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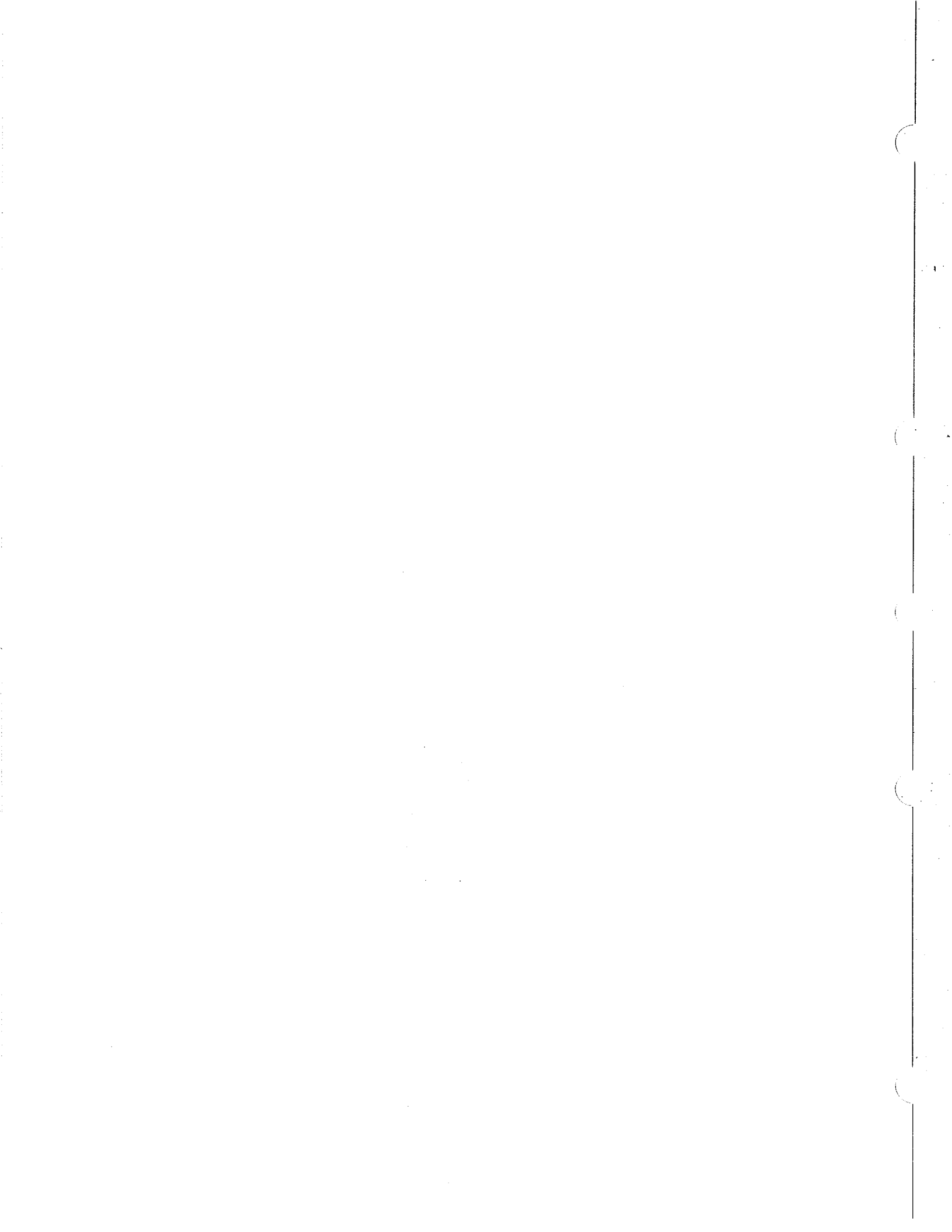
STEREO FM TUNER
GAMMA I



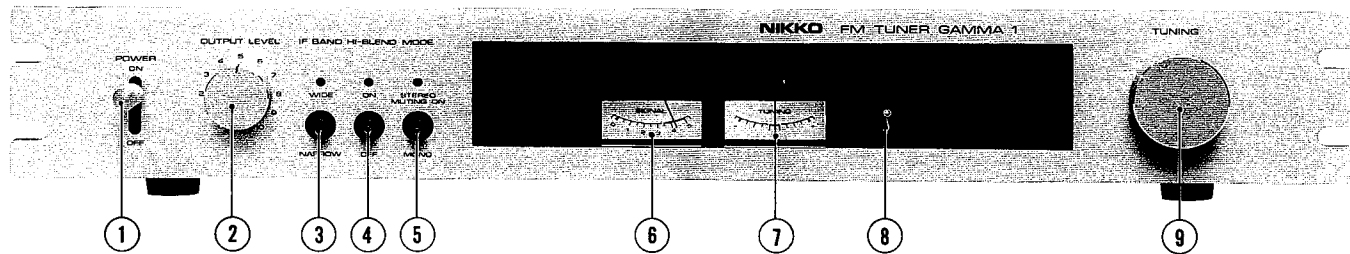
SERVICE MANUAL

W-TYPE UL and CSA type	120V AC
E-TYPE europe standard (universal) type	220/240V AC
N-TYPE DEMKO and SEMKO type	
D-TYPE DIN type	

NIKKO



EXPLANATION FOR FUNCTION OPERATION



1. POWER

To turn the tuner on and off.

2. OUTPUT LEVEL

This control determines the output level of the tuner.

3. IF BAND

This switch controls the selectivity of the IF band. When the signal being received is disturbed by nearby stations, press this switch to NARROW position for elimination of interference.

4. HI-BLEND

Press this switch to eliminate high frequency noise from incoming signals.

5. MODE

This switch is used to select the mode of reception. When it is set to MONO position, FM reception is heard in monaural and the Stereo Indicator lamp will be off.

This switch also functions as a muting switch. When selecting stations, set the switch to STEREO and interstation noise will be eliminated.

An indicating-lamp will light when the switch is in the STEREO position. Press this switch to MONO position for stations with weak signals.

6. SIGNAL METER

This meter indicates the signal strength of the FM station being received.

7. TUNING METER

This meter is used for accurate FM tuning. Turn the tuning knob to the desired station until the TUNING meter indicates the "center" position. At the same time, the SIGNAL meter will deflect maximum.

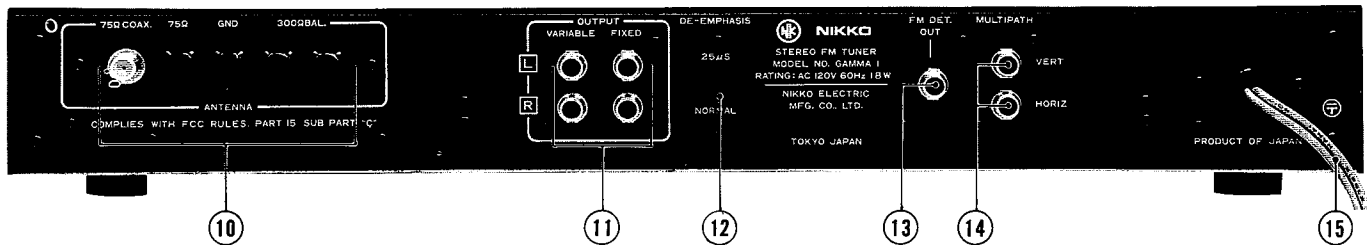
8. STEREO INDICATOR

This lamp will light when stereo reception is tuned accurately.

9. TUNING KNOB

Turn this knob to select the desired station. Observe both SIGNAL and TUNING meters for accurate readings.

TERMINALS ON REAR PANEL



10. ANTENNA

75 ohm UNBAL: For a 75 ohm coaxial cable connected to an outdoor antenna.

300 ohm BAL: For connection of a 300 ohm antenna. (T type)

11. OUTPUT

FIXED: The output level at this terminal is constant.
This terminal should be connected to your amplifier's input or the tape deck line input.

VARIABLE: The output level at this terminal can be varied by the OUTPUT LEVEL control, located on the front panel.

12. DE-EMPHASIS

Set this switch to the 25 μ s position when receiving FM Signals through a *Dolby System.

* Dolby is the trade mark of DOLBY LABORATORIES, INC.

13. DET. OUT. (Detector Output)

Audio signals from FM reception, before they enter the deemphasis circuit, are present at this DET. OUT. terminal. If and when a STANDARD 4-channel adaptor is available, it may be connected to this terminal.

14. MULTIPATH (Oscilloscope Jacks)

These are terminals to which an oscilloscope can be connected for checking multipath interference.

15. AC POWER CORD

Connect the AC power cord to the amplifier.

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SPECIFICATIONS

(W-TYPE, E-TYPE, N-TYPE)

SPECIFICATION RATINGS	UNIT	NOM. (NOR.)	LIMIT (NOR.)	NOM. (NARROW)	LIMIT (NARROW)
Usable Sensitivity	.dBf (μ V)	9.3 (1.6)	15.2 (3.16)	9.31 (1.6)	15.2 (3.16)
50 dB Quieting Sensitivity	.dBf (μ V)	11.2 (2.0)	20.2 (5.6)	11.2 (2.0)	20.2 (5.6)
Hum and Noise	MONO	.dB @ 65 dBf .78	72	.78	72
	STEREO	.dB @ 65 dBf .75	70	.75	70
T. H. Distortion	MONO	%.004	0.2	.01	0.5
	STEREO (L=-R)	%.008	0.3	.02	0.5
Capture Ratio	.dB	.1	2	.2	4
Alternate Channel Selectivity	.dB	.35	30 ⁺²⁰ ₋₁₀	.80	70
Spurious Response Ratio	.dB	.110	100	.110	100
Image Response Ratio (98 MHz)	.dB	.110	100	.110	100
IF Response Ratio (98 MHz)	.dB	.110	100	.110	100
AM Suppression Ratio	.dB	.60	40	.60	40
Separation	(100 Hz) STEREO	.dB .45	35	.35	25
	(1 kHz) STEREO	.dB .52	35	.45	30
	(10 kHz) STEREO	.dB .40	30	.30	20
Separation, Hi-Blend					
(1 kHz) STEREO	.dB	.30	30 \pm 5	.30	30 \pm 5
Subcarrier Product Ratio	STEREO .dB	.70	60	.70	60
Meter Sensitivity		4.5	4.5 \pm 0.3	4.5	4.5 \pm 0.3
Output Level (Fixed)	.Volts	.075	0.75 \pm 2 dB	.075	0.75 \pm 2 dB
FM Receiving Frequency	.MHz	.87.4-109	87.9-108.5	.87.4-109	87.9-108.5
Antenna Impedance		.300 ohm balanced & 75 ohm coaxial			

(D-TYPE)

SPECIFICATION RATINGS	UNIT	NOM. (NOR.)	LIMIT (NOR.)	NOM. (NARROW)	LIMIT (NARROW)
Usable Sensitivity @ 26 dB S/N	μ V	.056	1.0	.056	1.0
50 dB Quieting Sensitivity	μ V	.25	5.0	.25	5.0
Signal-to-Noise Ratio					
MONO	.dB @ 60 dB	.76	68	.76	68
STEREO	.dB @ 60 dB	.74	68	.74	68
T. H. Distortion					
MONO	%	.006	0.2	.01	0.5
STEREO (L=-R)	%	.008	0.3	.02	0.5
Capture Ratio	.dB	1	2	2	4
Alternate Channel Selectivity	.dB	.35	35 ⁺²⁰ ₋₁₀	.80	70
Spurious Response Ratio	.dB	.110	100	.110	100
Image Response Ratio (98 MHz)	.dB	.110	100	.110	100
IF Response Ratio (98 MHz)	.dB	.110	100	.110	100
AM Suppression Ratio	.dB	.60	40	.60	40
Separation					
(100 Hz) STEREO	.dB	.45	35	.35	25
(1 kHz) STEREO	.dB	.52	35	.45	30
(10 kHz) STEREO	.dB	.40	30	.30	20
Separation, Hi-Blend					
(1 kHz) STEREO	.dB	.30	30 \pm 5	.30	30 \pm 5
Subcarrier Product Ratio	STEREO .dB	.70	60	.70	60
Meter Sensitivity		.4.5	4.5 \pm 0.3	.4.5	4.5 \pm 0.3
Output Level (Fixed)	.Volts	.0.35	0.35 \pm 2 dB	.0.35	0.35 \pm 2 dB
FM Receiving Frequency	.MHz	.87.4-109	87.5-108.5	.87.4-109	87.5-108.5
Antenna Impedance		.300 ohm balanced & 75 ohm coaxial			

DISASSEMBLY

Note: Three digit numbers circled in this chapter (○) are represented by a (★) in the parts listing.

Cabinet Cover Removal

Remove eight tapping screws from the top and both sides of the metal cover as shown in Photo 1.

Bottom Plate Removal

Remove nine tapping screws from the bottom of the unit and lift away.

Power Transformer Removal

1. Remove two tapping screws (8, 9) (Photo 2).
2. Remove two tapping screws (10, 11) (Photo 2).
3. Disconnect all the power transformer cables before lifting out the power transformer.

* To reassemble, reverse the procedure.

Front Panel Removal

1. As indicated in Photo 2, disconnect three LED connectors from the LEDs mounted on the front plate by pulling them backward.
2. Remove POWER knob from the front of the unit by pulling it forward. Using a hexagon wrench, remove TUNING and OUTPUT LEVEL knobs from the front of the unit.
3. Remove two nuts (1, 2) (Photo 3) and lift out front panel.

* To reassemble, reverse the procedure.

Meter and Meter Lamp Replacement

1. Using long nose pliers, remove two push rivets (2, 3) (Photo 2).
2. Lift "BACK GND G2 PLATE" (1) (Photo 2) up and out of the unit.
3. Remove clamp spring before removing meters.
4. To replace meter lamps, desolder A & B (Photo 4).

* To reassemble, reverse the procedure.

IF and MPX/Regulator Circuit Parts Replacement

1. Remove "BACK GND G2 PLATE" (1) (Photo 2).
2. Remove four tapping screws (4 - 7) (Photo 2). Using a soldering iron, disconnect one cable (A) (Photo 2) from the wire wrapping pin. Lift the IF circuit board for service.
3. If necessary, disconnect three cables as follows:
Two cables (B & C) (Photo 2) from the wire wrapping pins and One cable (C) (Photo 4) from the bottom of the front end.

Dial Lamp Removal

1. Remove lamps from the REFLECTOR (light guide acrylic resin plate). (Photo 2)

* To reassemble, reverse the procedure.

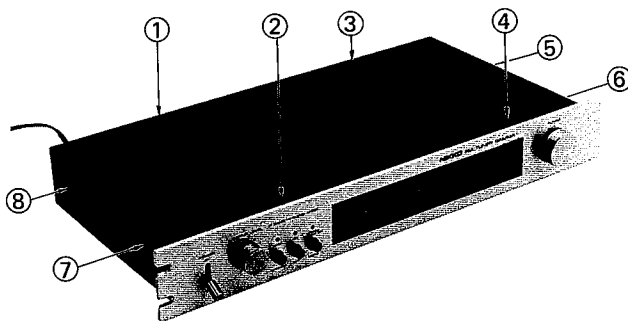


Photo 1

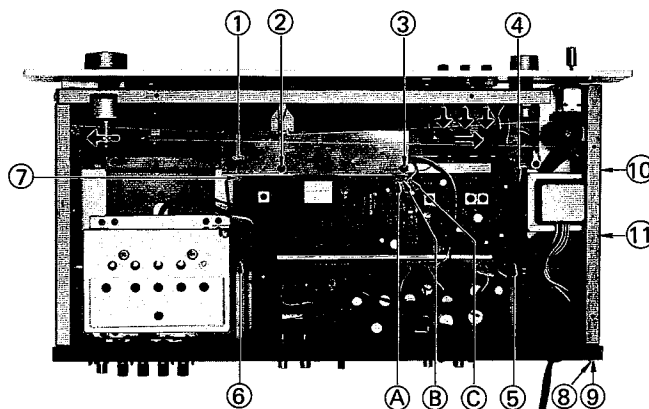


Photo 2

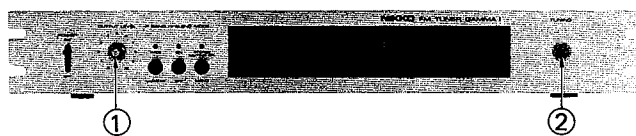


Photo 3

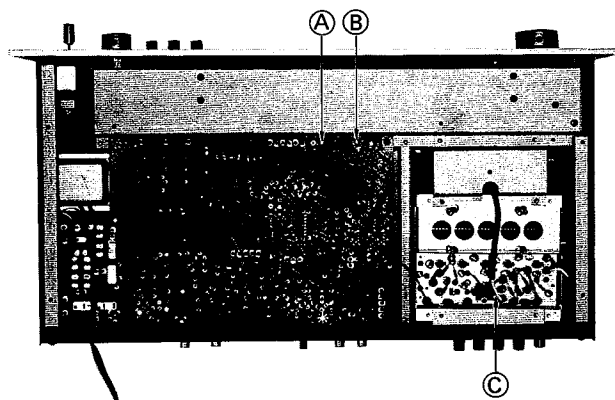


Photo 4

ALIGNMENT

Test Equipment

Allow a minimum of 10 minutes warm-up for test equipment and the tuner to be tested.

Maintain rated line voltage.

FM Stereo/Mono Signal Generator.

Vacuum Tube Voltmeter (VTVM)

Oscilloscope

Distortion Meter

Frequency Counter

FM Section Alignment

Connect test equipment as shown in Figure 1.

Connect FM Stereo/Mono signal generator through standard dummy antenna to FM antenna terminals of the tuner.

Connect VTVM, oscilloscope and distortion meter to OUTPUT terminals of the tuner with shielded cable.

Note: Adjust FM signal generator output level so that waveform on oscilloscope is uniform.

FM I-F Alignment

1. Set FM signal generator for 98 MHz.
2. Adjust the generator to ± 75 KHz deviation at 1000 Hz.
3. Switch:
 - a. IF BAND to "NARROW" position.
 - b. HI BLEND to "OFF" position.
 - c. MODE to "MONO" position.

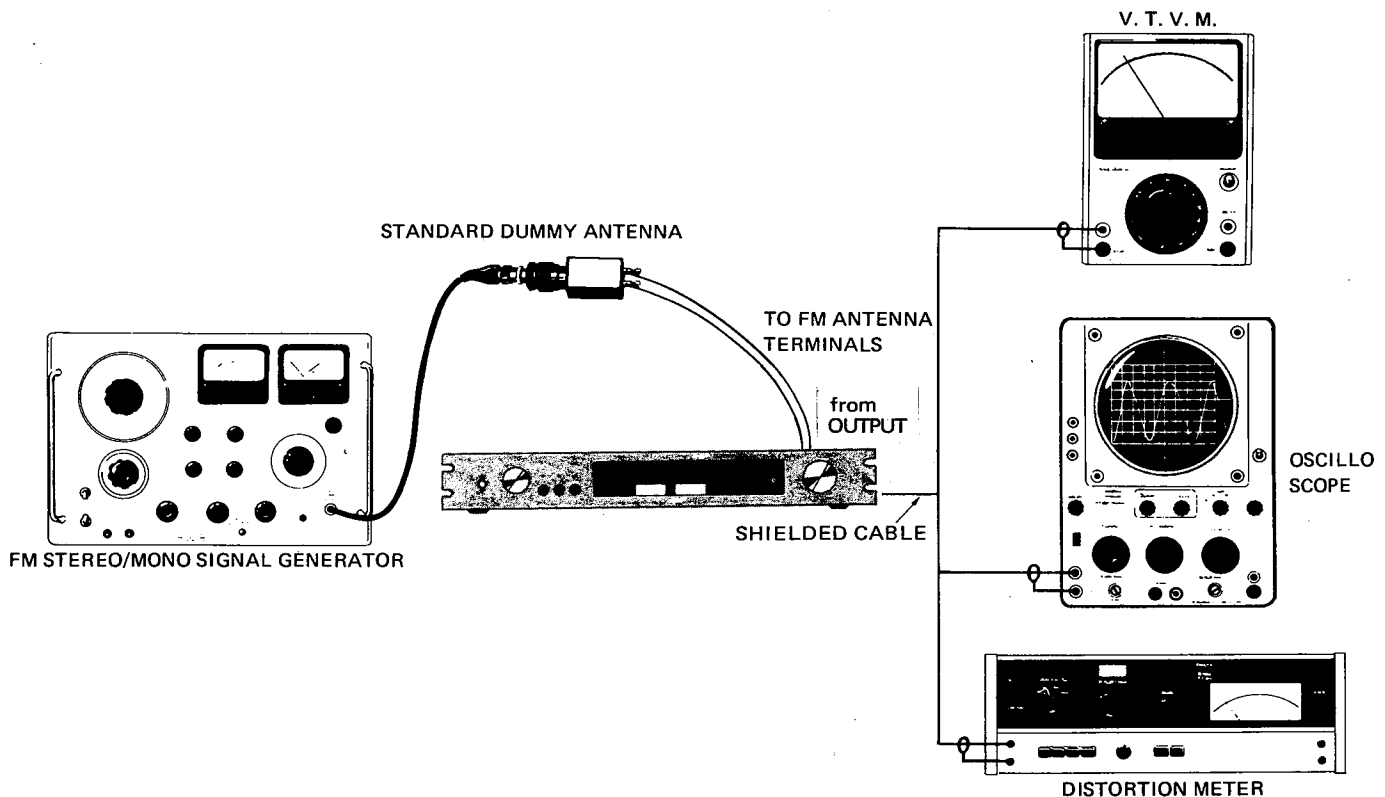


Figure 1. TEST EQUIPMENT

4. Tune the unit for outside of the FM bandwidth, then adjust T102 (Figure 2) until M1 (Center-of-Channel Tuning Meter) indicates mid-scale. Connect DC voltmeter to test point "TP" (Figure 2) and adjust T103 (green core) (Figure 2) for 0 ± 50 millivolts.
5. Attenuate generator output for $0 \sim 6$ dB. Tune the unit for 98 MHz modulated signal, then adjust "IF" transformer located in Front End (Figure 4) until M2 indicates maximum deflection.
6. Attenuate generator output for 60 dB and set IF BAND switch to "WIDE" position. Adjust T103 (red core, Figure 2) for minimum distortion. If M1 does not indicate mid-scale, repeat steps 3, 4 and 5.
7. Adjust R135 (Figure 2) until M1 indicates a " 4.5 ± 0.3 " meter reading.
8. Set IF BAND switch to "NARROW" position again and adjust R137 (Figure 3) until M2 indicates a " 4.5 ± 0.3 " meter reading.

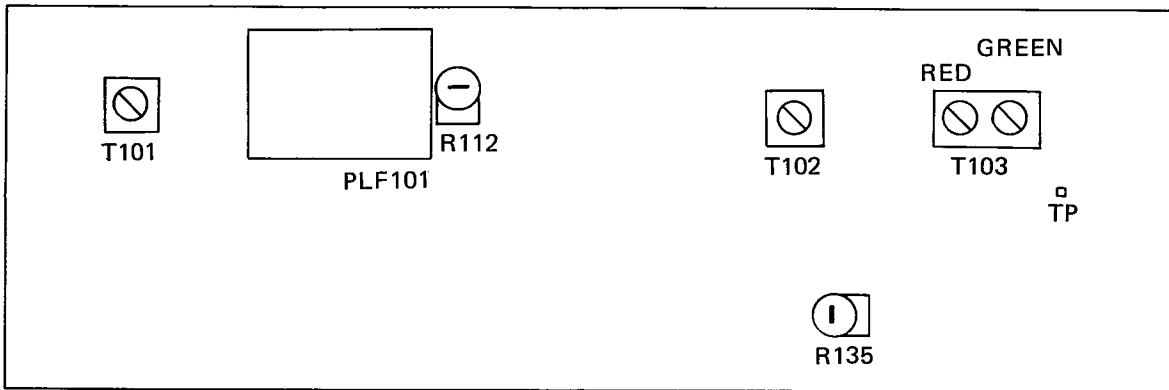


Figure 2. I-F CIRCUIT BOARD (TOP VIEW)

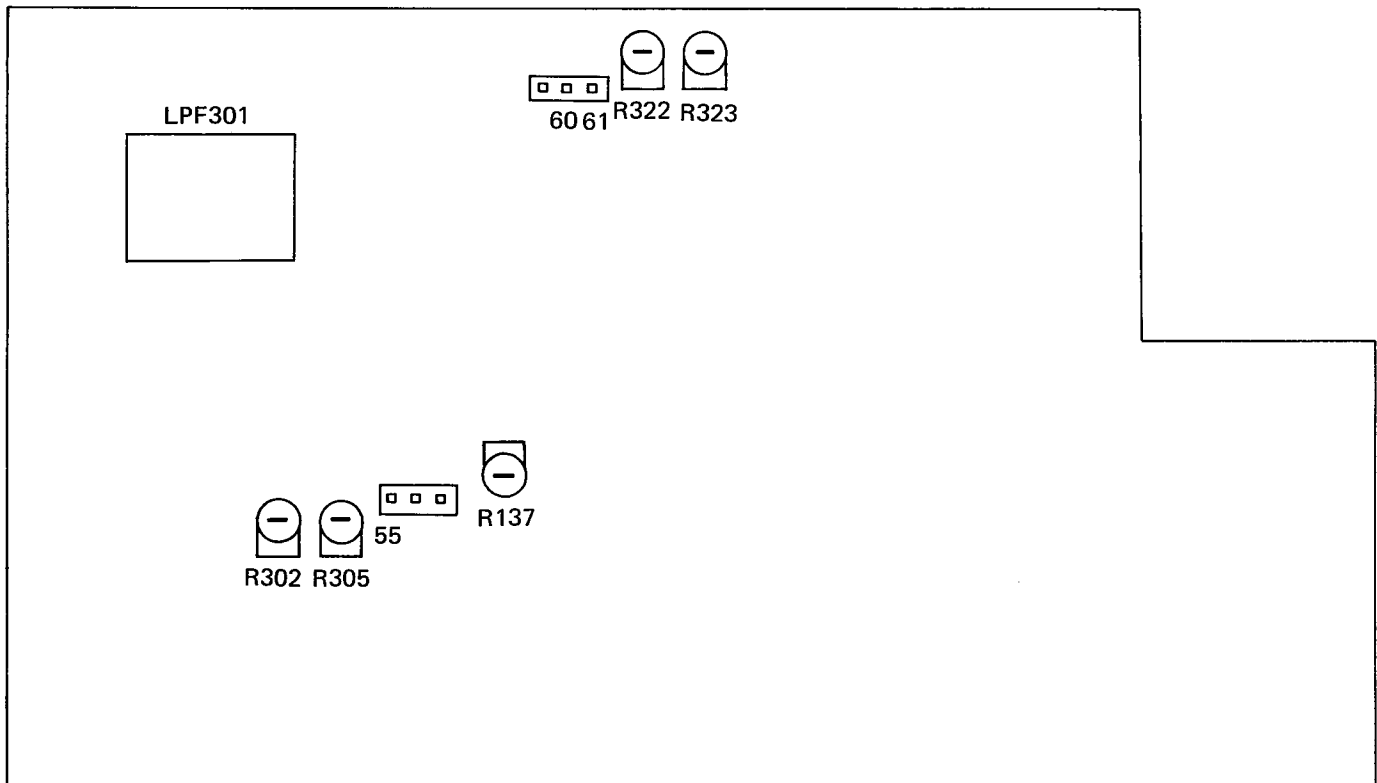


Figure 3. MPX/REGULATOR CIRCUIT BOARD (TOP VIEW)

FM Frequency Coverage and FM Tracking Alignment

These adjustments are factory preset and normally needs no further adjustment. However, if necessary proceed as follows:

1. Adjust FM signal generator to ± 75 KHz deviation at 1000 Hz.
2. Turn the tuning knob fully counterclockwise. If the dial pointer is not located on 87 MHz position of the dial scale, reset the dial pointer to this position.

STEP	GENERATOR	DIAL	ADJUSTMENT POINT	OSCILLOSCOPE	VTVM & M2
1	88 MHz	88 MHz	LO (Figure 4)	Maximum waveform	Maximum deflection
2	108 MHz	108 MHz	TCO (Figure 4)	Maximum waveform	Maximum deflection
3	88 MHz	88 MHz	LA (Figure 4) LR ₁ (Figure 4) LR ₂ (Figure 4) LR ₃ (Figure 4)	Maximum waveform	Maximum deflection
4	108 MHz	108 MHz	TCA (Figure 4) TCR ₁ (Figure 4) TCR ₂ (Figure 4) TCR ₃ (Figure 4)	Maximum waveform	Maximum deflection

3. Repeat adjustment of steps 1 and 2 two or three times.
4. Repeat adjustment of steps 3 and 4 once or twice.
5. Repeat adjustment of steps 1 and 2 once or twice.

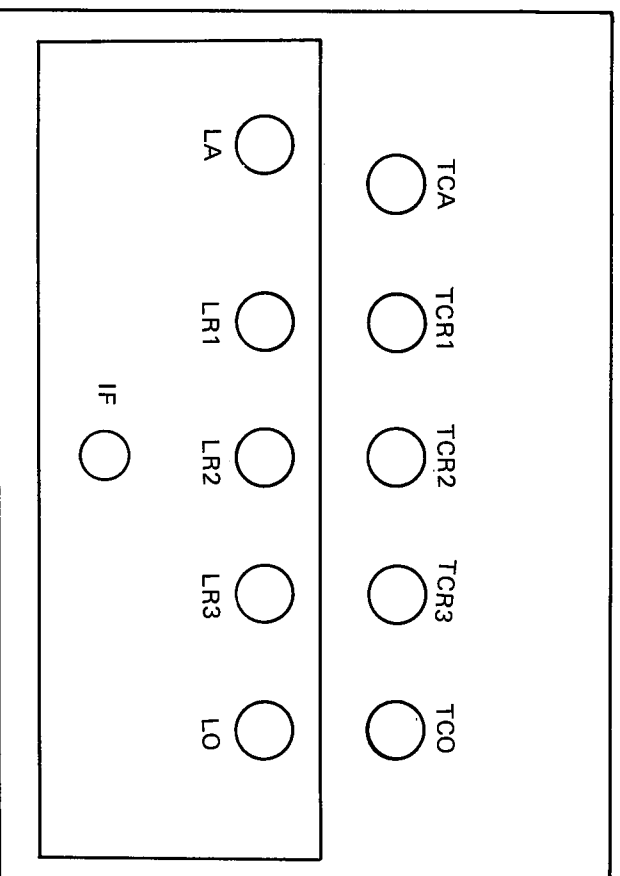


Figure 4. FM FRONT END (TOP VIEW)

FM MPX and Stereo Separation Alignment

Except in the case of IC103 (HA-11223) being replaced, no readjustments are required.

1. SWITCH setting:

Set MODE switch to "STEREO MUTING ON" position and IF BAND to "WIDE" position.

2. To adjust a correct VCO, a buffer amplifier should be connected between VCO test point "55" and the frequency counter. This amplifier should have high input impedance, which is more than 470 k ohms at 76 KHz and gains about 40 dB.
3. Set FM signal generator to 108 MHz and attenuate its output for 60 dB.
4. Tune the unit for 108 MHz unmodulated signal and adjust R302 (Figure 3) for 75.93 to 76.07 KHz for correct VCO.
5. Adjust generator to ± 7.5 KHz deviation for 19 KHz pilot signal. Using VTVM, adjust R305 (Figure 3) so that test points "60" and "61" are at the same potential. (Less than 15 millivolts)
6. Adjust generator to ± 67.5 KHz deviation at 1000 Hz for L-channel and to ± 7.5 KHz deviation for 19 KHz pilot signal. Adjust R322 (Figure 3) for minimum output of R-channel.
7. Repeat step 6 for L-channel adjustment for R322.
8. Adjustments with R322, for both L and R channels should be equal.
9. Set IF BAND switch to "NARROW" position and adjust R323 (Figure 3) in the same procedure as steps 6, 7 and 8.
10. Set IF BAND switch to "WIDE" position and set generator for a stereo signal (L or R). Adjust R112 (Figure 2) for minimum distortion.

Note: To correctly adjust for stereo separation, you must first start in the WIDE position, then proceed to the NARROW position.

DIAL CORD INSTALLATION

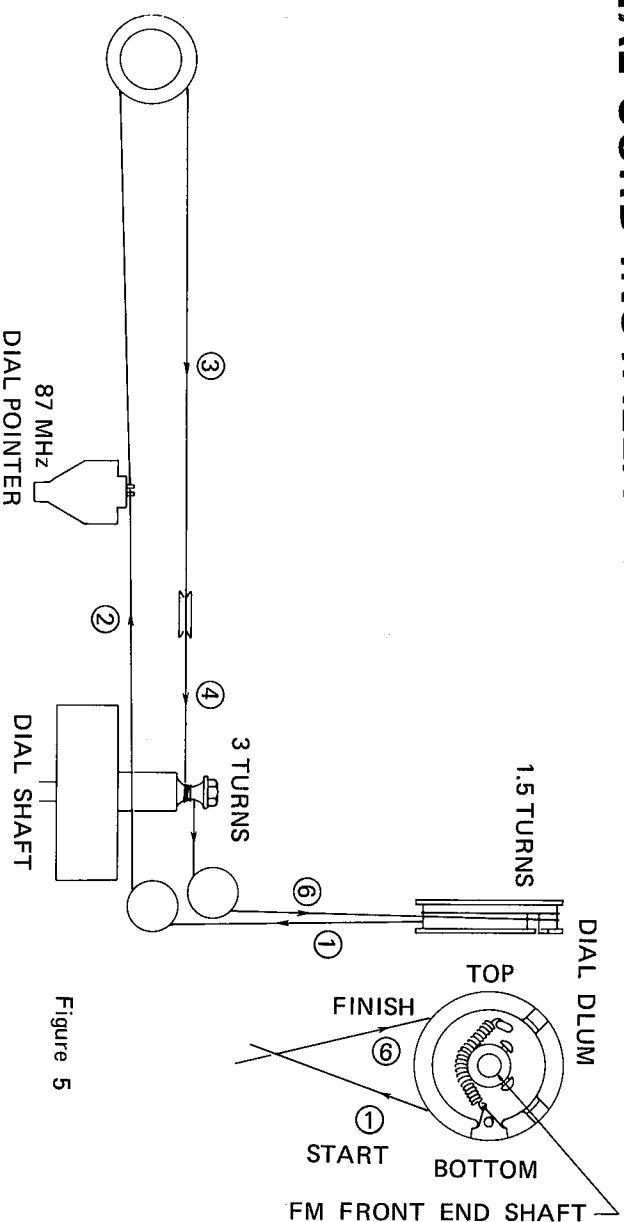


Figure 5

1. To remove "Side Angle Right", remove six tapping screws:
 - a. Two screws from the front edge of side angle.
 - b. Two screws from the right edge of the bottom plate.
 - c. Two screws from the right edge of the back panel.
2. Turn the FM Front end shaft to the left until the rotor of the variable capacitor is completely out of the stator. Locate the pin on dial drum in line with the FM front end shaft on vertical as shown in Figure 5.
3. String the dial drum and pulleys in the direction of arrows. (In circled number order.)
4. Fix dial pointer to the string at a reading of 87 MHz on the dial scale. (Step 2)

CIRCUIT BOARDS

- ⑥ To FRONT END
- ⑦ To FRONT END (GROUND)
- ⑧ To FRONT END
- ⑨ To MPX/REGULATOR C. B.
- ⑩ To MPX/REGULATOR C. B.
- ⑪ To MPX/REGULATOR C. B.
- ⑫ To MPX/REGULATOR C. B.
- ⑬ To MPX/REGULATOR C. B.
- ⑭ To S-METER ⊕
- ⑮ To S-METER ⊖
- ⑯ To MPX REGULATOR C. B.
- ⑰ To T-METER ⊖
- ⑱ To T-METER ⊕
- ⑲ To MULTIPATH GROUND (BACK PLATE)
- ⑳ To MULTIPATH HORIZ (BACK PLATE)
- ㉑ To MULTIPATH VERT (BACK PLATE)
- ㉒ To MPX/REGULATOR C. B.
- ㉓ To MPX/REGULATOR C. B.
- ㉔ To FM DET OUT (BACK PLATE)
- ㉕ To FM DET OUT GROUND (BACK PLATE)

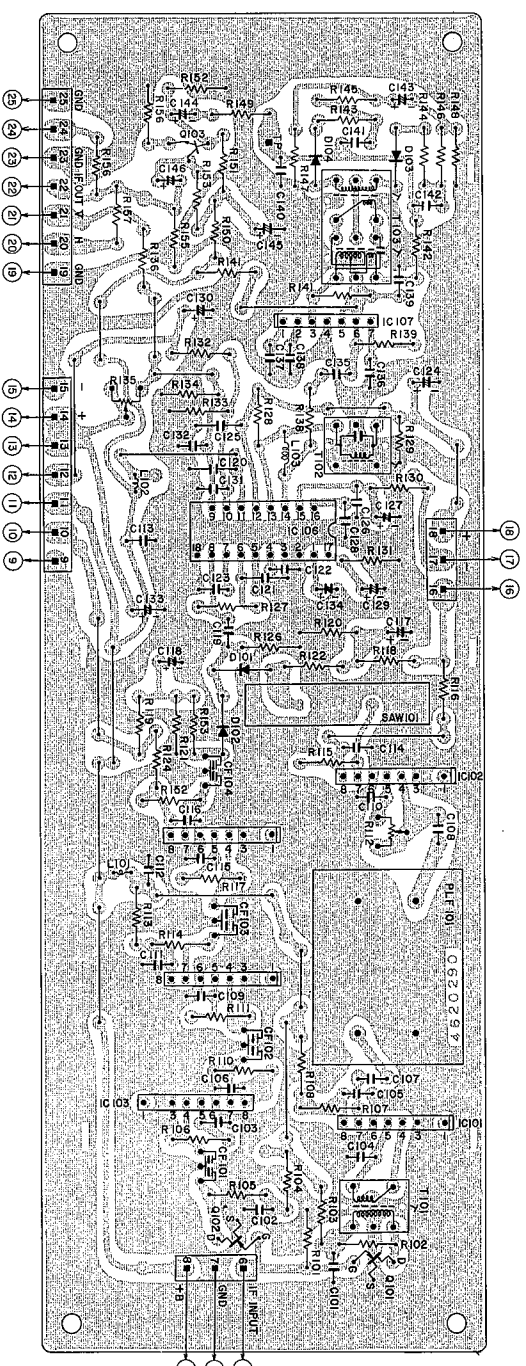


Figure 6. IF CIRCUIT BOARD (BOTTOM VIEW)

- ⑨ To I-F PCB
- ⑩ To I-F C. B.
- ⑪ To I-F C. B.
- ⑫ To I-F C. B.
- ⑬ To I-F C. B.
- ⑭ To I-F C. B.
- ⑮ To I-F C. B.
- ⑯ To I-F C. B.
- ⑰ To I-F C. B.
- ⑱ To I-F C. B.
- ⑳ To LED 4 ⊕
- ㉑ To LED 4 ⊖
- ㉒ To LAMP
- ㉓ To LAMP
- ㉔ To R3 (OUTPUT LEVEL R) To OUTPUT FIXED R (BACK PLATE)
- ㉕ To GROUND (OUTPUT LEVEL) To R2 (OUTPUT LEVEL L) To OUTPUT FIXED L (BACK PLATE)
- ㉖ TEST POINT
- ㉗ To S5a DE-EMPHASIS L (BACK PLATE)
- ㉘ To S5b DE-EMPHASIS R (BACK PLATE)

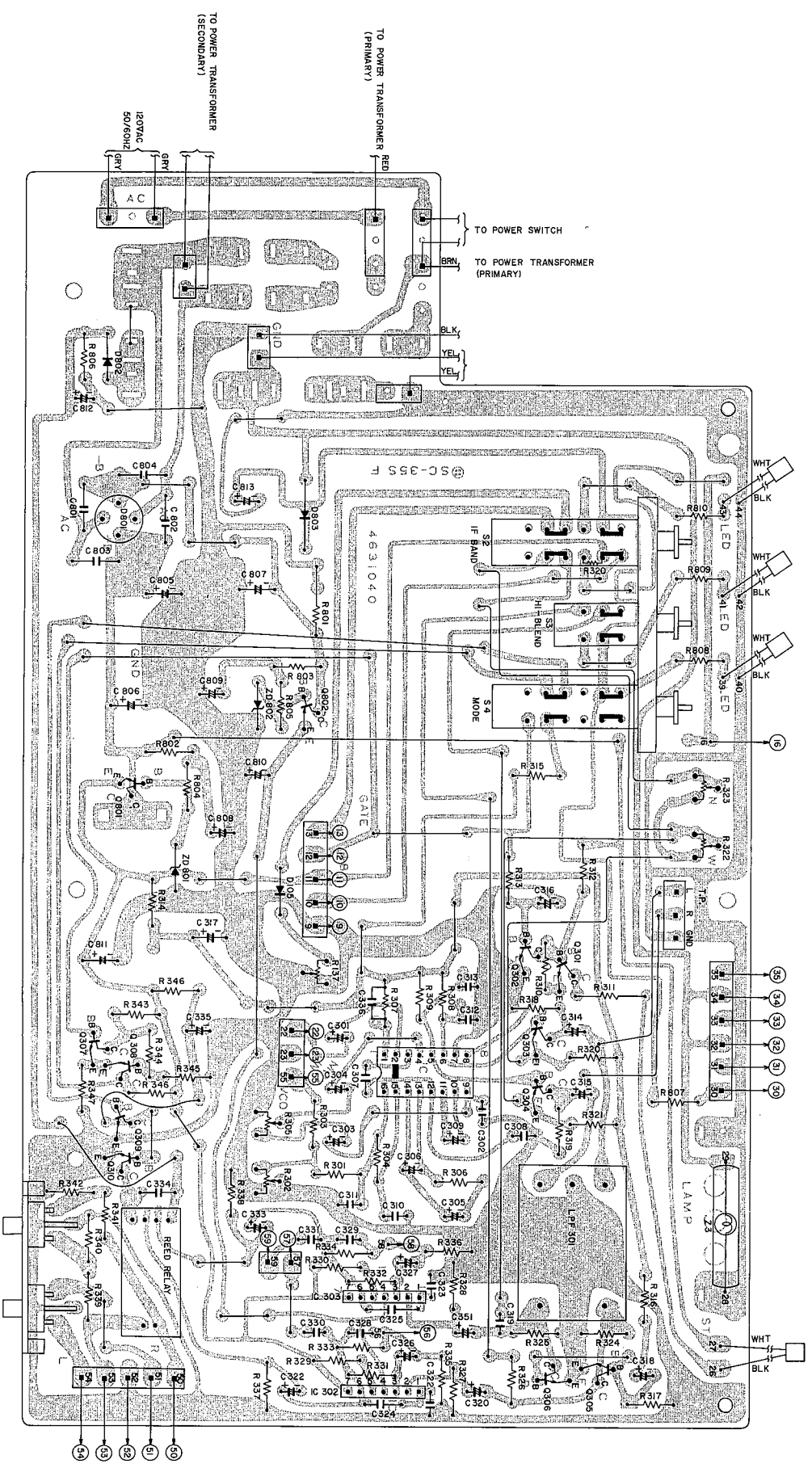
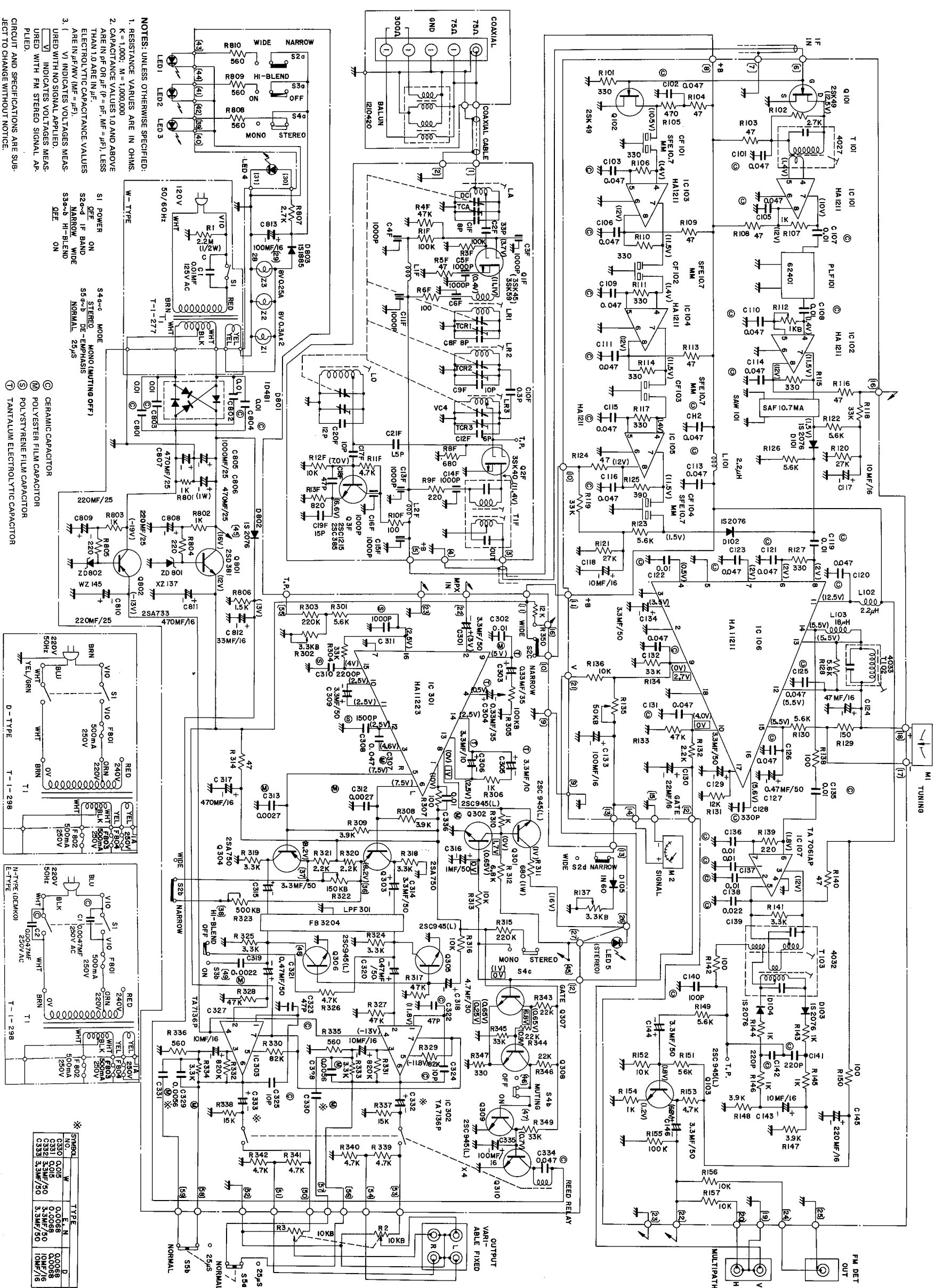


Figure 7. MPX/REGULATOR CIRCUIT BOARD (BOTTOM VIEW)

OVERALL SCHEMATIC DIAGRAM



- NOTES: UNLESS OTHERWISE SPECIFIED:
1. RESISTANCE VALUES ARE IN OHMS. K = 1,000; M = 1,000,000
 2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN PF OR μF (P = PF, M = μF), LESS THAN 1.0 ARE IN nF. ELECTROLYTIC CAPACITANCE VALUES ARE IN μF/WV (M = μF).
 3. () INDICATES VOLTAGES MEASURED WITH NO SIGNAL APPLIED. (V) INDICATES VOLTAGES MEASURED WITH FM STEREO SIGNAL APPLIED.

- RESISTOR COLOR CODES:
- ① 0
 - ② 1
 - ③ 2
 - ④ 3
 - ⑤ 4
 - ⑥ 5
 - ⑦ 6
 - ⑧ 7
 - ⑨ 8
 - ⑩ 9
 - ⑪ 00
 - ⑫ 01
 - ⑬ 02
 - ⑭ 03
 - ⑮ 04
 - ⑯ 05
 - ⑰ 06
 - ⑱ 07
 - ⑲ 08
 - ⑳ 09
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 - ⑦ 96
 - ⑧ 97
 - ⑨ 98
 - ⑩ 99

- W-TYPE MODE:
- ① 0
 - ② 1
 - ③ 2
 - ④ 3
 - ⑤ 4
 - ⑥ 5
 - ⑦ 6
 - ⑧ 7
 - ⑨ 8
 - ⑩ 9
 - ⑪ 00
 - ⑫ 01
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 - ⑦ 96
 - ⑧ 97
 - ⑨ 98
 - ⑩ 99

- RESISTOR COLOR CODES:
- ① 0
 - ② 1
 - ③ 2
 - ④ 3
 - ⑤ 4
 - ⑥ 5
 - ⑦ 6
 - ⑧ 7
 - ⑨ 8
 - ⑩ 9
 - ⑪ 00
 - ⑫ 01
 - ⑬ 02
 - ⑭ 03
 - ⑮ 04
 - ⑯ 05
 - ⑰ 06
 - ⑱ 07
 - ⑲ 08
 - ⑳ 09
 - ㉑ 10
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 - ㉓ 12
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- RESISTOR COLOR CODES:
- ① 0
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 - ⑩ 99

SYMBOL	TYPE	VALUE
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C394	0.005	0.005
C395	0.005	0.005
C396	0.005	0.005
C397	0.005	0.005
C398	0.005	0.005
C399	0.005	0.005
C400	0.005	0.005

