOWN.

2:

WIRING FOR RADIO FREQUENCY AMPLIFIER AM-14/APT AND RADIO FREQUENCY AMPLIFIER AM-18/APT IS INTERCHANGEABLE.

3:

THIS CABLE BETWEEN UNITS SHALL NOT BE LONGER THAN 2 FEET.

4:

WIRES 1757 AND 1759 SHALL BE SHIELDED WHEN ROUTED CLOSE TO AND PARALLEL WITH SKIN OF PLANE FOR DISTANCE GREATER THAN 3 FEET.

Figure 2-1. Radio Frequency Amplifier AM-18/APT—System Diagram

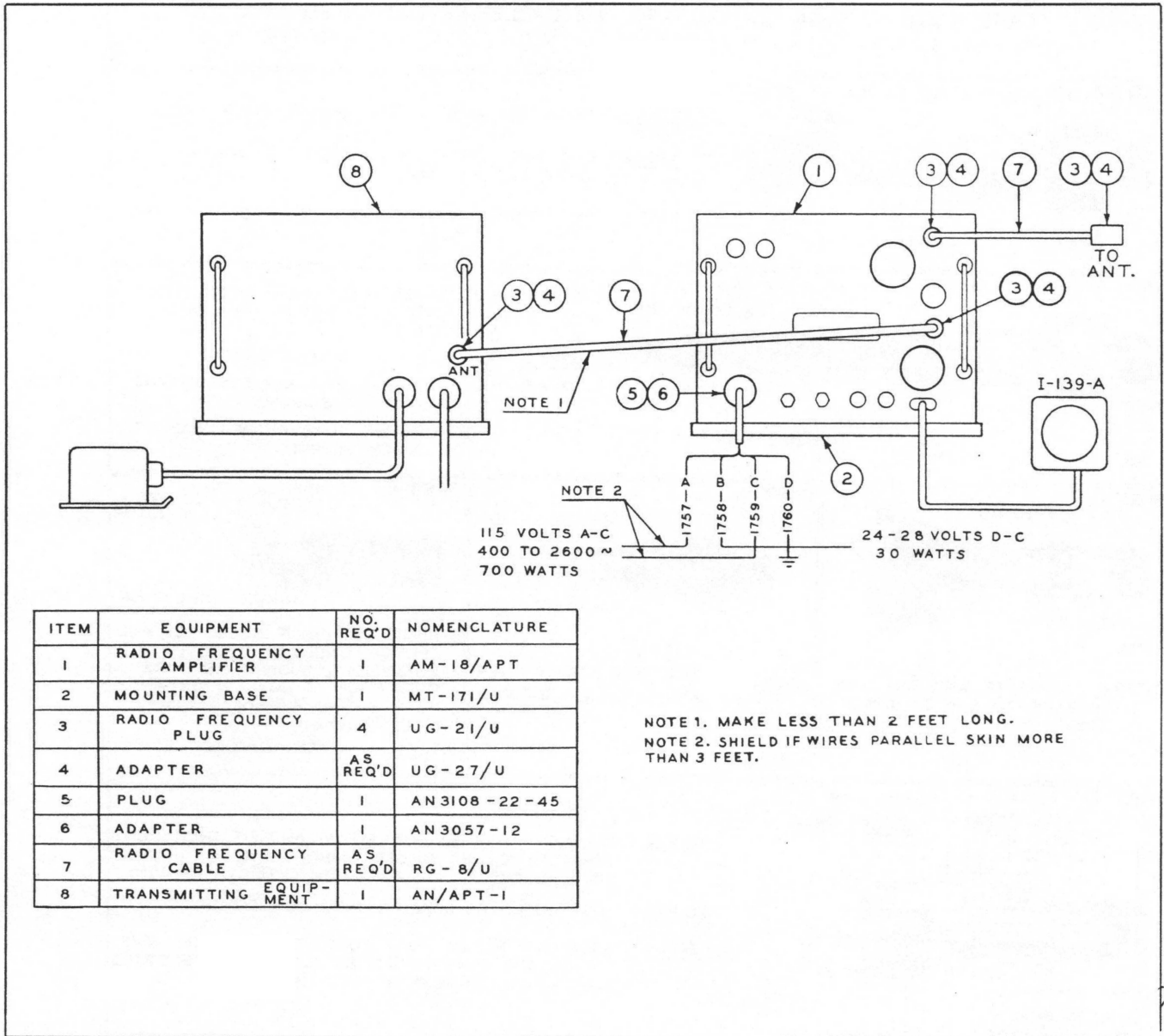
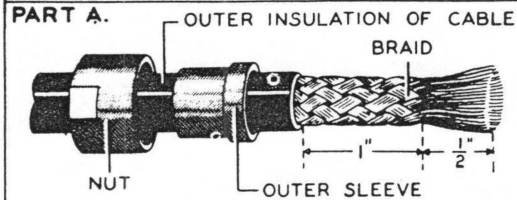
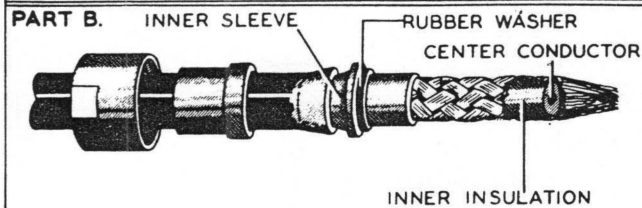


Figure 2-2. Radio Frequency Amplifier AM-18/APT—Cording Diagram

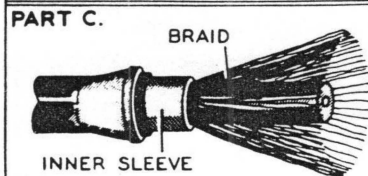
NOTE:-THESE PLUGS WILL CAUSE A MIS-MATCH OF IMPEDANCE IN THE CIRCUIT UNLESS THE INSTRUCTIONS GIVEN BELOW ARE FOLLOWED EXACTLY. EXTREME CARE MUST BE TAKEN IN CUTTING THE CABLE INSULATION SO THAT NO AIR GAPS EXIST BETWEEN THE INSULATION OF THE CABLE AND THE PLUG.



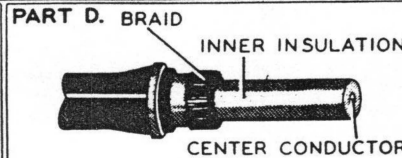
- STEP 1. SLIDE NUT AND OUTER SLEEVE OVER CABLE.
- STEP 2. CUT OFF OUTER INSULATION 1/2 INCHES FROM END OF CABLE.
- STEP 3. FAN SHIELD BRAID 1/2 INCH IN FROM THE END.



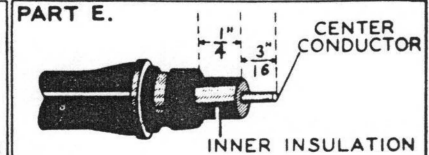
- STEP 4. CUT INNER INSULATION AND CENTER CONDUCTOR 1/2 INCH IN FROM END OF BRAID.
- STEP 5. TWIST FANNED END OF BRAID.
- STEP 6. SLIDE INNER SLEEVE OVER BRAID AND UNDER OUTER INSULATION.
- STEP 7. CHECK TO BE SURE RUBBER WASHER IS ON INNER SLEEVE.



STEP 8. SEPARATE AND FAN THE BRAID BACK TO END OF INNER SLEEVE.

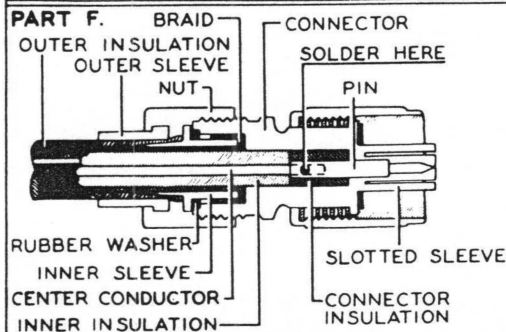


STEP 9. FOLD BRAID BACK OVER SLEEVE AND TRIM AS SHOWN.

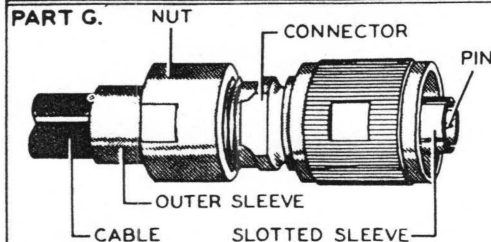


STEP 10. CUT INNER INSULATION AND CENTER CONDUCTOR EXACTLY TO DIMENSIONS SHOWN. BE SURE INSULATION IS CUT EVENLY AND AT A 90° ANGLE TO CENTER CONDUCTOR.

STEP 11. TIN CENTER CONDUCTOR



- STEP 12. REMOVE PIN FROM CONNECTOR AND FIT OVER CENTER CONDUCTOR. SOLDER THROUGH HOLES IN THE SIDE. REMOVE ALL SOLDER FROM EXTERIOR OF PIN.
- STEP 13. FORM BRAID BY FORCING INTO CONNECTOR.
- STEP 14. ASSEMBLE PIN IN PLUG TO CHECK POSITION. THE TIP OF THE PIN SHOULD BE FLUSH WITH SLOTTED SLEEVE OF CONNECTOR. SEE PART G.



STEP 15. SLIDE CABLE INTO CONNECTOR AND TIGHTEN NUT WITH A WRENCH.

NOTE:- CONNECTOR MUST NOT BE ALLOWED TO TURN WHEN NUT IS TIGHTENED.

NOTE: Plug and jack are put on cable in the same manner.

Figure 2-3. Installation Instructions for Radio Frequency Plug UG-21/U (Formerly Referred to as Navy Type C-49268 or Simply Type N Plug)

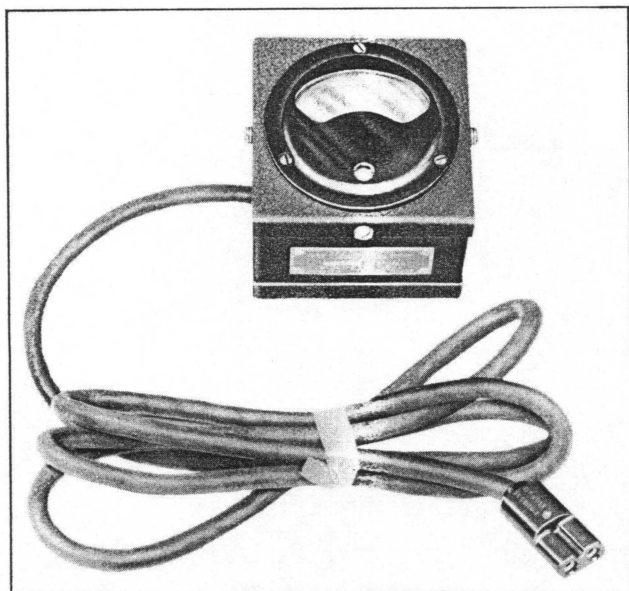


Figure 2-4. Test Set I-139-A—External View

Note

The meter on Test Set I-139-A has a 0-1 milli-ampere scale. Due to the use of series resistors and shunts in the circuit, full scale deflection represents 400 milliamperes when the test set is used with Radio Frequency Amplifier AM-18/APT.

2. TUNING PROCEDURE.

a. Place the driver in operation in accordance with the handbook of operating instructions for the driver.

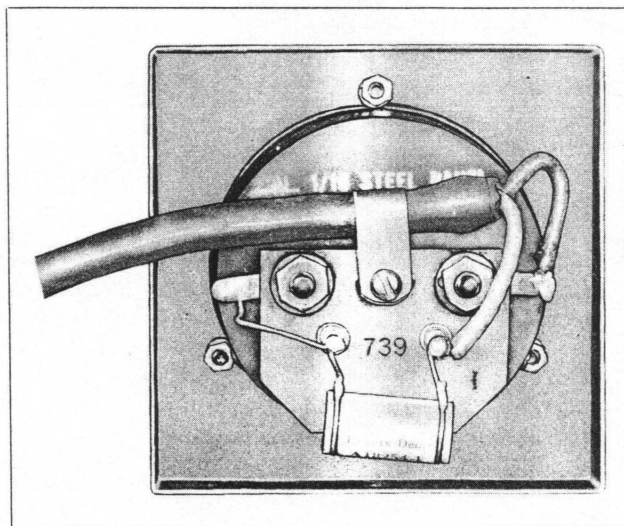


Figure 2-5. Test Set I-139-A—Rear View

CAUTION

Do not operate the amplifier unless it is connected to an antenna or dummy load.

b. Place the panel-located "FILAMENT" switch in the "ON" position.

c. Set the panel-located "GRID TUNING" dial to the setting indicated for the desired frequency by the grid tuning curve. (See fig. 2-6.)

d. Set the panel-located "PLATE TUNING" dial to the setting indicated for the desired frequency by the plate tuning curve. (See fig. 2-7.)

e. Plug Test Set I-139-A into the panel-located "METER" jack.

f. Adjust the driver for maximum power output as indicated by maximum indication on the test set meter. Refer to the handbook of maintenance instructions for the driver being used.

g. After the "FILAMENT" switch has been on for 40 seconds or more, place the panel-located "PLATE" switch in the "ON" position. This applies the high voltage to the circuit.

h. Adjust the "GRID TUNING" dial on the amplifier panel until the test set meter shows a maximum reading. This reading should be between 160 and 280 milliamperes (0.4 to 0.7 on test set meter).

i. Adjust the "PLATE TUNING" dial for maximum output as indicated by the maximum brilliance of the "OUT. IND." lamp.

j. Adjust the "GRID TUNING" dial for maximum output.

k. Repeat the "PLATE TUNING" adjustment for maximum output indication. The test set meter should now indicate a current of from 160 to 300 milliamperes (0.4 to 0.75 on scale of meter).

l. Set the panel-located "OUT. IND. ADJ." control to provide the desired brilliance of the "OUT. IND." lamp.

m. Lock dials in place.

n. Check frequency with monitor, wavemeter, or frequency meter as outlined in paragraph 3, this section.

3. AFTER-INSTALLATION TEST.

Note

The frequency range of Monitor BC-1255-A does not cover the band between 146 and 150 megacycles. Consequently, if the frequency to which the transmitter is to be tuned lies between these limits, it will be necessary either to make an approximate setting, or to obtain Frequency Meter TS-174/U or TS-175 ()/U if it is available (or equivalent). This frequency meter covers the entire frequency range of this amplifier.

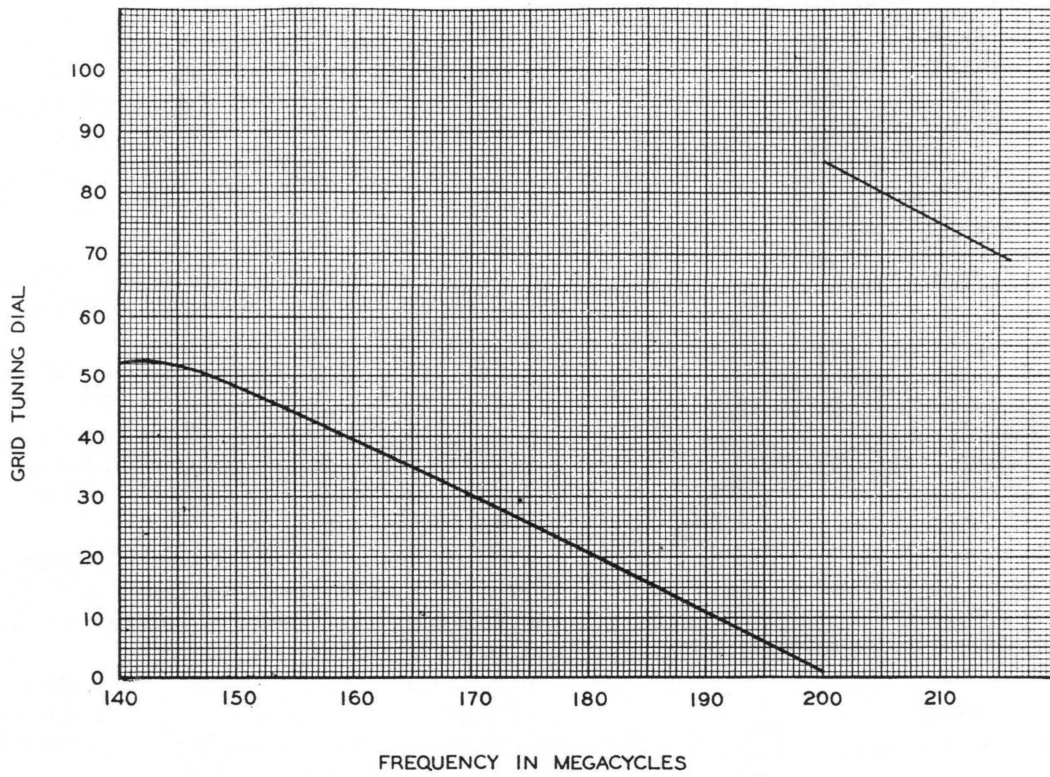


Figure 2-6. Radio Frequency Amplifier AM-18/APT—Grid Tuning Curve

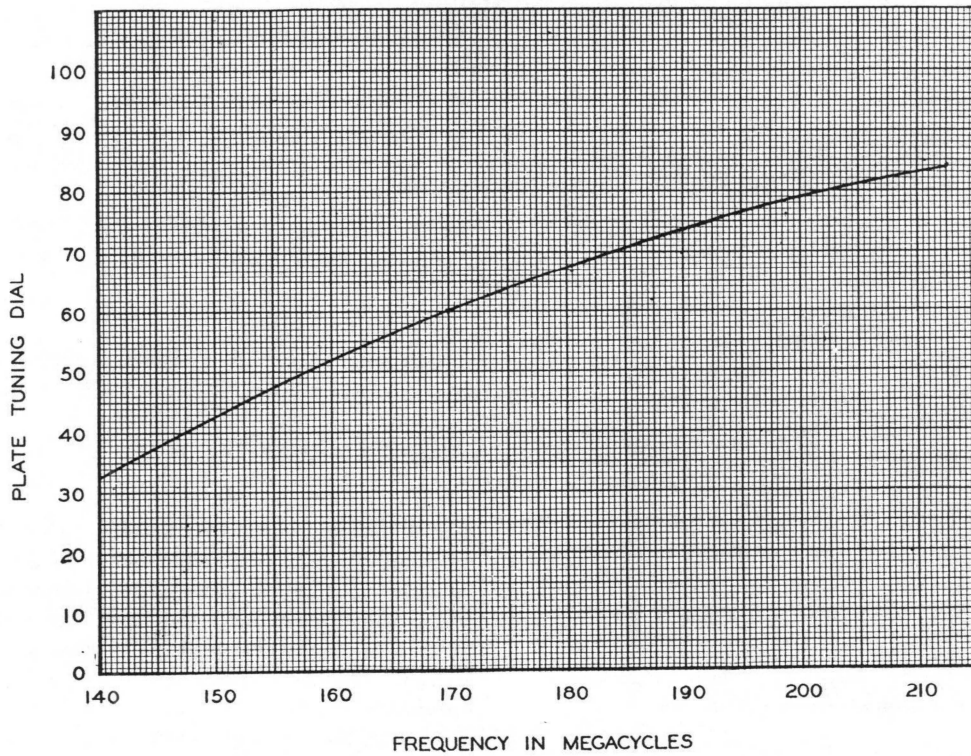


Figure 2-7. Radio Frequency Amplifier AM-18/APT—Plate Tuning Curve

a. FREQUENCY CHECK.

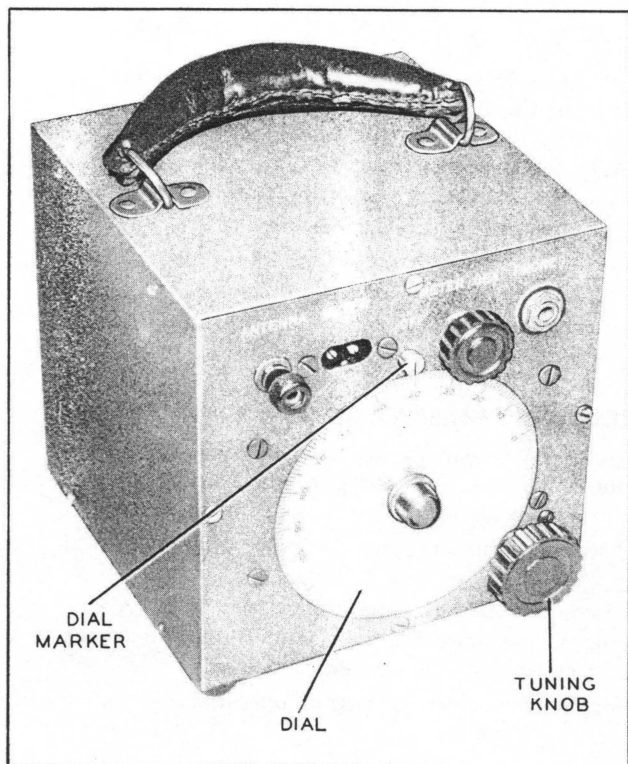


Figure 2-8. Monitor BC-1255-A—External View

Note

The following instructions apply specifically to the use of Monitor BC-1255-A. If an equivalent monitor or frequency meter is used, these instructions will also apply if interpreted in a general manner and if it is kept in mind that panel markings, etc., will differ.

(1) With the amplifier operating, place the monitor on the ground outside the plane at a point about 15 feet from the antenna.

(2) Fasten a 2-foot length of stiff wire to the "ANTENNA" terminal of the monitor and arrange the wire so it is parallel to the transmitter antenna. Be sure there are no obstructions in the line of sight between the monitor antenna and transmitter antenna.

(3) Turn on the monitor by turning the "METER SET" knob clockwise and plug Headset HS-23 into the "PHONES" jack.

(4) Turn the monitor tuning knob until a signal is heard in the headset then adjust the monitor tuning knob to the center of the signal.

(5) Note the reading at the dial marker and determine the frequency from the calibration chart provided with the monitor.

Note

Operation on the second harmonic of the monitor or frequency meter will be indicated by a chart reading lower than 140 megacycles. Multiply by a factor of two for the correct frequency reading.

(6) Place the "METER SET" switch in the "OFF" position.

(7) If the frequency is correct, the driver and radio frequency amplifier are ready for operation.

(8) Turn off the amplifier by placing both the "PLATE" and "FILAMENT" switches in the "OFF" position and turn off the driver as outlined in the handbook of operating instructions for the driver being used.

b. POWER CHECK.—If time permits, make a power check as outlined in paragraph 5, section VI. The "OUT IND." lamp is usually sufficient indication of normal power output.

SECTION III

OPERATION

I. TO START AND STOP THE EQUIPMENT.

Note

It is essential that the equipment be tuned on the ground previous to the time of its use. Check with a responsible source to insure that the required pre-tuning is complete before take-off.

a. TO START THE EQUIPMENT.

(See figure 1-1.)

(1) Place the driver in operation, following the procedure outlined in the handbook of operating instructions for the driver equipment being used.

(2) Be sure that the panel-located "PLATE" switch is in the "OFF" position.

(3) Place the panel-located "FILAMENT" switch in the "ON" position and wait about 40 seconds.

(4) Apply the 2,000-volt high voltage plate potential by placing the "PLATE" switch in the "ON" position.

tion. If the "OUT. IND." lamp is lit, the amplifier is in operation.

CAUTION

Do not operate the "PLATE" switch until the "FILAMENT" switch has been "ON" for at least 40 seconds, or damage to the equipment may result.

b. TO STOP THE EQUIPMENT.

(1) Place the panel-located "PLATE" switch in the "OFF" position.

(2) Place the panel-located "FILAMENT" switch in the "OFF" position.

(3) Turn off the driver equipment.

c. TO REMOVE THE SIGNAL DURING TACTICAL USE.—Instructions for removing the signal without shutting down the equipment are given in the handbook of operating instructions for the particular driver equipment being used. Leave both the "FILAMENT" and "PLATE" switches on the amplifier panel in the "ON" position.

2. OPERATION.

Start the equipment as outlined in paragraph 1, above.

IMPORTANT

Do not alter the setting of any of the controls, except as specifically directed in this handbook.

a. The panel-located "OUT. IND." lamp when lit indicates that the equipment is operating. It should be adjusted to a low brilliancy by adjusting the "OUT. IND. ADJ." screw. If the lamp brilliancy is turned very low or the exterior illumination is high, it may be necessary to remove the lamp assembly cover.

b. No other adjustments need be made during flight unless emergency repairs are necessary.

c. Do not leave the equipment turned on longer than necessary for tactical purposes.

3. EMERGENCY OPERATION.

In the event of damage to the amplifier, emergency operation at reduced power is possible, using the driver only, by making the following changes:

a. Disconnect the amplifier r-f input cable from the driver.

b. Disconnect the antenna cable from the "ANT" connector on the amplifier panel and connect it to the "ANT" connector on the driver.

c. Turn on the driver for normal operation.

SECTION IV**THEORY OF OPERATION****1. GENERAL.**

a. PURPOSE.—Radio Frequency Amplifier AM-18/APT is a single stage, push-pull class B, radio-frequency power amplifier designed for installation in aircraft. The operation of this amplifier requires the use of a radio frequency driver, operating within the correct frequency range and having a power output of not less than 5 watts or more than 30 watts.

b. OVERALL FUNCTIONING.—The radio frequency excitation is fed into the amplifier and energizes a grid tank circuit. Energy from the grid tank circuit is amplified by two push-pull amplifier tubes and fed to the plate tank circuit. Radio frequency energy is removed from the plate tank circuit by an inductor and fed to the antenna. This inductor is shielded to cut the capacitive coupling to a minimum.

2. DETAILED FUNCTIONING.

a. INPUT CIRCUIT. (See figure 4-1.)—The radio frequency excitation is fed into jack J-103-1 where the signal is carried by a concentric line and coupled to the

grid tank circuit by means of an electrostatically shielded inductive coupling loop. This circuit consists of a resonant line L-102 tuned by a split-stator variable capacitor C-103. These parts are both located on the underside of the chassis. Capacitor C-103 is coupled to the "GRID TUNING" control through an isolantite universal coupling. The outside ends of the grid tuning line are grounded, and the excitation voltage applied to the grids is taken off from the adjacent hot ends at the center of the loop. From 200 to 210 megacycles, grid inductor L-102 acts as a resonant line, and grid tuning capacitor C-103 acts as a shorting bar. From 140 to 200 megacycles grid inductor L-102 and grid tuning capacitor C-103 form an L/C circuit. This factor accounts for the drastic jump in the grid tuning curve. (See fig. 2-6.) Bias (cutoff bias) for class B operation is developed across resistor R-104.

b. SUB-CHASSIS ASSEMBLY. (See figure 4-1.)—The entire sub-chassis assembly deck (chassis painted red) is maintained 2000 volts negative with respect to ground. The deck is physically mounted by ten deck bypass capacitors (C-104 to C-106). The filaments of

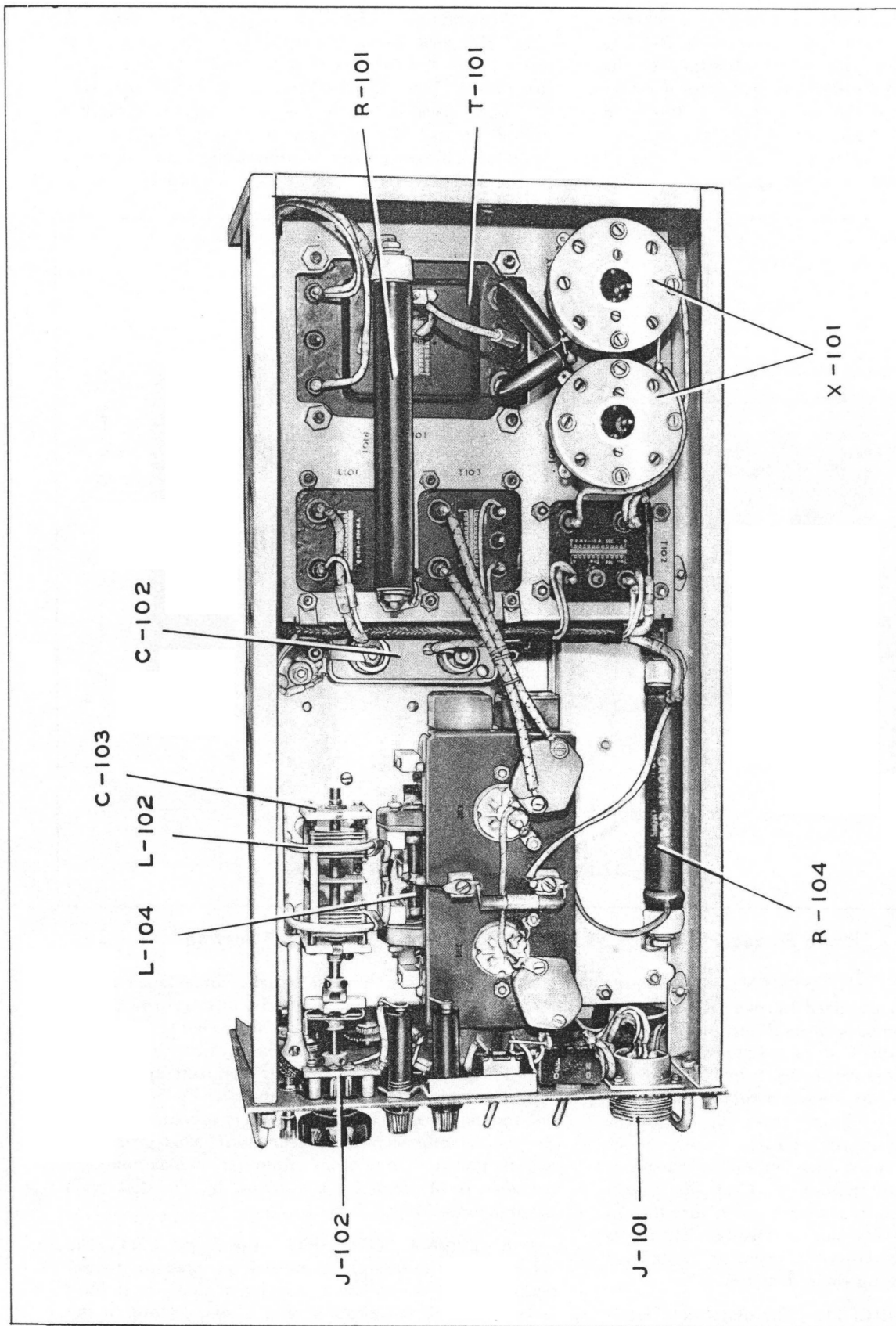


Figure 4-1. Radio Frequency Amplifier AM-18/APT—Bottom View of Chassis

the JAN-35TG amplifier tubes are at the same negative high voltage potential as the sub-chassis deck. R-F excitation is applied to the grids of the tubes through the two coupling capacitors C-105. The symmetrical center tapped choke L-104 and the series choke L-103 form the grid return circuit. Capacitors C-107 are filament bypass capacitors and serve to equalize the r-f current flowing through both halves of the filament.

c. METERING CIRCUIT. (See figure 4-1.)—A "METER" jack J-102 is provided on the panel. The meter series resistor R-103 is a resistor of such value that when Test Set I-139-A is plugged into the "METER" jack, a usable indication of the amplifier cathode current flowing through resistor R-102 will be provided. This constitutes an indication of the combined grid and plate current drawn by the amplifier tubes.

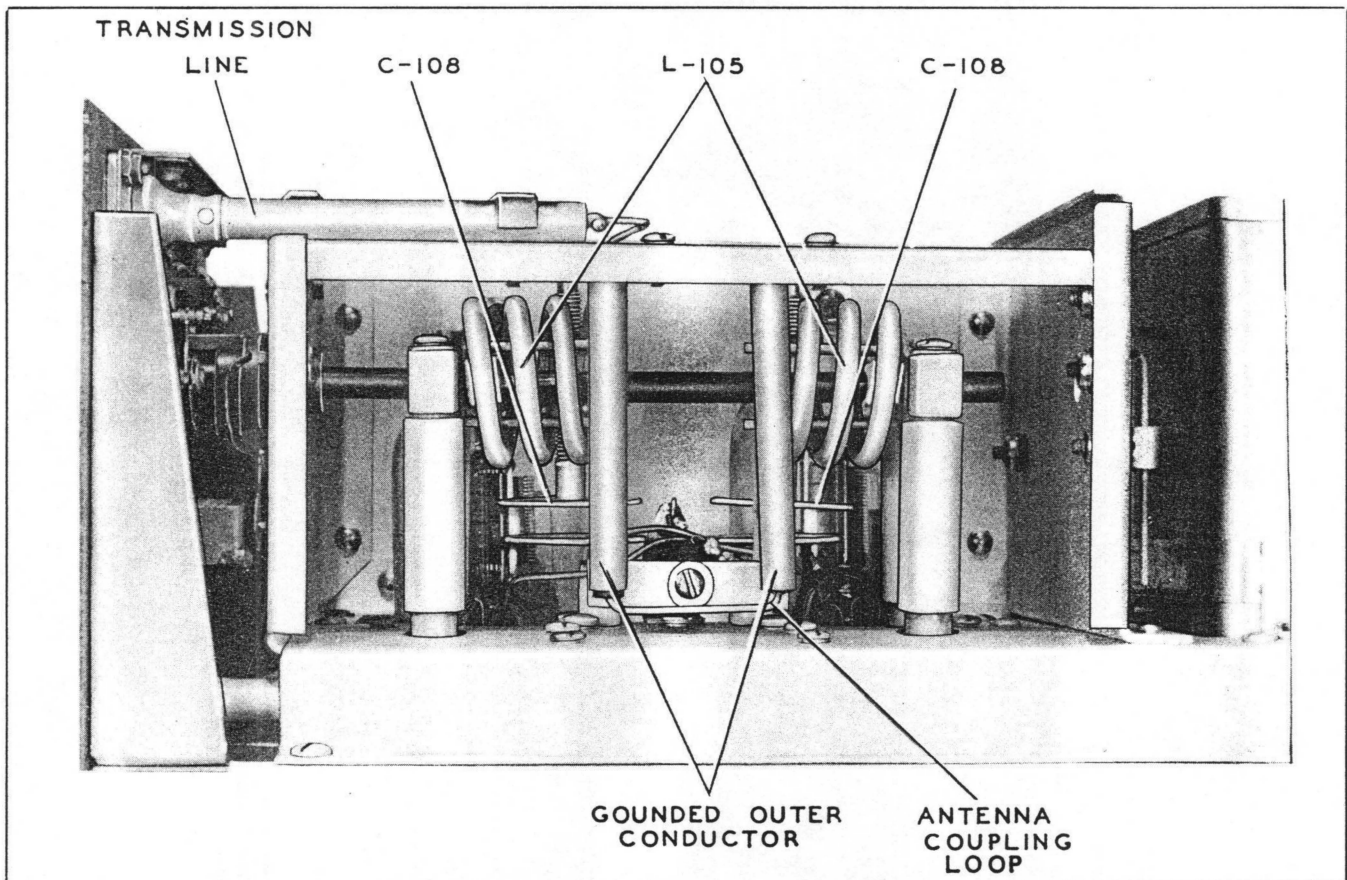


Figure 4-2. Radio Frequency Amplifier AM-18/APT—Internal View of R-F Section

d. NEUTRALIZING ADJUSTMENT. (See figure 4-2.)—This circuit is neutralized by two adjustable capacitors C-108 that feed back a small portion of the r-f signal 180 degrees out of phase to the opposite grids of the amplifier tubes. These capacitors form a bridge circuit that effectively prevents the self oscillation normally caused by the grid-to-plate interelectrode capacity of the tubes. The neutralizing capacitors each consist of two small metal discs. The fixed plate of each capacitor is supported by an isolantite standoff insulator. The adjustable plates are supported by threaded shafts that turn in tapped holes in the main coil support member. The shafts are slotted to permit screw driver adjustment, and a lock-nut is provided for locking them in place.

e. PLATE TANK CIRCUIT.—The plate tank circuit

consists of a center tapped variable inductance L-105 resonated by the distributed capacity of the entire circuit. The effective inductance of the coil is changed by turning the "PLATE TUNING" dial, which changes the position of the shorting contacts that rest against the coil. The contact assembly and the dial knob turn at a one-to-one ratio, and the dial scale is driven through a five-to-one ratio step-down gear train. This gear ratio is such that a change from minimum to maximum inductance is obtained by a rotation of the dial scale through one-half revolution.

f. ANTENNA COUPLING. (See figure 4-2.)—The r-f output of the amplifier stage is coupled to the antenna coaxial transmission line by a single-turn loop L-106 mounted close to a similar U-shaped loop at the

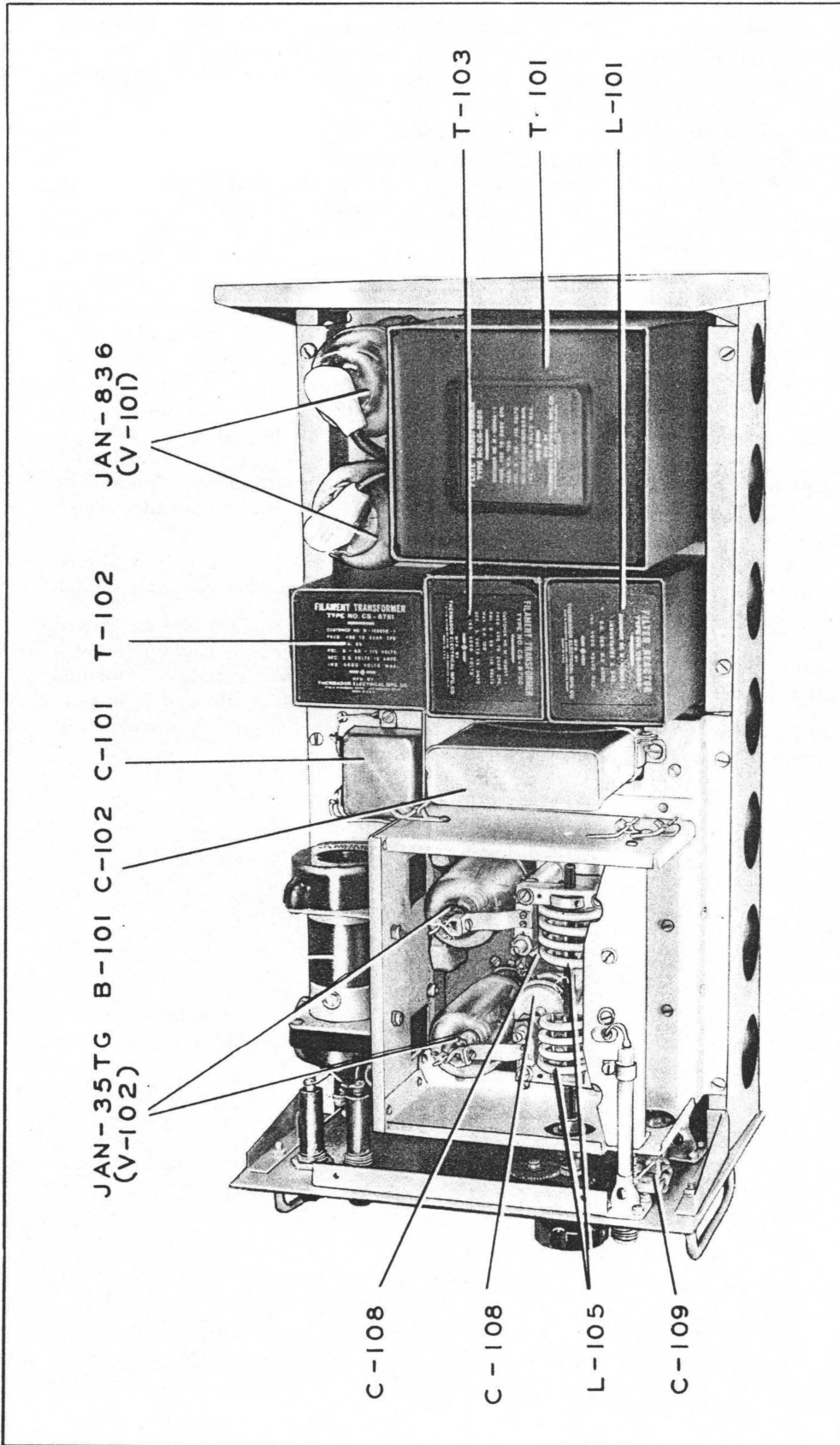


Figure 4-3. Radio Frequency Amplifier AM-18/APT—Top View, Case Removed

center of the plate output coil L-105 and held in place by two screws in slotted holes. The loop is shielded by a grounded outer conductor and provides inductive coupling with a minimum of capacitive coupling. The r-f output is fed through a coaxial line section to the antenna connector J-103-2 on the panel. The coupling is factory-adjusted for maximum output at 160 megacycles.

g. OUTPUT INDICATOR CIRCUIT.—The output indicator circuit consists of a small single-section variable capacitor C-109 connected in series with a small indicator lamp I-101. The capacity of the capacitor controls the amount of r-f energy fed from the coaxial line to the lamp, thus controlling its brilliance. Once set this circuit provides a relative indication of the amplifier r-f output.

b. POWER CIRCUITS.—Power from the 24- to 28-volt, d-c system and the 115-volt, 400-cycle system of the airplane is fed to the panel-mounted "POWER" receptacle J-101. Each of these circuits is fused separately by F-101 and F-102, and each of the power circuits is controlled by the double pole "FILAMENT" power switch S-102. With this switch "ON", the blower motor is energized and filament voltage is applied to the rectifier tubes V-101 and the amplifier tubes V-102. Power is not applied to the high voltage transformer T-101 until the "PLATE" power switch S-101 is closed.

i. POWER SUPPLY. (See figure 4-3.)—The power supply consists of filament transformers T-102 and

T-103, high voltage plate transformer T-101, rectifier tubes V-101, and a filter reactor L-101. The power supply is of the grounded-positive type and functions in the following manner:

(1) The 115-volt, 400-cycle alternating current appearing across the primary of T-101 is stepped up in the secondary to a 4,000-volt alternating current potential. The midpoint of the secondary of T-101 is maintained 2,000-volts negative with respect to the chassis. The anodes of the JAN-836 rectifier tubes V-101 alternately attain a potential of 2,000 volts positive or negative with respect to this midpoint. Because of the electron emission of the heated cathodes of these tubes, they alternately pass current over the portion of the cycle during which their anodes are positive. Thus, their cathodes assume a potential equal approximately to the peak positive excursion of the voltage on their plates (less voltage drop across tube), resulting in a potential of 2,000 volts between their cathodes and the secondary midpoint. The cathodes of the rectifier tubes are grounded through resistor R-102.

(2) The d-c output of the power supply is filtered by a single reactor L-101 and a filter capacitor C-102.

j. BLOWER. (See figure 4-3.)—Two blowers, driven by a single motor, provide forced air cooling for each of the amplifier tubes. The blower assembly is mounted as a unit beside the r-f assembly shield and is so positioned that the air is circulated around the envelopes of the JAN-35TG amplifier tubes.

SECTION V

MAINTENANCE

1. INSPECTION.

a. PREFLIGHT OR DAILY INSPECTION.

(1) Turn on the driver. (See the handbook of operating instructions for that equipment.)

(2) Place the "FILAMENT" switch located on the amplifier panel in the "ON" position and wait about 40 seconds before proceeding. Listen for operation of the blower motor located inside of the amplifier.

(3) Apply the 2000-volt plate potential by placing the "PLATE" switch located on the amplifier panel in the "ON" position.

(4) With the amplifier operating, see that the "OUT. IND." lamp on the panel is lighted.

(5) Adjust the panel located "OUT. IND. ADJ." control with a small screw driver until the "OUT. IND." lamp lights to the lowest usable brilliancy.

(6) If the lamp will not light at any setting, see paragraph 2, this section.

Note

Be sure that the driver is turned on and is operating properly before assuming that the amplifier is defective.

(7) Check to see that all connectors are tight.

(8) Check the security of mounting.

(9) Tap the case with a rubber hammer or jar it with the fist. If the "OUT. IND." lamp flickers or goes out, there is a loose connection or a defective part in the amplifier.

(10) When the preceding tests indicate that the equipment is operating properly, turn both the "PLATE" and the "FILAMENT" power switches off.

(11) Turn the driver off.

b. 100-HOUR INSPECTION.—After every 100 hours of operation or after each 30 days (whichever is the lesser) make the following routine test procedures on Radio Frequency Amplifier AM-18/APT.

(1) Using Test Set I-139-A, check and record the value of the current drawn by the amplifier tubes with the unit excited and adjusted for normal operation. Compare the readings with those previously recorded. A considerably lowered reading may indicate a weakened JAN-35TG amplifier tube, or failure of one or partial failure of both type JAN-836 rectifier tubes. A high reading may indicate either a defective amplifier tube, an incorrectly tuned circuit, or excessive excitation.

(2) Check the "OUT. IND." (output indicator) lamp.

(3) Check to insure that usable spare fuses are installed in the holders.

WARNING

High voltage! Discharge capacitors before handling any parts.

(4) Turn the equipment "OFF." Disconnect the "POWER" and "R-F INPUT" cables and remove the unit from the case.

(5) Check to insure that all of the tubes are firmly seated in their sockets, that their retaining clamps are tight, and that the plate and grid clips are firmly installed on the tube connectors.

CAUTION

Use extreme care in handling the plate leads for the JAN-35TG tubes. The seal may be easily fractured.

(6) Note the setting of the "PLATE TUNING" dial. Turn the dial to 100 and check to insure that, with the dial at this setting, the rollers or contacts in each coil section are in approximately the same position, and that in each case the contact nearest the coil center is close to the top of the vertical U-section at the coil center.

(7) Return the "PLATE TUNING" dial to its original setting and tighten the dial lock.

(8) Check the blower motor brushes and replace them if the carbon portion is less than 1/8-inch long. The brushes usually have a long life, but because of the importance of the blower, it is advisable to inspect them.

Note

There is a keyway in the brush holder and a metal key on the metal portion of the brush.

(9) Replace the unit in the case and connect the "POWER" and "R-F INPUT" connectors as they were originally.

WARNING

Dangerous voltages exist in this equipment. Take all possible precautions to avoid injury. Turn off both the transmitter and amplifier units before disconnecting the cable plugs, removing the equipment from the dust cover, or replacing the fuses.

2. TROUBLE-SHOOTING INSTALLED EQUIPMENT.

a. GENERAL.—Do not attempt any repairs other than the replacing of fuses and the repairing of damaged cordage.

b. TROUBLE LOCATION AND REMEDY CHART.—The following table lists the most common troubles and their remedies.

<i>Symptom</i>	<i>Trouble Location</i>	<i>Remedy</i>
Normal except blower motor does not work.	Blown fuse F-101	Replace with correct spare fuse.
Blower operates. No light visible from ventilating slits. "OUT. IND." doesn't light.	Blown fuse F-102	Replace with correct spare fuse.
Operates normally except "OUT. IND." doesn't light.	Burned out indicator lamp I-101	Replace lamp I-101.
Intermittent operation when one of the cables is moved.	Defective cable or connector	Repair or replace defective part.

suffice for location of the majority of troubles which might occur.

(1) In Radio Frequency Amplifier AM-18/APT the chassis is at ground potential. The power supply negative and the entire amplifier sub-chassis deck (painted red) are 2,000 volts negative with respect to the chassis. Measurement of these voltages requires the use of a meter having an internal resistance of at least 1,000 ohms per volt a. c. and preferably, 20,000 ohms per volt d. c. and capable of reading a-c and d-c potentials to 2,000 volts.

WARNING! HIGH VOLTAGE!

Watch that sub-chassis deck. It ain't painted red fur nuthin'.

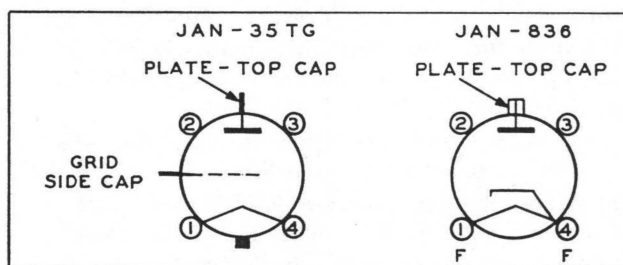


Figure 5-1. Radio Frequency Amplifier AM-18/APT—Tube Base Diagram

(2) An accurate indication of the total cathode current of the amplifier tubes JAN-35TG (V-102) is obtained when Test Set I-139-A is plugged in at the "METER" connector on the amplifier panel. This is also an indication of the total rectifier current. The plate

3. TROUBLE-SHOOTING AT REPAIR STATION.

Make the checks outlined in paragraph 2, above. If trouble is not located, use the following trouble chart.

a. TROUBLE CHART.—The following chart lists a few common troubles and their sources.

b. DETAILED TEST DATA.—The voltage, current, and resistance-to-ground tables which follow should

TROUBLE CHART

<i>Symptom</i>	<i>Indicated Source of Trouble</i>
Operates normally except test set meter does not register. . . .	Resistor R-103 open or Test Set I-139-A defective.
"OUT. IND." lamp flickers when case is tapped.	Capacitor C-103 plates bent too close together or dirty moving contacts on the rolo coil.
"OUT. IND." lamp dims when case is tapped.	Defective tube JAN-35TG or loose mounting screws for output coupling inductor L-106.
Completely dead and both fuses are good.	Defective connector J-101 or defective switch S-102.
Test set indicates that amplifier tubes draw grid current but no plate current.	Resistor R-105 open.
Fuse F-102 blows when replaced. Switch S-101 in "ON" position only.	Capacitor C-102 defective or insulation breakdown on transformer T-101, or capacitors C-104 or C-106 defective.
Fuse F-102 blows when switch S-102 is operated.	Capacitor C-107 defective.
Fuse F-101 blows when switch S-102 is operated.	Capacitor C-101 defective.
Normal except blower does not operate.	Check brushes on blower motor.

and grid currents drawn by the amplifier must be either measured individually by inserting a meter of suitable range in the respective circuits or estimated by subtracting the value of the indicated grid current ("PLATE"

VOLTAGE TO GROUND CHECK CHART

The following voltage readings were taken with a 115-volt input at 400 cycles per second.

Symbol	Function	Plate Volts	Grid Volts	Filament Volts
JAN-836 (V-101)	Rectifier	1950 a-c	8 d-c
JAN-35TG (V-102)	Amplifier	4-6 d-c	1850 d-c	1800 d-c

switch "OFF" and transmitter turned "ON") from the total value indicated with the "PLATE" switch "ON." The current values should correspond to the values shown in the following table.

AMPLIFIER GRID AND PLATE CURRENTS

The following voltage readings were taken with a 115-volt input at 400 cycles per second.

Symbol	Function	Grid Milliampères	Average Plate Milliampères
JAN-35TG (V-102) (Each tube, no excitation)	Amplifier	0	140
JAN-35TG (V-102) (Each tube with 10 to 25 watts excitation)	Amplifier	10 to 50	160

(3) The resistance-to-ground, measuring from the terminals indicated, should be in accordance with the following:

RESISTANCE-TO-GROUND

Terminal	Resistance
Filament of JAN-836 (V-101).....	42 ohms
Plate of JAN-35TG (V-102).....	25 ohms
Grid of JAN-35TG (V-102).....	100,000 ohms
Filament of JAN-35TG (V-102).....	100,200 ohms
Center tap high-voltage winding.....	100,000 ohms
J-101: Terminal "A".....	4½ megohms
Terminal "B".....	14 ohms
Terminal "C".....	4½ megohms
Terminal "D".....	0

4. REPLACEMENT OF FUSES AND LAMP.

a. ELECTRICAL SPECIFICATIONS.

Item	Electrical Specifications
Fuse F-101.....	1 ampere Type 4AG1
Fuse F-102.....	10 amperes Type 4AG10
Lamp I-101.....	6-8 volts 0.15 ampere

b. REPLACEMENT OF FUSES.—Remove the defective panel-located fuse by unscrewing the knurled fuse holder and replace it with the correct panel-located "SPARE" fuse.

c. REPLACEMENT OF LAMP.—Lamp I-101 has a miniature bayonet base. If the light shield has not been removed, it will be necessary to do so in order to replace the lamp.

5. SPECIAL MAINTENANCE OPERATIONS.

a. PANEL CONTROLS.—The "GRID TUNING" and "PLATE TUNING" dials are coupled to their respective tuning mechanisms through simple shaft linkages and universal couplings. The shaft couplings are provided with Allen set-screws. Suitable wrenches (sizes 6, 8, and 10) are provided in clips on the back of the r-f amplifier shield. Any of the universal couplings and shaft linkages can be removed after loosening the Allen set-screws.

b. ADJUSTMENT OF ROLO COILS.—The position of either of the contact assemblies on the shaft may be adjusted after loosening the two set-screws in their respective collars. The position of these contact assemblies should be so adjusted that, with the "PLATE TUNING" dial set at "100" (limit of travel), the contact nearest the coil center is just above the straight vertical portion of the "U" section. Adjust both of the contact assemblies similarly.

6. ALIGNMENT.

Consider the complete alignment procedure as two separate and distinct functions, (*a.*) the procedure required for adjustment of the equipment for operation at a desired frequency, and (*b.*) the procedure required for neutralization.

a. NORMAL TUNING PROCEDURE.—The normal tuning procedure is described in detail in section II. These tuning adjustments do not necessitate removal of the equipment from the case.

b. NEUTRALIZATION.—The following procedure is recommended for neutralizing the amplifier stage. A radio-frequency detecting and indicating device is re-

quired for this adjustment. The use of a crystal detector and a microammeter is recommended for this purpose.

(1) PRELIMINARY PROCEDURE.

(a) Construct a dummy output load from Radio Frequency Plug UG-21/U and 75 to 100 feet of Radio Frequency Cable RG-8/U with a 50-ohm, 25-watt resistor at the far end of the cable.

(b) Connect the dummy output load to the "ANT" jack J-103-2 located on the front panel of the amplifier.

WARNING

HIGH VOLTAGE! KEEP SWITCHES OFF!

(c) Pull the amplifier out of the case far enough to adjust the neutralizing capacitors with a screw driver and loosen the lock nuts.

(d) Adjust each neutralizing capacitor for approximately 1/4-inch spacing. (See fig. 4-2.)

(2) PREFERRED METHOD.

(a) Clip the crystal detector in series with a microammeter across the center U-shaped member of the output coupling loop. Place the clips about one inch from the bottom of the U-section. (See fig. 4-2.)

WARNING

HIGH VOLTAGE! DEATH IS PERMANENT!

(b) Place the amplifier in operation, using a driver tuned between 200 and 210 megacycles and the dummy output load.

(c) Make the following adjustments with the "FILAMENT" switch in the "ON" position and the "PLATE" switch in the "OFF" position.

CAUTION

Do not turn the "PLATE" switch on, as damage to the microammeter and tubes will result.

(d) Adjust the "GRID TUNING" and the "PLATE TUNING" dials for resonance. Resonance is indicated by maximum deflection on the microammeter.

(e) Slowly adjust the neutralizing capacitors, keeping the spacing on one capacitor the same as the spacing on the other capacitor. As the spacing is increased, the reading on the microammeter will decrease.

(f) Adjust the capacitors for minimum reading on the microammeter.

(g) Remove all power from the amplifier.

(h) Tighten the lock nuts and fasten the amplifier in the case.

Note

The neutralizing adjustments are normally at approximately the same d-c potential as the chassis. However, they would be at a high

potential if resistor R-105 should become defective.

(3) ALTERNATE METHOD.

(a) Construct a dummy input load from Radio Frequency Plug UG/21-U and a 50-ohm resistor and connect the dummy input load to the "R.F. INPUT" jack on the amplifier panel.

(b) Set the "PLATE TUNING" dial to the high frequency end of the band (200-210 megacycles).

(c) Place the amplifier in operation using both the input and output dummy loads.

(d) Plug Test Set I-139-A into the "METER" jack on the panel of the amplifier.

(e) Turn the "GRID TUNING" dial over its range and check for oscillation, which will be indicated by a reading of 0.8 or over on the test set meter.

(f) Every time that excessive current is indicated by the test set meter, turn the "PLATE" switch "OFF" and readjust the neutralizing capacitors.

(g) Adjust the neutralizing capacitors by increasing their spacing a small amount at a time until oscillation can no longer be detected as the "GRID TUNING" dial is turned over its range with the "PLATE" switch in the "ON" position.

WARNING! HIGH VOLTAGE!

KEEP ONE HAND IN YOUR POCKET.

(b) When the self-oscillation is completely eliminated, the neutralization is complete.

(i) Remove all power from the amplifier.

(j) Tighten the lock nuts and fasten the amplifier in the case.

7. MAINTENANCE OF MONITOR BC-1255-A.

a. GENERAL.

(1) Change batteries if Test Set I-139-A, plugged into the meter jack, cannot be adjusted by the "METER SET" knob to at least half-scale with no signal input to the monitor.

(2) If the monitor fails to operate after a good set of new batteries has been installed, check the tubes by replacing them with tubes known to be good.

(3) Make only minor maintenance repair such as battery or tube replacements, or reconnection of any broken battery leads at monitor or battery end of battery cable in the field. Replacing or adjusting any other components may change the calibration of the monitor.

(4) In case of major failure, secure a new monitor and return the defective one to the proper depot for repairs and recalibration.

(5) Never disturb any dial or internal coupling set-screws or internal adjustment controls. Failure to observe this rule will result in loss of calibration accuracy and render the monitor useless as a frequency standard.

b. BATTERY INSTALLATION OR REPLACEMENT.

- (1) Remove the back cover of the monitor (held by four screws).
- (2) Remove the batteries before disconnecting the leads.

(3) Connect the batteries as shown on the chart attached to the back cover of the monitor. Follow the chart or diagram carefully. Incorrect battery connections will burn out all tubes.

(4) Carefully replace batteries and surplus cable in the battery compartment and fasten the cover.

SECTION VI

SUPPLEMENTARY DATA

1. TUBE DATA.

a. TUBE COMPLEMENT.—The following table lists the tube complement.

Reference Symbol	Army-Type Designation	Army-Navy Designation	Function
V-101	VT-236	JAN-836	Rectifier
V-102	—	JAN-35TG	R-F amplifier

b. MAXIMUM RATINGS FOR TUBE JAN-35TG.—The maximum ratings for Tube JAN-35TG are as follows:

D-C plate voltage	2,000 volts
D-C plate current	150 milliamperes
D-C grid current	50 milliamperes
D-C grid voltage	500 volts
Plate dissipation	50 watts
Grid driving power	50 watts

2. FREQUENCY RANGE.

The frequency range of this amplifier is from 140 to 210 megacycles and may be adjusted to cover a maximum band width of 5 megacycles.

3. POWER REQUIREMENTS.

a. The blower motor requires 24 to 28 volts d-c at approximately 0.5 ampere.

b. The amplifier requires 80 or 115 volts a-c at 400 to 2600 cycles per second. The power required is 700 watts. The power factor is approximately 0.85.

4. TEMPERATURE.

This amplifier will operate satisfactorily on continuous duty at temperatures as low as -50°C (-58°F) and as high as $+50^{\circ}\text{C}$ ($+122^{\circ}\text{F}$). The amplifier may be operated at temperatures as high as $+71^{\circ}\text{C}$ ($+159.8^{\circ}\text{F}$) for a short period of time not to exceed two hours.

The maximum operating altitude is 35,000 feet unless otherwise specified on the name plate.

5. POWER OUTPUT.

a. GENERAL.—The maximum power output of Radio Frequency Amplifier AM-18/APT with 10 watts driving power is 50 watts at the low frequency end of its range and 100 watts at the high frequency end of its range.

b. POWER OUTPUT MEASUREMENT.—The r-f power output of Radio Frequency Amplifier AM-18/APT may be measured conveniently by using Radio Frequency Wattmeter TS-118/AP.

(1) Measure the frequency of the amplifier as outlined in section II, paragraph 3.

(2) Place the wattmeter near the radio frequency amplifier under test.

(3) Be sure the amplifier is turned off before starting this procedure.

(4) Connect one end of Power Cord CX-237/U to the power source and plug the other end into the recessed receptacle of the wattmeter.

(5) Using the correct test cord, connect one end to the "ANT" jack on the amplifier and the other end to the correct thermocouple for the power range desired.

(6) Connect the thermo-couple to the "lossy" line.

Note

A "lossy" line is a high leakage and high loss cable used as an attenuator.

CAUTION

Avoid sharp bends in the "lossy" line between the thermocouple and the wattmeter.

(7) Place meter selector switch in position "2" and adjust the meter for zero if necessary.

(8) Place the "ON-OFF" switch of the wattmeter in the "ON" position.

(9) Place the driver and radio frequency amplifier in operation as outlined in the handbook of operating instructions for the driver and amplifier.

CAUTION

Do not apply r-f voltage to the wattmeter if the fan in the wattmeter is not running.

(10) Note the reading on the scale of the wattmeter.

(11) Using the number of milliamperes indicated, and having the frequency in megacycles, find the power in watts on the calibration chart for the thermo-couple used.

CAUTION

Do not operate the thermo-couple continuously beyond 0.7 on the meter. When the meter continues to exceed 0.7, temporarily shut down the driver and amplifier, and exchange the thermo-couple for the next larger size.

(12) When power measurements have been completed, turn off the driver and amplifier first and then turn off the wattmeter by placing the "ON-OFF" switch in the "OFF" position.

6. MONITOR BC-1255-A.

a. Monitor BC-1255-A used for frequency measurement of Radio Frequency Amplifier AM-18/APT is a portable heterodyne frequency meter which can be used in adjusting a transmitter to a desired frequency and in checking the bandwidth of the radiated signal.

b. The monitor is complete with two Batteries BA-56, one Battery BA-54, two tubes JAN-1S5, and one tube JAN-958A.

c. The following components are used with the monitor:

- (1) Headset HS-23
- (2) Cord CD-307 or CD-307-A
- (3) Test Set I-139-A (Test Meter TS-60/U)
- (4) Antenna wire (18-inch length).

**7. FREQUENCY METERS TS-174/U
AND TS-175()/U.**

a. Frequency Meter TS-174/U is suitable for general purpose squadron use in checking frequency in the range 20 to 250 megacycles. It is of the heterodyne type, operating on the fundamental frequency range of 20 to 50 megacycles and on the harmonics thereof in the range 50 to 250 megacycles. It has crystal check points. The equipment is battery operated, requiring four each of Battery BA-23 and six each of Battery BA-2. The case, chassis, dial mechanism, and battery complement are the same as those of Frequency Meter BC-221. It is 10 inches wide, 12 $\frac{1}{2}$ inches high, and 9 $\frac{1}{4}$ inches deep. Its weight with batteries and spare tubes does not exceed 42 pounds.

b. Frequency Meter TS-175()/U is suitable for general purpose squadron use in checking frequency in the range 85 to 1000 megacycles. It is of the heterodyne type, operating on the fundamental frequency range of 85 to 220 megacycles and on the harmonics thereof in the range 220 to 1000 megacycles. Crystal check points are provided. The equipment requires four each of Battery BA-23 and six each of Battery BA-2. The case, chassis, dial mechanism, and battery complement are the same as those of Frequency Meter BC-221. It is 10 inches wide, 12 $\frac{1}{2}$ inches high, and 9 $\frac{1}{4}$ inches deep. Its weight with batteries does not exceed 42 pounds.

8. RADIO FREQUENCY WATTMETER TS-118/AP.

Radio Frequency Wattmeter TS-118/AP is an untuned wattmeter of the thermocouple type, designed for checking the output of radio frequency amplifiers. The thermocouples are interchangeable to allow the instrument to cover the frequency band from 50 to 250 megacycles. The maximum range is 200 watts between 85 and 150 megacycles and 100 watts between 150 and 250 megacycles.

SECTION VII

TABLE OF REPLACEABLE PARTS

ORDERING OF SPARE PARTS

Each Service using this list has established certain depots and service groups for the storage and issue of spare parts to its organizations requiring them. The regulations of each Service should be studied to determine the method and source for requisitioning spare parts. The information in this list, as to manufacturer's or contractor's name, type, model or drawing number, is not to be interpreted as authorization to field agencies to attempt to purchase identical or comparable spare parts direct from the manufacturer or a wholesale or retail store except under emergency conditions as covered by existing regulations of the Service concerned.

U.S. ARMY PERSONNEL: This table is for information *ONLY* and is not to be used as a basis for requisitioning parts. Authorities for obtaining maintenance items are as follows: For using organizations, applicable service publications of the 00-30 series of Army Air Forces Technical Orders; for higher maintenance and supply echelons, the applicable Standard Maintenance List or applicable service publications of the 08-55 series of Army Air Forces Technical Orders.

RMA COLOR CODES

FOR CAPACITORS (MMFD)

COLOR	NUMERAL	VOLTS	MULTIPLIER	TOLERANCE
BLACK	0		1	
BROWN	1	100	10	1%
RED	2	200	100	2%
ORANGE	3	300	1,000	3%
YELLOW	4	400	10,000	4%
GREEN	5	500	100,000	5%
BLUE	6	600	1,000,000	6%
VIOLET	7	700	10,000,000	7%
GRAY	8	800	100,000,000	8%
WHITE	9	900	1,000,000,000	9%
GOLD		1000	0.1	5%
SILVER		2000	0.01	10%
NO COLOR		500		20%

FOR RESISTORS (OHMS)

COLOR	A 1ST DIGIT	B 2ND DIGIT	C MULTIPLIER
SILVER			0.01
GOLD			0.1
BLACK		0	1.0
BROWN	1	1	10
RED	2	2	100
ORANGE	3	3	1,000
YELLOW	4	4	10,000
GREEN	5	5	100,000
BLUE	6	6	1,000,000
PURPLE	7	7	10,000,000
GRAY	8	8	100,000,000
WHITE	9	9	

D - TOLERANCE CODE:
GOLD = 5% SILVER = 10% NO COLOR = 20%

BODY COLOR (NEW COLOR ARRANGEMENT ONLY) INDICATES TYPE OF RESISTOR, AS FOLLOWS:-
 BLACK - COMPOSITION, NON-INSULATED
 TAN, OLIVE OR WHITE - COMPOSITION, INSULATED
 DARK BROWN - WIRE-WOUND, INSULATED

MODEL: RADIO FREQUENCY AMPLIFIER AM-18/APT
TABLE OF REPLACEABLE PARTS

Reference Symbol	Army Stock Number Navy Stock Number British Ref. Number	Name of Part and Description	Function	Mfr. and Desig. or AWS Type	Cont. or Govt. Dwg. or Spec. No.
B-101	3H3100-10 — —	MOTOR: Shunt type; 0.005 horsepower; 28 volts; 1610 frame.	Blower	Eicor Incorporated	L-100073-1
C-101	3DB1.6100B — —	CAPACITOR: Fixed; one microfarad; $\pm 20\%$; -10% ; 600 volts DCW; $2'' \times 1\frac{3}{4}'' \times 1\frac{3}{16}''$; 3 studs $\frac{5}{8}''$ long with 6-32 thread.	Motor filter	Cornell-Dubilier Electric Corp. 6100	L-61013-19R
C-102	3DB2.2002-3 — —	CAPACITOR: Fixed; oil filled; 2.0 microfarad; $\pm 10\%$; 2000 volts DCW; $4'' \times 3\frac{3}{4}'' \times 1\frac{1}{4}''$ high.	Filter	Cornell-Dubilier Electric Corp.	L-61003-38
C-103	3D9075V-12.1 — —	CAPACITOR: Variable; made from A-61250-1 by removing #4-36 screws and spacers and redrilling and tapping #4-36 holes for #6-32 threads.	Grid tuning	Aircraft Accessories Corporation	A-100154-1
C-104-1	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad; $\pm 10\%$ 5000 volt test; 2500 volt DCW; hexagonal shaped; $1\frac{3}{4}'' \times 1\frac{15}{16}'' \times 1\frac{5}{32}''$; holes tapped 6-32 thread.	Deck bypass	Sangamo Electric Company A2-5250	L-61030-25LST
C-104-2	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-104-1.	Deck bypass		
C-104-3	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-104-1.	Deck bypass		
C-104-4	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-104-1.	Deck bypass		
C-104-5	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-104-1.	Deck bypass		
C-104-6	3DA5-26 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-104-1.	Deck bypass		
C-105	3D9050-73.3 — —	CAPACITOR: Fixed; 0.005 microfarad; $\pm 10\%$; 5000 volt test; 2500 volt DCW; hexagonal shaped; $1\frac{3}{4}'' \times 1\frac{5}{16}'' \times 1\frac{5}{32}''$ holes tapped 6-32.	Grid bypass	Sangamo Electric	L-61030-8LST
C-106-1	3D10-173 — —	CAPACITOR: Fixed; 0.01 microfarad; $\pm 10\%$; 5000 volt test; 2500 volt DCW; hexagonal shaped; $1\frac{3}{4}'' \times 1\frac{5}{16}'' \times 1\frac{5}{32}''$; holes tapped 6-32.	Deck bypass	Sangamo Electric Company A2-5110	L-61030-28LST

C-106-2	3DA10-173 — —	CAPACITOR: Fixed; 0.01 microfarad. Same as ref. C-106-2.	Deck bypass	Aircraft Accessories Corporation	A-100032-2
C-106-3	3DA10-173 — —	CAPACITOR: Fixed; 0.01 microfarad. Same as ref. C-106-1.	Deck bypass		
C-106-4	3DA10-173 — —	CAPACITOR: Fixed; 0.01 microfarad. Same as ref. C-106-1.	Deck bypass		
C-107-1	3DA5-26.1 — —	CAPACITOR: Fixed; 0.005 microfarad; $\pm 10\%$; 5000 volt test; 2500 volt DCW; hexagonal shaped; reworked; from SA-A2-LST.	Filament bypass	Aircraft Accessories Corporation	A-100120-GL
C-107-2	3DA5-26.1 — —	CAPACITOR: Fixed; 0.005 microfarad. Same as ref. C-107-1.	Filament bypass		A-100120-GL
C-108-1A	2C449-18/R1 — —	CAPACITOR PLATE: Adjustable neutralizing capacitor; overall length 2"; aluminum plates 1 1/4" diameter x .064"; stud threads aluminum 1 1/2" long threaded 1/4-28 class 2.	Neutralizing	Aircraft Accessories Corporation	A-100120-GL
C-108-2A	2C449-18/R1 — —	CAPACITOR PLATE: Adjustable; same as ref. C-108-1A.	Neutralizing		A-100120-GL
C-108-1B	2C449-18/S1 — —	CAPACITOR PLATE: Stator plate; 1/4" diameter x .064" aluminum 52S(1/2H); 206" diameter hole.	Neutralizing	Aircraft Accessories Corporation	A-100120-GL
C-108-2B	2C449-18/S1 — —	CAPACITOR PLATE: Stator plate. Same as ref. C-108-1B.	Neutralizing		A-100120-GL
C-109	3D9007V-8 — —	CAPACITOR: Variable; maximum, 7 micromicrofarads; minimum, 2 micromicrofarads; 3 plates 1/8" x 1 7/32 high.	Output indicator adjustment	American Steel Package Company	A-61218-6
F-101	3Z1964 — —	FUSE: Aircraft anti-vibration type; 1 ampere; 250 volt; 1 1/4" x 9/32" diameter.	Blower fuse	Littlefuses Laboratories 1091	A-653113-1
F-102	3Z1923 — —	FUSE: Aircraft anti-vibration type; 10 ampere; 25 volt; 1 1/4" x 9/32" diameter.	A-C power	Littlefuses Laboratories 10900	A-653113-5
I-101	2Z5952 — —	LAMP: 6-8 volts; 15 ampere; miniature bayonet base.	Indicator	General Electric Company 3 1/4	A-65100-15
J-101	2Z8799-160 — —	CONNECTOR: Male contact; power connector 4 controls; 2 #8 contacts and 2 #12 contacts with 1/8" spacing.	Power connector	American Phenolic Corporation	A-62421-54

MODEL: RADIO FREQUENCY AMPLIFIER AM-18/APT
TABLE OF REPLACEABLE PARTS — (Continued)

Reference Symbol	Army Stock Number Navy Stock Number British Ref. Number	Name of Part and Description	Function	Mfr. and Desig. or AWS Type	Cont. or Govt. Dwg. or Spec. No.
J-102	2ZK9402-33 — —	JACK: Special plug board assembly.	Meter jack	Aircraft Accessories	L-100023-G1
J-103-1	2Z7390-22 — —	CONNECTOR: Silver plated brass; polystyrene insulation.	"R-F INPUT" connector	Sel. No. JNL-A 62424-12 ASF No. B7570	
J-103-2	2Z7390-22 — —	CONNECTOR: Same as ref. V-103-1.	"ANT" connector		
L-101	3C323-24E — —	REACTOR: Two henries; 300 milliamperes; 5000 volt insulation to case.	Filter	Aircraft Accessories Corporation	M-10055-1
L-102	2C449-18/L2 — —	INPUT LOOP ASSEMBLY: Made from 3/16" O.D. x 1/32" thick wall silver plated brass tubing.	R-F input	Aircraft Accessories Corporation	L-100148-G1
L-103	3C357-3 — —	CHOKER: Radio frequency; 0.85 ohms d-c resistance; 5.5 millihenries; 1 3/4" x 1/4" leads.	Grid return	Ohmite Manufacturing Company Z-1	A-63218-2
L-104	3C323-25G — —	CHOKER: Radio frequency; 0.75 ohms d-c; 4.5 millihenries; 18 turns of #22 wire each side; 1 3/4" x 1/4" diameter; 2 leads about 2" long.	Grid return	Ohmite Manufacturing Company Special	A63218-11
L-105	2C449-18/A1 — —	OUTPUT INDUCTOR: Special assembly; 3/16" diameter brass rod; developed length is 15-1/16"; two coils wound in opposite direction; 3 1/2 turns per inch; inside coil diameter 1"; assembly approximately 6" x 2 1/2" x 3 1/2".	Tank circuit	Aircraft Accessories Corporation	L-1001S1-61
L-106	2C449-18/L1 — —	OUTPUT LOOP ASSEMBLY: Base 1/8" thick brass loop S/16" O.D. x .250" I.D. copper tube; overall 4 1/4" x 2 1/4" x 1 1/2".	Output coupling	Aircraft Accessories Corporation	A-100110-G1
R-101	3Z6700-87 — —	RESISTOR: Fixed; 100,000 ohms; ± 10%; 100 watts; 6 1/2" long; comes with brackets DM#12.	Bleeder	Ohmite Manufacturing Company 0625	A-61287-65
R-102	3RC21BE102K — —	RESISTOR: Fixed; 2.58 ohms; ± 10%; 1 watt wire wound.	Meter shunt	Shallcross Manufacturing Company 190	L-61298-27

R-103	3RC21BE102K	RESISTOR: Fixed; 1000 ohms; $\pm 10\%$; $1\frac{1}{2}$ " watt; carbon type; insulated; $\frac{5}{8}$ " long x $\frac{3}{16}$ " diameter; 2 leads .036" diameter x $1\frac{1}{2}$ " long.	Meter series resistor	International Resistor Company BT-1/2	L-61319-108
R-104	3Z6020-86	RESISTOR: Fixed; 200 ohms; $\pm 10\%$; .75 watts; $6\frac{1}{2}$ " x $\frac{3}{4}$ " diameter; brackets $\frac{9}{16}$ " x $\frac{9}{32}$ ".	Grid leak bias resistor	Ohmite Manufacturing Company Special	A-100063-3
R-105	3Z6002E5-40	RESISTOR: Fixed; 25 ohms; $\pm 10\%$; 10 watts; $1\frac{3}{4}$ " x 1"; lug terminals.	Filament	Ohmite Manufacturing Company	L-61376-111
S-101	3Z9849-89	SWITCH: Toggle; DPST; 20 amperes; 24 volts fluorescent tip; $1\frac{1}{8}$ " x $\frac{5}{8}$ " x $2\frac{1}{32}$ ".	Plate	Cutler-Hammer Incorporated 8222K1	A-62045-2
S-102	3Z9845-16	SWITCH: Toggle; SPST; 20 amperes; fluorescent tip; $1\frac{15}{16}$ " x $\frac{3}{4}$ " $\frac{7}{16}$ ".	High voltage transformer	Cutler-Hammer Incorporated 8801K2	A-60245-2
T-101	2Z9618-13	TRANSFORMER: 115-volt primary winding tapped for 80-volt operation; 400-cycle to 2600-cycle per second; 4000-volt secondary center tapped at 2000 volts; $\pm 5\%$; $5\frac{3}{4}$ " x $4\frac{7}{8}$ " x 5"; 9000 volt insulation to case.	Rectifier filament transformer	Thermador Electrical Manufacturing Company 6S-5626	M-100056-1
T-102	2Z9617-35	TRANSFORMER: 115-volt primary winding tapped for 80-volt operation; 400-cycle to 2600 cycles per second; 5-volt; 15 ampere secondary winding; $3\frac{1}{16}$ " x $2\frac{9}{16}$ " x $4\frac{5}{16}$ "; 5000 volt insulation to case.	Rectifier filament transformer	Thermador Electrical Manufacturing Company CS-8751	M-10058-1
T-103	2Z9617-34	TRANSFORMER: 115-volt primary winding tapped for 80-volt operation; 400-cycle to 2600 cycles per second; 5-volt; 15 ampere secondary winding; $3\frac{1}{16}$ " x $2\frac{9}{16}$ " x $4\frac{5}{16}$ "; 5000 volt insulation to case.	Amplifier filament transformer	Thermador Electrical Manufacturing Company CS-8750	M-100057-1
V-101	2V836 2J836	VACUUM TUBE: Diode.	Rectifier		
V-102	2V35TG 2J35TG	VACUUM TUBE: Triode.	High frequency R-F amplifier	Eimac 35TG	
X-101-1	2Z8663	SOCKET: Beryllium copper steatite base; 4 holes 0.090" diameter.	Rectifier tube socket	E. F. Johnson Company	L-65221-4
X-101-2	2Z8663	SOCKET: Same as ref. X-101-1.	Rectifier tube socket		
X-102-1	2Z8674-22	SOCKET: Steatite; $1\frac{1}{4}$ " diameter; 4 contacts; retaining ring furnished.	Amplifier tube socket	American Phenolic Corporation SS4M	L-65209-11
X-102-2	2Z8674-22	SOCKET: Steatite; Same as ref. X-102-1.	Amplifier tube socket		

SECTION VIII
DRAWINGS

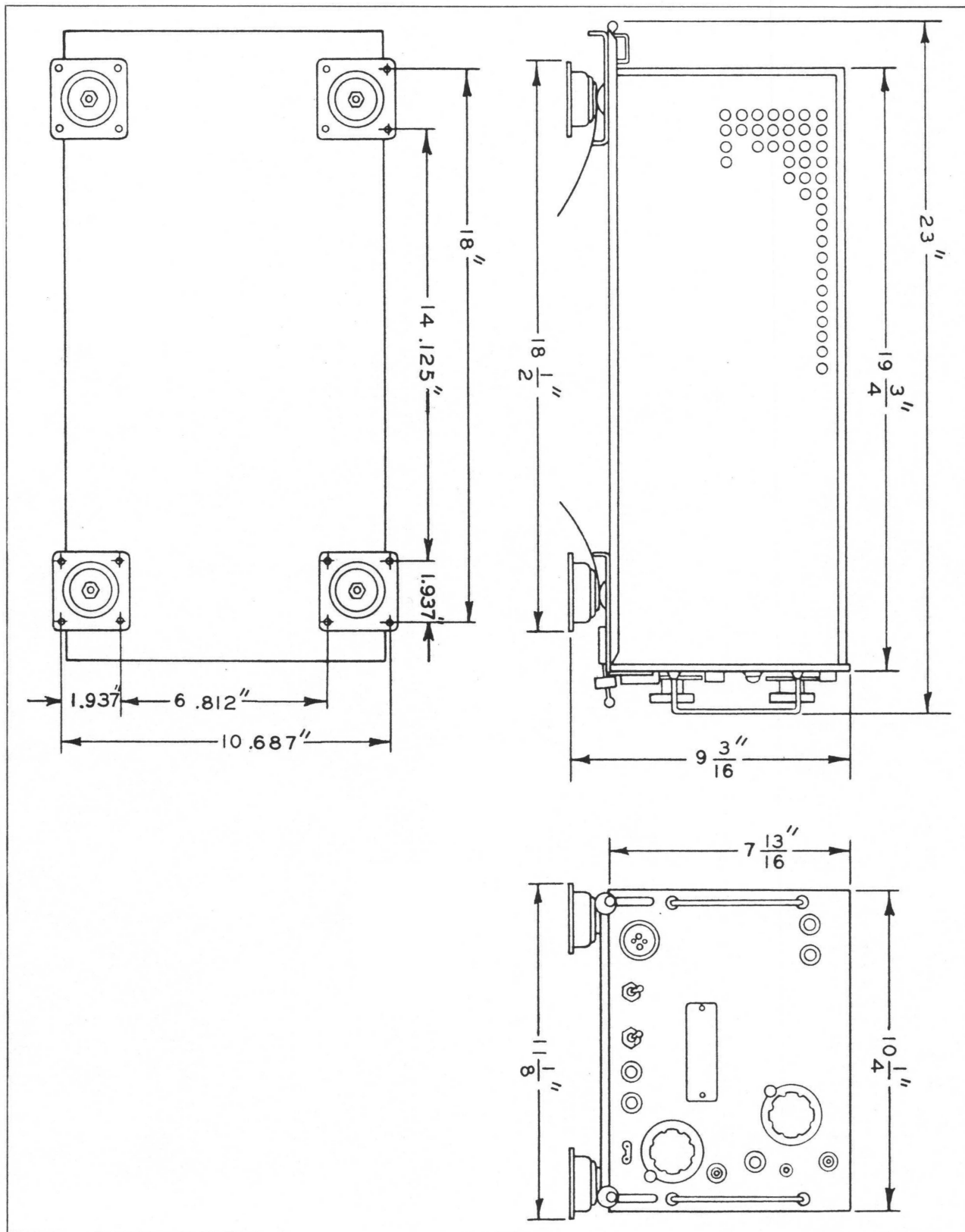


Figure 8-1. Radio Frequency Amplifier AM-18/APT—Outline Dimensional Drawing

CAUTION - OPERATE ONLY
WITH ANTENNA LOAD

FUSE
SPARE

24 V



NOT TO BE OPERATED
ABOVE 30,000 FEET

DANGER
HIGH VOLTAGE

AM-18/APT
80/115V. 1 ϕ 400-2600- & 24V. D.C.
57 : CKV ● 574-DAY-44

ALLOW 40 SEC.
FILAMENT WARM UP

ON OFF ON OFF
FILAMENT PLATE

SPARE

115 V.

GRID TUNING

METER

PLATE TUNING

AM

OUT IND. ADJ.
OUT IND.

RF INP

L 54-AA-20
U.S. Pat. Nos. 1,917,265 & 1,917,266
Made 1955.

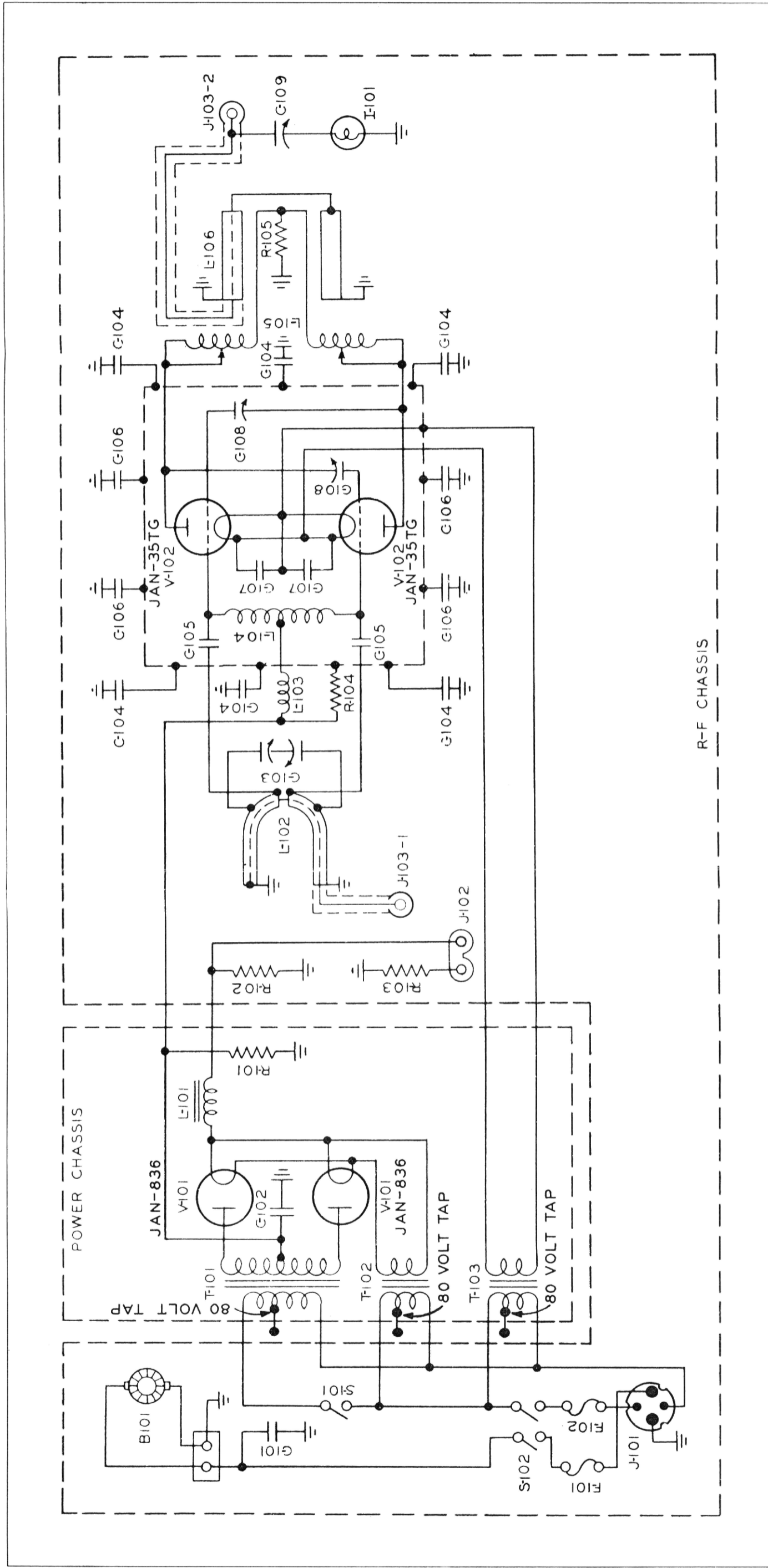
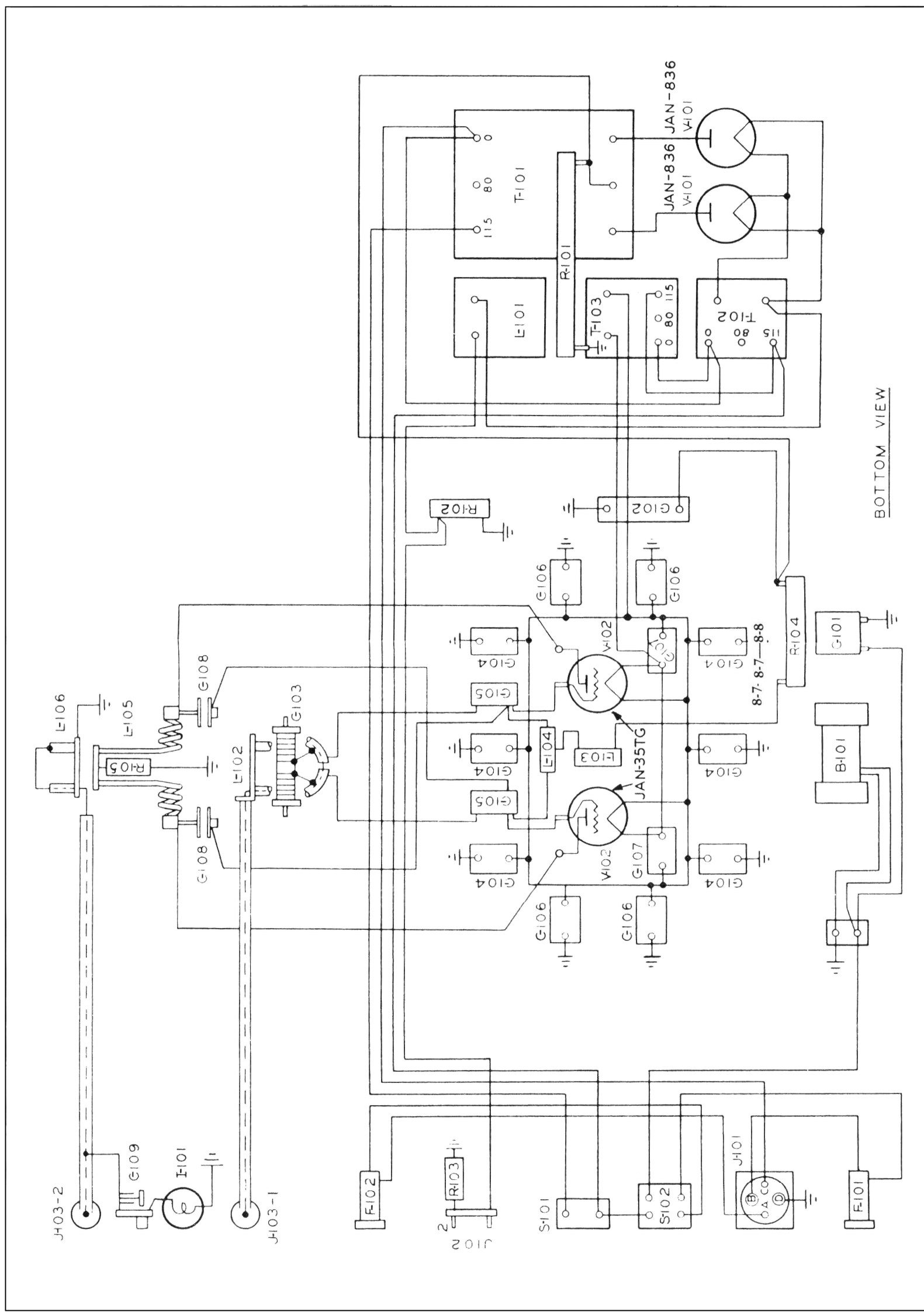


Figure 8-2—Radio Frequency Amplifier—Schematic Diagram.



CIRCUIT CONSTANTS

C-101	Capacitor	1 microfarad
C-102	Capacitor	2 microfarads
C-103	Capacitor	Variable
C-104	Capacitor	0.005 microfarad
C-105	Capacitor	0.0005 microfarad
C-106	Capacitor	0.01 microfarad
C-107	Capacitor	0.005 microfarad
C-109	Capacitor	Variable from 2 to 7 micromicrofarads
F-101	Fuse	1 ampere
F-102	Fuse	10 amperes
I-101	Lamp	6 to 8 volts
L-101	Reactor	2 henries
L-103	Choke	5.5 millihenries
L-104	Choke	4.5 millihenries
R-101	Resistor	100,000 ohms
R-102	Resistor	2.58 ohms
R-103	Resistor	1000 ohms
R-104	Resistor	200 ohms
R-105	Resistor	25 ohms
V-101	Tube	JAN-836
V-102	Tube	JAN-35TG

Figure 8-3—Radio Frequency Amplifier
AM-18/APT—Wiring Diagram.