



PG-3210 Service Manual

(GSM Cellular Phone)

Pantech Co., Ltd., Korea

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For Use by Authorized Service/Maintenance Personal Only

Documents to Receive This Addendum:

PG-3210 Maintenance/Repair/Operating Manual

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SECTION 1. Introduction

1.1 An Introduction of GSM Digital Cellular Mobile Communication System

GSM (Global System for Mobile communication) concluded that digital technology working in the Time Division Multiple Access (TDMA) mode would provide the optimum solution for the future system. Specifically , a TDMA system has the following advantage

- ▶ Offers a possibility of channel splitting and advanced speech coding ,resulting in improved spectrum efficiency.
- ▶ Offers much greater variety of service than the analog
- ▶ Allows considerable improvements to be made with regards to the protection of information.

The GSM system is basically designed as a combination of three major subsystem;

The network subsystem, the radio subsystem, and the operation support system.

The functional architecture of a GSM system can be divided into the Mobile Station (MS), the Base Station (BS), and the Network Subsystem (NS). The MS is carried by the subscriber, the BS subsystem controls the radio link with the MS and the NS performs the switching of calls between the mobile and other fixed or mobile network users as well as mobility management. The MS and the BS subsystem communicate across the Um interface also known as radio link

The specifications relating to MS are as follows:

- TS 100 607-1 : Digital cellular telecommunication system(Phase2+)Mobile Station (MS) Conformance specification Part1:Conformance specification

1.2 Frequency Allocation and Its Use

- Transmit frequency band : 824MHz ~ 849MHz(For GSM850) , 1710MHz ~1785MHz(For DCS), 1850MHz ~1910MHz(For PCS)
- Receive frequency band: 869MHz ~ 894MHz(For GSM850), 1805MHz ~ 1880MHz(For DCS), 1930MHz ~ 1990MHz(For PCS)
- Channel spacing : 200 KHz
- ARFCN(Absolute Radio Frequency Channel Number) : 128~251 (For GSM850), 512~885 (For DCS), 512~810 (For PCS)
- Transmit-receive frequency spacing: 45 MHz(For GSM850), 95MHz(For DCS), 80MHz(For PCS)
- Frequency band and Channel Arrangement

For GSM850 Band	$F_l(n)=824.2+0.2*(n-128)$	$128 \leq n \leq 251$	$F_u(n)=F_l(n)+45$
824 MHz ~849 MHz : Mobile Transmit,Base receive			
869 MHz ~894 MHz : Base Transmit, Mobile receive			
For DCS	$F_l(n)=1710.2+0.2*(n-512)$	$512 \leq n \leq 885$	$F_u(n)=F_l(n)+95$
1710 MHz ~ 1785 MHz : Mobile Transmit,Base receive			
1805 MHz ~ 1880 MHz : Base Transmit, Mobile receive			
For PCS Band	$F_l(n)=1850.2+0.2*(n-512)$	$512 \leq n \leq 810$	$F_u(n)=F_l(n)+80$
1850 MHz ~1910 MHz : Mobile Transmit,Base receive			

1930 MHz ~1990 MHz : Base Transmit, Mobile receive
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** $F_i(n)$ = frequency value of the carrier , $F_u(n)$ = corresponding frequency value in upper band

1.3 Item Name and Usage

PG-3210, GSM digital cell phone, is supercompact, superlight mobile communication terminal for personal use. It has a 850MHz, 1800MHz and 1900MHz frequency band and adopts GSM850, DCS and PCS mode having excellent spectrum efficiency, economy, and portability.

This product is GSM Cellular type portable phone, adopting 1-cell Li-ion battery and power saving circuit to maximize its operation time. Also, it is equipped with a fixed snap-in antenna and its color LCD with font built in enables both Chinese and English text service. And power control(basic feature of GSM), security feature, voice symbol feature, and variable data rate feature are used appropriately to ensure its best performance. This product consists of a handset, battery pack, and travel charger.

1.4 Characteristics

- 1) All the active devices of PG-3210 are made of semiconductors to ensure excellent performance and semi-permanent use.
- 2) Surface mounting device (SMD) is used to ensure high reliability, compactness and lightness.
- 3) PG-3210 adopts the Silab's Aero II RF transceiver, which is a complete RF front end for multi-band GSM and GPRS wireless communications.
- 4) PG-3210 is designed to perform excellently even in the worst environment

Section 2. Electrical Specifications

2.1 General

GSM850 / DCS / PCS Band

Mobile Transmit Frequency	824MHz~849MHz / 1710MHz ~ 1785MHz / 1850MHz ~1910MHz
Mobile Receive Frequency	869MHz~894MHz / 1805MHz~1880MHz / 1930MHz ~1990MHz
The Number of Time Slot	8
The Number of Channels	124 / 374 / 299
Channel Spacing	200 kHz
Power Supply	Rechargeable Li-Ion Battery 3.7V/730mAH(850mAH)
Operating Temperature	-10℃ ~ +55℃
Dimension	69(H) × 43(W) × 18.35(D) mm (SLIM)
Weight	About 71 g

2.2 Transmitter

GSM850 / DCS / PCS Band

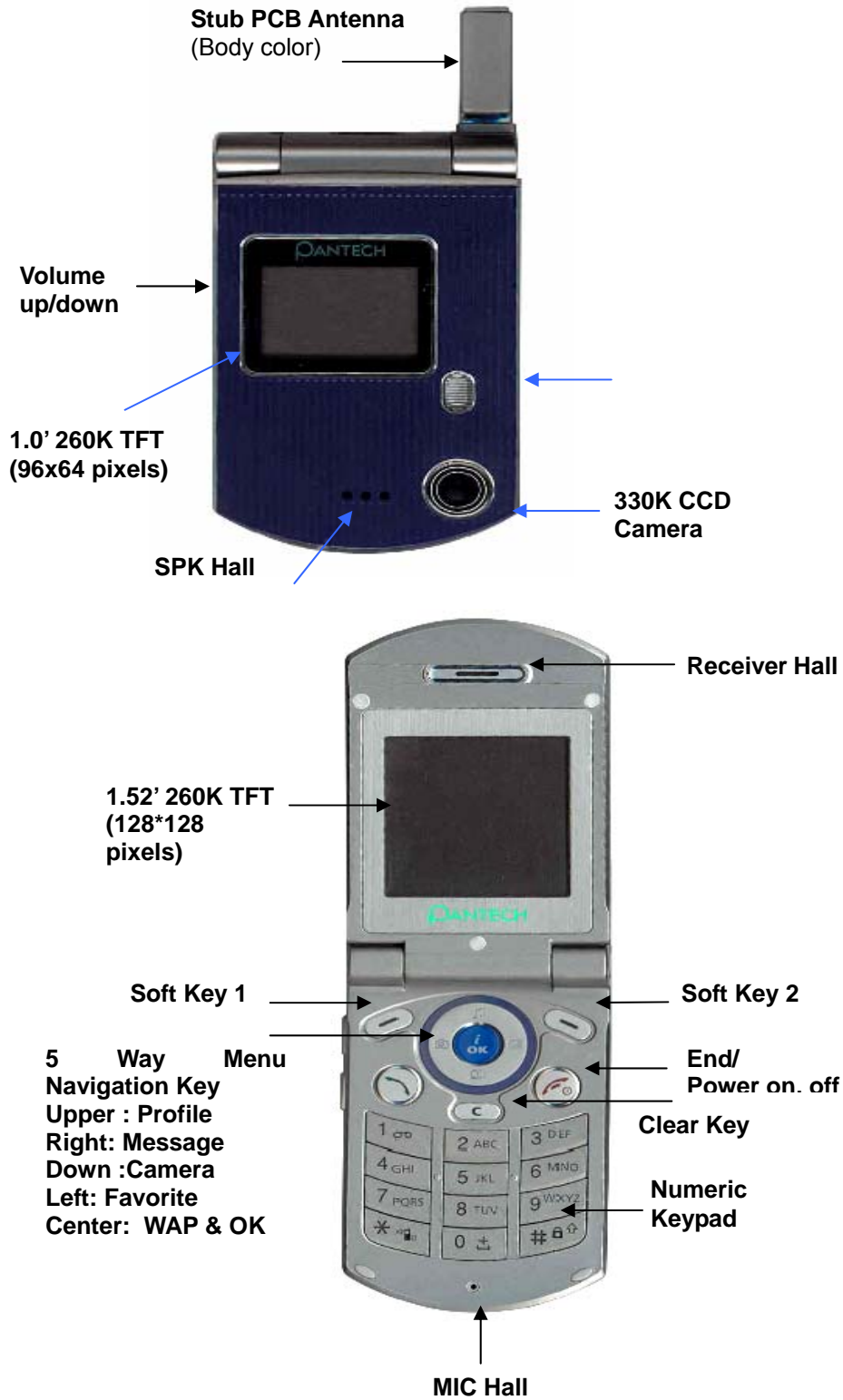
Maximum Output Power	33 ± 2 / 30 ± 2 / 30 ± 2dBm
Frequency Error	± 90Hz / ± 180Hz
Phase Error	RMS < 5° , PEAK < 20°
Minimum Output Power	5 ± 5 / 0 ± 5 / 0 ± 5dBm
Power Control	5~19 / 0~15 / 0~15 (2 dB Step)
Output RF Spectrum	TS 100 910V6.2.0
Switching Transient	TS 100 910V6.2.0
Intermodulation attenuation	TS 100 910V6.2.0
Conducted Spurious Emissions	Idle Mode -57dBm 9KHz~824M / 849MHz~1GHz -59dBm 824MHz~849MHz -53dBm 1.85~1.91GHz -47dBm 1~1.85GHz / 1.91GHz~12.75GHz
	Allocated Channel -36dBm 9KHz~ 1GHz -30dBm 1GHz~ 12.75GHz

2.3 Receiver

Reference Sensitivity	-102dBm	
For Adjacent interference For Adjacent(200KHz) interference For Adjacent(400KHz) interference For Adjacent(600KHz) interference	C/lc	9 dB
	C/la1	-9 dB
	C/la2	-41 dB
	C/la3	-49 dB

Section 3 Operation

3.1 Name of each part



3.2 Display(Dual LCD)

Parameter	Projected Actual(MAIN LCD)
Display	Color TFT LCD with white LED back lighting 1.52" 260k colors Pixels : 128*128 pixels Character : (font size : 12/14/16) 8characters x 8lines(max)
Driver	TP042(TOPPOLY)
Module Dimen.	37.2(W) x 40.1(H) x 4.05(D) mm
Effective Area	27.26(W) x 27.27(H) mm (1.5 inch)
Number of Pixel	128(W) x RGB(W)x 128(H) pixel
Pixel pitch	71(W) x 213(H) um

Parameter	Projected Actual(SUB LCD)
Display	Color TFT LCD with white LED back lighting 1.0" 260k colors Pixels : 96 x 64 Character : 6characters x 4lines(max)
Module Dimen.	37.2(W) x 40.1(H) x 4.05(D) mm
Effective Area	21.02(W) x 14.02(H) mm (1.0 inch)
Number of Pixel	96(W) x RGB(W) x 64(H) pixel
Pixel pitch	73(W) x 219(H) um

3.3 Keypad

	Market Goal	Projected Actual	Comments
English Keypad	0-9, *,# Send (Color) End/Pwr (Color) Up, Down, WAP Soft1, Soft2, CLR Camera * Key: Vib. Mode # Key: Auto Lock 0/+Key: nternational 2 Volume Keys	0-9, *,# Send (Color) End/Pwr (Color) Up, Down, WAP Soft1, Soft2, CLR Camera * Key: Vib. Mode # Key: Auto Lock 0/+ Key: International 2 Volume Keys	Meets Goal. (Industrial design sample required) Meets Goal Keys for VR and Lock International Volume up/down

3.4.Camera Module

Product Name	IGT99268B-P40(SANYO)
Effective pixel array	640 x 480
Unit Pixel size	3.3um x 3.3um
Module size	8.0mm x 8.0mm x 5.0mm
Operating voltage	2.9V
Weight	0.5g or below

Section 4. Theory of Operation

4.1 Logic Section

4.1.1 DC Distribution and Regulation Part

Applying battery voltage and pressing “END” key on the key pad short-circuits “Ground” and “ $\overline{\text{PowerON}}$ ”. AD6537B(U102) control that power manage regarding power on/off in handset Pressing POWERKEY on the key pad is active on the handset.

This will turn on all the LDOs, when $\overline{\text{PowerON}}$ is held low. The power of RF Tx power amplifier is supplied directly by the battery.

4.1.2 Logic part

4.1.2.1 Summary

The logic part consists of AD6527 ARM7 microprocessor-combined DBB(Digital BaseBand) GSM-ASIC, COMBO(flash ROM & SRAM), AD6537B ABB(Analog BaseBand) Chip. AD6527 is GSM-ASIC chipset implemented for GSM terminal's system control and baseband digital signal processing.

Major parts used in the logic part are as follows:

- 1) AD6527 : U101, [ARM7 Processor Core + DBB GSM Signal Processing] ASIC
- 2) AD6537B : U102, Analog Baseband Processor (Power management + Voice Codec)
- 3) COMBO MEMORY(Flash ROM : U103, 128Mbit Flash Memory + 32Mbit SRAM)

4.1.2.2 Baseband Digital Signal Processing

AD6527 is a GSM core device containing ARM7 CPU core. AD6527 is 204 pin LFBGA (mini-BGA) package, consisting of terminal chips. The function and characteristics of clock are as follows:

- 1) Complete single chip GSM Processor
- 2) Channel codec sub-system
 - Channel coder and decoder
 - Interleaver and Deinterleaver
 - Encryption and Decryption
- 3) Control Processor Subsystem including
 - Parallel and serial Display interface
 - Keypad Interface
 - SIM Interface
 - Control of RADIO subsystem
 - Real Time Clock with Alarm

☞ Configuration by Function of AD6527

1 Microprocessor Core

AD6527 has a built-in ARM7 microprocessor core, including microprocessor interrupt controller, timer/counter, and DMA controller. And besides, 32bit data path is included, and up to 8Mbyte addressing is enabled and can be extended up to 16Mbyte. Although external clock should be provided to operate the microprocessor, this core uses 13MHz VCTCXO to provide clock.

2 Input Clock

1) Main Clock(13 MHz):

This is the clock needed for the microprocessor built in AD6527 to operate.

2) VC-TCXO(26 MHz) , 32.768KHz Clock:

This is the system reference clock to control SLEEP mode.

This is the clock derived from 26MHz VC-TCXO clock, provided by RF part. It is the timing reference clock for GSM signal processing.

3 DSP Subsystem

This is a GSM signal processing part in GSM mode, consisting of speech transcoding and Channel equalization as follows:

1) Speech transcoding

In full rate, the DSP receives the speech data stream from VBC and encodes data from 104kbps to 13kbps. Using algorithm is Regular Pulse Excitation with Long Term Prediction (RPE-LTP).

2) Equalization

The Equalizer recovers and demodulates the received signal

The Equalizer establishes local timing and frequency references for mobile terminal as well as RSSI calculation.

The equalization algorithm is a version of Maximum Likelihood Sequence Estimation(MLSE) using Viterbi Algorithm.

☞ GSM Core and RF Interface

1) Transmitter:

AD6537B ABB receive data at 270kbps and use an on chip lock-up table to perform GMSK modulation. A pair of 10bit matched differential DACs convert the modulated data and pass I and Q analog data to the transmit section of the radio system.

2) Receiver:

The receiver I and Q signals are sampled by a pair of ADCs at 270kbps.

The I and Q samples are transferred to the ABB through a dedicated receive path serial port.

4 RF Interface

This interfaces the RF part to control power amplifier, Tx LO buffer amplifier, VC-TCXO, and AGC-end on transmit/receive paths in the RF part.

1) Transmitter Interface:

This sends Ramp_DAC signal to the RF part to control power amplifier.

2) Receiver Interface:

This transmits RX_AGC signal to Rx AGC amp. to adjust receive path gain.

5 General Purpose ADC Support

The AD6537B includes a general purpose 10bit auxiliary ADC with four multiplexed input channel. These are used for measurement of battery voltage ID, temperature and accessory ID.

6 USC(Universal System Connector) Interface

A Typical GSM handset requires serial connections to provide data during normal phone operation manufacturing, testing and debugging.

7 General Purpose Interface

The AD6527 provides 32 interface pin for control of peripheral devices.

All GPIO pins start up as inputs. Additional purpose inputs and outputs are available under SW control.

8 Speech Transcoding

In full rate mode, the DSP receive the speech data stream from the ABB and encodes data from 104kbps to 13kbps. Using algorithm is Regular Pulse Excitation with Long Term Prediction as specified GSM Recommendation

9 Power Down Control Section

1) Idle Mode Control:

If IDLE/ signal turns 'Low', transmitter section becomes disabled.

2) Sleep Mode Control:

If IDLE/ and SLEEP/ signals turn 'Low', all the sections except for VC-TCXO circuit become disabled.

3) Receiver & Transmitter Mode Control:

If IDLE/ and SLEEP/ signals turn 'High', all the sections become enabled to perform transmit/receive operation.

4.1.3 Memory Part

Memory consists of COMBO (flash ROM & SRAM).

1 Flash ROM

Flash ROM has a capacity of 128Mbit(16MByte). The main programs of the terminal(call processing, user interface, and diagnostic task) and supplemental programs (NAM program and test program) are stored in the flash ROM. Even if the program version may be changed in the future, customers can download the program.

2 Static RAM

SRAM has a capacity of 32Mbit(4MByte) and stores system parameters, data buffer, and stack of each task in it.

3 Key Tone Generation

All alert signals are generated by the DSP and output to the ABB audio output.

These alert can be used for the earpiece.

4.1.4 Notification Part

The notification of incoming call is given by melody, vibrator.

1) Melody:

This is a device sounding alert/melody tones.

The melody datas are stored in flash memory (U103) And generated by Melody IC(U104).

2) Vibrator:

This is a device enabling vibration. The vibrator data is stored in flash memory(U103)

And generated by A10(GPIO_9)pin.

4.1.5 Key Pad Part

To enable key operation to input information, the key matrix is configured using strobe signal of KEYPADROW(0-4) and 5 input ports of KEYPADCOL(0-4). Also, to use the key even at light, the backlight circuit is provided for LED 16s.

4.1.6 LCD Module(Display Part)

LCD module consists of LCD, controller, LED-Backlight,

LCD: 1S/W Icon x 1 lines[(128x3)x128] can be displayed on the LCD panel. 6 icons could be provided by S/W. Controller with English font built in has been used.

LED-backlight Using illuminates the LCD panel, and LCD reflector enhances LCD display effect.

4.1.7 CAMERA Module

Camera Module is activated by keypad sw105.

Taking a picture, Flash LED is provided to bright dark surroundings, and generated by U101.P16(GPO18)

4.2 Radio Transceiver Section

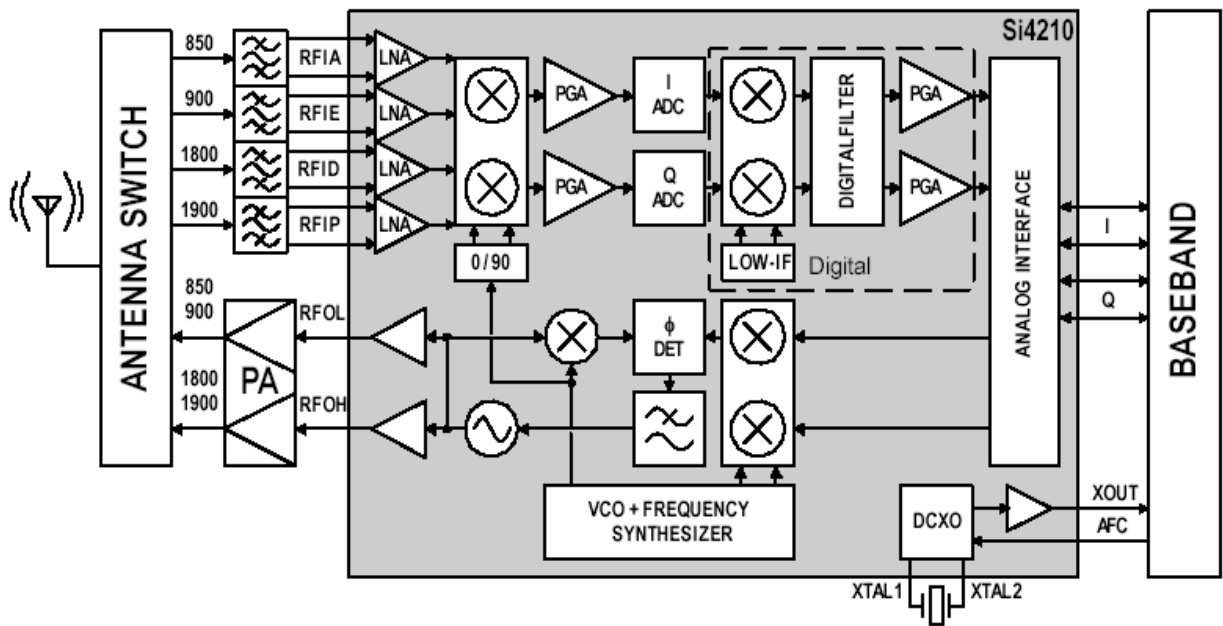


Fig.4-1. RF Transceiver block diagram

The PG-3210's RF Transceiver, which is Aero II, is the industry's most integrated RF front end for multi-band GSM/GPRS digital cellular handsets and wireless data modems. The high-level of integration obtained through patented and proven design architectures, fine line CMOS process technology, and high-performance quad flat no-lead (QFN) technology results in a transceiver solution with industry-leading performance, the smallest form factor, the fewest number of components, the smallest solution footprint, and the lowest bill of materials (BOM) in the industry. A quad-band RF front end using the Aero II transceiver can be implemented with 19 components in less than 1 cm² of board area. This level of integration is an enabling force in lowering the cost, simplifying the design and manufacturing, and shrinking the form factor in next-generation GSM/GPRS voice and data terminals. The receive section uses a digital low-IF architecture that avoids the difficulties associated with direct conversion while delivering higher performance, lower solution cost, and reduced complexity. The baseband interface is compatible with any supplier's baseband. The transmit section is a complete up-conversion path from the baseband subsystem to the power amplifier, and uses an offset phase-locked loop (OPLL) with a The frequency synthesizer uses Silicon Laboratories' proven technology that includes an integrated RF VCO, loop filter, and varactor. The unique integer-N PLL architecture produces a transient response superior in speed to fractional-N architectures without suffering the high phase noise or spurious modulation effects often associated with those designs. This fast transient response makes the Aero II transceiver well suited to GPRS multi-slot applications where channel switching. The analog baseband interface is used with conventional GSM baseband ICs (BBIC). The receive and transmit baseband I/Q pins are multiplexed together in a 4-wire interface. A standard three-wire serial interface is used to control the transceiver.

to be compatible only with a BBIC from the same supplier in order to address the complex dc offset issues. However, since the Aero II transceiver has no requirement for BBIC support of complex dc offset compensation, it is able to interface to all of the industry leading baseband ICs.

The receive (RX) section integrates four differential input low noise amplifiers (LNAs) supporting the GSM 850 (869–894 MHz), E-GSM 900 (925–960 MHz), DCS 1800 (1805–1880 MHz), and PCS 1900 (1930–1990 MHz) bands. The LNA gain is controlled with the LNAG bit.

A quadrature image-reject mixer downconverts the RF signal to a low intermediate frequency (IF). The mixer output is amplified with an analog programmable gain amplifier (PGA) that is controlled with the AGAIN bits. The quadrature IF signal is digitized with high resolution analog-to-digital converters (ADCs).

The ADC output is downconverted to baseband with a digital quadrature local oscillator signal. Digital decimation and FIR filters perform digital filtering, and remove ADC quantization noise, blockers, and reference interferers. The response of the FIR filter is programmable to a flat passband setting and a linear phase setting. After filtering, the digital output is scaled with a PGA, which is controlled with the DGAIN bits.

The LNAG, AGAIN, and DGAIN register bits should be set to provide a constant amplitude signal to the baseband receive inputs.

Digital-to-analog converters (DACs) drive differential I and Q analog signals onto the BIP, BIN, BQP, and BQN pins to interface to standard analog-input baseband ICs.

The receive DACs are updated at 1.083 MHz and have a first-order reconstruction filter with a 1 MHz bandwidth. No special processing is required in the baseband for dc offset compensation. The receive and transmit baseband I/Q pins are multiplexed together in a 4-wire interface (BIP, BIN, BQP, and BQN). The common mode level at the receive I and Q outputs is programmable with the DACCM bits, and the fullscale level is programmable with the DACFS bits.

4.2.3.2 Receiver Part

FEM (Front End Module)

The FEM consists of ASM (Antenna Switch Module) and SAW filters.

A signal receives from the antenna of frequency band which is 881.5 ± 12.5 MHz for GSM850 bands, 1842.4 ± 37.4 MHz for DCS bands and 1960.2 ± 30 MHz for PCS bands and transmits it to the saw filter. The Tx filter passes through the output signals of frequency band that is 836.5 MHz ± 12.5 MHz for GSM850 bands, 1747.4 ± 37.4 MHz for DCS and 1880.2 ± 30 MHz for PCS bands from the power amplifier and transmits it to the antenna. The maximum insertion loss is about 3.9 dB for the receiving bands at 25° C and about 1.6 dB for the transmitting bands at 25° C.

4.2.4 Transmit Section

4.2.4.1 An Overview of Transmit Section

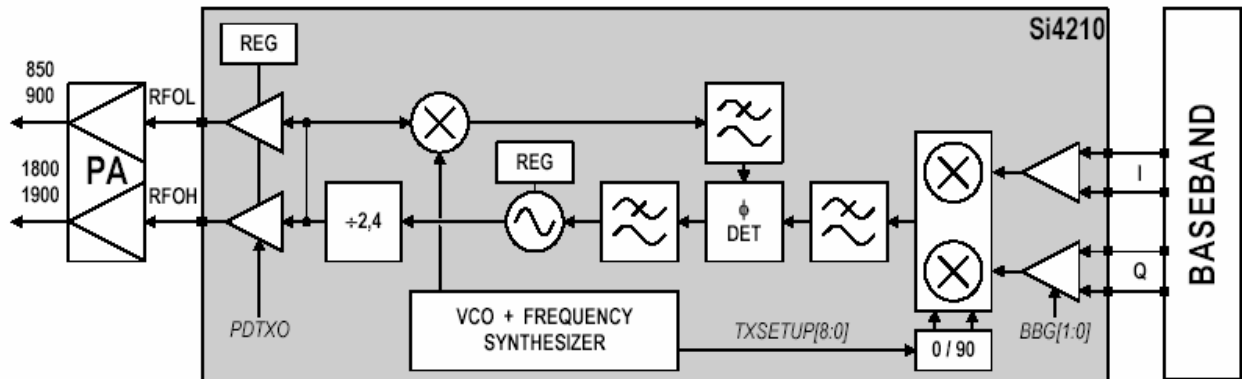


Fig.4-8. Transmitter block diagram

The transmit section consists of an I/Q baseband upconverter, an offset phase-locked loop (OPLL), and two $50\ \Omega$ output buffers that can drive an external power amplifier (PA). One output is for the GSM 850 (824–849 MHz) and E-GSM 900 (880–915 MHz) bands and one output is for the DCS 1800 (1710–1785 MHz) and PCS 1900 (1850–1910 MHz) bands.

The OPLL requires no external filtering to attenuate transmitter noise and spurious signals in the receive band, saving both cost and power. The output of the transmit VCO (TXVCO) is a constant-envelope signal that reduces the problem of spectral spreading caused by non-linearity in the PA. Additionally, the TXVCO benefits from isolation provided by the transmit output buffers. This significantly minimizes any load pull effects and eliminates the need for off-chip isolation networks. A quadrature mixer upconverts the differential in-phase (BIP, BIN) and quadrature (BQP, BQN) baseband signals to an intermediate frequency (IF) that is filtered and which is used as the reference input to the OPLL. The OPLL consists of a feedback mixer, a phase detector, a loop filter, and a fully integrated TXVCO.

Low-pass filters before the OPLL phase detector reduce the harmonic content of the quadrature modulator and feedback mixer outputs.

The transmit I/Q interface must have a non-zero input no later than 94 quarter bits after PDN is asserted for proper operation. If the baseband is unable to provide a sufficient TX I/Q non-zero input preamble, then the CWDUR bits can be used to provide a preamble extension.

The receive and transmit baseband I/Q pins are multiplexed together in a 4-wire interface (BIP, BIN, BQP, and BQN). In transmit mode, the BIP, BIN, BQP, and BQN pins provide the analog I/Q input from the baseband subsystem. The full-scale level at the baseband input pins is programmable with the BBG[1:0] bits. The I and Q signals are automatically swapped within the Aero II transceiver when switching bands. The transmit output path is automatically selected by the ARFCN bits and the BANDIND bits.

4.2.4.2 Transmitter Part

A. 3 dB attenuator

These passive components are adopted for PAM to operate in a stable output power.

B. FEM(Front End Module / built in LPF)

These filters pass through the signals of which frequency band of 824~849MHz, 1710MHz~1785MHz, 1850MHz~1910MHz which is the transmit frequency of GSM850, DCS, PCS system terminal, and it suppresses other images and spurious frequencies when the terminal transmits GMSK modulated frequencies.

C. Power AMP Module(PAM)

This device amplifies signals ahead of transmitting them through the antenna to provide a sufficient RF power. It has amplification factor of 28dB and efficiency of about 50% typically in GSM850 band and amplification of 20dB and efficiency of about 50% typically in DCS/PCS band.

4.2.5 VC-TCXO(Voltage Controlled Temperature Compensated Crystal Oscillator)

This is the mobile station's reference frequency source. Its frequency is 26MHz, this signal is applied to the XOUT Buffer in Si4210 and the XOUT Buffer provides the 13MHz system reference clock.

Section 5. Alignment Procedure

5.1 Recommended Test Equipment

Model No.	Description	Maker	Remark
8960	GSM Mobile Station Test Set	Agilent Technologies	
8593E	Spectrum Analyzer	Hewlett Packard	
TDS 340A	Oscilloscope	Tektronix	
FLUKE 87	Digital Multimeter	Fluke	
E3630A	DC Power Supply	Hewlett Packard	
Others	Accessory		Interface Connectors RF Connectors

5.2 Connection of Test Equipment

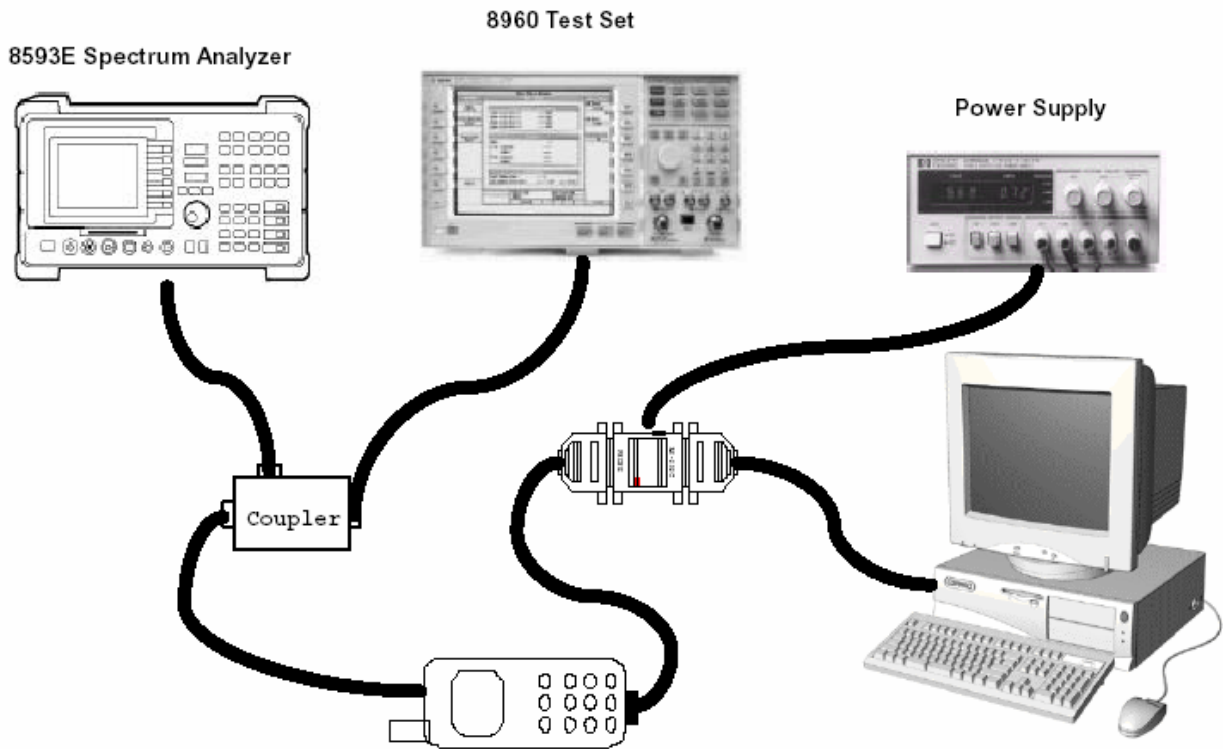


Fig.5-1. Test Set Configuration

4. Using the battery

4.1 Installing the battery

Put the contacts of the battery into the hole located at the bottom of the unit, as shown in the figure below.

Press the upper side of the battery until you hear a “click” sound.



4.2 Removing the battery

Push the battery lock button up and remove the battery.



4.3 Charging the battery

- This phone uses a Li-ion battery. Make sure to use an authorised battery and charger only. For more details, please inquire at your nearest dealer.
- You can use the phone during battery recharging.
- When the battery is mounted within the phone, open the cover located at the bottom of the phone and connect the adapter. An adapter is provided with the phone.



- If recharging is completed, detach the adapter connection from the outlet.



Tip

Your phone is powered by a Lithium Ion (Li-ion) battery.

You can use the following Li-ion battery types for your phone. (Contact your local dealer for more information.)

Standard-type battery.

4.4 Precautions while Using the Battery

- Do not use a damaged battery or charger.
- Use the battery for the specified purpose only.
- The closer you are to the base station, the longer the phone usage time because less battery power is consumed for the connection.
- Battery charging time varies depending on the remaining battery capacity and the battery and charger type in use.
- Battery life is shortened as time passes by.
- Use an authorised battery and charger only.
- Since overcharging may shorten battery life, remove the battery from its charger once it is fully charged. Unplug the charger, once charging is complete. Leaving the battery in hot or cold places, especially inside a car in summer or winter, may reduce the capacity and life of the battery. Always keep the battery within normal temperatures.
- Do not earth the battery. Earthing may occur when the battery is in contact with a conductive object. An earthed phone may also damage the battery.

- Dispose and recycle used batteries in accordance with local regulations.
- Do not dispose of the batteries in a fire.
- Do not use an unauthorised charger.
- In order to prevent injury or burns, ensure that metal objects do not come into contact with the + and – terminals of the battery.

II. New Functions

1. Video Caller ID

2. Setting MJPEG for Idle Screen

1. OTA Settings Service


2. DRM/ Forward Lock

1. Video Caller ID


Save the video clip of a contact or other video clips. Select and set a video clip to the corresponding contact in the address book. When a call is received from the contact, the corresponding video clip will be played on the screen.

You can use one of two setting methods.


1.1 Contacts

- ① Select 'Menu>2.Contacts>2.Add Contact'
- ② Select '2.Phone' option under 'Save to' option and input the appropriate information in all the fields.
- ③ Press the [] navigation key in the image saving menu, and the 'Add Contact' popup will appear.
- ④ Select '3.Take a Video' (For further details, see **Applications Menu 4.1.4**) or '4.Video Gallery' (For further details, see **Applications Menu 4.2.2**) to specify the video file.
- ⑤ The selected video will play when a call is received from the corresponding contact.

1.2 Fun & Tools


- ① Select 'Menu>4.Fun&Tools>1.Camera>2.Take a Video' and save the video. (For further details, see **Applications Menu 4.1.4**)
- ② Select 'Menu>4.Fun&Tools>1.Camera>4.Video Gallery' or 'Menu>4.Fun&Tools> 2.Media Gallery>2.Video Gallery'. (For further details, see **Applications Menu 4.4.2**)
- ③ Select the Video Album and press the [Option] soft key []

and select [**Set as**].

- ④ Select '2.**Contact**' when the '**Set as**' pop up appears, and select the target person and press the [] button. (At least one person should have been already stored in Contacts.)
- ⑤ The selected video will appear when a call is received from the corresponding number.

2. Setting MJPEG for Idle Screen

You can set a video file to play on the screen when the phone is idle.

- ① Select 'Menu>4.**Fun&Tools**>1.**Camera**>2.**Take a Video**' and save the video. (For further details, see **Applications Menu 4.1.4**)
- ② Select 'Menu>4.**Fun&Tools**>1.**Camera**>4.**Video Gallery**' or 'Menu>4.**Fun&Tools**> 2.**Media Gallery**>2.**Video Gallery**'. (For further details, see **Applications Menu 4.2.2**)
- ③ Select the Video Album and press the [**Option**] Soft key [] and select [**Set as**].
- ④ Select '1.**Wallpaper**' when the '**Set as**' pop up appears.
- ⑤ The selected video will play on the screen when the phone is idle.

1. OTA Settings Service

1.1 WAP/ OTA Provisioning

In order to use the WAP Browser, you need to have proper connection settings on your phone. You may add and/or edit the WAP Profile manually or receive the settings directly as a configuration message according to the operators and/or service providers, at the latter case you need to save them on your phone.

Please note that there should be some on-screen steps you need to follow to save and activate the settings.

Please also note that the compatibility to Ericsson/Nokia WAP Provisioning OTA has been made.

2. DRM/ Forward Lock

2.1 DRM/ Forward Lock

Your phone supports a Digital Rights Management (DRM) system to protect acquired content. A piece of content, for example ring tones, wall papers, etc. can be protected by Forward Lock, which means the protected contents cannot be forwarded to other devices including other phones and desktops.

Please note that you should and shall be informed by the service provider before and/or when you try to download such protected contents.

III. Basic Functions

1 Switching the Phone On or Off

2. Making a Call

3. Answering a Call

4. Calling Options


5. Using the Earpiece

6 Selecting Menu Functions

7. Entering Text

1. Switching the Phone On or Off

1.1 Switching the Phone On

- ① Open the folder.
- ② Press the [] key until the phone switches on.
- ③ If the phone requests you to input a PIN, enter the PIN and press the [OK] Soft key. (For further details, see **Applications Menu 6.8**)

Your phone starts to search for an available network and the current date and time will appear on the internal and external displays. Once connected to the network, you can send or receive a call.

If a malfunction occurs while using the phone or it is not turned on, remove the battery and install it again after 5 or 10 seconds.


Note: To change the language, use the Language menu option (For further details, see **Applications Menu 6.4**)

1.2 Switching the Phone Off

To switch the phone off, press the [] key until the power-off animation displays.

2. Making a Call

2.1 Making a Call


Enter the area code and the phone number to make a call in standby mode, and press the  key.

Note: If you have set the [**Auto Redial**] option (For further details, see **Application Menu 6.3.3**) to [**On**], the phone will attempt to make a call automatically for up to 10 times if it is not answered.

To clear the last digit displayed, press the [**C**] key.

To clear the all digits displayed, press and hold the [**C**] key.

2.2 Ending a Call



When you want to finish your call, press the  key or close the folder.


Once the call is completed, a call summary (Recipient Name or Number, Service Time) will be displayed.

2.3 Using Call Logs

The phone stores up to 30 dialled, received or missed calls chronologically. The last call is saved in the first position. If the same number was dialled more than once, only the latest occurrence will be



saved.

- ① Press the  key to see the call log list aligned dialled, chronologically.
- ② Press the [**Up/Down**] key to select a number.
- ③ Press the  key for dialling.
(For further details, see **Applications Menu 3**)

* **Tip:** Press and hold the  key to redial the last number in the call log.


2.4 Using Contacts

You can store frequently used names and phone numbers in the SIM card or the phone memory, which are called Contacts. You therefore do not have to remember all your phone numbers; simply select the name to recall the associated number.

- ① Press the  key and the [**Ph**] key in the standby screen to access the '2 Ph. Book' Menu and 'Name Search' List respectively
- ② Select a number from 'Name Search'.
- ③ Press the  key for dialling. (For further details, see **Applications Menu 2**)

2.5 Making an International Call

- ① Press and hold the [**0**] key for the international prefix until the '+' character appears on the display or enter the outgoing national code.

- ② Enter the country code, area code and phone number you want to make a call to.
- ③ Press the [] key.

2.6 Speed-dialling from Contacts


Press and hold the 'Speed Dial' number to make a call using the number you have saved. For example, press the "5" key longer to dial a number which has been saved as "5" in Speed Dial List.

For speed dial numbers longer than 2 digits, press the first one and then press and hold the second one.

(For further details, see **Applications Menu 2.5**)

2.7 Making an Emergency Call

You can make an emergency call without the SIM.


Enter 'Emergency Number'. Then press the [] key, or, press the [**SOS**] Soft key if no SIM Card is available.


3. Answering a Call

3.1 Answering a Call

When you receive a call, the phone rings (or vibrates) and the screen will display the name or the number of the caller (if the network supports the function and you have subscribed to it).

If the caller can be identified, the caller's phone number or name will be displayed if it is stored in your Contacts.

- ① To answer a call, open the folder.
- ② If it is already open, press the  key.

Tip: If the answer type is set as **[Any Key]**, you can answer a call by pressing any key except the  key.


3.2 Viewing Missed Calls


If the incoming call could not be answered, a missed call message will appear on the screen to remind you of the call you have missed (Network and subscription dependent feature, not necessarily available in all areas)

To reply to the missed call;


- ① Keep the folder open.
- ② Press the **[View]** Soft key to display a list of missed calls.
- ③ If necessary, scroll to the number you want by pressing the

[Up/Down] keys.

- ④ Press the  key to call the missed call.

Press the **[C]** or  key to close the missed call notification message

3.3 Rejecting a Call

Press the  key or the **[Reject]** Soft key when the folder is open. If the **[Reject]** Soft key is pressed, the caller will receive a busy line tone. When the folder is closed, press and hold the **[Side Up/Down]** key during an incoming call

3.4 Adjusting the Calling Volume

If you wish to adjust the earpiece volume during a call, use the volume keys on the left side of the phone.

Press the **[Side Up]** key to increase the volume level and the **[Side Down]** key to decrease it.

The current volume level will be displayed on the screen.

In standby mode with the folder open, you can adjust the key tone volume using the **[Side Up/Down]** keys.

4. Calling Options

During a call, press the  key to show the call options.

4.1 Switching the Microphone Off (Mute)

You can temporarily switch your phone's microphone off so that the person you talk to on the phone cannot hear you.

For example, you may wish to say something to another person in the room but do not want the person calling to hear you.

Press the [Mute] Soft key,

Or, select Options followed by 'Mute' to activate the Mute function.


To switch the microphone back on:

Press the [Unmute] Soft key.

Or, press the [Option] Soft key and then press the [Select] Soft key or the [OK] key, when [Sound] highlights.

4.2 Holding a Call

You can place a current call on hold whenever you want. You can make another call while you have a call in progress if your network service provider supports this service. Of these two calls, one is active and the other is on hold and you can switch between the calls.

To place a call on hold, simply select the [Option] Soft key followed by [Hold], or press the  key.

You can reactivate the call whenever you want by selecting [Option] followed by [Retrieve].

Once a call is held, the name and icon of the caller will fade to grey.


To make a call while you have a call in progress:

① Enter the phone number that you want to dial or look it up in Contacts.

② Press the key to dial the second call. The first call is automatically put on hold.

To switch between two calls, simply press the [Swap] Soft key.


The current call is placed on hold and the call on hold is reactivated so that you can continue your conversation with the other person.

If you want to finish, complete each call normally by pressing the  key.

4.3 Answering a Second Call

You can answer an incoming call while you have a call in progress, if your network service provider supports this service and you have activated the [Call waiting] option (For further details, see **Applications Menu 6.2.4**). You will be notified of an incoming call by a call waiting tone.

To answer a call while you have another call in progress:

① Press the  key to answer the incoming call.

② The first call is automatically put on hold.

③ To switch between two calls, press the [Swap] Soft key.

To end the current call, press the  key.

The call on hold is automatically reconnected to you.

4.4 Searching for a Number in Ph. Book

You can search for a number in your Ph. Book during a call.

- ① Press the [Option] Soft key.
- ② If necessary, press the [Up/Down] key to highlight the [Ph. Book] option. Press the [Select] Soft key.
- ③ Select the preferred search types like Name, Group, or Photo.
- ④ Press the [OK] Soft key.
- ⑤ The Contacts entries are displayed.
- ⑥ Enter the first letters of the name for Name Search.
- ⑦ The Contact entries are displayed starting with the first entry matching your input.

Note: You can also scroll through Contacts from the beginning, by pressing the [Up/Down] key.

- ⑧ To view the highlighted entry, press the [OK] Soft key.
(For further details, see **Applications Menu 2**)

4.5 Using DTMF Tones

You can turn the DTMF key tones off or on during a call.

When the [DTMF Off] option is selected, your phone does not transmit the key tones. It allows you to press keys without hearing annoying key tones during a call.

To communicate with answering machines or computerised telephone systems, the [DTMF On] option must be selected.

4.6 Transferring a Call

You can transfer the current call to the call on hold if your network service provider supports this service, so that callers can talk to each other. You will be disconnected from both of them.

- ① During a call, answer or make a call in the normal way, and press the [Option] Soft key.
- ② Press the [Up/Down] key to select the [Transfer] option and press the [Select] Soft key or [OK] key.

The two people will be connected to each other.

4.7 Using the Message Service

You can read or write a new message during a call.

- ① Press the [Option] Soft key.
- ② Press the [Up/Down] key to highlight the [Messages] option. Press the [Select] Soft key or the [OK] key.
- ③ To read a received message, select the 'Inbox' submenu, and then scroll to the message that you want to read.
- ④ To write a new message, select the 'Write New' submenu.
- ⑤ Press the [OK] Soft key.

(For further details, see **Applications Menu 1.1**)

4.8 Making a Multi-party Call

A multi-party call feature is a network service that allows up to six people to take part in a multi-party or conference call simultaneously. For more information, contact your service provider.

To make a multi-party call;

- ① Call the first participant in the normal way.
- ② Call the second participant in the normal way.
The first call is automatically put on hold.
- ③ To join the first participant to a multi-party call, press the [Option] Soft key and select the [Join All] option.
- ④ Press the [Select] Soft key or [OK] key.
- ⑤ To add a new person to the multi-party call, call the person in the normal way.
Then, press the [Option] Soft key and select the [Join All] option.
- ⑥ Press the [Select] Soft key or [OK] key.

You can add incoming callers by answering the call and selecting the [Join All] option. Repeat the above steps as needed.

Upon organising a multi-party call, you may view the people and their status in Multiparty with the [Left/Right] key.


An icon indicates either Far Multiparty or Far Hold.

Having a Second Call During a Multi-party Call

To answer or make a call when you have the multiparty call:

- ① To place the multi-party call on hold, press the [Option] Soft key and

select the [Hold All Calls] option.

- ② Answer or make a call in the normal way.
- ③ You can reactivate the multi-party call on hold by pressing the [Swap] Soft key.
- ④ To end the multi-party call, press the [] key.

Having a Private Conversation with One Participant

- ① Press the [Option] Soft key and select the [Private] option.
Press the [Select] Soft key or [OK] key.
- ② Press the [Up/Down] key to highlight a participant and press the [OK] key.
Now you can talk privately with that person.
The other participants can continue the conversation with each other.
- ③ To return to the multi-party call, press the [Option] Soft key and select the [Join All] option.
- ④ Press the [Select] Soft key.
All of the multi-party call participants can now hear each other.

Removing One Participant

- ① Press the [Option] Soft key and select the [Exclude] option.
- ② Press the [Up/Down] key to highlight a participant and press the [Select] Soft key or the [OK] key.

The call ends with that participant, but you can continue to talk with other participants.

- ③ Complete the multi-party call by closing the folder or pressing the



5. Using the Earpiece








You can send or receive a call without touching the phone, using the headset.

When you connect the headset to the jack located at the top of the phone, the button on the headset works as described below;

- To show the recent calls, press the button in standby mode
- To redial the last call, press the button twice in standby mode
- To answer a call, press the button when you receive a call
- To complete a call, press and hold the button when you have finished a call

6. Selecting Menu Functions

6.1 Entering into Menu Functions

Key	Function
	Goes to the main menu in standby mode.
	Goes to the Searching View Names
[], [] key	Moves within the main menu.
[], [] key	Searches for the sub-menu.
[] key	Goes to the sub-menu. Goes to the WAP menu in standby mode

Press the 4-way navigation keys in the main menu to move the menu.

See the bottom of the Sub Menu List to check the current setting values in the sub-menu.


Then, press the [**Left/Right**] key followed by the [**OK**] key to change the preset menu value.








If you do not press the [**OK**] key, the new value will be cleared without saving..

Note: Press the [**C**] key to return to the previous menu.

Input the menu number to access the sub-menu quickly.

6.2 Using the Shortcut Key in Standby Mode

Key	Menu selected if pressed	If pressed and held
	Menu	Goes to the main menu in standby mode.

	Ph. Book	Goes to the Searching View Names
[] key Navigation [RIGHT] key	Messages	Displays 'Message' menu
[] key Navigation [UP] key	Ring Tone	Displays ring tone setting mode
[] key	WAP	Goes to the WAP menu in standby mode
[] key Navigation [LEFT] key	Favorites	Favorites menu
[] key	Calendar Monthly View	Camera capture mode
	Recent Calls	Redial last call
Navigation [DOWN] key	Camera	Camera Capture mode

7. Entering Text

7.1 Input Mode

On many occasions you need to input text while you are using your phone, (e.g., storing a name in the Ph. Book, writing a new message, creating your greeting or scheduling events on your Scheduler).

The available text input modes include.

T9 mode

You can input a letter using only one keystroke per letter. The keypad has more than one letter on it – when you press the **5** key once, J, K or L may be displayed.

The T9 mode automatically compares your keystrokes with an internal linguistic dictionary to determine the correct word, thus requiring far fewer keystrokes than the conventional Multi-tap mode.

ABC mode

In this mode, you can input the letter you want by pressing the keypad once, twice, three or four times until the target letter appears.

123 mode

You can input a number in this mode.

Symbol mode

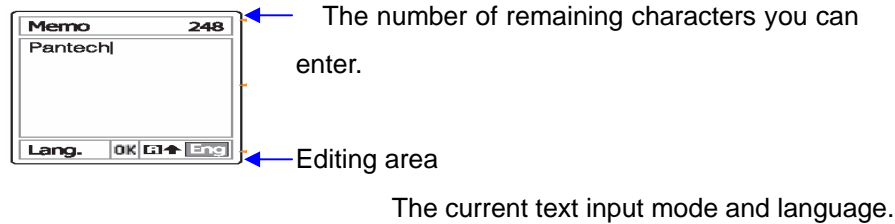
You can input the special characters like Greek letters, currency units, or

a period mark in this mode.


7.2 Changing Text Input Mode

When you are in the area where you can input the text, the text input mode indicator will be displayed at the bottom of the display.

Example: Entering a memo.



To switch to other text input modes:

- ① Press the right Soft key indicating the current text input mode.
- ② Toggle to the mode you want to use by pressing the [] right Soft key.

The 'Language select' option allows you to change the text input language.

Inserting a Space

To insert a space between words, press the [0] key.

Or, at the end of line, press the [Right] key to add a new space character.

Scrolling

To move the cursor to the left or right within the text, press the [Left/Right] key. And also, to move the cursor to the up or down among the lines, press the [Up/Down] key.

Note: By pressing the [Side Up/Down] key, the cursor can be moved very quickly to the beginning or the end of the text.

Clearing Letters and Words

To clear the letter to the left of the cursor, press the [C] key.

You can clear all of the letters on the display by pressing the [C] key longer.

Returning to the Previous Screen

When the text input field is empty, press the [C] key to return to the previous screen.

TIP: To change the text input mode quickly

[*] Press long	Shows symbol screen.
[0] Press short	Enters a space Character
[#] Press shprt	Changes the text input mode
[C] Press short	Deletes characters one by one. Returns to previous screen after deleting all characters.
[C] Press long	Deletes all characters and moves the cursor to the beginning of the input screen.

7.3 Using T9 Mode

6.2.3 Side Tone Not transmitted (Ear-piece)

Repeat 6-2-1 No receiving tone heard.(Ear-piece)

1. Check to see if Mic + pin is around 1.5V : CP117

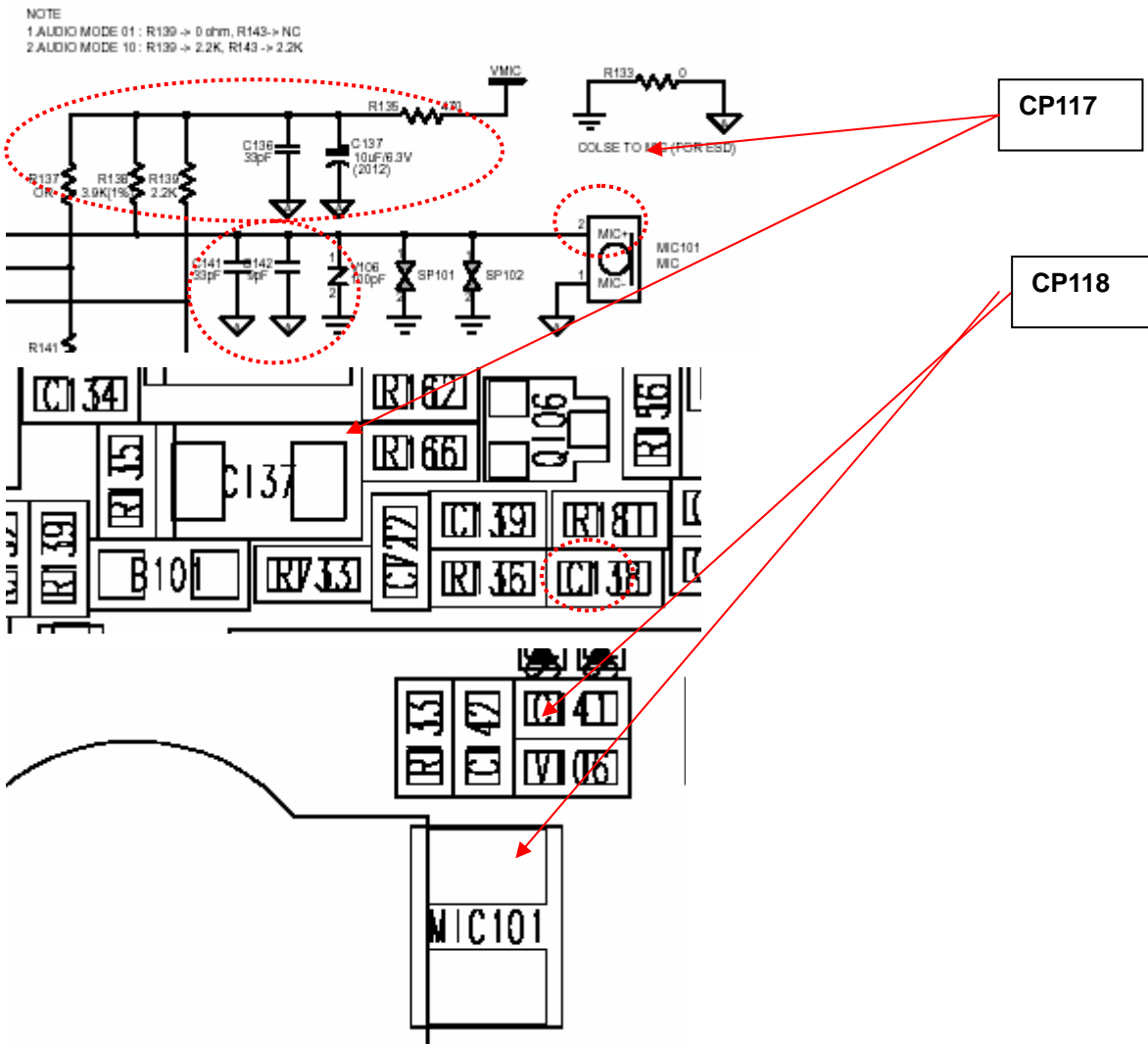
NO → Check that R135, C137, C136 and R138 is cold solder, broken, short to the other PCB pattern or not

If you find out any defective part, you replace it.

Set to HP8922M to connect a call and then set to 1kHz with Echo audio mode.

2. Check C142.C141 pins for wave form : CP118

NO→ Replace MIC



6.2.4 Side Tone Not transmitted (Hands-free Mic.)

Repeat 6-2-2 No receiving tone heard.(Hands-free Earphone).

1. Check to see if R139 pin is 2.5V : CP119

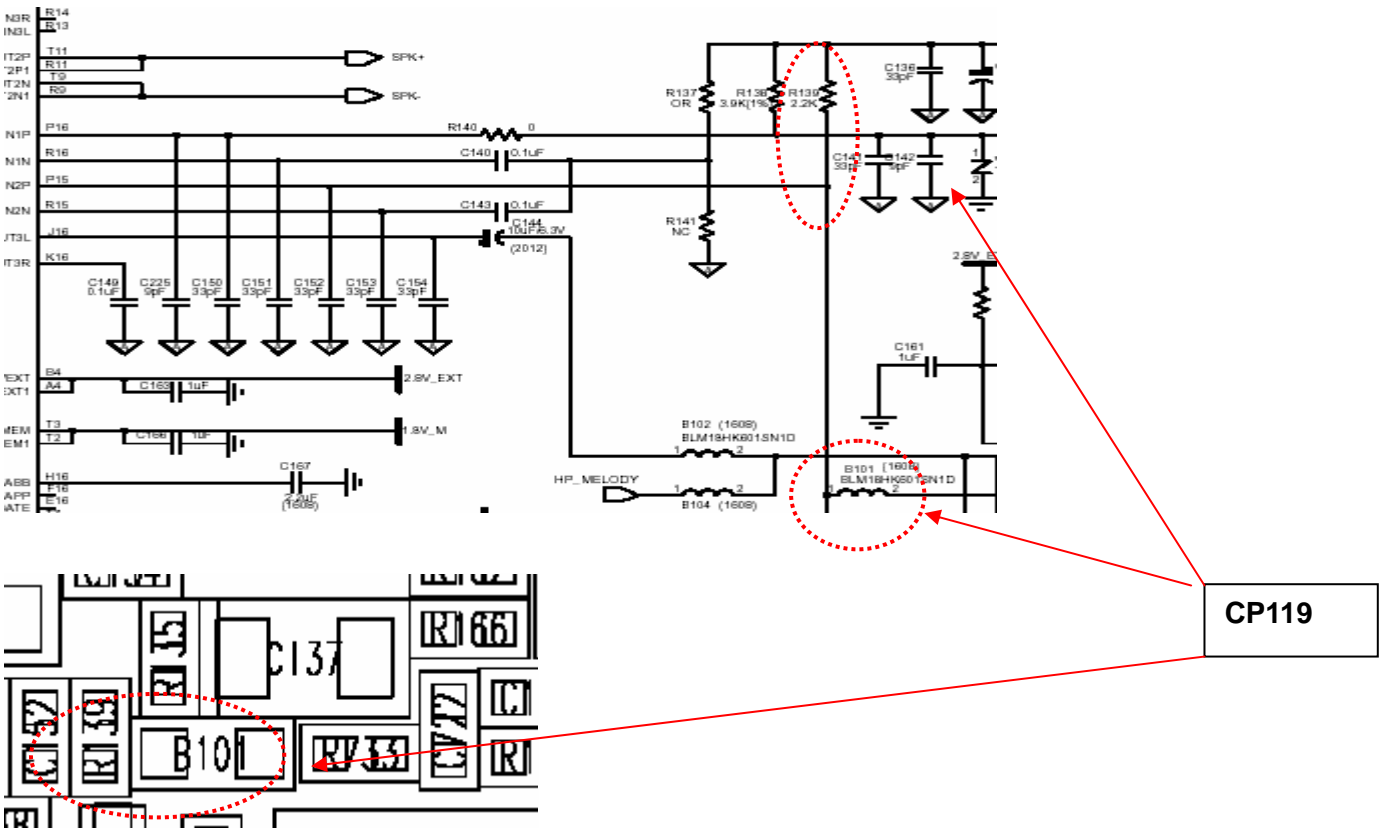
NO → Check that C152 is cold solder, broken, short to the other PCB pattern or not.

If you find out any defective part, you replace it.

Set to HP8922M to connect a call and then set to 1kHz with Echo audio mode.

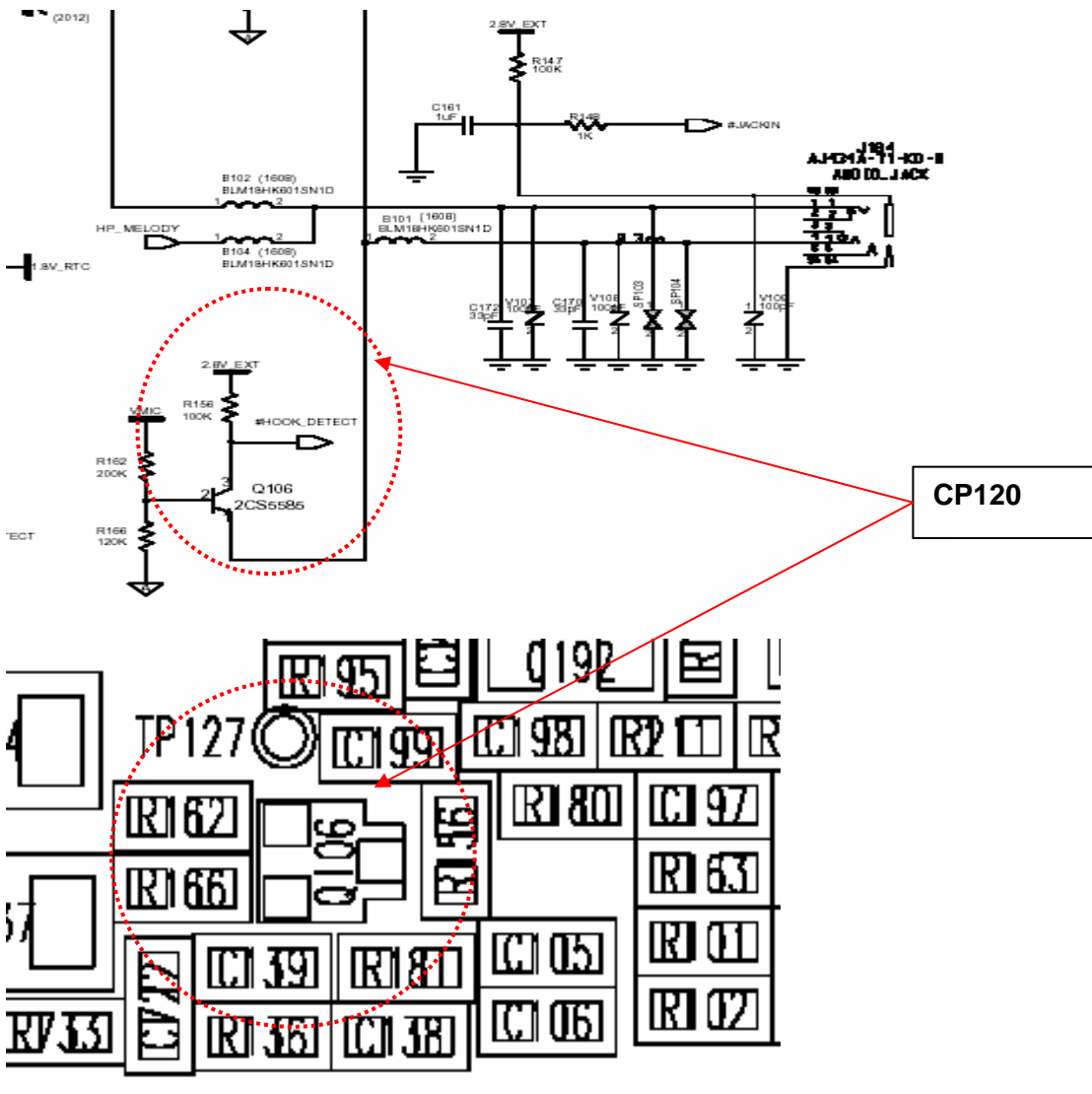
3. Check B101 pins for wave form : CP119

NO → Replace Handsfree Mic.



6.2.5 Hook Switch not working

1. Check to see if Q106.1 pin is 2.4V : CP120
2. Check to see if Q104.1 pin is 0V during pressing Hook Switch : CP120
 NO → Check that R162 and R166 cold solder, broken, short to the other PCB pattern or not
 If you find out any defect, you replace it
3. Check to see if Q104.1 pin is around 0V, when you press Hook Switch : CP120
 NO→ Check that Q104 cold solder, broken, short to the other PCB pattern or not
 If you find out any defect, you replace it

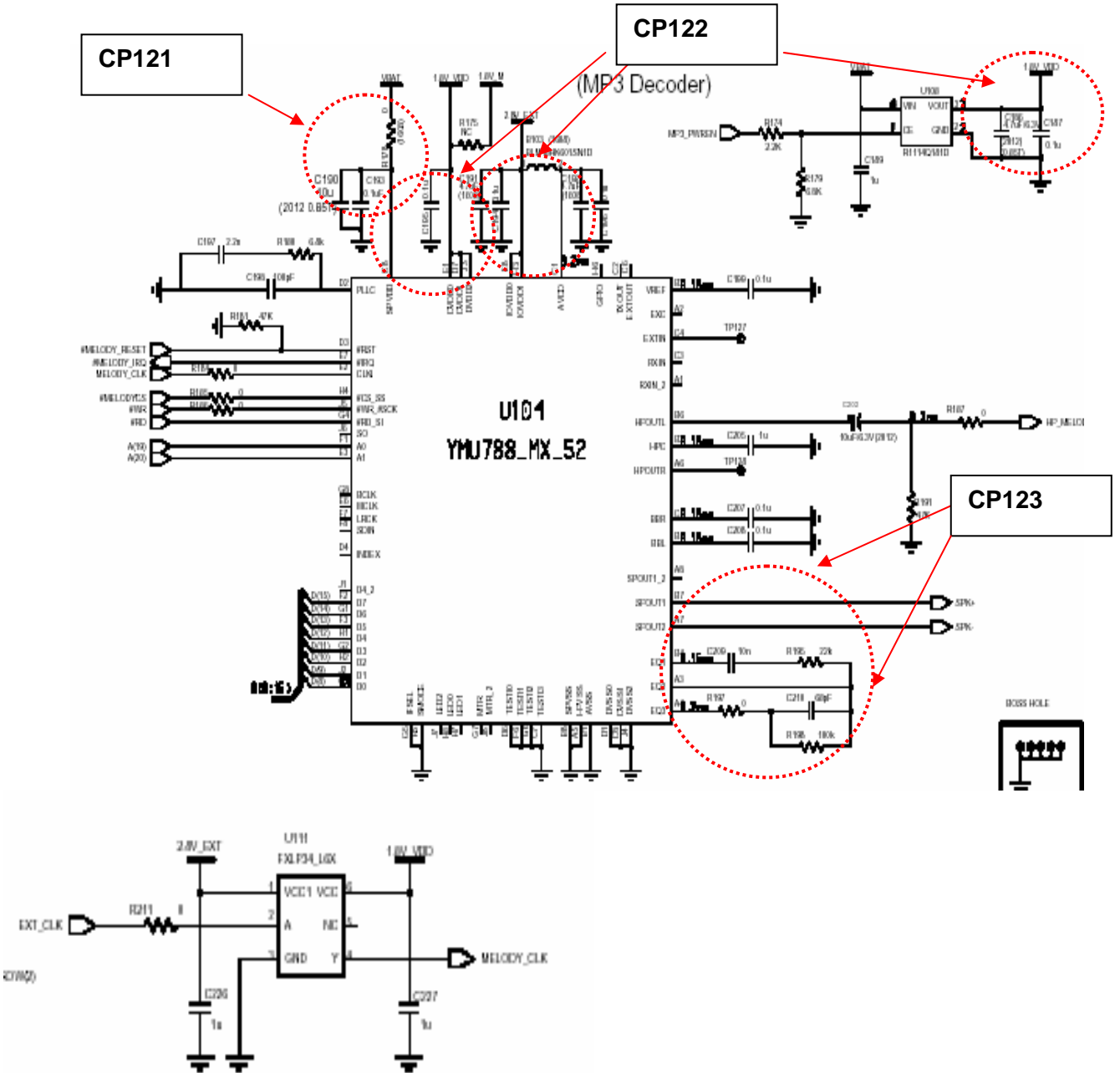


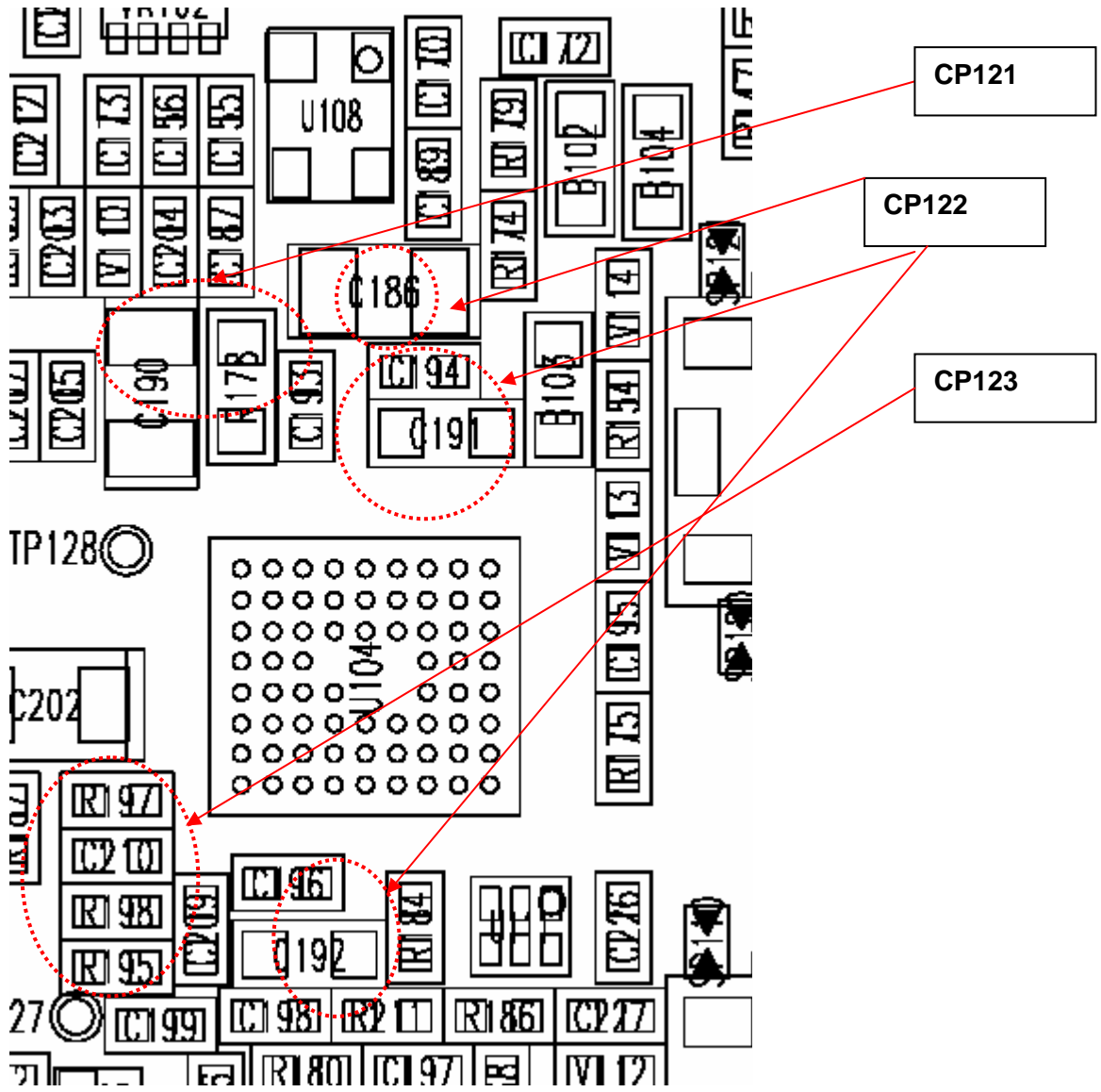
6.2.6 Melody not ringing

1. Check to see if C190, R178 is Vbat : CP121
2. Check to see if C191,C192 is 2.8 V : CP122
3. Check to see if C186,C195 is 1.8 V : CP122
4. Check U104.B4,A3,A46pin for waveform: CP123

NO → Check that C209,R195,R197,C210and R198 cold solder, broken, short to the other PCB pattern or not

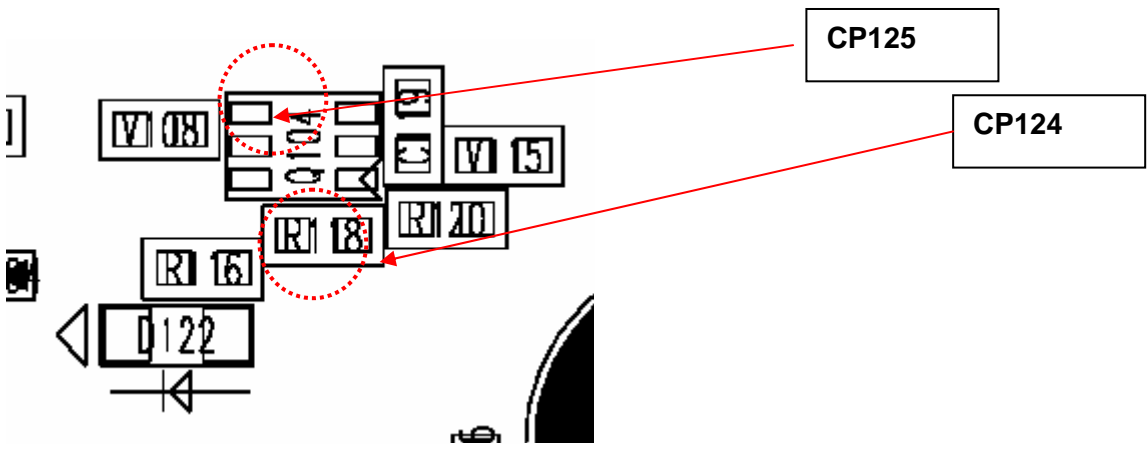
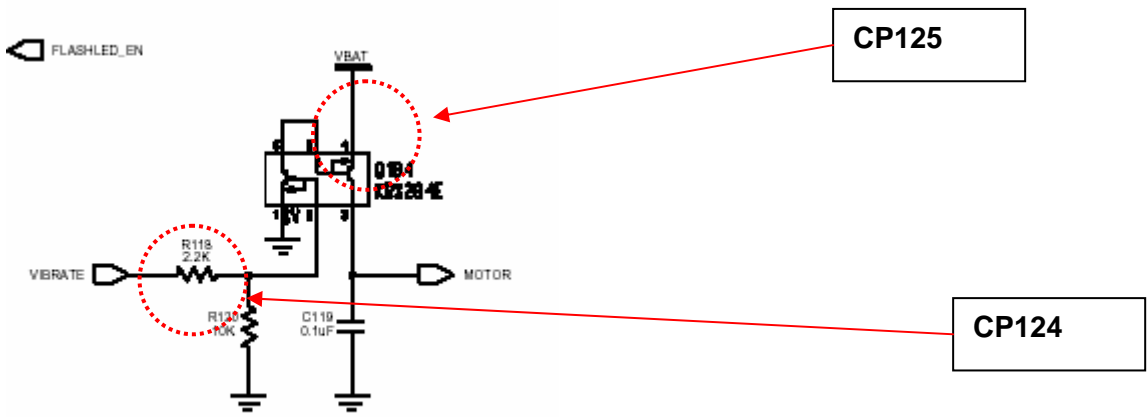
Check U104.,A7,B7pin SPOUT1,SPOUT2 for waveform : NO → replace SPK.





6.2.7 Vibrator not working

1. Check to see if R118 pin is 2.8V : CP124
 NO → Check to see R118 cold solder, broken, short to the other PCB pattern or not
 If you find out any defect, you replace it
2. Check to see Q104.4 is same with battery power : CP125
 NO → Check to see Q104 cold solder, broken, short to the other PCB pattern or not
 If you find out any defect, you replace it
3. Check to see Vibrator
 If you find out any defect, you replace it



6.3 SIM card part

6.3.1 SIM error

1. Check to see if J103.1 pin is around 2.85V : CP126

NO → Check to see C188 pin cold solder, broken, short to the other PCB pattern or not :

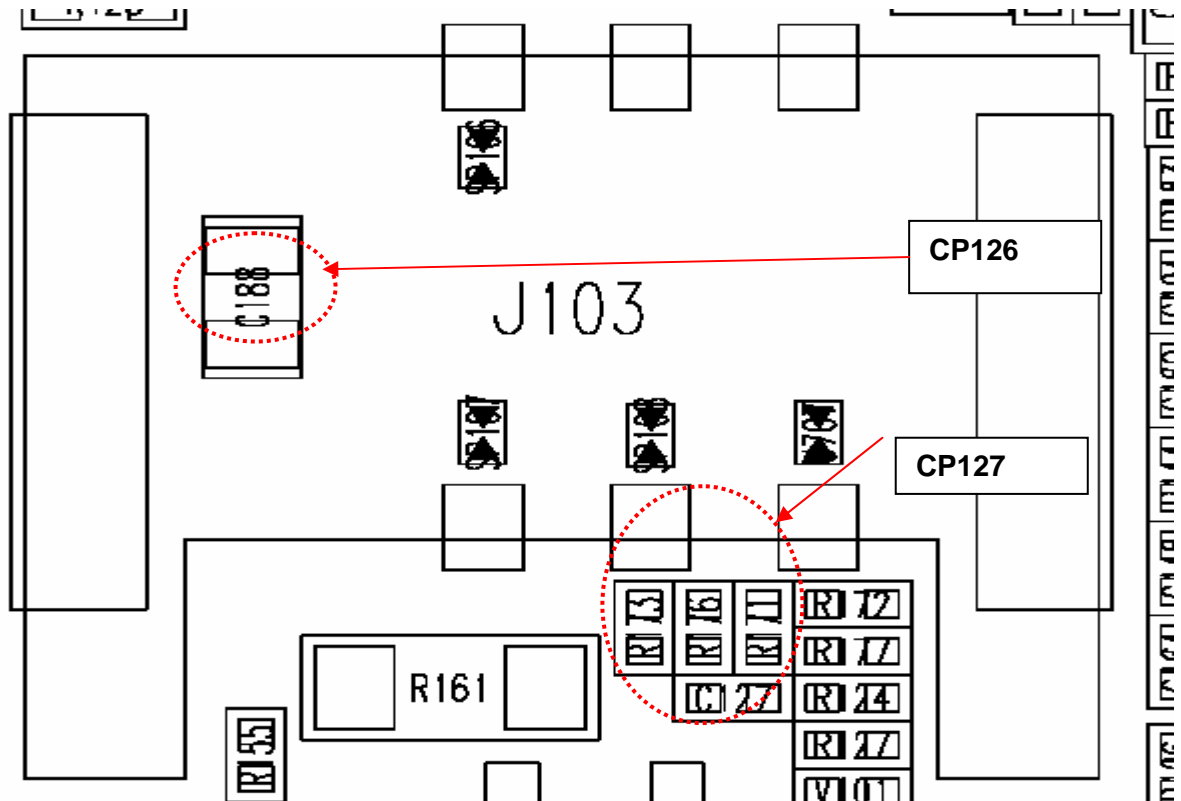
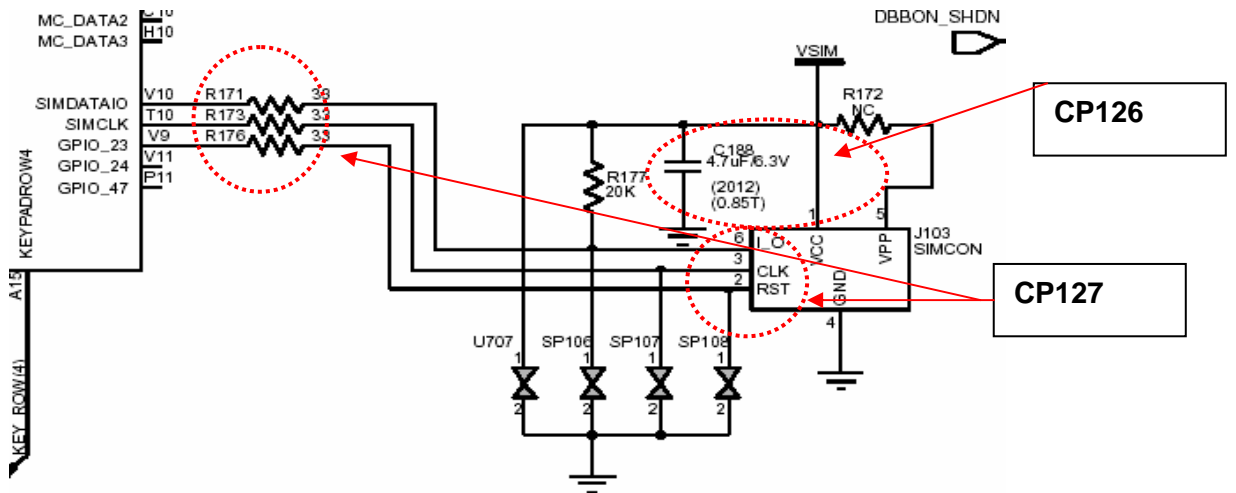
If you find out any defect, you replace it

2. Check to see J103.2, 3, 6(R171,R173,R176) for wave form : CP127

NO → Check to see J103, R171 cold solder, broken, short to the other PCB pattern

or not

If you find out any defect, you replace it



6.4 Charger part

6.4.1 Charging error

Insert adaptor into I/O jack.

1. Check to see if D101 pin is 5.2V : CP128

NO → Check to see J101.23, 24(I/O connector) pin and D118 cold solder, broken, short to the other PCB pattern or not :

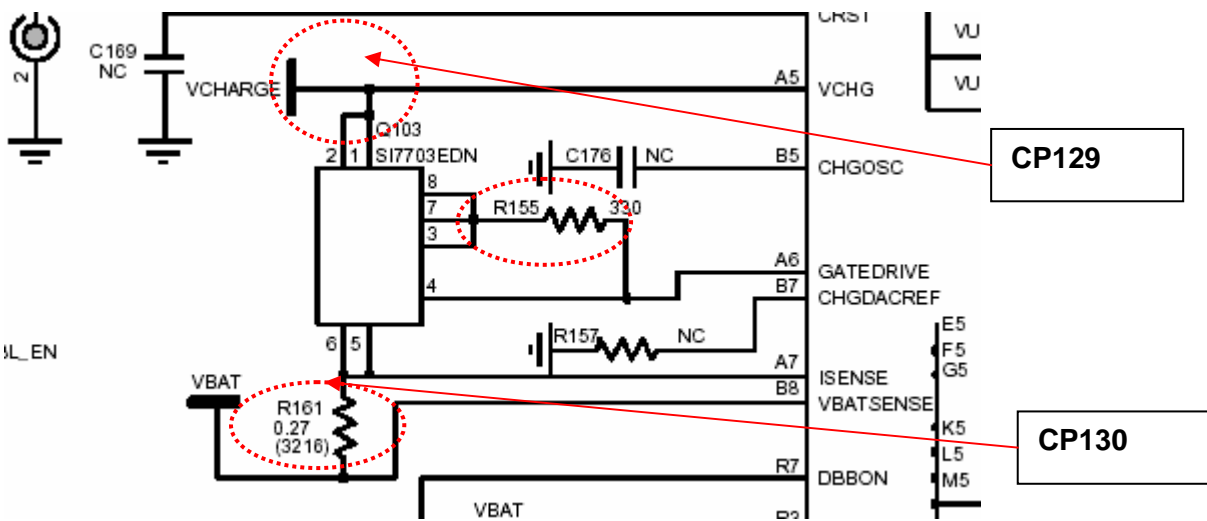
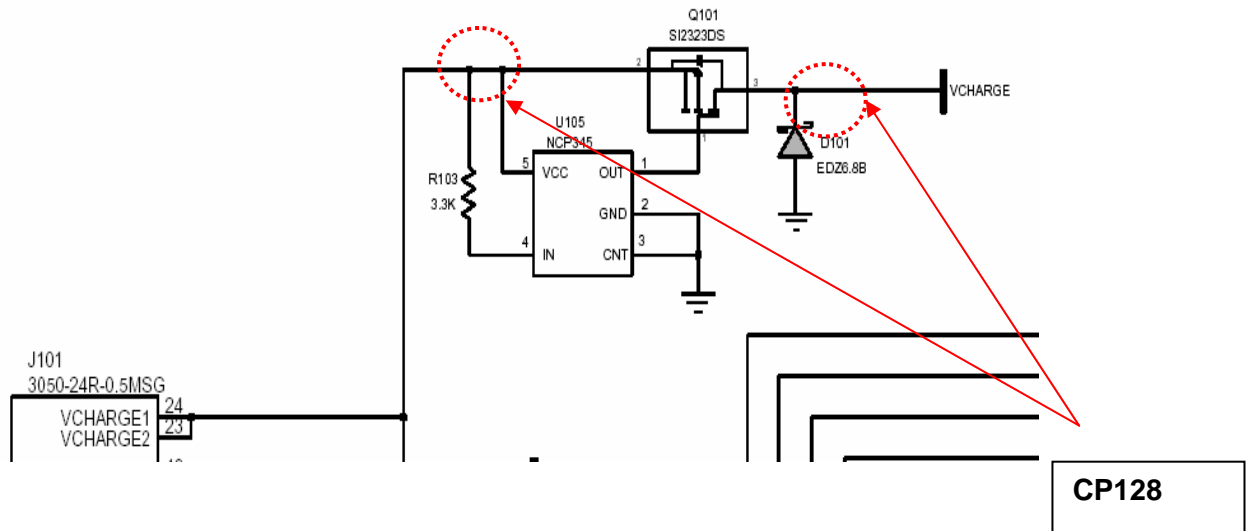
If you find out any defect, you replace it

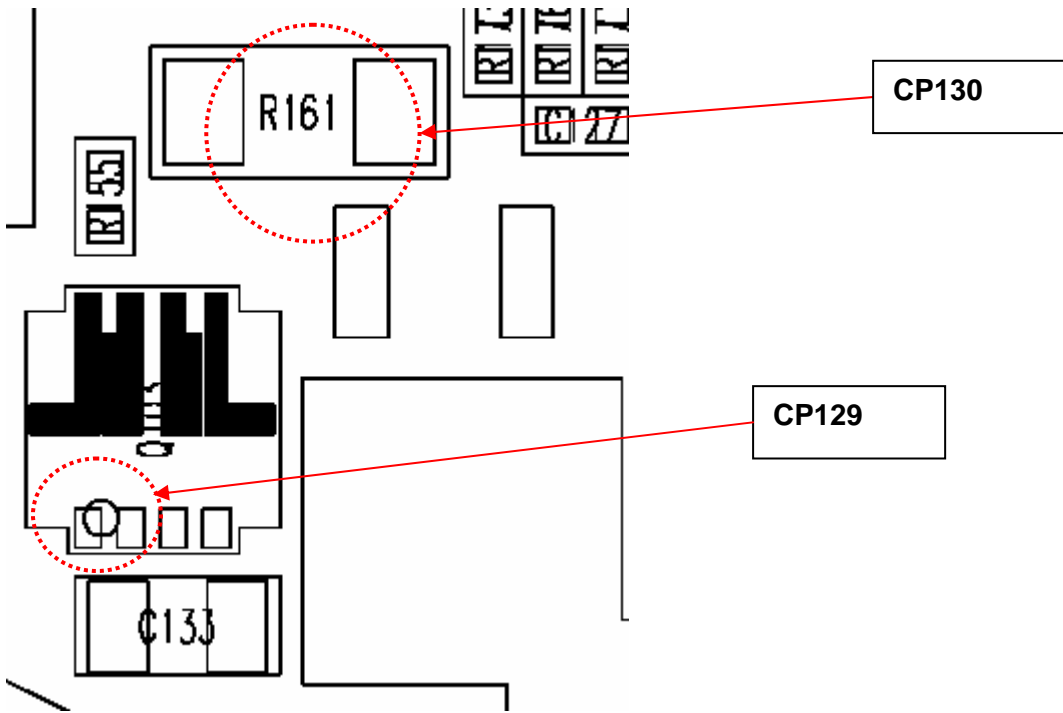
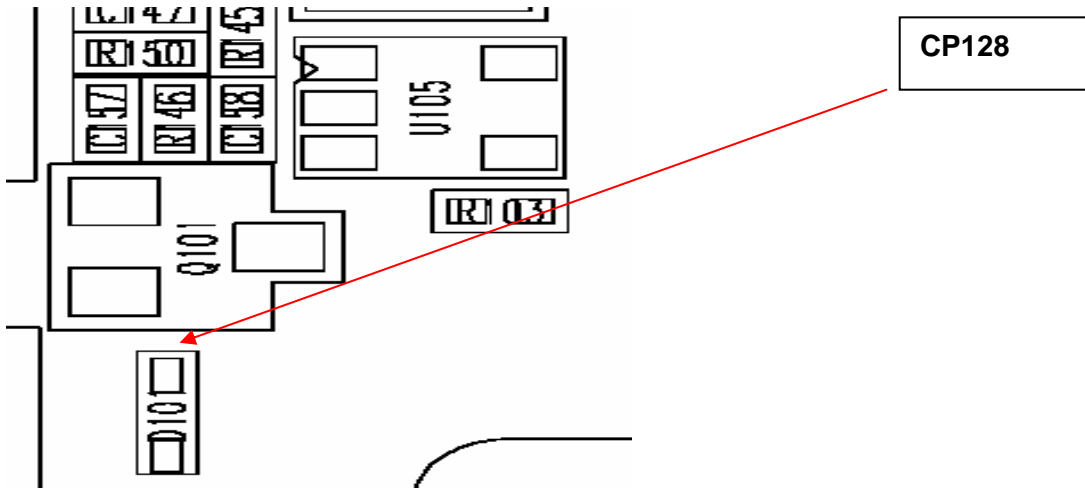
2. Check to see Q103 No.1,2 pin is 5.2V : CP129

NO → Check to see Q103, R157, R155, R161 cold solder, broken, short to the other PCB pattern or not

If you find out any defect, you replace it

3. Check to see R161.1 and R161.2 between voltage is about 150mV : CP130





6.5 RF Part

6.5.1 Test conditions

1. Test condition 1 : VBAT = 3.8V during all tests

2. Test condition 2 : Traffic channel :GSM850 Band
 - Tx mode
 - Ch190
 - Power Level : 13

3. Test condition 3 : Traffic channel : DCS Band
 - Tx mode
 - Ch698
 - Power Level : 10

4. Test condition 3 : Traffic channel : PCS Band
 - Tx mode
 - Ch662
 - Power Level : 10

5. Test condition 4 : Traffic channel :GSM850 Band
 - Rx mode
 - Ch190
 - Input power : -70dBm

6. Test condition 5 : Traffic channel : DCS Band
 - Rx mode
 - Ch698
 - Input power : -70dBm

7. Test condition 5 : Traffic channel : PCS Band
 - Rx mode
 - Ch662
 - Input power : -70dBm

8. RF power values are measured using 50 Ω coaxial cable.

6.5.2 Power Supply Check Point

Step	Test point	Typical Value	Condition	Checking Point
2-1	U705 Pin#1	3.8V	1,2,3,4,5,6,7	Check route connection : VBAT
2-2	U705 Pin#5	2.8V	1,2,3,4,5,6,7	Check route connection : VCC_RFCHIP
2-3	U702 Pin#3,8,20	3.8V	1,2,3,4,5,6,7	Check route connection : VBAT

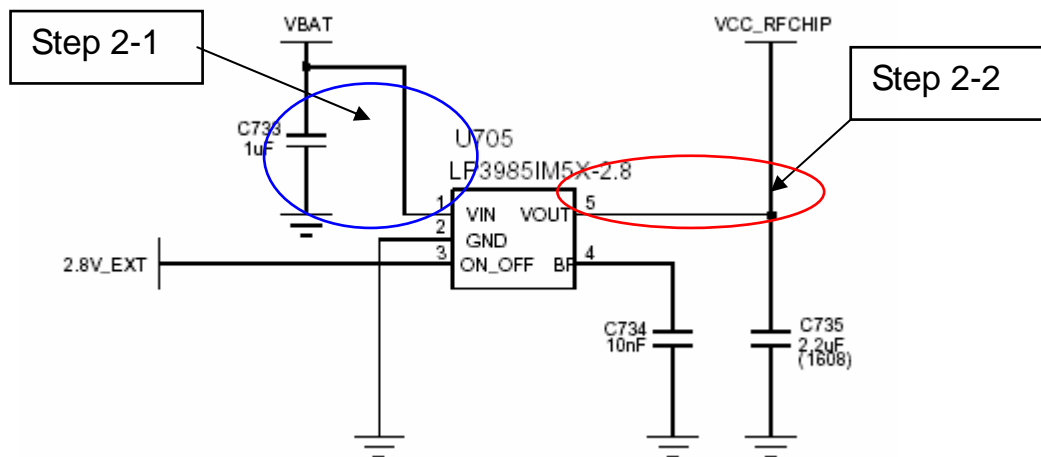


Fig.6-2 U705 Regulator Power Supply Schematic

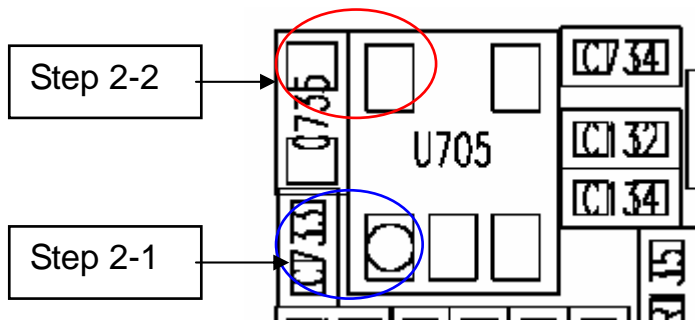


Fig.6-1 U705 Regulator Power Supply PCB Layout

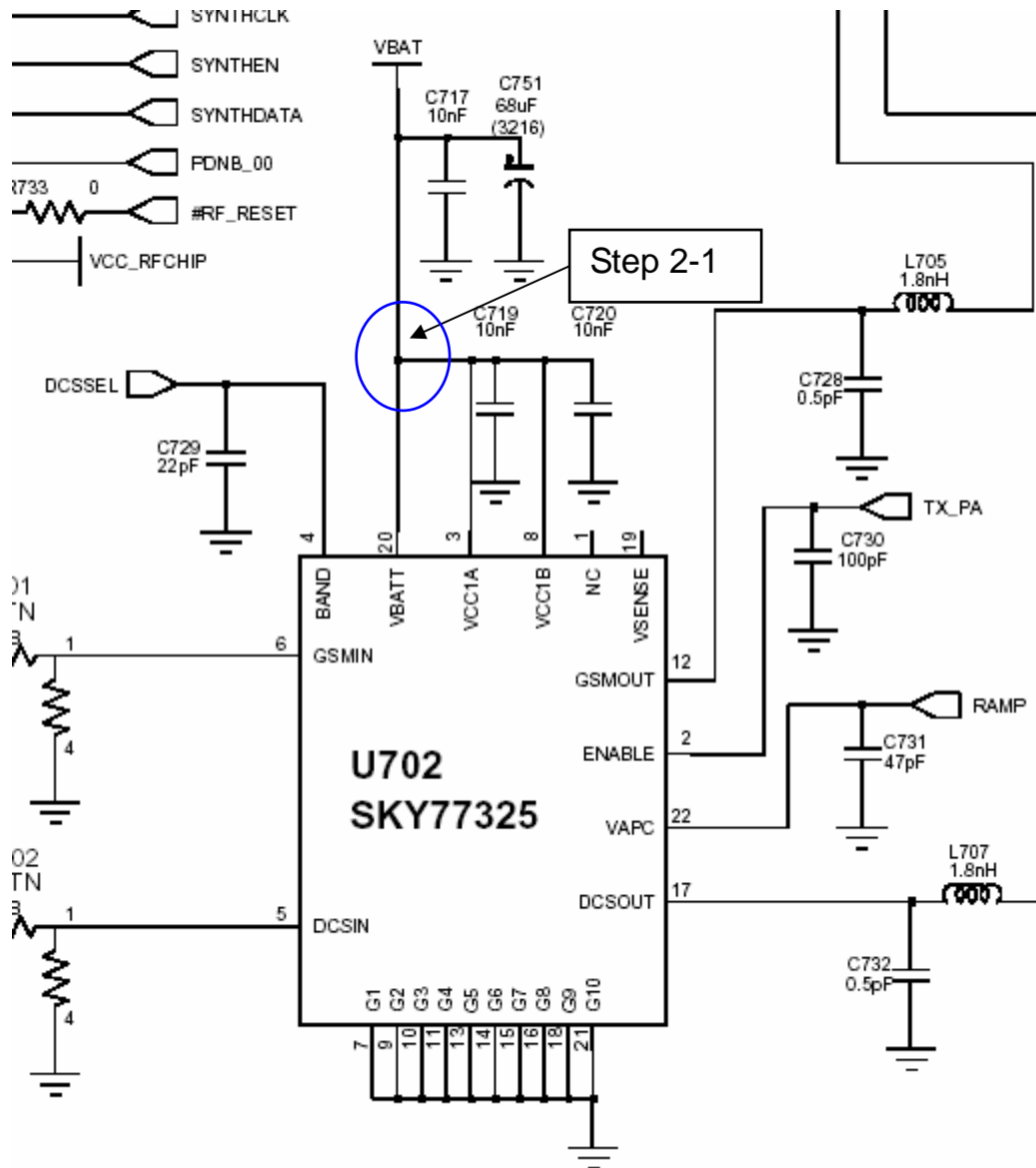


Fig.6-3 U702 PAM's Power Check Point

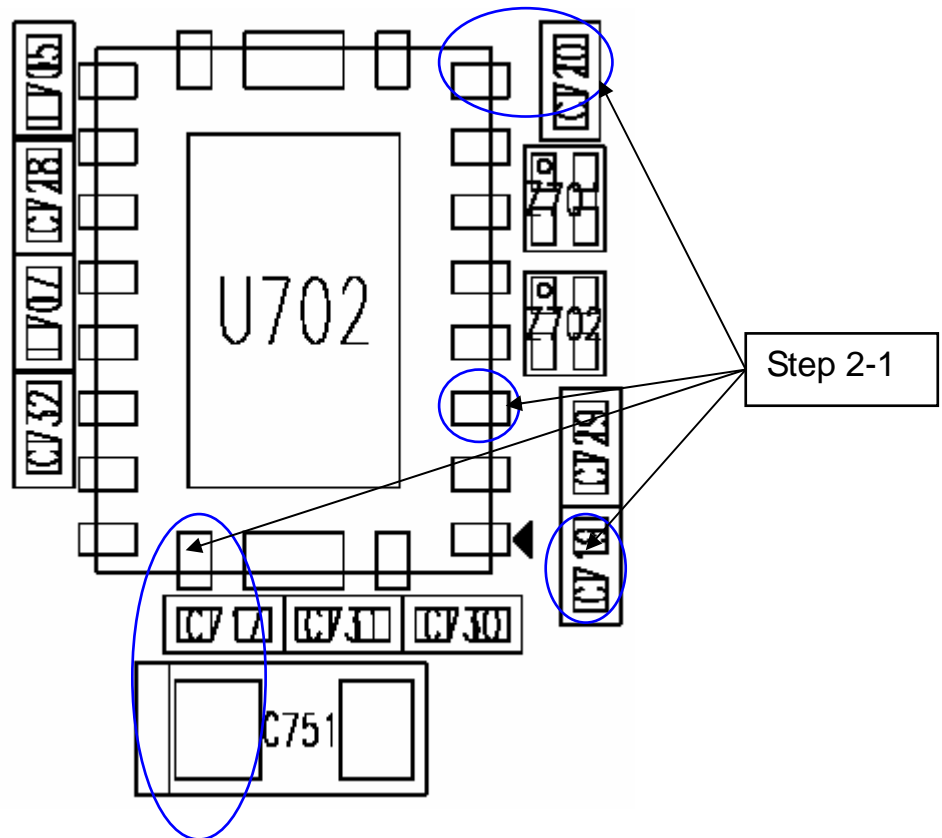


Fig.6-4 U702 PAM's PCB Layout

6.5.3 Power Amplifier Module

Step	Test point	Typical Value	Condition	Checking Point
3-1	U702 Pin#2	Logic High	2, 3, 4	Check route connection : TX_PA
3-2	U702 Pin#4	Logic High	3, 4	Check this pin 2, When Logic High, then DCS/PCS Mode. While Logic Low , GSM850 mode is operating.
		Logic Low	2, 5, 6, 7	

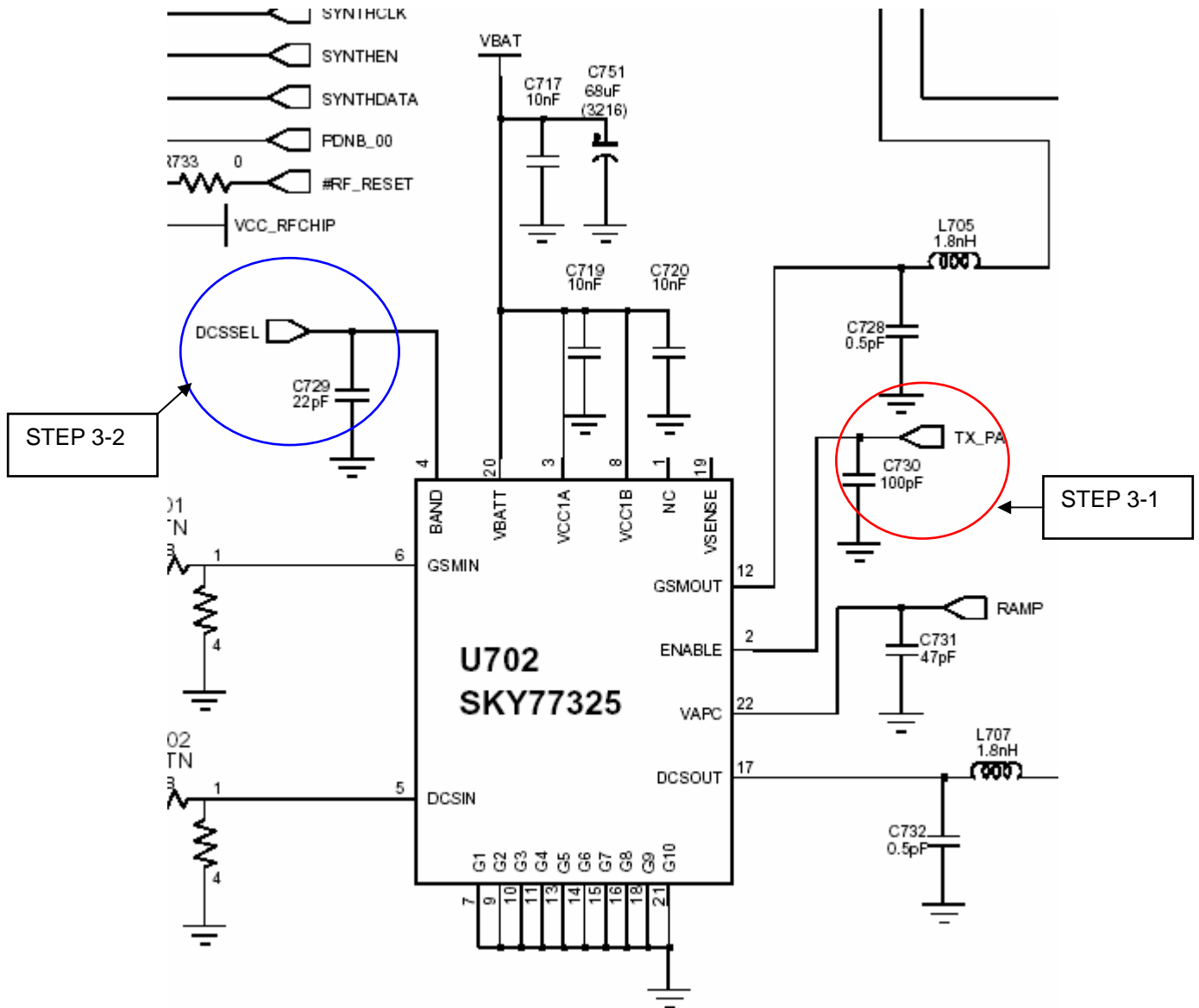


Fig.6-5. U702 PAM TX_PA and DCSSEL Test Point Circuit

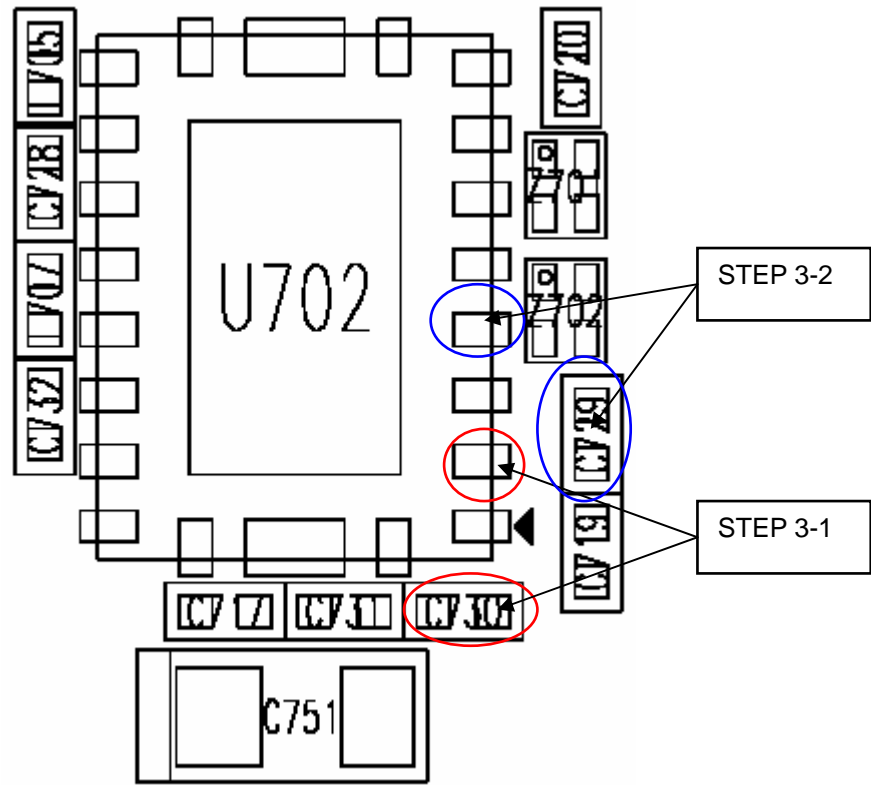


Fig.6-7. U303 PAM TXEN and DCSSEL Test Point on the PCB Layout

6.5.4 VCTCXO

Step	Test point	Typical Value	Condition	Reaction to Abnormality
4-1	U704 Pin#1	0.5V ~ 2.5V	1,2,3,4,5,6,7	Check route connection : AFC
4-2	U704 Pin#4	2.8V	1,2,3,4,5,6,7	Check route connection : VTCXO

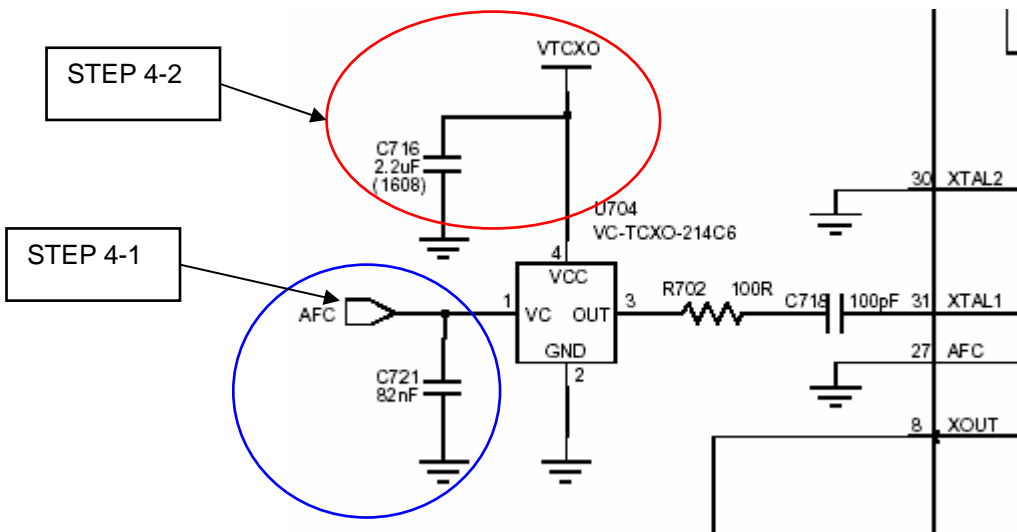


Fig.6-8. U302 VCTCXO Check Point Circuit

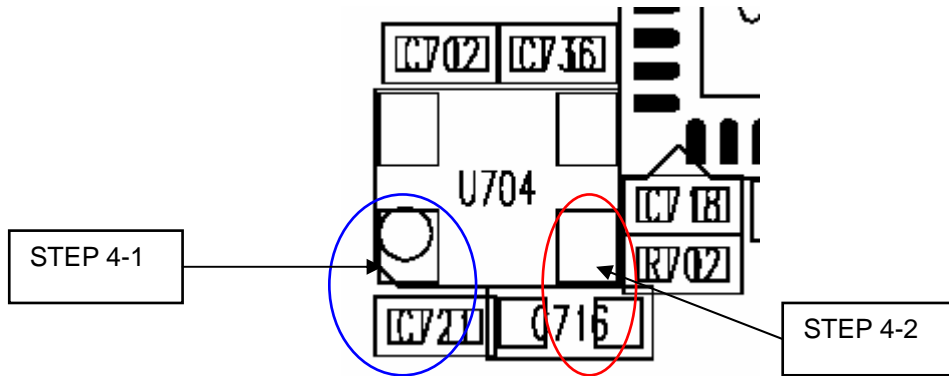


Fig.6-9. U704 VCTCXO Check Point on the PCB Layout

6.5.5 Front End Module

Step	Test point	Typical Value	Condition	Check point
5-1	U703 Pin#11	2.8V	2	Check route connection : GSMON (GSM850 Tx Mode)
5-2	U703 Pin#9,12	2.8V	3, 4	Check route connection : DCSON, PCSON (DCS/PCS Tx Mode)
5-3	U703 Pin#12	2.8V	7	Check route connection : PCSON (PCS Rx Mode)
5-4	U703 Pin#11,9,12	2.8V	5, 6	GSM850/DCS Rx Mode

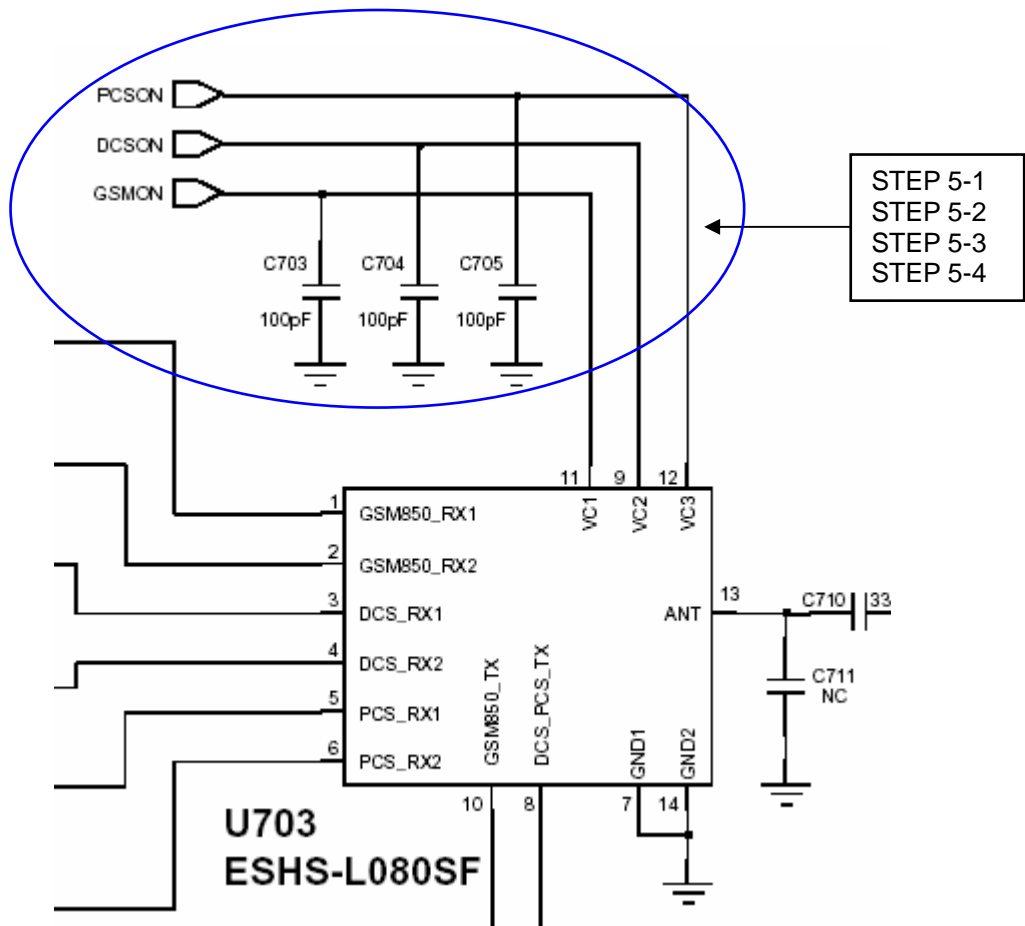


Fig. 6-10 U703 Front End Module Circuit

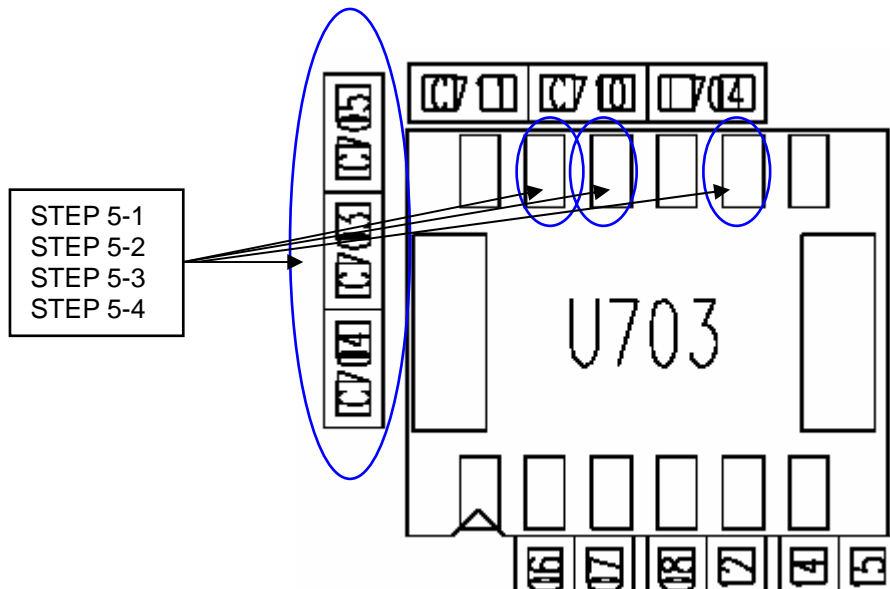


Fig. 6-11 U703 Front End Module PCB Layout