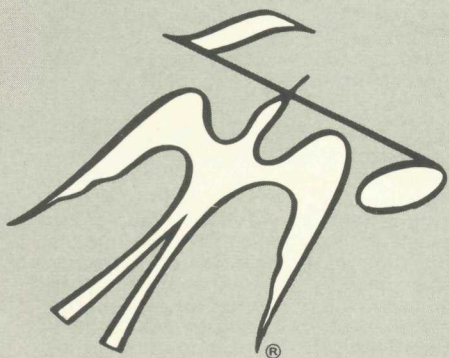


# Service Manual

# THE FISHER®



# TFM-200

CHASSIS SERIAL NUMBERS  
BEGINNING 10001

\$1.00

**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 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.

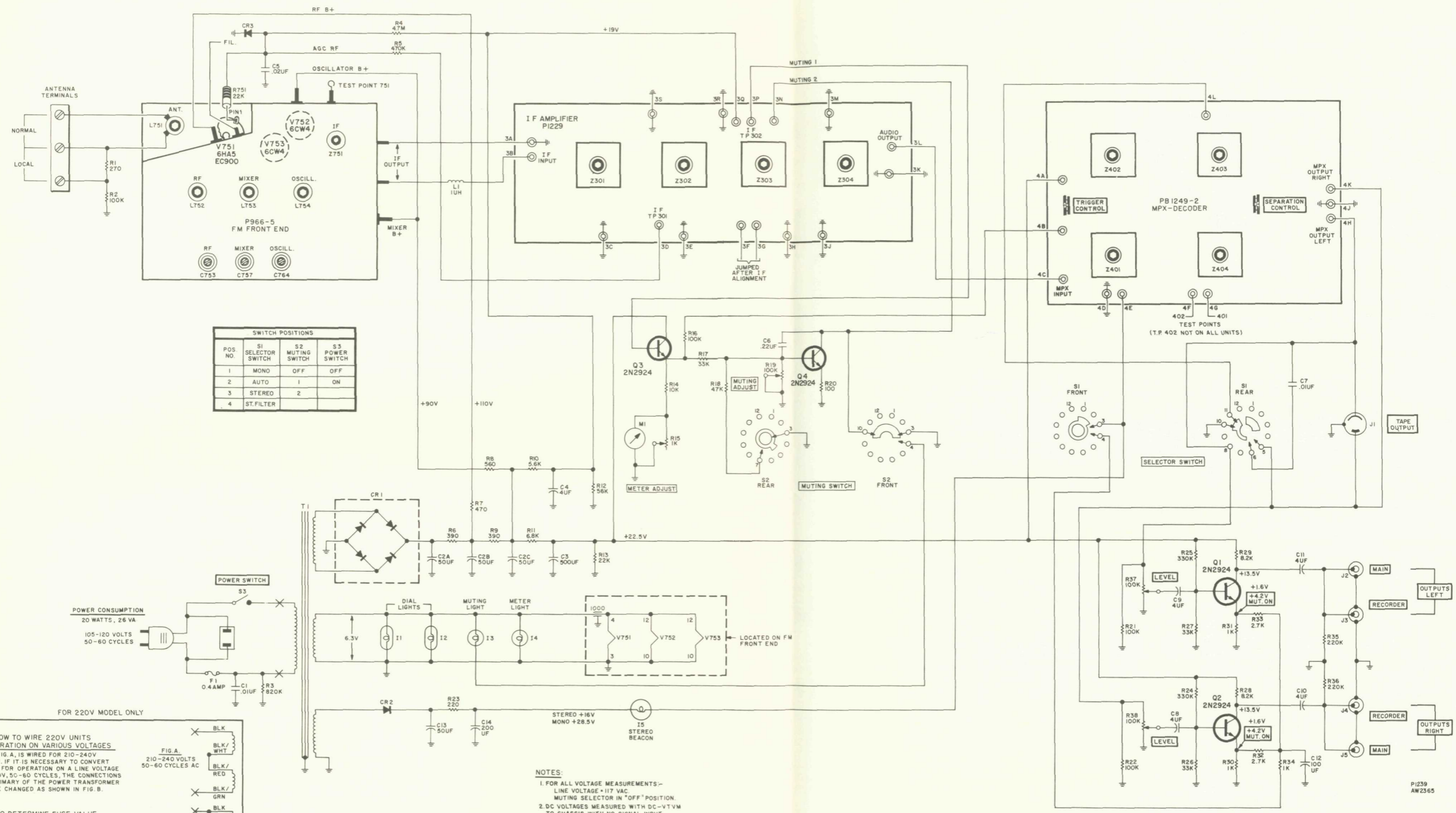
• Silicone grease must be used between the transistor and the mica insulator and between the mica and the heat sink for best heat conduction. Heat is the greatest enemy of electronic equipment. It can shorten the life of transistors, capacitors and resistors. (Use Dow-Corning DC-3 or C20194 or equivalent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

# MAIN CHASSIS



SWITCH POSITIONS			
POS NO	S1 SELECTOR SWITCH	S2 MUTING SWITCH	S3 POWER SWITCH
1	MONO	OFF	OFF
2	AUTO	1	ON
3	STEREO	2	
4	ST. FILTER		

**POWER CONSUMPTION**  
20 WATTS, 26 VA  
105-120 VOLTS  
50-60 CYCLES

FOR 220V MODEL ONLY

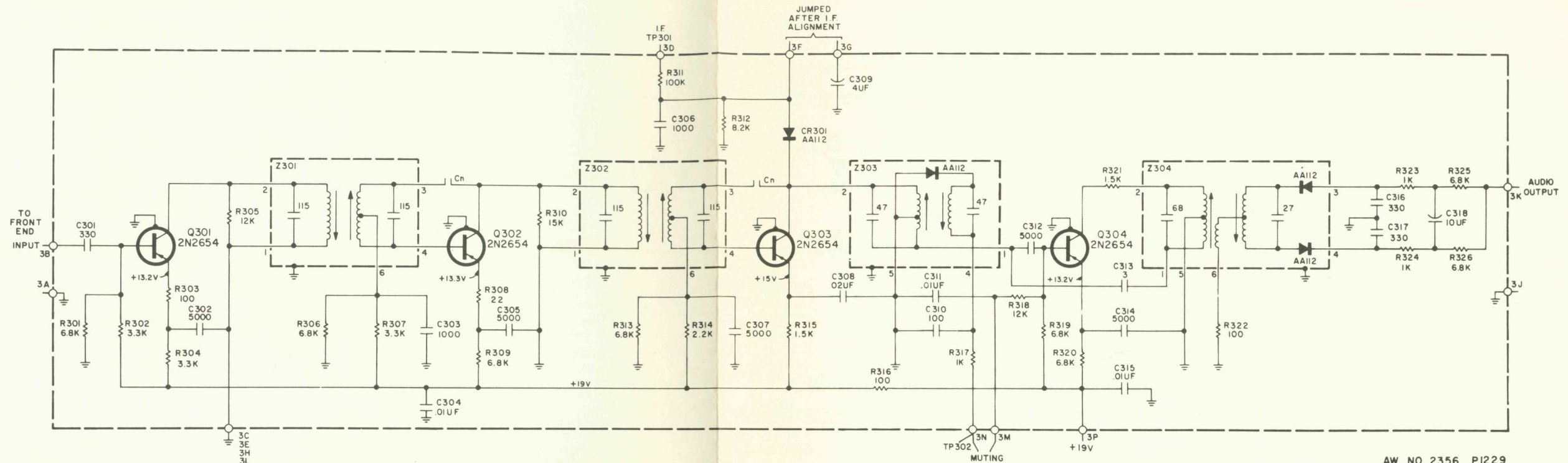
**HOW TO WIRE 220V UNITS FOR OPERATION ON VARIOUS VOLTAGES**  
PRIMARY, FIG. A, IS WIRED FOR 210-240V OPERATION. IF IT IS NECESSARY TO CONVERT THIS UNIT FOR OPERATION ON A LINE VOLTAGE OF 105-120V, 50-60 CYCLES, THE CONNECTIONS OF THE PRIMARY OF THE POWER TRANSFORMER SHOULD BE CHANGED AS SHOWN IN FIG. B.

**FIG. A**  
210-240 VOLTS  
50-60 CYCLES AC

**FIG. B**  
105-120 VOLTS  
50-60 CYCLES AC

- NOTES:**
- FOR ALL VOLTAGE MEASUREMENTS—LINE VOLTAGE +117 VAC. MUTING SELECTOR IN "OFF" POSITION.
  - DC VOLTAGES MEASURED WITH DC-VTVM TO CHASSIS, WITH NO SIGNAL INPUT.
  - REAR SECTION OF DUAL CONTROL USED IN LEFT CHANNEL; FRONT SECTION IN RIGHT.

# 1229 IF AMPLIFIER



AW NO. 2356 PI229

NOTE:  
CAPACITORS LABELLED C<sub>n</sub>  
CONSIST OF 2 PARALLEL STRIPS  
ON THE PRINTED CIRCUIT BOARD.

CAPACITORS		
Symbol	Description	Part No.
C301	Ceramic, 330pF, 10%, 1000V	C50B569-1
C302	Ceramic, 5000pF, 20%, 500V	C50B567-2
C303	Ceramic, 1000pF, 10%, 1000V	C50B569-3
C304	Ceramic, .01uF, +80-20%, 500V	C50B570-1
C305	Ceramic, 5000pF, 20%, 500V	C50B567-2
C306	Ceramic, 1000pF, 20%, 1000V	C50B569-4
C307	Ceramic, 5000pF, 20%, 500V	C50B567-2
C308	Ceramic, .02uF, +80-20%, 100V	C50B570-2
C309	Electrolytic, 4uF, 35V	C50483-1
C310	Ceramic, 100pF, 10%, N1500, 1000V	C50B568-3
C311	Ceramic, .01uF, +80-20%, 500V	C50B570-1
C312	Ceramic, 5000pF, 20%, 500V	C50B567-2
C313	Ceramic, 3pF, 10%, NPO, 1000V	C50070-28
C314	Ceramic, 5000pF, 20%, 500V	C50B567-2
C315	Ceramic, .01uF +80-20%, 500V	C50B570-1
C316, 317	Ceramic, 330pF, 10%, 1000V	C50B569-1
C318	Electrolytic, 10uF, 35V	C50483-2

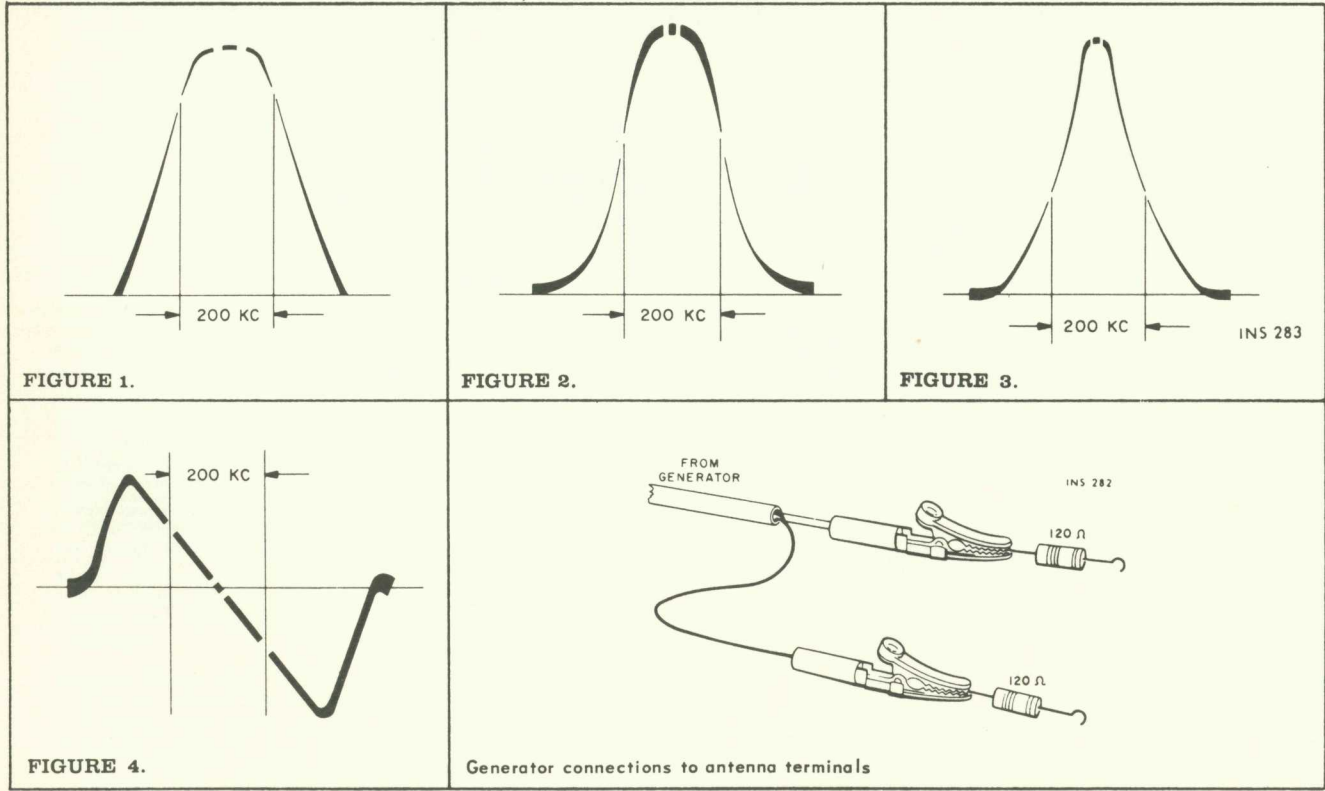
RESISTORS		
Symbol	Description	Part No.
R301	6.8K	R12DC682J
R302	3.3K	R12DC332J
R303	100	R12DC101J
R304	3.3K	R12DC332J

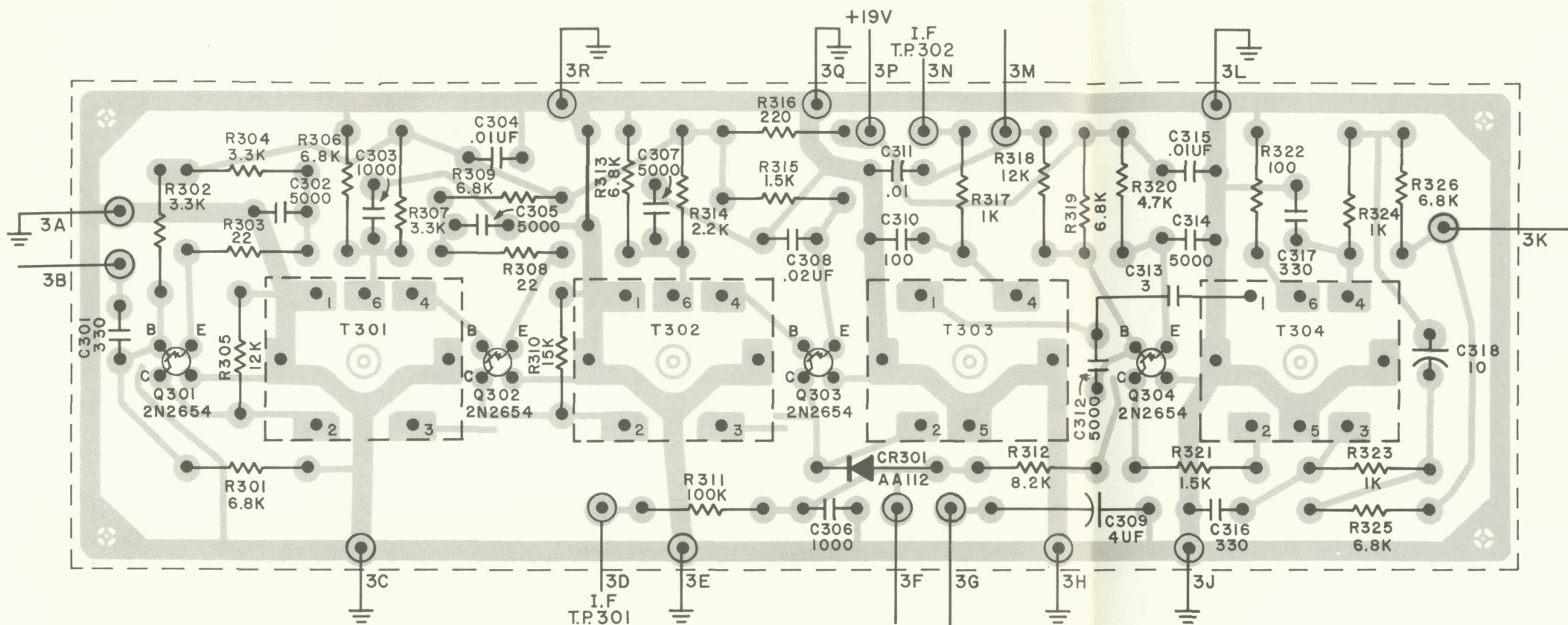
MISCELLANEOUS		
Symbol	Description	Part No.
CR301	Diode AA112	V50260-16
Z301, 302	I. F. Transformer	ZZ50C210-71
Z303	Limiter Coil	ZZ50C210-70
Z304	Ratio Detector	ZZ50C210-68
Q301, 302, 303, 304	Transistor 2N2654	TR2N2654

R305	12K	R12DC123J
R306	6.8K	R12DC682J
R307	3.3K	R12DC332J
R308	22	R12DC220J
R309	6.8K	R12DC682J
R310	15K	R12DC153J
R311	100K	R12DC104J
R312	8.2K	R12DC822J
R313	6.8K	R12DC682J
R314	2.2K	R12DC222J
R315	1.5K	R12DC152J
R316	100	R12DC101J
R317	1K	R12DC102J
R318	12K	R12DC123J
R319, 320	6.8K	R12DC682J
R321	1.5K	R12DC152J
R322	100	R12DC101J
R323, 324	1K	R12DC102J
R325, 326	6.8K	R12DC682J



# 1229 IF AMPLIFIER



INS 275

## IF ALIGNMENT

- Connect 10.7mc generator output lead to the collector of Q302. DO NOT use modulation (AM or FM).
- Connect DC VTVM across C318 (ratio-detector filter). Use 100K resistor in series with each lead - DO NOT ground VTVM.
- Adjust Z303 (bottom core) and Z304 (top and bottom cores) for maximum DC VTVM reading. Readjust generator output, during alignment, to keep DC VTVM reading between 4 and 5.5 volts.
- Connect DC VTVM and scope leads (through 100 K resistors) to TP301. Disconnect jumper between 3F and 3G on printed-circuit board.
- Connect sweep generator to point 3B 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 VTVM reading between -0.5 and -2.0 volts.
- Connect sweep generator output lead to TP751 (front end). Adjust top and bottom cores of Z751 for maximum gain and a symmetrical response curve on the scope. Generator output must be adjusted during alignment to keep DC VTVM reading between -0.5 and -1.5 volts. The IF response curve should now be like that in Figure 2.

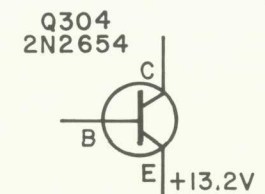
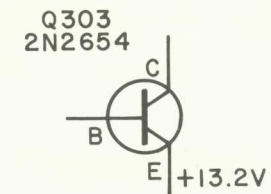
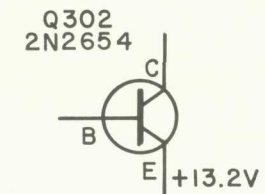
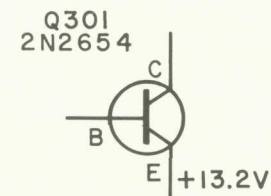
- Connect scope vertical input to TP302 on the printed-circuit board and adjust the top core of Z303 for maximum gain and in response curve like that in Figure 3.
- Reconnect jumper between 3F and 3G.
- Connect scope vertical input to the left or right REC OUT jack. Ratio-detector response curve should be like that in Figure 4.

## TUNING METER CALIBRATION

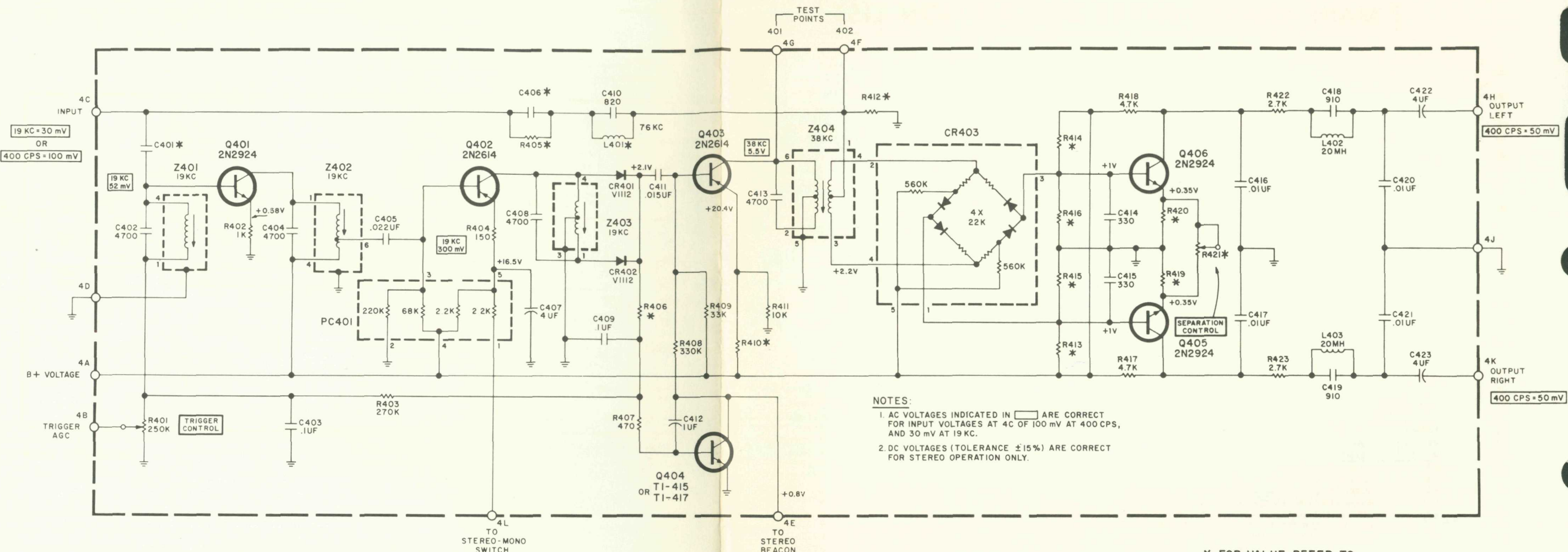
- Connect RF-generator output leads to the NORMAL antenna terminals through two 120-ohm composition resistors—one connected in series with each lead.
- Set generator output to 100 mV,  $\pm 22.5$  kc deviation at 400 cps.
- Adjust calibration control (R15) for meter reading of 4.

## MUTING ADJUSTMENT

- Connect FM-generator output leads to NORMAL antenna terminals through two 120-ohm composition resistors - one connected in series with each lead.
- Set generator frequency and tuner dial to 98 mc. Modulate generator with 400 cps,  $\pm 25$  kc deviation.
- Set FM-generator output-attenuator for 15uV and make a note of the signal amplitude (AC VTVM reading) at the right or left REC OUT jack - MUTING off.
- With MUTING in position 1, adjust muting level control for a reading of 1 to 5 db lower than that previously noted.
- Reduce FM generator output to zero—no signal (400 cycle modulation) or noise should be present at the REC OUT jacks.
- Increase FM-generator output to 20 uV. This reading should now be approximately the same as the reading obtained on the AC VTVM with muting off.
- With MUTING in position 2 slowly increase the FM-generator output. Between 25 and 50 uV (input at the antenna terminals) the signal level will over-ride the muting circuitry and the 400 cps audio will be heard or indicated (on the AC VTVM). There is no adjustment for MUTING position 2 - this is determined by the gain (alignment, etc.) of the IF amplifier and front-end.



# 1249-2 MULTIPLEX



**NOTES:**  
 1. AC VOLTAGES INDICATED IN   ARE CORRECT FOR INPUT VOLTAGES AT 4C OF 100 mV AT 400 CPS, AND 30 mV AT 19 KC.  
 2. DC VOLTAGES (TOLERANCE  $\pm 5\%$ ) ARE CORRECT FOR STEREO OPERATION ONLY.

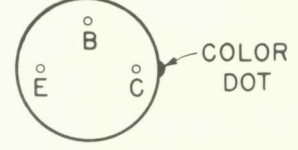
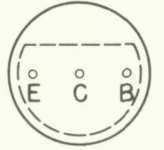
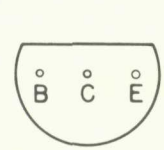
\* FOR VALUE REFER TO PARTS LIST

P1249-2  
AW#2341B

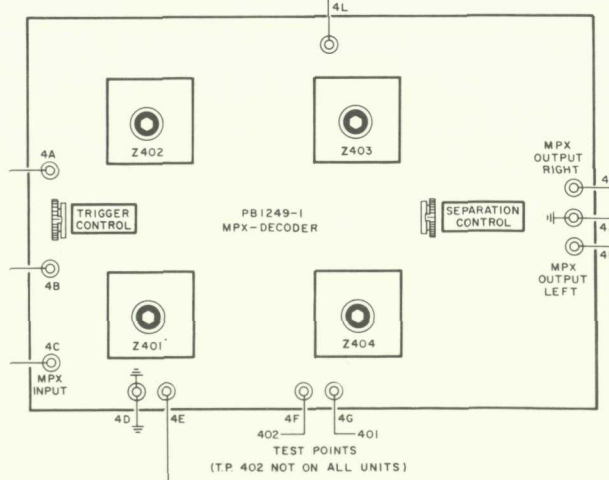
TI 415  
TI 417

2N2924  
2N2925

2N2613  
2N2614



**CAPACITORS**  
 10% 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.
C401	†Ceramic, 68, 5%, N220	C50568-5
	*Ceramic, 220, 5%, N1500	C50568-6
C402	Mica, Silver, 4700, 5%, 100VDC	C50571-2
C403	Mylar, 0.1uF, 20%, 250V	C50635-1
C404	Polystyrene, 4700, 5%, 33V	C50636-23
C405	Mylar, .022uF, 100V	C50574-7
C406	Ceramic, 15, P100, 1000V	C50568-14
C407	Electrolytic, 4uF, 35V	C50483-1
C408	Polystyrene, 4700, 5%, 33V	C50636-23
C409	Mylar, 0.1uF, 20%, 250V	C50635-1
C410	Polystyrene, 220, 5%, 33V	C50636-3
C411	Mylar, .015uF, 100V	C50574-2
C412	Electrolytic, 1uF, 70V	C50483-16
C413	Polystyrene, 4700, 5%, 33V	C50636-23
C414, 415	Polystyrene, 330, 5%, 33V	C50636-4
C416, 417	Mylar, .01uF, 5%, 100V	C50574-1
C418, 419	Polystyrene, 910, 5%, 33V	C50636-6
C420, 421	Mylar, .01uF, 5%, 100V	C50574-1

## PARTS DESCRIPTION LIST

C422, 423 Electrolytic, 4uF, 35V  
 C424 Polystyrene, 120, 5%, 33V  
 †Used on PB1249-1 Board—(Tube-type IF Amplifiers)  
 \*Used on PB1249-2 Board—(Transistor-type IF Amplifiers)

### RESISTORS AND POTENTIOMETERS

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

Symbol	Description	Part No.
R401	Potentiometer, Trimmer, 250K, $\pm 30\%$	R50694-4
R402	Composition, 1K, 10%, 1/2 W	RC20BF102K
R403	270K	R12DC274J
R404	150	R12DC151J
R405	39K	R12DC393J
R406	1.2K	R12DC122J
R407	470	R12DC471J
R408	330K	R12DC334J
R409	33K	R12DC333J
R410	390	R12DC391J
R411	10K	R12DC103J
*R412	15K	R12DC153J
R413, 414	470K	R12DC474J

R415, 416	68K	R12DC683J
R417, 418	4.7K	R12DC472J
R419, 420	560	R12DC561J
R421	Trimmer, 25K, $\pm 30\%$ , Separation Control	R50694-2
R422, 423	2.7K	R12DC272J
R424	22K	R12DC223J

### MISCELLANEOUS

Symbol	Description	Part No.
CR401, 402	Diode, V1112	V1112
CR403	Ring Demodulator	V50260-29
L401	Coil, 20mH	L50334-2
L402, 403	Coil, 20mH	L50334-6
Q401	Transistor, 2N2924	TR2N2924-18
Q402, 403	Transistor, 2N2614	TR2N2614
Q404	Transistor, TI 417	TR9100-18
Q405, 406	Transistor, 2N2924	TR2N2924-18
PC401	Printed Circuit	PC50B187-21
Z401	Transformer, 19Kc	ZZ50210-63
Z402	Transformer, 19Kc	ZZ50210-67
Z403	Transformer, 19Kc	ZZ50210-64
Z404	Transformer, 38Kc	ZZ50210-65

# 1249-2 MULTIPLEX

## MULTIPLEX DECODER TESTS

- Modulate FM generator with 19 kc,  $\pm 6.5$  kc deviation. (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  $\mu$ V at the antenna terminals the stereo indicator should light up. If the generator output is reduced to 5  $\mu$ 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, readjust the trigger control (R401) until the stereo indicator lamp just turns ON with a 4  $\mu$ 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 impossible.

This table is based on the FISHER Model 300 multiplex generator. Another alignment procedure, for MPX generators without an RF output, is shown in Table 2.

**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.

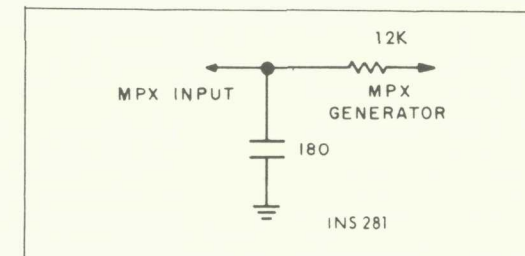
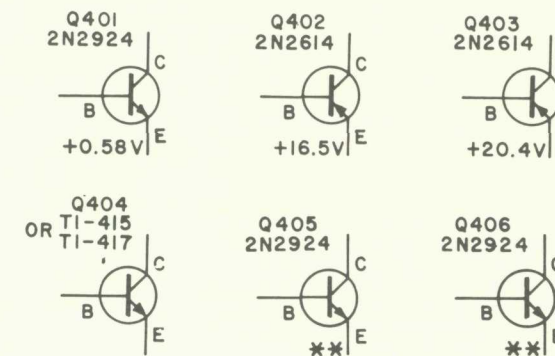
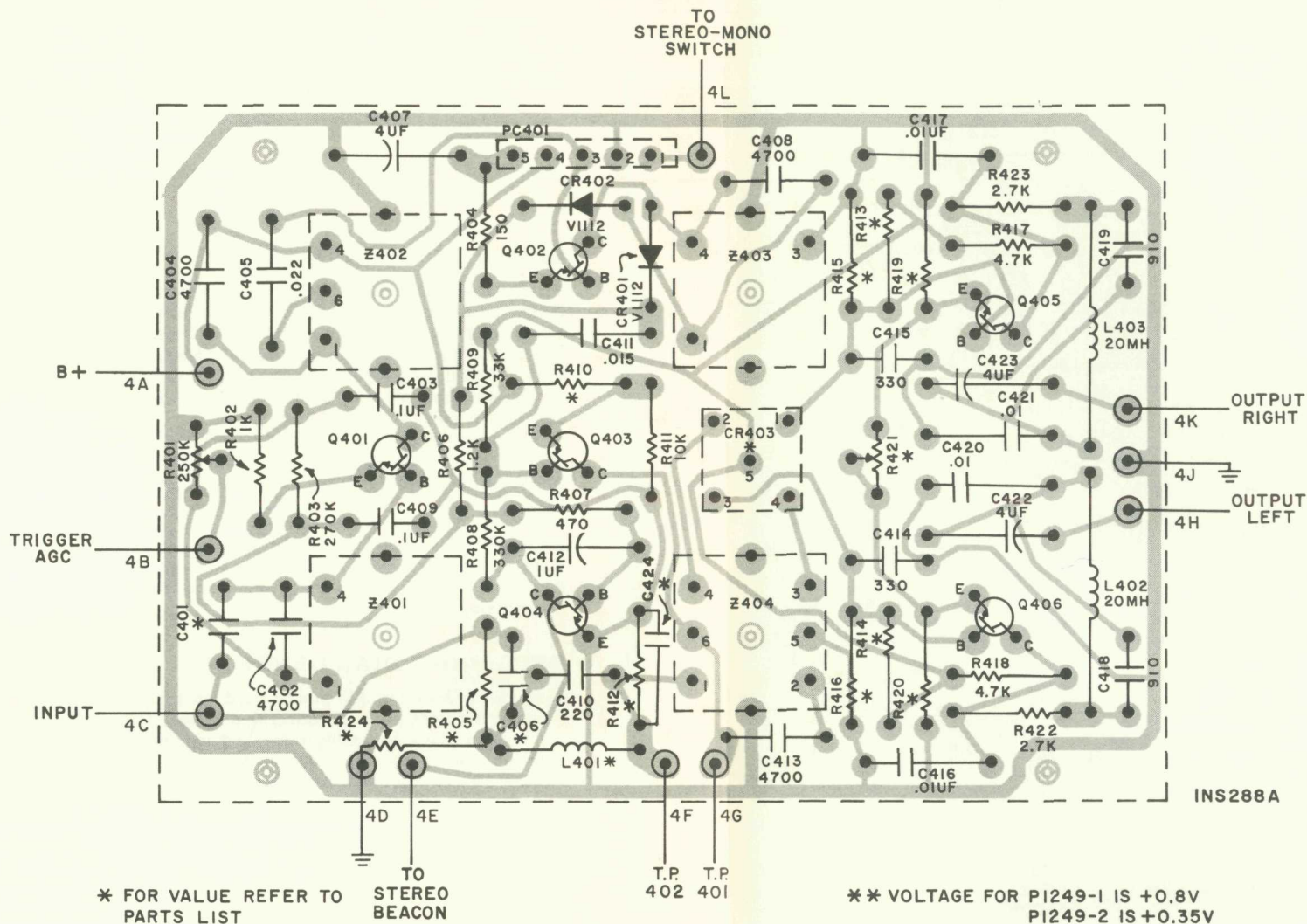


FIGURE 1. Multiplex-alignment pass filter circuit.

## ALTERNATE ALIGNMENT INSTRUCTIONS

(For multiplex generators without an RF output)

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

### MULTIPLEX-GENERATOR RF OUTPUT CONNECTED TO ANTENNA TERMINALS

STEP	GENERATOR MODULATION	RF DEV.	INDICATOR TYPE AND CONNECTION	ALIGNMENT	
				ADJUST	INDICATION
1	70 to 76 kc (connect external audio generator to SCA input of multiplex generator.)	$\pm 25$ kc	Audio (AC) VTVM input to TP402 with a 10 pF capacitor in series with lead.	---	Read minimum AC voltage between 70 and 76 kc.
2	19 kc pilot only	$\pm 6.5$	DC VTVM to TP401	Z401, 402, 403 and 404	Maximum AC voltage (38 kc)
3	Composite MPX signal 1 kc on left channel only	$\pm 75$ kc	Audio (AC) VTVM and oscilloscope vertical input to left channel output lug (4H)	Z402	Maximum AC voltage with clean 1 kc sine wave on oscilloscope
4	Composite MPX signal 1 kc on right channel only	$\pm 75$ kc	Same as Step 3	MPX Separation Control (R421)	Minimum reading on Audio (AC) VTVM—should be at least 35db below reading obtained in Step 3.
5	Same as Step 4	$\pm 75$ kc	Audio (AC) VTVM and oscilloscope vertical input to right channel output lug (4K)	---	Same Audio (AC) VTVM reading as obtained in Step 3 ( $\pm 2$ db); clean 1kc sine wave on scope.
6	Same as Step 4	$\pm 75$ kc	Same as Step 5		Minimum reading on Audio (AC) VTVM should be at least 35db below reading in Step 5.

### COMPOSITE OUTPUT OF MULTIPLEX GENERATOR CONNECTED TO INPUT OF MPX DECODER THROUGH LOW-PASS FILTER

STEP	GENERATOR MODULATION	LEVEL (RMS)	INDICATOR TYPE AND CONNECTION	ALIGNMENT	
				ADJUST	INDICATION
1	70 to 76 kc.	100mV	Audio (AC) VTVM input to TP402 with a 10 pF capacitor in series with lead.	---	Read minimum AC voltage between 70 and 76 kc.
2	19 kc pilot only	50mV	DC VTVM to TP401	Z401, 402, 403 and 404	Maximum AC voltage (38 kc)
3	Composite MPX signal 1 kc on left channel only	300mV	Audio (AC) VTVM and oscilloscope vertical input to left channel output lug (4H)	Z402	Maximum AC voltage with clean 1 kc sine wave on oscilloscope
4	Composite MPX signal 1 kc on right channel only	300mV	Same as Step 3	MPX Separation Control	Minimum reading on Audio (AC) VTVM—should be at least 35db below reading obtained in Step 3.
5	Same as Step 4	300mV	Audio (AC) VTVM and oscilloscope vertical input to right channel output lug	---	Same Audio (AC) VTVM reading as obtained in Step 3 ( $\pm 2$ db); clean 1kc sine wave on scope.
6	Same as Step 4	300mV	Same as Step 5		Minimum reading on Audio (AC) VTVM should be at least 35db below reading obtained in Step 5.

## MAIN CHASSIS PARTS DESCRIPTION LIST

### CAPACITORS

Symbol	Description	Part No.	C5	Description	C50089-4
C1	Molded, .01 $\mu$ F, 20%, 600V	C2747	C6	Mylar, .22 $\mu$ F, 20%, 250V	C50B575-3
C2	Electrolytic, 3-Section A-50 $\mu$ F, 200V B-50 $\mu$ F, 200V C-50 $\mu$ F, 200V	C50180-70	C7	Mylar, .01 $\mu$ F, 5%, 100V	C50B574-1
C3	Electrolytic, 500 $\mu$ F, 35V	C50483-17	C8, 9		
C4	Electrolytic, 4 $\mu$ F, 35V	C50483-1	10, 11	Electrolytic, 4 $\mu$ F, 35V	C50483-1
			C12	Electrolytic, 100 $\mu$ F, 25V	C50483-6
			C13	Electrolytic, 50 $\mu$ F, 35V	C50483-4
			C14	Electrolytic, 200 $\mu$ F, 35V	C50483-7

### RESISTORS AND POTENTIOMETERS

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

Symbol	Description	Part No.	R14	10K	R12DC103J
R1	Composition, 270, 10%, 1/2W	RC20BF271K	R15	Pot., 1K, Meter Adj.	R50694-4
R2	Composition, 100K, 10%, 1/2W	RC20BF104K	R16	100K	R12DC104J
R3	Composition, 820K, 10%, 1/2W	RC20BF824K	R17	33K	R12DC333J
R4	Composition, 4.7M, 10%, 1/2W	RC20BF475K	R18	47K	R12DC473J
R5	470K	R12DC473J	R19	Pot., 100K, Muting Adj.	R50694-6
R6	Wirewound, 390, 5%, 2W	RW200W391J	R20	100	R12DC101J
R7	470	R12DC471J	R21, 22	100K	R12DC104J
R8	560, 5%, 1/3W	R33DC561J	R23	Composition, 220, 10%, 1/2W	RC20BF221K
R9	Wirewound, 390, 5%, 2W	RW200W391J	R24, 25	330K	R12DC334J
R10	Composition, 5.6K, 5%, 2W	RC40BF562J	R26, 27	33K	R12DC333J
R11	Composition, 6.8K, 5%, 2W	RC40BF682J	R28, 29	8.2K	R12DC822J
R12	56K	R12DC563J	R30, 31	1K	R12DC102J
R13	22K	R12DC223J	R32, 33	2.7K	R12DC272J
			R34	1K	R12DC102J
			R35, 36	220K	R12DC224J
			R37, 38	Pot., 100K, Level Adj.	R50103-8

### MISCELLANEOUS

Symbol	Description	Part No.	-	Nameplate Assembly	AS50A818
CR1	Rectifier, Silicon Bridge	V50B260-26	-	Muting Indicator Assembly	A50338-1
CR2	Diode, Silicon	V50260-24	-	Dress Panel Assembly	AS1239A150
CR3	Diode, Silicon	V50260-15	-	Knob, Selector, Muting, Power	E50B562-1
F1	Fuse, 0.4A, 125V	F950-152	-	Knob, Tuning	E50B566-2
I1, 2	Lamp, Dial	I50441-1	-	Drive Wheel for Tuning Capacitor	E50C588
I3	Lamp, Muting	I50009-7	*	Stereo Beacon Lampholder	E1128A127-2
I4	Lamp, Meter	I50009-8	-	Stereo Beacon Assembly	AS1239B135
I5	Lamp, Stereo Beacon	I50594	-	Jack, Tape	J50B545
L1	Choke, 1 Microhenry	L50066-2	-	Dial Glass	N1239B107
M1	Meter, Tuning	M990-124	S1	Switch, Selector	S1128A128
Q1, 2, 3, 4	Transistor, 2N2924	TR2N2924	S2	Switch, Muting	S1128A130
-	Front End, FM	P966-5	S3	Switch, Power	S50358-7
-	Printed Circuit Board, IF	P1229	T1	Transformer, Power	T1239-115
-	Printed Circuit Board, MPX	P1249-2			
-	Antenna, FM Dipole	AS50227-1			

\* Serialization 10001 - 11000 only.

## TUNER MAINTENANCE

### CLEANING THE DIAL GLASS

- Remove the front panel: Disconnect the set from AC power as a precaution. Remove all knobs; pull gently. Remove any hex nuts on the control-shaft bushings, like the Muting switch and Tuning control. Next, gently lift the FISHER nameplate from the panel, by pulling it slowly outward. Remove the screw which is underneath the nameplate. Then lift off the front panel.
- Loosen the screws that retain the clips to the dial glass. (When you replace the dial glass, make certain to reset it by placing it firmly against the lower left-hand corner.) Swing the retaining clips aside, and carefully lift off the dial glass.
- Remove dust with a dry rag. 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.

### REPLACING DIAL LAMPS

First, disconnect the AC power cord as a precaution. Remove the front panel as described above. The lamps are held in place by spring clips and can be removed with the fingers. Replace with a new lamp from your FISHER Dealer (Part Number I-50441-1).

### REPLACING THE STEREO BEACON LIGHT

Disconnect the set from AC as a precaution.

- Remove the top of the metal cabinet, after loosening the screws which hold it in place.
- Remove the two wires of the STEREO BEACON lamp from the two clips located atop the chassis, behind the front panel.

- Remove the bulb (part No. I50461-3) from the cylinder which houses the STEREO BEACON jewel, and replace it with a new bulb.

- Fit the ends of the two wires from the lamp over the clips.

- Replace the cabinet top.

(Lamps may be ordered directly from the FISHER Parts Department if your dealer is out of stock.)

### REPLACING FUSES

**Power Fuse** — The chassis is fused to protect it against line surges and other adverse conditions sometimes encountered by electronic equipment. If the tuner appears to be inoperative, check to see if the dial lamps light when the Power switch is turned ON. If the lamps do not light, the unit may have a blown power fuse.

To replace the fuse, which is located in a black receptacle labelled in the center of the rear panel, proceed as follows:

- Turn the Power switch to the OFF position.
- Disconnect the power cord from the wall receptacle.
- Push the cap of the fuseholder in, and turn it counter-clockwise. The cap will disengage, and you can pull it out, with the fuse remaining in its clip. Replace the fuse with a 400 mA (4/10 A) fuse only. Return the cap and fuse to the receptacle, reconnect the power plug, and turn the Power switch ON.

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.



## SERVICE NOTES

## TROUBLESHOOTING GUIDE

Does not go on (pilot or dial lamps do not light).

- Check: ● Fuse F1, AC plug and line cord, wall outlet, power switch S3. (Use test lamp in AC OUTLET on rear of chassis.)

Distortion  
Hum or  
No audio output (both channels) in MONO and STEREO positions of SELECTOR.

- Tune to other stations – watch tuning indicator.
- Remove plug from front-panel TAPE jack (J1).
- Remove plugs from rear-chassis RCRDR jacks (J3, J4).

- Check: ● Antenna position and connections.  
● MUTING switch S2 (set to OFF position).  
● Rear-chassis LEVEL controls (R37, R38).  
● Plugs in MAIN OUTPUTS (J2, J5) and interconnecting cables to amplifier.  
● Power supply voltages at: CR1, C2A, R6; C2B, R6, R7, R9; C2C, R8, R9, R10, R11; C3, R11, R13.  
● IF amplifier printed-circuit subchassis.  
● Multiplex Decoder printed-circuit subchassis.

Test (filament leakage for hum) V751, V752, V753, or substitute.

Distortion  
Hum or  
No audio output (LEFT channel only) in MONO and STEREO positions of SELECTOR.

- Remove plug from front-panel TAPE jack (J1).
- Remove plug from rear-chassis RCRDR jack (J3).

- Check: ● Rear-chassis LEFT channel LEVEL control (R37).  
● Plug in LEFT MAIN OUTPUT (J2) and interconnecting cable to amplifier.  
● Q1 and associated circuit components.

Distortion  
Hum or  
No audio output (RIGHT channel only) in MONO and STEREO positions of SELECTOR.

- Remove plug from front-panel TAPE jack (J1).
- Remove plug from rear-chassis RCRDR jack (J4).

- Check: ● Rear-chassis RIGHT channel LEVEL control (R38).  
● Plug in RIGHT MAIN OUTPUT (J5) and interconnecting cable to amplifier.

MUTING does not work (Tuning meter indicates)

- Tune for weak signal station (disconnect antenna).

- Check: ● Setting of MUTING ADJUST (R19).  
● Q4 and associated circuit components.  
● MUTING switch S2 for continuity and shorts.

TUNING INDICATOR does not work.

- Tune for strong-signal station.

- Check: ● Antenna position and connections.  
● Setting of R15 METER ADJUST  
● Q3 and associated circuit components.

AUTOMATIC position of SELECTOR does not work.

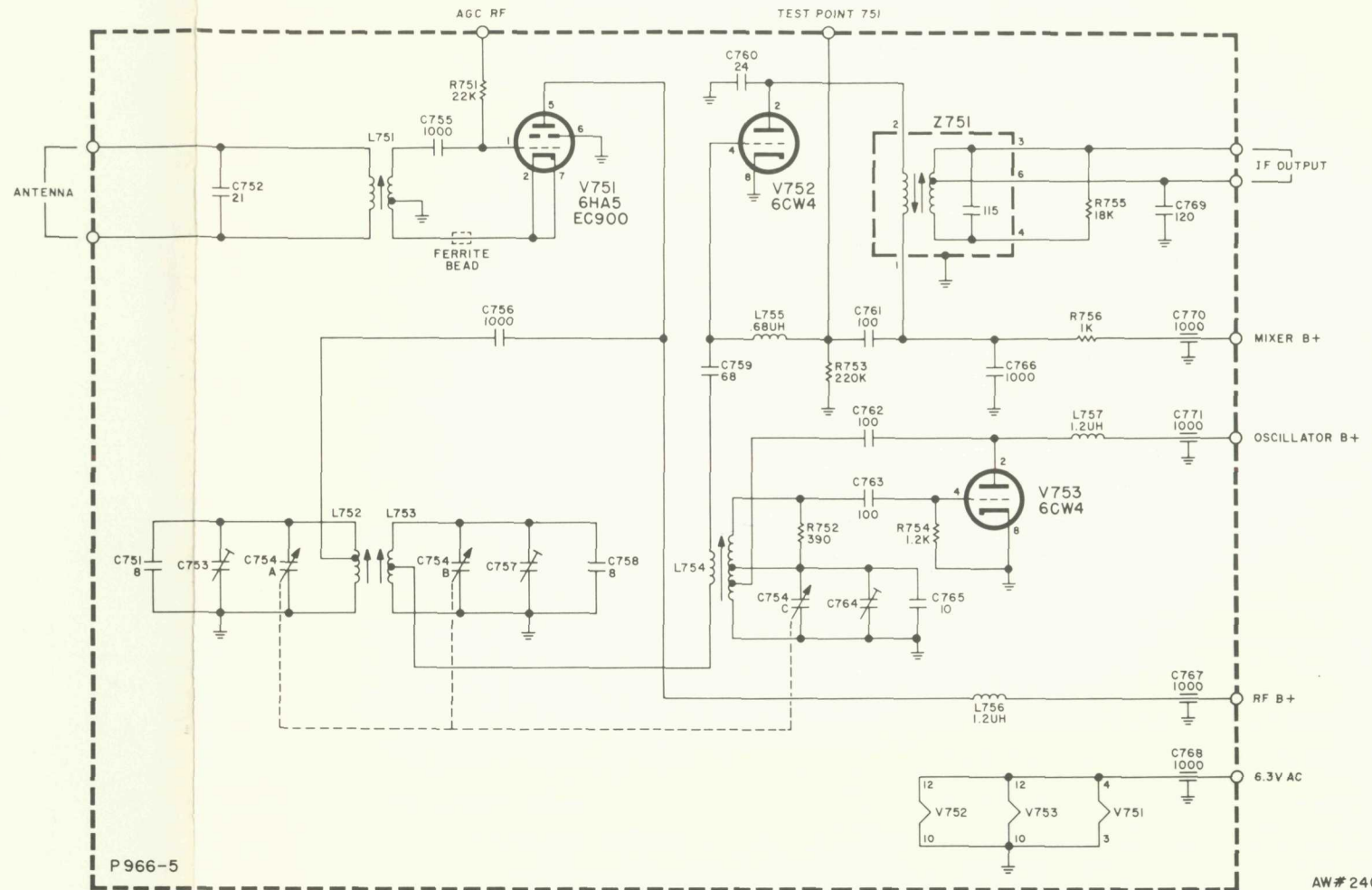
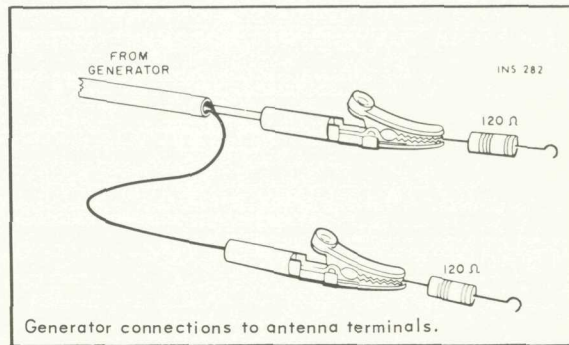
- Tune for strong-signal station
- Make sure station is broadcasting multiplex stereo.

- Check: ● Antenna position and connections.  
● Stereo Beacon indicator lamp (I5).  
● Multiplex Decoder alignment.

# 966-5 FM FRONT END

## FRONT-END ALIGNMENT

- Set dial pointer to zero (0) calibration mark on logging scale. If dial pointer does not coincide with the 0 without forcing the TUNING knob reposition pointer assembly on the dial cord and cement pointer in place.
- 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. DO NOT use modulation (AM or FM).
- Set generator frequency and tuning dial to 90 mc. Adjust the oscillator-coil core first—then adjust the RF-coil core for maximum VTVM reading.
- Set generator frequency and tuning dial to 106 mc. First adjust oscillator trimmer and then the RF trimmers for maximum VTVM reading.
- Set generator frequency and tuning dial to 98 mc. Adjust Antenna coil for maximum VTVM reading.
- Repeat steps above several times until dial calibration is accurate when VTVM reading is maximum. Keep the output of the generator as low as possible during all adjustments.



## PARTS DESCRIPTION LIST

### 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.
C751	Ceramic, 8, 5%, NPO, 1000V	C50070-45
C752	Ceramic, 21, 5%, N750, 1000V	C50070-32
C753	Trimmer	C662-123
C754A, B, C	Variable, F M Tuning	C966C117-1
C755, 756	Ceramic, 1000, GMV, 500V	C50089-2
C757	Trimmer	C662-123
C758	Ceramic, 8, 5%, NPO, 1000V	C50070-45
C759	Ceramic, 68, 5%, N750, 1000V	C50070-35
C760	Ceramic, 24, 5%, N150, 1000V	C50070-8
C761	Ceramic, 100, 5%, N1500, 1000V	C50070-19
C762, 763	Ceramic, 100, N1500, 1000V	C50070-6
C764	Trimmer	C662-123
C765	*Ceramic, 10, ±.5pF, P100, 500V	CC20AJ100D5
C766	Ceramic, 1000, 1000V	C50072-3
C767, 768	Ceramic, Feedthru, 1000, GMV	C592-187
C769	Ceramic, 120, N1500, 1000V	C50070-9
C770, 771	Ceramic, Feedthru, 1000, GMV	C592-187

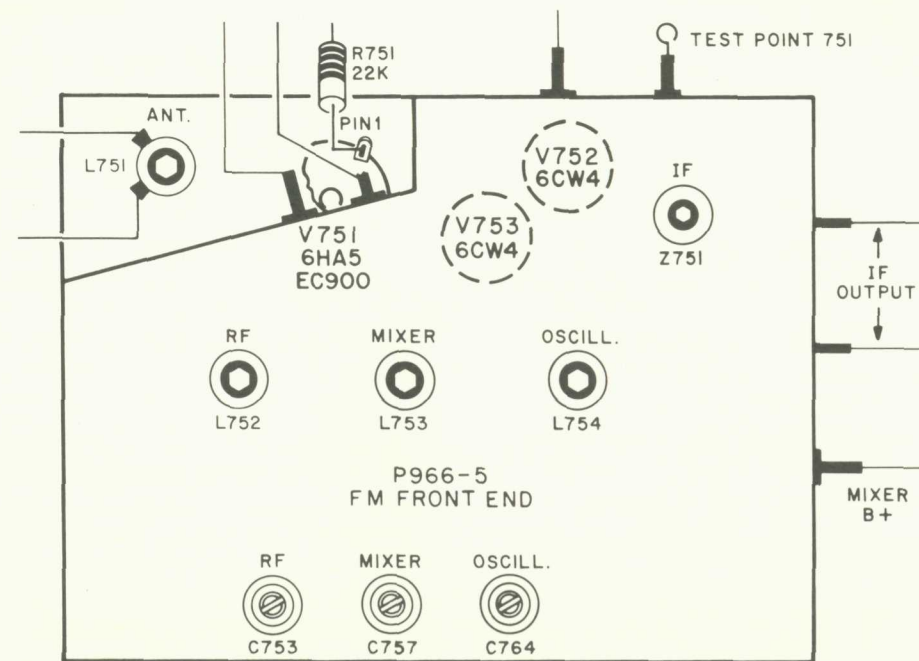
### RESISTORS

Deposited Carbon, in ohms, 5% tolerance 1/8 watt. K=Kilohms, M=Megohms.

Symbol	Description	Part No.
R751	22K	R12DC223J
R752	390	R12DC391J
R753	220K	R12DC224J
R754	1.2K	R12DC122J
R755	18K	R12DC183J
R756	1K	R12DC102J

### MISCELLANEOUS

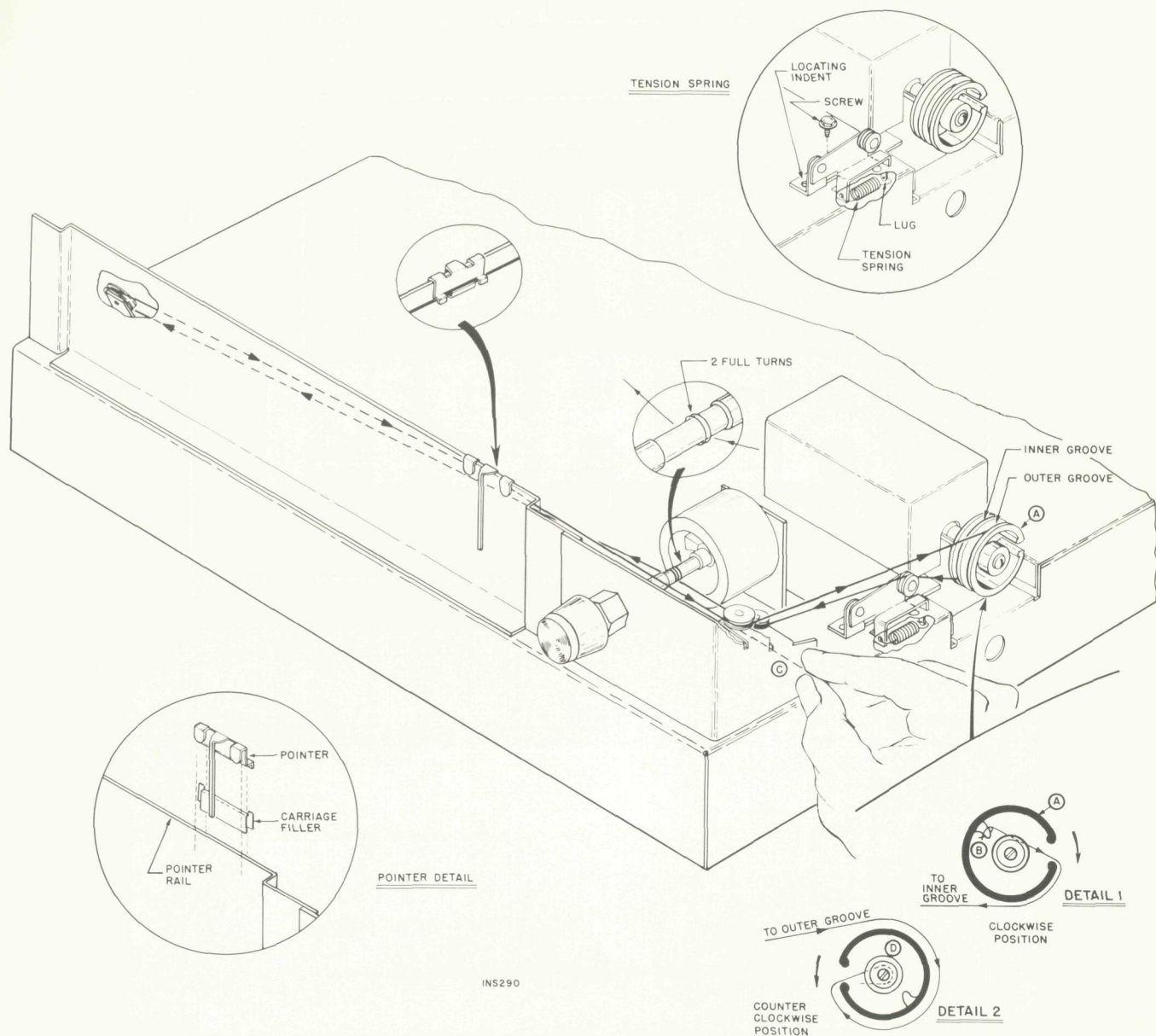
Symbol	Description	Part No.
L751	Coil, FM Antenna	L966-113
L752	Coil, FM RF	L1034-113
L753	Coil, FM Mixer	L966-115
L754	Coil, FM Oscillator	AS966-107
L755	Choke, .68 Microhenry	L50066-1
L756, 757	Choke, 1.2 Microhenry	L50066-3
V751	Tube, EC900/6HA5	V-EC900
V752, 753	Nuistor, 6CW4	V-6CW4
Z751	Transformer, FM IF	ZZ50210-45



\* For excessive drift replace with Ceramic, 10, ±.5pF, NPO, 500V

C20CG100D5

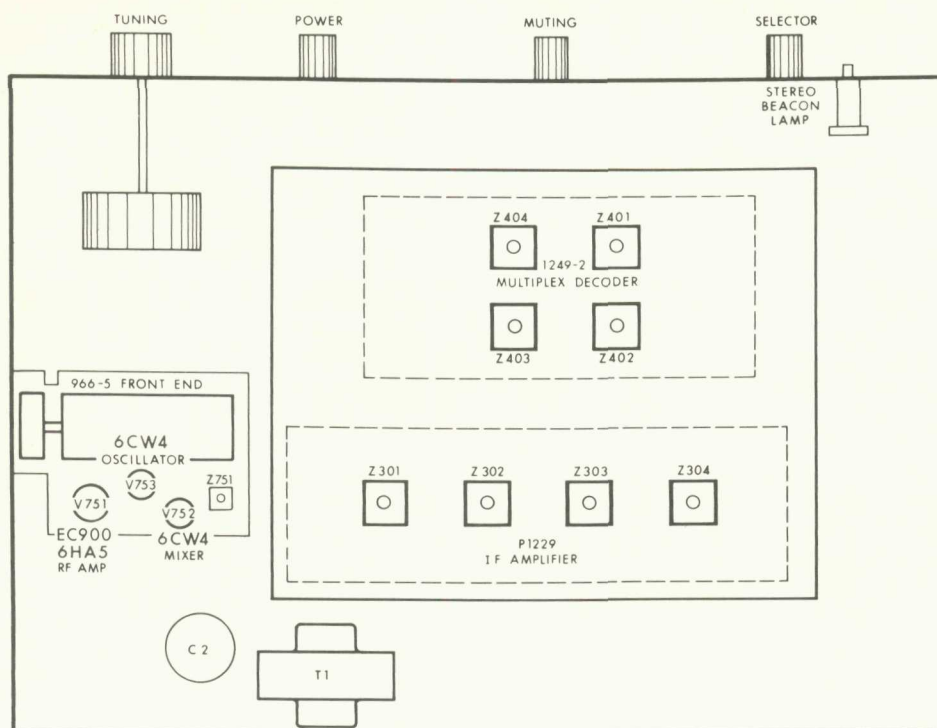
# DIAL STRINGING PROCEDURE



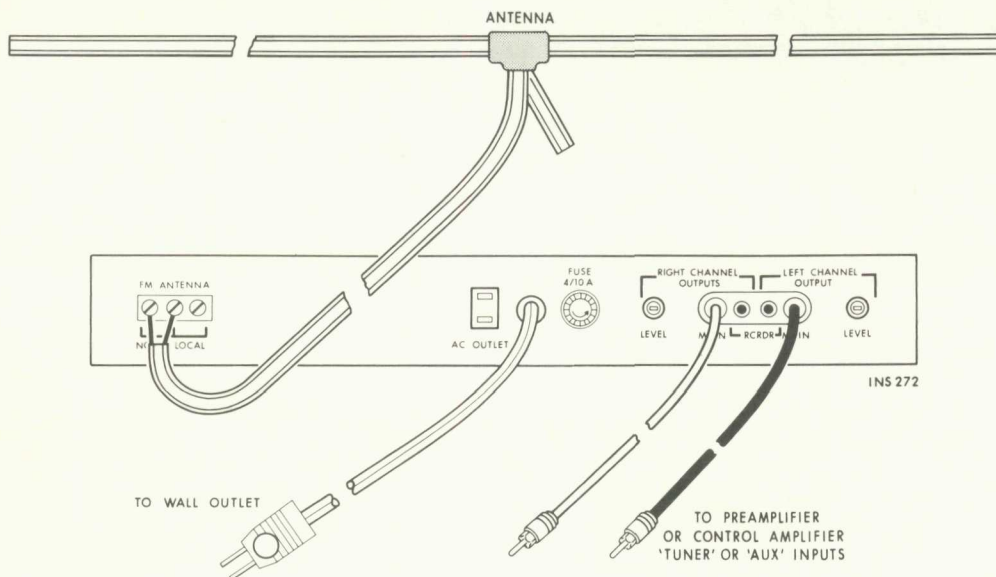
- 1—Rotate drive drum A (on tuning-capacitor shaft) to its maximum clockwise position.
- 2—Tie dial cord to ear B (inside drum A) as shown in Detail 1.
- 3—Run dial cord through slot in rim of drum A.
- 4—Set dial cord in INNER groove and over tension-spring pulley.
- 5—String dial cord, as shown, to point C.
- 6—Hold dial cord taut with left hand.

- 7—Wind drum A to maximum counterclockwise position (with right hand).
- 8—Wrap loose end of dial cord around drum A, in outer groove, as shown in Detail 2 (using right hand).
- 9—Secure loose end of dial cord under machine screw and washer (D) in the center of the drive drum.

# CHASSIS LAYOUT



# COMPONENT CONNECTION



FISHER RADIO CORPORATION • NEW YORK