MODULATOR-DRIVER

MODEL

730

INSTRUCTION

MANUAL

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

MODEL 730

MODULATOR - DRIVER

general description

The new EICO Model 730 is a superb, truly versatile modulator at low cost. It can deliver 50 watts of undistorted audio signal for phone operation — more than sufficient to modulate 100% the EICO Model 720 90-watt CW Transmitter or any transmitter whose RF amplifier has a plate input power of up to 100 watts. The multi-match output transformer matches most loads between 500 to 10,000 ohms and the unique over-modulation indicator permits easy, reliable monitoring, thus precluding any need for a plate meter. The Model 730 provides low level speech clipping and filtering with peak speech frequency range circuitry. Low distortion is also achieved through the use of feedback and the employment of premium quality audio power pentodes. The vacuum tube rectifier is the extra-rugged, slow warm-up GZ34, which eliminates high starting voltages and lengthens electrolytic and tube life. Balance and bias adjustment controls are also provided and the finest quality, conservatively rated parts are used throughout. The Model 730 is also an excellent low impedance driver for a class B high-power modulator.

SPECIFICATIONS

Power Output: 50 watts.

Output Transformer Matching Impedances: 500 to 10,000 ohms.

Inputs: Low level, high impedance — crystal or dynamic mikes. High level, low impedance — phone patch, etc.

Tubes: 1-ECC83/12AX7 speech amplifier, 1-6AL5 speech clipper, 1-6AN8 amplifier driver, 2-EL34/6CA7 power output, 1-EM84 over-modulation indicator, 1-GZ34 rectifier.

Power Requirements: 117 volts, 60 cycles; 150 watts drain.

Size: HWD — 6" x 14" x 8".

Weight: 21 lbs.

circuit description

MICROPHONE PRE-AMPLIFIER (V1): A 12AX7/ECC83 dual triode V1 is used as the microphone pre-amplifier. Contact bias is used in the first stage to obtain the greatest amplification. The gain control R4 is placed in the grid circuit of the second stage. To attenuate power-wasting low frequencies outside the speech range, the coupling capacitor C2 is low-valued (.001 mf). A phone patch input (J2) is also located at a low-impedance point in the second stage. In the latter service, the gain control R4 is set to minimum and the second stage behaves as a grounded grid amplifier. If the gain control is not set at minimum, mixing with the microphone is possible. Bias is obtained with an un-bypassed cathode resistor R6, which also provides negative feedback for reduced distortion in this stage. An RF filter (R1, C1) is employed at the input of the first stage to reduce any tendency towards RF feedback through the modulator.

CLIPPER-FILTER (V2): A 6AL5 dual-diode V2 is employed a series type clipping circuit. The clipping level is controlled by varying the common diode plate voltage by a potentiometer R9 in a voltage divider circuit. The output of the clipper is fed through a low pass filter L1, C5, and C6 to suppress high order harmonics generated by peak clipping. The clipper, when adjusted by means of the over modulation indicator, prevents the voice peaks from over-modulating the transmitter. The result is a reduction of any spurious sidebands and a restriction of bandwidth of the modulated wave. In addition the effective speech level of the signal will be raised 8-12 db. This gives the audio "punch" that is desirable under QRM conditions.

VOLTAGE AMPLIFIER & PHASE INVERTER (V3): A 6AN8 pentode-triode V3 is used as a voltage amplifier (pentode) direct-coupled to a split-load phase inverter (triode). Negative feed-back from the secondary of the modulation transformer is introduced at the cathode of the voltage amplifier.

OUTPUT STAGE (V4 & V5): A pair of EL34 premium audio power amplifier tubes V4 & V5 are operated in push-pull, class AB1. Fixed bias is obtained from a separate adjustable bias supply and a balance potentiometer. R19 is provided so that the tubes can be electrically balanced. The multi-tap modulation transformer, which allows flexibility in matching any desired load between 500 and 10,000 ohms, has a separate secondary winding providing the required feedback voltage for the outside loop returning to the cathode of the voltage amplifier. The use of feedback greatly reduces distortion and extends the range of uniform frequency response, resulting in increased clarity and pleasantness of speech. Another important value of feedback is the considerably improved regulation of the output, which is useful when the modulator is used to drive a class B load.

POWER SUPPLIES: The plate power supply is a full-wave capacitor-input type employing the rugged GZ34/5AR4 indirectly heated rectifier V7. The center-tap of the high voltage winding of T1 which operates this supply is grounded either through PLATE SUPPLY switch S2 or through a connection from pin 8 of OUTPUT octal socket J5. The latter permits the modulator to be tuned on and off by a set of contacts in the antenna change-over relay ("off" when transmitter is set to "standby", and "on" when transmitter is set to "transmit"). A separate bias supply, employing a selinium rectifier SR1 in a half-wave circuit, provides the necessary fixed bias for the output tubes. Potentiometer R29 controls the bias voltage.

OVER-MODULATION INDICATOR (V6): An EM84 electron-ray tube V6 provides visual indication of over-modulation when the Model 730 is employed as a plate modulator. Over-modulation is evidenced by clipping which occurs when the peak value of the audio output signal from the modulator exceeds the plate voltage of the RF amplifier. A negative voltage then appears at the grid of V6, causing the two green indicating bars of the tube to overlap. The peak value of the audio output signal of the modulator is controlled by the setting of the CLIPPING LEVEL control R19, which sets the plate voltage of the diode clipper V2 circuit and therefore the signal clipping level. R19 should be set so that the bars approach each other closely but do not overlap, which indication corresponds to 100% modulation.

functions of controls

GAIN Control: Controls gain of microphone preamplifier. Not operative as a gain control for phone patch service since it must be set to zero for this service unless mixing with the microphone is desired.

CLIPPING LEVEL Control: Sets voltage levels at which audio signal is clipped. Since the GAIN Control is between the CLIPPING LEVEL Control and the modulator microphone input, the CLIPPING LEVEL control also sets the maximum peak-to-peak amplitude of the modulator output and can be set to prevent the possibility of over-modulation.

OVER-MODULATION Indicator: An electron-ray indicator at the output of the modulator. Overlapping of the green indicating bars occurs when the output audio signal exceeds the plate voltage of the RF amplifier stage being modulated (over-modulation). The CLIPPING LEVEL Control described above can be set to avoid this condition.

PLATE SUPPLY Switch: Turns plate power supply of modulator ON and OFF. At the OFF position, remote control of this supply is possible via a connection from pin 8 of OUTPUT Socket J5 to a set of contacts on the antenna change-over relay. At the ON position, remote control is disabled.

AC Switch: Connects or disconnects unit from a-c line.

OUTPUT Socket: Modulator output and remote control connection are taken from this socket. Desired output impedance selected by pin connections in plug.

MICROPHONE Connector: Input for high impedance crystal or dynamic microphone.

PHONE PATCH Input: Low-impedance input for phone connection.

TEST Jacks: Meter connections for output tube balance adjustment.

electrical installation

1. Securely connect a heavy wire from the ground binding post of the modulator to the ground binding post of the transmitter. (The transmitter ground binding post should be connected to a true earth ground.)

2. Wire the octal plug provided to select the desired modulator output impedance as required by the load. Pin 1 is common and the remaining pins from 2 to 7 provide a choice of impedances (see table below). Note that pin 1 is always connected to the plate and screen circuits of the modulated RF stage and the other selected pin from 2 to 7 is always connected to the plate supply (B+). If a remote control relay or an antenna change-over relay with a spare set of contacts is being used, wire pin 8 of the plug for connection to one contact of the relay and make a connection from the ground binding post to the other relay contact to provide remote switching of the modulator plate supply by the function switch of the transmitter.

J5 Pin#	Impedance	J5 Pin#	Impedance
1	Common	5	6500Ω
2	500Ω	6	7500Ω
3	3000Ω	7	10,000Ω
4	5000Ω	8	Plate supply remote switching

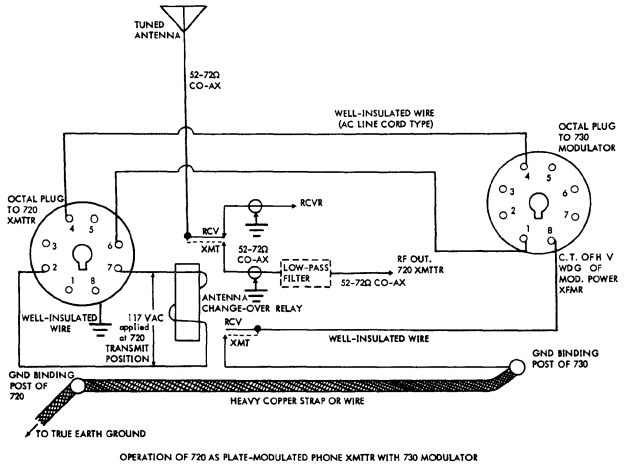


Fig. 1

Fig. 1 is diagram of the required interconnections between the EICO Model 720 Transmitter, the Model 730 Modulator, and an antenna change-over relay with a spare set of contacts for remote switching. Note that pin 1 of the octal plug going to the 730 connects to pin 6 of the octal plug going to the 720, and that pin 4 of the 730 plug connects to pin 4 of the 720 plug.

The operation of the remote control relay in conjunction with the modulator remote switching leads from pin 8 of the octal plug and ground is as follows: Pin 8 of the output octal socket in the modulator is internally connected to the center-tap of the high voltage secondary winding of the power transformer. The plate power supply of the modulator does not operate unless this center-tap is grounded. When the relay is energized (at the transmit function of the transmitter), the relay contacts used for remote switching are closed and thereby the center-tap is grounded, causing the modulator plate supply to operate. When the relay is not energized (at the standby and tune functions of the transmitter), the center-tap is left floating and the modulator plate supply is inoperative. The remote switching operation just described requires that the PLATE SUPPLY Switch of the 730 be set to OFF. At the ON position, the center-tap is internally grounded in the modulator and remote switching is disabled.

3. Connect a high-impedance crystal or dynamic microphone to the MICROPHONE input connector.

operating instructions

1. The Model 730 should not be operated without a proper load under signal conditions, as the high voltages generated in the modulation transformer may damage it. If it is used with a remote switching relay that turns on the modulator plate supply only at the transmit function of the transmitter, you are protected against this cause of damage. If no relay is used, the 730 plate supply must be turned on and off manually by means of the PLATE SUPPLY switch. Set the transmitter FUNCTION switch to TRANSMIT before turning the modulator PLATE SUPPLY switch to ON, and turn the PLATE SUPPLY switch to OFF before turning the transmitter FUNCTION switch to STANDBY or OFF.

2. Adjustment of the GAIN and CLIPPING LEVEL controls is made under operating conditions (modulator connected to transmitter set at the transmit function) in the following manner. First, turn the GAIN and CLIPPING LEVEL controls to zero. Speaking into the microphone in a normal voice from a normal distance (about 6 inches), turn up the GAIN control until the OVER-MODULATION indicator shows overlapping of the green bars occurring on peaks of normal speech. Now turn up the CLIPPING LEVEL control until the over-lapping on normal speech peaks disappears. Check the adjustment by speaking into the microphone quite loudly; loud speech should not be able to cause over-lapping on peaks if the adjustment is correct. Finally, turn up the GAIN control another fifteen divisions. This will give about 10 to 12 db of speech clipping as is normally desirable.

NOTE: If the 730 is being used to drive a higher-power modulator, the OVER-MODULATION INDICATOR evidently can no longer indicate over-modulation of the transmitter. The high-power modulator will usually have a plate meter which serves this purpose. The GAIN and CLIPPING LEVEL controls of the 730 are adjusted in the same way as described above, only the plate meter is observed for indication of over-modulation.

maintenance

The BIAS ADJ. and the BALANCE ADJ. for the output stage must be adjusted by kit builders before initial use of the amplifiers — factory wired units will have had these adjustments made. The BALANCE ADJ. will have to be readjusted by all users whenever one or both of the EL34 output tubes is replaced or if it is suspected that dc unbalance in the output tubes has occurred in the course of use.

a) PRELIMINARY STEPS TO BIAS & BALANCE ADJUSTMENTS: Set AC switch to OFF and disconnect modulator from the transmitter and any remote switching relay (remove plug from octal socket J5). Connect a resistive load of proper value (5KΩ for output taps appropriate to use with 720) to the output of the modulator. Set the GAIN and CLIPPING LEVEL controls to zero. Set PLATE SUPPLY switch to OFF. Set both the BIAS ADJ. control and the BALANCE ADJ. control at the approximate center of their ranges of rotation. Connect the a-c line cord to the a-c power line, and then set the AC switch to ON.

b) SETTING BIAS ADJ. control (BIAS VOLTAGE ADJUSTMENT): Use either a VOM of at least 20, 000Ω per volt sensitivity and ±3% accuracy on dc voltage measurement or a VTVM. Set the instrument at the minus or negative DC volts functions and a range of not less than 50 volts or more than 150 volts (the closer the point on the scale at which the reading is to full scale, the more accurate it is). Rest the modulator on either short side and remove the bottom plate. Locate the arm (center contact lug) of the BIAS ADJ. control and connect the "hot" meter lead to it. Touch the common or ground meter lead to any unpainted point on the chassis (ground) and read the negative dc voltage on the meter. Adjust the BIAS ADJ. control for a reading of - 43 dc volts (negative). Now set the PLATE SUPPLY switch to ON and allow one minute for warm-up, after which the bias reading should drop to about -42 volts. Disconnect the meter leads when this is completed.

c) SETTING BALANCE ADJ. CONTROL: Set the VOM or VTVM at either the plus or minus DC voltage function and select the lowest DC voltage range. Connect the meter leads to the two TEST jacks on the rear chassis apron. If the meter pointer deflects to the left of zero, reverse the leads. Adjust the BALANCE ADJ. control for a zero or minimum reading. This completes the balance adjustment, whereupon the meter leads can be removed from the TEST jacks.

d) Set the VOM or VTVM at the plus DC voltage function and select the lowest DC voltage range (not higher than 3 volts full scale). Insert the "hot" meter lead into either one of the TEST pin jacks and touch the common or ground meter lead to any unpainted point on the chassis (ground). Readjust the BIAS ADJ. control for a meter reading of 0.7 volt.

e) Repeat step c.

f) Repeat step d.

TROUBLE SHOOTING and OPERATING NOTES

Your amplifier should require little service except for normal tube replacement. We recommend no substitutions for the tube types used in this modulator except as stated. The EL34 and GZ34 types are distributed nationally by

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.

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 their 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 length when necessary. Do not cut any lead until you have determined the required length when the lead is routed as shown in the diagrams.

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 very many of the parts for which color coding is given may not be color coded, but have their values and ratings printed The letter K is a multiplier (X1000) and on resistors or capacitors indicates that the printed numerical value must be multiplied by one thousand to obtain the value in ohms or micro-micro farads respectively. Note also that one microfarad (mf) is equal to one million; micro-microfarads (mmf). To aid in rapid identification, keep in mind that 5%, 10%, and 20% resistors are color coded whereas 1% resistor have their values printed; also that molded tubular capacitors may or may not be color coded, whereas disc capacitors and electrolytics will always have their values printed. Please note the following relationships between the units used to express resistance or capacity.

1,000,000 ohms (Ω) = 1000 kilohms (KΩ) = 1 megohm (MΩ)
1,000,000 micro-micro farads (mmf) = 1 micro farads (mf)

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

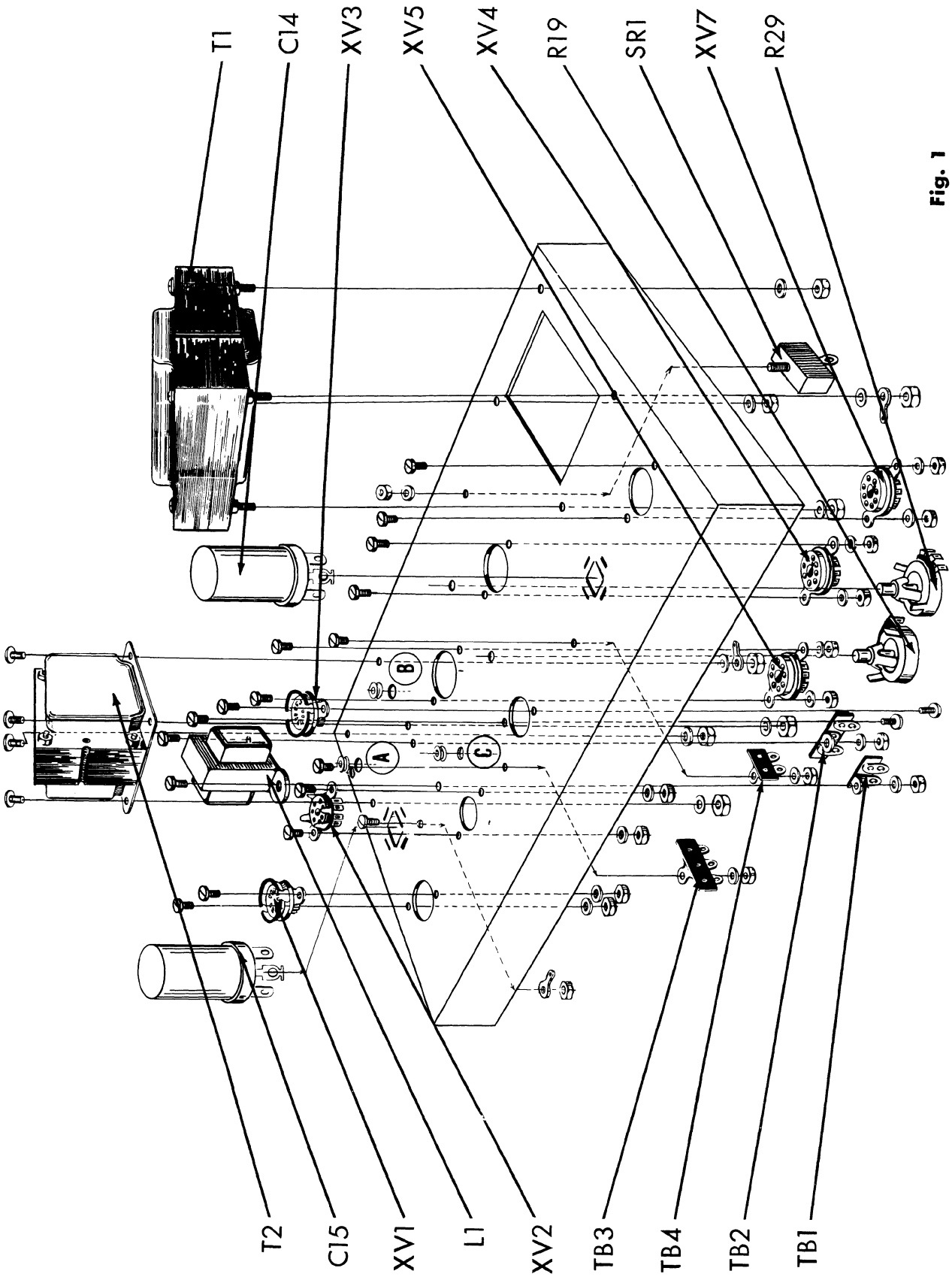

T1
C14
XV3
XV5
XV4
R19
SR1
XV7
R29
T2
C15
XV1
L1
XV2
TB3
TB4
TB2
TB1
A
B
C

Fig. 1

CHASSIS MOUNTING

As each component is mounted, mark the symbol number of the part, hole or lug on the chassis, next to the mounted component. This will make it easier to identify each part, hole or lug when wiring. When the leads on the transformers are wired, pay particular attention to the color of the lead and not to the exact physical placement on the drawing.

1. ( ) Fig. 1. On power transformer T1, (30029), cut both yellow leads to 6", red leads to 5", the green leads to 3", the blue leads to 4", the black lead to 4 1/4", the black-green and the black-red to 6 1/2", the red-yellow to 4 3/4" and the white lead to 3". Mount the transformer as shown, with the yellow leads closest to the side of the chassis. Use four #8 lockwashers and four #8-32 hex nuts. Under one of the hex nuts mount a #8 ground lug.

2. ( ) Fig. 1. Mount one 5/8" grommet in hole "A" in the top of the chassis and a second 5/8" grommet in hole "B".

3. ( ) Fig. 1. On output transformer T2, cut the red lead to 8", the brown lead to 6" and all other leads to 3". Mount the transformer as shown, pushing the red, brown, blue, green and black leads through the grommet mounted in hole "B", and the remaining leads through the grommet mounted in hole "A". Use four #8-32 screws, four #8 lockwashers and four #8-32 hex nuts. Under one of the hex nuts mount a #8 ground lug.

4. ( ) Fig. 1. Mount selinium rectifier SR1, from below the chassis, as shown. Use one #6 lockwasher and one #6-32 hex nut. Orient the rectifier so that plus terminal (marked on rectifier) is closest to the power transformer, T1.

5. ( ) Fig. 1. Mount the octal sockets, XV4, XV5 and XV7, from below the chassis, as shown. Note orientation of center key from figure 3. Use two #6-32 screws, two #6 lockwashers and two #6-32 hex nuts on each.

6. ( ) Fig. 1. Mount the 10K snap-in type pot, R29, between tube sockets XV4 and XV5, towards the rear of the chassis, as shown. Push the pot into the center hole and the two tabs at the side into the two smaller outside holes. Press firmly against the pot towards the chassis until a click is heard and the pot is secured to the chassis. (see fig. 3 for location of lugs)

7. ( ) Fig. 1. Similar to the above, in step 6, mount the 50K snap in type pot, R19. This is located between sockets XV4 and XV5 towards the front of the chassis.

8. ( ) Fig. 1. Mount the nine pin miniature tube sockets with shield support, XV1 and XV3, from the top of the chassis, as shown. Note orientation in Fig. 3. Use two #4-40 screws, two #4 lockwashers and two #4-40 hex nuts on each.

9. ( ) Fig. 1. Mount the seven pin miniature tube socket, with shield support XV2, from the top of the chassis, as shown. Note orientation in Fig. 3. Use two #4-40 screws, two #4 lockwashers and two #4-40 hex nuts.

10. ( ) Fig. 1. Mount a 1/4" grommet in hole "C", near socket XV2.

11. ( ) Fig. 1. On choke L1, cut one lead to 3 1/2" and the second lead to 4". Push these leads through the grommet mounted in hole "C". Mount the choke as shown, using two #6-32 screws, two #6 lockwashers and two #6-32 hex nuts. Under one of the lockwashers, nearest XV2, mount a one post left with ground terminal strip, TB1. Under the second lockwasher, mount a two post terminal strip, TB2.

12. ( ) Fig. 1. Mount electrolytic can capacitors, C14 and C15, as shown. Note orientation of half moon and triangle in figure 3. The mounting taps are inserted into the slots provided on the chassis and twisted somewhat less than a quarter turn. DO NOT twist the taps excessively or they will shear off. Solder one mounting tab to the chassis at the mounting point.

13. ( ) Fig. 1. Mount ground lug "Z" near XV1, as shown. Use one #6-32 screw and one #6-32 hex nut.

14. ( ) Fig. 1. Mount two post with ground terminal strip, TB3 between XV2 and XV3 and on post right with ground terminal strip, TB4 between XV3 and C14. Use one #6-32 screw, one #6 lockwasher and one #6-32 hex nut on each.

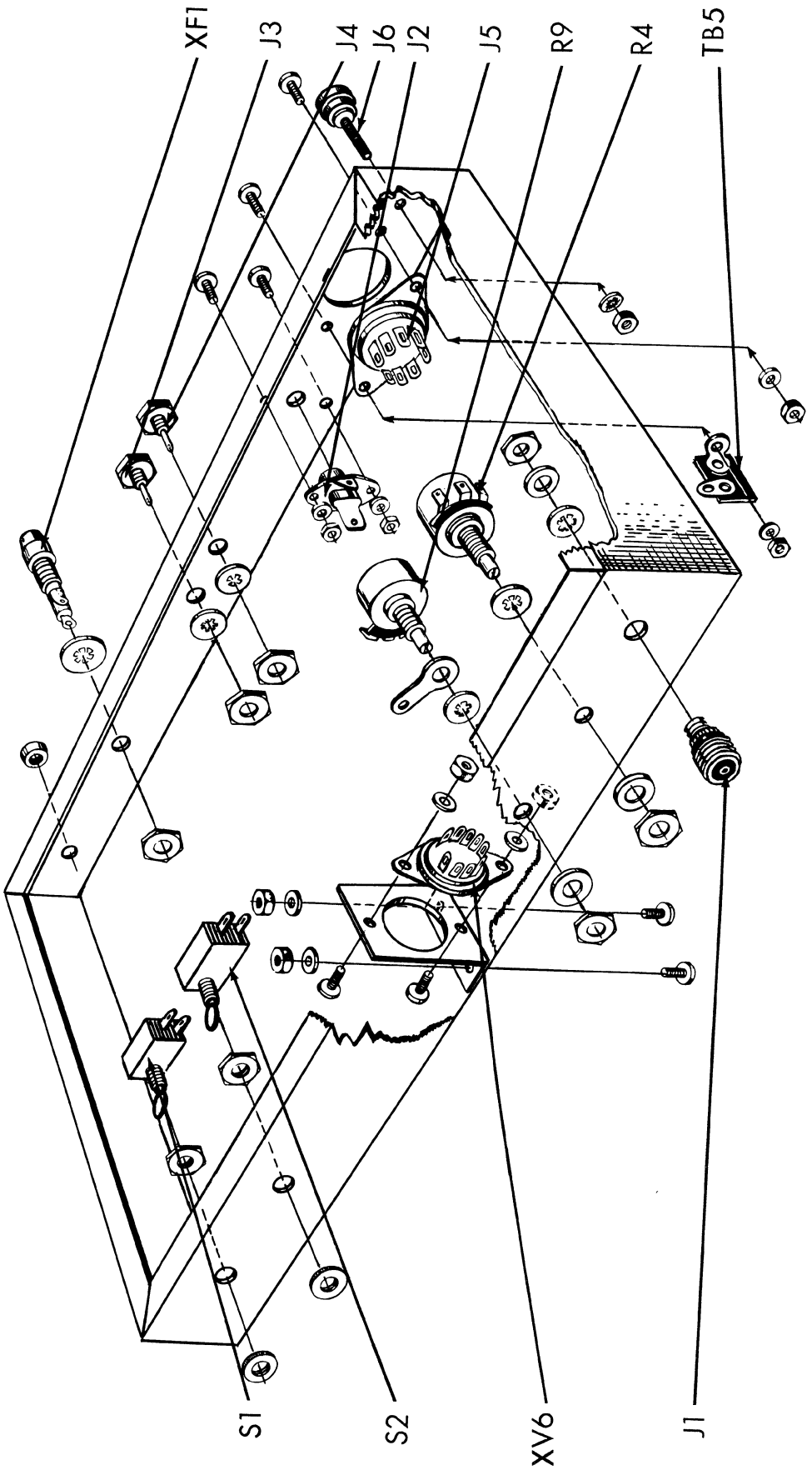


Fig. 2

1. ( ) Fig. 2. On the tube bracket, shown mounted, mount a nine pin miniature tube socket, XV6, as shown. Use two #4-40 screws, two #4 lockwashers and two #4-40 hex nuts.

2. ( ) Fig. 2. Mount the tube bracket, as shown. Use two #6-32 screws, two #6 lockwashers and two #6-32 hex nuts. Tighten these screws slightly, so that bracket can be adjusted after the tube is inserted in its socket.

3. ( ) Fig. 2. Mount 500K pot R4 and 50K pot, R9, as shown. Use one 3/8 lockwasher, one 3/8 flatwasher and one 3/8 hex nut on each. In addition, R9 gets a 3/8 ground lug mounted between the pot and the lockwasher. Orient the lug so that it is opposite R9-3.

4. ( ) Fig. 2. Mount the two SPST Toggle switches, S1 and S2, as shown. Use a hex nut inside the chassis and a round nut outside the chassis, on each. Adjust the hex nut so that only 1/16" of the screw threads can be seen from the front of the chassis, outside the round nut.

5. ( ) Fig. 2. Mount the mic input jack, J1, as shown. Use one 3/8 lockwasher, 3/8 flat fibre washer and one hex nut to secure jack to the chassis. Discard remaining hardware supplied with mic connector.

6. ( ) Fig. 2. Mount grounding terminal post, J6, as shown. Use one #8 lockwasher and one #8-32 hex nut.

7. ( ) Fig. 2. Mount octal socket J5, as shown. Note orientation in figure 3. Use two #6-32 screws, two #6 lockwashers and two #6-32 hex nuts. Under one of the lockwashers, mount a one post upright, right terminal strip, TB5.

8. ( ) Fig. 2. Mount phono jack, J2, as shown. Use two #4-40 screws, two #4 lockwashers and two #4-40 hex nuts.

9. ( ) Fig. 2. Mount test point pin jacks, J3 and J4, as shown. Use one fiber shoulder washer and one hex nut supplied with the jack, on each. Note that the shoulder washer fits through the hole so that the jack will not short to the side of the hole.

10. ( ) Fig. 2. Mount the fuseholder, XF1, as shown. Use a rubber washer against the outside of the chassis under the wider part of the holder. Slide the large nut over the fuseholder on the inside of the chassis. DO NOT tighten nut too much or holder will crack.

11. ( ) Fig. 2. Mount a 3/8 grommet in the remaining hole next to the fuseholder.

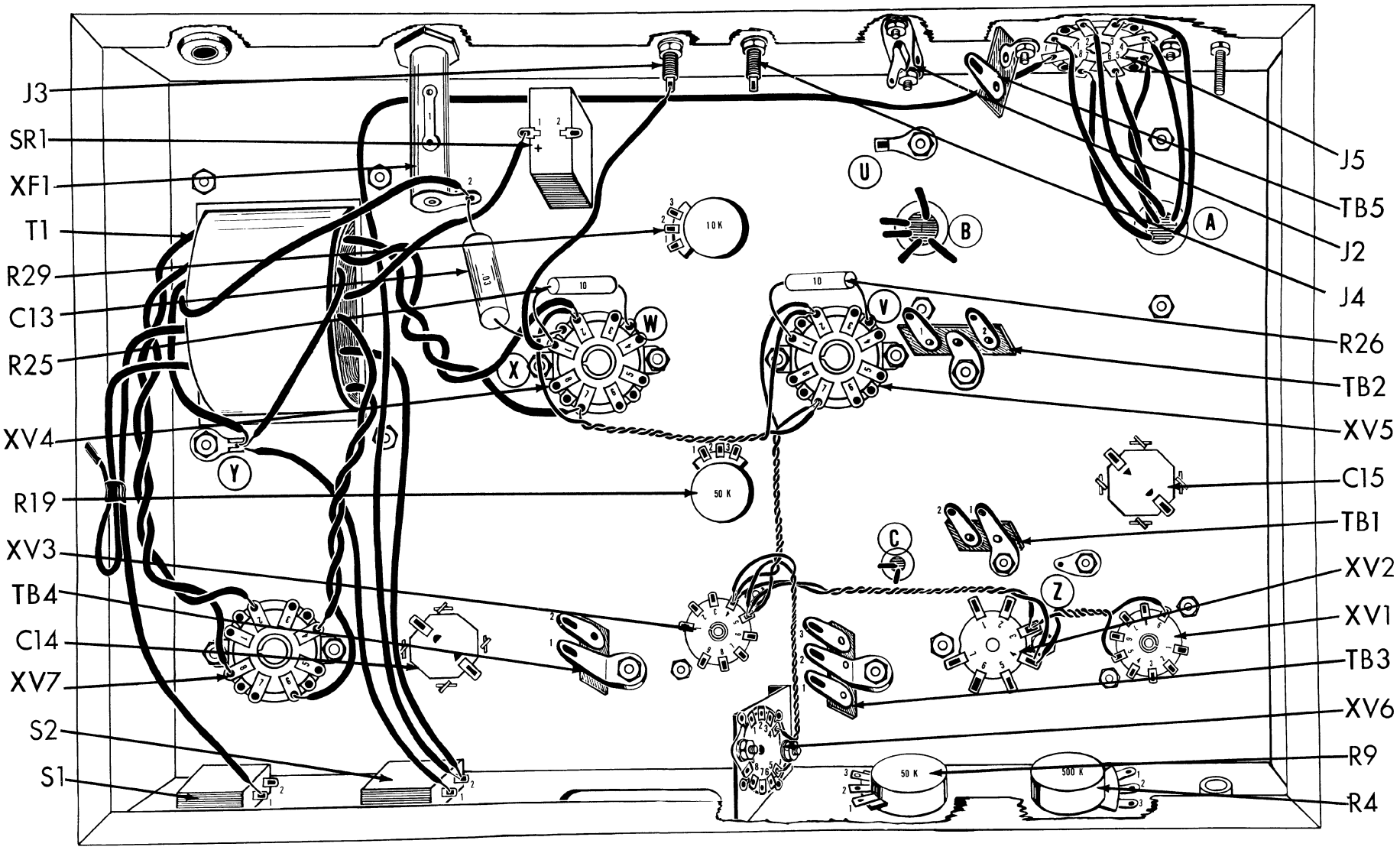

J3
SR1
XF1
T1
R29
C13
R25
XV4
R19
XV3
TB4
C14
XV7
S2
S1
J5
TB5
J2
J4
R26
TB2
XV5
C15
TB1
XV2
XV1
TB3
XV6
R9
R4
10 K
50 K
50 K
500 K
.02
10
10
U
A
B
V
W
X
Y
C
Z

Fig. 3

1. ( ) Fig. 3. From power transformer T1, twist the two yellow leads and run along the chassis, as shown. Connect one lead to XV7-8 (C) and the second lead to XV7-2 (S1).

2. ( ) Fig. 3. From power transformer T1, connect the white lead and one blue lead to ground lug "Y" (C).

3. ( ) Fig. 3. Connect a 5" piece of heavy yellow wire from ground lug "Y" (S3) to S2-1 (S1).

4. ( ) Fig. 3. Connect one end of a 15" piece of heavy yellow wire to S2-2 (C). Run along the chassis as shown. Connect the other end to J5-8 (S1).

5. ( ) Fig. 3. Connect the red-yellow lead from power transformer T1 to S2-2 (S2).

6. ( ) Fig. 3. From power transformer T1, twist the two green leads. Connect one lead to XV4-2 (C) and the second lead to XV4-7 (C).

7. ( ) Fig. 3. From power transformer T1, twist the two red leads. Connect one lead to XV7-4 (S1) and the second lead to XV7-6 (S1).

8. ( ) Fig. 3. Connect the remaining blue lead from T1 to SR1-1 (S1).

9. ( ) Fig. 3. Connect the black lead from T1 to XF1-2 (C).

10. ( ) Fig. 3. If your line voltage does not exceed 121 volts, connect the black-red lead from power transformer T1 to S1-1 (S1), and tape up the end of the black-green lead. Tape this to the black-red lead so that it is not loose in the chassis.

If your line voltage does exceed 121 volts, connect the black-green lead to S1-1 (S1), and tape up the end of the black-red lead. Tape this to the black-green lead so that it is not loose in the chassis.

11. ( ) Fig. 3. Connect one end of a 4" piece of brown wire to XV1-9 (C) and one end of a 4" piece of yellow wire to XV1-5 (C). Twist the two leads together and run along the chassis, as shown. Connect the other end of the brown wire to XV2-3 (C) and the other end of the yellow wire to XV2-4 (C).

12. ( ) Fig. 3. Connect one end of a 5" piece of brown wire to XV2-3 (S2) and one end of a 5" piece of yellow wire to XV2-4 (S2). Twist the two leads together and run along the chassis, as shown. Connect the other end of the yellow wire to XV3-4 (C) and the other end of the brown wire to XV3-5 (C).

13. ( ) Fig. 3. Connect one end of a 4" piece of yellow wire to XV3-4 (C) and one end of a 4" piece of brown wire to XV3-5 (C). Twist the two leads together and run along the chassis, as shown. Connect the other end of the brown lead to XV6-5 (S1) and the other end of the yellow lead to XV6-4 (S1).

14. ( ) Fig. 3. Connect one end of a 4" piece of brown wire to XV3-5 (S3) and one end of a 4 1/2" piece of yellow wire to XV3-4 (S3). Twist the two leads together and run along the chassis, as shown. Connect the other end of the brown lead to XV5-7 (C) and the other end of the yellow lead to XV5-2 (C).

15. ( ) Fig. 3. Connect one end of a 4" piece of brown wire to XV5-7 (S2) and one end of a 6 1/2" piece of yellow wire to XV5-2 (S2). Twist the two leads together and run along the chassis, as shown. Connect the other end of the brown lead to XV4-7 (S2) and the other end of the yellow lead to XV4-2 (S2).

16. ( ) Fig. 3. From hole "A", connect the green-yellow lead to J5-5 (S1), the blue-yellow lead to J5-6 (S1), the slate lead to J5-7 (S1), the yellow lead to J5-4 (S1), the orange lead to J5-3 (S1), the red-yellow lead to J5-2 (S1) and the white lead to J5-1 (C).

17. ( ) Fig. 3. Cut both leads on a .03 mfd, 600 volt molded capacitor, C13, to 3/4". Connect from XF1-2 (S2) to ground lug "X" (S1) on XV4.

18. ( ) Fig. 3. Connect a 4" piece of black wire from XV4-1 (C) to J3 (S1).

19. ( ) Fig. 3. On two 10Ω 1% 1 watt resistors, R25 and R26, cut all leads to 3/4". Connect R25 from XV4-1 (C) to ground lug "W" (C) on XV4. Connect R26 from XV5-1 (C) to ground lug "V" (S1) on XV5.

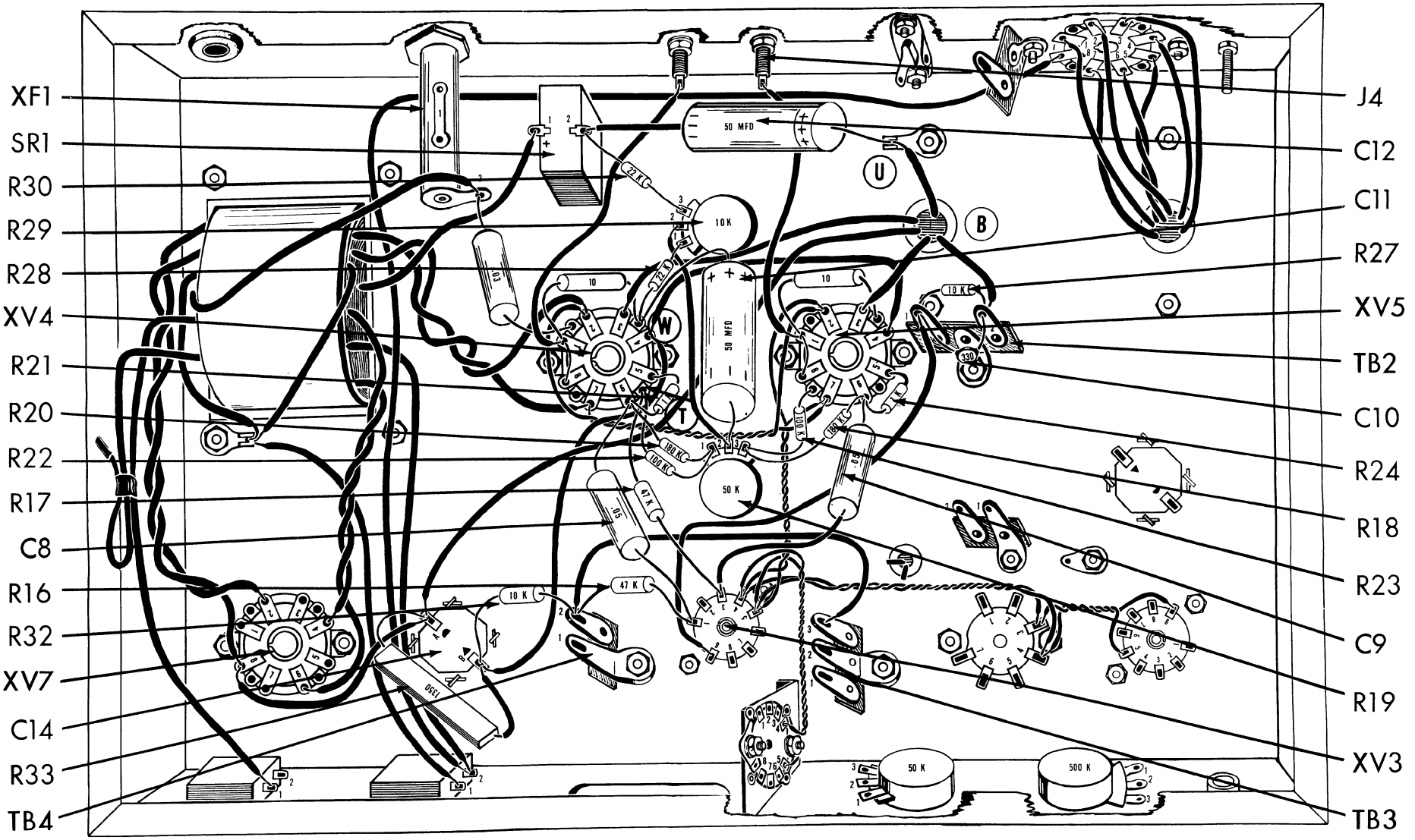

XF1
SR1
R30
R29
R28
XV4
R21
R20
R22
R17
C8
R16
R32
XV7
C14
R33
TB4
J4
C12
C11
R27
XV5
TB2
C10
R24
R18
R23
C9
R19
XV3
TB3
50 MFD
50 MFD
50 K
50 K
500 K
10 K
47 K
100 K
180 K
330
U
B
W
T

Fig. 4

1. ( ) Fig. 4. Connect a 4 1/2" piece of red wire from XV4-4 (C) to XV5-4 (S1).

2. ( ) Fig. 4. Connect a 6" piece of red wire from XV4-4 (S2) to C14-B (C).

3. ( ) Fig. 4. From hole "B", connect the black lead to ground lug "U" (C), the green lead to TB2-2 (C), the blue lead to XV5-3 (S1), the brown lead to XV4-3 (S1) and the red lead to C14-A (C).

4. ( ) Fig. 4. Connect a 4" piece of black wire from J4 (S1) to XV5-1 (C).

5. ( ) Fig. 4. On a 50 mfd, 150V electrolytic capacitor, C12, cut both leads to 1 1/2". Cover the negative (-) lead with a 1 1/4" piece of spaghetti and connect to SR1-2 (C). Connect the positive (+) lead to ground lug "U" (S2).

6. ( ) Fig. 4. Connect a 3 1/2" piece of yellow wire from R29-2 (S) to R19-2 (C).

7. ( ) Fig. 4. On two 22K (red, red, orange, silver) resistors, R28 and R30, cut all leads to 1/2". Connect R28 from R29-1 (S1) to ground lug "W" (C). Connect R30 from R29-3 (S1) to SR1-2 (S2).

8. ( ) Fig. 4. On a 50 mfd, 150V electrolytic capacitor, C11, cut the positive (+) lead to 1 1/2". Cover this lead with a 1 1/4" piece of spaghetti and connect to ground lug "W" (S3). Cut the negative (-) lead to 3/4" and connect to R19-2 (S2).

9. ( ) Fig. 4. Cut all leads on two 100K (brown, black, yellow, silver) resistors, R22 and R23, to 1/2". Connect R22 from R19-1 (C) to ground lug "T" (C) on XV4. Connect R23 from R19-3 (C) to ground lug "S" (S1) on XV5.

10. ( ) Fig. 4. Connect a 4" piece of red wire from TB3-3 (C) to TB4-2 (C).

11. ( ) Fig. 4. Connect a 7" piece of brown wire from TB2-1 (C) to XV3-9 (C).

12. ( ) Fig. 4. Cut both leads on a 47K (yellow, violet, orange, silver) 1 watt resistor, R17, to 1". Cover one lead with a 3/4" piece of spaghetti and connect to XV3-3 (C). Connect the other lead to ground lug "T" (S2).

13. ( ) Fig. 4. Cut all leads on two 180K (brown, grey, yellow, gold) resistors, R18 and R20, to 3/4". Connect R18 from XV5-6 (C) to R19-3 (S2). Connect R20 from R19-1 (S2) to XV4-6 (C).

14. ( ) Fig. 4. Cut all leads on two 1K (brown, black, red, silver) resistors, R21 and R24, to 1/2". Connect R21 from XV4-6 (C) to XV4-5 (S1). Connect R24 from XV5-6 (C) to XV5-5 (S1).

15. ( ) Fig. 4. Connect a 1/2" piece of bare wire from XV4-1 (S3) to XV4-8 (S1).

16. ( ) Fig. 4. Connect a 1/2" piece of bare wire from XV5-1 (S3) to XV5-8 (S1).

17. ( ) Fig. 4. Cut both leads on a 10K ± 5% (brown, black, orange, gold) resistor, R27, to 1/2". Connect from TB2-1 (C) to TB2-2 (C).

18. ( ) Fig. 4. Cut both leads on a 330 mmf disc capacitor, C10, to 3/4". Connect from TB2-1 (S3) to TB2-2 (S3).

19. ( ) Fig. 4. Cut one lead on each of two .05 mfd (green, black, orange, white, yellow) capacitors, C8 and C9, to 1 1/2", and cover each lead with a 1 1/4" piece of spaghetti. Cut the remaining lead on each of these capacitors to 3/4". Connect the shorter lead on C8 to XV4-6 (S3) and the longer lead to XV3-1 (C). Connect the shorter lead on C9 to XV5-6 (S3) and the longer lead to XV3-3 (S2).

20. ( ) Fig. 4. Connect a 5" piece of red wire from XV7-8 (S2) to C14-A (C).

21. ( ) Fig. 4. Cut both leads on a 1350Ω wire wound resistors, R33, to 1 1/4". Cover both leads with a 1" piece of spaghetti. Connect from C14-A (S3) to C14-B (C).

22. ( ) Fig. 4. Cut both leads on a 10K (brown, black, orange, silver) 1 watt resistor, R32, to 3/4". Connect from C14-B (S3) to TB4-2 (C).

23. ( ) Fig. 4. Cut both leads on a 47K (yellow, violet, orange, silver) 1 watt resistor, R16, to 3/4". Connect from TB4-2 (S3) to XV3-1 (S2).

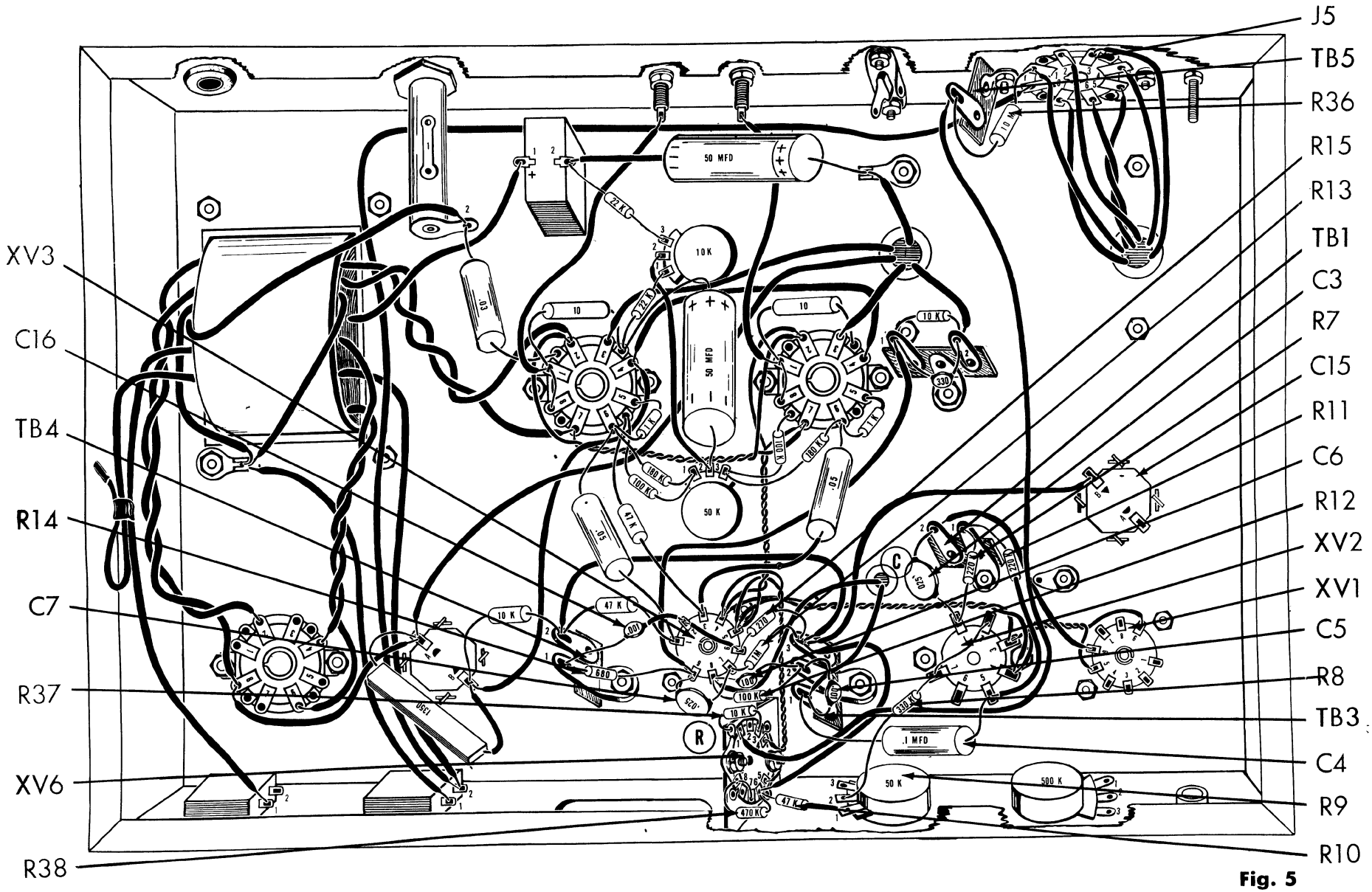

J5
TB5
R36
R15
R13
TB1
C3
R7
C15
R11
C6
R12
XV2
XV1
C5
R8
TB3
C4
R9
R10
XV3
C16
TB4
R14
C7
R37
XV6
R38
50 MFD
10 K
50 K
.1 MFD
500 K
47 K
100 K
470 K

Fig. 5

1. ( ) Fig. 5. Cut both leads on a .001 mfd (1K or 1000 mmf) disc capacitor, C16, to 1". Cover both leads with a 3/4" piece of spaghetti. Connect from XV3-2 (C) to TB4-1 (C).

2. ( ) Fig. 5. Cut both leads on a 680Ω (blue, grey, brown, silver) resistor, R14, to 3/4". Connect from XV3-9 (C) to TB4-1 (S2).

3. ( ) Fig. 5. Connect a 1" piece of bare wire covered with a 5/8" piece of spaghetti from XV3-2 (S2) to XV3-6 (C).

4. ( ) Fig. 5. Connect a 5" piece of red wire from TB3-3 (C) to C15-B (C).

5. ( ) Fig. 5. From hole "C", connect the shorter lead to TB3-1 (C) and the longer lead to XV3-8 (C).

6. ( ) Fig. 5. Cut both leads on a 10K (brown, black, orange, silver) resistor, R37, to 1/2". Connect from XV6-3 (S1) to ground lug "R" (S1) on XV6.

7. ( ) Fig. 5. Connect a 3" piece of red wire from XV6-6 (C) to TB3-3 (C).

8. ( ) Fig. 5. Connect a 3/4" piece of bare wire covered with a 3/8" piece of spaghetti from XV6-7 (S1) to XV6-9 (C).

9. ( ) Fig. 5. Cut both leads on a 47K (yellow, violet, orange, silver) resistor, R10, to 3/4". Cover each lead with a 1/2" piece of spaghetti. Connect from XV6-6 (C) to R9-1 (S1).

10. ( ) Fig. 5. Cut both leads on a 470K (yellow, violet, yellow, silver) resistor, R38, to 1/2". Connect from XV6-9 (S2) to XV6-6 (S3).

11. ( ) Fig. 5. Bend the pot grounding lug on R9 over R9-3 and solder this pot grounding lug to R9-3 (S1).

12. ( ) Fig. 5. Cut both leads on a 1M (brown, black, green, silver) resistor, R13, to 3/4". Connect from XV3-7 (C) to TB3-3 (C).

13. ( ) Fig. 5. Cut both leads on a 270K (red, violet, yellow, silver) resistor, R15, to 3/4". Connect from XV3-6 (S2) to TB3-3 (S5).

14. ( ) Fig. 5. Cut both leads on a .001 mfd (1K or 1000 mmf) disc capacitor, C6, to 3/4". Connect from XV3-8 (C) to TB3-2 (C).

15. ( ) Fig. 5. Cut both leads on a 100K (brown, black, yellow, silver) resistor, R12, to 3/4". Connect from XV3-8 (S3) to TB3-2 (C).

16. ( ) Fig. 5. Cut both leads on a .025 mfd (25K or 25,000 mmf) disc capacitor, C7, to 1/2". Connect from XV3-9 (S3) to XV3-7 (S2).

17. ( ) Fig. 5. Cut both leads on a .001 mfd (1K or 1000 mmf) disc capacitor, C5, to 1/2". Connect from TB3-1 (C) to TB3-2 (S3).

18. ( ) Fig. 5. Connect a 3" piece of red wire from TB1-2 (C) to XV1-6 (S1).

19. ( ) Fig. 5. Connect a 11" piece of brown wire from TB5 (C) to XV6-1 (S1).

20. ( ) Fig. 5. Cut both leads on a 10M, 1W ± 10% (brown, black, blue, silver) resistor, R36, to 3/4". Connect from J5-1 (S2) to TB5 (S2).

21. ( ) Fig. 5. Cut both leads on a .1 mfd (brown, black, yellow, white, yellow) capacitor C4, to 1". Connect from TB3-1 (S3) to XV2-5 (C).

22. ( ) Fig. 5. Cut both leads on a 330K (orange, orange, yellow, silver) resistor, R8, to 1". Connect from R9-2 (S1) to XV2-7 (C).

23. ( ) Fig. 5. Connect a 3/4" piece of bare wire from XV2-7 (S2) to XV2-2 (S1).

24. ( ) Fig. 5. Cut both leads on a 220K (red, red, yellow, silver) resistor, R7, to 1/2". Connect from XV2-1 (C) to TB1-1 (C).

25. ( ) Fig. 5. Cut both leads on a .025 mfd (25K or 25,000 mmf) disc capacitor, C3, to 1/2". Connect from XV2-1 (S2) to TB1-2 (C).

26. ( ) Fig. 5. Cut both leads on a 220K (red, red, yellow, silver) resistor, R11, to 1". Cover one lead with a 3/4" piece of spaghetti and connect to XV2-5 (S2). Connect the other lead to TB1-1 (S2).

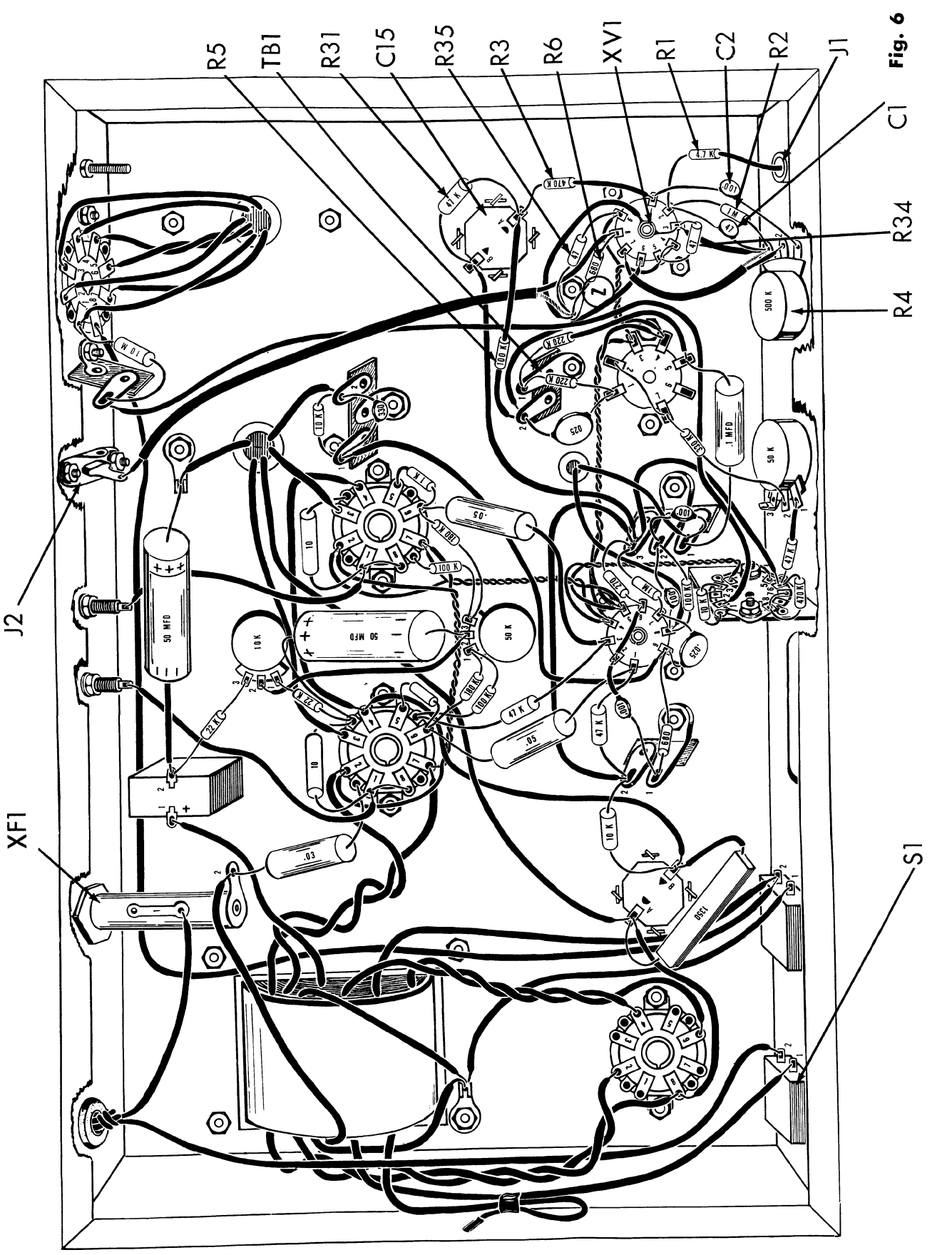


Fig. 6

1. ( ) Fig. 6. Connect a 3" piece of black wire from the center pin of XV1, XV1-10 (C) to ground lug "Z" (C).

2. ( ) Fig. 6. Connect a 3/4" piece of bare wire from the center pin of XV1, XV1-10 (S2) to XV1-3 (C).

3. ( ) Fig. 6. On one end of a 6 1/2" piece of shielded cable, strip the outer insulation back 1/2". Unwrap the shield strands from around the inner conductor and twist the strands together. Cut off these shield strands. Strip the insulation from the inner conductor back 1/4" and connect to J2 (S1).

On the other end of the same piece of shielded cable, strip the outer insulation back 1". Unwrap the shield strands from around the inner conductor and twist the strands together. Strip the insulation from the inner conductor back 1/4". Connect the twisted shield strands to ground lug "Z" (C) and the inner conductor to XV1-8 (C).

4. ( ) Fig. 6. Cover each lead of a 100K (brown, black, yellow, silver) resistor, R5, with a 1 1/4" piece of spaghetti. Connect from TB1-2 (S3) to C15-A (C).

5. ( ) Fig. 6. Cut one lead on a 47Ω (yellow, violet, black, silver) resistor, R35, to 3/4" and the remaining lead to 1 1/4". Connect the shorter lead to XV1-9 (S2) and the longer lead to ground lug "Z" (C).

6. ( ) Fig. 6. Cut both leads on a 47Ω (yellow, violet, black, silver) resistor, R35, to 1/2". Connect from XV1-3 (C) to XV1-5 (C).

7. ( ) Fig. 6. Connect a 1/2" piece of bare wire from XV1-5 (S3) to XV1-4 (S1).

8. ( ) Fig. 6. Cut one lead on a 680Ω (blue, grey, brown, silver) resistor, R6 to 1/2" and the remaining lead to 1". Connect the shorter lead to XV1-8 (S2) and the longer lead to ground lug "Z" (S4).

9. ( ) Fig. 6. Cut both leads on a 47K (yellow, violet, orange, silver) 1 watt resistor, R31, to 3/4". Connect from C15-A (C) to C15-B (S2).

10. ( ) Fig. 6. Cut both leads on a 470K (yellow, violet, yellow, silver) resistor, R3, to 1". Cover one lead with a 3/4" piece of spaghetti and connect to XV1-1 (C). Connect the remaining lead to C15-A (S3).

11. ( ) Fig. 6. Cut both leads on a 1M (brown, black, green, silver) resistor, R2, to 3/4". Connect from R4-1 (C) to XV1-2 (C).

12. ( ) Fig. 6. Cut both leads on a 47 mmf disc capacitor, C1, to 1". Connect from R4-1 (C) to XV1-2 (C).

13. ( ) Fig. 6. On one end of a 3 1/2" piece of shield cable, strip the outer insulation back 1/2". Unwrap the shield strands from around the inner conductor and twist the strands together. Cut off these shield strands. Strip the insulation from the inner conductor back 1/4" and connect to XV1-7 (S1).

On the other end of the same piece of shielded cable, strip the outer insulation back 3/4". Unwrap the shield strands from around the inner conductor and twist the strands together Cut off so that 1/2" of twisted strand length remains. Strip the insulation from the inner conductor back 1/4". Connect the twisted shield strands to R4-1 (C) and the inner conductor to R4-2 (S1).

14. ( ) Fig. 6. Cut one lead on a 4.7K (yellow, violet, red, silver) resistor, R1, to 1 1/4". Cover this lead with a 1 1/8" piece of spaghetti. Push this lead through the hole at the center of input jack J1. Solder this lead to the inner conductor being careful not to use too much solder, to prevent the excess from flowing into the jack. Form a rounded surface with the solder over the center post of jack J2. Let the solder cool without moving the resistor to prevent making a cold solder connection. Cut the other end of the resistor to 3/4" and connect to XV1-2 (S3).

15. ( ) Fig. 6. Cut both leads on a .001 mfd (1K or 1000 mmf) disc capacitor, C2, to 1 1/4". Cover one lead with a 1" piece of spaghetti and connect to XV1-1 (S2). Connect the other lead to R4-3 (S1).

16. ( ) Fig. 6. Push the line cord through the grommet at the rear of the chassis, and make a knot in the line cord 8" from the solder end of the cord, inside the chassis. Separate the two leads. Connect one lead to S1-2 (S1). Cut the remaining lead to 4", and connect to XF1-1 (S1).

17. ( ) Fig. 6. Connect a 2" piece of black wire from XV1-3 (S3) to R4-1 (S4).

NOTE: When testing - adjust the tube bracket and tighten screws.

FINAL STEPS

You have now completed the assembly and wiring of your modulator. When you have completed the following steps your amplifier 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 (and preferably also against the schematic wiring diagram in order to become more familiar with the component layout and circuitry). While doing so, check for rosin joints, loose lumps of solder, poor lead dress, and accidental shorts or leakage paths arising from the flow of rosin between contacts (remove with a stiff brush dipped in carbon tetrachloride).

2) Clean socket XV1 with carbon tetrachloride using a stiff brush. It is also advisable to remove the tube and shield from XV1, and clean the socket and pins on top of the chassis.

3) Insert tubes V1 through V7 in their correct sockets and the fuse in the fuse holder. Place shields over V1, V2, and V3.

4) Turn the GAIN and CLIPPING LEVEL controls fully counter-clockwise. Mount the knobs on the shafts so that they indicate zero on each dial and tighten the set screws.

5) Refer to the ELECTRICAL CONNECTIONS section of the instruction book and read it carefully. Then wire the octal plug as instructed and in accordance with the requirements imposed by the transmitter you are using (impedance tap required). Use well-insulated wire or a-c line cord for the connections between the modulator and the transmitter. Remember that the cap must be slipped onto the wires before making the connections to the plug. When the wiring to the plug is completed, press the cap down over it.

6) IMPORTANT: DO NOT CONNECT TO THE AC LINE UNTIL YOU ARE INSTRUCTED TO DO SO DURING THE PRELIMINARY BIAS AND BALANCE ADJUSTMENTS: Check for a cold dc resistance of 1.2 ohms across the AC plug; check for a resistance of at least 45 ohms between ground and pins 4 and 6 of XV7, and 9 ohms between ground and the positive terminal of rectifier, SR1; check for a resistance of at least 100K ohms between pin 8 of the rectifier tube V7 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 fail to obtain these resistance values, do not proceed to the next step until the cause is discovered and the condition remedied. If the measurements are satisfactory, proceed to the MAINTENANCE section of the book, and perform the balance and bias adjustments exactly as instructed, as otherwise you may damage the unit. When you have completed the bias and balance adjustments proceed to the step following this one, after having disconnected the amplifier from the AC line.

7) Press a speed nut in place over each hole on the bottom flange of the chassis (see Fig. 7).

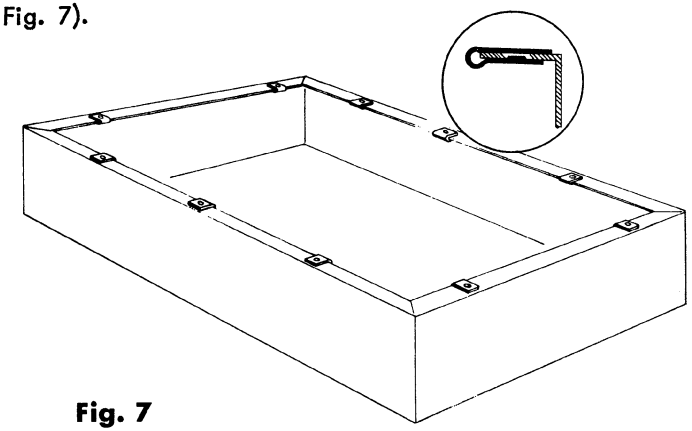


Fig. 7

8) Since the bottom plate is completely symmetrical, one surface can arbitrarily be designated as the "inside" surface and the other side the "outside" surface. 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) Mount the bottom plate to the chassis with 10 #8 x 3/8 screws through the holes along the edges of the plate into the speed nuts previously placed along the bottom flange of the chassis.

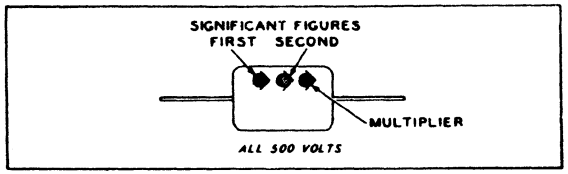
SERVICE

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 $7.50 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

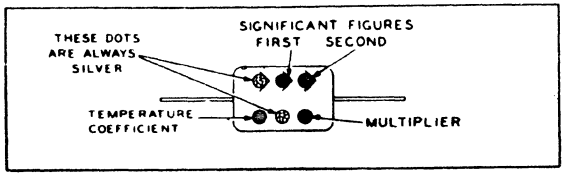
fluxes will be returned not repaired. NOTE: Before returning this unit, be sure all parts are securely mounted. Attach a tag to the instrument, giving your home address and the trouble with the unit. Pack very carefully in a rugged container, using sufficient packing material (cotton, shredded newspaper, 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

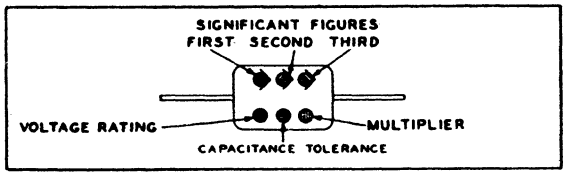
RMA 3-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



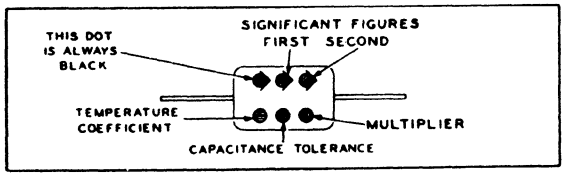
JAN 6-DOT COLOR CODE FOR PAPER-DIELECTRIC CAPACITORS



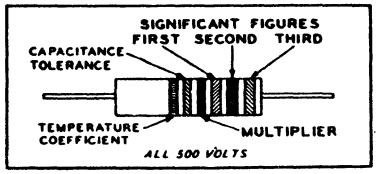
RMA 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS



JAN 6-DOT COLOR CODE FOR MICA-DIELECTRIC CAPACITORS

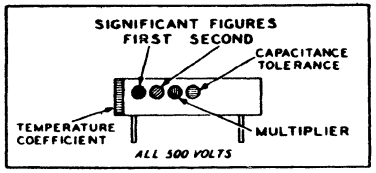


RMA COLOR CODE FOR TUBULAR CERAMIC-DIELECTRIC CAPACITORS

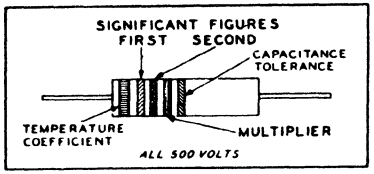


JAN COLOR CODE FOR FIXED CERAMIC-DIELECTRIC CAPACITORS

RADIAL TYPE NON-INSULATED



AXIAL TYPE INSULATED



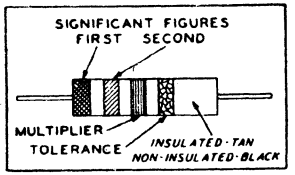
RMA: RADIO MANUFACTURERS ASSOCIATION
JAN: JOINT ARMY-NAVY

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	

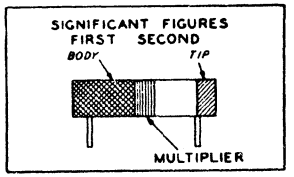
RESISTOR COLOR CODES

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE

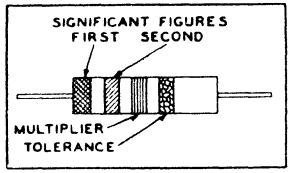


RADIAL TYPE

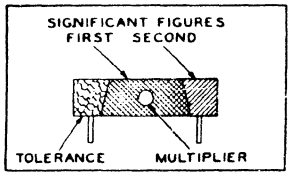


JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS

AXIAL TYPE INSULATED



RADIAL TYPE NON-INSULATED



the Amperex Electronic Corporation (230 Duffy Ave., Hicksville, L. I., N.Y.) and Mullard Ltd. (International Electronics Corp., 81 Spring St., N.Y. 12, N.Y.) If necessary, replacements can be obtained directly from EICO.

The Model 730 is intended for operation at a line voltage of 117VAC. To afford conservative operation of the unit in areas of high line voltage, both 117V and 125V taps have been provided on the primary of the power transformer. The normal connection in both kit and wired units is the 117V tap. The amplifier components will be operating within their ratings with the 117V tap so long as the line voltage does not exceed 124V. If the line voltage in your location exceeds 124V, it will be necessary to rewire the power transformer primary connections for 125V operation. To do this, it will be necessary to remove the bottom plate and connect the black-green lead (125V power transformer primary tap) to the AC switch terminal S1-1 instead of the black-red lead (117V primary tap). If you have built the kit according to instructions or purchased a wired unit, you will find the black-green lead strapped back on the black-red lead. Of course you must remove the line cord plug from the outlet before rewiring. The rewiring procedure is as follows:

1. Unsolder the black-red lead from AC switch terminal S1-1.

2. Remove electrical tape holding black-green lead to black-red lead.

3. Strip 1/2" insulation from end of black-green lead.

4. Cut off the stripped end of the black-red lead. Bend the end of this lead back on itself (about an inch) and tape it very carefully to the black-green lead so that the end of the black-red lead is entirely insulated and can not short out against the chassis. This is very important.

5. Connect and solder the black-green lead to AC switch terminal S1-1.

NOTE: Disconnect the amplifier from the power line and discharge capacitors prior to making any resistance check and prior to removing either or both of the EL34 output tubes V3 and V4 or disabling the bias supply. Do not turn the amplifier on with either of the output tubes removed or the bias supply disabled.

To facilitate servicing, remedial and trouble-shooting procedures have been provided in the TROUBLE SHOOTING CHART that follows. A VOLTAGE AND RESISTANCE CHART is also provided as an aid in locating defective components.

WARNING: If the modulator is operated at any time without the bottom plate, the operator is exposed to lethal high voltage points. Not only are the high voltages developed in the modulator present, but the even higher voltages developed in the transmitter are brought into the modulator via the interconnecting leads going to OUTPUT socket J5. In any case, never leave the modulator in an operative state with the bottom plate removed, especially if children have access to it.

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 $7.50 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.

VOLTAGE AND RESISTANCE CHART

	PIN NO.								
TUBE	1	2	3	4	5	6	7	8	9
GZ34 V7	0	475* DC	0	380 AC	0	380 AC	0	475* DC	
12AX7 V1	68	0	0	3.1 AC	3.1 AC	145	0	0.95	3.1 AC
6AL5 V2	35	35	3.1 AC	3.1 AC	35	0	35		
6AN8 V3	260	75	85	3.1 AC	3.1 AC	75	35	0	0.85
EL34 V4	0.7	3.1 AC	460	445	-36	-36	3.1 AC	0.7	
EL34 V5	0.7	3.1 AC	460	445	-36	-36	3.1 AC	0.7	
EM84 V6	—	0	19	3.1 AC	3.1 AC	350	190	0	190

*5.0VAC between 2 & 8; remove tube to measure

All voltages measured to ground with a high input impedance VTVM. GAIN and CLIPPING LEVEL controls set to zero, PLATE SUPPLY and AC switches set at ON. No input signal. Appropriate load resistor connected to output.

	PIN NO.								
TUBE	1	2	3	4	5	6	7	8	9
GZ34 V7	INF.	Above 100K	INF.	INF.	INF.	INF.	INF.	Above 200K	
12AX7 V1	550K	1M	0	25	25	160K	0	680	25
6AL5 V2	220K	400K	25	25	220K	INF.	400K		
6AN8 V3	60K	320K	47K	25	25	320K	1.05 Meg	100K	680
EL34 V4	10	25	100	1350	221K	220K	25	10	
EL34 V5	10	25	100	1350	221K	220K	25	10	
EM84 V6	INF.	DO NOT MEASURE	10K	47	47	10K	480K	INF.	480K
J5	INF.	INF.	INF.	INF.	INF.	INF.	INF.	INF.	

All resistance values measured to chassis with pin 8 of the GZ34 tube grounded except, of course, when the resistance to ground at pins 2 and 8 of the GZ34 is being checked. GAIN and CLIPPING LEVEL controls set to zero, PLATE SUPPLY and AC switches set at OFF. Plug removed from OUTPUT socket J5. Line cord disconnected from a-c power line.

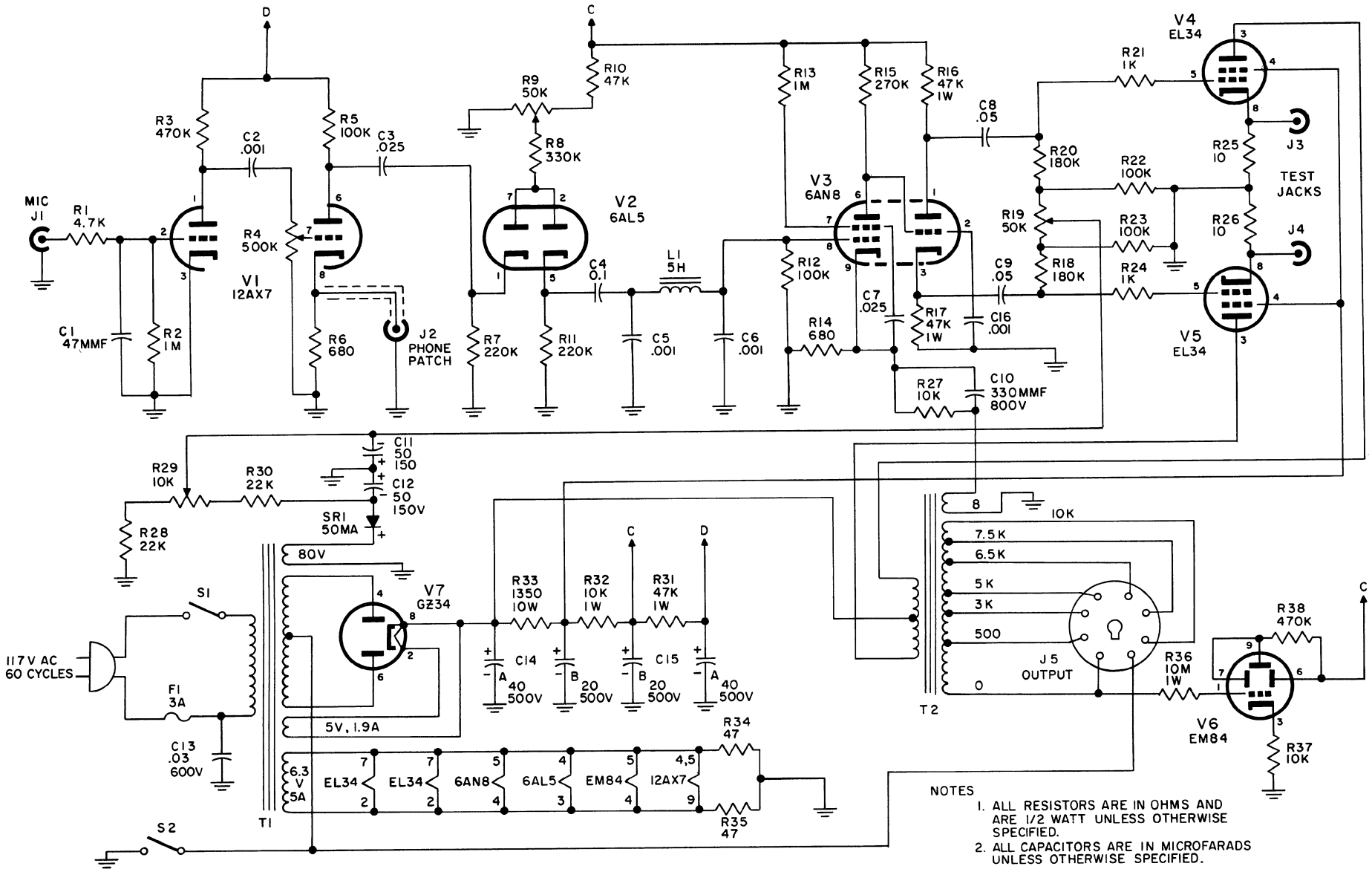
REPLACEMENT PARTS LIST

Stock #	Symbol	Description	Am't.
22533	C1	cap., disc, 47mmf ±10%	1
22521	C2, 5, 6, 16	cap., disc, .001mfd (1000 or 1K) ±10%	4
22517	C3, 7	cap., disc, .025" (25, 000 or 25K) GMV	2
20039	C4	cap., paper, .1mfd, 400V ±10%	1
20042	C8, 9	cap., paper, .05mfd, 400V ±10%	2
22512	C10	cap., disc, 330mmf, 800V ±10%	1
23015	C11, 12	cap., elec., 50mfd, 150V	2
20043	C13	cap., paper, .03mfd, 600V	1
24008	C14, 15	cap., elec., 20-40mfd - 500V	2
91005	F1	fuse, 3A	1
51000	J1	jack, amphenol	1
50014	J2	jack, phono	1
50007	J3, 4	jack, pin	2
97032	J5	jack, octal	1
34003	L1	choke, 5H	1
10430	R1	resistor, 4.7K, 1/2W, ±10%	1
10407	R2, 13	resistor, 1 Meg, 1/2W, ±10%	2
10431	R3, 38	resistor, 470K, 1/2W, ±10%	2
18043	R4	pot., 500KΩ, linear	1
10410	R5, 12, 22, 23	resistor, 100KΩ, 1/2W, ±10%	4
10406	R6, 14	resistor, 680Ω, 1/2W, ±10%	2
10417	R7, 11	resistor, 220K, 1/2W, ±10%	2
10412	R8	resistor, 330K, 1/2W, ±10%	1
16004	R9	pot., 50KΩ, linear	1
10428	R10	resistor, 47KΩ, 1/2W, ±10%	1
10419	R15	resistor, 270KΩ	1
10849	R16, 17,	resistor, 47KΩ, 1W, ±10%	3
11537	R18, 20	resistor, 180KΩ, 1/2W, ±5%	2
18029	R19	pot., 50KΩ, linear	1
10432	R21, 24	resistor, 1KΩ, 1/2W, 10%	2
11703	R25, 26	resistor, 10Ω, 1W, 1%	2
11500	R27	resistor, 10KΩ, 1/2W, 5%	1
10424	R28, 30	resistor, 22KΩ, 1/2W, 10%	2
18015	R29	pot., 10KΩ, linear	1
10853	R32	resistor, 10KΩ, 1W, ±10%	1
14800	R33	resistor, 1350Ω, 10W, ±10%	1
10526	R34, 35	resistor, 47Ω, 1/2W, ±5%	2
10835	R36	resistor, 10 Meg. Ω, 1W, ±10%	1
10400	R37	resistor, 10KΩ, 1/2W, ±10%	1
61000	S1, S2	switch, toggle SPST	2
93003	SR1	rectifier, 50 ma	1
30029	T1	transformer, power	1
32012	T2	transformer, modulation	1
54013	TB1	1 post, left, w/gnd.	
54003	TB2	2 post	
54004	TB3	2 post, w/gnd.	
54002	TB4	1 post, right, w/gnd.	
54017	TB5	1 post, up, right	
90034	V1	tube, 12AX7	1
90017	V2	tube, 6AL5	1
90057	V3	tube, 6AN8	1
90040	V4, 5	tube, EL34	2
90058	V6	tube, EM84	1
90044	V7	tube, GZ34	1
97800	XF1	fuseholder	1
97027	XV1, 3	socket, 9 pin min., top mount	2
97033	XV2	socket, 7 pin min., top mount	1
97032	XV4, 5, 7	socket, octal	3
97025	XV6	socket, 9 pin min., bottom mount	1
97300		shield, 9 pin tube	2
97301		shield, 7 pin tube	1
40000		nut, hex #6-32	16
40001		nut, hex 3/8 - 32	3
40002		nut, hex 15/32-32	2
40003		nut, ring 15/32-32	2
40007		nut, hex #4-40	10
40008		nut, hex #8-32	13
40016		nut, hex 1/2-24 (for fuseholder)	1
40017		nut, tin., #8-32	10
41000		screw, #6-32	15
41003		screw, #8-32 x 3/8	14
41016		screw, #4-40	10
41072		screw, #8-32 x 3/4	4
42000		washer, 3/8 lock	3
42001		washer, 3/8 flat	2
42002		washer, #6 lock	16
42007		washer, #4 lock	10
42008		washer, #8 lock	13
42029		washer, 1/2" rubber (for fuseholder)	1
42030		washer, 3/8 flat fibre	1
43000		lug, #6	1
43001		lug, 3/8	1
43004		lug, #8	2
46000		grommet, 3/8	1
46001		grommet, 1/4	1
46004		grommet, 5/8	2
46008		foot, rubber	4
51007		octal plug and hood	1
52001		binding post	1
53029		knob, 3/4" diam.	2
57000		line cord	1
58004		wire, hook up, 1/64" wall	length
58019		wire, hook up, 1/32" wall	length
58300		spaghetti	length
58408		cable, single conductor	length
58501		wire, bare #22	length
66074		manual of instructions (wired)	1
66324		manual of instructions (kit)	1
81195		chassis	1
81196		bottom plate	1
81197		bracket	1

TROUBLE-SHOOTING CHART

SYMPTOM	CAUSE
House power line fuse blows. Fuse F1 remains intact.	Short in line cord.
Fuse F1 blows.	If the modulator causes a replacement fuse to blow with rectifier tube V7 removed, then primary, high voltage secondary, filament, or bias windings of T1 are shorted, C13 may be shorted, or there may be a short in the bias supply circuit. If the modulator does not cause F1 to blow when V7 is out of the socket, but does cause F1 to blow when V7 is placed back in the socket, then check for a short in the B+ circuits, shorted or excessively leaky C14 or C15, or defective V7, V4, or V5.
Rectifier V7 filament not lit.	5V winding of T1 open or incorrect/defective wiring to V7 socket.
Any or all other tube filaments not lit.	6.3V winding of T1 open or incorrect/defective wiring of tube sockets.
DC voltage at V7 cathode (pin 8) is incorrect as specified below.	

SYMPTOMS	CAUSE
a) No voltage	Defective V7, C14 shorted, S2 open, Defective wiring from c.t. of h.v. sec. of T1 to either S2 or J5 pin 8 or defective T1.
b) Low voltage	Low line voltage, Defective T1, Connection to C14 from pin 8 of V7 is broken, Open or excessively leaky C14, Shorted or excessively leaky C15, V4 and V5 under-biased and drawing excessive current.
c) High voltage	High line voltage, V4 and V5 over-biased and not drawing normal current, Defective V4, V5, R33, R32 open, R25, R26 open, T2 defective.
OVER-MODULATION INDICATOR V6 not closing properly (fuzzy)	Reversed output connections to J5, Open R36, Defective V6.



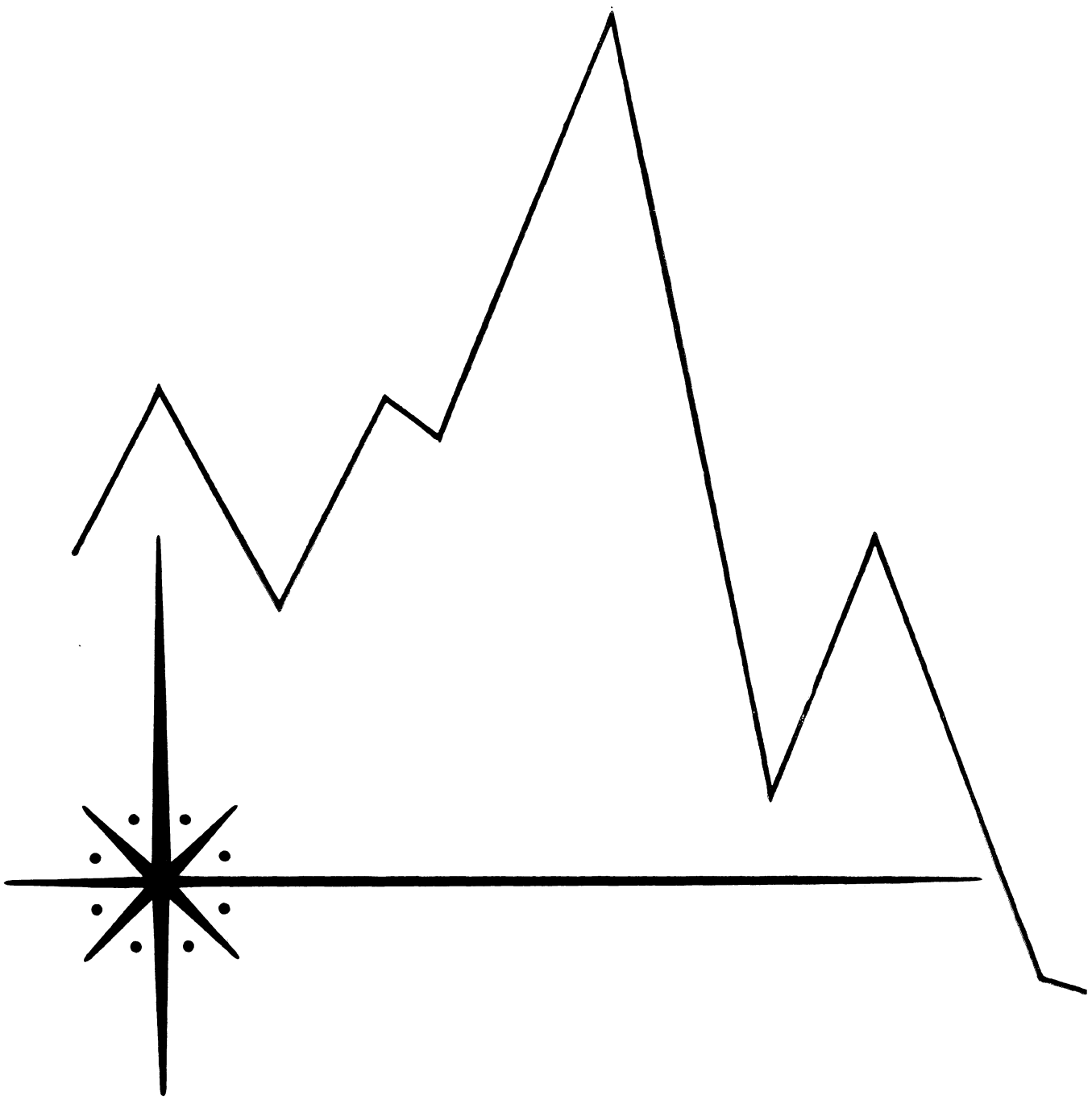
NOTES

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

EICO

EICO MODEL 730

MODULATOR - DRIVER



EICO

ANOTHER PERFORMANCE PROVEN PRODUCT