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 modern high-fidelity instruments such as amplifiers, tuners and receivers.

Test Instruments
Vacuum-Tube Voltmimeter 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)
Mark IV 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 des-soldering tips 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 amplifier 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 indicated by colored dots 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 transistor is not in contact with 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 speaker, 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-sized 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 the 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 Voltmeters (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.
DIAL STRINGING PROCEDURE

1 - Rotate variable-capacitor drive-drum to its maximum clockwise position.

2 - Fasten dial cord to drum. Wind dial cord clockwise around drum as shown in detail drawing. Keep dial cord taut while stringing to prevent slippage when stringing is completed.

3 - After stringing is completed rotate tuning drive to extreme counterclockwise position and set dial pointer to zero on the logging scale. Then cement pointer to dial cord.

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 Relations Department, FISHER Radio Corporation, Long Island City, New York 11101.
CAPACITORS

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C751</td>
<td>Ceramic, 21, 5%, N750, 1000V</td>
<td>CS0070-32</td>
</tr>
<tr>
<td>C752, 3, 4</td>
<td>-Deleted-</td>
<td></td>
</tr>
<tr>
<td>C756, 756</td>
<td>*Trimmer, Ceramic, 12pF</td>
<td>CS0972-01</td>
</tr>
<tr>
<td>C757</td>
<td>*Ceramic, Feedthru, 1000</td>
<td>CS92-187</td>
</tr>
<tr>
<td>C758</td>
<td>Polystyrene, 560, 5%, 33V</td>
<td>CS0836-10</td>
</tr>
<tr>
<td>C759</td>
<td>*Ceramic, 10, 5%, NPO, 1000V</td>
<td>CS0070-39</td>
</tr>
<tr>
<td>C760</td>
<td>*Trimmer, Ceramic, 6pF</td>
<td>CS0879-22</td>
</tr>
<tr>
<td>C761A-F</td>
<td>*Variable, AM-FM Tuning</td>
<td>CS1793-10</td>
</tr>
<tr>
<td>C762</td>
<td>Ceramic, 1000, 1000</td>
<td>CS0020-32</td>
</tr>
<tr>
<td>C763</td>
<td>Ceramic, 3.5, ± 25%, NPO, 1000V</td>
<td>CS0070-42</td>
</tr>
<tr>
<td>C764</td>
<td>Ceramic, 68, 5%, N750, 1000V</td>
<td>CS0070-35</td>
</tr>
<tr>
<td>C765</td>
<td>*Trimmer, Ceramic, 6pF</td>
<td>CS0879-22</td>
</tr>
<tr>
<td>C766</td>
<td>Ceramic, 68pF, 5%, N750, 1000V</td>
<td>CS0070-35</td>
</tr>
<tr>
<td>C767</td>
<td>Trimmer, Ceramic, 6pF</td>
<td>CS0020-32</td>
</tr>
<tr>
<td>C768</td>
<td>Mica, 120, 5%, 300V</td>
<td>CS0070-32</td>
</tr>
<tr>
<td>C769</td>
<td>*Ceramic, 10, 5%, NPO, 1000V</td>
<td>CS0070-39</td>
</tr>
<tr>
<td>C770</td>
<td>*Ceramic, 100, N1500, 1000V</td>
<td>CS0070-39</td>
</tr>
<tr>
<td>C771</td>
<td>-Deleted-</td>
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<tr>
<td>C772</td>
<td>*Ceramic, 15, 5%, NPO, 500V</td>
<td>CS0070-49</td>
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<tr>
<td>C773</td>
<td>Ceramic, 18, 5%, NPO, 1000V</td>
<td>CS0320-12</td>
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<tr>
<td>C774</td>
<td>Mica, 910, 5%, 500V</td>
<td>CS0070-32</td>
</tr>
<tr>
<td>C775, 776, 777</td>
<td>Feedthru, Ceramic, 1000</td>
<td>CS92-187</td>
</tr>
</tbody>
</table>

RESISTORS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R751</td>
<td>Dep. Carbon, 47, 5%, 1/BW</td>
<td>R12DC470</td>
</tr>
<tr>
<td>R752</td>
<td>Dep. Carbon, 220, 5%, 1/BW</td>
<td>R12DC224</td>
</tr>
<tr>
<td>R753</td>
<td>*Dep. Carbon, 39, 5%, 1/BW</td>
<td>R12DC390</td>
</tr>
<tr>
<td>R754</td>
<td>*Dep. Carbon, 15K, 5%, 1/BW</td>
<td>R12DC153</td>
</tr>
<tr>
<td>R755</td>
<td>Dep. Carbon, 1K, 5%, 1/BW</td>
<td>R12DC103</td>
</tr>
<tr>
<td>R756</td>
<td>Dep. Carbon 2M, 5%, 1/BW</td>
<td>R12DC203</td>
</tr>
</tbody>
</table>

MISCELLANEOUS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>L751</td>
<td>*Coil, FM Antenna</td>
<td>L818-113</td>
</tr>
<tr>
<td>L752</td>
<td>*Coil, FM RF</td>
<td>L1368A113</td>
</tr>
<tr>
<td>L753</td>
<td>*Coil, FM Mixer</td>
<td>L1368A113</td>
</tr>
<tr>
<td>L754</td>
<td>*Coil, FM Oscillator</td>
<td>L1368B114</td>
</tr>
<tr>
<td>L755</td>
<td>*Coil, 68 Microhenry</td>
<td>L5006-1</td>
</tr>
<tr>
<td>L756</td>
<td>*Coil, 1.2 Microhenry</td>
<td>L5006-3</td>
</tr>
<tr>
<td>L756, 757</td>
<td>Transformer, FM</td>
<td>L5006-3</td>
</tr>
<tr>
<td>L758</td>
<td>Transformer, 12, Microhenry</td>
<td>L5006-3</td>
</tr>
</tbody>
</table>

NOTE: Except for sections of C761 all AM Front-end components are listed in MAIN CHASSIS Parts Description.

Should any defect occur that cannot be remedied by replacing subassemblies (tubes) or normal realignment procedures, the unit may be returned to the manufacturer for repair. Replacing the electronic components indicated (*) in the parts description list is not recommended.
AM IF ALIGNMENT

- Connect 455 kHz (KC) sweep generator output lead to the collector of Q15 (pin 1 of Z3). Set modulation for approximately ±30 kHz sweep. Keep generator output as low as possible during alignment procedure.

- Connect scope to TP2 and short C761D (AM RF-amplifier tuning section) rotor-to-stator. A short between the AM antenna terminal and ground is not sufficient to prevent pickup on the AM ferrite-loop antenna.

- Adjust L3 and the bottom core of Z3 for maximum gain and a symmetrical IF amplifier response curve.

- Connect 455 kHz sweep generator output lead to TP1. Do not change settings, made above, except to reduce RF output to keep it as low as possible.

- With scope still connected to TP2 and the AM RF amplifier tuning section shorted, adjust Z3 top and Z2 top and bottom for maximum gain and a symmetrical IF amplifier response curve.

- Disconnect scope from TP2 and remove short from rotor-to-stator.

AM FRONT-END ALIGNMENT

- Set dial pointer to zero (0) calibration mark on logging scale. If dial pointer does not coincide with the 0 at the extreme end of the knob rotation reposition the pointer assembly on the dial cord and cement pointer in place to prevent slippage.

- Set AM TUNING dial pointer to 60 and set RF generator to 600 kHz or 0.600 MHz (MC), DO NOT USE MODULATION (AM or FM) and keep RF output as low as possible during alignment procedure.

- Adjust AM OSCILLATOR coil (L2) core for maximum indication on the front-panel tuning meter.

- Set AM TUNING dial pointer to 140 and set RF generator to 1.4 MHz, DO NOT USE MODULATION (AM or FM) and keep RF output as low as possible.

- Adjust OSCILLATOR trimmer capacitor (C13) for maximum indication on the front-panel tuning meter.

- Connect RF generator to AM ANTENNA terminals.

- Set AM TUNING dial pointer to 60 and set RF generator to 600 kHz. (DO NOT USE MODULATION (AM or FM) and keep RF output as low as possible.)

- Adjust AM MIXER coil (Z1) core and AM LOOP ANTENNA (L1) for maximum indication on the front-panel tuning meter.

- Set AM TUNING dial pointer to 140 and set RF generator to 1.4 MHz. (DO NOT USE MODULATION (AM or FM) and keep RF output as low as possible.)

- Adjust trimmer capacitors for AM MIXER (C756) and AM RF (C755) sections for maximum indication on the front-panel tuning meter.

- Repeat OSCILLATOR, RF and MIXER alignment procedure several times until accurate calibration and maximum gain are obtained.

FM FRONT-END ALIGNMENT

- Set TUNING dial pointer to zero (0) calibration mark on logging scale. If dial pointer does not coincide with the 0 at the extreme end of the knob rotation reposition the pointer assembly on the dial cord and cement the pointer in place to prevent slippage.

- Connect DC VTVM to TP301 on the IF board.

- Connect RF generator (with two 120-ohm composition resistors in series with the leads) to the LOCAL antenna terminals.

- Set RF generator frequency and FM TUNING dial pointer to 90 MHz (MC). DO NOT USE MODULATION (AM or FM) and keep RF output as low as possible during alignment procedure.

- Adjust FM OSCILLATOR coil (L754) core first—then adjust the FM MIXER coil (L753) and FM RF coil (L752) cores for maximum DC VTVM reading.

- Set RF generator frequency and FM TUNING dial pointer to 106 MHz.

- Adjust FM OSCILLATOR trimmer (C767) first—then adjust FM MIXER (C765) and FM RF (C755) trimmers for maximum DC VTVM reading.

- Repeat OSCILLATOR, MIXER and RF alignment procedure several times until accurate calibration and maximum gain are obtained. Keep the output of the generator as low as possible during all adjustments.

Generator connections to antenna terminals
OUTPUT-STAGE INTERMODULATION TEST

- Connect an 8-ohm, 50-watt resistor across the LEFT SPKR5 terminals.
- In parallel to the load resistor connect the input leads of an IM (Inter-Modulation) distortion analyzer.
- Connect the IM-analyzer generator output to the left MON IN jack.
- Apply AC power and rotate VOLUME control to its maximum clockwise position—full volume.
- Increase signal input (from IM-analyzer generator) for 20-watts output (12.5 VAC across 8-ohm load resistor). AFTER ONE FULL MINUTE OF WARM-UP TIME PROCEED TO NEXT STEP. (The warm-up time is very important to get proper adjustment) — the characteristics of the transistors change slightly as their internal temperature rises. Once they are warm the tests and adjustments should be completed without delay — before they can cool off.
- Reduce IM-analyzer generator output for 5 watts output from the amplifier (5.16 VAC across 8-ohm load resistor).
- Check LEFT channel for less than 0.6% IM distortion across the 8-ohm load resistance.
- Increase IM-analyzer generator output for 35 watts (16 VAC across 8-ohm load) and read less than 1% IM distortion.
- Repeat all the steps above for the RIGHT channel.

NOTE—If any of the above instructions differ from those in the IM analyzer instruction manual it is best to follow those in the IM manual. If a load resistor of 50-watts rating is built into the IM analyzer, a separate load resistor is not required for the channel under test—one should be wired across the other channel as a precaution. For best results the IM-analyzer range switch should be set to a range that gives a reading in the center to full-scale portion of the meter scale to get the greatest accuracy.

POWER OUTPUT MEASUREMENT

The power-output stage of this unit is designed to deliver its full-rated power with program material (voice or music) into 4-to-16-ohm loads for indefinite periods.

When a constant audio tone is used as a signal to measure the continuous RMS power output certain precautions must be taken. 
- Measure the power output of one channel at a time.
- Limit the measurement period to 10 minutes (with a load resistance between 4 and 16 ohms).

Should it ever be necessary to measure the power output of both channels simultaneously, use a load of 4 or 8 ohms (per channel), limit measurement to a period not longer than 1 minute for a 4-ohm load or to 5 minutes for an 8-ohm load.

POWER TRANSISTOR TEST

If a power-transistor tester is not available the circuit in Figure can be used to determine the DC beta of the transistors. This is not a complete test of the transistor.

OPERATION: Connect the transistor to the test circuit. Adjust R2 for a 0.5-ampere reading on M2 in the collector circuit. The DC beta is then calculated by:

DC beta = reading of M2
        reading of M1

The DC beta should be between 50 and 250.

Voltage tests can be made with safety — without ruining transistors — by substituting resistors for the emitter-collector circuit of the power transistors.

Parts list for test circuit:

- R1 100 ohms, ½W
- R2 1.5K, ½W
- M1 0-10mA milliammeter
- M2 0-1A ammeter
- Battery 1.5-3V at 1 amperage

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.
PARTS DESCRIPTION LIST

CAPACITORS
Symbol Description Part No. R105, 104 Mylar, 33uF, 10%, 250V C508638-10 R105, 106 Mylar, 33uF, 10%, 250V C508638-11 R107, 108 Mylar, 33uF, 10%, 250V C508638-12 R109, 110 Mylar, 33uF, 10%, 250V C508638-13

RESISTORS
Symbol Description Part No. R101, 102 Dep. Carbon, 1M R123C105J

MISCELLANEOUS Symbol Description Part No. Q101, 102 Printed Circuit Board Q102Y Q103, 104 2N2924 P1285 PC508187-28 X50B79-2 TR4015-3 TR2924-18

OUTPUT-STAGE INTERMODULATION TEST
- Connect an 8-ohm, 50-watt resistor across the LEFT SPKR terminals.
- In parallel to the load resistor connect the input leads of an IM (Intermodulation) distortion analyzer.
- Connect the IM-analyzer generator output to the left MON IN jack.
- Apply AC power and rotate VOLUME control to its maximum clockwise position–full volume.
- Increase input signal (from IM-analyzer generator) for 20-watts output (12.5 VAC across 8-ohm load resistor). AFTER ONE FULL MINUTE OF WARM-UP TIME PROCEED TO NEXT STEP. (The warm-up time is very important to get proper adjustment) – the characteristics of the transistors change slightly as their internal temperature rises. Once they are warm the tests and adjustments should be completed within 15 minutes before they can cool off.

NOTE: All of the above instructions differ from those in the IM-analyzer instruction manual. It is best to follow these in the LM manual. If a load resistor of 50-watts rating is built into the IM analyzer, a separate load resistor is not required for the channel under test–it should be wired across the other channel as a precaution. For best results the IM-analyzer generator switch should be set to a range that gives a reading in the center of the meter scale to get maximum accuracy.
IF ALIGNMENT

- Connect 10.7-mc generator output lead to the collector of Q302. DO NOT use modulation (AM or FM).
- Connect DC VTM across C318 (ratio-detector filter). Use 100k resistor in series with each lead—DO NOT ground VTM.
- Adjust Z303 (bottom core) and Z304 (top and bottom cores) for maximum DC VTM reading. Readout generator output, during alignment, to keep DC VTM reading between 4 and 5.5 volts.
- Connect DC VTM and scope leads (through 100k resistors) to TP301. Disconnect jumper between 3F and 3G on printed-circuit board.
- Connect sweep generator to point 3F of IF amplifier board. Adjust top and bottom cores of Z301 and Z302, and bottom core of Z303 for maximum gain and a symmetrical response curve (Figure 1) on scope. Adjust generator output during alignment to keep DC VTM reading between -0.5 and -2.0 volts.
- Connect sweep generator output lead to TP301 (bottom end). Adjust top and bottom cores of Z303 for maximum gain and a symmetrical response curve on the scope. Generator output must be adjusted during alignment to keep DC VTM reading between -0.5 and -1.5 volts. The IF response curve should now be like that in Figure 2.
- Connect scope vertical input to point 3H on the printed-circuit board and adjust the top core of Z303 for maximum gain and a response curve like that in Figure 3.
- Reconnect jumper between 3F and 3G.
- Connect scope vertical input to the left or right REC OUT jack. Ratio-detector response curve should be like that in Figure 4.

FM TUNING METER CALIBRATION

- Connect FM generator output leads to the LOCAL antenna terminals through two 120-ohm composition resistors—one connected in series with each lead.
- Set FM generator frequency and FM TUNING dial pointer to 90 kHz (MC).
- Set FM generator output to 16 uV, ±25 kHz (KC) deviation at 400 Hz (CPB).
- Connect AC (audio) VTM to the left (or right) REC OUT jack.
- Set MUTING to OFF position and make note of the AC VTM reading.
- Turn MUTING to ON position and rotate the FM MUTING ADJUST potentiometer (R28) shaft for an AC VTM reading 1 to 5 db lower than that previously noted.
- Increase FM generator output to zero—no signal (400 Hz modulation) or noise should be present at the REC OUT jack.
- Increase FM generator output to 30 uV. Reading on AC VTM should now be approximately the same as the reading obtained with MUTING in the OFF position.
MULTIPLEX DECODER TESTS

- Moderate FM generator with 19 kc, 1.5 ky deci-
tion. (Use external modulation if necessary.)
- Connect the FM generator output to the antenna
terminals of the unit under test.
- With the FM generator set for an output of 25 V at
the antenna terminals the stereo indicator should light
up. If the generator output is reduced to 5 V, at the
antenna terminals, the indicator light should remain ON.
- Reduce FM generator output to zero and the indicator
light should go OFF.
- If the stereo indicator light does not respond properly
to the tests above, re-adjust the tuning control (N401)
until the stereo indicator lamp just turns ON with a
4 V signal applied to the antenna terminals.

PREFERRED ALIGNMENT INSTRUCTIONS
(Using multiplex generator with RF and 19 kc
outputs and with 1 kc modulation)

In Table 1, below, a multiplex generator with an RF
output is used. This is the better method of alignment
since the multiplex circuitry is connected to the tuner
with which it will be used. Check the alignment of the
IF stages before making multiplex adjustments. Poor IF
alignment can make proper multiplex operation im-
possible.

TEST EQUIPMENT: Multiplex Generator, Audio
(AC) Vacuum Tube Voltmeter (RMS type preferred).
Vacuum-Tube Voltmeter (DC VTVM), Oscilloscope (100
kc minimum) with external sweep input.

WARNING: Use only the proper alignment tool to
prevent core breakage.

TABLE 1

<table>
<thead>
<tr>
<th>STEP</th>
<th>GENERATOR MODULATION</th>
<th>RF DEV.</th>
<th>INDICATOR TYPE AND CONNECTION</th>
<th>ALIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70 to 76 kc. (connect external audio generator to SCA input of multiplexer generator)</td>
<td>7.29kΩ</td>
<td>Audio (AC) VTVM input to TP404 with 10 pF capacitor in series with test lead.</td>
<td>Read minimum AC voltage between 70 and 76 kc.</td>
</tr>
<tr>
<td>2</td>
<td>19 kc pilot only</td>
<td>5.5</td>
<td>AC VTVM to TP403</td>
<td>Z401, 402, 403 and 404</td>
</tr>
<tr>
<td>3</td>
<td>Composite MPX signal</td>
<td>6kΩ</td>
<td>Audio (AC) VTVM and oscilloscope vertical input to left channel output log (4H)</td>
<td>Z402</td>
</tr>
<tr>
<td>4</td>
<td>Composite MPX signal</td>
<td>7.13kΩ</td>
<td>Same as Step 3</td>
<td>MPX Separation Control (located on chassis). Minimum reading on Audio (AC) VTVM—should be no less than 35 db below reading obtained in Step 3.</td>
</tr>
<tr>
<td>5</td>
<td>Same as Step 4</td>
<td>7.75kΩ</td>
<td>Audio (AC) VTVM and oscilloscope vertical input to right channel output log (4K)</td>
<td>Same Audio (AC) VTVM reading as obtained in Step 3. (32 db), clean 1 kc sine wave on scope.</td>
</tr>
<tr>
<td>6</td>
<td>Same as Step 4</td>
<td>7.75kΩ</td>
<td>Same as Step 5</td>
<td>Minimum reading on Audio (AC) VTVM should be at least 35 db below reading in Step 5.</td>
</tr>
</tbody>
</table>

Figure 1. Multiplex alignment pass filter circuit.

ALTERNATE ALIGNMENT INSTRUCTIONS
(For multiplexer generators without an RF output)

Disconnect the radio detector from the multiplexer unit
before using this procedure. A low-pass filter (Figure 1)
is used between the MPX generator output and the in-
put to the multiplexer circuitry. It has about the same
loading effect as the output of the radio detector in the
tuner.

TABLE 2

<table>
<thead>
<tr>
<th>STEP</th>
<th>GENERATOR MODULATION</th>
<th>LEVEL (RMS)</th>
<th>INDICATOR TYPE AND CONNECTION</th>
<th>ALIGNMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70 to 76 kc.</td>
<td>100mV</td>
<td>Audio (AC) VTVM input to TP404 with 10 pF capacitor in series with test lead.</td>
<td>Read minimum AC voltage between 70 and 76 kc.</td>
</tr>
<tr>
<td>2</td>
<td>19 kc pilot only</td>
<td>50mV</td>
<td>AC VTVM to TP403</td>
<td>Z401, 402, 403 and 404</td>
</tr>
<tr>
<td>3</td>
<td>Composite MPX signal</td>
<td>300mV</td>
<td>Audio (AC) VTVM and oscilloscope vertical input to left channel output log (4H)</td>
<td>Z402</td>
</tr>
<tr>
<td>4</td>
<td>Composite MPX signal</td>
<td>300mV</td>
<td>Same as Step 3</td>
<td>MPX Separation Control (located on chassis). Minimum reading on Audio (AC) VTVM—should be at least 35 db below reading obtained in Step 3.</td>
</tr>
<tr>
<td>5</td>
<td>Same as Step 4</td>
<td>300mV</td>
<td>Audio (AC) VTVM and oscilloscope vertical input to right channel output log (4K)</td>
<td>Same Audio (AC) VTVM reading as obtained in Step 3. (32 db), clean 1 kc sine wave on scope.</td>
</tr>
<tr>
<td>6</td>
<td>Same as Step 4</td>
<td>300mV</td>
<td>Same as Step 5</td>
<td>Minimum reading on Audio (AC) VTVM should be at least 35 db below reading obtained in Step 5.</td>
</tr>
</tbody>
</table>
1. Cleaning The Dial Glass
   Before cleaning the dial glass, disconnect the power plug from the
   wall socket, as a precaution. Next, proceed as follows:
   (1) Remove all control knobs from their shafts by gently pulling
       them away from the dress panel. Do not remove the pushbuttons.
   (2) Remove the nuts that are fastened to the shafts of the Volume
       and Muting controls.
   (3) Lift off the dress panel, to expose the chassis.
   (4) Loosen the screws that fasten down the dial glass retaining
       clips. (When you replace the dial glass, make certain to reset it by
       placing it firmly against the lower left-hand corner.) Swing the
       clips aside, and then lift off the glass.
   (5) Remove dust with a dry cloth. If you wish to clean more
       thoroughly, use a soap and water solution only; if you use any
       stronger cleaning agent, you may damage the markings on the
       glass.
   (6) Replace the dial glass, dress panel and knobs by reversing
       the procedure outlined in steps (1) through (4), above.

2. Replacing Dial Lamps
   In order to replace the dial lamps, it is necessary to remove the
   knobs and dress panel. Disconnect the power plug from the wall
   socket as a precaution, before proceeding.
   (1) Remove the dress panel, as outlined in Paragraph 1, steps
       (1) through (3).
   (2) The lamps, tubular in shape, are held in place at either end
       of the dial glass by spring clips, and can be removed by lifting
       gently.
   (3) Install a new lamp, making sure that the white-painted side
       faces away from the dial glass. Press the lamp down until it snaps
       into place.
   (4) Replace the dress panel by reversing steps (1) through (3) of
       Paragraph 1.
   Replacement lamps are available from the Parts Department of
   Fisher Radio Corporation, Long Island City 1, N. Y., as Part No.
   150441-5.

3. Stereo Beacon Lamp
   This lamp is a long-life device which should not require replace-
   ment with normal use.

4. Replacing Tuning Meter Lamp
   (1) Disconnect the power plug from the AC wall socket as a pre-
       caution and then locate the tuning-meter lamp. It is directly behind
       the tuning meter (on the underside of the receiver’s front panel)
       and can be reached from the rear of the console.
   (2) Remove the metal shade from the burned-out lamp and keep it
       for use with the replacement lamp (No. 18470F, available at your
       authorized FISHER dealer or at any electronics parts dealer).
   (3) Remove the burned-out lamp by pushing it into its socket and
       twisting it counterclockwise until it disengages.
   (4) Install the new lamp by pushing it into the socket and twisting
       it clockwise until it engages. Slip the shade over the lamp.
TROUBLESHOOTING GUIDE

Does not go on (pilot or dial lamps do not light).
  - Set AUTO SHUTOFF to OFF.

Check:
  - Fuse F2.
  - AC plug and line cord.
  - Wall outlet.
  - Power switch S2 (use test lamp in switched AC outlet on rear of chassis).

Fuse F1 blows as soon as replaced.

Check:
  - C67B
  - Internal speaker systems, jacks, plugs and interconnecting cables for shorts.
  - External speakers and connections and W51 jacks.
    (Quick check can be made by using SPEAKERS switch to disconnect speakers.)

Test:
  - Q1, Q2, Q4, Q5.

Fuse F2 blows as soon as replaced.

Check:
  - CR4, C9, R10.
  - C776 (Filament bypass in front end).
  - CR5, C67, R188.
  - C36, R48.

Distortion - (one or both channels) in any INPUT SELECTOR position.

Hum or No audio output
  - Set TAPE MONITOR to OFF (out) position.
  - Set BALANCE, BASS and TREBLE controls to NORMAL.
  - Remove cable plugs in RCDR OUT, REV IN and REV OUT jacks (insert jumpers between REV IN and REV OUT jacks).

Check:
  - CR5, C67, C23, Q19, C24, CR1.
  - Audio Control Amplifier circuitry.
  - Preamp circuitry and P51.

Distortion, (either or both channels) INPUT SELECTOR set for AM.

Hum, Weak or No audio output
  - Try other broadcast stations.
  - Reverse AC line-cord plug in wall outlet.

Check:
  - P51, R16, R12 for 23.5 volts.
  - AM RF/IF alignment.

Test:
  - Q13, Q14, Q15, Q16, Q18, Q19, CR2, CR3. and associated circuit components.

TUNING METER (AM) has little or no pointer movement.

  - Tune to other AM broadcast stations.

Check:
  - Antenna, lead-in and connection terminal.

Test:
  - Q17, C32, R33, R36, R38.

Distortion, (either or both channels) INPUT SELECTOR set for FM.

Hum, Weak or No audio output
  - Set MUTING (S4) to OFF position.
  - Tune to other FM broadcast stations.
  - Reverse AC line-cord plug in wall outlet.

Check:
  - FM RF/IF alignment.
  - Antenna, lead-in and connection terminals.
  - FM IF amplifier circuitry.
  - MPX DECODER circuitry.

Test:
  - V751, V752, V753 or substitute.
  - Q11, Q12, Q20.

TUNING METER (FM) has little or no pointer movement.

  - Setting of R26 (FM MUTING ADJUST).
  - Setting or R37 (FM METER ADJUST).
  - Continuity through P51.

Test:
  - Q11, Q12.

STEREO BEACON does not indicate (FM STEREO works).

  - Set MODE SELECTOR to STEREO.
  - Set INPUT SELECTOR to FM.
  - Tune to strong-signal station (watch tuning meter).

Check:
  - 11 indicator lamp.
  - MPX Decoder TRIGGER CONTROL setting.
  - MPX Decoder circuitry.

FM STEREO does not work (FM MONO normal).

  - Set MODE SELECTOR to STEREO.
  - Set INPUT SELECTOR to FM.
  - Tune to strong-signal station (watch tuning meter).

Check:
  - MPX SEPARATION ADJUST (R111).
  - Operation of MODE SELECTOR.
  - Continuity (look for shorts) through MODE SELECTOR.
  - MPX Decoder circuitry.
### CAPACITORS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>Ceramic, 100pF, ± 25%, 1000V</td>
<td>CS0070-1</td>
</tr>
<tr>
<td>C2</td>
<td>Ceramic, 8pF, 10%, 500V, 1000V</td>
<td>CS0070-14</td>
</tr>
<tr>
<td>C3</td>
<td>Electrolytic, 1μF, 70V</td>
<td>CS0083-16</td>
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<tr>
<td>C4</td>
<td>Mylar, 0.03μF, 10%, 100V</td>
<td>CS0507-11</td>
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<tr>
<td>C5</td>
<td>Polystyrene, 4700pF, 5%, 50V</td>
<td>CS0587-23</td>
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<tr>
<td>C6</td>
<td>Electrolytic, 200μF, 35V</td>
<td>CS0587-3</td>
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<td>C7</td>
<td>Ceramic, 8pF, 10%, 1000V</td>
<td>CS0587-42</td>
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<td>C8</td>
<td>Electrolytic, 1μF, 350V</td>
<td>CS0587-43</td>
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<td>C9 A, B</td>
<td>Electrolytic, 100/100μF, 150V</td>
<td>CS0587-52</td>
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<td>C10</td>
<td>Mylar, 220μF, 50V500</td>
<td>CS0595-1</td>
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<td>C11</td>
<td>Polystyrene, 435pF, 1%, 125V</td>
<td>CP0594-24</td>
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<tr>
<td>C12</td>
<td>Ceramic, 10pF, 50V, 1%, 50V, 500V</td>
<td>CS0789-21</td>
</tr>
</tbody>
</table>

### RESISTORS AND POTENTIOMETERS

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

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>Composition, 270, 10%, 1/2W</td>
<td>RC02BF271K</td>
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<tr>
<td>R2</td>
<td>Composition, 100K, 10%, 1/2W</td>
<td>RC02BF271K</td>
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<td>R3</td>
<td>12K</td>
<td>R12DC1233</td>
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<td>R4</td>
<td>8.2K</td>
<td>R12DC2223</td>
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<td>R5</td>
<td>22</td>
<td>R12DC2223</td>
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<tr>
<td>R6</td>
<td>470</td>
<td>R12DC3471</td>
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<td>R7</td>
<td>82</td>
<td>R12DC2820</td>
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<tr>
<td>R8</td>
<td>Composition, 4.7K, 10%, 1/2W</td>
<td>RC02BF472K</td>
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<tr>
<td>R9</td>
<td>Composition, 3.3K, 10%, 1/2W</td>
<td>RC02BF332K</td>
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<td>R10</td>
<td>Wirewound, 560, 5%, 2W</td>
<td>RW0205651</td>
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<td>1K</td>
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<td>Pot, 5K, FM Muting Adj</td>
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<td>R27</td>
<td>3.3K</td>
<td>R12DC3325</td>
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<td>R28</td>
<td>Composition, 2.2K, 10%, 1/2W</td>
<td>R12DC2393</td>
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<td>R29</td>
<td>39K</td>
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<td>R30</td>
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<tr>
<td>R31</td>
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<td>100K</td>
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### MISCELLANEOUS

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<tbody>
<tr>
<td>CR1</td>
<td>Diode, Zener Regulator</td>
<td>ZR052060</td>
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<td>CR2</td>
<td>Diode, Germanium AA112</td>
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<td>CR4</td>
<td>Rectifier, Selenium Bridge</td>
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<td>CR5</td>
<td>Rectifier, Silicon Bridge</td>
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<td>CR6</td>
<td>Meter, Tuning</td>
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<td>PC1, 2</td>
<td>Printed-Circuit, Equalization</td>
<td>PC5S0187-30</td>
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<td>Q1, 2, 4, 5</td>
<td>Transistor, 2N2386</td>
<td>TR2N2386</td>
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<td>Switch, P. B. Mode Selector</td>
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<td>Switch, Automatic Shutoff</td>
<td>S50358-9</td>
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<td>S1</td>
<td>Switch, Power (On/Off Control)</td>
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<td>Switch, Speaker Selector</td>
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