

Service Manual

Personal Cellular Telephone

GSM

EB-X500



	900 MHz	1800 MHz
Tx Frequency Range	880 - 915 MHz	1710 -1785 MHz
Rx Frequency Range	925 - 960 MHz	1805 -1880 MHz
Tx / Rx separation	45 MHz	95 MHz
RF Channel Bandwidth	200 kHz	
Number of RF channels	174	374
Speech coding	Full rate / Half rate / Enhanced Full rate	
Operating temperature	-10 °C to +55 °C	
Type	Class 4 Handheld	Class 1 Handheld
RF Output Power	2 W maximum	1 W maximum
Modulation	GMSK (BT = 0.3)	
WAP / GPRS	WAP 2.0 / GPRS Class 8	
Connection	8 ch / TDMA	
Voice digitizing	13 kbps RPE-LTP / 13 kps ACLEP / 5.6 kps CELP / VSLEP	
Transmission speed	270.833 kbps	
Signal Reception	Direct conversion	
Antenna Impedance (External Connector)	50 Ω	
Antenna VSWR	< 2.1 : 1	
Dimensions (Excluding antenna)	Height : 84.4 mm Width : 47.4 mm Depth : 17.5 mm	
Volume	65 cc	
Weight	85 g	
Main Display	LCD : 128 x 128 pixels, 65,536 colours	
Illumination	10 LEDs for Keypad Backlighting (White) 4 LEDs for LCD Backlighting (White) 3 LEDs for Sub LCD (Blue, Green, Orange)	
Keys	16-key Keypad, Navigation key, 1 shutter key	
SIM	3 V Plug-in type only	
External DC Supply Voltage	5.8 V	
Battery	3.7 V nominal, 600mAh, Li-Ion	
Standby Time	210 hrs	
Talk Time	4.5 hrs	

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

⚠ WARNING

This service information is designed for experienced repair technicians only and is not designed for use by the general public. It does not contain warnings or cautions to advise non-technical individuals of potential dangers in attempting to service a product.

Products powered by electricity should be serviced or repaired only by experienced professional technicians. Any attempt to service or repair the product or products dealt with in this service information by anyone else could result in serious injury or death.

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CP8 PATENTS

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CONTENTS

1. INTRODUCTION	1-1
1.1. Purpose of the Manual	1-1
1.2. Structure of the Manual	1-1
1.3. Servicing Responsibilities	1-1
2. GENERAL DESCRIPTION	2-1
2.1. General	2-1
2.2. Features	2-1
2.3. Handportable Main Kits	2-1
3. OPERATING INSTRUCTIONS	3-1
3.1. General	3-1
3.2. Liquid Crystal Display	3-1
3.3. Location of Controls	3-2
3.4. Alpha Entry	3-3
3.4.1. Character Set / Key Assignments	3-3
3.4.2. Editing Alpha Entry	3-4
3.5. Menu Structure	3-5
3.6. Incoming Call Line Identification (CLI)	3-6
3.7. Hot Key Dial Source List	3-6
3.8. Public Man Machine Interface (MMI)	3-6
3.8.1. General	3-6
3.8.2. Reading the Phonebook Memory Location	3-6
3.8.3. Presentation of IMEI	3-6
3.8.4. Security	3-6
3.8.5. Call Hold	3-6
3.8.6. Call Waiting	3-7
3.8.7. Call Line Identification	3-7
3.8.8. Telecommunication Services used for Public MMI	3-7
3.8.9. Dial Divert	3-8
3.8.10. Call Bar	3-8
3.9. Troubleshooting	3-9
3.10. Important Error Messages	3-9
3.11. Glossary of Terms	3-10

4. TECHNICAL SPECIFICATIONS

4.1.	Tx Characteristics	4-1
4.1.1.	Frequency Error	4-1
4.1.2.	Modulation Phase Error	4-1
4.1.3.	Output RF Spectrum due to Modulation	4-1
4.1.4.	Output RF Spectrum due to Switching Transients	4-1
4.1.5.	Spurious Emissions at Antenna Connector	4-2
4.1.6.	Residual Peak Power	4-2
4.2.	Rx Characteristics	4-2
4.2.1.	Sensitivity	4-2

5. TECHNICAL DESCRIPTION 5-1

5.1.	RF Overview	5-1
5.1.1.	RF Block Diagram	5-1
5.1.2.	RF Function Block	5-2
5.1.3.	Functional Description	5-3
5.1.4.	Transmitter	5-3
5.2.	Baseband Overview	5-5
5.3.	Keypad	5-6
5.4.	Subscriber Identity Module (SIM)	5-6
5.5.	TPU	5-6
5.6.	Memory	5-7
5.7.	Power Source	5-7
5.8.	Battery Temperature (BATTEMP)	5-7
5.9.	LCD	5-7
5.10.	Real Time Clock (RTC)	5-8
5.11.	Microphone	5-9
5.12.	Receiver	5-9
5.12.1.	Handheld Mode	5-9
5.12.2.	Handfree Mode	5-10
5.13.	Timers	5-10
5.14.	UART	5-10
5.15.	Power Supplies	5-11
5.15.1.	Introduction	5-11
5.15.2.	Power Source	5-11
5.15.3.	Power ON/OFF Control	5-12
5.15.4.	Voltage Regulation	5-12
5.16.	Battery Charging and Monitoring	5-13
5.16.1.	Charging Current	5-13
5.16.2.	Deeply Discharged Batteries	5-13
5.17.	Camera Module	5-13
5.18.	Interfaces and Test Points	5-15
5.18.1.	External I/O	5-15
5.18.2.	LCD Module Interface Signals	5-16
5.18.3.	Camera Module Interface	5-17
5.18.4.	SIM Interface	5-17
5.18.5.	Battery Connector	5-17
5.18.6.	Test Points	5-18

6. DISASSEMBLY / REASSEMBLY INSTRUCTIONS	6-1
6.1. General	6-1
6.1.1. Call Bar	6-1
6.2. Disassembly	6-2
6.3. Reassembly	6-9
7. REPAIR PROCEDURES	7-1
7.1. Introduction	7-1
7.2. Lead Free (PbF) solder	7-1
7.3. External Testing	7-1
7.3.1. General Information	7-1
7.4. Test Equipment Setup	7-5
7.4.1. Equipment Required	7-5
7.4.2. Fitting Handset to PCB Repair Jig	7-6
8. SOFTWARE DOWNLOAD & ADJUSTMENT PROCEDURE	8-1
8.1. Service Software Upgrade	8-1
8.2. Procedure	8-1
8.3. Calibration Procedure	8-7
8.3.1. Getting Started	8-7
8.3.2. Function Description	8-9
8.3.3. Calibration	8-12
8.3.4. Handset Specific Data	8-31
9. REPLACEMENT PARTS LIST	9-1
9.1. Exploded View and Mechanical Parts List	9-1
9.2. Main PCB	9-2
9.3. SUB PCB	9-5
10. BLOCK DIAGRAMS	10-1
10.1. Baseband	10-1
10.2. RF Band	10-2
11. CIRCUIT DIAGRAMS	11-1
11.1. Baseband	11-1
11.2. RF Band	11-2
11.3. Companion	11-3
11.4. IOTA	11-4
12. LAYOUT DIAGRAMS	12-1
12.1. Main PCB (Top View)	12-1
12.2. Main PCB (Bottom View)	12-2
12.3. SUB PCB	12-3
12.4. FB PCB	12-4

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 are described in Section 6.

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 EB-X500 is a high performance, small, light, handset for business and domestic use. The following features are provided:

- Triple Rate, which includes Full Rate, Half rate and Enhanced Full Rate (EFR) speech, codec.
- Dual Band, E-GSM 900 and GSM 1800 operation.
- Tegic T9 Text Entry.
- Voice Ringer.
- Desktop handsfree function comprising integral echo cancellation and noise suppression.
- Wireless Application Protocol (WAP) Browser.
- Backup Battery.
- Downloadable polyphonic melody ring tones.
- Clock, Calculator and Currency Converter.

2.3. Handportable Main Kit



Figure 2.1: Handportable Main Unit Kit Contents

Item	DESCRIPTION
1	Main Unit
2	Battery, Standard
3	Travel Charger

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
	Indicates received signal strength: strong signal area; weak signal area
 	Indicates that it is possible to make an emergency call.
Menu Number	The number of the feature indicated by the pointer. To access a feature enter the menu number on the keypad.
	Displays the battery charge level: Battery is at full charge Battery requires charging The battery icon flashes during charging
Menu Icon	Displays a small icon related to the current status of the telephone: telephone is roaming on a non-home network. using the "Call Divert" feature or the telephone has Call-Divert set; shows that vibration alert is switched on; shows that the telephone is in silent mode - no tones; flashes to indicate that there are unread text (SMS) messages. Lit when SMS area is full; indicates the telephone is locked; shows that the normal character set has been selected; shows that the Greek character set has been selected; shows that the Extended character set has been selected; shows that numbers have been selected for text entry T9 indicates that Tegic T9R predictive text mode is selected
Information Icon	Displays a small icon according to the current menu level: indicates the alarm is set. indicates the current Phonebook is sourced from the Mobile Phonebook. indicates the current Phonebook is sourced from the SIM Phonebook

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

3.3. Location of Controls

Incoming / Charge indicator:
Green - Incoming call.
Red - Charging battery pack.
External connector:
Used to connect to external accessories or to charging equipment.

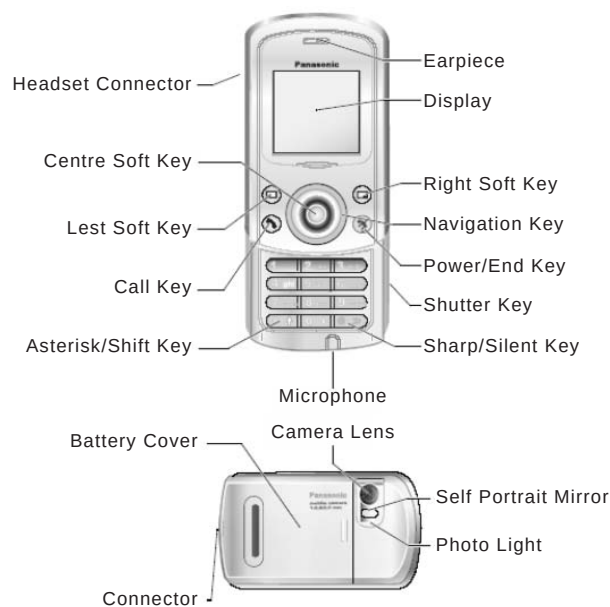
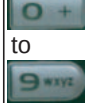


Figure 3.2. : Location of Controls

The keypad of Type A

	Navigation Key. Scrolls through options or features menu and increases or decreases volume.
	Cancel Key. Used mainly to cancel the current operation and return to the previous menu level. In some menus it has other functions.
	Option key. Primarily used for accessing the Phonebook or switching character types.
	Send Key. Makes a call.
	End Key. Ends a call or switches the telephone on/off when pressed and held.
	Digit keys. Enter wild numbers or pauses when pressed and held. Where appropriate the 0 key scrolls up or down through abbreviated control names and then select to reveal the international access code "+".
	Vibrate enable/disable Key. Press and hold to enable or disable the vibrate alert.

The keypad of Type B

	Navigation Key. Scrolls through options or features menu and increases or decreases volume.
	Cancel Key. Used mainly to cancel the current operation and return to the previous menu level. In some menus it has other functions.
	Option key. Primarily used for accessing the Phonebook or switching character types.
	Send Key. Makes a call.
	End Key. Ends a call or switches the telephone on/off when pressed and held.
	Digit keys. Enter wild numbers or pauses when pressed and held. Where appropriate the 0 key scrolls up or down through abbreviated control names and then select to reveal the international access code "+".
	Vibrate enable/disable Key. Press and hold to enable or disable the vibrate alert.

3.4. Alpha Entry

3.4.1. Character Set / Key Assignments

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

The keypad of Type A

Key		Character / Operation				
T9®		Normal	Greek	Extended	Numeric	
	Alternatives	+ -	+ -	+ -	0+P_	
	Punctuation	" @ - , . ; : ! i ? ¿ () ' & % + - / < > = £ \$ ¥ ¢ §				1
	abc	A B C a b c	A B Γ	A Ä Å Æ B C Ç a ä å æ à b c	2	
	def	D E F d e f	Δ E Z	D E É F d e é è f	3	
	ghi	G H I g h i	H Θ I	G H I g h i ì	4	
	jkl	J K L j k l	K Δ M	J K L j k l	5	
	mno	M N O m n o	N Ξ O	M N Ñ O Ö o m n ñ o ö ø	6	
	pqrs	P Q R S p q r s	Π P Σ	P Q R S p q r s É ¿	7	
	tuv	T U V t u v	T Υ Φ	T U U V t u ü ù v	8	
	wxyz	W X Y Z w x y z	X Ψ Ω	W X Y Z w x y z	9	
	Shift / Lock	*	*	*	*	
	Space	#	#	#	#	

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

To cycle between Greek characters (A B Γ), extended characters (A Ä Å), numerals (0-9) and normal characters (A B C)

press  .

The keypad of Type B

Key		Character / Operation				
T9®		Normal	Greek	Extended	Numeric	
	Alternatives	+ -	+ -	+ -	0+P_	
	Punctuation	" @ - , . ; : ! i ? ç () ' & % + - / < > = £ \$ ¥ ¢ §				1
	abc	A B C a b c	A B Γ	A Ä Å Æ B C Ç a ä å æ à b c	2	
	def	D E F d e f	Δ E Z	D E É F d e é è f	3	
	ghi	G H I g h i	H Θ I	G H I g h i ì	4	
	jkl	J K L j k l	K Δ M	J K L j k l	5	
	mno	M N O m n o	N Ξ O	M N Ñ O Ö o m n ñ o ö ø	6	
	pqrs	P Q R S p q r s	Π P Σ	P Q R S p q r s É ç	7	
	tuv	T U V t u v	T Υ Φ	T U U V t u ü ù v	8	
	wxyz	W X Y Z w x y z	X Ψ Ω	W X Y Z w x y z	9	
	Shift / Lock	*	*	*	*	
	Space	#	#	#	#	

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

To cycle between Greek characters (A B Γ), extended characters (A Ä Å), numerals (0-9) and normal characters (A B C)

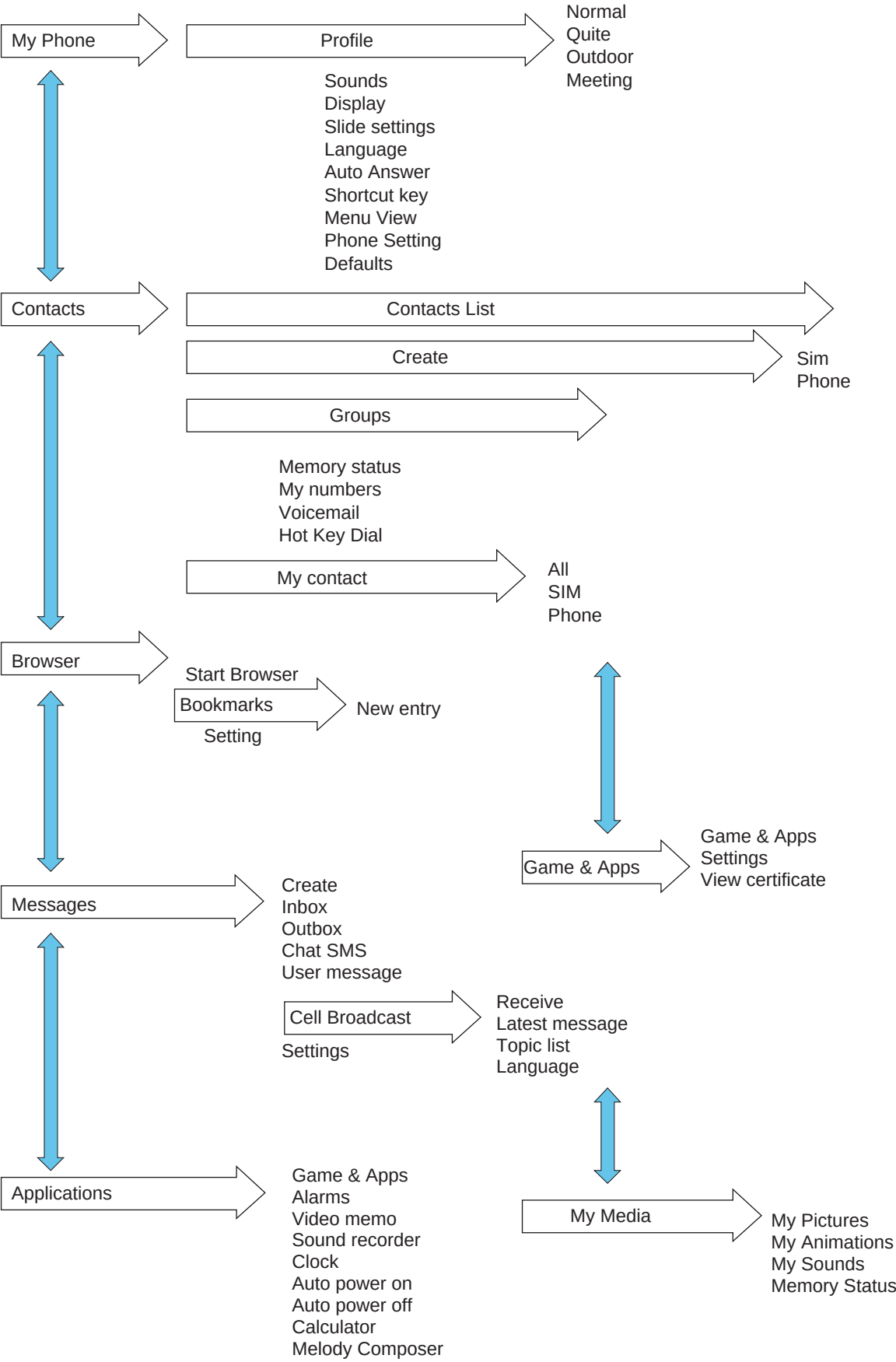
press  .

3.4.2. Editing Alpha Entry

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

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

3.5. Features Menu Structure



3.6. Incoming Call Line Identification (CLI)

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

3.7. Hot Key Dial Source List

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

3.8. 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	* 4 3 * <SND>
Disable Call Waiting	# 4 3 * <SND>
Call Waiting Status	*# 4 3 *# <SND>

3.8.7. Calling Line Identification

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

Enable * <SERVICE CODE> * # <SND>

Disable #<SERVICE CODE> * # <SND>

Temporary Suppress Identification # 3 1 # <TELEPHONE NUMBER> <SND>

Temporary Display Identification * 3 1 # <TELEPHONE NUMBER> <SND>

3.8.8. Telecommunication Services used for Public MMI Tel Service

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

Bearer Service

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

3.9. Troubleshooting

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

Problem	Cause	Remedy
Telephone will not switch on		Check that the battery pack is fully charged and correctly connected to the telephone.
Extremely short battery life for a new battery pack.	The network in use and the condition of the battery pack can affect battery life.	Avoid areas of poor reception. Ensure batteries are fully charged.
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 +5 °C and +35 °C.
Calls cannot be made.	The telephone is locked.	Unlock the telephone (Menu: Security: Phone Lock).
Outgoing calls are barred.		Disable the outgoing call barring (Menu: Security: Call Bar).
The telephone is not registered to a network.		Move to a coverage area and operate the telephone after it has registered with a network.
Emergency calls cannot be made.	User's phone is not in a GSM coverage area.	Check that the antenna symbol  symbol is displayed is displayed. Move to a coverage area and operate the telephone when the antenna.
Telephone numbers cannot be recalled.	The telephone is locked.	Unlock the telephone (Menu: Security: Phone Lock).
Fixed Dial is switched on.		Switch off Fixed Dial (Menu: Security: Fixed Dial).

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

3.11. 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 Provider. It is most likely to be preprogrammed to the Service Dial Numbers by the Service Provider.
Lock code	Used for security of the telephone. Factory set to "0000".
Message Centre	Where messages are sent before they are forwarded on to their destination. The Message Centre telephone number may be programmed into the SIM or supplied by the service provider.
Network operator	The organisation responsible for operating a GSM network.
Password	Used for the control of the call bar function. Supplied by the service provider.
PIN	Personal Identification Number used for SIM security. Supplied by the service provider.
PIN2	Personal Identification Number used for the control of Fixed Dial Memory and call charge metering. Supplied by the service provider.
PUK/ PUK2	PIN/PIN2 Unblocking Key. Used to unblock the PIN/PIN2. Supplied by the service provider.
Registration	The act of locking on to a GSM network. This is usually performed automatically by the telephone.
Roaming	The ability to use the telephone on networks other than the Home network.
Service Dial Numbers	Service Dial Numbers are predefined numbers that allow the user to access a set of special services provided by the Service Provider. For example billing information or access to Voice Mail.
Service provider	The organisation responsible for providing access to the GSM network.
SIM	Subscriber Identification Module. A small smart-card which stores unique subscriber and user-entered information such as Phone Book, Fixed Dial Memory and short messages. Supplied by the service provider.
Supplementary service	Network-controlled GSM functions supported by the telephone. Supplementary services may only be available on a subscription bases.
Wild numbers	Spaces in a stored telephone number. When the telephone number is recalled pressing a numeric key will fill in a space. This can be used to restrict dialling to a specific area.

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

± 0.1 ppm max., relative to base station frequency.

4.1.2 Modulation Phase Error

RMS: Equal to or less than 5°

Peak: Equal to or less than 20°

4.1.3. Output RF Spectrum due to Modulation

Offset from Centre Frequency (kHz)	Maximum Level Relative to Carrier (dB)
± 100	+0.5
± 200	-30
± 250	-33
± 400	-60
± 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
± 400	-19	-22
± 600	-21	-24
± 1200	-21	-24
± 1800	-24	-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
100 kHz to 50 MHz	–	10 kHz	30 kHz	–36	–36
50 MHz to 500 MHz	–	100 kHz	300 kHz	–36	–36
500 MHz to 1 GHz	0 to 1MHz	100 kHz	300KHz	–36	–36
1 GHz to 12.75 GHz	0 to 10 MHz	100 kHz	300 kHz	–30	–30 (1.0 GHz - 1.710 GHz)
Excl. relevant TX band	> 10 MHz	300 kHz	1 MHz	–30	
E -GSM : 880 MHz to 915 MHz	> 30 MHz	3 MHz	3 MHz	–30	–36 (1.710 GHz - 1.785GHz)
DCS : 1710 MHz to 1785 MHz	(offset from edge of relevant Tx band)				–30 (1.785 GHz - 12.75GHz)
-and the Rx bands					
925 MHz - 960 MHz					
1805 MHz - 1880 MHz					
Relevant TX band:	1.8 MHz to 6.0 MHz	30 kHz	100 kHz	–36	–36
E -GSM : 880 MHz to 915 MHz	> 6.0 MHz	100 kHz	300 kHz	–36	–36
DCS :1710 MHz 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* α	8,900					0.122* α	164,000
Class 1b (RBER)	0.42/ α	1,000,000	7.5	24,000	9.333	60,000	0.41/ α	20,000,000
Class II (RBER)	8.33	120,000					2.439	8,200

The reference sensitivity level is < -102 dBm.

NOTE: $1 < \alpha < 1.6$. The value of α 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 900 Half Rate Speech

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

Channels	Propagation Conditions TU high		Propagation Conditions RA		Propagation Conditions HT	
	Test Limit error rate %	Minimum No of samples	Test Limit error rate %	Minimum No of samples	Test Limit error rate %	Minimum No of samples
TCH/HS (FER)	4.598	13,050	8.500	20,000	7.600	20,000
TCH/HS Class Ib (BFI=0)	0.404	148,500				
TCH/HS Class II (RBER)	7.725	25,500				
TCH/HS (UFR)	6.250	9,600				
TCH/HS Class Ib (BFI or UFI=0)	0.269	227,000				

GSM 1800 Full Rate Speech

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

Channels	Propagation Conditions 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* α	13,400	7.5	24,000	9.333	30,000	0.122* α	164,000
Class Ib (RBER)	0.32/ α	1,500,000					0.41/ α	20,000,000
Class II (RBER)	8.333	60,000					2.439	8,200

The reference sensitivity level is < -103 dBm.

NOTE: $1 < \alpha < 1.6$. The value of α 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 Half Rate Speech

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

Channels	Propagation Conditions TU high		Propagation Conditions RA		Propagation Conditions HT	
	Test Limit error rate %	Minimum No of samples	Test Limit error rate %	Minimum No of samples	Test Limit error rate %	Minimum No of samples
TCH/HS (FER)	4.706	12,750	8.735	20,000	7.600	20,000
TCH/HS Class Ib (BFI=0)	0.426	141,000				
TCH/HS Class II (RBER)	7.725	25,500				
TCH/HS (UFR)	6.383	9,400				
TCH/HS Class Ib (BFI or UFI=0)	0.291	206,000				

Blocking:

Frequency	Small MS level in dB μ Vemf()	
	E-GSM 900	GSM 1800
FR $\pm$ 600 kHz to FR $\pm$ 800 kHz	70	70
FR $\pm$ 800 kHz to FR $\pm$ 1.6 MHz	70	70
FR $\pm$ 1.6 MHz to FR $\pm$ 3 MHz	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
1785 MHz to FR - 3 MHz	–	87
835 MHz to < 915 MHz	113	–
> 980 MHz to 1000 MHz	113	–
100 KHz to < 835 MHz	90	–
> 1000 MHz to 12.75 GHz	90	–
100 KHz to 1705 MHz	–	113
> 1705 MHz to < 1785 MHz	–	101
> 1920 MHz to 1980 MHz	–	101
> 1980 MHz to 12.75 GHz	–	90

Measurement Conditions:

Wanted carrier is 3 dB above reference sensitivity.

Interferer is CW.

Spurious response exceptions:

Six exceptions are permitted IN band 915 MHz - 980 MHz.

24 exceptions are permitted OUTSIDE band 915 MHz - 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 Dual Band product incorporating two switch able transceivers, one for the E-GSM 900 band and another for the GSM 1800 (DCS 1800) band. The transmit and receive bands for the mobile are given in the table below:

	Tx	Rx
EGSM 900	880 MHz - 915 MHz	925 MHz - 960 MHz
GSM 1800	1710 MHz - 1785 MHz	1805 MHz - 1880 MHz
GSM 850	824 MHz - 849 MHz	869 MHz - 894 MHz
GSM 1900	1850 MHz - 1910 MHz	1930 MHz - 1990 MHz

Other salient technical features are as follows:

	E-GSM 900	GSM 1800	GSM 850	GSM 1900
RX Bandwidth	35 MHz	75 MHz	25 MHz	60 MHz
TX Bandwidth	35 MHz	75 MHz	25 MHz	60 MHz
Duplex Spacing	45 MHz	95 MHz		
Number of Channels	174	374	124	299
AFRCN (Channel Numbers)	0 - 124 975 - 1023	512 - 885	128 - 251	512 - 810
1st TX Channel	880.2 MHz (Ch 975)	1710.2 MHz (Ch 512)	824.8 MHz (Ch 128)	1850.2 MHz (Ch 512)
Last TX Channel	914.8 MHz (Ch 124)	1784.8 MHz (Ch 885)	848.8 MHz (Ch 251)	1909.8 MHz (Ch 810)
1st RX Channel	925.2 MHz (Ch 975)	1805.2 MHz (Ch 512)	869.2 MHz (Ch 128)	1930.2 MHz (Ch 512)
Last RX Channel	959.8 MHz (Ch 124)	1879.8 MHz (Ch 885)	893.8 MHz (Ch 251)	1989.8 MHz (Ch 810)
Maximum TX Power	33.0 dBm {Class 4}{PL 5}	30.0 dBm {Class 1}{PL 0}	33.0 dBm {Class 4}{PL 5}	30.0 dBm {Class 1}{PL 0}
Minimum TX Power	5.0 dBm (PL 19)	0.0 dBm (PL 15)	5.0 dBm (PL 19)	0.0 dBm (PL 15)

5.1.2. RF Function Block

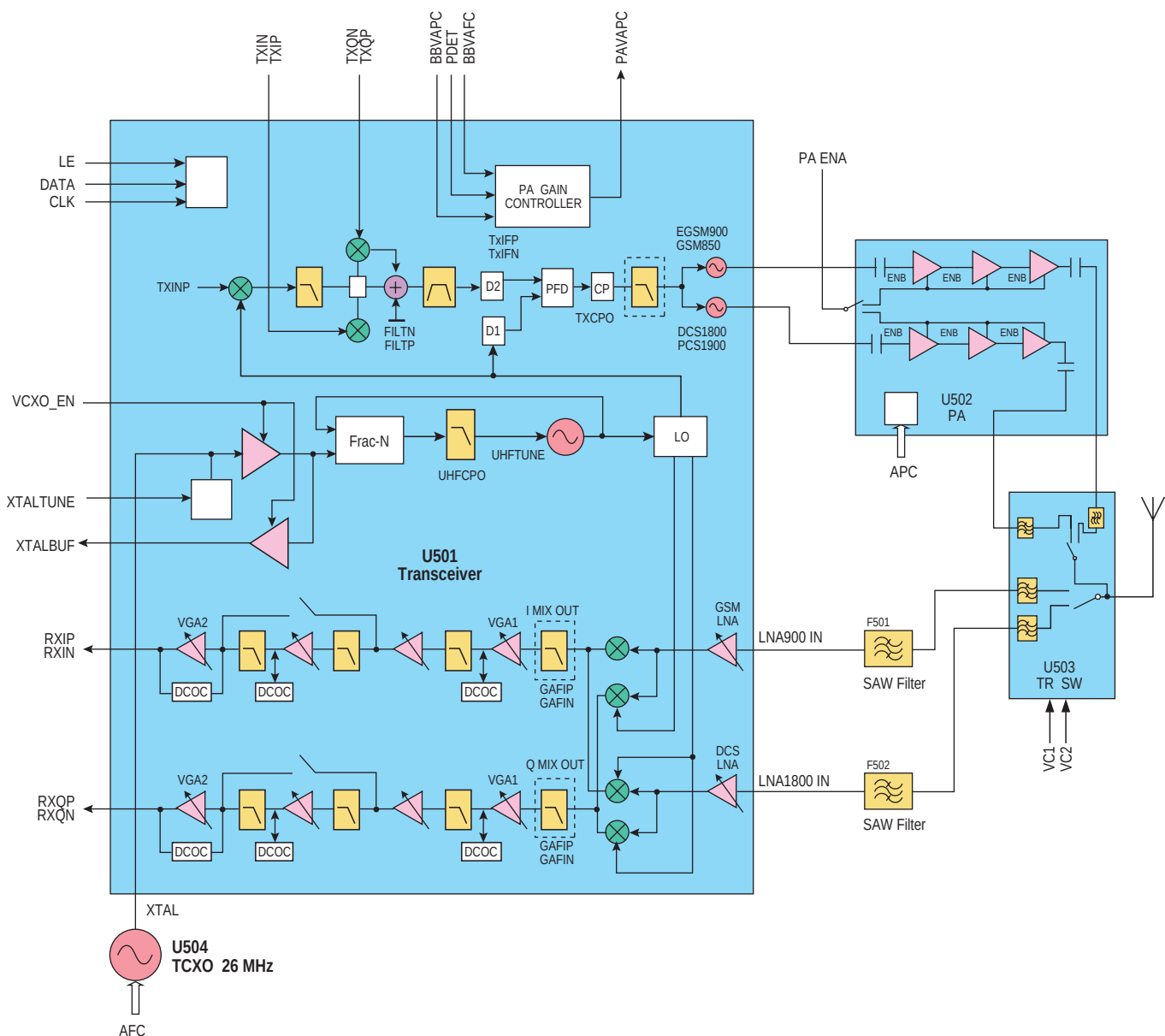


Figure 5.1 : RF Function Block Diagram

5.1.3. Functional Description

Frequency Plan

The frequency plan is shown below:

	TX Frequency	TX IF	TX UHF LO
E-GSM 900	880 MHz - 915 MHz	98.3 MHz - 114.4 MHz	1474.3 MHz -1543.8 MHz
GSM 1800	1710 MHz - 1785 MHz	90.3 MHz - 104.8 MHz	1354.7 MHz - 1414.5 MHz
GSM 850	824 MHz - 850 MHz	82.42 MHz - 105.55 MHz	1359.93 MHz - 1424.922 MHz
GSM 1900	1850 MHz - 1910 MHz	97.37 MHz - 112.34 MHz	1460.68 MHz - 1516.606 MHz

	RX	RX LO
E-GSM 900	925 MHz - 960 MHz	925.2 MHz -959.8 MHz
GSM 1800	1805 MHz - 1880 MHz	1805.2 MHz - 1879.8 MHz
GSM 850	869 MHz - 894 MHz	869.2 MHz - 839.8 MHz
GSM 1900	1930 MHz - 1990 MHz	1930.2 MHz - 1989.8 MHz

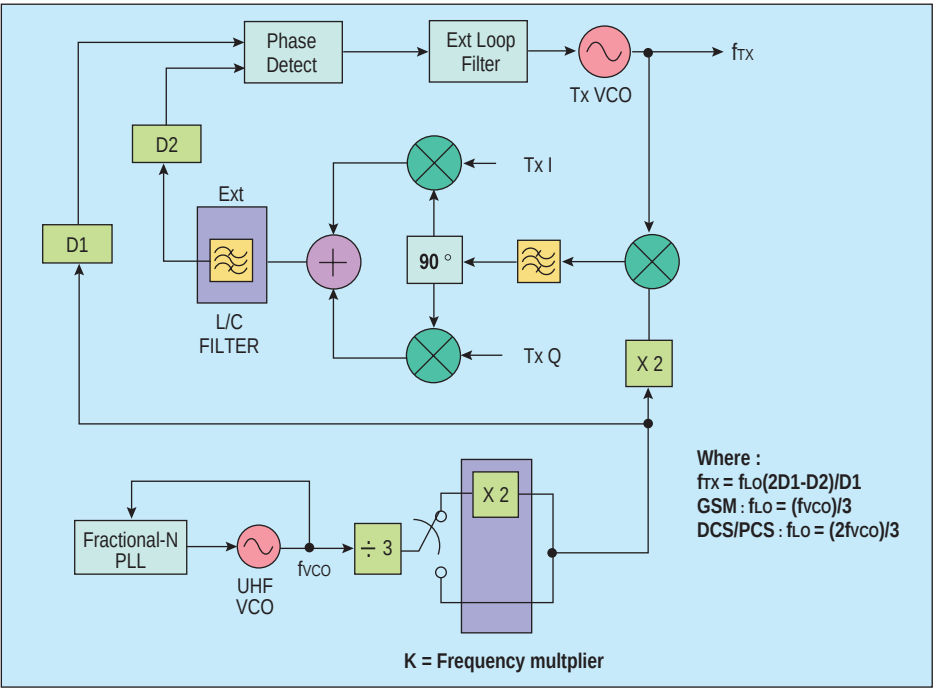


Figure 5.2. Receiver Block Frequency Plan

5.1.4. Transmitter

Introduction

This section provides a technical description of the transmitter circuits of the Main PCB. A circuit diagram of the whole system is provided in the Service Manual.

Functional Description

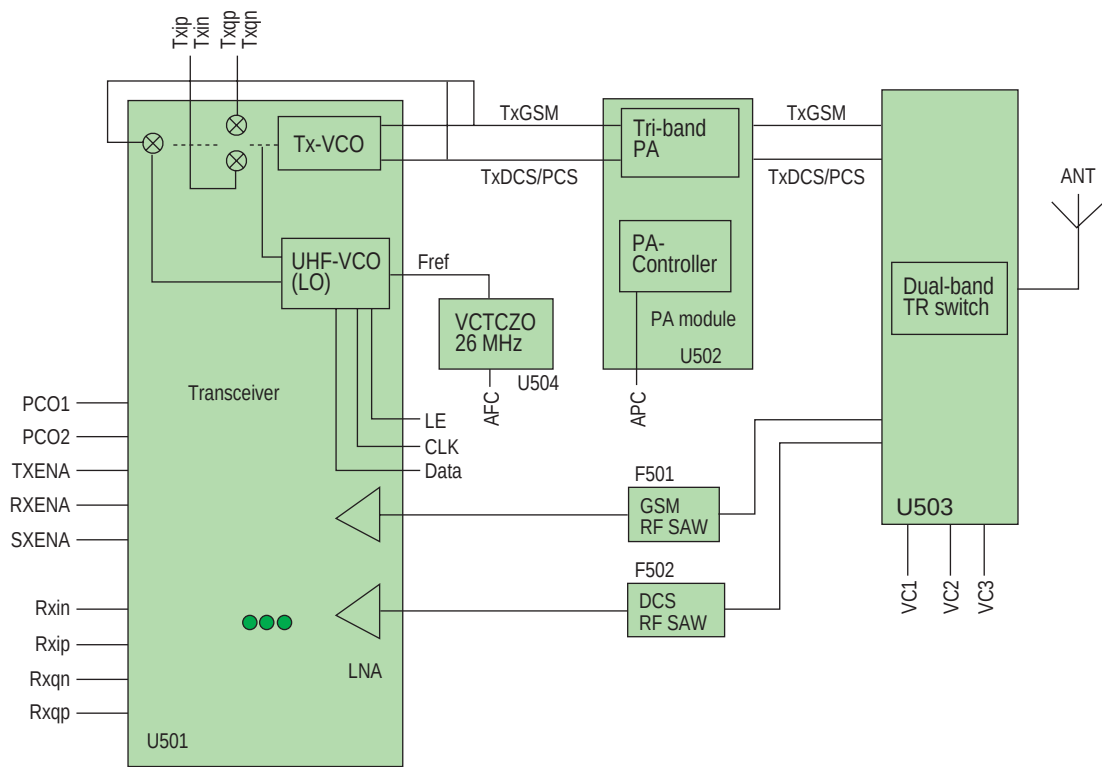


Figure 5.3. Functional block diagram

The handset employs a direct conversion receiver, i.e. it does not require intermediate frequency (IF) stages. A transceiver module is used which incorporates TXVCO and LO stages. The power amplifier stage (PA) is also contained in one module.

PCO1	PCO2	Select
0	0	No action
0	0	EGSM
1	0	DCS

TXENA	RXENA	SXENA	ACTION
1	0	1	TX
0	1	1	RX
X	X	0	RF off

TXENA	RXENA	SXENA	ACTION
1	0	1	TX
0	1	1	RX
X	X	0	RF off

5.2. Baseband Overview

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 40 Strings Melody Generation
- Power supply and battery management
- RF power control
- Synchronization
- Real time clock
- Camera

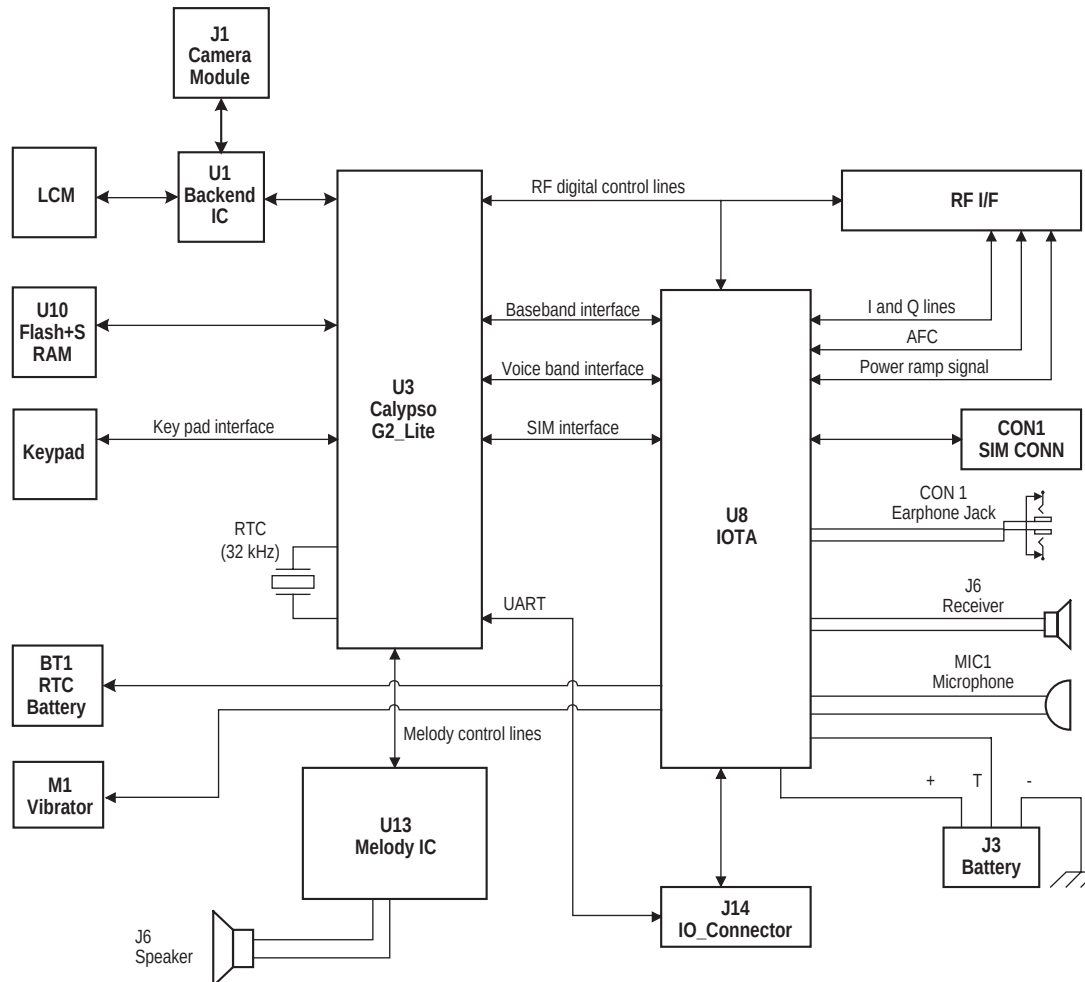


Figure 5.4. Baseband Block Diagram

The EB-X500 Baseband is built around a GSM chipset developed by Texas Instruments. One chip (Calypso_G2) carries out signal processing with DSP and CPU, and the other chip (IOTA) provides the analogue interface. The highly integrated nature of the chips means that each can contain a large number of functions.

5.3. Keypad

The Keypad has a 5 x 5 matrix, allowing 25 keys to be scanned. When a key is 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 20 ms intervals.

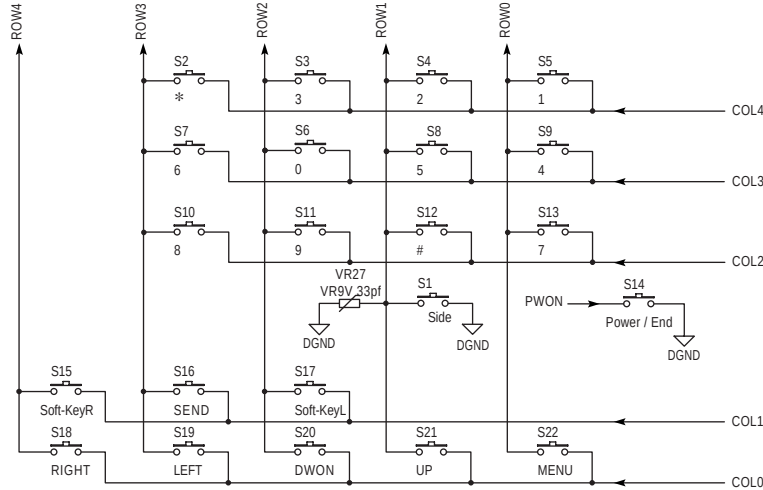


Figure 5.5. Keypad Circuit Diagram

Keyboard scanning is controlled by software. "Key pressed" is indicated by an interrupt, but "key released" is monitored by software.

5.4. Subscriber Identity Module (SIM)

To allow the use of both 1.8 V and 3 V SIM types, a SIM level-shifter module in the TWL3014 device interfaces the SIM signals (DBBSRST, DBBSIO, and DBBSCK) at a constant VRIO level from the DBB device with the SIM card (SIMRST, SIMIO, and SIMCK) at a 1.8V or 3V level depending on SIM type.

5.5. TPU

The TPU is a real time sequencer dedicate to the monitoring of GSM baseband processing. Working from an event table referring to a GSM TDMA time base, the TPU activates takes to control DSP peripheral with respect of the time constraints related to the GSM sequencing. To store the real time microinstructions of the sequencer, the TPU includes one 2 ports RAM of 1024 words of 16 bits with a dual page addressing capability.

TPU Timing output signal assignments of G2			
Name	PIN No.	Function	Connection
TSPACT 1	M14	PAENA	RF
TSPACT 2	L12	NC	N/A
TSPACT 3	L13	RXENA	RF
TSPACT 4	J10	TXENA	RF
TSPACT 5	K11	NC	N/A
TSPACT 6	K13	TRENA	RF
TSPACT 7:CLKX_SPI	K12	SXENA	RF
TSPACT 8:nMREQ	K14	PCSENA	RF
TSPACT 9:MAS1	J11	NC	N/A
TSPACT 10:nWAIT	J12	NC	N/A
TSPACT 11:MCLK	J13	NC	N/A

5.6. Memory

The ROM/RAM capacity of the X500 external memory U10 is 128-Mbit Flash + 64-Mbit SRAM.

5.7. Power Source

EB-X500 uses a 730 mAh Lithium-ion battery pack.

5.8. Battery Temperature (BATTEMP)

The battery packs used for EB-X500 contain a negative temperature coefficient thermistor. The basic parameters of the thermistor are 10 K Ω .

5.9. LCD

The LCD module consists of a LCD glass and driver chip connection to the Main PCB via a flexible PCB strip.

A 128 x RGB x 128 pixels graphical display is used which can display up to 16 characters x 6 rows-plus two rows of icons. It can accommodate Chinese and large character sets.

Features:

- Color Amorphous Silicon TFT 1.6inch display module for mobile phones, or handy electrical equipments.
- 128 x 128 pixels up to 65K colors.
- Transflective type
- TN mode.
- Line inversion mode
- 18bit CPU interface.
- Constructions:
- Display format: Color TFT transflective type
- Display mode: Normally White
- Display composition: 128 x RGB x 128 pixels
- Drive system: a-Si TFT active matrix
- Liquid Crystal: TN mode
- Back light: LED x 2

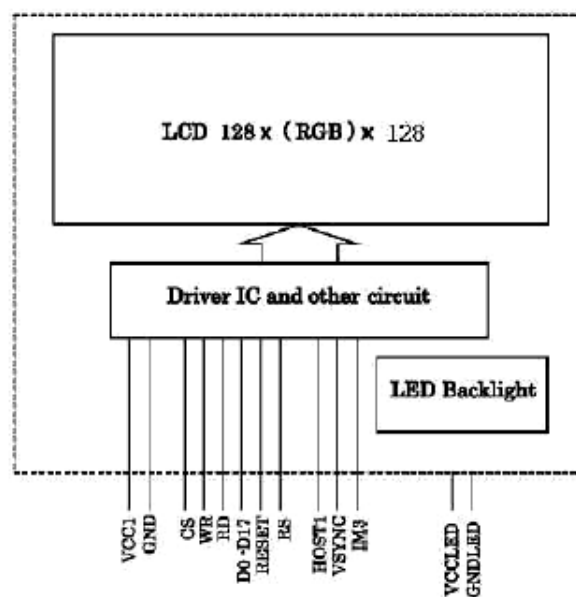


Figure 5.6. LCD Block Diagram

Dimension and weight

Item	Dimension	Unit
Module size	34.5 (W) X 39.1 (H) X 3.18 (D)	mm
Viewing area	30 (W) X 30 (H)	mm
weight	Typical	g

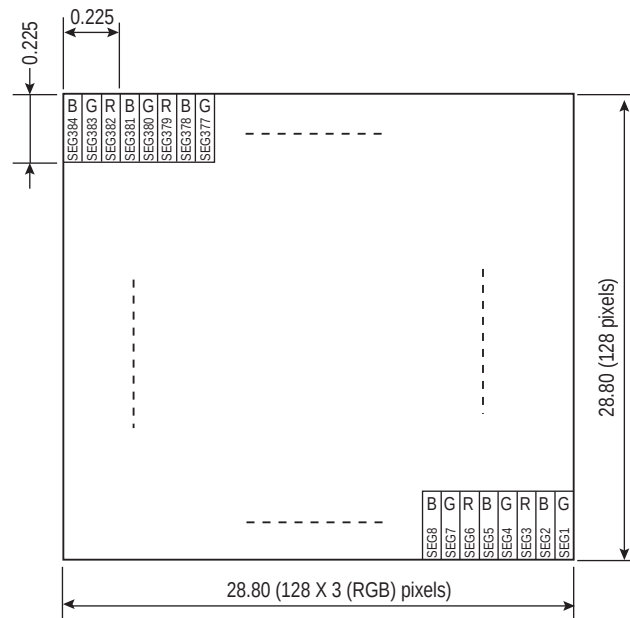


Figure 5.7. Pixel dimension

The LCD driver is controlled by setting the command register through the G2 u-wire interface and an I/O line, which distinguishes between command or data. To send data or a command to the display driver, the nCS2 line is used for chip select. LCDA0 (I/O 3) is set high to send data and set low to send commands.

5.10. Real Time Clock (RTC)

Clock Functions are provided by the Real Time Clock is built into G2. The module is synchronised by a 32.768 kHz crystal and has a backup power source provided by a button battery.

G2 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 calibration can provide adjustments $\pm 555.6\text{ppm}$ in 0.0085 ppm increments.

5.11. 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:

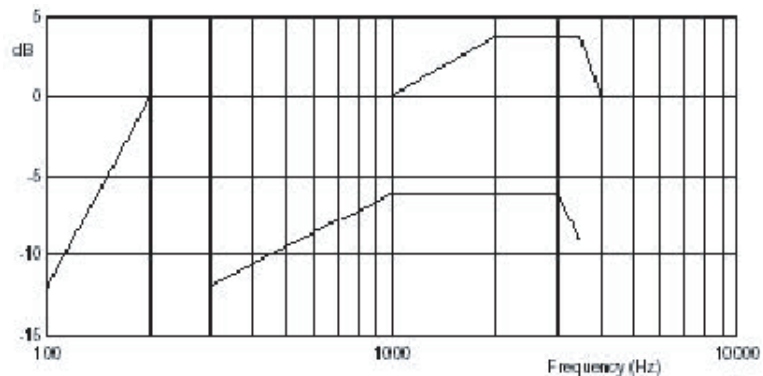


Figure 5.8. Handheld GSM Transmit Audio Frequency Response Mask

5.12. Receiver

5.12.1. Handheld Mode

Because IOTA is powered from a 2.85 V supply, a low impedance (dynamic) speaker must be used. The GSM Standard requires that the receiver audio frequency response must fit within the mask shown below:

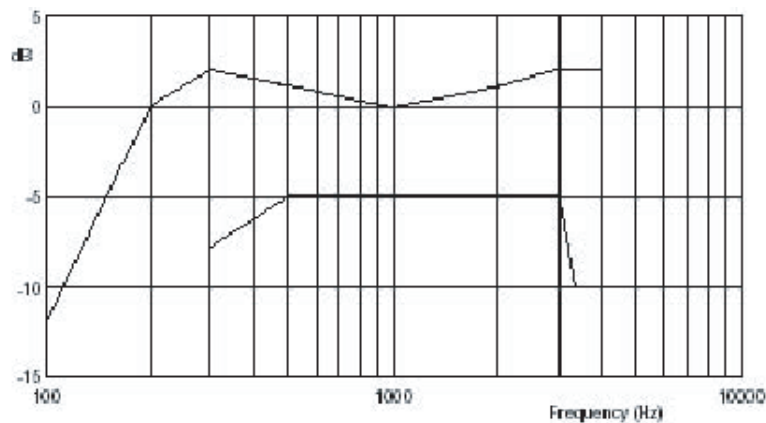


Figure 5.9. Handheld GSM Receive Audio Frequency Response

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

Volume Levels			
Volume Level	PGA	Volume	Total Gain
1	-6 dB	-12 dB	+2.21 dB
2	-3 dB	-18 dB	-1.12 dB
3	-6 dB	-18 dB	-4.32dB
4	-3 dB	-24 dB	-7.23 dB
5	-6 dB	-24 dB	-10.16 dB

5.12.2. Handsfree Mode

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

Ring tones and melodies are played via the speaker. The volume level of ring and melody tones are defined U13, and the voice volume is defined IOTA. Timer 1 in G2 is used to time the period between switching the ringing on and off to make the tone. For complex ringing tones, the speaker volume can be altered after each time-out of Timer 1.

5.13. Timers

There is a watchdog timer and two 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 bits register define the timer clock duration.

The watchdog timer receives a 928 kHz clock signal from the G2 clock module. A combination of pre-scaler and timer register gives a time range of 1.078 μ s to 9.039 s. The general-purpose timers receive a 812.5 kHz clock signal.

Timer range is between 2.4615 μ s and 20.649 s.

Timer 1 Function = Buzzer Timer
 Setting = Tone frequency

Timer 2 Function = N/A
 Setting = N/A

The timer unit registers are as follows:

5.14. UART

G2 has two UART ports, UART modem and UART / IrDA. The UART / modem port is used for optional accessories. The UART / IrDA port is used for software debug purposes.

UART / MODEM PORT ASSIGNMENT			
G2 SIGNAL	PIN No.	FUNCTION	I/O
TX_MODEM	B9	Transmit Data	O
RX_MODEM	A9	Receive Data	I
DSR_MODEM	D9	Data Set Ready	I
RTS_MODEM	E8	Request To Send	O
CTS_MODEM	C9	Clear To Send	I

5.15. Power Supplies

5.15.1. Introduction

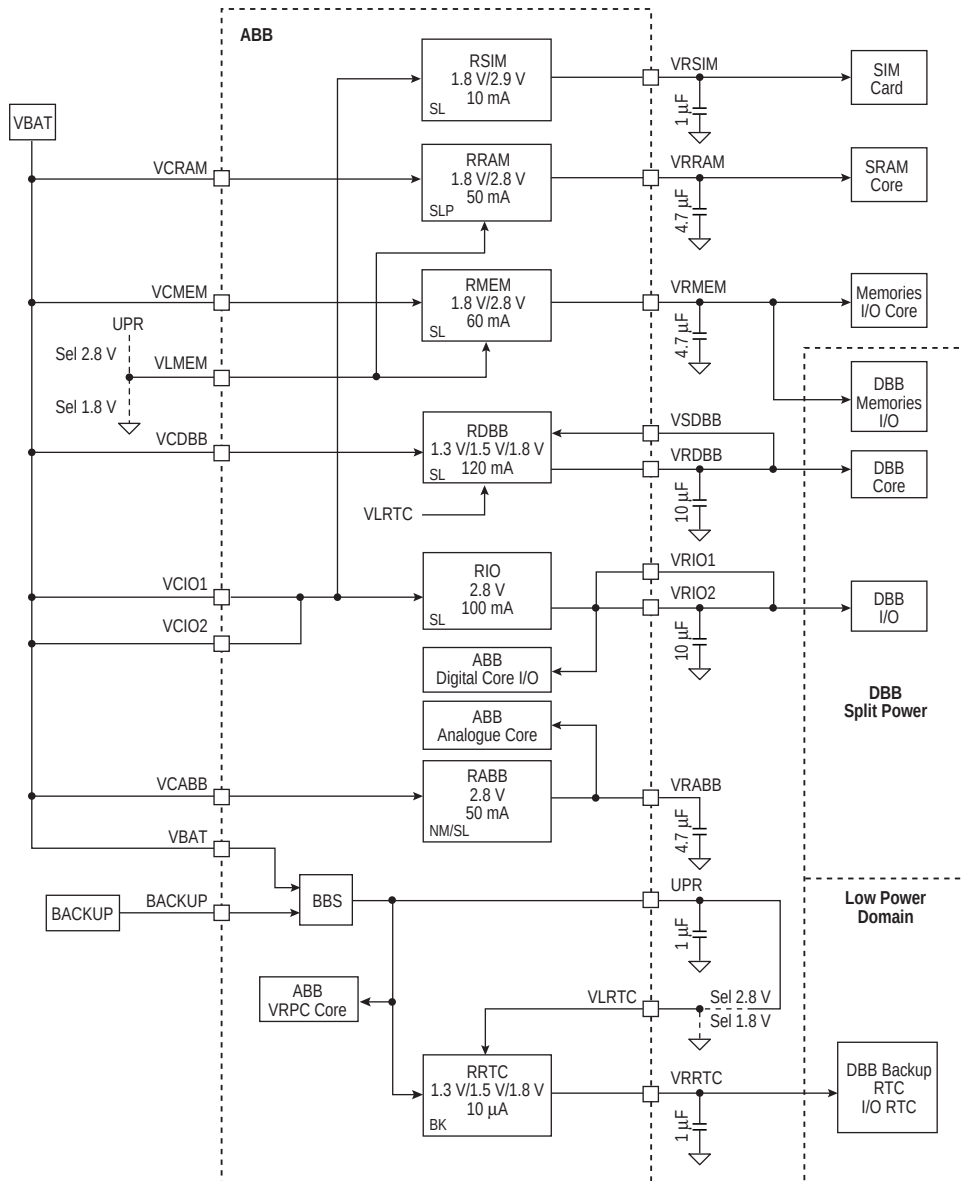


Figure 5.10. Power Management Block Diagram

The Power Management Block consists of six parts as follows:

1. Power Source
2. Power On/Off Control
3. Power Source Failure detection
4. Voltage Regulation
5. Battery Charging & Monitoring
6. Accessory Control

5.15.2. Power Source

The battery comprises a single Lithium-Ion (Li-Ion) cell with a nominal voltage of 3.7 V and 730 mAh capacities. This type of battery has an advantage in weight and size over Nickel Metal Hydride (Ni-MH) cells.

5.15.3. Power ON/OFF Control

The power on sequence can begin when VBAT > 2.8 V or VBACKUP > 2.8 V. In this state IOTA (U8) is in Power On Condition and internal supply UPR is active. RESPWRONZ signal to G2 (U3) is released high.

If IOTA is in the Power On Condition, one of following conditions starts the Power Up sequence.

- Power key is pushed for more than 30 ms.
- RPWON input goes high to low for more than 30 ms (e.g. accessory is connected or external RTC signal is activated).
- EXTPWR voltage is higher than (VBAT+0.4) V.
- G2 RTC ALARM signal goes high.

The Power Up sequence is as follows:

1. Local Oscillator OSCAS is started (if not already active for debouche operation).
2. IOTA internal band gap reference is activated.
3. If VBAT < 3.2 V after a timeout of 51.2 ms OSCAS is stopped and Power Up sequence is aborted.
4. Charge pump is enabled.
5. All regulators are enabled.
6. Power Up status bit and internal Reset bits are set.
7. ONNOFF signal is set to activate G2.
8. ARM in G2 starts running software using 32 kHz clock, and also starts 13 MHz clock.

The following Power Down sequence can only be started by G2 setting the DEVICE_OFF bit in IOTA or, in emergency case, when VBAT < 2.7 V (or VBAT < Vbackup & VBAT < 2.8 V):

1. If emergency case INT1 is set low by IOTA.
2. IOTA starts an internal 150 μ s watchdog timer to allow G2 to shutdown.
3. On nOff signal is reset to deactivate G2.
4. All regulators are disabled.
5. IOTA internal band gap reference is deactivated.
6. OSCAS is stopped.

5.15.4. Voltage Regulation

Each power source is specified as follows.

- VRDBB: Power supply for G2
 - Voltage 1.5 V
 - Current 120 mA max
 - Dropout 100 mV max (load max)
- VRRAM: Power supply for SRAM and G2
 - Voltage 2.8 V
 - Current 50 mA max
 - Dropout 100 mV max (load max)
- VRMEM: Power supply for flash memory, LCD and G2
 - Voltage 2.8 V
 - Current 60 mA max
 - Dropout 100 mV max (load max)
- VRIO: Power supply for Melody and G2
 - Voltage 2.8 V
 - Current 100 mA max
 - Dropout 100 mV max (load max)
- VRABB: Power supply for G2
 - Voltage 2.8 V
 - Current 50 mA max
 - Dropout 100 mV max (load max)
- VRSIM: Power supply for SIM
 - Voltage 2.85 V
 - Current 10 mA max
 - Dropout 100 mV max (load max)

- VRRTC: Power supply for SRAM and G2
Voltage 1.8 V
Current 30 μ A max
Dropout 100 mV max (load max)

5.16. Battery Charging and Monitoring

5.16.1. Charging Current

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

Icon	Status Battery Pack	
3 bar	3.795 V <	
2 bar	3.727 V <	< 3.795 V
1 bar	3.619 V <	< 3.727 V
0 bar (Low voltage alarm)	3.53 V <	< 3.619 V

The phone will be power down two minutes after generating a Low battery Alarm. The CPU within the phone controls Battery charging.

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 not greater than the maximum charge current for any battery option must be provided by the external power source.

5.16.2. 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.

5.17. Camera Module

The handset features an integrated VGA (640 x 480 pixels) size CMOS camera, comprising an OV 7649 sensor and Genius GA-8228A lens.

Sensor OV7649 includes :

- Image Sensor Array (640 x 480 resolution)
- Timing Generator
- Analog Processing Block
- A/C Converters
- Output Formatter
- Digital Video Port
- SCCB Interface

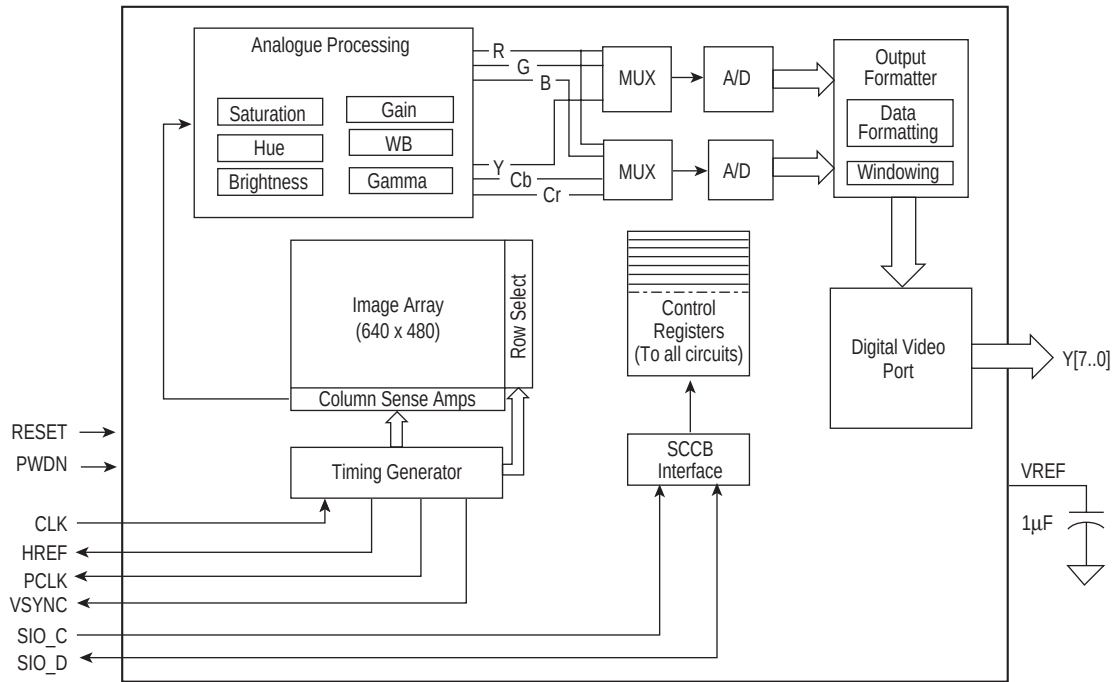


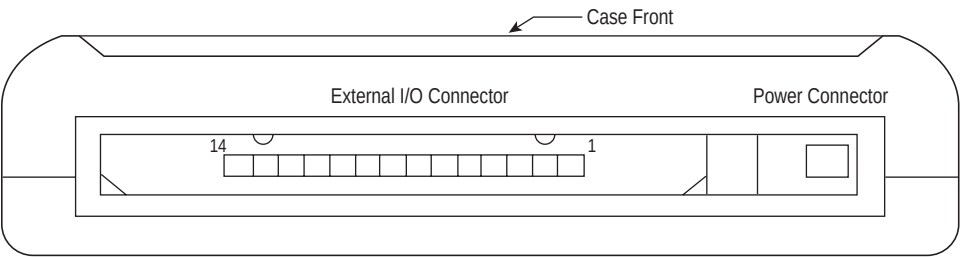
Figure 5.11. OV7649 Functional Block Diagram

GA-8228A lens

Optical	
Lens	Genius 8228A
Composition	2 Plastic+ 1 Glass , 3 elements , IR Coating
Effective Focal Length	3.73 mm
BFL	1.98 mm
F No.	2.4 (Infinite)
View Angle	67°
Distortion	-0.92%
Relative illumination	54% (> 70% after backend compensation)
Module Dimension	8 x 8 x 6.12mm (Approximation)
Weight	0.7g (Approximation)
Resolution 300	TV Line (Center) 250 TV Line (Corner)

5.18. Interfaces and Test Points

5.18.1. External I/O



No.	Name	H/H ↔ EXT	Function	H/H Circuit
1	TDI	←	Data In	
2	TX_IrDA	→	Transmit data	
3	TCK	→	Clock	
4	RX_IrDA	←	Receive data	
5	CTS	←	Clear to send	
6	RXD	←	Receive data	
7	TXD	→	Transmit data	
8	RTS	→	Request to send	
9	DSR	←	Data set ready	
10	TMS	→	TMS	
11	ACC_PWR	←	Power Supply	
12	VACCID	←	Analogue Input	
13	TDO	→	Data out	
14	GND	—	Power supply and digital signal ground	

5.18.2. LCD Module Interface Signals

No.	Name	PCB ↔ LCD	Function	Connection
1	VCC1	→	IC Power supply	DC 2.8 V
2	/CS	→	Chip Select at "L". Selected and Accessible	SPCA552A#C2
3	WR	→	Write	SPCA552A#D3
4	RD	→	Read	SPCA552A#C1
5	GND	—	Power supply ground	DGND
6	D0	→	Data bus	No Connect
7	D1	→	Data bus	SPCA552A#D1
8	D2	→	Data bus	SPCA552A#E1
9	D3	→	Data bus	SPCA552A#E2
10	D4	→	Data bus	SPCA552A#E3
11	D5	→	Data bus	SPCA552A#F1
12	D6	→	Data bus	SPCA552A#F2
13	D7	→	Data bus	SPCA552A#F3
14	D8	→	Data bus	SPCA552A#G1
15	D9	→	Data bus	No Connect
16	D10	→	Data bus	SPCA552A#G2
17	D11	→	Data bus	SPCA552A#H1
18	D12	→	Data bus	SPCA552A#J1
19	D13	→	Data bus	SPCA552A#H2
20	D14	→	Data bus	SPCA552A#J2
21	D15	→	Data bus	SPCA552A#G3
22	D16	→	Data bus	SPCA552A#H3
23	D17	→	Data bus	SPCA552A#J3
24	/RESET	→	System Reset	SPCA552A#G6
25	RS	→	Select Register at "H". Index/status Control at "L".	SPCA552A#D2
26	GND LED	—	Power Supply Ground for LED	68 Ω to GND
27	HOST1	←	IM1. 80 system at "H", 68 system at "L".	DC 2.8 V
28	VCC LED	→	Power Supply for LED	DC 2.8 V
29	YSYNC	→	Frame synchronizing signal	DC 2.8 V
30	IM3	→	18 or 19 bits interface at "H" 16 or 8 bits interface at "L"	DGND

5.18.3. Camera Module Interface

No.	Name	OV ⇔ PCB	Function	Connection
1	GND	—	System Ground	DGND
2	HREF	➡	HREF Output	SPCA552A#A1
3	VSYNC	➡	Vertical Sync Output	SPCA552A#B2
4	PWDN	⬅	Input (I) Power Down Mode Selection:	220 KΩ to DGND
5	PCLK	➡	Pixel Clock Output	SPCA552A#B1
6	AVDD2V5	⬅	Analogue Power Supply	DC 2.5 V
7	DVDD3V3	⬅	Analogue Power Supply	DC 2.5 V
8	SIO_D	⬅ ➡	SCCB Serial Interface Data I/O	SPCA552A#A2
9	XCLK	⬅	Crystal Clock input	SPCA552A#C3
10	SIO_C	⬅	SCCB Serial Interface Clock Input	SPCA552A#B3
11	Y0	➡	YUV Video Component Output bit [0]	SPCA552A#C6
12	Y1	➡	YUV Video Component Output bit [1]	SPCA552A#B6
13	Y2	➡	YUV Video Component Output bit [2]	SPCA552A#A6
14	Y3	➡	YUV Video Component Output bit [3]	SPCA552A#A5
15	GND	—	System Ground	DGND
16	Y4	➡	YUV Video Component Output bit [4]	SPCA552A#B5
17	Y5	➡	YUV Video Component Output bit [5]	SPCA552A#C5
18	Y6	➡	YUV Video Component Output bit [6]	SPCA552A#A4
19	Y7	➡	YUV Video Component Output bit [7]	SPCA552A#B4
20	RESET	⬅	Clear all registers and resets to their default value.	SPCA552A#C4
21	LED+	⬅	For LED+	DC 8.2 V
22	LED-	—	For LED-	FLED-

5.18.4. SIM Interface

Pin	Signal
1	SIM_CLK
2	SIM_IO
3	SIM_RST
4	SIMPWR
5	SIMPWR
6	Ground

5.18.5. Battery Connector

Pin	Signal
1	VBAT
2	BAT_TEMP
3	Ground

5.18.6. Test Points

TP No.	Signal Name
Main PCB	
TP1	XTALOUT
TP2	Nbscan
TP3	CLK32K_OUT
TP4	RPWON
TP5	TESTV
TP6	BS_TDO
TP7	RESPWRONZ
TP8	SWITCHONOFF
TP9	CLK13M_OUT
TP10	PWON
TP11	VRTC
TP12	VCHG
TP13	RTS
TP14	CTS
TP15	MMI_INT
TP16	RX
TP17	TX
TP18	DSR
TP19	TDI
TP20	TDO
TP21	TCK
TP22	TMS
TP23	VBAT
TP24	BATTEMP
TP25	RnW
TP26	nCS2
TP27	MSCI_FSY
TP28	MSCI_CLK
TP29	MSCI_TXD
TP30	MSCI_RXD
TP31	TPU-WAIT
TP32	BYPASS
TP33	GPIO2
SUB PCB	
TP34	SP+
TP35	SP-
TP36	EARP
TP37	EARN

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

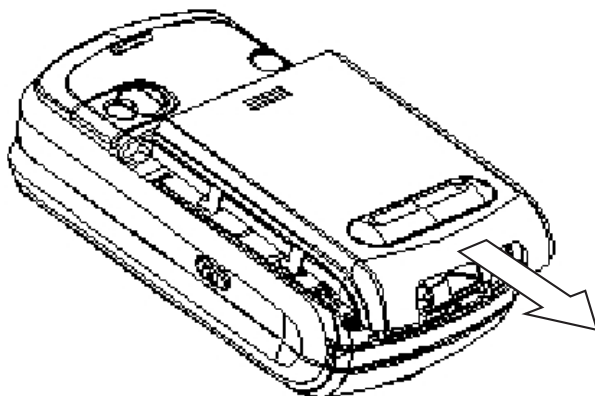
A QUICK RELEASE SKIN CONTACT DEVICE WITH A FLEXIBLE CORD, WHICH HAS AN INTEGRAL SAFETY RESISTOR OF BETWEEN 5.2 k Ω AND 1.2 M Ω , SHALL BE USED.

Containers

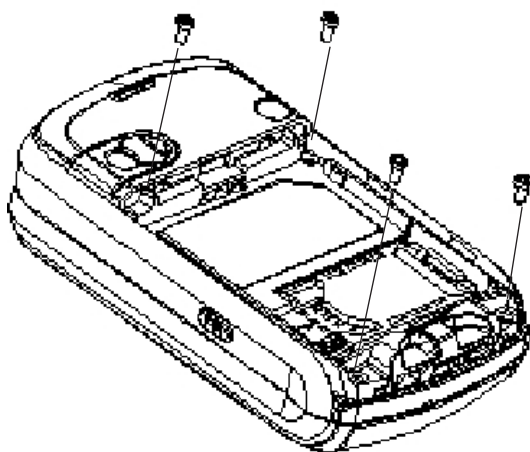
All containers and storage must be of the conductive type.

6.2. Disassembly

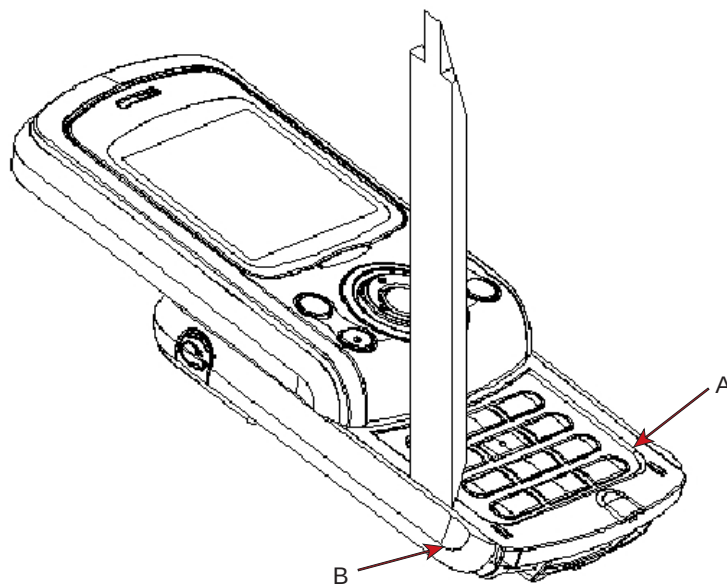
1. Place thumbs at outer edge of battery cover, press down then slide the battery cover toward to the bottom of the phone.



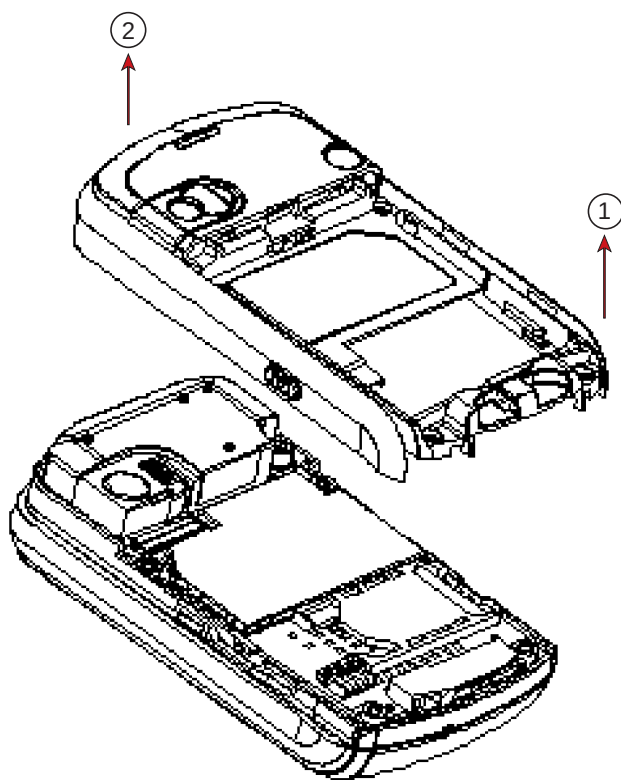
2. Use the T5 screwdriver to remove the four case screws located inside the battery compartment.



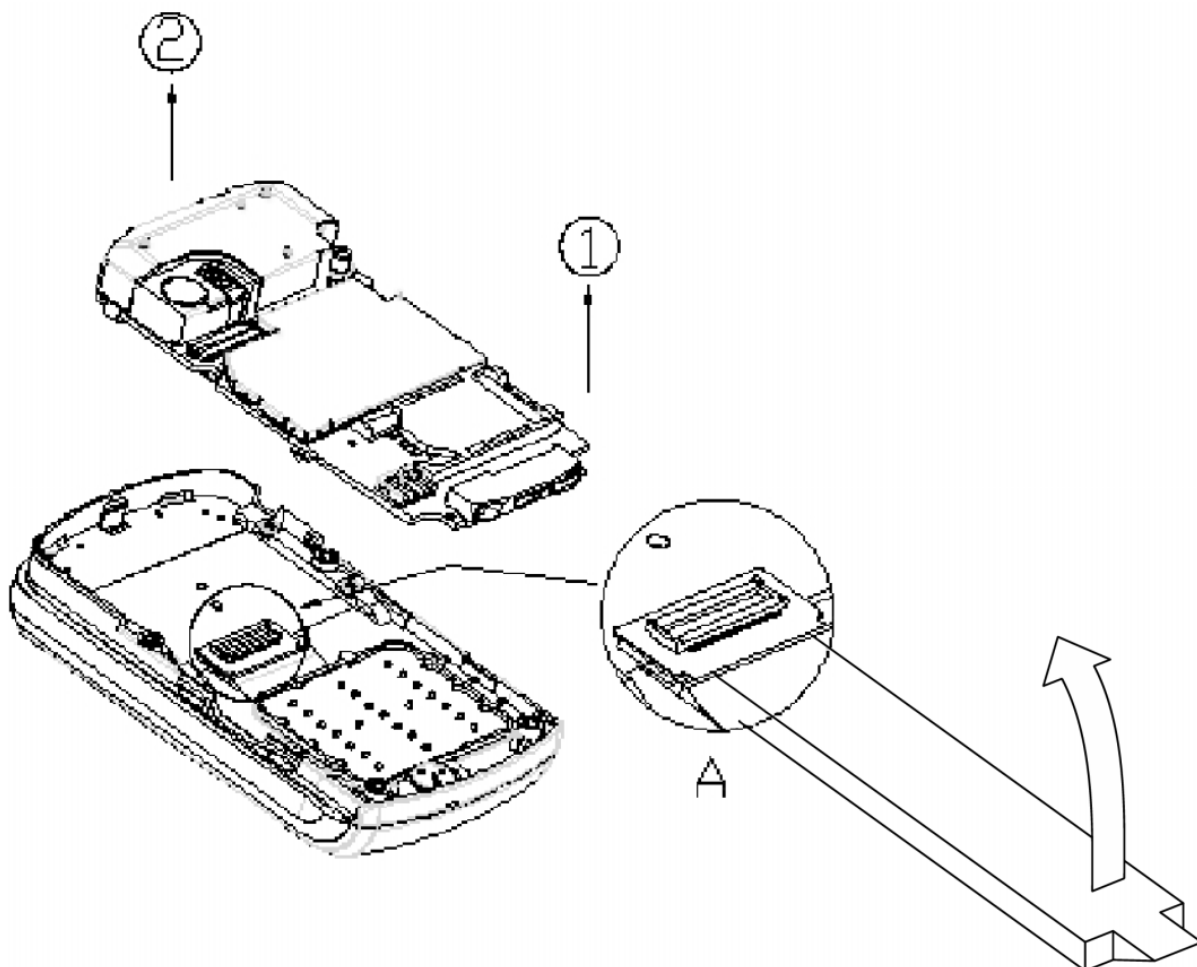
3. Slide open handset and carefully insert the case separation tool into the gap between keyboard upper case A and keyboard lower case B. Lift up the tool along the gap and bend it outside to unhook the keyboard upper case from keyboard lower case.



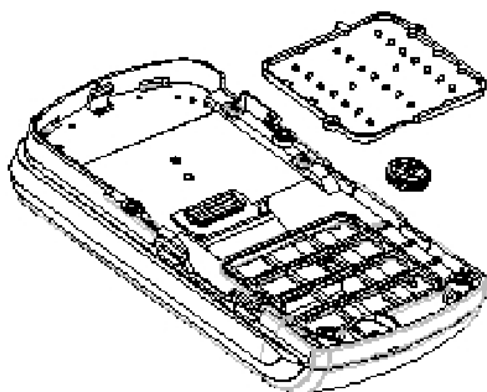
4. Slide close the handset and the gently lift up the case from ① first and ② second.



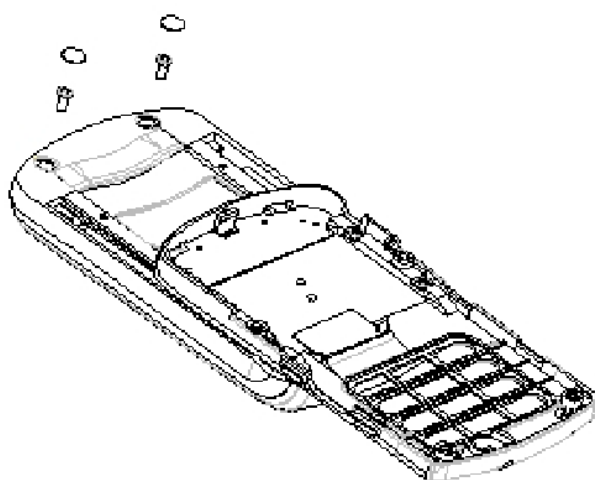
5. Use case separation tool to unhook the hook in both side of main PCB then lift up the PCB assembly from ① and ②. Use case separation tool to remove the board-to-board connector.



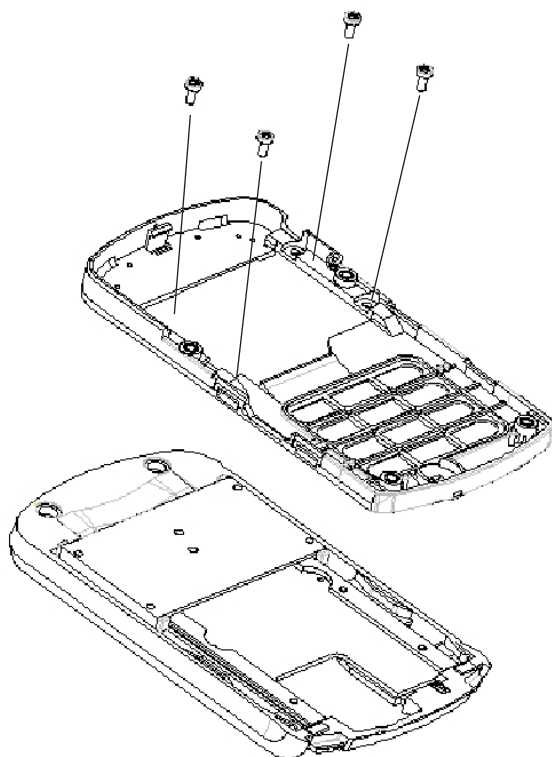
6. Remove the keypad and microphone.



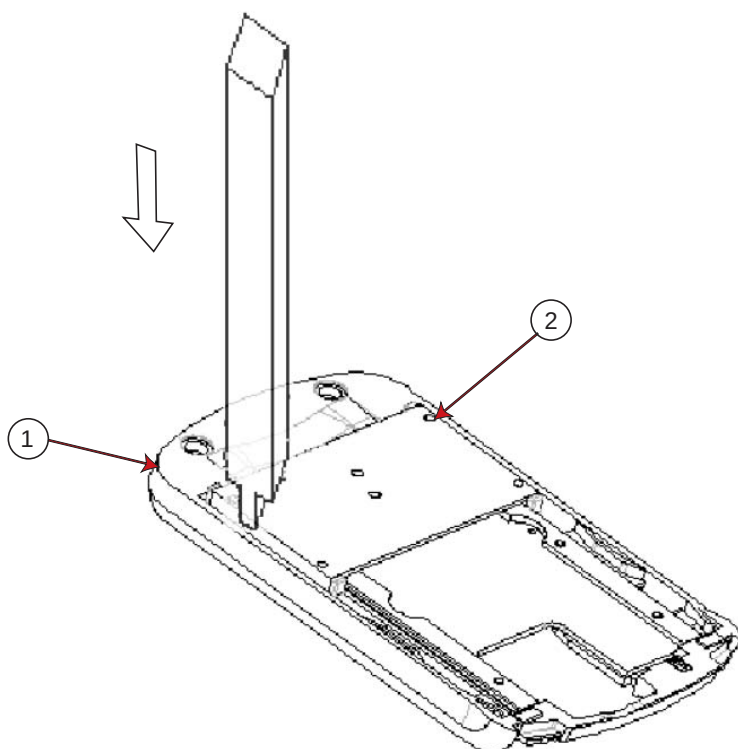
7. Remove the two screw cap and discard. Use the T5 screwdriver to remove the two screws of display lower case.



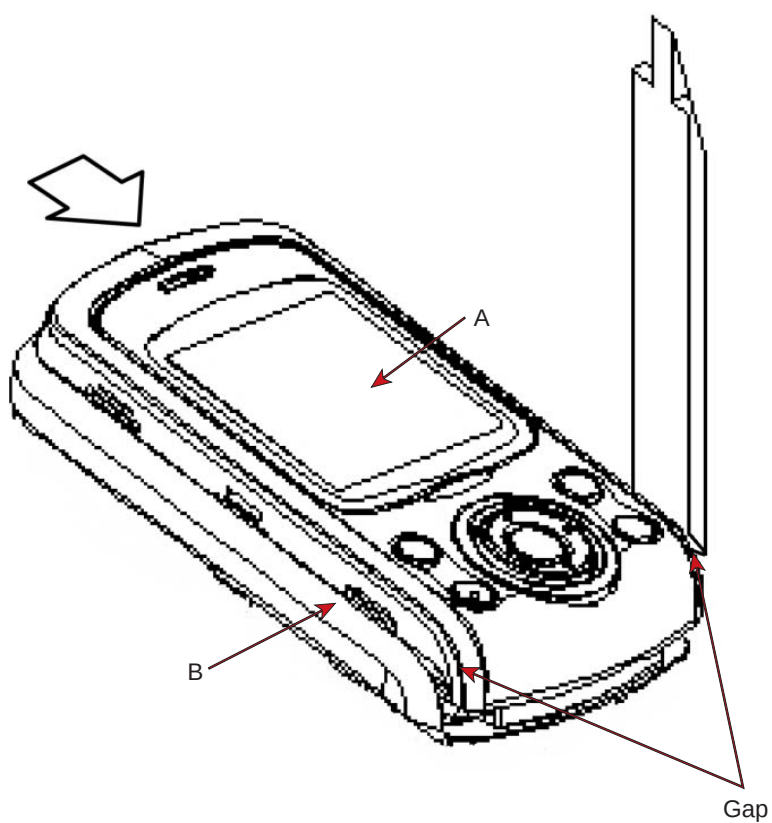
8. Use T5 screwdriver to remove the four screws located in keyboard upper case.



9. Use separation tool insert the gap of the display lower case and then push to the direction of the arrow.

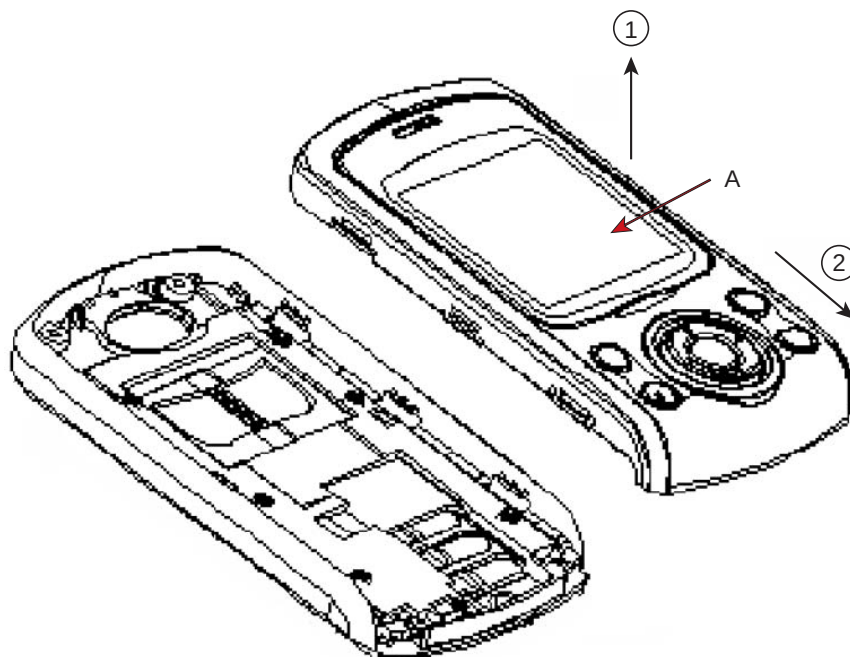


10. Slide close the handset and insert case separation tool into the gap between display upper case A and display lower case B from front side.



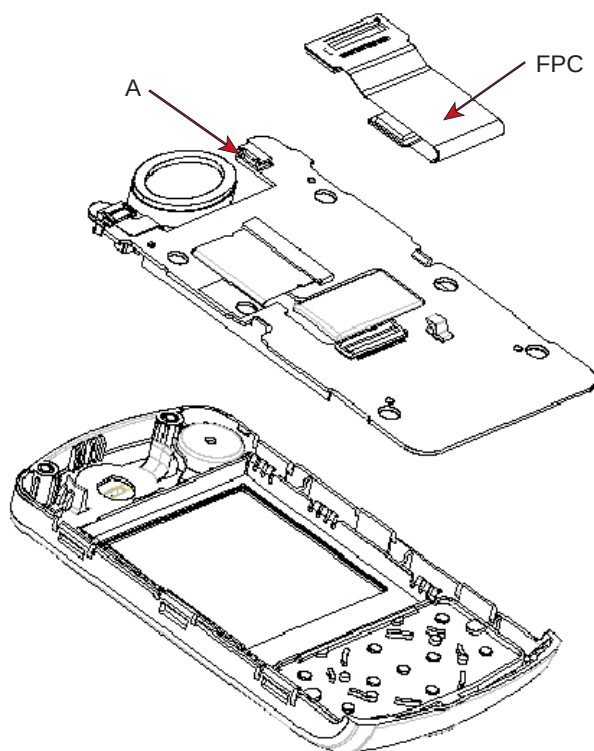
11. Separate the display upper cover and display lower case.

Caution : Separate carefully to prevent damage to the connector or FPC.

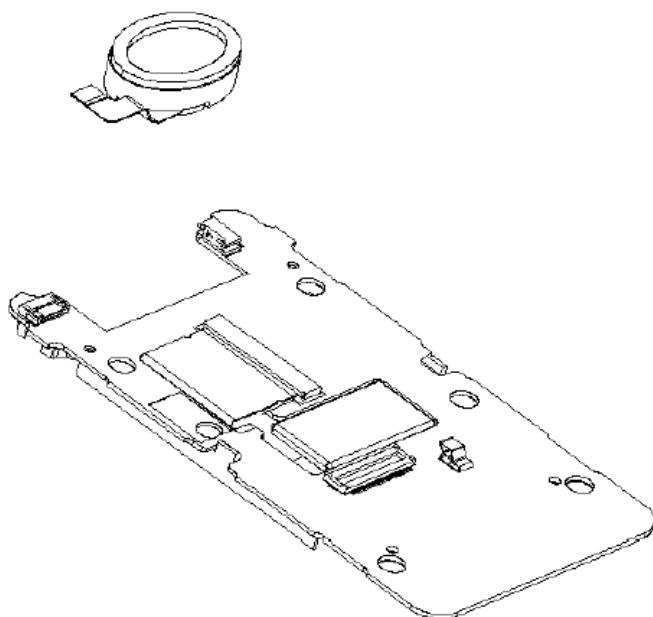


12. Disconnect the vibrator plug A from the MMI board.

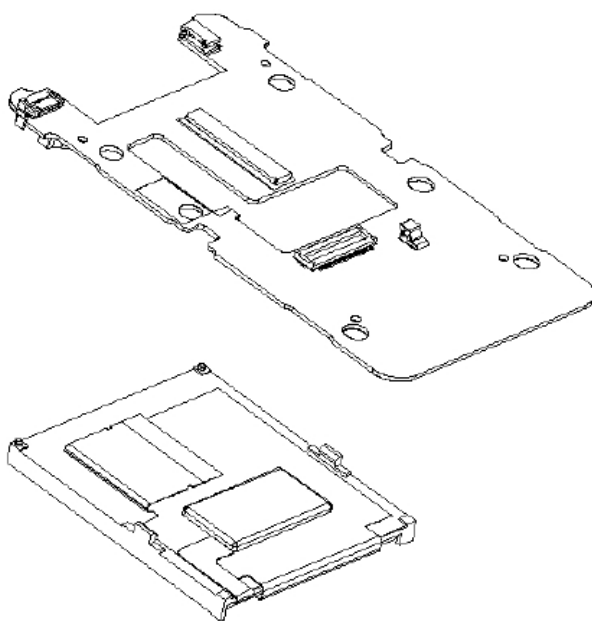
13. Remove the FPC from MMI board and then remove the MMI board from display upper case.



14. Remove the speaker/receiver from MMI board.



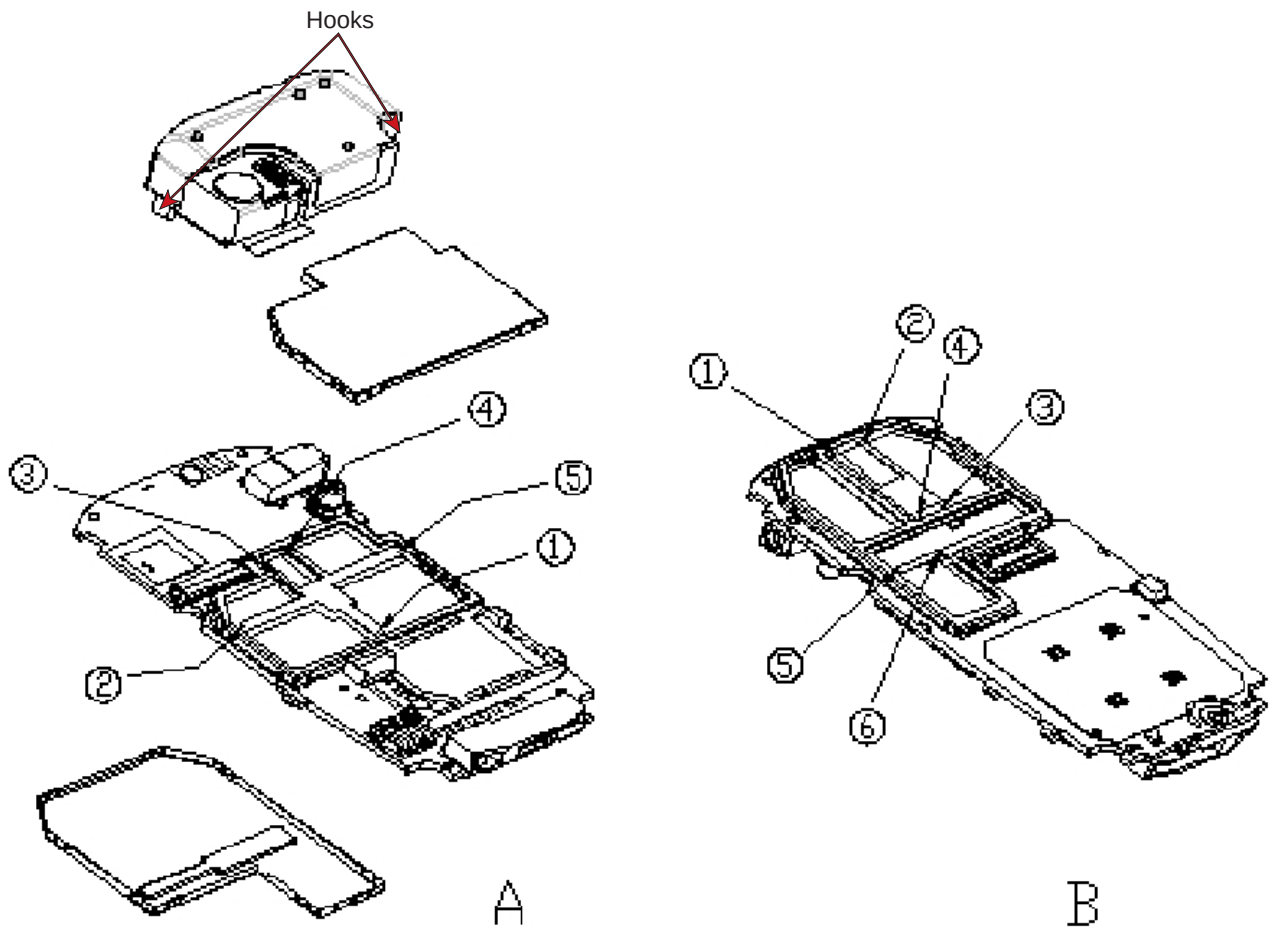
15. Remove LCD Module from MMI PCB.



16. Unhook the two hooks and then remove the antenna box and shield case from main board.

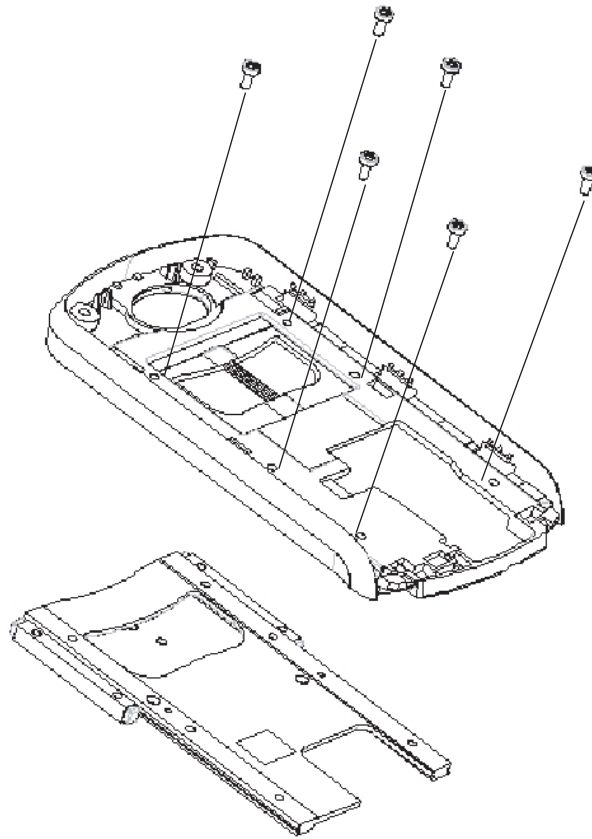
A. Base band area shield case cut point ① - ⑤.

B. RF area shield case cut point ① - ⑥.

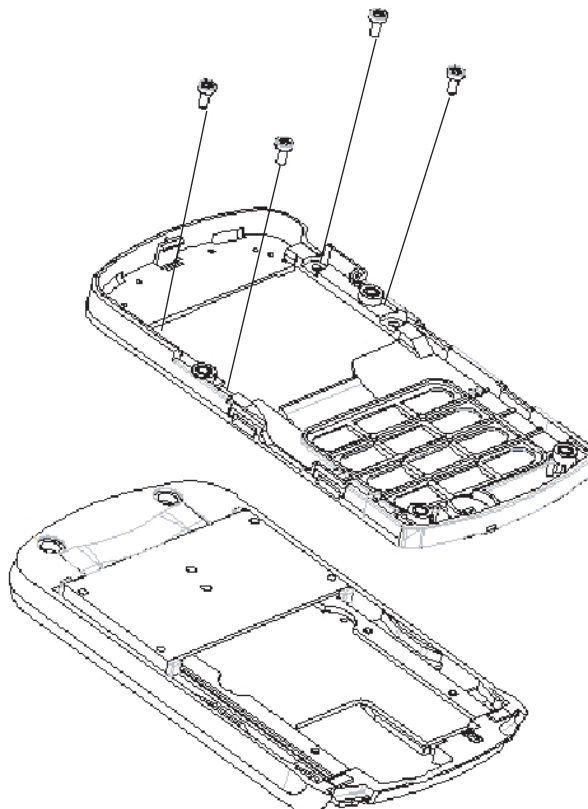


6.3. Reassembly

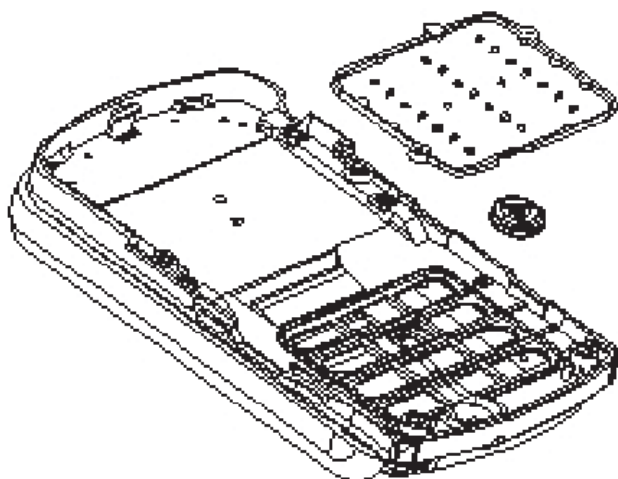
1. Use T5 screwdriver to screw the six screws located inside the display lower case and slide hinge.



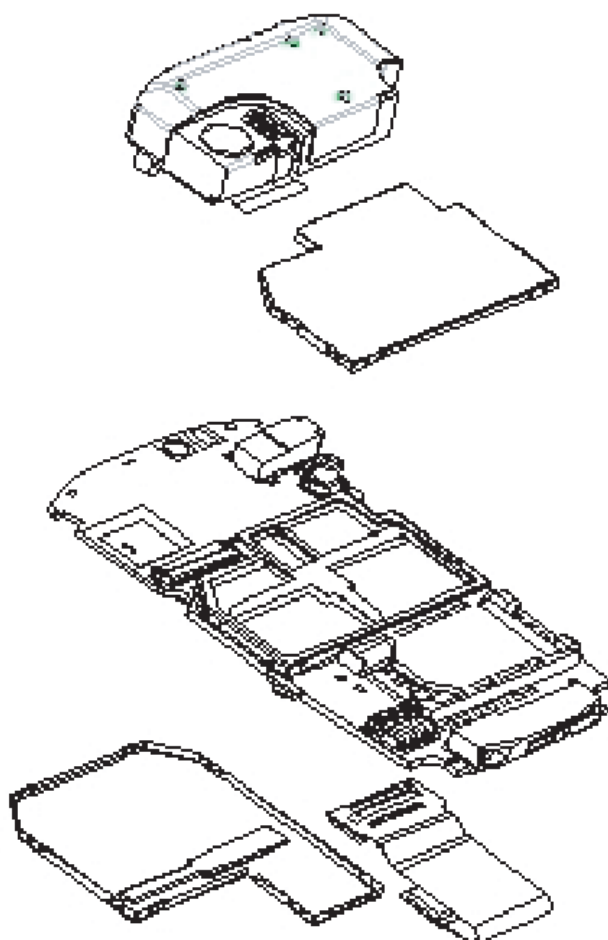
2. Use T5 screwdriver to screw the four screws located inside the keyboard upper case and slide hinge.



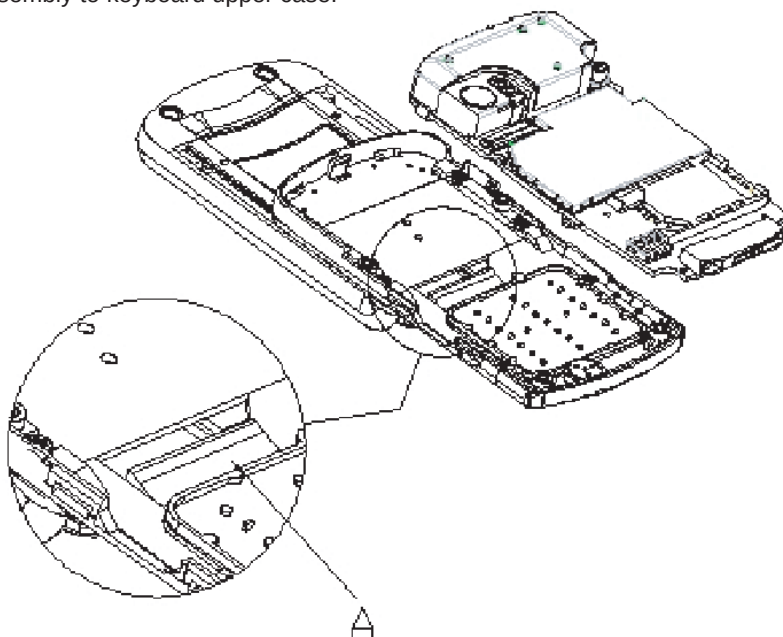
3. Assemble number keypad and microphone to keyboard upper case.



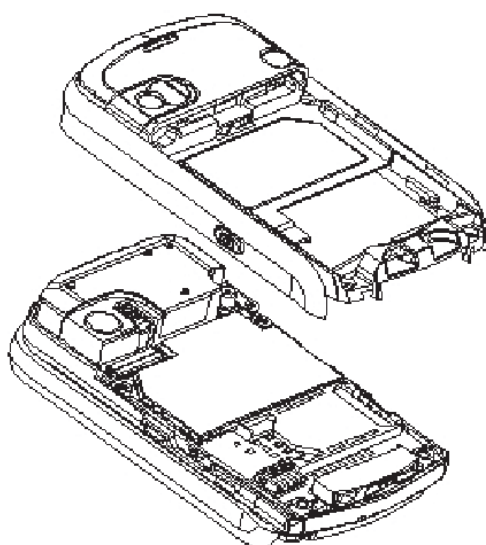
4. Assemble antenna assembly, two shielding case and FPC to main board.



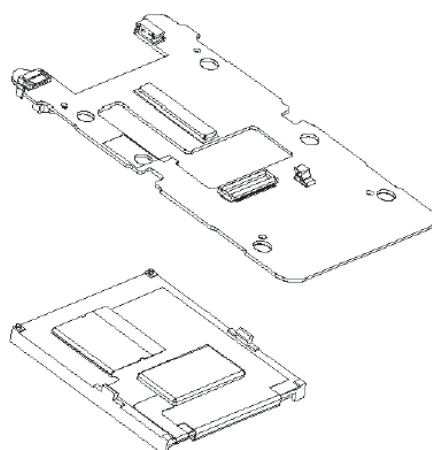
5. Slide opens the handset. Insert the FPC through the keyboard upper case and display lower case (Area A). Then assemble the main board assembly to keyboard upper case.



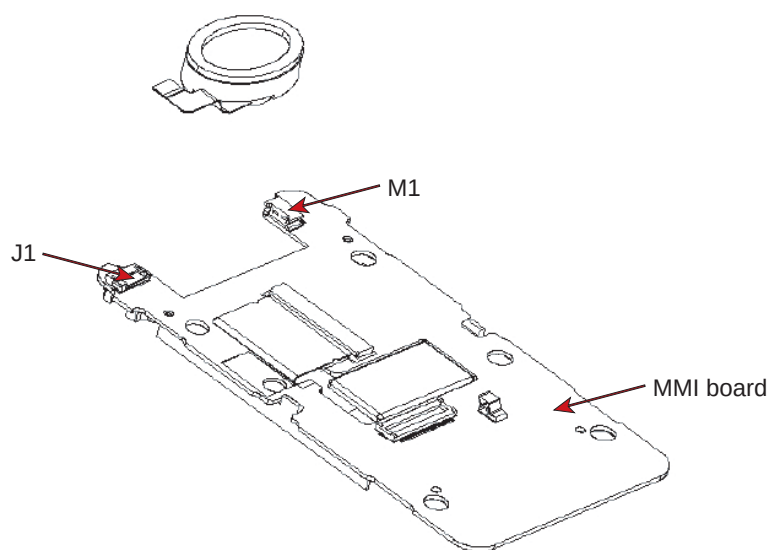
6. Assemble keyboard lower case to keyboard upper case.



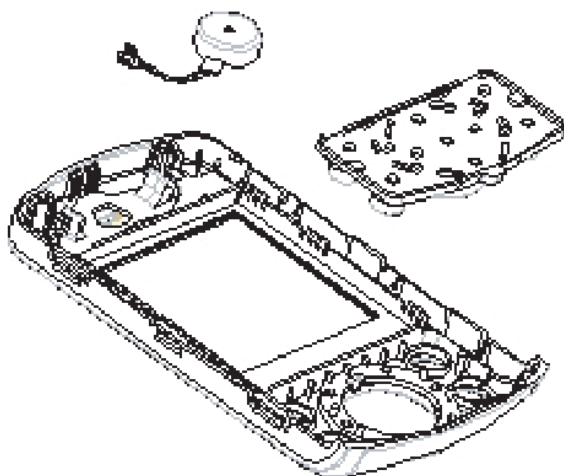
7. Assemble LCM to MMI board.



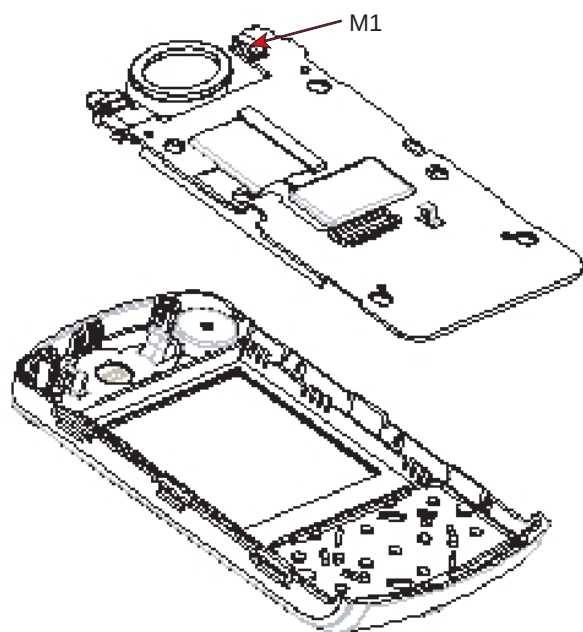
8. Connect the Mulch speaker M1 on the MMI board.



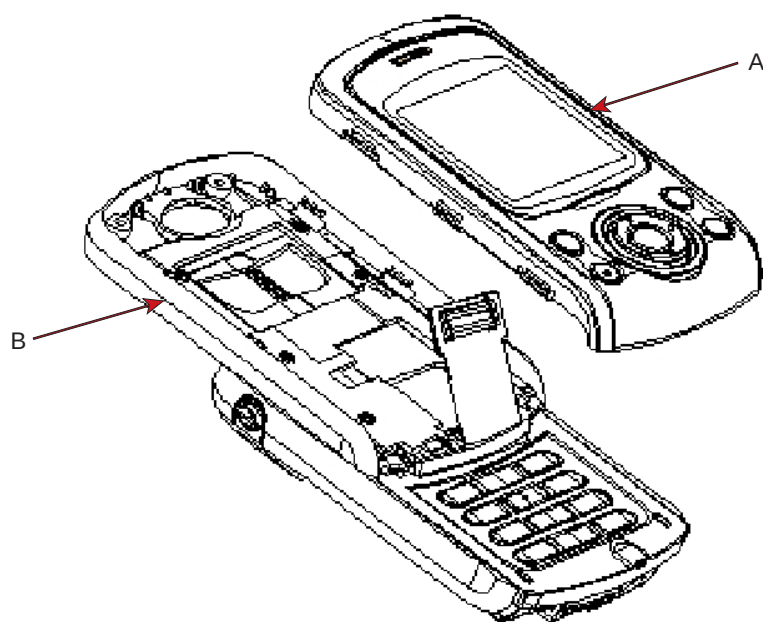
9. Attach the vibrator and keypad into the display upper cover.



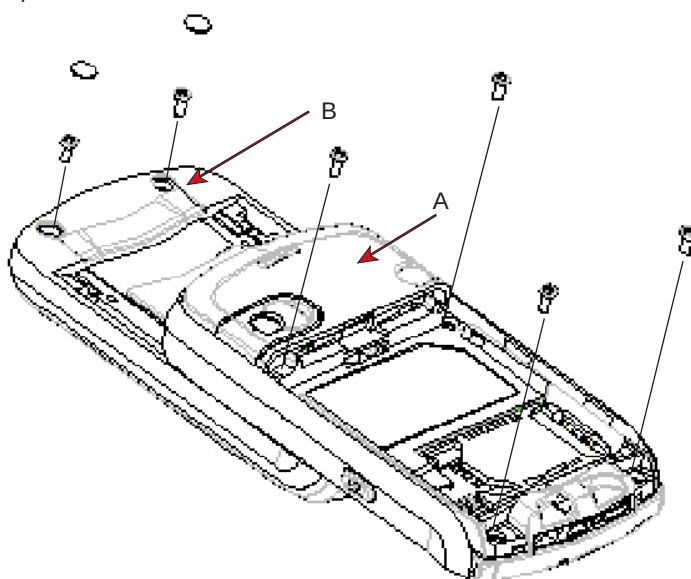
10. Attach the MMI board into the display upper case and then connect vibrator plug M1 to the MMI board.



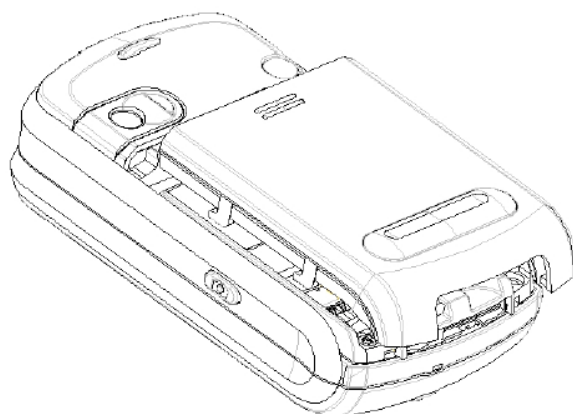
11. Connect FPC board to the MMI board and then assembly the display upper case A with the display lower case B.



12. Insert the four screws located keyboard lower case A and two screws located display lower case B. Then adhere two screw cap.



13. Push and close the battery cover.



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 Procedures 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 SOLDER : 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 ± 10 °C (700 ± 20 °F).

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

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

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 1800 MHz).

Personal Computer (PC)

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

The Microsoft Windows®, **98SE, 2000 or XP** operating system must be installed on the PC.

A Universal Serial Bus (USB) port must be installed on the PC if automatic RF calibration is to be performed.

Power Supply

A power supply is required to provide to the PCB via the PCB Repair Jig while a second unit is required to provide power baseband calibration and unit testing.

Dummy Battery (Part No. PS2DUMBAT)

The Dummy Battery via power supply equipment to provide stable power for the phone. It is required for software download.

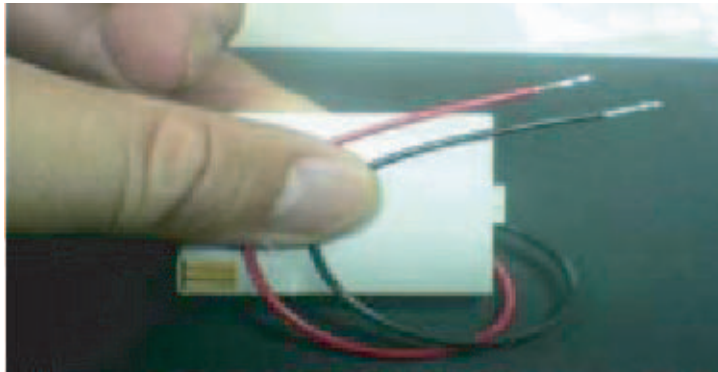


Figure 7.1. : Dummy Battery

PCB Repair Jig (Part No. PS2PCBAJIG)

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



Figure 7.2. : 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 0.7 dBm (GSM 1800)**.

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

Extension Board (Part No. PS2PCBPANEL)

The Extension Board makes the necessary connections between the Main board and Sub board.



Figure 7.3. : Extension Board

RF Test Jig (Part No. PS2G66RFJIG)

The RF Test Jig provides the connections between the test equipment and the phone for unit testing. It also provides power supply for the phone.

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



Figure 7.4. : RF Test Jig

RF Cable (Part No.73PV104001W)

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



Figure 7.5. : RF Cable

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 Jig to the service equipment. Cable losses for the RF connection are **0.5 dBm (GSM 900) and 0.7 dBm (GSM 1800)**.

Data Cable (Part No.733PS20301W)

The data cable is used for calibration and downloading software.



Figure 7.6. : Data Cable

Power Cable (Part No. 3WZ001130AAA)

The power cable provides the necessary connections between the PCBA repair jig / dummy battery and external power supply.



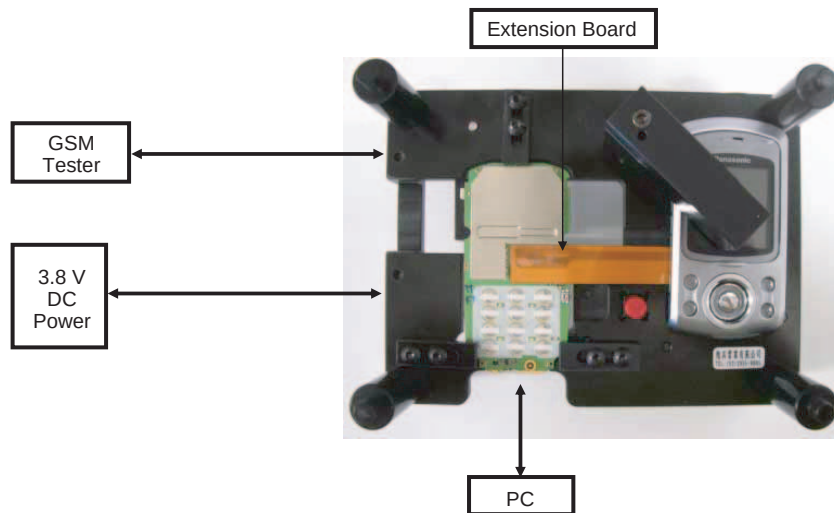
Figure 7.7. : Power Cable

GSM Tester

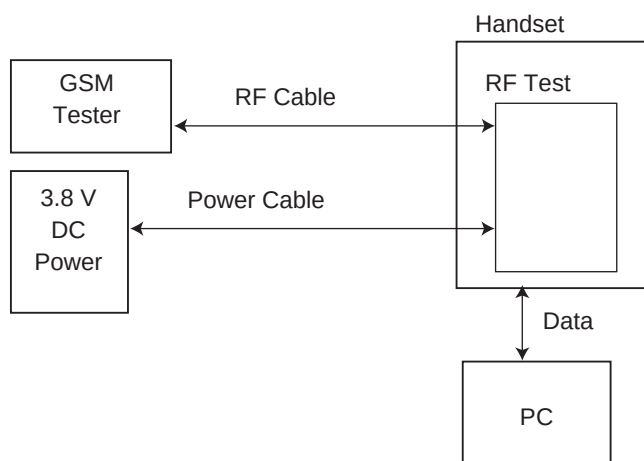
This unit acts as a base station providing all the necessary GSM signalling requirements and also provides GSM signal measuring facilities.

7.4. Test Equipment Setup

7.4.1. Equipment Required



PCB TEST SETUP



COMPLETE UNIT TEST SETUP

Figure 7.8. : Test Connection Diagram

IMPORTANT NOTE

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

1. PCB Repair Jig
2. Power Cable
3. Download Cable
4. RF Cable
5. 12 V power supply
6. Personal computer with RS232 interface and running Microsoft Windows® 95, 98, XP or 2000
7. GSM test station
7. EB-X500 Service software

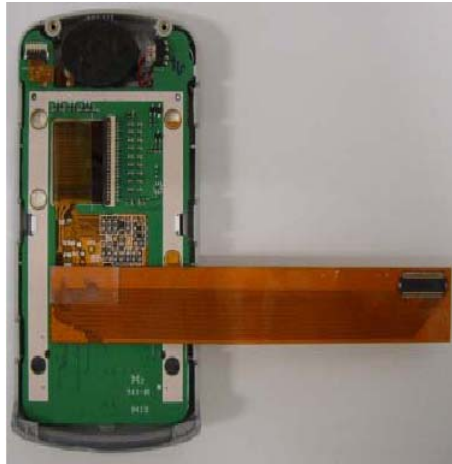
The EB-X500 Service software should be installed onto the main drive of the personal computer.

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 with power cable.

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

7.4.2. Fitting Handset to PCB Repair Jig

1. Referring to the Disassembly procedure in Section 6, separate the Main Board and Sub Board/Display upper cover.
2. Connect the Extension board to the Sub Board/Display upper cover.



3. Connect the other end of the Extension board to the Main Board.



4. Locate both parts of the handset into their respective locations on the PCB Repair Jig.

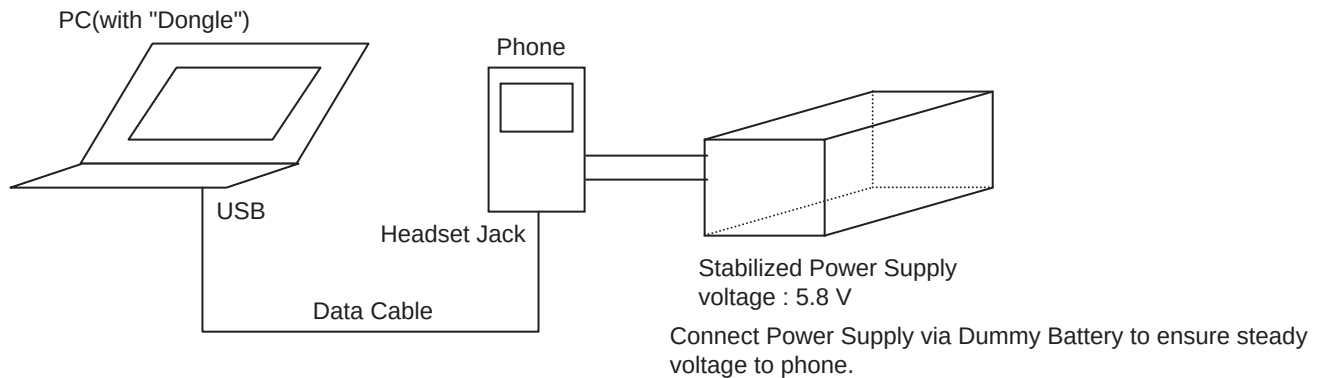


8. SOFTWARE DOWNLOAD & ADJUSTMENT PROCEDURE

8.1. Introduction

The purpose of this document is to describe the manual of the Dmtool V8.x.xx.1

■ System overview



■ Overview

Service Tool is an application that integrates the following functions:

1. Data Reserve function:
Some data fields (like Phone books, Calibration data . . . etc.) can be stored into files with this function. If data is lost, use this function to restore the original data back to the handset.
2. Re-Flash function:
Use to download the new versions of the core software and flex file, either individually or together.
3. Calibration function:
Use to calibrate RF parameters, ADC values, or NTC values.
4. The Service Tool runs on Microsoft Win95, Win98 (1st & 2nd edition), WinNT 4.0, Win2K and WinXP platforms.

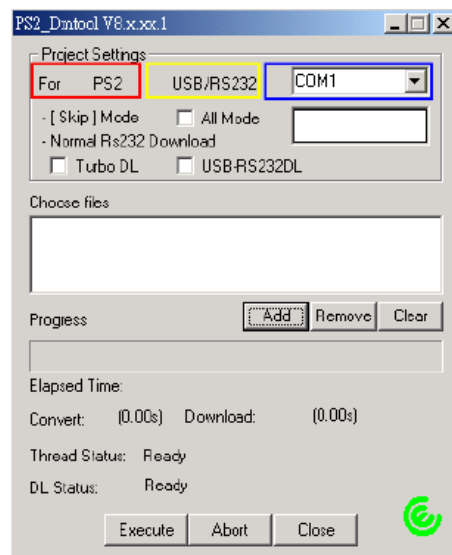
8.2. Procedure

1. Open Dmtool_V8.x.xx.1.exe

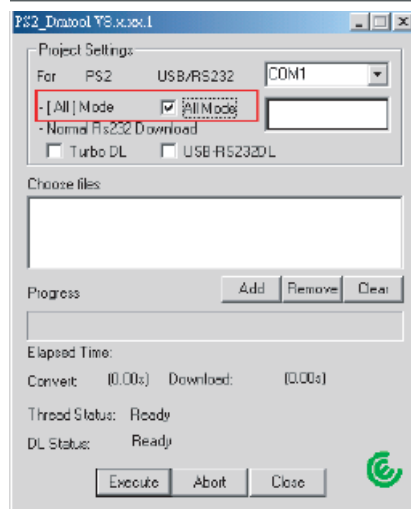
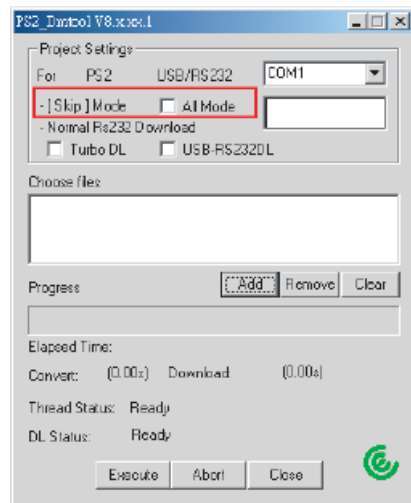


Dmtool_v8.x.xx.1

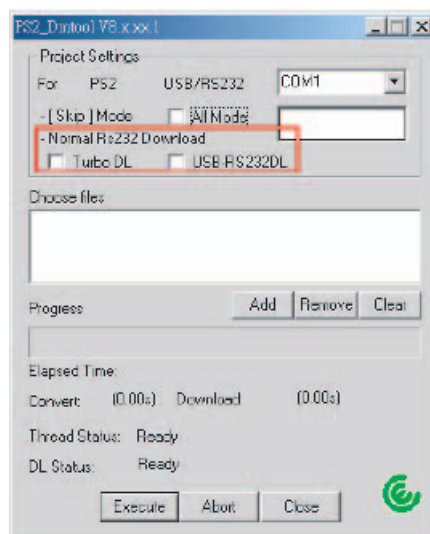
2. Procedure the Project Settings,
 - (a) The Tool is for PS2.
 - (b) Download path is RS232 or USB_RS232
 - (c) User can select COM port (COM1, COM2, . . .).



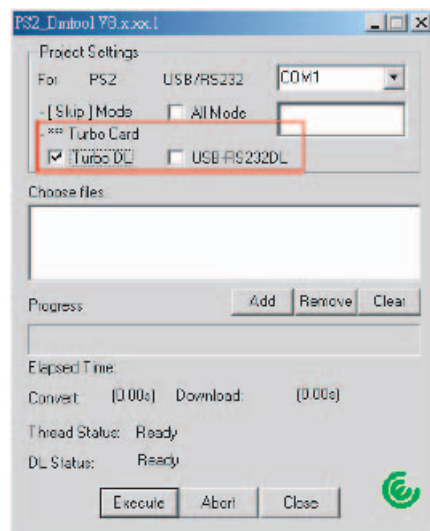
3. Select the "**All Mode**" Check-Box ➡ Dmtool will update the BootCode Region (flash block 0) when the user download the MainCode to the handset. (Default setting is the "**Skip Mode**", this will not update the BootCode Region).



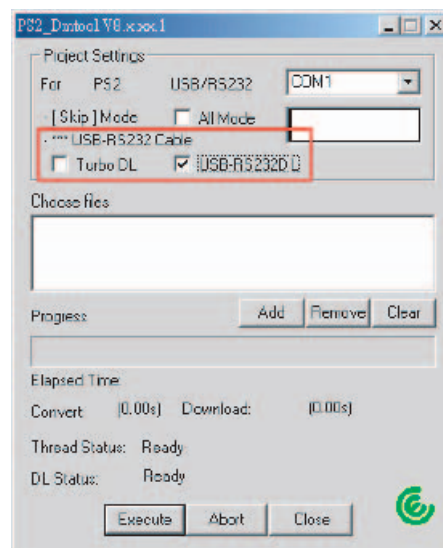
4. Select the download path. Up to three download path can be selected. The default setting is RS232.



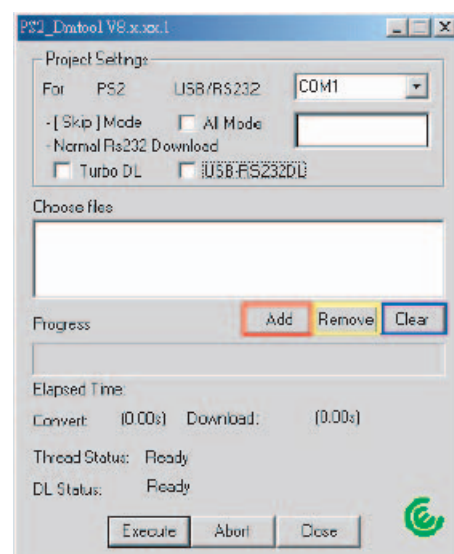
Turbo DL



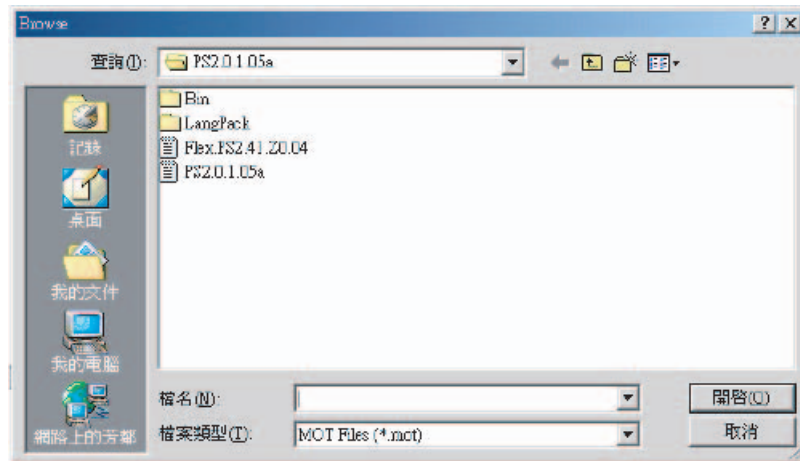
USB_RS232 DL



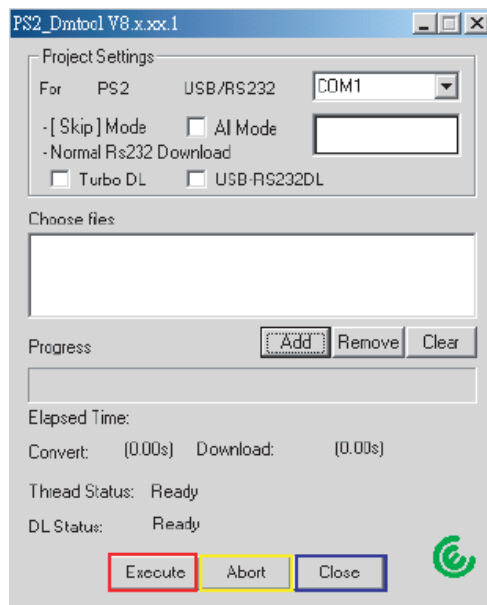
5. Click the "Add" Icon ➡ To add a select-download-mot-file to the download-list.
Click the "Remove" Icon ➡ To remove one select-download-mot-file from the download-list.
Click the "Clear" Icon ➡ To clear all download-mot-file from the download-list.



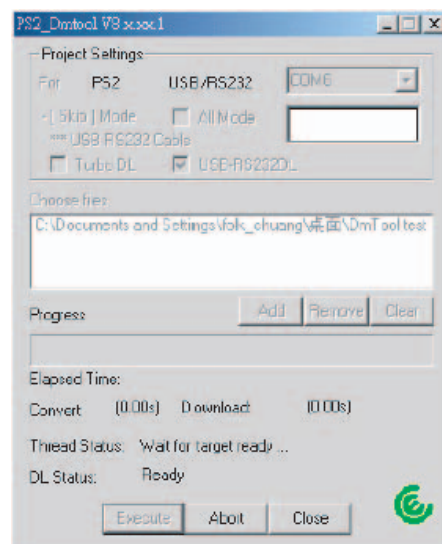
Clicking the "Add" button will open a Browse window which is used to select the download file.

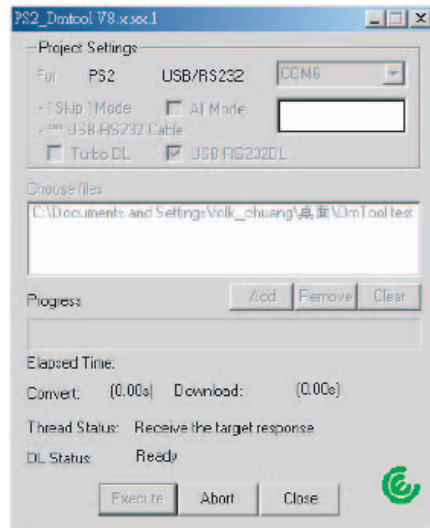


6. Click the "**Execute**" Icon ➡ Start the download process.
- Click the "**Abort**" Icon ➡ Abort the download process.
- Click the "**Close**" Icon ➡ Abort the download process and close the execution.

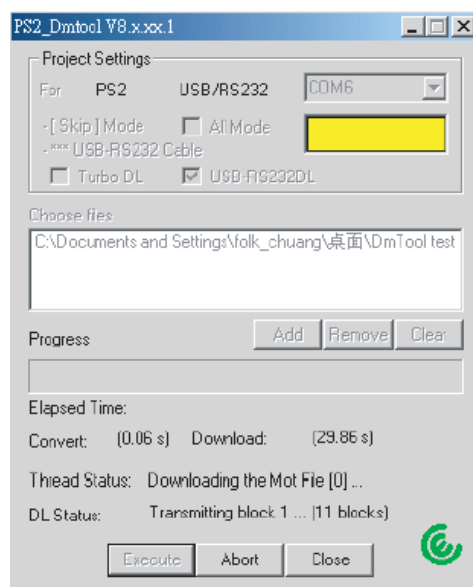


7. Add mot file to the tool and press Execute button. After that press the power key in handset the Interface shows as below.

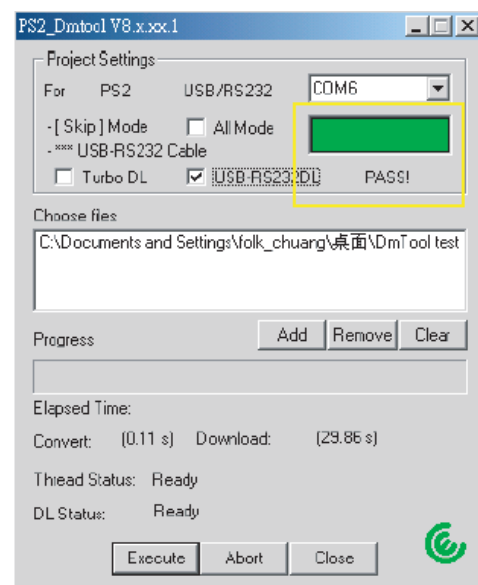




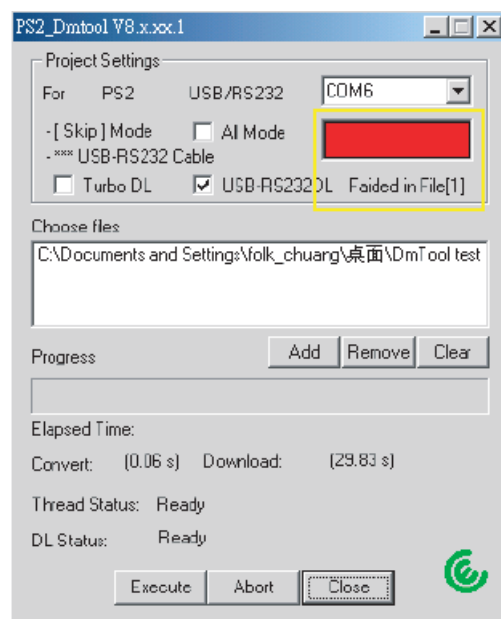
8. While downloading, the status window (top right) will flash yellow.



9. When the download process is complete, the target sector information data will be compared with the binary data in the PC RAM buffer. If the data in these two buffers is identical, the status window will change green and the message "PASS!" will be displayed below it. This indicates the download was successful with no errors occurring.



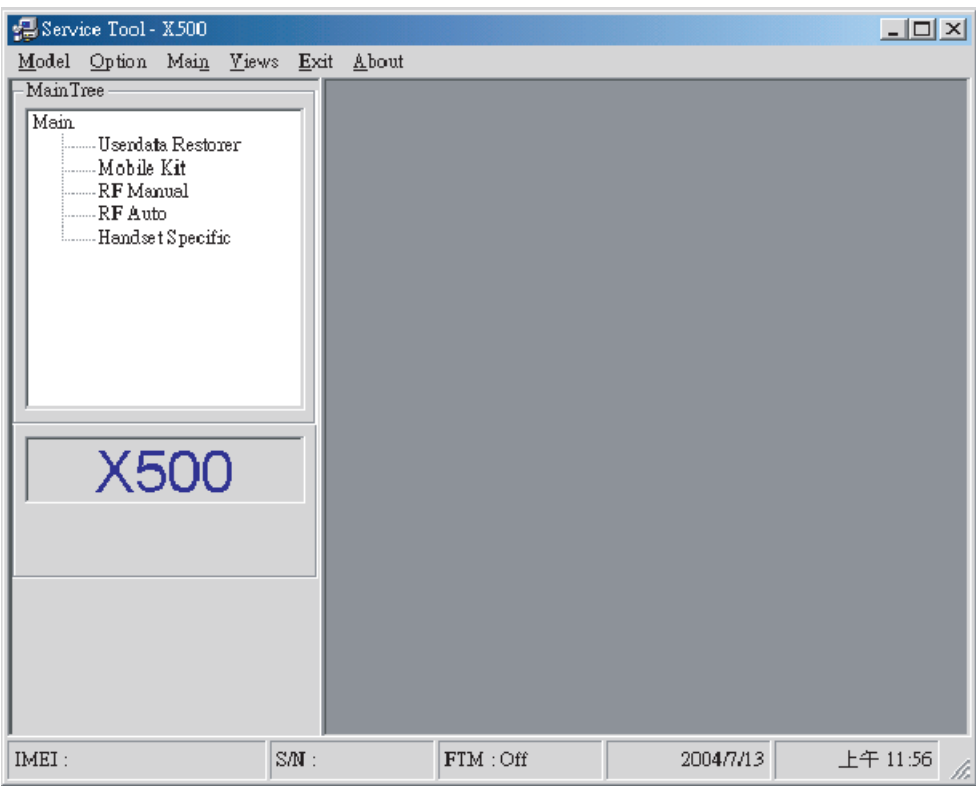
10. If any errors were found (i.e. there were differences in data between the two buffers) the Dmtool will report in which block of code the error was found.



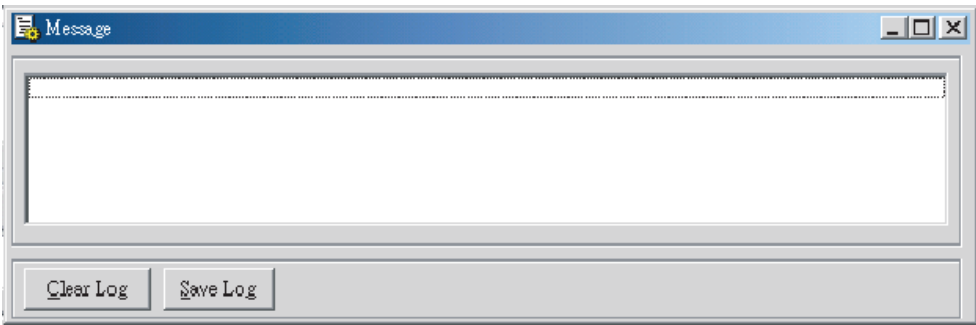
8.3. Calibration Procedure

8.3.1. Getting Started

To run the program, double-click on the Service Tool desktop icon. The main program window will be displayed:



A message log window also appears at the bottom of the main window to display the processing and status information.



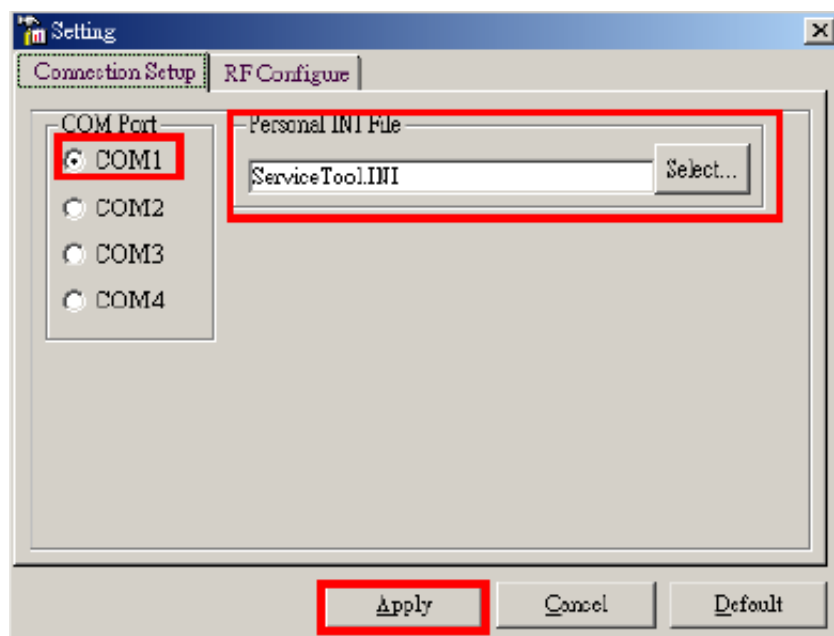
Click on "**option**" to change the COM port. The COM port setting is password protected to prevent accidental change. The password is "**Compal PV1**" and is case-sensitive. The password must be entered before the COM port setting can be changed.

Setup menu

1). Connection Setup: COM Port

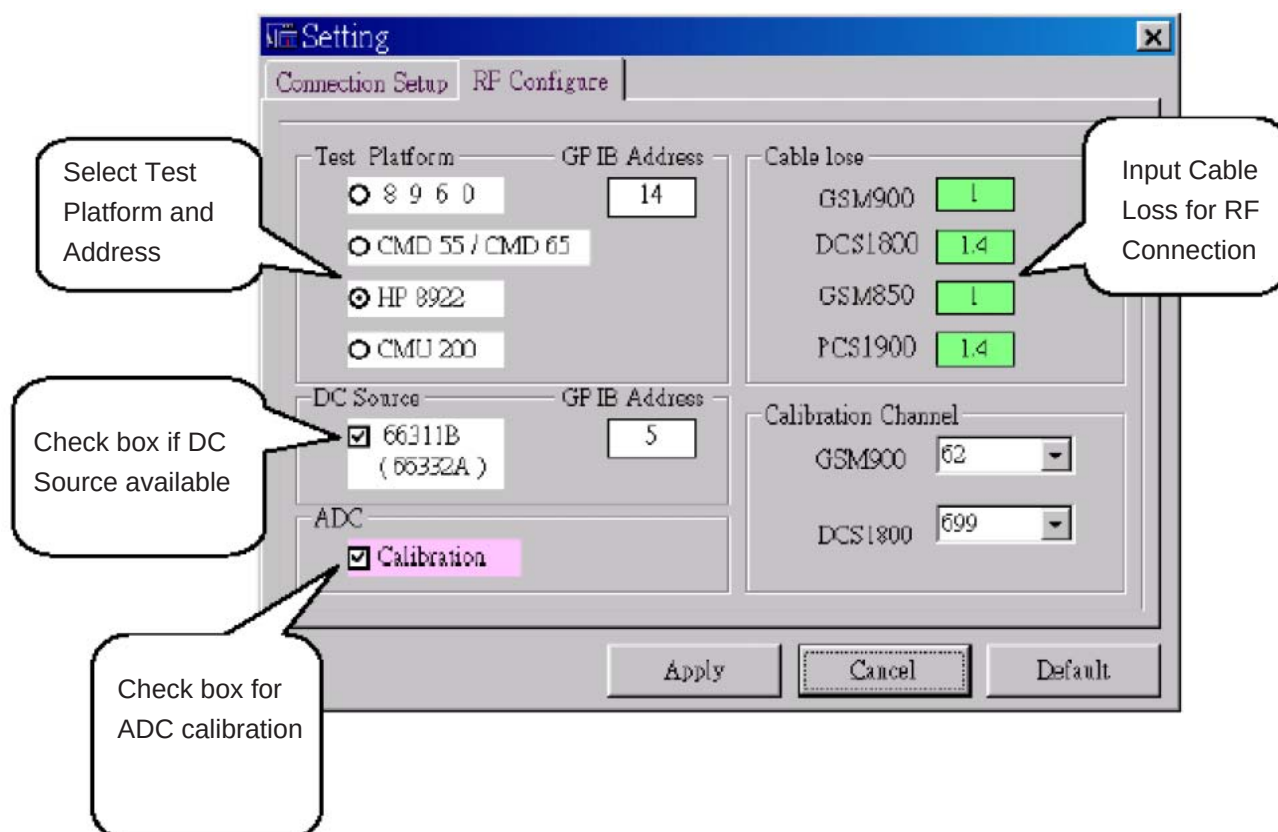
Select the COM port to which the data cable is connected. The Default is COM1.

2). Select the Personal INI File.



After selecting the COM port and Personal INI File, press "**Apply**" to confirm the setting.

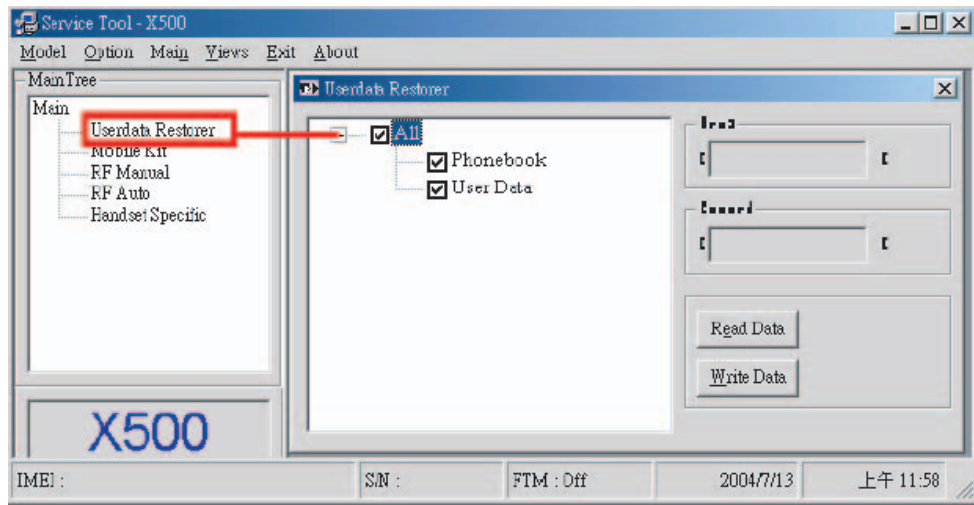
3). Click on the "**RF Configure (RF Configuration)**" tab to enter the required parameters for RF calibration and test environment. On completion, click on "**Apply**".



8.3.2. Function Description

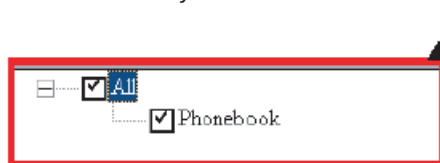
■ Restore User data

Select to read and write user data between the handset and PC. Currently, only the phonebook option is available.



□ Read

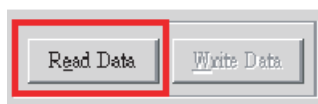
1. Select the area you want to read from the "Tree view".



If "All" is ticked, it means all of the items on the tree will be selected automatically for reading purpose. Otherwise you can select the specific items individually.

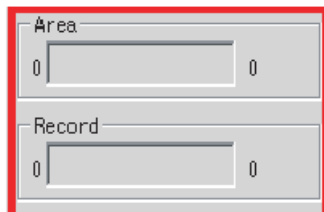
2. Make sure your handset is correctly connected with your pc, switch on your handset and click the button "Read Data".

It will automatically enter Factory Test Mode and start to read data.



Wait for "Reading Data finish" shown on the log list.

At the mean time, you can see the status of process on progress bar.



Note:

Before doing any operation of Service Tool (except reflash, reflexing), You need to turn on your handset first. If you have SIM card inserted, it is suggested that to wait until the Network searching complete and then start your operation. If the Network searching takes a long time to finish, the handset may enter sleep mode and will not be able to get the command from PC, please press any key to wake up the handset.

3. All the data that have been read from MS will be saved automatically as a file in the assigned folder.

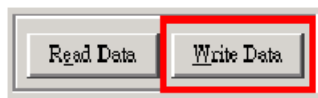
❑ Write

1. Select the area you want to write from the "**Tree view**".

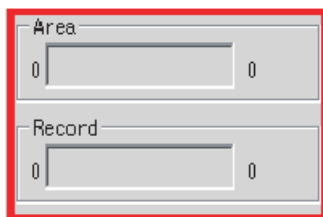


If "**All**" is ticked, it means all of the items on the tree will be selected automatically for writing purpose. Otherwise you can select the specific items individually.

2. Make sure your handset is correctly connected with your pc, switch on your handset and click the button "**Write Data**".
will automatically enter Factory Test Mode.

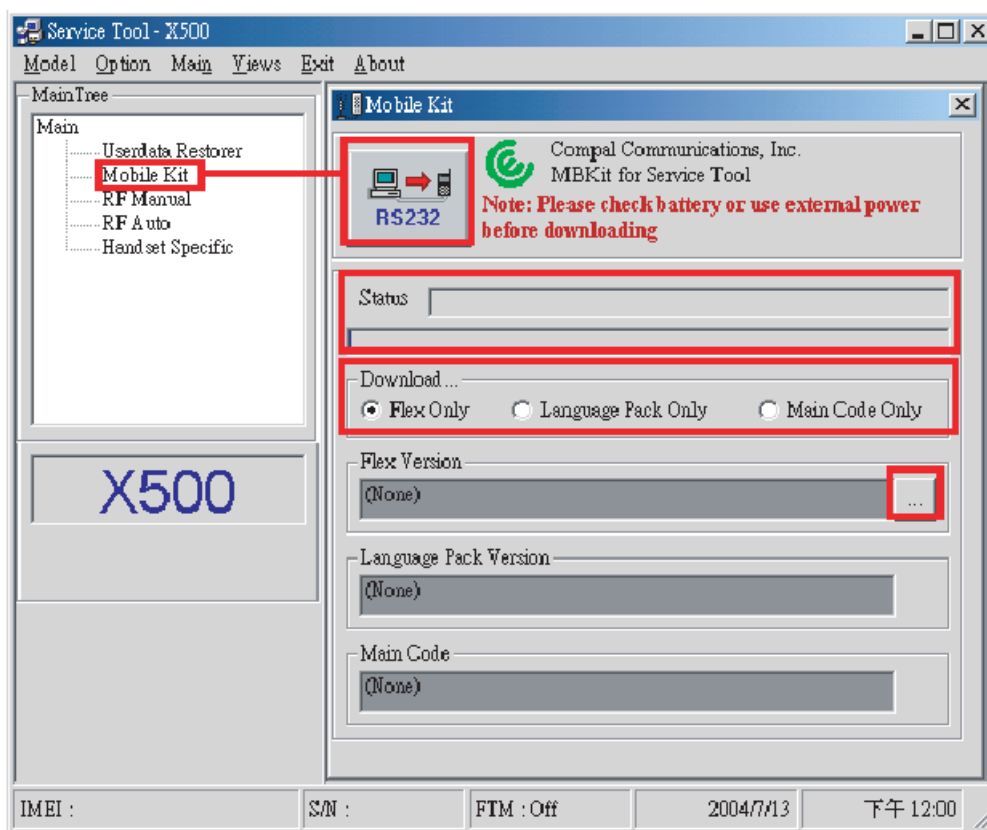


Wait for "**Writing Data finish**" shown on the log list.
At the mean time, you can see the status of process on progress bar.



3. Restart the MS to make sure userdata has been written back on.

■ Mobile Kit



- 1) In "**Download**" frame, you can choose either Flex Only, Language Pack Only, or Main Code Only, individually.
- 2) Click "... " to select the desired version of flex file, language pack file, or main code. Please notice that the selected flex, language pack, and main code should be with the same version. Unmatched version of flex, language pack, and main code could make the handset operate abnormally.
- 3) To start download, first make sure the phone is connected correctly with PC and switch off the phone. Click button "**RS232**" to start downloading and you can see the status of the process from the progress bar.

8.3.3. Calibration

Function Purpose :

ADC : Flt can calibration battery in 4.2V and 3.4V, or choose one.

NTC : Flt can calibration battery of temperature in 0 °C and 40 °C or choose one.

AGC : Flt can calibration gain value.

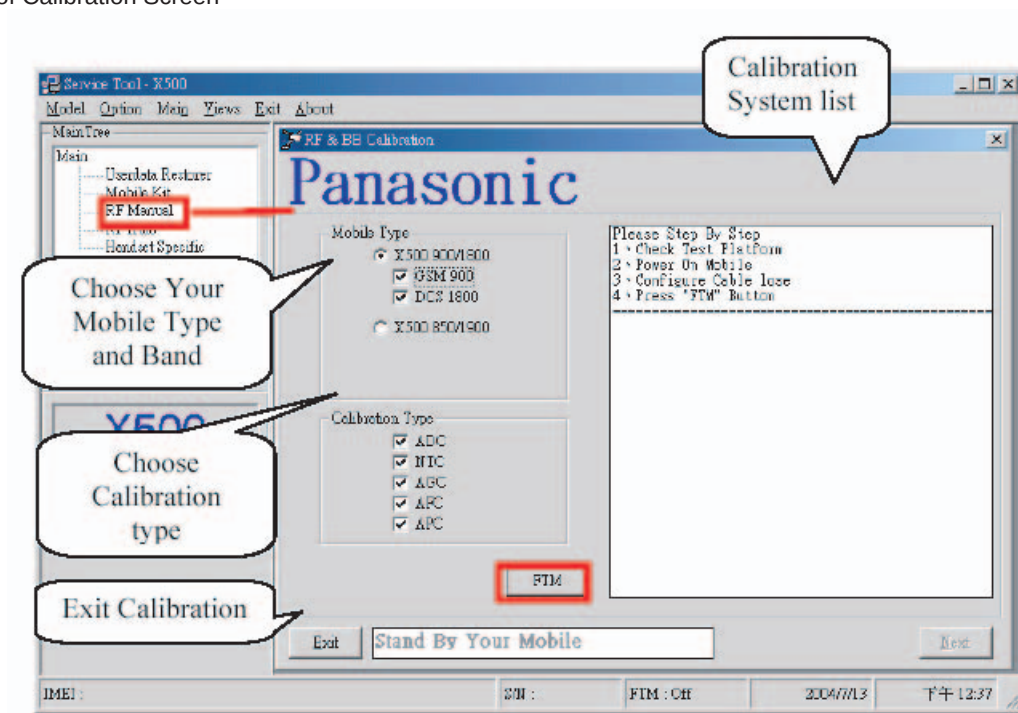
AFC : Flt can calibration frequency error and slope.

APC : Flt can calibration power for each level.

Warning:

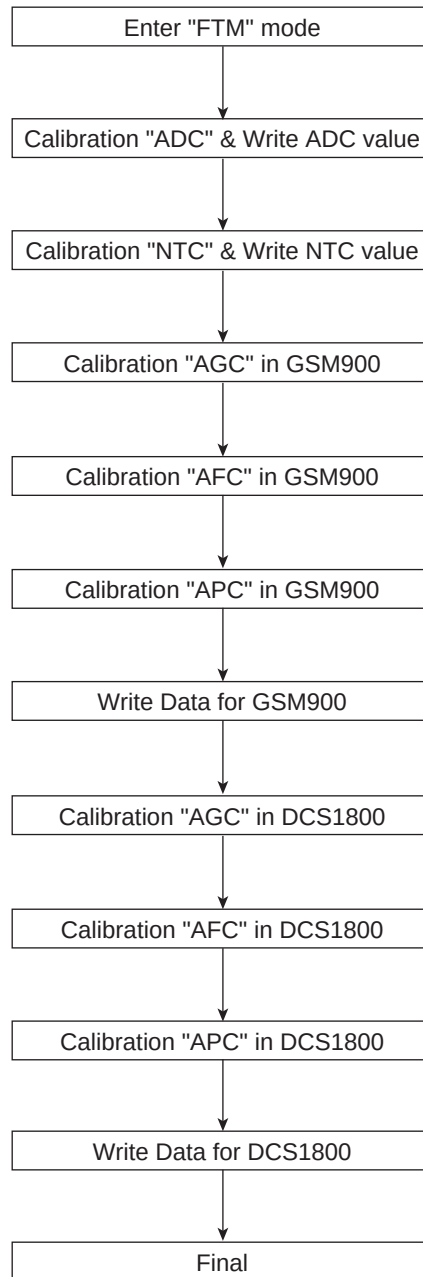
Before calibration, you must check parameter of instrument. Is it correct?

1) Snapshot of Calibration Screen

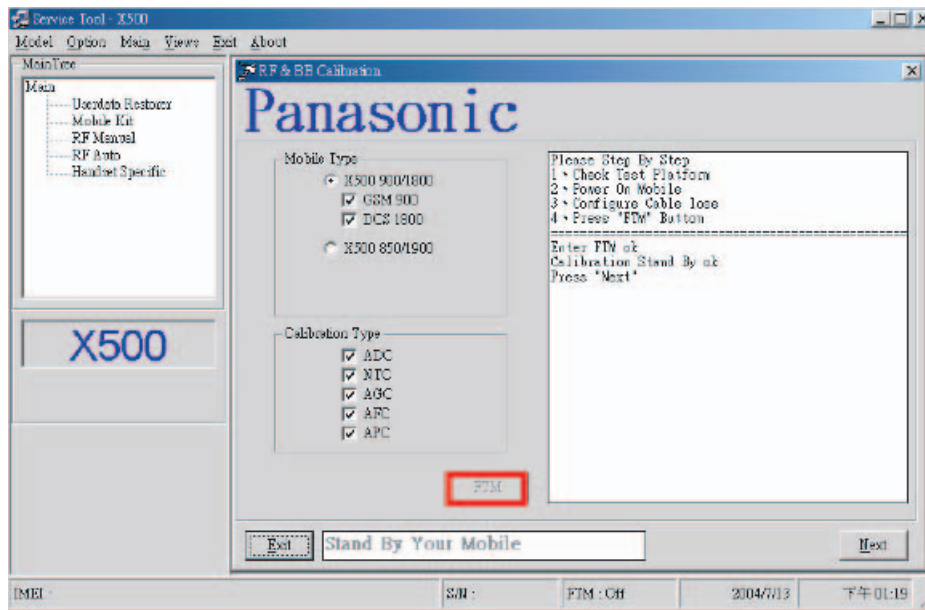


2) Example for Calibration

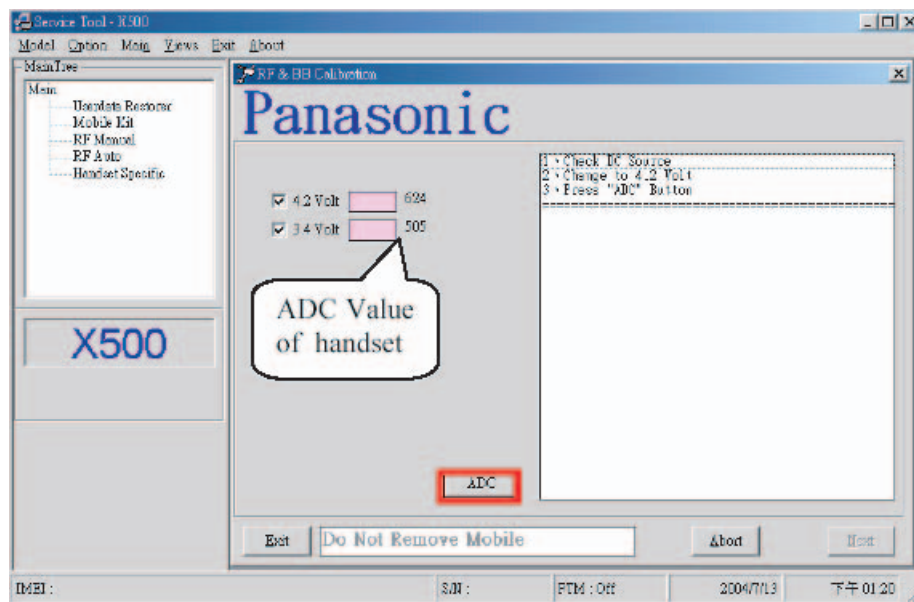
In this case, we select dual band (900/1800) and calibration all (ADC, NTC, AGC, AFC, APC).



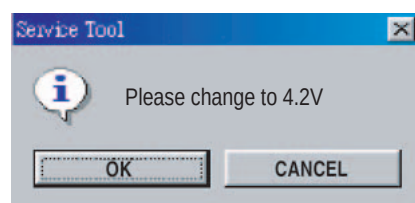
- Step 1 Make sure your handset is correctly connected with your PC, switch on your handset and click the button "**FTM**".
It will automatically enter Factory Test Mode and start to read data for calibration.
- Step 2 Press "**Next**" to continue.



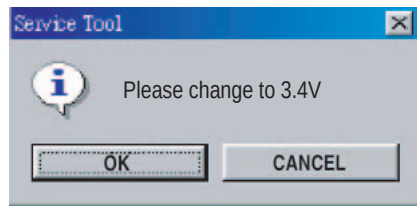
- Step 3 Click "**ADC**" and doing calibration battery



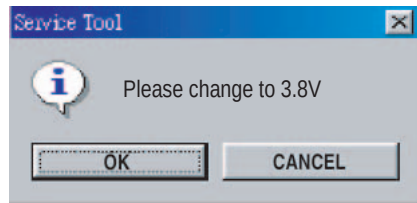
- Step 3.1. Change to 4.2 V and click "OK" to start calibration battery in 4.2 V.



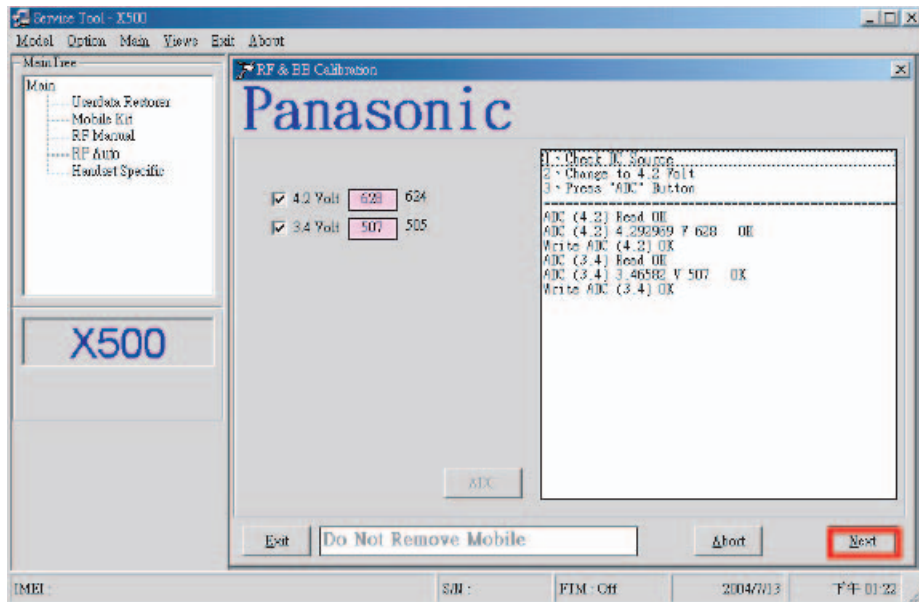
Step 3.2. After Calibration battery in 4.2 V, please turn to 3.4 V and click "OK" to start calibration battery in 3.4 V.



Step 3.3. After Calibration battery in 3.4 V, Don't forget turn to 3.8 V.



Step 3.4. ADC is complete.



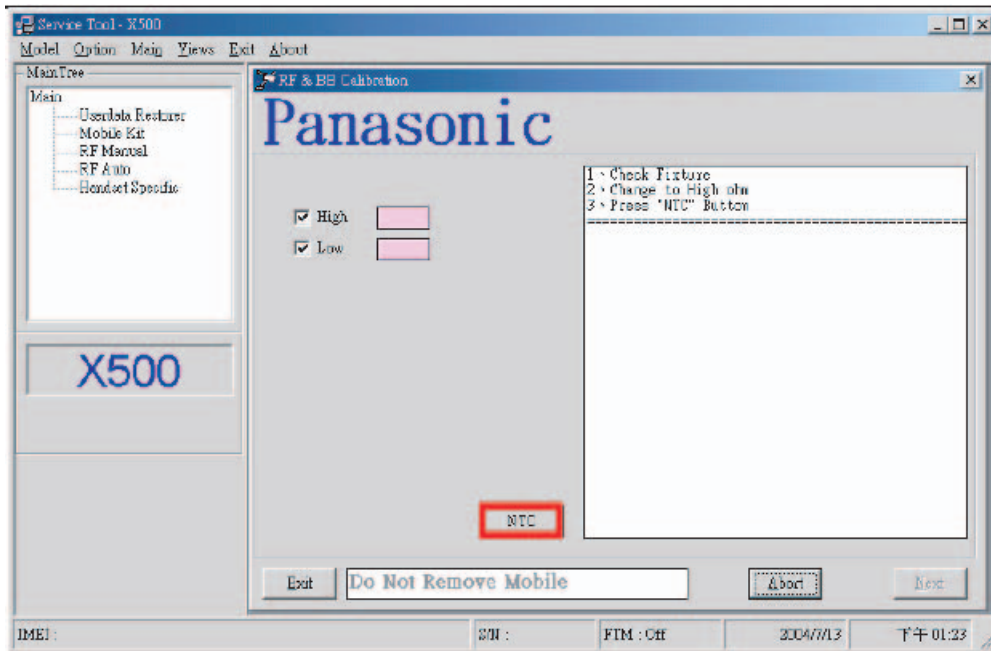
Step 4. Press "Next" to continue.

Step 5. Click "NTC" and doing calibration temperature of battery.

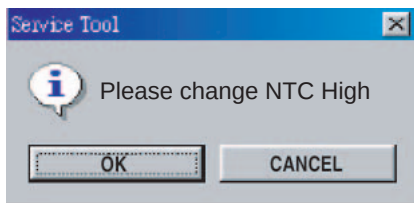
Temp Calibration. NTC is supposed to prevent battery Temp too higher or too lower.

NTC-High (40 °C) approve of range in 233 to 170 (6.95K Ω - 4.83K Ω).

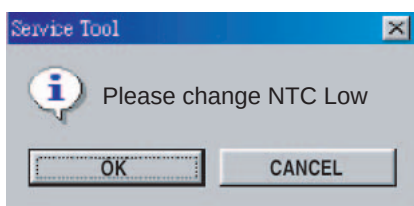
NTC-Low (0 °C) approve of range in 965 to 671 (33.9K Ω - 21.6K Ω).



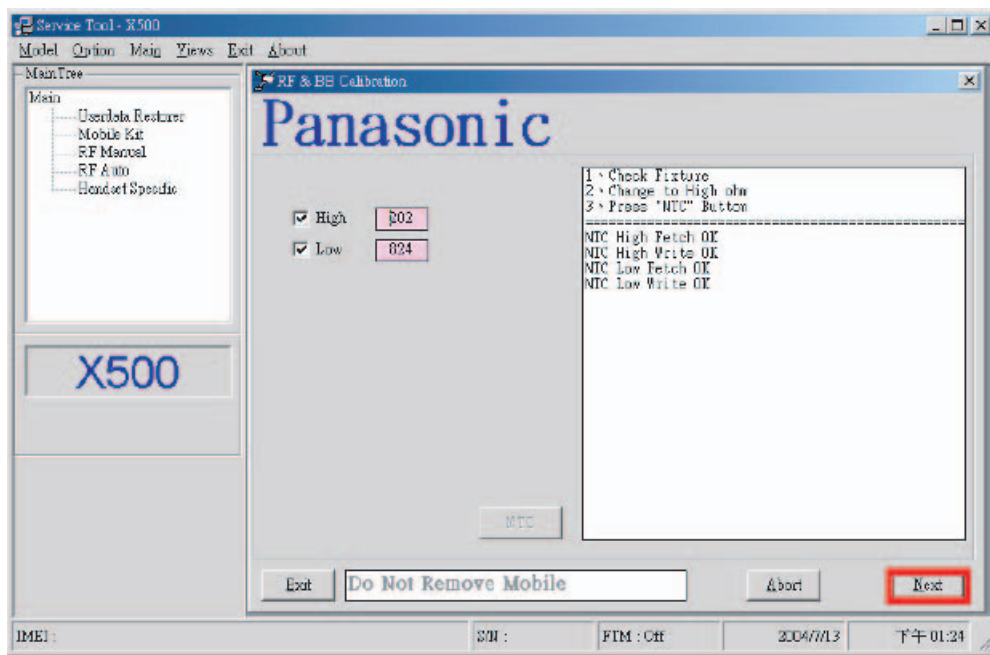
Step 5.1. Change to NTC-High (40 °C) and click "OK" to start calibration temperature of battery in NTC-High (40 °C).



Step 5.2. After calibration battery in NTC-High, please turn to 0 °C and click "OK" to start calibration temperature of battery in NTC-Low (0 °C).

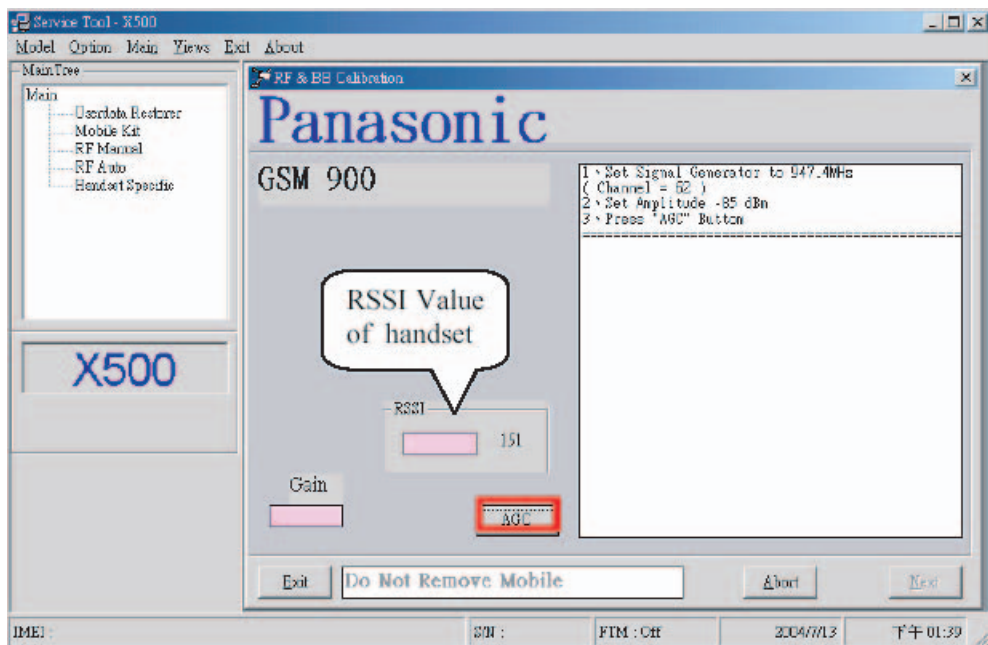


Step 6. After calibration NTC-Low, NTC is complete.



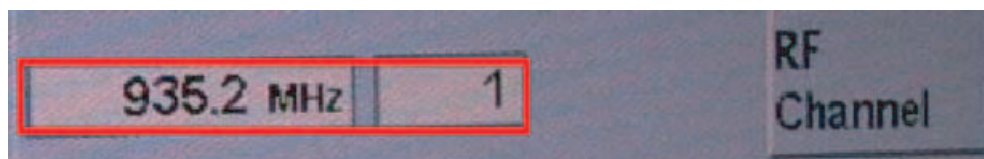
Step 6. Press "Next" to continue.

Step 7. After configure parameter of instrument, click "AGC", find gain value and RSSI of full channel.
In this case, If you use CMU200, please see [Annex notex2-1](#) to Configure.
If you use HP8960, please see [Annex notes2-2](#) to Configure.



Step 8. After find gain value, change channel (Generator and Analyzer channel) to RSSI value, press "OK" to next channel.
(In this case, channel 1, channel 49, channel 85, channel 975).

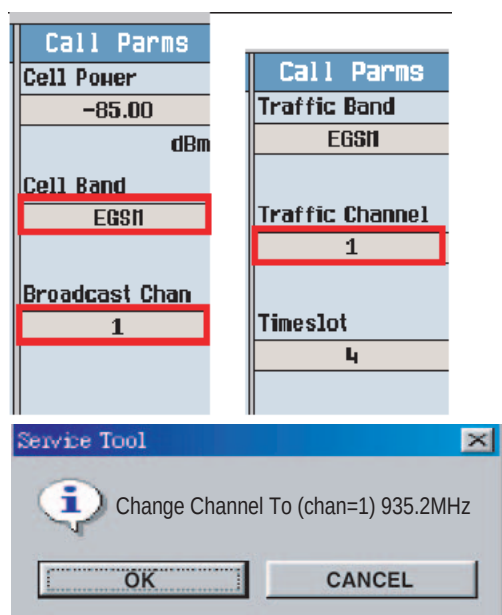
Generator setting for Cmu200



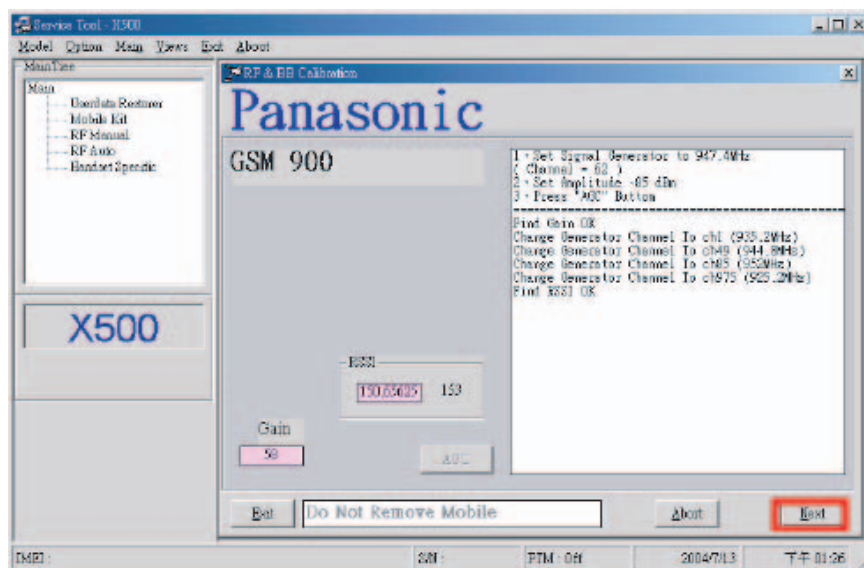
Analyzer setting for Cmu200



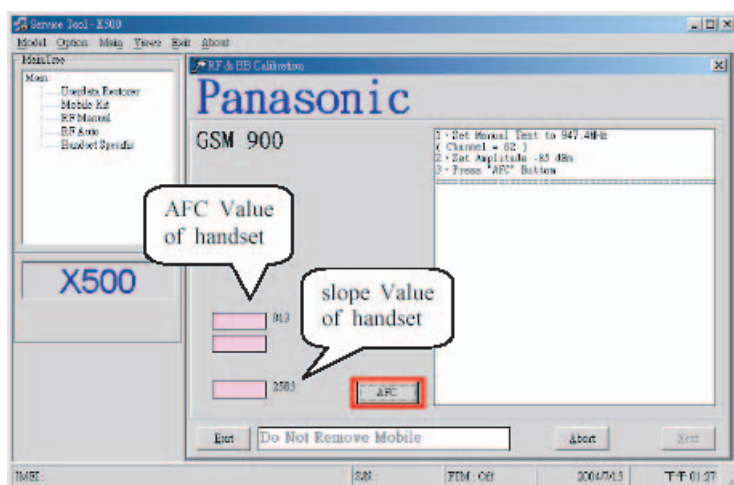
Setting for HP8960



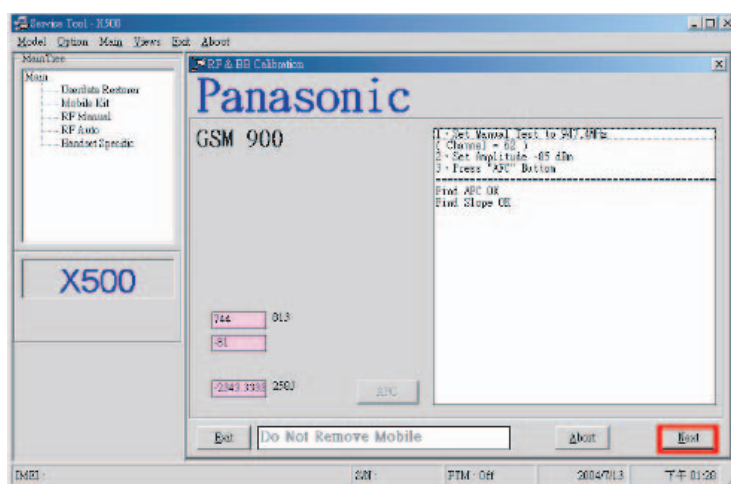
Step 9. AGC calibration is complete, press "Next" to continue.



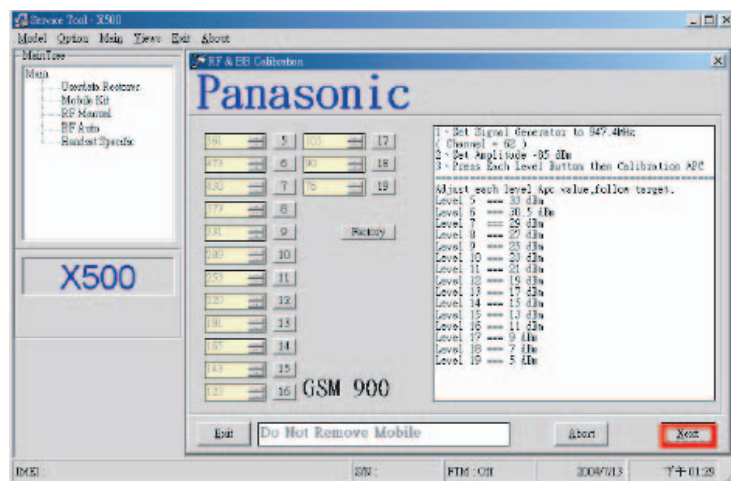
- Step 10. After configure parameter of instrument, click "**AFC**" and doing AFC calibration.
In this case, if you use CMU200, please see [Annex notex2-1](#) to Configure.
If you use HP8960, please see [Annex notes2-2](#) to Configure.



- Step 11. AFC calibration is complete, press "**Next**" to continue.

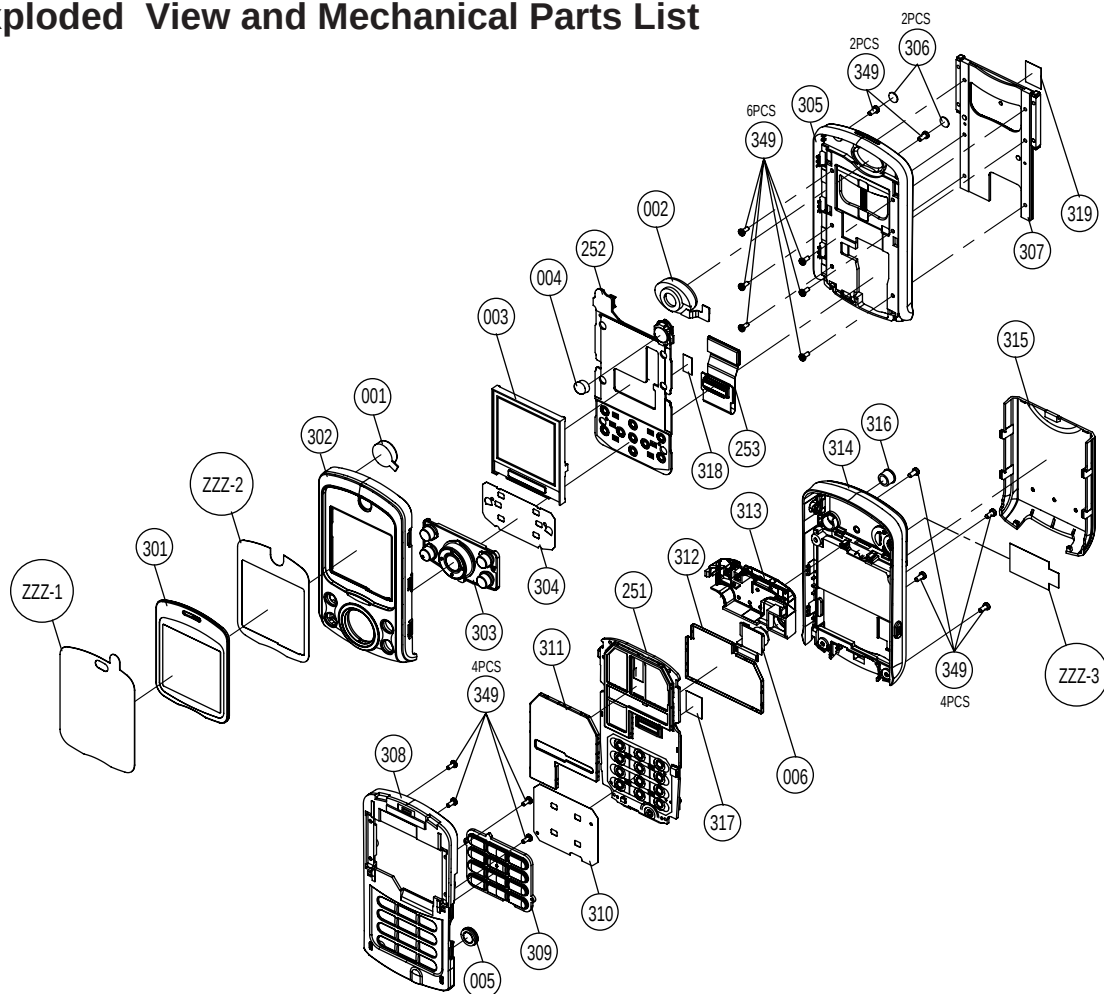


- Step 12. After configure parameter of instrument, Click "**APC**" and doing APC calibration. ("**factory**" key : Return APC value each level of the handset.)
In this case, if you use CMU200, please see [Annex notes3-1](#) to Configure.
If you use HP8960, please see [Annex notes3-2](#) to Configure.



9. REPLACEMENT PARTS LIST

9.1. Exploded View and Mechanical Parts List



REF. NO.	PART NO.	DESCRIPTION
ZZZ-1	8610PS2001W	PROTECT TAPE FOR LCD PANEL
ZZZ-2	8609PS2004W	ADHESIVE LENS
ZZZ-3	8610PS2002W	PROTECT TAPE FOR CAMERA
001	3921003403W	VIBRATOR
002	2251813401W	S P E A K E R
003	7630112351W	LCD MODULE
004	2210614001W	LITHIUM BATTERY
005	2220061201W	MICROPHONE
006	7650361201W	CAMERA ASS'Y
301	2541PS2001W	LCD-LENS SILVER
	2541PS2002W	LCD-LENS RED
302	2516PS2001W	DISPLAY UPPER COVER S ILVER
	2516PS2002W	DISPLAY UPPER COVER RED
303	3104PS2002W	FUNCTION KEYPAD SILVE R
	3104PS2004W	FUNCTION KEYPAD RED
304	3109PS2002W	METAL DOME FOR FUNCTION KEY
305	2517PS2001W	DISPLAY LOWER COVER SILVER
306	3064PS2001W	SCREW CAP
307	3400617001W	HINGE SLIDE
308	2518PS2001W	KEYBOARD UPPER ASS'Y S ILVER
	2518PS2002W	KEYBOARD UPPER ASS'Y RED
309	3104PS2001W	NUMBER KEYPAD SILVER-ENGLISH
	3104PS2003W	NUMBER KEYPAD RED-ENGLISH
	3104PS2021W	NUMBER KEYPAD SILVER-BOPOMOFO

REF. NO.	PART NO.	DESCRIPTION
	3104PS2022W	NUMBER KEYPAD RED-BOPOMOFO
	3104PS2031W	NUMBER KEYPAD SILVER-STROKE
	3104PS2032W	NUMBER KEYPAD RED-STROKE
	3104PS2061W	NUMBER KEYPAD SILVER-RUSSIAN
	3104PS2062W	NUMBER KEYPAD RED-RUSSIAN
	3104PS2071W	NUMBER KEYPAD SILVER-ARABIC
	3104PS2072W	NUMBER KEYPAD RED-ARABIC
310	3109PS2001W	METAL DOME FOR KEY BOARD
311	3052PS2007W	SHIELD CASE FOR BASEBAND
312	3052PS2009W	SHIELD-CASE FOR RF
313	23A1PS2001W	ANTENNA ASS'Y
314	2519PS2001W	KEYBOARD LOWER ASS'Y SILVER
	2519PS2002W	KEYBOARD LOWER ASS'Y RED
315	251APS2001W	BATTERY COVER ASS'Y SILVER
	251APS2002W	BATTERY COVER ASS'Y RED
316	3028PS2001W	RF-CAP GRAY
	3028PS2002W	RF-CAP RED
317	306APS2001W	CONDUCT FOR MAIN BOARD
318	306APS2002W	CONDUCT FOR LCD BOARD
319	3064PS2002W	MYLAR
349	3501434202W	SCREW
251		MAIN PCB ASS'Y (900/1800) To be announced from PMCP
252	7807620R 01W	FRU KEY PCB ASS'Y

9.2. Main PCB Assembly

Ref. No.	Part No.	Part Name & Description		Grid
C1	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C2	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C3	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C4	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C5	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C6	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C7	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C8	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C9	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C10	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C11	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C12	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C13	1310026111W	CERAMIC CAPACITOR	10pF 50V	
C14	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C15	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C16	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C17	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C19	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C20	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C21	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C22	1310026111W	CERAMIC CAPACITOR	10pF 50V	
C23	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C24	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C25	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C26	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C27	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C28	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C30	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C32	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C33	1347562831W	CERAMIC CAPACITOR	4.7uF 10V	
C34	1347562831W	CERAMIC CAPACITOR	4.7uF 10V	
C35	1347562831W	CERAMIC CAPACITOR	4.7uF 10V	
C36	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C37	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C38	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C39	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C40	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C41	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C42	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C43	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C44	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C45	1312046111W	CERAMIC CAPACITOR	12pF 50V	
C46	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C47	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C48	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C49	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C50	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C51	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C52	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C53	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C54	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C55	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C56	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C57	1333373411W	CERAMIC CAPACITOR	33nF 16V	
C58	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C59	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C60	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C61	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C62	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C63	1310473411W	CERAMIC CAPACITOR	100nF 16V	

Ref. No.	Part No.	Part Name & Description		Grid
C64	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C65	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C66	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C67	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C69	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C70	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C71	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C72	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C73	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C74	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C75	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C76	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C77	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C78	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C81	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C82	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C84	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C85	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C86	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C87	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C88	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C89	1310256311W	CERAMIC CAPACITOR	1nF 50V	
C91	1310562821W	CERAMIC CAPACITOR	1uF 10V	
C92	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C93	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C94	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C95	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C96	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C97	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C98	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C99	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C100	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C101	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C102	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C103	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C104	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C105	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C106	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C107	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C108	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C109	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C110	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C111	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C112	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C113	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C114	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C115	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C116	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C117	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C118	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C119	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C120	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C121	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C122	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C123	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C124	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C125	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C126	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C127	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C128	1322046111W	CERAMIC CAPACITOR	22pF 50V	

Ref. No.	Part No.	Part Name & Description		Grid
C129	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C130	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C131	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C132	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C133	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C134	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C136	1310662301W	CERAMIC CAPACITOR	10uF 10V	
C137	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C138	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C139	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C140	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C141	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C142	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C143	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C144	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C145	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C146	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C147	1310473411W	CERAMIC CAPACITOR	100nF 16V	
C148	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C149	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
C150	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C151	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C180	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C181	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C182	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C183	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C184	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C185	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C186	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C187	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C188	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C189	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C190	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C191	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C192	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C194	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C195	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C196	1322044151W	CERAMIC CAPACITOR	22pF 50V	
C198	1310026111W	CERAMIC CAPACITOR	10pF 50V	
C502	1310353311W	CERAMIC CAPACITOR	10nF 16V	
C504	1310026111W	CERAMIC CAPACITOR	10pF 50V	
C505	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C506	1339256311W	CERAMIC CAPACITOR	3.9nF 50V	
C507	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C508	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C509	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C510	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C511	1368156311W	CERAMIC CAPACITOR	680pF 50V	
C513	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C514	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C515	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C516	1310553221W	CERAMIC CAPACITOR	1uF 16V	
C517	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C518	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C519	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C520	132R716111W	CERAMIC CAPACITOR	2.7pF 50V	
C522	1339046111W	CERAMIC CAPACITOR	39pF 50V	
C524	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C525	130R516111W	CERAMIC CAPACITOR	0.5pF 50V	
C526	130R516111W	CERAMIC CAPACITOR	0.5pF 50V	

Ref. No.	Part No.	Part Name & Description		Grid
C527	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C528	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C530	1312046111W	CERAMIC CAPACITOR	12pF 50V	
C532	113R91N111W	INDUCTOR	3.9nH	
C533	1310353311W	CERAMIC CAPACITOR	10nF 16V	
C534	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C535	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C536	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C537	1368156311W	CERAMIC CAPACITOR	680pF 50V	
C538	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C539	1310662831W	CERAMIC CAPACITOR	10uF 10V	
C540	1333046111W	CERAMIC CAPACITOR	33pF 50V	
C541	112212N121W	INDUCTOR	220nH	
C542	11220N3201W	INDUCTOR	22nH	
C543	1339046111W	CERAMIC CAPACITOR	39pF 50V	
C544	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C547	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C548	134R716111W	CERAMIC CAPACITOR	4.7pF 50V	
C549	1310256311W	CERAMIC CAPACITOR	1nF 50V	
C551	1282211112W	FILM CAPACITOR	8.2nF	
C553	1333256311W	CERAMIC CAPACITOR	3.3nF 50V	
C555	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
C560	1347156311W	CERAMIC CAPACITOR	470pF 50V	
C561	1347156311W	CERAMIC CAPACITOR	470pF 50V	
C565	1239211112W	FILM CAPACITOR	3.9nF	
C566	1310146111W	CERAMIC CAPACITOR	100pF 50V	
C571	131R016111W	CERAMIC CAPACITOR	1pF 50V	
C574	1310452211W	CERAMIC CAPACITOR	100nF 10V	
C590	137R016111W	CERAMIC CAPACITOR	7pF 50V	
C600	1410721226W	TANTALUM CAPACITOR	100uF 6.3V	
C601	1347471411W	CERAMIC CAPACITOR	470nF 6.3V	
C602	131R016111W	CERAMIC CAPACITOR	1pF 50V	
C603	132R716111W	CERAMIC CAPACITOR	2.7pF 50V	
C604	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C605	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C606	1322046111W	CERAMIC CAPACITOR	22pF 50V	
C607	1347471411W	CERAMIC CAPACITOR	470nF 6.3V	
C608	1347561221W	CERAMIC CAPACITOR	4.7uF 6.3V	
C609	1347561221W	CERAMIC CAPACITOR	4.7uF 6.3V	
C610	1347471411W	CERAMIC CAPACITOR	470nF 6.3V	
C612	1347471411W	CERAMIC CAPACITOR	470nF 6.3V	
C613	1347561221W	CERAMIC CAPACITOR	4.7uF 6.3V	
CON1	2311003053W	AUDIOJACK		
CON2	2304506061W	SIM CONNECTOR		
D8	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
D9	1720016001W	SCHK DIODE RB160M-30 PMDU		
D10	1720055101W	SCHK DIODE RB551V-30 UMD2		
D11	1770060303W	LED SP0603B-WW WHITE TOP SOLIDITE		
D12	1770060303W	LED SP0603B-WW WHITE TOP SOLIDITE		
D13	1770060303W	LED SP0603B-WW WHITE TOP SOLIDITE		
D14	1770060303W	LED SP0603B-WW WHITE TOP SOLIDITE		
D22	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
D23	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
D24	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
D25	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
D26	1725203001W	SCHK DIODE SOD-523 ON_SEMI		
EF1	2090220001W	EMIF ESD SC-88A ON-SEMI		
EF2	2090220001W	EMIF ESD SC-88A ON-SEMI		
F501	2020900002W	SAW FILTER GSM900		
F502	2021800002W	SAW FILTER GSM1800		

Ref. No.	Part No.	Part Name & Description		Grid
J1	2306019221W	FPC CONNECTOR		
J2	2308502271W	BTB CONNECTOR		
J3	2303110101W	BATTERY CONNECTOR		
JP1	2302000301W	RF SWITCH		
L1	111012N111W	INDUCTOR 100nH		
L2	111012N111W	INDUCTOR 100nH		
L5	112200U5B1W	POWER INDUCTOR C3-Y1.5R	22uH	
L510	111202N111W	INDUCTOR	12nH	
L511	118202N111W	INDUCTOR	82nH	
L513	113R31N111W	INDUCTOR	3.3nH	
L514	111812N121W	INDUCTOR	180nH	
L520	1310146111W	CERAMIC CAPACITOR	100pF 50V	
L521	111012N111W	INDUCTOR	100nH	
Q5	1805585012W	XTOR 2SC5585 EMT3		
R2	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R3	0722414111W	FIXED RESISTOR	220K 1/16W	
R4	0722214111W	FIXED RESISTOR	2.2K 1/16W	
R5	0722214111W	FIXED RESISTOR	2.2K 1/16W	
R6	0722414111W	FIXED RESISTOR	220K 1/16W	
R7	0710314111W	FIXED RESISTOR	10K 1/16W	
R8	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R10	0710414111W	FIXED RESISTOR	100K 1/16W	
R11	0710414111W	FIXED RESISTOR	100K 1/16W	
R12	0710414111W	FIXED RESISTOR	100K 1/16W	
R13	0710414111W	FIXED RESISTOR	100K 1/16W	
R14	0710414111W	FIXED RESISTOR	100K 1/16W	
R15	0710214111W	FIXED RESISTOR	1K 1/16W	
R16	0710214111W	FIXED RESISTOR	1K 1/16W	
R17	0710114111W	FIXED RESISTOR	100Ω 1/16W	
R18	0751214111W	SPECIAL FIXED RESISTOR	5.1K 1/16W	
R19	0710114111W	FIXED RESISTOR	100Ω 1/16W	
R20	0710414111W	FIXED RESISTOR	100K 1/16W	
R21	0722414111W	FIXED RESISTOR	220K 1/16W	
R22	0720414111W	CF FIXED RESISTOR	200K 1/16W	
R23	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R24	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R25	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R30	0739014111W	SPECIAL FIXED RESISTOR	39Ω 1/16W	
R31	0710114111W	FIXED RESISTOR	100Ω 1/16W	
R33	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R34	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R35	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R37	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R38	0710414111W	FIXED RESISTOR	100K 1/16W	
R39	0710214111W	FIXED RESISTOR	1K 1/16W	
R43	0710214111W	FIXED RESISTOR	1K 1/16W	
R44	0710314111W	FIXED RESISTOR	10K 1/16W	
R46	0710414111W	FIXED RESISTOR	100K 1/16W	
R47	0710414111W	FIXED RESISTOR	100K 1/16W	
R48	0739014111W	SPECIAL FIXED RESISTOR	39Ω 1/16W	
R49	08R1501131W	CF FIXED RESISTOR	0.15Ω 1/4W	
R50	0722214111W	FIXED RESISTOR	2.2K 1/16W	
R51	0710114111W	FIXED RESISTOR	100Ω 1/16W	
R52	0727012401W	CF FIXED RESISTOR	27Ω 1/4W	
R53	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R54	0710414111W	FIXED RESISTOR	100K 1/16W	
R56	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R57	0710214111W	FIXED RESISTOR	1K 1/16W	
R58	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R560	0710114111W	FIXED RESISTOR	100Ω 1/16W	

Ref. No.	Part No.	Part Name & Description		Grid
R536	0730114111W	CF FIXED RESISTOR	300Ω 1/16W	
R537	0715114111W	SPECIAL FIXED RESISTOR	150Ω 1/16W	
R538	0739014111W	SPECIAL FIXED RESISTOR	39Ω 1/16W	
R539	0715114111W	SPECIAL FIXED RESISTOR	150Ω 1/16W	
R540	0718014111W	FIXED RESISTOR	18Ω 1/16W	
R541	0730114111W	CF FIXED RESISTOR	300Ω 1/16W	
R542	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R544	111R01N111W	INDUCTOR	1nH	
R545	111R21N111W	INDUCTOR	1.2nH	
R546	0710214111W	FIXED RESISTOR	1K 1/16W	
R547	0720214111W	FIXED RESISTOR	2K 1/16W	
R548	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R552	0718014111W	FIXED RESISTOR	18Ω 1/16W	
R555	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R560	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R576	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R577	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R603	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R701	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
R702	07R0014111W	FIXED RESISTOR	0Ω 1/16W	
U1	0100552001W	IC DSC SPCA552A TFBGA		
U2	1623276333W	CRYSTAL 32.768KHz 12.5pF		
U3	0151992131W	IC ASIC		
U5	0440111404W	IC LDO		
U8	0103014001W	IC INTE		
U9	1820032601W	MOSFET		
U10	0203050111W	IC FLASH		
U11	0301708031W	IC LOGIC		
U12	0440002801W	IC LDO		
U13	0510076201W	IC MELODY		
U14	2305033831W	I/O CONNECTOR		
U16	0450189601W	IC INV.		
U17	04D0003101W	IC SWITCH		
U17	04D0003101W	IC SWITCH		
U501	0417496301W	IC TRANSCEIVER		
U502	0427732501W	IC P.A.		
U503	04B0615401W	IC T/R-SW		
U504	1610018003W	TCXO 26MHz		
U505	0470011402W	IC TR.		
U506	0470012301W	IC TR.		
U603	0440111405W	IC LDO		
U604	0440111405W	IC LDO		
U605	0440111405W	IC LDO		
VR1	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR2	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR7	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR8	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR9	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR10	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR11	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR12	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR13	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR14	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR15	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR16	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR17	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR18	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR19	2012002931W	VARISTOR MLVS-0402-M07 20A 9V		
VR20	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V		
VR21	2012002931W	VARISTOR MLVS-0402-M07 20A 9V		

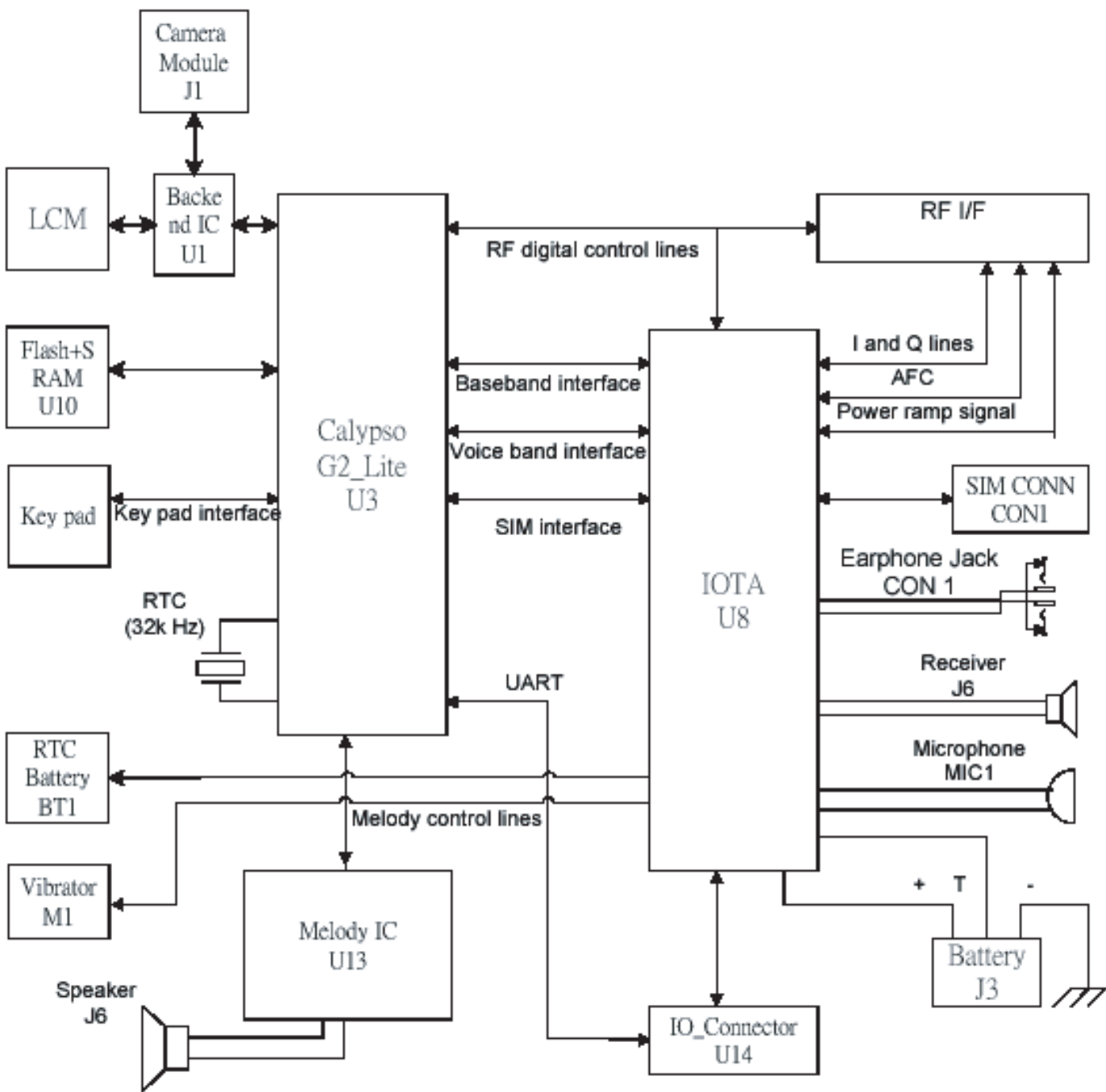
9.3. Sub Board PCB Assembly

Ref. No.	Part No.	Part Name & Description	Grid
VR22	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR23	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR24	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR25	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR26	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR27	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR28	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	
VR29	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	
VR30	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	

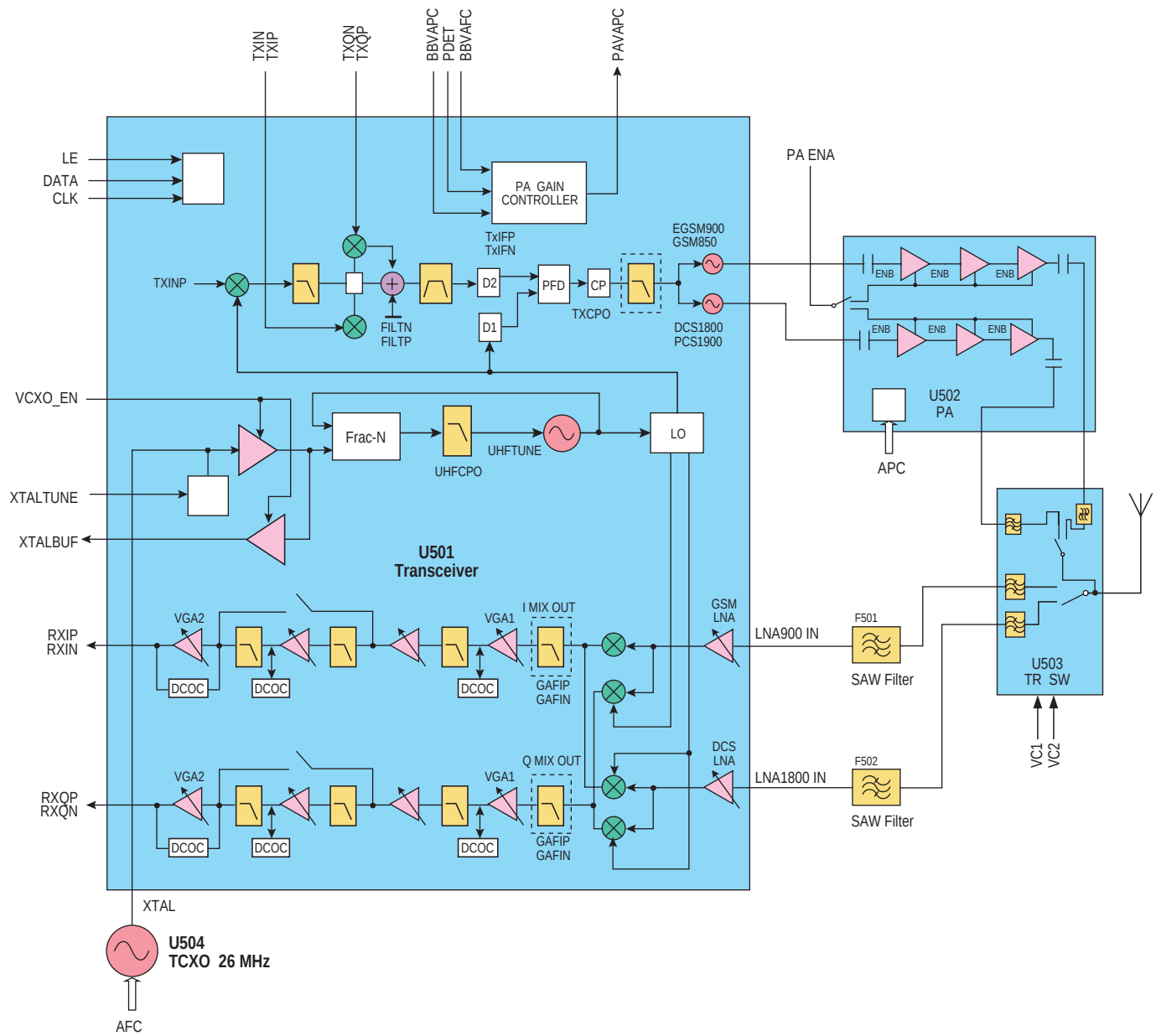
Ref. No.	Part No.	Part Name & Description	Grid
BT1	2316000011W	BAT SINGATRON 2BA-0003-001	
C79	1322046111W	22pF 50V	
C80	1322046111W	22pF 50V	
C150	1322046111W	22pF 50V	
C151	1322046111W	22pF 50V	
C152	1322046111W	22pF 50V	
C153	1322046111W	22pF 50V	
C154	1322046111W	22pF 50V	
C155	1322046111W	22pF 50V	
C156	1322046111W	22pF 50V	
C157	1322046111W	22pF 50V	
C158	1322046111W	22pF 50V	
C159	1322046111W	22pF 50V	
C160	1322046111W	22pF 50V	
C161	1322046111W	22pF 50V	
C162	1322046111W	22pF 50V	
C163	1322046111W	22pF 50V	
C164	1322046111W	22pF 50V	
C165	1322046111W	22pF 50V	
C166	1322046111W	22pF 50V	
C167	1322046111W	22pF 50V	
C168	1322046111W	22pF 50V	
C169	1322046111W	22pF 50V	
C171	1322046111W	22pF 50V	
C172	1322046111W	22pF 50V	
C173	1322046111W	22pF 50V	
C174	1322046111W	22pF 50V	
C175	1322046111W	22pF 50V	
C17	1322046111W	22pF 50V	
CON3	2308501251W	AXK8L50125J 50P P=0.4(M)-NAIS	
D15	1710016201W	BAS16XV2T1 SOD523 ON_SEMI	
D20	1770060303W	SP0603B-WW WHITE TOP SOLIDITE	
D21	1770060303W	SP0603B-WW WHITE TOP SOLIDITE	
J6	2306001961W	FH19S-6S-0.5SH HRS	
L10	11220N3201W	ELJPE22NKF 22nH	
L11	11220N3201W	ELJPE22NKF 22nH	
M1	2333080051W	8005 502 2PIN 1.27P AVX	
Q6	1810201801W	2SA2018 EMT3	
Q7	1810461701W	2SC4617 EMT3	
R28	0747114111W	FIXED RESISTOR 470Ω 1/16W	
R110	0722314111W	FIXED RESISTOR 22K 1/16W	
R111	0722214111W	FIXED RESISTOR 2.2K 1/16W	
R112	0710014111W	FIXED RESISTOR 10Ω 1/16W	
R113	0718014111W	FIXED RESISTOR 18Ω 1/16W	
R114	0710414111W	FIXED RESISTOR 100K 1/16W	
R123	0768014111W	FIXED RESISTOR 68Ω 1/16W	
R124	0710014111W	FIXED RESISTOR 10Ω 1/16W	
R125	0710014111W	FIXED RESISTOR 10Ω 1/16W	
R131	07R0014111W	FIXED RESISTOR 0Ω 1/16W	
R143	0710414111W	FIXED RESISTOR 100K 1/16W	
U18	2306019302W	FH19S-30S-0.5SH HRS	
VR3	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR4	2012002931W	VARISTOR MLVS-0402-M07 20A 9V	
VR28	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	
VR29	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	
VR30	2011001532W	VARISTOR V-PORT-0402-220M-V05 1A 5V	

10. BLOCK DIAGRAMS

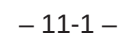
10.1. Baseband



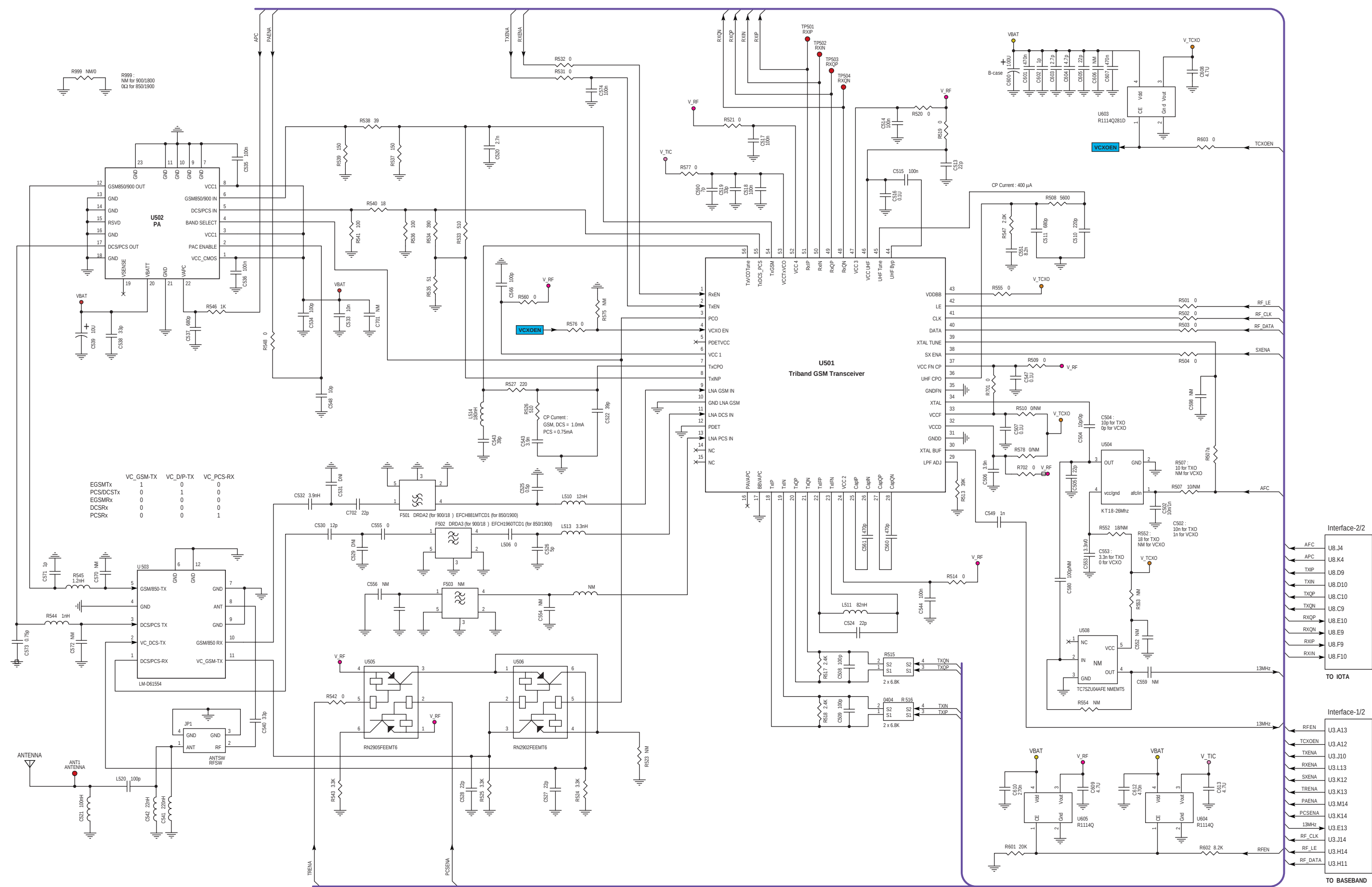
10.2. RF Band



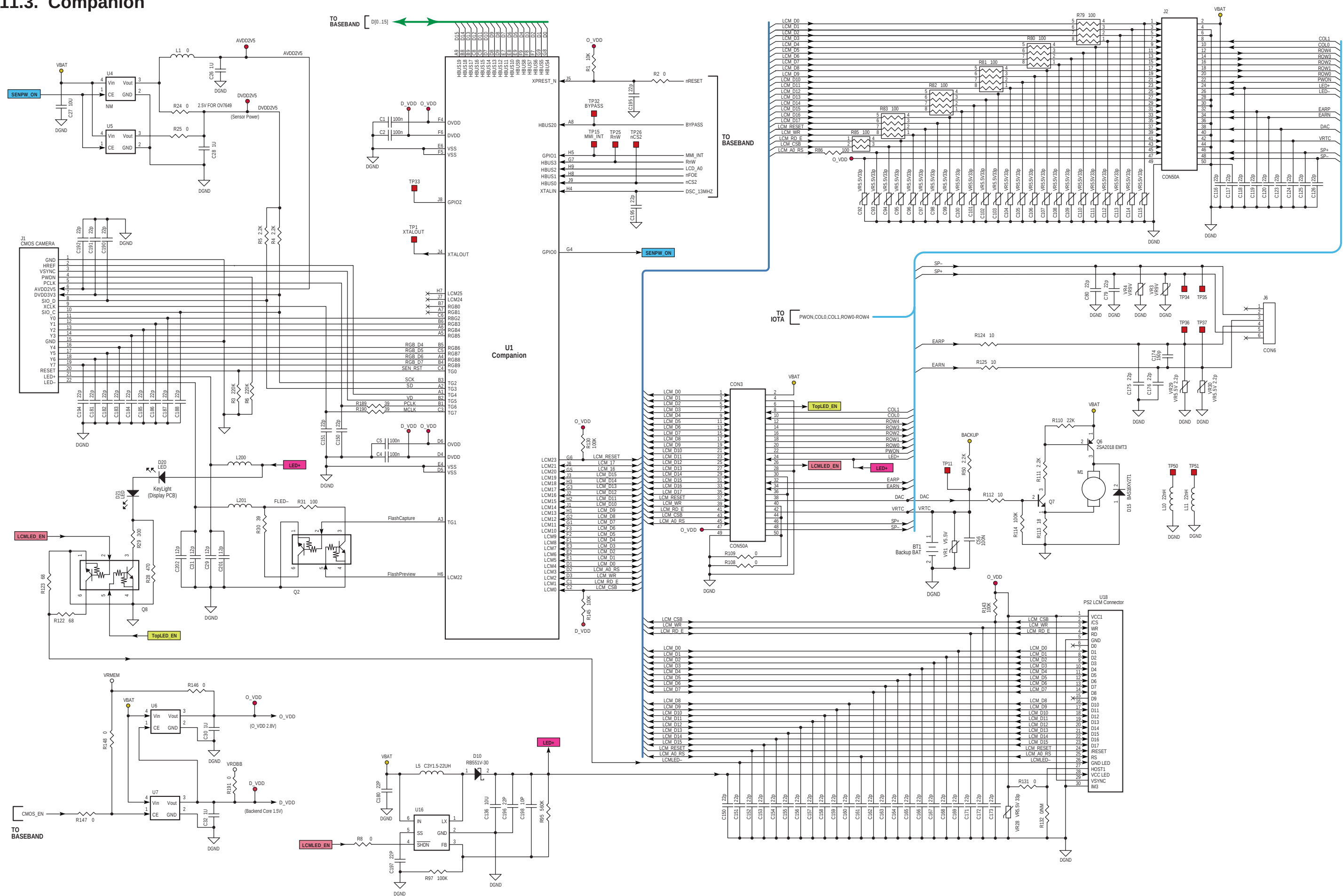
11.1. Main PCB (Baseband)



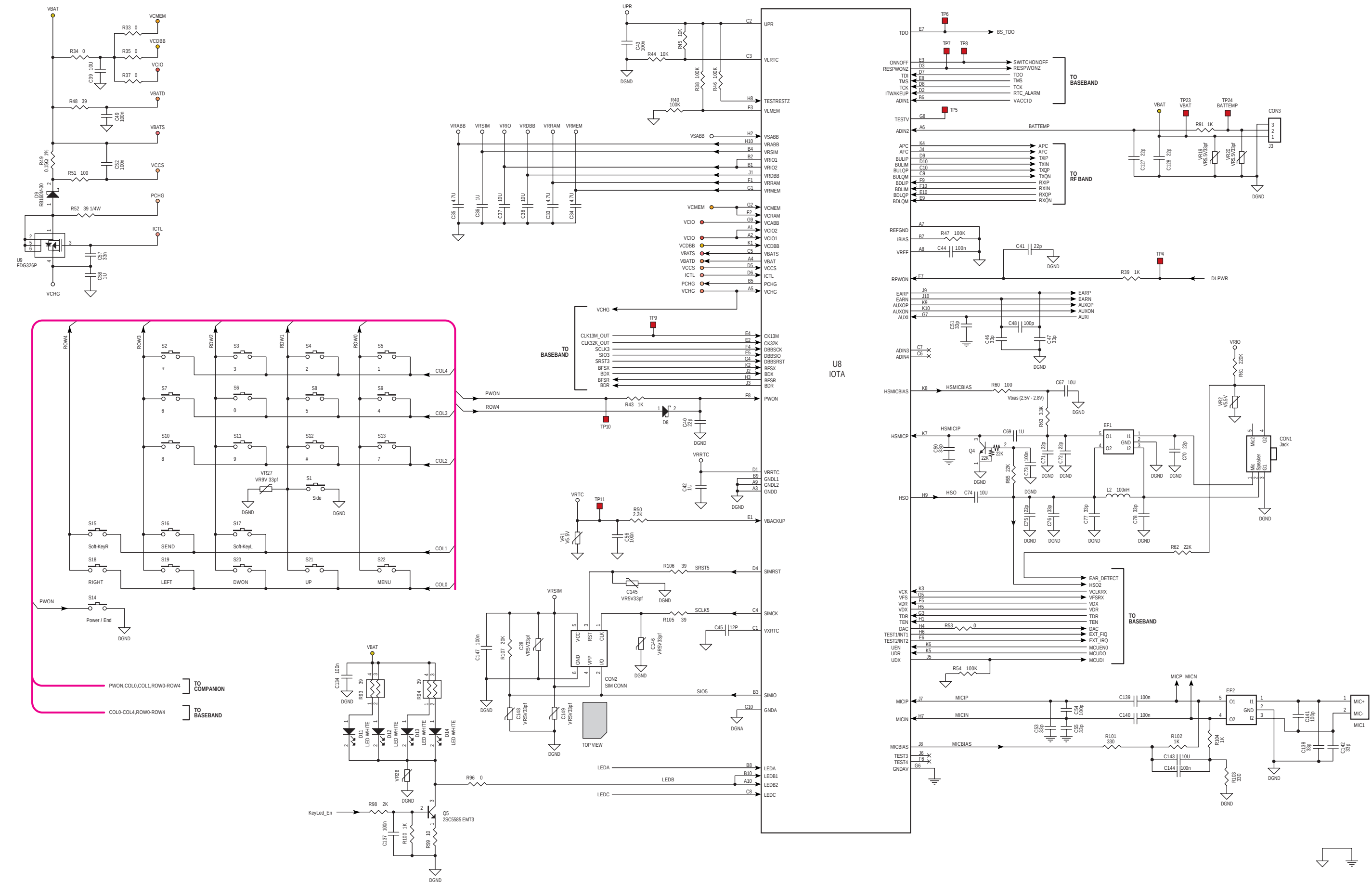
11.2. Main PCB (RF Band)



11.3. Companion

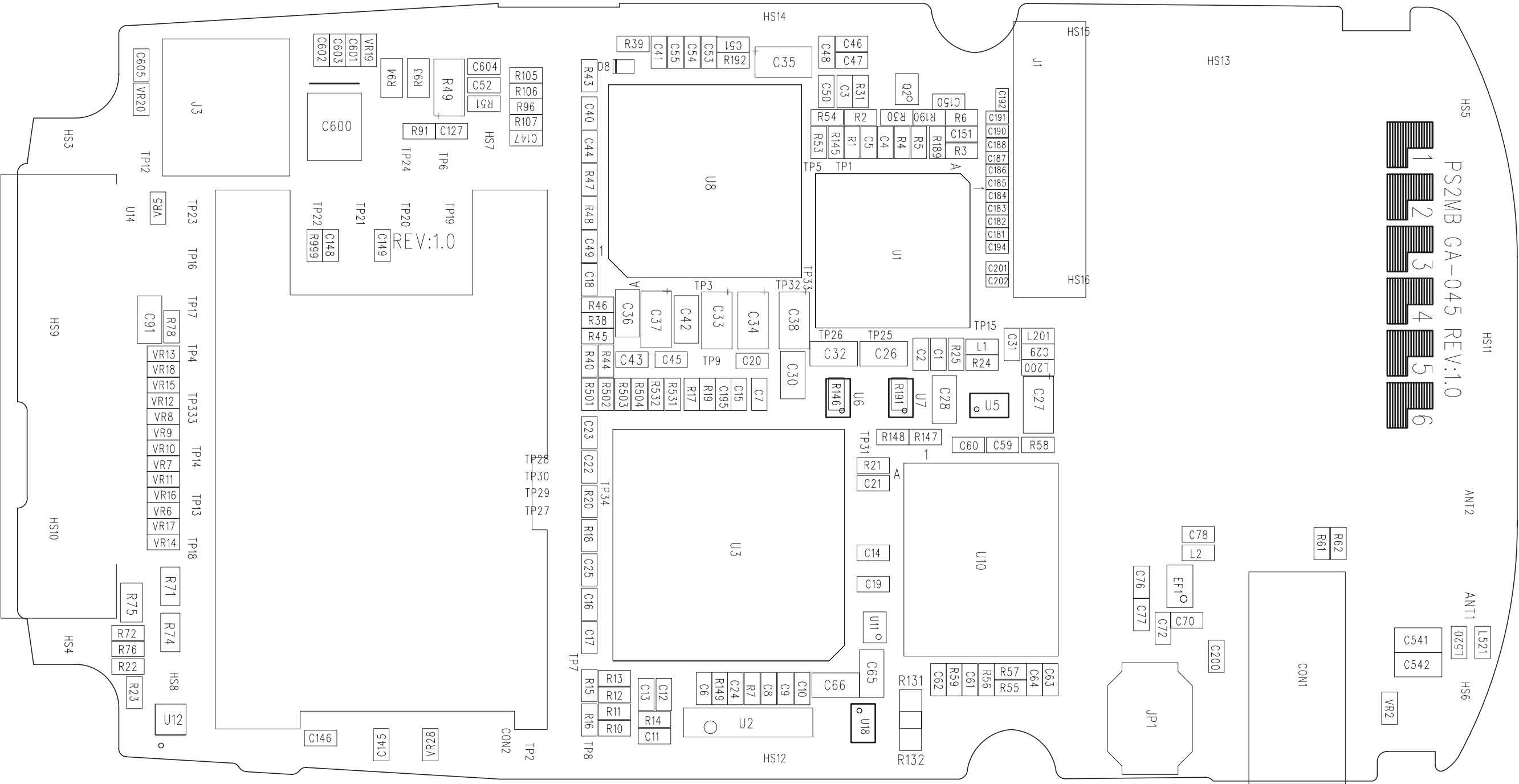


11.4. IOTA

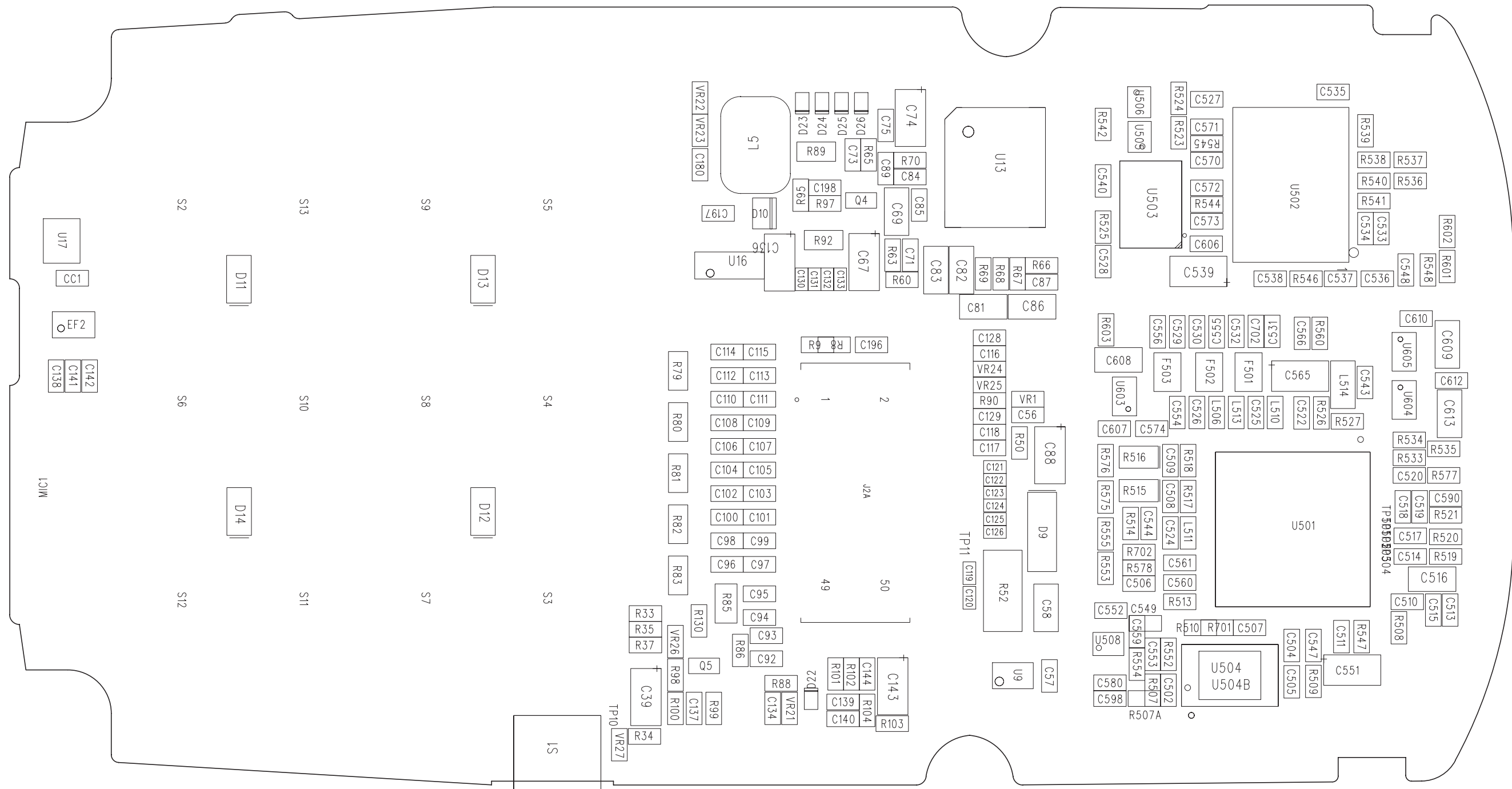


12. LAYOUT DIAGRAMS

12.1. Main PCB (Top View)



12.2. Main PCB (Bottom View)



12.3. SUB PCB

