



MOTOROLA

SM Series

Mobile Radios

150-170 MHz

450-470 MHz

Service Manual

6880903Z45-A

THIS MANUAL HAS BEEN
DISCONTINUED

6880903Z45-A

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Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It contains all service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date are incorporated by instruction manual revision. These revisions are added to the manuals as the engineering changes are incorporated into the equipment.

How to Use This Manual

This manual contains introductory material such as model charts, accessories, and specifications, as well as four sections that deal with specific service aspects of the SM50 and SM120 Mobile Radios. Refer to the Table of Contents for a general overview of the manual, or to the "Overview" paragraph in each section for a specific overview of the information in that section.

Other Documentation

Table 1 lists other documentation for the SM Series Mobile Radios.

Table 1. Other Documentations

Information	Location
Basic Use of SM50	SM50 Operator Card (6880903Z74)
SM50 Accessory Feature Sheet	6880903Z46
Basic Use of SM120	SM120 Operator Card (6880903Z89)
SM120 Accessory Feature Sheet	6880903Z88
SM Series Installation	SM Series Installation/Licensing Guide (6880904Z10)
Programming	SM Series RSS Manual (6880903Z78)

Technical Support

To obtain technical support, you may call Motorola's Radius Product Services. When you call, we ask that you have ready the model and serial numbers of the respective radio or its parts.

Service Policy

If malfunctions occur within 30 days that cannot be resolved over the phone with Radius Product Services, a defective major component should be returned. You must obtain authorization from Radius Product Services before returning the component.

Ordering Replacement Parts

You can order additional components and some piece parts directly through your Radius price pages. When ordering replacement parts, include the complete identification number for all chassis, kits, and components. If you do not know a part number, include with your order the number of the chassis or kit which contains the part, and a detailed description of the desired component. If a Motorola part number is identified on a parts list, you should be able to order the part through Motorola Parts. If only a generic part is listed, the part is not normally available through Motorola. If no parts list is shown, generally, no user serviceable parts are available for the kit.

Technical Support
Radius Product Services
 Hwy. 34 West
 Mt. Pleasant, IA 52641 USA

Radius 30-Day Warranty
Radius Repair Depot
 Attention: Warranty Return
 3760 South Central Avenue
 Rockford, IL 61102 USA
 1-800-227-6772 (U.S. & Canada)
 1-800-694-2161 (Latin America)

Radius Major Component Repair
Radius Repair Depot
 3760 South Central Avenue
 Rockford, IL 61102 USA

Motorola Parts
Worldwide System and
Aftermarket Products Division
 Attention: Order Processing
 1313 E. Algonquin Road
 Schaumburg, IL 60196

Customer Service
 1-800-422-4210
 1-847-538-8198 (FAX)

Worldwide System and
Aftermarket Products Division
 Attention: International Order Processing
 1313 E. Algonquin Road
 Schaumburg, IL 60196

Customer Service
 1-800-422-4210
 1-847-538-8198 (FAX)

Parts Identification
 1-847-538-8023
 1-847-576-3023 (FAX)

Model Charts

MODEL	FREQ.	DESCRIPTION
M33DGC00A1AA	2	12.5 kHz, 10-25 W (Cancelled)
M33DGC20A1AA	2	20/25/30 kHz, 10-25 W

SM50
VHF Mobile Radio
136 - 156 MHz
10-25 Watts RF Power

ITEM	DESCRIPTION
PMLN4022_	Display Board (2-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W (Cancelled)
(See Note)	Main Board, 20/25/30 kHz, 10-25 W

	Item	Description				
X	PMUD1024_	Radio, 12.5 kHz, 10-25 W (Cancelled)	X	X	X	
	PMUD1025_	Radio, 20/25/30 kHz, 10-25 W	X	X		X
X	X	HMN3174_	Microphone			
X	X	HLN9154_	Non-Locking Bracket			
X	X	HKN4137_	Power Cable			
X	X	HLN9335	SM50 Operator's Kit			

Note: Main board kits are not available separately for field replacement

MODEL	FREQ.	DESCRIPTION
M33DGC00A2AA	2	12.5 kHz, 10-25 W
M33DGC20A2AA	2	20/25/30 kHz, 10-25 W
M43DGC00A2AA	2	12.5 kHz, 40 W
M43DGC20A2AA	2	20/25/30 kHz, 40 W

ITEM	DESCRIPTION
PMLN4022_	Display Board (2-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W
(See Note)	Main Board, 20/25/30 kHz, 10-25 W
(See Note)	Main Board, 12.5 kHz, 40 W
(See Note)	Main Board, 20/25/30 kHz, 40 W

		Item	Description						
X		PMUD1030_	Radio, 12.5 kHz, 10-25 W	X	X	X			
	X	PMUD1031_	Radio, 20/25/30 kHz, 10-25 W	X	X		X		
		X	PMUD1067_	Radio, 12.5 kHz, 40 W	X	X			X
		X	PMUD1068_	Radio, 20/25/30 kHz, 40 W	X	X			X
X	X	X	HMN3174_	Microphone					
X	X	X	HLN9154_	Non-Locking Bracket					
X	X	X	HKN4137_	Power Cable					
X	X	X	HLN9335	SM50 Operator's Kit					

Note: Main board kits are not available separately for field replacement

MODEL	FREQ.	DESCRIPTION
M34DGC00A2AA	2	12.5 kHz, 10-25 W
M34DGC20A2AA	2	20-25 kHz, 10-25 W
M44DGC00A2AA	2	12.5 kHz, 40 W
M44DGC20A2AA	2	20-25 kHz, 40 W

ITEM	DESCRIPTION
PMLN4022_	Display Board (2-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W
(See Note)	Main Board, 20-25 kHz, 10-25 W
(See Note)	Main Board, 12.5 kHz, 40 W
(See Note)	Main Board, 20-25 kHz, 40 W

				Item	Description					
X				PMUE1006_	Radio, 12.5 kHz, 10-25 W	X	X	X		
	X			PMUE1007_	Radio, 20-25 kHz, 10-25 W	X	X		X	
		X		PMUE1039_	Radio, 12.5 kHz, 40 W	X	X			X
			X	PMUE1040_	Radio, 20-25 kHz, 40 W	X	X			X
X	X	X	X	HMN3174_	Microphone					
X	X	X	X	HLN9154_	Non-Locking Bracket					
X	X	X	X	HKN4137_	Power Cable					
X	X	X	X	HLN9335	SM50 Operator's Kit					

Note: Main board kits are not available separately for field replacement

MODEL	FREQ.	DESCRIPTION
M44DGC00A4AA	2	12.5 kHz, 40 W
M44DGC20A4AA	2	20-25 kHz, 40 W

SM50 UHF Mobile Radio 470 - 490 MHz 40 Watts RF Power	
ITEM	DESCRIPTION
PMLN4022_	Display Board (2-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 40 W
(See Note)	Main Board, 20-25 kHz, 40 W

		Item	Description				
X		HUE3761_	Radio, 12.5 kHz, 40 W	X	X	X	
	X	HUE3762_	Radio, 20-25 kHz, 40 W	X	X		X
X	X	HMN3174_	Microphone				
X	X	HLN9154_	Non-Locking Bracket				
X	X	HKN4137_	Power Cable				
X	X	HLN9335	SM50 Operator's Kit				

Note: Main board kits are not available separately for field replacement

Model Charts

MODEL	FREQ.	DESCRIPTION
M33DGC00C1AA	16	12.5 kHz, 10-25 W (Cancelled)
M33DGC20C1AA	16	20/25/30 kHz, 10-25 W

ITEM	DESCRIPTION
PMLN4023_	Display Board (16-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W (Cancelled)
(See Note)	Main Board, 20/25/30 kHz, 10-25 W

		Item	Description				
X		PMUD1042_	Radio, 12.5 kHz, 10-25 W (Cancelled)	X	X	X	
	X	PMUD1043_	Radio, 20/25/30 kHz, 10-25 W	X	X		X
X	X	HMN3174_	Microphone				
X	X	HLN9154_	Non-Locking Bracket				
X	X	HKN4137_	Power Cable (10-25 W)				
X	X	HLN9336	SM120 Operator's Kit				

**SM120
VHF Mobile Radio
136 - 156 MHz
10-25 Watts RF Power**

Note: Main board kits are not available separately for field replacement

MODEL	FREQ.	DESCRIPTION
M33DGC00C2AA	16	12.5 kHz, 10-25 W
M33DGC20C2AA	16	20/25/30 kHz, 10-25 W
M43DGC00C2AA	16	12.5 kHz, 40 W
M43DGC20C2AA	16	20/25/30 kHz, 40 W

ITEM	DESCRIPTION
PMLN4023_	Display Board (16-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W
(See Note)	Main Board, 20/25/30 kHz, 10-25 W
(See Note)	Main Board, 12.5 kHz, 40 W
(See Note)	Main Board, 20/25/30 kHz, 40 W

				Item	Description						
X				PMUD1086_	Radio, 12.5 kHz, 10-25 W	X	X	X			
	X			PMUD1087_	Radio, 20/25/30 kHz, 10-25 W	X	X		X		
		X		PMUD1088_	Radio, 12.5 kHz, 40 W	X	X			X	
			X	PMUD1089_	Radio, 20/25/30 kHz, 40 W	X	X				X
X	X	X	X	HMN3174_	Microphone						
X	X	X	X	HLN9154_	Non-Locking Bracket						
X	X	X	X	HKN4137_	Power Cable						
X	X	X	X	HLN9336	SM120 Operator's Kit						

Note: Main board kits are not available separately for field replacement

Model Charts

MODEL	FREQ.	DESCRIPTION
M34DGC00C2AA	16	12.5 kHz, 10-25 W
M34DGC20C2AA	16	20-25 kHz, 10-25 W
M44DGC00C2AA	16	12.5 kHz, 40 W
M44DGC20C2AA	16	20-25 kHz, 40 W

ITEM	DESCRIPTION
PMLN4023_	Display Board (16-Freq.)
PMLN4006_	Hardware Kit
(See Note)	Main Board, 12.5 kHz, 10-25 W
(See Note)	Main Board, 20-25 kHz, 10-25 W
(See Note)	Main Board, 12.5 kHz, 40 W
(See Note)	Main Board, 20-25 kHz, 40 W

		Item	Description							
X		PMUE1054_	Radio, 12.5 kHz, 10-25 W	X	X	X				
	X	PMUE1055_	Radio, 20-25 kHz, 10-25 W	X	X		X			
		X	PMUE1056_	Radio, 12.5 kHz, 40 W	X	X			X	
		X	PMUE1057_	Radio, 20-25 kHz, 40 W	X	X				X
X	X	X	X	HMN3174_	Microphone					
X	X	X	X	HLN9154_	Non-Locking Bracket					
X	X	X	X	HKN4137_	Power Cable (10-25 W)					
X	X	X	X	HLN9336	SM120 Operator's Kit					

Note: Main board kits are not available separately for field replacement

MODEL	FREQ.	DESCRIPTION	<p style="text-align: center;">SM120 UHF Mobile Radio 470 - 490 MHz 40 Watts RF Power</p>					
M44DGC00C4AA	16	12.5 kHz, 40 W					ITEM	DESCRIPTION
M44DGC20C4AA	16	20-25 kHz, 40 W					PMLN4023_	Display Board (16-Freq.)
			PMLN4006_	Hardware Kit				
			(See Note)	Main Board, 12.5 kHz, 40 W				
			(See Note)	Main Board, 20-25 kHz, 40 W				
		Item	Description					
X		HUE3611_	Radio, 12.5 kHz, 40 W		X	X	X	
	X	HUE3612_	Radio, 20-25 kHz, 40 W		X	X		X
X	X	HMN3174_	Microphone					
X	X	HLN9154_	Non-Locking Bracket					
X	X	HKN4137_	Power Cable (10-25 W)					
X	X	HLN9336	SM120 Operator's Kit					

Note: Main board kits are not available separately for field replacement

Accessories

Accessories

Radius offers several accessories to increase communications efficiency. Many of the accessories available are listed below, but for a complete list, consult your Radius dealer.

Antennas:

HAD4007_R	VHF 146-150.8 MHz, 1/4 Wave Roof Mount
HAD4008_R	VHF 150.8-162 MHz, 1/4 Wave Roof Mount
HAD4009_R	VHF 162-174 MHz, Antenna Roof Mount
HAD4014_R	VHF 146-172 MHz, 3 dB Gain Roof Mount
HAE4003_R	UHF 450-470 MHz, 1/4 Wave Roof Mount
HAE4011_R	UHF 450-470 MHz, 3.5 dB Gain Roof Mount
RAE4004AR	UHF 450-470 MHz, 5 dB Gain Roof Mount
HKN9557_R	PL259/Mini-U Antenna Adapter with 8 in. Cable
HLN5282_R	Mini-U Connector
HLN8027_	Mini - UHF to BNC Adapter

Microphones:

HMN1035_R	Heavy Duty Palm Microphone with 10.5 ft. cord	\$74.00 67.88 OL
HMN3174_	Compact Microphone with Tx LED, 7 ft. cord	STANDARD \$45.00
HMN3001_	Compact Microphone with Tx LED, 10 ft. cord	\$55.00 50.39 OL
HMN3175_	Compact Touch-Code™ Microphone with 7 ft. cord	\$37.00 CANX OL
HMN3141_R	Handset w/Hang-up Cup	54
HLN9073_R	Microphone Hang-up Clip	12.28 OL
HLN9414_	Universal Hang-up Clip	
HLN9560_R	10.5 ft. Extended Coil Cord	\$13.25 HLN9560A 7.78 OL
HLN9559_R	7 ft. Coil Cord	

Installation Accessories:

HLN9162_	5 in. Goose Neck Mounting Bracket	
HLN9227_	8 in. Goose Neck Mounting Bracket	
HLN9408_	Gooseneck Decor Sleeve	
HLN9228_	Clam Shell Swivel Mounting Bracket	
HLN9179_	Quick Release Mounting Bracket	
HLN9617_	Key Lock Mounting Bracket	
HLN9573_R	Shorting Plug	7.66 OL
HLN9534_	Right Angle Mini - UHF Connector	

Control Station Accessories:

HLN9226_	Mobile Holder	
HLN9415_	Mobile Holder with Power Supply	
HMN3000_	Black Desk Microphone	
HMN1038_R	Beige Desk Microphone	
HLN3053_	Control Station Package (10-25 W)	
HKN9018_A	Control Station Cable	8.93
HKN9019_A	16-pin Conductor Cable	11.69
HPN8393_	GR300/GR400 Power Supply (45 W)	

Accessories / Kits Interfacing with the 16-Pin Connector:

HKN9242_	16-pin Accessory Kit with Expanded Connector	\$43.00
HSN9008_	16-pin 7.5 W External Speaker for Received Audio	\$9.00
HKN9327_R	16-pin Ignition Switch Cable	\$56.00
HLN9328_R	External Alarm Relay and Cable for Horn & Lights	\$13.00
HKN9407_	Cigarette Lighter Adapter (25 W models only)	

Manuals/Kits:

L1547A	DC Remote Adapter Manual	
L1475A	Tone Remote Adapter Manual	
6880904Z05	DTMF Microphone Service Manual	6.33 OL
HLN9335	SM50 Manual Kit	
HLN9336	SM120 Manual Kit	
HLN3096_A	Quik-Call™ Advantage™ Option Board	CANX OL
HLN9247	SmarTrunk™ Advantage™ Option Board	

Specifications

GENERAL

	VHF		UHF	
Model Series:	M33DGC, M43DGC		M34DGC, M44DGC	
Frequency Range:	136-156 MHz & 150-170 MHz		450-470 MHz & 470-490 MHz	
RF Output:	10-25 W or 40 W			
Channel Spacing:	12.5 kHz	20/25/30 kHz	12.5 kHz	20/25/30 kHz
Dimensions:	H 1.73" X W 6.61" X D 4.25" (H 44mm X W 168mm X D 108mm)			
Weight:	36 oz. (1.02kg)			
Channel Capacity:	2 or 16 Channels			
Freq. Separation:	20 MHz			
Input Voltage:	13.6 ±10%			
Current Drain:	300 mA			
Standby	1.5 A			
Rx @Rated Audio	7 A @ 10-25 W		8 A @ 10-25 W	
Transmit	12.5 A @ 40 W		12.5 A @ 40 W	
Squelch Capabilities:	Tone Coded, Digital Coded and/or Carrier Squelch			

TRANSMITTER

	VHF		UHF	
Freq. Stability:	±0.00025%			
Spurs/Harmonics:	-16 dBm (25 µW)			
Audio Response*:	+1/-3 dB*			
Audio Distortion:	<3% TIA (@1000 Hz, 60% of Rated Max. Deviation)			
FCC Designation:	ABZ99FT3034 (10-25 W) ABZ99FT3035 (10-25 W) ABZ99FT3036 (40 W)		ABZ99FT4038 (10-25 W) ABZ99FT4039 (40 W) ABZ99FT4040 (40 W)	
FCC Modulation: 20/25/30 kHz 12.5 kHz	16K0F2D & 16K0F3E 11K0F2D & 11K0F3D			
Output Impedance:	50 ohms			
Modulation Sensitivity:	80 mV rms for 60% deviation @ 1000 Hz			
FM Noise:	40 dB	45 dB	35 dB	40 dB

*Relative to 6 dB/octave pre-emphasis, 300-3000 Hz (2550 Hz @ 12.5 kHz)

RECEIVER

	VHF		UHF	
Sensitivity EIA @ 12 dB SINAD:	0.35 µV	0.30 µV	0.35 µV	0.30 µV
Selectivity TIA:	65 dB	75 dB	60 dB	70 dB
Intermodulation TIA*:	65 dB	75 dB	60 dB	70 dB
Spur & Image Rejection:	75 dB		70 dB	
Audio Output: 8 ohms (external) 22 ohms (internal)	7.5 W @ 5% distortion 3.0 W Nominal			
Input impedance:	50 ohms			
Squelch (internally pre-set):	10 dB SINAD			
TIA Usable Bandwidth:	1.2 kHz	2.0 kHz	1.2 kHz	2.0 kHz

* Local mode adds 10 dB protection against wideband interference.

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Service Aids

Service Aids

The following table lists service aids recommended for working on the SM Series Mobile Radio.

Motorola Part No.	Description	Application
HLN9214	Radio Interface Box	Enables communication between the radio and the computer's serial communications adapter.
HSN9412	RIB Power supply	Used to supply power to the RIB.
HKN9216 HKN9215	Computer Interface cable	Connects the computer's serial communications adapter to the RIB.
HLN9390	AT to XT Computer adapter	Allows HKN9216 to plug into a XT style communications port.
HKN9217	Program Test Cable	RIB to Radio Cable
HKN9402	Power Supply Cable	Connects the power supply to the radio.
HVN9007	Radio Service Software	Software on 3-1/2 in. and 5-1/4 in. floppy disc.
HKN9755	Cloning Cable	Allows the radio to be duplicated from a master radio by transferring programmed data from one radio to another.

Test Equipment

The following table lists test equipment required to service the SM Series Mobile Radio and other two-way radios.

Motorola Model No.	Description	Characteristics	Application
R2200, R2400, or R2001 with trunking option	Service Monitor	This monitor will substitute for items with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
*R1049	Digital Multimeter		Two meters recommended for ac/dc voltage and current measurements
*S1100	Audio Oscillator	67 to 200 Hz tones	Used with service monitor for injection of PL tones
*S1053, *SKN6009, *SKN6001	AC Voltmeter, Power Cable for meter, Test leads for meter	1mV to 300V, 10-Megohm input impedance	Audio voltage measurements
R1053	Dual-trace Oscilloscope	20 MHz bandwidth, 5mV/cm - 20V/cm	Waveform measurements
*S1350, *ST1215 (VHF) *ST1223 (UHF) *T1013	Wattmeter, Plug-in Elements (VHF & UHF), RF Dummy Load	50-ohm, ± 5% accuracy 10 Watts, maximum 0-1000 Mhz, 300W	Transmitter power output measurements
S1339	RF Millivolt Meter	100uV to 3V RF, 10 kHz to 1.2 GHz	RF level measurements
*R1013	SINAD Meter		Receiver sensitivity
S1347 or S1348 (prog)	DC Power Supply	0-20 Vdc, 0-5 Amps	Bench supply for 12.5Vdc

Section 1

Radio Disassembly/Assembly

Overview

This section explains, step-by-step, how to disassemble and reassemble the SM Series radio.

Disassembling the Radio

Removing the Housing

1. Pull the volume control knob straight off.
2. Remove the housing cover by pushing down on the release latch with one finger while sliding the cover off with the other hand (Figure 1-1).

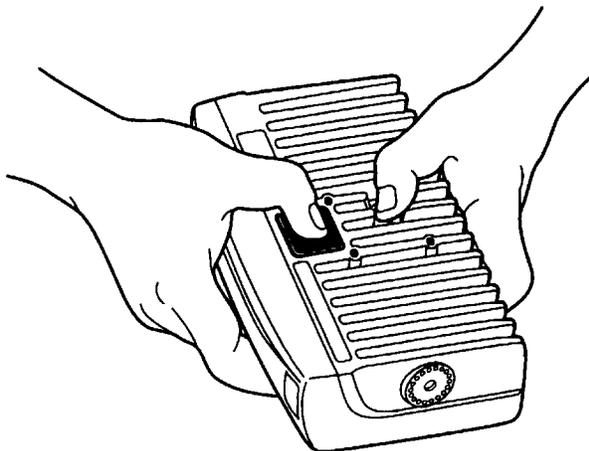


Figure 1-1. Removing the Housing

Removing the Front Panel Display Board

1. Disconnect the flex cable from the black header on the main board by gently lifting upwards.
2. Remove the display board by tilting it forward slightly and gently lifting upwards.

Removing the Mechanical Components from the Main Board

Refer to Figure 1-2 for steps 1 through 7 for the removal of the mechanical components from the main board. Refer to the exploded mechanical view diagram for more details.

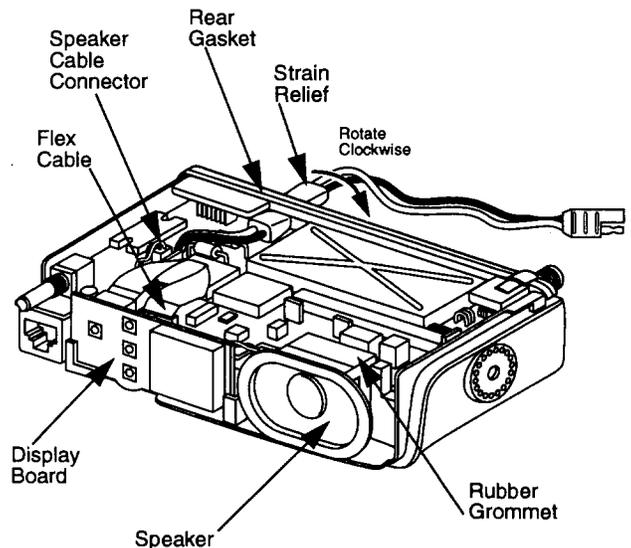


Figure 1-2. Mechanical Components

1. Pull the 2-pin speaker cable connector upwards to disconnect it from the main board.

CAUTION

In order to avoid damage to the speaker, *Do Not* grasp the speaker cone when removing the rubber gasket/speaker from the heatsink.

2. Grasp the speaker at its edges and slide the rubber gasket/speaker upwards to remove it from the heatsink.
3. Pry the plug of the rear gasket out of the square pocket of the heatsink.
4. Lift and peel off the rear gasket from the heat-sink.
5. Disengage the power cable from double-D slot of the heatsink by rotating the strain relief towards the PA shield (clockwise) and sliding it upwards.
6. Remove the shroud by unsnapping the catch-tabs, located on the inside wall of the heat-sink, using a thin bladed screwdriver and pulling the shroud away from the heatsink.
7. Pry off the PA shield cover using a thin bladed screwdriver.

Reassembling the Radio

Removing the Main Board

1. Remove the hex nut from the underside of the heatsink using a 5/16" nut driver.
2. Remove all 12 mounting screws from the main board using a T10 Torx® driver.
3. Loosen the antenna connection using a 1/2" nut driver.
4. Remove the main board. Using thumb and forefingers of both hands, grasp the edges of the main board, the antenna connector, the microphone connector, and the 16-pin connector and lift upwards and away from the heatsink.

CAUTION

Avoid damaging the PA stud on the underside of the main board when lifting away from the heatsink.

Reassembling the Radio**Replacing the Main Board**

1. Carefully place the main board into the heatsink, making sure that the PA stud clears the hole on the underside of the main board.

NOTE

Make sure that the internal tooth washer and nut of the mini-U connector are on the outside of the heatsink wall.

2. Tighten the antenna connection using a 1/2" nut driver and torque at 20-24 in-lbs.
3. Replace the 12 mounting screws into the main board using a T10 Torx® driver and torque the 3 screws attaching to the plastic devices at 6-8 in-lbs. and the remaining 9 screws at 8-10 in-lbs.

Replacing the Mechanical Components to the Main Board

1. Rotate the strain relief towards the PA shield (clockwise) and insert it into the double-D slot located on the heatsink
2. Slide the strain relief downward, and rotate it away from the PA shield until it's fully seated.
3. Insert the shroud into the heatsink and press the catch-tabs onto the snaps.
4. Place the rear gasket onto the heatsink, making sure it fits between the wall of the heatsink and the PA frame, while firmly pressing the five ribs into the five teardrop indentations on the heatsink.

5. Insert the plug on the rear gasket into the square pocket of the heatsink.
6. Attach the hex nut to the underside of the heatsink, using a 5/16" nut driver and torque to 5 in-lbs.
7. Snap the PA shield cover into place on the PA shield frame, making sure not to pinch the rear gasket.
8. Slide the rubber gasket/speaker downwards onto the posts on the heatsink with the word TOP facing up.

CAUTION

The speaker cable should be routed around the 10-position black header and the 8-position black header on the main board to prevent the housing's rear hook from dislodging and damaging the speaker connector when replacing the housing (Figure 1-3).

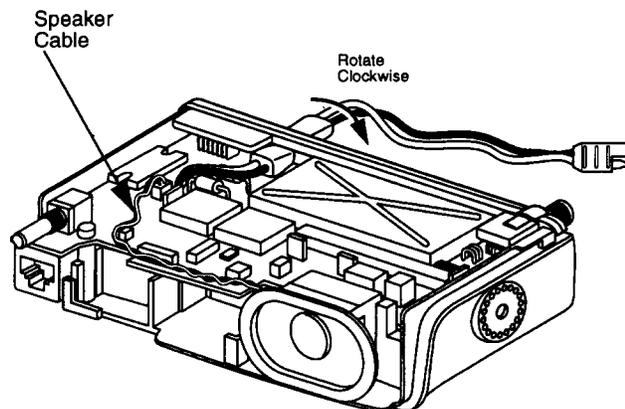


Figure 1-3. Position of Speaker Cable

9. Attach the 2-pin speaker cable connector to the connector on the main board.

Replacing the Front Panel Display Board

1. Insert the display board into the slide rails and gently push downward until it's fully seated.

NOTE

Make sure that the tab on the main board is locked into the slot on the display board.

2. Connect the flex cable to the black header on the main board.

Replacing the Housing

NOTE

Before replacing the housing, make sure that all four buttons on the keypad are protruding properly through the housing.

1. With the radio on a flat surface, place the housing approximately halfway onto the heat-sink (Figure 1-4).
2. Using both hands, press downward on both sides of the housing to assure that the heat-sink and the housing rails are properly aligned (Figure 1-4).
3. Slide the housing forward on the heatsink rails, making sure that the power cord and the rear gasket clear the housing.
4. Continue to slide the housing forward on the heatsink rails until the housing is flush with the rear of the heatsink.

NOTE

Verify that the outside corners of the gasket are properly inserted and aligned with the corners of the housing.

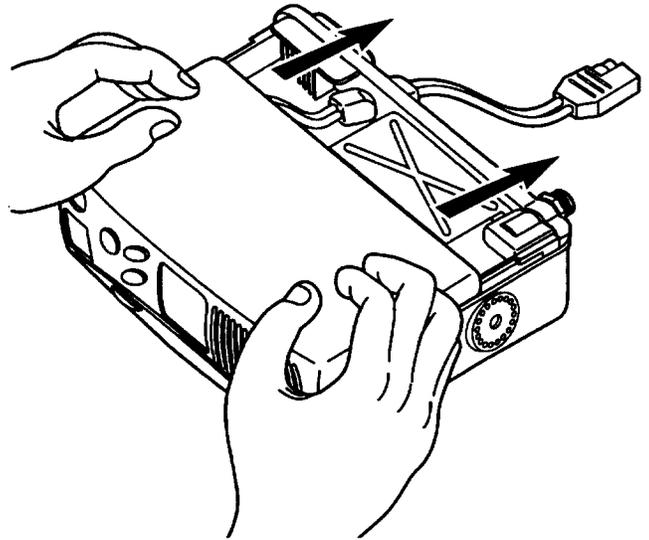


Figure 1-4. *Aligning the Heatsink to the Housing Rails*

Section 2

Theory of Operation

Overview

This section provides detailed theory of operation for the components of the SM Series radio.

Receiver Circuitry

VHF Receiver Front End

The received signal applied to the radio's antenna input connector is routed through the harmonic filter and PIN diode antenna switch. In the receive mode, PIN diodes CR2650 and CR2651 are both off, allowing the signal to pass unattenuated to the receiver front end filter. The insertion loss of the harmonic filter/antenna switch is less than 1 dB. The harmonic filter provides 19 dB attenuation for image protection at 240 MHz, with increased attenuation at higher frequencies.

The signal is routed to a fixed-tuned 4 pole capacitive-coupled resonator filter having a 3 dB bandwidth of 55 MHz and a 1 dB bandwidth of 50 MHz centered at 160 MHz. Insertion loss is 1.5 dB. Attenuation for image protection is 41 dB at 240 MHz, with increasing attenuation at higher frequencies.

The output of the filter is matched to the base of RF amplifier Q1, which provides 15 dB of gain and has a noise figure of 3.5 dB. Current source Q2 is used to maintain the collector current of Q1 constant at 30 mA. Transistors Q1 and Q2 are supplied from the 5R source. This source is switched by transistor Q412 which is controlled by an auxiliary output from DAC U403. 5R is only present in the receive mode. This reduces dissipation in Q1 during transmit. Diode CR1 clamps excessive input signals, protecting Q1.

The output of Q1 is applied to a fixed-tuned 3 pole series-coupled resonator filter having a 3 dB bandwidth of 68 MHz and a 1 dB bandwidth of 55 MHz centered at 160 MHz. Insertion loss is 1.3 dB. Attenuation for image protection is 34 dB at 240 MHz, with increasing attenuation at higher frequencies.

A pin diode attenuator is located between the 4 pole filter and the first mixer. The bias current through this diode is switched by dual-composite transistor switch Q3. In the Distance mode, Q3 is turned on by a logic high at Q3-4 from U403-19. CR2 is forward-biased which bypasses R10, and no loss is introduced. In the Local mode, Q3 and CR2 are off (U403-19 is low),

inserting 10 dB of attenuation due to R10. Because the attenuator is located after the RF amplifier, receiver sensitivity is reduced only by 5 dB, while the overall third order input intercept is raised by 15 dB. Thus, the Local mode significantly reduces the susceptibility to IM-related interference.

The first mixer, U1, is a passive, double-balanced type. This mixer provides all of the necessary rejection of the half-IF spurious response, since the improvement due to filter selectivity is negligible at 150 MHz. High-side injection at +6 dBm is delivered to the first mixer from the injection buffer in the VCO/Buffer IC (U251).

The mixer output is connected to a diplexer network which matches its output to the first two pole crystal filter, Y51A, at the IF frequency of 45.1 MHz, and terminates it in a 51 ohm resistor, R51, at all other frequencies.

UHF Receiver Front End

The received signal applied to the radio's antenna input connector is routed through the harmonic filter and PIN diode antenna switch. In the receive mode, PIN diodes CR2650 and CR2651 are both off, allowing the signal to pass unattenuated to the receiver front end filter. The insertion loss of the harmonic filter/antenna switch is less than 1 dB.

The signal is routed to a fixed-tuned 3 pole shunt resonator filter having a 3 dB bandwidth of 70 MHz and a 1 dB bandwidth of 50 MHz centered at 460 MHz. Insertion loss is 1.8 dB. Attenuation for image protection is 33 dB at 380 MHz, with increasing attenuation at lower frequencies.

The output of the filter is matched to the base of RF amplifier Q1, which provides 17 dB of gain and has a noise figure of 3 dB. Current source Q2 is used to maintain the collector current of Q1 constant at 30 mA. Transistors Q1 and Q2 are supplied from the 5R source. This source is switched by transistor Q412 which is controlled by an auxiliary output from DAC U403. 5R is only present in the receive mode. This reduces dissipation in Q1 during transmit. Diode CR1 clamps excessive input signals, protecting Q1.

The output of Q1 is applied to a fixed-tuned 4 pole shunt resonator filter having a 3 dB bandwidth of 45 MHz and a 1 dB bandwidth of 27.5 MHz centered at 460 MHz. Insertion loss is 2.6 dB. Attenuation for

Frequency Generation System

image protection is 57 dB at 380 MHz, with increasing attenuation at lower frequencies.

A pin diode attenuator is located between the 4 pole filter and the first mixer. The bias current through this diode is switched by dual-composite transistor switch U2. In the Distance mode, U2 is turned on by a logic high at U2-4 from U403-19. CR2 is forward-biased which bypasses R11, and no loss is introduced. In the Local mode, U2 and CR2 are off (U403-19 is low), inserting 10 dB of attenuation due to R11. Because the attenuator is located after the RF amplifier, receiver sensitivity is reduced only by 5 dB, while the overall third order input intercept is raised by 15 dB. Thus, the Local mode significantly reduces the susceptibility to IM-related interference.

The first mixer, U1, is a passive, double-balanced type. This mixer provides all of the necessary rejection of the half-IF spurious response, since the improvement due to filter selectivity is negligible at 470 MHz. Low-side injection at +6 dBm is delivered to the first mixer from the injection buffer, Q271, in the VCO/buffer circuit.

The mixer output is connected to a diplexer network which matches its output to the first two pole crystal filter, Y51A, at the IF frequency of 45.1 MHz, and terminates it in a 51 ohm resistor, R51, at all other frequencies.

Receiver Back End

Q51 amplifies the IF signal from Y51A by approximately 17 dB. The output of Q51 is matched to a second two pole crystal filter, Y51B. The overall 3 dB bandwidth of the crystal filters is 18 kHz for 20/25/30 kHz channel spacing models, and 10 kHz for 12.5 kHz channel spacing models. The signal from Y51B is applied to the input of the receiver system IC U51-6. Diode CR51 prevents overload of the amplifier and second mixer in the receiver system IC.

The 45.1 MHz first IF signal is applied to the second mixer section of U51. A 44.645 MHz crystal oscillator in U51 provides the low side injection signal, which is applied to U51-7. The output of the second mixer is a 455 kHz second IF signal which is filtered by ceramic filter FL51, amplified, filtered by ceramic filter FL52, and applied to the audio detector. As with the crystal filter, the bandwidth of the ceramic filters are narrower for 12.5 kHz channel spacing models than for 20/25/30 kHz.

The audio detector is a phase-locked loop type. The free-running oscillator frequency is determined by capacitor C61. Detected audio from U51-28 is routed to the RX IN and PL IN ports on the Audio Filter IC (AFIC) U402 (pins 7 and 8 respectively), and also via CMOS switch U553B to op-amp U551A, whose output is routed to the accessory connector J3-11.

U51 also contains the carrier-squelch circuitry. When an on-channel signal is present, the amount of high-frequency audio noise at the detector output is reduced. This change in noise level is sensed to indicate the presence of an on-channel signal. The bandwidth of the sampled noise is determined by R59, R60, C64 and C65. Squelch sensitivity is adjusted electronically by an attenuator in U402. Squelch noise is routed from U51-23 to U402-16, and the adjusted noise level is returned from U402-18 back to U51-20. This noise level is detected in U51 and compared to a preset threshold. Noise levels greater than a preset threshold, indicating weak or no signal present, cause U51-15 to go low. This is routed to microcomputer port PE6 (U401-18). When the noise level decreases below the threshold, due to on-channel quieting, U51-15 and therefore U401-18 go high. This indicates an on-channel signal is present, and the microcomputer unmutes the audio path.

Components R57, C68 and C69 determine squelch time constants as a function of the charging currents supplied by U51. These charging currents vary from weak to strong signal conditions, providing a variable squelch closing time-constant. For weak signals the time constant is long to minimize "chattering" or rapid muting and unmuting of the audio. For strong signals, where the carrier-absent to carrier-present conditions are substantial, the closing time-constant is shortened to minimize the length of the "squelch-tail".

Frequency Generation System

The frequency generation system utilizes two IC's, the Fractional-N Synthesizer (U201) and the VCO/Buffer (U251). Designed to maximize compatibility, the two IC's provide many functions which would normally require additional circuitry.

The frequency generation circuitry is supplied from the analog 5 V supply regulated by U405. The synthesizer IC further filters this voltage (SUPFOUT, U201-18, 4.65 Vdc) and supplies it to the VCO/Buffer IC.

The synthesizer also interfaces with the logic and AFIC circuitry. Synthesizer programming is accomplished through the SR DATA (U201-5), SR CLOCK (U201-6), and SYN LE (U201-7) lines by microcomputer U401. A serial stream of 98 bits is sent whenever the synthesizer is programmed. Synthesizer lock is indicated by a logic high at LOCK DET pin U201-2, and a logic low indicates out-of-lock.

In the transmit mode, modulation from the attenuators in the AFIC (U402-19 and 20) is resistively summed and applied to U201-8. The audio is digitized within U201 and applied to the loop divider to provide the low-port modulation. The audio is also routed through an internal attenuator for balancing of the high and low port modulation, before being applied to the VCO from U201-28.

The AFIC employs switched-capacitor filters which require an external 2.1 MHz clock signal. This clock is generated in U201 by dividing the 16.8 MHz reference oscillator. The signal, at U201-11, is filtered, attenuated, and applied to U402-35 at a level of approximately 2 Vp-p.

Synthesizer

The Fractional-N synthesizer uses a 16.8 MHz crystal (Y201) to provide the reference frequency for the system. External components C201-3, R201-2, and CR201 are also part of the temperature-compensated oscillator circuit. The dc voltage applied to varactor CR201 is determined by a temperature-compensation algorithm within U201, and is specific to each crystal Y201 based on a unique code assigned to the crystal.

The divided frequencies of the reference oscillator and the VCO signal (as applied to U201-20) are compared to generate the necessary correction voltage, or steering line voltage, which maintains the proper VCO frequency. The steering line voltage from U201-29 is filtered and applied to varactors CR241 and CR251 to control the frequencies of the receive and transmit VCOs respectively. To achieve fast lock time, an internal adaptive charge pump provides higher momentary current capability at U201-31 than in the normal steady-state mode. The normal and adapt charge pumps receive their dc supply from a voltage-multiplier circuit which includes CR211, CR212 and associated capacitors C210-C216. By combining two 5 V square waves which are 180 degrees out-of-phase and adding this to the regulated 5 V supply, a source of approximately 12.6 Vdc is available at U201-32. The current for the normal mode charge pumps is set by R242. The pre-scaler for the loop is internal to U201 with the value determined by the frequency band of operation.

VCO

The VCO (U251) used in conjunction with the Fractional-N synthesizer (U201) generates an RF signal for both receive and transmit modes. The TRB line (U251-5) determines which oscillator and buffer is enabled, as described below. A sample of the RF signal from the enabled oscillator is routed from U251-23 to the pre-scaler input U201-20 via a matching network. After frequency comparison with the reference in the synthesizer, a resultant control voltage is applied to the varactors CR241 and CR251. This voltage, when locked, is between 3 and 10 V depending on VCO frequency.

In the receive mode, U251-5 is low, enabling the receive VCO and buffer in U251. The RF output signal at U251-2 is further amplified by Q271 (in UHF models only), low-pass filtered, and matched to the 50 ohm injection port of first mixer U1 at a level of +6 dBm.

During transmit, U251-5 is high, activating the transmit VCO and buffer. The RF output signal at U251-4 is low-pass filtered and matched into Q281 for further amplification before being applied to the RF power amplifier. A resistive attenuator (R284 through R286) isolates the VCO and buffer from impedance variations presented by the power amplifier for improved stability. The power output presented to the first stage (Q2610) of the RF power amplifier is +13 dBm.

Transmit and Receive Audio Circuitry

The majority of Rx and Tx audio processing is performed by U402, the Audio Filter IC (AFIC), which provides the following functions:

- Tone/Digital PL encoding and decoding
- PL rejection filter in Rx audio path
- Tx pre-emphasis amplifier
- Tx audio limiter
- Post-limiter (splatter) filter
- Tx deviation adjust digitally-controlled attenuators
- Programmable microphone gain attenuator
- Carrier squelch digitally-controlled attenuator
- Microcomputer output port expansion
- 2.5 Vdc reference source

The parameters of U402 which are programmable are selected by the microcomputer via the SR CLOCK (U402-31), SR DATA (U402-30) and chip enable (U402-33) lines.

Rx Audio Path

Low-Level Rx Audio

Detected audio from the IFIC U51-28 is routed via C551 to the AFIC Rx input (U402-7) and PL input (U402-8) and also, via CMOS switch U553B, to op-amp U551A.

The audio applied to U402-7 is sharply high-pass filtered to remove all PL and DPL tones below 300 Hz. Audio is then routed through a digitally controlled attenuator which is set to approximately 6 dB attenuation. This attenuation is intended to be non-adjustable, since it is desirable for the output at U402-23 to be at a fixed and known level, since this level is applied to the internal option board via connector J6-4. Level adjustment is accomplished at a later point via the volume control R554. The internal de-emphasis characteristic is normally enabled within U402, with the result that audio at U402-23 is de-emphasized but otherwise unmuted.

This audio signal is routed via R551 to op-amp gain stage U551B, through mute gate U554A, and applied to the top of the volume control R554. The signal at the top of the volume control is also routed to two other paths, the Handset Audio path and the Accessory Connector Rx Audio path.

Transmit and Receive Audio Circuitry

Handset Audio Path

Rx audio from U551B via mute gate U554A is amplified by op-amp U551D and applied to the microphone connector J5-8 for use with a telephone-type handset. This audio is de-emphasized and muted (by U554A). When the radio has been programmed for handset operation, the audio power amplifier is muted whenever the handset is off-hook by a logic high from U402-3. Therefore, speaker audio is muted whenever the handset is in use.

Accessory Connector RX Audio Path

Rx audio from U551B via mute gate U554A is also routed via CMOS switch U553B-2 to op-amp gain stage U551A, whose output is routed to accessory connector J3-11. The audio at J3-11 is may be either de-emphasized and muted (U401-36 low, U553B-2 connected to 15) or flat and unmuted (U401-36 high, U553B-1 connected to 15). The flat, unmuted signal applied to U553B-1 comes directly from the IFIC detected audio output. In this path, the gain adjustment for 12.5 kHz vs. 20/25/30 kHz is accomplished by resistor R563. In a similar manner, IFIC detected audio output is supplied via R555 to the internal option connector J6-5.

Audio Power Amplifier

Audio from the wiper of the volume control is amplified by the audio power amplifier IC U501. This is a bridge amplifier delivering without distortion 7.8 Vrms between pins 4 and 6. This is sufficient to develop 7.5 watts of audio power into an external 8 ohm load, or approximately 3 watts of audio power into an internal 22 ohm speaker (under this condition, undistorted audio output voltage swing exceeds 8.2 Vrms). The audio power amplifier is muted whenever speaker audio is not required, to reduce current drain and eliminate all noise in the speaker. The audio amp is muted when U501-8 is low, which is accomplished when Q416 is saturated (U402-3 high) or when the radio is turned off. The current drain into supply pin U501-7 is negligible when U501-8 is low.

Because the power amplifier is a bridge-type, neither speaker terminal is grounded. Care should be taken that any test equipment used to measure the speaker audio voltage does not ground either speaker output terminal, otherwise damage to the audio power amplifier IC may result. If the test equipment input is not isolated from ground, voltage measurements may be made from either one of the speaker output terminals (J3-1 or J3-16) to ground, in which case the voltage indicated will be one half of the voltage applied to the speaker or load resistor. In any case when a load resistor is used, it should be connected from J3-1 to J3-16. Neither side of the load resistor should be grounded.

PL Decoder

Detected Rx Audio at U402-8, the PL Decoder input, first passes through the Tone PL filter or Digital PL filter, depending on the PL option selected for the current operating mode. Filtered PL is then coupled to the PL detector circuit, with detected output at U402-27. The detected PL signal is coupled from U402-27 to microcomputer U401-64 where algorithms perform the final PL decoding. Data for the tone PL frequency or Digital PL code for each mode is programmed through the Radio Service Software.

Center-Slicer

The center-slicer circuit U601A is used for detection of high-speed signalling on radio models equipped with this capability. Unattenuated Rx audio from U402-22 is dc-coupled to the two inputs of U601A. The non-inverting input U601A-3 is fed through resistor R603, with C602 providing a 3.3 kHz low-pass corner. The inverting input U601A-2 is fed through resistor R602, with C601 setting a low-pass corner frequency of 16 Hz. During operation, R602 and C601 establish an averaged dc offset level at U601A-2 dependent on the average dc level of the undetected signal to set the "trigger" threshold of U601A. R603 and C602 provide high-frequency roll-off to improve falsing immunity. The detected output from the center-slicer is coupled from to microcomputer U401-1 where algorithms perform the final data decoding.

RadiusPort™ Internal Option Board Rx Audio Path

De-emphasized, unmuted audio is available at J6-4 for use by an internally installed option board. If this audio is processed and returned to the receive audio path, for an option such as a scrambler, the processed audio is returned from a low-impedance source to J6-2. The unprocessed audio through R551 is shunted due to the low source impedance of the option board at J6-2.

Non-de-emphasized, unmuted audio is also available at J6-5. Options requiring non-de-emphasized audio may use this, or may re-pre-emphasize the audio at J6-4, depending on the design of the option.

Noise Squelch Attenuator

The AFIC contains a 16 step programmable digital squelch attenuator whose input is U402-16 and output is U402-18. Noise squelch sensitivity is set using RSS, with open squelch at step 0 and maximum (tight) squelch at step 15.

Tx Audio Path**Voice Path via Front Panel**

Microphone audio from the front panel mic jack J5-5 is attenuated from 80 mV rms (for 60% deviation at

(3kHz)

1 kHz) to 65 mV by R658 and R659. When mic PTT is sensed from J5-6, CMOS gate U554B is enabled by a logic high at U402-40. Audio passes R654 through pre-emphasis network R653 and C651 to the summing junction of an inverting op-amp gain stage within U402 (pin 10). Audio processing, including limiting, splatter filtering, and level adjustment are performed within U402. The outputs of the two programmable deviation-adjustment attenuators (U402-19 and 20) are resistively summed and applied to the VCO modulation input of the frequency generation system.

Voice Path via Accessory Connector

Microphone audio from an accessory such as a desk set applied to External Mic Audio input J3-2 is attenuated from 80 mV rms (for 60% deviation at 1 kHz) to 65 mV by R666 and R665. When External Mic PTT is sensed at J3-3 (or from any programmable input to which Ext Mic PTT has been assigned), CMOS gate U554C is enabled by a logic high at U401-37. Audio passes R654 through pre-emphasis network R653 and C651 to the summing junction of an inverting op-amp gain stage within U402 (pin 10). Audio processing, including limiting, splatter filtering, and level adjustment are performed within U402. The outputs of the two programmable deviation-adjustment attenuators (U402-19 and 20) are resistively summed and applied to the VCO modulation input of the frequency generation system.

Flat (Non-Pre-Emphasized) Tx Audio Path via Accessory Connector

Audio applied at J3-5 may be routed to the transmitter either before (PRE-LIM) or after (POST-LIM) the limiter. This is chosen by RSS one time and not changed subsequently. The path is controlled by CMOS gate U553C, as determined by the dc level of U402-2. Logic low provides PRE-LIM, logic high provides POST-LIM. When the POST-LIM path is chosen, audio is routed via R671 and op-amp U551C to the AUX TX INPUT (U402-13), therefore this input of the AFIC must be enabled whenever an accessory connector PTT is sensed at J3-3 (or from any programmable input to which Accessory PTT has been assigned).

If the PRE-LIM path is chosen, audio is coupled by C655 and R670 to the summing input of an op-amp within U402 (pin 10). Because R670 is significantly larger than R671, R669 provides a faster charging path for C655 when the PRE-LIM route is selected.

RadiusPort™ Internal Option Board Tx Audio Path

Microphone audio which is attenuated to a level of 65 mV rms for 60% deviation at 1 kHz is applied to the option board via J6-3. After processing by the option board, audio is returned via J6-1 from a low-impedance source on the option board. This effectively shorts out the direct audio path through resistor R654.

Transmitter Circuitry

VHF 10-25 Watt Transmitter RF Power Amplifier

The 10-25 watt VHF power amplifier is designed to cover the range of 150-170 MHz. It consists of three stages. The first stage, Q2610, operates in Class A with base bias supplied by the 8T source. The collector voltage is supplied from controlled B+. The output level of this stage (i.e. the gain of this device) is varied by changes in the controlled B+ voltage. The magnitude of the control voltage depends on the PA output power, temperature and also antenna load mismatch.

The second stage of the PA, Q2630, is the driver which amplifies the output of low level amplifier to a level sufficient to drive the final stage device. This device operated in Class C delivers up to 3 watts output power. Collector voltage is supplied by UNSWB+.

The third stage, Q2640, is the final RF power amplifier, which operates in Class C directly from UNSWB+. It provides up to 30 watts output power.

A directional coupler, located between the final power amplifier and the harmonic filter, monitors the forward and reflected power. The sampled RF is rectified by diodes CR2601 (forward power) and CR2602 (reflected power), and the resulting dc voltage is routed to the power control circuit. The HI/LO power line (U451-3) offsets the voltage reference for the forward power rectifier by 5 V to allow separating the power adjustment range into two overlapping segments, if required for greater power set resolution. This capability is presently not used.

Antenna switch consists of a pair of PIN diodes, CR2650 and CR2651, a pi-network and current limiting resistors. A voltage at the bias terminal 8T forward biases both diodes, so that there is a low impedance path from transmitter to antenna while shorting out the receiver input. When this voltage is absent, both diodes look like high impedances and transmitter is effectively disconnected from the antenna, while antenna signal appears across the receiver front-end input terminals.

During transmit mode, 8T is present and both diodes are forward biased into conduction. The transmitter RF from Q2640 via the directional coupler is routed through CR2650, and via the harmonic filter to the antenna jack J1. The PIN diode CR2651 in the shunt-leg conducts, shunting RF power and preventing it from reaching the sensitive receiver front-end. The impedance inverter network contributes approximately 30 dB to transmit/receive isolation. Whereas, during receive mode, both the PIN diodes are non-conducting. Thus, the signal applied at the antenna jack J1 are routed via the harmonic filter, through C2658, L2652 and C2659 to the receiver input.

Transmitter Circuitry

The harmonic filter is a seven pole 0.1 dB ripple Chebyshev low-pass filter with a 3 dB frequency of approximately 200 MHz and less than 1 dB insertion loss in the passband. The filter's primary function is to attenuate harmonic spurs generated by the transmitter. It also adds low-pass selectivity for the receiver. L2663 protects the power amplifier from static discharge.

VHF 40 Watt Transmitter RF Power Amplifier

The 40 watt VHF power amplifier is designed to cover the range of 150-170 MHz and has four stages. The first stage, Q2410, operates in Class A from the 8T source. It provides 13 dB of gain and an output of 400 mW.

The second stage, Q2420, has a nominal gain of 9.4 dB and power output of up to 3.5 watts. The output of this stage is adjusted by the controlled B+ voltage which supplies its collector. (VB+ max = 6.55 V).

The third stage, Q2430, operates in Class C with 8.1 dB gain and a power output of up to 22 watts. Collector voltage is directly from UNSW B+.

The fourth stage, Q2440, is the final RF power amplifier, which operates Class C directly from UNSW B+. It provides up to 65 watts output.

A directional coupler, located between the final power amplifier and the harmonic filter, monitors the forward and reflected power. The sampled RF is rectified by diodes CR2480 (forward power) and CR2481 (reflected power) and the resulting dc voltage is routed to the power control circuit.

The antenna switch consists of two pin diodes, CR2450 and CR2451. L2452 and C2450, combined with the "on" inductance of CR2451, form a series resonant circuit to lower the shunt impedance presented by CR2651 when it is turned on. In the receive mode, both diodes are off. Signals applied at the antenna jack J1 are routed, via the harmonic filter, through L2451 and C2453 to the receiver input. In the transmit mode, 8T is present and both diodes are forward-biased into conduction. The transmitter RF from Q2440 via the directional coupler is routed through CR2450, and via the harmonic filter to the antenna jack. CR2451 conducts, shunting RF power and preventing it from reaching the receiver. L2451 is selected to appear as a 1/4 wave at VHF, so that the low impedance of CR2451 appears as a high impedance at the junction of CR2450 and the harmonic filter input. This provides a high series impedance and low shunt impedance divider between the power amplifier output and receiver input.

The harmonic filter is a seven pole 0.1 dB ripple Chebyshev low pass filter with a 3 dB frequency of approximately 200 MHz and less than 1 dB insertion loss in the passband.

UHF 10-25 Watt Transmitter RF Power Amplifier

The 10-25 watt UHF power amplifier is designed to cover the range of 450-470 MHz and has four stages. The first stage, Q2610, operates in Class A from the 8T source. It provides 11.8 dB of gain and an output of 300 mW.

The second stage, Q2620, has a nominal gain of 8.2 dB and power output of up to 2 watts. The output of this stage is adjusted by the controlled B+ voltage which supplies its collector.

The third stage, Q2630, operates in Class C with 8.1 dB gain and a power output of up to 13 watts. Collector voltage is directly from UNSW B+.

The fourth stage, Q2640, is the final RF power amplifier, which operates Class C directly from UNSW B+. It provides up to 30 watts output.

A directional coupler, located between the final power amplifier and the harmonic filter, monitors the forward and reflected power. The sampled RF is rectified by diodes CR2680 (forward power) and CR2681 (reflected power) and the resulting dc voltage is routed to the power control circuit. The HI/LO power line (U403-20) offsets the voltage reference for the forward power rectifier by 5 V to allow separating the power adjustment range into two overlapping segments, if required for greater power set resolution. This capability is presently not used.

The antenna switch consists of two pin diodes, CR2650 and CR2651. L2652 and C2650, combined with the "on" inductance of CR2651, form a series resonant circuit to lower the shunt impedance presented by CR2651 when it is turned on. In the receive mode, both diodes are off. Signals applied at the antenna jack J1 are routed, via the harmonic filter, through L2651 and C2653 to the receiver input. In the transmit mode, 8T is present and both diodes are forward-biased into conduction. The transmitter RF from Q2640 via the directional coupler is routed through CR2650, and via the harmonic filter to the antenna jack. CR2651 conducts, shunting RF power and preventing it from reaching the receiver. L2651 is selected to appear as a 1/4 wave at UHF, so that the low impedance of CR2651 appears as a high impedance at the junction of CR2650 and the harmonic filter input. This provides a high series impedance and low shunt impedance divider between the power amplifier output and receiver input.

The harmonic filter is a seven pole 0.1 dB ripple Chebyshev low pass filter with a 3 dB frequency of approximately 600 MHz and less than 1 dB insertion loss in the passband.

UHF 40 Watt Transmitter RF Power Amplifier

The 40 watt UHF power amplifier is designed to cover the range of 450-470 MHz and has four stages. The first stage, Q2610, operates in Class A from the 8T source. It provides 11.8 dB of gain and an output of 300 mW.

The second stage, Q2620, has a nominal gain of 8.2 dB and power output of up to 2 watts. The output of this stage is adjusted by the controlled B+ voltage which supplies its collector.

The third stage, Q2630, operates in Class C with 8.1 dB gain and a power output of up to 13 watts. Collector voltage is directly from UNSW B+.

The fourth stage, Q2640, is the final RF power amplifier, which operates Class C directly from UNSW B+. It provides up to 50 watts output.

A directional coupler, located between the final power amplifier and the harmonic filter, monitors the forward and reflected power. The sampled RF is rectified by diodes CR2680 (forward power) and CR2681 (reflected power) and the resulting dc voltage is routed to the power control circuit.

The antenna switch consists of two pin diodes, CR2650 and CR2651. L2652 and C2650, combined with the "on" inductance of CR2651, form a series resonant circuit to lower the shunt impedance presented by CR2651 when it is turned on. In the receive mode, both diodes are off. Signals applied at the antenna jack J1 are routed, via the harmonic filter, through L2651 and C2653 to the receiver input. In the transmit mode, 8T is present and both diodes are forward-biased into conduction. The transmitter RF from Q2640 via the directional coupler is routed through CR2650, and via the harmonic filter to the antenna jack. CR2651 conducts, shunting RF power and preventing it from reaching the receiver. L2651 is selected to appear as a 1/4 wave at UHF, so that the low impedance of CR2651 appears as a high impedance at the junction of CR2650 and the harmonic filter input. This provides a high series impedance and low shunt impedance divider between the power amplifier output and receiver input.

The harmonic filter is a seven pole 0.1 dB ripple Chebyshev low pass filter with a 3 dB frequency of approximately 600 MHz and less than 1 dB insertion loss in the passband.

VHF Power Control Circuit

The VHF power control circuit is a dc-coupled amplifier whose output is the controlled voltage to Q2610 collector circuit. Comparator U451A is configured as a current source and maintains the reference current setting at the collector of Q451. Under steady-state conditions, the reference current is the sum of detected current by the rectified forward power and reflected

power at the bi-directional coupler. The reference current level varies proportionally with the desired output power level.

By changing the DAC settings, and thus varying dc current from DAC U403 pin 9 and 11, the desired output power between 10-25 watts can be obtained. The power control loop varies the collector voltage of Q2610 as necessary to maintain equal current at the collector of Q451.

Under conditions of poor antenna match resulting in high reflected power, the control voltage at the collector of Q455 is reduced due to lowering of the detected current by the forward power detector. The output power is reduced to maintain the reference current at the collector of Q451 (due to increase in detected current by reflected power detector).

The temperature-sensing circuit protects the PA devices from excessively high temperature. As the PA temperature increases, the resistance of thermistor RT460 decreases. When the temperature-sensing circuit triggers into operation, the voltage at pin 3 of comparator U451 increases. Since the DAC values remain unchanged, the reference current level at pin 1 of current source amplifier, U451, is lowered. This is interpreted by the power control circuit as a lowering of desired output power. When the power output is reduced, the generated heat is reduced to a safe level. If temperature falls below the cutback temperature, the output power of the PA is increased to its nominal value.

Under severe environmental conditions, more than one circuit may be attempting to reduce power output at the same time (i.e., during high VSWR conditions, the high reflected power may initially reduce power, but eventually heat build-up will cause further power reduction by the thermal cut-back circuitry).

UHF Power Control Circuit

The UHF power control circuit is a dc-coupled amplifier whose output is the controlled voltage applied to Q2620 collector circuit. The input voltage to U451A-2 is a dc voltage from the direction coupler forward power detector, and is proportional to RF power output. This is compared to a dc voltage from DAC U403 pins 9 and 11, which is proportional to the desired output power setting. The power control loop varies the output of stage Q2620 as necessary to keep equal voltages at U451A pins 2 and 3. Under conditions of poor antenna match resulting in high reflected power, or under excessively high temperatures near the RF final amplifier, the dc voltage at U451A-3 is reduced due to a lowering of the voltage at U451B-7 (mismatch) or decreasing resistance of thermistor R462 at high temperatures. These two voltages are summed via diode CR451, and are interpreted by the power control circuit as a lowering of the desired output power. The loop

PTT Circuit

reduces Q2620's output until equal voltages at U451A-2 and 3 are again achieved.

PTT Circuit

The logic system uses a single microcomputer A/D input port PE1 (U401-15) to distinguish between three different types of PTT information. This is done by assigning different voltage levels to the different PTT functions as follows:

- 0 to 2.1 Vdc, Microphone PTT
- 2.2 to 3.6 Vdc, Accessory PTT
- 3.9 to 4.5 Vdc, Reserved for Special Applications

A microphone connected via the front panel jack J5 must present a low of less than 2.1 Vdc to be correctly interpreted as MIC PTT and causing the appropriate audio paths to be enabled. Similarly, an accessory whose PTT output is connected to J3-3 must present a low of less than approximately 2.1 V to be interpreted as an accessory PTT. This voltage is shifted to the range between 2.2 and 3.6 V by series resistor R432.

Special applications may require a microphone with an additional button for some specialized function. A series resistor within the microphone is chosen to present between 3.9 and 4.5 Vdc at port PE1 when the button is activated.

DC Regulation and Distribution

Unswitched B+ supplies operating voltage directly to the RF power amplifier third and fourth stages, the power control series pass device Q451-E, the RAM keep-alive constant supply to U401-25, the audio power amplifier supply pin U501-7 and, via fuse F401, to the external alarm switch transistor Q409-E. All of these circuits draw negligible current when the radio is turned off (less than 15 mA total).

When the on-off switch is "on," battery voltage is applied to 8 V regulator U406, whose regulated output is routed to the display board for backlighting, to 8T transistor switch Q414, to U51 pins 13 and 14, to op-amp U551 supply pin 4, and to the inputs of the 5 V regulators U404 (digital) and U405 (analog). Separate analog and digital regulators are used to minimize microcomputer noise from being introduced into sensitive VCO and receiver circuits. The digital 5 V regulator includes a reset timer which hold the reset line

U404-3 low for a predetermined time after the radio is turned on. Zener diodes on the 8 V and digital 5 V lines minimize susceptibility to ESD damage.

Front Panel Circuits

2-Frequency Display Board

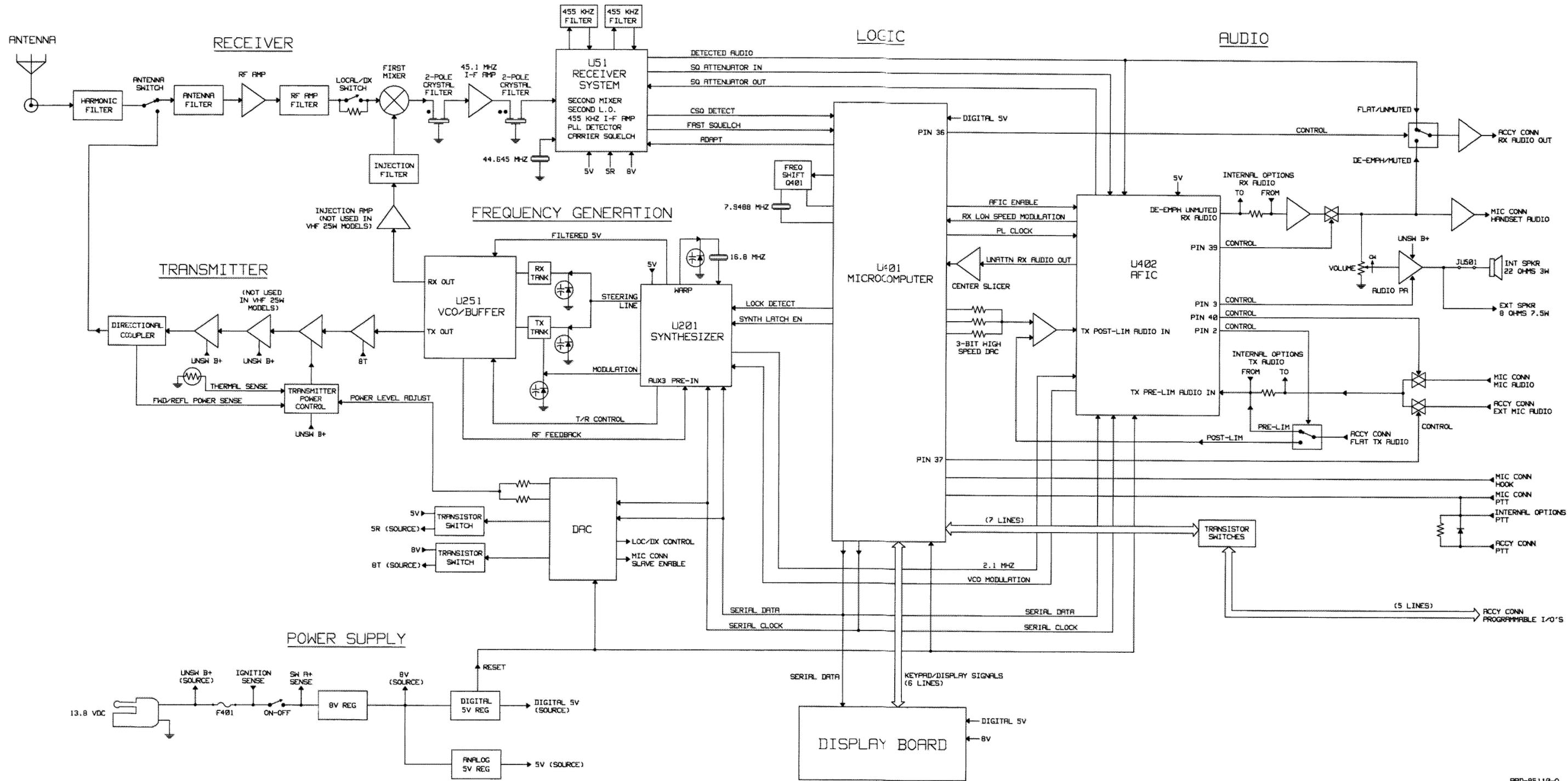
The 2-frequency display board contains backlighting LEDs, Option and Monitor LEDs controlled by transistor switches Q1006 and Q1007 respectively, and Red (Tx) and Green (Rx) LED indicators for each channel, controlled by transistors Q1001-Q1004. To function as a "channel busy" indicator, the appropriate channel Red LED is illuminated and the base drive to Q1005 is toggled on and off, causing the LED to blink.

The four pushbuttons apply voltage to the bases of four digital transistors Q1008-Q1011. The appropriate transistor, in turn, grounds a tap on the series resistor laddered R1015-R1017, producing a different dc level depending on which button is pressed. These dc levels are interpreted by an A/D input of the microcomputer (U401-17) and the corresponding function is enabled. The transistors ensure that the dc ladder voltage is consistent although the series resistance of the keypad contact may vary.

16-Frequency Display Board

The 16-frequency display board contains backlighting LEDs, and an LCD driven by LCD driver IC U1101. The desired display information is loaded serially into U1101 from the microcomputer via the SR Data and Display Clock lines. Because a dedicated clock line is used, no chip-select line is needed.

The four pushbuttons apply voltage to the bases of four digital transistors Q110-Q1104. The appropriate transistor, in turn, grounds a tap on the series resistor laddered R1106-R1108, producing a different dc level depending on which button is pressed. These dc levels are interpreted by an A/D input of the microcomputer (U401-17) and the corresponding function is enabled. The transistors ensure that the dc ladder voltage is consistent although the series resistance of the keypad contact may vary.



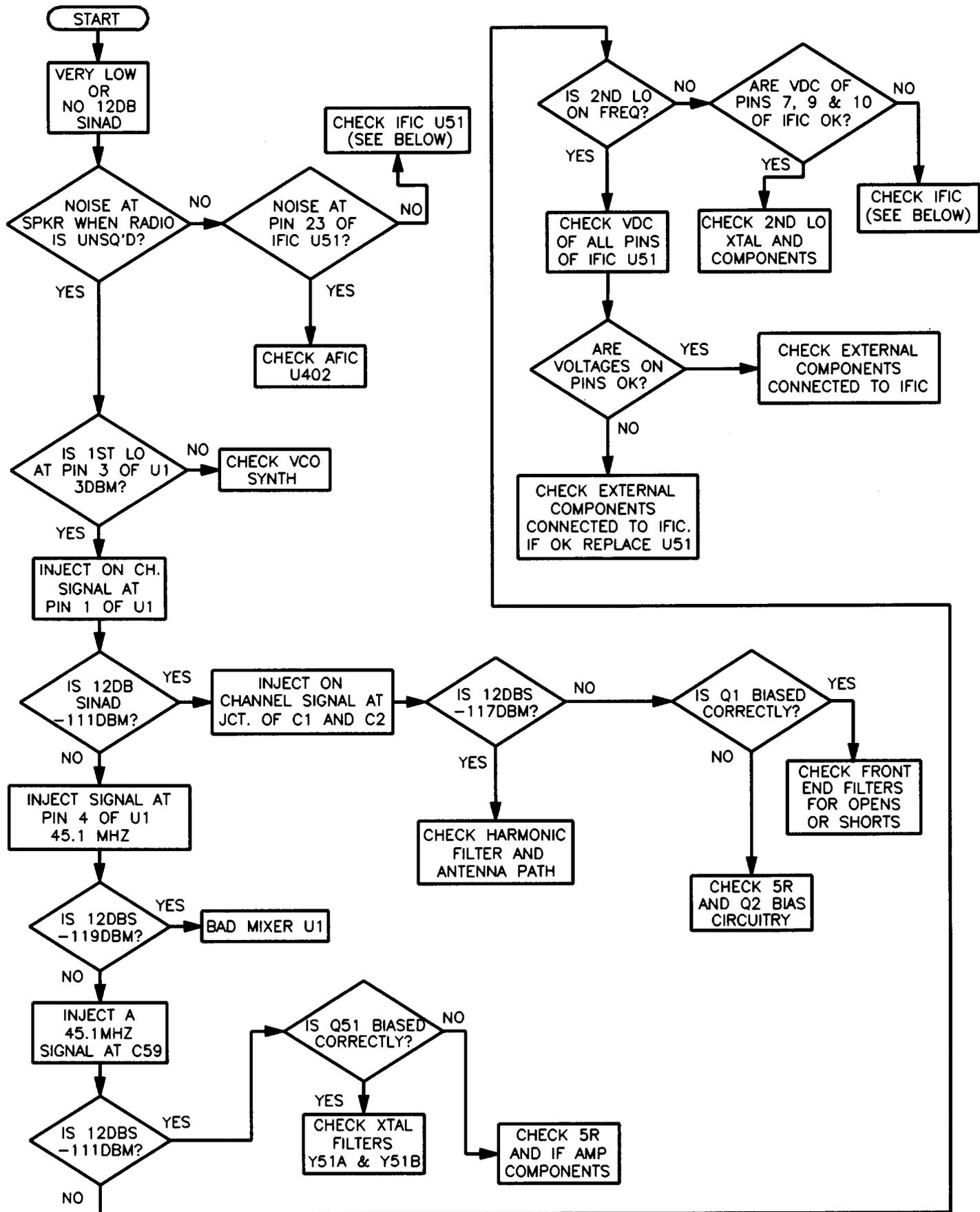
RPD-95110-0



Overview

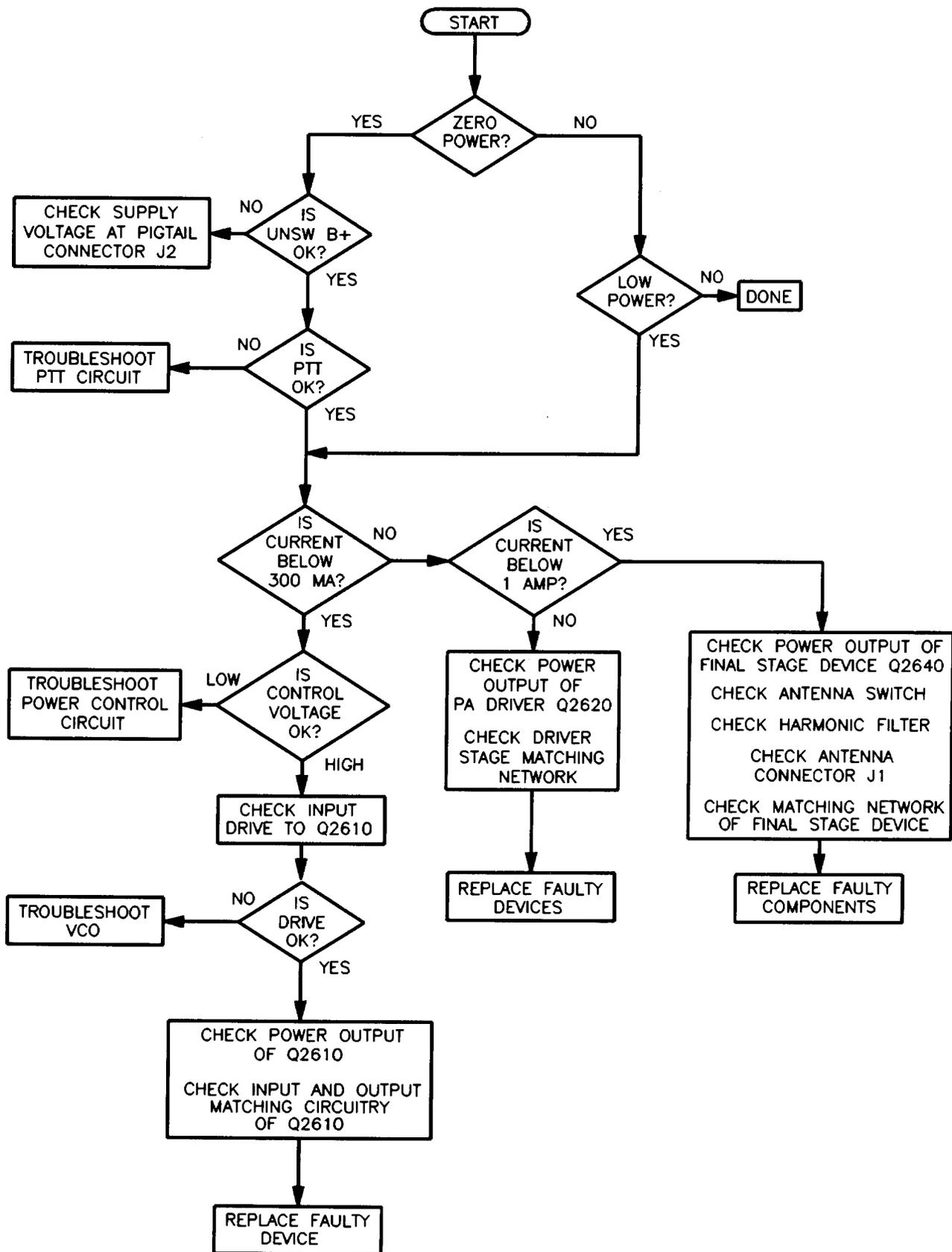
This section contains 9 troubleshooting tables for the following SM Series components:

- Receiver (all models)
- Transmitter (VHF 25 W models)
- Transmitter (VHF 40 W, UHF 25 W, and UHF 40 W models)
- Synthesizer (VHF 25 W models)
- Synthesizer (VHF 40 W, UHF 25 W, and UHF 40 W models)
- Voltage Controlled Oscillator (VCO) (VHF 25 W models)
- Voltage Controlled Oscillator (VCO) (VHF 40 W, UHF 25 W, and UHF 40 W models)
- Microprocessor (all models)



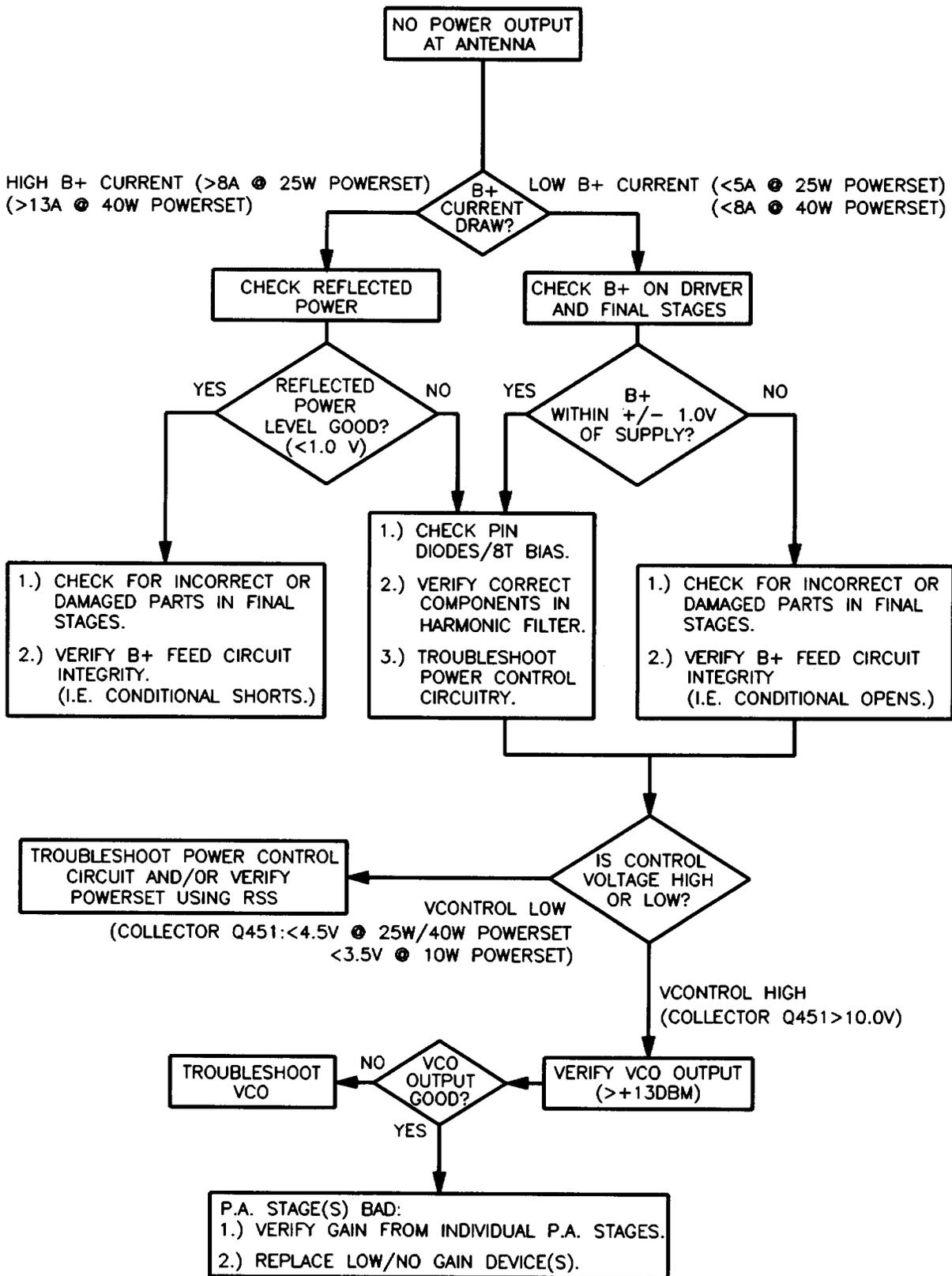
RPD-95102-0

Troubleshooting Flow Chart
for Receiver (all models)



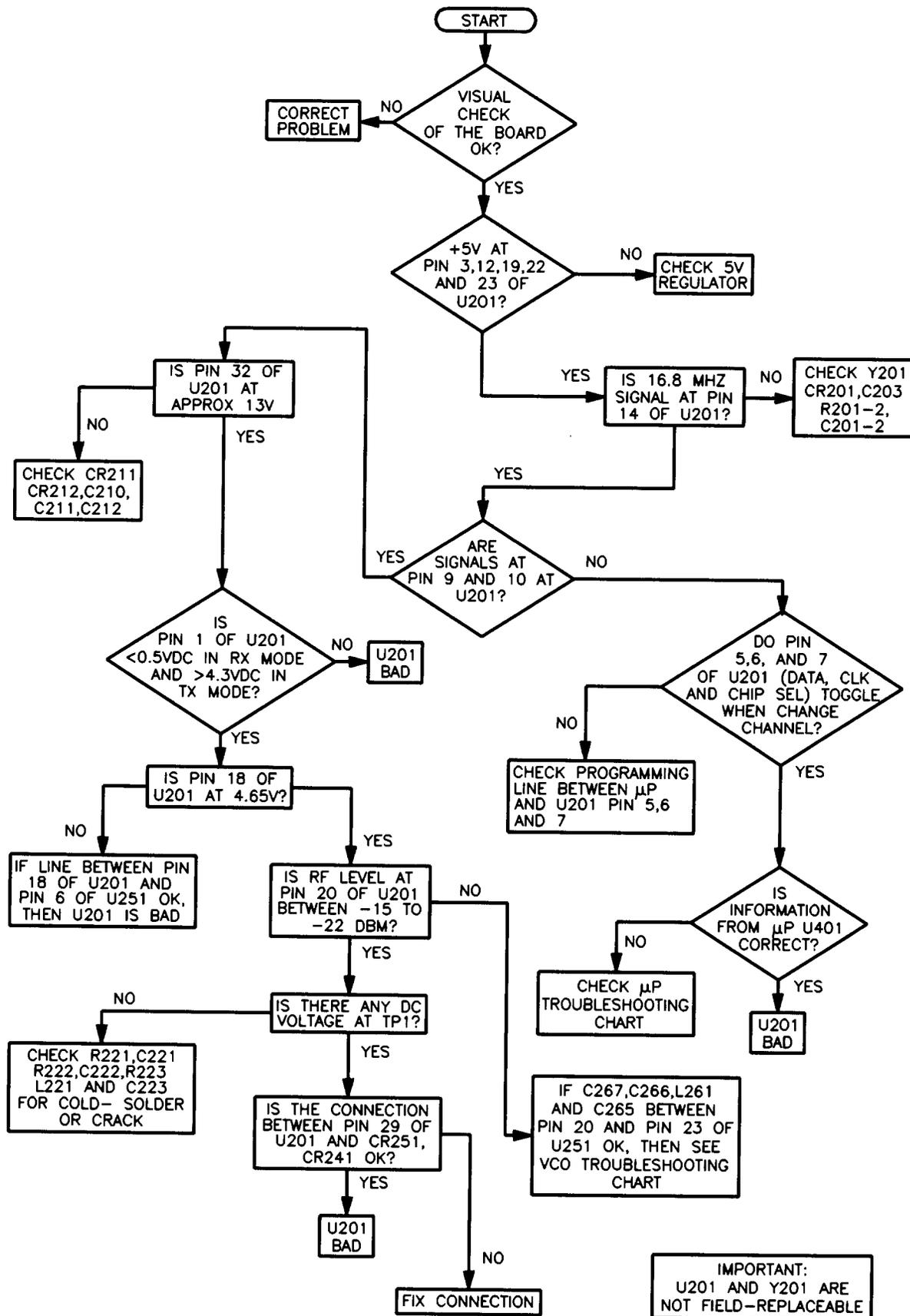
RPD-95103-0

*Troubleshooting Flow Chart
for Transmitter (VHF 25 W Models)*



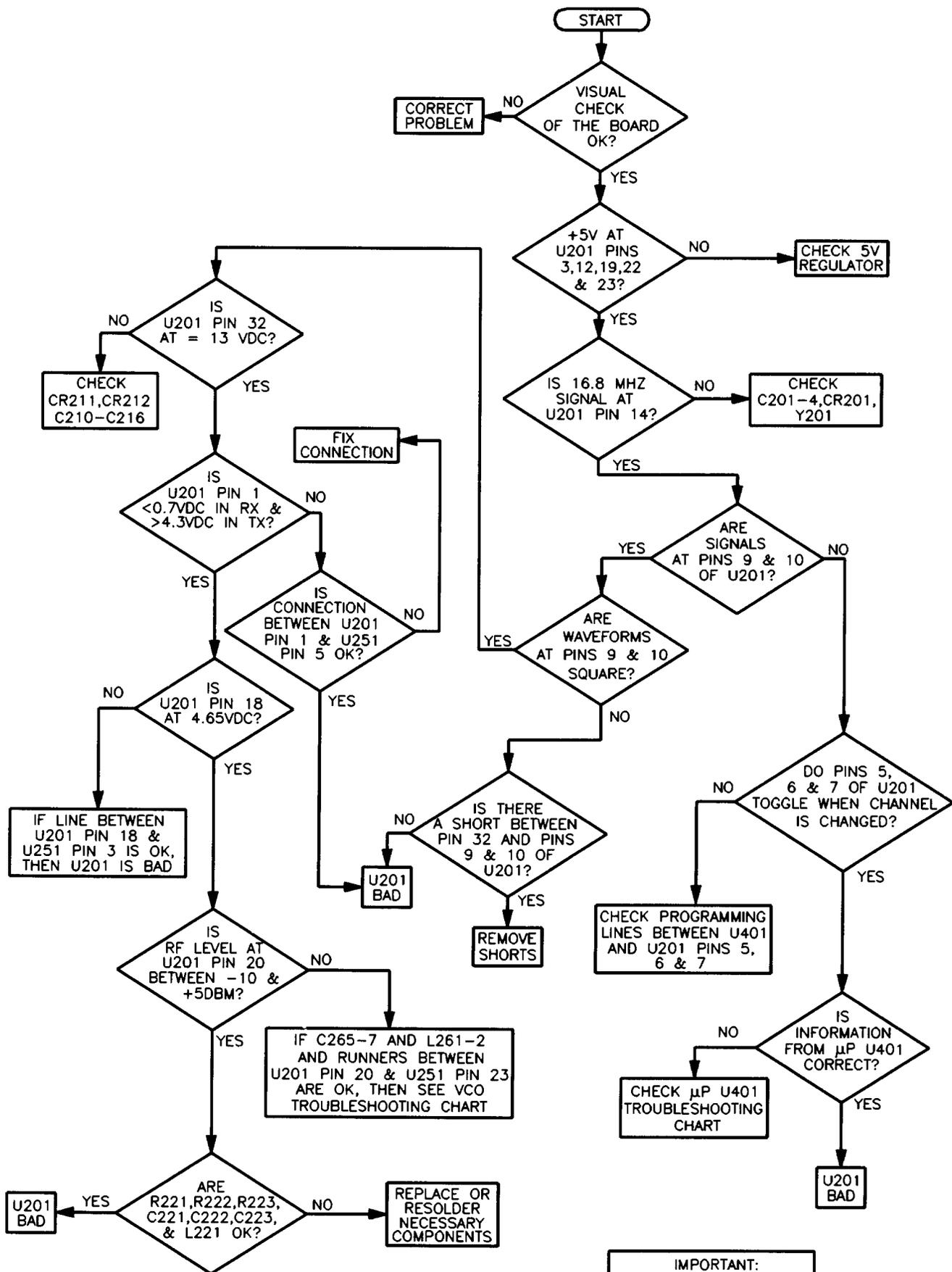
Troubleshooting Flow Chart
for Transmitter (VHF 40 W, UHF 25 W, and UHF 40 W Models)

RPD-95104-0



RPD-95105-0

*Troubleshooting Flow Chart
for Synthesizer (VHF 25 W Models)*

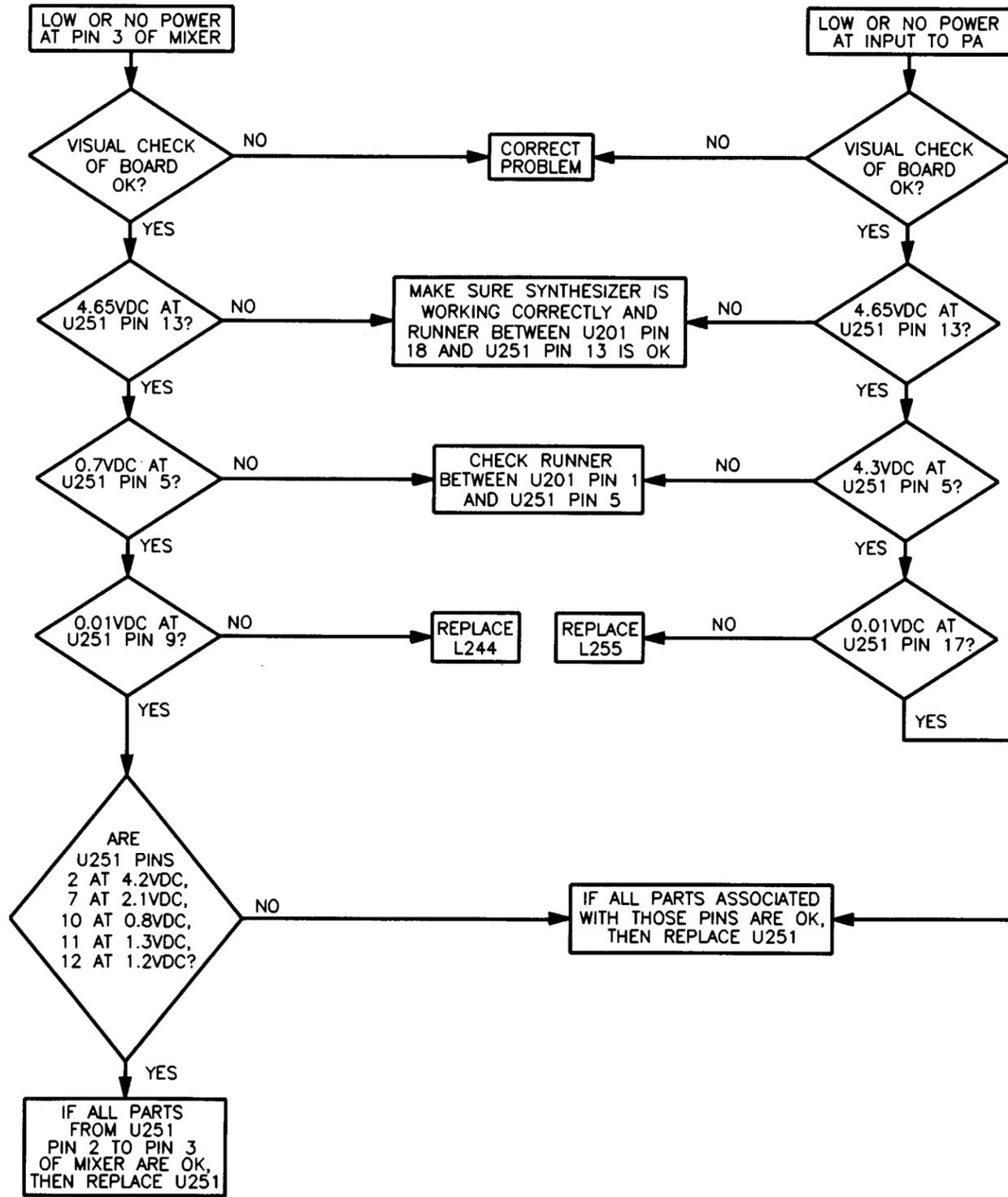


IMPORTANT:
U201 AND Y201 ARE NOT FIELD-REPLACEABLE

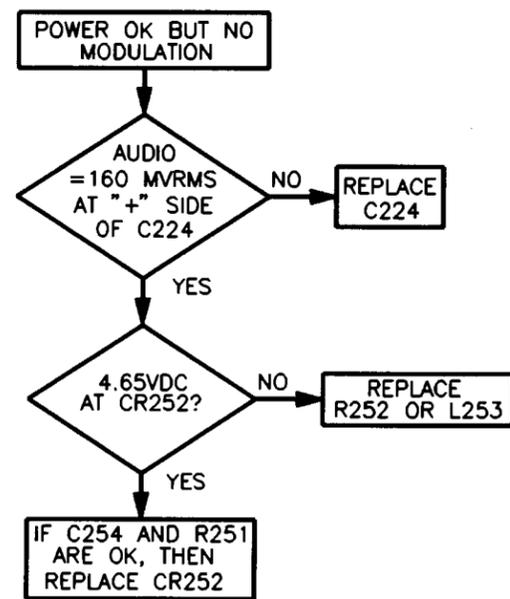
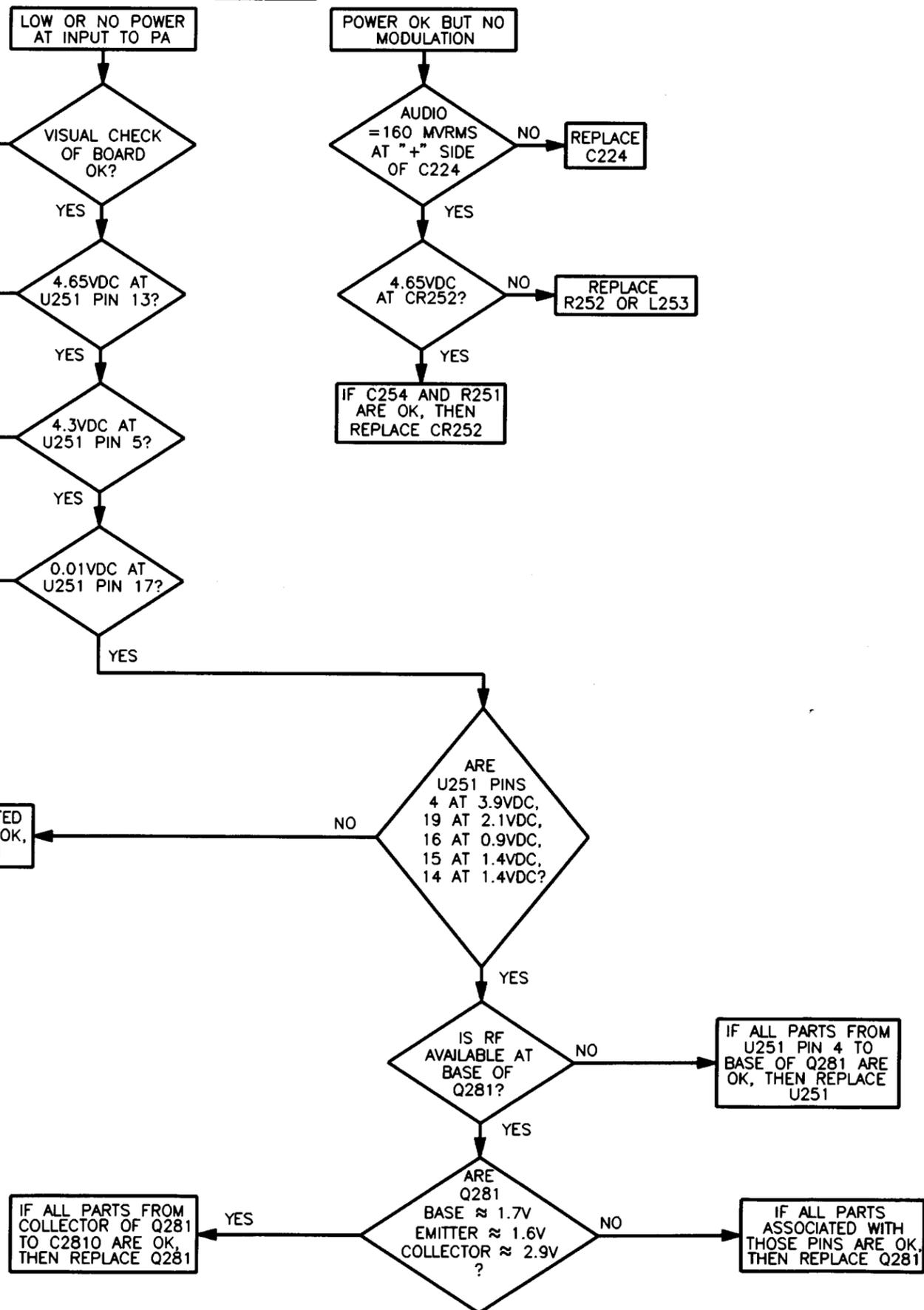
RPD-95106-0

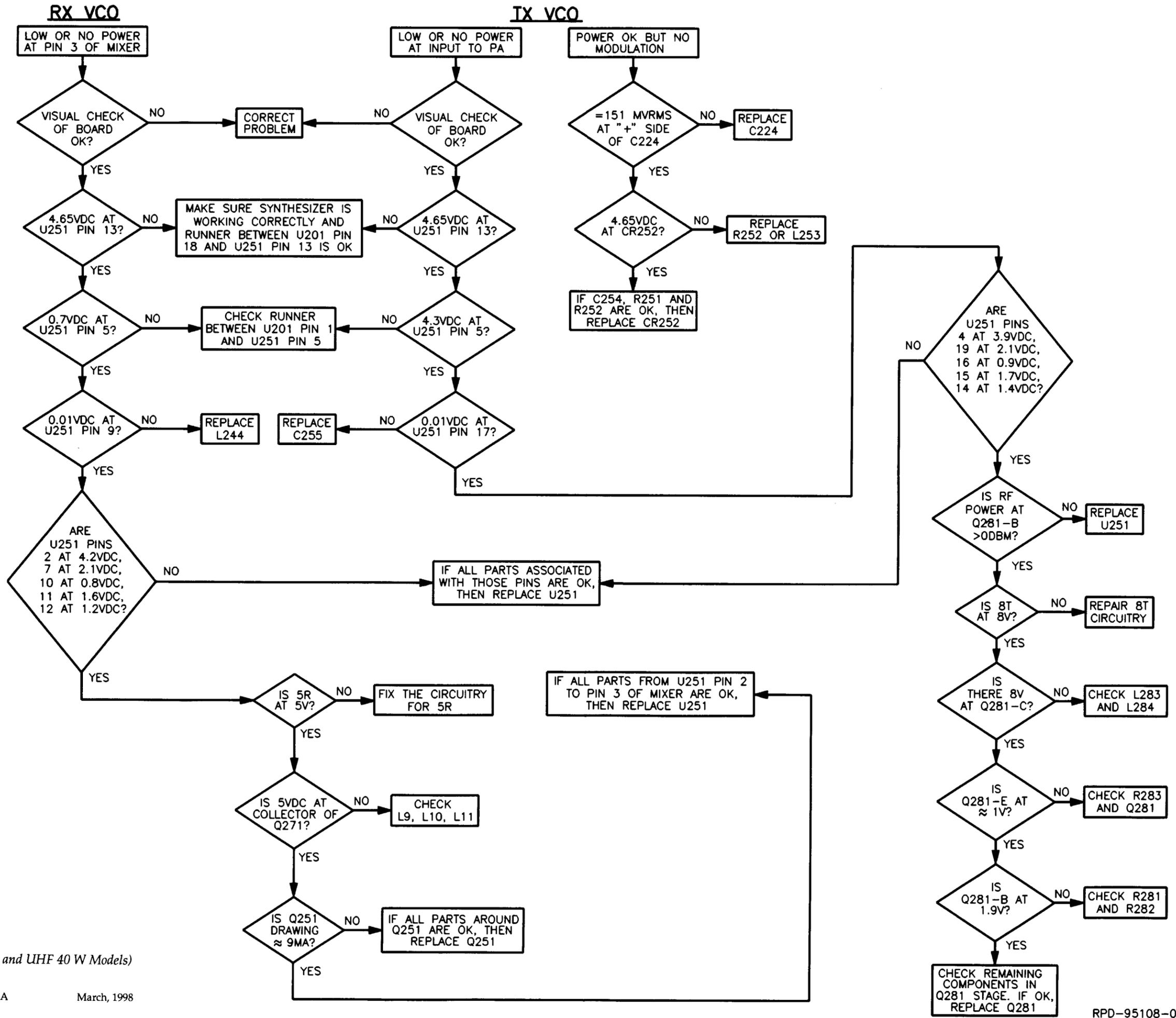
Troubleshooting Flow Chart for Synthesizer (VHF 40 W, UHF 25 W, and UHF 40 W Models)

RX VCO

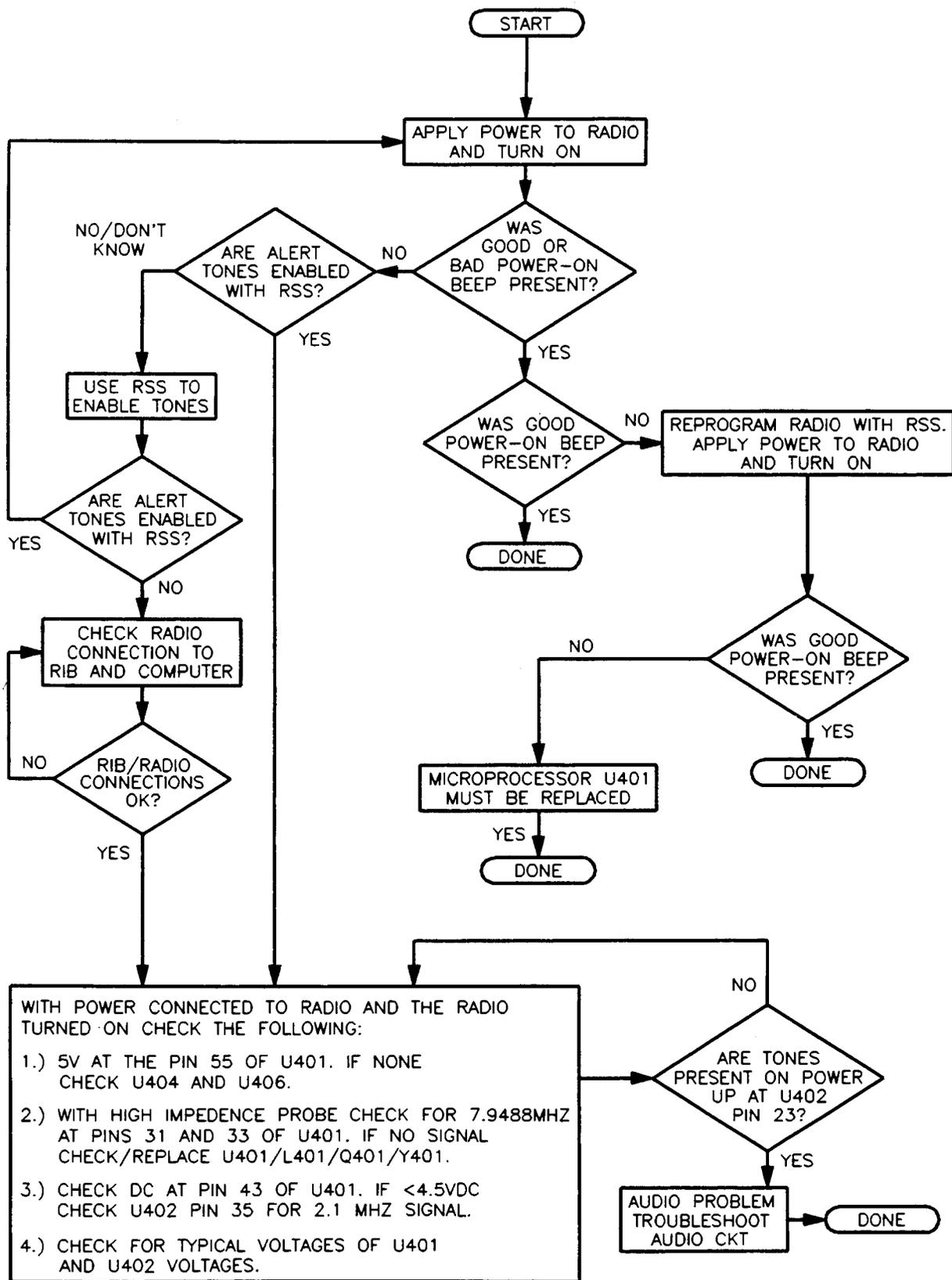


TX VCO





Troubleshooting Flow Chart for VCO (VHF 40 W, UHF 25 W, and UHF 40 W Models)

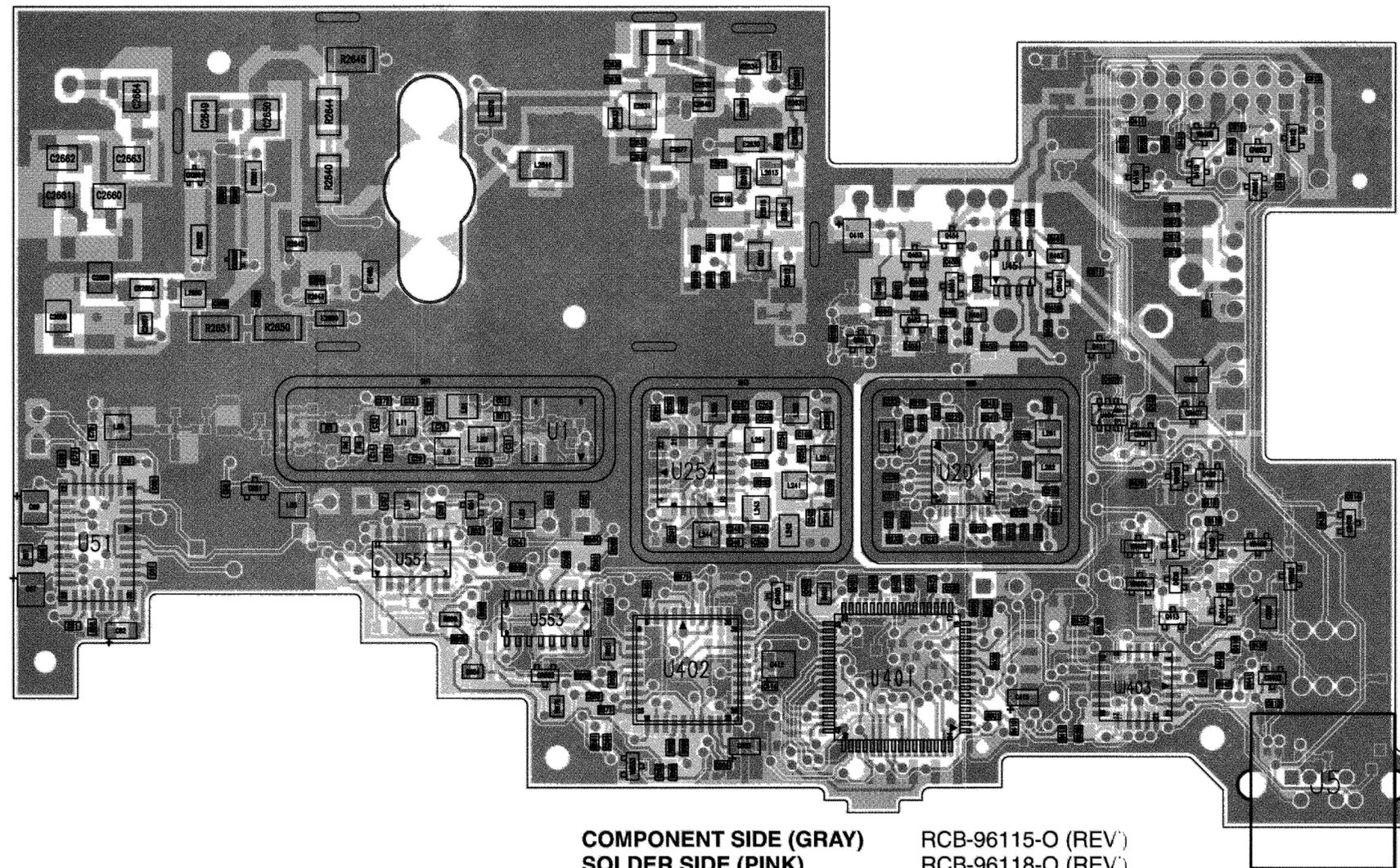


RPD-95109-0

*Troubleshooting Flow Chart
for Microprocessor (all models)*

MOTOROLA P/N 8404787J01 REV O

21 DECEMBER 1995



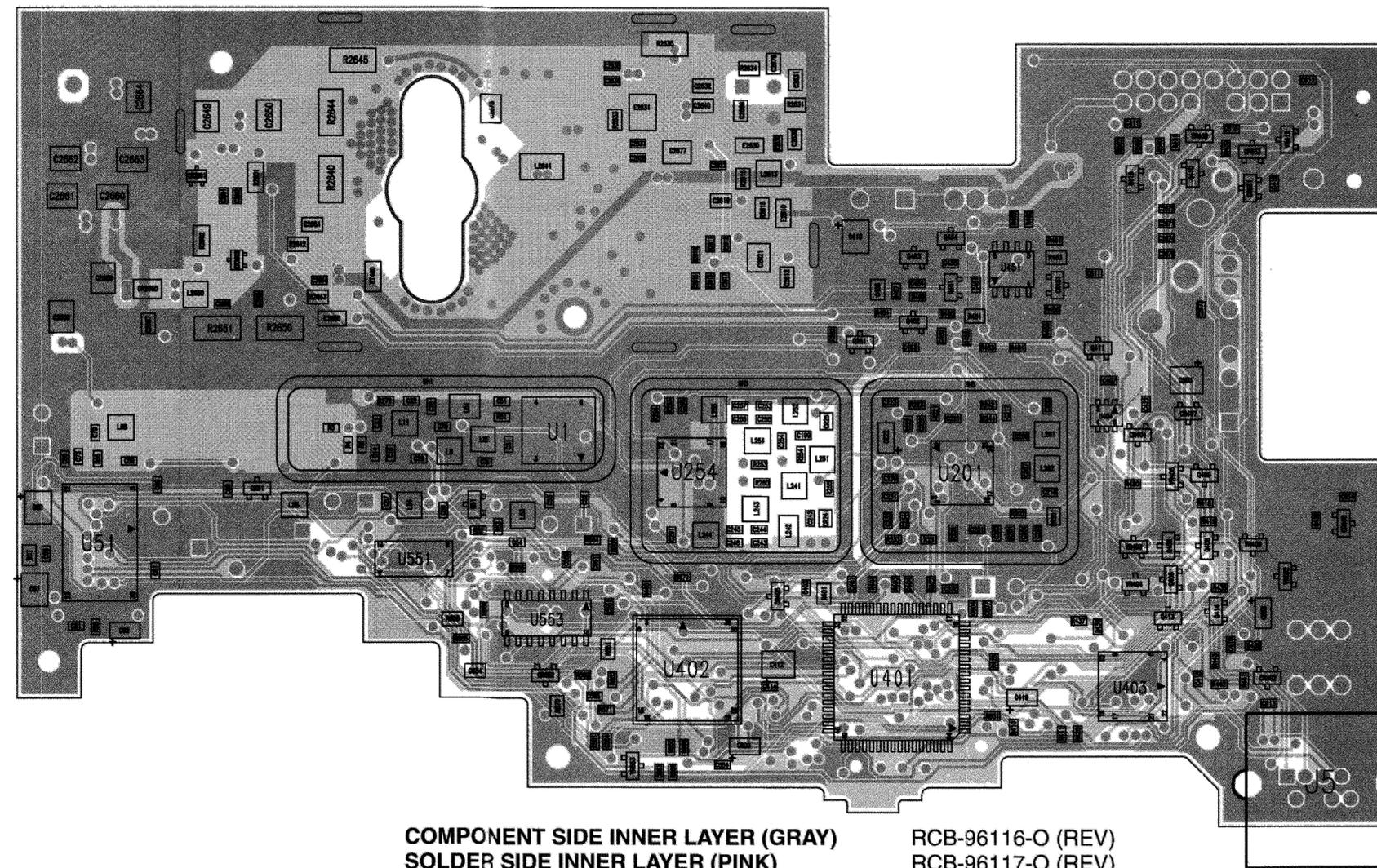
COMPONENT SIDE (GRAY)
SOLDER SIDE (PINK)
OVERLAY ----

RCB-96115-O (REV)
RCB-96118-O (REV)
RCB-96120-O

SOLDER SIDE VIEW

MOTOROLA P/N 8404787J01 REV O

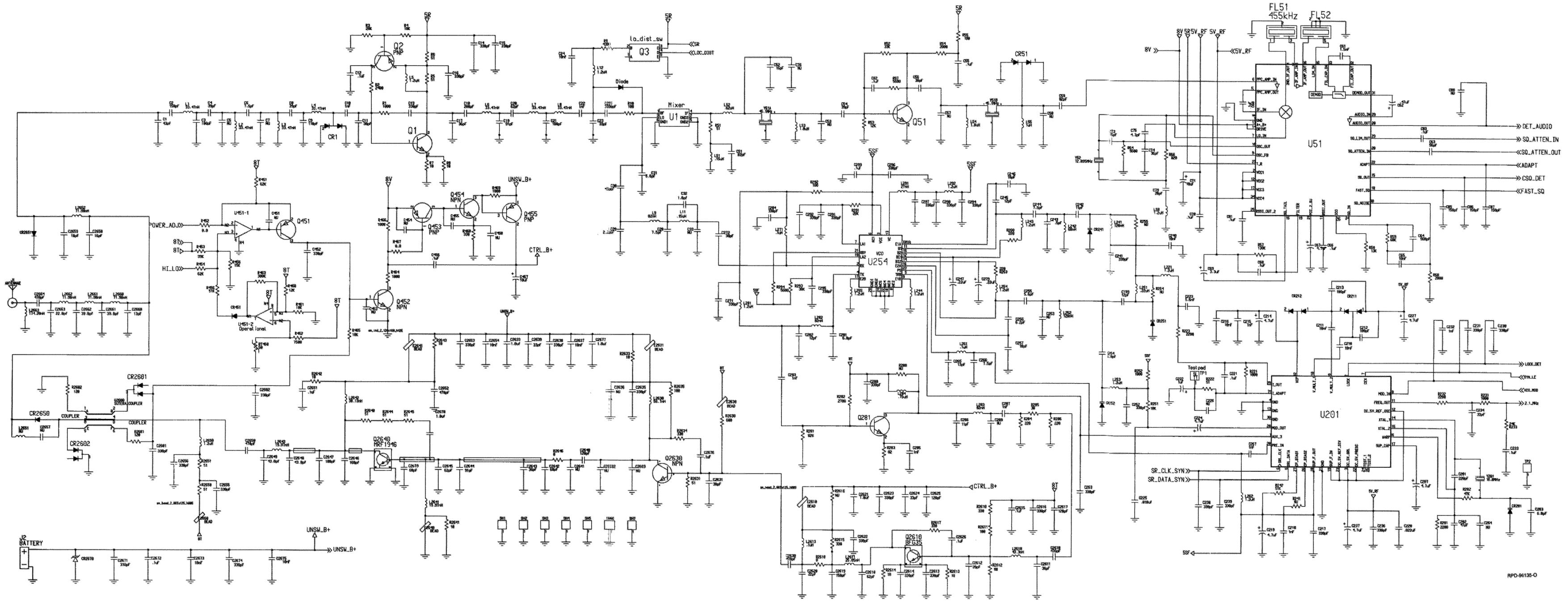
21 DECEMBER 1995



COMPONENT SIDE INNER LAYER (GRAY)
SOLDER SIDE INNER LAYER (PINK)
OVERLAY ----

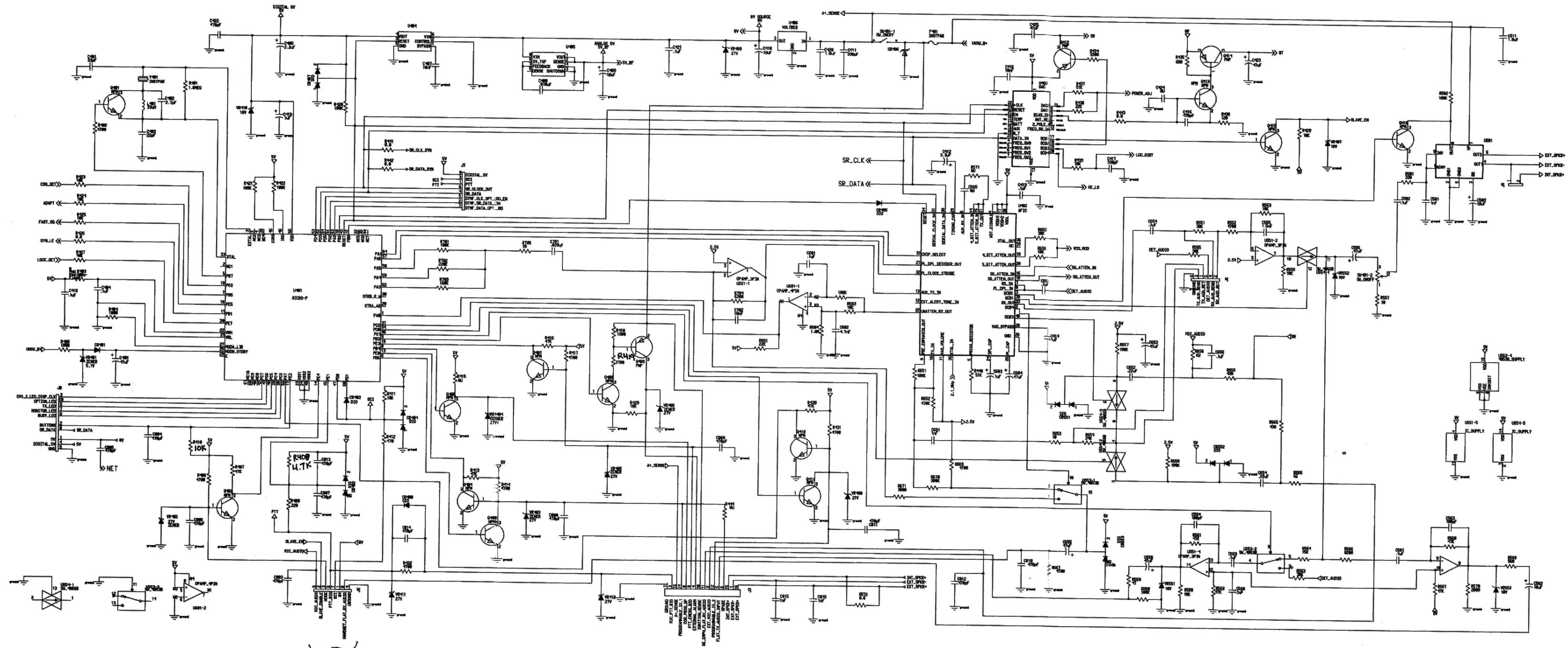
RCB-96116-O (REV)
RCB-96117-O (REV)
RCB-96120-O

SOLDER SIDE VIEW



RPD-96135-0

Schematic Diagram for
 VHF Main Boards, 136-156 MHz, 12.5 & 20/25/30 kHz, 10-25 W
 (Part of PMUD1024A, PMUD1042A, PMUD1025A, PMUD1043A Radios)
 (Sheet 1 of 2)



Schematic Diagram for
 VHF Main Boards, 136-156 MHz, 12.5 & 20/25/30 kHz, 10-25 W
 (Part of PMUD1024A, PMUD1042A, PMUD1025A, PMUD1043A Radios)
 (Sheet 2 of 2)

MIC

ACCESSORY

Parts List

SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 12.5 kHz (N)
 (used in PMUD1024 and PMUD1142)
 SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 20/25/30 kHz (W)
 (used in PMUD1025 and PMUD1143) PL-961020-A

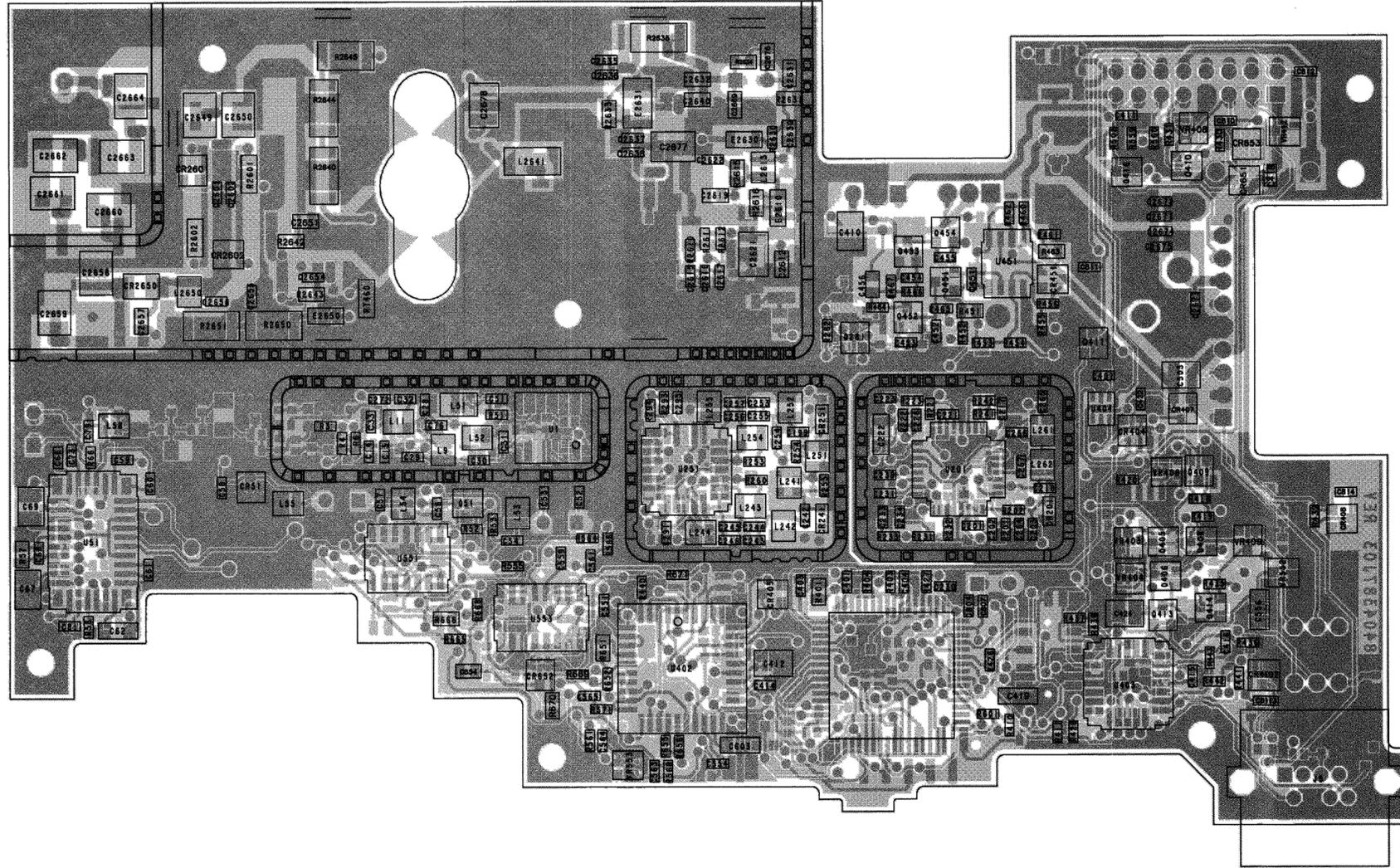
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740F42	capacitor, fixed: ±5%; 50 V; unless otherwise stated
C2	21-13740F52	43 pF
C3	21-13740F55	150 pF
C4	21-13740F51	100 pF
C5	21-13740F41	39 pF
C6	21-13740F24	Not Used
C7	---	7.5 uF ±10%; 25 pF
C8	21-13740F41	39 pF
C9	21-13740F52	110 pF
C10	21-13741F25	1000 pF
C11	21-13740F38	30 pF
C12	21-13743K15	0.1 uF ±10%; 16 V
C13 thru 16	21-13741F13	330 pF
C17	21-13740F40	36 pF
C18	21-13740F24	200 pF
C19	21-13740F50	91 pF
C20	21-13740F46	62 pF
C21	21-13740F51	100 pF
C22	21-13741F25	1000 pF
C23	21-13740F39	33 pF
C24	21-13741F29	.01 uF
C25	21-13741F13	330 pF
C28	21-13740F24	7.5 uF ±10%; 25 pF
C29	21-13740F11	2.2 uF ±10%; 25 pF
C30	21-13740F42	43 pF
C31	21-13740F21	5.6 uF ±10%; 25 pF
C32	21-13740F03	1.0 uF ±10%; 25 pF
C33	---	Not Used
C51	21-13740F49	82 pF
C52 (N)	21-13740F31	15 pF
C52 (W)	21-13740F32	16 pF
C53	---	Not Used
C54 (N)	21-13740F46	62 pF
C54 (W)	21-13740F41	39 pF
C55	21-13741K15	0.1 uF ±10%; 16 V
C56 (N)	21-13740F52	43 pF
C56 (W)	21-13740F38	30 pF
C57, 58	---	Not Used
C59 (N)	21-13740F51	100 pF
C59 (W)	21-13740F49	82 pF
C60	21-13743K15	0.1 uF ±10%; 16 V
C61	21-13741F29	1500 pF
C62	23-11049A05	tantalum 0.47 uF ±10%; 25 V
C63 (N)	21-13740F40	36 pF
C63 (W)	21-13740F45	56 pF
C64 (N)	21-13740A79	1000 pF
C64 (W)	21-13740A73	560 pF
C65	21-13741F49	.01 uF
C66	21-13743K15	0.1 uF ±10%; 16 V
C67	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C68	21-13743K15	0.1 uF ±10%; 16 V
C69	23-11049J07	tantalum 3.3 uF ±10%; 20 V
C70	21-13743K15	0.1 uF ±10%; 16 V
C71	23-11049A57	tantalum 10 uF ±10%; 16 V
C73	21-13740F31	15 pF
C74	21-13740F40	36 pF
C75	21-13740F18	4.3 uF ±10%; 25 pF
C76	---	Not Used
C79	21-13740F34	20 pF
C80	---	Not Used
C81 thru 83	21-13743K15	0.1 uF ±10%; 16 V
C85 thru 87	21-13740F55	150 pF
C199	21-13740F29	12 pF
C201	21-13740F59	220 pF
C202	21-13740F43	47 pF
C203	21-13740L14	6.8 uF ±10%; 16 V
C207	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C210, 211	21-13741F49	.01 uF
C212, 213	21-13740F51	100 pF
C214	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C215	21-13741F25	1000 pF
C216	21-13741F49	.01 uF
C217	21-13741F13	330 pF
C218	21-13741F25	1000 pF
C219	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C221	21-13743K15	0.1 uF ±10%; 16 V
C222	23-11049A07	tantalum 1 uF ±10%; 16 V
C223	21-13741F43	5.6 uF ±10%; 25 pF
C224	23-11049J11	tantalum 4.7 uF ±10%; 16 V

SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 12.5 kHz (N)
 (used in PMUD1024 and PMUD1142)
 SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 20/25/30 kHz (W)
 (used in PMUD1025 and PMUD1143) PL-961020-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C225	21-13741A51	.018 uF
C226	---	Not Used
C227	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C228	21-13743E07	.022 uF ±10%; 16 V
C230, 231	21-13741F13	330 pF
C232	21-13741F25	1000 pF
C233	21-13743K15	0.1 uF ±10%; 16 V
C234	21-13740F39	33 pF
C236	21-13741F13	330 pF
C237	23-11049J11	tantalum 4.7 uF ±10%; 16 V
C238, 239	21-13741F13	330 pF
C240	21-13741F49	.01 uF
C241	21-13741F13	330 pF
C242	21-13740E28	11 pF
C243	21-13740F01	0.5 uF ±10%; 16 V
C244	21-13740F24	7.5 uF ±10%; 25 pF
C245	21-13740F29	12 pF
C246	21-13740F39	18 pF
C247	23-11049A03	tantalum 0.22 uF ±10%; 35 V
C252	21-13741F13	330 pF
C253	---	Not Used
C254	21-13740F10	2 uF ±10%; 25 pF
C255	21-13740F21	5.6 pF
C256	21-13740F22	6.2 uF ±10%; 25 pF
C257	21-13740F39	18 pF
C263	21-13741F13	330 pF
C264	---	Not Used
C265	21-13740F30	13 pF
C266	21-13740F24	7.5 uF ±10%; 25 pF
C267	21-13741F25	1000 pF
C271	21-13741F13	330 pF
C272	21-13740F38	30 pF
C279	23-11049A03	tantalum 0.22 uF ±10%; 35 V
C281	21-13740F29	6.8 uF ±10%; 25 pF
C282	21-13740F29	12 pF
C283	21-13741F25	1000 pF
C284	21-13741F13	330 pF
C285	21-13741F25	1000 pF
C286	21-13740F28	11 pF
C287	21-13741F25	1000 pF
C288	21-13741F13	330 pF
C289	---	Not Used
C291, 292	21-13741F13	330 pF
C294 thru 298	21-13741F13	330 pF
C299	21-13743K15	0.1 uF ±10%; 16 V
C401	21-13740F39	35 pF
C402	21-13740F35	2.7 uF ±10%; 25 pF
C403	21-13740F35	22 pF
C404	21-13743K15	tantalum 1 uF ±10%; 16 V
C405	23-11049J43	tantalum 4.7 uF ±10%; 16 V
C406	23-11049A40	tantalum 2.2 uF ±10%; 10 V
C407	21-13741F49	.01 uF
C408	21-13741A51	.018 uF
C409, 410	23-11049A57	tantalum 10 uF ±10%; 16 V
C411	21-13741F13	330 pF
C412	23-11049J07	tantalum 3.3 uF ±10%; 20 V
C413, 414	21-13743K15	tantalum 1 uF ±10%; 16 V
C415	21-13741F49	.01 uF
C416	21-13741F17	470 pF
C417	21-13741F13	330 pF
C418	21-13743K15	0.1 uF
C419	23-11049A07	tantalum 1 uF ±10%; 16 V
C420	21-13741W01	1 uF ±10%; 25 V
C421	21-13743K15	.01 uF
C422	21-13741F17	470 pF
C423	23-11049J43	tantalum 4.7 uF ±10%; 10 V
C424	---	Not Used
C425	21-13740F43	47 pF
C451	---	Not Used
C452	21-13741F13	330 pF
C453 thru 455	21-13741F13	330 pF
C456	21-13743A19	0.1 uF ±10%; 16 V
C457	23-80090M24	lytic 10 uF ±20%; 25 V
C458	---	Not Used
C501	21-13741F25	1000 pF
C502	21-13743K15	0.1 uF ±10%; 16 V
C503	23-11049A57	tantalum 10 uF ±10%; 16 V
C511	21-13741W01	1 uF ±10%; 25 V
C512	21-13743K15	0.1 uF ±10%; 16 V
C554	21-13743K15	0.1 uF ±10%; 16 V
C555	21-13741F29	1500 pF

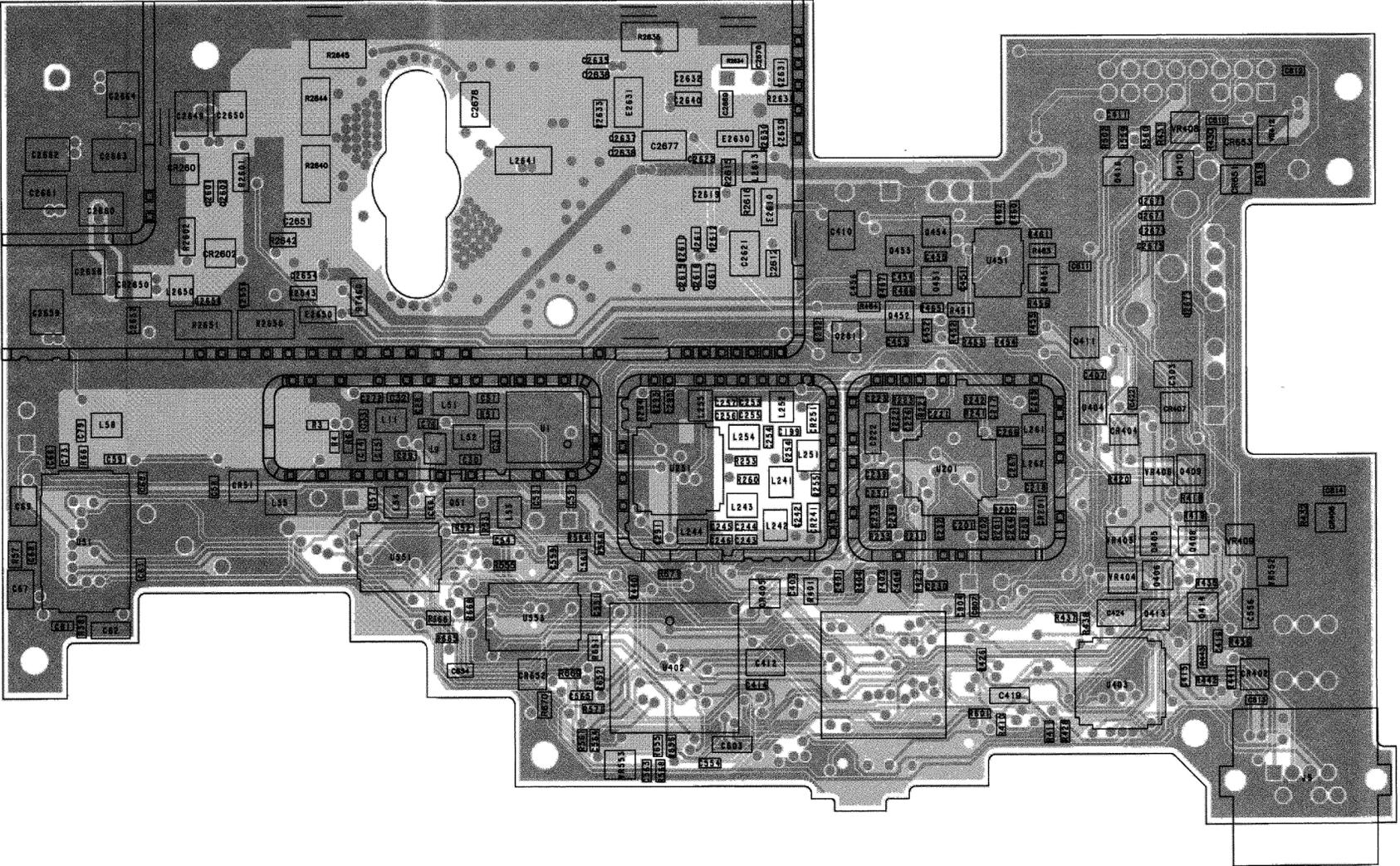
SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 12.5 kHz (N)
 (used in PMUD1024 and PMUD1142)
 SM50/SM120 VHF Main Board, 136-156 MHz, 10-25 W, 20/25/30 kHz (W)
 (used in PMUD1025 and PMUD1143) PL-961020-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C556	23-11049A05	tantalum 0.47 uF ±10%; 25 V
C558	23-11049J43	tantalum 4.7 uF ±10%; 10 V
C559 thru 561	21-13743K15	0.1 uF ±10%; 16 V
C562	23-11049A57	tantalum 10 uF ±10%; 16 V
C563, 564	21-13740F51	100 pF
C565	---	Not Used
C601	21-13743K15	0.1 uF ±10%; 16 V
C602	21-13741F41	470 pF
C603	23-11049A07	tantalum 1 uF ±10%; 16 V
C604	23-11049A05	tantalum 0.47 uF ±10%; 25 V
C651	21-13741F25	1000 pF
C652	21-13743F08	0.22 uF +80/-20%; 16 V
C653	23-11049J43	tantalum 4.7 uF ±10%; 10 V
C654	21-13743F08	0.22 uF +80/-20%; 16 V
C655	23-11049J43	tantalum 4.7 uF ±10%; 10 V
C656	21-13743K15	0.1 uF ±10%; 16 V
C701	21-13741A59	.039 uF
C702	21-13741F49	.01 uF
CR803 thru 814	21-13741F17	470 pF
CR815, 816	21-13741F25	1000 pF
CR801, 2602	21-13741F13	330 pF
CR211	21-13740A42	36 pF
CR212	21-13740A36	20 pF
E2613, 2614	21-13741F13	330 pF
E2615	21-13743K15	0.1 uF ±10%; 16 V
E2616	21-13741F13	330 pF
E2617	21-13740F53	120 pF
E2618	21-13740A50	62 pF
E2619	21-13740A59	150 pF
E2620	21-13740A37	22 pF
E2621	21-13741W01	1 uF ±10%; 25 V
E2622, 2623	21-13741F13	330 pF
E2624	21-13740F39	33 pF
E2625	21-13740F53	120 pF
E2626	21-13743A19	0.1 uF ±10%; 16 V
E2630	21-13740A71	470 pF
E2631	21-13740A40	30 pF
E2632	---	Not Used
E2633	21-13741W01	1 uF ±10%; 25 V
E2635	21-13741F13	330 pF
---	---	Not Used
J1	09-83228R01	connector, receptacle: non LHF coax
J2	30-04510J01	power cable assembly (includes J2)
J3	28-04503J01	16-pin, accessories
J4	09-04246J01	telephone type, 8 contact, microphone
J5	09-04424J05	6 pin, internal options audio
J6	09-04424J06	8-pin, internal options digital
J7	09-04422J01	10 pin, display board
J8	28-04423J01	2-pin, internal speaker
J9	---	Not Used
J10	---	Not Used
J11	---	Not Used
J12	---	Not Used
J13	---	Not Used
J14	---	Not Used
J15	---	Not Used
J16	---	Not Used
J17	---	Not Used
J18	---	Not Used
J19	---	Not Used
J20	---	Not Used
J21	---	Not Used
J22	---	Not Used
J23	---	Not Used
J24	---	Not Used
J25	---	Not Used
J26	---	Not Used
J27	---	Not Used
J28	---	Not Used
J29	---	Not Used
J30	---	Not Used
J31	---	Not Used
J32	---	Not Used
J33	---	Not Used
J34	---	Not Used
J35	---	Not Used
J36	---	Not Used
J37	---	Not Used
J38	---	Not Used
J39	---	Not Used
J40	---	Not Used
J41	---	Not Used
J42	---	Not Used
J43	---	Not Used
J44	---	Not Used
J45	---	Not Used
J46	---	Not Used
J47	---	Not Used
J48	---	Not Used
J49	---	Not Used
J50	---	Not Used
J51	---	Not Used
J52	---	Not Used
J53	---	Not Used
J54	---	Not Used
J55	---	Not Used
J56	---	Not Used
J57	---	Not Used
J58	---	Not Used
J59	---	Not Used
J60	---	Not Used
J61	---	Not Used
J62	---	Not Used
J63	---	Not Used
J64	---	Not Used
J65	---	Not Used
J66	---	Not Used
J67	---	Not Used
J68	---	Not Used
J69	---	Not Used
J70	---	Not Used
J71	---	Not Used
J72	---	Not Used
J73	---	Not Used
J74	---	



COMPONENT SIDE (GRAY) RCB-95108-O (REV)
SOLDER SIDE (PINK) RCB-95111-O (REV)
OVERLAY ----- RCB-95113-O

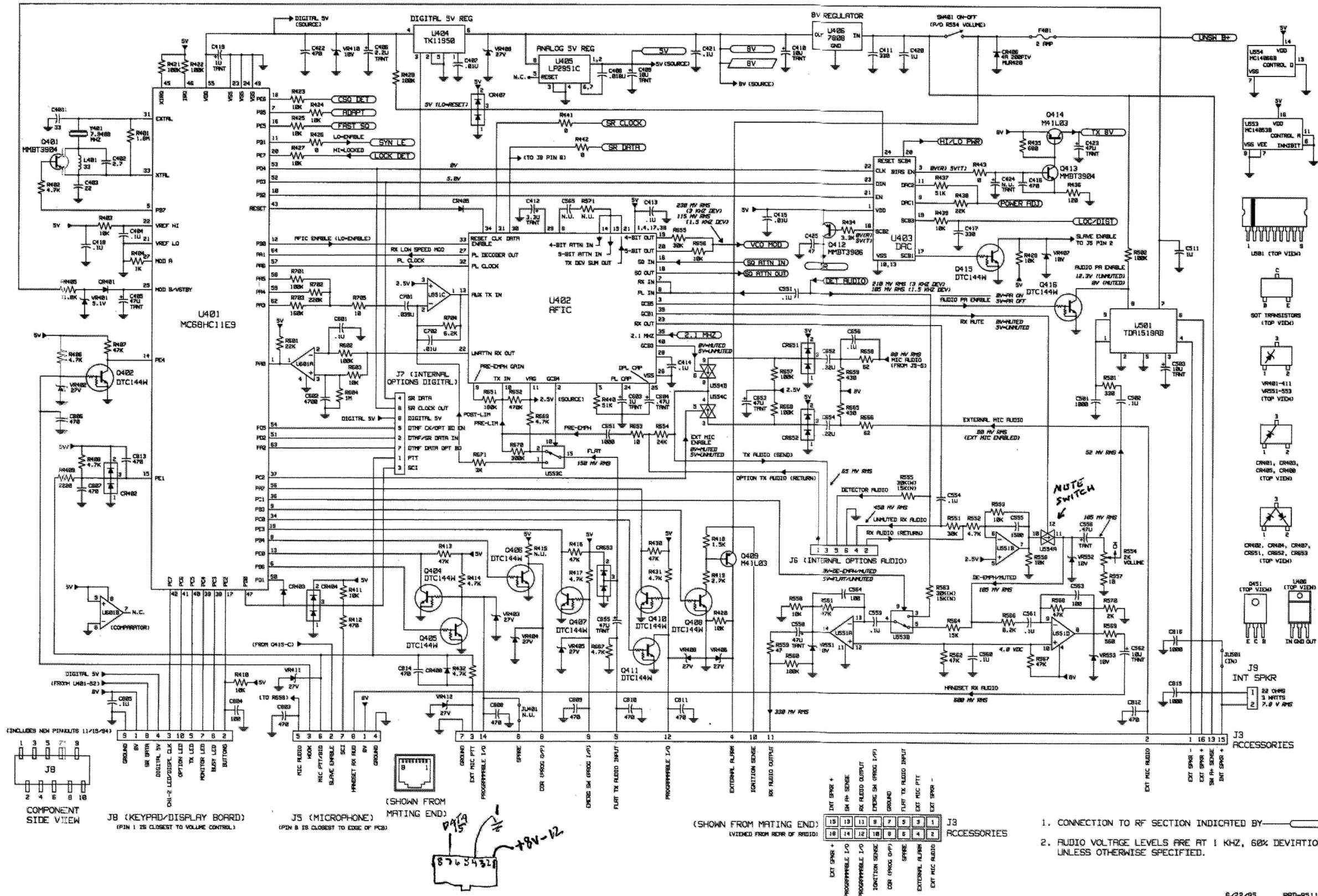
SOLDER SIDE VIEW



COMPONENT SIDE INNER LAYER (GRAY) RCB-95109-O (REV)
SOLDER SIDE INNER LAYER (PINK) RCB-95110-O (REV)
OVERLAY ----- RCB-95113-O

SOLDER SIDE VIEW

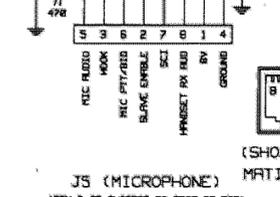
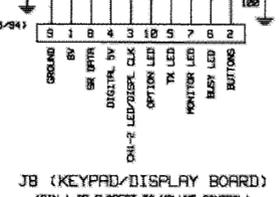
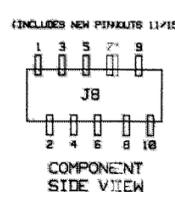
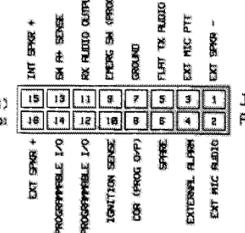
Circuit Board Details for
 VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 10-25 W
 (Part of PMUD1030A, PMUD1031A, PMUD1086A, and PMUD1087A Radios)



Schematic Diagram for VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 10-25 W (Part of PMUD1030A, PMUD1031A, PMUD1086A, and PMUD1087A Radios) (Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY _____
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

8763431
+8V-12



(SHOWN FROM MATING END)
(VIEWED FROM REAR OF RADIO)

(SHOWN FROM MATING END)

(PIN 8 IS CLOSEST TO EDGE OF PCB)

(PIN 1 IS CLOSEST TO VOLUME CONTROL)

J3 ACCESSORIES

J9 INT SPKR

CR482, CR484, CR487, CR551, CR552, CR553 (TOP VIEW)

CR481, CR485, CR486, CR488 (TOP VIEW)

CR483, CR489, CR490, CR491 (TOP VIEW)

CR484, CR485, CR486, CR487 (TOP VIEW)

CR488, CR489, CR490, CR491 (TOP VIEW)

CR492, CR493, CR494, CR495 (TOP VIEW)

Parts List

SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
12.5 kHz (N) (used in PMUD1030 & PMUD1086)
SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
20/25/30 kHz (W) (used in PMUD1031 & PMUD1087) PL-951009-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C1	21-13740F41	39 pF
C2	21-13740F53	120 pF
C3	21-13740F48	82 pF
C4	21-13740F39	33 pF
C5	---	Not Used
C6	21-13740F22	6.2 ±0.25 pF
C7	---	Not Used
C8	21-13740F38	30 pF
C9	21-13740F49	82 pF
C10	21-13740F25	1000 pF
C11	21-13740F36	24 pF
C12	21-13743K15	0.1 uF 10%; 16 V
C13 thru 16	21-13741F13	330 pF
C17	21-13740F40	36 pF
C18	21-13740F50	91 pF
C19	21-13740F49	82 pF
C20	21-13740F44	51 pF
C21	21-13740F50	91 pF
C22	21-13740F55	150 pF
C23	21-13740F38	30 pF
C24	21-13741F45	30 pF
C25	21-13741F13	330 pF
C28	21-13740F24	7.5 ±0.25 pF
C29	21-13740F11	2.2 ±0.25 pF
C30	21-13740F42	43 pF
C31	21-13740F21	5.6 ±0.25 pF
C32	21-13740F03	1 ±0.25 pF
C33	---	Not Used
C51	21-13740F49	82 pF
C52(N)	21-13740F31	15 pF
C52(W)	21-13740F32	16 pF
C53	---	Not Used
C54(N)	21-13740F46	62 pF
C54(W)	21-13740F41	39 pF
C55	21-13743K15	0.1 uF 10%; 16 V
C56(N)	21-13740F42	43 pF
C56(W)	21-13740F38	30 pF
C57, 58	---	Not Used
C59(N)	21-13740F51	100 pF
C59(W)	21-13740F49	82 pF
C60	21-13743K15	0.1 uF 10%; 16 V
C61	21-13741F29	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740F40	36 pF
C63(W)	21-13740F45	56 pF
C64(N)	21-13740A79	1000 pF
C64(W)	21-13740A73	560 pF
C65	21-13741F49	30 pF
C66	21-13743K15	0.1 uF 10%; 16 V
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743K15	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743K15	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740F31	15 pF
C74	21-13740F40	36 pF
C75	21-13740F18	4.3 ±0.25 pF
C76	---	Not Used
C79	21-13740F34	20 pF
C80	---	Not Used
C81 thru 83	21-13743K15	0.1 uF 10%; 16 V
C85 thru 87	21-13740F55	150 pF
C199	21-13740F31	15 pF
C201	21-13740F59	220 pF
C202	21-13740F43	4.7 pF
C203	21-13740L14	6.8 ±0.1 pF
C207	23-11049J11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741F49	.01 uF
C212, 213	21-13740F51	100 pF
C214	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13741F25	1000 pF
C216	21-13741F49	.01 uF
C217	21-13741F13	330 pF
C218	21-13741F25	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C221	21-13743K15	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741F43	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V

SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
12.5 kHz (N) (used in PMUD1030 & PMUD1086)
SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
20/25/30 kHz (W) (used in PMUD1031 & PMUD1087) PL-951009-A

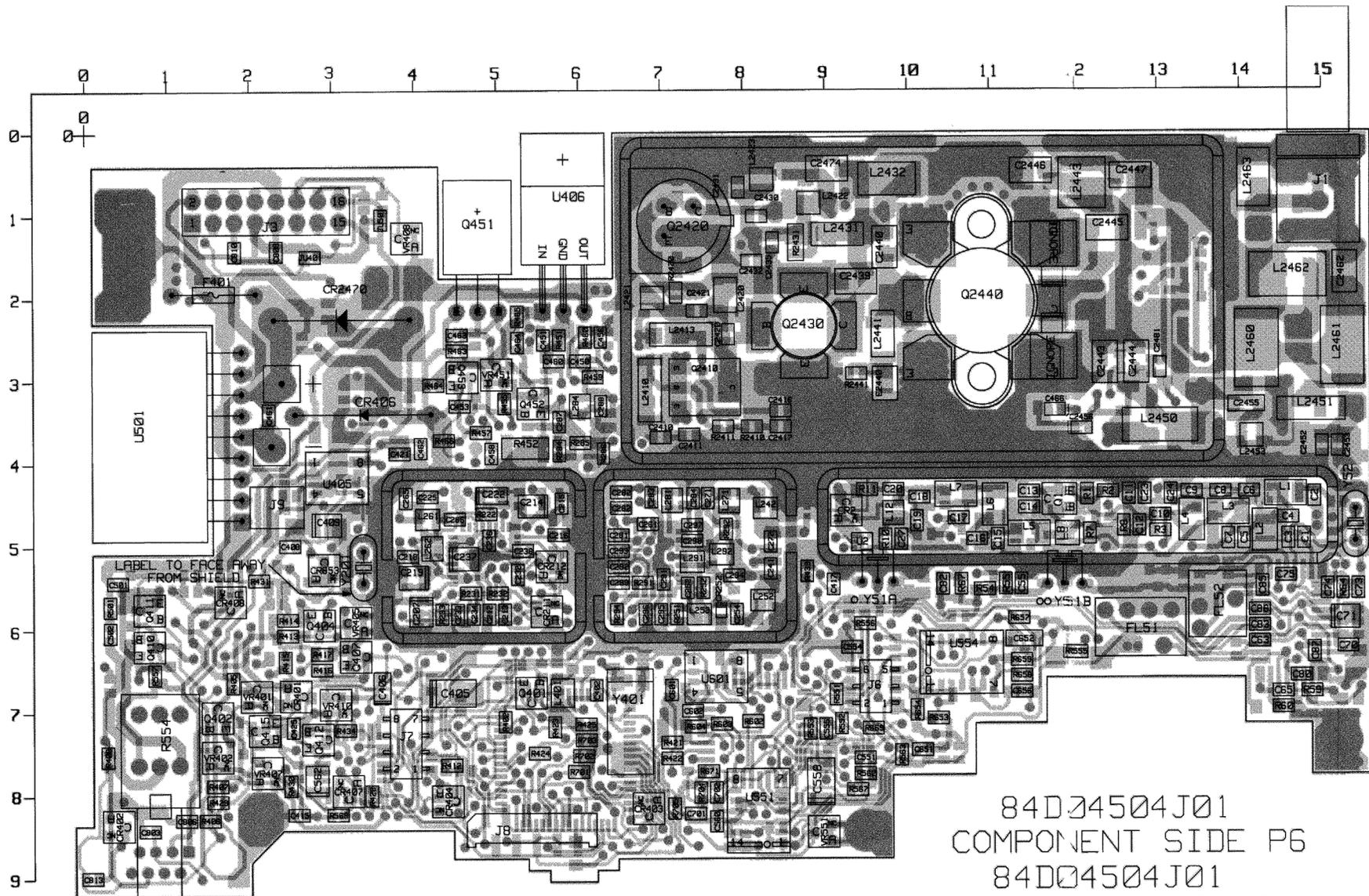
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C225	21-13741A51	.018 uF
C226	---	Not Used
C227	23-11049J11	tantalum 4.7 uF 10%; 16 V
C228	21-13743E07	322 uF 10%; 16 V
C229, 231	21-13741F13	330 pF
C232	21-13741F25	1000 pF
C233	21-13743K15	0.1 uF 10%; 16 V
C234	21-13740F39	33 pF
C236	21-13741F13	330 pF
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238	21-13741F13	330 pF
C239	21-13741F17	330 pF
C240	21-13741F49	.01 uF
C241	21-13741F13	330 pF
C242	21-13740F24	11 pF
C243	21-13740F01	0.5 ±0.1 pF
C244	21-13740F29	7.5 ±0.25 pF
C245	21-13740F24	12 pF
C246	21-13740F33	18 pF
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C252	21-13741F13	330 pF
C253	---	Not Used
C254	21-13740F10	2 ±0.25 pF
C255	21-13740F20	5.6 ±0.25 pF
C256	21-13740F24	6.2 ±0.25 pF
C257	21-13740F38	18 pF
C263	21-137401F13	330 pF
C264	---	Not Used
C265	21-13740F30	13 pF
C266	21-13740F24	7.5 ±0.25 pF
C267	21-13741F25	1000 pF
C271	21-13741F13	330 pF
C272	21-13740F83	120 pF
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740F23	6.8 ±0.25 pF
C282	21-13740F29	12 pF
C283	21-13740F39	33 pF
C284	21-13741F13	330 pF
C285	21-13741F25	1000 pF
C286	21-13740F28	11 pF
C287	21-13741F25	1000 pF
C288	21-13741F13	330 pF
C289	---	Not Used
C291	21-13741F13	330 pF
C292	21-13741F13	330 pF
C294 thru 298	21-13741F13	330 pF
C299	21-13743K15	0.1 uF 10%; 16 V
C401	21-13740F39	33 pF
C402	21-13740F13	2.7 ±0.25 pF
C403	21-13740F35	22 pF
C404	21-13743K15	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 4.7 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741F49	.01 uF
C408	21-13741A51	.018 uF
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13741F13	330 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743K15	.1 uF 10%; 16 V
C415	21-13741F49	.01 uF
C416	21-13741F17	470 pF
C417	21-13741F13	330 pF
C418	21-13743K15	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743K15	0.1 uF 10%; 16 V
C422	21-13741F17	470 pF
C423	23-11049J43	tantalum 4.7 uF 10%; 10 V
C424	---	Not Used
C425	21-13740F43	47 pF
C451	---	Not Used
C452	21-13741F13	330 pF
C453 thru 455	---	Not Used
C456	21-13743A19	0.1 uF 10%; 16 V
C457	23-80090M24	lytic 10 uF 20%; 25 V
C458	21-13741F25	1000 pF
C501	21-13741F25	1000 pF
C502	21-13743K15	0.1 uF 10%; 16 V
C503	23-11049A07	tantalum 1 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C551	21-13743K15	0.1 uF 10%; 16 V

SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
12.5 kHz (N) (used in PMUD1030 & PMUD1086)
SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
20/25/30 kHz (W) (used in PMUD1031 & PMUD1087) PL-951009-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C554	21-13743K15	0.1 uF 10%; 16 V
C555	21-13741F25	1000 pF
C556	23-11049A05	tantalum 0.47 uF 10%; 25 V
C558	23-11049J43	tantalum 4.7 uF 10%; 10 V
C559 thru 561	21-13743K15	0.1 uF 10%; 16 V
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740F51	100 pF
C565	---	Not Used
CR201	21-13743K15	0.1 uF 10%; 16 V
CR211, 212	21-13741F41	4700 pF
CR241	48-62624C03	tantalum 1 uF 10%; 16 V
CR251	23-11049A05	tantalum 0.47 uF 10%; 25 V
CR252	48-62624C01	1000 pF
CR401	48-05129M76	silicon varactor SOT 1SV292
CR402	21-13743F08	0.22 uF +80/-20%; 16 V
CR403	23-11049J43	tantalum 4.7 uF 10%; 10 V
CR404	21-13743F08	0.22 uF +80/-20%; 16 V
CR405	48-05129M76	silicon varactor SOT 1SV292
CR406	48-83553T12	4.0 200 PIV MUR420
CR407	48-13833C07	dual silicon SOT MMBD7000
CR408	48-05129M76	silicon SOT
CR451	48-05129M76	silicon SOT
CR651 thru 653	21-13743K15	0.1 uF 10%; 16 V
CR2601, 2602	48-05218N57	dual silicon SOT
CR2650, 2651	48-02482J02	silicon PIN M44P1250
CR2670	48-80236E07	transient suppressor
E2610	21-13740A71	470 pF
E2611	21-13740A39	27 pF
E2612	21-13740A43	39 pF
E2613, 2614	21-13741F13	330 pF
E2615	21-13743K15	0.1 uF 10%; 16 V
E2616	21-13741F13	330 pF
E2617	21-13740F83	120 pF
E2618	21-13740A41	33 pF
E2619	21-13740A59	150 pF
E2620	21-13740A37	22 pF
E2621	21-13741W01	1 uF 10%; 25 V
E2622, 2623	21-13741F13	330 pF
E2624	21-13740F39	33 pF
E2625	21-13740F58	120 pF
E2626	21-13743A19	0.1 uF 10%; 16 V
E2630	21-13740A71	470 pF
E2631	21-13740A40	30 pF
E2632	21-13740A40	30 pF
E2633	21-13741W01	1 uF 10%; 25 V
E2635	21-13741F13	330 pF
E2636	21-13743K15	0.1 uF 10%; 16 V
E2637	21-13740F39	33 pF
E2638	21-13741F13	330 pF
E2639	21-13740F39	33 pF
E2640	21-13740A57	120 pF
E2641	21-13740A37	22 pF
E2642	21-13740A48	51 pF
E2643	21-13740A51	68 pF
E2644	21-13740A55	100 pF
E2645	21-13740A51	68 pF
E2646	21-11078B46	180 pF 100 V
E2647	21-80060M19	10 pF 500 V
E2648	21-11078B42	1 uF 10%; 16 V
E2649	21-11078B52	39 pF 100 V
E2650	21-11078B59	470 pF 100 V
E2651	21-13743A19	0.1 uF 10%; 16 V
E2652	21-13740A71	470 pF
E2653	21-13741F13	330 pF
E2654	21-83411F63	0.15 uH 5% shielded
E2655	21-13741F13	330 pF
E2656	24-62587X63	chip 0.82 uH 5%
E2657	24-62587N71	chip 1.8 uH 5%
E2658, 2659	21-11078B19	16 pF 100 V
E2660	21-80060M22	13 pF 500 V
E2661	21-11078B32	39 pF 100 V
E2662	21-80060M32	36 pF 500 V
E2663	21-11078B15	16 pF 100 V
E2664	21-11078B59	470 pF 100 V
E2669	21-13740A34	16 pF
E2671	21-13741F13	330 pF
E2672	21-13743K15	0.1 uF 10%; 16 V
E2673	21-13741F49	.01 uF
E2674	21-13741F49	.01 uF
E2675	21-13741F49	.01 uF
E2676	21-13743A19	0.1 uF 10%; 16 V

SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
12.5 kHz (N) (used in PMUD1030 & PMUD1086)
SM50/SM120 VHF Main Board, 150-170 MHz, 10-25 W
20/25/30 kHz (W) (used in PMUD1031 & PMUD1087) PL-951009-A

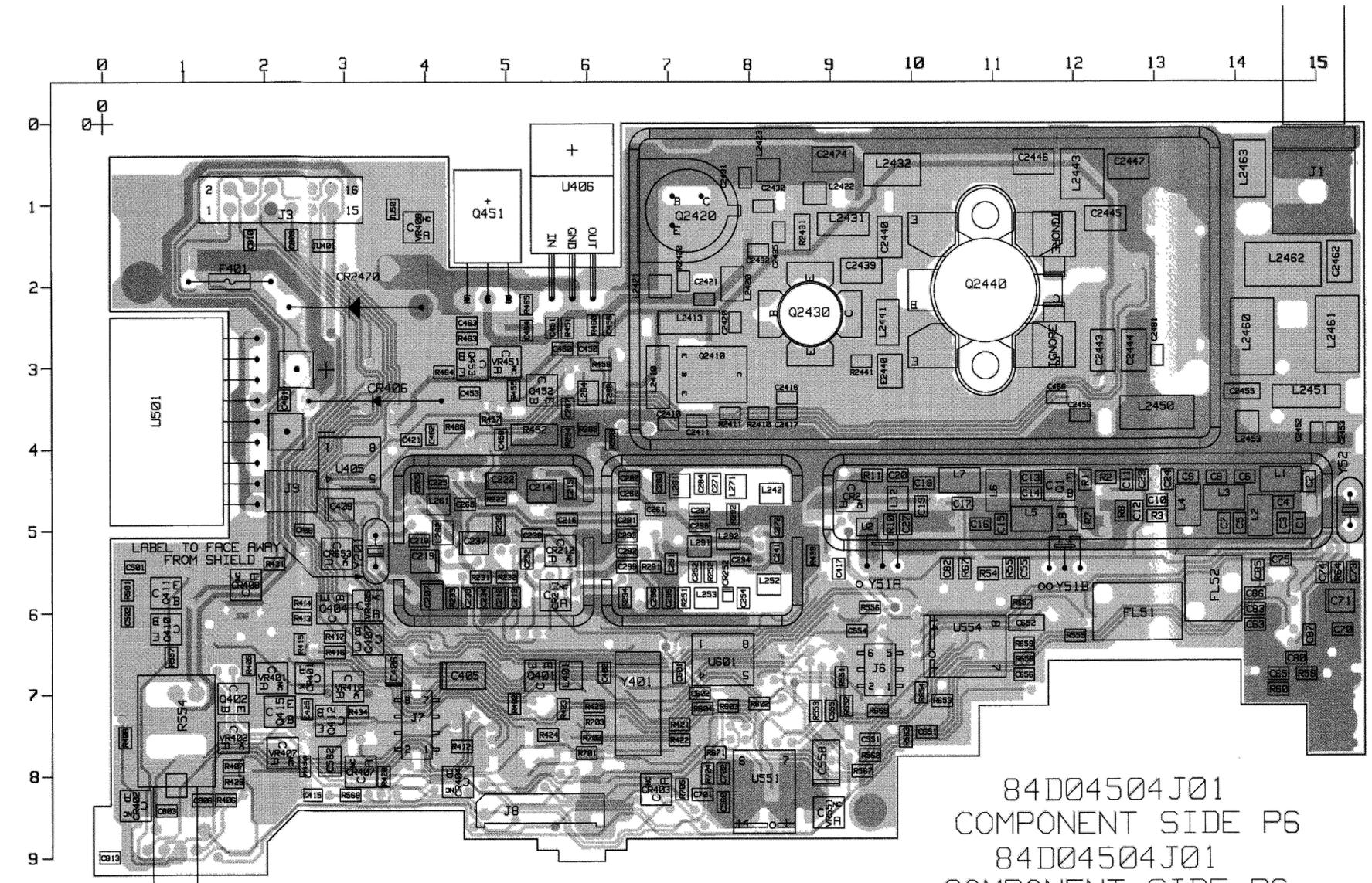
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C2677, 2678	21-13741W01	1 uF 10%; 25 V
C2679	21-13740A51	68 pF
L28		



84D04504J01
 COMPONENT SIDE P6
 84D04504J01
 COMPONENT SIDE P6
 LEADED PARTS

COMPONENT SIDE (GRAY) RCB-95114-O
 SOLDER SIDE (PINK) RCB-95117-O
 OVERLAY ----- RCB-95118-O

COMPONENT SIDE VIEW

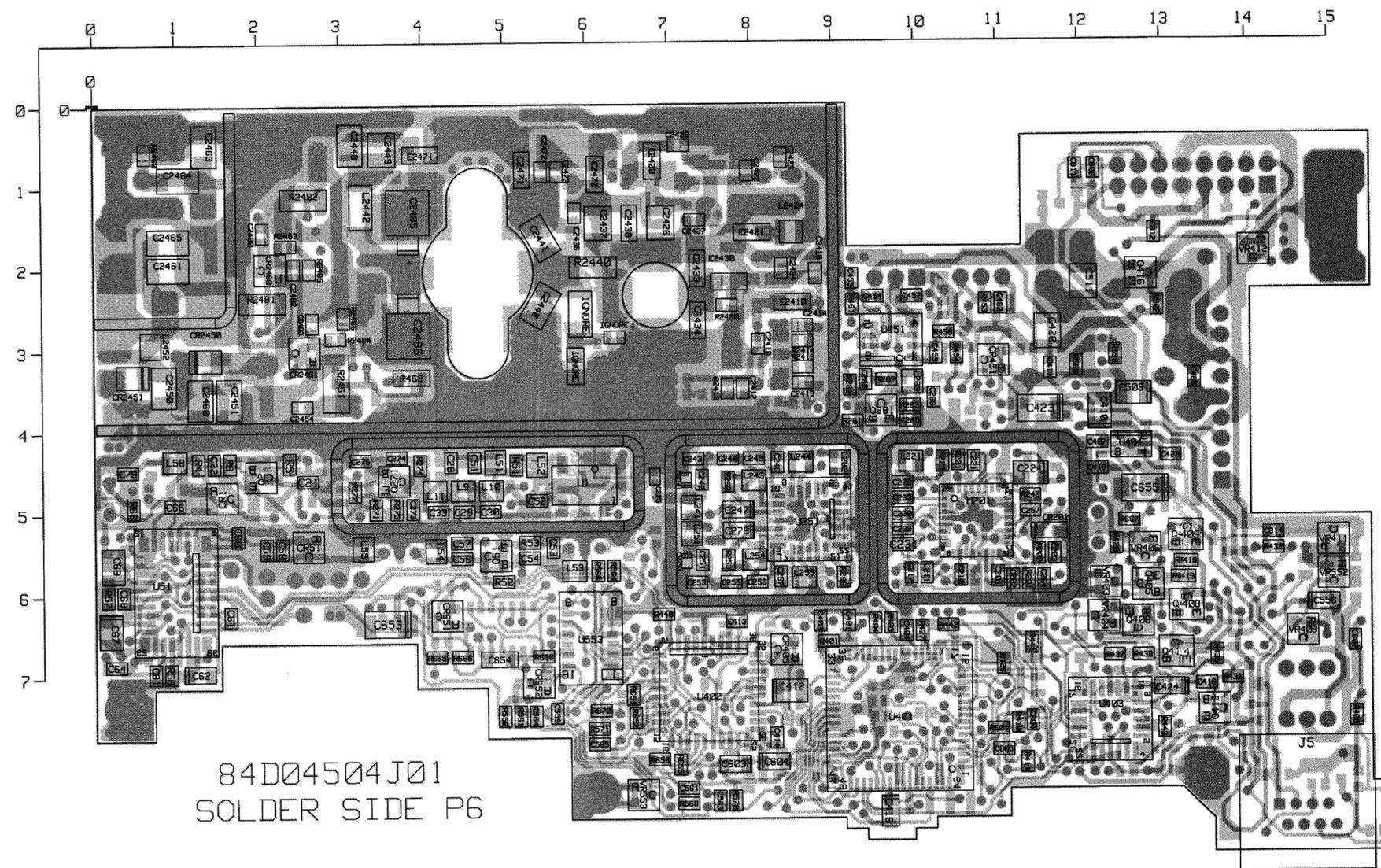


84D04504J01
 COMPONENT SIDE P6
 84D04504J01
 COMPONENT SIDE P6
 LEADED PARTS

COMPONENT SIDE INNER LAYER (GRAY) RCB-95115-O
 SOLDER SIDE INNER LAYER (PINK) RCB-95116-O
 OVERLAY ----- RCB-95118-O

COMPONENT SIDE VIEW

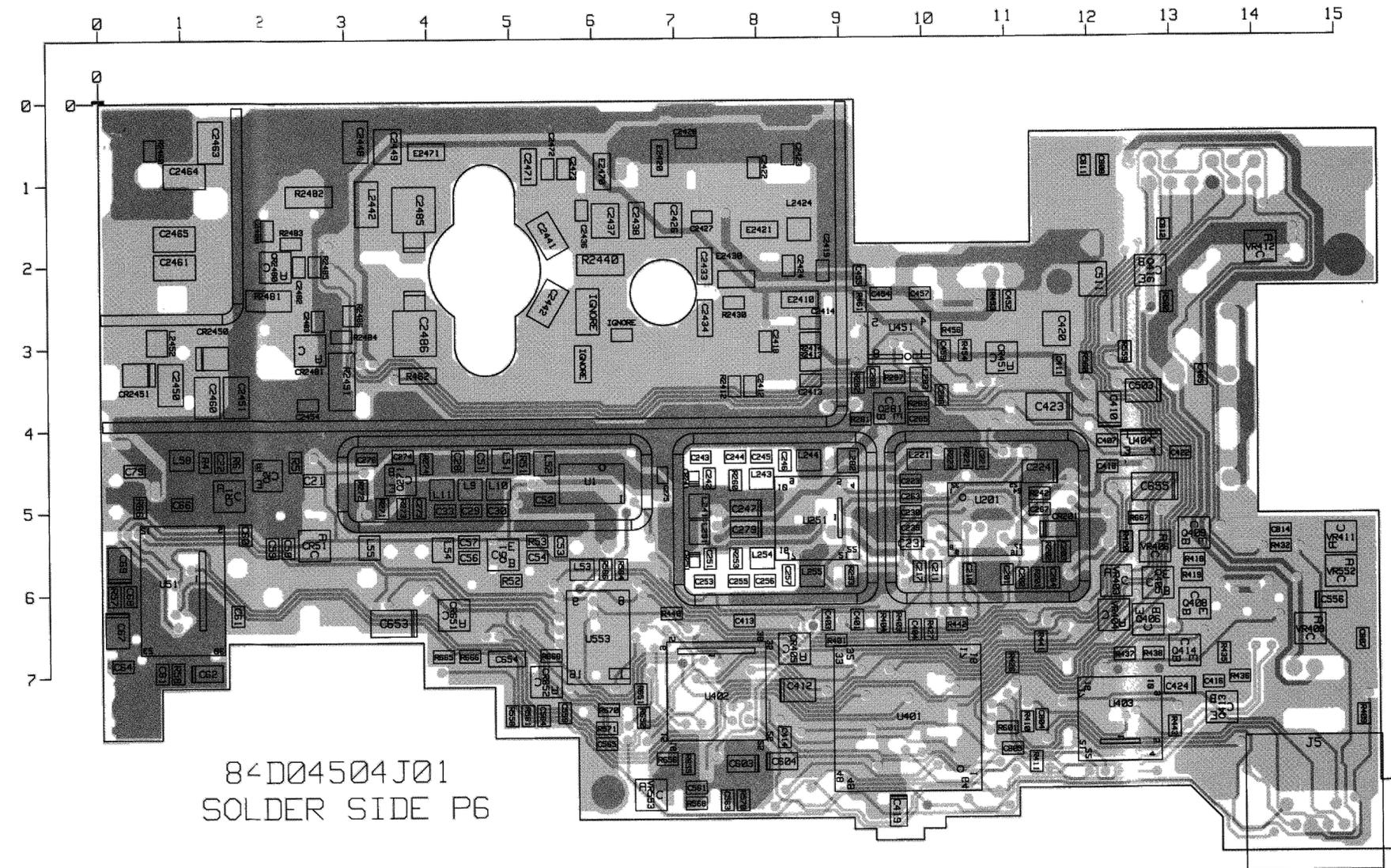
Circuit Board Details for
 VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
 (Part of PMUD1067A, PMUD1068A, PMUD1088A, PMUD1089A Radios)



84D04504J01
SOLDER SIDE P6

COMPONENT SIDE (GRAY) RCB-95114-O (REV)
 SOLDER SIDE (PINK) RCB-95117-O (REV)
 OVERLAY ----- RCB-95119-O (REV)

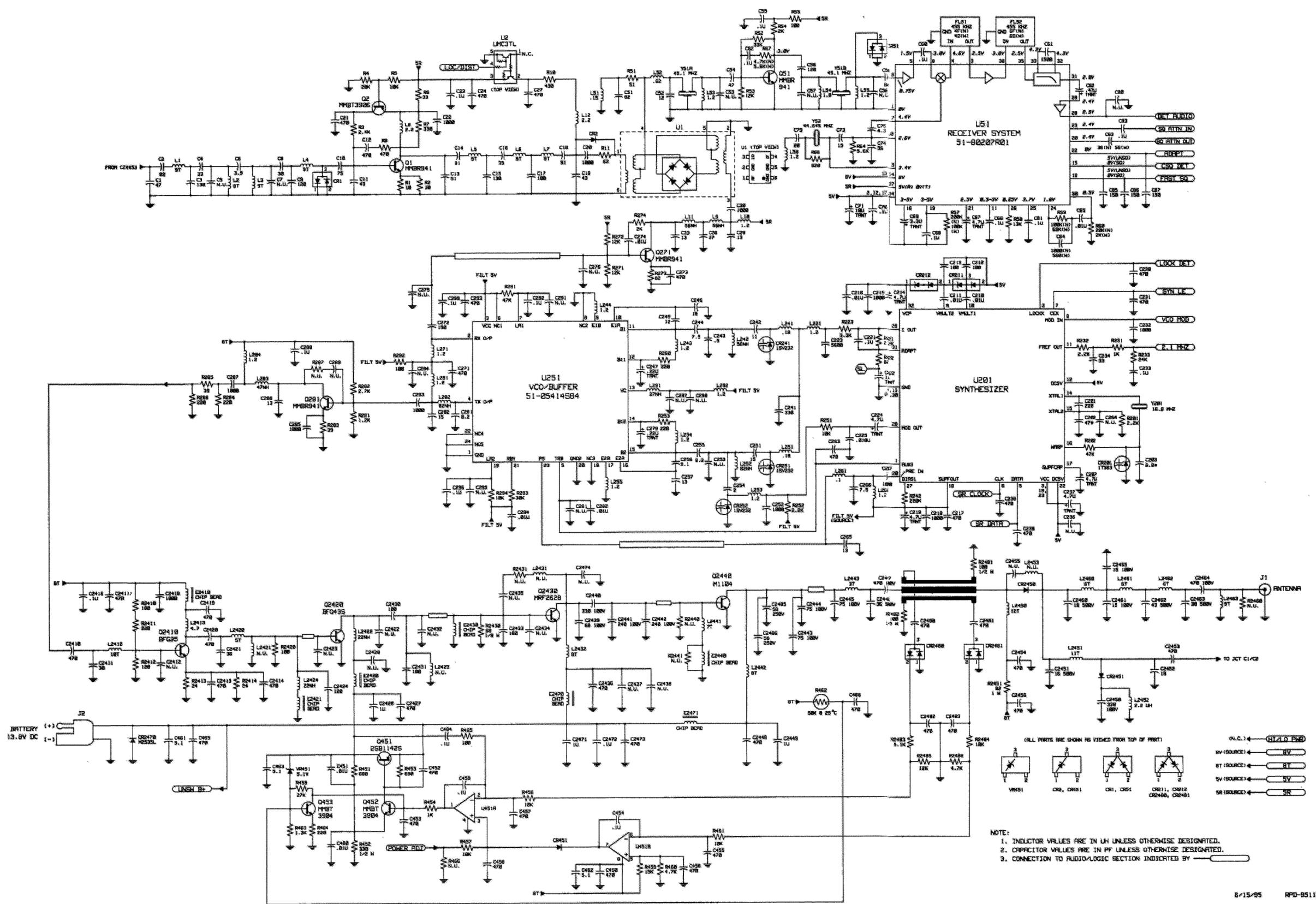
SOLDER SIDE VIEW



84D04504J01
SOLDER SIDE P6

COMPONENT SIDE INNER LAYER (GRAY) RCB-95115-O (REV)
 SOLDER SIDE INNER LAYER (PINK) RCB-95116-O (REV)
 OVERLAY ----- RCB-95119-O (REV)

SOLDER SIDE VIEW



(ALL PARTS ARE SHOWN AS VIEWED FROM TOP OF PRINT)

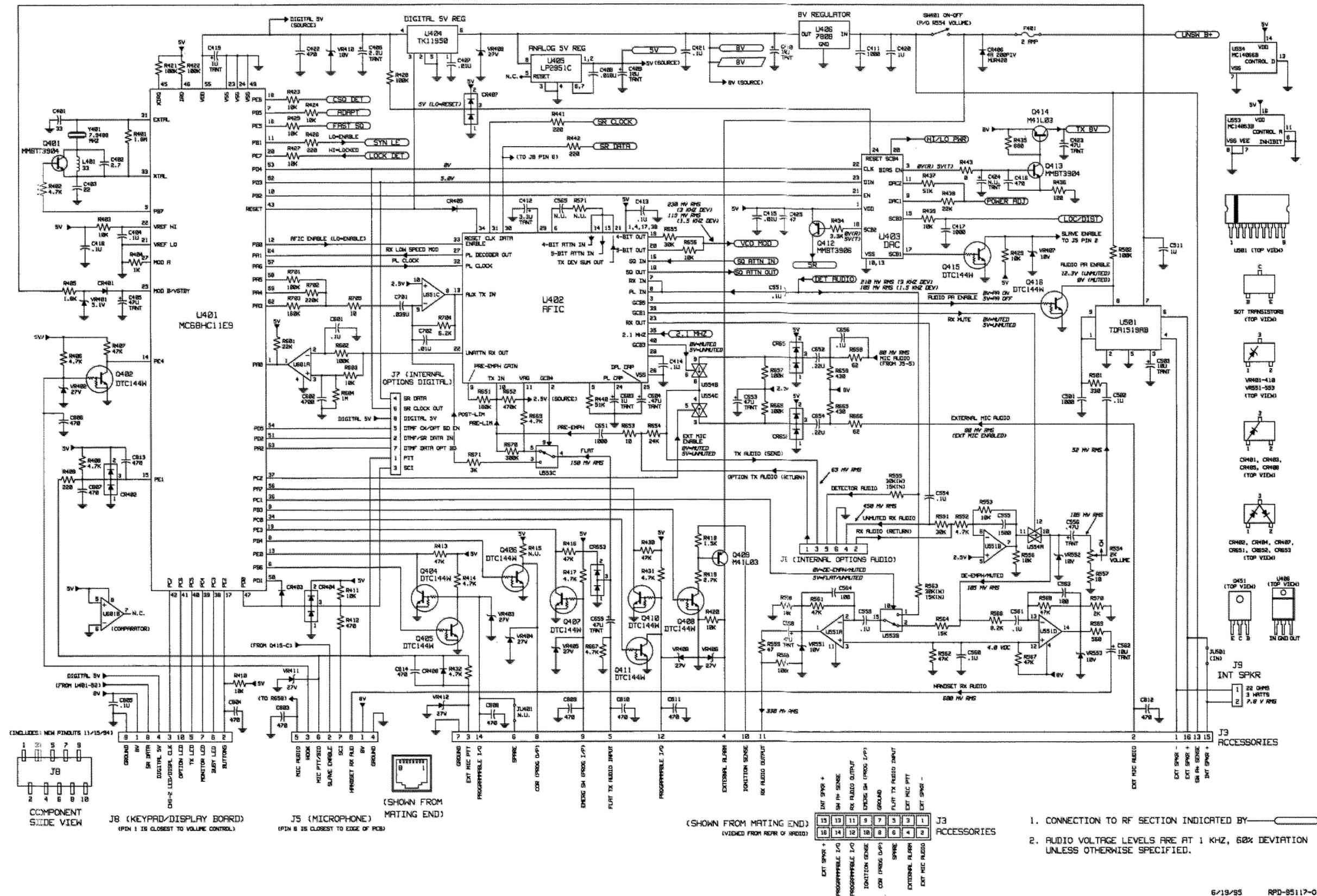
NOTE:

1. INDUCTOR VALUES ARE IN LH UNLESS OTHERWISE DESIGNATED.
2. CAPACITOR VALUES ARE IN PF UNLESS OTHERWISE DESIGNATED.
3. CONNECTION TO AUDIO/LOGIC SECTION INDICATED BY

Legend:

- (N.C.) ← N.T.O. (N.O.)
- 5V (SOURCE) ← 5V
- BT (SOURCE) ← BT
- 5V (SOURCE) ← 5V
- SR (SOURCE) ← SR

Schematic Diagrams for
 VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
 (Part of PMUD1067A, PMUD1068A, PMUD1088A, PMUD1089A Radios)
 (Sheet 1 of 2)



Schematic Diagrams for
VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
(Part of PMUD1067A, PMUD1068A, PMUD1088A, PMUD1089A Radios)
(Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY _____
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

Parts List

SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 12.5 kHz (N) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 20/25/30 kHz (W) (used in PMUD1068 & PMUD1089) PL-951010-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C1	21-13740A41	33 pF
C2	21-13740A59	150 pF
C3	21-13740A54	91 pF
C4	21-13740A41	33 pF
C5	---	Not Used
C6	21-13740A28	6.2 +/-0.25 pF
C7	---	Not Used
C8	21-13740A40	30 pF
C9	21-13740A54	91 pF
C10	21-13740A79	100 pF
C11	21-13740A38	24 pF
C12	21-13740A71	470 pF
C13	21-13740A41	33 pF
C14	21-13740A58	130 pF
C15	21-13740A54	91 pF
C16	21-13740A48	51 pF
C17	21-13740A53	82 pF
C18	21-13740A58	130 pF
C19	21-13740A42	36 pF
C20	21-13740A79	1000 pF
C21	21-13740A71	470 pF
C22	21-13740A79	1000 pF
C23	21-13740A71	470 pF
C24	21-13740A71	470 pF
C27	21-13740A71	470 pF
C28	21-13740A39	27 pF
C29	21-13740A32	13 pF
C30	21-13740A79	1000 pF
C33	21-13740A32	13 pF
C51	21-13740A53	82 pF
C52	21-13740A31	12 pF
C53	---	Not Used
C54	21-13740A46	47 pF
C55	21-13743A19	0.1 uF 10%; 16 V
C56	21-13740A57	120 pF
C57, 58	---	Not Used
C59	21-13740A53	82 pF
C60	21-13743A19	0.1 uF 10%; 16 V
C61	21-13741A25	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740A42	36 pF
C63(W)	21-13740A49	56 pF
C64(N)	21-13740A79	1000 pF
C64(W)	21-13740A73	560 pF
C65	21-13741A45	0.1 uF
C66	21-13743A19	0.1 uF 10%; 16 V
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743A19	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743A19	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740A33	15 pF
C74	21-13740A42	36 pF
C75	21-13740A18	20 pF
C76	21-13740A36	---
C80	---	Not Used
C81 thru 83	21-13743A19	0.1 uF 10%; 16 V
C85 thru 87	21-13740A59	115 pF
C201	21-13740A63	220 pF
C202	21-13740G46	47 pF 2%
C203	21-13740G24	6.8 +/-0.1 pF
C207	23-11049J11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741A45	0.1 uF
C212, 213	21-13740A55	100 pF
C214	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13740A79	1000 pF
C216	21-13741A45	0.1 uF
C217	21-13740A71	470 pF
C218	21-13740A79	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C221	21-13743A19	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741A39	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13741A51	0.18 uF
C230, 231	21-13740A79	1000 pF
C232	21-13743A19	0.1 uF 10%; 16 V
C234	21-13740A41	33 pF

SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 12.5 kHz (N) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 20/25/30 kHz (W) (used in PMUD1068 & PMUD1089) PL-951010-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C236	---	Not Used
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740A71	470 pF
C241	21-13740A67	330 pF
C242	21-13740A30	11 pF
C243	21-13740A01	0.5 +/-0.1 pF
C244, 245	21-13740A27	8.2 +/-0.25 pF
C246	21-13740A29	10 pF
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C251	21-13740A33	15 pF
C252	21-13740A79	1000 pF
C253	---	Not Used
C254	21-13740A10	2 +/-0.25 pF
C255	21-13740A27	8.2 +/-0.25 pF
C256	21-13740A28	9.1 +/-0.25 pF
C257	21-13740A32	13 pF
C261	---	Not Used
C262	21-13741A45	0.1 uF
C263	21-13740A71	470 pF
C264	---	Not Used
C265	21-13740A32	13 pF
C266	21-13740A25	7.5 +/-0.25 pF
C267	21-13740A79	1000 pF
C271	21-13740A71	470 pF
C272	21-13740A59	150 pF
C273	21-13740A71	470 pF
C274	21-13741A45	0.1 uF
C275	21-13740F29	12 pF
C276	---	Not Used
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740A27	8.2 +/-0.25 pF
C282	21-13740A33	15 pF
C283	21-13740A79	1000 pF
C284	---	Not Used
C285	21-13740A79	1000 pF
C286	21-13740A32	13 pF
C287	21-13740A79	1000 pF
C288	21-13743A19	0.1 uF 10%; 16 V
C289	---	Not Used
C291	---	Not Used
C292	21-13743A19	0.1 uF 10%; 16 V
C293	21-13740A71	470 pF
C294	21-13741A45	0.1 uF
C295	---	Not Used
C296	21-13743A19	0.1 uF 10%; 16 V
C297, 298	---	Not Used
C299	21-13743A19	0.1 uF 10%; 16 V
C401	21-13740A41	33 pF
C402	21-13740A13	2.7 +/-0.25 pF
C403	21-13740A37	22 pF
C404	21-13743A19	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 4.7 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741A45	0.1 uF
C408	21-13741A51	0.18 uF
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13740A79	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743A19	0.1 uF 10%; 16 V
C415	21-13741A45	0.1 uF
C416	21-13740A71	470 pF
C417	21-13740A79	1000 pF
C418	21-13743A19	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743A19	0.1 uF 10%; 16 V
C422	21-13740A71	470 pF
C423	23-11049J43	tantalum 4.7 uF 10%; 10 V
C424	---	Not Used
C425	21-13740A46	47 pF
C450	21-13740A71	470 pF
C451	21-13743A21	0.22 uF 10%; 16 V
C452	21-13740A71	470 pF
C453	21-13743A19	0.1 uF 10%; 16 V
C454	21-13743A19	0.1 uF 10%; 16 V
C455 thru 458	21-13740A71	470 pF
C459	21-13743A19	0.1 uF 10%; 16 V
C460	---	Not Used
C461 thru 463	21-13740A20	5.1 +/-0.25 pF
C464	21-13743A19	0.1 uF 10%; 16 V

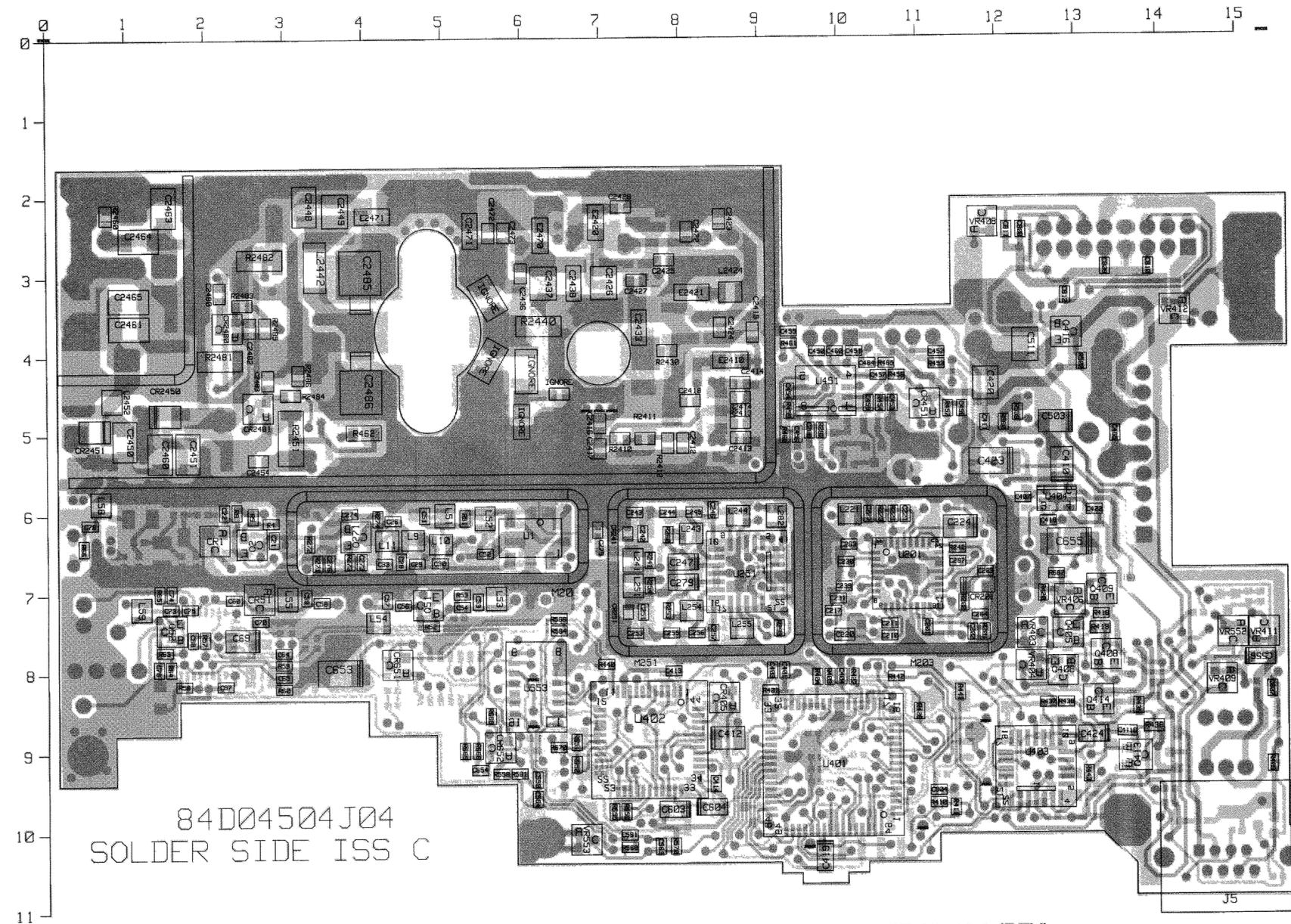
SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 12.5 kHz (N) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 20/25/30 kHz (W) (used in PMUD1068 & PMUD1089) PL-951010-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C465, 466	21-13740A71	470 pF
C501	21-13740A79	1000 pF
C502	21-13743A19	0.1 uF 10%; 16 V
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C551	21-13743A19	0.1 uF 10%; 16 V
C555	21-13741A79	1000 pF
C556	48-13833C07	dual silicon SOT MMBD7000
C558	23-11049J43	tantalum 47 uF 10%; 25 V
C559 thru 561	21-13740A33	15 pF
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740A55	100 pF
C565	---	Not Used
C801	21-13743A19	0.1 uF 10%; 16 V
C802	21-13741A37	4700 pF
C803	23-11049A07	tantalum 1 uF 10%; 16 V
C804	23-11049A05	tantalum 0.47 uF 10%; 25 V
C851	21-13740A79	1000 pF
C852	21-11032B15	0.22 uF +/-20%
C853	23-11049J43	tantalum 47 uF 10%; 10 V
C854	21-11032B15	0.22 uF +/-20%
C855	23-11049J43	tantalum 47 uF 10%; 10 V
C856	21-13743A19	0.1 uF 10%; 16 V
C857	21-13741A59	0.39 uF
C702	21-13741A45	0.1 uF
C803, 804	21-13740A71	470 pF
C805	21-13743A19	0.1 uF 10%; 16 V
C806 thru 814	21-13740A71	470 pF
C2411	21-13740A40	30 pF
C2412	---	Not Used
C2413, 2414	21-13740A71	470 pF
C2416	21-13743A19	0.1 uF 10%; 16 V
C2417	21-13740A71	470 pF
C2418	21-13740A79	1000 pF
C2419, 2420	21-13740A71	470 pF
C2421	21-13740A42	36 pF
C2422, 2423	---	Not Used
C2424	21-13740A57	120 pF
C2426	21-13741W01	1 uF 10%; 25 V
C2427	21-13740A71	470 pF
C2428	---	Not Used
C2429	21-13740A79	1000 pF
C2430, 2431	21-13740A55	100 pF
C2432	---	Not Used
C2433	21-13740B55	180 pF
C2434, 2435	---	Not Used
C2436	21-13740A71	470 pF
C2437	---	Not Used
C2438	21-11032B15	0.22 uF +/-20%
C2439	21-11078B42	100 pF 100 V
C2440	21-11078B55	330 pF 100 V
C2441, 2442	21-11078B52	240 pF 100 V
C2443 thru 2445	21-11078B39	75 pF 100 V
C2446	21-8006M32	36 pF 500 V
C2447	21-11078B59	470 pF 100 V
C2448	21-13740B65	470 pF
C2449	21-13741W01	tantalum 3.3 uF 10%; 25 V
C2450	21-11078B55	330 pF 100 V
C2451	21-8006M24	16 pF 800 V
C2452	21-13740A38	24 pF
C2453, 2454	21-13740A71	470 pF
C2455	---	Not Used
C2456	21-13740A71	470 pF
C2460	21-8006M25	16 pF 500 V
C2461	21-11078B18	15 pF 100 V
C2462	21-8006M34	43 pF 300 V
C2463	21-8006M30	30 pF 500 V
C2464	21-11078B53	470 pF 100 V
C2465	21-11078B18	15 pF 100 V
C2471	21-13741W01	1 uF 10%; 25 V
C2472	21-13743A19	0.1 uF 10%; 16 V
C2473	21-13740A71	470 pF
C2474	---	Not Used
C2480 thru 2483	21-13740A71	470 pF
C2485, 2486	21-80964X35	clamped mica 39 pF 250 V

CR1 48-80154K03 dual Schottky SOT
 CR2 48-80142L01 silicon PIN SOT MMBV3401

SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 12.5 kHz (N) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz, 40 Watts
 20/25/30 kHz (W) (used in PMUD1068 & PMUD1089) PL-951010-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR1	48-80154K03	dual Schottky SOT
CR201	48-02245J22	silicon varactor SOT 1T363
CR211, 212	48-13833C07	dual silicon SOT MMBD7000
CR241	48-62824C03	silicon varactor SOT 1SV232
CR251, 252	48-62824C03	silicon varactor SOT 1SV232
CR401	48-05129M76	silicon SOT
CR402	48-13833C07	dual silicon SOT MMBD7000
CR403	48-90397F01	Schottky SOT
CR404	48-13833C07	dual silicon SOT MMBD7000
CR405	48-05129M76	silicon SOT
CR406	48-83553T02	4A 2

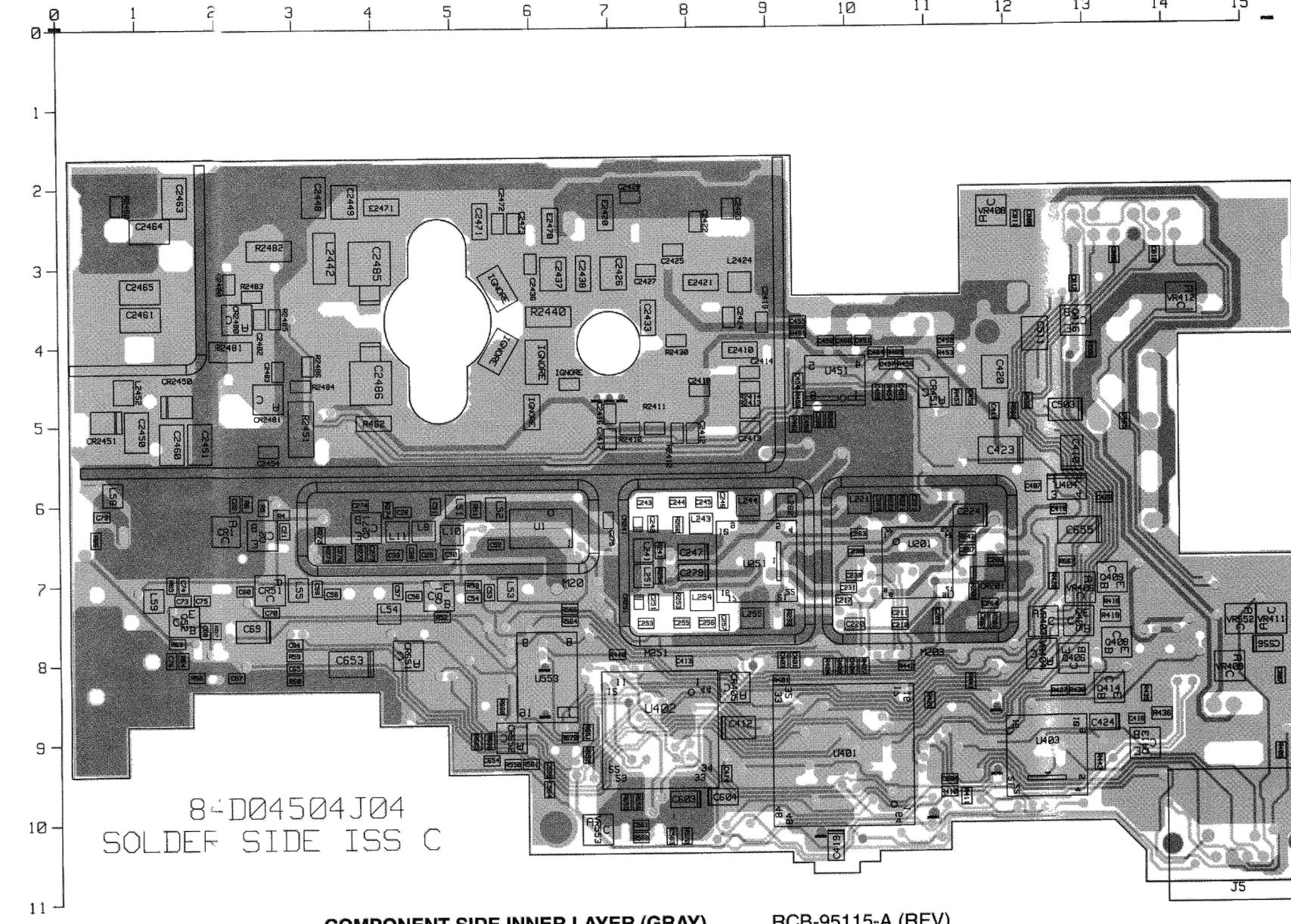


84D04504J04
SOLDER SIDE ISS C

COMPONENT SIDE (GRAY)
SOLDER SIDE (PINK)
OVERLAY -----

RCB-95114-A (REV)
RCB-95117-A (REV)
RCB-95119-A (REV)

SOLDER SIDE VIEW



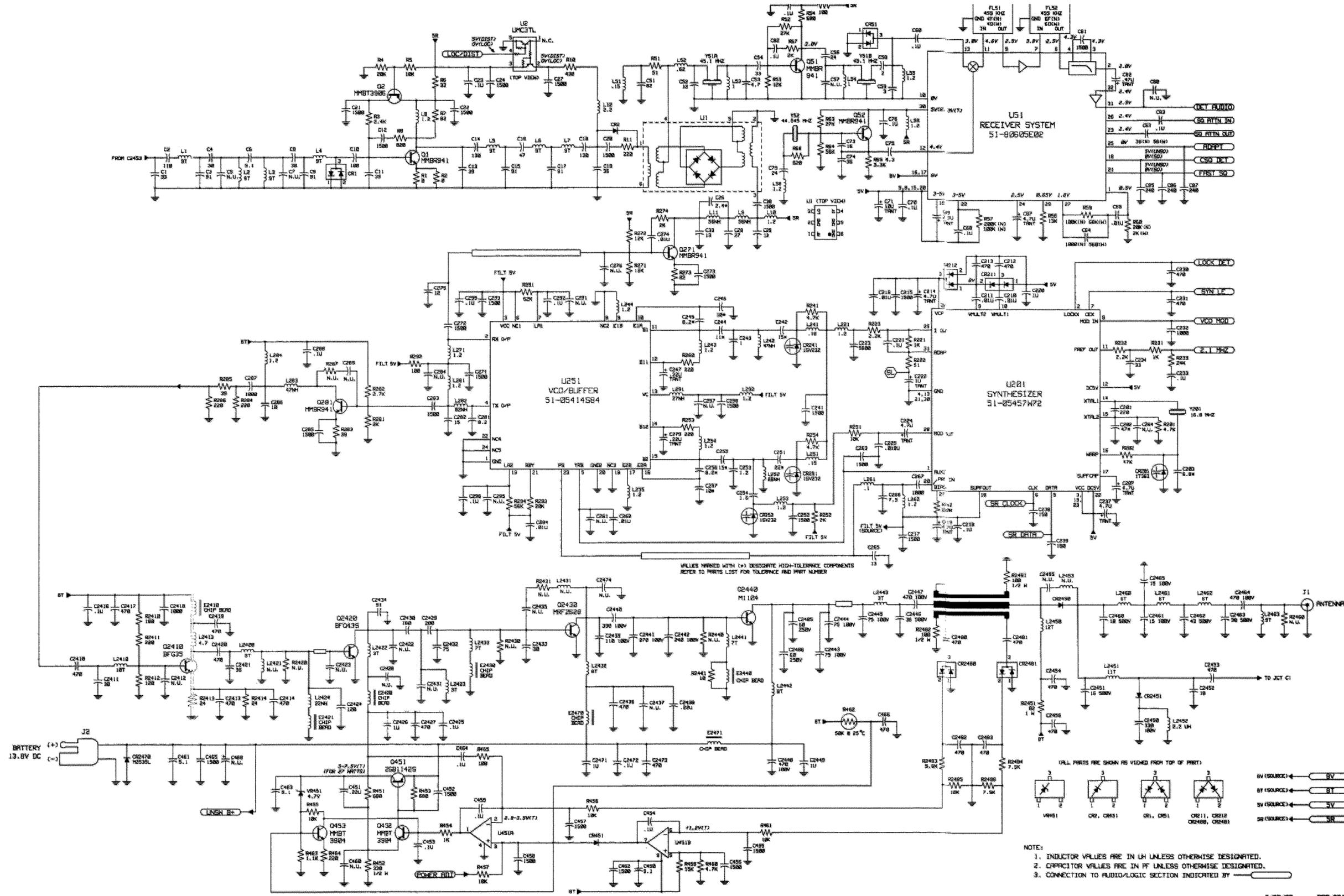
84D04504J04
SOLDER SIDE ISS C

COMPONENT SIDE INNER LAYER (GRAY)
SOLDER SIDE INNER LAYER (PINK)
OVERLAY -----

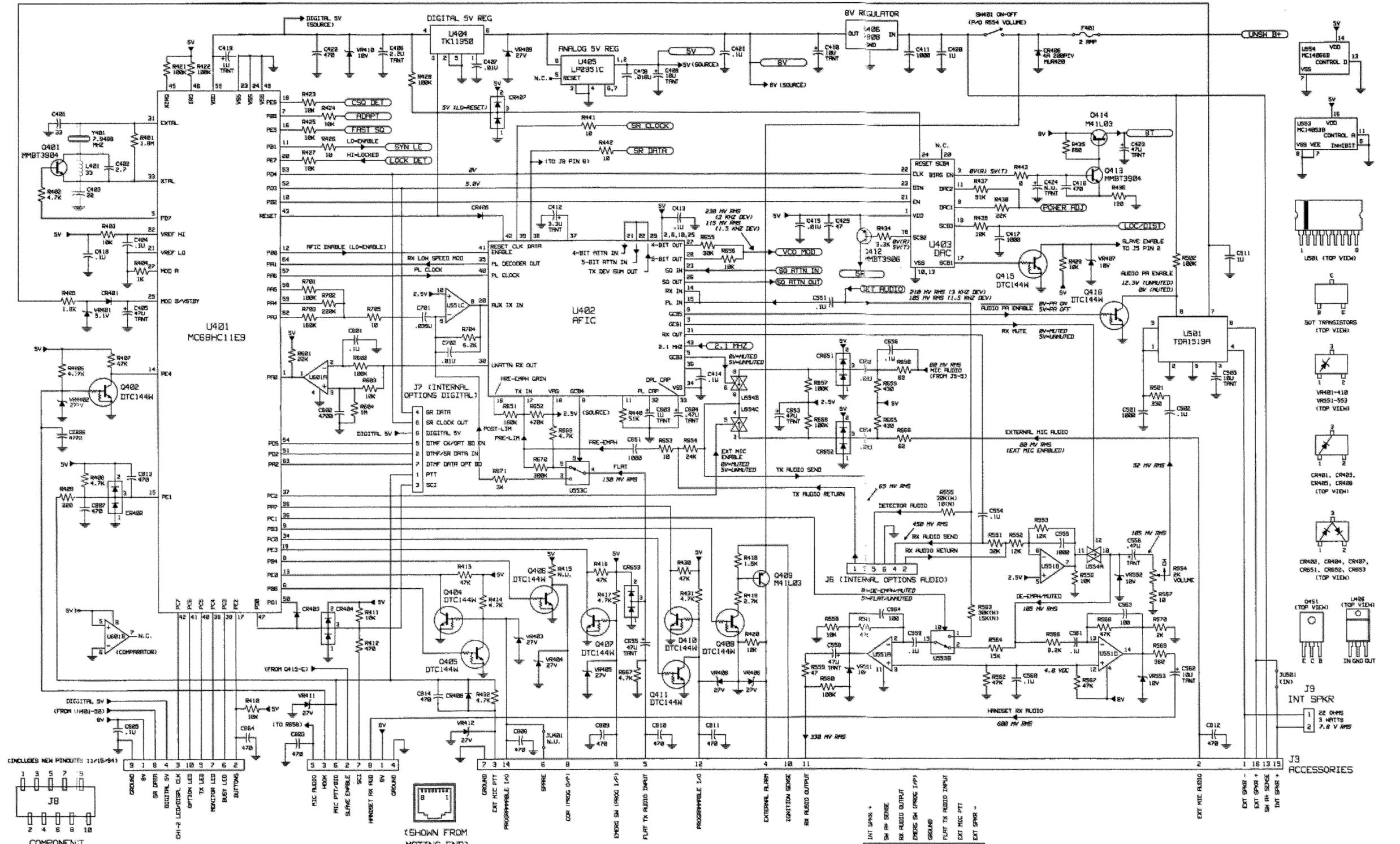
RCB-95115-A (REV)
RCB-95116-A (REV)
RCB-95119-A (REV)

SOLDER SIDE VIEW

Circuit Board Details for
VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
(Part of PMUD1067B, PMUD1068B, PMUD1088B, PMUD1089B Radios)



Schematic Diagrams for
 VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
 (Part of PMUD1067B, PMUD1068B, PMUD1088B, PMUD1089B Radios)
 (Sheet 1 of 2)



Schematic Diagrams for
 VHF Main Boards, 150-170 MHz, 12.5 & 20/25/30 kHz, 40 W
 (Part of PMUD1067B, PMUD1068B, PMUD1088B, PMUD1089B Radios)
 (Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY _____
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

Parts List

SM50/SM120 VHF Main Board, 150-170 MHz, 40 W, 12.5 kHz (N)
 (later version) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz 40 W, 20/25/30 kHz (W)
 (later version) (used in PMUD1068 & PMUD1089) PL-981003-0

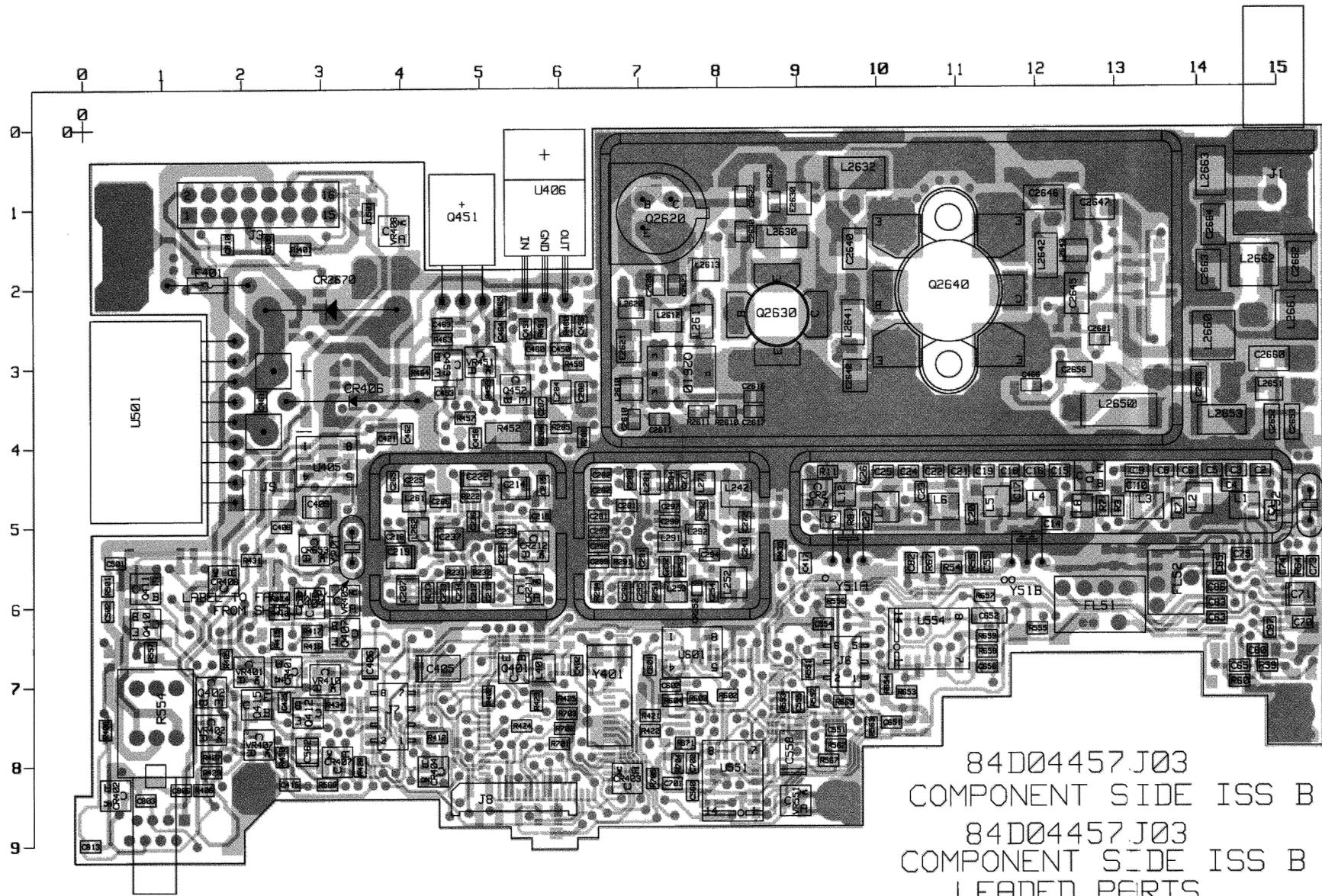
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740L15	capacitor, fixed: uF +/-5%; 80 V; unless otherwise stated
C2	21-13740L14	7.5 +/-0.1 pF
C3	21-13740L16	6.8 +/-0.1 pF
C4	21-13740L19	3.3 +/-0.1 pF
C5	21-13740L07	11 pF 2%
C6	21-13740L13	3.6 +/-0.1 pF
C7	21-13740L19	6.2 +/-0.1 pF
C8	21-13740L03	2.4 +/-0.1 pF
C9	21-13740L07	3.6 +/-0.1 pF
C10	21-13740L15	7.5 +/-0.1 pF
C11, 12	21-13740F60	240 pF
C14	21-13740L05	3.0 +/-0.1 pF
C15	21-13740L18	7.5 +/-0.1 pF
C16	21-13740L10	4.7 +/-0.1 pF
C17	21-13740L21	13 pF 2%
C18	21-13740L09	4.3 +/-0.1 pF
C19	21-13740L10	4.7 +/-0.1 pF
C20	21-13740L23	16 pF 2%
C21	21-13740L09	4.3 +/-0.1 pF
C22	21-13740L08	3.9 +/-0.1 pF
C23	21-13740L21	13 pF 2%
C24	21-13740L10	4.7 +/-0.1 pF
C25	21-13740L08	3.9 +/-0.1 pF
C26	21-13740L01	2.0 +/-0.1 pF
C27	21-13740F60	240 pF
C28	21-13740F29	12 pF
C29	21-13740F31	15 pF
C30	21-13740F60	240 pF
C33	21-13740F05	1.2 +/-0.25 pF
C51	21-13740F49	82 pF
C52	21-13740F29	12 pF
C53	21-13740F19	4.7 +/-0.25 pF
C54	21-13740F39	33 pF
C55	21-13743E20	0.1 uF 10%; 16 V
C56	21-13740F36	24 pF
C57	---	Not Used
C58	21-13740F10	2 +/-0.25 pF
C59	21-13740F14	3 +/-0.25 pF
C60	21-13743E20	0.1 uF 10%; 16 V
C61	21-13741F29	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740F40	36 pF
C63(W)	21-13740F45	56 pF
C64(N)	21-13740F69	560 pF
C64(W)	21-13741F25	1000 pF
C65	21-13741F49	.01 uF
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743E20	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743E20	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740F32	16 pF
C74	21-13740F40	36 pF
C75	21-13740F18	4.3 +/-0.25 pF
C76	21-13743E20	0.1 uF 10%; 16 V
C79	21-13740F36	24 pF
C80	---	Not Used
C82, 83	21-13743E20	0.1 uF 10%; 16 V
C85 thru 87	21-13740F60	240 pF
C201	21-13740F59	220 pF
C202	21-13740L34	47 pF 2%
C203	21-13740L14	6.8 +/-0.1 pF
C207	23-11049J11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741F49	.01 uF
C212, 213	21-13741F17	470 pF
C214	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13741F25	1000 pF
C216	21-13741F49	.01 uF
C217	21-13740F60	240 pF
C218	21-13741F25	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C220	21-13928E01	1 uF 10%; 10 V
C221	21-13743E20	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741F43	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13743E05	.018 uF 10%; 16 V
C230, 231	21-13740F60	240 pF
C232	21-13741F25	1000 pF

SM50/SM120 VHF Main Board, 150-170 MHz, 40 W, 12.5 kHz (N)
 (later version) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz 40 W, 20/25/30 kHz (W)
 (later version) (used in PMUD1068 & PMUD1089) PL-981003-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C233	21-13743E20	0.1 uF 10%; 16 V
C234	21-13740F39	33 pF
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740F60	240 pF
C241	21-13740F60	240 pF
C242	21-13740L15	7.5 +/-0.1 pF
C243	21-13740L03	2.4 +/-0.1 pF
C244	21-13740L16	8.2 +/-0.1 pF
C245	21-13740L12	5.6 +/-0.1 pF
C246	21-13740L13	6.2 +/-0.1 pF
C247	23-11049A03	tantalum .22 uF 10%; 35 V
C251	21-13740L16	8.2 +/-0.1 pF
R406	21-13740F60	240 pF
C252	21-13740F07	1.5 +/-0.25 pF
C253	21-13740F03	1 +/-0.25 pF
C255	21-13740L24	18 pF 2%
C256, 257	21-13740L13	6.2 +/-0.1 pF
C258	21-13740L14	18 pF 2%
C261	21-13740F60	240 pF
C262	21-13741F49	.01 uF
C263	21-13740F60	240 pF
C264 thru 266	---	Not Used
C267	21-13740F60	240 pF
C271, 272	21-13740F60	240 pF
C273	21-13740F41	39 pF
C274	21-13741F49	.01 uF
C275	21-13740F18	4.3 +/-0.25 pF
C276	21-13740F25	8.2 +/-0.25 pF
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740F22	6.2 +/-0.25 pF
C282	21-13740F34	20 pF
C283	21-13740F60	240 pF
C284	21-13741F49	.01 uF
C285	21-13740F47	68 pF
C286	---	Not Used
C287	21-13740F47	68 pF
C288	21-13743E20	0.1 uF 10%; 16 V
C289	---	Not Used
C291	---	Not Used
C292, 293	21-13740F60	240 pF
C294	21-13741F49	.01 uF
C295	21-13740F60	240 pF
C296	---	Not Used
C297	21-13740F60	240 pF
C298, 299	21-13743E20	0.1 uF 10%; 16 V
C401	21-13740F39	33 pF
C402	21-13740F13	2.7 +/-0.25 pF
C403	21-13740F35	22 pF
C404	21-13743E20	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 47 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741F49	.01 uF
C408	21-13743E05	.018 uF 10%; 16 V
C409	23-11049A57	tantalum 10 uF 10%; 16 V
C410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13741F25	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743E20	0.1 uF 10%; 16 V
C415	21-13741F49	.01 uF
C416	21-13741F17	470 pF
C417	21-13741F25	1000 pF
C418	21-13740L15	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13740L34	47 pF 2%
C421	21-13743E20	0.1 uF 10%; 16 V
C422	21-13741F17	470 pF
C423	23-11049J43	tantalum 47 uF 10%; 10 V
C424	---	Not Used
C425	21-13740F43	47 pF
C430	21-13740F26	8.1 +/-0.25 pF
C431	---	Not Used
C432	21-13740F60	240 pF
C433, 454	21-13743E20	0.1 uF 10%; 16 V
C435 thru 457	21-13740F60	240 pF
C458	21-13741F25	1000 pF
C459	21-13743E20	0.1 uF 10%; 16 V
C460	---	Not Used
C461	21-13740F20	5.1 +/-0.25 pF
C462	21-13740F60	240 pF
C463	21-13740F20	5.1 +/-0.25 pF
C464	21-13743E20	0.1 uF 10%; 16 V
C465	21-13741F17	470 pF

SM50/SM120 VHF Main Board, 150-170 MHz, 40 W, 12.5 kHz (N)
 (later version) (used in PMUD1067 & PMUD1088)
 SM50/SM120 VHF Main Board, 150-170 MHz 40 W, 20/25/30 kHz (W)
 (later version) (used in PMUD1068 & PMUD1089) PL-981003-0

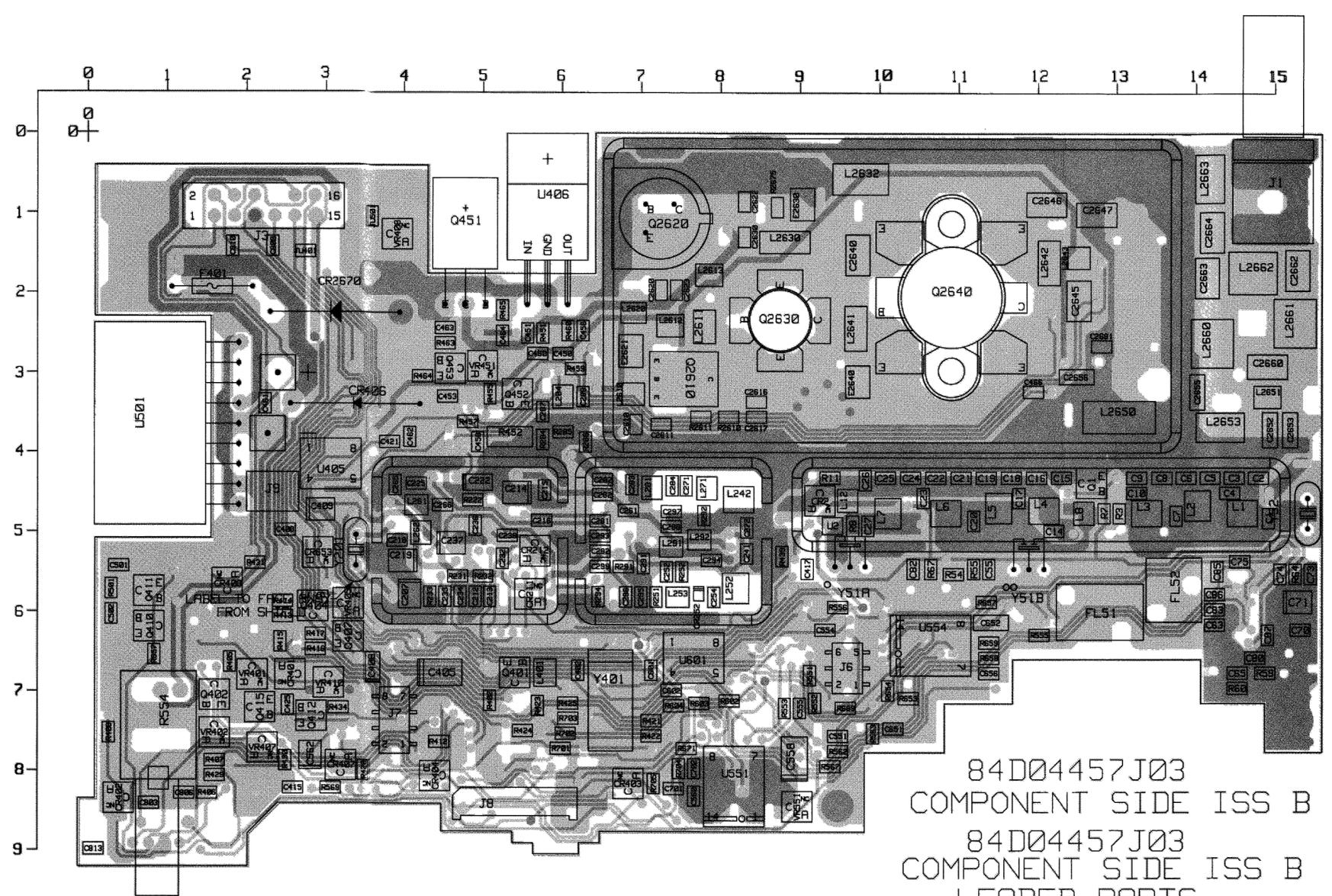
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C466	21-13740A59	150 pF
C468	---	Not Used
C501	21-13741F25	1000 pF
C502	21-13743E20	0.1 uF 10%; 16 V
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C551	21-13743E20	0.1 uF 10%; 16 V
C554	21-13743E20	0.1 uF 10%; 16 V
C555	21-13741F25	1000 pF
C556	23-11049A05	tantalum 0.47 uF 10%; 25 V
C558	23-11049J43	tantalum 47 uF 10%; 10 V
C559 thru 561	21-13743E20	0.1 uF 10%; 16 V
C560	21-13740A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740F51	100 pF
C601	21-13743E20	0.1 uF 10%; 16 V
C602	21-13741F41	4700 pF
C603	23-11049A07	tantalum 1 uF 10%; 16 V
C604	23-11049A05	tantalum .47 uF 10%; 25 V
C651	21-13741F25	1000 pF
C652	21-13743E20	0.22 uF +/-80/-20%; 16 V
C653	23-11049J43	tantalum 47 uF 10%; 10 V
C654	21-13743E16	0.22 uF +/-80/-20%; 16 V
C655	23-11049J43	tantalum 47 uF 10%; 10 V
C656	21-13743E20	0.1 uF 10%; 16 V
C657	21-13741F17	470 pF
C658	21-13740A30	11 pF
C659	21-13740A29	10 pF
C660	21-13740A33	15 pF
C661	21-13740A79	1000 pF
C662	21-13740A24	6.8 +/-0.25 pF
C663	21-13740A59	150 pF
C664	21-13740A39	15 pF
C665	21-13740A39	15 pF
C666	21-13740A39	15 pF
C667	21-13740A39	15 pF
C668	21-13740A39	15 pF
C669	21-13740A39	15 pF
C670	21-13740A39	15 pF
C671	21-13740A39	15 pF
C672	21-13740A39	15 pF
C673	21-13740A39	15 pF
C674	21-13740A39	15 pF
C675	21-13740A39	15 pF
C676	21-13740A39	15 pF
C677	21-13740A39	15 pF
C678	21-13740A39	15 pF
C679	21-13740A39	15 pF
C680	21-13740A39	15 pF
C681	21-13740A39	15 pF
C682	21-13740A39	15 pF
C683	21-13740A39	15 pF
C684	21-13740A39	15 pF
C685	21-13740A39	15 pF
C686	21-13740A39	15 pF
C687	21-13740A39	15 pF
C688	21-13740A39	15 pF
C689	21-13740A39	15 pF
C690	21-13740A39	15 pF
C691	21-13740A39	15 pF
C692	21-13740A39	15 pF
C693	21-13740A39	15 pF
C694	21-13740A39	15 pF
C695	21-13740A39	15 pF
C696	21-13740A39	15 pF
C697	21-13740A39	15 pF
C698	21-13740A39	15 pF
C699	21-13740A39	15 pF
C700	21-13740A39	15 pF
C701	21-13740A39	15 pF
C702	21-13740A39	15 pF
C703	21-13740A39	15 pF
C704	21-13740A39	15 pF
C705	21-13740A39	15 pF
C706	21-13740A39	15 pF
C707	21-13740A39	15 pF
C708	21-13740A39	15 pF
C709	21-13740A39	15 pF
C710	21-13740A39	15 pF
C711	21-13740A39	15 pF
C712	21-13740A39	15 pF
C713	21-13740A39	15 pF
C714	21-13740A39	15 pF
C715	21-13740A39	15 pF
C716	21-13740A39	15 pF
C717	21-13740A39	15 pF
C718	21-13740A39	15 pF
C719	21-13740A39	15 pF
C720	21-13740A39	15 pF
C721	21-13740A39	15 pF
C722	21-13740A39	15 pF
C723		



84D04457J03
 COMPONENT SIDE ISS B
 84D04457J03
 COMPONENT SIDE ISS B
 LEADED PARTS

COMPONENT SIDE (GRAY) RCB-95120-O
 SOLDER SIDE (PINK) RCB-95123-O
 OVERLAY ----- RCB-95124-O

COMPONENT SIDE VIEW

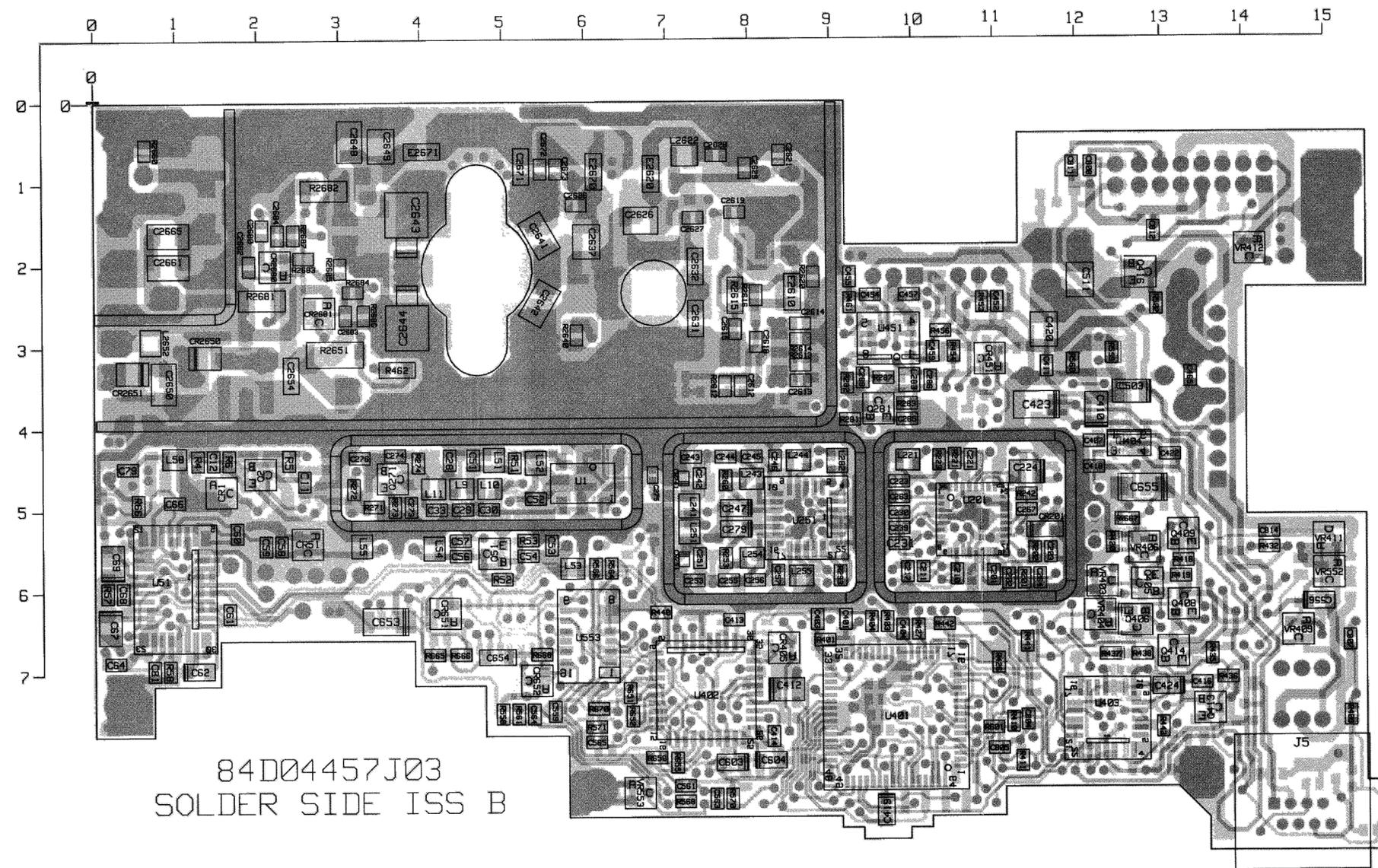


84D04457J03
 COMPONENT SIDE ISS B
 84D04457J03
 COMPONENT SIDE ISS B
 LEADED PARTS

COMPONENT SIDE INNER LAYER (GRAY) RCB-95121-O
 SOLDER SIDE INNER LAYER (PINK) RCB-95122-O
 OVERLAY ----- RCB-95124-O

COMPONENT SIDE VIEW

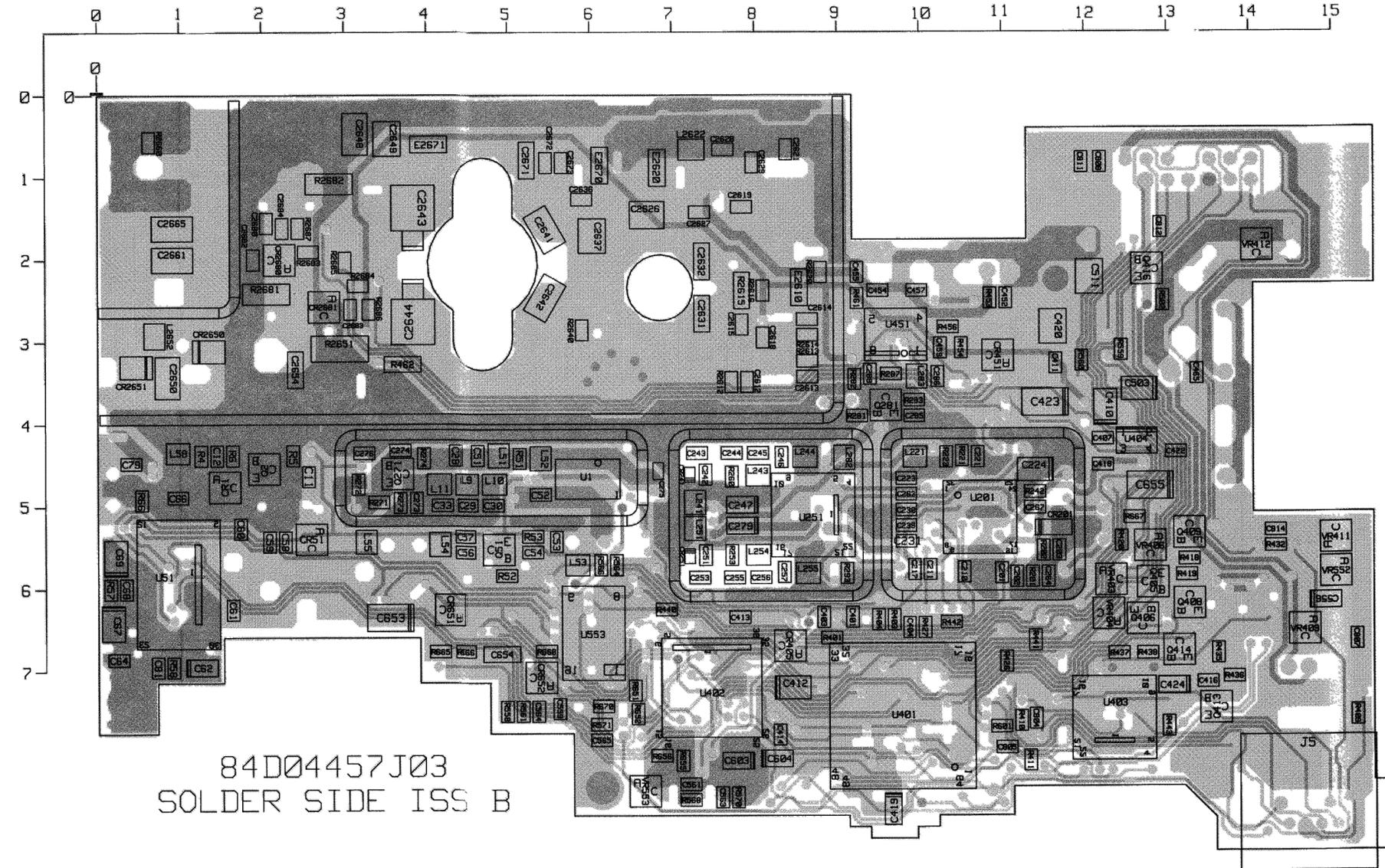
Circuit Board Details for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 10-25 W
 (Part of PMUE1006A, PMUE1007A, PMUE1054A, and PMUE1055A Radios)



COMPONENT SIDE (GRAY)
SOLDER SIDE (PINK)
OVERLAY ----

RCB-95120-O (REV)
RCB-95123-O (REV)
RCB-95125-O (REV)

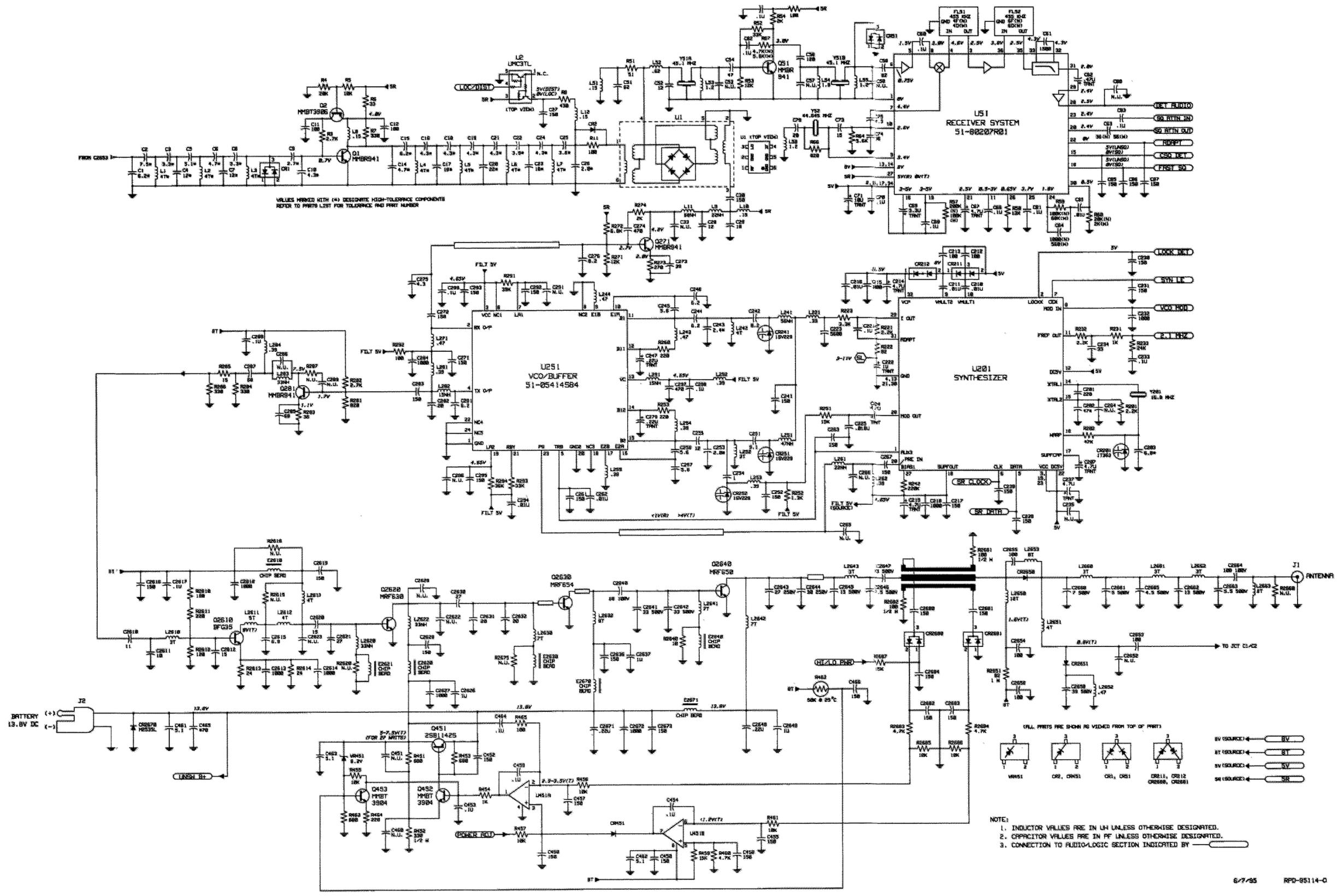
SOLDER SIDE VIEW



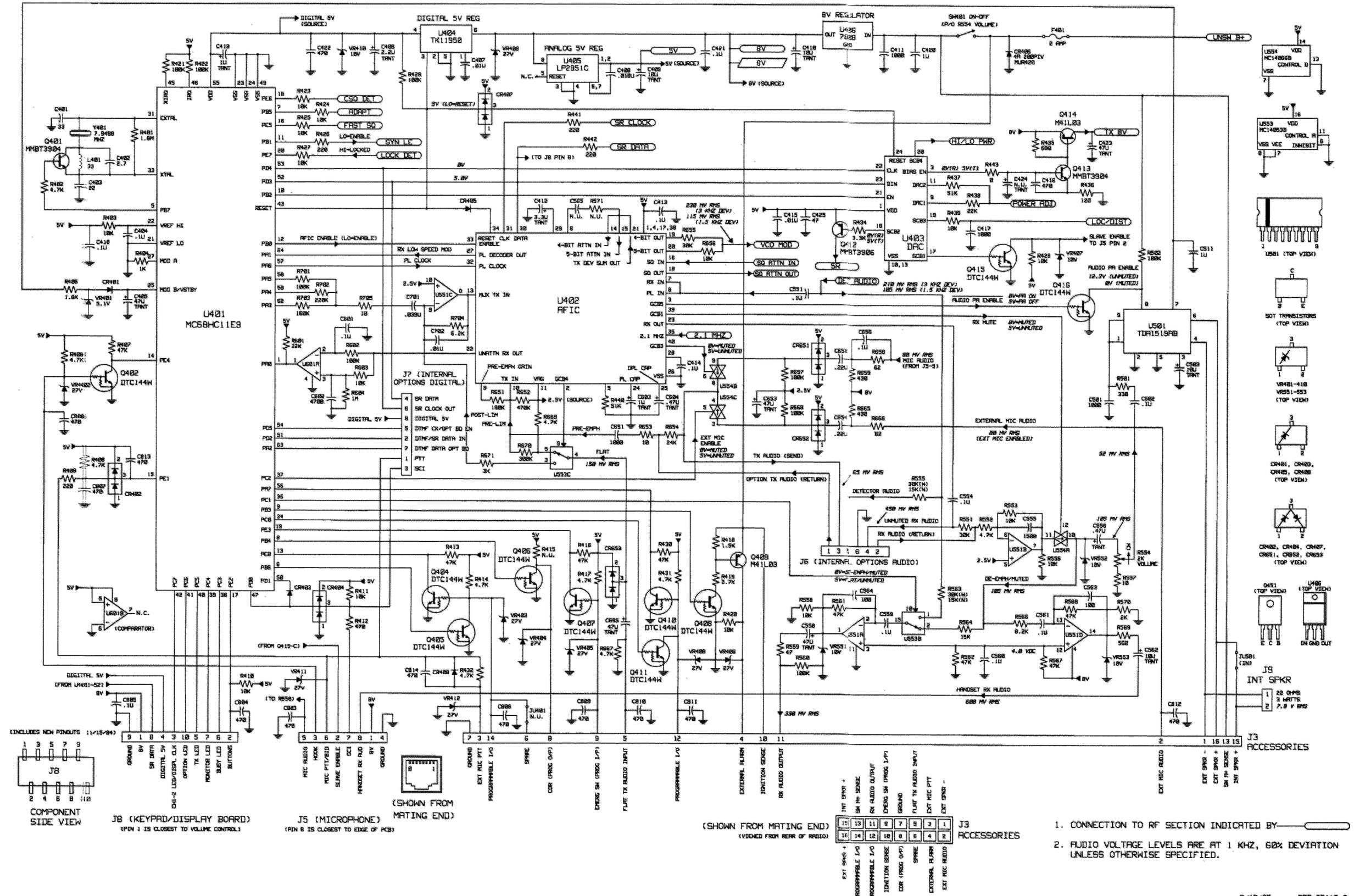
COMPONENT SIDE INNER LAYER (GRAY)
SOLDER SIDE INNER LAYER (PINK)
OVERLAY ----

RCB-95121-O (REV)
RCB-95122-O (REV)
RCB-95125-O (REV)

SOLDER SIDE VIEW



Schematic Diagram for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 10-25 W
 (Part of PMUE1006A, PMUE1007A, PMUE1054A, and PMUE1055A Radios)
 (Sheet 1 of 2)



Schematic Diagram for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 10-25 W
 (Part of PMUE1006A, PMUE1007A, PMUE1054A, and PMUE1055A Radios)
 (Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

Parts List

SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 12.5 kHz (N) (used in PMUE1006 & PMUE1054)
 SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 20/25 kHz (W) (used in PMUE1007 & PMUE1055) PL-951011-A

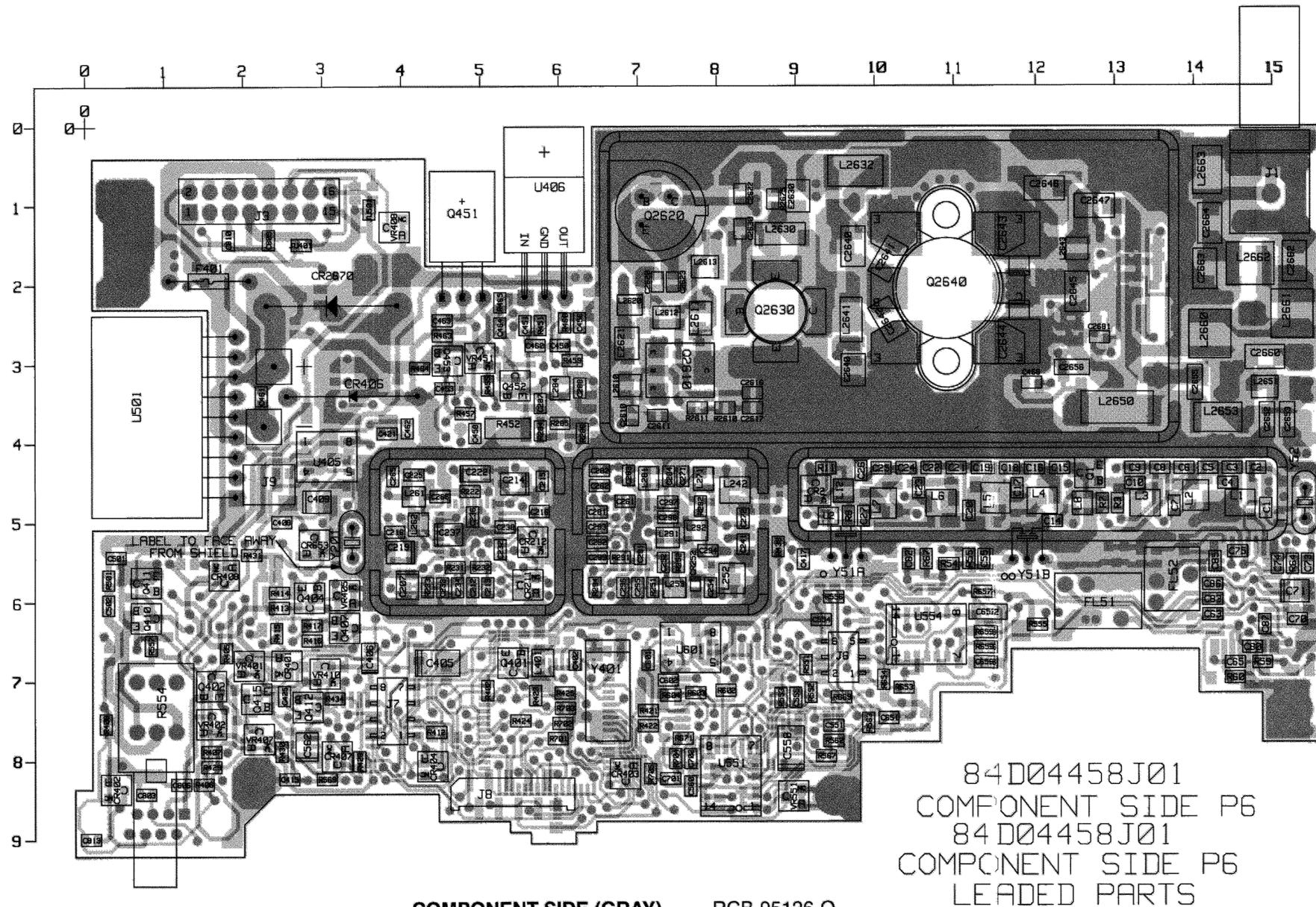
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740G21	capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C2	21-13740G24	5.6 +/-0.1 pF
C3	21-13740G16	3.6 +/-0.1 pF
C4	21-13740G30	11 pF 2%
C5	21-13740G17	3.9 +/-0.1 pF
C6	21-13740G23	6.2 +/-0.1 pF
C7	21-13740G28	9.1 pF 2%
C8	21-13740G12	2.4 +/-0.1 pF
C9	21-13740G13	2.7 +/-0.1 pF
C10	21-13740G12	2.4 +/-0.1 pF
C11, 12	21-13740A55	100 pF
C14	21-13740L05	3.0 +/-0.1 pF
C15	21-13740G25	7.5 +/-0.1 pF
C16	21-13740G18	4.3 +/-0.1 pF
C17	21-13740G32	13 pF 2%
C18, 19	21-13740G18	4.3 +/-0.1 pF
C20	21-13740G34	16 pF 2%
C21	21-13740G18	4.3 +/-0.1 pF
C22	21-13740G17	3.9 +/-0.1 pF
C23	21-13740G32	13 pF 2%
C24, 25	21-13740G18	4.3 +/-0.1 pF
C26	21-13740G10	2.0 +/-0.1 pF
C27	21-13740A59	150 pF
C28	21-13740A31	12 pF
C29	21-13740A35	18 pF
C30	21-13740A59	150 pF
C33	---	Not Used
C51	21-13740A53	82 pF
C52	21-13740A31	12 pF
C53	---	Not Used
C54	21-13740A46	47 pF
C55	21-13743A19	0.1 uF 10%; 16 V
C56	21-13740A57	120 pF
C57, 58	---	Not Used
C59	21-13740A53	82 pF
C60	21-13743A19	0.1 uF 10%; 16 V
C61	21-13741A25	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740A42	36 pF
C63(W)	21-13740A49	56 pF
C64(N)	21-13740A79	1000 pF
C64(W)	21-13740A73	560 pF
C65	21-13741A45	.01 uF
C66	21-13743A19	0.1 uF 10%; 16 V
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743A19	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743A19	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740A33	15 pF
C74	21-13740A42	36 pF
C75	21-13740A18	4.3 +/-0.25 pF
C79	21-13740A36	20 pF
C80	---	Not Used
C81 thru 83	21-13743A19	0.1 uF 10%; 16 V
C85 thru 87	21-13740A59	150 pF
C201	21-13740A63	220 pF
C202	21-13740G46	47 pF 2%
C203	21-13740G24	6.8 +/-0.1 pF
C207	23-11049J11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741A45	.01 uF
C212, 213	21-13740A55	100 pF
C21	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13740A79	1000 pF
C216	21-13741A45	.01 uF
C217	21-13740A59	150 pF
C218	21-13740A79	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C221	21-13743A19	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741A39	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13741A51	.018 uF
C230, 231	21-13740A59	150 pF
C232	21-13740A79	1000 pF
C233	21-13743A19	0.1 uF 10%; 16 V
C234	21-13740A41	33 pF
C236	---	Not Used

SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 12.5 kHz (N) (used in PMUE1006 & PMUE1054)
 SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 20/25 kHz (W) (used in PMUE1007 & PMUE1055) PL-951011-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740A59	150 pF
C241	21-13740A59	150 pF
C242	21-13740A27	8.2 +/-0.25 pF
C243	21-13740G12	2.4 +/-0.1 pF
C244	21-13740A23	6.2 +/-0.25 pF
C245	21-13740A23	6.2 +/-0.25 pF
C246	21-13740A23	6.2 +/-0.25 pF
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C251	21-13740A27	8.2 +/-0.25 pF
C252	21-13740G09	1.8 +/-0.1 pF
C253	21-13740G10	2.0 +/-0.1 pF
C254	21-13740A03	1 +/-0.25 pF
C255	21-13741A79	1000 pF
C256, 257	21-13740A21	5.6 +/-0.25 pF
C261	21-13740A59	150 pF
C262	21-13741A45	.01 uF
C263	21-13740A59	150 pF
C264 thru 266	---	Not Used
C267	21-13740A59	150 pF
C271, 272	21-13740A43	39 pF
C273	21-13740A71	470 pF
C274	21-13740A71	470 pF
C275	21-13740F18	4.3 +/-0.25 pF
C276	21-13740A27	8.2 +/-0.25 pF
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740A23	6.2 +/-0.25 pF
C282	21-13740A36	20 pF
C283	21-13740A59	150 pF
C284	21-13740A79	1000 pF
C285	21-13740A51	68 pF
C286	---	Not Used
C287	21-13740A51	68 pF
C288	21-13743A19	0.1 uF 10%; 16 V
C289	---	Not Used
C291	---	Not Used
C292, 293	21-13740A59	150 pF
C294	21-13741A45	.01 uF
C295	21-13740A59	150 pF
C296	---	Not Used
C297	21-13740A71	470 pF
C298, 299	21-13743A19	0.1 uF 10%; 16 V
C401	21-13740A41	33 pF
C402	21-13740A13	2.7 +/-0.25 pF
C403	21-13740A37	22 pF
C404	21-13743A19	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 47 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741A45	.01 uF
C408	21-13741A51	.018 uF
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13740A79	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743A19	0.1 uF 10%; 16 V
C415	21-13741A45	.01 uF
C416	21-13740A71	470 pF
C417	21-13740A79	1000 pF
C418	21-13743A19	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743A19	0.1 uF 10%; 16 V
C422	21-13740A71	470 pF
C423	23-11049J43	tantalum 47 uF 10%; 10 V
C424	---	Not Used
C425	21-13740A46	47 pF
C450	21-13740A59	150 pF
C451	---	Not Used
C452	21-13740A59	150 pF
C453, 454	21-13743A19	0.1 uF 10%; 16 V
C455 thru 458	21-13740A59	150 pF
C459	21-13743A19	0.1 uF 10%; 16 V
C460	---	Not Used
C461 thru 463	21-13740A20	5.1 +/-0.25 pF
C464	21-13743A19	0.1 uF 10%; 16 V
C465	21-13740A71	470 pF
C466	21-13740A59	150 pF
C501	21-13740A79	1000 pF
C502	21-13743A19	0.1 uF 10%; 16 V
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V

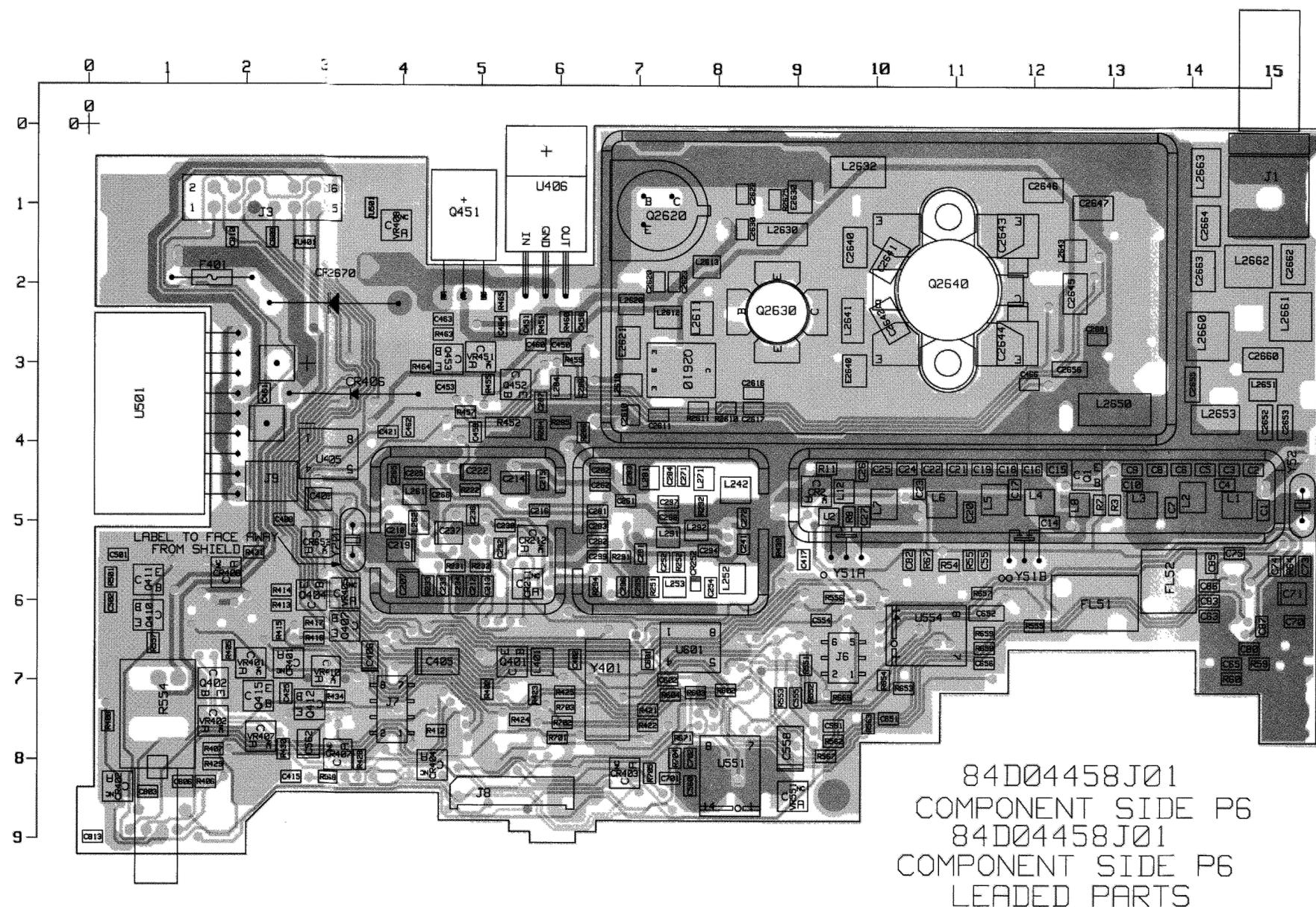
SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 12.5 kHz (N) (used in PMUE1006 & PMUE1054)
 SM50/SM120 UHF Main Board, 450-470 MHz, 10-25 Watts
 20/25 kHz (W) (used in PMUE1007 & PMUE1055) PL-951011-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C551	21-13743A19	0.1 uF 10% 16V
C554	48-05129M76	0.1 uF 10% 16 V
C555	21-13741A25	1500 pF
C556	23-11049A05	tantalum 0.47 uF 10%; 25 V
C558	23-11049J43	tantalum 47 uF 10%; 10 V
C559 thru 561	21-13743A19	0.1 uF 10% 16 V
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740A55	100 pF
C565	---	Not Used
C566	21-13743A19	0.1 uF 10%; 16 V
C602	21-13741A37	4700 pF
C603	23-11049A07	tantalum 1 uF 10%; 16 V
C604	23-11049A05	tantalum 0.47 uF 10%; 25 V
C651	21-13740A79	1000 pF
C652	21-11032B15	0.22 uF +/-80/-20%
C653	23-11049J43	tantalum 47 uF 10%; 10 V
C654	21-11032B15	0.22 uF +/-80/-20%
C655	23-11049J43	tantalum 47 uF 10%; 10 V
C656	21-13743A19	0.1 uF 10%; 16 V
C701	21-13741A59	309 pF
C702	21-13741A45	0.1 pF
C803, 804	21-13740A71	470 pF
C805	21-13743A19	0.1 uF 10%; 16 V
C806 thru 814	21-13740A71	470 pF
C810	21-13740A30	11 pF
C811	21-13740A20	10 pF
C812	21-13740A33	15 pF
C813, 2614	21-13740A79	1000 pF
C815	21-13740A24	6.8 +/-0.25 pF
C816	21-13740A59	150 pF
C817	21-13740A59	150 pF
C818	21-13743A19	0.1 uF 10%; 16 V
C819	21-13740A79	1000 pF
C820	21-13740A59	150 pF
C821	21-13740A33	15 pF
C822	21-13740A39	27 pF
C823	---	Not Used
C824, 2623	---	Not Used
C825	21-13741W01	1 uF 10%; 25 V
C826	21-13740A79	1000 pF
C827	21-13740A59	150 pF
C828	---	Not Used
C829	21-13740A59	150 pF
C830	---	Not Used
C831	21-13740B32	20 pF
C832	21-13741W01	1 uF 10%; 25 V
C833	21-13740A59	150 pF
C834	---	Not Used
C835	21-13740B32	20 pF
C836	21-80658M31	33 pF 500 V
C837	21-80658M31	33 pF 500 V
C838	21-80658M31	33 pF 500 V
C839	21-80658M31	33 pF 500 V
C840	21-80658M31	33 pF 500 V
C841	21-80658M31	33 pF 500 V
C842	21-80658M31	33 pF 500 V
C843	21-80658M31	33 pF 500 V
C844	21-80658M31	33 pF 500 V
C845	21-80658M31	33 pF 500 V
C846	21-80658M31	33 pF 500 V
C847	21-80658M31	33 pF 500 V
C848	21-80658M31	33 pF 500 V
C849	21-80658M31	33 pF 500 V
C850	21-80658M31	33 pF 500 V
C851	21-80658M31	33 pF 500 V
C852	21-80658M31	33 pF 500 V
C853	21-80658M31	33 pF 500 V
C854	21-80658M31	33 pF 500 V
C855	21-80658M31	33 pF 500 V
C856	21-80658M31	33 pF 500 V
C857	21-80658M31	33 pF 500 V
C858	21-80658M31	33 pF 500 V
C859	21-80658M31	33 pF 500 V
C860	21-80658M31	33 pF 500 V
C861	21-80658M31	33 pF 500 V
C862	21-80658M31	33 pF 500 V
C863	21-80658M31	33 pF 500 V
C864	21-80658M31	33 pF 500 V
C865	21-80658M31	33 pF 500 V
C866	21-80658M31	33 pF 500 V
C867	21-80658M31	33 pF 500 V
C868	21-80658M31	33 pF 500 V
C869	21-80658M31	33 pF 500 V
C870	21-80658M31	33 pF 500 V
C871	21-80658M31	33 pF 500 V
C872	21-80658M31	33 pF 500 V
C873	21-80658M31	33 pF 500 V
C874	21-80658M31	33 pF 500 V
C875	21-80658M31	33 pF 500 V
C876	21-80658M31	33 pF 500 V
C877	21-80658M31	33



COMPONENT SIDE (GRAY) RCB-95126-O
 SOLDER SIDE (PINK) RCB-95129-O
 OVERLAY ----- RCB-95130-O

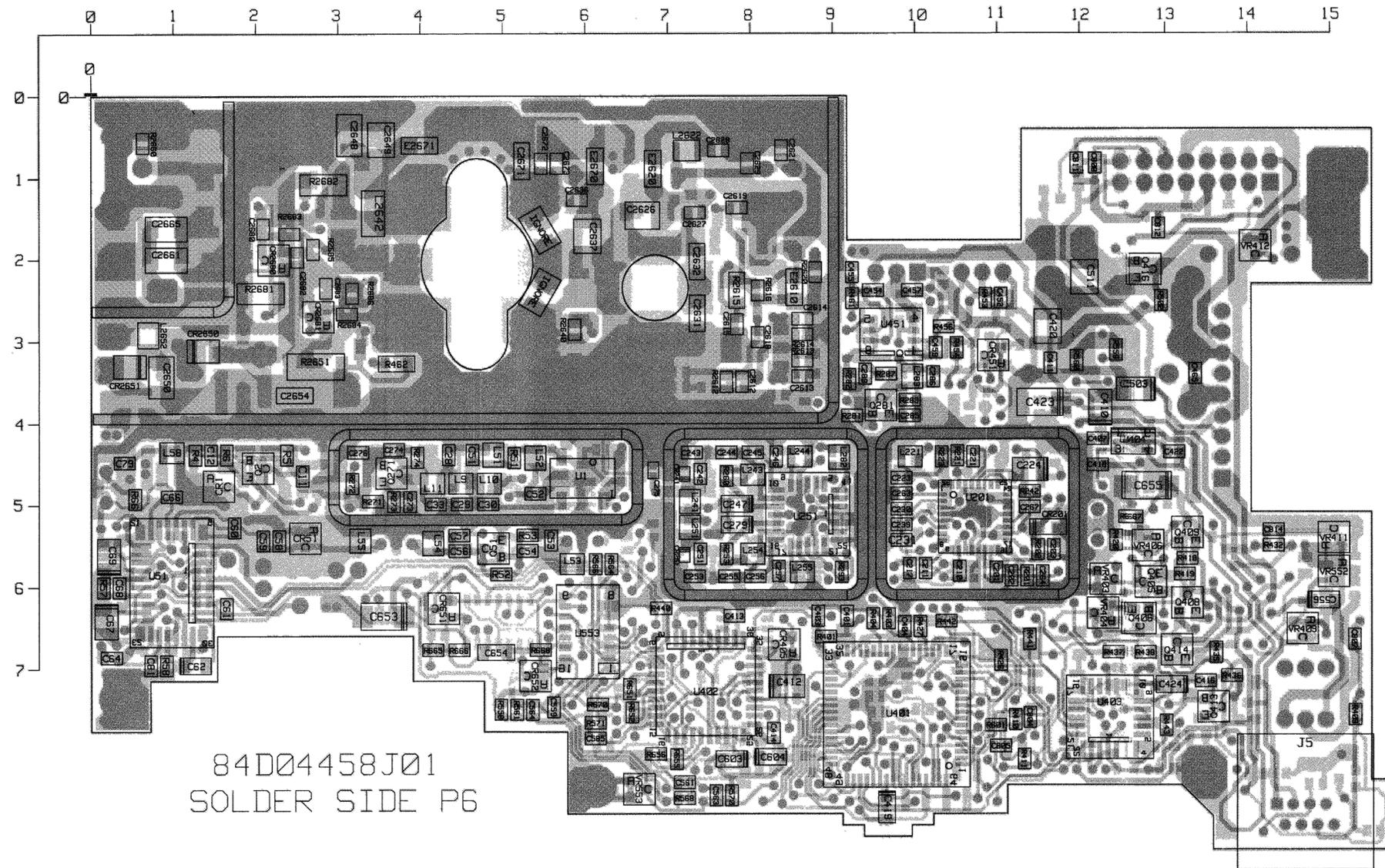
COMPONENT SIDE VIEW



COMPONENT SIDE INNER LAYER (GRAY) RCB-95127-O
 SOLDER SIDE INNER LAYER (PINK) RCB-95128-O
 OVERLAY ----- RCB-95130-O

COMPONENT SIDE VIEW

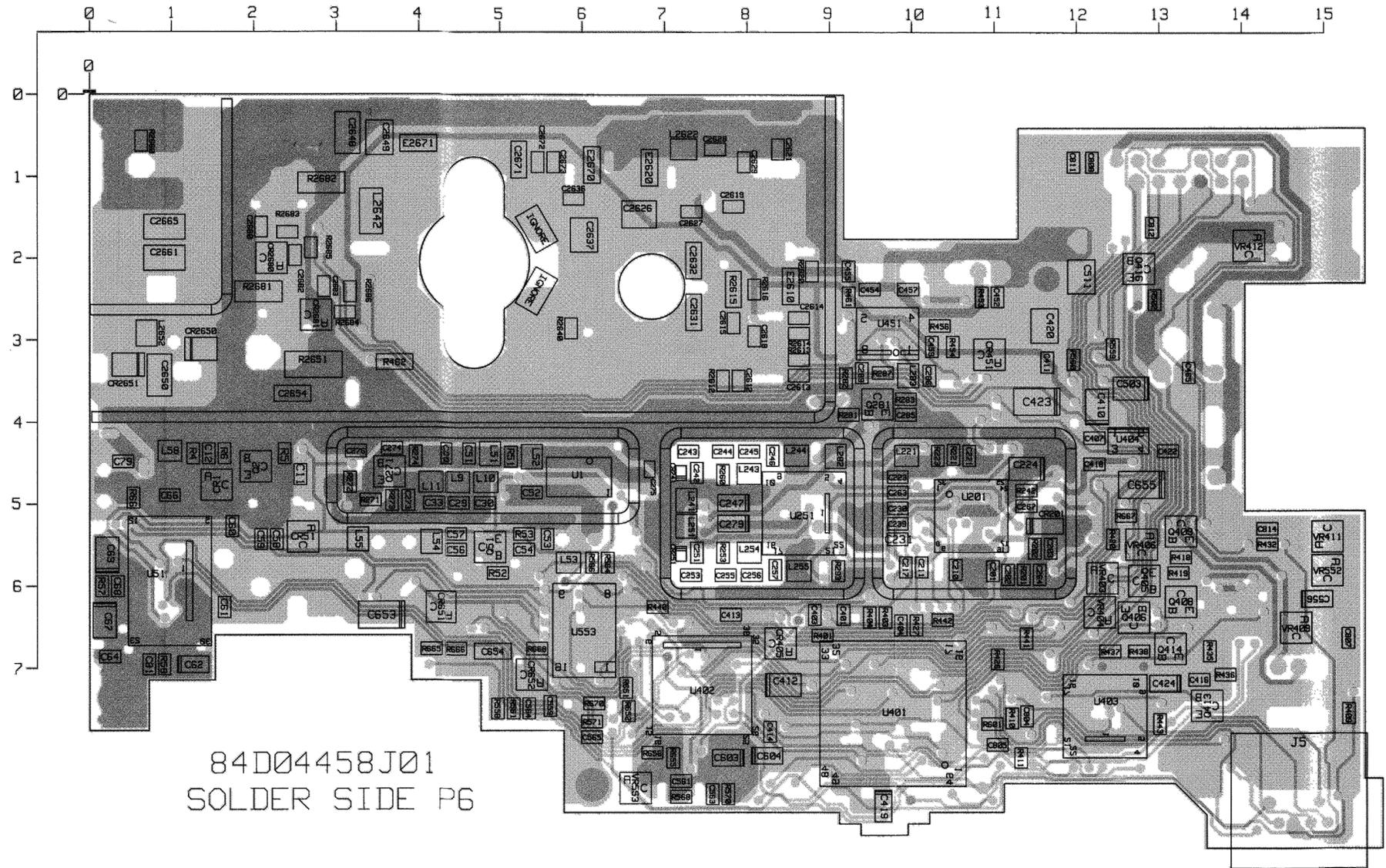
Circuit Board Details for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of PMUE1039A, PMUE1040A, PMUE1056A, and PMUE1057A Radios)



84D04458J01
SOLDER SIDE P6

COMPONENT SIDE (GRAY) RCB-95126-O (REV)
SOLDER SIDE (PINK) RCB-95129-O (REV)
OVERLAY ---- RCB-95131-O (REV)

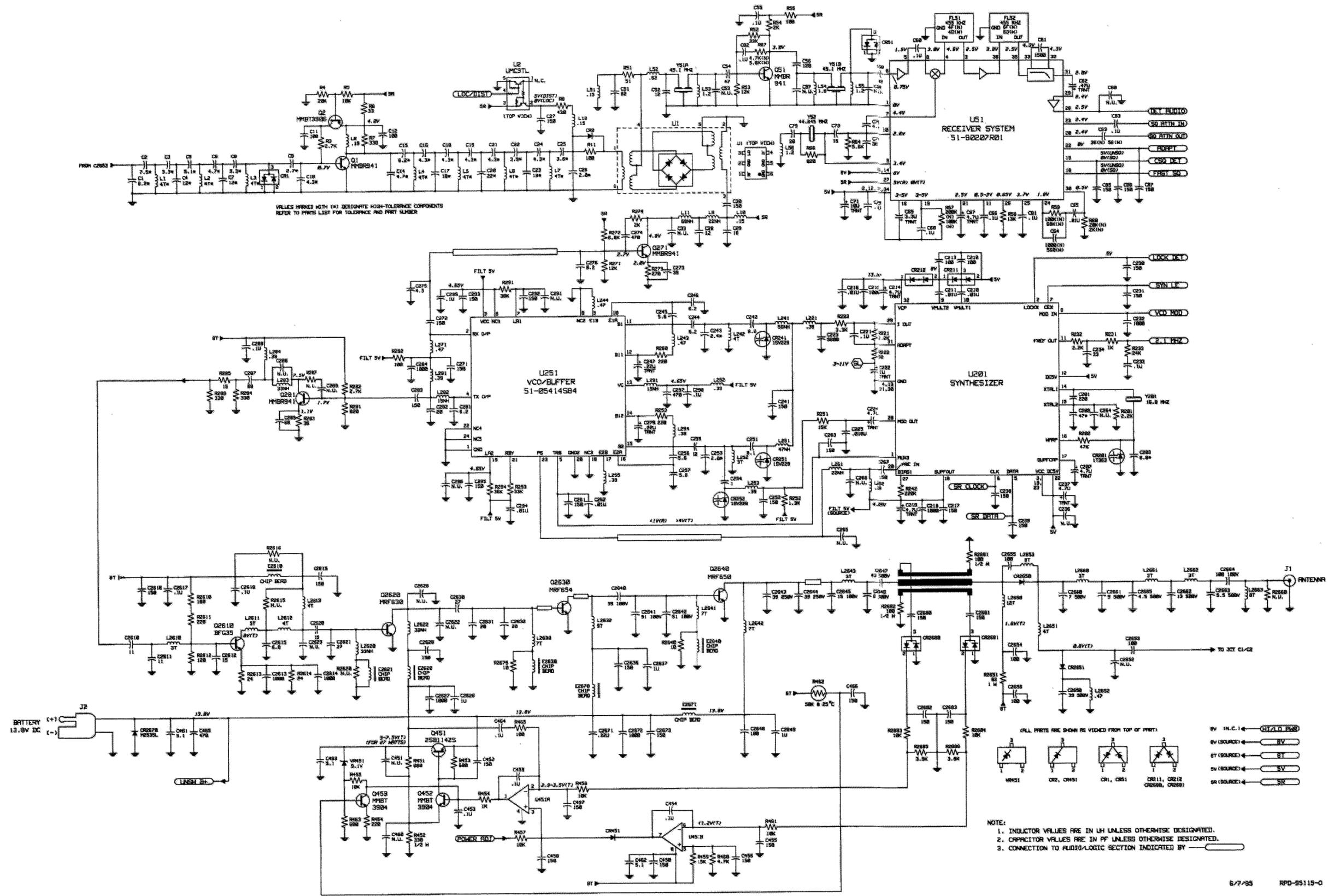
SOLDER SIDE VIEW



84D04458J01
SOLDER SIDE P6

COMPONENT SIDE INNER LAYER (GRAY) RCB-95127-O (REV)
SOLDER SIDE INNER LAYER (PINK) RCB-95128-O (REV)
OVERLAY ---- RCB-95131-O (REV)

SOLDER SIDE VIEW



Schematic Diagram for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of PMUE1039A, PMUE1040A, PMUE1056A, and PMUE1057A Radios)
 (Sheet 1 of 2)

6/7/95 RFD-95115-0

Parts List

SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 12.5 kHz (N) (Used in PMUE1039 & PMUE1056)
 SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 20/25 kHz (W) (used in PMUE1040 & PMUE1057)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740G21	capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C2	21-13740G24	5.6 ±0.1 pF
C3	21-13740G16	6.8 ±0.1 pF
C4	21-13740G30	3.6 ±0.1 pF
C5	21-13740G27	11 pF 2%
C6	21-13740G23	6.2 ±0.1 pF
C7	21-13740G28	6.2 ±0.1 pF
C8	21-13740G12	9.1 pF 2%
C9	21-13740G13	2.4 ±0.1 pF
C10	21-13740G12	2.7 ±0.1 pF
C11	21-13740A55	2.4 ±0.1 pF
C12	21-13740A55	100 pF
C14	21-13740L05	3.0 ±0.1 pF
C15	21-13740G25	7.5 ±0.1 pF
C16	21-13740G18	4.3 ±0.1 pF
C17	21-13740G32	13 pF 2%
C18	21-13740G18	4.3 ±0.1 pF
C19	21-13740G18	4.3 ±0.1 pF
C20	21-13740G34	16 pF 2%
C21	21-13740G18	4.3 ±0.1 pF
C22	21-13740G17	3.9 ±0.1 pF
C23	21-13740G32	13 pF 2%
C24, 25	21-13740G18	4.3 ±0.1 pF
C26	21-13740G10	2.0 ±0.1 pF
C27	21-13740A59	150 pF
C28	21-13740A31	12 pF
C29	21-13740A35	18 pF
C30	21-13740A59	150 pF
C33	---	Not Used
C51	21-13740A53	82 pF
C52	21-13740A31	12 pF
C53	---	Not Used
C54	21-13740A46	47 pF
C55	21-13743A19	0.1 uF 10%; 16 V
C56	21-13740A57	120 pF
C57, 58	---	Not Used
C59	21-13740A53	82 pF
C60	21-13740A59	150 pF
C61	21-13741A25	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740A42	96 pF
C64(W)	21-13740A49	56 pF
C65(N)	21-13740A79	1000 pF
C65(W)	21-13740A73	560 pF
C66	21-13741A45	0.1 uF
C67	21-13743A19	0.1 uF 10%; 16 V
C68	23-11049J11	tantalum 4.7 uF 10%; 16 V
C69	21-13743A19	0.1 uF 10%; 16 V
C70	21-13743A19	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740A33	15 pF
C74	21-13740A42	36 pF
C75	21-13740A18	4.3 ±0.25 pF
C79	21-13740A36	20 pF
C80	---	Not Used
C81 thru 83	21-13743A19	0.1 uF 10%; 16 V
C85 thru 87	21-13740A59	150 pF
C89	21-13740A63	220 pF
C90	21-13740G46	47 pF 2%
C92	21-13740G24	6.8 ±0.1 pF
C93	23-11049J11	tantalum 4.7 uF 10%; 16 V
C207	21-13741A45	0.1 uF
C210, 211	21-13740A55	100 pF
C212, 213	23-11049J11	tantalum 4.7 uF 10%; 16 V
C214	21-13740A79	1000 pF
C215	21-13741A45	0.1 uF
C216	21-13741A45	150 pF
C217	21-13740A59	150 pF
C218	21-13740A79	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C221	21-13743A19	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741A39	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13741A51	0.18 uF
C230, 231	21-13740A59	150 pF
C232	21-13740A79	1000 pF
C233	21-13743A19	0.1 uF 10%; 16 V
C234	21-13740A41	33 pF

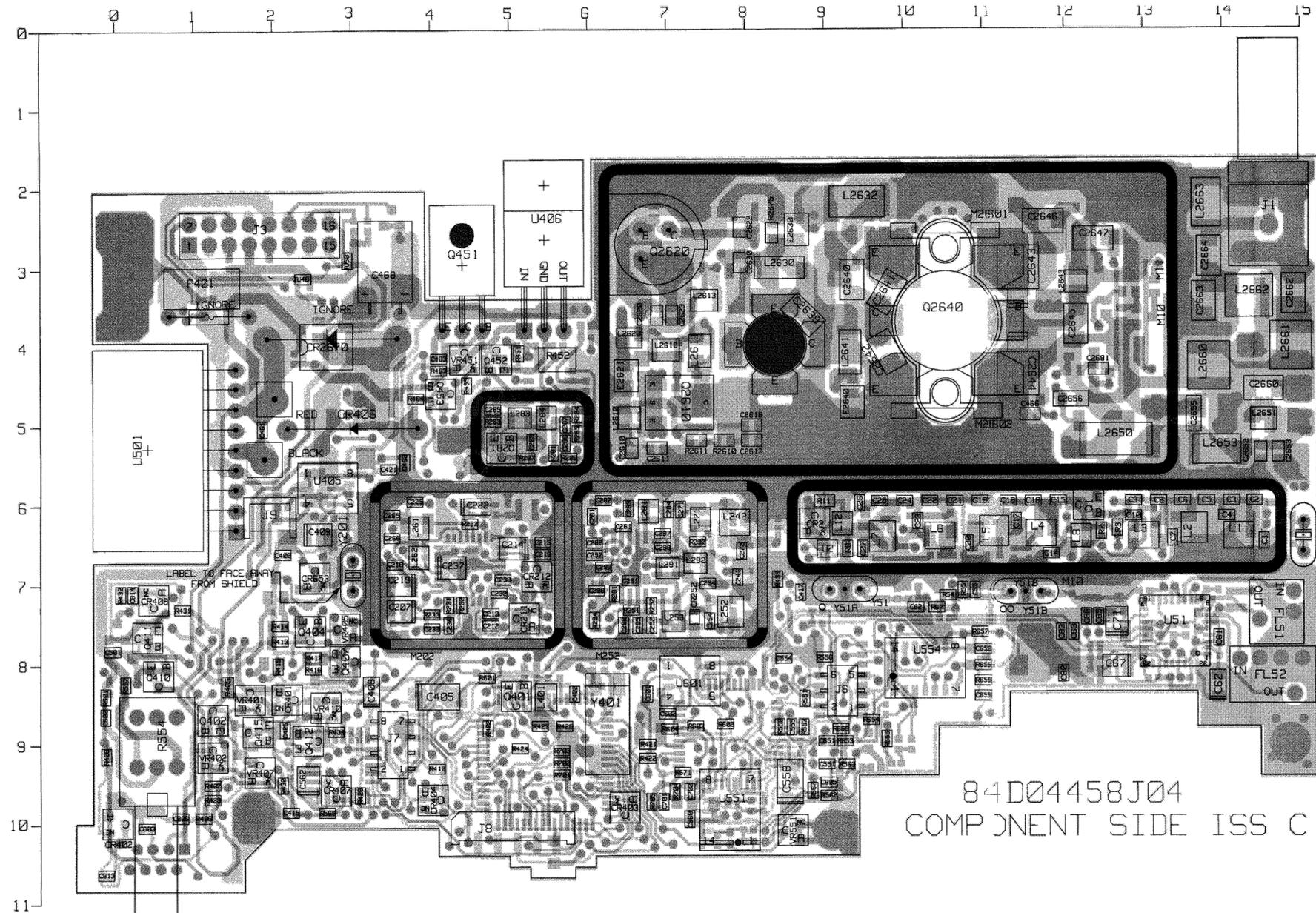
SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 12.5 kHz (N) (Used in PMUE1039 & PMUE1056)
 SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 20/25 kHz (W) (used in PMUE1040 & PMUE1057)

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C236	---	Not Used
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740A59	150 pF
C241	21-13740A59	150 pF
C242	21-13740A27	8.2 ±0.25 pF
C243	21-13740G12	2.4 ±0.1 pF
C244	21-13740A23	6.2 ±0.25 pF
C245	21-13740A21	5.6 ±0.25 pF
C246	21-13740A23	6.2 ±0.25 pF
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C251	21-13740A27	8.2 ±0.25 pF
C252	21-13740A59	150 pF
C253	21-13740G09	1.8 ±0.1 pF
C254	21-13740A03	1 ±0.25 pF
C255	21-13740A31	12 pF
C256, 257	21-13740A21	5.6 ±0.25 pF
C261	21-13740A59	150 pF
C262	21-13741A45	0.1 uF
C263	21-13740A59	150 pF
C264 thru 266	---	Not Used
C267	21-13740A59	150 pF
C271, 272	21-13740A59	150 pF
C273	21-13740A43	39 pF
C274	21-13740A71	470 pF
C275	21-13740F18	4.3 ±0.25 pF
C276	21-13740A27	8.2 ±0.25 pF
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740A23	6.2 ±0.25 pF
C282	21-13740A36	20 pF
C283	21-13740A59	150 pF
C284	21-13740A79	1000 pF
C285	21-13740A51	68 pF
C286	---	Not Used
C287	21-13740A51	68 pF
C288	21-13743A19	0.1 uF 10%; 16 V
C289	---	Not Used
C291	---	Not Used
C292, 293	21-13740A59	150 pF
C294	21-13741A45	0.1 uF
C295	21-13740A59	150 pF
C296	---	Not Used
C297	21-13740A71	470 pF
C298, 299	21-13743A19	0.1 uF 10%; 16 V
C401	21-13740A41	33 pF
C402	21-13741W01	2.7 ±0.25 pF
C403	21-13740A37	22 pF
C404	21-13743A19	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 4.7 uF 10%; 10 V
C406	23-11049A04	tantalum 2.2 uF 10%; 10 V
C407	21-13741A45	0.1 uF
C408	21-13741A51	0.18 uF
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13740A79	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743A19	0.1 uF 10%; 16 V
C415	21-13741A45	0.1 uF
C416	21-13740A71	470 pF
C417	21-13740A79	1000 pF
C418	21-13743A19	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743A19	0.1 uF 10%; 16 V
C422	21-13740A71	470 pF
C423	23-11049J43	tantalum 4.7 uF 10%; 10 V
C424	---	Not Used
C425	21-13740A46	47 pF
C450	21-13740A28	9.1 ±0.25 pF
C451	---	Not Used
C452	21-13740A59	150 pF
C453, 454	21-13743A19	0.1 uF 10%; 16 V
C455 thru 458	21-13740A59	150 pF
C459	21-13743A19	0.1 uF 10%; 16 V
C460	---	Not Used
C461	21-13740A20	5.1 ±0.25 pF
C462	21-13740A59	150 pF
C463	21-13740A20	5.1 ±0.25 pF
C464	21-13743A19	0.1 uF 10%; 16 V
C465	21-13740A71	470 pF
C466	21-13740A59	150 pF
C501	21-13740A79	1000 pF
C502	21-13743A19	0.1 uF 10%; 16 V

SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 12.5 kHz (N) (Used in PMUE1039 & PMUE1056)
 SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 20/25 kHz (W) (used in PMUE1040 & PMUE1057)

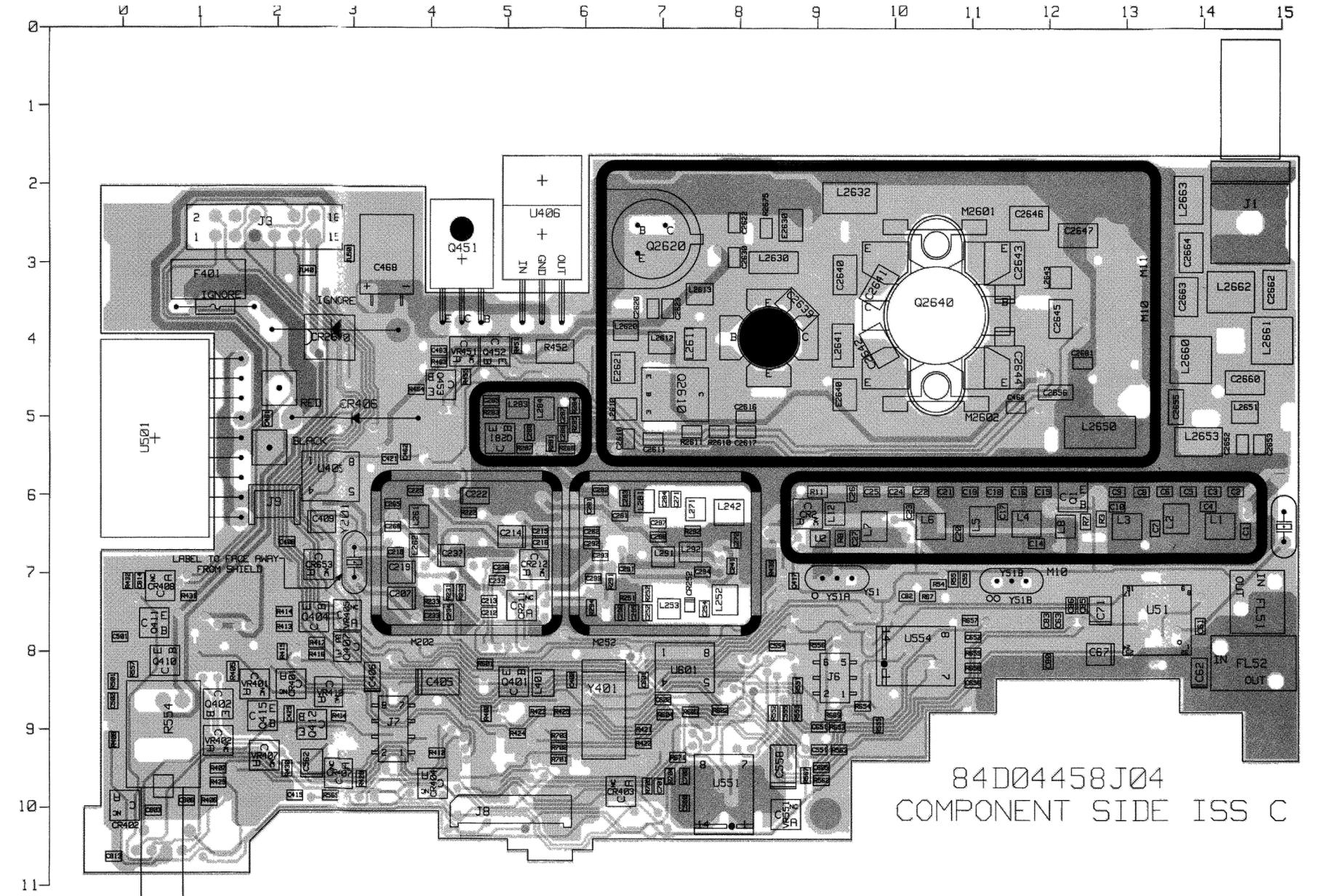
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C551	21-13743A19	0.1 uF 10%; 16 V
C554	21-13743A19	0.1 uF 10%; 16 V
C555	21-13741A79	1000 pF
C556	23-11049A05	tantalum .47 uF 10%; 25 V
C558	23-11049J43	tantalum 4.7 uF 10%; 10 V
C559 thru 561	21-13743A19	0.1 uF 10%; 16 V
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740A55	100 pF
C565	---	Not Used
C601	21-13743A19	0.1 uF 10%; 16 V
C602	21-13741A57	4700 pF
C603	23-11049A07	tantalum 1 uF 10%; 16 V
C604	23-11049A05	tantalum 0.47 uF 10%; 25 V
C651	21-13740A79	1000 pF
C652	21-11032B15	0.22 uF +80/-20%
C653	23-11049J43	tantalum 4.7 uF 10%; 10 V
C654	21-11032B15	0.22 uF +80/-20%
C655	23-11049J43	tantalum 4.7 uF 10%; 10 V
C656	21-13743A19	0.1 uF 10%; 16 V
C701	21-13741A59	.039 uF
C702	21-13741A45	.01 uF
C803, 804	21-13740A71	470 pF
C805	21-13743A19	0.1 uF 10%; 16 V
C806 thru 814	21-13740A71	470 pF
C810	21-13740A30	11 pF
C811	21-13740A29	10 pF
C812	21-13740A33	15 pF
C813, 2614	21-13740A79	1000 pF
C815	21-13740A24	6.8 ±0.25 pF
C816	21-13740A59	150 pF
C817, 2618	21-13743A19	0.1 uF 10%; 16 V
C818	21-13740A59	150 pF
C819	21-13740A33	15 pF
C821	21-13740A39	27 pF
C822, 2623	---	Not Used
C826	21-13741W01	1 uF 10%; 25 V
C827	21-13740A79	1000 pF
C828	21-13740A59	150 pF
C829	---	Not Used
C830	21-13740A39	27 pF
C831, 2632	21-13740B32	20 pF
C836	21-13740A59	150 pF
C837	21-13741W01	1 uF 10%; 25 V
C838	21-11078B18	16 pF; 100 V
C839	21-11078B34	47 pF; 100 V
C840	21-11078B35	51 pF; 100 V
C841	21-11078B36	56 pF; 100 V
C842	21-11078B36	56 pF; 100 V
C843, 2644	21-80964X35	clamped mica 39 pF 250 V
C845	21-11078B18	16 pF; 100 V
C846	21-80060M15	8 ±0.5 pF 500 V
C847	21-80060M34	43 pF 500 V
C848	21-13740B49	100 pF
C849	21-82587X69	chip 1.2 uH 5%
C850	21-13741W01	1 uF 10%; 25 V
C851	21-82587X63	39 pF 500 V
C852	21-13740A10	2.0 pF
C853	21-13740A36	20 pF
C854 thru 2656	21-13740B49	100 pF
C2660	21-80060M13	7 ±0.5 pF 500 V
C2661	21-11078B05	4.7 ±0.2 pF; 100 V
C2662	21-80060M22	13 pF 500 V
C2663	21-80060M11	6 ±0.5 pF 500 V
L261	24-82587X60	chip 0.39 uH 5%
L262	24-82587X60	chip 0.39 uH 5%
L263	24-82587X61	chip 0.39 uH 5%
L264	24-82587X43	chip 1.5 nH 5%
L265	21-11032B15	0.22 uF +80/-20%
L266	21-13740A79	1000 pF
L267	21-13740A59	150 pF
L268	24-82587X47	chip 33 nH 5%
L284	24-82587X60	chip 0.39 uH 5%
L291	24-82587X43	chip 15 nH 5%
L292	24-82587X60	chip 0.39 uH 5%
L401	24-80579C43	chip 33 uH
CR2	48-80142L01	silicon PIN SOT MMBV3401
CR51	24-80591C73	dual Schottky SOT
CR201	48-02245J22	silicon varactor SOT 1T363
CR211, 212	48-13839C07	dual silicon SOT MMBD7000
CR241	48-82824C01	silicon varactor SOT 1SV229
CR251, 252	48-82824C01	silicon varactor SOT 1SV229
CR401	48-05129M76	silicon SOT
CR402	48-13839C07	dual silicon SOT MMBD7000
CR403	48-80939T10	Schottky SOT

SM50/SM120 UHF Main Board, 450-470 MHz, 40 Watts, 12.5 kHz (N) (Used in PMUE1039 & PMUE1056)
 SM50/SM120 UHF Main Board



COMPONENT SIDE (GRAY) RCB-95126-A
 SOLDER SIDE (PINK) RCB-95129-A
 OVERLAY ----- RCB-95130-A

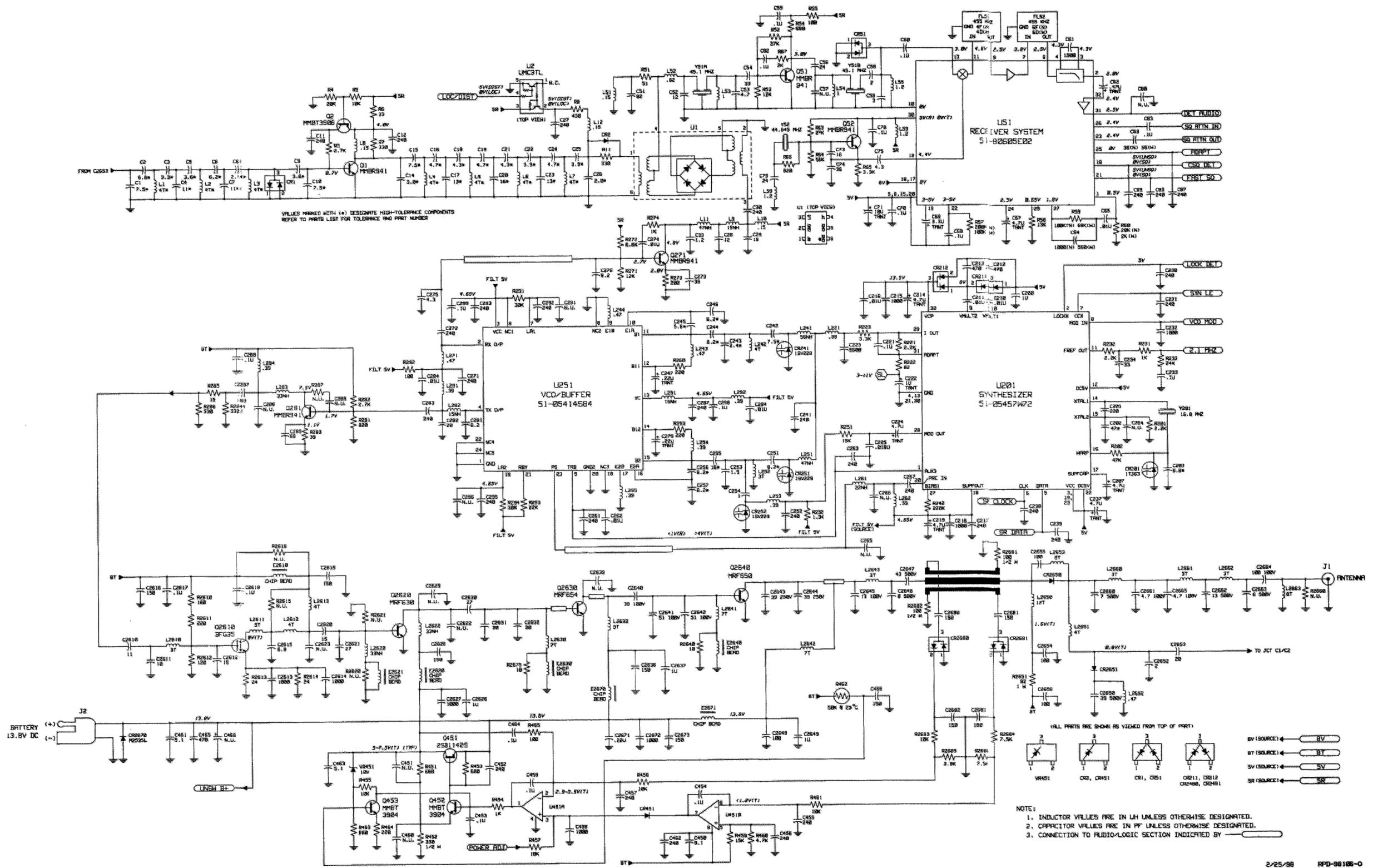
COMPONENT SIDE VIEW



COMPONENT SIDE INNER LAYER (GRAY) RCB-95127-A
 SOLDER SIDE INNER LAYER (PINK) RCB-95128-A
 OVERLAY ----- RCB-95130-A

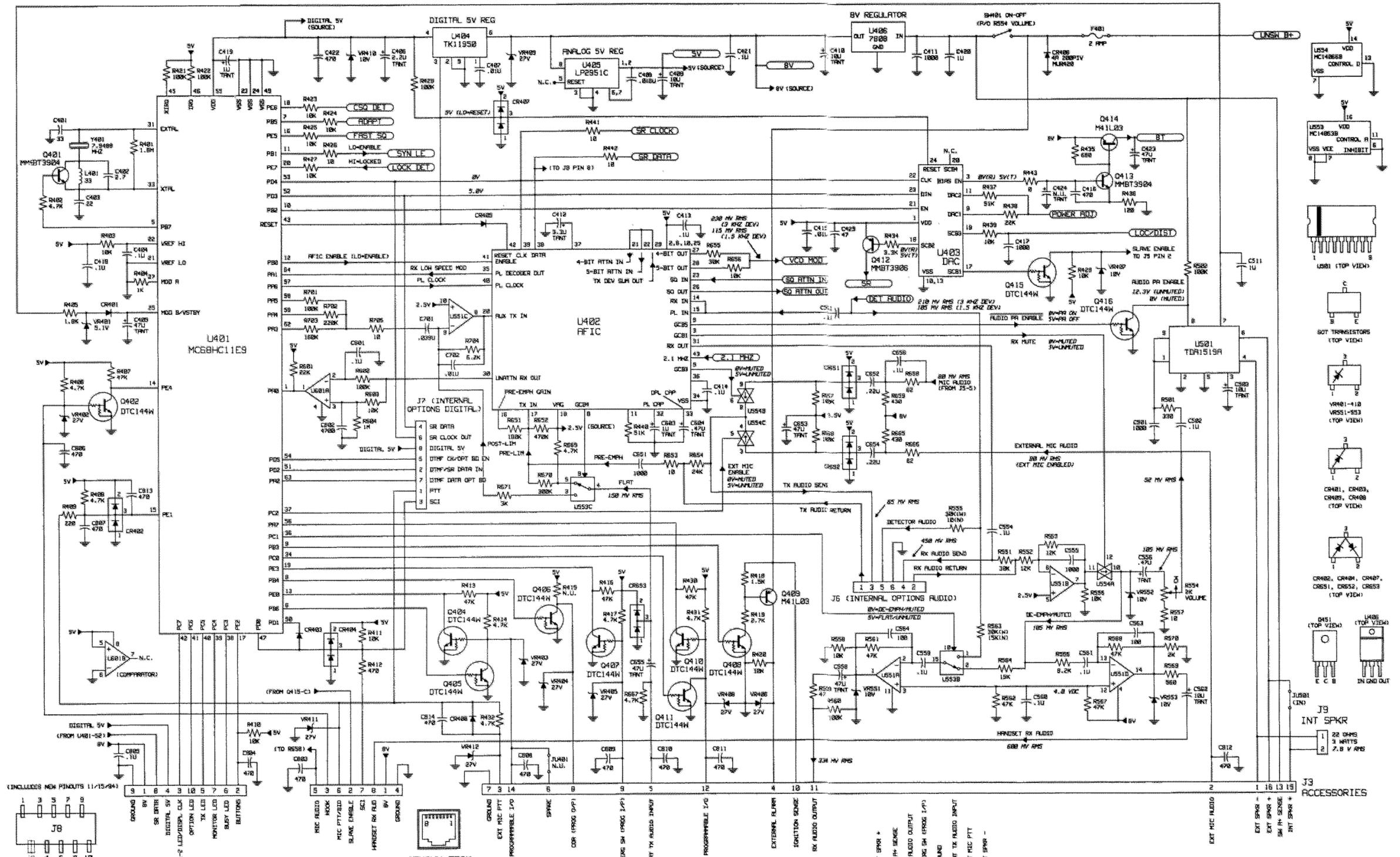
COMPONENT SIDE VIEW

Circuit Board Details for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of PMUE1039B, PMUE1040B, PMUE1056B, and PMUE1057B Radios)



Schematic Diagram for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of PMUE1039B, PMUE1040B, PMUE1056B, and PMUE1057B Radios)
 (Sheet 1 of 2)

2/25/98 RFD-98106-0



Schematic Diagram for
 UHF Main Boards, 450-470 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of PMUE1039B, PMUE1040B, PMUE1056B, and PMUE1057B Radios)
 (Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY .
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

Parts List

SM50/SM120 UHF Main Board, 450-470 MHz, 40 W, 12.5 kHz (N)
(later version) (used in PMUE1039 & PMUE1056)
SM50/SM120 UHF Main Board, 450-470 MHz 40 W, 20/25/30 kHz (W)
(later version) (used in PMUE1040 & PMUE1057) PL-981004-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740F39	capacitor, fixed: uF +/-10%; 100 V; unless otherwise stated
C2	21-13740F52	110 pF
C3	21-13740F50	91 pF
C4	21-13740F38	30 pF
C5	---	Not Used
C6	21-13740F20	5.1 +/-0.25 pF
C7	---	Not Used
C8	21-13740F38	30 pF
C9	21-13740F50	91 pF
C10	21-13740F51	100 pF
C11	21-13740F41	39 pF
C12	21-13741F29	1600 pF
C13	21-13740F41	39 pF
C14	21-13740F54	130 pF
C15	21-13740F50	91 pF
C16	21-13740F43	47 pF
C17	21-13740F50	91 pF
C18	21-13740F54	130 pF
C19	21-13740F40	36 pF
C20 thru 22	21-13741F29	1500 pF
C23	21-13743E20	0.1 uF 10%; 16 V
C24	21-13741F29	1500 pF
C26	21-13740L03	2.4 +/-0.1 pF
C27	21-13741F29	1500 pF
C28	21-13740F37	27 pF
C29	21-13740F30	19 pF
C30	21-13741F29	1500 pF
C33	21-13740F30	19 pF
C51	21-13740F49	82 pF
C52	21-13740F28	12 pF
C53	21-13740F19	4.7 +/-0.25 pF
C54	21-13740F39	33 pF
C55	21-13743E20	0.1 uF 10%; 16 V
C56	21-13740F36	24 pF
C57	---	Not Used
C58	21-13740F10	2.0 +/-0.25 pF
C59	21-13740F14	3.0 +/-0.25 pF
C60	21-13743E20	0.1 uF 10%; 16 V
C61	21-13741F29	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740F40	36 pF
C64(W)	21-13740F45	56 pF
C64(W)	21-13741F25	1000 pF
C65	21-13740F69	560 pF
C66	21-13741F49	0.01 uF
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743E20	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743E20	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740F32	16 pF
C74	21-13740F40	36 pF
C75	21-13740F18	4.3 +/-0.25 pF
C76	21-13743E20	0.1 uF 10%; 16 V
C79	21-13740F36	24 pF
C80	---	Not Used
C82, 83	21-13743E20	0.1 uF 10%; 16 V
C85 thru 87	21-13740F60	240 pF
C201	21-13740F69	220 pF
C202	21-13740L34	47 pF 2%
C203	21-13740L14	6.8 +/-0.1 pF
C207	23-11049J11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741F49	.01 uF
C212, 213	21-13741F17	470 pF
C214	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13741F29	1500 pF
C216	21-13741F49	.01 uF
C217	21-13741F29	1500 pF
C218	21-13743E20	0.1 uF 10%; 16 V
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C220	21-13743E20	0.1 uF 10%; 10 V
C221	21-13743E20	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741F43	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13743E05	.018 uF 10%; 16 V
C230, 231	21-13741F17	470 pF
C232	21-13741F25	1000 pF
C233	21-13743E20	0.1 uF 10%; 16 V

SM50/SM120 UHF Main Board, 450-470 MHz, 40 W, 12.5 kHz (N)
(later version) (used in PMUE1039 & PMUE1056)
SM50/SM120 UHF Main Board, 450-470 MHz 40 W, 20/25/30 kHz (W)
(later version) (used in PMUE1040 & PMUE1057) PL-981004-0

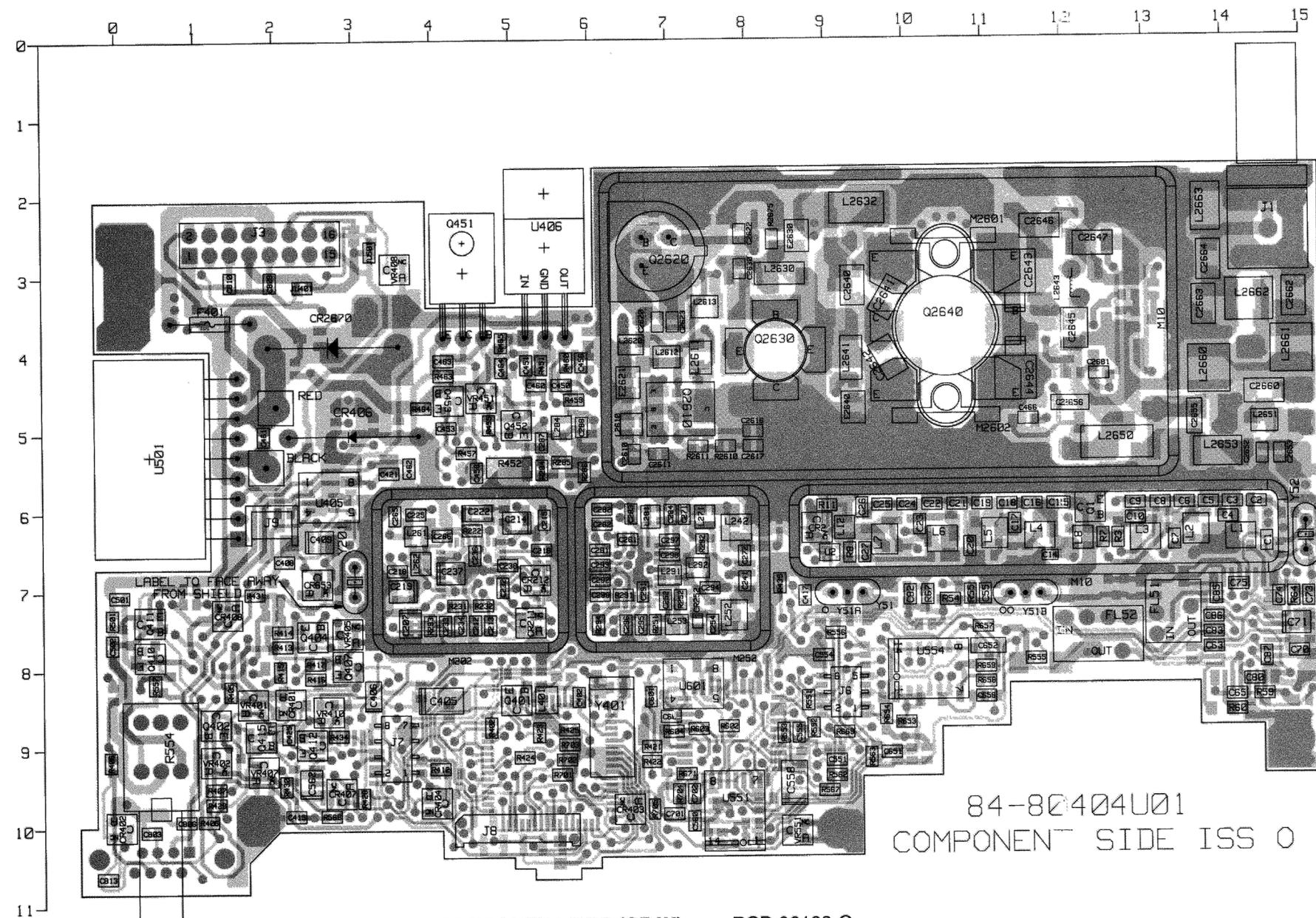
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C234	21-13740F39	33 pF
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740F55	150 pF
C241	21-13741F29	1500 pF
C242	21-13740L22	15 pF 2%
C243	21-13740F03	1 +/-0.025 pF
C244	21-13740L18	11 pF 2%
C245	21-13740L16	8.2 +/-0.1 pF
C246	21-13740L18	10 pF 2%
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C251	21-13740L26	22 pF 2%
C252	21-13741F29	1500 pF
C253	21-13740F05	1.2 +/-0.25 pF
C254	21-13740F08	1.6 +/-0.25 pF
C255	21-13740L22	15 pF 2%
C256	21-13740L18	8.2 +/-0.1 pF
C257	21-13740L18	10 pF 2%
C261	---	Not Used
C262	21-13741F49	.01 uF
C263	21-13741F29	1500 pF
C264	---	Not Used
C265	21-13740F30	13 pF
C266	21-13740F24	7.5 +/-0.25 pF
C267	21-13741F29	1500 pF
C271 thru 273	21-13741F29	1500 pF
C274	21-13741F49	.01 uF
C275	21-13740F29	12 pF
C276	---	Not Used
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740F25	8.2 +/-0.25 pF
C282	21-13740F31	15 pF
C283	21-13741F29	1500 pF
C284	---	Not Used
C285	21-13741F29	1500 pF
C286	21-13740F27	10 pF
C287	21-13741F25	1000 pF
C288	21-13743E20	0.1 uF 10%; 16 V
C289	---	Not Used
C291	---	Not Used
C292	21-13743E20	0.1 uF 10%; 16 V
C293	21-13741F29	1500 pF
C294	21-13741F49	.01 uF
C295	---	Not Used
C296	21-13743E20	0.1 uF 10%; 16 V
C297	---	Not Used
C298	21-13741F29	1500 pF
C299	21-13743E20	0.1 uF 10%; 16 V
C401	21-13740F39	33 pF
C402	21-13740F13	2.7 +/-0.25 pF
C403	21-13740F35	22 pF
C404	21-13743E20	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 47 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741F49	.01 uF
C408	21-13743E05	.018 uF 10%; 16 V
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13741F25	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743E20	0.1 uF 10%; 16 V
C415	21-13741F49	.01 uF
C416	21-13741F17	470 pF
C417	21-13741F25	1000 pF
C418	21-13743E20	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743E20	0.1 uF 10%; 16 V
C422	21-13741F17	470 pF
C423	23-11049J43	tantalum 47 uF 10%; 10 V
C424	---	Not Used
C425	21-13740F43	47 pF
C426	21-13740F26	9.1 +/-0.25 pF
C451	21-13743K16	0.22 uF +/-80%/20%; 16 V
C452	21-13741F29	1500 pF
C453, 454	21-13743E20	0.1 uF 10%; 16 V
C455 thru 458	21-13741F29	1500 pF
C459	21-13743E20	0.1 uF 10%; 16 V
C460	---	Not Used
C461	21-13740F20	5.1 +/-0.25 pF
C462	21-13741F29	1500 pF
C463	21-13740F20	5.1 +/-0.25 pF
C464	21-13743E20	0.1 uF 10%; 16 V

SM50/SM120 UHF Main Board, 450-470 MHz, 40 W, 12.5 kHz (N)
(later version) (used in PMUE1039 & PMUE1056)
SM50/SM120 UHF Main Board, 450-470 MHz 40 W, 20/25/30 kHz (W)
(later version) (used in PMUE1040 & PMUE1057) PL-981004-0

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C465	21-13741F29	1500 pF
C466	21-13740A71	470 pF
C468	---	Not Used
C501	21-13741F25	1000 pF
C502	21-13743E20	0.1 uF 10%; 16 V
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C512	21-13743E20	0.1 uF 10%; 16 V
C554	48-13833C07	diode silicon SOT
C555	21-13741F25	1000 pF
C556	23-11049A05	tantalum 0.47 uF 10%; 25 V
C558	23-11049J43	tantalum 47 uF 10%; 10 V
C559 thru 561	21-13743E20	0.1 uF 10%; 16 V
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740F51	100 pF
C601	21-13743E20	0.1 uF 10%; 16 V
C602	21-13741F41	4700 pF
C603	23-11049A07	tantalum 1 uF 10%; 16 V
C604	23-11049A05	tantalum 0.47 uF 10%; 25 V
C651	21-13741F25	1000 pF
C652	21-13743K16	0.22 uF +/-80%/20%; 16 V
C653	23-11049J43	tantalum 47 uF 10%; 10 V
C654	21-13743K16	0.22 uF +/-80%/20%; 16 V
C655	23-11049J43	tantalum 47 uF 10%; 10 V
C656	21-13743E20	0.1 uF 10%; 16 V
C701	21-13743E11	.039 uF 10%; 16 V
C702	21-13741F49	.01 uF
C805, 804	21-13741F17	470 pF
C806 thru 814	21-13741F17	470 pF
C2410	21-13740A71	470 pF
C2411	21-13740A40	30 pF
C2412	---	Not Used
C2413, 2414	21-13740A71	470 pF
C2416	21-13743A19	0.1 uF 10%; 16 V
C2417	21-13740A71	470 pF
C2418	21-13740A79	1000 pF
C2419, 2420	21-13740A71	470 pF
C2421	21-13740A42	470 pF
C2422, 2423	---	Not Used
C2424	21-13740A57	120 pF
C2425	21-13743A19	0.1 uF 10%; 16 V
C2426	21-13741W01	1 uF 10%; 25 V
C2427	21-13740A71	470 pF
C2428	---	Not Used
C2429	21-13740A62	200 pF
C2430	21-13740A61	180 pF
C2431	---	Not Used
C2432	21-13740A52	75 pF
C2433	21-13740B36	30 pF
C2434	21-13740A48	51 pF
C2435	---	Not Used
C2436	21-13740A71	470 pF
C2437	---	Not Used
C2438	21-11032B15	0.22 uF +/-80%/20%
C2439	21-11078B43	110 pF 100 V
C2440	21-11078B55	330 pF 100 V
C2441	21-11078B53	270 pF 100 V
C2442	21-11078B52	240 pF 100 V
C2443	21-11078B59	75 pF 100 V
C2444, 2455	21-11078B19	470 pF
C2446	21-80060M32	36 pF 500 V
C2447, 2448	21-11078B59	470 pF 100 V
C2449	21-13741W01	1 uF 10%; 25 V
C2450	21-11078B55	330 pF 100 V
C2451	21-80060M24	16 pF 500 V
C2452	21-13740A35	18 pF
C2453, 2454	21-13740A71	470 pF
C2455	---	Not Used
C2456	21-13740A71	470 pF
C2460	21-80060M25	18 pF 500 V
C2461	21-11078B19	470 pF 100 V
C2462	21-80060M34	43 pF 500 V
C2463	21-80060M30	30 pF 500 V
C2464	21-13741F29	1500 pF
C2465	21-11078B18	15 pF 100 V
C2471	21-13741W01	1 uF 10%; 25 V
C2472	21-13743A19	0.1 uF 10%; 16 V
C2473	21-13740A71	470 pF
C2474	---	Not Used
C2480	21-13740A71	470 pF

SM50/SM120 UHF Main Board, 450-470 MHz, 40 W, 12.5 kHz (N)
(later version) (used in PMUE1039 & PMUE1056)
SM50/SM120 UHF Main Board, 450-470 MHz 40 W, 20/25/30 kHz (W)
(later version) (used in PMUE1040 & PMUE1057) PL-981004-0

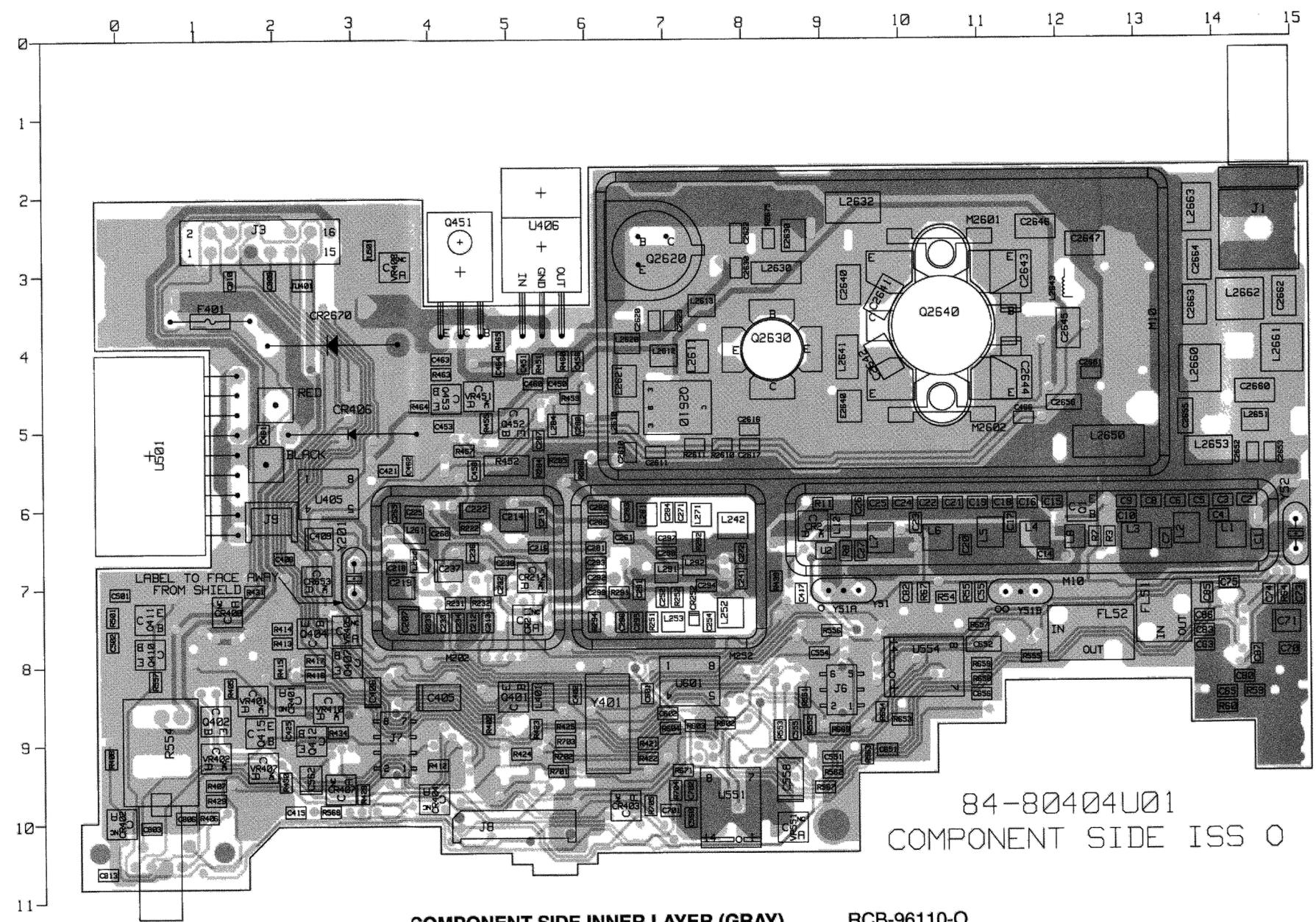
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C2481 thru 2483	21-13740A71	470 pF
C2485, 2486	21-80464E52	clamped mica 60 pF 250V
CR1	48-80154K03	diode: (see note)
CR2	48-80142L01	dual Schottky SOT



84-80404U01
COMPONENT SIDE ISS 0

COMPONENT SIDE (GRAY) RCB-96109-O
 SOLDER SIDE (PINK) RCB-96112-O
 OVERLAY ----- RCB-96113-O

COMPONENT SIDE VIEW

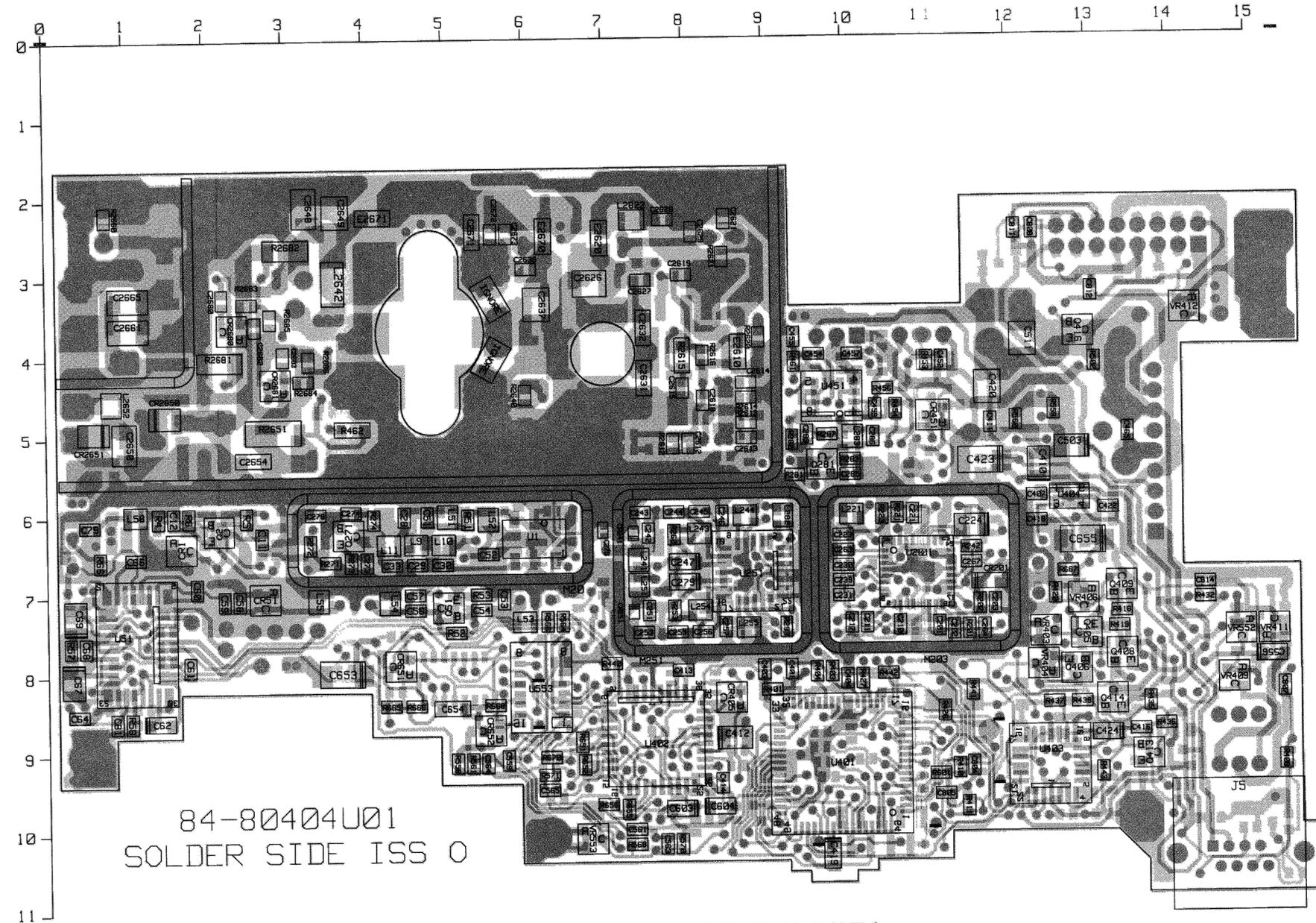


84-80404U01
COMPONENT SIDE ISS 0

COMPONENT SIDE INNER LAYER (GRAY) RCB-96110-O
 SOLDER SIDE INNER LAYER (PINK) RCB-96111-O
 OVERLAY ----- RCB-96113-O

COMPONENT SIDE VIEW

Circuit Board Details for
 UHF Main Boards, 470-490 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of HUE3761A, HUE3762A, HUE3611A, and HUE3612A Radios)

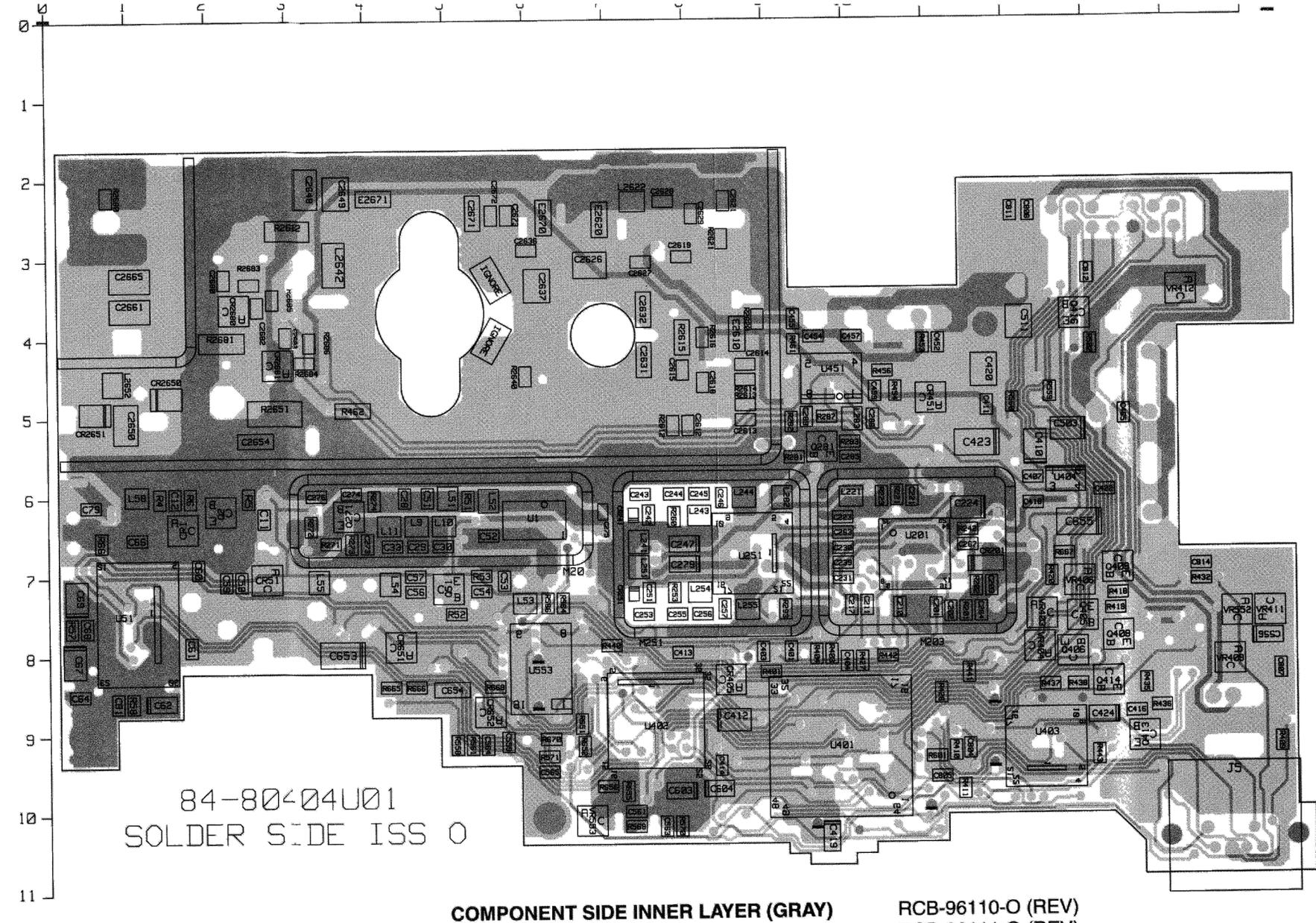


84-80404U01
SOLDER SIDE ISS 0

COMPONENT SIDE (GRAY)
SOLDER SIDE (PINK)
OVERLAY -----

RCB-96109-O (REV)
RCB-96112-O (REV)
RCB-96114-O

SOLDER SIDE VIEW



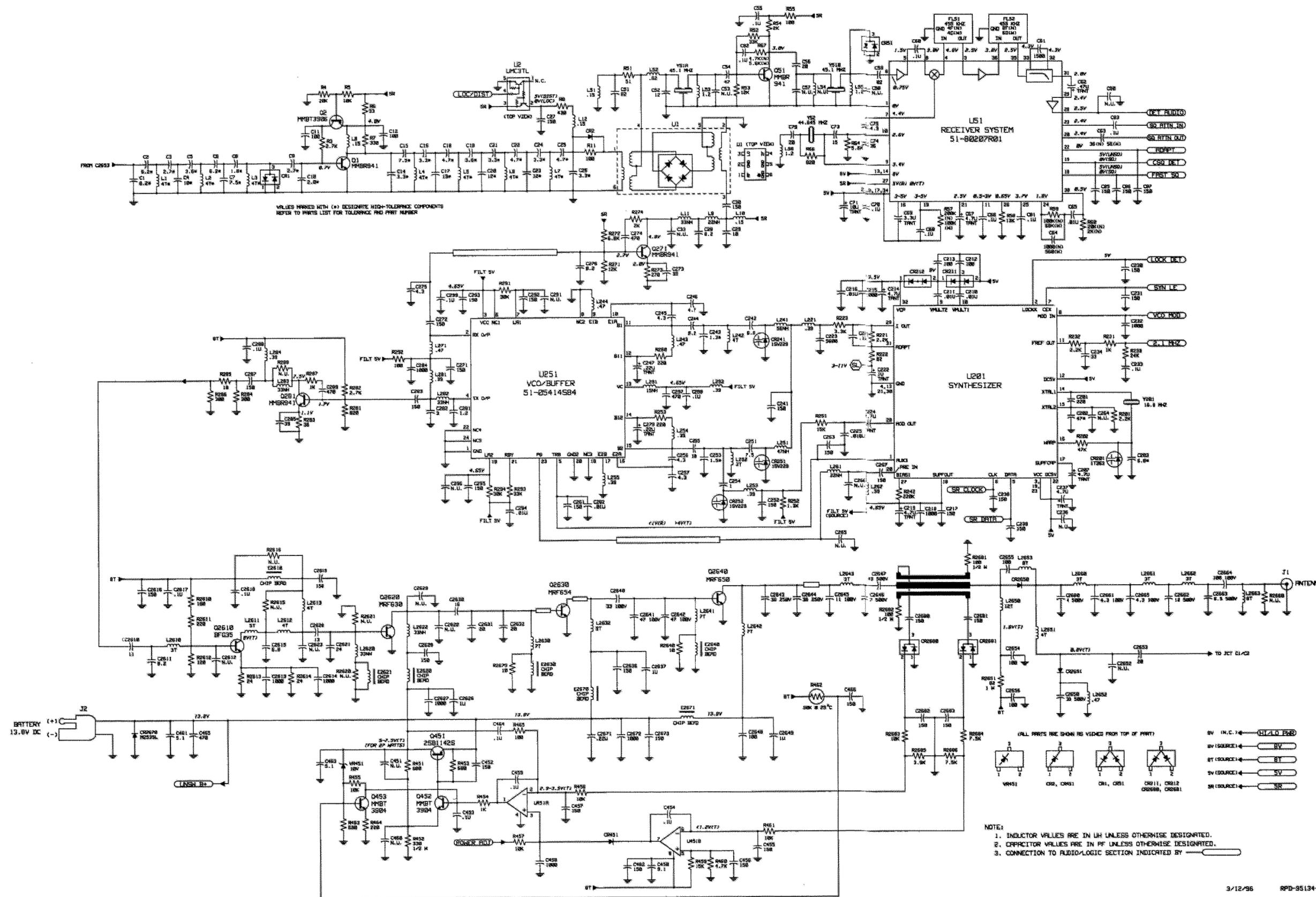
84-80404U01
SOLDER SIDE ISS 0

COMPONENT SIDE INNER LAYER (GRAY)
SOLDER SIDE INNER LAYER (PINK)
OVERLAY -----

RCB-96110-O (REV)
RCB-96111-O (REV)
RCB-96114-O

SOLDER SIDE VIEW

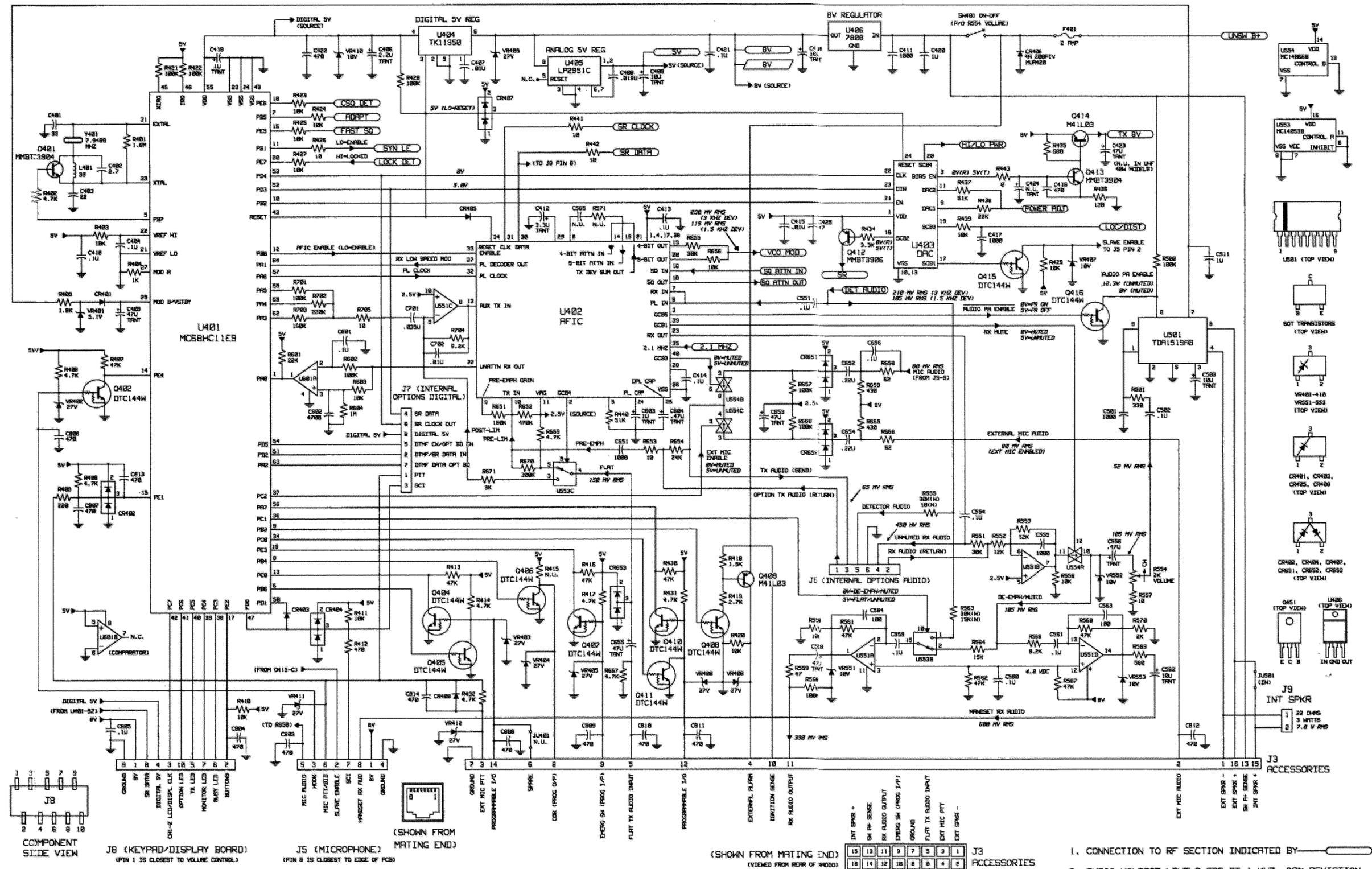
Circuit Board Details for
UHF Main Boards, 470-490 MHz, 12.5 & 20-25 kHz, 40 W
(Part of HUE3761A, HUE3762A, HUE3611A, and HUE3612A Radios)



VALUES MARKED WITH (*) DESIGNATE HIGH-TOLERANCE COMPONENTS REFER TO PARTS LIST FOR TOLERANCE AND PART NUMBER

- NOTE:
1. INDUCTOR VALUES ARE IN μ H UNLESS OTHERWISE DESIGNATED.
 2. CAPACITOR VALUES ARE IN PF UNLESS OTHERWISE DESIGNATED.
 3. CONNECTION TO AUDIO-LOGIC SECTION INDICATED BY

Schematic Diagram for
 UHF Main Boards, 470-490 MHz, 12.5 & 20-25 kHz, 40 W
 (Part of HUE3761A, HUE3762A, HUE3611A, and HUE3612A Radios)
 (Sheet 1 of 2)



Schematic Diagram for UHF Main Boards, 470-490 MHz, 12.5 & 20-25 kHz, 40 W (Part of HUE3761A, HUE3762A, HUE3611A, and HUE3612A Radios) (Sheet 2 of 2)

1. CONNECTION TO RF SECTION INDICATED BY _____
2. AUDIO VOLTAGE LEVELS ARE AT 1 KHZ, 60% DEVIATION UNLESS OTHERWISE SPECIFIED.

Parts List

SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 12.5 kHz (N) (used in HUE3761 & HUE3611)
 SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 20/25 kHz (W) (used in HUE3762 & HUE3612) PL-951030-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1	21-13740G27	capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C2	21-13740G23	8.2 +/-0.1 pF
C3	21-13740G13	2.7 +/-0.1 pF
C4	21-13740G29	10 pF 2%
C5	21-13740G16	3.6 +/-0.1 pF
C6	21-13740G23	6.2 +/-0.1 pF
C7	21-13740G25	7.5 +/-0.1 pF
C8	21-13740G09	1.8 +/-0.1 pF
C9	21-13740G10	2.0 +/-0.1 pF
C10	21-13740A55	100 pF
C11, 12	21-13740L06	3.3 +/-0.1 pF
C14	21-13740G25	7.5 +/-0.1 pF
C15	21-13740G25	7.5 +/-0.1 pF
C16	21-13740A29	3.3 +/-0.1 pF
C17	21-13740G32	13 pF 2%
C18	21-13740G19	4.7 +/-0.1 pF
C19	21-13740G16	3.6 +/-0.1 pF
C20	21-13740G31	12 pF 2%
C21	21-13740G15	3.3 +/-0.1 pF
C22	21-13740G19	4.7 +/-0.1 pF
C23	21-13740G31	12 pF 2%
C24	21-13740G15	3.3 +/-0.1 pF
C25	21-13740G19	4.7 +/-0.1 pF
C26	21-13740G15	3.3 +/-0.1 pF
C27	21-13740A59	150 pF
C28	21-13740A27	8.2 +/-0.25 pF
C29	21-13740A29	10 pF
C30	21-13740A59	150 pF
C39	---	Not Used
C51	21-13740A53	82 pF
C52	21-13740A31	12 pF
C53	---	Not Used
C54	21-13740A46	47 pF
C55	21-13743A19	0.1 uF 10%; 16 V
C56	21-13740A36	20 pF
C57, 58	---	Not Used
C59	21-13740A53	82 pF
C60	21-13743A19	0.1 uF 10%; 16 V
C61	21-13741A25	1500 pF
C62	23-11049A05	tantalum 0.47 uF 10%; 25 V
C63(N)	21-13740A42	36 pF
C63(W)	21-13740A49	56 pF
C64(N)	21-13740A79	1000 pF
C64(W)	21-13740A73	560 pF
C65	21-13741A45	.01 uF
C66	21-13743A19	0.1 uF 10%; 16 V
C67	23-11049J11	tantalum 4.7 uF 10%; 16 V
C68	21-13743A19	0.1 uF 10%; 16 V
C69	23-11049J07	tantalum 3.3 uF 10%; 20 V
C70	21-13743A19	0.1 uF 10%; 16 V
C71	23-11049A57	tantalum 10 uF 10%; 16 V
C73	21-13740A33	15 pF
C74	21-13740A42	36 pF
C75	21-13740A18	4.3 +/-0.25 pF
C79	21-13740A36	20 pF
C80	---	Not Used
C81 thru 83	21-13743A19	0.1 uF 10%; 16 V
C85 thru 87	21-13740A59	150 pF
C201	21-13740A63	220 pF
C202	21-13740G46	47 pF 2%
C203	21-13740G24	6.8 +/-0.1 pF
C207	23-11049A11	tantalum 4.7 uF 10%; 16 V
C210, 211	21-13741A45	.01 uF
C212, 213	21-13740A55	100 pF
C214	23-11049J11	tantalum 4.7 uF 10%; 16 V
C215	21-13740A79	1000 pF
C216	21-13741A45	.01 uF
C217	21-13740A59	150 pF
C218	21-13740A79	1000 pF
C219	23-11049J11	tantalum 4.7 uF 10%; 16 V
C221	21-13743A19	0.1 uF 10%; 16 V
C222	23-11049A07	tantalum 1 uF 10%; 16 V
C223	21-13741A39	5600 pF
C224	23-11049J11	tantalum 4.7 uF 10%; 16 V
C225	21-13741A51	.018 uF
C230, 231	21-13740A59	150 pF
C232	21-13740A79	1000 pF
C233	21-13743A19	0.1 uF 10%; 16 V

SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 12.5 kHz (N) (used in HUE3761 & HUE3611)
 SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 20/25 kHz (W) (used in HUE3762 & HUE3612) PL-951030-A

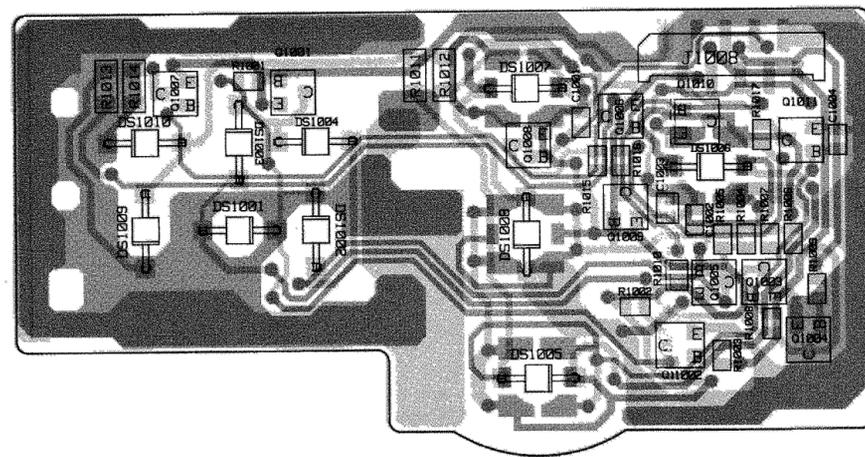
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C234	21-13740A41	33 pF
C236	---	Not Used
C237	23-11049J11	tantalum 4.7 uF 10%; 16 V
C238, 239	21-13740A59	150 pF
C241	21-13740A59	150 pF
C242	21-13740A24	6.8 +/-0.25 pF
C243	21-13740G09	1.8 +/-0.1 pF
C244	21-13740A25	7.5 +/-0.25 pF
C245	21-13740A18	4.3 +/-0.25 pF
C246	21-13740A19	4.7 +/-0.25 pF
C247	23-11049A03	tantalum 0.22 uF 10%; 35 V
C251	21-13740A25	7.5 +/-0.25 pF
C252	21-13740A59	150 pF
C253	21-13740G05	1.2 +/-0.1 pF
C254	21-13740A03	1 +/-0.25 pF
C255	21-13740A29	10 pF
C256, 257	21-13740A18	4.3 +/-0.25 pF
C261	21-13740A59	150 pF
C262	21-13741A45	.01 uF
C263	21-13740A59	150 pF
C264 thru 266	---	Not Used
C267	21-13740A59	150 pF
C271, 272	21-13740A59	150 pF
C273	21-13740A43	39 pF
C274	21-13740A71	470 pF
C275	21-13740F18	4.3 +/-0.25 pF
C276	21-13740A27	8.2 +/-0.25 pF
C279	23-11049A03	tantalum 0.22 uF 10%; 35 V
C281	21-13740A05	1.2 +/-0.25 pF
C282	21-13740A14	3 +/-0.25 pF
C283	21-13740A59	150 pF
C284	21-13740A79	1000 pF
C285	21-13740A43	39 pF
C287	21-13740A59	150 pF
C288	21-13743A19	0.1 uF 10%; 16 V
C289	21-13740A71	470 pF
C291	---	Not Used
C292, 293	21-13740A59	150 pF
C294	21-13741A45	.01 uF
C295	21-13740A59	150 pF
C296	---	Not Used
C297	21-13740A59	150 pF
C298, 299	21-13743A19	0.1 uF 10%; 16 V
C401	21-13740A41	33 pF
C402	21-13740A19	2.7 +/-0.25 pF
C403	21-13740A37	22 pF
C404	21-13743A19	0.1 uF 10%; 16 V
C405	23-11049J43	tantalum 4.7 uF 10%; 10 V
C406	23-11049A40	tantalum 2.2 uF 10%; 10 V
C407	21-13741A45	.01 uF
C408	21-13741A51	.018 uF
C409, 410	23-11049A57	tantalum 10 uF 10%; 16 V
C411	21-13740A79	1000 pF
C412	23-11049J07	tantalum 3.3 uF 10%; 20 V
C413, 414	21-13743A19	0.1 uF 10%; 16 V
C415	21-13741A45	.01 uF
C416	21-13740A71	470 pF
C417	21-13740A79	1000 pF
C418	21-13743A19	0.1 uF 10%; 16 V
C419	23-11049A07	tantalum 1 uF 10%; 16 V
C420	21-13741W01	1 uF 10%; 25 V
C421	21-13743A19	0.1 uF 10%; 16 V
C422	21-13740A71	470 pF
C423, 424	---	Not Used
C425	21-13740A46	47 pF
C426	21-13740A28	9.1 +/-0.25 pF
C451	---	Not Used
C452	21-13740A59	150 pF
C453, 454	21-13743A19	0.1 uF 10%; 16 V
C455 thru 457	21-13740A59	150 pF
C458	21-13740A79	1000 pF
C459	21-13743A19	0.1 uF 10%; 16 V
C460	---	Not Used
C461	21-13740A20	5.1 +/-0.25 pF
C462	21-13740A59	150 pF
C463	21-13740A29	5.1 +/-0.25 pF
C464	21-13743A19	0.1 uF 10%; 16 V
C465	21-13740A71	470 pF
C466	21-13740A59	150 pF
C501	21-13740A79	1000 pF
C502	21-13743A19	0.1 uF 10%; 16 V

SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 12.5 kHz (N) (used in HUE3761 & HUE3611)
 SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 20/25 kHz (W) (used in HUE3762 & HUE3612) PL-951030-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C503	23-11049A57	tantalum 10 uF 10%; 16 V
C511	21-13741W01	1 uF 10%; 25 V
C551	21-13743A19	0.1 uF 10%; 16 V
C554	21-13743A19	0.1 uF 10%; 16 V
C555	21-13740A79	1000 pF
C556	23-11049A05	tantalum .47 uF 10%; 25 V
C558	23-11049J43	tantalum 4.7 uF 10%; 10 V
C559 thru 561	21-13743A19	0.1 uF 10%; 16 V
C562	23-11049A57	tantalum 10 uF 10%; 16 V
C563, 564	21-13740A55	100 pF
C565	---	Not Used
C601	21-13743A19	0.1 uF 10%; 16 V
C602	21-13741A37	4700 pF
C603	23-11049A07	tantalum 1 uF 10%; 16 V
C604	23-11049A05	tantalum 0.47 uF 10%; 25 V
C651	21-13740A79	1000 pF
C652	21-11032B15	0.22 uF +/-80/-20%
C653	23-11049J43	tantalum 4.7 uF 10%; 10 V
C654	21-11032B15	0.22 uF +/-80/-20%
C655	23-11049J43	tantalum 4.7 uF 10%; 10 V
C656	21-13743A19	0.1 uF 10%; 16 V
C701	21-13741A59	.039 uF
C702	21-13741A45	.01 uF
C803, 804	21-13740A71	470 pF
C805	21-13743A19	0.1 uF 10%; 16 V
C806 thru 814	21-13740A71	470 pF
C2610	21-13740A30	11 pF
C2611	21-13740A27	8.2 +/-0.25 pF
C2612	---	Not Used
C2613, 2614	21-13740A79	1000 pF
J5	09-04424J05	6-pin, internal options audio
J7	09-04424J06	6-pin, internal options digital
J8	09-04424J02	10-pin, display board
J9	28-04423J01	2-pin, internal speaker
JU401	---	Not Used
JU501	06-62057C01	jumpers

SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 12.5 kHz (N) (used in HUE3761 & HUE3611)
 SM50/SM120 UHF Main Board, 470-490 MHz, 40 Watts
 20/25 kHz (W) (used in HUE3762 & HUE3612) PL-951030-A

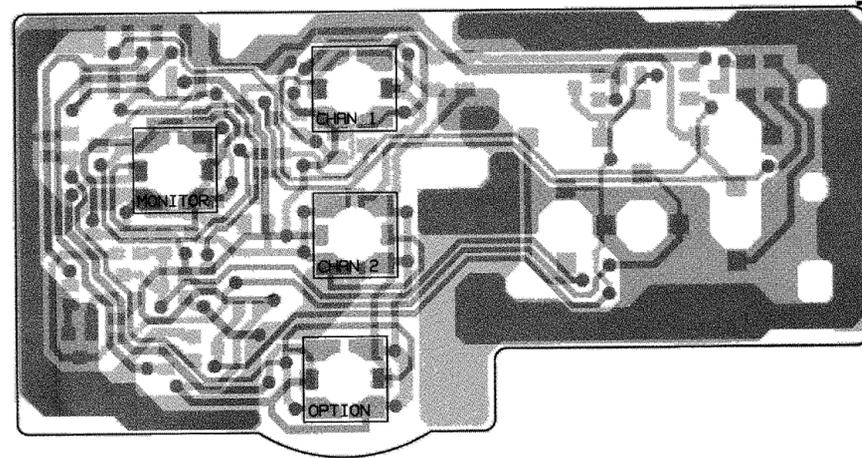
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
CR406	48-83583T02	4A 200 PIV MUR420
CR407	48-13833C07	dual silicon SOT MMBD7000
CR408	48-05129M76	silicon SOT
CR451	48-05129M76	silicon SOT
CR651 thru 653	48-13833C07	dual silicon SOT MMBD7000
CR2650, 2651	48-02482J02	silicon PIN MA4P1250
CR2670	48-80236E07	transient suppressor
CR2680, 2681	48-82290T02	dual Schottky SOT HSMS-2802
E2610	24-84657R01	ferrite bead:
E2620, 2621	24-84657R01	ferrite bead
E2630	24-84657R01	ferrite bead
E2640	24-84657R01	ferrite bead
E2670, 2671	24-84657R01	ferrite bead
F401	65-05214E04	fuse: 2 amp axial lead
FL51(N)	91-80098D04	455 kHz 4F
FL51(W)	91-80098D06	455 kHz 4D
FL52(N)	91-80097D06	455 kHz 6F
FL52(W)	91-80097D06	455 kHz 6D
J1	09-80627E01	connector, receptacle: mini UHF coax
J2	30-04510J01	power cable assembly (includes J2)
J3	28-04503J01	16-pin, accessories
J5	09-04424J01	telephone type, 3 contact, microphone
J6	09-04424J05	6-pin, internal options audio
J7	09-04424J06	6-pin, internal options digital
J8	09-04424J02	10-pin, display board
J9	28-04423J01	2-pin, internal speaker
JU401	---	Not Used
JU501	06-62057C01	jumpers
L1 thru 7	24-84662T11	coil, rt: 4 turns airwound 2%
L9	24-82587X45	chip 0.15 uH 5%
L10	24-83411T63	0.15 uH 5% shielded
L11	24-82587X47	chip 33 nH 5%
L12	24-82587X55	chip 0.15 uH 5%
L51	24-82587X55	chip 0.15 uH 5%
L52	24-82587X63	chip 0.62 uH 5%
L53	24-82587X69	chip 1.2 uH 5%
L54	---	Not Used
L55	24-82587X69	chip 1.2 uH 5%
L58	24-82587X69	chip 1.2 uH 5%
L221	24-82587X60	chip 0.39 uH 5%
L241	24-82587X50	chip 56 nH 5%
L242	24-84562T11	4 turns airwound 2%
L243, 244	24-82587X61	chip 0.47 uH 5%
L251	24-82587X49	chip 47 nH 5%
L252	21-84562T13	3 turns airwound 2%
L253 thru 255	24-82587X60	chip 0.39 uH 5%
L261	24-82587X49	chip 47 nH 5%
L262	24-82587X60	chip 0.39 uH 5%
L2		



COMPONENT SIDE
84-04430J03 ISS B

COMPONENT SIDE (GRAY) RCB-95132-O
SOLDER SIDE (PINK) RCB-95133-O
OVERLAY ---- RCB-95134-O

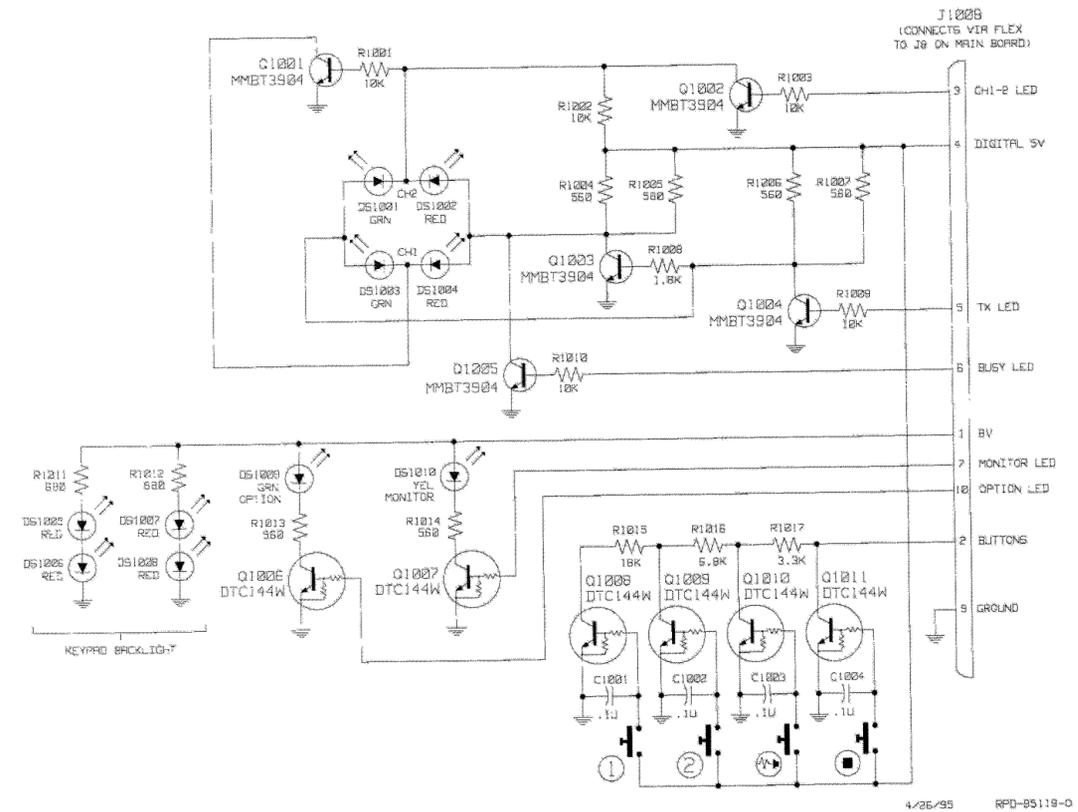
COMPONENT SIDE VIEW



SOLDER SIDE
84-04430J03 ISS B

COMPONENT SIDE (GRAY) RCB-95132-O (REV)
SOLDER SIDE (PINK) RCB-95133-O (REV)
OVERLAY ---- RCB-95135-O (REV)

SOLDER SIDE VIEW



PARTS LIST
PMLN4022 SM50 Display Board, 2-Frequency PL-951013-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1001 thru 1004	21-13743A19	capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated 0.1 uF 10%; 16 V
DS1001	48-82565T07	displays and indicators: diode LED GRN
DS1002	48-82565T05	diode LED RED
DS1003	48-82565T07	diode LED GRN
DS1004 thru 1008	48-82565T05	diode LED RED
DS1009	48-82565T07	diode LED GRN
DS1010	48-82565T06	diode LED YEL
J1008	09-04422J01	connector, receptacle: 10 pin, main board
Q1001 thru 1005	48-80214G02	transistor: (see note) NPN; type MMBT3904
Q1006 thru 1011	48-80947V01	digital NPN; type DTC144W
R1001 thru 1003	06-62057C99	resistor, fixed: +/-5%; 1/10 W; unless otherwise stated 10k
R1004 thru 1007	06-62057C89	560
R1008	06-62057C81	1.8k
R1009, 1010	06-62057C99	10k
R1011, 1012	06-11077A70	680
R1013, 1014	06-11077A68	560
R1015	06-62057D06	18k
R1016	06-62057C95	6.8k
R1017	06-62057C87	3.3k
non-referenced items		Non-referenced items
61-04731J01		Assembly, lightpipe
29-04431J01		Cable, flat flexible, 10-position

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

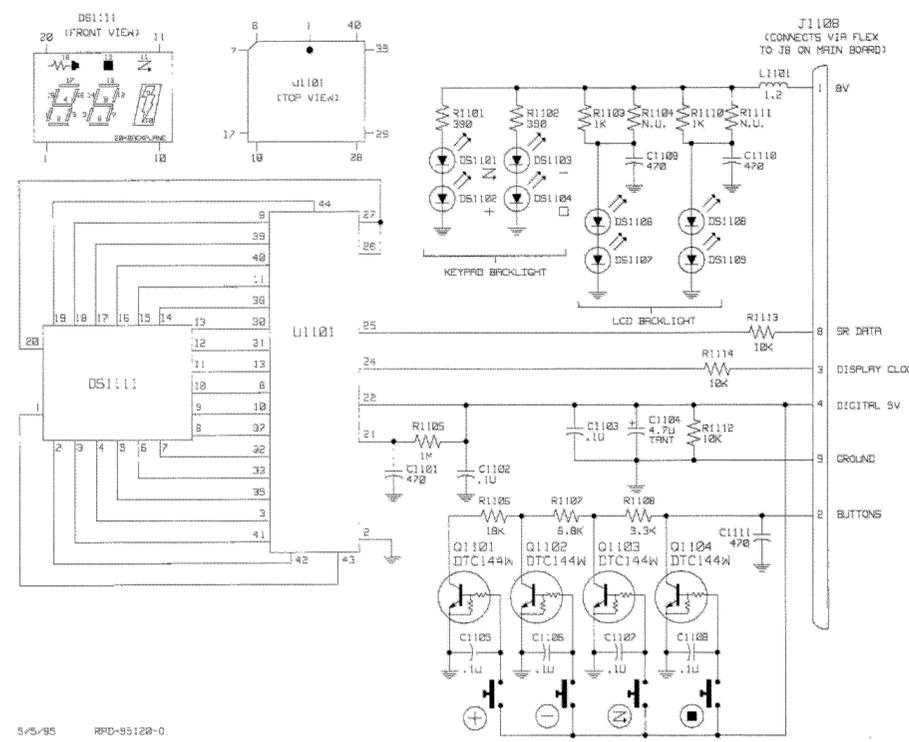
Parts List

PMLN4023 SM120 Display Board, 16-Frequency PL-951014-A

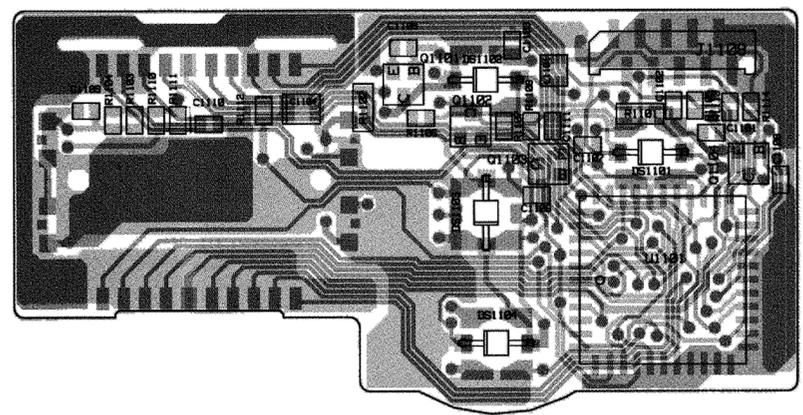
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
C1101	21-13740A71	capacitor, fixed: uF +/-5%; 50 V; unless otherwise stated
C1102, 1103	21-13743A19	0.1 uF 10%; 16 V
C1104	23-11049J11	tantalum 4.7 uF 10%; 16 V
C1105 thru 1108	21-13743A19	0.1 uF 10%; 16 V
C1109 thru 1111	21-13740A71	470 pF
DS1101 thru 1104	48-82565T05	diode LED RED
DS1106 thru 1109	48-05729G91	diode LED RED right-angle
DS1111	72-04427J01	display, LCD
J1108	09-04422J01	connector, receptacle: 10 pin, main board
L1101	24-62587N69	coll. rf; chip 1.2 uH 5%
Q1101 thru 1104	48-80947V01	transistor: (see note) digital NPN; type DTC144W
R1101, 1102	06-11077A64	resistor, fixed: +/-5%; 1/10 W; unless otherwise stated
R1103	06-62057C75	390
R1104	---	Not Used
R1105	06-62057D48	1 meg.
R1106	06-62057D06	18k
R1107	06-62057C95	6.8k
R1108	06-62057C87	3.3k
R1110	06-62057C75	1k
R1111	---	Not Used
R1112 thru 1114	06-62057C99	10k
U1101	51-80968X01	integrated circuit: (see note) LCD driver MC145453

non-referenced items
 07-04435J02 BRACKET, display bezel
 28-04431J01 Cable, flat flexible, 10-position

note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.



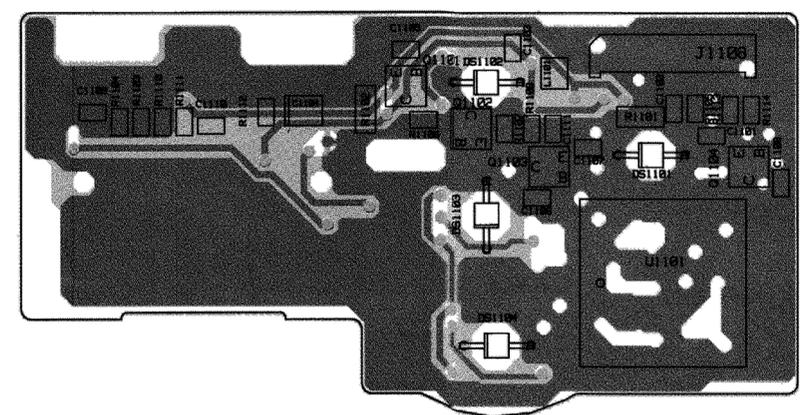
5/5/95 RPD-95120-0



COMPONENT SIDE
 84-04429J03 ISS B

COMPONENT SIDE (GRAY) RCB-95136-O
 SOLDER SIDE (PINK) RCB-95139-O
 OVERLAY ---- RCB-95140-O

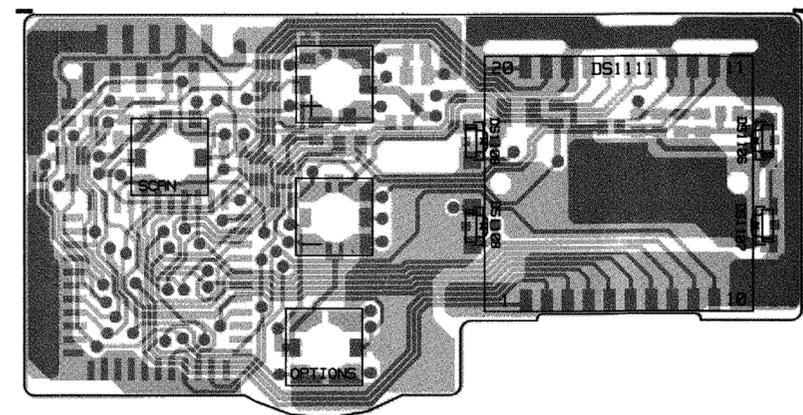
COMPONENT SIDE VIEW



COMPONENT SIDE
 84-04429J03 ISS B

COMPONENT SIDE INNER LAYER (GRAY) RCB-95137-O
 SOLDER SIDE INNER LAYER (PINK) RCB-95138-O
 OVERLAY ---- RCB-95140-O

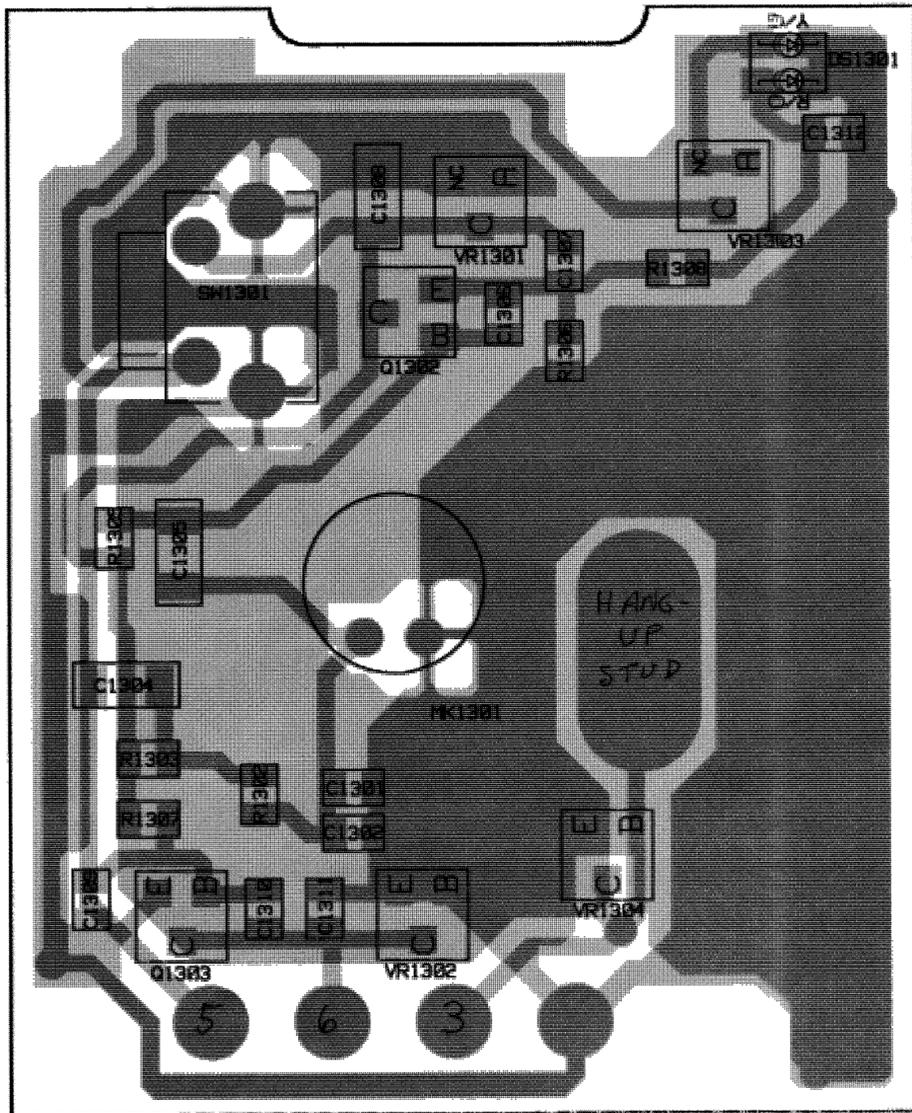
COMPONENT SIDE VIEW



SOLDER SIDE
 84-04429J03 ISS B

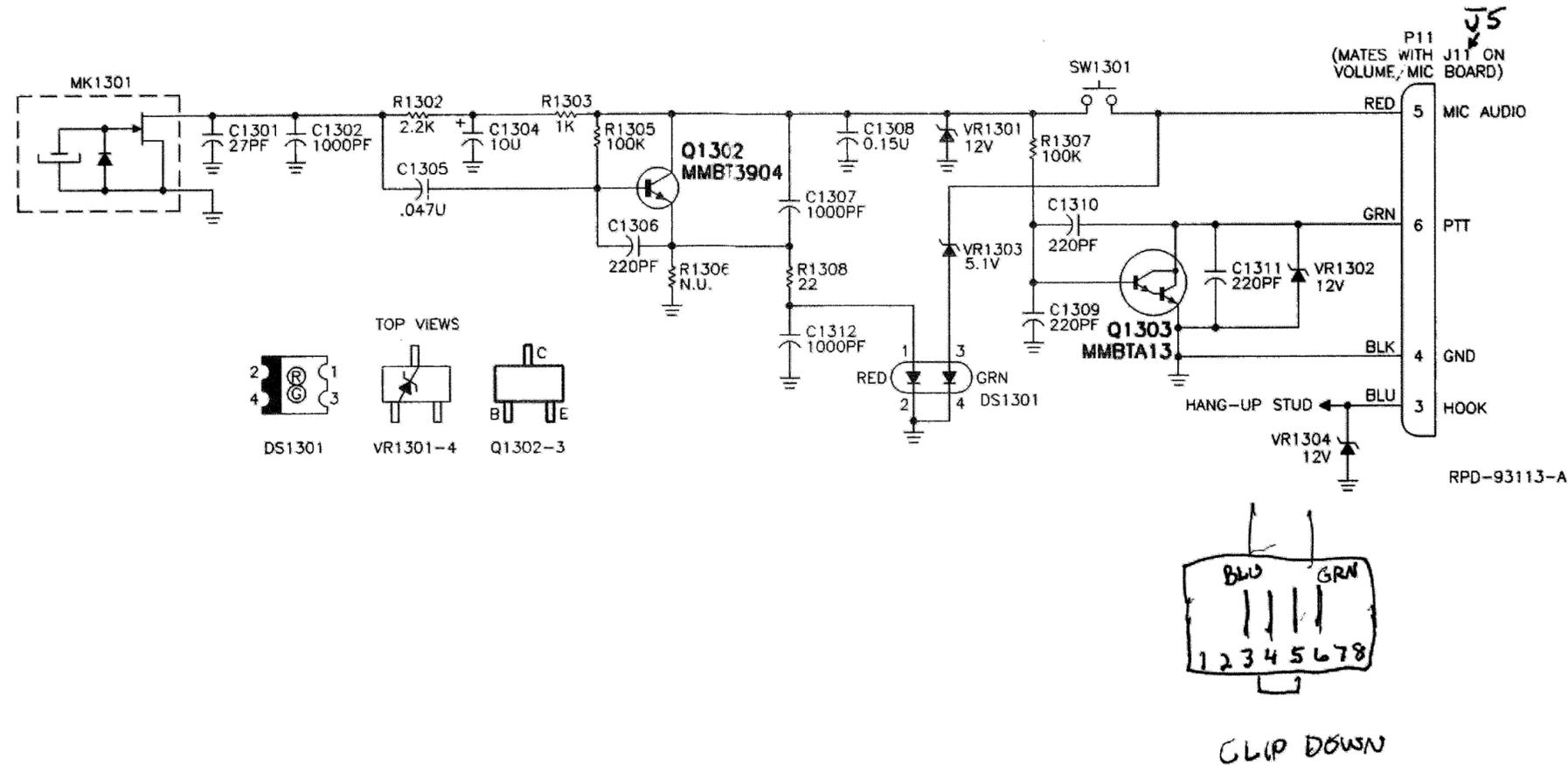
COMPONENT SIDE (GRAY) RCB-95136-O (REV)
 SOLDER SIDE (PINK) RCB-95139-O (REV)
 OVERLAY ---- RCB-95141-O (REV)

SOLDER SIDE VIEW



COMPONENT SIDE (GRAY) RCB-95101-O
 SOLDER SIDE (PINK) RCB-95102-O
 OVERLAY ----- RCB-95103-O

COMPONENT SIDE VIEW



Parts List

01-80446E01 Microphone Board with Cord
 (Used in HMN3174B Compact Microphone w/LED Indicator) PL-951006-A

REFERENCE NUMBER	MOTOROLA PART NO.	DESCRIPTION
C1301	21-13740A39	capacitor, chip, uF +/-5%, 50 V; unless otherwise stated
C1302	21-13740A79	27 pF
C1304	23-11049A59	1000 pF
C1305	21-13741A61	tantalum 10 uF, +/-10%; 6 V
C1306	21-13740A59	.047 uF
C1307	21-13740A79	150 pF
C1308	21-13740A79	1000 pF
C1309 thru 1311	21-11032B14	0.15 uF
C1309 thru 1311	21-13740A59	150 pF
C1312	21-13740A79	1000 pF
DS1301	48-05729G49	display: dual LED red/grn
MK1301	50-80258E04	microphone: cartridge electret
Q1302	48-80214G02	transistor: see note NPN; type MMBT3904
Q1303	48-05128M19	NPN Darlington; type MMBTA13
R1302	06-60076A57	resistor, chip; uF +/-5%, 1/10 W; unless otherwise stated
R1303	06-60076A49	2.2k
R1305	06-60076B01	1k
R1306	---	100k
R1307	---	Not Used
R1308	06-60076B01	100k
R1308	06-60076A09	22
SW1301	40-80164S01	switch: momentary pushbutton
VR1301, 1302	48-80140L17	voltage regulator: see note Zener diode SOT 12 V MMBZ5242L
VR1303	48-80140L06	Zener diode SOT 5.1 V MMBZ5231L
VR1304	48-80140L17	Zener diode SOT 12 V MMBZ5242L
non-referenced items		
	30-80978Z03	coiled cord

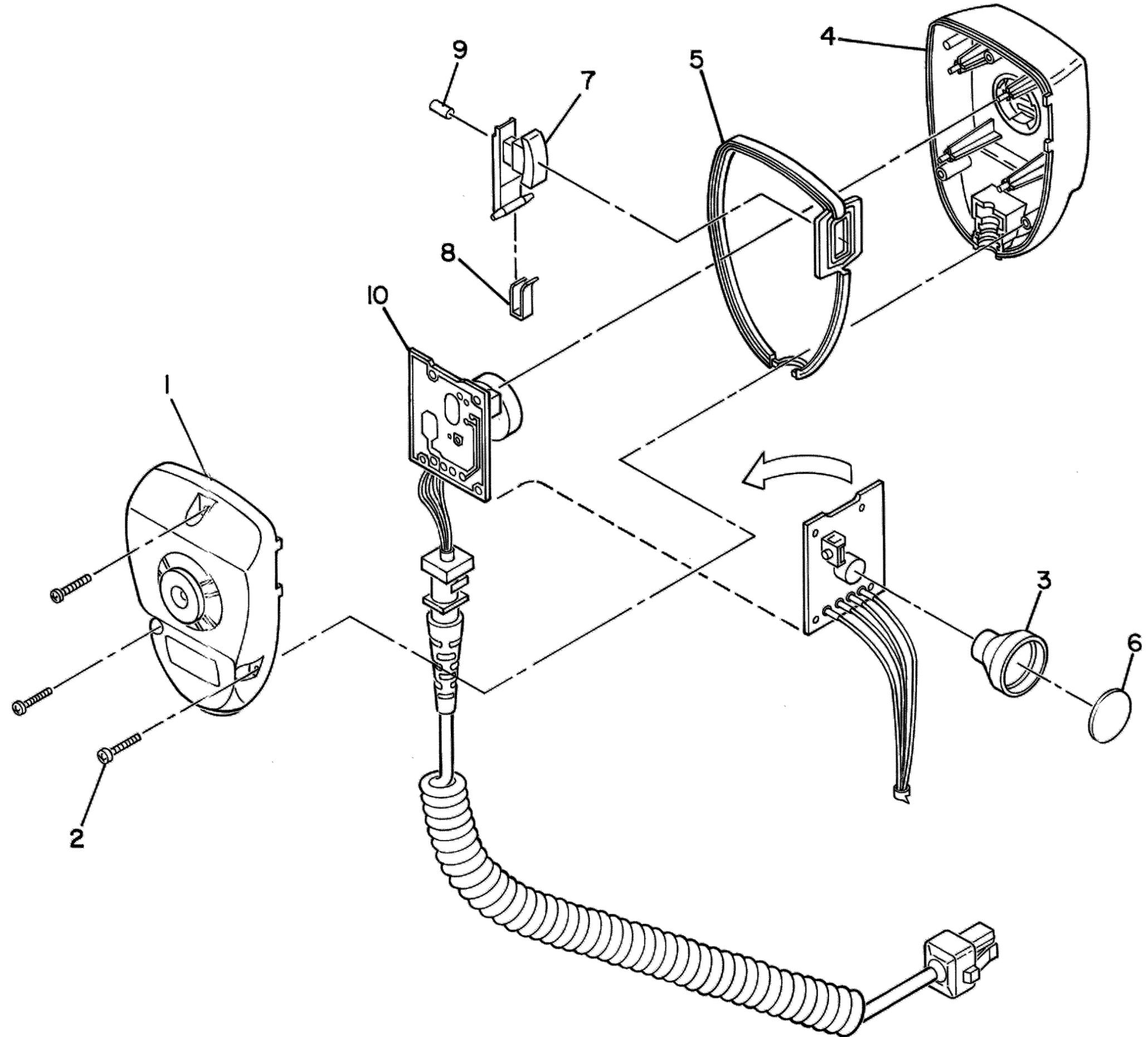
note: For optimum performance, diodes, transistors, and integrated circuits must be ordered by Motorola part numbers.

Parts List

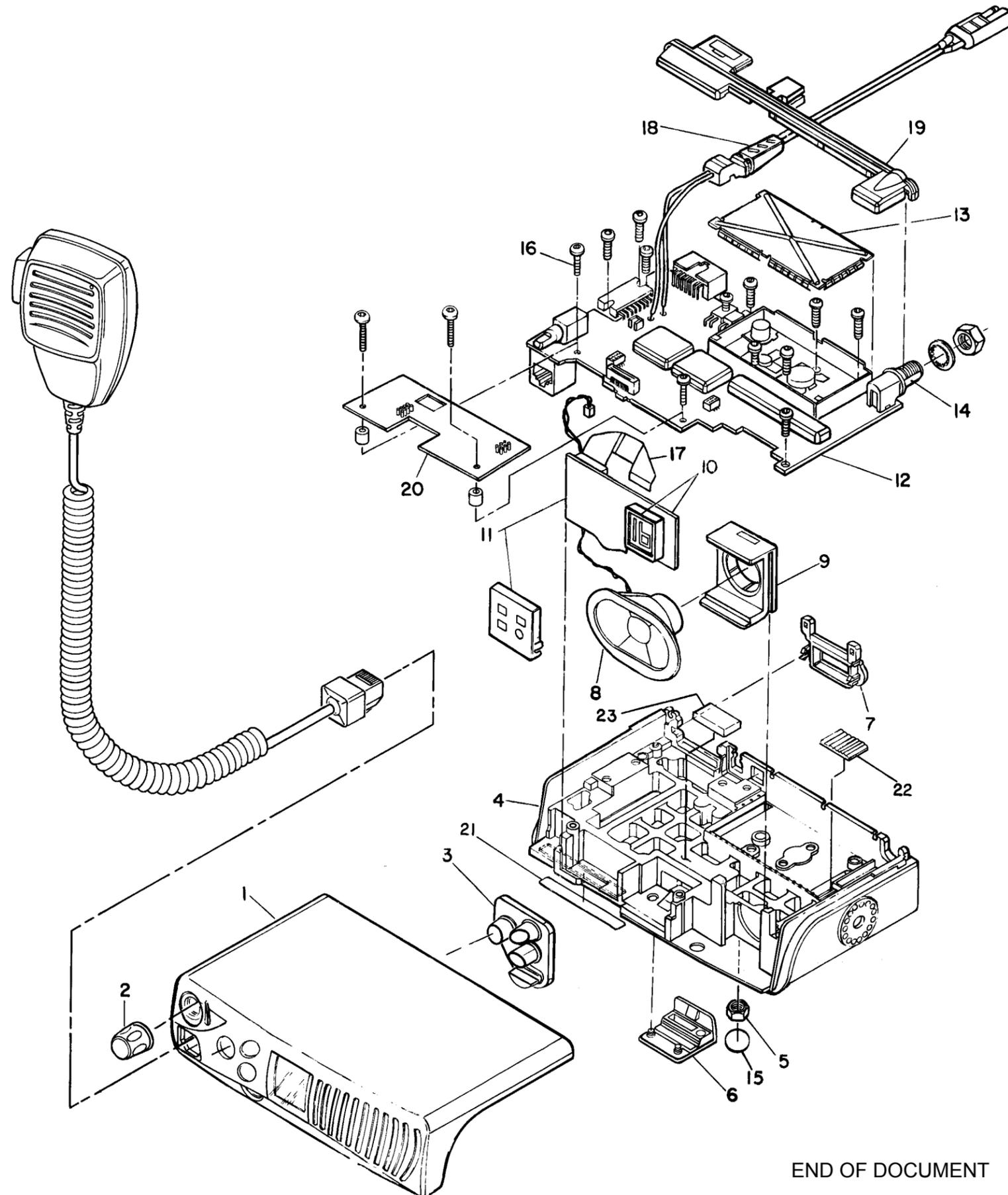
HMN3174B Compact Microphone w/LED Indicator

PL-951005-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	0180669D01	Assembly, HOUSING, rear
2	03139959	SCREW, 5-20 x 5/8; 3 used
3	0580149R01	GROMMET, microphone
4	1580443E01	HOUSING, front
5	3280565B01	GASKET, microphone
6	3580132R02	BAFFLE, felt
7	3880654D01	BUTTON, PTT
8	4180658D01	SPRING, PTT
9	7580983Z01	RUBBER SPACER, switch



Exploded Mechanical View and Parts List for HMN3174B Compact Microphone



Parts List

SM Series Exploded View, Mechanical

PL-951001-A

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
1	1504606J01	HOUSING, cover assembly, SM50
	1504606J02	HOUSING, cover assembly, SM120
2	3604414J02	KNOB, volume control
3	7504436J03	KEYPAD, SM50
	7504436J02	KEYPAD, SM120
4	2680424U01	HEATSINK
5	0200007003	NUT, 8-32 x 5/16 x 1/8 hex, UHF
6	3204502J02	GASKET, release latch
7	1504501J01	SHROUD, spacer, snap-on
8	5004410J01	SPEAKER, w/wire assembly
9	3204411J01	GASKET, speaker retaining
10	PMLN4023	ASSY, front panel display, SM120
11	PMLN4022	ASSY, front panel display, SM50
12	---	Main Board
13	2604420J01	SHIELD, PA frame cover
14	0980627E01	CONNECTOR, Mini-U antenna
15	3880603U01	PLUG BUTTON, VHF 10-25 W
16	0310943J11	SCREW, 3mm x 10; 12 used
17	2804431J01	CABLE, folded; 10 position
18	3004510J01	CABLE, power w/strain relief
19	3204412J02	GASKET, rear
20	---	Option Board
21	5404605J01	LABEL, warning
22	3204416J01	GASKET, thermal conductive pad
23	7504682J01	PAD, pullout VCO
non-referenced items		
	4280654E01	CLIP, PA

END OF DOCUMENT

SM Series Radio Exploded Mechanical View and Parts List