by Toko (toko@gsm-free.org)

Service Manual

Personal Cellular Telephone

EB-X400

	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 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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CONTENTS

1. INTRODUCTION

WARNING

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

Caution

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

Caution

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

1.1. Purpose of the Manual

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

1.2. Structure of the Manual

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

1. General and technical information - provides a basic understanding of the equipment, kits and options, together with detailed information for each of the major component parts.

2. Installation and operating information - provides instructions for unpacking, installing and operating the equipment.

3. Servicing information - provides complete instructions for the testing, disassembly, and reassembly of the product. 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 enable 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 cosmetic and some electrical components, for the ordering of replacement parts.

1.3. Servicing Responsibilities

The procedures described in this manual must performed by qualified service engineering personnel, at an authorized service center.
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-X400 is a high performance, small, light, handset for business and domestic use. The following features are provided:

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

2.3. Handportable Main Kit

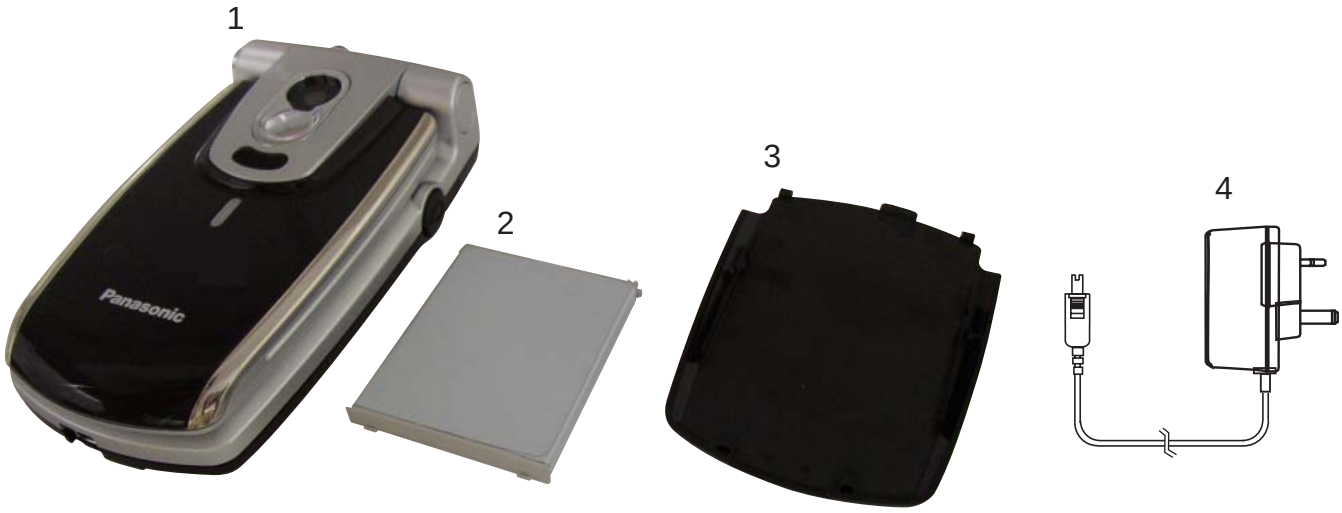


Figure 2.1: Handportable Main Unit Kit Contents

Item	Description
1	Main Unit
2	Battery Standard
3	Battery Cover
4	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. Controls and Indicators

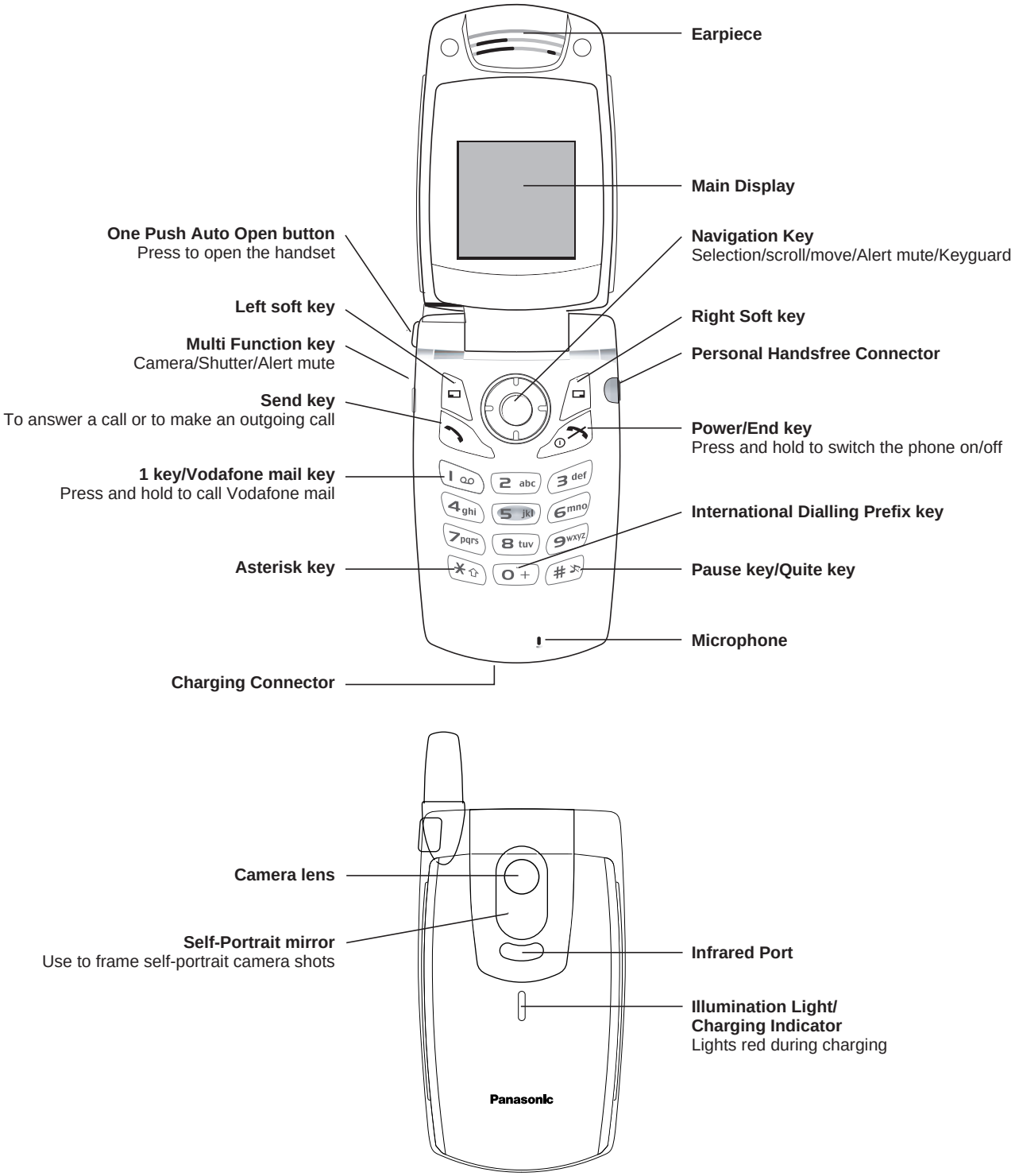


Figure 3.1: Location of Controls and Indicators

3.3. Liquid Crystal Display

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

Figure 3.2: Liquid Crystal Display

3.4. Text Entry (Edit)

Alphanumeric characters to enter details into the Phonebook, to create text, email, message, etc.

Key	Text Mode		
	T9® (T9↑, T9↥ or T9) (Input language : English)	Multi tap (Input mode indicator : Abc, ABC or abc)	Numeric (Input mode indicator : 0-9)
0 +	Alternatives	. @ / – _ + 0	0/ (Hold)+
1 ∞	. , ? ! ' @ : ; / 1 * / (Hold) Character list	. , ? 1 ! " - : ; @ / * ( ) # + _ = [ ] { } ' ¡ ¿ & % \ ^ ~ | < > € ¢ £ $ ¥ ¤ § Space ↵ / (Hold) Character list	1
2 abc	A B C 2 (a b c 2)	A B C 2 Γ Á Ä Å Æ Ç (a b c 2 α β γ á ä å æ à)	2
3 def	D E F 3 (d e f 3)	D E F 3 Δ É (d e f 3 δ ε ζ é è)	3
4 ghi	G H I 4 (g h i 4)	G H I 4 Θ (g h i 4 η θ ι ì í)	4
5 jkl	J K L 5 (j k l 5)	J K L 5 Λ (j k l 5 κ λ μ)	5
6 mno	M N O 6 (m n o 6)	M N O 6 Ξ Ñ Ö Φ (m n o 6 ν ξ ó ő ñ ö ø ò)	6
7 pqrs	P Q R S 7 (p q r s 7)	P Q R S 7 Π Σ (p q r s 7 φ ρ ς σ ß)	7
8 tuv	T U V 8 (t u v 8)	T U V 8 Φ Ü (t y v 8 τ υ π ú ű ü ù)	8
9 wxyz	W X Y Z 9 (w x y z 9)	W X Y Z 9 Ψ Ω (w x y z 9 χ ψ ω)	9
* ⇧	Shift / (Hold) Input mode	Shift / (Hold) Input mode change	* / (Hold) Input mode change
# ⇳	Space / (Hold) Line feed	Space * # / (Hold) Line Feed	# / (Hold) Line Feed
⌫	Delete text / (Hold) Delete all characters		

NOTE : Displayed characters of T9® vary depending on the selected Input language.

Shift mode

Shift mode change

The Shift mode changes by pressing (within 1 sec) * ⇧ .

Multi-tap	Tegic
Abc -> ABC -> abc	T9↑ -> T9↥ -> T9

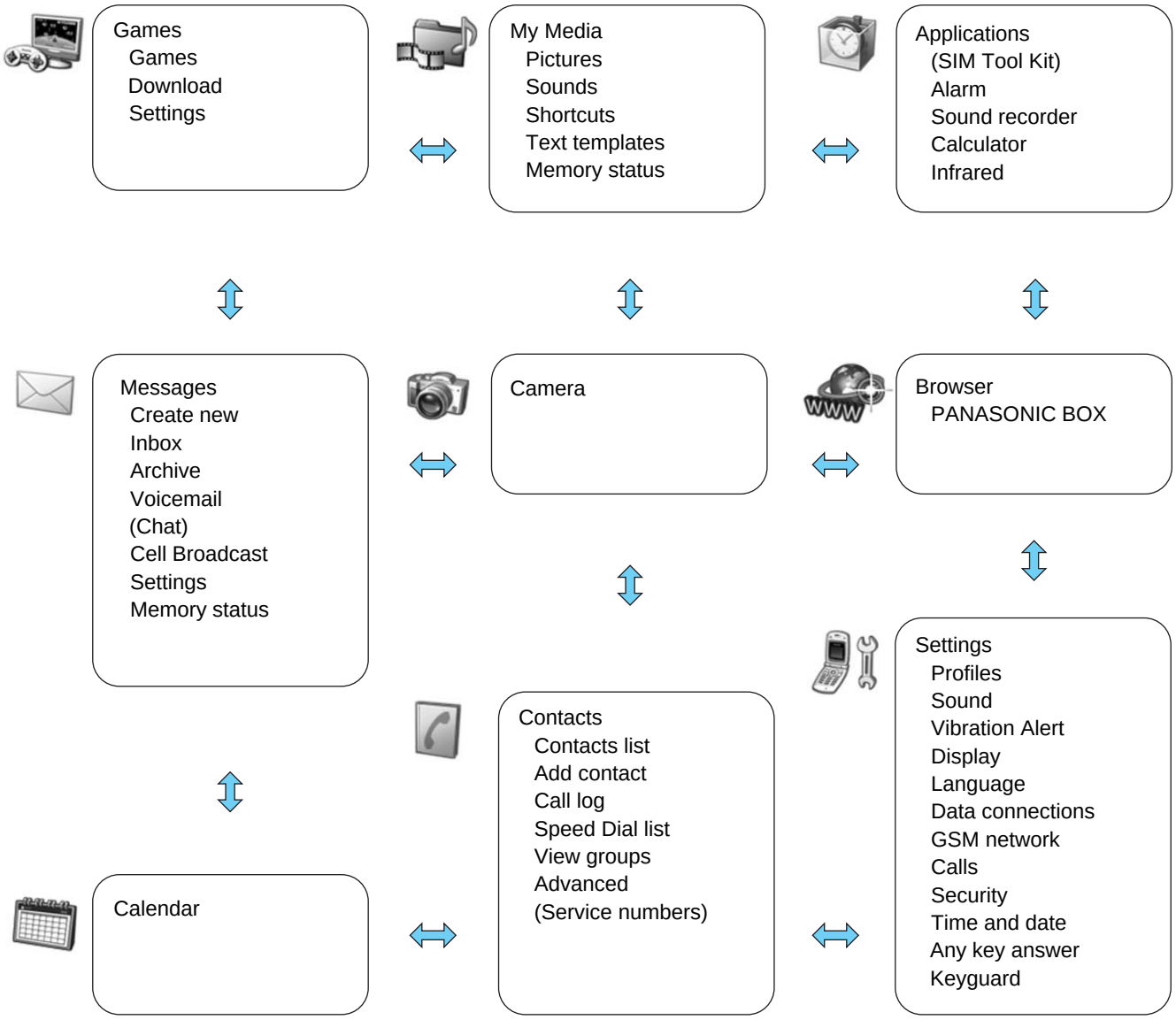
If Input mode is changed, Shift mode is initialised.

Auto capital change

Auto capital affects Abc and T9↑.

If Input mode is changed to Abc or T9↑, the first character is input as upper case and subsequent letters as lower case. (Input mode indicator changes to abc or T9.) If these characters [. (Period) or ! or ?] are input, the next character is input as upper case. (Input mode indicator changes to Abc or T9↑.)

3.5. Features Menu Structure



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
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 1 MHz	100 kHz	300 kHz	–36	–36
1 GHz to 12.75 GHz Excl. relevant TX band E-GSM : 880 MHz to 915 MHz DCS : 1710 MHz to 1785 MHz -and the Rx bands 925 MHz - 960 MHz 1805 MHz - 1880 MHz	0 to 10 MHz > 10 MHz > 30 MHz (off trom edge of relevant Tx band)	100 kHz 300 kHz 3 MHz	300 kHz 1 MHz 3 MHz	–30 –30 –30	–30 (1.0 - 1.710 GHz) –36 (1.710 - 1.785 GHz) –30 (1.785 - 12.75 GHz)
Relevant TX band: E-GSM : 880 MHz to 915 MHz DCS : 1710 MHz to 1785 MHz	1.8 to 6.0 MHz > 6.0 MHz	30 kHz 100 kHz	100 kHz 300 kHz	–36 –36	–36 –36

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 Ib (RBER)	0.42/ α	1,000,000					0.41/ α	20,000,000
class II (RBER)	8.333	120,000	7.5	24,000	9.333	60,000	2.439	8,200

The reference sensitivity level is < –104 dBm.

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

■ E-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/FS (FER)	4.598	13,050				
TCH/FS class Ib (BFI = 0)	0.404	148,500				
TCH/FS class II (BFI = 0)	7.725	25,500	8.500	20,000	7.600	20,000
TCH/FS (UFR)	6.250	9,600				
TCH/FS 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					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	600,000	7.5	24,000	9.333	30,000	2.439	8,200

The reference sensitivity level is < –103 dBm.

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

■ GSM 1800 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/FS (FER)	4.706	12,750				
TCH/FS class Ib (BFI = 0)	0.426	141,000				
TCH/FS class II (BFI = 0)	7.725	25,500	8.735	20,000	7.600	20,000
TCH/FS (UFR)	6.383	9,400				
TCH/FS class Ib ((BFI or UFI) = 0)	0.291	206,000				

■ Blocking:

Frequency	Small MS level in dBμVemf( )	
	E-GSM 900	GSM 1800
FR ± 600 kHz to FR ± 800 kHz	70	70
FR ± 800 kHz to FR ± 1,6 MHz	70	70
FR ± 1,6 MHz to FR ± 3 MHz	80	80
915 MHz to FR - 3 MHz	90	–
FR ± 3 MHz to FR 980 MHz	90	–
FR ± 600 KHz to FR ± 800 KHz	–	87
1785 MHz to FR - 3 MHz	–	87
835 MHz to < 915 MHz	113	–
> 980 MHz to 1000 MHz	113	–
100 KHz to < 835 MHz	90	–
> 1000 MHz to 12.75 GHz	90	–
100 KHz to 1705 MHz	_	113
> 1705 MHz to < 1785 MHz	_	101
> 1920 MHz to 1980 MHz	_	101
> 1980 MHz to 12.75 GHz	_	90

Measurement Conditions:

Wanted carrier is 3 dB above reference sensitivity.

Interferer is CW.

Spurious response exceptions:

Six exceptions are permitted IN band 915 - 980 MHz.

24 exceptions are permitted OUTSIDE band 915 - 980 MHz.

■ 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. RF Block Diagram

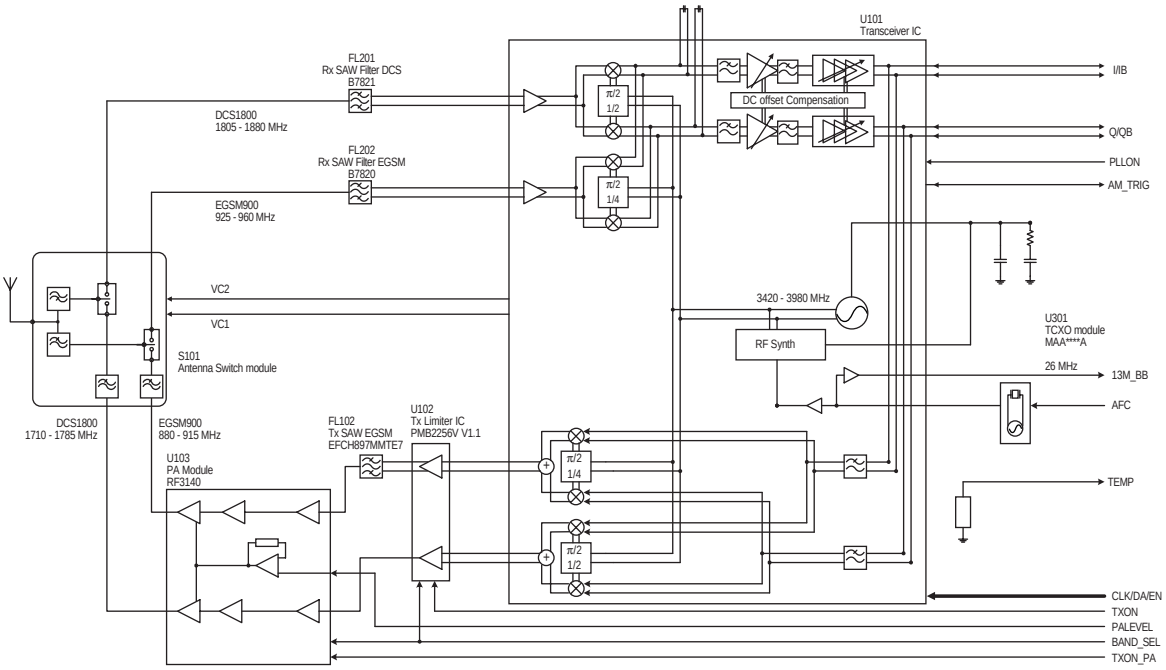


Figure 5.1. RF Block Diagram

5.1.2. Functional Description

The dual-band receiver comprises mainly an RF transceiver IC and and Front-End module.
The transceiver (U101) contains a direct conversion receiver with DC offset calibration circuitry and the following circuit blocks:

- EGSM900 and DCS1800 internal LNAs.
- EGSM900 and DCS1800 down-conversion mixers/demodulators.
- Channel filtering and base-band signal variable gain amplifiers with programmable gain control function.

The Antenna Switch Module S101 is a dual-band antenna switch module. Two external SAW filters EL201 and FL202 for EGSM900 and DCS1800 are used to improve the isolation between 900MHz and 1800MHz.
The impedance of these two filters' output is 150 Ω balanced.

EGSM900/DCS1800

The input receiving signals into the LNAs coming from the SAWs provide out-band reflection.
However, the receiver is a direct conversion type, there is no need to concern about the image frequency blocking problem.

■ Transmitter Description

The main block for the dual-band transmitter is also the Transceiver IC U101 RF chipset.
The Transceiver IC U101's modulator is a direct-conversion architecture, so there are no Tx IF frequencies.
The Transceiver IC U101 contains the following Tx blocks:

- Dual-band (EGSM900/DCS1800) IQ modulators with outputs at final frequencies, and integrated IQ uplink low pass filters.
- Open collector outputs to the rest of the Tx chains.

The open collector outputs of transceiver U101 are fed via internal H3 filter before application to the dual band inputs of Limiter U102. The function of U102 is to reduce the AM ripple from the I, Q modulators.
The 900 MHz output signal from the Tx Limiter U102 must pass through a Tx SAW filter FL102 before entering into the PA Module U103 in order to ensure Tx noise in Rx-band satisfy GSM specifications. For 1800 MHz, the 11.10 specifications are not very severe, so no SAW filtering is needed here. The signals are then attenuated through two attenuators to meet the drive levels of the PA Module U103. Power control is managed through the control line PALEVEL.
Harmonics in the PA output signal are attenuated by low-pass filters inside the Front-End Module.

■ Synthesiser Description

A synthesiser is provided in transceiver IC U101. The internal VCO operates from 3.42 GHz to 3.98 GHz, thus it is equivalent to 2 and 4 times of the DCS and EGSM frequencies. The registers, counters and phase detectors for this synthesiser are included in the transceiver IC U101.
To meet GPRS lock-up timing requirement, provides a switched frac-N and integer-N counter. It also provides switched bandwidth loop filter.
The TCXO module U301 generates 26 MHz in order to provide the reference clock to the transceiver IC and base-band portion. Baseband circuits provide an automatic frequency control (AFC) voltage to compensate for frequency drift caused by temperature variations.
Moreover, there is a thermistor RT101 which is used for the temperature compensation of PA and the reported RSSI.

■ DC Power Supplies

The PA runs directly from the battery and consumes no current when not transmitting. Two regulated 2.8 V lines (RF2V8, VCC_VCXO) are provided for the rest of the RF circuitry from the U2006.

■ Antenna

Fixed helical typed antenna is utilised for EB-X400. Its length is 16 mm and located at the top of the lower unit.
It covers 900 MHz and 1800 MHz.

5.2. Baseband Overview

5.2.1. Baseband Block Diagram

The EB-X400 Baseband is based around a GSM chipset developed by Infineon chip set. The Infineon chipset consists of 2 chips, one is a signal processing chip with DSP and CPU included the analogue baseband (e.g. RF, Audio, SIM), and the other is U2006 (E-Power) which manages power supply and charge control.

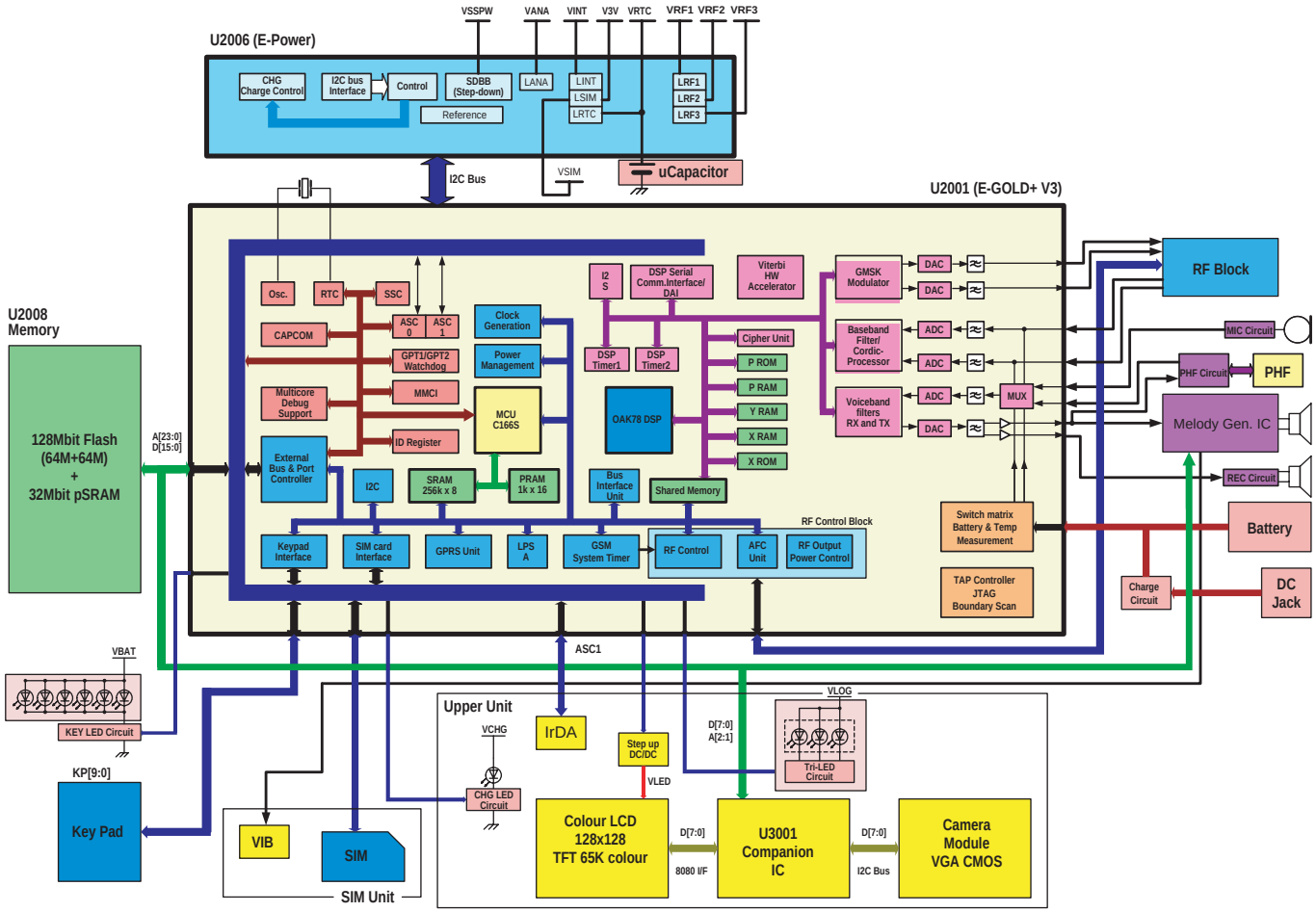


Figure 5.2. Baseband Block Diagram

5.2.2. Summary of device/circuit changes to achieve the new features

■ Baseband Chipset U2001 (E-Gold + V3 / E-Power V1.83)

The EB-X400 baseband is based around a GSM chipset developed by Infineon. Thee chipset comprises two ICs as follows:
E-Gold + V3 (U2001) Signal processing IC with DSP and CPU and analogue baseband (e.g. RF, Audio, SIM).
E-Power (U2006) power management and charge control IC.

■ Memory

The ROM/RAM capacity of the EB-X400 external memory U2008 is 64-Mbit Flash + 64-Mbit Flash + 32-Mbit mobile SRAM.

A 3-chip stacked MCP (Multi-Chip Package) is used. The 2-Mb E-Gold + V3 internal SRAM is required together with the external SRAM U2008.

■ Power Source

EB-X400 uses a 600 mAh Lithium-ion battery pack.

■ Main Colour TFT LCD

A 65536 colour 128 x 128 pixels full-penetration TFT LCD module.
A HD66782 chipset is used for the LCD driver.

■ Integrated Camera

As one of the most characteristic features of the EB-X400 design, an integrated digital camera is introduced.
A VGA (640 x 480 pixels) size CMOS camera module. This camera module does not have an integrated SRAM nor a JPEG encoder.

■ 16 polyphonic Melody Ringer

A new Melody generator IC ; U2011 YMU759B is used for the enhanced 16 polyphonic Melody ringer function with ADPCM.
Main features of the melody generator IC are as follows ;

- 16 multi-sounds
- ADPCM decode function (possible to mix-play with melody data)
- FIFO (512 byte for MIDI, 256 byte for ADPCM) and sequencer installed
- 0.4 W speaker amplifier integrated

■ IrDA

The IrDA transceiver function is added to EB-X400 to enable wireless data exchange with PCs and other handsets.

■ Real Time Clock (RTC)

Time and calendar informations provided within U2001, obviating the need for an external RTC.
The RTC has following functions:

Time counter (SEC, MIN, HOUR, WEEK, DAY, MONTH, and YEAR)
Daily/Weekly Alarm control
Time constant interrupt generator
High accuracy time correction control

■ Acoustic Components

Desktop handsfree (DTHF) operation is supported using a DTHF speaker located in the bottom of the handheld unit.
Ringing tones are also output from this speaker.

■ Headset with remote switch

A headset with remote control is available as an accessory.
This arrows the user to receive, end or place calls without opening the clamshell of the headset.

5.2.3. U2001 E-Gold + V3 (BASEBAND CHIPSET, DIGITAL AND ANALOGUE CHIP)

The U2001 (E-Gold + V3) manufactured by Infineon contains the DSP, CPU, GSM timing functions and many peripheral functions, this LSI contains the interface circuits to the Audio, RF, SIM and auxiliary analogue functions.

■ DSP (OAK)

The DSP core is a 16-bit (data and program) high performance fixed-point DSP core and is designed for the mid to high-end telecommunication applications, where low power and portability are still major requirements.
The core consists of a high performance central processing unit, including a full featured bit-manipulation unit, RAM and ROM addressing units, and program control logic. The core has an improved set of DSP and general microprocessor functions to meet the application requirements.
The DSP can be clocked at up to 78 MHz via a PLL contained within U2001 (E-Gold+ V3).

■ MCU (C166S)

The C166S controller core combines advantages of both RISC and CISC processors in advanced architecture which closely couples on-chip memory and controller peripherals to the core in a very efficient way. This micro controller works in 32 bits or 16 bits instructions and on 32,16 or 8 bit data. The C166S architecture is based on RISC.
The core uses multiple variable register banks, and single cycle context switch support. The memory space is organised logically as a van Neumann architecture, but physically the core uses multiple high bandwidth buses and core memory to increase performance.

■ Memory interface

The U2001 E-Gold + V3 has a physical address space of 128-Mbit / 16-Mbyte. The actual amount of memory needed depends on the features included in the product. The number of features also has an influence on the required memory access speed. The memory data bus is 16 bit wide. The SRAM utilizes the BHEQ signal to support both 8 and 16 bits access for more efficient use. The memory interface of the U2001 E-Gold + V3 supports 1.8 V or 2.6 V operation, allowing flexibility on the choice of memory components. EB-X400 adopted 2.6 V operation because the operation voltage of memory is 3.0 V operation. The memory interface voltage level is selected by connecting the VDD2.0x supplies on E-Gold + to either V_SD or to VINT.

	Maximum Access Time [ns]	MCU speed	Number of write state	Eff. Bus speed [MHz]
GSM stack, basic features	100	13MHz	0 ws	6.5
GSM stack, advanced features	70	26MHz	1 ws	8.67
GPRS stack	70	26MHz	1 ws	8.67

Memory Mapping:

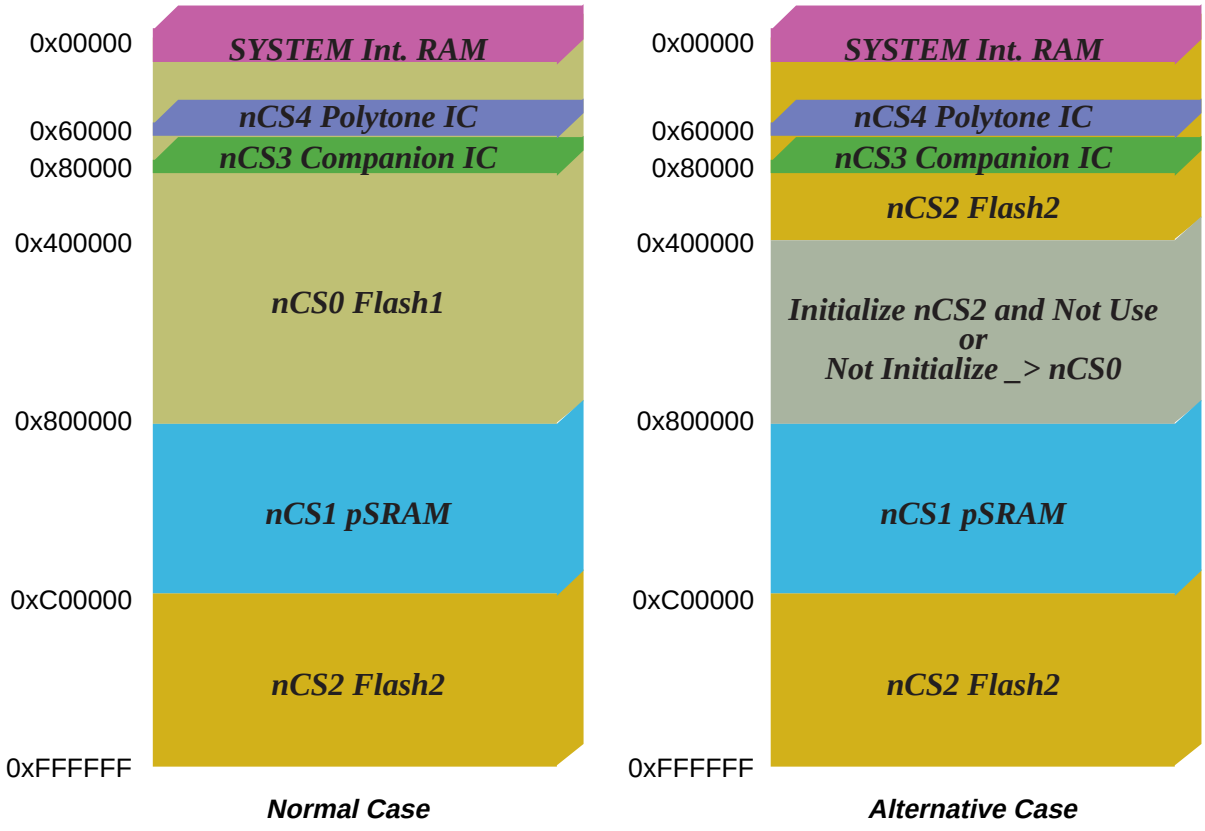


Figure 5.3. Memory Map

■ Clock Interface

The U2001 (E-Gold + V3) clock generation unit is used to generate all major system clocks. There are two clock signals connected to the clock generation unit.

- 32 kHz clock F32K
- 26 MHz clock F13/26M

The 32 kHz oscillator is used for the Real Time Clock block. As a power-saving feature the 32 kHz clock can be also used for the MCU domain. The 32 kHz oscillator and the RTC block have its own power supply pads. It has the facility for a back-up power source for when the main battery is discharged or remoed temporarily.

The 26 MHz clock is used as the major U2001 (E-Gold + V3) clock reference. An on chip shaper is used to maintain the low-swing input level on F13/26M. It can be powered-up with a delay (programmable in ECO block) related to the TCXO power-up. This can slightly reduce overall power consumption.

CLKCTRL Clock Control Register

15	14	13	12	11	10	9	8
13/26 MHz_IN	-	-	AFC32KEN	-	CPUPRE (2:0)		

7	6	5	4	3	2	1	0
-	CPUH	AFCEN	SX52M	SXMEN	CLKAEN	SWCLK	PLLUP

PLLUP : PLL Power Up Bit
SWCLK : PLL Clock Switch Bit
CLKAEN : CLKANA Enable Bit
SXMEN : Coprocessor clock enable
SX52M : Coprocessor clock switch
AFCEN : AFC Enable Bit
CPUH : Enables 52 MHz operation of the CPU and serial interface
CPUPRE [2:0] : CPU Clock Prescale Factor
AFC32KEN : AFC clock enable during ECO eco sleeep mode
13/26MHz_IN : Configure the CGU for the operation with either 13 MHz or 26 MHz input

CGURST Clock Generation Uint Reset Register

15	14	13	12	11	10	9	8
DSPSLOW	0	0	0	0	0	r	r

7	6	5	4	3	2	1	0
	0	0	0	0	RTCRST	SIMRST	DSPRST

DSPRST : DSP Reset Bit
SIMRST : SIM Card Interface Reset Bit
RTCRST : Real Time Clock Rest Bit
DSPSLOW : DSP slow-down control bit

The frequency of clk_pll depends on 13/26 MHZ_IN and DSPSLOW refers to the below table.

DSPSLOW	13/26 MHZ_IN	Frequency of Input Clock F13/26M	Frequency of clk_pll	Frequency of clk_dsp	Frequency of clk_master
0	0	26 MHz	104 MHz	104 MHz	52MHz
0	1	13 MHz	104 MHz	104 MHz	52MHz
1	0	26 MHz	156 MHz	78 MHz	52MHz
1	1	13 MHz	156 MHz	78 MHz	52MHz

■ Interrupt and Exception Handler

An Interrupt and Exception Handler is responsible for managing all system and core exceptions.
There are four different kinds of exceptions that are executed in a similar way:

- Interrupts generated by the Interrupt Controller (ITC)
- DMA transfers issued by the Peripheral Event Controller (PEC).
- Software traps caused by the TRAP instruction
- Hardware traps issued by faults or specific system states

Normal Interrupt Processing

The CPU temporarily suspends the current program execution and branches to an Interrupt Service Routine (ISR) in order to service an interrupt-requesting device. The current program status [Instruction Pointer (IP), Processor Status Word (PSW), and in segmentation mode, the Code Segment Pointer (CSP)] is saved on the internal system stack.
A prioritization scheme with 16 priority levels and with 8 sub-levels (8 group levels) specifies the order of multiple interrupt-request handling.
The maximum number of interrupt requests supported by the core architecture is 112 (configured in steps of 16).

Software and Hardware Traps

Trap functions are activated in response to special conditions that occur during the execution of instructions.
A trap can also be caused externally by the Non-Maskable Interrupt (NMI) pin. Several hardware trap functions are provided for handling erroneous conditions and exceptions that arise during the program execution. Hardware traps always have highest priority and cause immediate system reaction. The software trap function is invoked by the TRAP instruction, which generates a software interrupt for a specified interrupt vector. For all types of traps, the current program status is saved in the system stack.

Interrupt Processing via the Peripheral Event Controller

A faster alternative to normal interrupt processing is servicing an interrupt requesting device by the C166S's integrated PEC. Triggered by an interrupt request, the PEC performs a single-word or byte data transfer between any two memory locations through one of 16 programmable PEC service channels. During a PEC transfer, the normal program execution of the CPU is halted. No internal program status information needs to be saved. The same prioritization scheme is used for PEC service as for normal interrupt processing.

■ General Purpose I/O

The MCU can configure the pin functionality of most of the pins after reset. Whether those pins show GPIO functionality or one of the alternate functions ALT0 or ALT1 is defined by the PxCONF and PxALTSEL registers.
Because some of input functions appear on more than one pin, the PINSEL register must specify the respective pin. In case of ASCx the active input needs to be set by the SxPISEL register of ASCx.
For peripherals which are not able to select or disable their input signal, the corresponding input signal must be enabled by the INPEN register.

General purpose I/O lines usage

E-Gold + V3 pin name	Ball	EB-X60 use	Description
HLDAQ/CC03IO/DSPIN0/T2IN	U7	SDIR	IrDA sensor enable/disable
T_OUT4/DSPIN0	G14	AM_TRIG	Blocker detection in RF LSI
T_OUT5/CCI7IO	G17	CAM_INT	Companion IC interrupt detection
nCS0	A15	CSFLASH1	CS for FLASH1
nCS1	C16	CSMSRAM	CS for MSRAM
nCS2/CC02IOB	A17	CSFLASH2	CS for FLASH2
nCS3/EX4IN/DSPIN0/T4EUD	D15	CSCAM	CS for Companion IC
nCS4/DSPOUT	E14	POLY_EN	CS for Polytone IC
RESTR4/EX2IN/CLK32K	L15	CAM32K	CLK for Companion IC
MMCDAT	L16	CAM_A[2]	Command/data selection for Companion IC
LPAOUT0/CC05IO	P8	OPDET	Open/Close interrupt detection
CLKSXM/I2SWAO	R17	POLYCLK	Clock source for YAHAMA melody IC
T_OUT11/CC19IO	H15	HOOK_KEY	Hook key interrupt detection
CC02IO/nHOLD/DSPOUT1	D16	HS_DET	Headset insert interrupt detection
LPAOUT1/I2SCAO	U16	KEYLED	Key LED control (ON/OFF)
RFSTR3/CC21IO	K16	CUR_EN	LCD backlight control (ON/OFF)
CC00IO/T3OUT	R9	TRI_R	Tri-color LED (Red) control (ON/OFF)
MTSR/SDA	R16	TRI_B	Tri-color LED (Blue) control (ON/OFF)
SSCCLK/SCI	U17	TRI_G	Tri-color LED (Green) control (ON/OFF)
RFSTR2/CC07IO	K15	TOPLED1	Charge LED (Red) control (ON/OFF)
MMCRORD/LPAOUT3/EX3BIN	P15	SHUTDOWN	32 Ω driver amplifier control
T_OUT6/T4IN	K15	SW_EN	PHF path enable signal

■ Specific I/O

Specific I/Os are reserved for the buzzer and keyboard.
Buzzer is not supported in EB-X400 because ringing tones are sounded through a speaker.

○ PWM

The U2001 E-Gold + V3 supports driving a ringer with a digital PWM signal RINGIN. Earpiece buffer one can be switched into ringer mode by setting bit RINGSEL in the voiceband part of the analog control register.
The input to RINGIN can be selected by setting the bits RINS0 and RINS1 in the voiceband control register. The ringer input signal is usually a pulse-width modulated signal which can be programmed conveniently.

○ Keypad Interface

The Keypad gives a 6 x 4 scan matrix allowing 24 keys. The keyboard interface provides a passive key detect function, where a key press can be detected without activity scanning the matrix, thus enabling a fast key response, even when the CPU is in idle. The scan period is every 4 msec.
If there is a need to support more than 24 keys, the key matrix can be extended by adding scan column output GPIO's.
The maximum key resistance is 2 kΩ, leakage between any two key matrix lines must be kept below 5 μA.
The End Key is also used to power on the phone it is allocated a complete ROW of the keyboard scan.
EB-X400 supports the VSCL games and keypad assignments for VSCL games refers to the below table.

Keypad assignments

	Column 1 KP0	Column 2 KP1	Column 3 KP2	Column 4 KP3	Column 5 KP4	Column 6 KP5
Row 0 KP6	Left	Up	* (Game C)	7 (Game A)	4	1
Row 1 KP7	Send	Center (Fire)	0 (Fire)	8	5	2
Row 2 KP8	Right	Down	# (Game D)	9 (Game B)	6	3
Row 3 KP9		Soft_1	Soft_2	Shutter Bottom		

■ I2C Bus Interface

A standard I2C-Bus interface is implemented, especially to control the Infineon power management device U2006 E-Power. Operation of U2006 can be controlled completely by a set of control registers. E-Gold + can write to the control register via an I2C-bus interface. Using the I2C-bus master interface on E-Gold + the system controller can control most functions of U2006 as soon as power is supplied to E-Gold +. Via the same interface E-Gold + can read status registers permitting monitoring of the state of U2001, e.g. to detect the cause of a reset or whether an external supply voltage for battery charging is applied. The controller may power-down the system or parts of it by writing to the appropriate control register. Powering down parts of the system reduces stand-by power consumption of U2006 and may additionally reduce the power-down current of the attached devices. The I2C-bus interface of E-Power is a pure slave interface. It permits fast-mode operation with clock frequencies up to 400 kHz as described in the I2C-bus specification. Spike suppression is done by analogue filtering.
Error protection is used to prevent malfunction due to interference under adverse environmental conditions.
For this purpose an 8-bit CRC byte is appended to each command word. Only if the CRC has been verified by U2006 the transferred command will be executed. Correct reception and execution of the transmitted command can be verified by E-Gold + by reading back the transmitted CRC byte.

■ Timer / Watchdog Timer

The MCU general purpose timer blocks contain 9 16-bit timers and 16 capture compare channels with pulse width modulation options. The Watchdog Timer provides programmable time-out periods derived from the CPU clock. If it is not served before reaching time-out, the Watchdog Timer asserts a hardware reset.

■ UART (ASC : Asynchronous/Synchronous Serial Interface)

The U2001 E-Gold + V3 has two UART ports, ASC0 and ASC1. ASC0 with automatic baudrate detection running up to 3.28 Mbaud and IrDA DS3001 support up to 115.2 kBaud. ASC1 running up to 3.25 Mbaud and with IrDA support up to 115.2 kBaud. EB-X400 uses ASC0 port for serial interface in factory and software download. ASC1 port is used for DS3001 data transmission.

ASC0 port Assignment

E-Gold + SIGNAL	E-Gold+ Ball	EB-X400 use	I/O
TXD0	M15	Serial interface data TX	O
RXD0	M16	Serial interface data RX	I

ASC1 port Assignment

E-Gold + SIGNAL	E-Gold+ Ball	EB-X400 use	I/O
TXD1	L14	IrDA interface serial data TX	O
RXD1	L17	IrDA interface serial data RX	I
nHLDA	U7	IrDA module shutdown(L: Active, H:Shutdown)	O

■ Subscriber Identity Module (SIM)

The Chip Card Interface is a customized UART with additional features used for a 3 Volt Subscriber Identity Module (SIM) as specified by ISO 7816. It supports speed enhancement as specified in GSM 11.11 Phase 2+ with baud rates up to 100 kBaud. If the SIM card is disconnected, the chip card interface is able to power down the electrical contacts of the SIM card automatically.

E-Gold + V3 features a GSM phase 11/11+ compliant SIM interface, providing support for 3 V normal and high-speed SIM cards. 1.8 V cards are supported inherently, as 1.8 V cards according to specifications, must be able to work also at 3 V. EB-X400 SIM interface is designed to support 3 V technology SIMs.

■ GSM Timer / RF Control

The GSM Timer and RF control modules are used to control all radio channel timings and to program external devices. The main goal of the GSM timer is to off-load the MCU from scheduling periodic events within a TDMA frame. It provides high flexibility in scheduling and executing events using a programmable RAM table and is able to generate timing and trigger signals as well as interrupts to both the MCU and to the DSP. The RF Control Unit transmits user defined control information to up to 5 devices via two separate serial interfaces. The RAM of the RF Control Unit holds up to 40 messages and 6 times 16 values for power amplifier ramping. The reference counter of the GSM Timer Unit is the TDMA counter of the TDMA Compare Unit.

The TDMA counter is a programmable modulo 10000 D 15 bit counter, operated by a 0.461 µsec clock and allows to measure the length of one TDMA frame (4.615 msec) with a resolution of one eights of a bit. The RAM of the GSM Timer Unit contains the information at what time within a TDMA frame, one (or more) of the 26 output signals TRIG (25 : 0) change its value (called timing compare value), and the new values of all output signals at this time. One timing compare value and the corresponding TRIG (25:0) signal values are called timing event. The RAM operates like a FIFO. The TDMA Compare Unit compares the last timing compare value of the FIFO with the TDMA counter value. When both values are identical, the corresponding output values for TRIG (25 : 0) are read out of the RAM and taken over by the external signals. After a match, the RAM address is incremented by the address generator of the RAM Control Block and the next timing compare value is address decoder.

T_OUT Name	Feature	Ball	EB-X400 Use	Connection
T_OUT0	TXON	F16	Transmitter block power control	SmartiDC
T_OUT1	PLLON	F14	Phase Lock Loop ON	SmartiDC
T_OUT2	BAND_SEL	F15	Band select GSM/DCS	SmartiDC
T_OUT3	NC	G16	No Connection	
T_OUT4	AM_TRIG	G14	AM signal detection	SmartiDC
T_OUT5	CAM_INT	G17	Camera Module interrupt	Companion IC
T_OUT6	NC	E17	No Connection	
T_OUT7	DISP_RST	F17	Display Reset Signal	LCD Module
T_OUT8	TXON_PA	G15	Power Amplifier ON	Power Amplifier
T_OUT9	EP_INT	H16	E-Power interrupt	E-Power
T_OUT10	GND	J14	Ground	Ground
T_OUT11	HOOK_KEY	H15	Hook Key detection on Personal HF	Personal HF
T_OUT12	NC	K17	No Connection	

■ RTC

Real Time Clock block in U2001 E-Gold + V3 is used for EB-X400. The integrated RTC in the E-Gold + consumes only approx. 1 - 2 µA, hence backup can be provided simply by adding a large capacitance on the RTC supply.

In backup mode (E-Gold + powered off) with only the RTC running, the RTC will operate down to app. 1 V. EB-X400 has very large backup capacitors. Thus, EB-X400 inserts a series resistor to avoid initial charging of the capacitor and clamps the RTC supply, preventing the RTC circuit to work during E-Gold + initialization.

EB-X400 uses the micro capacitor instead of backup battery to save the cost and chip mount area.

The Transceiver IC U101 (PMB6256VV1.1) set does not support the backup function in these LSIs, it is necessary to add the external regulator and power control circuit for backup battery charging.

The backup battery capacity is 50 µAh (2.6 V to 0.0 V discharge).

■ Uplink / Downlink I & Q

U2001 (E-Gold + V3) performs GMSK modulation on data samples received form DSP at 270 Kbits per second.
The I & Q signals are multiplexed to interface with the SMARTi RF IC.

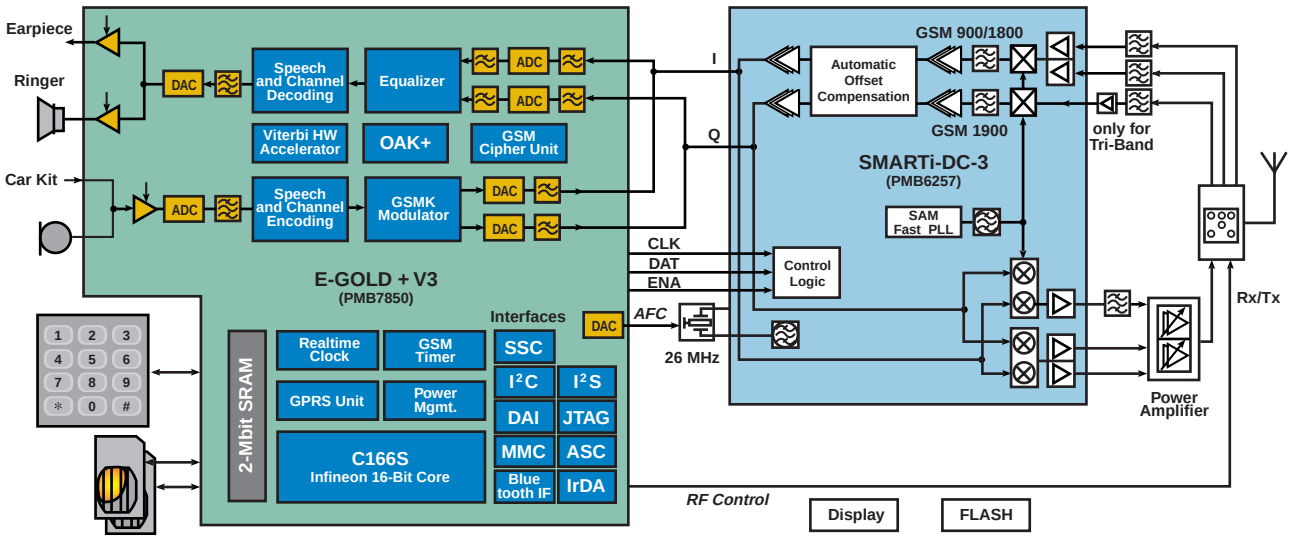


Figure 5.4. Functional structure of the baseband Uplink / Downlink path

■ Power amplifier Ramp

The PA control ensures that the power ramp up and down sequences are generated. Each power ramp up/down sequence consists of 16 values of 10-bit length which represents the shape of the rising (falling) edge of the desired ramping curve in digital form. All 10-bit values are delivered in serial manner to the power-ramping path of GAIM.

Shape

The Ramp Shape is defined by 16 steps, the shape can be defined differently for rising and falling ramps.
Typically a raised cosine shape will be used as a starting basis of the ramp shape.

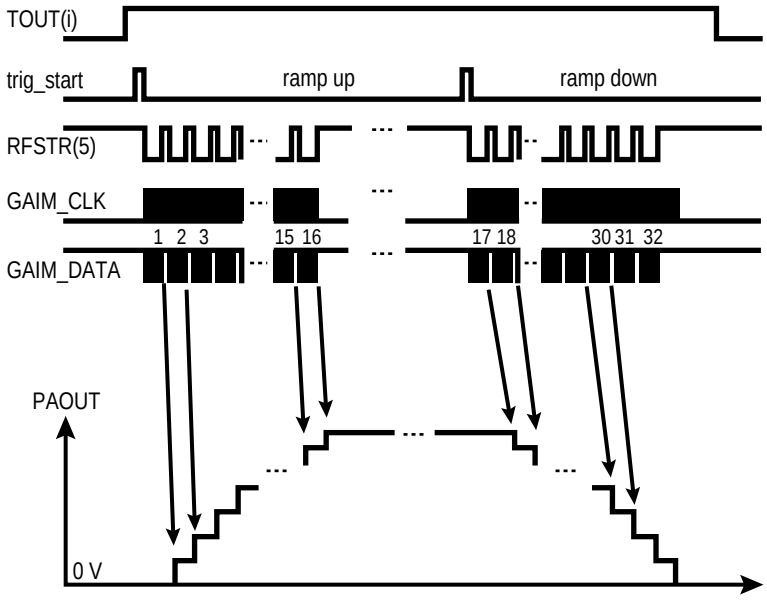


Figure 5.5. Raised and fall cosine for the PA ramp

■ AFC Control

The Automatic Frequency Control (AFC) Unit generates a pulse number modulated (PNM) signal which can be low pass filtered externally to make a programmable DC voltage for controlling the external VCXO. The PNM signal repeats itself with a period depending on the number of bits used in register AFCVAL.

For standard applications, the upper 11 bits are used and the PNM signal repeats every 2048 13 MHz clock cycles. (Approx. 158 µsec, frequency 6.35 kHz) For each 13 MHz clock input to the block, the output is driven to "1" or "0".

The ratio of the number of "1"s to "0"s output in a period is proportional to the value of the AFCVAL register. The "1"s are distributed equally in a PNM period. No pulse deviates more from a perfect distribution by more than 1 input clock period. For instance if the value 7 is programmed, the leading edge of the seven 77 nsec wide pulses are separated by 293, 293, 292, 293, 292, 293 and 292 clock periods, which is near the ideal value of 292.57. The equal spacing in a period ensures that most of the energy in the signal appears at harmonics of 6.35 kHz, (in this case 7 x 6.35 kHz), and very little at 6.35 kHz. Because of this the requirements for the low pass filter are considerably reduced compared to a pulse width modulated output or a pulse number modulated signal with unequal distribution. In this example which uses 11-bits, the lowest frequency component in the spectrum of any E-Gold + V3 PNM sequence is 6.35 kHz and has an effective amplitude of less than 1 LSB.

■ Audio

E-Gold + V3 provides the analogue interface for the digital audio samples processed by the DSP in E-Gold + V3.

Voice Uplink and Downlink path

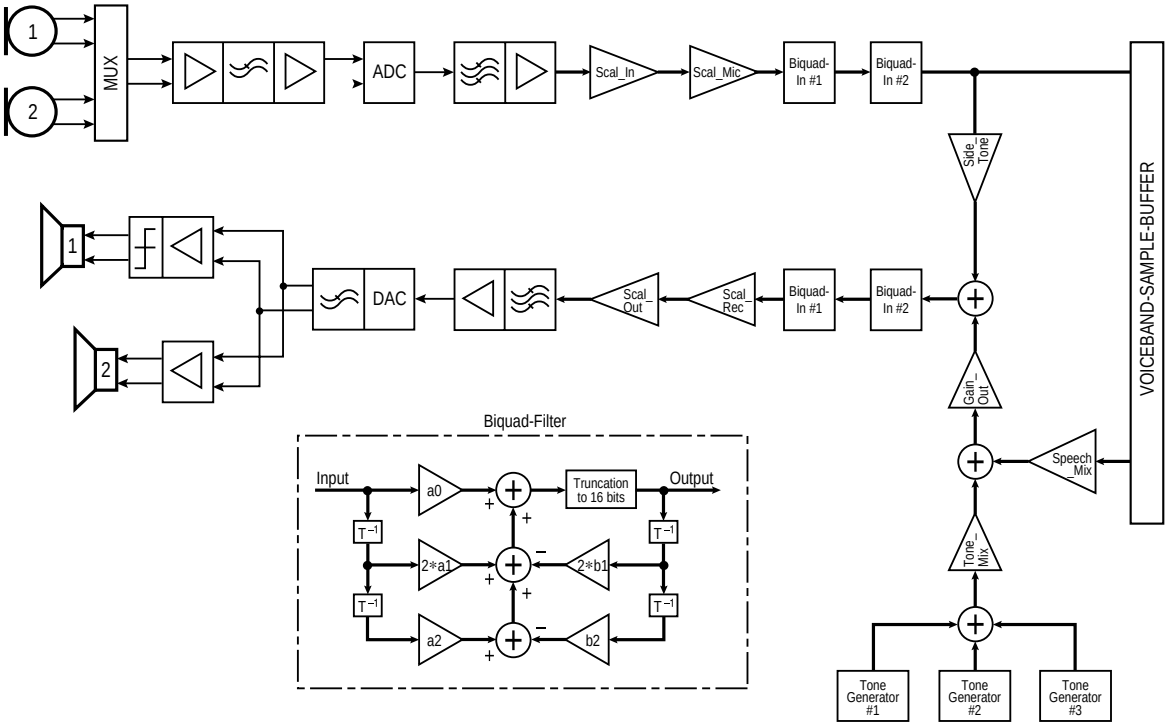


Figure 5.6. Voice ADC and DAC block diagram

■ Auxiliary A/D

U2001 (E-Gold + V3) provides 5-input 10-bit A/D converters for monitoring. These inputs are available externally to monitor the main battery voltage, charger voltage and charger current monitoring.

The functions of the four external A/D inputs are as follows.

E-Gold+ V3 A/D inputs			
E-Gold + input	Pin No.	Function	Values
VBAT	P1	Battery voltage	
TBAT	P2	Battery Temperature	
TENV	P3	Environment Temperature	
TVCO	H1	Quartz Temperature	No connection in EB-X400
BTEC	N2	Battery technology identification	No connection in EB-X400

The figure shows an AD converter path, starting from the analog inputs, the buffer amplifier, the ΣΔ modulator and digital decimating low-pass filter. The voltage is divided in an optional resistor divider to adapt to the input range of the ΣΔ modulators, and the resulting voltage difference to the reference voltage Vref is converted to a 6.5 Mbit/s bitstream at the output of the ΣΔ modulator. This bitstream is converted to a 16-bit value in the decimating low pass filter.

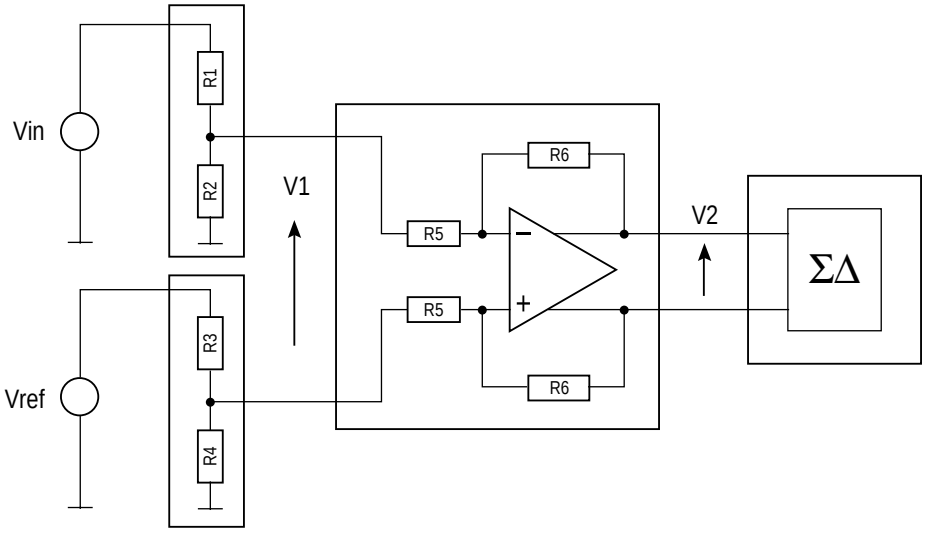


Figure 5.7. AD Converter Path

- **Battery Temperature (TBAT) :**

The battery packs used for EB-X400 contain a negative temperature coefficient thermistor. The basic parameters of the thermistor are as follows:
R25 = 10 kΩ ± 1%
B = 3435K ± 1%

- **Calibration :**

And EB-X400 has values of electrical volume for A/D calibration as follows.
Battery voltage : VBAT1, VBAT2
Battery temperature : TBAT1, TBAT2
Environment temperature : TENV1, TENV2

5.2.4. CPU MEMORY

EB-X400 uses following memory configuration.

128 Mbits Flash memory organised as 4M x 16 + 4M x 16
36 Mbits RAM organised as 128k x 32 (Internal SRAM) + 2M x 16 (mobile RAM)

EB-X400 uses Dual operation Flash memory + mobile RAM 3-chip stacked type MCP (Multi-Chip Package) to reduce chip mount spaces. 36-Mbit RAM consists of 4-Mbit internal SRAM of E-Gold + V3 and 32-Mbit external mobile RAM on the MCP device.

■ RAM Timing

This Timing chart is described in U2001 (E-Gold + V3) specification:
ABRIDGED APPROVAL FORM – PMB7850 Info Sheet

■ FLASH Timing

This Timing chart is described in U2001 (E-Gold + V3) specification:
ABRIDGED APPROVAL FORM – PMB7850 Info Sheet

5.2.5. Main LCD

A 128 x 128 pixel graphical display is used to give maximum information.
It can display Chinese and large character sets.

The HD66782 display driver is used. This driver has Display RAM.

LCD glass size is as follows.

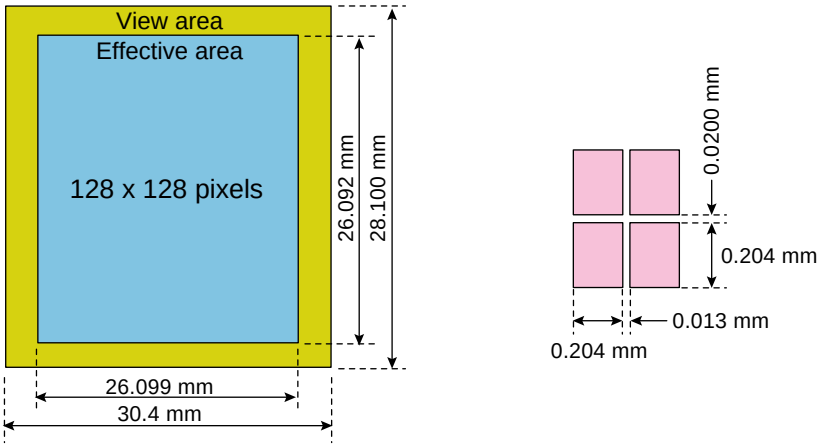


Figure 5.8. LCD Glass Size

The display driver is controlled by setting command register and display data registers.
To send data or command to display driver, nCS; provided from companion IC; is used for chip select.
These registers are assigned as follows.

Command register: $01C0:0000
Data register: $01C1:0000

These registers are write access only.

5.2.6. IrDA

The IrDA module is mounted on the upper unit PCB. EB-X400 supports IrDA file transfer and object exchange, but does not support IrDA dial-up.
In a special asynchronous mode of U2001 (E-Gold+ V3), the ASC supports IrDA data transmissions up to 115.2 KBaud with fixed or programmable IrDA pulse width. An autobaud detection unit detects asynchronous data frames with its baudrate and mode, with automatic initialization of the baudrate generator and the mode control bits.

■ **Block Diagram**

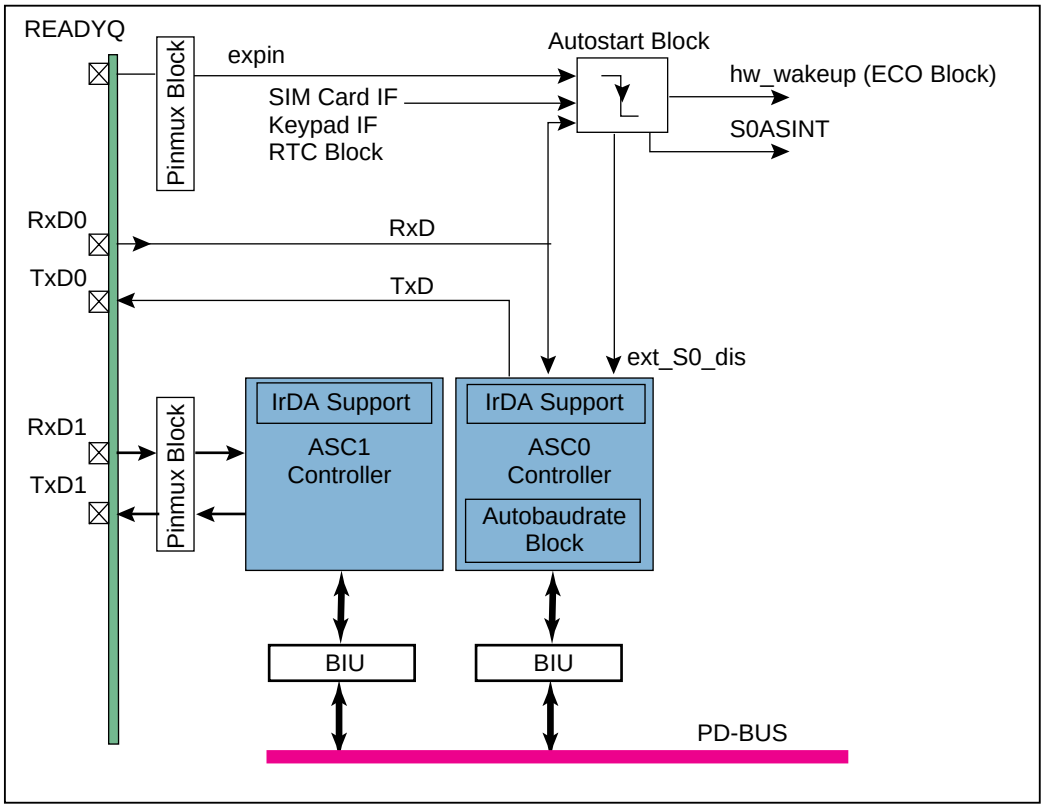


Figure 5.9. IrDA Block Diagram

EB-X400 use the ASC1 port for IrDA interface because serial baud rate of ASC1 is up to 115.2 kbps.
This value is satisfies the IrDA requirement. Otherwise, serial baud rate of ASC0 is up to 921.6 kbps. Thus, EB-X400 will use this interface for serial communication in factory and re-programming software.

5.2.7. Melody IC (U2011)

Melody ringing is generated by Melody IC (U2011). This IC supports generation of up to 16 tones, using the FM synthesizer principle. The control and data interface to the U2011 is provided by connecting the U2001 to the lower byte of the parallel data bus. Furthermore a 13 MHz clock output and a IRQ input must be provided.

■ **Block Diagram**

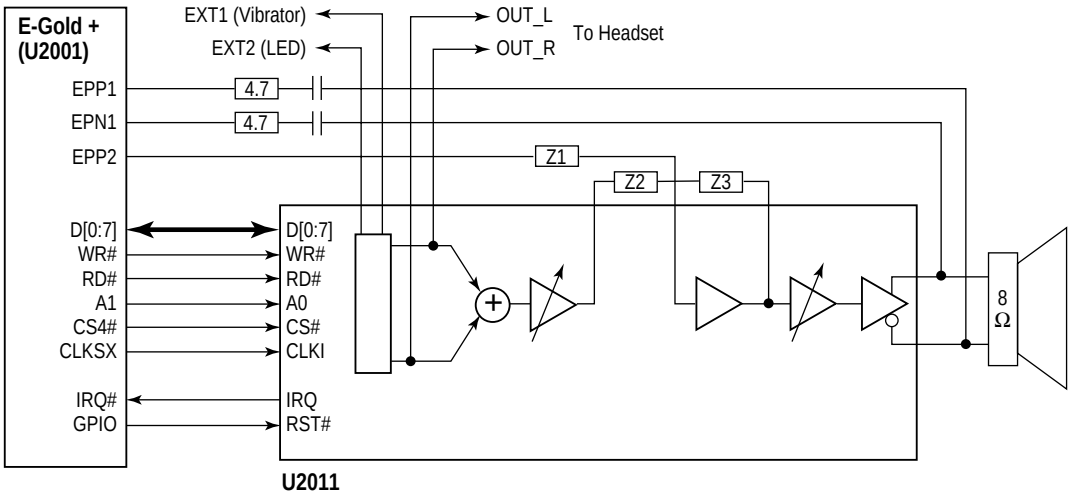


Figure 5.10. Melody Block Diagram

The U2011 features a speaker amplifier for playback synthesized tones though an internal amplifier before application to 8 Ω speaker, and a stereo headset amplifier output. For desktop handsfree applications, the voiceband downlink signal from the U2001 (E-Gold + V3). Series resistors/capacitors adapts the 8 Ω speaker to output drive capability of the U2001, and protects the speaker outputs of the U2001 against the large voltage swing of the U2011 output amplifier.
Z1, Z2 and Z3 tailor the frequency response and gain of the speaker amp.
The U2011 features two SW controllable outputs, intended for vibrator. If the synchronization features of the SMAF format should be 100% utilized, these outputs should be used to drive the vibrator.

5.2.8. AUDIO

■ Receiver

Because U2001 runs off 2.7 V, a high impedance ceramic speaker will not satisfy user requirements for volume, therefore, a lower impedance dynamic type is used.
GSM requires that the receive audio frequency response must fit within the mask shown below:

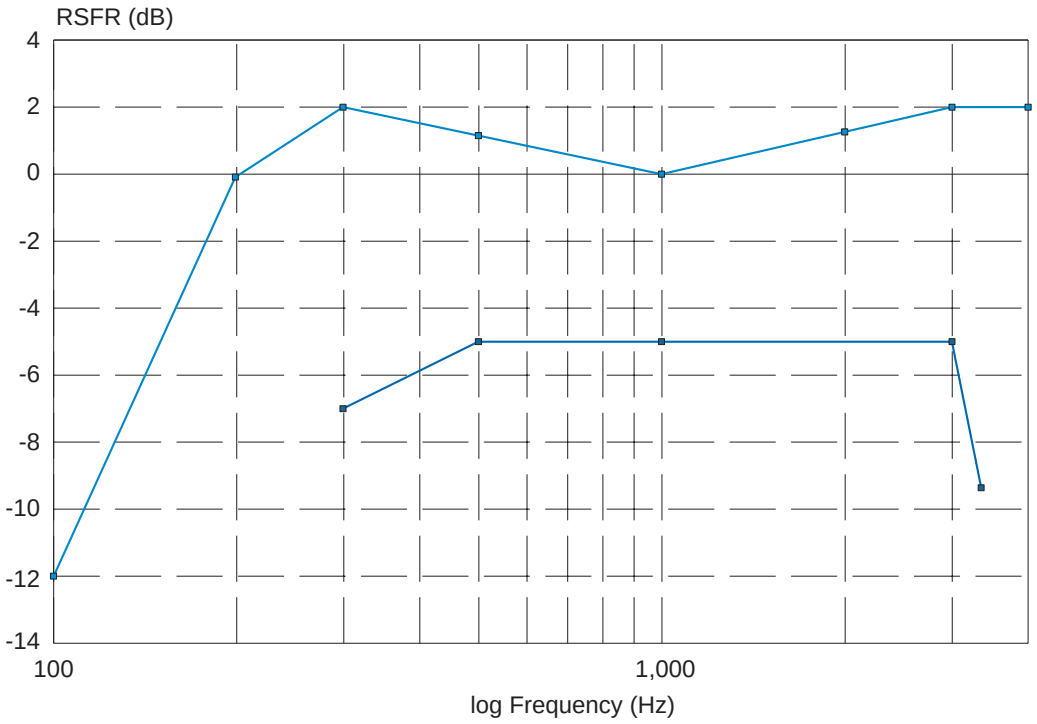


Figure 5.11. GSM Receive Audio frequency response mask

Level	VG1RX	SM_SCAL_OUT	SM_SCAL_REC	Total Gain
1	0 dB	6 dB	–4.5 dB	1.5 dB
2	–6 dB	6 dB	–1.5 dB	–1.5 dB
3	–6dB	6dB	–4.5dB	–4.5dB
4	–12dB	6dB	–4.5dB	–10.5B

■ **Microphone**

To provide improved speech pick-up, noise immunity and reduced echo, a noise-cancelling type microphone is employed. GSM requires that the sending audio frequency response must fit within the mask shown below:

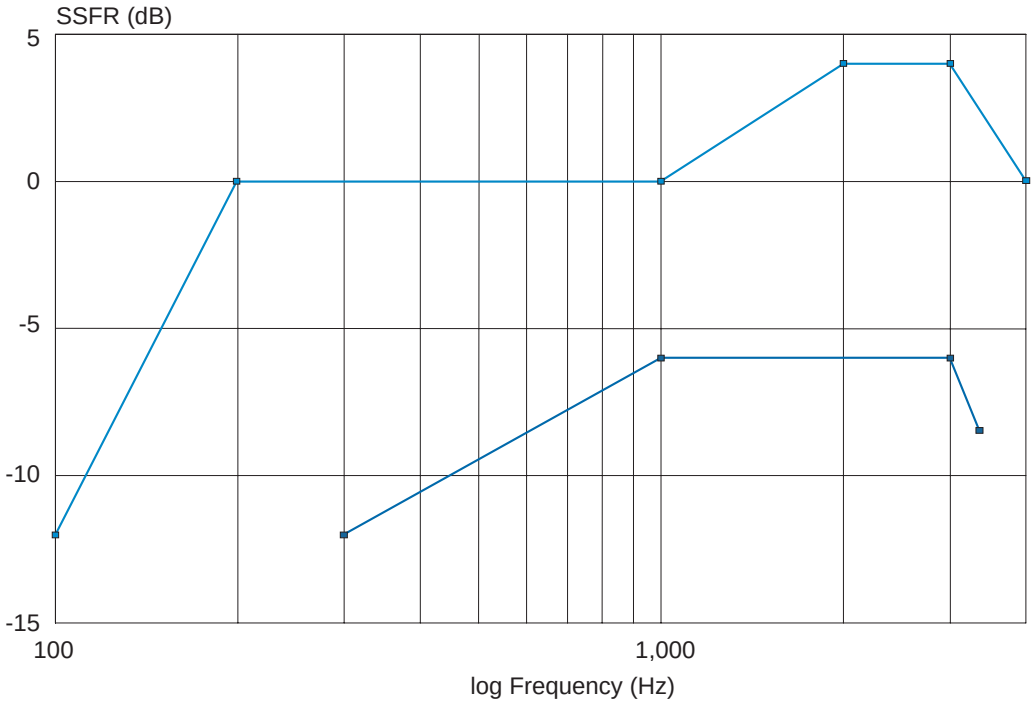


Figure 5.12. GSM Transmit Audio frequency response mask

■ **DTHF Speaker**

To achieve desktop handsfree feature EB-X400 has DTHF speaker mounted on the lower case back. EB-X400 rings some melody tones using DTHF speaker via Melody IC (U2011). This LSI IC can control ringing volume.

5.2.9. POWER MANAGEMENT

The Power supply circuit needs to supply regulated power to the baseband and RF parts, control battery charging and monitor battery usage. The Power Management Block consists of 5 parts as follows:

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

Lithium-ion (Li+) cells are used in the EB-X400 battery pack. These cells have improved gravimetric and volumetric energy densities compared to that of Nickel-Metal Hydride (Ni-MH) cells.

EB-X400 uses power amplifiers operating directly from the nominal 3.7 V battery supply.
Due to the finite internal resistance of battery cells the voltage available for the power amplifiers, Baseband and RF regulators are significantly reduced due to the large current drawn during the transmit burst.

The headset can be powered externally by Switching-type AC adaptor or DC adaptor.
The Switching-type AC adaptor complies with the worldwide voltage regulations.

		Input	Output	
		Voltage	Voltage	Current
AC Adaptor	Switching type	100 - 240 V	5.8 V	650 mA

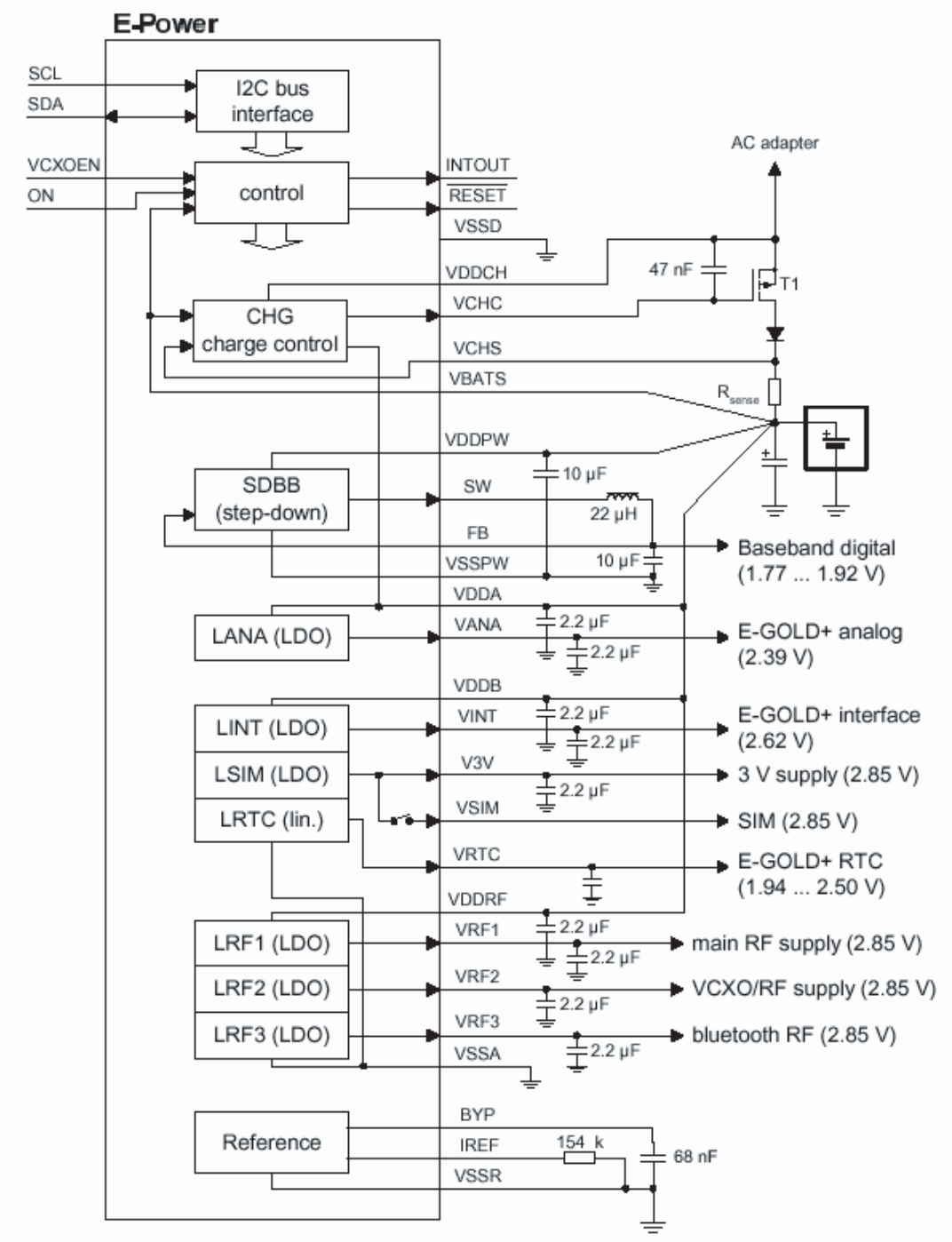


Figure 5.13. Power supply block diagram (E-Power)

■ Power Source

Vattery line Up		Part No.	Manufacturer	Chemistry	No. of Cells	Weight	Nominal Capacity	Nominal Voltage
EB-X400	Std	LP523436A	GS	Li+	1	17.3 g	600 mAh	3.7 V

■ Power On/Off Control

○ Power On Control

EB-X400 has three power on triggers at E-Power interface.

1) Push Power Key (ON_OFF)
2) Connect the external power (VDDCH)
3) Interrupt of RTC alarm (RTC_OUT)

If a battery is inserted with a voltage above 3.04 V ± 60 mV E-Power may be powered up either by a high level on pin ON or by an external supply voltage being applied on pin VDDCH. If the EB-X400 is powered up for the first time after a battery has been inserted the high level on pin ON may only be caused by a power-on push button having been pressed.

If a charged battery is inserted into the handset the RTC block on E-Gold + V3 will be activated if the supply voltage is above 2.50 V ± 0.4 V. The RTC voltage regulator is automatically switched on without power-on trigger.
The power on sequence of E-Power refers to the following figure.

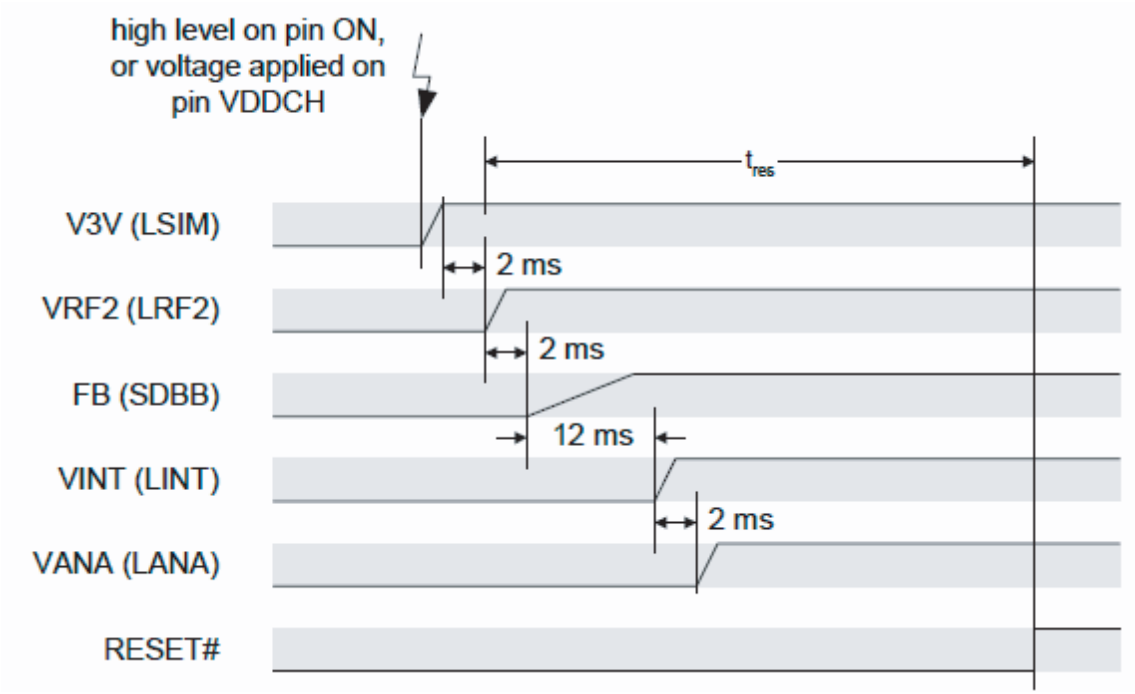


Figure 5.14. Power On/Off Control

○ **Power Off Control**

EB-X400 may be powered down either by a command from E-Gold + V3 or if the battery voltage drops below 2.84 V ± 60 mV. Usually the RTC regulator will continue operation. The RTC regulator is turned off when the battery voltage has dropped below 2.05 V ± 0.1 V.

■ Power Source Failure detection

The SIM card contains EEPROM, if power fails while the SIM is active, the SIM may corrupt its memory as the supply voltage drops out of specification.

The shutdown voltage is detected by the E-Power which monitor the VBATS terminal. This typically occurs when the main battery voltage drops below about 2.84 V ± 0.06 V.

■ Voltage Regulation

Each power sources are specified as follows.

V_SD : Baseband power supply for Digital core [V_SD]

Voltage: 1.83 V ± 0.06V
Current: 180 mA max.
Dropout: 100 mV max (load max)

VINT : Power supply for E-Gold + V3 I/O [VINT]

Voltage: 2.62 V ± 0.10 V
Current: 50 mA max.
Dropout: 150 mV max (load max)

V3V : Power supply for mobile SRAM and polytone IC [V3V]

Voltage: 2.85 V ± 0.10 V
Current: 50 mA max.
Dropout: 150mV max (load max)

VANA : Power supply for analogue part [VANA]

Voltage: 2.39 V ± 0.09 V
Current: 180 mA max.
Dropout: 150 mV max (load max)

VRTC : Power supply for external RTC [VRTC]

Voltage: 2.05 V ± 0.10 V
Current: 300 μA max.

V28 : Digital Power supply for upper unit [V28]

Voltage: 2.80 V ± 2 %
Current: 50 mA max.
Dropout: 10 mV max (load max)

■ Battery Charging & Monitoring

The status of the LCD battery icon is determined by the value of 'BAT_VOLT' returned from E-Power, as per the following table:

Icon Status	Battety pack	
	Li+ (EB-X400)	
3 bar	3.77 V <	
2 bar	3.68 V <	< 3.77 V
1 bar	3.46 V <	< 3.46 V
Low Voltage Alarm		< 3.46

EB-X400 will power off 2 minutes after generating Low Battery Alarm.

The battery charging is controlled by the MCU within the phone. If rechargeable cells and external power are detected, and the temperature is within specified limits, the charger starts its rapid charge algorithm.
When the battery is fitted, EB-X400 charging algorithm is determined by constant voltage and constant current control with time, temperature and voltage safe-guards. A current limit no greater than the maximum charge current for any battery option must be provided by the external power source.

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 must automatically start pre-charge until there is enough power to switch on the phone.

5.2.10. UI Related Control

■ Open (Close) Detection

The phone can detect when its clamshell style case is open or closed.
The Hall IC detector (E2001) has a low output when clamshell is closing and high when it is opening. The open/close status is monitored by the I/O terminal (P8) of U2001 (E-Gold + V3).
The MCU can generate an interrupt for Open or Close detection.

■ Remote Switch function of PHF

EB-X400 has the feature of remote switch of PHF. This PHF is same as EB-GD87.
It is shorted with GND and is Low output when switch on it. And it is monitored by the I/O terminal of U2001 (E-Gold + V3).
The MCU can generate an interrupt for the remote switch detection of PHF.

■ LED control

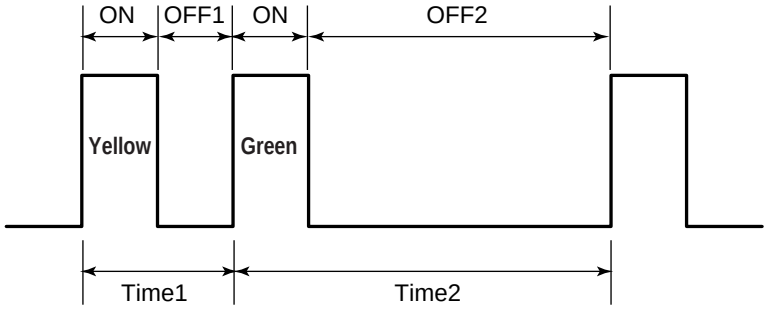
Location	LED Colour	Signal	Device
LCD Backlight	White x 3	CUR_EN	E-Gold + V3
Key Backlight	Blue x 6	KEYLED	E-Gold + V3
Tri-LED	Green x 1	TRI_G	E-Gold+ V3
	Orange x 1	TRI_R	E-Gold + V3
	Blue x 1	TRI_B	E-Gold + V3
Charge	Red x1	TOPLED1	E-Gold + V3

○ **Backlight control "MAIN_LED" for Main LCD**
To improve the brightness of white LED, the DC/DC set-up converter used is a constant current type.

○ **Tri-LED illumination**
The handset has a tri-LED for incoming call, missed called notification, massage notification (SMS, MMS or WAP) and voice call.

Location Luminous	Colour	Pattern	Lighting interval
Incoming Call	Purple	50% Duty	ON : 480 msec OFF : 480 msec
In Voice Call	Blue	50% Duty	ON : 1 sec OFF : 1 sec
Missed call notification	Yellow	4% On 96% Off	ON : 240 msec OFF : 5760 msec Period : 6 sec
Massage notification	Green	4% On 96% Off	ON : 240 msec OFF : 5760 msec Period : 6 sec
Alarm notification	Red	50% Duty	ON : 480 msec OFF : 480 msec

If the phone has received the missed call notification and massage notification at same time, the cadence of LED illumination is as follows:



ON : 100 msec
OFF1 : 2000 msec
OFF2 : 4160 msec
Time1 : 2100 msec
Time2 : 4260 msec

○ **Charging LED control**

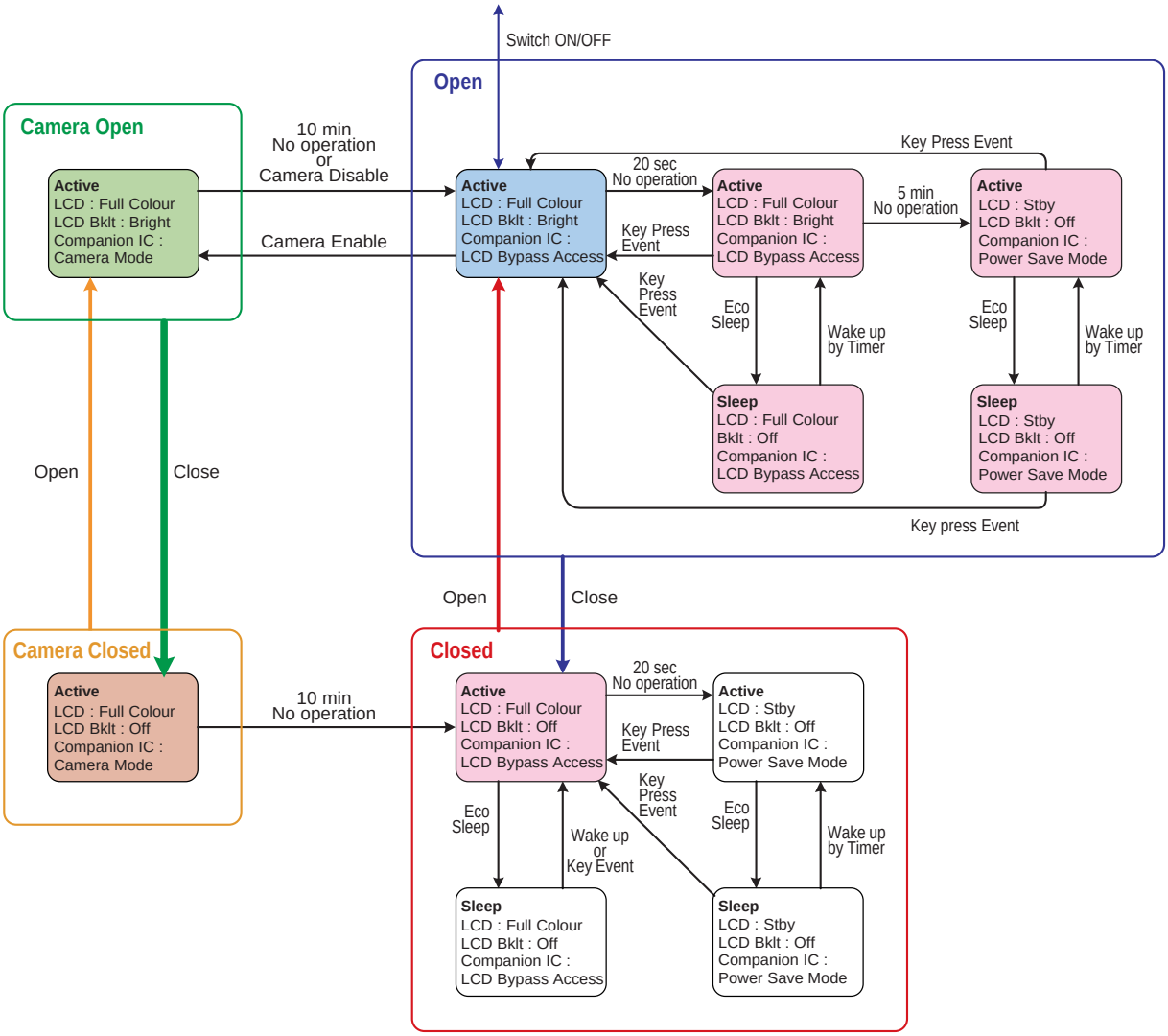
EB-X400 has Charging LED control paths.
The Charging LED (Red) is controlled by CC07IO port of U2001 (E-Gold + V3).
The charge LED is switched on when the charger is connected to the phone even if the battery is deeply discharged.
Charge LED automatically turns off when the handheld detects the temperature error during battery charging.

○ **Vibrator control**

The vibrator motor uses discrete components and is controlled by the MCU data bus via the Melody IC (U2011 (EXT2 pin)).
The EB-X400 vibrator uses a coin type vibrator to save space on the PCB.

○ **UI related Sleep control restrictions**

When E-Power is set to Sleep mode, the step down converter of E-Power changes the operation mode from PWM to PFM to save battery power. Maximum current delivery is 50 mA.
The following diagram shows the relations between UI condition state transition verses System sleep control restrictions.



Active denotes for >> E-Gold + V3 : Active & E-Power : PWM mode
Sleep denotes for >> E-Gold + V3 : Eco Sleep & E-Power : PFM mode

Figure 5.15. UI condition state transition verses System sleep control restrictions

5.2.11. Power Consumption

The estimated talk time and standby times for EB-X400 are as follows.

This estimated standby time is calculated by using DRX n=9, no neighbour cell, no GPRS condition.

Talk Time	GSM900	from 120 min to 350 min
	DCS1800	from 150 min to 375 min

Standby Time GSM900/1800 up to 240 hours (Target : DRX9)

5.2.12. INTERFACES

■ RF Interface Signals

No.	Signal Name	LOG ⇔ RF	Function	Connection	Status
1	AX	⬅ ➡	Multiplexed I signal	QRX of E-Gold + V3	DC center 1.35 V for demodulator (SMARTi)
2	A	⬅ ➡	Multiplexed nI signal	QR of E-Gold + V3	DC center 1.35 V for demodulator (SMARTi)
3	B	⬅ ➡	Multiplexed Q signa	IR of E-Gold + V3	DC center 1.35 V for demodulator (SMARTi)
4	BX	⬅ ➡	Multiplexed nQ signal	IRX of E-Gold + V3	DC center 1.35 V for demodulator (SMARTi)
5	TXON	➡	Transmitter block power control signal	T_OUT0 of E-Gold + V3	H: On, L: Off
6	PLLON	➡	Phase Lock Loop ON	T_OUT1 of E-Gold + V3	H: On, L: Off
7	BAND_SEL	➡	Band select GSM/DCS	T_OUT2 of E-Gold + V3	H: DCS1800, L: EGSM900
8	TXON_PA	➡	Power amplifier ON	T_OUT8 of E-Gold + V3	H: On, L: Off
9	AFC	➡	Frequency adjustment of TCXO	AFC of E-Gold + V3	
10	EN	➡	PLL & AGC serial interface signal : Enable	RFSTR0 of E-Gold + V3	H: Enable, L: Disable
11	CLK	➡	PLL & AGC serial interface signal : Clock	RFCLK of E-Gold + V3	
12	DA	➡	PLL & AGC serial interface signal : Data	RFDATA of E-Gold + V3	
13	PALEVEL	➡	Power control voltage for PA	PAOUT of E-Gold + V3	
14	TEMP	⬅	Environment temperature signal	TENV of E-Gold + V3	
15	BM_BB	⬅	System clock 26 MHz	F13/26 of E-Gold + V3	0.5 Vpp min DC coupled
16	AM_TRIG	➡	AM signal detection	T_OUT4 of E-Gold + V3	

■ Main LCD Module Interface Signals

No.	Signal Name	LOG ⇔ RF	Function	Connection	Status/Description
1	GND	—	Common GND	GND	
2	LEDK	⬅	Power supply for white LED	Step Up DC/DC	
3	LEDA	➡	Power supply for white LED	Step Up DC/DC	
4	GND	—	Common GND	GND	
5	VDD	➡	Power supply for LCD driver	V28 regulator	
6	VDD	➡	Power supply for LCD driver	V28 regulator	
7	nCS	➡	Chip select signal	Companion IC PCS0X	
8	RS	⬅ ➡	Register Select	Companion IC PRS	
9	nWE	➡	negative Write	Companion IC PWRX	
10	nRD	➡	negative Read	Companion IC PRDX	
11	DB0	⬅ ➡	Data Bus (0)	Companion IC PD0	
12	DB1	⬅ ➡	Data Bus (1)	Companion IC PD1	
13	DB2	⬅ ➡	Data Bus (2)	Companion IC PD2	
14	DB3	⬅ ➡	Data Bus (3)	Companion IC PD3	
15	DB4	⬅ ➡	Data Bus (4)	Companion IC PD4	
16	DB5	⬅ ➡	Data Bus (5)	Companion IC PD5	
17	DB6	⬅ ➡	Data Bus (6)	Companion IC PD6	
18	DB7	⬅ ➡	Data Bus (7)	Companion IC PD7	
19	FLM	⬅ ➡	Data Bus (7)	Companion IC PVSYNC0#	
20	DISP_RST	⬅ ➡	Reset signal	E-Gold + T_OUT7	
21	GND	—	Common GND	GND	

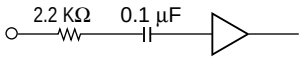
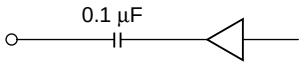
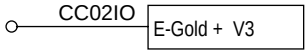
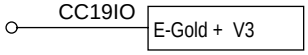
■ Camera Module Interface Signals

No.	Signal Name	LOG ⇔ RF	Function	Connection	Status/Description
1	SDATA	⇐ ⇒	Pixel clock from camera	Companion IC CMCLKIN	6MHz
2	D0	⇐ ⇒	Digital GND	Companion IC CMDAT0	Hi-Z at power down.
3	D1	⇐ ⇒	Data Bus (3)	Companion IC CMDAT1	Hi-Z at power down.
4	D2	⇐ ⇒	Data Bus (4)	Companion IC CMDAT2	Hi-Z at power down.
5	D3	⇐	Data Bus (5)	Companion IC CMDAT3	Hi-Z at power down.
6	D4	⇐	Data Bus (6)	Companion IC CMDAT4	Hi-Z at power down.
7	D5	⇐	Data Bus (7)	Companion IC CMDAT5	Hi-Z at power down.
8	D6	⇐	SIF clock for register setting	Companion IC CMDAT6	Hi-Z at power down.
9	D7	⇐	Digital Power supply	Companion IC CMDAT7	Hi-Z at power down.
10	GND	—	GND	Common GND	
11	PCLK	⇐	Pixel clock from camera	Companion IC CMCLKIN	12 MHz
12	GND	—	GND	Common GND	
13	GND	—	GND	Common GND	
14	Xin	⇒	Clock input for camera	Companion IC CMCLKOUT	12 MHz
15	RSTN	⇒	Reset signal	Companion IC GPIO 0	L : Reset; H: Active
16	GND	—	GND	Common GND	
17	AGND	⇒	Analogue Power supply	2.8 V Reg. Vout	
18	AVDD	⇒	Digital Power supply	2.8 V Reg. Vout	
19	GND	—	GND	Common GND	
20	PWRDOWN	⇒	Powwwer down control	Companion IC GPIO 1	L : power down; H : Active
21	VSYNC	⇐	Data Bus (0)	Companion IC CMVREF	
22	HSYNC	⇐	Power down control	Companion IC CMHREF	
23	GND	—	GND	Common GND	
24	SCLOCK	⇒	SIF clock for register setting	Companion IC SCL	375 kHz
25	GND	—	GND	Common GND	
26	GND	—	GND	Common GND	

■ IrDA Interface Signals

No.	Signal Name	LOG ⇔ RF	Function	Connection	Status/Description
1	VCC	⇒	IrDA	Power supply E-Power VINT	
2	GND	—	GND	Common GND	
3	SD	⇒	Shut down	E-Gold + nHLDA	H: Don't care (sleep); L: Active
4	RXD	⇐	Received IrDA signal	E-Gold + RXD1	
5	TXD	⇒	Sending IrDA signal	E-Gold + TXD1	
6	LEDA	⇒	LED Power supply	VBAT	
7	SGND-7	—	GND	Common GND	
8	SGND-7	—	GND	Common GND	

5.2.13. EXTERNAL INTERFACE

No.	Signal Name	LOG ⇔ RF	Function	H/H Circuit
1	GND	—	Audio ground	
2	HS-TX	⬅	Sending audio from personal headset	
3	HS-RX	➡	Received audio to personal headset	
4	HS_DET	⬅	Personal headset detection signal	
5	HOOK_KEY	⬅	Incoming call/end call signal at personal headset	

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 kΩ AND 1.2 MΩ, SHALL BE USED.

Containers

All containers and storage must be of the conductive type.

6.2. Disassembly

6.2.1. Lower Case Assembly and Main PCB Removal

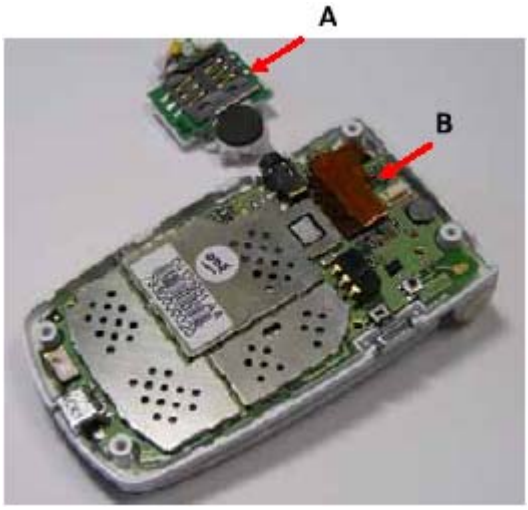
1. Place thumbs at outer edges of battery cover, press down, then slide the battery cover towards the bottom of the phone.
2. Lift and remove battery.

3. Using tweezers, remove the two grey screw caps.

Discard these items.

4. Use the Trident screwdriver to remove the four case screws, Retain the screws for re-use.
5. Separate the two haves of the lower case assembly using a plastic strip (of guitar pick thickness) as shown.

6. Disconnect the SIM connector board A from the Main PCB.
7. Disconnect the board to board connector B from the Main board.



6.2.2. Upper Case Assemby and Display Module Removal

1. Open the phone.
2. Using tweezers or a pin, remove the two grey screws cap and discard.

Remove the logo panel and discard.

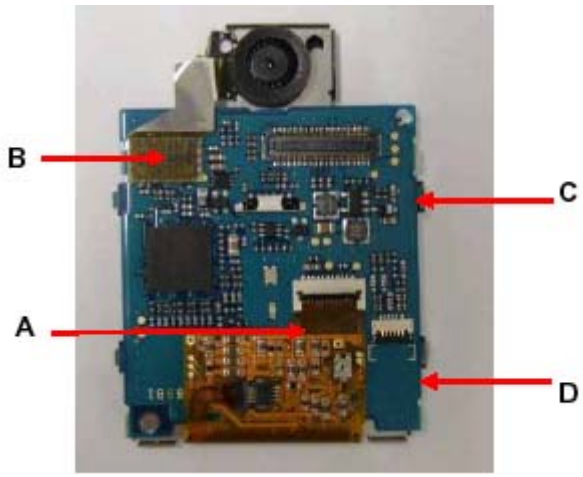
3. Use the trident screwdriver to remove the four screws. Retain the screws for re-assembly.

4. Insert the plastic strip (of gutar pick thickness) into the top of the upper case to unhook the hook.
Caution: Do not insert the separation tool at side plate area.

5. Open the upper case with finger and then insert the separation tool (of gutar pick thichness) into deeply the gap of the upper case and then slide direction of the arrow.

6. Disconnect the reciever/speaker flexi-strip A and board to board connector B Lift the display module out from the case, taking care not damage the board to board flexi-strip.

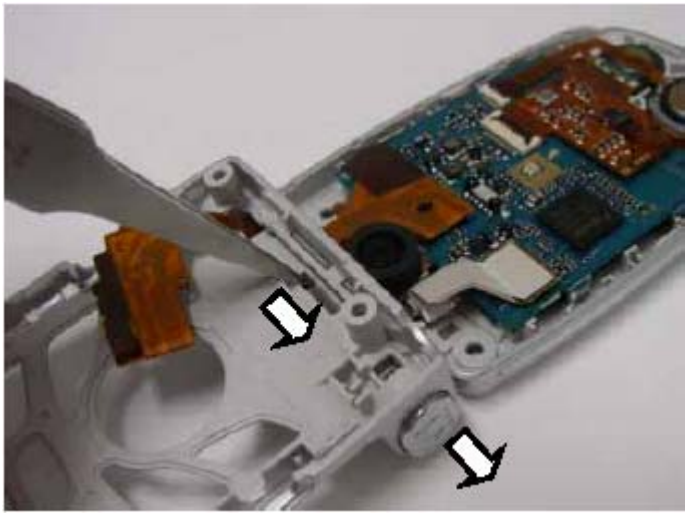
7. Disconnect the main LCD flexi-strip A and camera flexi-strips B.
8. Unhook C and D then remove the LCD board.



6.2.3. Removal of Hinge Unit and Spigot

1. Set the phone into the "open " position.
2. Remove the hinge stopper from the lower front cover.

3. Using a small screwdriver blade or blunt instrument, apply pressure to the one push hinge direction while pulling the hinge away from the case.



4. Take care not to damage the board-to-board flexi-strip.

6.2.4. Antenna Removal

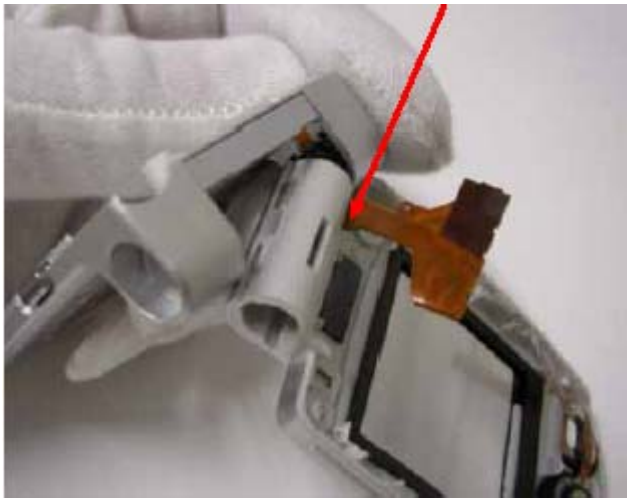
1. It is only necessary to remove the antenna if the antenna contact is damaged.
2. Using a small screwdriver blade or blunt instrument. Apply pressure to the antenna lug in direction shown while pulling the anntenna away from the case.

6.3. Reassembly

6.3.1. Hinge reassembly

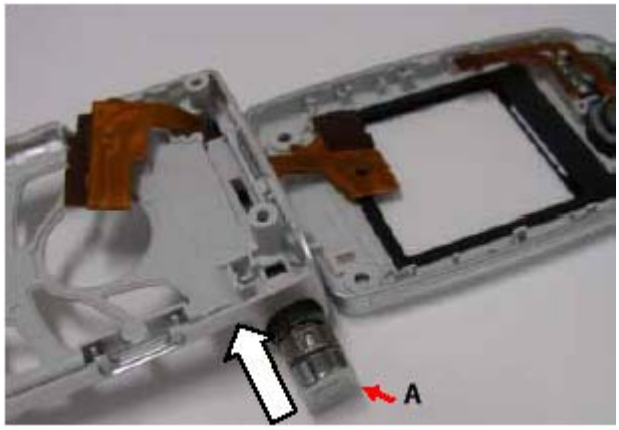
1. Insert the board-to-board flexi-strip into the slot of the hinge guide.

2. Fit the slot of the upper front cover to the board-to-board flexi-strip.

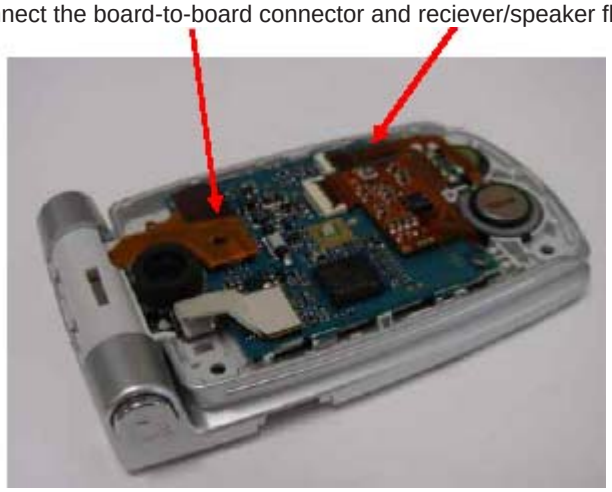


3. Twist the lower case unit until both sides of the hinge locate inside the case.

4. Set the phone into the" Open" position.
5. Insert the one push hinge A into the upper case assembly.



6. Locate the LCD assembly onto the upper front cover
7. Connect the board-to-board connector and reciever/speaker flexi-strip on the upper PCB.



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, 1800 MHz and 1900 MHz).

Personal Computer (PC)

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

Power Supply

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

PCB Repair Jig (Part No. 3WZ001139AAA)

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

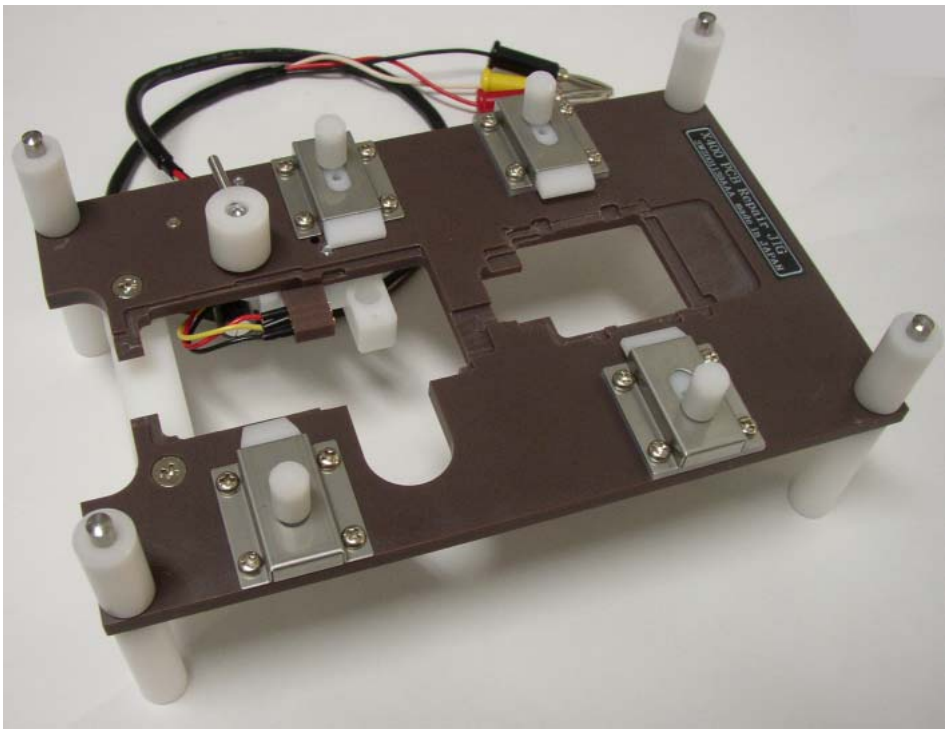


Figure 7.1. : PCB Repair Jig

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

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

RF Test Jig (Part No. 3WZ001138AAA)

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

Figure 7.2. : RF Test Jig

Power Cable (Part No. 3WZ001130AAA)

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

Figure 7.3. : Power Cable

Data Cable (Part No. 3WZ001107AAA)

The data cable for used to software download and calibration.

Figure 7.4. : Data Cable

RF Cable (Part No. 3WZ001103AAA)

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

Figure 7.5. : RF Cable

GSM Tester

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

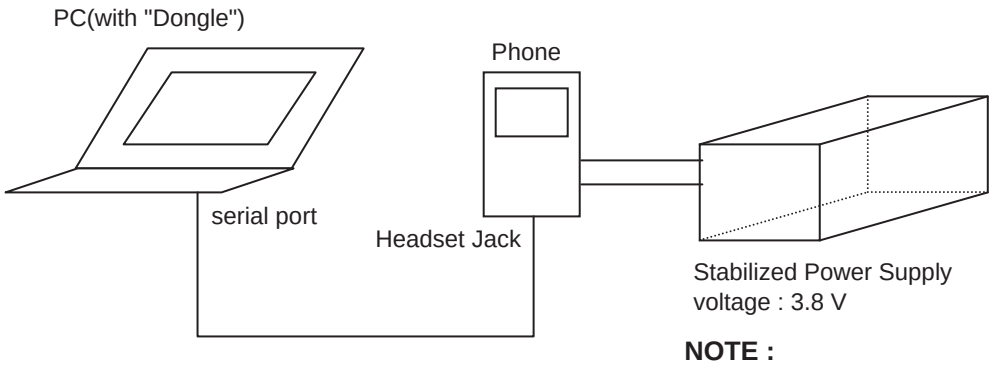
8. SOFTWARE DOWNLOAD & ADJUSTMENT PROCEDURES

8.1. FlashTool update and operation guide

8.1.1. Introduction

The system has been tested on the following platforms: Win98, Win2000, WinXP

■ System overview

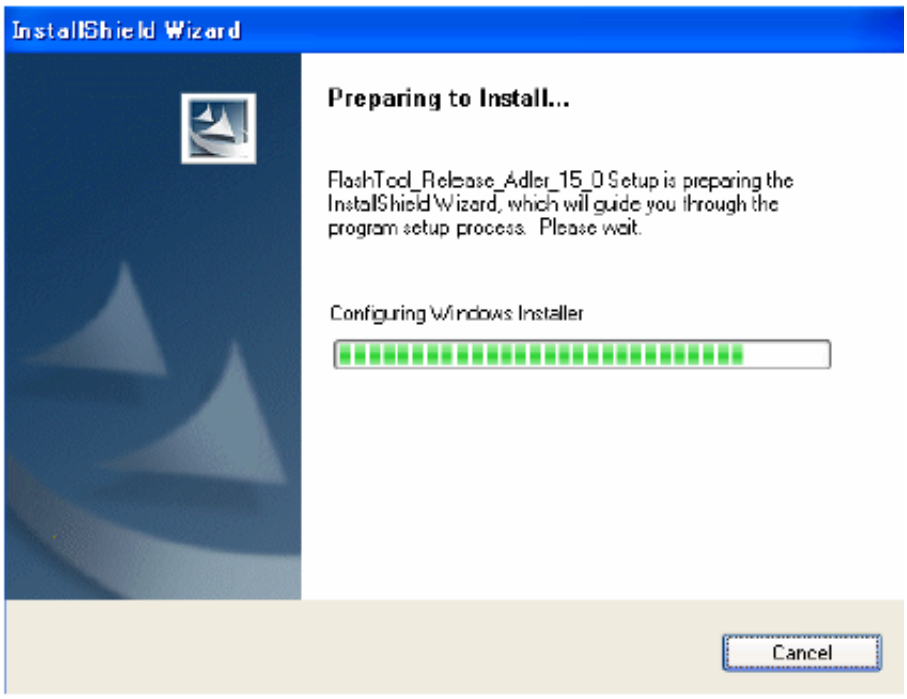


NOTE :
If using a battery pack to power the phone, ensure that it is fully charged.

8.2. FlashTool update

1. Unzip the latest version of the FlashTool to an appropriate directory on the hand of the PC.

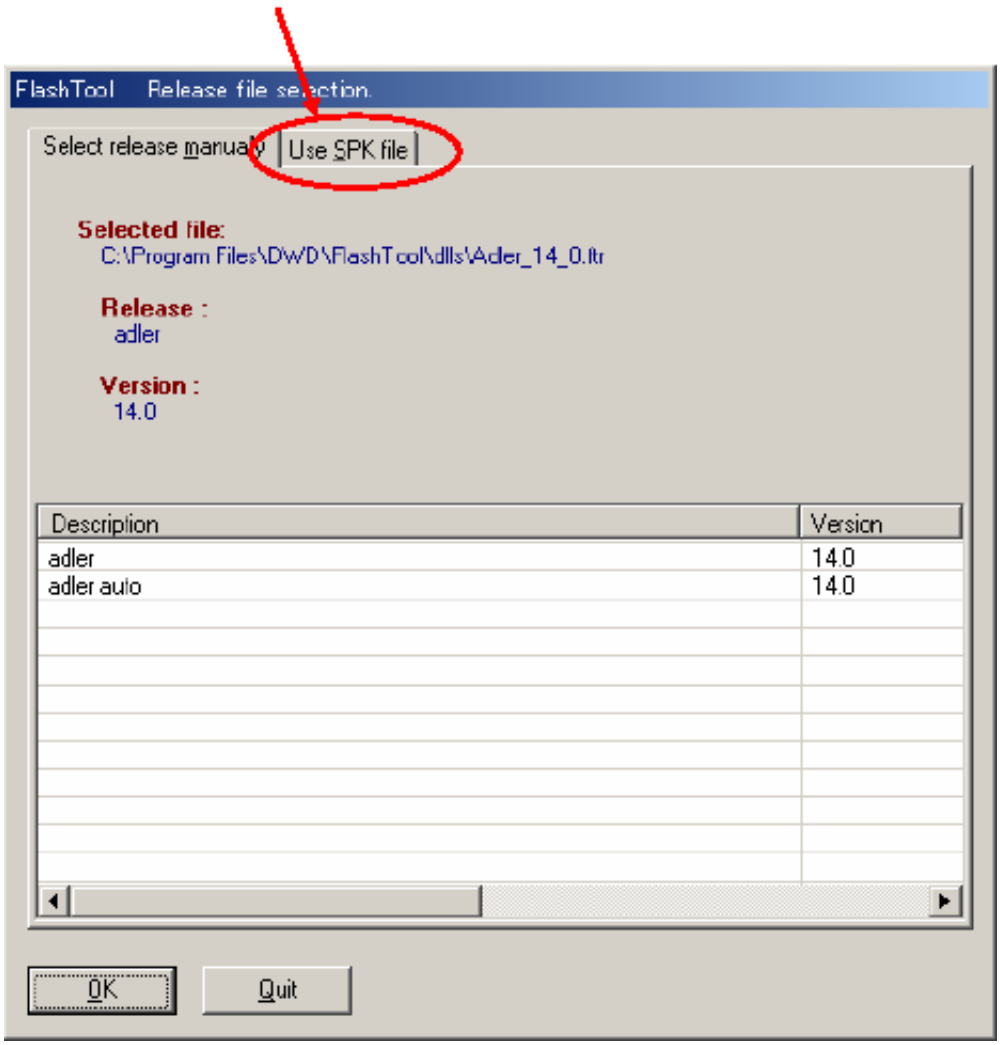
2. Double click on the Setup executable file - this will be called something like "**FlashTool_Release_Adler_15_0.exe.**" When the installer opens, the following window will be displayed:



3. Follow the on-screen prompts and click on "**Finish**" when the installation is complete.

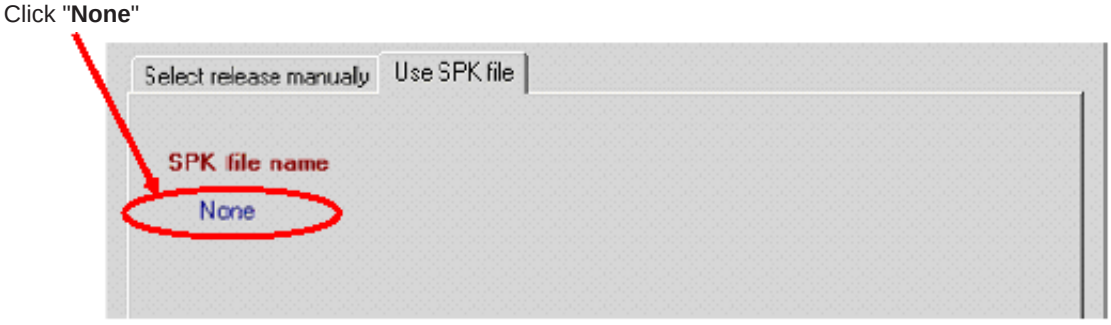
8.3. Software upgrade procedure - FlashTool operation by using SPK file

Select [Start]-[Program]-[FlashTool]-[FlashTool_4_4] in PC menu. Then the following screen appears.
Click the tab of "**Use SPK file**".



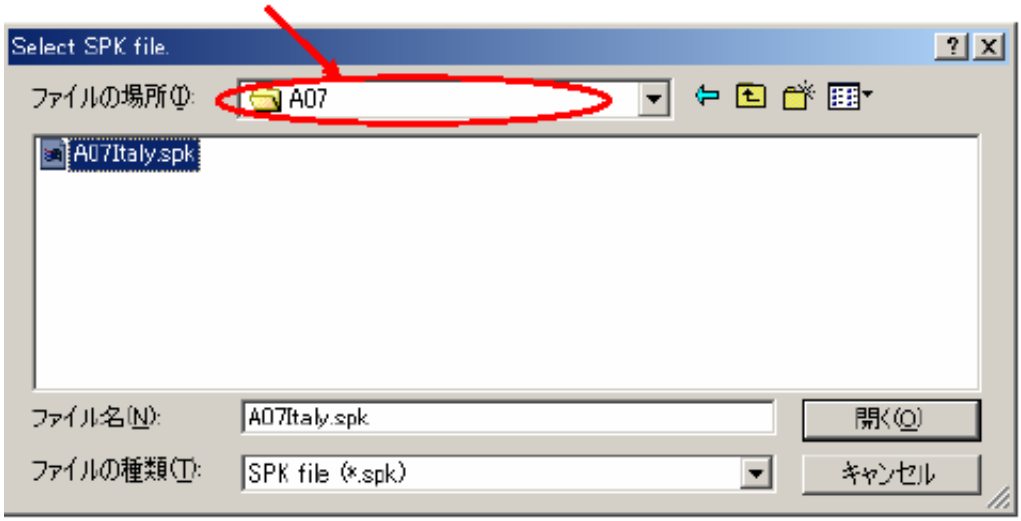
8.3.1. Select SPK file

The following screen is displayed.
Click "**None**" (If you have specifie.spk file before, the file name is displayed.) to specify .spk file as shown in the following procedure.



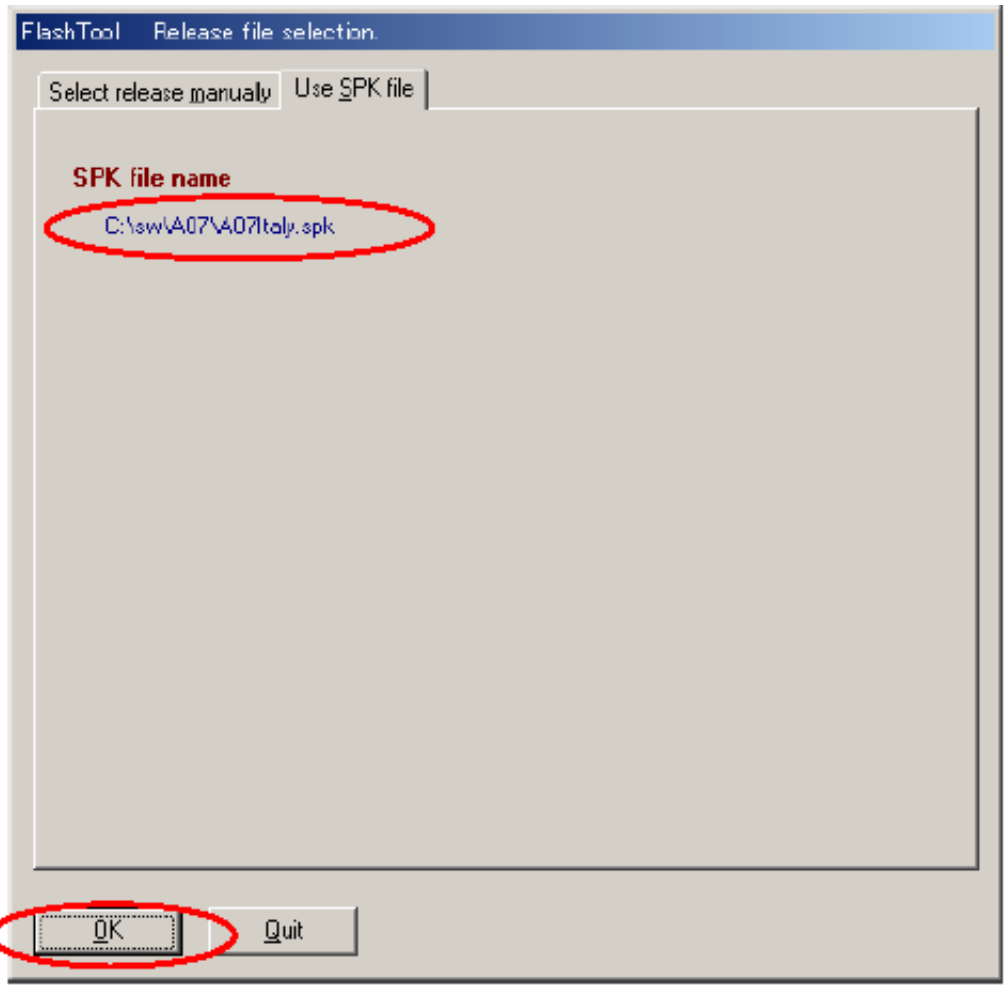
The following screen is displayed.

Move to the folder where .dffs is located



Select .spk file and press "**Open**" button.

Then the path and name of .spk file are displayed.

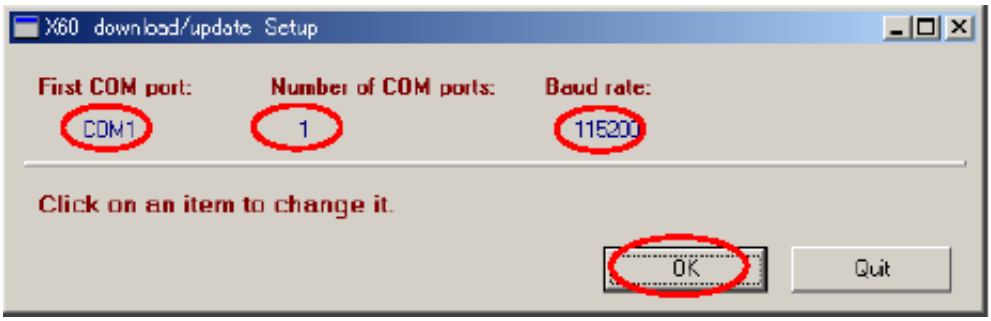


Then Click "**OK**".

Check that all required files are in the same folder.

8.3.2. COM port set-up

The following screen is displayed.



Each item can be changed by clicking the blue part.

First COM port: Specify port number to connect the data cable.

Number of COM ports: Number of actual machines to write. Normally one machine at a time, so 1 will be OK.

Baud rate: When COM port is used on PC, enter 115200.

Click "**OK**". Then the download screen appears after completion of the tool initialisation.

8.3.3. Start download

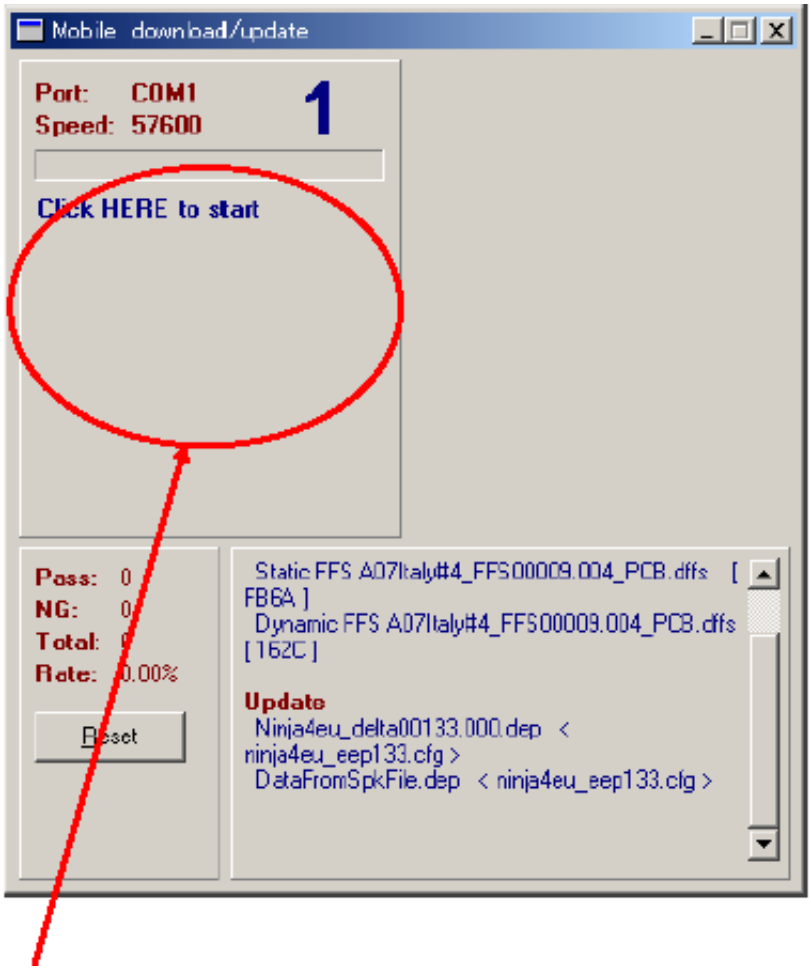
Caution

Should the PC or Download application crash or lock-up during downloading, calibration data in the phone may be lost. To minimise the risk of data loss, it is strongly recommended that no other PC applications are running when downloading data, and that a fully-charged battery is attached to the phone.

The download procedure is as follows:

1. Ensure that a fully charged battery is connected to the phone.
2. Connect the EB-X400 to the PC via the data cable.

This is the download screen.

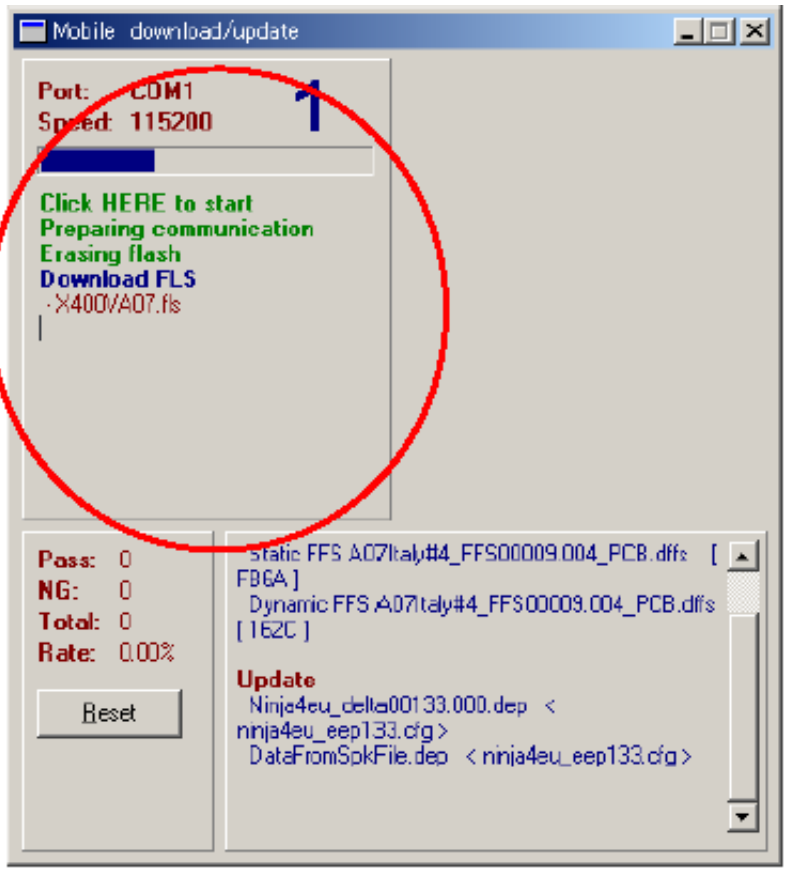


- Click around "**Click to start**".
- Press the power button on EB-X400.

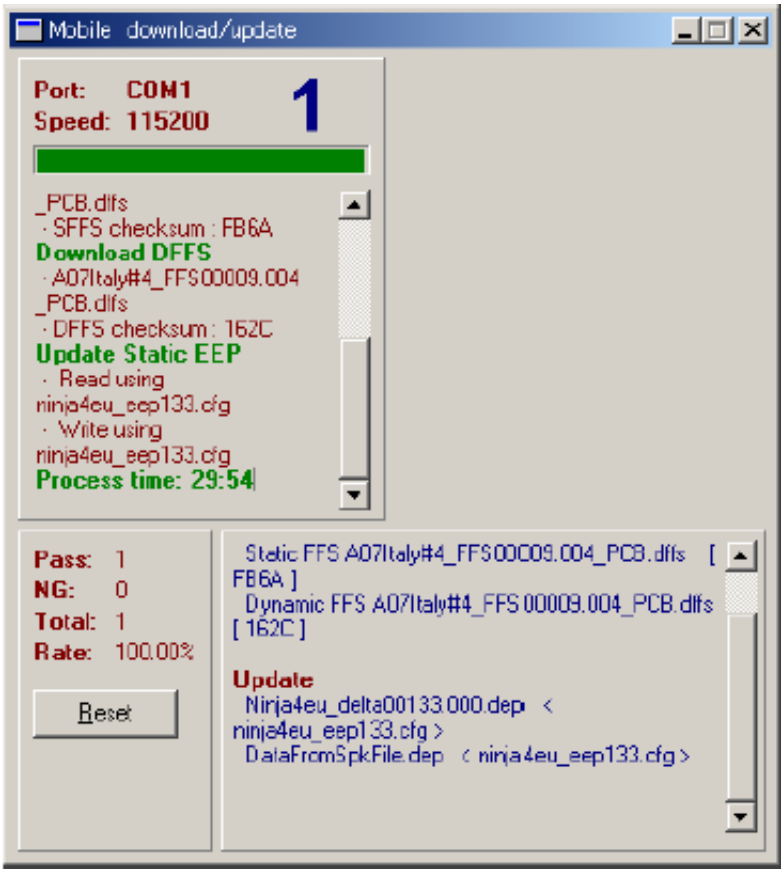
After the above procedure, download starts.

When download starts, progress bar is displayed.

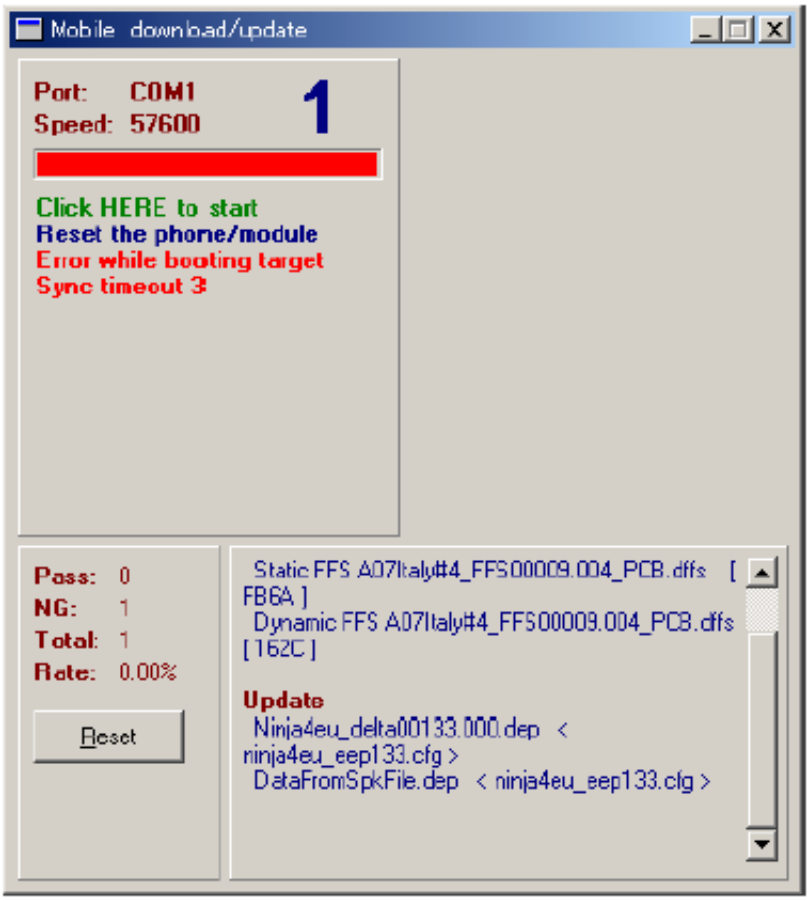
- Please do not disconnect the data cable while downloading.



When download is successful, the following screen is displayed.



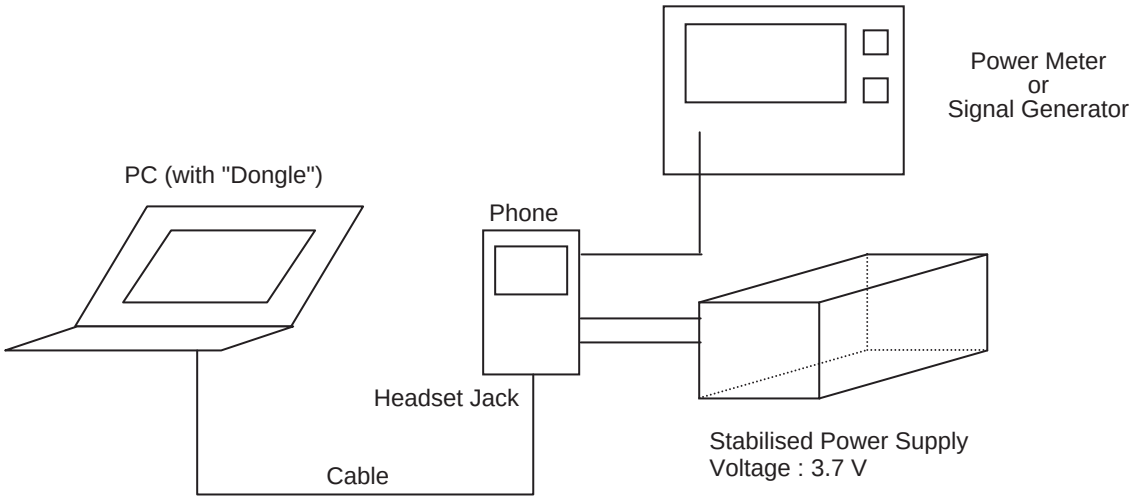
In case of an error, the following screen is displayed.



If a download fails, check all connections between the phone, data cable and PC.
Before restarting the download procedure, remove and then re-attach the phone battery.

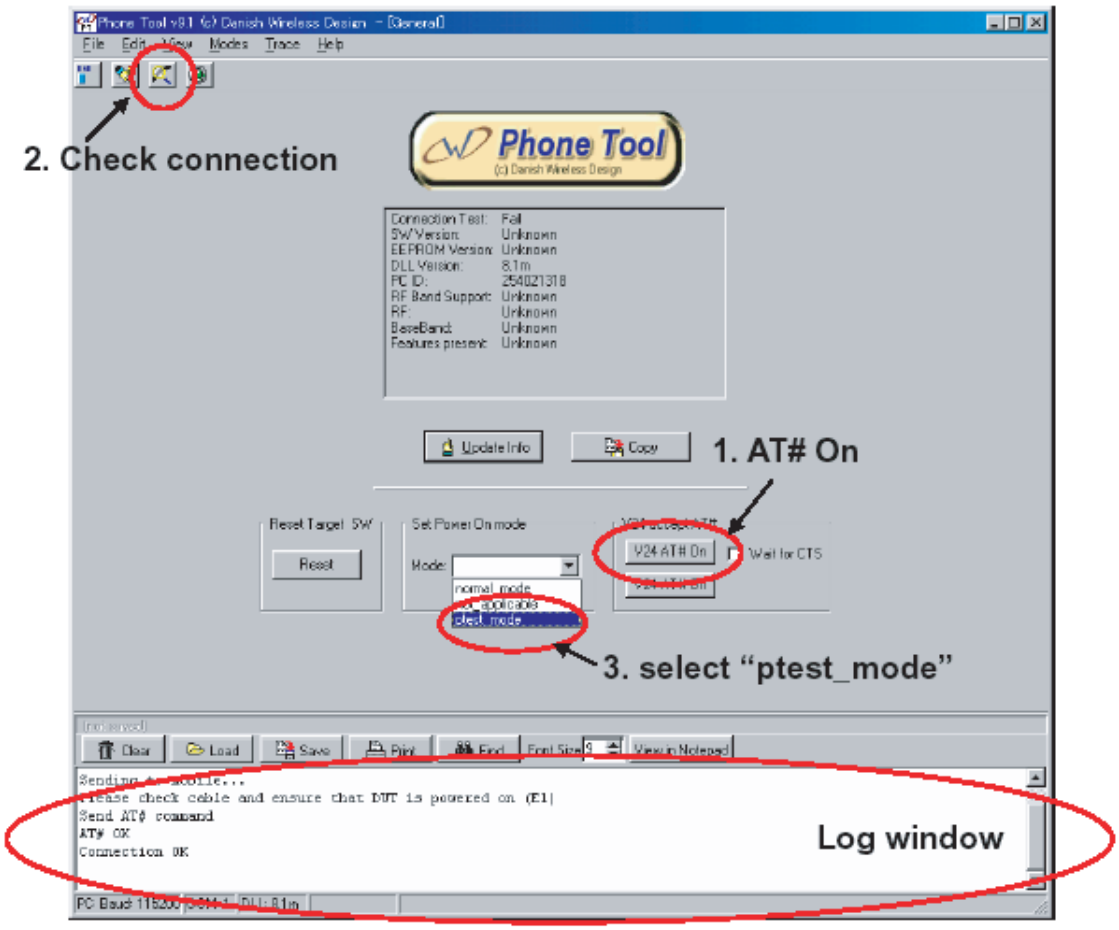
8.4. Baseband and RF Calibration

8.4.1. System Overview



8.4.2. P-test Mode

Press the power key to turn on the mobile phone.
Start the PhoneTool program.
The following screen is then displayed:



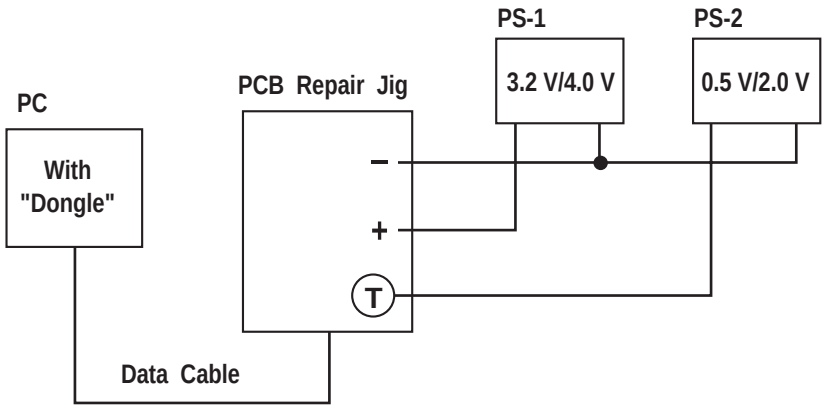
1. Click the "**V24 AT# On**", and check the log window. >>> "**AT# OK**"
2. Click the **Check Connection button**, and check the log window. >>> "**Connection OK**"

NOTE : If the message "ERROR! No Connection" is displayed, check the cable connections, the power supply and that the phone is switched on. Repeat steps 1 and 2.

3. Select "**ptest_mode**", and check the log window. >>> "**Sending to mobile...OK**".

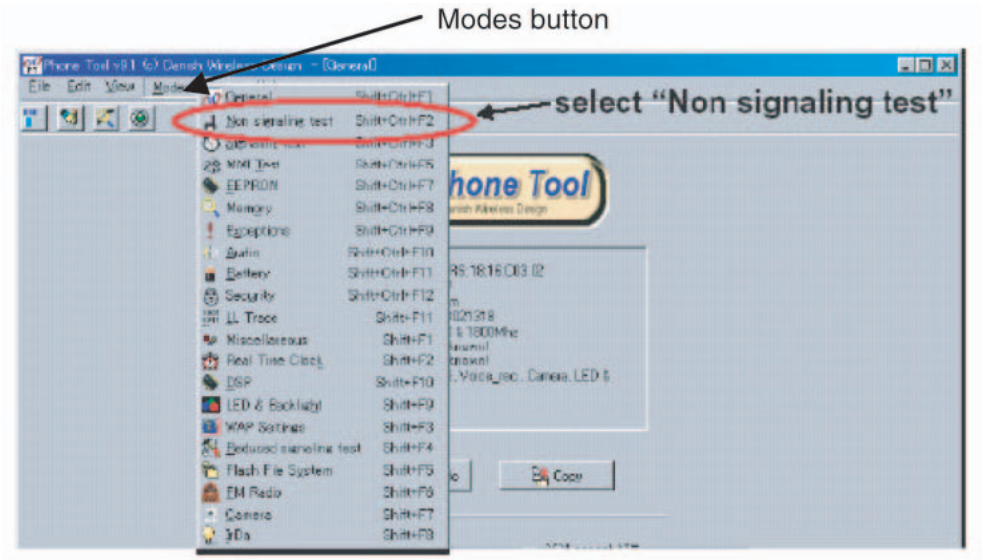
The mobile is now in ptest_mode.

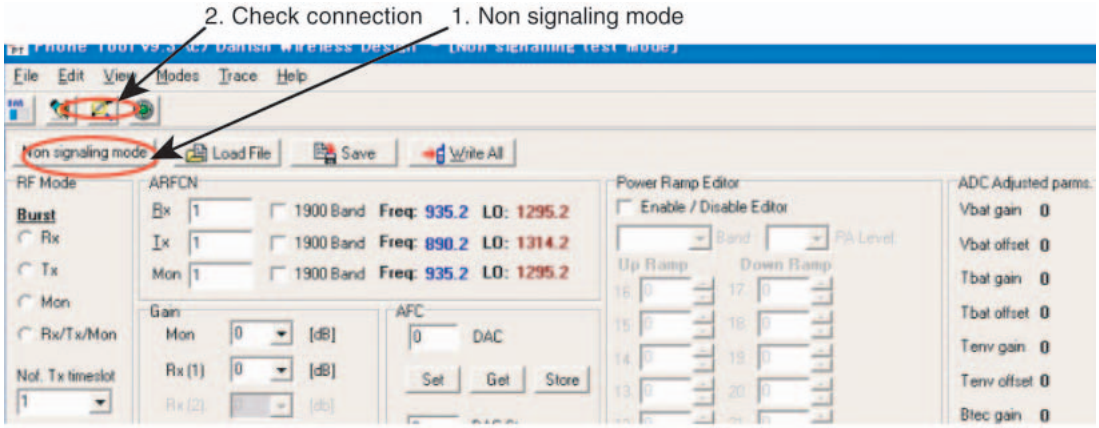
8.4.3. Battery Voltage AD / Temperature AD Calibration



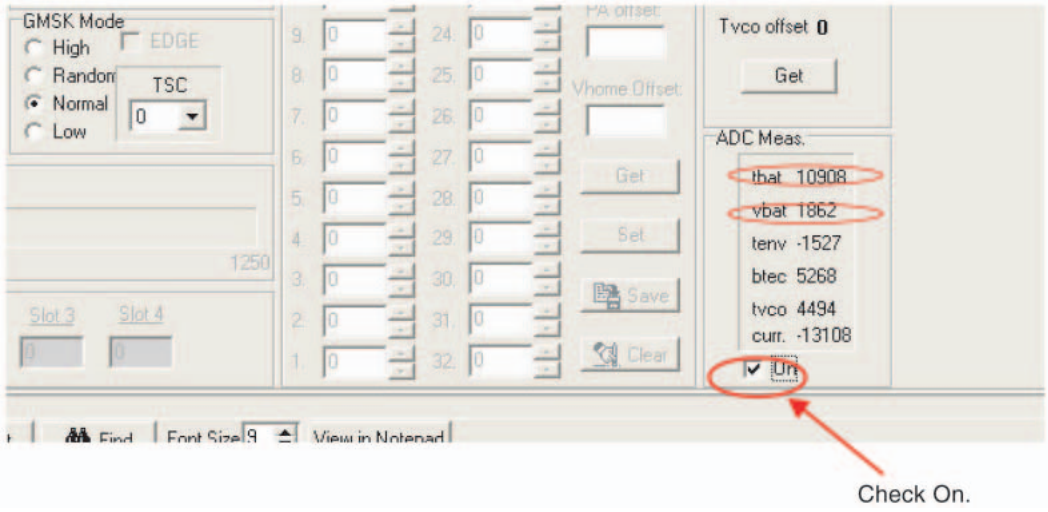
8.4.4. Battery Voltage AD Calibration

1.Click mode button and select "**Non signaling test**".





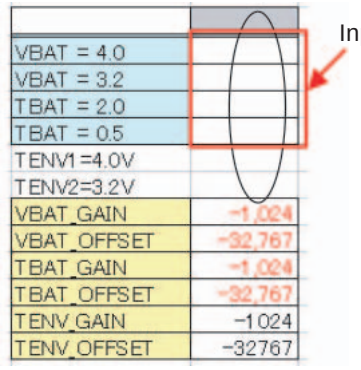
1. Click the "**Non signaling mode**" button.
2. Click Connection button.



3. Check the ADC Meas(urement).
4. Change the power supply PS-1 voltage from 3.7 V to 4.0 V
5. Check the vbat = 4.0 V value.
   If vbat = 4.0 V is outside the range -7000 to +6000, then the unit has failed.
6. Enter the calibrated vbat = 4.0 V value into the Battery ADJ Excel sheet.
7. Change the power supply-1 voltage from 4.0v to 3.2v.
8. Check the vbat = 3.2 v value.
   If VBAT = 3.2 V is outside the range 1000 to 13000, then the unit has failed.
9. Enter down the calibrated vbat value into the Battery ADJ Excel sheet.
10. Change the power supply voltage from 3.2v to 3.9v.

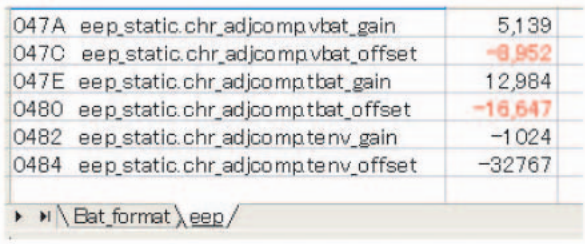
8.4.5. Battery Temperature AD Calibration

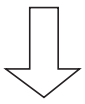
1. Supply the TBAT = 2.0v by PS-2.
2. Check the tbat = 2.0 V value
   If the value is outside the range -20000 to -900, then the unit has failed.
3. Enter the calibrated tvat = 2.0 V value to the Excel sheet.
4. Change the power supply PS-2 voltage from 2.0 V to 0.5 V.
5. Check the Tbat = 0.5 V value.
   If the value is outside the range 5000 to 12000, then the unit has failed.
6. Enter the calibrated Tbat = 0.5 V value into the Excel sheet. VBAT/TBAT value will be used to automatically calculate the VBAT_GAIN/OFFSET and TBAT_GAIN/OFFSET. It will then be stored to the eep file of the BATT format Excel sheet.

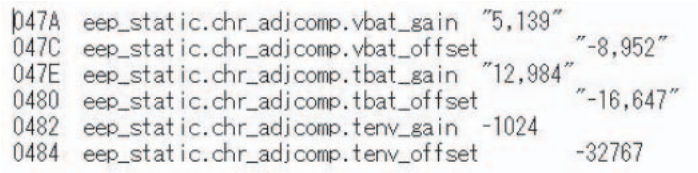


Input the calibrated VBAT & TBAT value

7. Convert the Excel sheet of EEP data to TXT(text) format.
   File -> Save As -> Text(Tab delimited) -> Save



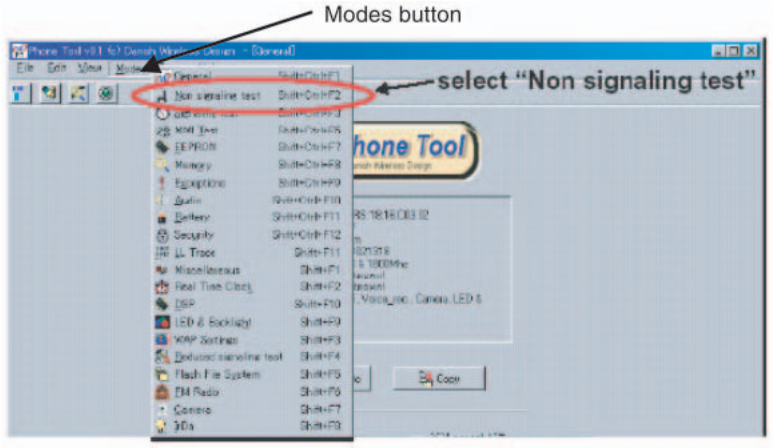


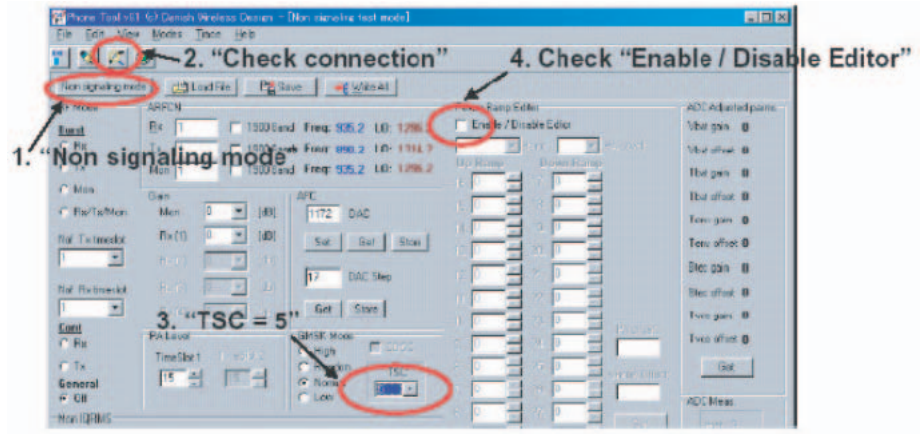


8. Rename the text file from the original filename and then save to PC.

8.4.6. Transmit Power Calibration

Note: *To calibrate the mobile, set it to ptest_mode.*
Click modes button and select "**Non signaling test**".

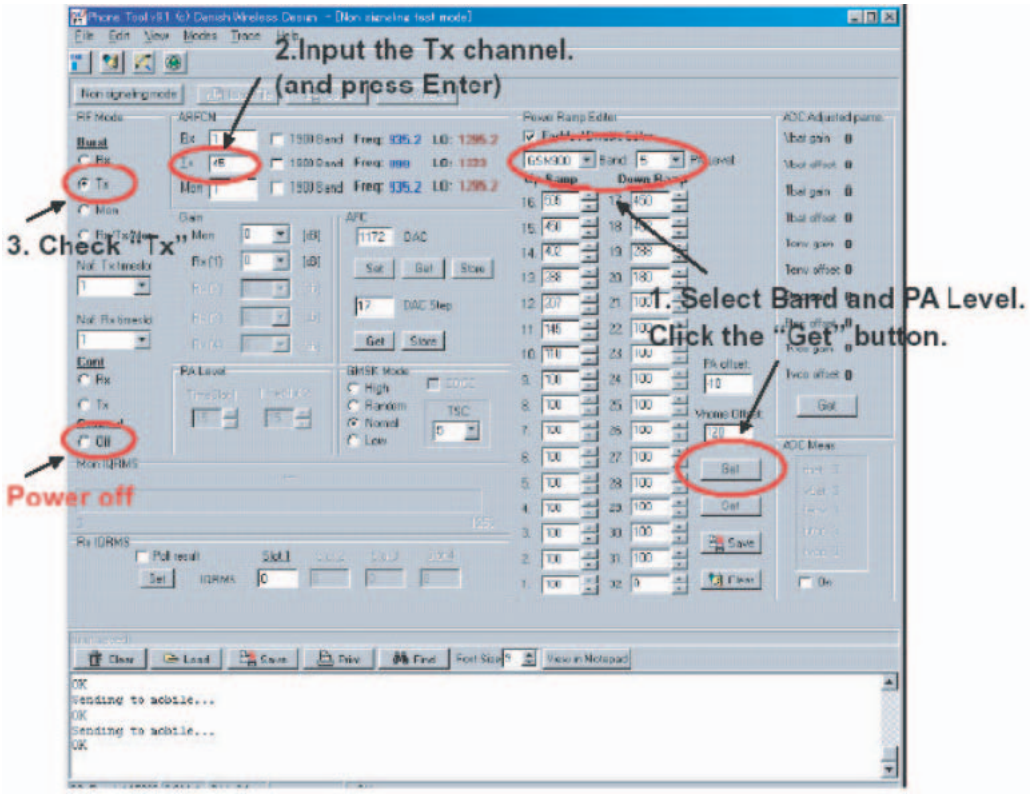




1. Click the "**Non signaling mode**" button.
2. Click the Check Connection button.
3. Select TSC = 5.
4. Check "**Enable/Disable Editor**".
5. Proceed to "**Power Ramp Editor**".

Power Level Calibration

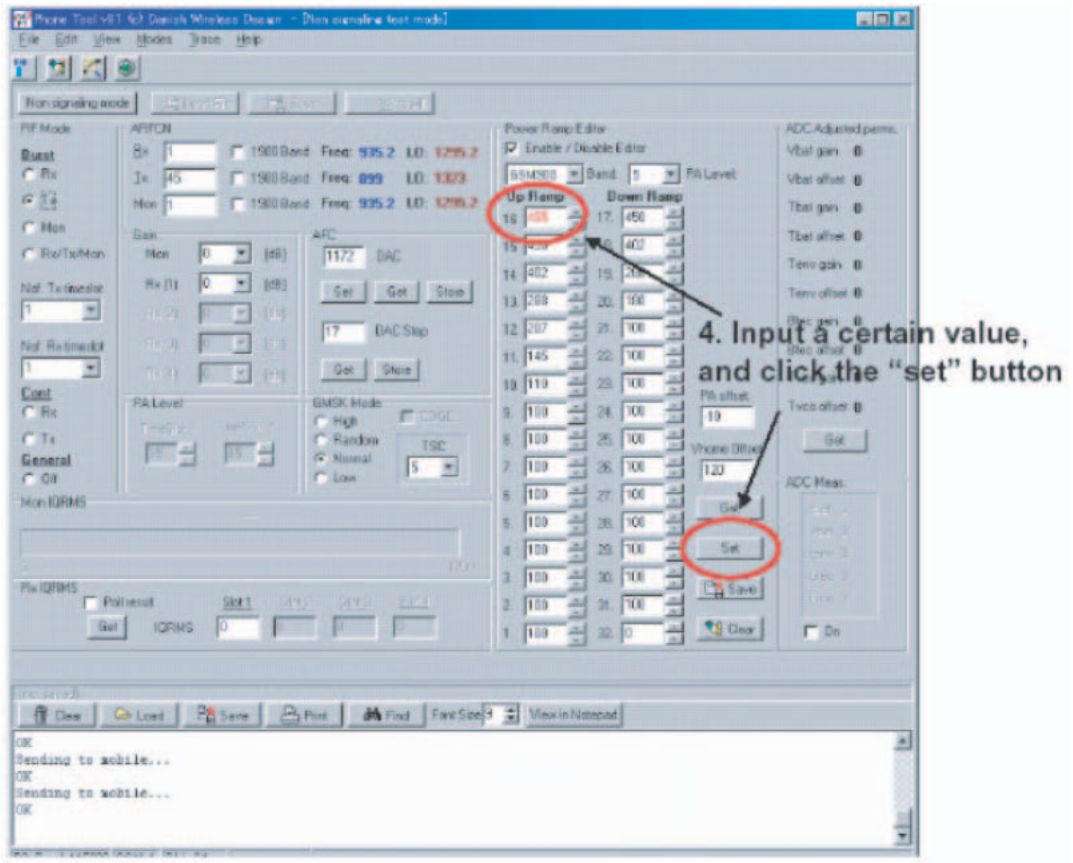
Before starting Power Level Calibration, the Power Ramp Editor should be enabled.
The mobile should be connected to GSM Tester or Power Meter.



1. Select the required Band and PA Level, and click the "**Get**" button.
   The default ramping value for the selected band and PA Level will be displayed.
2. Input the Tx ARFCN (EGSM = 45 ch, DCS = 633 ch), and press Enter key.
3. Check the "**Burst Tx**" of the RF Mode.
   The handset will transmit and the power meter will display the default Tx power level.

NOTE: *To stop the handset transmitting, click "General off".*

4. Input an appropriate value for "Up Ramp 16", and click "**set**".
   Check that the power meter registers a change in power level.
5. Repeat step 4 (Input and set) until the target power level is displayed on the power meter.
   (Refer to the Calibration Specification table below.)



Calibrating Specification Table

Note that each frequency band is divided into segments and that each segment has a Calibration Channel allocated to it.

Band	Segment	Calibration Channel	Channel Range	Calibrating Order	Calibrating Type
E-GSM	0 - 0	14	1 - 25	2	5
	0 - 1	45	26 - 99	1	5 - 19
	0 - 2	124	100 - 124	4	5
	0 - 3	1007	975 - 1023	3	5
DCS	1 - 0	550	512 - 600	2	0
	1 - 1	633	601 - 700	1	0 - 15
	1 - 2	775	701 - 800	4	0
	1 - 3	848	801 - 885	3	0

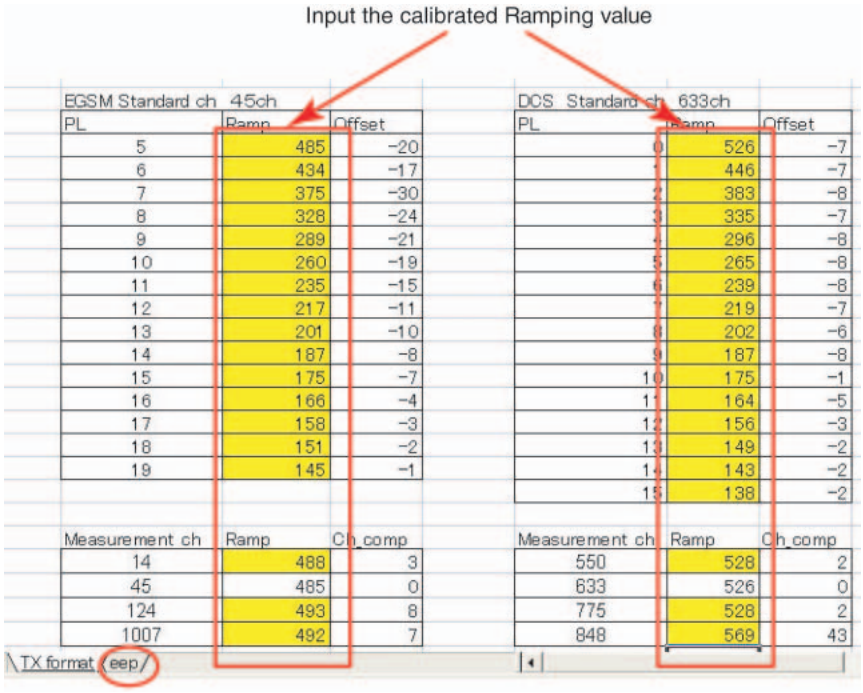
E-GSM900

Power Level (PL)	Output (dBm)		
	Nominal	Terget	
		Min	Max
5	31.75	31.5	32.0
6	30.4	30.0	30.9
7	28.5	28.5	29.5
8	26.5	26.5	27.5
9	24.5	24.5	25.5
10	22.5	22.5	23.5
11	20.5	20.5	21.5
12	18.5	18.5	19.5
13	16.5	16.5	17.5
14	14.5	14.5	15.5
15	12.5	12.5	13.5
16	10.5	10.5	11.5
17	8.5	8.5	9.5
18	6.5	6.5	7.5
19	4.5	4.5	5.5

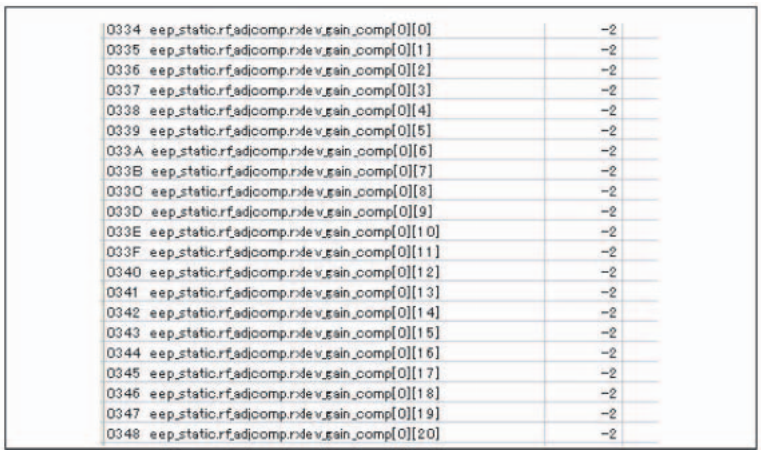
DCS1800

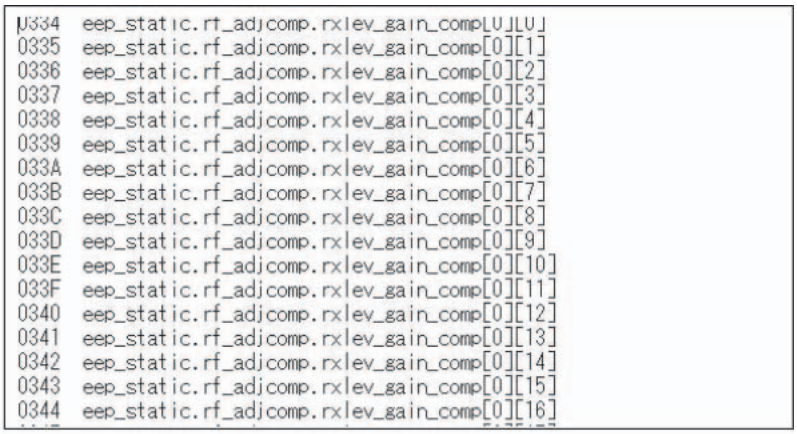
Power Level (PL)	Output (dBm)		
	Nominal	Terget	
		Min	Max
0	30.0	29.7	30.3
1	28.0	27.5	28.5
2	26.0	25.5	26.5
3	24.0	23.5	24.5
4	22.0	21.5	22.5
5	20.0	19.5	20.5
6	18.0	17.5	18.5
7	16.0	15.5	16.5
8	15.0	13.5	14.5
9	14.0	11.5	12.5
10	13.0	9.5	10.5
11	8.0	7.5	8.5
12	6.0	5.5	5.5
13	5.0	3.5	4.5
14	4.0	1.5	2.5
15	0.0	–0.5	0.5

6. Enter the calibrated Ramping value into the following TX Excel sheet.
   The Ramping value will be automatically calculated to the pa_offset value and then stored to the eep file of the Excel sheet.
7. To calibrate other PA Levels or Bands, repeat steps 1 to 6.
   After finished all calibrate the Ramping value and then it input to following Excel sheet.



8. Convert the Excel sheet of EEP data to TXT (Text) format and then save to PC.
   File -> Save As -> Text (Tab delimited) -> Save





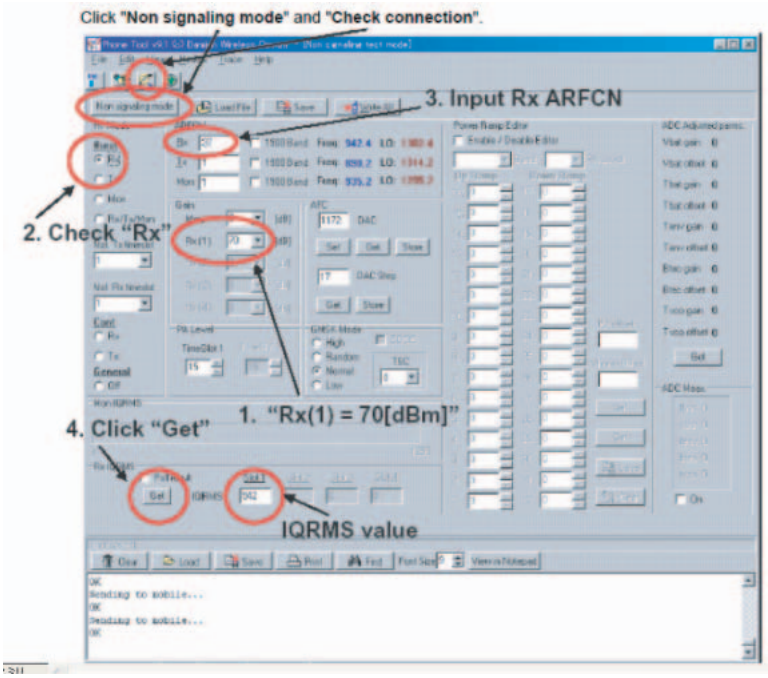
Rename the Text file from the original filename and then save to PC.

8.4.7. Rxlev Calibration

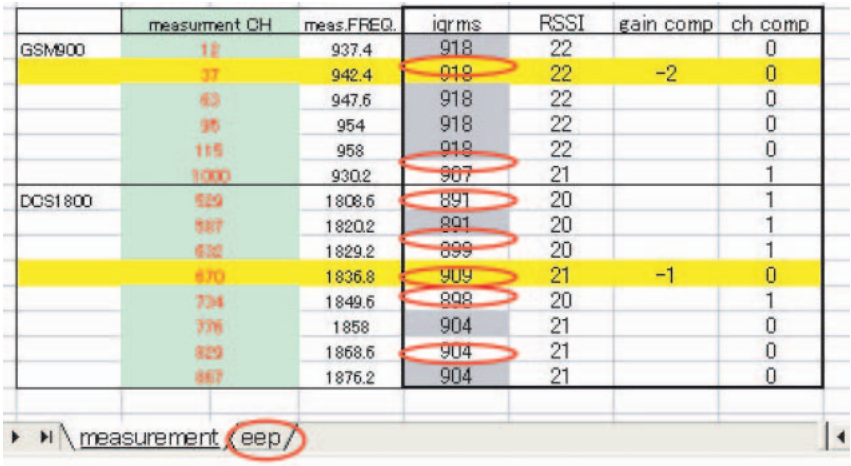
NOTE: *To calibrate Rxlev, the mobile should in under ptest_mode.*

Rxlev gain calibration

The mobile should be connected to the Signal Generator. RF input level is –90 dBm.
Select "**Non signaling mode**" in Phone Tool.



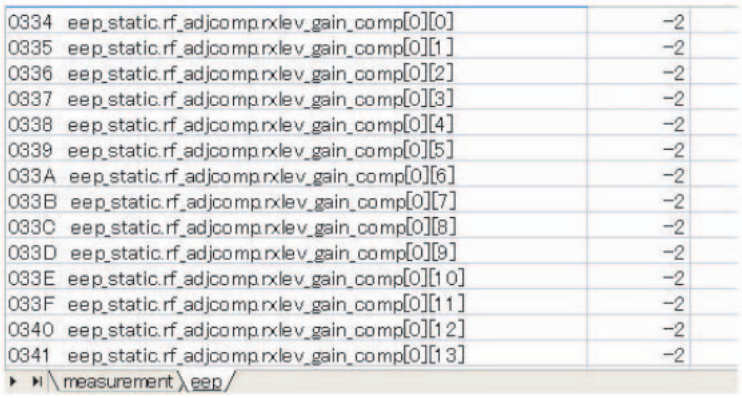
1. Select the Gain "**Rx(1) = 70 dB**".
2. Check the "**Burst Rx**" of the RF Mode.
3. Input the Rx ARFCN (EGSM = 37 ch, DCS = 670 ch) and press the Enter key.
4. Click the "**Get**" button of Rx IQRMS.
   The value displayed at "**Slot1**" will be the "**IQRMS value**".
5. Enter the calibrated IQRMS value into the RX Excel sheet (below).
   The IQRMS value will be calculated automatically for the GAIN comp and CHANNEL comp. It will then be stored to the eep file of the RX Excel sheet.



	measurment CH	meas.FREQ.	iqrms	RSSI	gain comp	ch comp
GSM900	12	937.4	918	22		0
	37	942.4	918	22	-2	0
	63	947.6	918	22		0
	95	954	918	22		0
	115	958	918	22		0
	1000	930.2	907	21		1
DCS1800	529	1808.6	891	20		1
	587	1820.2	891	20		1
	632	1829.2	899	20		1
	670	1836.8	909	21	-1	0
	734	1849.6	898	20		1
	776	1858	904	21		0
	829	1868.6	904	21		0
	867	1876.2	904	21		0

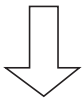
measurement eep

6. Convert the Excel sheet of EEP data to TXT (text) format.
   File -> Save As -> Text (Tab delimited) -> Save



0334	eep_static.rf_adjcomp.rxlev_gain_comp[0][0]	-2
0335	eep_static.rf_adjcomp.rxlev_gain_comp[0][1]	-2
0336	eep_static.rf_adjcomp.rxlev_gain_comp[0][2]	-2
0337	eep_static.rf_adjcomp.rxlev_gain_comp[0][3]	-2
0338	eep_static.rf_adjcomp.rxlev_gain_comp[0][4]	-2
0339	eep_static.rf_adjcomp.rxlev_gain_comp[0][5]	-2
033A	eep_static.rf_adjcomp.rxlev_gain_comp[0][6]	-2
033B	eep_static.rf_adjcomp.rxlev_gain_comp[0][7]	-2
033C	eep_static.rf_adjcomp.rxlev_gain_comp[0][8]	-2
033D	eep_static.rf_adjcomp.rxlev_gain_comp[0][9]	-2
033E	eep_static.rf_adjcomp.rxlev_gain_comp[0][10]	-2
033F	eep_static.rf_adjcomp.rxlev_gain_comp[0][11]	-2
0340	eep_static.rf_adjcomp.rxlev_gain_comp[0][12]	-2
0341	eep_static.rf_adjcomp.rxlev_gain_comp[0][13]	-2

measurement eep

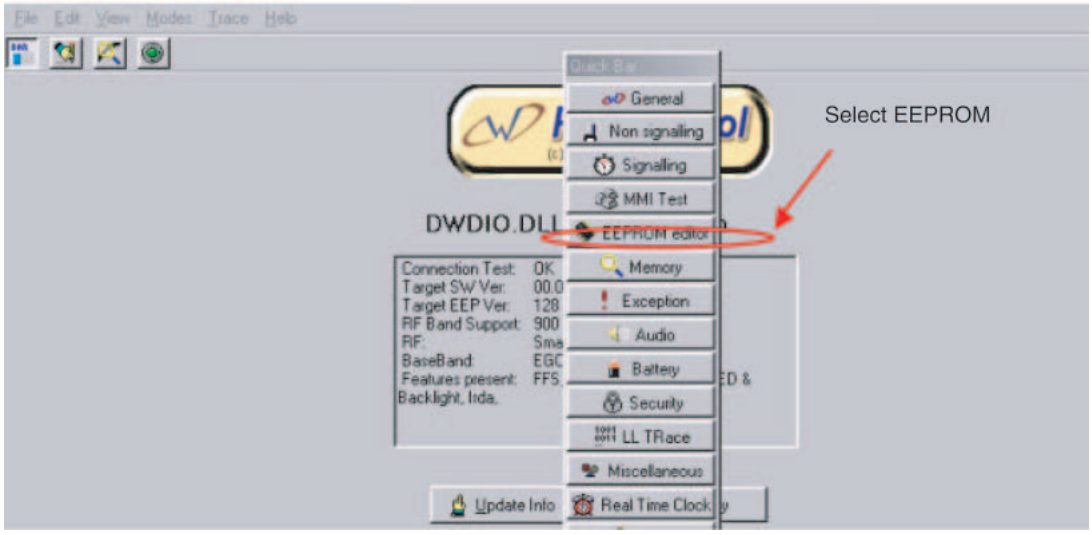


0334	eep_static.rf_adjcomp.rxlev_gain_comp[0][0]	-3
0335	eep_static.rf_adjcomp.rxlev_gain_comp[0][1]	-3
0336	eep_static.rf_adjcomp.rxlev_gain_comp[0][2]	-3
0337	eep_static.rf_adjcomp.rxlev_gain_comp[0][3]	-3
0338	eep_static.rf_adjcomp.rxlev_gain_comp[0][4]	-3
0339	eep_static.rf_adjcomp.rxlev_gain_comp[0][5]	-3
033A	eep_static.rf_adjcomp.rxlev_gain_comp[0][6]	-3
033B	eep_static.rf_adjcomp.rxlev_gain_comp[0][7]	-3
033C	eep_static.rf_adjcomp.rxlev_gain_comp[0][8]	-3
033D	eep_static.rf_adjcomp.rxlev_gain_comp[0][9]	-3
033E	eep_static.rf_adjcomp.rxlev_gain_comp[0][10]	-3
033F	eep_static.rf_adjcomp.rxlev_gain_comp[0][11]	-3
0340	eep_static.rf_adjcomp.rxlev_gain_comp[0][12]	-3
0341	eep_static.rf_adjcomp.rxlev_gain_comp[0][13]	-3
0342	eep_static.rf_adjcomp.rxlev_gain_comp[0][14]	-3
0343	eep_static.rf_adjcomp.rxlev_gain_comp[0][15]	-3

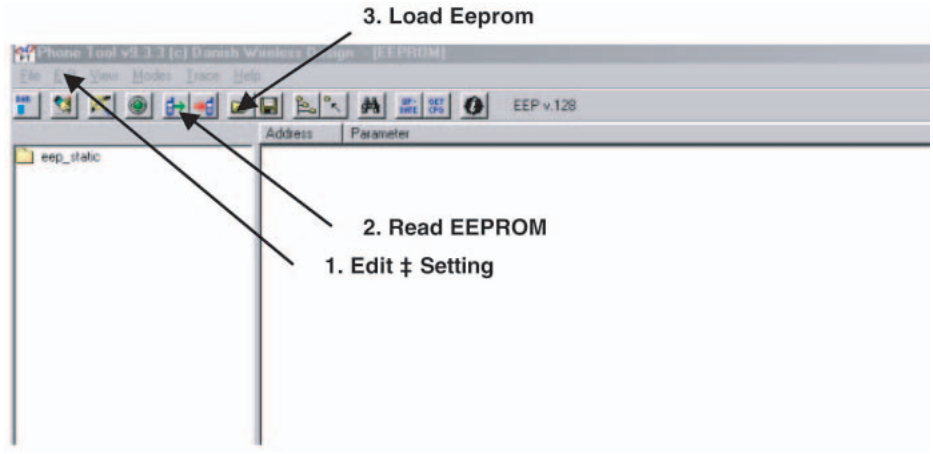
7. Rename the txt file from the original filename and then save to PC.

8.4.8. Data Overwrite Procedure

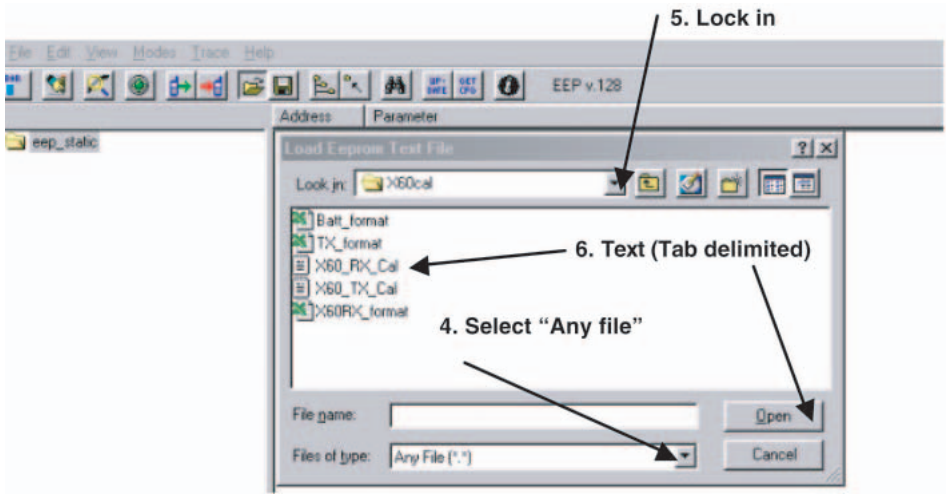
Press the power key to turn on the mobile phone.
Start the Phone Tool program.
Click the "**V24 At# On**".
Click the **Check Connection button**.



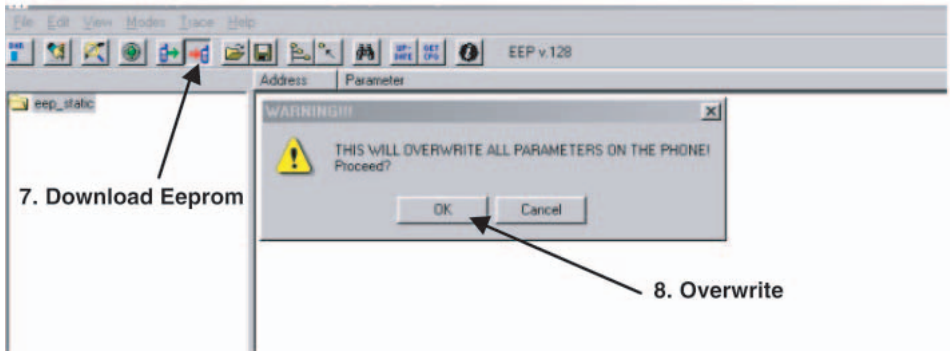
When the log window displays the message "**Connection OK**", select "**EEPROM**".



1. Click "**Edit à Setting**" , and check "**Read static EEPROM value only from phone**".
2. Click "**Read EEPROM value from phone**".
   The "**eep-static**" folder is opened.
3. Click "**Load Eeprom Text File**".



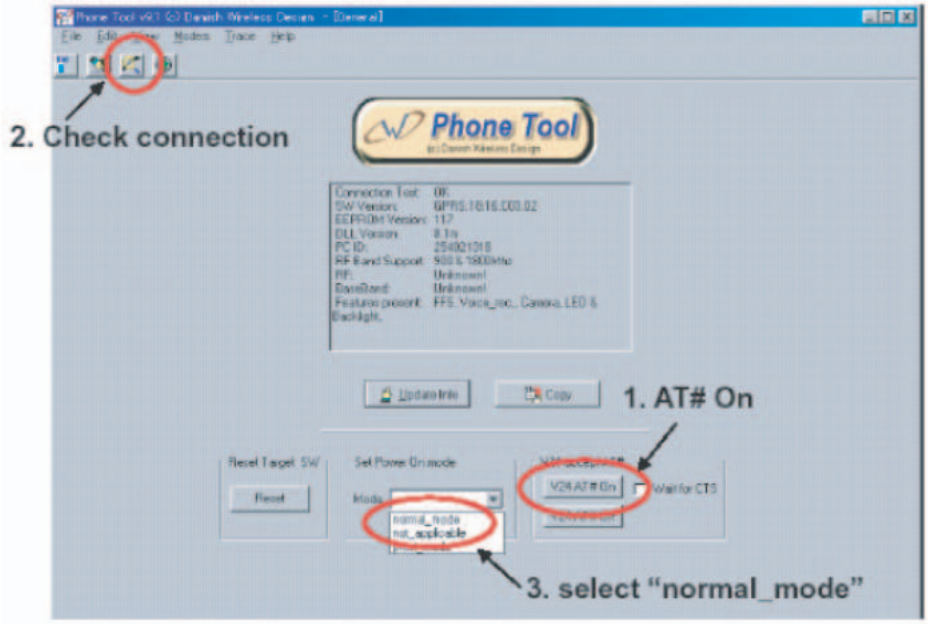
4. Select "**Any File**" of the Files of type
5. Click "**Lock in**" and then select which is saved each RX, TX and Battery text (Tab.delimted) file from PC.
6. Select Text file and then click "**Open**".



7. Click "**Download current Eeprom values to phone**".
8. Click "**OVERWRITE**" button.
   The TX, RX and Battery calibration values in the phone will be overwritten by the new values from the PC.

8.4.9. Normal Mode

NOTE: *When calibration has been completed, the mobile should be set to normal_mode.*
Press the power key to turn on the mobile phone.
Start the PhoneTool program.
The following screen will be displayed:



1. Click the"**V24 AT# On**", and check the log window. >>> "**AT#OK**".
2. Click the Check Connection button, and check the log window.>>> "**Connection OK**".

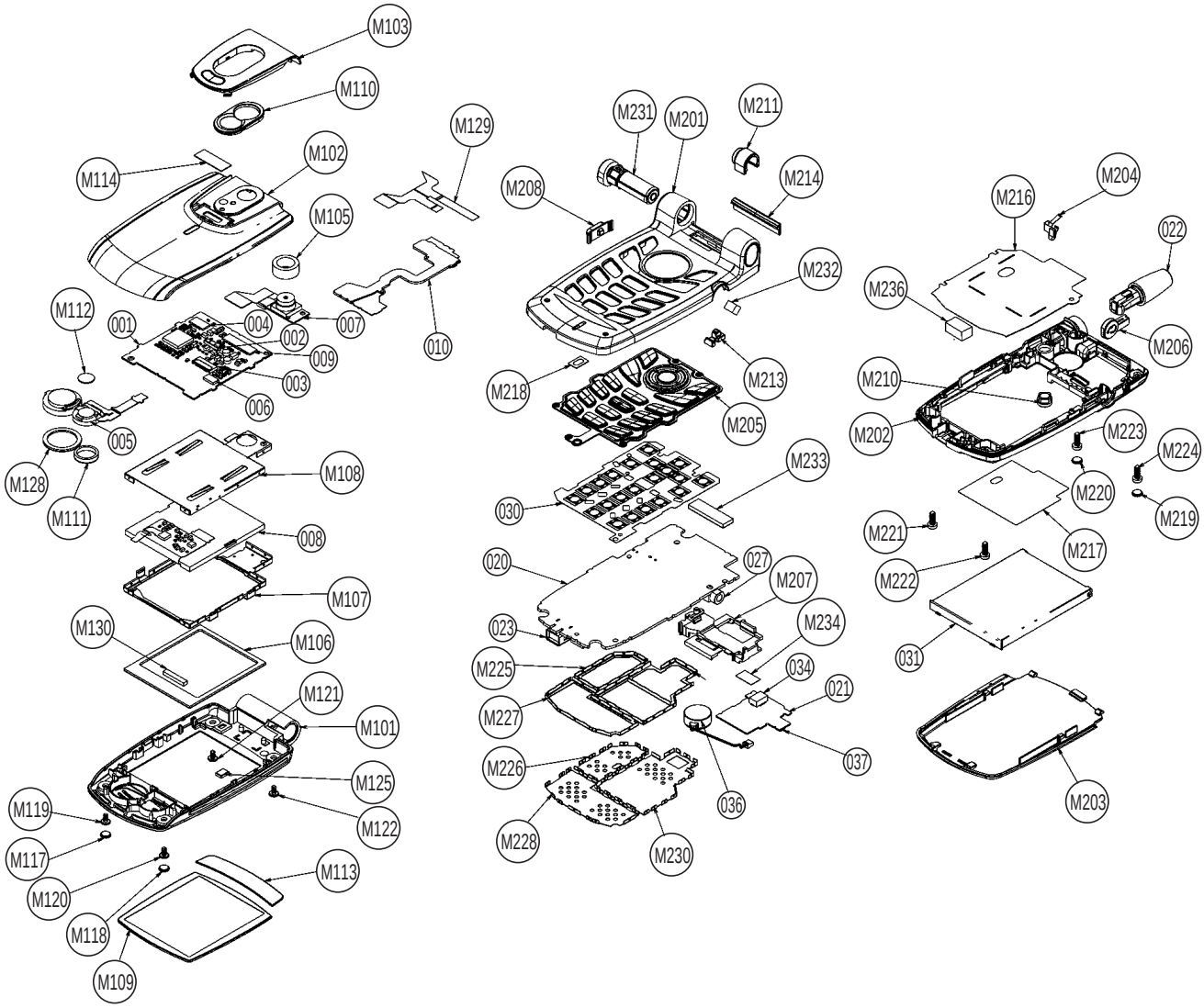
NOTE: *If the message "**ERROR! No Connection**" is displayed, check the cable connections, power supply and that the phone is switched on, then repeat steps 1 and 2.*

3. Select "**normal_mode**", and check the log window displays the message "**Sending to mobile ÅcOK.**"
4. Click the "**Reset**" button. The phone will power down automatically.

5. The phone is now in normal_mode.

9. REPLACEMENT PARTS LIST

9.1. Case and Cover Parts List



REF. NO.	PART NO.	DESCRIPTION
M101	3DA001974AAA	UPPER FRONT COVER
M102	3VA001770AAB	UPPER BACK CASE ASSY (BLACK-PANA)
	3VA001770AAD	UPPER BACK CASE ASSY (WHITE-PANA)
	3VA001770AAF	UPPER BACK CASE ASSY (RED-PANA)
M103	3VA001806AAA	HINGE COVER ASSY
M105	3CV001522AAA	CAMERA CUSHION
M106	3CV001523AAA	LCD CUSHION
M107	3CH001270AAA	LCD HOLDER FRONT
M108	3CH001271AAA	LCD HOLDER BACK
M109	3CF002405AAA	LCD PANEL
	3CF002405AAB	LCD PANEL (WHITE)
M110	3VA001753AAA	MIRROR ASSY
M111	3CV001524AAA	RECEIVER CUSHION FRONT
M112	3CV001275AAA	RECEIVER CUSHION BACK
M113	3CF002406AAB	LOGO PANEL (BLACK)
	3CF002406AAD	LOGO PANEL (WHITE)
M114	3DG001271AAA	IRDA SHEET
M117	3DB001083AAB	SCREW CAP (BLACK)
M118	3DB001083AAB	SCREW CAP (BLACK)
M119	3AB001160AAA	UPPER SCREW (MACHINE SCREW)

REF. NO.	PART NO.	DESCRIPTION
M120	3AB001160AAA	UPPER SCREW (MACHINE SCREW)
M121	3AB001160AAA	UPPER SCREW (MACHINE SCREW)
M122	3AB001160AAA	UPPER SCREW (MACHINE SCREW)
M125	3DF001017AAA	MAGNET
M128	3CV001521AAA	SPEAKER CUSHION
M129	3DH001482AAA	CAMERA SHIELD SHEET
M130	3CV001638AAA	LCD DRIVER CUSHION
M201	3VA001771AAA	LOWER FRONT COVER SUB-ASSY
M202	3CE001654AAA	LOWER BACK CASE (BLACK)
	3CE001654AAB	LOWER BACK CASE (WHITE)
	3CE001654AAC	LOWER BACK CASE (RED)
M203	3CE001653AAA	BATTERY COVER
	3CE001653AAB	BATT COVER (WHITE)
	3CE001653AAC	BATT COVER (RED)
M204	3DJ001115AAA	ANT TERMINAL
M205	3MB001163AAA	KEY SHEET (BLACK-EN)
	3MB001163AAB	KEY SHEET (WHITE-EN)
	3MB001163AAC	KEY SHEET (RED-EN)

REF. NO.	PART NO.	DESCRIPTION
M206	3DB001085AAA	HSJ CAP (BLACK)
	3DB001085AAB	HSJ CAP (WHITE)
	3DB001085AAC	HSJ CAP (RED)
M207	3CH001272AAA	SIM PCB HOLDER
M208	3MB001165AAA	SIDE KEY
M210	3DB001084AAA	RF CAP (BLACK)
	3DB001084AAB	RF CAP (WHITE)
	3DB001084AAC	RF CAP (RED)
M211	3CT001158AAA	HINGE GUIDE
M213	3CU001073AAA	HINGE STOPPER
M214	3EZ001188AAA	STOP RUBBER
M216	3CJ001200AAA	NAME PLATE SHEET
M217	3PA002723AAA	NAME PLATE
M218	3CY001046AAA	MIC MESH
M219	3DB001083AAA	SCREW CAP (BLACK)
	3DB001083AAC	SCREW CAP (WHITE)
	3DB001083AAD	SCREW CAP (RED)
M220	3DB001083AAA	SCREW CAP (BLACK)
	3DB001083AAC	SCREW CAP (WHITE)
	3DB001083AAD	SCREW CAP (RED)
M221	3AB001154AAA	LOWER SCREW (SELF TAPPING)
M222	3AB001154AAA	LOWER SCREW (SELF TAPPING)
M223	3AB001154AAA	LOWER SCREW (SELF TAPPING)
M224	3AB001154AAA	LOWER SCREW (SELF TAPPING)
M225	3DH001435AAA	SHIELD COVER
M226	3DH001436AAA	LOGIC SHIELD COVER S
M227	3DH001433AAA	SHIELD COVER
M228	3DH001434AAA	LOGIC SHIELD COVER L
M230	3DH001432AAA	RF SHIELD COVER
M231	3VA001750AAA	ONE PUSH HINGE ASSY
M232	3CV001289AAA	WATER CUSHION
M233	3CV001525AAA	WATER CUSHION (PCB)
M234	3AK001080AAA	HINGE FPC W/F
M236	3CV001583AAA	MIC CUSHION BACK

REF. NO.	PART NO.	DESCRIPTION
001	EBX400-E5	MOUNTED UPPER PCB
002	B3RBC0000023	IRDA
003	K1MN21B00052	LCD CONNECTOR
004	K1KB24A00043	B TO B CONNECTOR
005	L0ZZ00000017	SPEAKER-RECEIVER ASSY
006	K1MN06B	REC/SP CONNECTOR
007	UZ80059A	CAMERA MODULE
008	L5EDDXC00001	LCD MODULE
009	K1KB60A00117	B TO B CONNECTOR
010	EBX400-E6	MOUNTED HINGE FPC
020	EBX400-B12	MAIN PCB ASSY
021	EBX400-E4	MOUNTED SIM PCB
022	AN80013AAFA	ANTENNA (BLACK)
	AN80013AAGA	ANTENNA (WHITE)
	AN80013AAHA	ANTENNA (RED)
023	K1FB102E0002	DC CONNECTOR
027	K2HD105ED0007	H.S.J.
030	3DJ001181AAA	PANEL SWITCH
031	BT80084AAA	BATTERY PACK
	BT80084ABA	BATTERY PACK
036	L6GAAAPC0001	VIBRATOR ASSY

9.2. Main PCB Assembly

Ref. No.	Part No.	Part Name & Description		Grid
BT2001	N4EZA14A0001	BATTERY G		
C101	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C103	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C104	F1G1H2R0A391	CERAMIC CAPACITOR	2PF 50V	
C105	F1G1H2R0A391	CERAMIC CAPACITOR	2PF 50V	
C106	F1G1H2R0A391	CERAMIC CAPACITOR	2PF 50V	
C107	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C108	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C110	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C111	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C112	F1G1H1R0A391	CERAMIC CAPACITOR	1PF 50V	
C113	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C114	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C115	F1G1H1R0A391	CERAMIC CAPACITOR	1PF 50V	
C116	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C117	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C118	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C119	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C121	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C124	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C125	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C126	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C128	F1G1H7R0A406	CERAMIC CAPACITOR	7PF 50V	
C129	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C130	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C131	F1G1H2R0A391	CERAMIC CAPACITOR	2PF 50V	
C132	F1G1HR50A391	CERAMIC CAPACITOR	0.5PF 50V	
C201	F1G1E271A043	CERAMIC CAPACITOR	270PF 25V	
C202	F1G1E271A043	CERAMIC CAPACITOR	270PF 25V	
C203	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C207	F1G1H3R0A442	CERAMIC CAPACITOR	3PF 50V	
C210	F1G1H1R5A391	CERAMIC CAPACITOR	1.5PF 50V	
C211	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C301	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C302	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C303	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C304	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C305	F1H1H3910006	CERAMIC CAPACITOR	390PF 50V	
C306	ECHU1H102V41	FILM CAPACITOR	0.001UF 50V	
C307	ECHU1C103V41	FILM CAPACITOR	0.01UF 16V	
C309	F1G1H5R0A404	CERAMIC CAPACITOR	5PF 50V	
C310	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C351	F1G1H101A016	CERAMIC CAPACITOR	100PF 50V	
C352	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C353	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C354	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C355	F1G1C1030005	CERAMIC CAPACITOR	0.01UF 16V	
C356	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C357	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C358	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C359	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C360	F1G1C1030005	CERAMIC CAPACITOR	0.01UF 16V	
C361	F1G1H220A409	CERAMIC CAPACITOR	22PF 50V	
C362	F1G1C1030005	CERAMIC CAPACITOR	0.01UF 16V	
C402	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C2001	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C2003	F1H1C1050003	CERAMIC CAPACITOR	1UF 16V	
C2005	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2006	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2008	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	

Ref. No.	Part No.	Part Name & Description		Grid
C2009	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2015	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2016	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2017	ECJ0EB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C2026	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2027	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2032	ECJZEB1E102K	CERAMIC CAPACITOR	0.001UF 25V	
C2039	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2042	F1G1H100A406	CERAMIC CAPACITOR	10PF 50V	
C2044	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2045	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C2046	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C2047	ECJ0EB1A473K	CERAMIC CAPACITOR	0.047UF 10V	
C2048	ECJZEC1C101J	CERAMIC CAPACITOR	100PF 16V	
C2049	ECJZEC1C101J	CERAMIC CAPACITOR	100PF 16V	
C2052	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2053	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2054	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2055	F1K1A2260001	CERAMIC CAPACITOR	22UF 10V	
C2056	F1J1A106A023	CERAMIC CAPACITOR	10UF 10V	
C2057	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2058	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2059	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2060	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2061	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2062	F1H0J2250007	CERAMIC CAPACITOR	2.2UF 6.3V	
C2063	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C2064	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C2065	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2066	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2067	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2068	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2069	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2070	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2071	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2072	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2074	ECJZEB0J103K	CERAMIC CAPACITOR	0.01UF 6.3V	
C2078	F1G1H9R0A008	CERAMIC CAPACITOR	9PF 50V	
C2081	F1G1H9R0A008	CERAMIC CAPACITOR	9PF 50V	
C2089	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2091	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2092	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2093	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2095	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2096	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2098	ECJ0EB1A473K	CERAMIC CAPACITOR	0.047UF 10V	
C2100	F1G1H271A483	CERAMIC CAPACITOR	270PF 50V	
C2101	F1G1H472A498	CERAMIC CAPACITOR	0.0047UF 50V	
C2104	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C2106	F1J0J106A004	CERAMIC CAPACITOR	10UF 6.3V	
C2107	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2109	F1G1H270A006	CERAMIC CAPACITOR	27PF 50V	
C2110	F1G1H270A006	CERAMIC CAPACITOR	27PF 50V	
C2120	F1G1H470A006	CERAMIC CAPACITOR	47PF 50V	
C212	F1G1H102A498	CERAMIC CAPACITOR	0.001UF 50V	
C2130	ECJZEB0J104K	CERAMIC CAPACITOR	0.1UF 6.3V	
C2137	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2138	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2140	F1J1A4750003	CERAMIC CAPACITOR	4.7UF 10V	
C2141	F1G1H330A409	CERAMIC CAPACITOR	33PF 50V	

Ref. No.	Part No.	Part Name & Description		Grid
C2142	F1G1H330A409	CERAMIC CAPACITOR	33PF 50V	
C2143	ECJ0EB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C2146	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2147	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C2148	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
CN101	K1QZA1AD0012	CONNECTOR		
CN2001	K1FB102E0002	CONNECTOR		
CN2005	K2HD105E0007	PLUG,JACK		
CN2006	K1KB60A00111	CONNECTOR		
CN2008	200403110014	SQUARE CONNECTOR (J)		
CN2009	200403180006	SQUARE CONNECTOR (J)		
D2002	B0JCPB000001	DIODE		
D2003	B0JCPB000001	DIODE		
D2004	MA2SD1900L	DIODE		
D2005	MA2SD1900L	DIODE		
D2006	MA2SD1900L	DIODE		
D2007	MA2SD1900L	DIODE		
D2008	MA2SD1900L	DIODE		
D2009	MA2SD1900L	DIODE		
D2010	MAZS0750ML	ZENER DIODE		
D2015	B0BD6R800011	ZENER DIODE		
D2017	MAZS0750ML	ZENER DIODE		
D2018	MAZS0750ML	ZENER DIODE		
D2019	MAZS0750ML	ZENER DIODE		
D2020	MAZS0750ML	ZENER DIODE		
D2021	MAZS0750ML	ZENER DIODE		
D2022	MAZS0750ML	ZENER DIODE		
D2023	MAZW068H0L	DIODE		
D2024	MAZW068H0L	DIODE		
D2025	MAZW068H0L	DIODE		
D2026	MAZW068H0L	DIODE		
D2027	MAZW068H0L	DIODE		
DS2002	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2003	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2004	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2005	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2006	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2007	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2008	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2009	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2010	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2011	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2012	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2013	B3AEB0000035	PHOTO TRANFER ELEMENT		
DS2014	B3AEB0000035	PHOTO TRANFER ELEMENT		
E2001	B4ABC0000014	SEMICONDUCT TRANSFER		
E2002				
E2003				
E2004				
FL101	EXCML16A270U	FILTER		
FL102	200109140004	FILTER		
FL201	J0C1847B0007	FILTER		
FL202	J0C9426B0005	FILTER		
FL2001	200401190008	FILTER		
FL2002	200401190008	FILTER		
FL2003	200401190008	FILTER		
FL2007	J0JHC0000034	FILTER		
FL2008	J0JAC0000011	FILTER		
FL2010	J0MZB0000005	FILTER		
L101	ELJRF33NJF2	SURFACE MOUNT FIXED COIL	33NH	

Ref. No.	Part No.	Part Name & Description		Grid
L102	ELJRF33NJF2	SURFACE MOUNT FIXED COIL	33NH	
L103	ELJRF3N3DF2	RF COIL	3.3NH 5.5GHz	
L104	ELJRF3N3DF2	RF COIL	3.3NH 5.5GHz	
L105	ELJRF82NJF2	SURFACE MOUNT FIXED COIL	82NH	
L106	ELJRF82NJF2	SURFACE MOUNT FIXED COIL	82NH	
L107	ELJRF10NJF2	RF COIL	10NH 2.8GHz	
L108	ELJRF10NJF2	RF COIL	10NH 2.8GHz	
L110	ELJRF5N6JF2	RF COIL	5.6NH 4.6GHz	
L111	ELJRF22NJF2	SURFACE MOUNT FIXED COIL	22NH	
L112	ELJRF3N3DF2	RF COIL	3.3NH 5.5GHz	
L113	ELJRF5N6JF2	RF COIL	5.6NH 4.6GHz	
L201	ELJRF5N6JF2	RF COIL	5.6NH 4.6GHz	
L202	ELJRF5N6JF2	RF COIL	5.6NH 4.6GHz	
L203	ELJRF18NJF2	SURFACE MOUNT FIXED COIL	18NH	
L204	ELJRF18NJF2	SURFACE MOUNT FIXED COIL	18NH	
L205	ELJRF2N7DF2	RF COIL	2.7NH 5.5GHz	
L208	ELJRF6N8JF2	RF COIL	6.8NH 4GHz	
L301	ELJRF27NJF2	SURFACE MOUNT FIXED COIL	27NH	
L351	G1C1R0K00005	SURFACE MOUNT FIXED COIL	1UH	
L2010	ELL3GM220M	SURFACE MOUNT FIXED COIL	22UH	
L2011	G1C82NJ00009	SURFACE MOUNT FIXED COIL	82NH 600MHz	
L2012	ELJRF5N6DF	SURFACE MOUNT FIXED COIL	5.6NH 4.6GHz	
MK2001	L0CZAB000002	MICROPHONE UNIT		
Q2002	UNR9210J0L	TRANSISTOR 47K		
Q2006	B1DHCC000036	TRANSISTOR		
Q2008	2SD19790VL	TRANSISTOR		
R102	EXB28V102JX	SPECIAL FIXED RESISTOR	1K 1/32W	
R104	ERJ2RKF123X	SPECIAL RESISTOR	12K 1/16W	
R105	ERJ2GEJ221X	FIXED RESISTOR	220Ω 1/16W	
R106	ERJ2GEJ561X	FIXED RESISTOR	560Ω 1/16W	
R107	ERJ2GEJ182X	FIXED RESISTOR	1.8K 1/16W	
R108	ERJ2GEJ122X	FIXED RESISTOR	1.2K 1/16W	
R110	EXB24AT3AR3X	SPECIAL RESISTOR	50Ω 1/25W	
R111	ERJ2GEJ181X	FIXED RESISTOR	180Ω 1/16W	
R112	ERJ2GEJ100X	FIXED RESISTOR	10Ω 1/16W	
R113	EXB24AT3AR3X	SPECIAL RESISTOR	50Ω 1/25W	
R114	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R117	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R301	ERJ2GEJ182X	FIXED RESISTOR	1.8K 1/16W	
R302	ERJ2GEJ222X	FIXED RESISTOR	2.2K 1/16W	
R303	ERJ2GEJ472X	FIXED RESISTOR	4.7K 1/16W	
R352	ERJ2GEJ103X	FIXED RESISTOR	10K 1/16W	
R353	ERJ2GEJ391X	FIXED RESISTOR	390Ω 1/16W	
R2003	ERJ2GEJ682X	FIXED RESISTOR	6.8K 1/16W	
R2006	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2007	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2008	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2009	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2010	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2011	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2014	ERJ2GEJ222X	FIXED RESISTOR	2.2K 1/16W	
R2015	EXB24V104JX	SPECIAL FIXED RESISTOR	100K 1/16W	
R2016	EXB24V104JX	SPECIAL FIXED RESISTOR	100K 1/16W	
R2017	ERJ2GEJ473X	FIXED RESISTOR	47K 1/16W	
R2018	ERJ2GEJ472X	FIXED RESISTOR	4.7K 1/16W	
R2019	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2020	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R2021	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R2024	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2026	ERJ2GEJ223X	FIXED RESISTOR	22K 1/16W	

Ref. No.	Part No.	Part Name & Description		Grid
R2027	ERJ2GEJ473X	FIXED RESISTOR	47K 1/16W	
R2028	ERJ2RKF1543X	SPECIAL FIXED RESISTOR	154K 1/16W	
R2029	ERJ2GEJ223X	FIXED RESISTOR	22K 1/16W	
R2031	ERJ6RSJR10V	FIXED RESISTOR	0.1Ω 1/8W	
R2033	ERJ2GEJ334X	FIXED RESISTOR	330K 1/16W	
R2034	ERJ2GEJ154X	FIXED RESISTOR	150K 1/16W	
R2035	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2036	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2037	ERJ2GEJ2R2X	SPECIAL FIXED RESISTOR	2.2Ω 1/16W	
R2038	ERJ2RKF3002X	SPECIAL FIXED RESISTOR	30K 1/16W	
R2039	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2040	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2041	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2043	ERJ2GEJ473X	FIXED RESISTOR	47K 1/16W	
R2046	ERJ2GEJ222X	FIXED RESISTOR	2.2K 1/16W	
R2048	ERJ2GEJ472X	FIXED RESISTOR	4.7K 1/16W	
R2060	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R2070	ERJ2GEJ333X	FIXED RESISTOR	33K 1/16W	
R2073	ERJ2GEJ333X	FIXED RESISTOR	33K 1/16W	
R2074	ERJ2GEJ563X	FIXED RESISTOR	56K 1/16W	
R2078	ERJ2GEJ333X	FIXED RESISTOR	33K 1/16W	
R2079	ERJ2GEJ154X	FIXED RESISTOR	150K 1/16W	
R2080	ERJ2GEJ333X	FIXED RESISTOR	33K 1/16W	
R2081	ERJ2GEJ222X	FIXED RESISTOR	2.2K 1/16W	
R2082	ERJ2GEJ472X	FIXED RESISTOR	4.7K 1/16W	
R2083	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2086	D0GA104JA010	FIXED RESISTOR	100K 1/16W	
R2088	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2089	ERJ2GEJ222X	FIXED RESISTOR	2.2K 1/16W	
R2090	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2091	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2092	EXB24V181JX	BLOCK RESISTOR	180Ω 1/16W	
R2093	ERJ2GEJ181X	FIXED RESISTOR	180Ω 1/16W	
R2094	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R2141	ERJ1GEJ203C	FIXED RESISTOR	20K 1/20W	
R2142	ERJ1GEJ203C	FIXED RESISTOR	20K 1/20W	
R2143	ERJ1GEJ203C	FIXED RESISTOR	20K 1/20W	
R2144	ERJ2GEJ101X	FIXED RESISTOR	100Ω 1/16W	
RT101	D4CC16830006	THERMISTOR	68K	
RV2002	D4ED18R00002	NONLINEAR RESISTOR 8W		
RV2003	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2004	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2005	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2006	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2010	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2011	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2012	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2013	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2014	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2015	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2016	D4ED11200005	NONLINEAR RESISTOR 12W		
RV2017	D4ED11200005	NONLINEAR RESISTOR 12W		
RV2018	D4ED11200005	NONLINEAR RESISTOR 12W		
RV2019	D4ED18R00002	NONLINEAR RESISTOR 8W		
RV2025	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2026	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2027	D4ED12700002	NONLINEAR RESISTOR 27W		
RV2028	D4ED12700002	NONLINEAR RESISTOR 27W		
S101	K0ZZ00000604	SWITCH		
S2022	EVQP7D01K	SWITCH		

Ref. No.	Part No.	Part Name & Description	Grid
U101	C1CB00001525	RF TRANSCEIVER IC PMB6256V	
U102	C1CB00001476	RAMPING CONTROL IC PMB2256V	
U103	C5CB00000052	DUAL BAND PA IC RF3140TR13	
U301	H1D2605B0002	CRYSTAL OSCILLATOR	
U2001	C1CB00001610	SPECIFIC-USE IC	
U2002	C0JBAZ002043	IC 7SZ19P6X	
U2003	C0CBAAA00016	REGULATOR IC	
U2006	C1CB00001611	POWER CONTROL IC	
U2008	C3HBQG000003	MEMORY IC	
U2011	C1BB00000677	MELODY GENERATOR IC	
U2012	C1BB00000885	IC LM4809LQX/NOPB	
U2013	C0JBAS000063	GENERAL PURPOSE IC	
Y2001	H0J327200022	CRYSTAL OSCILLATION ELEME	

9.3. Upper Face PCB Assembly

Ref. No.	Part No.	Part Name & Description		Grid
C3001	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3002	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3003	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3004	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3005	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3006	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3007	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3008	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3009	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3010	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3011	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3012	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3013	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3014	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3015	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3016	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3017	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3018	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3019	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3021	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3022	ECST0JZ106R	TANTALUM CAPACITOR	10UF 6.3V	
C3023	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3025	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3026	ECJ0EB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3027	ECJ0EB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3029	F1G1H100A406	CERAMIC CAPACITOR	10PF 50V	
C3035	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3038	F1J1A475A034	CERAMIC CAPACITOR	4.7UF 10V	
C3039	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3040	F1G1H4R0A404	CERAMIC CAPACITOR	4PF 50V	
C3041	F1G1H390A409	CERAMIC CAPACITOR	39PF 50V	
C3044	F1G1H100A406	CERAMIC CAPACITOR	10PF 50V	
C3045	F1G1H102A498	CERAMIC CAPACITOR	0.001UF 50V	
C3047	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3048	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3049	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3052	F1G1H270A409	CERAMIC CAPACITOR	27PF 50V	
C3054	F1G1H470A409	CERAMIC CAPACITOR	47PF 50V	
C3055	F1G1A104A012	CERAMIC CAPACITOR	0.1UF 10V	
C3056	ECJ1VB0J105K	CERAMIC CAPACITOR	1UF 6.3V	
C3057	F1J1C1050031	CERAMIC CAPACITOR	1UF 16V	
CN3001	K1KB24A00043	CONNECTOR		
CN3002	K1MN21B00052	CONNECTOR		
CN3003	K1KB60A00117	CONNECTOR		
CN3004	200402050014	SQUARE CONNECTOR		
D3002	MAZS0470GL	DIODE		
D3006	MAZS0470GL	DIODE		
D3007	MAZS0750ML	ZENER DIODE		
D3008	MAZS0750ML	ZENER DIODE		
D3009	B0JCPB000001	DIODE		
D3010	MAZS15000L	DIODE		
DS3001	B3RBC0000023	PHOTO TRANFER ELEMENT		
DS3002	B3AAB0000161	PHOTO TRANFER ELEMENT		
DS3003	200207230014	LED		
FL3001	EXC24CP221U	FILTER		
FL3002	J0JCC0000249	FILTER		
FL3003	EXC24CP221U	FILTER		
L3003	ELJRF10NJF2	RF COIL	10NH 2.8GHz	
L3004	ELJRF1N0DF2	RF COIL	1NH 6GHz	
L3005	G1C220MA0104	SURFACE MOUNT FIXED COIL	22UH	

Ref. No.	Part No.	Part Name & Description		Grid
L3006	G1C4R7MA0104	SURFACE MOUNT FIXED COIL	4.7UH	
Q3001	UNR321N00L	TRANSISTOR		
Q3002	UNR521N00L	TRANSISTOR (4.7K/47K)		
Q3003	XP0421600L	TRANSISTOR		
R3001	EXB24V101JX	BLOCK RESISTOR	100Ω 1/16W	
R3002	EXB24V101JX	BLOCK RESISTOR	100Ω 1/16W	
R3003	EXB24V101JX	BLOCK RESISTOR	100Ω 1/16W	
R3004	EXB24V101JX	BLOCK RESISTOR	100Ω 1/16W	
R3005	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3006	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3007	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3008	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3009	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3010	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3011	EXB24V100JX	SPECIAL FIXED RESISTOR	10Ω 1/16W	
R3024	ERJ2GEJ151X	FIXED RESISTOR	150Ω 1/16W	
R3025	ERJ2GEJ121X	FIXED RESISTOR	120Ω 1/16W	
R3026	ERJ2GEJ103X	FIXED RESISTOR	10K 1/16W	
R3027	ERJ2GEJ103X	FIXED RESISTOR	10K 1/16W	
R3028	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3029	ERJ2GEJ100X	FIXED RESISTOR	10Ω 1/16W	
R3032	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3033	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3034	ERJ2GEJ181X	FIXED RESISTOR	180Ω 1/16W	
R3035	ERJ2GEJ181X	FIXED RESISTOR	180Ω 1/16W	
R3036	ERJ2GEJ101X	FIXED RESISTOR	100Ω 1/16W	
R3038	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3039	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3040	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3043	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R3044	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R3046	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R3047	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R3048	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R3049	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R3050	ERJ2GEJ471X	FIXED RESISTOR	470Ω 1/16W	
R3051	ERJ2GEJ123X	FIXED RESISTOR	12K 1/16W	
R3052	ERJ2GE0R00X	FIXED RESISTOR	0Ω 1/16W	
R3061	EXB24VR000X	SPECIAL FIXED RESISTOR	0Ω 1/16W	
R3062	EXB24VR000X	SPECIAL FIXED RESISTOR	0Ω 1/16W	
R3063	EXB24VR000X	SPECIAL FIXED RESISTOR	0Ω 1/16W	
R3064	EXB24VR000X	SPECIAL FIXED RESISTOR	0Ω 1/16W	
R3065	ERJ2GEJ102X	FIXED RESISTOR	1K 1/16W	
R3066	ERJ2GEJ104X	FIXED RESISTOR	100K 1/16W	
R3067	ERJ2GEJ180X	FIXED RESISTOR	18Ω 1/16W	
R3068	ERJ2GEJ100X	FIXED RESISTOR	10Ω 1/16W	
RV3001	D4ED18R00002	NONLINEAR RESISTOR 8W		
RV3002	D4ED18R00002	NONLINEAR RESISTOR 8W		
U3001	C1AB00001876	COMPANION IC		
U3002	C0CBAAC00144	IC XC62HR2820DR		
U3004	C0CBCAA00004	VOLTAGE REGULATOR RQ5RW28BA-TR		
U3005	200402100010	REGULATOR IC		

9.4. Hinge PCB Assembly

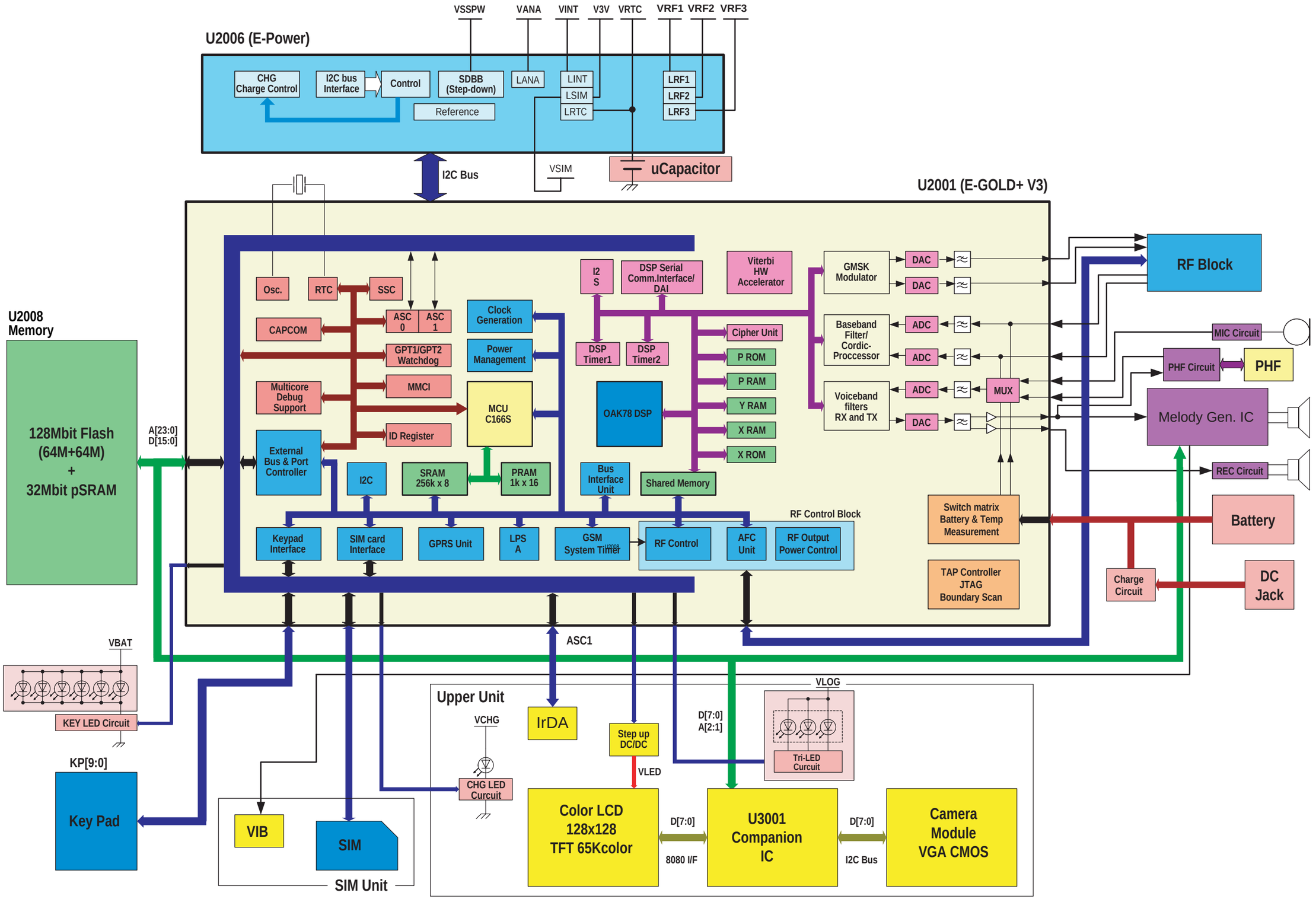
Ref. No.	Part No.	Part Name & Description	Grid

9.5. SIM PCB Assembly

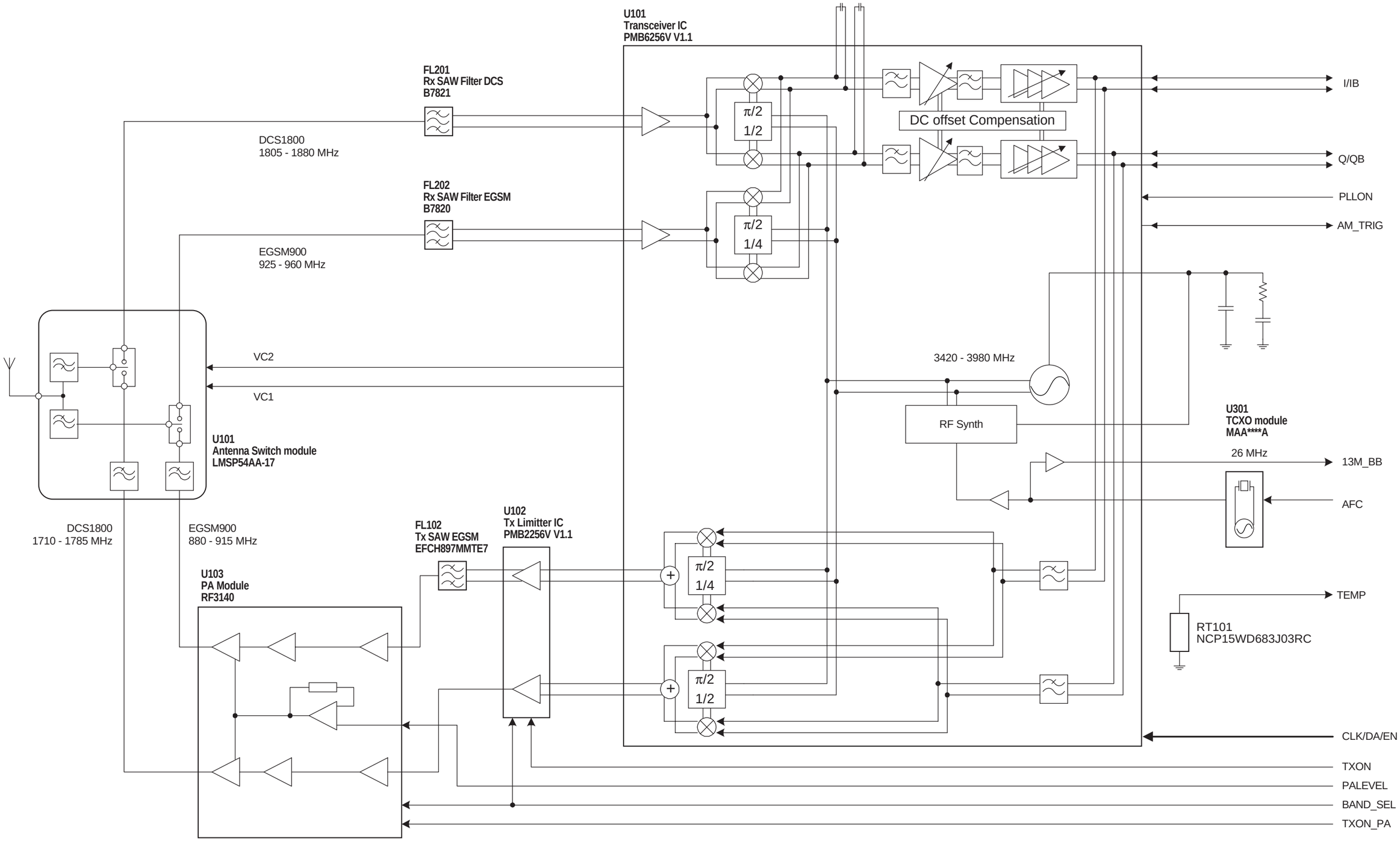
Ref. No.	Part No.	Part Name & Description		Grid
C4002	ECJ0EB1A104K	CERAMIC CAPACITOR	0.1UF 10V	
CN4001	200403110015	SQUARE CONNECTOR		
CN4002	K1KB02B00014	CONNECTOR		
CN4003	200402100011	SQUARE CONNECTOR(J)		
D4001	MA2S11100L	DIODE		
Q4001	B1ABGC000004	TRANSISTOR		
R4001	ERJ2GEJ272X	FIXED RESISTOR	2.7K 1/16W	
R4002	ERJ2GEJ273X	FIXED RESISTOR	27K 1/16W	

10. BLOCK DIAGRAM

10.1. Baseband

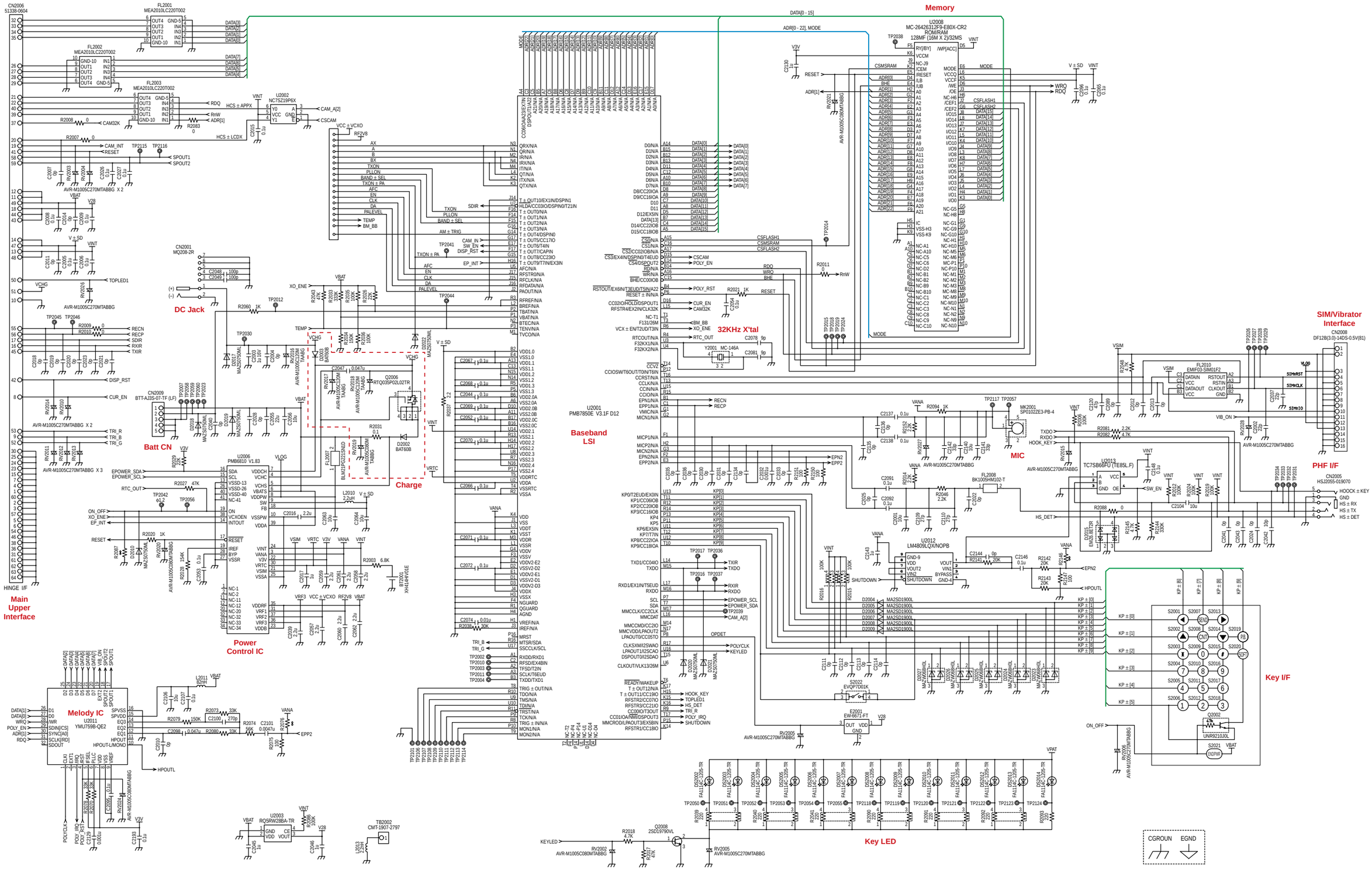


10.2. RF Band

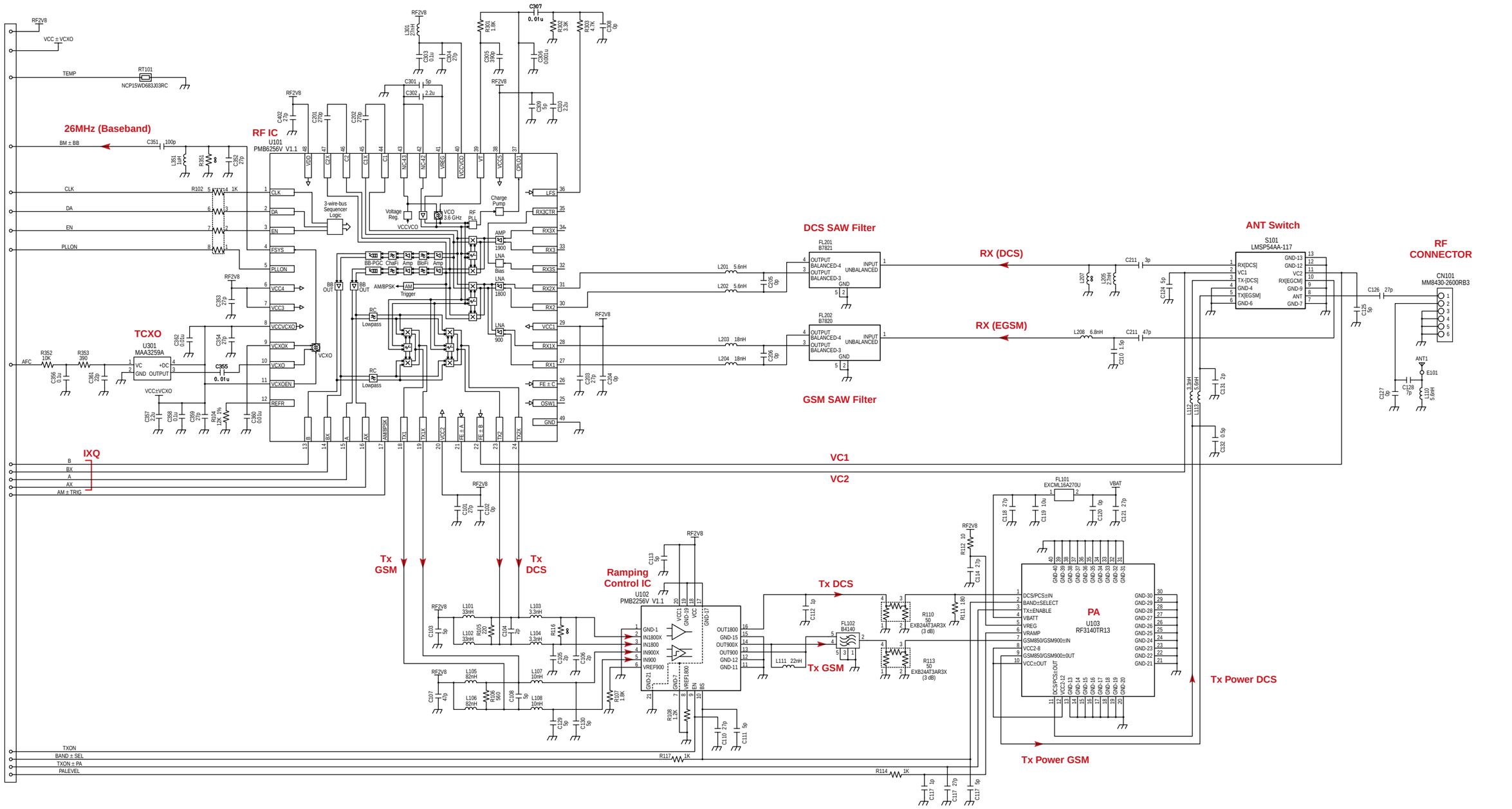

U101
Transceiver IC
PMB6256V V1.1
FL201
Rx SAW Filter DCS
B7821
DCS1800
1805 - 1880 MHz
FL202
Rx SAW Filter EGSM
B7820
EGSM900
925 - 960 MHz
π/2
1/2
π/2
1/4
DC offset Compensation
I/IB
Q/QB
PLLON
AM_TRIG
3420 - 3980 MHz
RF Synth
VC2
VC1
U101
Antenna Switch module
LMSP54AA-17
DCS1800
1710 - 1785 MHz
EGSM900
880 - 915 MHz
U301
TCXO module
MAA****A
26 MHz
13M_BB
AFC
FL102
Tx SAW EGSM
EFCH897MMTE7
U102
Tx Limitter IC
PMB2256V V1.1
U103
PA Module
RF3140
π/2
1/4
π/2
1/2
TEMP
RT101
NCP15WD683J03RC
CLK/DA/EN
TXON
PALEVEL
BAND_SEL
TXON_PA

11. CIRCUIT DIAGRAMS

11.1. Main PCB (Baseband)



11.2. Main PCB (RF Band)

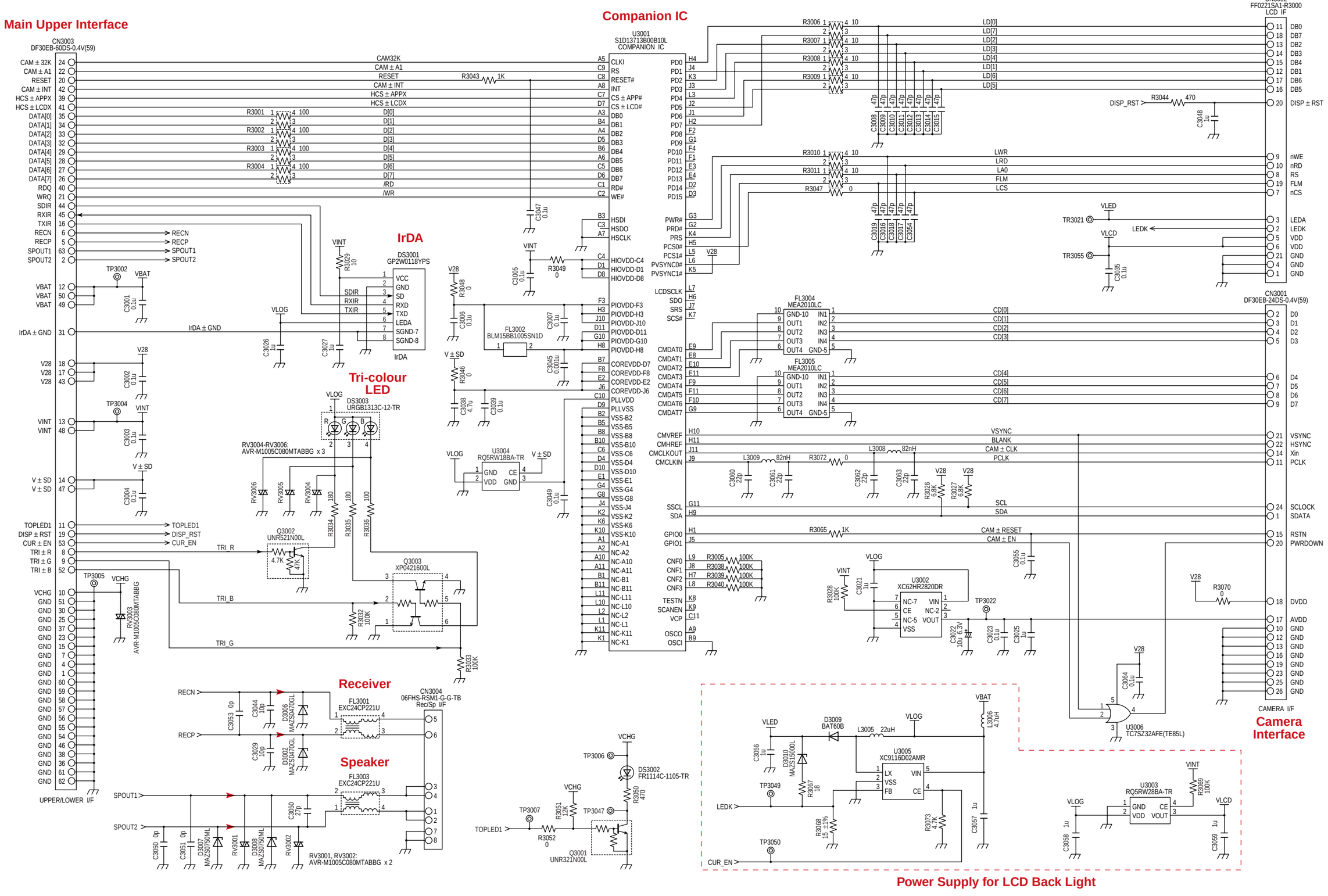


PARTS	NO.
TX	101 –
RX	201 –
SYN	301 –
TCXO	351 –
POWER SUPPLY	101 –

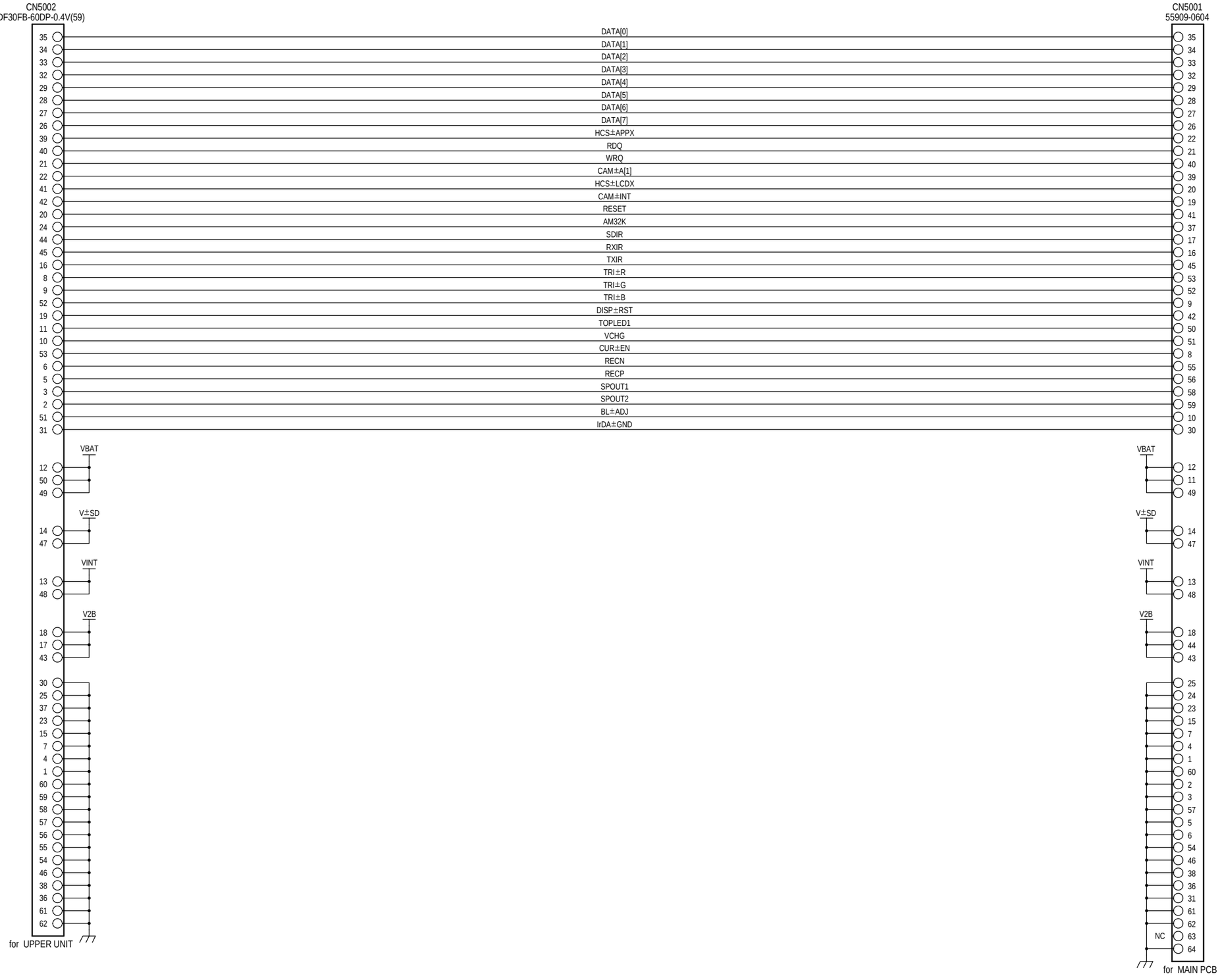
Ant – Sw

Mode	Vc1	Vc2
GSM Tx	L	H
DCS TX	H	L
GSM/DCS Rx	L	L

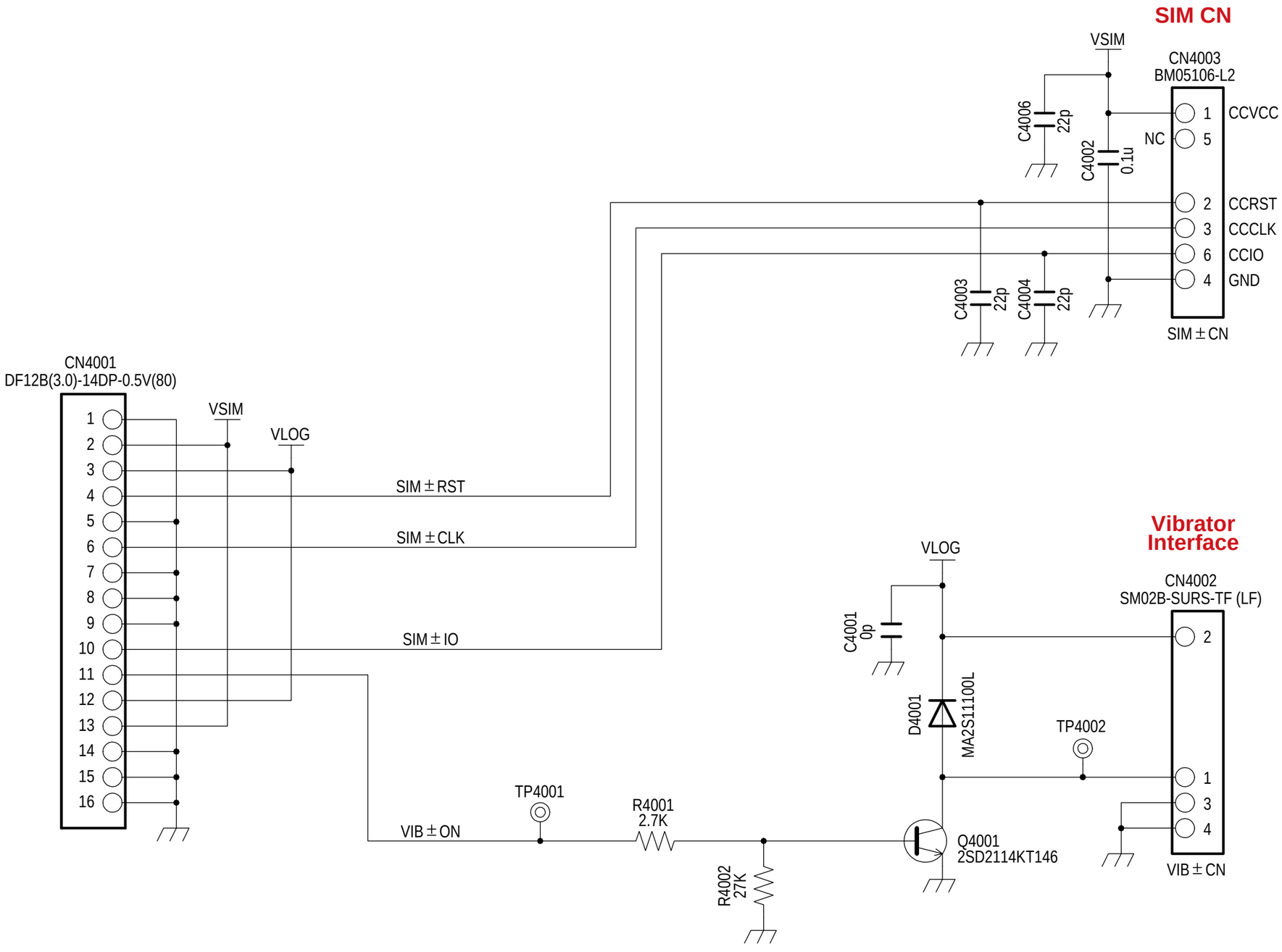
11.3. Upper Face PCB



11.4. Hinge PCB

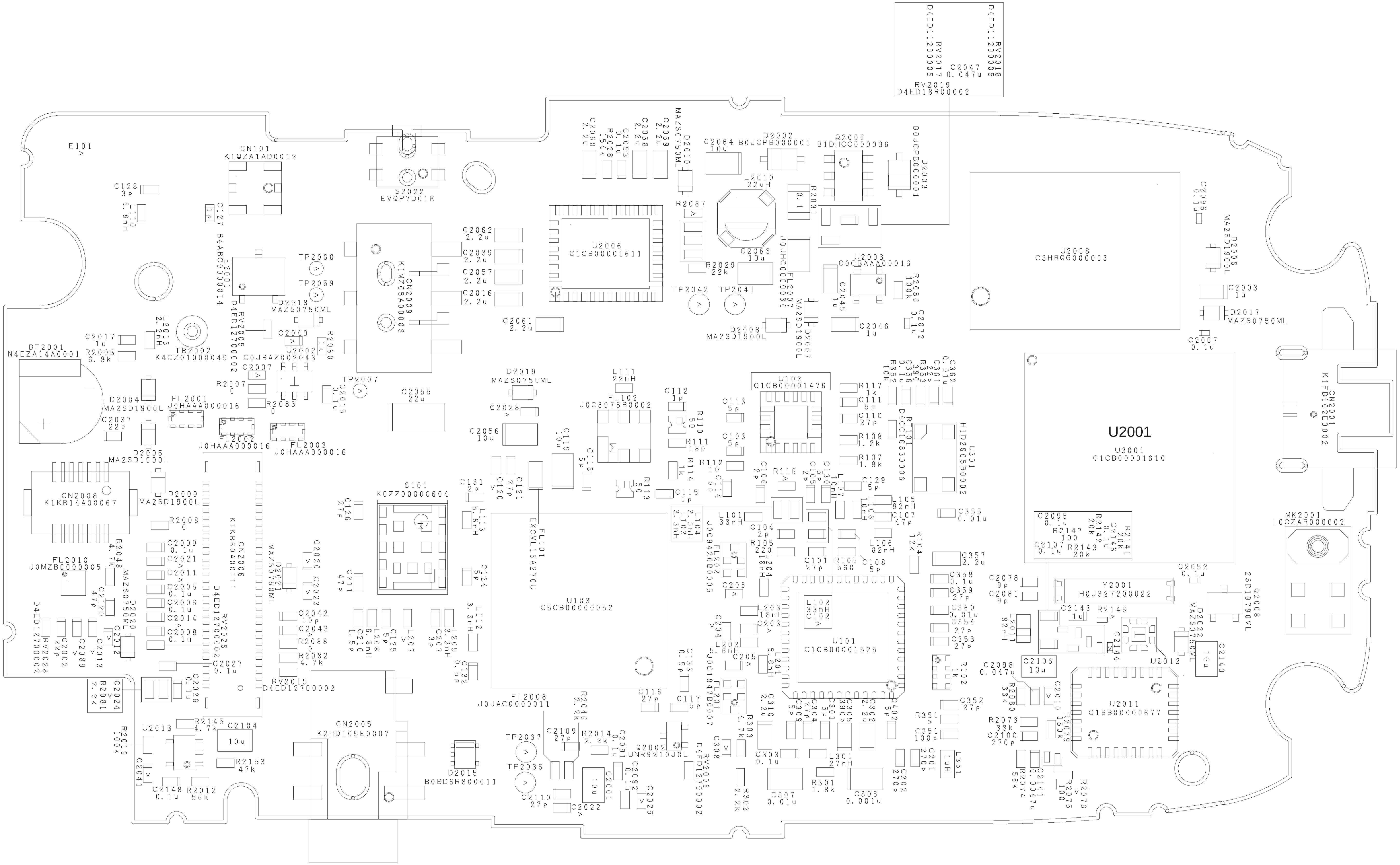


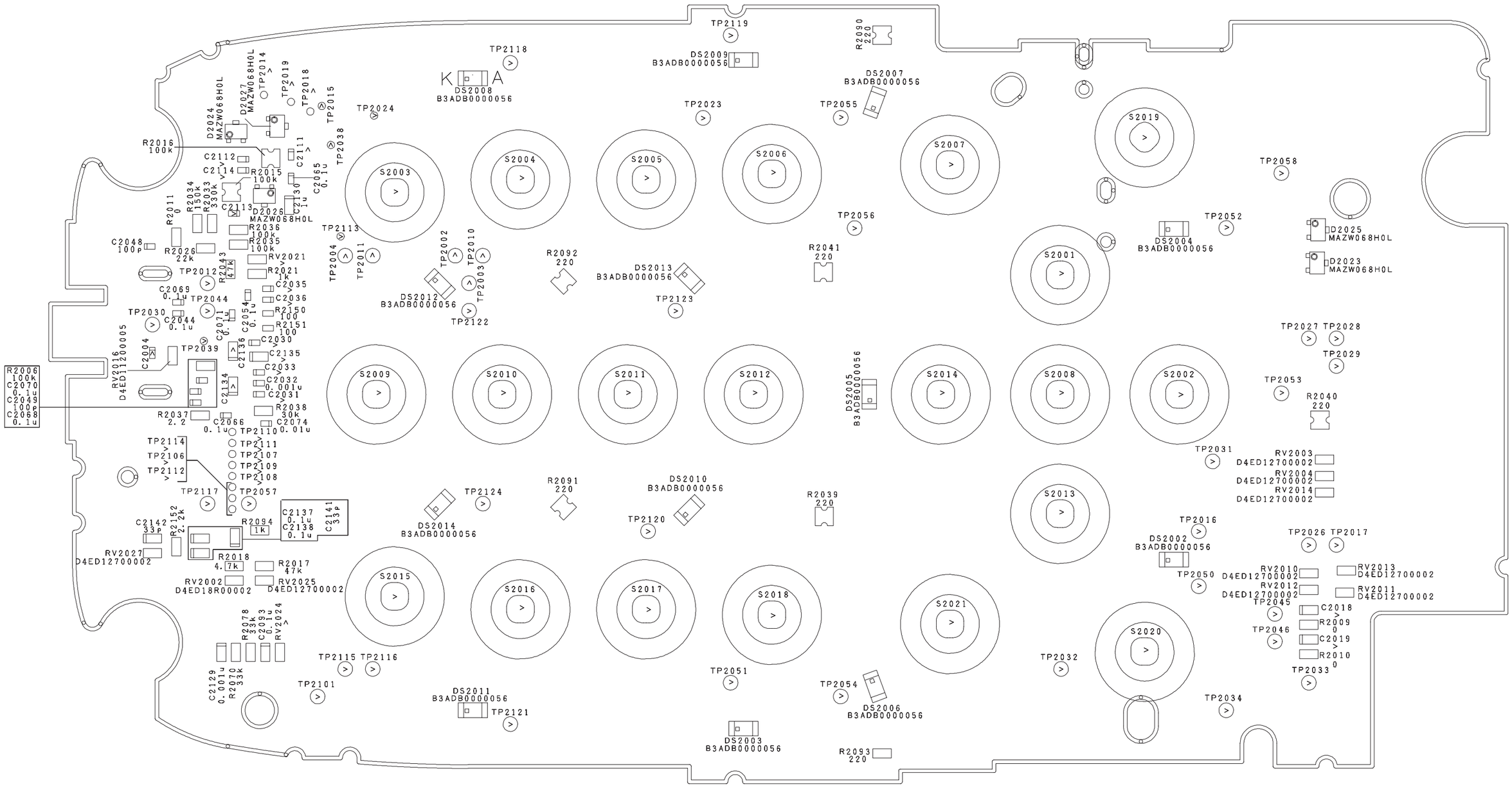
11.5. SIM PCB


SIM CN
VSIM
CN4003
BM05106-L2
C4006
22p
C4002
0.1u
NC
1
5
CCVCC
2
3
6
4
CCRST
CCCLK
CCIO
GND
C4003
22p
C4004
22p
SIM±CN
CN4001
DF12B(3.0)-14DP-0.5V(80)
VSIM
VLOG
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
SIM±RST
SIM±CLK
SIM±IO
VIB±ON
TP4001
R4001
2.7K
R4002
27K
Vibrator
Interface
VLOG
C4001
0p
D4001
MA2S11100L
TP4002
Q4001
2SD2114KT146
CN4002
SM02B-SURS-TF (LF)
2
1
3
4
VIB±CN

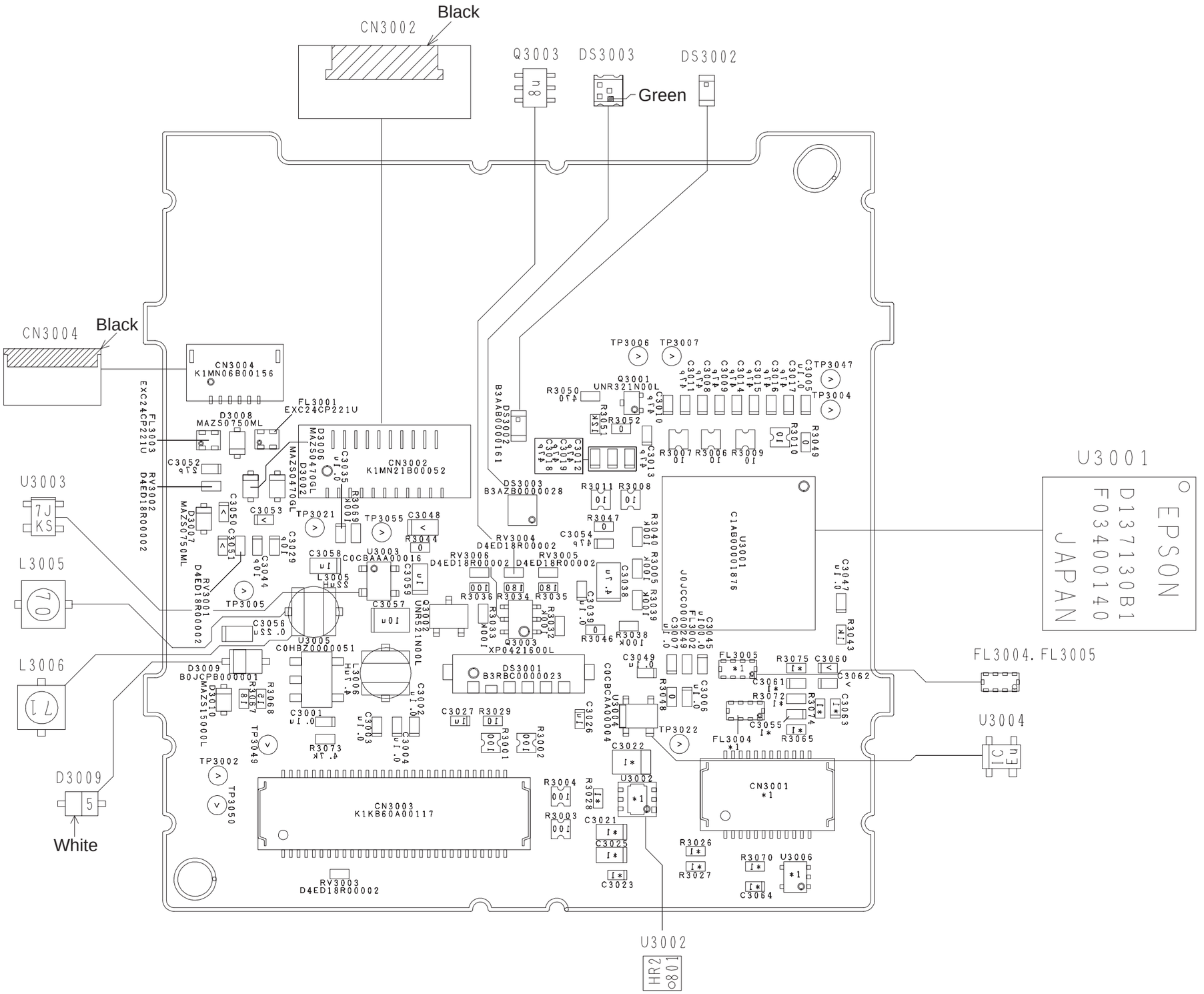
12 LAYOUT DIAGRAMS

12.1 Main Board

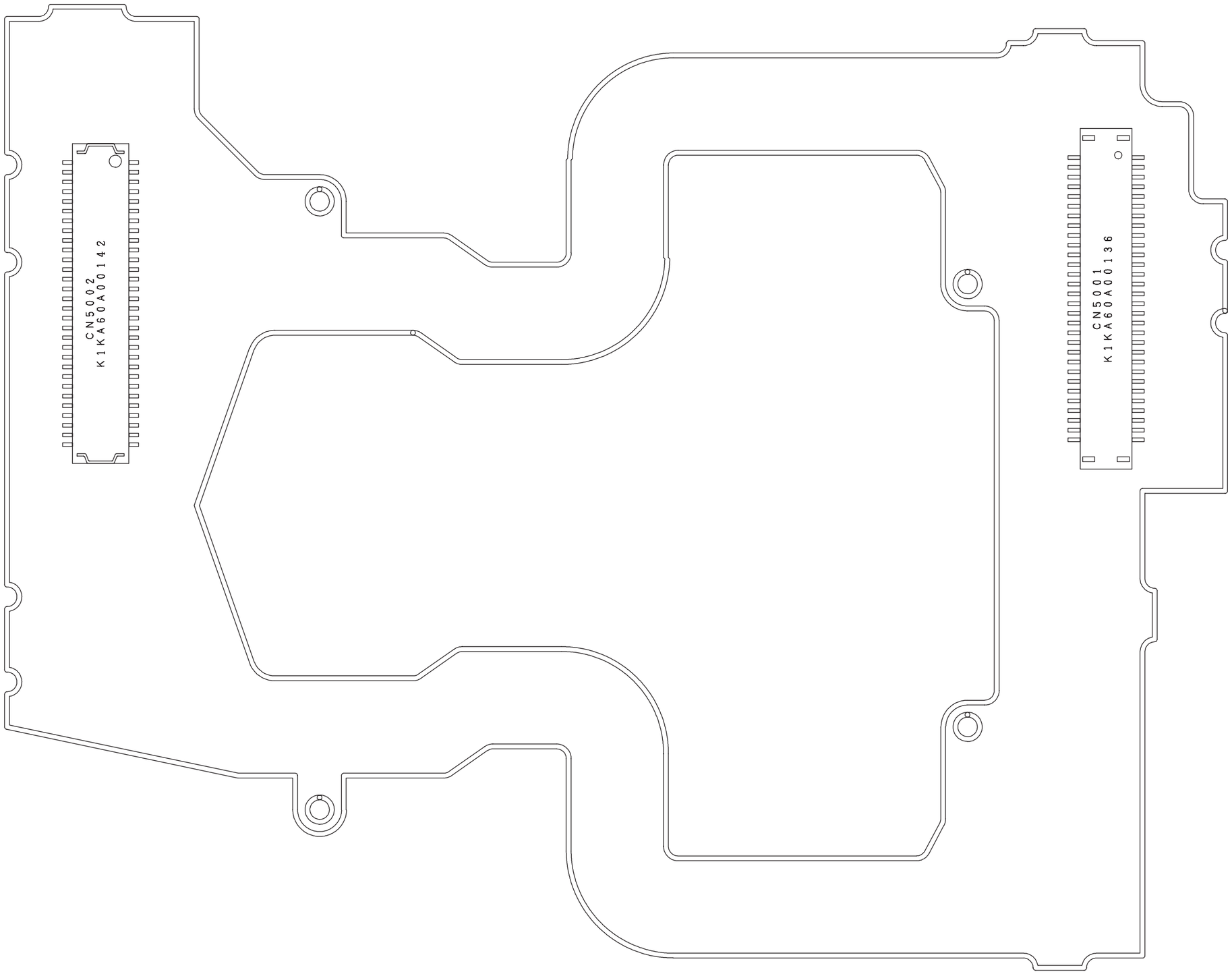



TP2119
R2090 220
TP2118
DS2009 B3ADB0000056
DS2007 B3ADB0000056
DS2008 B3ADB0000056
TP2024
TP2023
TP2055
S2019
TP2058
R2015 100k
C2112
C2114
R2015 100k
C2111
C2065 0.1u
TP2038
TP2015
TP2018
TP2019
TP2014
D2024 MAZW068H0L
D2027 MAZW068H0L
R2034 150k
R2033 330k
C2113
C2130 1u
D2026 MAZW068H0L
R2011 0
R2036 100k
R2035 100k
S2003
S2004
S2005
S2006
S2007
TP2056
TP2052
D2025 MAZW068H0L
D2023 MAZW068H0L
DS2004 B3ADB0000056
TP2113
C2048 100p
R2026 22k
TP2004
TP2011
TP2002
TP2010
TP2003
R2092 220
R2041 220
DS2013 B3ADB0000056
S2001
RV2021
R2021 1k
R2043 47k
TP2012
C2035
C2069 0.1u
TP2044
C2036
TP2030
C2044 0.1u
C2071 0.1u
C2054 0.1u
R2150 100
R2151 100
C2030
TP2039
C2004
C2136
C2135
C2033
C2032 0.001u
C2031
R2038 30k
C2074 0.01u
TP2110
TP2111
TP2107
TP2109
TP2108
TP2057
TP2122
DS2012 B3ADB0000056
TP2123
TP2027 TP2028
TP2029
TP2053
R2040 220
R2006 100k
C2070 0.1u
C2049 100p
C2068 0.1u
RV2016 D4ED11200005
R2037 2.2
C2066 0.1u
S2009
S2010
S2011
S2012
DS2005 B3ADB0000056
S2014
S2008
S2002
TP2031
RV2003 D4ED12700002
RV2004 D4ED12700002
RV2014 D4ED12700002
TP2114
TP2106
TP2112
TP2117
C2137 0.1u
C2138 0.1u
C2141 33p
R2152 2.2k
R2094 1k
C2142 33p
TP2124
R2091 220
DS2010 B3ADB0000056
TP2120
R2039 220
S2013
TP2016
DS2002 B3ADB0000056
TP2026 TP2017
RV2027 D4ED12700002
R2018 4.7k
R2017 47k
RV2002 D4ED18R00002
RV2025 D4ED12700002
S2015
S2016
S2017
S2018
S2021
RV2010 D4ED12700002
RV2013 D4ED12700002
RV2012 D4ED12700002
RV2011 D4ED12700002
TP2050
TP2045
TP2046
C2018
R2009 0
C2019
R2010 0
TP2033
R2078 33k
C2093
RV2024
C2129 0.001u
R2070 33k
TP2115 TP2116
TP2101
DS2011 B3ADB0000056
TP2121
TP2051
TP2054
DS2006 B3ADB0000056
TP2032
S2020
TP2034
DS2003 B3ADB0000056
R2093 220

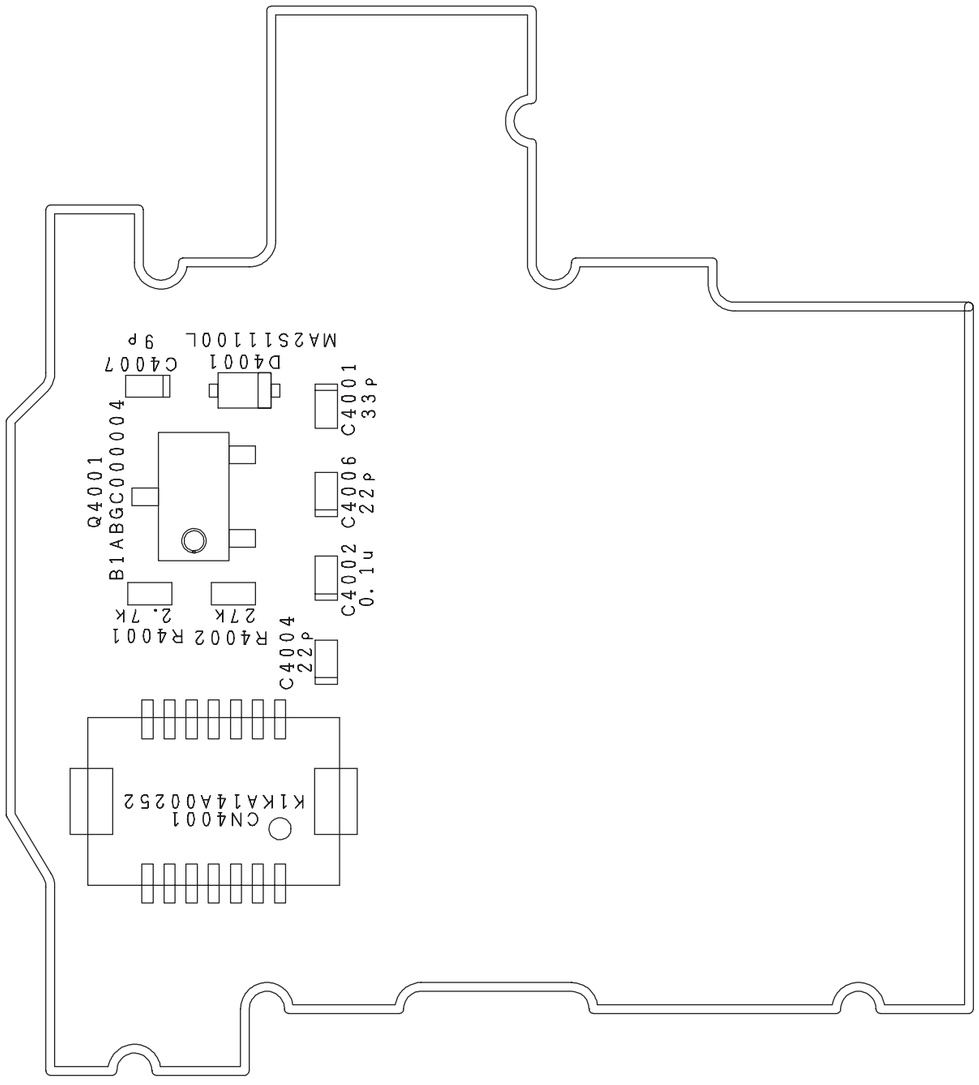
12.2. Upper Face PCB

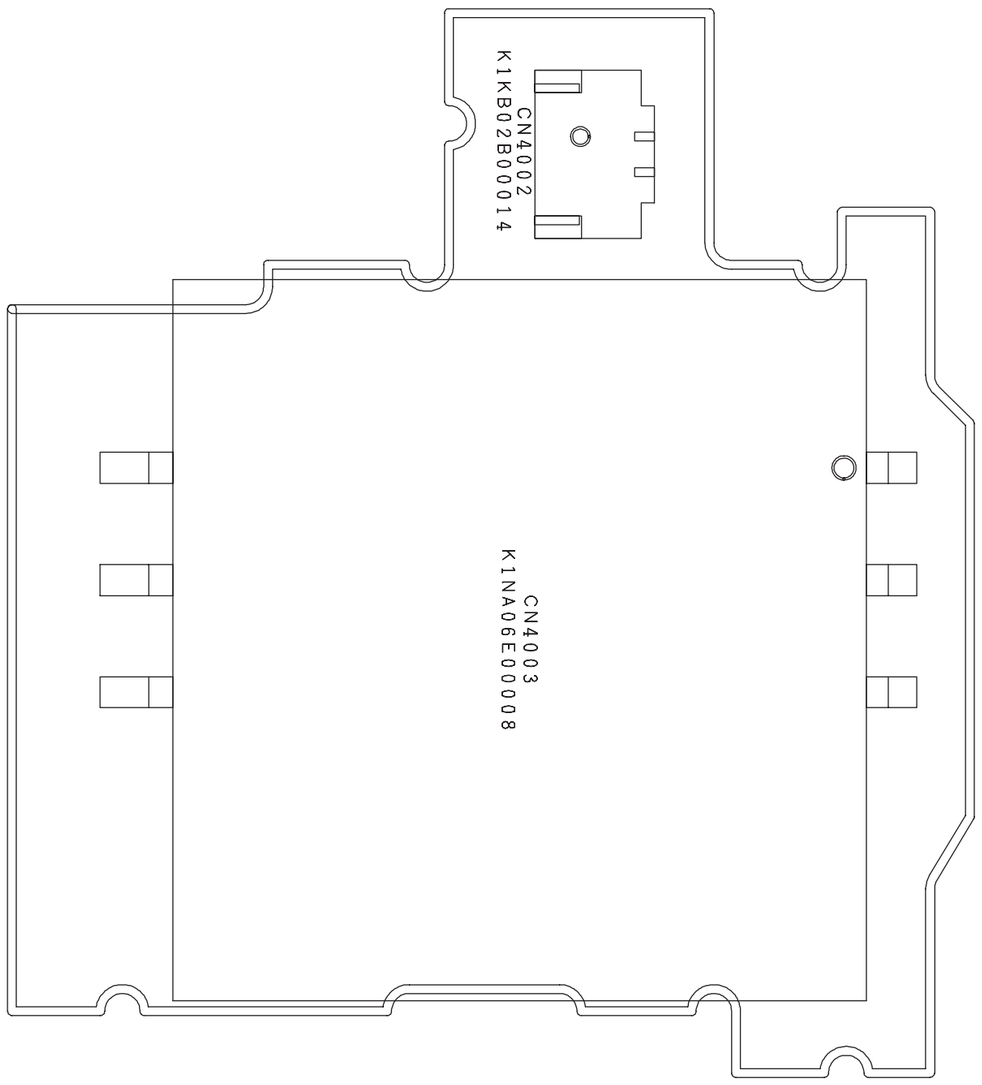


12.3. Hinge PCB



12.4. SIM PCB


MA2S111 00L
9p
C4007
D4001
C4001
33p
Q4001
B1ABGC000004
C4006
22p
C4002
0.1u
2.7k
R4001
27k
R4002
C4004
22p
CN4001
K1KA14A00252


CN4002
K1KB02B00014
CN4003
K1NA06E00008