

# Service Manual

## GD90 Personal Cellular Telephone

Handheld Portable  
**EB-GD90**

## Specification



	900 MHz	1800 MHz
Frequency range	Tx: 890 - 915 MHz Rx: 935 - 960 MHz	Tx: 1710 - 1785 MHz 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	Full rate/Half 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 kbps ACLEP / 5.6 kbps CELP / VSLEP	
Transmission speed	270.3 kbps	
Diversity	Frequency hopping	
Signal Reception	Double superheterodyne	
Intermediate Frequency	282MHz and 45MHz	
Antenna Terminal Impedance	50 Ω	
Antenna VSWR	<2.1 : 1	
Dimensions	Height: 118 mm Width: 42 mm Depth: 16.5 mm	
Volume	84.5 cc	
Weight	88 g	
Display	Graphical chip on glass liquid crystal, Alphanumeric 16 x 3 characters, 5 icons and 6 x 1 characters	
Illumination	Green: 4 LEDs for the LCD 8 LEDs for the keyboards 1 LED Incoming call Red: 1 LED Charging indicator	
Keypad	17 keys, Navigation key	
SIM	Plug-in type only	
External DC Supply Voltage	3.6 V	
Battery	3.6 V	
Standby Battery Life DRX 9	95 hrs maximum	
Conversation Battery Life PL 7, DTX 50%	200 minutes	

Unless stated these specifications are with Battery Pack (EB-BSD90) fitted.

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.

**Panasonic**  
**GSM**

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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 sensitive 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 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 a built in safety resistor of between 5k2 and 1M2 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

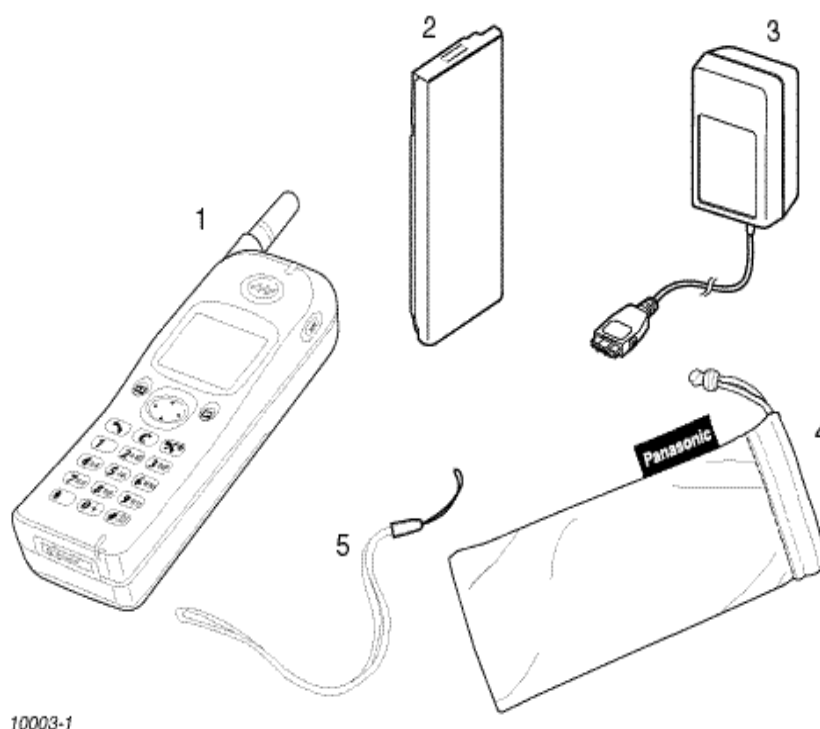
This section provides a general description and kit composition details for the GSM Handportable Telephone system and optional kits.

GD90 is a high performance, small, light, business GSM telephone. The following features are included as standard:

1. Triple Rate which includes Full Rate, Half Rate and enhanced Full Rate speech, codec.
2. Dual Band, GSM900 and GSM1800 operation.
3. Desktop Handsfree Function - comprised of integral echo cancellation and noise suppression.

### 2.2 Handportable Main Kit

The handportable main kit provides a standalone Class 4 GSM telephone. The plug-in SIM contains the subscriber and network information necessary to operate the phone on a GSM network.



**Figure 2.1: Handportable Main Unit Kit Contents**

NUMBER	DESCRIPTION	PART NUMBER
1	Main unit	EB-GD90
2	Battery	EB-BS70
3	Adaptor	EB-CAD70
4	Pouch	7AA516A
5	Strap	6P70022AA
—	Documentation	See Section 9

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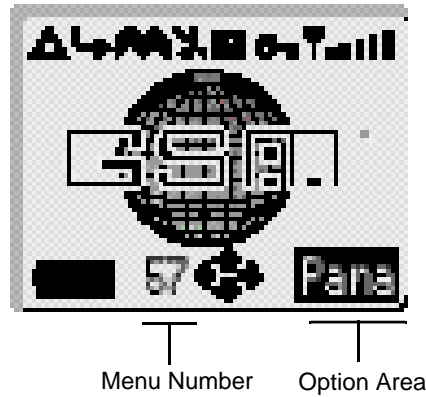
## 3 OPERATING INSTRUCTIONS

### 3.1 General

This section provides a brief guide to the operation and facilities available on the GD90 handportable unit. Refer to the Operating Instructions for full operational information.

### 3.2 LCD Display

The GD90 handportable unit has a graphical chip on glass liquid crystal display in conjunction with the following icons:



**Figure 3.1: LCD display**

T	Indicates received signal strength: T strong signal area; \ weak signal area.
S	Indicates that it is possible to make an emergency call.
Menu Number	The number of the feature pointed to by the pointer. To access a feature enter the menu number on the keypad.
H	Displays the battery charge level: H Battery is at full charge; K Battery requires recharging; G The battery icon flashes during charging. During car mount use, when the battery is fully charged, the battery icon will not light.
Menu Icon	Displays a small icon related to the current status of the telephone: Y telephone is roaming on a non-home network; t using the "Call Divert" feature or the telephone has Call Divert set; ] shows that the vibrate alert is switched on; [ shows that telephone is in silent mode - no tones; N indicates there are unread Short Text Messages (SMS.). Lit when SMS area is full; O the telephone is locked; U shows that normal character have been entered in Alpha Entry; V shows that Greek character have been entered in Alpha Entry; W shows that extended character have been entered in Alpha Entry; X shows that numbers have been entered in Alpha Entry.
p	Indicates that the navigation key (G) can be pressed. Each arrow will light individually to indicate which direction is valid.
Option Area	Pressing the select key (B) will select the option displayed in the option area of the display.

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

### 3.3 Location of Controls

Incoming/Charge indicator:

Green – incoming call.

Red – charging battery pack.

External connector:

Used to connect to external accessories or charging equipment.

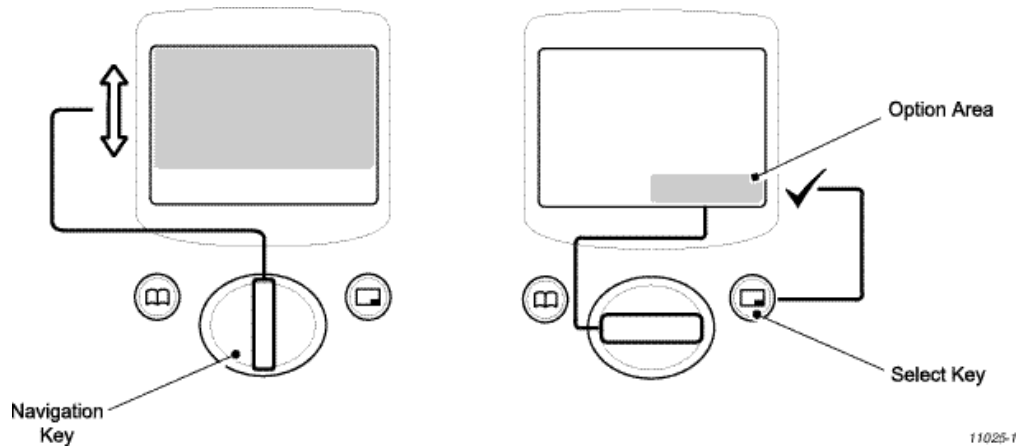


**Figure 3.2: Location of controls for GD90**

g	Navigation Key. Scrolls through options or features menu and increases or decreases volume.
B	Select Key. Selects option shown in the Option Area of the display.
A	Phonebook Key. Browses through the Phonebook or stores a number in the Phonebook. Changes the type of characters entered during Alpha Entry.
D	Send Key. Makes a call.
C	Clear Key. Clears the last digit entered, clears all digits when pressed and held or returns to the previous display.
E	End Key. Ends a call or switches the telephone on/off when pressed and held.
0 to 9	Digit keys. Enter wild numbers or pauses when pressed and held. Where appropriate the 0 key scrolls up or down through abbreviated control names and then select to reveal the international access code "+".
#	Vibrate enable/disable Key. Press and hold to enable or disable the vibrate alert.

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

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

## 3.5 Alpha Entry

Alpha Entry is used to enter alphanumeric characters into Phonebook, Short Messages and the Greeting Message.

Key	Character/Operation			
	U	V	W	X
1	" @ - , . ; !   ? ¿ ( ) ' & % + - / < > = £ \$ ¥ ¤ §			1
2	A B C a b c	Δ E Z	À Á Â Æ B C Ç à á â ã	2
3	D E F d e f	H Θ I	D E É F d e è é f	3
4	G H I g h i	K Λ M	G H I g h i ì	4
5	J K L j k l	N Ξ O	J K L j k l	5
6	M N O m n o	Π P Σ	M N Ñ O Ö ø m n ñ o ö	6
7	P Q R S p q r s	T Υ Φ	P Q R S p q r s ß	7
8	T U V t u v	Ξ Ψ Ω	T U Ü V t u ü v	8
9	W X Y Z w x y z		W X Y Z w x y z	9
C	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 (V), extended characters (W), numerals (X) and normal characters (U) press A.

### 3.5.1 Editing Alpha Entry

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

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

## 3.6 Incoming Calling 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 the EEPROM. When the source is the EEPROM 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 the EEPROM. However, in the event that an OEM would like the Hot Key Dial source to be stored in the EEPROM, it is unlikely that the user will have the option to change the Hot Key Dial source.

### 3.8 Features Menu Structure

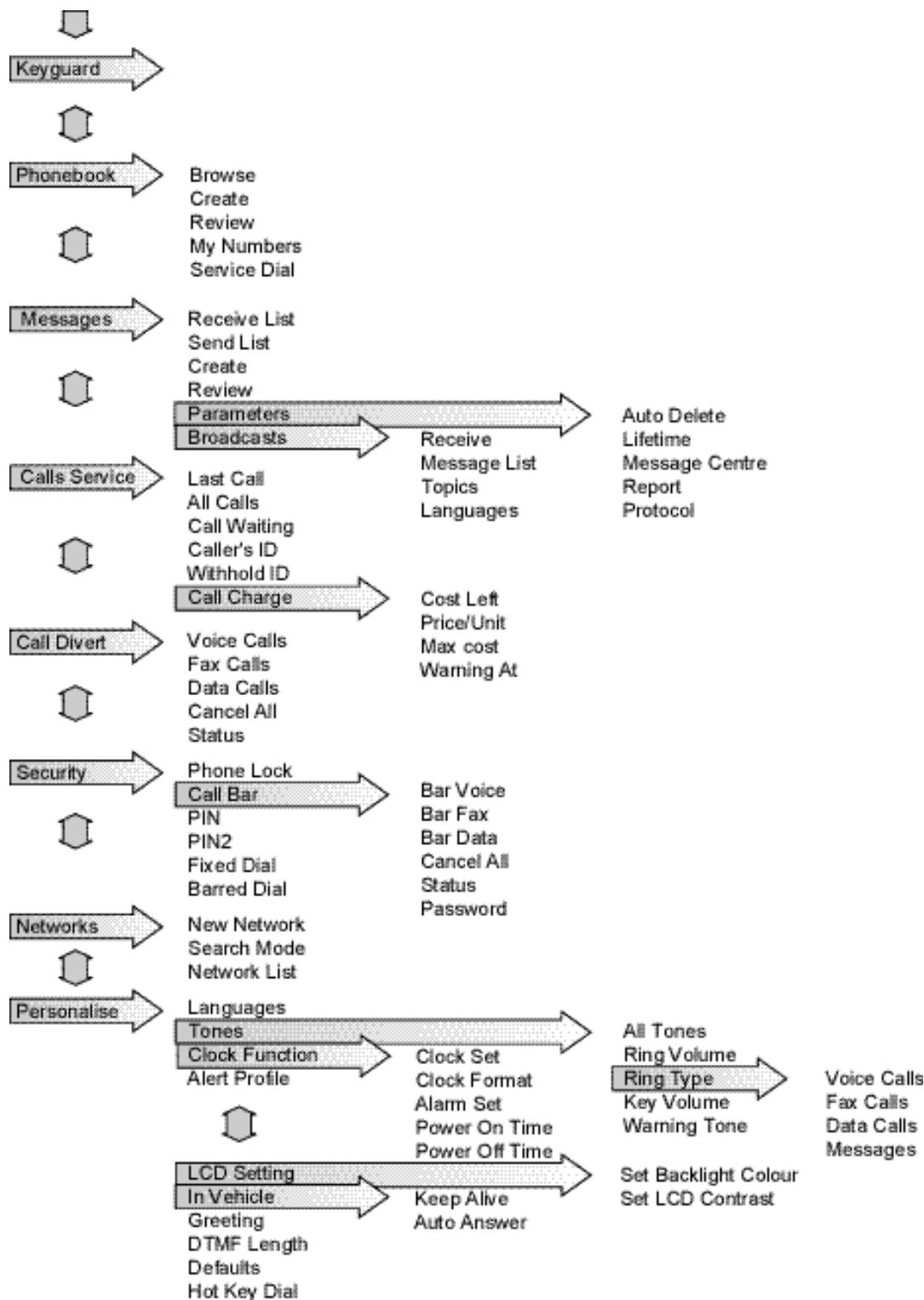


Figure 3.4: Feature Menu

### 3.9 Public Man Machine Interface (MMI)

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 that are supported by GD90.

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

### 3.9.1 Reading Phonebook Memory Location

# &lt;MEMORY LOCATION&gt;

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

### 3.9.2 Presentation of IMEI

\* # 0 6 #

### 3.9.3 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 2 \* <PIN2 UNBLOCKING KEY> \* <NEW PIN2> \* <NEW PIN2> #

### 3.9.4 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** O <SND>

**End active call** 1 <SND>

Reject incoming call	0 <SND>
----------------------	---------

### 3.9.5 Call Waiting

**Enable Call Waiting** \* 4 3 \* # <SND>

**Disable Call Waiting** # 4 3 \* # <SND>

**Call Waiting Status** \* # 4 3 \* # <SND>

### 3.9.6 Calling Line Identification

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

<b>Enable</b>	* <SERVICE CODE> * # <SND>
<b>Disable</b>	# <SERVICE CODE> * # <SND>
<b>Temporary suppress identification</b>	# 3 1 # <TELEPHONE NUMBER> <SND>
<b>Temporary display identification</b>	* 3 1 # <TELEPHONE NUMBER> <SND>

### 3.9.7 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

### 3.9.8 Call Divert

Call Divert Type	Service Code
Divert all calls	21
Divert 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>

#### Set “No Reply” Call Bar

\*\* <SERVICE CODE> \* <FORWARD TELEPHONE NUMBER> \* <TELECOMMUNICATION SERVICE> \*  
<TIME TO RING (seconds)> # <SND>

#### Clear

# # <SERVICE CODE> \* <TELECOMMUNICATION SERVICE> \* # <SND>



**Status**

\* # <SERVICE CODE> \* <TELECOMMUNICATION SERVICE> \* # <SND>

**Clear all Call Diverts**

# # 0 0 2 #

**3.9.9 Call Bar**

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

**Set** \* <PASSWORD> \* <TELECOMMUNICATION SERVICE> # <SND>

**Clear** # <PASSWORD> \* <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 you are using 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 and then fully recharge the battery pack. To revive the Battery Pack use the telephone until the Low Battery Warning 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 H 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 H.	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 your telephone after it has registered with a network.
Calls cannot be made from Fixed Dial Store		Check your 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 your telephone after it has registered with a network.
Emergency calls cannot be made	You are not in a GSM coverage area.	Check that the antenna symbol S is displayed. Move to a coverage area and operate your 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:

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 your SIM is not registered with that network. Contact your Service Provider.
SIM Blocked	The SIM is blocked because the wrong PUK has been entered ten times. Contact your 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 your 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 your Service Provider.
Warning Store Full Continue?	The message area is full. Your 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 (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, your 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 GD90 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 GD90 contains a SIM that is from a different source it will display the message "SIM ERROR" when switched on. This personalisation of GD90 is sometimes referred to as SIM lock or SIM latch.

### 3.13.2 Testing

To test a personalised GD90, 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.

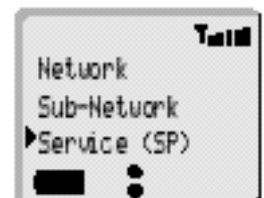
There are two special key sequences to enter the enable/disable menu:

Key sequence	Notes
7 4 6 B B	Can only disable personalisation.
5 2 8 2 4 B B	Can both enable and disable personalisation.

### 3.13.4 Disabling Procedure

1. F 7 4 6 B B or 5 2 8 2 4 B B.
2. F e 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.
3. F B.
4. F the 16 digit Control Key.
5. F B.
6. F the 16 digit Control Key.
7. F B.

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



### 3.13.5 Enabling Procedure

1. 5 2 8 2 4 B B.
2. F e 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.
3. F B.
4. F the 16 digit Control Key.
5. F B.
6. F the 16 digit Control Key.
7. F B.



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	Network Operator	Network Code	
Albania	+355	AMC	276	01
Andorra	+376	STA -Mobiland	213	03
Armenia	+374	Armentel	283	01
Australia	+61	TELECOM Australia	505	01
		OPTUS Communications Pty Ltd.	505	02
		Vodafone PTY	505	03
Austria	+43	Mobilkom Austria	232	01
		max.mobil	232	03
Azerbaijan	+994	Azercell	400	01
Bahrain	+973	Batelco	426	01
Bangladesh	+880	Grameen Phone Ltd	470	01
Belgium	+32	Belgacom Mobile	206	01
		Mobistar	206	10
Bosnia & Herzegovina	+387	Cronet	218	01
	+068	PTT Bosnia	218	19
Bulgaria	+359	Citron	284	01
Brunei Darussalam	+673	DSTCom	528	11
		Jabatan Telekom	528	01
Cambodia	+855	CamGSM	456	01
Cameroon	+237	PTT Cameroon Cellnet	624	01

Country	Access Code	Network Operator	Network Code	
China	+86	Guangdong MCC	460	00
		China United Telecommuni-cations Corporation	460	01
		Liaoning PPTA	460	02
Croatia	+385	HR Cronet	219	01
Cyprus	+357	Cyprus Telecommunication Authority	280	01
Czech Republic	+42	Eurotel Praha	230	02
		Radio Mobil	230	01
Germany	+49	DeTeMobil GmbH	262	01
		Mannesmann Mobilfunk	262	02
Denmark	+45	TELE Danmark Mobile	238	01
		Sonofon	238	02
		Telia	238	20
		Mobilix	238	30
Egypt	+20	Arento	602	01
Estonia	+372	Eesti Mobiiltelefon	248	01
		Radiolinja Eesti AS	248	02
		Q GSM	248	03
Ethiopia	+251	ETA	636	01
Fiji	+679	Vodafone	542	01
Finland	+358	Sonera	244	91
		Finnet	244	09
		OY Radiolinja AB	244	05
		Telia	244	03
		Alands Mobiltelefon	244	05
France	+33	France Telecom	208	01
		SFR	208	10
		Bouygues Telekom	208	20
French Polynesia	+689	Tikiphone	547	20
French West Indies	+590	Ameris	340	01
Georgia	+995	Geocell	282	01
		Magticom	282	02
Germany	+49	D1, T-Mobil	262	01
		D2, Mannesmann	262	02
		E-Plus Mobilfunk	262	03
Ghana	+233	ScanCom	620	01
Gibraltar	+350	GibTel	266	01
Greece	+30	Cosmote	202	01
		Panafon S.A	202	05
		STET HELLAS	202	10
Guinea	+224	Sotelgui	611	02
Hungary	+36	Westel 900 GSM RT	216	30
		Pannon GSM RT	216	01
Hong Kong	+852	Hong Kong Telecom CSL Ltd.	454	00
		Hutchison Telephone Co. Ltd.	454	04
		SmarTone Mobile Communications Ltd.	454	06
		P Plus Comm	454	22
		New World PCS	454	10
		Mandarin Comm	454	16
		Pacific Link	454	18
		Peoples Telephone	454	12
Hungary	+36	Pannon GSM	216	01
		Westel 900	216	30
Iceland	+354	Post & Simi	274	01
		Icelandic Mobile Phone	274	02

Country	Access Code	Network Operator	Network Code
India	+91	Bharti Cellular Limited	404 10
		BPL Mobile	404 21
		Skycell	404 40
		Airtel	404 10
		Essar	404 11
		Maxtouch	404 20
		Command	404 30
		Mobilenet	404 31
		RPG MAA	404 41
		Modi Telstra	404 14
		Sterling Cellular	404 11
		BPL USWest	404 27
		TATA	404 07
		Escotel	404 12
		Aircel Digilink	404 15
Indonesia	+62	PT Telekomunikasi Indonesia	510 10
		PT. Satelit Palapa Indonesia	510 01
		PT Excelcomindo Pratama	510 11
Iran (Islamic Republic of)	+98	T.C.I	432 11
Ireland	+353	Telecom Ireland	272 01
		Digifone	272 02
		Meteor	272 03
Italy	+39	Omnitel Pronto Italia	222 10
		Telecom Italia Mobile	222 01
Ivory Coast	+225	Comstar	612 01
		Ivoiris	612 03
		Loteny Telecom	612 05
Jordan	+962	JMTS	416 01
Kuwait	+965	MTCNet	419 02
Luxembourg	+352	P & T Luxembourg	270 01
Laos (People's Democratic Republic)	+856	Lao Shinawatra	457 01
Latvia	+371	Latvian Mobile Telephone Co.Ltd.	247 01
Lebanon	+961	Libancell	415 03
		Cellis	415 01
Lesotho	+266	Vodacom	651 01
Liechtenstein	+4175	Natel-D	228 01
Lithuania	+370	Bite GSM	246 02
		Omnitel	246 01
Luxembourg	+352	P&T LUXGSM	270 01
		Millicom Lux SA	270 77
Macau	+853	C.T.M.	455 01
Macedonia	+389	PTT Makedonija	294 01
Madagascar	+261	Sacel	646 03
		Madacom	646 01
Malawi	+265	TNL	650 01
Malaysia	+60	Celcom	502 19
		Maxis	502 12
		My BSB	502 02
		MRTEL	502 13
		Adam	502 17
		Mutiara Telecom	502 16
Malta	+356	Telecell	278 01
Mauritius	+230	Mauritius Telecom Ltd.	617 01
Monaco	+377	France Telecom	208 01
		SFR	208 10
Morocco	+212	ONPT Morocco	604 01
Mozambique	+258	Telecom de Mocambique	634 01

Country	Access Code	Network Operator	Network Code	
Myanmar	+95	HPT	219	01
Namibia	+264	MTC	649	01
Netherlands	+31	LIBERTEL	204	04
		PTT Telecom	204	08
New Caledonia	+687	Mobilis	546	01
New Zealand	+64	Bell South	530	01
Norway	+47	Telenor Mobil AS	242	01
		NetCom GSM A/S	242	02
Oman	+968	General Telecoms	422	02
Pakistan	+92	Mobilink	410	01
Papua New Guinea	+675	Pacific	310	01
Philippines	+63	Globe Telecom GMCR Inc	515	02
		IslaCom	515	01
Poland	+48	Plus GSM	260	01
		ERA GSM	260	02
		IDEA Centertel	260	03
Portugal	+351	Telecomunicações Moveis Nacionais (TMN)	268	06
		TELECEL	268	01
		Optimus	268	03
Qatar	+974	Q-Net	427	01
Reunion	+262	SRR	647	10
Romania	+40	MobiFon	226	01
		MobilRom	226	10
Russian Federation	+701	Mobile Telesystems	250	01
		North-West GSM	250	02
		KB Impuls		
San Marino	+378	Omnitel	222	10
		Telecom Italia Mobile	222	01
Saudi Arabia	+966	Al Jawal	420	01
		EAE	420	07
Senegal	+221	Sonatel	608	01
Seychelles	+248	SEZ SEYCEL	633	01
Singapore	+65	Singapore Telecom	525	01
		MobileOne	525	03
Slovak Republic	+42	Eurotel	231	02
		Globtel	231	01
Slovenia	+386	Mobitel	293	41
South Africa	+27	Vodacom	655	01
		MTN	655	10
Spain	+34	Movistar	214	07
		AIRTEL Spain	214	01
Sri Lanka	+94	MTN Networks (PVT) Sri Lanka	413	02
Sudan	+249	Mobitel	634	01
Sweden	+46	Telia Mobitel	240	01
		Comviq GSM AB	240	07
		Europolitan AB	240	08
Switzerland	+41	Swisscom 900	228	01
		Swisscom 1800	228	01
Syria	+963	Mobile Syria	417	09
Taiwan	+886	LDTA	466	92
Tanzania (United Republic of)	+255	Tritel	640	01
Thailand	+66	TH AIS GSM	520	01
		Total Access Comms	520	18
Tunisia	+216	Tunisian PTT	605	02
Turkey	+90	Turkcell	286	01
		Telsim	286	02
Uganda	+256	Celtel Cellular	641	01

Country	Access Code	Network Operator	Network Code
Ukraine	+380	Mobile comms	255 01
		Golden Telecom	255 05
United Arab Emirates	+971	UAE ETISALAT-G1	424 01
		UAE ETISALAT-G2	424 02
United Kingdom (Guernsey) (Jersey) (Isle of Man)	+44	Vodafone	234 15
		Cellnet	234 10
		Guernsey Telecoms	234 55
		Jersey Telecoms	234 50
		Manx Telecom	234 58
Uzbekistan	+7	Daewoo GSM	434 04
		Coscom	434 05
		Buztel	434 01
Vietnam	+84	MTSC	452 01
		DGPT	452 02
Yugoslavia	+381	Mobile Telekom	220 01
		Pro Monte	220 02
Zimbabwe	+263	NET ONE	648 01

### 3.16 Glossary of Terms

<b>DTMF</b>	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 computerised home banking.
<b>GSM</b>	Global System for Mobile communications. The name given to the advanced digital technology that your telephone uses.
<b>Home country</b>	The country where your home network operates.
<b>Home network</b>	The GSM network on which your subscription details are held.
<b>Hot Key Dial</b>	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 Provider. It is most likely to be preprogrammed to the Service Dial Numbers by the Service Provider.
<b>Lock code</b>	Used for security of your telephone. Factory set to "0000".
<b>Message Centre</b>	Where messages are sent before they are forwarded onto their destination. The Message Centre telephone number may be programmed into your SIM or supplied by your service provider.
<b>Network operator</b>	The organisation responsible for operating a GSM network. Each country will have at least one network operator.
<b>Password</b>	Used for the control of the call bar function. Supplied by your service provider.
<b>PIN</b>	Personal Identification Number used for SIM security. Supplied by your service provider.
<b>PIN2</b>	Personal Identification Number used for the control of Fixed Dial Memory and call charge metering. Supplied by your service provider.
<b>PUK/ PUK2</b>	PIN/PIN2 Unblocking Key. Used to unblock the PIN/PIN2. Supplied by your service provider.
<b>Registration</b>	The act of locking on to a GSM network. This is usually performed automatically by your telephone.
<b>Roaming</b>	The ability to use your telephone on networks other than your Home network.
<b>Service Dial Numbers</b>	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.
<b>Service provider</b>	The organisation responsible for providing access to the GSM network.
<b>SIM</b>	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 your service provider.
<b>Supplementary service</b>	Network-controlled GSM functions which your telephone will support. Supplementary services may only be available on a subscription bases.
<b>Wild numbers</b>	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.



## 4 DISASSEMBLY / REASSEMBLY INSTRUCTIONS

### 4.1 General

This section provides disassembly and reassembly procedures for the main components of the GD90 system.

These procedures **MUST** be performed by qualified service personnel, at an authorized service centre.

The following warnings and precautions **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 sensitive 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 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 1M2 resistor (usually built into the lead) to a common ground point.

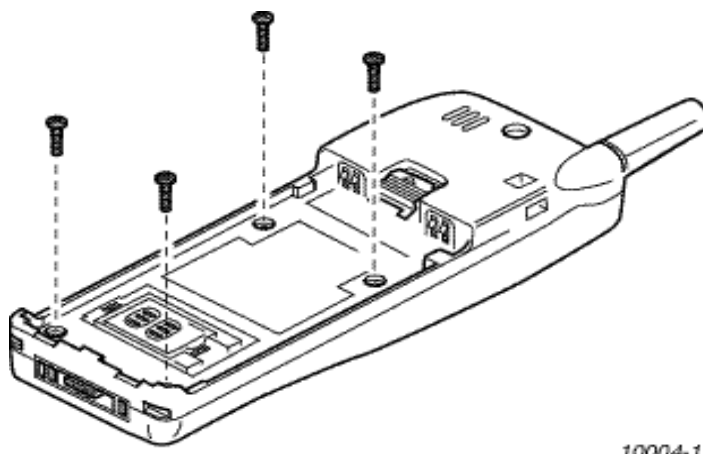
**Wrist Strap** – A quick release skin contact device with a flexible cord, which has a built in safety resistor of between 5k2 and 1M2 shall be used. The flexible cord must be attached to a dissipative earth point.

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

## 4.2 Disassembly

### 4.2.1 Case Removal

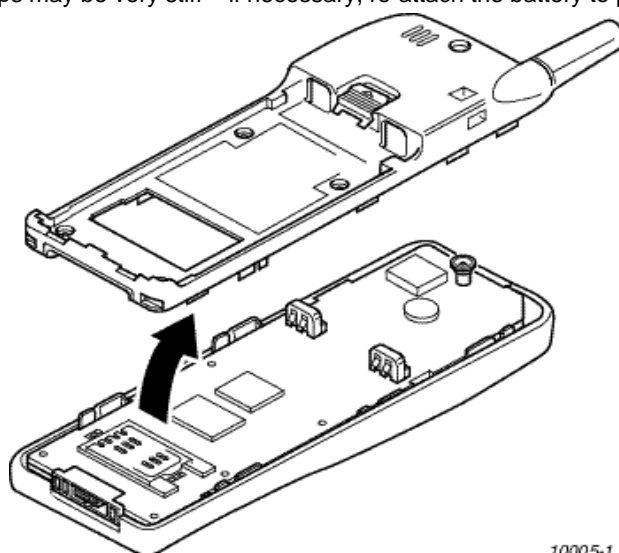
1. Remove the battery from the back of the telephone. Remove the four case screws located inside the battery compartment.



10004-1

**Figure 4.1: Screw removal**

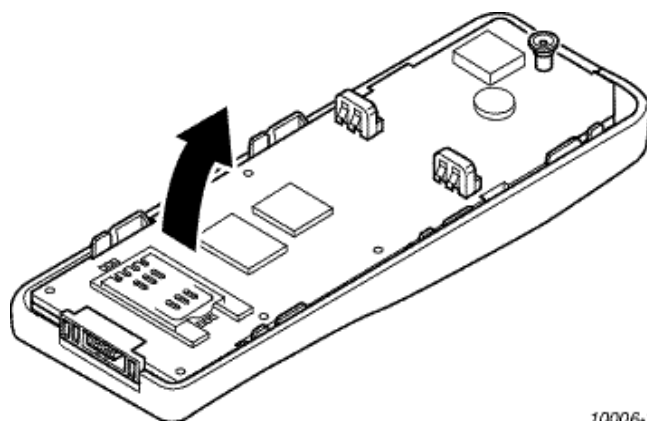
2. Remove the case by pulling from the connector end of the case/cover. Care must be taken when separating the case from the cover as the retaining clips may be very stiff – if necessary, re-attach the battery to provide extra support for the case.



10005-1

**Figure 4.2: Case Disassembly**

3. Remove the PCB assembly from the cover.



10006-1

**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.

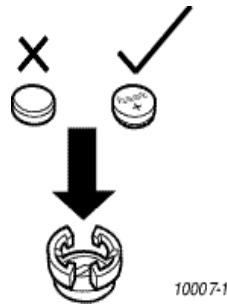


Figure 4.4: Battery Polarity

### 4.2.3 Access to Printed Circuit Boards

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

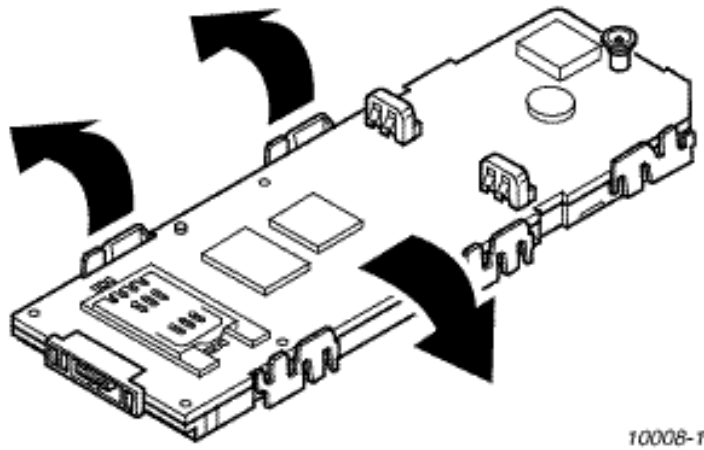


Figure 4.5: Main PCB removal

2. While applying slight pressure to the side retaining clips, lift the Key PCB away from the chassis.

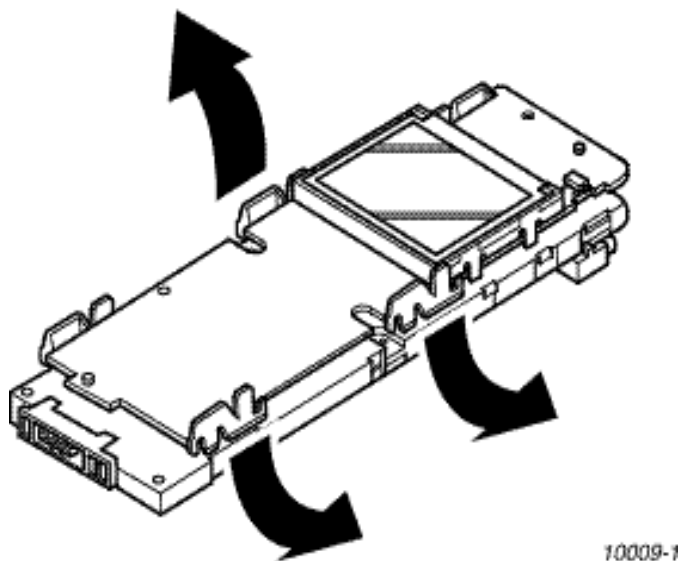


Figure 4.6: Key PCB removal

3. Gently bend the four Display Assembly lugs to allow removal from the Key PCB.

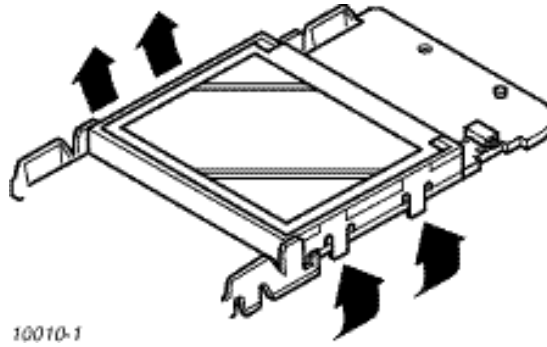


Figure 4.7: Display Assembly removal

#### 4.2.4 Case-Mounted Components

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

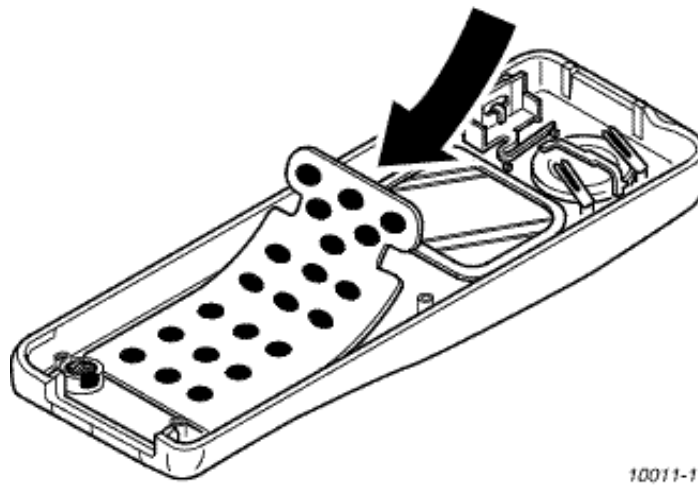


Figure 4.8: Removing the keypad

2. Remove the rubber boot which contains the microphone. When refitting, ensure contacts are oriented such that they make contact with the corresponding printed circuit pads on the Main PCB..

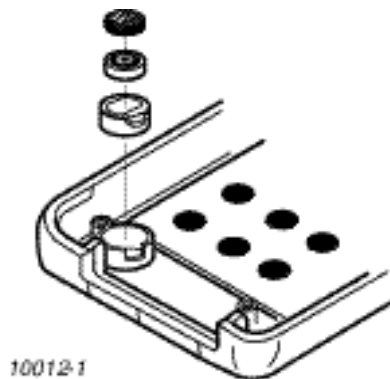
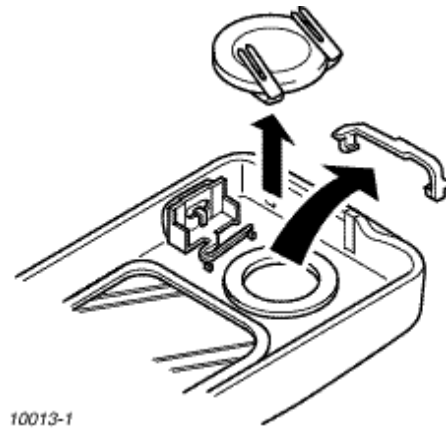


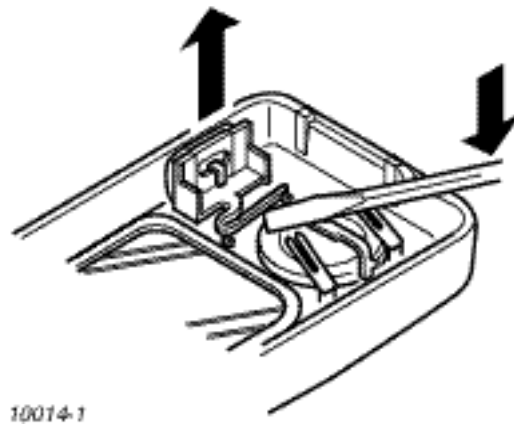
Figure 4.9: Microphone assembly removal

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



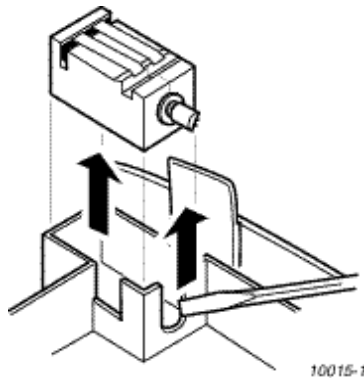
**Figure 4.10: Speaker removal**

4. Remove the Memo button by pressing a screwdriver against the actuator spring.



**Figure 4.11: Memo button removal**

5. The Vibrate motor may be removed by gently applying pressure under the spindle/counterweight.



**Figure 4.12: Vibrate motor removal**

## 4.3 Reassembly

Care must be taken when reinstalling the back onto the telephone case. Ensure that the LCD module is oriented correctly, i.e. the ribbon connector is facing the top of the telephone. Also 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 the 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 kHz

Video Bandwidth: 100 kHz

Peak Hold

#### 5.1.5 Spurious Emissions at the 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 Excl. relevant TX band: P-GSM: 890 to 915 MHz; DCS: 1710 to 1785 MHz	0 to 10 MHz $\geq 10$ MHz $\geq 20$ MHz (offset from edge of relevant TX band)	100 kHz 300 kHz 1 MHz	300 kHz 1 MHz 3 MHz	-30 -30 -30	-36 -36 -36
Relevant TX band: P-GSM: 890 to 915 MHz; DCS: 1710 to 1785 MHz	1.8 to 6.0 MHz (offset from carrier)	30 kHz	100 kHz	-30	-30

Measurement conditions:

Peak Hold, Modulated Carrier

- Measurement averaged over a burst and then averaged again over 50 bursts.
- In each of the bands 925-960 MHz and 1805-1880 MHz up to five spurious measurements can fail these limits, in which case the limit  $\leq -36$  dBm shall apply.

## 5.1.6 Output Level, Dynamic Operation

### GSM 900

Power Control Level	Transmitter Output Power (dBm)	Tolerance for Conditions (dB)	
		Normal	Extreme
5	33	±3	±4
6	31	±3	±4
7	29	±3	±4
8	27	±3	±4
9	25	±3	±4
10	23	±3	±4
11	21	±3	±4
12	19	±3	±4
13	17	±3	±4
14	15	±3	±4
15	13	±3	±4
16	11	±5	±6
17	9	±5	±6
18	7	±5	±6
19	5	±5	±6

### GSM 1800

Power Control Level	Transmitter Output Power (dBm)	Tolerance for Conditions (dB)	
		Normal	Extreme
0	30	±3	±4
1	28	±3	±4
2	26	±3	±4
3	24	±3	±4
4	22	±3	±4
5	20	±3	±4
6	18	±3	±4
7	16	±3	±4
8	14	±3	±4
9	12	±4	±5
10	10	±4	±5
11	8	±4	±5
12	6	±4	±5
13	4	±4	±5
14	2	±5	±6
15	0	±5	±6

## 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 <-102dBm.

**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 3dB above reference sensitivity.

Interferer is CW

Spurious response exceptions:

6 exceptions are permitted IN band 915 - 980MHz

24 exceptions are permitted OUTSIDE band 915 - 980MHz.

## Intermodulation Characteristics:

Interferer Level (f1 & f2) dBm	Interferer Frequencies (f1 & f2)
-49	Wanted frequency = $2f_1 - f_2$ , and $ f_1 - f_2  = 800 \text{ kHz}$

## 6 TEST AND MEASUREMENT

### 6.1 Introduction

This section provides information on testing the GD90 telephone. The layout is as follows:

1. Section 6.2 External testing: describes the test equipment required for the repair and calibration of the telephone.
2. Section 6.3 Complete Unit Test Setup: describes how the items of test equipment are used together and general set up procedure.
3. Section 6.4 Channel box test commands: provides detailed explanation of the different commands available using the test equipment and channel-box software.
4. Section 6.5 Adjustment mode: describes adjustments available on the GD90 handheld unit.
5. Section 6.6 Lock code: describes the procedure to check or reset the lock code using the Channel box software.

### 6.2 External Testing

The GD90 unit 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 be disassembled (refer to Section 4), and the two PCBs inserted into the PCB Repair Jig. Fault finding can then be performed on the PCBs using suitable test equipment, such as spectrum analysers and oscilloscopes.

Before the repaired unit is returned to the customer, it must be tested and calibrated for both frequency bands (900 MHz and 1800 MHz) as well as for the two battery types.

#### 6.2.1 Jigs and Tools

##### *Test Equipment Descriptions*

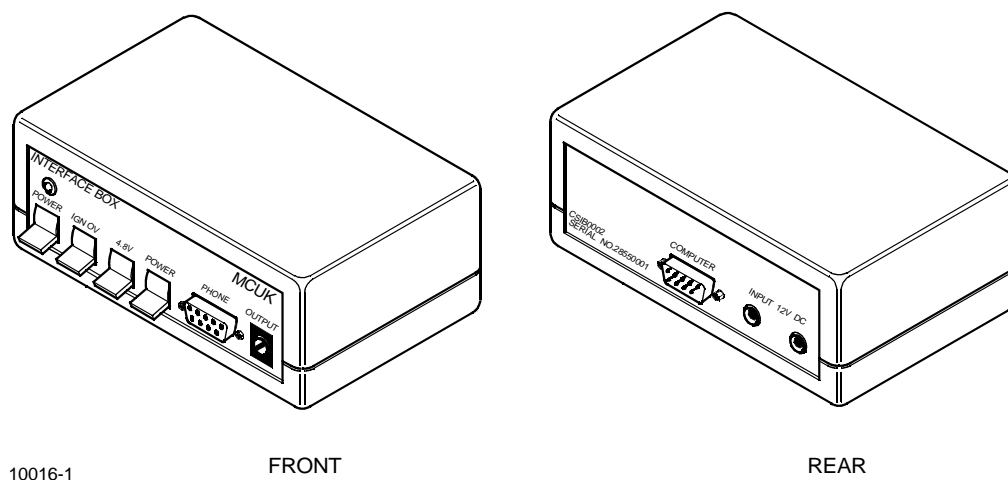
1. Interface box,  
Part Number: IFB003/IFB004

The IFB003 provides:

- a. 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 +8.6 V DC outputs. It also allows selection of external power via the Interface cable.

- b. 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**

2. 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.

## TEST AND MEASUREMENT

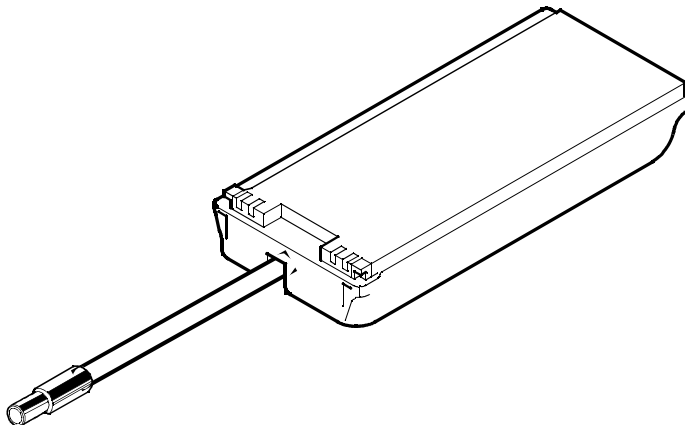
### 3. Power Supply

Provides 12 V DC supply to the Interface Box IFB003 or IFB004.

### 4. External Battery Supply Unit

Part Number: JT00021

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



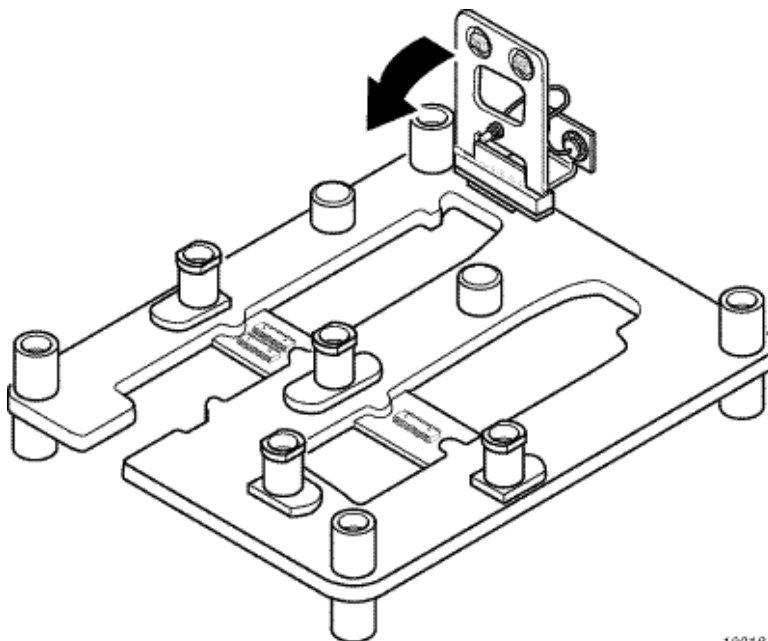
10017-1

**Figure 6.2: External Battery Supply Unit**

### 5. PCB Repair Jig

Part Number: JT00012

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

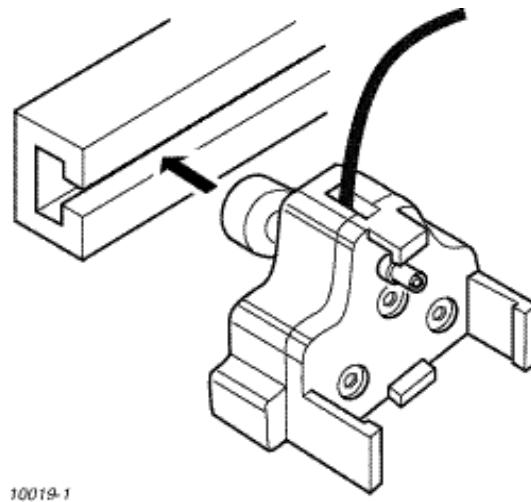


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**Figure 6.3: PCB Repair Jig**

6. RF Adaptor  
Part Number: JT00013

This unit provides an RF connection between the Unit Under Test and external test equipment. It has a lug on the back to allow both Adaptor and Unit Under Test to be suspended from a suitable rack or channel bracket, if required.



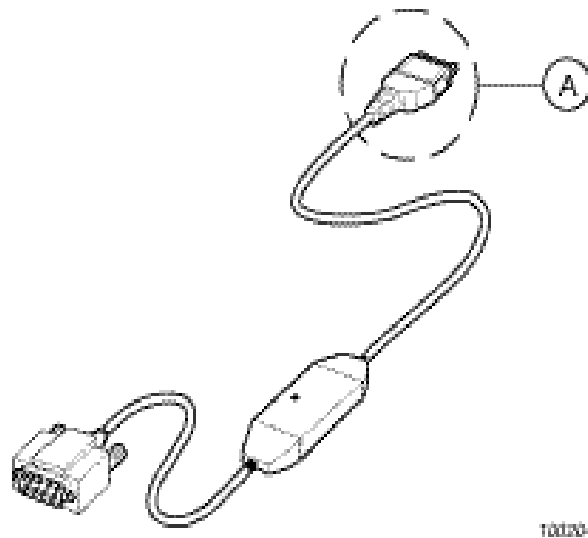
**Figure 6.4: RF Adaptor**

7. GSM Tester

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

8. Interface Cable  
Part Number: JT00004

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

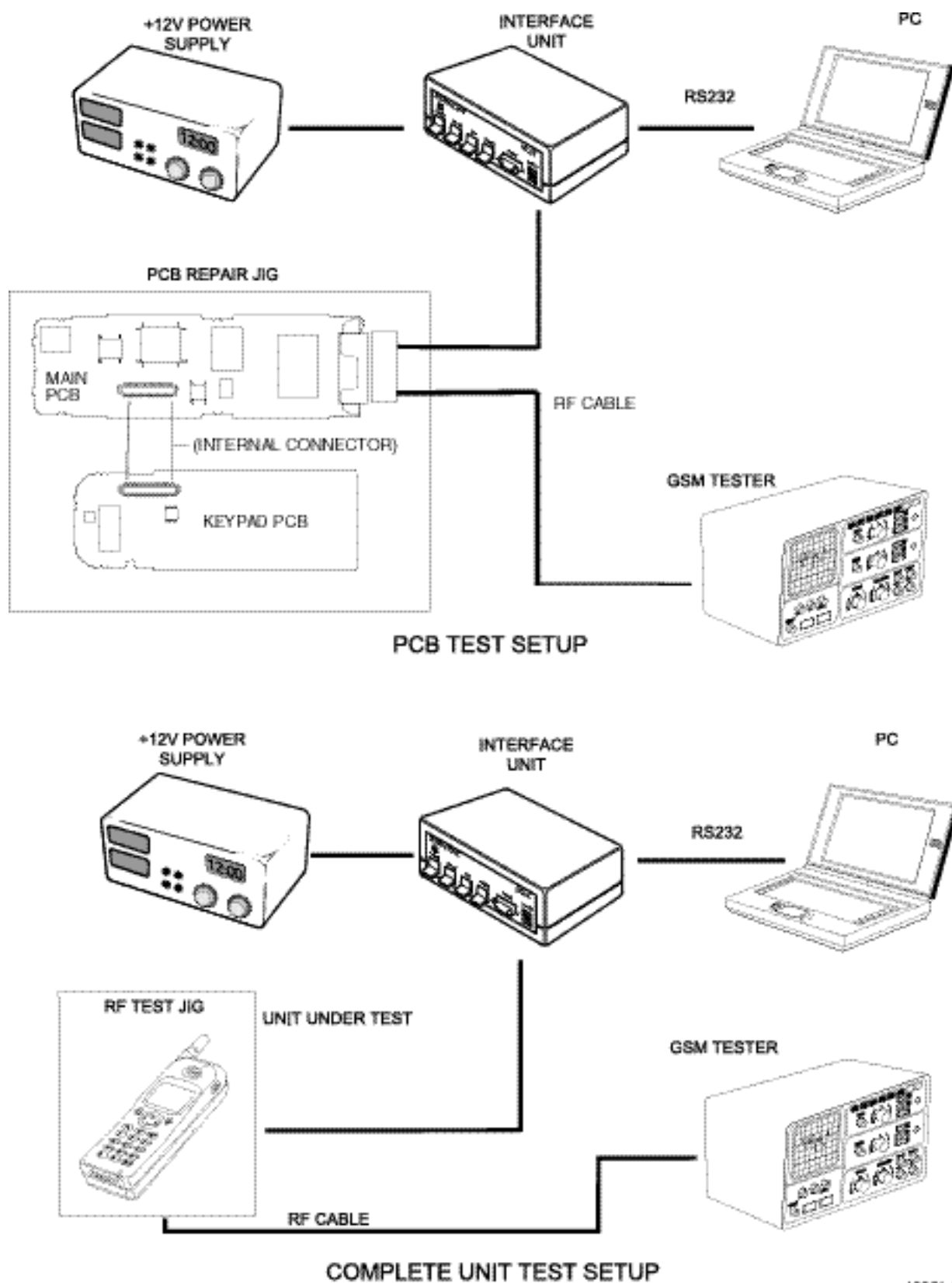


**Figure 6.5: Interface Cable**

9. Channel Box Software

This is the test software for the GD90 unit and should be installed onto the personal computer to be used for testing.

## 6.3 Complete Unit Test Setup



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Figure 6.6: Complete unit test setup

### 6.3.1 External Testing Setup Procedure

#### IMPORTANT NOTE

To allow accurate measurement of the complete unit the test equipment must be connected as shown (Figure 6.7). 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 6.6.

#### 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.

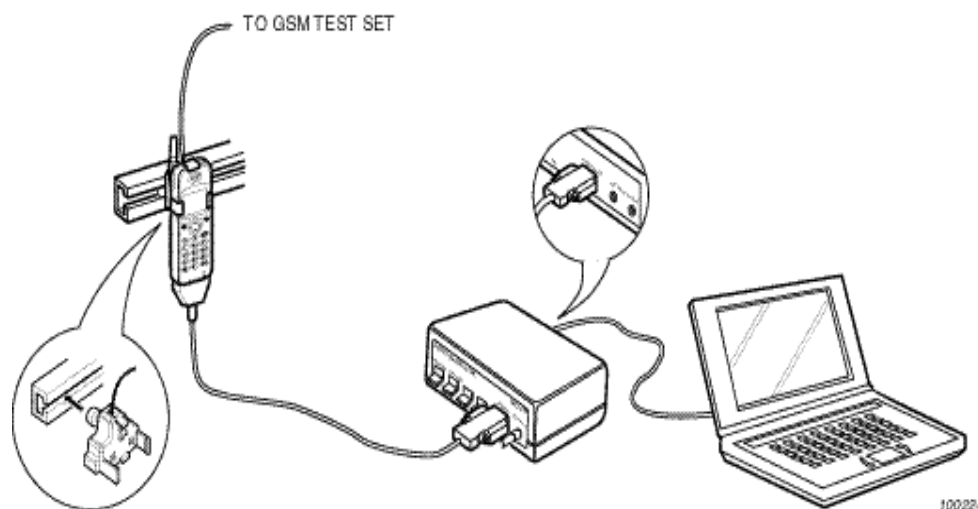
2. Normal Mode.

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 6.7: External test equipment setup**

2. Ensure that the following settings are made:

- a. Interface box IFB003 or IFB004

Power: UP position  
 IGN: DOWN position  
 Mode: UP position  
 Voltage: Dependent upon operation:  
           5.6 V for PCB testing  
           4.8 V for Nickel Metal Hydride battery

- b. Power supply

+12V DC: OFF

## c. PC

Channel box software loaded and the screen indicating as shown:

TEST-SET MODE	<CH-BOX>
NORMAL MODE	<Emulat>
SOFT-SIM MODE	<Emulat>

[ESC] to END of PROGRAM

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**Figure 6.8: PC Screen (SCRN10)**

- Press ENTER on the PC keyboard.
- Switch on the +12 V supply.
- At the PC press F10.
- At the Interface box switch the power to ON.
- Steps 5 and 6 above must be carried out within 1 second or power ON will time-out.

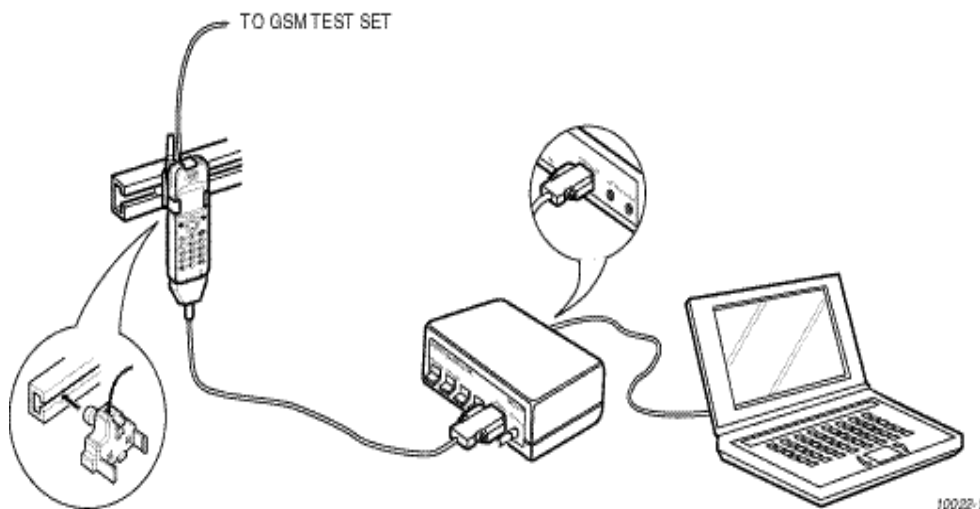
**NOTE:** The display will read:  
 GET STATION  
 ADDRESS = \_\_  
 INFO = \_\_

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

Go to Section 6.4 (Channel Box Test Commands) for further testing information.

## Power On in Normal Mode

- Connect together the test equipment.



**Figure 6.9: External test equipment setup**



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

```

TEST-SET MODE <CH-BOX>
NORMAL MODE <Emulat>
SOFT-SIM MODE <Emulat>
  
```

[ESC] to END of PROGRAM

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Figure 6.10: PC Screen (SCRN9)

3. On the PC, select NORMAL MODE and press ENTER.
4. Switch on the 12V supply.
5. At the PC press F10.
6. At the Interface box switch the POWER to ON.

### Entering Call Mode from Test Mode

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

The screen of the PC will resemble the one shown:

```

<<< PANASONIC GD90 SERVICE BOX  VER: 1.127 >>> 1999/06/10 12:03:52
INITIALIZE < 1111 >----- SP LOOPBACK< STOP>----- GET KEYCODE< ENABLE>-----
CHG CH GSM < 62>----- PATH CONT < MESI>----- CONTROL OUT<ALL ON>-----
CHG CH DCS <698>----- TAM CONT <PLAYOFF>----- CHECK LCD1 < P1>-----
POWER LEVEL< PL 5>----- VOL. BUZZ < 1>----- 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 < SHOW>-----
SET AGC 3 < +1dB>-----
VER [GD9ST0/34/00/990524]
IMEI [004400870290085]
PRDCT[
ST IN[
MOBILE BOOT OK
1:END 2: 3: 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON
  
```

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Figure 6.11: PC Screen (SCRN11)

1. At the PC change the SOFT SIM field to read <ENB>. Press ENTER.
2. At the PC change the TEST 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 5 seconds the UUT will register service.
3. To return to test mode, set SOFT SIM field to <DIS> and set TEST field to <Test>. Press ENTER.

## 6.4 Channel Box Test Commands

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

After the handheld unit has been switched on (Section 6.3), use the up/down scroll keys on the personal computer keyboard to select the channel-box command. Use the left/right scroll keys to display the required indication and press the ENTER key to select the displayed function.

CHANNEL BOX COMMAND	INDICATION	FUNCTION
TEST MODE	<TERM> <ReST>	Terminates test mode. Restarts test mode
INITIALIZE	<INIT>	When RETURN is pressed this will reset the default channel settings.
CHANGE CH GSM	<xxx>	Sets up predefined channel settings for GSM frequencies.
CHANGE CH DCS	<xxx>	Sets up predefined channel settings for DCS frequencies.
POWER LEVEL	<xxx>	Allows a specified power level to be set at the UUT.
TX DATA	<NRL 0> <NRL 1> <NRL R> <ACC R>	Sets TX Modulation to Normal burst DATA all 0s Normal burst DATA all 1s Normal burst DATA all random Access burst DATA random
RSSI (DBM)	<xxx>	Provides an RSSI reading on the User specified channel.
SET AGC 1 SET AGC 2 SET AGC 3	<xxx> <xxx> <xxx>	Allows changes to AGC levels on LOW, MIDDLE, HIGH channels.
SP LOOP BACK	<START>  <STOP>	Provides an audio path for use with the GSM test station Sets audio loop-back from TX audio to RX audio without processing by the CODEC
PATH CONT	<MOSO> <MESI> <MESE> <MISI> <MISE>	Sets audio paths: MIC off speaker off MIC external speaker internal MIC external speaker external MIC internal speaker internal MIC internal speaker external
VOL. BUZZ	<xx>	Sets buzzer volume between values 0 to 3 (Min to Max)
VOL. SIDE	<xx>	Sets 4 side tone volume levels between 0dB and -18dB
VOL. MIC	<xx>	Sets 8 MIC volume levels between 26dB and 40dB
VOL. SP1	<xx>	Sets speaker pre-amp volume levels
VOL. SP2	<xx>	Sets speaker volume levels
GET KEY CODE	<ENABLE><DISABLE>	Displays the value of a key pressed on the keypad
CONTROL OUT	<LED R> <LED B> <CHARGE ON> <LED C> <HF ON> <ALL OFF> <ALL ON>	Switches on Incoming LED Switches on Backlight LEDs Switches charge sequence on LCD Switches on Charging LED Switches on handsfree mode Switches off all above Switches on all above
CHECK LCD1	<P1>  <P2>	Provides 50% visual display of check pattern on the UUT LCD  Provides 50% visual display of check pattern on the UUT LCD

CHANNEL BOX COMMAND	INDICATION	FUNCTION
SET ER.DISP	<ENABLE> <DISABLE>	Unit error codes will be displayed on the UUT display Unit error codes will not be displayed on the UUT display
SOFT SIM	<ENABLE> <DISABLE>	With ENABLE set and TEST MODE <TERM> the UUT is removed from test mode and can be placed into call mode
TEST MODE	<TERM>	With SOFT SIM <ENABLED> the UUT will be removed from test mode and can be placed into a call
SIM STATUS	<SHOW>	Checks and displays the SIM status
CHECK SUM	<SHOW>	Displays the software checksum

## 6.5 Adjustment Mode

**NOTE:** See Section 6.2.1 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 6.5.1)
2. RSSI (Section 6.5.2)
3. I and Q values (Section 6.5.3)

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

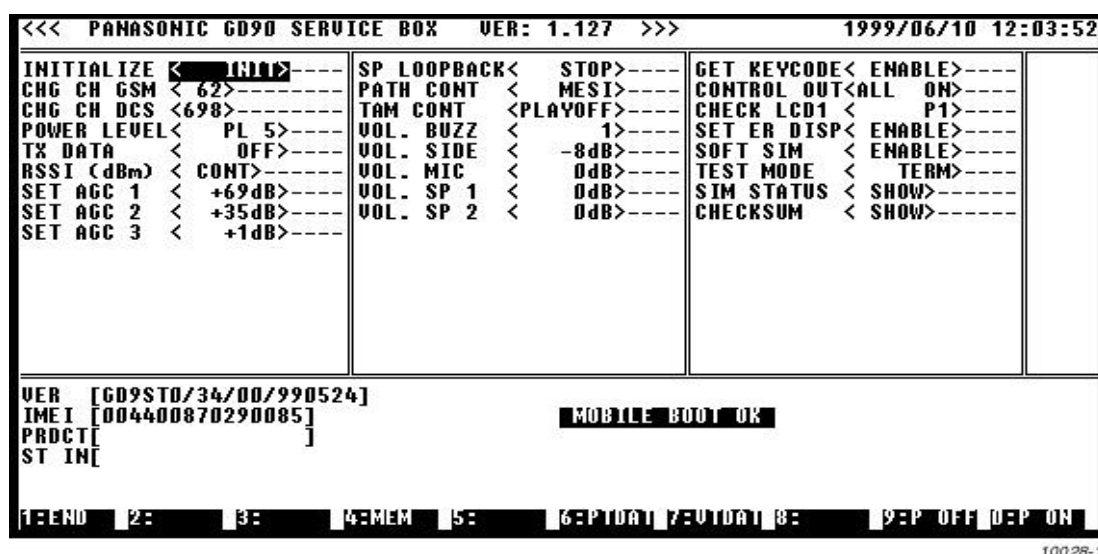


Figure 6.12: Test software screen

### 6.5.1 Ramping Gain

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

#### GSM 900

Power Level	Peak Power (dBm)	Tolerance (dBm)	Initial Calibration Value	Change per dB
PL5	32.2	±0.5	170	10.0
PL6	30.8	±0.8	150	8.0
PL7	29	±1	140	5.0
PL8	27	±1	127	4.0
PL9	25	±1	122	3.5
PL10	23	±1	115	3.5
PL11	21	±1	107	3.5
PL12	19	±1	102	3.5
PL13	17	±1	95	3.5
PL14	15	±1	87	3.4
PL15	13	±1	80	3.4
PL16	11	±1	75	3.4
PL17	9	±1	69	3.4
PL18	7	±1	62	3.3
PL19	5	±1	57	3.1

#### GSM 1800

Power Level	Peak Power (dBm)	Tolerance	Initial Calibration Value	Change per dB
PL0	28.5	±0.2	190	10.0
PL1	27	±0.5	175	6.5
PL2	26	-1 +0	164	5.0
PL3	24	±1	154	4.5
PL4	22	±1	145	4.0
PL5	20	±1	137	3.5
PL6	18	±1	131	3.3
PL7	16	±1	125	3.3
PL8	14	±1	117	3.5
PL9	12	±1	112	3.6
PL10	10	±1	104	3.6
PL11	8	±1	97	3.6
PL12	6	±1	90	3.5
PL13	4	±1	82	3.3
PL14	2	±1	77	3.0
PL15	0	±1	72	2.7

### Calibration of output power on each power level

To be able to calibrate the ramping gain it is first necessary to switch the unit into Test Mode (Section 6.3.1).

This procedure must be followed for all power levels PL5 to PL19, for low, middle and high channels for GSM 900. GSM 1800 shall be calibrated for all power levels PL0 to PL15 for top middle and bottom channels.

1. Set the Channel box controls to Channel 62 at Power Level 14, normal burst modulated with random data as follows:
  - a. Press the down arrow until CHANGE CH <62> is highlighted and then press ENTER.
  - b. Press the down arrow until PL <14> is highlighted. Press the move left arrow until <14> appears in the highlighted field. Press ENTER.
  - c. Press the down arrow until TX DATA <OFF> is highlighted. Press the move arrow until <NRL R> appears in the highlighted field. Press ENTER.

<<< PANASONIC GD90 CHANNEL BOX VER: 1.127 >>>		1999/06/03 08:58:39	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET KEYCODE< ENABLE>----	
CHG CH GSM < 62> ACK	PATH CONT < MESI>----	CONTROL OUT<ALL ON>----	
CHG CH DCS <698>----	TAM CONT <PLAYOFF>----	CHECK LCD1 < P1>----	
POWER LEVEL< PL14>ACK	UOL. BUZZ < 1>----	SET ER DISP< ENABLE>----	
TX DATA < <b>NRL R</b> >ACK	UOL. SIDE < -8dB>----	SOFT SIM < ENABLE>----	
RSSI <dBm> < CONT>----	UOL. MIC < 0dB>----	TEST MODE < TERM>----	
SET AGC 1 < +69dB>----	UOL. SP 1 < 0dB>----	SIM STATUS < SHOW>----	
SET AGC 2 < +35dB>----	UOL. SP 2 < 0dB>----	CHECKSUM < SHOW>----	
SET AGC 3 < +1dB>----			
VER [GD9ST0/34/00/990524] IMEI [004400870290085] PRDCT [ ] ST INI			
INIT CHG_CH SET_PL5 1 TX_DAT_NR			
1:END 2: 3:PROG 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON			

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Figure 6.13: Tx data field

2. At the GSM test unit measure the Peak Power.
3. If the measured power is in the range of the target power (see previous table), then proceed to step 10.
4. At the Channel box press F7 to view the TRIM for the mid-channel.

<<< PANASONIC GD90 CHANNEL BOX VER: 1.127 >>>		1999/06/03 09:00:52	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET KEYCODE< ENABLE>----	
CHG CH GSM < 62> ACK	PATH CONT < MESI>----	CONTROL OUT<ALL ON>----	
CHG CH DCS <698>----	TAM CONT <PLAYOFF>----	CHECK LCD1 < P1>----	
POWER LEVEL< PL14>ACK	UOL. BUZZ < 1>----	SET ER DISP< ENABLE>----	
TX DATA < <b>NRL R</b> >ACK	UOL. SIDE < -8dB>----	SOFT SIM < ENABLE>----	
RSSI <dBm> < CONT>----	UOL. MIC < 0dB>----	TEST MODE < TERM>----	
SET AGC 1 < +69dB>----	UOL. SP 1 < 0dB>----	SIM STATUS < SHOW>----	
SET AGC 2 < +35dB>----	UOL. SP 2 < 0dB>----	CHECKSUM < SHOW>----	
SET AGC 3 < +1dB>----			
VER [GD9ST0/34/00/990524] IMEI [004400870290085] PRDCT [ ] ST INI			
C S T			
VIEW TRIM PL Mch TRIM PL Hch TRIM PL Lch TRIM PL Tch TRIM PL Bch TRIM Other			
1:END 2: 3:PROG 4:MEM 5: 9:P OFF 0:P ON			

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Figure 6.14: Power level view 1

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

```

<<< PANASONIC GD990 CHANNEL BOX VER: 1.127 >>> 1999/06/03 09:05:53

INITIALIZE < INIT>-----
CHG CH GSM < 62> ACK
CHG CH DCS <698>
POWER LEVEL< PL14>ACK
TX DATA < NRL R>ACK
RSSI <dBm> <CONT>
SET AGC 1 < +69dB>-----
SET AGC 2 < +35dB>-----
SET AGC 3 < +1dB>-----

SP LOOPBACK<
PATH CONT <
TAM CONT <PLA
VOL. BUZZ <
VOL. SIDE <
VOL. MIC <
VOL. SP 1 <
VOL. SP 2 <

M ch
PL5 GSM = 159 PL0 DCS = 160
PL6 GSM = 142 PL1 DCS = 152
PL7 GSM = 135 PL2 DCS = 144
PL8 GSM = 130 PL3 DCS = 136
PL9 GSM = 123 PL4 DCS = 129
PL10 GSM = 117 PL5 DCS = 124
PL11 GSM = 110 PL6 DCS = 118
PL12 GSM = 104 PL7 DCS = 110
PL13 GSM = 99 PL8 DCS = 104
PL14 GSM = 93 PL9 DCS = 101
PL15 GSM = 89 PL10 DCS = 96
PL16 GSM = 85 PL11 DCS = 92
PL17 GSM = 81 PL12 DCS = 85
PL18 GSM = 78 PL13 DCS = 79
PL19 GSM = 71 PL14 DCS = 75
PL15 DCS = 71

VER [GD9ST0/34/00/990524]
IMEI [004400870290085]
PRDCT[ ]
ST INI

HIT ANY KEY
1:END 2: 3:PROG 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON

```

**Figure 6.15: Power level view 2**

6. 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)                      (step2)                      (table)

Make a note of the result.

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

```

<<< PANASONIC GD90 CHANNEL BOX   VER: 1.127   >>>          1999/06/03 09:08:01

INITIALIZE <  INIT>-----
CHG CH GSM < 62>      ACK
CHG CH DCS <698>-----
POWER LEVEL<  PL14>ACK
TX DATA   <  NRL R>ACK
RSSI <dBm> < CONT>-----
SET AGC 1  < +69dB>-----
SET AGC 2  < +35dB>-----
SET AGC 3  < +1dB>-----

SP LOOPBACK<  STOP>-----
PATH CONT  <  MES1>-----
TAM CONT   <PLAYOFF>-----
UOL. BUZZ  <    1>-----
UOL. SIDE  < -8dB>-----
UOL. MIC   < 0dB>-----
UOL. SP 1  < 0dB>-----
UOL. SP 2  < 0dB>-----

GET KEYCODE< ENABLE>-----
CONIROL OUT<ALL ON>-----
CHECK LCD1 <    P1>-----
SET ER DISP< ENABLE>-----
SOFT SIM   < ENABLE>-----
TEST MODE  <  TERM>-----
SIM STATUS < SHOW>-----
CHECKSUM   < SHOW>-----

VER [GD9ST0/34/00/990524]
IMEI [004400870290085]
PRDCT[          ]
ST INI          1

1:END  2:  3:PROG  4:MEM  5:  6:PTDAT  7:UIDAT  8:  9:P OFF 0:P ON

```

**Figure 6.16: Power level selection 1**

8. Select PROGRAM TRIM PL MCH GSM.

```

<<< PANASONIC GD90 CHANNEL BOX  UER: 1.127 >>> 1999/06/03 09:08:01
INITIALIZE < INIT>----- SP LOOPBACK< STOP>----- GET KEYCODE< M ch>-----
CHG CH GSM < 62>----- ACK PATH CONT < MESI>----- CHECK PL5 GAIN GSM
CHG CH DCS < 698>----- TAM CONT < PLAYOFF>----- CHECK PL6 GAIN GSM
POWER LEVEL< PL14>ACK UOL. BUZZ < 1>----- SET PL7 GAIN GSM
TX DATA < NRL R>ACK UOL. SIDE < -8dB>----- SOFT PL8 GAIN GSM
RSSI < dBm> < CONT>----- UOL. MIC < 0dB>----- TEST PL9 GAIN GSM
SET AGC 1 < +69dB>----- UOL. SP 1 < 0dB>----- SIM PL10 GAIN GSM
SET AGC 2 < +35dB>----- UOL. SP 2 < 0dB>----- CHECK PL11 GAIN GSM
SET AGC 3 < +1dB>-----
UER [GD9ST0/34/00/990524]
IMEI [004400870290085]
PRDCT [ ]
ST INI [ ]
1:END 2: 3:PROG 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON

```

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Figure 6.17: Power level selection 2

9. Highlight the PL14 field and press ENTER.

```

<<< PANASONIC GD90 CHANNEL BOX  UER: 1.127 >>> 1999/06/03 09:08:01
INITIALIZE < INIT>----- SP LOOPBACK< STOP>----- GET KEYCODE< ENABLE>-----
CHG CH GSM < 62>----- ACK PATH CONT < MESI>----- CONTROL OUT< ALL ON>-----
CHG CH DCS < 698>----- TAM CONT < PLAYOFF>----- CHECK LCD1 < P1>-----
POWER LEVEL< PL14>ACK UOL. BUZZ < 1>----- SET ER DISP< ENABLE>-----
TX DATA < NRL R>ACK UOL. SIDE < -8dB>----- SOFT SIM < ENABLE>-----
RSSI < dBm> < CONT>----- UOL. MIC < 0dB>----- TEST MODE < TERM>-----
SET AGC 1 < +69dB>----- UOL. SP 1 < 0dB>----- SIM STATUS < SHOW>-----
SET AGC 2 < +35dB>----- UOL. SP 2 < 0dB>----- CHECKSUM < SHOW>-----
SET AGC 3 < +1dB>-----
UER [GD9ST0/34/00/990524]
IMEI [004400870290085]
PRDCT [ ]
ST INI [ ]
PL5 GAIN GSM
Mch PL5 GSM GAIN [0-255] [ ]
1:END 2: 3:PROG 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON

```

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Figure 6.18: Power level selection 3

10. Enter the value calculated in step 6 into the data field and then press ENTER.
11. Press ESC.
12. At the GSM test unit re-measure the peak power.
13. Repeat steps 2 to 11 of this procedure 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 PL19 and PL14
14. After calibrating at channel 62, the carrier power must be measured and calibrated at LOW and HIGH channels as described above.
15. Repeat step 2 to 14 for the GSM 1800 settings for power levels in the following order:
  - PL10 (limits (±0.5dB)
  - PL1, PL5 and PL15
  - PL5 to PL1
  - PL10 to PL5
  - PL15 to PL10

PL0 (limits  $\pm 0.2\text{dB}$ )

NOTE: Calibration data exists for GSM 1800 low and high channels, but is not used.

Channel	GSM900	GSM1800
Low/Bottom	1	544
Mid	62	698
High/Top	124	855

## 6.5.2 RSSI

This procedure describes the calibration of RSSI on the Mid-channel (Mch = Ch 60). This process must be carried out for LOW/ BOTTOM CHANNEL and HIGH/TOP CHANNEL. The following channel settings are used in this procedure:

1. Set up the test equipment as described in Section 6.3 and switch the unit into test mode as described.
2. Apply a carrier frequency of +68kHz to the telephone (for Ch 60 = 947.068 MHz) at an input level of -90 dBm.
3. On the Channel box, highlight the CHANGE CH field and, press the left-right arrow keys until <60> is displayed in the window. Press ENTER to select.
4. Highlight the SET AGC 1 field and change the set value to 49 dB. Press ENTER.
5. Highlight the RSSI dBm <> field and press ENTER.

<<< PANASONIC GD90 CHANNEL BOX VER: 1.127 >>>		1999/06/03 09:15:31	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET KEYCODE< ENABLE>----	
CHG CH GSM < 60> ACK	PATH CONT < MESI>----	CONTROL OUT<ALL ON>----	
CHG CH DCS <698>----	TAM CONT <PLAYOFF>----	CHECK LCD1 < P1>----	
POWER LEVEL< PL 5>----	UOL. BUZZ < 1>----	SET ER DISP< ENABLE>----	
TX DATA < OFF>----	UOL. SIDE < -8dB>----	SOFT SIM < ENABLE>----	
RSSI <dBm> < CONT> -91.5	UOL. MIC < 0dB>----	TEST MODE < TERM>----	
SET AGC 1 < +49dB>ACK	UOL. SP 1 < 0dB>----	SIM STATUS < SHOW>----	
SET AGC 2 < +35dB>----	UOL. SP 2 < 0dB>----	CHECKSUM < SHOW>----	
SET AGC 3 < +1dB>----			
VER [GD9ST0/34/00/990524]		MOBILE BOOT OK	
IMEI [004400870290085]		CHG_CH	
PRDCT [ ]		CHG_CH	
ST INI		AGC+49	
1:END 2: 3:PROG 4:MEM 5: 6:PTDAT 7:UTDAT 8: 9:P OFF 0:P ON			

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Figure 6.19: RSSI dB field

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

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

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

Record the result.



7. At the Channel box press F7 to view data.

<<< PANASONIC GD90 CHANNEL BOX UER: 1.127 >>>		1999/06/03 09:16:31	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET KEYCODE< ENABLE>----	
CHG CH GSM < 60>----- ACK	PATH CONT < MESI>-----	CONTROL OUT<ALL ON>----	
CHG CH DCS <698>-----	TAM CONT <PLAYOFF>----	CHECK LCD1 < P1>-----	
POWER LEVEL< PL 5>-----	UOL. BUZZ < 1>-----	SET ER DISP< ENABLE>----	
TX DATA < OFF>-----	UOL. SIDE < -8dB>-----	SOFT SIM < ENABLE>-----	
RSSI <dBm> < CONT> -91.5	UOL. MIC < 0dB>-----	TEST MODE < TERM>-----	
SET AGC 1 < +49dB>ACK	UOL. SP 1 < 0dB>-----	SIM STATUS < SHOW>-----	
SET AGC 2 < +35dB>-----	UOL. SP 2 < 0dB>-----	CHECKSUM < SHOW>-----	
SET AGC 3 < +1dB>-----			
UER [GD9ST0/34/00/990524]		VIEW TRIM PL Mch	
IMEI [004400870290085]		TRIM PL Hch	
PRDCTI ]		TRIM PL Lch	
ST INI		TRIM PL Tch	
		TRIM PL Bch	
		TRIM Other	
1:END 2: 3:PROG 4:MEM 5:		9:P OFF 0:P ON	

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Figure 6.20: RSSI reading 1

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

<<< PANASONIC GD90 CHANNEL BOX UER: 1.127 >>>		1999/06/03 09:16:31	
INITIALIZE < INIT>----	SP LOOPBA		
CHG CH GSM < 60>----- ACK	PATH CONT	IQCH GAIN = 0.00dB	RSSI Lch GSM = 248
CHG CH DCS <698>-----	TAM CONT	ICH OFFSET = 127	RSSI Mch GSM = 248
POWER LEVEL< PL 5>-----	UOL. BUZZ	QCH OFFSET = 127	RSSI Hch GSM = 250
TX DATA < OFF>-----	UOL. SIDE	BAT TEMP = 14	RSSI Comp GSM = 253
RSSI <dBm> < CONT> -91.5	UOL. MIC	BAT VOLT HI = 803	RSSI Bch DCS = 244
SET AGC 1 < +49dB>ACK	UOL. SP 1	BAT VOLT LO = 573	RSSI Lch DCS = 244
SET AGC 2 < +35dB>-----	UOL. SP 2	DAC REF = 716	RSSI Mch DCS = 246
SET AGC 3 < +1dB>-----		DELTA U = 6	RSSI Hch DCS = 246
		U IGNORE = 12	RSSI Tch DCS = 248
		TIMER OFFSET = 0	RSSI Comp DCS = 0
		COMP OFFSET = 40	
		AFC OFFSET = 12	
		RTC COMP = 0	
		LCD CONTRAST = 42	
UER [GD9ST0/34/00/990524]			
IMEI [004400870290085]			
PRDCTI ]			
ST INI			
HIT ANY KEY			
1:END 2: 3:PROG 4:MEM 5: 6:PIDAT 7:UTDAT 8: 9:P OFF 0:P ON			

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Figure 6.21: RSSI reading 2

9. Press ESC.

10. At the Channel box press F6 to program data.

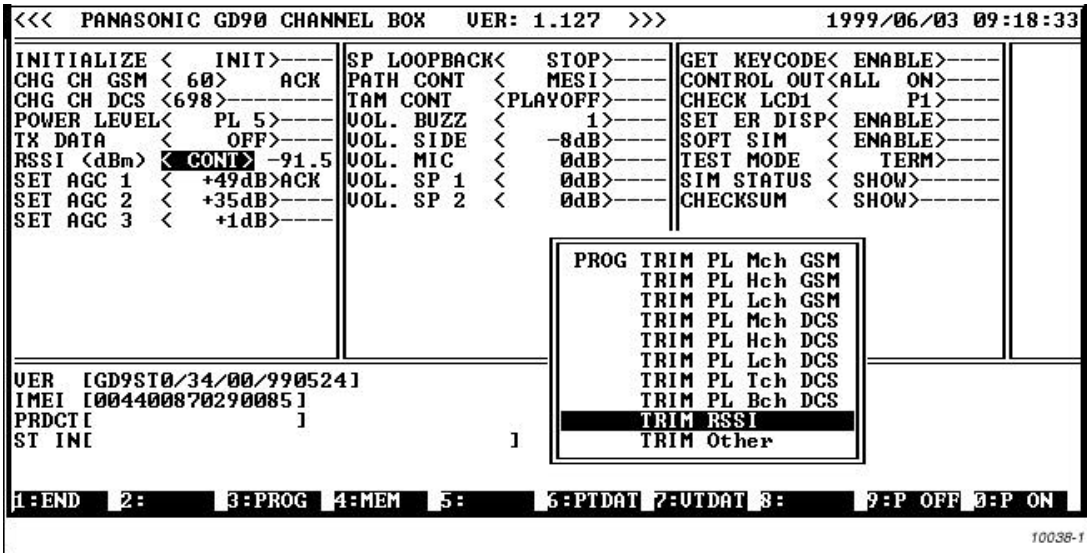


Figure 6.22: RSSI reading 3

11. Select TRIM RSSI and press ENTER.
12. Make the following calculation:  
RSSI offset value (from step 8) + reading noted in step 6. Enter the result into RSSI COMP field for example: 10+ 5 = 15

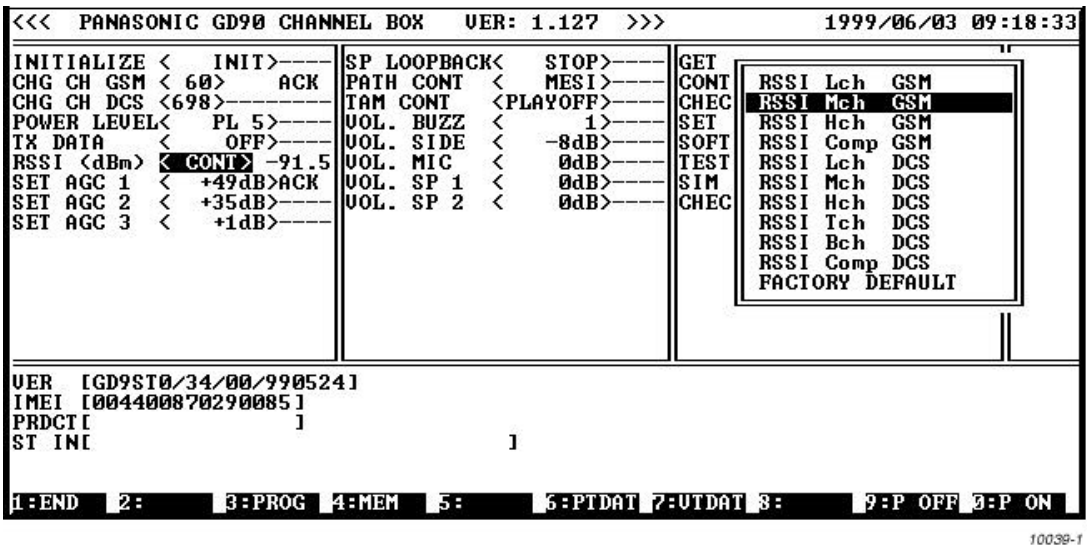


Figure 6.23: RSSI reading 4

13. Press ENTER.
14. Press ESC.
15. Measure the RSSI level again by highlighting the RSSI dBm field and press ENTER.
16. Repeat steps 6 to 15 for both LOW/BOTTOM and HIGH/TOP channels.

Channel	GSM
Low/Bottom	1
Mch	60
High/Top	115

17. Repeat steps 6 to 15 for GSM 1800 on the channels listed below.

Channel	GSM 1800
Bch	520
Lch	630
Mch	700
Hch	810
Tch	870

## 6.6 I and Q Values

**NOTE:** By observing the image leakage and adjusting the relative gain between I and Q channels, phase error and modulation spectrum can be improved. With the I, Qch adjustment procedures the transmitter must be set to Power Level 5 (this presents the worst case of non-linearity) so care must be taken that the spectrum analyser used can accept a signal input of 33 dBm. If not, an appropriate attenuator must be used.

### I, Qch Gain

**IMPORTANT:** I, Qch offset calibration should be done before this calibration.

Spectrum Analyser Setup.

centre frequency = 902.4 MHz

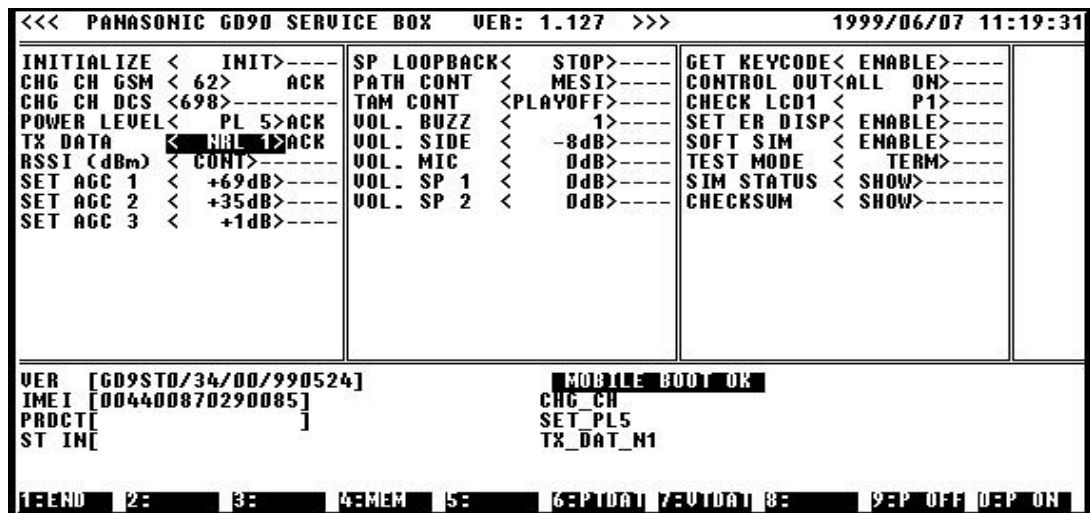
RBW = 10 kHz

VBW = 10 kHz

Span = 1 MHz

Sweep time = 2 sec

1. On the Channel box, highlight CHANGE CH GSM.
  - a. Press the left-right arrow keys until channel number '62' is visible in the window. Press ENTER to select.
  - b. Press the down-arrow key until the POWER LEVEL field is highlighted. Press the left-right arrow keys until PL5 is visible in the window. Press ENTER to select.
  - c. Press the down arrow until the TX DATA field is highlighted. Press the left-right arrow keys until NRL 1 is visible in the window. Press ENTER to select.



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Figure 6.24: Image leak ratio

2. Using the spectrum analyser measure the image leak ratio. Image leak ratio is the measured ratio of peak power and the power at 135 kHz below peak frequency.

Example:

peak power (902.468 Mhz) = 33 dBm

power at 135 kHz below peak power = -9 dBm

image leak ratio = 33 dBm - (-9 dBm) = 42 dBm

## TEST AND MEASUREMENT

- If image leak ratio is greater than 30 dBc then unit is OK. (offset calibration is complete).
- If image leak ratio is less than 30 dBc then proceed to ICh gain calibration.

I

<<< PANASONIC GD90 SERVICE BOX VER: 1.127 >>>		1999/06/07 11:28:19	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET	<div style="border: 1px solid black; padding: 5px;">           FACTORY DEFAULT  <b>IQCH GAIN</b>            ICH OFFSET            QCH OFFSET            BAT TEMP            BAT VOLT HIGH            BAT VOLT LOW            DAC REFERENCE            DELTA V            V IGNORE            TIMER OFFSET            COMPLETE OFFSET            AFC OFFSET            RTC COMP            LCD CONTRAST         </div>
CHG CH GSM < 62> ACK	PATH CONT < MESI>----	CONT	
CHG CH DCS < 698>----	TAM CONT <PLAYOFF>----	CHEC	
POWER LEVEL< PL 5>ACK	VOL. BUZZ < 1>----	SET	
TX DATA < NAL 1>ACK	VOL. SIDE < -8dB>----	SOFT	
RSSI (dBm) < CONT>----	VOL. MIC < 0dB>----	TEST	
SET AGC 1 < +69dB>----	VOL. SP 1 < 0dB>----	SIM	
SET AGC 2 < +35dB>----	VOL. SP 2 < 0dB>----	CHEC	
SET AGC 3 < +1dB>----			
VER [GD9ST0/34/00/990524] IMEI [004400870290085] PRDCT[ ] ST IN[ ]		MOBILE BOOT 0 CHG_CH SET_PL5 TX_DAT_M1	
1:END 2: 3: 4:MEM 5: 6:PTOAT 7:UTDAT 8: 9:P OFF 0:P ON			

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<<< PANASONIC GD90 SERVICE BOX VER: 1.127 >>>		1999/06/07 11:28:19	
INITIALIZE < INIT>----	SP LOOPBACK< STOP>----	GET KEYCODE< ENABLE>----	
CHG CH GSM < 62> ACK	PATH CONT < MESI>----	CONTROL OUT<ALL ON>----	
CHG CH DCS < 698>----	TAM CONT <PLAYOFF>----	CHECK LCD1 < P1>----	
POWER LEVEL< PL 5>ACK	VOL. BUZZ < 1>----	SET ER DISP< ENABLE>----	
TX DATA < NAL 1>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 < SHOW>----	
SET AGC 3 < +1dB>----			
VER [GD9ST0/34/00/990524] IMEI [004400870290085] PRDCT[ ] ST IN[ ]		<b>IQCH GAIN</b> IQCH GAIN [0-7][ ]	
1:END 2: 3: 4:MEM 5: 6:PTOAT 7:UTDAT 8: 9:P OFF 0:P ON			

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### Qch Gain Calibration

- Set IQch gain to -0.25 dB.
  - On the Channel box press F6.
  - Press the left-right arrow keys until IQCH GAIN field is highlighted. Press ENTER.
  - Enter 1 into the data field (for -0.25dB). Press ENTER.
- Measure the image leak ratio.
- If image leak ratio is greater than 30 dBc, then unit is OK. (offset calibration is complete)
- If image leak ratio is less than 30 dBc, then repeat steps 1, 2 and 3 with IQch gain values: -0.50 dB (2), -0.75 dB (3).
- If image leak ratio is still less than 30 dBc, then the unit is a fail.

### 6.6.1 Simple Receiver Test

The following procedure gives a method by which the Unit Under Test (UUT) can be placed into a condition allowing the service technician to probe the entire receive RF path. Input level and frequency can also be specified.

To perform the following procedure the UUT must first be placed into Test Mode. Perform the following steps:

1. At the Channel box highlight the CHG CH (GSM900 or GSM1800) field and set the required test channel. Press ENTER.
2. Highlight the SET AGC 1,2,3 field and enter the required gain value.
3. At the GSM test unit input an RF signal at the required frequency and level.

The unit has now been placed in a state which will allow the received signal path to be monitored.

### 6.6.2 Simple Transmitter Test

The following procedure gives a method by which the Unit Under Test (UUT) can be placed into a condition allowing the service technician to probe the entire transmit RF path. Input level and frequency can also be specified.

To perform the following procedure the UUT must first be placed into Test Mode. Perform the following steps:

1. At the Channel box highlight the CHG CH (GSM900 or GSM1800) field and set the required test channel.
2. Press ENTER.
3. Highlight the PL field and set the required test power level.
4. Press ENTER.
5. Highlight the TX\_DATA field and select the required modulation type and data.
6. Press ENTER.

The UUT is now in the required state to allow probing of the transmit RF path.

### 6.6.3 Battery Charging & Calibration

There are three procedures to calibrating the battery, voltage, temperature and charging calibration. To perform this operation, two regulated power supplies are needed in addition to the power supply required for the IFB003/IFB004. The DC output on the front of the IFB003 is unsuitable for use in the battery calibration procedure because of the voltages required. In addition, a dummy battery and an 82 ohm resistor are needed.

#### *Voltage Calibration*

1. Connect dummy battery to phone. Connect the dummy battery's power leads to a PSU (set to 3.7 V). This is VBAT (PSU 1 o/p). Connect the Interface Box to the telephone using the Interface Box.
2. Select and run Channel Box software - in Test Mode. Press [F10] and power the phone on. "TEST SET TEST MODE" should be displayed in the phone display.
3. Set VBAT (PSU1 o/p) to  $4.1 \text{ V} \pm 5 \text{ mV}$ .
4. Press [F4] on the PC. Go to, and select: "VIEW ADC LINES".
5. Look at ADIN1 (BAT VOLT) reading. This reading is "BAT VOLT HIGH". If reading is outside the range  $763 \pm 40$  then there is a fault, and further investigation is required. Otherwise, record the value for later use.
6. Set VBAT (PSU1 o/p) to  $3.0 \text{ V} \pm 5 \text{ mV}$ .
7. Press "[Y]" [enter] on the PC to re-read ADC Data.
8. Look at ADIN1 (BAT VOLT) reading again. This reading is "BAT VOLT LOW". If the reading is outside the range  $558 \pm 40$  then there is a fault, and further investigation is required. Otherwise, record the value for later use.
9. Press [N] (in repeat yes/no box), then [Enter].
10. Press [F6]. Go to, and select: "TRIM Other". Go to, and select: "BAT VOLT HIGH". Enter value from step 5 above.
11. Press [F6]. Go to, and select: "TRIM Other" again. Go to, and select: "BAT VOLT LOW". Enter value from step 8 above. Set PSU1 o/p to 3.7 volts.

#### *Temperature Calibration*

12. There is a 10 k $\Omega$  resistor in the test battery, between BAT\_TEMP and Ground. Ensure that it is  $10 \text{ k}\Omega \pm 1\%$  before proceeding. Ensure that PSU1 o/p is set to 3.7 V.
13. If the ADC data are not already being displayed, press [F4], "VIEW ADC LINES", [enter].
14. Look at the value for ADIN3 (BAT TEMP). If the value is outside the range  $410 \pm 40$ , then there is a fault, and further investigation is required. Otherwise, calculate the difference between the reading and the theoretical value of 365. Record this value for use below.
15. Press [N] (in repeat yes/no box), then [enter].

16. Press [F6]. Go to, and select: "TRIM Other" again. Go to, and select: "BAT TEMP". Enter value from step 14 above.

### Charging Calibration

17. For this procedure, set up the equipment as follows.

- a. Connect 82  $\Omega$  1 W resistor between VBAT and Ground.
- b. Connect PSU1 between VBAT and Ground, set to 3.7 volts and switch on. (note that this gives 50 mA)
- c. Connect a second PSU (PSU2) to the phone via the phone's external connector. Set PSU2 to 5.8 volts - current limit set to 700 mA.

18. Press {shift}+[F4].

19. Go to, and select: "Set DAC Data". Type a value of 714, [enter].

20. Using arrows  $\uparrow\downarrow$ , highlight "Control out". Use  $\leftarrow\rightarrow$  arrows to highlight and select "CRG ON".

21. Disconnect VBAT by switching PSU1 output OFF.

22. Measure VBAT voltage at test battery. If the voltage is inside the range  $4.1\text{ V} \pm 5\text{ mV}$  then go to step 27 below. Otherwise, calculate the difference thus:- (measured voltage - 4.2)/0.00616 = difference.

23. Press {shift}+[F4].

24. Go to, and select: "Set DAC Data". Enter value of:- (previously set value (which you originally set to 714)) - result from step 22 above (integer only).

25. Repeat steps 22 to 24 until measured voltage is  $4.1\text{ V} \pm 5\text{ mV}$

26. If the final value for DAC Data is outside the range  $710 \pm 40$  then there is a fault, and further investigation is required. Otherwise store the value as described below.

27. Press [F6]; Go to, and select:- "Trim Other";

28. Go to, and select:- "DAC Reference"; Enter value.

29. Press {shift}+[F4].

30. Go to, and select:- "Set DAC Data".

31. Enter:- (value stored in step 28) - 200.

32. Press [F4].

33. Go to, and select:- View ADC lines.

34. Read value for ADIN1 ("BAT VOLT").

35. If ["BAT VOLT HIGH" (from step 5) - value read above], is inside the range  $213 \pm 42$  then go to step 36 below to store value. Otherwise there is a fault, and further investigation is required.

36. Press [N] (in repeat yes/no box), then [enter]. Press [F6]; Highlight and select "Trim Other".

37. Highlight and select "DAC Step".

38. Enter value obtained in step 35, above.

39. Press {shift}+[F4].

40. Select: "Set DAC Data".

41. Re-enter original value from step 26 (i.e. present value +200).

42. Press [F4].

43. Highlight, and select:- "View ADC Lines".

44. Read ADIN5 (CRG CURRENT) value and record it as "Total current".

45. Disconnect the 82  $\Omega$  Resistor.

46. Press [Y], [enter] to read ADC value again, and record it as "Phone current".

47. "Charge current" = "Total current" - "Phone current". If this outside the range  $43 \pm 4$  then there is a fault, and further investigation is required. Otherwise, calculate offset thus:- "Charging current" - 43 = Offset.

48. Press [N] (in repeat yes/no box), then [enter]. Press [F6]

49. Go to, and select:- "TRIM other".

50. Go to, and select:- "Complete offset".

51. Enter offset calculated above.

52. At the end of all tests, turn OFF power supplies and remove the phone.

## 6.7 Lock Code

**NOTE:** See Section 6.2.1 for a list of the equipment and setup procedures required to perform the following adjustment and calibration procedures.

To perform the following procedures the UUT must be placed into Test Mode.

### 6.7.1 Check current lock code

1. At the Channel box press F4 and highlight VIEW LOCK CONDITION. Press ENTER.

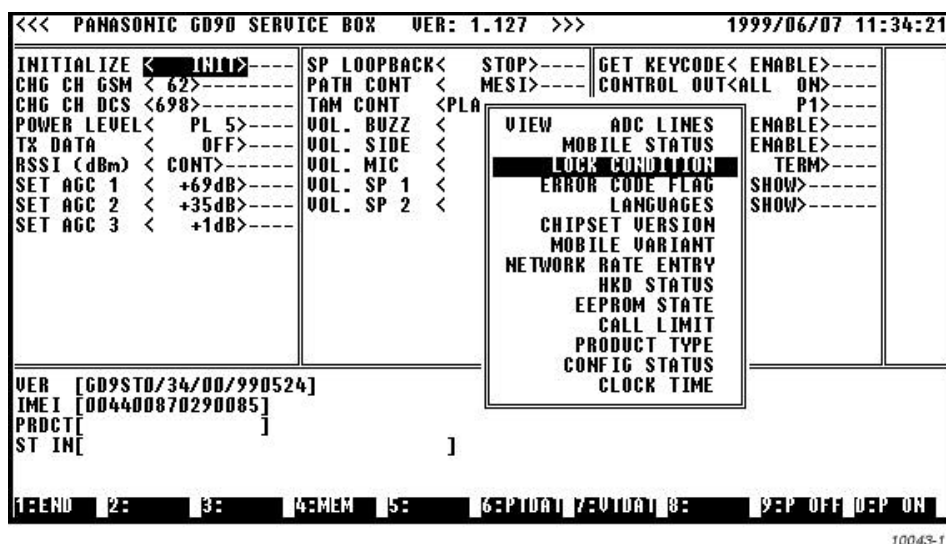
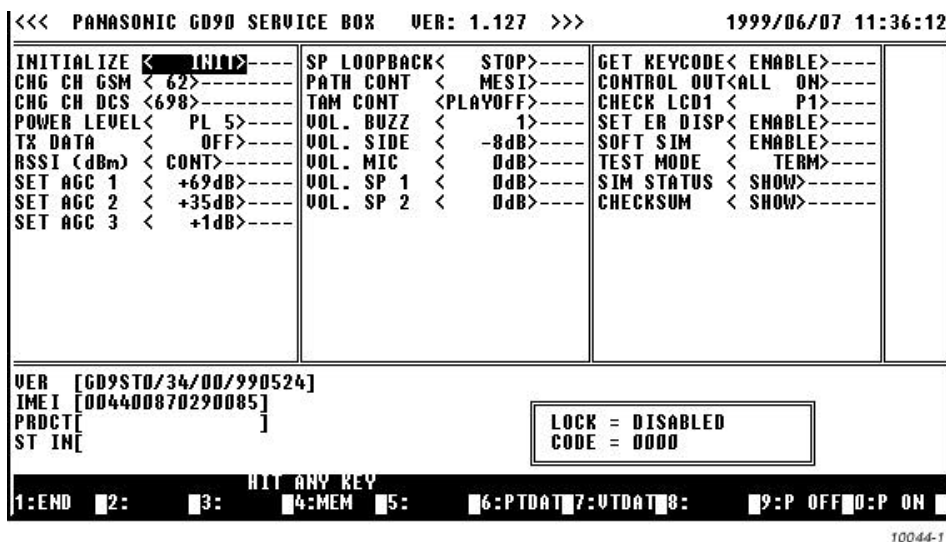


Figure 6.25: View lock code

2. The display will show the current lock status and lock code for the Unit Under Test.



## 6.7.2 Change current lock code

1. At the Channel box press SHIFT and F4 and highlight PROG LOCK CONDITION. Press ENTER.
2. Press ENTER to unlock the Unit Under Test. The current lock code will be used.

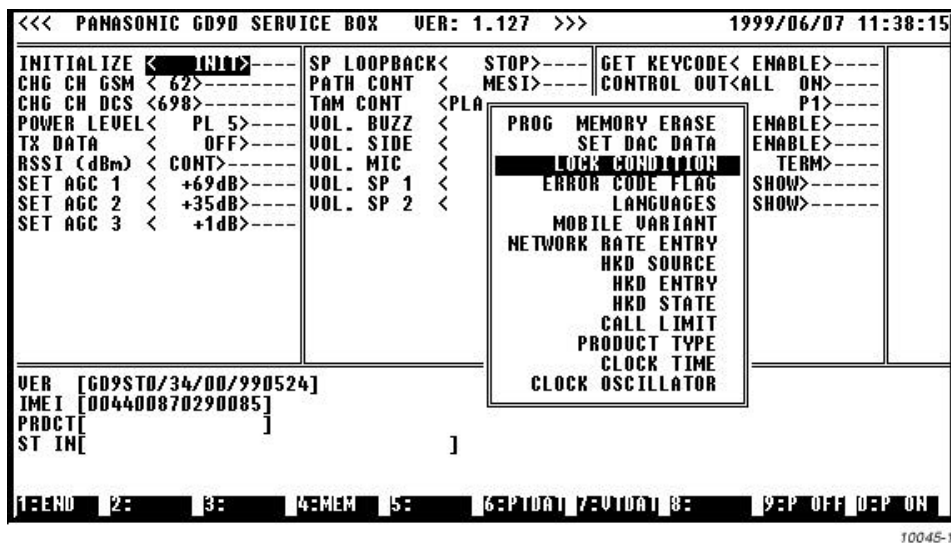
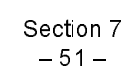


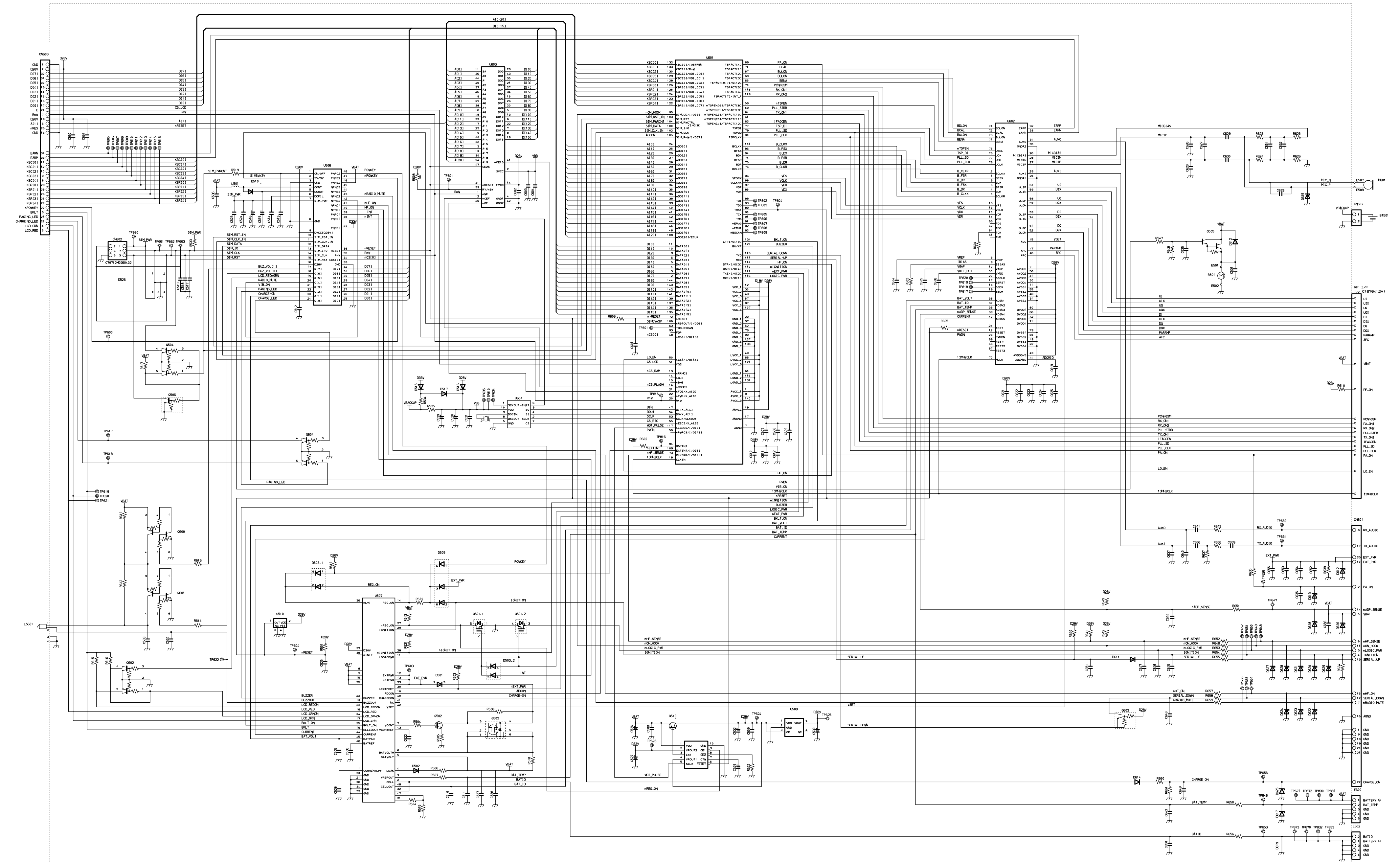
Figure 6.26: Program lock code

3. Enter "0000" to reset and lock the Unit Under Test to the factory default lock code "0000".

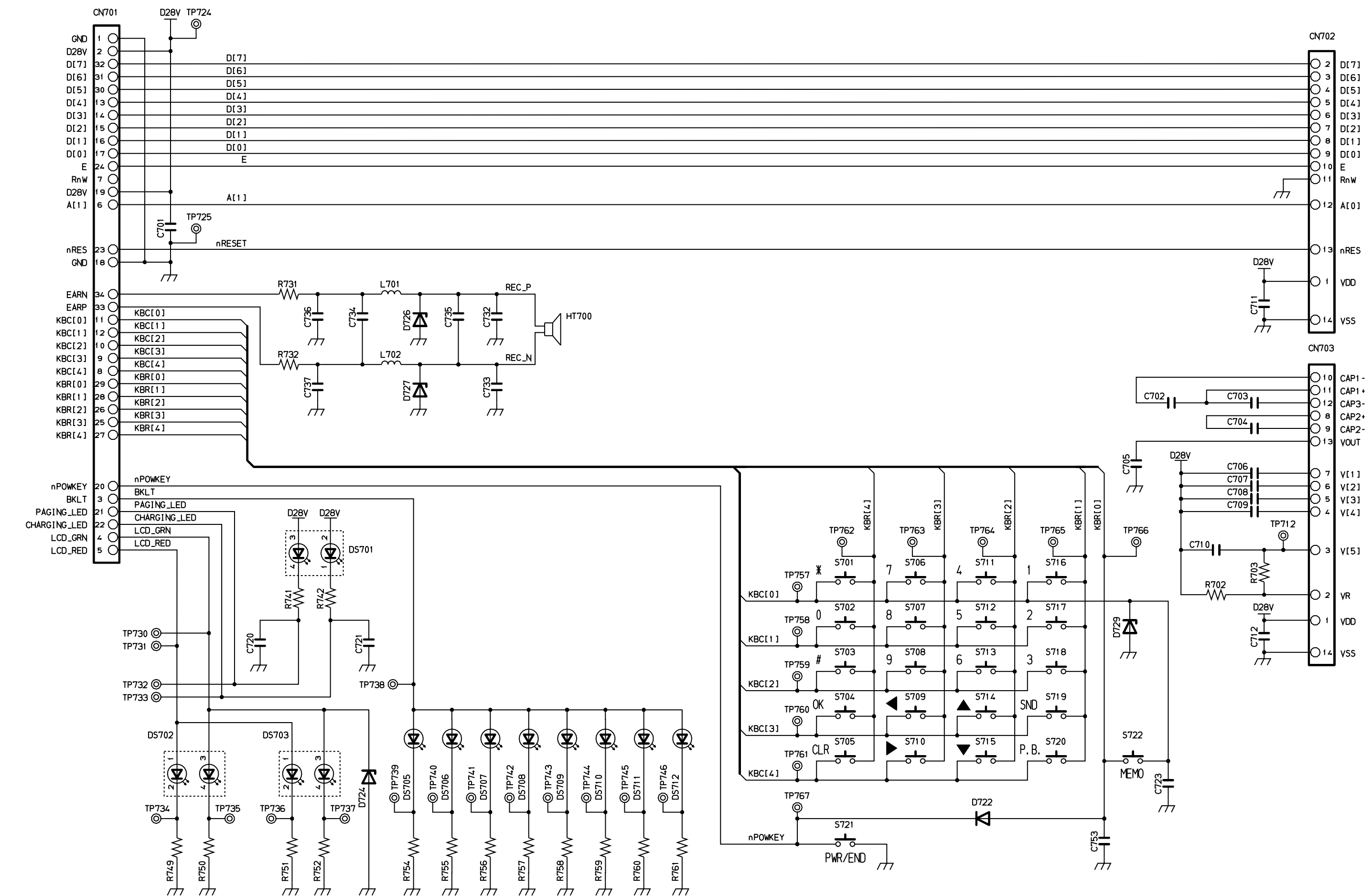


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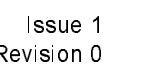




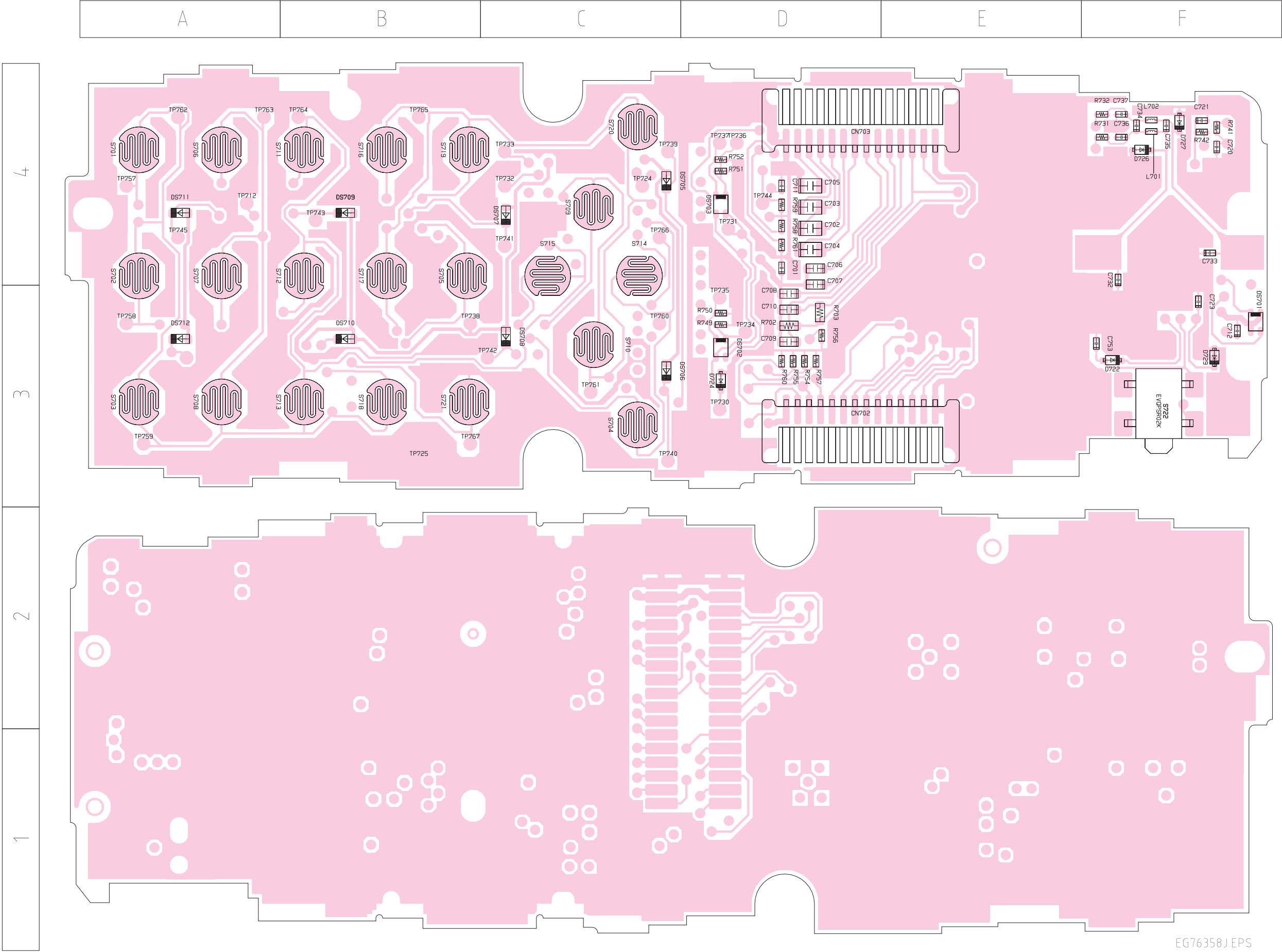
7.3 Keypad PCB



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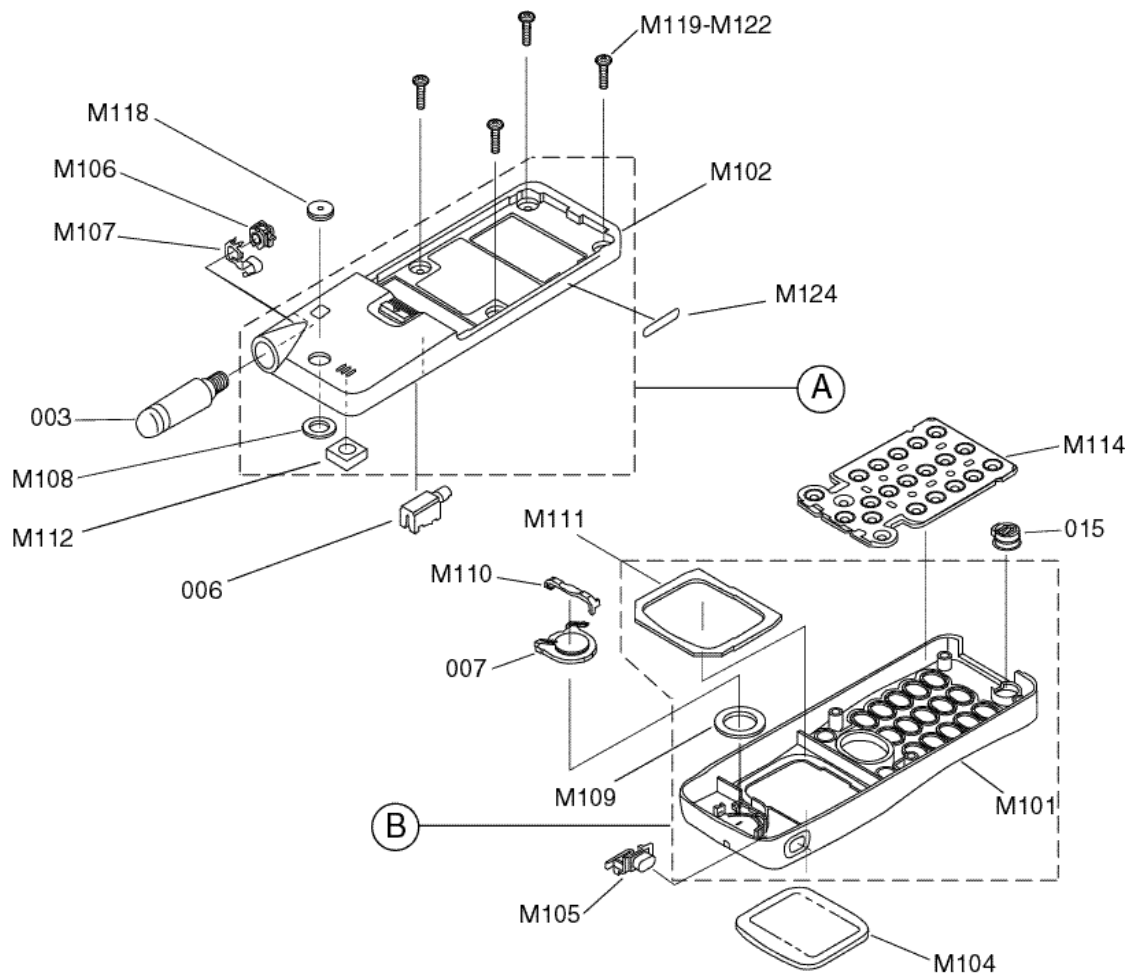
8.2 Keypad PCB



EG76358J.EPS

## 9 REPLACEMENT PARTS LIST

### 9.1 Case Parts



10001-1

Figure 9.1: Case Parts

Ref	Part Number	Description
M104	2EA554AAAA	LCD PANEL, BLUE
"	2EA554AABA	LCD PANEL, GOLD
M105	2CA511AAAA	MEMO KEY BUTTON (Dark)
"	2CA511AABA	MEMO KEY BUTTON (Light)
M106	4GA518A	ANTENNA NUT
M107	4FA541A	ANTENNA TERMINAL
M110	2RA506A	RETAINER, RECEIVER
M114	6TA526AAAA	KEYPAD MEMBRANE, BLUE
"	6TA526AABA	KEYPAD MEMBRANE, GOLD
M118	6RA507AAAA	RF CAP BLUE
"	6RA507AABA	RF CAP GOLD
M119	3Z70054A	SCREW, CASE-FRONT COVER
M120	"	" " " "
M121	"	" " " "
M122	"	" " " "
M123	7HA817A	EQUIPMENT LABEL
M124	G5MDS002C	PATENT LABEL

Ref	Part Number	Description
003	AN76031AAAA	ANTENNA, BLUE
"	AN76031AABA	ANTENNA, GOLD
006	BD76012A	VIBRATE MOTOR ASSEMBLY
007	HH76009A	RECEIVER
015	9ZA652A	MICROPHONE ASSEMBLY
<b>(A)</b>	<b>GD90CAS01B</b> <b>GD90CAS01G</b>	<b>SERVICE CASE ASSY, BLUE</b> <b>SERVICE CASE ASSY, GOLD</b>
consists of:		
M102	9ZA678AAxx	CASE, COLOURED
M108	6HA567A	RF CUSHION
M112	6HA622A	BUZZER CUSHION
<b>(B)</b>	<b>GD90CVR01B</b> <b>GD90CVR01G</b>	<b>SERVICE FRONT COVER, BLUE</b> <b>SERVICE FRONT COVER, GOLD</b>
consists of:		
M101	9ZA677AAxx	FRONT COVER, COLOURED
M109	6HA623A	RECEIVER CUSHION
M111	6HA621A	LCD CUSHION

9.2 Sub-Assemblies

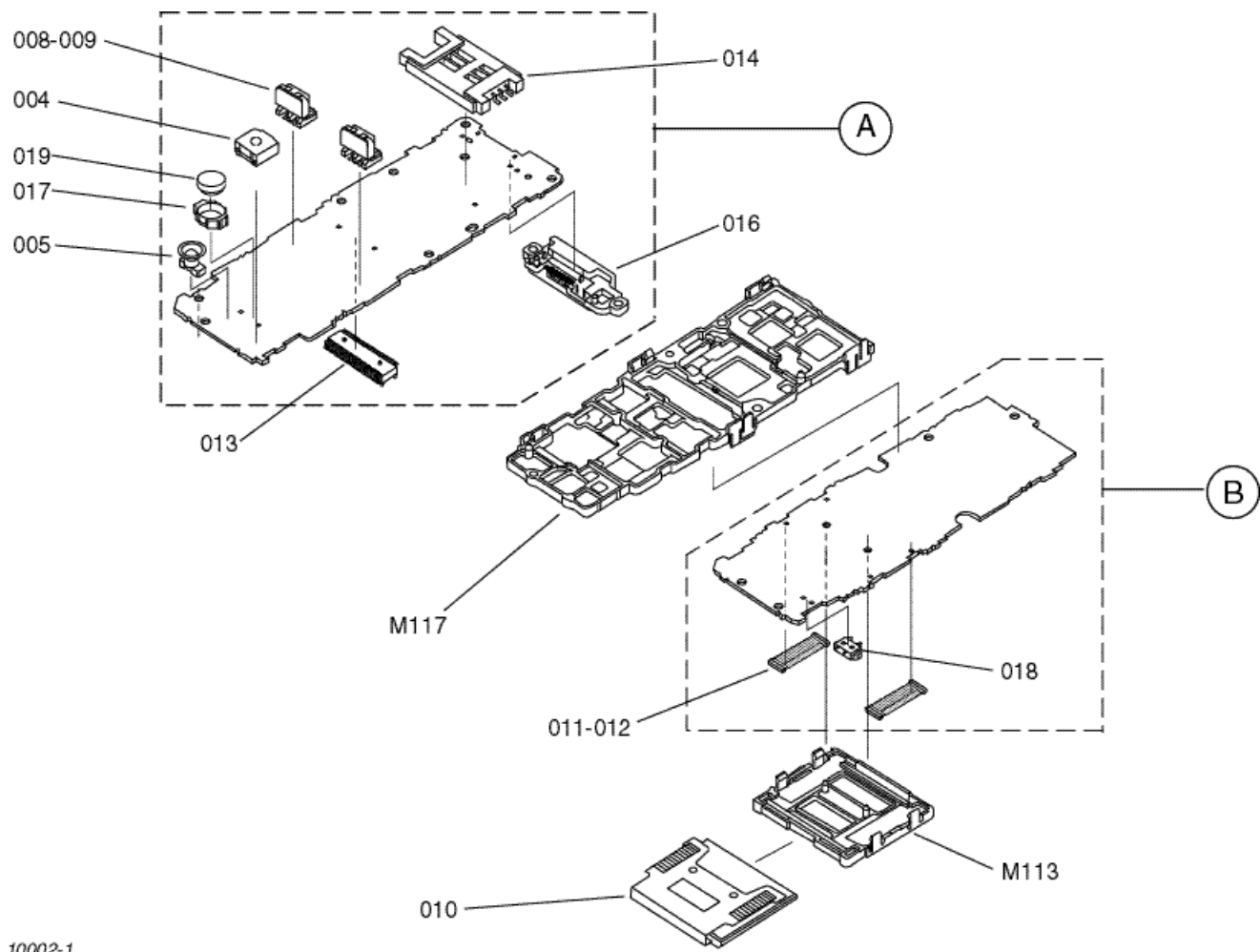


Figure 9.2: Sub-Assemblies

Ref	Part Number	Description	
M113	2QA548A	LCD BACKLIGHT	
M117	2FA528A	CHASSIS	
010	AA76004B	LCD MODULE	
B	GD90KPCB01	KEYPAD PCB	
	les:		
	011	PY76003A	LCD CONNECTOR
	012	" "	" " "
	018	EVQPSR02K	SWITCH, MEMO KEY

Ref	Part Number	Description	
A	GD90BRDxxx	MAIN PCB	
	004	HB76004A	BUZZER
	005	PY76011B	RF CONNECTOR
	008	JJ76002A	BATTERY CONTACT
	009	" "	" "
	013	PY76024A	PCB CONNECTOR, MAIN-KEYPAD
	014	JS8A00005	SIM HOLDER
	016	JA76020A	I/O CONNECTOR, 18-WAY
	017	K3ZZ00200009	BACKUP BATTERY/HOLDER
	019	M616LS	BUTTON CELL, 3V



## 9.3 Handheld Replacement Parts List

### 9.3.1 Main PCB Variants

Part No.	Description
GD90BRD001	GD90 MAIN PCB ASSEMBLY STANDARD PROGRAM
GD90BRD002	GD90 MAIN PCB ASSEMBLY BINARING PROGRAM
GD90BRD003	GD90 MAIN PCB ASSEMBLY CELCOM PROGRAM
GD90BRD004	GD90 MAIN PCB ASSEMBLY AIRTEL PROGRAM
GD90BRD005	GD90 MAIN PCB ASSEMBLY EUROTTEL PROGRAM
GD90BRD006	GD90 MAIN PCB ASSEMBLY MOVISTAR PROGRAM
GD90BRD007	GD90 MAIN PCB ASSEMBLY S.F.R PROGRAM
GD90BRD008	GD90 MAIN PCB ASSEMBLY WESTEL PROGRAM
GD90BRD009	GD90 MAIN PCB ASSEMBLY HUTCHISON PROGRAM
GD90BRD010	GD90 MAIN PCB ASSEMBLY PLUS GSM PROGRAM
GD90BRD011	GD90 MAIN PCB ASSEMBLY TURKCELL PROGRAM
GD90BRD012	GD90 MAIN PCB ASSEMBLY FRANCETEL PROGRAM
GD90BRD013	GD90 MAIN PCB ASSEMBLY FT FTMS PROGRAM
GD90BRD014	GD90 MAIN PCB ASSEMBLY TELESTET PROGRAM
GD90BRD015	GD90 MAIN PCB ASSEMBLY ACTIVA PROGRAM
GD90BRD016	GD90 MAIN PCB ASSEMBLY TMN PROGRAM
GD90BRD017	GD90 MAIN PCB ASSEMBLY PANNON PROGRAM
GD90BRD018	GD90 MAIN PCB ASSEMBLY VODACOM PROGRAM
GD90BRD019	GD90 MAIN PCB ASSEMBLY NRTCOM PROGRAM
GD90BRD020	GD90 MAIN PCB ASSEMBLY K.P.N PROGRAM
GD90BRD021	GD90 MAIN PCB ASSEMBLY MOBILCOM PROGRAM
GD90BRD022	GD90 MAIN PCB ASSEMBLY TELSTRA PROGRAM
GD90BRD023	GD90 MAIN PCB ASSEMBLY E.R.A PROGRAM

### 9.3.2 Main PCB Components

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C102	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	D1
C103	ECUE1H151JCQ	CAP CER 150pF 5% 50V NP0 SMD 1005	D1
C104	ECUE1H151JCQ	CAP CER 150pF 5% 50V NP0 SMD 1005	C2
C105	ECUE1E152KBQ	CAP CER 1.5nF 10% 25V X7R SMD 1005	B4
C106	F1G1C2230001	CAP CER 22nF 10% 16V SMD 1005	B4
C110	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	E2
C111	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	E2
C112	F1G0J1040003	CAP CER 0.1µF 10% 6.3V SMD 1005	C2
C114	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	E2
C116	F1G0J1040003	CAP CER 0.1µF 10% 6.3V SMD 1005	C2
C119	F1G1H5R0A404	CAP CER 5pF +/-0.25pF 50V SMD 1005	B3
C120	F1G1H5R0A404	CAP CER 5pF +/-0.25pF 50V SMD 1005	B3
C124	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	B3
C125	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	B3
C126	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	B3
C129	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	B3
C130	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	B4
C131	F3F1A1560001	CAP TANT 15µF 20% 10V SMD	E2
C132	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	A3
C133	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	B3
C134	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	A3
C135	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	B4
C136	F3F1A1560001	CAP TANT 15µF 20% 10V SMD	B3
C137	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	A4
C138	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	A4
C139	F1G1H270A409	CAP CER 27pF +1-5% 50V SMD 1005	A3
C140	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	B4
C142	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	A3
C143	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	F1

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C148	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	A4
C149	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C150	F1G1H1R5A391	CAP CER 1.5pF +/-0.25pF 50V SMD 1005	A4
C152	F1G1H2R0A389	CAP CER 2pF +/-0.1pF 50V SMD 1005	A4
C155	F1G1H560A016	CAP CER 56pF 5% 50V SMD 1005	B4
C156	F1G1H1R0A389	CAP CER 1pF +/-0.1pF 50V SMD 1005	B4
C157	F1G1H120A409	CAP CER 12pF 5% 50V SMD 1005	B4
C158	F1G1H560A016	CAP CER 56pF 5% 50V SMD 1005	A4
C160	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	B4
C161	F1G1H820A016	CAP CER 82pF 5% 50V SMD 1005	B4
C162	F1G1H820A016	CAP CER 82pF 5% 50V SMD 1005	B4
C181	F1G1H6R0A406	CAP CER 6pF +/-0.5pF 50V SMD 1005	F1
C183	F1G1H6R0A406	CAP CER 6pF +/-0.5pF 50V SMD 1005	A3
C185	F1G1H1R0A389	CAP CER 1pF +/-0.1pF 50V SMD 1005	A3
C186	ECJ1VB0J105K	CAP CER 1µF 10% 6.3V SMD 1608 X7R	B4
C191	F1H1H3R0A254	CAP CER 3pF +/-0.25pF 50V SMD 1608	A3
C201	F1G1H4R0A404	CAP CER 4pF +/- 0.25pF 50V SMD 1005	A4
C202	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C204	F1G1H1R5A391	CAP CER 1.5pF +/-0.25pF 50V SMD 1005	A4
C214	F1G1H2R0A389	CAP CER 2pF +/-0.1pF 50V SMD 1005	E2
C215	F1G1H5R0A404	CAP CER 5pF +/-0.25pF 50V SMD 1005	E2
C216	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	E2
C217	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	E2
C220	F1G1H2R0A389	CAP CER 2pF +/-0.1pF 50V SMD 1005	E2
C221	F1G1H2R0A389	CAP CER 2pF +/-0.1pF 50V SMD 1005	E1
C222	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	E1
C224	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	E1
C225	F1G0J1040003	CAP CER 0.1µF 10% 6.3V SMD 1005	E1
C227	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E1
C228	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E1
C232	F1G1H4R0A404	CAP CER 4pF +/- 0.25pF 50V SMD 1005	E1

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C233	F1G1H4R0A404	CAP CER 4pF +/- 0.25pF 50V SMD 1005	E1
C234	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	E1
C236	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	E1
C237	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	E1
C238	ECUE1H151JCQ	CAP CER 150pF 5% 50V NP0 SMD 1005	D1
C239	F1G1H4R0A404	CAP CER 4pF +/- 0.25pF 50V SMD 1005	A4
C241	F1G1HR50A389	CAP CER 0.5pF +/-0.1pF 50V SMD 1005	A4
C242	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C244	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C246	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C247	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C251	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	A4
C256	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E1
C257	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	E1
C301	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	C3
C302	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	B4
C303	F1G0J1040003	CAP CER 0.1µF 10% 6.3V SMD 1005	D1
C304	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C3
C305	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C3
C306	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C4
C307	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	B4
C308	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C3
C311	ECUE1E222KBQ	CAP CER 2.2nF 10% 25V SMD 1005	C4
C312	F1G1H2R0A389	CAP CER 2pF +/-0.1pF 50V SMD 1005	C4
C313	ECHU1C183JB5	CAP FILM 18nF 5% 16V SMD 3216	B4
C314	ECUE1E221KBQ	CAP CER 220pF 10% 25V X7R SMD 1005	C4
C315	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C3
C317	F1G1A563A002	CAP CER 56nF 10% 10V SMD 1005	C3
C318	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C3
C324	F1G1H4R0A404	CAP CER 4pF +/- 0.25pF 50V SMD 1005	C3
C325	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C3

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C330	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	B4
C332	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	C3
C333	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C4
C350	ECUE1H151JCQ	CAP CER 150pF 5% 50V NP0 SMD 1005	C2
C351	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C2
C352	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	D4
C353	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	C2
C355	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	C2
C356	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C2
C357	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C2
C358	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C2
C359	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C2
C360	ECUE1E271KBQ	CAP CER 270pF 10% 25V X7R SMD 1005	C2
C361	ECUE1C103KBQ	CAP CER 10nF 10% 16V X7R SMD 1005	C2
C363	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	D4
C401	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	D1
C402	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	D1
C403	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	D1
C404	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	D1
C405	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	D1
C406	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	D1
C407	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	D1
C408	F3F1A1560001	CAP TANT 15µF 20% 10V SMD	C3
C409	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	D1
C411	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	D1
C412	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	D1
C505	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E3
C506	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E3
C510	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E3
C511	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E3
C512	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E4

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C514	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E4
C515	F3F1A1560001	CAP TANT 15µF 20% 10V SMD	E4
C516	F3E1A2250001	CAP	E4
C517	F1G1H820A016	CAP CER 82pF 5% 50V SMD 1005	F4
C518	F1G1H150A409	CAP CER 15pF +1-5% 50V SMD 1005	F4
C519	F1G1H820A016	CAP CER 82pF 5% 50V SMD 1005	C1
C520	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	B1
C521	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	B1
C523	F1G1A4740002	CAP CER 470nF +80-20% 10V SMD 1005	E1
C524	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	E4
C525	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E3
C526	F3F1A1560001	CAP TANT 15µF 20% 10V SMD	D3
C527	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	E3
C528	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E3
C529	F3E1A1050002	CAP	E3
C530	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	C1
C531	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F1
C532	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	C1
C533	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F2
C534	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F2
C537	F1G1H3R0A442	CAP CER 3pF +/-0.25pF 50V SMD 1005	E3
C538	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	E3
C539	F3E0J1060005	CAP TANT 10µF 20% 6.3V SMD 2012	C1
C601	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C1
C602	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	B2
C603	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	B1
C604	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	B1
C607	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C2
C608	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C2
C609	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C1
C610	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C2

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C611	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C2
C612	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	C1
C614	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E4
C615	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E4
C616	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D4
C619	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	D4
C622	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D4
C623	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D3
C624	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D4
C625	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D4
C626	F1G1H330A408	CAP CER 33pF 5% 50V SMD 1005	D4
C627	F1G1H330A408	CAP CER 33pF 5% 50V SMD 1005	D4
C628	F1G1H330A408	CAP CER 33pF 5% 50V SMD 1005	D4
C629	ECUE1C333ZFQ	CAPACITOR	D4
C630	ECUE1C333ZFQ	CAPACITOR	D4
C631	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	D4
C632	F1J1A4750004	CAP CER 4.7µF +80-20% 10V SMD 1005	E4
C633	F1G1H330A408	CAP CER 33pF 5% 50V SMD 1005	A2
C635	F1G1H331A402	CAP CER 330pF 10% 50V SMD 1005	A1
C637	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	D4
C638	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	E4
C639	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	E4
C640	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	D4
C641	F1G0J1050001	CAP CER 1µF +80-20% 6.3V SMD 1005	E4
C643	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D1
C644	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	A1
C645	F1G1A4740002	CAP CER 470nF +80-20% 10V SMD 1005	E4
C646	F1G1A4740002	CAP CER 470nF +80-20% 10V SMD 1005	F4
C647	F1G1A4740002	CAP CER 470nF +80-20% 10V SMD 1005	B1
C648	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	B1
C649	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	F3

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
C650	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	D1
C651	ECUE1E102KBQ	CAP CER 1nF 10% 25V X7R SMD 1005	B1
C652	F1G1A4740002	CAP CER 470nF +80-20% 10V SMD 1005	F4
C653	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F3
C654	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	E3
C655	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	F3
D316	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D350	MA2SB07700L	DIODE 35V 100MA	C2
D501	B0JCMC000004	DIODE SHOTTKY 20V 1A SMD SC-59	F3
D502	YDRTU0005	30V 200mA DIODE	E3
D503	B0ADEJ000010	DIODE ARRAY QUAD SW SMD UMD6	F3
D505	B0ADEJ000010	DIODE ARRAY QUAD SW SMD UMD6	F3
D510	YDRTU0005	30V 200mA DIODE	E4
D512	MA2S11100L	DIODE 80V 100MA SMD SS-M1W1 2 PIN	F1
D515	YDRTU0005	30V 200mA DIODE	C1
D516	B0JCDD000001	DIODE	C1
D517	B0JCDD000001	DIODE	C1
D526	YHZM6.8FATR	6.8V 200mW DIODE	F3
D611	YDRTU0005	30V 200mA DIODE	B1
D612	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A2
D614	YDRTU0005	30V 200mA DIODE	E3
D615	MAZS0470GL	DIODE MAZS0470G ZENER 4.7V SMD SS-MINI	A2
D616	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D617	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	D1
D618	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D619	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	C2
D620	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A2
D621	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D622	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D623	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	B1
D624	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
D625	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	F3
D627	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	B1
D628	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	A1
D629	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	B1
E101	B9Z000000018	COUPLER 897.5 MHz SMD 2012 6PIN	A4
E102	B9Z000000019	COUPLER 1.747GHz SMD 2012 6PIN	A3
E600	JJ76002A	CONNECTOR BATTERY 2 WAY SMD	D1
E602	JJ76002A	CONNECTOR BATTERY 2 WAY SMD	C2
FL101	EFCH9017MTY1	FILTER SAW TX GSM/PCN SMD 3.8x3.8x1.6	B3
FL103	EXCML16A270U	FILTER	D4
FL104	EXCML16A270U	FILTER	B4
FL201	EFCH9418MTY2	FILTER SAW RX GSM/PCN SMD 3.8x3.8x1.6	A4
FL203	EFCH9418MTY2	FILTER SAW RX GSM/PCN SMD 3.8x3.8x1.6	E2
FL204	EFCH225MDQP1	FILTER IF SAW 225MHz SMD 7.2x5.2x1.8	E1
J502	K3ZZ00200009	HOLDER FOR BATTERY CELL	F1
J601	JA76020B	CONNECTOR SKT I/O 18 WAY SMD	C3
L103	G1C6N8J00004	INDUCTOR 6.8nH 5% SMD 1005	B3
L105	G1C6N8J00004	INDUCTOR 6.8nH 5% SMD 1005	B3
L106	G1C22NJ00010	INDUCTOR 22nH 5% SMD 1005	B3
L107	G1C10NJ00008	INDUCTOR 10nH 5% SMD 1005	A3
L108	G1C15NJ00008	INDUCTOR 15nH 5% SMD 1005	B3
L111	G1C5N6Z00005	INDUCTOR 5.6nH +/-0.3nH SMD 1005	B3
L112	G1C3N3Z00005	INDUCTOR 3.3nH +/-0.3nH SMD 1005	A3
L150	G1C5N6Z00005	INDUCTOR 5.6nH +/-0.3nH SMD 1005	B4
L151	G1C12NJ00011	INDUCTOR 12nH 5% SMD 1005	B4
L191	G1C8N2J00002	INDUCTOR	A3
L201	G1CR10J00010	INDUCTOR 100nH 5% SMD 1005	E1
L206	G1C12NJ00011	INDUCTOR 12nH 5% SMD 1005	E2
L207	G1C3N3Z00005	INDUCTOR 3.3nH +/-0.3nH SMD 1005	E2
L208	G1C56NJ00007	INDUCTOR 56nH 5% SMD 1005	E1

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
L209	G1C56NJ00007	INDUCTOR 56nH 5% SMD 1005	E1
L210	G1CR15J00003	INDUCTOR 150nH 5% SMD 1608	E1
L211	G1C68NJ00006	INDUCTOR 68nH 5% SMD 1608	E1
L212	G1CR10J00007	INDUCTOR 0.1uH 5% SMD 1608	E1
L213	G1C33NJ00009	INDUCTOR 33nH 5% SMD 1005	E1
L214	G1C82NJ00001	INDUCTOR 82nH 5% SMD 2125	D1
L215	G1C8N2J00004	INDUCTOR 8.2nH 5% SMD 1005	A4
L216	G1C33NJ00009	INDUCTOR 33nH 5% SMD 1005	A4
L217	G1C47NJ00010	INDUCTOR 47nH 5% SMD 1005	A4
L218	G1C22NJ00010	INDUCTOR 22nH 5% SMD 1005	A4
L219	G1C8N2J00004	INDUCTOR 8.2nH 5% SMD 1005	A4
L220	G1C6N8J00004	INDUCTOR 6.8nH 5% SMD 1005	A4
L221	G1C15NJ00008	INDUCTOR 15nH 5% SMD 1005	A4
L222	G1C10NJ00008	INDUCTOR 10nH 5% SMD 1005	A4
L230	G1C33NJ00009	INDUCTOR 33nH 5% SMD 1005	E1
L301	G1C22NJ00010	INDUCTOR 22nH 5% SMD 1005	B3
L303	G1C8N2J00004	INDUCTOR 8.2nH 5% SMD 1005	B4
L351	G1C1R2K00006	INDUCTOR 1.2uH 5% SMD 1608	C2
L501	G1A101C00002	INDUCTOR 100uH 30% 1.73 OHM 0.2A SMD	E4
LS601	HB76004A	BUZZER GD90	F2
P101	PY76011A	G520 COAXIAL RF CONNECTOR	
P603	PY76024A	CONNECTOR	
Q101	B1GKCFJJ0006	TRANSISTOR UMC3NTR PNP+NPN SMD UMT5/6	D2
Q102	B1GKCFJJ0006	TRANSISTOR UMC3NTR PNP+NPN SMD UMT5/6	E2
Q103	B1GKCFJJ0006	TRANSISTOR UMC3NTR PNP+NPN SMD UMT5/6	E1
Q104	B1GKCFLL0008	TRANSISTOR UMC2NTR PNP+NPN SMD UMT5/6	E1
Q105	UNR9213J0L	TRANSISTOR UNR9213J0L	E1
Q106	XP0338300L	TRANSISTOR NPN/PNP DUAL S-MINI 5 TERMS	B3
Q201	B1GKCFJJ0006	TRANSISTOR UMC3NTR PNP+NPN SMD UMT5/6	D3
Q301	B1GKCFJJ0006	TRANSISTOR UMC3NTR PNP+NPN SMD UMT5/6	C2

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
Q350	B1ABCB000024	TRANSISTOR 2SC4226 NPN SMD SOT323	C2
Q501	B1CFJC000001	TRANSISTOR DUAL FET N-CH SMD SC70-66	E4
Q502	2SD2216J-TX	TRANSISTOR	E3
Q503	B1DHDC000006	TRANSISTOR	E3
Q504	B1GFCFNN0010	TRANSISTOR UMG2NTR NPN X 2 SMD UMT5/6	D3
Q505	2SD15110FL	TRANSISTOR 2SD15110FL	E1
Q510	B1ADPC000003	TRANSISTOR 2SB1424T100R PNP SMD SOT89	D3
Q600	B1GKGFBJ0001	TRANSISTOR IMD14 DUAL SMD SMT6	D1
Q601	B1GKGFBJ0001	TRANSISTOR IMD14 DUAL SMD SMT6	C2
Q602	B1GFCFNN0010	TRANSISTOR UMG2NTR NPN X 2 SMD UMT5/6	E4
Q603	YDTC123JETL	TRANSISTOR 150MW 50V	B1
Q604	B1GFCFNN0010	TRANSISTOR UMG2NTR NPN X 2 SMD UMT5/6	D3
R101	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	D1
R102	EXB24V392JX	RES NETWORK 3.9K OHMx2 5% 1/16W SMD 1010	C2
R103	EXB24V392JX	RES NETWORK 3.9K OHMx2 5% 1/16W SMD 1010	C2
R104	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	D2
R107	ERJ2GEJ223X	CHIP RESISTOR 22K OHM +/-5% 1/16W SM 1005	C2
R108	ERJ2GEJ330X	CHIP RESISTOR 33 OHM +/-5% 1/16W SM 1005	B4
R109	ERJ2GEJ561X	CHIP RESISTOR 560 OHM +/-5% 1/16W SM 1005	B4
R111	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	B4
R112	EXB24AT2AR3X	ATTENUATOR	B4
R115	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	B4
R117	EXB24AT2AR3X	ATTENUATOR	B3
R122	ERJ2GEJ470X	CHIP RESISTOR 47 OHM +/-5% 1/16W SM 1005	A4
R123	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	B4
R132	ERJ2GEJ273X	CHIP RESISTOR 27K OHM +/-5% 1/16W SM 1005	E1
R134	ERJ2GEJ122X	CHIP RESISTOR 1K2 OHM +/-5% 1/16W SM 1005	E1
R135	ERJ2GEJ273X	CHIP RESISTOR 27K OHM +/-5% 1/16W SM 1005	E1
R137	ERJ2GEJ122X	CHIP RESISTOR 1K2 OHM +/-5% 1/16W SM 1005	E1
R141	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	A4
R144	ERJ2GEJ470X	CHIP RESISTOR 47 OHM +/-5% 1/16W SM 1005	A3

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
R150	ERJ2GEJ820X	CHIP RESISTOR 82 OHM +/-5% 1/16W SM 1005	A4
R151	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	A4
R152	ERJ2GEJ820X	CHIP RESISTOR 82 OHM +/-5% 1/16W SM 1005	A4
R153	ERJ2GEJ563X	CHIP RESISTOR 56K OHM +/-5% 1/16W SM 1005	E4
R154	ERJ2GEJ563X	CHIP RESISTOR 56K OHM +/-5% 1/16W SM 1005	A4
R155	ERJ2GEJ273X	CHIP RESISTOR 27K OHM +/-5% 1/16W SM 1005	C4
R156	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	C4
R157	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C4
R158	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C4
R161	ERJ2GEJ273X	CHIP RESISTOR 27K OHM +/-5% 1/16W SM 1005	C4
R162	ERJ2GEJ820X	CHIP RESISTOR 82 OHM +/-5% 1/16W SM 1005	A3
R163	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	A3
R164	ERJ2GEJ820X	CHIP RESISTOR 82 OHM +/-5% 1/16W SM 1005	A3
R165	ERJ2GEJ681X	CHIP RESISTOR 680 OHM +/-5% 1/16W SM 1005	C4
R166	ERJ2GEJ681X	CHIP RESISTOR 680 OHM +/-5% 1/16W SM 1005	A4
R201	ERJ2GEJ222X	CHIP RESISTOR 2K2 OHM +/-5% 1/16W SM 1005	E1
R202	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	D1
R203	EXB24V103JX	RES NETWORK 10K OHMx2 5% 1/16W SMD 1010	D1
R208	ERJ2GEJ393X	CHIP RESISTOR 39K OHM +/-5% 1/16W SM 1005	A4
R210	EXB24AT1AR3X	ATTENUATOR	E1
R220	ERJ2GEJ471X	CHIP RESISTOR 470 OHM +/-5% 1/16W SM 1005	A4
R302	ERJ2GEJ182X	CHIP RESISTOR 1K8 OHM +/-5% 1/16W SM 1005	B4
R303	ERJ2GEJ472X	CHIP RESISTOR 4K7 OHM +/-5% 1/16W SM 1005	C4
R304	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	C4
R305	ERJ2GEJ150X	CHIP RESISTOR 15 OHM +/-5% 1/16W SM 1005	C4
R309	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	C3
R309	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	E3
R310	ERJ2GEJ222X	CHIP RESISTOR 2K2 OHM +/-5% 1/16W SM 1005	C3
R311	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	C3
R312	ERJ2GEJ270X	CHIP RESISTOR 27 OHM +/-5% 1/16W SM 1005	C3
R317	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	B3

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
R318	ERJ2GEJ560X	CHIP RESISTOR 56 OHM +/-5% 1/16W SM 1005	B3
R319	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C2
R319	F1G1H100A406	CAP CER 10pF +1-0.5pF 50V SMD 1005	E4
R322	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	D1
R323	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	D4
R324	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	D1
R350	ERJ2GEJ472X	CHIP RESISTOR 4K7 OHM +/-5% 1/16W SM 1005	D4
R351	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C2
R352	ERJ2GEJ221X	CHIP RESISTOR 220 OHM +/-5% 1/16W SM 1005	C2
R353	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C2
R354	ERJ2GEJ223X	CHIP RESISTOR 22K OHM +/-5% 1/16W SM 1005	C2
R355	ERJ2GEJ681X	CHIP RESISTOR 680 OHM +/-5% 1/16W SM 1005	C2
R356	ERJ2GEJ682X	CHIP RESISTOR 6K8 OHM +/-5% 1/16W SM 1005	C2
R357	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	C2
R501	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E3
R503	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E4
R504	ERJ2GEJ473X	CHIP RESISTOR 47K OHM +/-5% 1/16W SM 1005	E3
R505	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E3
R506	ERJ6GEYJ330V	RES 33 OHM 5% 1/10W SMD 2012	E3
R507	ERJ2GEJ153X	CHIP RESISTOR 15K OHM +/-5% 1/16W SM 1005	E3
R508	ERJ2GEJ123X	CHIP RESISTOR 12K OHM +/-5% 1/16W SM 1005	E3
R510	ERJ6RSFR15V	CHIP RESISTOR 0R15 OHM +/-5% 1/10W SM 2012	E3
R511	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	F3
R512	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E3
R513	ERJ2GEJ105X	RES 1M OHM 5% 1/16W SMD 1005	E4
R514	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E3
R515	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E3
R516	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	E4
R517	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E3
R521	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E4
R522	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E3

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
R530	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	
R531	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	
R532	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	
R533	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E4
R534	ERJ2GEJ222X	CHIP RESISTOR 2K2 OHM +/-5% 1/16W SM 1005	B1
R535	ERJ2GEJ472X	CHIP RESISTOR 4K7 OHM +/-5% 1/16W SM 1005	B1
R547	ERJ2GEJ222X	CHIP RESISTOR 2K2 OHM +/-5% 1/16W SM 1005	F1
R548	ERJ2GEJ393X	CHIP RESISTOR 39K OHM +/-5% 1/16W SM 1005	F1
R602	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	C1
R603	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	E4
R604	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	D3
R605	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	D4
R606	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	C1
R610	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	C1
R611	ERJ6GEYJ560V	RES 56 OHM 5% 1/10W SMD 2012	D1
R612	ERJ6GEYJ270V	RES 27 OHM 5% 1/10W SMD 2012	C2
R613	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C1
R614	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	C1
R615	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E4E
R616	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E4
R619	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	
R623	ERJ2GEJ152X	CHIP RESISTOR 1K5 OHM +/-5% 1/16W SM1005	D4
R624	ERJ2GEJ152X	CHIP RESISTOR 1K5 OHM +/-5% 1/16W SM1005	D4
R625	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	D4
R626	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	D4
R635	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	A2
R637	ERJ2GEJ332X	CHIP RESISTOR 3K3 OHM +/-5% 1/16W SM1005	E4
R638	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	E4
R639	ERJ2GEJ681X	CHIP RESISTOR 680 OHM +/-5% 1/16W SM 1005	E4
R640	ERJ2GEJ472X	CHIP RESISTOR 4K7 OHM +/-5% 1/16W SM 1005	B1
R641	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	B1

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
R642	ERJ2GEJ104X	CHIP RESISTOR 100K OHM +/-5% 1/16W SM 1005	D3
R643	ERJ2GEJ561X	CHIP RESISTOR 560 OHM +/-5% 1/16W SM 1005	E4
R648	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	D4
R649	ERJ2RKF104X	CHIP RESISTOR 100K OHM 1005 +/-1% 1/16W	A1
R650	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	C2
R651	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	A1
R652	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	B1
R653	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	E4
R654	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	E4
R655	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	B1
R656	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	D1
R657	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	B1
R658	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	B1
R659	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	A1
R660	ERJ2GEJ331X	CHIP RESISTOR 330 OHM +/-5% 1/16W SM 1005	F3
R661	ERJ2GEJ103X	CHIP RESISTOR 10K OHM +/-5% 1/16W SM 1005	F3
S101	SY76003A	DIPLEXER ANTENNA SWITCH GSM/DSC SMD	A4
U101	C1CB00000803	IC HD155123FEB RF BRIGHT 2 GSM/PCN SMD	E1
U102	UY76044A	VCO TX SMD 9.3x7.2x2.0	C4
U103	C1CB00000794	IC MGA-81563-1HA MMIC AMP SMD SOT363	B3
U104	C5CB00000023	PA PF08103B-02-TB DUAL GSM/DCS SMD	B3
U150	C1CB00000711	IC DUAL BAND APC TSSOP20	C4
U203	GN01073B01MC	LNA DUAL GSM/DCS SMD 0.65mm PITCH S06	A4
U301	C1CB00000795	IC	C3
U302	UY76043A	VCO RF SMD 9.3x7.2x2.0	B4
U303	UY76084A	VCO IF DUAL 520/540MHz SMD 5.3x5.0x2.0	C3
U350	TX76001A	TCVCXO 13MHz SMD 7.0x5.0x1.7 4PIN	C4
U401	C0DBZFC00004	IC	D1
U506	UY76046A	IC BH6107KV INTERFACE ASIC SMD QFP48	E4

Model: EB-GD90		Name: Main PCB	
Ref:	Part Number	Description	Grid
U507	UY76051A	IC BA3891KV CHARGE ASIC SMD QFP48	E3
U508	C0DBFGG000001	IC R5102V001A-E2 REG WDT SMD SSOP10	D3
U509	C0DBAFC000007	IC R1111N181B REG 1.8V SMD SOT23-5	C1
U510	C0EBD00000030	IC S-80824ANNP-EDM-T2 VOL DET 2.4V SMD	C1
U602	UY76085A	IC	D4
U604	YRS5C348A	IC RS5C348A REAL TIME CLOCK SMD SSOP10	C1
X601	JS8A000005	G600 SIM HOLDER	A2
Y601	H0J327200022	CRYSTAL 32.768KHz SMD 7.0x1.5x1.4	D3



## 9.3.3 Keypad PCB

Model: EB-GD90		Name: Keypad PCB	
Ref:	Part Number	Description	Grid
C701	ECUE1C104ZFQ	CAP CER 0.1µF +80-20% 16V Y5V SMD 1005	D4
C702	F1J1A1050011	CAP CER 1µF 10% 10V SMD X5R 2012	D4
C703	F1J1A1050011	CAP CER 1µF 10% 10V SMD X5R 2012	D4
C704	F1J1A1050011	CAP CER 1µF 10% 10V SMD X5R 2012	D4
C705	F1J1A1050011	CAP CER 1µF 10% 10V SMD X5R 2012	D4
C706	F1H1A224A006	CAP CER 220nF 10% 10V SMD 1608	D4
C707	F1H1A224A006	CAP CER 220nF 10% 10V SMD 1608	D4
C708	F1H1A224A006	CAP CER 220nF 10% 10V SMD 1608	D3
C709	F1H1A224A006	CAP CER 220nF 10% 10V SMD 1608	D3
C710	F1H1A224A006	CAP CER 220nF 10% 10V SMD 1608	D3
C712	F1G1H220A409	CAP CER 22pF 5% 50V SMD 1005	F3
C734	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F4
C735	F1G1H101A016	CAP CER 100pF +/-5% 50V SMD 1005	F4
D722	MA2S11100L	DIODE 80V 100MA SMD SS-M1W1 2 PIN	F3
D724	MAZS0750ML	DIODE ZENER 7V5 SMD SS-MINI 2PIN	D3
D726	MAZS0470GL	DIODE MAZS0470G ZENER 4.7V SMD SS-MINI	F4
D727	MAZS0470GL	DIODE MAZS0470G ZENER 4.7V SMD SS-MINI	F4
D729	MAZS0470GL	DIODE MAZS0470G ZENER 4.7V SMD SS-MINI	F3
DS701	LNJ115W8PRA	LED	F3
DS702	LNJ115W8V0MC	LED	D3
DS703	LNJ115W8V0MC	LED	D4
DS705	LNJ312G8J0MC	LED	C4
DS706	LNJ312G8J0MC	LED	D3
DS707	LNJ312G8J0MC	LED	C4
DS708	LNJ312G8J0MC	LED	D3
DS709	LNJ312G8J0MC	LED	B4
DS710	LNJ312G8J0MC	LED	D3
DS711	LNJ312G8J0MC	LED	A4
DS712	LNJ312G8J0MC	LED	D3

Model: EB-GD90		Name: Keypad PCB	
Ref:	Part Number	Description	Grid
L701	HK100582NJT	INDUCTOR 82nH 5% SMD 1005	F4
L702	HK100582NJT	INDUCTOR 82nH 5% SMD 1005	F4
P702	PY76003A	CONNECTOR	D3
R702	ERJ3RED274V	RES	D3
R703	ERJ3RED105V	RES	D3
R711	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	F3
R731	ERJ2GEJ120X	CHIP RESISTOR 12 OHM +/-5% 1/16W SM 1005	F4
R732	ERJ2GEJ120X	CHIP RESISTOR 12 OHM +/-5% 1/16W SM 1005	F4
R741	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	F4
R742	ERJ2GEJ101X	CHIP RESISTOR 100 OHM +/-5% 1/16W SM 1005	F4
R749	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R750	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R751	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D4
R752	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D4
R753	F1G1H470A409	CAP CER 47pF 5% 50V SMD 1005	F3
R754	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R755	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R756	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R757	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R758	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D4
R759	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D4
R760	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D3
R761	ERJ2GEJ181X	CHIP RESISTOR 180 OHM +/-5% 1/16W SM 1005	D4
R771	ERJ2GE0R00X	RES JUMPER 0 OHM 1A SMD 1005	F4
S722	EVQPSR02K	SWITCH TACTILE	F3

9.3.4 Mechanical

Model: EB-GD70		Name: Mechanical Items	
Ref	Part Number	Description	Notes
	9R9000B 9R9000G	REFURBISHMENT KIT, BLUE REFURBISHMENT KIT, GOLD	
	GD90CAS01B GD90CAS01G GD90CVR01B GD90CVR01G	SERVICE CASE ASSEMBLY BLUE SERVICE CASE ASSEMBLY GOLD SERVICE FRONT COVER ASSEMBLY BLUE SERVICE FRONT COVER ASSEMBLY GOLD	
	M104 2EA554AAAA	GD90 LCD PANEL STANDARD PANASONIC BLUE	
	M104 2EA554AABA	GD90 LCD PANEL STANDARD PANASONIC GOLD	
	M105 2CA511AAAA	GD90 MEMO KEY (DARK)	
	M105 2CA511AABA	GD90 MEMO KEY GOLD	
	M106 4GA518A	GD70 ANTENNA NUT	
	M107 4FA541A	GD90 ANTENNA TERMINAL	
	M113 2QA548A	GD90 LCD BACKLIGHT	
	M114 6TA526AAAA	GD90 KEYPAD MEMBRANE, BLUE	
	M114 6TA526AABA	GD90 KEYPAD MEMBRANE, GOLD	
	M117 2FA528A	CHASSIS	
	M118 6RA507AAAA	GD90 RF - CAP BLUE	
	M118 6RA507AABA	GD90 RF - CAP GOLD	
	M119 3Z70054A	GD90 H/S SCREW	
003	AN76031AAAA	GD90 ANTENNA BLUE	
003	AN76031AABA	GD90 ANTENNA GOLD	
006	BD76012A	GD90 VIBRATE MOTOR	
007	HH76009A	GD30 RECEIVER	
010	AA76004B	GD90 LCD MODULE	
015	9ZA652A	GD30 MICROPHONE ASSEMBLY	
019	ML616S	BUTTON CELL 3V	

Model: EB-GD70		Name: Mechanical Items	
Ref	Part Number	Description	Notes
	GD90BRDxxx GD90KPCB01	GD90 MAIN PCB COMPLETE GD90 KEYPAD PCB	

9.3.5 Refurbishment Kits

Model: EB-GD70		Name: Mechanical Items	
Ref	Part Number	Description	Notes
	9R9000B 9R9000G	REFURBISHMENT KIT, BLUE REFURBISHMENT KIT, GOLD	

**NOTE:** Each Refurbishment Kit includes; Coloured Cover Assembly, Case Assembly, Key Sheet, Memo Key, LCD Panel, Screws (x4), RF Cap, Antenna Battery Clip, Battey Spring and Patent Label.

9.3.6 Repair Jigs and Tools

Model: EB-GD90		Name: Jigs and Tools	
Ref.	Part Number	Description	Notes
	JT00004 JT00012 JT00013 JT00021	INTERFACE CABLE GD90 PCB REPAIR JIG GD90 RF ADAPTOR EXTERNAL BATTERY POWER SUPPLY	
	IFB004	INTERFACE BOX	

## 9.4 Printed Material

### 9.4.1 Document Packs

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

Model: EB-GD90		Name: Document Packs	
Ref.	Part Number	Description	Notes
	GD90DPKAR GD90DPKAS	ARABIC, ENGLISH GERMAN, ENGLISH, TURKISH, EUROPEAN WARRANTY	
	GD90DPKBE	DUTCH, FRENCH, GERMAN, EUROPEAN WARRANTY	
	GD90DPKCH	FRENCH, GERMAN, ITALIAN, EUROPEAN WARRANTY	
	GD90DPKCZ GD90DPKDE GD90DPKDN GD90DPKES GD90DPKEUA	CZECH DANISH, EUROPEAN WARRANTY DUTCHTONE SPANISH DANISH, GERMAN, EUROPEAN WARRANTY	
	GD90DPKEUB	DUTCH, FRENCH, GERMAN, EUROPEAN WARRANTY	
	GD90DPKFN GD90DPKFR GD90DPKGE	FINNISH, EUROPEAN WARRANTY FRENCH, EUROPEAN WARRANTY GERMAN, EUROPEAN WARRANTY	
	GD90DPKGR GD90DPKHU GD90DPKKPN GD90DPKKU GD90DPKLE	GREEK, ENGLISH, EUROPEAN WARRANTY HUNGARIAN DUTCH PTT/KPN ENGLISH, FRENCH, ARABIC ENGLISH,FRENCH	
	GD90DPKMT	ITALIAN, ENGLISH, ITALIAN WARRANTY CARD, EUROPEAN WARRANTY CARD	
	GD90DPKNL GD90DPKNW	DUTCH, EUROPEAN WARRANTY NORWEGIAN, EUROPEAN WARRANTY	

Model: EB-GD90		Name: Document Packs	
Ref.	Part Number	Description	Notes
	GD90DPKPL GD90DPKPR GD90DPKPUK GD90DPKRM GD90DPKRU	POLISH PORTUGUESE, EUROPEAN WARRANTY PANASONIC UK ROMANIAN RUSSIAN	
	GD90DPKSK GD90DPKSW GD90DPKTA GD90DPKTL GD90DPKTU	SLOVAKIAN SWEDISH, EUROPEAN WARRANTY TAIWAN, ENGLISH ITALIAN, EUROPEAN WARRANTY TURKISH, EUROPEAN WARRANTY	
	GD90DPKUK GD90DPKYU	ENGLISH, EUROPEAN WARRANTY ENGLISH	
	7QA959AAAA	BOX, PRINTED	

### 9.4.2 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 GD90 instruction is 7LB230A where the suffix 'A' denotes that the manual is at Issue A.