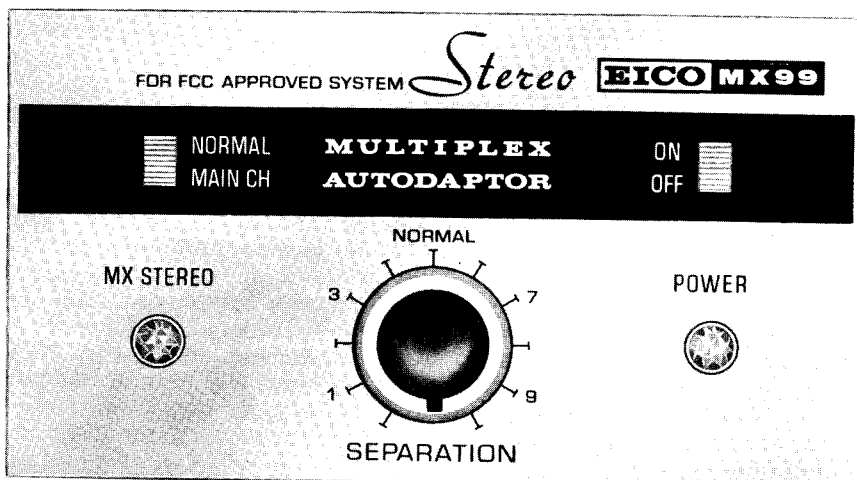


# MULTIPLEX AUTODAPTOR



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**EICO MX99**

## INSTRUCTION BOOK

### SECTION I. GENERAL DESCRIPTION

The new EICO MX-99 Multiplex Autodaptor\* employs an original method of zero phase shift, filterless detection of multiplexed signals. The unit automatically delivers stereo on a stereo broadcast signal, and mono from a mono signal without spurious signals in either case. The stereo signal is automatically gain-balanced and the mono signal is automatically equal from both outputs without adjustment. An indicator lamp turns on when the station selected is broadcasting multiplex stereo.

The design features freedom from phase distorting filters in either the main or sub channel paths which cause loss of separation. Nevertheless this design provides the required, or better-than-required, suppression of all spurious signals including SCA (67kc) background music carrier, reinserted 38kc sub-carrier, 19kc pilot carrier, and all harmonics thereof. This is achieved partly through an original technique for deriving the left and right signals, and partly by sharp ultrasonic filters after the signals are derived. All of the foregoing is very important for high quality tape recording, where spurious signals can beat against the tape recorder bias oscillator and result in audible spurious tones in a recording. This adaptor will synchronize with any usable output from the FM tuner and will demodulate without significant distortion tuner (composite signal) as high as 5 volts peak-to-peak.

The MX-99 is self powered, and includes low impedance cathode follower outputs. External controls include an oscillator turn-off switch to permit interference-free listening to mono stations having low sub-carrier frequency SCA store-casting and a separation control. A separation of 30db between channels is typical and an overall gain of unity is provided from input to output on both stereo and mono. The MX-99 is designed for all EICO FM equipment (HFT90, HFT92, ST96), and any other component quality, wide band FM tuner provided with a multiplex output.

Tubes: 2-12AU7, 1-12AT7, 1-6AU6, 1-6D10, 1-6X4 and 6 diodes

Size (HWD): 3-7/8" x 9-1/8" x 6-3/8"

Weight: 7 lbs.

Cover: OPTIONAL

\*Patent Pending

### SECTION II. CABINET INSTALLATION

#### 2-1. GENERAL

1. Mount horizontally on a well-braced shelf. The stock thickness of the wood panel may not exceed 3/4".

2. Do not remove feet for mounting. Air must be allowed to enter through the perforations in the bottom plate to avoid overheating.

3. To avoid over heating when stacking components mount the tuner below the amplifier with the MX-99 alongside the tuner. Any shelf above the MX-99 must be spaced at least 2 inches away. Allow at least a 1-inch tolerance on either side of the unit.

4. Leave the back of the cabinet entirely open.

#### 2-2. PREPARATION OF UNIT

1. Loosen the left and right side pairs of screws (4 in all) that fasten the bottom plate and cover to the chassis, just enough to permit the cover and bottom plate to slide backward or forward in the 3/4" chassis slots.

2. Push both cover and bottom plate back as far as they will go (3/4"). The screws that have been loosened will move from the front to the rear ends of the slots in the chassis.

3. Detach the knob from the separation control shaft. Then remove the 2 screws, that fasten the panel to the chassis, one at the left of the NORMAL-MAIN CH switch and the other at the right of the ON-OFF switch. Take panel off and set it aside. The unit is now prepared for cabinet installation.

#### 2-3. PREPARATION OF CABINET

1. Two templates are provided, one for the cabinet shelf and the other for the cabinet panel. The shelf template is used to locate exactly two holes that are to be drilled in the shelf. The panel template is used to locate exactly the required rectangular cut-out. The two templates must be used together as indicated, as there is an exact relationship between the locations of the shelf holes and panel cut-out.

2. To use the shelf template, cut it or fold it back exactly along the dashed line. Remove the shelf from the cabinet and line up this dashed line on the template with the front edge of the shelf, positioning it also along the edge to leave at least 1 clearance on each side. Tape the template in position and use a center punch to mark the centers of the two holes to be drilled. If the shelf can not be removed, place the template in a similar manner on the top side of the shelf if there is room to drill from the top side, or on the under side of shelf if there is room only to drill from the under side. If the template is used on the underside of the shelf, mark the rear edge of the shelf at the points where the extended heavy lines on the template hit the rear shelf edge. After the holes are center-punched, remove the template and drill carefully through the punched centers to a diameter of 1/4". If the shelf has been removed for the drilling operation, now re-mount it. Finally, replace the shelf-template in exactly its former position on the top-side of the shelf and

tape it down. If the shelf template had been used on the underside of a stationary shelf, now place it on the top-side of the shelf using the marks on the rear edge of the shelf previously made. (In the latter case, accuracy may be improved by cutting the two holes out of the shelf-template with a razor blade and then lining up the holes in the shelf template with the holes in the shelf).

3. To use the panel template, cut it or fold it back exactly along the dashed line. This dashed line corresponds to the junction of the top side of the cabinet shelf and the interior side of the wood panel. Position the panel template against the interior side of the wood panel so that the dashed line rests against the shelf and the two heavy vertical lines in the panel template meet with the two heavy horizontal lines in the shelf template. Tape the panel template down and use a center-punch to mark the centers of the four 3/8" holes in the four corners of the rectangular cut-out shown on the template. Now remove both templates and drill carefully through each of the four punched centers to a hole diameter of 3/8". On the front side of the wood panel scribe a rectangle externally tangential to the four drilled holes. Check the height and width of the rectangle against the panel template dimensions. These dimensions should not be exceeded. Now carefully cut out the rectangle with a sabre saw, using a small blade to start accurately in the 3/8" holes. After the cutting operation, any rough spots or excess material along the edges of the cut-out may be removed with a file. Finally, brush or blow out all chips and sawdust.

#### 2-4. MOUNTING THE UNIT

1. Insert the unit from the rear of the cabinet, carefully guiding the chassis control plate through the panel cut-out. Center the unit in the cut-out and re-mount the panel with the two screws previously removed.

2. Hold the front panel against the wood (from the outside) and push the cover and bottom plate forward (from the inside) until they contact the inside surface of the wood panel.

3. Obtain from a hardware dealer two No. 8-32 binding head machine screws that are 1/2" longer than the thickness of the mounting shelf.

4. Now place 5/8" flatwashers against the heads of the two No. 8-32 screws referred to in step 3, and insert them from the bottom side of the shelf into the two holes drilled previously. It may be necessary to shift the unit slightly to the left or right in order to afford clear access for the screws. When both screws have caught, tighten them to secure the unit to the shelf.

5. Replace the knob previously removed on the separation control shaft.

#### SECTION III. ELECTRICAL CONNECTIONS

1. The input of the MX-99 is the MX IN jack. Connect this to the multiplex output jack of the FM or FM-AM tuner (variously called MULTI, MX, or MPX OUTPUT).

2. The outputs of the MX-99 are the CH.1 OUT and CH.2 OUT jacks. Connect these to an auxiliary (high level) pair of stereo inputs of your amplifier. Connect the regular tuner outputs to the amplifier's regular tuner inputs. If you have the EICO ST-96 FM-AM tuner, you may connect the MX-99 outputs to the MX ADAPTOR jacks MX1 and MX2 and select the adaptor outputs with the tuner SELECTOR switch; the ST-96 then is connected to the amplifier as normally.

3. Plug the line cord of the MX-99 into a switched convenience outlet on the tuner. When the system is in operation, this plug may be oriented for least audible hum.

#### NOTES:

The MX-99 is designed for use with component-type FM (or FM-AM) high fidelity tuners of wide-band design equipped with a multiplex output jack. Not included are non-component type ac-dc equipment (severe shock hazard), tuners without one or more limiting stages ahead of the detector (excessive output may overload adaptor).

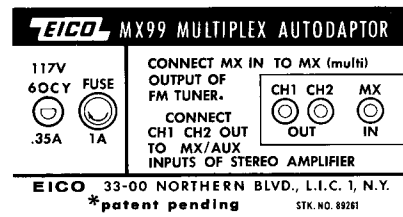


Figure 3-1. Input Connections

#### SECTION IV. OPERATION

1. Turn on your FM tuner and stereo amplifier.

2. Set your amplifier input selector at the auxiliary input to which the MX-99 is connected if you are going to listen to a stereobroadcast. For a monobroadcast, you may by-pass the adaptor altogether by setting the amplifier input selector to the input to which the tuner's regular output is connected. In the case of the ST-96, this selection may be made with the tuner's SELECTOR switch.

NOTE: The following applies to stereo and mono tuner listening with the adaptor outputs selected by the stereo amplifier.

3. Set the ON-OFF switch at ON, indicated by the lighting of the POWER pilot lamp. If this switch is left at ON, the MX-99 will turn off and on with your tuner, as is usually desired. Allow a few minutes warm-up.

4. The NORMAL-MAIN CH. switch must be set at NORMAL (oscillator on) for stereo broadcasts. It may be left at NORMAL for most mono broadcasts when you are listening casually. However, the MAIN CH. position (oscillator off) must be used for mono broadcasts when the station is broadcasting SCA store-cast) at a low sub-carrier frequency (other than that authorized by the FCC for stations broadcasting stereo.) This will usually show up as squeals interfering with the mono broadcast when the switch is set at NORMAL. All mono

broadcasts will come through with slightly less noise at the MAIN CH. position. For critical mono listening or recording, selection of the tuner's regular output by the stereo amplifier is desirable.

5. Operate your tuner as you normally would in either tuning to a station known to be broadcasting stereo at the time, or in searching for a station that is broadcasting stereo. (Note: If your FM tuner has an AFC circuit and also an "AFC defeat" switch, it is recommended that you tune with AFC defeated for greater tuning accuracy and then switch in the AFC afterwards.) When you are tuned to a station broadcasting stereo, the MX stereo neon lamp indicator of the MX-99 will glow steadily. (NOTE: The neon lamp will go out if the station switches to mono broadcasting at any time.) Adjust your stereo amplifier controls for the desired listening level and best balance between channels.

6. Adjust the SEPARATION control of the MX-99 for best audible separation between the stereo channels. This setting will usually be the same for all stations broadcasting stereo, although there may be one or more stations in your area for which different settings are necessary because of non-standard practice on the part of these particular stations.

NOTE: The MX STEREO lamp may glow at some off-station points on the dial. These are spurious indications and should be ignored.

## SECTION V. CIRCUIT DESCRIPTION

The composite stereo signal as received from the ratio detector is amplified by V1A. In order not to alter the performance of the ratio detector, the input impedance of this stage is made exceptionally high.

The 19kc pilot signal is isolated and amplified by V4. Frequency doubling is accomplished by a full-wave rectifier (CR1, CR2) at the plate of V4, and the 38kc signal thus obtained is used to synchronize a 38kc push-pull oscillator (V5) which drives a ring modulator (CR3-CR6, R12-17). In addition to a strong 38kc component, the full-wave rectifier delivers a negative DC voltage when the 19kc pilot carrier is received. This DC voltage is used to cut off switching tube V1B, and thus ignite the MX STEREO neon pilot lamp I1, indicating that a stereo broadcast is in progress.

V1A also delivers the amplified composite stereo signal to the grid of a split load phase inverter (V2A). V2A provides two outputs which differ in phase by 180° and which are alternately sampled by the ring modulator at a 38kc rate. The two sampled outputs are added and amplified by V2B. Adding the two alternately sampled out of phase signals effectively produces an output which is the input signal multiplied by a 38kc switching function of zero average value and odd symmetry. The audible portion of this signal is (L-R).

The output of V2B (L-R) is mixed with the two outputs of V2A (L+R, -L-R), available at the plate and cathode of V2A, respectively, to derive L and -R. De-emphasis is accomplished in the mixing networks.

Evidently the phase of one signal must be reversed to duplicate the original phase relationship, and this is accomplished by V3A. The signal inverted by V3A is fed to the grid of cathode follower V3B and the other signal (not inverted) is fed to the grid of V3C.

Channel separation is controlled by varying the amount of (L-R) signal which is injected into the mixing network. This is effected by a gain control in the grid of V2B. The output signal level under the condition of optimum separation is thus determined by the direct (L+R) component and is virtually independent of the phase of the reinjected carrier. An error in the phase of the injected carrier will simply require a higher setting of the separation control to achieve the same output amplitude and channel separation that would be obtained under the optimum carrier phase condition.

Note that the demodulator is of the balanced type so that the potentially troublesome 38kc carrier does not appear in the adaptor output. The presence of this signal might conceivably introduce beat notes with tape recorder bias oscillators.

Cathode follower outputs (V3B and V3C) are provided in each channel and filtering of the output waveforms are effected in these stages. Filtering attenuates the high frequency components which are introduced in the demodulation process, and which, while substantially attenuated by the de-emphasis networks, may become objectionable in tape recording. In addition, the filters are designed to remove the 19kc pilot signal which is usually present to a noticeable degree in the output signals.

## SECTION VI. MAINTENANCE

### 6-1. GENERAL

Your instrument will normally require little service outside of tube replacement. The performance of the instrument is not dependent on tube selection, and all of the types employed are available nationally.

Completed kits do not require alignment because of factory pre-alignment of all tuned circuits. However, a service alignment procedure is given which does not require the use of instruments. Use this procedure on completed kits only if there is definite indication of misalignment, and after checking that wiring is entirely correct and that there are no damaged or defective parts.

Trouble-shooting information is provided also. Included in this section are a trouble-shooting chart and a table of operating voltages and resistances.

### 6-2. SERVICE ALIGNMENT

NOTE: This adjustment procedure can be performed only when an FM station is known to be broadcasting multiplexed stereo.

1. Pull power cord from outlet. Remove the MX-99 cover and temporarily dismount (but do not disconnect) the printed board.

2. Disconnect R25 (100K ohm, 1% resistor) from pt. X on board. (See Fig. 6-1). This point is called out on the schematic diagram also.

3. Disconnect R30 (100K ohm, 1% resistor) from pt. Y on board. (See Fig. 6-1). This point is called out on the schematic diagram also.

4. Re-mount the printed board to permit the adjustments that follow.

5. Remove tube V4 (6AU6) from socket temporarily.

6. Insert power cord in outlet and connect MX-99 into your system as for normal use. (See Connection Procedure). Set the POWER switch to ON, the NORMAL-MAIN CHANNEL switch to NORMAL, and allow a 15-minute warm-up.

**NOTE:** The adaptor, as set-up at this point, can deliver only the L-R sub-channel signal to both outputs of the adaptor identically. The resistor disconnections in steps 2 and 3 above temporarily eliminate the L+R main channel signal. The reason for this is that a key indication of proper adjustment is maximum recovery of the L-R sub-channel signal, which is easiest to do with L+R temporarily eliminated.

7. Turn on your stereo amplifier and your FM tuner, and allow them to warm-up. Set the input selector on your amplifier at the position for the regular audio output (s) of your tuner. Set the amplifier MODE selector to MONO. Set the FM tuner to a station broadcasting multiplex stereo at the time. Then adjust the amplifier level control for a normal listening level.

8. Next, set the amplifier input selector at the position for the inputs to which the CH.1 and CH.2 out jacks of the MX-99 are connected. The sound may be distorted at this time, and, depending on whether or not the audio stages of the tuner are designed to provide audio gain, the level may be lower. Ignore the distortion and re-adjust the amplifier level control for a normal listening level. **NOTE:** What you will hear at this point and during the following adjustments is the L-R signal only, not stereo. It will appear at both the CH.1 and CH.2 OUT jacks identically with equal amplitude. You may set the amplifier MODE switch at either MONO or STEREO.

9. Turn the MX-99 SEPARATION control maximum clockwise.

10. With a tuning wand, or insulated screwdriver, adjust the slug of T4 for a condition as close as possible to "zero beat", which is indicated by the "clearest", lowest distortion sound. This adjustment is only approximate because the removal of V4 has disabled the synchronizing circuit.

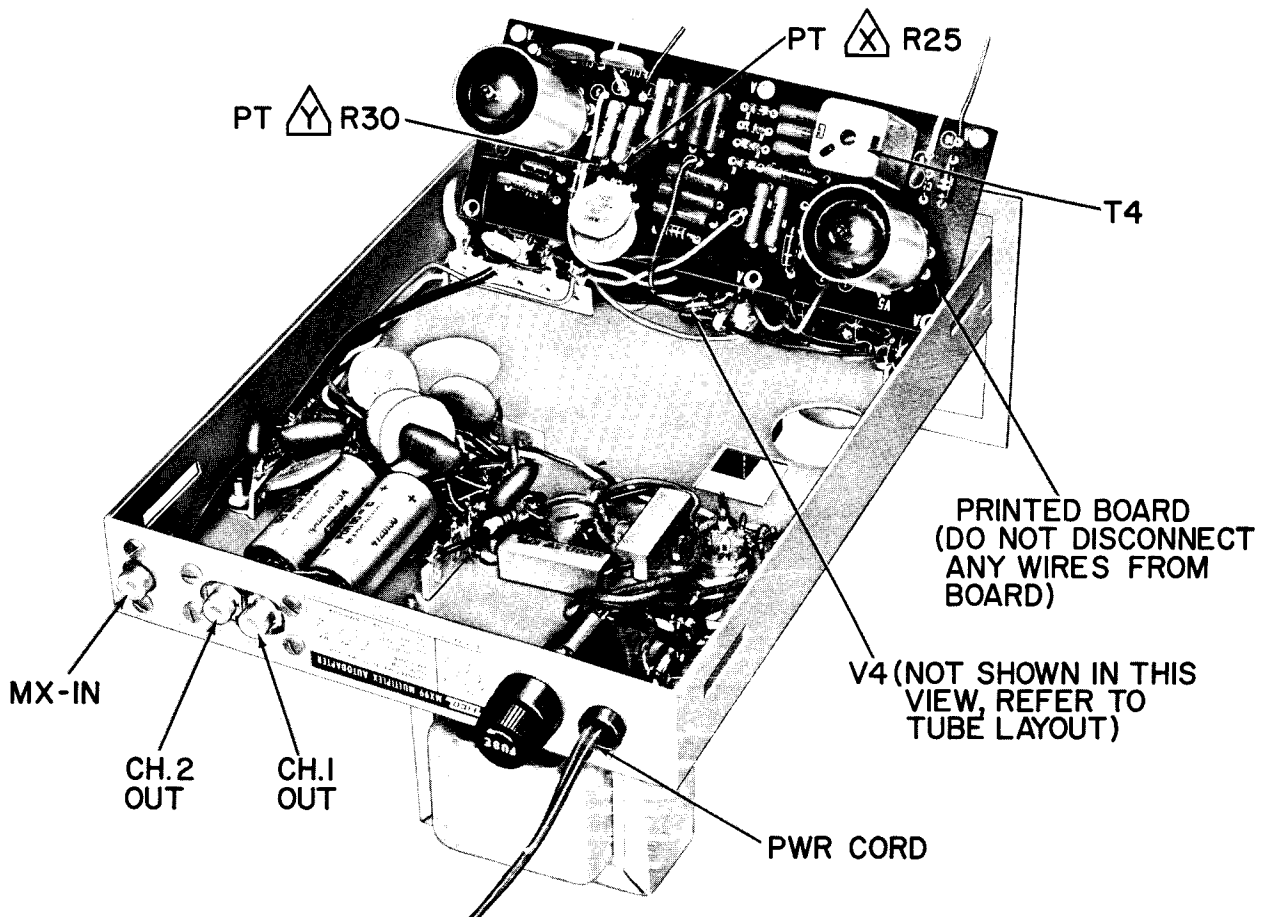


Figure 6-1. Service Alignment (Board Removed)

11. Set the slug of T3 to approximately mid-rotation.

12. Re-insert tube V4 (6AU6) back in its socket.

13. Adjust the slug of T2 for maximum audible output. You will find that there are two points of maximum output, approximately one-half turn of the slug apart. You may adjust to either one, since it makes no difference from the performance point of view.\* The MX STEREO lamp will light when this adjustment is made.

14. Set the POWER switch of the MX-99 to OFF and pull the power cord from the outlet.

15. Dismount printed board.

16. Re-connect and solder R25 to pt. X on the board.

17. Re-connect and solder R30 to pt. Y on the board.

18. Re-mount the printed board on the chassis and replace the cover on the MX-99.

19. Insert the MX-99 power cord in a line outlet and set the POWER switch at ON. Allow the unit to warm-up. Set the NORMAL-MAIN CHANNEL switch to NORMAL and the SEPARATION control to mid-rotation.

20. Set the amplifier INPUT SELECTOR at the position for the inputs to which the MX-99 CH.1 and CH.2 OUT jacks are connected. Set the amplifier MODE switch to stereo. Adjust the amplifier controls as for any stereo source.

NOTE: There is no difference from the performance point of view, however there is a difference, between adjusting to one maximum or the other, that should be understood for final system adjustments. At one maximum, the left signal will appear at the CH.1 OUT jack and the right signal at the CH.2 OUT jack. At the other maximum, the right signal will appear at the CH.1 OUT jack and the left signal at the CH.2 OUT jack. Whichever is obtained, the opposite can always be had by interchanging the patch cord connections at either the adaptor output or the tuner input.

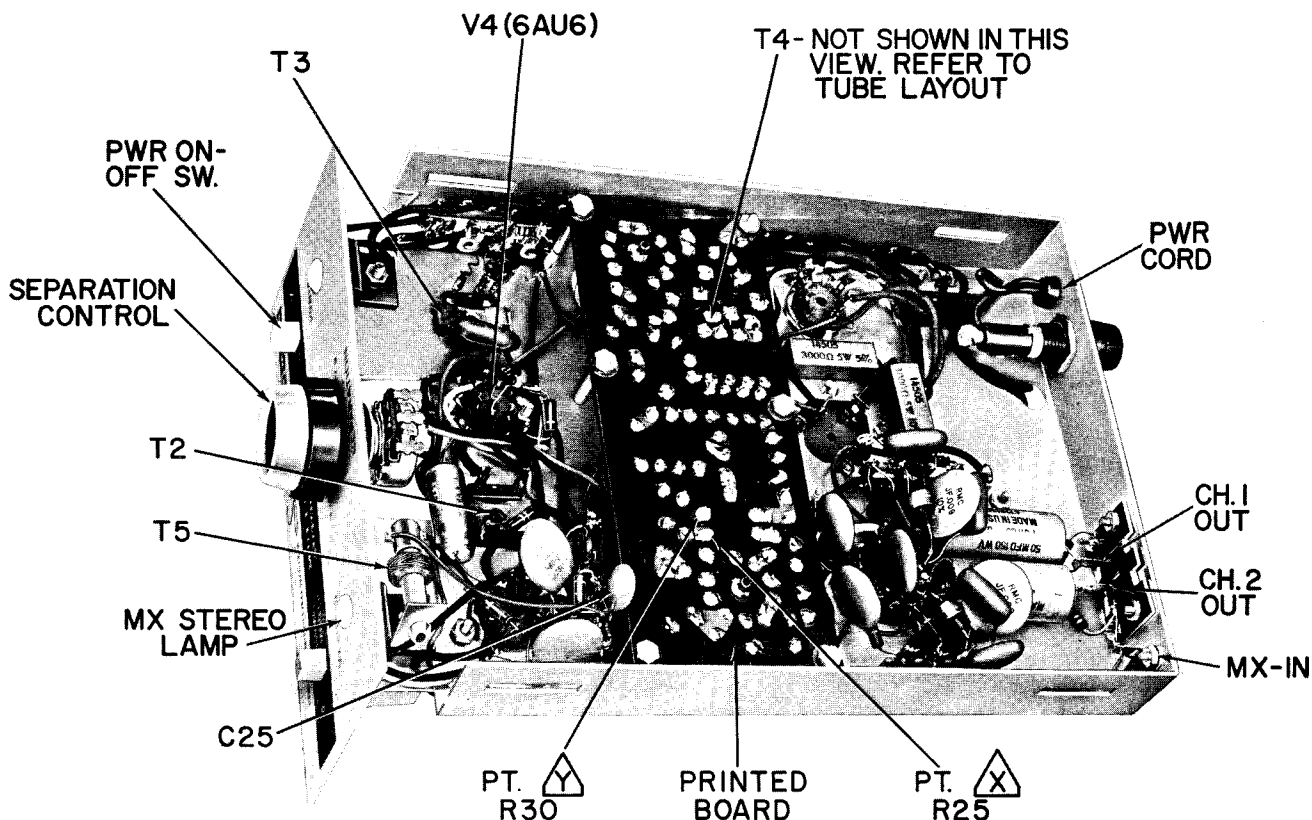


Figure 6-2. Service Alignment (Bottom View)

6-3. VOLTAGE & RESISTANCE CHART

	Pin#	Column 1 DC Volts	Column 2 38KC	Column 3 Resistance		Pin#	Column 1 DC Volts	Column 2 38KC	Column 3 Resistance
V1	1	100	DC	25K	V3	10	140	DC	6K
	2	5.5	DC	2.2M		11	10	DC	2.2M
	3	11.3	DC	4,100		12	0	DC	0
	4	0	DC	0	V4	1	0	DC	60
	5	0	DC	0		2	1.5	DC	150
	6	32 to 50	DC	125K		3	0	DC	0
	7	-1.3	DC	50-250		4	Filament -6.3 VAC, 60 cps to ground		
	8	0	DC	0		5	140	DC	6,000
	9	Filament -6.3 VAC, 60 cps to ground			6	140	DC	6,000	
V2	1	80	DC	28K	7	1.5	DC	150	
	2	0	DC	90K	V5	1	140	16	6,000
	3	2.8	DC	1,500		2	0	0	1M
	4	0	DC	0		3	9.8	5	1.5K
	5	0	DC	0		4	0	0	0
	6	120	DC	15K		5	0	0	0
	7	13.5	DC	2.2M		6	140	17	6,000
	8	27	DC	10K		7	-3.2	9	100K
	9	Filament -6.3 VAC, 60 cps to ground				8	9.8	5	1,500
V3	1	Filament -6.3VAC, 60cps to ground				9	Filament -6.3 VAC, 60 cps to ground		
	2	110	DC	18K	V6	1	AC	280V, 60 cps	370
	3	28	DC	10K		2	—	—	—
	4	12	DC	3K		3	0	0	0
	5	140	DC	6K		4	Filament -6.3VAC, 60 cps to ground		
	6	12	DC	3K		5	—	—	—
	7	8	DC	1M		6	AC	280V, 60 cps	370
	8	—	—	—		7	350	2.5	200K*
	9	8	DC	1M					

All readings are  $\pm 20\%$ .

Column 1, 2 and 3: POWER switch to ON, MX STEREO switch to NORMAL, SEPARATION control to NORMAL. Feed no signal to inputs.

Column 2: All measurements are made with a high impedance VTVM and are at 38kc, unless otherwise indicated.

Column 3: Line Cord removed from power outlet. Pin 7 of V6 is connected to ground.

\* Connection to ground removed when making this measurement.

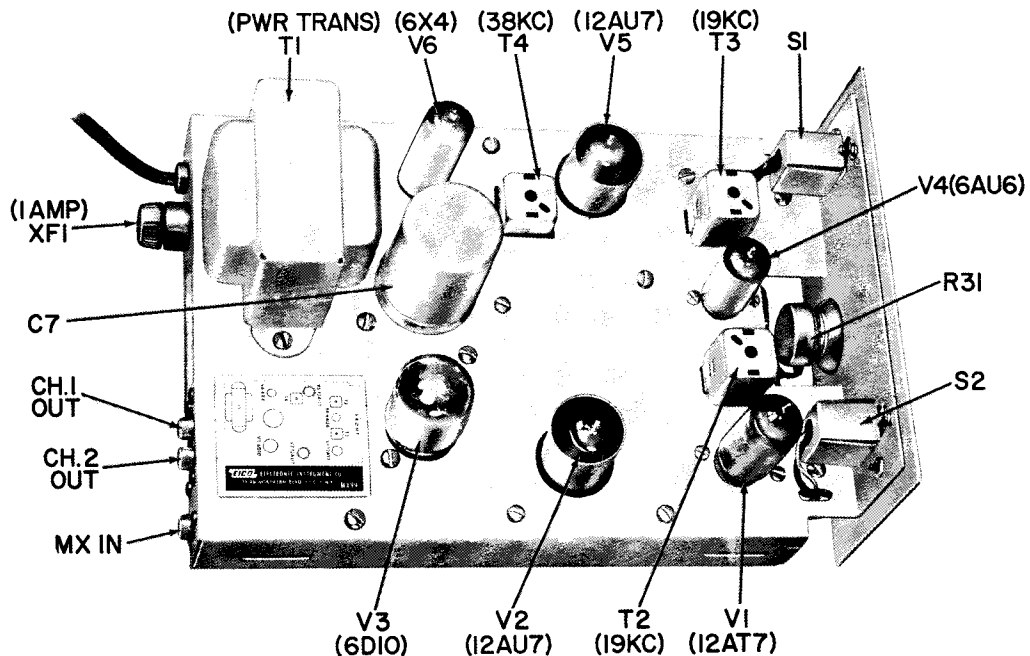


Figure 6-3. Tube and Transformer Layout

## 6-4. TROUBLE-SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Fuse blows with V6 out of socket.	Short in T1	Replace
Fuse blows only with V6 in socket.	Defective V6, short C7	Replace
Filament not lit.	Open heater in tube Open green lead for T1 or leads to filaments. 6.3V winding of T1 open	Replace tube  Replace T1
POWER bulb doesn't light	Defective R18, I2	Replace
MX stereo bulb doesn't light when stereo program is in progress	Defective R10, T2, T3, I1, C6, CR1, CR2	Replace
MX stereo bulb lights only with V1 out of socket	Misaligned T2 and T3	Realign
DC voltage at V6 cathode (pin 7) is incorrect as specified below:		
a) No voltage	Defective V6 C7 shorted internally or externally Connection to center top of h.v. secondary winding of T1 open	Replace Repair or replace  Repair or replace
b) High voltage	Lead from C7C, R19, or R20 open	Repair or Replace
c) Low voltage	T4 shorted to ground C7A open or shorted V6 defective	Replace Replace Replace
Excess hum	C7 open	Replace
Sustained microphonics	V1 defective	Replace
Distorted Stereo	T2, T3, T4 out of alignment	Realign
Lack of separation	V2, R31, R33, R34, R35, CR1, CR2, CR3, CR4, CR5, CR6	Replace
High-pitched whistle on certain FM stereo stations	67kc (SCA sub-carrier) trap T5 misaligned or defective	Realign by adjusting coil slug for inaudibility of whistle. If defective, replace.

## 6-5. SPECIAL OPERATING NOTES

The MX-99, as supplied, incorporates a capacitor, C25, having a value of .001 mfd and associated with input stage V1A, which is designed to provide optimum compensation for the high frequency roll-off (at 53kc) of all EICO tuners (HFT-90, 92 and ST-96). When using the MX-99 with one of these EICO tuners that is properly aligned and operating normally, the optimum setting of the MX-99 SEPARATION control will usually fall somewhere between 4 and 8 on the dial,\* and at this setting separation will be maximum across the audio band. There are two other cases involving the use of the MX-99 with other brands of FM tuners.

\*Provided that the station is employing the modulation percentage practices recommended by the FCC, i.e., 45% main carrier, 45% sub-carrier, 10% pilot carrier. Check with the station involved.

CASE 1

If you are using the MX-99 with another brand of FM tuner, and you find that maximum separation is obtained with the SEPARATION control set somewhere between 0 and 4, you can usually maximize high-frequency separation and reduce distortion by removing capacitor C25 from the circuit.



## CASE 2

If you are using the MX-99 with another brand of FM tuner, and you find that maximum separation is obtained with the SEPARATION control set somewhere between 8 and 10, you can usually maximize high-frequency separation by increasing the value of C25 to as much as twice its present value of .001mfd. (You may do this by soldering an additional 10% disc capacitor in parallel with C25. Try 470mmf first and stick with this value if separation is noticeably improved; if not, try .001mfd).

NOTE: In Case 1, the results of removing C25 are favorable in all respects. In Case 2, the increase in the value of C25 over its present value of .001 mfd will result in a somewhat higher background noise level. The latter effect is not related to the performance of the MX-99 Adaptor, but merely reflects the actual signal-to-noise ratio in the tuner over the frequency band containing the multiplexed signal.

## 6-6. EICO's SERVICE POLICY

## SERVICE CONSULTATION

If you are experiencing trouble that you cannot diagnose yourself, you are invited to avail yourself of the EICO Service Consultation Department. The consultant handling your inquiry will make every effort to diagnose the cause of your particular difficulty based on the information that you provide. Please be as thorough as possible. Include the following information about your unit:

- a) Have you made a thorough check of the wiring, checking also for cold solder joints, or accidental shorting between parts, or to chassis? (Check to see whether a bare wire or lead extends far enough to be shorted when the bottom plate is put on).
- b) Have you checked that the proper tube or transistor is in each socket, and also making proper contact in the socket? Are all shields firmly in place?
- c) Does the trouble occur at one time or one operating situation, but not at another time or operating situation? Be as specific as possible in this respect.

- d) If the unit is of the type that involves alignment or calibration, be as specific as possible as to what you have done or not done with regard to these requirements. If the unit incorporates tuned circuits stated to be factory pre-aligned, did you change any settings? If so, what alignment procedure did you use?
- e) Have you observed any peculiarity about a part? If a part appears charred or otherwise damaged by excessive heat, please say so. If you think you have damaged a particular part in the assembly or wiring, please say so. In conjunction with the symptoms, the consultant may be able to determine whether such a part is likely to be defective.
- f) Have you gone through any trouble-shooting procedure that may be provided? If your manual includes a table of contacts made at each switch position, have you checked out the switches accordingly (if the trouble is such that doing this would be appropriate)? Have you been able to make checks of the operating voltages and/or resistances, if this is appropriate, and your manual provides a table of voltages and resistances? What are the results of these checks? Also, have you taken any other trouble-shooting approaches? What have been the results?
- g) If this is high fidelity equipment, please state the type (magnetic, ceramic, crystal) of phono cartridge you are using and/or the make and model number. State the make and model of your record changer, or turntable and tone arm. Are the speakers in the same cabinet with your electronic equipment? If so, describe the cabinet and the placement of the components. Please state the make and model of your speakers.

In addition, list any code numbers in red under the words INSTRUCTION MANUAL on the cover of the book provided with your unit. If there are no red code numbers, state this specifically. If the unit bears a serial number, it is essential that you include this also.

## PARTS REPLACEMENT

If it appears that a component is defective, and you desire a replacement from EICO, address your correspondence to our Customer Service Department.

If you are claiming the right to a no-charge replacement under the terms and conditions of the warranty, it is required that you shall have sent in the

registration card within 10 days of the date of purchase, and that you send back the defective part transportation prepaid. EICO will make the necessary replacement at no charge for parts eligible under the terms and conditions of the warranty. In returning tubes, pack them very carefully to avoid breakage in shipment. Broken tubes will not be replaced. Please read the warranty on the subject of parts eligible for replacement.

Further information required on a part returned to the factory for a no-charge replacement under the terms and conditions of the warranty is as follows:

- a) Model number and serial number, if any, of unit. Also any code numbers in red under the words INSTRUCTION MANUAL on the cover of the book supplied with the unit.
- b) Stock number and description of part as given on the parts list. If the part is not listed (of itself) in the parts list, it means that the part is integral with a sub-assembly. If the sub-assembly is not sealed, and the defective part is definitely identified and easily replaceable (not more than two connections), you may request replacement for the particular part. If the sub-assembly is sealed, or if the defective part is not definitely identified or is not easily replaceable (more than two connections), then remove the sub-assembly and return it to EICO (less any tubes) for repair or replacement, if your unit is in warranty. If your unit is out of warranty, you are generally advised to order a replacement sub-assembly.
- c) Describe as completely as possible the nature of the defect, or your reason for requiring replacement.

## FACTORY REPAIR SERVICE

EICO maintains a Factory Repair Service Department for in-warranty or out-of-warranty repair of EICO equipment. It is intended to serve those customers who are not adequately familiar with electronics to make use of the EICO Service Consultation facilities, or whose difficulties cannot be solved by correspondence.

For all out-of-warranty units, there is a minimum labor and handling fee. For the Model MX-99, this fee is \$7.50. Charges for components replaced are additional to the minimum fee.

For in-warranty completed kit units, there is a minimum labor and handling fee. For the Model MX-99,

this fee is \$7.50. There is no charge for a replaced defective part provided that the terms and conditions of the warranty for no charge replacement are not violated in the judgement of EICO.

For in-warranty factory-wired units, there is no labor and handling fee if the unit complies with the terms and conditions of the warranty in the judgement of EICO. However, if the terms and conditions of the warranty are violated, then there will be charged to customer a minimum labor and handling fee plus the cost of parts replaced.

In all cases, the unit must be sent to the factory transportation prepaid, and the unit will be returned to the customer transportation collect.

The services rendered for the minimum labor and handling fee are the correction of any minor wiring errors (not extensive corrections or re-wiring), the labor involved in replacing defective parts, and any adjustments, alignment, or calibration procedures that would normally be performed on a factory-wired unit. Units not wired according to instructions, or modified in any way, or showing evidence of the use of acid core solder, will not be serviced and will be returned to the customer forthwith.

Units requiring extensive corrections or re-wiring will incur an additional labor charge which will be set by EICO. The customer will be informed of this situation and written authorization from the customer will be required before the work is done.

Please note: minimum labor and handling fees are subject to revision at any time.

#### LOCAL REPAIR FACILITIES

Out-of-warranty repair work may also be performed by authorized service stations as well as the EICO factory. A list of authorized service stations is provided with this manual. The roster of stations may change from time to time, and if considerable time has elapsed since you purchased your unit, you are advised to contact the station you choose before sending the unit to them for repair. Use of a local service station will often result in faster service, and, usually, lower transportation costs.

It is necessary that you comply with the Shipping Instructions that follow when sending in a unit for service.

#### SHIPPING INSTRUCTIONS

You are strongly advised to retain the original shipping carton and inserts in the case that re-shipment is required for service or any other purpose. The carton may be collapsed, for storage in as small a space as possible. In very many cases, the same carton is used for kit and factory-wired units so that the kit carton will serve for re-shipment of the completed kit.

To submit a unit for service, either to the factory or an authorized service station\*, fill out completely the Service Work Order from provided with the manual. Pack the unit very carefully, preferably in the original shipping carton with the original inserts.

If this is not possible, use a strong oversize carton, preferably wood, allowing at least 3 inches of resilient packing material such as shredded paper or excelsior, to be inserted between all sides of the unit and the carton. Seal the carton with strong gummed paper tape or strong twine, or both. Include the Service Work Order in the carton and in addition, attach a tag to the instrument on which is printed your name and address and brief reference to the trouble experienced. Affix "FRAGILE" or "HANDLE WITH CARE" labels to at least four sides of the carton, or print these words large and clear with a bright color crayon. Ship by prepaid Railway Express or parcel post to:

EICO Electronic Instrument Co., Inc.  
33-00 Northern Blvd.  
Long Island City 1, N. Y.  
Attention: Service Dept.

Include your name and address on the outside of the carton. Return shipment will be made transportation charges collect. Note that a carrier cannot be held liable for damages in transit, if packing, **IN HIS OPINION**, is insufficient.

\*Authorized service stations are for out-of-warranty units only, unless the station is specifically noted on the List of Authorized Service Stations to be authorized for other work.



THE EICO WARRANTY



The Electronic Instrument Company, Inc., hereafter referred to as EICO, warrants that, for a period of 90 days from the date of purchase, any EICO kit will be free of defects in parts, and that any EICO factory-wired unit will be free of defects in parts and workmanship. For an EICO kit, EICO's obligation is limited to those parts which are returned transportation prepaid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use. For an EICO factory-wired unit, EICO's obligation is limited to those parts, sections, or the entire unit which is returned transportation prepaid to the factory without further damage, and in the judgement of EICO are either originally defective or have become defective in normal use.

The warranty does not apply to any parts damaged in the course of handling, assembling, or wiring by the customer, or damaged due to abnormal usage or in violation of instructions or reasonable practice, or further damaged to a consequential degree in return shipment. Furthermore, the foregoing warranty is made only to the original customer, and is and shall be in lieu of all other warranties, whether expressed or implied, and of all other obligations or liabilities on the part of EICO, and in no event shall EICO be liable for any anticipated profits, consequential damages, loss of time, or other losses incurred by the customer in connection with the purchase or operation of EICO products or components thereof.

The registration card, which accompanies each EICO kit or factory-wired unit, must be filled in and returned to the company within 10 days after the date of purchase. This warranty applies only to registered units.

## SECTION VII. REPLACEMENT PARTS LIST

SYM.#	STOCK#	AM'T.	DESCRIPTION
C1	22560	1	capacitor, disc, .05mfd, GMV (50K or 50,000mmf)
C2	23039	1	capacitor, elec., 1mfd, 15V
C3	20063	1	capacitor, mylar, .03mfd, 5%
C4,5	22552	2	capacitor, disc, 220mmf, 10%
C6	23048	1	capacitor, elec., 1mfd, 150V
C7	24005	1	capacitor, elec., 20 x 40 x 40mfd
C8,9,10	22560	3	capacitor, disc, .05mfd, GMV (50K or 50,000mmf)
C11	22532	1	capacitor, disc, .0015mfd, 10% (1.5K or 1500mmf)
C12,14,16	22560	3	capacitor, disc, .05mfd, GMV (50K or 50,000mmf)
C13	22532	1	capacitor, disc, .0015mfd, 10% (1.5K or 1500mmf)
C15	23500	1	capacitor, elec., 10mfd, 12V
C17	22548	1	capacitor, disc, .009mfd, 10% (9K or 9000mmf)
C18,19	20062	2	capacitor, mylar, .025mfd, 10% (25K or 25,000mmf)
C20	22548	1	capacitor, disc, .009mfd, 10% (9K or 9000mmf)
C21,22	20062	2	capacitor, mylar, .025mfd, 10% (25K or 25,000mmf)
C23,24	23015	2	capacitor, elec., 50mfd, 150V
C25	22521	1	capacitor, disc, .001mfd, 10% (1K or 1000mmf)
CR1,2,3,4,5,6	95006	6	diode, 40V, PIV
F1	91002	1	fuse, 1 Amp
I1,2	92012	2	bulb, NE-2E
J1	50014	1	jack, single
J2-3	50011	1	jack, dual
L1,2	35068	2	coil, 8mh
R1	10453	1	resistor, 18K ohm, 10%, 1/2W (brown, grey, orange, silver)
R2	10434	1	resistor, 2.2M ohm, 10%, 1/2W (red, red, green, silver)
R3	10446	1	resistor, 270 ohm, 10%, 1/2W (red, violet, brown, silver)
R4	10450	1	resistor, 3900 ohm, 10%, 1/2W (orange, white, red, silver)
R5	10435	1	resistor, 150K ohm, 10%, 1/2W (brown, green, yellow, silver)
R6	10441	1	resistor, 150 ohm, 10%, 1/2W (brown, green, brown, silver)
R7	10431	1	resistor, 470K ohm, 10%, 1/2W (yellow, violet, yellow, silver)
R8	10407	1	resistor, 1M ohm, 10%, 1/2W (brown, black, green, silver)
R9,10	10410	2	resistor, 100K ohm, 10%, 1/2W (brown, black, yellow, silver)
R11	10442	1	resistor, 1500 ohm, 10%, 1/2W (brown, green, red, silver)
R12,13,14,15,16,17	11068	6	resistor, 1500 ohm, 1%, 1/2W
R18	10426	1	resistor, 33K ohm, 10%, 1/2W (orange, orange, orange, silver)
R19,20	14505	2	resistor, 3000 ohm, 10%, 5W
R21	10434	1	resistor, 2.2M ohm, 10%, 1/2W (red, red, green, silver)
R22	11038	1	resistor, 9000 ohm, 1%, 1/2W
R23	10442	1	resistor, 1500 ohm, 10%, 1/2W (brown, green, red, silver)
R24	11018	1	resistor, 9500 ohm, 1%, 1/2W
R25	11079	1	resistor, 100K ohm, 1%, 1/2W
R26,27,28,29	11020	4	resistor, 40K ohm, 1%, 1/2W
R30	11079	1	resistor, 100K ohm, 1%, 1/2W
R31	18091	1	potentiometer, 250K ohm, linear, taper
R32	11079	1	resistor, 100K ohm, 1%, 1/2W
R33	10426	1	resistor, 33K ohm, 10%, 1/2W (orange, orange, orange, silver)
R34	10442	1	resistor, 1500 ohm, 10%, 1/2W (brown, green, red, silver)
R35	10435	1	resistor, 150K ohm, 10%, 1/2W (brown, green, yellow, silver)
R36	11049	1	resistor, 70K ohm, 1%, 1/2W
R37	10434	1	resistor, 2.2M ohm, 10%, 1/2W (red, red, green, silver)
R38	10407	1	resistor, 1M ohm, 10%, 1/2W (brown, black, green, silver)
R39	11559	1	resistor, 12K ohm, 5%, 1/2W (brown, red, orange, gold)
R40	10528	1	resistor, 270 ohm, 5%, 1/2W (red, violet, brown, gold)
R41	11051	1	resistor, 10K ohm, 1%, 1/2W
R42	10407	1	resistor, 1M ohm, 10%, 1/2W (brown, black, green, silver)
R43	10446	1	resistor, 270 ohm, 10%, 1/2W (red, violet, brown, silver)
R44,45	10413	2	resistor, 2700 ohm, 10%, 1/2W (red, violet, red, silver)
R46	10446	1	resistor, 270 ohm, 10%, 1/2W (red, violet, brown, silver)
R47,48	10453	2	resistor, 18K ohm, 10%, 1/2W (brown, grey, orange, silver)

## Replacement Parts List (Cont'd.)

SYM.#	STOCK#	AM'T.	DESCRIPTION
S1,2	62015	2	switch, slide, SPST
T1	30056	1	transformer, power
T2	34631	1	coil, filter, 19kc
T3	34632	1	coil, doubler, 19kc
T4	34633	1	coil, oscillator, 38kc
T5	33001	1	coil, trap, 67kc
TB1	54018	1	terminal strip, 4 post, with ground
TB2	54015	1	terminal strip, 3 post 2 left, with ground
TB3	54006	1	terminal strip, 3 post, 2 right
TB4	54018	1	terminal strip, 4 post, with ground
TB5	54024	1	terminal strip, 2 post, left
TB6	54044	1	terminal strip, 3 post left, with ground
V1	90012	1	tube, 12AT7
V2	90033	1	tube, 12AU7
V3	90081	1	tube, 6D10
V4	90020	1	tube, 6AU6
V5	90033	1	tube, 12AU7
V6	90036	1	tube, 6X4
XF1	97800	1	fuseholder
XV1	97025	1	tube, socket, 9 pin miniature, bottom mount
XV2	97065	1	tube, socket, 9 pin with shield
XV3	97064	1	tube, socket, 12 pin, compactron
XV4	97022	1	tube, socket, 7 pin miniature, bottom mount
XV5	97065	1	tube, socket, 9 pin with shield
XV6	97022	1	tube, socket, 7 pin miniature, bottom mount
	40000	10	nut, hex, No. 6-32
	40001	1	nut, hex, 3/8"-32
	40007	18	nut, hex, No. 4-40
	40016	1	nut, 1/2", fuseholder
	40017	6	nut, Tinnerman, No. 8-32
	40034	4	nut, Tinnerman, No. 4-40
	41046	4	screw, No. 8-32 x 3/8, brown
	41086	10	screw, No. 6-32 x 5/16
	41090	12	screw, No. 4-40 x 5/16
	41091	4	screw, No. 4-40 x 1/4, flat head
	41097	2	screw, No. 6-32 x 5/16, brown
	41110	6	screw, No. 4-40 x 1-1/8
	42000	1	washer, lock, 3/8"
	42001	1	washer, flat, 3/8"
	42002	10	washer, lock, No. 6
	42007	24	washer, lock, No. 4
	42029	1	washer, rubber, 1/2"
	42039	6	washer, flat, No. 4
	44020	6	spacer, 3/4"
	46015	4	foot, plastic
	51503	2	clip, can
	53049	1	knob
	57000	1	line cord, brown
	80122	1	panel
	81333	1	chassis
	81334	1	bottom plate
	81335	1	cover (OPTIONAL)
	81955	1	bracket, coil
	82101	1	strain relief
	82509*	1	printed board
	89261	1	label, nomenclature, back
	89262	1	label, tube layout
	89627	1	capsule, glue
	89684	2	bulb, housing, fishpaper
	97304	2	shield for slide switch
	97720	2	jewel
	66106	1	manual of instruction (wired)
	66359	1	manual of instruction (kit)

\*82512 and 82509 are interchangeable

