



Service Manual

Nakamichi

ST-7
ST-7E
ST-70

AM/FM Stereo Tuner



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1. GENERAL

1.1 Introduction

For the ST-7 (U.S.A., Canada & Australia) and ST-7E, this Service Manual is the revised edition.

1.2. Voltage Selector

Voltage selector is installed on the rear panel for Other version of the Nakamichi ST-7. This voltage selector can select either 120 V or 220-240 V at customer's disposal.

1.3. Packing Materials, Owner's Manual, and Auxiliary Parts

<u>Part No.</u>	<u>Description</u>	<u>Q'ty</u>
0F03865A	Carton Box (ST-7)	1
0F03866B	Carton Box (ST-7E)	1
0F03957A	Carton Box (ST-70)	1
0F03863A	Packing L	1
0F03864A	Packing R	1
0D04527A	Owner's Manual (English) (ST-7 (U.S.A.))	1
0D04528A	Owner's Manual (English/German/French) (ST-7 (Canada, Australia & Other) & ST-7E)	1
0D04528A	Owner's Manual (Japanese) (ST-70)	1
0D04449A	Important Notice	1
0B90069A	AM Loop Antenna	1
0B90070A	AM Loop Antenna Holder for wall mounting	1

2. PARTS LOCATION FOR ELECTRICAL ADJUSTMENT

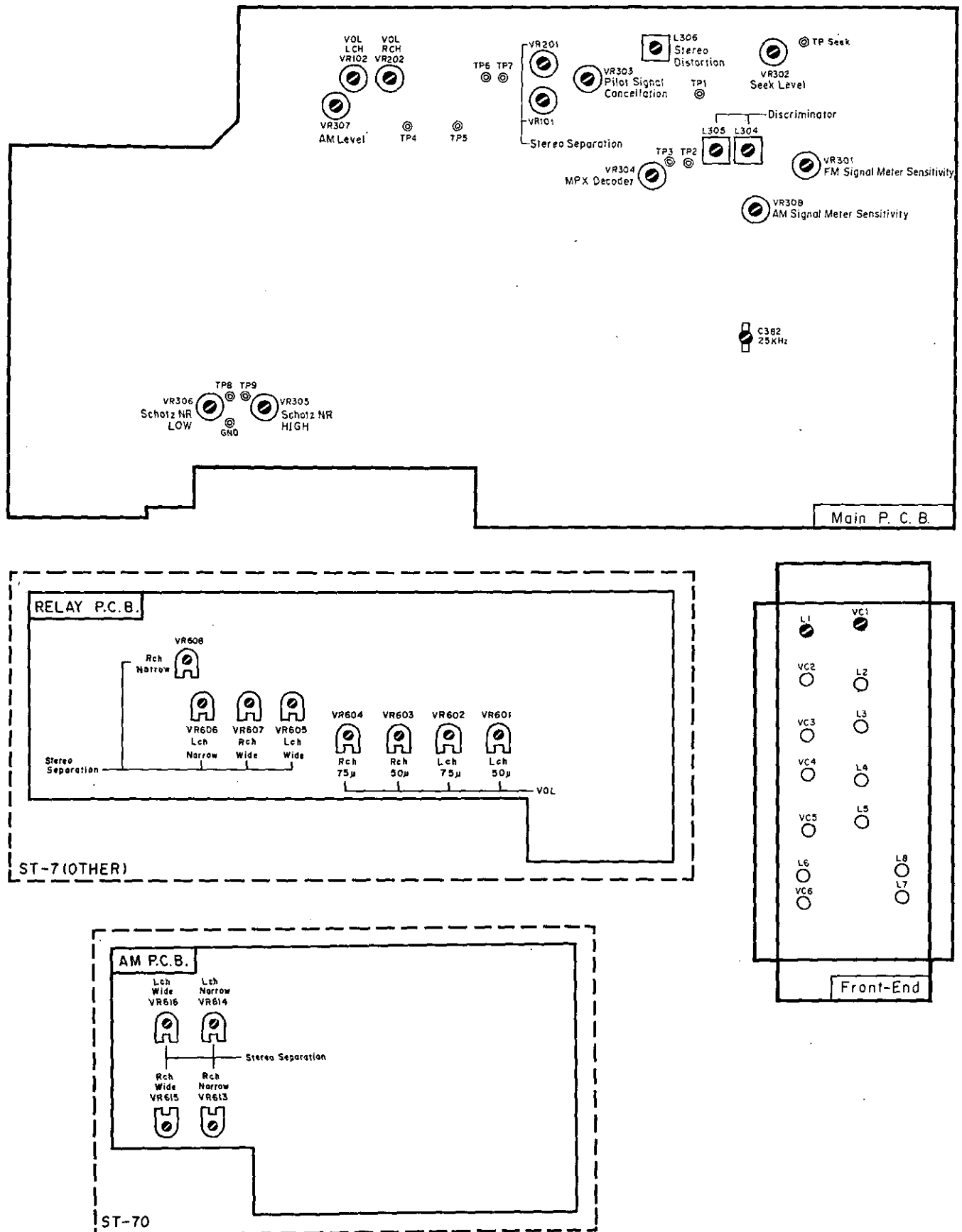


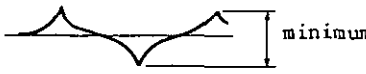
Fig. 2

3. ELECTRICAL ADJUSTMENTS

Note: Adjustment should be made in a shielded room in principle.

3.1. FM Adjustments

STEP	ITEM	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
1	Preliminary Step				1. Connect an FM Generator to the FM Antenna Input Terminal of the ST-7/7E/70. 2. Set the FM Generator as follows (either Stereo or Mono mode): The FM Generator should be set as follows unless otherwise specified. 1. Frequency 93 MHz (83 MHz for ST-70) 2. Modulation - o ST-7 (U.S.A., Canada & Other (Wide)) & ST-70 Stereo Audio: 1 kHz, 91% Pilot: 19 kHz, 9% - Mono Audio: 1 kHz, 100% - o ST-7 (Australia & Other (Narrow)) Stereo Audio: 1 kHz, 51% Pilot: 19 kHz, 9% - Mono Audio: 1 kHz, 60% 3. RF Level: 65 dBf 3. Set the Output Level controls on the rear panel at maximum. 4. The IF Band selector which selects either Wide or Narrow is provided only for ST-7 (Other) & ST-70.
2	25 kHz Adjustment	Frequency Counter to Pin 24 of IC310 (TC9147BP) on Main P.C.B.		Main P.C.B. C382	1. Short pins 36 and 41 of IC310 (TC9147BP) on the Main P.C.B. Ass'y. 2. Adjust trimmer capacitor C382 to obtain 25000 Hz $\pm$ 3 Hz on the frequency counter. 3. Remove short between pins 36 and 41 of IC310.
3	Monophonic Sensitivity Adjustment	Oscilloscope, AC voltmeter and Distortion Meter to Output Jacks	FM Generator Mono ST-7/7E/70 FM Mute - OFF Seek Level - 20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - OFF	FM Front-end L1, VC1	1. Set the frequency of the FM Generator to 90 MHz and tune the ST-7/7E/70. 2. Turn L1 to obtain minimum distortion and maximum output level. 3. Decrease the RF Level of the FM Generator and repeat above 2 to perform precise adjustment. 4. Set the frequency of the FM Generator to 106 MHz and tune the ST-7/7E/70. 5. Adjust VC1 to obtain minimum distortion and maximum output level. 6. Decrease the RF level and repeat above 5 to perform precise adjustment. 7. Repeat above 2 to 6 two or three times. Note: Do not turn other coils or trimmer capacitors on the Front-end. However, if distortion is not small enough, finely adjust L2 - L5 and VC2 - VC5 on the Front-end till satisfactory result is obtained. (Set the frequency to 90 MHz for adjusting L2 - L5 and to 106 MHz for VC2 - VC5.)

STEP	ITEM	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
4	Discriminator Alignment	DC voltmeter across TP1 and TP2 on Main P.C.B. and Distortion Meter to Output Jack	FM Generator Mono ST-7/7E/70 FM Mute - OFF Seek Level - 20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - OFF	Main P.C.B. L304, L305	1. Adjust L304 to obtain $0\text{ V} \pm 20\text{ mV}$ on the DC voltmeter. 2. Adjust L305 to obtain minimum distortion. 3. Repeat above 1 and 2 two or three times.
5	MPX Decoder Adjustment	Frequency Counter to TP3 on Main P.C.B.	FM Generator Stereo ST-7/7E/70 Same as above	Main P.C.B. VR304	1. Cut the RF signal applied to the ST-7/7E/70. 2. Adjust VR304 to obtain $76\text{ kHz} \pm 50\text{ Hz}$ on the frequency counter.
6	Pilot Signal Cancellation Adjustment	Oscilloscope across TP6 and TP7 on Main P.C.B.	FM Generator Stereo ST-7/7E/70 FM Mute - ON Seek Level - 20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - OFF	Main P.C.B. VR303	1. Cut the 1 kHz audio signals of the FM Generator to provide only 19 kHz pilot signal. 2. Adjust VR303 so that the shape of waveform on the oscilloscope is as follows with minimum amplitude. 
7	Stereo Distortion Adjustment	Distortion Meter and AC voltmeter to Output Jacks	FM Generator Stereo ST-7/7E/70 Same as above	Main P.C.B. L306	With decreasing the RF level of the FM Generator gradually, adjust L306 (yellow top) to obtain minimum distortion and maximum output level on both channels.
8	Level Adjustment	AC voltmeter to TP4(L), TP5(R) on Main P.C.B.	FM Generator Mono ST-7/7E/70 Same as above	ST-7 (except for Other), ST-7E & ST-70 VR102 VR202 ST-7 (Other) Relay P.C.B. VR601 VR602 VR603 VR604	ST-7 (except for Other), ST-7E & ST-70: Adjust VR102 (VR202) to obtain 550 mV on the AC voltmeter. ST-7 (Other): 1. Set the IF Band selector of the ST-7 (Other) to Wide. 2. Adjust VR602 (VR604) to obtain 550 mV on the AC voltmeter. 3. Set the IF Band selector to Narrow. 4. Adjust VR601 (VR603) to obtain 550 mV on the AC voltmeter.

STEP	ITEM	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
9	Stereo Separation Adjustment	AC voltmeter to Output Jack	FM Generator Stereo ST-7/7E/70 FM Mute - ON Seek Level - 20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - OFF	ST-7 (except for Other) & ST-7E: VR101 VR201 ST-7(Other): Relay P.C.B. VR605 VR606 VR607 VR608 ST-70: AM P.C.B. VR613 VR614 VR615 VR616	ST-7 (except for Other) & ST-7E: 1. Cut the R channel 1 kHz audio signal of the FM Generator to provide only L channel signal. Adjust VR201 to obtain minimum R channel output level on the AC voltmeter. 2. Cut the L channel 1 kHz audio signal to provide only R channel signal. Adjust VR101 to obtain minimum L channel output level on the AC voltmeter. ST-7 (Other) & ST-70 - Wide: 1. Set the IF Band selector of the ST-7 (Other)/ST-70 to Wide. 2. Cut the R channel 1 kHz audio signal of the FM Generator to provide only L channel signal. Adjust VR607 (ST-7 (Other))/VR615 (ST-70) to obtain minimum R channel output level on the AC voltmeter. 3. Cut the L channel 1 kHz audio signal to provide only R channel signal. Adjust VR605 (ST-7 (Other))/VR616 (ST-70) to obtain minimum L channel output level on the AC voltmeter. ST-7 (Other) & ST-70 - Narrow 1. Set the IF Band selector of the ST-7 (Other)/ST-70 to Narrow. 2. Apply the same procedure as in 2 as above, except for VR608 (ST-7 (Other))/VR613 (ST-70). 3. Apply the same procedure as in 3 as above, except for VR606 (ST-7 (Other))/VR614 (ST-70).
10	FM Signal Meter Sensitivity Adjustment	None	FM Generator Mono ST-7/7E/70 Same as above	Main P.C.B. VR301	1. Set the RF level of the FM Generator to 69 dBf. 2. Adjust VR301 so that the figure "5" of the Signal Meter starts illuminating.
11	Seek Level Adjustment	None	FM Generator Stereo ST-7/7E/70 FM Mute - ON Seek Level - 40 dBf/20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - OFF	Main P.C.B. VR302 Function Switch P.C.B. VR301	1. Set the RF level of the FM Generator and Seek Level switch of the ST-7/7E/70 to 40 dBf. 2. Turn VR301 on the Function Switch P.C.B. Ass'y fully counterclockwise. 3. Connect TPseek (the pin with yellow wire by VR302) to GND. 4. Turn VR302 counterclockwise until the Lock Indicator on the FM/AM Indicator goes out. 5. Slowly turn VR302 clockwise to find the position where the Lock Indicator starts illuminating. 6. Remove GND of TPseek. 7. Set the RF level and Seek Level switch to 20 dBf. 8. Press the Seek button to set the ST-7/7E/70 in Seek mode. 9. Turn VR301 on the Function Switch P.C.B. Ass'y so that the ST-7/7E/70 is locked at the FM Generator's frequency. Note: Turning VR301 or VR302 clockwise causes the seek operation to stop in lower RF level.

STEP	ITEM	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
12	Schotz NR Adjustment	Oscilloscope to TP8, TP9	FM Generator Stereo ST-7/7E/70 FM Mute - ON Seek Level - 20 dBf Mode - ST Meter - Signal IF Band - Wide Schotz NR - ON/OFF	Main P.C.B. VR305 VR306	1. Set the RF level of the FM Generator to 59 dBf and cut the R channel 1 kHz audio signal. 2. Set the oscilloscope to DC input mode and connect it to TP9. 3. Adjust VR305 to obtain maximum DC level on the oscilloscope. 4. Set the RF level to 30 dBf and connect the oscilloscope to TP8. 5. Turn VR306 and check that the level on the oscilloscope changes from 0 V to approx. 5.5 V. Next, slowly turn VR306 to obtain 3.9 V at TP8. 6. Set the RF level to 45 dBf and cut the 1 kHz audio signals. 7. With switching ON and OFF the Schotz NR switch, check that the noise to signal ratio is improved more than 6 dB in Schotz NR ON mode. If not, repeat steps 1 through 6.

3.2. AM Adjustments

STEP	ITEM	OUTPUT CONNECTION	MODE	ADJUSTMENT	REMARKS
1	Level Adjustment	AC voltmeter to Output Jacks	AM Generator 1000 kHz 116 dB μ /m Modulation - 30% Audio Signal - 400 Hz ST-7/7E/70 AM Mode	Main P.C.B. VR307	1. Set the measurement instruments as shown in Fig. 3. Set the distance between the AM Loop Antenna of the ST-7/7E/70 and a test loop to 60 cm. To obtain 90 dBμ/m field strength at AM Loop Antenna, set the output of the AM signal generator to 116 dBμ/m as loss is 26 dBμ/m in this setting. 2. Adjust VR307 to obtain 900 mV (except for ST-70)/750 mV (ST-70) on the AC voltmeter.
2	AM Signal Meter Sensitivity Adjustment	DC voltmeter between IC301-16 (LA1245) and GND on AM P.C.B.	AM Generator Same as above ST-7/7E/70 Same as above	Main P.C.B. VR308	With the same setting as in Step 1, adjust VR308 to obtain 10 V $\pm$ 50 mV on the DC voltmeter.

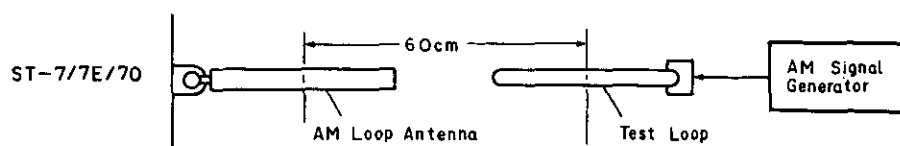


Fig. 3

4. MECHANISM ASS'Y AND PARTS LIST

4.1. Synthesis

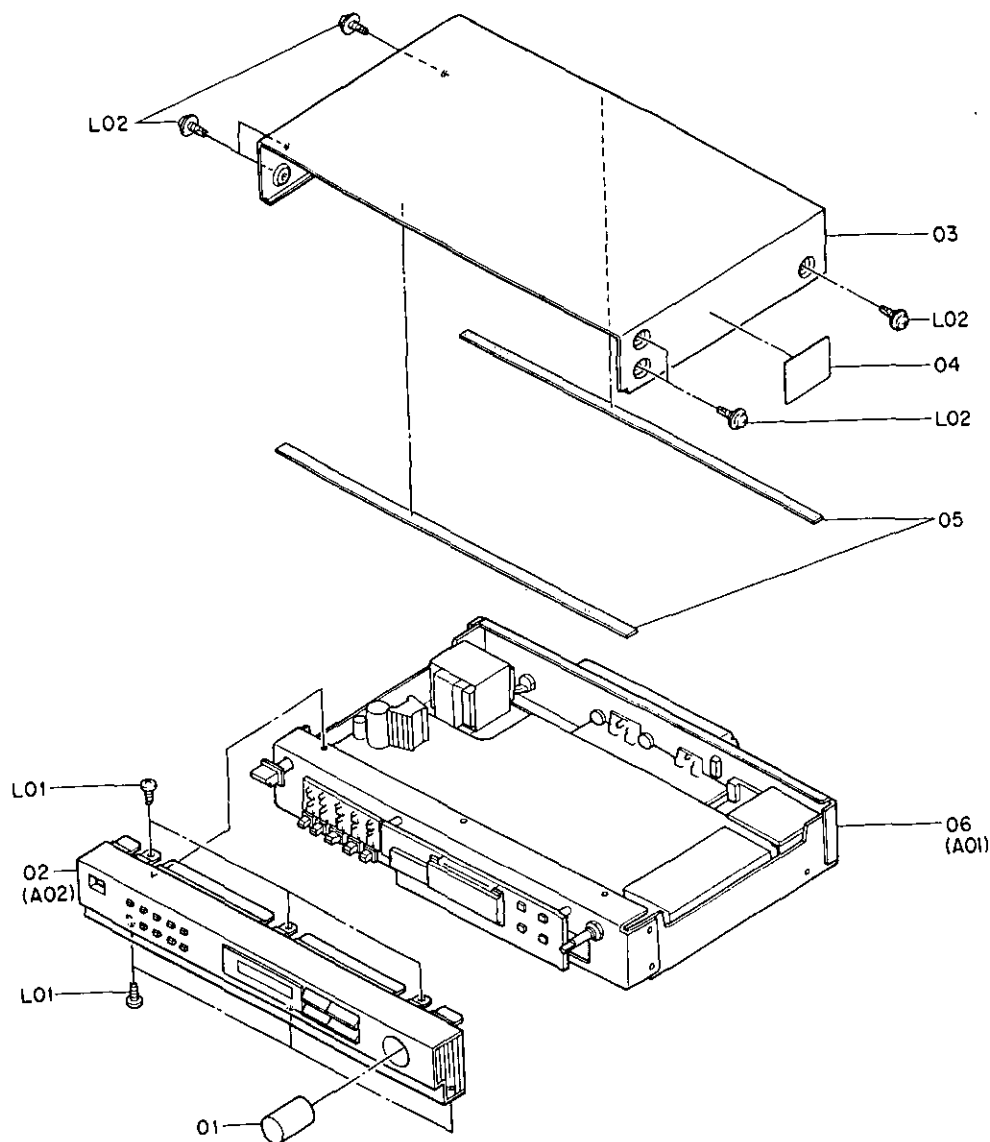


Fig. 4.1

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
		Synthesis					
01	HA04818A	Tuning Knob Ass'y	1		BA05702A	Power Switch P.C.B. Ass'y (ST-7E (Except UK))	1
02	HA04816A	Front Panel Ass'y (ST-7)	1		BA05704B	Power Switch P.C.B. Ass'y (ST-7E (UK) & ST-7 (Australia & Other))	1
	HA04817A	Front Panel Ass'y (ST-7E)	1		BA05700A	Power Switch P.C.B. Ass'y (ST-70)	1
	HA05015A	Front Panel Ass'y (ST-70)	1	07	0H04843A	Push Button (ST-7)	5
03	0H04668A	Top Cover	1		0H04643A	Push Button (ST-7E & ST-70)	6
04	0M04377B	Caution Label	1	08	BA05698B	Function Switch P.C.B. Ass'y (ST-7)	1
05	0J05002C	Top Cover Himelon	2		BA05699B	Function Switch P.C.B. Ass'y (ST-7E)	1
06	—	Chassis Ass'y	1		BA06311B	Function Switch P.C.B. Ass'y (ST-70)	1
L01	OE03283A	ST8x6 @ Binding (Black Chromate)	6		0B50042A	Power Transformer (ST-7 (U.S.A. & Canada))	1
L02	OE03278A	BT8x8 @ Pan (Black Chromate)	6		0B50043A	Power Transformer (ST-7 (Australia & ST-7E))	1
A01	—	Chassis Ass'y	1		0B50044C	Power Transformer (ST-7 (Other))	1
01	BA05708B	Display P.C.B. Ass'y (ST-7 (U.S.A. & Canada) & ST 70)	1		0B50041B	Power Transformer (ST-70)	1
	BA05709B	Display P.C.B. Ass'y (ST-7 (Australia & Other) & ST-7E)	1	10	HA05160A	Rear Panel Ass'y (ST-7 (U.S.A.))	1
02	0J04988A	Front Chassis	1		HA05181A	Rear Panel Ass'y (ST-7 (Canada))	1
03	BA05711A	Incremental Rotary Encoder Ass'y	1		HA05158A	Rear Panel Ass'y (ST-7 (Australia))	1
04	BA05697A	Memory Switch P.C.B. Ass'y	1		HA05157A	Rear Panel Ass'y (ST-7 (Other))	1
05	HA04799B	Power Button Ass'y	1		HA05159A	Rear Panel Ass'y (ST-7E (Except UK))	1
06	BA05701A	Power Switch P.C.B. Ass'y (ST-7 (U.S.A. & Canada))	1				

4.2. Chassis Ass'y (A01)

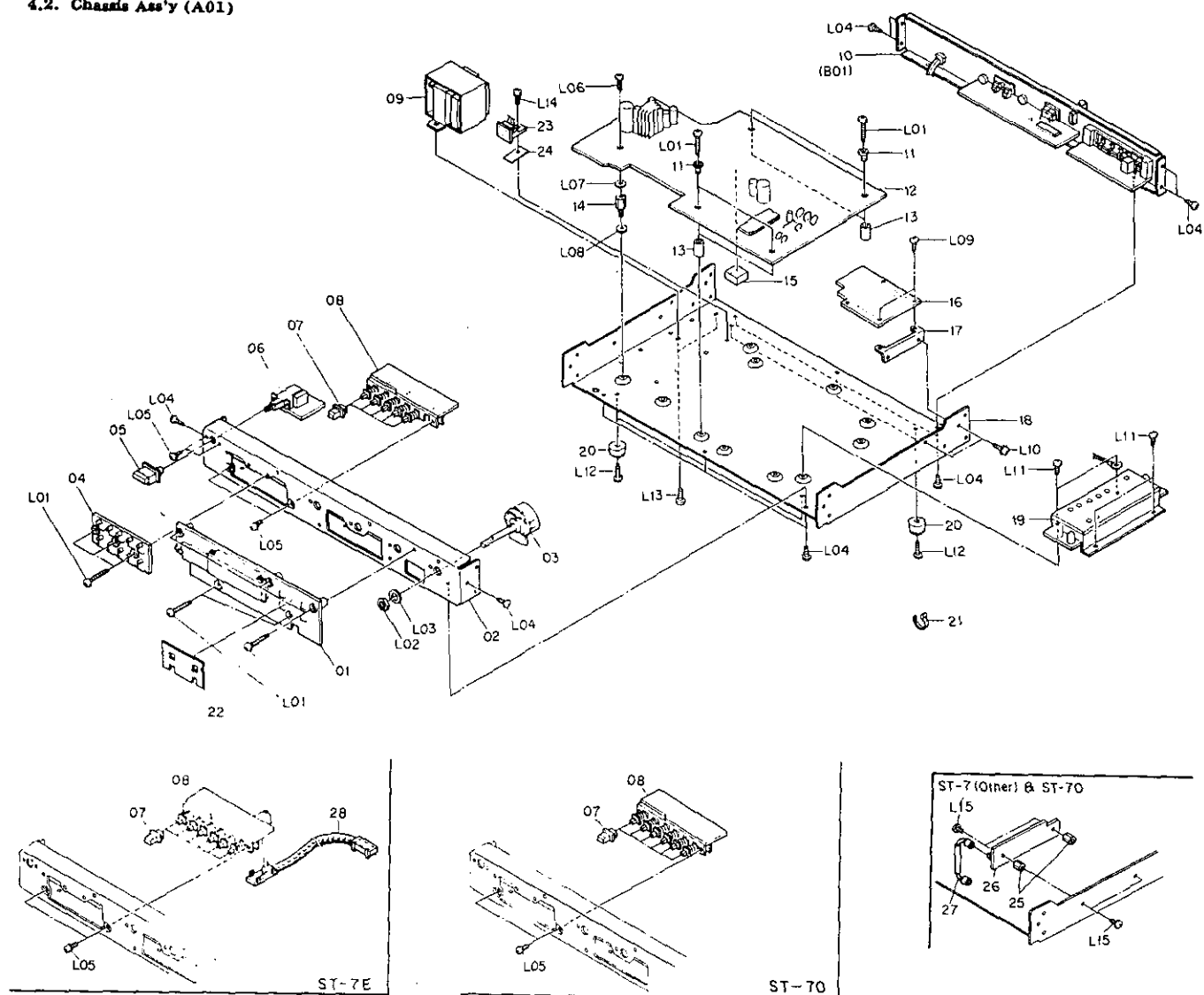


Fig. 4.2

Schematic Ref. No.	Part No.	Description	Qty	Schematic Ref. No.	Part No.	Description	Qty
11	HA05155A	Rear Panel Ass'y (ST-7E (UK))	1	25	OJ05177A	P.C.B. Stud (ST-7 (Other) & ST-70)	2
	HA05156A	Rear Panel Ass'y (ST-70)	1		BA06188A	IF P.C.B. Ass'y (ST-7 (Other))	1
	OJ05019A	Collar Bushing NB-300	4		BA06316A	IF P.C.B. Ass'y (ST-70)	1
	BA06473A	Main P.C.B. Ass'y (ST-7 (U.S.A. & Canada))	1		OB81587A	Cord with Pin Plugs (ST-7 (Other) & ST-70)	1
12	BA06475A	Main P.C.B. Ass'y (ST-7 (Australia) & ST-7E)	1	28	OB70059A	Flex Wire (ST-7E)	1
	BA06478A	Main P.C.B. Ass'y (ST-7 (Other))	1		OE03279A	ST3x18 @ Binding (Black Chromate)	12
	BA06474A	Main P.C.B. Ass'y (ST-70)	1		—	Nut	(1)
	OJ05020A	Collar Bushing NA-310	4		—	Washer	(1)
13	OJ05027A	Earth Spacer	1	L01	OE03283A	ST3x6 @ Binding (Black Chromate)	12
14	OJ05005B	P.C.B. Cushion	1	L02	OE00612A	M3x6 @ Pan (2A)	4
15	BA05735A	AM P.C.B. Ass'y (ST-7 & ST-7E)	1	L03	OE03319A	M3x8 @ Binding (Nickel)	1
16	BA06809A	AM P.C.B. Ass'y (ST-70)	1	L04	OJ05057A	Washer 3.4x7x0.5 (Fiber)	1
17	OJ05018A	P.C.B. Holder	1	L05	OE00732A	Washer 8mm	1
18	OH04626E	Main Chassis	1	L06	OE03321A	ST3x6 @ Binding	2
19	OB91009A	Front-end FD812 (ST-7 & ST-7E)	1	L07	OE03082A	BT3x8 @ Binding Toothed-Lock Washer Faced	2
20	OB91010A	Front-end FD812DM (ST-70)	1	L08	OE00800A	ST3x6 @ Binding	4
21	OJ05162A	Leg T-S	4	L09	OE00888A	BT3x12 @ Binding	4
22	OB90019A	Insu-Lock SKB80 (ST-7 (U.S.A., Canada & Australia) & ST-7E)	11	L10	OE00907A	ST4x8 @ Binding (Black Chromate)	2
	OB90019A	Insu-Lock SKB80 (ST-7 (Other))	14	L11	OE00800A	ST3x6 @ Binding	1
	OJ05054A	P.C.B. Himelon	1	L12	OE00870A	M3x6 @ Binding (Black Chromate) (ST-7 (Other) & ST-70)	4
	BA06512A	+15V Regulator P.C.B. Ass'y	1	L13			
23	OJ05179A	Insulator	1	L14			
24				L15			

4.3. Front Panel Ass'y (A02)

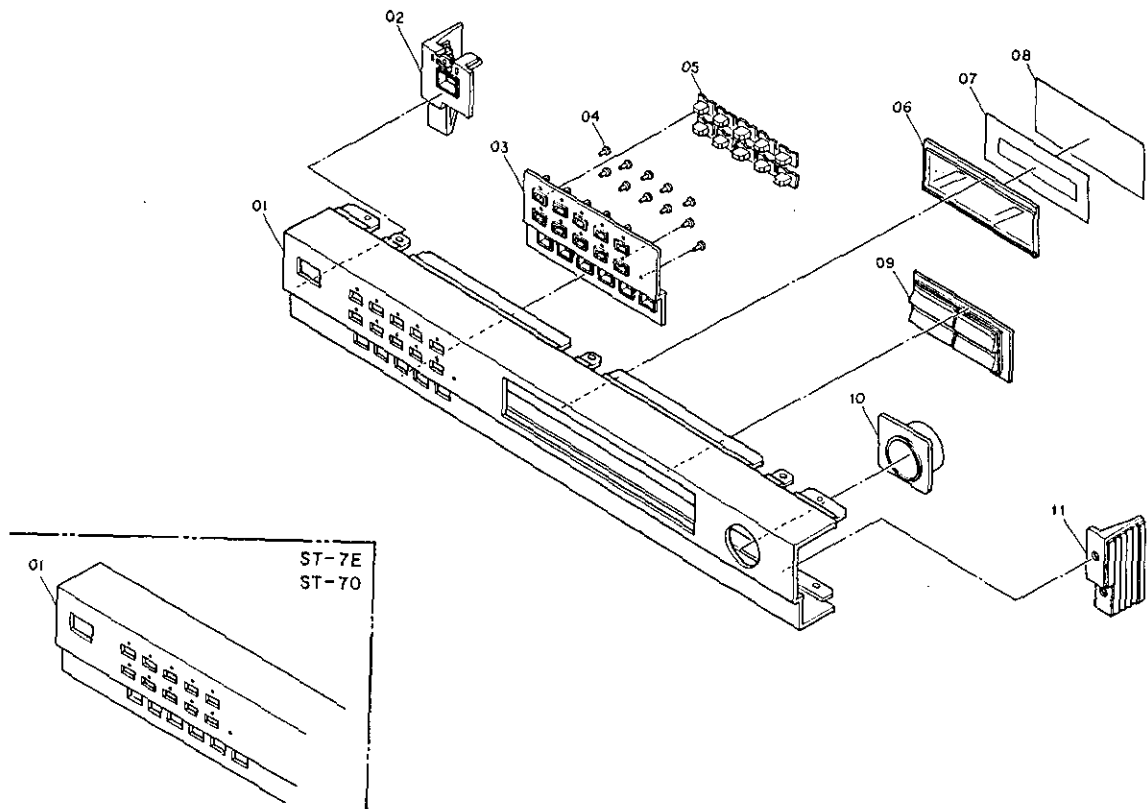


Fig. 4.3

Schematic Ref. No.	Part No.	Description	Qty
A02	HA04816A	Front Panel Ass'y (ST-7)	1
	HA04817A	Front Panel Ass'y (ST-7E)	1
	HA05016A	Front Panel Ass'y (ST-70)	1
01	OH04620B	Front Panel (ST-7)	1
	OH04621B	Front Panel (ST-7E)	1
	OH04851B	Front Panel (ST-70)	1
02	OH04640B	Side Panel L	1
03	OJ04997A	Station Button Base	1
04	OH04639B	Lens	11
05	OH04644A	Station Button	10
06	OH04647A	FL Indicator Lens	1
07	OJ04998A	FL Indicator Filter A	1
08	OJ04995B	FL Indicator Filter B	1
09	HA04800B	Up Button Ass'y	1
10	OH04648B	Volume Knob Holder	1
11	OH04641A	Side Panel R	1

4.4. Rear Panel Ass'y (B01)

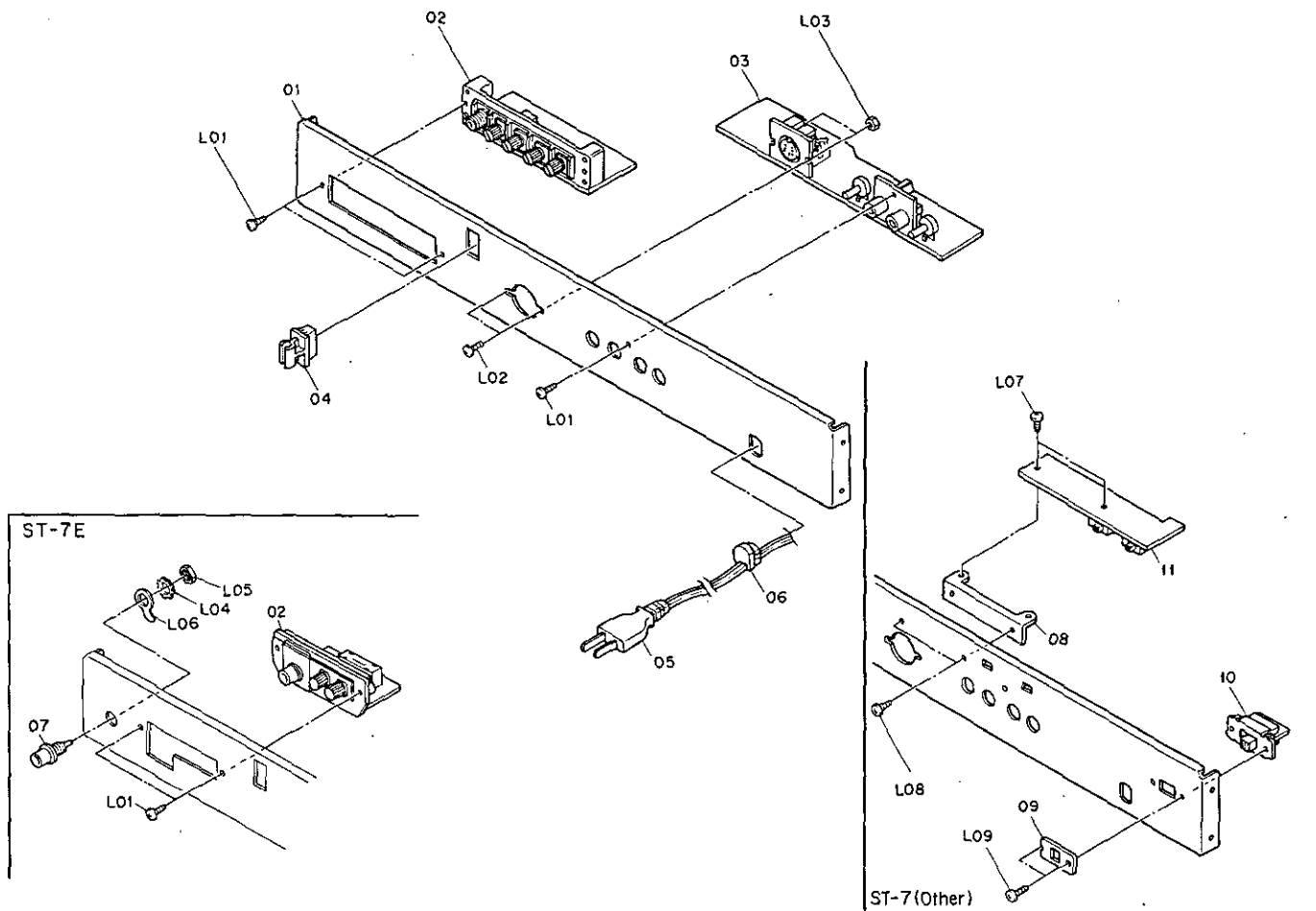


Fig. 4.4

Schematic Ref. No.	Part No.	Description	Qty	Schematic Ref. No.	Part No.	Description	Qty
B01	HA05160A	Rear Panel Ass'y (ST-7 (U.S.A.))	1	07	OB90079A	Antenna Plug (ST-7E)	1
	HA05181A	Rear Panel Ass'y (ST-7 (Canada))	1	08	OJ05018A	P.C.B. Holder (ST-7 (Other))	1
	HA05158A	Rear Panel Ass'y (ST-7 (Australia))	1	09	OM03948A	Voltage Selector Lock Plate (ST-7 (Other))	1
	HA05157A	Rear Panel Ass'y (ST-7 (Other))	1	10	OB07092U	Voltage Selector (ST-7 (Other))	1
	HA05159A	Rear Panel Ass'y (ST-7E (Except UK))	1	11	BA06190A	Relay P.C.B. Ass'y (ST-7 (Other))	1
	HA05155A	Rear Panel Ass'y (ST-7E (UK))	1	L01	OE00921A	BT3x8 @ Binding (Black Chromate)	3
01	HA05156A	Rear Panel Ass'y (ST-70)	1	L02	OE00818A	M3x8 @ Binding (Black Chromate)	2
	OH04656A	Rear Panel (ST-7 (Except Other))	1	L03	OE00507A	Nut Hex. M3	2
	OH04875A	Rear Panel (ST-7 (Other))	1	L04	OE03284A	Washer 10mm Toothed Lock (ST-7E)	1
02	OH04657B	Rear Panel (ST-7E)	1	L05	—	Nut for Antenna Plug (ST-7E)	(1)
	OH04852A	Rear Panel (ST-70)	1	L06	—	Earth Lug for Antenna Plug (ST-7E)	(1)
03	BA05696A	Antenna P.C.B. Ass'y (ST-7 & ST-70)	1	L07	OE00800A	ST3x6 @ Binding (ST-7 (Other))	2
	BA05695A	Antenna P.C.B. Ass'y (ST-7E)	1	L08	OE00921A	BT3x8 @ Binding (Black Chromate) (ST-7 (Other))	2
04	BA06476A	Pin Jack P.C.B. Ass'y (ST-7 & ST-7E)	1	L09	OE00818A	M3x8 @ Binding (Black Chromate) (ST-7 (Other))	2
	BA06477A	Pin Jack P.C.B. Ass'y (ST-70)	1				
05	OB90071A	AM Loop Antenna Holder	1				
	OB90189A	Power Cord (ST-7 (U.S.A.))	1				
	OB08533A	Power Cord (ST-7 (Canada & Other))	1				
	OB05241A	Power Cord (ST-7 (Australia))	1				
	OB08093U	Power Cord (ST-7E (Except UK))	1				
06	OB08348A	Power Cord (ST-7E (UK))	1				
	OB08219B	Power Cord (ST-70)	1				
	OB08037U	Cord Bushing (ST-7 (U.S.A., Australia & Other), ST-7E (Except UK) & ST-70)	1				
	OB08351A	Cord Bushing (ST-7 (Canada) & ST-7E (UK))	1				

5. MOUNTING DIAGRAMS AND PARTS LIST

Notes: 1. Mounting diagram shows a dip side view of the printed circuit board.

2. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.

3. Following transistors are interchangeable with each other.

a. 2SA733, 2SA608SP, 2SA1048, 2SA1175

b. 2SC945, 2SC536SP, 2SC2458, 2SC2785

4. Abbreviation for part name:

TR — Transistor, SiD — Silicon Diode, GD — Germanium Diode, ZD — Zener Diode

RK — Carbon Resistor, RM — Metal Film Resistor, RF — Fail Safe Type Resistor, RW — Wire Wound Resistor

CE — Electrolytic Capacitor, CM — Mylar Capacitor, CC — Ceramic Capacitor,

CT — Tantalum Capacitor, CSP — Polystyrene Capacitor, C — Mica Capacitor

5.1. Power Switch P.C.B. Ass'y

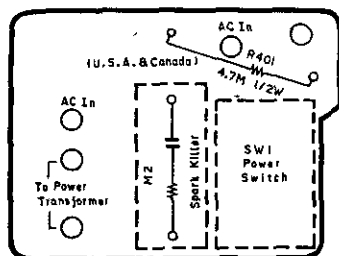


Fig. 5.1

5.2. +15 V Regulator P.C.B. Ass'y

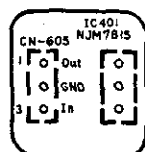


Fig. 5.2

5.3. Antenna P.C.B. Ass'y
(1) For ST-7E

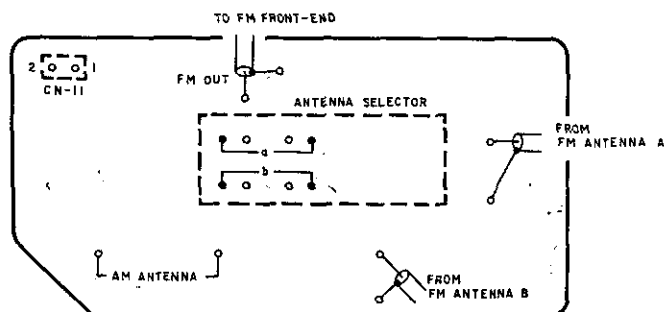


Fig. 5.3.1 For ST-7E

(2) For ST-7 and ST-70

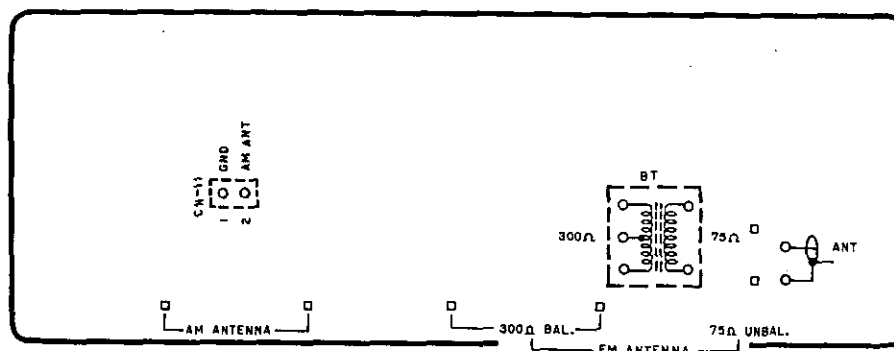


Fig. 5.3.2 For ST-7 and ST-70

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
R401 SW1 M2	BA05701A	Power Switch P.C.B. Ass'y (ST-7 (U.S.A. & Canada))	IC401 CN605	OB08955A	Spark Killer (ST-7E (UK) & ST-7 (Australia & Other))	BT CN11	OB60212A	Antenna P.C.B. (ST-7E)
	BA05702A	Power Switch P.C.B. Ass'y (ST-7E (Except UK))		OB90059A	Spark Killer Cover (ST-7E (Except UK))		OB60211B	Antenna P.C.B. (ST-7 & ST-70)
	BA05704B	Power Switch P.C.B. Ass'y (ST-7E (UK) & ST-7 (Australia & Other))		OE00752A	Eyelet 2x3 (2)		OB50045A	Balun Transformer (ST-7 & ST-70)
	BA05700A	Power Switch P.C.B. Ass'y (ST-70)		OB81409A	Switch GND (ST-7 (U.S.A. & Canada)) (1)		OB81223A	2P-T Post
	OB60203B	Power Switch P.C.B. RK 4.7M 1/2W J (ST-7 (U.S.A. & Canada))	IC401 CN605	BA05612A	+15V Regulator P.C.B. Ass'y		OB90078A	Antenna Terminal (ST-7E) (1)
	OB20057A	Power Switch P.C.B. Ass'y (ST-7 (U.S.A. & Canada))		OB60363A	+15V Regulator P.C.B. IC NJM7815 3P Connector		OB90072A	Antenna Terminal (ST-7 & ST-70) (1)
	OB71006A	Power Switch Spark Killer (ST-7 (U.S.A. & Canada))		BA05695A	Antenna P.C.B. Ass'y (ST-7E)		OB80081A	Antenna Cable (ST-7E) (1)
	OB08342A	Spark Killer (ST-7 (U.S.A. & Canada))		BA05696A	Antenna P.C.B. Ass'y (ST-7 & ST-70)		OB90019A	Insu-Lock SKB80 (1)
	OB08445A	Spark Killer (ST-7E (Except UK))					OB70058A	Antenna Selector (ST-7E) (1)
	OB08363A	Spark Killer (ST-70)						

5.4. Memory Switch P.C.B. Ass'y

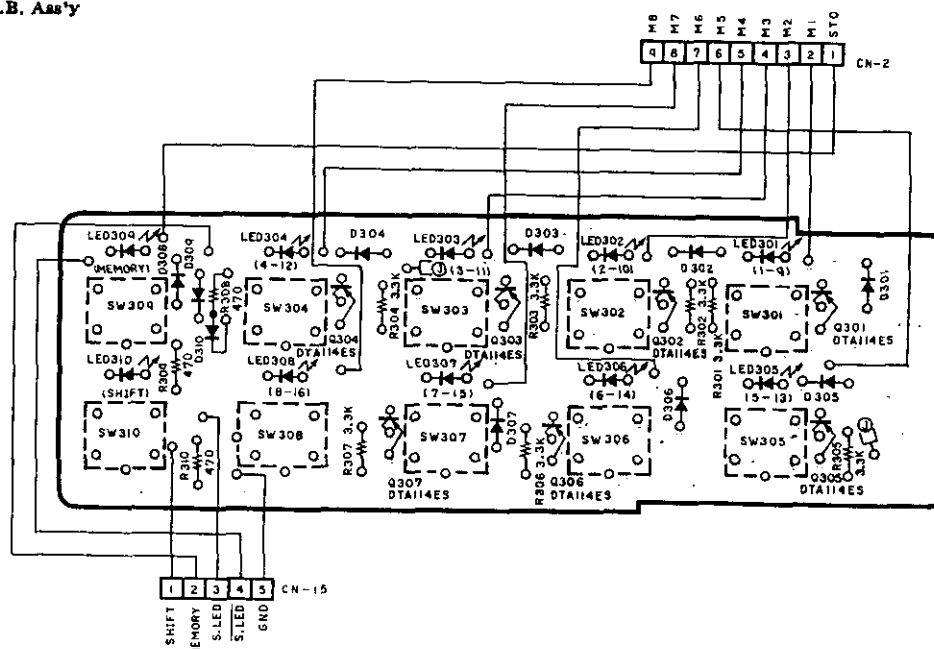


Fig. 5.4

5.5. Function Switch P.C.B.

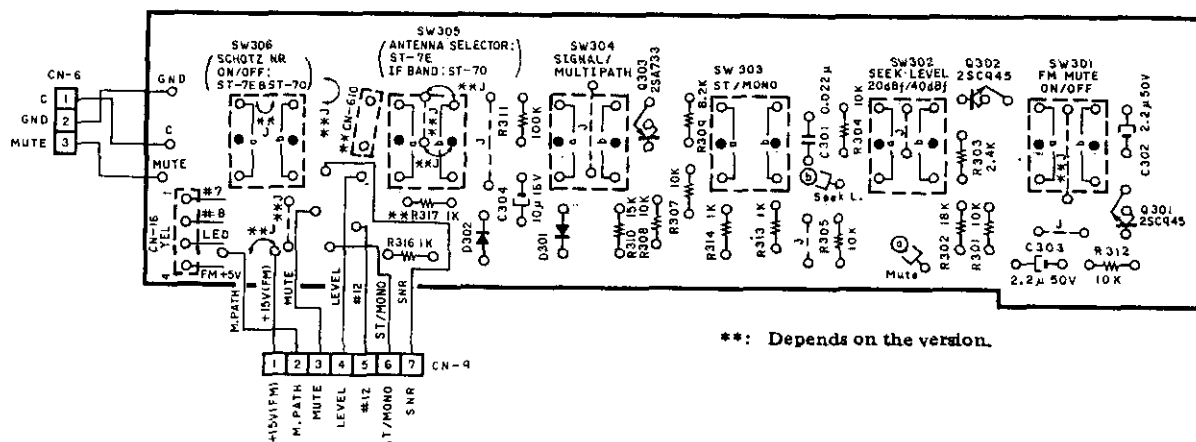


Fig. 5.5

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
Q301-307 LED301-310 D301-310 R301-307 R308,309 310 SW301-310 CN2 CN15	BA05697A	Memory Switch P.C.B. Ass'y		BA05698B	Function Switch P.C.B. Ass'y (ST-7)	R317	OB09677A	RK 1K 1/6W J (ST-70)
	OB60207C	Memory Switch P.C.B.		BA05699B	Function Switch P.C.B. Ass'y (ST-7E)	C301 C302,303 C304 SW301-305	OB09860A OB09372A OB40009A OB70040A	CM 0.022μ 50V J CE 2.2μ 50V CE 10μ 16V Push Switch 5-Key (ST-7)
	OB10058A	TR DTA114ES		BA06311B	Function Switch P.C.B. Ass'y (ST-70)			
	OB12406A	LED LD201MG (Green)		OB60206E	Function Switch P.C.B.	SW301-306	OB70041A	Push Switch 6-Key (ST-7E)
	OB06398A	SID 1SS176	Q301,302	OB10025A	TR 2SC945L (P,K)	SW301-306	OB70086A	Push Switch SUFX6 (ST-70)
	OB09689A	RK 3.3K 1/6W J	Q303	OB06155A	TR 2SA733 (P)			
	OB09669A	RK 470 1/6W J	D301,302	OB06398A	SID 1SS176	CN6 CN9 CN16 CN610	OB81354B OB81367A OB81190A OB82892A	3P Connector 7P Connector 4P-S Post (Yellow) 3P Connector (ST-70)
	OB70043A	Tact Switch KHH15910	VR301	OB32060A	Semi VR 4.7K			
			R301,304	OB09701A	RK 10K 1/6W J			
			305,307 308,312					
	OB81362B	9P Connector	R302	OB09707A	RK 18K 1/6W J		OB81379B	1P Contact L=430 (1)
	OB81366C	5P Connector	R309	OB09699A	RK 8.2K 1/6W J			
	OJ04703A	Bushing TB-300 (3)	R310	OB09705A	RK 15K 1/6W J		OB81380B	1P Contact L=430 (1)
	OJ05008A	Bushing TA-310 (3)	R311	OB09725A	RK 100K 1/6W J			
	OB02377B	PD Connector V090 (1)	R313,314 316	OB09677A	RK 1K 1/6W J			

5.6. AM Switch P.C.B. Ass'y

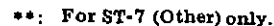


Fig. 5.6

Schematic Ref. No.	Part No.	Description	Schematic Ref. No.	Part No.	Description
	BA05735A	AM P.C.B. Ass'y (ST-7 & ST-7E)	CN11	OB82481C	2P Connector
	BA06809A	AM P.C.B. Ass'y (ST-70)	CN18	OB82444C	9P Connector
			CN606	OB81204A	8P-S Post (Black) (ST-70)
	OB60242D	AM P.C.B	CN607	OB81608A	4P Connector (ST-70)
IC301	OB11243A	IC LA1247	CN608	OB81607A	4P Connector (ST-70)
IC603	OB06144A	IC μ PD4066BC (ST-70)		OB51214A	AM RF Block (1)
T1	OB51218A	IFT 450kHz			
X301	OB92003A	Crystal 450kHz			
Q608-610	OB11248A	IC ICP-N5 (ST-70)			
VR613-616	OB32082A	Seml-VR 22K (ST-70)			
R301	OB09657A	RK 150 1/6W J			
R302	OB09681A	RK 1.5K 1/6W J			
R303,304	OB09216A	RF 10 1/6W J			
R306	OB09669A	RK 470 1/6W J			
R307	OB09683A	RK 270 1/8W J			
R308,311	OB09701A	RK 10K 1/8W J			
R310	OB09651A	RK 82 1/8W J			
R316	OB09677A	RK 1K 1/8W J			
R316	OB09723A	RK 82K 1/6W J			
R317	OB09689A	RK 3.3K 1/6W J			
R655,657	OB09701A	RK 10K 1/6W J (ST-70)			
R656,658	OB09685A	RK 2.2K 1/6W J (ST-70)			
C301,311	OB09288A	CC 1000P 50V K			
C302,314	OB41027A	CC 0.047 μ 25V M			
317					
C303-305	OB41023A	CC 0.022 μ 25V M			
308,321					
324					
C306,309	OB40012A	CE 47 μ 16V			
C310	OB09292A	CC 0.1 μ 50V Z			
C312,322	OB41019A	CC 0.01 μ 25V M			
C313	OB40189A	CE 1 μ 50V			
C315	OB40168A	CE 3.3 μ 35V			
C316	OB40014A	CE 4.7 μ 25V			
C323	OB09778A	CM 0.33 μ 50V M			

Fig. 5.7

Schematic Ref. No.	Part No.	Description
	BA06190A	Relay P.C.B. Ass'y (ST-7 (Other))
IC603	OB60362B	Relay P.C.B.
Q605	OB06144A	IC μ PD4066BC
ZD601,602	OB10034A	TR 2SC1740S
	OB12103A	ZD 2.7V
ZD603,604	OB12305A	RD2.7EB2
		ZD 9.1V
D604,605	OB06398A	MTZ9.1A
606,607		SiD 1SS176
VR601,602	OB32086A	Semi VR 100K
603,604		
VR605,606	OB32082A	Semi VR 22K
607,608		
R638,641	OB09697A	RK 6.8K 1/6W J
R639,642	OB09689A	RK 3.3K 1/6W J
R640,643	OB09685A	RK 2.2K 1/6W J
R644	OB09701A	RK 10K 1/6W J
C625	OB40010A	CE 22 μ 16V
C626	OB40206A	CE 100 μ 16V
C627,629	OB40009A	CE 10 μ 16V
C628	OB40027A	CE 2.2 μ 50V
RL601,602	OB90142A	Relay MR62-12SR
SW601,602	OB70073A	Mini Slide Switch SSF-022A
CN602	OB81211A	10P-S Post (White)
CN603	OB81201A	7P-S Post (Red)
CN604	OB81194A	5P-S Post (Yellow)

5.8. IF P.C.B. Ass'y

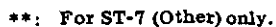


Fig. 5.8

Schematic Ref. No.	Part No.	Description
	BA06189A	IF P.C.B. Ass'y (ST-7 (Other))
	BA06316A	IF P.C.B. Ass'y (ST-70)
	OB60361A	IF P.C.B.
IC601,602	OB11156A	IC TA7060AP
Q601,603	OB10127A	FET 2SK241 (GR)
Q602,604	OB10034A	TR 2SC1740S
D601,602	OB06398A	SID 1SS176
603		
R601	OB09671A	RK 560 1/6W J
R602,603	OB09677A	RK 1K 1/6W J
619,620		
633		
R604,607	OB09645A	RK 47 1/6W J
622		
R605,621	OB09701A	RK 10K 1/6W J
R606,609	OB09665A	RK 330 1/6W J
611,624		
625,628		
R608,612	OB09629A	RK 10 1/6W J (ST-7 (Other))
627,636		
637		
R610,618	OB09653A	RK 100 1/6W J
626		
R613,616	OB09667A	RK 390 1/6W J
617,629		
634		
R614,632	OB09709A	RK 22K 1/6W J
R615	OB09693A	RK 4.7K 1/6W J
R623	OB09657A	RK 150 1/6W J
R630	OB09685A	RK 2.2K 1/6W J
R631	OB09691A	RK 3.9K 1/6W J
R635	OB09669A	RK 470 1/6W J
C601,602	OB41023A	CC 0.022 μ 25V (19)
604-608		
612-614		
616-621		
623,624		
631		
C603,615	OB41549A	CC 4700P 100V J
C609,610	OB41553A	CC 0.01 μ 25V Z
611,622		
CF601,602	OB41075A	Ceramic Filter SFE10.7MLK-A
CF603,604	OB41746A	Ceramic Filter SFE10.7MSGH15A
CF605	OB41697A	Ceramic Filter SFE10.7MZZK-A
CN601	OB81228A	3P-T Post (Black)
	OB81589A	Phone Jack S-Q3063 (2)

5.10. Display P.C.B. Ass'y

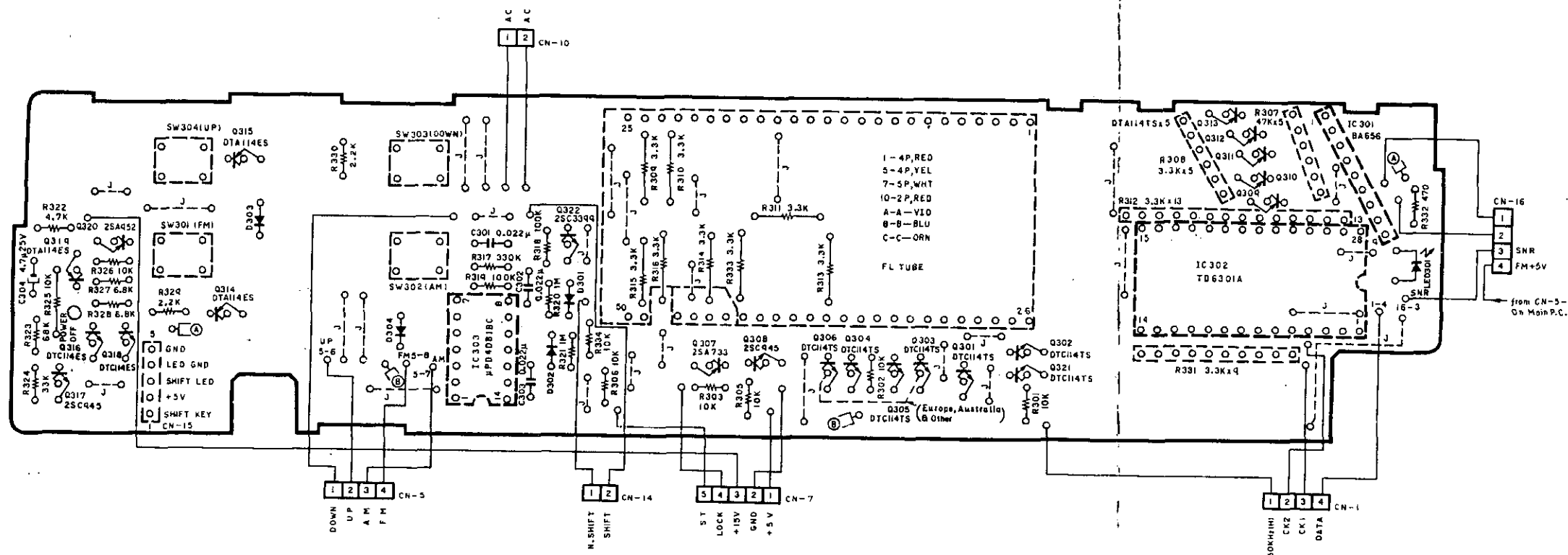
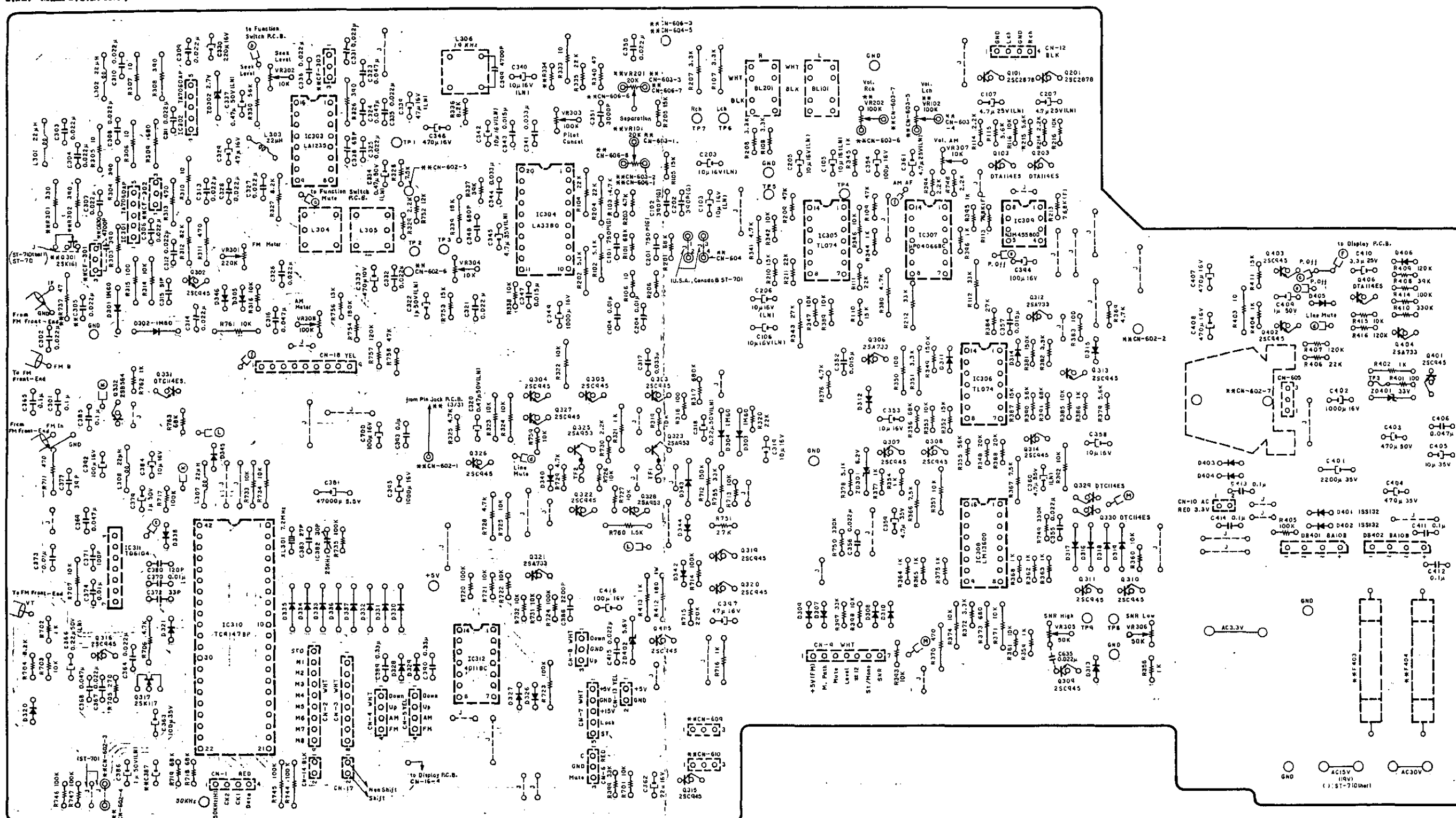


Fig. 5.10

16



****:** Depends on the version.

Fig. 6.11

6. SCHEMATIC DIAGRAM

6.1. IC Block Diagrams

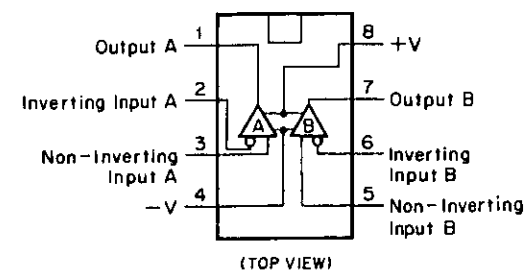


Fig. 6.1.1 Operational Amp. IC NJM4558DD

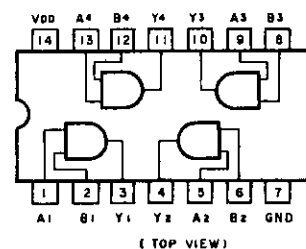


Fig. 6.1.2 AND Gate C-MOS IC μPD4081BC

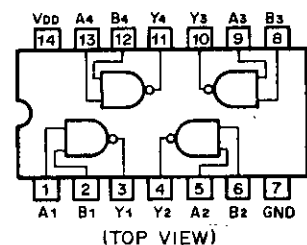


Fig. 6.1.3 NAND Gate C-MOS IC μPD4011BC

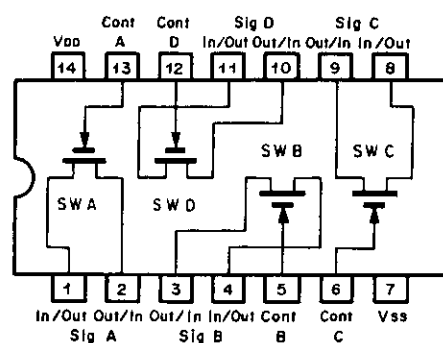


Fig. 6.1.4 Bilateral Switch C-MOS IC μPD4066BC

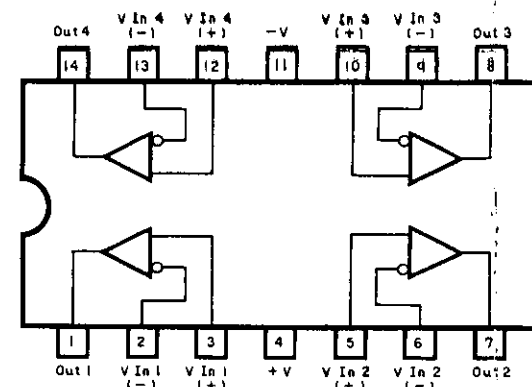


Fig. 6.1.5 Operational Amp. IC TL074

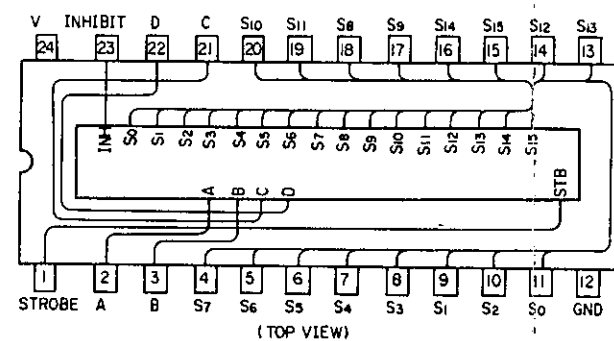


Fig. 6.1.6 4-to-16 Line Decoder IC M4514BP

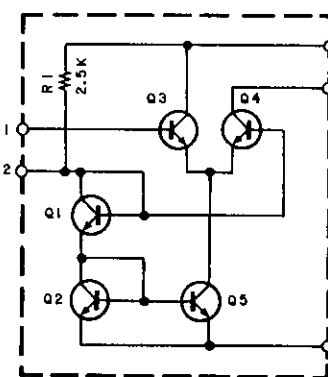


Fig. 6.1.7 FM IF Amp. IC TA7060AP

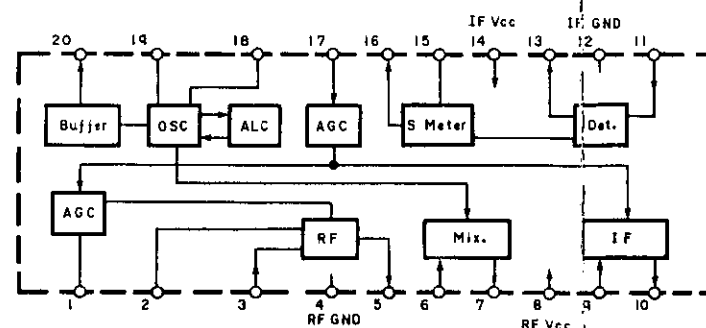


Fig. 6.1.8 AM Tuner IC (with Electronic Tuning of Table Top Stereo) LA1247

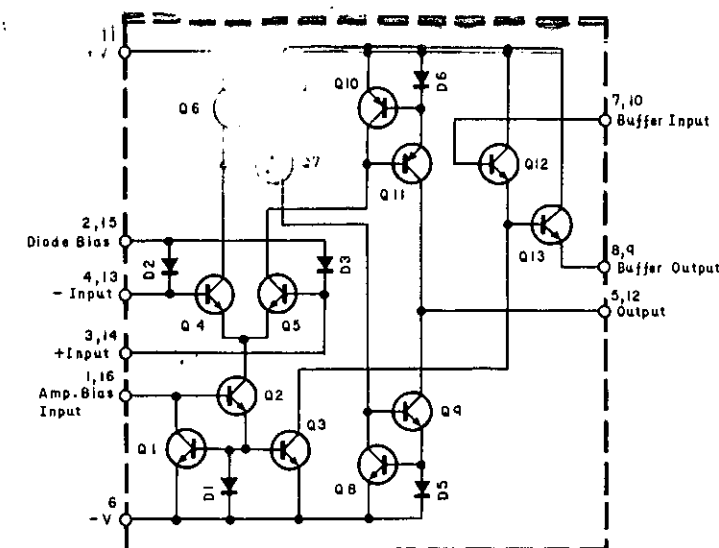


Fig. 6.1.9 Operational Transconductance Amp. (with Linearizing Diodes and Buffer) IC LM13600

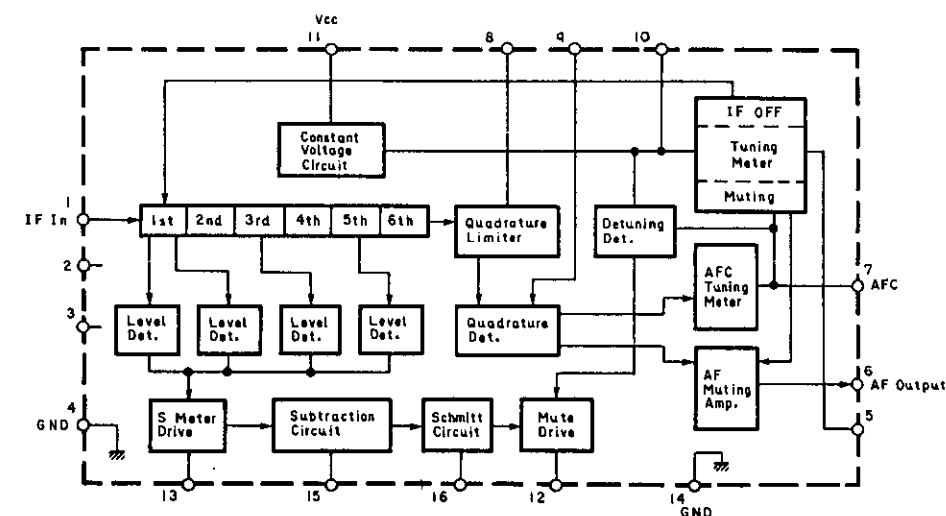


Fig. 6.1.10 FM IF System IC LA1235

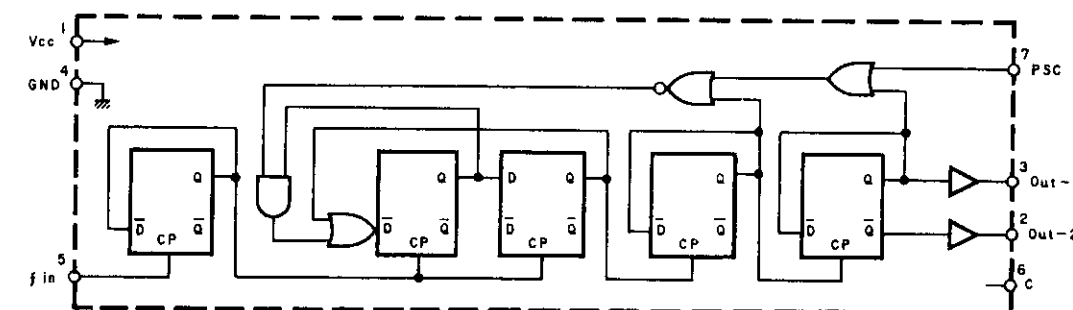


Fig. 6.1.11 ECL Prescaler (FM) IC TD6104

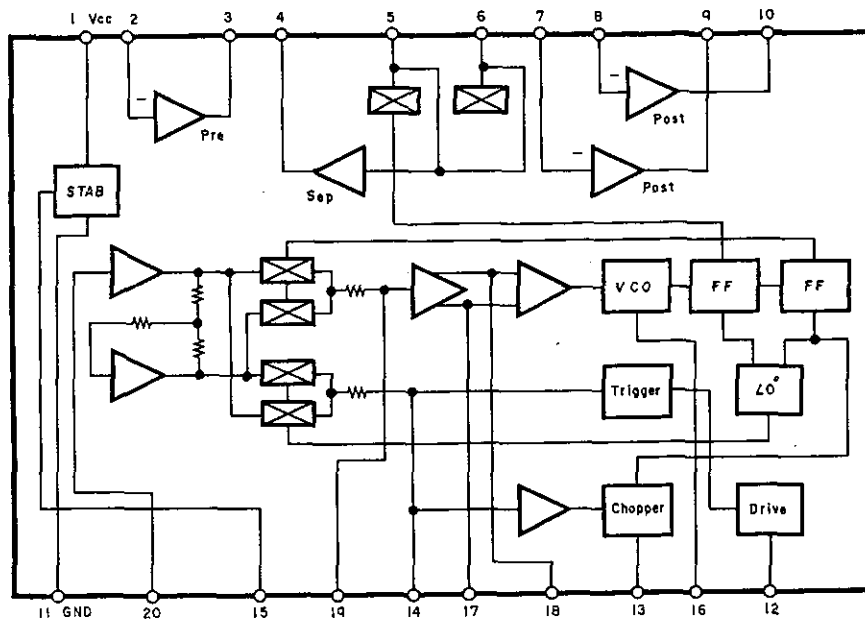


Fig. 6.1.12 PLL FM Stereo MPX Demodulator IC LA3380

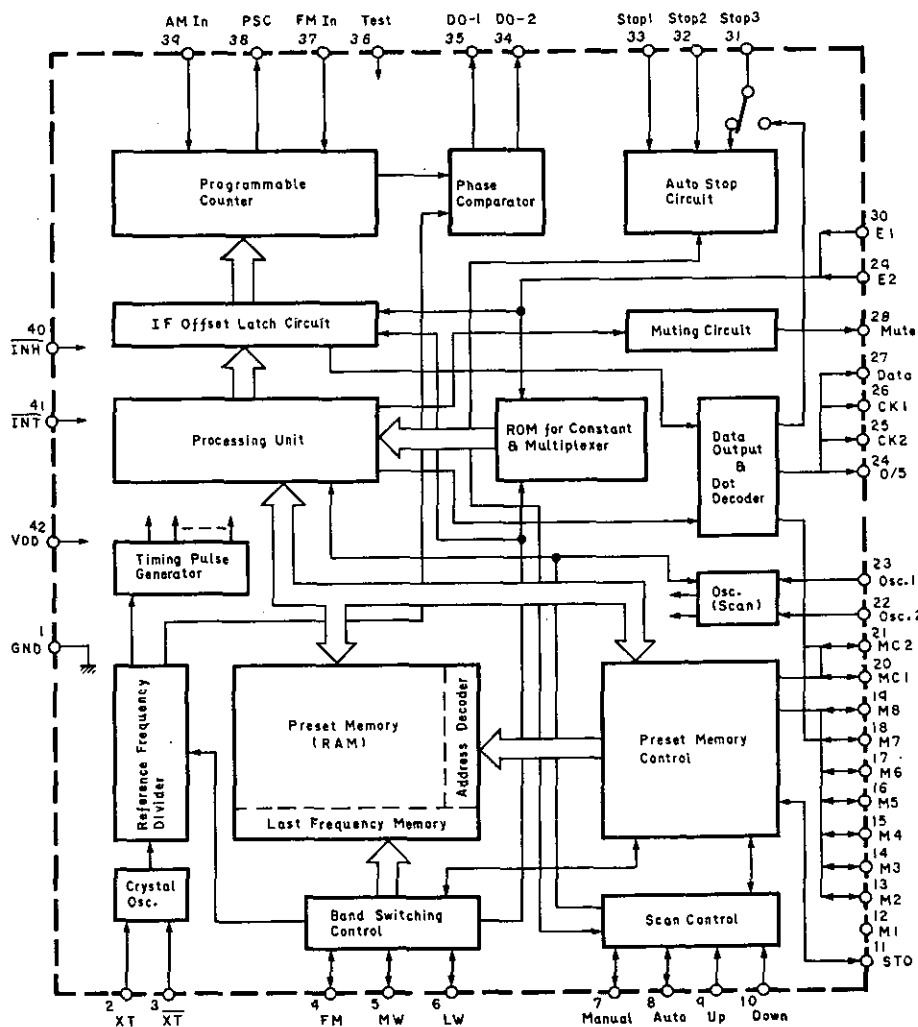


Fig. 6.1.13 FM/MW/LW 3-Band Digital Tuning (Static Method) IC TC9147BP

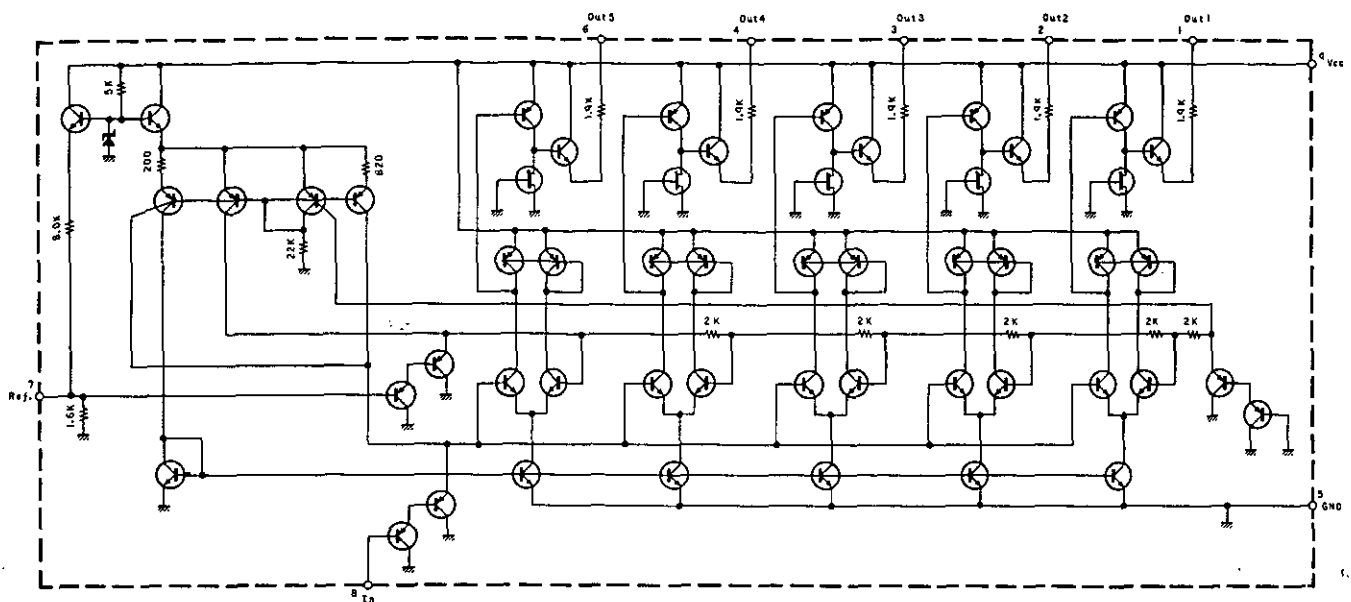


Fig. 6.1.14 Level Meter Driver IC BA656

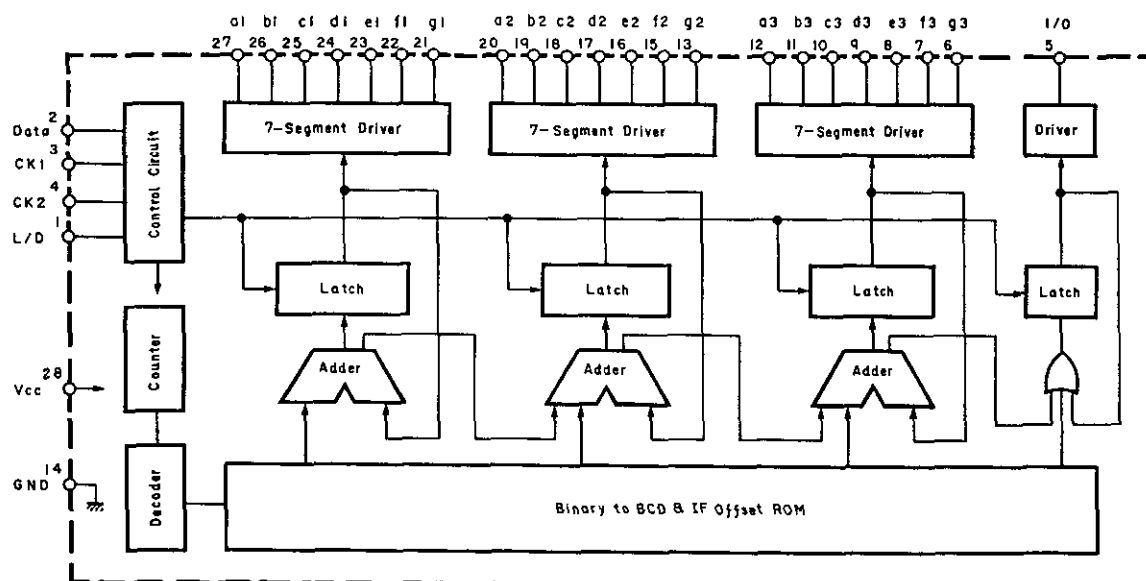


Fig. 6.1.15 Indicator Driver IC TD6301A

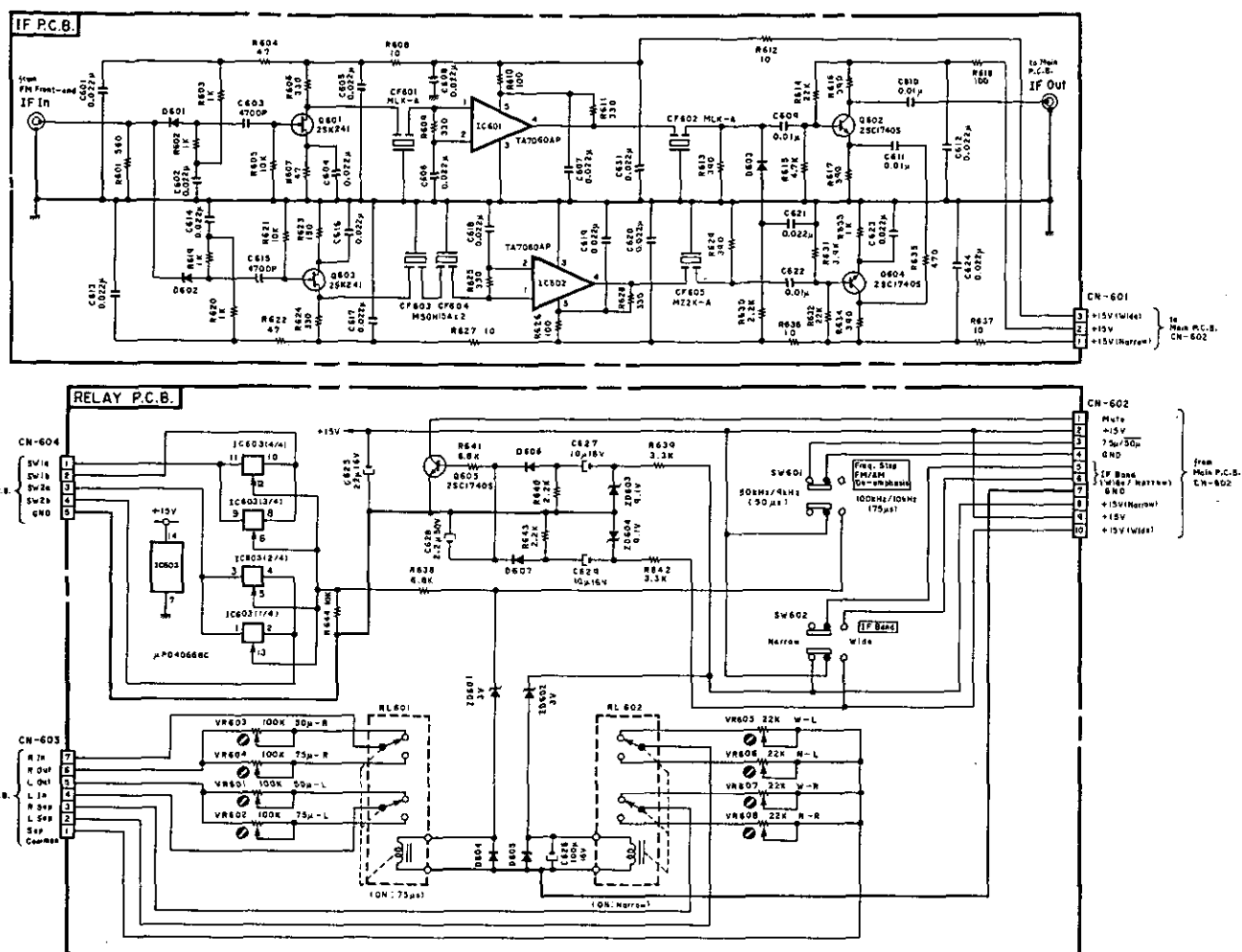


Fig. 6.2.2.2 For ST-7 (Other)

(3) For ST-70

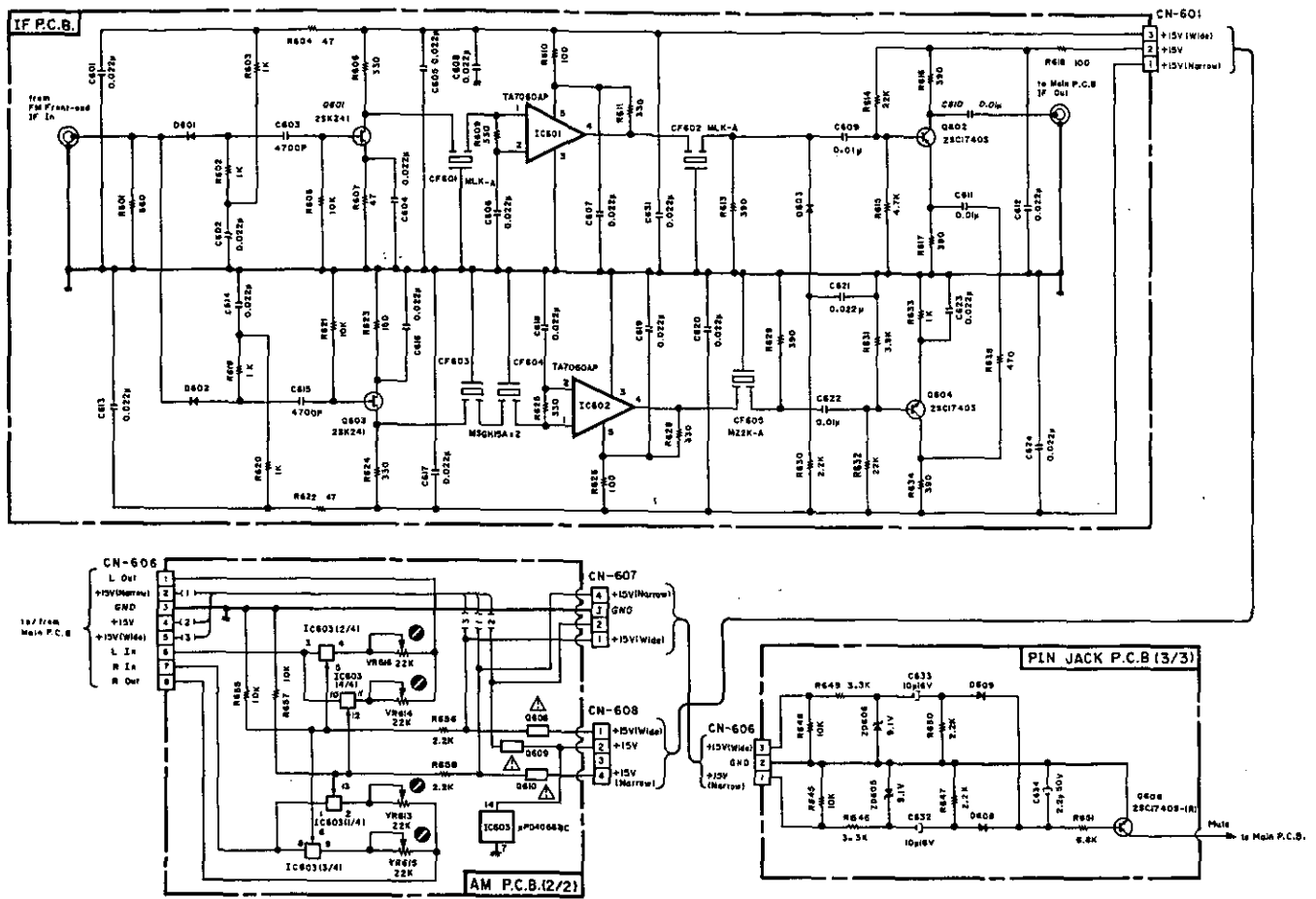
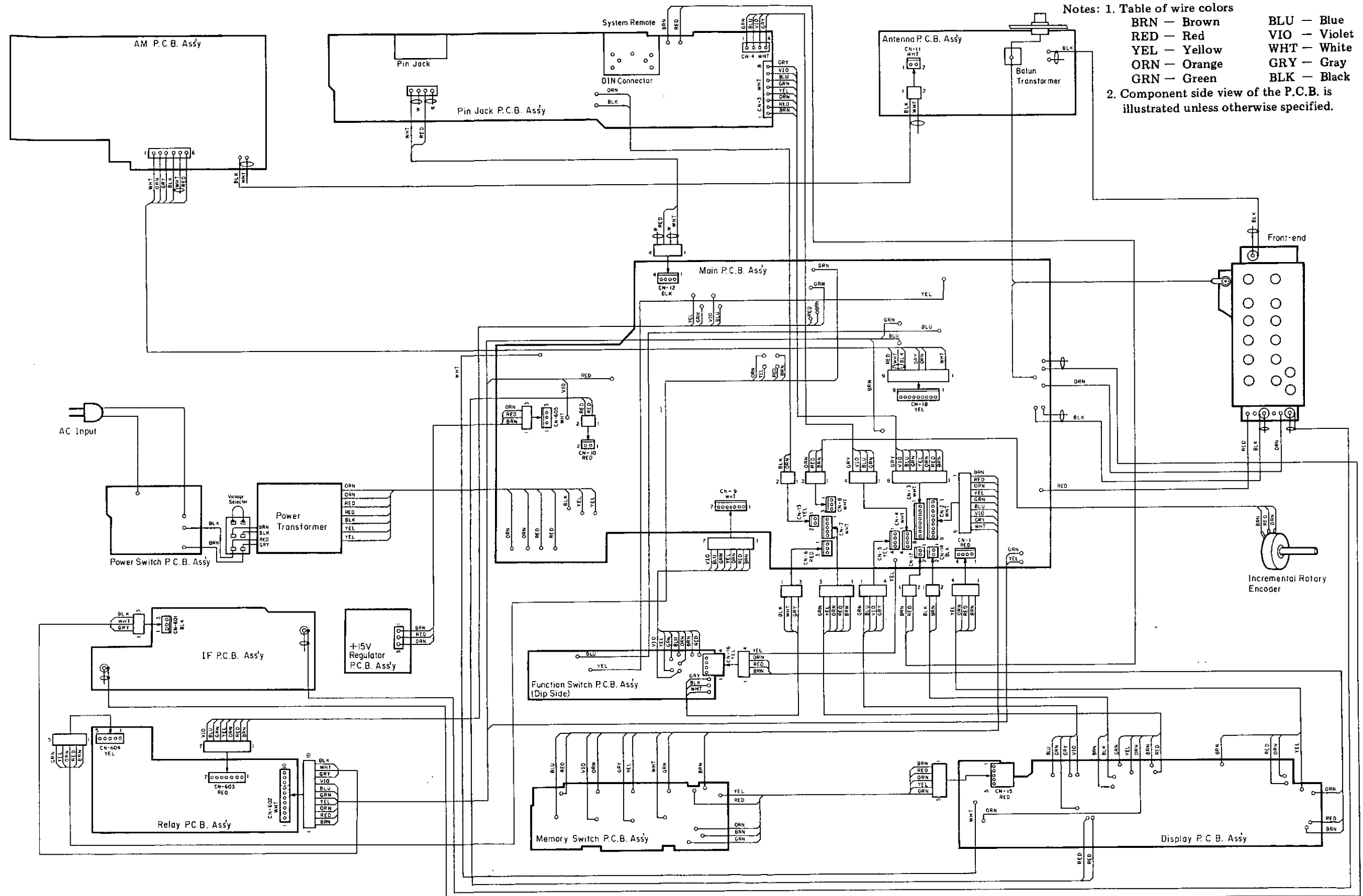


Fig. 6.2.3.1 For ST-70

(2) For ST-7 (Other)



- Notes: 1. Table of wire colors
- | | |
|--------------|--------------|
| BRN — Brown | BLU — Blue |
| RED — Red | VIO — Violet |
| YEL — Yellow | WHT — White |
| ORN — Orange | GRY — Gray |
| GRN — Green | BLK — Black |
2. Component side view of the P.C.B. is illustrated unless otherwise specified.

Fig. 7.2 For ST-7 (Other)

(8) For ST-70

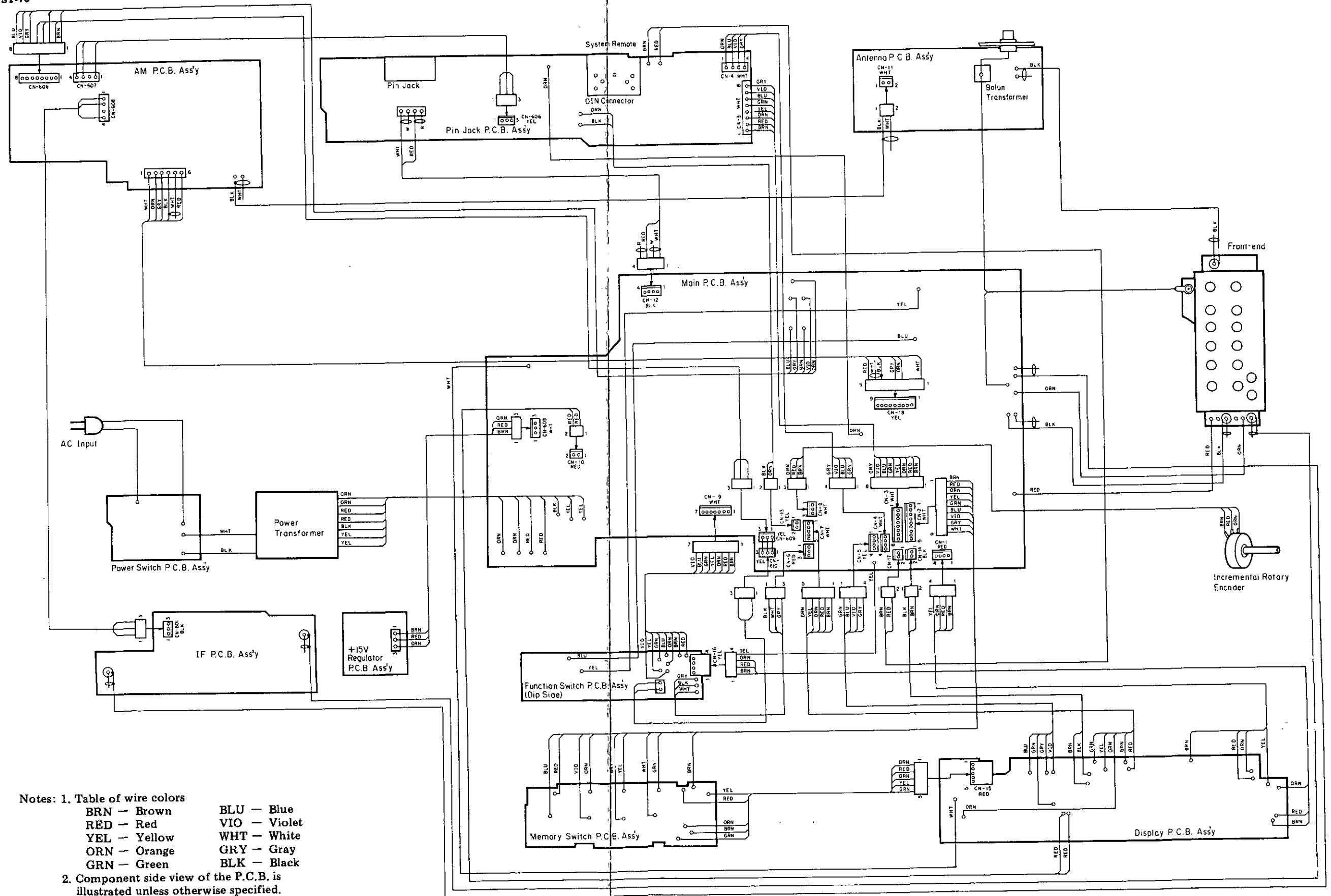
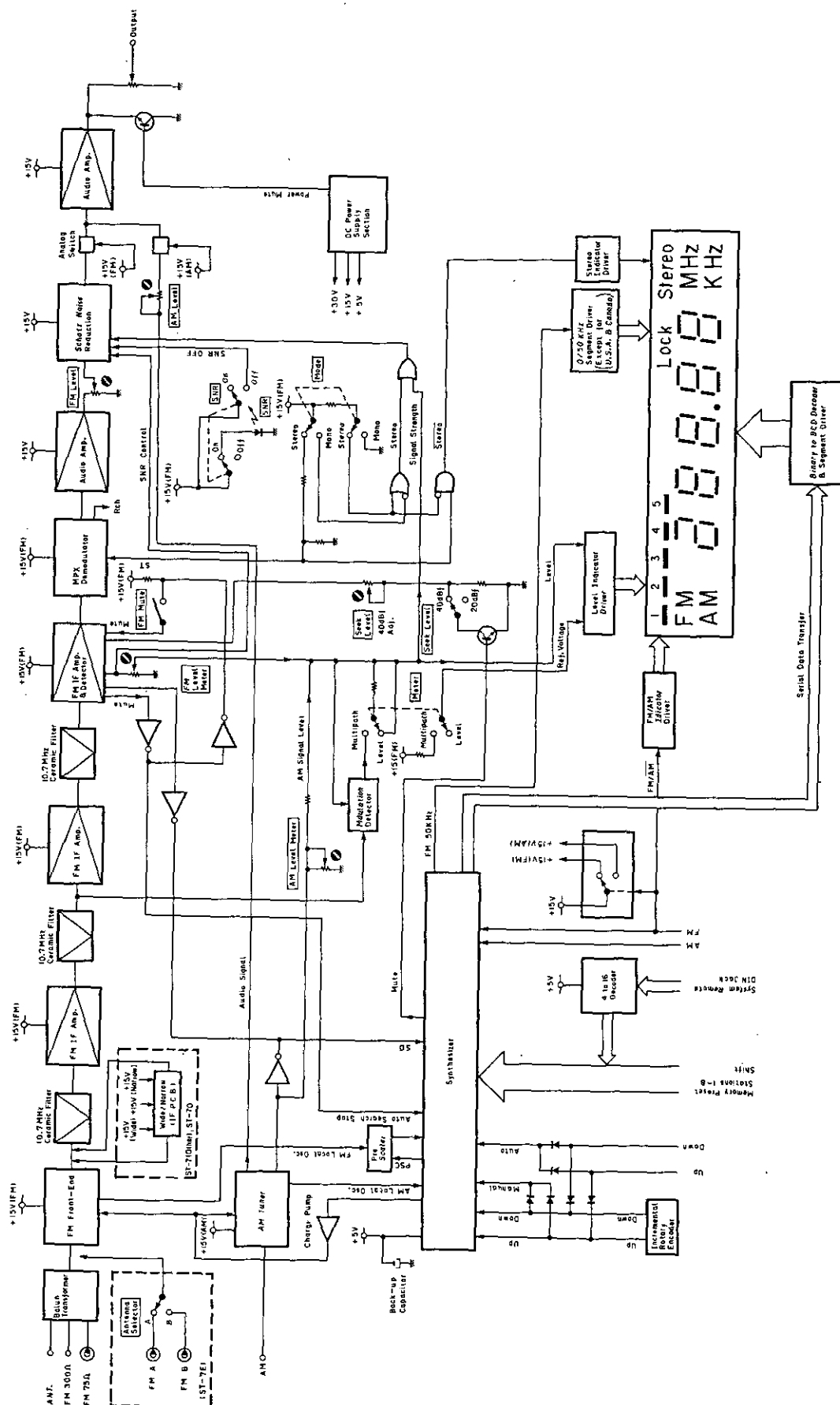


Fig. 7.3 For ST-70

8. BLOCK DIAGRAM



9. SPECIFICATIONS

(1) ST-7 (U.S.A., Canada & Other (see Note))

Note: Selector switch settings: Frequency step FM/AM: 100 kHz/10 kHz, De-emphasis: 75 μ s, IF Band: Wide

FM Section

Notes: 1. All RF levels in microvolts are given re 300-ohm antenna input.

2. Modulation: Mono 100%, Stereo Pilot 9%, Stereo Audio Signal 91%

Frequency Range	87.5—108.0 MHz in 100 kHz steps
IHF Usable Sensitivity	
Mono	10 dBf/1.7 μ V
Stereo	17 dBf/3.9 μ V
50 dB Quieting Sensitivity	
Mono	14 dBf/2.7 μ V
Stereo with Schotz NR	28 dBf/14 μ V
Stereo without Schotz NR	37 dBf/39 μ V
Signal to Noise Ratio	
Mono	Better than 80 dB (U.S.A. & Canada)
	Better than 79 dB (Other)
Stereo	Better than 76 dB (U.S.A. & Canada)
	Better than 75 dB (Other)
Schotz NR S/N Improvement	More than 6 dB
Schotz NR Active Level	19—53 dBf/5—250 μ V
High-Blend Threshold Level	19 dBf/5 μ V
Muting Threshold Level	20 dBf/5.5 μ V
Frequency Response	20—15,000 Hz $\pm$ 1 dB
Total Harmonic Distortion (1 kHz)	
Mono	Less than 0.06%
Stereo	Less than 0.08%
Capture Ratio	1.9 dB
Alternate Channel Selectivity	
($\pm$ 400 kHz)	Better than 60 dB (U.S.A. & Canada)
	Better than 70 dB (Other)
Stereo Separation	
100 Hz/1 kHz/10 kHz	50/55/45 dB (U.S.A. & Canada)
	45/50/35 dB (Other)
Spurious Response Rejection	Better than 100 dB
Image Rejection	Better than 100 dB
IF Rejection	Better than 100 dB
AM Suppression	Better than 60 dB

AM Section

Note: Modulation: 400 Hz, 30%

Frequency Range	520—1,710 kHz in 10 kHz steps
Usable Sensitivity	50 dB μ /m
Signal to Noise Ratio	
(RF input 90 dB μ /m)	Better than 48 dB
Total Harmonic Distortion	
(RF input 90 dB μ /m)	Less than 0.4%
Selectivity ($\pm$ 10 kHz)	Better than 20 dB

General Specifications

Output Level/Impedance	
FM (1 kHz, Mono, 100% Modulation)	0.5—2.0 V (variable)/1.5k ohms
AM (400 Hz, 30% Modulation)	0.2—0.9 V (variable)/1.5k ohms
FM Antenna Inputs	75 Ω unbalanced
	300 Ω balanced
Power Source	120, 220 or 240 V AC; 50/60 Hz
	(According to country of sale)
Power Consumption	15 W max. (U.S.A. & Canada)
	16 W max. (Other)

Dimensions	435 (W) x 63 (H) x 289 (D) mm 17-1/8 (W) x 2-1/2 (H) x 11-3/8 (D) inches
Approximate Weight	4.7 kg, 10 lb 6 oz

(2) ST-7 (Other) (see Note)

Note: Selector switch settings: Frequency step FM/AM: 50 kHz/9 kHz, De-emphasis: 50 μ s, IF Band: Narrow

FM Section

Notes: 1. All RF levels in microvolts are given re 300-ohm antenna input.
2. Modulation: Mono 60%, Stereo Pilot 9%, Stereo Audio Signal 51%

Frequency Range	87.50—108.00 MHz in 50 kHz steps
IHF Usable Sensitivity	
Mono	10 dBf/1.7 μ V
Stereo	20 dBf/5.5 μ V
50 dB Quieting Sensitivity	
Mono	18 dBf/4.4 μ V
Stereo with Schotz NR	31 dBf/19.4 μ V
Stereo without Schotz NR	40 dBf/54 μ V
Signal to Noise Ratio	
Mono	Better than 75 dB
Stereo	Better than 71 dB
Schotz NR S/N Improvement	More than 6 dB
Schotz NR Active Level	19—53 dBf/5—250 μ V
High-Blend Threshold Level	19 dBf/5 μ V
Muting Threshold Level	20 dBf/5.5 μ V
Frequency Response	20—15,000 Hz $\pm$ 1 dB
Total Harmonic Distortion (1 kHz)	
Mono	Less than 0.12%
Stereo	Less than 0.15%
Capture Ratio	2.3 dB
Alternate Channel Selectivity	
($\pm$ 300 kHz)	Better than 75 dB
Stereo Separation	
100 Hz/1 kHz/10 kHz	35/50/30 dB
Spurious Response Rejection	Better than 100 dB
Image Rejection	Better than 100 dB
IF Rejection	Better than 100 dB
AM Suppression	Better than 60 dB

AM Section

Note: Modulation: 400 Hz, 30%

Frequency Range	522—1,611 kHz in 9 kHz steps
Usable Sensitivity	50 dB μ /m
Signal to Noise Ratio	
(RF input 90 dB μ /m)	Better than 48 dB
Total Harmonic Distortion	
(RF input 90 dB μ /m)	Less than 0.4%
Selectivity ($\pm$ 9 kHz)	Better than 18 dB

General Specifications

Output Level/Impedance	
FM (1 kHz, Mono, 60% Modulation)	0.5—2.0 V (variable)/1.5k ohms
AM (400 Hz, 30% Modulation)	0.2—0.9 V (variable)/1.5k ohms
FM Antenna Inputs	75 Ω unbalanced 300 Ω balanced
Power Source	120, 220 or 240 V AC; 50/60 Hz (According to country of sale)
Power Consumption	16 W max.
Dimensions	435 (W) x 63 (H) x 289 (D) mm 17-1/8 (W) x 2-1/2 (H) x 11-3/8 (D) inches
Approximate Weight	4.7 kg, 10 lb 6 oz

(3) ST-7 (Australia) & ST-7E

FM Section

- Notes: 1. All RF levels in microvolts are given re 75-ohm antenna input.
2. Modulation: Mono 60%, Stereo Pilot 9%, Stereo Audio Signal 51%

Frequency Range	87.50–108.00 MHz in 50 kHz steps
IHF Usable Sensitivity	
Mono	10 dBf/0.9 μ V
Stereo	20 dBf/2.7 μ V
50 dB Quieting Sensitivity	
Mono	18 dBf/2.2 μ V
Stereo with Schotz NR	31 dBf/9.7 μ V
Stereo without Schotz NR	40 dBf/27 μ V
Signal to Noise Ratio	
Mono	Better than 76 dB
Stereo	Better than 71 dB
Schotz NR S/N Improvement	More than 6 dB
Schotz NR Active Level	19–53 dBf/2.5–125 μ V
High-Blend Threshold Level	19 dBf/2.5 μ V
Muting Threshold Level	20 dBf/2.7 μ V
Frequency Response	20–15,000 Hz $\pm$ 1 dB
Total Harmonic Distortion (1 kHz)	
Mono	Less than 0.08%
Stereo	Less than 0.1%
Capture Ratio	2.3 dB
Alternate Channel Selectivity ($\pm$ 300 kHz)	Better than 60 dB
Stereo Separation	
100 Hz/1 kHz/10 kHz	45/50/40 dB
Spurious Response Rejection	Better than 100 dB
Image Rejection	Better than 100 dB
IF Rejection	Better than 100 dB
AM Suppression	Better than 60 dB

AM Section

Note: Modulation: 400 Hz, 30%

Frequency Range	522–1,611 kHz in 9 kHz steps
Usable Sensitivity	50 dB μ /m
Signal to Noise Ratio (RF input 90 dB μ /m)	Better than 48 dB
Total Harmonic Distortion (RF Input 90 dB μ /m)	Less than 0.4%
Selectivity ($\pm$ 9 kHz)	Better than 18 dB

General Specifications

Output Level/Impedance	
FM (1 kHz, Mono, 60% Modulation)	0.5–2.0 V (variable)/1.5k ohms
AM (400 Hz, 30% Modulation)	0.2–0.9 V (variable)/1.5k ohms
FM Antenna Inputs	
ST-7E	75 Ω unbalanced x 2 (300 Ω /75 Ω Converter Plug supplied)
ST-7 (Australia)	75 Ω unbalanced 300 Ω balanced
Power Source	120, 220 or 240 V AC; 50/60 Hz (According to country of sale)
Power Consumption	15 W max.
Dimensions	435 (W) x 63 (H) x 289 (D) mm 17-1/8 (W) x 2-1/2 (H) x 11-3/8 (D) inches
Approximate Weight	4.7 kg, 10 lb 6 oz

(4) ST-70 (Japan)

FM Section

- Notes: 1. All RF levels in microvolts are given re 300-ohm antenna input.
2. Modulation: Mono 100%, Stereo Pilot 10%, Stereo Audio Signal 90%

Frequency Range	76.0—90.0 MHz in 100 kHz steps
IHF Usable Sensitivity	
Mono	10 dBf/1.7 μ V
Stereo	17 dBf/3.9 μ V
50 dB Quieting Sensitivity	
Mono	16 dBf/3.5 μ V
Stereo with Schotz NR	28 dBf/14 μ V
Stereo without Schotz NR	37 dBf/39 μ V
Signal to Noise Ratio (Input 65 dBf)	
Mono	Better than 80 dB
Stereo	Better than 74 dB
Schotz NR S/N Improvement	More than 6 dB
Schotz NR Active Level	19—53 dBf/5—250 μ V
High-Blend Threshold Level	19 dBf/5 μ V
Muting Threshold Level	20 dBf/5.5 μ V
Frequency Response	20—15,000 Hz $\pm$ 1 dB
Total Harmonic Distortion (1 kHz)	
Mono	Less than 0.06% (Wide) Less than 0.25% (Narrow)
Stereo	Less than 0.08% (Wide) Less than 0.3% (Narrow)
Capture Ratio	1.9 dB
Alternate Channel Selectivity	
	Better than 70 dB ($\pm$ 400 kHz, Wide) Better than 75 dB ($\pm$ 300 kHz, Narrow)
Stereo Separation	
100 Hz/1 kHz/10 kHz	45/50/35 dB (Wide) 45/45/35 dB (Narrow)
Spurious Response Rejection	Better than 100 dB
Image Rejection	Better than 100 dB
IF Rejection	Better than 100 dB
AM Suppression	Better than 60 dB

AM Section

Note: Modulation: 400 Hz, 30%

Frequency Range	522—1,629 kHz in 9 kHz steps
Usable Sensitivity	50 dB μ /m
Signal to Noise Ratio (RF input 90 dB μ /m)	Better than 48 dB
Total Harmonic Distortion (RF input 90 dB μ /m)	Less than 0.4%
Selectivity ($\pm$ 9 kHz)	Better than 18 dB

General Specifications

Output Level/Impedance	
FM (1 kHz, Mono, 100% Modulation)	0.5—2.0 V (variable)/1.5k ohms
AM (400 Hz, 30% Modulation)	0.2—0.7 V (variable)/1.5k ohms
FM Antenna Inputs	75 Ω unbalanced 300 Ω balanced
Power Source	100 V AC; 50/60 Hz
Power Consumption	14 W max.
Dimensions	435 (W) x 63 (H) x 289 (D) mm 17-1/8 (W) x 2-1/2 (H) x 11-3/8 (D) inches
Approximate Weight	4.7 kg, 10 lb 6 oz

- Specifications and design are subject to change for further improvement without notice.
- Schotz Noise Reduction manufactured under license from L.S. Research, Inc., U.S. and foreign patents pending.

Service Manual

Nakamichi ST-7,ST-7E,ST-70

Nakamichi Corporation

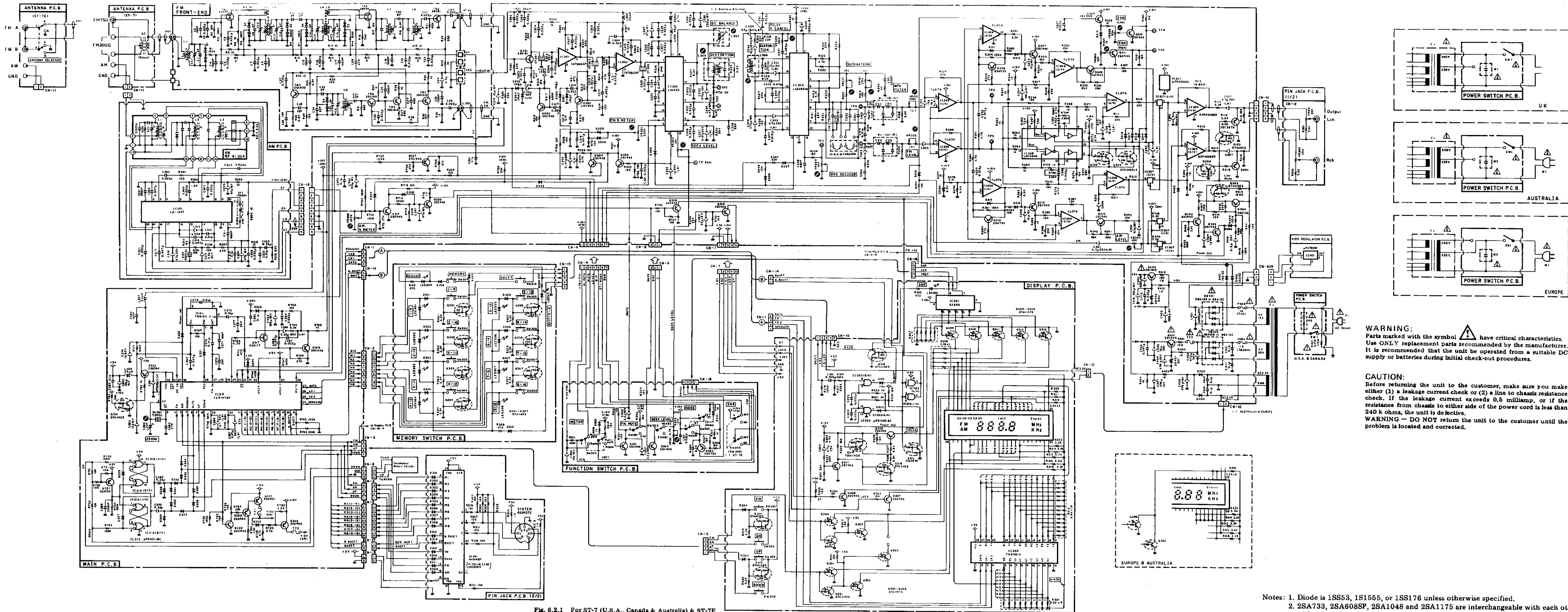
Tokyo Office
Shinjuku Daiichi Seimei Bldg.
2-7-1 Nishishinjuku, Tokyo
Phone (03) 342-4461
Telex : 2324721 (NAKAM J)

Nakamichi U.S.A. Corporation

19701 South Vermont Avenue
Torrance, California 90502
Phone : (213) 538-8150

Nakamichi GmbH

Stephanienstrasse 6, 4000 Düsseldorf 1
Phone : (0211) 359036

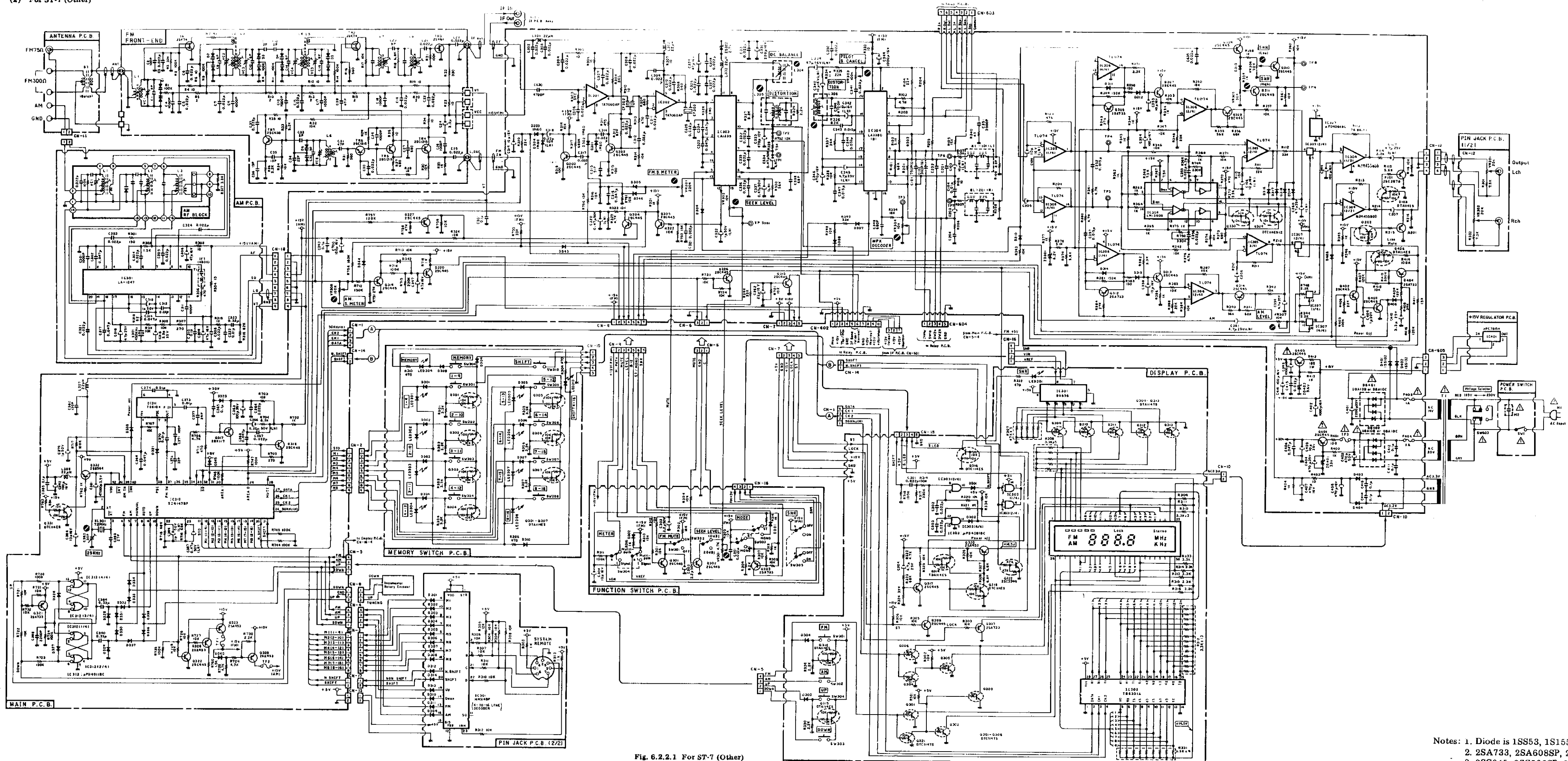


WARNING:  Parts marked with the symbol  have critical characteristics. Use **ONLY** replacement parts recommended by the manufacturer. It is recommended that the unit be operated from a suitable DC supply or batteries during initial check-out procedures.

CAUTION:
Before returning the unit to the customer, make sure you make either (1) a leakage current check or (2) a line to chassis resistance check. If the leakage current exceeds 0.5 milliamp, or if the resistance from chassis to either side of the power cord is less than 240 k ohms, the unit is defective.

WARNING — DO NOT return the unit to the customer until the problem is located and corrected.

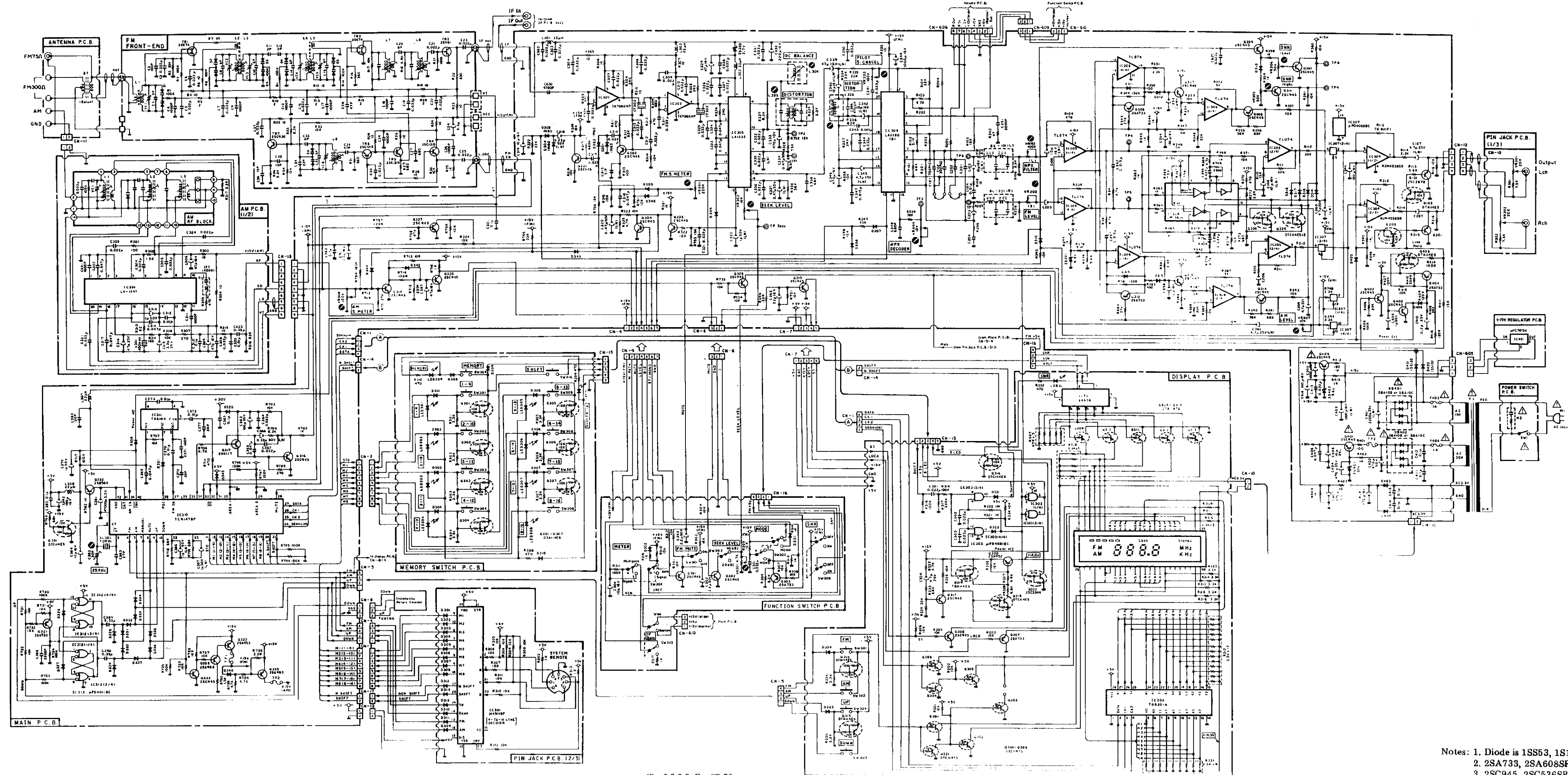
Notes: 1. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
2. 2SA733, 2SA608SP, 2SA1048 and 2SA1175 are interchangeable with each other.
3. 2SC945, 2SC536SP, 2SC2458 and 2SC2785 are interchangeable with each other.



WARNING:
Parts marked with the symbol  have critical characteristics. Use ONLY replacement parts recommended by the manufacturer. It is recommended that the unit be operated from a suitable DC supply or batteries during initial check-out procedures.

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Before returning the unit to the customer, make sure you make either (1) a leakage current check or (2) a line to chassis resistance check. If the leakage current exceeds 0.5 milliamp, or if the resistance from chassis to either side of the power cord is less than 240 k ohms, the unit is defective.
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Before returning the unit to the customer, make sure you make either (1) a leakage current check or (2) a line to chassis resistance check. If the leakage current exceeds 0.5 milliamp, or if the resistance from chassis to either side of the power cord is less than 240 k ohms, the unit is defective. **WARNING — DO NOT** return the unit to the customer until the problem is located and corrected.

- Notes: 1. Diode is 1SS53, 1S1555, or 1SS176 unless otherwise specified.
2. 2SA733, 2SA608SP, 2SA1048 and 2SA1175 are interchangeable with each other.
3. 2SC945, 2SC536SP, 2SC2458 and 2SC2785 are interchangeable with each other.

Fig. 6.2 3.2 For ST-70

7. WIRING DIAGRAMS

(1) For ST-7 (U.S.A., Canada & Australia) & ST-7E

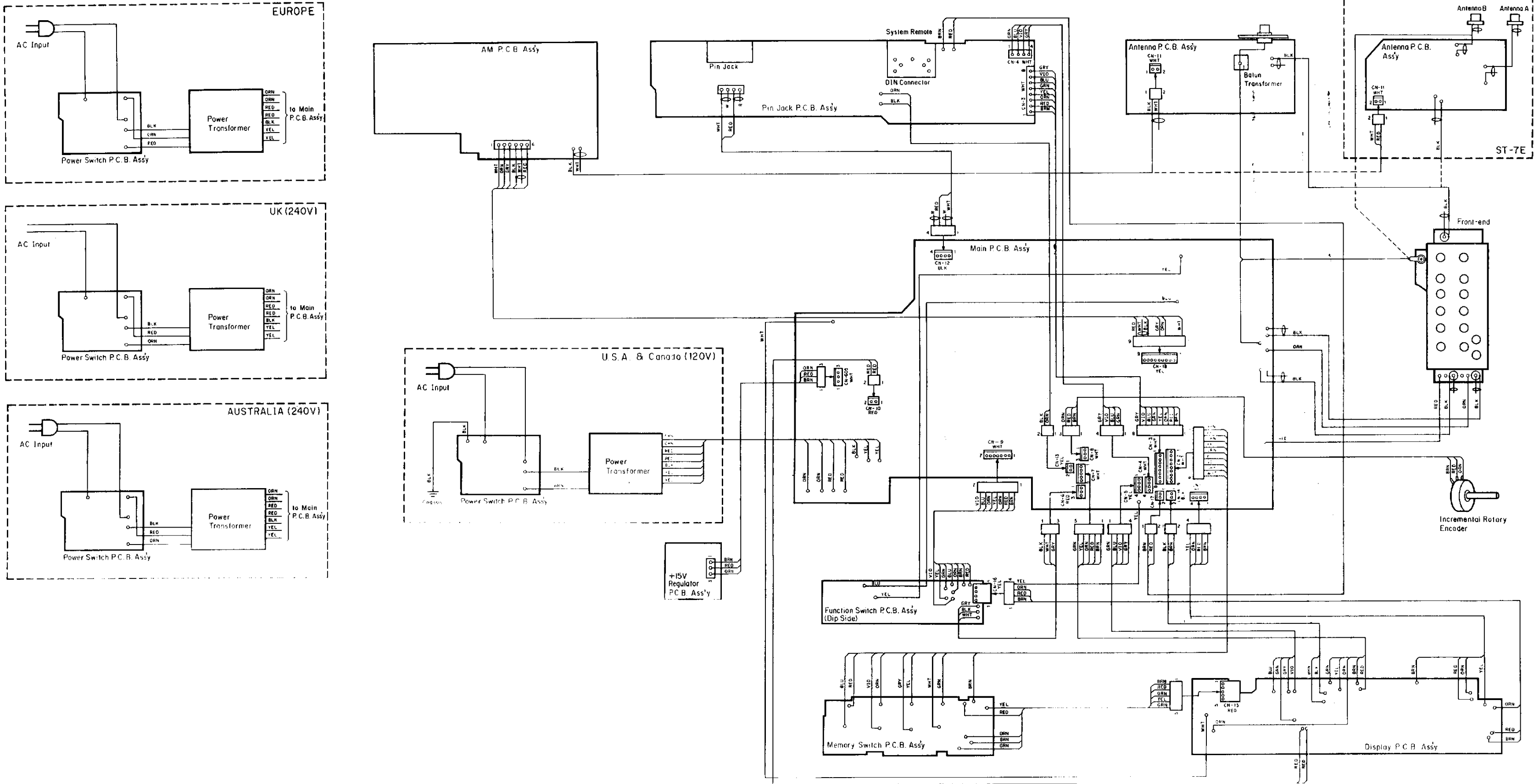


Fig. 7.1 For ST-7 (U.S.A., Canada & Australia) & ST-7E