TECHNICAL MANUAL

Model RX-600 AM / FM Stereo Receiver

Roland Electronics Co., Ltd.
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310, Sec. 5, Nanking E. Road, Taipei, Taiwan

ALIGNMENT PROCEDURE

PRECAUTIONS

1. Always disconnect the chassis from power line when soldering. Turning the power switch OFF is not enough. Power line leakage passing through the heating element may destroy the transistors.
2. Never attempt to do any work on the transistor amplifiers without first disconnecting the AC line cord and waiting until the power supply filter capacitors have discharged.
3. Replacement for output and driver transistors, if necessary, must be made from the same beta group as the orignal type.
4. If one output transistor burns out (open or short) always remove all the output transistors in that channel and check the bias adjustment, the control and other parts in the network with an ohm-meter before inserting a new transistor. All transistors in one channel will be destroyed if the base biasing circuit is open on the emitter end.
5. When mounting a replacement power transistor, be sure that the bottom of the flange, the mica insulators and the surface of the heat sink are free of foreign matter, for they may cause transistors failure.
6. Silicon grease must be applied between the transistor and the mica insulator, and between the mica insulator and the heat sink for better heat conduction.

Rx200. Rx300. Rx600

RX 600

POWER AMP. BIAS (IDLING CURRENT) ADJUSTMENT

Adjust Idling Current using a DC milli-volt meter.

1. Set Volume Control to minimum position = no signal input.
2. Connect the plus lead of a DC milli-volt meter to Pin #5. (on Power Amp. board) and the minus lead of a DC milli-volt meter to Pin #7. See Fig. 1.
3. Rotate VR601 (on Driver board) to obtain a 15mV reading on DC milli-volt meter. See Fig. 2.
4. Repeat the steps 2 and 3 as above for Right channel. (Use VR602, Pin #1. and Pin #3).

Fig. 1 Bias Adjustment Hook-up

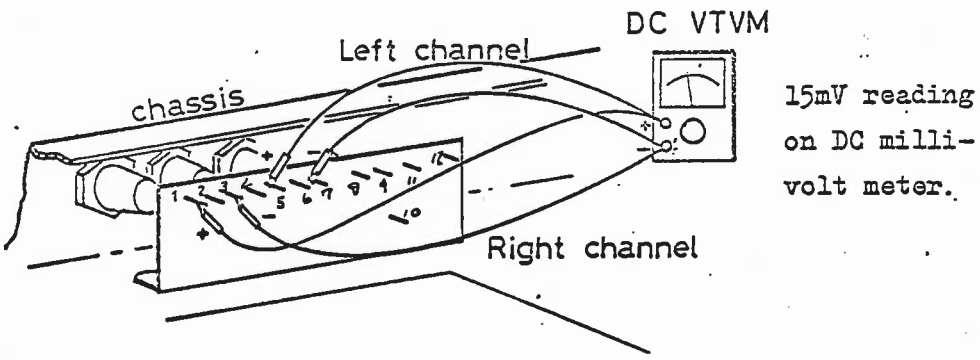
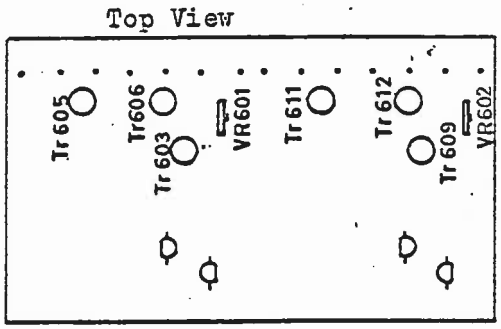


Fig. 2 Driver Circuit Board Layout



AM ALIGNMENT PROCEDURE

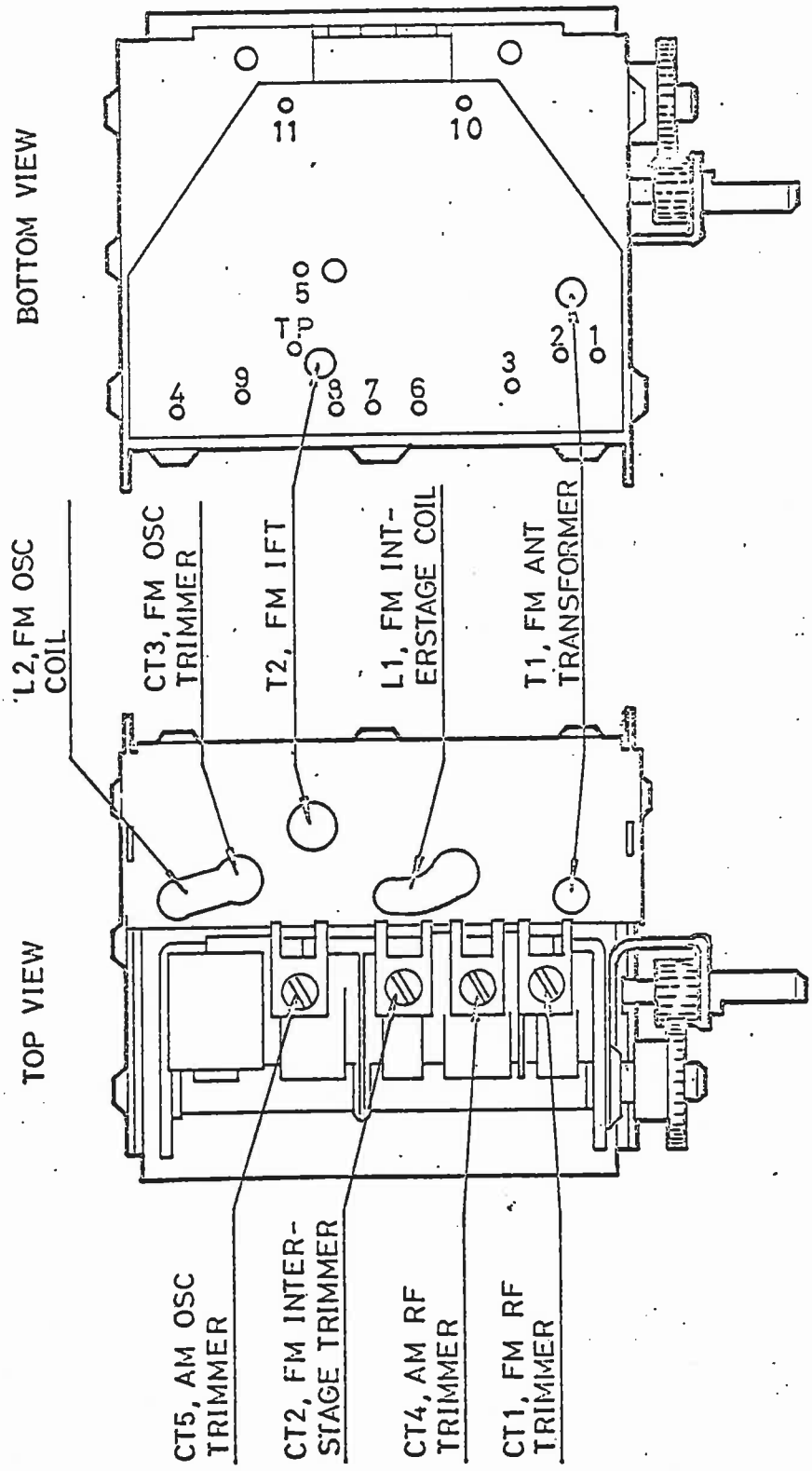
Instruments: AM Signal Generator and AC VTVM.

Set Selector switch to AM.

NOTE: Input signal must be kept as low as possible to avoid AVC action.

Step	Generator		Tuning Dial	Output Indicator	Adjust	Adjust for
	Coupling	Frequency	Setting	Connected to		
1	Tr201 Base (Pin #2 on AM IF board) through a 0.01mfd capacitor.	455 KHz (400 Hz 30% mod.)	Non-interfering at low end of scale.	AC VTVM to TAPE OUT jack.	T204,203, 202 & 201 (on AM IF board)	Maximum reading on VTVM.
2	Connect to short loop of wire. Radiste signal into ferrite loopstick antenna.	600 KHz (400 Hz 30% mod.)	600 KHz		L201 (OSC) coil (on AM IF board) and L901 ANT. Ring.	
3		1400 KHz (400 Hz 30% mod.)	1400 KHz		CT5 (OSC) and CT4 (ANT) Trim. (on Front-end)	
4	Repeat the steps 2 and 3 until no further improvement is noticed.					

FRONT END LAYOUT



FM ALIGNMENT PROCEDURE

Instruments: FM Sweep Generator, FM Signal Generator, AC VTVM and Oscilloscope.
Set Selector switch to FM.

Step	Generator		Tuning Dial Setting	Output Indicator Connected to	Adjust	Adjust for
	Connected to	Freq.				
1	FM Swoop Generator to junction of C913, and C912. (FM IF input, pin #1, on FM IF board).	10.7 MHz	Quiet point on band.	Oscilloscope to junction of R127 and C126 (on FM IF board)	T104, 103, 102 & 101 (on FM IF board) Top and Bottom	Maximum and Balanced S curve on scope.
2	Disconnect FM Sweep Generator and connect FM Signal Generator to FM antenna terminals.					
3	FM Signal Generator to FM antenna terminals.	98MHz (400Hz 100% mod.)	Tune for maximum output point.	Oscilloscope and AC VTVM. to TAPE OUT jack.	T2, Top & Bottom (on Front end) Touch up T101, 102, 103 & 104 if necessary.	Maximum and undistorted amplitude on scope.
4	* To align the steps 4 and 5, input signal level must be kept -3db of limitter satulation.	90MHz (400Hz 100% mod.)	90MHz		L2 (OSC), L1 (RF) & T1 (ANT) (on Front end)	Maximum reading on VTVM.
5		106MHz (400Hz 100% mod.)	106MHz		CT3 (OSC), CT2 (RF) & CT1 (ANT) (on Front end).	
6	Repeat the steps 4 and 5 until no further improvement is noticed.					

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FM-STEREO ALIGNMENT PROCEDURE

Instruments: FM Signal Generator, AC VTVM and Oscilloscope.

NOTE: The FM IF Amplifier Alignment must be completed before attempting this FM-Stereo Alignment. Poor IF alignment will result in poor FM-Stereo Adjustment.

Set Stereo Beacon Level Adj. VR301 (on MPX board) to mid-position.

Set Separation Adj. VR302 (on MPX board) to max-position.

Set Selector switch to FM.

Connect Stereo Generator to FM antenna terminals.

Step	Stereo Generator		Output Indicator Connected to	Adjust	Adjust for
	Modulation	RF Deviation			
1	19KHz Pilot signal only	2 - 5%	Oscilloscope to Test Point (#6 on MPX board)	L301, 302 and 303	Maximum Amplitud on scope.
2		5%	**********	VR301	Stereo Beacon Lamp just comes on.
3	Composite 1 KHz signal to Left channel only	Pilot 10% Signal 70%	Oscilloscope and VTVM to Left channel TAPE OUT jack.	L302	Maximum and undistorted sine wave on scope.
4			Oscilloscope and VTVM to Right channel TAPE OUT jack.		Minimum reading on VTVM.
5	Composite 1 KHz signal to Right channel only		Same as in step 3		
6	Repeat the steps 4 and 5 until no further improvement is noticed. And adjust Separation Adj. VR302, if necessary.				

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FM MONO -STEREO AUTOMATIC SWITCHING LEVEL ADJUSTMENT PROCEDURE

1. Connect a VTVM and Oscilloscope to the TAPE OUT jack (Left or Right channel).
2. Feed the FM signal whose MPX has been varied into the FM antenna terminals.

MPX variation	Pilot	10%
	Modulation Frequency	1 KHz (Left or Right channel).
	RF deviation	± 45 KHz

3. Set the frequency at 98 MHz (when there are disrupting signal, choose another setting).
4. Set the Mode switch to STEREO and Selector switch to FM.
5. Turn CCW the MONO -STEREO Auto-switching Level Adj. VR101 (on FM IF board): this is a condition in which Auto-switching dose not function.
6. Adjust the FM-Stereo so that the distortion and separation will be best.
7. Adjust the VR101 so that when the antenna input level is 30uV or more, Stereo will switch in and when the input is below the 30uV level, Mono will switch in.
8. After adjustment, check to make sure, indeed, when the antenna input level exceeds 30uV, Stereo will switch in.

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FM MUTING ADJUSTMENT PROCEDURE

1. Connect an Oscilloscope to the TAPE OUT jack (Left or Right channel).
2. Feed the FM signal into the FM antenna terminals.
3. Set the frequency at 98 MHz (when there are disrupting signal, choose another setting).
4. Set Selector switch to FM.
5. Adjust the Muting Level Adj. VR801 (on muting board) so that when the antenna input level is 10uV, Muting will be effective (= the signal will disappear from scope) and when the input is upward of 10uV level, Muting will not be effective (= the signal will appear on scope).
6. After adjustment, check to make sure, that when the antenna input level exceeds 30uV, Muting will, indeed, not be effective.

Fig. 5 FM IF CIRCUIT BOARD LAYOUT

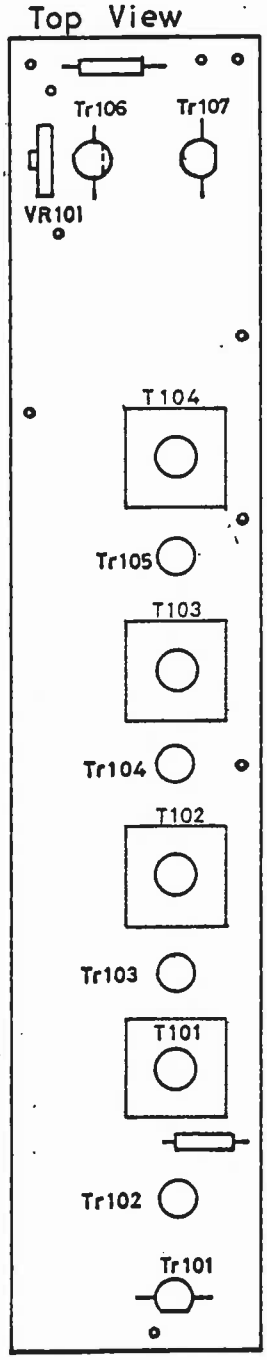


Fig. 6 MUTING CIRCUIT BOARD LAYOUT

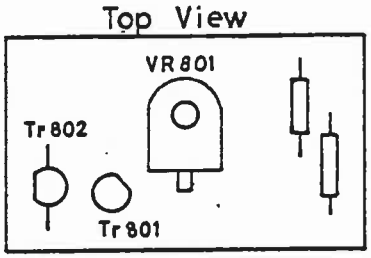
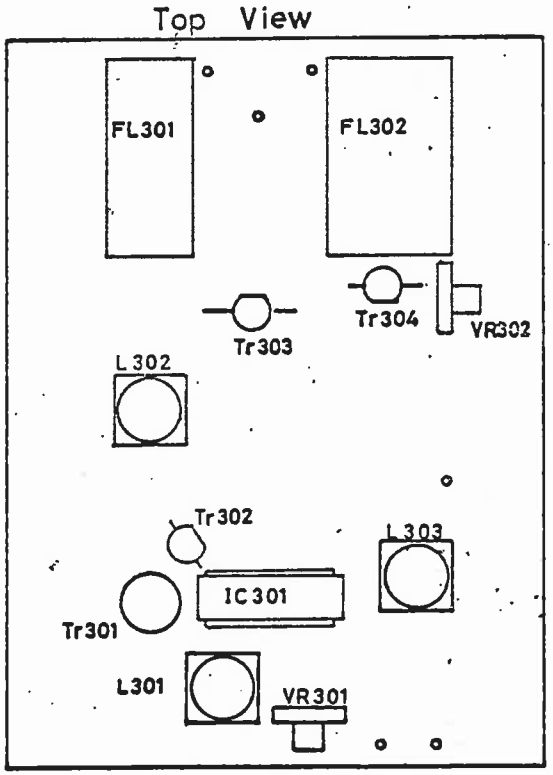
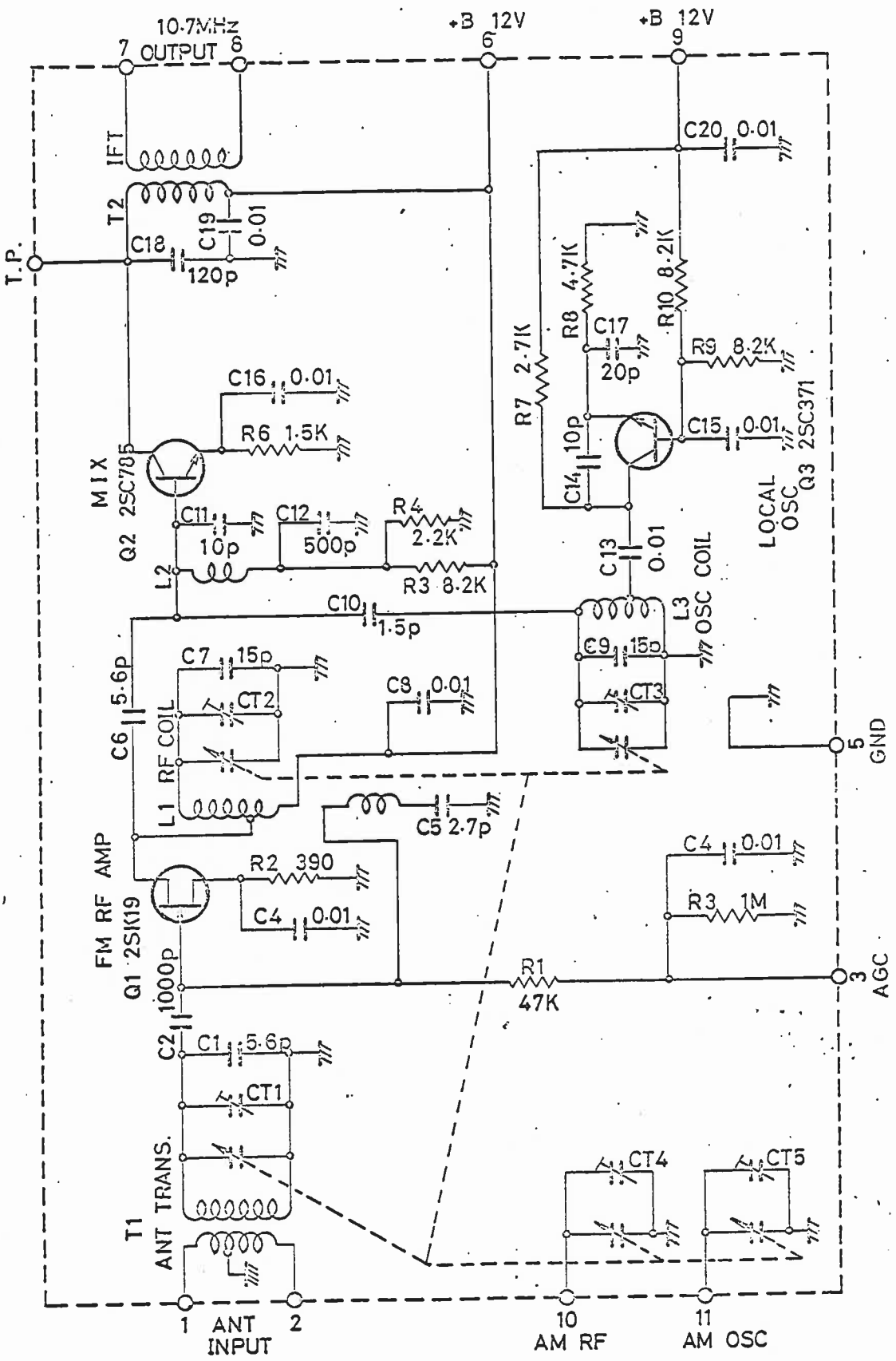


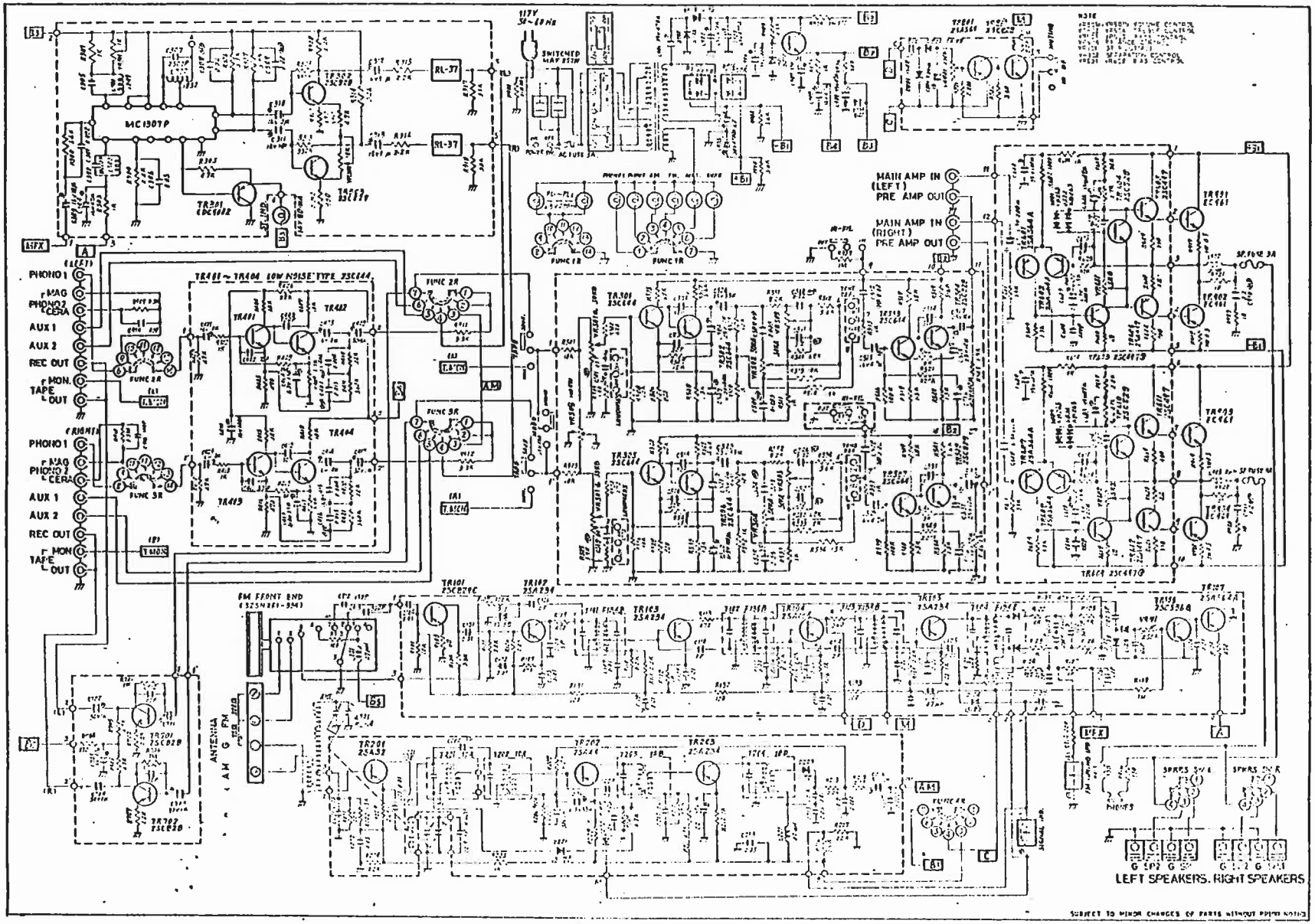
Fig. 7 FM-STEREO CIRCUIT BOARD LAYOUT



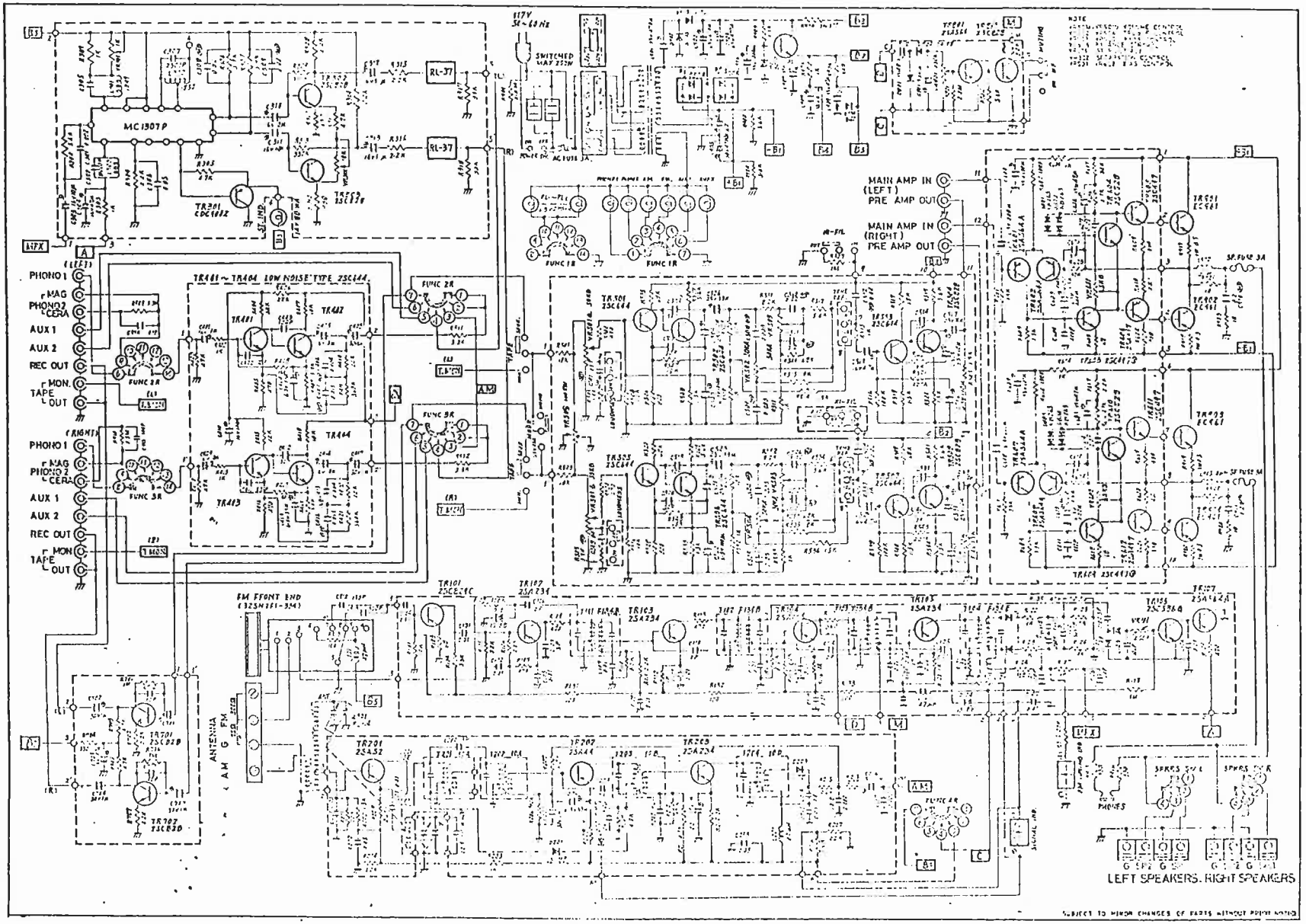
FRONT END SCHEMATIC DIAGRAM



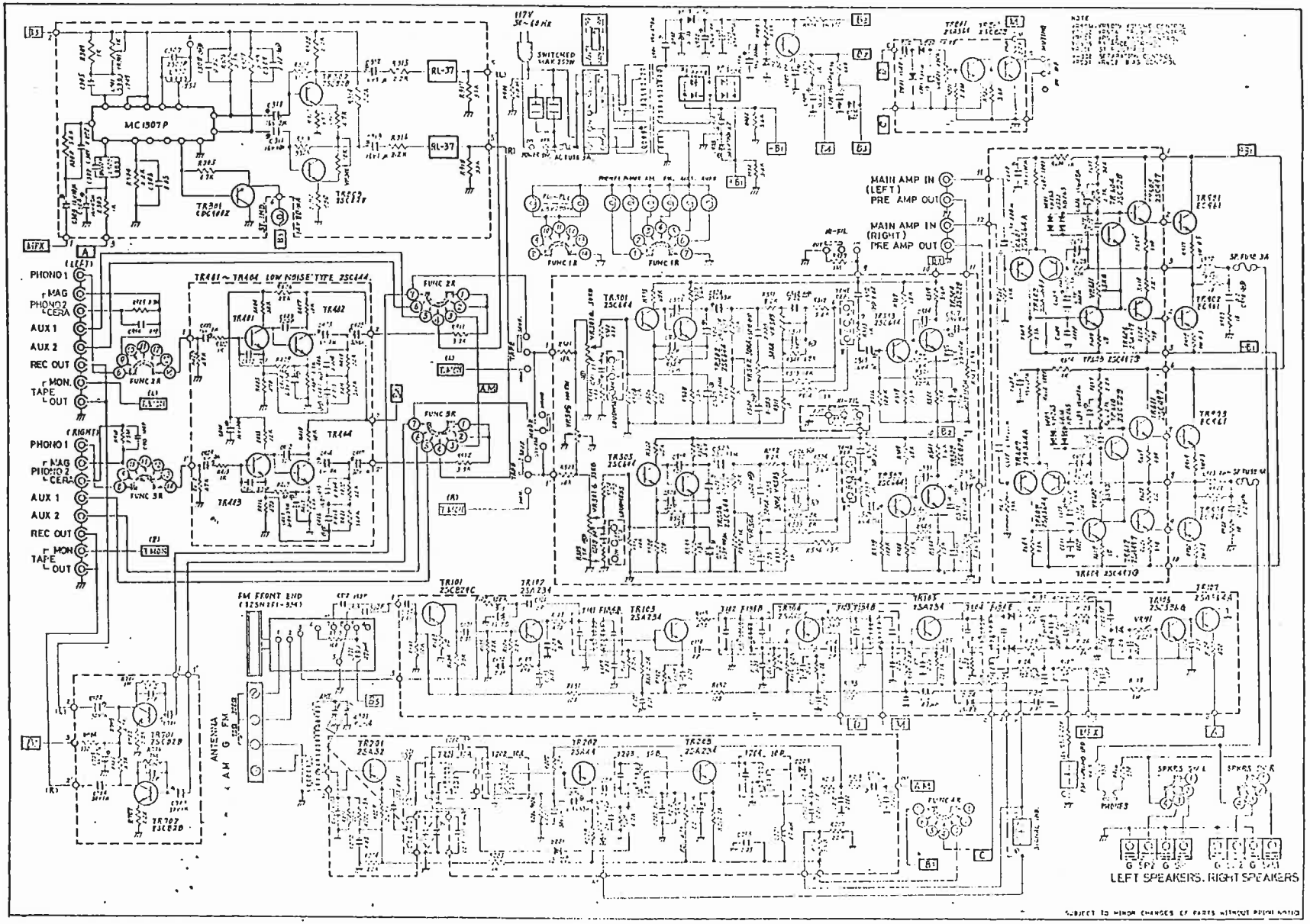
SCHEMATIC DIAGRAM



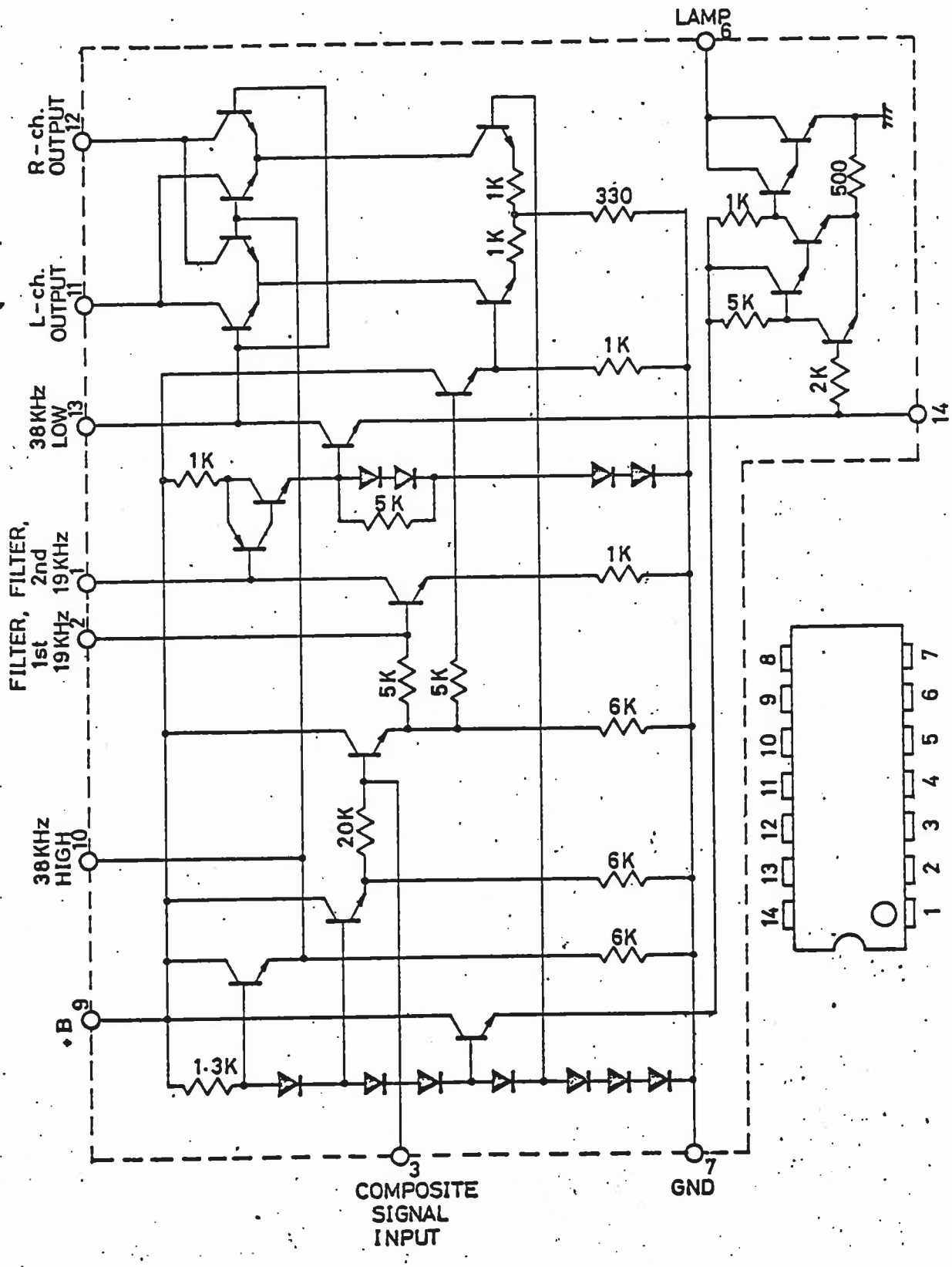
SCHEMATIC DIAGRAM



SCHEMATIC DIAGRAM



INTEGRATED CIRCUIT MC1307
SCHEMATIC DIAGRAM



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ENTIRE UNIT INOPERATIVE

I. If the pilot lamp dose not light,
   A. Check to see if the AC Power Supply Cord is properly connected to the power source.
   B. Check to see if there is adequate voltage from the power source.
   C. If A and B are OK, check to see if the AC fuse F903 is not blown.
      1. If the AC fuse is blown,
         a. Main Amp.Transistors Tr603,605,606,609,611,612,901,902,903 or 904 are shorted out, or
         b. Capacitors C901,902,904 or 905 are shorted out, or
         c. Rectifiers D902,903,905 or 906 are shorted out, or
         d. Primary or Secondary Winding in the Power Transformer is shorted out.
      2. If the AC fuse is OK,
         a. Primary Winding in the Power Transformer is cut, or
         b. Power Switch connection is faulty, or
         c. AC Power Supply Cord is cut.

II. If the pilot lamp dose light,
   A. Check to see if the Speaker fuse F901 or 902, is not blown.
      1. If the Speaker fuse is blown,
         a. Output Circuits (including the speakers) are shorted out.
      2. If the Speaker fuse is OK, and if the B1 voltage (refer to schematic Diagram) is not OK,
         a. Rectifier D905 or 906 is open, or
         b. Secondary Winding in the Power Transformer (Center tap, black lead) is cut, or
         c. Faulty grounding of Black Lead Wire.
      3. If the B1 voltage is OK, and if there is signal output at the PRE OUT jacks.
         a. Transistor Tr601 or 607 is faulty, or
         b. Capacitor C601 or 608 is faulty, or
         c. Jumper Pin (PRE OUT - MAIN AMP. IN) connection is faulty.
      4. If there is not signal output at PRE OUT jacks, measure voltage at B2 (refer to schematic diagram).
         a. If there is no voltage at B2,
            (1). Capacitor C901 is open, or
            (2). Capacitor C906 or 907 is shorted out, or
            (3). Zener Diode D901 is shorted out, or
            (4). Transistor Tr905 is open, or
            (5). Rectifier D903 is open.

II. A. 4. b. If there is proper voltage at B2,
(1). Transistors Tr501,502,503,504,505,506,507 or 508 are faulty, or
(2). Capacitor C506,513,517,534,523,529,533 or 535 are faulty, or
(3). Tone Def. switch connection is faulty.

ONLY PHONO SECTION INOPERATIVE

I. If there is no fault in the wires to the Preamplifier circuit board,
A. Transistors Tr401,402,403 or 404 are shorted out or open, or
B. Capacitors C401,405,408,409,410,414 or417 are faulty, or
C. Function Selector switch connection is faulty.

RADIO SECTION INOPERATIVE

I. If both AM and FM are inoperative,
A. Measure voltage at B5 (refer to schematic diagram).
1. If there is no voltage at B5,
a. Capacitor C909 is faulty, or
b. Zener Diode D904 is shorted out.
2. If there is proper voltage at B5,
a. Function Selector switch connection is faulty, or
b. Wire to the Function Selector switch is cut.

II. If only AM is inoperative,
A. Measure voltage of AM Circuit Board (B).
1. If there is no voltage,
a. Capacitor C202,213 or 215 are shorted out, or
b. Function Selector switch connection is faulty, or
c. Wire from Function Selector switch is cut.
2. If there is proper voltage,
a. Transistors Tr201,202 or 203 are faulty, or
b. Coil L201 or 901 are faulty, or
c. AM IFT T201,202,203 or 204 are faulty.

III. If only FM is inoperative, check to see if Muting Circuit is working properly. And if Muting is OK, check to see if FM-Stereo is working properly.
A. If FM-Stereo is faulty,
1. And if there is no pilot signal at Test Point (on FM-Stereo board Pin #6)
a. Integrated Circuit IC301 is faulty, or
b. Capacitor C303 is open, or
c. Auto-switching circuit (on FM IF board) is faulty.
(1). Transistor Tr106 or 107 is shorted out, or
(2). Capacitor C122 is open, or
(3). Diode D102 or 103 is faulty.

III. A. 2. If there is pilot signal at Test Point,

a. Capacitors C310,311,312 or 313 are faulty, or

b. Transistor Tr303 or 304 is faulty.

3. If there is proper voltage at B3, but Stereo Beacon Lamp dose not light

a. Check for audibility of stereo signal.

(1). If no stereo signal hoard from speakers, then, check the above mentioned transistors and IC.

(2). If stereo signal is heard, then, stereo lamp or transistor Tr30 or 302 is faulty.

B. If FM-Stereo is OK, check FM IF circuit..

1. If FM IF is not OK,

a. Meadure voltage of IF circuit board (2).

(1). If there is no voltage,

(a). Function Selector switch connection is faulty, or

(b). Wire from Function Selector switch is cut, or

(c). Capacitors C102,108,113 or 116 are faulty.

(2). If there is proper voltage,

(a). Transistors Tr102,103,104 or 105 are faulty, or

(b). Capacitor C103 or 105 is faulty.

2. If FM IF is OK,

a. And if FM Front end is faulty,

(1). Transistors Q1,2 or 3 are faulty, or

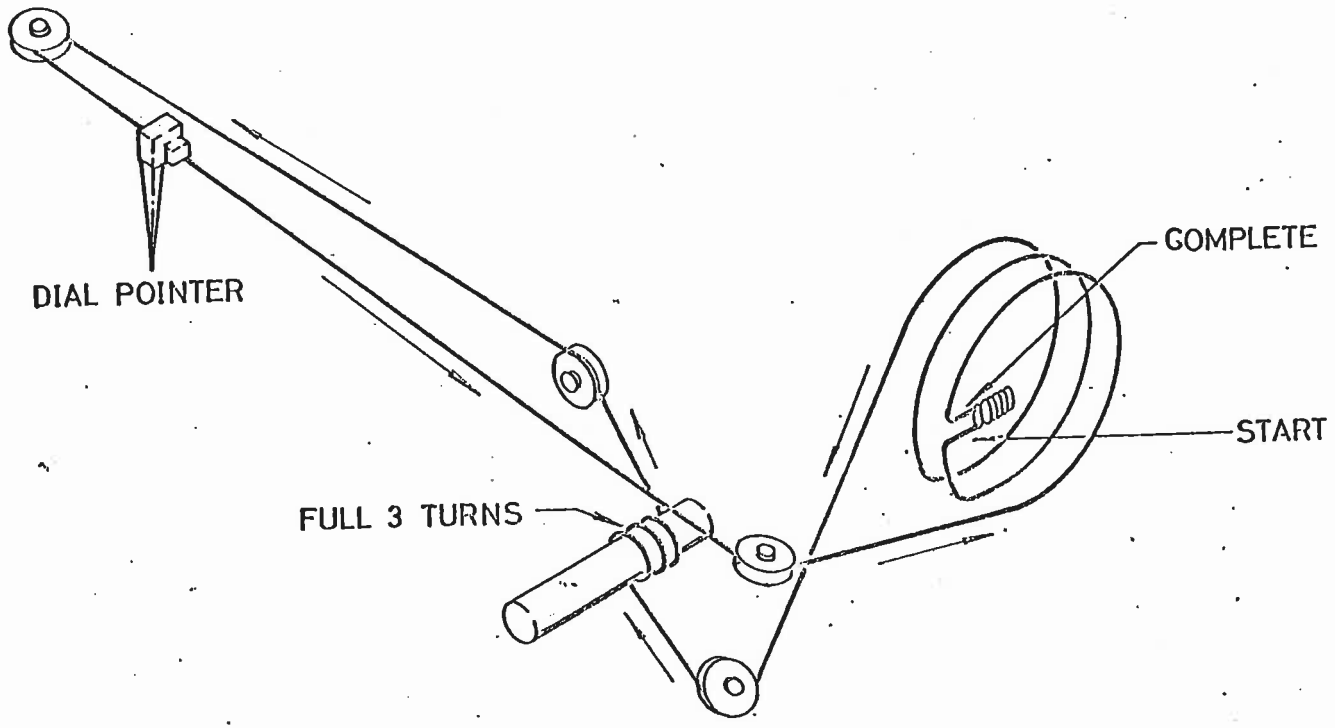
(2). Capacitors C10,12,13,15,18 or 20 are faulty.

b. If FM Front end is OK,

(1). Input circuit is grounded, or

(2). FM antenna inproperly connected.

DIAL STRINGING



REPLACEMENT PARTS LIST FOR MODEL RX-600

Roland's Part No.	Symbol No.	Descriptions
TRANSISTORS		
301901122	Tr901,902,903,904.	EC961, Power Amp.
301001116	Tr606,612.	2SA497, Driver
301201119	Tr603,605,611,609.	2SC497, Predriver, Driver
301901112	Tr302.	CDC9002, Stereo Beacon Driver
301001111	Tr202.	2SA49, AM IF 1st Amp.
301001112	Tr201.	2SA52, AM Conv.
301301121	Tr901.	2SD234, Stabilizer
301201114	Tr401,402,403,404,501,502, 503,505,506,507.	2SC644, Equalizer Amp., Tone Amp.
301201115	Tr301,303,304,504,508,604, 610,802.	2SC828, FM Matrix Amp, Tone Amp. Muting Operator, etc.
301201117	Tr101.	2SC829, FM IF 1st Amp.
301001117	Tr107,601,602,607,608,801.	2SA564A, FM MODE Auto-switching, Differential Amp., etc.
301001114	Tr102,103,104,105,203.	2SA341 or 2SA234, FM IF Amp.,etc.
301201112	Tr106.	2SC536G, FM MODE Auto-switching
DIODES		
300919005	D905.	1S850, Rectifier, Power Amp. Sec.
300919006	D906.	1S850R, Rectifier, Power Amp. Sec.
300919008	D902,903,301.	S-05, Recitfier, Tuner & Preamp. Sec., Bias Compensator
300111008	D101,102,103,104,201,202, 203,801,802.	1S188, FM AGC, FM-Stereo Dec., AM Det., etc.
300313004	D904.	BZ-120, Zener, 12V
300313009	D901.	BZ-240, Zener, 24V
300212002	D601,602,603,604.	KB-265, Bias Compensator
COILS		
222391115	L901.	Coil, AM Antenna
223301121	L201.	Coil, AM Local Oscillator
225601128	L303.	Coil, FM-Stereo 38KHz tune
225601127	L301,302.	Coil, FM-Stereo 19KHz tune
220001121	L101,201.	Coil, RF Choke, 47uH
220401120	L902,903.	Coil, Anti-parasitic, 2uH

Roland's Part No.	Symbol No.	Descriptions
TRANSFORMERS		
201001316	T901.	Trans., Power Supply, 120V (Pri.)
225501114	T101,102,103.	IFT, FM 2nd and 3rd stage
225501118	T104.	IFT, FM Ratio
225301121	T201,202.	IFT, AM 1st stage
225301122	T203.	IFT, AM 2nd stage
225301124	T204.	IFT, AM Det. stage
RESISTORS		
551022033	R610,620.	Composition, 22 ohm (K), ½W
551068033	R608,618.	" , 68 ohm (K), ½W
551022133	R906.	" , 220 ohm (K), ½W
551033133	R609,622,621,619.	" , 330 ohm (K), ½W
551047133	R926,927.	" , 470 ohm (K), ½W
551010233	R905.	" , 1 Kohm (K), ½W
551022233	R607,617,903.	" , 2.2 Kohm (K), ½W
551047233	R606,616.	" , 4.7 Kohm (K), ½W
551056233	R901,902.	" , 5.6 Kohm (K), ½W
551022533	R801,925.	" , 2.2 Mohm (K), ½W
552033533	R909,910.	Carbon Film, 3.3 Mohm (K), ½W
552010523	R128,408,417,907,908.	" , 1 Mohm (K); ¼W
552056423	R411,421.	" , 560 Kohm (K), ¼W
552033423	R309,313.	" , 330 Kohm (K), ¼W
552047423	R320.	" , 470 Kohm (K), ¼W
552027423	R553,554.	" , 270 Kohm (K), ¼W
552022423	R521,543.	" , 220 Kohm (K), ¼W
552010423	R108,206,319,321,504,516,526,	" , 100 Kohm (K), ¼W
552068323	R505,517,527,539.	" , 68 Kohm (K), ¼W
552047323	R403,412.	" , 47 Kohm (K), ¼W
552033323	R210,317,318,601,623,611,624.	" , 33 Kohm (K); ¼W
552022323	R201,217,404,406,410,415,420, 914.	" , 22 Kohm (K), ¼W
552015323	R207,547,548.	" , 15 Kohm (K), ¼W
552010323	R101,125,126,304,407,418,501, 509,551,513,520,523,531,535, 542,603,613.	" , 10 Kohm (K), ¼W
552082223	R105,110,114,803.	" , 8.2 Kohm (K), ¼W

Roland's Part No.	Symbol No.	Descriptions
	RESISTORS — Continued	
552068223	R549,550.	Carbon Film, 6.8 Kohm (K), ¼W
552056223	R302,507,512,519,529,534,541, 802.	" , 5.6 Kohm (K), ¼W
552047223	R209,211,311.	" , 4.7 Kohm (K), ¼W
552039223	R306,307,503,525.	" , 3.9 Kohm (K), ¼W
552033223	R104,911,912.	" , 3.3 Kohm (K), ¼W
552022223	R106,111,115,119,130,203,204, 214,215,308,314,315,316.	" , 2.2 Kohm (K), ¼W
552015223	R202,216,409,419,508,518,514, 522,545,530,536,504,544,546, 605,615.	" , 1.5 Kohm (K), ¼W
552010223	R107,112,116,120,122,123,127, 208,212,301,303,402,413,510, 511,532,533,537,604,614,928, 929,930,931,515.	" , 1 Kohm (K), ¼W
552082123	R506,528.	" , 820 ohm (K), ¼W
552068123	R121.	" , 680 ohm (K), ¼W
552056123	R117,405,416.	" , 560 ohm (K), ¼W
552047123	R109,113,129,305,502,524.	" , 470 ohm (K), ¼W
552033123	R311,312.	" , 330 ohm (K), ¼W
552010123	R124,131,132,133,205,913.	" , 100 ohm (K), ¼W
552068023	R103.	" , 68 ohm (K), ¼W
554050963	R917,918,919,920.	Bath-tub, 0.5 ohm (K), 3W
554010053	R921,922.	" , 10 ohm (K), 2W
553150173	R904.	Metal Oxide, 500 ohm (K), 5W
	VARIABLE RESISTORS	
525121115	VR502.	Volume Control, 50 Kohm
525101114	VR503,504.	Bass and Treble Control, 50 Kohm
515121116	VR501.	Balance Control, 100 Kohm
510502111	VR302.	FM Separation Adj., 10 Kohm
510502117	VR601,602.	Idling Current Adj., 5 Kohm
510502116	VR101.	FM MODE Auto-switching Level Adj., 250 Kohm
510502115	VR801.	FM Muting Level Adj., 250 Kohm
510502119	VR301.	FM-Stereo Beacon Level Adj., 1 Kohm

Roland's Part No.	Symbol No.	Descriptions
CAPACITORS		
400100459	C902.	Electrolytic, 1,000 mfd, 63V (L)
400470449	C904,905.	" , 4,700 mfd, 50V (L)
402100439	C906.	" , 1,000 mfd, 35V (SU)
402470539	C901,907.	" , 470 mfd, 35V (SU)
402100539	C602,609.	" , 100 mfd, 35V (SU)
402470649	C606,613.	" , 47 mfd, 50V (SU)
402100749	C120,205,211,312,313,408,417.	" , 1 mfd, 50V (SU)
402470639	C908,909.	" , 47 mfd, 35V (SU)
402330609	C206,404,413.	" , 33 mfd, 6.3V (SU)
402100509	C507,522,516,532.	" , 100 mfd, 6.3V (SU)
402220509	C601,608,603,610.	" , 220 mfd, 6.3V (SU)
402100519	C410.	" , 100 mfd, 16V (SU)
402470729	C304,513,529,534,535.	" , 4.7 mfd, 25V (SU)
402100629	C303,310,311,314,401,405,409, 414,504,521,515,517,531,533.	" , 10 mfd, 25V (SU)
402330629	C506,523.	" , 33 mfd, 25V (SU)
454251033	C307.	Polystyren Film, 2,500 pF (K), 50V
454100933	C302,305.	" , 10,000 pF (K), 50V
450100833	C501,518.	Mylar Film, 0.1 mfd (K), 50V
450200833	C511,527,910,911.	" , 0.2 mfd (K), 50V
450500933	C306.	" , 0.05 mfd (K), 50V
450300933	C509,525.	" , 0.03 mfd (K), 50V
450200933	C510,526,512,528,308,309.	" , 0.02 mfd (K), 50V
450150933	C407,416.	" , 0.015 mfd (K), 50V
441301336	C219.	Ceramic, 3 pF (N5.6), 50V
442201083	C301,508,524.	" , 0.002 mfd (K), 250V (YE)
442401083	C406,415.	" , 0.004 mfd (K), 250V (YE)
440100835	C801,803,914.	" , 0.1 mfd, 50V
440500935	C201,202,209,210,213,215,216.	" , 0.05 mfd, 50V
440100985	C101,102,105,107,108,109,111, 112,113,115,116,117,124,125, 127,128,203,214,607,614.	" , 0.01 mfd, 250V
440201085	C217,218.	" , 0.002 mfd, 250V
440501183	C913.	" , 500 pF (K), 250V
440201183	C118,119.	" , 200 pF (K), 250V
440151183	C912,502,519.	" , 150 pF (K), 250V

Roland's Part No.	Symbol No.	Descriptions
CAPACITORS —— Continued		
440101183	C121,123,126,403,412,914,915.	Ceramic, 100 pF (K), 250V
440501283	C402,411,503,514,520,530.	" , 50 pF (K), 250V
440701388	C208.	" , 7 pF ± 0.5 pF, 250V
440501388	C103,122,802.	" , 5 pF ± 0.5 pF, 250V
440301388	C204.	" , 3 pF ± 0.5 pF, 250V
440201388	C106,110,114.	" , 2 pF ± 0.5 pF, 250V
MISCELLANEOUS		
321304359		AM/FM Front end
231310006	M902.	Meter, FM Tuning
231310007	M901.	Meter, AM/FM Signal Strength
610312416		Switch, Func. Selector
610314124		Switch, Speaker Selector
614061203		Push Switch, 6 keys
614010101		Switch, Power
120311215		AM ANT. Ring
116310026		Knob, Bass & Treble, (R-ch)
116310027		Knob, Bass & Treble, (L-ch)
116310016		Knob, Tuning
116310017		Knob, Vol., Bal., Func. & Speaker selector
303452143	IC301.	Integrated Circuit, MC1307P, FM-ST.
228641108	FL301,302.	38 KHz Filter, FM-ST.
352063028	PL1,2,3,4,5,6.	Lamp, Dial Illumination, 6.3V 0.28A
351080015	PL7,8,9,10,11,12.	Lamp, Func. Imdicator, 8V 0.15A
351140008	PL13.	Lamp, FM-St. Indicator, 14V 80mA
341220030	F901,902,903.	Fuse, 3A 3AG
642400104		Speaker Terminal
620101114	J902,903.	AC Outlet
640253334		Blacket, Fuse
626107702	J901.	Jack, Headphone