

# Features of Mobile Subscriber Radio Handset (LG-KD3000 Type)

## 1. Wave Type

- G7W

## 2. Frequency Scope

- Transmit Frequency : 824.820 ~ 848.190MHz
- Receive Frequency : 869.820 ~ 893.190MHz

## 3. Rated Output Power

- 0.282W(24.5dBm)

**4. Output Conversion Method** : This is possible by correcting the key board channel.

## 5. Voltage and Current Value of Termination Part Amplifier(Catalogue included)

Mode	Type Name	Voltage	Current	Power
CDMA	SKY77162	3.4V	455mA	0.282W

## 6. Functions of Major Semi-Conductors

Classification	Function
QSC6010	MSM baseband, radioOne RF, and power management.
MCP (PF38F2040W0YBQ0)	Flash Memory (64Mbit) Storing of the mobile station operation program
MCP (PF38F2040W0YBQ0)	PSRAM (32Mbit) Temporary storing of the data created while busy

## 7. Frequency Stability

- $\pm 0.5$ PPM





CDMA MOBILE SUBSCRIBER UNIT

***LG-KD3000***

***SERVICE MANUAL***

**SINGLE BAND  
CDMA MOBILE PHONE**

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## General Introduction

The LG-KD3000 cellular phone functions as digital cellular phone worked in CDMA (Code Division Multiple Access) mode.

CDMA mode applies the DSSS (Direct Sequence Spread Spectrum) technique that has been used in military. This technique enables to share one frequency channel with many users in the same specific area. As a result, that it increases the capacity 10 times more compared with that in the analog mode (AMPS) currently used.

Soft/Softer Handoff, Hard Handoff, and Dynamic RF power Control technologies are combined into this phone to reduce the call being interrupted in a middle of talking over phone.

CDMA digital cellular network consists of MSC (Mobile Switching Office), BSC (Base Station Controller), BTS (Base station Transmission System), and MS (Mobile Station). Communication between MS and BTS is designed to meet the specification of TIA/EIA/IS-95-A/B/C (Common Air Interface). MS meets the specifications of the below :

- TIA/EIA/IS-95-A/B/C (Common Air Interface) : Protocol between MS and BTS
- TIA/EIA/IS-96-B : Speech CODEC
- TIA/EIA/IS-98 : Basic MS functions
- IS-126 : Voice loopback
- TIA/EIA/IS-99 : Short Message Service, Asynchronous Data Service, and G3 Fax Service

LG-KD3000 is composed of a transceiver, a adapter, a Li-Polymer Battery.



# CHAPTER 1. System Introduction

## 1. System Introduction

### 1.1 CDMA Abstract

The cellular system has a channel hand-off function that is used for collecting the information on the locations and movements of radio mobile telephones from the cell site by automatically controlling several cell site through the setup of data transmission routes and thus, enabling one switching system to carry out the automatic remote adjustment. This is to maintain continuously the call state through the automatic location confirmation and automatic radio channel conversion when the busy subscriber moves from the service area of one cell site to that of another by using automatic location confirmation and automatic radio channel conversion functions. The call state can be maintained continuously by the information exchange between switching systems when the busy subscriber moves from one cellular system area to the other cellular system area.

In the cellular system, the cell site is a small-sized low output type and utilizes a frequency allocation system that considers mutual interference, in an effort to enable the re-use of corresponding frequency from a cell site separated more than a certain distance. The analog cellular systems are classified further into an AMPS system, E-AMPS System, NMT system, ETACS system, and JTACS system depending on technologies used.

Unlike the Time Division Multiple Access (TDMA) or the Frequency Division Multiple Access (FDMA) used in the band limited environment, the Code Division Multiple Access(CDMA) system which is one of digital cellular systems is a multi-access technology under the interference limited environment. It can process more number of subscribers compared to other systems (TDMA system has the processing capacity three times greater than the existing FDMA system whereas CDMA system, about 12~15 times of that of the existing system).

CDMA system can be explained as follows: TDMA or SDMA can be used to enable each person to talk alternately or provide a separate room for each person when two persons desire to talk with each other at the same time, whereas FDMA can be used to enable one person to talk in soprano, whereas the other in bass (one of the two talkers can carry out synchronization for hearing in case there is a bandpass filter function in the area of the hearer).

Another method available is to make two persons to sing in different languages at the same time, space, and frequency when wishing to let the audience hear the singing without being confused. This is the characteristics of CDMA.



On the other hand, when employing the CDMA technology, each signal has a different pseudo-random binary sequence used to spread the spectrum of carrier. A great number of CDMA signals share the same frequency spectrum. In the perspective of frequency area or time area, several CDMA signals are overlapped. Among these types of signals, only desired signal energy is selected and received through the use of pre-determined binary sequence; desired signals can be separated and then, received with the correlator used for recovering the spectrum into its original state. At this time, the spectrums of other signals that have different codes are not recovered into its original state and instead, processed as noise and appears as the self-interference of the system.



## 2. Features and Advantages of CDMA Mobile Phone

### 2.1 Various Types of Diversities

When employing the narrow band modulation (30kHz band) that is the same as the analog FM modulation system used in the existing cellular system, the multi-paths of radio waves create a serious fading. However, in the CDMA broadband modulation(1.25MHz band), three types of diversities (time, frequency, and space) are used to reduce serious fading problems generated from radio channels in order to obtain high-quality calls.

Time diversity can be obtained through the use of code interleaving and error correction code whereas frequency diversity can be obtained by spreading signal energy to more wider frequency band. The fading related to normal frequency can affect the normal 200~300kHz among signal bands and accordingly, serious affect can be avoided. Moreover, space diversity (also called path diversity) can be realized with the following three types of methods.

First, it can be obtained by the duplication of cell site receive antenna. Second, it can be obtained through the use of multi-signal processing device that receives a transmit signal having each different transmission delay time and then, combines them. Third, it can be obtained through the multiple cell site connection (Soft Handoff) that connects the mobile station and more than two cell sites at the same time.

### 2.2 Power Control

The CDMA system utilizes the forward (from a base station to mobile stations) and backward (from the mobile station to the base station) power control in order to increase the call processing capacity and obtain high-quality calls. In case the originating signals of mobile stations are received by the cell site in the minimum call quality level (signal to interference) through the use of transmit power control on all the mobile stations, the system capacity can be maximized.

If the signal of mobile station is received too strong, the performance of that mobile station is improved. However, because of this, the interference on other mobile stations using the same channel is increased and accordingly, the call quality of other subscribers is reduced unless the maximum accommodation capacity is reduced.

In the CDMA system, forward power control, backward open loop power control, and closed loop power control methods are used. The forward power control is carried out in the cell site to reduce the transmit power on mobile stations less affected by the multi-path fading and shadow phenomenon and the interference of other cell sites when the mobile station is not engaged in the call or is relatively nearer to the corresponding cell site. This is also used to provide additional power to mobile stations having high call error rates, located in bad reception areas or far away from the cell site.

The backward open loop power control is carried out in a corresponding mobile station; the mobile station measures power received from the cell site and then, reversely increases/decreases transmit power in order to compensate channel changes caused by the forward link path loss and terrain



characteristics in relation to the mobile station in the cell site. By doing so, all the mobile office transmit signals in the cells are received by the cell site in the same strength.

Moreover, the backward closed loop power control used by the mobile station to control power with the commands issued out by the cell site. The cell site receives the signal of each corresponding mobile station and compares this with the pre-set threshold value and then, issues out power increase/decrease commands to the corresponding mobile station every 1.25 msec (800 times per second).

By doing so, the gain tolerance and the different radio propagation loss on the forward/backward link are complemented.

## **2.3 Voice Encoder and Variable Data Speed**

The bi-directional voice service having variable data speed provides voice communication which employs voice encoder algorithm having power variable data rate between the mobile telephone cell site and mobile station. On the other hand, the transmit voice encoder performs voice sampling and then, creates encoded voice packets to be sent out to the receive voice encoder, whereas the receive voice encoder demodulates the received voice packets into voice samples.

One of the two voice encoders described in the above is selected for use depending on inputted automatic conditions and message/data; both of them utilize four-stage frames of 9600, 4800, 2400, and 1200 bits per second. In addition, this type of variable voice encoder utilizes adaptive threshold values when selecting required data rate. It is adjusted in accordance with the size of background noise and the data rate is increased to high rate only when the voice of caller is inputted.

Therefore, background noise is suppressed and high-quality voice transmission is possible under the environment experiencing serious noise. In addition, in case the caller does not talk, data transmission rate is reduced so that the transmission is carried out in low energy. This will reduce the interference on other CDMA signals and as a result, improve system performance (capacity, increased by about two times).

## **2.4 Protecting Call Confidentiality**

CDMA signals have the function of effectively protecting call confidentiality by spreading and interleaving call information in broad bandwidth. This makes the unauthorized use of crosstalk, search receiver, and radio very hard substantially. Also included is the encryption function on various authentication and calls specified in IS-95 for the double protection of call confidentiality.

## **2.5 Soft Handoff**

During the soft hand, the cell site already in the busy state and the cell site to be engaged in the call later participate in the call conversion. The call conversion is carried out through the original call





connection cell site, both cell sites, and then, new cell site. This method can minimize call disconnection and prevent the user from detecting the hand-off.

## **2.6 Frequency Re-Use and Sector Segmentation**

Unlike the existing analog cellular system, the CDMA system can reuse the same frequency at the adjacent cell and accordingly, there is no need to prepare a separate frequency plan. Total interference generated on mobile station signals received from the cell site is the sum of interference generated from other mobile stations in the same cell site and interference generated from the mobile station of adjacent cell site. That is, each mobile station signal generates interference in relation to the signals of all the other mobile signals.

Total interference from all the adjacent cell sites is the ratio of interference from all the cell sites versus total interference from other mobile stations in the same cell site (about 65%). In the case of directional cell site, one cell normally uses a 120 ° sector antenna in order to divide the sector into three. In this case, each antenna is used only for 1/3 of mobile stations in the cell site and accordingly, interference is reduced by 1/3 on the average and the capacity that can be supported by the entire system is increased by three times.

## **2.7 Soft Capacity**

The subscriber capacity of CDMA system is flexible depending on the relation between the number of users and service classes. For example, the system operator can increase the number of channels available for use during the busy hour despite the drop in call quality. This type of function requires 40% of normal call channels in the standby mode during the handoff support, in an effort to avoid call disconnection resulting from the lack of channels.

In addition, in the CDMA system, services and service charges are classified further into different classes so that more transmit power can be allocated to high class service users for easier call set-up; they can also be given higher priority of using hand-off function than the general users.



### 3. Structure and Functions of CDMA Mobile Phone

The mobile station of CDMA system is made up of a radio frequency part and logic/control (digital) part. The mobile station antenna is connected with the transmitter/receiver via a SAW duplexer filter so that it can carry out the transmit/receive function at the same time.

The transmit frequency is the 25MHz band of 824~849MHz, whereas the receive frequency is the 25MHz band of 869~894MHz. The transmit/receive frequency is separated by 45MHz. The RF signal from the antenna passes the LNA, bandpass SAW filter having the 1.25MHz band and then, is directly converted into baseband signal by the frequency synthesizer and frequency down converter. Baseband output signals that have been filtered from spurious signal are converted into digital signals via an analog-to-digital converter (Rx ADC) and then, sent out respectively to 5 correlators in each CDMA de-modulator. Of these, one is called a searcher whereas the remaining 4 are called data receiver (finger). Rx signals include a great number of call signals that have been sent out by the adjacent cells. These signals are detected with pseudo-noise sequence (PN Sequence). Signal to interference ratio (C/I) on signals that match the desired PN sequence are increased through this type of correlation detection process. Then, other signals obtain processing gain by not increasing the ratio. The carrier wave of pilot channel from the cell site most adjacently located is demodulated in order to obtain the sequence of encoded data symbols.

During the operation with one cell site, the searcher searches out multi-paths in accordance with terrain and building reflections. On three data receivers, the most powerful four paths are allocated for the parallel tracing and receiving. Fading resistance can be improved a great deal by obtaining the diversity combined output for de-modulation. Moreover, the searcher can be used to determine the most powerful path from the cell sites even during the soft handoff during the two cell sites. Moreover, four data receivers are allocated in order to carry out the de-modulation of these paths. Data output that has been demodulated change the data string in the combined data row as in the case of original signals (deinterleaving), and then, are de-modulated by the forward error correction decoder which uses the Viterbi algorithm.

On the other hand, mobile station user information sent out from the mobile station to the cell site pass through the digital voice encoder via a mike. Then, they are encoded and forward errors are corrected through the use of convolution encoder. Then, the order of code rows is changed in accordance with a certain regulation in order to remove any errors in the interleaver. Symbols made through the above process are spread after being loaded onto PN carrier waves. At this time, PN sequence is selected by each address designated in each call.

Signals that have been code spread as above are digital modulated (OQPSK) and then, power controlled at the automatic gain control amplifier (AGC Amp). Then, they are converted into RF band by the frequency synthesizer synchronizing these signals to proper output frequencies. Transmit signals obtained pass through the duplexer filter and then, are sent out to the cell site via the antenna.



## 4. Specification

### 4.1 General Specification

**4.1.1 Transmit/Receive Frequency Interval** : 45MHz

**4.1.2 Number of Channels (Channel Bandwidth)** : 20CH (BW : 1.23MHz)

**4.1.3 Operating Voltage** : DC 3.2~4.2V

**4.1.4 Battery Power Consumption** : DC 3.7V

	<b>SLEEP</b>	<b>IDLE</b>	<b>MAX POWER</b>
<b>CDMA</b>	1.2 mA	80 ~ 100 mA	580 mA (25dBm)

**4.1.5 Operating Temperature** : -30° ~ +60°

**4.1.6 Frequency Stability** : ± 0.5PPM

**4.1.7 Antenna** : Fixed PIFA Type (Internal), 50 Ω

#### 4.1.8 Size and Weight

- Size : 105.7 x 44 x 16.5mm (L x W x D)
- Weight : 70g(TBD)

**4.1.9 Channel Spacing** : 1.25MHz

#### 4.1.10 Battery Type, Capacity and Operating Time

Unit = Hours, Minutes

	<b>Standard (950mAh)</b>
<b>Stand-By Time</b>	140 Hrs (SCI=2)
<b>Talk Time</b>	145 Min (Cell power -92dBm)

### 4.2 Receive Specification

**4.2.1 Frequency Range** : 869.820 MHz ~ 893.190 MHz

**4.2.2 Local Oscillating Frequency Range** : 1738.08MHz ~ 1787.94MHz



**4.2.3 Intermediate Frequency** : QSC60X0 seires (Zero IF)

**4.2.4 Sensitivity** : -104dBm ( C/N 12dB or more)

**4.2.5 Selectivity** : 3dB C/N Degration (With Fch  $\pm$  1.25KHz : -30dBm)

**4.2.6 Spurious Wave Suppression** : Maximum of -80dB

**4.2.7 CDMA Input Signal Range**

- Dynamic area of more than -115~ -12.6 dB : 102.4dB at the 1.23MHz band

## **4.3 Transmit Specification**

**4.3.1 Frequency Range** : 824.820 MHz ~ 848.190 MHz

**4.3.2 Intermediate Frequency** : QSC60X0 seires (Zero IF)

**4.3.3 Output Power** : 0.282W

**4.3.4 Interference Rejection**

- Single Tone : -30dBm at 900 kHz
- Two Tone : -43dBm at 900 kHz & 1700kHz

**4.3.5 CDMA TX Frequency Deviation** :  $\pm$  300Hz or less

**4.3.6 CDMA TX Conducted Spurious Emissions**

- 900kHz : - 42 dBc/30kHz below
- 1.98MHz : - 54 dBc/30kHz below

**4.3.7 CDMA Minimum TX Power Control** : - 50dBm below



#### 4.4 MS (Mobile Station) Transmitter Frequency

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	824.640 MHz	11	404	837.120 MHz
2	29	825.870 MHz	12	445	838.350 MHz
3	70	827.100 MHz	13	486	839.580 MHz
4	111	828.330 MHz	14	527	840.810 MHz
5	152	829.560 MHz	15	568	842.04 MHz
6	193	830.790 MHz	16	609	843.270 MHz
7	234	832.020 MHz	17	650	844.500 MHz
8	275	833.250 MHz	18	697	845.910 MHz
9	316	834.480 MHz	19	738	847.140 MHz
10	363	835.890 MHz	20	779	848.370 MHz

#### 4.5 MS (Mobile Station) Receiver Frequency

FA NO.	CH.NO.	CENTER FREQUENCY	FA NO.	CH.NO.	CENTER FREQUENCY
1	1011	869.640 MHz	11	404	882.120 MHz
2	29	870.870 MHz	12	445	883.350 MHz
3	70	872.100 MHz	13	486	884.580 MHz
4	111	873.330 MHz	14	527	885.810 MHz
5	152	874.560 MHz	15	568	887.04 MHz
6	193	875.790 MHz	16	609	888.270 MHz
7	234	877.020 MHz	17	650	889.500 MHz
8	275	878.250 MHz	18	697	890.910 MHz
9	316	879.480 MHz	19	738	892.140 MHz
10	363	880.890 MHz	20	779	893.370 MHz

#### 4.6 Charge time

##### 4.6.1 Standard Battery : 200 Min.



## 5. Installation

### 5.1 Installing a Battery Pack (Soft Pack type)

- 1) The soft battery pack is keyed so it can only fit one way. Align the groove in the battery pack with the rail on the back of the phone until the battery pack rests flush with the back of the phone.
- 2) Insert the bottom of battery into the opening on the back of the phone. Then, push the battery cover up until the latch clicks.

### 5.2 For Adapter Use

- 1) Plug the adapter into a wall outlet. The adapter can be operated from either a 110V or a 220V source.
- 2) Insert the adapter jack into the phone with the installed battery pack.  
Red light indicates battery is being charged. Green light indicates battery is fully charged

### 5.3 For Mobile Mount

#### 5.3.1 Installation Position

In order to reduce echo sound when using the Hands-Free Kit, make sure that the speaker and microphone are not facing each other and keep microphone a generous distance from the speaker.

#### 5.3.2 Cable Connections

##### 5.3.2.1 Power and Ignition Cables

Connect the red wire to the car battery positive terminal and the black wire to the car ground. Connect the green wire to the car ignition sensor terminal. ( In order to operate HFK please make sure to connect green wire to ignition sensor terminal.) Connect the kit's power cable connector to the interface box power receptacle.

##### 5.3.2.2 Antenna Cable Connection

Connect the antenna coupler cable connector from the cradle to the external antenna connector. ( Antenna is not included.)



## CHAPTER 2. NAM Input Method (Inputting of MIN included)

### 1. HOW TO POWER UP

1. Press power key.
2. You have to input correct PIN code[Default Code: 0000], then press [OK] key.
3. Handset start data loading process, and then searching signal.

### 2. NAM Input Method (Inputting of telephone numbers included)

#### 1. Telephone Number and NAM Programming Method

- Press # # # #

Then, the following Menu is appeared.

1 : Service Program  
2 : Test Calls  
3 : CDG Test  
4 : Field Menu  
5 : Applications

- Press 1: Service Mode to program MIN and NAM.

1. ESN  
2. MIN  
3. NAM Name  
4. Security Code  
5. MCC  
6. NMSID  
7. IMSI\_T MCC  
8. IMSI\_T NMSID  
9. PRL Enabled  
10. MDN  
11. CDMA Home SID  
12. CDMA Home NID

13. CDMA Pri.ChA  
14. CDMA Sec.ChA  
15. CDMA Pri.ChB  
16. CDMA Sec.ChB  
17. Lockout SID  
18. Lockout NID  
19. Home SID Reg  
20. Forn SID Reg  
21. Forn NID Reg  
22. ACCOLC  
23. Phone Model  
24. Slot Cycle Index

- Press a number what you want to edit.
- Press [edit] to edit, after input, press [OK] to save
- To reset the handset, press [END]



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## CHAPTER 3. Circuit Description

### 1. RF Transmit/Receive Part

#### 1.1 Overview

The RF transmit/receive part employs the direct conversion architecture (ZIF, Zero Intermediate Frequency). The transmit/receive frequency is respectively 824.04~848.97MHz and 869.04~893.97 MHz. The block diagram is shown in [Figure 3-1].

RF signals received through the antenna are fed QSC6010 through the duplexer. And then, they pass the low noise amplifier (LNA), combined with the signals of local oscillator (VCO) at the frequency mixer in order to create baseband signal directly.

Baseband signals created are changed into digital signals by the analog / digital converter (ADC, A/D Converter) and then, auto gain controlled and, are demodulated by the modulator / demodulator.

In the case of transmission, QSC6010 modulates, interpolates, and converts the digital signal into an analog baseband before upconverts the Tx analog baseband into RF.

The baseband quadrature signals are upconverted to the Cellular Tx frequency bands and amplified to provide signal drive capability to the power amp.

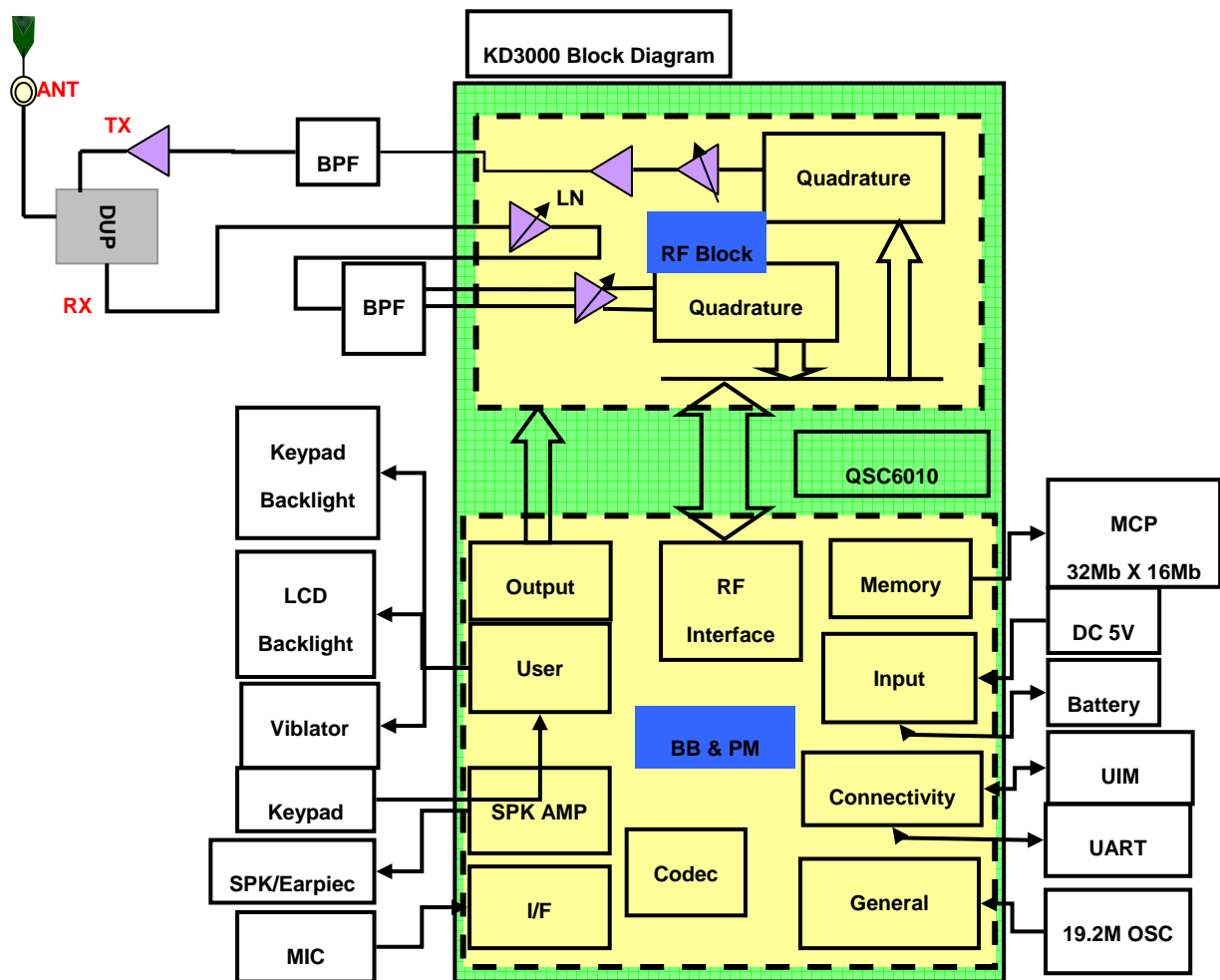
After that, the RF signal is amplified by the Power Amp in order to have enough power for radiation.

Finally, the RF signal is sent out to the cell site via the antenna after going through the duplexer





[Figure 3-1] Block Diagram Of KD3000



## 1.2 Description of Receive Part Circuit

### 1.2.1 Duplexer (DP101)

The duplexer consists of the receive part bandpass filter (BPF) and the transmit part bandpass filter (BPF) which have the function of separating transmit/receive signals in the full duplex system using the transmit/receive common antenna. The transmit part BPF is used to suppress noises and spurious waves entering the receive band among transmit signals in order to prevent the drop in receive sensitivity characteristics. The receive part BPF blocks the signals sent out from entering the receive end in order to improve sensitivity characteristics.

Insertion loss (IL) in the transmit band is 2.8dB (Max), whereas IL in the receive band is 3.5dB (Max).

The receive band attenuation amount of transmit filter is 45dB (Min) and the transmit band attenuation



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amount of receive filter is 57dB or more (Min).

### **1.2.2 Rx RF SAW FILTER (F101)**

The main function of Rx RF SAW filter is to attenuate mobile phone spurious frequency, attenuate noise amplified by the LNA and suppress second harmonic originating in the LNA.

### **1.2.3 Down-Converter Mixers (U201)**

The QSC6010 device performs signal direct-down-conversion for Cellular applications. It contains all the circuitry (with the exception of external filters) needed to support conversion of received RF signals to baseband signals. The LO Buffer Amplifier buffers the RF VCO to the RF Transmit Upconverter. QSC6010 offers the most advanced and integrated CDMA Rx solution designed to meet cascaded Noise Figure (NF) and Third-order Intercept Point (IIP3) requirements of IS-98C and J-STD-018 specifications for Sensitivity, Two-Tone Intermodulation, and Single-tone Desense. Operation modes and band selection are specially controlled from the Mobile Station Modem QSC6010.

## **1.3 Description of Transmit Part Circuit**

### **1.3.1 Description on the Internal Circuit of QSC6010(U201)**

For the transmit data path(Tx), the QSC6010 modulates, interpolates, and converts the digital signal into an analog baseband, and upconverts the Tx analog baseband into RF. The QSC6010 communicates with the external RF and analog baseband to control signal gain in the RF Rx and Tx signal paths, reduce base band offset errors, and tune the system frequency reference.

The QSC6010 baseband-to-RF Transmit Processor performs all Tx signal-processing functions required between digital baseband and the Power Amplifier Module (PAM). The baseband quadrature signals are upconverted to the Cellular frequency bands and amplified to provide signal drive capability to the PAM. The QSC6010 includes an mixer for up-converting analog baseband to RF, a programmable PLL for generating Tx and Rx LO frequency, cellular driver amplifier and Tx power control. As added benefit, the single sideband upconversion eliminates the need for a band-pass filter normally required between the upconverter and driver amplifier.

I, I/, Q and Q/ signals are modulated by Offset Quadrature Phase Shift Keying (OQPSK). I and Q are 90 deg. out of phase, and I and I/ are 180 deg. The mixer in QSC6010 converts baseband signals into RF signals. After passing through the upconverters, RF signal is inputted into the Power Amplifier Module.



The QSC6010 Cellular CDMA RF specifications are described below:

	Condition	Min.	Typ.	Max.	Unit
<b>Maximum Output Power</b>		28			dBm
<b>Noise power</b>	869-894 MHz, all power levels			-135.0	dBm/Hz
<b>ACPR</b>	$\pm 885\text{kHz}$ , < 2:1 VSWR			-44	dBc
	$\pm 1.98\text{MHz}$ , < 2:1 VSWR			-57	dBc

### 1.3.2 Power Amplifier (U102)

The power amplifier that can be used in the CDMA mode has linear amplification capability.

For higher efficiency, it is made up of one module (Monolithic Microwave Integrated Circuit) for which RF input terminal and internal interface circuit are integrated onto one IC after going through the GaAs HBT (heterojunction bipolar transistor) process.

The module of power amplifier is made up of an output end interface circuit including this module.

The maximum power that can be inputted through the input terminal is 8dBm and conversion gain is about 28.5dB. RF transmit signals that have been amplified through the power amplifier are sent to the duplexer.

## 1.4 Description of Frequency Synthesizer Circuit

### 1.4.1 Crystal Oscillator (X202)

Crystal Unit generates the reference frequency of 19.2MHz. Tolerance at 25°C is  $\pm 12 \times 10^{-6}$   
Max.Tolerance over the tmperature range is  $\pm 12 \times 10^{-6}$  Max. at -30 to 85°C



## 2. Digital/Voice Processing Part

### 2.1 Overview

The digital/voice processing part processes the user's commands and processes all the digital and voice signal processing in order to operate in the phone. The digital/voice processing part is made up of a keypad/LCD, receptacle part, voice processing part, mobile station modem part, memory part, and power supply part.

### 2.2 Configuration

#### 2.2.1 Keypad/LCD and Receptacle Part

This is used to transmit keypad signals to QSC6010. It is made up of a keypad backlight part that illuminates the keypad, LCD part that displays the operation status on to the screen, and a receptacle that receives and sends out voice and data with external sources.

#### 2.2.2 Voice Processing Part

The voice processing part is made up of an audio codec in QSC6010 used to convert MIC signals into digital voice signals and other external MIDI Synthesizer used to convert digital voice signals into analog voice signals, amplifying parts for amplifying the voice signals and MIC signals are on external MIDI Synthesizer and Codec in QSC6010.

#### 2.2.3 QSC6010 (Mobile Station Modem) Part

QSC6010 is the core elements of a CDMA mobile station and carries out the functions of CPU, encoder, interleaver, deinterleaver, Viterbi decoder, Mod/Demod, codec, and vocoder. with RF, and PA module

#### 2.2.4 Memory Part

The memory part is made up of a flash memory, SRAM for storing data.



## 2.3 Circuit Description

### 2.3.1 Keypad/LCD and Receptacle Part

Once the keypad is pressed, the key signals are sent out to QSC6010 for processing. In addition, when the key is pressed, the keypad lights up through the use of 8 LEDs and LCD backlights up. The status and operation of a mobile station are displayed on the screen for the user with the characters and icons on the LCD.

Receptacle(CON404) exchanges audio signals and data with external sources and external power. Battery Connector receives power from the battery.

### 2.3.2 QSC Part

The baseband circuits and system software incorporate a low-power, high-performance RISC microprocessor core featuring the ARM926EJ-S™ CPU and Jazelle™ accelerator circuit from ARM® Limited. There are two low-power, high-performance QDSP4000™ digital signal processor (DSP) cores, one for the modem and one for applications. Camera functions are supported by the QSC6030 device only, and MIDI and MP3 functions are supported by the various QSC tiers as indicated in Table 1-2.

The baseband function reduces part costs by using two external bus interfaces to support next-generation memory architectures such as NAND FLASH, SRAM and pseudo SRAM (PSRAM), page and burst mode NOR or MLC NOR FLASH. The EBI2 also serves as an enhanced LCD interface.

A variety of connectivity options are supported: the keypad interface and USB, UART, and RUIM ports are available.

A camera interface is provided; this feature is available in the QSC6030 device only (not the QSC6020 or QSC6010 devices).

Audio support supplements the analog/RF function's CODEC, including up to 32- polyphonic MIDI in the QSC6010 device, MP3, AAC and AAC+ decoding support in the QSC6020 and QSC6030 devices and additionally a Compact Media Extension (CMX™)/MIDI synthesizer, and QCELP®.

The CDMA air interfaces mentioned earlier are implemented on the baseband CDMA processor. All necessary interfaces to the RF functions are provided, some using a portion of the 57 GPIOs. Many of the AMSS-configurable GPIOs are available for alternate uses as desired by the wireless product designers.



Support circuitry and baseband internal functions include security, clock generation and distribution, JTAG/ETM test interfaces, mode and reset controls, and the Q-fuse.

### **2.3.2.1 Audio Processing Part**

MIC signals are inputted into the audio codec, and amplified with programmable gain, and converted into digital signals(PCM). Then, they are inputted into QSC6010.

In addition, digital audio signals(PCM) outputted from QSC6010 are converted into analog signals after going through the audio codec. These signals are amplified with programmable gain on codec's internal AMP and external MIDI Synthesizer, transferred to the ear-piece.

### **2.3.3 Memory Part**

The memory part consists of a 64Mbits Flash Memory and a 32Mbits SRAM. On the Flash Memory, there are programs used for the operation of a mobile station and the non-volatile data of the mobile station such as a ESN(Electronic Serial Number) are stored. The programs can be changed through down loading after the assembling of mobile stations. On the SRAM, data generated during the operation of a mobile station are stored temporarily.

### **2.3.4 Power Supply Part**

When the battery voltage (+4.2V) is fed and the PWR key of keypad is pressed, the power-up circuitry in QSC6010(U201) is activated by the PWR\_ON\_SW/ signal, and then the LDO regulators embedded in QSC6010 are operated and +2.80V\_MSMC, +2.85V\_MSMP and +2.6V\_MSMA are generated.



### **2.3.5 Logic Part**

The Logic part consists of internal CPU of QSC6010, MCP (SRAM+FLASH ROOM).

The QSC6010 receives X-tal(19.20MHz) clock signals, and then controls the phone during the CDMA mode. The major components are as follows:

CPU : ARM926EJ-S microprocessor core

MEMORY :

- FLASH ROM : 64Mbits (U301, PF38F2040W0YBQ0)
- STATIC RAM : 32Mbits (U301, PF38F2040W0YBQ0)

#### **CPU**

The ARM7TDMI 32-bit microprocessor is used and CPU controls all the circuitry. Some of the features of the ARM microprocessor include a 3 stage pipelined RISC architecture, both 32-bit ARM and 16-bit THUMB instruction sets, a 32-bit address bus, and a 32-bit internal data bus. It has a high performance and low power consumption.

#### **FLASH ROM and SRAM**

Flash Memory is used to store the program of the mobile station. Using the down-loading program, the program can be changed even after the mobile station is fully assembled.

SRAM is used to store the internal flag information, call processing data, and timer data.

#### **KEYPAD**

For key recognition, key matrix is setup using KEY\_SENSE[0]-[4] signals and GPIO of output ports of QSC6010. 8 LEDs and backlight circuitry are included in the keypad for easy operation in the dark.

#### **LCD MODULE**

LCD module contains a controller which will display the information onto the LCD by 16-bit data from the QSC6010. It is also supplied stable 1.8V\_MSM\_E1 by inner regulator in U201 for fine view angle and and LCD reflects to improve the display efficiency.

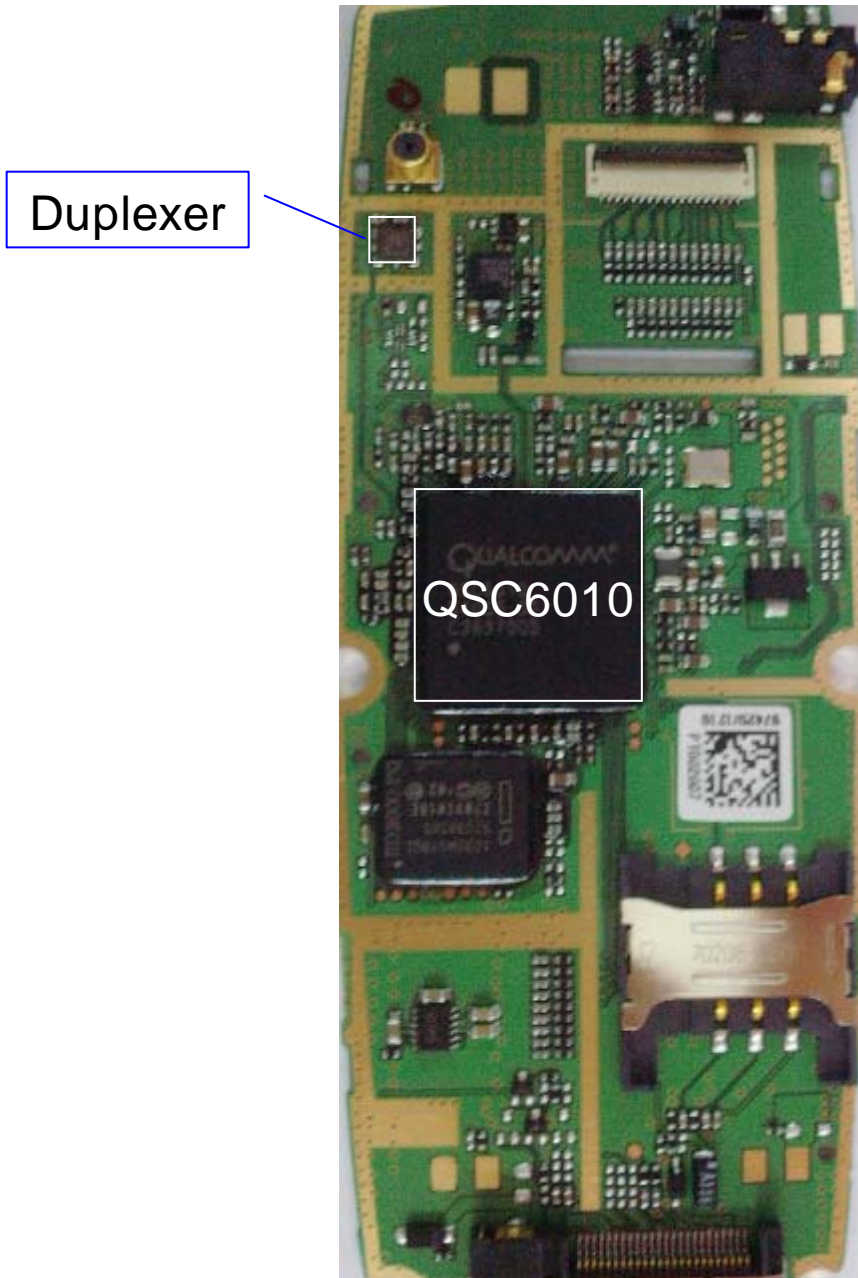


# CHAPTER 4. Trouble Shooting

## 4.1 Rx Part Trouble

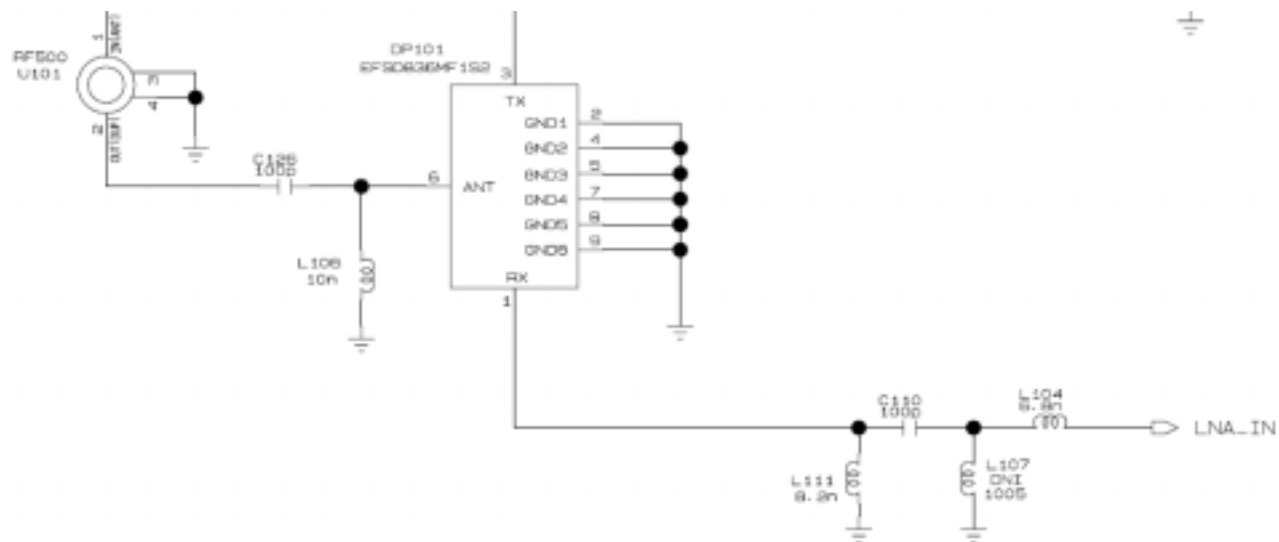
When Rx Sensitivity isn't good enough

Test Point

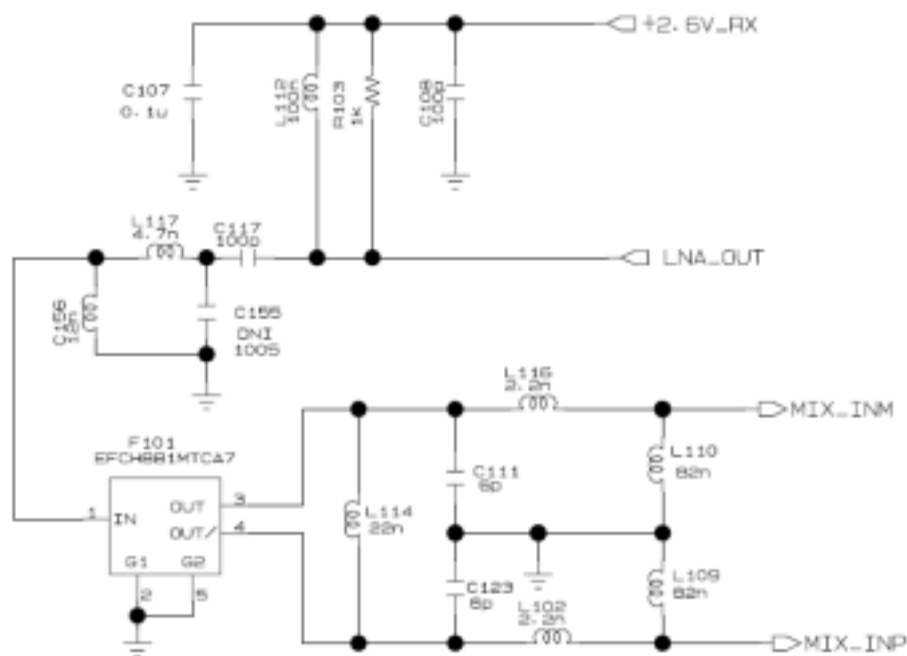




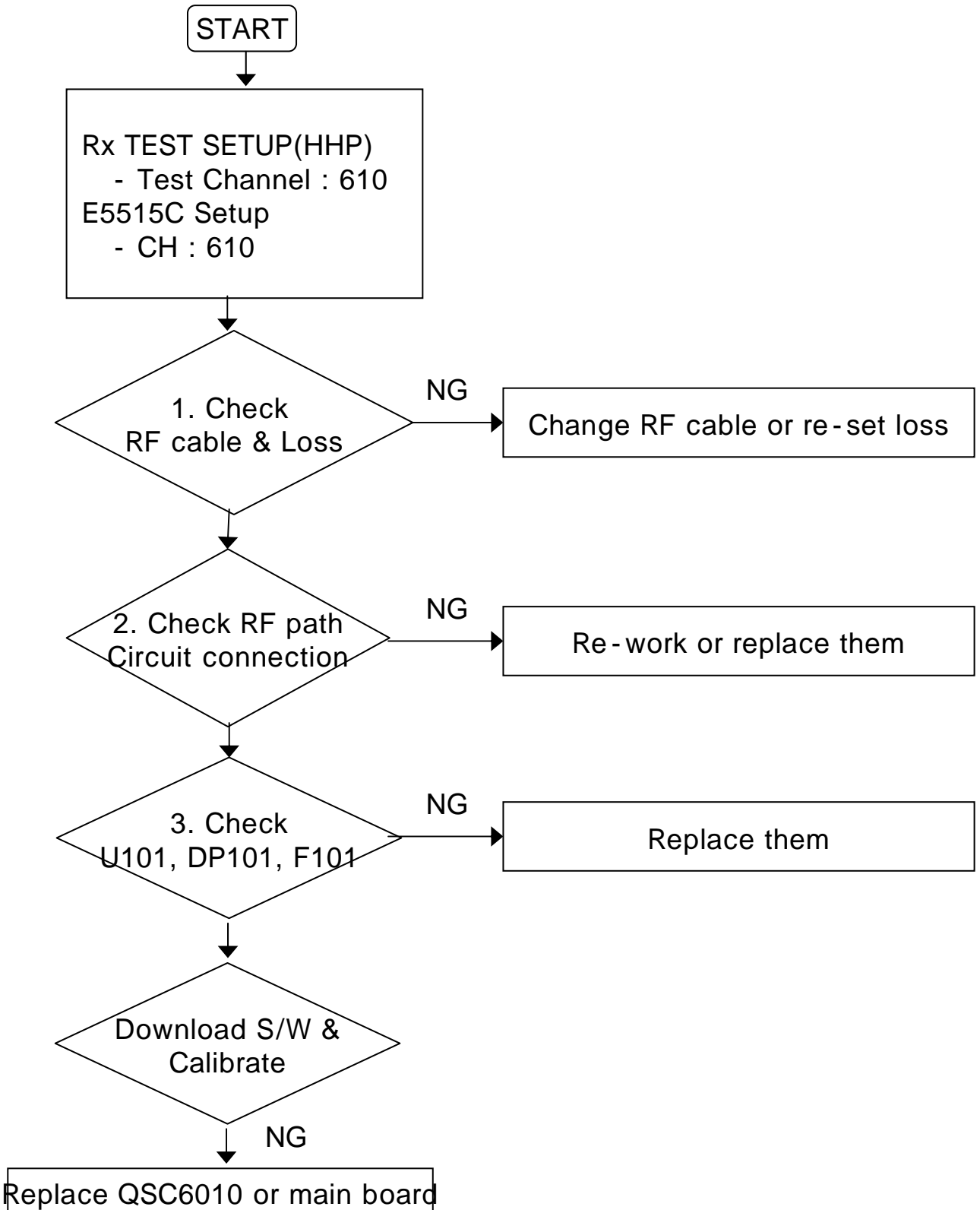
# Circuit Diagram



## < RF RX PATH >

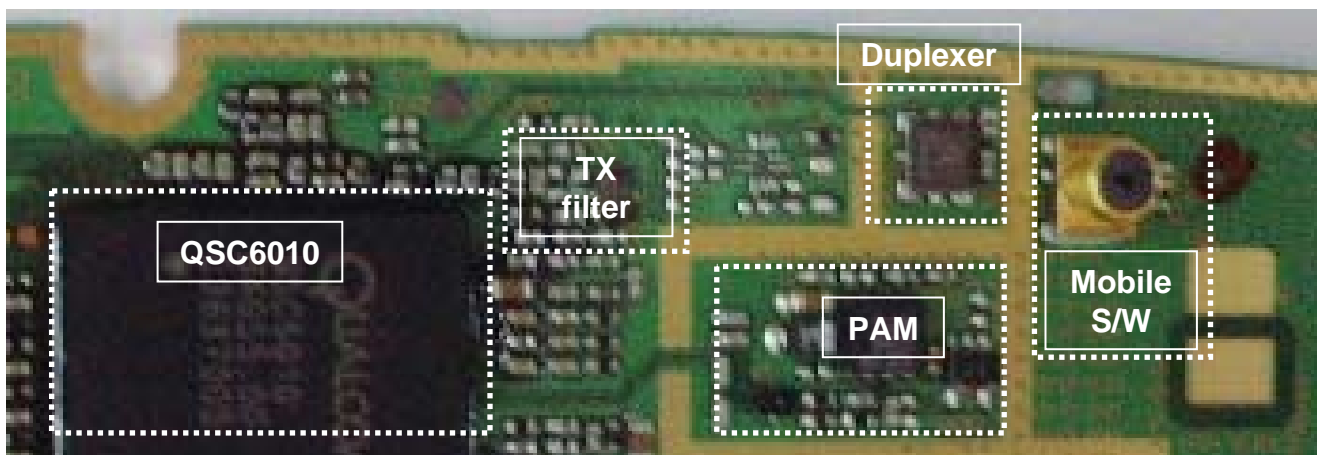


## Checking Flow

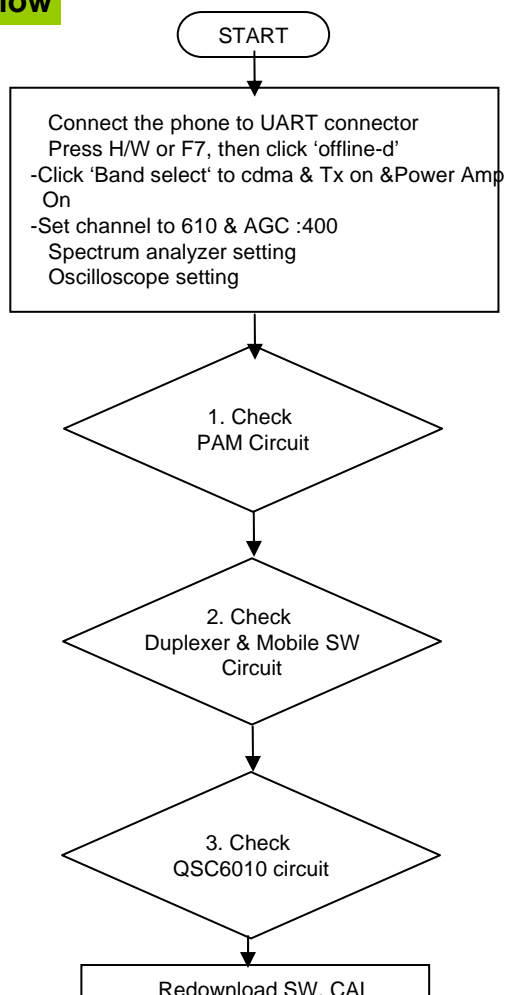


## 4.2 Tx Trouble

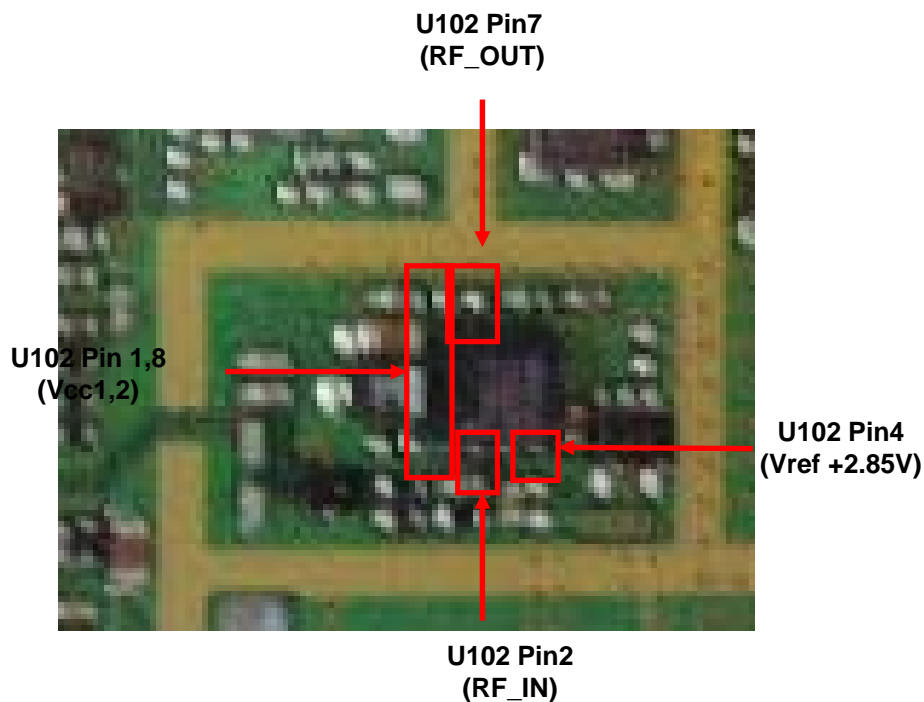
### Test Point



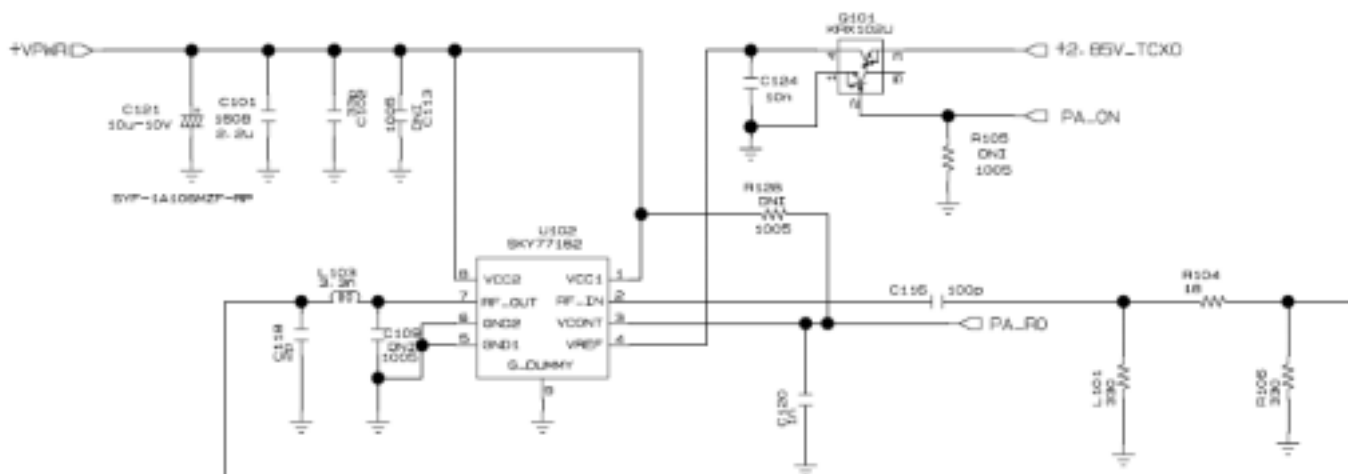
### Checking Flow



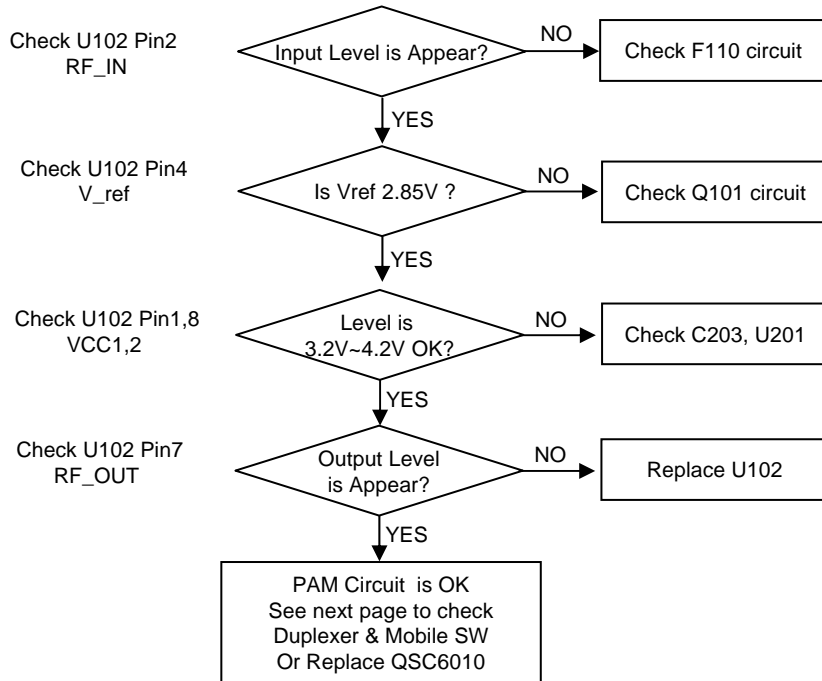
## Test Point



## Circuit Diagram



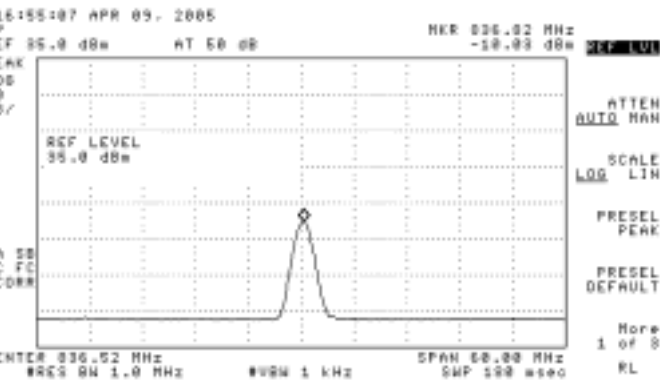
## Circuit Flow



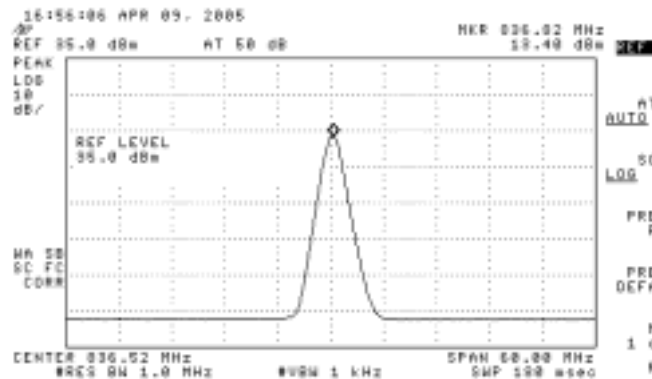
## Waveform

### SPECTRUM ANALYZER CONDITION

- RBW : 1MHz,VBW: 1KHz
- Span : 60MHz
- Frequency : DCN( 836.52MHz)



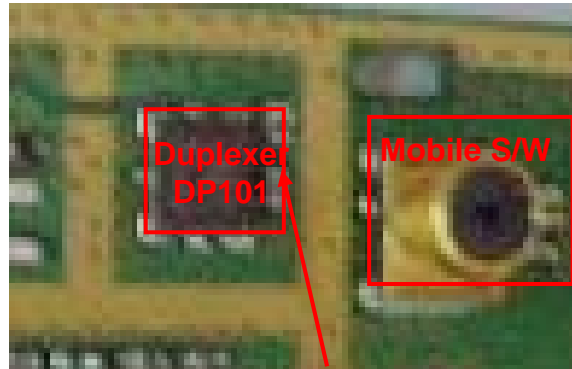
U102 Pin2 DCN PAM\_IN



U102 Pin7 DCN PAM\_OUT

## 4.2.2 Check Duplexer & Mobile SW

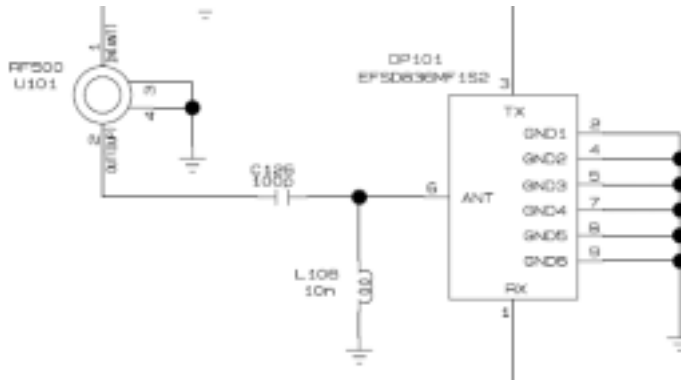
### TEST POINT



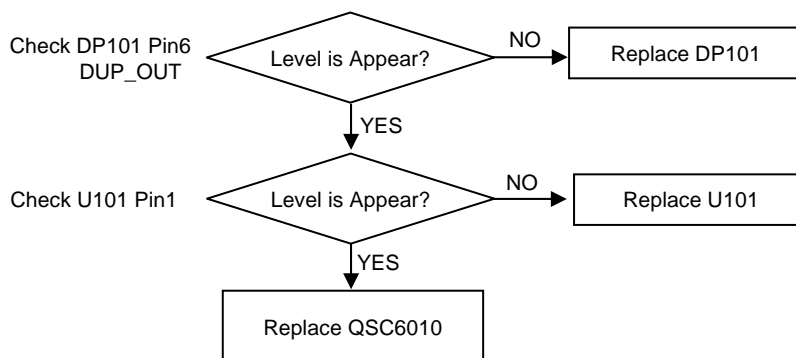
U101 PIN1  
Mobile S/W in

DP101 PIN6  
DP\_out

### Circuit Diagram

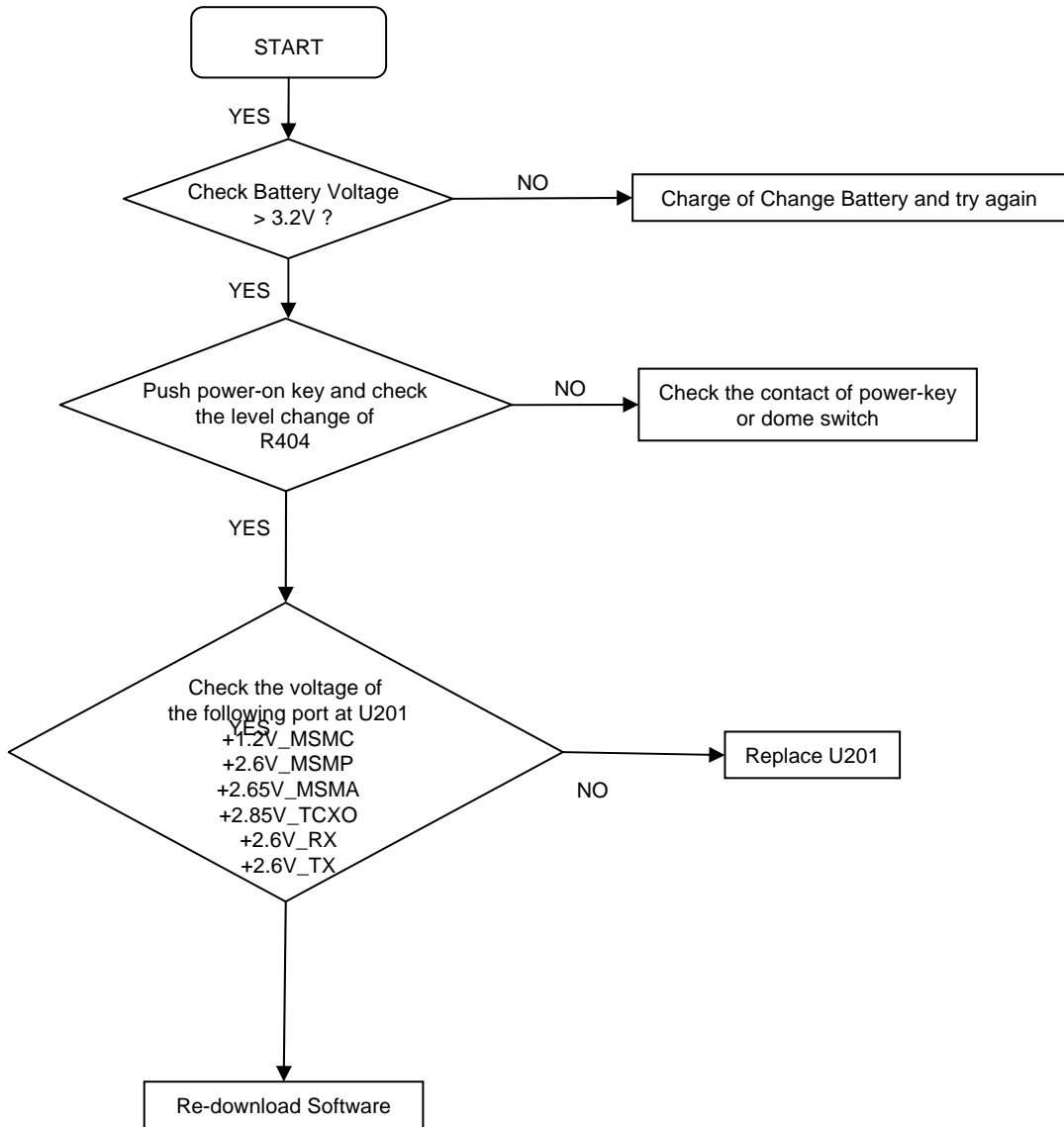


### Circuit Flow





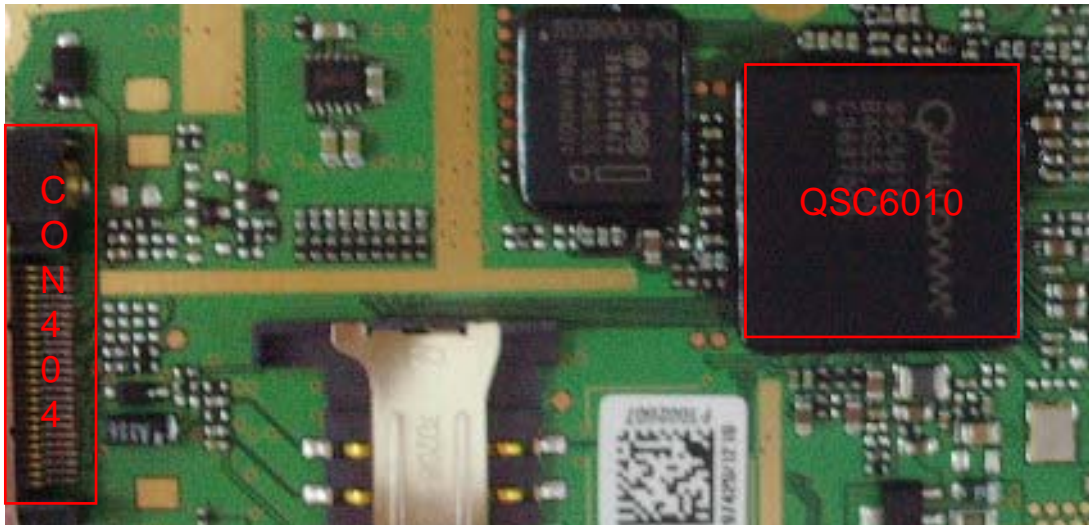
## Checking Flow



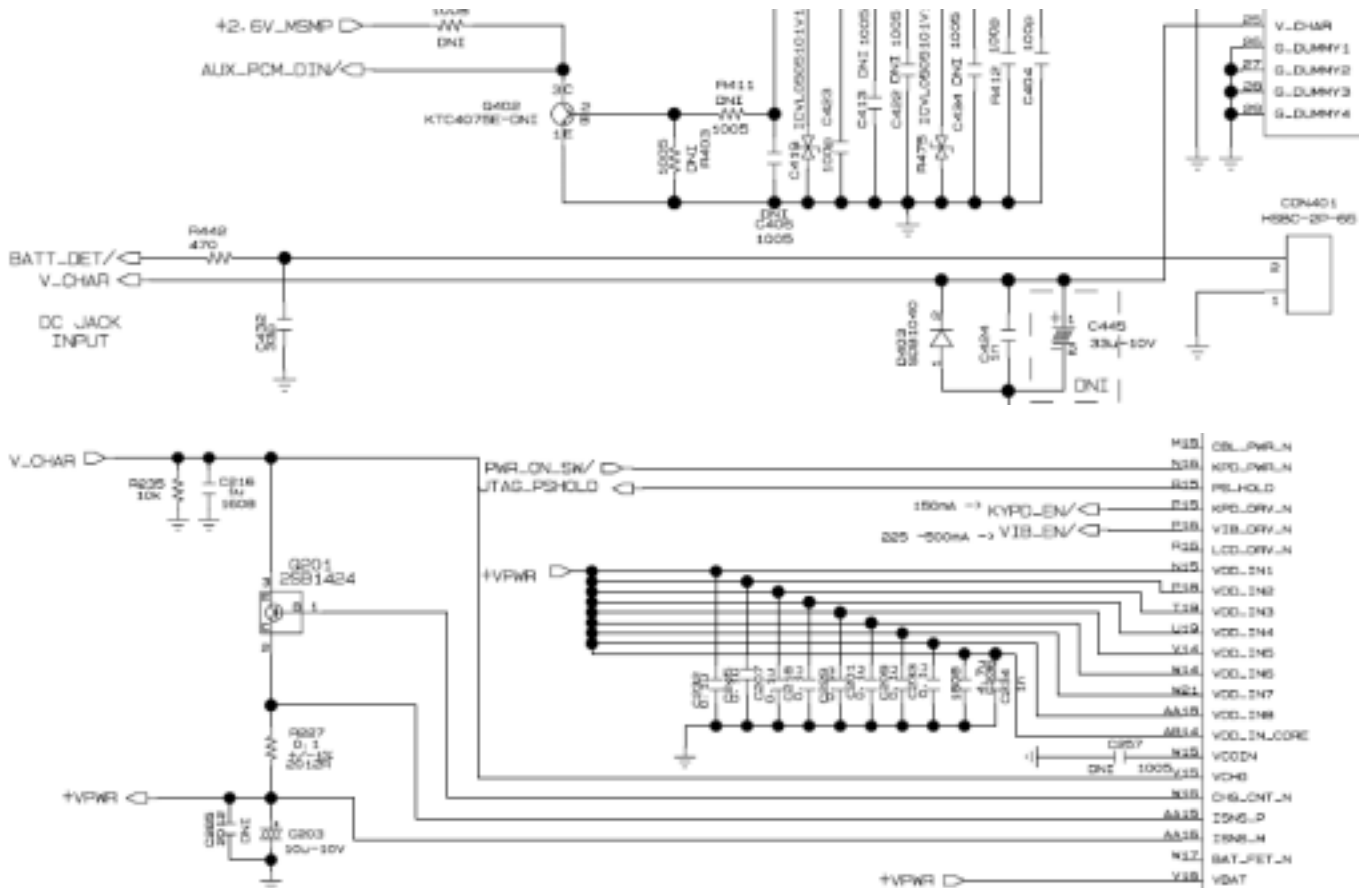


### 4.3.2 Charging Trouble

## Test Points

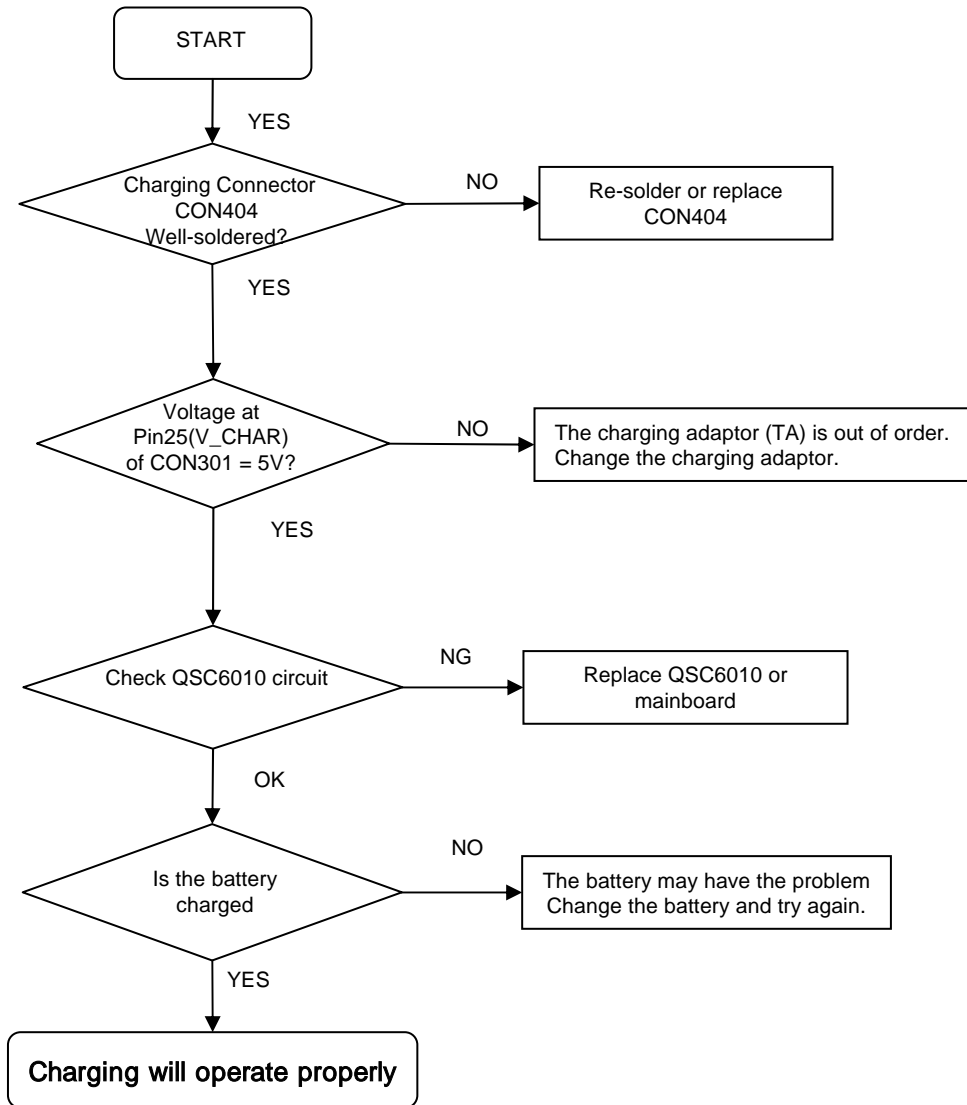


## Circuit Diagram



## Checking Flow

**SETTING : Connect the battery and the charging adaptor (TA) to the phone**



4.3.3 Audio AMP Trouble

Test Points

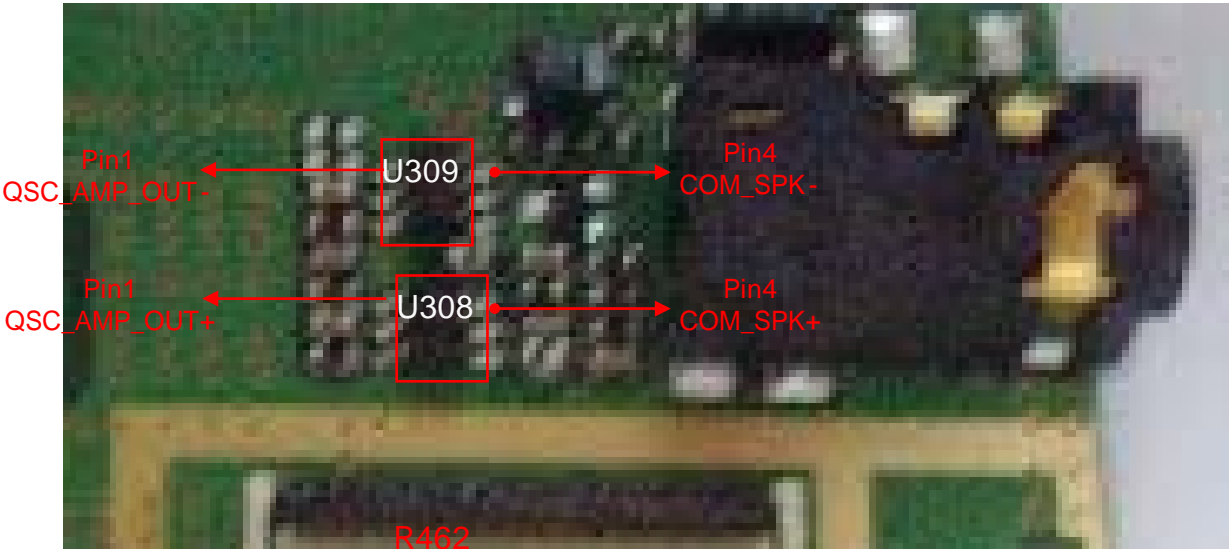
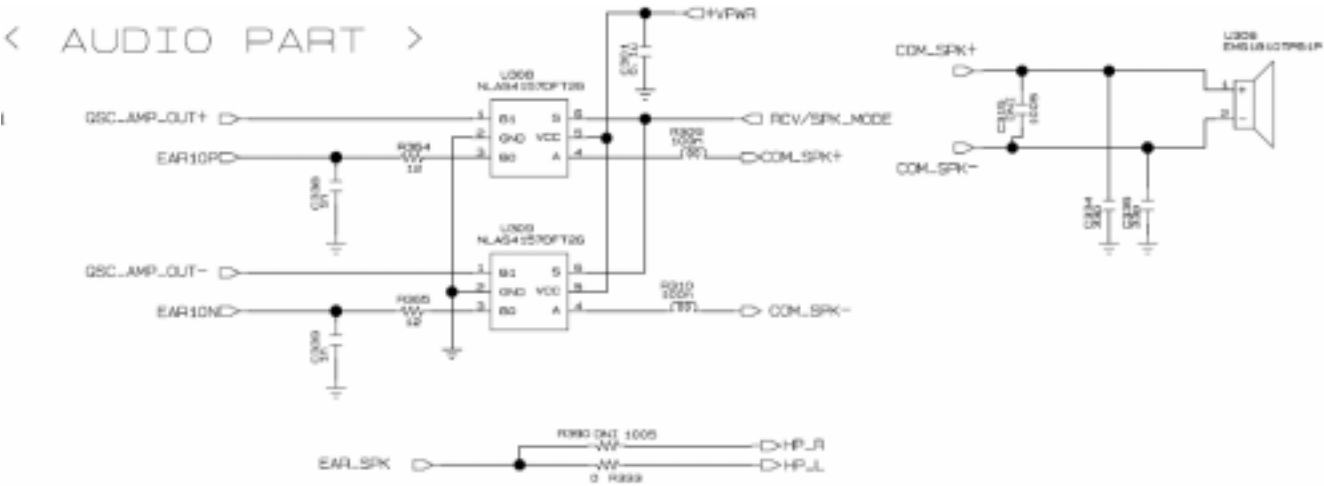


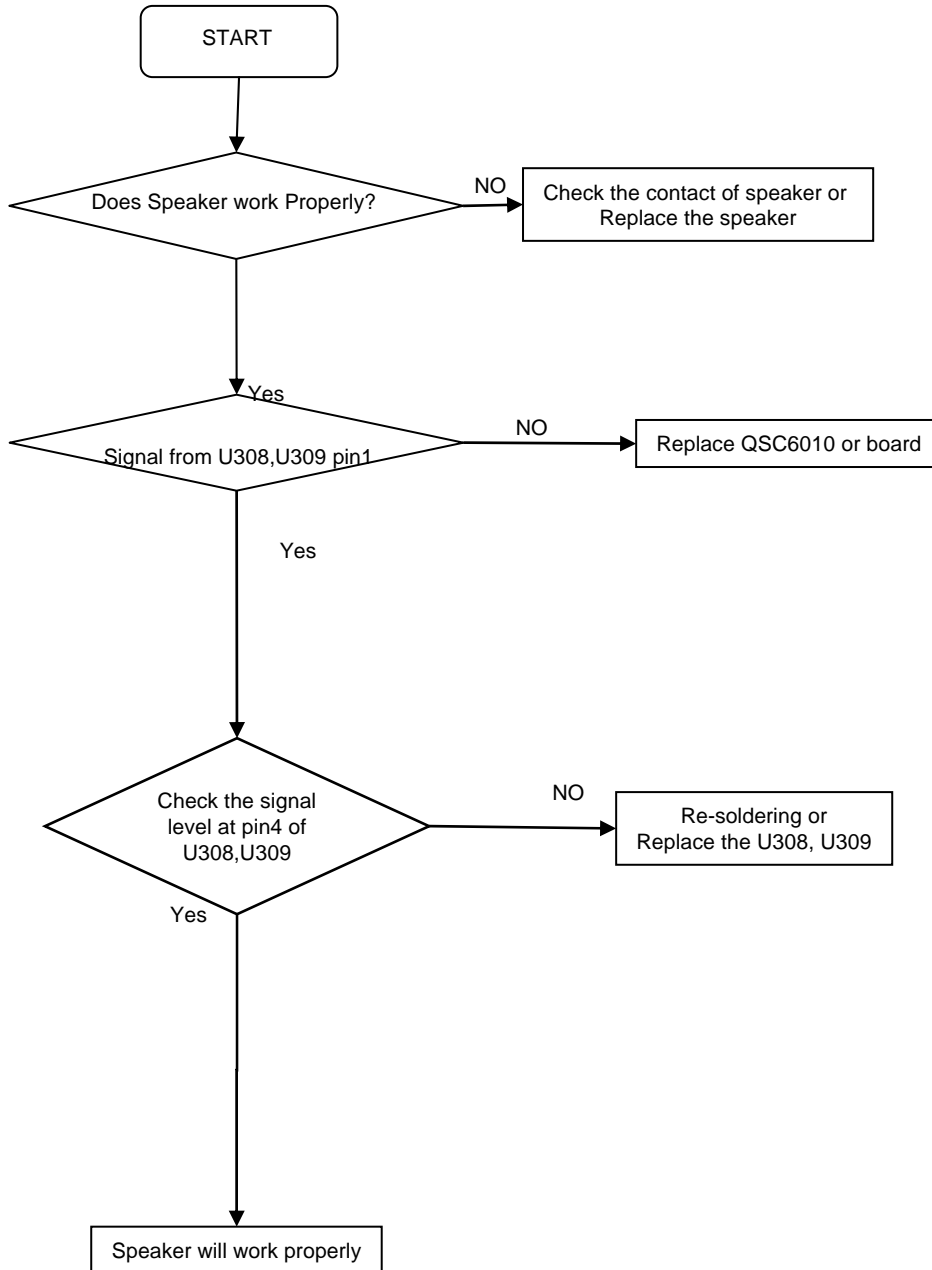
Figure 4.3.3 RECEIVER PART

Circuit Diagram



## Checking Flow

### SETTING : “Ringers” at Sounds menu



4.3.6 MIC Trouble

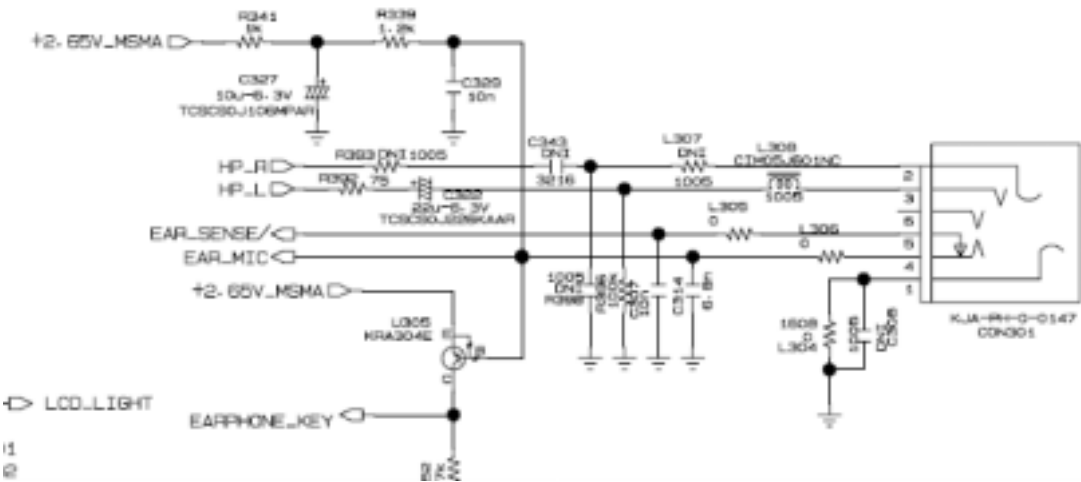
Test points



Circuit Diagram

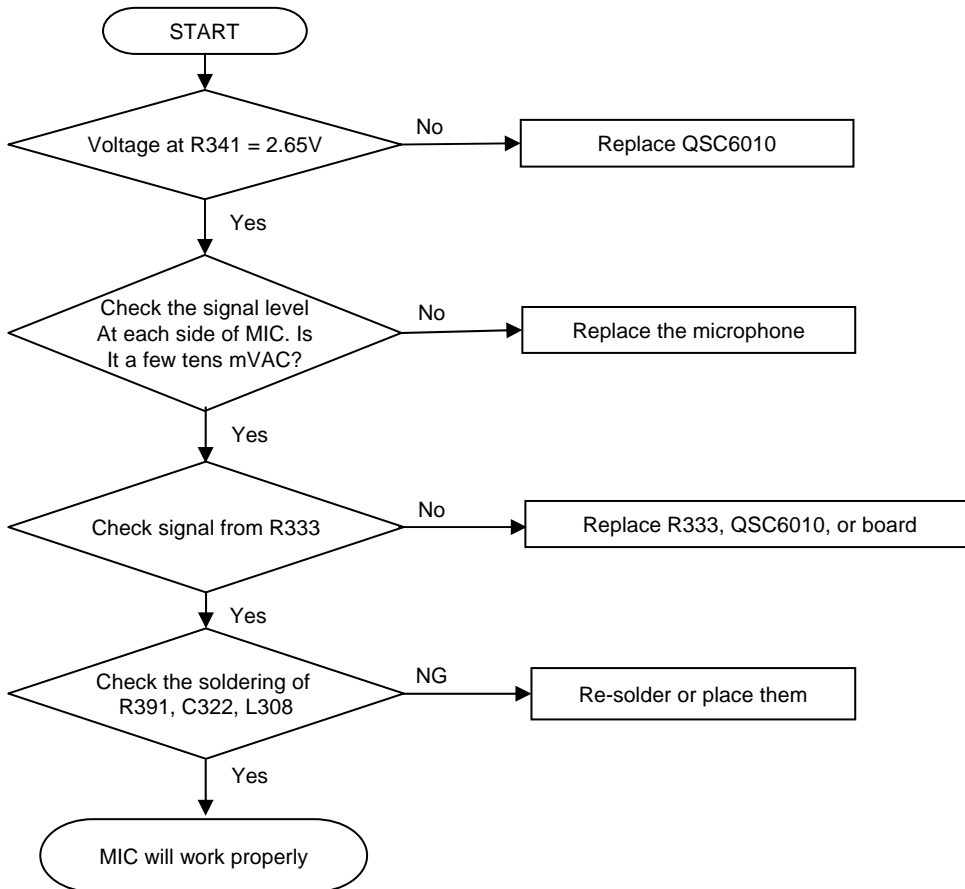


<EAR MIC JACK>



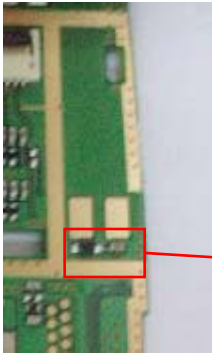
## Checking Flow

**SETTING : After initialize 5515C, Test US Cellular**



### 4.3.7 Vibrator Trouble

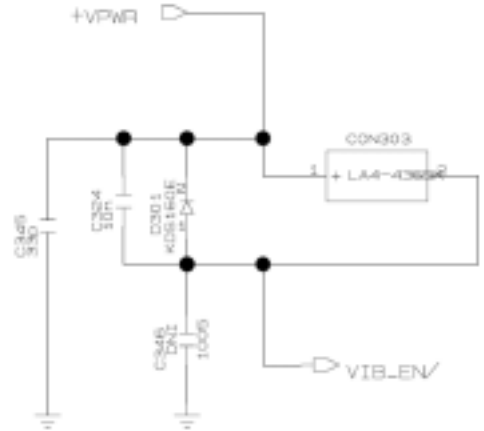
## Test points



D301, C324

## Circuit Diagram

&lt; MOTOR &gt;

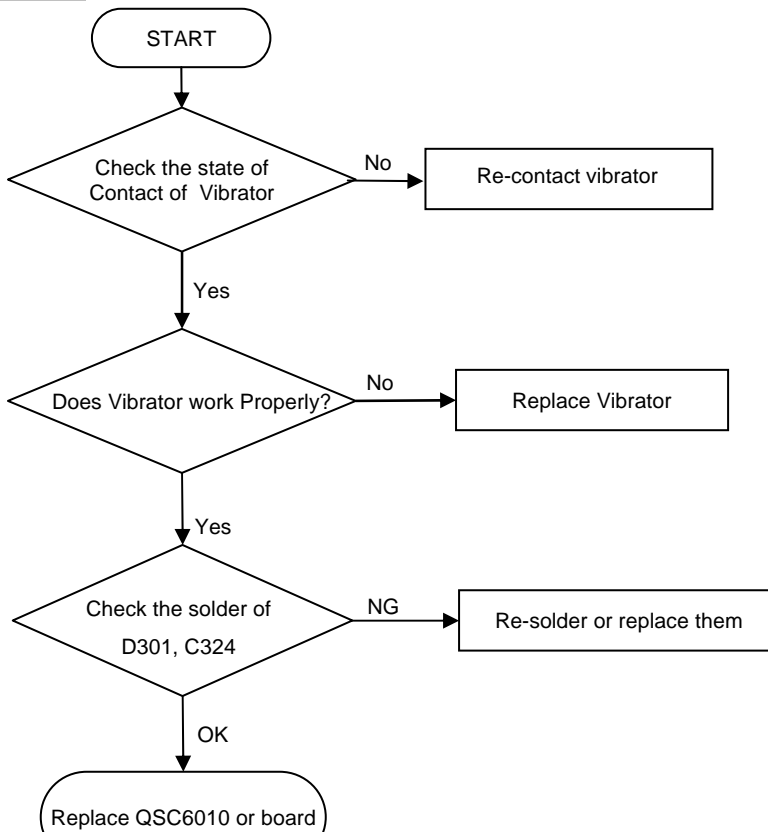


**Figure 4.3.7 VIBRATION CONTROL BLOCK**

### Figure 4.3.7 Vibrator PART

## Checking Flow

**SETTING : “Vibrator on” at Sounds of test menu**



### 4.3.8 Key Backlight LED Trouble

#### Test Points

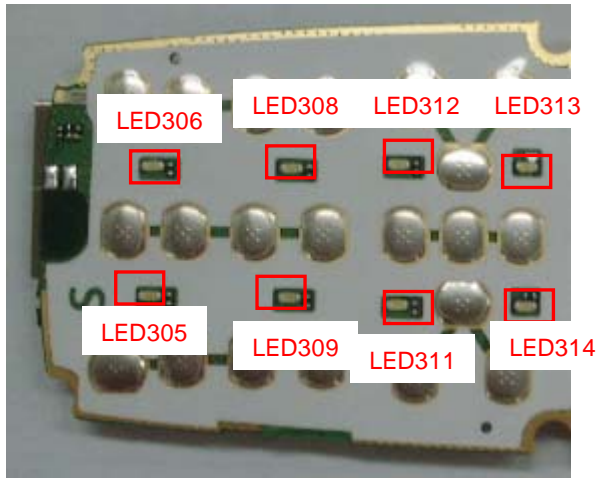


Figure 4.3.8 KEYPAD BACK LIGHT PART

#### Circuit Diagram

<KEY LED PART>

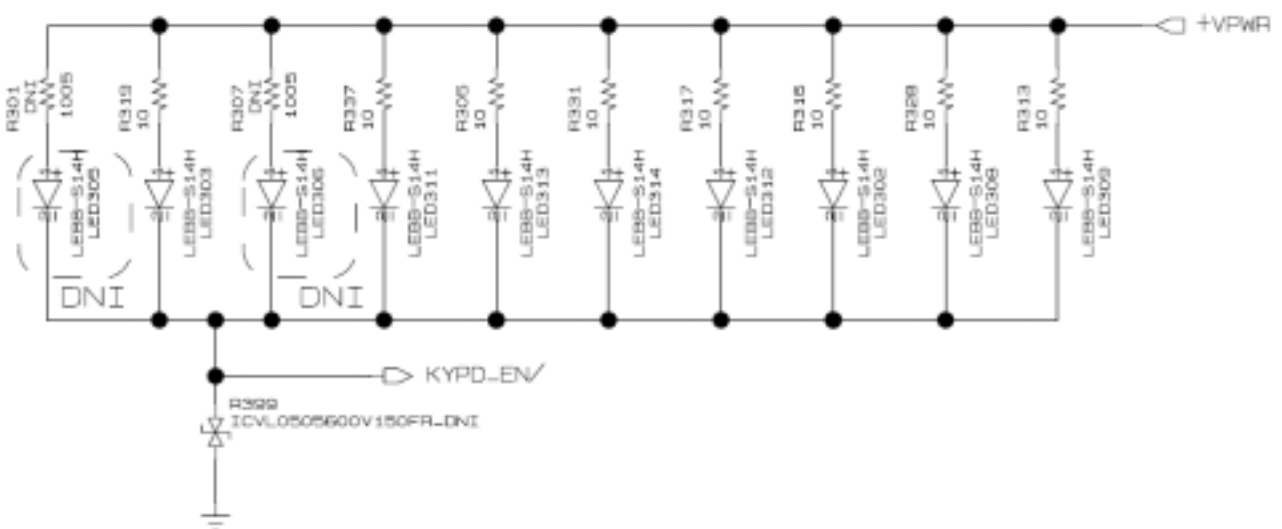
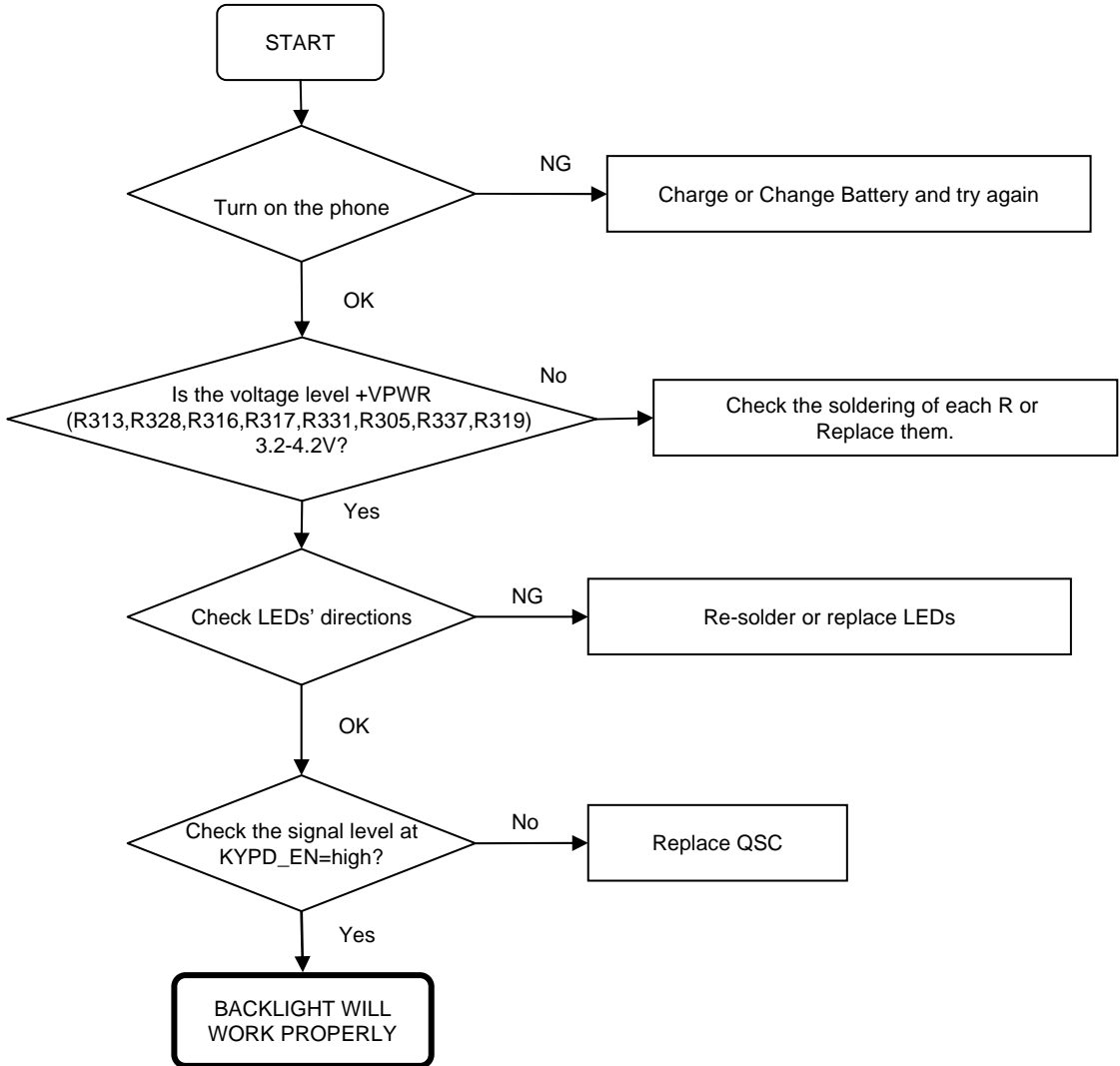


Figure 4.3.8 KEYPAD Back Light Circuit



## Checking Flow



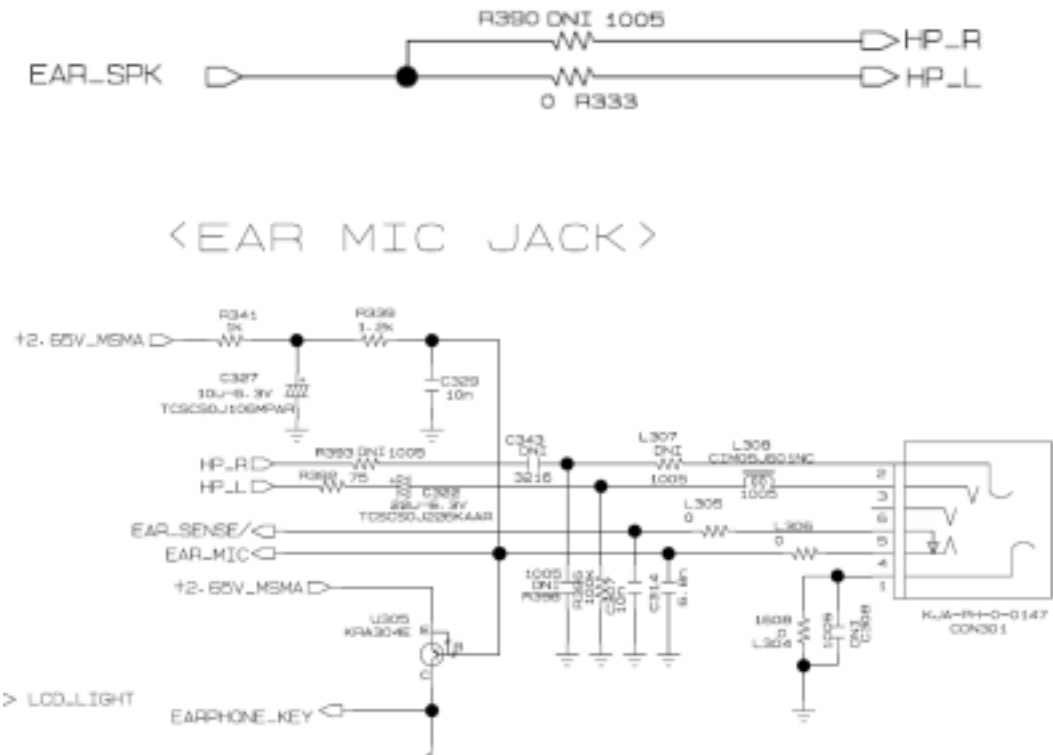
# 4.3.9 Earphone Trouble

## Test Points



Figure 4.3.9 EAR MIC JACK PART

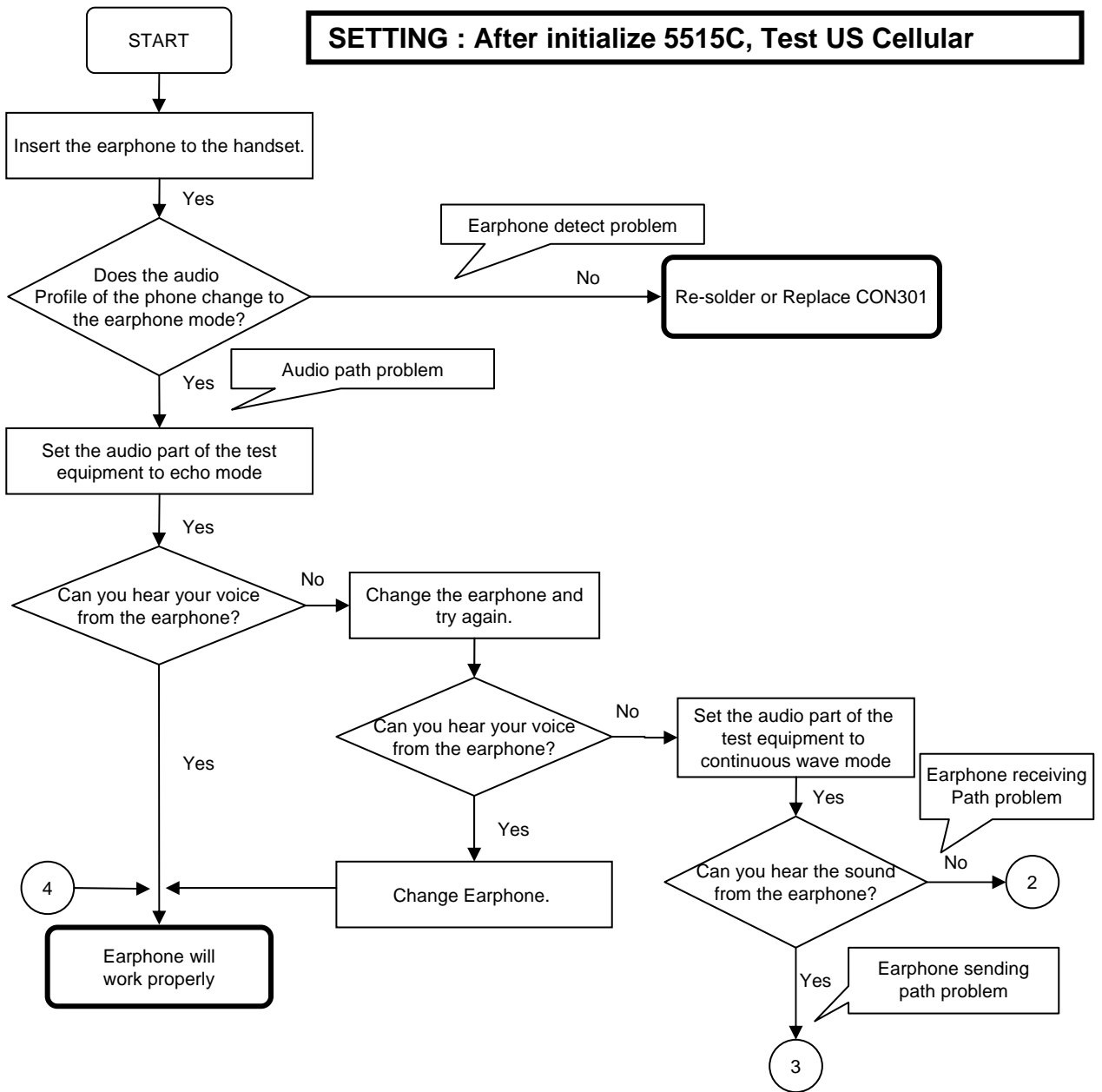
## Circuit Diagram



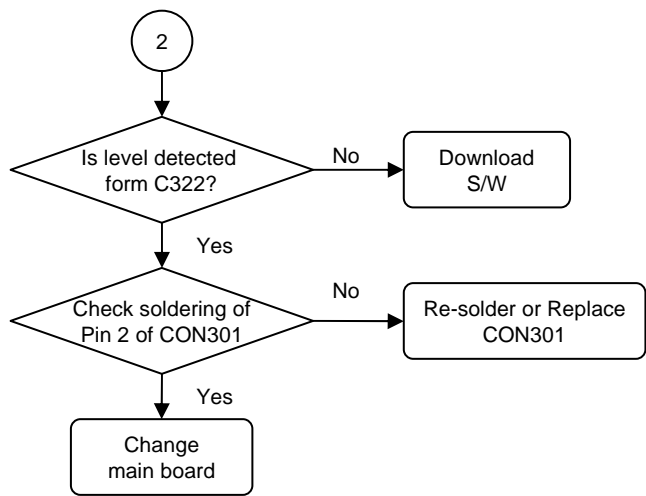
Circuit 4.3.9 EAR MIC JACK PART

## Checking Flow

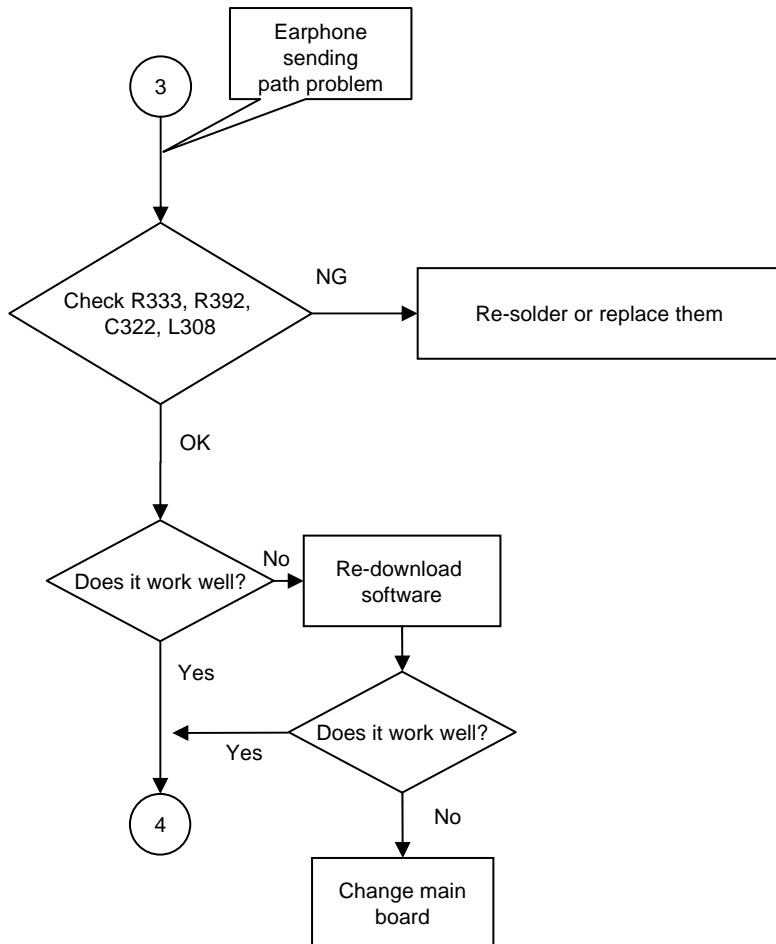
**SETTING : After initialize 5515C, Test US Cellular**



## Earphone receiving path problem

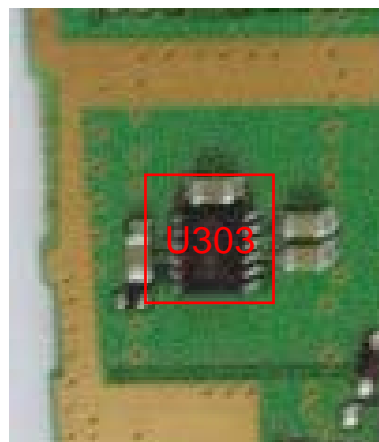


## Earphone sending path problem

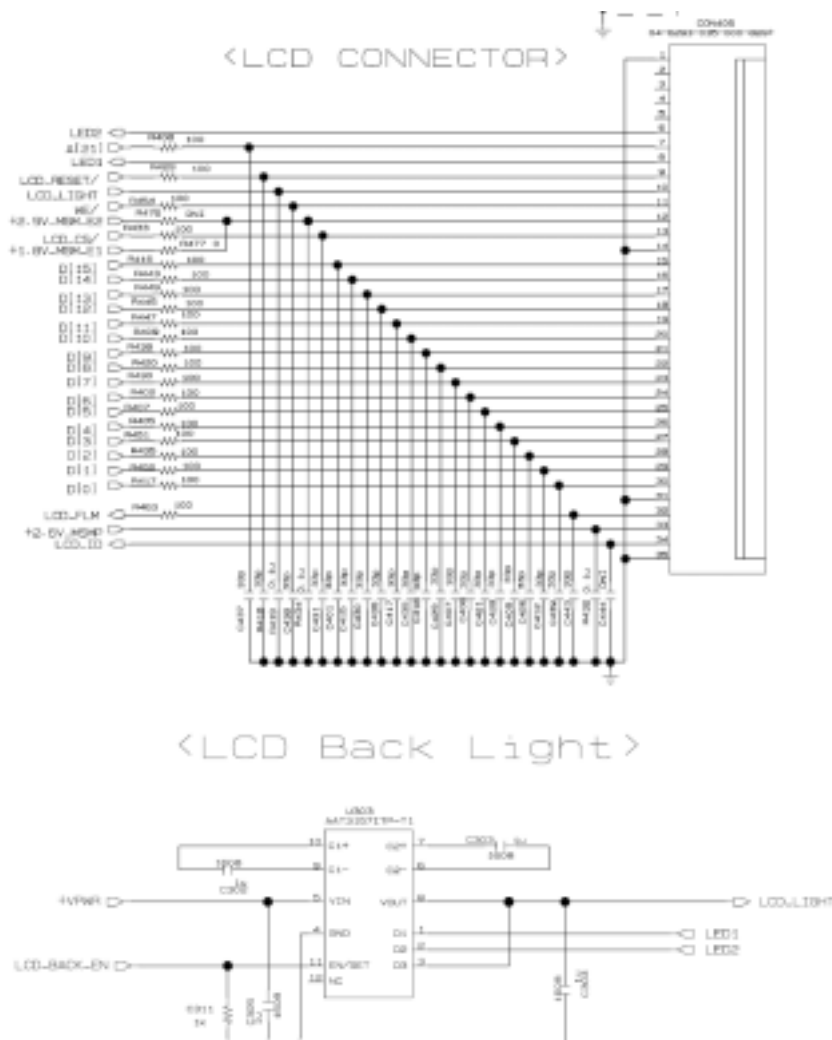


### 4.3.10 LCD Trouble

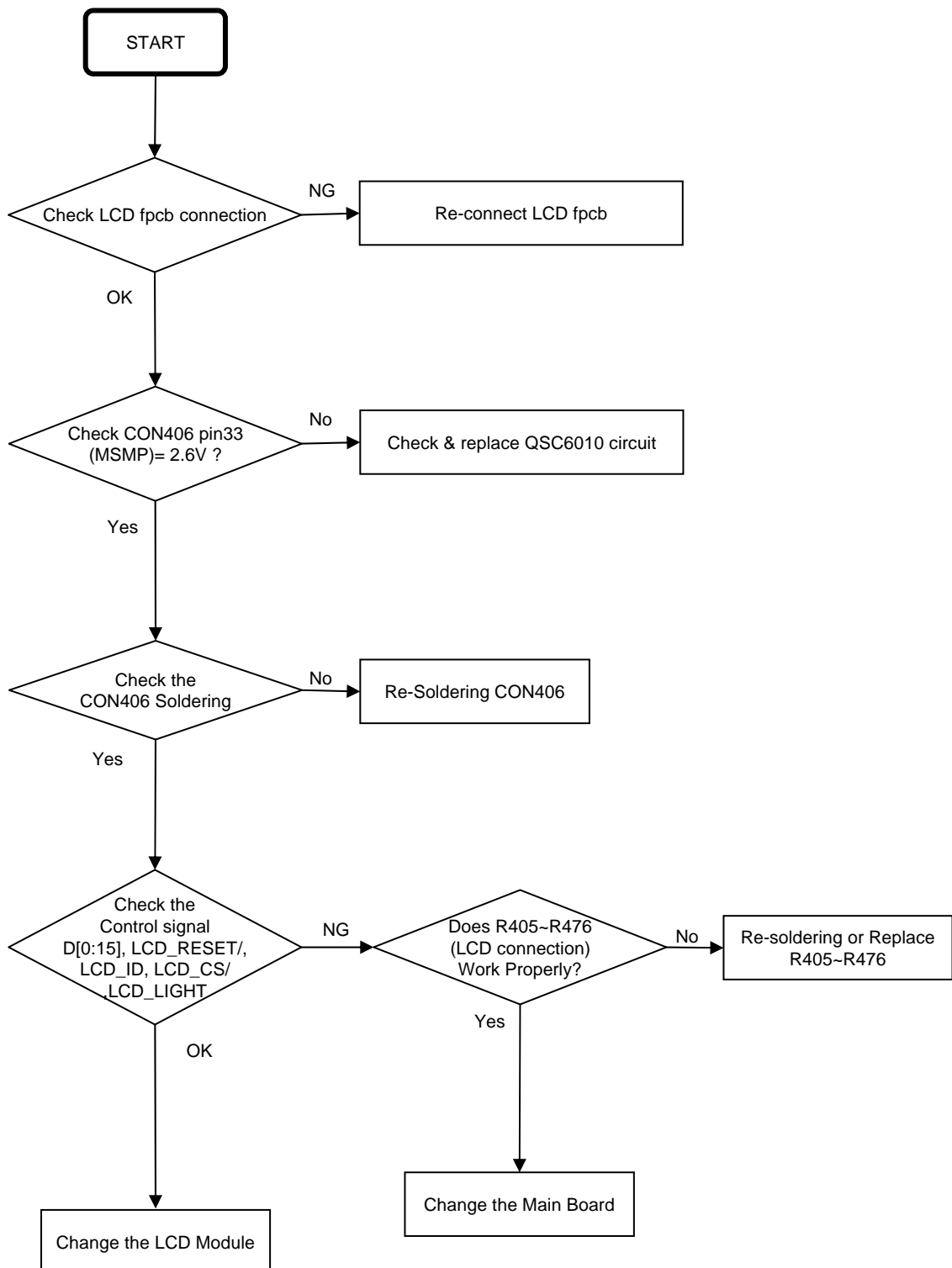
## Test Points



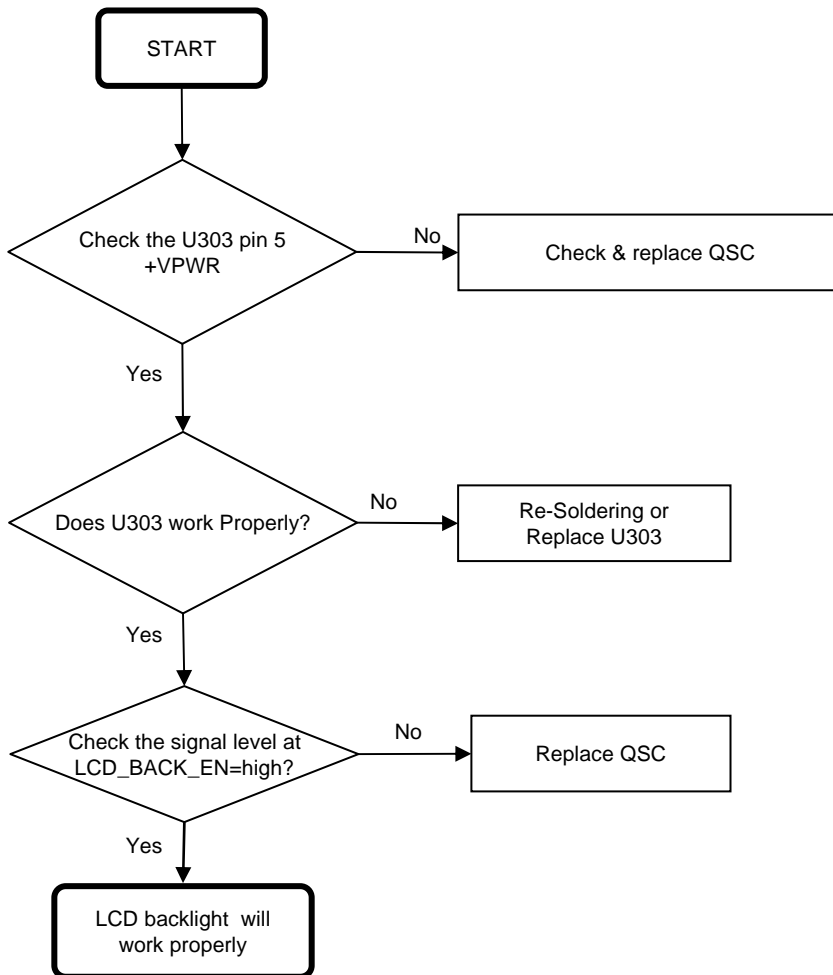
## Circuit Diagram



## Checking Flow : LCD

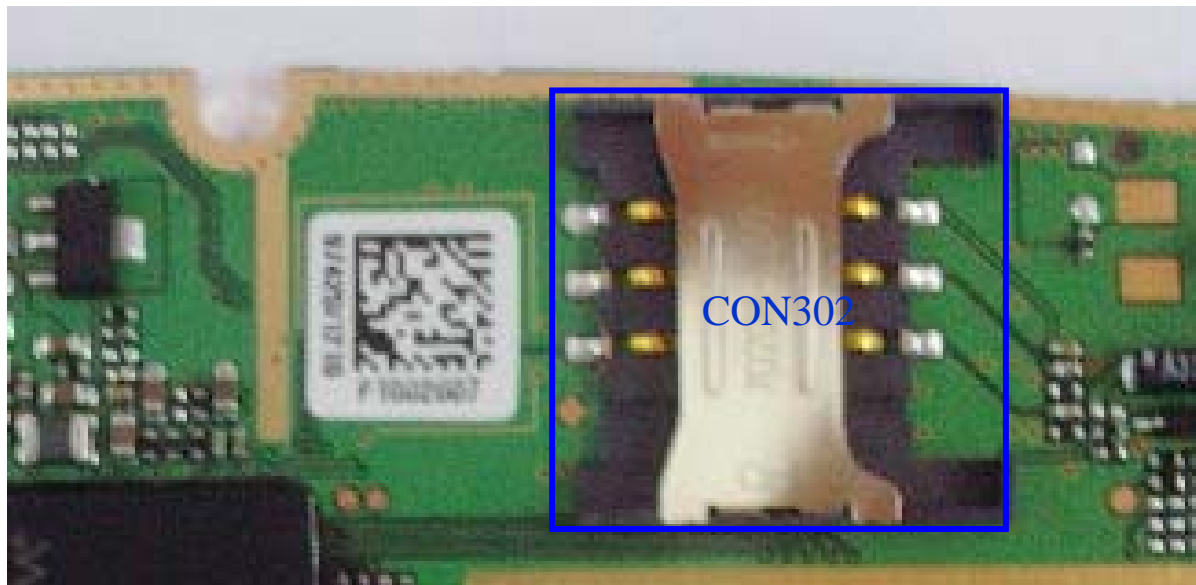


## Checking Flow : Back Light



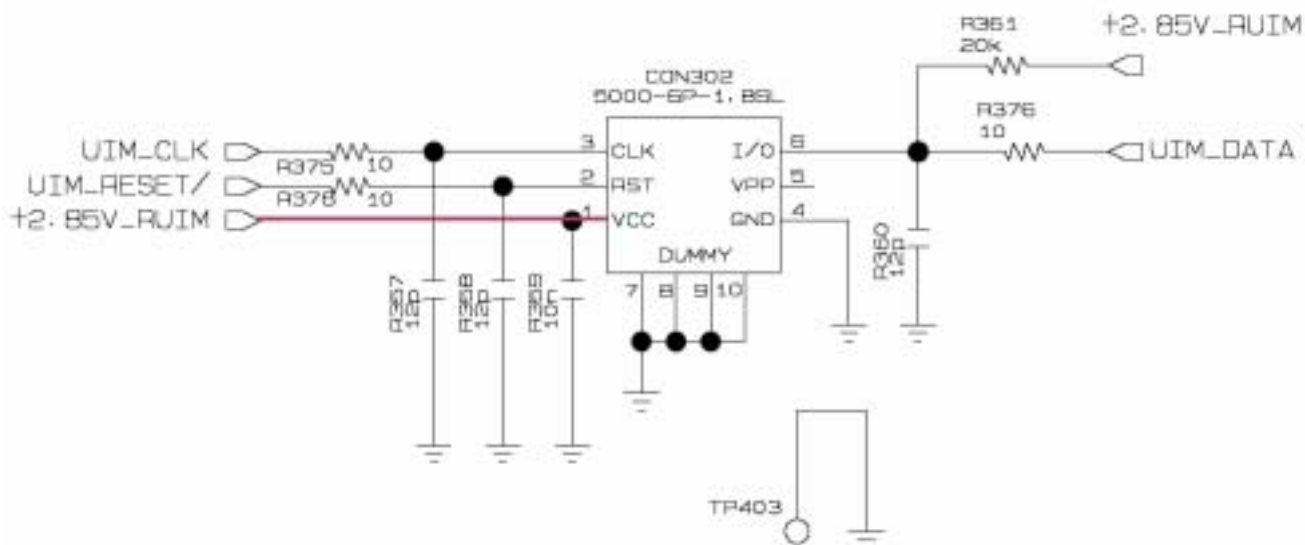
### 4.3.11 UIM Trouble

#### Test Points



#### Circuit Diagram

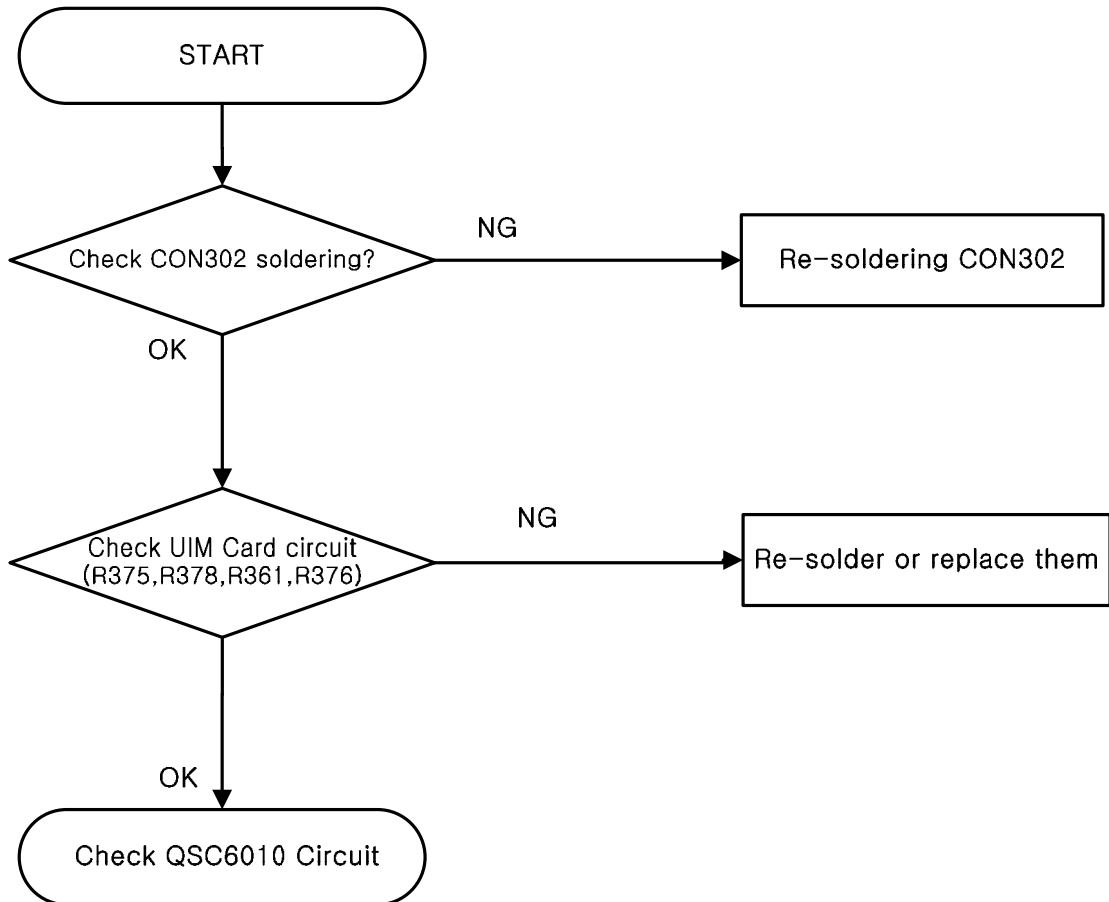
<UIM CARD>



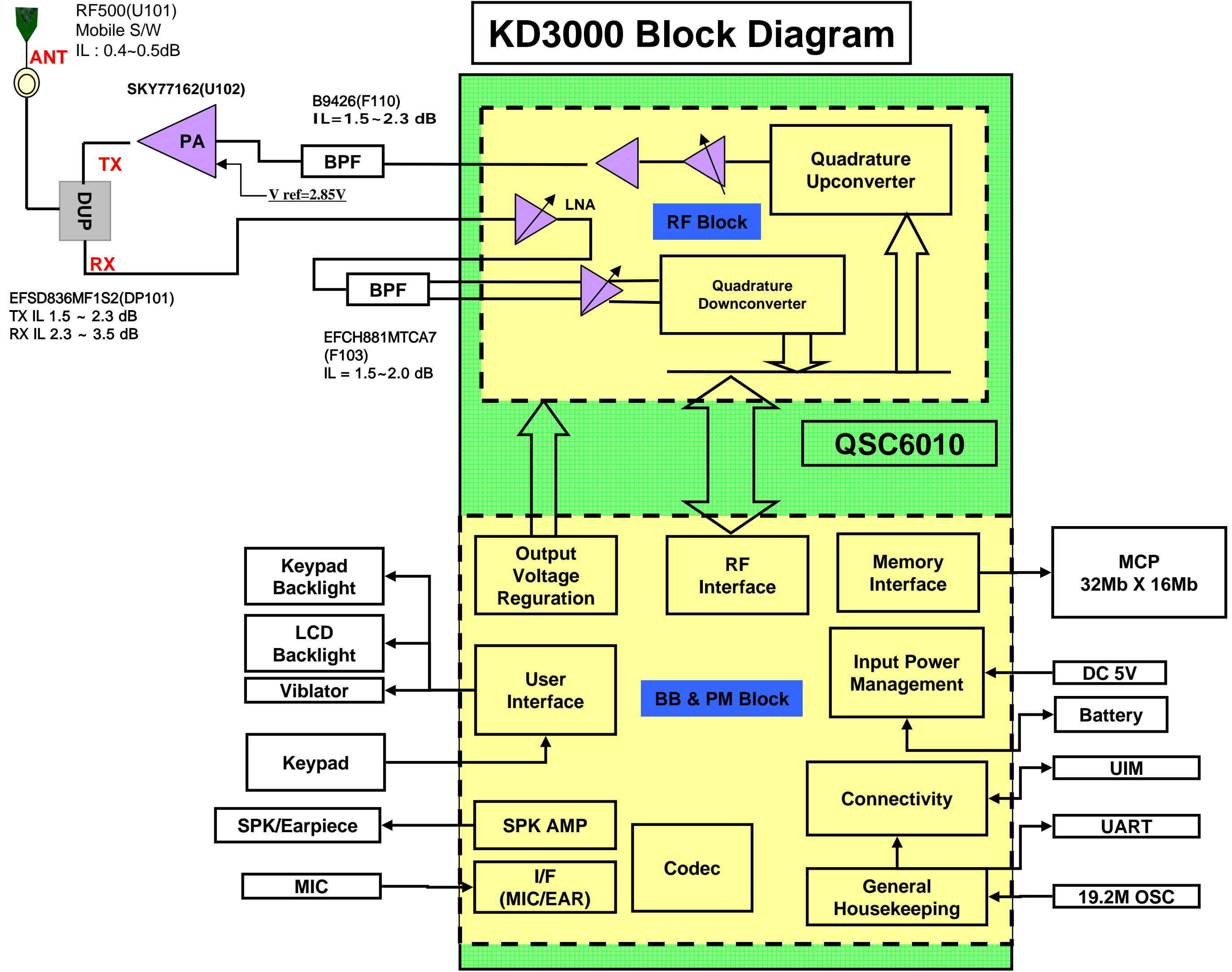


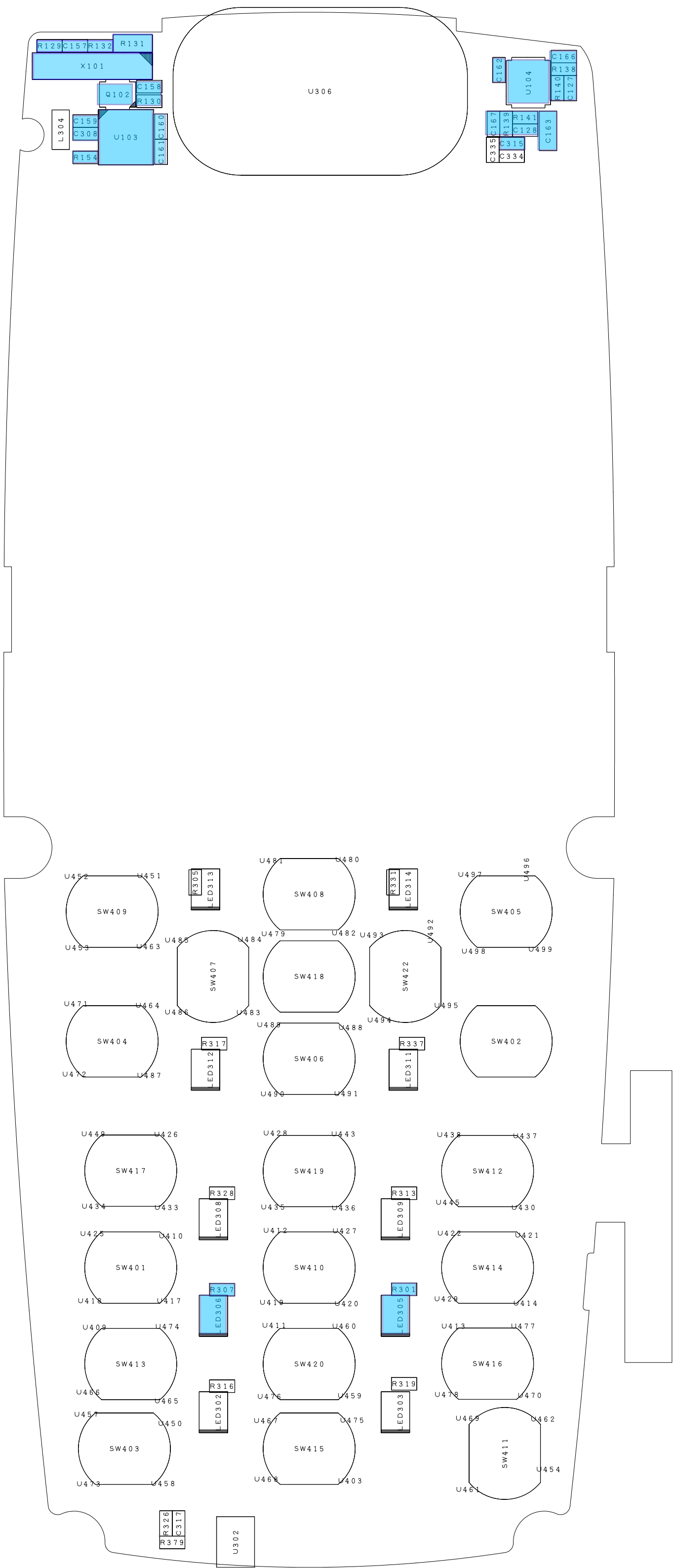
## Checking Flow

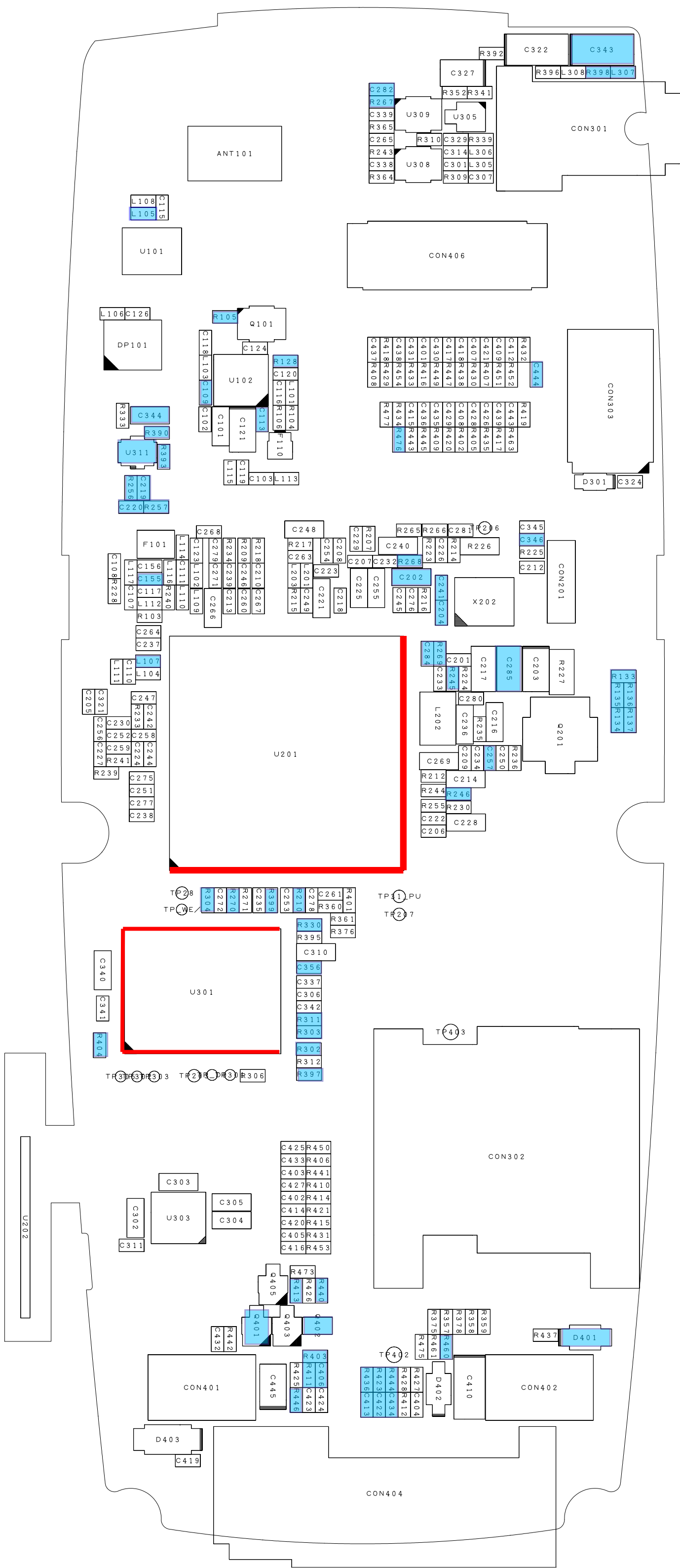
- CON302 : 5000-6P-1.8SL
- U201 : QSC6010



# KD3000 Block Diagram



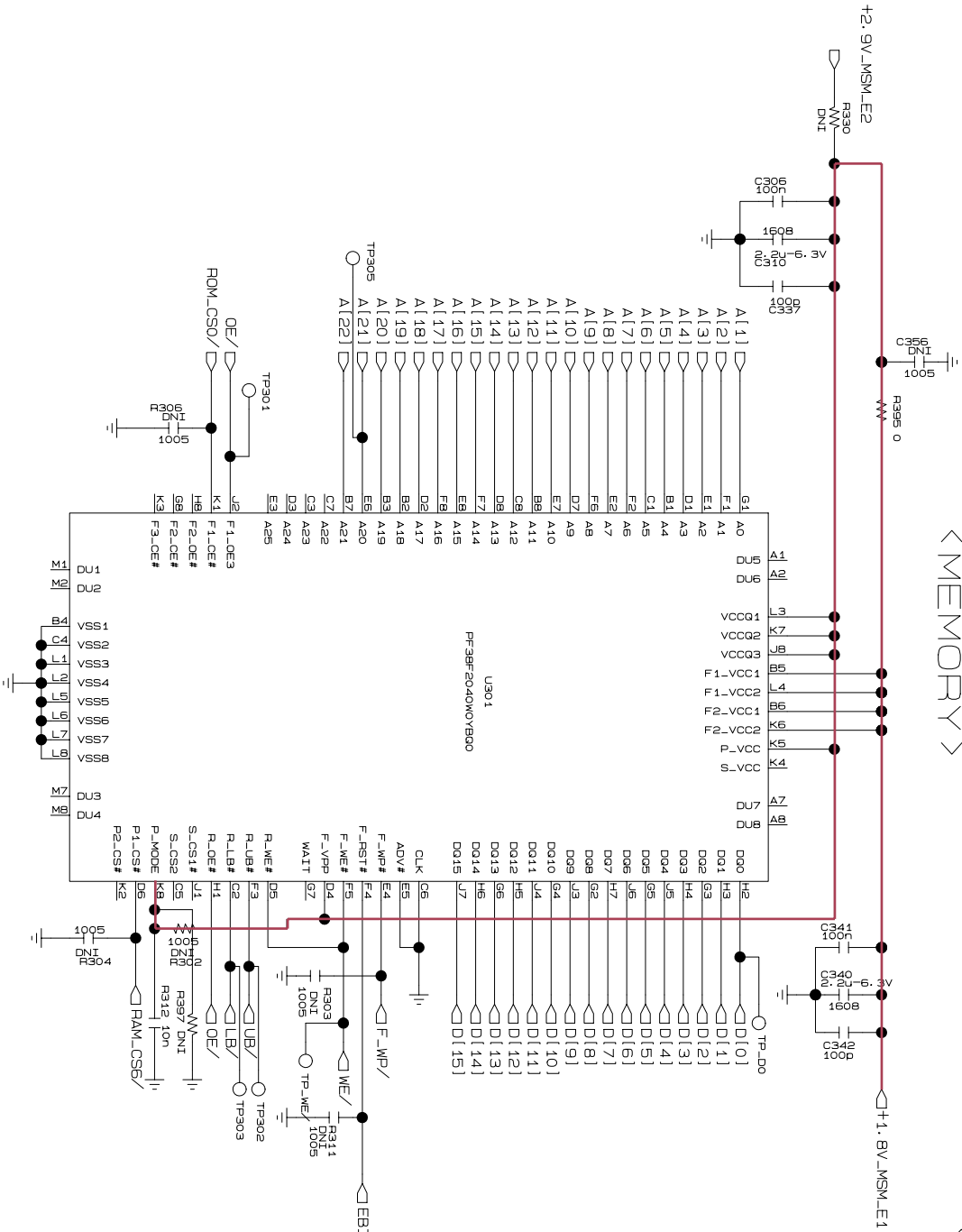




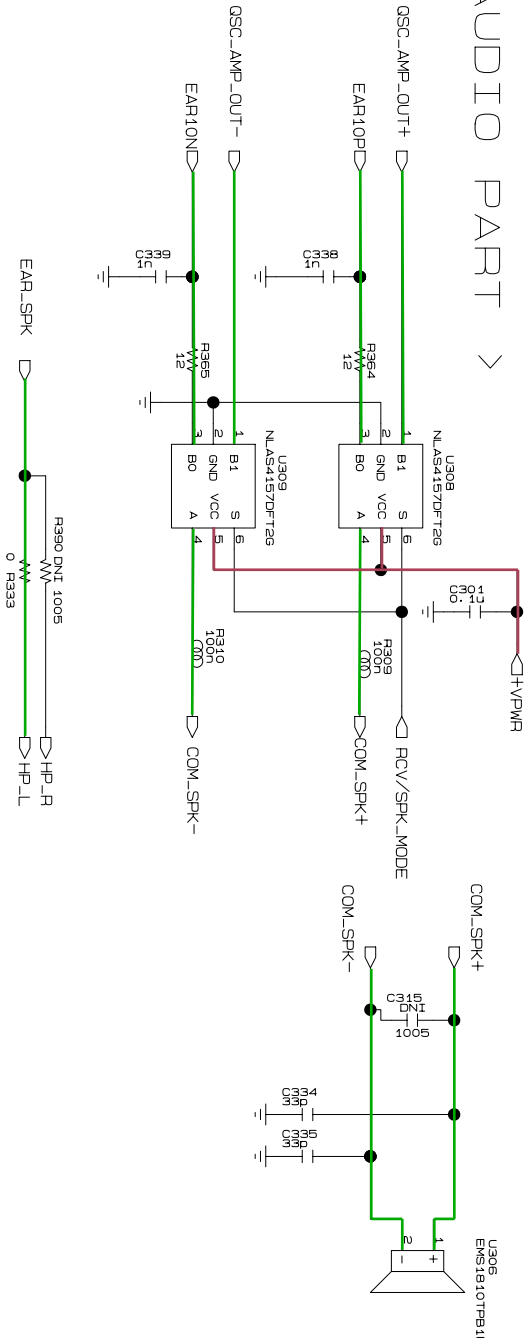




< MEMORY >



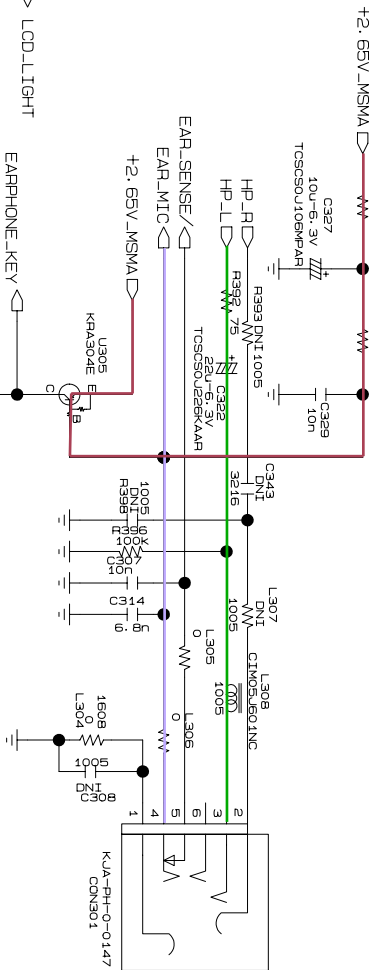
< AUDIO PART >



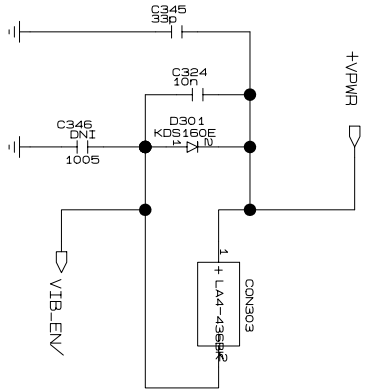
MIC

Audio

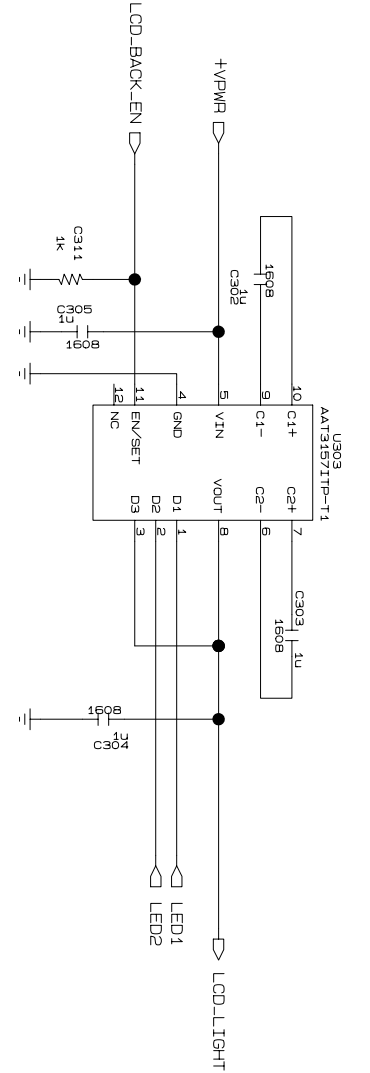
< EAR MIC JACK >



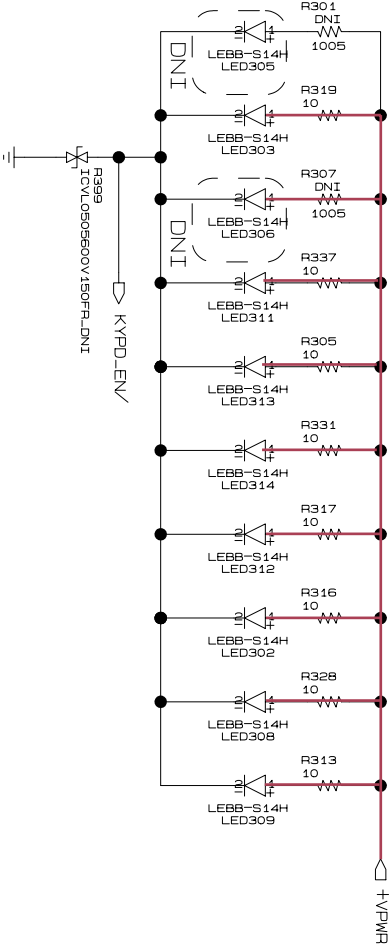
< MOTOR >



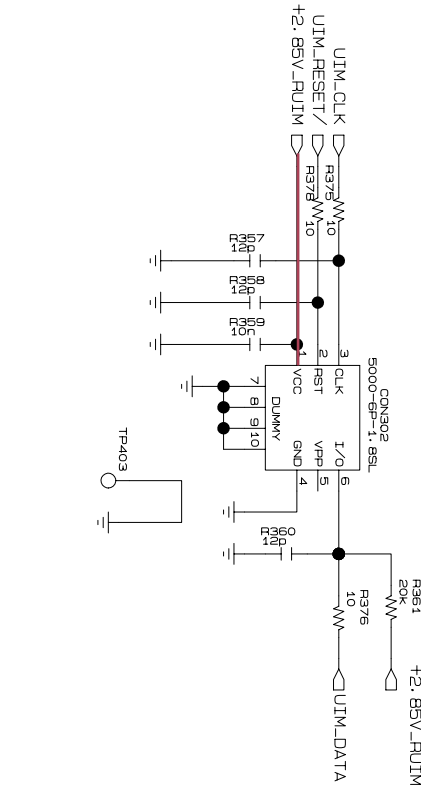
< LCD Back Light >



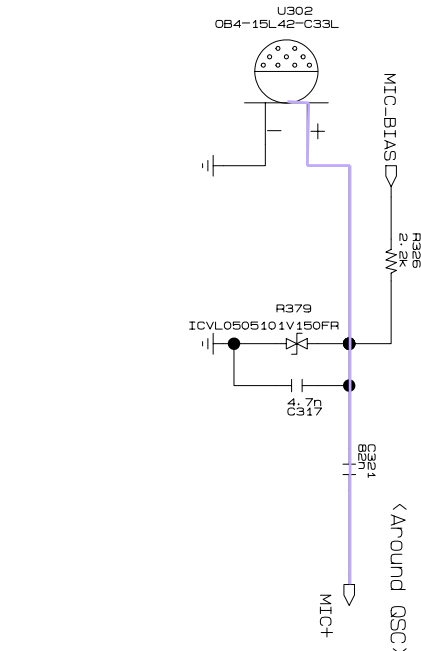
< KEY LED PART >



< UIM CARD >



< MIC >



DRAW	: T.H. KIM
DATE	2007. 04. 10
CHKD	H.T. KIM
APRD	
REF	
MAN	
ISSUE	:
CONTENT	: Rev. 1.2

Rev. 1.0

HP-R R390 INSERT

Value Change

EAR-POP UP Noise

R392, R393 OR->75R

Rev. 1.1

C311: 10K -> 1K

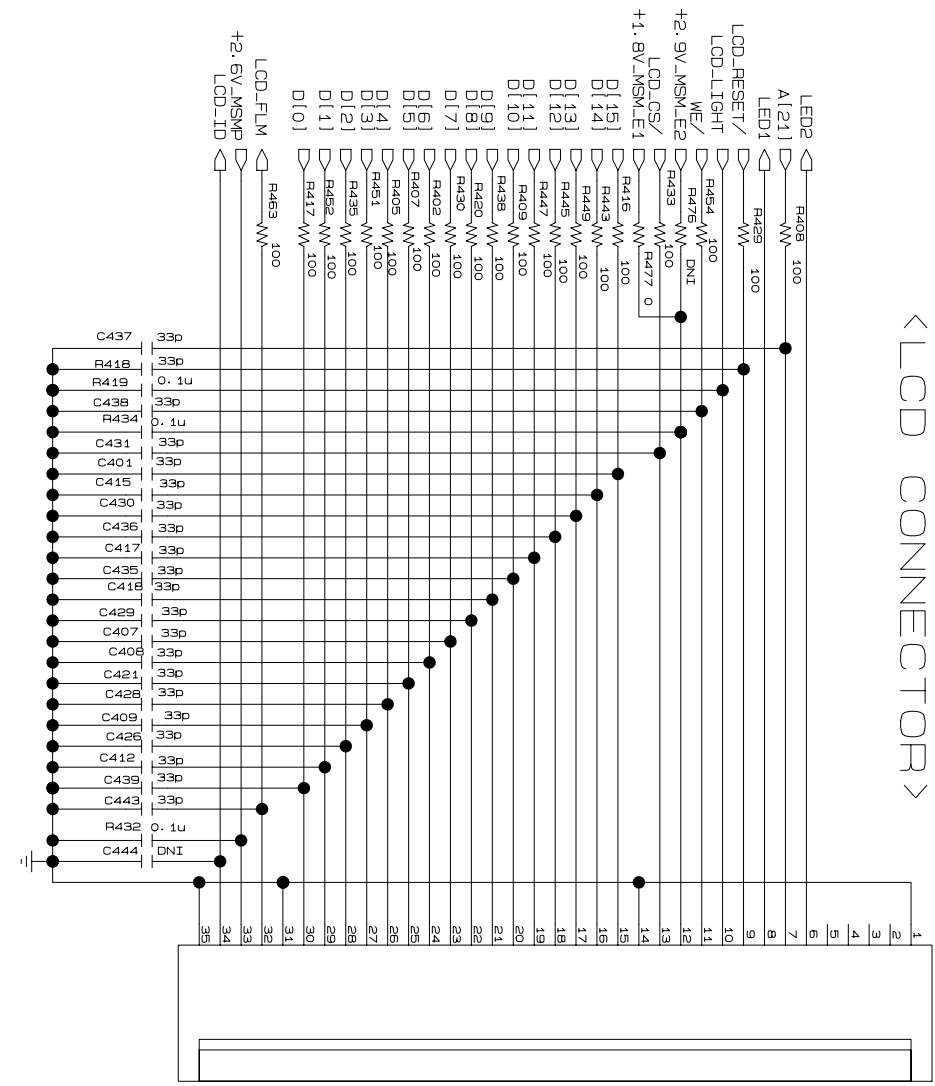
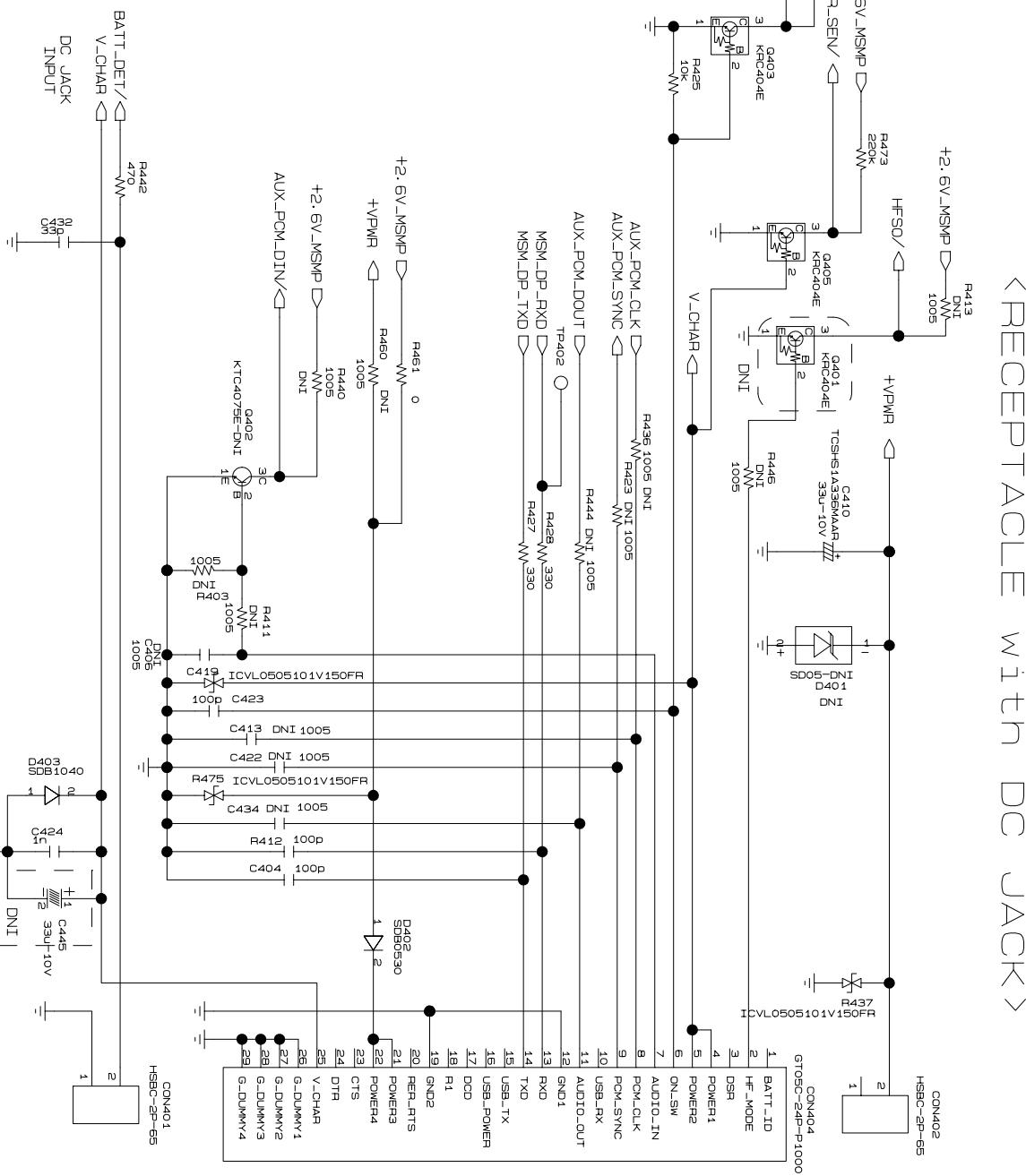
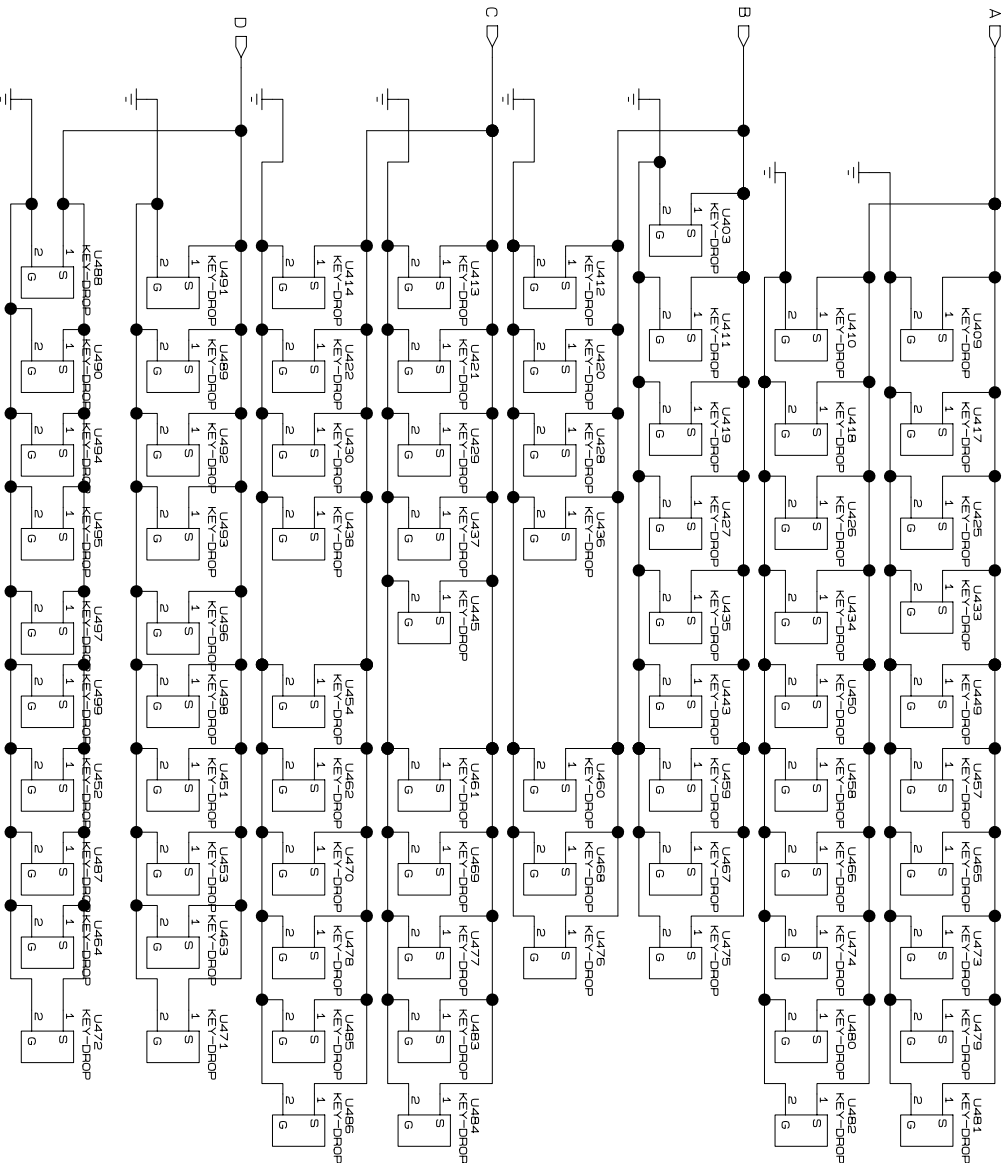
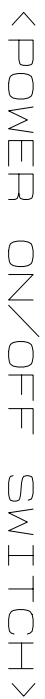
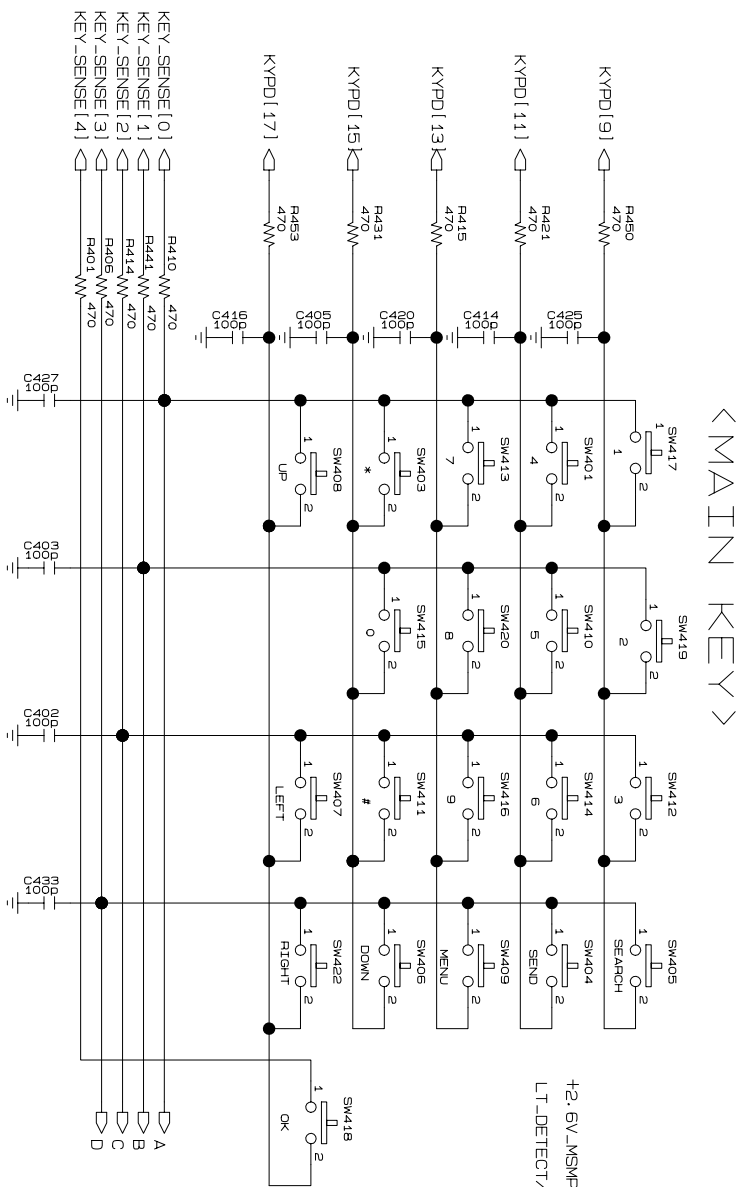
Rev. 1.2

R397-DNI INSERT

TP-POINT-INSERT

R395 o ohm INSERT

C356 DNI INSERT

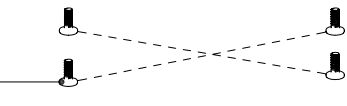
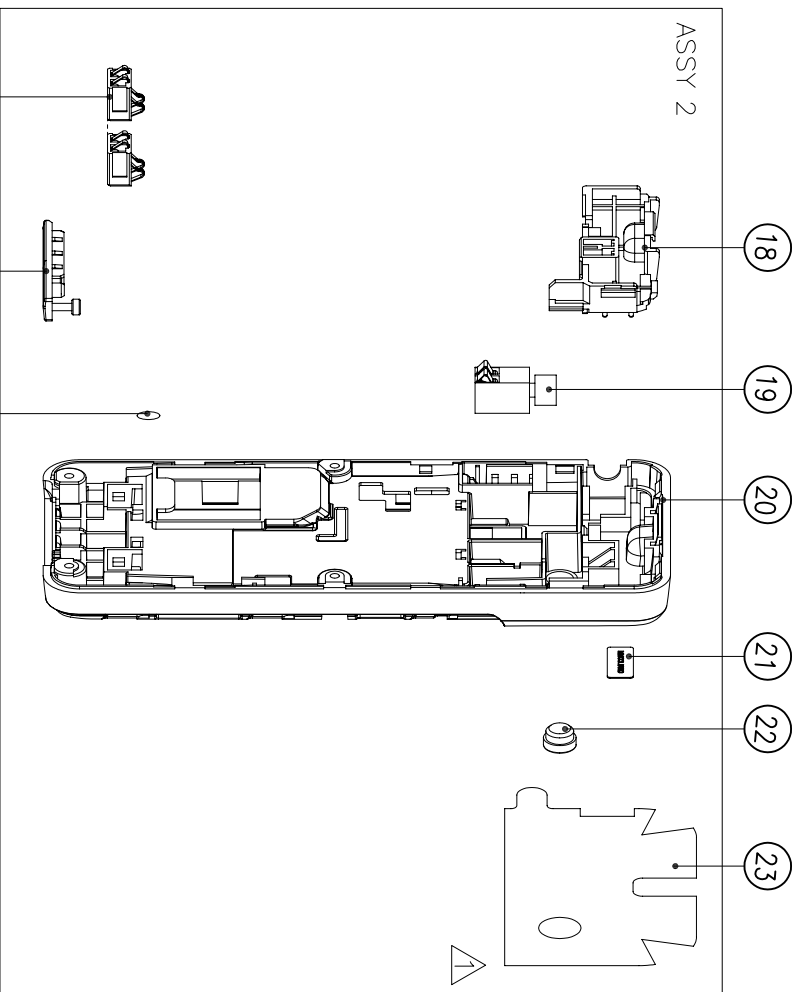
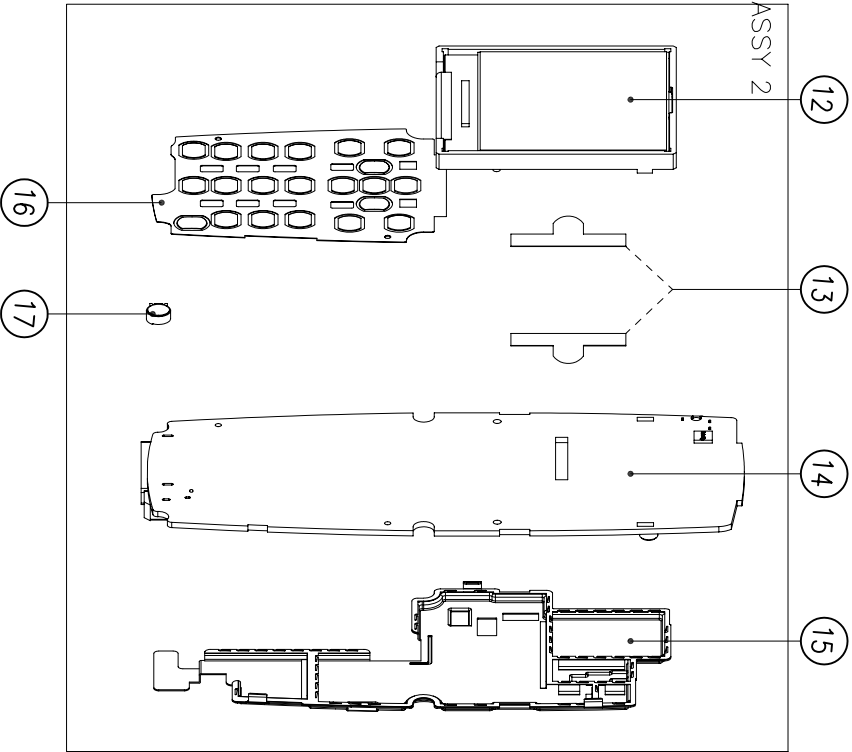
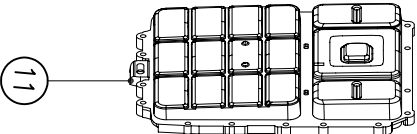
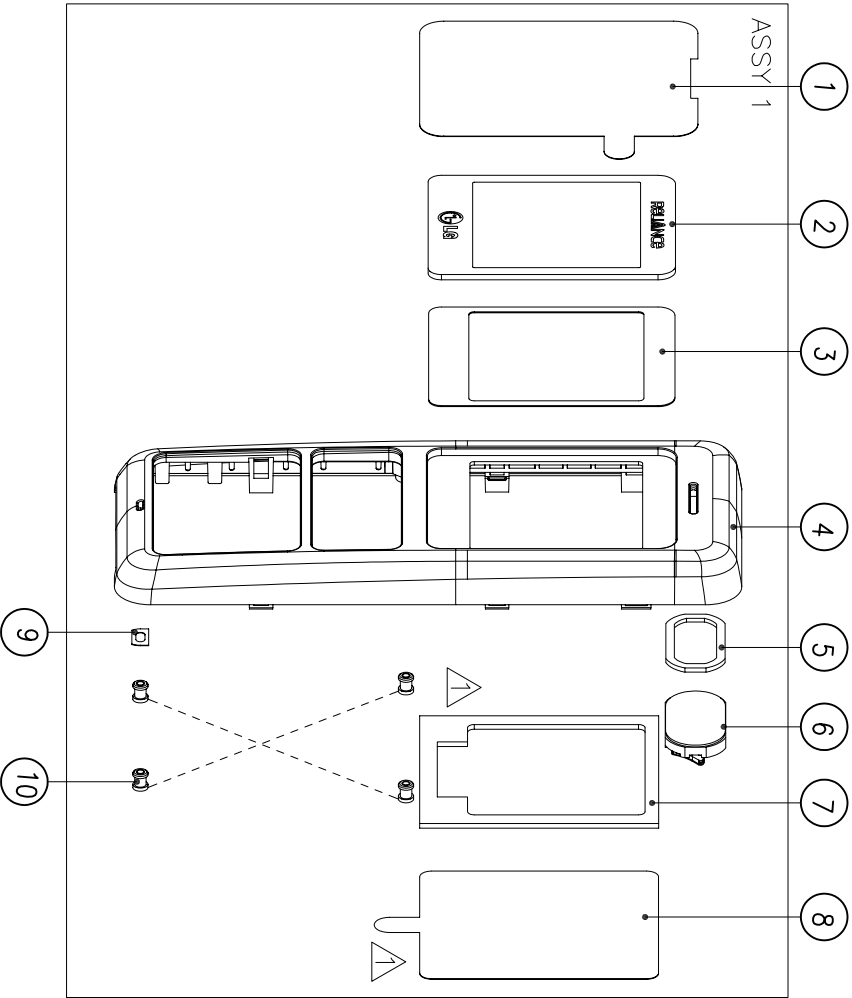


DRAW	: T.H.KIM
DATE	2006. 04. 10
CHKD	H. T.KIM
APRD	
REF	
MAN	
ISSUE :	
CONTENT :	Rev. 1

Rev. 12  
R477 0 ohm INSEF



CTQ table					판단 근거 (A,B,C)
상 세 SPEC.		공 차		목표 Z값 (3~6)	
Q.	항 목	치 수	+		-
1					
2					

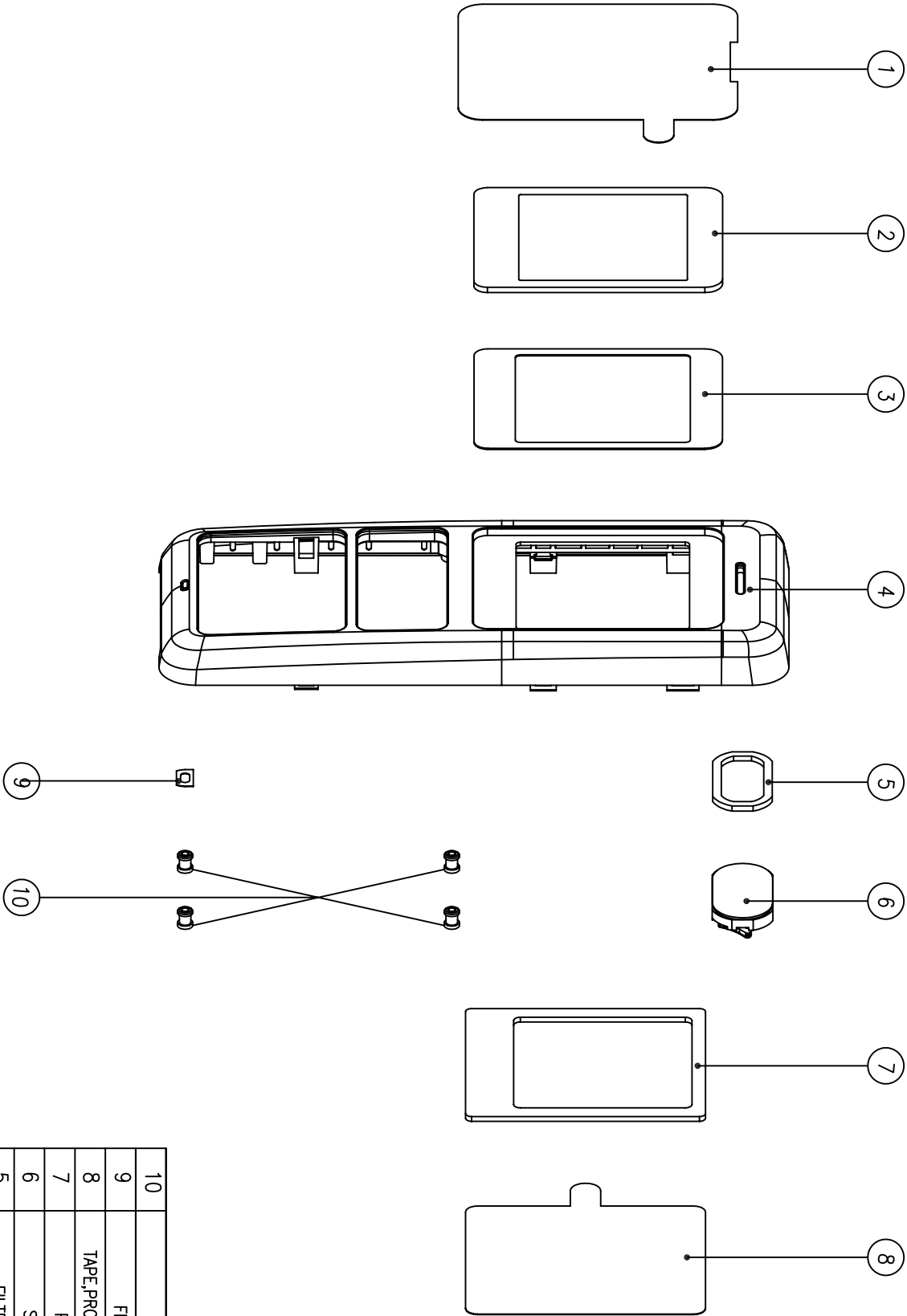


REVISION			
ISSUE	CONTENTS	ENGINEER	APPROVER
1.0	초 도 발 행	김운현	조두환
1.1	TAPE PROTECTION REAR 추가, ANTENNA 돌번변경 PAD LCD 형상변경, TAPE PROTECTION BACK 형상변경	김운현	조두환
			07.05.17

28	SCREW MACHINE BIND	4	GMEY0009201	
27	LABEL APPROVAL	1	MLAB0002505	
26	LABEL A/S	1	MLAB0000601	
25	CAP RECEPTACLE	1	MCCE0036301	
24	CONNECTOR ETC	2	ENZT0013201	
23	TAPE PROTECTION (REAR)	1	MTAB0180301	
22	CAP MOBILE SWITCH	1	MCCF0037102	
21	LABEL QUALCOMM	1	MLAN0000603	
20	COVER REAR	1	MCJN0066201	
19	VIBRATOR MOTOR	1	SJMY0007904	
18	ANTENNA	1	SNMF0033101	
17	MIKE	1	SJMY0003802	
16	DOME ASSY METAL	1	ADCA0065701	
15	SHIELD CAN	1	MGBA0017501	
14	PCB ASSY MAIN SMT	1	SAFF0121601	
13	TAPE LCD	2	MTA20188601	
12	LCD	1	SLAM0024701	
11	KEYPAD	1	MKA20036201	
10	INSERT	4	MCC20028601	
9	FILTER,MIC	1	MFB00023001	
8	TAPE,PROTECTION (BACK)	1	MTAB0162901	
7	PAD,LCD	1	MPB30059101	
6	SPEAKER	1	SUSY0026601	
5	FILTER,SPEAKER	1	WFB00030001	
4	COVER,FRONT	1	MCJK0069901	
3	TAPE,WINDOW	1	MTAD0066701	
2	WINDOW,LCD	1	MMAC0077501	
1	TAPE,PROTECTION (FRONT)	1	MTAB0162801	

허용 공 차		UNIT	SCALE	PARTS INDEX	
치 수	공 차	mm	N/S	NAME	재 질
~ 6 미만	±0.05	TOLERANCE		DATE	
6~18 미만	±0.10			APP. 06.07.12	조두환
18~30 미만	±0.15	FINISH		CHEC. 06.07.12	안현부
30~50 미만	±0.20	DESC.	06.07.12	김운현	
50~80 미만	±0.25	F/N		SIZE	
				DWG NAME	LG - RD3000 ASSY,TOTAL
				DWG NO.	APFY0397501

REVISION				
ISSUE	CONTENTS	ENGINEER	APPROVER	DATE
1.0	초도 발행	김 덕 현	조두환	07.01.02



10	INSERT	4	MIC20027001	
9	FILTER,MIC	1	MFBDD0023001	
8	TAPE,PROTECTION (BACK)	1	MTAB0162901	
7	PAD,LCD	1	MPBG0059101	
6	SPEAKER	1	SUST0026601	
5	FILTER,SPEAKER	1	MFBCC0030001	
4	COVER,FRONT	1	MCJK0069901	
3	TAPE,WINDOW	1	MTAD0066701	
2	WINDOW,LCD	1	MWAC0077501	
1	TAPE,PROTECTION (FRONT)	1	MTAB0162801	

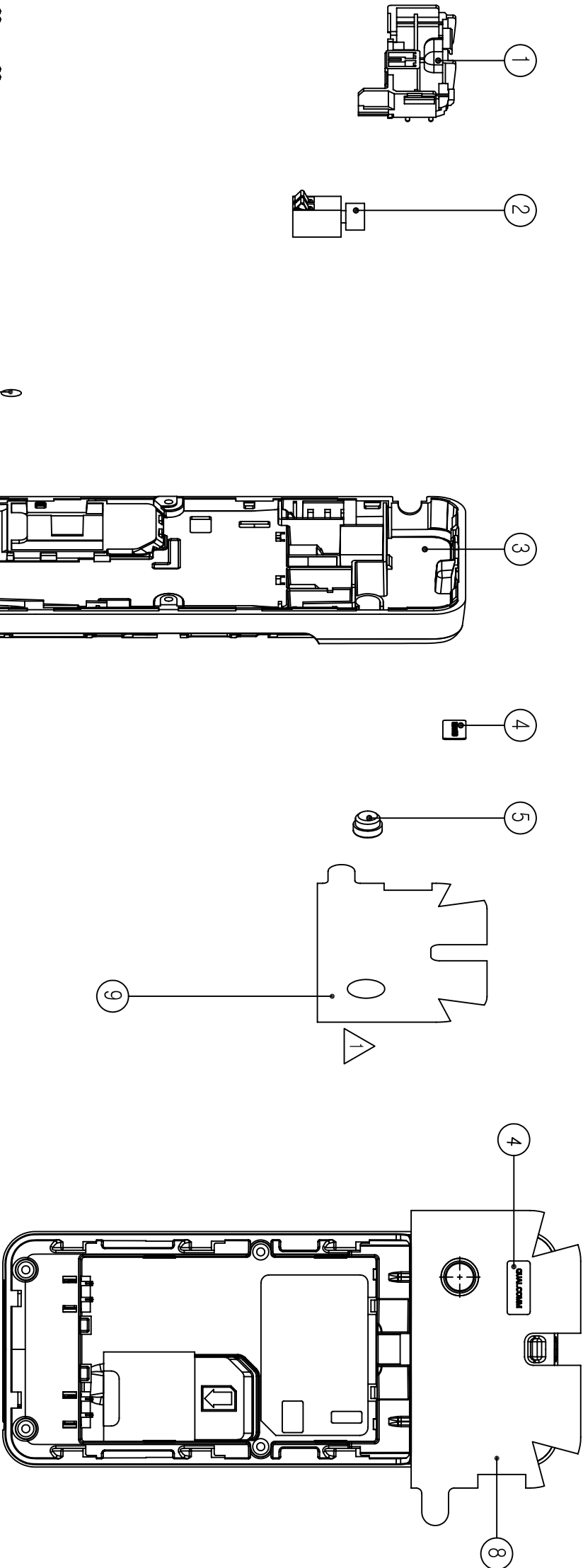
허용공차		UNIT	SCALE	NO.	DESCRIPTION	Q'TY	DRAWING NO.	REMARK
치수	공차	mm						
~ 6 미만	±0.05	TOLERANCE			DATE	NAME	PARTS INDEX	
6~18 미만	±0.08				APP.	조두환		
18~30 미만	±0.10	FINISH			CHEC.	안현부		
30~50 미만	±0.15				DESQ.	김덕현		
50~80 미만	±0.20	F/N				SIZE		
							도명 DWG NAME	LG-RD3000 COVER,FRONT_ASSY
							도번 DWG NO.	ACGK0086101



NOTES

1. 모든 사항은 LG E SPEC에 준하며 외문사항은 설계자와 협의 할 것.

REVISION				
ISSUE	CONTENTS	ENGINEER	APPROVER	DATE
1.0	초도 발행	김 덕 현	조두환	07.01.02
1.1	보호테입 추가, ANTENNA 품번변경	김 덕 현	조두환	07.05.17



1	9	TAPE PROTECTION REAR	1	MTAB0180301	
	8	LABEL A/S	1	MLAB0000601	
	7	CAP, RECEPTACLE	1	MCCE0036301	
	6	CONNECTOR, ETC	2	ENZ0013201	
	5	CAP, MOBILE SWITCH	1	MCCF0037101	
	4	TAPE QUALCOMM	1	MLAN0000603	
	3	COVER, REAR	1	MCJN0066201	
	2	VIBRATOR MOTOR	1	SJM-Y0007904	
	1	ANTENNA MOBILE FIXED	1	SNMF0033101 <del>SNMF0033101</del>	1

허용 공차		UNIT	SCALE	NO.	DESCRIPTION	Q'TY	DRAWING NO.	REMARK
치수	공차	mm						
~6 미만	±0.05	TOLERANCE						
6~18 미만	±0.08				APP.	07.01.02	조두환	
18~30 미만	±0.10	FINISH			CHEC.	07.01.02	안철부	
30~50 미만	±0.15				DESG.	07.01.02	김덕현	
50~80 미만	±0.20	F/N					SIZE	
				PARTS INDEX				
		DATE	NAME			재질		
		07.01.02	조두환			MATERIAL		
		07.01.02	안철부			관련도번		
		07.01.02	김덕현			REL DWG		
						도명		
						DWG NAME		
							LG-RD3000 COVER, REAR_ASSY	

## NOTES

1. 모든 사항은 LG SPEC에 준하며 외문사항은 설계자와 협의 할 것.

## **1. Accessory**

NO	Discription	LG Part NO	SPEC
1	COVER,BATTERY	MCJA0044701	MOLD, PC LUPOY SC-1004A
2	MANUAL,OPERATION	MMBB026240 1	PRINTING,
3	BATTERY PACK,LI-ION	SBPL0088901	3.7 V,950 mAh,1 CELL,PRISMATIC
5	ADAPTOR,AC-DC	SSAD0020501	100-240V ,5060 Hz,5.1 V,0.7 A,CE ,AC-DC Adaptor

## **2. PCB**

NO	Discription	LG Part NO	Q'ty
1	PCB, MAIN	SPFY014990 3	1

## **3. Mechanical Part**

NO	Description	LG Part No.	QTY
1	COVER, FRONT	MCJK0069901	1
2	FILTER,SPEAKER	MFBC0030001	1
3	PAD,LCD	MPBG0059101	1
4	TAPE,PROTECTION FRONT	MTAB0162801	1
5	TAPE,PROTECTION BACK	MTAB0162901	1
6	TAPE,WINDOW	MTAD0066701	1
7	WINDOW,LCD	MWAC0077506	1
8	FILTER,MIC	MFBD0023001	1
9	SPEAKER	SUSY0026601	1
10	COVER, REAR	MCJN0066201	4
11	CAP,RECEPTACLE	MCCE0036301	1
12	CAP, MOBILE SWITCH	MCCF0037102	1
13	ANTENNA MOBILE FIXED	SNMF0033101	2
14	VIBRATOR MOTOR	SJMY0007904	1
15	LABEL A/S	MLAB0000601	1
16	TAPE QUALCOMM	MLAN0000603	1
17	TAPE PROTECTION REAR	MTAB0180301	1
18	PCB ASSY, MAIN	SAFY0200301	

19	DOME ASSY, METAL	ADCA0065701	1
20	CAN, SHIELD	MCBA0017501	1
21	LCD	SVLM0024701	1
22	TAPE LCD	MTAZ0188601	2

#### **4. The Top Of Main PCB**

NO	Ref No	Description	LG Part NO.	SPEC
1	C317	CHIP-CAPACITOR	ECZH0001106	
2	C334,C335	CHIP-CAPACITOR	ECZH0000830	
3	L304	RESISTOR	ERHZ0000701	
4	LED302,LED303,LED308,LED309,LED311,LED312,LED313,LED314	BLUE-LED	EDLH0006001	
5	R305,R313,R316,R317,R319,R328,R331,R337	RESISTOR	ERHZ0000402	
6	R326	RESISTOR	ERHZ0000443	
7	R379	VARISTOR	SEVY0003601	

#### **5. The Bottom Of Main PCB**

NO	Ref No	Description	LG Part NO.	QTY
1	C101	CHIP-CAPACITOR	ECZH0001511	1
2	C102,C345,C401,C407,C408,C409,C412,C415,C417,C418,C421,C426,C428,C429,C430,C431,C432,C435,	CHIP-CAPACITOR	ECZH0000830	24

	C436,C437, C438,C439, C443,R418			
3	C103,C119	CHIP-CAPACITOR	ECCH0000110	2
4	C107,C201, C206,C207, C209,C210, C218,C222, C224,C227, C229,C230, C232,C233, C235,C238, C242,C244, C245,C251, C252,C253, C256,C261, C265,C267, C272,C275, C276,C277, C278,C301, R419,R432, R434	CHIP-CAPACITOR	ECCH0000182	35
5	C108,C110, C116,C117, C126,C223, C237,C249, C263,C264, C268,C271, C337,C342, C402,C403, C404,C405, C414,C416, C420,C423, C425,C427, C433,R412	CHIP-CAPACITOR	ECZH0000813	26
6	C111,C123	CHIP-CAPACITOR	ECCH0000107	2
7	C115	CHIP-CAPACITOR	ECZH0000810	1
8	C118	CHIP-CAPACITOR	ECZH0000803	1

9	C120,C234, C280,C338, C339,C424	CHIP-CAPACITOR	ECCH0000143	6
10	C121,C203	P-TANTAL	ECTZ0001316	2
11	C124,C307, C324,C329, R359	CHIP-CAPACITOR	ECCH0000155	5
12	C156,L108	CHIP-INDUCTOR	ELCH0001410	2
13	C205,C247, C279,C321	CHIP-CAPACITOR	ECZH0001207	4
14	C208,C254	CHIP-CAPACITOR	ECCH0000157	2
15	C212	CHIP-CAPACITOR	ECZH0001121	1
16	C213	CHIP-CAPACITOR	ECCH0000149	1
17	C214,C221, C225,C228, C240,C248, C255,C266, C269,C310, C340	CHIP-CAPACITOR	ECZH0001421	11
18	C216	CHIP-CAPACITOR	ECZH0001501	1
19	C217	CHIP-CAPACITOR	ECZH0025501	1
20	C226	CHIP-CAPACITOR	ECZH0003121	1
21	C236	CHIP-CAPACITOR	ECCH0006201	1
22	C239	CHIP-CAPACITOR	ECCH0002002	1
23	C246	CHIP-CAPACITOR	ECZH0001105	1
24	C250	CHIP-CAPACITOR	ECZH0001215	1
25	C258	CHIP-CAPACITOR	ECZH0001216	1
26	C259	CHIP-CAPACITOR	ECZH0001206	1
27	C260	CHIP-CAPACITOR	ECZH0000801	1
28	C281	CHIP-CAPACITOR	ECZH0001203	1
29	C302,C303, C304,C305	CHIP-CAPACITOR	ECZH0003503	4
30	C306,C341	CHIP-CAPACITOR	ECCH0002001	2
31	C311,R103, R341	RESISTOR	ERHZ0000404	3
32	C314,C419, R437,R475	VARISTOR	SEVY0003601	4
33	C322	TANTAL-CAPACITOR	ECTZ0003704	1

34	C327	TANTAL-CAPACITOR	ECTZ0003701	1
35	C410	TANTAL-CAPACITOR	ECTH0005103	1
36	CON301	EAR-JACK	ENJE0006401	1
37	CON302	UIM-SOCKET	ENSY0018701	1
38	CON404	RECEPTACLE	ENRY0002901	1
39	CON406	35PIN-CONNECTOR	ENQY0013901	1
40	D301	SWITCHING-DIODE	EDSY0009901	1
41	D402	SCHOTTKY	EDSY0017702	1
42	D403	SCHOTTKY	EDSY0017701	1
43	DP101	DCN-DUPLEXER	SDDY0004301	1
44	F101	SAW-FILTER	SFSY0023401	1
45	F110	SAW-FILTER	SFSY0031901	1
46	L101,R106,R 427,R428	RESISTOR	ERHZ0000464	4
47	L102,L116	CHIP-INDUCTOR	ELCH0001427	2
48	L103	CERAMIC-INDUCTOR	ELCH0001405	1
49	L104	CHIP-INDUCTOR	ELCH0001408	1
50	L106	CHIP-INDUCTOR	ELCH0001409	1
51	L109,L110	CHIP-INDUCTOR	ELCH0001425	2
52	L111	CHIP-INDUCTOR	ELCH0001426	1
53	L112,R309,R 310	CHIP-INDUCTOR	ELCH0001430	3
54	L113,L115	CHIP-CAPACITOR	ECCH0000178	2
55	L114,L201,L 203	CHIP-INDUCTOR	ELCH0001413	3
56	L117	COIL-INDUCTOR	ELCH0001406	1
57	L202	POWER-INDUCTOR	ELCP0008001	1
58	L305,L306,R 207,R212,R2 17,R218,R22 4,R228,R236 ,R244,R271, R312,R333, R395,R461, R477	RESISTOR	ERHZ0000401	16
59	L308	BEAD-INDUCTOR	SFBH0006806	1
60	Q101	TRANSISTOR	EQBA0000601	1
61	Q201	TRANSISTOR	EQBP0008701	1



62	Q403,Q405	TR	EQBN0012301	2
63	R104	RESISTOR	ERHZ0000428	1
64	R209	RESISTOR	ERHZ0000221	1
65	R214,R239, R241	RESISTOR	ERHZ0000288	3
66	R215	RESISTOR	ERHZ0000351	1
67	R216	RESISTOR	ERHZ0004201	1
68	R223	RESISTOR	ERHZ0000318	1
69	R225	RESISTOR	ERHZ0000486	1
70	R226	THERMISTOR	SETY0004501	1
71	R227	RESISTOR-1/8W	ERHZ0003901	1
72	R230,R235, R425	RESISTOR	ERHZ0000405	3
73	R233	RESISTOR	ERHZ0000441	1
74	R234	RESISTOR	ERHZ0000212	1
75	R240	RESISTOR	ERHZ0003202	1
76	R243	RESISTOR	ERHZ0000488	1
77	R255	RESISTOR	ERHZ0000402	1
78	R265,R396	RESISTOR	ERHZ0000406	2
79	R266	RESISTOR	ERHZ0000498	1
80	R339	RESISTOR	ERHZ0000412	1
81	R352	RESISTOR	ERHZ0000485	1
82	R357,R358, R360	CHIP-CAPACITOR	ECZH0000816	3
83	R361	RESISTOR	ERHZ0000438	1
84	R364,R365	RESISTOR	ERHZ0000410	2
85	R375,R376, R378	RESISTOR	ERHZ0000206	3
86	R392	RESISTOR	ERHZ0000509	2
87	R401,R406, R410,R414, R415,R421, R431,R441, R442,R450, R453	RESISTOR	ERHZ0000484	11
88	R402,R405, R407,R408, R409,R416,	RESISTOR	ERHY0003301	21

	R417,R420, R429,R430, R433,R435, R438,R443, R445,R447, R449,R451, R452,R454, R463			
89	R426	RESISTOR	ERHZ0000444	1
90	R473	RESISTOR	ERHZ0000445	1
91	U101	MOBILE-S/W	ENWY0004501	1
92	U102	PAM	SMPY0009101	1
93	U201	MODEM	EUSY0298001	1
94	U301	MEMORY	EUSY0180602	1
95	U303	LED-CHARGE-PUMP	EUSY0238702	1
96	U305	PNP-TR	EQBP0006701	1
97	U308,U309	Single-SPDT-Switch	EUSY0263301	2
98	X202	X-TAL	EXXY0024101	1