

# Service Manual

## Personal Cellular Telephone

GSM™

### EB-G50



	900 MHz	1800 MHz	1900 MHz
Frequency Range	TX: 880 MHz – 915 MHz RX: 925 MHz – 960 MHz	TX: 1710 MHz – 1785 MHz RX: 1805 MHz – 1880 MHz	1850 MHz – 1990 MHz
TX/RX Frequency Separation	45 MHz	95 MHz	80 MHz
RF Channel Bandwidth	200 kHz		
Number of RF Channels	174	374	300
Speech Coding	Full Rate / Enhance Full Rate		
Operating Temperature	-10 °C – +55 °C		
Type	Class 4 Handheld	Class 1 Handheld	Class 1 Handheld
RF Output Power	Max. 32 dBm	Max. 29 dBm	Max. 29 dBm
Modulation	GMSK		
WAP	WAP 1.2.1		
Connection	8 ch / TDMA		
Voice digitizing	13 kbps RPE-LTP / 13 kbps ACLEP		
Transmission speed	270.833 KBPS		
Signal Reception	Direct Conversion		
Antenna Impedance (External Connector)	50		
Dimensions (Excluding antenna)	Height: 77 mm *Width: 43 mm *Depth : 16.9 mm		
Weight	Max 65 g		
Display	Header (1128 x 12 pix)+Body (128 x 96 pix) Bottom (128 x 16 pix)		
Illumination	2 LED for the LCD (Blue Light) 6 LED for the keypad (Blue Light)		
Keys	18 Physical Keys, 2 Way Navi-Key		
SIM	3 V Plug-in Only		
External DC Supply Voltage	3.8 V		
Battery	Standard Li-Ion 720 AHh		
Standby Time	78.3-230 Hrs (*)		
Talk Time	1.6-7.9 Hrs (*)		

(\*)The network being used, SIM card usage, and the condition of the battery affect Battery life.

#### ⚠ 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 information by anyone else could result in serious injury or death.

# COMPANY LIABILITY

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CP8 PATENTS

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# 1. INTRODUCTION

## **WARNING**

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

## **Caution**

The equipment described in this manual contains electrostatic devices (ESDs). Damage can occur to these devices if the handling procedures described in Section 4 are not adhered to.

## **Caution**

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.

## 1.1. Purpose of the Manual

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

## 1.2. Structure of the Manual

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

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

## 1.3. Servicing Responsibilities

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

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

## 2. GENERAL DESCRIPTION

### 2.1. General

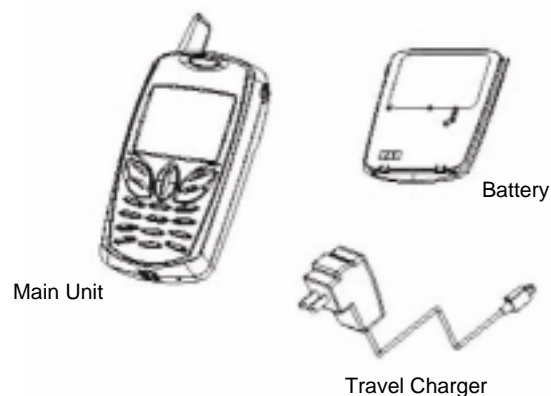
This section provides a general description and kit composition details for the GSM Handportable Telephone System and optional kits.

### 2.2. Features

The Panasonic Telephone Model G50 is a high performance, small, light, handset for business and domestic use. The following features are provided:

1. Dual Codec, which includes Full Rate and Enhanced Full Rate (EFR) Speech Codec.
2. Triple Band, E-GSM 900 and PCS 1800 /1900 operation.
3. Tegic T9 Text Entry.
4. Voice Ringer.
5. Desktop handsfree function comprising integral echo cancellation and noise suppression.
6. Wireless Application Protocol (WAP) Browser.
7. Backup Battery.
8. Downloadable polyphonic melody ring tones.
9. Clock, Calculator and Currency Converter.

### 2.3. Handportable Main Kit



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

## 3. OPERATING INSTRUCTIONS

### 3.1. General

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

### 3.2. Liquid Crystal Display

The telephone handset has a graphical chip on glass display. The following icons are available:



Figure 3.1: Liquid Crystal Display

Icon	Description
	The received signal strength indication – No CHPS;  : Line1;  : Line2
	Indicated the battery level / Low Battery:
	Displayed when the user is registered to a non-home network-roaming
	Displayed when call divert is enabled – No CPHS;  : Line1;  : Line2;  : Line1 & Line2
	Displayed when phone lock is enabled
	Displayed when an unread message is store or lights when message area is full
	Voice mail icon
	Indicated alarm is set
	Displayed when vibration alert is enable
	Displayed when all tones or ring volume is off
	GPRS ON indication
	GPRS ON and attached indication
	Context active and coverage lost/searching

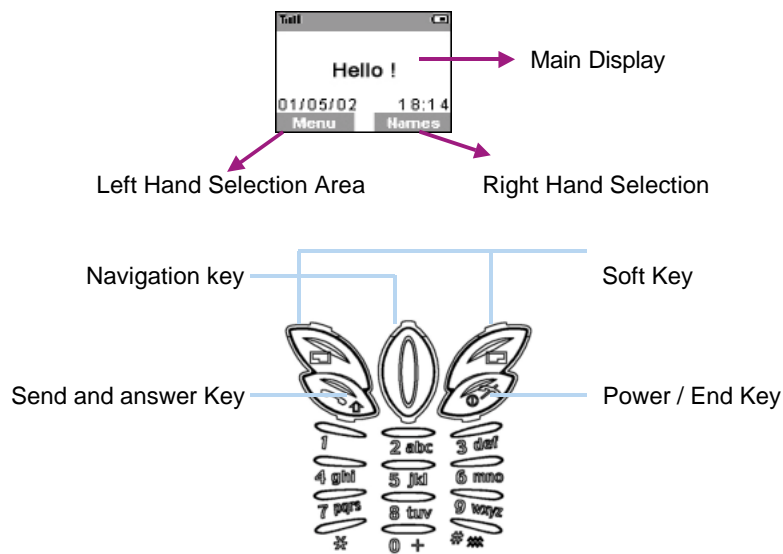
### 3.3. Location of Controls



The Phone Jack can be used as data transmission port to perform download and test tasks.

### 3.4. Concept of Operation

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





**Navigation Key:** Moving up and down through the options in the display area. In idle mode, pressing to enter Own Menu. Own menu is a short cut to access your favourite menu. You can set it the personalize.



**Soft keys:** Perform the functions indicated by text shown on the LCD screen. In idle, long press left soft key to enter Messages, long press right soft key to enter Profile Mode List.



**Numeric key pads:** Long Press  to enter a "+" or "P". When you need to dial an extension number, dial the phone number firstly then longer press  to add a "P" and enter the extension number.



**Send/Answer Key:** Make a call or answer a call, In mode, check the last dialled list.



**Power/End Key:** To end a call return to idle mode, return to previous menu or reject an incoming call, Long press it to switch the phone on/off.



In idle, long press to active Browser.



In idle, long press to switch the Mute Mode on and off.

## 3.5. Alpha Entry

### 3.5.1 Character Set / Key Assignments

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

**Alphabetic, small / capital letter mode:**

Key	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1	1	/	(	)	<	=	>	%	~		&				
2	a / A	b / B	c / C	2	ä	à	ç								
3	d / D	e / E	f / F	3	é	è									
4	g / G	h / H	i / I	4	ì										
5	j / J	k / K	l / L	5											
6	m / M	n / N	o / O	6	ö	ñ	ò								
7	p / P	q / Q	r / R	s / S	7	ß									
8	t / T	u / U	v / V	8	ü	ù									
9	w / W	x / X	y / Y	z	9	æ	ø	å							
*	*	Γ	Δ	Θ	Λ	Ξ	Π	Σ	Φ	Ψ	Ω				
0	Space	0	.	,	?	!	+	-	:	¿	¡	"	'	;	_
#T	9 on/off mode	Space	#£\$					@	\	§					

**T9 mode**

Key	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
	space	1	/	(	)	<	=	>	%	~		&				
	*	Γ	Δ	Θ	Λ	Ξ	Π	Σ	Φ	Ψ	Ω					
	0.		,	?	!	+	-	:	¿	¡	"	'	;	_		
	#	£	\$	¥		@	¥	§								

**T9 Editor Sequence**

Key	T9 Editor Sequence	Tegic mode	1.	2.	3.	4.	5.	6.
Send	TC	T9 on	T9 Abc	T9 abc	T9 ABC	123	BPMF	Stroke_TC
	SC	T9 off	Abc	abc	ABC	123	Pin Yin	Stroke_SC

n Key 1, 2, 3, 4, 5, 6, 7, 8, 9, 0 long press provides corresponding numbers.

n All other keys are used for Tegic T9 intelligent text mapping.

n TC: Traditional Chinese; SC: Simplified Chinese; BPMF: Input method of traditional Chinese

### 3.5.2 Editing Alpha Entry

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

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

### 3.6. Features Structure

Feature Set Listing			
<b>1 Telephone Functionality</b>			
	<b>Display and Lighting</b>		
		<b>LCD Display</b>	
			Received Signal Strength Indication
			Battery Status Icon
			Call Processing Signal Indication
			Dialled Number Indication
			Last Dialed Digit Clear/Entire Line Clear
			Own Telephone Number Indication
			Service/No Service Indication
			Country/PLMN Indication
			Service Provider Indication
			Roaming Indication
			SMS Ariving Indication
			SMS Overflow Indication
			Vibration Mode Status Indication
			Lock Status Indication (Keypad Lock)
			Greeting Message Editing
			Power On/Off Animations
			Clock Alarm Indication
			Show Time & Date
			Line Service Indication
			GPRS Status Indication
		<b>Back-lighting</b>	
			LCD Backlight
			Keypad Backlight
			Incoming Call Backlighting
	<b>Security</b>		
		<b>Access Codes</b>	
			PIN

			PUK	
			PIN2	
			PUK2	
			Phone Code	
		<b>PIN Check</b>		
		<b>Change PIN</b>		
		<b>FDN Mode (On/Off)</b>		
	<b>ME Personalization</b>			
		<b>Network lock</b>		
		<b>Network Subset Lock</b>		
		<b>Service Provider Lock</b>		
		<b>Corporate Lock</b>		
		<b>SIM Lock</b>		
		<b>Custom IMSI</b>		
		<b>Multiple Lock</b>		
	<b>Sound Settings</b>			
		<b>Ring Tone/Melody (20 predefined, 5 composed, X download)</b>		
		<b>Ring Volume Control (1-5)</b>		
		<b>Alert Type</b>		
			Ring Only	
			Vibration Only	
			Vibration and Ring	
			None	
		<b>Keypad Tone</b>		
			On (Individual Key Sounds: DTMF tones)	
			Off (No Keypad Sound)	
		<b>Service Tone</b>		
			Network Found	
			Warning Tones (for low battery, etc.)	
	<b>Phone Parameters</b>			
		<b>Greeting Message</b>		
		<b>Own Number</b>		
		<b>Language</b>		
		<b>Any-key Answer (On/Off)</b>		
		<b>Auto Answer (On/Off)</b>		
		<b>Brightness (Off, Low, Medium, High, Maximum)</b>		
		<b>Redial</b>		

		Reset Setting to Default	
		Hot Key Dial (On/Off)	
			Key 1 to 9 assigned to the Phone-number in SIM or Mobile records from 1 to 9 according to the selection of My Phonebook and press <Send> to dial out
	Clock Setting		
		Set Time	
		Set Date	
		Display Format	
	Languages/Fonts/Bitmaps		
		Fonts & Bitmaps	
		Character Set Definition, mapping & Decoding	
		Text String Translation For all languages	
		Full GSM Character Set	
	Network Service (Requires Carrier Protocol Stack Support)		
		Call Diverting	
			Divert Always
			Busy
			No Reply
			Unreachable
			Cancel All
		Call Barring	
			All outgoing Calls
			Outgoing International Calls
			Outgoing International Calls, Except Home
			All Incoming Calls
			All Incoming Calls When Roaming
			Cancel All
			Change barring Password
		Cali Waiting	
			Enable
			Disable
	Network Selection		
		Network Select	
		Auto/Manual Selection	
		Preferred List	
		Band Select	

		Line Identification			
			Calling Line Identification Presented (CLIP)		
			Calling Line Identification Restricted (CLIR)		
			Connected Line Identification Restriction (COLP)		
			Connected Line Identification Restriction (COLR)		
	In-Call Menu (Requires Protocol Stack Support)				
		Call on Hold/Swap			
		Answer Second Call			
		Display of Change Advice Information			
		Multiple Call			
			Having Private Conversation With One Participant		
			Dropping One Participant		
	SMS (Requires Carrier and Stack Support)				
		Enhanced Message Service			
			Bitmap (15)		
			Melody for ringer tone (10)		
		UCS2, 8 Bit Encoding support			
		Read Message			
			Header Display		
				Message Number	
				Message Status	
			View Message		
				Sender's Phone Number (If Sent)	
				Date And Time Message Received	
				Message Text	
				EMS Picture Message	
				EMS Sound Message	
			Text Reply		
				Change SMS Center Number	
				Send Message	
				Save Message	
			Delete Message		
			Extract Number From Message		
			Recognition of phone number		
			Send (Resend Message Already Sent)		
			Edit Message		
		Write Messages			

			Send
			Insert Predefined Text
			Insert Picture/Melody (EMS MO)
			Save and Send Message
			Save Only
			Auto capital letter in the beginning of string input
		<b>Predefined Text (15)</b>	
			Edit Preset Message
			Clear Preset Message to Empty
		<b>Setup</b>	
			Service Center Number
			Store SMS Center Number
			Edit SMS Center Number
			Message Type
			Reply Path
			Status Report
			Validity Period
		<b>Broadcast</b>	
			Read Messages
			Save Messages
			Receive (Enable/Disable)
			Channel List (scan up to 5 channels in parallel)
			Enter New Channel
			All Channels (Enable/Disable)
			Language Preference
	<b>Call Records</b>		
		<b>Missed Calls (Number: 20)</b>	
			Display Number, Name (if available), Date and Time
			Edit, Dial or Save Number
			Delete Number From List
		<b>Received Calls (Number: 20)</b>	
			Display Number, Name (if available), Date and Time
			Edit, Dial or Save Number
			Delete Number From List
		<b>Dialled Calls (Number: Minimum to 10)</b>	
			Display Number, Name (if available)
			Edit or Save Number

			Redial Number	
			Delete Number	
		Call Time		
			Last Call Time	
			Total Sent	
			Total Received	
			Reset Times	
		Call Cost (Requires Protocol Stack Support)		
			Last Call Cost	
			Total Cost	
			Max Cost	
			Reset Counters	
			Set Max Cost	
			Price/Unit	
	GSM 2.30 MMI and GSM 2.90 USSD			
2 Optional Network Service (Requires Carrier and Protocol Stack Support)				
	SIM Toolkit			
		Class 1 (SIM Content Update)		
		Class 2 (SMS Proactive SIM)		
		Class 3 Send USSD		
3 Applications				
	Mobile Phonebook			
		7 fields available		
			Name	
			Mobile phone number	
			Home phone number	
			Office phone number	
			Groups	
				- No Group
				- Friends
				- Colleagues
				- Family
				- Others
				- VIP
			Image Caller ID	

			Melody
		<b>Mobile Phonebook Menu</b>	
			Edit Phonebook Number and Name
			Erase Phonebook Number and Name
			Speed Dialling (1-9) if mobile phonebook selected as preferred phonebook
			Copied one or all to SIM Phonebook
	<b>SIM Phonebook</b>		
		<b>Phonebook Name and Number Storage</b>	
			ADN (Depends on SIM, Max 255)
			FDN (Number of entries Max 50)
		<b>SIM Phonebook Menu</b>	
			Edit Phonebook Number and Name
			Erase Phonebook Number and Name
			Speed Dialling (1-9) of SIM phonebook selected according to preferred phonebook
			Copied one or all to Mobile Phonebook
	<b>Own Number</b>		
	<b>Service Dialling Number</b>		
	<b>Dialling From Phonebook</b>		
	<b>Calculator</b>		
	<b>Appointment List</b>		
		Data/Time with Alarm-like Reminder	
	<b>Currency Converter</b>		
	<b>World Clock</b>		
		<b>Select cities</b>	
		<b>Set Time</b>	
		<b>Set Date</b>	
		<b>Daylight Saving On/Off</b>	
		<b>Time Format</b>	
		<b>Date Format</b>	
	<b>Melody Composer (Max. 5)</b>		
	<b>Wall Paper in Idle Mode (20 default, X download)</b>		
	<b>Picture Manager :</b>		
		Manage picture list	
		The picture can be used as wallpaper in idle screen or picture link	
		20 128x80 predefined pictures (10 idle screen + 10 picture link)	

		X downloaded; X depends on the media library's size; The size of a downloaded picture can be variable.	
	<b>Melody manager (20 default. 5 composed, X downloaded)</b>		
		Manage picture list	
		20 predefined melodies	
		5 user composed melodies	
		X downloadable, X depends on the Media Library size.	
	<b>Games (WGE)</b>		
		Game 1	
		Game 2	
		Game 3	
<b>4 Miscellaneous</b>			
	<b>Battery Management</b>		
		<b>Low Battery Warning</b>	
		<b>Power Off Indication</b>	
		<b>Charging Status</b>	
	<b>Accessory Support</b>		
	<b>Alpha-numeric Input</b>		
		<b>Alpha Mode</b>	
		<b>Numeric Mode</b>	
	<b>T9 Smart input version 5.0</b>		
		<b>English: Predictive input</b>	
		<b>Chinese:</b>	
			1. Bopomofo (for Traditional Chinese)
			2. Pinyin (for Simplified Chinese)
			3. Stroke (for Traditional Chinese)
			4. Stroke (for Simplified Chinese)
<b>5 Additional Services</b>			
	<b>OTA Download via WAP</b>		
		Bitmap Picture	
		JPEG picture	
		Melody for ring tone	
	<b>WAP Browser (Openwave 6.1)</b>		
		Home	
		Bookmark (10 available)	
		Profiles (5 available)	
		Connection setting	

		- Homepage	
		- Connection Type	
		- Connection Security	
		- IP Address	
		- Linger Time	
		(CSD Bearer)	
		- Dial number	
		- Data Call type	
		- User Name	
		- Password	
		<b>(GPRS Bearer)</b>	
		- APN	
		- User Name	
		- Password	
		- Authentication	





## 3.7. Incoming Call Line Identification (CLI)

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

## 3.8. Public Man Machine Interface (MMI)

### 3.8.1. General

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

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

### 3.8.2. Reading the Phonebook Memory Location

# <MEMORY LOCATION>

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

### 3.8.3. Presentation of IMEI

\* # 0 6 #

### 3.8.4. Security

Change PIN	** 0 4 * <OLD PIN> * <NEW PIN> * <NEW PIN> #
Change PIN2	** 0 4 2 * <OLD PIN2> * <NEW PIN2> * <NEW PIN2> #
Unblock PIN	** 0 5 * <PIN UNBLOCKING KEY> * <NEW PIN> * <NEW PIN> #
Unblock PIN2	** 0 5 * <PIN2 UNBLOCKING KEY> * <NEW PIN2> * <NEW PIN2> #

### 3.8.5. Call Hold

Place a Call on Hold	2 <SND>
Recall a Held Call	2 <SND>
Make a Second Call	<TELEPHONE NUMBER>?<SND>
Swap between two Held Calls	2 <SND>
End Held Call	0 <SND>
End Active Call	1 <SND>
Reject Incoming Call	0 <SND>

### 3.8.6. Call Waiting

Enable Call Waiting	*43 * <SND>
Disable Call Waiting	#43 * <SND>
Call Waiting Status	* # 4 3 * # <SND>

### 3.8.7. Call Line Identification

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

Enable \* <SERVICE CODE> \* # (SND>  
Disable # <SERVICE CODE> \* # (SND>  
Temporary Suppress Identification # 31 # <TELEPHONE NUMBER> <SND>  
Temporary Display Identification \* 31 # <TELEPHONE NUMBER> <SND>

### 3.8.8. Telecommunication Services used for Public MMI

#### Teleservice

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

### 3.8.9. Dial Divert

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

Set Call Bar (Except "No Reply")	* * <SERVICE CODE> * <FORWARD TELEPHONE NUMBER> * <TELECOMMUNICATION SERVICE> # <SND>
Set "No Reply" Call Bar	* * <SERVICE CODE> * <FORWARD TELEPHONE NUMBER> * <TELECOM' SERVICE> * <TIME TO RING (sec)>#<SND>
Clear	# # <SERVICE CODE> * <TELECOMMUNICATION SERVICE> * # <SND>
Status	* * # <SERVICE CODE> * <TELECOMMUNICATION SERVICE> * # <SND>
Clear all Call Diverts	# # 002 #




### 3.8.10. Call Bar

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

Set	* <PASSWORD> * <TELECOMMUNICATION SERVICE> # <SND>
Clear	# <TELECOMMUNICATION SERVICE> # <SND>
Status	# <TELECOMMUNICATION SERVICE> # <SND>
Clear all Call Bar Type	# 330 * <PASSWORD> # <SND>
Change Call Bar Password	** 03 ** <OLD PASSWORD> * <NEW PASSWORD> * <NEW PASSWORD> # <SND>

### 3.9. Troubleshooting

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

Problem	Cause	Remedy
Telephone will not switch on		Check that the battery pack is fully charged and correctly connected to the telephone.
Extremely short battery life for a new battery pack	The network in use and the condition of the battery pack can affect battery life.	Avoid areas of poor reception. Ensure batteries fully charged.
Short battery life for an old battery pack	The battery pack was worn out.	Replace with a new one.
The battery level indicator  does not light when charging	If a battery is deeply discharged it will take a short time before there is sufficient power in the telephone to light the battery level indicator  .	Leave to charge for several minutes in temperatures between +5 °C and +35 °C
Calls cannot be made	The telephone is locked.	Unlock the telephone.
	Outgoing calls are barred.	Disable the outgoing call barring (Phone Option: Security: Call bar).
	The telephone is not registered to a network.	Move to a coverage area and operate the telephone after it has registered with a network.
Calls cannot be made from Fixed Dial Store		Check that SIM supports Fixed Dial Check if the Fixed Dial is switched on (Phone Operation: 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 (Phone Option: Security: Call Bar).
	The telephone is not registered to a network.	Move to a coverage area and operate the telephone after it has registered with a network.
Emergency calls cannot be made	User's phone is not in a GSM coverage area.	Check that the antenna symbol  is displayed. Move to a coverage area and operate the telephone when the antenna symbol is displayed.
Telephone numbers Cannot be recalled	The telephone is locked.	Unlock the telephone.
	Fixed Dial is switched on	Switched off Fixed Dial (Phone Option: Security: Fixed Dial).

### 3.10. Important Error Messages

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

Error Message	Explanation / Remedy
Area not Allowed	Roaming in the selected area is not allowed.
Network not allowed	Roaming with the selected network is not allowed.
Security Failure	The network has detected authentication failure because the SIM is not registered with that network. Contact the Service Provider.
SIM Blocked	The SIM is blocked because the wrong PUK has been entered 10 times. Contact the Service Provider.
SIM Error	The telephone has detected a problem with the SIM. Switch the telephone off and then back on. If the message does not disappear, contact the Service Provider.
Message Rejected Store Full	A message has been received but the message store is full. To receive messages, delete some of the currently stored messages.
PIN2 Invalidated	The PIN2 is blocked permanently because the wrong PUK2 has been entered 10 times. Services controlled by PIN2 cannot be used. Contact the Service Provider.
Warning Store Full Continue?	The message area is full. New messages cannot be stored until some of the currently stored messages are deleted.

### 3.11. Security Codes

Code Type	Number or Digits	Description
Personal Identification Number (PIN)	4 to 8	Controls SIM security. Supplied by the service provider.
PIN2	4 to 8	Controls memory security. Supplied by the service provider.
PIN/PIN2 Unblocking Key		Supplied by the service provider.
(PUK/PUK2)	8	Used to unblock PIN and PIN2. A PIN or PIN2 will become blocked if the wrong PIN or PIN2 is entered three times. When the blocked PIN or PIN2 is unblocked, a new PIN or PIN2 must be entered. If the wrong PUK or PUK2 is entered 10 times, the cursor SIM will be unusable.
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.
Phone lock Code	4 to 8	Controls telephone security.

### 3.12. Glossary of Terms

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

## 4. TECHNICAL SPECIFICATIONS

### 4.1. Tx Characteristics

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

#### 4.1.1. Frequency Error

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

#### 4.1.2 Modulation Phase Error

RMS: Equal to or less than  $5^\circ$

Peak: Equal to or less than  $20^\circ$

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

Offset from Centre Frequency (kHz)	Maximum Level Relative to Carrier (dB)
$\pm 100$	+0.5
$\pm 200$	-30
$\pm 250$	-33
$\pm 400$	-60
$\pm 600$ to 1800	-60

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

Offset from Centre Frequency (kHz)	Maximum Level (dBm)		
	E-GSM 900	GSM 1800	GSM 1900
$\pm 400$	-19	-22	-22
$\pm 600$	-21	-24	-24
$\pm 1200$	-21	-24	-24
$\pm 1800$	-24	-27	-27

Measurement conditions for output RF spectrum measurements:

Frequency Span	0 Hz
Measurement Bandwidth:	30 kHz
Video Bandwidth:	30 kHz (modulation) 100 kHz (switching)
Average (Modulation)	Over 200 burst
Peak Hold (Switching)	Over 10 burst

### 4.1.5. Spurious Emissions at Antenna Connector

Frequency Range	Frequency offset	Filter Bandwidth	Approx Video B/W	Limits(dBm)	
				E-GSM 900	GSM1800/1900
100KHz to 50MHz	-	10KHz	30KHz	-36	-36
50 to 500MHz	-	100KHz	300KHz	-36	-36
500MHz to 1GHz	0 to 1MHz	100KHz	300KHz	-36	-36
1 GHz to 12.75 GHz	0 to 10MHz	100KHz	300KHz	-30	-30(1.0 -1.710GHz)
Excl. relevant TX band	>10MHz	300KHz	1MHz	-30	
E-GSM:880 to 915 MHz	>30MHz	3MHz	3MHz	-30	-36(1.710 -1.785GHz)
DCS:1710 to 1785 MHz	(off from edge of relevant Tx band)				-30(1.785 -12.75GHz)
-and the Rx bands					
925 -960 MHz					
1805 -1880 MHz					
Relevant TX band:	1.8 to 6.0 MHz	30KHz	100KHz	-36	-36
E-GSM:880 to 915 MHz	> 6.0MHz	100KHz	300KHz	-36	-36
DCS:1710 to 1785 MHz					

### 4.1.6. Residual Peak Power

Equal to or less than 70 dBc (BW = 300 kHz)

## 4.2. Rx Characteristics

### 4.2.1. Sensitivity

#### E-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 TU high		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*_	8900					0.122*_	164000
Class 1b (RBER)	0.42/_	1,000,000	7.5	24000	9.33	60000	0.41/_	20,000,000
Class II (RBER)	8.33	120,000					2.439	8200

The reference sensitivity level is < -102 dBm.

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

## GSM 1800/1900 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 TU high		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*_	13400					0.122*_	164000
Class 1b (RBER)	0.32/_	1,500,000					0.41/_	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:**  $1 < _ < 1.6$ . The value of \_ can be different for each channel condition but must remain the same for FER and class 1b RBER measurements for the same channel condition.

## Blocking:

Frequency	Small MS level in dB $\mu$ Vemf( )		
	E-GSM 900	GSM 1800	GSM 1900
FR $\pm$ 600 kHz to FR $\pm$ 800 kHz	70	70	70
FR $\pm$ 800 kHz to FR $\pm$ 1,6 MHz	70	70	70
FR $\pm$ 1,6 MHz to FR $\pm$ 3 MHz	80	80	80
915 MHz to FR - 3 MHz	90	-	-
FR $\pm$ 3 MHz to FR 980 MHz	90	-	-
FR $\pm$ 600 KHz to FR $\pm$ 800 KHz	-	87	87
1785 MHz to FR - 3 MHz	-	87	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	113
> 1705 MHz to < 1785 MHz	-	101	101
> 1920 MHz to 1980 MHz	-	101	101
> 1980 MHz to 12.75 GHz	-	90	90

Measurement Conditions:

Wanted carrier is 3 dB above reference sensitivity.

Interferer is CW.

Spurious response exceptions:

Six exceptions are permitted IN band 915 - 980 MHz.

24 exceptions are permitted OUTSIDE band 915 - 980 MHz.

## Intermodulation Characteristics

Interferer Level ( f1 & f2) dBm	Interferer Frequencies ( f1 & f2 )
-49	Wanted frequency= 2f1 - f2, and [ f1 - f2] = 800 kHz

## 5. TECHNICAL DESCRIPTION

### 5.1. RF Overview

#### 5.1.1. Introduction

##### ■ General Specifications

The telephone is a Tri-Band product.

The transmit and receive bands for the mobile are given in the table below:

	<b>Tx</b>	<b>Rx</b>
E-GSM 900	880 - 915 MHz	925 - 960 MHz
GSM 1800	1710 - 1785 MHz	1805 - 1880 MHz
PCS 1900	1850 - 1910 MHz	1930 - 1990 MHz

Other salient technical features are as follows:

	<b>E-GSM 900</b>	<b>GSM 1800</b>	<b>PCS 1900</b>
RX Bandwidth	35 MHz	75 MHz	60 MHz
TX Bandwidth	35 MHz	75 MHz	60 MHz
Number of Channels	174	374	299
AFRCN (Channel Numbers)	0- 124 975-1023	512-885	512-810
1st TX Channel	880.2 MHz (Ch 975)	1710.2 MHz (Ch 512)	1850.2 MHz (Ch 512)
Last TX Channel	914.8 MHz (Ch 124)	1784.8 MHz (Ch 885)	1909.8 MHz (Ch 810)
1st RX Channel	925.2 MHz (Ch 975)	1805.2 MHz (Ch 885)	1930.2 MHz (Ch 512)
Last RX Channel	959.8 MHz (Ch 124)	1879.8 MHz (Ch 885)	1989.8 MHz (Ch 810)
Maximum TX Power	33.0 dBm (Class 4)(PL 5)	30.0 dBm (Class 1)(PL 0)	30.0 dBm (Class 1)(PL 0)
Minimum TX Power	5.0 dBm (PL 19)	0.0 dBm (PL 15)	0.0 dBm (PL 15)

5.1.2. RF Function Block

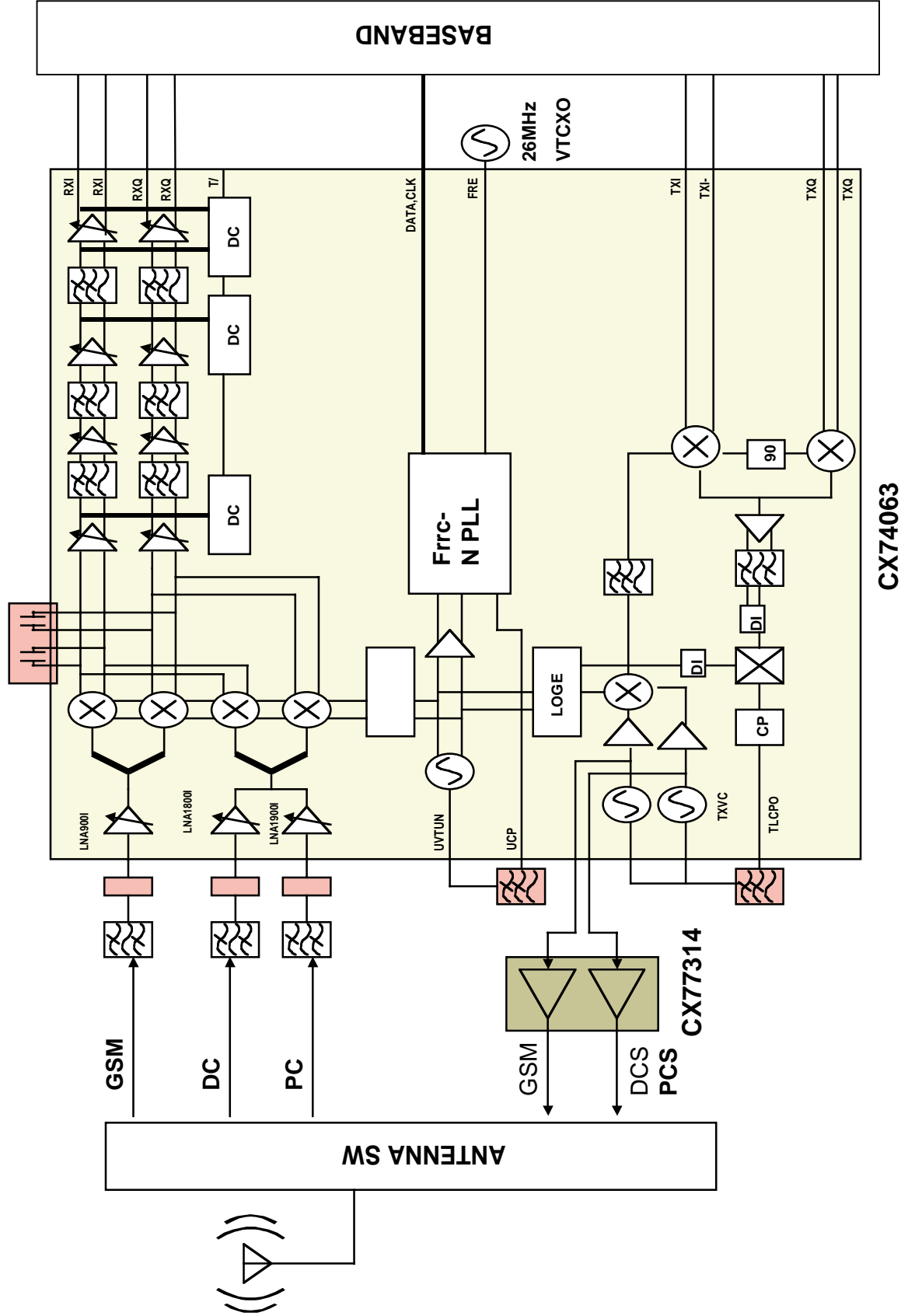


Figure 5.1. : RF Function Block Diagram

### 5.1.3. Functional Description

#### ■ Frequency Plan

The frequency plan is shown below:

TX Frequency Plan	TX Frequency	TX IF	TX RF LO
E-GSM 900	880.2 - 914.8MHz	88.46 - 114.35MHz	1459.59 -1543.725MHz
GSM 1800	1710.2 - 1784.8MHz	90.316 - 104.776MHz	1354.737 - 1414.482MHz
PCS 1900	1850.2 - 1909.8MHz	97.379 - 112.341MHz	1460.684 - 1516.606MHz

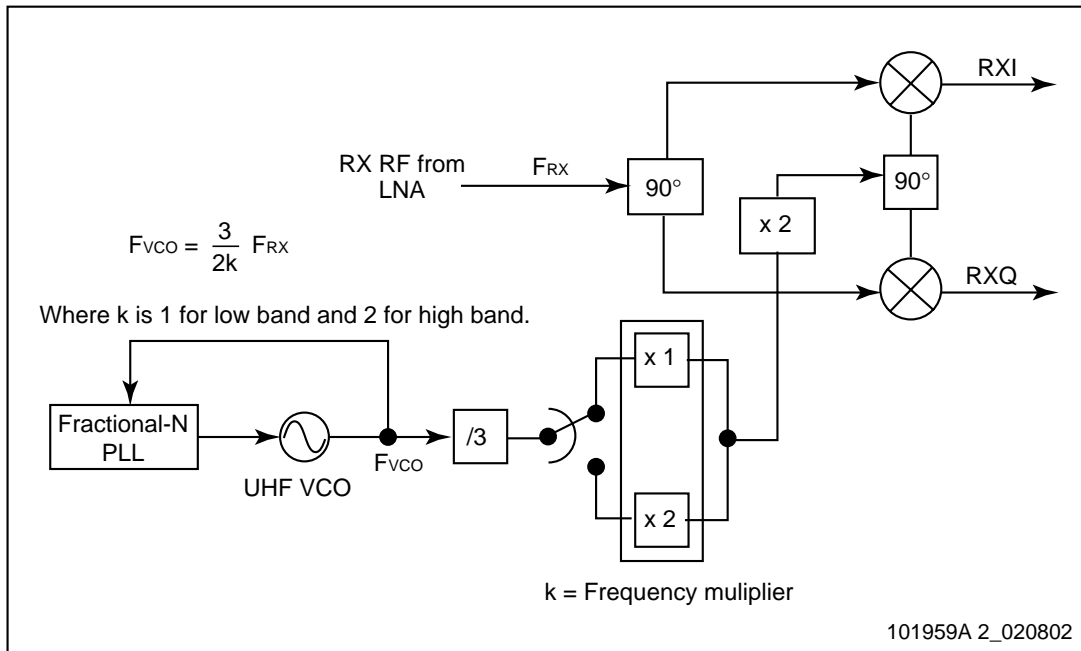


Figure 5.2. Receiver Block Frequency Plan

#### ■ General

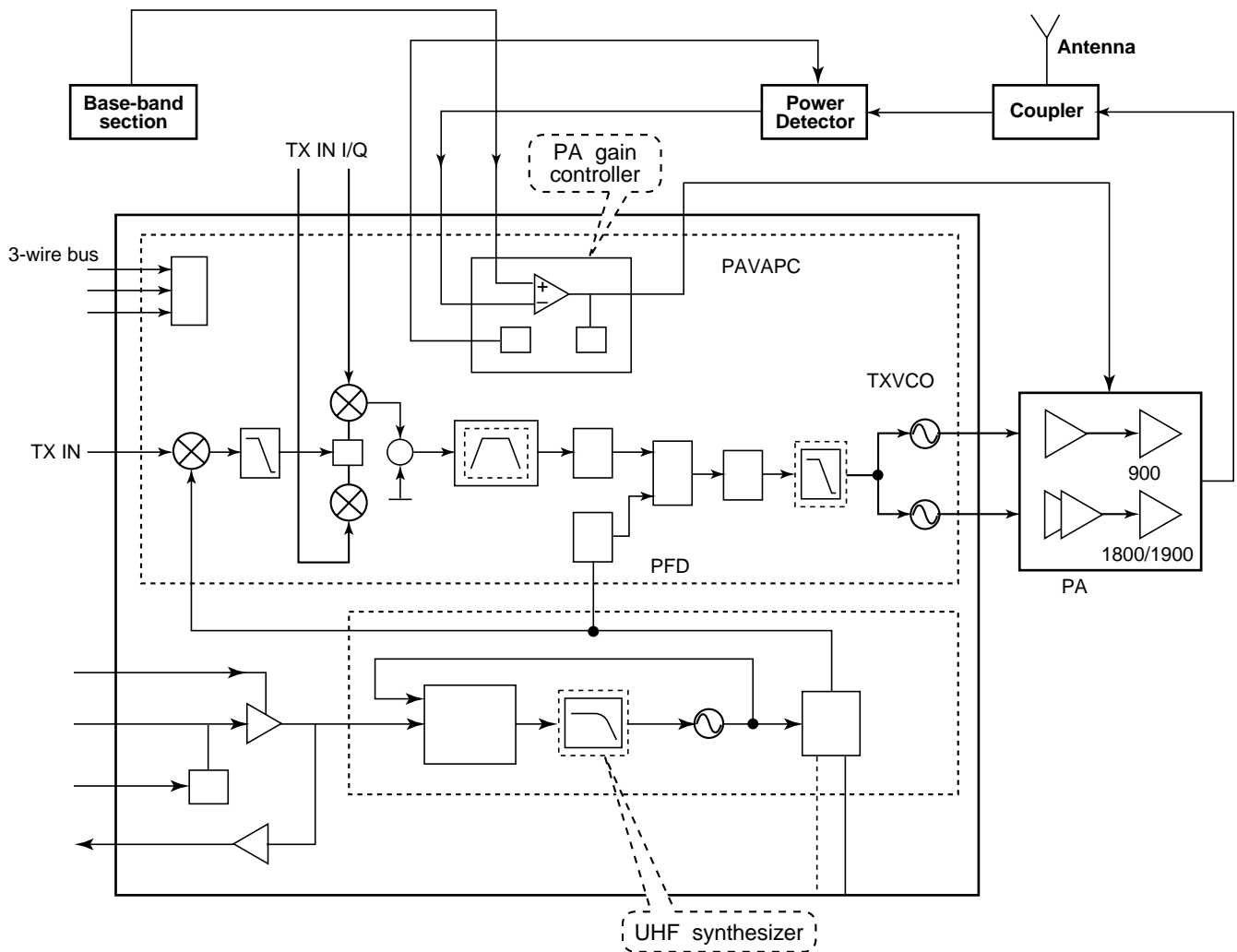
RF circuit design is built based on SKYWORKS-74063 direction conversion transceiver IC integrated by SAW filters, power amplifier with control circuit, and Transmitter/receiver switch.

RF LO always requires external frequency sources with VCTCXO in VE2. And LO frequency is periodically re-tuning to synchronize with cell or network.

#### ■ Antenna

EB-G50 uses Helical-type antenna, which is most low-cost, monopole-like antenna. The antenna takes different spacing to define bands of GSM, DCS and PCS.

## ■ Transceiver - - Transmitter



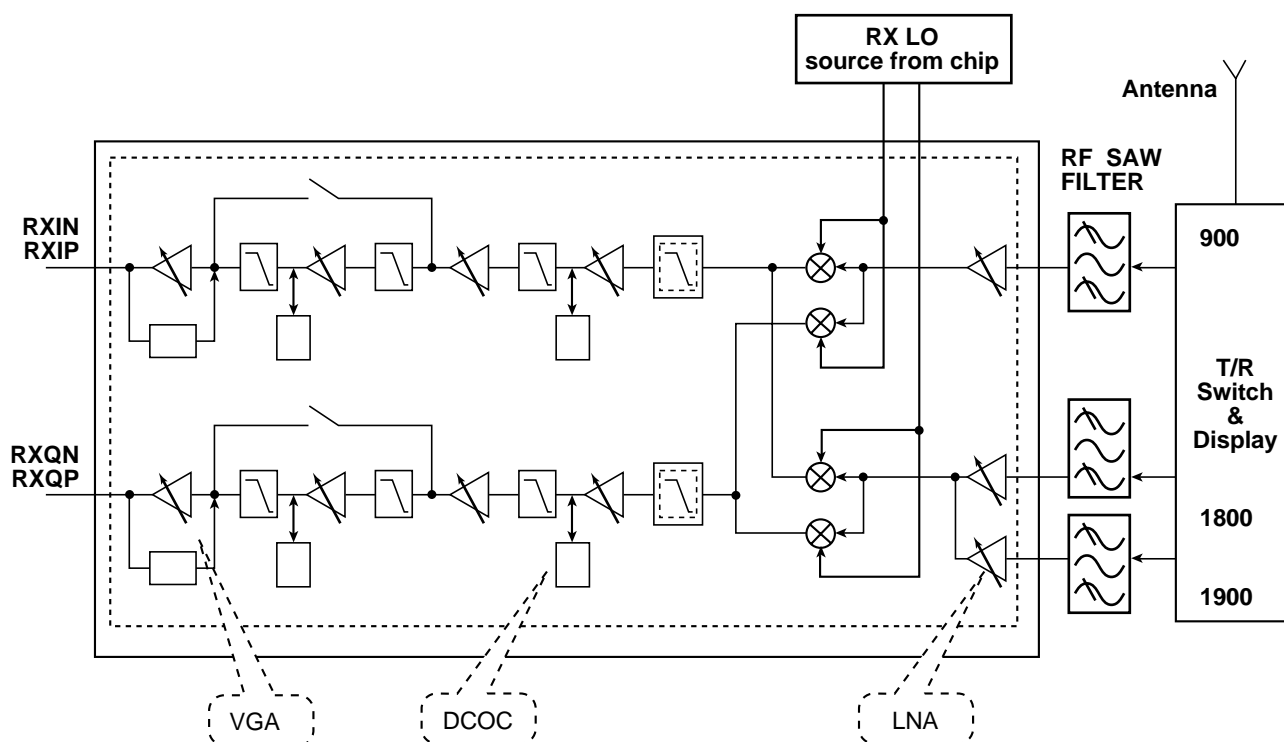
**Figure 5.3. Transmitter block diagram**

TX path is a translation loop architecture consisting of an IQ modulator, integrated high power VCO, offset mixer, programmable divider, PFD, charge pump, and power amplifier with its control circuit.

The device consists of an In-phase and Quadrature (I/Q) modulator within a frequency translation loop designed to perform frequency up-conversion with high output spectral purity.

Clock source is 26MHz VCTCXO external instead of XTAL function block active. VCTCXO is more stable over extreme condition and current saving in standby mode.

## ■ Transceiver - - Receiver



**Figure 5.4. Receiver block diagram**

RX path is a direction down conversion architecture that eliminates the need for Intermediate Frequency (IF) components. The device includes three bands integrated LNAS, a quadrature demodulator, baseband amplifier circuit with I/Q outputs and three stages of DC-offset correction.

The DCOC correction loop ensures DC-offsets, generated in CX74063, do not overload baseband chain.

The receiver can be calibrated to optimize IP2 performance, which ensures limited baseband interfering signal amplitude.

The CX74063 also features an integrated, fully programmable, sigma-delta fraction-N synthesizer suitable for GPRS multi-slot operation.

## 5.2. Baseband Overview

### 5.2.1. Introduction

The Baseband circuits of the phone are required to perform the following functions:

- Equalization
- Channel coding / decoding
- Speech coding / decoding
- Data Encryption
- Layer 1, 2 and 3 software tasks
- Man Machine interface (MMI)
- System Interface
- SIM Interface and Management
- Audio and Tone Generation
- Power supply and battery management
- RF power control
- Synchronization
- Real time clock

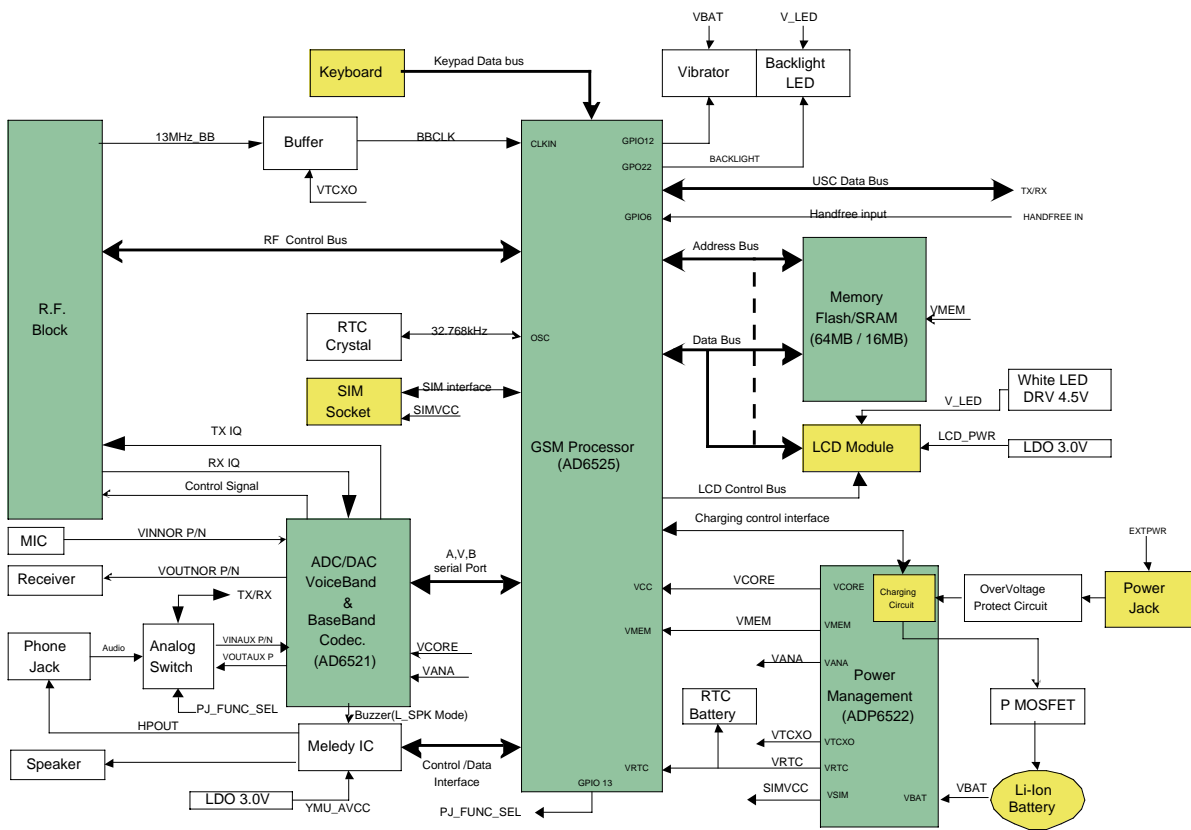


Figure 5.5. Baseband Block Diagram

The EB-G50 Baseband is built around a GSM chipset developed by Advanced Device. One chip (AD6525) carries out signal processing with DSP and CPU, and the other chip (AD6521) provides the analogue interface. The highly integrated nature of the chips means that each contains a large number of functions.

## 5.2.2. Digital Baseband Processor

GSM processor ADI AD6525

Package 160 -Ball LFBGA

Feature

Complete single chip GSM Programmable Digital Baseband Processor divided into three main subsystems:

1. Control processor subsystem including
  - 32-bit MCU ARM7TDMI control processor
  - 39 MHz operation at 1.8V
  - 1Mb on-chip System SRAM Memory
2. DSP subsystem including
  - 16-bit Fixed-point DSP Processor
  - 78 MIPS at 1.8V
  - Data and Program SRAM
  - Program Instruction Cache
  - Full rate, Enhanced full rate and Half Rate Speech Encoding / Decoding
  - Capable of Supporting PDC, AMR Speech Algorithms
3. Peripheral Subsystem including
  - Shared Peripheral Bus and Interface Peripherals

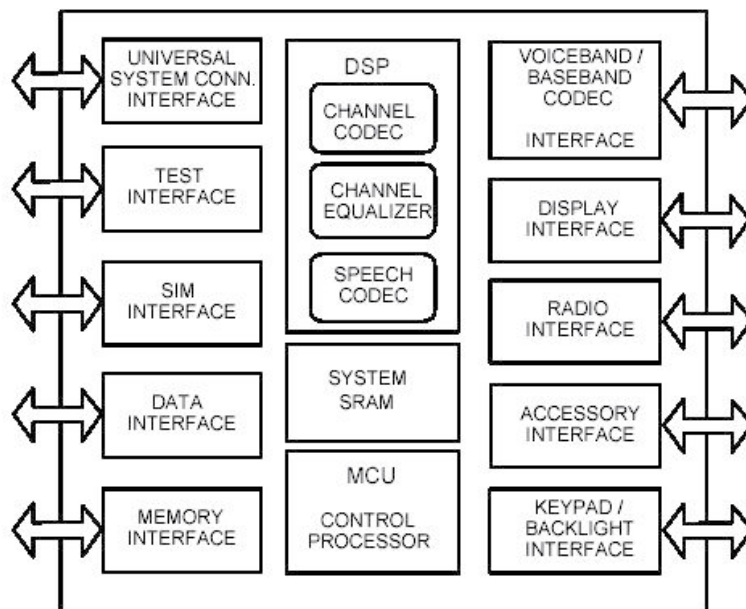


Figure 5.6. AD6525 Functional Block Diagram

### 5.2.3. Keypad

The Keypad has a 4 x 5 matrix, allowing 18 keys to be scanned. When a key being pressed, a keypad interrupt is generated. To find which key has been pressed, the software scans each column in turn and reads which row is active. Because of key bounce, the key press is confirmed twice at approximately 40-60 ms intervals.

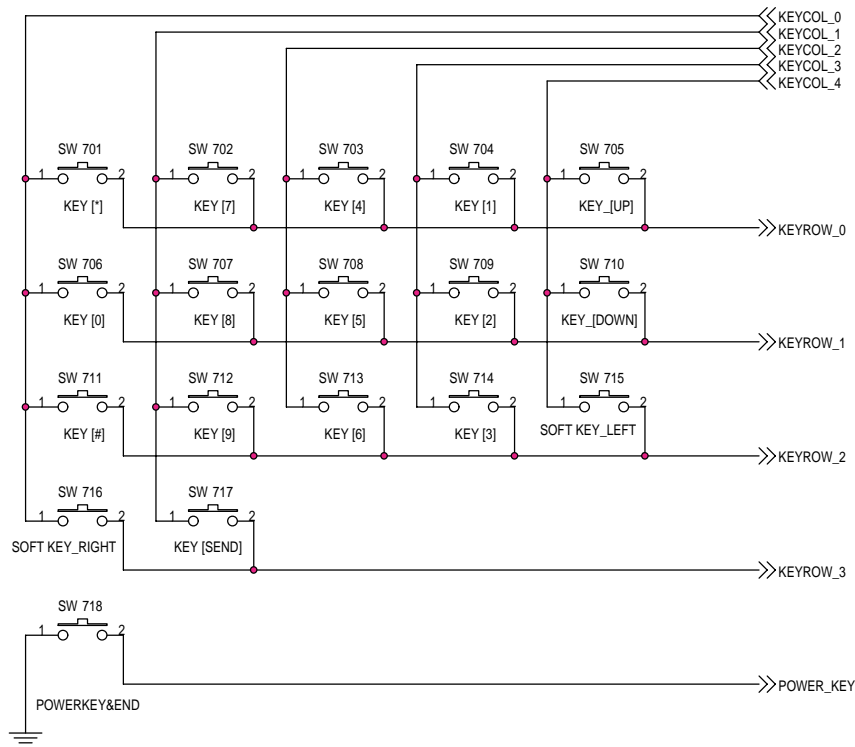


Figure 5.7. Keypad Connections

As the End Key doubles for the ON / OFF key, it is allocated an entire row of the keyboard scan. Keyboard scanning is controlled by software.

### 5.2.4. Subscriber Identity Module (SIM)

The SIM interface is designed to support 3 V SIM card. And work voltage is supplied by ADP3522 "VSIM" (2.85 V).

0x00	SMSMR	SIM Character Mode Register	Read/Write
0x02	SMBRR	SIM Bit Rate Register	Read/Write
0x04	SMSCR	SIM Control Register	Read/Write
0x06	SMTDR	SIM Data Transmit Register	Read/Write
0x0A	SMRDR	SIM Data Receive Register	Read/Write
0x08	SMSSR	SIM Status register	Read/Write
0x0C	SMSCMR	SIM Smart Card Mode Register	Read/Write

### 5.2.5. CPU Memory

To reduce component space, the phone uses a BGA package with Dual operation Flash memory and SRAM MCP. The following memory configuration is used:

64Mbits	Flash memory	organized as 4M * 16bits or 8M * 8bits
32Mbits	Pseudo RAM	organized as 2M * 16 bits

### 5.2.6. LCD

The LCD module consists of a LCD glass, white LED and driver chip connection to the Main PCB via a flexible PCB strip. A 96 x 128 pixels graphical display is used which can display up to 21 characters x 5 rows - plus two rows of icons. It can accommodate Chinese and large character sets.

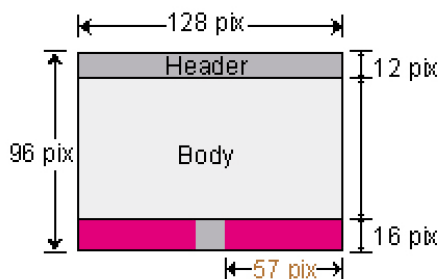


Figure 5.8. LCD Dimensions

The LCD driver is controlled by setting the command register through the AD6525 u-wire interface and an I/O line that distinguishes between command or data. To send data or a command to the display driver, the nDISPLAYCS line is used for chip select. LCD\_CTL is set high to send data and set low to send commands.

### 5.2.7. Real Tim Clock (RTC)

Clock functions are provided by a Real Time Clock built into AD6525. The module is synchronized by a 32.768 kHz crystal and has a backup power source provided by a capacitor. AD6525 has a clock auto compensation function to take into account any inaccuracies of the crystal. This is able to calibrate out crystal tolerance / drift by writing to the compensation registers. This functionality allows the application software to implement standard, calendar, or organizer functions such as:

- Time and date display

- Programmable alarm

- Programmable mobile activation

The RTC interrupt is routed through the IRQ-controller to the MCU or the DSP, as defined by software in interrupt configuration registers.

## 5.3. Audio System

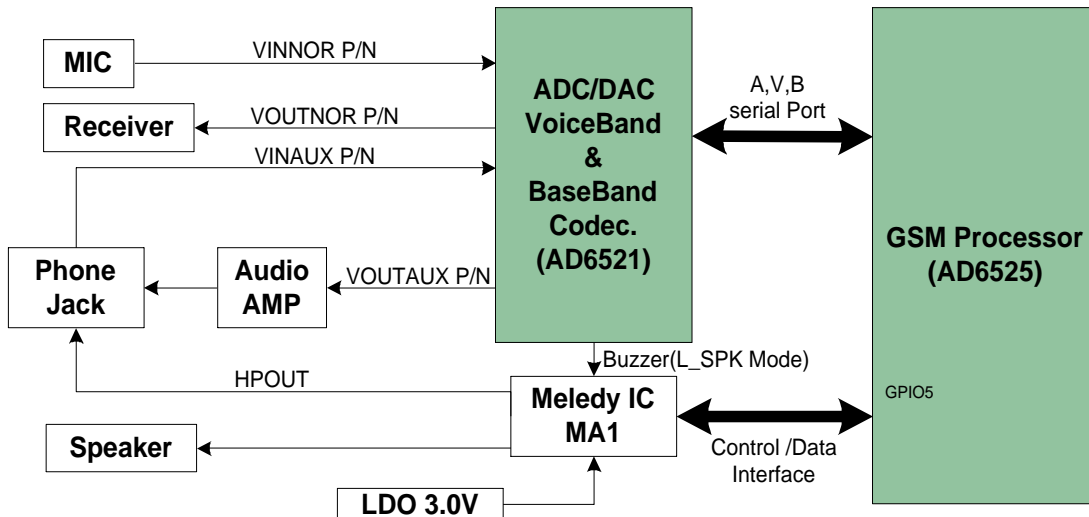


Figure 5.9. Audio system block diagram

AD6521 is a Voiceband Baseband Codec (VBC) that combines, onto a single chip, all A/D and D/A converters that are necessary to build a complete GSM, DCS1800, and PCS1900 mobile radio. It has two differential output port, two differential input ports, and a buzzer output. Voiceband normal output is used in normal receiver mode. Voiceband auxiliary output is used in earpiece receiver mode. Buzzer output signal via a meledy IC is used in loud-speak mode. About input, voiceband normal input is used to microphone and the auxiliary input is design for earpiece microphone.

### 5.3.1. Voiceband Baseband Codec

Chipset ADI AD6521

Package 64-Ball LFBGA

Feature

- Complete Analog/Digital Interface for Voiceband Input/Output-Signals; Baseband Input/Output-Signals; Auxiliary/Control-Signals
- Baseband Codec
  - Supports Multi-slot Operation
  - Differential I and Q Inputs/Outputs
  - On-Chip GMSK Modulator for GSM
  - Two 10-Bit D/A Converters
  - 10-Bit RAMP D/A Converter
  - On-Chip RAMP-RAM
  - Two High Resolution A/D Converters
  - On-Chip FIR-Filter
- Voiceband Codec
  - Complete Linear Coded Codec
  - Two Channel 16-Bit A/D Converter with Filter
  - Complete Microphone Interface
  - Two Channel 16-Bit D/A Converter with Filter
  - Complete Speaker Drive Capability
  - Programmable Gain on Input and Output
  - Multi-Standard Sample Rate Conversion
- Auxiliary Section
  - 13-Bit AFC D/A Converter
  - 10-Bit Current DAC
  - Six Channel 10-Bit A/D-Converter

- Individual Power Management Features
- Baseband, Voiceband and Auxiliary Serial Ports
- JTAG Interface
- Optimized Low-Power Converter Design
- Low 1.6V Digital Supply Operation
- Variable Digital Interface Supply
- Low 2.4V Analog Supply Operation

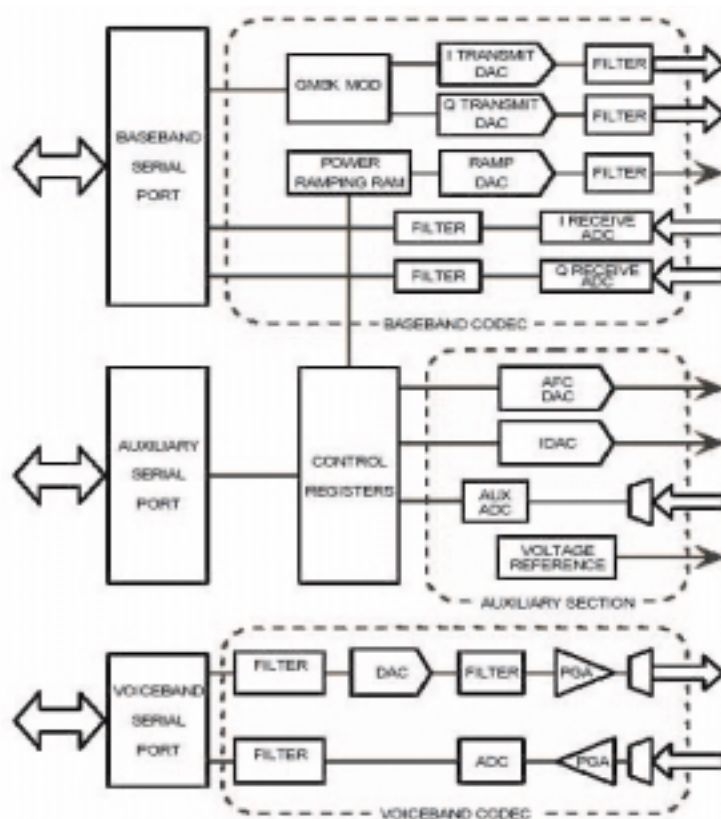


Figure 5.10. AD6521 Functional Block Diagram

### 5.3.2. Microphone

The microphone is a noise canceling type to provide improved speech pick-up, noise immunity and reduced echo. The GSM standard requires that when in handheld mode, the transmitter audio frequency response must fit within the mask shown below:

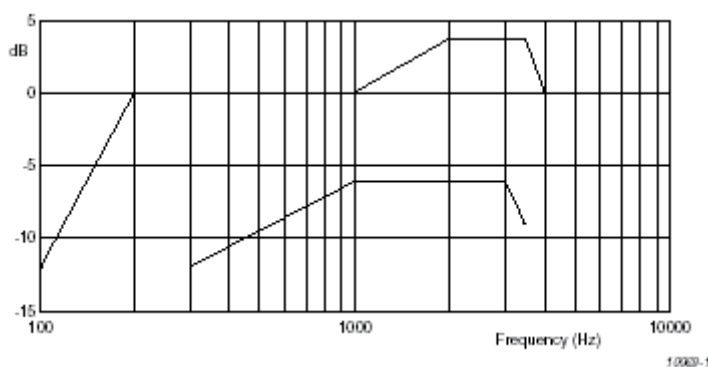
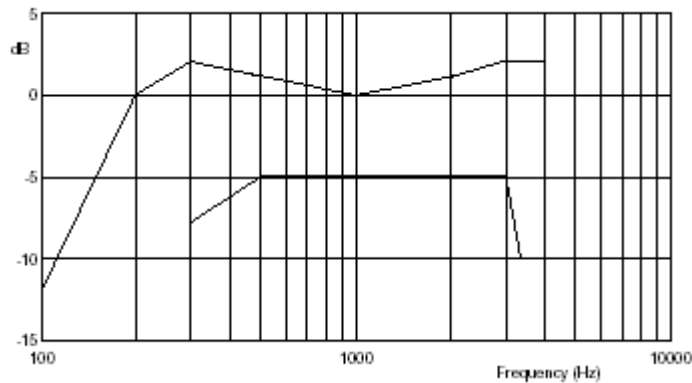


Figure 5.11. Handheld GSM Transmit Audio Frequency Response Mask

### 5.3.3. Receiver

The GSM Standard requires that the receiver audio frequency response must fit within the mask shown below.



**Figure 5.12. Handheld GSM Receive Audio Frequency Response**

The phone is designed to meet requirements with a Type 1 artificial ear.

Volume Level	PGA	Volume	Total Gain
1	+1 db	0 db	+3 db
2	-2 db	0 db	-0 db
3	-5 db	0 db	-3 db
4	-5 db	-6 db	-9 db

### 5.3.4. Loud Speaker

A second speaker is mounted in the rear case for DTHF operation.

Ring tones and melodies are played via the loud speaker. The volume level of ring tones is defined by the 6-bit PWM register setting in AD6521, and melody tone volume defined by the MASOUND\_DEVICECONTROL register setting in the YMU762.

Timer 1 in AD6521 is used to time the period between switching the ringing on and off to make the tone. For complex ringing tones, the buzzer volume can be altered after each time-out of Timer 1.

## 5.4. Timers

There is a watchdog timer and three 16 bit general-purpose timers which can be used either as auto reload or one-shot timers to provide interrupts to the ARM CPU. A pre-scaler and 16-bit register defines the timer clock duration. The watchdog timer receives a 217 Hz clock signal from clock module. The time-out is fixed at 1024 clock ticks, which gives a time-out of approximately 4.72s. The general-purpose timers can receive different clock sources. The clock sources can be System clock, MicroSM Clock, MicroSM timetick, 32KHz oscillator.

\$8014:0000 Watchdog_R	Watchdog register,	0 bit	Write only, reserved
\$8014:0002 Watchdog_CR	Watchdog control register	1 bit	Read/Write
\$8014:0004 Watchdog_INT	Watchdog interrupt register	1 bit	Read/Write
\$8020:0080 TimerStatus		6 bits	Read/Write
\$8020:0082 Reserved		0 bit	Read/Write
\$8020:0084 EndCountA		16 bits	Read/Write
\$8020:0086 TimerAControl		12 bits	Read/Write
\$8020:0088 EndCountB		16 bits	Read/Write
\$8020:008A TimerBControl		12 bits	Read/Write
\$8020:008C EndCountC		16 bits	Read/Write
\$8020:008E TimerCControl		12 bits	Read/Wr

# 5.5. Power Management Subsystem

In base-band power management, ADI ADP3522 is designed for all base-band main power supply. It provides six regulator outputs for V<sub>CORE</sub> (1.8V), V<sub>MEM</sub> (2.8V), V<sub>ANA</sub> (2.55V), V<sub>RTC</sub> (1.95V), V<sub>CTCXO</sub> (2.75V), SIMVCC (2.85V). V<sub>CORE</sub> and V<sub>MEM</sub> provide all digital power and V<sub>ANA</sub> provides all analog power. V<sub>RTC</sub> is used to charge Li-Mn coin cell for real time clock, and V<sub>CTCXO</sub> is the power source of 13MHz clock buffer. Besides, ADP3522 is also combined charge pump and hardware reset. The following is the detailed description:

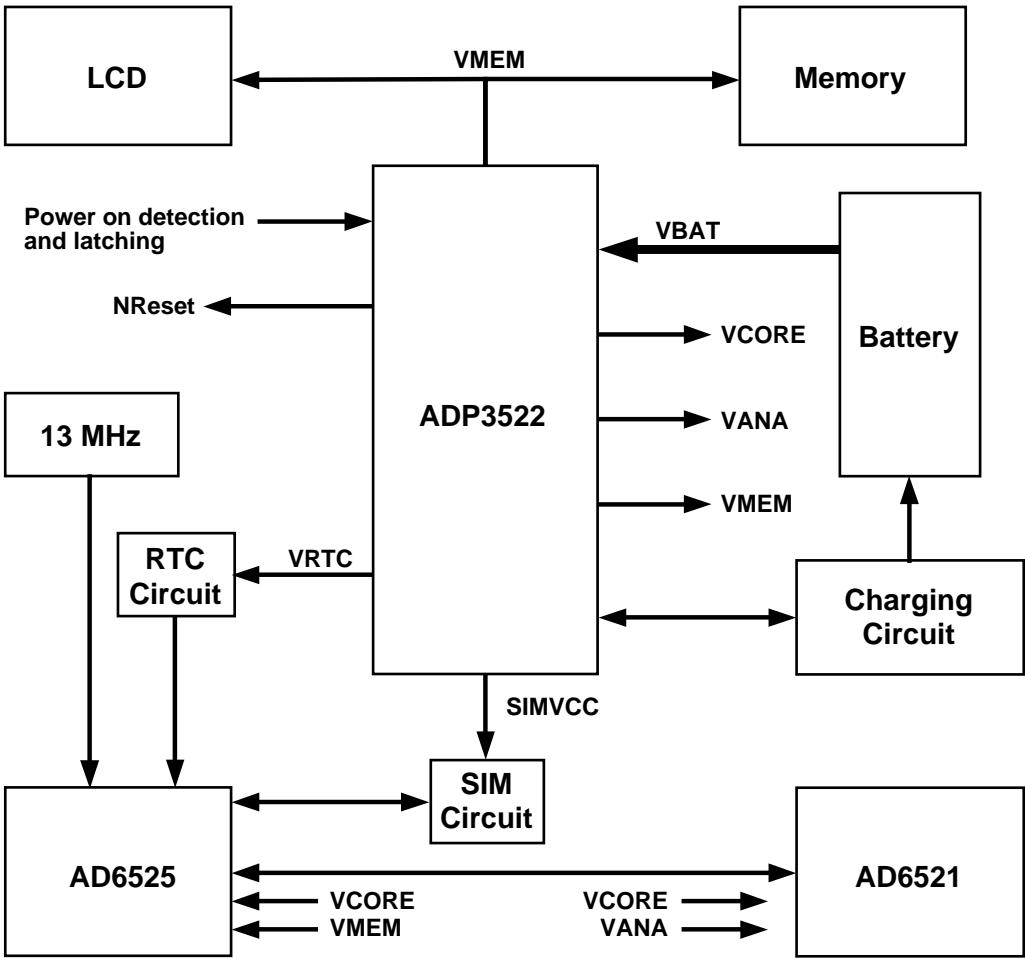


Figure 5.13. Power Management Subsystem Block Diagram

### 5.5.1. Power System Ship

Chipset ADI ADP3522  
Package 32-pin LFCSP5x5

#### FEATURES

- Handles all GSM Baseband Power Management
- Six LDOs Optimized for Specific GSM Subsystems
- Li-Ion Battery Charge Function
- Optimized for the AD20msp430 Baseband Chipset
- Reduced Package Size: 5x5 mm LFCSP-32

ADP3522 is specified over the temperature range of  $-20^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ .

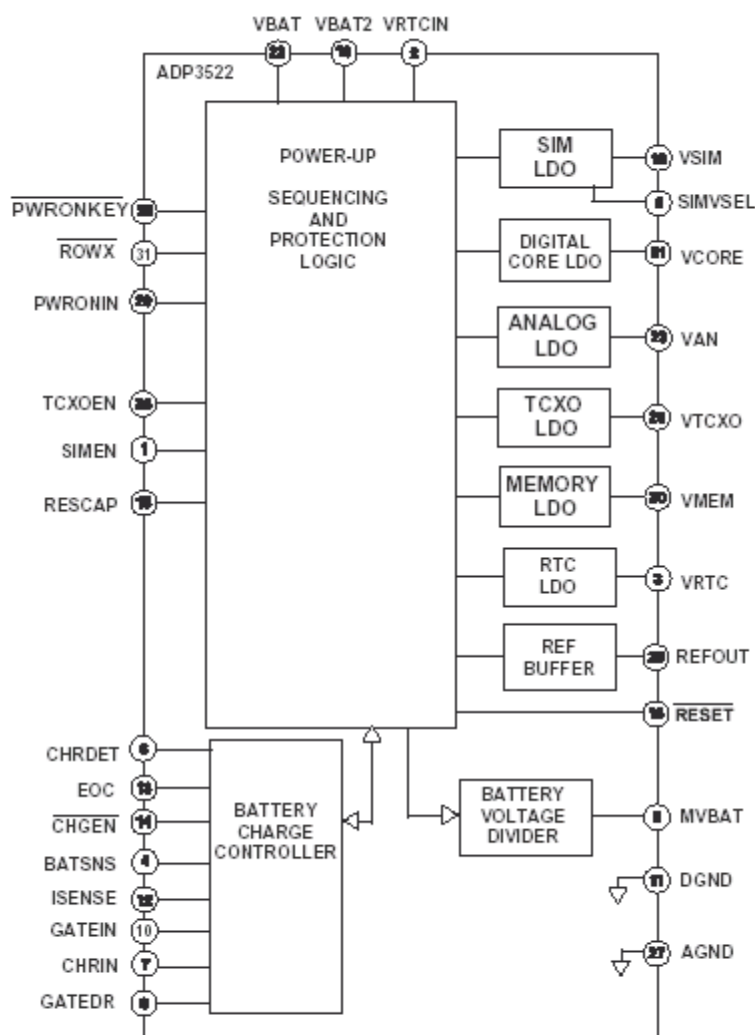


Figure 5.14. ADP3522 Functional Block Diagram

### 5.5.2. Power Source

The battery comprises a single Lithium-Ion (Li-Ion) cell with a nominal voltage of 3.7 V and 720-mAh capacity. This type of battery has an advantage in weight and size over Nickel Metal Hydride (NiMH) cells.

### 5.5.3. Power On / Off Control

The ADP3522 handles all issues regarding the powering ON and OFF of the handset. It is possible to turn on the ADP3522 in three different ways:

- Pulling the PWRONKEY Low
- Pulling PWRONIN high
- CHRIN exceeds CHRDET threshold

Pulling the PWRONKEY low is the normal way of turning on the handset. This will turn on all the LDOs on, except the SIM LDO, as long as the PWRONKEY is held low. When the VCORE LDO comes into regulation the RESET timer is started. After timing out, the RESET pin goes high, allowing the baseband processor to start up. With the baseband processor running, it can poll the ROWX pin of the ADP3522 to determine if the PWRONKEY has been depressed and pull PWRONIN high. Once the PWRONIN is taken high, the PWRONKEY can be released. Note that by monitoring the ROWX pin, the baseband processor can detect a second.

### 5.5.4. Voltage Regulation

Each power source is specified as follows.

#### Digital Core LDO (VCORE)

The digital core LDO supplies the baseband circuitry in the handset (baseband processor and baseband converter). The LDO has been optimized for very low quiescent current at light loads as this LDO is on whenever the handset is switched on.

#### Memory LDO (VMEM)

The memory LDO supplies the system memory as well as the subsystems of the baseband processor including memory IO, display, and melody interfaces. It is capable of delivering up to 150 mA of current and is available for either 1.8 V or 3 V based systems. The LDO has also been optimized for low quiescent current and will power up at the same time as the core LDO.

#### Analog LDO (VAN)

This LDO has the same features as the core LDO. It has furthermore been optimized for good low frequency ripple rejection for use with the baseband converter sections in order to reject the ripple coming from the RF power amplifier.

VAN is rated to 180 mA, which is sufficient to supply the analog section of the baseband converter such as the AD6521, as well as the microphone and speaker.

#### TCXO LDO (VTCXO)

The TCXO LDO is intended as a supply for a temperature compensated crystal oscillator, which needs its own ultra-low noise supply. VTCXO is rated for 20 mA of output current and is turned on along with the analog LDO when TCXOEN is asserted.

#### RTC LDO (VRTC)

The RTC LDO is capable of charging rechargeable Lithium or capacitor-type backup coin cells to run the real-time clock module. The RTC LDO supplies current both for charging the coin cell and for the RTC module. In addition it features a very low quiescent current since this LDO is running all the time, even when the handset is switched off. It also has reverse current protection with low leakage, which is needed when the main battery is removed and the coin cell supplies the RTC module.

#### SIM LDO (VSIM)

The SIM LDO generates the voltage needed for 1.8 V or 3 V SIMs. It is rated for 20 mA of supply current and can be controlled completely independently of the other LDOs.

Applying a low to SIMEN shuts down the SIM LDO. A discharge circuit is active when SIMEN is low. This pulls the SIM LDO's output down when the LDO is disabled. SIMVSEL allows the SIM LDO to be programmed for either 1.8 V or 2.8V. Asserting a high on SIMVSEL sets the output for 2.8 V. SIMEN and SIMVSEL allow the baseband processor to properly sequence the SIM supply when determining which type of SIM module is present.

## 5.6. Battery Charging and Monitoring

### 5.6.1. Charging Current

The status of the LCD battery icon is determined by the value of ADC0 returned from AD6521, as indicated in the table:

	Battery Pack	
	Li-Ion	
3 bar	3.65 V <	< 3.95 V
2 bar	3.54 V <	< 3.65 V
1 bar	3.3 V <	< 3.54 V
Low Voltage Alarm		< 3.3 V

The phone will power down two minutes after generating a Low battery Alarm.

Battery charging is controlled by the CPU within the phone. If external power is detected and the temperature is within specified limits, the charger starts the rapid charge algorithm.

When the battery is fitted, the charging algorithm is determined by constant voltage and constant current control with time, temperature and voltage safeguards. A current limit no greater than the maximum charge current for any battery option must be provided by the external power source.

### 5.6.2. Deeply Discharged Batteries

In the case of deeply discharged batteries, there may not be enough power in the battery to initiate charging. In this case, the charging circuit automatically starts to trickle charge the battery until there is enough power to switch on the phone.

## 6. DISASSEMBLY / REASSEMBLY INSTRUCTIONS

### 6.1. General

This section provides disassembly and reassembly procedures for the main components of the telephone. These assemblies **MUST** be performed by qualified service personnel at an authorized service center. The following Warnings and Cautions **MUST** be observed during all disassembly / reassembly operations:

#### **WARNING**

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

#### **Caution**

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

#### 6.1.1. Call Bar

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

#### **Working Surfaces**

All working surfaces must have a dissipative bench mat, safe for use with live equipment, connected via 1M2 resistor (usually built into the lead) to a common ground point.

#### **Wrist Strap**

A QUICK RELEASE SKIN CONTACT DEVICE WITH A FLEXIBLE CORD, WHICH HAS AN INTEGRAL SAFETY RESISTOR OF BETWEEN 5K2 AND 1M2, SHALL BE USED.

#### **Containers**

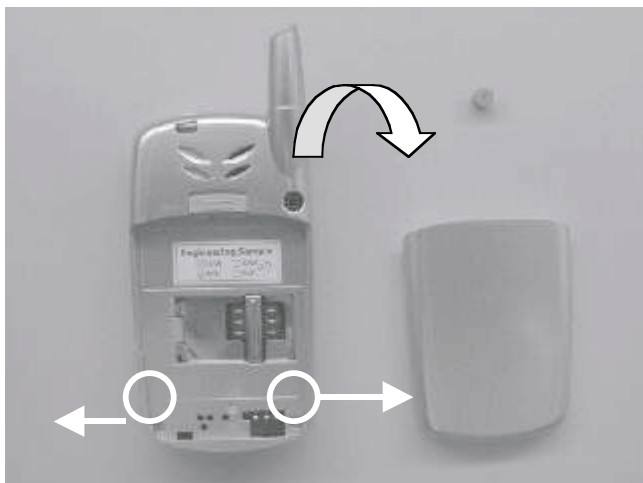
All containers and storage must be of the conductive type.

## 6.2. Disassembly

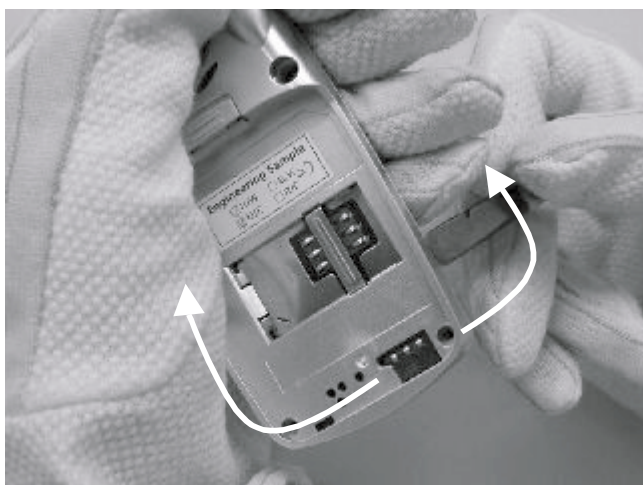
1. Take out the Antenna Knob by tweezers.



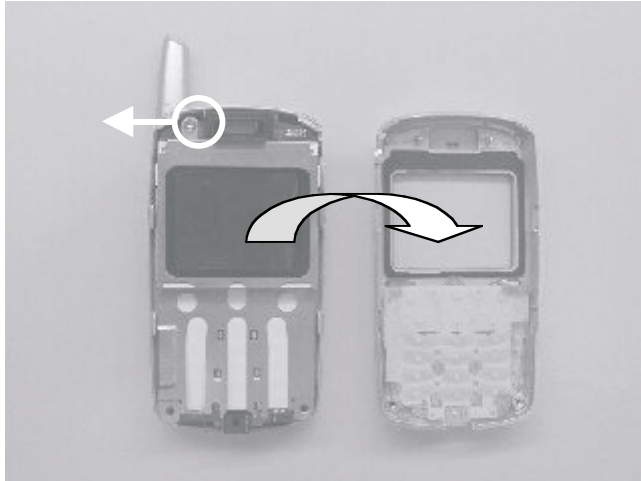
2. Push the Battery Knob up to remove the battery and unscrew 2 screws on the Base Case.



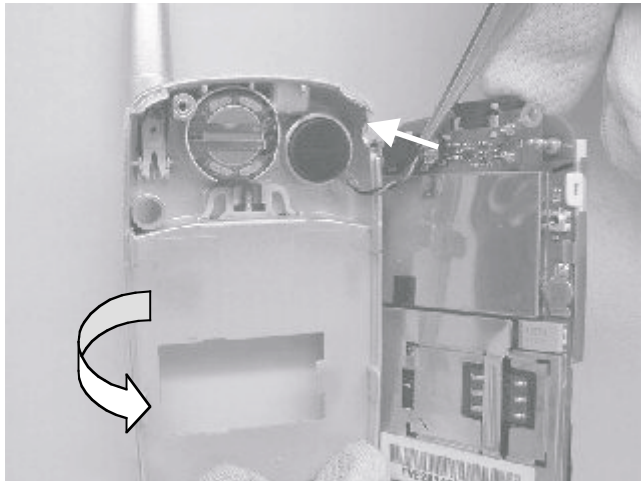
3. Carefully prise apart the Upper Case and Bottom Case, creating a gap around the DC Jack. Insert the separation tool into the gap created, and gently slide the tool in the direction as shown, ensuring that the moduled hocks separate all the way.



4. Take out the Upper Case and unscrew 1 screw located on PCB-A.



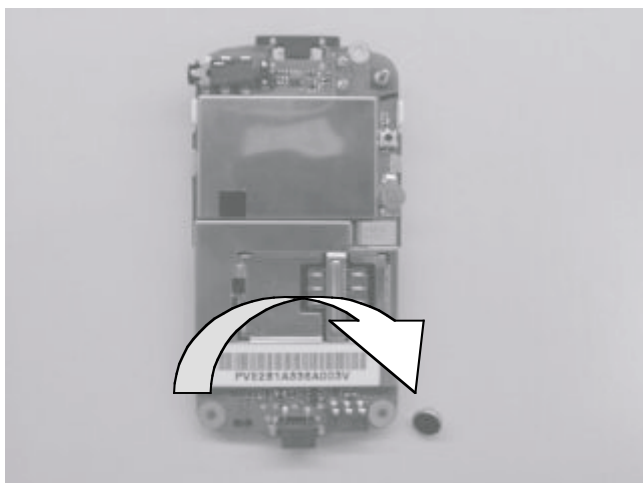
5. Carefully lift PCB-A from right side and pull out the Vibrator Cable to completely separate from the PCB- and the base Unit.



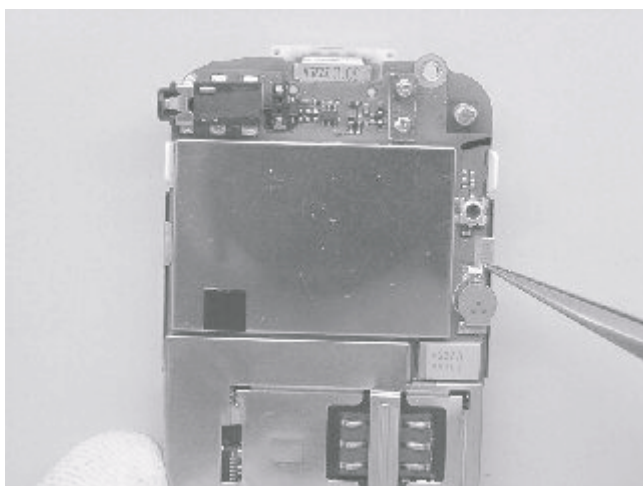
6. Take out the Receiver Rubber.



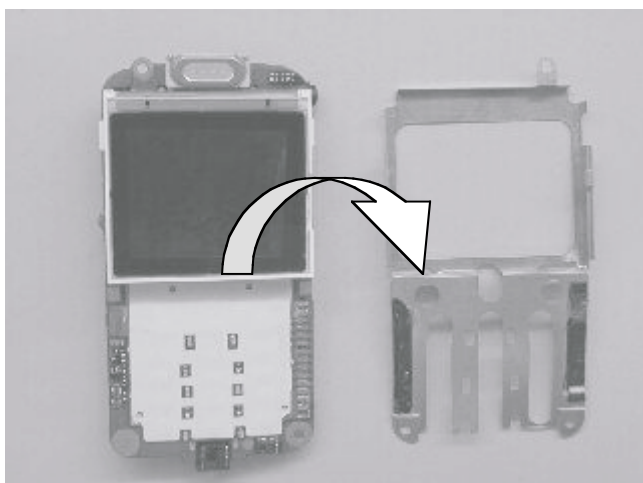
7. Remove the Microphone.



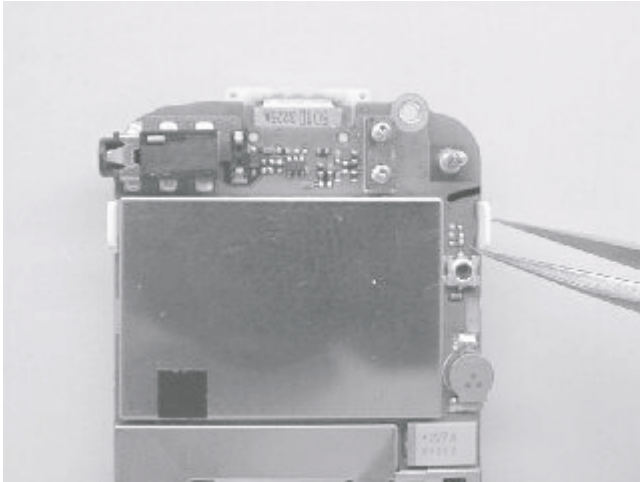
8. Unsolder the hook of Shield-Key (on top of the RTC) and detach from the PCB-A.



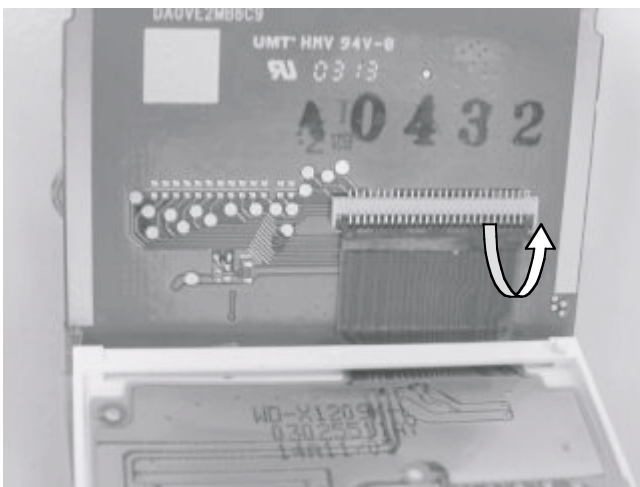
9. Gently separate the glue in both sides and remove the Shield-Key.



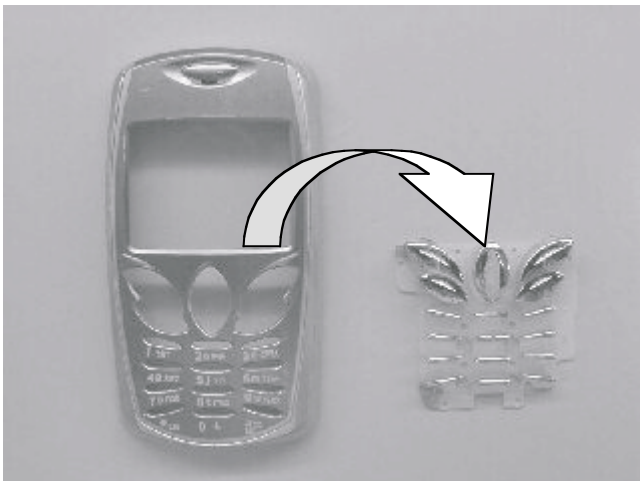
10. Gently prise two ears of the LCD Module to separate it from the PCB-A..



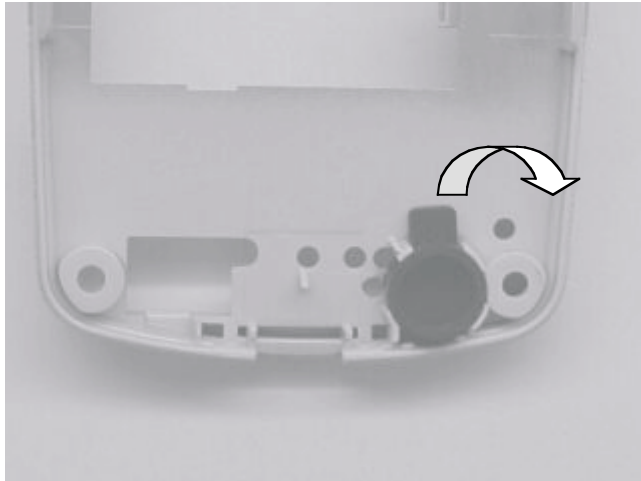
11. Carefully lift up the connector cover to vertical to take out the LCD Module.



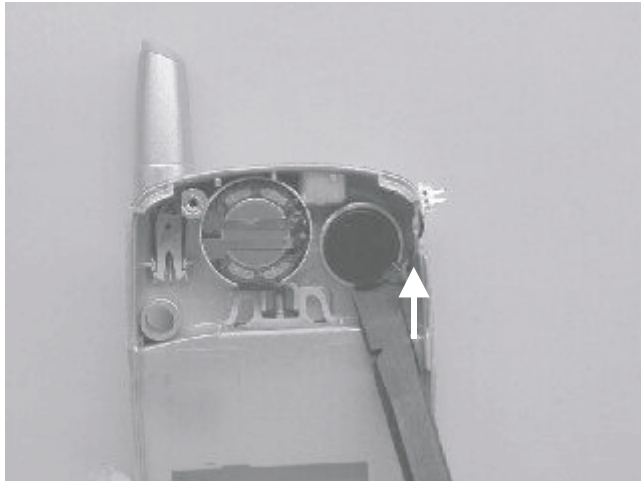
12. Remove the Key Set from the Upper Case.



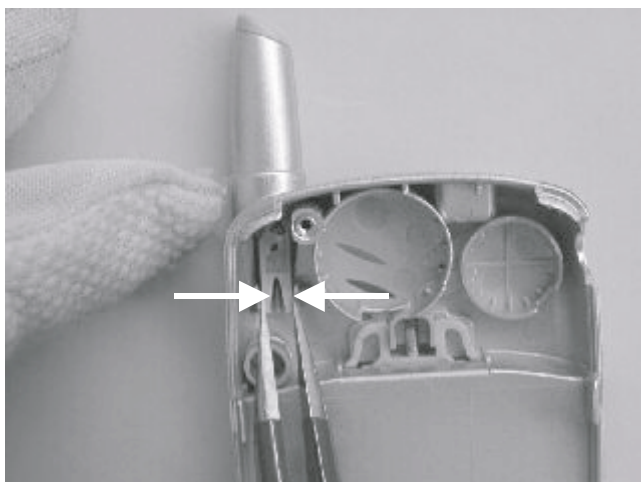
13. Remove the MIC Holder from the Base Case.



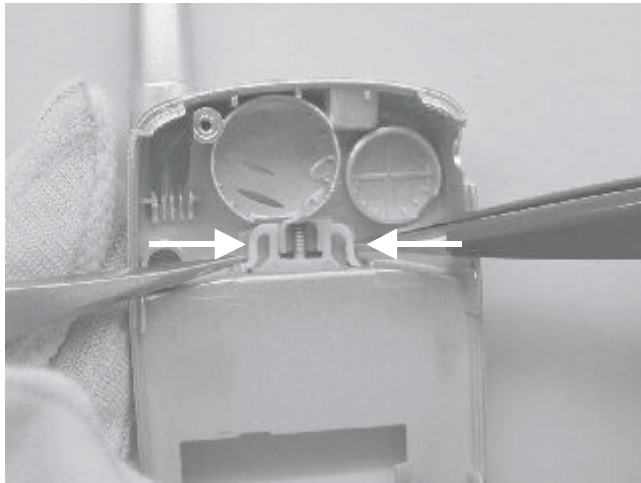
14. Lift the Vibrator and Speaker from the Base Case by inserting small blunt object underneath them.



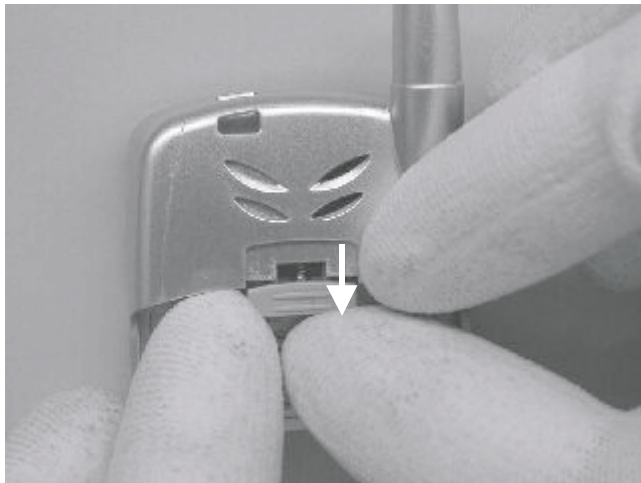
15. Narrow the hooks of the Antenna Ass'y, push upward and take it out.



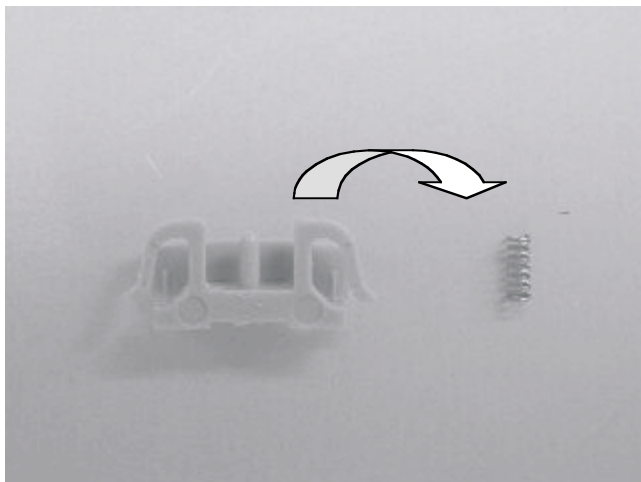
16. Carefully narrow the Battery Knob by pressing both hooks from internal side of the Base Case push the hooks downward to slide out.



17. Pull down the Battery Knob from outside to completely remove.

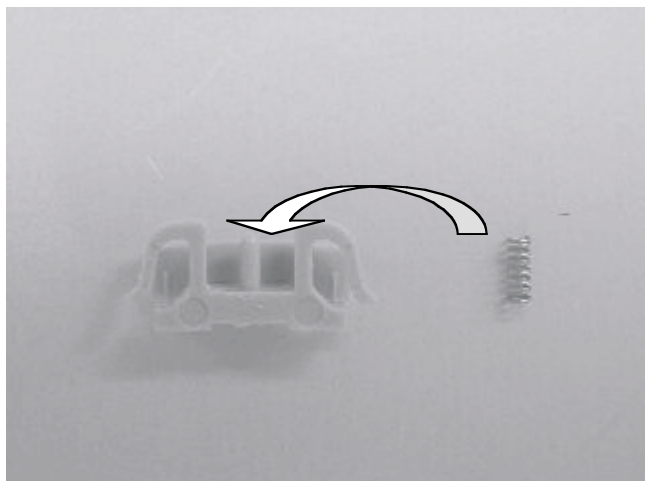


18. Take out the Battery Knob Spring.

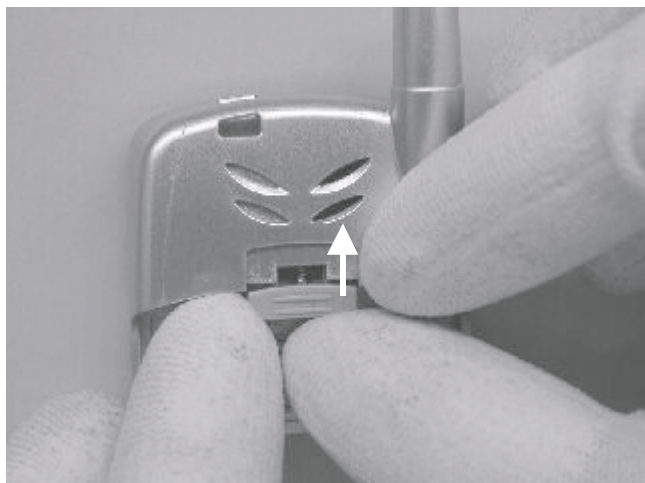


## 6.3. Reassembly

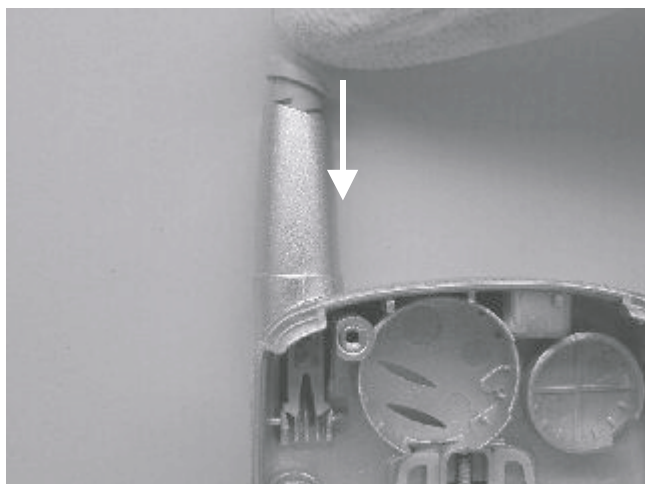
1. Put the Battery Knob Spring back.



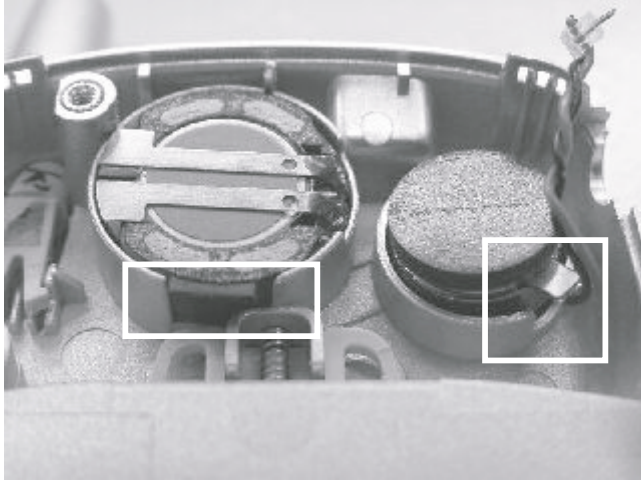
2. Locate the Battery Knob in the middle and push upward to the top and release. make sure the Knob keep normal flexibility.



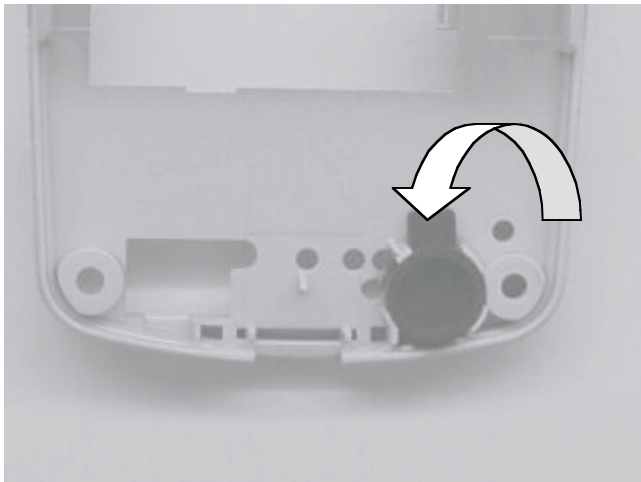
3. Push the Antenna Ass'y downward until the hooks are fixed probably.



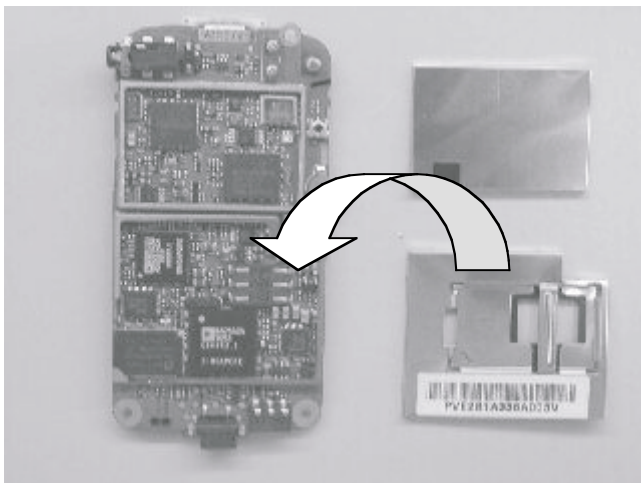
4. Utilize the bulge to put the Speaker and Vibrator back into the fillister.



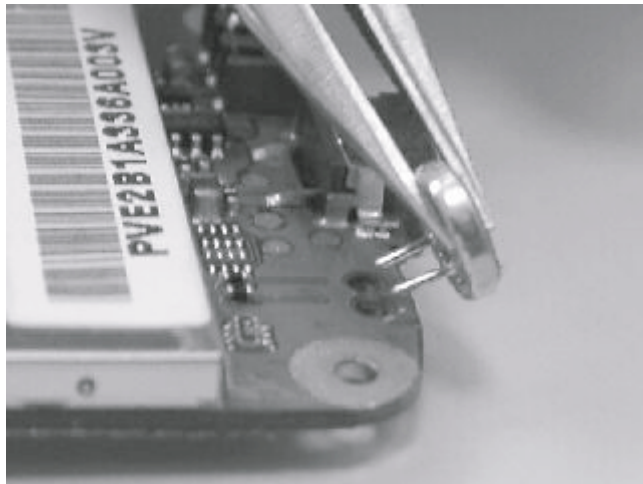
5. Fix the MIC Holder in the Base Case as shown.



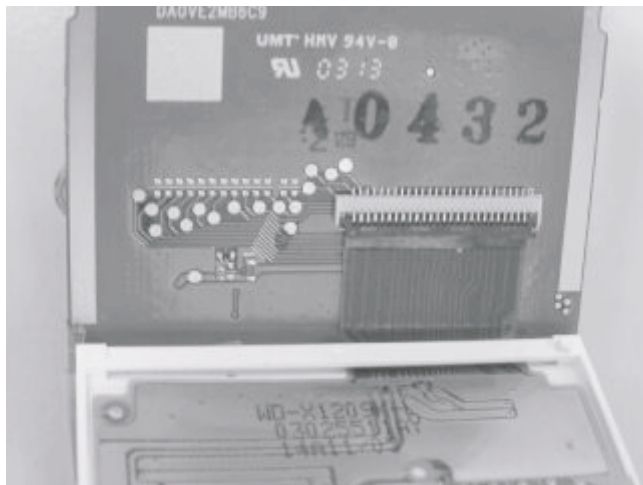
6. Put the Shield\_Top and Shield-SIM-Holder back. If the shields are out of shape, replace a new one.



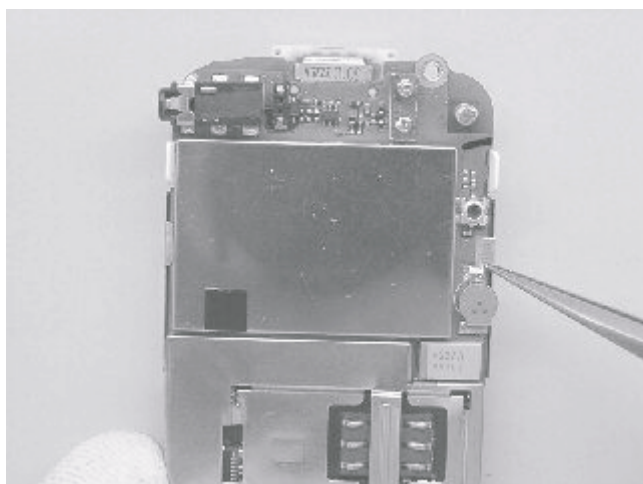
7. Insert the MIC into the PCB-A by aligning pins in down sides.



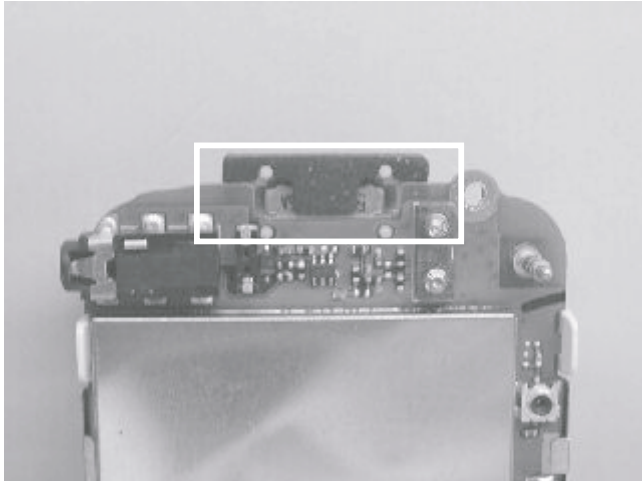
8. Carefully insert the LCD Cable, close the connector cover and attach the LCD Module.



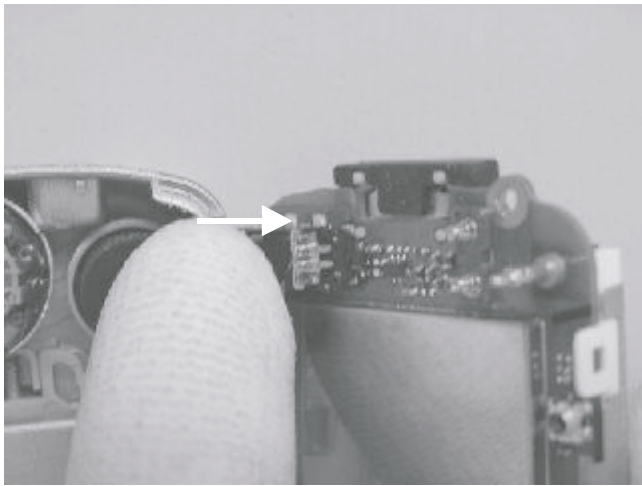
9. Cover Shield-Key and solder the hook (on top of the RTC) to ensure complete performance.



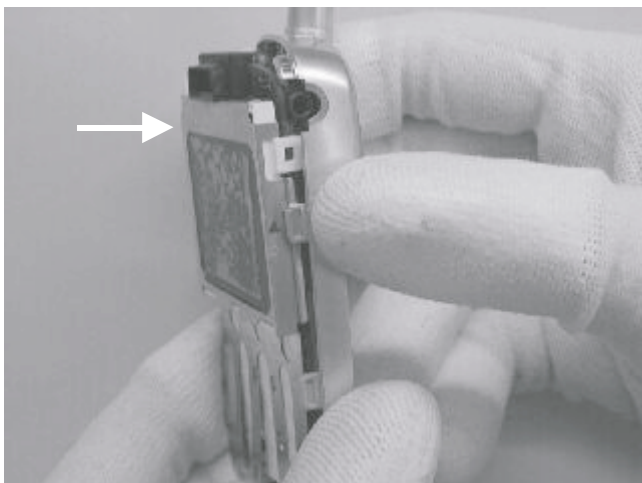
10. Cover the Receiver with the Receiver Rubber.



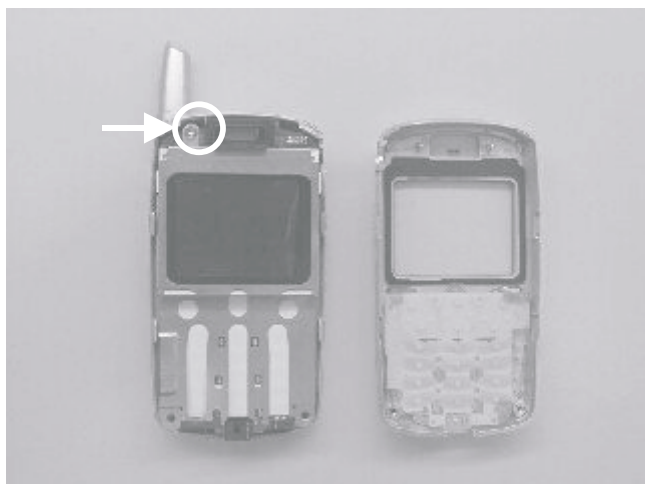
11. Insert the Vibrator Cable into connector and organize the Cable to avoid stuck.



12. Put the PCB-A into the Base Case from the Phone Jack side.  
Make sure the PCB-A located properly.



13. Tighten the screw on the PCB-A.



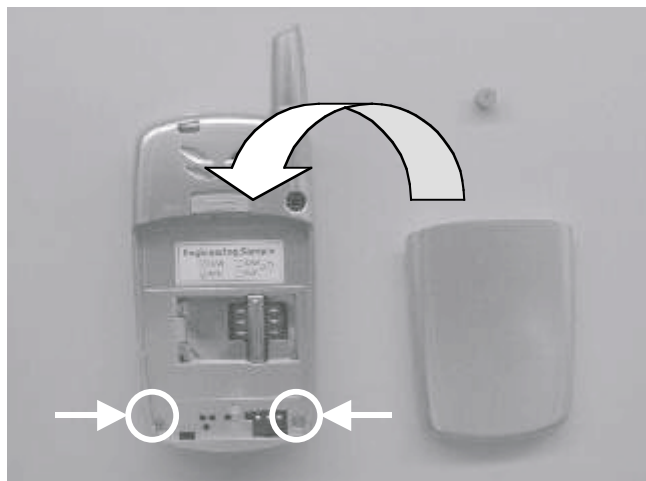
14. Assemble the Upper Case by combining from top.



15. Carefully press along both sides to make sure the casing fixed properly. Check the side caps are within specifications.



16. Tighten 2 screws on the Case and put the Antenna Rubber in the hole.



# 7. REPAIR PROCEDURES

## 7.1. Introduction

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

- Section 7.2. : Lead Free (PbF) solder: Identification and repair of PCBs using PbF solder.
- Section 7.3. : External testing: describes equipment requirements and general set up procedure.
- Section 7.4. : Complete Unit Test Setup: Describes how the items of test equipment are used together and general set up procedure.

Adjustment Procedure are described in Section 8.

## 7.2. Lead Free (PbF) solder

### CAUTION

The Printed Circuit Board (PCB) used in this telephone has been manufactured using Lead Free solder.  
(SPARKLE ECO SOLDE : Part No. ESC F3 M705 0.3)

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

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

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

## 7.3. External Testing

### 7.3.1. General Information

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

Prior to testing and adjustment, the unit should first be disassembled, as detailed in Section 6, and then the PCB connected to the PCB Repair Jig. Fault tracing can be performed on the PCB using suitable test equipment, such as spectrum analysers and oscilloscope.

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

#### Personal Computer (PC)

The PC (IBM compatible) is used as a Unit Under Test controller.

#### Power Supply

Provides 3.8 V DC supply to RF Adaptor and PCB Repair Jig.

### PCB Repair Jig (Part No. 3WZ001102AAA)

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



**Figure 7.1. : PCB Repair Jig**

A cable with SMA female connector is provided to make the RF connection. An SMA to N-Type male adaptor will be required to connect the Repair Jig to the service equipment. Cable losses for the RF connection are 0.5 dBm (GSM 900) and 0.8 dBm (GSM 1800).

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

### **DL Cable (Part No. DD0VE2TH004)**

DL Cable is used for software download and TX Power/RX RSSI calibration with dummy battery.



**Figure 7.3. : DL Cable**

### **RF Cable (Part No. 3WZ001103AAA)**

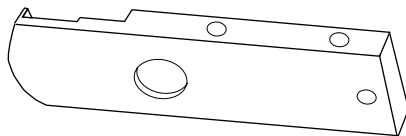
The RF cable provides the necessary connections between the PCB Repair Jig/RF Adapter and external test equipment.



**Figure 7.4. : RF Cable**

### **Case Separation Tool (Part No. JT00059)**

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



**Figure 7.5. : Case Separation Tool**

### **Dummy Battery (Part No. 3WZ001104AAA)**

Dummy battery is used for software download and Battery calibration.



**Figure 7.6. : Dummy Battery**

### **GSM Tester**

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

### **Calibration Software**

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

### **T5 Screwdriver**

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

## 7.4. Test Equipment Setup

### 7.4.1. Equipment Required

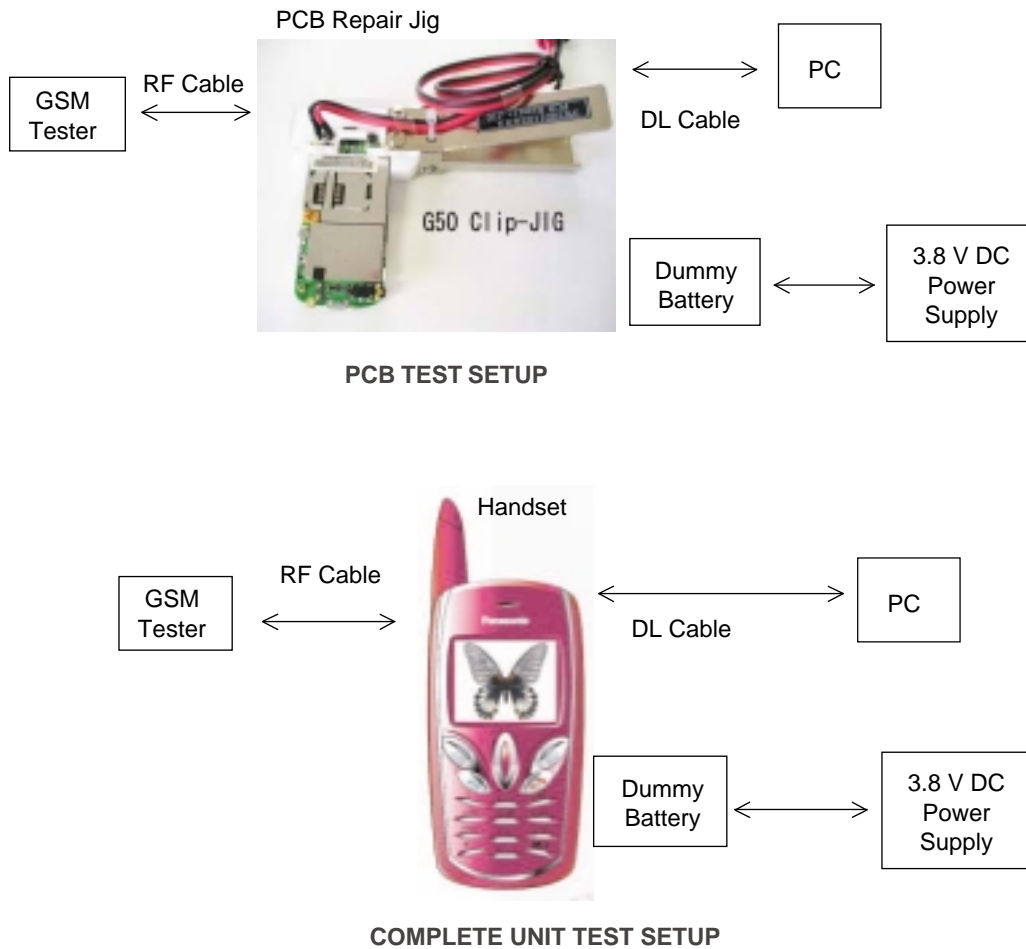


Figure 7.7. : Test Connection Diagram

### IMPORTANT NOTE

To allow accurate measurement of the complete unit the test equipment must be connected as shown, For testing the handheld unit the following equipment is required:

1. PCB Repair Jig
2. DL Cable
3. RF Cable
4. 12 V power supply
5. Personal computer with RS232 interface and running Microsoft Windows® 95, 98, NT, XP or 2000
6. GSM test station
7. G50 Service software

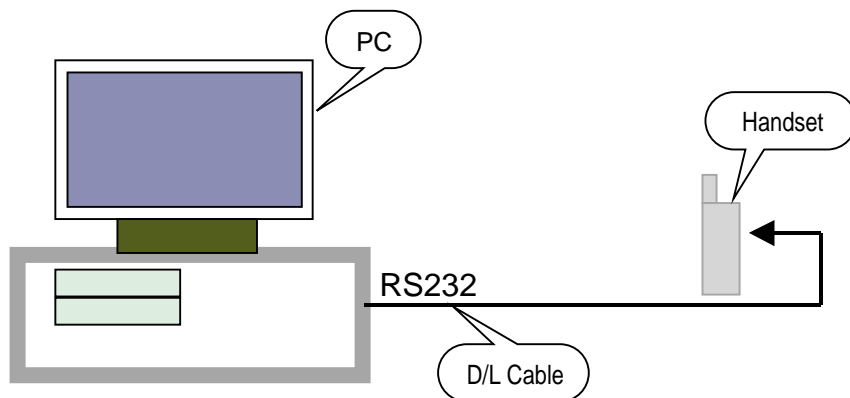
The G50 Service software should be installed onto the main drive of the personal computer. The RF cable is connected to the GSM test station via suitable adaptor. The 3.8 V supply is connected to the RF Adaptor and PCB Repair Jig.

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

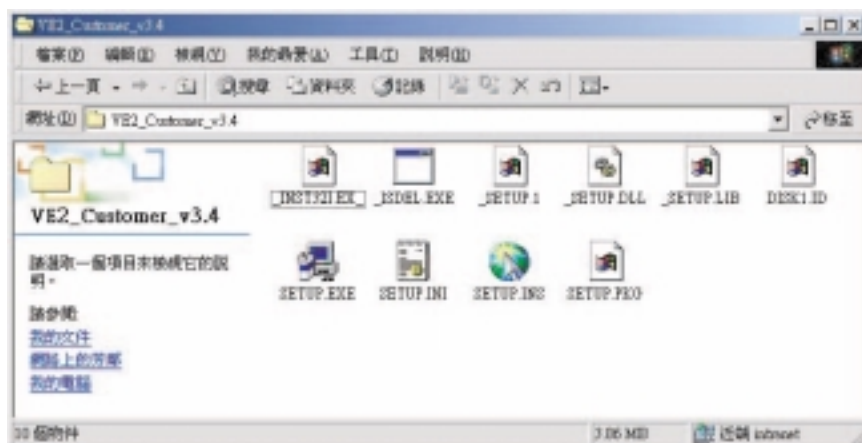
## 8. SOFTWARE DOWNLOAD & ADJUSTMENT PROCEDURE

### 8.1. Service Software Upgrade

Equipment setting for single downloading:

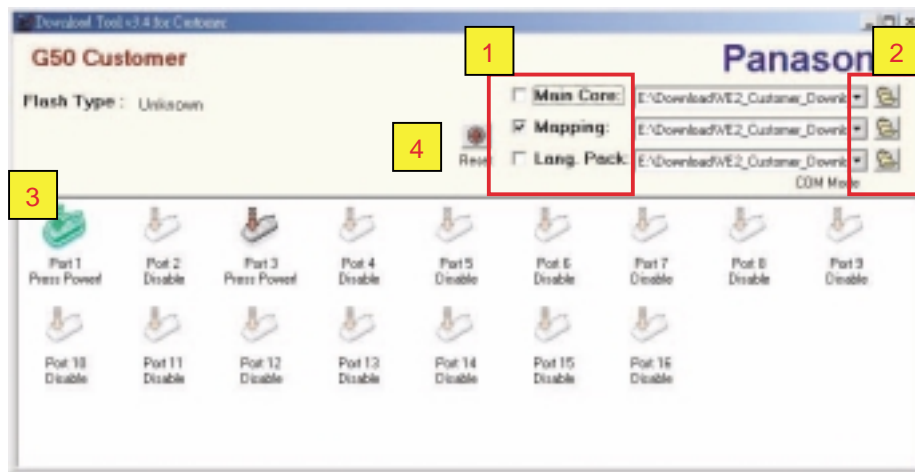


1. Install the download tool on PC.



2. Keep the handset off. make sure the correct target file (\*.mbf) is ready.  
(Please make sure the capacity of battery is enough during downloading.)

3. Execute main program  
(In the first time or target file is removed, it will show "File not found".)



The program will detect how many ports are available on PC.

- 3-1 Select download function.
- 3-2 Click the wheel icon and select the target file.
- 3-3 Long press on the power key and follow the indication on screen.  
The progress status will be shown on screen.
- 3-4 If any fail happens, click that single failed handset icon and press "Reset".

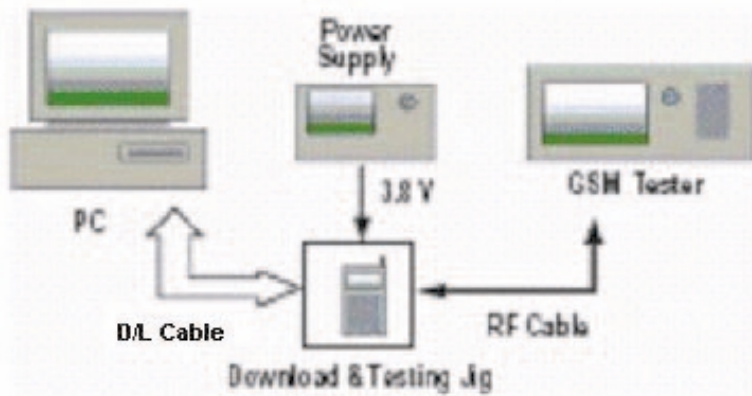
## 8.2. MMI Test

In EB-G50, the repair technicians can dial \*#369# on handset under normal operating condition to check or adjust the below functions. Please notice the items 4,5,7 are for production and for special purpose, don't change the default value arbitrarily or may cause mobile malfunction.

1. Contrast: Up& Down to adjust; Select & Back to exit.
2. Baseband test: Up & Down to chose item; Select to enter.
  - Back Light: test if the backlight shows; OK to exit.
  - Buzzer: test if the ring tone gives sound, OK to exit.
  - Vibrator: test if the vibrator works, OK to exit.
  - Keypads: press each key to eliminate the indicators on screen; long press OK to exit.
  - RTC status: show if the RTC OK; OK to exit.
  - Mic. Speaker Test: blow to microphone and listen the sound from receiver; OK to exit.
3. Software Version: Check the current software version
  - Software Version
  - Mapping Version
  - LP Version
4. Auto-answer: Valid setup when insert test SIM
5. DTMF-On: Determine if DTMF function valid during calling.
6. LCD Test:
  - Black: click any key to exit.
  - White: click any key to exit.
  - RGB: click any key to exit.
7. Comport:
  - AT-DATA: set phone jack for special D/L port, ex: IMEI burning.
  - GENIE
  - Off: set phone jack for normal earphone usage.

## 8.3. ADJUSTMENT PROCEDURE

### 8.3.1. Equipment Setting for TX/RX adjustment



1. Connect all equipments as above.
2. Please set the cable loss within the GSM tester before proceeding to any tests. It's recommended that each band (GSM 900 /DCS 1800/PCS 1900) tested separately.
3. Power on the handset before executing the main program.
4. Change the handset comport setting: \*#369#->Com port->GENIE

**Notice:**

1. Please make sure the RF probe contacts properly during the test process.
2. Remember to set the handset comport setting back to "Off" after adjustment, or it will cause malfunction to earphone.

### 8.3.2. Main Subjects

<A> TX Power

- TX Power Scaling Factors
- TX Freq Compensation

<B> RX RSSI (Received Signal Strength Indication)

- Accurate Gain Control
- RX Freq Compensation

<C> Battery Calibration

Band	TX/Fu(n)	RX/FI(n)	ARFCN
E-GSM900	$Fu(n)=890+0.2*n$ $Fu(n)=890+0.2(n-1024)$	$FI(n)=Fu(n)+45$	0 n 124 975 n 1023, Middle: 37
DCS1800	$Fu(n)=1710.2+0.2(n-512)$	$FI(n)=Fu(n)+95$	512 n 885, Middle: 698
PCS1900	$Fu(n)=1850.2+0.2(n-512)$	$FI(n)=Fu(n)+80$	512 n 810, Middle: 661

ARFCN: Absolute Radio Frequency Channel Numbers

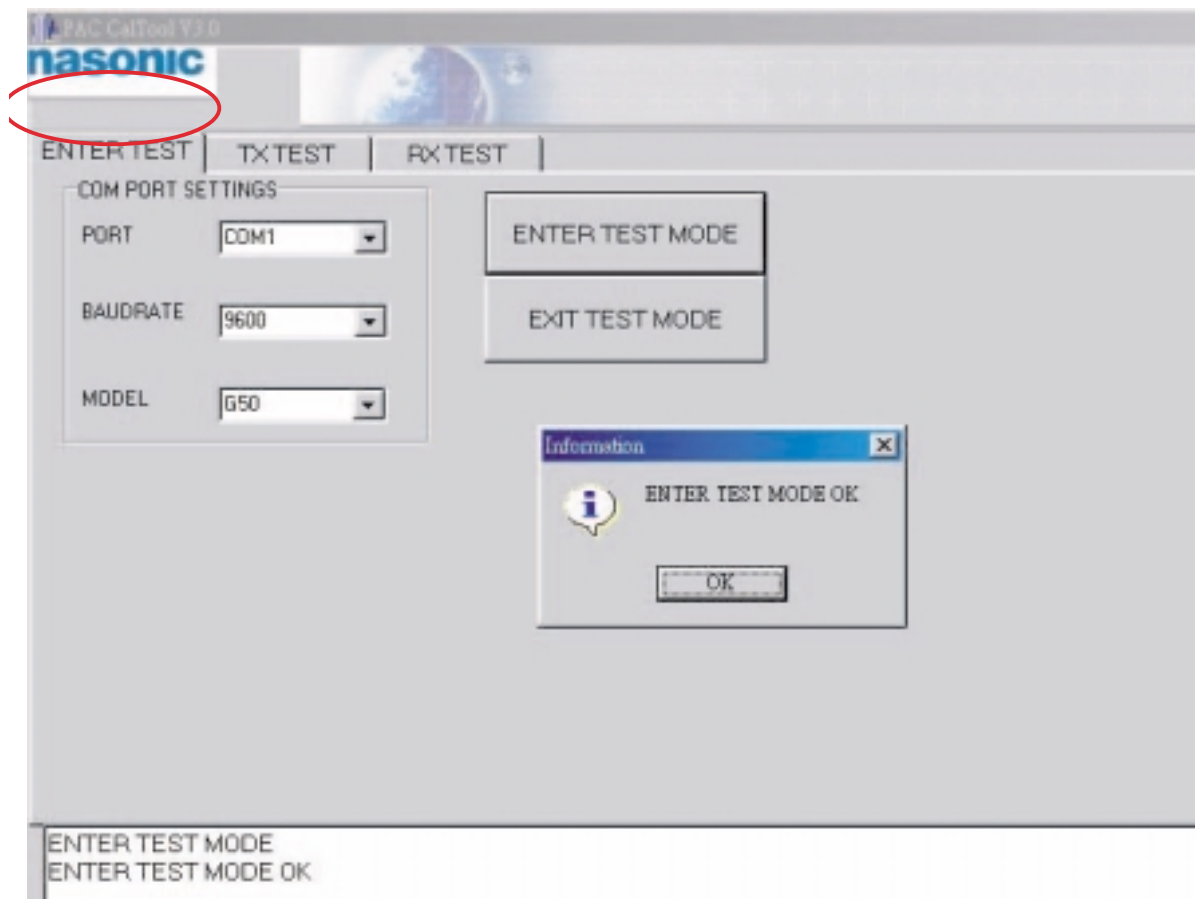
### 8.3.3. Test Operation Procedure



Execute the main program "PAC CalTool V3.0.exe"

#### ■ Enter Test

1. Select the related "PORT", "MODEL".
2. Click [ENTER TEST MODE].
3. If successful, the information dialog will pop up within 3 sec and click [OK].



## ■ TX Test

### Power Control Level

GSM 900			
Power Control Level	Transmitter Output Power	Tolerances	
	dbm	Normal	Extreme
0-2	39	± 2	± 2.5
3	37	± 3	± 4
4	35	± 3	± 4
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
19-31	5	± 5	± 6

DCS 1800			
Power Control Level	Transmitter Output Power	Tolerances	
	dbm	Normal	Extreme
29	36	± 2	± 2.5
30	34	± 3	± 4
31	32	± 3	± 4
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
15-28	0	± 5	± 6

PCS 1900			
Power Control Level	Transmitter Output Power	Tolerances	
	dbm	Normal	Extreme
22-29	Reserved	Reserved	Reserved
30	33	± 2	± 2.5
31	32	± 2	± 2.5
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
16-21	Reserved	Reserved	Reserved

There are two parts in this test item.

### (1) TX POWER SCALING FACTOR

1. Click [Read] to read the values inside the handset as reference.
2. Select "BANDMODE", EGSM\_DCS for 900/1800, EGSM\_PCS for 1900
3. Enter the ARFCN of each middle band-> click [APPLY] (ex: EGSM-37) and set tester in the same channel.
4. Enter the estimate value in SCALING FACTOR -> click [APPLY] and read the TX output power value on the tester. Repeat until the TX power is within the allowed range.
5. Repeat step 2-4 for the other bands which are optional.
6. Click [WRITE] when the chosen bands are all tested to adjust the handset.

**Panasonic Calibration Tool**

**TX TEST**

BANDMODE: ☒ EGSM\_DCS ☐ EGSM\_PCS

ARFCN (1~112, 512~885):  APPLY

SCALING FACTOR (0~65535):  30000 APPLY

Buttons: READ WRITE CLEAR

GSM															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
49740	49740	49740	49740	49740	54000	45860	38329	32225	27363	23612	20469	18022	16017	14434	13176
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
12065	11248	10459	9646	9646	9646	9646	9646	9646	9646	9646	9646	9646	9646	9646	9646

DCS															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
40270	37068	31479	26963	23383	20000	18264	16318	14849	13506	12486	11637	10937	10364	9881	9478
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	40270	40270

PCS															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
45700	42256	35420	29977	25682	21000	19668	17468	15765	14319	13158	12171	11345	10676	10071	9607
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

READ SCALING FACTORS FROM NVRAM  
SCALING FACTOR READ OK

## (2) TX FREQ COMPENSATION

1. Select "BANDMODE", EGSM\_DCS for 900/1800, EGSM\_PCS for 1900
2. Enter the first ARFCN listed in CH column -> click [APPLY] and set tester in the same channel.
3. Enter the estimate value in SCALING FACTOR -> click [APPLY] and read the TX output power value on the tester. Repeat until the TX power is within the allowed range.
4. Enter the ideal scaling factor in the corresponding cell of SF column.
5. Repeat step 2-4 until ALL 9 channels are down.
6. Click [WRITE] to adjust the handset in the end.

**Panasonic CALIBRATION TOOL**

ENTER TEST TX TEST RX TEST

BANDMODE  
☒ EGSM\_DCS  
☐ EGSM\_PCS

ARFCN (1~124, 512~885)  
 975 APPLY

SCALING FACTOR (0~65535)  
 53000 APPLY

READ WRITE CLEAR

**TX FREQ COMPENSATION**  
 WRITE

**GSM**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
49740	49740	49740	49740	49740	55000	45860	38329	32225	27363	23612	20469	18022	16017	14434	13176	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
12085	11248	10459	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846	9846	

**DCS**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
40270	37068	31479	26953	23383	20000	18264	16318	14849	13506	12486	11637	10937	10364	9881	9478	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	9478	40270	40270	40270

**PCS**

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
45760	42256	35420	29977	25682	21000	19668	17468	15765	14319	13158	12171	11345	10676	10071	9607	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

**TX FREQ COMPENSATION**

	CH	SF	T>C
LOW	975	53000	
MID	37	55000	
HIGH	124	54000	

**TX FREQ COMPENSATION**

	CH	SF	T>C
LOW	512		
MID	698		
HIGH	885		

**TX FREQ COMPENSATION**

	CH	SF	T>C
LOW	512		
MID	661		
HIGH	810		

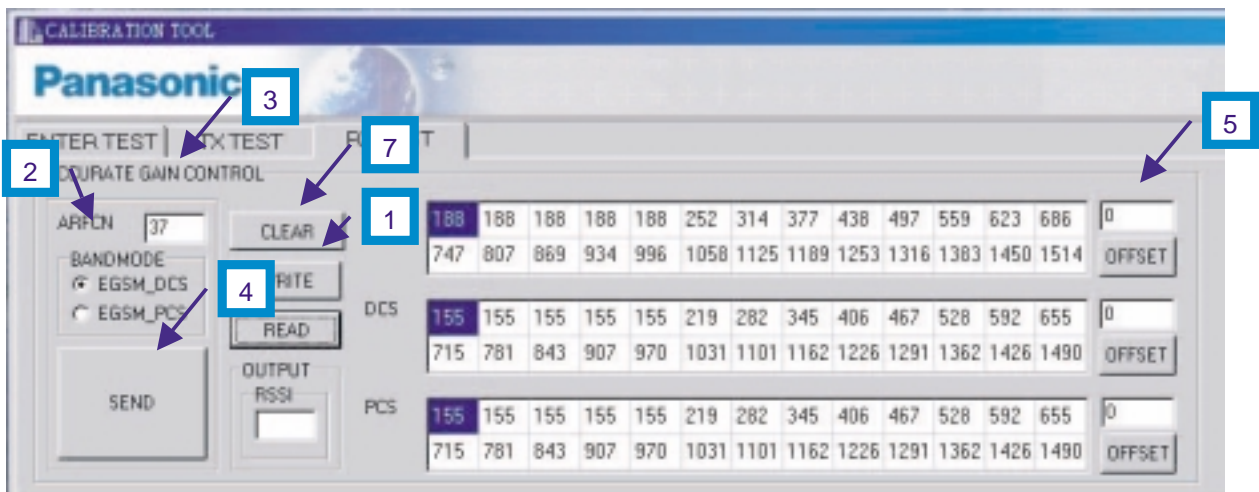
## ■ RX Test

There are two parts in this test item.

### (1) RX POWER SCALING FACTOR

Set tester as (a) Test Function: CW (b) RF Gen Power: -60dbm (c) MS TX Level: 5

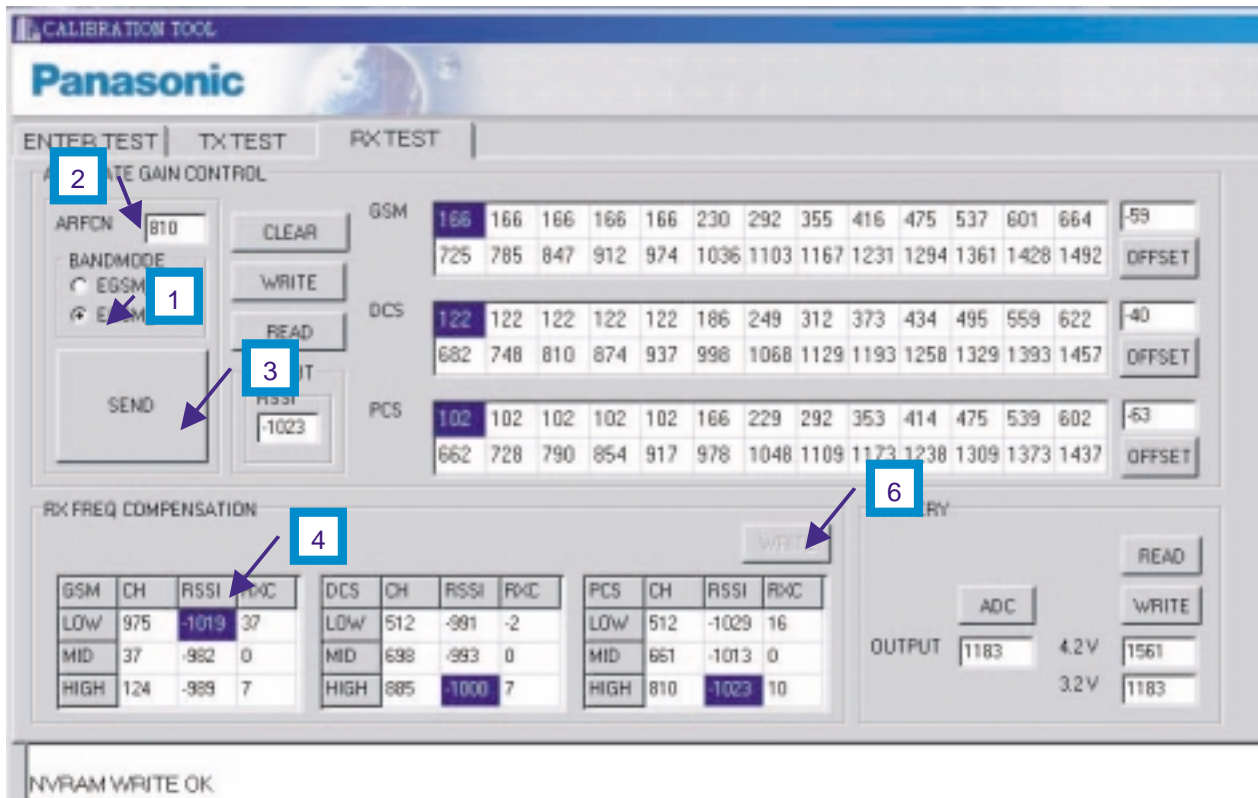
1. Click [Read] to read the values inside the handset as reference.
2. Select "BANDMODE", EGSM\_DCS for 900/1800, EGSM\_PCS for 1900.
3. Enter the ARFCN of each middle band and plus 0.0677 MHz to tester's RF Gen Frequency in the related.
4. Click [SEND], the RSSI and OFFSET will be counted automatically and shown on.
5. Click [OFFSET] related to the test band.
6. Repeat step 2-4 for the other bands which are optional.
7. Click [WRITE] when the chosen bands are all tested to adjust the handset.



## (2) RX FREQ COMPENSATION

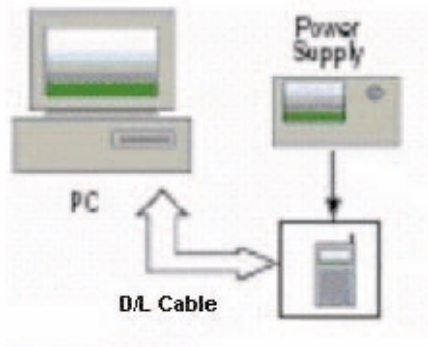
Set tester as (a) Test Function: CW (b) RF Gen Power: -60dbm (c) MS TX Level: 5

1. Select "BANDMODE", EGSM\_DCS for 900/1800, EGSM\_PCS for 1900
2. Enter the first ARFCN in the CH column and plus 0.0677MHz to tester's RF Gen Freq in the related.
3. Click [SEND],
4. Enter the shown RSSI value in the corresponding cell of RSSI column.
5. Repeat step 2-4 until ALL 9 channels are down.
6. Click [WRITE] to adjust the handset in the end.



### 8.3.4. Battery

Equipment setting for battery adjustment

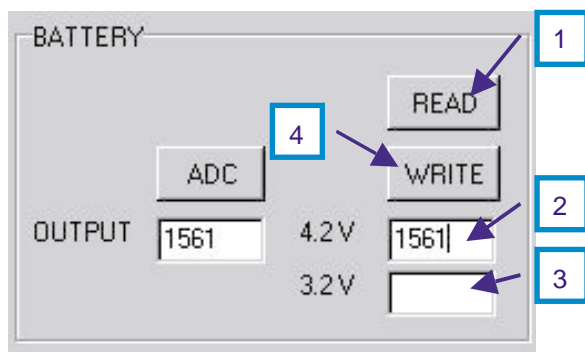


Notice:

1. Change the handset comport setting: \*#369#->Com port->GENIE before process.
2. Remember to set the handset comport setting back to ÅgOffÅh after adjustment, or it will cause malfunction to earphone.

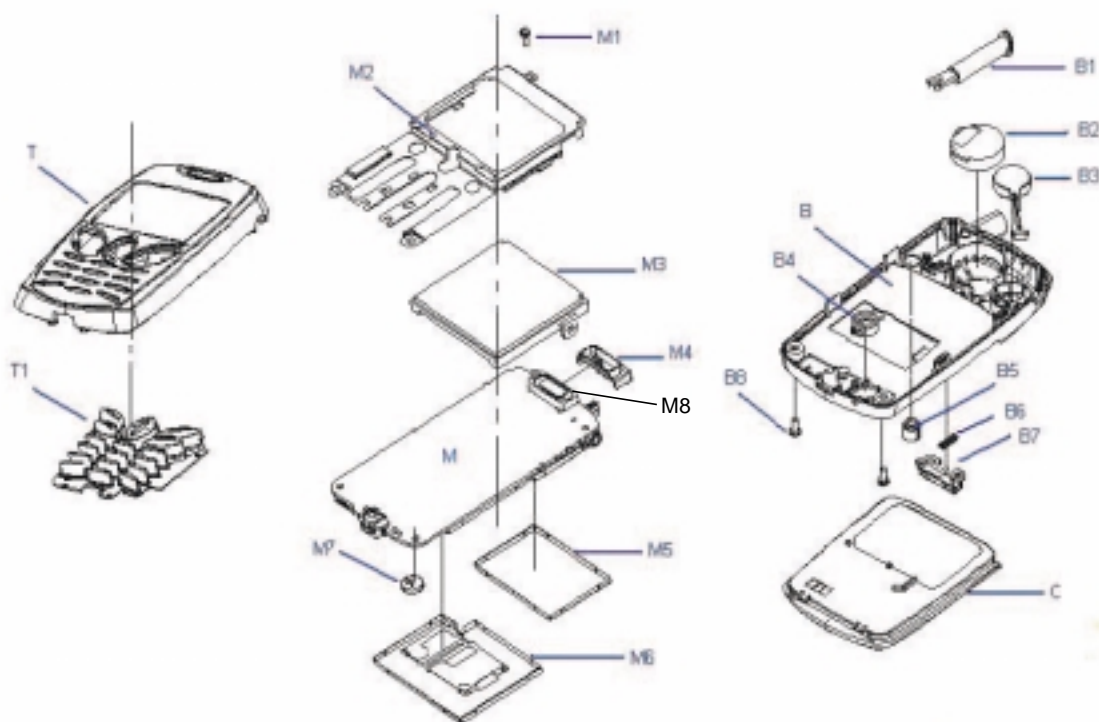
Operation Process

1. Click [Read] to read the values inside the handset as reference.
2. Set power supply to 4.2V DC and click [ADC] and enter the value shown into the 4.2 V cell.
3. Set power supply to 3.2V DC and click [ADC] and enter the value shown into the 3.2 V cell.
4. Click [WRITE] to adjust the handset.



## 9. REPLACEMENT PARTS LIST

### 9.1. Case and Cover Parts



Ref. No	Description	Sliver	Red	Blue
T	Upper Case + Panal (BPMF)	1MIZZZZPAG8	1MIZZZZPAH6	1MIZZZZPAI4
	Upper Case + Panel (Standard)	1MIZZZZPAJ1	1MIZZZZPAK9	1MIZZZZPAL7
	Upper Case + Panel (Stroke)	1MIZZZZPA19	1MIZZZZPA27	1MIZZZZPA35
	Upper Case + Panel (Thai)	1MIZZZZPAM5	1MIZZZZPAN3	1MIZZZZPAP1
T1	KEY JEWEL + P+R KEY SET	34VE2KBPA01	34VE2KBPA10	34VE2KBPA28
B	BASE CASE	EAVE2003011	EAVE2003020	EAVE2003038
B1	ANTENNA ASS'Y	DQ600233109	DQ60023105	DQ600253100
B5	CAR KIT RUBBER	GAVE2001019	GAVE2001027	GAVE2001035
B7	BATTERY KNOB	EBVE2001010	EBVE2001028	EBVE2001036
C	BATTERY ASS'Y (EU)	AHL03707211	AHL03707246	AHL03707220
	BATTERY ASS'Y (US)	AHL03707289	AHL03707271	AHL03707297
	BATTERY ASS'Y (CN)	AHL03707238	AHL03707262	AHL03707254

Ref. No	Description	Part NO	Ref. No	Description	Part NO
M	PCBA (INTL)	10MBZZZPA25	M7	MIC	DNWM63PR011
	PCBA (CN)	21VE2MB0009	M8	RECEIVER	DND501D2004
M1/B8	SCREW	MS16040IKQ8	B2	SPEAKER	DND5H486002
M2	SHIELD-KEY	FBVE2001010	B3	VIBRATOR	AY010312301
M3	LCD MODULE	AA001209001	B4	MIC HOLDER	GBVE22002016
M4	RECEIVER RUBBER	GBVE2001010	B6	BATT KNOB SPRING	FDE2001011
M5	SHIELD-TOP	FBCE2005019		KEY PAD ASS'Y	35VE2KAPA07
M6	SHIELD-SIM-HOLDER	FBVE1002012			

## 9.2. Main PCB Assembly

Cct Ref	Part No.	Part Name & Description	Grid
AN1161	DFHD01MS101	CONN SMD SPRING HD 1P 1R MS(P2.3,H7.3)	
B1221	CX1HB102001	EMI FILTER CHIP BLM11HB102SDPT	
B1222	CX1HB102001	EMI FILTER CHIP BLM11HB102SDPT	
B1241	CX1HB102001	EMI FILTER CHIP BLM11HB102SDPT	
BAT101	CC9700KTZ08	RTC	
C201	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C214	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C218	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C301	CH54701MA99	CERAMIC CAPACITOR 4.7uF 6.3V	
C304	CH54701MA99	CERAMIC CAPACITOR 4.7uF 6.3V	
C305	CH54701MA99	CERAMIC CAPACITOR 4.7uF 6.3V	
C306	CH54701MA99	CERAMIC CAPACITOR 4.7uF 6.3V	
C307	CH52202MA91	CERAMIC CAPACITOR 2.2uF 10V	
C308	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C309	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C310	CH52204ZE42	CERAMIC CAPACITOR 2.2uF 25V	
C312	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C317	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C318	CH06806JB01	CERAMIC CAPACITOR 68pF 50V	
C319	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C324	CH01806JB07	CERAMIC CAPACITOR 18pF 50V	
C325	CH03906JBD9	CERAMIC CAPACITOR 39pF 50V	
C404	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C405	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C515	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C516	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C517	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C518	CH12006KB17	CERAMIC CAPACITOR 200pF 50V	
C523	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C524	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C525	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C526	CH54701MA99	CERAMIC CAPACITOR 4.7uF 6.3V	
C528	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C601	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C602	CH61001ME96	CERAMIC CAPACITOR 10uF 6.3V	
C607	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C608	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C610	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C611	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C615	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C616	CH61002MA41	CERAMIC CAPACITOR 10uF 10V	
C623	CH11006JBD2	CERAMIC CAPACITOR 100pF 50V	
C624	CH11006JBD2	CERAMIC CAPACITOR 100pF 50V	
C626	CH61001ME96	CERAMIC CAPACITOR 10uF 6.3V	
C628	CH61002MA41	CERAMIC CAPACITOR 10uF 10V	
C629	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C630	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C735	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C736	CH52201M993	CERAMIC CAPACITOR 2.2uF 6.3V	
C737	CH61001ME96	CERAMIC CAPACITOR 10uF 6.3V	
C738	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C739	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C740	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C754	CH61002MA41	CERAMIC CAPACITOR 10uF 10V	
C1102	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1103	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C1107	CH11006JBD2	CERAMIC CAPACITOR 100pF 50V	
C1108	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C1112	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C1113	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	

Cct Ref	Part No.	Part Name & Description	Grid
C1116	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1141	CH03906JBD9	CERAMIC CAPACITOR 39pF 50V	
C1143	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1145	CH01206JBD8	CERAMIC CAPACITOR 12pF 50V	
C1154	CH01006JBD1	CERAMIC CAPACITOR 10pF 50V	
C1155	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1156	CH01206JBD8	CERAMIC CAPACITOR 12pF 50V	
C1171	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1172	CH01006JBD1	CERAMIC CAPACITOR 10pF 50V	
C1173	CH01006JBD1	CERAMIC CAPACITOR 10pF 50V	
C1174	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C1175	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C1176	CH51001K991	CERAMIC CAPACITOR 1uF 6.3V	
C1177	CH31003KB11	CERAMIC CAPACITOR 0.01uF 16V	
C1178	CH61001ZA31	CERAMIC CAPACITOR 10uF 6.3V	
C1180	CH01506JB06	CERAMIC CAPACITOR 15pF 50V	
C1181	CH06806JB01	CERAMIC CAPACITOR 68pF 50V	
C1182	CH11504JBD0	CERAMIC CAPACITOR 150pF 25V	
C1184	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1202	CH03906JBD9	CERAMIC CAPACITOR 39pF 50V	
C1203	CH22206KB16	CERAMIC CAPACITOR 2200pF 50V	
C1204	CH03906JBD9	CERAMIC CAPACITOR 39pF 50V	
C1205	CH11006JBD2	CERAMIC CAPACITOR 100pF 50V	
C1211	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C1214	CH14706KB18	CERAMIC CAPACITOR 470pF 50V	
C1215	CH14706KB18	CERAMIC CAPACITOR 470pF 50V	
C1221	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C1223	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C1225	CH21006JB10	CERAMIC CAPACITOR 1000pF 50V	
C1226	CH01006JBD1	CERAMIC CAPACITOR 10pF 50V	
C1227	CH16806KB17	CERAMIC CAPACITOR 680pF 50V	
C1228	CD28203JT09	MYLAR CAPACITOR 8200pF 16V	
C1229	CH12206JB00	CERAMIC CAPACITOR 220pF 50V	
C1242	CH61001ZA31	CERAMIC CAPACITOR 10uF 6.3V	
C1243	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C1245	CH02206JBD1	CERAMIC CAPACITOR 22pF 50V	
C1247	CH01006JBD1	CERAMIC CAPACITOR 10pF 50V	
C1248	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1249	CH33302KB12	CERAMIC CAPACITOR 33nF 50V	
C1250	CH-2706TB06	CERAMIC CAPACITOR 2.7pF 50V	
C1253	CH03306JBD7	CERAMIC CAPACITOR 33pF 50V	
C1254	CH01806JB07	CERAMIC CAPACITOR 18pF 50V	
C1262	CH01506JB06	CERAMIC CAPACITOR 15pF 50V	
C1265	CH01506JB06	CERAMIC CAPACITOR 15pF 50V	
C1267	CH01206JBD8	CERAMIC CAPACITOR 12pF 50V	
C1271	CH+5006TB07	CERAMIC CAPACITOR 0.5pF 50V	
C1272	CH+5006TB07	CERAMIC CAPACITOR 0.5pF 50V	
CON301	DFHD03MS240	BATTERY CONNECTOR	
CON302	DFHS04FS080	DC JACK	
D713	BC1SS355Z05	DIODE SMD 1SS355	
F302	DK100WFO013	FUSE SMD 1A 32V	
J401	DG006000114	SIM CONNECTOR	
J601	DFPJ06FR018	PHONE JACK	
J1161	DFRF06FS022	CAR KIT CONNECTOR	
M701	DFHS02FS081	VIBRATOR CONNECTOR	

Cct Ref	Part No.	Part Name & Description	Grid
L301	CV-2201KN16	INDUCTOR CHIP 2.2uH	
L1102	CVB4703TN04	INDUCTOR CHIP 4700pH	
L1142	CH+5006TB07	CERAMIC CAPACITOR 0.5pF 50V	
L1161	CVA1503JN00	INDUCTOR CHIP 0.015uH	
L1162	CVA1503JN00	INDUCTOR CHIP 0.015uH	
L1201	CV+1803JN00	IND CHIP 0.18uH	
L1211	CVA8201GN0	IND CHIP 0.082uH	
L1241	CVA2702JN04	INDUCTOR CHIP 0.027uH	
L1261	CVB8203JN00	INDUCTOR CHIP 8200pH	
LS501	FDDG1003011	SPEAKER SPRING	
R102	CS61003J903	FIXED RESISTOR 10M 1/10W	
R105	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R106	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R201	CJ410042N04	SPECIAL FIXED RESISTOR 100K 1/16W	
R206	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R207	CJ410042N04	SPECIAL FIXED RESISTOR 100K 1/16W	
R208	CS42002FB04	FIXED RESISTOR 200K 1/16W	
R209	CU410000Z07	THERMISTOR 100K	
R210	CS41002FB01	FIXED RESISTOR 100K 1/16W	
R211	CS42002FB04	FIXED RESISTOR 200K 1/16W	
R212	CU410000Z07	THERMISTOR 100K	
R213	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R301	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R302	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R303	CS+3004FA04	FIXED RESISTOR 0.3O 1/8W	
R307	CS51002JB05	FIXED RESISTOR 1M 1/16W	
R309	CS31002JB01	FIXED RESISTOR 10K 1/16W	
R310	CS31002JB01	FIXED RESISTOR 10K 1/16W	
R401	CJ000084N25	SPECIAL FIXED RESISTOR 0O 1/16W	
R403	CS31002JB01	FIXED RESISTOR 10K 1/16W	
R404	CS11502FB04	FIXED RESISTOR 150O 1/16W	
R405	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R508	CS32002JB04	FIXED RESISTOR 20K 1/16W	
R509	CS34702JB05	FIXED RESISTOR 47K 1/16W	
R514	CS31002JB01	FIXED RESISTOR 10K 1/16W	
R521	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R602	CS24702JB03	FIXED RESISTOR 4.7K 1/16W	
R609	CS51002JB05	FIXED RESISTOR 1M 1/16W	
R610	CS51002JB05	FIXED RESISTOR 1M 1/16W	
R611	CS00002JB03	FIXED RESISTOR 0O 1/16W	
R615	CS34702JB05	FIXED RESISTOR 47K 1/16W	
R626	CS22402JB07	FIXED RESISTOR 2.4K 1/16W	
R633	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R637	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R639	CS51002JB05	FIXED RESISTOR 1M 1/16W	
R640	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R709	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R710	CS41002JB03	FIXED RESISTOR 100K 1/16W	
R1101	CS12202FB06	FIXED RESISTOR 200O 1/16W	
R1102	CT030R3N001	ATTENUATOR	
R1103	CT030R3N001	ATTENUATOR	
R1131	CS05102JB01	FIXED RESISTOR 51O 1/16W	
R1142	CS21002JB00	FIXED RESISTOR 1K 1/16W	
R1190	CS05112FB03	FIXED RESISTOR 51.1O 1/16W	
R1191	CS19092FB09	FIXED RESISTOR 909O 1/16W	
R1192	CS05112FB03	FIXED RESISTOR 51.1O 1/16W	
R1193	CS35102JB06	FIXED RESISTOR 51K 1/16W	
R1198	CS21002JB00	FIXED RESISTOR 1K 1/16W	
R1199	CS21202JB07	FIXED RESISTOR 1.2K 1/16W	
R1202	CS15102FB01	FIXED RESISTOR 51O 1/16W	

Cct Ref	Part No.	Part Name & Description	Grid
R1203	CS12202FB06	FIXED RESISTOR 220O 1/16W	
R1204	CS13902JB06	FIXED RESISTOR 390O 1/16W	
R1205	CS15102FB01	FIXED RESISTOR 51O 1/16W	
R1206	CS05102JB01	FIXED RESISTOR 51O 1/16W	
R1207	CS01002JB06	FIXED RESISTOR 10O 1/16W	
R1221	CS33902FB08	FIXED RESISTOR 39K 1/16W	
R1222	CS01002JB06	FIXED RESISTOR 10O 1/16W	
R1223	CS01002JB06	FIXED RESISTOR 10O 1/16W	
R1224	CS01002JB06	FIXED RESISTOR 10O 1/16W	
R1225	CS25602JB02	FIXED RESISTOR 5.6K 1/16W	
R1226	CS22002FB01	FIXED RESISTOR 2K 1/16W	
R1232	CS31002JB01	FIXED RESISTOR 10K 1/16W	
C1252	CS11802JB07	FIXED RESISTOR 180O 1/16W	
T301	CY040205B01	SURGE SUP VC040205X150 (5.6V,0402)	
U101	AJ065250T07	AD6525	
U201	AJ065210T05	AD6521	
U301	AJ035220U07	ADP3522	
U506	AL000762081	MA3 YMU762	
U302	BCDAN222001	DIODE DAN222 (80V,300MA) SWITCH	
U305	AL7SZU04019	IC (5P) NC7SZU04P5X	
U306	BC55C9V1Z06	DIODE SMD BZM55C9V1-TR	
U307	BAM06400Z03	TRANSFER MOSFET FDC640P	
U308	BAMEMD20Z07	TRANSISTOR MOSFET EMD2 T2R	
U309	BAM34430004	TRANSISTOR MOSFET SI3443DV	
U311	BC0CRS03Z09	DIODE SMD CRS03	
U312	BC0CRS03Z09	DIODE SMD CRS03	
U505	AL001563019	IC (5P) SC1563ISK-3.0TR	
U507	CY000956001	SURGE SUP BZA956A	
U601	AL002985065	IC (5P) LP2985AIM5X-2.5	
U603	ALSB3157000	IC (6P) NC7SB3157P6X (SC70-6)	
U605	CY000956001	SURGE SUP BZA956A	
U703	AL002985014	IC (5P) LP2985AIM5X-3.0	
U704	AL000600000	IC (10P) SC600BIMSTR	
U1101	AL077314001	CX77314	
U1103	AL008315002	AD8315	
U1131	DP200007A01	COUPLER DUAL LDC15D190A0007A	
U1141	AT0L090TZ17	HYBRID	
U1171	BAPEMB30Z07	TRANSISTER SMD PEMB3	
U1172	BAPEMB30Z07	TRANSISTER SMD PEMB3	
U1173	AL009122011	IC ( 8P) MAS9122ASM3-T TRIPLE LDO (MSOP8)	
U1201	AL072063A05	CX74063	
U1261	CXT05R05001	FILTER SAW SAFSE942MAL0T05R05 (2.5*2*1)	
U1271	CX007744008	FILTER SAW B7744 (1842.5MHZ 2.5*2.0*0.8)	
U1272	CX007740002	FILTER SAW RF B7740 (2.5*2.0*0.8MM)	
U1291	BF626000004	OSCILLATER	
X101	BG332768372	XTAL SMD 32.768KHZ	

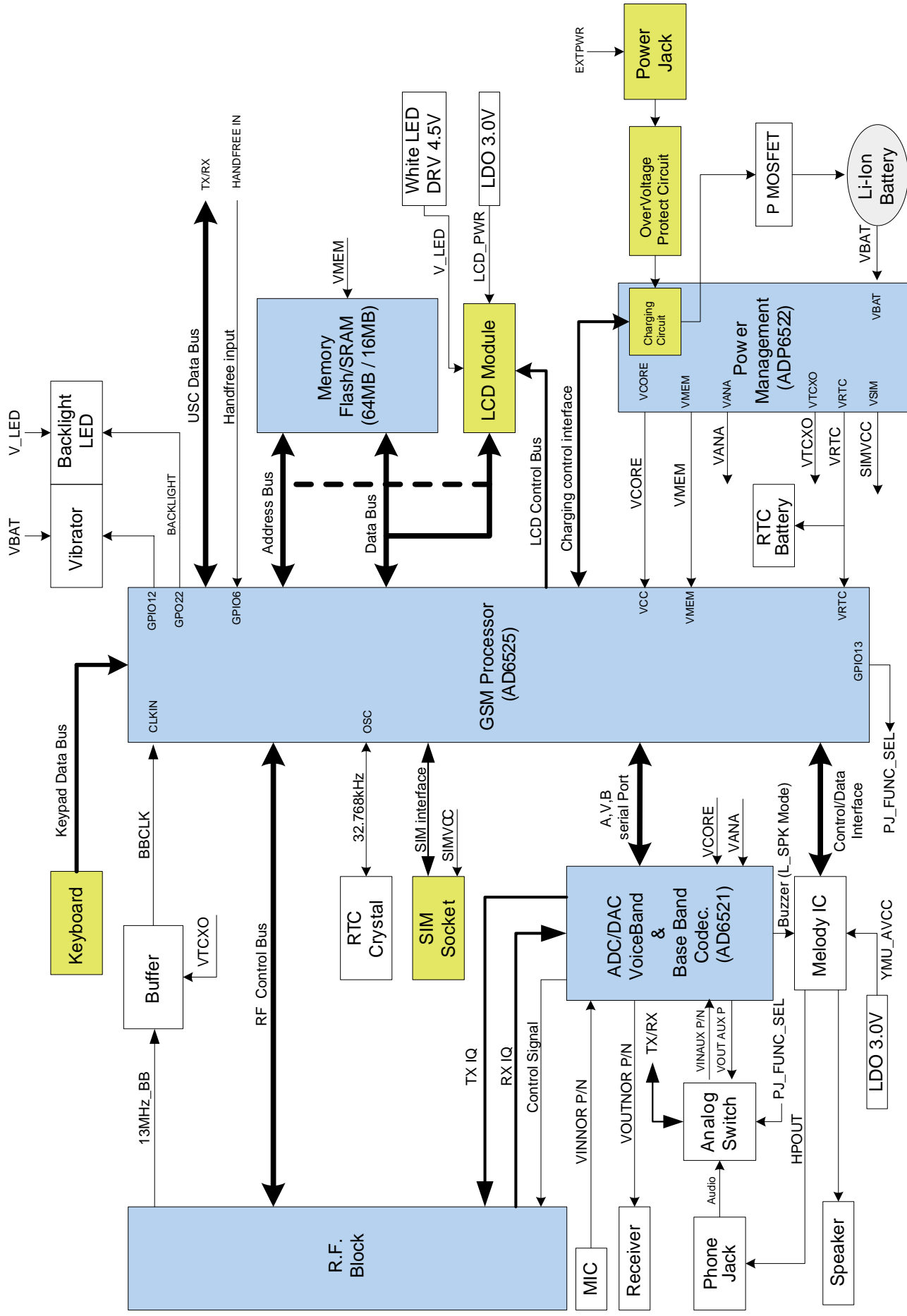
### 9.3. MMI (Keyboard) PCB Assembly

Cct Ref	Part No.	Part Name & Description	Grid
C7	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C531	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C532	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C733	CH41002KB93	CERAMIC CAPACITOR	0.1uF 10V
C746	CH01806JB07	CERAMIC CAPACITOR	18pF 50V
C747	CH01806JB07	CERAMIC CAPACITOR	18pF 50V
C748	CH01806JB07	CERAMIC CAPACITOR	18pF 50V
C749	CH01806JB07	CERAMIC CAPACITOR	18pF 50V
C750	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C751	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C752	CH03306JBD7	CERAMIC CAPACITOR	33pF 50V
C753	CH01806JB07	CERAMIC CAPACITOR	18pF 50V
D701	BEBL0026Z00	LED	
D702	BEBL0026Z00	LED	
D703	BEBL0026Z00	LED	
D704	BEBL0026Z00	LED	
D709	BEBL0026Z00	LED	
D710	BEBL0026Z00	LED	
MIC601	DFHS02FR068	MIC CONNECTOR	
R701	CS11002FB06	FIXED RESISTOR	1000 1/8W
R704	CS00824JA05	FIXED RESISTOR	8.20 1/8W
R706	CS11002JB08	FIXED RESISTOR	1000 1/16W
R707	CS31002JB01	FIXED RESISTOR	10K 1/16W
R713	CS11002FB06	FIXED RESISTOR	1000 1/8W
R714	CJ120084N14	SPECIAL FIXED RESISTOR	2200 1/8W
JP702	CS00002JB03	FIXED RESISTOR	00 1/16W
U701	DFHS26FR233	LCD CONNECTOR	
U702	BA022220004	TRANSISTOR SMD FFB2222A 40V,500MA	

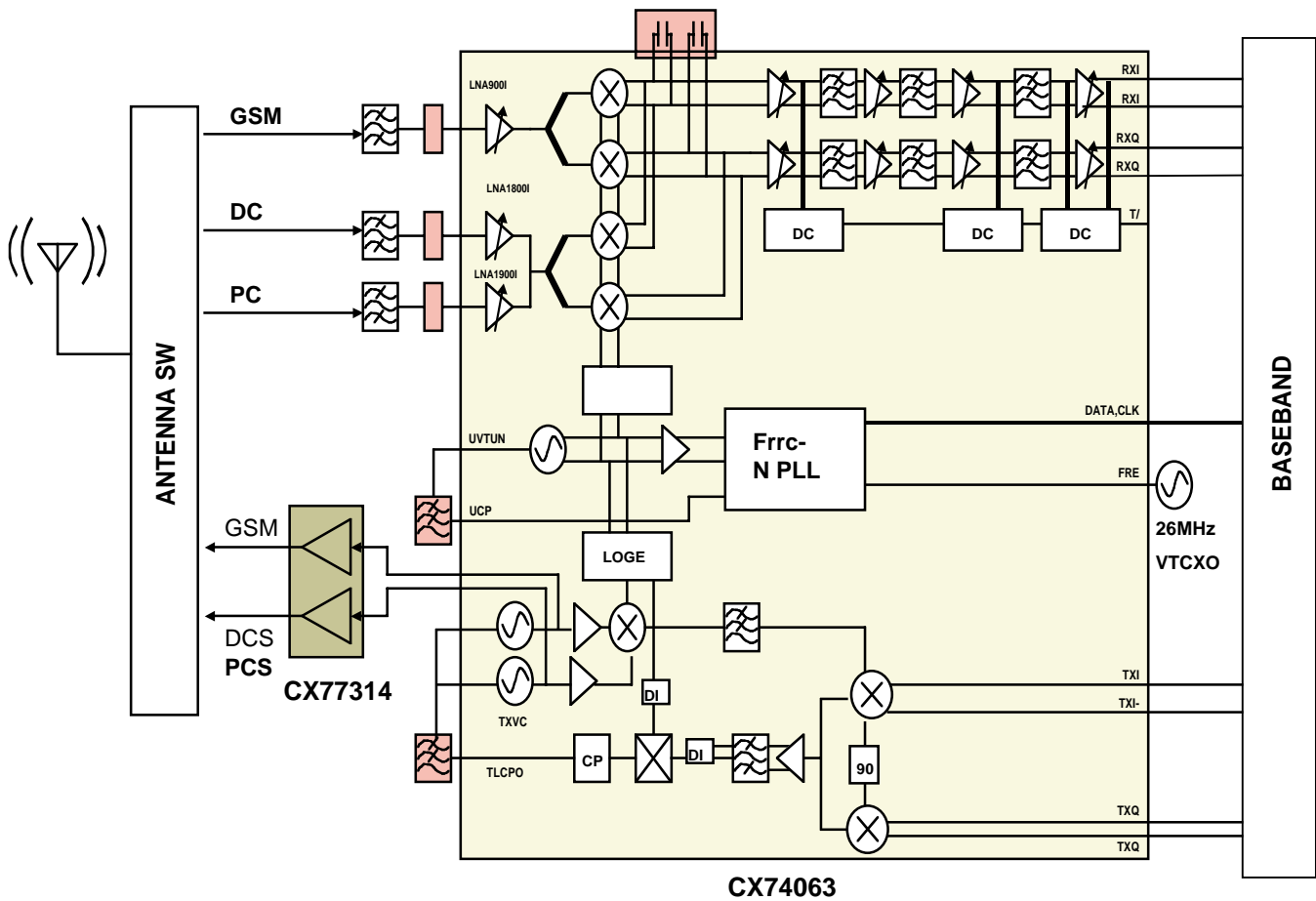
Cct Ref	Part No.	Part Name & Description	Grid

## 10. BLOCK DIAGRAM

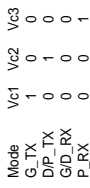
### 10.1. Block Diagram of Base Band



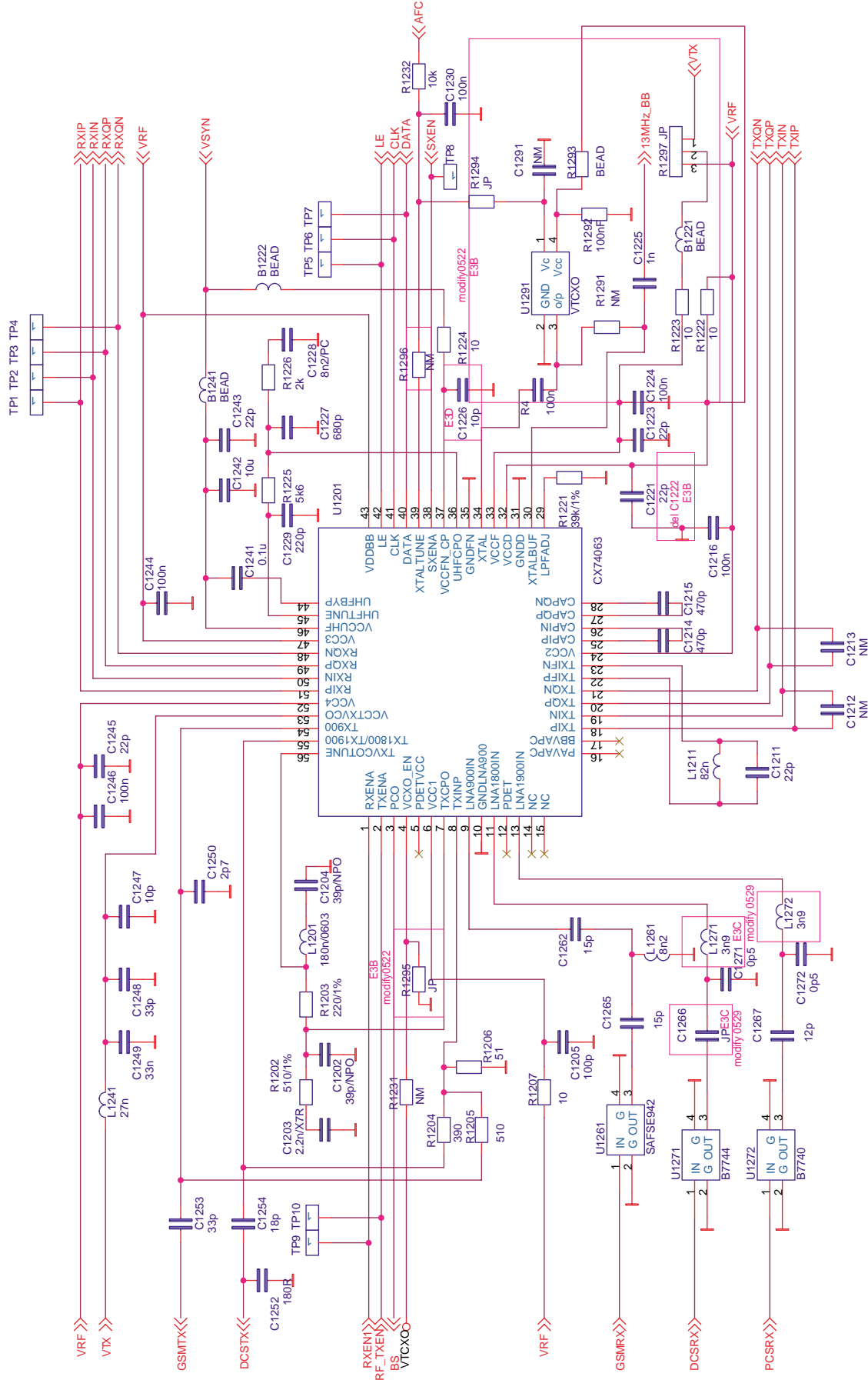
10.2. RF Block Diagram



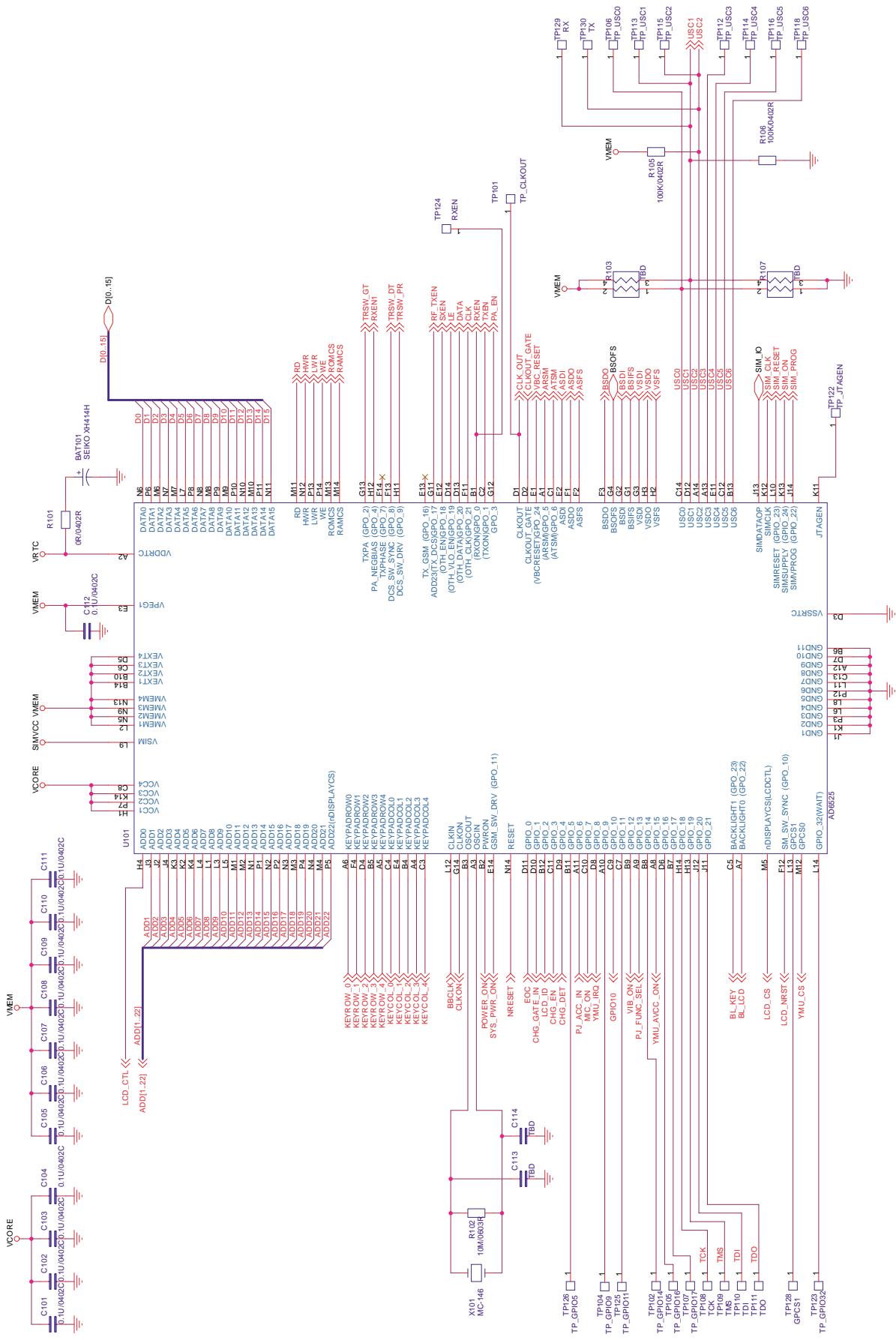
## 11. CIRCUIT DIAGRAM



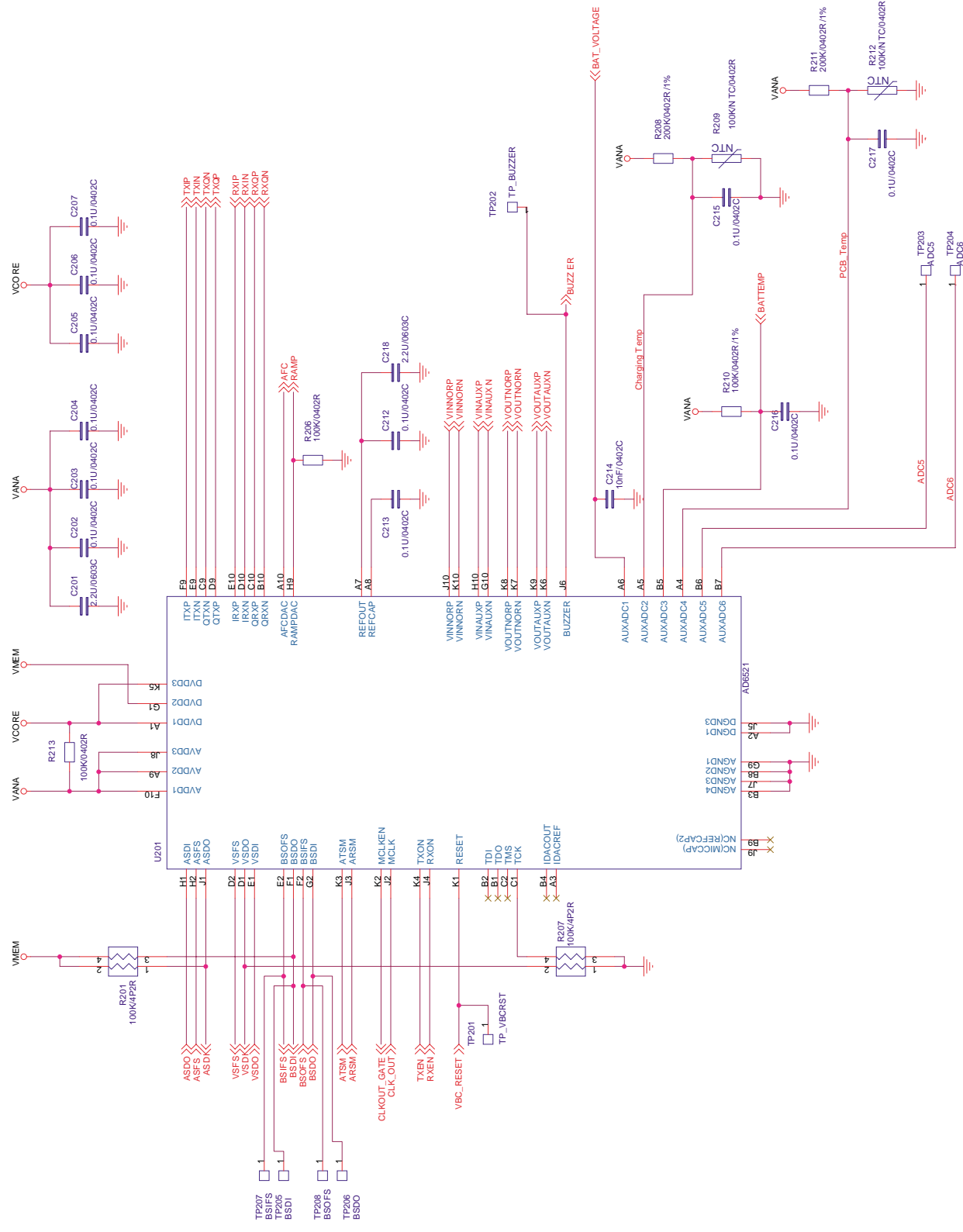
## 11.2. Circuit Diagram of RF Band-2



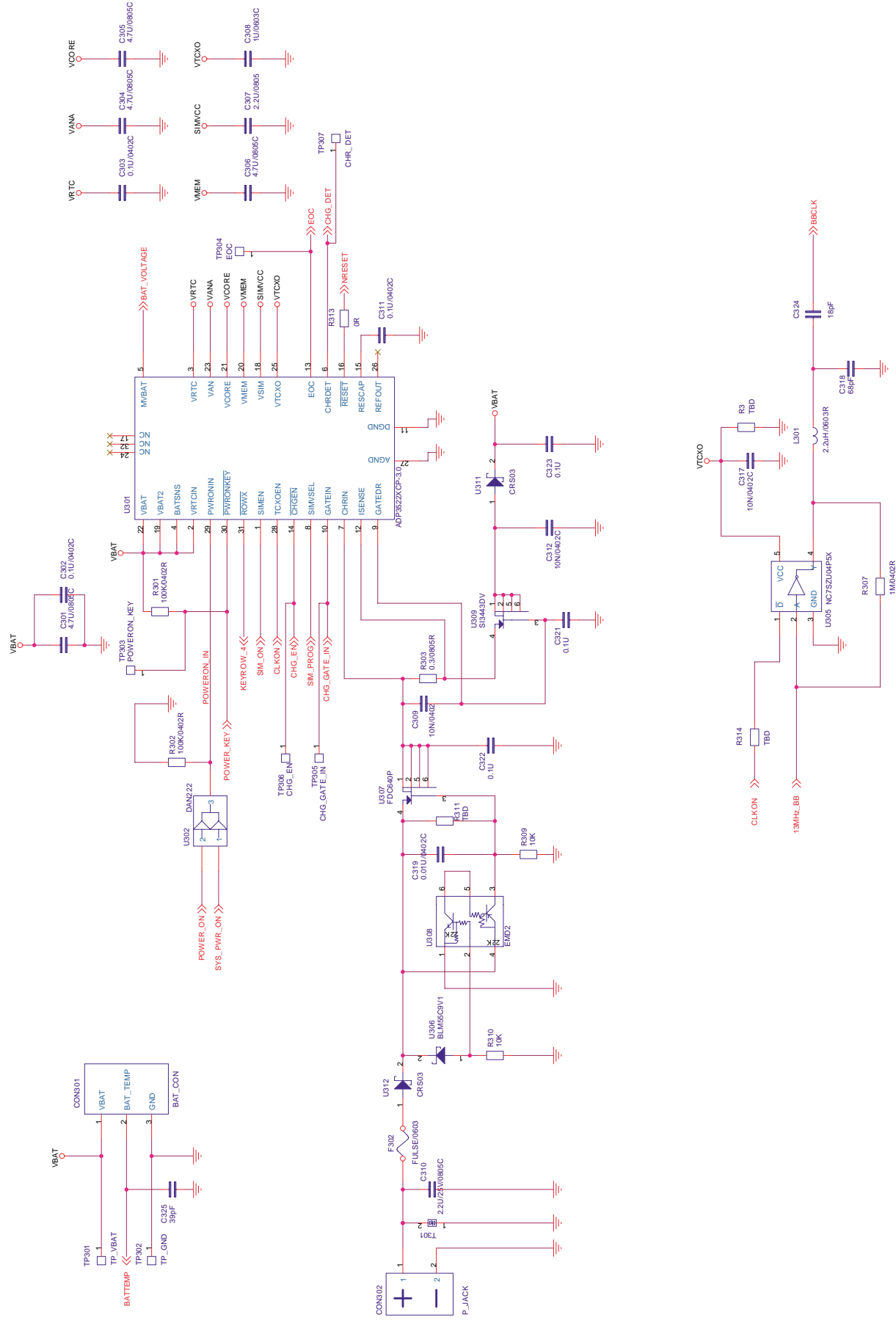
### 11.3. Circuit Diagram of GSM Processor



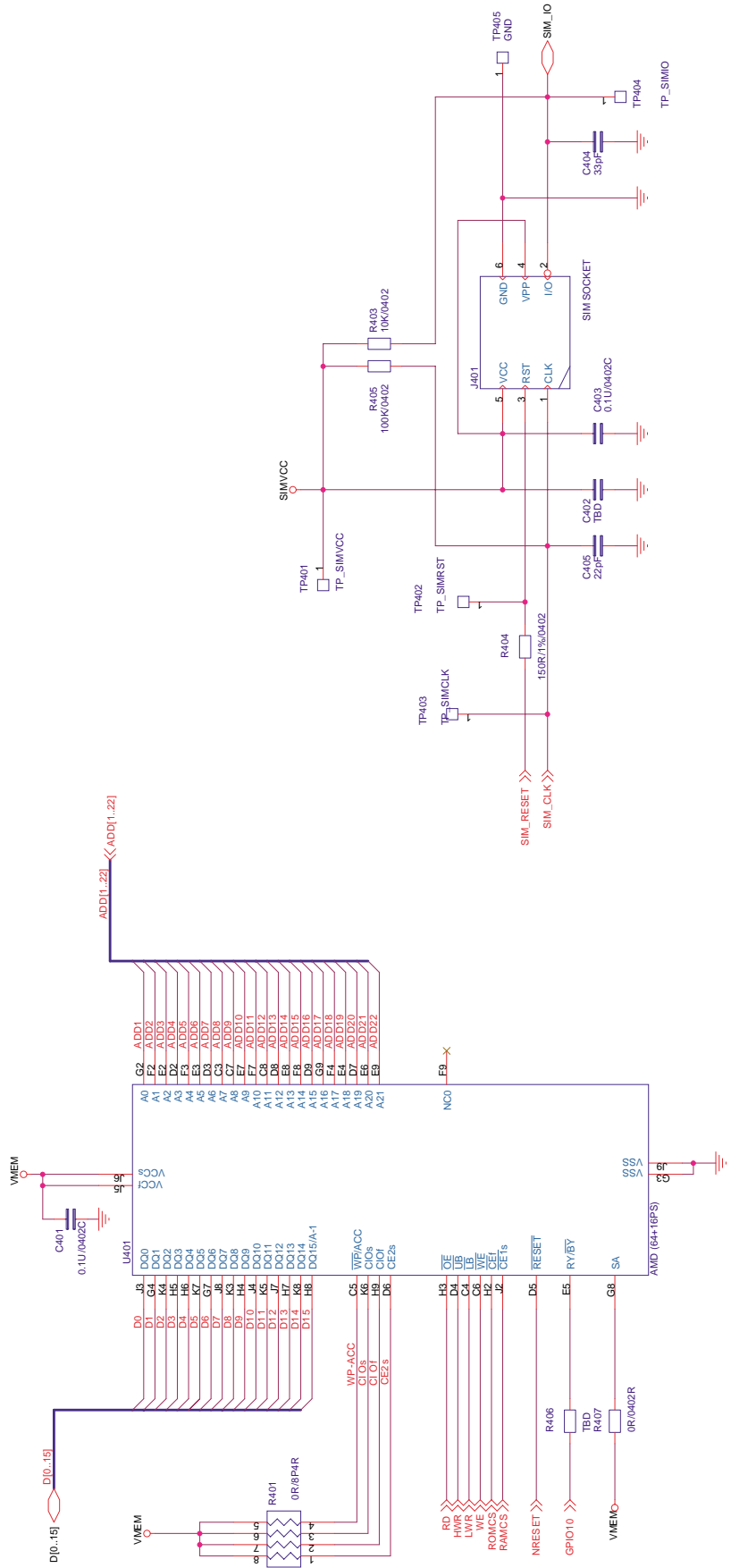
## 11.4. Circuit Diagram of Voiceband, Baseband and Codec



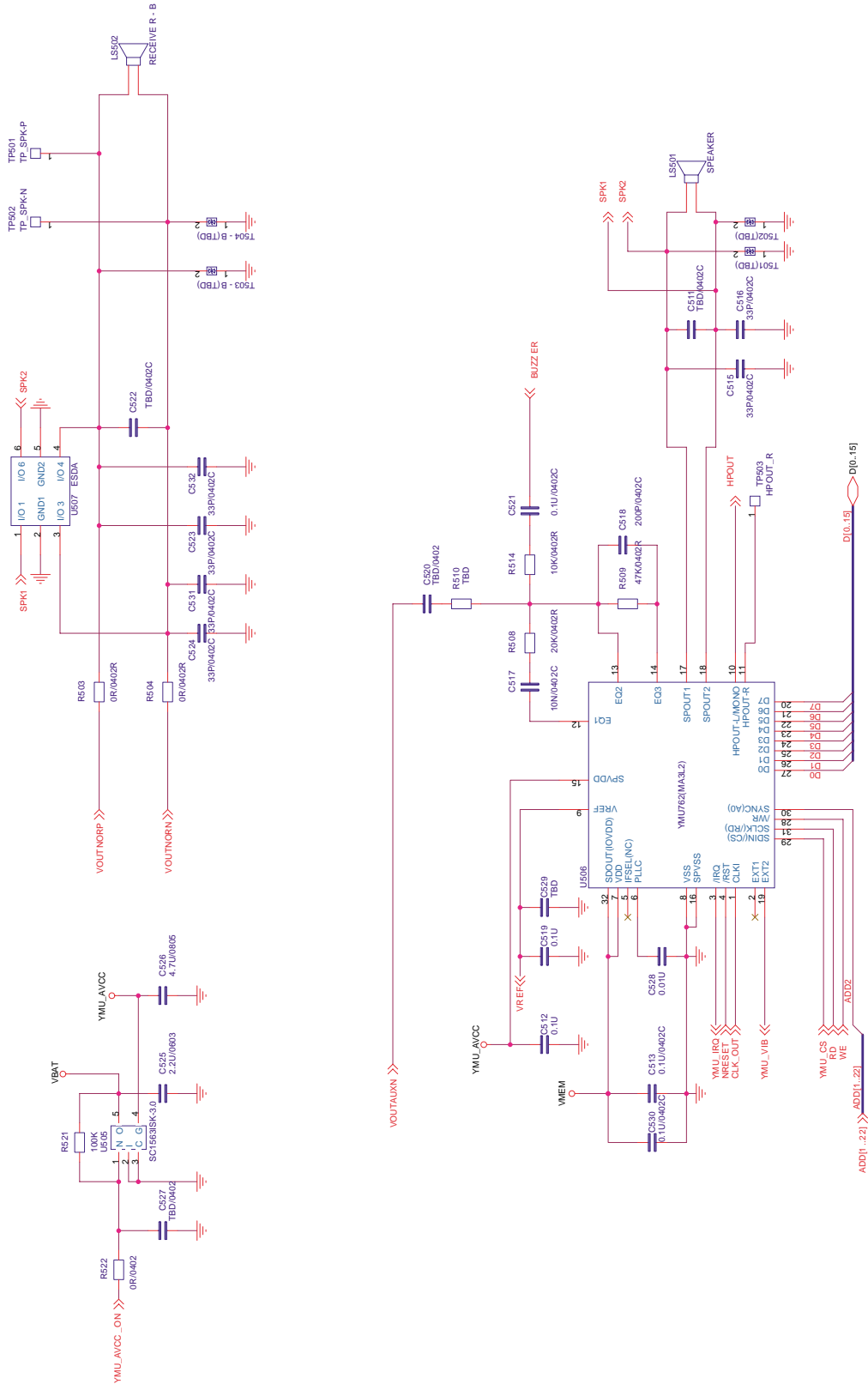
### 11.5. Circuit Diagram of Power Management System



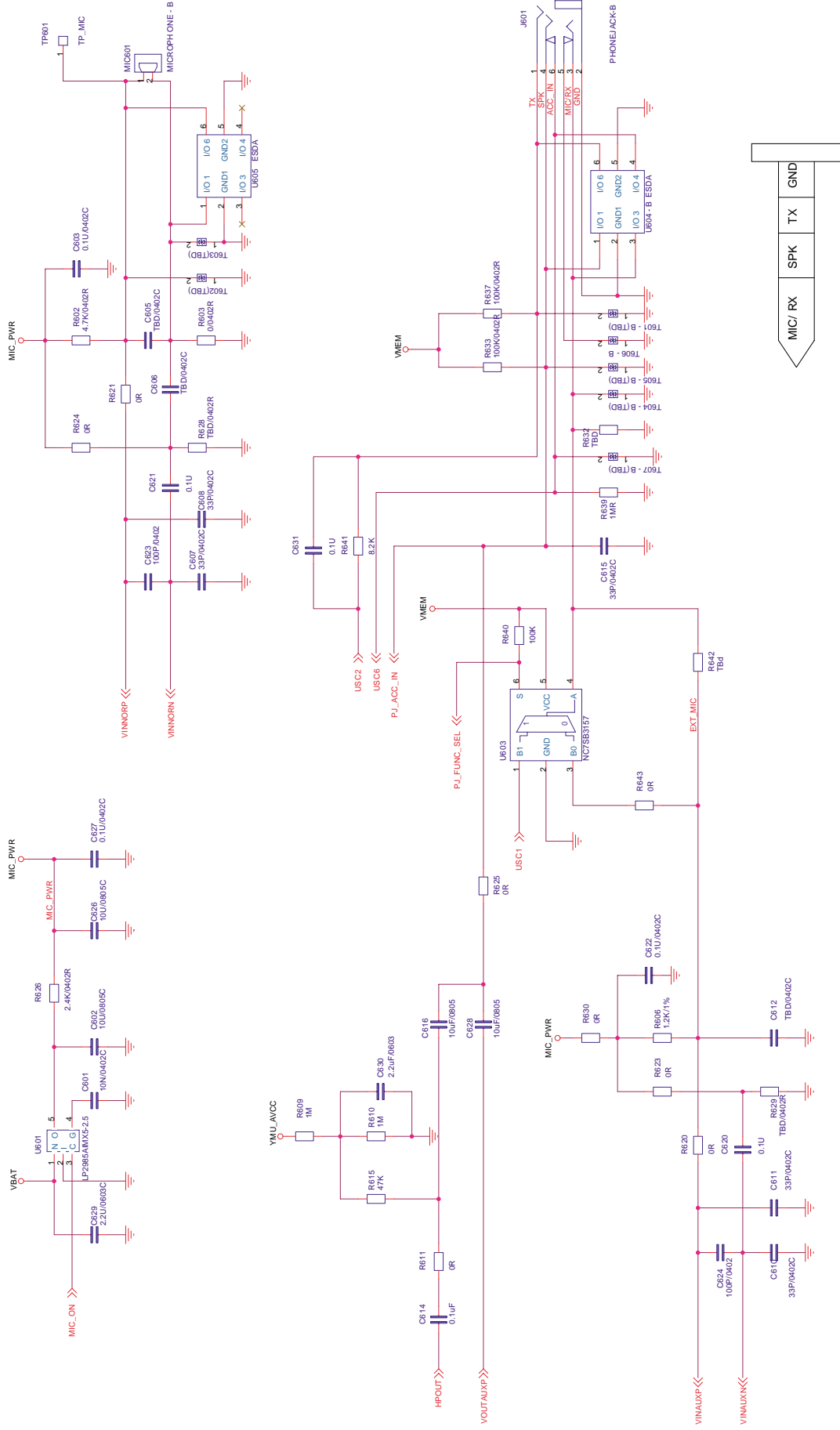
11.6. Circuit Diagram of Memory & SIM



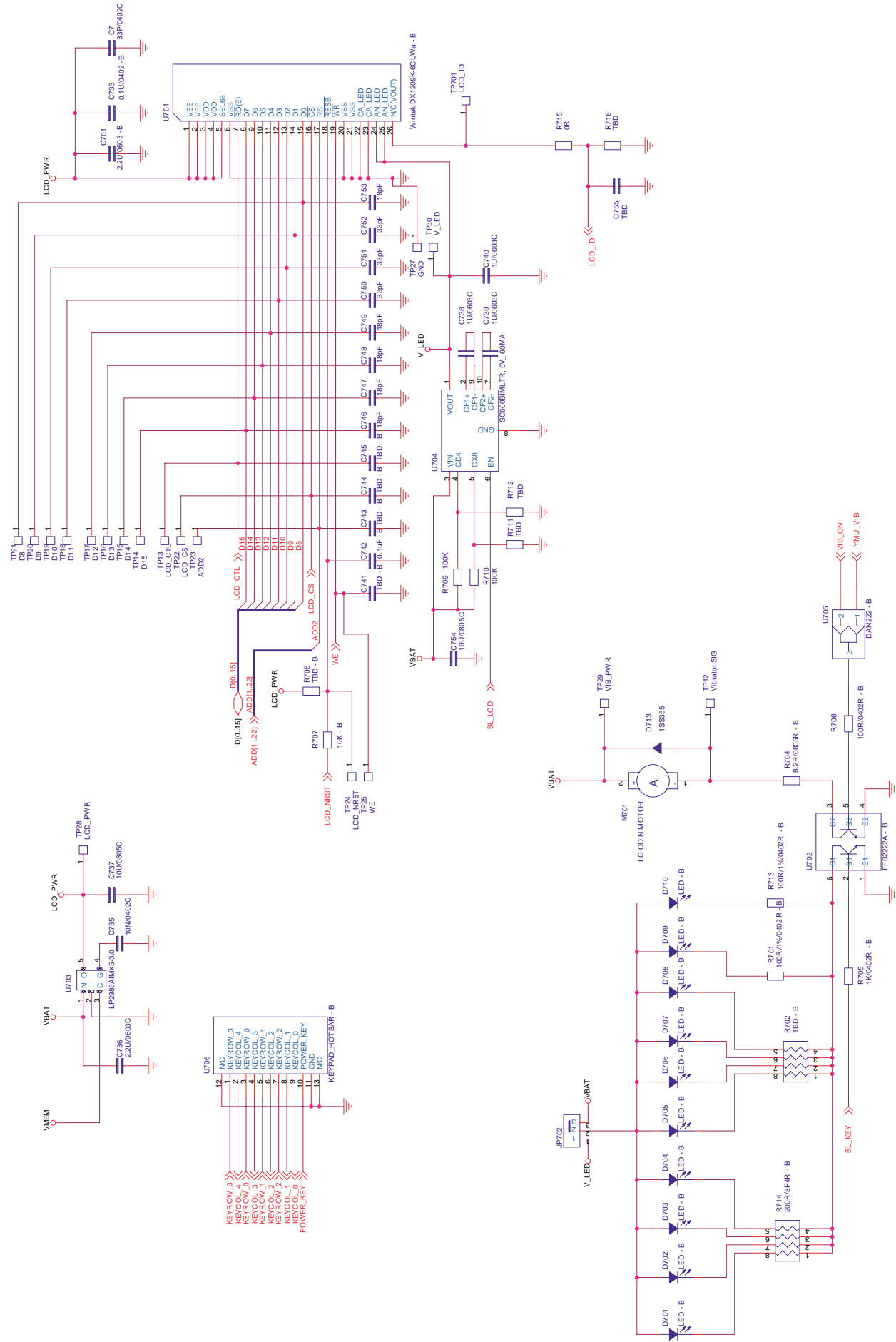
# 11.7. Circuit Diagram of Audio 1



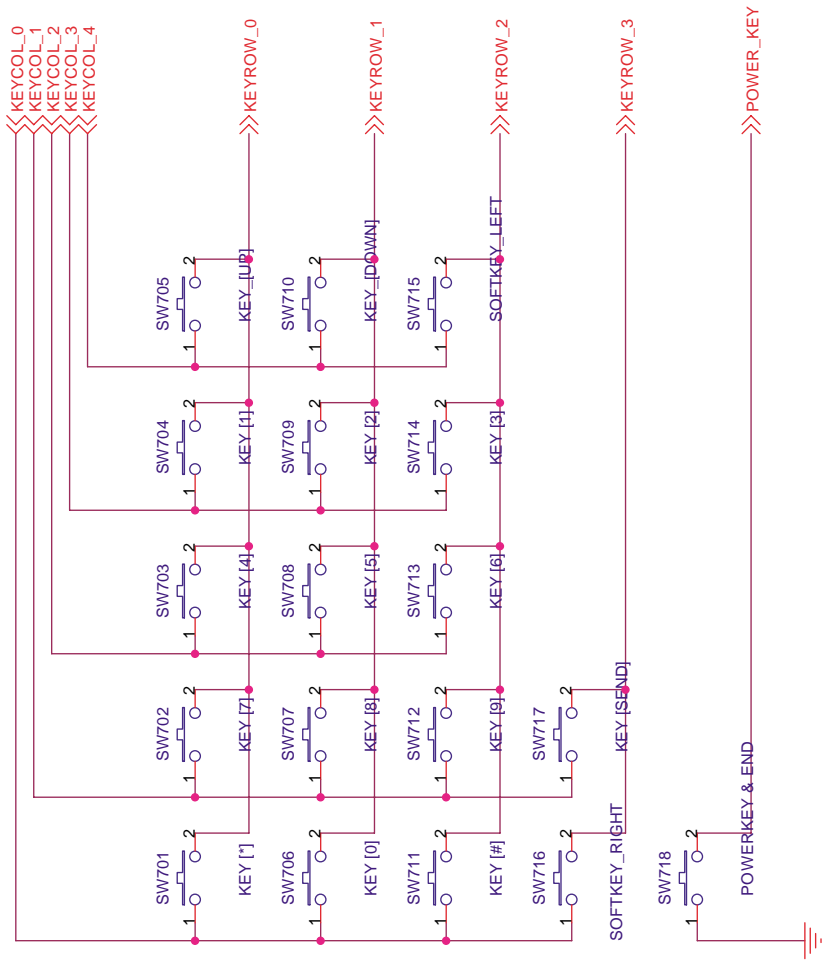
### 11.8. Circuit Diagram of Audio 2



## 11.9. Circuit Diagram of User Interface



11.10. Circuit Diagram of Keypad



### 12.1. Main PCB

