CDMA Mobile Subscriber Unit
LG-LX570

SERVICE MANUAL

TRI BAND, TRI MODE
[PCS/GPS/CELLULAR]
CDMA MOBILE PHONE

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General Introduction

The LG-LX570 phone has been designed to operate on the latest digital mobile communication technology, Code Division Multiple Access (CDMA). This CDMA digital technology has greatly enhanced voice clarity and can provide a variety of advanced features. Currently, CDMA mobile communication technology has been commercially used in Cellular and Personal Communication Service (PCS). The difference between them is the operating frequency spectrum. Cellular uses 800Mhz and PCS uses 1.9Ghz. The LG-LX570 support GPS Mode, we usually call it tri-band phone.

The CDMA technology adopts DSSS (Direct Sequence Spread Spectrum). This feature of DSSS enables the phone to keep communication from being crossed and to use one frequency channel by multiple users in the same specific area, resulting that it increases the capacity 10 times more compared with that in the analog mode 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 the phone.

Cellular and PCS CDMA network consists of MSO (Mobile Switching Office), BSC (Base Station Controller), BTS (Base station Transmission System), and MS (Mobile Station). The following table lists some major CDMA Standards.

CDMA Standard	Designator	Description
Basic air interface	TIA/EIA/IS-95-A/B/C	Protocol between MS and BTS for Cellular & AMPS
	ANSI J-STD-008	Protocol between MS and BTS for PCS
Network	TIA/EIA/IS-634	MAS-BS
	TIA/EIA/IS/651	PCSC-RS
	TIA/EIA/IS-41-C	Intersystem operations
	TIA/EIA/IS-124	Nom-signaling data comm.
Service	TIA/EIA/IS-96-B	Speech CODEC
	TIA/EIA/IS-99	Assign data and fax
	TIA/EIA/IS-637	Short message service
	TIA/EIA/IS-657	Packet data
Performance	TIA/EIA/IS-97	Cellular base station
	TIA/EIA/IS-98	Cellular mobile station
	ANSI J-STD-018	PCS personal station
	ANSI J-STD-019	PCS base station
	TIA/EIA/IS-125	Speech CODEC

* TSB –74: Protocol between an IS-95A system and ANSI J-STD-008

Chapter 1. System Introduction

1. System Introduction

1.1 CDMA Abstract

The CDMA mobile communication system has a channel hand-off function that is used for collecting the information on the locations and movements of mobile telephones from the cell site by automatically controlling several cell site through the setup of data transmission routes, and then 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 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 CDMA 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 available method 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 characteristic 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 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 wider frequency band. The fading related to normal frequency can affect the normal 200~300kHz among signal bands and accordingly, serious effect 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 with 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 power 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 transmit signals received by the base station have same strength.
Moreover, the backward closed loop power control used by the mobile station is performed to control power using 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 1.25msec (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 base station and the 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 for cellular and 14400,7200,3600,1800 bits per second for PCS, so PCS provide relatively better voice quality (almost twice better than the existing celluar system). In addition, this type of variable voice encoder utilizes adaptive threshold values on 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

Voice privercy is provided in the CDMA system by means of the private long code mask used for PN spreading. Voice privacy can ve applied on the traffic channels only. All calls are initiated using the public long code mask for PN spreading. The mobile station user may request voice privacy during call setup using the origination message or page response message, and during traffic channel operation using the long code transition request order.

The Transition to private long code mask will not be performed if authentication is not performed. To initiate a transition to the private or public long code mask, either the base station or the mobile station sends a long code transition request order on the traffic channel.

2.5 Soft Handoff

A handoff in which the mobile station commences communications with a new base station without interrupting communications with the old base station. Soft handoff can only be used between CDMA channels having identical freqeuncy assignments.

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. 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 stations.

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 the 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, 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 tri-band CDMA Mobile Phone

The hardware structure of CDMA mobile phone is made up of radio frequency (RF) part and logic part. The RF part is composed of Receiver part (Rx), Transmitter part (Tx) and Local part (LO). For the purpose of operating on tri-band, It is necessary dual Tx path, tri Rx path, dual PLL and switching system for band selection. The mobile phone antenna is connected with the frequency seperater which divide antenna input/output signals between cellular frequency band (824~894 Mhz) and PCS frequency band (1850~1990Mhz). Each separated path is linked with the cellular duplexer and PCS duplexer. Duplexer carrys out seperating Rx band and Tx band. The Rx signals from the antenna are converted into intermediate frequency(IF) band by the frequency synthesizer and frequency down converter. And then, pass SAW filter which is a band pass filter for removing out image frequency. The IF output signals that have been filtered is converted into digital signals via Analog-to-Digital Converter (ADC). In front of the ADC, switching system is required to choose which band path should be open. The digital signals send to 5 correlators in each CDMA de-modulator. Of these, one is called a searcher whereas the remaining 4 are called data receivers (fingers). Digitalized IF 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, but 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 3 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 between the two cell sites. Moreover, 3 data receivers are allocated in order to carry out the de-modulation of these paths. Output data that has been demodulated changes the data string in the combined data row as in the case of original signals(deinterleaving), and then, are demodulated by the forward error correction decoder which uses the Viterbi algorithm.

Mobile station user information send 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 (QPSK) 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 :

1) CELLULAR : 45 MHz
2) PCS : 80 MHz

4.1.2 Number of Channels (Channel Bandwidth)

1) CELLULAR : 20 Channels
2) PCS : 48 Channels

4.1.3 Operating Voltage : DC 3.3~4.2V

4.1.4 Battery Power Consumption : DC 3.7V

	SLEEP	IDLE	MAX POWER
CELLULAR	1.0 mA	200mA	800 mA (24.5 dBm)
PCS	1.0 mA	200mA	800 mA (24.5 dBm)

4.1.5 Operating Temperature : -20°C ~ +60°C

4.1.6 Frequency Stability

1) CDMA : ±0.5PPM
2) PCS : ±0.1PPM

4.1.7 Antenna : Internal Antenna, 50 Ω

4.1.8 Size and Weight

1) Size : 15.4(H) x 49.5(W) x 96.5(D) mm (with800mAh)
2) Weight : 88g (with 800mAh)

4.1.9 Channel Spacing

1) CELLULAR : 1.25MHz
2) PCS: 1.25 MHz

4.1.10 Battery Type, Capacity and Orerating Time.

Unit = Hours, Minutes

		Standard (800mAh)
Standby Time	**PCS(Slot Cycle 2)**	About 130 Hrs (SCI=2)
	DCN (Slot Cycle 2)	About 130 Hrs (SCI=2)
Talk Time	**PCS(Slot Cycle 2)**	190 Min.(typical duplexer,10dBm output)
	DCN (Slot Cycle 2)	172Min.(typical duplexer,10dBm output)

4.2 Receive Specification

4.2.1 Frequency Range

1) CELLULAR : 869.820 MHz ~ 893.190 MHz
2) PCS : 1930 MHz ~ 1990 MHz
3) GPS : 1575.42 MHz

4.2.2 Local Oscillating Frequency Range :

1) CELLULAR : 1738.08MHz ~ 1787.94MHz
2) PCS : 1715.56MHz ~ 1768.89MHz
3) GPS : 3150.84MHz

4.2.3 Sensitivity

1) CELLULAR : -104dBm (C/N 12dB or more)
2) PCS : -104dBm (C/N 12dB or more)
3) GPS : -148.5dBm

4.2.4 Selectivity

1) CELLULAR : 3dB C/N Degration (With Fch±1.25 kHz : -30dBm)
2) PCS : 3dB C/N Degration (With Fch±1.25 kHz : -30dBm)

4.2.5 Interference Rejection

1) Single Tone : -30dBm at 900 kHz (CELLULAR), -30dBm at 1.25MHz(PCS)
2) Two Tone : -43dBm at 900 kHz & 1700kHz(CELLULAR), -43dBm at 1.25 MHz & 2.05 MHz

4.2.6 Spurious Wave Suppression : Maximum of -80dB

4.2.7 CDMA Input Signal Range

- Dynamic area of more than -104~ -25 dB: 79dB at the 1.23MHz band.

4.3 Transmit Specification

4.3.1 Frequency Range

1) CELLULAR : 824.820MHz ~ 848.190MHz
2) PCS : 1850 MHz ~ 1910 MHz

4.3.2 Output Power

1) CELLULAR : 0.236W
2) PCS: 0.251W

4.3.3 CDMA TX Frequency Deviation :

1) CELLULAR: ±300Hz or less
2) PCS: ± 150Hz

4.3.4 CDMA TX Conducted Spurious Emissions

1) CELLULAR : 900kHz : - 42 dBc/30kHz below
   1.98MHz : - 54 dBc/30kHz below
2) PCS : -42 dBc / 30KHz below

4.3.5 CDMA Minimum TX Power Control

1) CELLULAR : - 50dBm below
2) PCS: -50dBm below

4.4 MS (Mobile Station) Transmitter Frequency

4.4.1 CELLULAR mode

Ch #	Center Freq. (MHz)	Ch #	Center Freq. (MHz)
1011	824.640	404	837.120
29	825.870	445	838.350
70	827.100	486	839.580
111	828.330	527	840.810
152	829.560	568	842.040
193	830.790	609	843.270
234	832.020	650	844.500
275	833.250	697	845.910
316	834.480	738	847.140
363	835.890	779	848.370

4.4.2 PCS mode

Ch #	Center Freq (MHz)	Ch #	Center Freq (MHz)	Ch #	Center Freq (MHz)
25	1851.25	425	1871.25	825	1891.25
50	1852.50	450	1872.50	850	1892.50
75	1853.75	475	1873.75	875	1893.75
100	1855.00	500	1875.00	900	1895.00
125	1856.25	525	1876.25	925	1896.25
150	1857.50	550	1877.50	950	1897.50
175	1858.75	575	1878.75	975	1898.75
200	1860.00	600	1880.00	1000	1900.00
225	1861.25	625	1881.25	1025	1901.25
250	1862.50	650	1882.50	1050	1902.50
275	1863.75	675	1883.75	1075	1903.75
300	1865.00	700	1885.00	1100	1905.00
325	1866.25	725	1886.25	1125	1906.25
350	1867.50	750	1887.50	1150	1907.50
375	1868.75	775	1888.75	1175	1908.75

4.5 MS (Mobile Station) Receiver Frequency

4.5.1 CELLULAR mode

Ch. #	Center Freq. (MHz)	Ch. #	Center Freq. (MHz)
1011	869.640	404	882.120
29	870.870	445	883.350
70	872.100	486	884.580
111	873.330	527	885.810
152	874.560	568	887.040
193	875.790	609	888.270
234	877.020	650	889.500
275	878.250	697	890.910
316	879.480	738	892.140
363	880.890	779	893.370

4.5.2 PCS mode

Ch #	Center Freq (MHz)	Ch #	Center Freq (MHz)	Ch #	Center Freq (MHz)
25	1931.25	425	1951.25	825	1971.25
50	1932.50	450	1952.50	850	1972.50
75	1933.75	475	1953.75	875	1973.75
100	1935.00	500	1955.00	900	1975.00
125	1936.25	525	1956.25	925	1976.25
150	1937.50	550	1957.50	950	1977.50
175	1938.75	575	1958.75	975	1978.75
200	1940.00	600	1960.00	1000	1980.00
225	1941.25	625	1961.25	1025	1981.25
250	1942.50	650	1962.50	1050	1982.50
275	1943.75	675	1963.75	1075	1983.75
300	1945.00	700	1965.00	1100	1985.00
325	1946.25	725	1966.25	1125	1986.25
350	1947.50	750	1967.50	1150	1987.50
375	1948.75	775	1968.75	1175	1988.75

4.5.3 GPS mode : 1575.42MHz

4.6 AC Adaptor : See Appendix

4.7 Cigar Lighter Charger: *See* Appendix

4.8 Hands-Free Kit : See Appendix

5. Installation

5.1 Installing a Battery Pack

1) The 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) Slide the battery pack forward until you hear a “click”, which locks the battery in place.

5.2 For Adapter Use

1) Plug the adapter into a wall outlet. The adapter can be operated from a 110V source. When AC power is connected to the adapter.
2) Insert the adapter jack into the phone with the installed battery pack.
   Red light indicates battery is being charged.. Green light indicates battry 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 Cradle Installation

Choose an appropriate flat surface where the unit will not interface with driver’s movement or passenger’s comfort. The driver/user should be able to access the phone with ease. Using the four self-tapping screws provided, mount the supplied braket on the selected area. Then with the four machine screws provided, mount the counterpart on the reverse side of the reverse side of the cradle. Secure the two brackets firmly together by using the two bracket joint screws provide. The distance between the cradle and the interface box must not exceed the length of the main cable.

5.3.3 Interface Box

Choose an appropriate flat surface (somewhere under the dash on the passenger side is preferred) and mount the IB bracket with the four self-tapping screws provided. Clip the IB into the IB bracket.

5.3.4. Microphone Installation

Install the microphone either by cliiping I onto the sunvisor (driver’s side) or by attaching it to door post (driver’s side), using a velcno adhesive tape (not included).

5.3.5 Cable Connections

5.3.5.1 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. Connect the kit's power cable connector to the interface box power receptacle.

5.3.5.2 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 telephone numbers included)

1. NAM Programming Method and Telephone Number Input Method

1. Press ##2342# (##CDG2#)
2. Enter Service Code “ 000000” .
3. You can see following Menu

CDG-II
1. Service Progra..
2. Field Tests
3. Vocoder Select
4. Reg. Tests
5. Data Setting

4 Select ‘ Service Prog’ , and press OK

You can see following submenus.

Service Program
1. Reset Phone
2. Mobile Phone #
3. Home SID
4. Advanced

4-1) Select ‘ Reset Phone’ , and Press OK

You can reset the phone

4-2) Select ‘ Mobile Phone #’ and press OK

Input Mobile Phone Number and select OK

Phone Number
0000000000

4-3) Select ‘ Home SID’ and press OK

Input the Home SID and select OK

Home SID
11111

4-4) Advanced

There are fifteen submenus as below.

4-4.1) Select ‘ MCC’ and press OK

Input the Mobile Country Code and select OK

Country Code
00

4-4.2) Select ‘ NMSI’ and press OK

Input the NMSI and select OK

NMSI
001112223333

4-4.3) Select ‘ True MCC’ and press OK

Input the True MCC and select OK

True MCC
10

4-4.4) Select ‘ True IMSI NMSI’ and press OK

Input the True IMSI NMSI and select OK

True IMSI NMSI
001112223333

4-4.5) Select ‘ Home NID’ and press OK

Input the Home NID and select OK

Home NID
5535

4-4.6) Select ‘ Home Sys Reg’ and press OK

Select one what you want , and press OK

Home Sys Reg
◉ Yes
○ No

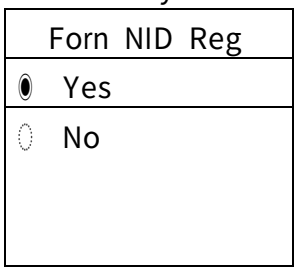
4-4.7) Select ‘ Forn SID Reg’ and press OK

Select one what you want , and press OK

Forn SID Reg
◉ Yes
○ No

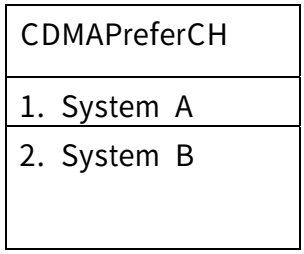
4-4.8) Select ‘ Forn NID Reg’ and press OK

Select one what you want , and press OK



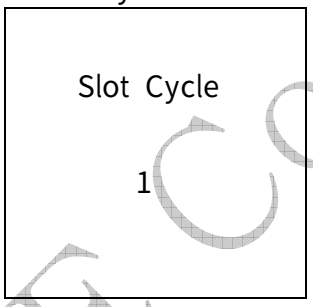
4-4.9) Select ‘ CDMA Preferred CH’ and press OK

Select one what you want , and press OK



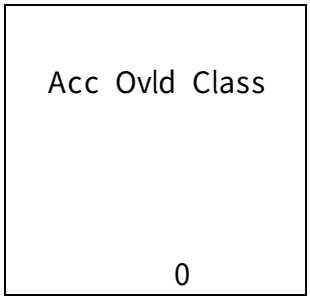
4-4.10) Select ‘ Slot Cycle Idx’ and press OK

Input the Slot Cycle and select OK



4-4.11) Select ‘ Acc Ovld Class’ and press OK

You can see the Access Overload Class that is automatically set according to IMSI_M



CHAPTER 3. Circuit Description

1. RF Transmit/Receive Part

1.1 Overview

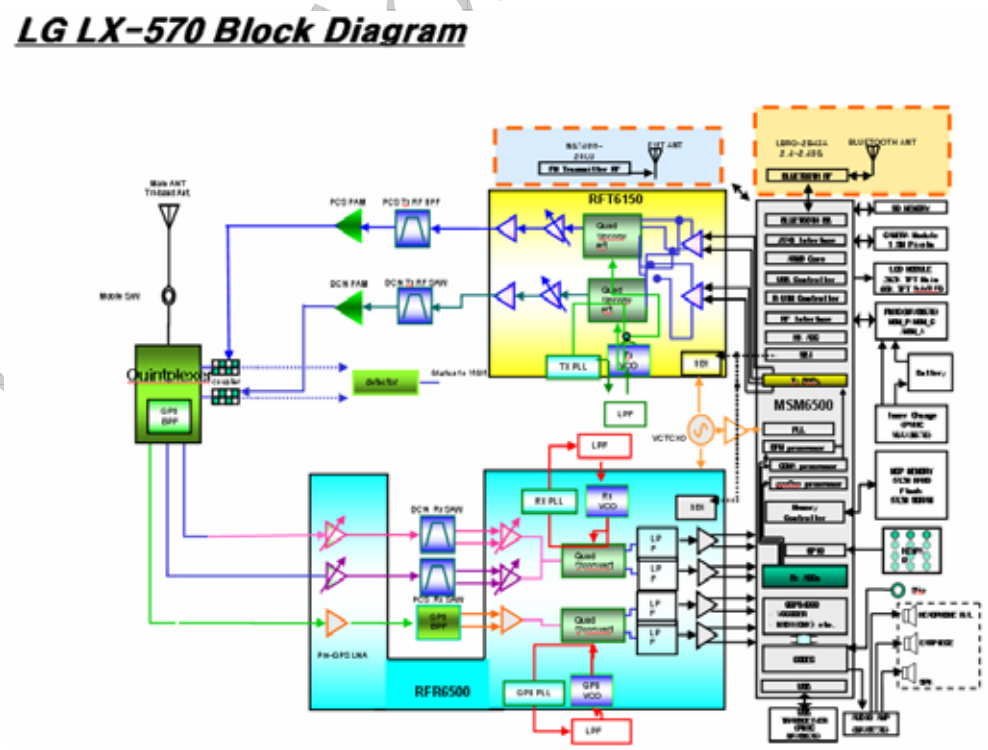
The Tx and Rx part employs the Direct Conversion system. The Tx and Rx frequencies are respectively 824.04~848.97 and 869.04~893.97 for cellular and 1850~1910 and 1930~1990 for PCS. The block diagram is shown in [Figure 1-1]. RF signals received through the antenna are seperated by Triplexer.

RF Signal fed into the low noise amplifier (LNA) which is embedded in RFR6500 through the duplexer. Then, they are into baseband signal directly. Then, this signal is changed into digital signal by the analog to digital converter (ADC, A/D Converter), and the digital circuit part of the MSM(Mobile Station Modem)6500 processes the data from ADC. The digital processing part is a demodulator.

In the case of transmission, RFT6150 receives OQPSK-modulated anlog signal from the MSM6500.

The RFT6150 connects directly with MSM6500 using an analog baseband interface. In RFT6150, the baseband quadrature signals are upconverted to the Cellular or PCS 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 isolator and duplexer.



[Figure 1-1] Block Diagram Of LX570

1.2 Description of Rx Part Circuit

1.2.1 Quintiplexer(DP1000)

The Quintplexer combines PCS, and Cellular duplexer functions with a GPS filter. Each duplexer consists of the Rx bandpass filter (BPF) and the Tx BPF which has the function of separating Tx and Rx signals in the full duplex system for using the common antenna. The Tx part BPF is used to suppress noises and spurious out of the Tx frequency band. The Rx BPF is used to receive only Rx signal coming from the antenna, which is usually called preselector. It's main function is to limit the bandwidth of spectrum reaching the LNA and mixer, attenuate receiver spurious response and suppress local oscillator energy. As a result frequency sensitivity and selectivity of mobile phone increase. The specification of LG-LX570 quintplexer is described below ;

- PCS Duplexer

	Tx	Rx	Tx to Rx (min)
Pass Band	1850~1910 MHz	1930~1990 MHz	
Insertion Loss	3.0dB max	3.2dB max	
Return Loss	9.5dB min	12dB min	
Attenuation	45dB min (1930~1990MHz)	55dB min (1850~1910MHz)	60dB (1850~1910MHz) 50dB (1930~1990MHz)

- Cellular Duplexer

	Tx	Rx	Tx to Rx (min)
Pass Band	824~849MHz	869~894 MHz	
Insertion Loss	2.0dB max	2.5dB max	
Return Loss	12dB min	12dB min	
Attenuation	48dB min (869~894MHz)	60dB min (824~849MHz)	60dB (824~849MHz) 50dB (869~894MHz)

- GPS Filter

	MAX.	TYP.	MIN.	UNIT
Insertion Loss	2.0			dB
Return Loss			9	dB
ISOLATION	40 ~ 46			dB

1.2.3 LNAs (U1008)

The RFR6500 has cellular and PCS LNAs, respectively. The characteristics of Low Noise Amplifier (LNA)

are low noise figure, high gain, high intercept point and high reverse isolation. The frequency selectivity characteristic of mobile phone is mostly determined by LNA.

The specification of LX570 LNAs are described below.

● Cellular

	High current mode	Low current mode	Passive status
Power Gain			
*Gain mode G0(G2)	16dB	14dB	-6.0dB
*Gain mode G1(G3)	4.0dB	3.0dB	-20.0dB
Noise Figure			
Gain mode G0(G2)	1.4dB	1.4dB	7.0dB
Gain mode G1(G3)	4.0dB	4.0dB	20.0dB
Input IP3			
Gain mode G0(G2)	8dB	-5dB	12dB
Gain mode G1(G3)	5dB	-5dB	10dB

*Gain mode G0 and G1 operate in high and low current mode.

*Gain mode G2 and G3 operate in Passive status.

● PCS

	High current mode	Low current mode	Passive status
Power Gain			
*Gain mode G0(G1)	16dB	14dB	-3.0dB
Gain mode G2	X	X	-20.0dB
Noise Figure			
Gain mode G0(G1)	1.6dB	1.6dB	4.0dB
Gain mode G2	X	X	20.0dB
Input IP3			
Gain mode G0(G1)	6dB	-2dB	10dB
Gain mode G2	X	X	10dB

*Gain mode G0 operate in high and low current mode.

*Gain mode G1 and G2 operate in Passive status.

● GPS

Parameter	GPS Band	Unit
Gain	14.5	dB
Noise Figure	1.3	dB
IIP3	5.0	dBm

1.2.4 Down-converter Mixers

The RFR6500 device performs signal down-conversion for Cellular, PCS and GPS tri-band applications. It contains all the circuitry (with the exception of external filters) needed to support conversion of received RF signals to baseband signals. It consists of the three downconverting Mixers(Cellular, PCS and GPS), and an RX VCO and RX PLL circuit.

The GPS LNA & mixers offer 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 MSM6500.

The specification of LX570 Mixers are described below:

● Cellular

	High current mode	Mid current mode	Low current mode
Noise Figure			
High Gain mode	10dB	10dB	9dB
Low Gain mode	25dB	25dB	25dB
Input IP3			
High Gain mode	4.0dB	4.0dB	-10.0dB
Low Gain mode	-5.0dB	-5.0dB	-5.0dB
Input IP2			
High Gain mode	56dB	56dB	40dB
Low Gain mode	30dB	30dB	30dB

● Cellular

	High current mode	Mid current mode	Low current mode
Noise Figure			
High Gain mode	10dB	10dB	9dB
Low Gain mode	25dB	25dB	25dB
Input IP3			
High Gain mode	4.0dB	-8.0dB	-8.0dB
Low Gain mode	-11.0dB	-11.0dB	-11.0dB
Input IP2			
High Gain mode	56dB	56dB	40dB
Low Gain mode	30dB	30dB	30dB

1.2.4 Rx RF SAW FILTER(F1000,F1001,F1002)

The main function of Rx RF SAW filter is to attenuate mobile phone spurious frequency, attenuate direct RF frequency pick up, attenuate noise at the image frequency originating in or amplified by the LNA and suppress second harmonic originating in the LNA. The Rx RF SAW filter usually called image filter.

1.3 Description of Transmit Part Circuit

1.3.1 RFT6150 (U1009)

The RFT6150 base-band-to-RF Transmit Processor performs all Tx signal-processing functions required between digital base-band and the Power Amplifier Modulator (PAM). The base-band quadrature signals are up-converted to the Cellular or PCS frequency bands and amplified to provide signal drive capability to the PAM. The RFT6150 includes an RF mixer for upconverting analog baseband to RF, a programmable PLL for generating Tx LO frequency, two cellular and two PCS driver amplifiers and Tx power control through an 85 dB VGA. 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 proceed from the MSM6500 to RFT6150 are analog signal. In CDMA mode, These signals are modulated by Quadrature Phase Shift King (QPSK). I and Q are 90 deg. out of phase, and I and I/ are 180 deg. The mixer in RFT6150 converts baseband signals into RF signals. After passing through the upconverter , RF signal is inputted into the Power AMP.

- RFT6150 Cellular and PCS CDMA RF Specifications

	Condition	Min.	Typ.	Max.	Units
Rated Output Power	Average CDMA Cellular Average CDMA PCS		7 9		dBm dBm
Min Output Power	Average CDMA Cellular Average CDMA PCS		-75 -75		dBm dBm
Rx band noise power	CDMA Cellular CDMA PCS		-136 -133		dBm/Hz
ACPR	Cellular: Fc±885kHz PCS: Fc±1.25MHz		-56 -57		dBc/ 30kHz

1.3.2 Power Amplifier(U1006,U1007)

The power amplifier that can be used in the PCS and CDMA mode has linear amplification capability and high efficiency. For higher efficiency, it is made up of one MMIC (Monolithic Microwave Integrated Circuit) for

which RF input terminal and internal interface circuit are integrated onto one IC after going through the AlGaAs/GaAs HBT (heterojunction bipolar transistor) process. The module of power amplifier is made up of an output end interface circuit including this MMIC. The maximum power that can be inputted through the input terminal is +10dBm and conversion gain is about 28dB. RF transmit signals that have been amplified through the power amplifier are sent to the duplexer.

1.3.3 NS740M-20LU (U4006)

FM Transmitter IC (NS740M-20LU) is a FM band low power output transmitter IC. The Left and Right audio signals are modulated in FM with stereo multiplexing.

Manufactured process is full CMOS process, and DSP is implement. DSP process stereo generation.

	Min	Max	UNIt
Tx Frequency Range	76	108	MHz
Tx output power	0.1	2.0	mW
Consumption Current	15(typ)	20	mA
Standby current		20	uA

1.4 Description of Frequency Synthesizer Circuit

1.4.1 Voltage Control Temperature Compensation Crystal Oscillator (VCTCXO, U1004)

The temperature variation of mobile phone can be compensated by VCTCXO. The reference frequency of a mobile phone is 19.2MHz. The receives frequency tuning signals called TRK_LO_ADJ from MSM as 0.5V~2.5V DC via R and C filter in order to generate the reference frequency of 19.2MHz and input it into the frequency synthesizer. Frequency stability depending on temperature is ±2.0 ppm.

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 and Receptacle Part

This is used to transmit keypad signals to MSM6500. It is made up of a keypad backlight part that illuminates the keypad part that displays the operation status onto 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 used to convert MIC signals into digital voice signals and digital voice signals into analog voice signals, amplifying part for amplifying the voice signals and sending them to the ear piece, amplifying part that amplifies ringer signals coming out from MSM6500, and amplifying part that amplifies signals coming out from MIC and transferring them to the audio processor.

2.2.3 MSM (Mobile Station Modem) 6500 Part

MSM is the core elements of CDMA terminal and carries out the functions of CPU, encoder, interleaver, deinterleaver, Viterbi decoder, Mod/Demod, and vocoder.

2.2.4 Memory Part

The memory part is made up of a sdram/nand memory, nand for storing data.

2.2.5 Power Supply Part

The power supply part is made up of circuits for generating various types of power, used for the digital/voice processing part.

2.3 Circuit Description

2.3.1 Keypad/LCD and Receptacle Part

Once the keypad is pressed, the key signals are sent out to MSM6500 for processing. In addition, when the key is pressed, the keypad lights up through the use of 14 LEDs. The terminal status and operation are displayed on the screen for the user with the characters and icons.
Moreover, it exchanges audio signals and data with external sources through the receptacle, and then receives power from the battery or external batteries.

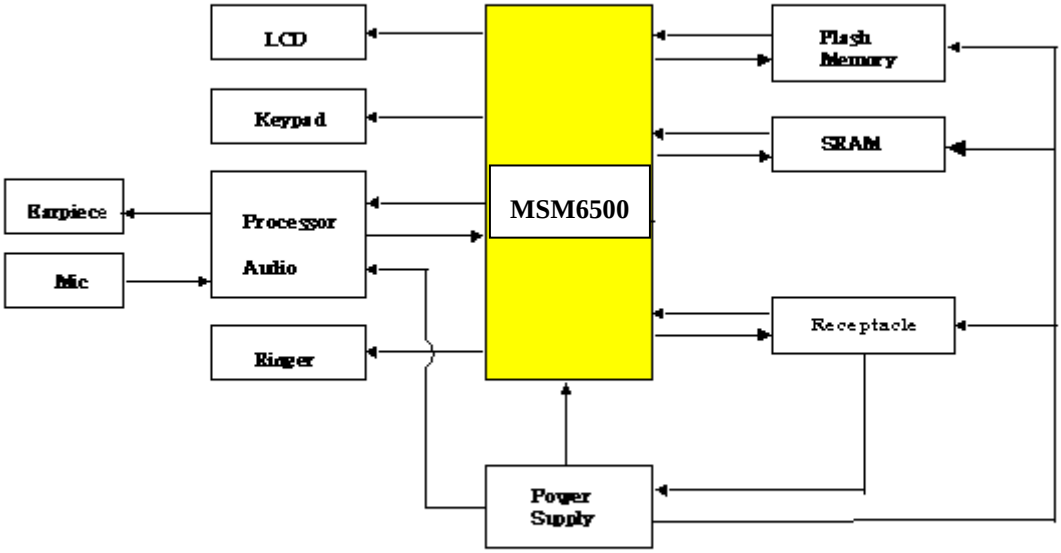
2.3.2 Audio Processing Part

MIC signals are amplified through OP AMP, inputted into the audio codec(included in MSM6500) and converted into digital signals. Oppositely, digital audio signals are converted into analog signals after going through the audio codec. These signals are amplified at the audio amplifier and transmitted to the ear-piece. The signals from MSM6500 activate the ringer by using signals generated in the timer in MSM6500.

2.3.3 MSM Part

MSM6500 is the core element of CDMA system terminal that includes ARM926EJ-S microprocessor core. It supports CDMA, operating in both the cellular and PCS spectrums. The subsystems within the MSM6500 include a CDMA processor, a DFM processor, a multi-standard Vocoder, an integrated CODEC with earpiece and microphone amplifiers, general-purpose ADC for subsytem monitoring, an ARM926EJ-S microprocessor, and both Universal Serial Bus(USB) and an RS-232 serial interfaces supporting forward and reverse link data communications of 307.2 Kbps simultaneously. And it also contains complete digital modulation and demodulation systems for CDMA standards, as specified in IS-95-A/B/C.

In MSM, coded symbols are interleaved in order to cope with multi-path fading. Each data channel is scrambled by the long code PN sequence of the user in order to ensure the confidentiality of calls. Moreover, binary quadrature codes are used based on walsh functions in order to discern each channel. Data created thus are 4-phase modulated by one pair of Pilot PN code and they are used to create I and Q data.
When received, I and Q data are demodulated into symbols by the demodulator, and then de-interleaved in reverse to the case of transmission. Then, the errors of data received from viterbi decoder are detected and corrected. They are voice-decoded at the vocoder in order to output digital voice data..



[Figure 2-2] Block Diagram of Digital/Voice Processing Part

2.3.4 Memory Part

MCP contents 512 Mbits flash memory and 512 Mbits SDRAM. In the Flash Memory part of MCP are programs used for terminal operation. The programs can be changed through down loading after the assembling of terminals. On the SDRAM data generated during the terminal operation are stored temporarily.

2.3.5 Power Supply Part

When the battery voltage (+4.0V) is fed and the PWR key of keypad is pressed, the power-up circuitry in PM (power management) IC (U600) is activated by the PWR_ON_SW signal, and then the LDO regulators embedded in PMIC for MSM) are operated and +1.4V_MSMC, +1.8_MSMP1, +2.6V_MSMP2 and +2.6V_MSMA are generated.

The Rx part regulator (+2.9V_RX) is operated by the control signal of SLEEP/ from MSM6500

The Tx part regulator (+2.85V_TX) is operated by the I^2C control signal from MSM6500

2.3.6 Logic Part

The logic part consists of internal CPU of MSM, RAM, MCP. The MSM6500 receives TCXO (=19.2MHz)

from X101 and controls the phone in CDMA mode. The major components are as follows:

- **CPU**

The ARM926EJ-S microprocessor includes 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.

- **MCP**

Flash ROM is used to store the terminal's program. Using the down-loading program, the program can be changed even after the terminal is fully assembled.

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

- **KEYPAD**

For key recognition, key matrix is setup using KYPD[1][3][5][7][9][11][13][15][17][19] signal from MSM. 16 LEDs and backlight circuitry are included in the keypad for easy operation in the dark.

CHAPTER 4. Safety

▣ IMPORTANT

Read This Information Before Using Your Hand-Held Portable Cellular Telephone

First introduction in 1984, the hand-held portable cellular telephone is one of the most exciting and innovative electronic products ever developed.

With it you can stay in contact with your office, your home, emergency service, and others. For the safe and efficient operation of your phone, observe these guidelines.

Your cellular phone is a radio transmitter and receiver. When it is ON, it receives and also sends out radio frequency (RF) energy. The phone operates in the frequency range of 824 MHz to 894 MHz and employs commonly used frequency modulation (FM) techniques. When you use your phone, the cellular system handling your calls controls the power level at which your phone transmits. The power level can range from 0.006 of a watt to .6 of a watt.

▣ Exposure to Radio Frequency Energy

In 1991 the Institute of Electrical and Electronics Engineers (IEEE), and in 1992 the American National Standards Institute (ANSI) updates the 1982 ANSI Standard for safety levels with respect to human exposure to RF energy. Over 120 scientists, engineers, and physicians from universities, government health agencies, and industry, after reviewing the available boy of research, developed this updated Standard. In March, 1993, the US Federal Communications Commission (FCC) proposed the adoption of this updated Standard.

The design of your phone complies with this updated Standard. Of course, if you want to limit RF exposure even further than the updated ANSI Standard, you may choose to control the duration of your calls and opration your phone in the most power efficient manner.

▣ Efficient Phone Operation

For your phone to operate at the lowest power level, consistent with satisfactory call quality, please observe the following guidelines:

If your phone has an extendable antenna, extend it fully. Some models allow you to place a call with the antenna retracted. However, your phone operates more efficiently with the antenna fully extended.

Hold the phone as you would any other telephone. While speaking directly into the mouthpiece, position the antenna up and over your shoulder.

Do not hold the antenna when the phone is “IN USE”. Holding the antenna affects call quality and may cause the phone to operated at a higher power level than needed.

▣ Antenna Care and Replacement

Do not use the phone with a damaged antenna. If a damaged antenna comes into contact with skin, a minor bum may result. Replace a damaged antenna immediately. Consult your manual to see if you may change your

antenna yourself. If so, use only a manufacture approves antenna. Otherwise, take your phone to a qualifies service center for repair.

Use only the supplied or approved antenna. Non-approved antennas, modifications, or attachments, could impair call quality, damage the phone, and violate FCC egulations.

▣ Driving

Check the laws and regulations on the use of cellular telephones in the areas where you drive. Always obey them. Also, when using your phone while driving, please:

Give full attention to the driving. Use hands-free operation, if available, and pull off the road and park before making or answering a call if driving conditions require.

▣ Electronic Devices

Most modem electronic equipment is shielded from RF energy. However, RF energy from cellular telephones may affect inadequately shielded electronic equipment.

RF energy may effect improperly installed or inadequately shielded electronic operating and entertainment system in motor vehicles. Check with the manufacturer or its representative to determine if these systems are adequately shielded from external RF energy. You should check with the manufacturer of any equipment that has been added to your vehicle.

Consult the manufacturer of any personal medical devices (such as pacemakers, hearing aids, etc.) to determine if they are adequately shielded from external RF energy.

Turn your phone OFF in health care facilities. When any regulations posted in the areas instruct you to do so. Hospitals or health care facilities may be using equipment that could be sensitive to external RF energy.

▣ Aircraft

Turn your phone OFF before boarding any aircraft.

Use it on the ground only with crew permission. Do not use it in the air.

To prevent possible interference with aircraft systems, US Federal Aviation Administration (FAA) regulations require you to have permission from a crew member to use your phone while the plane is on the ground. Using your phone while the plane is in the air.

▣ Children

Do not allow children to play with your phone. It is not a toy. Children could hurt themselves or others (by poking themselves or others in the eye with the antenna, for example). Children also could damage the phone, or make calls that increase your telephone bills.

▣ Blasting Areas

To avoid interfering with blasting operations, turn you unit OFF when in a “blasting area” or in areas posted “Turn off two-way radio”. Construction crews often use remote control RF devices to set off explosives.

▣ Potentially Explosive Atmospheres

Turn your phone OFF when in any area with a potentially explosive atmosphere. It is rare, but your phone or accessories could generate sparks. Sparks in such area could cause an explosion or fire resulting in bodily injury or even death.

Areas with a potentially explosive atmosphere are often, but not always, clearly marked. They include fueling areas such as gas station; below deck on boats; fuel or chemical transfer or storage facilities; areas where the air contains chemical or particles, such as grain, dust, or metal powders; and any other area where you would normally be advised to turn off your vehicle engine.

Do not transport or store flammable gas, liquid, or explosives in the compartment of your vehicle which contains your phone or accessories.

Vehicles using liquefied petroleum gas (such as propane or butane) must compl7y with the National Fire Protection Standard (NFPA-58). For a copy of this standard, contact the National Fire Protection Association, One Battery march Park, Quincy, MA 02269, Attn: Publication Sales Division.

Rule of Thumb: Using common sense at all times when handling, installing or using the phone. Any questions should be directed to you nearest Service Center or authorized service technician or electrician.

CHAPTER 5. Glossary

General Terms

Abbreviated Alert. An abbreviated alert is used to remind the mobile station user that previously selected alternative routing features are still active.

AC. See Authentication Center.

Access Attempt. A sequence of one or more access probe sequences on the Access Channel containing the same message. See also Access Probe and Access Probe Sequence.

Access Channel. A Reserve CDMA Channel used by mobile stations for communicating to the base station. The Access Channel is used for short signaling message exchanges such as call origination's, responses to pages, and registrations. The Access Channel is a slotted random access channel.

Access Channel Message. The information part of an access probe consisting of the message body, length field, and CRC.

Access Channel Message Capsule. An Access Channel message plus the padding.

Access Channel Preamble. The preamble of an access probe consisting of a sequence of all-zero frames that is sent at the 4800bps rate.

Access Channel Request Message. An Access Channel message that is autonomously generated by the mobile station. See also Access Channel Response Message.

Access Channel Response Message. A message on the Access Channel generated to reply to a message received from the base station.

Access Channel Slot. The assigned time interval for an access probe. An Access Channel slot consists of an integer number of frames. The transmission of an access probe is performed within the boundaries of an Access Channel slot.

Access Probe. One Access Channel transmission consisting of a preamble and a message. The transmission is an integer number of frames in length and transmits one Access Channel message. See also Access Probe Sequence and Access Attempt.

Access Probe Sequence. A sequence of one or more access probes on the Access Channel. The same Access Channel message is transmitted in every access probe of an access attempt. See also Access Probe and Access Attempt.

Acknowledgement. A Layer 2 response by the mobile station or the base station confirming that a signaling message was received correctly.

Action Time. The time at which the action implied by a message should take effect.

Active Set. The set of pilots associated with the CDMA Channels containing Forward Traffic Channels assigned to a particular mobile station.

Aging. A mechanism through which the mobile station maintains in its Neighbor Set the pilots that have been

recently sent to it from the base station and the pilots whose handoff drop timers have recently expired.

A-key. A secret, 64-bit pattern stored in the mobile station. It is used to generate update the mobile station's Shared Secret Data. The A-key is used in the mobile station authentication process.

Analog Access Channel. An analog control channel used by a mobile station to access a system to obtain service.

Analog Color-Code. An analog signal (see Supervisory Audio Tone) transmitted by a base station on an analog voice channel and used to detect capture of a mobile station by an interfering base station or the capture of a base station by an interfering mobile station.

Analog Control Channel. An analog channel used for the transmission of digital control information from a base station to a mobile station or from a mobile station to a base station.

Analog Paging Channel. A forward analog control channel that is used to page mobile stations and send orders.

Analog Voice Channel. An analog channel on which a voice conversation occurs and on which brief digital messages may be sent from a base station to a mobile station or from a mobile station to a base station.

Authentication. A procedure used by a base station to validate a mobile station's identity.

Authentication Center (AC). An entity that manages the authentication information related to the mobile station.

Authentication Response (AUTHR). An 18-bit output of the authentication algorithm. It is used, for example, to validate mobile station registrations, origination and terminations. A method of registration in which the mobile station registers without an explicit command from the base station.

AWGN. Additive White Gaussian Noise.

Bad Frames. Frames classified as erasures (frame category 10) or9600bps frames, primary traffic only with bit errors (frame category 9). See also Good Frames.

Base Station. A station in the Domestic Public Cellular Radio Telecommunications Service, other than a mobile station, used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, or other part of the cellular system. See also MSC.

Base Station Authentication Response (AUTHBS). An 18-bit pattern generated by the authentication algorithm. AUTHBS is used to confirm the validity of base station orders to update the Shared Secret Data.

Base Station Random Variable (RANDBS). A 32-bit random number generated by the mobile station for authenticating base station orders to update the Shared Secret Data.

BCH Code. See Bose-Chaudhuri-Hocquenghem Code.

Busy-Idle Bits. The portion of the data stream transmitted by a base station on a forward analog control channel that is used to indicate the current busy-idle status of the corresponding reverse analog control channel.

Call Disconnect. The process that releases the resources handling a particular call. The disconnect process beings either when the mobile station user indicates the end of the call by generating an on-hook condition or other call release mechanism, or when the base station initiates a release.

Call History Parameter(COUNT). A modulo-64 event counter maintained by the mobile station and Authentication Center that us used for clone detection.

Candidate Set. The set of pilots that have been received with sufficient strength by the mobile station to be successfully demodulated, but have not been placed in the Active Set by the base station. See also Active Set. Neighbor Set, and Remaining Set.

. See Code Division Multiple Access

CDMA Channel. The set of channels transmitted between the base station within a given CDMA frequency assignment. See also Forward CDMA Channel and Reverse CDMA Channel.

CDMA Channel Number. An 11-bit number corresponding to the center of the CDMA frequency assignment.

CDMA Frequency Assignment. A 1.23MHz segment of spectrum centered on one of the 30KHz channels of the existing analog system.

Code Channel. A subchannel of a Forward CDMA Channels. A Forward CDMA Channel contains 64 code channels. Code channel zero is assigned to the Pilot Channel. Code channels 1 through 7 may be assigned to the either Paging Channels or the Traffic Channels. Code Channel 32 may be assigned to either a Sync Channel or a Traffic Channel. The remaining code channels may be assigned to Traffic Channels.

Code Division Multiple Access (CDMA). A technique for spread-spectrum multiple-access digital communications that creates channels through the use of unique code sequences.

Code Symbol. The output of an error-correcting encoder. Information bits are input to the encoder and code symbols are output from the encoder. See Convolutional Code.

Continuous Transmission. A mode of operation in which Discontinuous Transmission is not permitted.

Control Mobile Attenuation Code(CMAC). A 3-bit field in the Control-Filler Message that specifies the maximum authorized power level for a mobile transmitting on an analog reverse control channels.

Convolution Code. A type of error-correcting code. A code symbol can be considered as the convolution of the input data sequence with the impulse response of a generator function.

CRC. See Cyclic Redundancy Code.

Cyclic Redundancy Code (CRC). A class of linear error detecting codes which generate parity check bits by finding the remainder of a polynomial division.

Data Burst Randomizer. The function that determines which power control groups within a frame are transmitted on the Reverse Traffic Channel when the data rate is lower than 9600 bps. The data burst randomizer determines, for each mobile station, the pseudo random position of the transmitted power control groups in the frame while guaranteeing that every modulation symbol is transmitted exactly once.

DBc. The ratio(in dB) of the sideband power of a signal, measured in a given bandwidth at a given frequency offset from the center frequency of the same signal, to the total inband power of the signal. For CDMA, the total inband power of the signal is measured in a 1.23MHz bandwidth around the center frequency of the CDMA signal.

DBm. A measure of power expressed in terms of its ration (in dB) to one milliwatt.

DBm/Hz. A measure of power spectral density. DBm/Hz is the power in one Hertz of bandwidth. Where power is expressed in units of dBm.

DBW. A measure of power expressed in terns of its ration (in dB) to one Watt.

Dedicated Control Channel. An analog conrtol channel used for the transmisson of digital control information from either a base station or a mobile station.

Deinterleaving. The process of unpermuting the symbols that were permuted by the interleaver..
Deinterleavering is performed on reveived symbols prior to decoding.

Digital Color Code(DCC). A digital signal transmitted by a base station on a forward analog control channel that is used to detect capture of a base station by an interfering mobile station.

Dim-and-Burst. A frame in which primary traffic is multiplexed with either secondary traffic or signaling traffic.

Discontinuous Transmission (DTX). A mode of operation in which a mobile station transmitter autonomously switches between two transmitter power levels while the mobile station is in the conversation state on an analog voice channel.

Distance-Based Registration. An autonomous registration method in which the mobile station registers whenever it enters a cell whose distance from the cell in which the mobile station last registered exceeds a given threshold.

DTMF. See Dual Tone Multifrequency.

Dual-Tone Multifrequency(DTMF). Signaling by the simultaneous transmission of two tones, one from a group of low frequencies and another from a group of high frequencies. Each group of frequecies consists of four frequencies.

Eb. The energy of an information bit.

Ec/I0. The ratio in (dB) between the pilot energy accumulated over one PN chip period(Ec) to the power spectral density in the received bandwidth(Io).

Effective Radiated Power (ERP). The transmitted power multiplied by the antenna gain referenced to a half wave dipole.

Electronic Serial Number(ESN). A 32-bit number assigned by the mobile station manufacturer, uniquely identifying the mobile station equipment.

Encoder Tail Bits. A fixed sequence of bits added to the end of a block of data to reset the convolutional encoder to a known state.

ERP. See Effective Radiated Power.

ESN. See Electronic Serial Number.

Extended Protocol. An optional expansion of the signaling message between the base station and mobile station to allow for the addition of new system features and operational capabilities.

Fade Timer. A timer kept by the mobile station as a measure of Forward Traffic Channel continuity. If the Fade timer expires, the mobile station drops the call.

Flash. An indication sent on an analog voice channel or CDMA Traffic Channel indicating that the user Directed the mobile station to invoke special processing.

Foreign NID Roamer. A mobile station operating in the same system (SID) but a different network (NID)Form the one in which service was subscribed. See also Foreign SID Roamer and Roamer.

Foreign SID Roamer. A mobile station operating in a system (SID) other than the one from which service was subscribed. See also Foreign NID Roamer and Roamer.

Forward Analog Control Channel (FOCC). An analog voice channel used from a base station to a mobile station.

Forward Analog Voice Channel (FVC). An analog voice channel used from a base station to a mobile station.

Forward CDMA Channel. A CDMA Channel form a base station to mobile stations. The Forward CDMA Channel contains one or more code channels that are transmitted on a CDMA frequency assignment using a Particular pilot PN offset. The code channels are associated with the Pilot Channel, Sync Channel, Paging Channels, and Traffic Channels. The Forward CDMA Channel always carries a Pilot Channel and may carry up to one Sync Channel, up to seven Paging Channels, and up to 63 Traffic Channels, as long as the total number of channels, including the Pilot Channel, is no greater than 64.

Forward Traffic Channel. A code channel used to transport user and signaling traffic from the base station to the mobile station.

A basic timing interval in the system. For the Access Channel, Paging Channel, and Traffic Channel, a frame is 20 ms long. For the Sync Channel, a frame is 26.666…ms long.

Frame Category. A classification of a received Traffic Channel frame based upon transmission data rate, the Frame contents (primary traffic, secondary traffic, or signaling traffic), and whether there are detected error in the frame.

Frame Offset. A time skewing of Traffic Channel frames from System Time in integer multiples of 1.25 ms. The maximum frame offset is 18..75 ms..

Frame Quality Indicator. The CRC check applied to 9600 bps and 4800 bps Traffic Channel frames.

Global Positioning System (GPS). A US government satellite system that provides location and time Information to users. See Navstar GPS Space segment / Navigation User interfaces ICD-GPS-200 for Specifications.

Half Frame. A 10 ms interval on the paging Channel. Two half frames comprise a frame, the first half frame begins at the same time as the frame.

Handoff. The of transferring communication whth a station mobile station from one base station to another.

Hard Handoff. A handoff characterized by a temporary disconnection of the Traffic Channel. Hard handoffs Occur when the mobile station is transferred between disjoint Active Sets, the CDMA frequency assignment changes, the frame offset changes, or the mobile station is directed from a CDMA Traffic Channel to an analog voice channel, See also Soft Handoff.

Hash Function. A function used by the mobile station to select one out of N available resource. The hash function distributes the available resources uniformly among a random sample of mobile stations.

HLR. See Home Location Register.

Home Location Register (HLR). The location register to which a MIN is assigned for record purposes such as subscriber information.

Home System. The cellular system in which the mobile station subscribes for service.

Idle Handoff. The act of transferring reception of the Paging Channel from one bass station to another, when the mobile station is in the ***Mobile Station Idle State.***

Implicit Registration. A registrationachieved by a successful transmission of an origination or page response on the Access Channel.

Interleaving. The process of permuting a sequence of symbols.

kHz. Kilohertz (10^3 Hertz).

ksps. Kilo-symbols per second (10^3 symbols per second).

Layer 1. See Physical Layer.

Layer 2. Layer 2 provides for the correct transmission and reception of signaling messages, including partial duplicate detection. See also Layering and Layer 3.

Layer 3. Layer 3 provides the control of the cellular telephone systems. Signaling messages originate and terminate at layer 3. See also Layering and Layer 2.

Local Control. An optional mobile station feature used to perform manufacturer-specific functions.

A PN sequence with period 24^2-1 that is used for scrambling on the Forward CDMA Channel and spreading on the Reverse CDMA Channel. The long code uniquely identifies a mobile station on both the Reverse Traffic Channel and the Forward Traffic Channel. The long code provides limited privacy. The long code also separates multiple Access Channels on the same CDMA channel. See also Public Long Code and Private Long Code.

Long Code Mask. A 42-bit binary number that creates the unique identity of the long code. See also Public Long Code, Private Long Code, Public Long Code Mask, and Private Long Code Mask.

LSB. Least significant bit.

Maximal Length Sequence (m-Sequence). A binary sequence of period 2n-1, n a positive integer, with no internal periodicities. A maximal length sequence can be generated by a tapped n-bit shift register with linear feedback.

Mcps. Megachips per second (10^6 chips per second).

Mean Input Power. The total received calorimetric power measured in a specified bandwidth at the antenna connector, including all internal and external signal and noise sources.

Mean Output Power. The total transmitted calorimetric power measured in a specified bandwidth at the antenna connector when the transmitter is active.

Message. A data structure that conveys control information or application information. A message consists of a length field (MSG_LENGTH), a message body (the part conveying the information), and a CRC.

Message Body. The part of the message contained between the length field (MSG_LENGTH) and the CRC field.

Message Capsule. A sequence of bits comprising a single message and padding. The padding always follows the message and may be of zero length.

Message CRC. The CRC associated with a message. See also Cyclic Redundancy Check.

Message Field. A basic named element in a message. A message field may consist of zero or more bits.

Message Record. An entry in a message consisting of one or more field that repeats in the message.

MHz. Megahertz.(10^6 Herz)

MIN. See Mobile Station Identification Number.

Mobile Protocol Capability Indicator (MPCI). A 2-bit field used to indicate 속 mobile station's capabilities.

Mobile Station. A station in the Domestic Public Cellular Radio Telecommunications Service intended to be used while in motion or during halts at unspecified points. Mobile station include portable units (e.g., handheld personal units) and units installed in vehicles.

Mobile Station Class. Mobile station classes define mobile station characteristics such as slotted operation and transmission power.

Mobile Station Identification Number (MIN). The 34-bit number that is a digital representation of the 10-digit directory telephone number assigned to a mobile station.

Mobile Station Originated Call. A call originating from a mobile station.

Mobile Station Terminated Call. A call received by a mobile station (not to be confused with a disconnect or call release).

Mobile Switching Center (MSC). A configuration of equipment that provides cellular radiotelephone service. Also called the Mobile Telephone Switching Office (MTSO)

Modulation Symbol. The output of the data modulator before spreading. On the Reverse Traffic Channel, 64-ary orthogonal modulation is used and six code symbol (when the data rate is 9600bps) or each repeated code symbol (when the data rate is less than 9600bps) is one modulation symbol.

Ms. Millisecond.

MSB. Most significant bit.

MSC. See Mobile Switching Center.

Multiplex Option. The ability of the multiplex sublayer and lower layer to be tailored to provide special capabilities. A multiplex option defines such characteristics as the frame format and the rate decision rules. See also Multiplex Sublayer.

Multiplex Sublayer. One of the conceptual layers of the system that multiplexes and demultiplexes primary

traffic, secondary traffic, and signaling traffic.

NAM. See Number Assignment Module.

Narrow Analog. A type of voice channel that uses 10kHz channel spacing and subaudible signaling.

Neighbor Set. The set of pilots associated with the CDMA Channel that are probable candidates for handoff. Normally, the Neighbor Set consists of the pilots associated with CDMA Channel that cover geographical areas near the mobile station. See also Active Set, Candidate Set, and Remaining Set.

- A network is a subset of a cellular system, such as an area-wide cellular network, a private group of base stations, or a group of base stations set up to handle a special requirement. A network can be as small or as large as needed, as long as it is fully contained within a system. See also System.

Network Identification (NID). A number that uniquely identifies a network within a cellular system. See also System Identification.

NID. See Network Identification.

Non-Autonomous Registration. A registration method in which the base station initiates registration. See also Autonomous Registration.

Non-Slotted Mode. An operation mode of the mobile station in which the mobile station continuously monitors the Paging Channel when in the Mobile Station Idle State.

Ns. Nanosecond.

NULL. Not having any value.

Null Traffic Channel Data. One or more frames of 16 '1's followed by eight '0's sent at the 1200bps rate. Null Traffic Channel data is sent when no service option is active and no signaling message is being sent. Null Traffic Channel data serves to maintain the connectivity between the mobile station and the base station.

Number Assignment Module (NAM). A set of MIN-related parameters stored in the mobile station.

Numeric Information. Numeric information consists of parameters that appear as numeric fields in message exchanged by the base station and the mobile station and information used to describe the operation of the mobile station.

OLC. See Overload Class (CDMA) or Overload Control (analog).

Optional Field. A field defined within a message structure that is optionally to the message recipient.

Order. A type of message that contains control codes for either the mobile station or the base station.

Ordered Registration. A registration method in which the base station orders the mobile station to send registration related parameters.

Overhead Message. A message sent by the base station on the Paging Channel to communicate base-station-specific and system-wide information to mobile station.

Overload Class. The means used to control system access by mobile stations, typically in emergency or other overload conditions. Mobile station are assigned one (or more) of sixteen overload classed, Access to the CDMA system can then be controlled on a per class basis by persistence values transmitted by the base station.

Overload Control (OLC). A means reverse analog control channel accesses by mobile stations. Mobile station are assigned one(or more) of sixteen control levels. Access is selectively restricted by a base station setting one or more OLC bits in the Overload Control Global Action Message.

Packet. The unit of information exchanged between the service option applications of the base station and the mobile station.

Padding. A sequence of bits used to fill from the end of a message to the end of a message capsule, typically to the end of the frame or half frame. All bits in the padding are '0'.

Paging. The act of seeking a mobile station when a call has been placed to that mobile station.

Paging Channel (Analog). See Analog Paging Channel.

Paging Channel (CDMA). A code channel in a Forward CDMA Channel used for transmission of control information and pages from a base station to a mobile station.

Paging Channel Slot. An 80ms interval on the Paging Channel. Mobile station operating in the slotted mode are assigned specific slots in which day monitor messages from the base station.

Parameter-Change Registration. A registration method in which the mobile station registers when certain of its stored parameters change.

Parity Check Bits. Bits added to a sequence of information bits to provide error detection, correction, or both.

Persistence. A probability measure used by the mobile station to determine if it should transmit in a given Access Channel Slot.

Physical Layer. The part of the communication protocol between the mobile station and the base station that is responsible for the transmission and reception of data. The physical layer in the transmitting station is presented a frame by the multiplex sublayer and transforms it into an over-the-air waveform. The physical layer in the receiving station transforms the waveform back into a frame and presents it to the multiplex sublayer above it.

Pilot Channel. An unmodulated, direct-sequence spread spectrum signal transmitted continuously by each CDMA base station. The Pilot Channel allows a mobile station to acquire the timing of the Forward CDMA Channel, provides a phase reference for coherent demodulation, and provides a means for signal strength comparisons between base station for determining when to handoff.

Pilot PN Sequence. A pair of modified maximal length PN sequences with period 2^{15} used to spread the Foward CDMA Channel and the Reserve CDMA Channel. Different base station are identified by different pilot PN sequence offsets.

Pilot PN Sequence Offset Index. The PN offset in units of 64 PN chips of a pilot, relative to the zero offset pilot PN sequence.

PN Chip. One bit in the PN sequence.

PN Sequence. Pseudonoise sequence. A periodic binary sequence.

Power Control Bit. A bit sent in every 1.25ms interval on the Forward Traffic Channel to signal the mobile station to increase or decrease its transmit power.

Power Control Group. A 1.25ms interval on the Forward Traffic Channel and the Reverse Traffic Channel. See also Power Control Bit.

Power-Down Registration. Au autonomous registration method in which the mobile station registers on power up.

PPM. Parts per million.

Preamble. See Access Channel Preamble and Traffic Channel Preamble.

Primary CDMA Channel. A CDMA Channel at a pre-assigned frequency assignment used by the mobile station for initial acquisition. See also Secondary CDMA Channel.

Primary Paging Channel (CDMA). The default code channel (code channel 1) assigned for paging on a CDMA Channel.

Primary Traffic. The main traffic stream carried between the mobile station and the base station, supporting the active promaty service option, on the Traffic Channel. See also Secondary Traffic, Signaling Traffic, and Servic3e Option.

Private Long Code. The long code characterized by the private long code mask. See also Long Code.

Private Long Code Mask. The long code mask used to form the private long code. See also Public Long Code Mask and Long Code.

Public Long Code. The long code characterized by the public long code mask.

Public Long Code Mask. The long code mask used to form the private long code. The mask contains the ESN of the mobile station. See also Private Long Code Mask and Long Code.

Punctured Code. An error-correcting code generated from another error-correcting code by deleting (i.e., puncturing) code symbols from the code output.

Quick Repeats. Additional transmissions of identical copies of a message within a short interval to increase the probability that the message is received correctly.

Receive Objective Loudness Rating (ROLR). A perceptually weighted transducer gain of telephone receivers relating electrical excitation from a reference generator to sound pressure at the earphone. The receive objective loudness tating is normally specified in dB relative to one Pascal per millivolt. See IEEE Standard 269-1992, IEEE Standard 661-1979, CCITT Recommendation P.76, and CCITT Recommendation P.79.

Registration. The process by which a mobile station identifies its location and parameters to a base station.

Registration Zone. A collection of one or more base stations treated as a unit when determining whether a mobile station should perform zone-based registration.

Release. A process that the mobile station and base station use to inform each other of call disconnect.

The set of all allowable pilot offsets as determined by PILOT_INC, excluding the pilot offsets of the pilots in the Active Set, Candidate Set, and Neighbor Set. See also Active Set, Candidate Set, and Neighbor Set.

Request. A layer 3 message generated by either the mobile station or the base station to retrieve information, ask for service, or command an action.

Response. A layer 3 message generated as a result of another message, typically a request.

Reverse Analog Control (RECC). The analog control channel used from a mobile station to a base station.

Reverse Analog Voice Channel (RVC). The analog voice channel used from a mobile station to a base station.

Reverse CDMA Channel. The CDMA Channel from the mobile station to the base station. From the base station's perspective, the Reverse CDMA Channel is the sum of all mobile station transmissions on a CDMA frequency assignment.

Reverse Traffic Channel. A Reverse CDMA Channel used to transport user and signaling traffic from a single mobile station to one or more base stations.

Roamer. A mobile station operating in a cellular system (or network) other than the one from which service was

subscribed. See also Foreign NID Roamer and Foreign SID Roamer.

ROLR. See Receive Objective Loudness Rating.

SAT. See Supervisory Audio Tone.

Scan of Channels. The procedure by which a mobile station examines the signal strength of each forward analog control channel.

SCI. Synchronized Capsule Indicator bit.

Search Window. The range of PN sequence offsets that a mobile station searches for a pilot.

Secondary CDMA Channel. A CDMA Channel at a preassigned frequency assignment used by the mobile station for initial acquisition. See also Primary CDMA Channel.

Secondary Traffic. An additional traffic stream that can be carried between the mobile station and the base station on the Traffic Channel. See also Primary Traffic and Signaling Traffic.

Seizure Precursor. The initial digital sequence transmitted by a mobile station to a base station on a reverse analog control channel.

Seizure Option. A service capability of the system. Service options may be applications such as voice, data, or facsimile.

Shard Secret Data (SSD). A 128-bit pattern stored in the mobile station (in semi-permanent memory) and known by the base station. SSD is a concatenation of two 64-bit subsets: SSD_A, which is used to support the authentication procedures and SSD_B, which serves as one of the inputs to the process generating the encryption mask and private long code.

Short Message Services (SMS). A suite of services which include SMS Text Delivery, Digital Paging (i.e., Call Back Number – CBN), and Voice Mail Notification (VMN).

SID. See System Identification.

Signaling Tone. A 10kHz tone transmitted by a mobile station on an analog voice channel to: 1) confirm orders, 2)signal flash requests, and 3) signal release requests.

Signal Traffic. Control message that are carried between the mobile station and base station on the Traffic Channel. See also Primary Traffic and Secondary Traffic.

Slot Cycle. A periodic interval at which a mobile station operating in the slotted monitors the Paging Channel.

Slotted Mode. An operation mode of the mobile station in which the mobile station monitors only selected slots on the Paging Channel when in the Mobile Station Idle State.

Soft Handoff. A handoff occurring while the mobile station is in the Mobile Station Control on the Traffic Channel State. This handoff is characterized by commencing communications with a new base station on the same CDMA frequency assignment before terminating communications with the old base station. See also Hard Handoff.

SOM. Start-of-Message Bit.

SPS. Symbols per second.

- An identification of certain characteristics of a mobile station. Classes are defined in Table 2.3.3-1.

Status Information. The following status information is used to describe mobile station operation when using the

analog system.

- Serving-System Status. Indicates whether a mobile station is turned to channels associated with System A or System B.
- First Registration ID Status. A status variable used by the mobile station in association with its processing of received Registration ID messages.
- First Location Area ID Status. A status variable used by the mobile station in association with its processing of received Location Area ID messages.
- Location Registration ID Status. A status variable used by the mobile station in association with its processing of power-up registration and location-based registration.
- First Idle ID Status. A status variable used by the mobile station in association with its processing of the Idle Task.
- Local Control Status. Indicates whether a mobile station must respond to local control messages.
- Roam Status. Indicates whether a mobile station is in its home system.
- Termination Status. Indicates whether a mobile station must terminate the call when it is on an analog voice channel.

Supervisory Audio Tone (SAT). One of three tones in the 6 kHz region that is transmitted on the forward analog voice channel by a base station and transponder on the reverse analog voice channel by as mobile station.

Supplementary Digital Color Code (SDCC1, SDCC2). Additional bits assigned to increase the number of color codes from four to sixty four, transmitted on the forward analog control channel.

Symbol. See Code Symbol and Modulation Symbol.

Sync Channel. Code channel 32 in the Forward CDMA Channel which transports the synchronization message to the mobile station.

Sync Channel Superframe. An 80ms interval consisting of three Sync Channel frames (each 26.666…ms in length).

System. A system is a cellular telephone service that covers a geographic area such as a city. Metropolitan region, country, or group of countries. See also Network.

System Time. The time reference used by the system. System Time is synchronous to UTC time(except for leap seconds) and used the same time origin as GPS time. Offset by the propagation delay from the base station to the mobile station. See also Universal coordinated Time.

Timer-Based Registration. A registration method in which the mobile station registers whenever a counter reaches a predetermined value. The counter is incremented an average of once per 80 ms period.

Time Reference. A reference established by the mobile station that is synchronous with the earliest arriving multipath component used for demodulation.

TOLR. See Transmit Objective Loudness Rating.

Traffic Channel. A communication path between a mobile station and base station used for user and signaling traffic. The term Traffic Channel implies a Forward Traffic Channel and Reverse Traffic Channel pair. See also

Forward Traffic Channel and Reverse Traffic Channel.

Traffic Channel Preamble. A sequence of all-zero frames that is sent at the 9600 bps rate by the mobile station on the Reverse Traffic Channel. The Traffic Channel preamble is sent during initialization of the Traffic Channel.

Transmit Objective Loudness Rating(TOLR). A perceptually weighted transducer gain of telephone transmitters relation sound pressure at the microphone to voltage at a reference electrical termination. It is normally specified in dB relative to one millivolt per Pascal. See IEEE Standard 269-1992, IEEE Standard 661-1979, CCITT Recommendation P.76 , and CCITT Recommendation. P.79

Unique Challenge-Response Procedure. An exchange of information between a mobile station and a base station for the purpose of confirming the mobile station's identity. The procedure is initiated by the base station and is characterized by the use of a challenge-specific random number(i.e., RANDU) instead of the random variable broadcast globally(RAND).

Unique Random Variable(RANDU). A 24-bit random number generated by the base station in support of the Unique Challenge-Response procedure.

Universal Coordinated Time(UTC). An internationally agreed-upon time scale maintained by the Bureau International de l'Heure(BIH) used as the time reference by nearly all commonly available time and frequency distribution systems i.e., WWW, WWVH, LORAN-C, Transit, Omega, and GPS.

UTC. Universal Temps Coordine. See Universal Coordinated Time.

Voice Channel. See Analog Voice Channel.

Voice Mobile Attenuation Code(VMAC). A 3-bit field in the Extended Address Word commanding the initial mobile power level when assigning a mobile station to an analog voice channel.

Voice Privacy. The process by which user voice transmitted over a CDMA Traffic Channel is a afforded a modest degree of protection against eavesdropping over the air.

Walsh Chip. The shortest identifiable component of a Walsh function. There are 2^N Walsh chips in one Walsh function where N is the order of the Walsh function. On the Forward CDMA channel one Walsh chip equals 1/1.2288MHz, or 813.802…ns. On the Reverse CDMA Channel, one Walsh chip equals 4/1.2288MHz, or 3.255…μs.

Walsh Function. One of 2^N time orthogonal binary functions (note that the functions are orthogonal after mapping '0' to 1 and '1' to –1).

Zone-Based Registration. An autonomous registration method in which the mobile station registers whenever it enters a zone that is not in the mobile station's zone list.

μs. Microsecond

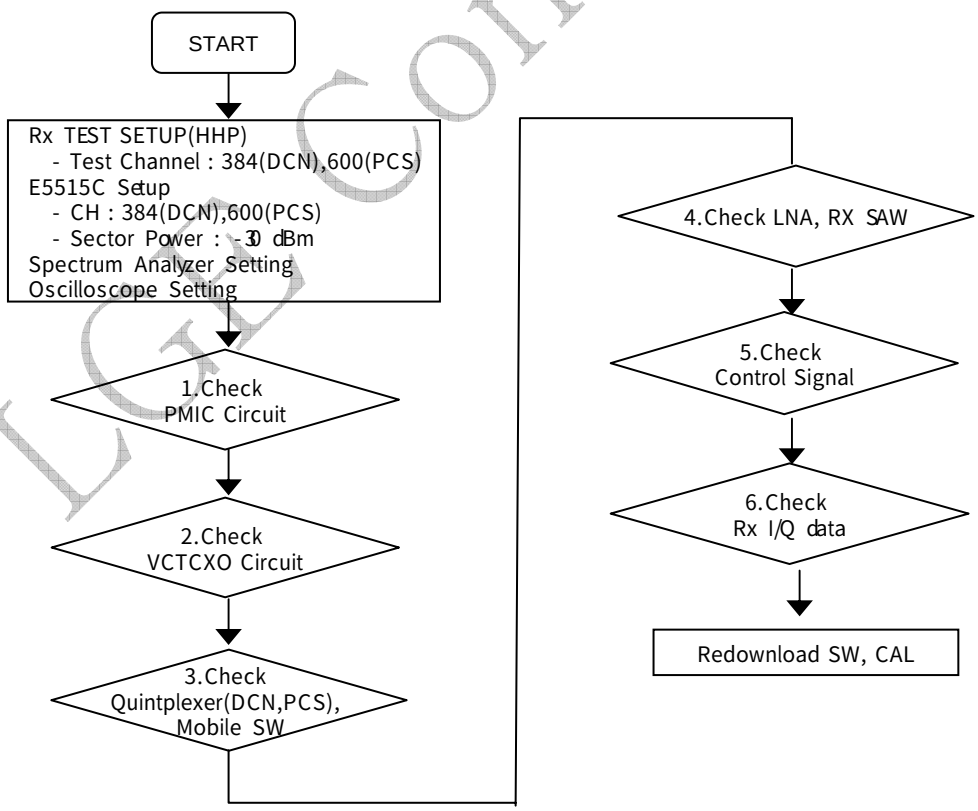
6.1 Rx Part Trouble

6.1.1 When Rx Power isn't enough

Test Point

Figure 1

Checking Flow



6.1.2 Checking Regulator (PMIC) Circuit

Test Point

U3002. A7 (+2.9V_RX)

U3002. B24 (PS_HOLD)

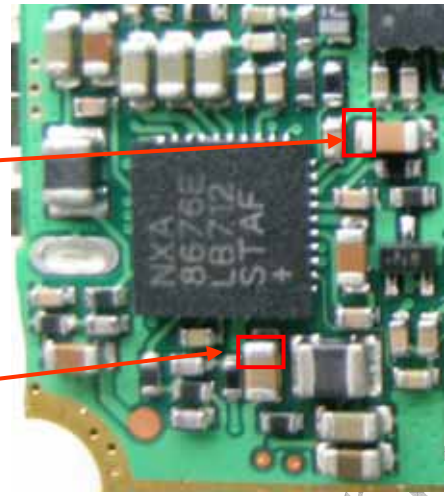
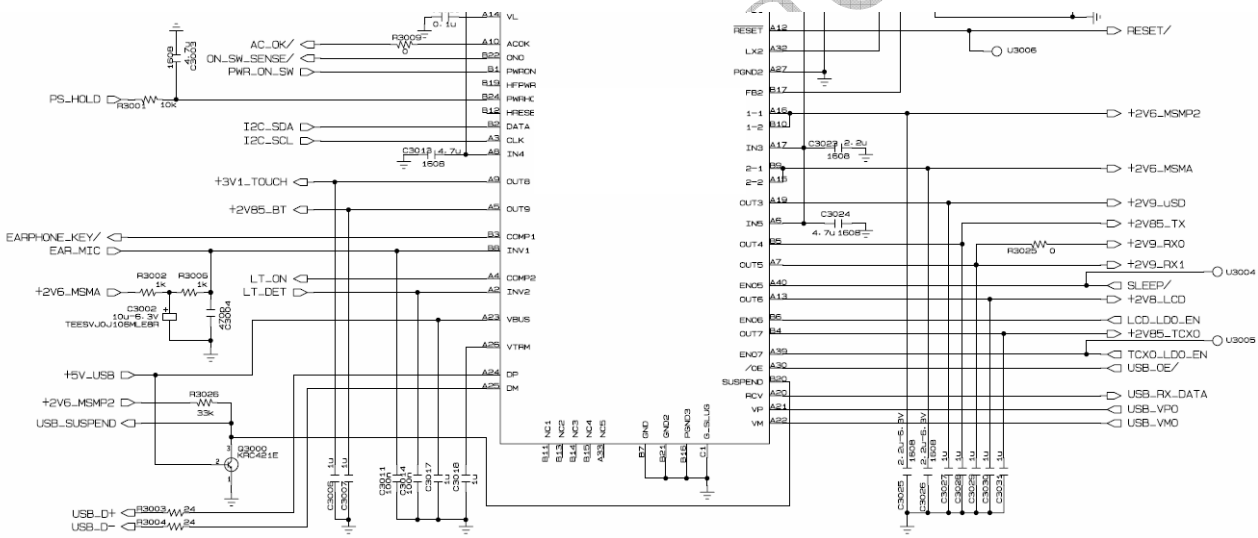
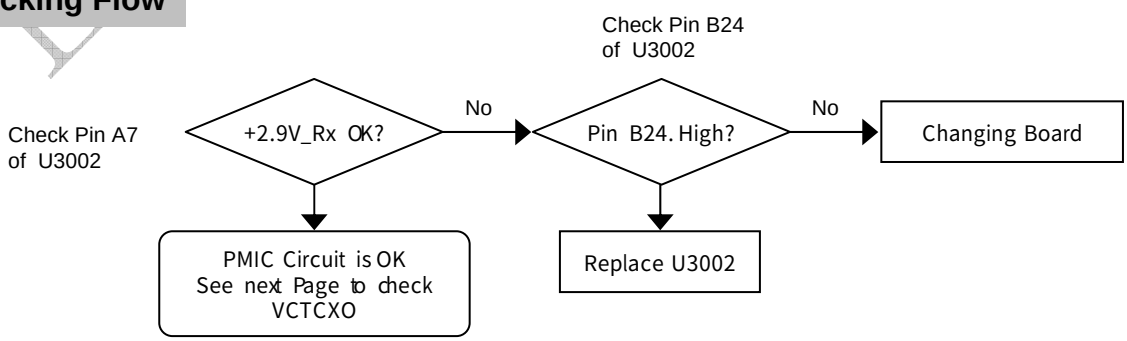


Figure 2

Circuit Diagram



Checking Flow



6.1.3 Checking VCTCXO Circuit

Test Point

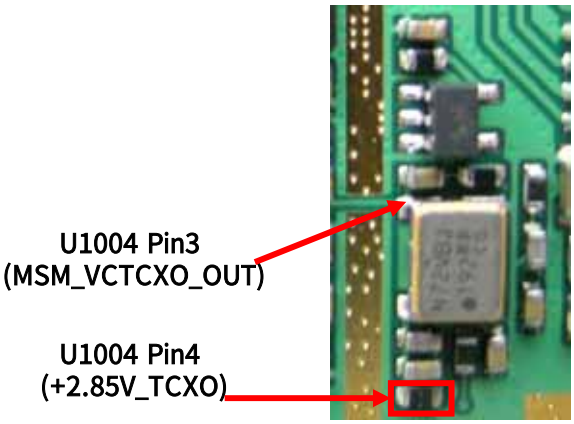
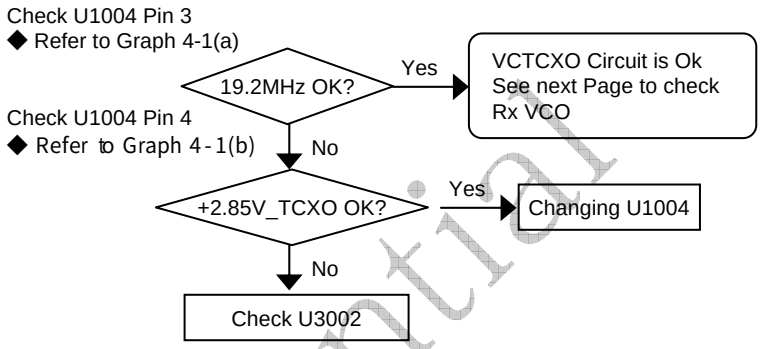
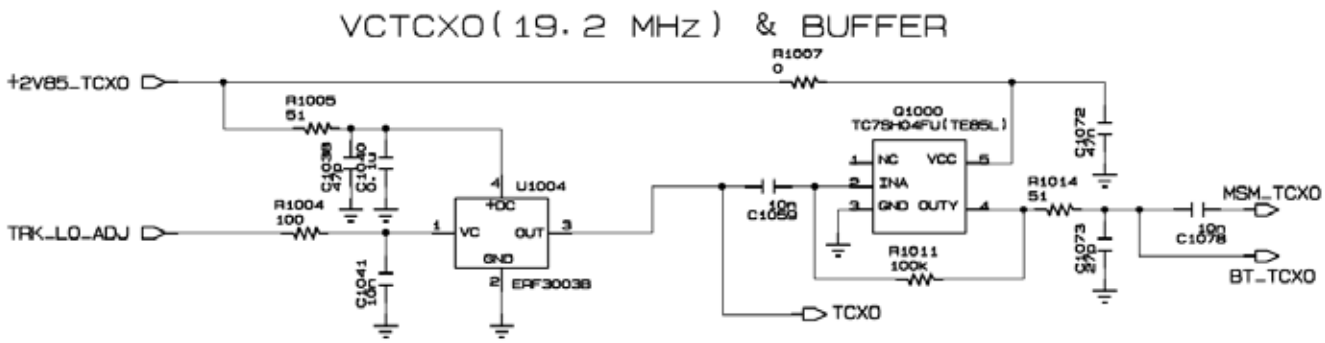


Figure 3

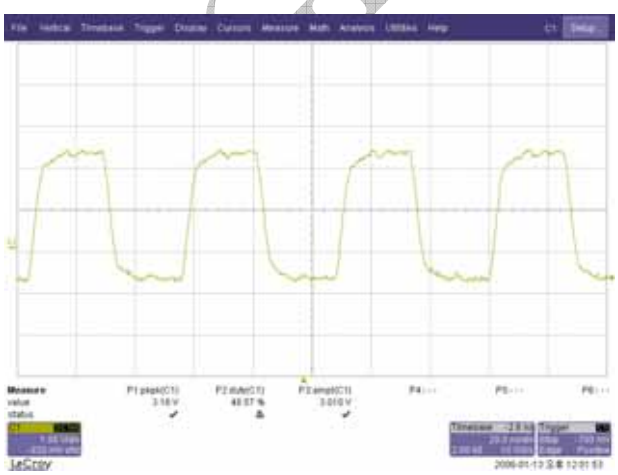
Checking Flow



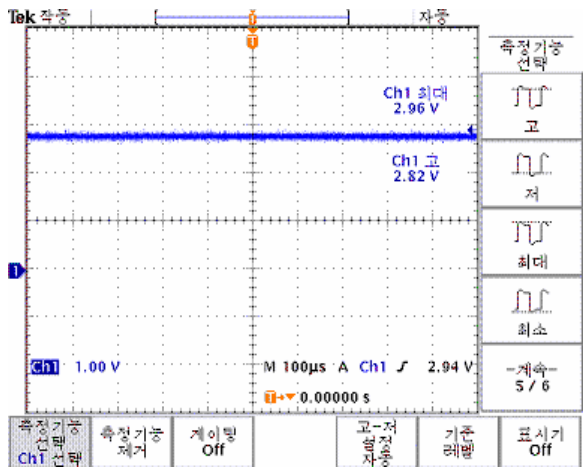
Circuit Diagram



Waveform



Graph 4-1(a)



Graph 4-1(b)

6.1.4 Checking Mobile S/W & Quintplexer(DCN,PCS)

Test Point

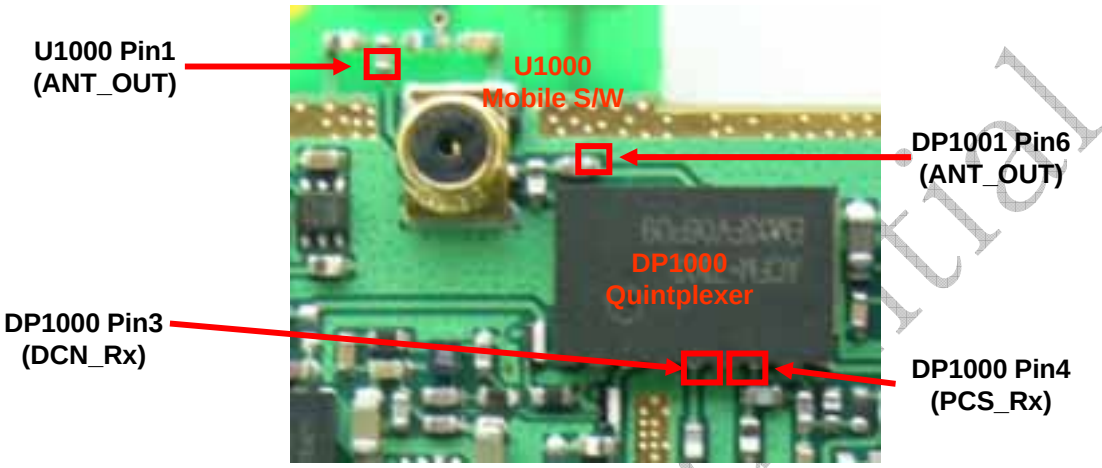
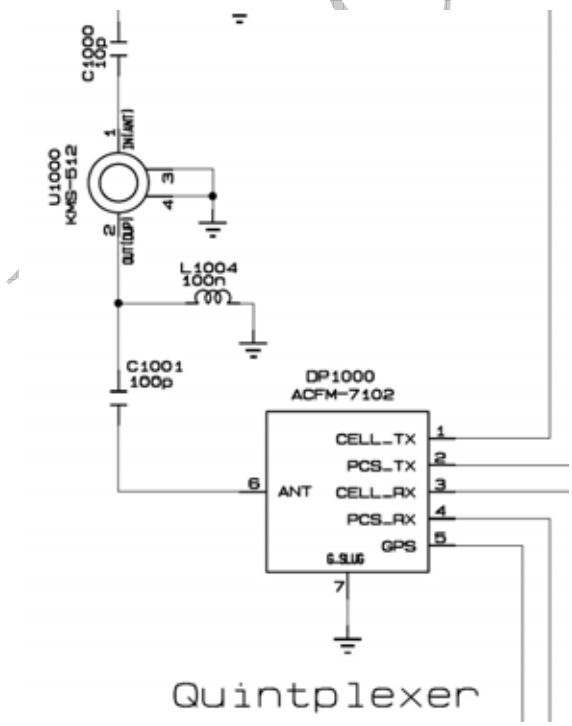


Figure 4

Circuit Diagram



6.1.5 Checking LNA & SAW (DCN,PCS)

Test Point

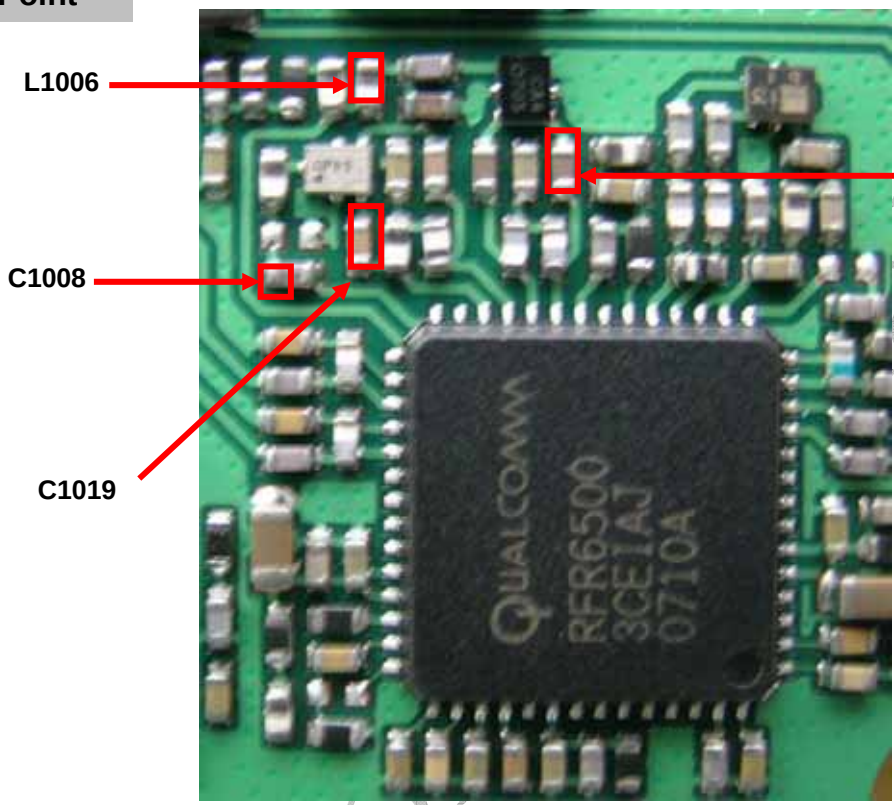
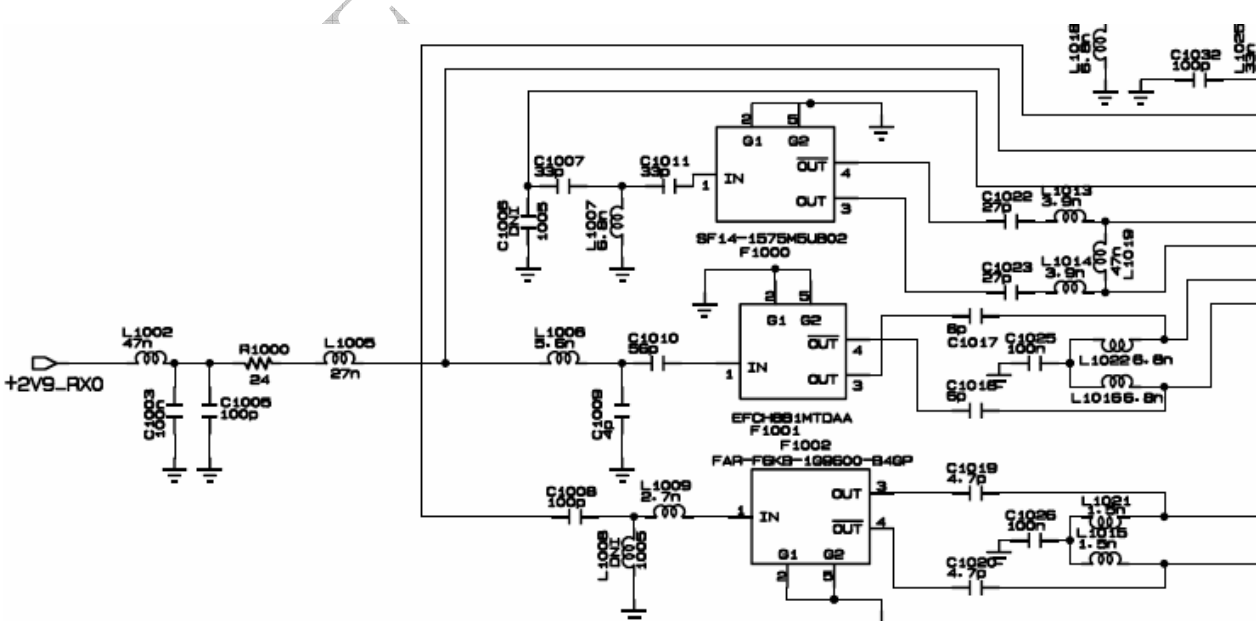
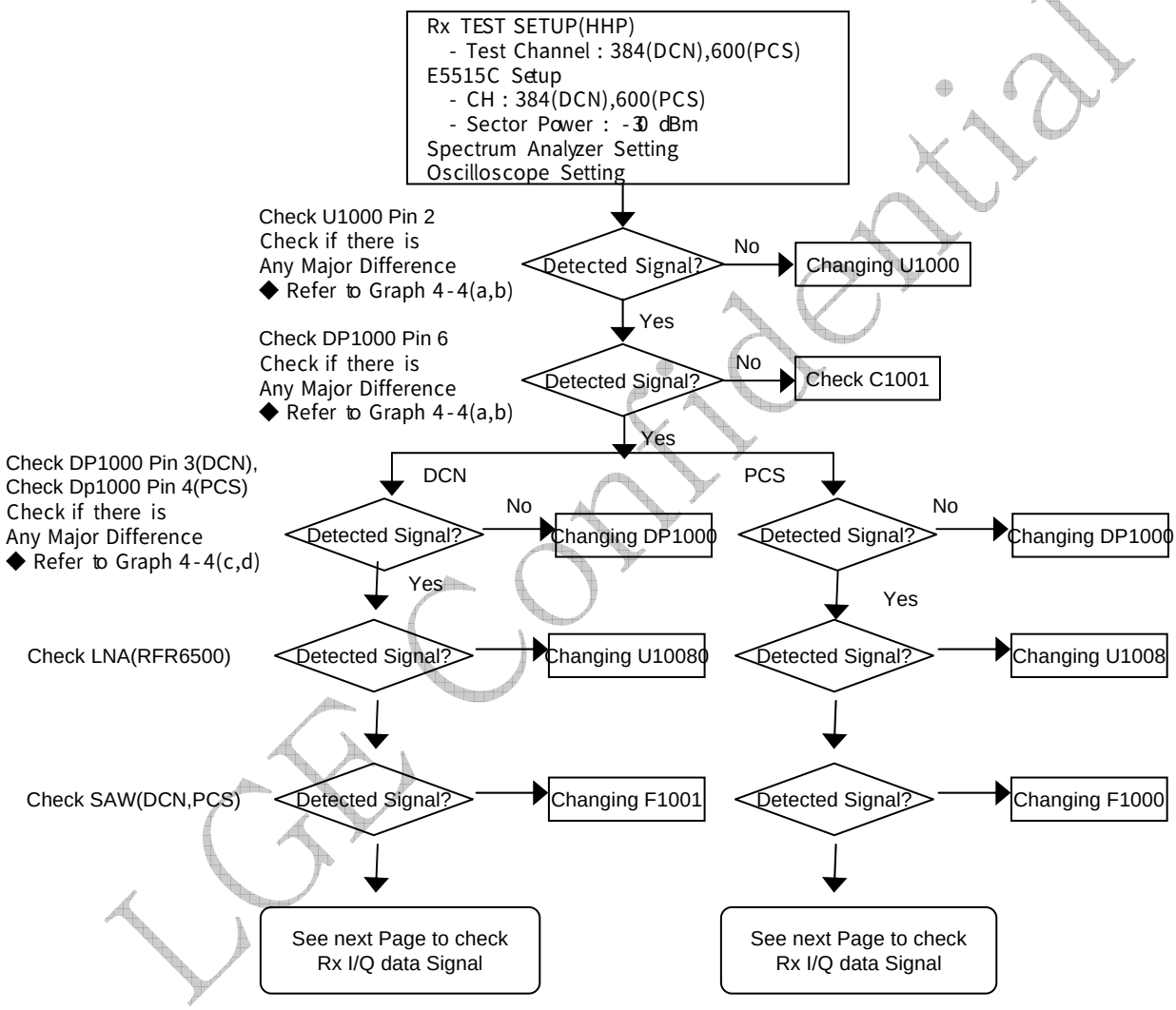


Figure 5

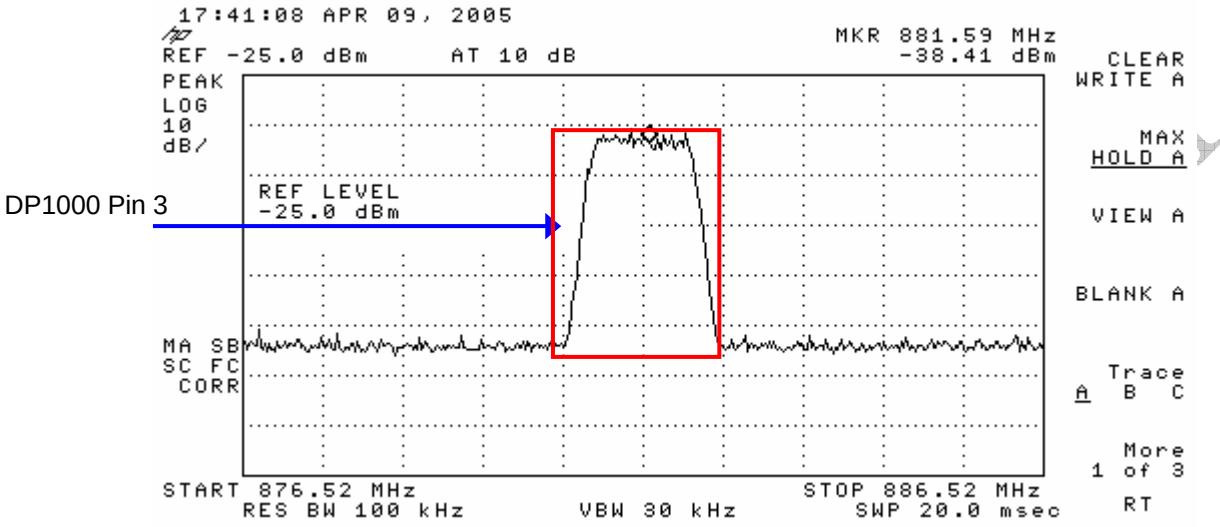
Circuit Diagram



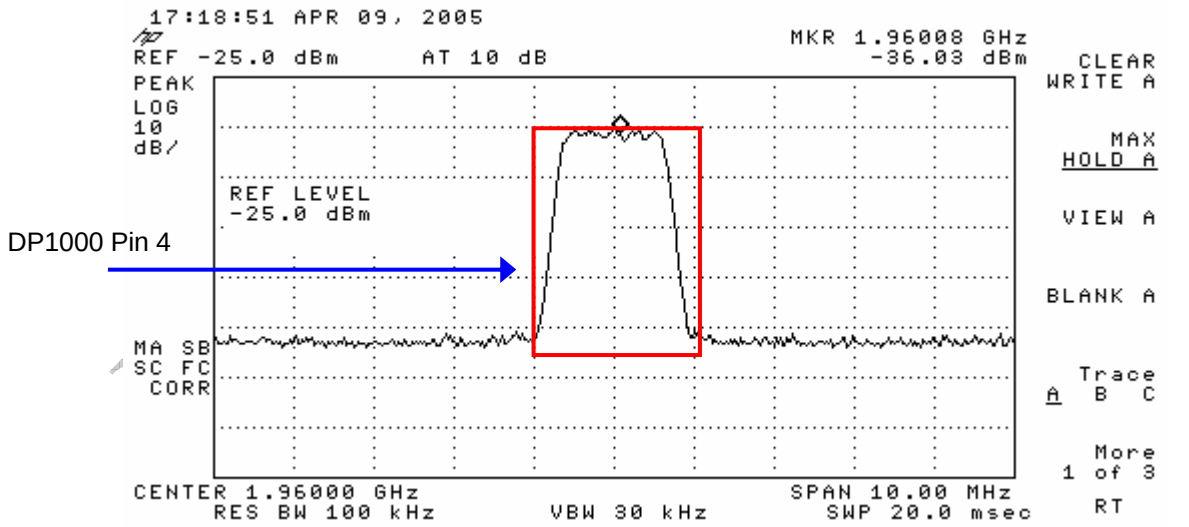
Checking Flow



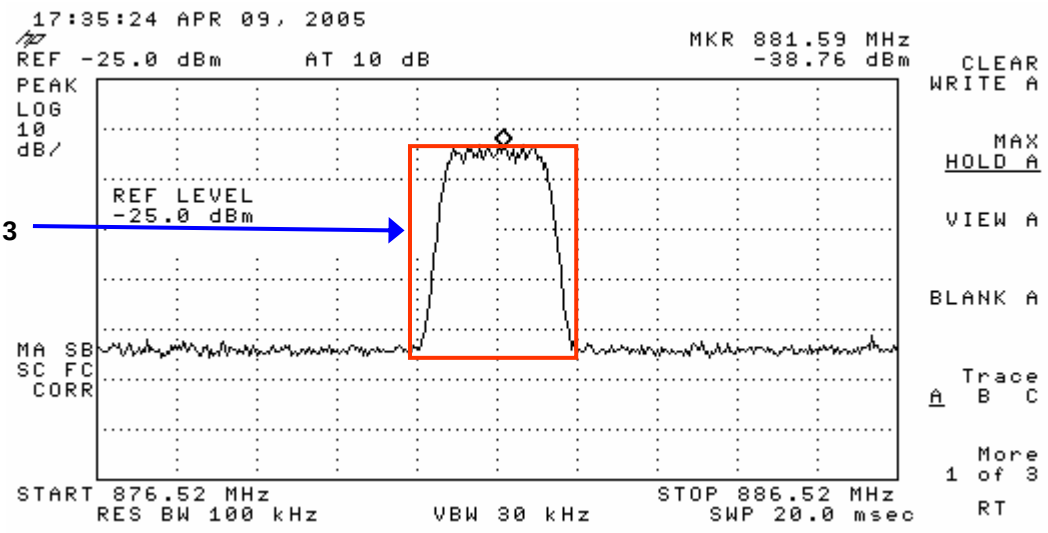
Waveform



DCN
Graph 4-4(a)

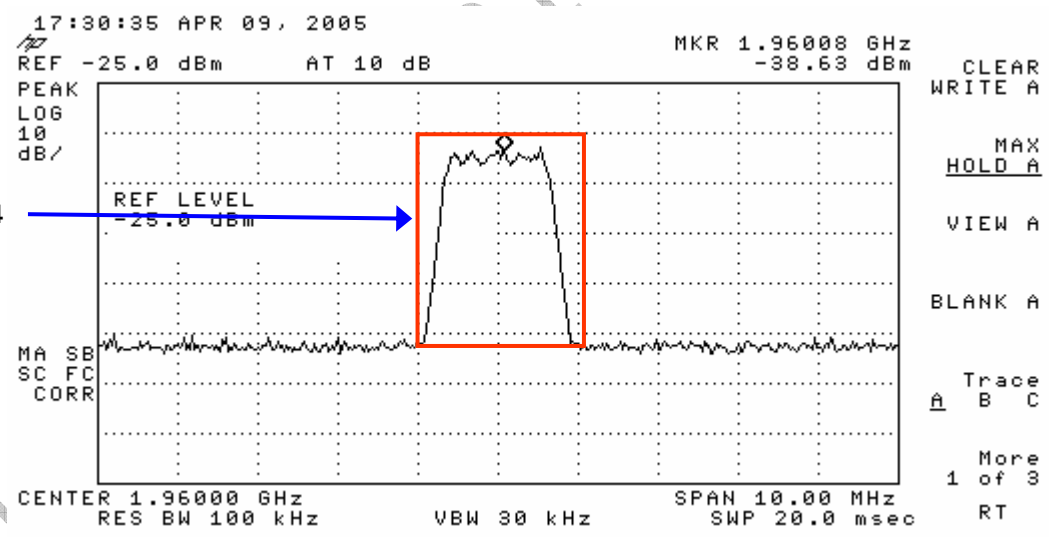


PCS
Graph 4-4(b)



DP1000 Pin 3

DCN
Graph 4-4(c)



DP1000 Pin 4

PCS M
Graph 4-4(d)

6.1.6 Checking Control Signal

Test Point

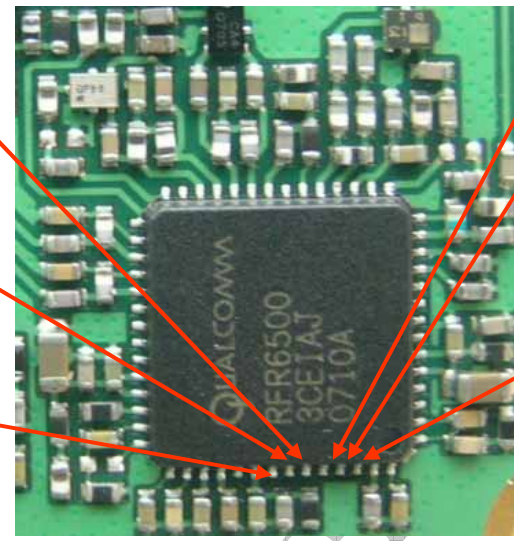
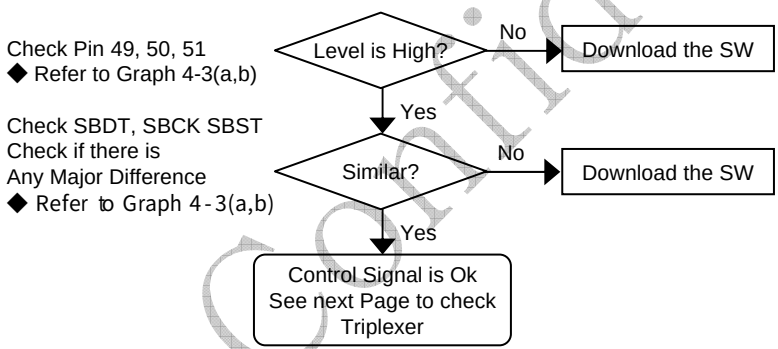
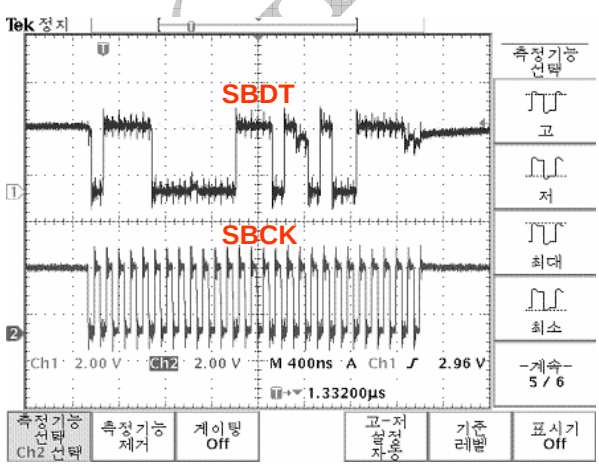


Figure 6

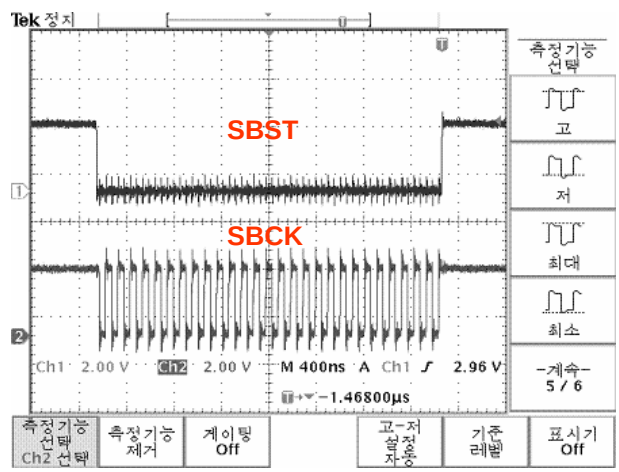
Checking Flow



Waveform



Graph 4-3(a)



Graph 4-3(b)

6.1.7 Checking Rx I/Q data

Test Point

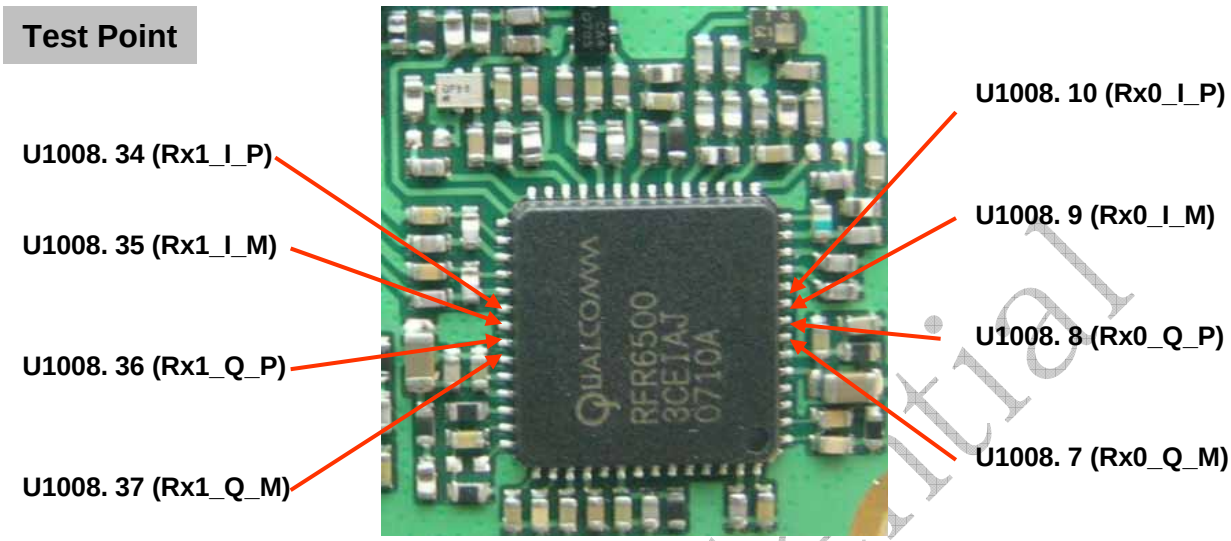
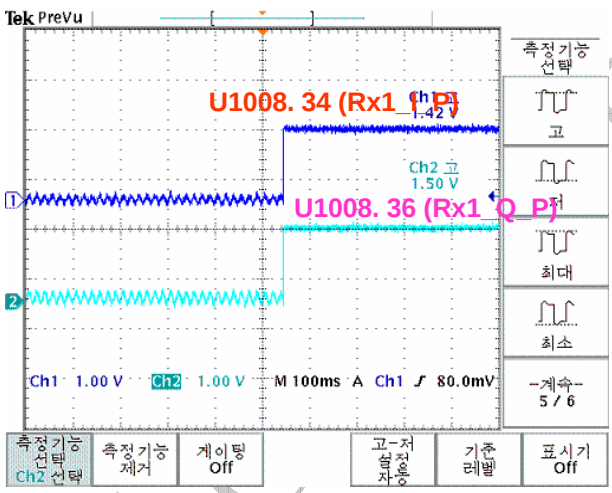
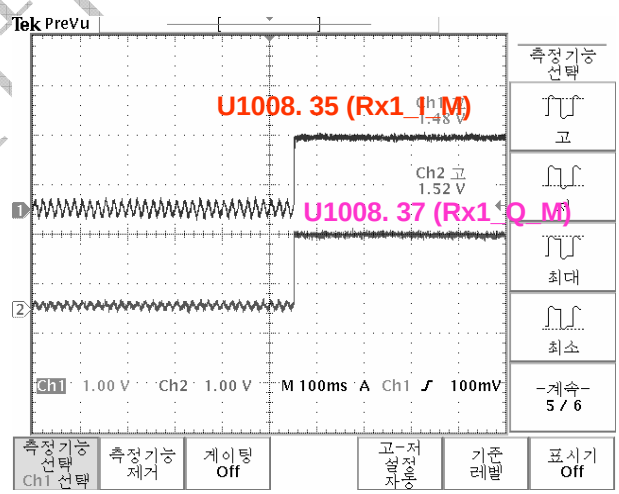


Figure 7

Waveform



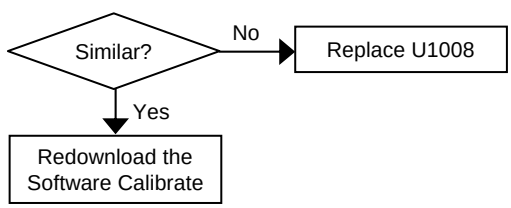
Graph 4-5(a)



Graph 4-5(b)

Checking Flow

Check U1008 Pin 34, 35, 36, 37
Check if there is
Any Major Difference
◆ Refer to Graph 4-5(a,b)



6.2 Tx Trouble

Test Point

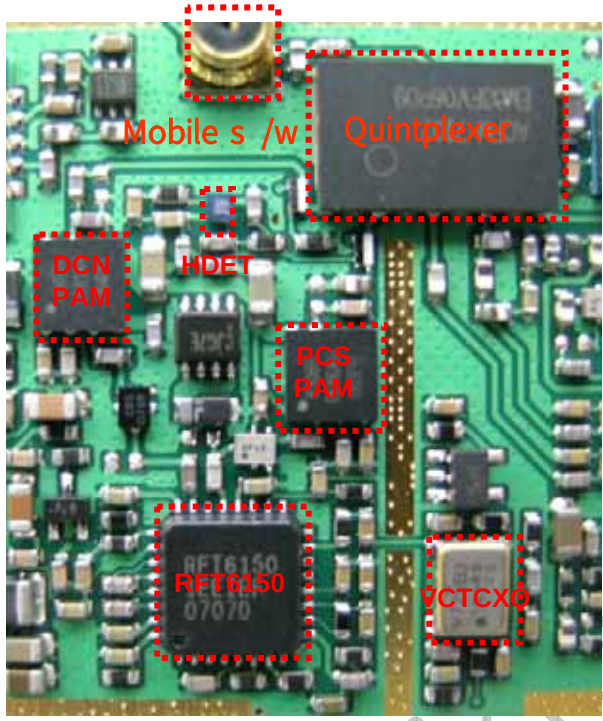
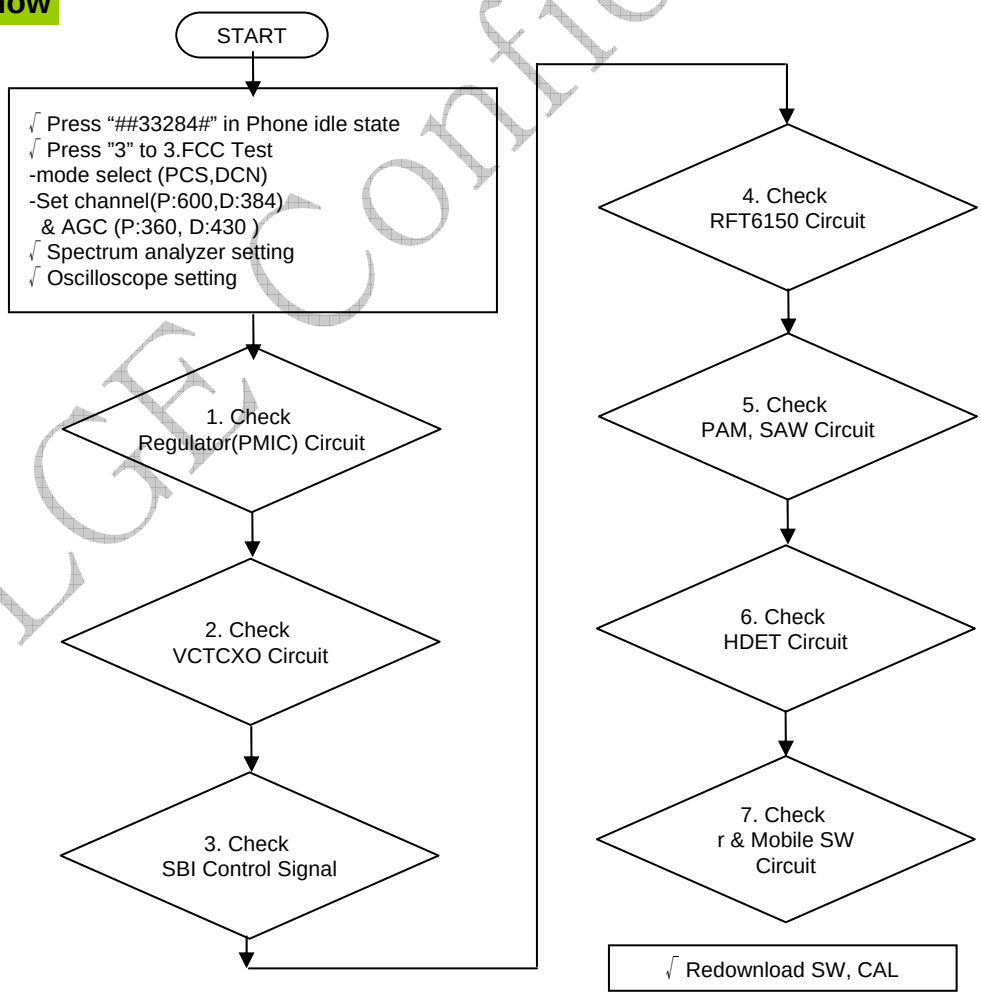


Figure 1

Checking Flow



6.2.1 Check Regulator(PMIC) Circuit

TEST POINT

U3002 Pin A16
(+2.6V_MSMP2)

U3002 Pin B5
(+2.85V_TX)

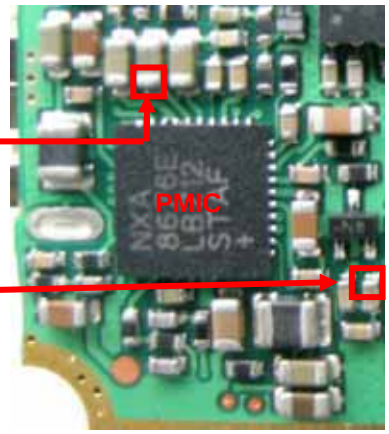
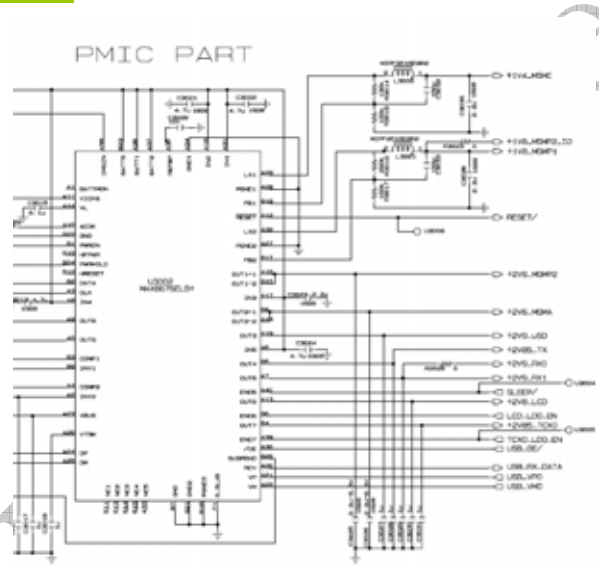
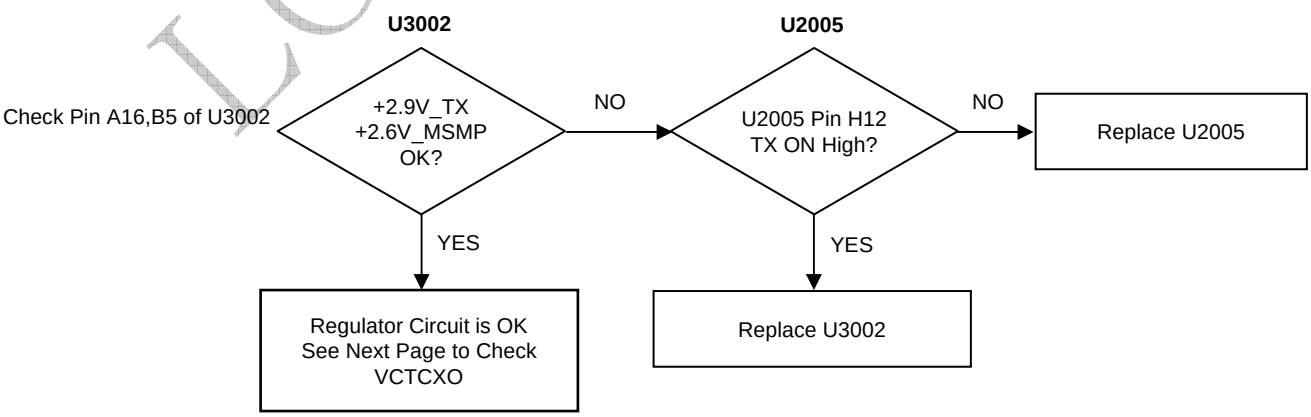


Figure 2

Circuit Diagram



Checking Flow



6.2.2 Check VCTCXO Circuit

TEST POINT

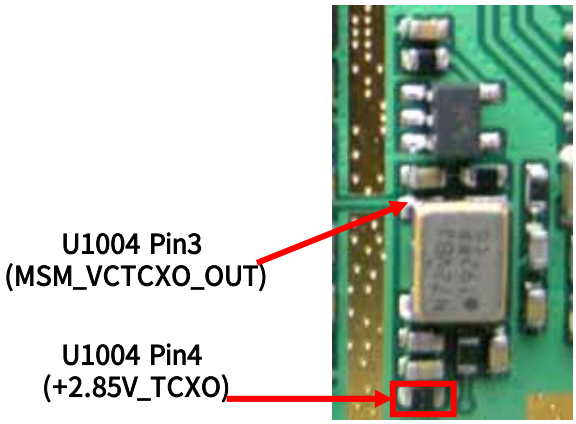
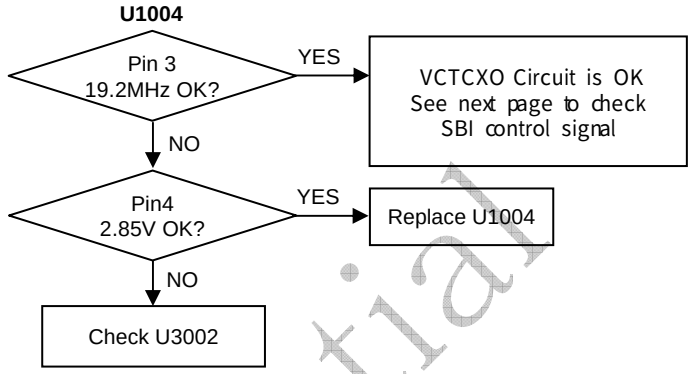
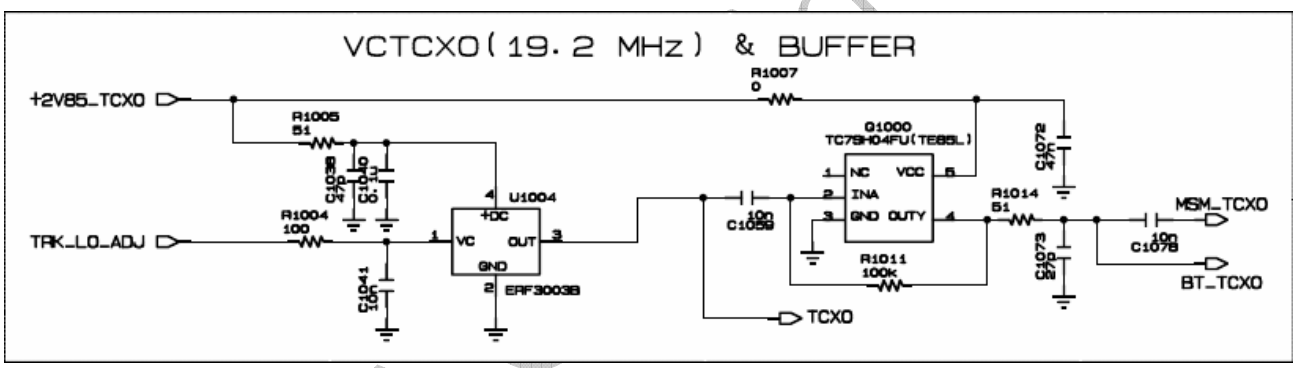


Figure 3

Checking Flow



Circuit Diagram



Waveform

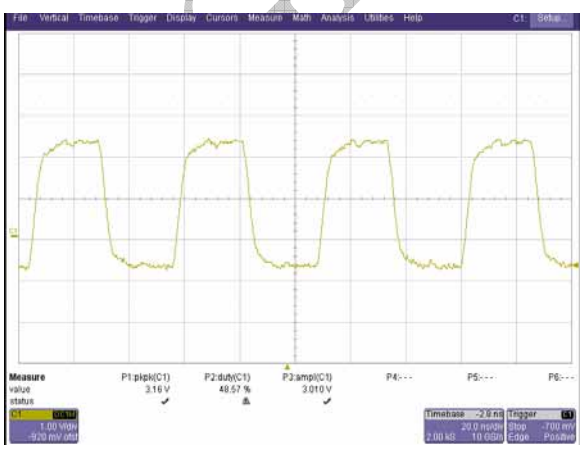


Figure 4: U1004 Pin3 VCTCXO_OUT

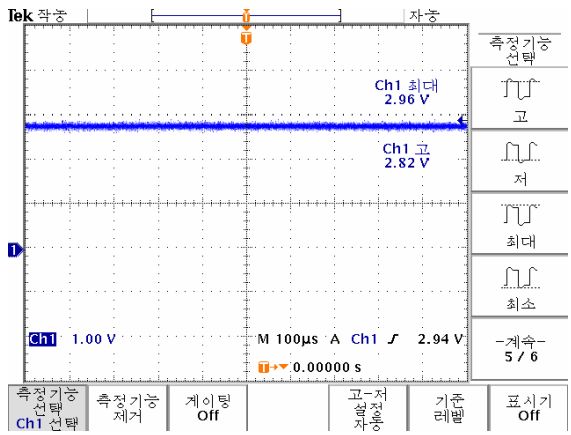
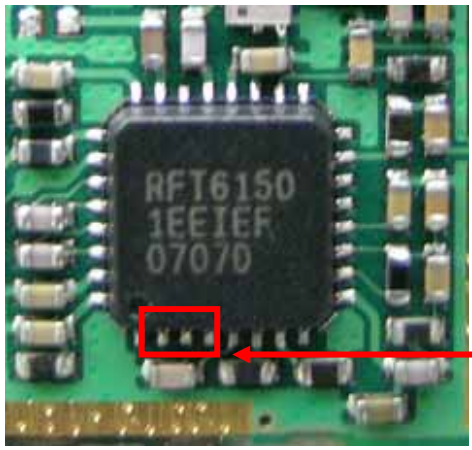


Figure 5: U1004 Pin4 +2.85V_TCXO

6.2.3 Check SBI Control Signal

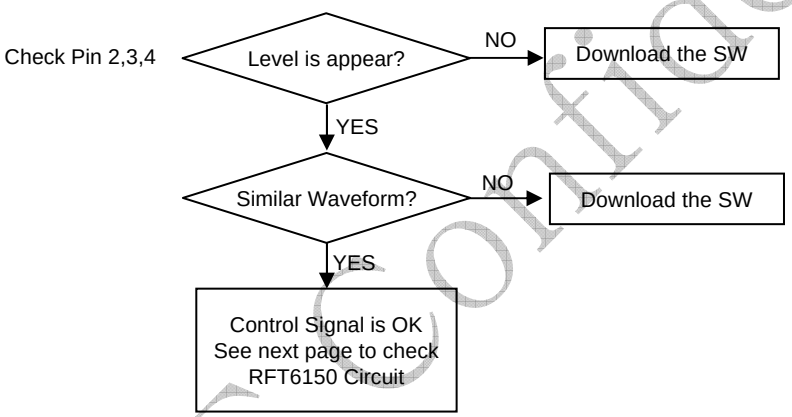
Test Point



U1009 Pin 2,3,4
(SBST,SBDT,SBCK)

Figure 6

Circuit Flow



Waveform

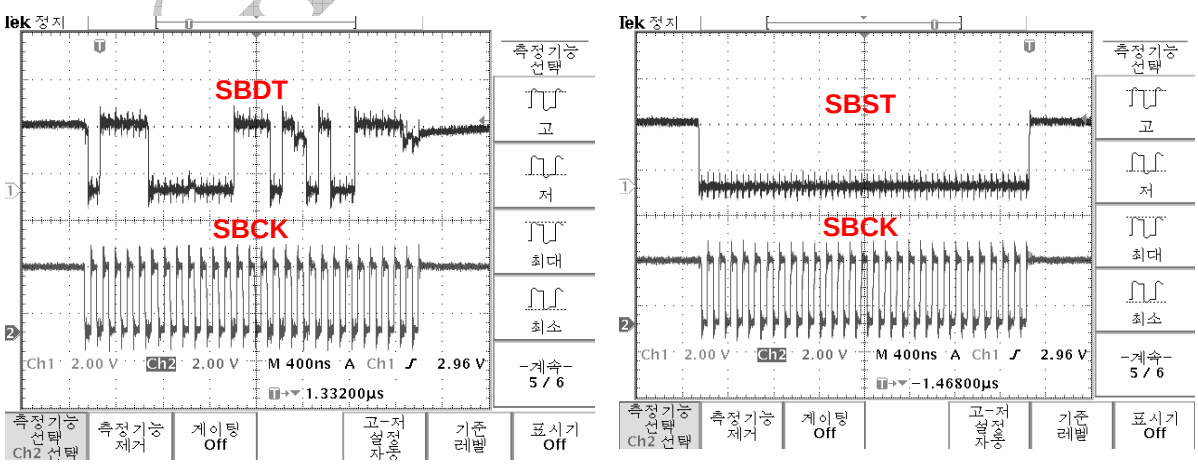


Figure 7

6.2.4 Check RFT6150 Circuit

Test Point

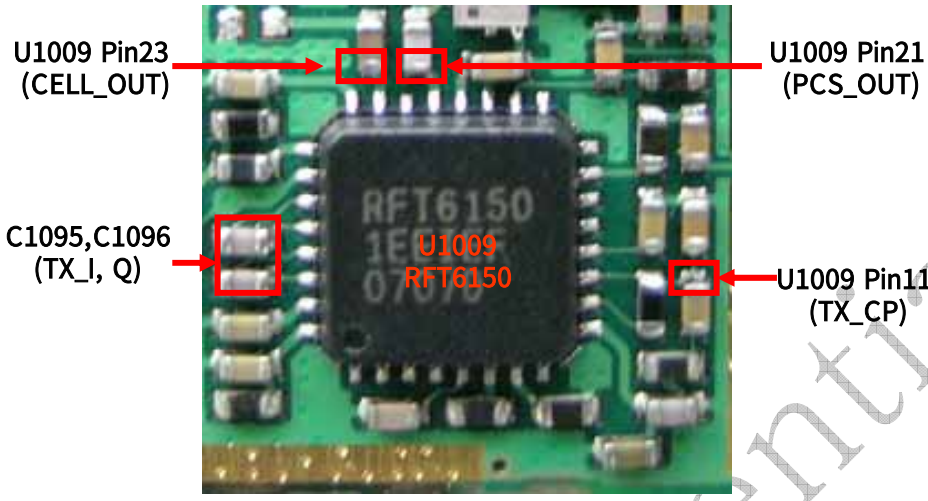
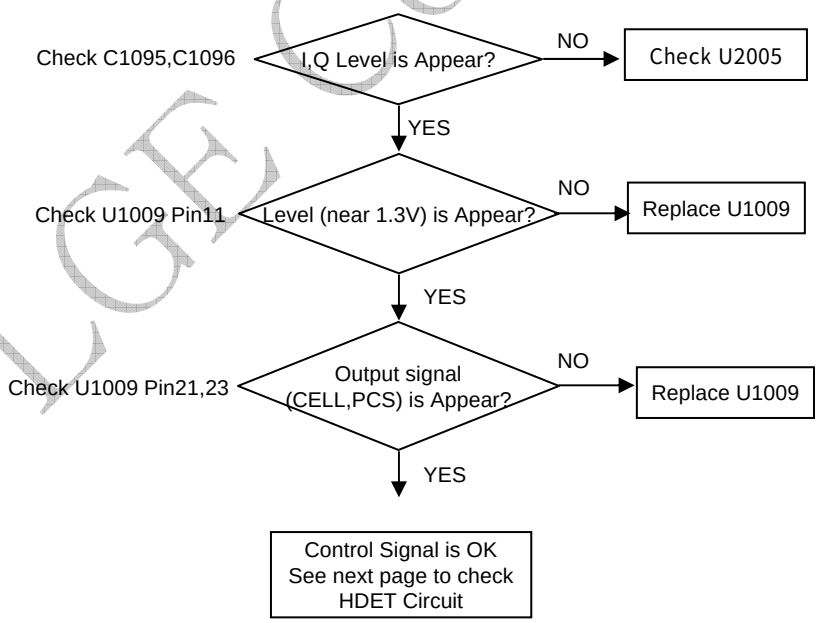
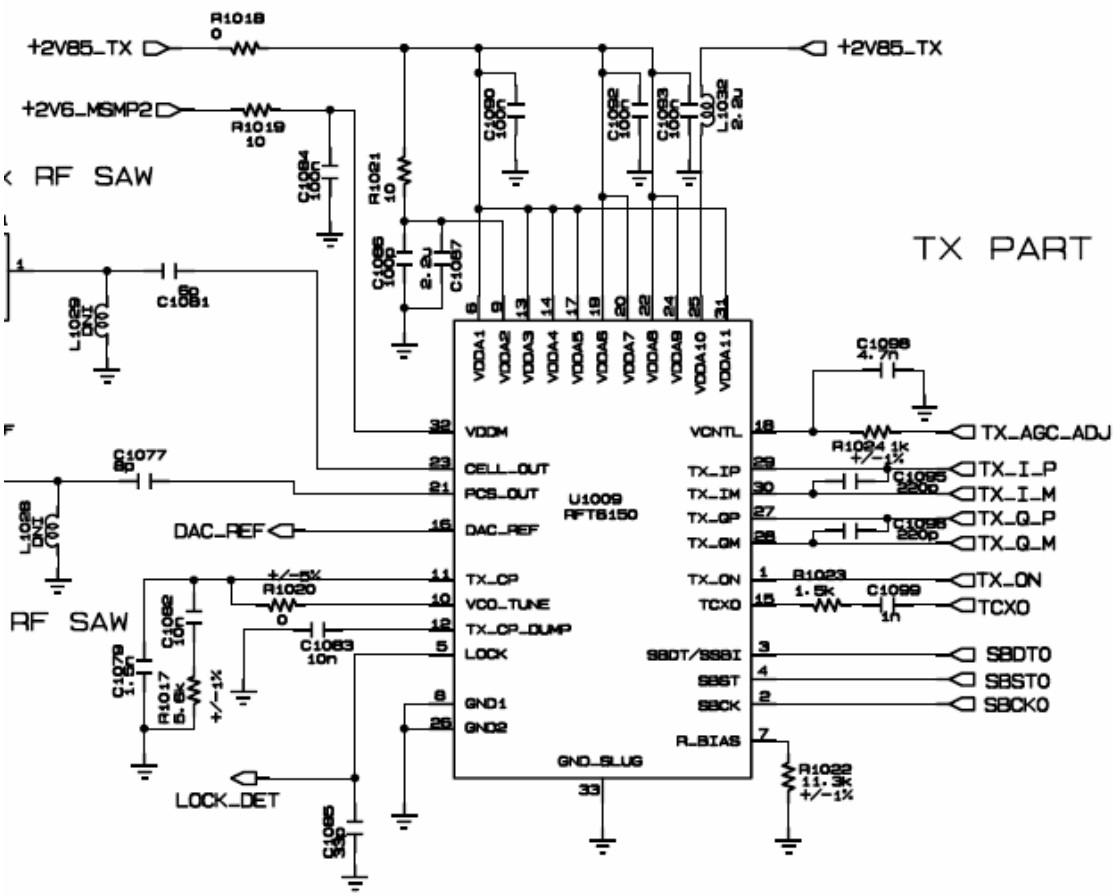


Figure 8

Circuit Flow



Circuit Diagram



Waveform

SPECTRUM ANALYZER CONDITION
-RBW : 1MHz,VBW: 1KHz
-Span : 60MHz
-Frequency : DCN(836.52MHz),PCS(1880MHz)

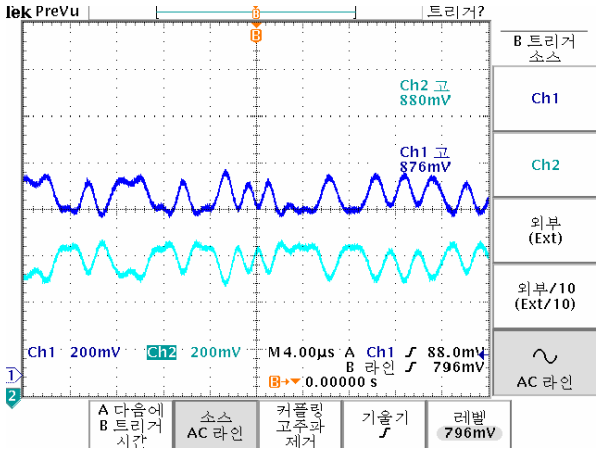


Figure 9: C1095,C1096TX_I,Q DATA

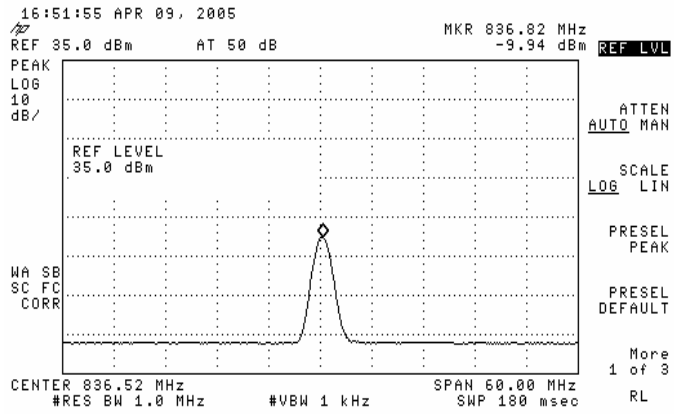


Figure 10: U1009 Pin23 DCN_OUT

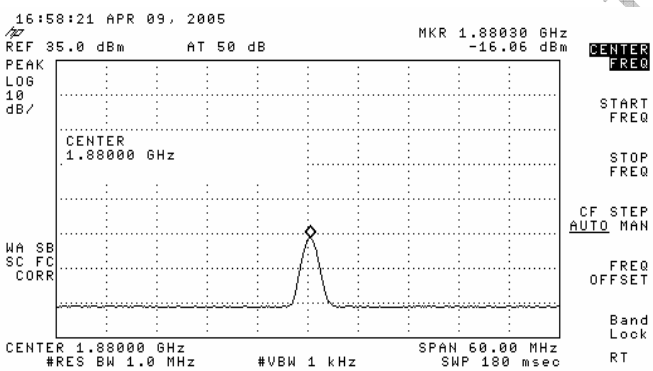


Figure 11: U1009 Pin21 PCS_OUT

6.2.5 Check HDET Circuit

TEST POINT

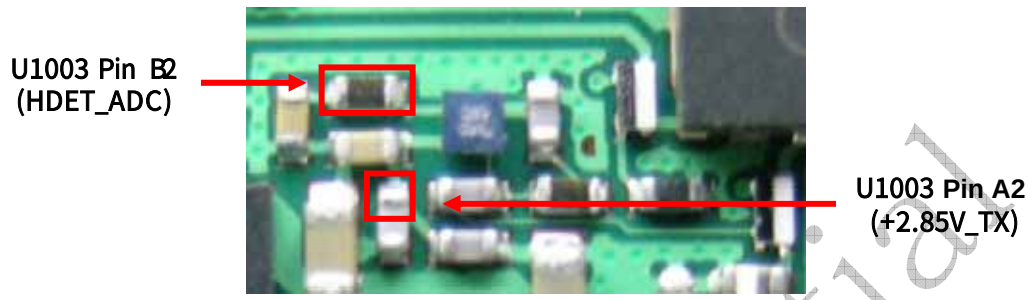
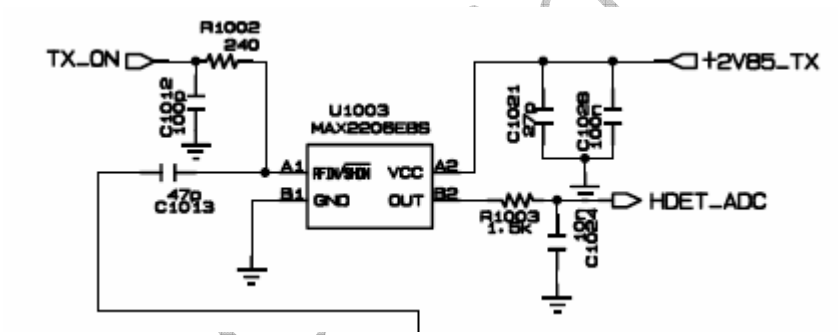
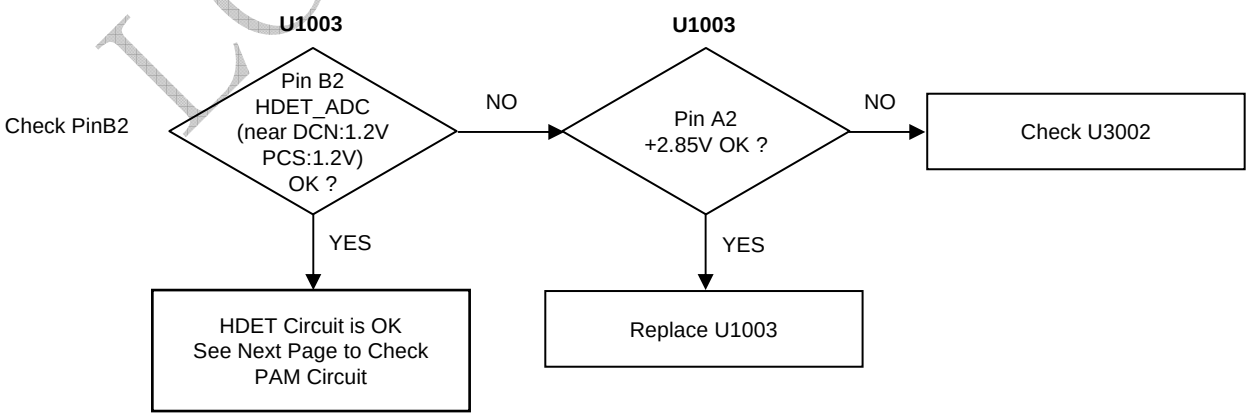


Figure 12

Circuit Diagram



Checking Flow



6.2.6 Check PAM Circuit

Test Point

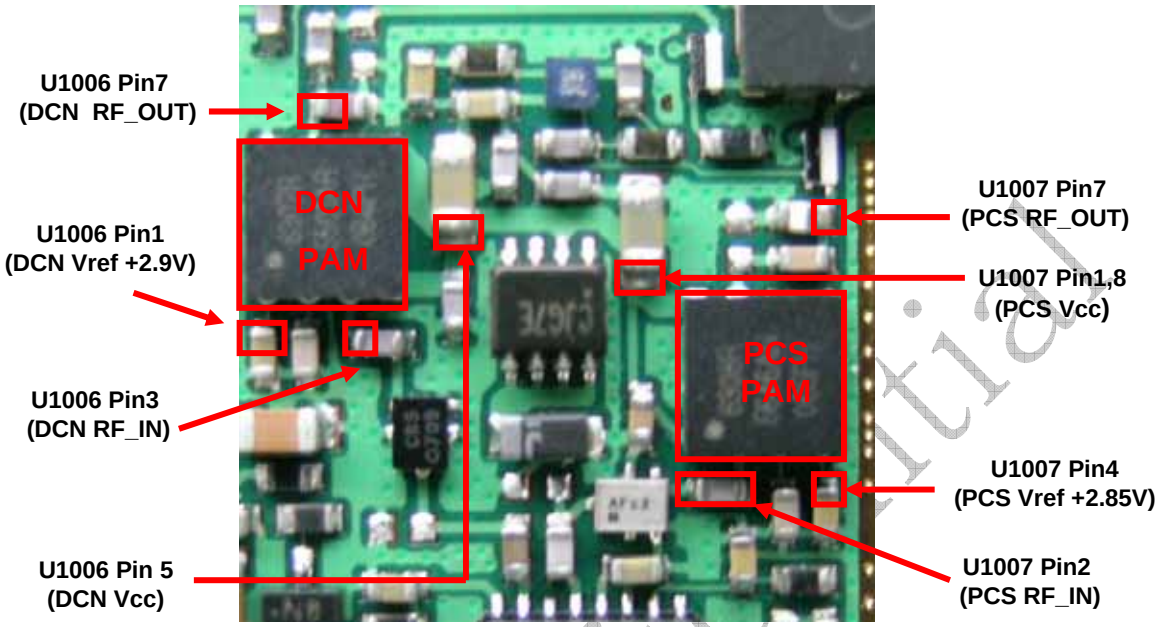
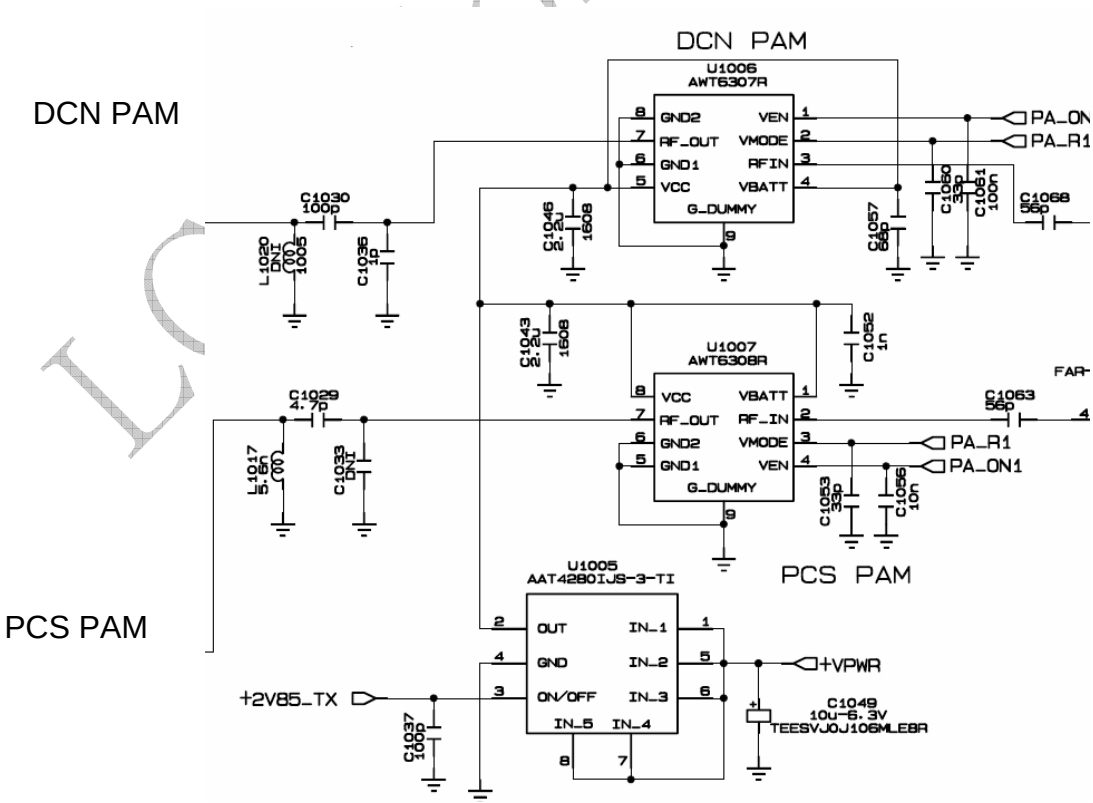
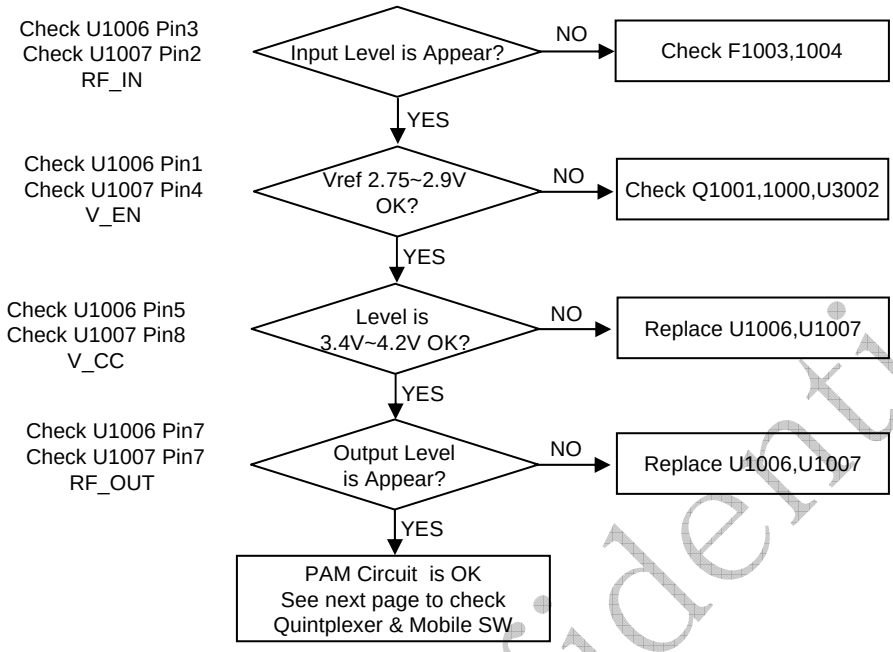


Figure 13

Circuit Diagram



Circuit Flow



Waveform

SPECTRUM ANALYZER CONDITION
-RBW : 1MHz,VBW: 1KHz
-Span : 60MHz
-Frequency : DCN(836.52MHz),PCS(1880MHz)

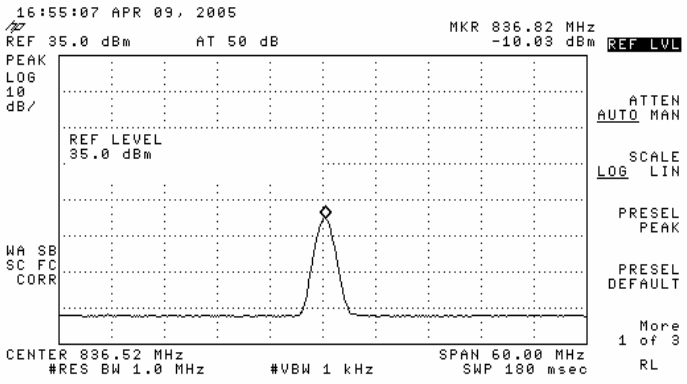


Figure 14: U1006 Pin3 DCN PAM_IN

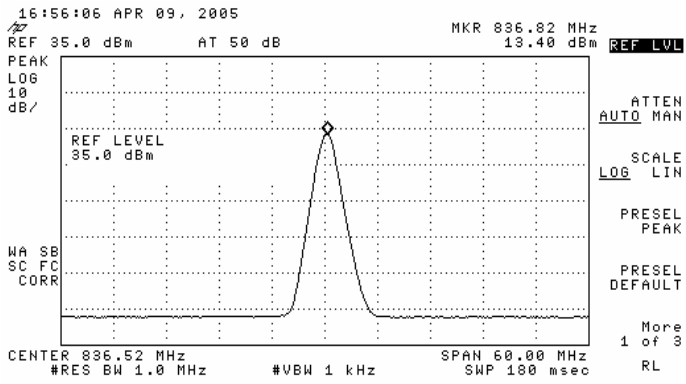


Figure 15: U1006 Pin7 DCN PAM_OUT

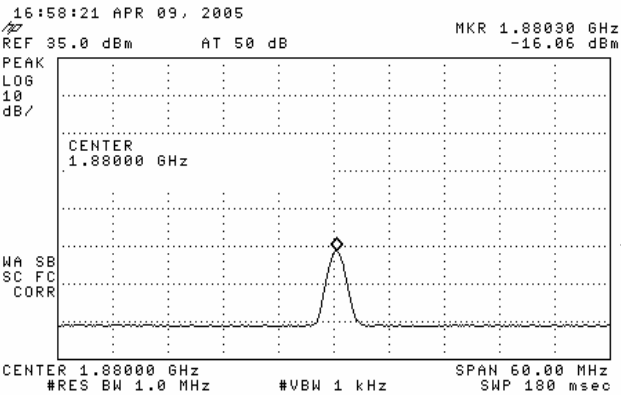


Figure 16: U1007 Pin2 PCS PAM_IN

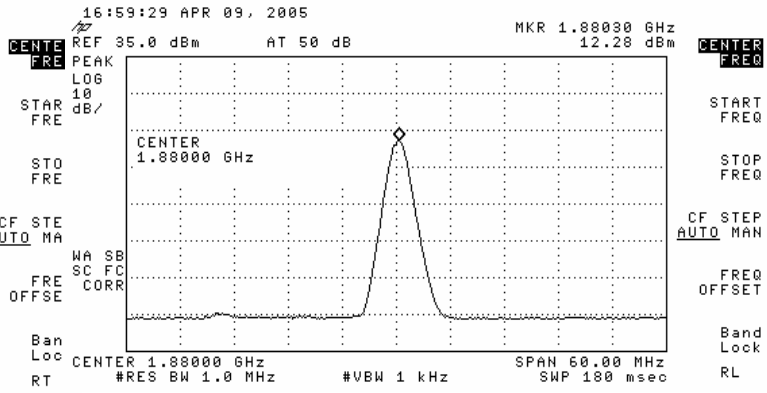


Figure 17: U1007 Pin7 PCS PAM_OUT

6.2.7 Check Coupler & Quintplexer & Mobile S/W

TEST POINT

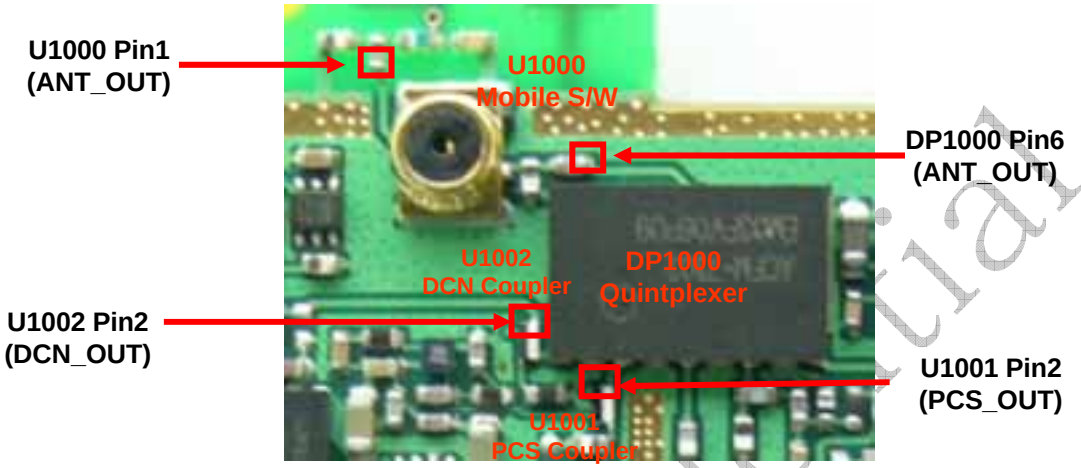
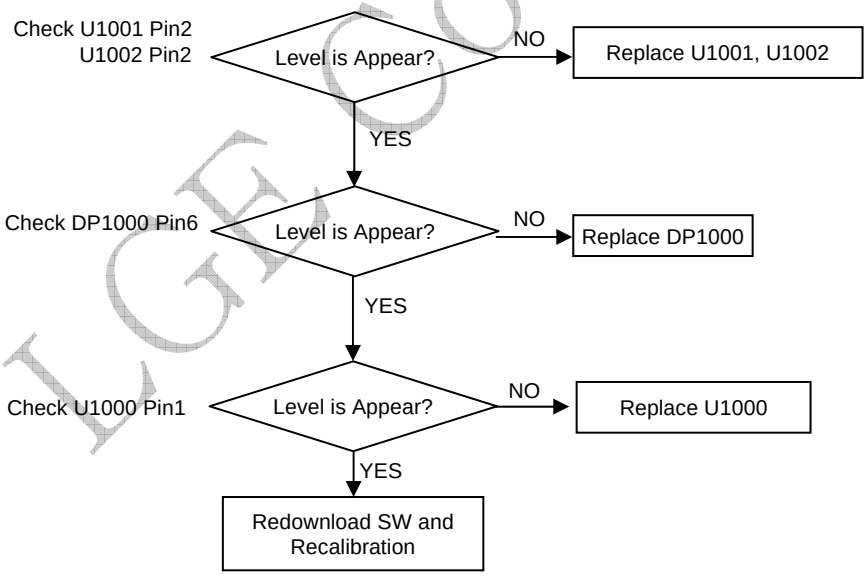
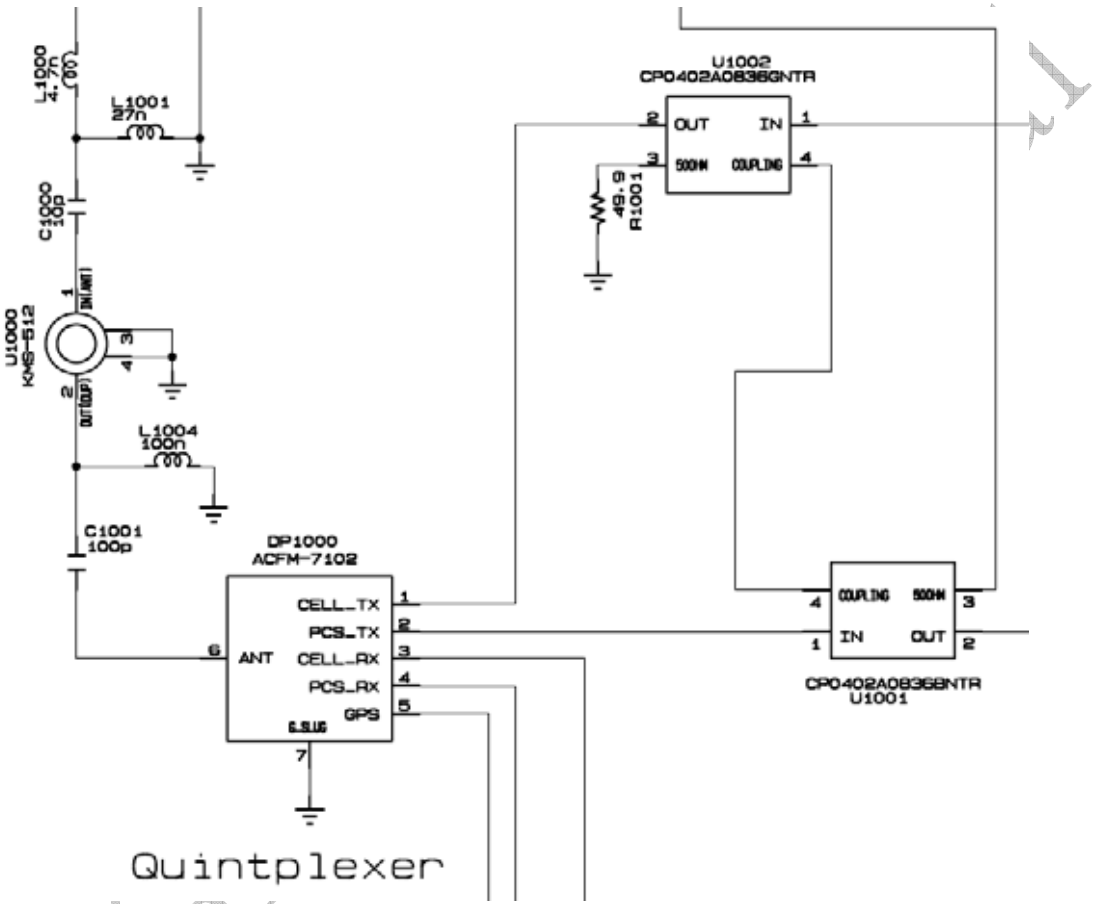


Figure 18

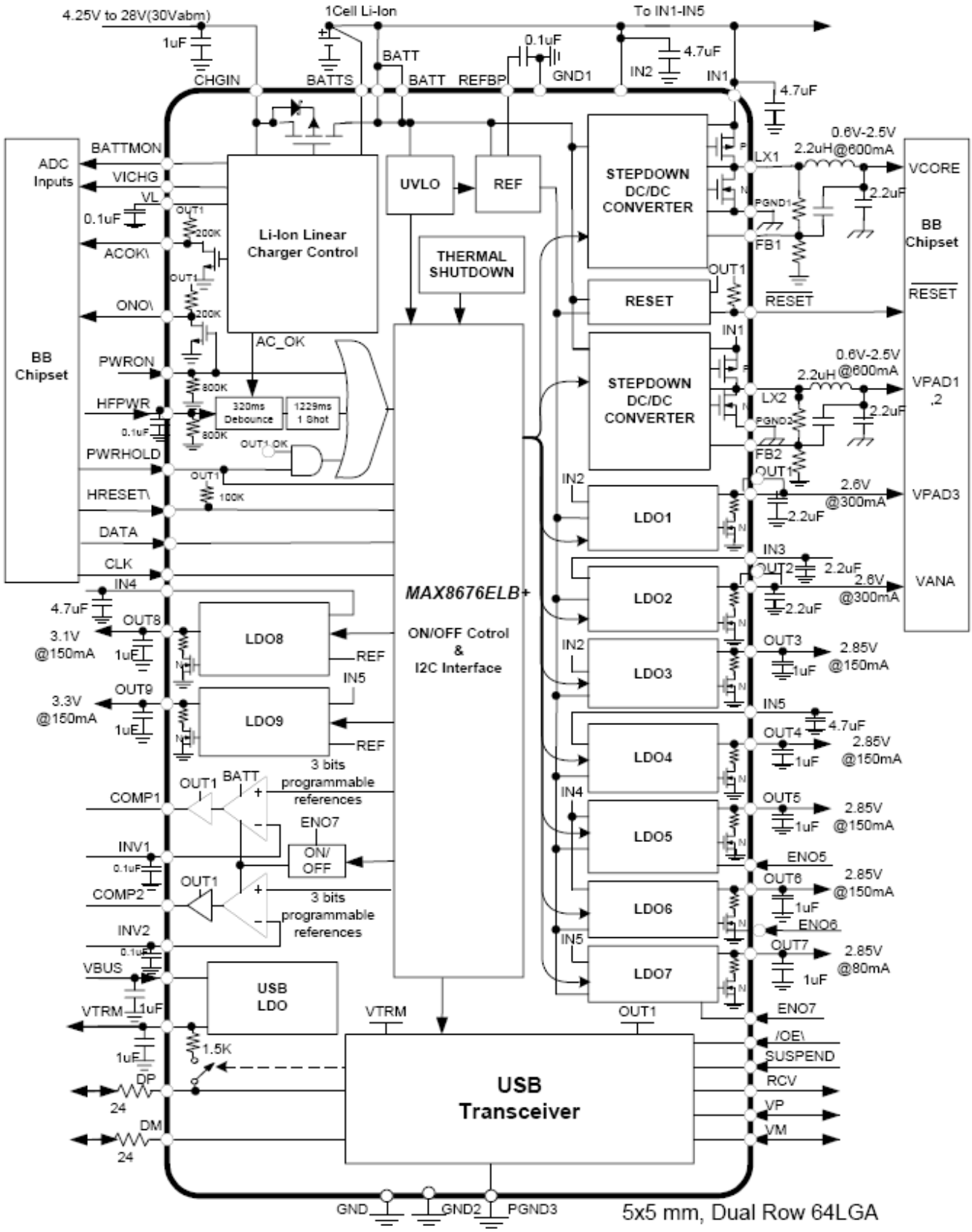
Circuit Flow



Circuit Diagram



6.3 Logic Part Troubleshooting



6.3.1 Power On Trouble

Circuit Diagram

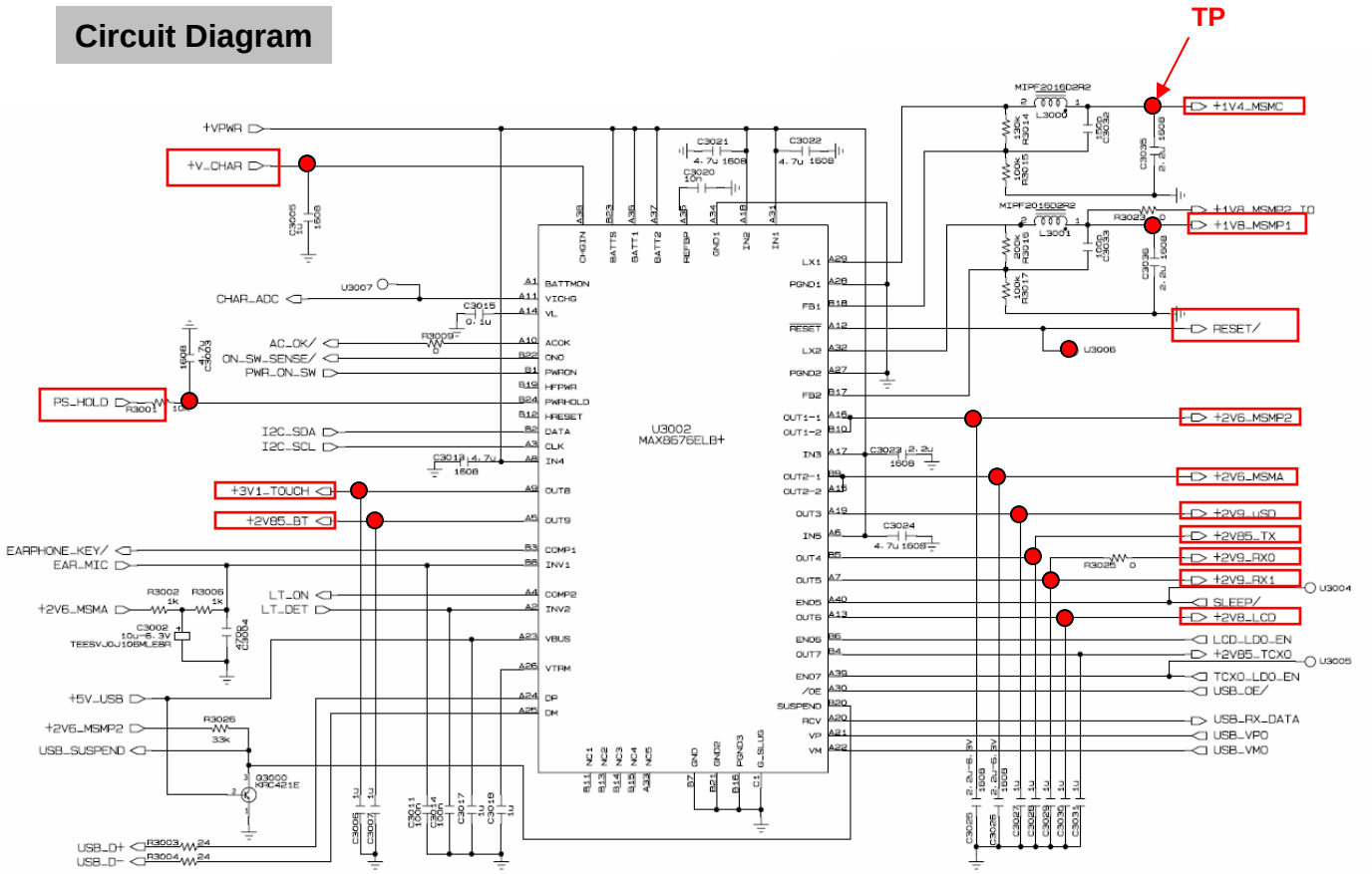


Figure 2 - PMIC circuit diagram

Figure 3 - Power-on switch circuit diagram

Test Points

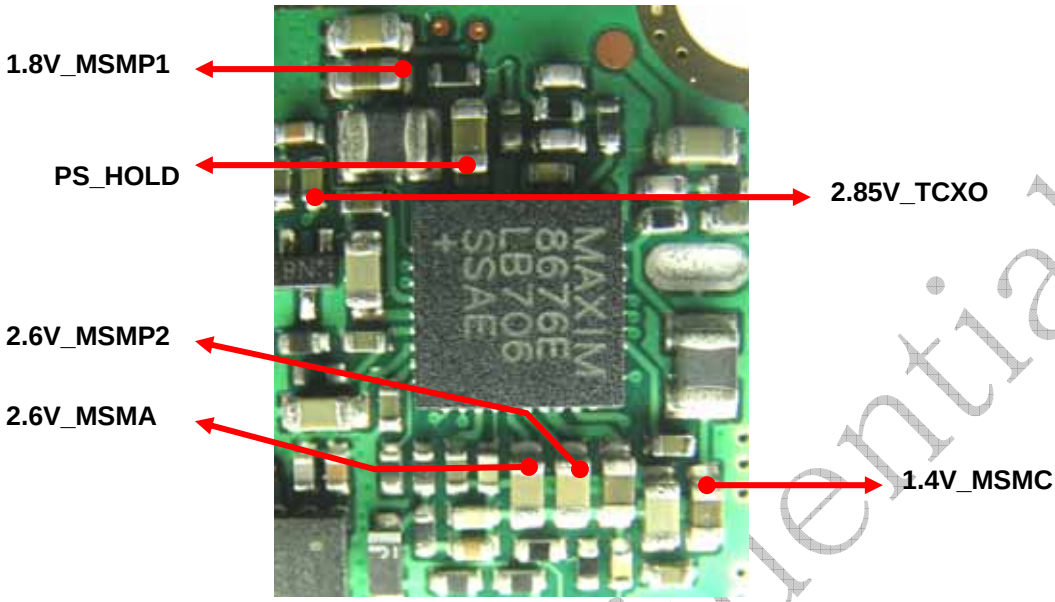


Figure 4 - MAX8676 Power Management IC

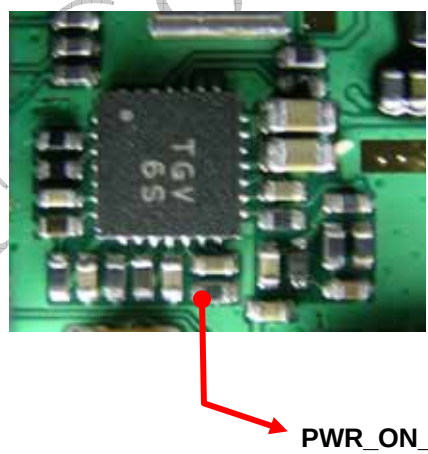
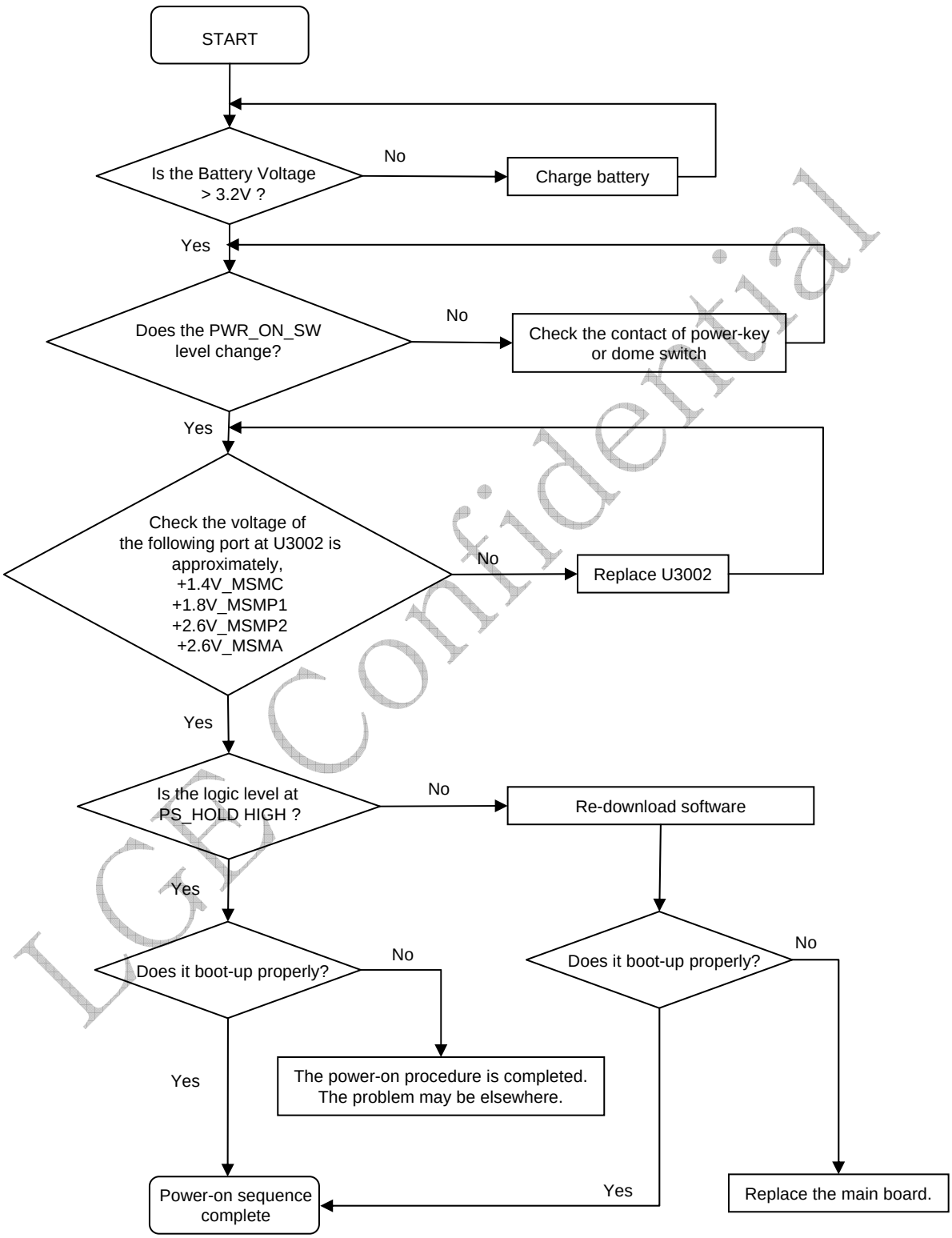


Figure 5 - Main PCB Top Keypad Area

Checking Flow



6.3.2 Battery Charge Failure

Test Points

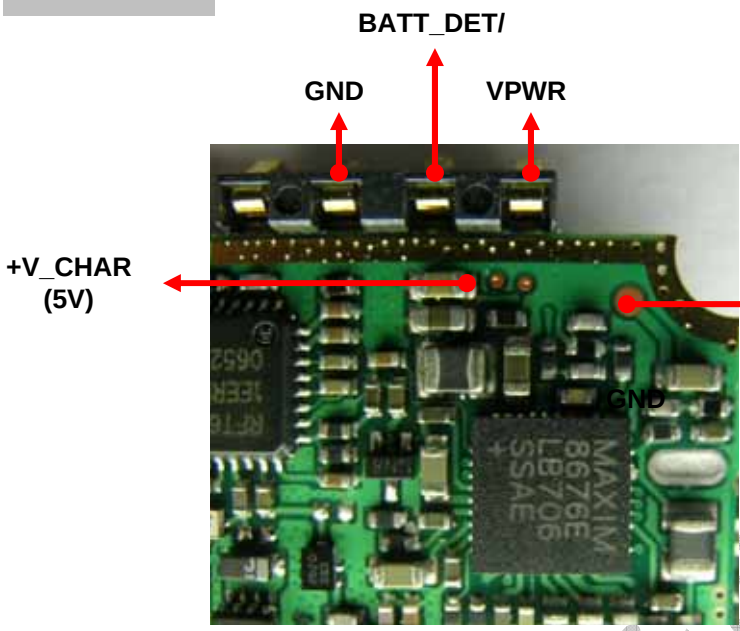


Figure 6 – Charger Circuit Part

Circuit Diagram

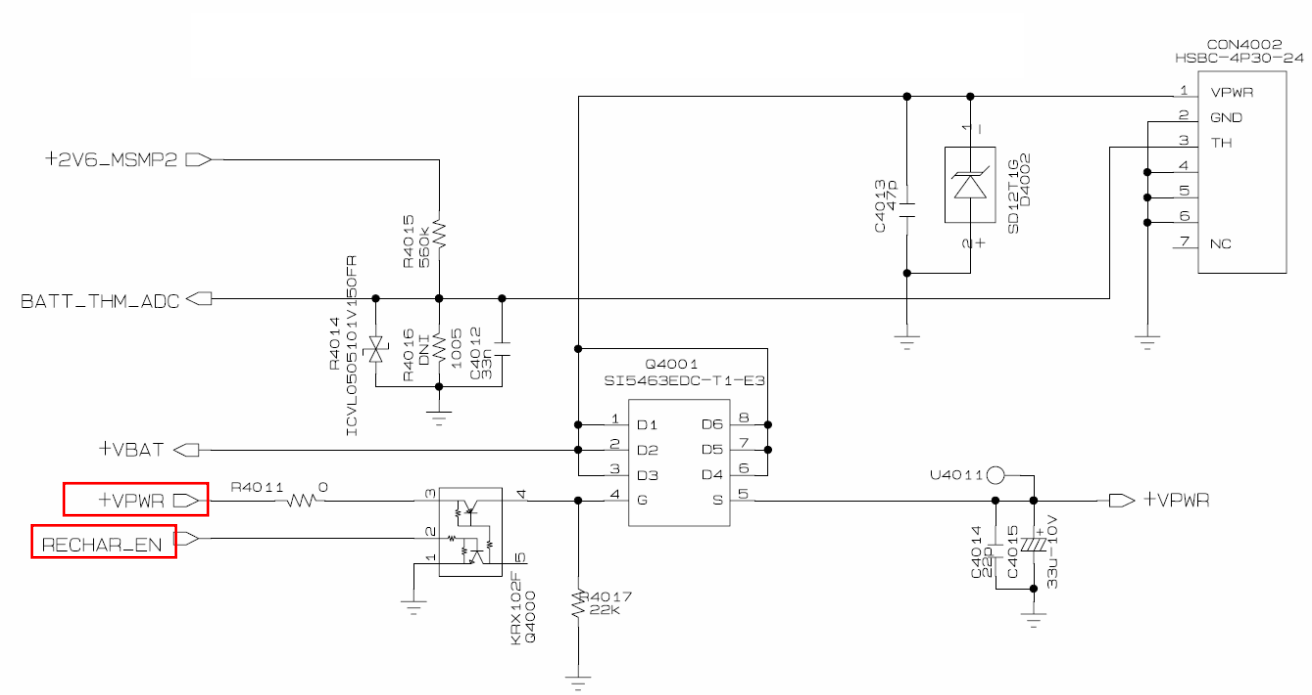
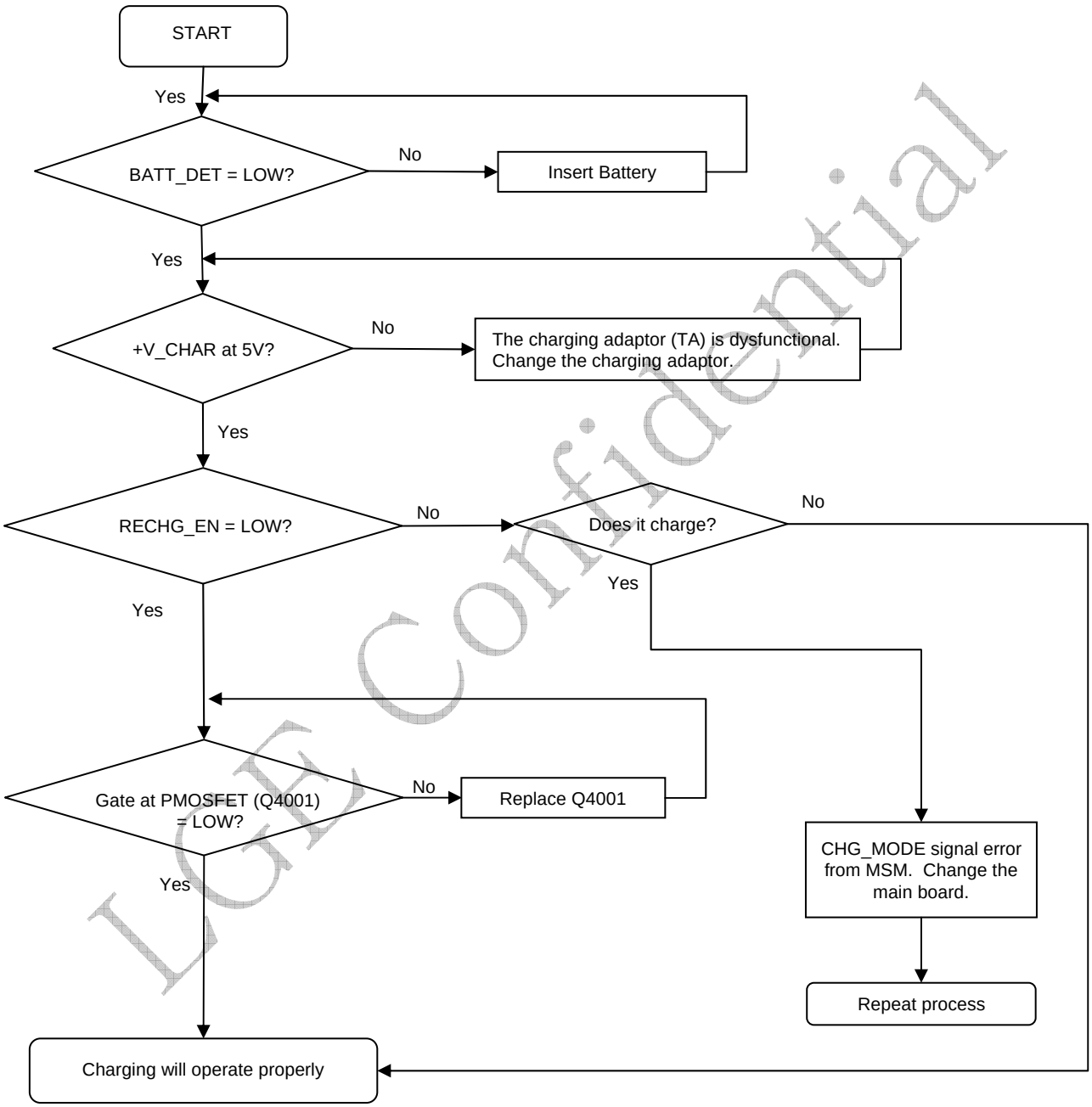


Figure 7 – Battery Contact Diagram

Checking Flow

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



6.3.3 USB Interface Failure

Test Points

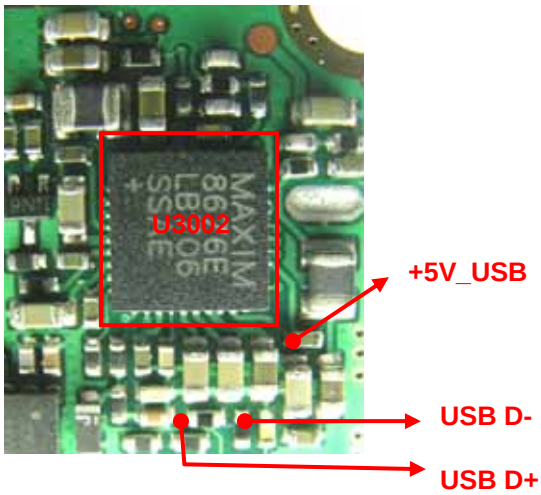


Figure 7 - USB Transceiver

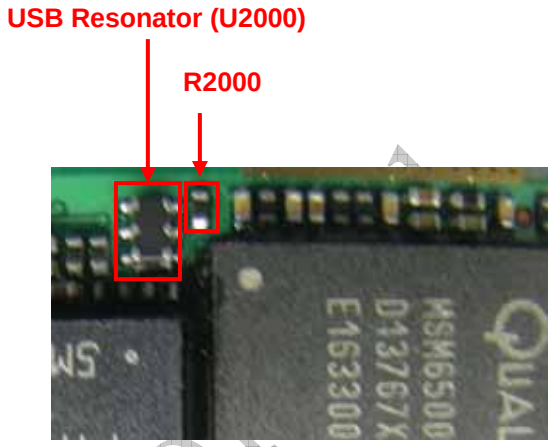


Figure 8 - USB Resonator

Block Diagram

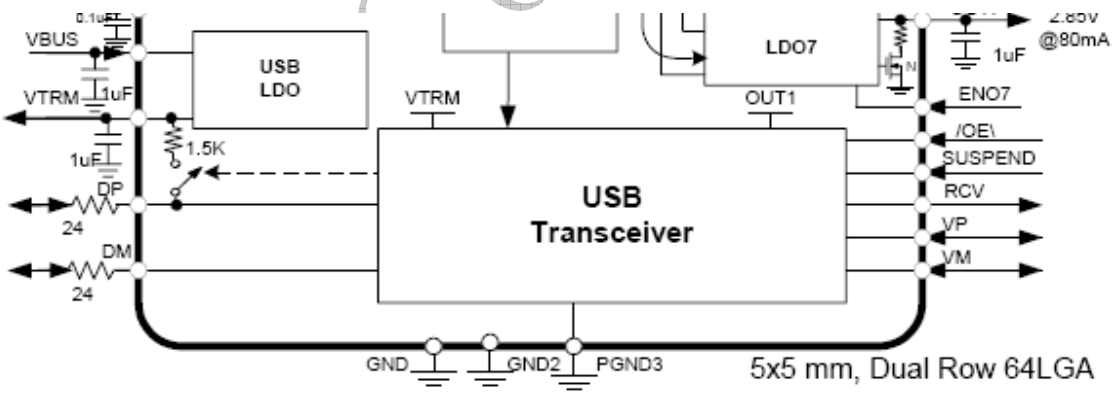


Figure 9 - USB Transceiver Block (MAX8676)

Circuit Diagram

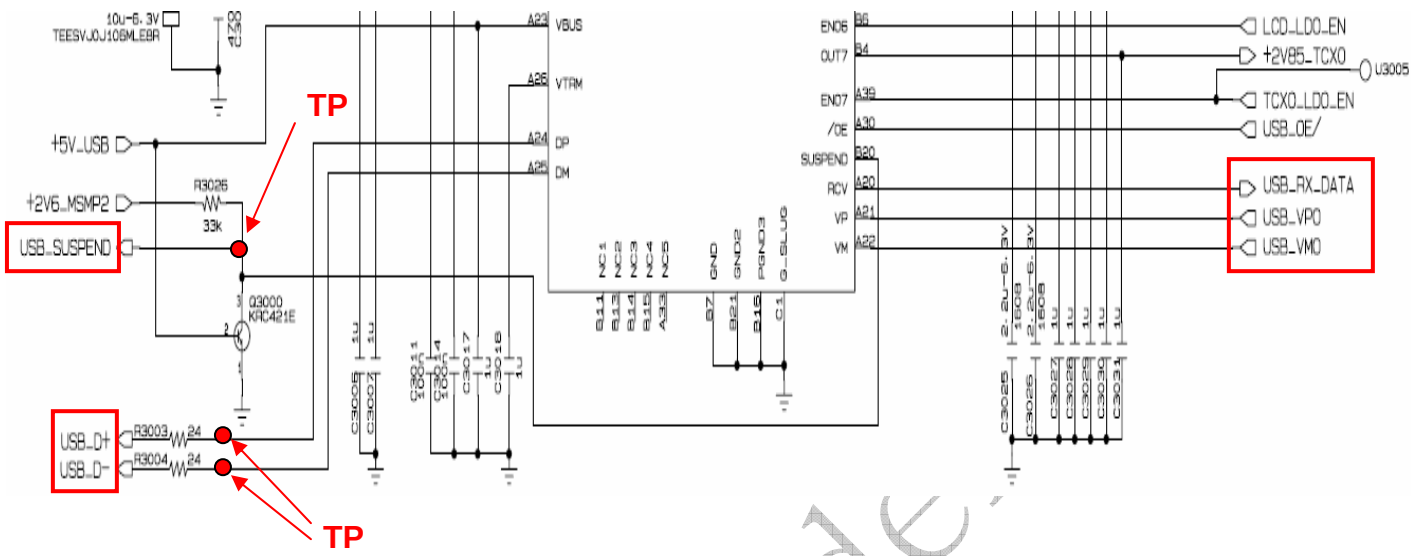


Figure 10 - USB Transceiver

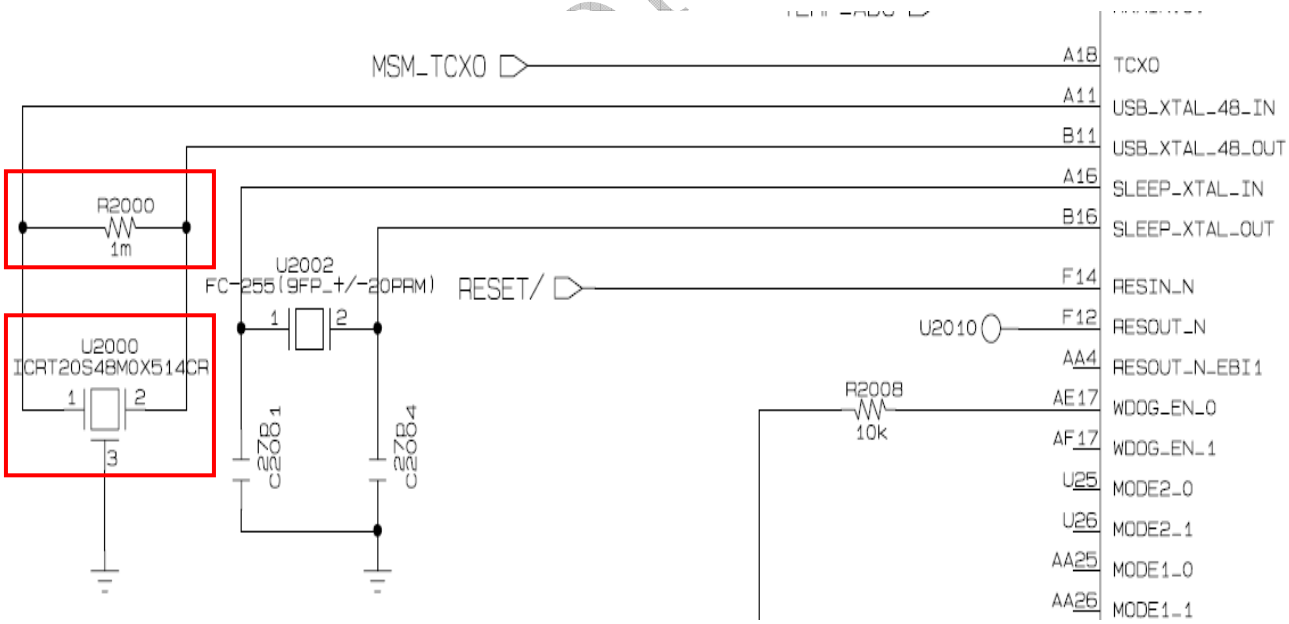
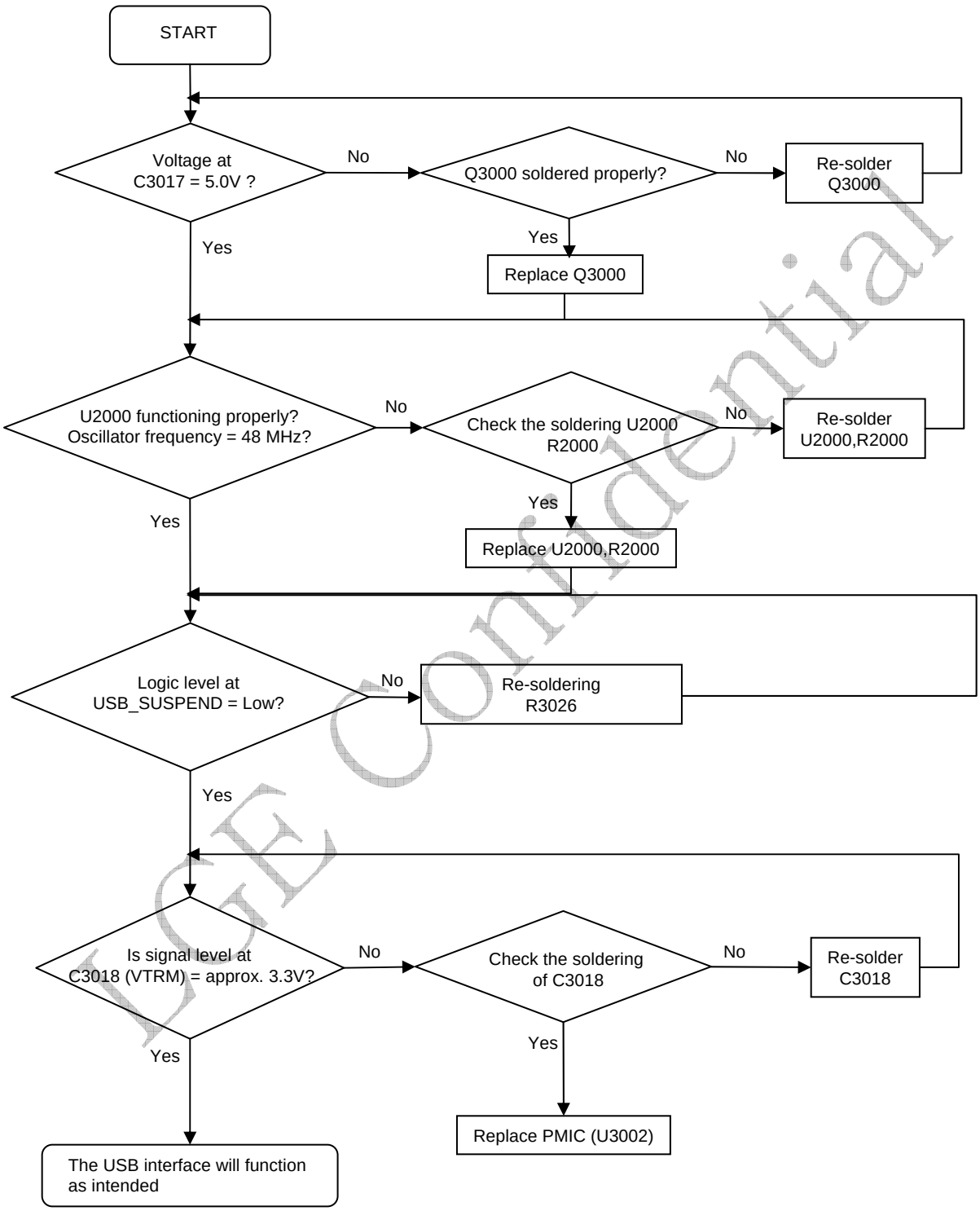


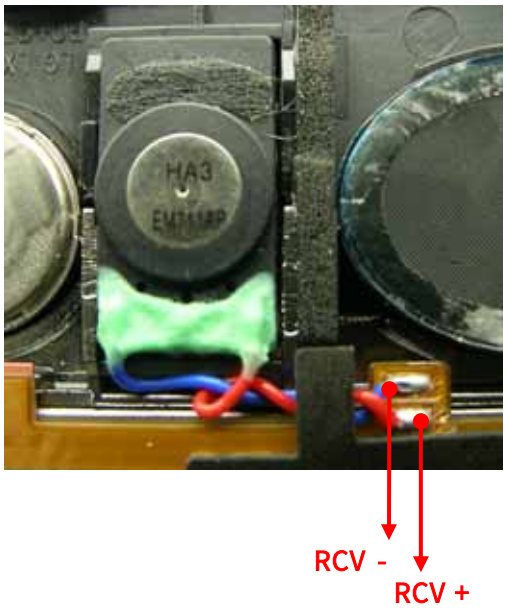
Figure 11 - USB Resonator

Checking Flow



6.3.4 Receiver Trouble

Test Points



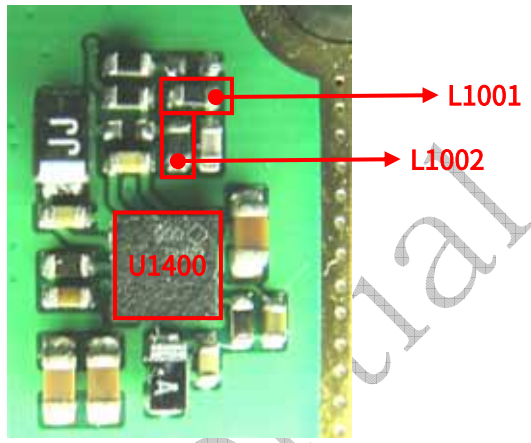


Figure 12 - RECEIVER PART

Circuit Diagram

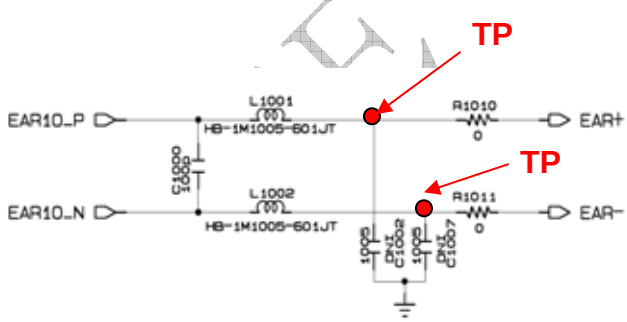


Figure 13 - RECEIVER PART Circuit Diagram

Block Diagram

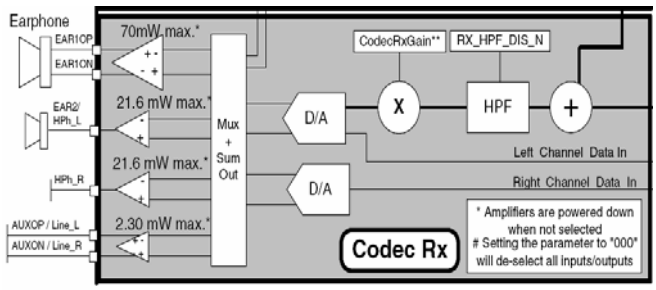
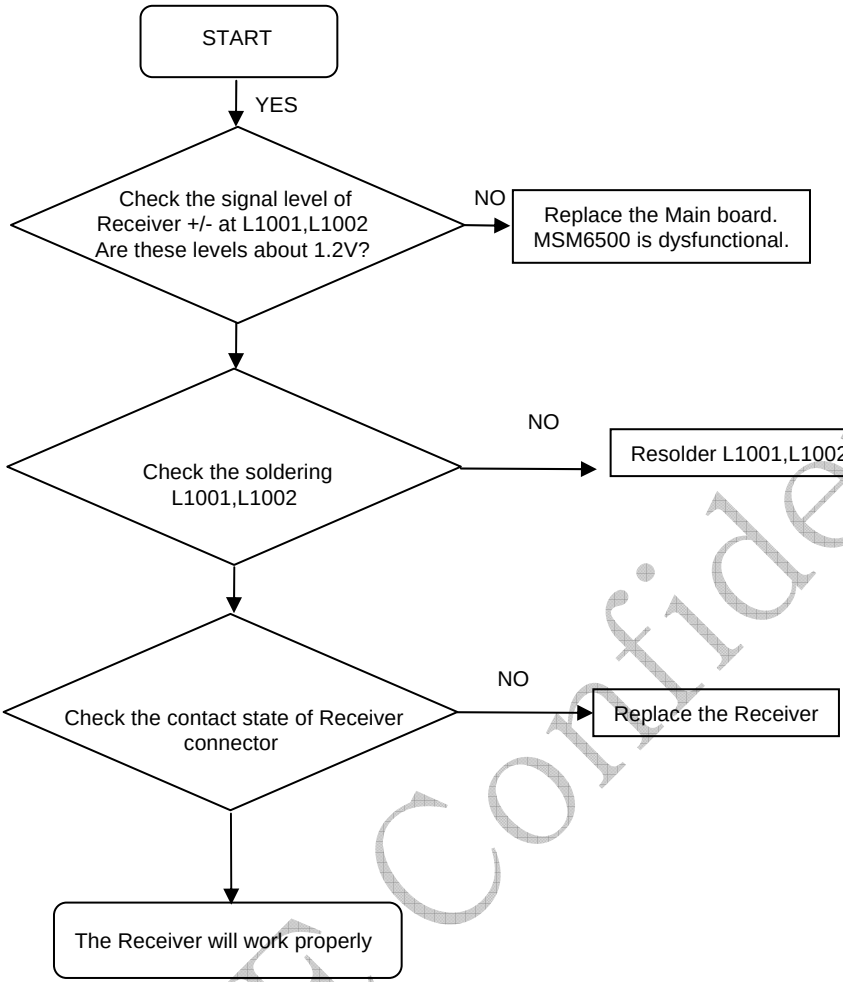


Figure 14 - RECEIVER CODEC BLOCK

Checking Flow

SETTING : After initialize 5515C, Test Cellular or US PCS



Waveform

AC voltage of the signals

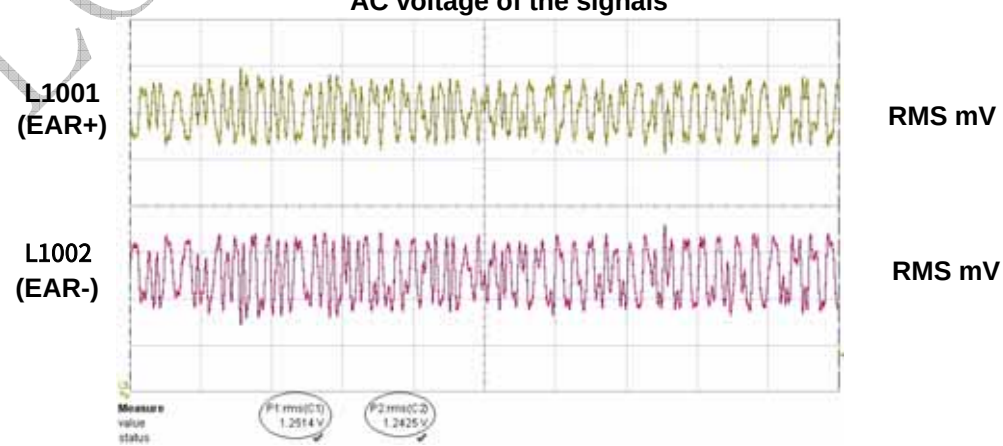


Figure 15 - AC VOLTAGE OF THE SIGNALS WAVEFORM

6.3.5 Speaker Trouble

Test points

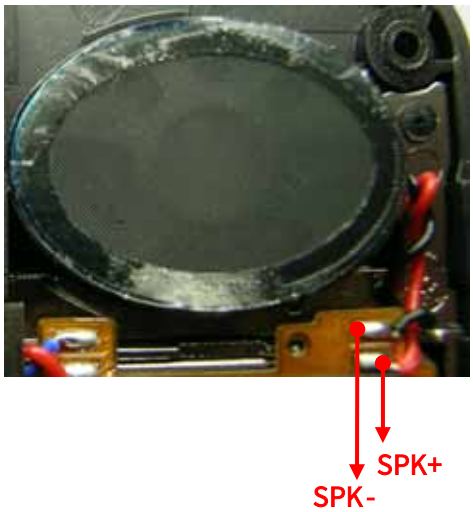


Figure 16 - SPK CONNECTOR PART

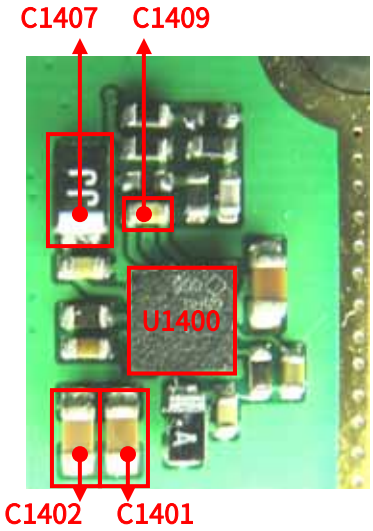


Figure 17 - SPK PHONE AUDIO AMP PART

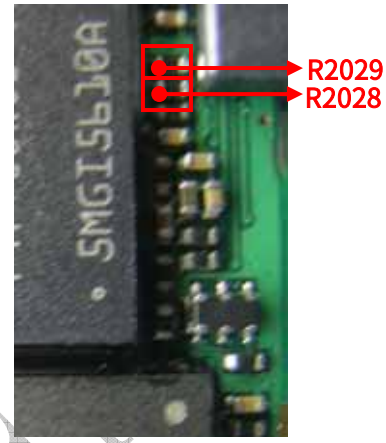


Figure 18 - I2C (MSM)

Circuit Diagram

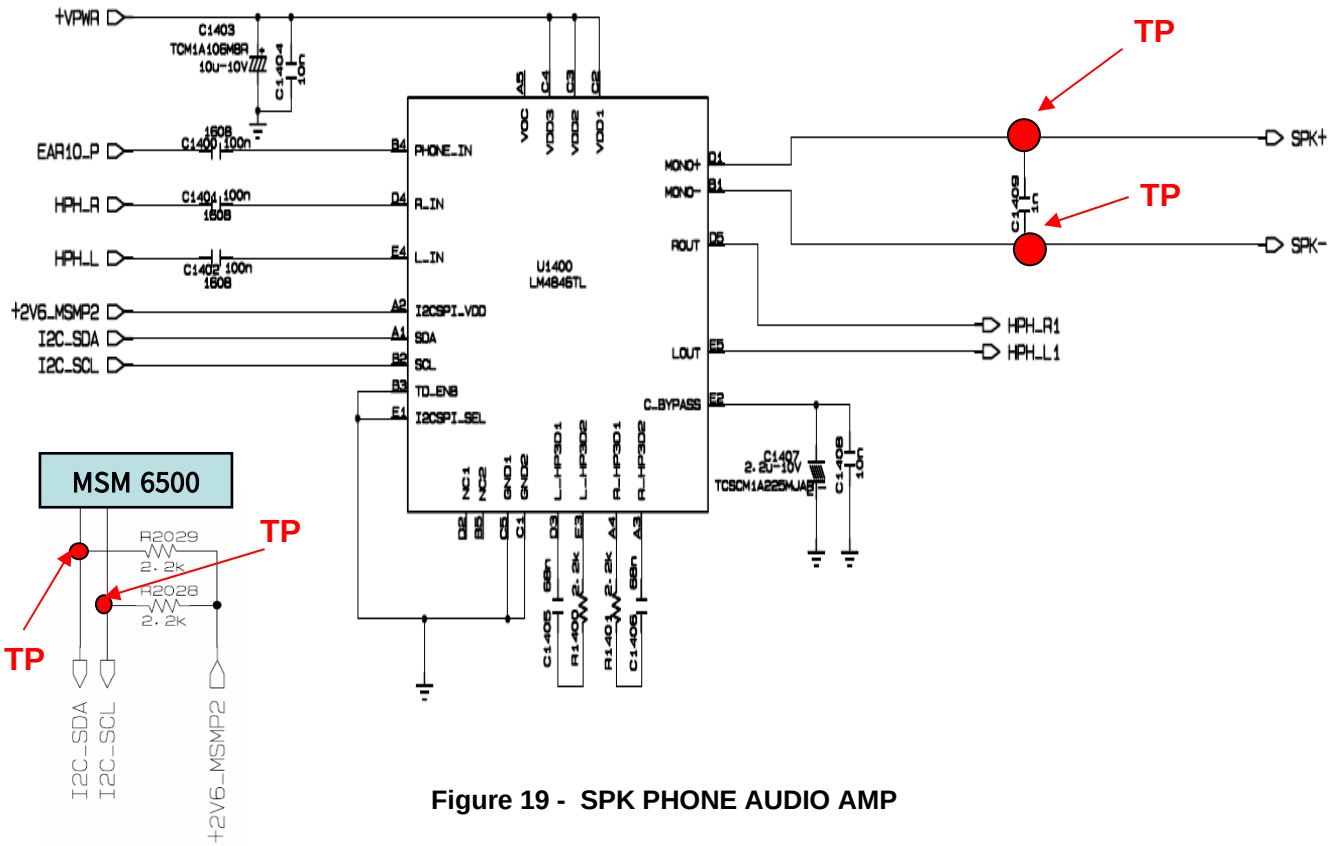
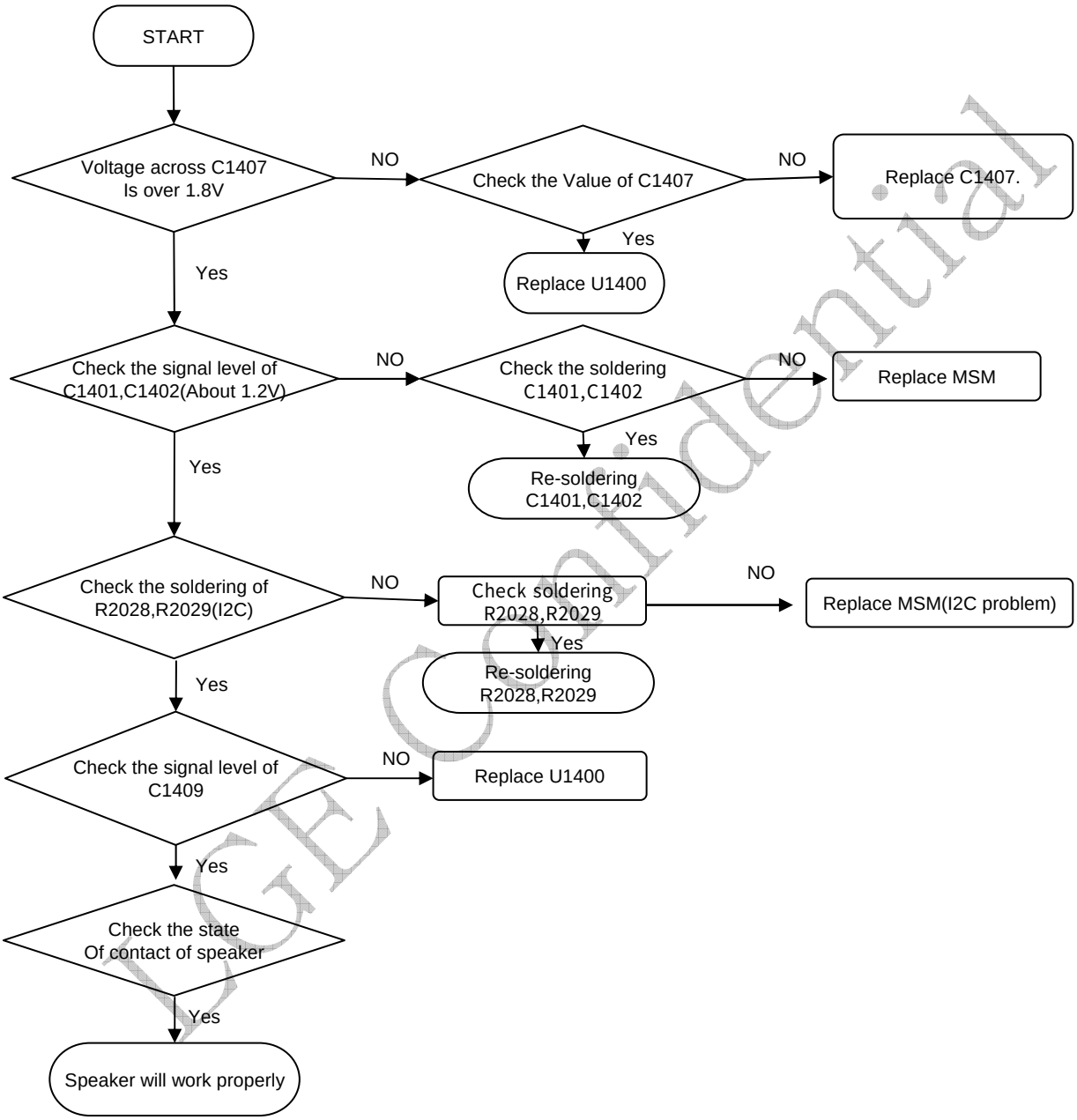


Figure 19 - SPK PHONE AUDIO AMP

Checking Flow

SETTING : “Ringer on” at sounds of test menu.



6.3.6 MIC Trouble

Test points

Figure 20 - MIC PART

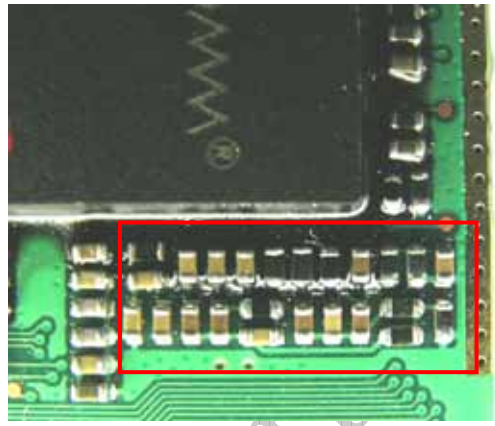


Figure 21 - MIC NETWORK

Circuit Diagram

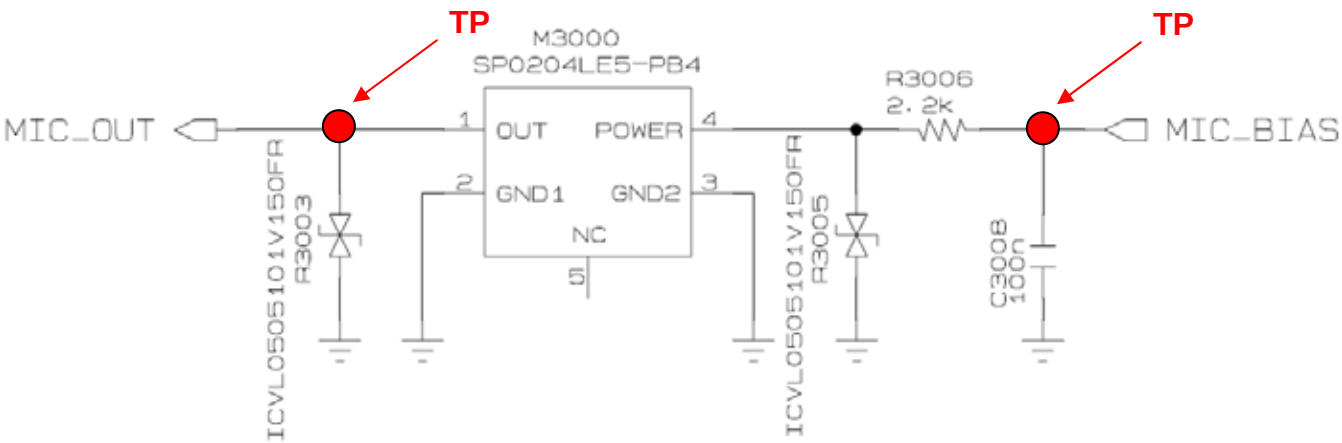
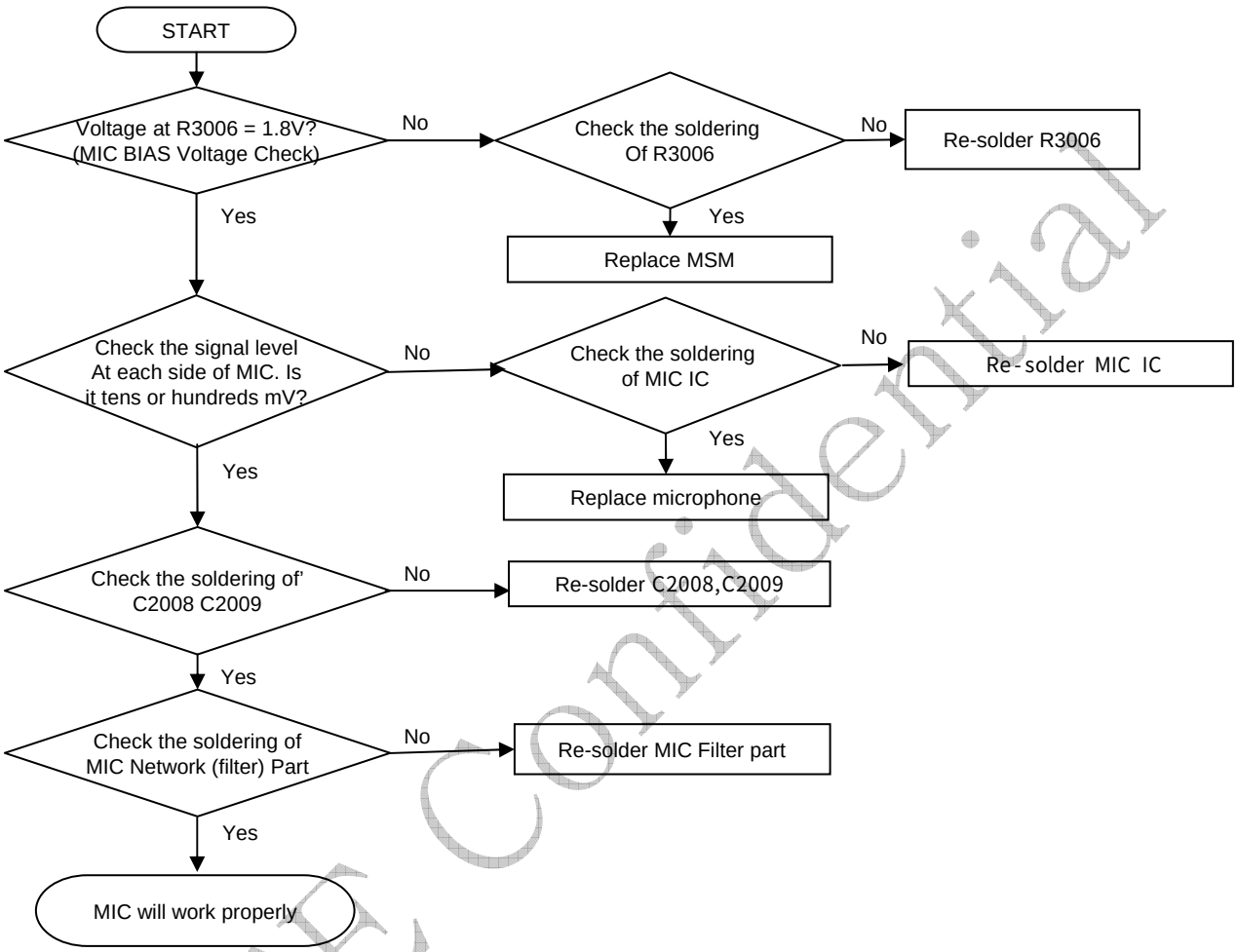


Figure 22 - MIC CIRCUIT DIAGRAM

Checking Flow

SETTING : After initialize 5515C, Test Cellular or US PCS



Waveform

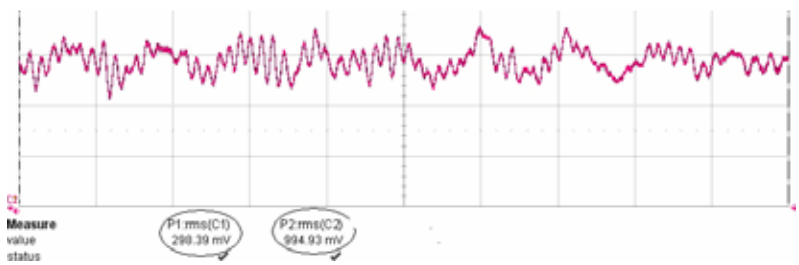


Figure 23 - Mic Waveform

6.3.7 Earphone Trouble

Test Points

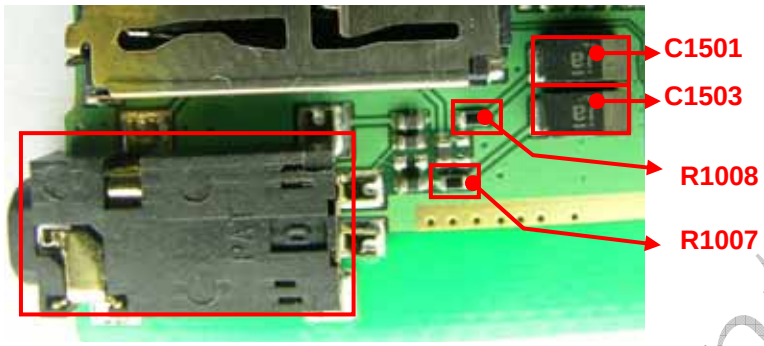


Figure 24 – EAR MIC JACK PART

Circuit Diagram

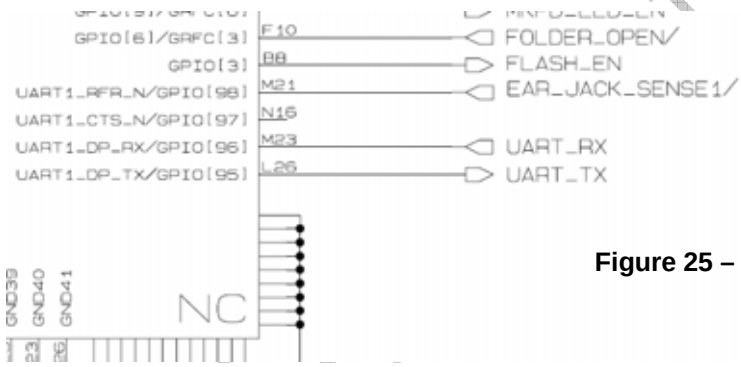


Figure 25 – EARJACK_SENSE1 (MSM)

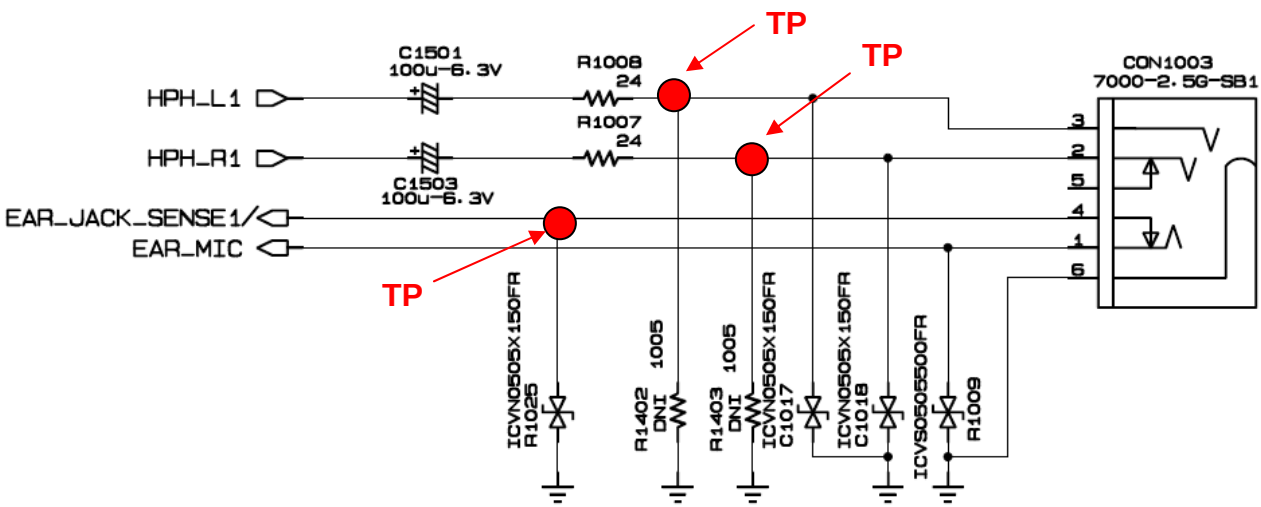
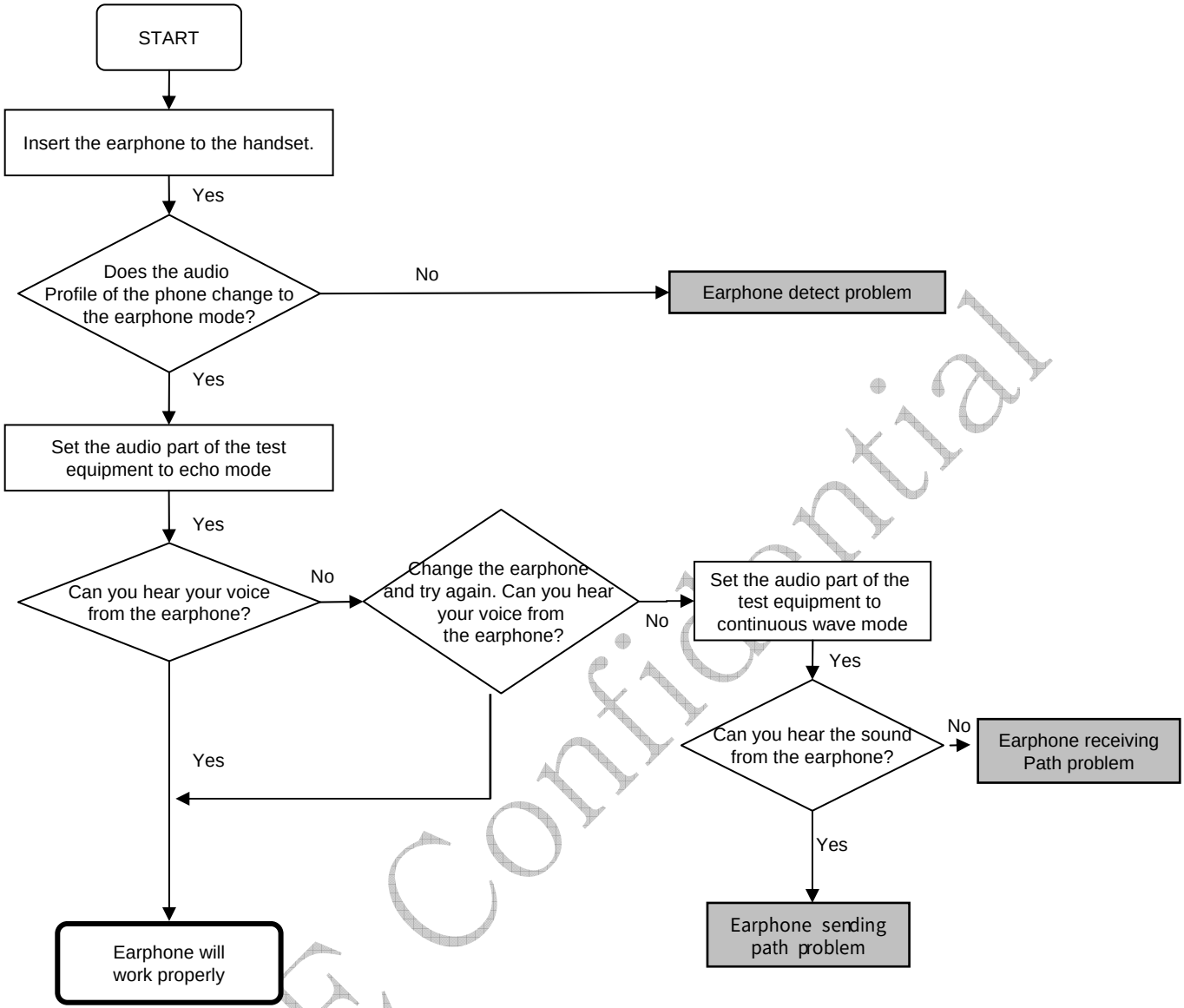
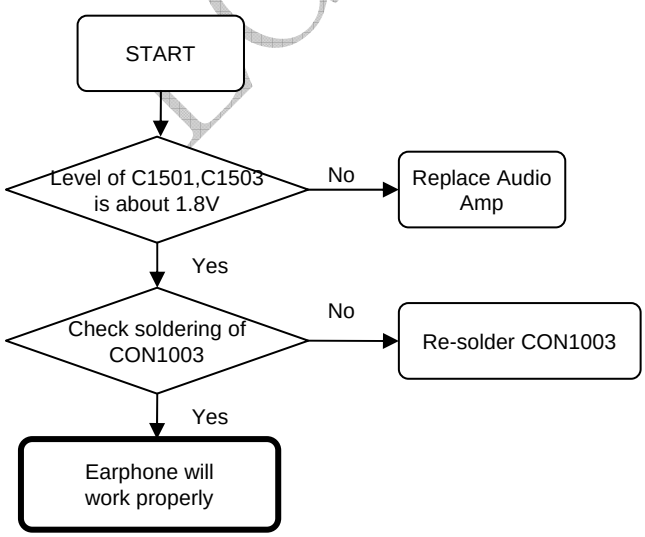


Figure 26 - EAR MIC JACK PART

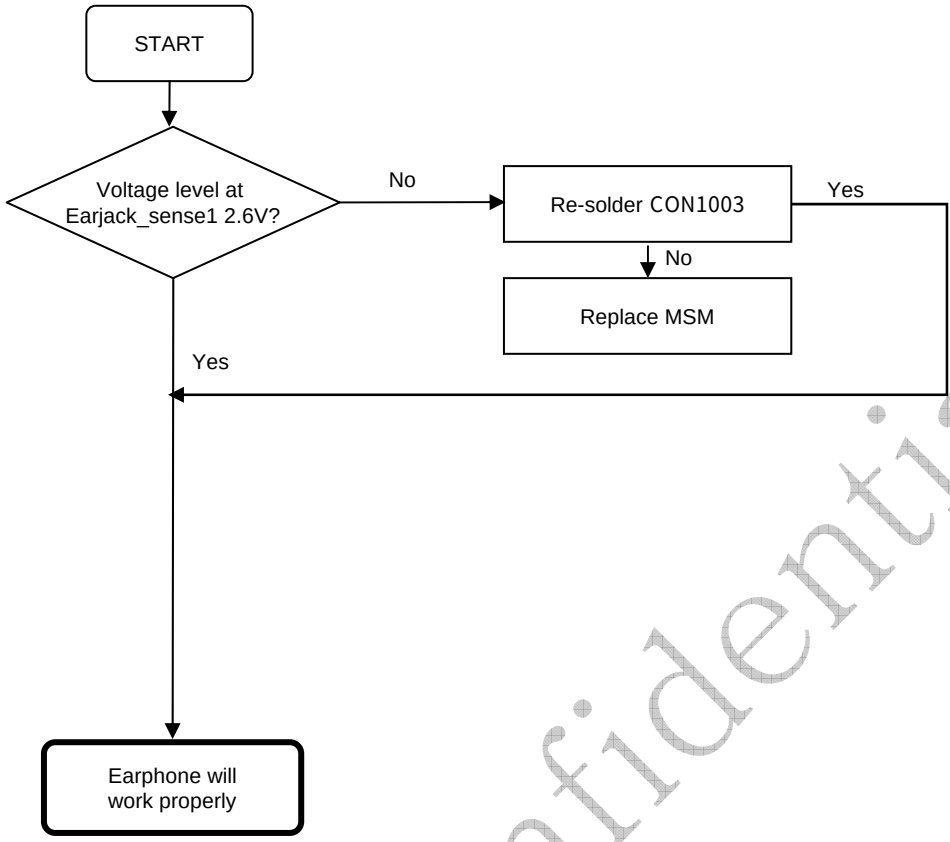
Checking Flow



Earphone receiving path problem



Earphone detect problem



6.3.8 Vibrator (Motor) Functionality Failure

Checking Flow

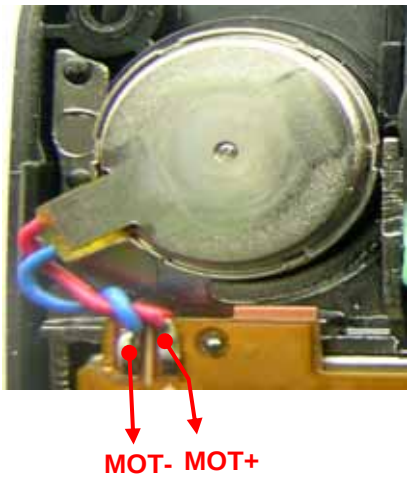


Figure 27 - MAIN FPCB Motor Contact Area

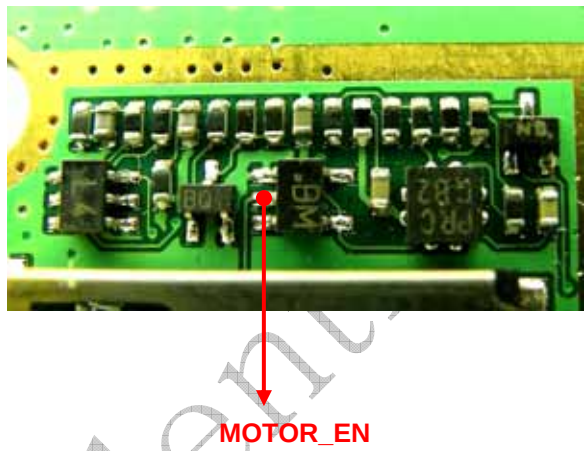


Figure 28 - Q2000 Transistor Area

Circuit Diagram

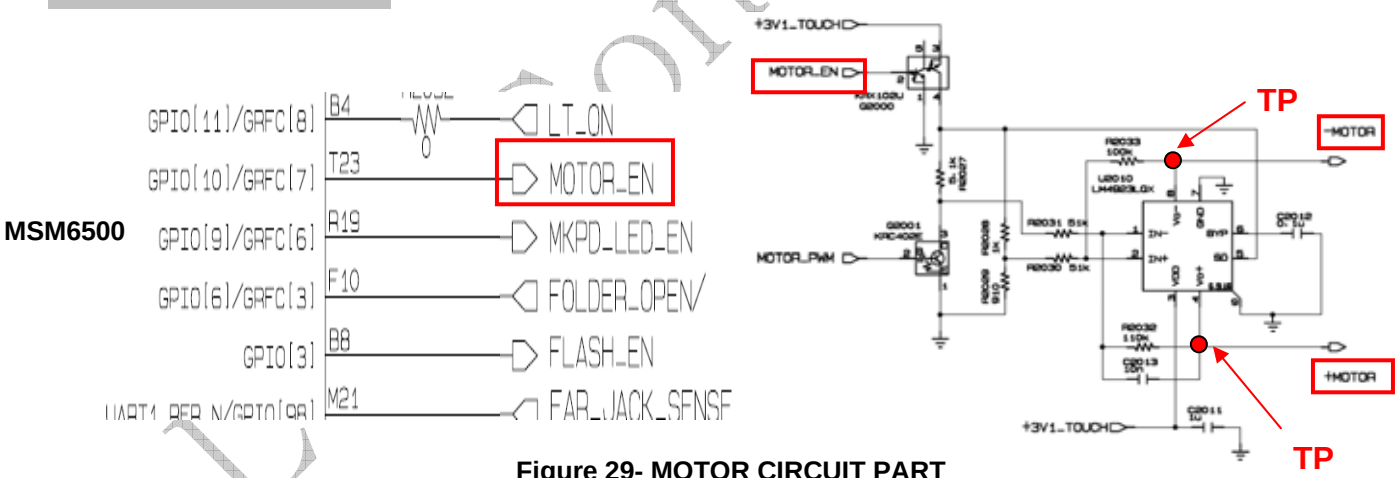


Figure 29- MOTOR CIRCUIT PART

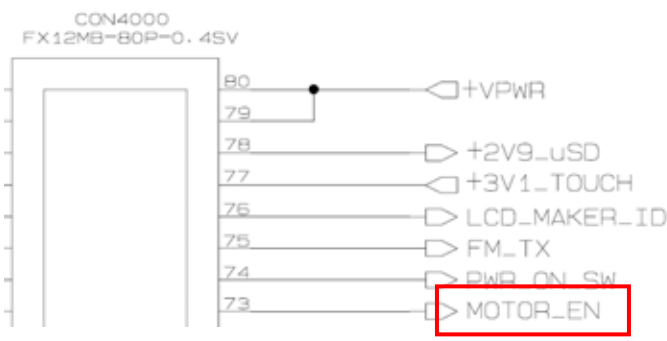
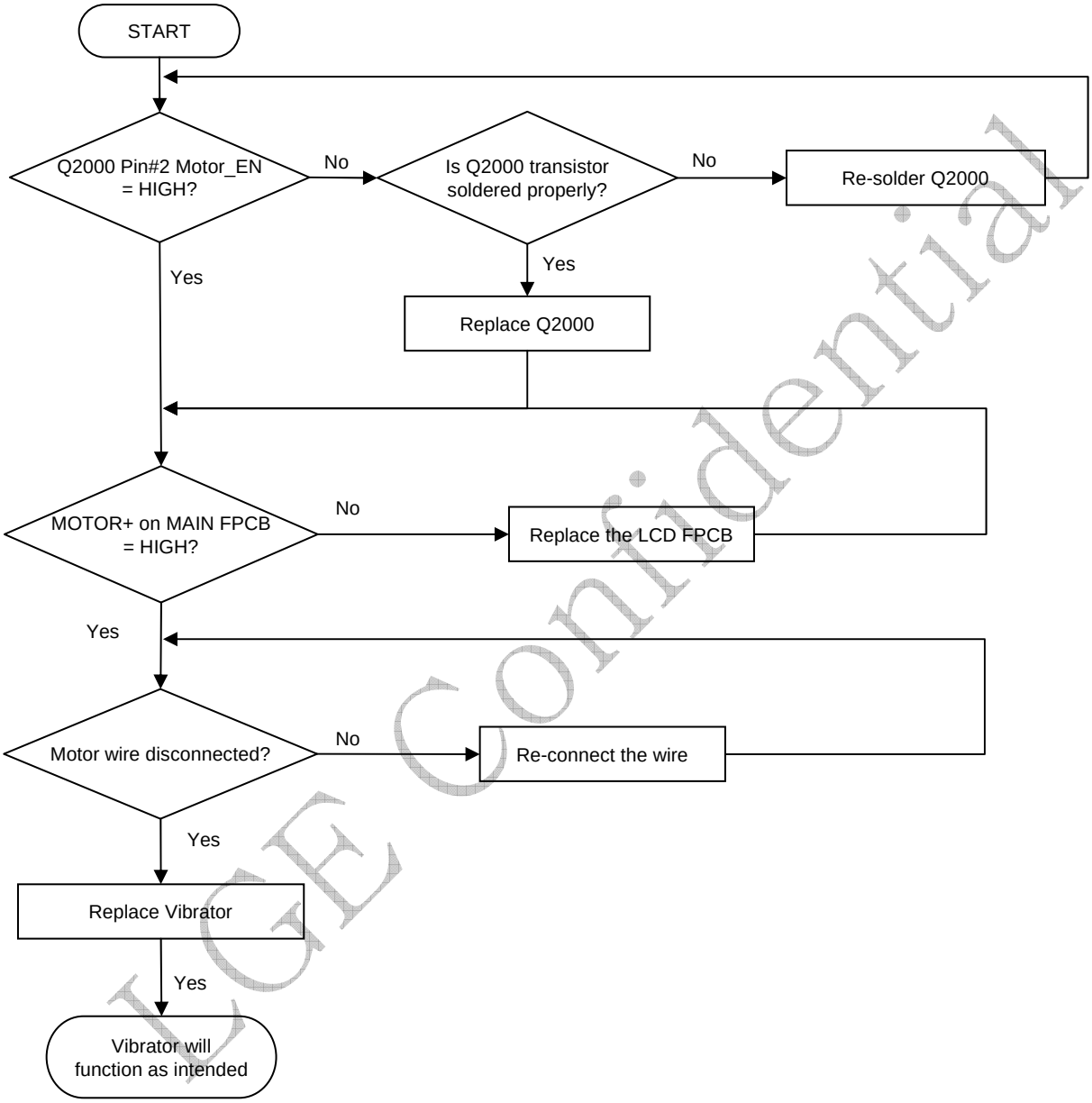


Figure 30 - CON4000 (80-pin Connector)

Checking Flow

SETTING : “Vibrator on” at Sounds of test menu



6.3.9 Camera Display Error

Circuit Diagram

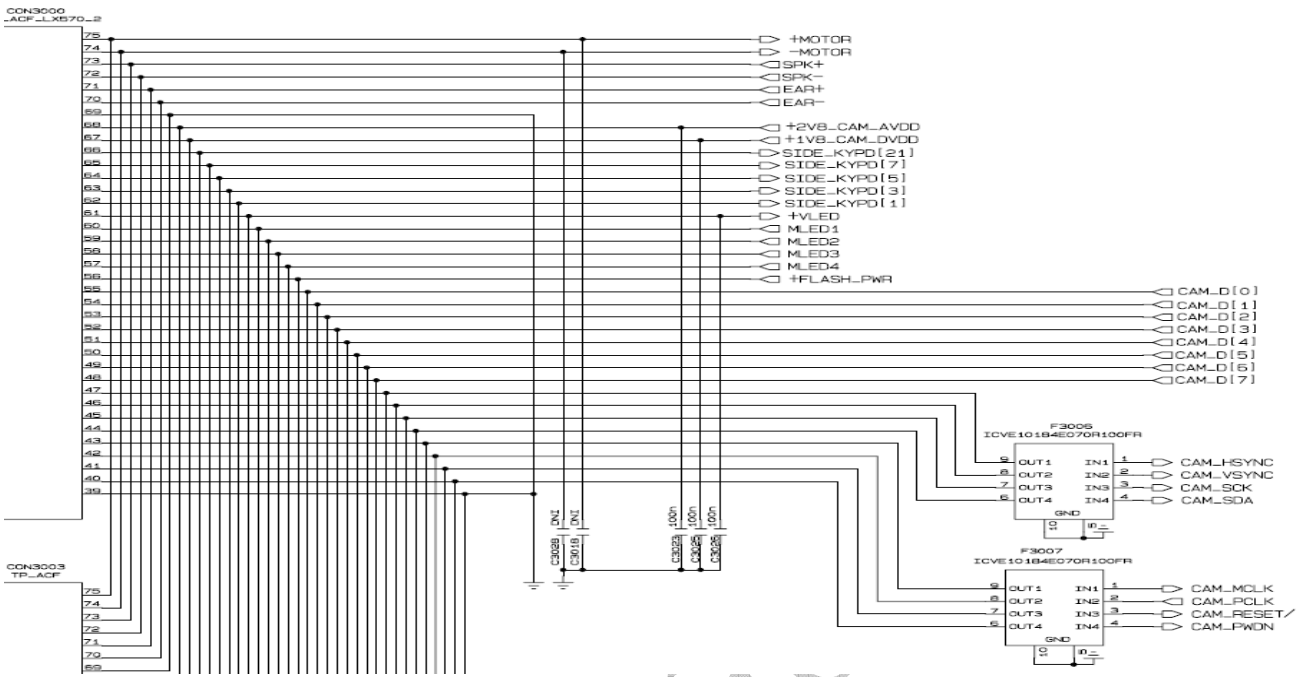


Figure 31 – ACF CONNECTOR

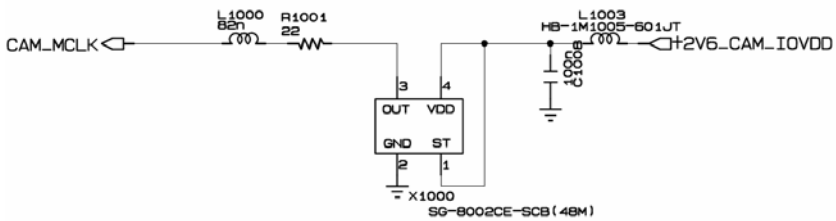


Figure 32 – CAMERA TCXO (24 MHz)

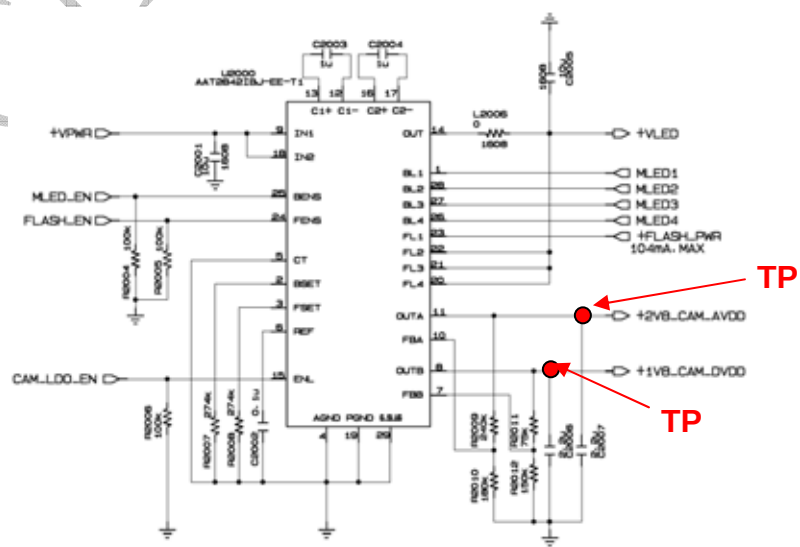


Figure 33 – FLASH CHARGE PUMP

Camera Control Signals

From MSM6500:
CAMIF_DATA[0:7], CAM_DIS, CAM_HSYNC, CAM_VSYNC, CAM_EN, I2C_DATA, I2C_CLK

Check Points

- The assembly status of the Camera Module
  - Check if the camera module is connected to the main FPCB properly
  - Probe L1003 using an oscilloscope and check if voltage is 2.6V

Test Points

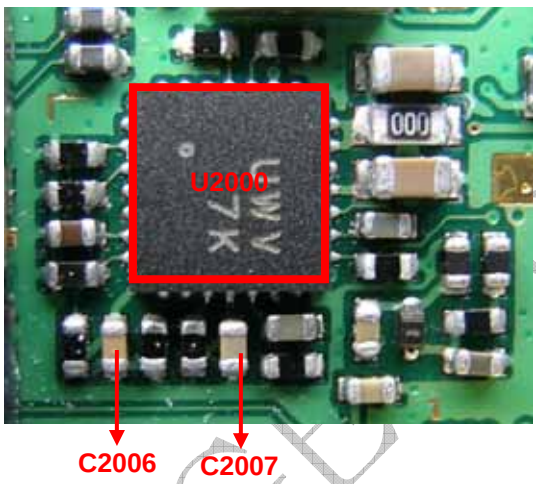
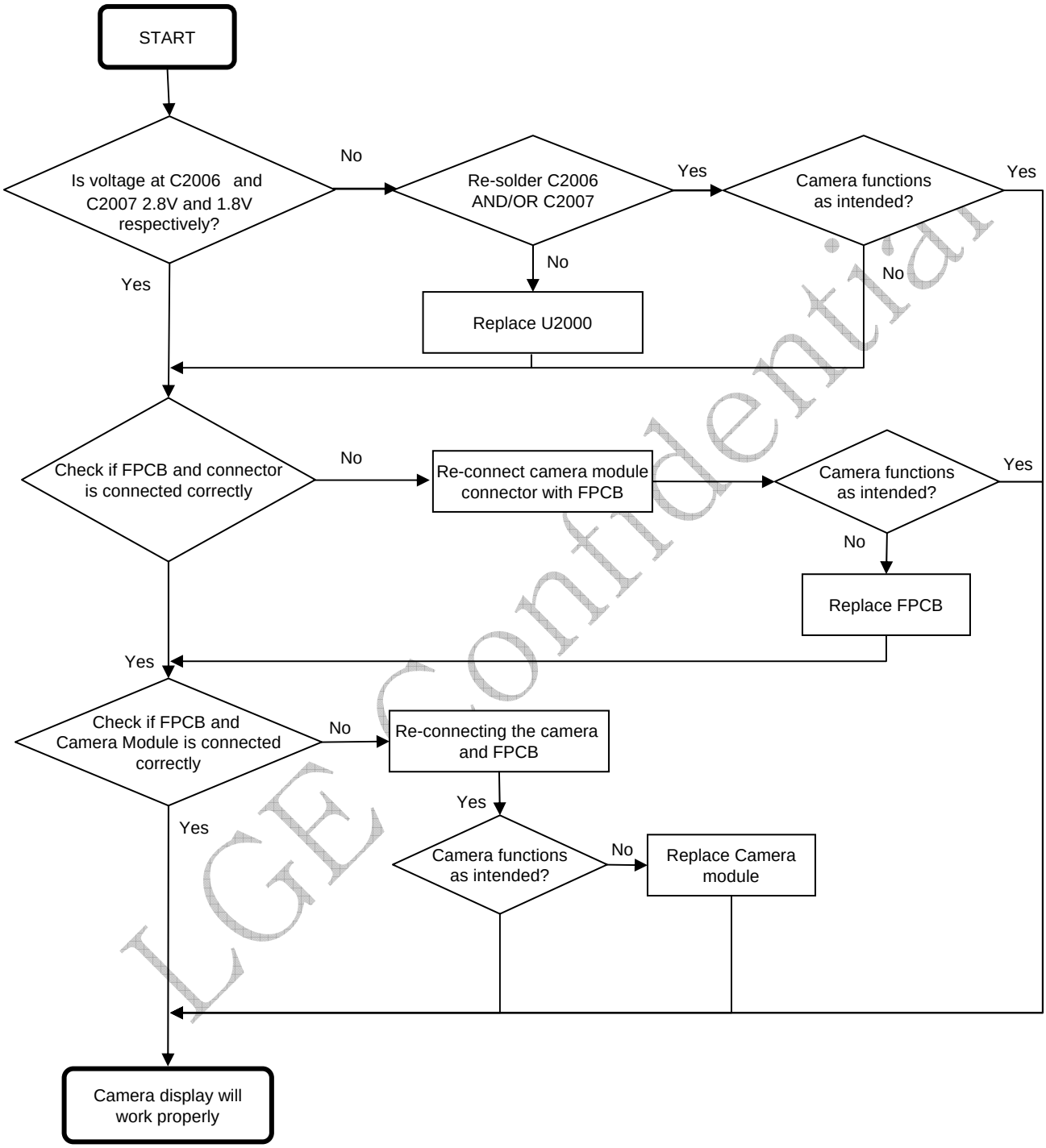


Figure 34 – Probe C2006 AND C2007 and check if voltages are 2.8V and 1.8V respectively

Camera Flow Chart



6.3.10 Camera Flash Error

Check Points

- Check if R1000 soldered properly.
- Check if LED1000 soldered properly.

Test Points

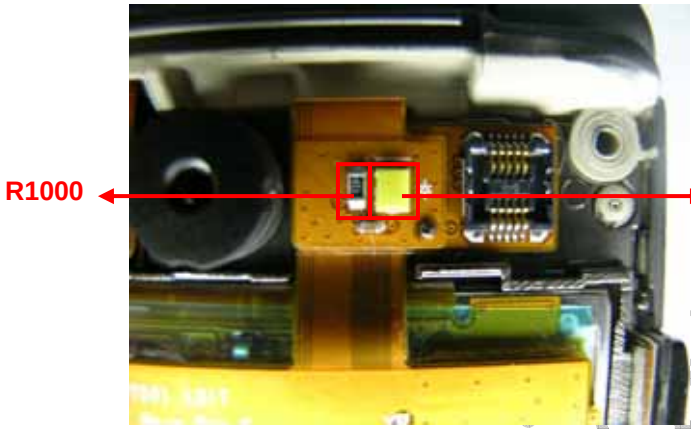
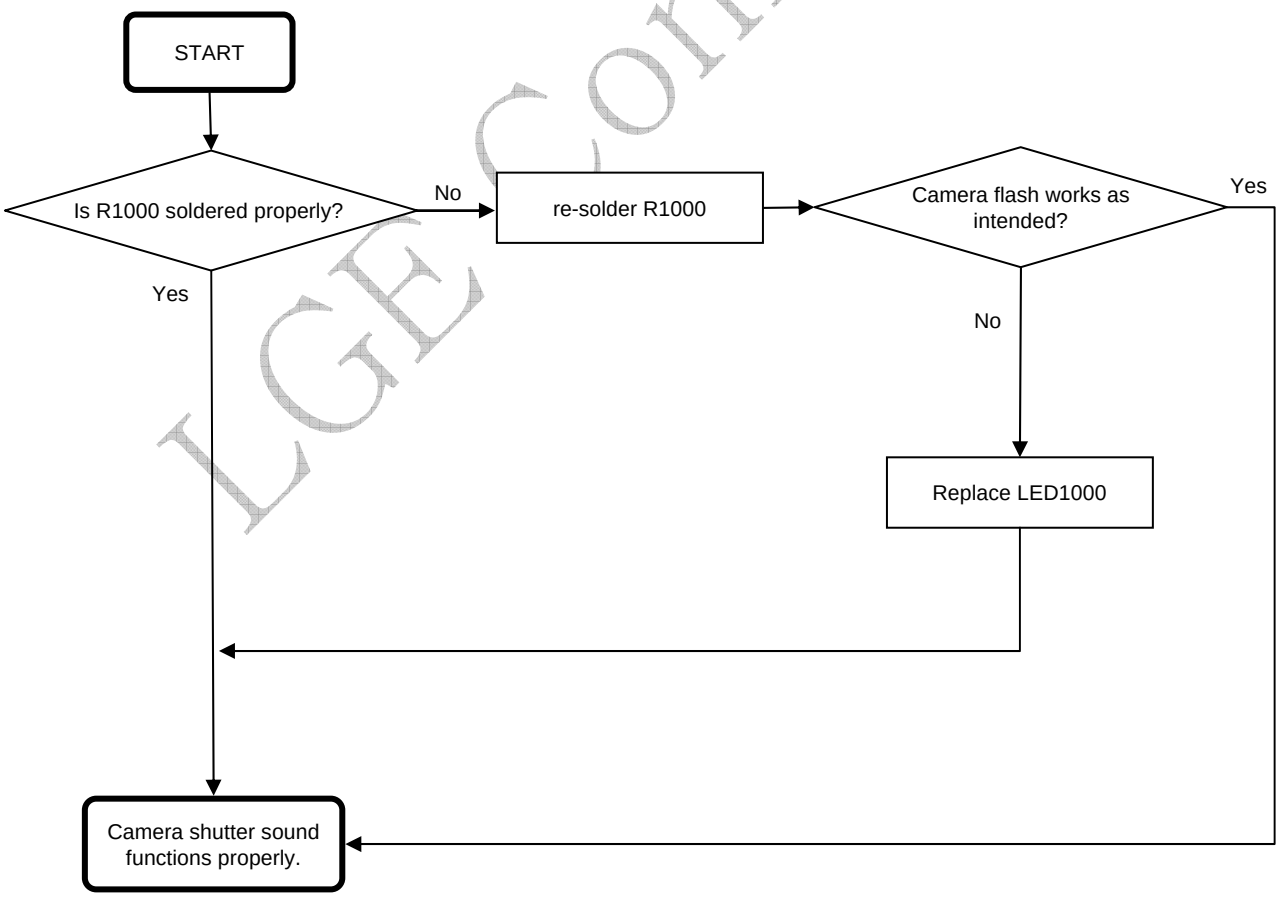


Figure 35 – MAIN FPCB

Camera Flash Flow Chart



6.3.11 LCD Distortion Error

Circuit Diagram

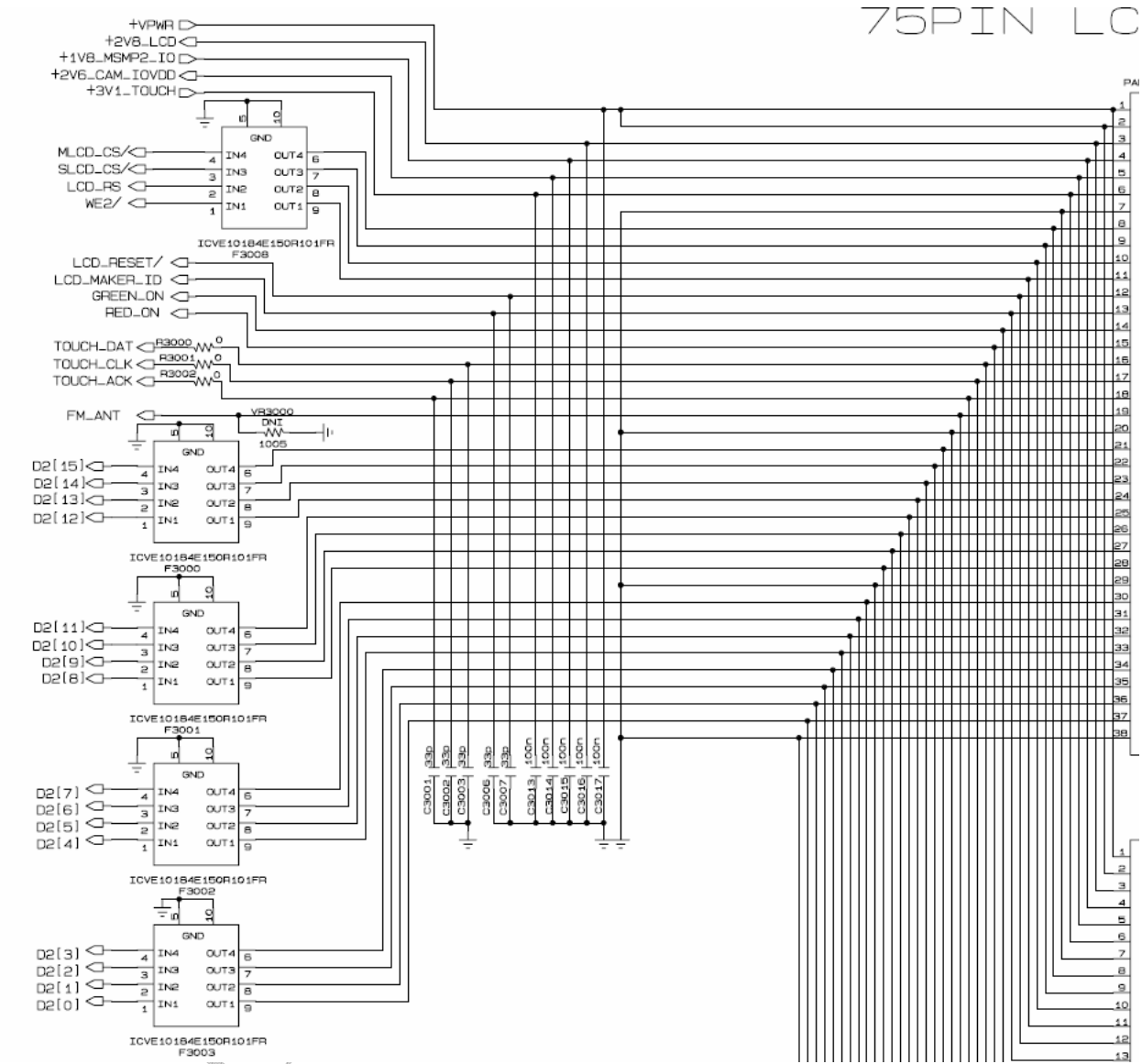


Figure 36 – 75 PIN ACF Connector

Circuit Diagram (cont'd)

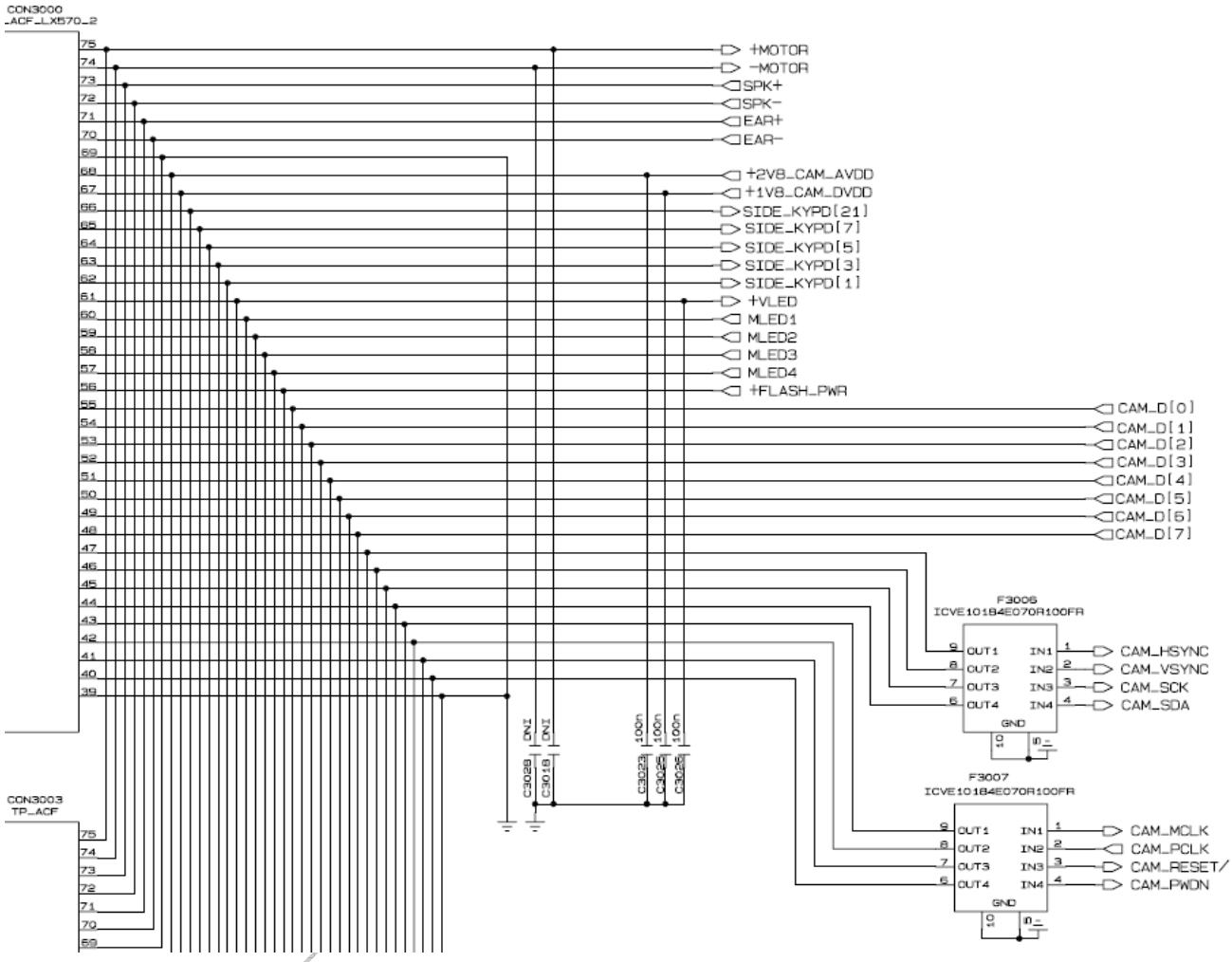
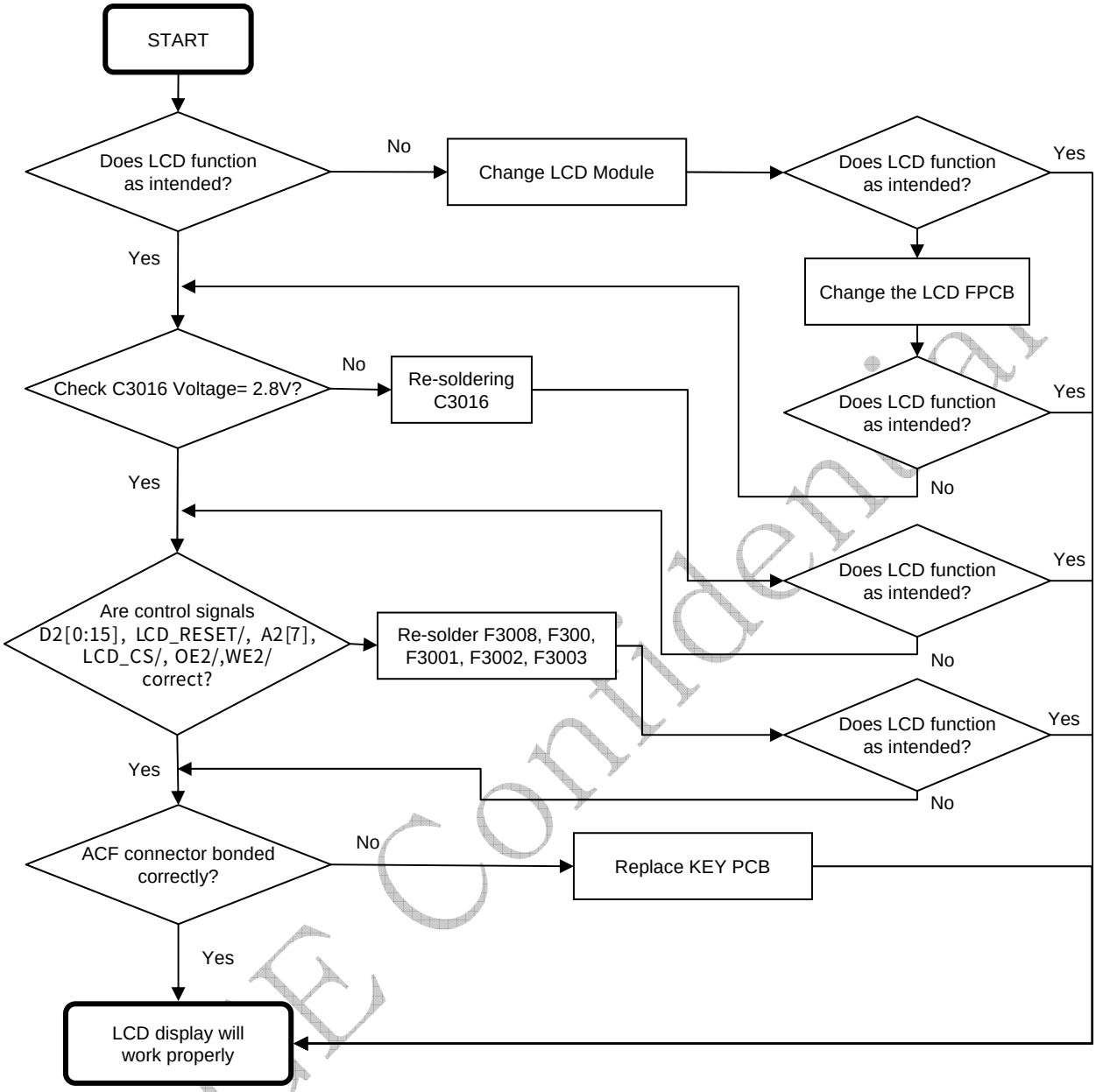


Figure 37 – 75 PIN ACF Connector

LCD Flow Chart



Note

- If you experience LCD line/noise distortion, than simply change the LCD module.
- Most occurring problem during distortion is the Driver IC built in the LCD module.

6.3.12 Touch Sensor

Circuit Diagram

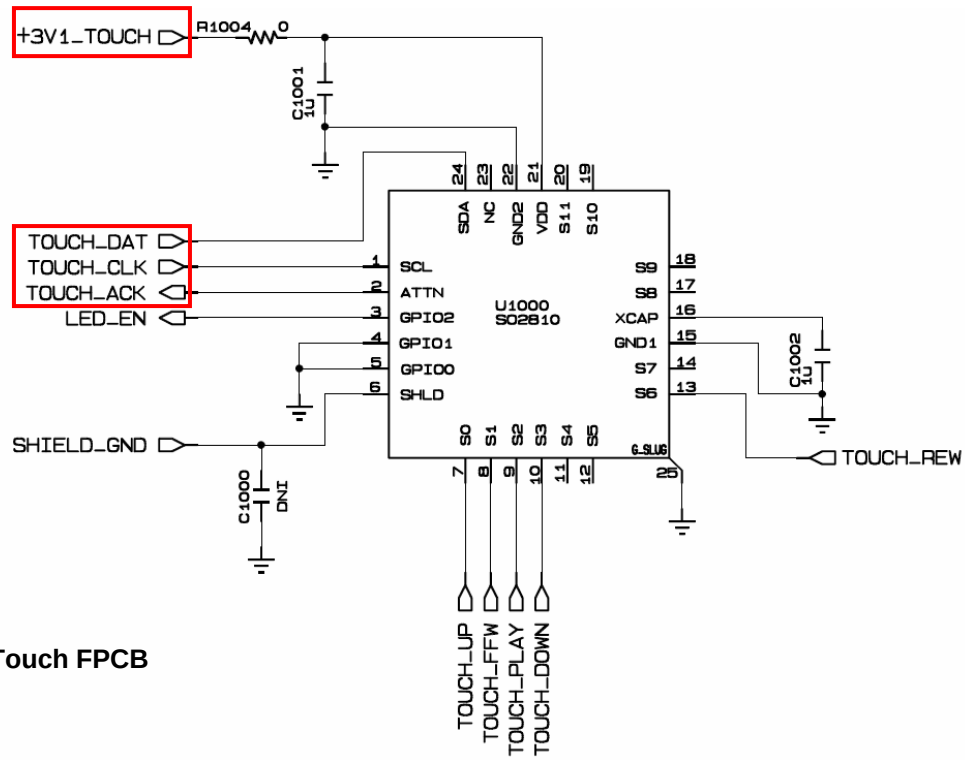


Figure 38 – Touch FPCB

Check Points

- The assembly status of Touch Sensor
    - Check if Touch FPCB is connected to the Main FPCB properly
    - Probe C3006 using an oscilloscope and check if voltage is 3.1V

Test Points

Figure 39 – TOUCH FPCB and TOUCH IC

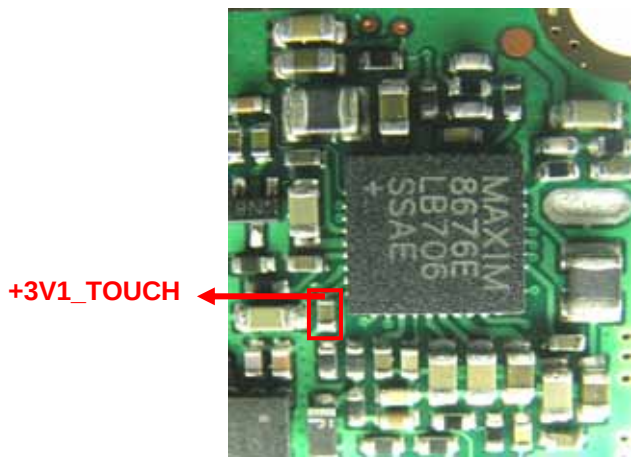
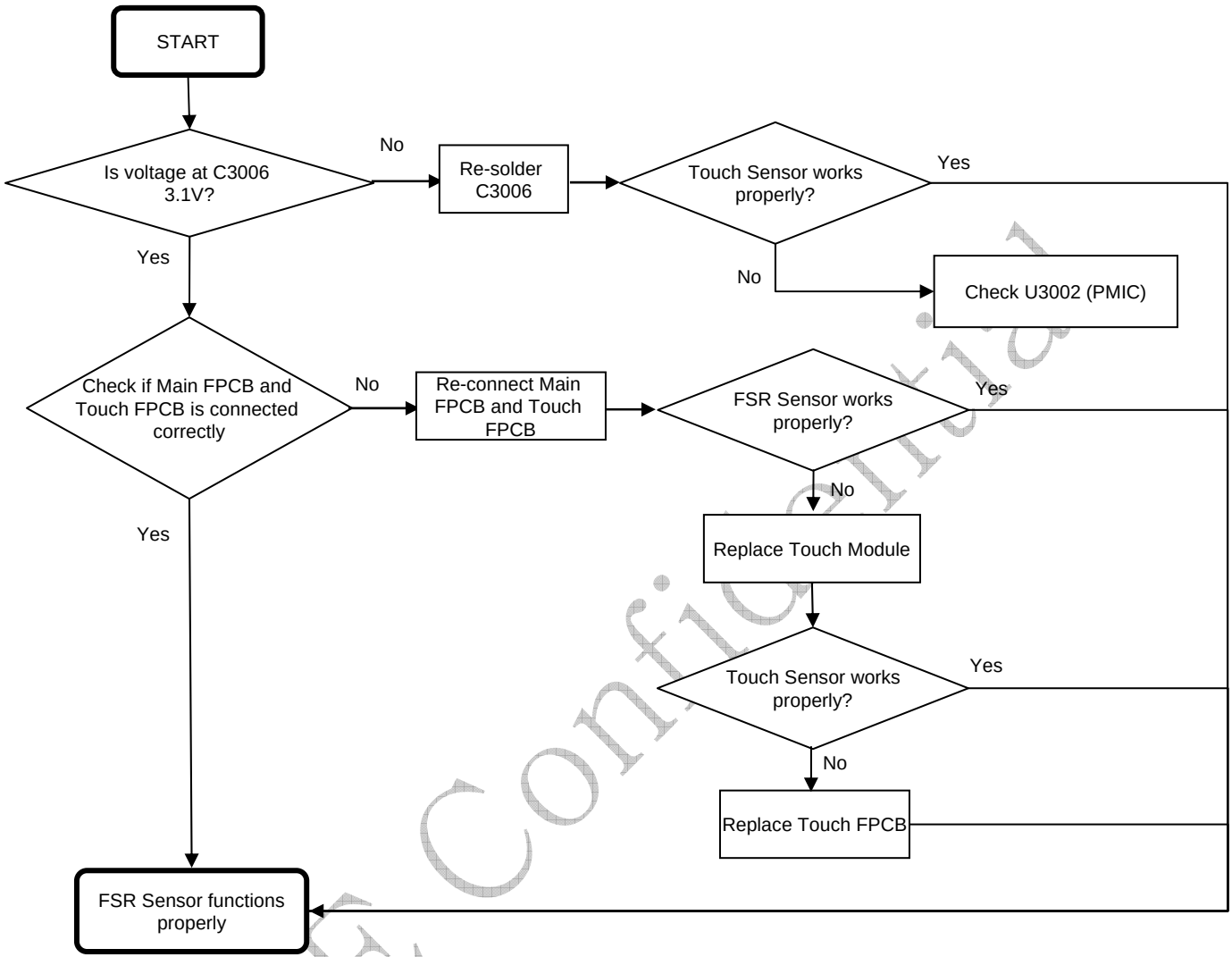


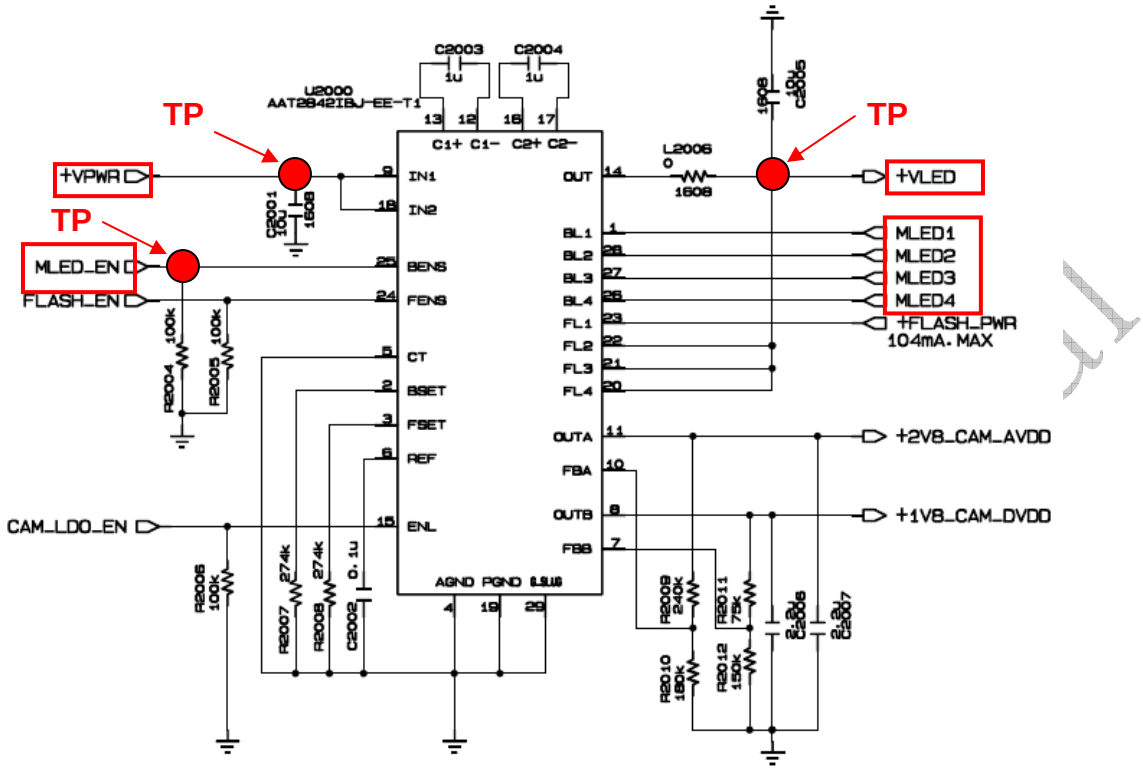
Figure 40 – PMIC

Touch Sensor Flow Chart



6.3.13 Backlight

Circuit Diagram



Test Points

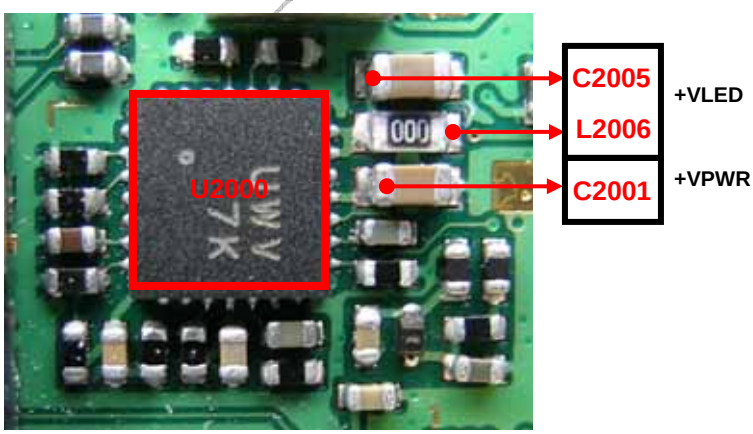


Figure 41 – Charge pump

Waveform

Figure 42 – Input and Output waveform for backlight

+VPWR

+VLED – backlight OFF

+VLED – backlight ON

MLED – backlight ON

MLED – backlight OFF

Test Criteria

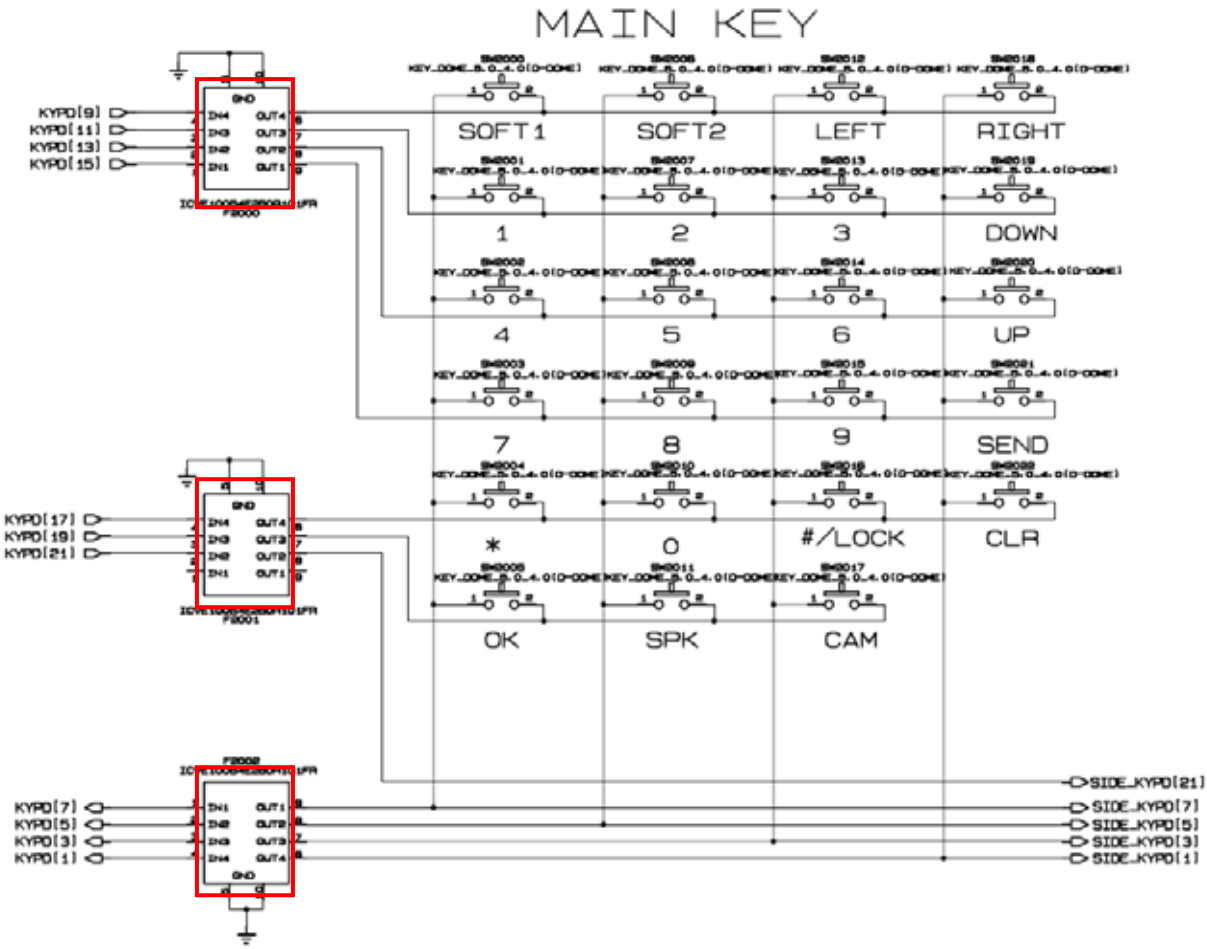
1. Check the waveforms at points MLED and +VPWR when the backlight is ON

2. Check the waveforms at points MLED and +VPWR when the backlight is OFF

3. - If backlight is OFF but MLED logic is HIGH, than charge pump (U2000) is dysfunctional.
   - If backlight is ON but MLED logic is LOW, than charge pump (U2000) is dysfunctional.
   - If backlight is OFF and +VLED is low than check the main FPCB connector to see if it's connected properly.
   - If backlight is ON and +VLED is high than backlight is working properly.

6.3.14 Keypad

Circuit Diagram



Test Points

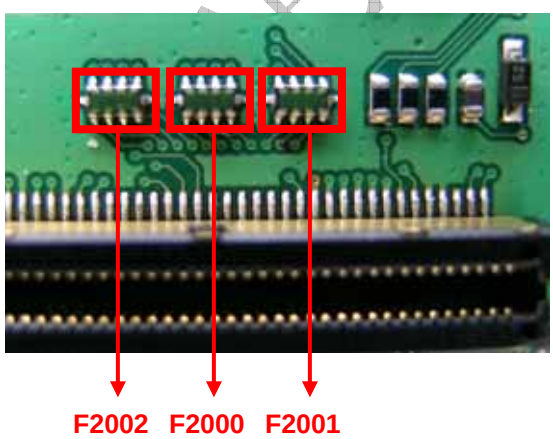


Figure 42 – EMI Filters for the Key matrix

Test Criteria

Keypad functions abnormally if:

- EMI Filters F2002, F2000, F2001 isn't soldered properly. Re-solder the filters.
- Dome sheet is misplaced on the Key PCB

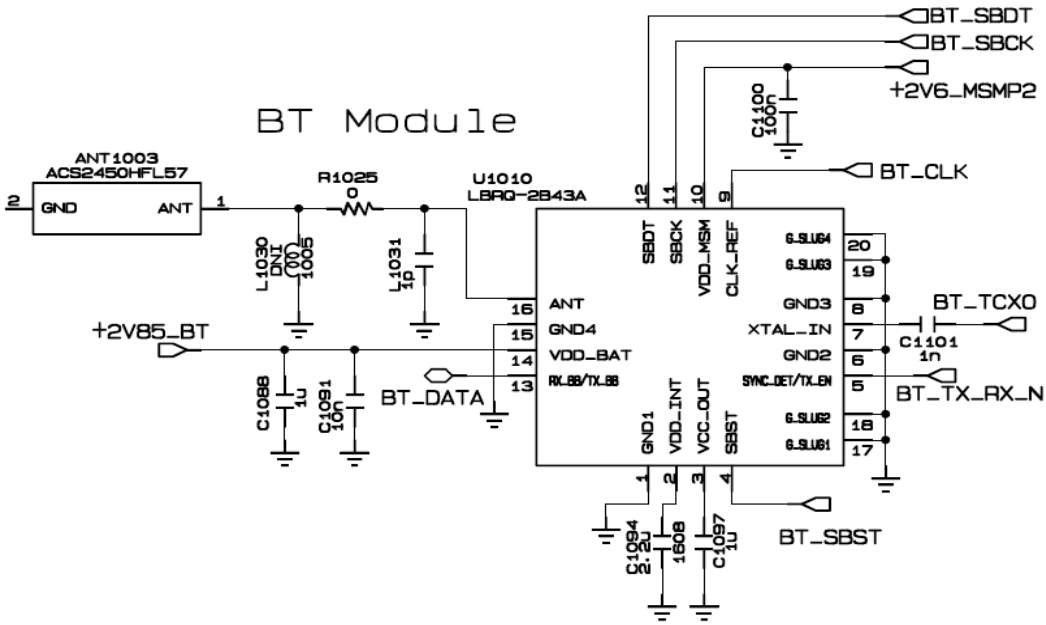
Figure 42 – Dome Sheet on the Key PCB

6.4 Bluetooth Part Trouble

6.4.1 Bluetooth Block

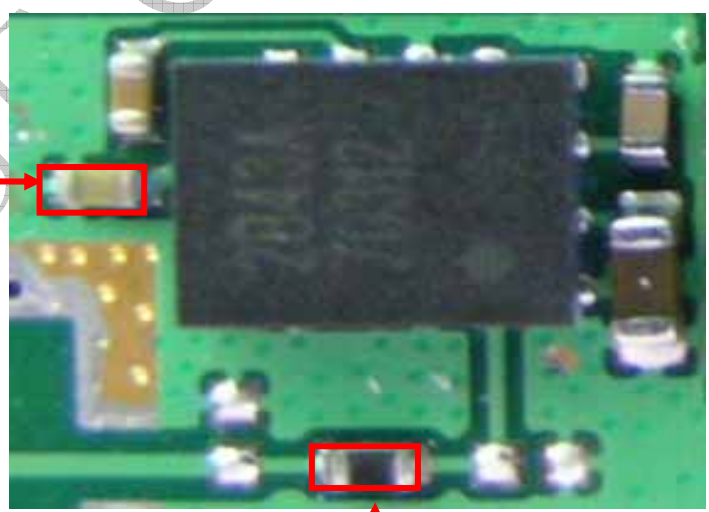
Circuit Diagram

U1010



Test Point

U1010
Bluetooth
Module



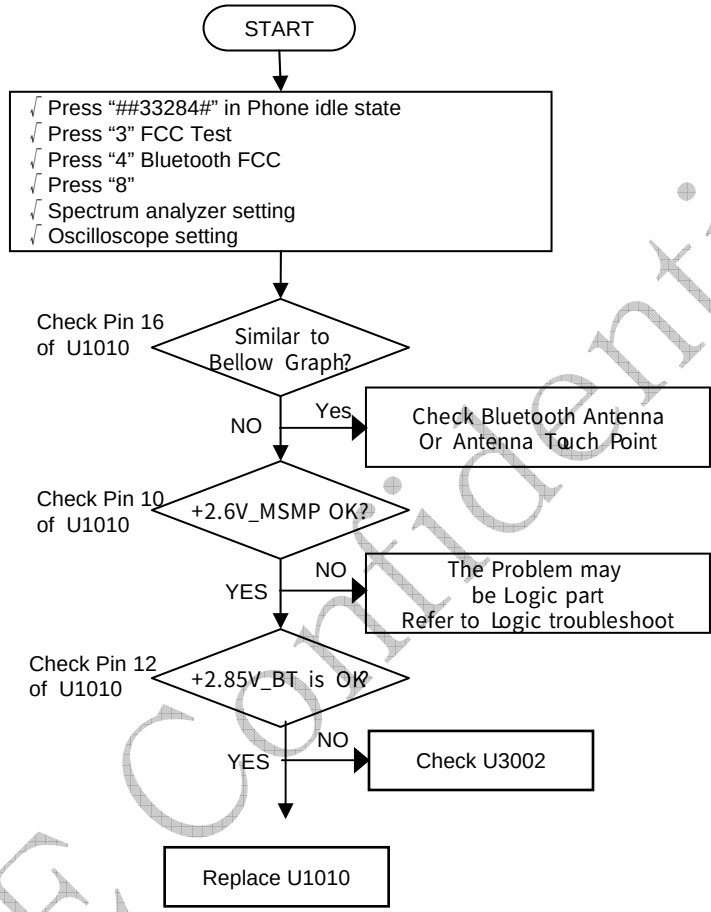
U1010 Pin10
(+2.6V_MSMP)

U1010 Pin16
(Bluetooth In/Out)

Figure 1

6.4.1.1 Checking Bluetooth In/Out and Power supply Circuit

Checking Flow



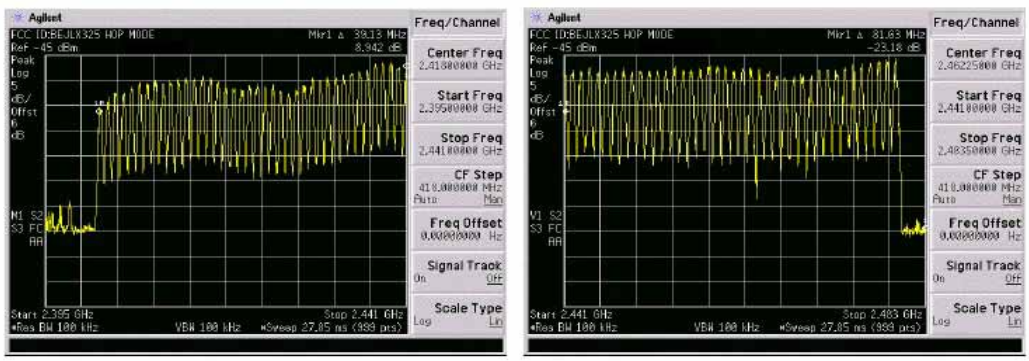
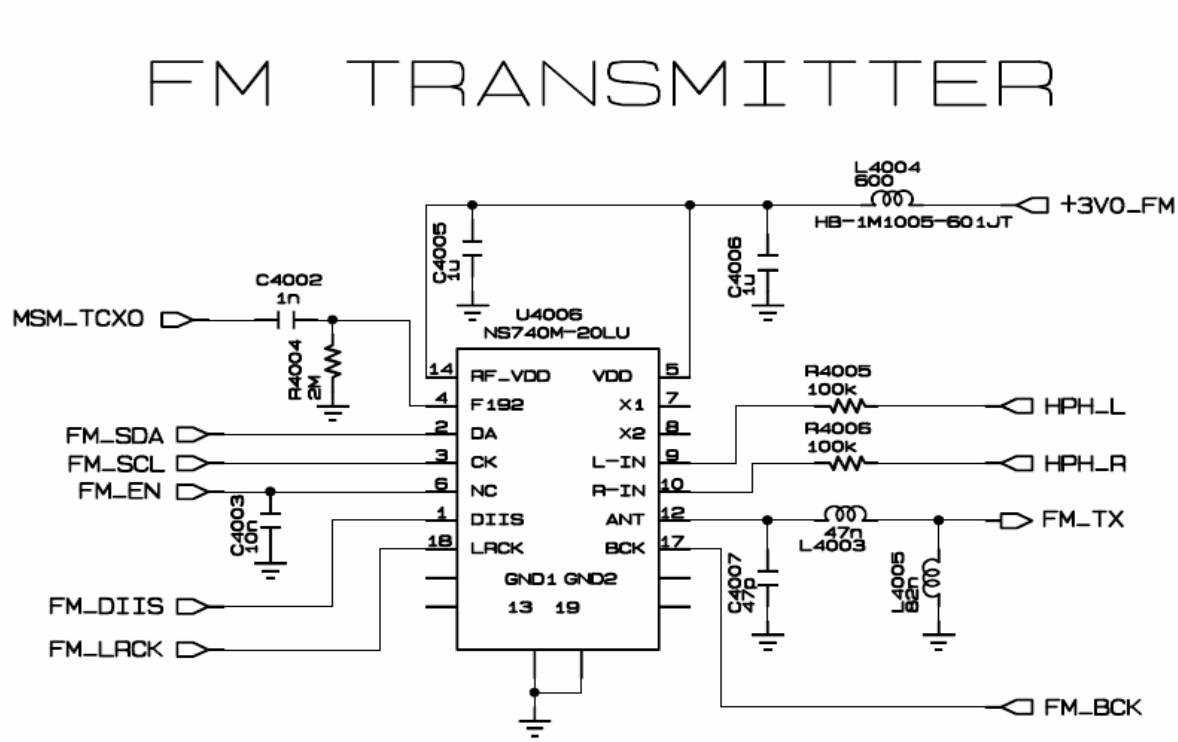


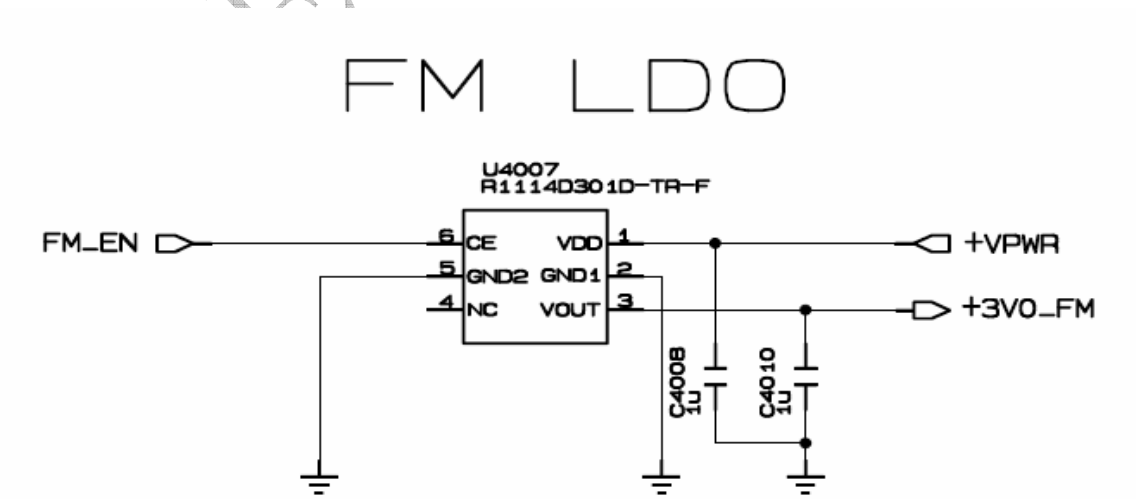
Figure 2

6.5 FM Transmitter Part Trouble

6.5.1 FM Transmitter Block

Circuit Diagram





Test Point

FM Transmitter Circuit

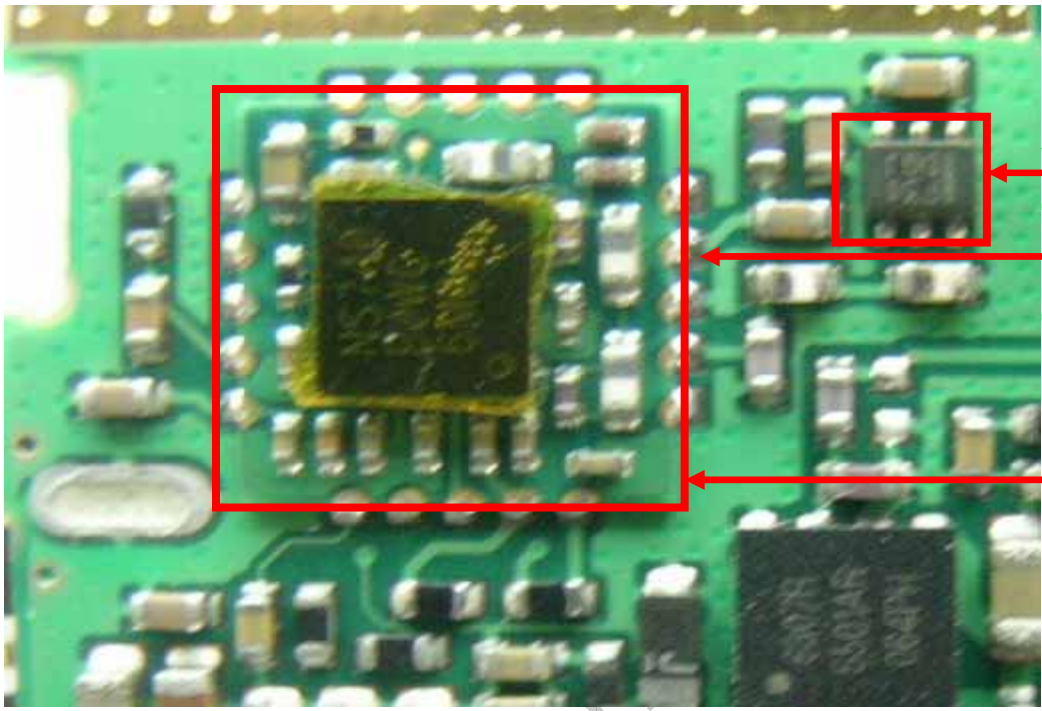
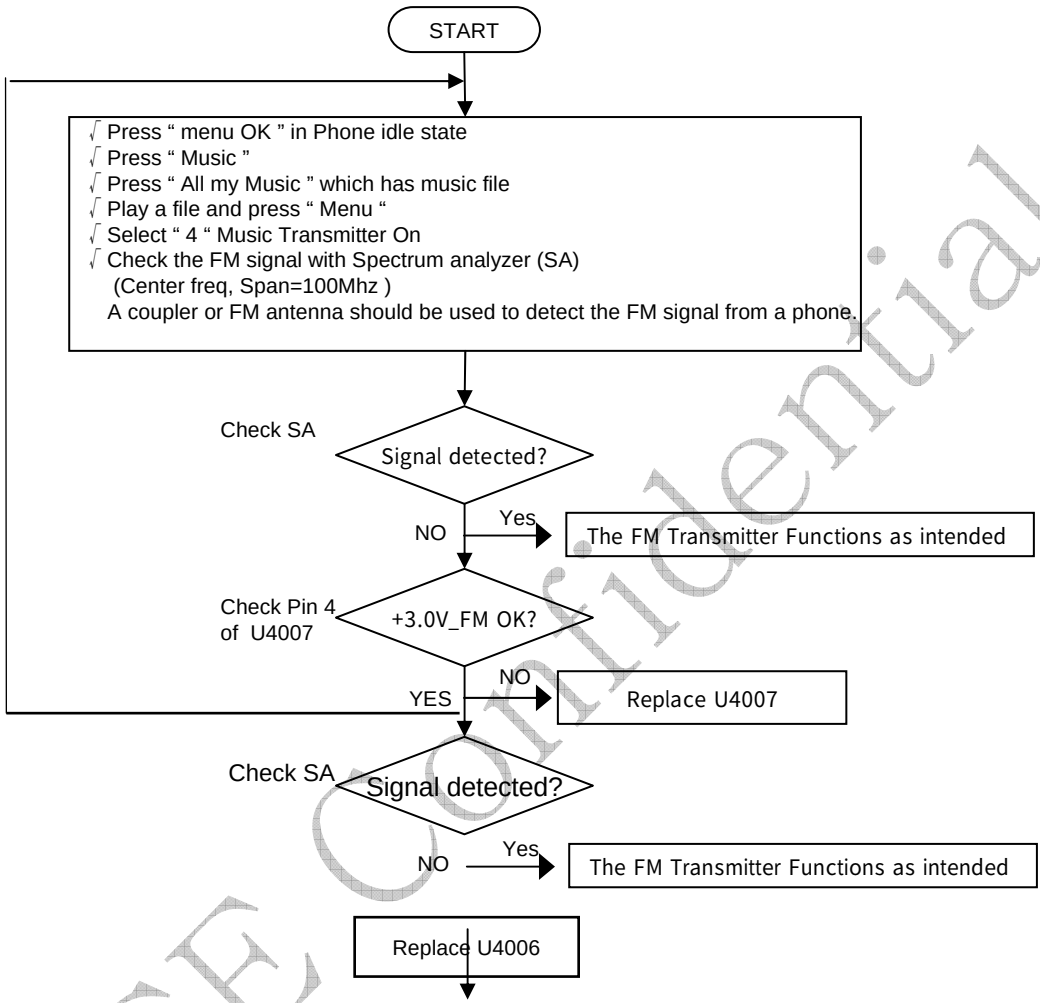


Figure 1

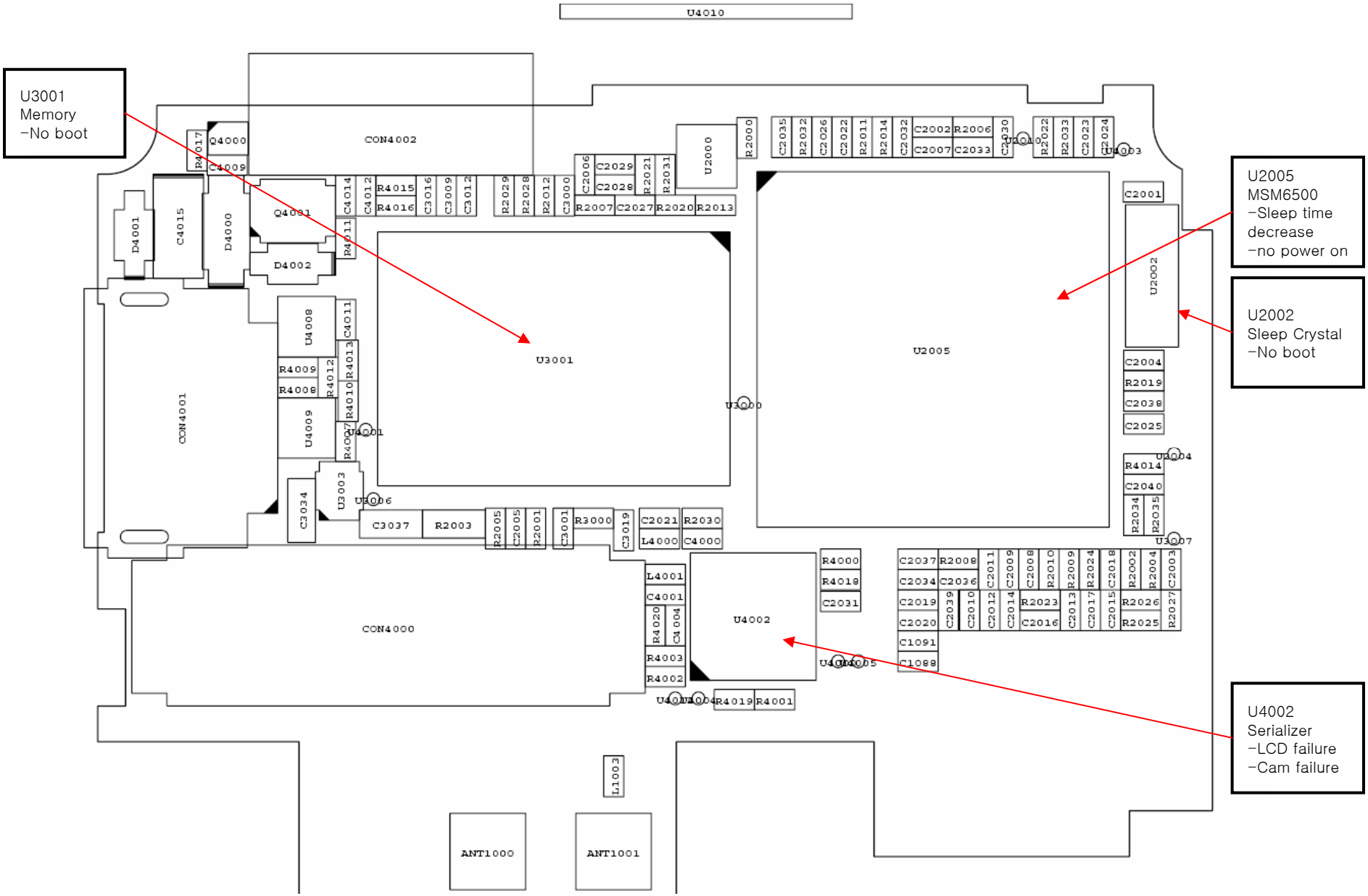
6.5.1.1 Checking FM Transmitter Circuit

Checking Flow



MAIN PCB

BOTTOM



MAIN PCB

TOP

F1000
GPS, RX SAW
-GPS failure

F1001
DCN, RX SAW
-low sensitivity
-no service

F1002
PCS, RX SAW
-low sensitivity
-no service

U1004
VCTCXO
-No local freq

U1009
RFT6150
-low sensitivity
-no service

F1003
PCS, TX SAW
-low sensitivity
-no service

U1008
RFR6500
-No boot

U3002
MAX8676
PMIC
-No boot
-No charge
-USB error

U1010
Bluetooth IC
-Bluetooth
failure

DP1000
Quintplexer
-No service
-Unable to
make call

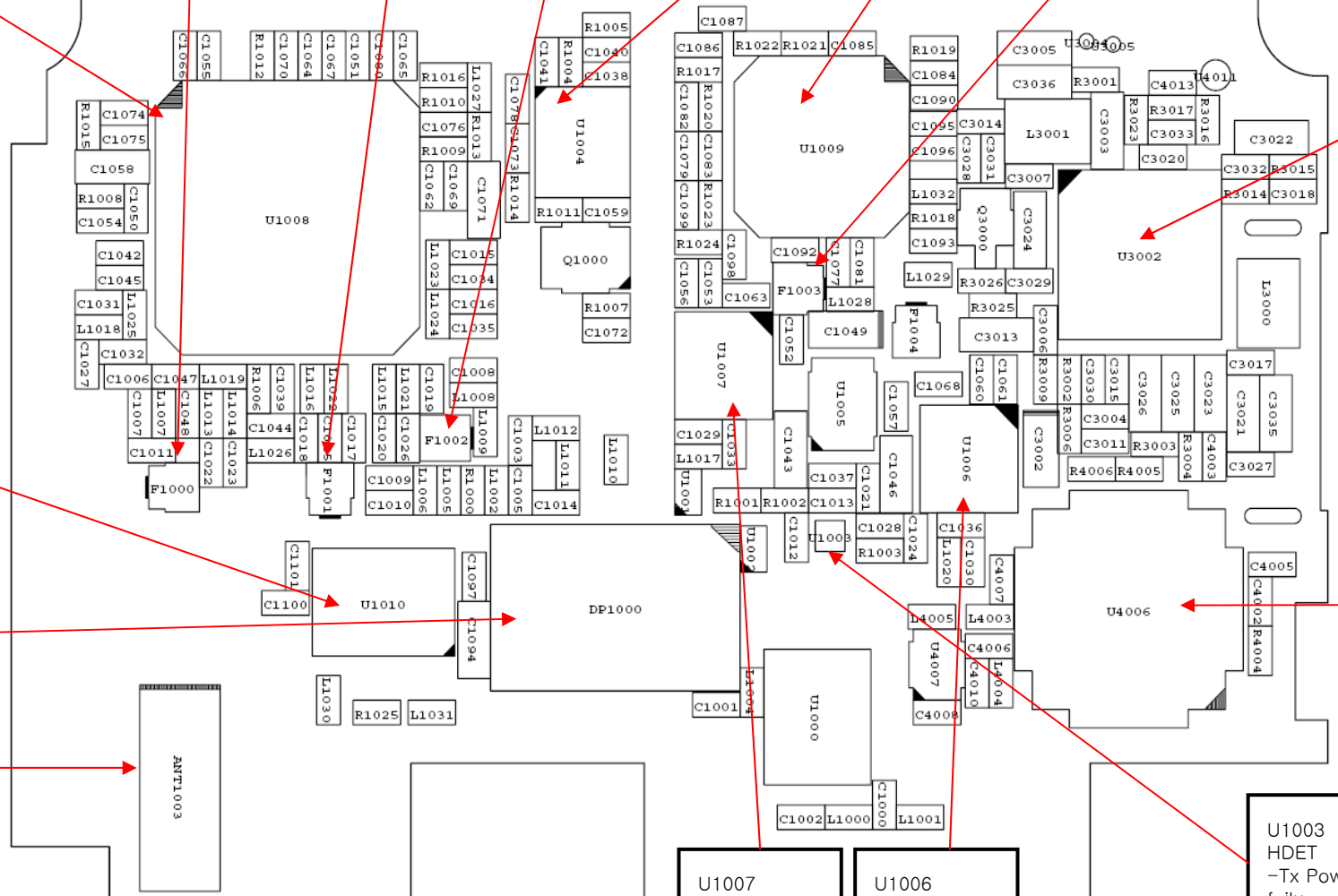
U1010
Bluetooth ANT
-Bluetooth
failure

U4002
FM Transmitter
-FM failure

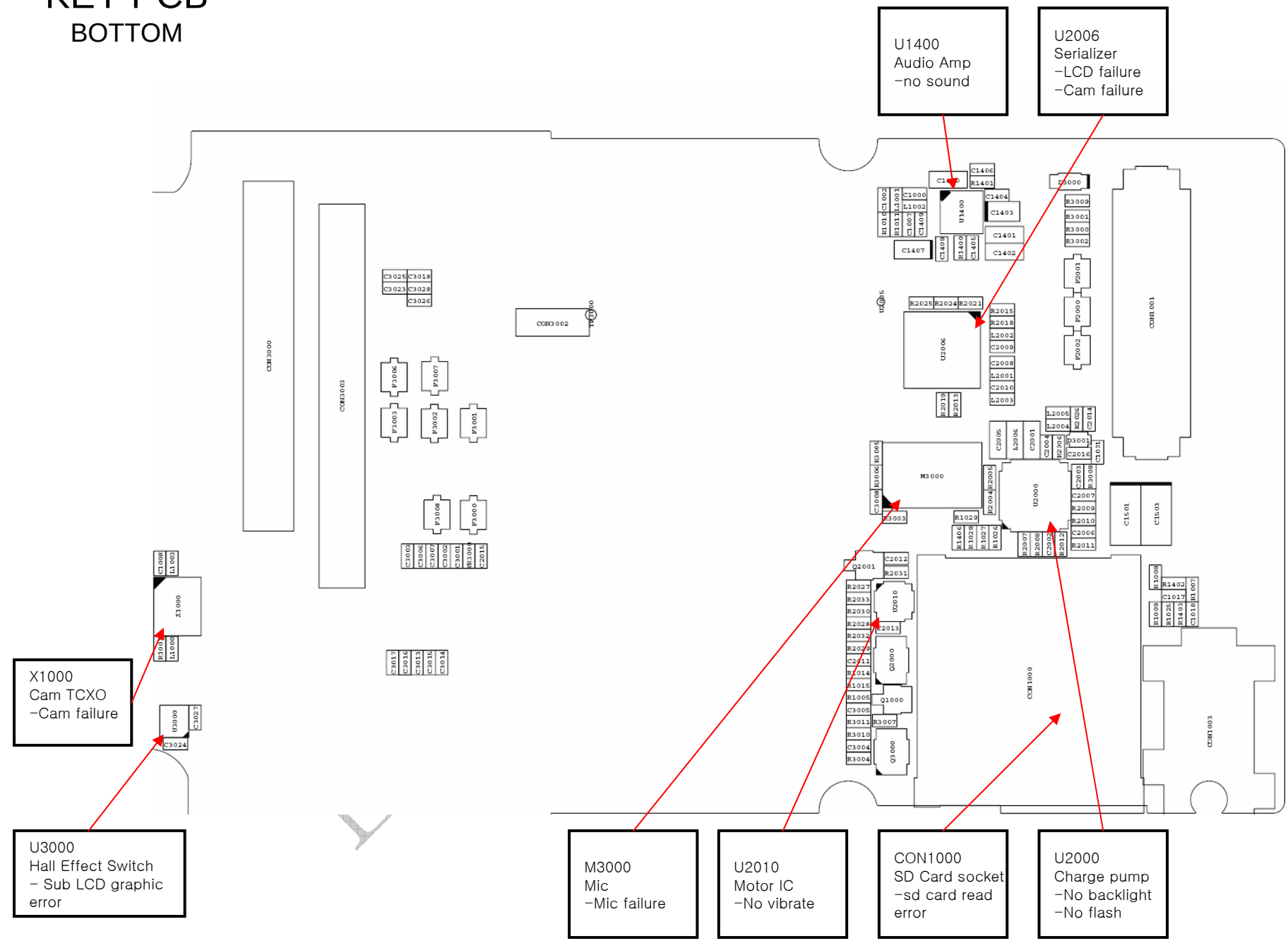
U1003
HDET
-Tx Power
failure

U1007
PCS, PAM
-low Tx power
-no service

U1006
DCN, PAM
-low Tx power
-no service

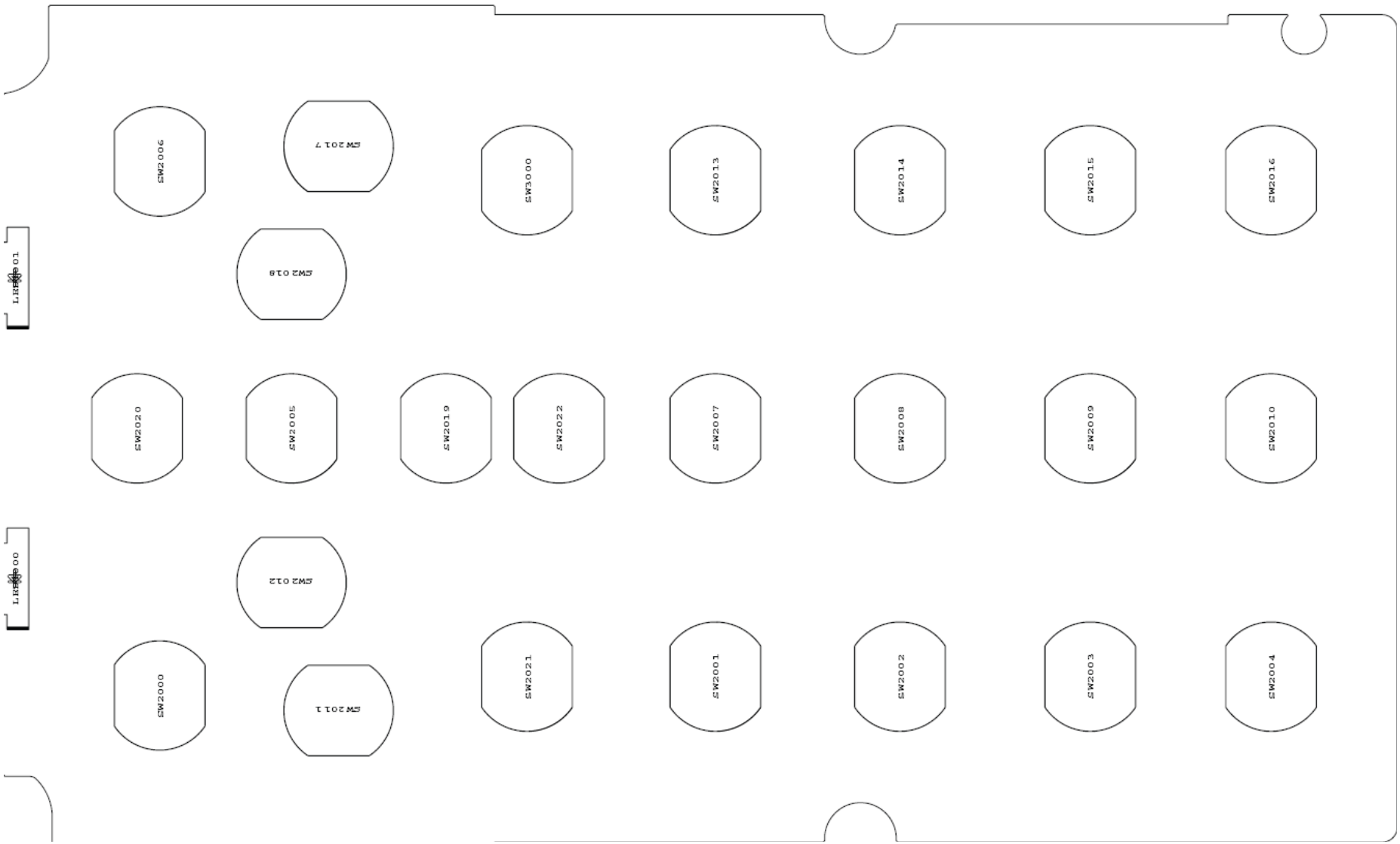


KEY PCB
BOTTOM



KEY PCB

TOP


SW2006
SW2017
SW3000
SW2013
SW2014
SW2015
SW2016
SW2018
LED001
SW2020
SW2005
SW2019
SW2022
SW2007
SW2008
SW2009
SW2010
LED000
SW2012
SW2000
SW2011
SW2021
SW2001
SW2002
SW2003
SW2004

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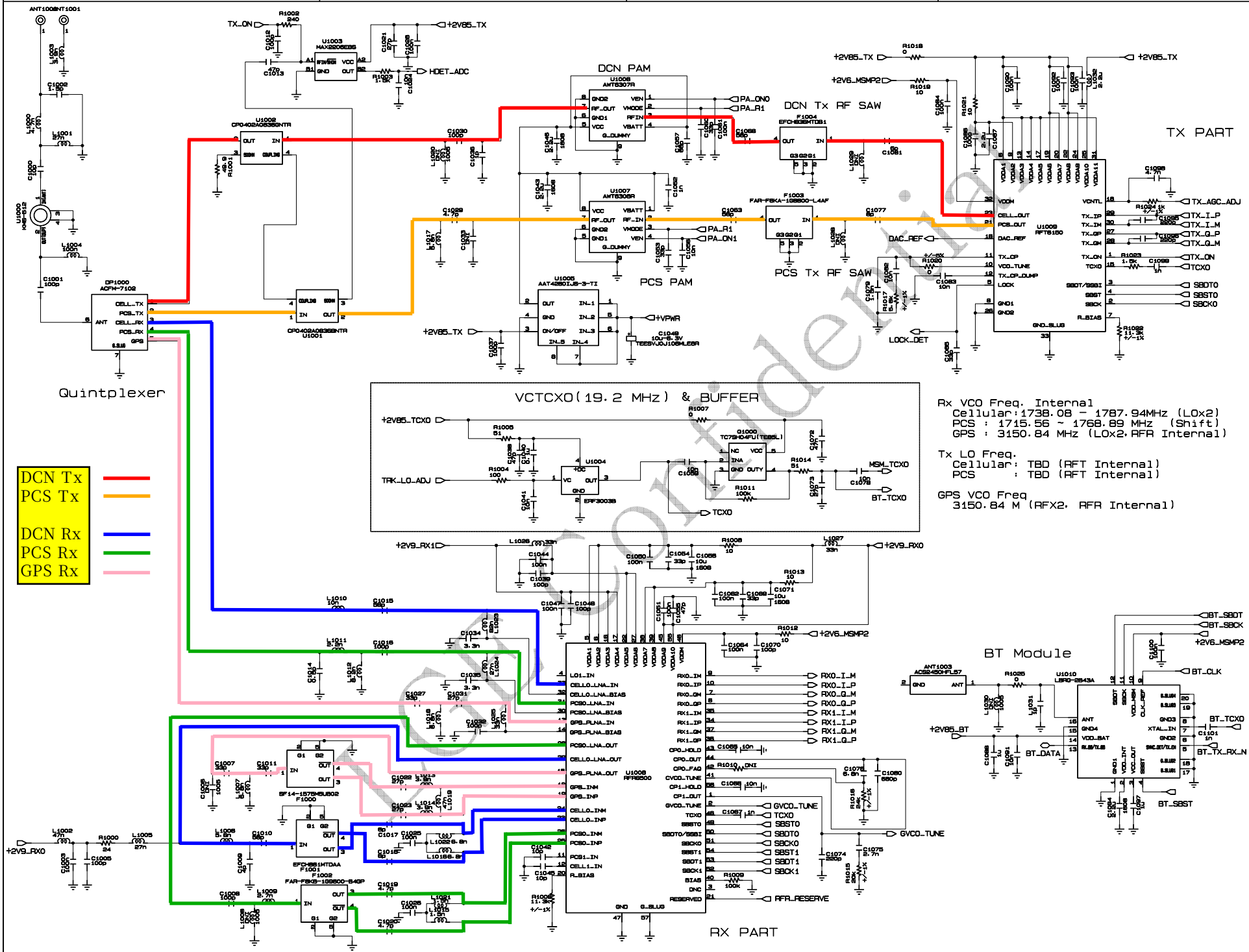

Doc. Name	LX570 MAIN FPCB	Doc. Number	

SHEET : 1 OF 1
DRAW : M. G. PARK
DATE 01/03/2007
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APRD J. H. CHO
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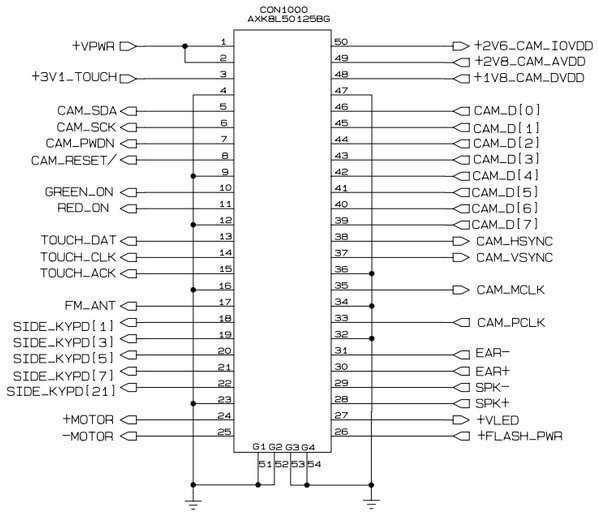
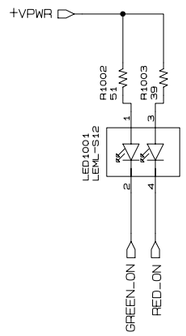
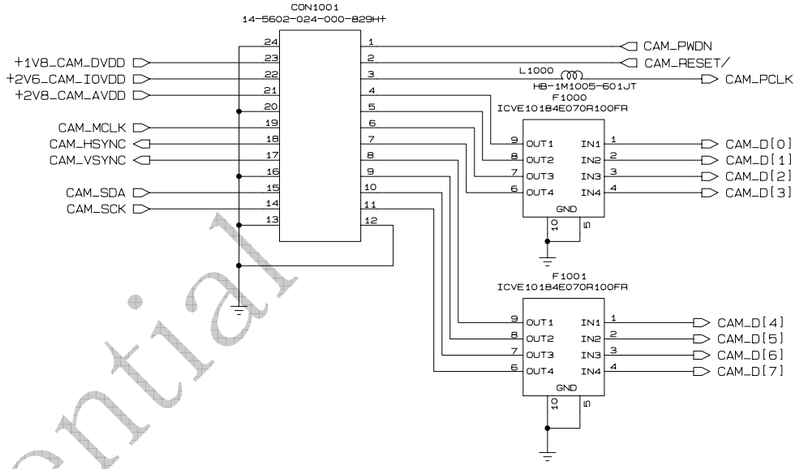
FPCB Connector



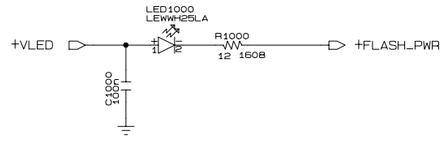
DUAL INDICATOR



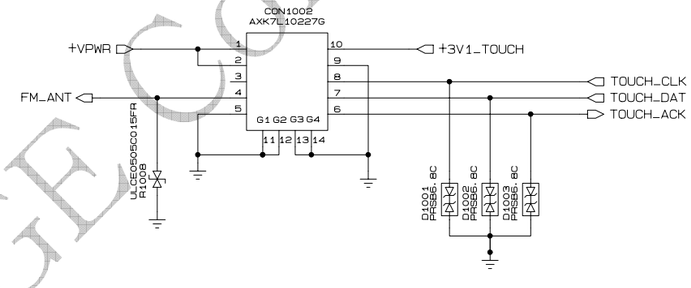
Camera Connector



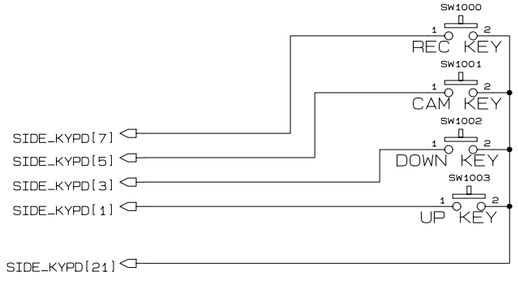
FLASH WHITE LED



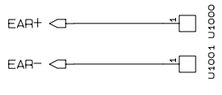
10PIN CONNECTOR



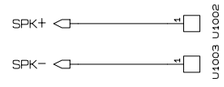
CAM/UP/DOWN SIDE KEYPAD



RECEIVER



SPEAKER



MOTOR

LGE

Doc. Name	LX570 MAIN	Doc. Number	

SHEET	: 1 OF 4
DRAW	: Y.K.YOO
DATE	04/02/2007
CHKD	J.H.CHO
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REF	
MAN	
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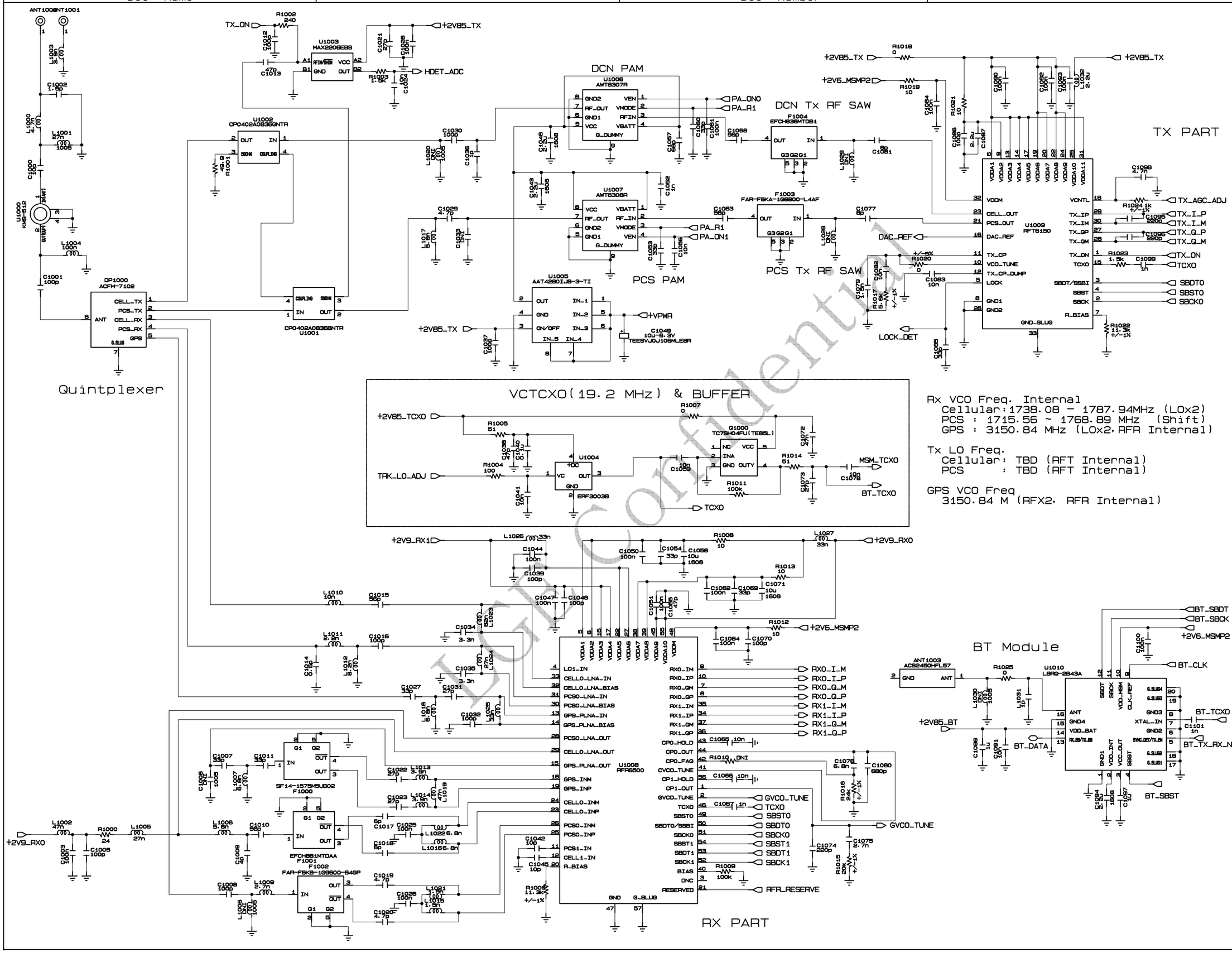

LGE

Doc. Name	LX570 MAIN	Doc. Number	

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CHKD M. G. PARK

APRD J. H. CHO

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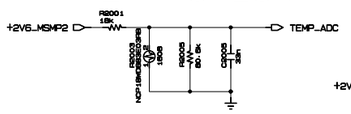
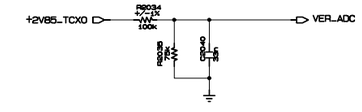
TEMP. CHECK

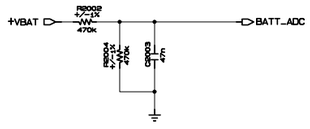


PCB REVISION CHECK

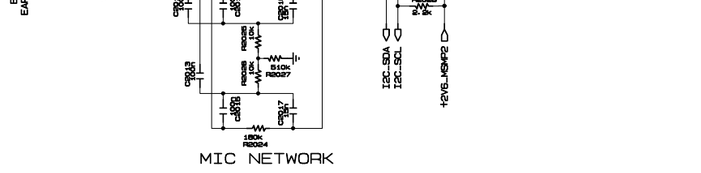


Revision	R2034	R2035	ADC_HEX
A	100K	5.6K	07. 15
C	100K	12K	15. 25
D	100K	19. 1K	26. 34
E	100K	27K	35. 43
F	100K	36K	44. 53
G	100K	47K	54. 60
H	100K	56K	61. 70
1.0	100K	75K	71. 83
1.1	100K	100K	84. 97
1.2	100K	130K	98. AC
1.3	100K	180K	AD. C1
1.4	100K	240K	C2. D5
1.5	100K	360K	D6. EA
1.6	100K	560K	EB. F9

BATT LEVEL CHECK



MIC NETWORK



U2005 MSM6500_90NM

Doc. Name	LX570 MAIN	Doc. Number	

HYNIX MCP (512Mbit NAND FLASH + 512Mbit SDRAM)

U3001
HYG0SEG0AF1P-6S(S/H)0E

2.6V CAMIO

U3003
R1114D261D-TR-F

PMIC PART

U3002
MAX8676ELB+

SHEET	: 3 OF 4
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DATE	04/05/2007
CHKD	M. G. PARK
APRD	J. H. CHO
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Doc. Name	LX570 MAIN	Doc. Number	

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DRAW : M. G. PARK
DATE 04/02/2007
CHKD M. G. PARK
APRD J. H. CHO
REF
MAN
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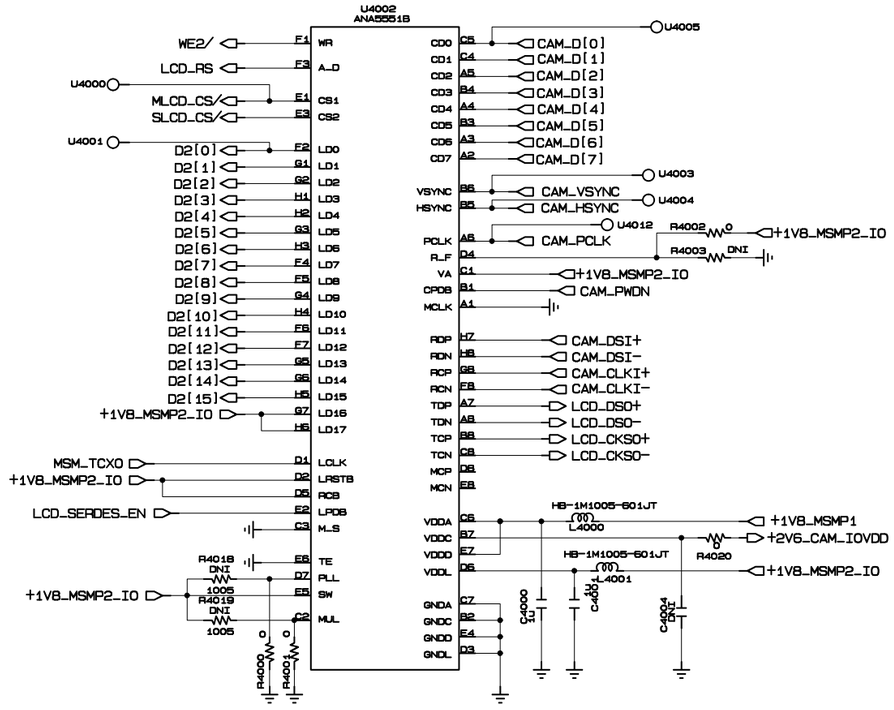
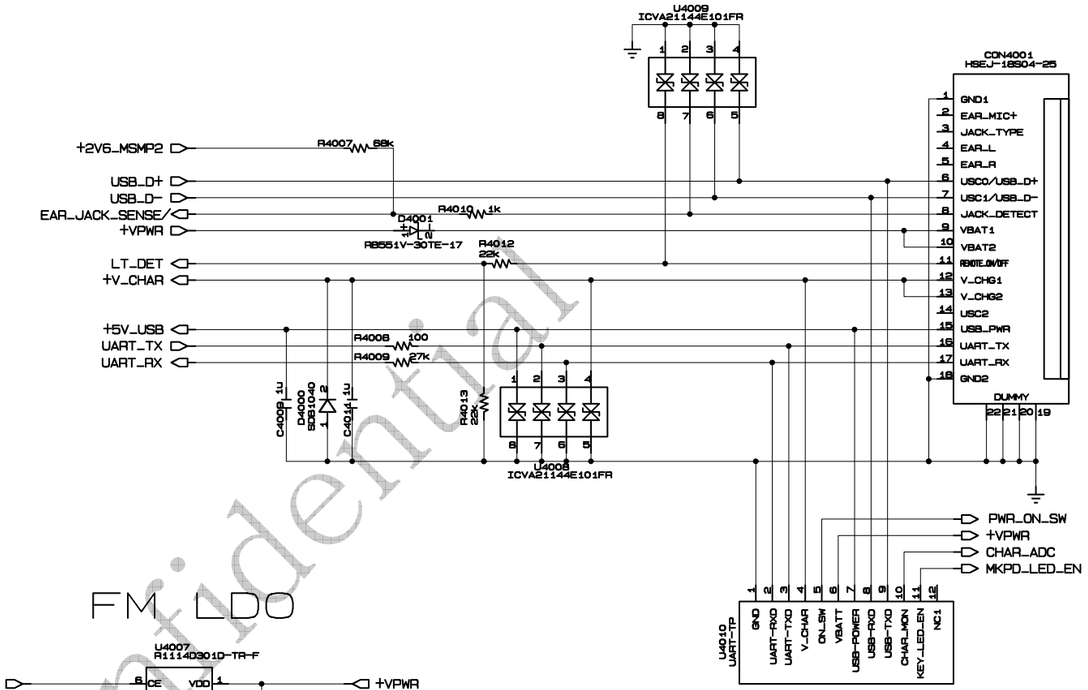
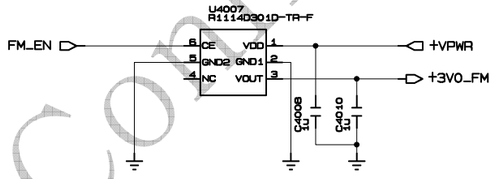
SERIAL/DESERIAL



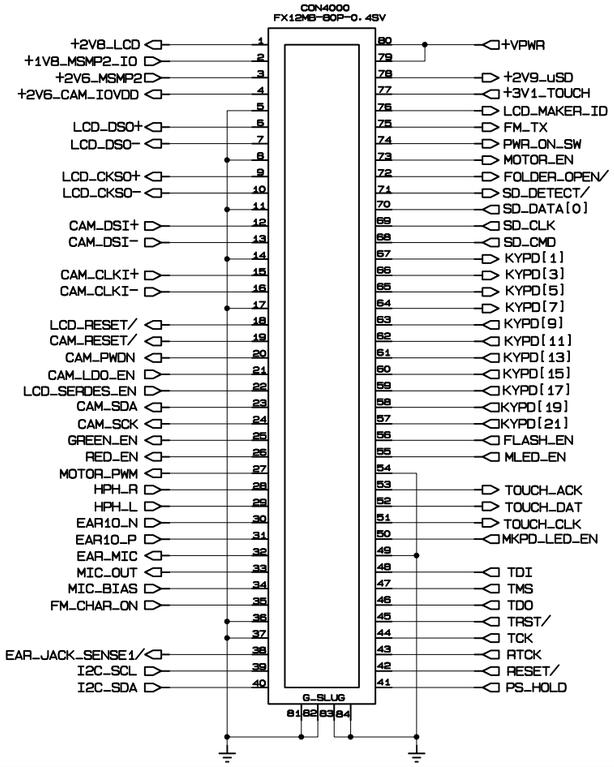
18PIN RECEPTACLE



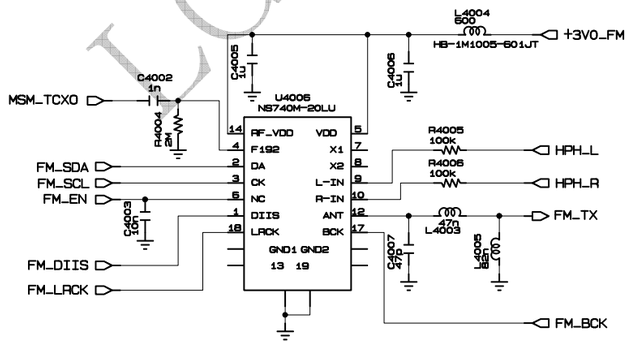
FM LDO



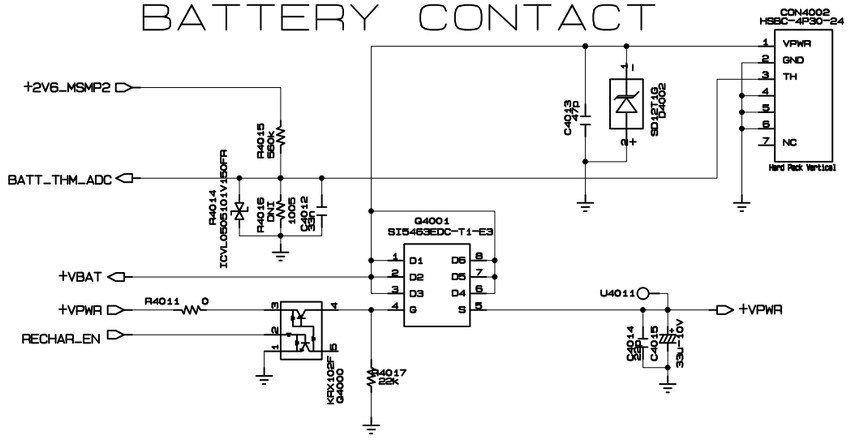
80 PIN BTOB CON



FM TRANSMITTER



BATTERY CONTACT



LGE

Doc. Name	LX570 LCD ACF FPCB	Doc. Number	

SHEET : 1 OF 1
DRAW : J. W. ROH
DATE 01/03/2007
CHKD J. W. ROH
APRD J. H. CHO
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MAN
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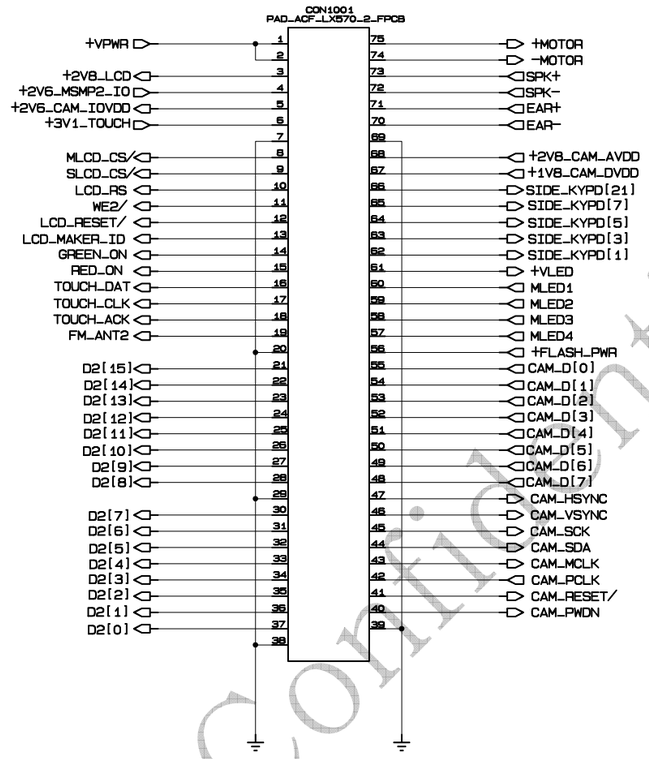
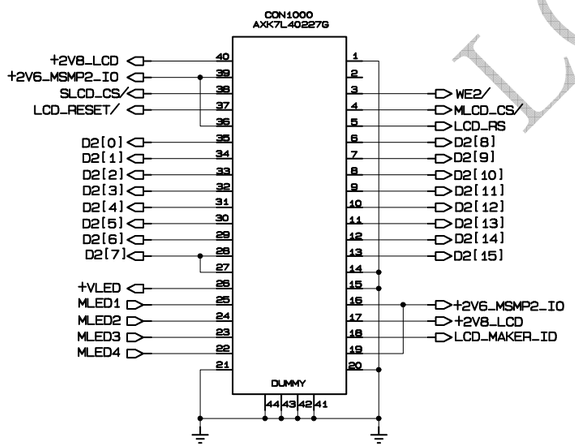
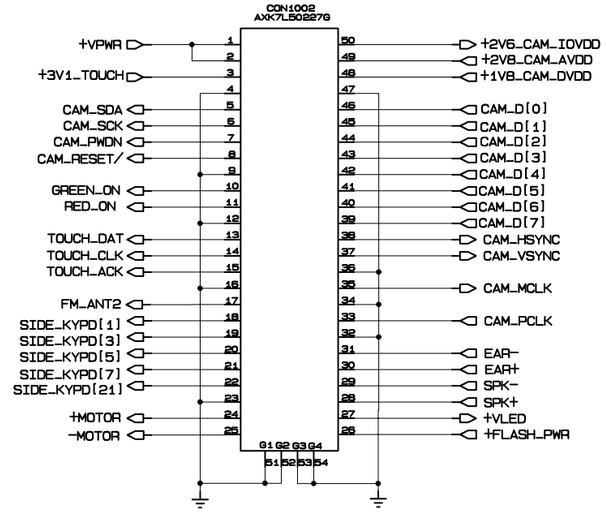
75PIN LCD CONNECTOR



LCD Connector



FPCB Connector



LGE

Doc. Name	LX570 KEY	Doc. Number	

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DRAW : M. G. PARK
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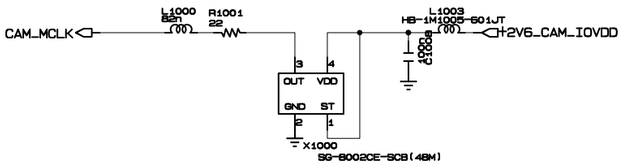
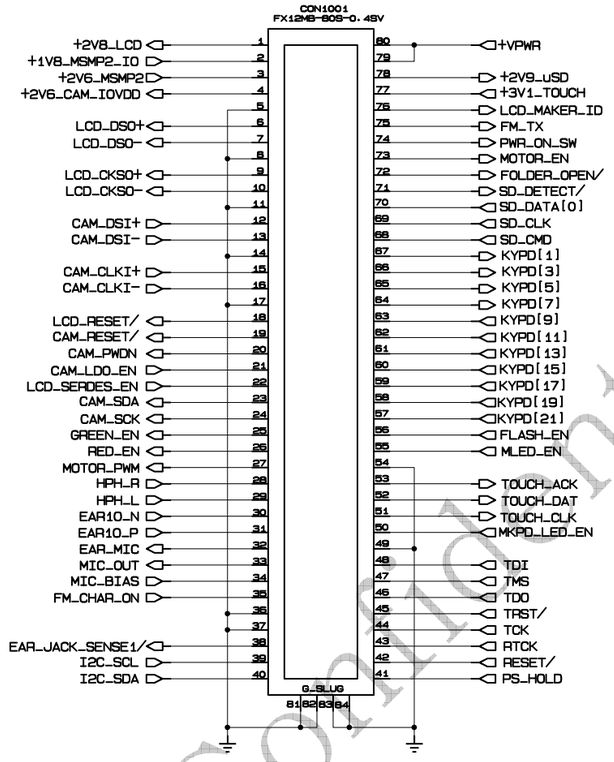
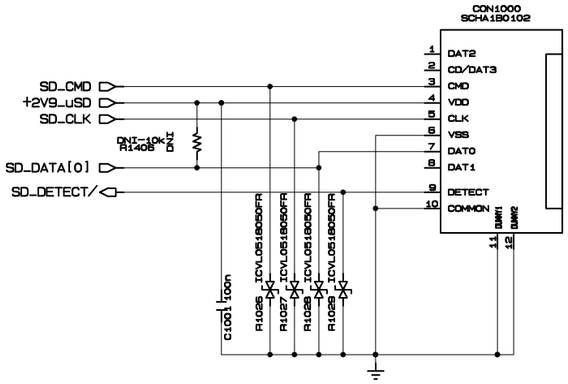
CAMERA TCXO 48MHz



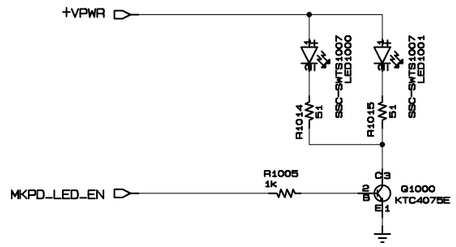
80 PIN BTOB CON



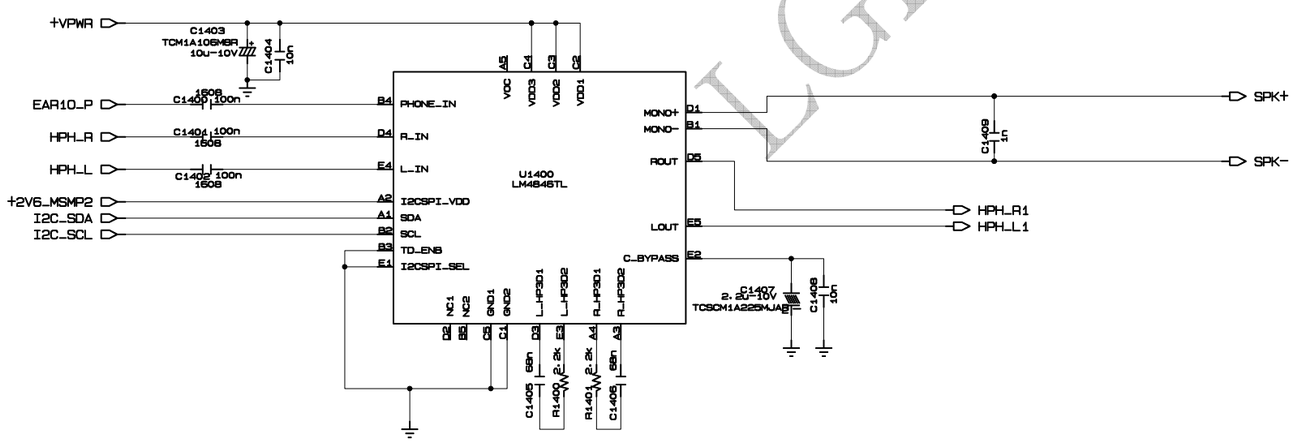
MICRO SDCARD



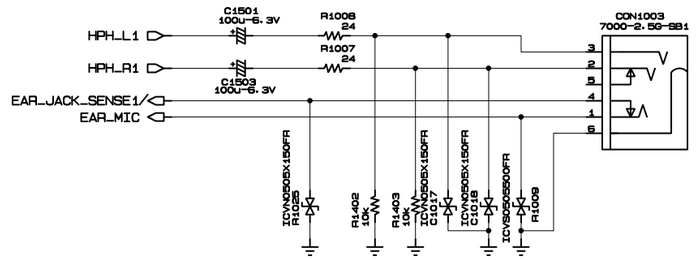
KEY BACKLIGHT

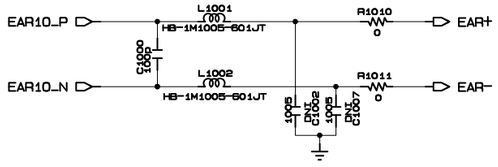


AUDIO SUBSYSTEM



EAR JACK





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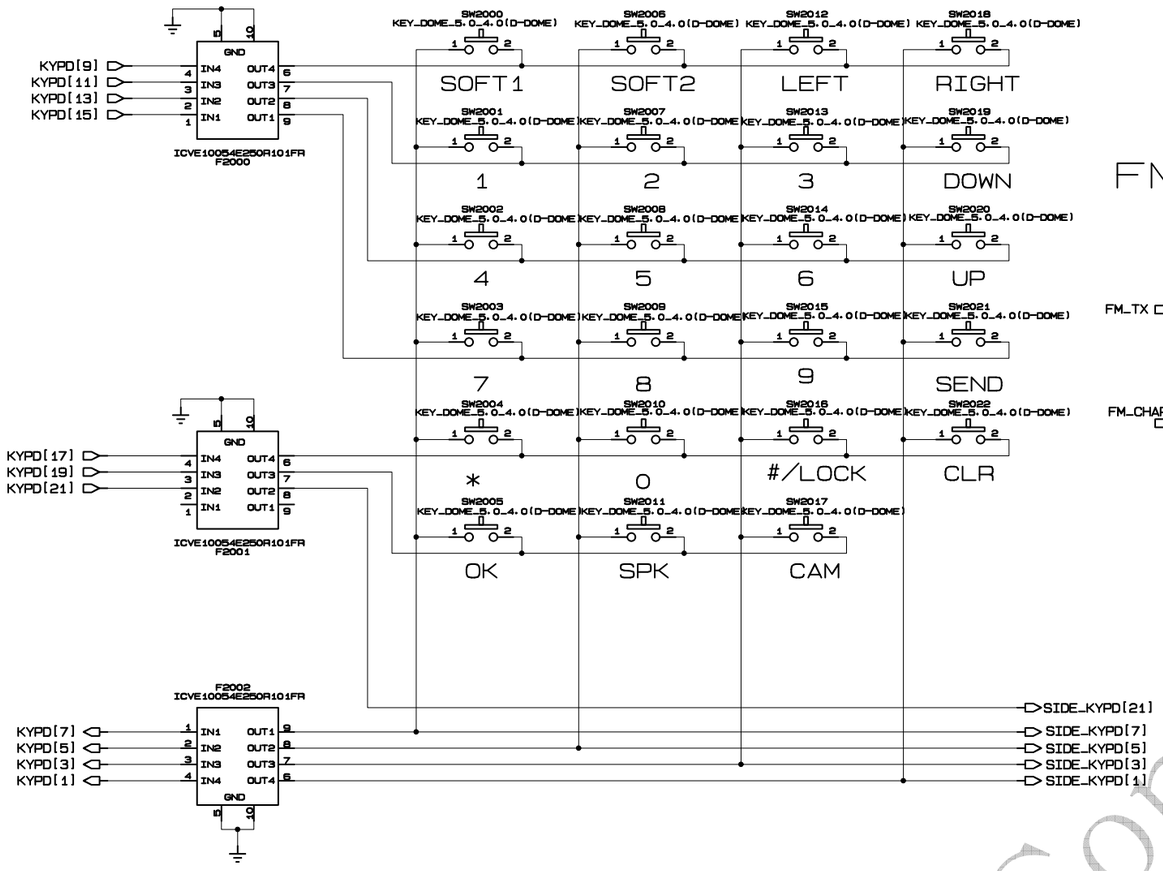
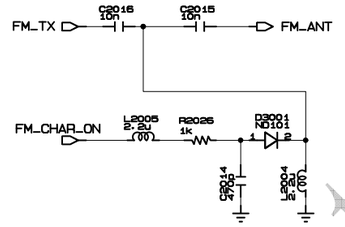
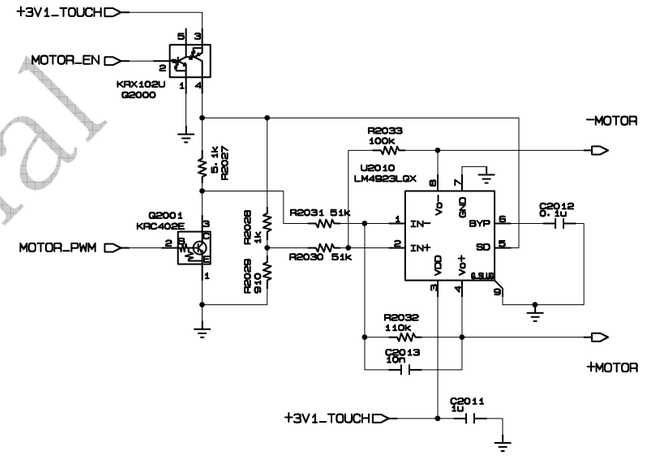
MAIN KEY



FM ANTENNA



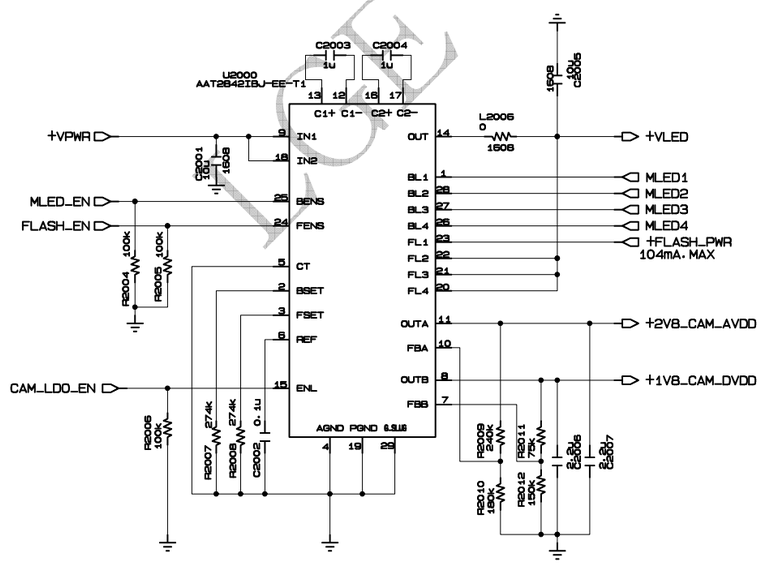
MOTOR CIRCUIT



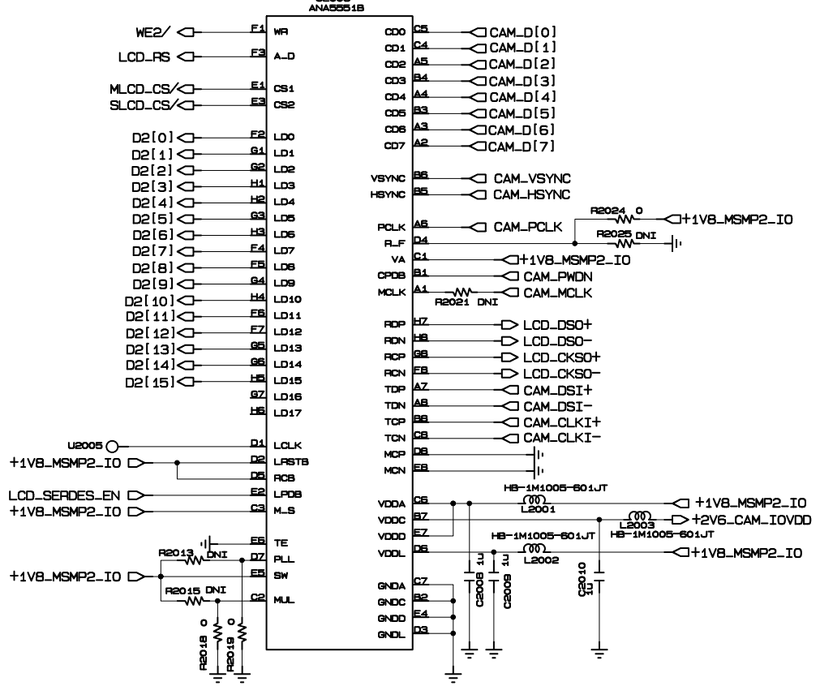
KEY MATRIX

	KEY07	KEY05	KEY03	KEY01
KEY09	SOFT1	SOFT2	LEFT	RIGHT
KEY11	1	2	3	DOWN
KEY13	4	5	6	UP
KEY15	7	8	9	SEND
KEY17	*	0	#	CLR
KEY19	OK	SPK	CAM	
KEY21	REC(S)	CAM(S)	DOWN(S)	UP(S)

FLASH CHARGEPUMP



SERIAL/DESERIAL



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Doc. Name	LX570 KEY	Doc. Number	

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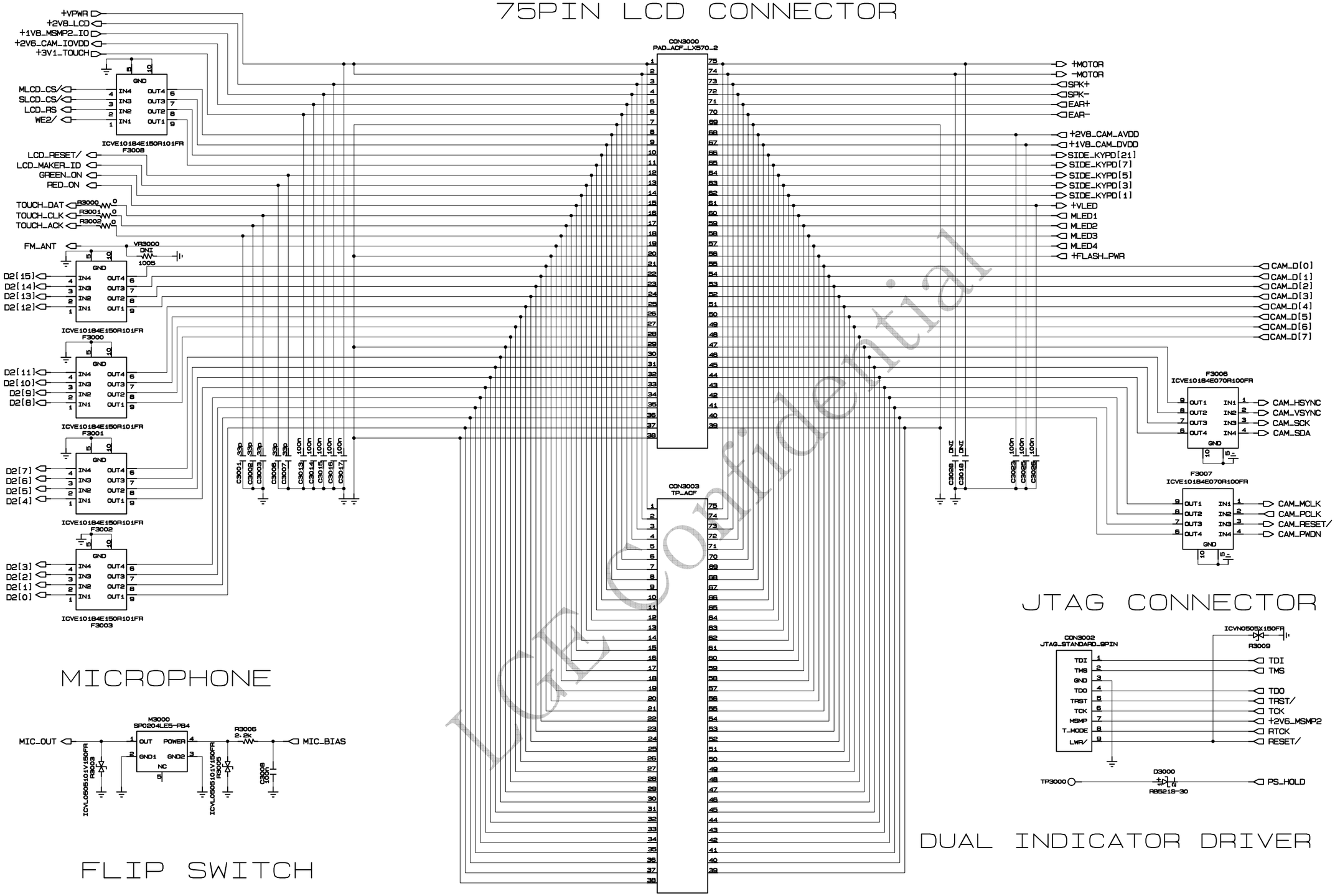
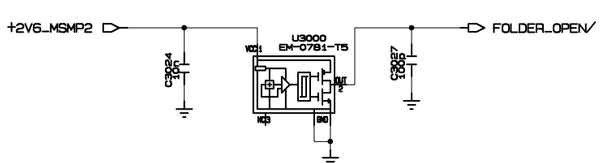
75PIN LCD CONNECTOR

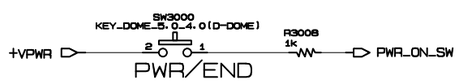


MICROPHONE

FLIP SWITCH

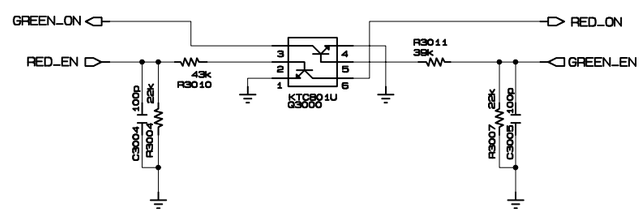


POWER SWITCH



JTAG CONNECTOR

DUAL INDICATOR DRIVER



LGE

Doc. Name	LX570 TOUCH PCB	Doc. Number	

SHEET : 1 OF 1
DRAW : M. G. PARK
DATE 04/03/2007
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APRD J. H. CHO
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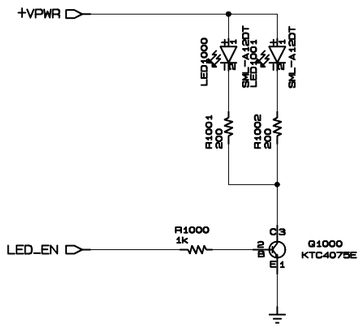
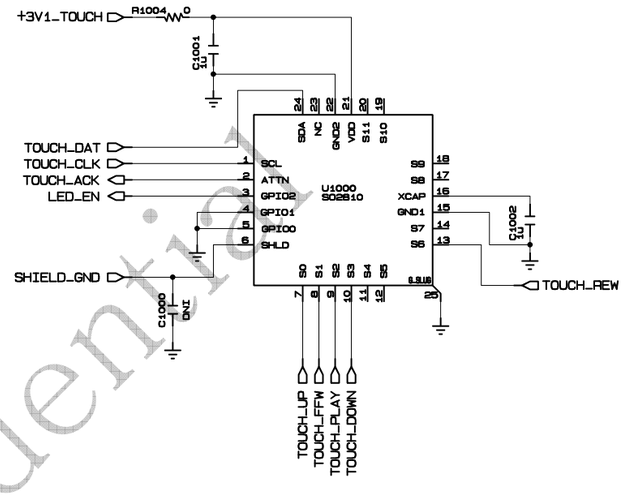
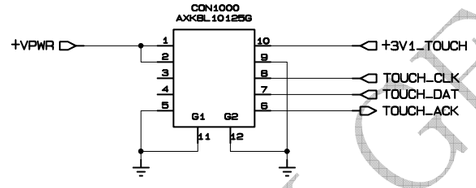
TOUCH BACKLIGHT



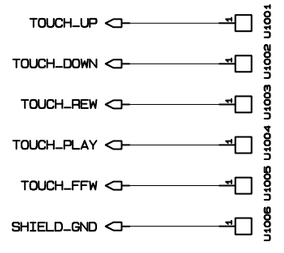
SYNAPTICS SENSOR



10PIN CONNECTOR



SENSOR PAD



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DRAW : Y. K. YOO
DATE 04/02/2007
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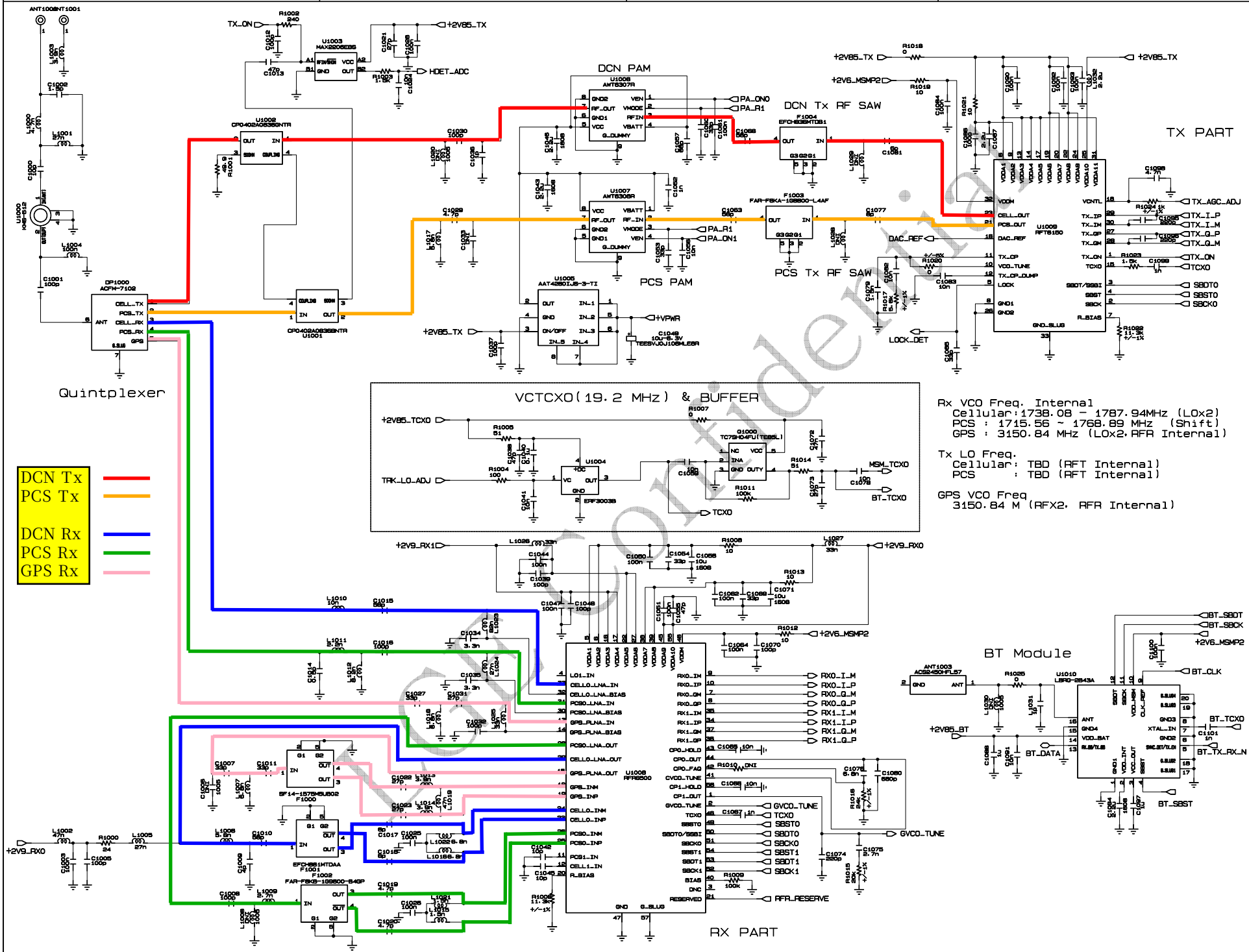
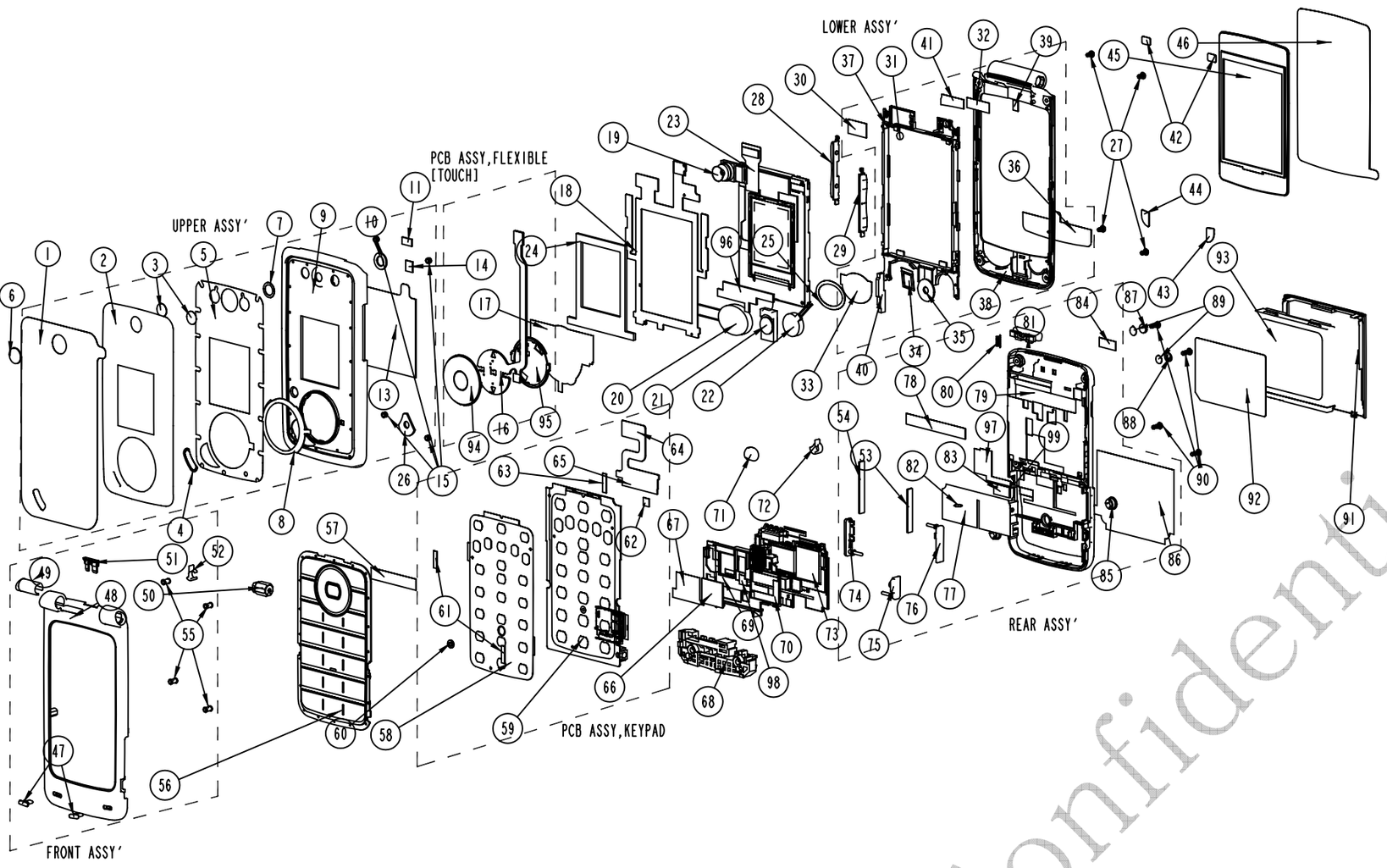
CONTENT : RF





REVISION				
ISSUE	CONTENTS	ENGINEER	APPROVER	DATE
1.0	INITIAL RELEASE	J.H. LEE	J.W. SEO	070613

NO	DESCRIPTION	Q'TY	DRAWING NO	REMARK
ADDITION			AAAY019550	
91	COVER,BATTERY		MCJA003930	
PHONE ASSY'			APEY038240	
93	BATTERY PACK,LI-ION		SBPL0085702	
92	LABEL,APPROVAL		MLAA004490	
90	SCREW,MACHINE,BIND	4	GMEY000920	
89	APE[CAP,SCREW]	2	MTAZ017600	
88	CAP,SCREW[REAR,LEFT]		MCCH010030	
87	CAP,SCREW[REAR,RIGHT]		MCCH010040	
PCB, MAIN ASSY'			SAEY019170	
98	PAD[SHIELD,FRAME]		MPBZ016810	
73	PCB ASSY,MAIN,SMT		SAEF011290	
70	INSULATOR[FRAME,SHIELD]		MIDZ013940	
69	FRAME,SHIELD		MFEA001380	
67	TAPE,SHIELD[FRAME]		MTAC004780	
66	PAD,MSM		MPBL000460	
PCB ASSY,KEYPAD			SAEY005430	
65	TAPE[ACF]		MTAZ017640	
64	PCB ASSY,FLEXIBLE,SMT[ACF]		SACE005430	
63	TAPE,SHIELD[KEYPCB,BACK,RIGHT]		MTAC005200	
62	TAPE,SHIELD[KEYPCB,BACK,LEFT]		MTAC005190	
61	TAPE,SHIELD[KEYPCB,FRONT]	2	MTAC005200	
60	PAD,MIKE		MPBH002780	
59	PCB ASSY,KEYPAD,SMT		SAEF002200	
58	DOME ASSY,METAL		ADCA006230	
PCB ASSY,FLEXIBLE [TOUCH]			SACY005730	
95	FRAME[도광]		MFEZ001270	
94	BUTTON,FUNCTION[MODKEY]		MBJC002130	
16	PCB ASSY, FLEXIBLE, SMT[TOUCH FPCB]		SACE005190	
REAR ASSY'			ACGM008520	
89	INSULATOR[MAINPCB,2]		MIDZ014350	
87	INSULATOR[KEYPCB,2]		MIDZ013930	
86	TAPE,PROTECTION[REAR]		MTAB015570	
85	CAP,MOBILE SWITCH		MCCF004180	
84	LABEL,QUALCOMM		MLAN000603	
83	PAD[PMIC]		MPBZ016800	
82	LABEL,A/S		MLAB000060	
81	LOCKER,BATTERY		MLEA003670	
80	SPRING,LOCKER		MSDC001360	
79	COVER,REAR		MCJN006330	
78	INSULATOR [KEYPCB]		MIDZ012390	
77	INSULATOR [MAINPCB]		MIDZ012290	
76	CAP,MULTIMEDIA CARD		MCCG000740	
75	CAP,EARPHONE JACK		MCCC004280	
74	CAP,RECEPTACLE		MCCE003520	
54	FRAME[RIGHT,LONG]		MBEZ001260	
53	FRAME[LEFT,SHORT]		MBEZ001250	
	FOLDER ASSY		ACGG007920	
96	PAD[FPCB]		MPBZ016790	
72	BRACKET[LEFT]		MBFZ002780	
71	DECO,SIDE [LEFT]		MDAC001970	
68	ANTENNA,MOBILE,FIXED		SNME002780	
57	TAPE[KEYPAD]		MTAZ017590	
56	KEYPAD		MKAZ003520	
50	HINGE FOLDER		MHFD001260	
46	TAPE,PROTECTION[MAIN,WINDOW]		MTAB015090	
45	WINDOW,LCD		MWAC007520	
44	CAP,SCREW[FOLDER,LEFT]		MCCH010500	
43	CAP,SCREW[FOLDER,RIGHT]		MCCH010510	
42	CAP,SCREW[FOLDER,BOTTOM]	2	MCCH010020	
30	TAPE [CONN,LCD]		MTAZ017570	
29	BUTTON,SHUTTER [LEFT]		MBJP000620	
28	BUTTON,VOLUME [RIGHT]		MBJN001140	
27	SCREW,MACHINE,BIND	4	GMET001060	
26	PAD,MOTOR [UPPER]		MPBJ003980	
25	TAPE[SPEAKER,FOLDER]		MTAZ017620	
24	PAD,LCD(SUB)		MPBQ003090	
23	LCD MODULE		SVLM0020502	
22	VIBRATOR, MOTOR		SJMY0008404	
21	RECEIVER		SURY0010201	
20	SPEAKER		SUSY0026902	
19	CAMERA		SVCY0013001	
18	PCB ASSY, FLEXIBLE [MAIN FPCB]		SACY005740	
17	SHEET [REFLECTION]		MSAZ004820	
6	WINDOW,CAMERA		MWAE002360	
FRONT ASSY'			ACGK008350	
55	INSERT,FRONT(UPPER)	4	MICC001040	
52	BRACKET[RIGHT,BUSHING]		MBFZ002890	
51	STOPPER,HINGE		MSGB001710	
49	DECO,SIDE [RIGHT,BUSHING]		MDAC001960	
48	COVER,FRONT		MCJK006740	
47	STOPPER	2	MSGY002040	
LOWER ASSY'			ACGH004660	
41	TAPE[BRACKET]		MTAZ018340	
40	PAD[BRACKET]		MPBZ016770	
39	PAD,CAMERA[LOWER]		MPBT004450	
38	COVER,FOLDER(LOWER)		MCJH003750	
37	BRACKET,LCD		MBFF001200	
36	TAPE,PROTECTION [REMOVER]		MTAB015510	
35	PAD,MOTOR [LOWER]		MPBJ004330	
34	PAD,RECEIVER		MPBM001580	
33	TAPE [SPEAKER]		MTAZ017560	
32	TAPE [CAMERA]		MTAZ017580	
31	MAGNETIC		MMAA000820	
30	TAPE [CONN,LCD]		MTAZ017570	
UPPER ASSY'			ACGJ006060	
26	PAD,MOTOR [UPPER]		MPBJ003980	
15	INSERT	4	MICZ001990	
14	PAD [TOUCH]		MPBZ016780	
13	TAPE,PROTECTION [INMOLD,BACK]		MTAB016220	
11	GASKET, SHIELD FORM [CONN]		MGAD013560	
10	PAD,CAMERA		MPBT003730	
9	COVER,FOLDER(UPPER)		MCJJ004680	
8	DECO,BUTTON		MDAA000670	
7	TAPE,WINDOW[CAMERA]		MTAD006490	
5	TAPE,WINDOW(SUB)		MTAE003010	
4	FILTER,SPEAKER		MFBC002890	
3	SHEET[FLASH]	2	MSAZ004800	
2	WINDOW,LCD(SUB)		MWAE003570	
1	TAPE,PROTECTION[WINDOW]		MTAB015080	

PRODUCT TPFA00795##		UPPER ASSY' ACGJ00606##		LOWER ASSY' ACGH00466##		FRONT ASSY' ACGK00835##		REAR ASSY' ACGN00852##		PCB ASSY',FLEXIBLE[TOUCH] SACY00573##		WINDOW,LCD[MAIN] MWAC00752##		COVER,BATTERY MCJA00393##	
03	BLACK	01	BLACK	01	DARK GRAY	01	DARK GRAY	01	BLACK	01	BLACK	01	BLACK	01	BLACK
10	PINK	02	PINK	02	SILVER	02	SILVER	02	PINK	02	PINK	02	SILVER	02	PINK

PRODUCT TPFA00795##		BUTTON,VOLUME[RIGHT] MBJN00114##		BUTTON,SHUTTER[LEFT] MBJP00062##		CAP,SCREW[FOLDER,BOTTOM] MCCH01002##		CAP,SCREW[FOLDER,LEFT] MCCH01050##		CAP,SCREW[FOLDER,RIGHT] MCCH01051##		KEYPAD MKAZ00352##			
03	BLACK	01	BLACK	01	BLACK	01	DARK GRAY	01	DARK GRAY	01	DARK GRAY	01	BLACK		
10	PINK	02	PINK	02	PINK	02	SILVER	02	SILVER	02	SILVER	02	SILVER		

PRODUCT TPFA00795##		CAP,SCREW[REAR,LEFT] MCCH01003##		CAP,SCREW[REAR,RIGHT] MCCH01004##											
03	BLACK	01	BLACK	01	BLACK										
10	PINK	02	PINK	02	PINK										