SERVICE DATA
FILE NO.170-072

TOSHIBA

DIGITAL SYNTHESIZER TUNER

ST-F15

SPECIFICATIONS			
Receiving Frequency:	87.5 ~ 108 MHz	General	
Sensitivity (IHF):	0.9μV (10.3 dBf)	Power Supply:	AC 220V 50 Hz or AC 240V 50 Hz
Harmonic Distortion:	1 kHz MONO 0.15% STEREO 0.25%	Power Consumption:	9W
		Weight:	2.2 kg
S/N (IHF A Network):	MONO 72 dB STEREO 68 dB	Dimensions (mm):	257(W) x 54(H) x 196(D)
Frequency Response:	30 ~ 15 kHz $^{+0.5}_{-1.5}$ dB		
Selectivity (IHF):	75 dB		
Image Rejection:	50 dB		
IF Rejection:	80 dB		
Capture Ratio:	1.0 dB		
AM Suppression:	50 dB		
Stereo Separation:	45 dB (at 1 kHz)		

Specifications are subject to change without notice.

TE, TU, AY

CONTENTS

1. BLOCK DIAGRAM

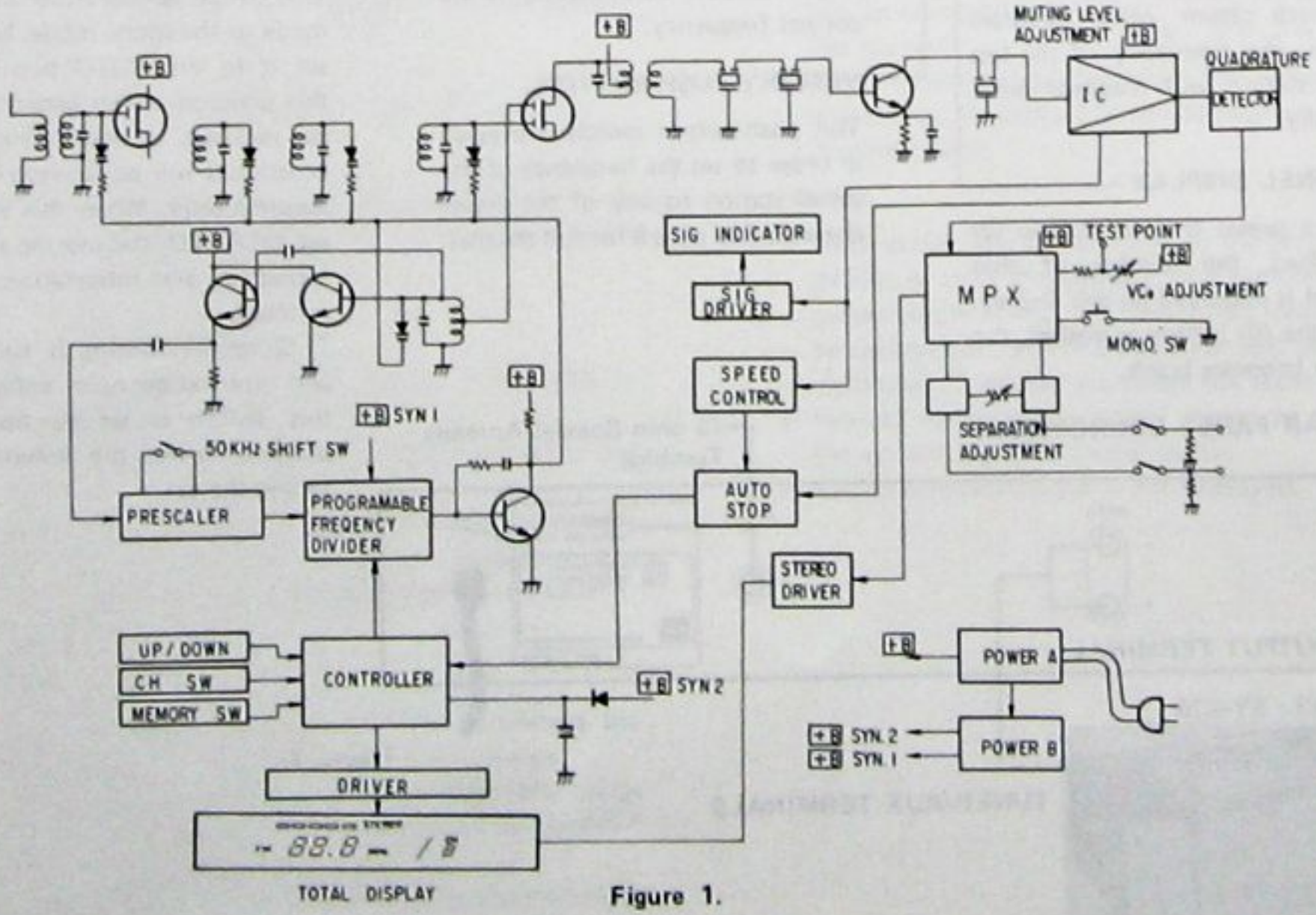


Figure 1.

2. OPERATING CONTROLS

■ FRONT PANEL CONTROLS

PRESET CHANNEL PUSH-BUTTONS/MANUAL PUSH TUNING BUTTONS

After a station has been preset, you can tune it in instantly by just pressing the appropriate preset button. The corresponding preset indicator lamp will light up and the tuned frequency will be shown on the digital frequency display along with the preset channel number. You can also use these buttons to directly "dial" the frequency you want after pressing the MANU button.

AUTO TUNING PUSH-BUTTON

Press this push-button, and then either the UP or DOWN push-button, for automatic scanning up or down the frequency band. The frequency shown in the digital frequency display will change rapidly for a while, and then suddenly stop at a particular station.

+50 kHz SHIFT PUSH-BUTTON SWITCH

When this switch is pushed, a frequency 50 kHz higher than the frequency displayed on the frequency display is received.

UP AND DOWN PUSH-BUTTONS

To move up or down the frequency band one step at a time (by 0.1 MHz steps), press either of these push-buttons, releasing the switch after each step. For rapid movement up or down the band, press the relevant push-button switch continuously (until the desired frequency is reached).

MONO PUSH-BUTTON SWITCH

This switch selects either the stereo mode or the mono mode. Normally set it to the AUTO position. At this position stereo broadcasts will be received in stereo and mono broadcasts will be received in mono automatically. When this switch is set to AUTO, the muting switch is turned on and interstation noise is rejected.

* Since the muting is turned off and interstation noise enters when this switch is set to the mono position, lower the volume when tuning the set.

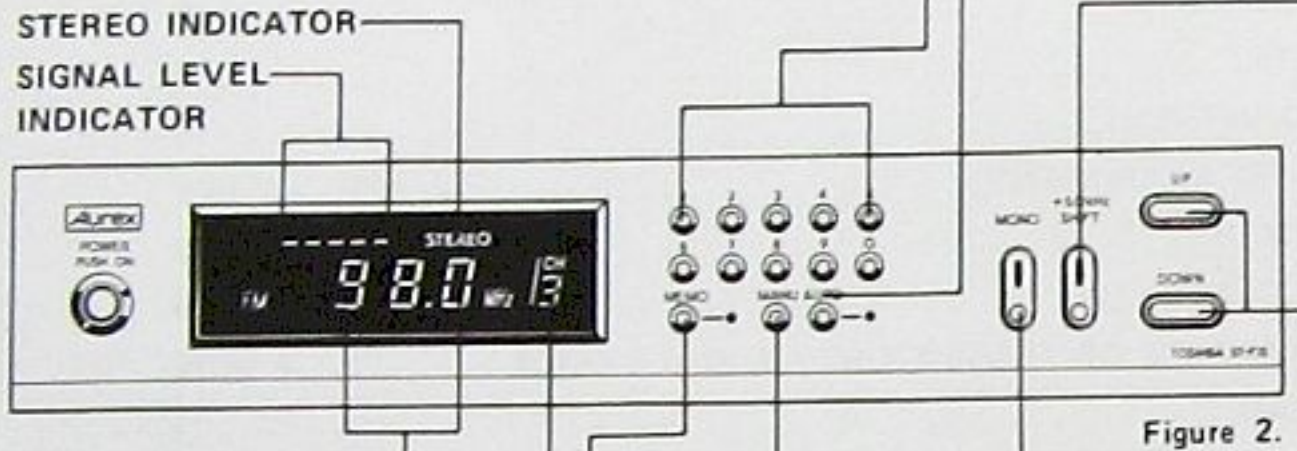


Figure 2.

DIGITAL FREQUENCY DISPLAY

The frequency of the station is displayed immediately when the appropriate push-button switches are pressed. When the power is first turned on, the displayed frequency will be at either end of the previously tuned band, but when switching back from other program sources, the frequency of the last tuned station will reappear automatically.

CHANNEL DISPLAY

When a preset channel button (3) is pushed, the number of that channel is displayed on this display. When the (0) button is pushed, the display becomes blank.

MANUAL TUNING BUTTON

Press this button before using the manual push tuning buttons (same as preset buttons) to directly "dial" a frequency. For actual reception to take place, you must press the memory button and then one of the preset buttons after dialing in the correct frequency.

MEMORY PUSH-BUTTON

This push-button switch is pressed in order to set the frequency of the tuned station to any of the preset channels (see page 6 for full details).

■ REAR PANEL CONNECTIONS

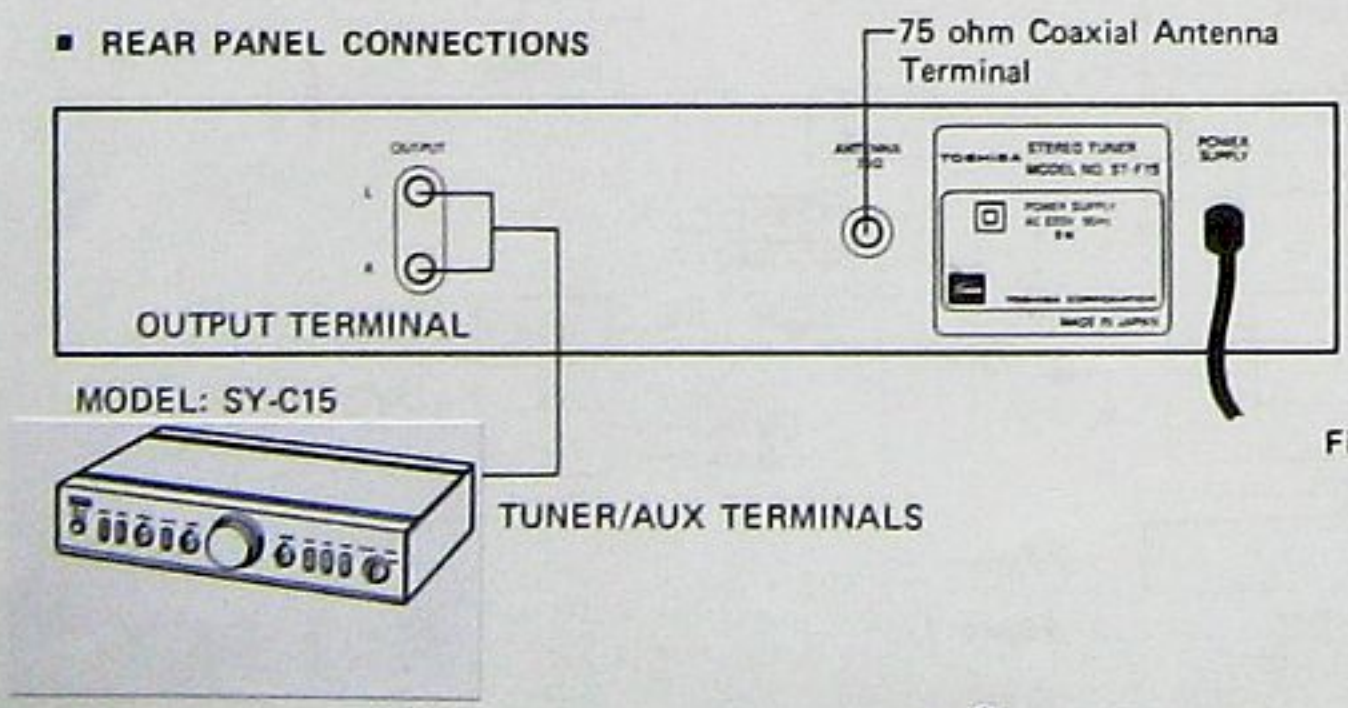


Figure 3.

■ OPERATING THE TUNER

TUNING WITH THE UP, DOWN SWITCHES

(Auto tuning and manual tuning are possible)

Normally, the frequency can be changed in 0.1 MHz steps by pushing the UP or DOWN switch. Pushing the UP switch increases the frequency and pushing the DOWN switch decreases the frequency (manual tuning). Broadcast stations can be searched automatically by pushing the AUTO switch.

• AUTOTUNING

1. Push the AUTO switch. The indicator at the right lights.
2. Push the UP or DOWN switch. When the UP switch is pushed, tuning is stopped automatically when a higher frequency broadcast station is received. If no broadcast station is found, the direction of search is reversed at the upper limit frequency (108 MHz) and tuning is stopped automatically when a broadcast station of a lower frequency is found. When the DOWN switch is pushed, autotuning is performed in the lower frequency direction.

NOTES:

- Auto tuning will stop automatically at a station whose signal field strength is greater than the prescribed input level. If tuning is not stopped at the desired station, recheck the antenna or tune in the desired station manually.
- The AUTO switch is released at the end of station selection. When desiring to listen to another station, push the AUTO switch again.

STATION SELECTION USING THE CHANNEL BUTTONS (0 ~ 9)

When the frequency of the desired station is known, it can be selected by pushing the pertinent channel buttons (0 ~ 9).

• MANUAL TUNING

1. Push the MANU (manual) switch. 0.00 MHz is displayed on the frequency display.
2. Push buttons 0 ~ 9 consecutively according to the frequency of the desired station.
3. Verify that the desired frequency is displayed on the frequency display and preset that frequency at a channel between CH1 and CH10. (See the PRESETTING item.)

NOTES:

- The displayed frequency will not be received (no sound will be heard) if it has not been preset.
- Frequencies outside the 87.5 ~ 108 MHz range cannot be preset; that is, they cannot be received, even if displayed.
- If you make a mistake while presetting the frequency, stop and restart from the beginning.

EXAMPLE: Presetting 88.5 MHz at CH1

1. Push the MANU switch. See figure 4.

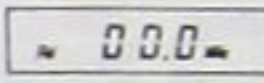



Figure 4.
2. Push channel button (8). See figure 5.

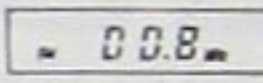



Figure 5.
Push channel button (8). See figure 6.

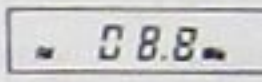



Figure 6.
Push channel button (5). See figure 7.

Figure 7.
3. Push the MEMO switch. Then push channel button (1). See figure 8.

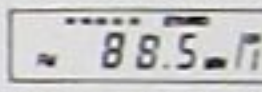



Figure 8.

When that channel is selected thereafter, the signal lamp will light and the broadcast will be received. If the broadcast is in stereo, the indicator will also light.

• PRESETTING

After the desired station has been selected, automatically or manually, it can be preset to the channel buttons (0 ~ 9). After presetting, that station can be selected by simply pushing the channel button. To preset a station, proceed as follows:

1. Tune in the desired station either by autotuning or manually.
2. Push the MEMO (memory) switch. The indicator lights.
3. While the indicator is lit (approximately 2 ~ 3 seconds), push the desired channel button (0 ~ 9). If button (1) is pushed, for instance, the frequency will be memorized at CH1. See figure 9.

Figure 9.
4. Up to 10 stations can be preset. Thereafter the preset stations can be selected by simply pushing the desired channel button.

NOTES:

- Once preset, the stations will be memorized permanently, or until the power cord is disconnected. If a power failure occurs, the memorized frequencies will be maintained for 1 ~ 2 days, but will be destroyed thereafter. If this occurs, preset the stations again.
- For the above reason power should be supplied to the set directly from an AC socket.
- CH0 is memorized, but is not displayed.

3. DISASSEMBLY INSTRUCTIONS

■ PANEL REMOVAL

1. Remove 2 Screws (1). See figure 10.
2. Remove 2 Screws (2). See figure 10.
3. Remove 2 terminals connecting the Panel to the Set. See figure 11.

■ BOTTOM PLATE REMOVAL

1. Remove teh Panel. See figure 10 and 11.
2. Remove the 6 Screws (3). See figure 10.
3. Remove the Bottom Plate from the Set

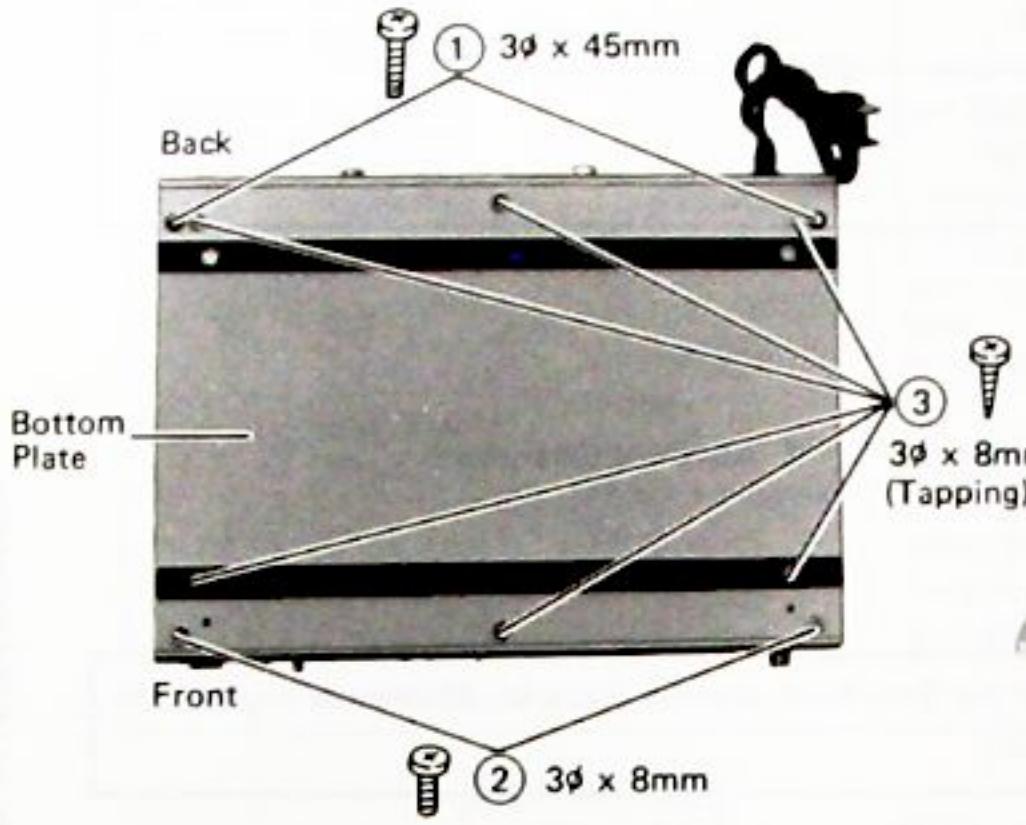


Figure 10.

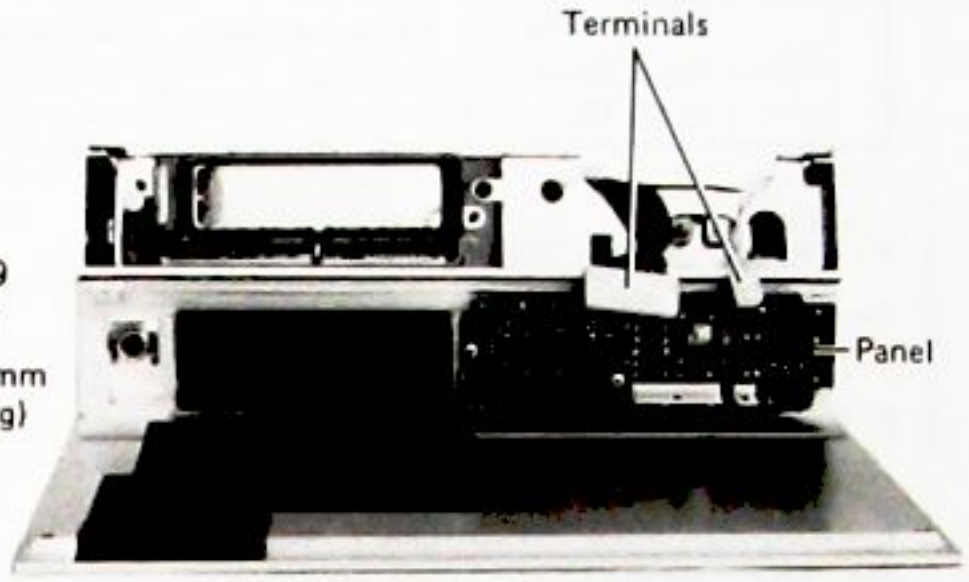


Figure 11.

4. ELECTRICAL ADJUSTMENTS

■ TEST EQUIPMENTS

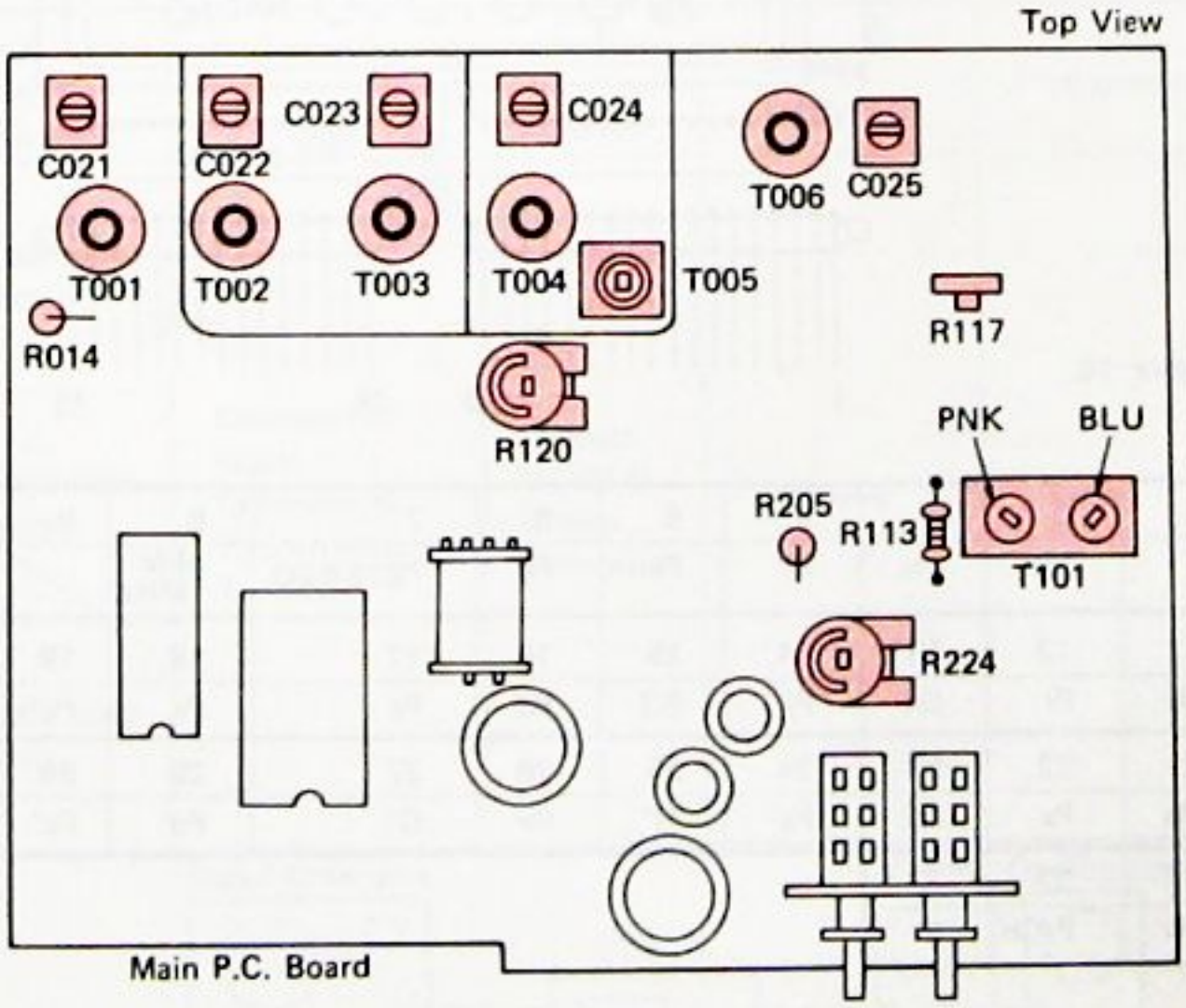


Figure 12.

Input (FM Signal Generator) 1 kHz 100% Modulation.
75 ohm direct Terminal.
Road OPEN
MONO Switch ..... ON Position

■ FM TRAKING ADJUSTMENT

Test equipments/Tools required

1. Signal Generator
2. Oscilloscope
3. VTVM
4. DC Digital Volt Meter
5. Adjusting Screwdriver
6. Adjusting Bar

1. VD ADJUSTMENT (Variable Capacitor Diode Voltage)

Step	Signal Generator Frequency	Connection		Display Frequency	Adjustment	Remarks
		Input	Output			
1	88.000 MHz	Connect FM Signal Generator to 75 ohm Antenna Terminal.	Connect DC Digital Volt Meter R014 (VD).	88 MHz	T006	Adjustment 4 to 5V
2	108.000 MHz			108 MHz	C025	Adjustment 10V
3	Repeat steps 1 and 2.					

2. TRAKING ADJUSTMENT

Step	Signal Generator Frequency	Connection (See figure 13.)		Display Frequency	Adjustment	Remarks
		Input	Output			
1	88.000 MHz (10 to 15 dB)	Connect FM Signal Generator to 75 ohm Antenna Terminal.	Connect VTVM to Output Terminal.	88 MHz	T001, 002 T003, 004	Adjust for maximum
2	108.000 MHz (10 to 15 dB)			108 MHz	C021, 022 C023, 024	Adjust for maximum
3	Repeat steps 1 and 2.					

3. IF ADJUSTMENT

Signal Generator Frequency	Connection (See figure 13.)		Display Frequency	Adjustment	Remarks
	Input	Output			
88.000 MHz (10 to 11 dB)	Connect FM Signal Generator to 75 ohm Antenna Terminal.	Connect OSC to Output Terminal.	88 MHz	T005	Adjust for the best wave form 

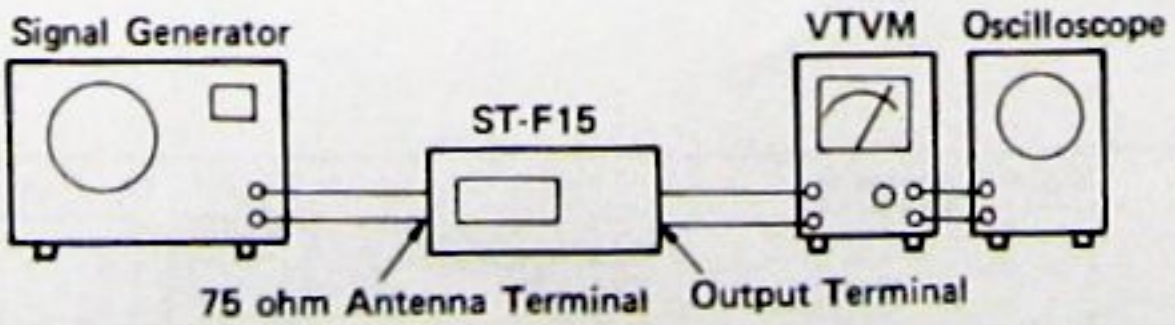


Figure 13.

■ DISTORTION RATIO ADJUSTMENT

Test equipments/Tools required

1. Distortion Meter
2. Signal Generator
3. Oscilloscope
4. VTVM
5. DC Meter
6. Adjusting Screwdriver
7. Adjusting Bar

1. DISTORTION ADJUSTMENT (MONO)

Step	Signal Generator Frequency	Connection (See figure 14.)		Display Frequency	Adjustment	Remarks
		Input	Output			
1	98.000 MHz (60 dB)	Connect FM Signal Generator to 75 ohm Antenna Terminal.	Connect DC Meter to both terminals of R113.	98 MHz	T101 (Pink Color)	Adjust for DC Meter probe at center position.
2			Connect Distortion Meter to Output Terminal.		T101 (Blue Color)	Adjust for Distortion Meter minimum
3	Repeat steps 1 and 2.					

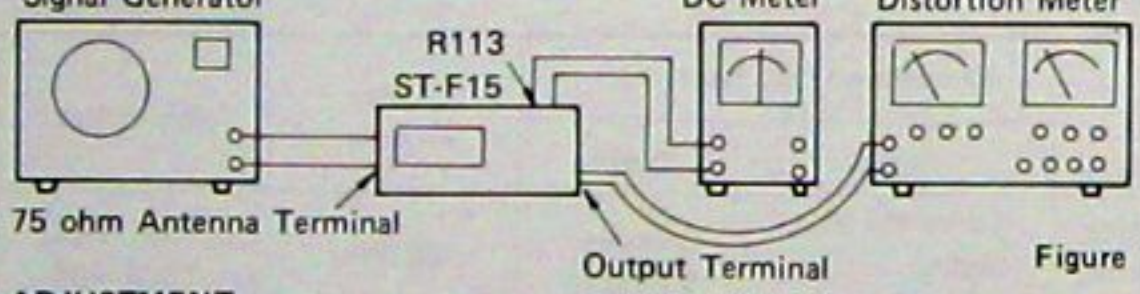


Figure 14.

2. SIGNAL LEVEL ADJUSTMENT

Step	Signal Generator Frequency	Connection (See figure 15.)		Display Frequency	Adjustment	Remarks
		Input	Output			
1	98.000 MHz (50 dB)	Connect FM Signal Generator to 75 ohm Antenna Terminal	Connect VTVM to Output Terminal.	98 MHz	R120	Adjust so four SIGNAL Indicators from S1 to S4 light up.
2	98.000 MHz (60 dB)					Adjust so all the SIGNAL Indicators from S1 to S5 light up.
3	98.000 MHz (0 dB)					Adjust so all the SIGNAL Indicators from S1 to S5 go out.

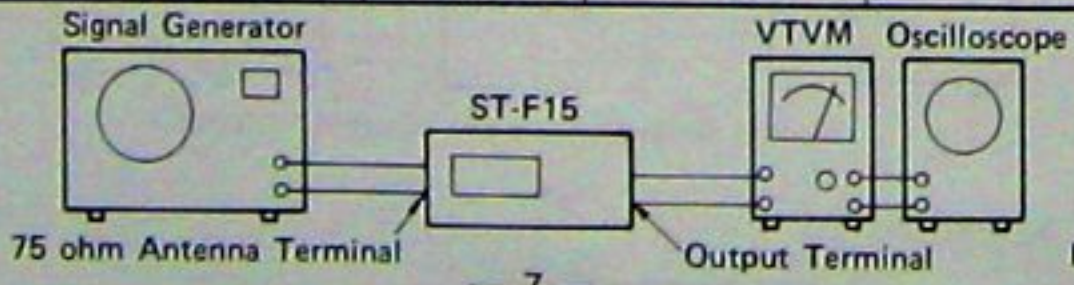


Figure 15.

3. MUTING SINSITIVITY ADJUSTMENT

Step	Signal Generator Frequency	Connection (See figure 15.)		Display Frequency	Adjustment	Remarks
		Input	Output			
1	98.000 MHz (30 dB)	Connect FM Signal Generator to 75 ohm Antenna Terminal.	Connect VTVM Oscilloscope to Output Terminal.	98 MHz	R117	Turn R117 to the extreem right, then turn it to the left until the signal appears on the OSC.
2	98.000 MHz (from 30 dB to 25 dB)					Adjust so the signal appears on the OSC between 30 dB and 25 dB.

■ FM MPX ADJUSTMENT

Test equipments

1. Frequency Counter
2. Signal Generator
3. VTVM
4. Oscilloscope
5. Adjusting Screwdriver

1. FREE-RUNNING FREQUENCY ADJUSTMENT

Connect a frequency counter to the R205 and Adjust the Semi-fixed Resistor R224 for 76 kHz reading counter with no-signal input. (MONO Switch ..... OFF Position.)

■ DISPLAY TUBE CONNECTION

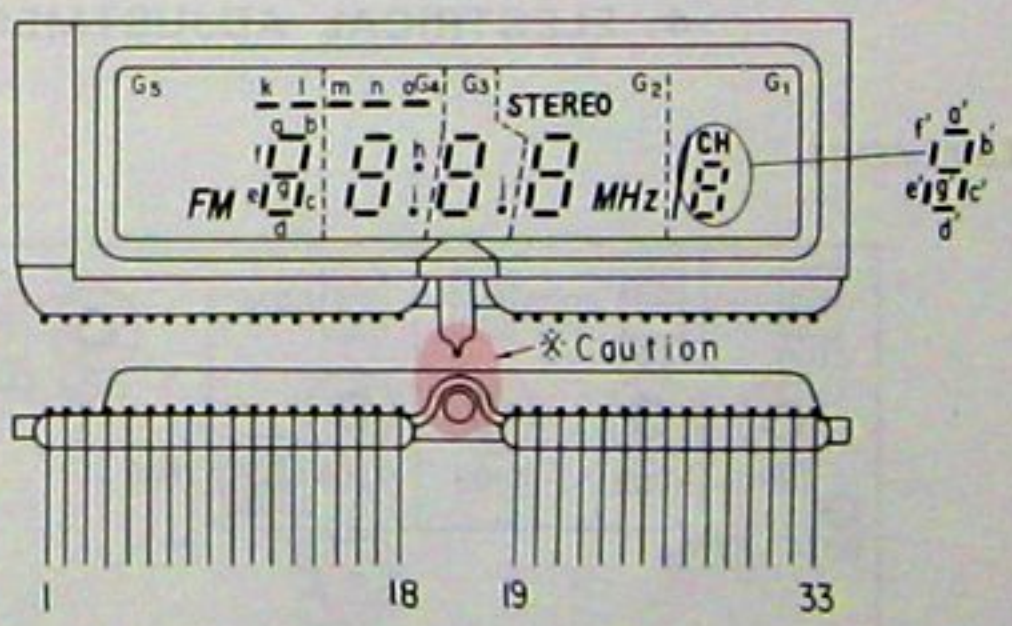


Figure 16.

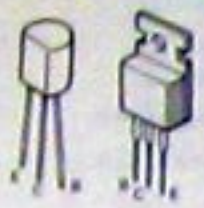
Pin Connection

PIN No.	1	2	3	4	5	6	7	8	9	10
Connection	F	Pn	Pm	Pl	Pk	Po	PSTEREO	PFM MHz		G5
PIN No.	11	12	13	14	15	16	17	18	19	20
Connection	Ph	Pi	G4	Pj	G3	Pd	Pc	Pe	Pg	Pf
PIN No.	21	22	23	24	25	26	27	28	29	30
Connection	Pb	Pa	G2	Pa'	Pf'	Pe'	G1	Pd'	Pc'	Pg'
PIN No.	31	32	33							
Connection	Pb'	P/CH	F							

CAUTION

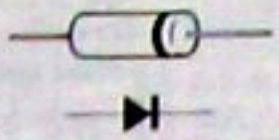
■ Be carefull not to break the part marked ※ in figure 16 when drawing out the Tube, Display Assembly from the Cabinet since it is very fragile.

EXTERNAL APPERANCE OF TRANSISTORS ICS AND DIODES

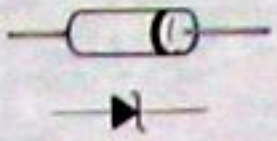


2SC982 2SD234
2SC1815
2SC2120

ITT310



IS1555V
IS1553V
IS1941
IN60



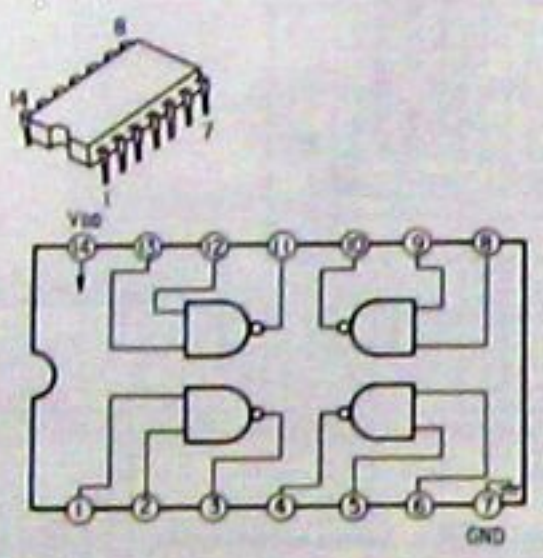
02Z9.1A 05Z8.2U
02Z13A RD3.9E
02Z18A

MI-152R

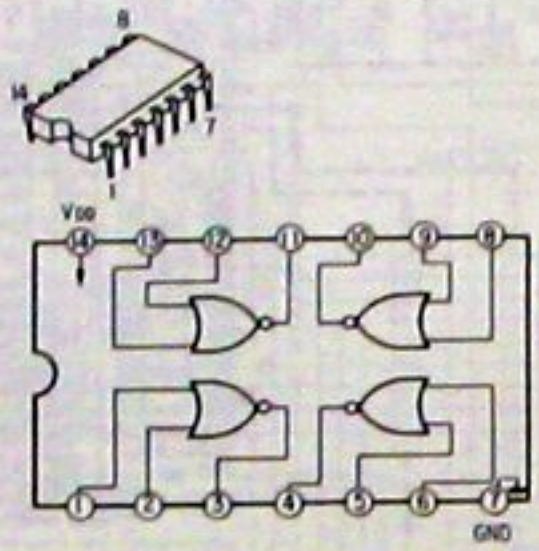
MI-152

SEL101S
SEL301E

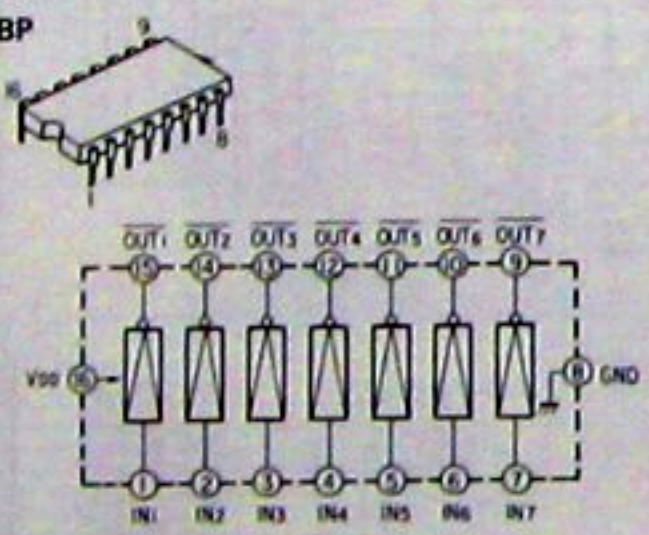
TC4001P



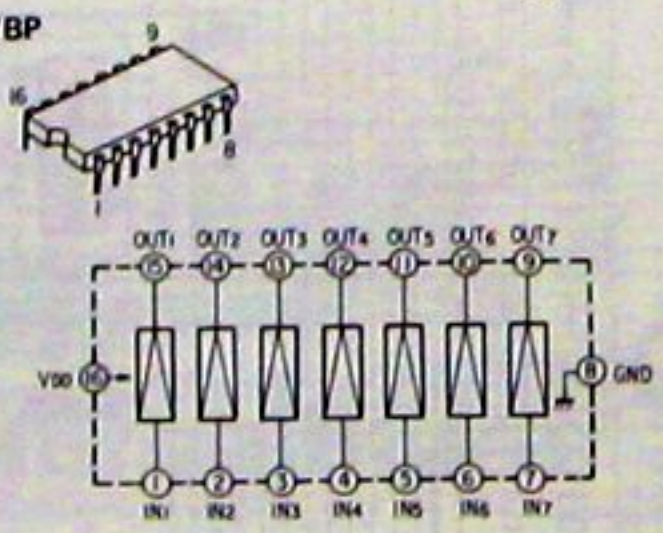
TC4011P



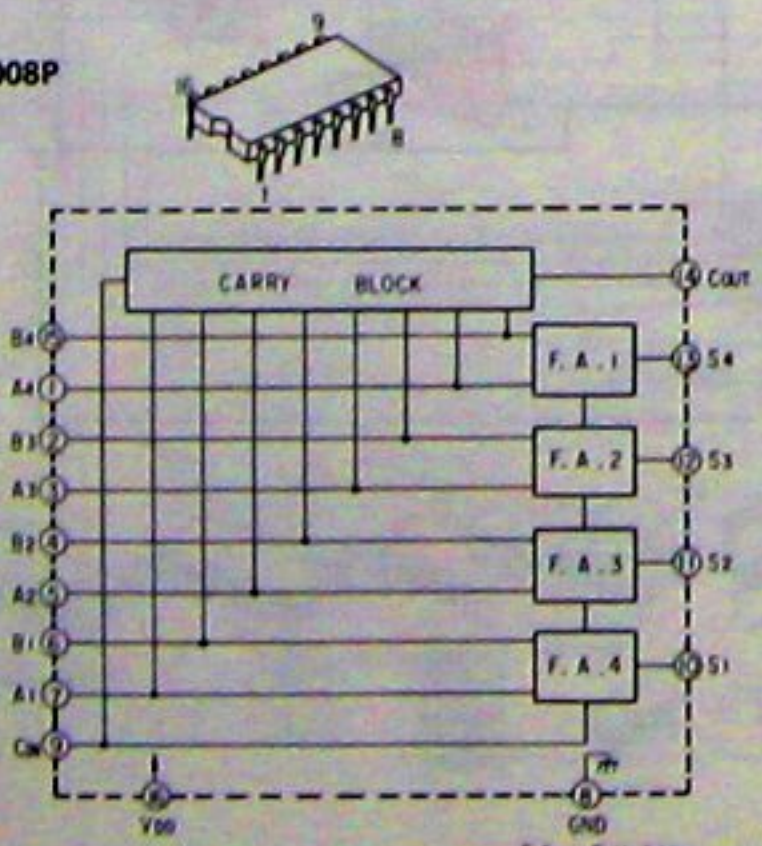
TC5066BP



TC5067BP

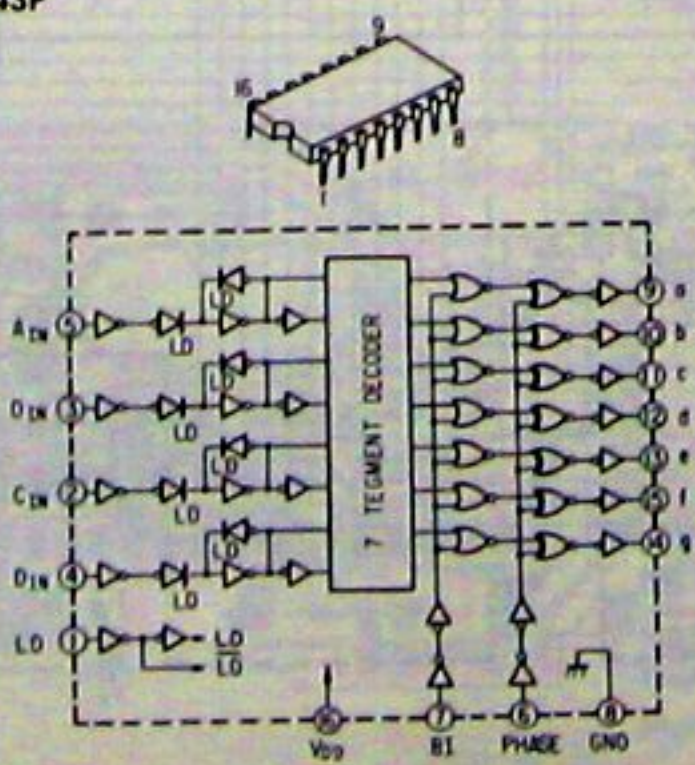


TC4008P

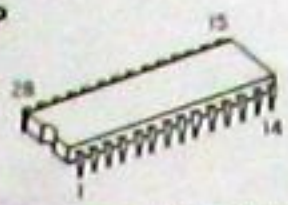


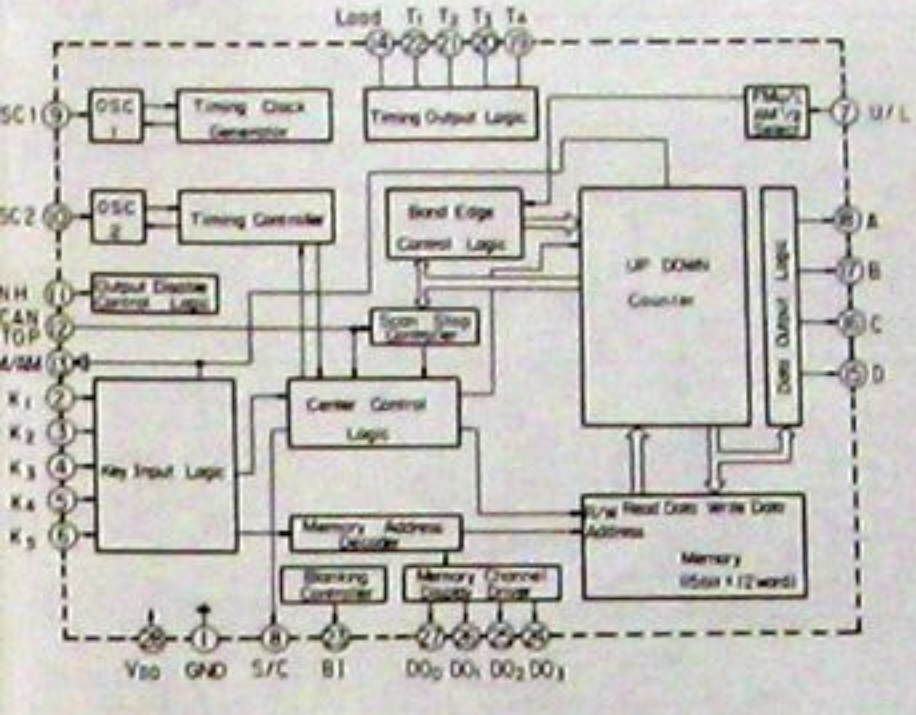
F.A. —Full Adder

TC4543P

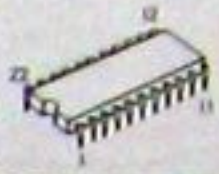


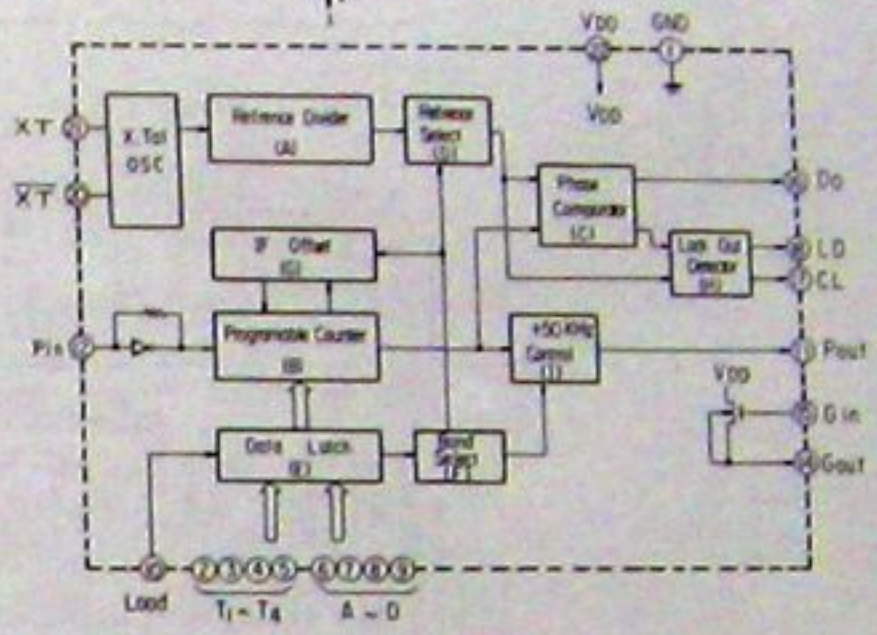
TC9124P



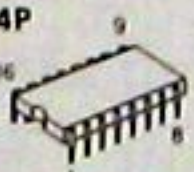


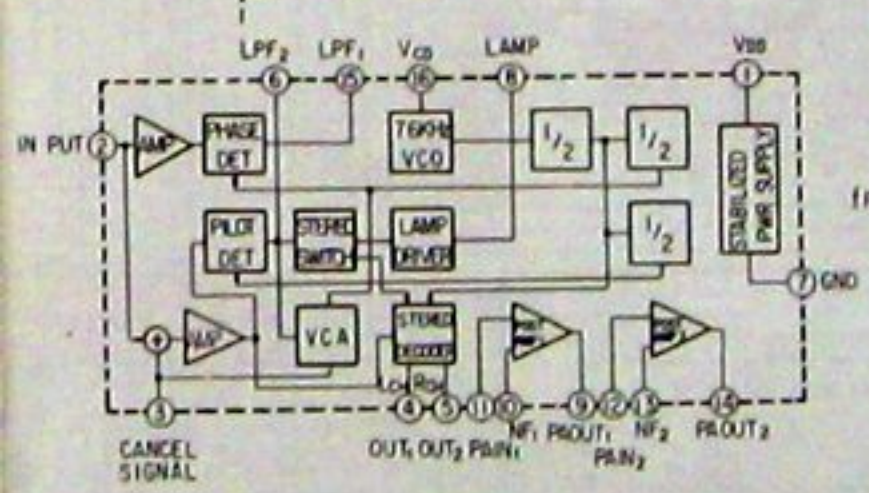
TC9123P



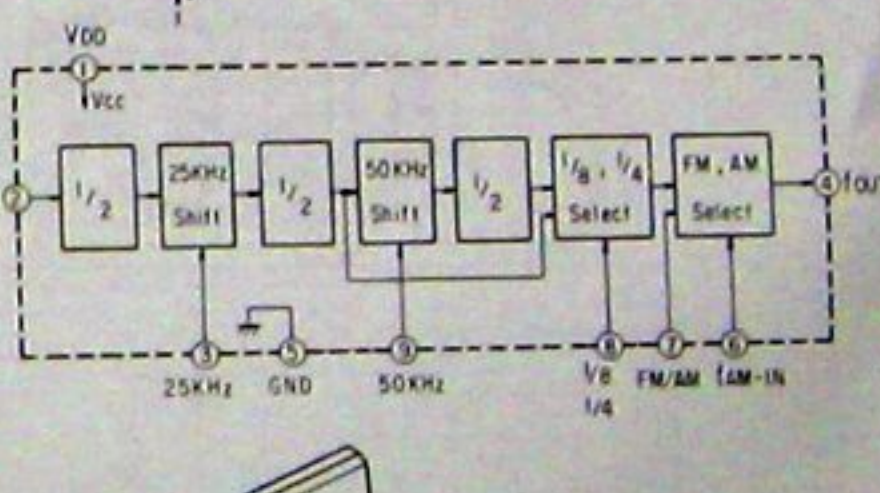


TA7624P

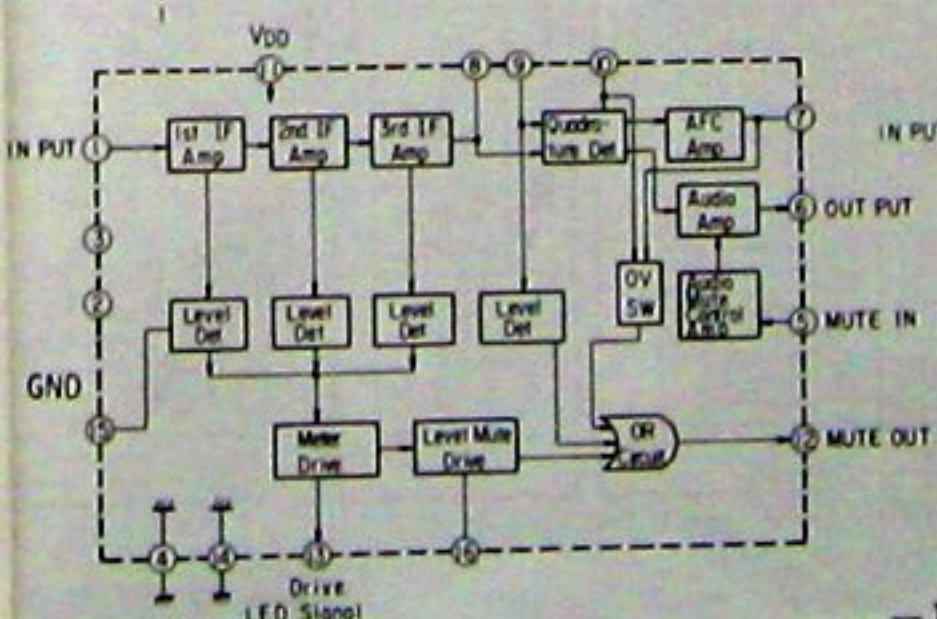




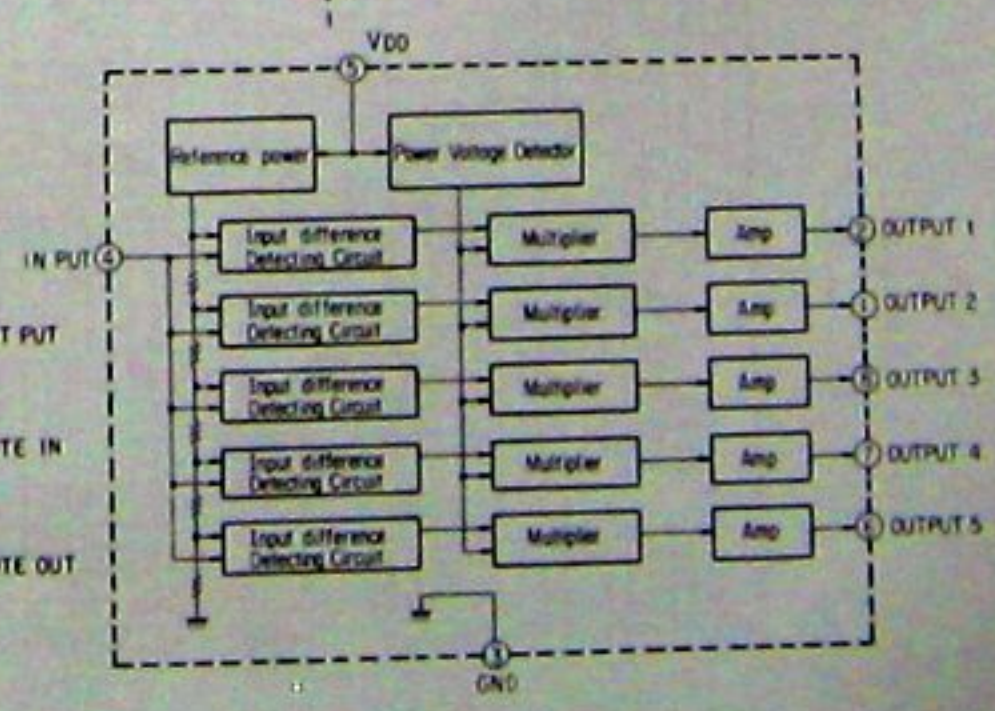
TD6102P



HA11225



M51903L



5. SCHEMATIC DIAGRAM

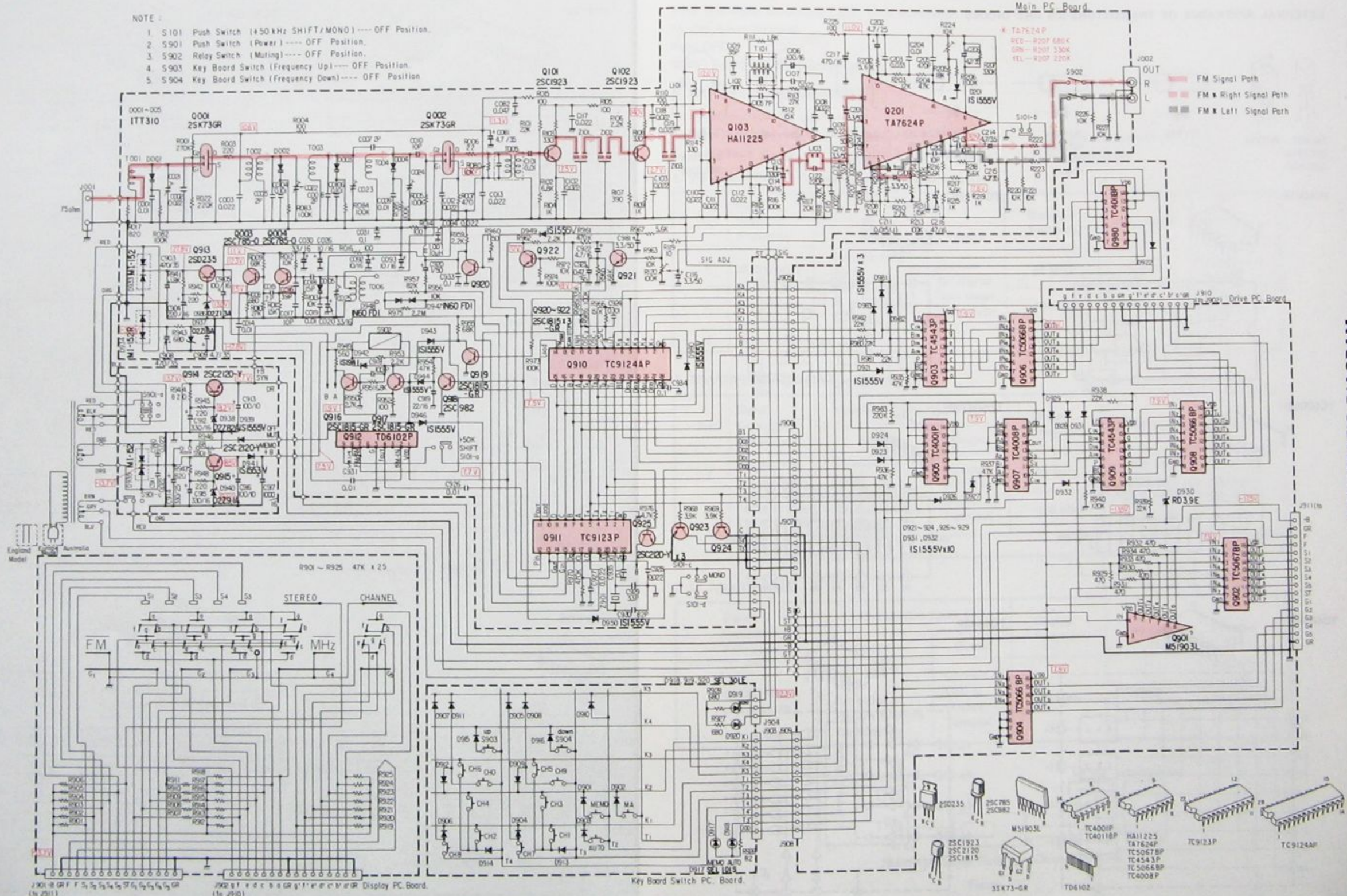


Figure 17.

6. P.C. BOARD PARTS LOCATIONS

■ MAIN P.C. BOARD PARTS LOCATIONS

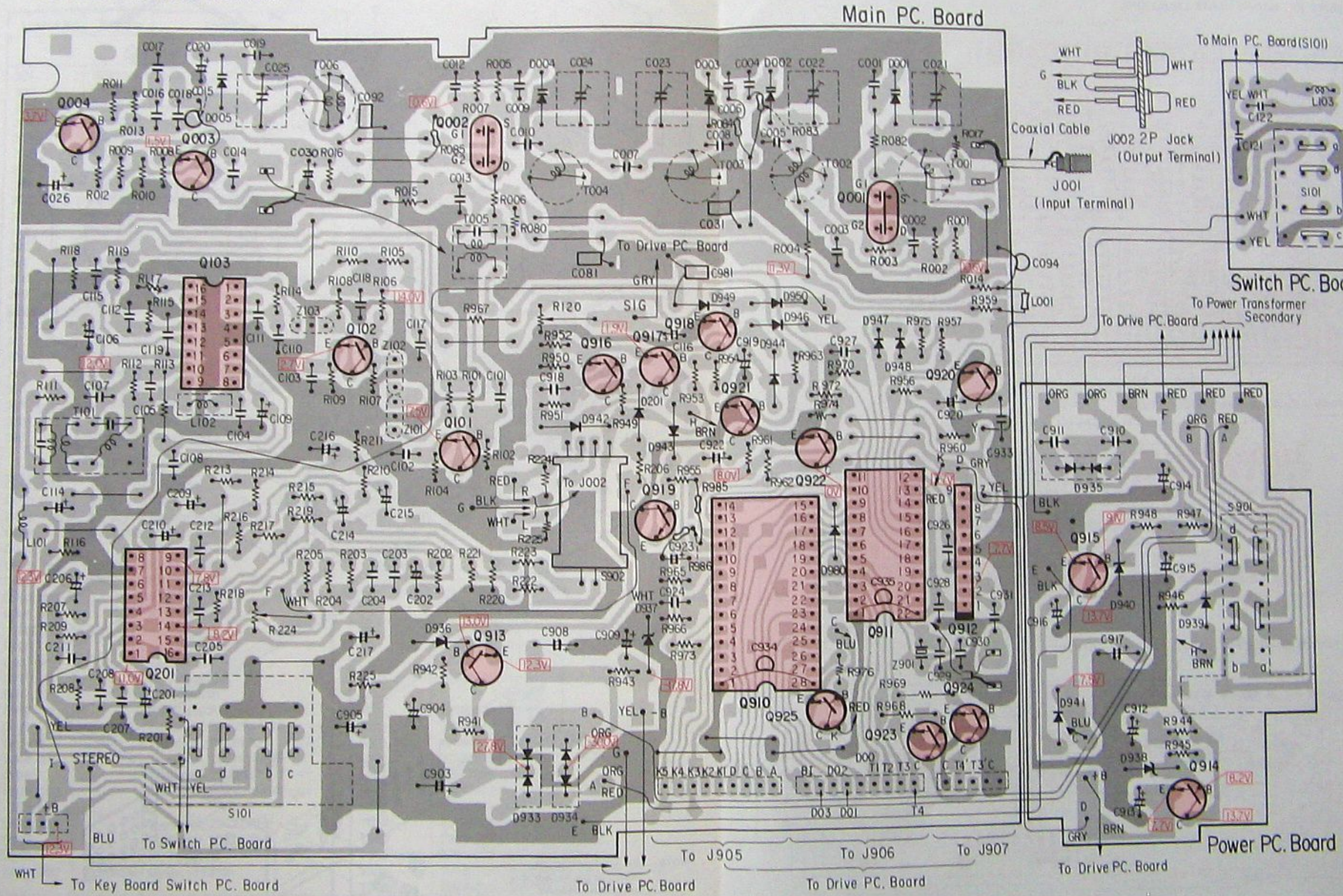


Figure 18.

■ DRIVE P.C. BOARD PARTS LOCATIONS

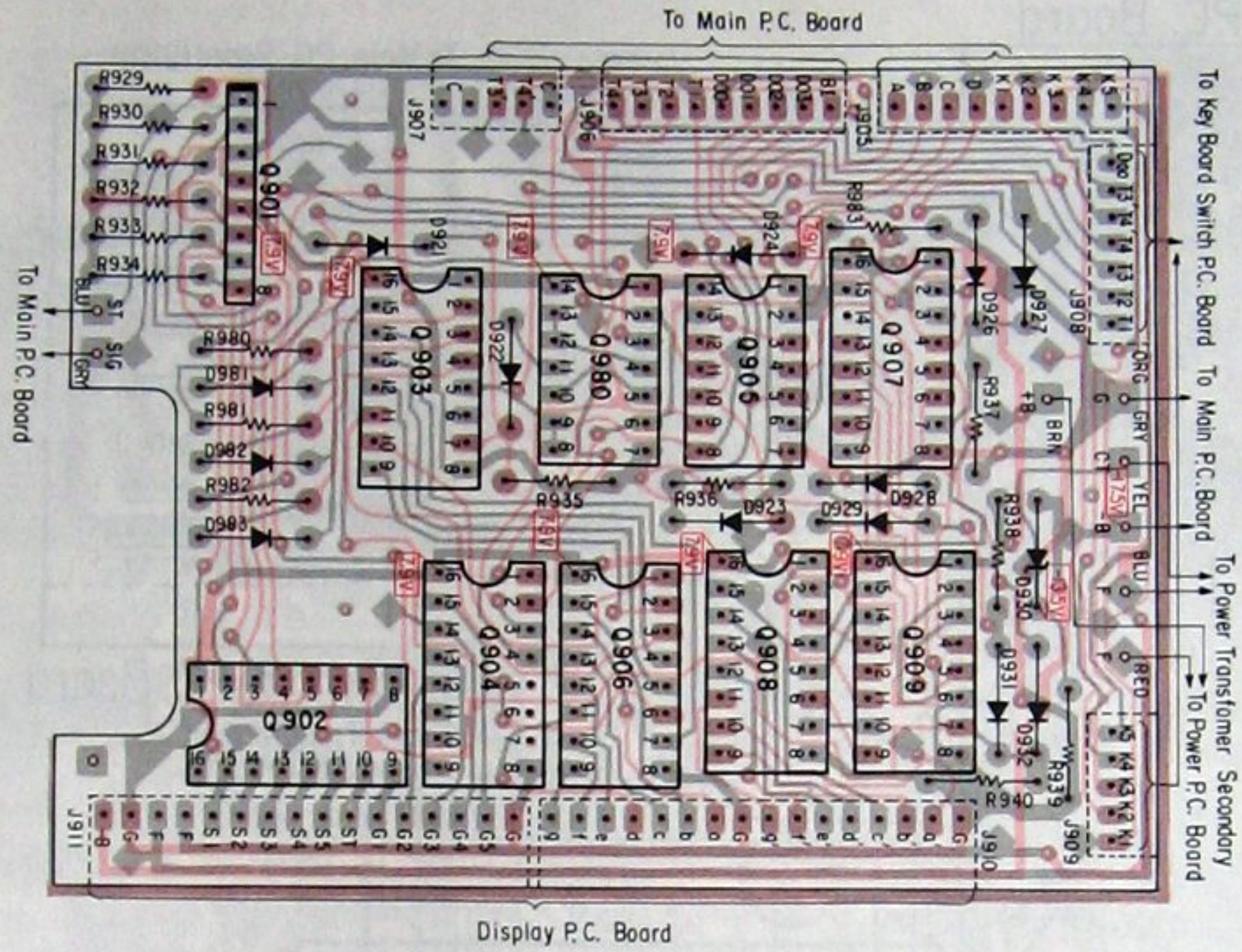


Figure 19.

■ DISPLAY P.C. BOARD PARTS LOCATIONS

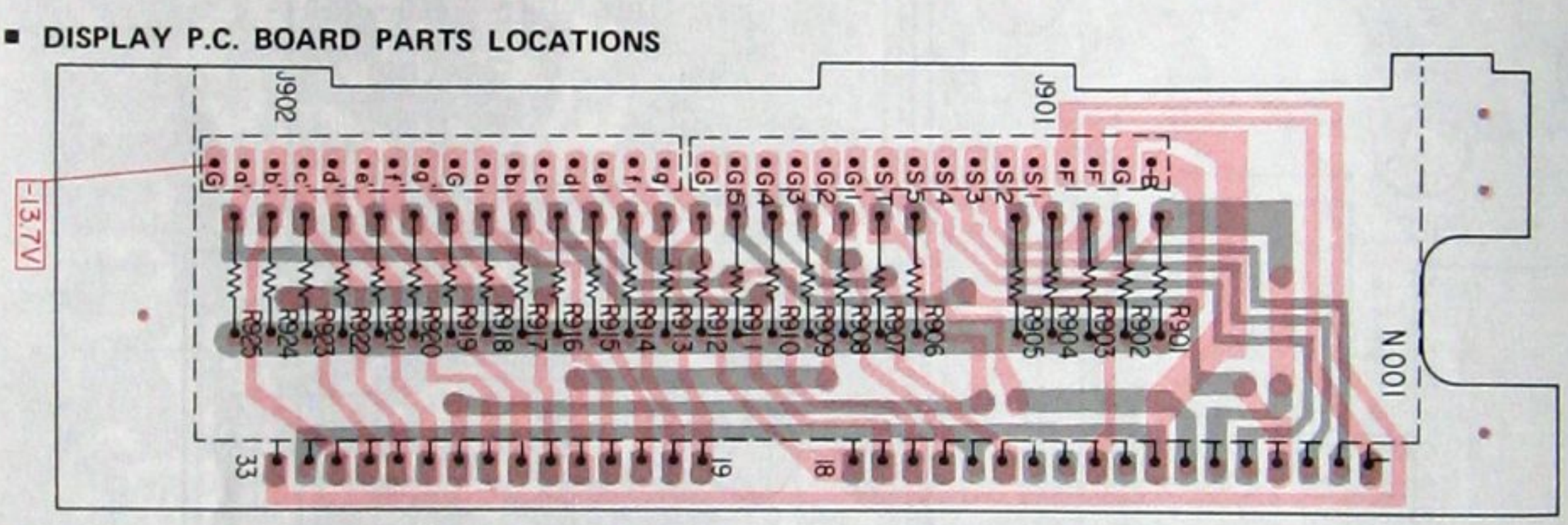


Figure 20.

■ KEY BOARD SWITCH P.C. BOARD PARTS LOCATIONS

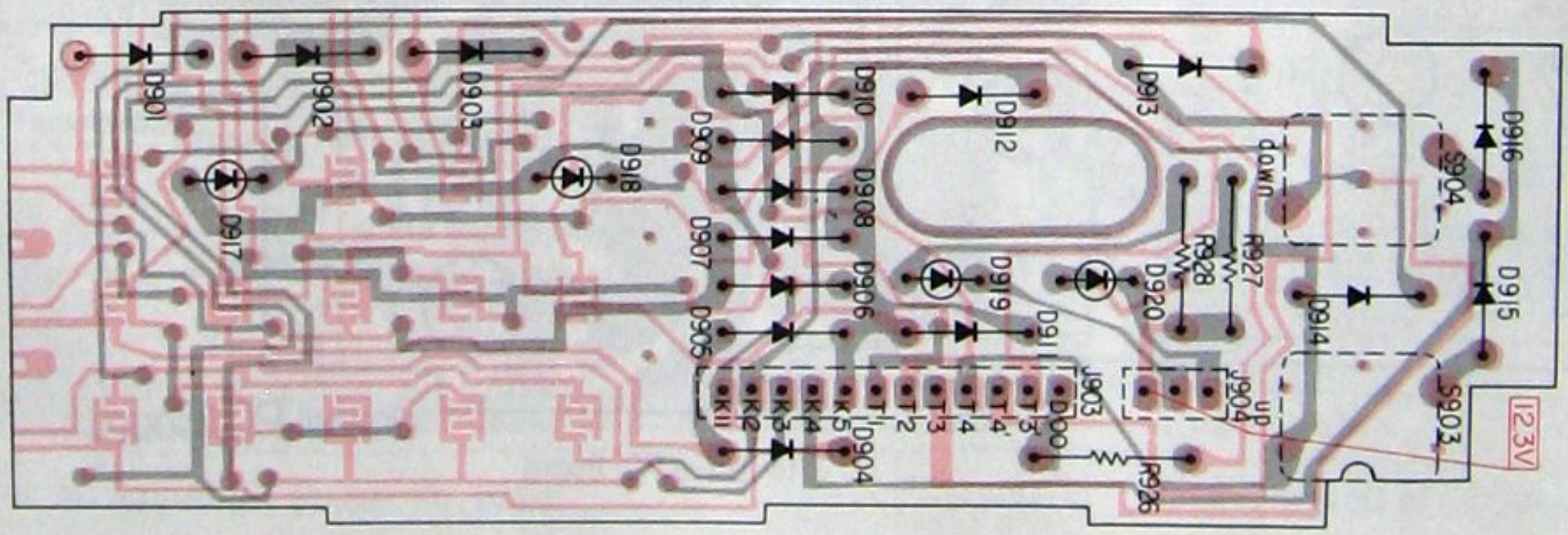
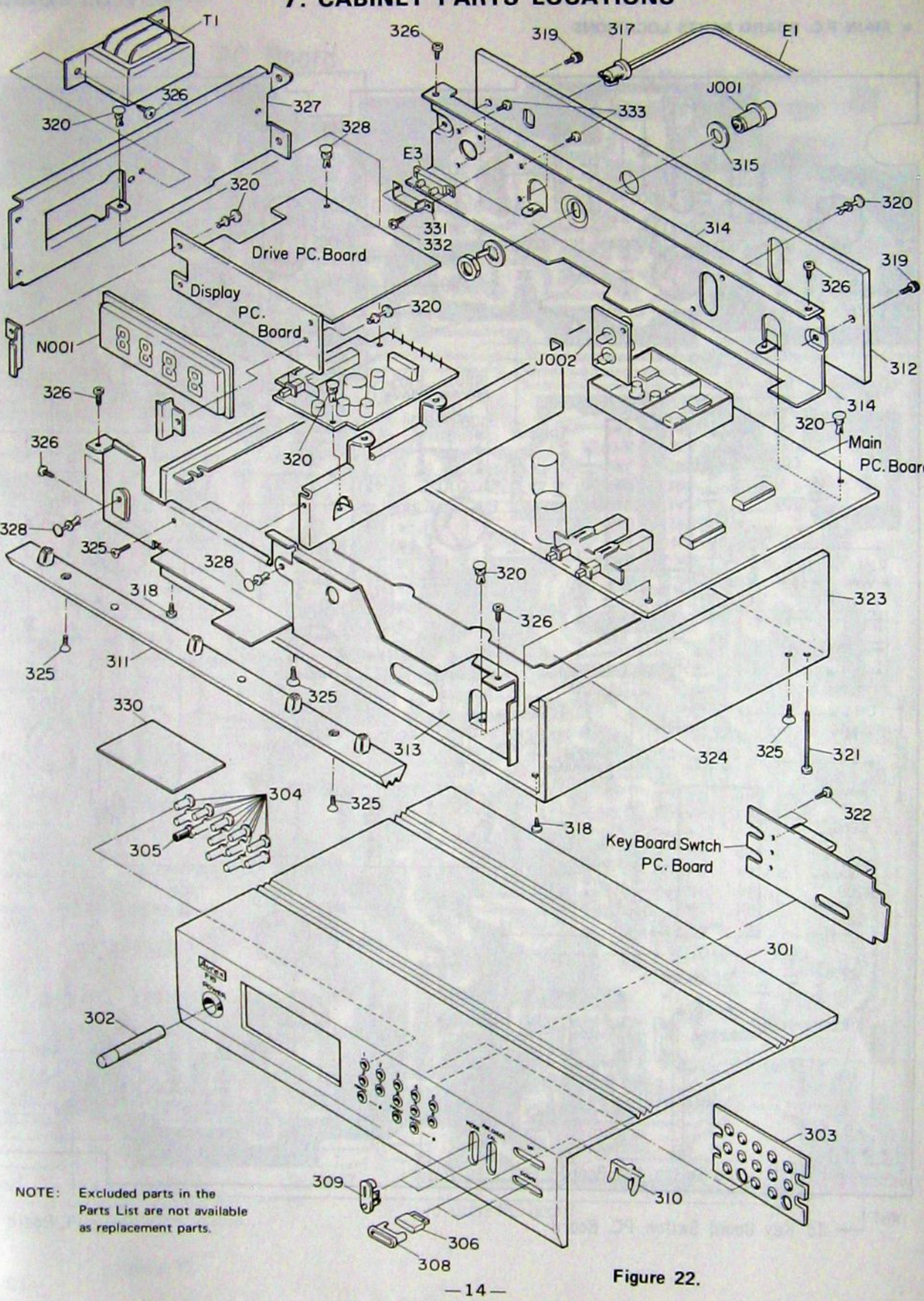


Figure 21.

7. CABINET PARTS LOCATIONS



NOTE: Excluded parts in the Parts List are not available as replacement parts.

Figure 22.

8. PARTS LIST

Symbol No.	Part No.	Description
	CABINET PARTS	
301	22821447	Panel Ass'y
302	22824291	Knob, Power
303	22751161	Rubber, Button 13
304	22824267	Knob, Push 10
305	22824268	Knob, Push (MEMORY)
306	22824269	Knob, Auto
308	22833358	Holder, Knob
309	22824264	Knob Ass'y, Push
310	25774572	Spring, Knob, Push
311	22874045	Leg, Bottom Plate
312	22844154	Panel, Jack (England/Australia)
312	22843698	Panel, Jack (Europe)
317	22844035	Bushing, Power Cord
318	22707327	Screw (BID), 3ø x 8mm, Tapping
319	22707028	Screw, Special
320	22705020	Rivet, 3ø x 4.5mm
321	22707328	Screw (BID), 3ø x 45mm
322	22707300	Screw (BID), 2.6ø x 6mm
323	22843621	Chassis
325	20794138	Screw, 3ø x 8mm, Tapping
326	22701326	Screw (BID), 3ø x 8mm, Tapping
328	22705022	Rivet, 3ø x 5.5mm
330	22864239	Label, Caution
333	22707304	Screw (FLT), 3ø x 8mm
	TRANSISTORS, ICS AND DIODES	
Q001, 002		Transistor, 3SK73-G
Q003, 004		Transistor, 2SC785-O JA
Q101, 102		Transistor, 2SC1923-O
Q103	22114689	IC, HA11225
Q201		IC, TA7624P
Q901	22114634	IC, M51903L
Q902		IC, TC5067BP
Q903, 909		IC, TC4543P
Q904, 906, 908		IC, TC5066BP
Q905		IC, TC4001P
Q907		IC, TC4008P
Q910		IC, TC9124P
Q911		IC, TC9123P
Q912		IC, TD6102P
Q913		Transistor, 2SD235-Y JA
Q914, 915		Transistor, 2SC2120-Y
Q916, 917		Transistor, 2SC1815-GR
Q918		Transistor, 2SC982
Q919, 920, 921, 922		Transistor, 2SC1815-GR
Q923, 924		Transistor, 2SC2120-Y
Q925		Transistor, 2SC2120-Y
Q980		IC, TC4011P
D001, 002	22115304	Diode, ITT310
D003, 004, 005	22115304	Diode, ITT310
D201		Diode, 1S1555V
D901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916		Diode, 1S1555V
D917	22115472	Diode, SEL101S
D918, 919, 920	22115473	Diode, SEL301E
D921, 922, 923, 924, 926, 927, 928, 929, 931, 932		Diode, 1S1555V
D930	22115410	Diode, RD3.9E
D933, 935	22115427	Diode, MI-152
D934	22115428	Diode, MI-152R
D936		Diode, 02Z13A
D937		Diode, 02Z18A
D938		Diode, 05Z8.2U
D939, 943		Diode, 1S1555V
D940		Diode, 02Z9.1A
D941		Diode, 1S1553V
D942		Diode, 1S1941
D944, 946		Diode, 1S1555V
D947, 948		Diode, 1N60-FD1
D949, 950, 980, 981, 982, 983		Diode, 1S1555V
	ELECTRICAL PARTS	
T1	22223275	Transformer, Power (Europe)
T1	22223288	Transformer, Power (England/ Australia)
S101	22195211	Switch, Push (MONO/+50 kHz SHIFT)
S901	22195228	Switch, Push (Power)
S902	22148647	Relay
S903, 904	22195145	Switch, Key Board
L001	22291012	Coil, 10µH
L101	22241014	Coil, 2.2mH
L102	22241044	Coil, 22µH
L103	22232219	Coil
T001	22294376	Coil (RT61S4376)
T002	22294339	Coil (RT61S4339)
T003, 004	22294338	Coil (RT61S4338)
T005	22265727	Transformer, IF (IT16S5727)
T006	22294371	Coil (RT71S4371)

Symbol No.	Part No.	Description
T101	22267365	Transformer, IF (IT1057365)
J001	22163447	Connecter (INPUT)
J002	22162430	2P Jack (OUTPUT)
Z101, 102, 103	22153063	Ceramic Filter (10.7 MHz)
Z901	22153069	Crystal, HC-43/U-6400 (6.4 MHz)
N001	22104460	Tube, Display
E1	22176286	Cord, Power (Europe)
E1	22176536	Cord, Power (England)
E1	22176588	Cord, Power (Australia)
E2	22191277	PC Board (Display)

CAPACITORS
D = ±0.5pF, J = ±5%, K = ±10%, N = ±30%, Z = –20+80%

C001, 004	22342103	Ceramic, 0.01mfd, 50V, Z
C002, 003	22342223	Ceramic, 0.022mfd, 50V, Z
C005	22361209	Ceramic, 2pF, 50V, D
C006	22342103	Ceramic, 0.01mfd, 50V, Z
C007	22361209	Ceramic, 2pF, 50V, D
C008	22361209	Ceramic, 2pF, 50V, D
C009	22342103	Ceramic, 0.01mfd, 50V, Z
C010	22361100	Ceramic, 10pF, 50V, D
C012, 013	22342223	Ceramic, 0.022mfd, 50V, Z
C014	22342103	Ceramic, 0.01mfd, 50V, Z
C015	22361209	Ceramic, 2pF, 50V, D
C016	22360137	Ceramic, 39pF, 50V, J
C017	22360310	Ceramic, 10pF, 50V, D
C018	22360132	Ceramic, 15pF, 50V, J
C019	22342103	Ceramic, 0.01mfd, 50V, Z
C020	22445330	Electrolytic, 33mfd, 16V
C021, 022, 023, 024, 025	22309157	Trimmer, 10pF
C026	22445100	Electrolytic, 10mfd, 16V
C030	22445330	Electrolytic, 33mfd, 16V
C031	22371104	Mylar, 0.1mfd, 50V, J
C081	22447479	Electrolytic, 4.7mfd, 35V
C082	22342473	Ceramic, 0.047mfd, 50V, Z
C092	22445100	Electrolytic, 10mfd, 16V
C093	22445100	Electrolytic, 10mfd, 16V
C094	22342223	Ceramic, 0.022mfd, 50V, Z
C101	22342103	Ceramic, 0.01mfd, 50V, Z
C102, 103	22342223	Ceramic, 0.022mfd, 50V, Z
C104	22361359	Ceramic, 35pF, 50V, D
C105	22360409	Ceramic, 7pF, 50V, D
C106	22445101	Electrolytic, 100mfd, 16V
C107, 108	22342223	Ceramic, 0.022mfd, 50V, Z
C109	22448228	Electrolytic, 0.22mfd, 50V
C110, 111	22342223	Ceramic, 0.022mfd, 50V, Z
C112	22342223	Ceramic, 0.022mfd, 50V, Z
C113	22362331	Ceramic, 330pF, 50V, K
C114	22445100	Electrolytic, 10mfd, 16V
C115	22342223	Ceramic, 0.022mfd, 50V, Z
C116	22448339	Electrolytic, 3.3mfd, 50V
C117, 118	22342223	Ceramic, 0.022mfd, 50V, Z
C119	22342223	Ceramic, 0.022mfd, 50V, Z
C121	22349331	Ceramic, 330pF, 50V, K
C122	22349221	Ceramic, 220pF, 50V, K
C201	22448339	Electrolytic, 3.3mfd, 50V
C202	22447479	Electrolytic, 4.7mfd, 35V
C203	22371333	Mylar, 0.033mfd, 50V, J
C204	22371103	Mylar, 0.01mfd, 50V, J
C205	22321053	Polypropylene, 470pF, 50V, J
C206	22447479	Electrolytic, 4.7mfd, 35V
C207	22371472	Mylar, 0.0047mfd, 50V, J
C208	22371153	Mylar, 0.015mfd, 50V, J
C209, 210	22448339	Electrolytic, 3.3mfd, 50V
C211	22371153	Mylar, 0.015mfd, 50V, J
C212, 213	22361100	Ceramic, 10pF, 50V, D
C214, 215	22447479	Electrolytic, 4.7mfd, 35V
C216	22445470	Electrolytic, 47mfd, 16V
C217	22445471	Electrolytic, 470mfd, 16V
C903	22447471	Electrolytic, 470mfd, 35V
C904	22445221	Electrolytic, 220mfd, 16V
C905	22445101	Electrolytic, 100mfd, 16V
C908	22447471	Electrolytic, 470mfd, 35V
C909	22447479	Electrolytic, 4.7mfd, 35V
C910, 911	22342223	Ceramic, 0.022mfd, 50V, Z
C912	22445331	Electrolytic, 330mfd, 16V
C913	22443101	Electrolytic, 100mfd, 10V
C914	22446331	Electrolytic, 330mfd, 25V
C915	22445331	Electrolytic, 330mfd, 16V
C916	22443101	Electrolytic, 100mfd, 10V
C917	22445102	Electrolytic, 1000mfd, 16V
C918	22362101	Ceramic, 100pF, 50V, K
C919	22445220	Electrolytic, 22mfd, 16V
C920	22448109	Electrolytic, 1mfd, 50V
C922	22475479	Electrolytic, 4.7mfd, 16V, N
C923	22448478	Electrolytic, 0.47mfd, 50V
C924	22342103	Ceramic, 0.01mfd, 50V, Z
C926	22342103	Ceramic, 0.01mfd, 50V, Z
C927	22342223	Ceramic, 0.022mfd, 50V, Z
C928	22342223	Ceramic, 0.022mfd, 50V, Z
C929	22360136	Ceramic, 33pF, 50V, J
C930	22362820	Ceramic, 82pF, 50V, K
C931	22342103	Ceramic, 0.01mfd, 50V, Z
C933	22340002	Ceramic, 0.1mfd, 12.5V, Z
C934	22340002	Ceramic, 0.1mfd, 12.5V, Z
C935	22340002	Ceramic, 0.1mfd, 12.5V, Z
C981	22448339	Electrolytic, 3.3mfd, 50V

RESISTORS
All resistors are ¼W, ±5% carbon film unless otherwise noted.

R001	22555274	270K ohm
R002	22555224	220K ohm
R003	22555221	220 ohm
R004	22545101	100 ohm
R005	22555104	100K ohm
R006	22555220	22 ohm
R007	22555471	470 ohm
R008	22555681	680 ohm
R009	22555683	68K ohm
R010	22555273	27K ohm
R011	22555152	1.5K ohm
R012	22555103	10K ohm
R013	22555103	10K ohm
R014	22555101	100 ohm
R015	22555101	100 ohm
R016	22555101	100 ohm
R017	22555821	820 ohm
R080	22545103	10K ohm
R082	22545104	100K ohm
R083	22555104	100K ohm
R084	22555104	100K ohm
R085	22555104	100K ohm
R101	22555223	22K ohm
R102	22555682	6.8K ohm
R103	22555331	330 ohm
R104	22555102	1K ohm
R105	22555101	100 ohm
R106	22555222	2.2K ohm
R107	22555391	390 ohm
R108	22555331	330 ohm
R109	22555102	1K ohm
R110	22555101	100 ohm
R111	22555182	1.8K ohm
R112	22555153	15K ohm
R113	22545273	27K ohm
R114	22555331	330 ohm
R115	22555153	15K ohm
R116	22555104	100K ohm
R117	22658483	Semi-fixed Resistor, 20K ohm
R118	22555473	47K ohm
R119	22555100	10 ohm
R120	22658155	Semi-fixed Resistor, 100K ohm
R201	22555104	100K ohm
R202	22555562	5.6K ohm
R203	22555123	12K ohm
R204	22555473	47K ohm
R205	22555183	18K ohm
R206	22555104	100K ohm
R207	22555334	330K ohm
R208	22555332	3.3K ohm
R209	22555332	3.3K ohm
R210	22555272	2.7K ohm
R211	22555153	15K ohm
R213, 214	22555104	100K ohm
R215	22555102	1K ohm
R216	22555562	5.6K ohm
R217	22555562	5.6K ohm
R218	22555562	5.6K ohm
R219	22555102	1K ohm
R220, 221	22555103	10K ohm
R222, 223	22555100	10 ohm
R224	22658129	Semi-fixed Resistor, 10K ohm
R225	22555101	100 ohm
R226, 227	22555103	10K ohm
R901, 902, 903, 904, 905, 906, 907, 908, 909, 910, 911, 912, 913, 914, 915, 916, 917, 918, 919, 920, 921, 922, 923, 924, 925	22543473	47K ohm, 1/8W
R926	22545820	82 ohm
R927, 928	22545681	680 ohm
R929, 930, 931, 932, 933, 934	22543471	470 ohm, 1/8W
R935	22545473	47K ohm
R936, 937	22543473	47K ohm, 1/8W
R938, 939	22543223	22K ohm, 1/8W
R940	22543124	120K ohm, 1/8W
R941	22555182	1.8K ohm
R942	22555221	220 ohm
R943	22555681	680 ohm
R944	22555821	820 ohm
R945	22555221	220 ohm
R946	22555680	68 ohm
R947	22555821	820 ohm
R948	22555221	220 ohm
R949	22555561	560 ohm
R950	22555272	2.7K ohm
R951	22555682	6.8K ohm
R952	22555101	100 ohm
R953	22555222	2.2K ohm
R954	22555472	4.7K ohm
R955	22555683	68K ohm
R956	22555103	10K ohm
R957	22555823	82K ohm
R959	22555222	2.2K ohm
R960	22555151	150 ohm
R961	22555474	470K ohm
R962	22555222	2.2K ohm
R963	22555103	10K ohm

Symbol No.	Part No.	Description
R965	22555683	68K ohm
R966	22555153	15K ohm
R967	22545562	5.6K ohm
R968, 969	22543392	3.9K ohm, 1/8W
R970	22555474	470K ohm
R972	22555103	10K ohm
R973	22555104	100K ohm
R974	22555104	100K ohm
R975	22555225	2.2M ohm
R976	22555472	4.7K ohm
R980	22543223	22K ohm, 1/8W

Symbol No.	Part No.	Description
R981	22543223	22K ohm, 1/8W
R982	22543223	22K ohm, 1/8W
R983	22543224	220K ohm, 1/8W
R985	22545333	33K ohm
R986	22545104	100K ohm
ACCESSORIES		
	22167421	Connecter, (FP-5)
	22170388	Cord, Connection
	22830042	Cap, Connecter
	22902225	Owner's Manual

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