
STEREO FM TUNER
GAMMA I

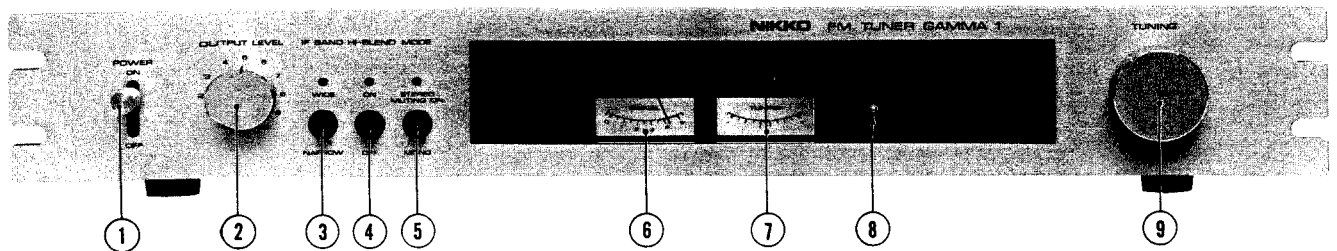


SERVICE MANUAL

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.

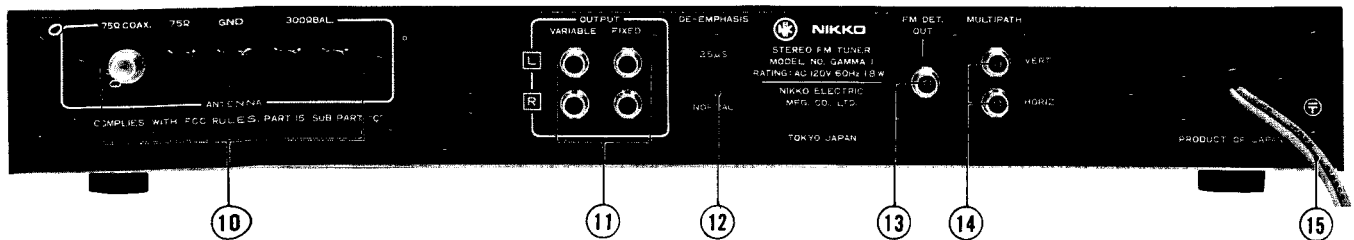
8. STEREO INDICATOR

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	0.75	0.75 \pm 2 dB	0.75	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	μV	.056	1.0	.056	1.0
50 dB Quieting Sensitivity	μV	.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 ± 5	.30	30 ± 5
Subcarrier Product Ratio	STEREO	.70	60	.70	60
Meter Sensitivity		4.5	4.5 ± 0.3	4.5	4.5 ± 0.3
Output Level (Fixed)	Volts	.035	0.35 ± 2 dB	.035	0.35 ± 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, disolder 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.

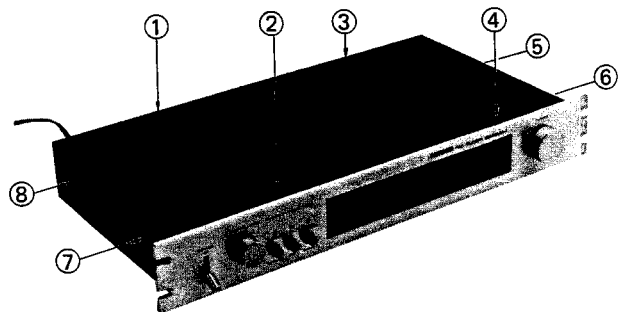


Photo 1

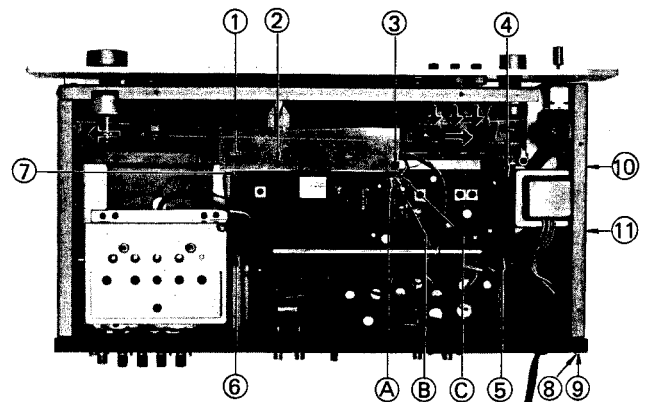


Photo 2



Photo 3

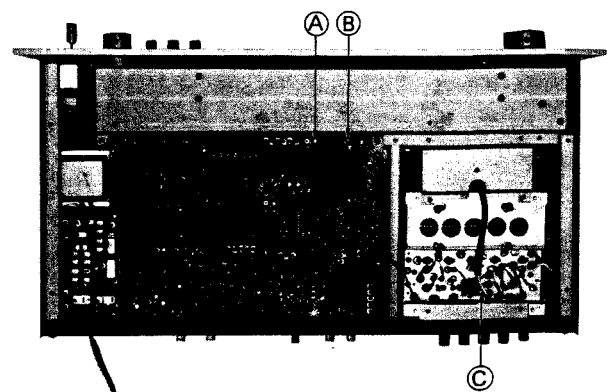


Photo 4

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.

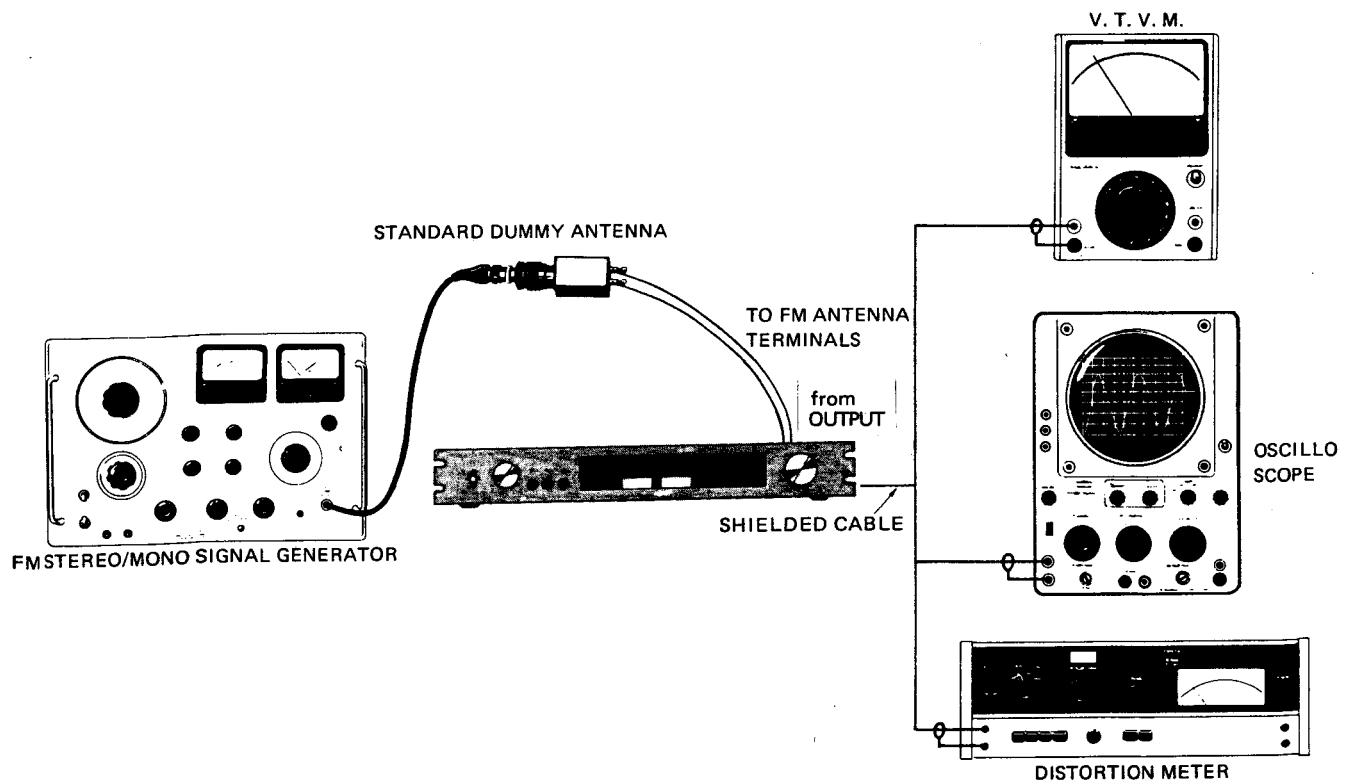


Figure 1. TEST EQUIPMENT

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.

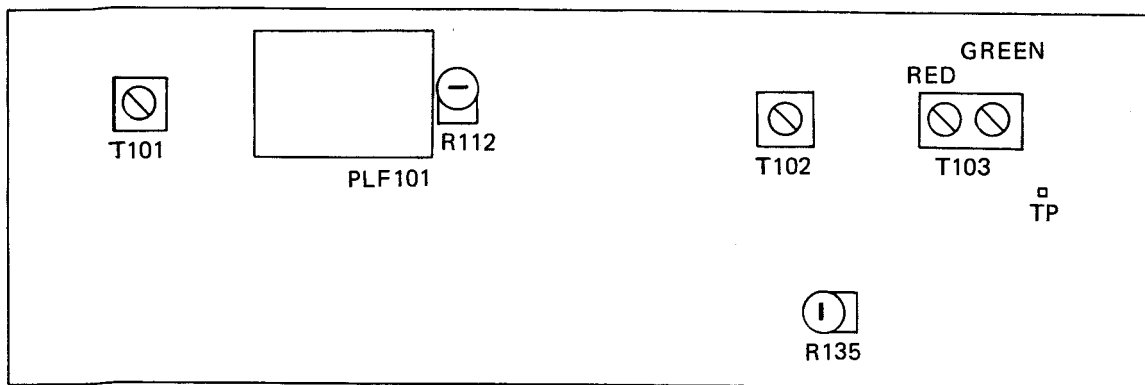


Figure 2. I-F CIRCUIT BOARD (TOP VIEW)

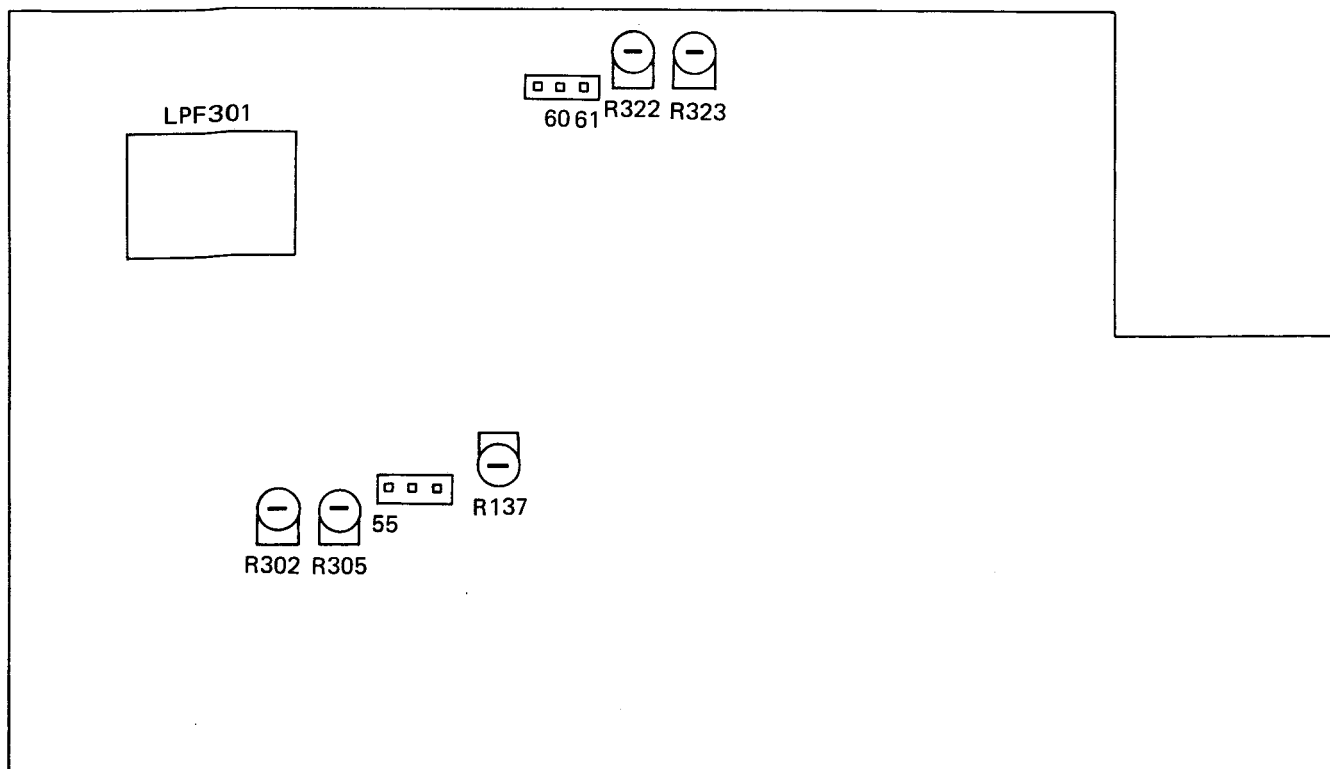


Figure 3. MPX/REGULATOR CIRCUIT BOARD (TOP VIEW)

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.

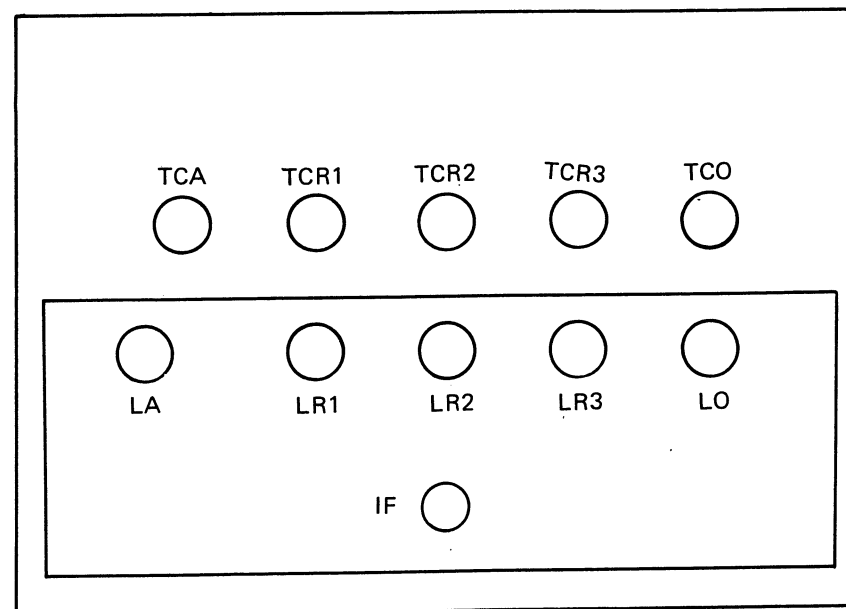


Figure 4. FM FRONT END (TOP VIEW)

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

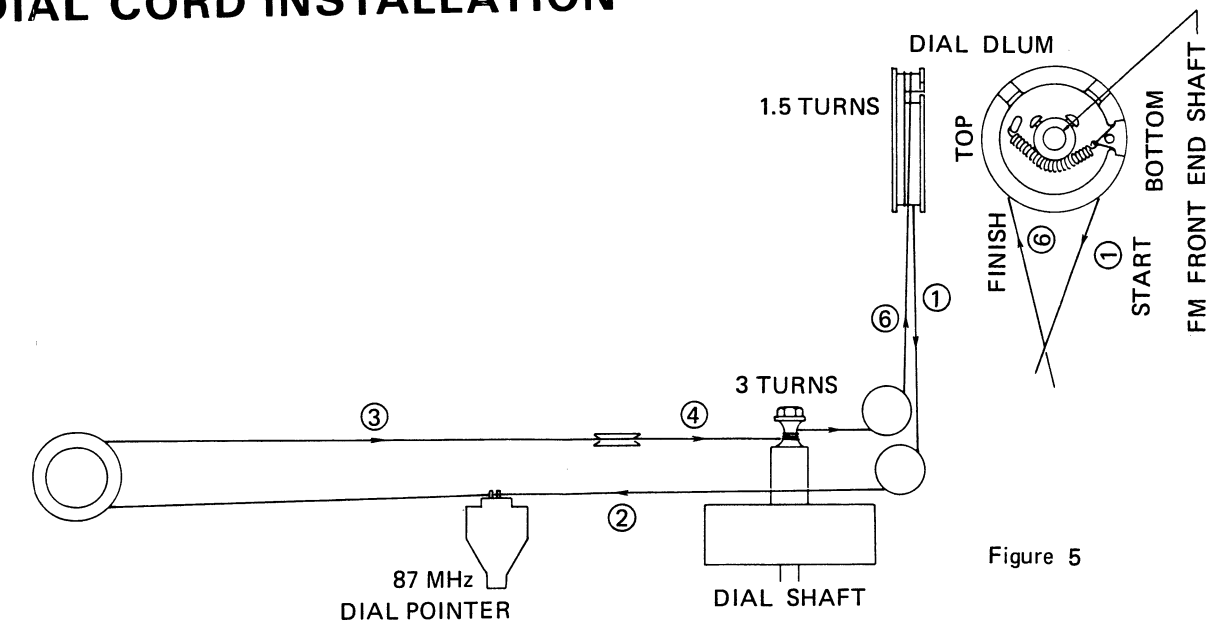


Figure 5

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/REGURATOR C. B. ⑨
- ⑩ To MPX/REGURATOR C. B. ⑩
- ⑪ To MPX/REGURATOR C. B. ⑪
- ⑫ To MPX/REGURATOR C. B. ⑫
- ⑬ To MPX/REGURATOR C. B. ⑬
- ⑭ To S-METER ⊕
- ⑮ To S-METER ⊖
- ⑯ To MPX REGURATOR C. B. ⑯
- 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/REGURATOR C. B. ㉒
- ㉓ To MPX/REGURATOR C. B. ㉓
- ㉔ To FM DET OUT (BACK PLATE)
- ㉕ To FM DET OUT GROUND (BACK PLATE)

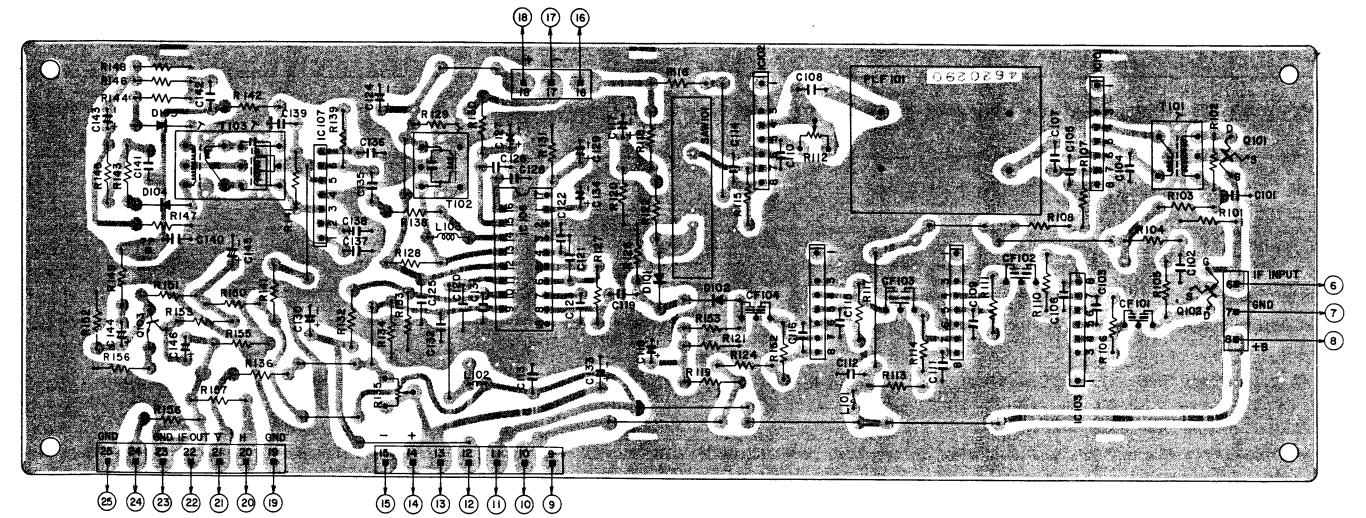


Figure 6. IF CIRCUIT BOARD (BOTTOM VIEW)

- ⑨ To I-F PCB
- ⑩ To I-F C. B. ⑩
- ⑪ To I-F C. B. ⑪
- ⑫ To I-F C. B. ⑫
- ⑬ To I-F C. B. ⑬
- ⑯ To I-F C. B. ⑯
- ㉒ To I-F C. B. ㉒
- ㉓ To I-F C. B. ㉓
- ⑳ To LED 4 ⊕
- ㉑ To LED 4 ⊖
- ㉒ ㉓ To LAMP
- ㉔ ㉕ To LAMP
- ⑵ To R3 (OUTPUT LEVEL R)
- ⑶ To OUTPUT FIXED R (BACK PLATE)
- ⑷ To GROUND (OUTPUT LEVEL)
- ⑸ To R2 (OUTPUT LEVEL L)
- ⑹ To OUTPUT FIXED L (BACK PLATE)
- ⑺ TEST POINT
- ⑻ ⑿ To S5a DE-EMPHASIS L (BACK PLATE)
- ⑼ ⑽ To S5b DE-EMPHASIS R (BACK PLATE)

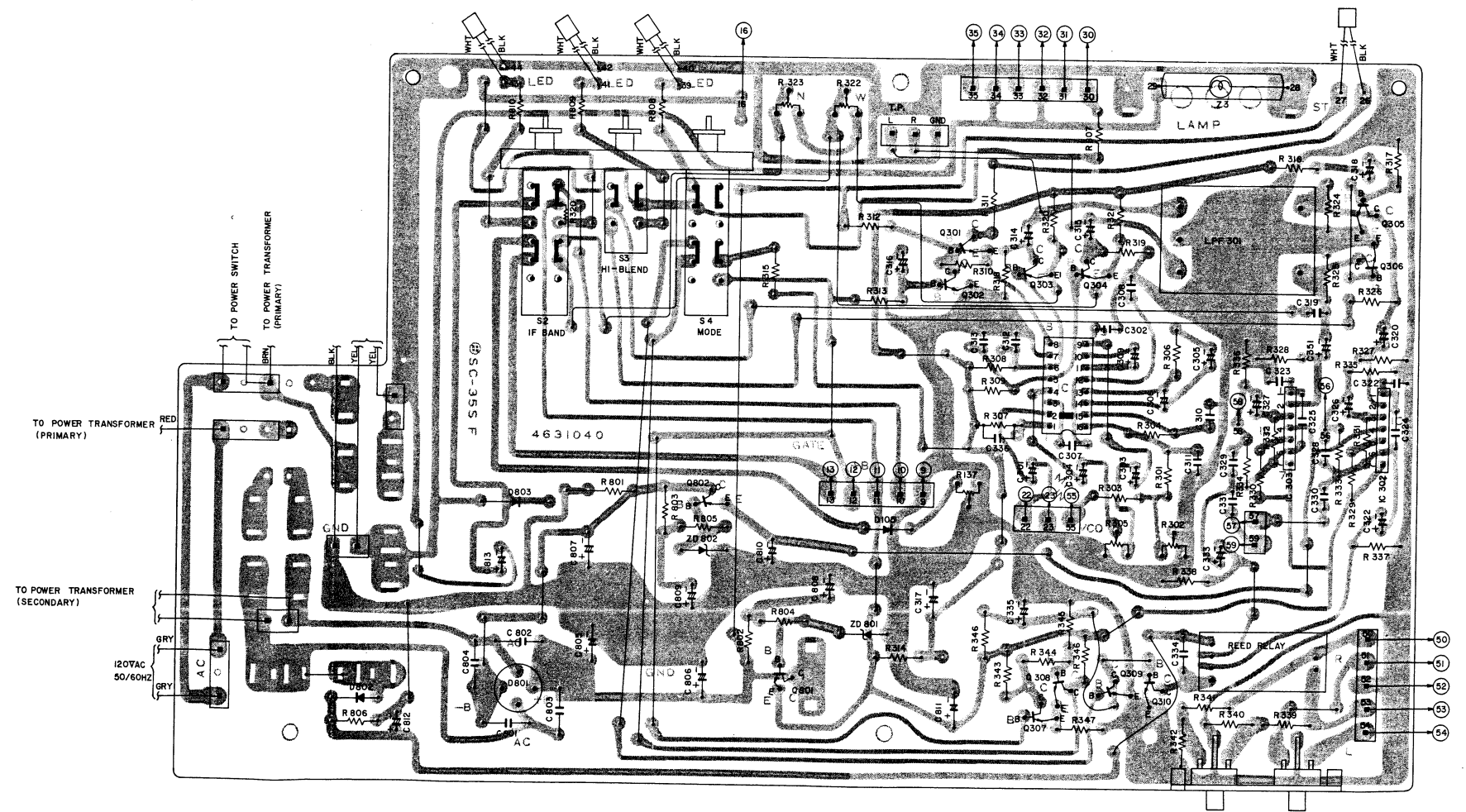
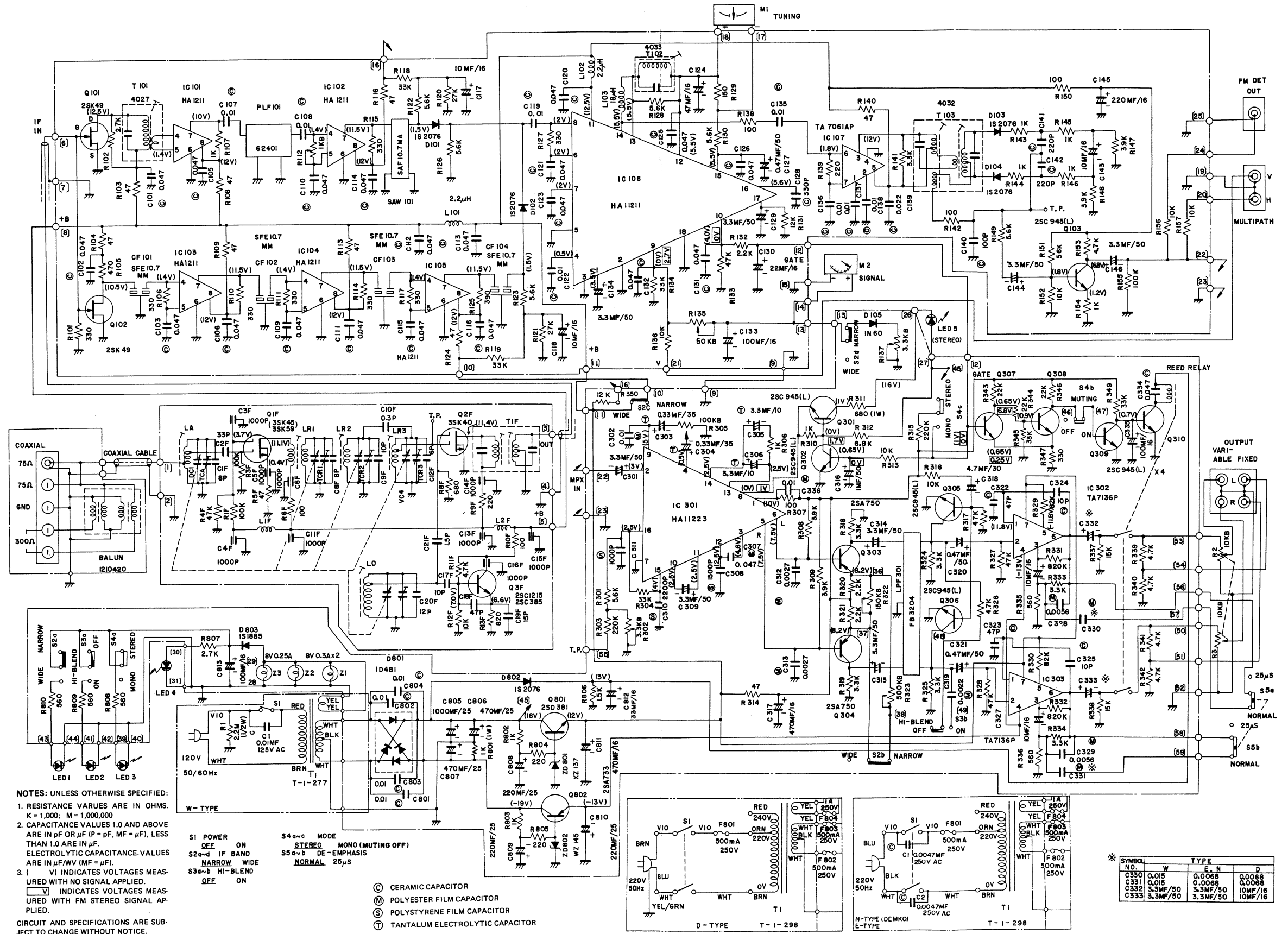


Figure 7. MPX/REGURATOR CIRCUIT BOARD (BOTTOM VIEW)

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 μ F (P = pF, MF = μ F), LESS THAN 1.0 ARE IN μ F.
 ELECTROLYTIC CAPACITANCE VALUES ARE IN μ F/VV (MF = μ F).
 3. () (V) INDICATES VOLTAGES MEASURED WITH NO SIGNAL APPLIED.
 (V) INDICATES VOLTAGES MEASURED WITH FM STEREO SIGNAL APPLIED.

S1 POWER ON
 S2-a-b IF BAND
 S3-a-b WIDE
 S4-a-b HI-BLEND ON

S4-a-c MODE
 S5-a-b DE-EMPHASIS
 NORMAL 25 μ S

- (C) CERAMIC CAPACITOR
- (P) POLYESTER FILM CAPACITOR
- (M) POLYSTYRENE FILM CAPACITOR
- (T) TANTALUM ELECTROLYTIC CAPACITOR

NO.	W	E	N	D
C330	0.015	0.0068	0.0068	
C331	0.015	0.0068	0.0068	
C332	3.3MF/50	3.3MF/50	3.3MF/50	10MF/16
C333	3.3MF/50	3.3MF/50	3.3MF/50	10MF/16

PARTS LOCATION

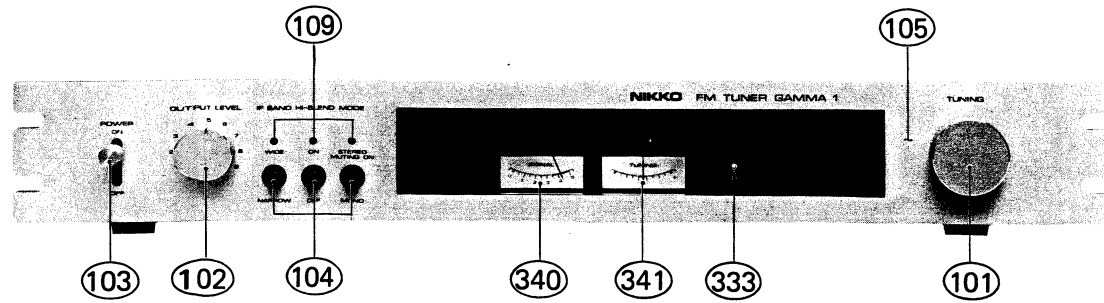


Photo 5

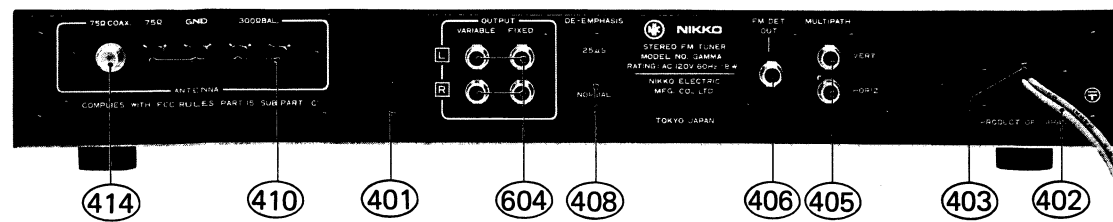


Photo 6

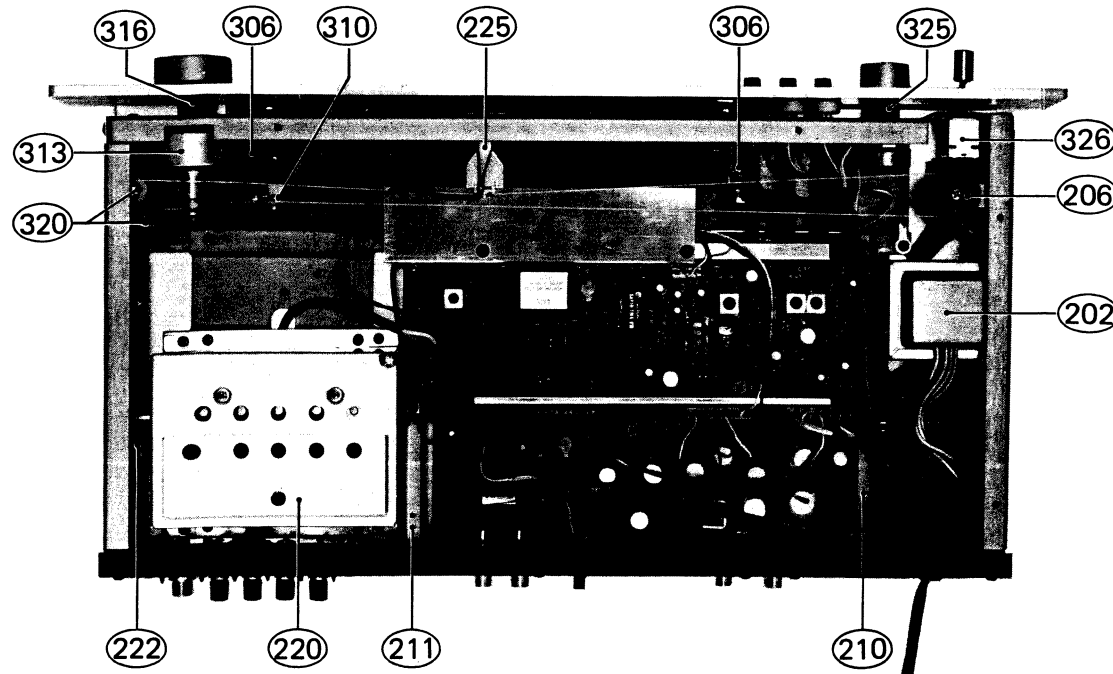


Photo 7

PARTS LIST

NOTES:

- * The KEY NUMBER (#) marked with a (*) on parts list relate to number of three digits with a () . (Photo 1 ~ 7).
- + Numerals in file indicate the quantity of parts used in one type.
- ++ TR : Transistor
FET : Field effect transistor
IC : Integrated circuit
VR : Volume control (Variable resistor)
RES : Carbon film fixed resistor
MORES : Metal oxide film fixed resistor
CEMRES : Cemented wirewound fixed resistor
FP : Flame proof
C-CAP : Ceramic capacitor
E-CAP : Aluminium electrolytic capacitor

M-CAP : Polyester film capacitor
S-CAP : Polystyrene film capacitor
T-CAP : Tantalum electrolytic capacitor
BP-CAP : Bipolar electrolytic capacitor

E-CAP, T-CAP and BP-CAP values (1 x 10uF) are in (1) uF, (10) V.

4. Assemblies and parts are subject to change without notice.

5. Parts ordering procedure:

Include in any order

- Part number.
- Part description.
- Model number.

(Any of the above lacking from an order may delay shipment of that order.)

KEY NO.	SYMBOL NO.	TYPE*	DESCRIPTION**	PART NO.
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PACKING MATERIALS & ACCESSORIES

001	1111	CARTON BOX	9825310
002	2222	STYROL PAD	9840660
003	1111	POLY SACK	9640680
004	111-	POLY SACK #1	9640590
005	111-	POLY SACK #13	9640320
006	---	ENVELOPE (G)	9690170
007a	1---	INSTRUCTION MANUAL USA	960191E
007b	---	INSTRUCTION MANUAL Canada	960216E
007c	- 11-	INSTRUCTION MANUAL K	960201K
007d	---	INSTRUCTION MANUAL D	960204G
008	1---	WARRANTY CARD (N)	967003A
009	1111	POLISHING CLOTH	9690040
010	1111	SILICAGEL - dryer	9690010
011	1111	PIN PLUG CORD 2T	962012J
012	1111	Q-MATCH ANT (EX) - FM antenna	4581360

CABINET ASSEMBLY

(CHAMPAGNE-GOLD TYPE)

*101a	1111	KNOB 2GL-34 (tuning)	7851660	
*102a	1111	KNOB 2GL-23D (output level)	7851670	
*103	1111	KNOB PC-16 (power)	7850590	
*104	3333	PUSHBUTTON P8B (IF band, hi-brend, mode)	7851700	
*105a	1111	PNL - front panel (gold)	7883680	
106	↑	3333	PUSHBUTTON GUIDE (G)	7401360
107	↑	1111	DUST COVER 2442	7001760
*108	↑	1111	DIAL SMOKED GLASS	7802240
*109	3333	LED 3φ x 4.5 GD-4-207 RD	506001S	
110	3333	LED HOLDER	7903060	
*111a	1---	METAL COVER W	7820740	
111b	- 111	METAL COVER E-N-D	7820750	
*112	↑	4444	TFTS 4φ x 10 BLACK - screw	887410W
*113	↑	4444	W 4φ BLACK - washer	893104W
*114	↑	4444	PTS 3φ x 6 BLACK - screw	814306W
115	4444	FOOT (TG)	7401350	
116	↑	4444	PTS 3φ x 8 - screw	814308S
117	↑	2222	SN 9φ - nut	892249S
118	↑	2222	W 9φ - washer	893109S

KEY NO.	SYMBOL NO.	TYPE*	DESCRIPTION**	PART NO.
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(BLACK TYPE)

101b	1111	KNOB 2BK-34 (tuning)	7851750	
102b	1111	KNOB 2BK-23D (output level)	7851770	
103	1111	KNOB PC-16 (power)	7850590	
104	3333	PUSHBUTTON P 8 B (IF band, hi-brend, mode)	7851700	
105b	111-	PNL - front panel (black & white)	7883810	
105c	---	PNL - front panel (black & yellow)	7883800	
106	↑	3333	BUTTON GUIDE (G)	7401360
107	↑	1111	DUST COVER 2442	7001760
108	↑	1111	DIAL SMOKED GLASS	7802240
109	3333	LED 3φ x 4.5 GD-4-207RD	506001S	
110	3333	LED HOLDER	7903060	
111a	1---	METAL COVER W	7820740	
111b	- 111	METAL COVER E-N-D	7820750	
112	↑	4444	TFTS 4φ x 10 BLACK - screw	887410W
113	↑	4444	W 4φ BLACK - washer	893104W
114	↑	4444	PTS 3φ x 6 BLACK - screw	814306W
115	4444	FOOT (TG)	7401350	
116	↑	4444	PTS 3φ x 8 - screw	814308S
117	↑	2222	SN 9φ - nut	892249S
118	↑	2222	W 9φ - washer	893109S

CHASSIS ASSEMBLY

((FRONT PLT ASS))				
((BACK PLT ASS))				
*201	1111	SIDE ANGLE (L)	7226290	
*202a	1---	POWER TRANSFORMER T-1-277 120V	1102770	
202b	- 111	POWER TRANSFORMER T-1-298 220V/240V	1102980	
203	↑	2222	PT STP PLATE	7031290
204	↑	2222	PMS 4φx10 - screw	810410S
205	1111	PULLEY BRACKET (S)	7031400	
*206	↑	1111	PULLEY 20φ	7400830
207	↑	1111	PULLEY SHAFT 4L	7120980
208	↑	4444	PTS 3φ x 6 - screw	814306S
209	↑	2222	PTS 3φ x 6 BLACK - screw	814306W
*210	1111	PCB ANGLE (L)	7226340	
*211	1111	PCB ANGLE (R)	7226350	
212	↑	4444	PTS 3φ x 6 BLACK - screw	814306W
213	↑	2222	PTS 3φ x 6 - screw	814306S
600	((MPX REG PCB ASS))			
214	↑	4444	PTS 3φ x 6 - screw	814306S
215	↑	2222	PTS 3φ x 10 BLACK - screw	814310W
216	1111	FRONT END HOLDER	8031440	
217	↑	2222	PTS 3φ x 6 - screw	814306S
*218	1111	BOTTOM PLATE	7324750	

PART ORDERING PROCEDURE ----- Include in any order : A. Part number, B. Part description, C. Model number.
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KEY NO.	SYMBOL NO.	TYPE ⁺ W-type E-type N-type D-type	DESCRIPTION**	PART NO.	KEY NO.	SYMBOL NO.	TYPE ⁺ W-type E-type N-type D-type	DESCRIPTION**	PART NO.
FRONT PLATE ASSEMBLY					BLACK PLATE ASSEMBLY				
*219	↑	9999	PTS 3φ x 6 - screw	814306S					
*220		1111	FRONT END FS114U13	4910070					
221	↑	4444	PTS 3φ x 6 - screw	814306S	401a		1---	BACK PLATE W	7324760
*222		1111	DIAL DRUM 37φ MK2	7400860	401b		- 111	BACK PLATE E-N-D	7324860
223	↑	1111	SPRING (R)	7440380	*402a		1---	PLUG CORD KP-2	606002J
224		1111	DIAL CORD	4580430	402b		- 11-	PLUG CORD CEE-2T	600506J
*225		1111	NEEDLE - dial pointer	7860550	402c		---1	PLUG CORD CEE-3T	601809A
*226		1111	SIDE ANGLE (R)	7226310	*403a		1---	CORD STOPPER SR-3P-4	7400620
227	↑	4444	PTS 3φ x 6 - screw	814306S	403b		- 11-	CORD STOPPER SR-4N-4	7400690
228	↑	2222	PTS 3φ x 6 BLACK - screw (I-F PCB ASS)	814306W	403c		---1	CORD STOPPER SR-6W-1	7400740
500					404a		1---	CORD BRACKET (W)	7031460
229	↑	4444	PTS 3φ x 8 - screw	814308S	404b		- 111	CORD BRACKET (E)	7031680
230		1---	SHIELD PLATE (G)	7031550	*405		1111	WP PIN TERMINAL 2P (CE)	4442010
231		- 111	SHIELD PLATE (D)	7031670	*406		1111	WP PIN TERMINAL 1P	4440190
232		1111	LUG 1L-2P (R)	441120R	407	↑	4444	PTS 3φ x 10 BLACK - screw	814310W
*233		1111	BACK GND G2 - plate	7226430	408	S5	1111	SLIDE SWITCH SL-13 (de-emphasis)	4020440
234	↑	2222	PUSH RIVET FNRP 3 x 3.5	7401190	409	↑	2222	PMS 3φ x 6 BLACK - screw	810306W
235		2222	W 3φ - washer	893403S	*410		1111	ANTENNA TERMINAL 5P	4450540
					411		1111	ANTENNA PCB	4620280
					412		1111	BALUN COIL	1210420
					413	↑	2222	PTS 3φ x 10 BLACK - screw	814310W
					414		1111	COAXIAL PLUG P212B	4530530
					415		1111	BACK PLATE ANGLE	7031450
					416	↑	2222	PTS 3φ x 6 BLACK - screw	814306W
					417		1111	EARTH LUG	440000D
					418	↑	1111	TW (I) 3φ - washer	893403U
					419	↑	1111	PMS 3φ x 6 - screw	810306W
					420	↑	1111	IN 3φ - nut	892013S
301		1111	FRONT PLATE	7324740					
302		1111	DIAL BACK	7226330					
303		1111	SIDE BRACKET (L)	7031420					
304		1111	SIDE BRACKET (R)	7031430					
305		4444	PTS 3φ x 6 - screw	814306S					
*306		2222	REFLECTOR - light guide acrylic resin plate	7401370					
307		2222	LAMP 8V 0.3A BF352-54010A (dial scale)	5808120					
308	↑	4444	PTS 3φ x 8 - screw	814308S					
309		1111	PULLEY BRACKET (D)	7031380					
*310		1111	PULLEY 9φ	7400790					
311		1111	PULLEY SHAFT 4L	7120980					
312	↑	2222	PTS 3φ x 6 - screw	814306S					
*313		1111	DIAL SHAFT	7152360					
314	↑	1111	W 9φ - washer	893109S					
315	↑	1111	TW (I) 9φ - washer	893409U					
*316		1111	NUT	7152350					
317		1111	PULLEY HOLDER	7031410	500		1111	I-F PCB ASS - complete circuit board	9410400
318	↑	1111	PULLEY BRACKET (F)	7031390					
319	↑	1111	PULLEY BRACKET (B)	7031370					
*320	↑	2222	PULLEY 9φ	7400790					
321	↑	2222	PULLEY SHAFT 4L	7120980					
322	↑	7777	PTS 3φ x 6 - screw	814306S					
323	R2, R3	1111	VR, V24L5GN25R, B10 Kohm x 2	4320770		C101			
324	↑	1111	W 8φ - washer	893108S		~C106	6666	C-CAP 0.047uF 80, -20% 50V YG	231473Z
*325	↑	1111	SPACER 885	7152230		C107	1111	C-CAP 0.01uF 80, -20% 50V YG	231103Z
*326a	S1	1---	LV SW SY02 U74SF TV-3 (power) - lever switch	4025210		C108	1111	C-CAP 0.01uF 80, -20% 50V YG	231103Z
326b	S1	- 111	LV SW SY02 U80DV-S 27 (8) (power) - lever switch	4025150		C109			
327	↑	2222	PMS 3φ x 6 - screw	810306S		~C116	8888	C-CAP 0.047uF 80, -20% 50V YG	231473Z
328a		1---	C-CAP 0.0047uF 125V AC	239472C		C117	1111	E-CAP 16R10uF	211220Q
328b		- 222	C-CAP 0.0047uF 250V AC	239472E		C118	1111	E-CAP 16R10uF	211220Q
329	↑	1222	C-CAP COVER (M)	7400980		C119	1111	C-CAP 0.01uF 80, -20% 50V YG	231103Z
330	R1	1---	RES 2.2 M ohm 10% 1/2W	325225K		C120	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
331		1---	EARTH LUG	440000D		C121	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
332	↑	1---	TW (I) 3φ - washer	893403U		C122	1111	C-CAP 0.01uF 80, -20% 50V YG	231103Z
333	↑	1---	PTS 3φ x 6 - screw	814306S		C123	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
*334	↓	1111	LED 3φ x 4.5	506001S		C124	1111	E-CAP 16R47uF	211225Q
335	↓	1111	LED HOLDER	7903060		C125	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
336		1111	LED PLATE	7031640		C126	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
337	↑	2222	PUSH RIVET 3 x 3.5	7401190		C127	1111	E-CAP 50R0.47uF	211505Q
338		1111	SCALE HOLDER	7226320		C128	1111	C-CAP 330pF 10% 50V SL	232331K
339		1111	DIAL SCALE	7802230		C129	1111	E-CAP 50R3.3uF	211513Q
340	↑	4444	PTS 3φ x 6 - screw	814306S		C130	1111	E-CAP 16R22uF	211222Q
*341	M2	1111	METER (signal)	4582110		C131	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
*342	M1	1111	METER (tuning)	4582120		C132	1111	C-CAP 0.047uF 80, -20% 50V YG	231473Z
343	↑	1111	CLAMP SPRING	744022A		C133	1111	E-CAP 16R100uF	211230Q
						C134	1111	E-CAP 50R3.3uF	211513Q
						C135			
						~138	4444	C-CAP 0.01uF 80, -20% 50V YG	231103Z

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KEY NO.	SYMBOL NO.	TYPE* W-type Z-type D-type	DESCRIPTION**	PART NO.	KEY NO.	SYMBOL NO.	TYPE* W-type Z-type D-type	DESCRIPTION**	PART NO.
C139	1111		C-CAP 0.022uF 80, -20% 50V YG	231223Z	R143	1111	RES 1 Kohm 5% 1/4W	328102J	
C140	1111		C-CAP 100pF 10% 50V SL	232101K	R144	1111	RES 1 Kohm 5% 1/4W	328102J	
C141	1111		C-CAP 220pF 10% 50V SL	232221K	R145	1111	RES 1 Kohm 5% 1/4W	328102J	
C142	1111		C-CAP 220pF 10% 50V SL	232221K	R146	1111	RES 1 Kohm 5% 1/4W	328102J	
C143	1111		E-CAP 16R10uF	211220Q	R147	1111	RES 3.9 Kohm 5% 1/4W	328392J	
C144	1111		E-CAP 50R3.3uF	211513Q	R148	1111	RES 3.9 Kohm 5% 1/4W	328392J	
C145	1111		E-CAP 16R220uF	211232Q	R149	1111	RES 5.6 Kohm 5% 1/4W	328562J	
C146	1111		E-CAP 50R3.3uF	211513Q	R150	1111	RES 100 ohm 5% 1/4W	328101J	
CF101	1111		CERAMIC FILTER SFE10.7MM-A	1280410	R151	1111	RES 56 Kohm 5% 1/4W	328563J	
CF102	1111		CERAMIC FILTER SFE10.7MM-A	1280410	R152	1111	RES 10 Kohm 5% 1/4W	328103J	
CF103	1111		CERAMIC FILTER SFE10.7MM-A	1280410	R153	1111	RES 4.7 Kohm 5% 1/4W	328472J	
CF104	1111		CERAMIC FILTER SFE10.7MM-A	1280410	R154	1111	RES 1 Kohm 5% 1/4W	328102J	
D101					R155	1111	RES 100 Kohm 5% 1/4W	328104J	
~D104	4444		DIODE 1S2076	501019S	R156	1111	RES 10 Kohm 5% 1/4W	328103J	
IC101					R157	1111	RES 10 Kohm 5% 1/4W	328103J	
~IC105	5555		IC HA1211	518053S	SAW101	1111	FILTER SAF10.7MA1	1280370	
IC106	1111		IC HA11211	518052S	T101	1111	FM IFT - transformer	1240270	
IC107	1111		IC TA7061AP	518047S	T102	1111	FM IFT (BLK) - transformer	1240330	
L101	1111		INDUCTOR FL4H 2R2M 2.2uH 20%	1210860	T103	1111	FM DET SW10G - transformer	1240320	
L102	1111		INDUCTOR FL4H 2R2M 2.2uH 20%	1210860					
L103	1111		INDUCTOR 180J RC-157 18uH 5%	1210850					
PLF101	1111		P.L.FILTER 62401	1280350					
Q101	1111		FET 2SK49	516018S					
Q102	1111		FET 2SK49	516018S	600a	1---	MPX REG PCB ASS W - complete circuit board	9492420	
Q103	1111		TR 2SC945 (P, Q)	515077S	600b	-1--	MPX REG PCB ASS E - complete circuit board	9492530	
R101	1111		RES 330 ohm 5% 1/4W	328331J	600c	--1-	MPX REG PCB ASS N - complete circuit board	9492530	
R102	1111		RES 2.7 Kohm 5% 1/4W	328272J	600d	---1	MPX REG PCB ASS D - complete circuit board	9492520	
R103	1111		RES 47 ohm 5% 1/4W	328470J					
R104	1111		RES 47 ohm 5% 1/4W	328470J					
R105	1111		RES 470 ohm 5% 1/4W	328471J					
R106	1111		RES 330 ohm 5% 1/4W	328331J					
R107	1111		RES 1 Kohm 5% 1/4W	328102J					
R108	1111		RES 47 ohm 5% 1/4W	328470J					
R109	1111		RES 47 ohm 5% 1/4W	328470J					
R110	1111		RES 330 ohm 5% 1/4W	328331J					
R111	1111		RES 330 ohm 5% 1/4W	328331J					
R112	1111		HVR, RVA-7B, 1 Kohm - potentiometer	4300750					
R113	1111		RES 47 ohm 5% 1/4W	328470J					
R114	1111		RES 330 ohm 5% 1/4W	328331J					
R115	1111		RES 330 ohm 5% 1/4W	328331J					
R116	1111		RES 47 ohm 5% 1/4W	328470J					
R117	1111		RES 330 ohm 5% 1/4W	328331J					
R118	1111		RES 33 Kohm 5% 1/4W	328333J					
R119	1111		RES 33 Kohm 5% 1/4W	328333J					
R120	1111		RES 27 Kohm 5% 1/4W	328273J					
R121	1111		RES 27 Kohm 5% 1/4W	328273J					
R122	1111		RES 5.6 Kohm 5% 1/4W	328562J					
R123	1111		RES 5.6 Kohm 5% 1/4W	328562J					
R124	1111		RES 47 ohm 5% 1/4W	328470J					
R125	1111		RES 390 ohm 5% 1/4W	328391J					
R126	1111		RES 5.6 Kohm 5% 1/4W	328562J					
R127	1111		RES 330 ohm 5% 1/4W	328331J					
R128	1111		RES 5.6 Kohm 5% 1/4W	328562J					
R129	1111		RES 150 ohm 5% 1/4W	328151J					
R130	1111		RES 5.6 Kohm 5% 1/4W	328562J					
R131	1111		RES 12 Kohm 5% 1/4W	328123J					
R132	1111		RES 2.2Kohm 5% 1/4W	328222J					
R133	1111		RES 47 Kohm 5% 1/4W	328473J					
R134	1111		RES 33 Kohm 5% 1/4W	328333J					
R135	1111		HVR, RVA-7B, 50 Kohm - potentiometer	4300780					
R136	1111		RES 10 Kohm 5% 1/4W	328103J					
R138	1111		RES 100 ohm 5% 1/4W	328101J					
R139	1111		RES 220 ohm 5% 1/4W	328221J					
R140	1111		RES 47 ohm 5% 1/4W	328470J					
R141	1111		RES 3.3 Kohm 5% 1/4W	328332J					
R142	1111		RES 100 ohm 5% 1/4W	328101J					
					C301	1111	E-CAP 50R3.3uF	211513Q	
					C302	1111	M-CAP 0.01uF 10% 50V	222103K	
					C303	1111	T-CAP 35D0.33uF	252403M	
					C304	1111	T-CAP 35D0.33uF	252403M	
					C305	1111	T-CAP 10D3.3uF	252113M	
					C306	1111	T-CAP 10D3.3uF	252113M	
					C307	1111	M-CAP 0.047uF 10% 50V	222473K	
					C308	1111	S-CAP 1500pF	223152V	
					C309	1111	E-CAP 50R3.3uF	211513Q	
					C310	1111	S-CAP 2200pF	223222V	
					C311	1111	S-CAP 1000pF	223102V	
					C312	1111	M-CAP 0.0027uF	222272J	
					C313	1111	M-CAP 0.0027uF	222272J	
					C314	1111	E-CAP 50R3.3uF	211513Q	
					C315	1111	E-CAP 50R3.3uF	211513Q	
					C316	1111	E-CAP 50R1uF	211510Q	
					C318	1111	E-CAP 50R4.7uF	211515Q	
					C319	1111	M-CAP 0.0022uF 10% 50V	222222K	
					C335	1111	E-CAP 16R470uF	211235V	
					C336	1111	M-CAP 0.01uF 10% 50V	222103K	
					IC301	1111	IC HA11223	518054S	
					LPF301	1111	LPF FB3204	1280360	
					Q301	1111	TR 2SC945 (P, Q)	515077S	
					Q302	1111	TR 2SC945 (P, Q)	515077S	

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KEY NO.	SYMBOL NO.	TYPE ⁺ W-type-u E-type-u N-type-d D-type-g	DESCRIPTION ⁺⁺	PART NO.
(THE OTHERS)				
	D105	11 11	DIODE 1N60P	500001G
	R137	11 11	HVR, RVA-7B, 3.3 Kohm — potentiometer	4300760
601	S2~S4	11 11	TR1 PUSH SW 6S562 — triple pushbutton switch (IF band, hi-blend, mode)	4040920

KEY NO.	SYMBOL NO.	TYPE ⁺ W-type-u E-type-u N-type-d D-type-g	DESCRIPTION ⁺⁺	PART NO.
602	Z3	1111	LAMP PL-8 8V 0.25A BF310-T6 (meters)	5808130
603	1	1111	SHIELD PLATE	7028700
*604		1111	CB PIN TERMINAL 2P x 2 (SE)	4444030
605		4444	MINI SOCKET 3021-2-N	4510090

SEMICONDUCTOR DATA

NOTE: Ge: Germanium A: Alloy Df: Drift-field M: Mesa
 B: Base E: Epitaxial P: Planar
 D: Diffused G: Grown Pc: Point-contact
 Dd: Double-diffused J: Junction Td: Triple-diffused

TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)													MANUFACTURE			
			Collector-to-Base Voltage VcBo (V)	Emitter-to-Base Voltage VEBo (V)	Collector Current Ic (mA)	Collector Dissipation Pc (mW)	Junction Temperature Tj (°C)	Collector Cutoff Current IcBo (uA)	VcB (V)	hFE	VCE (V)	Ic (mA)	VCE(sat) (V)	Ic (mA)	Ib (mA)	ft (MHz)	VCE* (V)	IE* (mA)	fbb* (dB)	VCE* (V)		IE* (mA)	Output Capacitance (pF)	
2SA733 (Q, R)	AF	PNP Si-E	-50	-5	-100	250	125	-0.1	-40	90 ~ 270	-8	-1	-0.1	-30	-3	180	-6	10				12	N E C	
2SA750 (I) (E)	AF; Low noise	PNP Si-E	-80	-5	-50	250	125	-0.05	-50	350 ~ 700	-3	-0.5	-0.82	-30	-3	100	-6	1				10	N E C	
2SC372 (Y)	RF; Conv., Mix., Osc.	NPN Si-E	35	4	100	200	125	0.5	18	120 ~ 240	12	2	0.4	10	1	80	10	1				3.5	TOSHIBA	
2SC385A	RF; Conv., Mix., Osc.	NPN Si-EP	30	3	20	200	125	0.5 max	15	20 min.	3	8				600 min.	10	-8	35	6	-2	1.5	TOSHIBA	
2SC416 (C)	RF; Conv., Mix., Osc.	NPN Si-E	30	5	100	200	125	0.5	18	100 ~ 200	12	2	0.6	10	1	230	12	2				1.8	HITACHI	
2SC785	RF; FM tuner	NPN Si-EP	40	4	20	100	125	0.5	18	25 ~ 140	6	1				500	6	-1	Cc: fbb = 10ps	6	-1	Cre = 0.65	TOSHIBA	
2SC945 L (Q, P)	AF	PNP Si-E	60	5	100	250	125	0.1	120	135 ~ 400	6	1	0.15	100	10	250	6	-10				3.5	N E C	
2SC1215	RF	PNP Si-E	30	3	50	200	125	100	30	25 min.	10	2	0.1	10	1	1200	10	-10	Cc: fbb' = 25ps max.					MATSUSHITA
2SC1675 (L, M)	RF; Conv. Mix., Osc.	NPN Si-E	80	5	300	600	150	0.1	50	40 ~ 120	12	2	0.4 max.	10	1	250	10	-1	20	10	-1	2	TOSHIBA	
2SD235 (O)	AF; Power	NPN Si-DJ	50	10	3A	25W (Tc=25°C)	150	100	20	70 ~ 140	5	0.5A	0.5	3A	0.3A	1	5	-0.5A				250	TOSHIBA	
2SD381 (L, M)	AF; Power	NPN Si-E	130	5	1.5A	20W (Tc=25°C)	150	1	130	60 ~ 180	5	5	0.9	1A	0.1A	45	5	-0.1A				25	N E C	

FIELD EFFECT TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (TA = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)													MANUFACTURE		
			Gate-to-Drain Voltage VGdC (V)	Gate-to-Source Voltage VGsO (V)	Gate Current IG (mA)	Drain Current ID (mA)	Total Power Dissipation Pd (mW)	Channel Temperature Tj (°C)	Date Leak Current ISSL (uA)	Gate to Drain Breakdown Voltage VBR/GDD (V)	Drain Current IDSS (mA)	Gate to Source Cutoff Voltage VGS(off) (V)	Forward Transfer Admittance Mfs (mS)	Feed Back Capacitance Crss (pF)	Power Gain (Common Source) Gps (dB)	Noise Figure NF (dB)							
2SK49 (F, H)	FM tuners, VHF tuners	Si, N-channel J-FET	-20		10	10	72 (TA=80°C)	80	VGS=-0.5V VDS=0	50 max.		VDS=5V VGS=0	1.5 ~ 6	VDS=10V ID=10uA	-2.5 max.	2.8	VGS=5V VGS=0 f=1 MHz	0.07	VDS=5V VGS=0 Zin, out =50Ω f=100MHz	18	VDS=5V VGS=0	80 max.	N E C
2SK61 (GR)	FM tuners, VHF tuners	Si, N-channel J-FET	-18		10	10	200	125	VGS=-0.5V VDS=0	-10		VDS=10V VGS=0	5 ~ 10	VDS=10V ID=0.5mA f=1 kHz	-4 max.	9	VGS=10V VGS=0 f=1 MHz	0.15	VDS=15V VGS=0 Zin, out =50Ω f=100MHz	18 min.	VDS=10V VGS=0	3.5 max.	TOSHIBA
3SK40	FM tuners, VHF tuners	Si, N-channel dual gate MOS-FET		VG1S = +27 VG2S = +27		25	250	150	VG1S=+25V VGS=0 VG2S=0 VG2S=+25V VDS=0 VG1S=0	IG1SS = 100 IG2SS = 100		VDS=10V VG1S=0 VG2S=4V	4 ~ 25	VDS=15V VGS=0 ID=100uA VGS=15V VGS=0 ID=100uA	VG1S = -4 max. VG2S = -4 max.	10	VDS=15V VGS=4V ID=5mA f=1 MHz	0.03	VDS=15V VGS=4V ID=10mA f=200MHz	18 min.	VDS=15V VGS=4V ID=10mA f=200MHz	4.5 min.	N E C
3SK45	FM tuners, VHF tuners	Si, N-channel dual gate MOS-FET		VG1S = +27 VG2S = +27		35	330	175	VG1S=+27V VGS=0 VG2S=0 VG2S=+27V VDS=0 VG1S=0	IG1SS = 20 IG2SS = 20		VDS=16V VG1S=0 VG2S=4V	4 ~ 32	VDS=15V VGS=0 ID=100uA VGS=15V VGS=0 ID=100uA	VG1S = -3 max. VG2S = -4 max.	14	VDS=15V VGS=4V ID=10mA f=1 MHz	0.02	VDS=15V VGS=4V ID=10mA f=200MHz	17 min.	VDS=15V VGS=4V ID=10mA f=200MHz	3.3 max.	HITACHI
3SK59	FM tuners, VHF tuners	Si, N-channel depletion dual gate MOS-FET		VG1S = +29 VG2S = +29		30	300	150	VG1S=+27V VGS=0 VG2S=0 VG2S=+27V VDS=0 VG1S=0	IG1SS = +250 IG2SS = +250		VDS=15V VG1S=0 VG2S=4V	3 ~ 24	VDS=15V VGS=0 ID=100uA VGS=15V VGS=0 ID=100uA	VG1S = -2.5 max. VG2S = -2.5 max.	20	VDS=15V VGS=4V ID=10mA f=1 MHz	0.03	VDS=15V VGS=4V ID=10mA f=100 MHz	18 min.	VDS=15V VGS=4V ID=10mA f=100MHz	3.5 max.	TOSHIBA

DIODES, LEDs

DEVICE TYPE	APPLICATION	STRUCTURE†	MAXIMUM RATINGS Absolute - Maximum Values: (TA = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)										MANUFACTURE						
			Reverse Surge Voltage VR surge (V)	Peak Reverse Voltage VRM (V)	Reverse Voltage VR (V)	Peak Forward Voltage VFM (V)	Peak Forward Current IFM (mA)	Average Rectified Current IO (mA)	Junction Temperature Tj (°C)	Total Power Dissipation Pd (mW)	Forward Current IF min (mA)	Test Condition V/ V	Forward Voltage VF (V)	Reverse Current IR (uA)	Test Condition V/ V									
VD1212							30									1.24 min. 1.34 max.	1.5						γF = -3.6 mV/°C (IF = 1.5 mA)	N E C
104B1	Rectifiers	Si-D Bridge			200			1.3A (TA=80°C)	60	150						1.2 max.	1.5A	400	200					TOSHIBA
1N60	FM Detectors	Si-P			35	25		150	50	0.5	70			4	1			75	10					HITACHI
1S18B5	Rectifiers	Si-A			100		70	1A (TA=85°C)	60							1.2	1.5A	10	100					TOSHIBA
1S2076	Detectors Modulators	Si-P			35	30	35	450	150	1	175					0.8	10	1	30					HITACHI
GD-4-207RD	LED								IF=50		100					1.5 min. 2.0 max.	20	100	3					STANLEY
TLR109	LED	GaP			4				IF=25		75					2.1 typ. 2.6 max.	20	5	4				TYP. 3.0 mcd. (IF=15 mA)	TOSHIBA

ZENER DIODES

DEVICE TYPE	APPLICATION	STRUCTURE†	MAXIMUM RATINGS Absolute - Maximum Values: (TA = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Typical Values: (TA = 25°C unless otherwise specified)										MANUFACTURE							
			Total Power Dissipation Pd (mW)	Zener Current Iz (A)	Junction Temperature Tj (°C)	Zener Voltage Vz (V)	Test Condition	Differential Resistance Rd (Ω)	Temperature Coefficient γZ (%/°C)	Reverse Current IR (uA)	Test Condition	Reverse Voltage VR (V)											
RD5, 6E (B)		Si, P	400			5.3	6.3	20	25	20								5	1.5				N E C
RD15E (B)		Si, P	400			13.8	15.6	10	30	10								2	11				N E C
WZ145			500			13.9	14.5	15.1	5	15	5	0.076						1	11				J R C
XZ137			500			13.3	13.7	14.1	5	15	5	0.073						1	11				J R C

INTEGRATED CIRCUIT (HA11211)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Ratings	Unit
Supply Voltage	V _{CC}	13	V
Power Dissipation	P _T *	730	mW
Operating Temperature	T _{opr}	-20 to +70	°C
Storage Temperature	T _{stg}	-55 to +125	°C

* Value at Ta = 60°C

■ ELECTRICAL CHARACTERISTICS (Ta=25°C)

DC CHARACTERISTICS (V_{CC} = 12V, Non-signal)

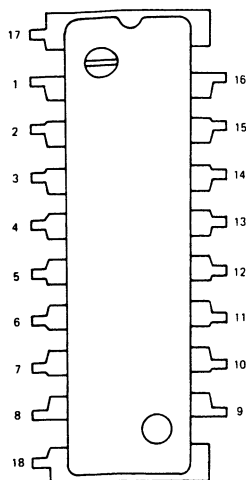
Item	Symbol	Typical Value	Unit
Pin 1 (AM IF Bypass)	V ₁	2.7	V
Pin 4 (AM IF Input)	V ₄	0.7	V
Pin 6 (FM IF Input DC Feedback)	V ₆	1.9	V
Pin 7 (FM IF Input DC Feedback)	V ₇	1.9	V
Pin 8 (FM IF Input)	V ₈	1.9	V
Pin 10 (Muting Control Voltage)	V ₁₀	5.4	V
Pin 12 (Reference)	V ₁₂	5.6	V
Pin 15 (AFC)	V ₁₅	5.6	V
Pin 16 (Audio Out.)	V ₁₆	5.6	V

■ AC CHARACTERISTICS (Notes 1)

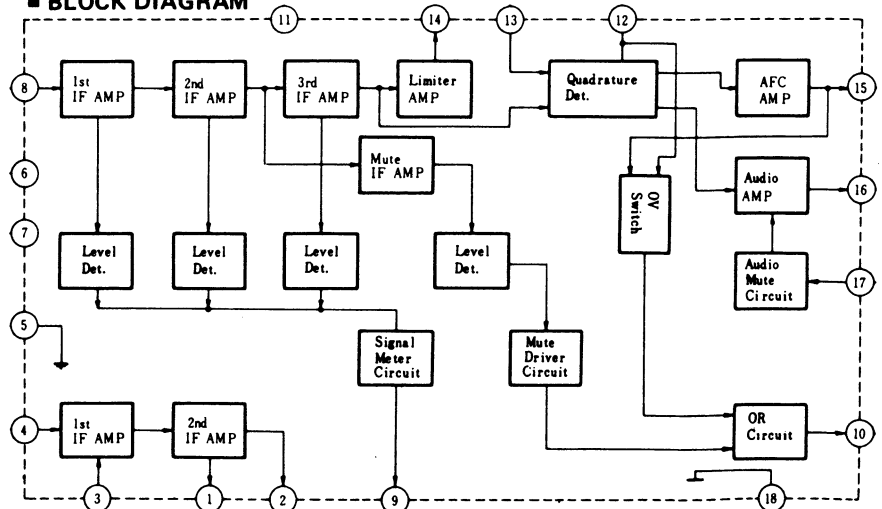
Item	Symbol	Test Condition	min	typ	max	Unit	
Total Current Drain	I ₁₁	V _{in} = 100dBμ, M _{UTE} ; ON	—	38.5	56.2	mA	
FM	Limiting Sensitivity	V _{in Lim}	—	31	37	dBμ	
	Recovered AF Voltage	V _{O1 AF}	V _{in} = -3dB point from output voltage when 100dBμ input	270	450	700	mVrms
	Total Harmonic Distortion	T.H.D ₁		—	0.04	0.1	%
	Signal-to-noise Ratio	(S + N/N) ₁		73	79	—	dB
	AM Rejection Ratio	AMR	V _{in} = 100dBμ, FM; 400Hz, Δf = 75kHz, AM; 1kHz, m = 0.3	—	55	—	dB
	Muting Sensitivity	V _{in (MUTE)}	V ₁₀ = 1.4V	43	48	53	dBμ
	Muting Attenuation	M _{UTE ATT}	V ₁₇ = 2V	73	80	—	dB
	Muting Bandwidth	BW (MUTE)	V ₁₀ = 1.4V (Note 3)	78	130	220	kHz
	Meter Swing	V _{9 70}	V _{in} = 70dBμ	0.5	1.8	—	V
V _{9 100}		V _{in} = 100dBμ	3.0	4.4	—	V	
AM	Recovered AF Voltage	V _{O2 AF}		55	82	125	mVrms
	Total Harmonic Distortion	T.H.D ₂		—	0.5	2.0	%
	Signal-to-noise Ratio	(S + N/N) ₂		44	50	—	dB
	IF AGC Figure of Merit	AGC (FOM)	V _{in} = Voltage difference from 84dBμ input, when 10dB output down	—	48	—	dB
	Input Impedance	R _{in}		—	0.9	—	kΩ

Note 1: Unless otherwise specified, test conditions are: V_{CC} = 12V
 FM: f_{IF} = 10.7MHz, f_{mod} = 400Hz, Δf = 75kHz and V_{in} = 100dBμ
 AM: f_{IF} = 455kHz, f_{mod} = 400Hz, m = 0.3 and V_{in} = 64dBμ
 Test circuit is shown below.
 2. Test point of Vin is:
 FM: point A in test circuit, so that the voltage between pin 8 and ground is a half of Vin at point A.
 AM: point B
 3. BW etc. is tested under sampling of AQL = 1.0%

■ TERMINAL GUIDE (TOP VIEW)



■ BLOCK DIAGRAM



INTEGRATED CIRCUIT (HA11223)

■ ABSOLUTE MAXIMUM RATINGS ($T_a=25^\circ\text{C}$)

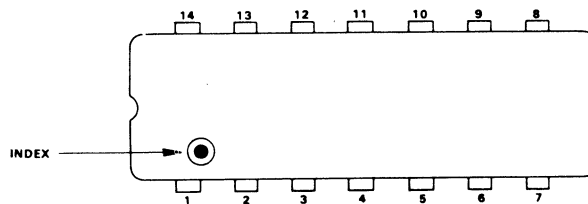
Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	16	V
Power Dissipation*	P_T	500	mW
Operating Temperature	T_{opr}	-20 to +75	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +125	$^\circ\text{C}$
Lamp Drive Current	Continuous	75	mA
	Peak	100	

*Value at $T_a=75^\circ\text{C}$

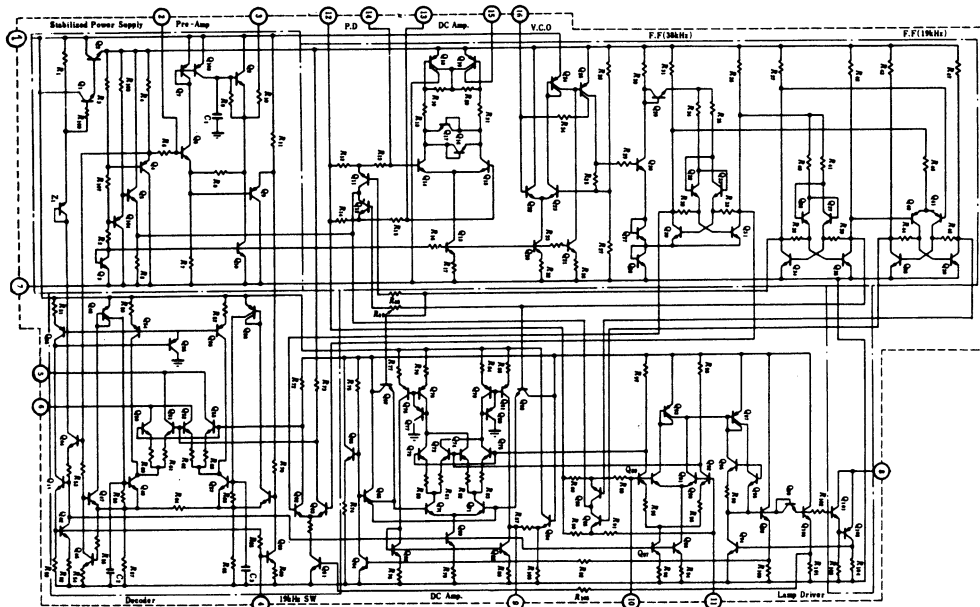
■ ELECTRICAL CHARACTERISTICS ($V_{CC}=13\text{V}$, $f=1\text{kHz}$, $T_a=25^\circ\text{C}$ unless otherwise noted)

Item	Symbol	Test Condition	min	typ	max	Unit	
Input Impedance	Z_{in}		30	75	—	$\text{k}\Omega$	
Channel Separation	Sep	$P=30\text{mV}$, $L+R=270\text{mV}$	100Hz	—	40	—	dB
			1kHz	35	45	—	
			10kHz	—	40	—	
Stereo Total Harmonic Distortion	ST, T.H.D	$P=30\text{mV}$, $L+R=270\text{mV}$	100Hz	—	0.04	—	%
			1kHz	—	0.02	0.08	
			10kHz	—	0.05	—	
Output Voltage	V_{out}	$V_{in}=300\text{mV}$	185	240	310	mV	
Channel Balance	C.B	$V_{in}=300\text{mV}$	—	0	—	dB	
Monaural Total Harmonic Distortion	M_{ono} , T.H.D	$V_{in}=300\text{mV}$	—	0.01	0.08	%	
Pilot Level for Lamp ON	$L_{(ON)}$		8	11.5	15	mV	
Stereo Lamp Hysteresis			—	4	—	dB	
Carrier Leak	C.L	$P=30\text{mV}$, $L+R=270\text{mV}$	19kHz	55	60	—	dB
			38kHz	—	35	—	
SCA Rejection Ratio	SCA R_{s1}	$P=30\text{mV}$, $L+R=270\text{mV}$; $SCA=30\text{mV}$, $f_{SCA}=67\text{kHz}$	—	80	—	dB	
Signal-to-noise Ratio	S/N	$V_{in}=300\text{mV}$, $R_g=4.7\text{k}\Omega$	80	86	—	dB	
Capture Range	C.R	$P=30\text{mV}$	—	± 3.5	—	%	
Max Input Signal	V_{in}	$P=10\%$, $L+R=90\%$, $T.H.D \leq 0.5\%$	—	1.2	—	V	
Total Current Drain	I_T		—	17	—	mA	

■ TERMINAL GUIDE (TOP VIEW)



■ SCHEMATIC DIAGRAM



INTEGRATED CIRCUIT (HA1211)

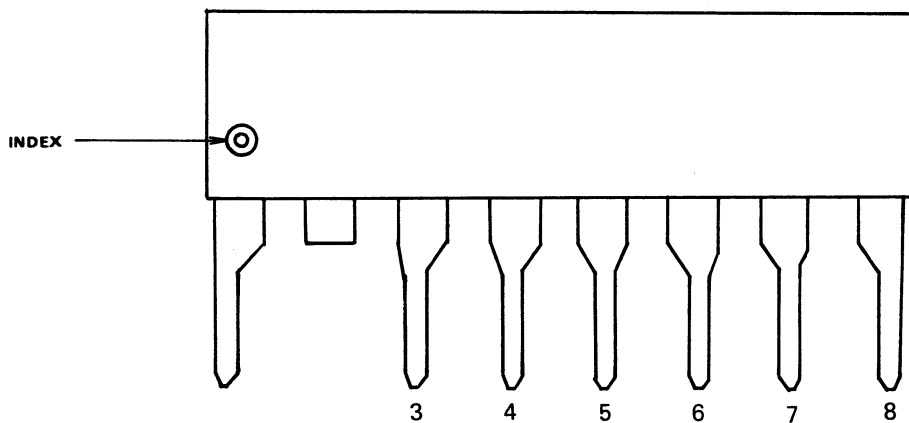
■ ABSOLUTE MAXIMUM RATINGS ($T_a = 25^\circ\text{C}$)

Item	Symbol	Rating	Unit
Supply Voltage	\bar{V}_{cc}	20	V
Input Voltage	V_{in}	± 5	V
Power Dissipation	P_r	200	mW
Operating Temperature	T_{opr}	-20 to +70	$^\circ\text{C}$
Storage Temperature	T_{stg}	-55 to +125	$^\circ\text{C}$

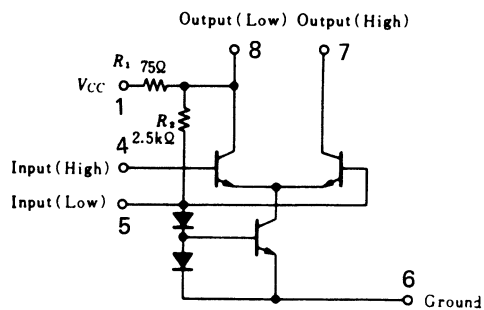
■ ELECTRICAL CHARACTERISTICS ($V_{cc} = 12\text{V}$, $T_a = 25^\circ\text{C}$)

Item	Symbol	Test Condition	min	typ	max	Unit
Power Dissipation	P_r		—	110	170	mW
DC Total Current	I_r		5.4	9.15	14.1	mA
Power Gain	PG	$f = 10.7\text{MHz}$	27	31	—	dB
Forward Transadmittance	$ y_f $	$V_{in} = 10\text{mVrms}, f = 10.7\text{MHz}$	—	30	—	mS
Reverse Transadmittance	$ y_r $		—	0.002	—	mS
Input Conductance	g_i		—	0.4	—	mS
Input Capacitance	C_i		—	7.0	—	pF
Output Conductance	g_o		—	0.03	—	mS
Output Capacitance	C_o		—	2.5	—	pF
Noise Figure	NF		$f = 10.7\text{MHz}$	—	6	—

■ TERMINAL GUIDE (TOP VIEW)



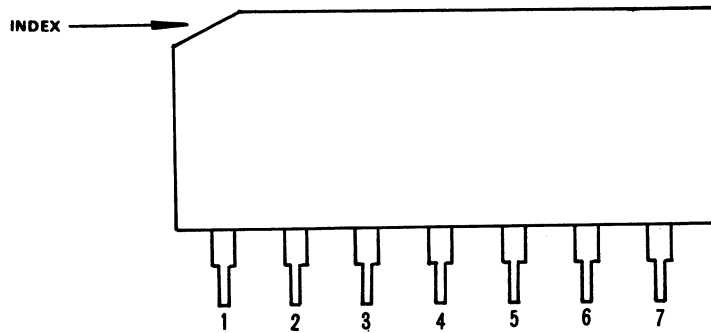
■ CIRCUIT SCHEMATIC



INTEGRATED CIRCUIT (TA7136P)

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATINGS (T _A = 25 °C)				ELECTRICAL CHARACTERISTICS (T _A = 25 °C) Typical Values				Manufacture
		Supply Voltage (V)	Power Dissipation (mW)	Operating Temperature Range (°C)	Storage Temperature Range (°C)	Supply Current (mA)	Voltage Gain (Open Loop) (dB)	Maximum Output Voltage (V _{rms})	Equivalent Input Noise Voltage (μV _{rms})	
TA7136P	Preamplifier	40	400	-25 75	-55 125	3.1	92	7.0	1.0	TOSHIBA

Terminal Guide (Side View)



Schematic Diagram

