55

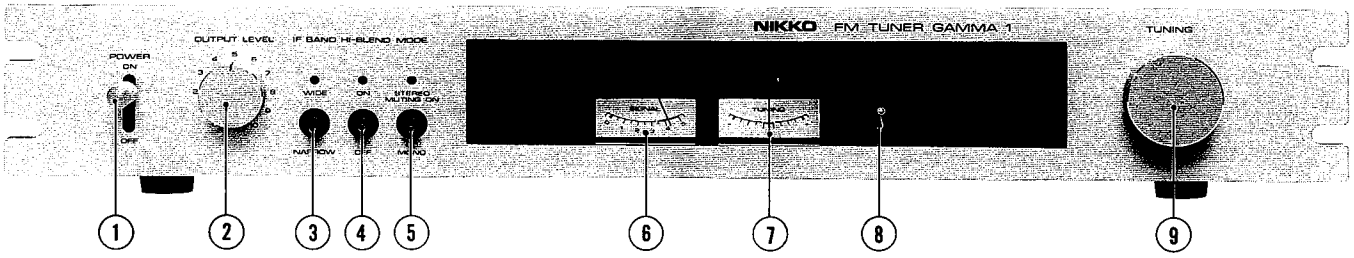
STEREO FM TUNER
GAMMA I

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.

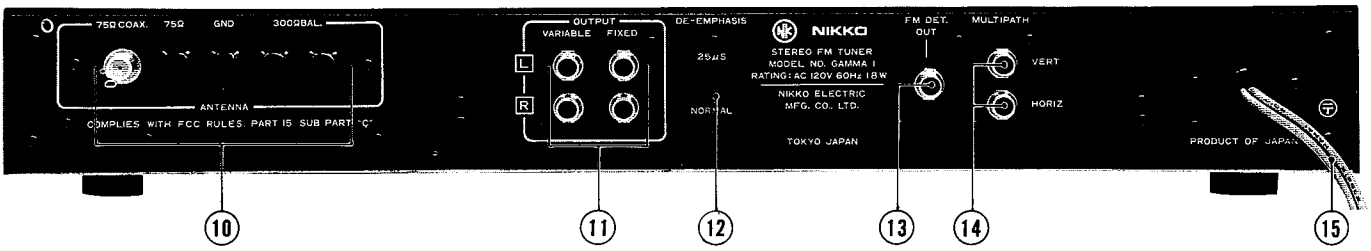
8. STEREO INDICATOR

   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 μs 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.

CONTENTS

SPECIFICATIONS

(W–TYPE, E–TYPE, N–TYPE)

SPECIFICATION RATINGS	UNIT	NOM. (NOR.)	LIMIT (NOR.)	NOM. (NARROW)	LIMIT (NARROW)
Usable Sensitivity	dBf (μV)	9.3 (1.6)	15.2 (3.16)	9.31 (1.6)	15.2 (3.16)
50 dB Quieting Sensitivity	dBf (μV)	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	%	0.04	0.2	0.1	0.5
STEREO (L=–R)	%	0.08	0.3	0.2	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 ± 5	30	30 ± 5
Subcarrier Product Ratio STEREO	dB	70	60	70	60
Meter Sensitivity		4.5	4.5 ± 0.3	4.5	4.5 ± 0.3
Output Level (Fixed)	Volts	0.75	0.75 ± 2 dB	0.75	0.75 ± 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	0.56	1.0	0.56	1.0
50 dB Quieting Sensitivity	μV	2.5	5.0	2.5	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	%	0.06	0.2	0.1	0.5
STEREO (L=–R)	%	0.08	0.3	0.2	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
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(10 kHz) STEREO	dB	40	30	30	20
Separation, Hi-Blend					
(1 kHz) STEREO	dB	30	30 ± 5	30	30 ± 5
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Meter Sensitivity		4.5	4.5 ± 0.3	4.5	4.5 ± 0.3
Output Level (Fixed)	Volts	0.35	0.35 ± 2 dB	0.35	0.35 ± 2 dB
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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.

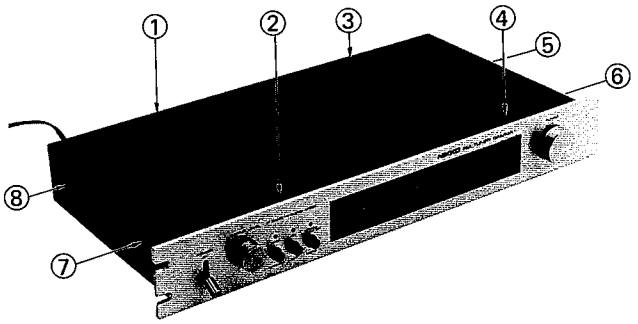


Photo 1

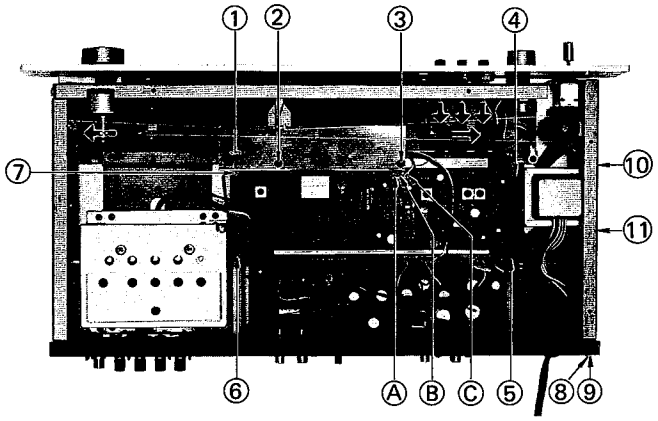


Photo 2

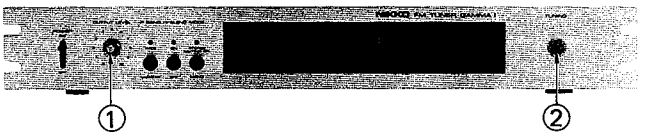


Photo 3

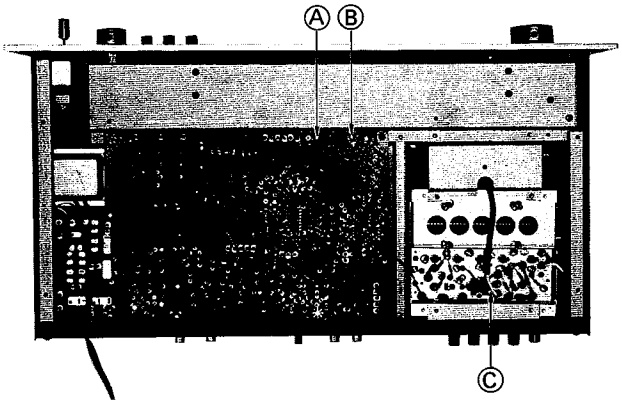


Photo 4

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.

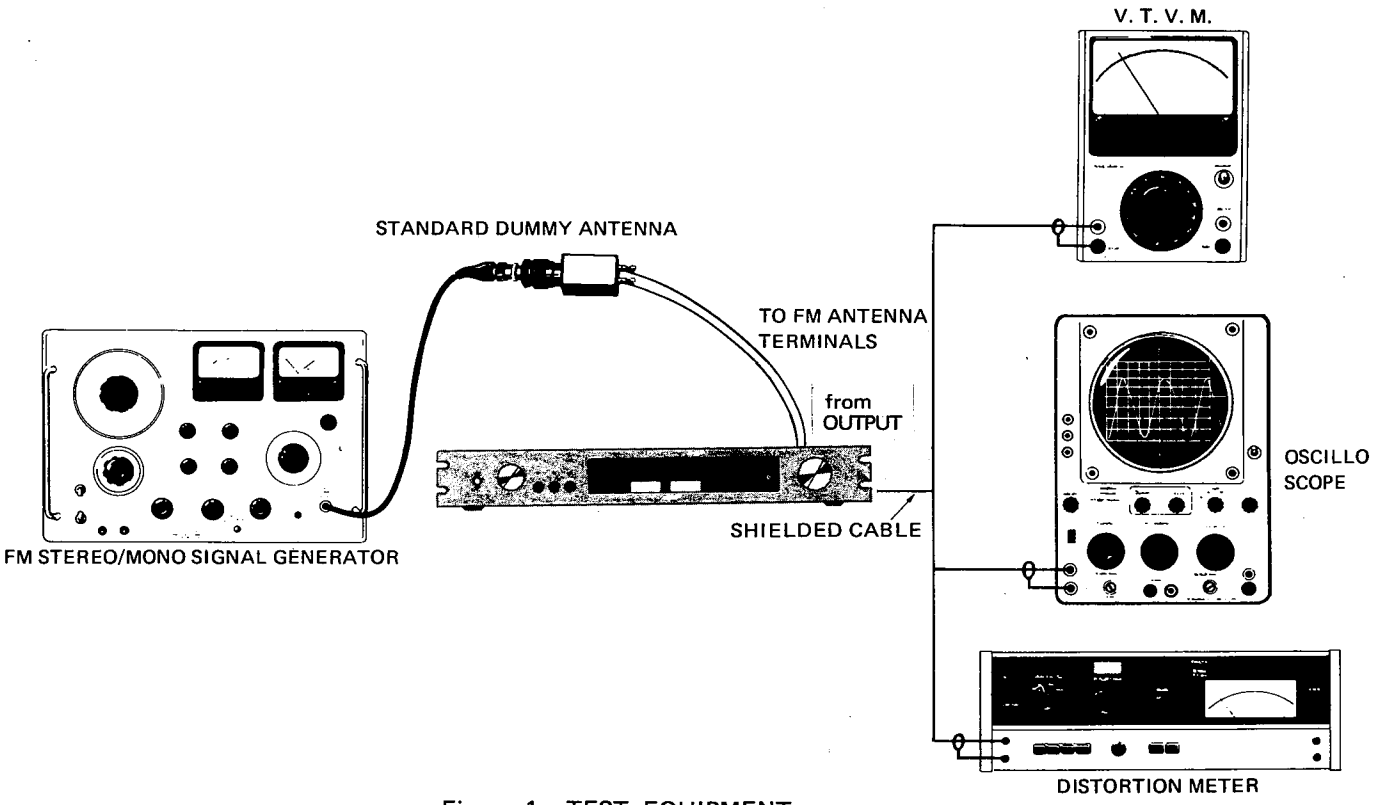


Figure 1. TEST EQUIPMENT

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 ~ 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.

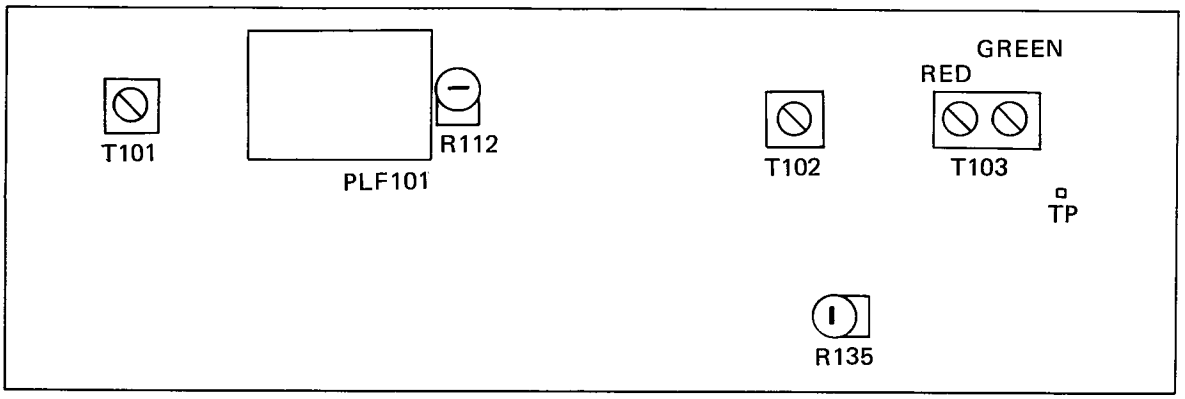


Figure 2. I-F CIRCUIT BOARD (TOP VIEW)

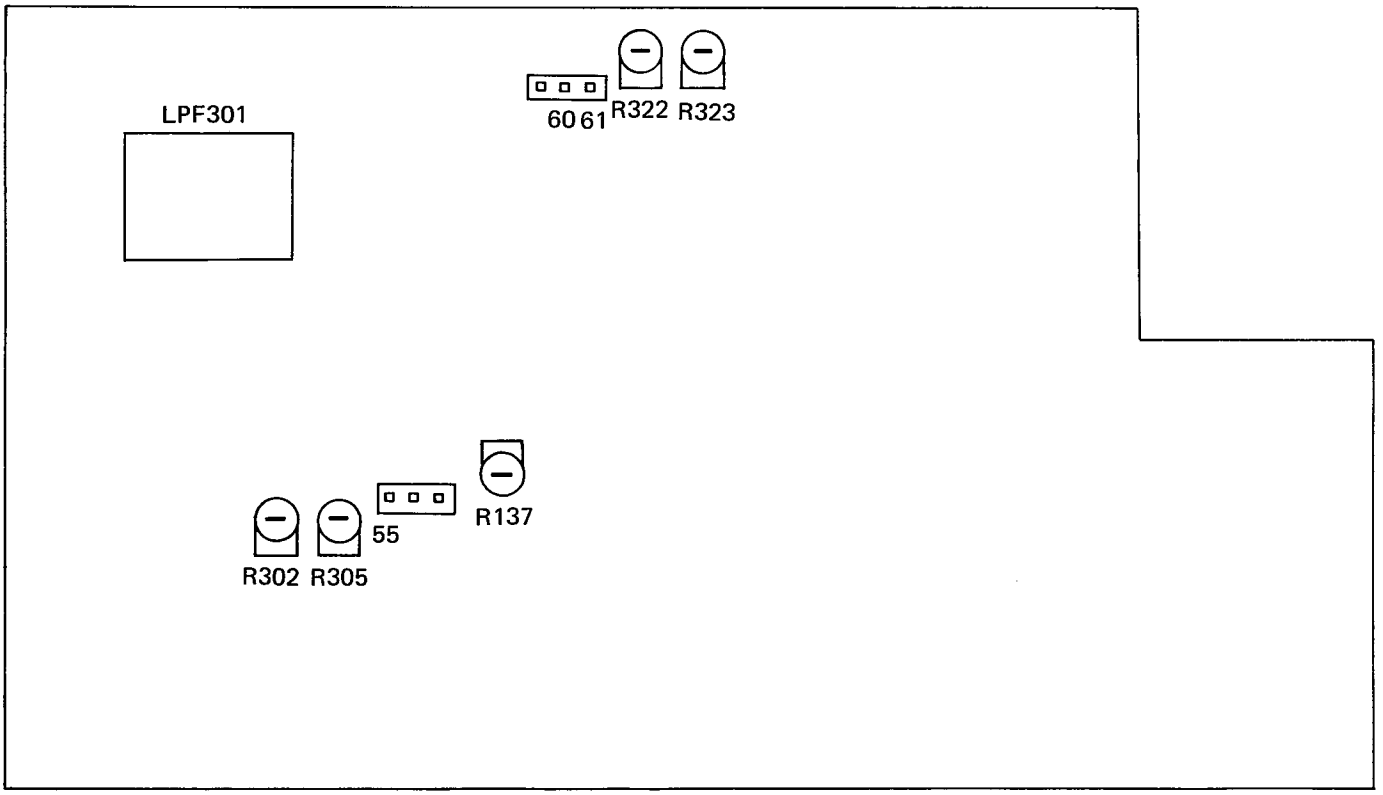


Figure 3. MPX/REGULATOR CIRCUIT BOARD (TOP VIEW)

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.

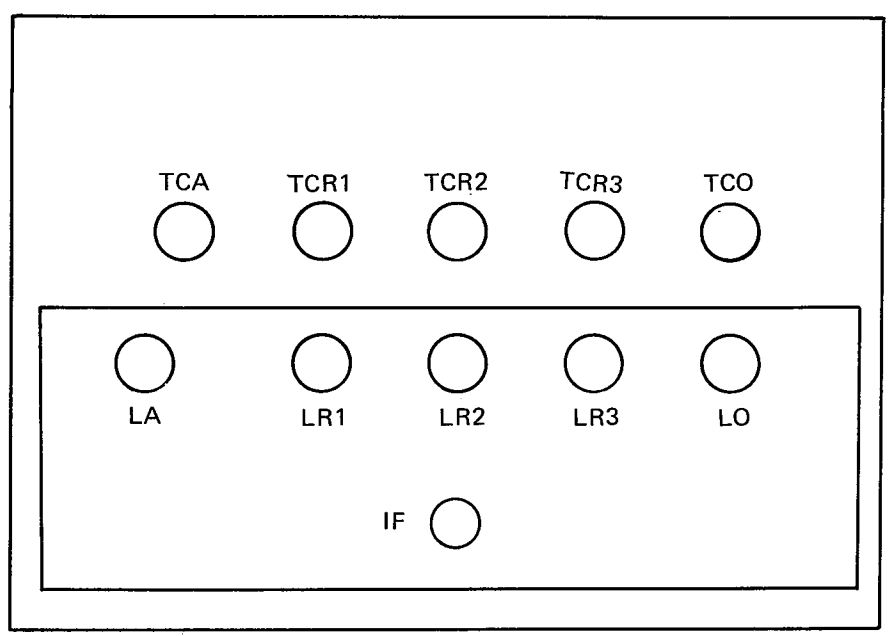


Figure 4. FM FRONT END (TOP VIEW)

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

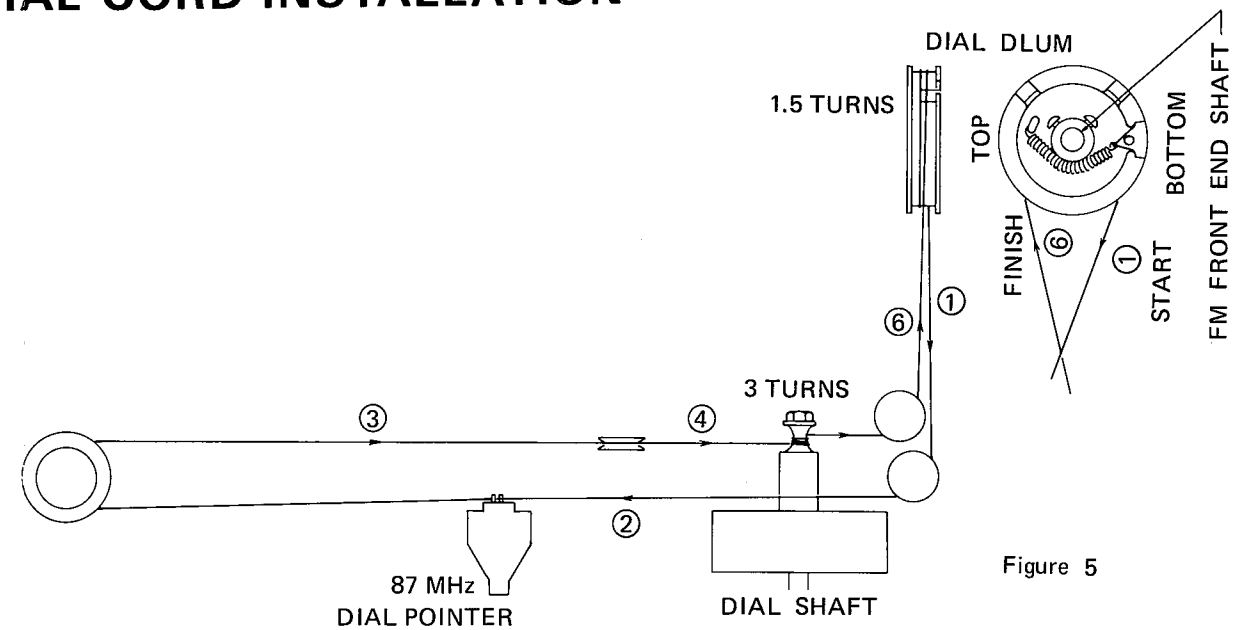


Figure 5

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)

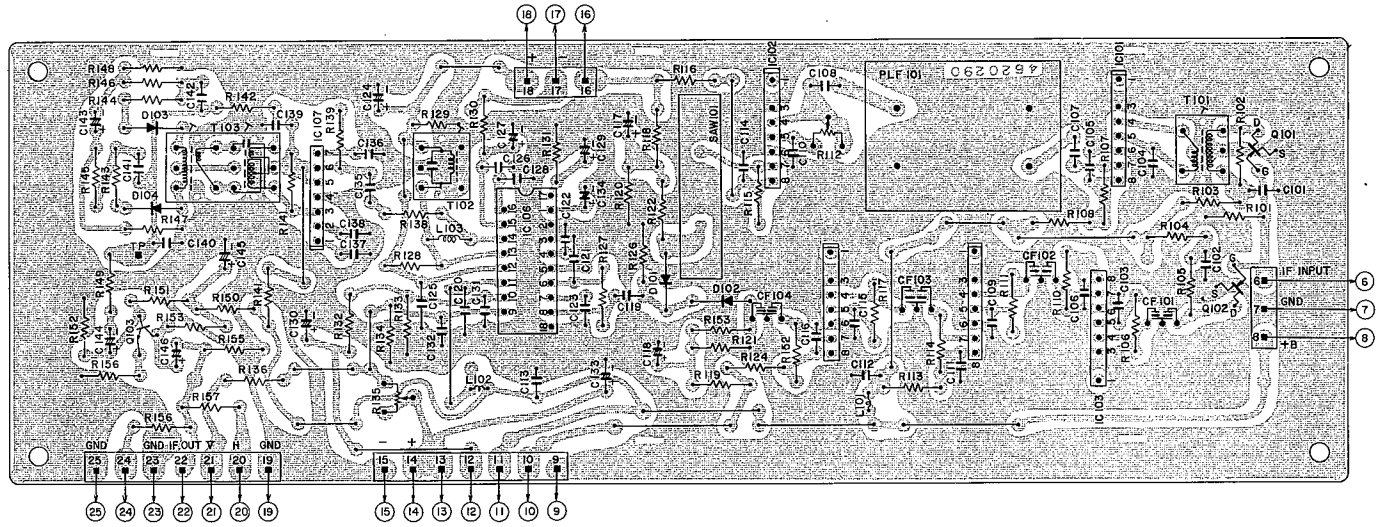


Figure 6. IF CIRCUIT BOARD (BOTTOM VIEW)

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
㉚ To LED 4 ⊕
㉛ To LED 4 ⊖
㉜ ㉝ To LAMP
㉞ ㉟ To LAMP
㊿ To R3 (OUTPUT LEVEL R)
(51) To OUTPUT FIXED R (BACK PLATE)
(52) To GROUND (OUTPUT LEVEL)
(53) To R2 (OUTPUT LEVEL L)
(54) To OUTPUT FIXED L (BACK PLATE)
(55) TEST POINT
(56) (57) To S5a DE-EMPHASIS L (BACK PLATE)
(58) (59) To S5b DE-EMPHASIS R (BACK PLATE)

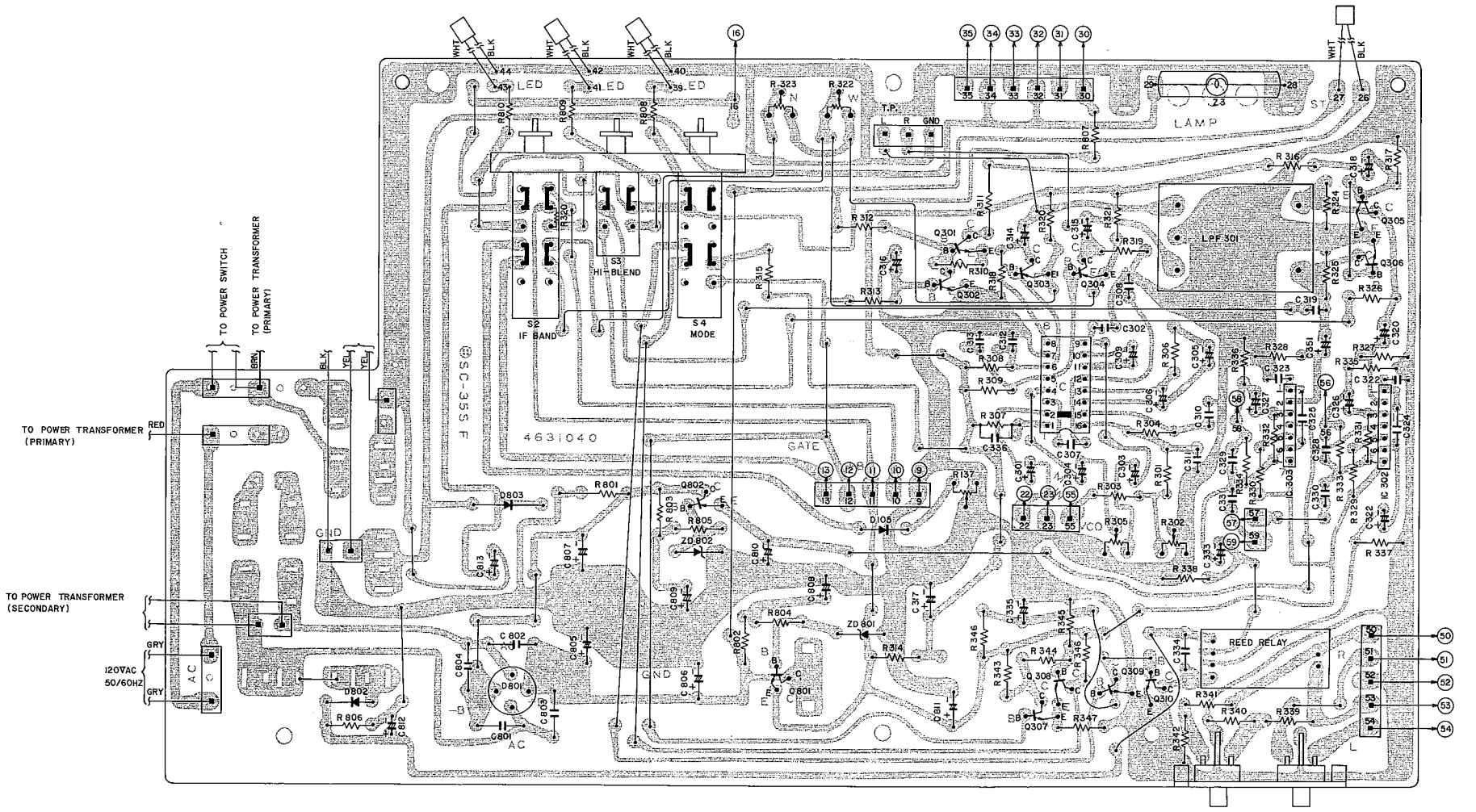
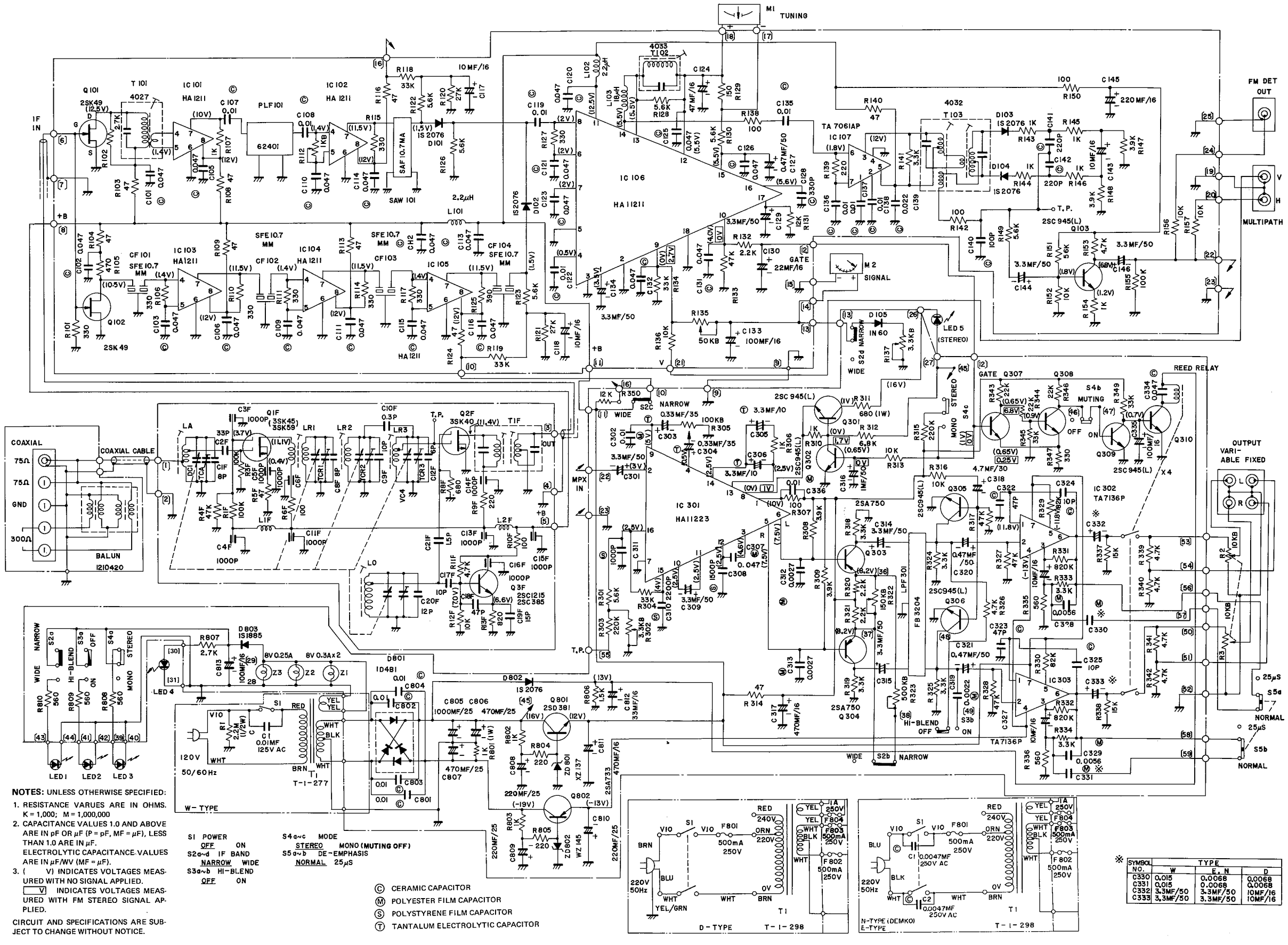


Figure 7. MPX/REGURATOR CIRCUIT BOARD (BOTTOM VIEW)

OVERALL SCHEMATIC DIAGRAM



NOTES: UNLESS OTHERWISE SPECIFIED:

1. RESISTANCE VARUES ARE IN OHMS. K = 1,000; M = 1,000,000
2. CAPACITANCE VALUES 1.0 AND ABOVE ARE IN pF OR μF (P = pF, MF = μF), LESS THAN 1.0 ARE IN μF. ELECTROLYTIC CAPACITANCE VALUES ARE IN μF/WV (MF = μF).
3. (V) INDICATES VOLTAGES MEASURED WITH NO SIGNAL APPLIED. [V] INDICATES VOLTAGES MEASURED WITH FM STEREO SIGNAL APPLIED.

CIRCUIT AND SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

※

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

PARTS LOCATION

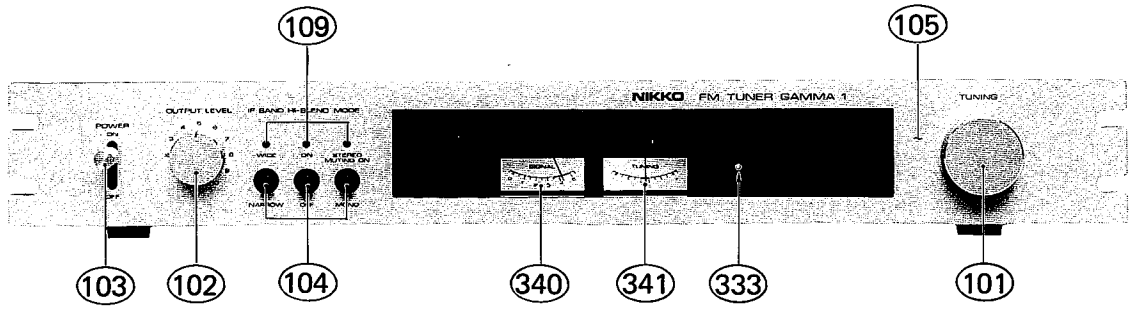


Photo 5

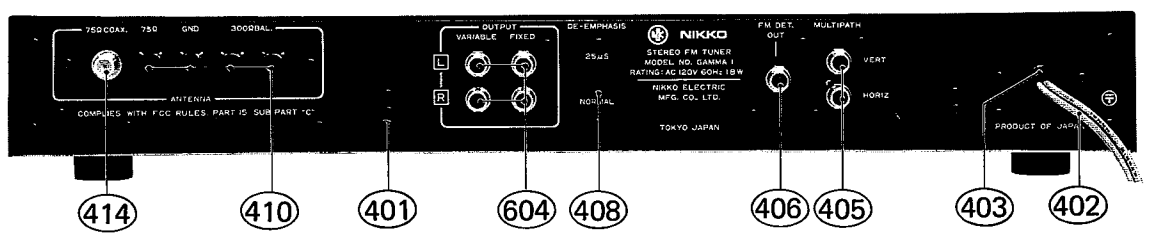


Photo 6

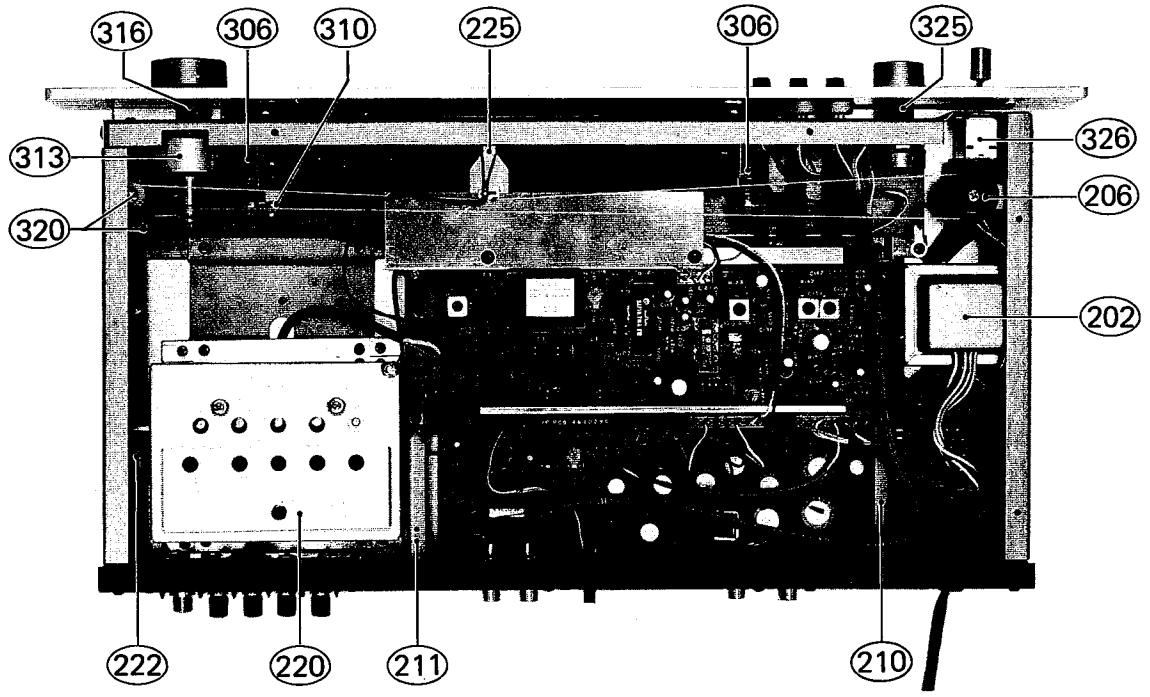


Photo 7

PARTS LIST

NOTES:

1. ★ The KEY NUMBER (#) marked with a (★) on parts list relate to number of three digits with a (◯). (Photo 1 ~ 7).
2. \+ Numerals in file indicate the quantity of parts used in one type.
3. ++ 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 vaiues (1 x 10uF) are in (1) uF, (10) V.
4. Assemblies and parts are subject to charge without notice.
5. Parts ordering procedure:

   Include in any order

   a. Part number.
   b. Part description.
   c. Model number.

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

KEY NO.	SYMBOL NO.	TYPE+ (W-type-u, E-type-j, N-type-d, D-type-g)	DESCRIPTION++	PART NO.
			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		---1	ENVELOPE (G)	9690170
007a		1---	INSTRUCTION MANUAL USA	960191E
007b		---	INSTRUCTION MANUAL Canada	960216E
007c		-11-	INSTRUCTION MANUAL K	960201K
007d		---1	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+ (W-type-u, E-type-j, N-type-d, D-type-g)	DESCRIPTION++	PART NO.
			(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		---1	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-u E-type-u N-type-d D-type-g)	DESCRIPTION++	PART NO.
★219	†	9999	PTS 3φ x 6 – screw	814306S
★220		1111	FRONT END FS114U13	4910070
221	†	4444	PTS 3φ x 6 – screw	814306S
★222		1111	DIAL DRUM 37φ MK2	7400860
223	†	1111	SPRING (R)	7440380
224		1111	DIAL CORD	4580430
★225		1111	NEEDLE – dial pointer	7860550
★226		1111	SIDE ANGLE (R)	7226310
227	†	4444	PTS 3φ x 6 – screw	814306S
228	†	2222	PTS 3φ x 6 BLACK – screw	814306W
500		((I-F PCB ASS))		
229	†	4444	PTS 3φ x 8 – screw	814308S
230		1---	SHIELD PLATE (G)	7031550
231		-111	SHIELD PLATE (D)	7031670
232		1111	LUG 1L-2P (R)	441120R
★233		1111	BACK GND G2 – plate	7226430
234	†	2222	PUSH RIVET FNRP 3 x 3.5	7401190
235		2222	W 3φ – washer	893403S
			FRONT PLATE ASSEMBLY	
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
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
324	†	1111	W 8φ – washer	893108S
★325	†	1111	SPACER 885	7152230
★326a	S1	1---	LV SW SY02 U74SF TV-3 (power) – lever switch	4025210
326b	S1	-111	LV SW SY02 U80DV-S 27 (8) (power) – lever switch	4025150
327	†	2222	PMS 3φ x 6 – screw	810306S
328a		1---	C-CAP 0.0047uF 125V AC	239472C
328b	-	-222	C-CAP 0.0047uF 250V AC	239472E
329	†	1222	C-CAP COVER (M)	7400980
330	R1	1---	RES 2.2 M ohm 10% ½W	325225K
331		1---	EARTH LUG	440000D
332	†	1---	TW (I) 3φ – washer	893403U
333	†	1---	PTS 3φ x 6 – screw	814306S
★334	↓	1111	LED 3φ x 4.5	506001S
335	↓	1111	LED HOLDER	7903060
336		1111	LED PLATE	7031640
337	†	2222	PUSH RIVET 3 x 3.5	7401190
338		1111	SCALE HOLDER	7226320
339		1111	DIAL SCALE	7802230
340	†	4444	PTS 3φ x 6 – screw	814306S
★341	M2	1111	METER (signal)	4582110
★342	M1	1111	METER (tuning)	4582120
343	†	1111	CLAMP SPRING	744022A

KEY NO.	SYMBOL NO.	TYPE+ (W-type-u E-type-u N-type-d D-type-g)	DESCRIPTION++	PART NO.
			BLACK PLATE ASSEMBLY	
401a		1---	BACK PLATE W	7324760
401b		-111	BACK PLATE E-N-D	7324860
★402a		1---	PLUG CORD KP-2	606002J
402b		-11-	PLUG CORD CEE-2T	600506J
402c		---1	PLUG CORD CEE-3T	601809A
★403a		1---	CORD STOPPER SR-3P-4	7400620
403b		-11-	CORD STOPPER SR-4N-4	7400690
403c		---1	CORD STOPPER SR-6W-1	7400740
404a		1---	CORD BRACKET (W)	7031460
404b		-111	CORD BRACKET (E)	7031680
★405		1111	WP PIN TERMINAL 2P (CE)	4442010
★406		1111	WP PIN TERMINAL 1P	4440190
407	†	4444	PTS 3φ x 10 BLACK – screw	814310W
408	S5	1111	SLIDE SWITCH SL-13 (de-emphasis)	4020440
409	†	2222	PMS 3φ x 6 BLACK – screw	810306W
★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
			I-F CIRCUIT BOARD	
500		1111	I-F PCB ASS – complete circuit board	9410400
	C101			
	~C106	6666	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C107	1111	C-CAP 0.01uF 80, –20% 50V YG	231103Z
	C108	1111	C-CAP 0.01uF 80, –20% 50V YG	231103Z
	C109			
	~C116	8888	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C117	1111	E-CAP 16R10uF	211220Q
	C118	1111	E-CAP 16R10uF	211220Q
	C119	1111	C-CAP 0.01uF 80, –20% 50V YG	231103Z
	C120	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C121	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C122	1111	C-CAP 0.01uF 80, –20% 50V YG	231103Z
	C123	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C124	1111	E-CAP 16R47uF	211225Q
	C125	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C126	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C127	1111	E-CAP 50R0.47uF	211505Q
	C128	1111	C-CAP 330pF 10% 50V SL	232331K
	C129	1111	E-CAP 50R3.3uF	211513Q
	C130	1111	E-CAP 16R22uF	211222Q
	C131	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C132	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	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-u E-type-u N-type-d D-type-g)	DESCRIPTION++	PART NO.
	C139	1111	C-CAP 0.022uF 80, –20% 50V YG	231223Z
	C140	1111	C-CAP 100pF 10% 50V SL	232101K
	C141	1111	C-CAP 220pF 10% 50V SL	232221K
	C142	1111	C-CAP 220pF 10% 50V SL	232221K
	C143	1111	E-CAP 16R10uF	211220Q
	C144	1111	E-CAP 50R3.3uF	211513Q
	C145	1111	E-CAP 16R220uF	211232Q
	C146	1111	E-CAP 50R3.3uF	211513Q
	CF101	1111	CERAMIC FILTER SFE10.7MM-A	1280410
	CF102	1111	CERAMIC FILTER SFE10.7MM-A	1280410
	CF103	1111	CERAMIC FILTER SFE10.7MM-A	1280410
	CF104	1111	CERAMIC FILTER SFE10.7MM-A	1280410
	D101 ~D104	4444	DIODE 1S2076	501019S
	IC101			
	~IC105	5555	IC HA1211	518053S
	IC106	1111	IC HA11211	518052S
	IC107	1111	IC TA7061AP	518047S
	L101	1111	INDUCTOR FL4H 2R2M 2.2uH 20%	1210860
	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
	Q103	1111	TR 2SC945 Ⓛ (P, Q)	515077S
	R101	1111	RES 330 ohm 5% ¼W	328331J
	R102	1111	RES 2.7 Kohm 5% ¼W	328272J
	R103	1111	RES 47 ohm 5% ¼W	328470J
	R104	1111	RES 47 ohm 5% ¼W	328470J
	R105	1111	RES 470 ohm 5% ¼W	328471J
	R106	1111	RES 330 ohm 5% ¼W	328331J
	R107	1111	RES 1 Kohm 5% ¼W	328102J
	R108	1111	RES 47 ohm 5% ¼W	328470J
	R109	1111	RES 47 ohm 5% ¼W	328470J
	R110	1111	RES 330 ohm 5% ¼W	328331J
	R111	1111	RES 330 ohm 5% ¼W	328331J
	R112	1111	HVR, RVA-7B, 1 Kohm – potentiometer	4300750
	R113	1111	RES 47 ohm 5% ¼W	328470J
	R114	1111	RES 330 ohm 5% ¼W	328331J
	R115	1111	RES 330 ohm 5% ¼W	328331J
	R116	1111	RES 47 ohm 5% ¼W	328470J
	R117	1111	RES 330 ohm 5% ¼W	328331J
	R118	1111	RES 33 Kohm 5% ¼W	328333J
	R119	1111	RES 33 Kohm 5% ¼W	328333J
	R120	1111	RES 27 Kohm 5% ¼W	328273J
	R121	1111	RES 27 Kohm 5% ¼W	328273J
	R122	1111	RES 5.6 Kohm 5% ¼W	328562J
	R123	1111	RES 5.6 Kohm 5% ¼W	328562J
	R124	1111	RES 47 ohm 5% ¼W	328470J
	R125	1111	RES 390 ohm 5% ¼W	328391J
	R126	1111	RES 5.6 Kohm 5% ¼W	328562J
	R127	1111	RES 330 ohm 5% ¼W	328331J
	R128	1111	RES 5.6 Kohm 5% ¼W	328562J
	R129	1111	RES 150 ohm 5% ¼W	328151J
	R130	1111	RES 5.6 Kohm 5% ¼W	328562J
	R131	1111	RES 12 Kohm 5% ¼W	328123J
	R132	1111	RES 2.2Kohm 5% ¼W	328222J
	R133	1111	RES 47 Kohm 5% ¼W	328473J
	R134	1111	RES 33 Kohm 5% ¼W	328333J
	R135	1111	HVR, RVA-7B, 50 Kohm – potentiometer	4300780
	R136	1111	RES 10 Kohm 5% ¼W	328103J
	R138	1111	RES 100 ohm 5% ¼W	328101J
	R139	1111	RES 220 ohm 5% ¼W	328221J
	R140	1111	RES 47 ohm 5% ¼W	328470J
	R141	1111	RES 3.3 Kohm 5% ¼W	328332J
	R142	1111	RES 100 ohm 5% ¼W	328101J
	R143	1111	RES 1 Kohm 5% ¼W	328102J
	R144	1111	RES 1 Kohm 5% ¼W	328102J
	R145	1111	RES 1 Kohm 5% ¼W	328102J
	R146	1111	RES 1 Kohm 5% ¼W	328102J
	R147	1111	RES 3.9 Kohm 5% ¼W	328392J
	R148	1111	RES 3.9 Kohm 5% ¼W	328392J
	R149	1111	RES 5.6 Kohm 5% ¼W	328562J
	R150	1111	RES 100 ohm 5% ¼W	328101J
	R151	1111	RES 56 Kohm 5% ¼W	328563J
	R152	1111	RES 10 Kohm 5% ¼W	328103J
	R153	1111	RES 4.7 Kohm 5% ¼W	328472J
	R154	1111	RES 1 Kohm 5% ¼W	328102J
	R155	1111	RES 100 Kohm 5% ¼W	328104J
	R156	1111	RES 10 Kohm 5% ¼W	328103J
	R157	1111	RES 10 Kohm 5% ¼W	328103J
	SAW101	1111	FILTER SAF10.7MA1	1280370
	T101	1111	FM IFT – transformer	1240270
	T102	1111	FM IFT (BLK) – transformer	1240330
	T103	1111	FM DET SW10G – transformer	1240320

MPX/REGURATOR CIRCUIT BOARD

600a	1- - -	MPX REG PCB ASS W – complete circuit board	9492420
600b	- 1- -	MPX REG PCB ASS E – complete circuit board	9492530
600c	- - 1-	MPX REG PCB ASS N – complete circuit board	9492530
600d	- - - 1	MPX REG PCB ASS D – complete circuit board	9492520

(MPX SECTION)

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.
	Q303	1111	TR 2SA750 (1) (E)	514088S
	Q304	1111	TR 2SA750 (1) (E)	514088S
	Q305	1111	TR 2SC945 (L) (P, Q)	515077S
	Q306	1111	TR 2SC945 (L) (P, Q)	515077S
	R301	1111	RES 5.6 Kohm 5% ¼W	328562J
	R302	1111	HVR, RVG-10B, 3.3 Kohm – potentiometer	4300820
	R303	1111	RES 220 Kohm 5% ¼W	328224J
	R304	1111	RES 33 Kohm 5% ¼W	328333J
	R305	1111	HVR, RVA-7B, 100 Kohm – potentiometer	4300790
	R306	1111	RES 1 Kohm 5% ¼W	328102J
	R307	1111	RES 100 ohm 5% ¼W	328101J
	R308	1111	RES 3.9 Kohm 5% ¼W	328392J
	R309	1111	RES 3.9 Kohm 5% ¼W	328392J
	R310	1111	RES 1 Kohm 5% ¼W	328102J
	R311	1111	MO-RES 680 ohm 5% 1W	361681B
	R312	1111	RES 6.8 Kohm 5% ¼W	328682J
	R313	1111	RES 10 Kohm 5% ¼W	328103J
	R314	1111	RES 47 ohm 5% ¼W	328470J
	R315	1111	RES 220 Kohm 5% ¼W	328224J
	R316	1111	RES 10 Kohm 5% ¼W	328103J
	R317	1111	RES 47 Kohm 5% ¼W	328473J
	R318	1111	RES 3.3 Kohm 5% ¼W	328332J
	R319	1111	RES 3.3 Kohm 5% ¼W	328332J
	R320	1111	RES 2.2 Kohm 5% ¼W	328222J
	R321	1111	RES 2.2 Kohm 5% ¼W	328222J
	R322	1111	HVR, RVA-7B, 105 Kohm – potentiometer	4300800
	R323	1111	HVR, RVA-7B, 500 Kohm – potentiometer	4300810
	R324	1111	RES 3.3 Kohm 5% ¼W	328332J
	R325	1111	RES 3.3 Kohm 5% ¼W	328332J
	R326	1111	RES 4.7 Kohm 5% ¼W	328472J
	R350	1111	RES 12 Kohm 5% ¼W	328123J
			(FLAT AMP SECTION)	
	C320	1111	E-CAP 50R0.47uF	211505Q
	C321	1111	E-CAP 50R0.47uF	211505Q
	C322	1111	C-CAP 47pF 10% 50V SL	232470K
	C323	1111	C-CAP 47pF 10% 50V SL	232470K
	C324	1111	C-CAP 10pF 10% 50V SL	232100K
	C325	1111	C-CAP 10pF 10% 50V SL	232100K
	C326	1111	E-CAP 16R10uF	211220Q
	C327	1111	E-CAP 16R10uF	211220Q
	C328	1111	M-CAP 0.0056uF 5% 50V	222562J
	C329	1111	M-CAP 0.0056uF 5% 50V	222562J
	C330	1- - -	M-CAP 0.015uF 5% 50V	222153J
	C330	- 111	M-CAP 0.0068uF 5% 50V	222682J
	C331	1- - -	M-CAP 0.015uF 5% 50V	222153J
	C331	- 111	M-CAP 0.0068uF 5% 50V	222682J
	C332	111-	E-CAP 50R3.3uF	211513Q
	C332	- - - 1	E-CAP 16R10uF	211220Q
	C333	111-	E-CAP 50R3.3uF	211513Q
	C333	- - - 1	E-CAP 16R10uF	211220Q
	IC302	1111	IC TA7136P	518045S
	IC303	1111	IC TA7136P	518045S
	R327	1111	RES 47 Kohm 5% ¼W	328473J
	R328	1111	RES 47 Kohm 5% ¼W	328473J
	R329	1111	RES 82 Kohm 5% ¼W	328823J
	R330	1111	RES 82 Kohm 5% ¼W	328823J
	R331	1111	RES 820 Kohm 5% ¼W	328824J
	R332	1111	RES 820 Kohm 5% ¼W	328824J
	R333	1111	RES 3.3 Kohm 5% ¼W	328332J
	R334	1111	RES 3.3 Kohm 5% ¼W	328332J
	R335	1111	RES 560 ohm 5% ¼W	328561J
	R336	1111	RES 560 ohm 5% ¼W	328561J
	R337	1111	RES 15 Kohm 5% ¼W	328153J
	R338	1111	RES 15 Kohm 5% ¼W	328153J
	R339	1111	RES 4.7 Kohm 5% ¼W	328472J
	R340	1111	RES 4.7 Kohm 5% ¼W	328472J
	R341	1111	RES 4.7 Kohm 5% ¼W	328472J
	R342	1111	RES 4.7 Kohm 5% ¼W	328472J
			(MUTING SECTION)	
	C334	1111	C-CAP 0.047uF 80, –20% 50V YG	231473Z
	C335	1111	E-CAP 16R100uF	211230Q
	Q307 ~Q310	4444	TR 2SC945 L (P, Q)	515077S
	R343	1111	RES 22 Kohm 5% ¼W	328223J
	R344	1111	RES 22 Kohm 5% ¼W	328223J
	R345	1111	RES 33 Kohm 5% ¼W	328333J
	R346	1111	RES 22 Kohm 5% ¼W	328223J
	R347	1111	RES 330 Kohm 5% ¼W	328334J
	R349	1111	RES 33 Kohm 5% ¼W	328333J
		1111	REED RELAY URT-103	1700200
			(REGURATOR SECTION)	
	C801 ~C804	4444	C-CAP 0.01uF 100, –0% 500V	238103P
	C805	1111	25R1000uF	211340V
	C806	1111	25R470uF	211335V
	C807	1111	25R470uF	211335V
	C808 ~C810	3333	25R220uF	211332V
	C811	1111	16R470uF	211235V
	C812	1111	16R33uF	211223Q
	C813	1111	16R100uF	211230V
	D801	1111	BRIDGE DIODE 1D4B1	560031S
	D802	1111	DIODE 1S2076	501019S
	D803	1111	DIODE 1S1885	560032S
	F801 ~ F803	- 333	MIDGET FUSE (S) EAK 500 mA	4720310
	F804	- 111	MIDGET FUSE (S) EAK 1A	4720330
	†	- 888	MIDGET FUSE HOLDER	7050430
	Q801	1111	TR 2SD381 (L, M)	510038S
		1111	HEATSINK (S10)	7081820
		1111	PMS 3φ x 6 – screw	810306S
		1111	TW (I) 3φ – washer	893403U
	Q802	1111	TR 2SA733 (Q, R)	514074S
	R801	1111	MO-RES 1 Kohm 5% 1W	361102J
	R802	1111	RES 1 Kohm 5% ¼W	328102J
	R803	1111	RES 1 Kohm 5% ¼W	328102J
	R804	1111	RES 220 ohm 5% ¼W	328221J
	R805	1111	RES 220 ohm 5% ¼W	328221J
	R806	1111	RES 1.5 Kohm 5% ¼W	328152J
	R807	1111	RES 2.7 Kohm 5% ¼W	328272J
	R808	1111	RES 560 ohm 5% ¼W	328561J
	R809	1111	RES 560 ohm 5% ¼W	328561J
	R810	1111	RES 560 ohm 5% ¼W	328561J
	ZD801	1111	ZENER DIODE XZ137	502037S
	ZD802	1111	ZENER DIODE WZ145	502025S

PART ORDERING PROCEDURE - - - - - Include in any order : A. Part number, B. Part description, C. Model number.
(Any of the above lacking from an order may delay shipment of that order.)

KEY NO.	SYMBOL NO.	TYPE+ W-type-u E-type-u N-type-d D-type-g	DESCRIPTION++	PART NO.
			(THE OTHERS)	
	D105	1111	DIODE 1N60P	500001G
	R137	1111	HVR, RVA-7B, 3.3 Kohm – potentiometer	4300760
601	S2~S4	1111	TR1 PUSH SW 6S562 – triple pushbutton switch (IF band, hi-blend, mode)	4040920
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 Si : Sillicon
A : Alloy B : Base D : Diffused Dd : Double-diffused
Df : Drift-field E : Epitaxial G : Grown J : Junction
M : Mesa P : Planer Pc : Point-contact Td : Triple-diffused

TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T_A = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Tipical Values: (T_A = 25°C unless otherwise specified)														MANUFACTURE
			Collector-to-Base Voltage V_{CBO} (V)	Emitter-to-Base Voltage V_{EBO} (V)	Collector Current I_C (mA)	Collector Dissipation P_C (mW)	Jundtion Temperature T_J (°C)	Collector Cutoff Current I_{CBO} (uA)	V_{CB} (V)	Static Forward-Current Transfer Ratio h_{FE}	V_{CE} (V)	I_C (mA)	Collector-Emitter Saturation Voltage $V_{CE(sat)}$ (V)	I_C (mA)	I_B (mA)	Gain-Bandwidth Product f_T (MHz)	V_{CE}	I_E	Base Spreading Resistance $r_{bb'}$ hie(real)* (Ω)	V_{CE}	I_E	Output Capacitance (pF)	
2SA733 (Q, R)	AF	PNP Si–E	–50	–5	–100	250	125	–0.1	–40	90 ~270	–6	–1	–0.1	–30	–3	180	–6	10				12	NEC
2SA750 (1) (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	NEC
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–P	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·rbb' = 10ps	6	–1	Cre = 0.65	TOSHIBA
2SC945 L (Q, P)	AF	NPN Si–E	60	5	100	250	125	0.1	120	135 ~400	6	1	0.15	100	10	250	6	–10				3.5	NEC
2SC1215	RF	NPN SI–EP	30	3	50	200	125	100	30	25 min.	10	2	0.1	10	1	1200	10	–10	Cc·rbb' =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	NEC

FIELD EFFECT TRANSISTORS

DEVICE TYPE	APPLICATIONS	STRUCTURE†	MAXIMUM RATINGS Absolute-Maximum Values: (T_A = 25°C unless otherwise specified)					ELECTRICAL CHARACTERISTICS Tipical Values: (T_A = 25°C unless otherwise specified)																	MANUFACTURE
			Gate-to-Drain Voltage V_{GDO} (V)	Gate-to-Source Voltage V_{GSO} (V)	Gate Current I_G (mA)	Drain Current I_D (mA)	Total Power Dissipation P_D (mW)	Channel Temperature T_J (°C)	Date Leak Current Test Conditions	I_{GSS} (mA)	Gate to Drain Breakdown Voltage Test Conditions	$V_{BR(GDO)}$ (V)	Drain Current Test Conditions	I_{DSS} (mA)	Gate to Source Cutoff Voltage Test Conditions	$V_{GS(off)}$ (V)	Forward Transfer Admittance Test Conditions	Mfsl (mts)	Feed Back Capacitance Test Conditions	C_{rss} (pF)	Power Gain (Common Source) Test Conditions	G_{PS} (dB)	Noise Figure Test Conditions	NF (dB)	
2SK49 (F, H)	FM tuners, VHF tuners	Si, N– channel J–FET	–20		10	10	72 (Ta= 60°C)	80	VGS=–0.5V VDS=0	50 max.			VDS=5V VGS=0	1.5 ~6	VDS=5V ID=10uA	–2.5 max.	VDS=5V ID=0.5mA f=1 kHz	2.8	VDS=5V VGS=0 f=1 MHz	0.07	VDS=5V VGS=0 Zin, out =50Ω f=100MHz	18	VDS=5V VGS=0 Zin, out =50Ω f=100MHz	60 max.	NEC
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=1 uA	–4 max.	VDS=10V ID=0.5mA f=1 kHz	9	VGD=–10V VGS=0 f=1 MHz	0.15			VDS=10V f=100MHz	3.5 max.	TOSHIBA
3SK40	FM tuners, VHF tuners	Si, N– channel dual gate MOS-FET		VG1S =±7 VG2S =±7		25	250	150	VG1S=±5V VDS=0 VG2S=0	IG1SS =100			VDS=10V VG1S=0 VG2S=4V	4 ~25	VDS=15V VG2S=0 ID=100uA	VG1S =–4 max.	VDS=15V VG2S=4V ID=5mA f=1 kHz	10	VDS=15V VG2S=4V ID=5mA f=1 MHz	0.03	VDS=15V ID=5mA f=200MHz	18 min.	VDD=15V VG2S=4V ID=10mA f=200MHz	4.5 min.	NEC
									VG2S=±5V VDS=0 VG1S=0	IG2SS =100					VDS=15V VG1S=0 ID=100uA	VG2S =–4 max.									
3SK45	FM tuners, VHF tuners	Si, N– channel dual gate MOS-FET		VG1S =±7 VG2S =±7		35	330	175	VG1S=±7V VDS=0 VG2S=0	IG1SS = 20			VDS=16V VG1S=0 VG2S=4V	4 ~32	VDS=15V VG2S=4V ID=100uA	VG1S =–3 max.	VDS=15V VG2S=4V ID=10mA f=1 kHz	14	VDS=15V VG2S=4V ID=10mA f=1 MHz	0.02	VDD=15V VG2S=4V ID=20mA f=200MHz	17 min.	VDD=15V VG2S=4V ID=10mA f=200MHz	3.3 max.	HITACHI
									VG2S=±7V VDS=0 VG1S=0	IG1SS = 20					VDS=15V VG1S=0 ID=100uA	VG2S =–0.3 min.									
3SK59	FM tuners, VHF tuners	Si, N– channel depletion dual gate MOS-FET		VG1S =±9 VG2S =±9		30	300	150	VG1S=±2V VDS=0 VG2S=0	IG1SS =±50			VDS=15V VG1S=0 VG2S=4V	3 ~24	VDS=15V VG2S=4V ID=100uA	VG1S =–2.5 max.	VDS=15V VG2S=4V ID=10mA f=1 kHz	20	VDS=15V VG2S=4V ID=10mA f=1 MHz	0.03	VD=15V f=100 MHz	18 min.	VD=15V f=100MHz	3.5 max.	TOSHIBA
									VG2S=±7V VDS=0 VG1S=0	IG2SS =±50					VDS=15V VG1S=0 ID=100uA	VG2S =–2.5 max.									

DIODES, LEDS

DEVICE TYPE	APPLICATION	STRUCTURE†	MAXIMUM RATINGS Absolute – Maximum Values: (T_A = 25°C unless otherwise specified)									ELECTRICAL CHARACTERISTICS Tipical Values: (T_A = 25°C unless otherwise specified)							MANUFACTURE
			Reverse Surge Voltage $V_{R\,surge}$ (V)	Peak Reverse Voltage V_{RM} (V)	Reverse Voltage V_R (V)	Peak Forward Voltage V_{FM} (V)	Peak Forward Current I_{FM} (mA)	Average Rectified Current I_O (mA)	Forward Surge Current $I_{F\,surge}$ (A)	Junction Temperature T_J (°C)	Total Power Dissipation P_D (mW)	Forward Current $I_{F\,min}$ (mA)	Test Condition V_F V)	Forward Voltage V_F (V)	Test Condition I_F (mA)	Reverse Current $I_{R\,max}$ (uA)	Test Condition V_R (V)		
VD1212							30				50			1.24 min. 1.34 max.	1.5			γ_F = –3.6 mV/°C (IF = 1.5 mA)	NEC
1D4B1	Rectifiers	Si–D Bridge		200				1.3A (T_A=60°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
1S1885	Rectifiers	Si–A		100		70		1A (T_A=65°C)	60					1.2	1.5A	10	100		TOSHIBA
1S2076	Detectors Modulators	Si–P		35	30	35	450	150	1	175	250			0.8	10	1	30		HITACHI
GD-4-207RD	LED							IF=50		100	100			1.5 min. 2.0 max.	20	100	3		STANLEY
TLR109	LED	GaP			4			IF=25		75	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: (T_A = 25°C unless otherwise specified)			ELECTRICAL CHARACTERISTICS Tipical Values: (T_A = 25°C unless otherwise specified)													MANUFACTURE
			Total Power Dissipation P_D (mW)	Zener Current I_Z (A)	Junction Temperature T_J (°C)	Zener Voltage V_Z MIN (V)	V_Z TYP (V)	V_Z MAX (V)	Test Condition I_Z (mA)	Defferential Resistance r_d TYP (Ω)	r_d MAX (Ω)	Test Condition I_Z (mA)	Temperature Coefficient γ_Z TYP (%/°C)	γ_Z MAX (%/°C)	Test Condition I_Z (mA)	Reverse Current I_R MAX (uA)	Test Condition V_R (V)		
RD5, 6E (B)		Si, P	400			5.3		6.3	20		25	20				5	1.5		NEC
RD15E (B)		Si, P	400			13.8		15.6	10		30	10				2	11		NEC
WZ145			500		175	13.9	14.5	15.1	5		15	5	0.076			1	11		JRC
XZ137			500		175	13.3	13.7	14.1	5		15	5	0.073			1	11		JRC

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)

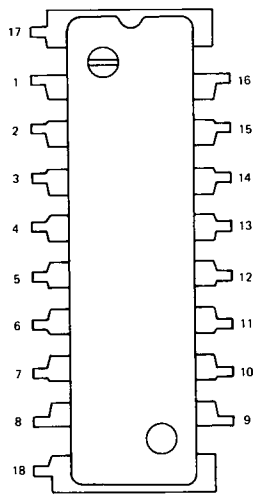
Item	Symbol	Typical Value	Unit
Pin 1 (AM IF Bypass)	V_1	2.7	V
Pin 4 (AM IF Input)	V_4	0.7	V
Pin 6 (FM IF Input DC Feedback)	V_6	1.9	V
Pin 7 (FM IF Input DC Feedback)	V_7	1.9	V
Pin 8 (FM IF Input)	V_8	1.9	V
Pin 10 (Muting Control Voltage)	V_{10}	5.4	V
Pin 12 (Refference)	V_{12}	5.6	V
Pin 15 (AFC)	V_{15}	5.6	V
Pin 16 (Audio Out.)	V_{16}	5.6	V

■ AC CHARACTERISTICS (Notes 1)

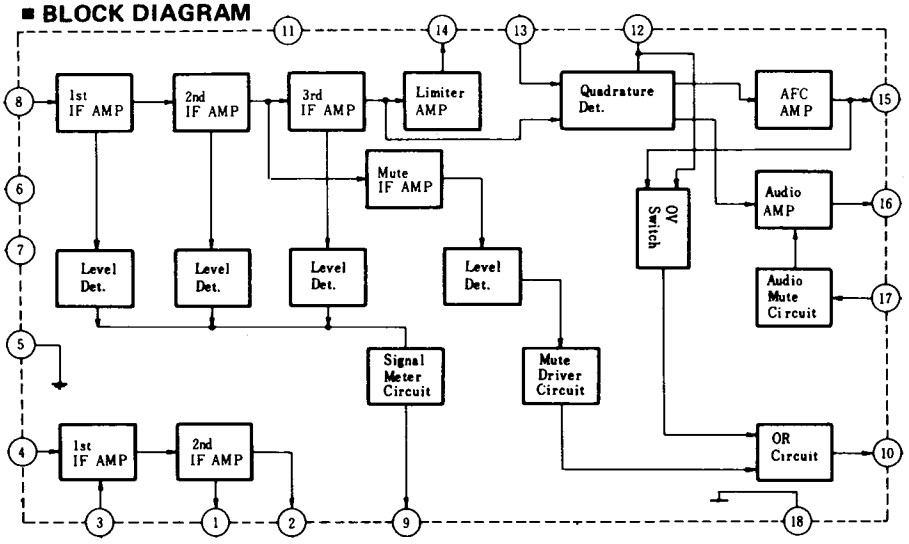
Item		Symbol	Test Condition	min	typ	max	Unit
Total Current Drain		I_{11}	V_{in}=100dBμ, M_{ute}; ON	—	38.5	56.2	mA
FM	Limiting Sensitivity	$V_{in\ lim}$	V_{in}=-3dB point from output voltage when 100dBμ input	—	31	37	dBμ
	Recovered AF Voltage	$V_{01\ AF}$		270	450	700	mVrms
	Total Harmonic Distortion	$T.H.D_1$		—	0.04	0.1	%
	Signal-to-noise Ratio	$(S+N/N)_1$		73	79	—	dB
	AM Rej ection Ratio	AMR	V_{in}=100dBμ, FM ; 400Hz, Δf=75kHz, AM ; 1kHz m=0.3	—	55	—	dB
	Muting Sensitivity	$V_{in}(M_{ute})$	V_{10}=1.4V	43	48	53	dBμ
	Muting Attenuation	$M_{ute\ ATT}$	V_{17}=2V	73	80	—	dB
	Muting Bandwidth	$BW(M_{ute})$	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	$V_{02\ AF}$		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_{in}=10.7MHz, f_{mod}=400Hz, Δf=75kHz and V_{in}=100dBμ
AM·····f_{in}=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_{-3dB} is tested under sampling of AQL=1.0%

■ TERMINAL GUIDE (TOP VIEW)



■ BLOCK DIAGRAM



INTEGRATED CIRCUIT (HA11223)

■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

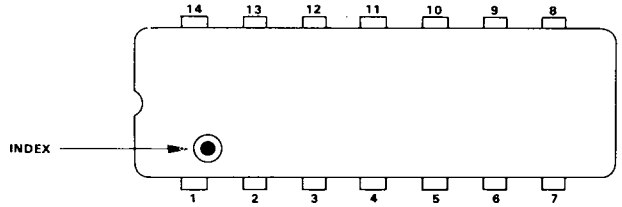
Item		Symbol	Rating	Unit
Supply Voltage		V_{CC}	16	V
Power Dissipation*		P_T	500	mW
Operating Temperature		T_{opr}	−20 to +75	°C
Storage Temperature		T_{stg}	−55 to +125	°C
Lamp Drive Current	Continuos	I_L	75	mA
	Peak		100	

*Value at Ta=75°C

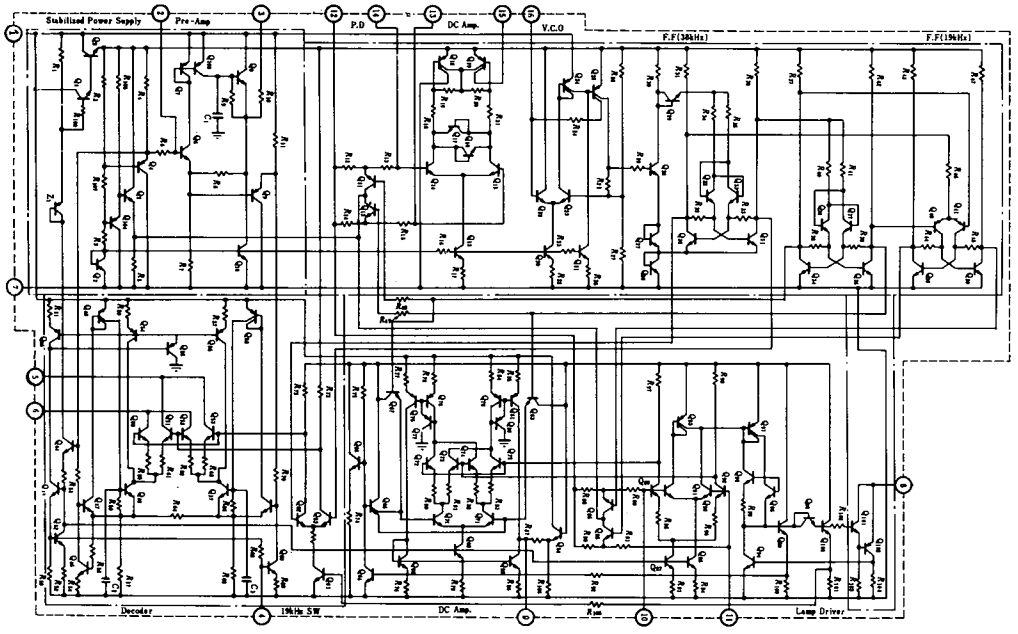
■ ELECTRICAL CHARACTERISTICS (V_{CC}=13V, f=1kHz, Ta=25°C unless otherwise noted)

Item	Symbol	Test Condition		min	typ	max	Unit
Input Impedance	Z_{in}			30	75	—	kΩ
Channel Separation	Sep	P=30mV, $L+R$=270mV	100Hz	—	40	—	dB
			1kHz	35	45	—	
			10kHz	—	40	—	
Stereo Total Harmonic Distortion	ST, T.H.D	P=30mV, $L+R$=270mV	100Hz	—	0.04	—	%
			1kHz	—	0.02	0.08	
			10kHz	—	0.05	—	
Output Voltage	V_{out}	V_{in}=300mV		185	240	310	mV
Channel Balance	C.B	V_{in}=300mV		—	0	—	dB
Monaural Total Harmonic Distortion	M_{ono}, T.H.D	V_{in}=300mV		—	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=30mV, $L+R$=270mV	19kHz	55	60	—	dB
			38kHz	—	35	—	
SCA Rejection Ratio	SCA R_{ej}	P=30mV, $L+R$=270mV; SCA=30mV, f_{SCA}=67kHz		—	80	—	dB
Signal-to-noise Ratio	S/N	V_{in}=300mV, R_g=4.7kΩ		80	86	—	dB
Capture Range	C.R	P=30mV		—	±3.5	—	%
Max Input Signal	Vin	P=10%, $L+R$=90%, T.H.D≦0.5%		—	1.2	—	V
Total Current Drain	I_T			—	17	—	mA

■ TERMINAL GUIDE (TOP VIEW)



■ SCHEMATIC DIAGRAM



INTEGRATED CIRCUIT (HA1211)

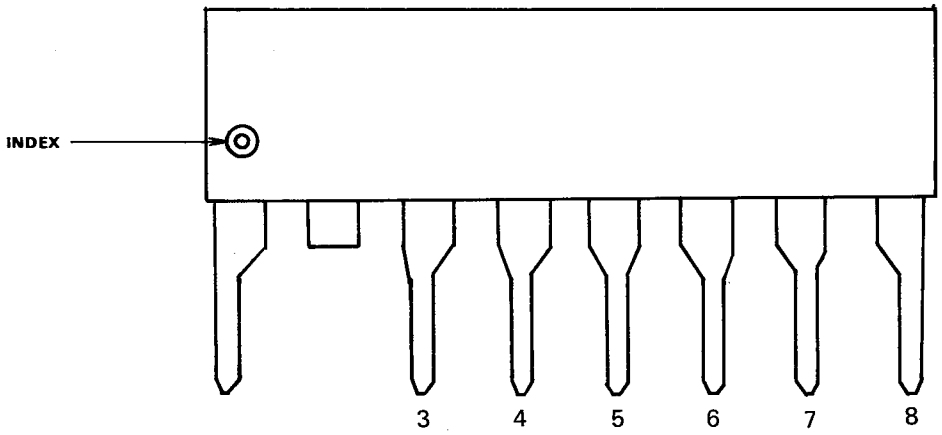
■ ABSOLUTE MAXIMUM RATINGS (Ta=25°C)

Item	Symbol	Rating	Unit
Supply Voltage	V_{CC}	20	V
Input Voltage	V_{in}	±5	V
Power Dissipation	P_T	200	mW
Operating Temperature	T_{opr}	−20 to +70	°C
Storage Temperature	T_{stg}	−55 to +125	°C

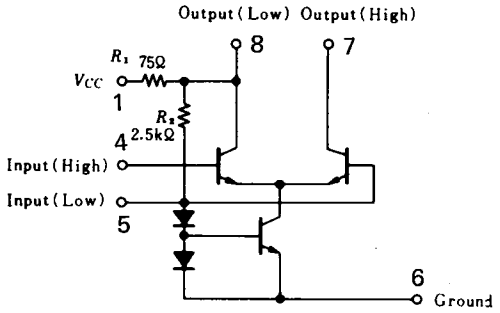
■ ELECTRICAL CHARACTERISTICS (V_{CC}=12V, Ta=25°C)

Item	Symbol	Test Condition	min	typ	max	Unit
Power Dissipation	P_T		—	110	170	mW
DC Total Current	I_T		5.4	9.15	14.1	mA
Power Gain	PG	f=10.7MHz	27	31	—	dB
Forward Transadmittance	$\|y_f\|$	V_{in}=10mVrms, f=10.7MHz	—	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=10.7MHz	—	6	—	dB

■ TERMINAL GUIDE (TOP VIEW)



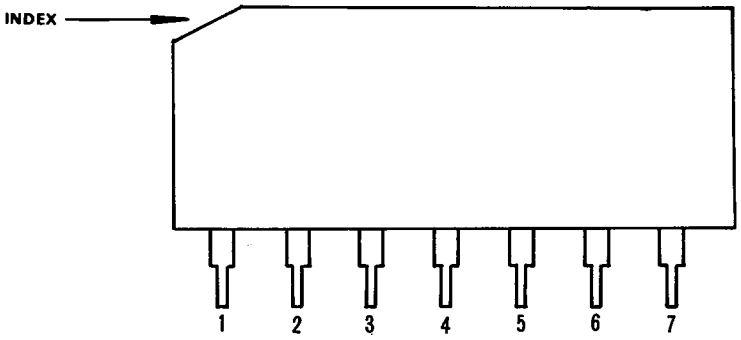
■ CIRCUIT SCHEMATIC



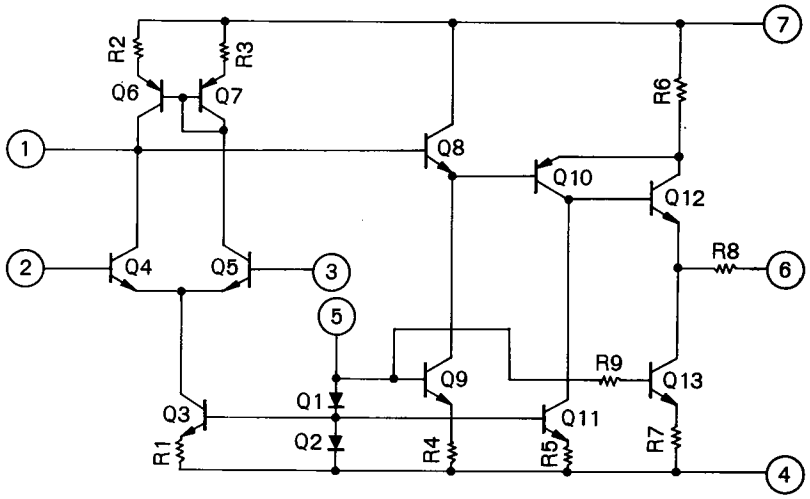
INTEGRATED CIRCUIT (TA7136P)

DEVICE TYPE	APPLICATION	ABSOLUTE MAXIMUM RATINGS (T_A = 25 °C)				ELECTRICAL CHARACTERISTICS(T_A=25 °C) Tipical 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 (Vrms)	Equivalent Input Noise Voltage (μVrms)	
TA7136P	Preamplifier	40	400	−25 75	−55 125	3.1	92	7.0	1.0	TOSHIBA

Terminal Guide (Side View)



Schematic Diagram



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965168E 78.4 1,500 Printed in Japan