

# Service Manual

## Personal Cellular Telephone EB-GD93

**GSM**

### Specification



|                                            | 900 MHz                                                                                                               | 1800 MHz                                   |
|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| Frequency Range                            | Tx: 890 - 915MHz<br>Rx: 935 - 960 MHz                                                                                 | Tx: 1710 - 1785 MHz<br>Rx: 1805 - 1880 MHz |
| Tx/Rx frequency separation                 | 45 MHz                                                                                                                | 95 MHz                                     |
| RF Channel Bandwidth                       | 200 kHz                                                                                                               |                                            |
| Number of RF channels                      | 124                                                                                                                   | 374                                        |
| Speech coding                              | Full rate/Half rate/Enhanced Full rate                                                                                |                                            |
| Operating temperature                      | -10 °C to +55 °C                                                                                                      |                                            |
| Type                                       | Class 4 Handheld                                                                                                      | Class 1 Handheld                           |
| RF Output Power                            | 2 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                         | 270.3 kbps                                                                                                            |                                            |
| Diversity                                  | Frequency hopping                                                                                                     |                                            |
| Signal Reception                           | Double superheterodyne                                                                                                |                                            |
| Intermediate Frequencies                   | 225 MHz and 45 MHz                                                                                                    |                                            |
| Antenna Terminal Impedance                 | 50 Ω                                                                                                                  |                                            |
| Antenna VSWR                               | <2.1 : 1                                                                                                              |                                            |
| Dimensions                                 | Height: 120 mm<br>Width: 45 mm<br>Depth: 16.4 mm                                                                      |                                            |
| Volume                                     | 81 ml                                                                                                                 |                                            |
| Weight                                     | 80 g                                                                                                                  |                                            |
| Display                                    | Graphical chip on glass liquid crystal, Alphanumeric, 16 x 4 characters + 2 lines of icons.                           |                                            |
| Illumination                               | 4 LEDs for the LCD (7-colour)<br>8 LEDs for the keypad (Green)<br>1 LED Incoming call (Green)<br>1 Charging LED (Red) |                                            |
| Keys                                       | 18-key Keypad, Navigation key, Memo key.                                                                              |                                            |
| SIM                                        | Plug-in type only                                                                                                     |                                            |
| External DC Supply Voltage                 | 5.8 V                                                                                                                 |                                            |
| Battery                                    | 3.7 V nominal, 650mAh, Li-Ion                                                                                         |                                            |
| Standby Battery Life<br>DRX 9              | 170 hrs maximum                                                                                                       |                                            |
| Conversation Battery Life<br>PL 7, DTX 50% | 210 minutes                                                                                                           |                                            |

Battery life figures are dependent on network conditions.

### 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.

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# WARNINGS AND CAUTIONS

## WARNING

The equipment described in this manual contains polarized 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.

## ESD Handling Precautions

A working area where ESDs may be safely handled 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 a 1 M $\Omega$  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 a built in safety resistor of approximately 1 M $\Omega$  shall be used. The flexible cord must be attached to a dissipative earth point.

Containers - All containers and storage must be of the conductive type.

## Batteries

This equipment may contain 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.

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# **1 INTRODUCTION**

## **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 the GSM Digital Cellular Network.

## **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.

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## 2 GENERAL DESCRIPTION

### 2.1. General

This section provides a general description and kit composition details for the GSM Handportable Telephone system and optional kits.

### 2.2. Features

Panasonic Telephone Model GD93 is a high performance, small, light, handset for business and domestic use. The following features are provided

1. Triple Rate, which includes Full Rate, Half rate and Enhanced Full Rate (EFR) speech, codec.
2. Dual Band, GSM 900 and GSM 1800 operation.
3. Tegic T9 Text Entry
4. Voice Ringer
5. Desktop Handsfree function comprising integral echo cancellation and noise suppression.
6. Wireless Application Protocol (WAP) Browser.
7. E-Mail access via Point-to-Point Protocol (PPP).
8. Backup Battery.
9. Seven background display colours.

### 2.3. Handportable Main Kit

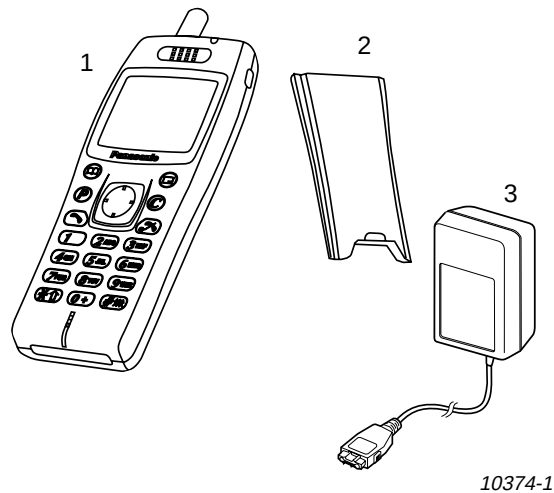


Figure 2.1: Handportable Main Unit Kit Contents

| ITEM | DESCRIPTION       | PART NUMBER   |
|------|-------------------|---------------|
| 1    | Main Unit GD93    | EB-GD93       |
| 2    | Battery, Standard | EB-BSD93      |
| 3    | AC Adaptor        | EB-CAD92      |
| -    | Documentation     | See Section 7 |

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## 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 telephones for full operational information.

### 3.2. LCD Display

The telephone unit has a graphical chip on glass liquid crystal display in conjunction with the following icons:



Figure 3.1: LCD Display

|                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                  | Indicates received signal strength:  strong signal area;  weak signal area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|                  | Indicates that it is possible to make an emergency call.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Menu Number      | The number of the feature indicated by the pointer. To access a feature enter the menu number on the keypad.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                  | Displays the battery charge level:  Battery is at full charge;  Battery requires charging;  The battery icon flashes during charging. During car mount use, when the battery is fully charged, the icon will not light.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Menu Icon        | Displays a small icon related to the current status of the telephone: <ul style="list-style-type: none"> <li> telephone is roaming on a non-home network.</li> <li> using the "Call Divert" feature or the telephone has Call-Divert set;</li> <li> shows that vibration alert is switched on;</li> <li> shows that the telephone is in silent mode - no tones;</li> <li> flashes to indicate that there are unread text (SMS) messages. Lit when SMS area is full;</li> <li> indicates the telephone is locked;</li> <li> shows that the normal character set has been selected;</li> <li> shows that the Greek character set has been selected;</li> <li> shows that the Extended character set has been selected;</li> <li> shows that numbers have been selected for text entry.</li> </ul> |
| Information Icon | Displays a small icon according to the current menu level: <ul style="list-style-type: none"> <li> indicates the alarm is set.</li> <li> indicates the current Phonebook is sourced from the Mobile Phonebook.</li> <li> indicates the current Phonebook is sourced from the SIM Phonebook.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                  | Indicates that the navigation key (  ) can be pressed. Each arrow will light individually to indicate which direction is valid.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Option Area      | Pressing the select key (  ) will select the option displayed in the option area of the display.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

Following some operations, the display will clear automatically after three seconds or after pressing any key except .

### 3.3. Location of Controls

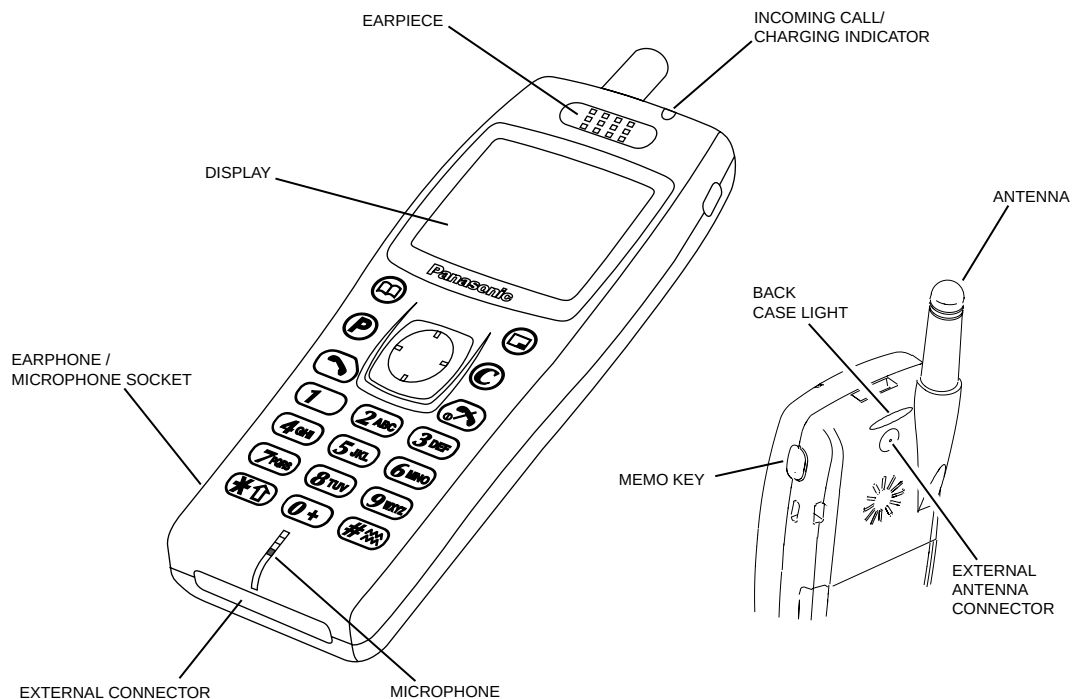
Incoming / Charge indicator:

Green - Incoming call.

Red - Charging battery pack.

External connector:

Used to connect to external accessories or to charging equipment.



10366-1

Figure 3.2: Location of Controls

|  |                                                                                                                                                                                                              |
|--|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Navigation Key. Scrolls through options or features menu and increases or decreases volume.                                                                                                                  |
|  | Select Key. Selects option shown in the Option Area of the display.                                                                                                                                          |
|  | Phonebook Key. Browses through the Phonebook or stores a number in the Phonebook. Changes the type of characters entered during Alpha Entry.                                                                 |
|  | Personal Dial Key. Provides instant access to one phone number. Also provides shortcut to WAP Browser.                                                                                                       |
|  | Send Key. Makes a call.                                                                                                                                                                                      |
|  | Clear Key. Clears the last digit entered, clears all digits when pressed and held or returns to the previous display.                                                                                        |
|  | 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 "+". |
|  | Vibrator enable/disable Key. Press and hold to enable or disable the vibrator.                                                                                                                               |

### 3.4. Concept of Operation

There is a close relationship between the Select Key, Navigation Key and display.

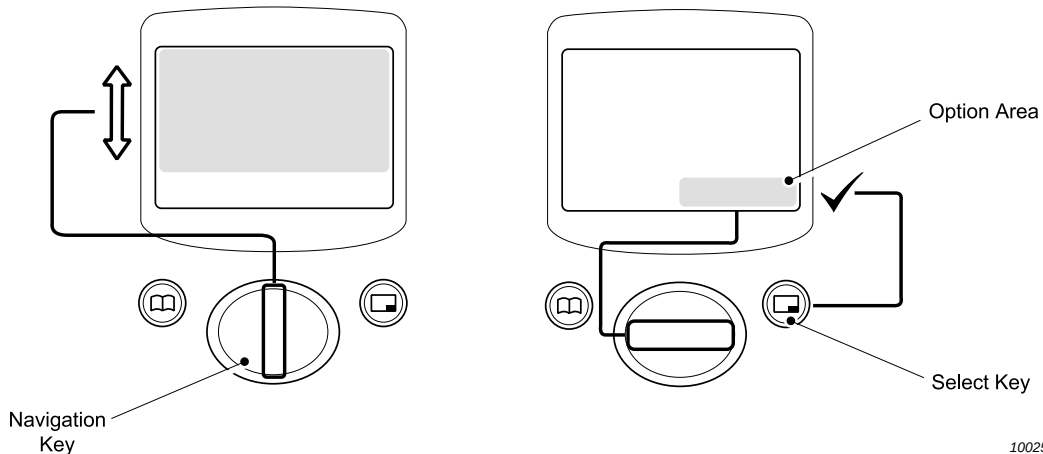


Figure 3.3: Concept of Operation

Pressing up and down (⬆️⬆️) will move the pointer up and down and scroll through more information in the main area of the display.

Pressing left and right (⬅️➡️) will scroll through options in the option area of the display. To choose the option press the Select Key (⏎️).

### 3.5. Alpha Entry

#### 3.5.1 Character Set / Key Assignments

Alpha entry is used to enter alphanumeric characters in to the Phonebook, Short Messages and Greeting Message areas

| Key  | Character / Operation                                                                                                                                   |       |                         |     |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------------------------|-----|
|      | Normal                                                                                                                                                  | Greek | Extended                | Num |
| ⏎️   | " @ - , . : ; !   ? ' & % + - / < > = £ \$ ¥ ¢ §                                                                                                        |       |                         | 1   |
| ⬅️➡️ | A B C a b c                                                                                                                                             | Α Β Γ | Α Ἀ Ἀ Ἐ Β C Ç a à b c   | 2   |
| ⬅️➡️ | D E F d e f                                                                                                                                             | Δ Ε Ζ | Δ Ε Ἐ F d e è é f       | 3   |
| ⬅️➡️ | G H I g h i                                                                                                                                             | Η Θ Ι | G H I g h i i           | 4   |
| ⬅️➡️ | J K L j k l                                                                                                                                             | Κ Λ Μ | J K L j k l             | 5   |
| ⬅️➡️ | M N O m n o                                                                                                                                             | Ν Ξ Ο | M N Ñ Ō Ö ø m n ñ o ö ö | 6   |
| ⬅️➡️ | P Q R S p q r s                                                                                                                                         | Π Ρ Σ | P Q R S p q r s ß       | 7   |
| ⬅️➡️ | T U V t u v                                                                                                                                             | Τ Υ Φ | T U Ŭ V t u ŭ ŭ v       | 8   |
| ⬅️➡️ | W X Y Z w x y z                                                                                                                                         | Ξ Ψ Ω | W X Y Z w x y z         | 9   |
| ⏎️   | Deletes the character above the cursor, deletes the character to the left when at the end of the line or clears the entire entry when pressed and held. |       |                         |     |

Each time a key is pressed, it will display the next character. When another key is pressed, or no key is pressed for a short time, the cursor will move to the next position.

To cycle between Greek characters ( Α Β Γ ), extended characters ( Α Ἀ Ἀ Ἐ ), numerals (0–9) and normal characters (ABC) press ⏎️.

#### 3.5.2 Editing Alpha Entry

Pressing ⬆️⬆️ will move the cursor up or down one line. Pressing ⬅️➡️ will move the cursor left or right one character. When the cursor is moved over a character and another key pressed this will insert the new character.

Pressing ⏎️ will delete the character to the left of the cursor.

### 3.6. Incoming Call Line Identification (CLI)

When a call is received the last 6 digits of the CLI information is matched with the phonebook. Therefore an incoming call could match to the wrong phonebook entry.

### 3.7. Hot Key Dial Source List

The source for Hot Key Dial Numbers is normally 'Phonebook' or 'Service Dial Numbers'. For some OEMs it may be a requirement to store these numbers in Flash-ROM. When the source is the Flash-ROM and the telephone software is updated, the source numbers may be lost. Also, if the user changes the source of the Hot Key Dial numbers, it will not be possible to redirect the source back to Flash-ROM. However, in the event that an OEM would like the Hot Key Dial source to be stored in the Flash-ROM, it is unlikely that the user will have the option to change the Hot Key Dial source.

### 3.8. Features Menu Structure

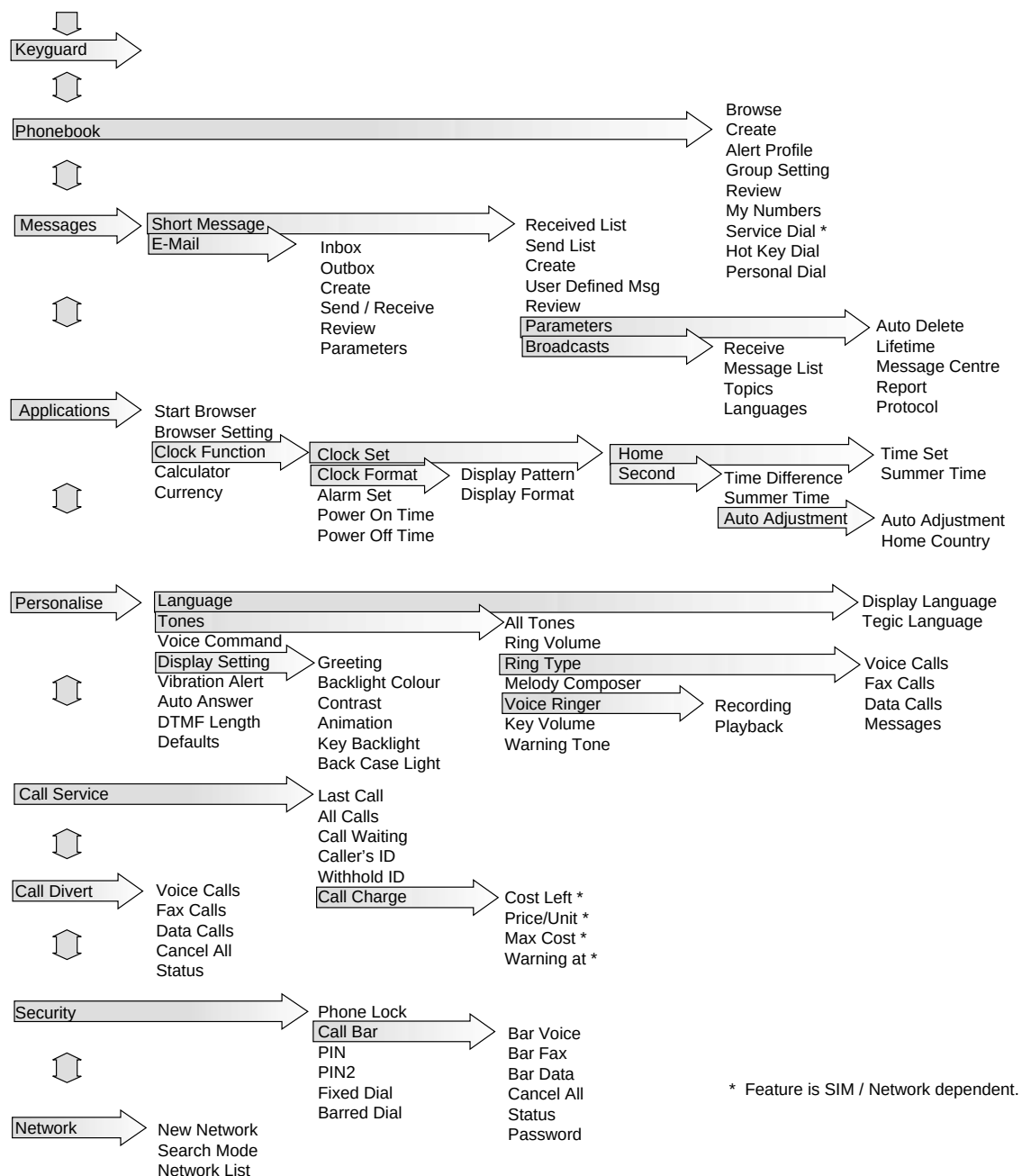


Figure 3.4: Features Menu Structure

## 3.9. Public Man Machine Interface (MMI)

### 3.9.1 General

It is possible to operate all GSM telephones in the same way using the Public MMI. The following operations will work with all GSM telephones. However, this information is restricted to those operations supported by the GD93 telephone.

The \* and # in the following procedures should be replaced by  and  respectively. Also <SND> and <END> should be replaced with  and  keys.

### 3.9.2 Reading the Phonebook Memory Location

# <MEMORY LOCATION>

Leading zeros can be left out of the location number, e.g. 007 can be 7.

### 3.9.3 Presentation of IMEI

\* # 0 6 #

### 3.9.4 Security

Change PIN

\*\* 0 4 \* <OLD PIN> \* <NEW PIN> \* <NEW PIN> #

Change PIN2

\*\* 0 4 2 \* <OLD PIN2> \* <NEW PIN2> \* <NEW PIN2> #

Unblock PIN

\*\* 0 5 \* <PIN UNBLOCKING KEY> \* <NEW PIN> \* <NEW PIN> #

Unblock PIN2

\*\* 0 5 \* <PIN2 UNBLOCKING KEY> \* <NEW PIN2> \* <NEW PIN2> #

### 3.9.5 Call Hold

Place a Call on Hold

2 <SND>

Recall a Held Call

2 <SND>

Make a Second Call

<TELEPHONE NUMBER> <SND>

Swap between two Held Calls

2 <SND>

End Held Call

0 <SND>

End Active Call

1 <SND>

Reject Incoming Call

0 <SND>

### 3.9.6 Call Waiting

Enable Call Waiting

\* 4 3 \* <SND>

Disable Call Waiting

# 4 3 \* <SND>

Call Waiting Status

\* # 4 3 \* # <SND>

### 3.9.7 Calling Line Identification

| Feature                                         | Service Code |
|-------------------------------------------------|--------------|
| Calling Line Identification Presentation (CLIP) | 30           |
| Calling Line Identification Restriction (CLIR)  | 31           |
| Connected Line Presentation (CLOP)              | 76           |
| Connected Line Restriction (CLOR)               | 77           |

|                                   |                                  |
|-----------------------------------|----------------------------------|
| Enable                            | * <SERVICE CODE> * # <SND>       |
| Disable                           | # <SERVICE CODE> * # <SND>       |
| Temporary Suppress Identification | # 3 1 # <TELEPHONE NUMBER> <SND> |
| Temporary Display Identification  | * 3 1 # <TELEPHONE NUMBER> <SND> |

### 3.9.8 Telecommunication Services used for Public MMI

#### Teleservice

| Service                      | MMI Service Code |
|------------------------------|------------------|
| All teleservices             | 10               |
| Telephony                    | 11               |
| All data teleservices        | 12               |
| Facsimile services           | 13               |
| Short Message Services (SMS) | 16               |
| All teleservices except SMS  | 19               |
| Voice group services         | 17               |

#### Bearer Service

| Service                        | MMI Service Code |
|--------------------------------|------------------|
| All bearer services            | 20               |
| All asynchronous services      | 21               |
| All synchronous services       | 22               |
| All data synchronous services  | 24               |
| All data asynchronous services | 25               |
| All dedicated packet access    | 26               |
| All dedicated PAD access       | 27               |

### 3.9.9 Call Divert

| Call Divert Type         | Service Code |
|--------------------------|--------------|
| Divert all calls         | 21           |
| Divert all calls if busy | 67           |
| Divert calls if no reply | 61           |
| Divert if not reachable  | 62           |

Set (except "No Reply" Call Bar      \* \* <SERVICE CODE> \* <FORWARD TELEPHONE NUMBER> \* <TELECOMMUNICATION SERVICE> # <SND>  
 Bar  
 Set "No Reply" Call Bar      \* \* <SERVICE CODE> \* <FORWARD TELEPHONE NUMBER> \* <TELECOM' SERVICE> \* <TIME TO RING (sec)> # <SND>  
 Clear      # # <SERVICE CODE> \* <TELECOMMUNICATION SERVICE> \* # <SND>  
 Status      \* \* # <SERVICE CODE> \* <TELECOMMUNICATION SERVICE> \* # <SND>  
 Clear all Call Diverts      # # 0 0 2 #

### 3.9.10 Call Bar

| Call Bar Type                                                 | Service Code |
|---------------------------------------------------------------|--------------|
| All outgoing calls                                            | 33           |
| Outgoing International calls                                  | 331          |
| Outgoing International calls except those to the PLMN country | 332          |
| All incoming calls                                            | 35           |
| Incoming international calls when roaming                     | 351          |

Set      \* <PASSWORD> \* <TELECOMMUNICATION SERVICE> # <SND>  
 Clear      # <TELECOMMUNICATION SERVICE> # <SND>  
 Status      # <TELECOMMUNICATION SERVICE> # <SND>  
 Clear all Call Bar Types      # 3 3 0 \* <PASSWORD> # <SND>  
 Change Call Bar Password      \* \* 0 3 \* \* <OLD PASSWORD> \* <NEW PASSWORD> \* <NEW PASSWORD> # <SND>

### 3.10. Troubleshooting

The user is given the following information and advised to contact the dealer if the problems persist:

| Problem                                                                                                                                    | Cause                                                                                                                                                                                                                                  | Remedy                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Telephone will not switch on                                                                                                               |                                                                                                                                                                                                                                        | Check that the battery pack is fully charged and correctly connected to the telephone.                                                                                                                                                                                                                                                                            |
| Extremely short battery life for a new battery pack                                                                                        | The network in use and the condition of the battery pack can affect battery life.                                                                                                                                                      | Avoid areas of poor reception. Ensure batteries are fully charged. Additionally, for NiMH batteries, ensure batteries are also discharged fully before recharging.                                                                                                                                                                                                |
| Short battery life for an old battery pack                                                                                                 | The battery pack was worn out.                                                                                                                                                                                                         | Replace with a new one.                                                                                                                                                                                                                                                                                                                                           |
| Short battery life for Ni-MH battery pack                                                                                                  | The life of the battery pack is affected by improper charging, this is inherent in all Ni-MH batteries.                                                                                                                                | To maintain maximum performance, always use until the Low Battery Warning appears and then fully recharge the battery pack. To revive a Battery Pack, use the telephone until the Low Battery Warning appears and then fully recharge three times. However, if the battery life still is short, the battery pack has eventually worn out. Replace with a new one. |
| The battery level indicator  does not light when charging | If a battery is deeply discharged it will take a short time before there is sufficient power in the telephone to light the battery level indicator  . | Leave to charge for several minutes in temperatures between +5°C and +35°C.                                                                                                                                                                                                                                                                                       |
| Calls cannot be made                                                                                                                       | The telephone is locked.                                                                                                                                                                                                               | Unlock the telephone (Menu: Security: Phone Lock).                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                            | Outgoing calls are barred.                                                                                                                                                                                                             | Disable the outgoing call barring (Menu: Security: Call Bar).                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                            | The telephone is not registered to a network.                                                                                                                                                                                          | Move to a coverage area and operate the telephone after it has registered with a network.                                                                                                                                                                                                                                                                         |
| Calls cannot be made from Fixed Dial Store                                                                                                 |                                                                                                                                                                                                                                        | Check that SIM supports Fixed Dial Check if the Fixed Dial is switched on (Menu: Security: Fixed Dial). Check the telephone number is stored in the Fixed Dial.                                                                                                                                                                                                   |
| Calls cannot be received                                                                                                                   | The telephone is not switched on.                                                                                                                                                                                                      | Switch the telephone on.                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                            | Incoming calls are barred.                                                                                                                                                                                                             | Disable the incoming call barring (Menu: Security: Call Bar).                                                                                                                                                                                                                                                                                                     |
|                                                                                                                                            | The telephone is not registered to a network.                                                                                                                                                                                          | Move to a coverage area and operate the telephone after it has registered with a network.                                                                                                                                                                                                                                                                         |
| Emergency calls cannot be made                                                                                                             | User's phone is not in a GSM coverage area.                                                                                                                                                                                            | Check that the antenna symbol  is displayed. Move to a coverage area and operate the telephone when the antenna symbol is displayed.                                                                                                                                           |
| Telephone numbers cannot be recalled                                                                                                       | The telephone is locked.                                                                                                                                                                                                               | Unlock the telephone (Menu: Security: Phone Lock).                                                                                                                                                                                                                                                                                                                |
|                                                                                                                                            | Fixed Dial is switched on.                                                                                                                                                                                                             | Switch off Fixed Dial (Menu: Security: Fixed Dial).                                                                                                                                                                                                                                                                                                               |
|                                                                                                                                            |                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                   |

### 3.11. Important Error Messages

The following table is a list of error messages that may occur during use of the telephone, with a description and suggested course of action:

| Error Message                | Explanation / Remedy                                                                                                                                                                                           |
|------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Area not Allowed             | Roaming in the selected area is not allowed.                                                                                                                                                                   |
| Network not Allowed          | Roaming with the selected network is not allowed.                                                                                                                                                              |
| Security Failure             | The network has detected authentication failure because the SIM is not registered with that network. Contact the Service Provider.                                                                             |
| SIM Blocked                  | The SIM is blocked because the wrong PUK has been entered ten times. Contact the Service Provider.                                                                                                             |
| SIM Error                    | The telephone has detected a problem with the SIM. Switch the telephone off and then back on. If the message does not disappear, contact the Service Provider.                                                 |
| Message Rejected Store Full  | A message has been received but the message store is full. To receive messages, delete some of the currently stored messages or set messages to automatically clear (Menu: Messages: Parameters: Auto Delete). |
| PIN2 Invalidated             | The PIN2 is blocked permanently because the wrong PUK2 has been entered 10 times. Services controlled by PIN2 cannot be used. Contact the Service Provider.                                                    |
| Warning Store Full Continue? | The message area is full. New messages cannot be stored until some of the currently stored messages are deleted.                                                                                               |
| Auto Redial List Full        | Redial list of unsuccessfully dialled numbers is full. Switch the telephone off and then on again.                                                                                                             |
|                              |                                                                                                                                                                                                                |

### 3.12. Security Codes

| Code Type                               | Number of Digits | Description                                                                                                                                                                                                                                                                         |
|-----------------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Personal Identification Number (PIN)    | 4 to 8           | Controls SIM security. Supplied by the service provider.                                                                                                                                                                                                                            |
| PIN 2                                   | 4 to 8           | Controls memory security. Supplied by the service provider.                                                                                                                                                                                                                         |
| PIN/PIN 2 Unblocking Key<br>(PUK/PUK 2) | 8                | Used to unblock PIN and PIN 2. A PIN or PIN 2 will become blocked if the wrong PIN or PIN 2 is entered three times. When the blocked PIN or PIN 2 is unblocked, a new PIN or PIN 2 must be entered. If the wrong PUK or PUK 2 is entered 10 times, the cursor SIM will be unusable. |
| Supplied by the service provider.       |                  |                                                                                                                                                                                                                                                                                     |
| Password                                | 4                | Controls the call bar function. If the wrong password is entered three times, this service will be revoked. Supplied by the service provider.                                                                                                                                       |
| Lock Code                               | 4                | Controls telephone security.                                                                                                                                                                                                                                                        |
| Factory set to "0000".                  |                  |                                                                                                                                                                                                                                                                                     |

### 3.13. SIM Personalisation

#### 3.13.1 Introduction

SIM personalisation will limit the use of the telephone to a single SIM, a SIM supplied by one Network/Sub-network/Service Provider or a SIM purchased by a company (corporation). If a personalised handset contains a SIM that is from a different source, it will display the message "SIM ERROR" when switched on. This personalisation is sometimes referred to as SIM lock or SIM latch.

#### 3.13.2 Testing

To test a personalised handset when the user has not supplied the SIM, a SIM configured for test purposes (e.g. test SIM or soft SIM) should be used. The mobile will recognise that the SIM is for testing purposes only and operate as normal.

### 3.13.3 Personalisation Function

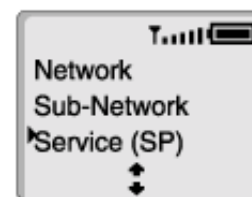
Personalisation is activated during manufacture and then enabled at a later stage. Enabling/disabling is available by entering a special key sequence immediately after power on. Once the enable/disable menu is shown it is possible to select the type of personalisation. When personalisation is enabled it is only possible to disable it if the mobile contains an illegal SIM and the sixteen digit Control Key (CK) is known. When enabled the CK is withheld from the user and cannot be read, for security reasons.

There are two special key sequences to enter the enable/disable menu:

| Key Sequence        | Notes                                       |
|---------------------|---------------------------------------------|
| 7  4  6  0  0       | Can only disable personalisation            |
| 5  2  0  2  4  0  0 | Can both enable and disable personalisation |

### 3.13.4 Disabling Procedure

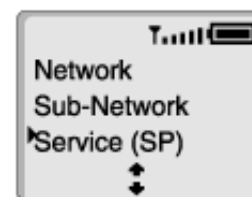
- 7 4 6 0 0 or 5 2 0 2 4 0 0
- 0 to point at:  
 "SIM" for SIM Personalisation  
 "Network" for Network Personalisation  
 "Subnetwork" for Subnetwork Personalisation  
 "SP" for Service Provider Personalisation or  
 "Corporate" for Company Personalisation.
- 0.
- the 16 digit Control Key.
- 0.
- the 16 digit Control Key.
- 0.



The display will confirm which type of Personalisation has been disabled.

### 3.13.5 Enabling Procedure

- 5 2 0 2 4 0 0
- 0 to point at:  
 "SIM" for SIM Personalisation  
 "Network" for Network Personalisation  
 "Subnetwork" for Subnetwork Personalisation  
 "SP" for Service Provider Personalisation or  
 "Corporate" for Company Personalisation.
- 0.
- the 16 digit Control Key.
- 0.
- the 16 digit Control Key.
- 0.



The display will confirm which type of Personalisation has been enabled.

### 3.14. GSM Services Supported by PC Card

| Bearer Service Number | Bearer Service Rate           | Access Structure | Access Rate | Information Transfer | Error Correction Options |
|-----------------------|-------------------------------|------------------|-------------|----------------------|--------------------------|
| 21                    | Asynchronous 300 bps          | Asynch           | 300 bps     | UDI or modem         | T or NT                  |
| 22                    | Asynchronous 1.2 kbps         | Asynch           | 1.2 kbps    | UDI or modem         | T or NT                  |
| 23                    | Asynchronous 1200/75 bps      | Asynch           | 1200/75 bps | UDI or modem         | T or NT                  |
| 24                    | Asynchronous 2.4 kbps         | Asynch           | 2.4 kbps    | UDI or modem         | T or NT                  |
| 25                    | Asynchronous 4.8 kbps         | Asynch           | 4.8 kbps    | UDI or modem         | T or NT                  |
| 26                    | Asynchronous 9.6 kbps         | Asynch           | 9.6 kbps    | UDI or modem         | T or NT                  |
| 41                    | Dedicated PAD Access 300 bps  | Asynch           | 300 bps     | UDI                  | T or NT                  |
| 42                    | Dedicated PAD Access 1.2 kbps | Asynch           | 1.2 kbps    | UDI                  | T or NT                  |
| 44                    | Dedicated PAD Access 2.4 kbps | Asynch           | 2.4 kbps    | UDI                  | T or NT                  |
| 45                    | Dedicated PAD Access 4.8 kbps | Asynch           | 4.8 kbps    | UDI                  | T or NT                  |
| 46                    | Dedicated PAD Access 9.6 kbps | Asynch           | 9.6 kbps    | UDI                  | T or NT                  |

### 3.15. GSM Network Codes and Names

| Country              | Access Code | Service or Operator | Phone Display    | Network Code |    | Band      |
|----------------------|-------------|---------------------|------------------|--------------|----|-----------|
| ALBANIA              | +355        | AMC MOBIL           | AMC - AL         | 276          | 01 | GSM 900   |
| ANDORRA              | +376        | MOBILAND            | STA-MOBILAND     | 213          | 03 | GSM 900   |
| ARMENIA              | +374        | ARMGSM              | RA-ARMGSM        | 283          | 01 | GSM 900   |
| AUSTRALIA            | +61         | MOBILENET           | TELSTRA          | 505          | 01 | GSM 900   |
|                      |             | OPTUS Mobile        | Yes Optus        | 505          | 02 | GSM 900   |
|                      |             | VODAFONE            | AUS VODAFONE     | 505          | 03 | GSM 900   |
| AUSTRIA              | +43         | A max.              | A max.           | 232          | 03 | GSM 900   |
|                      |             | A1                  | A1               | 232          | 01 | GSM 900   |
|                      |             | one                 | one              | 232          | 05 | GSM 1800  |
| AZERBAIJAN           | +994        | AZERCELL GSM        | AZE-AZERCELL GSM | 400          | 01 | GSM 900   |
| BAHREIN              | +973        | MOBILE PLUS         | BHR MOBILE PLUS  | 426          | 01 | GSM 900   |
| BELGIUM              | +32         | PROXIMUS            | BEL PROXIMUS     | 206          | 01 | GSM 900   |
|                      |             | mobistar            | B mobistar       | 206          | 10 | GSM 900   |
| BOSNIA & HERZEGOVINA | 387         | PTT-GSMBIH          | PTT-GSMBIH       | 218          | 90 | GSM 900   |
| BULGARIA             | +359        | M-TEL GSM BG        | M-TEL GSM BG     | 284          | 01 | GSM 900   |
| CAMEROON             | +237        | CAM CELLNET         | CAM CELLNET      | 624          | 01 | GSM 900   |
| CHINA                | +86         | CT-GSM              | CHINA TELECOM    | 460          | 00 | GSM 900   |
|                      |             | CU-GSM              | CHINA UNICOM     | 460          | 01 | GSM 900   |
| CROATIA              | +385        | CRONET              | HR-CRONET        | 219          | 01 | GSM 900   |
|                      |             | Vip Net GDM d.o.o.  | HR VIP           | 219          | 10 | GSM 900   |
| CYPRUS               | +357        | CYTAGSM             | CY CYTAGSM       | 280          | 01 | GSM 900   |
| CZECH_REPUBLIC       | +42         | EUROTEL GSM         | EUROTEL-CZ       | 230          | 02 | GSM 900   |
|                      |             | OSKAR               | OSKAR            | 230          | 03 | not known |
|                      |             | Radio Mobil CZE     | PAEGAS-CZ        | 230          | 01 | GSM 900   |
| DENMARK              | +45         | SONOFON             | DK SONOFON       | 238          | 02 | GSM 900   |
|                      |             | TDK-MOBIL           | DK TDK-MOBIL     | 238          | 01 | GSM 900   |
|                      |             | Telia DK            | Telia DK         | 238          | 20 | GSM 1800  |
|                      |             | mobilix             | mobilix          | 238          | 30 | GSM 1800  |
| EGYPT                | +20         | EGY CLICK GSM       | EGY CLICK GSM    | 602          | 02 | not known |
|                      |             | MobiNil             | MobiNil          | 602          | 01 | GSM 900   |
| ESTONIA              | +372        | EMT GSM             | EE EMT GSM       | 248          | 01 | GSM 900   |
|                      |             | RADIOLINJA EESTI    | EE RLE           | 248          | 02 | GSM 900   |

| Country                       | Access Code | Service or Operator  | Phone Display    | Network Code |    | Band      |
|-------------------------------|-------------|----------------------|------------------|--------------|----|-----------|
| ETHIOPIA                      | +251        | ETMTN                | ETH-MTN          | 636          | 01 | GSM 900   |
| FIJI                          | +679        | VODAFONE FIJI        | VODAFONE FIJ     | 542          | 01 | GSM 900   |
| FINLAND                       | +358        | FINNET               | FINNET           | 244          | 09 | GSM 1800  |
|                               |             | Finland SONERA       | SONERA           | 244          | 91 | GSM 900   |
|                               |             | RADIOLINJA           | FI RADIOLINJA    | 244          | 05 | GSM 900   |
|                               |             | Telia                | Telia            | 244          | 03 | GSM 1800  |
| FRANCE                        | +33         | Bouygues             | Bouygues         | 208          | 20 | GSM 1800  |
|                               |             | Itineris             | F Itineris       | 208          | 01 | GSM 900   |
|                               |             | SFR                  | F SFR            | 208          | 10 | GSM 900   |
| FRENCH POLYNESIA              | +689        | TIKIPHONE            | F-VINI           | 547          | 20 | GSM 900   |
| GERMANY                       | +49         | D2 PRIVAT            | D2               | 262          | 02 | GSM 900   |
|                               |             | E-Plus               | E-Plus           | 262          | 03 | GSM 1800  |
|                               |             | Telekom Mobilfunk D1 | D1-TELEKOM       | 262          | 01 | GSM 900   |
|                               |             | Viag Interkom        | D Interkom       | 262          | 07 | GSM 1800  |
| GIBRALTAR                     | +350        | GIBTEL               | GIBTEL GSM       | 266          | 01 | GSM 900   |
| GREECE                        | +30         | Cosmote              | Cosmote          | 202          | 01 | GSM 1800  |
|                               |             | PANAFON              | GR PANAFON       | 202          | 05 | GSM 900   |
|                               |             | TELESTET             | GR TELESTET      | 202          | 10 | GSM 900   |
| HONG_KONG                     | +852        | HK SMC               | HK SMC           | 454          | 06 | GSM 900   |
|                               |             | HK TELECOM           | CAMPERSANDW HKT  | 454          | 00 | GSM 900   |
|                               |             | NEW WORLD            | NEW WORLD        | 454          | 10 | GSM 1800  |
|                               |             | Orange               | Orange           | 454          | 04 | GSM 900   |
|                               |             | P Plus               | P Plus           | 454          | 22 | GSM 1800  |
|                               |             | P-Link               | P-Link           | 454          | 18 | GSM 1800  |
|                               |             | PEOPLES              | PEOPLES          | 454          | 12 | GSM 1800  |
|                               |             | SUNDAY               | SUNDAY           | 454          | 16 | GSM 1800  |
| HUNGARY<br>HUNGARY<br>HUNGARY | +36         | PANNON GSM           | H PANNON GSM     | 216          | 01 | GSM 900   |
|                               |             | Vodafone             | Vodafone         | 216          | 70 | not known |
|                               |             | WESTEL 900           | H-WESTEL 900     | 216          | 30 | GSM 900   |
| ICELAND                       | +354        | Postur og simi       | IS SIMINN        | 274          | 01 | GSM 900   |
| INDIA                         | +91         | AirTel               | INA-AIRTL        | 404          | 10 | GSM 900   |
|                               |             | BPL MOBILE           | BPL MOBILE       | 404          | 21 | GSM 900   |
|                               |             | BPL MOBILE           | BPL MOBILE       | 404          | 27 | GSM 900   |
|                               |             | BPL MOBILE           | BPL MOBILE       | 404          | 43 | GSM 900   |
|                               |             | BPL MOBILE           | BPL MOBILE       | 404          | 46 | GSM 900   |
|                               |             | ESSAR CELLPHONE      | ESSAR CELLPHONE  | 404          | 11 | GSM 900   |
|                               |             | INA - TATA CELLULAR  | TATA CELLULAR    | 404          | 07 | GSM 900   |
|                               |             | INA-ESCOTEL          | INA-ESCOTEL      | 404          | 12 | GSM 900   |
|                               |             | INA-ESCOTEL          | INA-ESCOTEL      | 404          | 19 | GSM 900   |
|                               |             | INA-ESCOTEL          | INA-ESCOTEL      | 404          | 56 | GSM 900   |
|                               |             | MaxTouch             | MaxTouch         | 404          | 20 | GSM 900   |
|                               |             | RPG Cellular         | NA RPG           | 404          | 41 | GSM 900   |
|                               |             | SKYCELL              | SKYCELL          | 404          | 40 | GSM 900   |
| INDONESIA                     | +62         | EXCELCOM             | IND-EXCELCOM     | 510          | 11 | GSM 900   |
|                               |             | IND SATELINDOCEL     | IND SATELINDOCEL | 510          | 01 | GSM 900   |
|                               |             | TELKOMSEL            | IND TELKOMSEL    | 510          | 10 | GSM 900   |
| IRELAND                       | +353        | EIRCELL-GSM          | IRL EIR-GSM      | 272          | 01 | GSM 900   |
|                               |             | IRL - DIGIFONE       | IRL DIGIFONE     | 272          | 02 | GSM 900   |
| ITALY                         | +39         | BLU                  | I BLU            | 222          | 98 | GSM 1800  |
|                               |             | I WIND               | I WIND           | 222          | 88 | GSM 1800  |
|                               |             | OMNITEL              | I OMNITEL        | 222          | 10 | GSM 900   |
|                               |             | TELECOM ITALIA MOBIL | I TIM            | 222          | 01 | GSM 900   |
| JORDAN                        | +962        | Fastlink             | Fastlink         | 416          | 01 | GSM 900   |
| KUWAIT                        | +965        | MTCNet               | KT MTCNet        | 419          | 02 | GSM 900   |

| Country                      | Access Code | Service or Operator          | Phone Display    | Network Code |    | Band     |
|------------------------------|-------------|------------------------------|------------------|--------------|----|----------|
| LATVIA<br>LATVIA             | +371        | BALTEL                       | LV BALTEL        | 247          | 02 | GSM 900  |
|                              |             | LMT GSM                      | LV LMT GSM       | 247          | 01 | GSM 900  |
| LEBANON                      | +961        | Cellis                       | RL Cellis        | 415          | 01 | GSM 900  |
|                              |             | LibanCell                    | RL LibanCell     | 415          | 03 | GSM 900  |
| LESOTHO                      | +266        | VODACOM LESOTHO              | VCL COMMS        | 651          | 01 | GSM 900  |
| LITHUANIA                    | +370        | BITE GSM                     | LT BITE GSM      | 246          | 02 | GSM 900  |
|                              |             | LITHUANIAN OMNITEL           | OMNITEL LT       | 246          | 01 | GSM 900  |
| LUXEMBOURG                   | +352        | Millicom 1800 -> TANGO       | TANGO            | 270          | 77 | GSM 1800 |
|                              |             | LUXGSM                       | L LUXGSM         | 270          | 01 | GSM 900  |
| MACAU                        | +853        | TELEMOVE+                    | MAC-CTMGSM       | 455          | 01 | GSM 900  |
| MACEDONIA                    | +389        | MOBIMAK                      | MKD-MOBIMAK      | 294          | 01 | GSM 900  |
| MALAWI                       | +265        | CALLPOINT 900                | MW/CP 900        | 650          | 01 | GSM 900  |
| MALAYSIA                     | +60         | MY DiGi                      | MY DiGi          | 502          | 16 | GSM 1800 |
|                              |             | MY TMTouch                   | MY TMTouch       | 502          | 13 | GSM 900  |
|                              |             | MY a.d.a.m                   | MY a.d.a.m       | 502          | 17 | GSM 900  |
|                              |             | MY celcom                    | MY celcom        | 502          | 19 | GSM 900  |
|                              |             | MY maxis                     | MY maxis         | 502          | 12 | GSM 900  |
| MAURITIUS                    | +230        | CELLPLUS                     | CELLPLUS-MRU     | 617          | 01 | GSM 900  |
| MOROCCO                      | +212        | ONPTGSM                      | MOR ONPT GSM     | 604          | 01 | GSM 900  |
| NAMIBIA                      | +264        | MTC                          | NAM MTC          | 649          | 01 | GSM 900  |
| NETHERLANDS                  | +31         | Ben NL                       | Ben NL           | 204          | 16 | GSM 1800 |
|                              |             | KPN TELECOM                  | NL KPN TELECOM   | 204          | 08 | GSM 900  |
|                              |             | LIBERTEL                     | NL LIBERTEL      | 204          | 04 | GSM 900  |
|                              |             | NL Dutchtone                 | NL Dutchtone     | 204          | 20 | GSM 1800 |
|                              |             | TELFORT                      | TELFORT          | 204          | 12 | GSM 1800 |
| NEW_ZEALAND                  | +64         | BELLSOUTH                    | BELLSOUTH NZ     | 530          | 01 | GSM 900  |
| NORWAY                       | +47         | NetCom GSM                   | N NetCom GSM     | 242          | 02 | GSM 900  |
|                              |             | Telenor Mobile               | N Telenor Mobil  | 242          | 01 | GSM 900  |
| OMAN                         | +968        | OMAN MOBILE                  | OMAN MOBILE      | 422          | 02 | GSM 900  |
| PHILLIPINES                  | +63         | Globe Telecom                | PH GLOBE         | 515          | 02 | GSM 900  |
|                              |             | Islacom                      | ISLACOM          | 515          | 01 | GSM 900  |
| PHILLIPINES                  |             | Smart Communications         | SMART            | 515          | 03 | GSM 1800 |
| POLAND                       | +48         | ERA GSM                      | PL-ERA GSM       | 260          | 02 | GSM 900  |
|                              |             | IDEA                         | IDEA             | 260          | 03 | GSM 1800 |
|                              |             | PL PLUS                      | PL PLUS          | 260          | 01 | GSM 900  |
| PORTUGAL                     | +351        | P OPTIMUS                    | P OPTIMUS        | 268          | 03 | GSM 1800 |
|                              |             | TELECEL                      | P TELECEL        | 268          | 01 | GSM 900  |
|                              |             | TMN                          | P TMN            | 268          | 06 | GSM 900  |
| QATAR                        | +974        | QATARNET                     | QAT-QATARNET     | 427          | 01 | GSM 900  |
| RÉUNION                      | +262        | SRR                          | SFR REUNION      | 647          | 10 | GSM 900  |
| RUSSIAN FEDERATION           | +701        | BeeLine                      | BeeLine          | 250          | 99 | GSM 1800 |
|                              |             | MTS                          | MTS-RUS          | 250          | 01 | GSM 900  |
|                              |             | North-West GSM               | North-West GSM   | 250          | 02 | GSM 900  |
| SAUDI_ARABIA<br>SAUDI_ARABIA | +966        | EAE-ALJAWWAL                 | EAE-ALJAWWAL     | 420          | 07 | GSM 900  |
|                              |             | MoPTT, DMTS-1                | ALJAWWAL         | 420          | 01 | GSM 900  |
| SEYCHELLES                   | +248        | SEYCHELLES CELLULAR SERVICES | CELLULAR SERVICE | 633          | 01 | GSM 900  |
| SINGAPORE                    | +65         | M1-GSM                       | M1-GSM-SGP       | 525          | 03 | GSM 900  |
|                              |             | ST-GSM                       | ST-GSM-SGP       | 525          | 01 | GSM 900  |
|                              |             | ST-GSM1800-SGP               | ST-GSM1800-SGP   | 525          | 02 | GSM 1800 |
| SLOVAK REPUBLIC              | +42         | EUROTEL                      | SK EUROTEL       | 231          | 02 | GSM 900  |
| SLOVAKIA                     |             | GLOBTEL                      | SK GLOBTEL       | 231          | 01 | GSM 900  |
| SLOVENIA                     | +386        | MOBITEL GSM (Slovenia)       | SI MOBITEL GSM   | 293          | 41 | GSM 900  |

| Country                                                       | Access Code | Service or Operator   | Phone Display   | Network Code |    | Band      |
|---------------------------------------------------------------|-------------|-----------------------|-----------------|--------------|----|-----------|
| SOUTH_AFRICA<br>SOUTH_AFRICA                                  | +27         | MTN                   | MTN-SA          | 655          | 10 | GSM 900   |
|                                                               |             | VodaCom               | VodaCom-SA      | 655          | 01 | GSM 900   |
| SPAIN                                                         | +34         | AIRTEL                | E AIRTEL        | 214          | 01 | GSM 900   |
|                                                               |             | AMENA                 | AMENA           | 214          | 03 | not known |
|                                                               |             | MOVISTAR              | MOVISTAR        | 214          | 02 | not known |
|                                                               |             | MOVISTAR              | MOVISTAR        | 214          | 07 | GSM 900   |
| SRI_LANKA                                                     | +94         | DIALOG                | SRI DIALOG      | 413          | 02 | GSM 900   |
| SUDAN                                                         | +249        | SDN MOBILTEL          | SDN MobiTel     | 634          | 01 | GSM 900   |
| SWEDEN                                                        | +46         | COMVIQ                | S COMVIQ        | 240          | 07 | GSM 900   |
|                                                               |             | EUROPOLITAN           | S EUROPOLITAN   | 240          | 08 | GSM 900   |
|                                                               |             | TELIA MOBILTEL        | TELIA S         | 240          | 01 | GSM 900   |
| SWITZERLAND<br>SWITZERLAND<br>SWITZERLAND                     | +41         | Orange                | Orange          | 228          | 03 | GSM 900   |
|                                                               |             | SWISS GSM             | SWISS GSM       | 228          | 01 | GSM 900   |
|                                                               |             | diAx Swiss            | diAx Swiss      | 228          | 02 | GSM 900   |
| SYRIA                                                         | +963        | MOBILE SYRIA          | SYR MOBILE SYR  | 417          | 09 | GSM 900   |
| TAIWAN                                                        | +886        | Chunghwa              | Chunghwa        | 466          | 92 | GSM 900   |
|                                                               |             | Far EasTone           | Far EasTone     | 466          | 01 | GSM 900   |
|                                                               |             | KGT-ONLINE            | KGT-ONLINE      | 466          | 88 | GSM 1800  |
|                                                               |             | ROC MOBILTAI          | MOBITAI         | 466          | 93 | GSM 900   |
|                                                               |             | TUNTEX                | TUNTEX          | 466          | 06 | GSM 1800  |
|                                                               |             | TWN GSM               | TWN GSM         | 466          | 97 | GSM 1800  |
|                                                               |             | TransAsia Telecom GSM | TransAsia GSM   | 466          | 99 | GSM 900   |
| TANZANIA                                                      | +255        | Tritel-TZ             | Tritel-TZ       | 640          | 01 | GSM 900   |
| THAILAND                                                      | +66         | AIS GSM               | TH AIS GSM      | 520          | 01 | GSM 900   |
|                                                               |             | HELLO                 | HELLO           | 520          | 10 | GSM 1800  |
|                                                               |             | WP-1800               | WP-1800         | 520          | 18 | GSM 1800  |
| TURKEY<br>TURKEY                                              | +90         | PTT TELSIM GSM        | TR TELSIM       | 286          | 02 | GSM 900   |
|                                                               |             | PTT/TURKCELL GSM      | TR TURKCELL     | 286          | 01 | GSM 900   |
| UKRAINE                                                       | +380        | GOLDEN TELECOM        | GOLDEN TELECOM  | 255          | 05 | GSM 1800  |
|                                                               |             | UA KYIVSTAR           | UA KYIVSTAR     | 255          | 03 | GSM 900   |
|                                                               |             | UA UMC                | UA UMC          | 255          | 01 | GSM 900   |
|                                                               |             | UA WELLCOM            | UA WELLCOM      | 255          | 02 | GSM 900   |
| UNITED ARAB<br>EMIRATES (UAE)                                 | +971        | UAE ETISALAT          | ETISALAT-G2     | 424          | 02 | GSM 900   |
| UNITED KINGDOM<br><br>(Guernsey)<br>(Jersey)<br>(Isle of Man) | +44         | BTCellnet             | UK BTCELLNET    | 234          | 10 | GSM 900   |
|                                                               |             | ONE2ONE               | one2one         | 234          | 30 | GSM 1800  |
|                                                               |             | ORANGE                | ORANGE          | 234          | 33 | GSM 1800  |
|                                                               |             | VODAFONE              | UK VODAFONE     | 234          | 15 | GSM 900   |
|                                                               |             | GUERNSEY TELECOMS     | GUERNSEY TEL UK | 234          | 55 | GSM 900   |
|                                                               |             | Jersey Telecoms GSM   | Jersey Telecoms | 234          | 50 | GSM 900   |
|                                                               |             | PRONTO GSM            | MANX PRONTO GSM | 234          | 58 | GSM 900   |
| VIETNAM                                                       | +84         | Mobi Fone             | VN Mobi Fone    | 452          | 01 | GSM 900   |

### 3.16. Glossary of Terms

| Term                  | Definition                                                                                                                                                                                                                                                                                     |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| DTMF                  | Dual Tone Multiple Frequency tones. The numeric keys 0 to 9, and * and # will generate different DTMF tones when pressed during conversation. These are used to access voice mail, paging and home banking services.                                                                           |
| GSM                   | Global System for Mobile communications. The name given to the advanced digital technology that the telephone uses.                                                                                                                                                                            |
| Home country          | The country in which the home network operates.                                                                                                                                                                                                                                                |
| Home network          | The GSM network on which subscription details are held.                                                                                                                                                                                                                                        |
| Hot Key Dial          | Hot Key Dial allows quick access to numbers stored in the Phonebook of Service Dial Number list. The source of the Hot Key Dial may be defined by the user or preprogrammed by the Service Provide. It is most likely to be preprogrammed to the Service Dial Numbers by the Service Provider. |
| Lock code             | Used for security of the telephone. Factory set to "0000".                                                                                                                                                                                                                                     |
| Message Centre        | Where messages are sent before they are forwarded onto their destination. The Message Centre telephone number may be programmed into the SIM or supplied by the service provider.                                                                                                              |
| Network operator      | The organisation responsible for operating a GSM network. Each country will have at least one network operator.                                                                                                                                                                                |
| Password              | Used for the control of the call bar function. Supplied by the service provider.                                                                                                                                                                                                               |
| PIN                   | Personal Identification Number used for SIM security. Supplied by the service provider.                                                                                                                                                                                                        |
| PIN2                  | Personal Identification Number used for the control of Fixed Dial Memory and call charge metering. Supplied by the service provider.                                                                                                                                                           |
| PUK/ PUK2             | PIN/PIN2 Unblocking Key. Used to unblock the PIN/PIN2. Supplied by the service provider.                                                                                                                                                                                                       |
| Registration          | The act of locking on to a GSM network. This is usually performed automatically by the telephone.                                                                                                                                                                                              |
| Roaming               | The ability to use the telephone on networks other than the Home network.                                                                                                                                                                                                                      |
| Service Dial Numbers  | Service Dial Numbers are predefined numbers that allow the user to access a set of special services provided by the Service Provider. For example billing information or access to Voice Mail.                                                                                                 |
| Service provider      | The organisation responsible for providing access to the GSM network.                                                                                                                                                                                                                          |
| SIM                   | Subscriber Identification Module. A small smart-card which stores unique subscriber and user-entered information such as Phone Book, Fixed Dial Memory and short messages. Supplied by the service provider.                                                                                   |
| Supplementary service | Network-controlled GSM functions supported by the telephone. Supplementary services may only be available on a subscription bases.                                                                                                                                                             |
| Wild numbers          | Spaces in a stored telephone number. When the telephone number is recalled pressing a numeric key will fill in a space. This can be used to restrict dialling to a specific area.                                                                                                              |

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## 4 DISASSEMBLY / REASSEMBLY INSTRUCTIONS

### 4.1. 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.

#### 4.1.1. 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 1M2 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 5k2 and 1M2, shall be used.

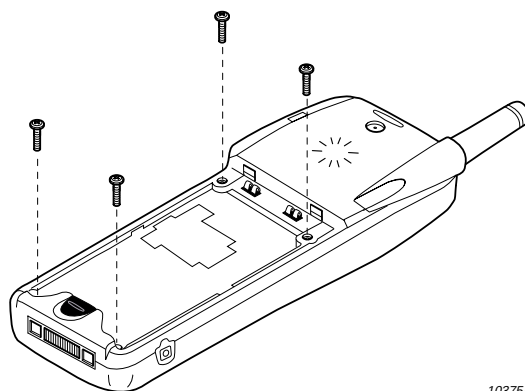
##### Containers

All containers and storage must be of the conductive type.

### 4.2. Disassembly

#### 4.2.1 Case Removal

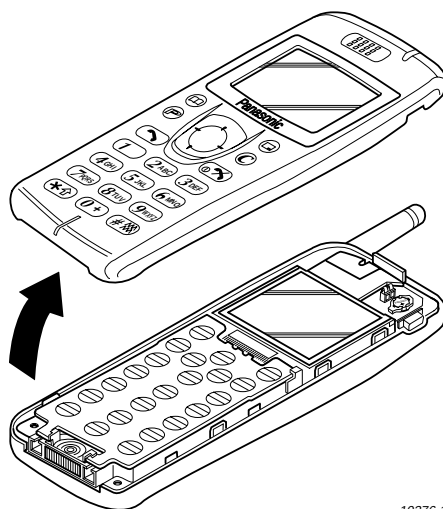
1. Remove the battery from the back of the telephone. Remove the four case screws located inside the battery compartment.



10375-1

Figure 4.1: Case Screw Removal

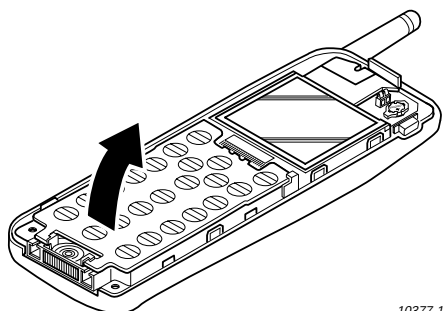
2. Remove the cover from the case by pulling from the connector end of the telephone. Care must be taken when separating the case from the cover as the retaining clips may be very stiff. If necessary, re-attach the battery to provide extra support for the case.



10376-1

**Figure 4.2: Case-Cover Separation**

3. Remove the PCB assembly from the cover.

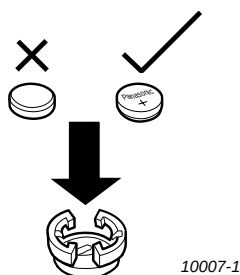


10377-1

**Figure 4.3: PCB Assembly Removal**

#### 4.2.2 Changing the Backup Battery

Remove the case as previously described. The backup battery is held in a retainer on the Main PCB. Observe polarity when replacing the battery.

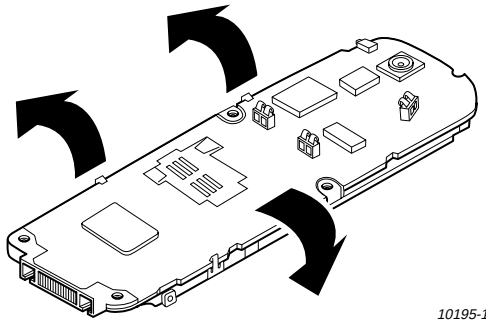


10007-1

**Figure 4.4: Backup Battery Polarity**

### 4.2.3 Access to Printed Circuit Boards

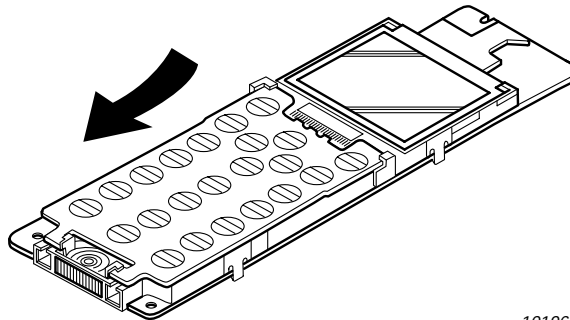
1. Remove the case as described previously. While applying slight pressure to the side retaining clips, lift the Main PCB away from the chassis.



10195-1

**Figure 4.5: Main PCB Removal**

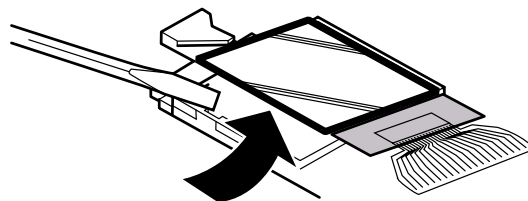
2. While applying slight pressure to the side retaining clips, slide the Keypad PCB towards the bottom (I/O) connector until it is released from the chassis.



10196-1

**Figure 4.6: Key PCB Removal**

3. Insert a small screwdriver blade or similar blunt object into the chassis recess to the side of the LCD, and gently prise the LCD from the chassis assembly.



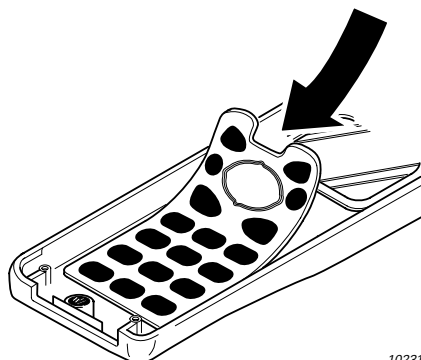
10226-1

**Figure 4.7: LCD Removal**

4. The Light Guide and Reflector can be removed in turn by prising one side away from the chassis.

#### 4.2.4. Case-Mounted Components

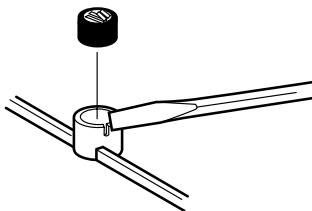
1. Remove the keypad membrane by peeling it away from the case front.



10231-1

**Figure 4.8: Keypad Membrane Removal**

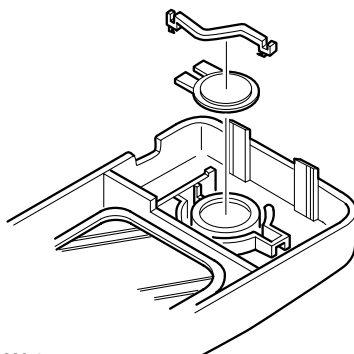
2. Remove the microphone assembly by prising upward with a small screwdriver blade or similar blunt object through the slot in the side of the microphone holder.



10230-1

**Figure 4.9: Removal of Microphone**

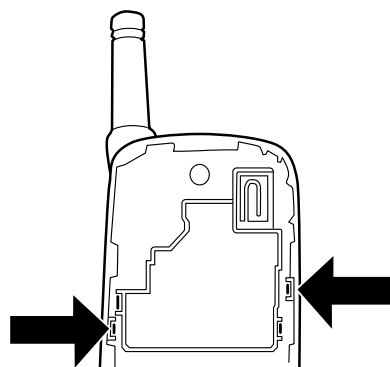
3. Unclip the speaker holder and lift out the speaker.



10229-1

**Figure 4.10: Speaker Removal**

4. Remove the RF Shield by depressing one of the side retaining clips with a small screwdriver blade or similar blunt object.



10227-1

**Figure 4.11: Removal of RF Shield**

5. Once the RF Shield has been removed, the Memo button and Desktop Handsfree (DTHF) speaker may be lifted out from the case.
6. The Vibrate motor may be removed by gently applying pressure under the spindle / counterweight.

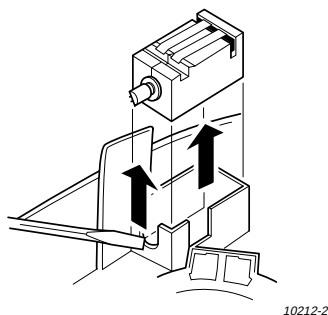


**Figure 4.12: Removal of Vibrate Motor**

7. Using a small screwdriver blade or similar blunt object, depress the lug on the antenna base in order to release the entire antenna unit.

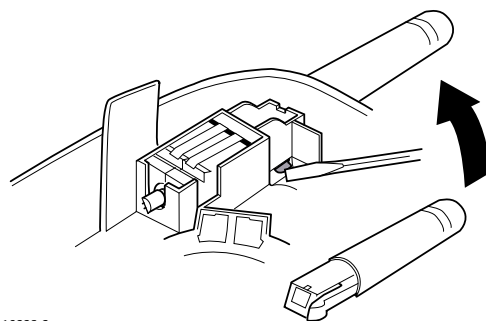


**Figure 4.13: Antenna Removal**

## 4.3. Reassembly

Reassembly is the reverse of disassembly, except that the Keypad PCB should be located in the chassis guides adjacent to the base I/O connector before sliding it in to its normal location.

Ensure that the securing screws are not over-tightened as this may affect the operation of the keypad.

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## 5 TECHNICAL SPECIFICATIONS

### 5.1. Tx Characteristics

All data is applicable to GSM 900 and GSM 1800 except where stated.

#### 5.1.1. Frequency Error

$\pm 0.1$  ppm max., relative to base station frequency.

#### 5.1.2. Modulation Phase Error

RMS:  $\leq 5^\circ$

Peak:  $\leq 20^\circ$

#### 5.1.3. Output RF Spectrum due to Modulation

| Offset from Centre Frequency (kHz) | Maximum Level Relative to Carrier (dB) |
|------------------------------------|----------------------------------------|
| $\pm 100$                          | +0.5                                   |
| $\pm 200$                          | -30                                    |
| $\pm 250$                          | -33                                    |
| $\pm 600$ to 1800                  | -60                                    |

#### 5.1.4. Output RF Spectrum due to Switching Transients

| Offset from Centre Frequency (kHz) | Maximum Level (dBm) |          |
|------------------------------------|---------------------|----------|
|                                    | GSM 900             | GSM 1800 |
| $\pm 400$                          | -19                 | -22      |
| $\pm 600$                          | -21                 | -24      |
| $\pm 1200$                         | -21                 | -24      |
| $\pm 1800$                         | -24                 | -27      |

Measurement conditions for output RF spectrum measurements:

Frequency Span: 0 Hz

Measurement Bandwidth: 30 Hz

Video Bandwidth: 100 kHz

Peak Hold

#### 5.1.5. Spurious Emissions at Antenna Connector

| Frequency Range                                                                             | Frequency Offset                                                              | Filter Bandwidth            | Approximate Video Bandwidth | Limits (dBm)      |                   |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------|-----------------------------|-------------------|-------------------|
|                                                                                             |                                                                               |                             |                             | GSM 900           | GSM 1800          |
| 30 to 50 MHz                                                                                | -                                                                             | 10 kHz                      | 30 kHz                      | -36               | -36               |
| 50 to 500 MHz                                                                               | -                                                                             | 100 kHz                     | 300 kHz                     | -36               | -36               |
| 500 MHz to 1GHz                                                                             | 0 to 1MHz                                                                     | 100 kHz                     | 300 kHz                     | -36               | -36               |
| 1 GHz to 4GHz<br>Excl. relevant TX band:<br>P-GSM: 890 to 915 MHz;<br>DCS: 1710 to 1785 MHz | 0 to 10 MHz<br>§ 10 MHz<br>§ 20 MHz<br>(offset from edge of relevant TX band) | 100 kHz<br>300 kHz<br>1 MHz | 300 kHz<br>1 MHz<br>3 MHz   | -30<br>-30<br>-30 | -36<br>-36<br>-36 |
| Relevant TX band:<br>P-GSM: 890 to 915 MHz;<br>DCS: 1710 to 1785 MHz                        | 1.8 to 6.0 MHz<br>(offset from carrier)                                       | 30 kHz                      | 100 kHz                     | -30               | -30               |

### 5.1.6. Output Level, Dynamic Operation

#### GSM 900

| Power Control Level | Transmitter Output Power (dBm) | Tolerance for Conditions (dB) |         |
|---------------------|--------------------------------|-------------------------------|---------|
|                     |                                | Normal                        | Extreme |
| TBA                 |                                |                               |         |

#### GSM 1800

| Power Control Level | Transmitter Output Power (dBm) | Tolerance for Conditions (dB) |         |
|---------------------|--------------------------------|-------------------------------|---------|
|                     |                                | Normal                        | Extreme |
| TBA                 |                                |                               |         |

### 5.1.7. Residual Peak Power

≤70 dBc (BW = 300 kHz)

## 5.2. Rx Characteristics

### 5.2.1. Sensitivity

#### GSM 900 Full Rate Speech

The reference sensitivity performance in terms of frame erasure, bit error, or residual bit error rates (whichever is appropriate) is specified in the following table, according to the propagation conditions.

| Channels        | Propagation Conditions TUhigh |                        | Propagation Conditions RA |                        | Propagation Conditions HT |                        | Static Conditions       |                        |
|-----------------|-------------------------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|-------------------------|------------------------|
|                 | Test Limit error rate %       | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate % | Minimum No. of samples |
| TCH/FS FER      | $6.742 \cdot \alpha$          | 8900                   |                           |                        |                           |                        | $0.122 \cdot \alpha$    | 164000                 |
| class Ib (RBER) | $0.42/\alpha$                 | 1,000,000              |                           |                        |                           |                        | $0.41/\alpha$           | 20,000,000             |
| class II (RBER) | 8.33                          | 120,000                | 7.5                       | 24000                  | 9.333                     | 60000                  | 2.439                   | 8200                   |

The reference sensitivity level is < -102 dBm.

**NOTE:**  $1 \leq \alpha \leq 1.6$ . The value of  $\alpha$  can be different for each channel condition but must remain the same for FER and class Ib RBER measurements for the same channel condition.

#### GSM 900 Half Rate Speech

The reference sensitivity performance in terms of frame erasure, bit error, or residual bit error rates (whichever is appropriate) is specified in the following table, according to the propagation conditions.

| Channels                          | Propagation Conditions TUhigh |                        | Propagation Conditions RA |                        | Propagation Conditions HT |                        |
|-----------------------------------|-------------------------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|
|                                   | Test Limit error rate %       | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples |
| TCH/HS (FER)                      | 4.598                         | 13050                  |                           |                        |                           |                        |
| TCH/HS class Ib (BFI=0)           | 0.404                         | 148500                 |                           |                        |                           |                        |
| TCH/HS class II (BFI=0)           | 7.725                         | 25500                  | 8500                      | 20000                  | 7600                      | 20000                  |
| TCH/HS (UFR)                      | 6.250                         | 9600                   |                           |                        |                           |                        |
| TCH/HSL class Ib ((BFI or UFI)=0) | 0.269                         | 227000                 |                           |                        |                           |                        |

### GSM 1800 Full Rate Speech

The reference sensitivity performance in terms of frame erasure, bit error, or residual bit error rates (whichever is appropriate) is specified in the following table, according to the propagation conditions.

| Channels        | Propagation Conditions TUhigh |                        | Propagation Conditions RA |                        | Propagation Conditions HT |                        | Static Conditions       |                        |
|-----------------|-------------------------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|-------------------------|------------------------|
|                 | Test Limit error rate %       | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate % | Minimum No. of samples |
| TCH/FS FER      | $4.478 \cdot \alpha$          | 13400                  |                           |                        |                           |                        | $0.122 \cdot \alpha$    | 164000                 |
| class Ib (RBER) | $0.32/\alpha$                 | 1,500,000              |                           |                        |                           |                        | $0.41/\alpha$           | 20,000,000             |
| class II (RBER) | 8.333                         | 60,000                 | 7.5                       | 24000                  | 9.333                     | 30000                  | 2.439                   | 8200                   |

The reference sensitivity level is < -102 dBm.

**NOTE:**  $1 \leq \alpha \leq 1.6$ . The value of  $\alpha$  can be different for each channel condition but must remain the same for FER and class Ib RBER measurements for the same channel condition.

### GSM 1800 Half Rate Speech

The reference sensitivity performance in terms of frame erasure, bit error, or residual bit error rates (whichever is appropriate) is specified in the following table, according to the propagation conditions.

| Channels                          | Propagation Conditions TUhigh |                        | Propagation Conditions RA |                        | Propagation Conditions HT |                        |
|-----------------------------------|-------------------------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|
|                                   | Test Limit error rate %       | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples | Test Limit error rate %   | Minimum No. of samples |
| TCH/HS (FER)                      | 4.706                         | 12750                  |                           |                        |                           |                        |
| TCH/HS class Ib (BFI=0)           | 0.426                         | 141000                 |                           |                        |                           |                        |
| TCH/HS class II (BFI=0)           | 7.725                         | 25500                  | 8735                      | 20000                  | 7600                      | 20000                  |
| TCH/HS (UFR)                      | 6.383                         | 9400                   |                           |                        |                           |                        |
| TCH/HSL class Ib ((BFI or UFI)=0) | 0.291                         | 206000                 |                           |                        |                           |                        |

### Blocking:

| Frequency                  | Small MS level in dBμVemf() |          |
|----------------------------|-----------------------------|----------|
|                            | GSM 900                     | GSM 1800 |
| FR ±600 kHz to FR ±800 kHz | 70                          | 70       |
| FR ±800 kHz to FR ±1.6 MHz | 70                          | 70       |
| FR ±1.6 MHz to FR ±3 MHz   | 80                          | 80       |
| 915 MHz to FR -3 MHz       | 90                          | -        |
| FR ±3 MHz to FR 980 MHz    | 90                          | -        |
| FR ±600 kHz to FR ±800 kHz | -                           | 87       |
| 1785 MHz to FR - 3 MHz     | -                           | 87       |
| 835 MHz to <915 MHz        | 113                         | -        |
| >980 MHz to 1000 MHz       | 113                         | -        |
| 100 kHz to <835 MHz        | 90                          | -        |
| >1000 MHz to 12.75 GHz     | 90                          | -        |
| 100 kHz to 1705 MHz        | -                           | 113      |
| >1705 MHz to <1785 MHz     | -                           | 101      |
| >1920 MHz to 1980 MHz      | -                           | 101      |
| >1980 MHz to 12.75 GHz     | -                           | 90       |

Measurement Conditions:

Wanted carrier is 3 dB above reference sensitivity.

Interferer is CW.

Spurious response exceptions:

Six exceptions are permitted IN band 915 - 980 MHz.

24 exceptions are permitted OUTSIDE band 915 - 980 MHz.

## TECHNICAL SPECIFICATIONS

### Intermodulation Characteristics

| Interferer Level (f1 & f2) dBm | Interferer Frequencies (f1 & f2)                                  |
|--------------------------------|-------------------------------------------------------------------|
| -49                            | Wanted frequency = $2f_1 - f_2$ ,<br>and $[f_1 - f_2] = 800$ kHz. |

## 6 TEST AND MEASUREMENT

### 6.1. Introduction

This section provides information on testing the GD93 telephone. The layout is as follows

1. Section 6.2 ALIVH PCBs: Description and repair procedures.
2. Section 6.3 External testing: describes equipment requirements and general set up procedure.
3. Section 6.4 Complete Unit Test Setup: describes how the items of test equipment are used together and general set up procedure.
4. Section 6.5 Channel box test commands: provides detailed explanation of the different commands available using the test equipment and channel-box software.
5. Section 6.6 Adjustment mode: describes adjustments available on the handheld unit.

### 6.2. Any-Layer Interstitial Via Hole (ALIVH) PCBs

#### CAUTION

The telephone handset uses an ALIVH PCB assembly, the substrate of which is hydrophilic. To avoid damaging the ALIVH PCB, the specialist equipment and procedures described below must be employed when replacing suspect or faulty components.

#### 6.2.1. General Information

To reduce overall size and provide enhanced speech and data performance, an Any-Layer Interstitial Via Hole (ALIVH) PCB is used in this telephone. ALIVH PCBs are multi-layer boards which have an IVH structure in all inter-layers and can provide an inter-layer connection immediately under the land of a component. In addition, the PCB has no through holes and any number of layers can be interconnected.

As the specification and performance characteristics of ALIVH PCBs differ from that of conventional multi-layered boards, special attention is required when handling and repairing these assemblies.

##### Moisture Absorbency

The ALIVH PWB is more absorbent than a conventional PCB because of the nature of its material. Its aramid substrate is hydrophilic, i.e. it absorbs moisture from the air. If, after having absorbed moisture, the ALIVH PWB is submitted to re-flow or repair process, moisture in the board can suddenly evaporate and cause vapour explosion.

##### Copper Foil Peel Strength (Land Detachment Resistance)

The ALIVH PCB is slightly less resistant to copper detachment force than conventional boards. Therefore, it is necessary to ensure that solder is melted sufficiently before a component is removed from the board.

##### Warping Property

The ALIVH PCB has a smaller Young's Modulus and is therefore more pliant than conventional boards. It is important that the ALIVH PCB is not bent when component placement is performed.

#### 6.2.2. Repair Procedures

To prevent problems caused by moisture absorption, it will be necessary to perform dehydration of ALIVH PCBs in a suitable oven or similar heating device prior to repair. The boards should be heated at 85 °C for a duration of at least ten hours.

The repair should also be performed under the following conditions:

##### Soldering Iron

The temperature of the tip of the soldering iron should be 350 °C  $\pm$  10 °C for an application time of five seconds or less.

Removal and re-mounting of components should be performed only once at any component position.

**Note:** To avoid land detachment, do NOT apply excessive force on the soldering iron when heating the board. Ensure that the solder has melted sufficiently to allow component removal without damaging the board.

##### Hot-Air Blower

The blower air temperature should be at:

## TEST AND MEASUREMENT

295 °C  $\pm$ 5 °C for an application time of 120 seconds or less,

or:

395 °C  $\pm$ 5 °C for an application time of 30 seconds or less.

Removal and re-mounting of components should be performed only once at any component position.

**Note:** To avoid land detachment, do NOT apply excessive force on the soldering iron when heating the board. Ensure that the solder has melted sufficiently to allow component removal without damaging the board.

### Re-flowing / Re-touching

1. Re-touching by soldering iron:

HAKKO 928 soldering iron is recommended.

900S-T-B tip for thicker solder joints and 900M-T-LB tip for thinner solder joints are recommended

2. Tip temperature/time

Normal pad : 325 $\pm$ 10°C, less than five seconds

Large Pad : 400 $\pm$ 10°C, less than five seconds

3. Pressure at solder tip

· Weight of soldering iron, (50gm) + 100gm to 150gm

· Do not exert pressure in the horizontal direction

4. Retouching small components

Pinch the component using two soldering irons and retouch within four seconds

## 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.

Testing and adjustment of the handheld unit can be performed with the outer case in place and the cradle connected. For in-depth fault finding the unit should first be disassembled, as detailed in Section 4, and then the PCB Repair Jig used to connect the PCBs together externally as they would be found in normal use. Fault tracing can then be performed on the PCBs using suitable test equipment, such as spectrum analysers and oscilloscopes.

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

### 6.3.2. Jigs and Tools

#### Interface Box (Part No. IFB003 / IFB004)

The Interface box provides:

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.

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.

RS 232 interface. Ensures that the Unit Under Test is supplied with the correct signal levels and format.

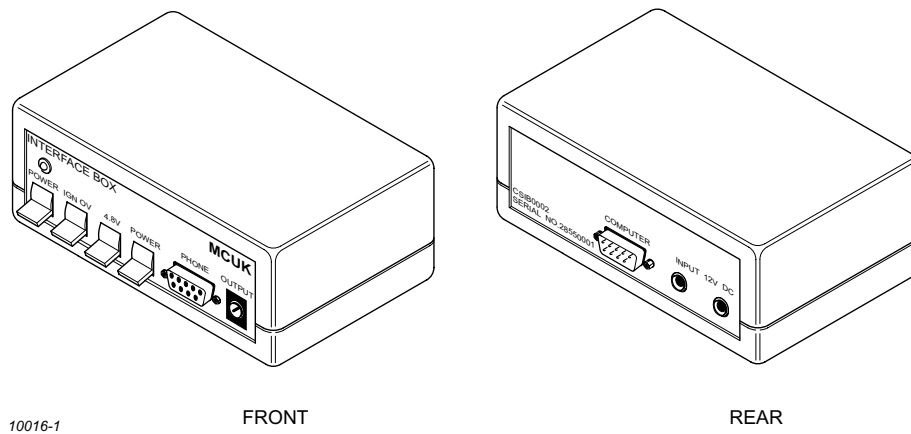


Figure 6.1: Interface Box IFB003 / IFB004

### 6.3.3. 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.

### 6.3.4. Power Supply

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

#### *Test Battery (Part Number JT00042)*

Provides 3.6 V DC supply to Interface Box IFB003 or IFB004 to compensate for the current drain when the Unit Under Test is used at full transmit power.

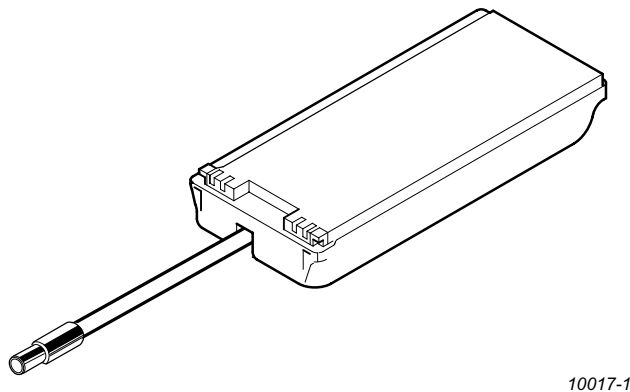


Figure 6.2: Test Battery

#### *PCB Repair Jig (Part No. JT00057)*

This unit provides the necessary connections between the Main and Keypad PCBs, and the connections between Main PCB and external test equipment.

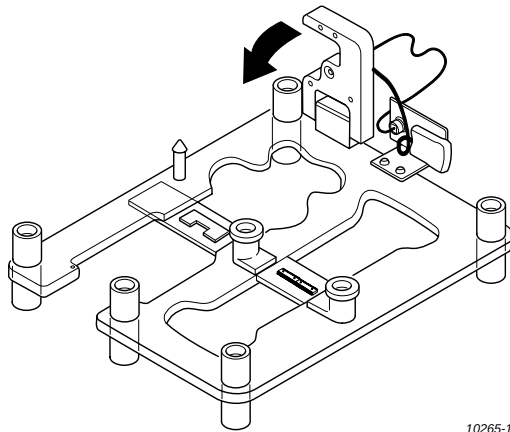


Figure 6.3: PCB Repair Jig

#### *RF Adaptor (Part No JT00055)*

This unit provides an RF connection between the Unit Under Test and external test equipment.

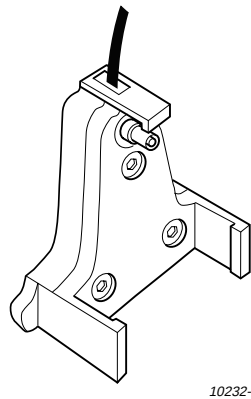


Figure 6.4: RF Adaptor

#### *GSM Tester*

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

#### *Interface Cable (Part No. JT00043)*

The interface cable allows connection between a computer and the Unit Under Test via IFB003 or IFB004.

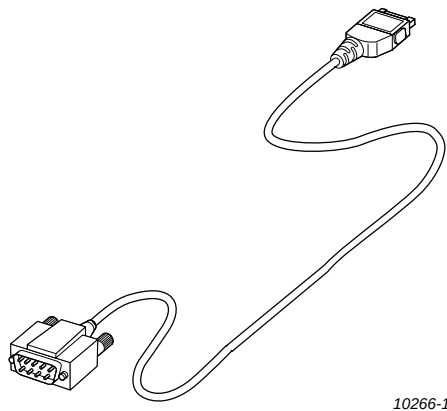


Figure 6.5: Interface Cable

### *Battery Calibration Voltage Control Unit (Part No. JT00010)*

The Battery Calibration Voltage Control Unit (BCVCU) provides three voltage levels (3 V, 4.1 V and 0 V) to the Test Battery, and is used during battery calibration checks. It is powered from the Interface Box.

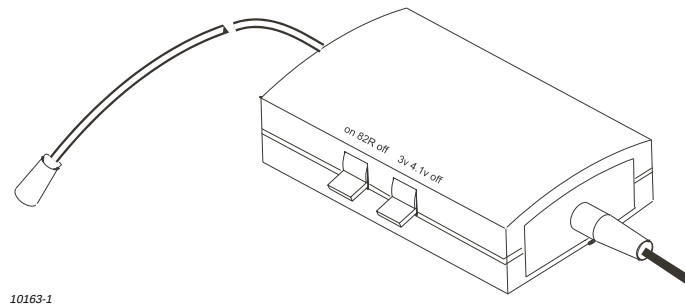
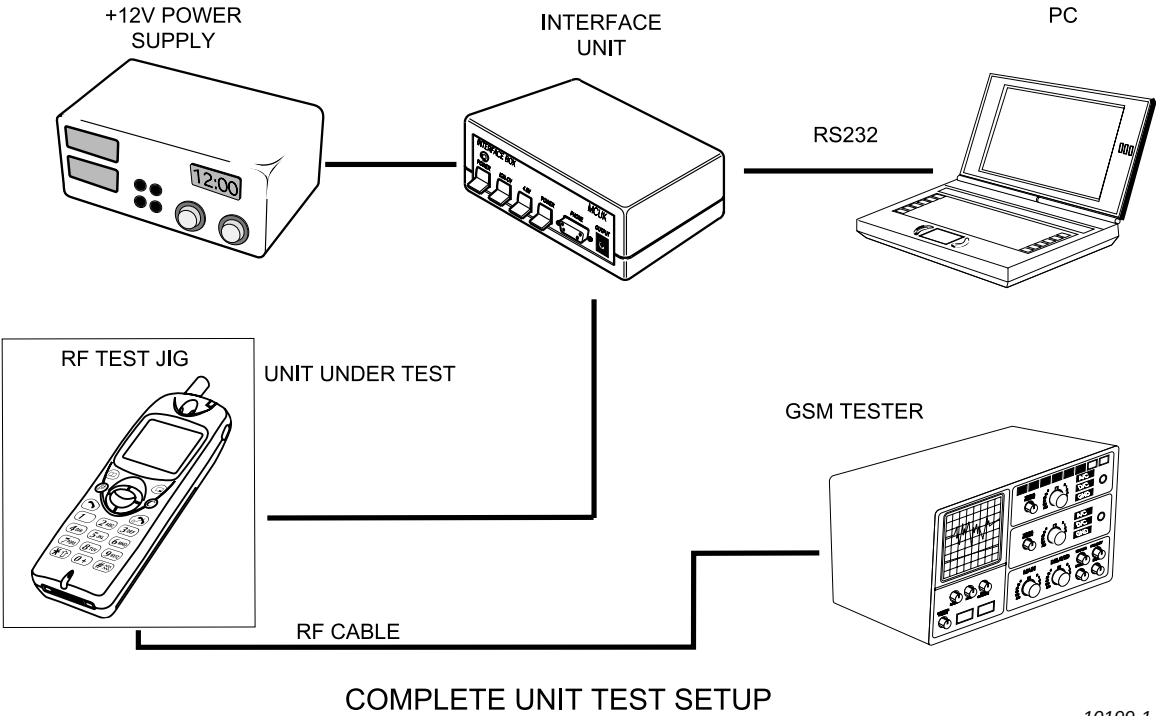
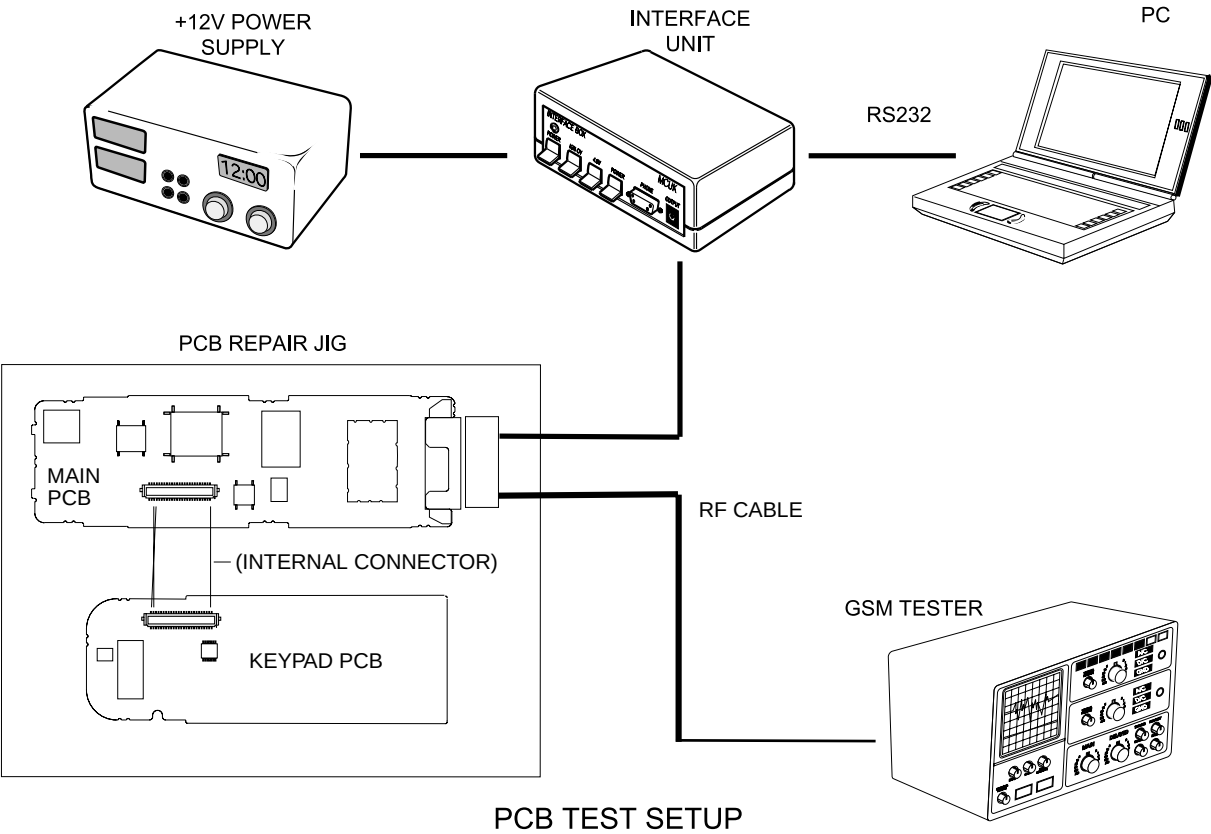


Figure 6.6: Battery Calibration Control Unit

### **6.3.5. 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.

6.4. Complete Unit Setup



10199-1

Figure 6.7: Complete Unit Test Setup

### 6.4.1. External Testing Setup Procedure

#### IMPORTANT NOTE

To allow accurate measurement of the complete unit the test equipment must be connected as shown (Figure 6.6). The PCB Test Setup must be used to enable repair to PCBs. Once repair/replacement is complete, the assembled unit must be tested and calibrated with the jigs and tools connected as shown in Figure 6.7.

#### Full Test Equipment Requirements

For testing the handheld unit the following equipment is required:

1. Interface box
2. 12 V power supply
3. Personal computer (IBM compatible) with RS232 interface
4. RS232 interface cable (9 pin straight through connection)
5. GSM test station
6. RF Adaptor
7. Interface cable – JT00004

The channel box software (supplied on floppy disk) should be installed onto the main drive of the personal computer.

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

Two modes are available for testing the handheld unit:

1. Test Mode.

The Test Mode facility allows various sections of the handheld unit to be individually activated.

2. Normal Mode.

The Normal Mode facility allows the handheld unit to be powered externally for call origination/receiving operations.

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

#### Power On into Test Mode

1. Connect the test equipment into test mode configuration.

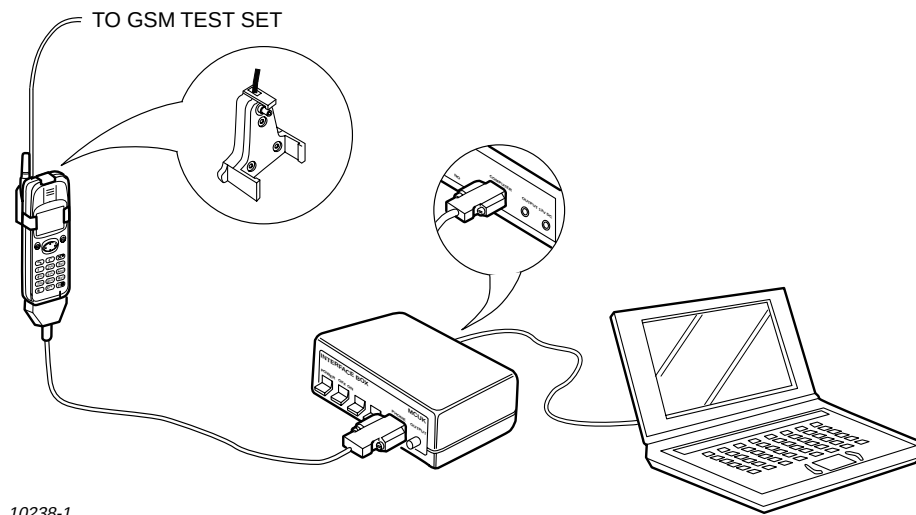


Figure 6.8: External test equipment setup

2. Ensure that the following settings are made:

- a. Interface box IFB003 or IFB004
 

|         |                         |
|---------|-------------------------|
| Power:  | UP position             |
| IGN:    | UP position             |
| Mode    | DOWN position           |
| Voltage | Middle Position (7.2 V) |

## TEST AND MEASUREMENT

- b. Power supply  
+12V DC: ON
- c. PC  
Channel box software loaded and the screen indicating as shown:

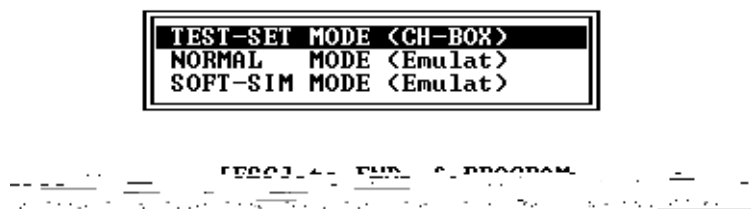


Figure 6.9: PC Screen (SCRN10)

3. Press ENTER on the PC keyboard.
4. At the PC press F10.
5. After approximately 1 second, set the Interface Cable switch to ON (position is marked by a dot).

**NOTE:** The display will read:

GET STATION  
ADDRESS = \_ \_  
INFO = \_ \_

The back light will be illuminated and all LEDs will be lit.

Go to Section 6.5 (Channel Box Test Commands) for further testing information.

### Power On In Normal Mode

1. Connect the test equipment as shown in the diagram.

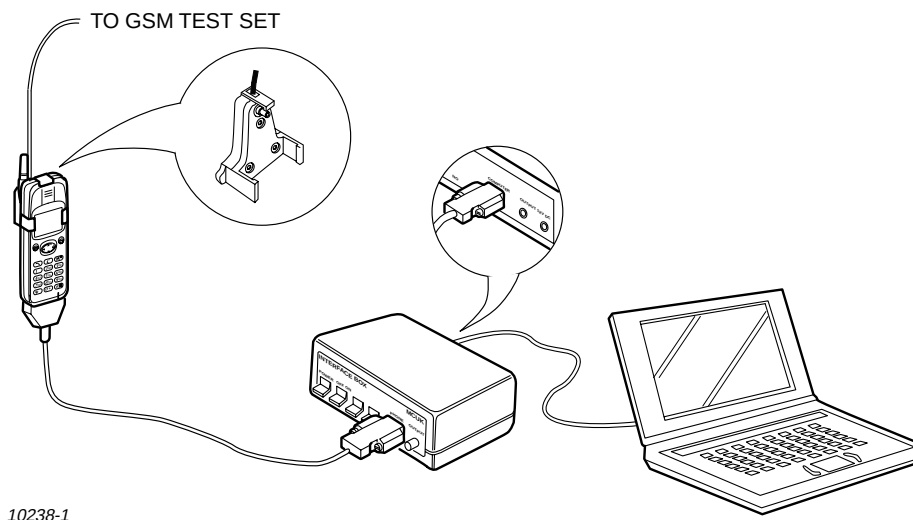


Figure 6.10: External test equipment setup

2. Ensure that the following settings are made:
  - a. Interface box IFB003 or IFB004  
Power: DOWN position  
IGN: UP position  
MODE: UP position
  - b. Power supply:  
+12V DC: ON
  - c. PC  
Channel box software loaded and the screen indicating as shown:

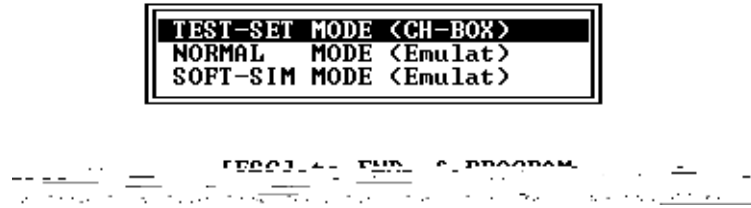


Figure 6.11: PC Screen (SCRN9)

- On the PC, select NORMAL MODE and press ENTER.
- Press F10 on the PC.
- After approximately 1 second, set the interface cable switch to ON (position is marked by a dot).

### Entering Call Mode from Test Mode

Ensure that a fully-charged battery is attached to the telephone.

The screen of the PC should resemble the one shown below:

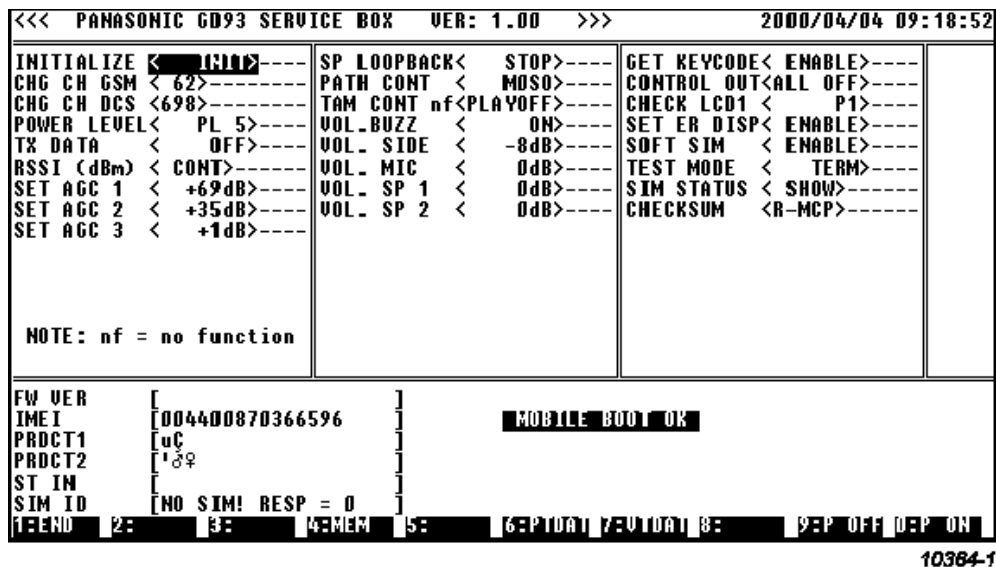


Figure 6.12: PC Screen (SCRN11)

- At the PC, change the SOFT SIM field to read <ENABLE>. Press ENTER.
- At the PC, change the TEST MODE field to read <TERM>. Press ENTER.  
The UUT will power down and up again. If the UUT is connected to a GSM test set, after a delay of approximately five seconds, the UUT will register service.
- To return to test mode, set the SOFT SIM field to <DISABLE> and set the TEST MODE field to <TEST>. Press Enter.

## 6.5. Channel Box Test Commands

The following table outlines the commands available using the channel box software.

After the telephone unit has been switched on (Section 6.4), use the up / down cursor keys on the PC keyboard to select the channel box command. Use the left / right cursor keys to display the required indication and then press the ENTER key to select the displayed function.

| CHANNEL BOX COMMAND | INDICATION         | FUNCTION |
|---------------------|--------------------|----------|
| ESMODE              | <ERM>              | REN      |
| INITALIZ            | <R>                | REN      |
| CHANGE CH GSI       | <N>                | REN      |
| CHANGE CH DCS       | <X>                | REN      |
| POWER LEVL          | <X>                | REN      |
| DATA                | <NRL 0>            | REN      |
|                     | <NRL 1>            | REN      |
|                     | <NRL R>            | REN      |
|                     | <ACC R>            | REN      |
| RS(DBM)             | <X>                | REN      |
| STAGC 1             | <X>                | REN      |
| STAGC 2             | <X>                | REN      |
| STAGC 3             | <X>                | REN      |
| B LOOP BACK         | <RT>               | REN      |
|                     | <DP>               | REN      |
| PAR CONT            | <MOS>              | REN      |
|                     | <MES>              | REN      |
|                     | <MES>              | REN      |
|                     | <MIS>              | REN      |
|                     | <MIS>              | REN      |
| VL BZ               | <X>                | REN      |
| VL DE               | <X>                | REN      |
| VL MIC              | <X>                | REN      |
| VL B1               | <X>                | REN      |
| VL B2               | <X>                | REN      |
| GETKEYCODE          | <ENABLE><DISABLE>  | REN      |
| CONTROL ON          | <LED R>            | REN      |
|                     | <LED B>            | REN      |
|                     | <CHARGE ON>        | REN      |
|                     | <LED C>            | REN      |
|                     | <HF ON>            | REN      |
|                     | <ALL OFF>          | REN      |
|                     | <ALL ON>           | REN      |
| CHECK LCD1          | <P1>               | REN      |
|                     | <P2>               | REN      |
| STER.DIB            | <ENABLE>           | REN      |
|                     | <DISABLE>          | REN      |
| OFM                 | <ENABLE> <DISABLE> | REN      |

| CHANNEL BOX COMMAND | INDICATION | FUNCTION                  |
|---------------------|------------|---------------------------|
| TEST MODE           | <TERM>     | TEST MODE <ENABLED> b000b |
| SET AGC             | <BOW       | Set AGC to b000b          |
| CHECK MODE          | <BOW       | Check MODE to b000b       |

## 6.6. Adjustment Mode

### 6.6.1. RF Calibration Procedure

**NOTE:** See Section 6.2 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 one or both of the PCBs in the handheld unit. Failure to do so may result in incorrect operation of the telephone.

The following adjustments MUST be made on BOARD PAIRS.

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

1. Ramping gain (Section 6.6.1)
2. RSSI (Section 6.6.2)
3. I and Q values (Section 6.6.3)

The adjustment data selected during calibration is stored in Flash ROM.

| <<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> |                          |                          |       | 2000/04/04 09:57:39 |                     |
|----------------------------------------------|--------------------------|--------------------------|-------|---------------------|---------------------|
| INITIALIZE < IMIT>----                       | SP LOOPBACK< STOP>----   | GET KEYCODE< ENABLE>---- |       |                     |                     |
| CHG CH GSM < 62> ACK                         | PATH CONT < MOSO>----    | CONTROL OUT<ALL OFF>---- |       |                     |                     |
| CHG CH DCS <698>-----                        | TAM CONT nf<PLAYOFF>---- | CHECK LCD1 < P1>----     |       |                     |                     |
| POWER LEVEL< PL14>ACK                        | VOL_BUZZ < ON>----       | SET ER DISP< ENABLE>---- |       |                     |                     |
| TX DATA < NR14>ACK                           | VOL_SIDE < -8dB>----     | SOFT SIM < ENABLE>----   |       |                     |                     |
| RSSI (dBm) < CONT>-----                      | VOL_MIC < 0dB>----       | TEST MODE < TERM>----    |       |                     |                     |
| SET AGC 1 < +69dB>----                       | VOL_SP 1 < 0dB>----      | SIM STATUS < SHOW>----   |       |                     |                     |
| SET AGC 2 < +35dB>----                       | VOL_SP 2 < 0dB>----      | CHECKSUM <R-MCP>----     |       |                     |                     |
| SET AGC 3 < +1dB>----                        |                          |                          |       |                     |                     |
| NOTE: nf = no function                       |                          |                          |       |                     |                     |
| FW VER                                       | [ 004400870366596 ]      | MOBILE BOOT OK           |       |                     |                     |
| IMEI                                         | [ uC ]                   | CHG CH                   |       |                     |                     |
| PRDCT1                                       | [ 139 ]                  | SET_PL14                 |       |                     |                     |
| PRDCT2                                       | [ 139 ]                  | TX_DAT_NR                |       |                     |                     |
| ST IM                                        | [ NO SIM! RESP = 0 ]     |                          |       |                     |                     |
| SIM ID                                       |                          |                          |       |                     |                     |
| 1:END                                        | 2:                       | 3:                       | 4:MEM | 5:                  | 6:PI DAT 7:O DAT 8: |
|                                              |                          |                          |       |                     | 9:P OFF 0:P ON      |

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Figure 6.13: Test software screen

### 6.6.2. Ramping Gain

The carrier power must be measured and calibrated for each power level at channel 62.

#### GSM 900

| Power Level<br>(PL) | Output Power (dBm) |        |      |      |      |
|---------------------|--------------------|--------|------|------|------|
|                     | Nominal            | Target |      | Spec |      |
|                     |                    | Min    | Max  | Min  | Max  |
| 5                   | 32.3               | 32.0   | 32.6 | 31.8 | 32.8 |
| 6                   | 30.9               | 30.4   | 31.4 | 30.0 | 31.8 |
| 7                   | 29                 | 28.5   | 29.5 | 28   | 30   |
| 8                   | 27                 | 26.5   | 27.5 | 26   | 28   |
| 9                   | 25                 | 24.5   | 25.5 | 24   | 26   |
| 10                  | 23                 | 22.5   | 23.5 | 22   | 24   |
| 11                  | 21                 | 20.5   | 21.5 | 20   | 22   |
| 12                  | 19                 | 18.5   | 19.5 | 18   | 20   |
| 13                  | 17                 | 16.5   | 17.5 | 16   | 18   |
| 14                  | 15                 | 14.5   | 15.5 | 14   | 16   |
| 15                  | 13                 | 12.5   | 13.5 | 12   | 14   |
| 16                  | 11                 | 10.5   | 11.5 | 10   | 12   |
| 17                  | 9                  | 8.5    | 9.5  | 8    | 10   |
| 18                  | 7                  | 6.5    | 7.5  | 6    | 8    |
| 19                  | 5                  | 4.5    | 5.5  | 4    | 6    |

#### GSM 1800

| Power Level<br>(PL) | Output Power (dBm) |        |      |      |      |
|---------------------|--------------------|--------|------|------|------|
|                     | Nominal            | Target |      | Spec |      |
|                     |                    | Min    | Max  | Min  | Max  |
| 0                   | 29.05              | 28.8   | 29.3 | 28.8 | 29.3 |
| 1                   | 27.8               | 27.3   | 28.3 | 27.0 | 28.8 |
| 2                   | 26                 | 25.5   | 26.5 | 25   | 27   |
| 3                   | 24                 | 23.5   | 24.5 | 23   | 25   |
| 4                   | 22                 | 21.5   | 22.5 | 21   | 23   |
| 5                   | 20                 | 19.5   | 20.5 | 19   | 21   |
| 6                   | 18                 | 17.5   | 18.5 | 17   | 19   |
| 7                   | 16                 | 15.5   | 16.5 | 15   | 17   |
| 8                   | 14                 | 13.5   | 14.5 | 13   | 15   |
| 9                   | 12                 | 11.5   | 12.5 | 11   | 13   |
| 10                  | 10                 | 9.5    | 10.5 | 9    | 11   |
| 11                  | 8                  | 7.5    | 8.5  | 7    | 9    |
| 12                  | 6                  | 5.5    | 6.5  | 5    | 7    |
| 13                  | 4                  | 3.5    | 4.5  | 3    | 5    |
| 14                  | 2                  | 1.5    | 2.5  | 1    | 3    |
| 15                  | 0                  | -0.5   | 0.5  | -1   | 1    |

## Calibration of output power on each power level

**NOTE:** To ensure that the telephone operates within set SAR margins, Panasonic recommends that a power meter capable of measurement to an accuracy of  $\pm 0.2$  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. Power on the telephone in Test Set Mode.
2. Scroll down the menu until CHANGE CH <62> is highlighted and then press ENTER.
3. Scroll down the menu until PL <5> is highlighted. Use the left and right cursor keys to select <14>. Press ENTER.
4. Scroll down the menu until TX DATA <OFF> is highlighted. Using the left / right cursor keys, highlight <NRL R> and press ENTER.
5. At the power meter, measure the peak power.
6. If measured power is in the range of the target power, then proceed to step 10.
7. At the Channel box, press F7 to view the TRIM for the mid-channel.

```

<<<  PANASONIC GD93 SERVICE BOX  VER: 1.00  >>>                2000/04/04 10:06:51
INITIALIZE < IMIT>----- SP LOOPBACK< STOP>----- GET KEYCODE< ENABLE>-----
CHG CH GSM < 62>  ACK    PATH CONT < MOSO>----- CONTROL OUT<ALL OFF>-----
CHG CH DCS <698>----- TAM CONT nf<PLA YOFF>----- CHECK LCD1 < P1>-----
POWER LEVEL< PL14>ACK  VOL_BUZZ < ON>----- SET ER DISP< ENABLE>-----
TX DATA < NRL R>ACK    VOL_ SIDE < -8dB>----- SOFT SIM < ENABLE>-----
RSSI (dBm) < CONT>----- VOL_ MIC < 0dB>----- TEST MODE < TERM>-----
SET AGC 1 < +69dB>----- VOL_ SP 1 < 0dB>----- SIM STATUS < SHOW>-----
SET AGC 2 < +35dB>----- VOL_ SP 2 < 0dB>----- CHECKSUM <R-MCP>-----
SET AGC 3 < +1dB>-----

NOTE: nf = no function

FW VER [004400870366596] T VIEW TRIM PL Mch
IMEI [uC] T TRIM PL Hch
PRDCT1 [189] T TRIM PL Lch
PRDCT2 [189] T TRIM PL Tch
ST IN [NO SIM! RESP = 0] T TRIM PL Bch
SIM ID [NO SIM! RESP = 0] T TRIM Other
1:END 2: 3: 4:MEM 5: 9:P OFF 0:P ON
  
```

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Figure 6.14: Power level view 1

8. Select VIEW TRIM PL MCH, and make a note of this value.

```

<<<  PANASONIC GD93 SERVICE BOX  VER: 1.00  >>>                2000/04/04 10:06:51
INITIALIZE < IMIT>----- SP LOOPBACK< STOP>----- GET KEYCODE< ENABLE>-----
CHG CH GSM < 62>  ACK    PATH CONT < MOSO>----- CONTROL OUT<ALL OFF>-----
CHG CH DCS <698>----- TAM CONT nf<PLA YOFF>----- CHECK LCD1 < P1>-----
POWER LEVEL< PL14>ACK  VOL_BUZZ < ON>----- SET ER DISP< ENABLE>-----
TX DATA < NRL R>ACK    VOL_ SIDE < -8dB>----- SOFT SIM < ENABLE>-----
RSSI (dBm) < CONT>----- VOL_ MIC < 0dB>----- TEST MODE < TERM>-----
SET AGC 1 < +69dB>----- VOL_ SP 1 < 0dB>----- SIM STATUS < SHOW>-----
SET AGC 2 < +35dB>----- VOL_ SP 2 < 0dB>----- CHECKSUM <R-MCP>-----
SET AGC 3 < +1dB>-----

NOTE: nf = no function

FW VER [004400870366596] T VIEW TRIM PL Mch
IMEI [uC] T TRIM PL Hch
PRDCT1 [189] T TRIM PL Lch
PRDCT2 [189] T TRIM PL Tch
ST IN [NO SIM! RESP = 0] T TRIM PL Bch
SIM ID [NO SIM! RESP = 0] T TRIM Other
1:END 2: 3: 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON
  
```

| M ch |           |      |           |
|------|-----------|------|-----------|
| PL5  | GSM = 78  | PL0  | DCS = 91  |
| PL6  | GSM = 72  | PL1  | DCS = 202 |
| PL7  | GSM = 26  | PL2  | DCS = 190 |
| PL8  | GSM = 38  | PL3  | DCS = 54  |
| PL9  | GSM = 209 | PL4  | DCS = 58  |
| PL10 | GSM = 29  | PL5  | DCS = 190 |
| PL11 | GSM = 126 | PL6  | DCS = 178 |
| PL12 | GSM = 73  | PL7  | DCS = 219 |
| PL13 | GSM = 109 | PL8  | DCS = 146 |
| PL14 | GSM = 14  | PL9  | DCS = 191 |
| PL15 | GSM = 221 | PL10 | DCS = 81  |
| PL16 | GSM = 87  | PL11 | DCS = 190 |
| PL17 | GSM = 226 | PL12 | DCS = 86  |
| PL18 | GSM = 243 | PL13 | DCS = 190 |
| PL19 | GSM = 56  | PL14 | DCS = 221 |
|      |           | PL15 | DCS = 159 |

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Figure 6.15: Power level 2

## TEST AND MEASUREMENT

9. Perform the following calculation and make a note of the result:

$$\text{New Trim Value} = \text{Old Trim Value} + (\text{Required Power} - \text{Measured Power}) \times \text{Change per dB}$$

(step 5)                      (table)                      (step 2)                      (table)

10. At the Channel box, press F6 to program the TRIM for the mid-channel.

```

<<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> 2000/04/04 10:28:09

INITIALIZE < IMIT>---- SP LOOPBACK< STOP>---- GET KEYCODE< ENABLE>----
CHG CH GSM < 62> ACK PATH CONT < MOSO>---- CONTROL OUT<ALL OFF>----
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>---- CHECK LCD1 < P1>----
POWER LEVEL< PL14>ACK VOL_BUZZ < ON>---- SET ER DISP< ENABLE>----
TX DATA < NAL B>ACK VOL_SIDE < -8dB>---- SOFT SIM < ENABLE>----
RSSI (dBm) < CONT>---- VOL_MIC < 0dB>---- TEST MODE < TERM>----
SET AGC 1 < +69dB>---- VOL_SP 1 < 0dB>---- SIM STATUS < SHOW>----
SET AGC 2 < +35dB>---- VOL_SP 2 < 0dB>---- CHECKSUM <R-MCP>----
SET AGC 3 < +1dB>----

NOTE: nf = no function

FW VER [ 004400870366596 ]
IMEI [ uC ]
PRDCT1 [ '02 ]
PRDCT2 [ '02 ]
ST IN [ ]
SIM ID [ NO SIM! RESP = 0 ]

1:END 2: 3: 4:MEM 5: 6:PTDA 7:UTDA 8: 9:P OFF 0:P ON
  
```

PROC TRIM PL Mch GSM  
 TRIM PL Hch GSM  
 TRIM PL Lch GSM  
 TRIM PL Mch DCS  
 TRIM PL Hch DCS  
 TRIM PL Lch DCS  
 TRIM PL Tch DCS  
 TRIM PL Bch DCS  
 TRIM RSSI  
 TRIM Other

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Figure 6.16: Power level selection 1

11. Select PROGRAM TRIM PL MCH GSM.

```

<<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> 2000/04/04 10:28:09

INITIALIZE < IMIT>---- SP LOOPBACK< STOP>---- GET KEYCODE< ENABLE>----
CHG CH GSM < 62> ACK PATH CONT < MOSO>---- CONTROL OUT<ALL OFF>----
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>---- CHECK LCD1 < P1>----
POWER LEVEL< PL14>ACK VOL_BUZZ < ON>---- SET ER DISP< ENABLE>----
TX DATA < NAL B>ACK VOL_SIDE < -8dB>---- SOFT SIM < ENABLE>----
RSSI (dBm) < CONT>---- VOL_MIC < 0dB>---- TEST MODE < TERM>----
SET AGC 1 < +69dB>---- VOL_SP 1 < 0dB>---- SIM STATUS < SHOW>----
SET AGC 2 < +35dB>---- VOL_SP 2 < 0dB>---- CHECKSUM <R-MCP>----
SET AGC 3 < +1dB>----

NOTE: nf = no function

FW VER [ 004400870366596 ]
IMEI [ uC ]
PRDCT1 [ '02 ]
PRDCT2 [ '02 ]
ST IN [ ]
SIM ID [ NO SIM! RESP = 0 ]

1:END 2: 3: 4:MEM 5: 6:PTDA 7:UTDA 8: 9:P OFF 0:P ON
  
```

M ch  
 PL5 GAIN GSM  
 PL6 GAIN GSM  
 PL7 GAIN GSM  
 PL8 GAIN GSM  
 PL9 GAIN GSM  
 PL10 GAIN GSM  
 PL11 GAIN GSM  
 PL12 GAIN GSM  
 PL13 GAIN GSM  
 PL14 GAIN GSM  
 PL15 GAIN GSM  
 PL16 GAIN GSM  
 PL17 GAIN GSM  
 PL18 GAIN GSM  
 PL19 GAIN GSM

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Figure 6.17: Power level selection 2

12. Highlight the PL14 field and press ENTER.

```

<<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> 2000/04/04 10:28:09

INITIALIZE < INIT>---- SP LOOPBACK< STOP>---- GET KEYCODE< ENABLE>----
CHG CH GSM < 62> ACK PATH CONT < MOSO>---- CONTROL OUT<ALL OFF>----
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>---- CHECK LCD1 < P1>----
POWER LEVEL< PL14>ACK VOL_BUZZ < ON>----- SET ER DISP< ENABLE>----
TX DATA < NAL R>ACK VOL_SIDE < -8dB>----- SOFT SIM < ENABLE>----
RSSI (dBm) < CONT>----- VOL_MIC < 0dB>----- TEST MODE < TERM>----
SET AGC 1 < +69dB>----- VOL_SP 1 < 0dB>----- SIM STATUS < SHOW>----
SET AGC 2 < +35dB>----- VOL_SP 2 < 0dB>----- CHECKSUM <R-MCP>----
SET AGC 3 < +1dB>-----

NOTE: nf = no function

FW VER [ ]
IMEI [004400870366596]
PRDCT1 [uC]
PRDCT2 [']
ST IM [ ]
SIM ID [NO SIM! RESP = 0]
1:END 2: 3: 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON

```

10345-1

Figure 6.18: Power level selection 3

13. Enter the value calculated in step 9 into the data field and then press ENTER.
14. Press ESC.
15. Re-measure the peak power.
16. Repeat steps 5 to 14 for the remaining power levels, in the following order:
  - PL6, PL9, and PL19.
  - Power levels between PL9 and PL6.
  - Power levels between PL14 and PL9.
  - Power levels between PL19 and PL14.
17. Calibrate PL15 (limits  $\pm 0.2$  dB).
18. After calibrating at channel 62, the carrier power must be measured and calibrated at LOW and HIGH channels as shown in the table below.

| Channel        | GSM 900 | GSM 1800 |
|----------------|---------|----------|
| B <sub>0</sub> | -       | 512      |
| L <sub>0</sub> | 1       | (698)    |
| M <sub>0</sub> | 62      | 698      |
| H <sub>0</sub> | 124     | (698)    |
| P <sub>0</sub> | -       | 885      |

19. Repeat steps 2 to 14 for the GSM 1800 settings in the following order:
  - PL10 (limits  $\pm 0.5$  dB).
  - PL1, PL5, and PL15.
  - Power levels between PL1 and PL4.
  - Power levels between PL15 and PL10.
  - Power level PL0 (limits  $\pm 0.2$  dB).
20. Save TRIM data.

### 6.6.3. RSSI

This procedure describes the calibration of RSSI on the mid-channel. This procedure must also be carried out for low / bottom channel and high / top channel.

The procedure is as follows:

1. Power the telephone into Test Set mode in the service channel box.
2. Connect the telephone to the GSM Test Set and apply a carrier frequency of 68 kHz (for channel 60 = 947.00 MHz) at an input level of -90 dBm.
3. At the channel box, highlight CHANGE CH, and, using the left / right cursor keys, select CH <60>. Press ENTER.
4. Highlight the SET AGC1 field and change the set value to 45 dB. Press ENTER.
5. Highlight the RSSI dBm <> field and press ENTER

| <<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>>                                                                                                                                                                                                                                                                                                                                                                      |                          | 2000/04/04 15:58:43      |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------------------------|--|--------|---------------------|----------------|------|-------------|--------|--------|-----------------|--------|--------|-------|--|-------|---------------------|--|--------|--|--|
| INITIALIZE < IMIT>----                                                                                                                                                                                                                                                                                                                                                                                            | SP LOOPBACK< STOP>----   | GET KEYCODE< ENABLE>---- |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| CHG CH GSM < 60> ACK                                                                                                                                                                                                                                                                                                                                                                                              | PATH CONT < MOSO>----    | CONTROL OUT<ALL OFF>---- |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| CHG CH DCS <698>----                                                                                                                                                                                                                                                                                                                                                                                              | TAM CONT nf<PLAYOFF>---- | CHECK LCD1 < P1>----     |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| POWER LEVEL< PL 5>----                                                                                                                                                                                                                                                                                                                                                                                            | VOL_BUZZ < ON>----       | SET ER DISP< ENABLE>---- |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| TX DATA < OFF>----                                                                                                                                                                                                                                                                                                                                                                                                | VOL_SIDE < -8dB>----     | SOFT SIM < ENABLE>----   |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| RSSI (dBm) < CONT> -90.0                                                                                                                                                                                                                                                                                                                                                                                          | VOL_MIC < 0dB>----       | TEST MODE < TERM>----    |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| SET AGC 1 < +45dB>ACK                                                                                                                                                                                                                                                                                                                                                                                             | VOL_SP 1 < 0dB>----      | SIM STATUS < SHOW>----   |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| SET AGC 2 < +35dB>----                                                                                                                                                                                                                                                                                                                                                                                            | VOL_SP 2 < 0dB>----      | CHECKSUM <R-MCP>----     |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| SET AGC 3 < +1dB>----                                                                                                                                                                                                                                                                                                                                                                                             |                          |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| NOTE: nf = no function                                                                                                                                                                                                                                                                                                                                                                                            |                          |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| <table border="0"> <tr> <td>FW VER</td> <td>[ 000315620060246 ]</td> <td>MOBILE BOOT OK</td> </tr> <tr> <td>IMEI</td> <td>[ 0324000 ]</td> <td>CHG_CH</td> </tr> <tr> <td>PRDCT1</td> <td>[ 0324000.002E*</td> <td>AGC+45</td> </tr> <tr> <td>PRDCT2</td> <td>[ 0 ]</td> <td></td> </tr> <tr> <td>ST IN</td> <td>[ 894410000001785 ]</td> <td></td> </tr> <tr> <td>SIM ID</td> <td></td> <td></td> </tr> </table> |                          |                          |  | FW VER | [ 000315620060246 ] | MOBILE BOOT OK | IMEI | [ 0324000 ] | CHG_CH | PRDCT1 | [ 0324000.002E* | AGC+45 | PRDCT2 | [ 0 ] |  | ST IN | [ 894410000001785 ] |  | SIM ID |  |  |
| FW VER                                                                                                                                                                                                                                                                                                                                                                                                            | [ 000315620060246 ]      | MOBILE BOOT OK           |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| IMEI                                                                                                                                                                                                                                                                                                                                                                                                              | [ 0324000 ]              | CHG_CH                   |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| PRDCT1                                                                                                                                                                                                                                                                                                                                                                                                            | [ 0324000.002E*          | AGC+45                   |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| PRDCT2                                                                                                                                                                                                                                                                                                                                                                                                            | [ 0 ]                    |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| ST IN                                                                                                                                                                                                                                                                                                                                                                                                             | [ 894410000001785 ]      |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| SIM ID                                                                                                                                                                                                                                                                                                                                                                                                            |                          |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |
| 1:END 2: 3: 4:MEM 5: 6:PIDAT 7:UIDAT 8: 9:P OFF 0:P ON                                                                                                                                                                                                                                                                                                                                                            |                          |                          |  |        |                     |                |      |             |        |        |                 |        |        |       |  |       |                     |  |        |  |  |

10346-1

Figure 6.19: RSSI dB field

6. If the measured power is not  $-90 \pm 1$ , then make the following calculation:

$$\begin{aligned} \text{RSSI offset value} &= [-(90 + \text{MEASURED RSSI VALUE})] \times 2 \\ &= [-90 - \text{MEASURED RSSI VALUE}] \times 2, \end{aligned}$$

$$\begin{aligned} \text{for example} \quad &[-(90 + (95))] \times 2 \\ &= [-90 - (-95)] \times 2 \\ &= 10 \end{aligned}$$

Record the result.

7. At the channelbox, press F7 to view data.

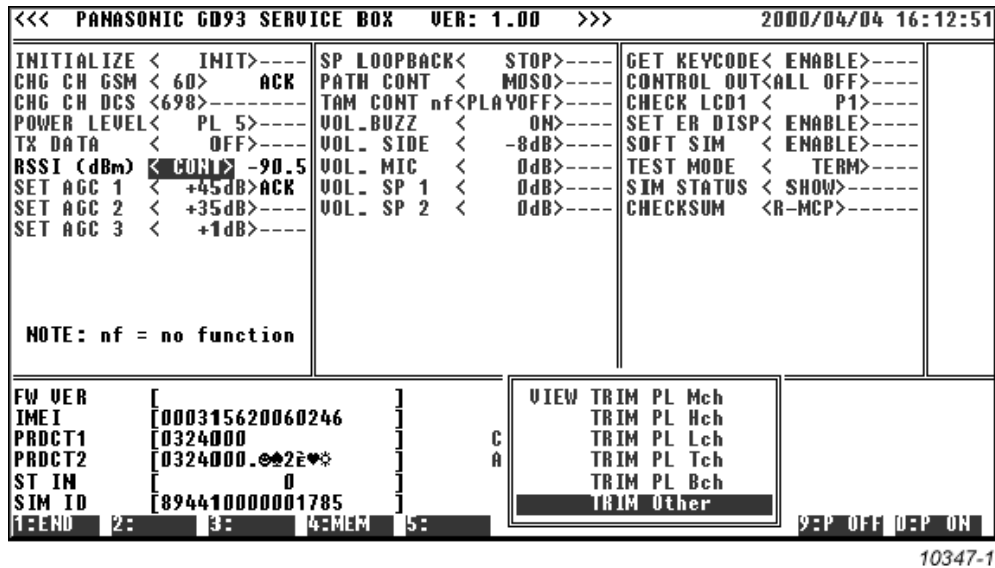


Figure 6.20: RSSI reading 1

8. Select TRIM OTHER and make a note of the RSSI COMP GSM reading.

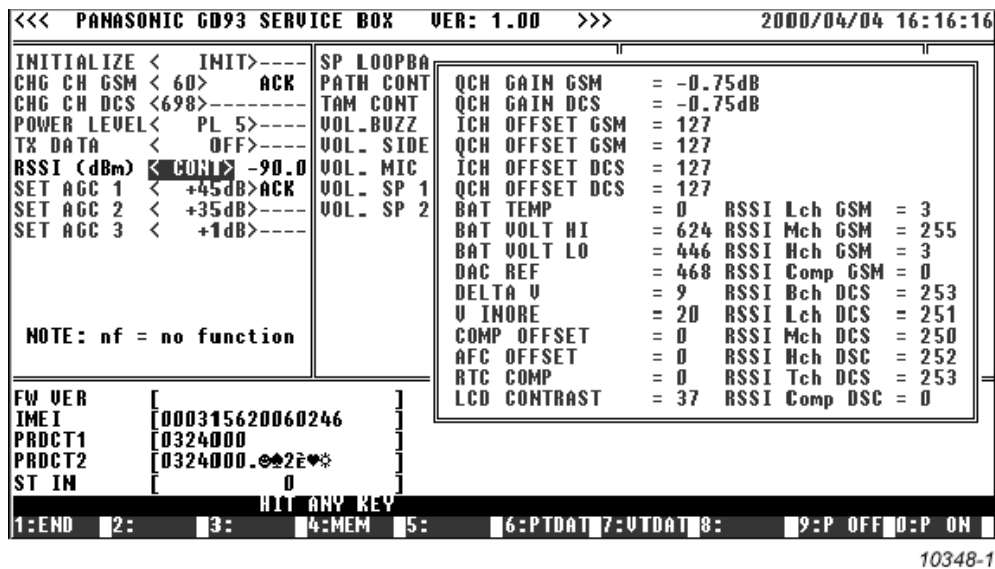


Figure 6.21: RSSI reading 2

9. Press ESC.  
 10. At the Channel box, press F6 to program data.

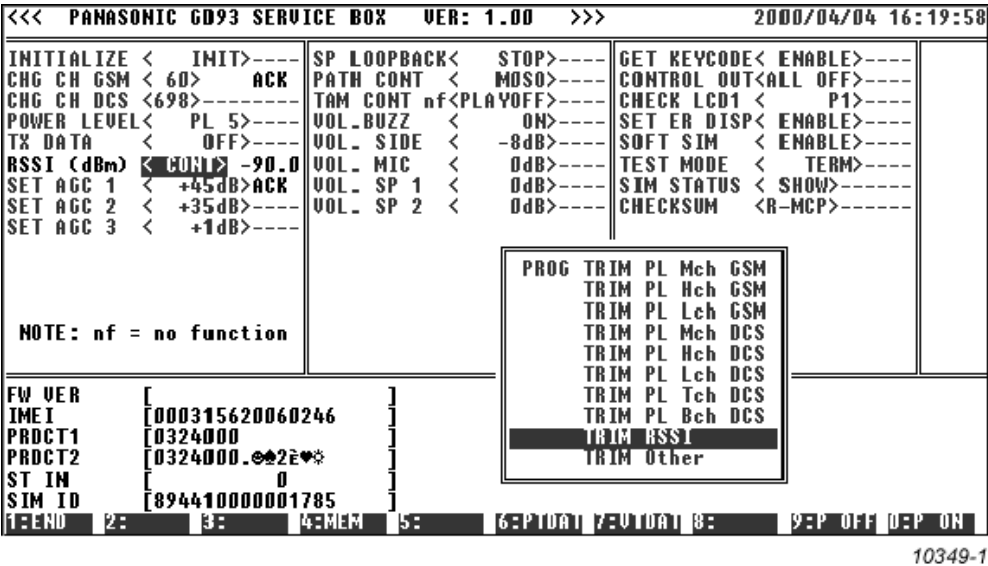


Figure 6.22: RSSI reading 3

- 11. Select TRIM RSSI and press ENTER.
- 12. Highlight RSSI Mch GSM and press ENTER.
- 13. Make the following calculation:  
RSSI Offset Value (step 8) + reading noted in step 6.  
Enter the result in to the RSSI Mch field.
- 14. Press ENTER.
- 15. Press ESC.
- 16. Measure the RSSI level again by highlighting the RSSI dBm field again and press ENTER.
- 17. Repeat steps 6 to 16 for both low / bottom and high / top channels.

| Channel  | GSM 900 |
|----------|---------|
| Low 1    | 60      |
| Mid      |         |
| High 111 |         |

- 18. Repeat steps 6 to 16 for GSM 1800 on the following channels with the SET AGC 1 field set to 51 dB:

| Channel    | GSM 1800 |
|------------|----------|
| Bottom 512 | 650      |
| Mid        |          |
| High 885   |          |

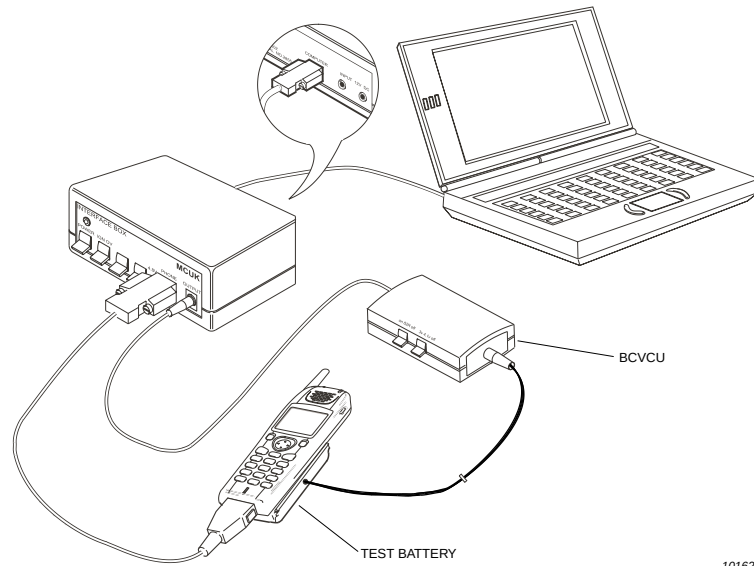
- 19. Save TRIM Data.

## 6.6.4. Battery Calibration

### Preliminaries

There are three procedures to calibrating the battery, voltage, temperature and charging calibration. A Battery Calibration Voltage Control Unit (BCVCU) is used to provide the necessary voltage levels for these checks. The BCVCU replaces the two regulated power supplies and 82 Ohm resistor required to calibrate previous mobile products.

1. Connect the telephone, test battery, BCVCU and Interface Box as shown in the diagram below.



10162-1

Figure 6.23: Battery calibration test connections

2. Set the Interface box to POWER ON, IGN and EXT PWR OFF.

### Voltage Calibration

1. Enter Test-Set mode in Service Channel Box.

|                                              |                          |                          |                     |    |                    |
|----------------------------------------------|--------------------------|--------------------------|---------------------|----|--------------------|
| <<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> |                          |                          | 2000/04/05 09:28:13 |    |                    |
| INITIALIZE < F4>-----                        | SP LOOPBACK< STOP>----   | GET KEYCODE< ENABLE>---- |                     |    |                    |
| CHG CH GSM < 62>-----                        | PATH CONT < MOS0>----    | CONTROL OUT<ALL OFF>---- |                     |    |                    |
| CHG CH DCS <698>-----                        | TAM CONT nf<PLAYOFF>---- | CHECK LCD1 < P1>----     |                     |    |                    |
| POWER LEVEL< PL 5>----                       | VOL_BUZZ < ON>----       | SET ER DISP< ENABLE>---- |                     |    |                    |
| TX DATA < OFF>----                           | VOL_SIDE < -8dB>----     | SOFT SIM < ENABLE>----   |                     |    |                    |
| RSSI (dBm) < CONT>----                       | VOL_MIC < 0dB>----       | TEST MODE < TERM>----    |                     |    |                    |
| SET AGC 1 < +69dB>----                       | VOL_SP 1 < 0dB>----      | SIM STATUS < SHOW>----   |                     |    |                    |
| SET AGC 2 < +35dB>----                       | VOL_SP 2 < 0dB>----      | CHECKSUM <R-MCP>----     |                     |    |                    |
| SET AGC 3 < +1dB>----                        |                          |                          |                     |    |                    |
| NOTE: nf = no function                       |                          |                          |                     |    |                    |
|                                              |                          |                          |                     |    |                    |
| FW VER                                       | [                        |                          |                     |    |                    |
| IMEI                                         | [                        | 000315620060246          |                     |    | MOBILE BOOT OK     |
| PRDCT1                                       | [                        | 0324000                  |                     |    |                    |
| PRDCT2                                       | [                        | 0324000.002200           |                     |    |                    |
| ST IM                                        | [                        | 0                        |                     |    |                    |
| SIM ID                                       | [                        | 894410000001785          |                     |    |                    |
| 1:END                                        | 2:                       | 3:                       | 4:MEM               | 5: | 6:PT0AT 7:UT0AT 8: |
|                                              |                          |                          |                     |    | 9:P OFF 0:P ON     |

10353-

10353-1

Figure 6.24: Battery calibration 1

2. Press F4 and select VIEW ADC LINES.
3. Observe the ADIN1 value. This value is BAT VOLT HIGH. If this reading is outside the range 564 - 664, then there is a fault and further investigation is required. Otherwise, record this value for later use.

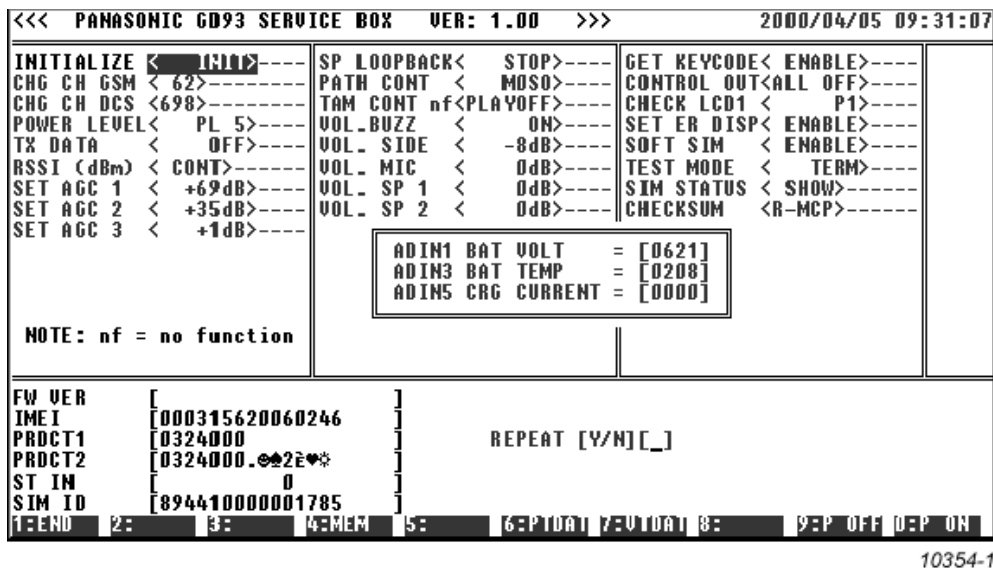


Figure 6.25: Battery calibration 2

4. Set VBAT to 3.0 V by selecting 3.0 V on the BCVCU.
5. On the PC, press 'Y' and then ENTER.
6. Check the ADIN1 reading again - this is the BAT VOLT LOW value. If the reading is outside the range 390 - 490, there is a fault and further investigation is required. Otherwise, record this value for use later.
7. Press 'N' in the {repeat yes / no box}, then press ENTER.
8. Press F6. Scroll down to, and select TRIM OTHER.
9. Scroll down to, and select BAT VOLT HIGH. Enter the value recorded in step 3.

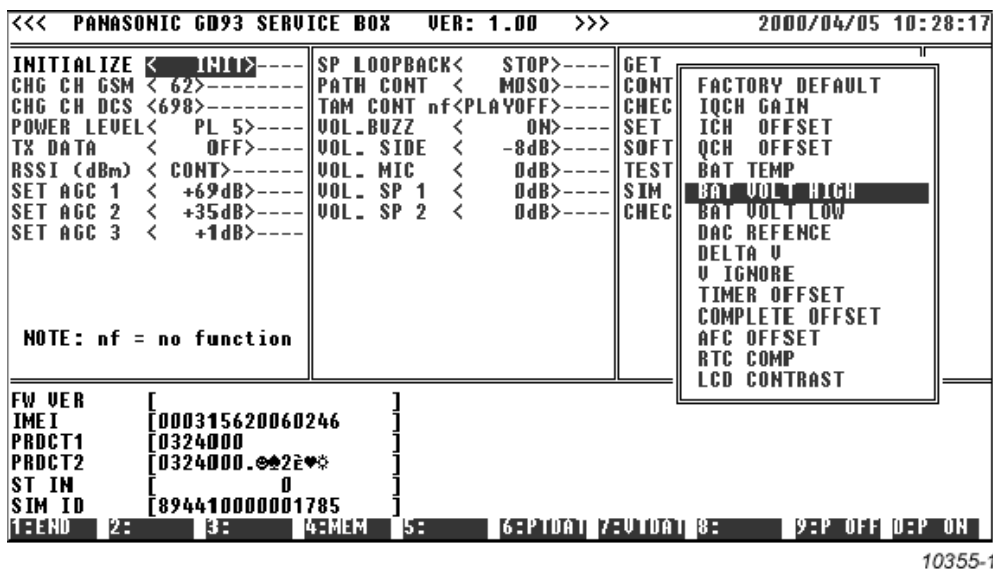


Figure 6.26: Battery Calibration 3

10. Press F6. Scroll down to TRIM OTHER and press ENTER.
11. Highlight BAT VOLT HIGH and press ENTER. Type in the value recorded in step 6.

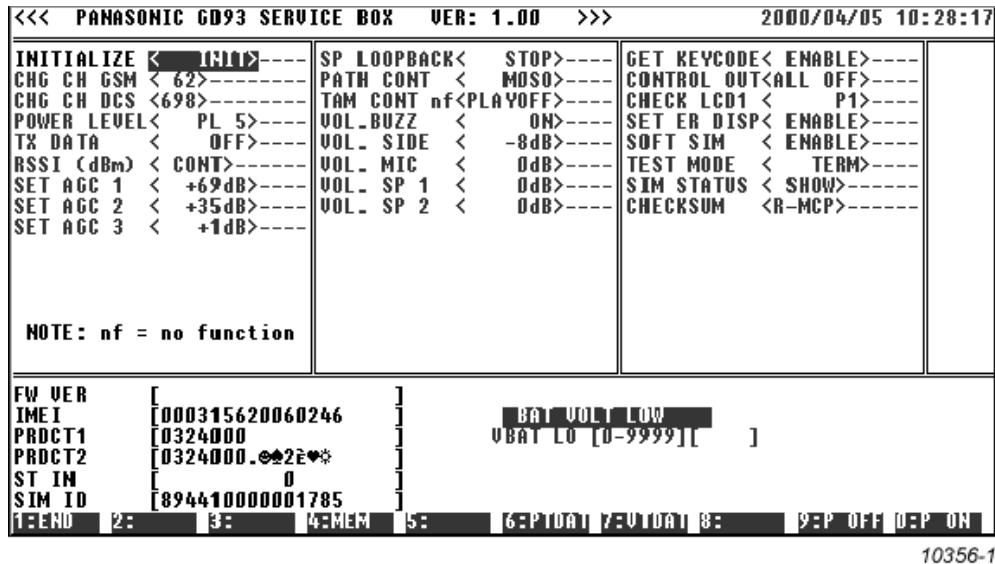


Figure 6.27: Battery calibration 4

- Set the BCVCU to 12 V.

### Temperature Calibration

- Ensure that VBAT is set to 4.1 V. Check that EXT PWR and IGN on the Interface Box is set to OFF.
- Scroll up the menu until CONTROL OUT is highlighted. Using the left / right cursor keys, highlight AADC ON and then press ENTER.
- Press F4 and select VIEW ADC LINES.
- Check the value for ADIN3 (BAT TEMP). If the value is outside the range 168 - 248, then there is a fault and further investigation is required. Otherwise, subtract this value from the theoretical value of 208 and record the result for later use.

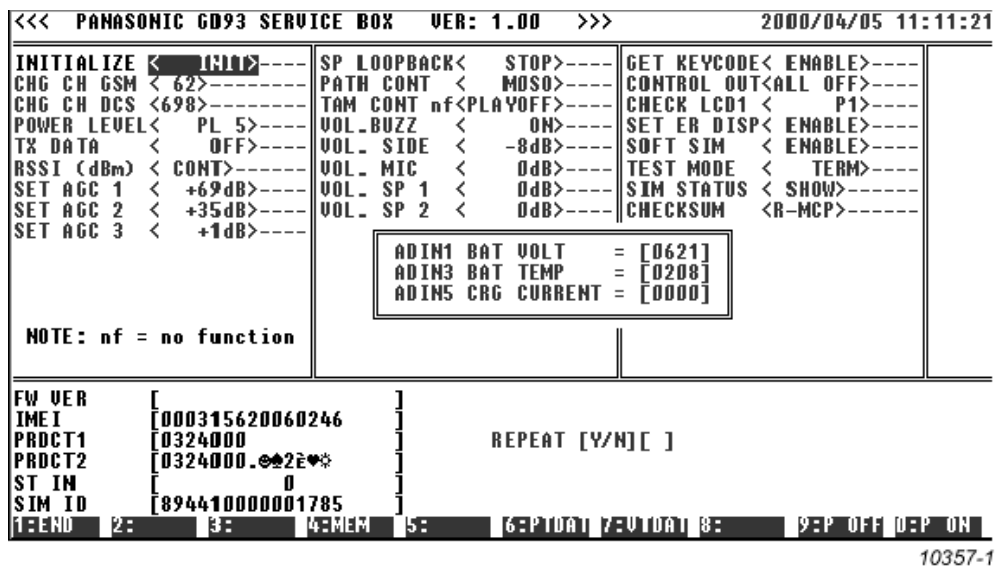


Figure 6.28: Temperature calibration 1

- Press 'N' in the {repeat yes/no box}, then press ENTER.
- Press F6. Scroll down and highlight TRIM OTHER. Press ENTER.
- Highlight BAT TEMP and press ENTER to select. Enter the value recorded in step 4.

```

<<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> 2000/04/05 11:23:26

INITIALIZE < 439>----- SP LOOPBACK< STOP>----- GET KEYCODE< ENABLE>-----
CHG CH GSM < 62>----- PATH CONT < MOSO>----- CONTROL OUT<ALL OFF>-----
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>----- CHECK LCD1 < P1>-----
POWER LEVEL< PL 5>----- VOL.BUZZ < ON>----- SET ER DISP< ENABLE>-----
TX DATA < OFF>----- VOL. SIDE < -8dB>----- SOFT SIM < ENABLE>-----
RSSI (dBm) < CONT>----- VOL. MIC < 0dB>----- TEST MODE < TERM>-----
SET AGC 1 < +69dB>----- VOL. SP 1 < 0dB>----- SIM STATUS < SHOW>-----
SET AGC 2 < +35dB>----- VOL. SP 2 < 0dB>----- CHECKSUM <R-MCP>-----
SET AGC 3 < +1dB>-----

NOTE: nf = no function

FW VER [000315620060246]
IMEI [0324000]
PRDCT1 [0324000.002E*]
PRDCT2 [0]
ST IN [894410000001785]
SIM ID [0]

1:END 2: 3: 4:MEM 5: 6:PTD 7:UTD 8: 9:P OFF 0:P ON
10358-1

```

Figure 6.29: Temperature calibration 2

### Charging Calibration

1. On the Interface Box, ensure that the EXT PWR switch is ON. Check that the BCVCU 82 Ohms switch is set to ON.
2. Holding down the Shift key, press F4. Select PROG CHARG-DAC DATA.

```

<<< PANASONIC GD93 SERVICE BOX VER: 1.00 >>> 2000/04/05 13:09:45

INITIALIZE < 439>----- SP LOOPBA PROG MEMORY ERASE >-----
CHG CH GSM < 62>----- PATH CONT AUX-DAC DATA >-----
CHG CH DCS <698>----- TAM CONT CHARG-DAC DATA >-----
POWER LEVEL< PL 5>----- VOL.BUZZ ERROR CODE FLAG >-----
TX DATA < OFF>----- VOL. SIDE LANGUAGES >-----
RSSI (dBm) < CONT>----- VOL. MIC CALL LIMIT >-----
SET AGC 1 < +69dB>----- VOL. SP 1 PRODUCT TYPE >-----
SET AGC 2 < +35dB>----- VOL. SP 2 CLOCK TIME DATE >-----
SET AGC 3 < +1dB>----- ULPD STATUS >-----
                                CHARGE MODE >-----
                                USER DEF KEY >-----

NOTE: nf = no function

FW VER [000315620060246]
IMEI [0324000]
PRDCT1 [0324000.002E*]
PRDCT2 [0]
ST IN [894410000001785]
SIM ID [0]

1:END 2: 3: 4:MEM 5: 6:PTD 7:UTD 8: 9:P OFF 0:P ON
10359-1

```

Figure 6.30: Charging calibration 1

3. Enter a value of 439.
4. Highlight CNTROL OUT and, using the left / right cursor keys, select CHAR ON. Press ENTER.

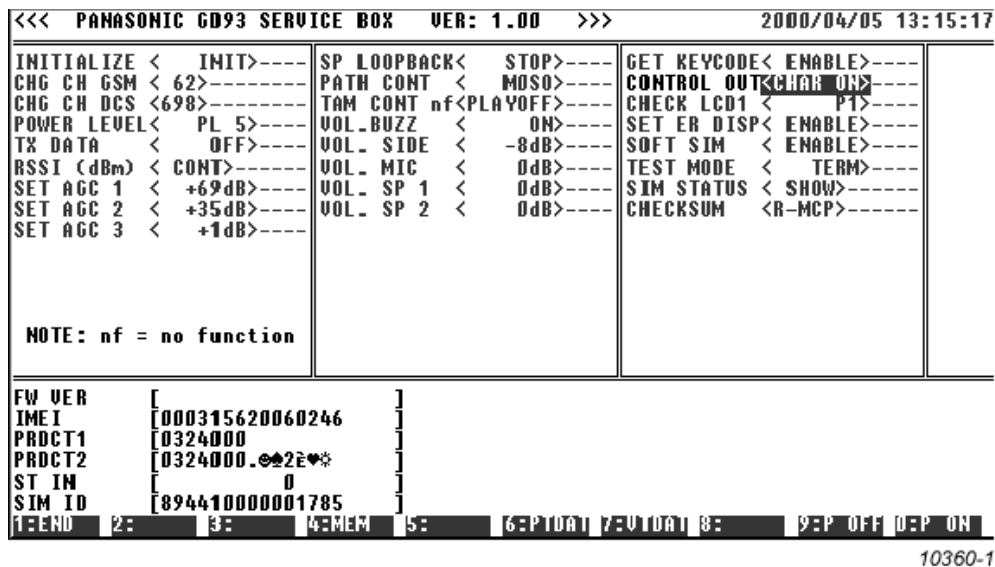


Figure 6.31: Charging Calibration 2

5. Disconnect VBAT by setting the BCVCU Voltage switch to OFF.
6. Measure the voltage across the Test Battery terminals. If the voltage is within the range 4.2 V  $\pm$  5 mV, proceed to step 11. Otherwise, calculate the difference (DAC STEP) as follows:  

$$\text{difference} = (\text{measured voltage} - 4.2 \text{ V}) / 7.4 \text{ mV}$$
7. Press Shift + F4.
8. Scroll down and select PROG CHARG-DAC DATA and enter the value calculated by subtracting the value recorded in step 6 from the initial CHARG-DAC DATA value (439).
9. Repeat steps 6 to 8 until the measured voltage is 4.2 V  $\pm$  5 mV.
10. If the final value is outside the range 342 - 542, then there is a fault and further investigation is required. Otherwise, record the value for use later.
11. Press F6. Highlight TRIM OTHER and press ENTER. Highlight DAC REFERENCE and press ENTER.

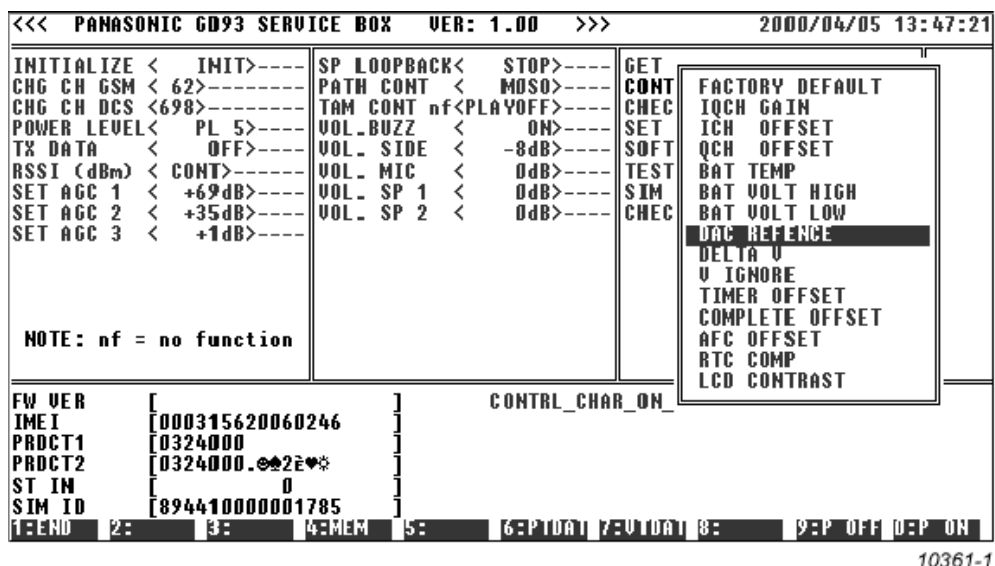


Figure 6.32: Charging calibration 3

12. Enter the value recorded in step 10.

```

<<<  PANASONIC GD93 SERVICE BOX  VER: 1.00  >>>          2000/04/05 13:47:21

INITIALIZE <  INIT>---- SP LOOPBACK<  STOP>---- GET KEYCODE<  ENABLE>----
CHG CH GSM < 62>----- PATH CONT <  MDS0>---- CONTROL OUT<  CHARG ON>ACK
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>---- CHECK LCD1 <  P1>----
POWER LEVEL<  PL 5>---- VOL.BUZZ <  ON>---- SET ER DISP<  ENABLE>----
TX DATA <  OFF>---- VOL. SIDE < -8dB>---- SOFT SIM <  ENABLE>----
RSSI (dBm) < CONT>---- VOL. MIC <  0dB>---- TEST MODE <  TERM>----
SET AGC 1 < +69dB>---- VOL. SP 1 <  0dB>---- SIM STATUS <  SHOW>----
SET AGC 2 < +35dB>---- VOL. SP 2 <  0dB>---- CHECKSUM <R-MCP>----
SET AGC 3 < +1dB>----

NOTE: nf = no function

FW VER [ 000315620060246 ]
IMEI [ 0324000 ]
PRDCT1 [ 0324000.002E* ]
PRDCT2 [ 0 ]
ST IN [ 894410000001785 ]
SIM ID [  ]
DAC REFERENCE
DAC Ref [0-9999][450 ]

F:END 2: 3: 4:MEM 5: 6:PTD1 7:UTD1 8: 9:P OFF 0:P ON

```

10362-1

Figure 6.33: Charging calibration 4

### Current Charging ADC Calibration

It is important to monitor the current when charging the Li-ion battery, both to protect against over-current and to determine when charging is complete. The telephone uses the VCC3 and MADC (ICHG) connections of OMEGA to measure charging current as an amplified voltage across a sense resistor.

**NOTE:** This calibration procedure *MUST* be carried out once Charging Voltage calibration has been completed.

1. Press F4 and select VIEW ADC LINES. Read ADIN5 (CRG CURRENT) and record this value.

```

<<<  PANASONIC GD93 SERVICE BOX  VER: 1.00  >>>          2000/04/05 15:08:16

INITIALIZE <  INIT>---- SP LOOPBACK<  STOP>---- GET KEYCODE<  ENABLE>----
CHG CH GSM < 62>----- PATH CONT <  MDS0>---- CONTROL OUT<  CHARG ON>ACK
CHG CH DCS <698>----- TAM CONT nf<PLAYOFF>---- CHECK LCD1 <  P1>----
POWER LEVEL<  PL 5>---- VOL.BUZZ <  ON>---- SET ER DISP<  ENABLE>----
TX DATA <  OFF>---- VOL. SIDE < -8dB>---- SOFT SIM <  ENABLE>----
RSSI (dBm) < CONT>---- VOL. MIC <  0dB>---- TEST MODE <  TERM>----
SET AGC 1 < +69dB>---- VOL. SP 1 <  0dB>---- SIM STATUS <  SHOW>----
SET AGC 2 < +35dB>---- VOL. SP 2 <  0dB>---- CHECKSUM <R-MCP>----
SET AGC 3 < +1dB>----

NOTE: nf = no function

ADIN1 BAT VOLT = [0623]
ADIN3 BAT TEMP = [0000]
ADIN5 CRG CURRENT = [0129]

FW VER [ 000315620060246 ]
IMEI [ 0324000 ]
PRDCT1 [ 0324000.002E* ]
PRDCT2 [ 0 ]
ST IN [ 894410000001785 ]
SIM ID [  ]
REPEAT [Y/N][_]

F:END 2: 3: 4:MEM 5: 6:PTD1 7:UTD1 8: 9:P OFF 0:P ON

```

10363-1

Figure 6.34: ADC Calibration

2. If this value is outside the range 101 - 251, then there is a fault and further investigation is required. Otherwise, calculate the difference between the recorded value and the theoretical value of 161. Record this value for use later.
3. Press F6 and select TRIM OTHER. Select COMP OFFSET and enter the value recorded in step 2.
4. Press F9. Wait for the prompt "Saving EV Trim data" to disappear, turn OFF the power supplies and disconnect the telephone.

## 7 REPLACEMENT PARTS LIST

### 7.1. Exploded Diagrams

#### 7.1.1. Case and Cover Assemblies

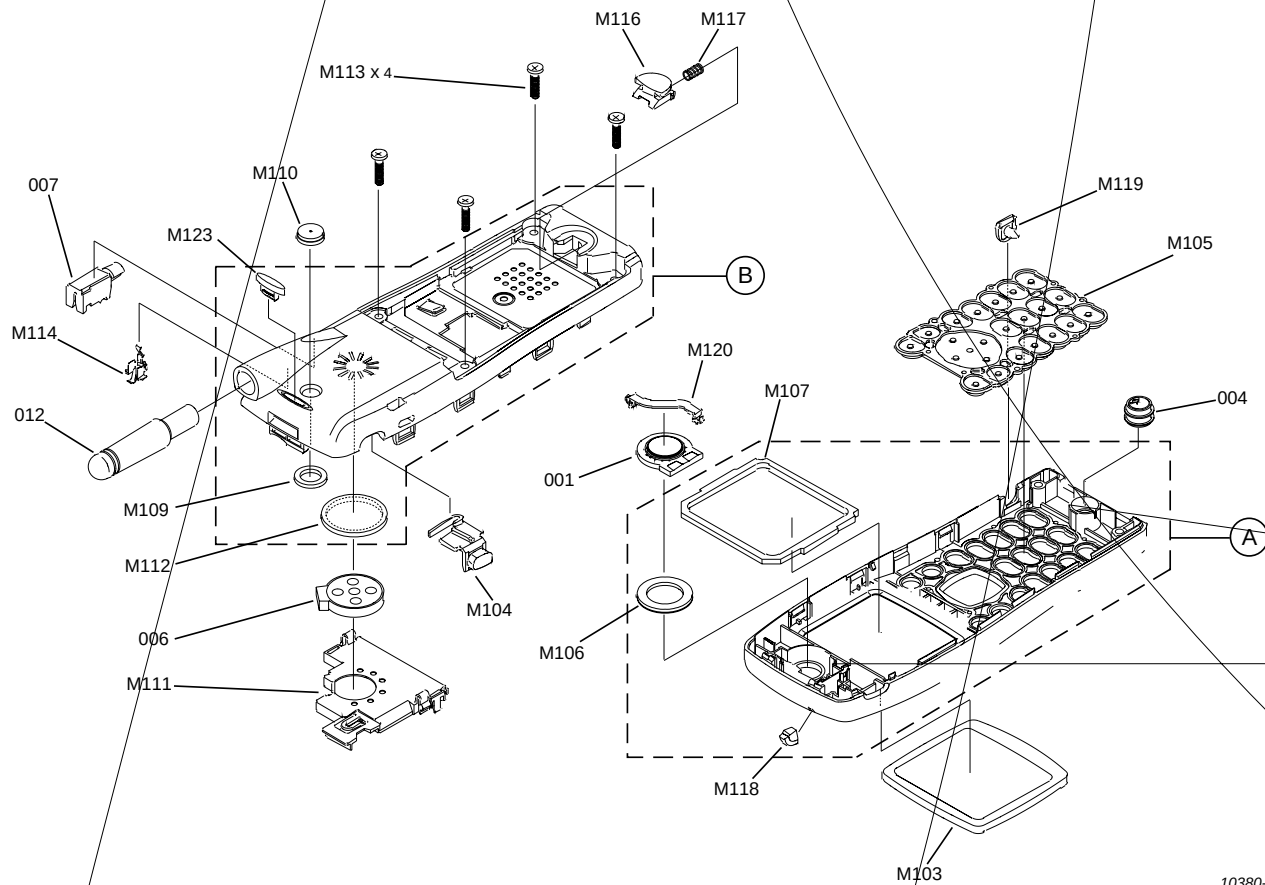
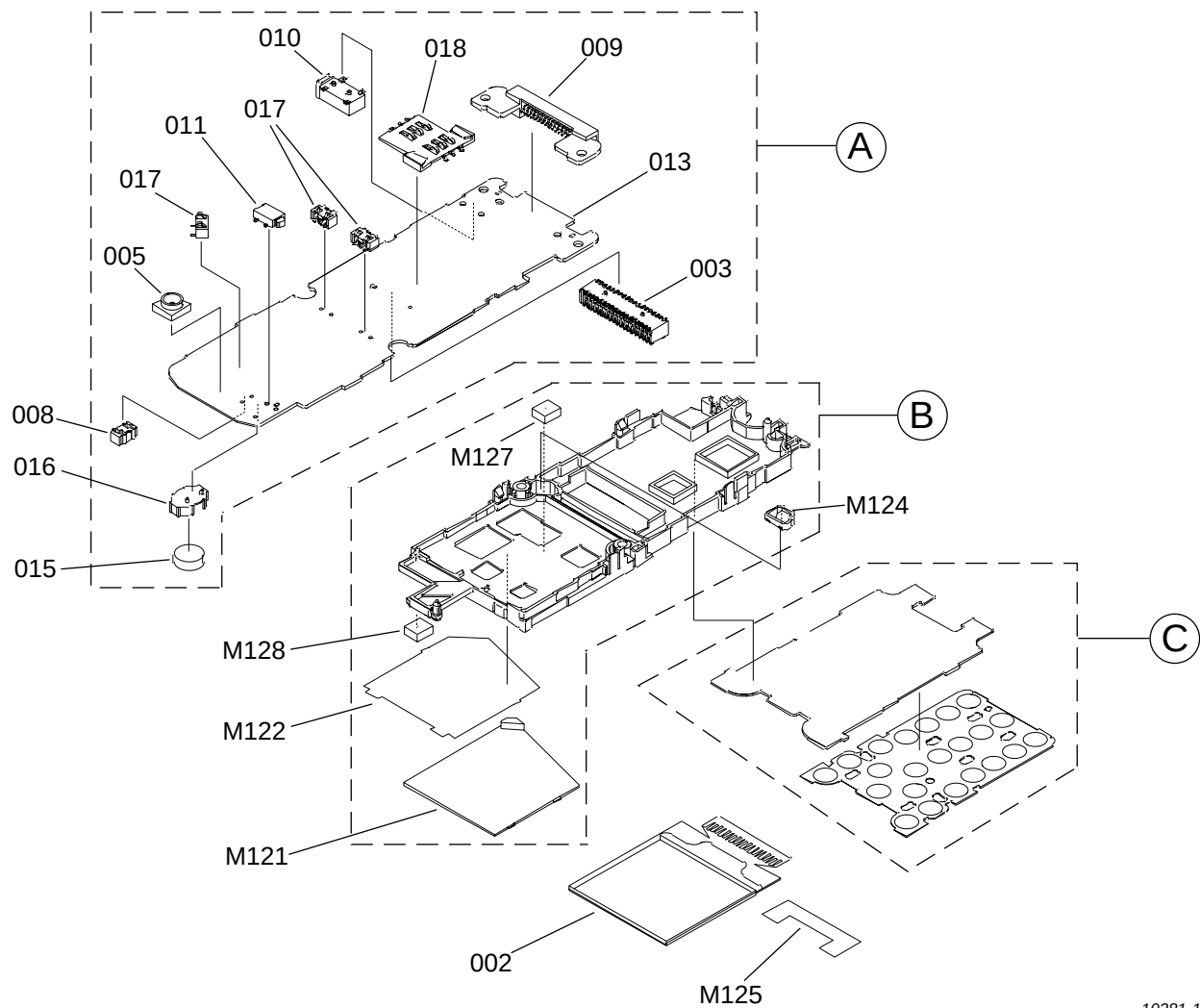


Figure 7.1: Case Parts

10380-1

| Ref    | Part Number                 | Description                | Ref  | Part Number | Description         |
|--------|-----------------------------|----------------------------|------|-------------|---------------------|
| A<br>A | GD93CVR01Y                  | Front Cover Assy, Silver   | M111 | 4JA587A     | RF SHIELD CASE      |
|        | GD93CVR01T                  | Front Cover Assy, Titanium | M113 | 3Z70054B    | SCREW, M1.6 x 6mm   |
|        | includes:                   |                            | M114 | 4HA532A     | ANTENNA CONTACT     |
|        | RECEIVER CUSHION (M106)     |                            | M116 | 2AA503AABA  | BATTERY HOOK, GREY  |
|        | LCD CUSHION (M107)          |                            | M117 | 4N70042A    | HOOK SPRING         |
|        | ALERT LED LENS (M118)       |                            |      |             |                     |
| B<br>B | GD93CAS01Y                  | Case Assembly, Silver      | M118 | 2QA588A     | ALERT LED LENS      |
|        | GD93CAS01T                  | Case Assembly, Titanium    | M119 | 4CA520AABA  | H/S JACK CAP, GREY  |
|        | includes:                   |                            | M120 | 2RA592A     | RECEIVER HOLDER     |
|        | RF CONNECTOR CUSHION (M109) |                            | 001  | HH76016A    | RECEIVER            |
|        | SPEAKER CUSHION (M112)      |                            | 004  | 9ZA791A     | MICROPHONE UNIT     |
|        | BACK CASE LENS (M123)       |                            | 006  | HS76006A    | DTHF SPEAKER        |
| M103   | 2EA575AAAA                  | LCD PANEL                  | 007  | BD76012A    | VIBRATE MOTOR UNIT  |
| M104   | 2CA517AAAA                  | MEMO KEY, GREY             | 012  | AN76097AABA | ANTENNA, LIGHT GREY |
| M105   | 6TA558AAAA                  | KEYPAD, GREY               |      |             |                     |
| M110   | 6RA507AADA                  | RF CONNECTOR CAP, GREY     |      |             |                     |

7.1.2. Sub-Assemblies



10381-1

Figure 7.2: Sub-Assemblies

| Ref         | Part Number       | Description         |
|-------------|-------------------|---------------------|
| A           | See Section 7.2.1 | MAIN BOARD ASSEMBLY |
| B           | LNLU100211        | CHASSIS             |
| Comprising: |                   |                     |
| M121        | 2QA590A           | LIGHT PIPE          |
| M122        | 6DA526A           | REFLECTOR SHEET     |
| M124        | 2QA591A           | CUSHION, REFLECTOR  |
| M127        | 6JA758A           | CHASSIS CUSHION     |
| M128        | 6JA759A           | CHASSIS CUSHION-2   |
| C           | GD93KPCB01        | KEYPAD PCB ASSEMBLY |
| M125        | 6JA771A           | LCD TAPE            |

| Ref | Part Number  | Description                 |
|-----|--------------|-----------------------------|
| 002 | AA7603A      | LCD MODULE                  |
| 003 | PY76036B     | INTER-BOARD CONNECTOR       |
| 005 | PY6037B      | EXTERNAL RF CONNECTOR       |
| 008 | 4FA018ZAJ    | BTM CONNECTOR               |
| 009 | JA76026A     | I/O CONNECTOR               |
| 010 | JC76001A     | H/S JACK SOCKET             |
| 011 | EVQPSR02K    | MEMO KEY SWITCH             |
| 015 | ML616S       | BACK-UP BATTERY             |
| 016 | K3ZZ00200009 | BACK-UP BATTERY HOLDER      |
| 017 | PY70641A     | BATTERY / SPEAKER CONNECTOR |
| 018 | JS76002A     | SIM CONNECTOR               |

## 7.2. Printed Circuit Boards (PCBs)

### 7.2.1. Main PCB: Variants

| Model EB-GD93 |             | Name: Main PCB Variants    |
|---------------|-------------|----------------------------|
| Ref           | Part Number | Description                |
|               | GD93BRD001  | MAIN PCB STANDARD PROGRAM  |
|               | GD93BRD002  | MAIN PCB BINARING PROGRAM  |
|               | GD93BRD003  | MAIN PCB CELCOM PROGRAM    |
|               | GD93BRD004  | MAIN PCB AIRTEL PROGRAM    |
|               | GD93BRD005  | MAIN PCB EUROTTEL PROGRAM  |
|               | GD93BRD006  | MAIN PCB MOVISTAR PROGRAM  |
|               | GD93BRD007  | MAIN PCB S.F.R. PROGRAM    |
|               | GD93BRD008  | MAIN PCB WESTEL PROGRAM    |
|               | GD93BRD009  | MAIN PCB HUTCHISON PROGRAM |
|               | GD93BRD010  | MAIN PCB PLUS GSM PROGRAM  |
|               | GD93BRD011  | MAIN PCB TURKCELL PROGRAM  |
|               | GD93BRD012  | MAIN PCB FRANCETEL PROGRAM |
|               | GD93BRD013  | MAIN PCB FT FTMS PROGRAM   |
|               | GD93BRD014  | MAIN PCB TELESTET PROGRAM  |
|               | GD93BRD015  | MAIN PCB ACTIVA PROGRAM    |
|               | GD93BRD016  | MAIN PCB TMN PROGRAM       |
|               | GD93BRD017  | MAIN PCB PANNON PROGRAM    |
|               | GD93BRD018  | MAIN PCB VODACOM PROGRAM   |
|               | GD93BRD019  | MAIN PCB NETCOM PROGRAM    |
|               | GD93BRD020  | MAIN PCB K.P.N. PROGRAM    |
|               | GD93BRD021  | MAIN PCB MOBILCOM PROGRAM  |
|               | GD93BRD022  | MAIN PCB TELESTRA PROGRAM  |

| Model EB-GD93 |             | Name: Main PCB Variants             |
|---------------|-------------|-------------------------------------|
| Ref           | Part Number | Description                         |
|               | GD93BRD023  | MAIN PCB E.R.A. PROGRAM             |
|               | GD93BRD024  | MAIN PCB PAYT VODAFONE PROGRAM      |
|               | GD93BRD025  | MAIN PCB CHINESE ENABLED PROGRAM    |
|               | GD93BRD026  | MAIN PCB TMN PROGRAM                |
|               | GD93BRD027  | MAIN PCB PAEGAS PROGRAM             |
|               | GD93BRD028  | MAIN PCB EUROTTEL CZ CONTRACT PROGR |
|               | GD93BRD029  | MAIN PCB MOVISTAR ACTIVA PROGRAM    |
|               | GD93BRD030  | MAIN PCB DIGIFONE PROGRAM           |
|               | GD93BRD031  | MAIN PCB SFR CONTRACT PROGRAM       |
|               | GD93BRD032  | MAIN PCB SFR PRE-PAID PROGRAM       |
|               | GD93BRD033  | MAIN PCB AIRTEL PRE-PAID PROGRAM    |
|               | GD93BRD034  | MAIN PCB SONOFON PROGRAM            |
|               | GD93BRD035  | MAIN PCB SINGTEL PROGRAM            |

## 7.2.2. GD93 Main PCB

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C101          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | F2    |
| C104          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | E2    |
| C105          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | E2    |
| C106          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | F1    |
| C107          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | F1    |
| C108          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | A4    |
| C109          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | F2    |
| C112          | F1G1HR50A391 | CAP CER 0.5pF +/-0.25pF 50V NP | F2    |
| C113          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | A3    |
| C114          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | A3    |
| C116          | F3F1A1560001 | CAP TANT 15uF 20% 10V SMD CASE | E2    |
| C117          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | E2    |
| C118          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | E2    |
| C122          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | B4    |
| C123          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | E2    |
| C125          | ECUE1E681KBQ | CAP CER 680pF 10% 25V X7R SMD  | D2    |
| C127          | F3F1A1060005 | CAP TANT 10uF 20% 10V SMD CASE | B4    |
| C129          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | B4    |
| C131          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | D2    |
| C132          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | E1    |
| C133          | F1G1H270A409 | CAP CER 27pF 5% 50V NP0 SMD 10 | B3    |
| C134          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | E1    |
| C135          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | E1    |
| C136          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | B4    |
| C137          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | E1    |
| C138          | F1H1E223A029 | CAP CER 22nF 10% 25V X7R SMD 1 | E1    |
| C139          | ECUE1H391KBQ | CAP CER 390pF 10% 50V X7R SMD  | B3    |
| C141          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B3    |
| C142          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B3    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C143          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | B3    |
| C144          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B3    |
| C145          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B3    |
| C146          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | B3    |
| C148          | F1G1C1030002 | CAP CER 10nF 10% 16V X7R SMD 1 | B3    |
| C152          | ECUE1H121JCQ | CAP CER 120pF 5% 50V NP0 SMD 1 | E1    |
| C153          | ECUE1H121JCQ | CAP CER 120pF 5% 50V NP0 SMD 1 | E1    |
| C154          | ECUE1H151JCQ | CAP CER 150pF 5% 50V NP0 SMD 1 | E1    |
| C155          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | E1    |
| C156          | F1G1H1R5A391 | CAP CER 1.5pF +/-0.25pF 50V NP | E1    |
| C157          | F1G1H6R0A406 | CAP CER 6pF +/-0.5pF 50V NP0 S | E1    |
| C158          | ECUE1E221KBQ | CAP CER 220pF 10% 25V X7R SMD  | E1    |
| C159          | F1G1H1R5A391 | CAP CER 1.5pF +/-0.25pF 50V NP | E1    |
| C161          | F1G1C1030002 | CAP CER 10nF 10% 16V X7R SMD 1 | E1    |
| C162          | ECUE1E681KBQ | CAP CER 680pF 10% 25V X7R SMD  | E1    |
| C163          | ECUE1E681KBQ | CAP CER 680pF 10% 25V X7R SMD  | E1    |
| C164          | ECUE1E221KBQ | CAP CER 220pF 10% 25V X7R SMD  | E1    |
| C201          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | B3    |
| C202          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | F1    |
| C204          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | B3    |
| C205          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | B4    |
| C206          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | B4    |
| C207          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C208          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | B4    |
| C209          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C211          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | B4    |
| C211          | G1CR22J00006 | INDUCTOR 220nH 5% SMD 1608     | B4    |
| C212          | F1G1H4R0A404 | CAP CER 4pF +/-0.25pF 50V NP0  | B4    |
| C213          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | B4    |
| C214          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C215          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | B4    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C216          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | B4    |
| C217          | F1G1H1R5A391 | CAP CER 1.5pF +/-0.25pF 50V NP | B4    |
| C219          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | B4    |
| C223          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | B4    |
| C224          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | B4    |
| C225          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C226          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C227          | F1G1H2R0A391 | CAP CER 2pF +/-0.25pF 50V NP0  | B4    |
| C228          | F1G1H5R0A404 | CAP CER 5pF +/-0.25pF 50V NP0  | C4    |
| C229          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | C4    |
| C230          | F1G1H6R0A406 | CAP CER 6pF +/-0.5pF 50V NP0 S | C4    |
| C231          | F1G1H6R0A406 | CAP CER 6pF +/-0.5pF 50V NP0 S | C4    |
| C232          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B3    |
| C234          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C235          | ECUE1H151JCQ | CAP CER 150pF 5% 50V NP0 SMD 1 | B4    |
| C236          | F1G1H1R0A391 | CAP CER 1pF +/-0.25pF 50V NP0  | C4    |
| C301          | ECUE1H122KBQ | CAP CER 1.2nF 10% 50V X7R SMD  | C4    |
| C302          | F1J1E1030005 | CAP CER 10nF 10% 25V X7R SMD 2 | C3    |
| C303          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | B3    |
| C304          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B3    |
| C305          | ECUE1E221KBQ | CAP CER 220pF 10% 25V X7R SMD  | B3    |
| C306          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | B3    |
| C307          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | B3    |
| C308          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C309          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | C4    |
| C310          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B4    |
| C311          | F1G1E1020001 | CAP CER 1nF 10% 25V X7R SMD 10 | B4    |
| C312          | F1G1C1030002 | CAP CER 10nF 10% 16V X7R SMD 1 | C4    |
| C313          | F1G1E1820001 | CAP CER 1.8nF 10% 25V X7R SMD  | C4    |
| C314          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | C4    |
| C315          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | C4    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C316          | ECUE1H151JCQ | CAP CER 150pF 5% 50V NP0 SMD 1 | C4    |
| C320          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | C3    |
| C321          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | C3    |
| C322          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | B3    |
| C323          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | B3    |
| C324          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | B3    |
| C353          | F1G1C1030002 | CAP CER 10nF 10% 16V X7R SMD 1 | C3    |
| C355          | F1G1E1020001 | CAP CER 1nF 10% 25V X7R SMD 10 | C4    |
| C357          | F1G1C1030002 | CAP CER 10nF 10% 16V X7R SMD 1 | C3    |
| C358          | F1G1E1020001 | CAP CER 1nF 10% 25V X7R SMD 10 | C3    |
| C360          | ECUE1H680JCQ | CAP CER 68pF 5% 50V NP0 SMD 10 | C3    |
| C392          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 |       |
| C401          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | D2    |
| C402          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | D2    |
| C403          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | D1    |
| C404          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | D1    |
| C405          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | D1    |
| C406          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | D1    |
| C407          | F1G1H3R0A442 | CAP CER 3pF +/-0.25pF 50V NP0  | C4    |
| C408          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | C4    |
| C409          | F3F1A1060005 | CAP TANT 10uF 20% 10V SMD CASE | C4    |
| C410          | F1G1H5R0A404 | CAP CER 5pF +/-0.25pF 50V NP0  | D2    |
| C605          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | D1    |
| C606          | F1H1A1050019 | CAP CER 1uF 10% 10V X7R SMD 16 | D3    |
| C607          | F1H1A1050019 | CAP CER 1uF 10% 10V X7R SMD 16 | D3    |
| C608          | F1H1A1050019 | CAP CER 1uF 10% 10V X7R SMD 16 | D3    |
| C609          | F1H1A1050019 | CAP CER 1uF 10% 10V X7R SMD 16 | C4    |
| C610          | F1H1A1050019 | CAP CER 1uF 10% 10V X7R SMD 16 | C3    |
| C611          | F1J1A1050011 | CAP CER 1uF 10% 10V X5R SMD 20 | D3    |
| C612          | F1J1A1050011 | CAP CER 1uF 10% 10V X5R SMD 20 | D3    |
| C613          | F1J1A1050011 | CAP CER 1uF 10% 10V X5R SMD 20 | D4    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C614          | F1J1A1050011 | CAP CER 1uF 10% 10V X5R SMD 20 | D4    |
| C615          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | E3    |
| C616          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C1    |
| C617          | F1G1E2720001 | CAP CER 2.7nF 10% 25V X7R SMD  | E3    |
| C618          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | E3    |
| C619          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | E3    |
| C620          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B1    |
| C621          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C1    |
| C622          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | D3    |
| C623          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | E3    |
| C624          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | D3    |
| C625          | F3E0G2260003 | CAP TANT 22uF 20% 4V SMD CASE  | D3    |
| C626          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | D3    |
| C627          | F3E1A4750001 | CAP TANT 4.7uF 20% 10V SMD CAS | D3    |
| C628          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | D3    |
| C630          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | A3    |
| C631          | F1G1H100A406 | CAP CER 10pF +/-0.5pF 50V NP0  | A3    |
| C632          | F1G1E2220001 | CAP CER 2.2nF 10% 25V X7R SMD  | D3    |
| C633          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | A1    |
| C634          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A1    |
| C635          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | E3    |
| C638          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C639          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C640          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F3    |
| C641          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C642          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C643          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F3    |
| C644          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C645          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | A3    |
| C646          | F1G1H6R0A406 | CAP CER 6pF +/-0.5pF 50V NP0 S | A2    |
| C647          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C649          | F1G1H150A409 | CAP CER 15pF 5% 50V NP0 SMD 10 | B2    |
| C650          | F1G1H270A409 | CAP CER 27pF 5% 50V NP0 SMD 10 | A3    |
| C651          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A3    |
| C652          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | A3    |
| C654          | F1G1H270A409 | CAP CER 27pF 5% 50V NP0 SMD 10 | A3    |
| C657          | F1G1C3330001 | CAP CER 33nF 10% 16V X5R SMD 1 | B2    |
| C658          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | B2    |
| C660          | F1G1C3330001 | CAP CER 33nF 10% 16V X5R SMD 1 | B2    |
| C661          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | E4    |
| C662          | F1J1A4750004 | CAP CER 4.7uF -20+80% 10V Y5V  | E4    |
| C663          | F1H1A224A006 | CAP CER 220nF 10% 10V X7R SMD  | E3    |
| C664          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | C1    |
| C668          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C1    |
| C669          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C671          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | D4    |
| C672          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | E4    |
| C674          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | E4    |
| C675          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | E4    |
| C676          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | D4    |
| C677          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A1    |
| C678          | F3F1A1560001 | CAP TANT 15uF 20% 10V SMD CASE | D4    |
| C681          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C683          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C2    |
| C685          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C687          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C689          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C2    |
| C691          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C4    |
| C696          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | A1    |
| C699          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A1    |
| C700          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A1    |
| C701          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | D3    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| C702          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | A1    |
| C703          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | A1    |
| C704          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | F4    |
| C705          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C706          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | A2    |
| C707          | ECUE1H101JCQ | CAP CER 100pF 5% 50V NP0 SMD 1 | A2    |
| C708          | ECUE1E331KBQ | CAP CER 330pF 10% 25V X7R SMD  | A2    |
| C709          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | A4    |
| C710          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | E4    |
| C711          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C713          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | B2    |
| C714          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C1    |
| C716          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | C1    |
| C717          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C721          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | D3    |
| C722          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | B1    |
| C723          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | B1    |
| C724          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | B1    |
| C725          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | D1    |
| C726          | ECUE1H330JCQ | CAP CER 33pF 5% 50V NP0 SMD 10 | E3    |
| C727          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | F4    |
| C728          | F1H0J1050009 | CAP CER 1uF 10% 6.3V X5R SMD 1 | E3    |
| C729          | F1G1A104A012 | CAP CER 100nF 10% 10V X5R SMD  | D4    |
| C730          | F1G1H220A409 | CAP CER 22pF 5% 50V NP0 SMD 10 | D2    |
| C902          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | E3    |
| C903          | ECUE1H470JCQ | CAP CER 47pF 5% 50V NP0 SMD 10 | E3    |
| C999          | ECST0JZ106R  | CAP TANT 10uF 20% 6.3V SMD CAS | E4    |
| CN101         | PY76037A     | CONNECTOR RF (FOR GD52/92)     | F1    |
| CN601         | PY76036B     | CONNECTOR BOARD TO BOARD 33 PI | D4    |
| CN602         | JC76001A     | CONNECTOR AUDIO JACK SKT 2.5mm | F3    |
| CN603         | K3ZZ00200009 | HOLDER FOR BATTERY CELL        | A4    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| CN604         | JA76026A     | CONNECTOR I/O 14 WAY SMD       | A1    |
| CN605         | PY76041A     | CONNECTOR BATTERY 2 PIN 2A SMD | F1    |
| CN606         | PY76041A     | CONNECTOR BATTERY 2 PIN 2A SMD | D2    |
| CN607         | PY76041A     | CONNECTOR BATTERY 2 PIN 2A SMD | D1    |
| D602          | MAZS0470GL   | DIODE MAZS0470G ZENER 4.7V SMD | A3    |
| D603          | MAZS0470GL   | DIODE MAZS0470G ZENER 4.7V SMD | A3    |
| D604          | B0BD6R800004 | DIODE UMZ6.8EN ZENER 6.8V QUAD | D4    |
| D605          | B0JCMC000004 | DIODE RB491DT146 SCHOTTKY 20V  | D4    |
| D608          | MAZS0750ML   | DIODE MAZS0750ML ZENER 7.5V SM | A2    |
| D609          | B0BD6R800004 | DIODE UMZ6.8EN ZENER 6.8V QUAD | A1    |
| D610          | B0BD6R800004 | DIODE UMZ6.8EN ZENER 6.8V QUAD | A2    |
| D612          | MAZS0750ML   | DIODE MAZS0750ML ZENER 7.5V SM | A2    |
| D614          | B0JCDD000001 | DIODE RB521S-30 SCHOTTKY 30V 2 | A2    |
| D618          | MAZS0470GL   | DIODE MAZS0470G ZENER 4.7V SMD | A1    |
| D619          | MA2S11100L   | DIODE MA2S111 80V 100mA SMD SS | A3    |
| D620          | MAZS0470GL   | DIODE MAZS0470G ZENER 4.7V SMD | F3    |
| D621          | MAZS0470GL   | DIODE MAZS0470G ZENER 4.7V SMD | F3    |
| D623          | B0JCDC000001 | DIODE RB520S-30 SCHOTTKY 30V 2 | E4    |
| D624          | B0JCDD000001 | DIODE RB521S-30 SCHOTTKY 30V 2 | E4    |
| D625          | B0JCDD000001 | DIODE RB521S-30 SCHOTTKY 30V 2 | C1    |
| D626          | B0JCDC000001 | DIODE RB520S-30 SCHOTTKY 30V 2 | D3    |
| D627          | B0JCDC000001 | DIODE RB520S-30 SCHOTTKY 30V 2 | F3    |
| D628          | B0JCDC000001 | DIODE RB520S-30 SCHOTTKY 30V 2 | F4    |
| D629          | B0JDAE000003 | DIODE RB715W SCHOTTKY 40V 30mA |       |
| DS601         | LNJ717W800MC | DIODE LNJ717W800MC LED GREEN/O | C3    |
| DS603         | LNJ115W8PRA  | DIODE LED GREEN/RED 10mA SMD 1 | A4    |
| DS901         | B3AEB0000007 | DIODE LED BLUE DB1111C-13-TR S | F1    |
| E101          | B9Z000000018 | COUPLER 897.5 MHz SMD 2012 6PI | E2    |
| FL101         | EXCML16A270U | SUPPRESSOR EMI 27 OHM 4A SMD 1 | B4    |
| FL102         | EXCML16A270U | SUPPRESSOR EMI 27 OHM 4A SMD 1 | E2    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| FL201         | EFCH9418MTYF | FILTER SAW RX GSM/PCN SMD      | B3    |
| FL202         | J0E1847B0002 | FILTER DUAL LC RX SMD          | B4    |
| FL203         | EFCH225MDQA2 | FILTER IF SAW 225MHz SMD       | C4    |
| FL601         | J0JAC0000011 | SUPPRESSOR EMI FERRITE 1K OHM  | A1    |
| L102          | G1C3N9Z00004 | INDUCTOR 3.9nH +/-0.3nH SMD 10 | E2    |
| L104          | G1C33NJ00009 | INDUCTOR 33nH 5% SMD 1005      |       |
| L105          | ELJRE3N3DF2  | INDUCTOR 3.3nH +/-0.3nH SMD 16 | A3    |
| L108          | G1C10NJ00008 | INDUCTOR 10nH 5% SMD 1005      |       |
| L151          | G1C5N6Z00005 | INDUCTOR 5.6nH +/-0.3nH SMD 10 | E1    |
| L152          | G1C15NJ00008 | INDUCTOR 15nH 5% SMD 1005      | E1    |
| L201          | G1C10NJ00008 | INDUCTOR 10nH 5% SMD 1005      | B3    |
| L203          | G1C2N7Z00007 | INDUCTOR 2.7nH +/-0.3nH SMD 10 | B4    |
| L204          | G1C8N2J00004 | INDUCTOR 8.2nH 5% SMD 1005     | B4    |
| L205          | G1C6N8J00004 | INDUCTOR 6.8nH 5% SMD 1005     | B4    |
| L206          | G1C5N6Z00005 | INDUCTOR 5.6nH +/-0.3nH SMD 10 | B4    |
| L208          | G1C5N6Z00005 | INDUCTOR 5.6nH +/-0.3nH SMD 10 | B4    |
| L209          | G1C82NJ00010 | INDUCTOR 82nH 5% SMD 1005      | B4    |
| L210          | G1C82NJ00010 | INDUCTOR 82nH 5% SMD 1005      | B4    |
| L212          | ELJRE56NJF3  | INDUCTOR 56nH 5% SMD 1608      | C4    |
| L213          | ELJRER12JF3  | INDUCTOR 120nH 5% SMD 1608     | C4    |
| L214          | G1CR10J00010 | INDUCTOR 100nH 5% SMD 1005     | C4    |
| L215          | G1C3N3Z00005 | INDUCTOR 3.3nH +/-0.3nH SMD 10 | B4    |
| L217          | G1C15NJ00008 | INDUCTOR 15nH 5% SMD 1005      |       |
| L218          | ELJRE82NJF3  | INDUCTOR 82nH 5% SMD 1608      | B4    |
| L219          | G1CR18J00004 | INDUCTOR 180nH 5% SMD 1608     | C4    |
| L220          | ELJRER12JF3  | INDUCTOR 120nH 5% SMD 1608     | C4    |
| L303          | G1C39NJ00009 | INDUCTOR 39nH 5% SMD 1005      | B3    |
| L601          | ELJRE82NJF3  | INDUCTOR 82nH 5% SMD 1608      | D3    |
| L603          | ELJRE82NJF3  | INDUCTOR 82nH 5% SMD 1608      | A3    |
| L604          | ELJRE82NJF3  | INDUCTOR 82nH 5% SMD 1608      | A3    |
| L605          | G1C82NJ00010 | INDUCTOR 82nH 5% SMD 1005      | A3    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| L606          | G1C82NJ00010 | INDUCTOR 82nH 5% SMD 1005      | A3    |
| M603          | 4FA018AZAJ   | CONNECTOR 2 PIN CONTACT        | A4    |
| Q103          | B1GKCFLL0006 | TRANSISTOR UMD2N DUAL SMD UMT6 | B3    |
| Q104          | B1GKCFLL0006 | TRANSISTOR UMD2N DUAL SMD UMT6 | B3    |
| Q106          | XP0338900L   | TRANSISTOR XP03389 NPN/PNP 10K | B3    |
| Q301          | B1GKCFJJ0006 | TRANSISTOR UMC3NTR PNP+PNP SMD | E1    |
| Q601          | 2SD15110FL   | TRANSISTOR 2SD15110FL NPN HFE= | F1    |
| Q602          | B1DHDC000006 | TRANSISTOR SI3443DV MOSFET 20V | D4    |
| Q603          | B1GBCFJJ0024 | TRANSISTOR DTC114EMT2L NPN 2x1 | B1    |
| Q604          | B1GBCFNN0015 | TRANSISTOR DTC144EM NPN 47K SM | B1    |
| Q901          | B1GBCFLL0001 | TRANSISTOR DTC124EETTL NPN 50V | A3    |
| R101          | ERJ2GEJ470X  | RES 47 OHM 5% 1/16W SMD 1005   | E2    |
| R102          | ERJ2GEJ470X  | RES 47 OHM 5% 1/16W SMD 1005   | F2    |
| R104          | ERJ2GEJ821X  | RES 820 OHM 5% 1/16W SMD 1005  | D2    |
| R105          | ERJ2GEJ4R7X  | RES 4.7 OHM 5% 1/16W SMD 1005  | D2    |
| R106          | ERJ2GEJ821X  | RES 820 OHM 5% 1/16W SMD 1005  | D2    |
| R109          | ERJ2GEJ223X  | RES 22K OHM 5% 1/16W SMD 1005  | B3    |
| R110          | ERJ2GEJ122X  | RES 1.2K OHM 5% 1/16W SMD 1005 | B3    |
| R111          | ERJ2GEJ223X  | RES 22K OHM 5% 1/16W SMD 1005  | B3    |
| R112          | ERJ2GEJ122X  | RES 1.2K OHM 5% 1/16W SMD 1005 | B3    |
| R114          | ERJ2GEJ271X  | RES 270 OHM 5% 1/16W SMD 1005  | E2    |
| R115          | ERJ2GEJ561X  | RES 560 OHM 5% 1/16W SMD 1005  | E1    |
| R116          | ERJ2GEJ270X  | RES 27 OHM 5% 1/16W SMD 1005   | E1    |
| R117          | ERJ2GEJ153X  | RES 15K OHM 5% 1/16W SMD 1005  | B3    |
| R118          | ERJ2GEJ392X  | RES 3.9K OHM 5% 1/16W SMD 1005 | B3    |
| R119          | ERJ2GEJ392X  | RES 3.9K OHM 5% 1/16W SMD 1005 | B3    |
| R120          | ERJ2GEJ153X  | RES 15K OHM 5% 1/16W SMD 1005  | B3    |
| R121          | ERJ2GEJ392X  | RES 3.9K OHM 5% 1/16W SMD 1005 | B3    |
| R122          | ERJ2GEJ392X  | RES 3.9K OHM 5% 1/16W SMD 1005 | B3    |
| R123          | ERJ2GEJ123X  | RES 12K OHM 5% 1/16W SMD 1005  | B3    |

| Model EB-GD93 |             | Name: GD93 Main PCB            |       |
|---------------|-------------|--------------------------------|-------|
| Ref           | Part Number | Description                    | Notes |
| R124          | ERJ2GEJ223X | RES 22K OHM 5% 1/16W SMD 1005  | B3    |
| R150          | ERJ2GEJ121X | RES 120 OHM 5% 1/16W SMD 1005  | E2    |
| R151          | ERJ2GEJ680X | RES 68 OHM 5% 1/16W SMD 1005   | E2    |
| R152          | ERJ2GEJ680X | RES 68 OHM 5% 1/16W SMD 1005   | E2    |
| R153          | ERJ2GEJ181X | RES 180 OHM 5% 1/16W SMD 1005  | E2    |
|               |             |                                |       |
| R153          | ERJ2GEJ223X | RES 22K OHM 5% 1/16W SMD 1005  | E2    |
| R154          | ERJ2GEJ680X | RES 68 OHM 5% 1/16W SMD 1005   | E2    |
| R155          | ERJ2GEJ680X | RES 68 OHM 5% 1/16W SMD 1005   | E2    |
| R157          | ERJ2GEJ103X | RES 10K OHM 5% 1/16W SMD 1005  | E1    |
| R158          | ERJ2GEJ103X | RES 10K OHM 5% 1/16W SMD 1005  | E1    |
|               |             |                                |       |
| R159          | ERJ2GEJ273X | RES 27K OHM 5% 1/16W SMD 1005  | E1    |
| R160          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | E1    |
| R161          | ERJ2GEJ333X | RES 33K 5% 1/16W SMD 1005      | E1    |
| R163          | ERJ2GEJ153X | RES 15K OHM 5% 1/16W SMD 1005  | E1    |
| R301          | ERJ2GEJ332X | RES 3.3K OHM 5% 1/16W SMD 1005 | C3    |
|               |             |                                |       |
| R302          | ERJ2GEJ562X | RES 5.6K OHM 5% 1/16W SMD 1005 | C3    |
| R304          | ERJ2GEJ150X | RES 15 OHM 5% 1/16W SMD 1005   | B3    |
| R305          | ERJ2GEJ470X | RES 47 OHM 5% 1/16W SMD 1005   | B4    |
| R306          | ERJ2GEJ4R7X | RES 4.7 OHM 5% 1/16W SMD 1005  | B3    |
| R307          | ERJ2GEJ821X | RES 820 OHM 5% 1/16W SMD 1005  | B3    |
|               |             |                                |       |
| R308          | ERJ2GEJ821X | RES 820 OHM 5% 1/16W SMD 1005  | B3    |
| R309          | ERJ2GEJ222X | RES 2.2K OHM 5% 1/16W SMD 1005 | C4    |
| R310          | ERJ2GEJ152X | RES 1.5K OHM 5% 1/16W SMD 1005 | C4    |
| R312          | ERJ2GEJ120X | RES 12 OHM 5% 1/16W SMD 1005   |       |
| R313          | ERJ2GEJ270X | RES 27 OHM 5% 1/16W SMD 1005   | C4    |
|               |             |                                |       |
| R314          | ERJ2GEJ471X | RES 470 OHM 5% 1/16W SMD 1005  |       |
| R315          | ERJ2GEJ471X | RES 470 OHM 5% 1/16W SMD 1005  |       |
| R350          | ERJ2GEJ472X | RES 4.7K OHM 5% 1/16W SMD 1005 | C3    |
| R353          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | C3    |
| R601          | ERJ2GEJ101X | RES 100 OHM 5% 1/16W SMD 1005  | D4    |
|               |             |                                |       |
| R602          | ERJ2GEJ101X | RES 100 OHM 5% 1/16W SMD 1005  | D4    |

| Model EB-GD93 |             | Name: GD93 Main PCB            |       |
|---------------|-------------|--------------------------------|-------|
| Ref           | Part Number | Description                    | Notes |
| R603          | ERJ2GEJ101X | RES 100 OHM 5% 1/16W SMD 1005  | D4    |
| R604          | ERJ2GEJ101X | RES 100 OHM 5% 1/16W SMD 1005  | D4    |
| R605          | ERJ2GEJ101X | RES 100 OHM 5% 1/16W SMD 1005  | D4    |
| R606          | ERJ2GEJ121X | RES 120 OHM 5% 1/16W SMD 1005  | D1    |
| R607          | ERJ2GEJ121X | RES 120 OHM 5% 1/16W SMD 1005  | D1    |
|               |             |                                |       |
| R608          | ERJ2GEJ121X | RES 120 OHM 5% 1/16W SMD 1005  | D1    |
| R612          | ERJ2GEJ471X | RES 470 OHM 5% 1/16W SMD 1005  | D1    |
| R613          | ERJ2GEJ181X | RES 180 OHM 5% 1/16W SMD 1005  | D1    |
| R614          | ERJ2GEJ153X | RES 15K OHM 5% 1/16W SMD 1005  | E4    |
| R615          | ERJ2GEJ222X | RES 2.2K OHM 5% 1/16W SMD 1005 | E4    |
|               |             |                                |       |
| R616          | ERJ2GEJ222X | RES 2.2K OHM 5% 1/16W SMD 1005 | E4    |
| R617          | ERJ2GEJ222X | RES 2.2K OHM 5% 1/16W SMD 1005 | E3    |
| R618          | ERJ2GEJ223X | RES 22K OHM 5% 1/16W SMD 1005  | D3    |
| R619          | ERJ2GEJ562X | RES 5.6K OHM 5% 1/16W SMD 1005 | D3    |
| R620          | ERJ2GEJ150X | RES 15 OHM 5% 1/16W SMD 1005   | A1    |
|               |             |                                |       |
| R621          | ERJ2GEJ102X | RES 1K OHM 5% 1/16W SMD 1005   | E4    |
| R622          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | F3    |
| R623          | ERJ3RED105V | RES 1M OHM 0.5% 1/16W SMD 1608 | D1    |
| R624          | ERJ3RED274V | RES 270K OHM 0.5% 1/16W SMD 16 | D1    |
| R625          | ERJ2GEJ222X | RES 2.2K OHM 5% 1/16W SMD 1005 | A3    |
|               |             |                                |       |
| R626          | ERJ2GEJ393X | RES 39K OHM 5% 1/16W SMD 1005  | A3    |
| R627          | ERJ2GEJ124X | RES 120K OHM 5% 1/16W SMD 1005 |       |
| R628          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | F3    |
| R630          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | C2    |
| R631          | ERJ2GEJ224X | RES 220K OHM 5% 1/16W SMD 1005 | B2    |
|               |             |                                |       |
| R632          | ERJ2GEJ120X | RES 12 OHM 5% 1/16W SMD 1005   | A3    |
| R633          | ERJ2GEJ120X | RES 12 OHM 5% 1/16W SMD 1005   | A3    |
| R634          | ERJ2GEJ152X | RES 1.5K OHM 5% 1/16W SMD 1005 | B2    |
| R635          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | E4    |
| R636          | ERJ2GEJ152X | RES 1.5K OHM 5% 1/16W SMD 1005 | B2    |
|               |             |                                |       |
| R637          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | E4    |

| Model EB-GD93 |             | Name: GD93 Main PCB            |       |
|---------------|-------------|--------------------------------|-------|
| Ref           | Part Number | Description                    | Notes |
| R639          | ERJ2GEJ223X | RES 22K OHM 5% 1/16W SMD 1005  | C2    |
| R640          | ERJ2GE0R00X | RES JUMPER 0 OHM 1A SMD 1005   | C2    |
| R641          | ERJ2GEJ470X | RES 47 OHM 5% 1/16W SMD 1005   | C2    |
| R643          | ERJ2GEJ223X | RES 22K OHM 5% 1/16W SMD 1005  | C2    |
| R644          | ERJ6RSFR15V | RES 0.15 OHM 1% 1/10W SMD 2012 | D4    |
|               |             |                                |       |
| R645          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | D1    |
| R646          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | C4    |
| R647          | ERJ2GEJ561X | RES 560 OHM 5% 1/16W SMD 1005  | A1    |
| R648          | ERJ2GEJ103X | RES 10K OHM 5% 1/16W SMD 1005  | A1    |
| R649          | ERJ2GEJ332X | RES 3.3K OHM 5% 1/16W SMD 1005 | A1    |
|               |             |                                |       |
| R650          | ERJ2GEJ681X | RES 680 OHM 5% 1/16W SMD 1005  | F4    |
| R651          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | A1    |
| R652          | EXB24V331JX | RES NETWORK 330 OHMx2 5% 1/16W | A1    |
| R654          | EXB24V331JX | RES NETWORK 330 OHMx2 5% 1/16W | A2    |
| R656          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | A2    |
|               |             |                                |       |
| R657          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | A2    |
| R660          | ERJ2GEJ473X | RES 47K OHM 5% 1/16W SMD 1005  | C2    |
| R664          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | F4    |
| R669          | ERJ2GEJ331X | RES 330 OHM 5% 1/16W SMD 1005  | B1    |
| R674          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | F4    |
|               |             |                                |       |
| R675          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | F4    |
| R676          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | A2    |
| R679          | ERJ2GEJ103X | RES 10K OHM 5% 1/16W SMD 1005  | B2    |
| R680          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | B2    |
| R683          | ERJ2GEJ104X | RES 100K OHM 5% 1/16W SMD 1005 | E4    |
|               |             |                                |       |
| R684          | ERJ2GEJ472X | RES 4.7K OHM 5% 1/16W SMD 1005 | F4    |
| R685          | ERJ2GEJ181X | RES 180 OHM 5% 1/16W SMD 1005  | F3    |
| R686          | ERJ2GEJ4R7X | RES 4.7 OHM 5% 1/16W SMD 1005  | C1    |
| R687          | ERJ2GEJ4R7X | RES 4.7 OHM 5% 1/16W SMD 1005  | C1    |
| R688          | ERJ2GEJ4R7X | RES 4.7 OHM 5% 1/16W SMD 1005  | A2    |
|               |             |                                |       |
| R689          | ERJ2GEJ4R7X | RES 4.7 OHM 5% 1/16W SMD 1005  | A2    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| R690          | ERJ2GEJ104X  | RES 100K OHM 5% 1/16W SMD 1005 | C1    |
| R691          | ERJ2GEJ104X  | RES 100K OHM 5% 1/16W SMD 1005 | C1    |
| R692          | ERJ2GEJ104X  | RES 100K OHM 5% 1/16W SMD 1005 | A1    |
| R694          | ERJ2GEJ104X  | RES 100K OHM 5% 1/16W SMD 1005 | F3    |
| R695          | ERJ2GEJ473X  | RES 47K OHM 5% 1/16W SMD 1005  | F4    |
|               |              |                                |       |
| R696          | ERJ2GE0R00X  | RES JUMPER 0 OHM 1A SMD 1005   | B1    |
| R901          | ERJ2GEJ681X  | RES 680 OHM 5% 1/16W SMD 1005  | D1    |
| R902          | ERJ2GE0R00X  | RES JUMPER 0 OHM 1A SMD 1005   | E3    |
| R904          | ERJ2GEJ183X  | RES 18K OHM 5% 1/16W SMD 1005  | A3    |
| R905          | ERJ2GEJ221X  | RES 220 OHM 5% 1/16W SMD 1005  | F1    |
|               |              |                                |       |
| R998          | ERJ3GEY0R00V | RES JUMPER 0 OHM 1A SMD 1608   | B2    |
| R999          | ERJ2GEJ102X  | RES 1K OHM 5% 1/16W SMD 1005   |       |
|               |              |                                |       |
| S601          | EVQPSR02K    | SWITCH TACTILE                 | F2    |
|               |              |                                |       |
| U101          | C5CB00000023 | PA PF08103B-02-TB DUAL GSM/DCS | E2    |
| U102          | J2FZ00000002 | DIPLEXER ANT SW GSM/DCS SMD    | F2    |
| U103          | UY76130A     | VCO TX 9.1mmx7.0mm SMD         | E1    |
| U104          | C1CB00000982 | IC HD155133TF01EB TX/RX PLL BR | B4    |
| U105          | EHFFD1729    | COUPLER 1.747 GHz SMD 2012 6PI | E1    |
| U150          | C1CB00000870 | IC HD155171NPEL DUAL BAND APC  |       |
| U301          | UY76129A     | VCO RF SMD 9.1mm x 7.0mm       |       |
| U302          | UY76165A     | VCO IF 538-566MHz SMD          |       |
| U350          | TX76001A     | TCVCXO 13MHz SMD 7.0x5.0x1.7 4 |       |
| U351          | C0JBAB000007 | IC TC7S04FU INVERTER SMD SSOP5 | C3    |
|               |              |                                |       |
| U401          | C0DBZFC00004 | IC R5320G001A VOLTAGE REGULATO | C3    |
| U601          | UY76158A     | IC HERCULES WITH 2M SRAM 0.8mm | F4    |
| U602          | C1CB00000992 | IC OMEGA 3.5 0.8mm PITCH SMD B | E4    |
| U604          | UY76159A     | IC ACCESSORY ASIC 0.4mm PITCH  | E3    |
| U605          | C3BBJG000004 | IC UPD442012LGY-B85X-MJH 2M SR | B1    |
|               |              |                                |       |
| U606          | C0EBF0000042 | IC S-80833ANNP-EDX-T2 VOL DET  | F3    |
| U607          | C0JBAZ001190 | IC RV5C348B RTC OUTPUT ENABLED | E4    |

| Model EB-GD93 |              | Name: GD93 Main PCB            |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| U608          | C0JBAA000099 | IC TC7S08FU AND GATE SMD SSOP5 | E4    |
| U609          | C0EBD0000030 | IC S-80824ANNP-EDM-T2 VOL DET  | F3    |
| U610          | C0DBZGB00015 | IC RQ5RW30AATR VOLTAGE REG SMD | F4    |
| X608          | JS76002A     | CONNECTOR SIM HOLDER GSM 6 PIN | C2    |
| Y601          | H0J327200022 | CRYSTAL 32.768KHz SMD 7.0x1.5x | E4    |

### 7.2.3. Keypad PCB

| Model EB-GD93 |              | Name: GD93 Keypad PCB          |       |
|---------------|--------------|--------------------------------|-------|
| Ref           | Part Number  | Description                    | Notes |
| D801          | MA2S11100L   | DIODE MA2S111 80V 100mA SMD SS |       |
| DS801         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS802         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS803         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS804         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS805         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS806         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS807         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| DS808         | LNJ312G8J0MC | DIODE LED GREEN 2.2V 22mA SMD  |       |
| R801          | EXB24V181JX  | RES NETWORK 180 OHMx2 5% 1/16W |       |
| R802          | EXB24V181JX  | RES NETWORK 180 OHMx2 5% 1/16W |       |
| R803          | EXB24V181JX  | RES NETWORK 180 OHMx2 5% 1/16W |       |
| R804          | EXB24V181JX  | RES NETWORK 180 OHMx2 5% 1/16W |       |

## 7.3. Refurbishment Kits

### 7.3.1. GD93

| Model EB-GD93 |             | Name: Refurbishment Kits         |       |
|---------------|-------------|----------------------------------|-------|
| Ref           | Part Number | Description                      | Notes |
|               | 9R9300B     | REFURBISHMENT KIT, BLUE          |       |
|               | 9R9300T     | REFURBISHMENT KIT, TITANIUM GREY |       |

## 7.4. Repair Jigs and Tools

| Model EB-GD93 |             | Name: Jigs and Tools    |       |
|---------------|-------------|-------------------------|-------|
| Ref           | Part Number | Description             | Notes |
|               | IFB004      | INTERFACE BOX           |       |
|               | JT00010     | BATTERY CALIBRATION VCU |       |
|               | JT00042     | GD93TEST BATTERY        |       |
|               | JT00043     | INTERFACE CABLE         |       |
|               | JT00055     | GD93 RF ADAPTOR         |       |
|               | JT00057     | GD93 PCB TEST JIG       |       |

## 7.5. Printed Material

### 7.5.1. Document Packs

NOTE: Document Packs consist of language-specific User Guide, Quick Start and Warranty Guide where applicable.

| Model EB-GD93 |             | Name: Document Packs                 |
|---------------|-------------|--------------------------------------|
| Ref           | Part Number | Description                          |
|               | GD93DPK01   | ARABIC, ENGLISH                      |
|               | GD93DPK02   | CZECH                                |
|               | GD93DPK03   | DANISH, GERMAN, EU WARRANTY          |
|               | GD93DPK04   | DANISH EU WARRANTY                   |
|               | GD93DPK05   | DUTCH, FRENCH, GERMAN, EU WARRANTY   |
|               | GD93DPK06   | DUTCH, EU WARRANTY                   |
|               | GD93DPK07   | not used                             |
|               | GD93DPK08   | ENGLISH, FRENCH                      |
|               | GD93DPK09   | ENGLISH, GERMAN, EU WARRANTY         |
|               | GD93DPK10   | ENGLISH, EU WARRANTY, ACCY CARD UK   |
|               | GD93DPK11   | ENGLISH, EU WARRANTY                 |
|               | GD93DPK12   | ENGLISH                              |
|               | GD93DPK13   | FINNISH, SWEDISH, EU WARRANTY        |
|               | GD93DPK14   | FRENCH, GERMAN, ITALIAN, EU WARRANTY |
|               | GD93DPK15   | FRENCH, EU WARRANTY                  |
|               | GD93DPK16   | GERMAN, EU WARRANTY                  |
|               | GD93DPK17   | GREEK, EU WARRANTY                   |
|               | GD93DPK18   | HUNGARIAN                            |
|               | GD93DPK19   | ITALIAN, EU WARRANTY                 |
|               | GD93DPK20   | NORWEGIAN, EU WARRANTY               |
|               | GD93DPK21   | POLISH                               |
|               | GD93DPK22   | PORTUGUESE, EU WARRANTY              |

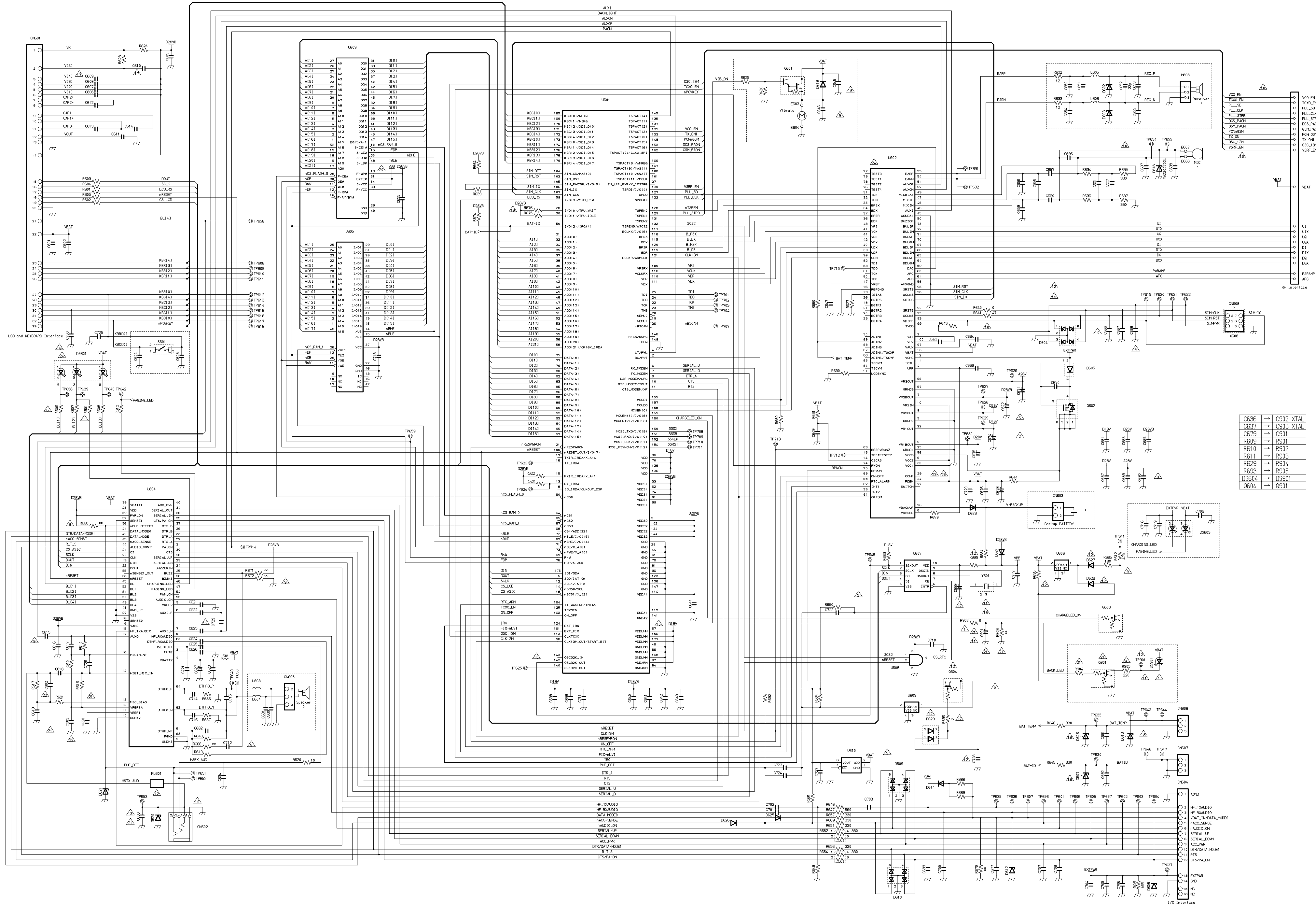
| Model EB-GD93 |             | Name: Document Packs |
|---------------|-------------|----------------------|
| Ref           | Part Number | Description          |
|               | GD93DPK23   | RUSSIAN              |
|               | GD93DPK24   | SPANISH, EU WARRANTY |
|               | GD93DPK25   | SWEDISH, EU WARRANTY |
|               | GD93DPK26   | TURKISH, EU WARRANTY |

### 7.5.2. Identification of Individual Instructions

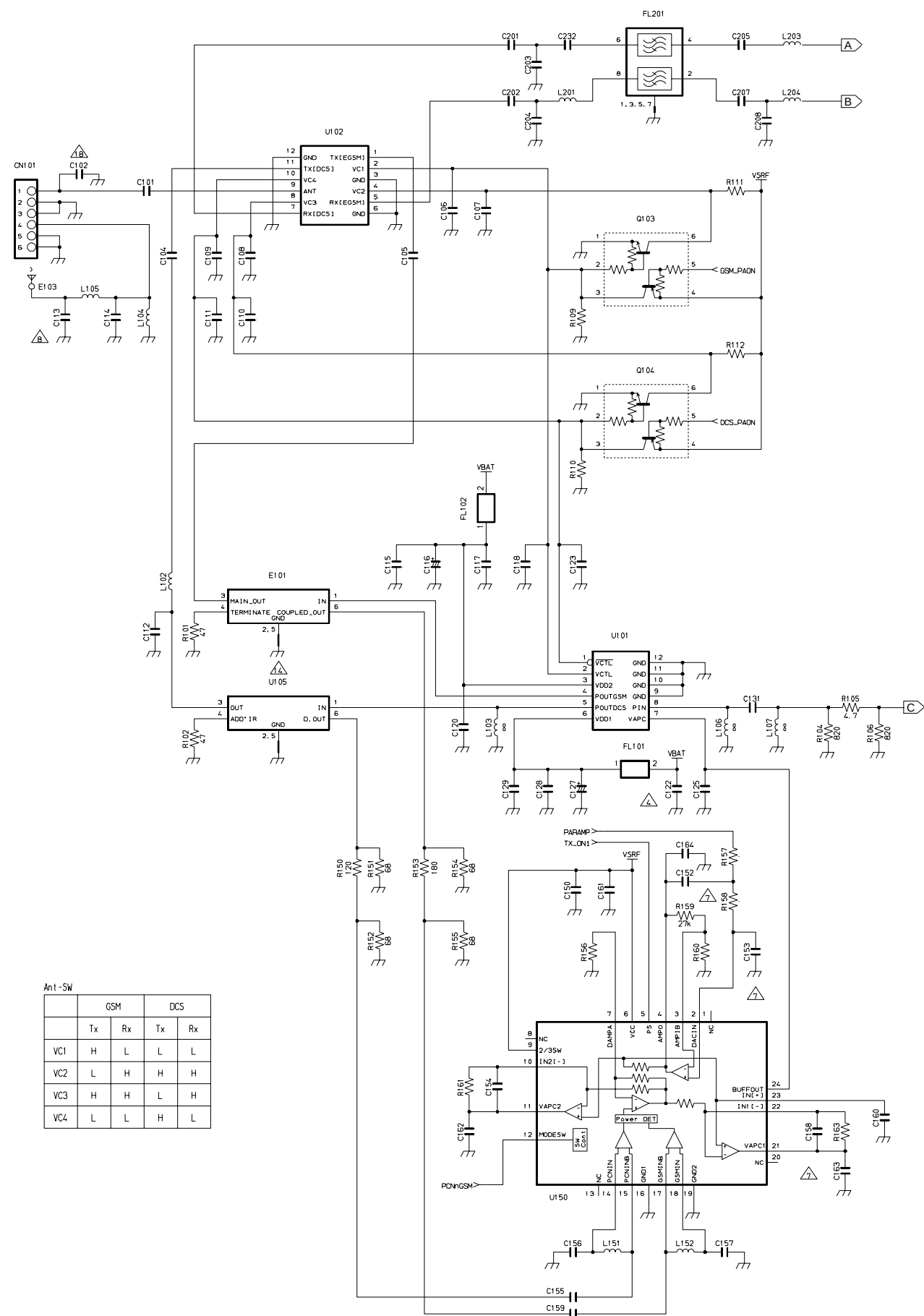
On the rear cover of each manual there is a part number. The suffix to this number is the issue level of the manual. For example, the part number for the English GD93 Instruction is 7LC043A, where the final 'A' shows the manual is issue 'A'.

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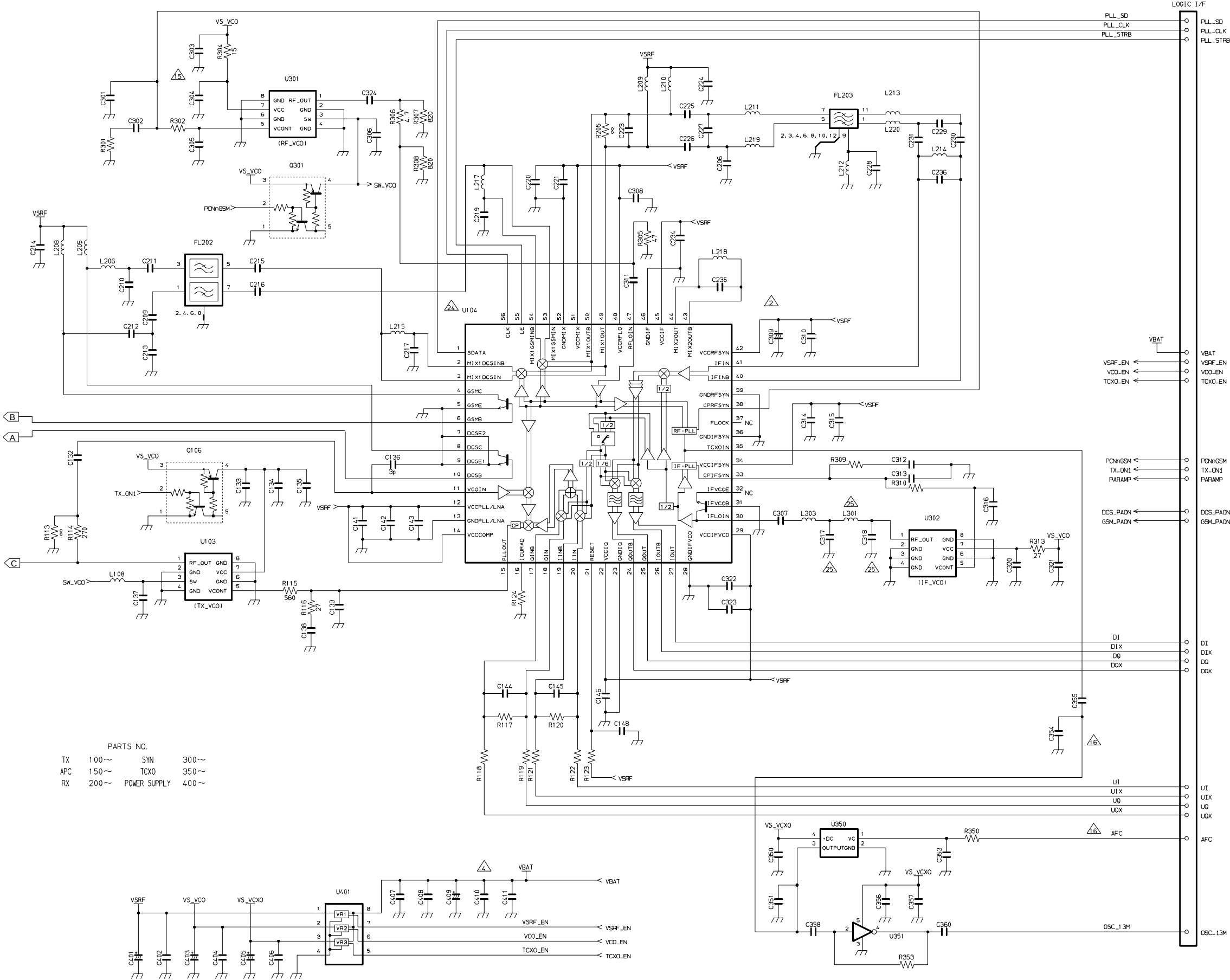
0DLQ 3&% /RJLF



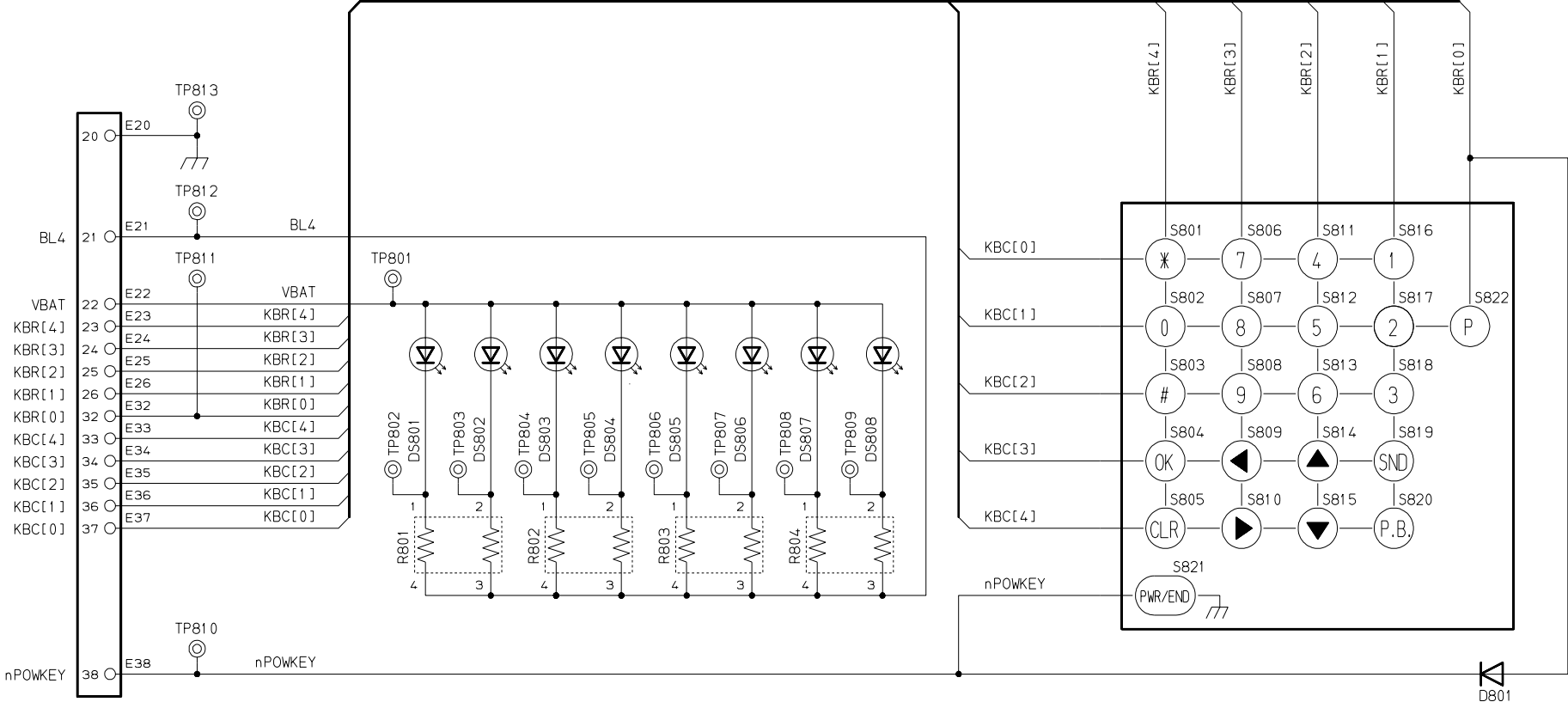
0DLQ 3&% 5) 6KHHW RI



0DLQ 3&% 5) 6KHHW RI



8.4 Keypad PCB



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