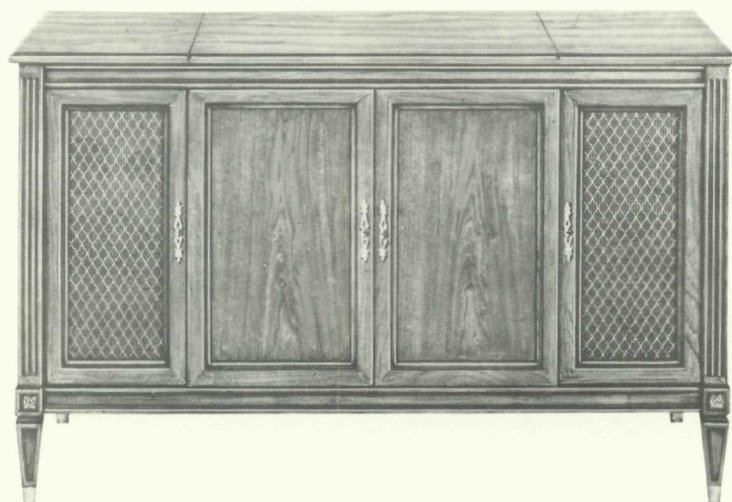


# Service Manual

# THE FISHER<sup>®</sup>



## Custom Electra VIII

MODEL E-490



**CAUTION:** This is a FISHER precision high-fidelity instrument. It should be serviced only by qualified personnel — trained in the repair of transistor equipment and printed circuitry.

### EQUIPMENT AND TOOLS NEEDED

The following are needed to completely test and align this high-fidelity instrument.

#### Test Instruments

Vacuum-Tube Voltohmmeter DC VTVM  
Audio (AC) Vacuum-Tube Voltmeter (AC VTVM)  
Oscilloscope (Flat to 100 kc minimum)  
Audio (Sine-wave) Generator  
Intermodulation Analyzer  
Sweep (FM) Generator (88 to 108 mc)  
Marker Generator  
Multiplex Generator (preferably with RF output — FISHER Model 300 or equal).

#### Miscellaneous

Adjustable-Line-Voltage Transformer or line-voltage regulator  
Load Resistors (2) — 8-ohm, 50-watt (or higher)  
Stereo source (Turntable with stereo cartridge or Tape Deck)  
Speakers (2) Full-range, for listening tests  
Soldering iron (with small-diameter tip) fully insulated from power line.

### PRECAUTIONS

Many of the items below are included just as a reminder—they are normal procedures for experienced technicians. Shortcuts can be taken but often they cause additional damage—to transistors, circuit components or the printed-circuit board.

**Soldering**—A well-tinned, hot, clean soldering iron tip will make it easier to solder without damage to the printed-circuit board or the many many circuit components mounted on it. It is not the wattage of the iron that counts—it is the heat available at the tip. Low-wattage soldering irons will often take too long to heat a connection—pigtail leads will get too hot and damage the part. Too much heat, applied too long, will damage the printed-circuit board. Some 50-watt irons reach temperatures of 1,000° F—others will hardly melt solder. Small-diameter tips should be used for single solder connections—larger pyramid and chisel tips are needed for larger areas.

- When removing defective resistors, capacitors, etc., the leads should be cut as close to the body of the circuit component as possible. (If the part is not being returned for in-warranty factory replacement it may be cut in half—with diagonal-cutting pliers—to make removal easier.)

- Special de-soldering tiptlets are made for unsoldering multiple-terminal units like IF transformers and electrolytic capacitors. By unsoldering all terminals at the same time the part can be removed with little chance of breaking the printed-circuit board.

- Always disconnect the chassis from the power line when soldering. Turning the power switch OFF is not enough. Power-line leakage paths, through the heating element, can destroy transistors.

**Transistors**—Never attempt to do any work on the transistor amplifiers without first disconnecting the AC-power linecord—wait until the power supply filter-capacitors have discharged.

- Guard against shorts—it takes only an instant for a base-to-collector short to destroy that transistor and possibly others direct-coupled to it. [In the time it takes for a dropped machine screw, washer or even the screwdriver, to glance off a pair of socket terminals (or between a terminal and the chassis) a transistor can be ruined.]

- DO NOT bias the base of any transistor to, or near, the same voltage applied to its collector.

- DO NOT use an ohmmeter for testing transistors. The voltage applied through the test probes may be higher than the base-emitter breakdown voltage of the transistor.

**Output Stage and Driver**—Replacements for output and driver transistors, if necessary, must be made from the same beta group as the original type. The beta group is indicated by a colored dot on the mounting flange of the transistor. Be sure to include this information, when ordering replacement transistors.

- If one output transistor burns out (open or shorts), always remove all output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohmmeter before inserting a new transistor. All output transistors in one channel will be destroyed if the base-biasing circuit is open on the emitter end.

- When mounting a replacement power transistor be sure the bottom of the flange, the mica insulator and the surface of the heat sink are free of foreign matter. Dust and grit can prevent perfect contact. This reduces heat transfer to the heat sink. Metallic particles can puncture the insulator and cause shorts—ruining the transistor.

- Silicone grease must be used between the transistor and the mica insulator and between the mica and the heat sink for best heat conduction. Heat is the greatest enemy of electronic equipment. It can shorten the life of transistors, capacitors and resistors. (Use Dow-Corning DC-3 or C20194 or equivalent compounds made for power transistor heat conduction.)

- Use care when making connections to speakers and output terminals. Any frayed wire ends can cause shorts that may burn out the output transistors—they are direct-coupled to the speakers. There is no output transformer—nothing to limit current through the transistors except the fuses. To reduce the possibility of shorts at the speakers, lugs should be used on the exposed ends—at least the ends of the stranded wires should be tinned to prevent frayed wire ends. The current in the speakers and output circuitry is quite high. Any poor contact or small-size wire, can cause power losses in the speaker system. Use 14 or 16 AWG for long runs of speaker-connecting wiring.

**DC-Voltage Measurements**—These basic tests of the transistor circuitry are made without the signal generator. Without any signal input measure the circuit voltages—as indicated on the schematic. The voltage difference between the base and the emitter should be in the millivolt range—a sensitive DC meter is needed for these readings. A low-voltage range of 1 volt, full scale—or lower—is needed.

**Audio-Voltage (gain) Measurements**—The schematic and printed-circuit board layout diagrams are used. Input signals are injected at the proper points—found most quickly by using layout of the printed-circuit board instead of the schematic. An AUDIO (AC) VTVM connected to the test points should indicate voltages close to those values shown in the boxes on the schematic. Many of the signal levels in the input stages are only a few millivolts—they can not be read on the AC ranges supplied on most Vacuum-Tube AC/DC Volt-ohmmeters (VTVMs). Even with a 1-volt range a signal level of 100 millivolts (.1 volt) will be the first 1/10 of the meter scale. A reading of 1 millivolt (.001 volt) will hardly even move the meter needle.

# PARTS DESCRIPTION LIST

## SPEAKER SYSTEM SPS107

| Symbol | Parts Description             | Part No. |
|--------|-------------------------------|----------|
| W134   | Woofers, 10-inch              | W134     |
| M135   | Mid-Range, 5-inch             | M135     |
| T129A  | Tweeter, 2½-inch              | T129A    |
| L215   | Inductor                      | L215     |
| L212.5 | Inductor                      | L212.5   |
| C303   | Capacitor, 3uF, nonpolarized  | C303     |
| C325   | Capacitor, 25uF, nonpolarized | C325     |
| C350   | Capacitor, 50uF, nonpolarized | C350     |
| R404.7 | Resistor, 4.7-ohm             | R404.7   |

## TUNER - PREAMPLIFIER CAPACITORS

10% Tolerance for all fixed capacitors, unless otherwise noted or marked GMV (guaranteed minimum value). All capacitors not marked uF are pF (uuF).

| Symbol          | Description                     | Part No.    |
|-----------------|---------------------------------|-------------|
| C1              | Ceramic, 33, N750, 1000V        | C50070-15   |
| C2, 3           | Ceramic, 100, GMV, N1500, 1000V | C50070-5    |
| C4              | Ceramic, 21, 5%, N750, 1000V    | C50070-32   |
| C5              | Ceramic, 3, NPO, 1000V          | C50070-28   |
| C6              | Ceramic, 100, GMV, N1500, 1000V | C50070-5    |
| C7A-H           | Variable, Tuning FM/AM          | C953-115    |
| C8              | Ceramic, 1000, GMV, 500V        | C50089-2    |
| C9, 10          | Ceramic, .01uF, 20%, 500V       | C50089-3    |
| C11             | Ceramic, .02uF +80-20%, 500V    | C50089-4    |
| C12, 13         | Ceramic, .02uF, 20%, 500V       | C50089-5    |
| C14             | Ceramic, Feedthru 1000, GMV     | C592-187    |
| C15             | Ceramic, .02uF, +80-20%, 500V   | C50089-4    |
| C16             | Ceramic, 5, ±.5pF NPO 500V      | CC20CJ050D5 |
| C17             | Ceramic, Feedthru, 1000, GMV    | C592-187    |
| C18             | Mylar, .047, 250V               | C50197-52   |
| C19             | Ceramic, 1000, GMV, 500V        | C50089-2    |
| C20             | Ceramic, Trimmer                | C662-123    |
| C21             | Ceramic, 560, 1000V             | C50072-14   |
| C22             | Ceramic, 33, 5%, N750, 1000V    | C50070-25   |
| C23             | Ceramic, 100, GMV, N1500, 1000V | C50070-5    |
| C24             | Ceramic, 24, 5%, N150, 1000V    | C50070-8    |
| C25             | Ceramic, Trimmer                | C662-123    |
| C26             | Ceramic, 68, 5%, N750, 1000V    | C50070-35   |
| C27             | Ceramic, Feedthru, 1000, GMV    | C592-187    |
| C28             | Ceramic, .02uF, +89-20%, 500V   | C50089-4    |
| C29             | Ceramic, 82, 5%, N1500, 1000V   | C50070-33   |
| C30             | Ceramic, 5, ±.5pF, N150, 500V   | CC20PJ050D5 |
| C31             | Ceramic, 10, ±.5pF, NPO, 500V   | CC20CJ100D5 |
| C32, 33         | Ceramic, Feedthru, 1000, GMV    | C592-187    |
| C36             | Ceramic, 1, 20%, P100, 1000V    | C50070-1    |
| C37             | - Deleted -                     |             |
| C38             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C39             | Ceramic, 2700, 1000V            | C50072-17   |
| C40             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C41, 42         | Ceramic, 68, N2200, 1000V       | C50070-12   |
| C43             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C44, 45         | Ceramic, 5000, 20%, 500V        | C50089-1    |
| C46             | Ceramic, 100, N1500, 1000V      | C50070-6    |
| C47, 48         | Ceramic, 5000, 20%, 500V        | C50089-1    |
| C49             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C50             | - Deleted -                     |             |
| C51             | Ceramic, 2700, 1000V            | C50072-17   |
| C52             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C53             | Ceramic, .02uF, GMV, 1000V      | C50071-6    |
| C54             | - Deleted -                     |             |
| C55, 56         | Ceramic, 1000, 1000V            | C50072-3    |
| C57, 58, 59, 60 | - Deleted -                     |             |
| C61             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C62             | Ceramic, 2700, 1000V            | C50072-17   |
| C63             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C64             | Ceramic, .02uF, GMV, 1000V      | C50071-6    |
| C65             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C66             | Ceramic, 330, 1000V             | C50072-1    |
| C67, 68, 69     | - Deleted -                     |             |
| C70, 71         | Ceramic, 330, 1000V             | C50072-1    |
| C72             | Ceramic, 5000, +80-20%, 500V    | C50089-6    |
| C73             | - Deleted -                     |             |

|     |   |           |
|-----|---|-----------|
| C74 | Electrolytic, 4 Section<br>A-60uF, 200V<br>B-60uF, 200V<br>C-20uF, 300V<br>D-40uF, 350V | C50180-65 |
| C75 | Ceramic, 5000, +80-20%, 500V  | C50089-6  |
| C76 | - Deleted -   |           |
| C77 | Electrolytic 8uF, 50V   | C629-138  |
| C78 | Ceramic, 5000, +80-20%, 500V  | C50089-6  |
| C79 | Ceramic, 100, GMV, N1500, 1000V   | C50070-5  |

## RESISTORS AND POTENTIOMETERS

Deposited Carbon in ohms, 5% Tolerance, 1/8 watt unless otherwise noted K=Kilohm, M=Megohm.

| Symbol  | Description                       | Part No.   |
|---------|-----------------------------------|------------|
| R1      | Composition 100K, 10%, ½W         | RC20BF104K |
| R2      | Composition, 270, 10%, ½W         | FC20BF271K |
| R3      | 470K, 5%, 1/3W                    | R33DC474J  |
| R4      | 47K                               | R12DC473J  |
| R5      | 10                                | R12DC100J  |
| R6      | 47K                               | R12DC473J  |
| R7      | 10                                | R12DC100J  |
| R8, 9   | 10K                               | R12DC103J  |
| R10     | Composition, 470K, 10%, ½W        | RC20BF474K |
| R11     | 4.7M, 5%, 1/3W                    | R33DC475J  |
| R12, 13 | Glass, 330K, 5%, 1W               | R30G334J   |
| R14     | 2.2M, 5%, 1/3W                    | R33DC225J  |
| R15     | 4.7M, 5%, 1/3W                    | R33DC475J  |
| R16, 17 | 220K, 5%, 1/3W                    | R33DC224J  |
| R18     | Composition, 470, 10%, ½W         | RC20BF471K |
| R19, 20 | 4.7M, 5%, 1/3W                    | R33DC475J  |
| R21     | - Deleted -                       |            |
| R22     | Composition, 47K, 10%, ½W         | RC20BF473J |
| R23, 24 | 100K                              | R12DC104J  |
| R25     | 180K, 5%, 1/3W                    | R33DC184J  |
| R26, 27 | 150K                              | R12DC154J  |
| R28     | Composition, 1.5K, 10%, ½W        | RC20BF152K |
| R29     | Composition, 150K, 10%, ½W        | RC20BF154K |
| R30     | Composition, 22K, 10%, ½W         | RC20BF223K |
| R31     | Composition, 100, 10%, ½W         | RC20BF101K |
| R32     | Composition, 18K, 10%, 1W         | RC30BF183K |
| R33, 34 | Composition, 1K, 10%, ½W          | RC20BF102K |
| R35, 36 | 1M                                | R12DC105J  |
| R37     | 180                               | RC20BF181K |
| R38     | 27K                               | RC20BF273K |
| R39, 40 | 390K                              | R12DC394K  |
| R41     | Composition, 1000, 10%, ½W        | RC20BF102K |
| R42     | 2.2M, 5%, 1/3W                    | R33DC225J  |
| R43     | Composition, 15M, 10%, ½W         | RC20BF156K |
| R44     | 2.7M, 5%, 1/3W                    | R33DC275J  |
| R45     | Composition, 15M, 10%, ½W         | RC20BF156K |
| R46     | 2.7M, 5%, 1/3W                    | R33DC275J  |
| R47     | 150K                              | R12DC154J  |
| R48     | 47K, 5%, 1/3W                     | R33DC473J  |
| R49     | Composition, 22M, 10%, ½W         | RC20BF226K |
| R50     | 100K, 5%, 1/3W                    | R33DC104J  |
| R51     | 1K, 5%, 1/3W                      | R33DC102J  |
| R52     | 100K, 5%, 1/3W                    | R33DC104J  |
| R53     | 1K, 5%, 1/3W                      | R33DC102J  |
| R54, 55 | Potentiometer, Dual 500K Bass     | R5016B163  |
| R56     | Composition, 100, 10%, ½W         | RC20BF101K |
| R57, 58 | Potentiometer, Dual 500K Treble   | R50160B163 |
| R59     | Composition, 47K, 10%, ½W         | RC20BF473K |
| R60     | Composition, 1K, 10%, ½W          | RC20BF102K |
| R61     | 47K                               | R12DC473K  |
| R62     | Potentiometer, 500K, Balance      | R50160B164 |
| R63     | 47K                               | R12DC473K  |
| R64     | 3.3M, 5%, 1/3W                    | R33DC335J  |
| R65     | - Deleted -                       |            |
| R66     | 47K                               | R12DC473J  |
| R67, 68 | Glass, 2.7K, 5%, ½W               | R20G272J   |
| R69, 70 | 22K                               | R12DC223J  |
| R71, 72 | Potentiometer, Dual, 500K, Volume | R50160B162 |
| R73     | Composition, 68K, 10%, ½W         | RC20BF683K |
| R74     | Composition, 1K, 10%, ½W          | RC20BF102K |
| R75     | Composition, 270, 5%, ½W          | RC20BF271J |
| R76     | Composition, 22M, 10%, ½W         | RC20BF226K |
| R77     | - Deleted -                       |            |

# PARTS DESCRIPTION LIST

|         |   |                 |             |                                     |              |
|---------|---|-----------------|-------------|-------------------------------------|--------------|
| R78     | Composition, 39, 10%, 1/2W                              | RC20BF390K      | C17, 18     | Ceramic, 330pF, 10%, 1000V          | C50072-1     |
| R79     | Composition, 1500, 5%, 1/2W                             | RC20BF152J      | C19         | Electrolytic, 4uF, 350V             | C50475-4     |
| R80     | Composition, 1000, 5%, 1/2W                             | RC20BF102J      | C20         | Electrolytic, 4 section             | C50180-63    |
| R81, 82 | Glass, 150, 10%, 3W                                     | RPG3W151K       |             | A-40uF, 400V                        |              |
| R83     | Composition, 22K, 10%, 1/2W                             | RC20BF223K      |             | B-40uF, 400V                        |              |
| R84     | Composition, 15K, 10%, 1/2W                             | RC20BF153K      |             | C-40uF, 400V                        |              |
| R85     | 470K  | R12DC474J       |             | D-60uF, 200V                        |              |
| R86     | Composition, 10M, 10%, 1/2W                             | RC20BF106K      | C21, 22     | Electrolytic, 200uF, 35V            | C50483-7     |
| R87     | 470K  | R12DC474J       | C23         | Electrolytic, 3000uF, 35V           | C50180-61DX  |
| R88     | - Deleted -   |                 | C24         | Mylar, .01uF, 250V                  | C50197-48    |
| R89     | 150K  | R12DC154J       | C25         | Electrolytic, 100uF, 200V           | C50475-2     |
| R90     | Composition, 3.3, 10%, 1/2W                             | RC20BF3R3K      | C26, 27     | Molded .01uF, 600V                  | C2747        |
| CR1     | Diode   | Y1112           | C28         | Electrolytic, 3000uF, 35V           | C50180-61DX  |
| I1      | Lamp, Stereo Beacon                                     | I50461-3        | C29         | Electrolytic, 100uF, 200V           | C50475-2     |
| I2, 3   | Lamps, Dial   | I50441-3        | C30, 31     | Ceramic, 16pF, 10%, N75, 1000V      | C50070-21    |
| L1      | Loopstick (AM Antenna)                                  | L50210-36       | C32, 33     | Mylar, 0.33uF, 20%, 250V            | C50B575-6    |
| L2      | Coil, FM Antenna  | L818-113        |             |                                     |              |
| L3      | Choke, R. F.  | L629-180        |             |                                     |              |
| L4      | Choke, 1.5 Microhenry                                   | L50066-4        |             |                                     |              |
| L5      | Coil, AM R. F.  | L50210-35       |             |                                     |              |
| L6      | Coil, FM R. F.  | L953-119        |             |                                     |              |
| L7      | Choke, .68 Microhenry                                   | L50066-1        |             |                                     |              |
| L8, 9   | Coil, FM Oscillator                                     | A5953-116       |             |                                     |              |
| L10     | Coil, AM Oscillator                                     | L50210-28       |             |                                     |              |
| L11     | Choke, .2 Microhenry                                    | L50066-21       |             |                                     |              |
| L12     | Choke, 3.3 Microhenry                                   | L50066-8        |             |                                     |              |
| PC1, 2  | Printed Circuit Phono Equalization                      | PC50187-12      |             |                                     |              |
| PC3, 4  | Printed Circuit Tone Control                            | PC50187-9       |             |                                     |              |
| S1      | Switch, Selector  | S1197-112       |             |                                     |              |
| S2      | Switch, Power   | PART OF R71, 72 |             |                                     |              |
| S3      | Switch, Automatic Shut-Off                              | S1197-115       |             |                                     |              |
| S4      | Switch, Speakers  | S1197-112       |             |                                     |              |
| Z1      | Transformer, FM IF                                      | ZZ662-117       | Symbol      | Description                         | Part No.     |
| Z2      | Transformer, AM IF                                      | ZZ2984          | R1, 2       | 1M                                  | R12DC105J    |
| Z3      | Transformer, FM IF                                      | ZZ2987          | R3          | 220K, 5%, 1/3W                      | R33DC224J    |
| Z4      | Transformer, AM IF                                      | ZZ2984          | R4          | 1.8K                                | R12DC182J    |
| Z5      | Coil, FM Limiter  | ZZ50210-6       | R5          | 82                                  | R12DC820J    |
| Z6      | Transformer, FM Ratio Detector                          | ZZ50210-9       | R6          | 220K, 5%, 1/3W                      | R33DC224J    |
| -       | Dial Glass Screened                                     | N1197-107       | R7          | 1.8K                                | R12DC182J    |
| -       | Cartridge, Pickering                                    | G50663          | R8          | 82                                  | R12DC820J    |
| -       | Replacement Stylus                                      | G3505           | R9, 10      | 22K                                 | R12DC223J    |
| -       | Lamp No. 1847   | I50009-7        | R11, 12     | 1K                                  | R12DC102J    |
| -       | Knob, Automatic Shut-off                                | E50561          | R13A, B     | Wirewound, 6.8K, 10%, 7W            | RPG7W682K    |
| -       | Knob, Selector, Bass, Treble, Balance, Volume, Speakers | E50565-1        | R14         | - Deleted -                         |              |
| -       | Knob, Tuning  | E50565-2        | R15, 16     | 1.8K                                | R12DC182J    |
| -       | Stereo Beacon Lampholder                                | E946-175-1      | R17, 18     | 10K                                 | R12DC103J    |
|         |   |                 | R19         | Composition, 330, 10%, 2W           | RC40BF331K   |
|         |   |                 | R20, 21     | - Deleted -                         |              |
|         |   |                 | R22         | Composition, 330, 10%, 2W           | RC40BF331K   |
|         |   |                 | R23, 24     | - Deleted -                         |              |
|         |   |                 | R25, 26     | Composition, 330, 10%, 2W           | RC40BF331K   |
|         |   |                 | R27, 28     | - Deleted -                         |              |
|         |   |                 | R29, 30     | Composition, 10, 10%, 1/2W          | RC20BF100K   |
|         |   |                 | R31, 32     | - Deleted -                         |              |
|         |   |                 | R33, 34     | Wirewound, .51 ohm, 5%, 2W          | RW200WR51J   |
|         |   |                 | R35, 36     | 3.9K                                | R12DC392J    |
|         |   |                 | R37A, B     | Wirewound, Dual, 15 + 10, 10%, 10W  | R50500-2BX   |
|         |   |                 | R38         | - Deleted -                         |              |
|         |   |                 | R39A, B     | Wirewound Dual, 15 + 10, 10%, 10W   | R50500-2BX   |
|         |   |                 | R40         | - Deleted -                         |              |
|         |   |                 | R41         | Composition 820, 10%, 1/2W          | RC20BF821K   |
|         |   |                 | R42         | Composition, 1K, 10%, 1/2W          | RC20BF102K   |
|         |   |                 | R43         | 100K                                | R12DC104J    |
|         |   |                 | R44         | Wirewound, 390, 10%, 3W             | RPG3W391K    |
|         |   |                 | R45, 46     | Wirewound 22, 5%, 2W                | RW200W220J   |
|         |   |                 | R47         | 100K                                | R12DC104J    |
|         |   |                 | R48, 49     | Wirewound, 390, 10%, 3W             | RPG3W391K    |
|         |   |                 | R50         | Wirewound, 150, 10%, 3W             | RPG3W151K    |
|         |   |                 | R51         | Wirewound, 1 ohm, 5%, 3W            | RL300W010J   |
|         |   |                 | R52         | Composition, 820K, 10%, 1/2W        | RC20BF824K   |
|         |   |                 | R53, 54     | 47K                                 | R12DC473J    |
|         |   |                 | P1, 2, 3, 4 | Potentiometer, W. W. 10 ohm 20%, 2W | R50160-141-1 |

## RESISTORS AND POTENTIOMETERS

Deposited Carbon in ohms, 5% Tolerance, 1/8 watt unless otherwise noted. K=Kilohms, M=Megohms.

## 1135 POWER AMPLIFIER CAPACITORS

| Symbol          | Description                    | Part No.  |
|-----------------|--------------------------------|-----------|
| C1, 2           | Mylar, .022uF, 250V            | C50197-49 |
| C3, 4           | Electrolytic, 100uF, 15V       | C50483-5  |
| C5, 6           | Ceramic, 24pF, 5%, N150, 1000V | C50070-8  |
| C7, 8           | Electrolytic, 20uF, 250V       | C50475-3  |
| C9, 10          | Electrolytic, 16uF, 10V        | C50483-10 |
| C11, 12, 13, 14 | - Deleted -                    |           |
| C15, 16         | Ceramic, 560pF, 10%, 1000V     | C50072-14 |

If replacement parts are out of stock, locally, they may be obtained directly from the Parts Department of FISHER Radio Corporation. They will be shipped "best way", either prepaid or C.O.D. unless otherwise specified.

For instrument-operation information and technical assistance write Richard Hamilton, Customer Service Department, FISHER Radio Corporation, Long Island City, New York 11101.

# PREFERRED ALIGNMENT PROCEDURE

**READ THESE INSTRUCTIONS VERY CAREFULLY BEFORE ATTEMPTING ALIGNMENT**

## CONTROL POSITIONS:

- Rotate tuning knob to set dial pointer to the zero index mark on logging scale (if the pointer will not go to zero without forcing reset the pointer.)
- Set volume control to minimum (full counterclockwise).
- Disconnect the external antennas and the AM-antenna link.
- Disable the AGC for AM RF alignment – just short across C18 or C80.

**FM SIGNAL GENERATOR:** Modulated 30% ( $\pm 22.5$  deviation at 400 cps).

## ALIGNMENT PRECAUTIONS:

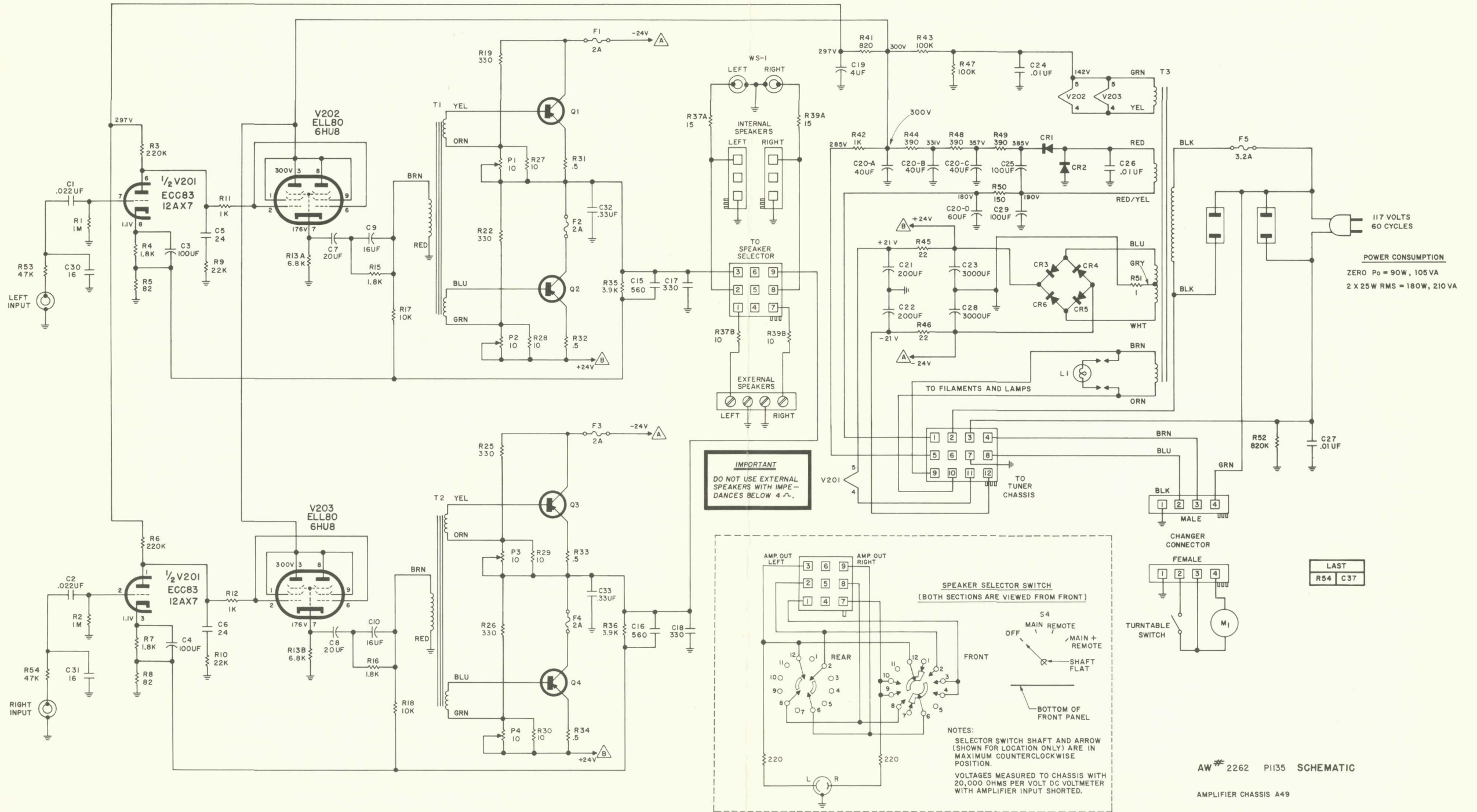
- The chassis and the test instruments must be warmed up for at least 15 minutes to reduce any possible drift.
- Adjust the AC powerline input for 117 VAC to the chassis (50 to 60 cycle).
- Use only the proper, fully insulated, alignment tools.

## AM ALIGNMENT

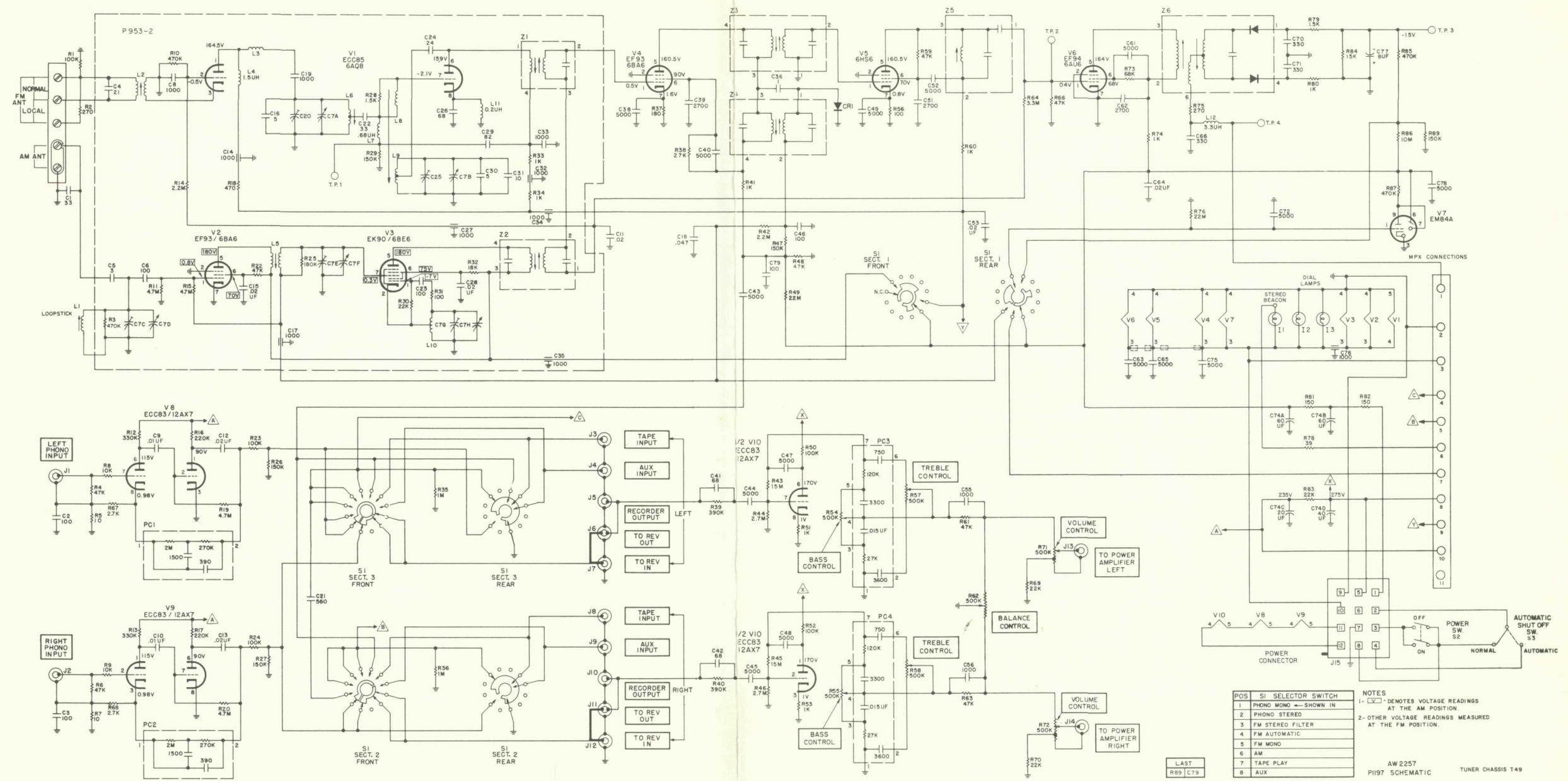
| STEPS   | CHASSIS  |  | SIGNAL GENERATOR  |         |                                  | INDICATOR  |  | ALIGNMENT                       |  |
|---|--|--|---|---------|----------------------------------|--|--|---------------------------------|--|
|   | SELECTOR   | STATION SELECTOR                       | COUPLING  | FREQ.   | MOD.                             | TYPE   | CONNECTION                                     | ADJUST                          | INDICATION   |
| 1   | AM   | Point of no signal and no interference | AM Gen. connected thru .01-uF cap to V2, Pin 1  | 455 KC  | 30% AM at 400 cps                | AC VTVM  | to Left RCRDR Output                           | Z2, Z4 top and bottom           | Maximum voltage  |
| 2   | AM   | 600 KC                                 | AM Gen. connected thru 220-uF cap. to the AM antenna terminal<br>Disconnect link.                 | 600 KC  | 30% AM at 400 cps                | AC VTVM  | to Left RCRDR Output                           | L10, L5<br>L1                   | Maximum voltage  |
| 3   | AM   | 1400 KC                                | AM Gen. connected thru 220-uF cap. to the AM antenna terminal<br>Disconnect link.                 | 1400 KC | 30% AM at 400 cps                | AC VTVM  | to Left RCRDR Output                           | C7H, C7E<br>C7C                 | Maximum voltage  |
| 4   | Repeat steps 2 and 3 for proper dial calibration and maximum output.               |  |   |         |                                  |  |  |                                 |  |
| 5   | FM   | Point of no signal and no interference | FM Gen. connected to ungrounded tube shield over V1   | 10.7 MC | None                             | DC VTVM  | to test point 3                                | Z1, Z3, Z5 and Z6, top & bottom | Maximum negative voltage   |
| 6   | FM   | Point of no signal and no interference | FM Gen. connected to ungrounded tube shield over V1   | 10.7 MC | None                             | Connect two 47K ohm resistors in series across C77. Connect a VTVM between the junction of the two 47K ohm resistors and the junction of L12 and C66 |  | Z6 top                          | Zero reading on zero center scale  |
| 7   | FM   | 90 MC                                  | FM Gen. connected thru two 120-ohm carbon resistors (Figure 1) to the FM Normal Antenna terminals | 90 MC   | 30% FM (22.5 KC Dev.) at 400 cps | DC VTVM  | to test point 2 and scope to Left RCRDR Output | L9, L6,<br>L2                   | Check for sinusoidal waveform (Figure 2) and adjust for maximum negative voltage |
| 8   | FM   | 106 MC                                 | FM Gen. connected thru two 120-ohm carbon resistors (Figure 1) to the FM Normal Antenna terminals | 106 MC  | 30% FM (22.5 KC Dev.) at 400 cps | DC VTVM  | to test point 2 and scope to Left RCRDR Output | C25 and C20                     | Check for sinusoidal waveform (Figure 2) and adjust for maximum negative voltage |
| 9   | Repeat steps 7 and 8 at least once for proper dial calibration and maximum output. |  |   |         |                                  |  |  |                                 |  |
| <b>NOTE:</b> For calibrating both the AM and FM, use as low an output voltage as possible from your signal generator. |  |  |   |         |                                  |  |  |                                 |  |

## FM ALIGNMENT

# SCHEMATIC DIAGRAM • AMPLIFIER



# SCHEMATIC DIAGRAM • TUNER



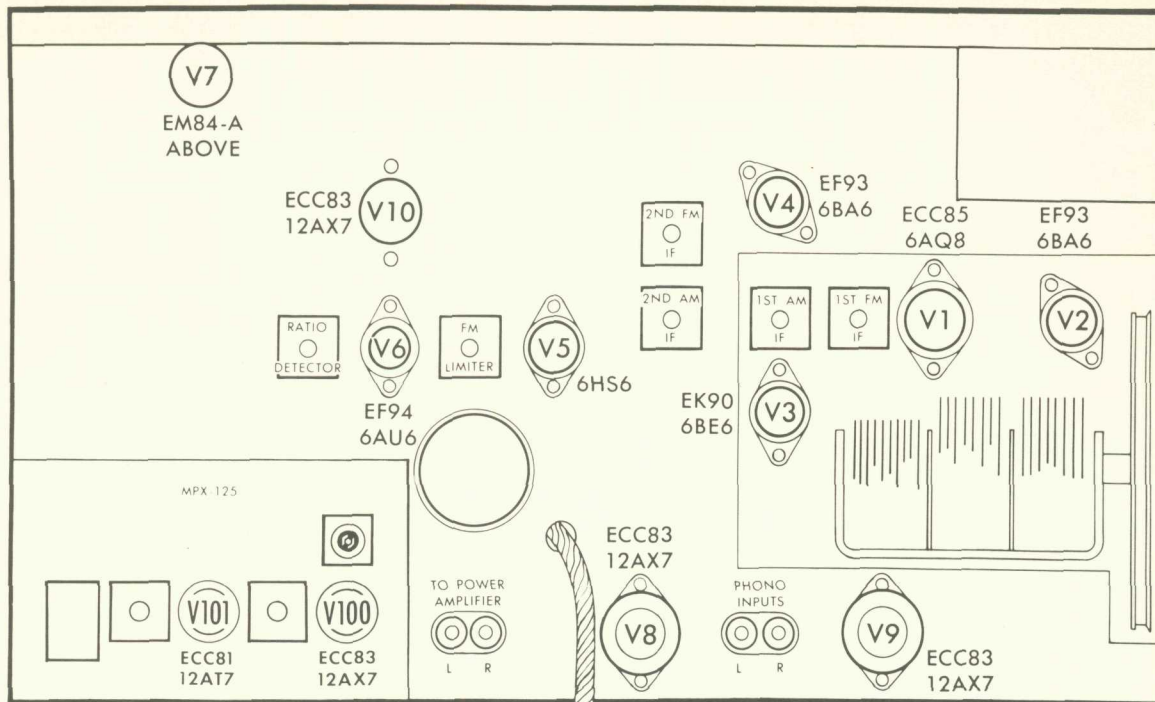
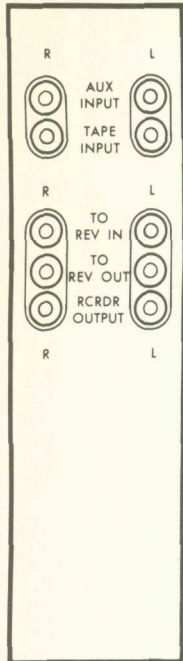
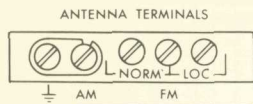
| POS | SI SELECTOR SWITCH    |
|-----|-----------------------|
| 1   | PHONO MONO ← SHOWN IN |
| 2   | PHONO STEREO          |
| 3   | FM STEREO FILTER      |
| 4   | FM AUTOMATIC          |
| 5   | FM MONO               |
| 6   | AM                    |
| 7   | TAPE PLAY             |
| 8   | AUX                   |

NOTES  
 1- [Symbol] DENOTES VOLTAGE READINGS AT THE AM POSITION.  
 2- OTHER VOLTAGE READINGS MEASURED AT THE FM POSITION.

AW 2257  
 PI97 SCHEMATIC  
 TUNER CHASSIS 149

BECAUSE ITS PRODUCTS ARE SUBJECT TO CONTINUOUS IMPROVEMENT, FISHER RADIO CORPORATION RESERVES THE RIGHT TO MODIFY ANY DESIGN OR SPECIFICATION WITHOUT NOTICE AND WITHOUT INCURRING ANY OBLIGATION.

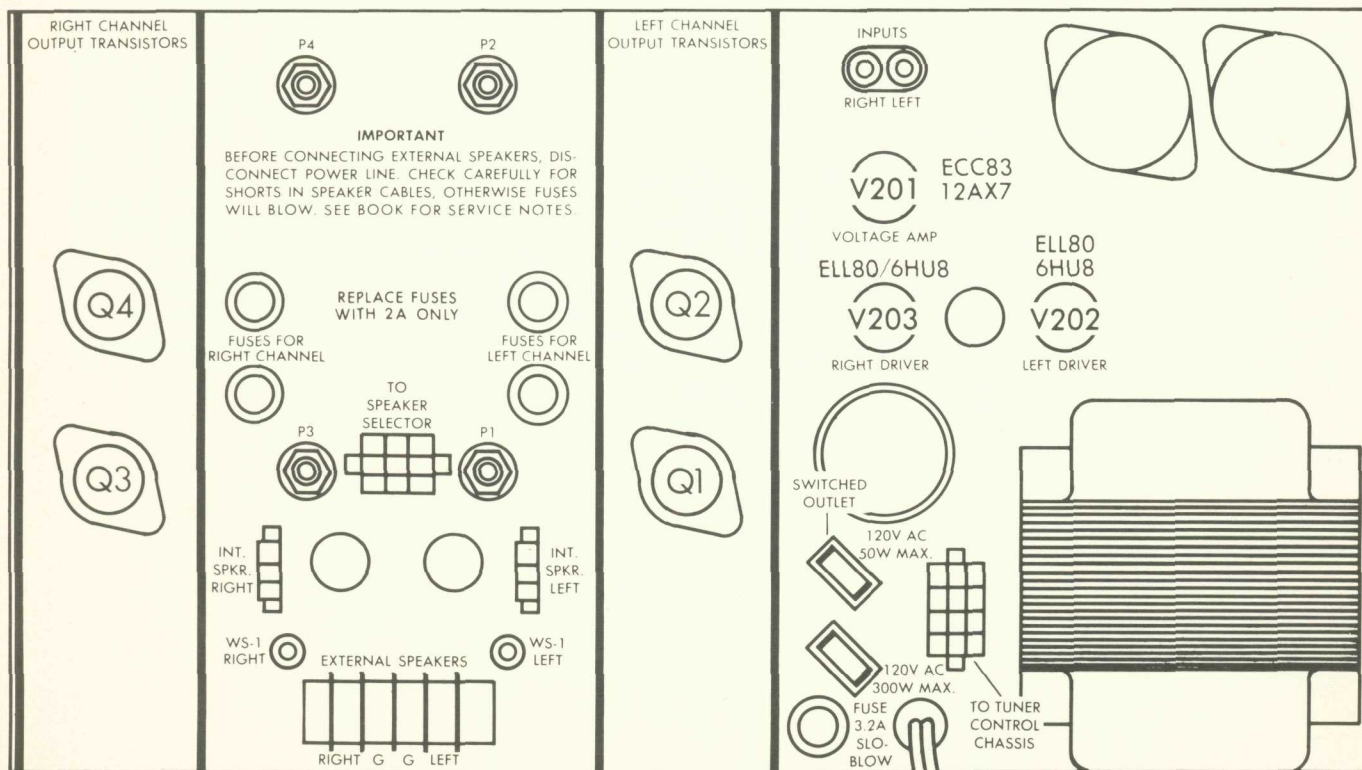
# TUBE LAYOUT • TUNER



INS 236



# TUBE LAYOUT • POWER AMPLIFIER



CAUTION: EXTERNAL SPEAKERS MUST HAVE IMPEDANCE EQUAL TO OR GREATER THAN FOUR OHMS, OR FUSES WILL BLOW TO PROTECT CIRCUIT.

INS 235



# P1131-2 MULTIPLEX DECODER

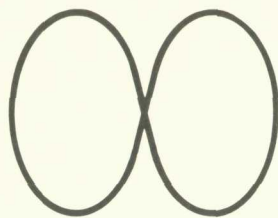


FIGURE 1. Lissajous pattern for MPX Oscillator alignment.

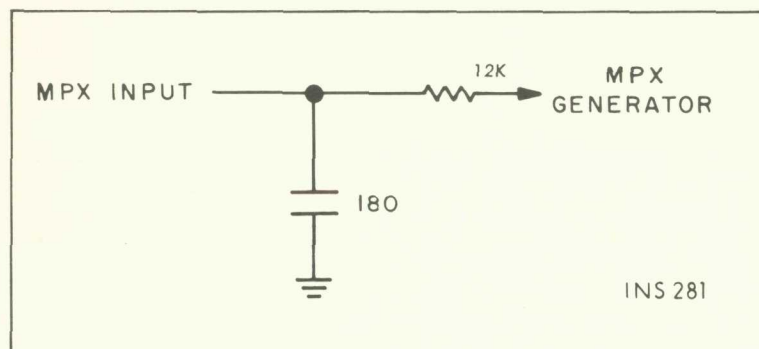
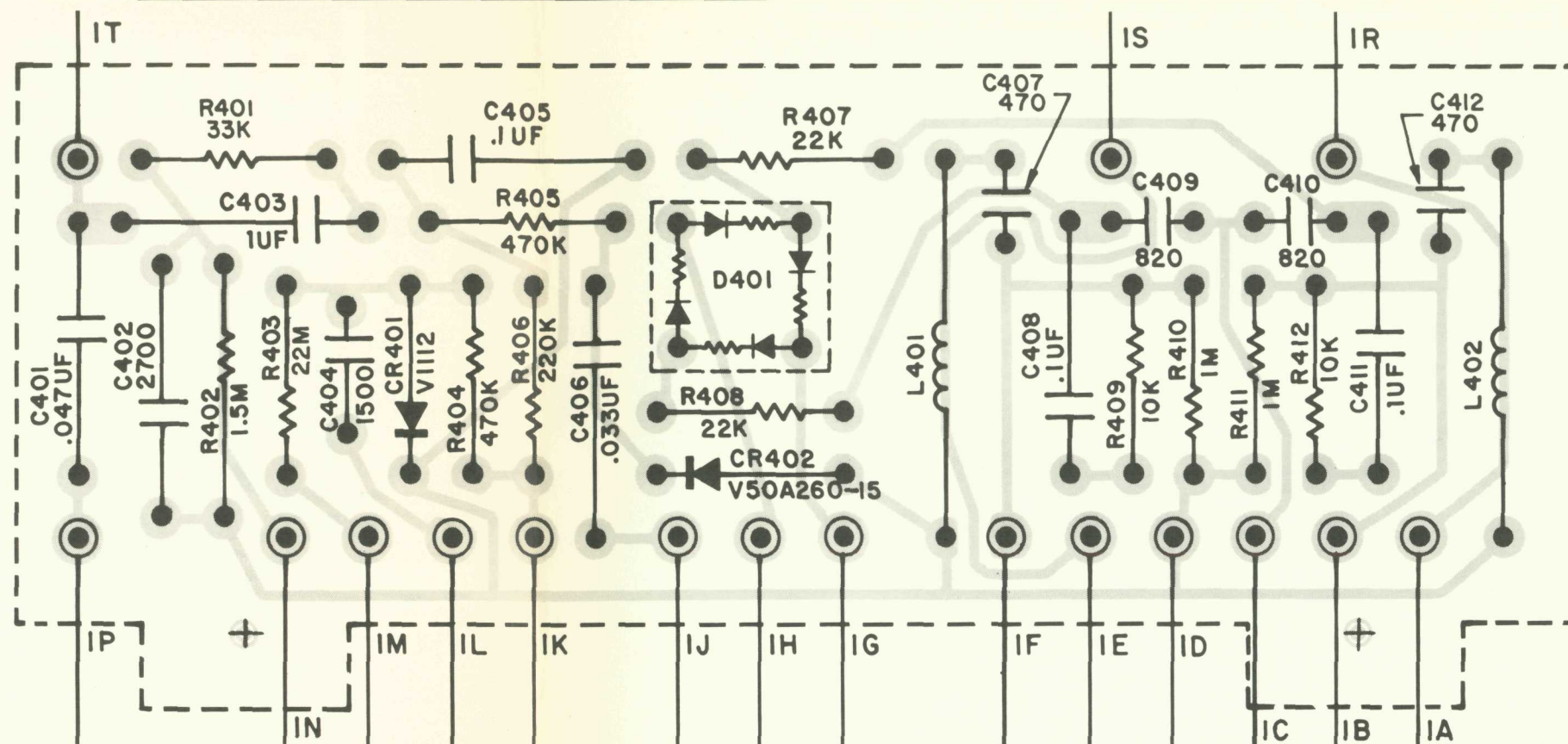


FIGURE 2. Multiplex-alignment hi-pass filter circuit.



## ALIGNMENT INSTRUCTIONS • MULTIPLEX SECTION

### GENERAL

The preferred alignment procedure, in table 1 below, uses a multiplex generator with an RF output, like the FISHER Model 300. Optimum performance will be obtained only when the multiplex decoder is connected to the FM detector with which it will be used. Check IF alignment first—poor alignment can prevent proper multiplex decoder operation.

**TEST EQUIPMENT REQUIRED:** MULTIPLEX GENERATOR, AUDIO (AC) VTVM, 100 KC OSCILLOSCOPE WITH EXTERNAL SWEEP JACKS, ALIGNMENT TOOL.

TABLE 1

| STEPS | GENERATOR  |   | R F DEVIATION | INDICATOR TYPE AND CONNECTION  | ALIGNMENT                                  |  |
|-------|--|---|---------------|--|--|--|
|       | CONNECTION   | MODULATION                                    |               |  | ADJUST                                     | INDICATION   |
| 1     | Multiplex generator RF output to antenna terminals   | 19 kc pilot only                              | $\pm 7.5$ kc  | VTVM to TP 1   | Z1 top and bottom                          | Maximum reading on VTVM  |
| 2     | 19 kc output of generator to oscilloscope horizontal input; generator not connected to MPX section | —   | —             | Vertical input of oscilloscope to TP 2; set oscilloscope for external sweep    | Z2   | Set frequency of free-running oscillator as close as possible to 38 kc. Lissajous pattern (see figure 1) should be as slow-moving as possible. |
| 3     | Same as Step 1   | Composite MPX; 1000 cps on left channel only  | $\pm 75$ kc   | VTVM and oscilloscope vertical input to right channel output lug (terminal 1R) | Z1 top                                     | Maximum reading on VTVM; clean 1000 cps sine wave on oscilloscope  |
| 4     | Same as Step 1   | Composite MPX; 1000 cps on right channel only | $\pm 75$ kc   | Same as Step 3   | MPX separation control (R4)*               | Minimum reading on VTVM should be at least 33 db below reading obtained in Step 3  |
| 5     | Same as Step 1   | Same as Step 4                                | $\pm 75$ kc   | VTVM and oscilloscope vertical input to right channel output lug (terminal 1S) | —  | Same VTVM reading as obtained in Step 3 $\pm 2$ db; clean 1000 cps sine wave on oscilloscope   |
| 6     | Same as Step 1   | Composite MPX; 1000 cps on left channel only  | $\pm 75$ kc   | Same as Step 5   | MPX separation control (R4), if necessary* | Minimum reading on VTVM should be at least 33 db below reading obtained in Step 5.   |

\* If adjustment is required, adjust for best compromise readings in Steps 4 and 6.

### ALTERNATE ALIGNMENT PROCEDURE

For multiplex generators without an RF output

When using this alignment procedure, it is necessary to disconnect the ratio detector from the multiplex decoder at the point where the generator is connected. Unsolder point IT carefully. The generator input must be through a simple low-pass filter—a 12 K resistor between the multiplex generator and the MPX input with a 180 pF capacitor from the MPX input end of the resistor to ground (Figure 2, on schematic).

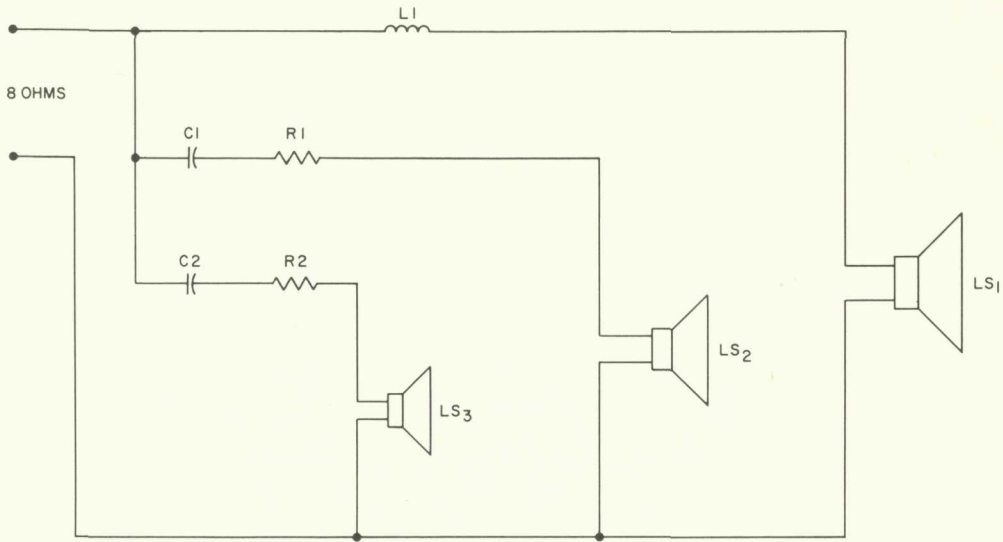
**TEST EQUIPMENT REQUIRED:** MULTIPLEX GENERATOR, AUDIO (AC) VTVM, 100 KC OSCILLOSCOPE WITH EXTERNAL SWEEP JACKS, ALIGNMENT TOOL.

TABLE 2

| STEPS | GENERATOR  |                                |                         | INDICATOR TYPE AND CONNECTION  | ALIGNMENT                                  |  |
|-------|--|--------------------------------|-------------------------|--|--|--|
|       | CONNECTION   | AUDIO                          | LEVEL                   |  | ADJUST                                     | INDICATION   |
| 1     | Composite output of MPX generator to input of MPX demodulator (Point 1)                            | 19 kc pilot only               | 100 mV RMS (280 MV P-P) | AC VTVM to TP 1  | Z1 top and bottom                          | Maximum reading on VTVM  |
| 2     | 19 kc output of generator to oscilloscope horizontal input; generator not connected to MPX section | —                              | —                       | Oscilloscope vertical input to TP 2  | Z2   | Set frequency of free-running oscillator as close as possible to 38 kc. Lissajous pattern (see figure 1) should be as slow-moving as possible. |
| 3     | Same as Step 1   | 1000 cps on left channel only  | 0.7 V RMS (3.92 V P-P)  | AC VTVM and oscilloscope vertical input to left channel output lug (terminal 1R) | Z1 top                                     | Maximum reading on VTVM; clean 1000 cps sine wave on oscilloscope  |
| 4     | Same as Step 1   | 1000 cps on right channel only | 0.7 V RMS (3.92 V P-P)  | Same as Step 3   | MPX separation control (R4)*               | Minimum reading on VTVM should be at least 33 db below reading obtained in Step 3  |
| 5     | Same as Step 1   | Same as Step 4                 | 0.7 V RMS (3.92 V P-P)  | VTVM and oscilloscope vertical input to right channel output lug (terminal 1S)   | —  | Same VTVM reading as obtained in Step 3 $\pm 2$ db; clean 1000 cps sine wave on oscilloscope   |
| 6     | Same as Step 1   | 1000 cps on left channel only  | 0.7 V RMS (3.92 V P-P)  | Same as Step 5   | MPX separation control (R4), if necessary* | Minimum reading on VTVM should be at least 33 db below reading obtained in Step 5.   |

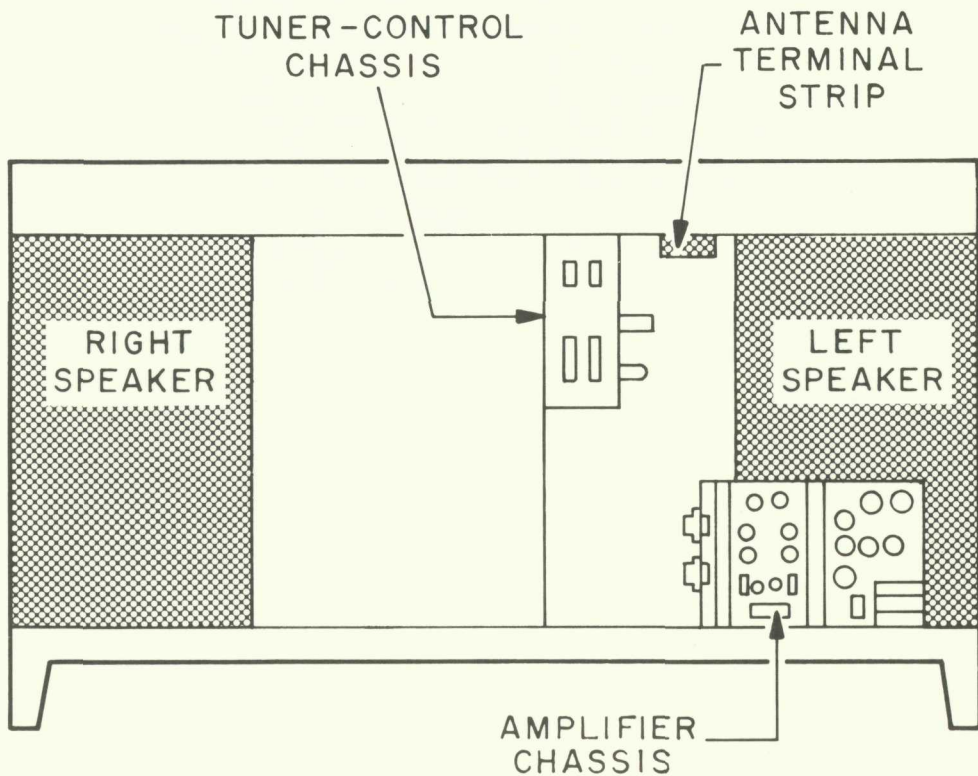
\* If adjustment is required, adjust for best compromise readings in Steps 4 and 6.

# SCHEMATIC DIAGRAM • SPEAKER SYSTEMS



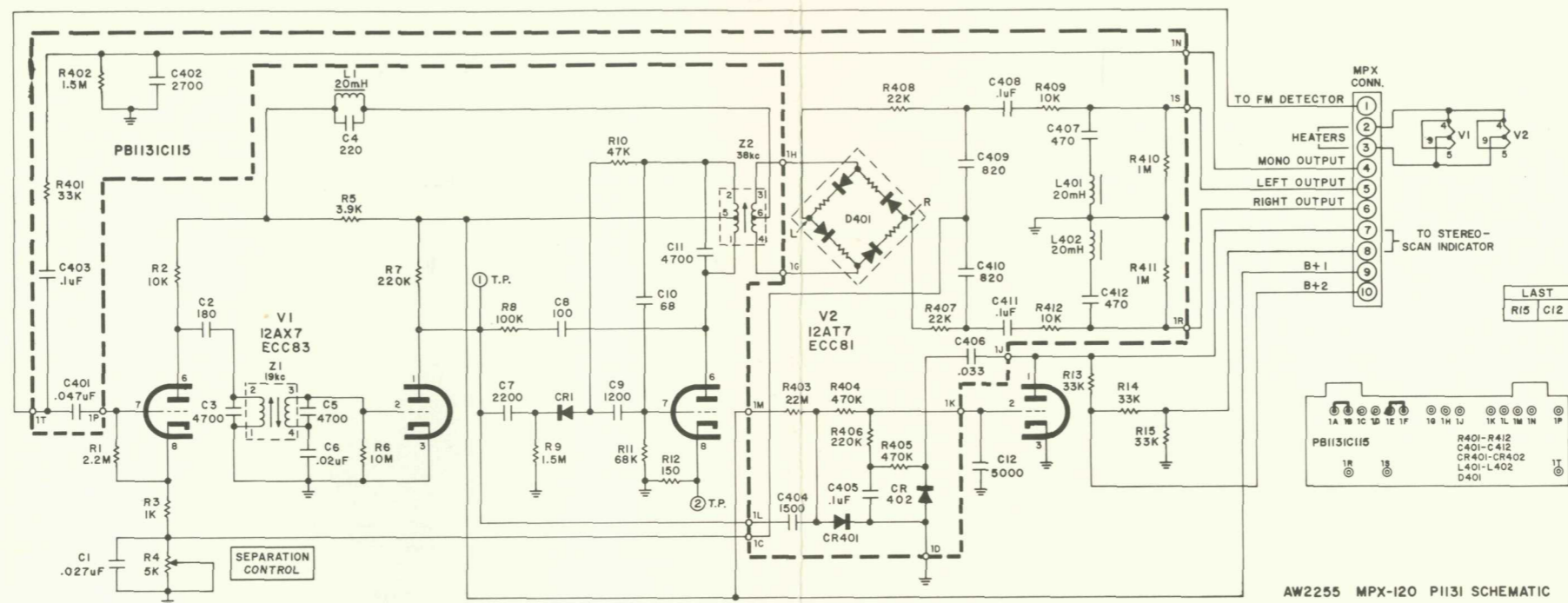
INS150

# REAR VIEW CONSOLE CONNECTIONS



INS 237

## SCHEMATIC DIAGRAM • MULTIPLEX SECTION



AW2255 MPX-120 P1131 SCHEMATIC

## PARTS DESCRIPTION LIST • MULTIPLEX SECTION

### MULTIPLEX SECTION CAPACITORS

20% tolerance for all fixed capacitors, unless otherwise noted or marked GMV (guaranteed minimum value). All capacitors not marked uF are pF (uf).

| Symbol | Description                      | Part No.   |
|--------|----------------------------------|------------|
| C1     | Mylar, .027 uF, 5%, 100V         | C50B574-6  |
| C2     | Polystyrene, 180, 5%, 500V       | C50B634-1  |
| C3     | Polystyrene, 4700, 5%, 125V      | C50B634-21 |
| C4     | Polystyrene, 220, 5%, 500V       | C50B634-2  |
| C5     | Polystyrene, 4700, 5%, 125V      | C50B634-21 |
| C6     | Ceramic, .02 uF, +80, -20%, 500V | C50089-4   |
| C7     | Ceramic, 2200, 20%, 1000V        | C50183-10  |
| C8     | Ceramic, 100, 20%, 1000V         | C50183-9   |
| C9     | Ceramic, 1200, 10%, 1000V        | C50183-8   |
| C10    | Ceramic, 68, 10% NPO, 1000V      | C50070-46  |
| C11    | Mica, 4700, 5%, 300V             | C50332-7   |
| C12    | Ceramic, 5000, 20%, 500V         | C50089-1   |

NOTE: For all other capacitors in multiplex section, see layout of printed circuit board.

### RESISTORS

| Symbol | Description                          | Part No.   |
|--------|--------------------------------------|------------|
| R1     | Dep. Carbon, 2.2M, 5%, 1/3W          | R33DC225J  |
| R2     | Dep. Carbon, 10K, 5%, 1/3W           | R33DC103J  |
| R3     | Dep. Carbon, 1K, 5%, 1/3W            | R33DC102J  |
| R4     | Potentiometer, 5K Separation Control | R50150-11  |
| R5     | Dep. Carbon, 3.9K, 5%, 1/3W          | R33DC392J  |
| R6     | Composition, 10M, 10%, 1/2W          | RC20BF106K |

|             |                             |            |
|-------------|-----------------------------|------------|
| R7          | Dep. Carbon, 220K, 5%, 1/3W | R33DC224J  |
| R8          | Dep. Carbon, 100K           | R12DC104J  |
| R9          | Dep. Carbon, 1.5M, 5%, 1/3W | R33DC155J  |
| R10         | Dep. Carbon, 47K, 5%, 1/3W  | R33DC473J  |
| R11         | Dep. Carbon, 68K            | R12DC683J  |
| R12         | Dep. Carbon, 150, 5%, 1/3W  | R33DC151J  |
| R13, 14, 15 | Composition, 33K, 10%, 1W   | RC30BF333K |

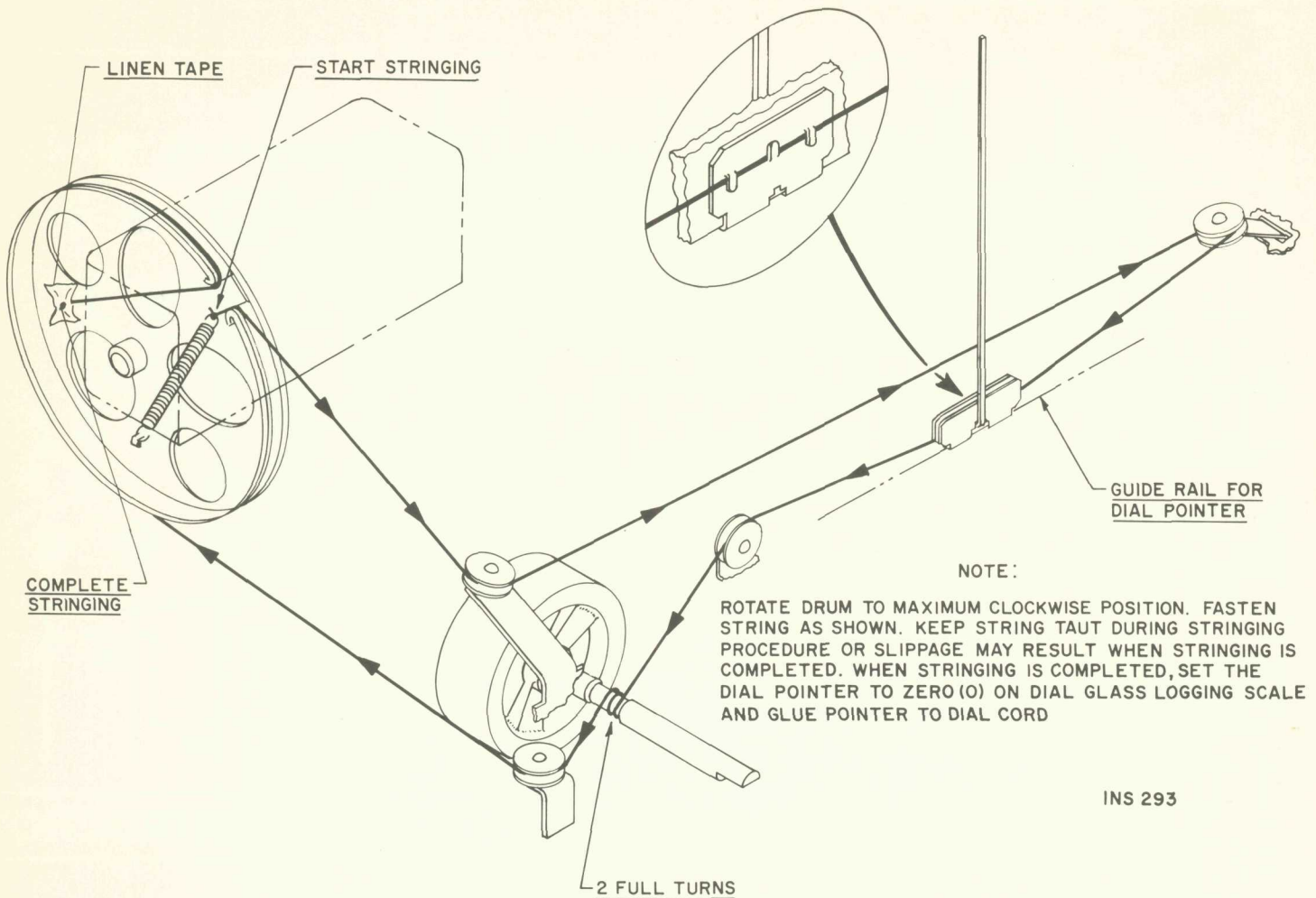
NOTE: For all other resistors in multiplex section, see layout of printed circuit board.

### MISCELLANEOUS

| Symbol | Description                           | Part No.   |
|--------|---------------------------------------|------------|
| CR1    | Diode, Type 1112                      | V1112      |
| L1     | Coil, 20 uH                           | L503342    |
| Z1     | Transformer, 19 kc                    | ZZ50210-34 |
| Z2     | Transformer, 38kc                     | ZZ50210-54 |
| R401   | Resistor, Dep. Carbon, 33k 5%, 1/8W   | R12DC333J  |
| R402   | Resistor, Dep. Carbon, 1.5m, 5%, 1/3W | R33DC155J  |
| R403   | Resistor, Composition, 22M, 10%, 1/2W | RC20BF226K |
| R404   | Resistor, Dep. Carbon, 470k, 5%, 1/8W | R12DC474J  |
| R405   | Resistor, Dep. Carbon, 470k, 5%, 1/8W | R12DC474J  |
| R406   | Resistor, Dep. Carbon, 470k, 5%, 1/8W | R12DC224J  |
| R407   | Resistor, Dep. Carbon, 22k, 5%, 1/8W  | R12DC223J  |
| R408   | Resistor, Dep. Carbon, 22k, 5%, 1/8W  | R12DC223J  |

|       |  |  |
|-------|--|--|
| R409  | Resistor, Dep. Carbon, 10k, 5%, 1/8W                                     | R12DC103J  |
| R410  | Resistor, Dep. Carbon, 1m, 5%, 1/8W                                      | R12DC105J  |
| R411  | Resistor, Dep. Carbon, 1m, 5%, 1/8W                                      | R12DC105J  |
| R412  | Resistor, Dep. Carbon, 10k, 5%, 1/8W                                     | R12DC103J  |
| C401  | Capacitor, Mylar, .047uF 10% 100V  | C50B574-5  |
| C402  | Capacitor, Polystyrene, 2700 5% 125V                                     | C50B634-20                                       |
| C403  | Capacitor, Plastic Film, .1uF 20% 250V                                   | C50B633-1  |
| C404  | Capacitor, Cer. Disc., 1500, 10%   | C50B576-4  |
| C405  | Capacitor, Plastic Film, 1uF 20% 250V                                    | C50B633-1  |
| C406  | Capacitor, Plastic Film, .033uF 20% 400V                                 | C50B633-20                                       |
| C407  | Capacitor, Cer. Disc., 470 pF 10%  | C50B576-1  |
| C408  | Capacitor, Plastic Film, .1uF 20% 250V                                   | C50B633-1  |
| C409  | Capacitor, Cer. Disc., 820 10%   | C50B576-3  |
| C410  | Capacitor, Cer. Disc., 820 10%   | C50B576-3  |
| C411  | Capacitor, Plastic Film, .1uF 20% 250V                                   | C50B633-1  |
| C412  | Capacitor, Cer. Disc., 470 pF, 10%                                       | C50B576-1  |
| CR401 | Diode  | V1112  |
| CR402 | Diode  | V50A260-15                                       |
| L401  | Coil   | L50334-2   |
| L402  | Coil   | L50334-2   |
| D401  | Ring Demodulator Printed Circuit Bd. Mini. Pin Term. Sleeving 23-32" Lg. | V50A260-18<br>PB1131B111<br>A50A577<br>E50A684-4 |

# DIAL STRINGING PROCEDURE



## Replacing Dial Lamps

Before replacing the dial lamps, disconnect the power plug from the wall outlet. Proceed as follows:

- 1 - Remove all control knobs from their shafts, by pulling them gently away from the control panel.
- 2 - Remove the two screws located on the upper right side of the partition which separates the Turntable compartment from the control section.
- 3 - Slide the entire control panel (the plate and wood panel to which it is fastened) to the right and upward. The panel can then be lifted off to expose the chassis.
- 4 - The lamps, tubular in shape, are held in spring clips at either end of the dial glass, and can be removed by lifting gently.
- 5 - Install the new lamp, making sure that the white, painted side faces away from the dial glass. Press the lamp down until it snaps into place.
- 6 - Replace the panel by reversing steps 1 and 3 above.

Replacement dial lamps can be ordered from Fisher Radio Corporation, Long Island City 1, New York. Please send all requests for parts to the attention of the Parts Department. The part No. is 150441-3.

## Replacing Stereo Beacon Lamp

Before replacing the STEREO BEACON lamp, disconnect the power plug from the wall outlet. The lamp assembly is accessible from the rear of the cabinet. It is housed in a white cylinder on the chassis, directly below the dial, and located near the front of the set. Replace the lamp as follows:

- 1 - Locate the white cylinder described above. Follow the two leads which protrude from the rear of the cylinder to the chassis.
- 2 - Slide the clips, located on the other ends of the leads, off the terminal strip contacts by moving them gently away from the chassis.
- 3 - Remove the white flexible band which secures the bulb leads to the cylinder. Remove the bulb from the cylinder by pulling gently on the leads.
- 4 - Place the new bulb in the cylinder, and secure it with the flexible band removed in the previous step.
- 5 - Slide the clips on the bulb leads over the terminal strip contacts.

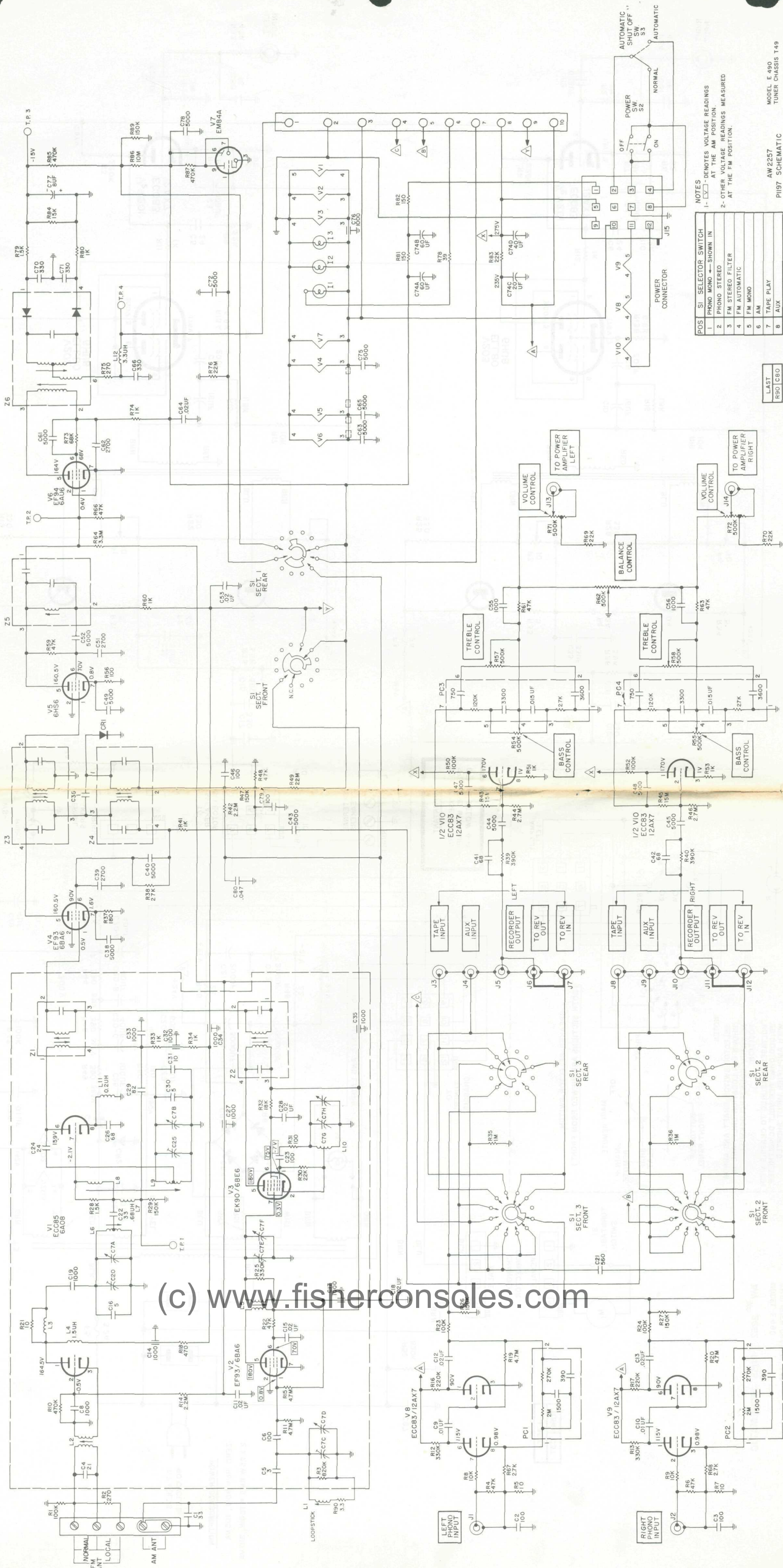
Replacement STEREO BEACON lamps can be ordered from Fisher Radio Corporation, Long Island City 1, New York. Please send all requests for parts to the attention of the Parts Department. The part number is 150461-3.



FISHER RADIO CORPORATION • NEW YORK

# THE FISHER ELECTRA VIII MODEL E-490

## TUNER-CONTROL CHASSIS PRELIMINARY SERVICE INFORMATION



POS. SI SELECTOR SWITCH

|   |                  |
|---|------------------|
| 1 | PHONO MONO       |
| 2 | PHONO STEREO     |
| 3 | FM STEREO FILTER |
| 4 | FM AUTOMATIC     |
| 5 | FM MONO          |
| 6 | AM               |
| 7 | TAPE PLAY        |
| B | AUX              |

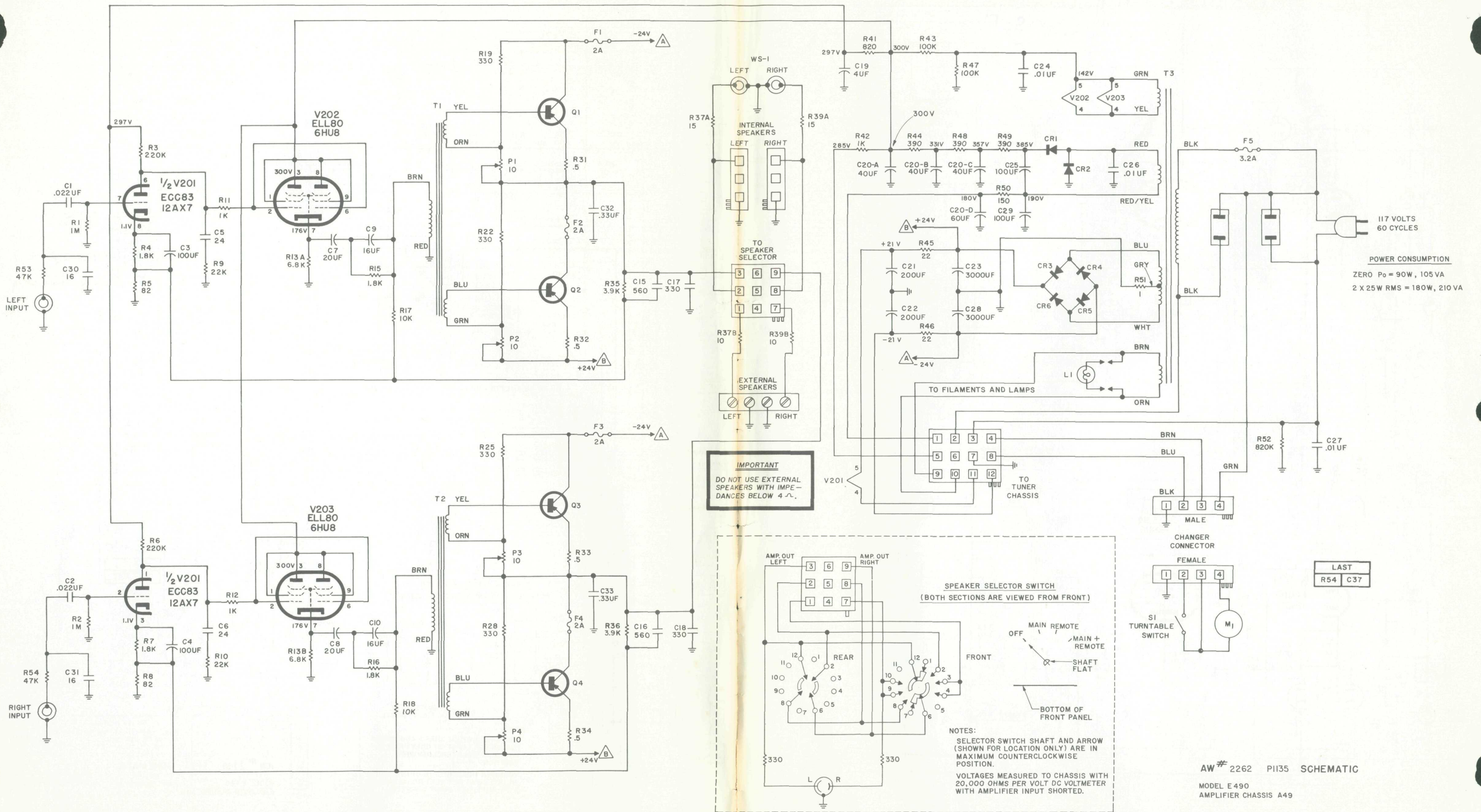
NOTES  
 1- [X] DENOTES VOLTAGE READINGS AT THE AM POSITION.  
 2- OTHER VOLTAGE READINGS MEASURED AT THE FM POSITION.

LAST  
R90 C80

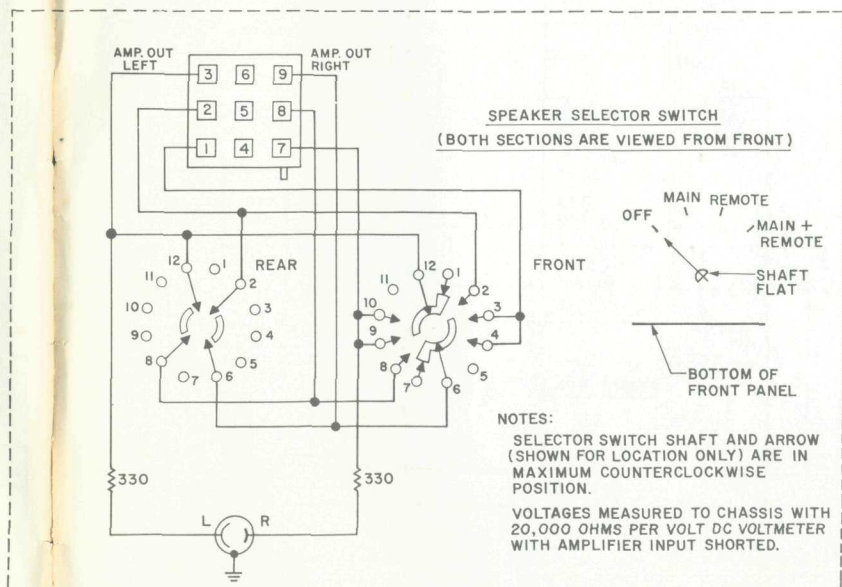
AW 2257  
PI97 SCHEMATIC  
MODEL E 490  
TUNER CHASSIS 149

(c) www.fisherconsoles.com

# POWER AMPLIFIER CHASSIS



**IMPORTANT**  
DO NOT USE EXTERNAL SPEAKERS WITH IMPEDANCES BELOW 4 Ω.



NOTES:  
SELECTOR SWITCH SHAFT AND ARROW (SHOWN FOR LOCATION ONLY) ARE IN MAXIMUM COUNTERCLOCKWISE POSITION.  
VOLTAGES MEASURED TO CHASSIS WITH 20,000 OHMS PER VOLT DC VOLTMETER WITH AMPLIFIER INPUT SHORTED.

LAST  
R54 C37

AW# 2262 P1135 SCHEMATIC  
MODEL E490  
AMPLIFIER CHASSIS A49