

A.M./FM STEREO RECEIVER

R-1050

SERVICE MANUAL

9-1050
CIRCUIT DESCRIPTION

[POWER SUPPLY]

The AC line is connected to the primary side of power transformer via a two pole power switch (front panel) and a voltage selector. Four windings are provided for the secondary side i.e. (1) the 117 AC is utilized for a pilot lamp, and is at the same time half-wave rectified by D103 to realize DC 117V for the working circuit and the heater circuit. (2) 117 AC for tuner section: This 117V AC is half-wave rectified by D107 to obtain 18V unsmooth DC, which is further regulated by transistor Q113 and zener diode D108 to realize 11V regulated DC against 200k AC line. (3) 117V AC for preamp equalizer stage, intermediate stage and tone control: The 117V AC is half-wave rectified by D109 to obtain -14V unsmooth DC, which is turned into low noise -10V DC via ripple filter Q116. Actual supply voltage at each section is: equalizer stage -37V, tone control -27V, intermediate stage -25.5V, all of which are determined by the voltage-drop at the de-coupling circuit placed in each stage. (4) 20V x 2 AC for main amp: The 20V x 2 AC are rectified by D001 - D004 and then led to large filtering capacitors C006 and C007 (10000uF x 2) to obtain dual supply +10V and -10V. (5) 21V x 2 AC for Push Indicator, which are tapped out from the same winding of the above (4). The 21V x 2 AC are rectified by B003 - B006 to obtain dual supply +27V and -27V.

[PRE AMP SECTION]

The preamplifier consists of an equalizer, and intermediate amplifier, and a tone control. The equalizer adopts the Negative Feedback circuit using two silicon transistors, 2S838 (Q101), 2S1245(Q102) per channel, and is designed to provide proper equalization to the input signals. Input signals given through the AUX and TUNES section bypass the equalizer and are fed directly to the later stages of this amplifier.

Controls arranged after the equalizer stage are: REC. ONT connector, TPE MONITOR SWITCH, MUTE/PAUSE SWITCH, LO-CUT FILTER, HIGH-CUT FILTER, BASS SELECTOR, VOLUME CONTROL, and LOUDNESS SWITCH. The intermediate amplifier consisting of Q101, Q102 is a flat amplifier adopting 2-stage Negative Feedback circuit which is designed to boost the equalizer, tuner or AUX. This covers sufficiently the insertion loss by the tone control in the next stage and leads low impedance output to the tone control for its smooth function. The tone control adopts the EB-8F circuit of Q103 and Q107. Any desired frequency response can be adjusted by the following controls: Variable resistor R001 (Bass), and variable resistor R001 (Treble). Major components of the preamplifier are arranged on the printed circuit boards PR109-1061, 1064. (PR1064 for equalizer, PR109 for Filters, Loudness and Mode, PR1062 for Flat Amp, PR1061 Tone Control)

[MAIN AMPLIFIER]

The main amplifier is of full stage direct coupling, two stage differential amplification, pre-driving and fully complementary circuits. The power transistors Q109 2S1088A (NPN) and Q110 2S1051A (PNP) (2-transistor per channel) are fitted over to the heat sink inside the chassis. All components are assembled to the printed circuit board PR102. The differential amplifier is consisted of Q101 and Q102, the pre-driving stage of Q103, Q104, Q105 (Q103 & Q104 are for the differential amp, and Q105 is arranged for the active load of Q103), and the driver transistors, Q107 and Q108. Besides the above transistors, capacitors, resistors, and semi-fixed volume controls are integrated in the circuit.

[AM SECTION]

The RF signal received by the ferrite-rod antenna is converted into 455KHz IF frequency by Q113. The output of the local oscillation circuitry composed of Q113 and T135 is mixed in Q113 with the incoming radio signal to provide the 455KHz IF frequency, which is connected to the next stage.

[PEAK INDICATOR CIRCUIT] (PB-1063)

The output signal passed through the "Peak Indicator Sensitivity Selector Switch" SW305 meets the Peak Detection circuit composed of Q601, Q602 and Q603, whose detected DC signal is then converted into low-impedance by current booster Q603 and Q604.

Of course different threshold level is arranged for each LED driver Q605 - Q610 to make them light up in accordance with the signal level.

[A.F.C.C. ----- Automatic Filter Control Circuit] (PB-1059)

At the time of AM reception, if the higher order harmonics caused by clipping of power amp are fed back to the AM antenna, the operation will be unstable. Therefore the harmonics passed through the high pass filter Q501 are detected by D501, which controls the electronic high frequency attenuator Q502 and C508 connected to the output of AM detector. Thus unstable factors such as oscillation are eliminated.

[MUTING & PROTECTION CIRCUIT] (PB-1062)

Charging of C114 is commenced through R130 and R137 by activating the Power Switch. Thus when base voltage of Q114 becomes 1.0V one 10 seconds later, the driver of R101, that is, Q114 and Q115 are turned on to connect the output of power amp to the speaker selector switch SW006.

When the power switch is released to off, C114 is discharged via R109 and R131, and promptly R101 is turned to be "break".

In case such DC ingredient that exceeds 1.5V is at the output caused by abnormal operation of power amplifier, Q111 or Q112 is turned on, and C114 is discharged via R109 by Q111, thus R101 is released.

[BLINDER CIRCUIT] (PB-1063)

During the breaking time of R101, power is supplied to the vibrator to be oscillated, which turns LED101 on and off.

3.1000 ALIGNMENT PROCEDURE

The alignment procedure described in each chart may be performed independently, without affecting the others.

Warm up the signal generators for at least 15 minutes to make certain that they are stabilized at their operating temperature particularly generators containing vacuum tubes. Consult the instruction manual supplied with the particular test instrument for specific information concerning connection and operation.

The test equipment listed here is intended only as a guide, but alternate instruments should be of similar quality.

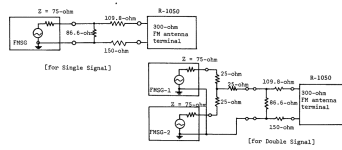
The following instruments are required for a complete alignment of the tuner.

1. Measurement Instruments and Tools

Signal Source:	1) FM signal generator (FMIG)	Output Indicator:	7) Oscilloscope (OSC)
	2) Sweep generator (SWG)		8) Distortion Meter (DM)
	3) AM signal generator (AMIG)		9) AC voltmeter (ACVTM)
	4) FM stereo modulator (FMSTM)		10) DC volt meter (DCVTM)
	5) Audio Oscillator (AFO)	Tools:	11) Hex head alignment tool
	6) An standard loop antenna		12) Thin plastic shaft alignment tool

2. General alignment conditions

- 1) The normal test voltage is within 10% of what is indicated on the receiver with less than 5% harmonic distortion.
- 2) Unless otherwise specified, the normal ambient temperature is 15°C - 25°C and humidity 55 - 75%. But if this is not possible, 5 - 30°C, 45 - 85% will provide acceptable results.
- 3) FM dummy antenna shall be as follows if not otherwise specified. The output voltage of the signal generator is 1/4 of the unloaded terminal voltage.



- 4) Connect the low side of signal source and the output indicator to the chassis ground as close as possible to the high side connection unless otherwise specified.
- 5) The 10.7 MHz marker used in each section of the alignment should be the same.
- 6) Marker insertion and amplitude should not distort the oscilloscope trace.
- 7) The AM standard loop antenna should be set above the ferrite loopstick antenna.
- 8) The output level of the sweep generator is measured by the output attenuator regardless of its terminated impedance.
- 9) FM modulation is 100% with 7500Hz.
- 10) All tuner audio output measurement are at TAPE OUT 1.

TUNER SECTION ALIGNMENT PROCEDURE

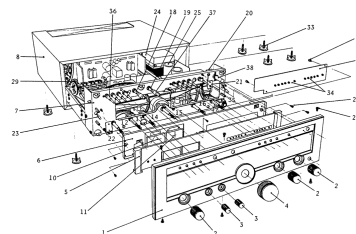
[CAUTION]

1. FM alignment must be done after 5 minutes of the power switch "ON".
2. Low distortion SG or stereo signal generator is indispensable for the FM-mono, stereo alignment procedure.

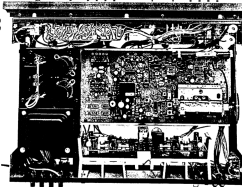
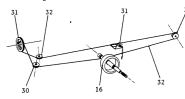
Preliminary Check	1. Voltage selector must be at the appointed voltage.
	2. Fuses on P3-105V must be the appointed one.
	3. Set the Input Selector Switch at the "AM" position.
	4. Set the Dial Pointer at the maximum-right position.
	5. Set all semi-fixed pots (6 pos) at their centre position.
	6. Select the De-emphasis Switch to the appointed time-constant.
AM Section Alignment	7. Push the Power Switch to "ON", and confirm if there is no trouble.
	8. Measure the voltage at the (+) side of power rectifying diode D107, which must be 5V ±1V.
	9. Voltage at Pin No.41 or No. 42 must be 18V ±1V.
	10. Set the output of 455KHz Sweep Generator for AM at 400Hz, and connect it to Pin No.35. At the same time connect the line input of the SG to the TP-2.
	11. Adjust the Ceramic Filter T105 and T106, and the Detector T1 T107 to have symmetrical response.
	12. Set the loop antenna connected to AM-SG at the measuring position.
	13. Connect oscilloscope and millivoltmeter to the REC. OUT terminal.
	14. Obtain 400Hz 30% modulation on AM SG, and set the output attenuator at 80dB.
	15. Set both SG and the dial pointer at 600KHz.
	16. Adjust T104, Ferrite-core antenna and RF coil T103 to obtain maximum response on the signal meter or 400Hz side-wave.
	17. Set SG and the Dial Pointer at 1400KHz.
	18. Adjust 3 trimmers on top of the variable capacitor (viewing from front, the right side is for OSC.) to obtain maximum response on the Signal Meter or 400Hz side-wave. Repeat steps 14-18 for 2 or 3 times to obtain maximum sensitivity.
	19. Set SG and the Dial Pointer at 1000KHz, and at maximum output level (120dB), adjust V1216 to have 4.5 reading on the Signal Meter calibration.
	20. Check that all the specification items, sensitivity, output level, etc., are fulfilled.

Note the following adjustment must be done at least 5 minutes after the power "ON".	
FM Frontend & IF Section Alignment	21. Set the Input Selector Switch at the "FM" position.
	22. Connect millivoltmeter, distortion meter and synchroscope to the REC. OUT terminal.
	23. Connect FM SG of 400Hz, 100% modulated to the 300-ohm ANT. terminal through balun. In this case the attenuator of the SG must be minimum, and set VR101 at the extreme counter-clockwise direction.
	24. Set SG and the Dial Pointer at 98MHz. Short-circuit Pin No.19 and 21 on P8-105A.
	25. Adjust the detection transformer T101 to obtain center indication of the center meter.
	26. Set the SG output at 1mV, and adjust VR102 to have 1.0V output level at REC. OUT. Adjust detection trans T102 (both L & R oh) to realize minimum distortion (no more than 0.1%).
	27. Set SG output at minimum, and turn the tuning knob to let the center meter stay at the center. Then set SG output at 1mV, and adjust detection trans T101 and T102 for 2 or 3 times to realize minimum distortion of the detection output.
	28. Set SG and dial pointer at 108MHz, then obtain 1.5 - 1.8uV of SG output.
	29. Adjust the trimmer on top of the Frontend (SF, ANT side) to obtain maximum indication of millivoltmeter.
	30. Set SG and dial pointer at 98MHz, then obtain 1.5 - 1.8uV SG output.
	31. Adjust IF core on the Frontend to obtain maximum indication of millivoltmeter.
	32. Set SG output at 1.9uV.
	33. Set the tuning switch at "ON", and adjust VR101 to set tuning point. In this case set it so that 400Hz detection output waveform can be stable against the level fluctuation and that stable output is feasible. After adjustment set the switch to "OFF".
	34. Repeat step 27 and check distortion. Center: 0.1%, Limit: 0.2%
	35. Set SG output at 1mV, then adjust VR105 to have 4.5 reading on the signal meter calibration.
	36. Check that all the specification items such as sensitivity, output level, etc., are fulfilled.
	37. Set FM SG 100% modulated, and connect both equipments to the 300-ohm ANT. terminal through 300-ohm balun.
	38. Connect distortion meter, millivoltmeter, oscilloscope or synchroscope to the REC. OUT terminal. Remove short circuit made between 19 and 21.
	39. Set SG and the dial pointer at 98MHz, and fix the SG output at 1mV.

	40.	Connect Frequency Counter to TP-1, and adjust VR104 to obtain 5880±0.100KHz. Only this case, the pilot signal of the SG should be "OFF".
	41.	Modulate the L-ch of the stereo signal generator, and make note of the output by the millivoltmeter.
	42.	Adjust VR103 to obtain minimum movement of the L-ch millivoltmeter.
	43.	Measure the distortion and separation on both channels, which must fulfill the specification. Note that only in the case the distortion is critical against the spec., adjust the IF core in the frontend within 1/3 turn.
	44.	Switch on and off the pilot signal, and confirm if the stereo indicator LED's light up in accordance with the signal.
	45.	Confirm all specification items such as S/N ratio etc. are fulfilled. And make note of them.
FM Dolby Section Alignment	46.	Set the input selector switch at the "FM" position, and the FM Dolby switch at the "ON/OFF" position. At this time confirm if the Dolby indicator LED's light up.
	47.	Set SO and the dial pointer at 98MHz, and fix the SG output at 1mV.
	48.	Adjust VR801 on the Dolby printed circuit board PB-1055 to obtain 588mV output level at the L-ch REC. OUT terminal. At this step, stereo signal generator must be---modulation L+R 50% and pilot signal 10%.
	49.	Same as the above. Adjust VR802 on PB-1055 to have 588mV output level at the REC. OUT terminal.
	50.	Set stereo signal generator at 100% modulation at 10KHz. Confirm the output level of L-ch and R-ch at REC. OUT terminal is 1.1V.



1. Front Panel (W1108)
2. Knob (W1203, function etc.)
3. Knob (W1204, same cont.)
4. Knob (W1205, tuning)
5. Dial Scale Hat* (W1206)
6. Holder
7. Sub Panel (W1207)
8. Wooden Case (W1208)
9. PP-1000
10. Signal Strength Meter (AW041)
11. PE Fine Tuning Meter (AW042)
12. Rotary Sw. (S8008, Input Select.)
13. VR (L506 w. 2)
14. VR (L506 w. 2)
15. Tuning Shaft & Flywheel (W1209)
16. VR (L506 w. 2)
17. Rotary Sw. (S8009, Suppl. Sel.)
18. Rotary Sw. (S8002, Gaining)
19. VR (L506 w. 2, Balance)
20. Power Sw. (S8003)
21. L.E.D. (T5008)
22. L.E.D. (T5008)
23. Dial Lamp (A4003)
24. Power Transformer (P5018)
25. Electrolytic (C2145, 2000uf 50V)
26. Screw 1/8" x 1/2"
27. Screw 1/8" x 1/2"
28. Screw 1/8" x 1/2"
29. Drive (S3024)
30. Plastic Pulley (K3002)
31. Tuning Pointer (L2100)
32. Dial Cord
33. Screw 1/8" x 1/2"
34. L.E.D. (T5008)
35. Molded Knob (W1201)
36. Molded Knob (W1202)
37. Molded Knob (W1203)
38. Molded Knob (W1204)



REPLACEMENT PARTS LIST
 PH-1004

RESISTORS (5%, 1/4W unless otherwise noted)

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
800	R00028	15k	R147	R00048	560k
802	R00030	27k	148	R00046	800
803	R00032	47k	149	R00037	1.5k
804	R00034	1.5k	150	R00037	1.5k
805	R00036	47k	151	R00049	470k
806	R00043	1k	152	R00049	470k
807	R00039	40k	153	R00046	25k
808	R00029	12k	154	R00016	25k
809	R00027	47k	155	R00022	47k
810	R00050	330	156	R00034	1.5k
811	R00050	330	157	R00009	47k
812	R00056	100	158	R00050	330
813	R00037	1.5k	159	R00034	1.5k
814	R00061	47	160	R00013	200k
815	R00056	100	161	R00029	12k
816	R00037	1.5k	162	R00041	1k
817	R00045	1k	163	R00024	35k
818	R00056	100	164	R00013	200k
819	R00056	100	165	R00022	47k
820	R00047	5k	166	R00022	22k
821	R0004	5k	167	R0004	5k
822	R00024	35k	168	R00059	35k
823	R00030	10k	169	R00009	47k
824	R00065	22	170	R00060	210 2W
825	R00028	15k	171	R00001	200
826	R00060	10k	172	R00017	100k
827	R00045	1k	173	R00014	10k
828	R00039	40k	174	R00010	10k
829	R00022	47k	175	R00010	10k
830	R00039	40k	176	R00014	1k
831	R00048	47k	178	R00014	1.5k
832	R0001	2k	179	R00041	1.5k
833	R00012	47k	180	R00025	27k
834	R00022	47k	181	R00054	100
835	R0004	5k	182	R00046	25k
836	R00026	22k	183	R00056	100
837	R00030	10k	187	R00052	100
838	R00022	47k	191	R00056	100
839	R00043	1k			
840	R00029	12k			
841	R00028	15k			
842	R00056	100			
843	R00041	1.5k			
844	R00037	1.5k			
845	R00037	1.5k			
846	R00048	47k			

CAPACITORS (C...ceramic, E...electrolytic, S...stylol, T...tanalan, M...mylar)

SYMBOL NO.	STOCK NO.	DESCRIPTION
C001	CK0011	0.01uF 25V C
C02	CK0011	0.01uF 25V C
C03	CK0011	0.01uF 25V C
C04	CK0010	0.01uF 25V C
C05	CK0010	0.01uF 25V C
C06	CK0013	0.47uF 50V E
C07	CK0010	0.01uF 25V C
C08	CK0010	0.01uF 25V C
C09	CK0010	0.01uF 25V C
C10	CK0011	0.01uF 25V C

113	CR0011	0.01uF	C	
113	CR0011	0.01uF	C	
114	CR0011	0.01uF	C	
115	CR0011	0.01uF	C	
116	CR0011	0.04uF	C	
117	CR0010	0.04uF	C	
118	CR0010	0.04uF	C	
119	CR0099	2.2uF	50V	E
120	CR0011	0.01uF	E	
121	CR0010	0.04uF	E	
122	CR0010	0.04uF	E	
123	CR0010	0.04uF	E	
124	CR0099	2.2uF	E	
125	CR0007	100uF	C	
126	CR0215	0.47	50V	E
127	CR0010	0.04	C	
128	CR0010	0.04	C	
129	CR0059	1uF	50V	E
130	CR0076	10uF	16V	E
131	CR0076	10uF	16V	E
132	CR0098	1uF	50V	E
133	CR0441	1000pF	50V	S
134	CR0098	0.33uF	25V	T
135	CR0211	0.47uF	50V	F
136	CR0098	0.33	25V	T
137	CR0099	2.2uF	50V	E
138	CR0099	2.2uF	50V	E
139	CR0078	22uF	16V	E
140	CR0002	1000pF	S	
141	CR0010	1000pF	S	
142	CR0100	82pF	S	
143	CR0100	82pF	S	
144	CR0043	1000pF	S	
145	CR0043	1000pF	S	
146	CR0079	220pF	16V	B
147	CR0084	4.7uF	25V	E
148	CR0084	4.7uF	25V	E
149	CR0098	0.056uF	H	
150	CR0084	0.2uF	16V	E
151	CR0019	470pF	C	
152	CR0098	0.056uF	H	
153	CR0076	33pF	16V	E
154	CR0090	1000pF	E	
155	CR0079	220pF	E	
156	CR0079	220pF	16V	E
157	CR0079	220pF	16V	E
158	CR0079	220pF	16V	E
159	CR0010	0.04uF	C	
160	CR0011	0.01uF	C	
161	CR0010	0.04uF	C	
162	CR0010	0.04uF	C	
163	CR0010	0.04uF	16V	E
164	CR0010	0.04uF	16V	E
165	CR0084	4.7uF	25V	E
166	CR0011	0.01uF	C	
167	CR0010	0.04uF	C	
168	CR0084	0.01uF	C	
169	CR0024	0.002uF	C	
170	CR0063	0.01uF	C	
171	CR0010	0.04uF	C	
172	CR0063	0.01uF	C	
173	CR0011	0.01uF	C	
174	CR0074	10uF	16V	E
175	CR0010	0.04uF	C	
176	CR0063	0.01uF	C	
177	CR0112	30uF	50V	C
178	CR0064	22pF	50V	C
179	CR0060	10uF	50V	C
180	CR0010	0.04uF	C	
181	CR0010	0.04uF	C	

182	CD8076	0.1uF		C
183	CD8076	220uF	10V	E
184	CD8076	220uF	10V	E
185	CD8010	0.1uF		C
186	CD8010	0.1uF		C
187	CD8001	50V		C

SEMICONDUCTORS (FR-1054)

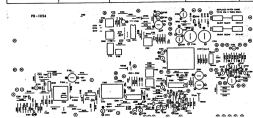
SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION		
Q001	TR0014	2SC284	TR	TR0047	2SD235	TR	
102	TC0011	8N431	IC	314	TC0011	8N1897	IC
103	TC0011	8N431	IC				
104	TC0010	LA1250	IC	0101	TD0018	1A188PM-1	
105	TR0006	2SC122	TR	105	TD0018	1A188PM-1	
106	TC0012	LA33488	IC	105	TD0013	1A2475	
107	TR0001	2SC93A-D	RF	104	TD0015	1A2475	
108	TR0146	2SC1740	TR	105	TD0013	1A2475	
109	TR0066	2SC1212	TR	106	TD0015	1A2475	
110	TR0068	2SA642	TR	107	TD0002	1M4007	
111	TR0066	2SC1212	TR	108	TD0019	W140	
112	TR0068	2SA642	TR	109	TD0018	1A188PM-1	

FILTERS, COILS & TRANSFORMERS (FR-1054)

SYMBOL NO.	STOCK NO.	DESCRIPTION	
F101	LA1106	CFSE-28AC-10	ceramic filter
102	LA1106	CFSE-28AC-10	ceramic filter
103	LA1107	BF-41	block filter
104	LA1103	FB-3204	low-pass filter
	LA1122	FB-720102	front-end
T101	LA1092	LUX-1092	FM trans.
102	LA1093	LUX-1093	"
103	LA1097	LA1097	AM trans.
104	LA1073	LA1073	"
105	LA1098	FSM-1067	"
106	LA1099	FSM-1030	"
107	LA1100	LA1100	"
L101	LA1086	SK525-300	choke coil
102	LA1085	LUX-1085	"
103	LA1086	SK525-300	"
401			
Re	LA1092	LUX-1092	balun

DIAGNOSTIC POTENTIOMETERS (FR-1054)

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
VP01	RT0054	KVSR-FNFR301	VP104	RT0051	KVSR-FNFR502
102	RT0051	" " S01	105	RT0052	" " S02
103	RT0050	" " S01	106	RT0053	" " S02



SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R001	R0001	10	R011	R0012	20K
R002	R0002	4%	R015	R0015	4.7%
R003	R0003	20%	R10	R0045	20
R004	R0004	4.7%	R18	R0022	4%
R005	R0005	1.5%	R19	R0051	1.5%
R006	R0006	47%	R20	R0022	4%
R007	R0007	10%	R21	R0053	10%
R008	R0008	47%	R22	R0015	15%
R009	R0009	10%	R23	R0012	20%
R010	R0010	10%	R24	R0007	40%
R011	R0007	40%	R25	R0005	10%
R012	R0015	15%	R26	R0017	10%
R013	R0012	20%	R27	R0022	4%
R014	R0004	4%			

RESISTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
C001	C0056	0.1uF 50V T	+50V-20%		
C002	C0111	0.4uF 50V Z	+5% -10%		
C003	C0121	0.12uF 50V M	+10% -10%		
C004	C0074	10uF 16V E	+10% -10%		
C005	C0074	10uF 16V E	+10% -10%		
C006	C0012	0.027uF 50V M	+10% -10%		
C007	C0079	200pF 14V S	+20% -20%		
C008	C0074	20uF 16V E	+10% -10%		
C009	C0009	1uF 14V E	+10% -10%		
C010	C0029	0.047uF 50V M	+10% -10%		
C011	C0009	0.3uF 20V M	+10% -10%		
C012	C0074	0.1uF 20V C	+10% -10%		
C013	C0060	10uF 16V E	+10% -10%		
C014	C0056	500pF 50V S			
C015	C0011	0.1uF 20V T	+5% -5%		
C016	C0121	0.12uF 50V E			
C017	C0074	0.12uF 16V M			
C018	C0074	10uF 16V E			
C019	C0074	10uF 16V E			
C020	C0079	200pF 14V S			
C021	C0060	400pF 14V S			
C022	C0060	500pF 14V S			
C023	C0012	0.027uF 14V M			
C024	C0074	10uF 14V E			
C025	C0009	0.01uF 14V M			
C026	C0011	0.1uF 14V E			
C027	C0074	0.1uF 14V C			
C028	C0029	0.3uF 14V M			
C029	C0079	200pF 14V E			
C030	C0077	47nF 14V E	+5% -10%		

SEMICONDUCTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
TR01	TR001	2SC1062C TR	TR01	TR001	14188
TR02	TR002	NE5458 TR	TR02	TR002	14188
TR03	TR003	2SC1062C TR			
TR04	TR002	NE5458 TR			

 PB-1055 (SWITCH BOARD)

RESISTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R501a	R2004	1K	R50	R2000	10K
R501b	R2005	5.1K	R10	R2002	47K
R501c	R2004	1K	R11	R2001	15K
R501d	R2005	5.1K	R12	R2003	1K
R501e	R2005	5.1K	R13	R2005	4.7K
R501f	R2005	5.1K	R14	R2001	100K
R501g	R2007	50K	R15	R2000	10K
R501h	R2005	5.1K	R16	R2000	47K

CAPACITORS

SYMBOL NO.	STOCK NO.	DESCRIPTION
C501a	C2011	0.05uF 50V S
C501b	C2011	0.05uF 50V S
C501c	C2011	0.05uF 50V S
C501d	C2011	0.05uF 50V S
C501e	C2011	0.05uF 50V S
C501f	C2011	0.05uF 50V S
C501g	C2011	0.05uF 50V S
C501h	C2011	0.05uF 50V S
C501i	C2011	0.05uF 50V S
C501j	C2011	0.05uF 50V S
C501k	C2011	0.05uF 50V S
C501l	C2011	0.05uF 50V S
C501m	C2011	0.05uF 50V S
C501n	C2011	0.05uF 50V S
C501o	C2011	0.05uF 50V S
C501p	C2011	0.05uF 50V S
C501q	C2011	0.05uF 50V S
C501r	C2011	0.05uF 50V S
C501s	C2011	0.05uF 50V S
C501t	C2011	0.05uF 50V S
C501u	C2011	0.05uF 50V S
C501v	C2011	0.05uF 50V S
C501w	C2011	0.05uF 50V S
C501x	C2011	0.05uF 50V S
C501y	C2011	0.05uF 50V S
C501z	C2011	0.05uF 50V S

SEMICONDUCTORS (PB-1055 94109 100001)

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
Q501	TR0039	2SC945	Q50	TR0016	181555
Q502	TR0029	2SC945			

SWITCHES

SYMBOL NO.	STOCK NO.	DESCRIPTION
S501 - S505	SP0073	50ES

 PB-1060 (FLAT AMP. BOARD)

RESISTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R301a	R2004	1K	R304b	R2007	10K
R301b	R2002	47K	R304c	R2004	1K
R301c	R2004	1K	R304d	R2005	1.5K
R301d	R2005	5.1K	R304e	R2007	5.1K
R301e	R2005	5.1K			

CAPACITORS (PB-1060 FLAT AMP. BOARD)

SYMBOL NO.	STOCK NO.	DESCRIPTION
C301a	C2017	1.5uF 50V E
C301b	C2017	10uF 25V E
C301c	C2017	10uF 25V E
C301d	C2017	10uF 25V E
C301e	C2017	10uF 25V E
C301f	C2017	10uF 25V E
C301g	C2017	10uF 25V E
C301h	C2017	10uF 25V E
C301i	C2017	10uF 25V E
C301j	C2017	10uF 25V E
C301k	C2017	10uF 25V E
C301l	C2017	10uF 25V E
C301m	C2017	10uF 25V E
C301n	C2017	10uF 25V E
C301o	C2017	10uF 25V E
C301p	C2017	10uF 25V E
C301q	C2017	10uF 25V E
C301r	C2017	10uF 25V E
C301s	C2017	10uF 25V E
C301t	C2017	10uF 25V E
C301u	C2017	10uF 25V E
C301v	C2017	10uF 25V E
C301w	C2017	10uF 25V E
C301x	C2017	10uF 25V E
C301y	C2017	10uF 25V E
C301z	C2017	10uF 25V E

SEMICONDUCTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
Q301a	TR017L	2SA436E	Q302a	TR0025	2SC1342E

CAPACITORS (L...low leakage type)

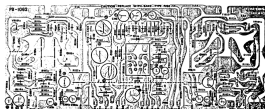
SYMBOL NO.	STOCK NO.	DESCRIPTION
4041ab	CC0808	2.2uF 50V I
4042ab	CC0808	33pF 50V C
4043ab	CC0876	100uF 50V S
4044ab	CC0808	100pF 50V S
4045ab	CC0130	1000pF 50V S
4046ab	CC0130	1000pF 50V S
4047ab	CC0122	6800pF 50V S
4048ab	CC0100	10uF 16V H
4049ab	CC0017	5pF 50V C
4101ab	CC0012	0.47uF 50V T
412	CC0014	47uF 10V E
413	CC0017	47uF 50V E

SEMI-CONDUCTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
Q015ab	T0125	2SA836E	Q102ab	T0025	2SC1345E

RESISTORS (PP...film, 5%tol)

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
1010ab	RS0062	50K	R0120ab	RS0166	4.7K 1W
1012ab	RS0037	1.5K	R0120ab	RS2706	15K 1W
1020ab	RS0028	15K	R0120ab	RS0022	8.2K 1W
1060ab	RS0048	47K	R02645	RS2770	5.6K 1W
1062ab	RS0024	10K	R02645	RS2770	5.6K 1W
1064ab	RS0015	220K	R02645	RS0017	3.3K
1070ab	RS0020	15K	R02645	RS0017	8.2K
1080ab	RS0037	1.5K	R02645	RS0014	5.6K
1090ab	RS0037	1.5K	R02645	RS0014	10K
1100ab	RS0064	180K FF	R02645	RS0017	100K
1110ab	RS0064	180K FF	R02645	RS0017	100K
1120ab	RS0017	47K 1/2W	R02645	RS0017	2.2K
1130ab	RS0022	47K	R02645	RS0017	68K
1140ab	RS0064	150K	R02645	RS0017	10K
1150ab	RS0040	47K	R02645	RS0017	10K
1160ab	RS0040	1.8K	R02645	RS0017	1W
1170ab	RS0047	68K	R02645	RS0017	2.2K
1180ab	RS0074	100 FF 1/2W	R02645	RS0074	100 FF 1/2W
1190ab	RS0074	100 FF 1/2W	R02645	RS0074	100 FF 1/2W
1200ab	RS0060	0.55 1/4W 5%	R02645	RS0074	100 FF 1/2W
1210ab	RS0060	0.55 1/4W 5%	V0101ab	RT0013	330K



CAPACITORS (R...N-polar)

SYMBOL NO.	STOCK NO.	DESCRIPTION
6104a	CE0175	5.0uF 25V E
1024a	CE0010	300pF 50V C
1024a	CE0070	220pF 10V E
1044a	CE0074	10uF 16V E
1044a	CE0010	0.047uF 25V C
1064a	CE0018	47pF 500V C
1064a	CE0018	2.2uF 100V E
1084a	CE0117	2.2uF 500V E
1084a	CE0036	100pF 500V C
1104a	CE0005	0.1uF 50V C
112	CE0070	220pF 10V E
114	CE0009	100pF 10V E
116	CE0021	0.01uF 1.5kV C
118	CE0007	220pF 25V E
117	CE0086	10uF 25V E
118	CE0086	10uF 25V E
119	CE0012	0.01uF 1.5kV C
120	CE0146	220pF 10V E
122	CE0146	220pF 10V E
123	CE0007	100pF 50V C

SEMICONDUCTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
6107a	TR0151	2SA750	0110a	TR009	2N6414 power TR
1024a	TR0151	2SA750	111	TR017	2SC735
1024a	TR0152	2SC1940	112	TR017	2SC735
1044a	TR0152	2SC1940	114	TR017	2SC733
1044a	TR0152	2SC015	115	TR017	2SC733
1064a	TR0029	2SC045	117	TR017	2SC733
1064a	TR0045	2SC045	118	TR008	2SA642
1084a	TR0027	2SD250	119	TR007	2SC734
1094a	TR0060	2SD358A power TR	118	TR007	2SA641
0101a	TR0027	NC-120 timer	0105	TR002	1N4002
1024a	TR0005	55523A register	109	TR016	151255
103	TR0008	14188PM-1	107	TR016	151255
104	TR0001	1N4001	108	TR001	1N4002

DIODES (TR-1N4001)

SYMBOL NO.	STOCK NO.	DESCRIPTION
Ry101	AY0028	WATER-RESISTANT relay
R101a	RF0211	2 SA1C1 BFD300 fuse
R102a	RF0211	2 SA1C1 BFD300 fuse
LS101a	LS4304	2A1

RESISTORS (TYPE 50W)

SYMBOL NO.	STOCK NO.	DESCRIPTION
CR01-004	CR0004	0.1uF 250V P
RF01-004	RF0100	100k
RF02-004	RF0206	RF0206 0.5A

FR-1003 (FRANK INDICATOR BOARD)

RESISTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
R001ab	R00026	22k	R013ab	R00037	3.2k
R002ab	R00029	22k	R014ab	R00046	480
R003ab	R00030	10k	R015ab	R00035	4.7k
R004ab	R00031	8.2k	R016ab	R00046	480
R005ab	R00037	10k	R017ab	R00030	10k
R006ab	R00041	820	R018ab	R00040	1.8k
R007ab	R00041	1.5k	R019ab	R00040	1.8k
R008ab	R00046	680	R020ab	R00040	1.8k
R009ab	R00040	1.8k	R021ab	R00040	1.8k
R010ab	R00046	680	R022ab	R00035	6.8k
R011ab	R00039	2.2k			
R012ab	R00046	680			

CAPACITORS

SYMBOL NO.	STOCK NO.	DESCRIPTION
C001ab	CE0171	4.7uF 16V E
C012ab	CE0008	1uF 50V E
C01	CE0170	100uF 50V E
C02	CE0028	0.04uF 50V C
C03	CE0028	0.04uF 50V C
C05	CE0028	0.04uF 50V C
C07	CE0008	0.04uF 50V C
C08	CE0150	100uF 50V E

SEMICONDUCTORS

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
Q001ab-Q002ab	T00127	2SC733	Q001ab	T00016	1N1555
Q04ab	T00128	2SA95E	Q002ab	T00016	1N1555
Q05ab-Q008ab	T00127	2SC733	Q01-Q08	T00002	1N4002
			LED001ab-Q006ab	T00088	SLP-1199

FR-1004

SYMBOL NO.	STOCK NO.	DESCRIPTION
	R00043	1k resistor
	T00088	SLP-1199 LED

FR-1005

SYMBOL NO.	STOCK NO.	DESCRIPTION
	T00088	SLP-1199 LED

