90 - WATT CW TRANSMITTER

MODEL

720

INSTRUCTION

MANUAL

720-1

ELECTRONIC INSTRUMENT CO. INC.
3300 NORTHERN BLVD., L. I. CITY 1, N. Y.

MODEL 720

90 - WATT CW TRANSMITTER

general description

GENERAL

The new EICO Model 720 is a very "clean" 90 watt CW, 80 through 10 meters bandswitching amateur transmitter. This exceptionally conservative, stable high efficiency electrical design is housed in a modern "low-silhouette" cabinet to permit its use in normal living-room space. Some important design features are: one-knob band switching; one-knob power, tune and operate switch; final amplifier grid drive control without detuning oscillator; oscillator keying for break in operation; a "novice limit" calibration (75 watts) on the meter; matching antennas from 50 to 1000 ohms. External plate modulation terminals permit use as an AM phone transmitter delivering up to 65 watts plate power input with the EICO Model 730 High Level Universal Modulator-Driver.

FEATURES

1. Ideal for seasoned veteran or beginning novice.

2. 6146 final amplifier for full 90 watts cw input.

3. Completely sealed cabinet and careful by-passing and choking of all input and output leads for effective TVI suppression.

4. Protection of final amplifier is provided by a clamper tube circuit, when a loss of excitation exists.

5. One knob band-switching — no coils to change.

6. Final amplifier grid drive control without detuning oscillator.

7. Auxiliary power socket provided.

8. One knob power, tune, and operate switch.

9. Oscillator keying for break-in operation.

10. No shock hazard at key terminals.

SPECIFICATIONS

Power Input: 90 watts cw (novice limit calibration on meter); 65 watts AM-phone with EXT plate modulation.

Output Load Impedance: 50-1000 ohms.

Band Coverage: 80, 40, 20, 15, 11, 10 meters.

Operation: XTAL, EXT, VFO

Tubes: 1-6146 final amplifier; 1- 6CL6 oscillator, 1-6AQ5 clamper; 1 - 6AQ5 buffer - multiplier, 1-GZ34 rectifier.

Power Requirements: 117 volts, 60 cycles AC, 175 watts

Cabinet Size: 15" wide x 6" high x 9" deep.

Weight: 27 lbs.

circuit description

OSCILLATOR: A high transconductance 6CL6 pentode is employed as an electron-coupled Colpitts crystal oscillator. This circuit is noted for its high harmonic output and low crystal heating. Since the oscillatory part of the circuit is isolated from the load side by the screen grid, frequency shift due to plate loading is minimized.

The plate tank circuit consists of a broadly tuned slug coil. It resonates at 40 meters for all bands of operation. The coil acts as a RF choke for 80 meter operation. 80 meter crystals are used for 80 and 40 meter and 40 meter crystals are used for 20, 15, and 10 meters. An external VFO jack is provided which is connected to the grid of the 6CL6 and is selected by a slide switch.

BUFFER MULTIPLIER: A 6AQ5 tube is used as a class A buffer on 80 and 40 meters and a class C multiplier on all other bands. Second, third and fourth harmonics are obtained for operation on the 20, 15 and 10 meter bands. A pi-network is employed in the plate circuit to provide a stable load for the final amplifier. Harmonics of the fundamental operating frequency are greatly attenuated by this type of circuit. The screen voltage of the 6AQ5 is variable by a wire-wound potentiometer to provide drive control of the final stage. By this means, efficient and stable operation of the buffer and final is obtained.

FINAL AMPLIFIER: A 6146 high perveance power pentode is used as a straight-through class C power amplifier. The grid circuit is driven by the pi-network of the buffer stage. This type of coupling helps to prevent parasitics and self-oscillation in the final and also attenuates any high order harmonics that may be present in the grid circuit. The 68 mmf capacitor connected between grid and cathode provides stability for the 6146.

A variable pitch, band-switching, pi-network tank circuit is used to match the final amplifier to various loads between 50 and 1000 ohms approximately. This type of circuit is highly efficient and provides additional harmonic attenuation. A variable 900 mmf capacitor is connected across the output of the pi-network for controlling the degree of loading of the antenna or other load. This tank tunes the 80, 40, 20, 15 and 10 meter bands only.

A 6AQ5 clamper tube is employed to prevent excessive plate current flow if grid drive of the final should fail. It operates by dropping the 6146 screen grid voltage to a low value in the event of such failure.

This tube also is part of the keying circuit and acts as a type of oscillator screen grid regulator when the transmitter is keyed. The transmitter is basically keyed in the oscillator and final cathode circuits, which results in a clean crisp note. Furthermore, there is only about 12 volts across the key terminals at all times since the full B minus potential that is present when cathode circuits are keyed is kept away from the keying terminals. The 6AQ5, in addition to its clamping function, performs this task and thus prevents sparking at the key and also key clicks which result from heavy sparking.

POWER SUPPLY AND CONTROL: The power supply is a full-wave, choke input type providing 600 volts with a high efficienty GZ - 34 indirectly heated rectifier. A swinging choke is used in conjunction with two 40 mf electrolytic capacitors connected in series to provide good regulation under CW conditions. The power for the final plate and screen supply is connected to two terminals on an octal plug so that plate modulation can be applied simply by connecting a suitable modulation source to the terminals. A jumper is normally used for CW operation. 6.3 volts ac is also at the same socket for any accessory. There is 117 volts provided at the octal socket for the antenna change-over relay which is energized only in the XMIT position of the FUNCTION switch.

The four-position ceramic wafer FUNCTION switch is used to control the ac line input, center tap grounding of high voltage winding of the power supply, STANDBY and TRANSMIT pilot lamps, and the screen circuit of the 6146. In the TUNE position, the screen of the 6146 is grounded in order to prevent excessive plate current flow when the grid circuit is being tuned. A full pi line filter is employed at the input of the transmitter to attenuate any harmonics that are present on the AC leads. There is a three position METER switch that switches the meter to the grid of the final or the plate. The center OFF position shorts the meter out.

functions of controls

FUNCTION Switch: Four-position switch providing an OFF position and three mode of operation positions.

OFF — Disconnected from ac line.

STANDBY — Filaments energized B+ supply disabled. STANDBY pilot lit.

TUNE — Filaments energized and B+ supply enabled and applied generally, but withheld from screen of 6146 final amplifier which is grounded to limit plate current to a very low level.

TRANSMIT — Filaments energized, B+ supply enabled and applied to all appropriate points including the 6146 final amplifier screen through its associated dropping resistor. 117VAC line power applied to external relay terminals via pins 2 & 7 of the MODULATOR/EXT. POWER octal socket on the rear chassis apron. TRANSMIT pilot lit.

METER Switch: Three-position switch providing three positions of meter insertion.

GRID — Inserted in grid circuit of 6146 final amplifier.

OFF — Meter shorted.

PLATE — Inserted in cathode circuit of 6146 final amplifier.

GRID DRIVE Control: Wire-wound potentiometer that varies screen grid voltage of the 6AQ5 buffer — multiplier in order to control the grid current of the final stage.

ANTENNA LOADING Control: Variable capacitor in the output pi-network that permits matching of the final amplifier to various antenna load impedances between approximately 50 and 1000 ohms. Functions on all bands.

BAND SELECTOR Switch: Three-section ceramic wafer switch permitting choice of the desired band of operation from 80 to 10 meter. Selects one of five coils in the buffer-multiplier circuit and proper taps and coils in the plate tank circuit of the final amplifier.

PLATE TUNING Control: Variable capacitor in the output pi-network that tunes the final amplifier to resonance.

GRID TUNING Control: Variable capacitor that tunes the buffer-multiplier plate tank circuit to resonance at the desired fundamental or harmonic (second, third, or fourth) frequency.

VFO-XTAL Switch: Slide switch on rear chassis apron that permits choice of either crystal (inserted in front panel crystal socket) or VFO (external) operation of the 6CL6 oscillator stage.

EXT. VFO Input: RCA phono-type receptacle on rear chassis apron for connection of external VFO providing about 10-20 volts RF.

MODULATOR/ACCESSORY Socket: Octal socket on rear chassis apron which may serve a number of purposes. a) modulator input, b) operation of antenna relay, c) power take-off for any VFO not having a power supply, d) emergency power input.

operating instructions

1. From the ground binding post on the rear chassis apron, connect a heavy copper strap to earth ground. A good earth ground connection can be a cold water pipe or an eight to ten foot metal stake driven into the ground.

2. Connect the antenna feed line co-axial cable to the RF output co-axial receptacle on the rear chassis apron. An Amphenol 83-1SP type or equivalent male connector is required for this connection. If a single wire or twin lead is employed, attach a banana plug to the end of the single wire or one conductor of the twin lead and insert it in the center hole of the receptacle. (The remaining conductor of the twin lead should be connected to the adjacent ground binding post.) In areas where interference with TV reception is a difficulty, it is recommended that a low-pass filter and possibly an antenna coupler be inserted between the RF transmitter and the antenna feed line. A short length of co-axial cable should be used to connect the transmitter RF output to the input end of the filter and the antenna feed line co-ax should be connected to the output of the filter. A balanced type of feed line (300Ω, 600Ω, etc.) requires an antenna coupler or balun matching device for proper connection to the transmitter or low-pass filter. (See Fig. 1.) For satisfactory use of a low-pass filter, a low SWR is necessary.

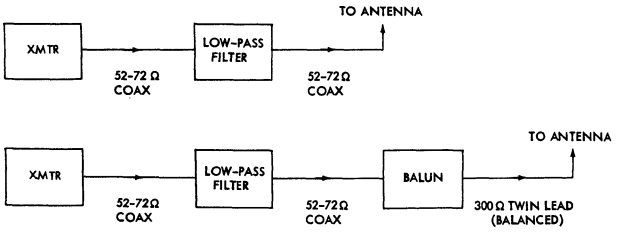


Fig. 1

3. Set controls as follows: FUNCTION switch to STAND-BY, BAND SELECTOR switch to desired band from 80-10 meters, DRIVE control to 50, ANTENNA LOADING control to 0, PLATE TUNING control to 30, GRID TUNING to 30, METER switch to GRID. Set VFO-XTAL switch on rear apron to desired operation. If VFO is used, connect output of VFO to VFO input receptacle on rear apron; if crystal operation is desired, insert proper crystal into CRYSTAL receptacle on front panel. The frequency range of crystals for each band on the possible VFO frequency settings are given in the following chart:

Band	Crystal or VFO (KC)
80	3500-4000
40	7000-7300
20	7000-7175
15	7000-7150
11	6740-6807
10	7000-7425

For CW operation, 80 meter crystals can be used for the 40, 20, and 15 meter bands for improved keying characteristics providing that the GRID TUNING control is set within the range given in the chart. This will eliminate the possibility of tuning to the wrong harmonic.

4. Insert the phone plug from the telegraph key into the KEY jack on the front panel. Set the FUNCTION switch at TUNE. Then close the key terminals and adjust the GRID TUNING control for maximum grid current, not to exceed 3 ma. Use the DRIVE control to limit the grid current peaked by the GRID TUNING control to 3 ma maximum. The following chart gives typical settings of the GRID TUNING control for each band*.

BAND	GRID TUNING control setting
80	10-40
40	20-40
20	20-40
15	30-50 (not 70-90)*
10	20-50 (not 70-90)*

*NOTE: On the 15 and 10 meter bands, two peaks will occur if an 80 meter crystal (or VFO) is used. The larger of the two peaks is the correct one and will occur within the range of settings indicated in the chart. When in doubt use a grid-dip meter or an absorption wavemeter.

5. Set the METER switch to PLATE and the FUNCTION switch to TRANSMIT. Then close the key terminals and adjust the PLATE TUNING control for a minimum current reading (dip). The dip should occur within the following range of settings for each band of operation.

BAND	PLATE TUNING control settings
80	30-70
40	40-70
20	15-30 (not 0-10)*
15	15-30
10	15-30

*When using 80 meter crystal or VFO.

NOTE: Obtain the dip as quickly as possible as the 6146 final amplifier will draw very high plate current when the plate tank is off resonance. The high current, if prolonged, will damage the 6146 tube.

On 80 meters, it may be required to shunt the RF output terminals with additional capacitance (from .0005 to .001 mmf) in order to obtain a good dip with low impedance loads.

6. Turn the ANTENNA LOADING control gradually until the plate current reaches 120 ma. Again adjust the PLATE TUNING control for a minimum current reading (dip). Repeat these two operations until the current reading is at either the NOVICE LIMIT calibration or 160 ma for full power input. These operations can be performed with two hands, one adjusting the PLATE TUNING and the other the ANTENNA LOADING. An increase in the plate current dip indicates antenna loading (power transfer to the load).

7. After the final amplifier is properly loaded, re-set the METER switch to GRID and again adjust the GRID TUNING control for a peak grid current reading. Then use the DRIVE control to set the grid current to the proper value for the type of operation. For CW operation, the proper maximum grid current is 2 ma. For operation with plate modulation, 2.5 to 3 ma maximum grid current is necessary.

accessory connections

The octal socket on the rear chassis apron is mainly intended to provide 117 VAC line power to an antenna change-over relay (pins 2 & 7) applied at the TRANSMIT position of the FUNCTION switch only, and to permit connection of an external modulator (pins 4 & 6) such as the EICO Model 730. It also permits power take-off for accessory equipment as follows: 600 VDC at up to 15 ma between pins 3 and 8 (gnd); 6.3 VAC at up to 600 ma between pins 1 and 8 (gnd). In case of absence or failure of AC power line, emergency power to operate the transmitter may be fed in through this socket as follows: 500-600 VDC at 170 ma between pins 3 and 8 (gnd) and 6.3 VDC at 3A between pins 2 and 8 (gnd). In all cases, pins 4 and 6 must be shorted together if a modulator is not connected to these pins, as otherwise the transmitter will not operate. An octal plug must always be inserted in this socket connected appropriately for the desired type of operation. See Figures 2 & 3 for details.

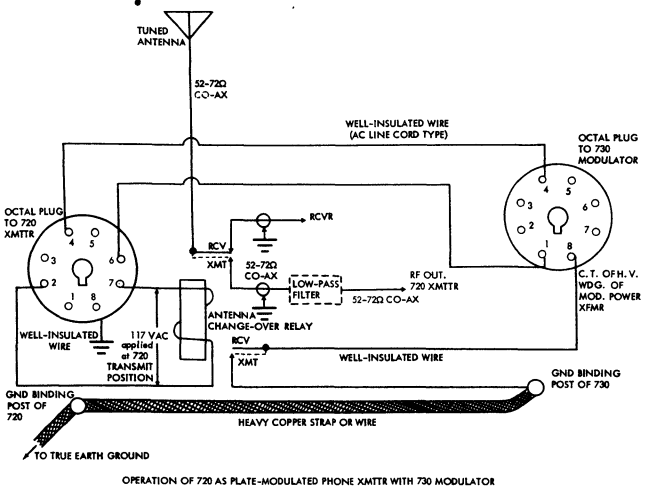


Fig. 2

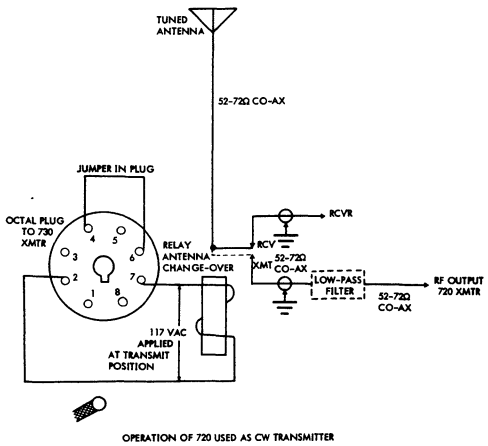


Fig. 3

GENERAL INSTRUCTIONS

The section of the manual beginning with this page is the CONSTRUCTION section. All pages in this section have page numbers followed by "C" (1C, 2C, etc.). The INSTRUCTION section resumes on the pages following the CONSTRUCTION section. Note that the CONSTRUCTION section is located centrally in the book and may be removed without desrupting the INSTRUCTION section that both precedes it and follows it.

Care taken in the construction of this instrument will reward the constructor with many years of satisfactory service and greater confidence in his instrument. We urge you to not rush the construction, but to take all the time necessary for proper assembly and wiring.

Furthermore, we urge strongly that you follow the wire and parts layout shown in the pictorial diagrams as closely as possible. Very often wires are placed as shown for a good reason, and certainly the appearance of the completed instrument will be improved and the difficulty of finding a wiring error will be reduced by the following the wire and parts layout shown.

UNPACKING THE KIT: Unpack the kit carefully and check each part against the parts list including those parts that are mounted to the chassis. If you have trouble identifying any parts refer to the pictorial diagrams or the color code chart. The color code of each components is printed each time the component is referred to in the book.

You will find that the value of a component will vary within the allowable circuit tolerance. For example, the 4.7KΩ, ±10% resistor may measure anywhere between 4.2KΩ and 5.2KΩ. Tolerances on paper capacitors are substantially greater, and the tolerance for electrolytics is usually +100% and -50%.

CONSTRUCTION HINTS: USE THE BEST GRADE OF ROSIN CORE SOLDER ONLY, preferably one containing the new activated fluxes such as Kester "Resin-Five", Ersin "Multicore" or similar types. UNDER NO CIRCUMSTANCES USE ACID CORE SOLDER OR ACID FLUX since acid flux can cause serious corrosion. Before soldering make a certain of a good mechanical connection. Use a clean, freshly tinned soldering iron, no smaller than 100 watts, and place the solder on the joint (not on the iron) so that the solder is melted by the heat from the joint itself. Do not remove the soldering iron until the solder flows and check to see that the resulting joint is smooth and shiny when the solder has cooled. There are two extremes to be avoided; too little heat and too much heat. If too little heat is supplied, the joint will appear pitted and grey, indicating a rosin joint which is unsatisfactory. On the other hand, if too much heat is applied to a joint, the parts connected to it may either change value, loose thier protective coating, or break down. If you are soldering close to a part, hold the lead between the part and the joint being soldered with the tip of a pair of longnose pliers. The pliers will conduct the heat away and prevent the component from being unduly overheated. If for any reason it is necessary to resolder a joint, be sure to use new solder.

It should also be noted that the leads on resistors, capacitors, and transformers are often longer than required. These leads should be trimmed to the proper lengths. The recommended lengths, as well as the required lengths of all wires, are indicated in the wiring steps.

BASIC TOOLS REQUIRED: These basic tools are required for the construction of the amplifier.

1. Screwdriver - 3/16" to 1/4" blade
2. Screwdriver - 1/8" blade
3. Longnose pliers - 5 or 6"
4. Diagonal cutters
5. Soldering iron (100 watts), or soldergun, or pencil iron (35 watts)
6. Gas pliers
7. High quality rosin or equivalent synthetic flux core solder. Do not use acid or paste flux under any circumstances.

A set of spintites and a wire stripper are also very useful supplementary tools.

PARTS IDENTIFICATION: Please note that many of the resistors and capacitors for which color coding is given, may not be color coded, but have their values are ratings printed. To aid in rapid identification 10% and 20% resistors are almost always color coded, while all 1%, 5% resistors and all capacitors usually have their values printed. Printed numbers may appear with the letter "K", indicating that the number is to be multiplied by 1000. The letter "M" indicates a multiplication by 1,000,000. "mf" indicates microfarads or 1/1,000,000 farad. "mmf" indicates micromicrofarads or 1/1,000,000 of a microfarad. The alternate way of writing capacitor values are indicated in the construction book when the component is used. Please note the following examples of relationship between units.

1,000,000 micro-microfarads (mmf) = 1 microfarad (mf)
10,000 mmf = 10K mmf = .01 mf
1,000,000 ohms (Ω) = 1000 kilohms = 1 megohm (MΩ)
2,700,000Ω = 2,700KΩ = 2.7MΩ
470,000Ω = 470KΩ = 0.47MΩ
2,700Ω = 2.7KΩ

CONSTRUCTION PROCEDURE: The complete step-by-step mounting and wiring procedure follows. To keep the drawings uncrowded, unnecessary repetition of mounting or wiring details may be omitted. Note: The abbreviation (C) means connect but do not solder (until other leads have been connected). The abbreviation (S) means connect and solder. The number after "(S)" indicates the number of connections to be soldered to the terminal. You can also check if you have made the proper number of connections to the terminal.

Bend the ground lug tabs on the sockets toward the chassis to prevent accidental shorting to the socket pins.

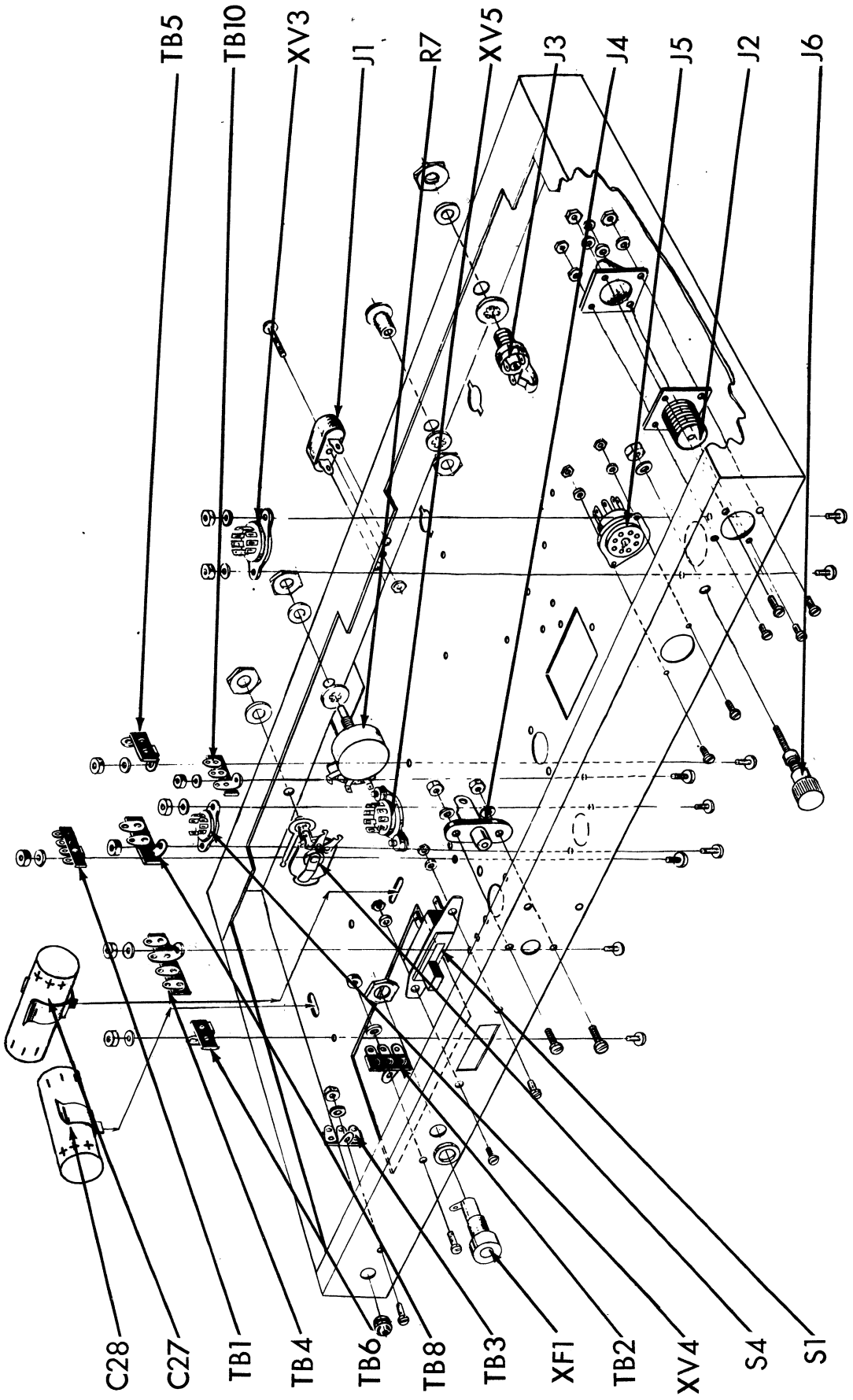

TB5
TB10
XV3
J1
R7
XV5
J3
J4
J5
J2
J6
C28
C27
TB1
TB4
TB6
TB8
TB3
XF1
TB2
XV4
S4
S1

Fig. 1

BELOW CHASSIS MOUNTING

In all the mounting steps, below and above the chassis write down the component symbol on the chassis next to the component after the component is mounted. For example, next to the two post with ground terminal strip, TB2, mark a TB2 on the chassis with a dark crayon. It will then be easier to identify each part when wiring.
RF chokes and fixed coils are identified either by stock number, size and shape of coil or by a color dot stamped on body of coil. Only one of these methods of identification is usually given for each inductor.

When cutting leads to size, on components or single wires, strip the insulation off for 1/4" from the end of each lead.

1. ( ) Fig. 1. Mount the two post with ground terminal strip, TB3, as shown. Use one #6-32 x 1/4 screw, one #6 lockwasher and one #6-32 hex nut.

2. ( ) Fig. 1. Push a 3/8" rubber grommet into the hole next to TB3.

3. ( ) Fig. 1. Mount the two post with ground terminal strip, TB2, as shown. Use one #6-32 x 1/4 screw, one #6 lockwasher and one #6-32 hex nut.

4. ( ) Fig. 1. Mount the single pole single throw slide switch, S1, as shown. See Fig. 5 for orientation. Use two #4-40 x 1/4 screws, two #4 lockwashers and two #4-40 x 1/4 hex nuts.

5. ( ) Fig. 1. Mount RCA phono jack, J4, as shown. See Fig. 4 for orientation. Use two #4-40 x 1/4 screws, two #4 lockwashers and two #4-40 x 1/4 hex nuts.

6. ( ) Fig. 1. Mount the octal socket, J5, as shown. Note direction of key at center of socket. Use two #6-32 x 1/4 screws, two #6 lockwashers and two #6-32 hex nuts.

7. ( ) Fig. 1. Mount binding post, J6, as shown. Do not use any insulating washers. Use one #8 lockwasher and one #8 hex nut.

8. ( ) Fig. 1. Mount the jack, J2, as shown. The cover for the jack (shield cup) and the jack are both mounted from the inside of the chassis. Use four #4-40 x 1/4 screws, four #4 lockwashers and four #4-40 x 1/4 hex nuts. Do not tighten the nuts as yet.

9. ( ) Fig. 1. The front panel is held against the front apron with the same 3/8 nuts used for mounting the switches, pots, capacitors, and jacks. This is accomplished by first placing the panel against the front apron. Next, mount the three position switch, S4, as shown. Use a pot grounding lug under the switch, and orient as shown. Mount with one 3/8 flatwasher and one #3/8 hex nut. Note that the 3/8 flat washer and 3/8 hex nut are over the front panel. Break off locating lug on front metal frame of switch by bending it back and forth several times.

10. ( ) Fig. 1. Similar to the above, mount the pot, R7, as shown. Use one 3/8 lockwasher, one 3/8 flatwasher and one 3/8 hex nut.

11. ( ) Fig. 1. Mount the crystal holder jack, J1, as shown. Use a #4-40 x 3/4 screw and one #4-40 x 3/16 hex nut.

12. ( ) Fig. 1. In the hole next to J1, in the front apron, mount a 3/8 bushing. Use a 3/8 lockwasher and a 3/8 hex nut. Note that a 5" shaft will be pushed through this bushing.

13. ( ) Fig. 1. Mount the jack, J3, as shown. Use one 3/8 lockwasher, one 3/8 flatwasher and one 3/8 hex nut. J3 is to be mounted at an angle with the chassis, so that it will not short against the chassis when a plug is inserted.

14. ( ) Fig. 1. Mount the octal tube sockets, XV3 and XV5, as shown. Use two #6-32 x 1/4 screw, two #6 lockwashers and two #6-32 hex nuts. Note mounting direction in Fig. 4.

15. ( ) Fig. 1. Mount the 7 pin miniature tube socket, XV4, as shown. Use two #4-40 x 1/4 screws, one #4 lockwasher and two #4-40 x 1/4 hex nuts. Under one nut, mount a two post right terminal strip, TB8. Note orientation in Fig. 4.

16. ( ) Fig. 1. Mount the one post right terminal strip, TB6, as shown. Use one #6-32 x 1/4 screw, one #6 lockwasher and one #6-32 hex nut.

17. ( ) Fig. 1. Mount the two brackets for the 40 mfd, 450 volts electrolytic capacitors, C27 and C28, as shown. These brackets snap in through the elongated holes. Push the capacitors into the brackets noting the polarity.

18. ( ) Fig. 1. Mount the three post, two left with ground terminal strip, TB1; three post two left with ground terminal, TB4; one post left terminal strip, TB5; and two post right with ground terminal strip, TB10, as shown. Use one #6-32 x 1/4 screw, one #6-32 lockwasher and one #6-32 hex nut as shown.

19. ( ) Fig. 1. Mount fuseholder, XF1, as shown. Use the small rubber washer under the head of the fuseholder outside the chassis and the fuseholder nut inside the chassis. Do not tighten this nut too much or fuseholder will crack.

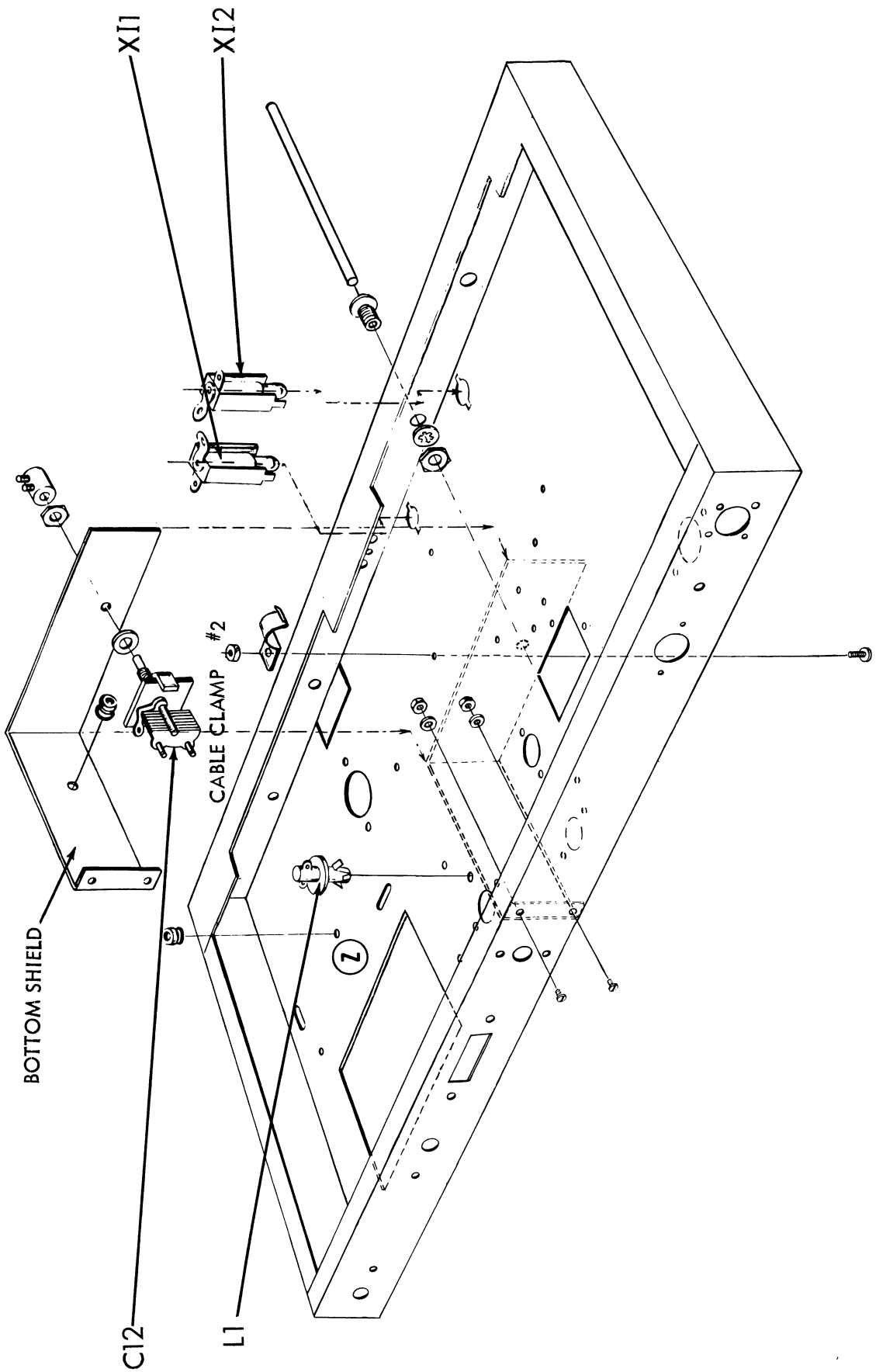


Fig. 1A

1. ( ) Fig. 1A. Mount one cable clamp facing away from TB5, as shown. Use one #6-32 x 1/4 screw, one #6 lockwasher and one #6-32 hex nut. See Fig. 5.

2. ( ) Fig. 1A. Snap in the pi choke, L1, Stock #36014, as shown. Note direction in Fig. 6. Push the metal coil form bracket into the hole until the two small slips catch on top of the chassis.

3. ( ) Fig. 1A. Push the two #47 bulbs into the sockets, X11 and X12. Push these sockets with the bulbs into the mounting holes so that the bulbs extend to the top of the chassis. The sockets are held in place by the spring action of the socket legs. The clips at the end of each leg fits through the hole at the top of the chassis.

4. ( ) Fig. 1A. Mount the bottom shield in the chassis by pushing the two tabs through the small rectangular holes in the bottom of the chassis. Twist these tabs somewhat more than quarter of a turn. Do not twist too much or they will shear off. Secure the shield to the rear of the chassis with two #6-32 x 1/4 screws, two #6 lockwashers and two #6-32 hex nuts. Do not tighten nuts yet.

5. ( ) Fig. 1A. Remove the nut and all the washers from the bushing on the smallest variable capacitor, C12, Stock #29009. Next, mount the capacitor as shown. Use the flatwasher and the hex nut supplied on the capacitor. Do not tighten nut yet.

6. ( ) Fig. 1A. Attach one side of the straight brass coupling with two set screws to the shaft on the condenser. There should be about 1/4" of the shaft of the condenser showing between the bushing on the capacitor and the edge of the brass coupling. Tighten the set screw on the capacitor shaft. Next, push the 5" shaft (mentioned in step 12, Fig. 1) through the bushing in the front panel of the chassis and into the remaining side of the straight brass coupling. Between 3/8" and 1/2" of shaft should stick out from the front of the panel. Adjust the shield and capacitor so that the shaft goes through the center of the bushing in the front panel. With the shaft perpendicular to the front panel, tighten the screws holding the bottom shield and the nut holding the variable capacitor. Also, tighten the remaining brass coupling set screw over this shaft.

7. ( ) Fig. 1A. Push a 1/4" rubber grommet into the side of the bottom shield.

8. ( ) Fig. 1A. Push a 1/4" rubber grommet into the hole "Z" near capacitors C27 and C28.

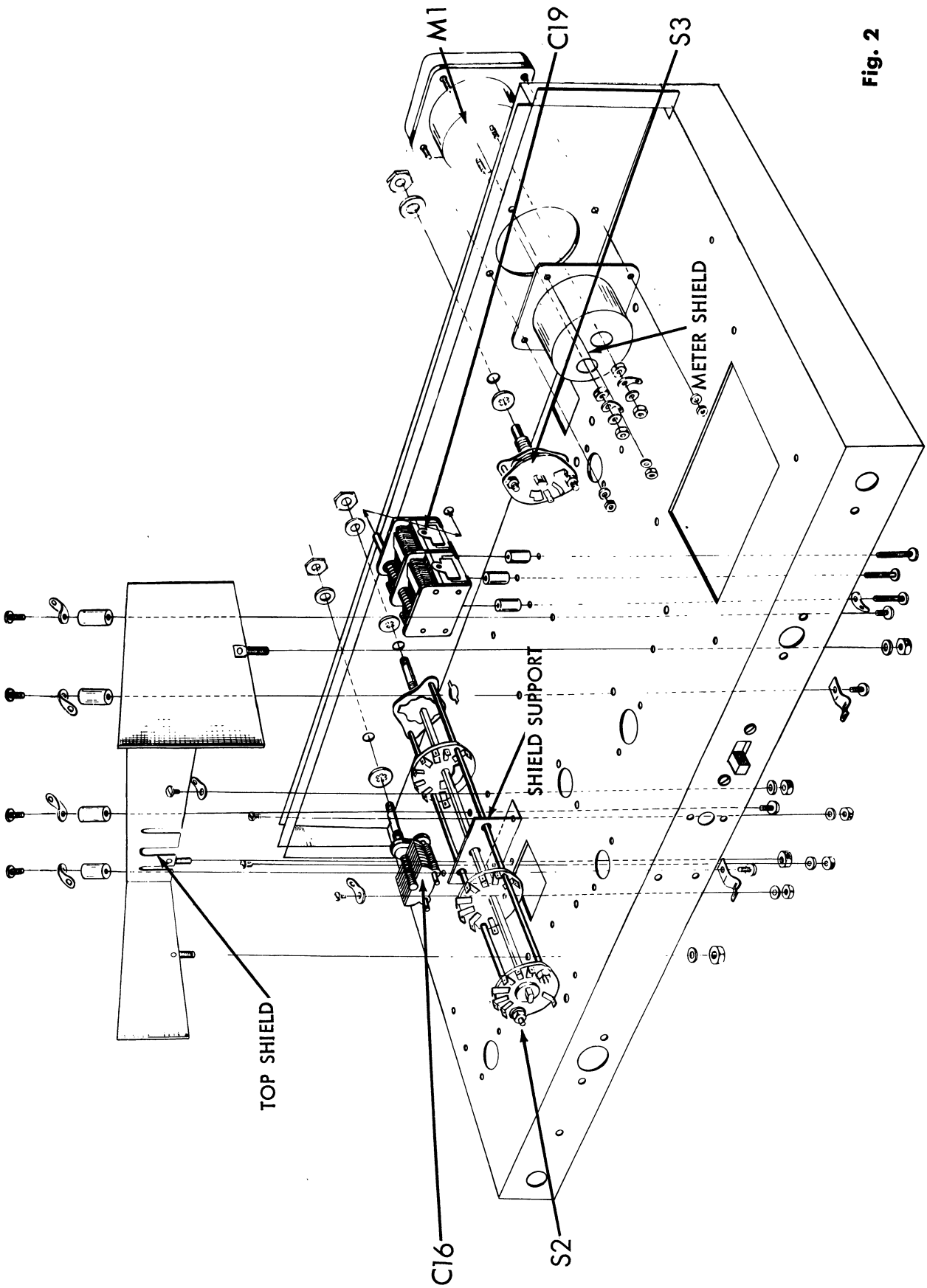


Fig. 2

TOP OF CHASSIS MOUNTING

1. (✓) Fig 2. Mount the meter from the front of the panel as shown. Over the rear of the meter, place the meter shield behind the panel. Place four #4 lockwashers over the four mounting screws. Secure the meter to the panel with four #4 brass hex nuts found in the carton containing the meter. On each meter terminal, use one #8 brass flat washer, one #8 ground lug, a second #8 brass flatwasher and the #8 brass hex nut. The hardware for both lugs are found in the box containing the meter.

2. (✓) Fig. 2. Turn the single wafer ceramic switch, S3, to its maximum counter clockwise position. Mount as shown, using one #3/8 lockwasher, one #3/8 flatwasher and one #3/8 hex nut.

3. (✓) Fig. 2. Mount the two gang variable capacitor, C19, as shown. First push the three #6-32 x 1 1/8 screws through the three holes from the bottom of the chassis below the capacitor. Under the head of one of the screws, below the chassis, mount a #6 ground lug. Hold all these screws in place by temporiarily taping each with a separate piece of scotch electrical, masking or adhesive tape to the bottom of the chassis. Place a 13/16" metal cylindrical standoff over each of these screws from the top of the chassis. Push the capacitor shaft through the hole in the front panel of the chassis. Remove the tape from one of the screws, and with a screwdriver, screw it into the appropriate threaded hole in the capacitor. Do not tighten this screw. Repeat with the other two mounting screws. When capacitor is in place, tighten all screws.

4. (✓) Fig. 2. Mount the three wafer switch, S2, as shown. Use one 3/8 lockwasher, one 3/8 flatwasher and one 3/8 hex nut. Mount the shield support on S2 using two #6-32 x 1/4 screws, two #6 lockwashers and two #6-32 hex nuts.

5. (✓) Fig. 2. Mount the variable capacitor, C16, Stock# 29011, as shown. Use one 3/8 lockwasher, one 3/8 flatwasher and one 3/8 hex nut.

6. (✓) Fig. 2. Behind the two variable capacitors, on either side of the switch, S2, you will find a row of 5 unevenly spaced, 5/32" holes, running across the chassis. In the middle hole mount a #6 ground lug. Use one #6-32 x 1/4 screw, and one #6 hex nut.

7. (✓) Fig. 2. In the four remaining holes mentioned in step 6, mount four 1" ceramic insulators, using a #8-32 x 3/8 screw from the bottom of the chassis. DO NOT tighten too much or ceramic will crack. Place a metal cable clamp under each one of two of the screws as shown below the chassis. On the top of each of these insulators, mount a #8 ground lug with a #8-32 x 3/8 screw. DO NOT tighten too much or ceramic will crack. (Note direction of lugs in Fig. 3.)

NOTE: Top shield shown in fig. 2 will be mounted later.

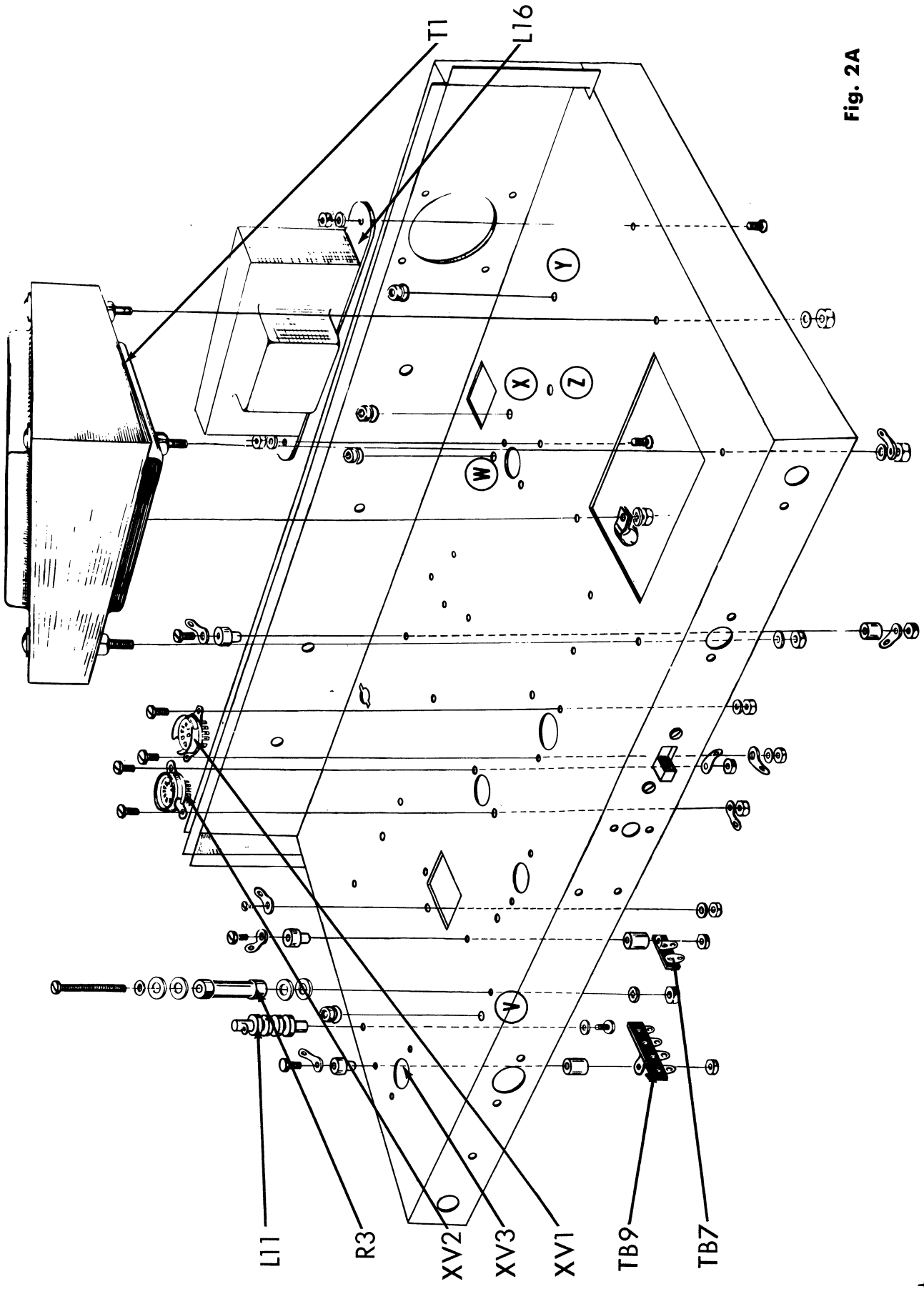


Fig. 2A

TOP OF CHASSIS MOUNTING

1. (✓) Fig. 2A. On choke, L16, cut one lead to 4" and the second lead to 6". Push both leads through the grommet in hole "Z". Mount the choke using two #8-32 x 3/8 screws, two #8 lockwashers and two #8-32 hex nuts. It may be necessary to remove C28 temporarily (under the chassis) to tighten the nut.

2. (✓) Fig. 2A. On the power transformer, T1, cut the white lead to 1 1/2" and the adjacent green lead to 2 1/2". Cut the second green lead to 3 1/2" and the black lead closest to the white to 7". Cut the remaining black lead to 3". Cut both yellow leads to 7 1/2" and both red leads to 5 1/2". Mount the transformer with the red and yellow leads nearest C27, below the chassis. Use four #8-32 lockwashers and four #8-32 hex nuts. Under one of the lockwashers, mount a #8 ground lug. Under a second lockwasher, mount a plastic cable clamp as shown. Do not tighten the nut holding this clamp as yet.

3. (✓) Fig. 2A. The small ceramic insulators consists of two sections. There is first a larger section with the outside diameter of 1/2". The second section is smaller, consisting of a larger diameter section of 1/2" and a smaller diameter section of 5/16". This smaller diameter section fits through the hole in the chassis.
Next to the tube socket, XV3, push the thinner part of a small ceramic insulator from the top through the hole in the chassis. Place the larger section over the thinner part of the smaller section, from the bottom of the chassis. Secure this insulator to the chassis with a #6-32 x 3/4 screw and one #6-32 hex nut. Under the screw head, mount a #6 ground lug. Under the hex nut, mount the three post, two right with ground terminal strip, TB9.

4. (✓) Fig. 2A. Similar to the above, behind the rectangular hole below S2, push the thinner part of a small ceramic insulator from the top through the hole in the chassis. Place the larger section over the thinner part of the smaller section, from the bottom of the chassis. Secure this insulation with a #6-32 x 3/4 screw and a #6 hex nut. Under the screw head, mount a #6 ground lug. Under the hex nut, mount a one post right with ground terminal strip, TB7.

5. (✓) Fig. 2A. Similar to the above, next to C19 and behind XI1, push the thinner part of a small ceramic insulator from the top through the hole in the chassis. Place the larger section over the thinner part of the smaller section, from the bottom of the chassis. Secure this insulator with a #6-32 x 3/4 screw and a #6-32 hex nut. Under the screw head mount one #6 ground lug. Under the hex nut mount a second #6 ground lug.

6. (✓) Fig. 2A. Mount the 7500Ω, 20 watt wire-wound resistor, R3, using a #6-32 x 2 1/2 screw thru the top and secure to the chassis with a #6 lockwasher and a #6-32 hex nut. Between the head of the screw and the top of the resistor there are three washers; a #6 flat metal washer, a #6 fibre shoulder washer and a #12 fibre shoulder washer in that order. Please note that the shoulder on the #12 washer fits into the resistor and the shoulder on the #6 washer fits into the hole in the #12 washer. Between the resistor and the chassis, there are two washers, a #12 fibre shoulder washer and a #6 fibre shoulder washer in that order.
(Note direction of mounting in Fig. 3.)

7. (✓) Fig. 2A. Push a 1/4" rubber grommet into hole "V" next to the resistor, R3.

8. (✓) Fig. 2A. Mount the seven pin miniature tube socket, XV2, with shield support as shown. Use two #4-40 x 1/4 screws, two #4 ground lugs and two #4-40 x 1/4 hex nuts. Note direction of mounting in Fig. 4.

9. (✓) Fig. 2A. Mount the nine pin miniature tube socket with shield support XV1, as shown. Use two #4-40 x 1/4 screws, one #4 lockwasher, one #4 ground lug and two #4-40 hex nuts.

10. (✓) Fig. 2A. Mount the four pi choke, L11, as shown. Use a #6-32 x 1/4 screw, and a #6 lockwasher. Do not tighten too much or ceramic will crack.

11. (✓) Fig. 2A. Push a 1/4" rubber grommet in holes "W", "X" and "Y".

12. (✓) Fig. 2A. Mount a #6 ground lug in the small hole adjacent to the rectangular hole below S2. Use one #6-32 x 1/4 screw, one #6 lockwasher and one #6 hex nut.

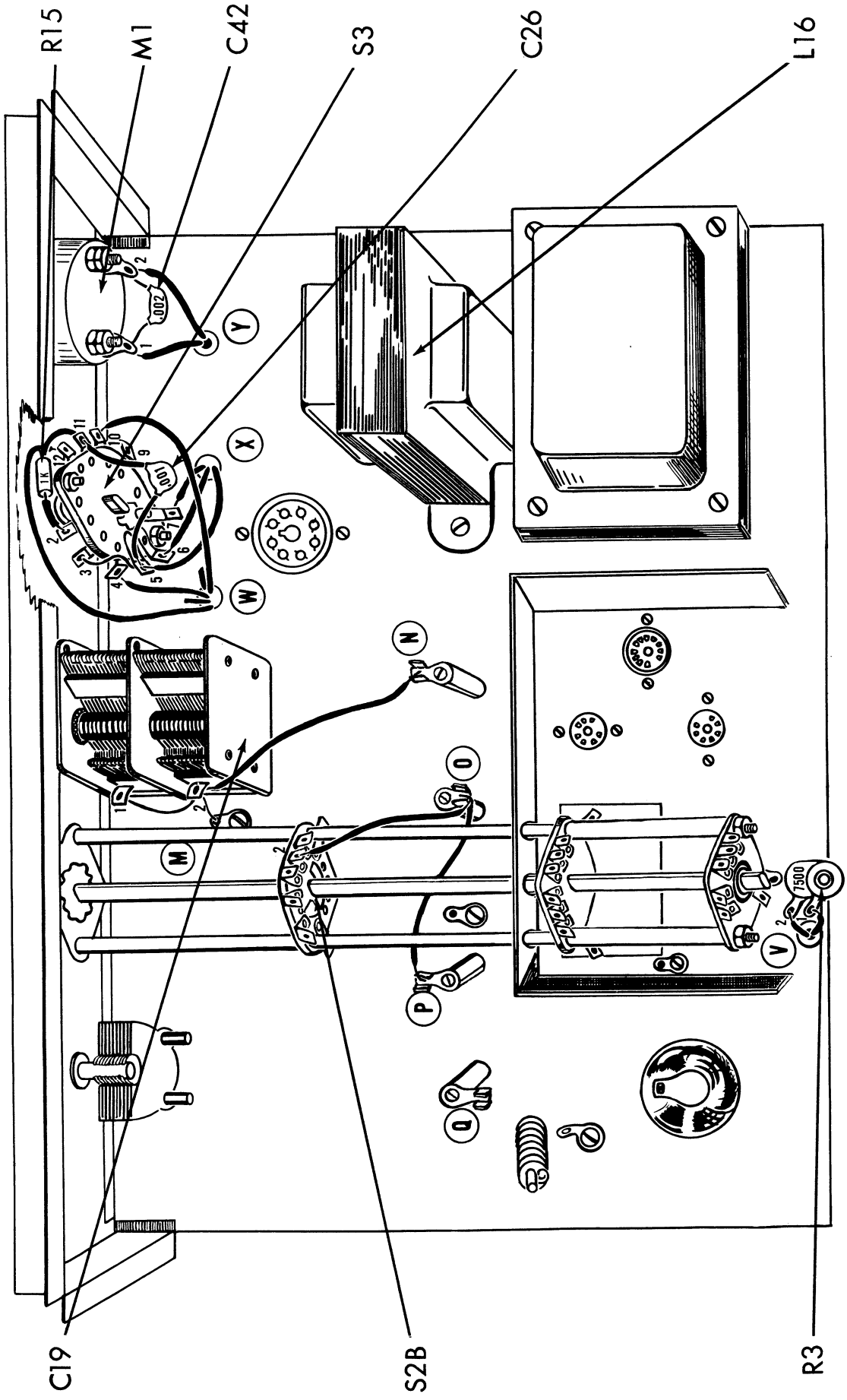


Fig. 3

PREWIRING TOP OF CHASSIS

NOTE: Rotary switch pins are identified by four symbols. The first symbol is always an "S", indicating switch. The next symbol is a number, indicating which switch is referred to — such as S3 refers to switch #3 in the transmitter. The letter after the number, indicates the side of the wafer. Thus S3B indicates the second side of the wafer of switch #3. The number after the hyphen indicates the number of the lug. S3B-7 means the lug appearing in the 7th hole, on the rear wafer of switch #3. If there were a second wafer on the switch, the front side would be designated by S3C and the rear by S3D. On the third wafer the front side would be indicated by S3E and the rear by S3F, etc.

1. (✓) Fig. 3. Connect a 5" piece of red wire to meter lug M1-1 (C) and a 5" piece of black wire to M1-2 (C). Push both leads through hole "Y" in the chassis.

2. (✓) Fig. 3. Cut both leads on a .002 mfd - 1000 V (2K or 2000 mmf) disc capacitor, C42, to 3/4". Connect from M1-1 (S2) to M1-2 (S2).

3. (✓) Fig. 3. Connect one end of a 18" piece of violet wire to S3A-12 (S1). Push the other end of the wire through hole "W" in the chassis.

4. (✓) Fig. 3. Connect one end of an 11" piece of green wire to S3A-4 (S1). Push the other end of the wire through hole "W" in the chassis.

5. (✓) Fig. 3. Connect one end of a 9" piece of blue wire to S3A-10 (S1). Push the other end of the wire through hole "W" in the chassis.

6. (✓) Fig. 3. Connect one end of a 4" piece of yellow wire to S3B-5 (C). Push the other end of the wire through hole "X" in the chassis.

7. (✓) Fig. 3. Connect one end of a 17" piece of orange wire to S3B-7 (S1). Push the other end of the wire through hole "X" in the chassis.

8. (✓) Fig. 3. Connect one end of a 20" piece of brown wire to S3B-6 (S1). Push the other end of the wire through hole "X" in the chassis.

9. (✓) Fig. 3. Connect a 3 1/2" red lead to the top of the 7500 ohm, 20 watt resistor, R3-1 (S1) and a 3 1/2" orange lead to the bottom of the resistor, R3-2 (S1). Push both leads through hole "V" in the chassis.

10. (✓) Fig. 3. Cut both leads on a 1KΩ (brown, black, red) resistor, R15, to 3/4". Cover both leads with a 1/2" piece of spaghetti. Connect from S3A-11 (C) to S3A-2 (C).

11. (✓) Fig. 3. Connect a 1 1/2" piece of bare wire covered with a 1" piece of spaghetti from S3A-3 (S1) to S3B-5 (C). (Unless otherwise specified - bare wire means thin bare wire).

12. (✓) Fig. 3. Cut both leads on a .001 mfd - 2000V (1K or 1000 mmf) disc capacitor, C26, to 1 1/4". Cover both leads with a 1" piece of spaghetti. Connect from S3B-5 (S3) to S3A-11 (S2).

13. (✓) Fig. 3. Connect a 1 1/2" piece of the heavy bare wire from C19-1 (S1) to C19-2 (C).

14. (✓) Fig. 3. Connect a 1 1/2" piece of the heavy bare wire from C19-2 (C) to insulated lug "M" (S1).

15. (✓) Fig. 3. Connect a 4" piece of the heavy bare wire from the lug "N" (C) (closest to L16) to C19-2 (C). Cover the wire with a 4" piece of spaghetti.

16. (✓) Fig. 3. Connect a 2 1/2" piece of the heavy bare wire from lug "O" (C) to S2B-2 (S1). Cover the wire with a 2" piece of spaghetti.

17. (✓) Fig. 3. Cover a 3" piece of heavy bare wire with a 2 1/2" piece of spaghetti. Connect from lug "O" (C) to lug "P" (C).

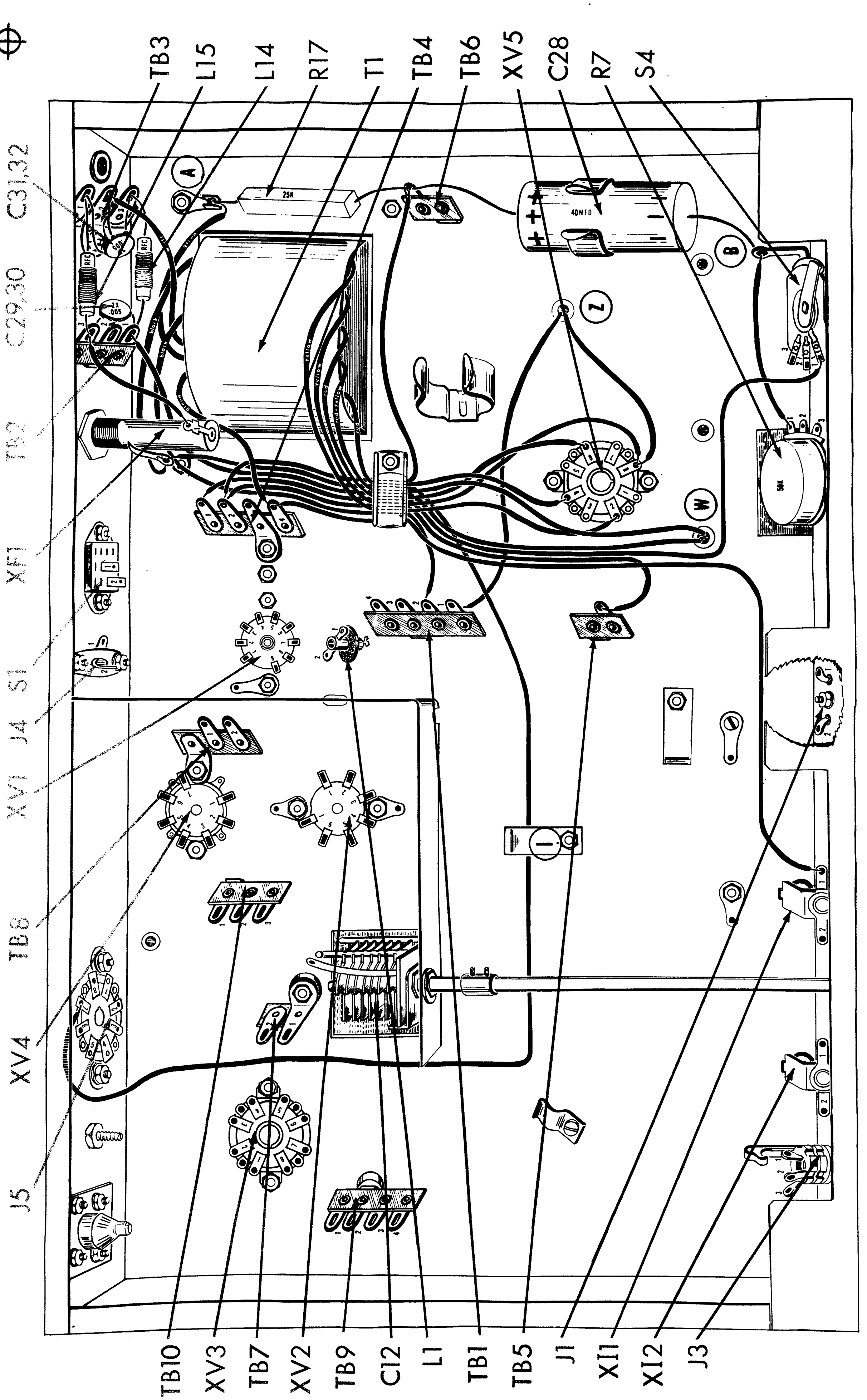

TB3
L15
L14
R17
T1
TB4
TB6
XV5
C28
R7
S4
C31,32
C29,30
TB2
XF1
S1
J4
XV1
TB8
XV4
J5
TB10
XV3
TB7
XV2
TB9
C12
L1
TB1
TB5
J1
XI1
XI2
J3
25K
40MFD
50K
A
B
Z
W

Fig. 4

1. (✓) Fig. 4. Connect the shorter of the two leads from hole "Z" to XV5-8 (C) and the longer lead to TB1-1 (C).

2. (✓) Fig. 4. Cut all leads on the two dual .005 mfd (5K or 5000 mmf) disc capacitors, C31, C32 and C29, C30, to 5/8". Cover each lead with a 3/8" piece of spaghetti. Connect the center lead of one dual capacitor to TB2-2 (S1) and the center lead of the second dual capacitor to TB3-2 (C). On the former capacitor, connect one lead to TB2-1 (C) and the remaining lead to TB2-3 (C). On the second capacitor, connect one end lead to TB3-1 (C) and the remaining end lead to TB3-3 (C).

3. (✓) Fig. 4. The two RF chokes, L14, L15, are about 1" in length with leads emerging from the ends (axial leads). Cut all axial leads (the two leads on each choke to 3/4". Connect one choke from TB2-1 (C) to TB3-3 (C). Connect the second choke from TB2-3 (C) to TB3-1 (C).

4. ( ) Fig. 4. From the power transformer, T1, connect the shorter green lead to ground lug "A" (C).

5. (✓) Fig. 4. From the power transformer, T1, connect the shorter black lead to XF1-2 (C).

6. (✓) Fig. 4. From the power transformer, T1, connect the white lead to TB3-2 (S2).

7. (✓) Fig. 4. Connect one end of a 13" piece of black wire to TB2-1 (S3). Run the other end of this wire through the plastic cable clamp and along the chassis, as shown. Push this end through hole "W".

8. (✓) Fig. 4. Connect a 1 1/2" piece of black wire from TB2-3 (S3) to XF1-1 (S1).

9. (✓) Fig. 4. Connect one end of a 20" piece of grey wire to XF1-2 (S2). Run the other end of this wire along the chassis, through the plastic cable clamp. Bend the wire at a right angle and run it under metal cable clamp 1. Bend the wire again at a right angle and run it along the chassis to J5-7 (C).

10. (✓) Fig. 4. From the power transformer, T1, run the remaining black lead through the plastic cable clamp and connect to TB1-2 (C).

11. (✓) Fig. 4. Connect one end of a 7" piece of red wire to TB4-2 (C). Run the other end of the wire along the chassis, as shown, through the plastic cable clamp. Connect this end to TB5 (C).

12. (✓) Fig. 4. Connect one end of a 11" piece of green wire to TB4-4 (C). Run the other end of this wire through the plastic cable clamp along the chassis as shown. Bend the wire at a right angle near the front apron of the chassis. Connect this end to XI1-1 (C).

13. (✓) Fig. 4. Connect one end of a 13" piece of brown wire to TB4-1 (C). Run the other end of this wire through the plastic cable clamp along the chassis as shown. Bend the wire at a right angle near the front apron of the chassis. Connect this end to S4B-1 (C).

14. (✓) Fig. 4. Connect one end of a 9" piece of blue wire to TB4-2 (C). Run the other end of this wire through the plastic cable clamp along the chassis as shown. Connect this end to TB6 (C).

15. (✓) Fig. 4. Connect the remaining green lead from power transformer, T1, to TB4-4 (C).

16. (✓) Fig. 4. Push all the remaining leads from the power transformer, T1, through the plastic cable clamp. Tighten the nut holding the cable clamp to the chassis. (This is one of the four mounting nuts for the power transformer.) Running these transformer leads along the chassis as shown, connect one red lead to XV5-4 (S1), the second red lead to XV5-6 (S1), one yellow lead to XV5-2 (S1) and the second yellow lead to XV5-8 (S2). Push the red-yellow lead through hole "W" to the top of the chassis.

17. (✓) Fig. 4. Cut both leads on a 25K, 10 watt, wire-wound resistor, R17, to 1 1/4". Connect from TB6 (C) to ground lug "A" (S2).

18. (✓) Fig. 4. Cut both leads on the 40 mfd, 450 V, electrolytic capacitor, C28, to 2". Connect the positive (+) lead to TB6 (C) and the negative (-) lead to pot grounding lug "B" (C) on S4.

19. (✓) Fig. 4. Connect a 3 1/2" piece of black wire from pot grounding lug "B" (S2) on S4 to R7-1 (C).

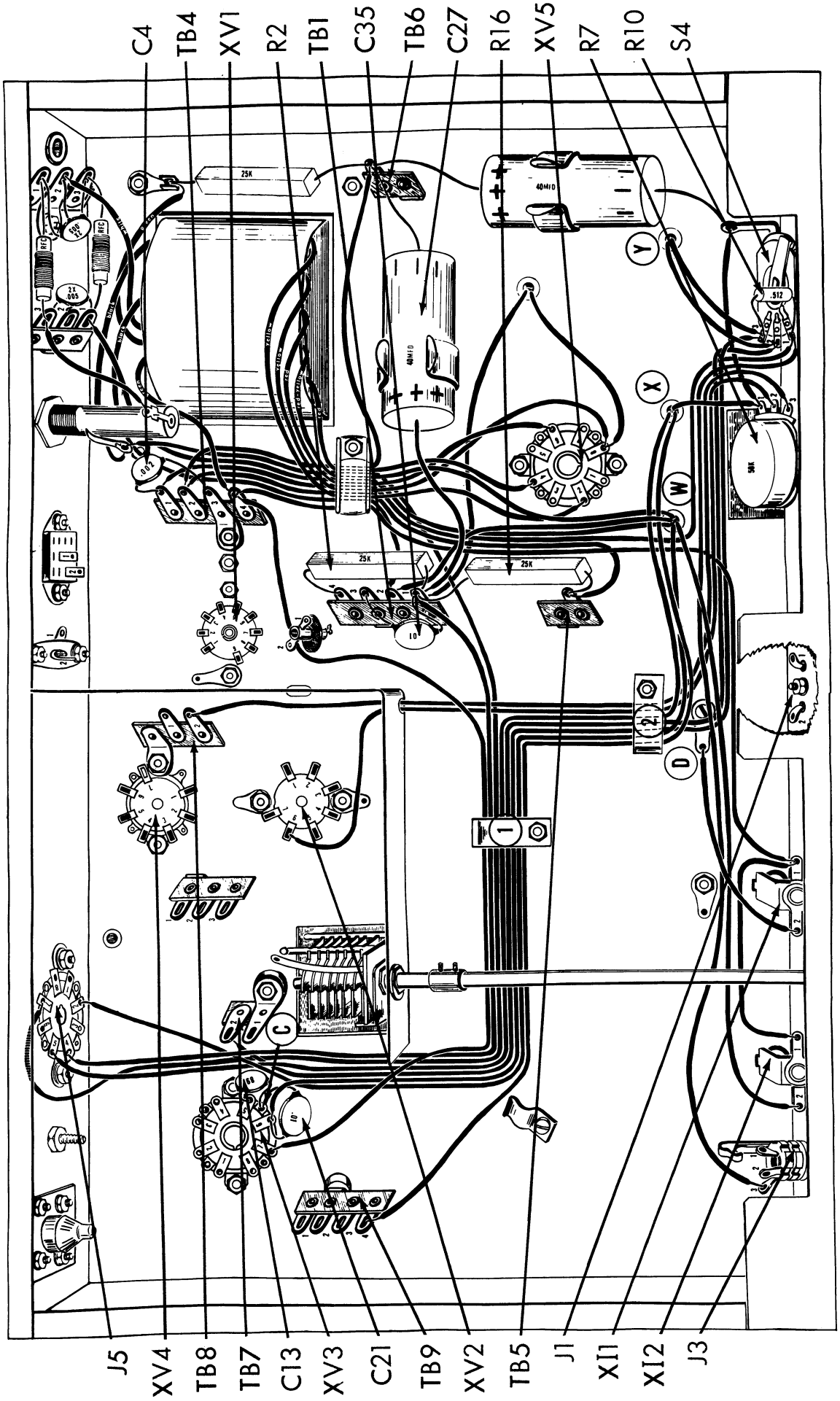

C4
TB4
XV1
R2
TB1
C35
TB6
C27
R16
XV5
R7
R10
S4
J5
XV4
TB8
TB7
C13
XV3
C21
TB9
XV2
TB5
J1
XI1
XI2
J3
25K
40MFD
.512
5MK
10
Y
X
W
D
C

Fig. 5

1. (√) Fig. 5. Connect one end of a 17" piece of yellow wire to S4B-2 (C). Run the wire along the front apron of the chassis. Bend the wire at a right angle and run it under metal cable clamp 2; bend the wire again at a right angle and run through metal cable clamp 1; finally bend the wire at another right angle and run it along the chassis as shown. Connect the remaining end of the wire to TB7-2 (C).

2. (√) Fig. 5. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C21, to 1/2". Connect from XV3-6 (C) to ground lug "C" (C) at XV3.

3. (√) Fig. 5. Cut both leads on a 68 mmf disc capacitor, C13, to 1/2". Connect from XV3-5 (C) to ground lug "C" (S2) at XV3.

4. (√) Fig. 5. Connect one end of an 18" piece of black wire to S4B-3 (C). Run the wire along the front apron of the chassis. Bend the wire at a right angle and run it under metal cable clamp 2; bend the wire again at a right angle and run it under metal cable clamp 1; finally bend the wire at another right angle and run it along the chassis as shown. Connect the remaining end of the wire to XV3-6 (S2).

5. (√) Fig. 5. From hole "Y", connect the red wire to S4B-3 (C) and the black wire S4B-2 (S2).

6. (√) Fig. 5. Cut both leads on a .512 ohm resistor, R10, to 1/2". Connect from S4B-1 (C) to S4B-3 (S3).

7. (√) Fig. 5. Connect a 12" piece of brown wire from S4B-1 (S3) to J3-3 (C). Run along the front apron of the chassis as shown.

8. (√) Fig. 5. Connect one end of a 13" piece of blue wire to R7-2 (S1) and one end of a 13" piece of red wire to R7-3 (S1). Run both wires along the front apron of the chassis. Bend both wires at a right angle and run them under the metal cable clamp 2. Run both straight along the chassis as shown, through the semi-circular opening at the bottom of the bottom shield. Connect the red wire to TB8-2 (C) and the blue wire to XV2-6 (C).

9. (√) Fig. 5. From hole "X" connect the yellow wire to R7-1 (S2).

10. (√) Fig. 5. From hole "X", run the orange and brown wires along the front apron of the chassis. Bend both wires at a right angle and run them under metal cable clamp 2. Bend both wires again at a right angle and run both under metal cable clamp 1. Finally, bend only the brown wire once again and run it along the chassis as shown. Connect the brown wire to J5-5 (C). Connect the orange wire to TB9-4 (C).

11. (√) Fig. 5. From hole "W", run the violet lead under metal cable clamp 2. Bend the wire at a right angle and run it under cable clamp 1; bend the wire again at a right angle and run it along the chassis as shown. Connect to J5-2 (C).

12. (√) Fig. 5. Connect one end of a 12" piece of red wire to TB1-1 (C). Run it under metal cable clamp 1. Bend the wire at a right angle and connect the remaining end to J5-4 (C).

13. (√) Fig. 5. Connect one end of a 15" piece of green wire to TB4-4 (C). Run it along the chassis as shown, under metal cable clamp 1. Bend the wire at a right angle. Connect to XV3-7 (C).

14. (√) Fig. 5. Connect the green lead from hole "W" to XI2-2 (S1).

15. (√) Fig. 5. Connect a 4" piece of green wire from XI1-1 (S2) to XI2-1 (S1).

16. (√) Fig. 5. Connect a 3" piece of black wire from ground lug "D" (C) to XI1-2 (S1).

17. (√) Fig. 5. Cut both leads on a 25K, 10 watt, wire-wound resistor, R16, to 3/4". Cover each lead with a 1/2" piece of spaghetti. Connect from TB5 (S2) to TB1-1 (C).

18. (√) Fig. 5. Connect the blue lead from hole "W" to TB1-2 (S2).

19. (√) Fig. 5. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C35, to 3/4". Connect from TB1-1 (C) to TB1-3 (S1).

20. (√) Fig. 5. Cut both leads on a 25K, 10 watt, wire-wound resistor, R2, to 3/4". Connect from TB1-4 (C) to TB1-1 (C).

21. (√) Fig. 5. Cut the positive (+) lead on the 40 mfd, 450 volt electrolytic capacitor, C27, to 2 1/4" and cover with a 2" piece of spaghetti. Connect this end to TB1-1 (S6). Connect the negative (-) end to TB6 (S4).

22. (√) Fig. 5. Cut both leads on a .002 mfd (2K or 2,000 mmf) disc capacitor, C4, to 3/4". Connect from TB4-1 (C) to TB4-3 (S1).

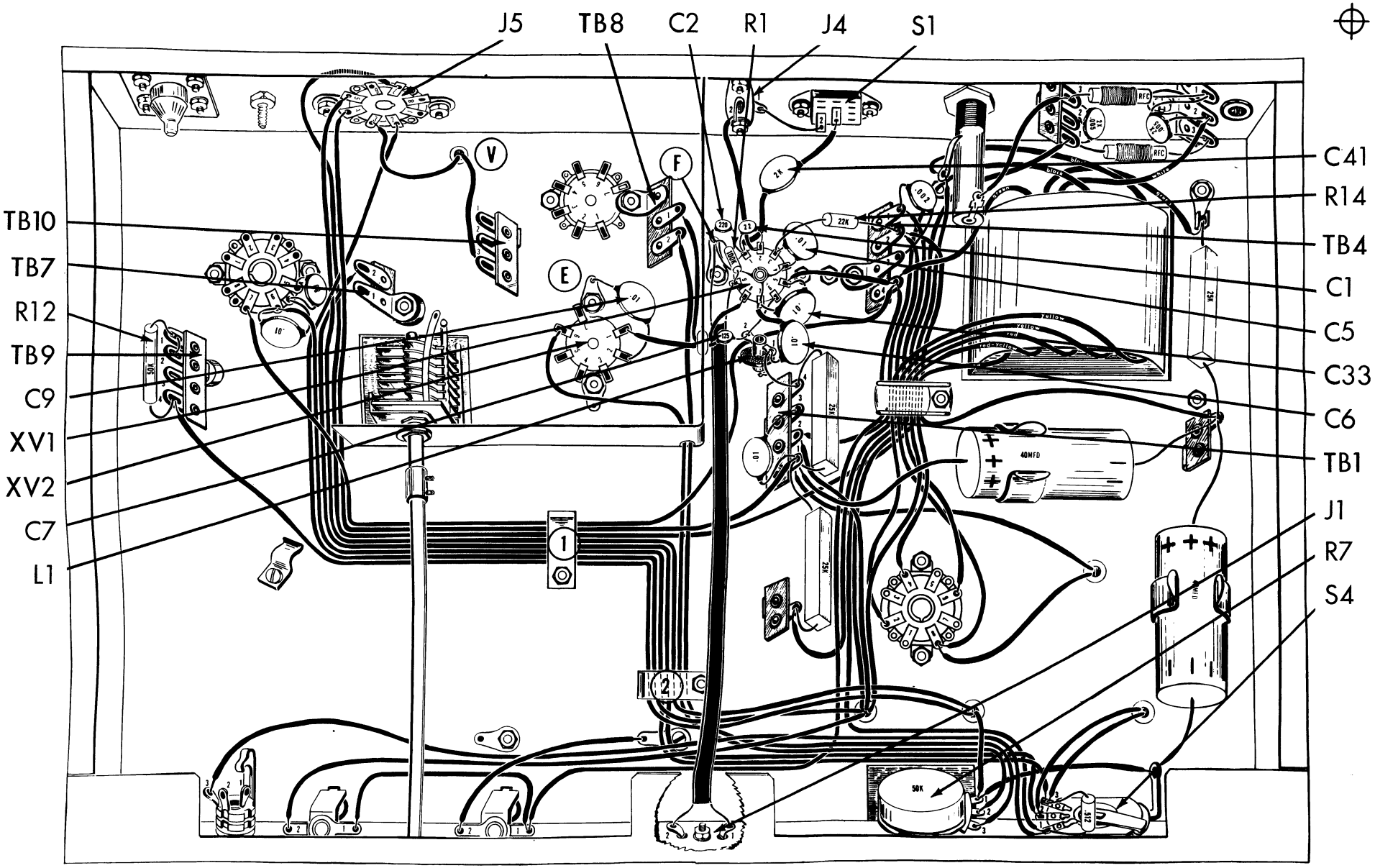

J5
TB8
C2
R1
J4
S1
C41
R14
TB4
C1
C5
C33
C6
TB1
J1
R7
S4
TB10
TB7
R12
TB9
C9
XV1
XV2
C7
L1
V
F
E
1
2
40MFD
50K
22K

Fig. 6

1. (✓) Fig. 6. L1 is an 18 microhenry choke with a slug adjustment, previously mounted on the chassis next to XV1. The form holding the choke coil should be so oriented that one lug is close to TB1 and the second lug is close to pin 6 of XV1. Designate the lug near TB1 as L1-1 and the lug near XV1 as L1-2. Connect a 3/4" piece of bare wire from TB1-4 (S2) to L1-1 (C). Connect a second 3/4" piece of bare wire from L1-2 (C) to XV1-6 (S).

2. (✓) Fig. 6. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C9, to 3/4". Cover each lead with a 1/2" piece of spaghetti. Connect from XV2-2 (C) to ground lug "E" (C).

2a. (✓) Fig. 6. Prepare a piece of 300 ohm twin line wire as follows. Cut an 8 1/2" piece of the dual wire. On one end, cut out the insulation for a 1 1/4" length between the two conductors, without removing the insulation from around the conductor. Then strip back the insulation 1/4" from the end of one of these conductors and connect this to ground lug "F" (C). On the same end of the wire, cut the second conductor to a 3/4" length and strip the insulation back 1/4". Connect this to XV1-9 (C). On the other end of the same piece of dual wire, cut out the insulation for a 3/4" length between the two conductors without removing the insulation from around the conductor. Strip back the insulation 1/4" from the ends of both of these conductors. Without twisting the twin line, connect one of these conductors to J1-1 (S1) and the second conductor to J1-2 (S1). DO NOT apply excess heat or insulation will melt.

3. (✓) Fig. 6. Cut one lead on a 125 mmf disc capacitor, C7, to 1/2". Connect this end to L1-2 (S2). Cut the other lead to 1 3/4". Cover this lead with a 1 1/2" piece of spaghetti. Push this lead through the hole in the side of the bottom shield and connect to XV2-1 (C).

4. (✓) Fig. 6. Cut all leads on two .01 mfd (10K or 10,000 mmf) disc capacitors, C5 and C33, to 1/2". Connect one from XV1-3 (C) to XV1-4 (C). Connect the second from XV1-5 (C) to XV1-7 (C).

5. (✓) Fig. 6. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C6, to 3/4". Connect one lead to L1-1 (S2). Cover the second lead with a 1/2" piece of spaghetti and connect to XV1-7 (C).

6. (✓) Fig. 6. Connect a 1 1/2" piece of green wire from TB4-4 (S4) to XV1-5 (S2).

7. (✓) Fig. 6. Cut both leads on a 22KΩ (red, red, orange, silver) 1 watt resistor, R14, to 3/4". Connect from TB4-2 (S3) to XV1-3 (S2).

8. (✓) Fig. 6. Cut both leads on a 220 mmf disc capacitor, C2, to 1/2". Connect from XV1-1 (C) to ground lug "F" (C).

9. (✓) Fig. 6. Cut both leads on a .002 mfd (2K or 2000 mmf) disc capacitor, C41, to 1". Cover both leads with a 3/4" piece of spaghetti. Connect from S1-1 (S1) to XV1-1 (C).

10. (✓) Fig. 6. Connect a 3/4" piece of bare wire from S1-2 (S1) to J4-1 (S1).

11. (✓) Fig. 6. Connect a 2 1/4" piece of yellow wire from J4-2 (S1) to XV1-2 (C).

12. (✓) Fig. 6. Connect a 3/4" piece of bare wire from the center pin (C) on XV1 to ground lug "F" (C).

13. (✓) Fig. 6. Cut both leads on a 100KΩ (brown, black, yellow, silver) resistor, R1, to 1/2". Connect from XV1-9 (S2) to ground lug "F" (S4). DO NOT apply excess heat or twin lead insulation will melt.

14. (✓) Fig. 6. Cut both leads on a 22 mmf disc capacitor, C1, to 1/2". Connect from XV1-2 (S2) to XV1-1 (C).

15. (✓) Fig. 6. Connect one end of a 3" piece of yellow wire to XV1-8 (S1). Run through the hole in the side of the bottom shield and connect the other end to TB8-1 (C).

16. (✓) Fig. 6. Connect a 3/4" piece of bare wire from the center pin (C) on XV1 to XV1-4 (S2).

17. (✓) Fig. 6. Connect a 3/4" piece of bare wire from the center pin (S3) on XV1 to XV1-7 (S3).

18. (✓) Fig. 6. Connect a 3/4" piece of bare wire from TB9-1 (C) to TB9-2 (S1).

19. (✓) Fig. 6. Cut both leads on a 50KΩ, 10 watt, wire-wound resistor, R12, to 3/4". Connect from TB9-1 (C) to TB9-4 (C).

20. (✓) Fig. 6. Connect the orange lead from hole "V" to TB10-3 (C).

21. (✓) Fig. 6. Connect the red lead from hole "V" to J5-3 (C).

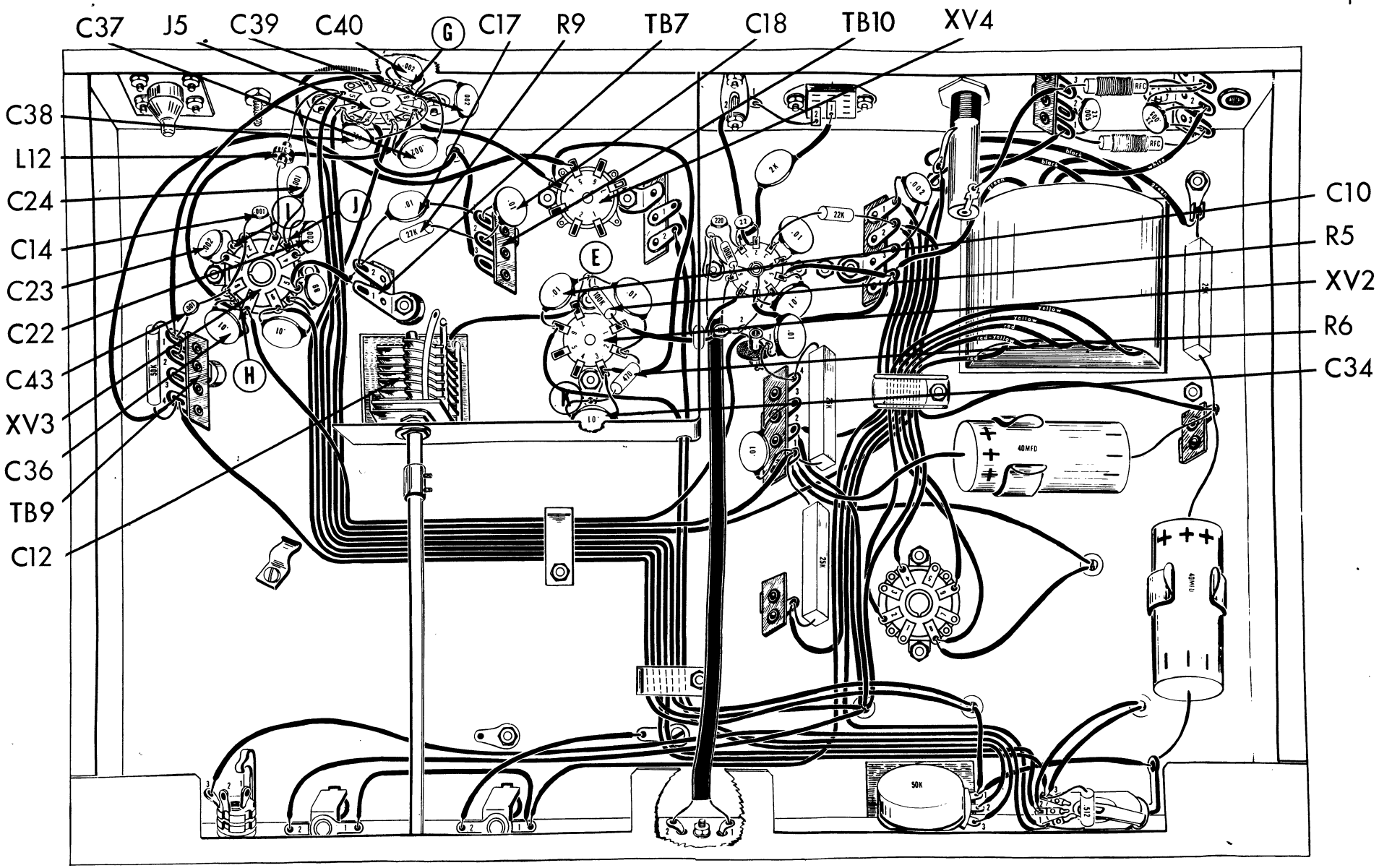

C37
J5
C39
C40
G
C17
R9
TB7
C18
TB10
XV4
C38
L12
C24
C14
C23
C22
C43
XV3
C36
TB9
C12
C10
R5
XV2
R6
C34
E
J
H
40MFD
50K

Fig. 7

1. (✓) Fig. 7. Connect a 6 1/2" piece of green wire from XV2-3 (C) to XV4-4 (C).

2. (✓) Fig. 7. Connect a 11" piece of yellow wire from TB9-4 (S3) to XV4-5 (S1).

3. (✓) Fig. 7. Connect an 6" piece of red wire from TB9-1 (C) to J5-6 (S1).

3a. (✓) Fig. 7. Connect a 6" piece of green wire from XV3-7 (C) to J5-1 (C).

4. (✓) Fig. 7. Connect a 4" piece of green wire from XV4-4 (S2) to J5-1 (C).

5. (✓) Fig. 7. Connect a 3/4" piece of bare wire from J5-8 (C) to ground lug "G" (S1) at J5.

6. (✓) Fig. 7. Connect a 3/4" piece of bare wire from J5-3 (S2) to J5-4 (C).

7. (✓) Fig. 7. Cut all leads on four .002 mfd (2K or 2000 mmf) disc capacitor, C37, C38, C39, and C40 to 1/2". Cover each of these leads with a 1/4" piece of spaghetti. Connect C39 from J5-1 (S3) to J5-8 (C). Connect C40 from J5-8 (C) to J5-7 (S2). Connect C37 from J5-2 (S2) to J5-8 (C). Connect C38 from J5-4 (S3) to J5-8 (S5).

8. (✓) Fig. 7. Connect a 3/4" piece of bare wire from XV3-8 (C) to ground lug "H" (C) at XV3.

9. (✓) Fig. 7. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C36, to 1/2". Connect C36 from XV3-7 (S3) to ground lug "H" (S2).

10. (✓) Fig. 7. Cut both leads on a .001 mfd - 1000 V (1K or 1000 mmf) disc capacitor, C14, to 1/2". Connect from XV3-2 (C) to XV3-3 (C).

11. (✓) Fig. 7. Connect a 3/4" piece of bare wire from XV3-2 (C) to ground lug "I" (C) at XV3.

12. (✓) Fig. 7. Cut all leads on two .002 mfd (2K or 2000 mmf) disc capacitors, C22 and C23, to 1/2". Connect C22 from XV3-4 (S1) to ground lug "J" (C) and C23 from XV3-1 (S1) to ground lug "I" (S2).

13. (✓) Fig. 7. Connect a 1 1/4" piece of bare wire from XV3-8 (C) to XV3-2 (S3).

14. (✓) Fig. 7. Cut both leads on a .001 mfd - 2000 V (1K or 1000 mmf) disc capacitor, C43, to 3/4". Connect from TB9-1 (S4) to XV3-8 (S3).

15. (✓) Fig. 7. Cut both leads on a .001 mfd - 1000 V (1K or 1000 mmf) disc capacitor, C24, to 3/4". Connect from J5-5 (C) to ground lug "J" (S2) at XV3.

16. (✓) Fig. 7. The small RF choke, L12, is about 3/8" long and consists of a single concentrically wound coil of about 1/2" diameter. A yellow dot is stamped on the body or coil. Cut both axial leads to 3/4". Connect from J5-5 (S3) to XV3-3 (S2).

17. (✓) Fig. 7. Cover a 2 3/4" piece of the heavy bare wire with a 2 1/4" piece of spaghetti. Connect from TB7-1 (C) to XV3-5 (S2).

18. (✓) Fig. 7. Cut both leads on a 27KΩ (red, violet, orange, silver) resistor, R9, to 1/2". Connect from TB7-2 (C) to TB10-2 (C).

19. (✓) Fig. 7. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C17, to 3/4". Connect from TB7-2 (S3) to TB10-1 (C).

20. (✓) Fig. 7. Cut both leads on a 470Ω (yellow, violet, brown, silver) 1 watt resistor, R6, to 1/2". Connect from XV2-2 (S2) to ground lug "K" (C) at XV2.

21. (✓) Fig. 7. Connect one end of a 4" piece of heavy bare wire covered with a 3 1/2" piece of spaghetti to XV2-7 (S1). Push the other end of the cable through the rectangular hole under capacitor, C12.

22. (✓) Fig. 7. Cut all leads on three .01 mfd (10K or 10,000 mmf) disc capacitors, C10, C18, C34 to 1/2". Connect C10 from XV2-6 (S2) to ground lug "E" (C). Connect C18 from TB10-1 (C) to TB10-2 (C). Connect C34 from XV2-3 (S2) to ground lug "K" (C).

23 (✓) Fig. 7. Cut both leads on a 100KΩ (brown, black, yellow, silver) 1 watt resistor, R5, to 1/2". Connect from XV2-1 (S2) to ground lug "E" (C).

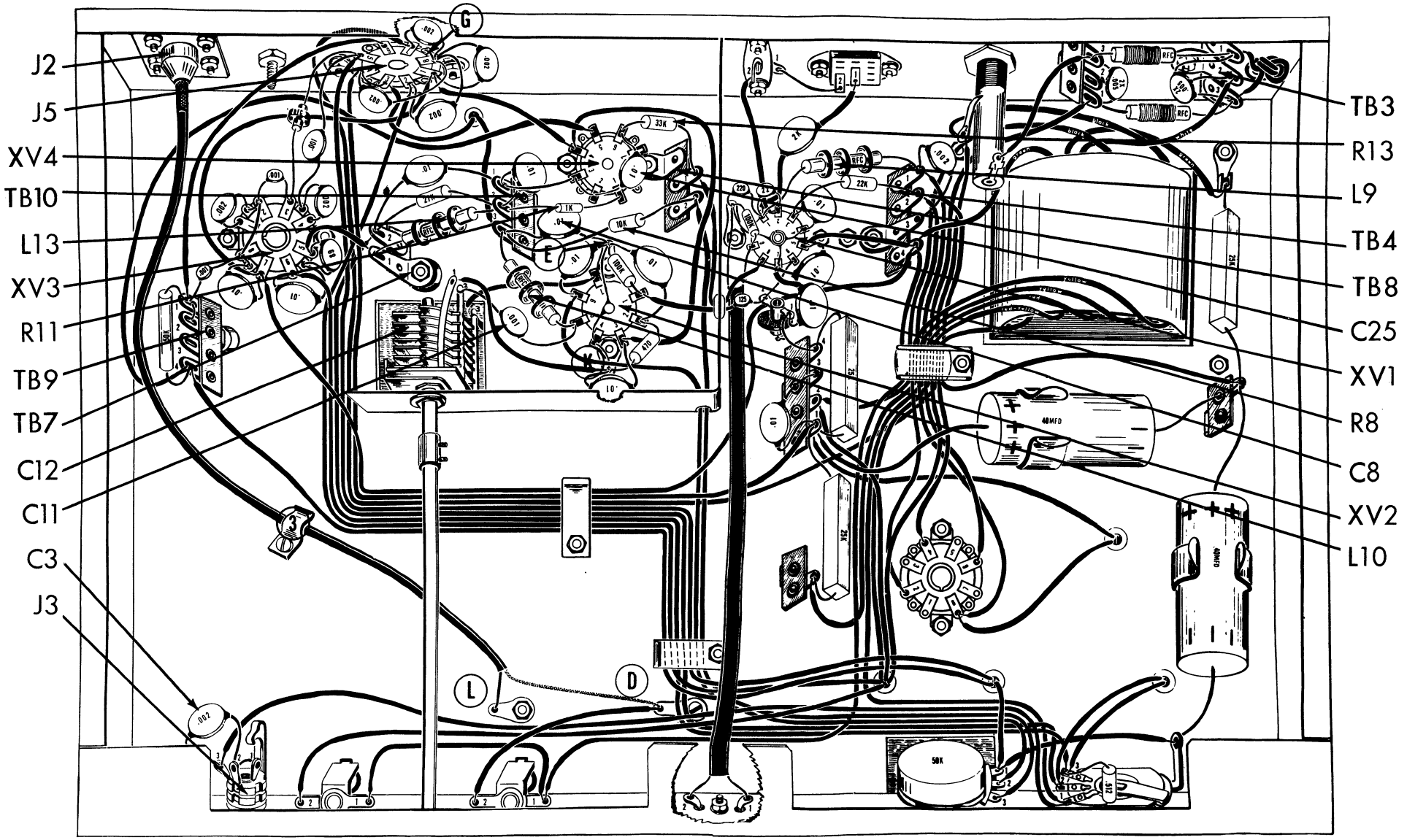

J2
J5
XV4
TB10
L13
XV3
R11
TB9
TB7
C12
C11
C3
J3
TB3
R13
L9
TB4
TB8
C25
XV1
R8
C8
XV2
L10
G
E
K
L
D
40MFD
50K

Fig. 8

1. (✓) Fig. 8. Connect a 3/4" piece of bare wire from XV2-4 (C) to ground lug "K" (C).

2. (✓) Fig. 8. Connect a 3/4" piece of bare wire from XV2-4 (S2) to center pin (C) on XV2.

3. (✓) Fig. 8. Cut both leads on a .01 mfd (10K or 10,000 mmf) C8 to 3/4". Connect from TB10-3 (C) ground lug "E" (C).

4. (✓) Fig. 8. Connect a 1 1/4" piece of bare wire from the center pin (S2) on XV2 to ground lug "E" (S5).

5. (✓) Fig. 8. Connect a 2 1/4" piece of heavy bare wire covered with a 1 1/2" piece of spaghetti from ground lug "K" (S4) to C12-1 (S1) on the variable capacitor. Do not splash solder on capacitor plates.

6. (✓) Fig. 8. Connect one end of a 3" piece of heavy bare wire to C12-3 (S1) on the variable capacitor. Push the other end through the rectangular hole in the chassis below the capacitor. Cover with a 2 1/2" piece of spaghetti.

7. (✓) Fig. 8. Cut both leads on a .001 mfd - 1000V (1K or 1000 mmf) disc capacitor, C11 to 3/4". Connect from XV2-5 (C) to C12-2 (S1) on the variable capacitor.

8. (✓) Fig. 8. Cut both leads on a 10KΩ (brown, black, orange, silver) 1 watt resistor, R8, to 3/4". Connect from TB8-2 (S2) to TB10-3 (C).

9. (✓) Fig. 8. Cut both leads on a 33KΩ (orange, orange, orange, silver) 1 watt resistor, R13, to 3/4". Connect from TB8-1 (S2) to XV4-6 (C).

10. (✓) Fig. 8. Cut both leads on a 1KΩ (brown, black, red) resistor, R11, to 3/4". Connect from XV4-1 (S1) to TB10-2 (C).

11. (✓) Fig. 8. Connect a 1 1/4" piece of bare wire from XV4-3 (C) to TB10-1 (S3).

12. (✓) Fig. 8. Connect a 3/4" piece of bare wire from XV4-2 (C) to XV4-3 (S2).

13. (✓) Fig. 8. Cut both leads on a .01 mfd (10K or 10,000 mmf) disc capacitor, C25, to 3/4". Cover both leads with a 1/2" piece of spaghetti. Connect from XV4-6 (S2) to XV4-2 (S2).

14. (✓) Fig. 8. The three RF chokes, L9, L10, and L13 are identical. Each one of these chokes is about 1" long and has 3 coils wound on the form. Cut both axial leads on all of these chokes to 3/4". Connect L9 from TB4-1 (S3) to XV1-1 (S4). Connect L10 from TB10-3 (S4) to XV2-5 (S2). Connect from L13, TB7-1 (S2) to TB10-2 (S4).

15. (✓) Fig. 8. Cut both leads on an .002 mfd (2K or 2000 mmf) disc capacitor, C3, to 1/2". Connect from J3-2 (C) to J3-3 (S2).

16. (✓) Fig. 8. Connect a 1/2" piece of bare wire from J3-2 (S2) to J3-1 (S1).

17. (✓) Fig. 8. Cut a 13" piece of shielded coaxial cable. On one end of the shielded cable, strip the outer insulation back 1 1/4". Push the shield braid back, over the inner insulation, toward the outer insulation. Strip the inner insulation back 1/4". Remove the shield cup and the output jack, J2, which were previously mounted on the chassis. Push the inner conductor through the center hole from the rear (narrower side) of the shield cup. Note that none of the braided shield passes through the shield cup hole. All the braided shields remain outside the cup. Solder the inner conductor to the output jack, J2. Press the cup to the jack and smooth the braided shield wires over the outside of the shield cup. Solder the braided shield to the outside of the cup. When soldering this braided shield to the outside of the cup, do not use excessive heat or the inner insulation will melt. At the other end of the shield cable, strip the outer insulation back 2 1/4". Pull the strands of the braided shield apart to the outer insulation. Separate the braid strands from the inner conductor and twist the braid strands together. Cut the inner conductor to 1/2". Strip the inner insulation back 1/4". Run the lead along the chassis, as shown, below the shaft from variable capacitor C12 and under cable clamp #3. Connect the inner conductor to the insulated lug "L" (S1) and the twisted shield strands to ground lug "D" (S2). Mount the jack with the shield cup once again as described above in Fig. 1, step #8, from the inside of the chassis using four #4-40 screws, four #4 lockwashers and four #4-40 hex nuts.

18. (✓) Fig. 8. Push the line cord through the hole at the rear of the chassis. Tie a knot 1 1/2" from the tinned leads at the end of the line cord inside the chassis. Connect one lead to TB3-1 (S3) and the second lead to TB3-3 (S3).

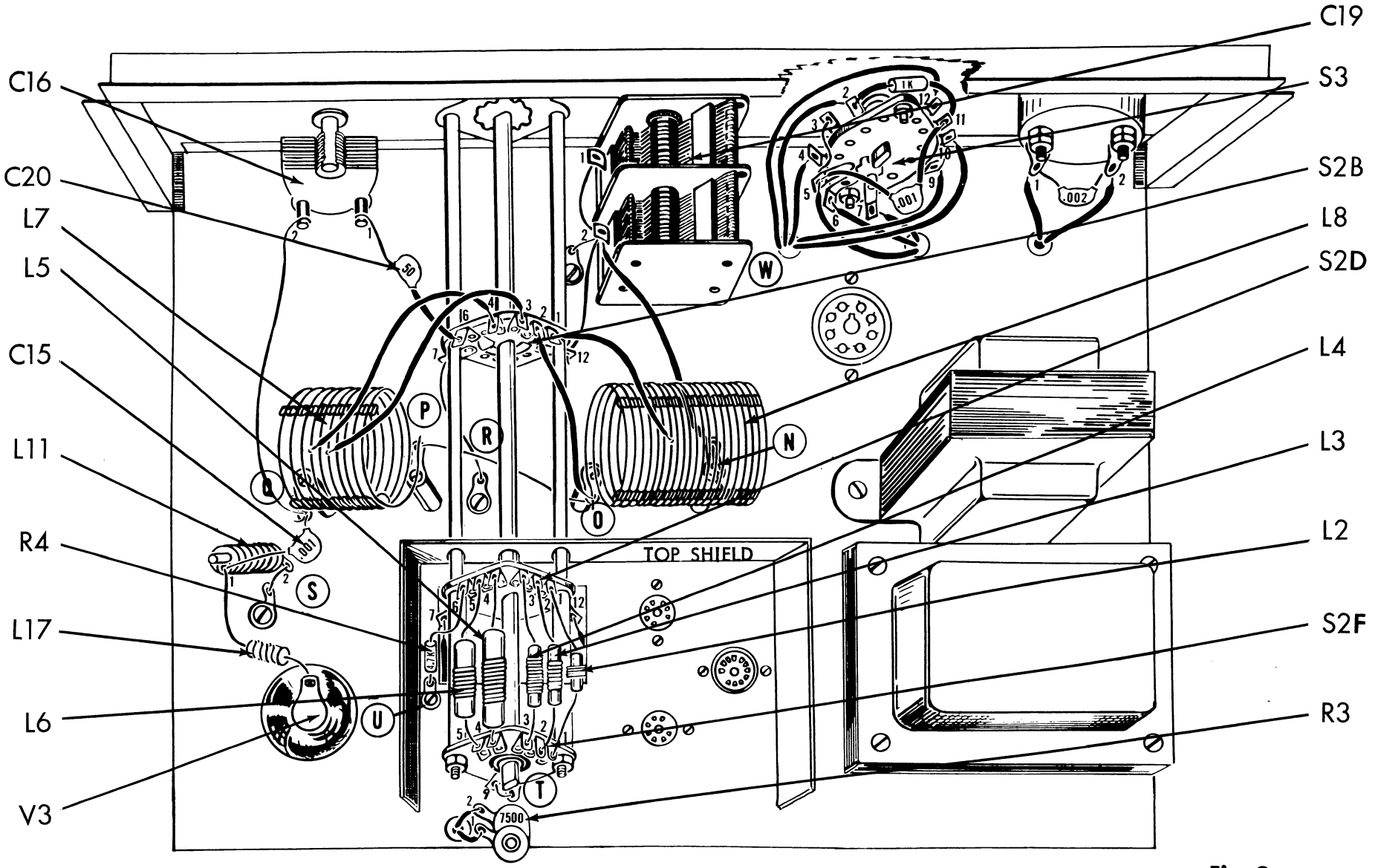

C16
C20
L7
L5
C15
L11
R4
L17
L6
V3
C19
S3
S2B
L8
S2D
L4
L3
L2
S2F
R3
TOP SHIELD
1K
.001
.002
7500

Fig. 9

COMPLETION OF TOP OF CHASSIS WIRING

1. (√) Fig. 9. Connect a 2 1/2" piece of the heavy bare wire from C19-2 (S4) to S2B-12 (S1).

2. ( ) Fig. 9. Connect a 3" piece of heavy bare wire covered with a 2 1/2" piece of spaghetti from S2B-7 (S1) to ground lug "R" (S1) under S2.

3. (√) Fig. 9. The two large coils, L7 and L8, are to be mounted as follows. Note that L7 has less turns than L8. L7 has 2 taps while L8 has one tap. The chassis is oriented with the panel away from the builder. Mount L7 (the coil with less turns), as shown. The two taps are to be close to the left edge of the chassis, away from S2. The first tap is 4 1/2 turns from the right. The ends of the coil are to be soldered to the two #8 ground lugs which are mounted on the two ceramic standoff insulators at the left of S2. Bend the ears on the lugs around the ends of the coil wire. Solder the ends of the coil wire and all the other leads going to lugs "P" & "Q". Clip off any excess length of coil wire, extending beyond the soldered lugs.

Mount L8 (the coil with one tap), as shown. The tap is to be closer to S2 than to the right edge of the chassis. The ends of this coil are to be soldered to the two #8 ground lugs which are mounted on the two ceramic standoff insulators at the right of S2. Bend the ears on the lugs around the ends of the coil wire and all other leads going to the lugs. Solder the ends of the coil wire and all the other leads going to lugs "N" & "O". Clip off any excess length of coil wire, extending beyond the soldered lugs.

4. (√) Fig. 9. Cut the lead coming from the center of L8 to 2 3/4". Cover the lead with a 2 1/2" piece of spaghetti. Connect the lead to S2B-1 (S1).

5. (√) Fig. 9. Cut the two leads connected near the center of L7 to 3". Cover each lead with a 2 3/4" piece of spaghetti. Connect the lead from the tap nearest the switch to S2B-3 (S1). Connect the other lead to S2B-4 (S1).

6. (√) Fig. 9. Cut both leads on a 50 mmf disc capacitor, C20, to 1 1/4". Cover one lead with a 1" piece of spaghetti and connect to S2B-6 (S1). Connect the other lead to C16-1 (S1).

7. (√) Fig. 9. Connect a 3 1/4" piece of heavy bare wire from C16-2 (S1) to lug "Q" (C).

8. (√) Fig. 9. Cut both leads on a .001 mfd - 2000V (1K or 1000 mmf) disc capacitor, C15, to 1". Connect from L11-1 (C) to Lug "Q" (S3).

9. (√) Fig. 9. Connect a 3/4" piece of bare wire from L11-2 (S1) to insulated lug "S" (S1).

DO NOT plug this line cord into the wall until the unit is completed and al necessary checks are made. Remember — you must have a license to operate a transmitter legally.

10. (√) Fig. 9. Cut one end of the parasitic suppressor choke, L17, to 3/4". This is a 47Ω (yellow, violet, black) resistor with four turn of wire. Connect this end to L11-1 (S2).

11. (√) Fig. 9. Cut the other end of the choke L17 to 1 1/4". Push it through the rear hole in the insulation of the tube cap. Solder this lead to the cap.

12. (√) Fig. 9. From hole "W", connect the black lead to S3A-9 (S1).

13. (√) Fig. 9. From hole "W", connect the red-yellow lead to S3A-2 (S2).

14. (√) Fig. 9. One end of a heavy bare wire covered with spaghetti was previously connected to C12-3 and pushed through the rectangular hole. Connect the other end of this wire to S2D-12 (S1).

15. (√) Fig. 9. Connect the remaining heavy bare wire covered with spaghetti coming through this same rectangular hole to S2D-7 (S1).

16. (√) Fig. 9. Connect a 1" piece of heavy bare wire from S2F-9 (S1) to insulated lug "T" (S1).

17. (√) Fig. 9. Cut both leads on a 4.7KΩ (yellow, violet, red) resistor, R4, to 1 1/4". Connect from S2D-6 (S1) to ground lug "U" (S1). Cover lead to S2D-6 with 1" spaghetti.

18. ( ) Fig. 9. In one bag included in the kit there are five RF coils, L2, L3, L4, L5 and L6. The coil on the smallest form with the red dot is L2. The coils on the largest coil form with stock number 35031 stamped on the body is L6. All the coils range from the smallest to the largest in that order. For example, L6 is larger than L5, which has stock #35030 stamped on the body. L5 is larger than L4, etc. L3 with the orange dot and L4 with the green dot are on the same size coil form. However, L3 uses a finer (thinner) wire than L4. Cut all leads to 3/4" except L6. Connect L2 from S2D-1 (S1) to S2F-1 (S1). Connect L3 from S2D-2 (S1) to S2F-2 (S1). Connect L4 from S2D-3 (S1) to S2F-3 (S1). Connect L5 from S2D-4 (S1) to S2F-4 (S1). Cut leads on L6 to 1/2" and connect L6 from S2D-5 (S1) to S2F-5 (S1).
Align all coils so that they are parallel to each other and are spaced as far apart as practicable.

19. (√) Fig. 9. Mount the top shield as shown in Figure 1, by sliding the slits in the shield over the switch rods. Use four #6 lockwashers and four #6-32 hex nuts.

20. (√) Fig. 9. Solder one of the twist tabs of the bottom shield to the top of the chassis.

FINAL STEPS

You have now completed the assembly and wiring of your transmitter. When you have completed the following steps, your transmitter will be ready for use.

1) To catch any wiring errors, it is suggested that the entire wiring be checked point-by-point against the wiring instructions for correctness of each connection and also proper lead dress. While doing so, carefully check the wiring for inadvertant shorts between adjacent tube socket pins, resistor and capacitor leads to each other or to the tube socket center shield or to the chassis. Also look for cold solder joints, loose blobs of solder and wire clippings (shake out the chassis as a final precaution). Any leakage paths arising from the flow of rosin between terminals should be removed with a stiff brush dipped in carbon tetrachloride, being careful not to spring contacts when cleaning switches.

2) Insert the tubes V1-V5 in their sockets, referring to the tube layout diagram in the instruction section. Be certain each tube is in the right socket and that the cap is on V3. Insert the fuse F1 in the fuseholder. Place shields over tubes V1 and V2. Insert the green plastic pilot button in the panel hole under "STANDBY", and the red plastic pilot button on the panel hole under "TRANSMIT".

3) Cut a 2" length of black-up wire. Strip 3/4" of insulation from both ends. This will leave 1/2" of insulation at the exact center of the wire. Bend the wire into a "U" shape. This wire will be used as a jumper between pins 4 & 6 of the octal plug. Push one end of the lead into pin 4 of the octal plug and the other end into pin 6. When the lead ends have reached the ends of the pins, only the insulation will be visible at the rear of the plug. Form a puddle of solder at the tip of the soldering iron. Hold the plug with the pins down directly above the tip of the soldering iron. Dip each of the pin-ends into which wires have been inserted one at a time into the solder puddle and hold there for several seconds until the solder rises up into the pin by capillary action. Press the cap down over the octal plug and insert in the socket on the rear chassis apron. Preserve this arrangement for all checking, tuning and use of the Model 720 as a CW transmitter. If the Model 720 is then to be used with a modulator such as the EICO Model 730, this plug will have to be rewired as described in the instruction section.

4) Mounting the control knobs:

a) Place the four small knobs on the shafts of the FUNCTION, BAND SELECTOR, METER switches, and also the DRIVE control. The set screws of the first two knobs should be tightened down on the flats on the shafts. The latter two shafts are not flatted and the knobs must be positioned to agree with the panel indications.

b) Adjust the shafts of the PLATE TUNING, GRID TUNING, and ANTENNA loading control so that in each case the rotor and stator plates of the particular variable air capacitor are fully meshed. Place the three large knobs on the shafts of these controls and position them to indicate as follows before tightening down the set screws: PLATE TUNING to "100", GRID TUNING TO "100", ANTENNA LOADING to "0".

5) An internal short circuit may cause serious damage to the transmitter components when the transmitter is connected to the a-c power line. Set the FUNCTION switch to TUNE, and with a VTVM or VOM, make the following resistance checks before connecting to the a-c line: Check for a cold d-c resistance of at least 1 ohm across the a-c line plug; check for a resistance of at least 65 ohms between pins 4 and 6 of XV5; check for a resistance of at least 25KΩ between pin 8 of the XV5 and ground. Allow sufficient time for the electrolytic capacitors to be charged by the ohmmeter battery in this last measurement. These measurements constitute a reasonable check of the power supply components and wiring before applying power. If you do not obtain the minimum resistance values indicated, do not proceed to the next step until the cause is discovered and the condition remedied.

NOTE: The significant measurement of electrolytic capacitor leakage resistance necessitates that the ohmmeter battery potential be applied with polarity corresponding to that of the capacitor. If the resistance check is made with the test leads one way and then reversed, the higher reading is always the significant one and occurs when the polarities correspond.

6) Mount the top shield cover to the top shield with self tapping 2 #6 P. K. screws.

7) Lay the transmitter chassis upside down. Find the position of the bottom plate at which the 1/2" hole (a few inches away from the center of the plate) is directly over coil L1 (near socket XV1). This 1/2" hole provides access for a tuning wand when it is desired to adjust coil L1 with the bottom plate attached. Having found the correct position, the inside and outside surfaces and the front and rear edges of the bottom plate are all established. It may be helpful to mark the bottom plate accordingly.

8) Note the four 3/16" holes in the bottom plate, each about 2" diagonally in from the corners. Mount the four rubber feet to the outside surface of the plate, using a #8-32 x 3/4" screw, a #8 lockwasher, and a #8-32 hex nut to secure each. The wider diameter end of the foot should rest against the outside surface of the bottom plate and the screw should be inserted through the smaller diameter end; the screw is secured on the inside surface of the plate by means of the nut and lockwasher.

9) Lay the transmitter chassis upside down and attach the bottom plate with eight #6 self-tapping (P. K.) screws, using the eight 3/16" holes along the perimeter of the plate (one on each side, three at the front and three at the rear). There are two 1/4" holes, one on each side, which will be used later.

10) Pick up the transmitter cover and notice the wide horizontal flanges welded to the left and right side inner surfaces. Near the back on each flange you will find a 3/16" hole. From the top side, insert a #8-32 x 2 1/4" machine screw through each of these 3/16" holes and secure each with one #8 lockwasher and one #8-32 hex nut.

11) Set the transmitter chassis in the normal upright position with front panel facing you. Position the cover directly over the chassis and observe the following: the narrow flange running along the top and both sides of the cover just inside the front edge; the corresponding narrow lip running along the top and both sides of the chassis frontal structure; the long screws mounted in the previous step to the wide horizontal flanges on the left and right sides of the cover at the rear; the two 1/2" holes at the left and right side rear of the chassis surface, intended to accept the long screws mounted on the cover, and large enough to pass the mounting nuts for same. Now drop the cover down slowly, first seeing that the two long screws in the cover enter the rear left and right side chassis holes intended for them and then that the narrow flange along the front of the top and side edges of the cover passes down in front of the narrow lip along the chassis frontal structure. Now secure the cover to the chassis with five #6 black self-tapping (P. K.) screws through the narrow flange running along the front edge of the cover into the narrow lip on the chassis frontal structure. Then turn the transmitter upside down and secure the two long screws from the cover, now emerging through the 1/4" holes in the bottom plate at the left and right side rear, with one #8 lockwasher and one #8-32 hex nut each. The cover is finally secured at the rear by three #6 self-tapping (P. K.) screws through the perforated metal panel into the rear chassis apron.

12) Set the FUNCTION and METER switches to OFF and insert the line cord into a 117 VAC receptacle. Then set the FUNCTION switch to STANDBY and note the lighting of the green STANDBY pilot lamp.

13) Set the VFO-XTAL slide switch on the rear chassis apron to XTAL and insert a 40 meter* crystal in the CRYSTAL socket on the front panel. Set the BAND SELECTOR to 20 meter, the DRIVE control to 50, and the FUNCTION switch to TUNE. Then set the METER switch to GRID and adjust the GRID TUNING control for a maximum reading on the meter. If the maximum exceeds 4 ma, use the DRIVE control to limit the maximum to 4 ma. Now turn the transmitter up on one of the sides, and use a hex tuning wand through the 1/2" access hole in the bottom plate to adjust the oscillator coil L1 slug for maximum grid current. Again, if the maximum current exceeds 4 ma, use the DRIVE control to limit the current to 4 ma.

14) Re-set the FUNCTION switch to STANDBY. The unit is now ready for operation and tune-up. (See Instruction Manual.)

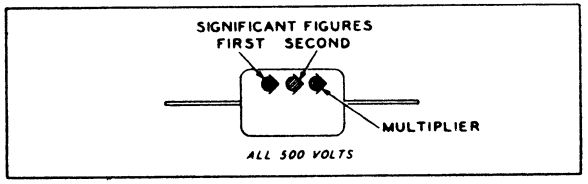
*For CW operation on all bands, it is desirable to perform the adjustment of L1 with at crystal between 7100 and 7200 kc. For phone operation, use a crystal between 7200 and 7300 kc.

SERVICE

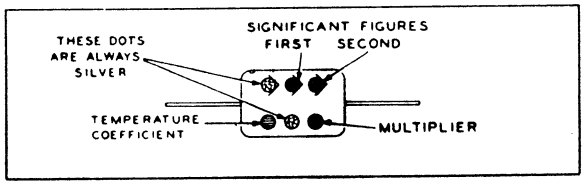
If you are still having difficulty, write to our service department listing all possible indications that might be helpful. If desired, you may return the instrument to our factory where it will be placed in operating condition for $12.50 plus the cost of parts replaced due to their being damaged in the course of construction. .This service policy applies only to completed instruments constructed in accordance with the instructions as stated in the manual. Instruments that are not completed or instruments that are modified will not be accepted for repair. Instruments that show evidence of acid core solder or paste fluxes will be returned not repaired. NOTE: Before returning this unit, be sure all parts are securely mounted. Attach a tag to the instrument, giving your home address and the trouble with the unit. Pack very carefully in a rugged container, using sufficient packing material (cotton, shredded newspaper, or excelsior), to make the unit completely immovable within the container. The original shipping carton is satisfactory, providing the original inserts are used or sufficient packing material is inserted to keep the instrument immovable. Ship by prepaid Railway Express, if possible, to the Electronic Instrument Co., Inc., 33-00 Northern Blvd., L. I. C. 1, New York. Return shipment will be made by express collect. Note that the carrier cannot be held liable for damages in transit if packing, IN HIS OPINION, is insufficient.

CAPACITOR COLOR CODES

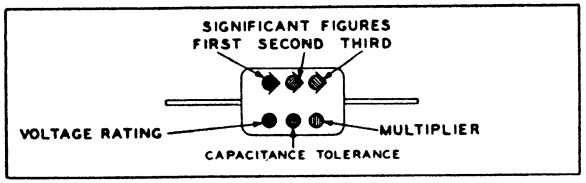
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



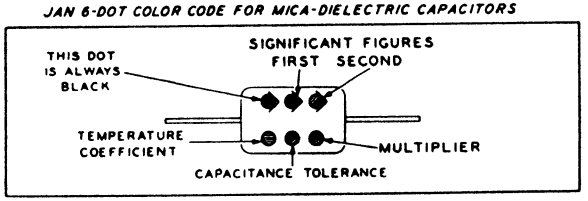
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



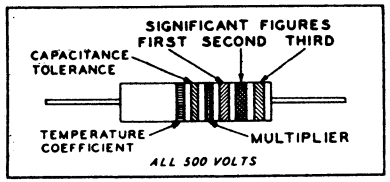
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

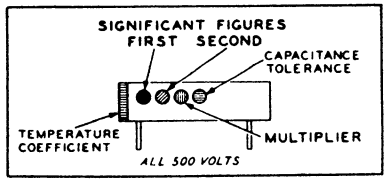


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

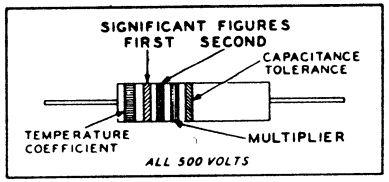


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



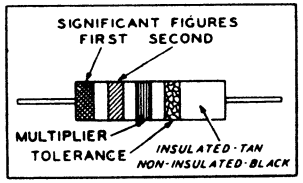
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

RESISTORS				CAPACITORS				
				MULTIPLIER				
TOLERANCE	MULTIPLIER	SIGNIFICANT FIGURE	COLOR	RMA MICA AND CERAMIC-DIELECTRIC	JAN MICA AND PAPER-DIELECTRIC	JAN CERAMIC DIELECTRIC	VOLTAGE RATING	TEMPERATURE COEFFICIENT
	1	0	BLACK	1	1	1		A
	10	1	BROWN	10	10	10	100	B
	100	2	RED	100	100	100	200	C
	1,000	3	ORANGE	1,000	1000	1000	300	D
	10,000	4	YELLOW	10,000			400	E
	100,000	5	GREEN	100,000			500	F
	1,000,000	6	BLUE	1,000,000			600	G
	10,000,000	7	VIOLET	10,000,000			700	
	100,000,000	8	GRAY	100,000,000		0.01	800	
	1,000,000,000	9	WHITE	1,000,000,000		0.1	900	
5	0.1		GOLD	0.1	0.1		1000	
10	0.01		SILVER	0.01	0.01		2000	
20			NO COLOR				500	

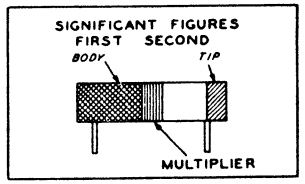
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

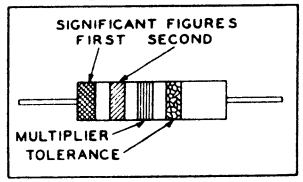


RADIAL TYPE

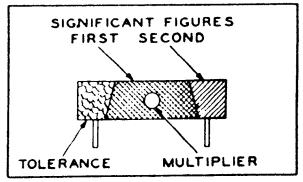


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED



GENERAL

Your transmitter should require little service except for normal tube replacement. We recommend no substitutions for the tube types used. To facilitate servicing, remedial and trouble-shooting procedures have been provided in the TROUBLE-SHOOTING CHART that follows. A VOLTAGE CHART and a RESISTANCE CHART have also been provided as aids in locating defective components and to permit a careful, stage-by-stage check to the transmitter.

WARNING: If the transmitter is operated at any time without the cover or the bottom plate, the operator is exposed to lethal high voltage points and locations where severe RF burns can occur through bodily contact. If, for purpose of voltage checks, the transmitter must be operated with the cover and/or bottom plate removed, great care must be taken to avoid inadvertant bodily contact to dangerous points and all the general precautions for high voltage work must be observed. In any case, never leave the transmitter in an operative state with the cover and/or bottom plate removed, especially if children have access to it.

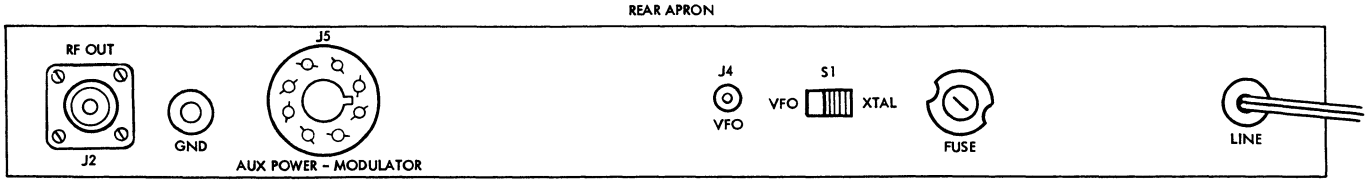
ADJUSTMENT OF COIL L1.

Insert the line cord into a 117 VAC receptacle and set the FUNCTION switch to STANDBY. Set the VFO-XTAL slide switch on the rear chassis apron to XTAL and insert a 40 meter crystal* in the CRYSTAL socket on the front panel. Set the BAND SELECTOR to 20 meters, the DRIVE contool to 50, and the FUNCTION switch to TUNE. Then set the METER switch to GRID and adjust the GRID TUNING control for a maximum reading on the meter. If the maximum exceeds 4 ma, use the DRIVE control to limit the maximum to 4 ma. Now turn the transmitter up on one of the sides, and use a hex tuning wand, inserted through the 1/2" access hole in the bottom plate, to adjust the oscillator coil L1 slug for maximum grid current. Again, if the maximum current exceeds 4 ma, use the DRIVE control to limit the current to 4 ma. Re-set the FUNCTION switch to STANDBY and set the transmitter down in its normal position. The unit is now ready for operation and tune-up.

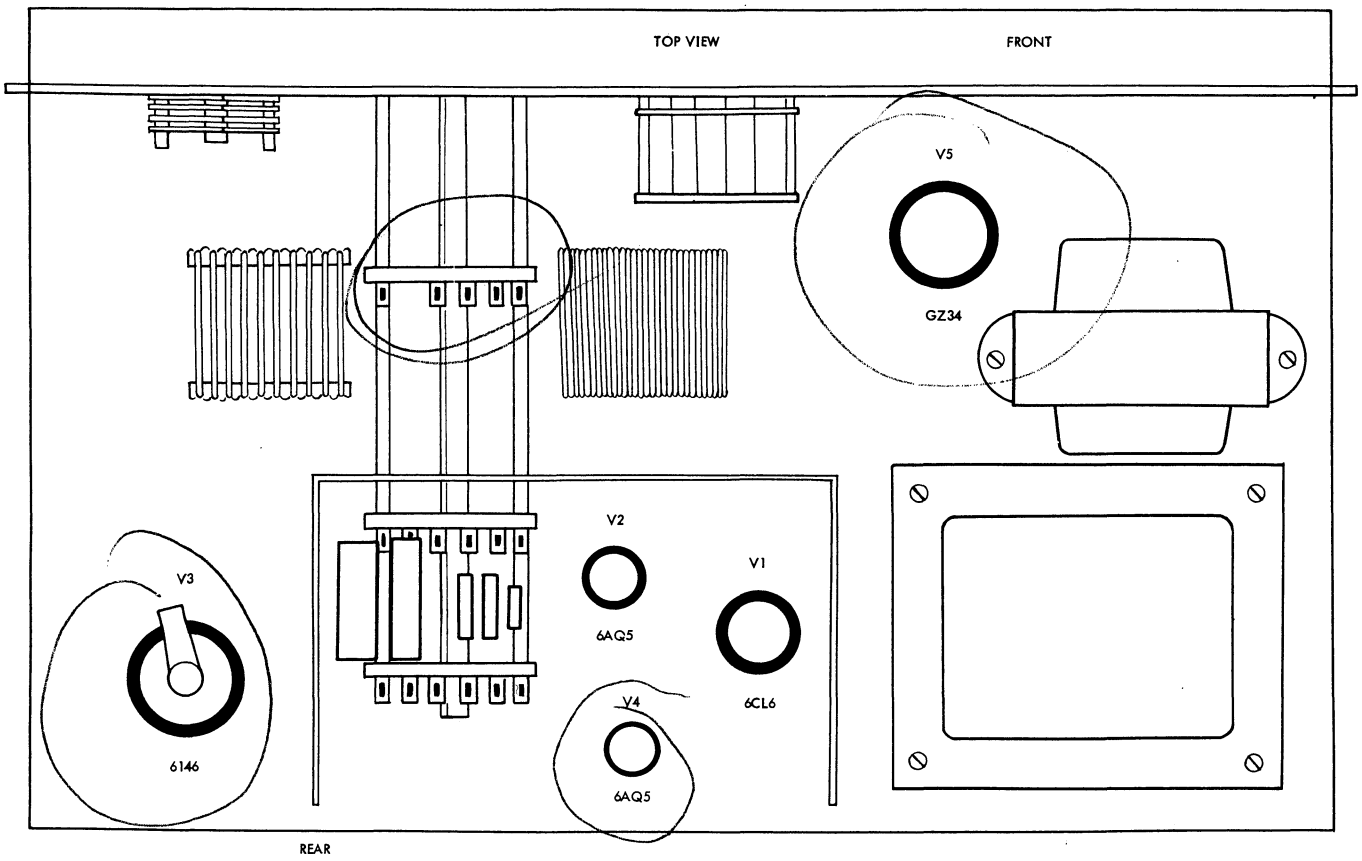
*NOTE: For CW operation on all bands, it is desirable to perform the adjustment of L1 with a crystal between 7100 and 7200 kc for the coil L1 adjustment. For phone operation, use a crystal between 7200 and 7300 kc for the coil L1 adjustment.

SERVICE

If trouble develops in your instrument which you can not remedy yourself, write to our service department listing all possible indications that might be helpful. If desired, you may return the instrument to our factory where it will be placed in operating condition for $12.50 plus the cost of parts replaced due to their being damaged in the course of construction. NOTE: Before returning this unit, be sure all parts are securely mounted. Attach a tag to the instrument, giving your home address and the trouble with the unit. Pack very carefully in a rugged container, using sufficient packing material (cotton, shredded newspaper, or excelsior), to make the unit completely immovable within the container. The original shipping carton is satisfactory, providing the original inserts are used or sufficient packing material is inserted to keep the instrument immovable. Ship by prepaid Railway Express, if possible, to Electronic Instrument Co., Inc., 33-00 Northern Blvd., Long Island City 1, N.Y. Return shipment will be made by express collect. Note that a carrier cannot be held liable for damages in transit if packing IN HIS OPINION, is insufficient.



TUBE LAYOUT



TROUBLE-SHOOTING CHART

SYMPTOM	CAUSE
House power line fuse blows. Fuse F1, remains intact.	Short in line cord. Shorted C29, 30, 31, or 32. L14 or L15 shorted to ground.
Fuse F1, blows.	T1 pri., h.v. sec., filament windings shorted. Short in FUNCTION switch S3. Short in J5 (pins 2 & 7). Shorted V5 rectifier. C27, C28 excessively leaky or shorted. Shorted C35, 38, 43, 15. L16 shorted to ground.
Standby pilot I1 not lit. All filaments except V5 lit.	Pilot lamp I1 blown.
STANDBY pilot & all filaments except V5 not lit.	Open 6.3V filament winding.
Rectifier V5 filament not lit.	Open 5V filament winding.
DC voltage at V5 cathode (pin 8) is incorrect as specified below.	
(a) No voltage.	Defective V5. C27 or C28 shorted internally or externally. Connection to center tap of high voltage winding of T1 is open. Open choke L16.
(b) Low voltage.	Low line voltage. One-half of h.v. sec. of T1 open. C5, 6, or 8 shorted. R16, 17 partially shorted.
(c) High voltage.	High line voltage. R16, 17 open.

SYMPTOM	CAUSE
No drive, or absence of grid current.	Defective V1, V2, V3, V4 Key contacts not closed. No B+; open R2, R3, defective DRIVE pot. R7. C7, C10, C11, C13 shorted. Meter M1 open. METER switch S4 defective. Crystal defective. FUNCTION switch S3 defective. Coil L1 out of alignment, defective, shorted, or open. (Replace, or see coil L1 adjustment in this section).
Final amplifier not dipping properly. (Meter off scale).	No grid excitation. (No grid current - improper tuning).
Meter shunt R10 blown.	Overloaded antenna (short, etc.). Improper setting of BAND SELECTOR S2 for a given crystal. (e.g. 40 m crystal used for 80 m operation or vice versa).
Antenna will not load properly. (Low plate current after attempting to load antenna).	Defective ground system. Wrong type of antenna. Shorted plates in ANT. LOADING capacitor C19. Shorted co-ax cable, etc.
Heavy arcing at key contacts.	Defective V4. Open R11.
No final amplifier plate current with grid current.	Absence of shorting jumper between pins 4 and 6 of the octal plug inserted in octal socket J5 (when used as CW transmitter). Open modulation transformer (in external modulator). RF choke L11 open. Open R12. FUNCTION switch S3 defective.

VOLTAGE CHART

PIN NO.										
TUBE	1	2	3	4	5	6	7	8	9	
GZ34 V5	0	620 DC	0	720 AC	0	720 AC	0	620 DC		
6CL6 V1	RF —	RF —	150 DC	0	6.3 AC	RF	0	150 DC	RF	
6AQ5 V2	RF	9 DC	6.3 AC	0	RF	*90 DC	RF			
6AQ5 V4	-80 DC	0	0	6.3 AC	200 DC	150 DC	-80 DC			
6146 V3	0	0	200 DC	0	RF	0	6.3 AC	0		(CAP) RF
J5	6.3 AC	0	600 DC	600 DC	200 DC	600 DC	0	0		

*Variable 0-150V

All voltages measured to ground with a 20,000Ω/V VOM (not VTVM). Set to 20 meter operation with a 52Ω dummy load or a 100 watt lamp connected to the RF output co-axial connector. Plate current set to 150 ma and grid current to 3 ma.

RESISTANCE CHART

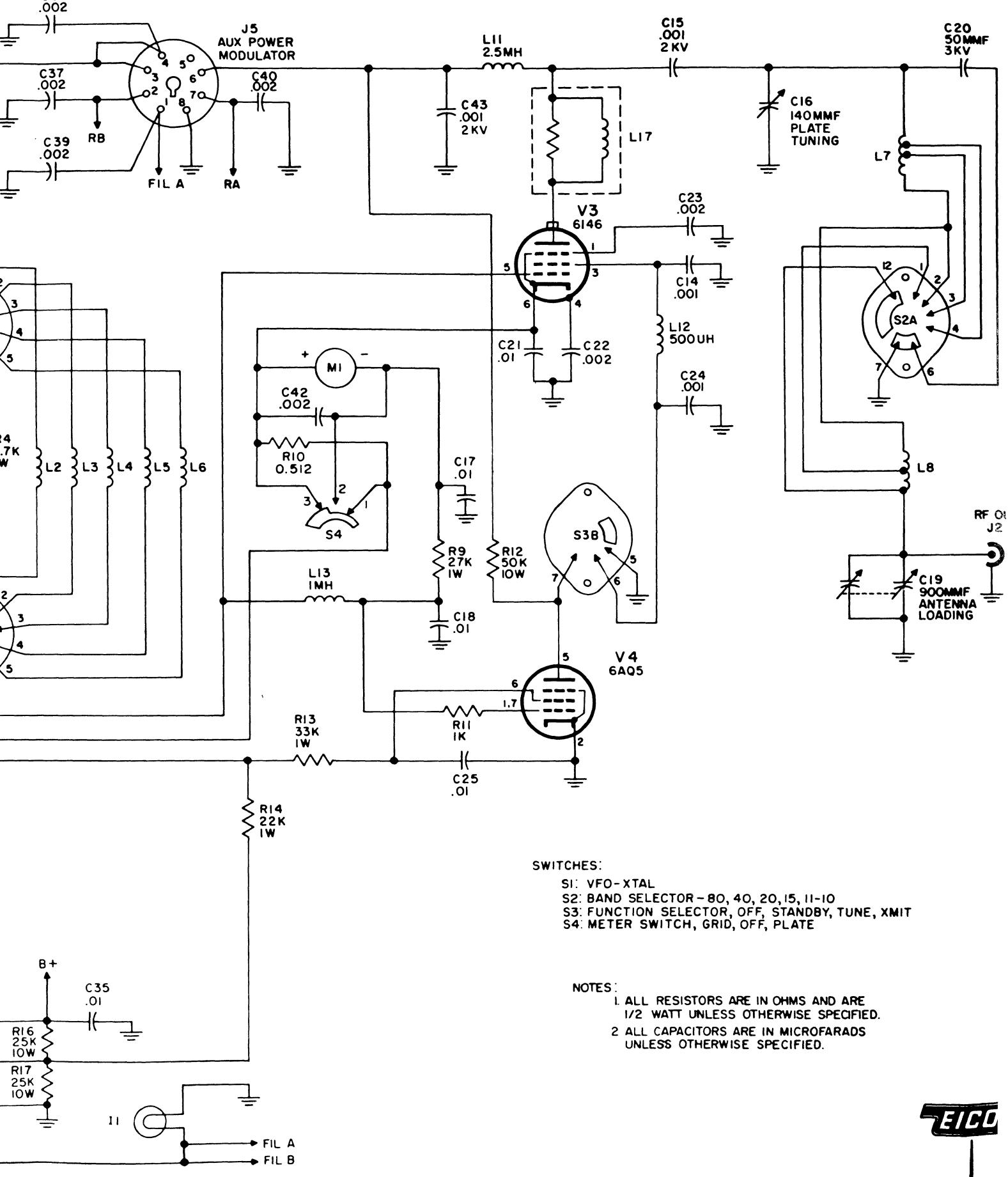
PIN NO.										
TUBE	1	2	3	4	5	6	7	8	9	
GZ34 V5	INF.	27K	INF.	INF.	INF.	INF.	INF.	27K		
6CL6 V1	35	100K	40K	0	—	52K	0	40K	100K	
6AQ5 V2	4.7K	470	—	0	28K	0	4.7K			
6AQ5 V4	27K	0	0	—	75K	73K	27K			
6146 V3	0	—	INF.	0	27K	0	—	0		(CAP) 27K
J5 Rear Octal	—	INF.	27K	27K	INF.	27K	INF.	0		

Transmitter line cord disconnected from AC power line, FUNCTION and METER switches set to OFF. DRIVE control set to zero. Dash (—) indicates "too low to read". INF. means infinite.

REPLACEMENT PARTS LIST

Stock#	Symbol	Description	Am't.
22551	C1	cap., disc., 22mmf - 500V, ±10%	1
22552	C2	cap., disc., 220mmf - 500V, ±10%	1
22553	C3, 4, 22 23, 37, 38, 39, 40, 41, 42	cap., disc., .002mfd - 1000V, GMV (2K or 2000)	10
22554	C5,6,8,9, 10, 17, 18, 21, 25, 33, 34, 35, 36	cap., disc., .01mfd - 1000V, GMV (10K or 10,000)	13
22545	C7	cap., disc., 125mmf - 1000V, ±10%	1
22555	C11,14,24	cap., disc., .001mfd - 1000V, ±10%	3
29009	C12	cap., variable, 50mmf	1
22556	C13	cap., disc., 68 mmf - 1000V, ±10%	1
22557	C15,26,43	cap., disc., .001mfd - 2000V, ±20%	3
29011	C16	cap., variable, 140mmf	1
29010	C19	cap., variable, 2x420mmf	1
22558	C20	cap., disc., 50mmf - 3000V, ±10%	1
23021	C27, 28	cap., elec., 40mfd - 450V	2
22528	C29-30, 31-32	cap., disc., 2x.005mfd	2
91008	F1	fuse, 3A, slow blow	1
92000	I1, 2	bulb, #47	2
97500	J1	socket, crystal	1
50023	J2	jack, UHF	1
50022	J3	jack, phone, closed circuit	1
50014	J4	jack, RCA phono	1
97041	J5	socket, octal	1
52001	J6	binding post	1
36014	L1	coil, slug tuned, 18uh	1
35027	L2	coil, fixed, 72uh, red dot	1
35028	L3	coil, fixed, 18uh, orange dot	1
35029	L4	coil, fixed, 4.3uh, green dot	1
35030	L5	coil, fixed, 1.5uh	1
35031	L6	coil, fixed, .95uh	1
35033	L7	coil, fixed, air inductor	1
35032	L8	coil, fixed, air inductor	1
35034	L9, 10, 13	choke, RF, 1mh (3 windings)	3
35035	L11	choke, RF, 2.5mh (standoff)	1
35036	L12	choke, RF, 500uh	1
35020	L14, 15	choke, line, 25uh	2
34003	L16	choke, filter	1
35037	L17	choke, parastic (coil on resistor)	1
74006	M1	meter	1
10410	R1	res., 100KΩ, 1/2W, ±10% (brown, black, yellow, silver)	1
14303	R2, 16, 17	res., 25KΩ, 10W, ±10% (red, green, orange, silver)	3
14350	R3	res., 7.5KΩ, 20W, ±10% (violet, green, red, silver)	1
10816	R4	res., 4.7KΩ, 1W, ±20% (yellow, violet, red)	1
10847	R5	res., 100KΩ, 1W, ±10% (brown, black, yellow, silver)	1
10861	R6	res., 470Ω, 1W, ±10% (yellow, violet, brown, silver)	1
19017	R7	pot., 50KΩ, 4W, linear	1
10853	R8	res., 10KΩ, 1W, ±10% (brown, black, orange, silver)	1
10832	R9	res., 27KΩ, 1W, ±10% (red, violet, orange, silver)	1
13004	R10	res., .512Ω, 1/2W, ±1%	1
10015	R11, 15	res., 1KΩ, 1/2W, ±20% (brown, black, red)	2
14304	R12	res., 50KΩ, 10W, ±10% (green, black, orange, silver)	1
10850	R13	res., 33KΩ, 1W, ±10% (orange, orange, orange, silver)	1
10851	R14	res., 22KΩ, 1W, ±10% (red, red, orange, silver)	1
62001	S1	switch, slide, SPST	1
60062	S2	switch, rotary, 3 sections	1
60063	S3	switch, rotary, 1 section	1
60064	S4	switch, rotary, 1 section	1
30026	T1	transformer, power	1
54015	TB1, 4	terminal strip, 3 post 2 left w/gnd	2
54004	TB2, 3	terminal strip, 2 post w/gnd	2
54000	TB5	terminal strip, 1 post left	1
54001	TB6	terminal strip, 1 post right	1
54002	TB7	terminal strip, 1 post right w/gnd	1
54019	TB8	terminal strip, 2 post right	1
54007	TB9	terminal strip, 3 post, 2 right w/gnd	1
54005	TB10	terminal strip, 2 post right w/gnd	1
90056	V1	tube, 6CL6	1
90047	V2, 4	tube, 6AQ5	2
90055	V3	tube, 6146	1
90044	V5	tube, GZ34	1
97800	XF1	fuseholder	1

Stock#	Symbol	Description	Am't.
97701	XI1, 2	pilot lite assembly	2
97027	XV1	socket, top mount, 9 pin min.	1
97040	XV2	socket, top mount, 7 pin	1
97041	XV3, 5	socket, octal	2
97022	XV4	socket, bottom mount, 7 pin	1
40000		nut, hex, #6-32	28
40001		nut, hex, 3/8-32	7
40007		nut, hex, #4-40 x 1/4	14
40008		nut, hex, #8-32	15
40016		nut, hex, 1/2-24 for fuseholder	1
40022		nut, hex, #4-40 x 3/16 for crystal socket	1
41000		screw, #6-32 x 1/4	21
41003		screw, #8-32 x 3/8	10
41004		screw, #6-32 x 2 2 1/2	1
41007		screw, #6-32 x 3/4	3
41009		screw, #4-40 x 3/4	1
41016		screw, #4-40 x 1/4	14
41069		screw, set, #6-32 x 1/8	2
41059		screw, #6-32 x 1 1/8	3
41071		screw, #8-32 x 2 1/4	2
41072		screw, #8-32 x 3/4	4
41073		screw, #6 P. K. black	18
42000		washer, lock, 3/8	7
42001		washer, flat, 3/8	6
42002		washer, lock, #6	26
42005		washer, flat, #6 metal	1
42006		washer, fibre shoulder #6	2
42007		washer, lock, #4	18
42008		washer, lock, #8	15
42025		washer, fibre shoulder #12	2
42029		washer, rubber for fuseholder	1
43000		lug, #6	7
43001		lug, pot ground, 3/8	1
43004		lug, #8	5
43006		lug, #4	3
44016		standoff, metal 13/16	3
45005		standoff, ceramic	4
46000		grommet, 3/8	1
46001		grommet, 1/4	6
46008		feet, rubber	4
50024		hood, UHF receptacle	1
51007		octal plug and hood	1
53025		knob, round, 1 1/4" D	4
53026		knob, round, 1 1/2" D	3
57000		line cord	1
58000		wire, hook-up	length
58300		spaghetti	length
58402		cable, 300Ω twin lead	length
58405		cable, RG58A/U	length
58501		wire, bare #22 (thin)	length
58504		wire, bare #18 (heavy)	length
66072		manual of instruction (wired)	1
66321		manual of instruction (kit)	1
80065		panel	1
81174		shield, meter	1
81175		clamp, plastic cable	1
81181		chassis, main	1
81182		bottom plate	1
81183		shield, bottom	1
81184		shield, top	1
81185		cover, top shield	1
81186		hood	1
81903		cable clamp, metal	3
81908		clamp, for electrolytic capacitor	2
82004		shaft, 1/4 OD	1
83002		coupler fixed	1
85000		bushing, 3/8" OD	1
85004		bushing, male ceramic	3
85005		bushing, female ceramic	3
97300		shield, tube, short	1
97302		shield, tube, long	1
97710		jewel, red	1
97713		jewel, green	1
98502		cap, tube	1



SWITCHES:

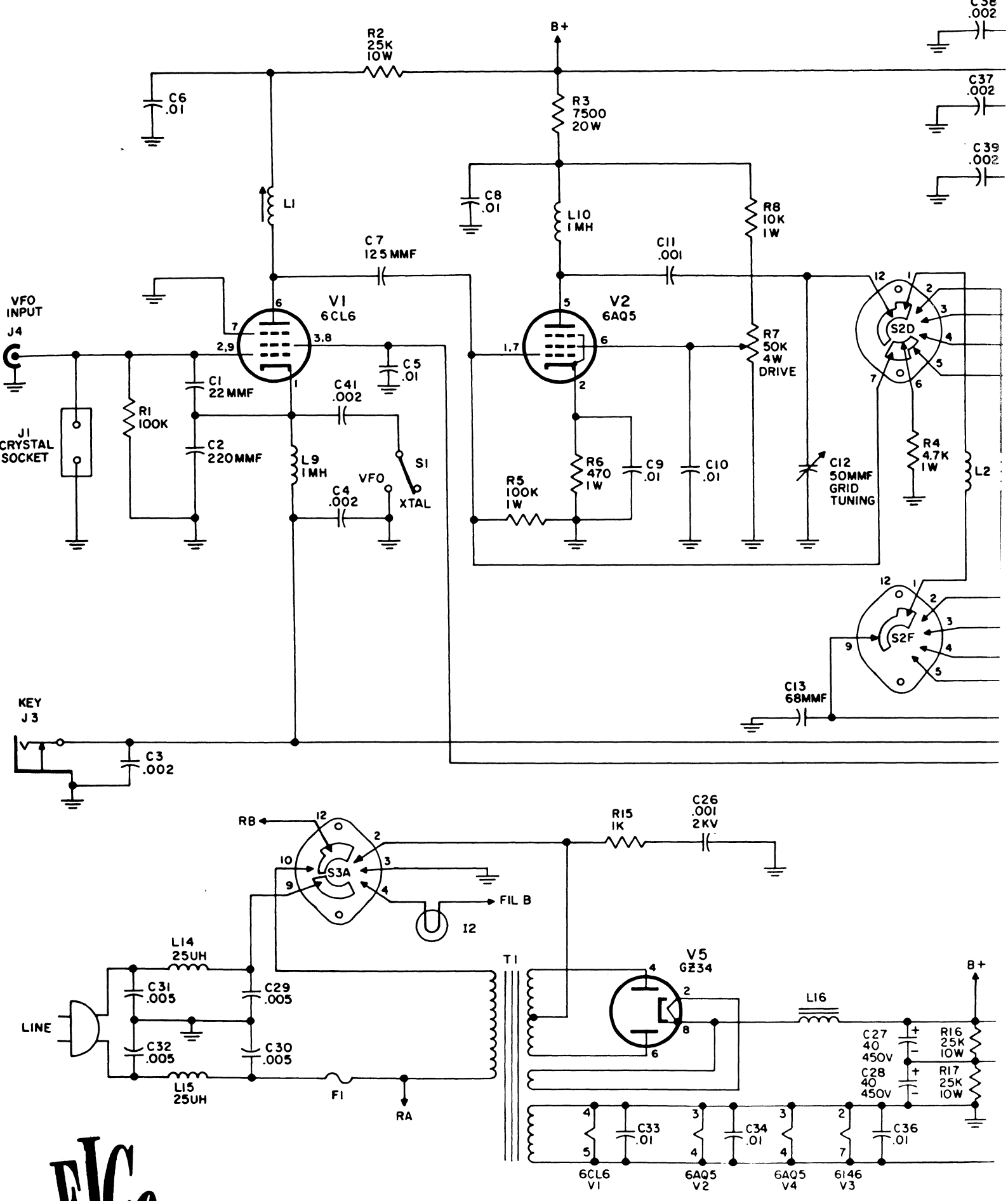
S1: VFO-XTAL
S2: BAND SELECTOR – 80, 40, 20, 15, 11-10
S3: FUNCTION SELECTOR, OFF, STANDBY, TUNE, XMIT
S4: METER SWITCH, GRID, OFF, PLATE

NOTES:

1. ALL RESISTORS ARE IN OHMS AND ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS UNLESS OTHERWISE SPECIFIED.

EICO

90-WATT CW TRANSMITTER


B+
R2 25K 10W
C6 .01
R3 7500 20W
C38 .002
C37 .002
C39 .002
L1
C8 .01
L10 1MH
R8 10K 1W
C7 125 MMF
C11 .001
VFO INPUT
J4
V1 6CL6
V2 6AQ5
R7 50K 4W DRIVE
S2D
C1 22 MMF
C41 .002
C5 .01
R1 100K
J1 CRYSTAL SOCKET
C2 220MMF
L9 1MH
VFO
S1
XTAL
C4 .002
R5 100K 1W
R6 470 1W
C9 .01
C10 .01
C12 50MMF GRID TUNING
R4 4.7K 1W
L2
S2F
C13 68MMF
KEY J3
C3 .002
RB
S3A
FIL B
I2
R15 1K
C26 .001 2KV
L14 25UH
T1
V5 GZ34
L16
C31 .005
C29 .005
LINE
C32 .005
C30 .005
L15 25UH
F1
RA
C27 40 450V
R16 25K 10W
C28 40 450V
R17 25K 10W
C33 .01
C34 .01
C36 .01
6CL6 V1
6AQ5 V2
6AQ5 V4
6146 V3