

Service Manual

Digital Cellular Phone

GSM

EB-GD87

EB-GU87



	900 MHz	1800 MHz	1900 MHz
Tx Frequency Range:	880 - 915MHz	1710 - 1785 MHz	1850 - 1910 MHz
Rx Frequency Range:	925 - 960 MHz	1805 - 1880 MHz	1910 - 1990 MHz
Tx / Rx separation	45 MHz	95 MHz	60 MHz
RF Channel Bandwidth	200 kHz		
Number of RF channels	174	374	299
Speech coding	Full rate/Half rate/Enhanced Full rate		
Operating temperature	-10 °C to +55 °C		
Type	Class 4 Handheld	Class 1 Handheld	Class 1 Handheld
RF Output Power	2 W maximum	1 W maximum	1 W maximum
Modulation	GMSK (BT = 0.3)		
Connection	8 ch / TDMA		
Voice digitizing	13 kbps RPE-LTP / 13 kps ACLEP / 5.6 kps CELP / VSLEP		
Transmission speed	270.833 kbps		
Signal Reception	Direct conversion		
Antenna Impedance (External Connector)	50 Ω		
Antenna VSWR	< 2.1 : 1		
Dimensions (excluding antenna)	Height: 97.5 mm Width: 49 mm Depth: 23 mm		
Volume	89 cc		
Weight	103 g		
Main Display	LCD, 176 x 132 pixels, 65,536 colours		
Sub Display	LCD, 96 x 28 pixels, monochrome		
Illumination	8 LEDs for Keypad Backlighting (Green) 1 LED for LCD Backlighting (White) 2 LEDs for Incoming call (Green) and Charging (Red)		
Keys	17-key Keypad, Navigation key, 2 shutter keys		
SIM	3 V Plug-in type only		
External DC Supply Voltage	5.8 V		
Battery	3.7 V nominal, 720mAh, Li-Ion		
Standby Time	75 - 220 hrs		
Talk Time	1.6 - 7.0 hrs		

Talk and standby time will be dependent on network conditions, SIM card, backlight usage and network condition.

WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product. Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service manual by anyone else could result in serious injury or death.

Panasonic®

Issue B
Revision 0

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1 INTRODUCTION

WARNING

The equipment described in this manual contains polarised capacitors utilising liquid electrolyte. These devices are entirely safe provided that neither a short-circuit or a reverse polarity connection is made across the capacitor terminals. FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT OR, AT WORST, POSSIBLE INJURY TO PERSONNEL RESULTING FROM ELECTRIC SHOCK OR THE AFFECTED CAPACITOR EXPLODING. EXTREME CARE MUST BE EXERCISED AT ALL TIMES WHEN HANDLING THESE DEVICES.

Caution

The equipment described in this manual contains devices sensitive to electrostatic discharge (ESD). Damage can occur to these devices if the handling procedures described in this manual are not adhered to.

Caution

This equipment contains an internal battery in addition to the external battery packs. These batteries are recyclable and should be disposed of in accordance with local legislation. They must not be incinerated, or disposed of as ordinary rubbish.

Caution

The equipment uses a Printed Circuit Board PCB manufactured using Lead Free (PbF) solder. The procedures described in this manual should be adhered to when repairing these items.

1.1. Purpose of this Manual

This Service Manual contains the information and procedures required for installing, operating and servicing the Panasonic GSM Personal Cellular Mobile Telephone system operating on GSM Digital Cellular Networks.

1.2. Structure of the Manual

The manual is structured to provide service engineering personnel with the following information and procedures:

1. General and technical information - provides a basic understanding of the equipment, kits and options, together with detailed information for each of the major component parts.
2. Installation and operating information - provides instructions for unpacking, installing and operating the equipment.
3. Servicing information - provides complete instructions for the testing, disassembly, repair and reassembly of each major component part. Step-by-step troubleshooting information is given to enable the isolation and identification of a malfunction, and thus determine what corrective action should be taken. The test information enables verification of the integrity of the equipment after any remedial action has been carried out.
4. Illustrated parts list - provided to enable the identification of all equipment components, for the ordering of spare / replacement parts.

1.3. Servicing Responsibilities

The procedures described in this manual must be performed by qualified service engineering personnel, at an authorised service centre.

The service engineering personnel are responsible for fault diagnosis and repair of all equipment described in this manual.

2 GENERAL DESCRIPTION

2.1. General

This section provides a general description and kit composition details for the Digital Cellular Phone and optional kits.

2.2. Features

The Panasonic Phone Models GD87 and GU87 are high performance, small, light, telephone handsets for business and domestic use on General Packet Radio Service (GPRS) running on GSM networks. The following features are provided:

- Triple Band, E-GSM 900, GSM 1800 and GSM 1900 operation.
- Triple Rate, which includes Full Rate, Half rate and Enhanced Full Rate (EFR) speech, codec.
- GPRS-compatible (Class 8).
- 65,536-colour LCD Main Display and monochrome LCD Sub-Display.
- Integral Digital Camera.
- Multimedia Message Service (MMS).
- Tegic T9 Text Entry.
- Infrared communications port (IrDA).
- Voice Ringer.
- Wireless Application Protocol (WAP) Browser.
- Backup Battery.
- 16-voice polyphonic ringtones.
- Downloadable pictures, animations and polyphonic melody ring tones.
- Clock, Calculator and Currency Converter.

2.3. Telephone Handset Main Kit

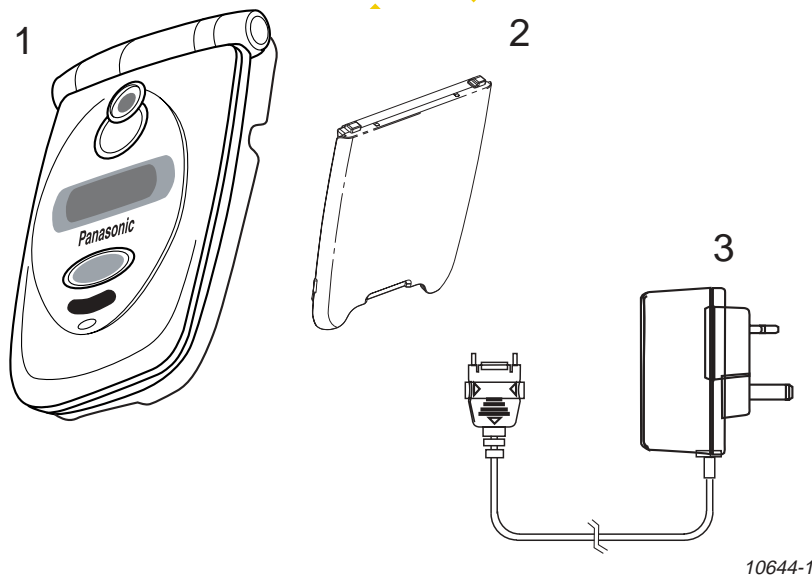


Figure 2.1: Telephone Handset Main Unit Kit Contents

2.3.1. GD87

ITEM	DESCRIPTION	PART NUMBER
1	Main Unit	EB-GD87
2	Battery, Standard	EB-BSD87
3	Travel Charger	EB-CAD95
-	Document Pack	See Section 9.

2.3.2. GU87

ITEM	DESCRIPTION	PART NUMBER
1	Main Unit	EB-GU87
2	Battery, Standard	EB-BSU87
3	Travel Charger	EB-CA370
-	Document Pack	

PROVISIONAL INFORMATION

3 OPERATING INSTRUCTIONS

3.1. General

This section provides a brief guide to the operation and facilities available on the telephone handset. Refer to the Operating Instructions supplied with the telephone for full operational information.

3.2. Controls and Indicators



Figure 3.1: Location of Controls and Indicators

The phone has 17-keys and Navigation key on the main keypad area. Their functions are summarised as follows:

	Navigation Key. Scrolls through options or features menu and increases or decreases volume.
	Cancel Key. Used mainly to cancel the current operation and return to the previous menu level. In some menus it has other functions.
	Option key. Primarily used for accessing the Phonebook or switching character types.
	Send Key. Makes a call.
	End Key. Ends a call or switches the telephone on/off when pressed and held.
	Digit keys. Enter wild numbers or pauses when pressed and held. Where appropriate the key scrolls up or down through abbreviated control names and then select to reveal the international access code “+”.
	Vibrate enable/disable Key. Press and hold to enable or disable the vibrate alert.

There is a combined Voice Memo / Camera Shutter key below the Sub Display.

4 TECHNICAL DESCRIPTION

4.1. RF Overview

4.1.1 General Specifications

The telephone is a triple band product incorporating three switchable transceivers, E-GSM 900 band, GSM 1800 (DCS 1800) band and GSM 1900 band. The transmit and receive bands are given in the table below:

	Tx	Rx
E-GSM 900	880-915 MHz	925-960 MHz
GSM 1800	1710-1785 MHz	1805-1880 MHz
GSM 1900	1850-1910MHz	1910-1990MHz

Other notable technical features are as follows:

	E-GSM 900	GSM 1800	GSM 1900
Rx Bandwidth	35 MHz	75 MHz	60MHz
Tx Bandwidth	35 MHz	75 MHz	60MHz
Duplex Spacing	45 MHz	95 MHz	80MHz
Number of Channels	174	374	299
AFRCN (Channel Numbers)	0-124 975 - 1023	512-885	512-885
1st Tx Channel	880.2 MHz (Ch 975)	1710.2 MHz (Ch 512)	1850.2MHz (Ch 512)
Last Tx Channel	914.8 MHz (Ch 124)	1784.8 MHz (Ch 885)	1909.8MHz (Ch 885)
1st Rx Channel	925.2 MHz (Ch 975)	1805.2 MHz (Ch 512)	1930.2MHz (Ch 512)
Last Rx Channel	959.8 MHz (Ch 124)	1879.8 MHz (Ch 885)	1989.8MHz (Ch 885)
Maximum Tx Power	33.0 dBm (Class 4) (PL5)	30.0 dBm (Class 1) (PL0)	30.0 dBm (Class 1)
Minimum Tx Power	5.0 dBm (PL19)	0.0 dBm (PL15)	0.0 dBm (PL15)

4.1.2 Main PCB Description

All RF components are located on one side of the top half area of the Main PCB, with the baseband components (Logic circuits) occupying the lower half of the Main PCB. The RF circuit area is shielded by two metal screens and the Logic circuits area by one screen.

The keypad is mounted on the reverse side of the PCB.

4.1.3 Flexi-PCB

All components and the connectors for the Sub LCD module, camera, receiver, main display (x2) are located on one side of the Flexi-PCB.

5 DISASSEMBLY / REASSEMBLY INSTRUCTIONS

5.1. General

This section provides disassembly and reassembly procedures for the main components of the telephone.

These assemblies **MUST** be performed by qualified service personnel at an authorised service centre.

The following Warnings and Cautions **MUST** be observed during all disassembly / reassembly operations:

WARNING

The equipment described in this manual contains polarised capacitors utilising liquid electrolyte. These devices are entirely safe provided that neither a short-circuit nor a reverse polarity connection is made across the capacitor terminals. **FAILURE TO OBSERVE THIS WARNING COULD RESULT IN DAMAGE TO THE EQUIPMENT OR, AT WORST, POSSIBLE INJURY TO PERSONNEL RESULTING FROM ELECTRIC SHOCK OR THE AFFECTED CAPACITOR EXPLODING. EXTREME CARE MUST BE EXERCISED AT ALL TIMES WHEN HANDLING THESE DEVICES.**

Caution

The equipment described in this manual contains electrostatic devices (ESDs). Damage can occur to these devices if the appropriate handling procedure is not adhered to.

5.1.1 ESD Handling Precautions

A working area where ESDs may be handled safely without undue risk of damage from electrostatic discharge, must be available. The area must be equipped as follows:

Working Surfaces

All working surfaces must have a dissipative bench mat, safe for use with live equipment, connected via 1M Ω resistor (usually built into the lead) to a common ground point.

Wrist Strap

A quick release skin contact device with a flexible cord, which has an integral safety resistor of between 5k Ω and 1M Ω , shall be used.

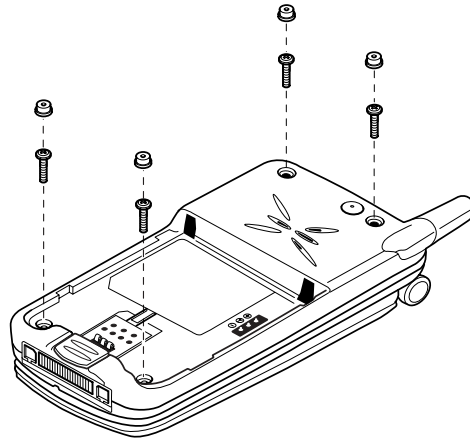
Containers

All containers and storage must be of the conductive type.

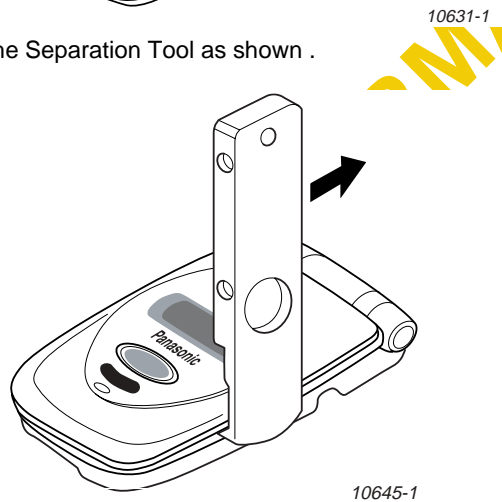
5.2. Disassembly

5.2.1. Lower Case Removal

1. Remove the battery from the phone.
2. Remove the two grey screw caps and discard
3. Remove the four case screws and retain for re-use.

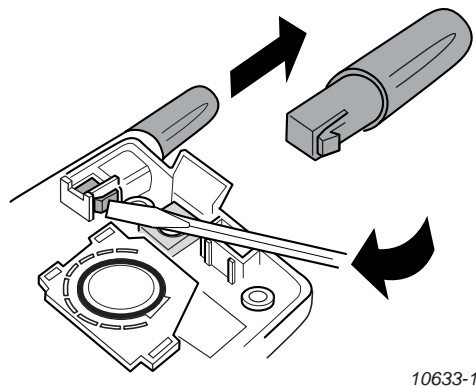


4. Separate the case and cover using the Separation Tool as shown .



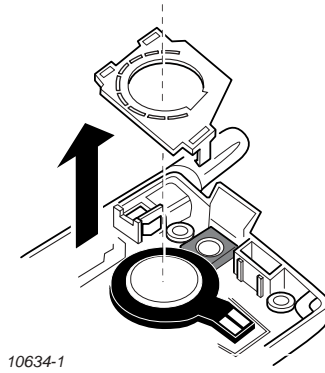
5.2.2 Antenna Removal

1. Apply pressure to the lug in the direction shown to release the antenna from the case.



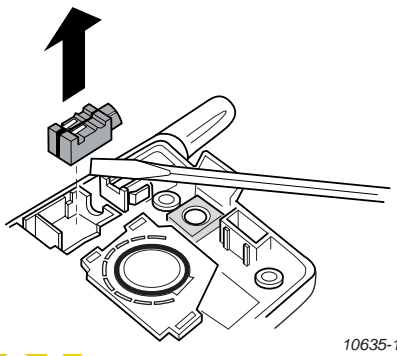
5.2.3 Speaker Removal

1. Using tweezers lift the single lug on the speaker holder to release.
2. Remove the holder and speaker.



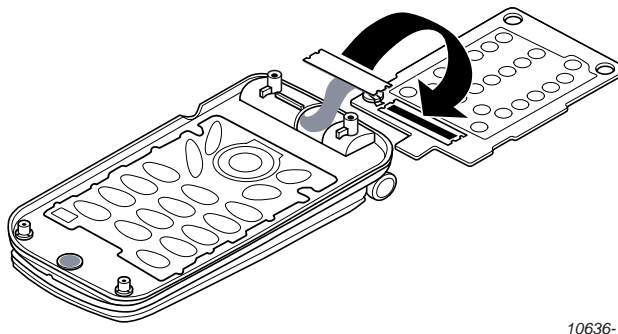
5.2.4. Vibrate Motor Removal

1. The Vibrate motor may be lifted from the case by gently applying pressure under the body. Do not lift the unit by the counterweight spindle as it may bend the spindle.



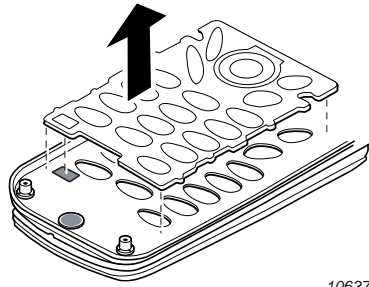
5.2.5 Main PCB Removal

1. Carefully hinge the Main PCB over and lay the the pcb on a flat surface ensuring no strain is placed on the flexible connector.
2. Disconnect the flexible connector and lift the main pcb clear.



5.2.6. Keypad and Magnet Removal

1. Remove the keypad by pressing on the navigation key until the membrane can be peeled away from the case front.

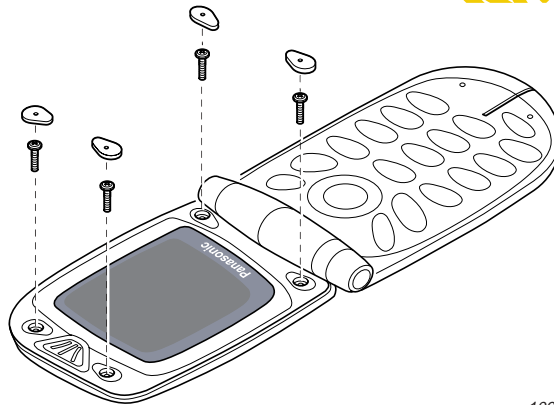


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5.2.7. Display Removal

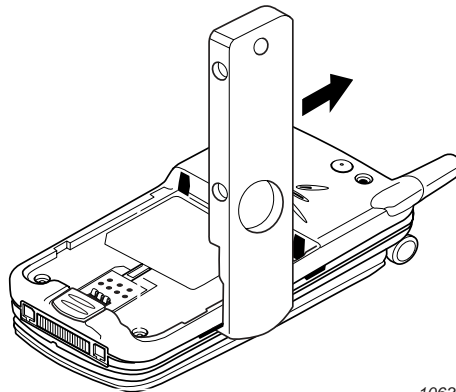
1. Open the phone
2. Remove the four grey screw caps and discard.
3. Remove and retain the four screws.

Note that the two screws at the top of the display are smaller and blue in colour.



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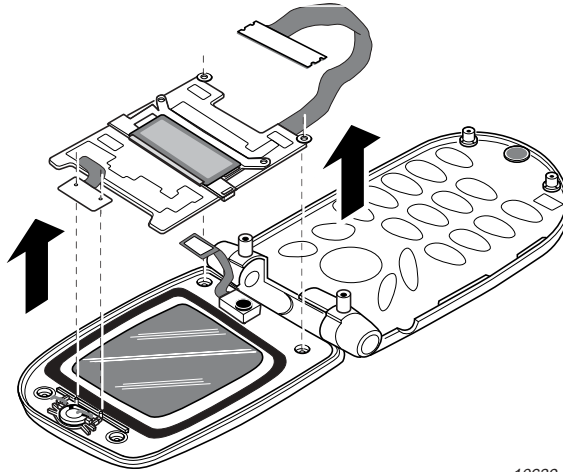
4. Close the phone
5. Carefully prise apart the lower back case and the lower front cover, creating a gap at the base of the I/O connector.
6. Separate the case and cover using the Separation Tool as shown .



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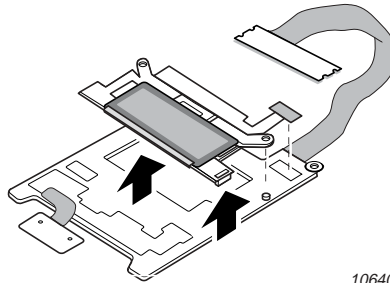
5.2.8 Flexi-PCB Removal

1. Open the phone
2. Disconnect the receiver and camera connections.
3. Using a small screwdriver or similar blunt object press the lugs on the side of the Flexi-PCB to release it from the upper front cover.



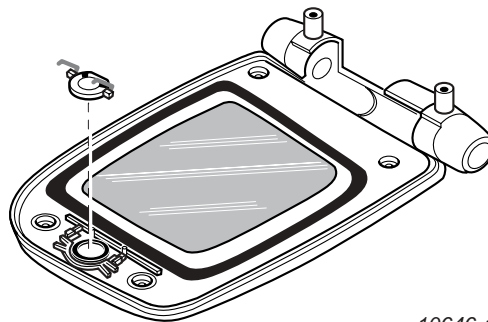
5.2.9 Sub-LCD Removal

1. Release the Sub LCD connector on the Flexi-PCB.
2. Release the white Sub LCD by pressing the lug.
3. Lift the LCD clear, ensuring the flexible connector disengages.
4. Disconnect the LCD / LED connector from the Flexi-PCB and lift clear.



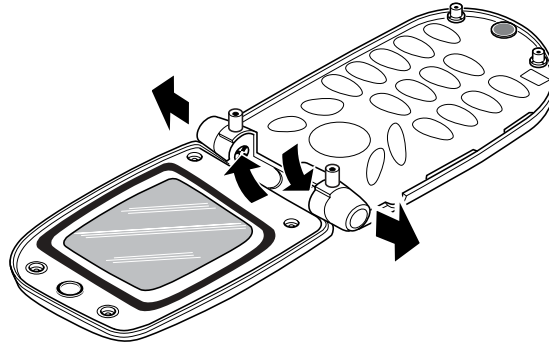
5.2.10 Receiver (Earpiece) Removal

1. Depress the earpiece retaining clips and lift up.



5.2.11 Hinge Removal

1. Open the phone. From the hinge cavity press the retaining lugs on the hinge pins to release the hinge pins. Note that the hinge pins are different lengths and must be replaced in their original positions.



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5.3. Reassembly

Reassembly is the reverse of disassembly. However, the following checks should be observed:

- All flexible connectors are located and secured correctly.
- Roll the connector end of the Flexi-PCB round to enable the excess to be located in the hinge cavity.
- Ensure earth springs are in position in the LCD holder.
- The vibrate unit contacts are not bent.
- The speaker cushion is placed with mesh facing the moulding.
- All securing screws are not over-tightened as this may affect the operation of the keypad.
- The hinge pins are replaced in their correct sides.
- On refitting the four case screws, new grey screw caps are fitted to the screw recesses.

IF ANY OF THE RF OR LOGIC SHIELDS ARE REMOVED FROM THE PCB AT ANY TIME, THEY MUST BE REPLACED BY NEW ITEMS. ONCE REMOVED, THE SHIELDS MUST **NOT** BE REUSED.

On completion of reassembly, the handset must be re-calibrated as detailed in Section 8.

PROVISIONAL INFORMATION

6 REPAIR PROCEDURES

6.1. Introduction

This section provides information on testing the telephone. The layout is as follows:

- Section 6.2: Lead Free (PbF) solder: Identification and repair of PCBs using PbF solder.
- Section 6.3 External testing: describes equipment requirements and general set up procedure.
- Section 6.4 Complete Unit Test Setup: describes how the items of test equipment are used together and general set up procedure.
- Section 6.5 Channel box test commands: provides detailed explanation of the different commands available using the test equipment and channel-box software.

Calibration Procedures are described in Section 8.

6.2. Lead Free (PbF) solder

CAUTION

The Printed Circuit Board (PCB) used in this telephone has been manufactured using Lead Free solder.

Lead Free solder has a higher melting point than Lead solder - typically 30 - 40 °C higher. Always use a high temperature soldering iron. When using a soldering iron with temperature control, it should be set to 370 ±10 °C (700 ± 20°F).

When using lead solder, all PbF solder must be removed from the solder area. Where this is not possible, heat the PbF solder until it melts before applying lead solder.

Avoid overheating PbF solder as it has a tendency to splash at temperatures above 600 °C (1100 °F).

6.3. External Testing

6.3.1 General Information

The handset can be connected to a compatible personal computer for electronic adjustment and fault diagnosis. This section provides a description of the equipment required to perform those tasks.

Prior to testing and adjustment, the unit should first be disassembled, as detailed in Section 5, and then the PCB connected to the PCB Repair Jig. Fault tracing can be performed on the PCB using suitable test equipment, such as spectrum analysers and oscilloscopes.

The unit must be tested and calibrated for both frequency bands (900 MHz, 1800 MHz and 1900 MHz).

6.3.2 Jigs and Tools

Interface Box (Part No. IFB003 / IFB004)

The Interface box provides:

1. IFB003: Voltage regulation for +7.2 V, +5.6 V or 4.8 V DC outputs. The +7.2 V switch setting is used as a supply to Li-Ion type batteries (compatible for other products), the 5.6 V switch setting is used for PCB testing and the 4.8 V switch setting is used for testing the complete unit.
2. Interface Box IFB004 is a later version that provides +4.8 V, +7.2V and +8.2 V DC outputs. It also allows selection of external power via the Interface cable.
3. RS 232 interface. Ensures that the Unit Under Test is supplied with the correct signal levels and format.

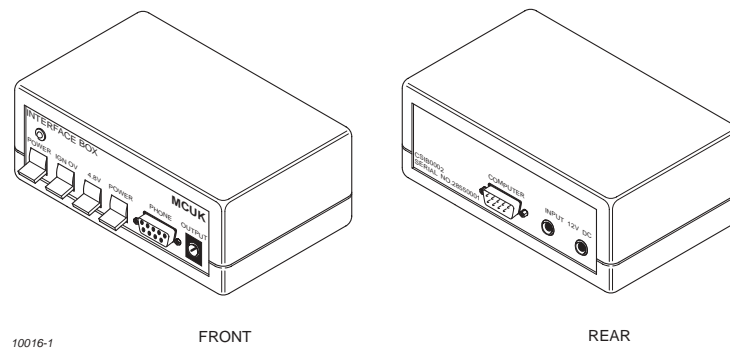


Figure 6.1: Interface Box IFB003 / IFB004

Personal Computer (PC)

The PC (IBM compatible) is used as a Unit Under Test controller. This, in conjunction with the channel box software, allows all of the test facilities normally provided through the keypad of the Unit Under Test.

Power Supply

Provides 12 V DC supply to Interface box IFB003 or IFB004.

PCB Repair Jig (Part No. JT00086)

Caution

The power cable has a large capacitor across the positive and negative leads to reduce the loading effect on the power supply during RF calibration. Therefore, it is important that the correct polarity of the cables is observed, otherwise serious damage will occur to the capacitor.

The PCB Repair Jig provides the necessary connections between the PCB Assembly and external test equipment. It is required for RF calibration.

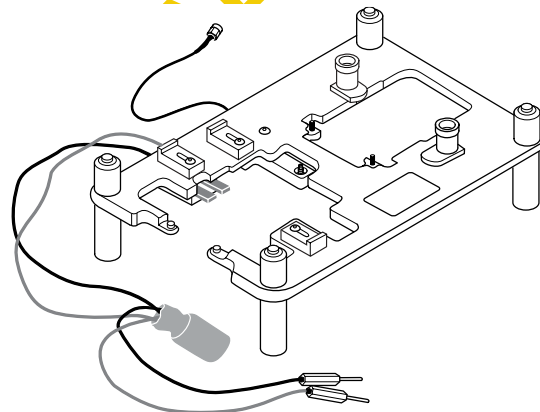


Figure 6.2: PCB Repair Jig

A cable with an N-Type male connector and SMA female connector will be required to make the RF connection between the Repair Jig and service equipment.

A replacement RF Probe for the Repair Jig is available as a spares item.

RF Adaptor / Baseband Jig (Part No. JT00087)

The RF Adaptor / Baseband Jig provides the connections between the test equipment and the phone for unit testing. It also provides power supply, via the Interface Box, for the phone.

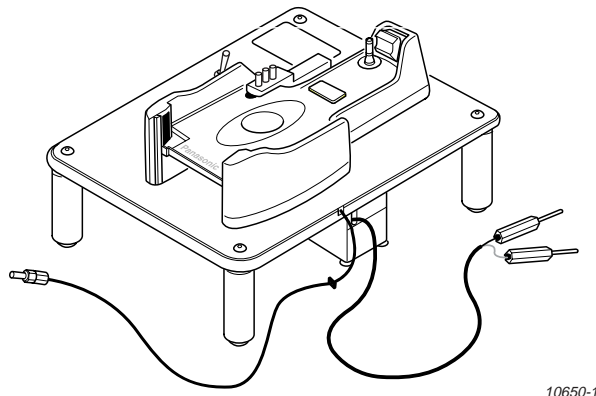


Figure 6.3: RF Adaptor / Baseband Jig

Light Box

The unit is used to provide a controlled light source for calibration of the camera.

GSM Tester

This unit acts as a base station providing all the necessary GSM signalling requirements and also provides GSM signal measuring facilities.

Channel Box Software

This is the test software for the telephone unit and should be installed onto the personal computer to be used for testing.

Case Separation Tool (Part No. JT00059)

The Case Separation Tool is used to facilitate separation of the front cover and case.

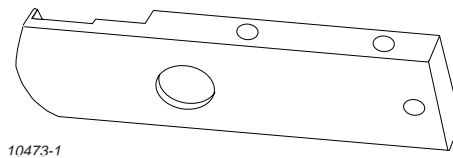


Figure 6.4: Case Separation Tool

Trident Screwdriver (Part No. JT00088)

This screwdriver is required to remove the case screws from the phone.

6.4. Test Equipment Setup

6.4.1 Equipment Required

Figure 6.5: Test Connection Diagram

IMPORTANT NOTE

To allow accurate measurement of the complete unit the test equipment must be connected as shown.

For testing the handheld unit the following equipment is required:

1. PCB Repair Jig.
2. Interface Box IFB003 or IFB004
3. 12 V power supply
4. Personal computer with RS232 interface and running Microsoft Windows® 95, 98 or NT
5. RS232 interface cable (9 pin straight through connection)
6. GSM test station.
7. Panasonic Channel Box software for Microsoft Windows ®.

The Channel Box software should be installed onto the main drive of the personal computer.

The RF cable is connected to the GSM test station via a suitable adaptor. The 12 V supply is connected to the rear socket of the Interface box.

NOTE: A suitable test SIM card compatible with the GSM test station will be required.

6.4.2 Using the Channel Box software

1. Connect the PCB and test equipment as shown in Figure 6.5:
2. Ensure that the following settings are made:

Interface box IFB003 or IFB004	
Power:	ON position
IGN:	OFF position
Ext Pwr:	OFF position
Voltage:	Top position (8.2 V)

REPAIR PROCEDURES

3. Place the PCB into the repair jig, taking care not to damage the sensitive RF probe.
4. Connect a power supply to the power cables of the PCB repair jig. Set the power supply to 3.6 V.
5. Start the Windows Channel Box software. The main screen should display as shown below:

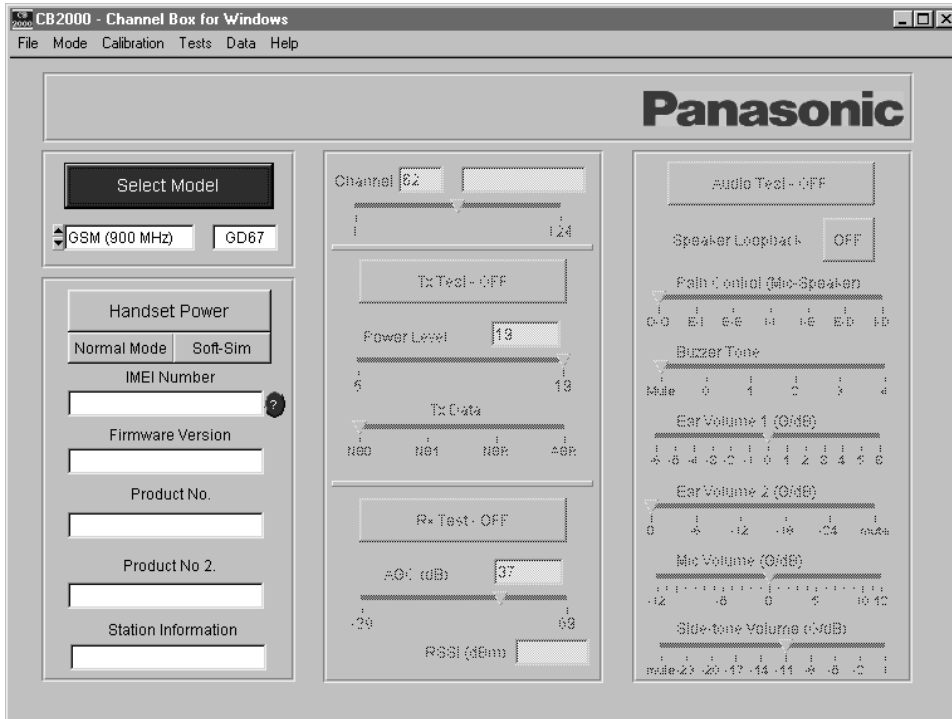


Figure 6.6: Channel Box Main Screen

1. Click on the SELECT MODEL button on the main screen. In the pop-up window, select GD87 or GU87 from the list box and click on the OK button.
6. Click on the HANDSET POWER button and, within one second, switch on the handset using the key.
7. Check that the handset is powered-up (LCD is backlit and all LEDs are on). The Channel Box should also display handset IMEI number and Firmware version information in the left-hand column of the screen. A toolbar should also be visible in the top panel where the Panasonic logo is displayed.



Figure 6.7: Channel Box Toolbar

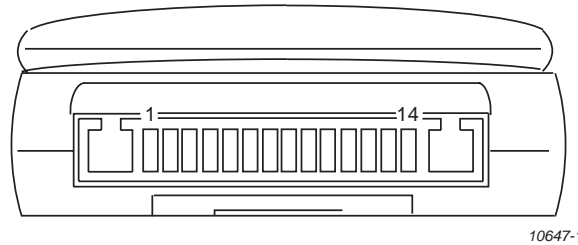
Additional user instructions are provided in the documentation files supplied with the Channel Box.

7 INTERFACES AND TEST POINTS

7.1. Interfaces

7.1.1 External I/O

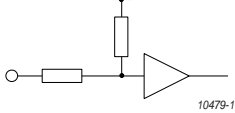
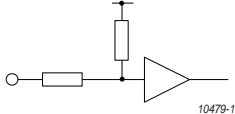
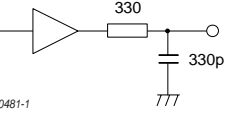

(PHONE SHOWN IN CLOSED POSITION)



10647-1

Figure 7.1: External I/O Connector

No.	Name	HH <=>EXT	Function	H/H Circuit
1	AGND	-	Audio Ground	
2	TX-AUDIO	<==	Sending Audio	
3	RX-AUDIO	==>	Received Audio	
4	VBAT IN / DATA_MODE0	<==	Battery Voltage Supply input / Data Accessory Recognition 0	
5	nACC_SENSE	<==	Handsfree / Data Accessory detection	
6	nAUDIO-ON	==>	Audio Path Control (L: On = un mute, Hi-Z: Off = mute)	
7	SERIAL UP	<==	Upward serial (9600 bps: SMS cable) (33.8 kbps: Data adaptor I/F Card) (up to 38.4 kbps: Soft Modem cable) (57.6 kbps: Test Command)	
8	SERIAL DOWN	==>	Downward serial (Baud rate same as SERIAL-UP)	
9	ACC_PWR	==>	Peripheral power supply (on: less than 100 mA)	

No.	Name	HH <=>EXT	Function	H/H Circuit
10	DTR / DATA_MODE1	<==	RS232C: Data Terminal Ready / Data Accessory recognition 1	 10479-1
11	RTS	<==	RS232C: Request to Send	 10479-1
12	CTS / PA-ON	==>	PA control signal for test trigger (L: off, H 2.8V: on)	 10481-1
13	EXT-PWR	<==	Power supply for Battery Charge	
14	GND	-	Power supply and digital signal ground	 10095-2

7.1.2 Main LCD Module Interface Connections



Figure 7.2: LCD Module Connector

Pin	Signal	PCB-LCD	Function	Connection	Status
1	VDD	->	POWER SUPPLY	IOTA D28IO	
2	VDD	->	POWER SUPPLY	IOTA D28IO	
3	VDD	->	POWER SUPPLY	IOTA D28IO	
4	VSS	-	COMMON GROUND	GND	
5	VSS	-	COMMON GROUND	GND	
6	VSS	-	COMMON GROUND	GND	
7	nCS	->	CHIP SELECT SIGNAL	ADDRESS DECODER nCS_LCD	LCD drv chip select signal
8	RS	->	REGISTER SELECT	CALYPSO A16	DATA/COMMAND reg select
9	nWR	->	negative WRITE	CALYPSO nWR	
10	nRD	->	negative READ	CALYPSO nOE	
11	DB8	<->	DATA BUS (8)	CALYPSO D0	
12	DB9	<->	DATA BUS (9)	CALYPSO D1	
13	DB10	<->	DATA BUS (10)	CALYPSO D2	
14	DB11	<->	DATA BUS (11)	CALYPSO D3	
15	DB12	<->	DATA BUS (12)	CALYPSO D4	
16	DB13	<->	DATA BUS (13)	CALYPSO D5	
17	DB14	<->	DATA BUS (14)	CALYPSO D6	
18	DB15	<->	DATA BUS (15)	CALYPSO D7	

Pin	Signal	PCB-LCD	Function	Connection	Status
19	nRESET	->	negative Reset Signal	CALYPSO nRESET	
20	Vsync	->	Vertical Synchronised signal	NC	
21	dummy	-	Reset signal	NC	

7.1.3 Sub LCD Module Interface Signals

Pin	Signal	PCB-LCD	Function	Connection	Status
1	VSS	->	COMMON GROUND	GND	
2	VSS	-	POWER SUPPLY	IOTA D28IO	
3	VSS	-	SERIAL DATA	CALYPSO DOUT	
4	SCLK	->	SERIAL CLOCK	CALYPSO SCLK	
5	A0	->	DATA SELECTION	CALYPSO RS_SUB	
6	nRES	->	negative Reset signal	CALYPSO nRESET	
7	nCS1	->	negative CHIP SELECT signal	CALYPSO nCS_SUB	

7.1.4. SIM Interface

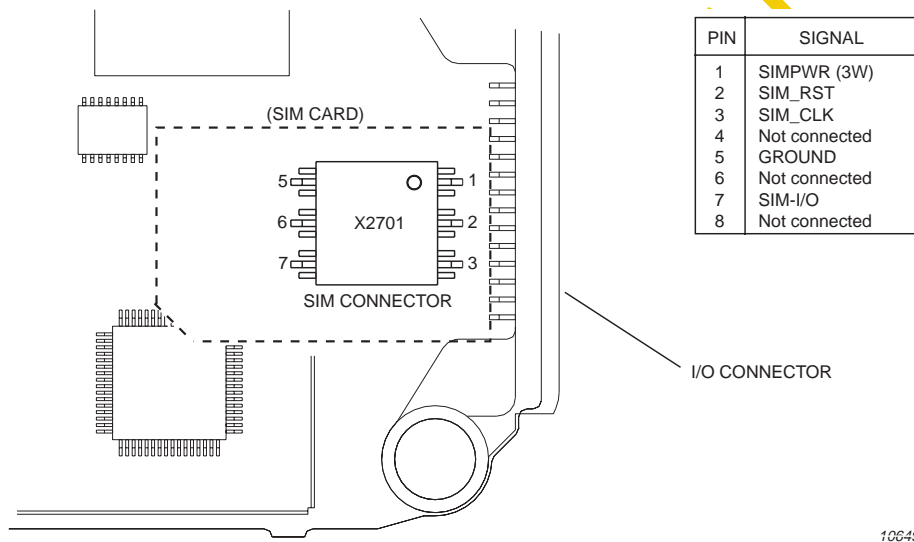


Figure 7.3: SIM Connection Details

7.1.5 Battery Connector

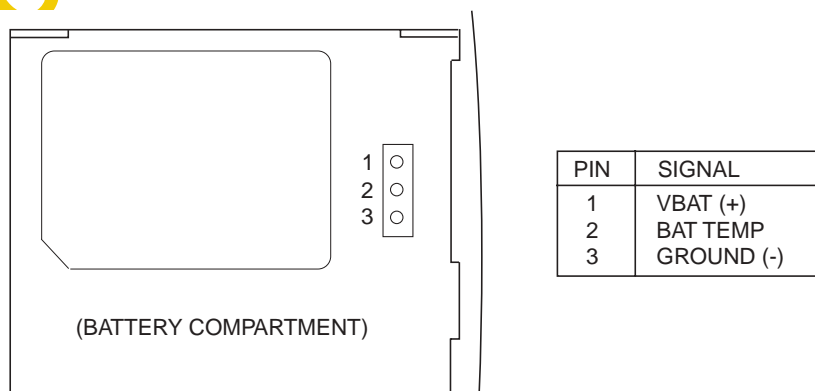


Figure 7.4: Battery Connection Details

7.2. Test Points

TP2001	BDLIP
TP2002	BDLIM
TP2003	BDLQP
TP2004	BDLQM
TP2101	CALYPSO TDI
TP2102	CALYPSO TDO
TP2103	CALYPSO TCK
TP2104	CALYPSO TMS
TP2105	CALYPSO nBSCAN
TP2106	CALYPSO SSDX
TP2107	CALYPSO SSRD
TP2108	CALYPSO SSCLK
TP2109	CALYPSO SSRST
TP2110	PAON
TP2116	OP_DET
TP2117	NWAIT
TP2118	TX_IRDA
TP2119	RX_IRDA
TP2201	FLASH RY[BY]
TP2203	nCS_FLASH2
TP2301	VXRTC
TP2302	VRRTC
TP2303	VRI02
TP2305	A28BB
TP2306	D28MEM
TP2307	D28RAM
TP2308	D15BB
TP2309	IOTA TDO
TP2311	RPWON
TP2313	nRESPWRON
TP2314	ON_OFF
TP2315	IRQ
TP2316	FIQ_nLVI
TP2317	VBACKUP
TP2318	IT_WAKEUP
TP2319	TEST3
TP2320	TEST4
TP2401	D50V
TP2402	nRESET
TP2503	SPEAKER OUT 1
TP2504	SPEAKER OUT 2
TP2505	SUSPEND_CTRL
TP2506	nPHF_DET
TP2507	HSMICIN
TP2508	HSET_RX
TP2509	REC_P
TP2510	REC_N
TP2511	PHF JACK
TP2601	CAM_RDY
TP2611	PWON
TP2612	KEY_LED
TP2613	DS2601
TP2614	DS2602
TP2615	DS2603
TP2616	DS2604
TP2617	DS2605
TP2618	DS2606
TP2619	DS2607
TP2620	DS2608
TP2621	DS2609
TP2622	DS2610
TP2623	DS2611
TP2624	DS2612
TP2625	DS2613
TP2626	DS2614
TP2701	GROUND
TP2702	GROUND
TP2703	VBAT
TP2704	VBAT
TP2705	BAT-TEMP
TP2706	SIM_IO
TP2707	VR SIM
TP2708	SIM_RST
TP2709	SIM_CLK
TP2710	CTS / PA_ON

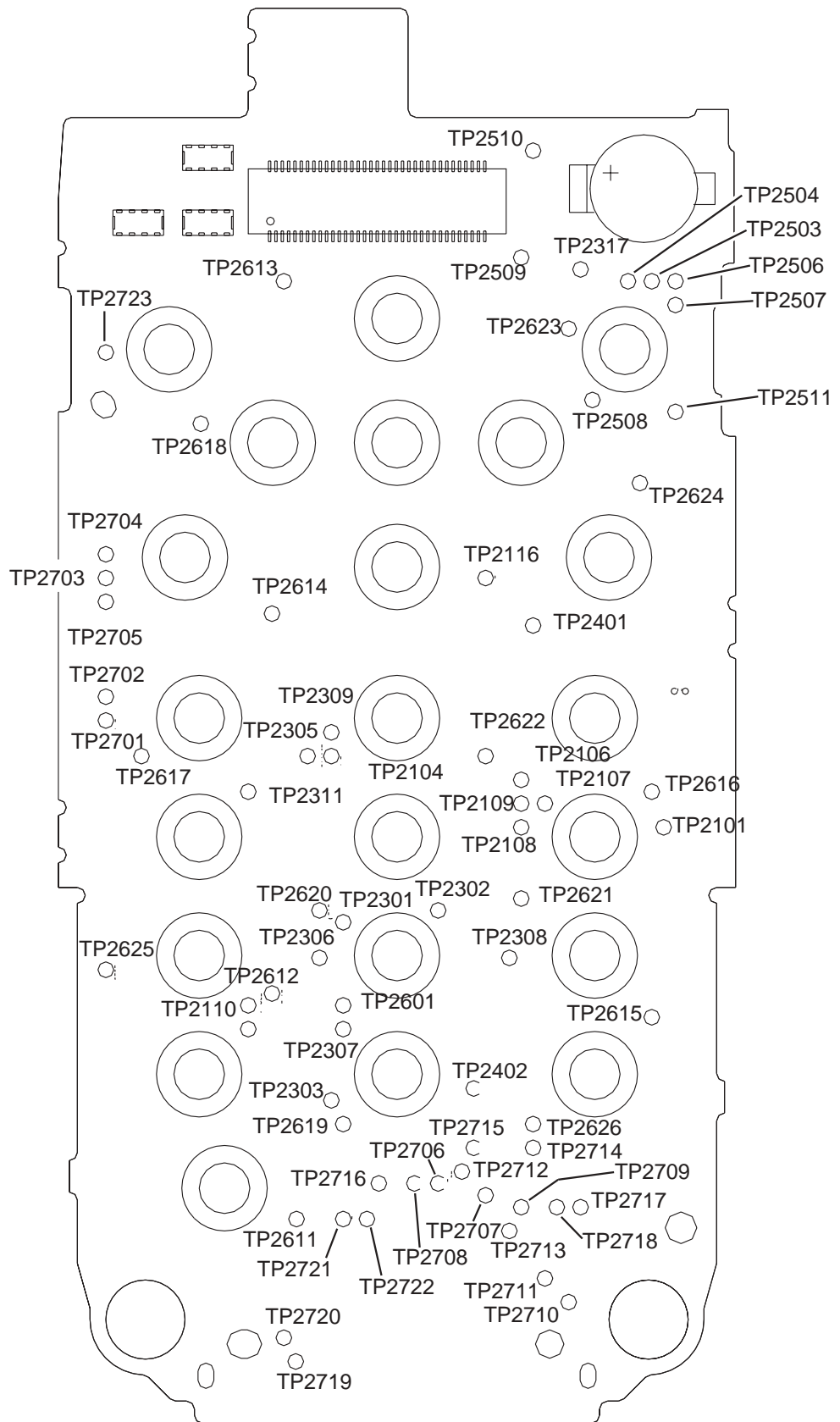


Figure 7.5: Location of Test Points

10628-1

8 CALIBRATION PROCEDURES

8.1. Introduction

NOTE: See Section 6 for a list of the equipment and setup procedures required to perform the following adjustment and calibration procedures.

The following procedures MUST be performed after replacement or repair of the PCB. Failure to do so may result in incorrect operation of the telephone.

The following adjustments MUST be made to the PCB using the specified PCB Repair Jig. The applied voltage should be a constant 3.7 V DC at 2 A.

There are two distinct calibration procedures to adjust RF performance. These procedures are:

Carrier Power calibration (Section 8.2.)

RSSI (Section 8.2.5)

To ensure that the phone is within set SAR margins after a Peak Power Calibration has been performed, a power meter that is accurate to 0.2 dB MUST be used.

The output power of the phone can be influenced by the RF Shield cans, therefore all power calibration procedures MUST be performed with the shield can wall sections and lids in place.

IF ANY OF THE RF OR LOGIC SHIELDS ARE REMOVED FROM THE PCB AT ANY TIME, THEY MUST BE REPLACED BY NEW ITEMS. ONCE REMOVED, THE SHIELDS MUST **NOT** BE REUSED.

Battery calibration includes checks on voltage, temperature and charging. These procedures are described in Section 8.3. Adjustment data selected during calibration is stored in Flash ROM.

8.2. Carrier Power Calibration

8.2.1 General Information

Tx Calibration can be performed manually or automatically. Automatic Calibration is the preferred method but requires a Gigatronics 8541C power meter. Manual Calibration is used to adjust or verify each calibration channel in turn.

To minimise the variation of Tx power with frequency due to component tolerance, each GSM band is split into sub-bands, which are calibrated separately. The calibration bands and channels used are as follows:

Band Start	Band Stop	Calibration Channel	Sub-band
975	1009	992	PL_GSM_Bch
1010	20	3	PL_GSM_Lch
21	55	38	PL_GSM_Mch
56	90	73	PL_GSM_Hch
91	124	108	PL_GSM_Tch
512	586	544	PL_GSM_Bch
587	661	624	PL_DCS_Lch
662	736	698	PL_DCS_Mch
737	811	774	PL_DCS_Hch
812	885	885	PL_DCS_Tch

E-GSM 900

The following table shows the measurement limits according to power level:

Power Level (PL)	Output Power (dBm)		
	Nominal	Target	
		Min	Max
5	32.75	32.5	33.0
6	31.0	30.5	31.5
7	29.0	28.5	29.5
8	27	26.5	27.5
9	25	24.5	25.5
10	23	22.5	23.5
11	21	20.5	21.5
12	19	18.5	19.5
13	17	16.5	17.5
14	15	14.5	15.5
15	13	12.5	13.5
16	11	10.5	11.5
17	9	8.5	9.5
18	7	6.5	7.5
19	5	4.5	5.5

GSM 1800

The following table shows the measurement limits according to power level:

Power Level (PL)	Output Power (dBm)		
	Nominal	Target	
		Min	Max
0	29.75	29.5	30.0
1	28.0	27.5	28.9
2	26.0	25.5	26.5
3	24.0	23.5	24.5
4	22.0	21.5	22.5
5	20.0	19.5	20.5
6	18.0	17.5	18.5
7	16.0	15.5	16.5
8	14.0	13.5	14.5
9	12.0	11.5	12.5
10	10.0	9.5	10.5
11	8.0	7.5	8.5
12	6.0	5.5	6.5
13	4.0	3.5	4.5
14	2.0	1.5	2.5
15	0.0	-0.5	0.5

GSM 1900

The following table shows the measurement limits according to power level:

Power Level (PL)	Output Power (dBm)		
	Nominal	Target	
		Min	Max
0	29.25	29.0	29.5
1	28.0	27.5	28.5
2	26.0	25.5	26.5
3	24.0	23.5	24.5
4	22.0	21.5	22.5
5	20.0	19.5	20.5
6	18.0	17.5	18.5
7	16.0	15.5	16.5
8	14.0	13.5	14.5
9	12.0	11.5	12.5
10	10.0	9.5	10.5
11	8.0	7.5	8.5
12	6.0	5.5	6.5
13	4.0	3.5	4.5
14	2.0	1.5	2.5
15	0.0	-0.5	0.5

The values in these tables are required only if manual Tx Trim is used to trim individual channels.

8.2.2 Automatic Calibration Procedure

This procedure requires the use of a Gigatronics 8541C power meter.

NOTE: To ensure that the telephone operates within set SAR margins, Panasonic recommends that a power meter capable of measurement to an accuracy of ± 0.2 dB is used when calibrating power levels. Use of a less accurate power meter may result in the telephone failing to meet SAR standards.

1. Connect the test equipment as shown in Figure 6.5:
2. Select GD87 and then select the required band, e.g. 'GSM (900 MHz)'.
3. With the CB2000 software running, select '**TX CAL**' button
4. When the Tx Calibration screen is displayed, start automatic calibration by selecting the '**Run Auto Cal**' button.
5. Once the automatic calibration has finished, select the '**Run Auto Verify**' button to verify the calibration.
6. When finished, select the '**EXIT**' button to save data to the handset. A confirmation message will be displayed in the next box.

8.2.3 Manual Calibration Procedure

This procedure is used to adjust or verify each calibration channel in turn.

NOTE: To ensure that the telephone operates within set SAR margins, Panasonic recommends that a power meter capable of measurement to an accuracy of ± 0.2 dB is used when calibrating power levels. Use of a less accurate power meter may result in the telephone failing to meet SAR standards.

1. Ensure the correct offset values for attenuation are stored in the Setup menu.
2. Connect the test equipment as shown in Figure 6.5:
3. Select GD87 and then select the required band, e.g. 'GSM (900 MHz)'.
4. With the CB2000 software running, select the '**TX CAL**' button.
5. The Tx Calibration screen should be displayed.
6. Within the Manual Calibration area of the screen, select the '**START CALIBRATION**' button.
7. Carry out any instruction displayed in the top text box. The second text box displays the expected power meter reading for the given channel. The text box to the right of the '**ADJUST POWER**' slider displays the current DAC value for the channel.
8. Adjust the DAC value on the CB2000 until the power meter is within the power limits listed in paragraph 8.2.1.
Note: If other media programs are running, e.g. Winamp, an error message may be returned.
9. Select the '**NEXT CAL**' button and repeat steps 7 and 8. When the message "**Copy cal. values operation - click the 'Next cal'. button**", select the '**NEXT CAL**' button.
10. When manual calibration is complete, the new DAC values will be calculated and downloaded to the handset. The message: "Downloading new DAC values - do not remove handset" will be displayed on the phone.
11. On completion of manual calibration, the Verification procedure **MUST** be followed as detailed in Section 8.2.4

8.2.4 Manual Verification Procedure

1. If the Manual Calibration screen is not already open, carry out steps 1 to 5 of Section 8.2.3
2. Select the '**VERIFY**' Button.
3. Read the expected power and check against the power-meter value.
4. If the values are not correct, adjust them by selecting the '**TRIM**' button to open the Trim Power Level window.
5. If required, check the '**VOICE AID**' box for aural confirmation of the expected power meter reading. The Voice Aid is played back through a sound card - if one is fitted to the PC. Note that if other media programs are running, e.g. Winamp, an error message may be returned.
6. Select the '**NEXT VER**' button and repeat steps 3 and 4. When the calibration progress bar is full, the '**NEXT VER**' button will dim and the screen will reset.
7. The Verification procedure is now complete.

8.2.5 RSSI

This procedure describes the calibration of RSSI for all channels and bands.

The procedure is as follows:

1. Connect the test equipment as shown in Figure 6.5:
2. With the CB2000 software running, select the '**RX CAL**' button
3. Select the '**RUN**' button.
4. Carry out the instructions described in the main dialogue window.
5. Select the '**STEP**' button.
6. Follow the steps until the calibration is complete.
7. Select the '**EXIT**' button when finished.

8.3. Battery Calibration

8.3.1 Preliminaries

There are two procedures associated with battery calibration, battery temperature and battery voltage. A dummy battery, as listed in Section 6.3.2, is required to perform these checks.

1. Connect the dummy battery, telephone and PC as shown in the diagram below.

Figure 8.1: Battery calibration test connections

2. Set the Interface box to **POWER ON, IGN** and **EXT PWR OFF**.
3. With the CB2000 software running, select the '**Battery Calibration**' button.
4. The Battery Calibration window is divided into three areas:
 - a) Semi-Auto Voltage Calibration
 - b) Temperature Calibration.
 - c) Charging Calibration.

8.3.2 Temperature Calibration

1. Ensure that VBAT is set to 4.1 V.
2. Carry out the instructions described in the main dialogue window.
3. If at any time the message "**Temperature Cal failed**", the calibration procedure has failed. Check all test equipment connections and that the correct resistor has been selected before suspecting a problem with the handset. Further information may be displayed in the dialogue window.
4. When the message "**Temperature Cal Done**" is displayed in the dialogue window, the calibration procedure has been completed.

8.3.3 Voltage and Current MDAC Calibration

1. On the Interface Box, ensure that the **EXT PWR** switch is **ON**. Check that the dummy battery 82 Ohms switch is set to **ON**.
2. Carry out the instructions described in the main dialogue window.
3. When prompted, measure the dummy battery voltage by connecting a voltmeter to the terminals on the top of the dummy battery.
4. If at any time the message "**Charging Cal failed**", the calibration procedure has failed. Check all test equipment connections and that the correct resistor has been selected before suspecting a problem with the handset. Further information may be displayed in the dialogue window.
5. When the message "**Charging Cal Done**" is displayed in the dialogue window, the calibration procedure has been completed.

9 REPLACEMENT PARTS LIST

9.1. Upper Case Parts

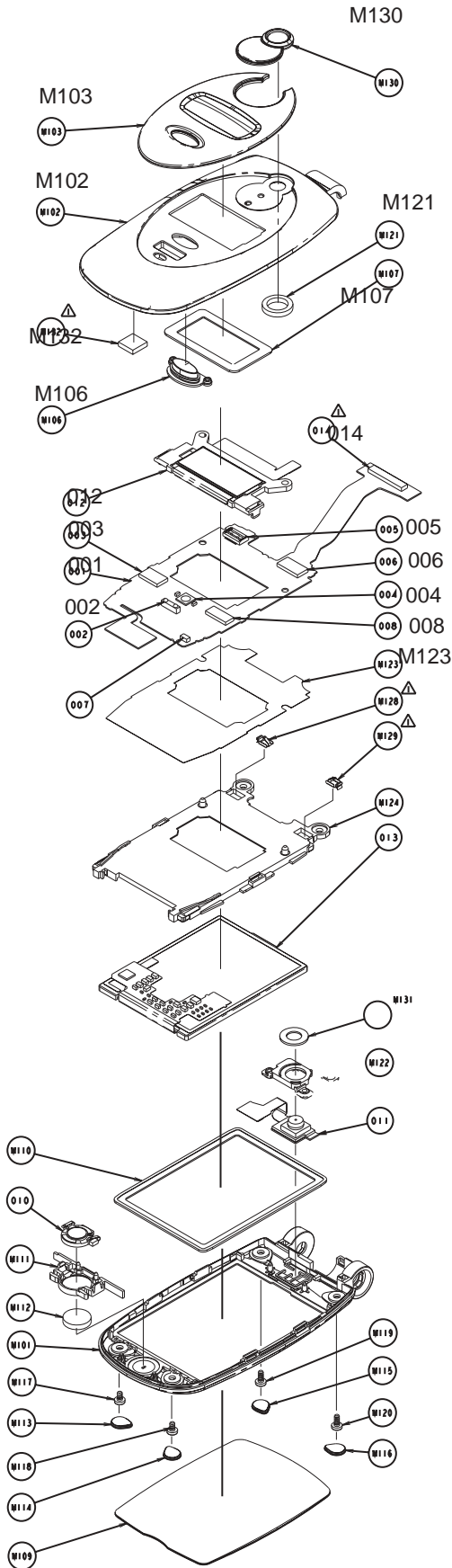


Figure 9.1: Upper Case Parts

Ref. No.	Part No.	Part Name & Description
Ref	Part No	Description
A	GD87CAS01S	SERVICE CASE ASSEMBLY
M102		UPPER BACK CASE
M202		LOWER BACK CASE
M121		CAMERA CUSHION
M107		SUB LCD CUSHION
M106		MEMO KEY
		ESD CUSHION
M132		FPC CUSHION
M130		MIRROR ASSY
M125		SUB LCD PROTECT SHEET
M209		RF CUSHION
M214		SPEAKER CUSHION (6HA693A)
M215		SPEAKER HOLDER
M224		SIM SHEET
M211		HSJ CAP
M220		SCREW, LOWER CASE
M212		BATTERY HOOK
B	GD87COVR01S	SERVICE COVER ASSEMBLY
M101		UPPER FRONT COVER
M201		LOWER FRONT COVER
M126		LCD PANEL PROTECT SHEET
M109		LCD PANEL
M111		RECEIVER HOLDER
M122		CAMERA HOLDER
M110		LCD CUSHION
M112		RECEIVER CUSHION
M117		SCREW, UPPER CASE
M119		SCREW, UPPER CASE, 4mm
M204		HINGE, RIGHT-HAND
M205		HINGE, LEFT-HAND
M103	3CF001010AAA	SUB LCD PANEL
M124	3CH001003AAA	LCD HOLDER
M128	3CW001009AAA	EARTH SPRING
M203	3MB001005AAA	KEYSHEET
M210	3DJ001001AAA	ANTENNA CONTACT
M225	3DB001030AAA	I/O CAP
010	RE80003A	RECEIVER ASSEMBLY
011	AA80024A	CAMERA MODULE
013	AA80013A	MAIN LCD MODULE
021	AN800013A	ANTENNA
022	KHN4NZ1AC	VIBRATE MOTOR ASSEMBLY
023	HS80005A	SPEAKER ASSY
024	3DH001005AAA	LOGIC SHIELD COVER
025	3DH001006AAA	LOGIC SHIELD FRAME
026	3DH001001AAA	RF SHIELD - A COVER
027	3DH001002AAA	RF SHIELD - A FRAME
028	3DH001003AAA	RF SHIELD - B COVER
029	3DH001004AAA	RF SHIELD - B FRAME
037	L0FZBA000002	MIC ASSY
039	BT80024A	BATTERY PACK GD87, SERVICE

9.2. Lower Case Parts

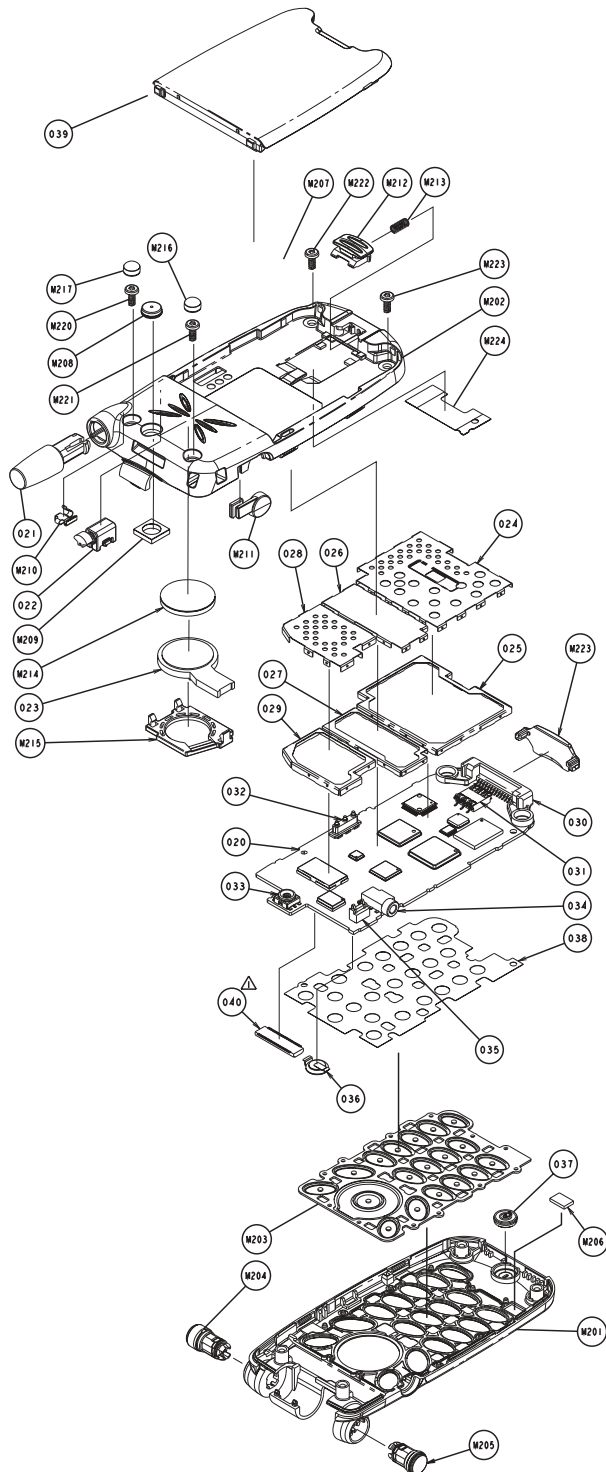


Figure 9.2: Lower Case Parts

9.3. PCB Variants

Ref. No.	Part No.	Part Name & Description
D	GD87BRD001A	PCB ASSY LANGUAGE PACK A
D	GD87BRD001B	PCB ASSY LANGUAGE PACK B
D	GD87BRD001C	PCB ASSY LANGUAGE PACK C
D	GD87BRD001D	PCB ASSY LANGUAGE PACK D

Network-specific (SIM-locked) PCB Assemblies are available - please refer to Panasonic spares representative for details.

10 CIRCUIT DIAGRAMS

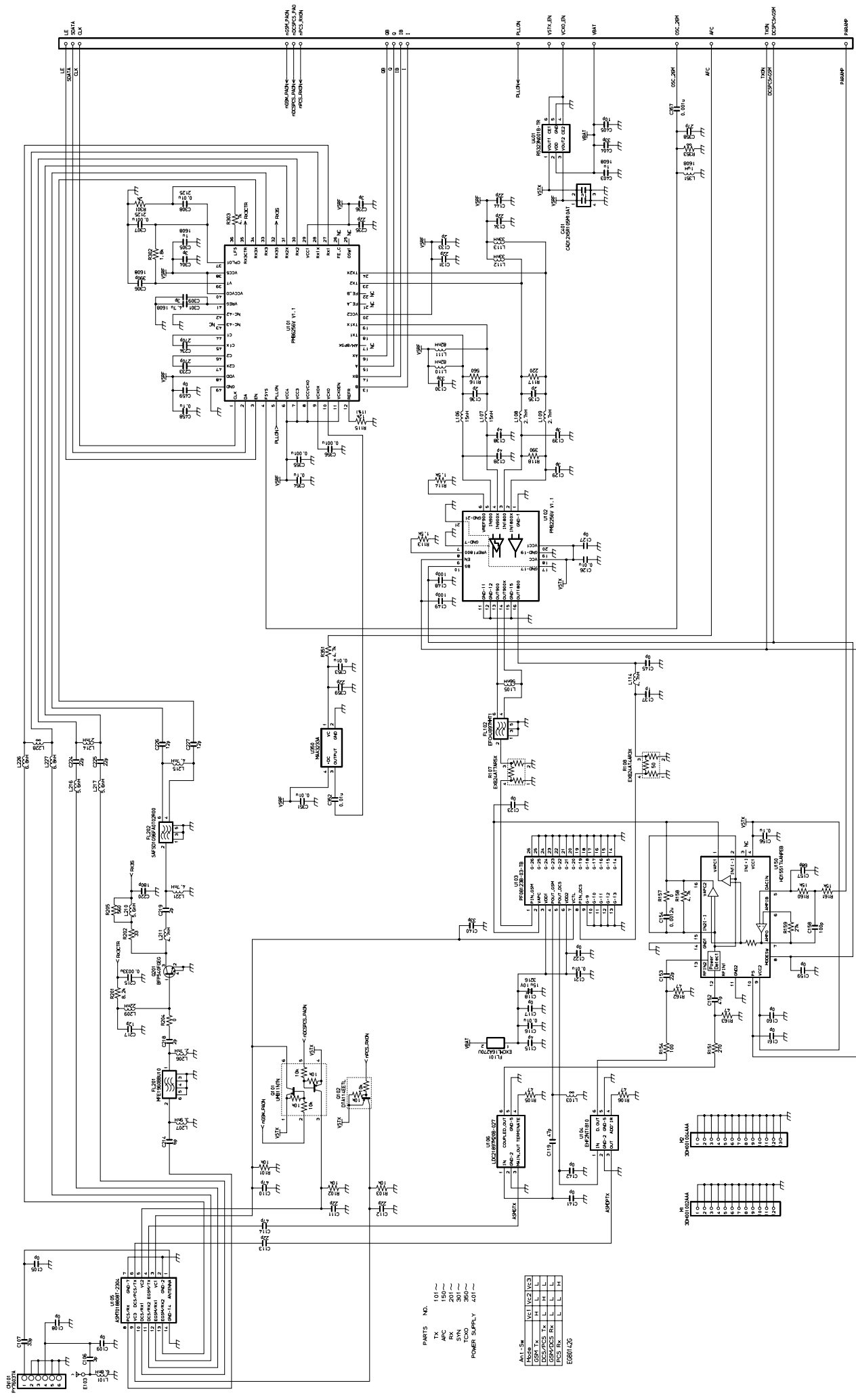


Figure 10.1: Circuit Diagram - RF

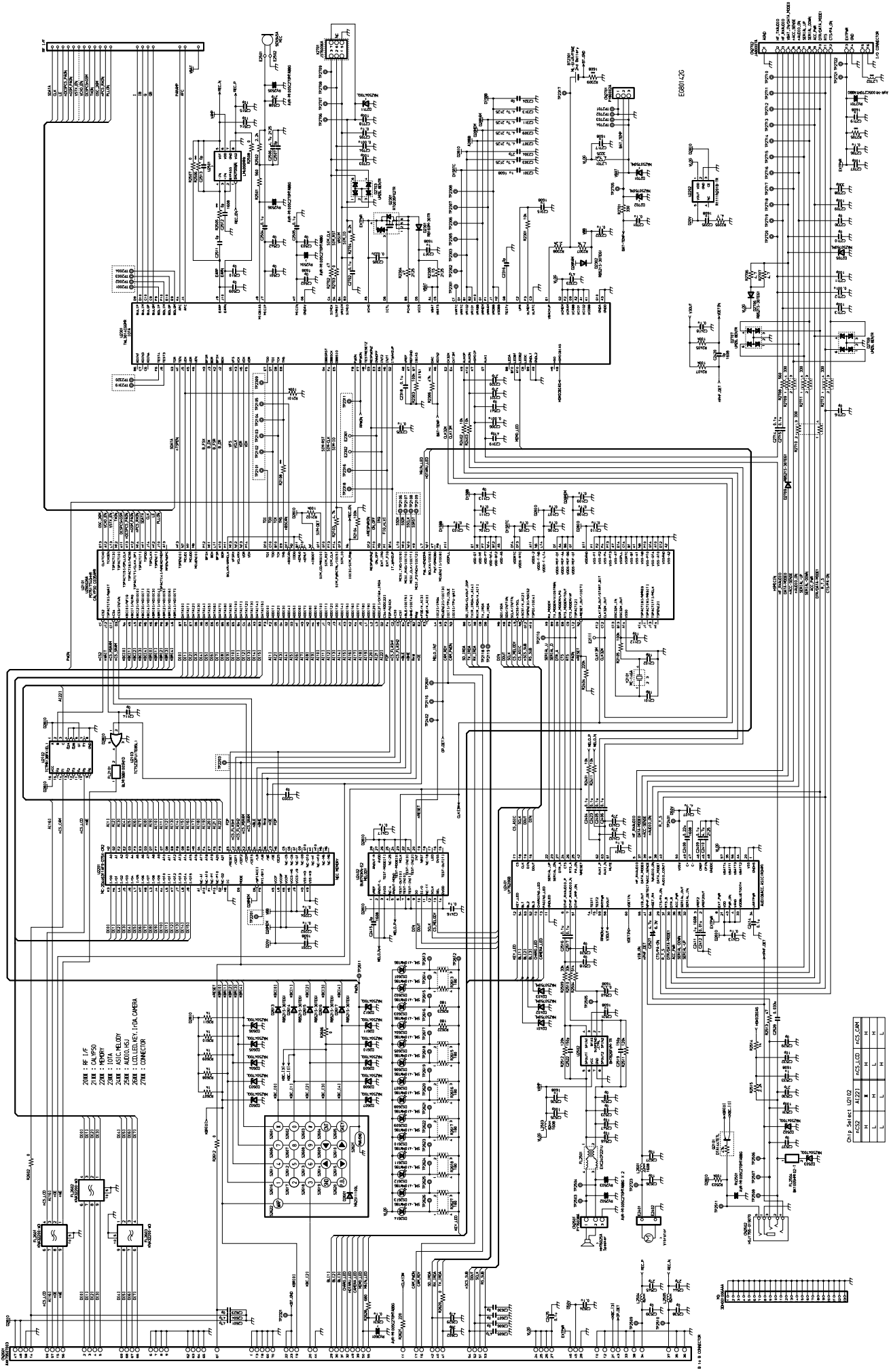


Figure 10.2: Circuit Diagram - Logic

11 LAYOUT DIAGRAMS

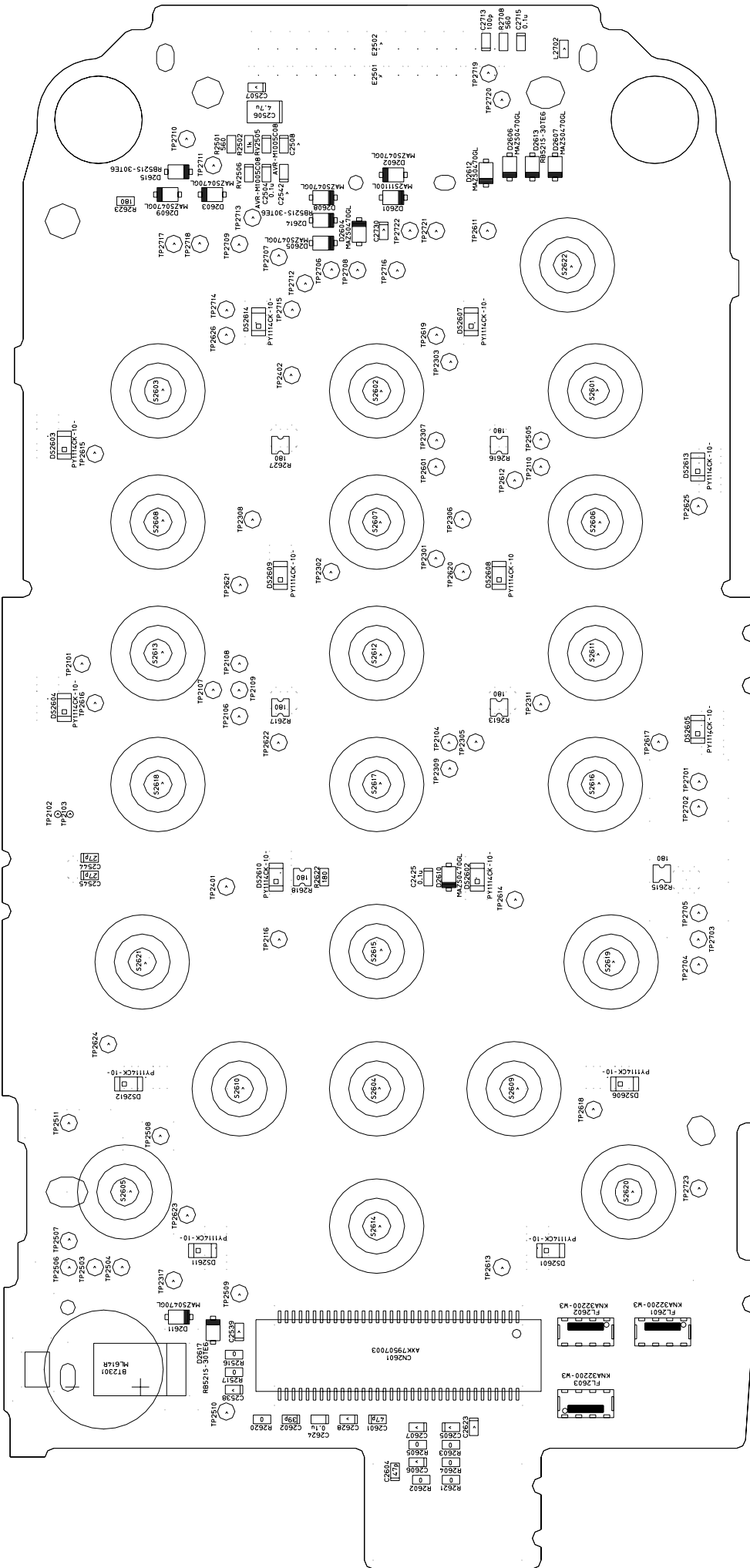


Figure 11.1: Main PCB Layout - Side A

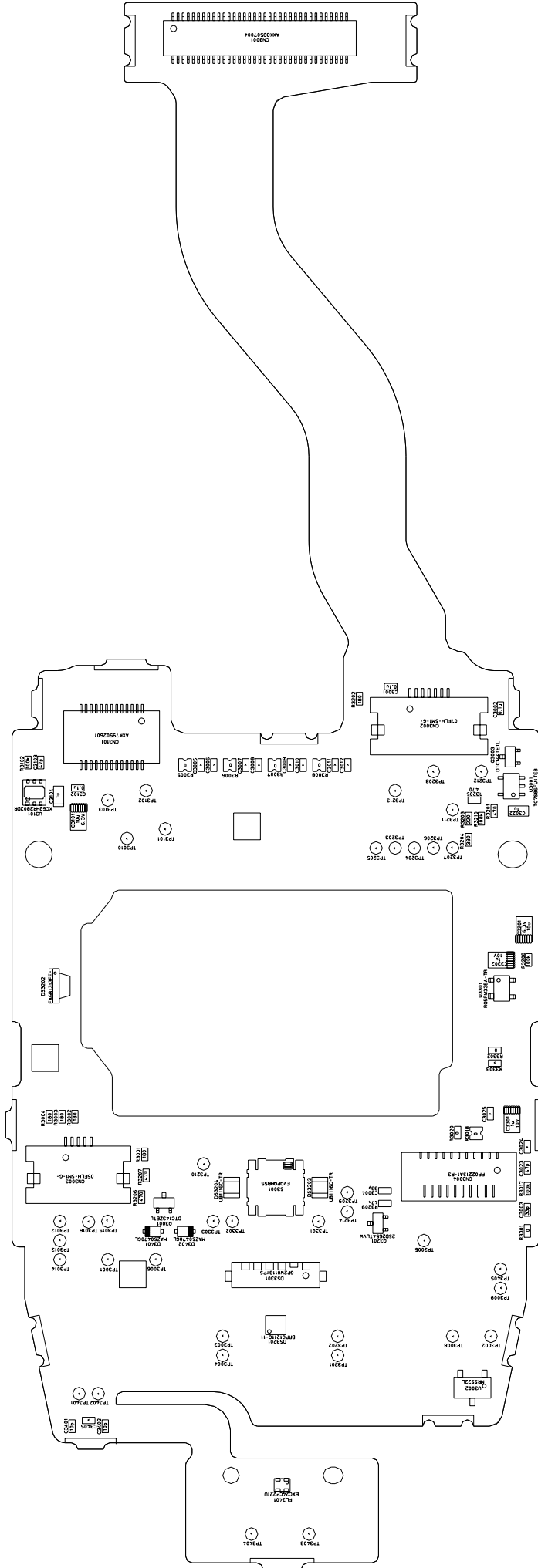


Figure 11.3: LCD PCB Layout

