CDMA MOBILE SUBSCRIBER UNIT

LG-YD636

SERVICE MANUAL

SINGLE BAND
CDMA MOBILE PHONE

Table of Contents

CHAPTER 1. NAM Input Method
(Inputting of telephone numbers included)

1. HOW TO POWER UP

ENTER PIN Avail Cnt: 03 [ ]	ENTER PIN Avail Cnt: 03 [****]	CHV PIN Verified

1. When you press power key, "Enter PIN Avail cnt:03" message is displayed.
2. You have to input correct PIN code[Default Code: 1234], then press [OK] key.
3. Handset start data loading process, and then searching signal.

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

1. Telephone Number and NAM Programming Method

- Press " ********159753 " in idle state**

Then, the following Menu is appeared.

1 . Service Menu 2 . Test Screen 3 . Test Call 4 . Vocoder Set 5 . Verify ADM 6 . Error Screen 7 . Del Error	Phone Model	SlotCycle Idx

- Press **1** to program the telephone number and NAM.
- Phone model displayed , then press [OK].
- Slot cycle index displayed , then press [OK].

Phone Number	Nam Name	ACCOLC

- Phone number displayed , then press [OK].

- Nam   Name is displayed , then press [OK].
- ACCOLC is displayed, then press[OK].
- Now, the basic programming is completed. To reset the handset, press [Done].

The detail programming method is same as basic programming. Set up required values and then, press the Up-Down key in an effort to move to the next screen..

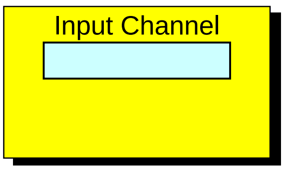
The editable NAM items are followed:

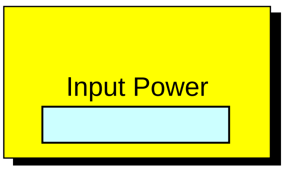
SERVICE RPOGRAMMING CODE
NAM1 MOBILE COUNTRY CODE
NAM 1 MOBILE NETWORK CODE
NAM 1 PRL Enabled
NAM 1 CDMA Home System Reg
NAM 1 CDMA Foreign SID Reg
NAM 1 CDMA Foreign NID Reg
NAM 1 CDMA Home SID/NID
NAM 1 Lock out SID/NID
NAM1 CDMA Primary CH A
NAM1 CDMA Primary CH B
NAM1 CDMA Secondary CH A
NAM1 CDMA Secondary CH B

※ Editing this items is not recommended.

3. FCC TEST MENU

1. FCC TEST MENU: Press ******159753 in idle state ➔ Left/Right Key in an effort to move to the DEBUG MENU2 ➔ Select CDMA FCC
2. Channel setting: input channel number
3. Power setting: input power number (Input Power Setting 0~511, Normal Input is CH 400)
4. If you want to end the test, press END Key, then handset will be reset.





CHAPTER 2. 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 824.04~848.97 and 869.04~893.97. RF signals received through the antenna are seperated by the duplexer.

RF Signal fed into the RFR6122(RF receiver) through the duplexer. The IF signal is changed 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) 6025 processes the data from ADC. The digital processing part is a demodulator.

In the case of transmission, RFT6122 receives OQPSK-modulated anlaog signal from the MSM6025.

The RFT6122 connects directly with MSM6025 using an analog baseband interface. In RFT6122, 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 duplexer.

1.2 Description of Receive Part Circuit

1.2.1 Duplexer (EFSD836MD2S2)

The 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-YD636 duplexer described below ;

	Tx	Rx	Tx to Rx (min)
Pass Band	824~849MHz	869~894 MHz	
Insertion Loss	2.0dB max	4.0dB max	
VSWR	2.2 max	2.2 max	
Attenuation	45.0dB min (869~894MHz)	55.0dBmin(824~849MHz)	55.0dB (824~849MHz) 45.0dB (869~894MHz)

1.2.2 Receiver (RFR6122)

The RFR6122 is RF RECEIVER (LNA&MIXER, ADC CONVERTER) 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 LG-YD636 LNA is described below:

Parameter	Gain mode 0	Gain mode 1	Gain mode 2	Gain mode 3	Units
	Cellular	Cellular	Cellular	Cellular	
Gain	16.3	4.0	-4.4	-18.0	dB
Noise Figure	1.60	5.0	5.0	20.0	dB
Input IP3	16.5	8.7	15.0	15.0	dBm

The RFR6122 IC is an RF-to-baseband receiver IC and provides the Zero-IF receiver signal path for Cellular-CDMA reception. For this chipset, Cellular-CDMA refers to band classes 0 and 3 as defined by the cdma2000 standard, with mobile station receivers operating between 824 and 894 MHz. The Rx signal path includes the LNA, quadrature downconversion, and baseband functions.

Numerous secondary functions are integrated on-chip: the Rx LO generation and distribution circuits, the UHF VCO circuits, and various interface, control, and status circuits.

The Cellular-CDMA receive signal is routed from the antenna to the RFR6122 IC via the duplexer. The analog baseband outputs interface with one of MSM6025 devices that also provide status and control signaling. Power reduction features controlled by the MSM6025 device (such as selective circuit power-down, gain control, and bias control) extend handset standby time. Integrated Rx LO circuits, ideally supplemented by the RFT6122 transmitter IC.

1.2.3 Receive RF SAW Filter

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

RX RF filter has IL of 2.2dB (Max) on the average whereas the ripple of passband is about 1.0dB (Max) and the RF signal suppression rate on transmit band is 47dB (Min).

1.3 Transmit Part Circuit Description

1.3.1 RFT6122

The RFT6122 baseband-to-RF Transmit Processor performs all Tx signal-processing functions required between digital baseband and the Power Amplifier Modulator (PAM). The baseband quadrature signals are upconverted to the Cellular frequency bands and amplified to provide signal drive capability to the PAM. The RFT6122 includes an mixers for up-converting analog baseband to RF, a programmable PLL for generating Tx and Rx LO frequency, cellular 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 MSM6025 to RFT6122 are analog signal. In CDMA mode, These signals are modulated by Offset Quadrature Phase Shift King (OQPSK). I and Q are 90 deg. out of phase, and I and I/ are 180 deg. The mixers in RFT6122 converts baseband signals into RF signals. After passing through the upconverters, RF signal is inputted into the Power AMP.

- RFT6122 Cellular CDMA RF Specifications

Parameter	**Condition**	**Min.**	**Typ.**	**Max.**	**Units**
Rated Output Power	Average CDMA Cellular		6.0		dBm
Min Output Power	Average CDMA Cellular		-75		dBm
Rx band noise power	CDMA Cellular		-132		dBm/Hz
ACPR	Cellular: Fc±885kHz		-52		dBc/

1.3.2 Power Amplifier

The power amplifier that can be used in the CDMA mode has linear amplification capability.
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 +17dBm and conversion gain is about 28dB in the CDMA mode.

1.4 Description of Frequency Synthesizer Circuit

1.4.1 Voltage Control Temperature Compensation Crystal Oscillator

The temperature range that can be compensated by VC-TCXO which is the reference frequency generator of a mobile station is -30~+80 C.
The VC-TCXO receives frequency tuning signals called TRK_LO_ADJ from MSM as 0.5V~2.5V DC via R and C filters in order to generate the reference frequency of 19.2MHz and input it into the frequency synthesizer of UHF band. 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/LCD and Receptacle Part

This is used to transmit keypad signals to MSM6025. It is made up of a keypad backlight part that illuminates the keypad, LCD 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 MSM6025, and amplifying part that amplifies signals coming out from MIC and transferring them to the audio processor.

2.2.3 MSM6025 (Mobile Station Modem) 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 flash memory, SDRAM for storing data.

2.2.5 Power Supply Part

The PMIC(PM6610) is made up of 7 Regulators and direct connet to Batt.
Regulator(150mA)s give the power each Circuits(RFR,RFT, MSMA,MSMP,MSMC,RUIM).
Regulator(50mA) gives the power to the TCXO parts.
PAM, Motor, LED, Charge Pump and Audio amplifier are directly conneted to Battery.

2.3 Circuit Description

2.3.1 Keypad/LCD and Receptacle Part

Once the keypad is pressed, the key signals are sent out to MSM6100 for processing. In addition, when the key is pressed, the keypad/LCD lights up through the use of 16 LEDs. The terminal status and operation are displayed on the screen for the user with the characters and icons on the LCD.
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 MSM6025) 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 MSM6025 activate the ringer by using signals generated in the timer in MSM6025.

2.3.3 MSM Part

The MSM6025 chipset integrates functions that support both tri-mode CDMA/FM and cellular-only handset operation. Subsystems within the MSM6025 baseband processor device include a CDMA processor, digital FM (DFM) processor, QCT's latest generation of DSP, the QDSP4000™ core, for voice compression and applications support, PLL and an ARM® ARM7TDMI microprocessor. Also integrated in the MSM6025 device are analog functions such as a wideband mono codec and analog interfaces for the radioOne RF ASICs. Controllers for a universal serial bus (USB), device controller for an R-UIM (CDMA SIM), GPIOs, and peripheral interfaces complete the system integration. And the MSM6025 chipset and system software are designed to support IS95A/95B and Release 0 of CDMA2000 standards.

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.

2.3.4 Memory Part

Memory part consists of 64 Mbits Flash Memory and 32 Mbits Static RAM. the Flash Memory part are programs used for terminal operation. The programs can be changed through down loading after the assembling of terminals. On the SRAM data generated during the terminal operation are stored temporarily.

2.3.5 UIM Part

The MSM6025 is supports RUIM.

The UIM card contains the informations of phone number, PIM data, SMS data, etc.

The whole circuits are designed to operate 2.85V UIM cards.

2.3.6 Power Supply Part

Turn On

When the battery voltage (4.2V ~ 3.2V) is fed and the PWR key of keypad is pressed, PMIC is activated by the PWR_ON_SW/ signal, and then the control signal PS_HOLD signal is generated. And then, the regurator 1.9V_MSMC & 2.85V_MSMP, 2.6V_MSMA, are operated.

Operating

During the phone is on operating state,

LDO(in PMIC) for MSM is always enable and gives the power MSM6025 and memory part

LDO(in PMIC) for +2.60V_TX part is enabled on traffic state, and gives the power TX part devices.
LDO(in PMIC) for +2.60V_RX part is enabled on idel state, and gives the power RX part devices.

Turn OFF

When the PWR key is pressed during a few seconds, PMIC is turned on by PWR_ON_SW/ and then, 'Low' is outputted on PS_HOLD. MSM6025 receives this signal and then, recognizes that the POWER key has been pressed. During this time, MSM6025 outputs PS_HOLD as low and turn off all devices

2.3.7 Logic Part

The Logic part consists of internal CPU of MSM6025, MCP(SRAM& FLASH MEMORY) .
The MSM6025 receives TCXO (=19.2MHz) from U101 and controls the phone in both CDMA and FM modes. The major components are as follows:

CPU : ARM7TDMI microprocessor core

MEMORY :

- FLASH Memory + SRAM : 64M bits(Flash) + 32M bits(SRAM)

CPU

ARM7TDMI 32-bit microprocessor is used and CPU controls all the circuitry. Some of the features of the ARM microprocessor include a 3 stage pipelined RISC architecture, both 32-bit ARM and 16bit THUMB instruction setsm, a 32-bit address bus, and a 32-bit internal data bus.

FLASH Memory

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

SRAM

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

KEYPAD

For key recognition, key matrix is setup using KEY_SENSE0/-3/ signals and GPIO57-61, GPIO21 of output ports of MSM. Backlight circuitry are included in the keypad for easy operation in the dark.

LCD MODULE

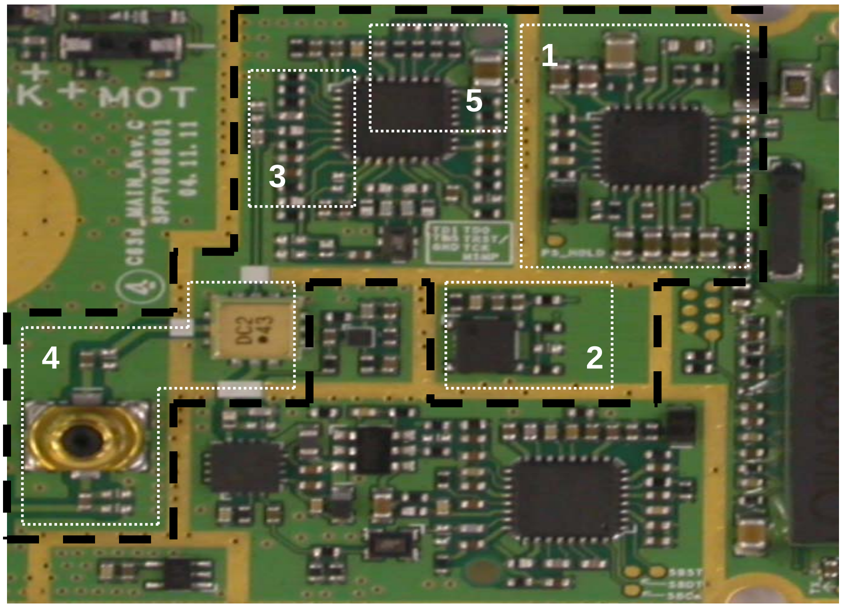
LCD module contains a controller which will display the information onto the LCD by 16-bit data from the MSM6025. It is consist of one LCD with 128(W) X 128(H) dots 65,000 STN Color.
It is also supplied stable +2.85V_MSMP by PMIC for fine view angle and LCD reflects to improve the display efficiency. White LEDs are used to display LCD backlight.

CHAPTER 3. Trouble Shooting

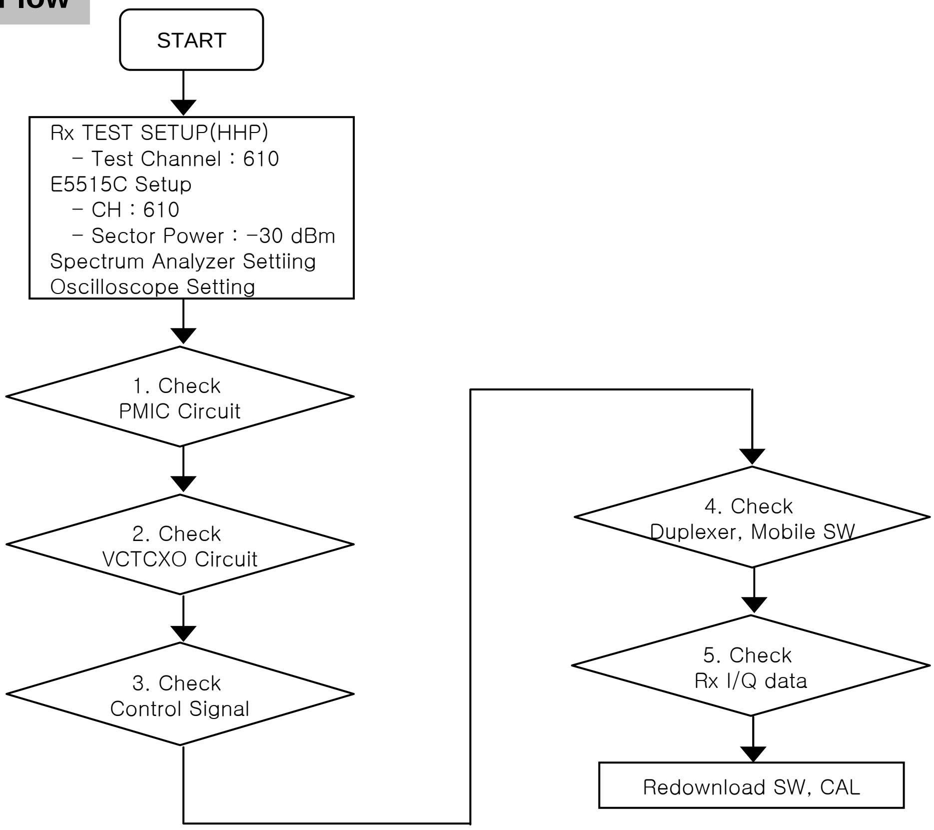
3.1 Rx Part Trouble

3.1.1 When Tx power isn’t enough

Test Point

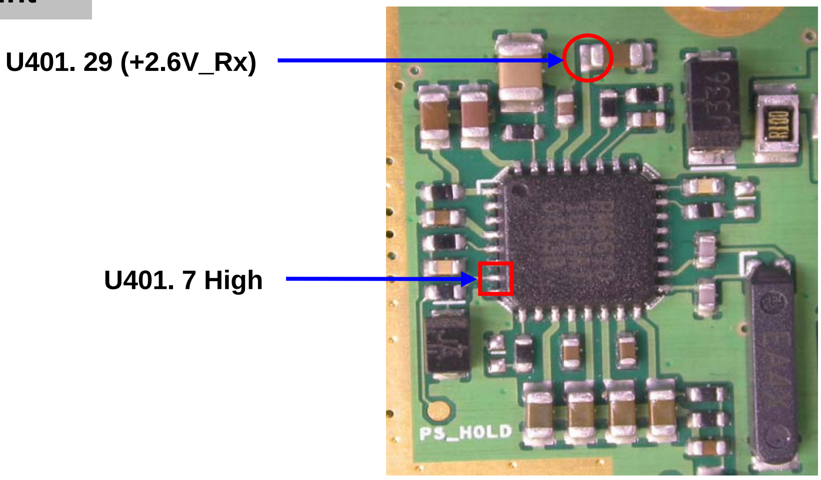


Checking Flow

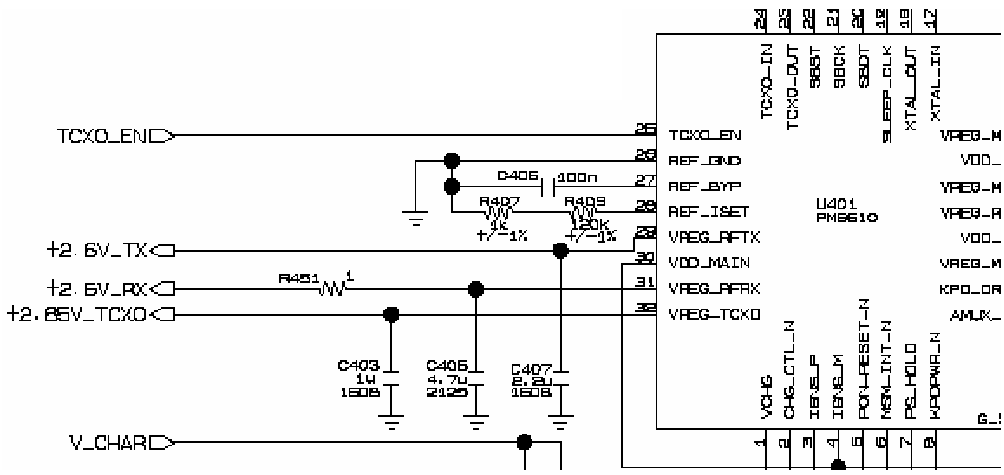


3.1.2 Checking Regulator Circuit

Test Point



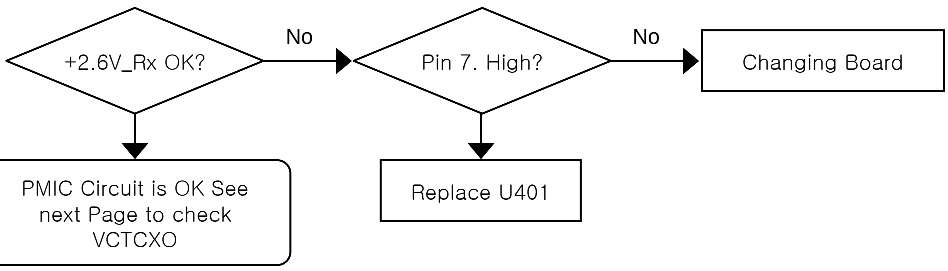
Circuit Diagram



Checking Flow

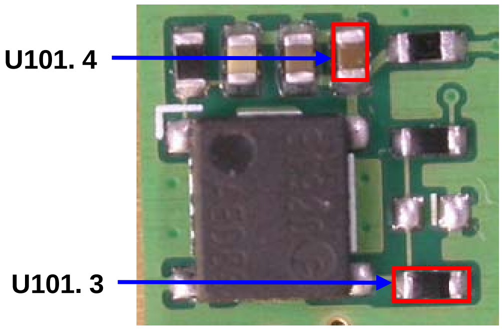
Check Pin 29 of U401

Check Pin 7 of U401

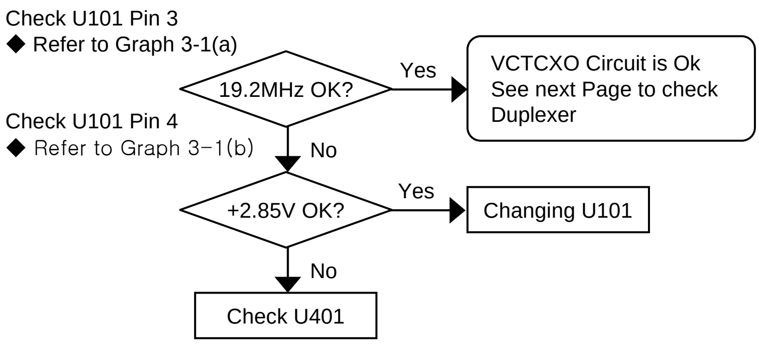


3.1.3 Checking VCTCXO Circuit

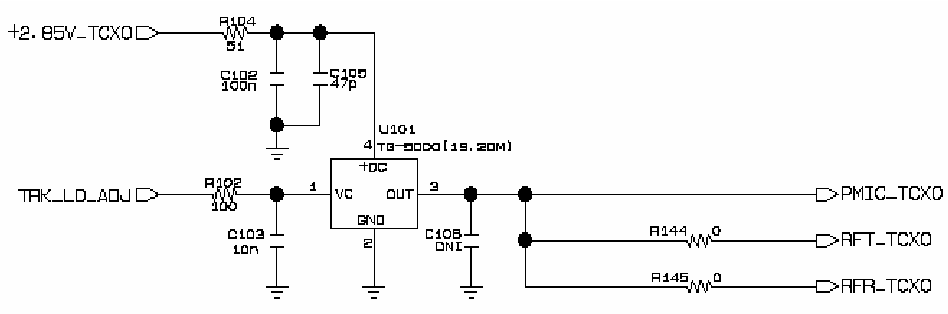
Test Point



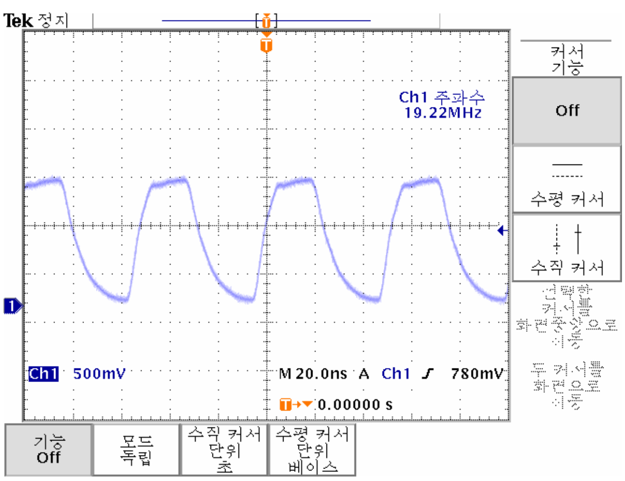
Checking Flow



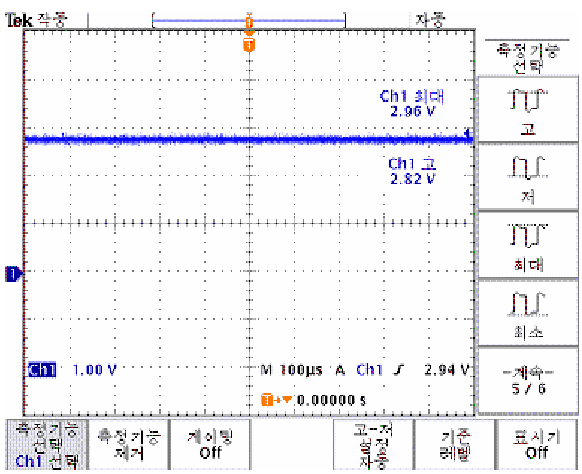
Circuit Diagram



Waveform



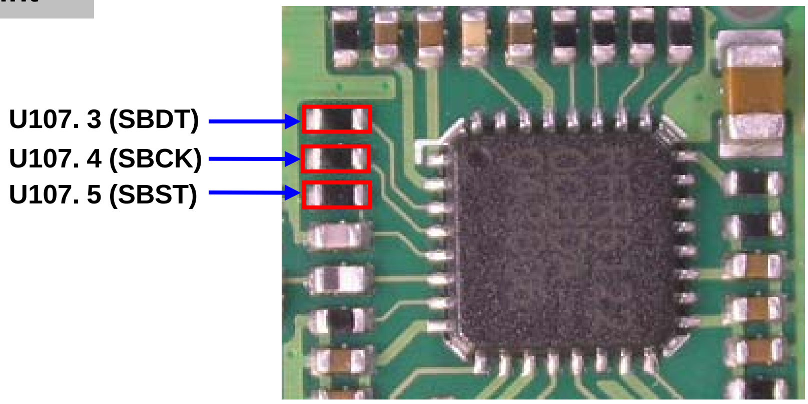
Graph 3-1(a)



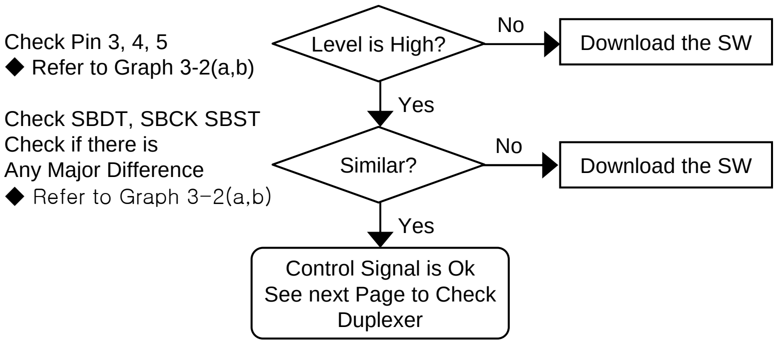
Graph 3-1(b)

3.1.4 Checking Control Signal

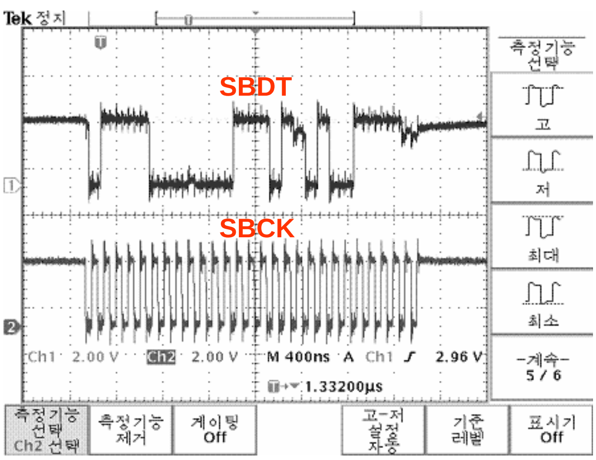
Test Point



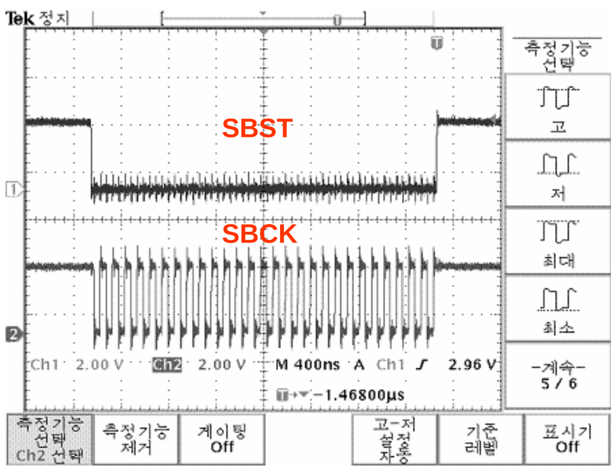
Checking Flow



Waveform



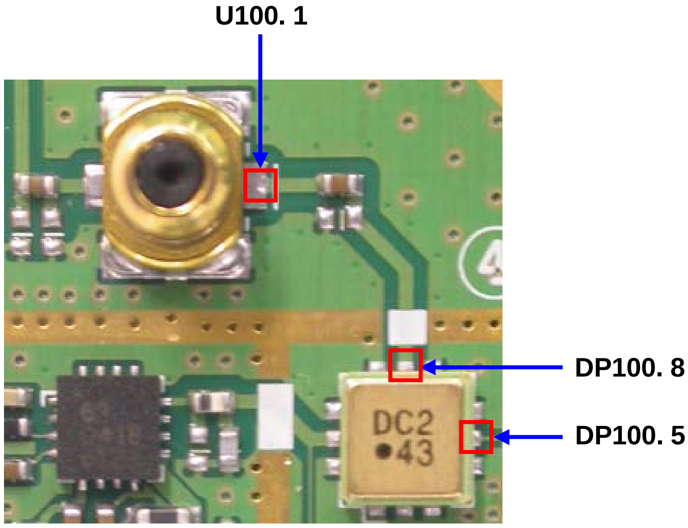
Graph 3-2(a)



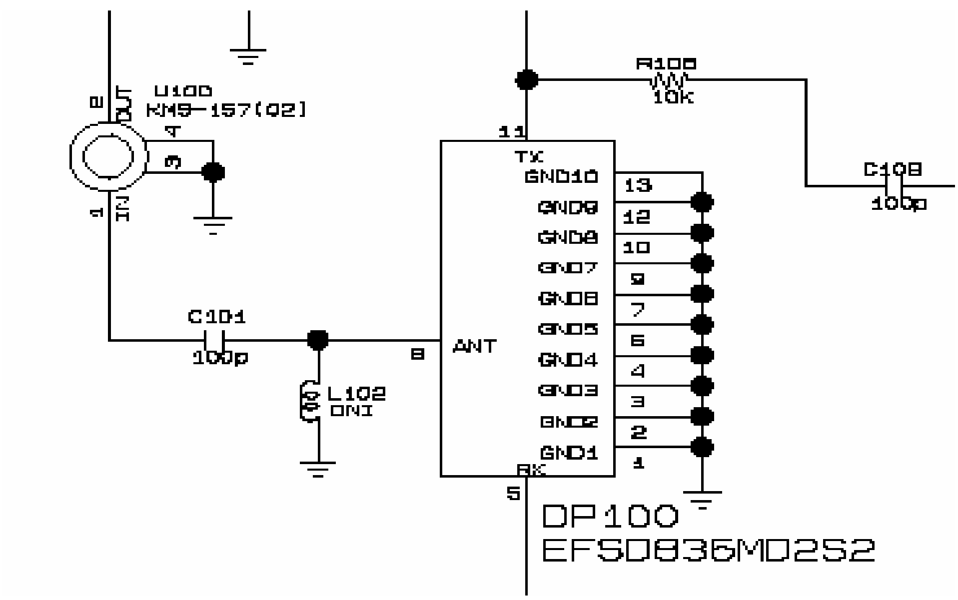
Graph 3-2(b)

3.1.5 Checking Duplexer & Mobile SW

Test Point

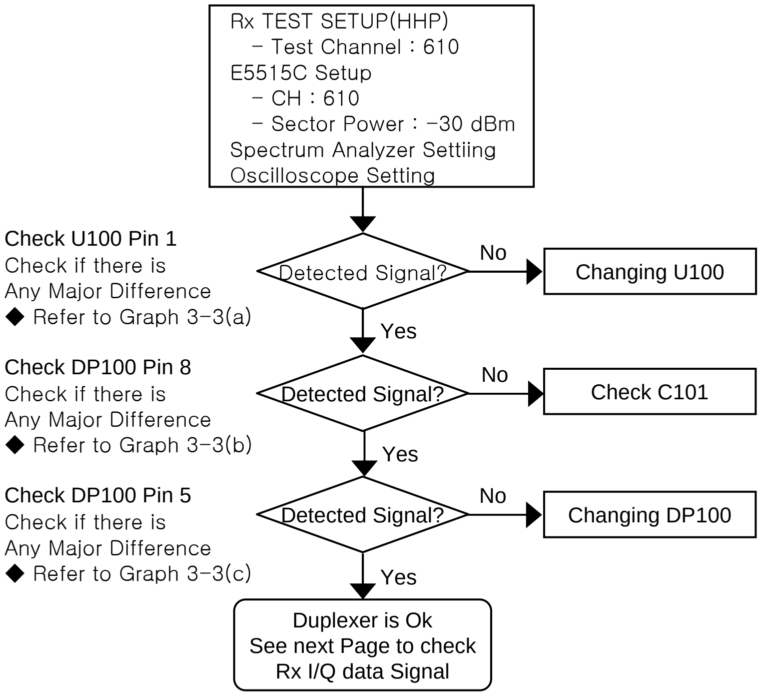


Circuit Diagram

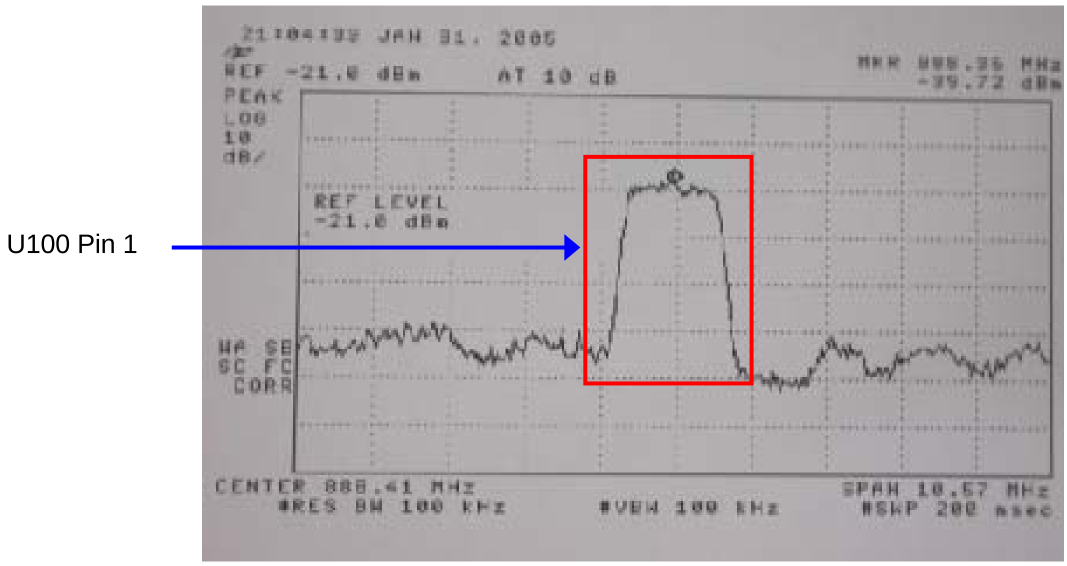


3.1.6 Checking Mobile SW & Duplexer

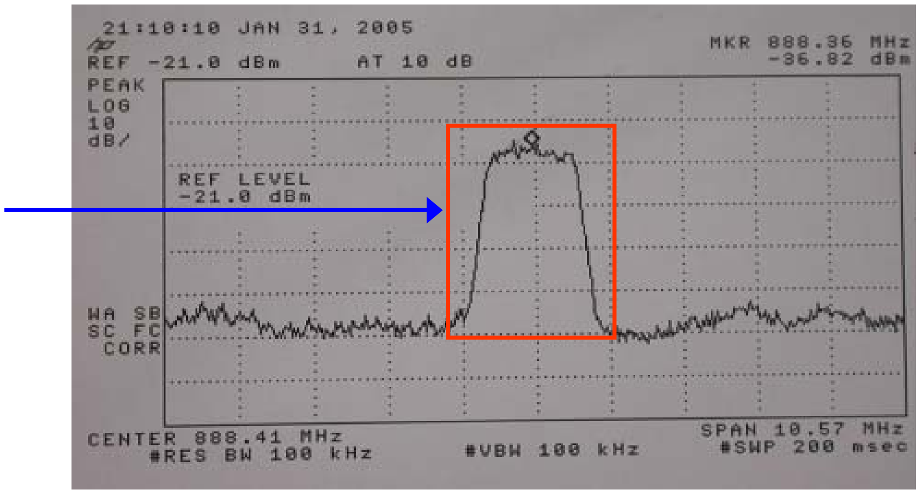
Checking Flow



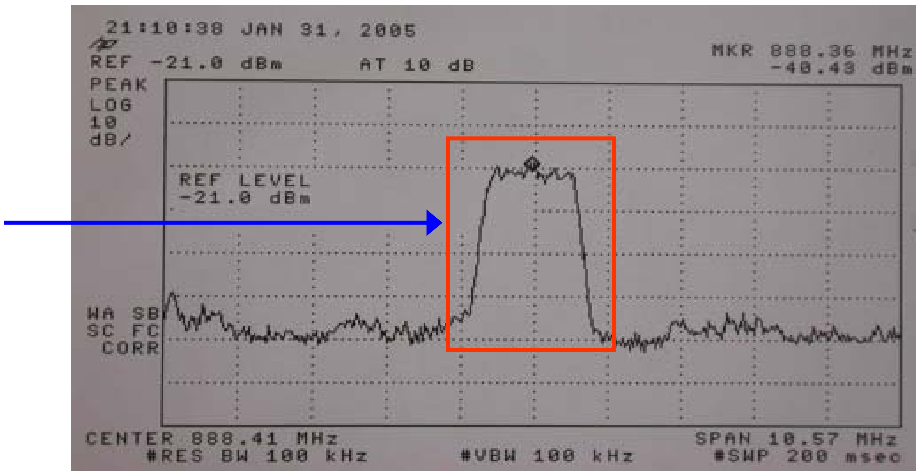
Waveform



Graph 3-3(a)



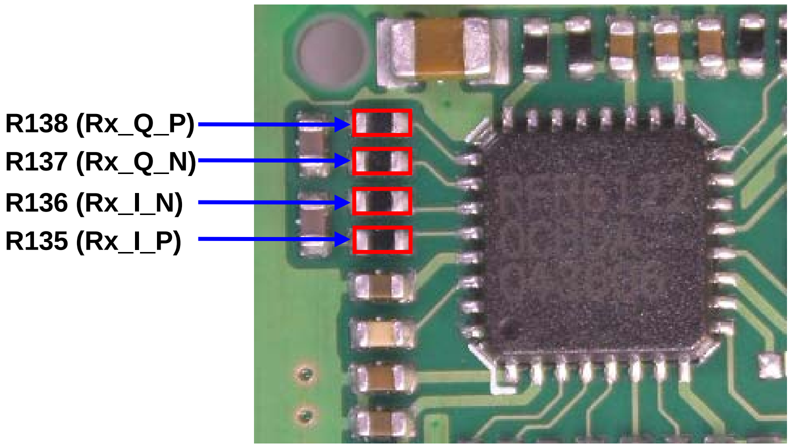
Graph 3-3(b)



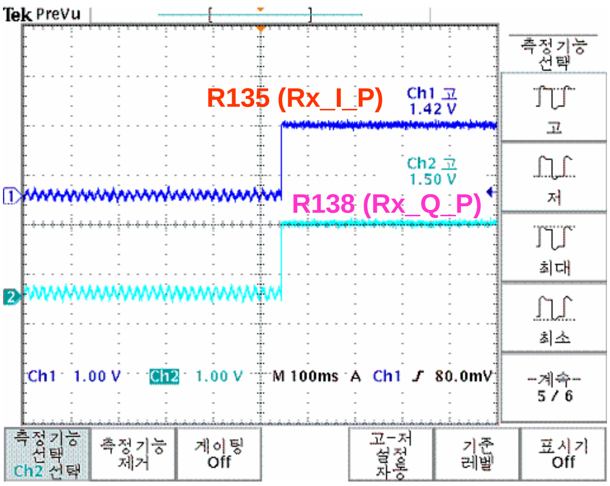
Graph 3-3(c)

3.1.7 Checking Rx I/Q data

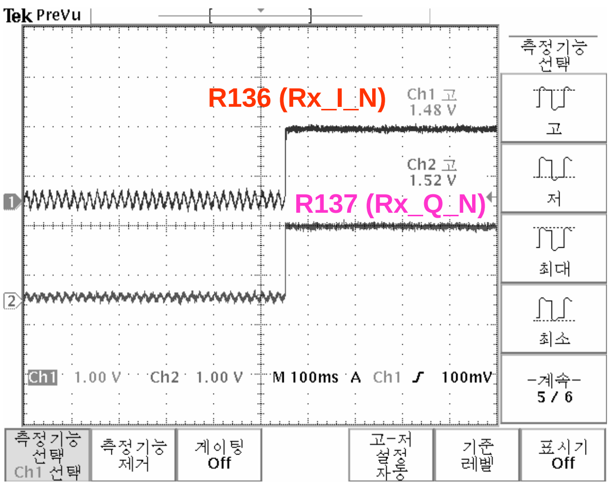
Test Point



Waveform



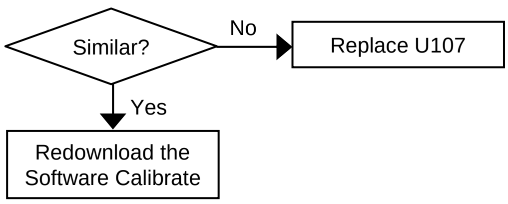
Graph 3-4(a)



Graph 3-4(b)

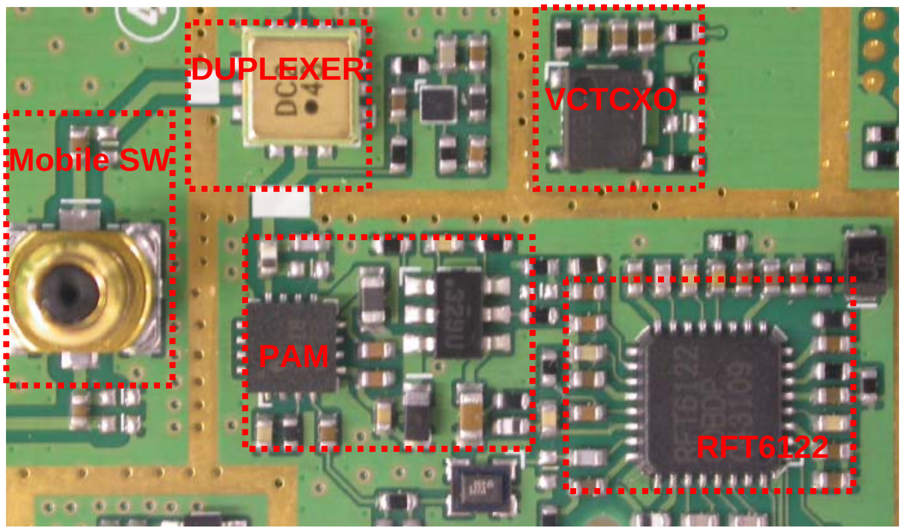
Checking Flow

Check R138, R137, R136, R135
Check if there is
Any Major Difference
◆ Refer to Graph 3-4(a,b)

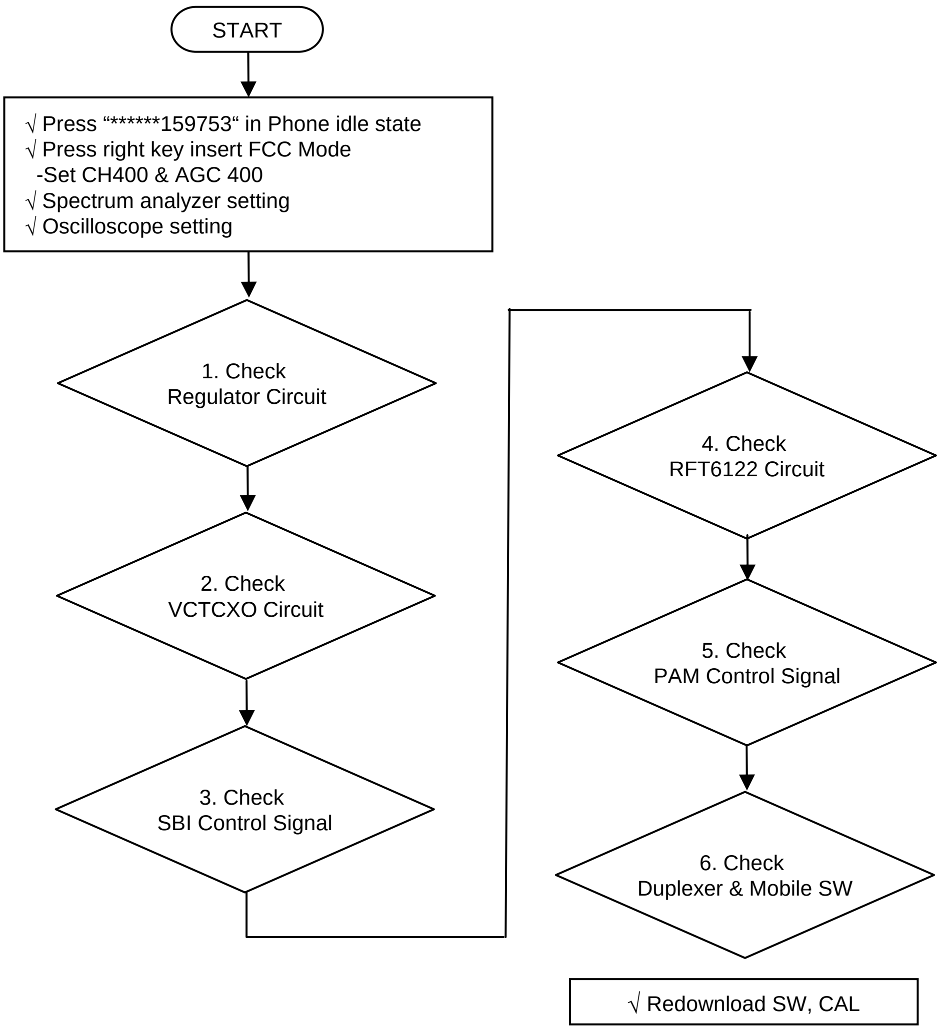


3.2 Tx Trouble

Test Point



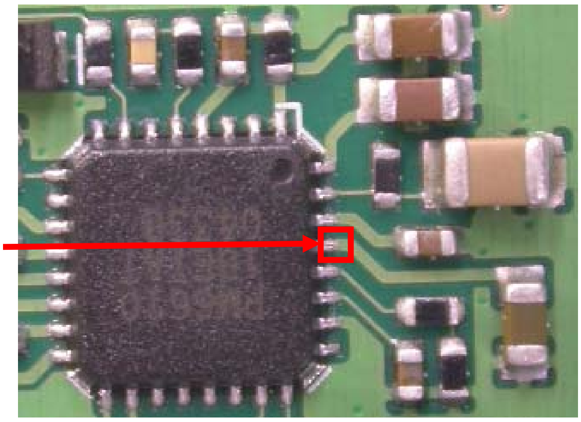
Checking Flow

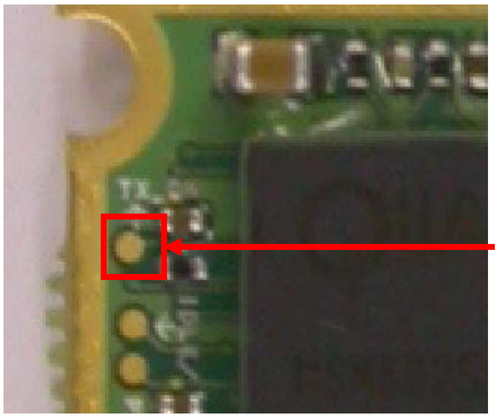


3.2.1 Check Regulator Circuit

TEST POINT

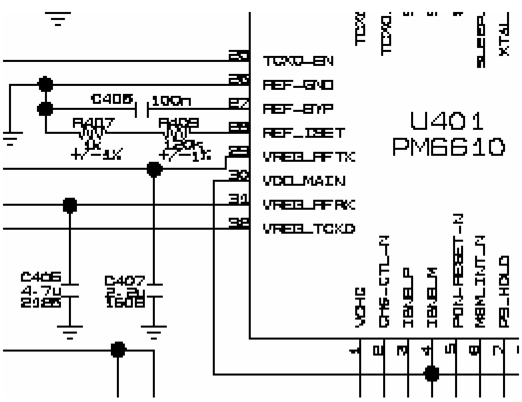
U401 **Pin29**
V_RFTX 2.6V

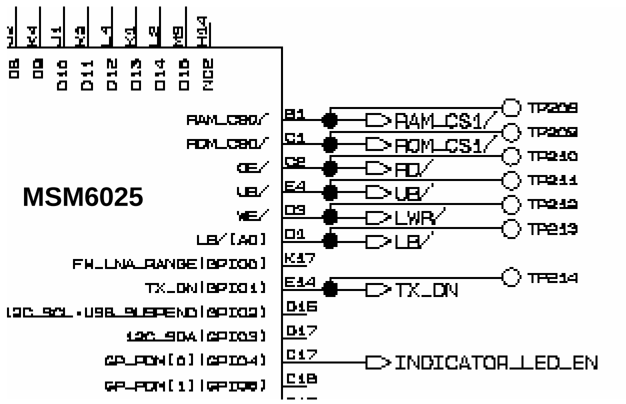




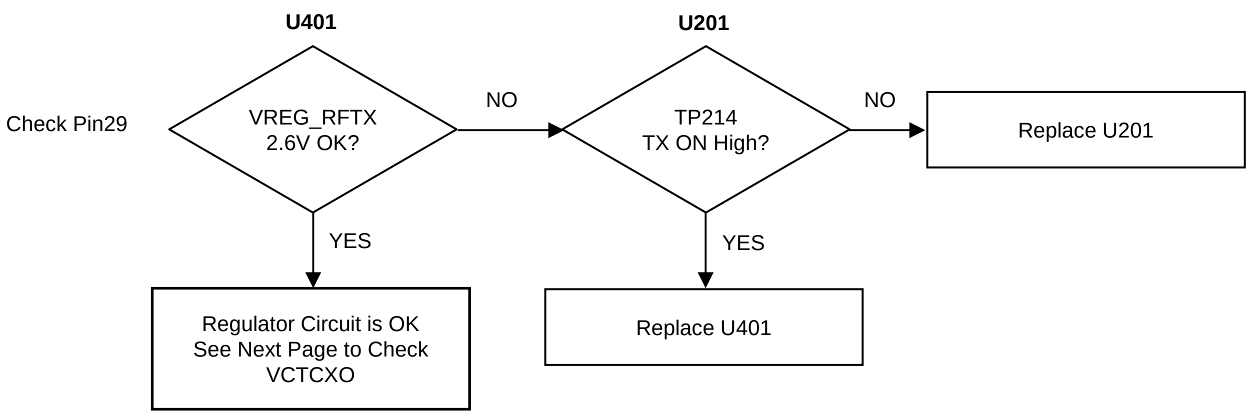
U201 TP214
TX ON

Circuit Diagram



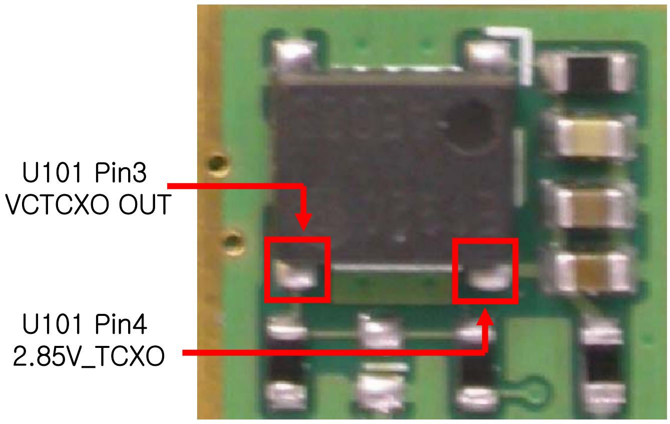


Checking Flow

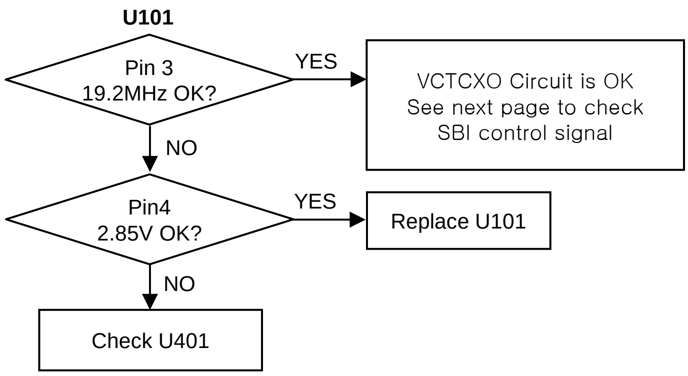


3.2.2 Check VCTCXO Circuit

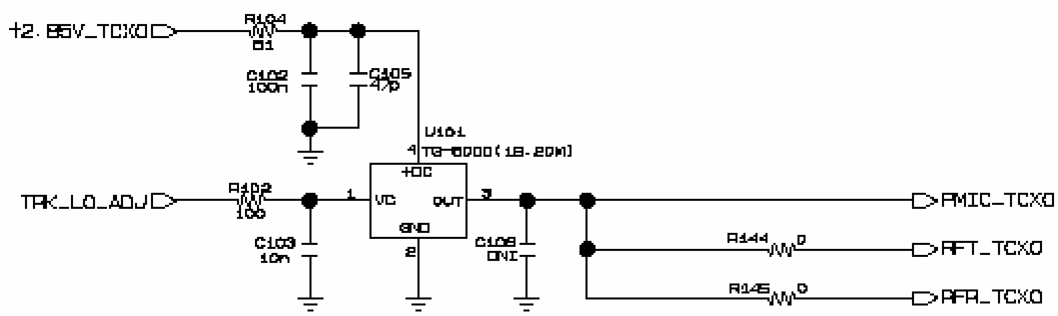
TEST POINT



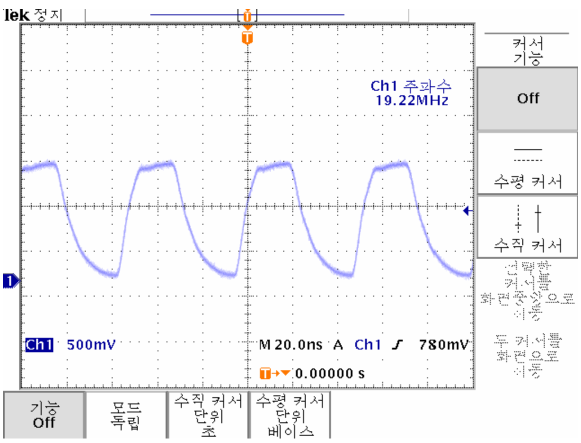
Checking Flow



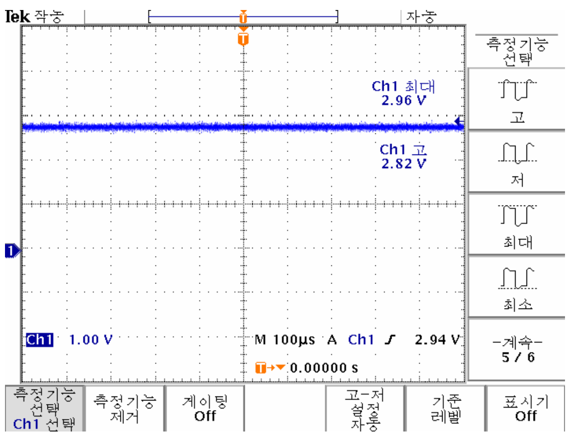
Circuit Diagram



Waveform



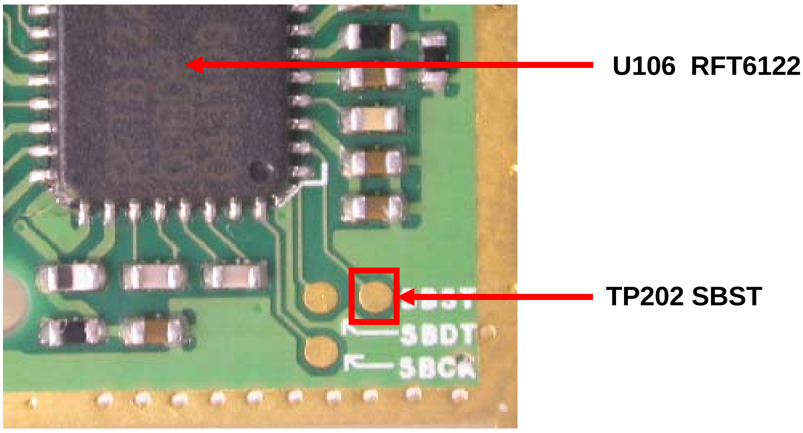
U101 Pin3 VCTCXO_OUT



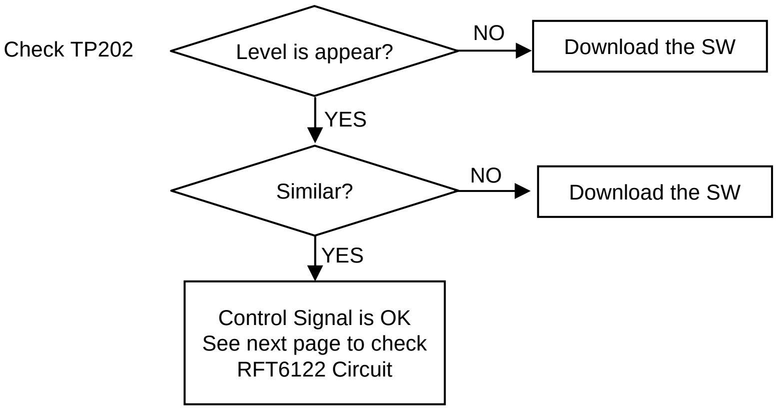
U101 Pin4 2.85V_TCXO

3.2.3 Check SBI Control Signal

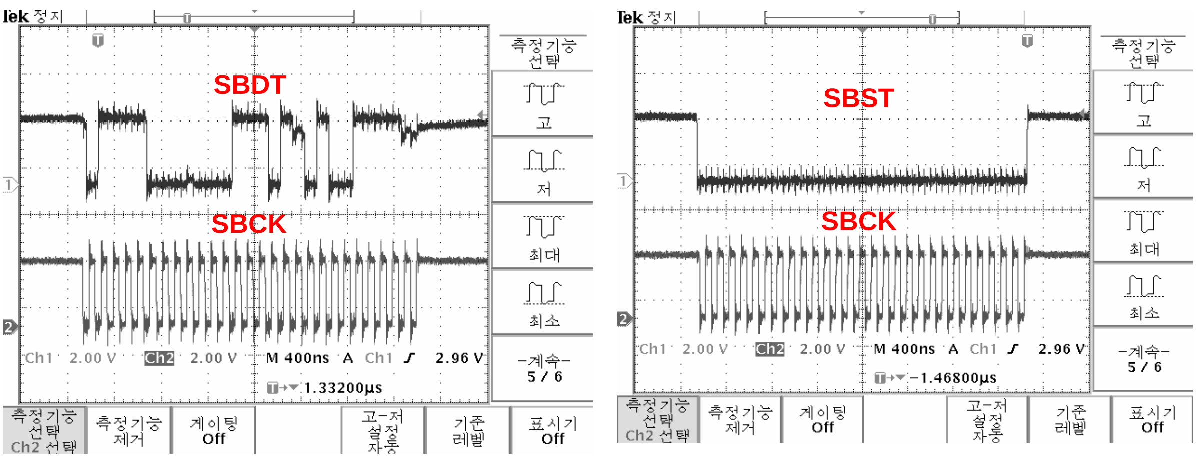
Test Point



Circuit Flow

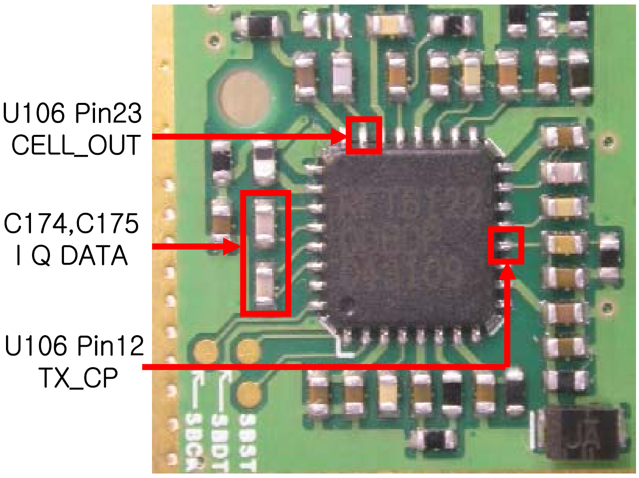


Waveform

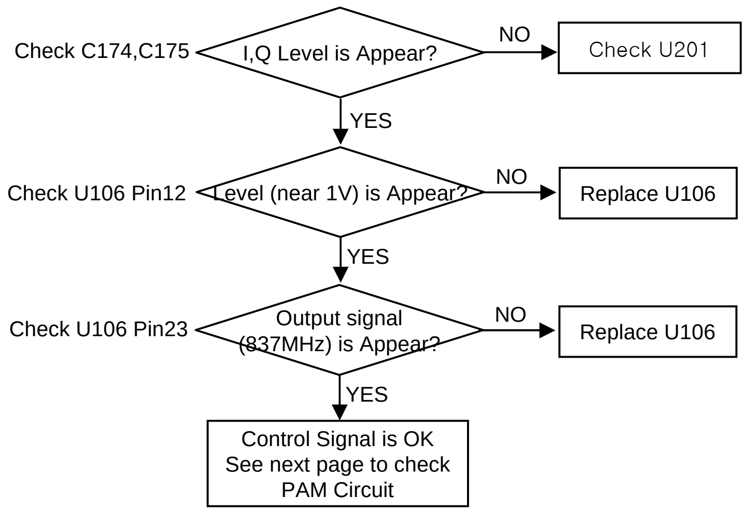


3.2.4 Check RFT6122 Circuit

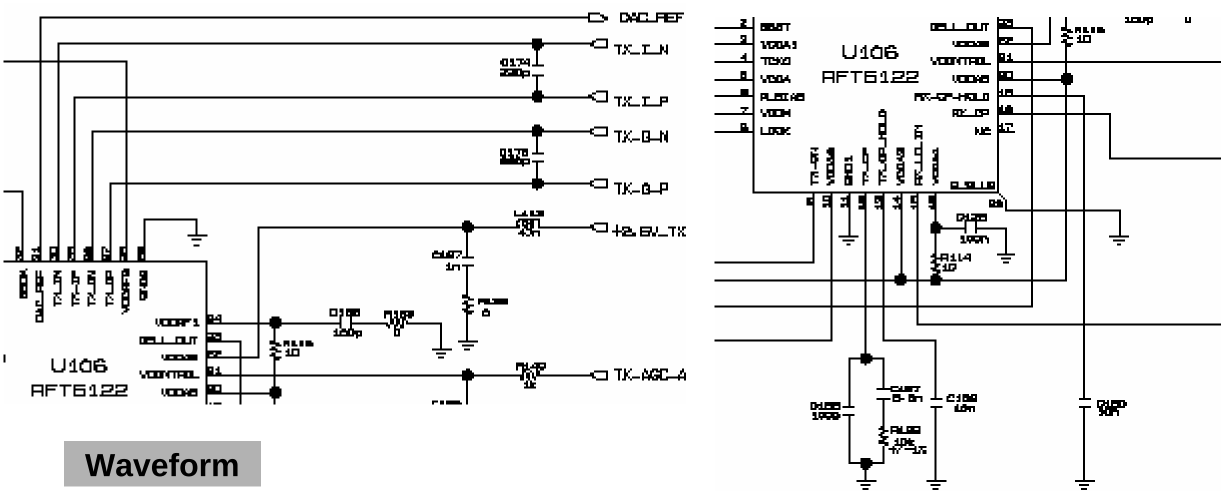
Test Point



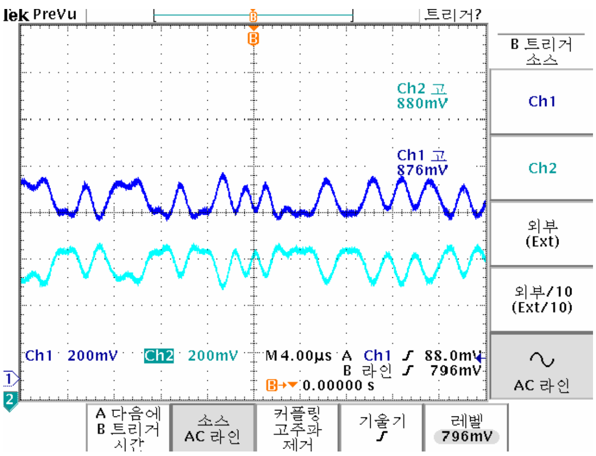
Circuit Flow



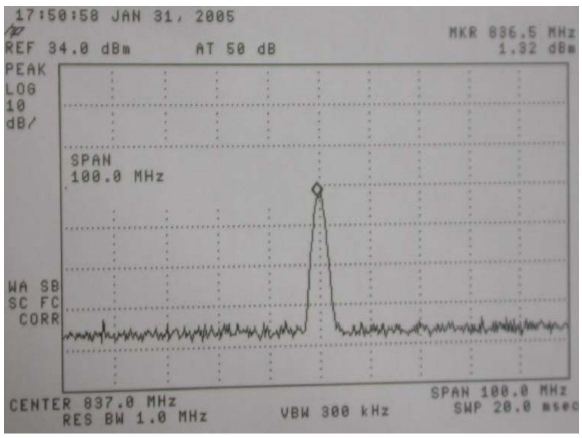
Circuit Diagram



Waveform



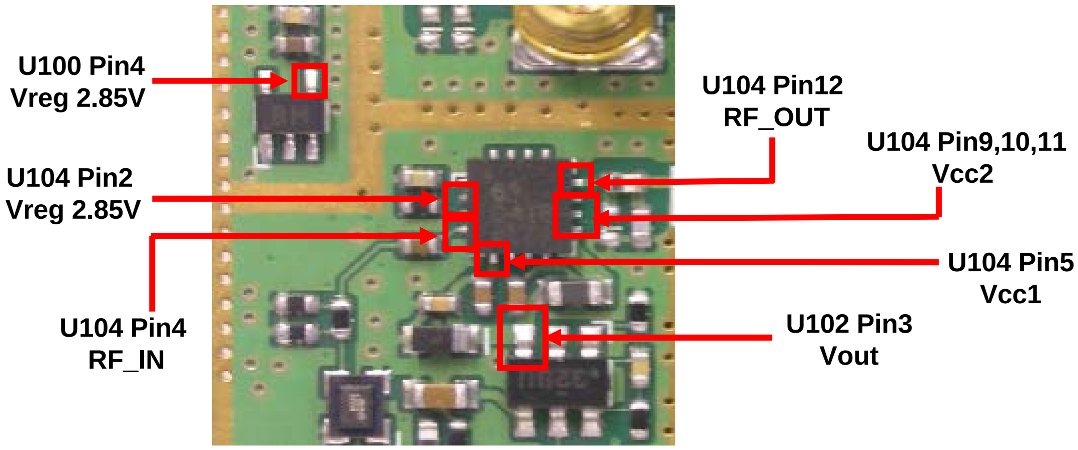
C174,C175 TX_I,Q DATA



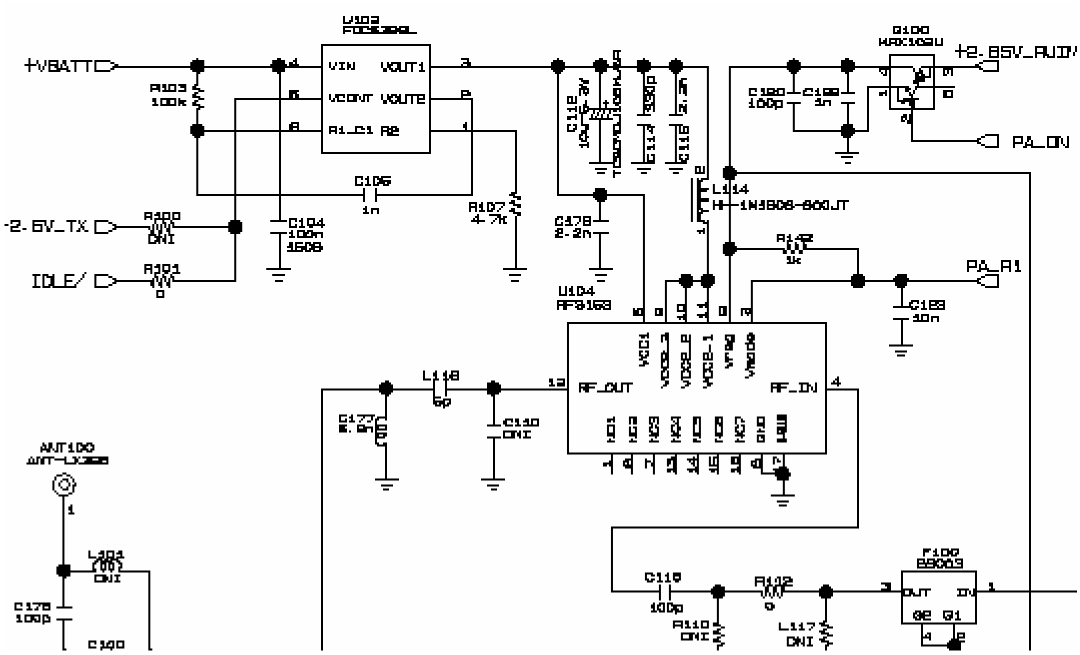
U106 Pin23 CELL_OUT

3.2.5 Check PAM Circuit

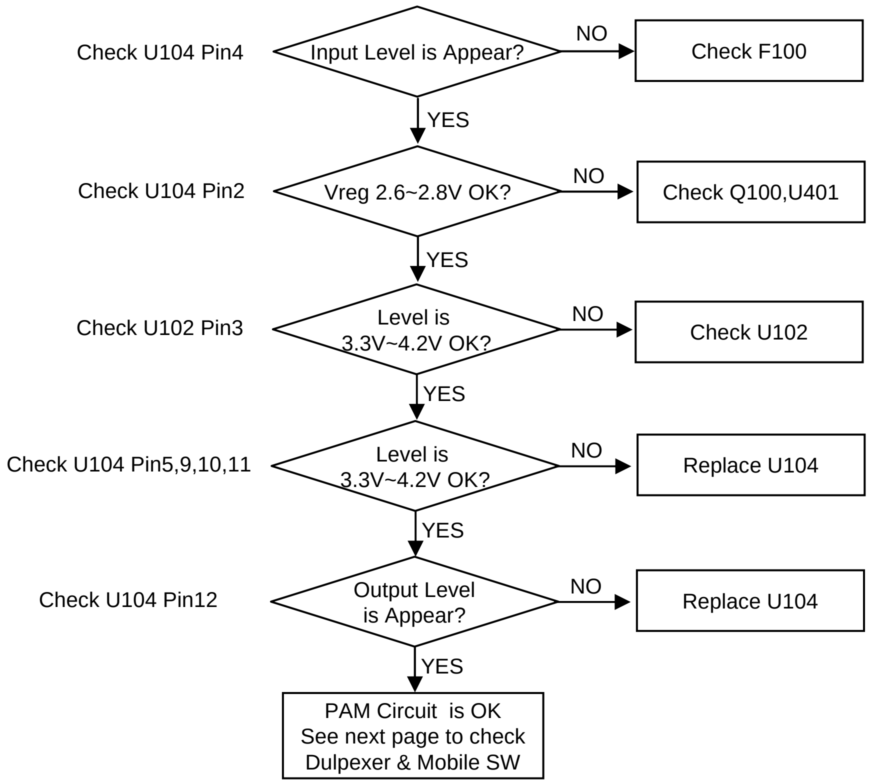
Test Point



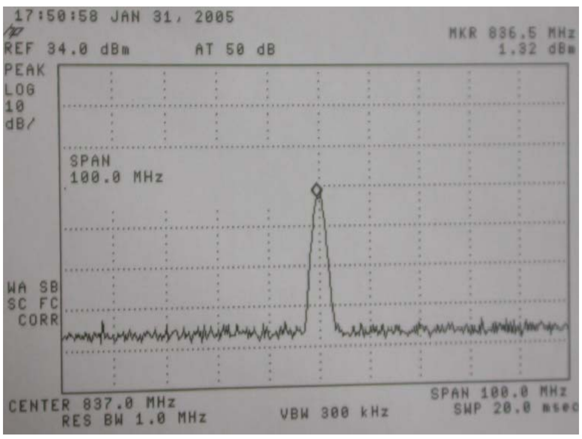
Circuit Diagram



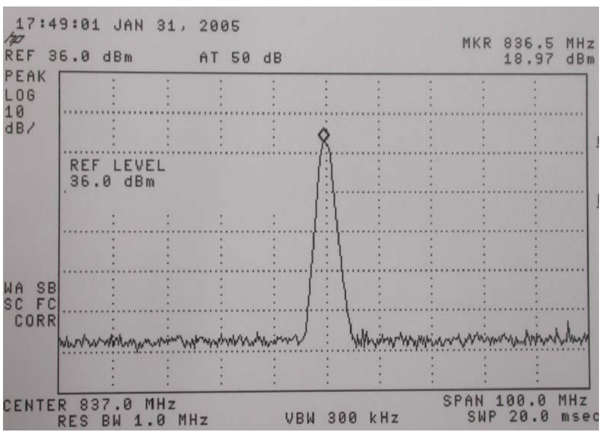
Circuit Flow



Waveform



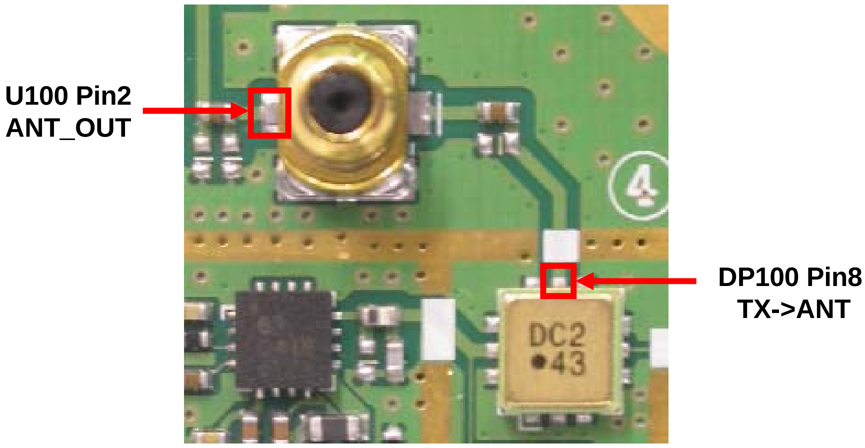
U104 Pin4 RF_IN



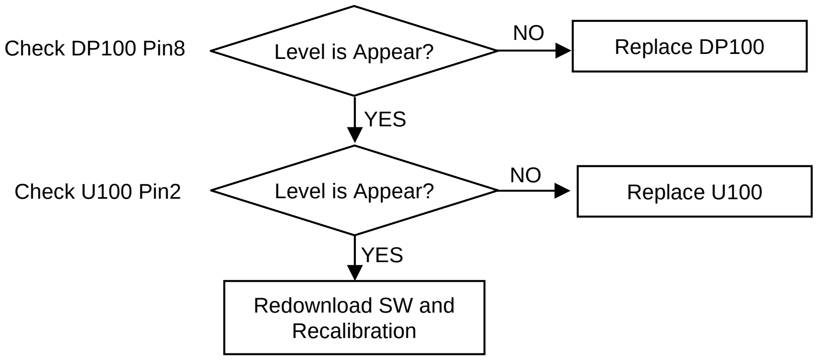
U104 Pin12 RF_OUT

3.2.6 Check Duplexer & Mobile SW

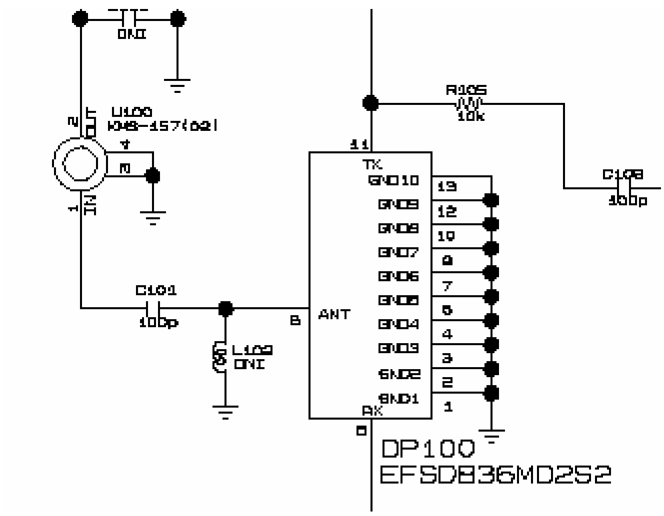
TEST POINT



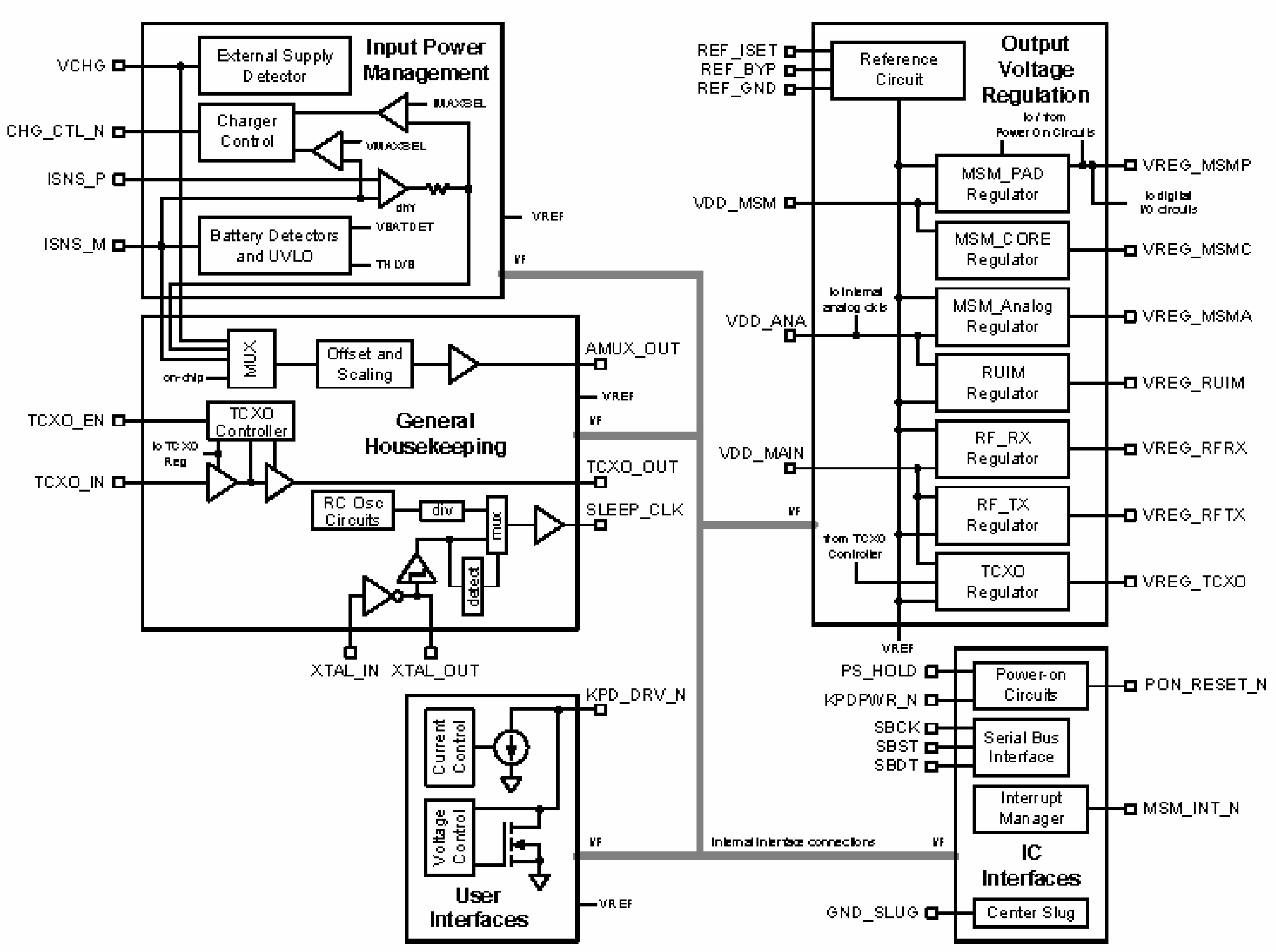
Circuit Flow



Circuit Diagram



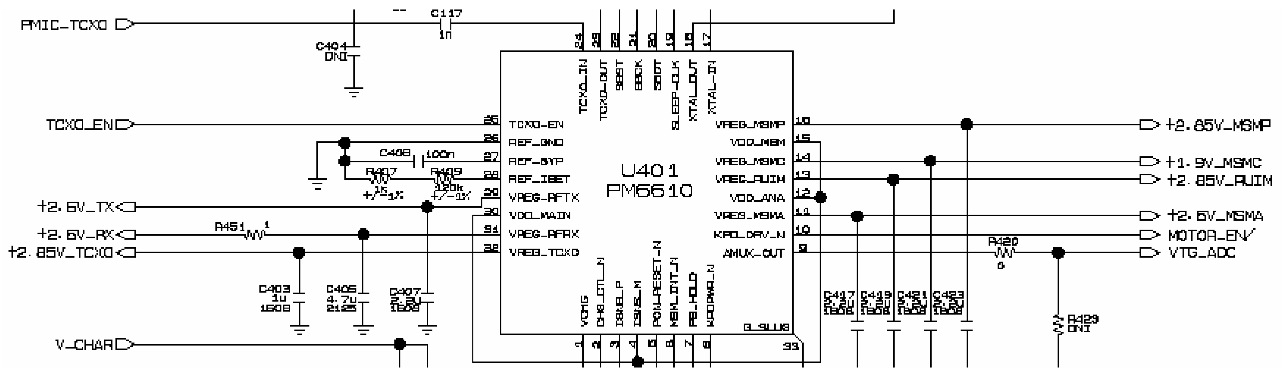
3.3 Logic Part Trouble



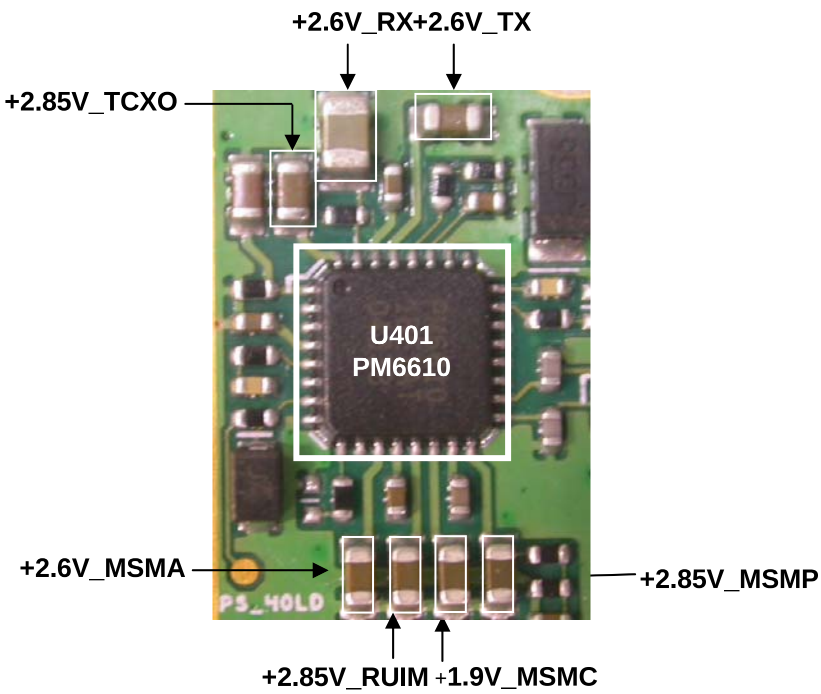
< PM6610 FUNCTIONAL BLOCK DIAGRAM3.3 >

3.3.1 Power On Trouble

Circuit Diagram

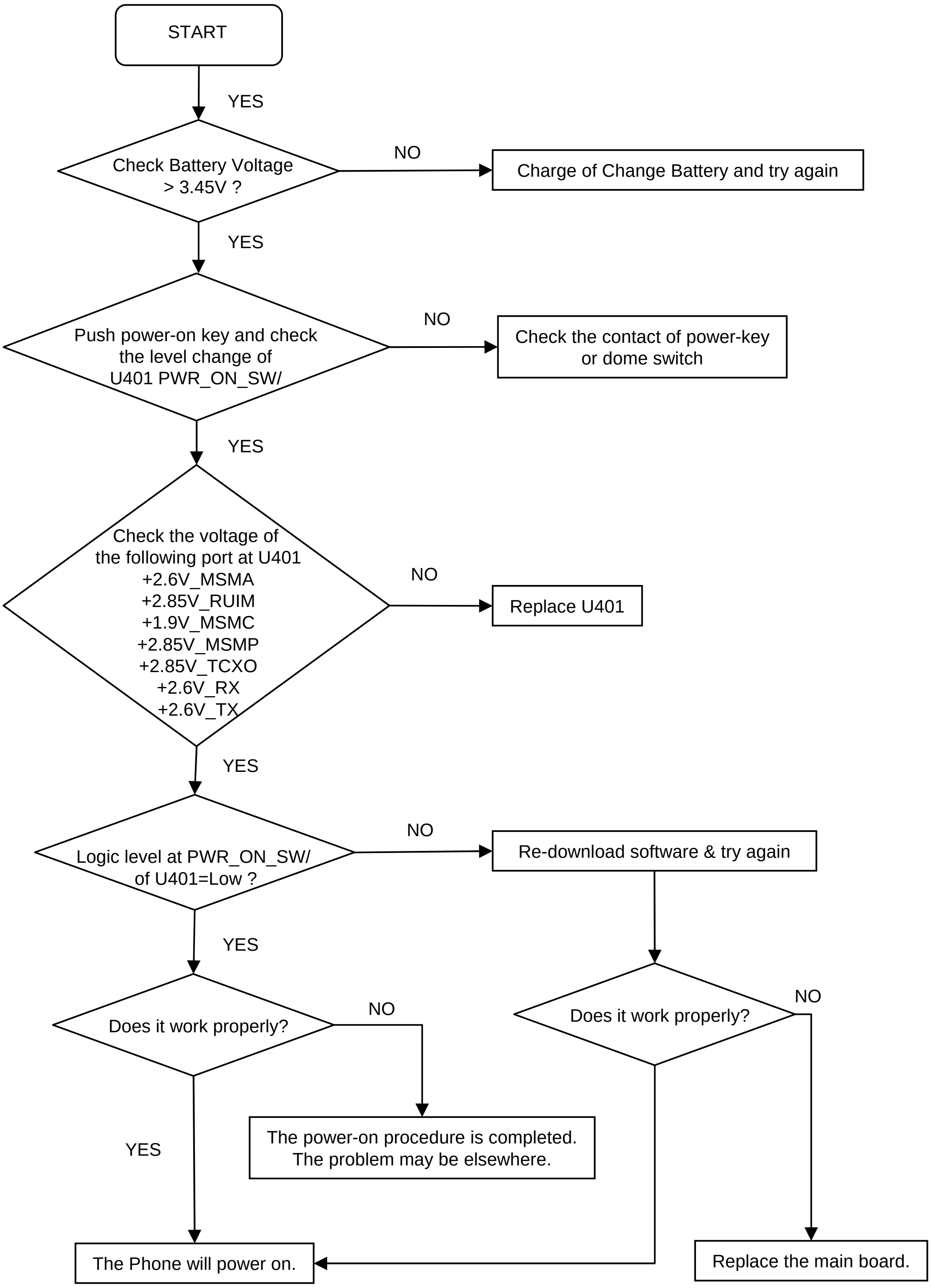


Test Point



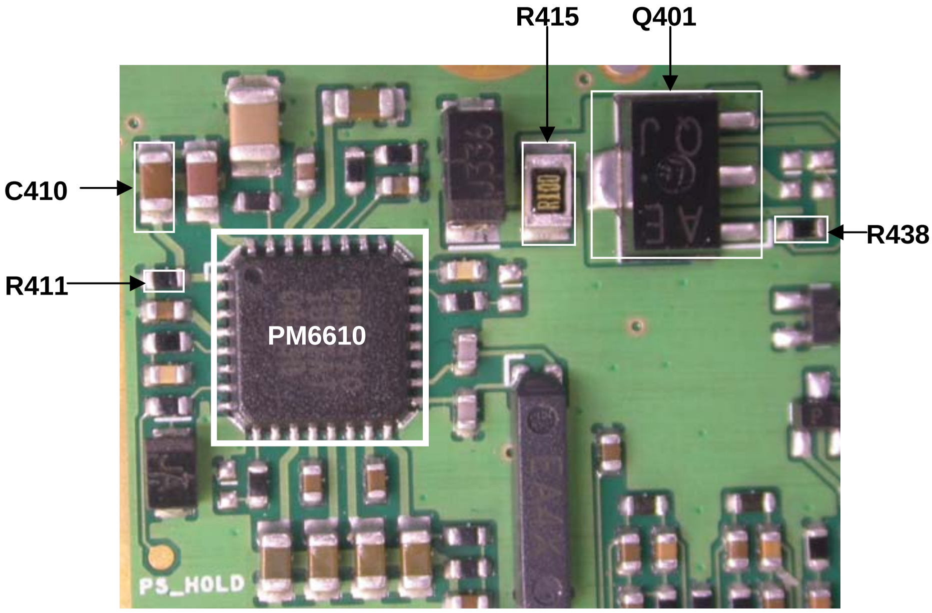
PM6610 POWER MANAGEMENT SECTION

Checking Flow



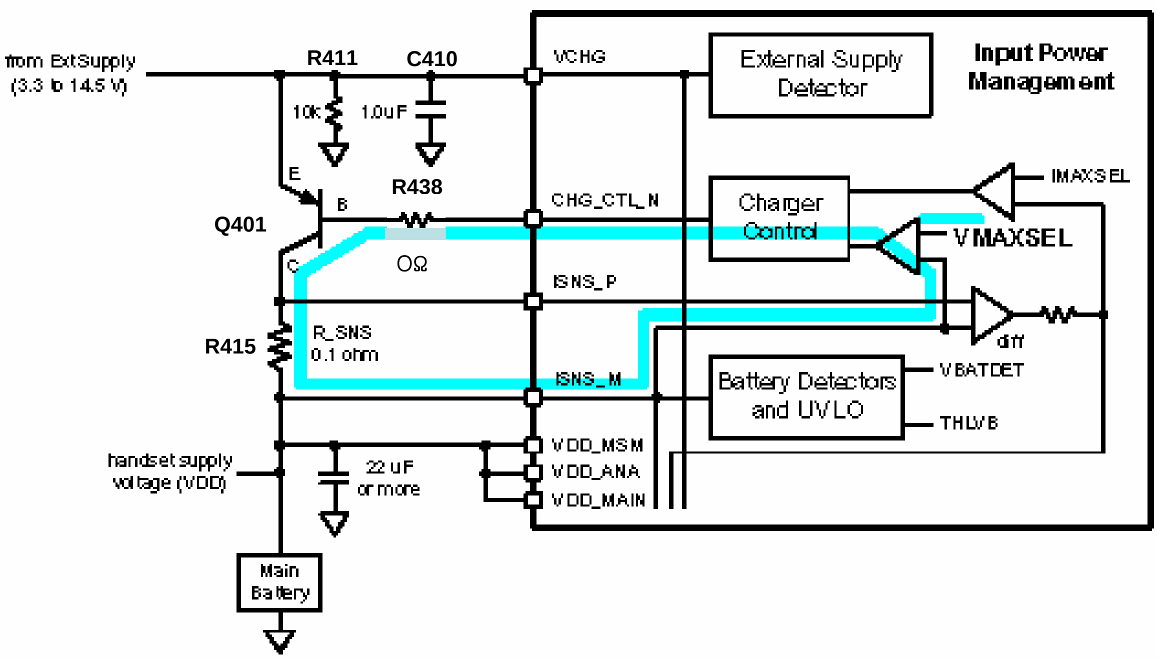
3.3.2 Charging Trouble

Test Points



CHARGER CIRCUIT PART

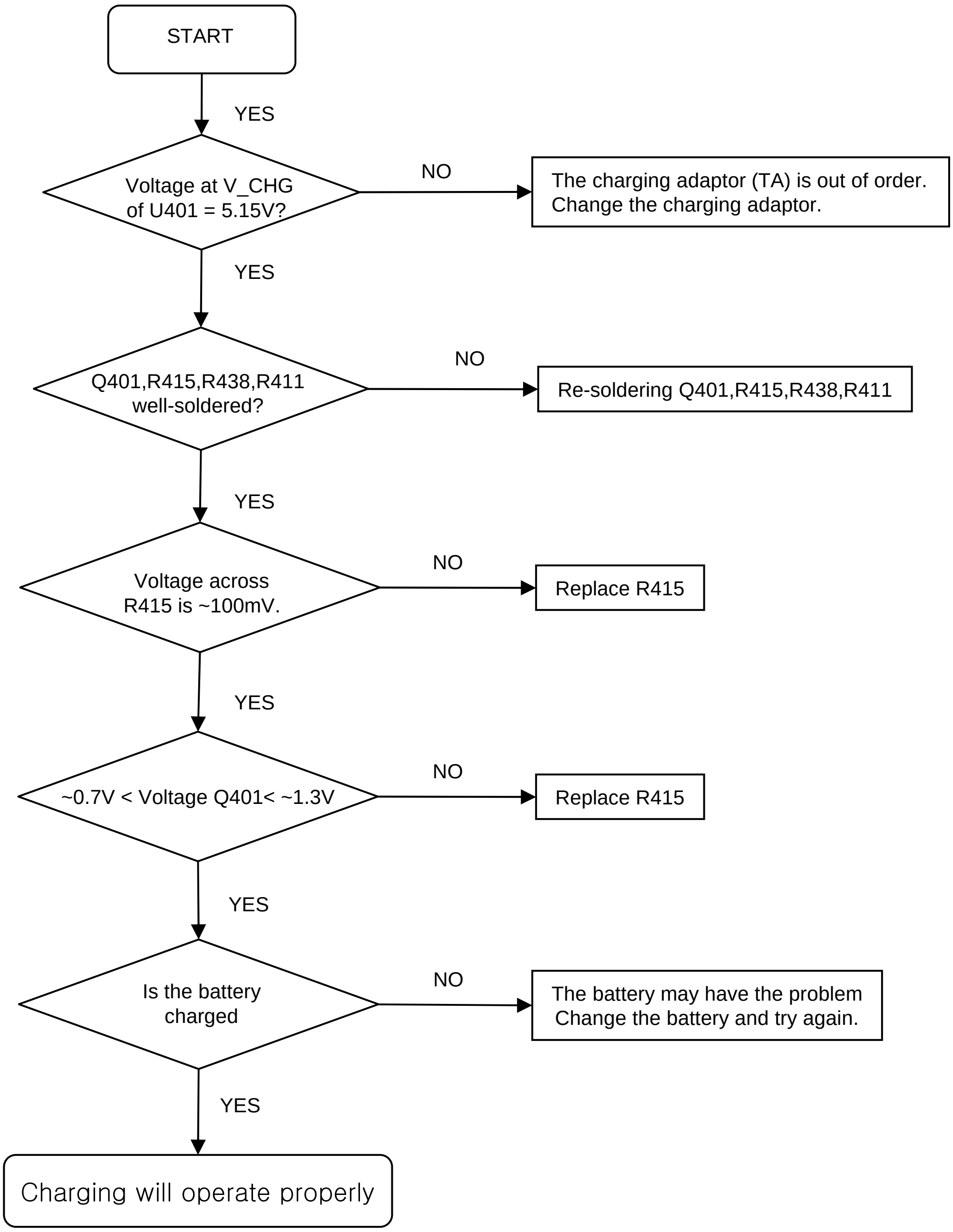
Block & Circuit Diagram



PM6610 CHARGING CONTROL BLOCK

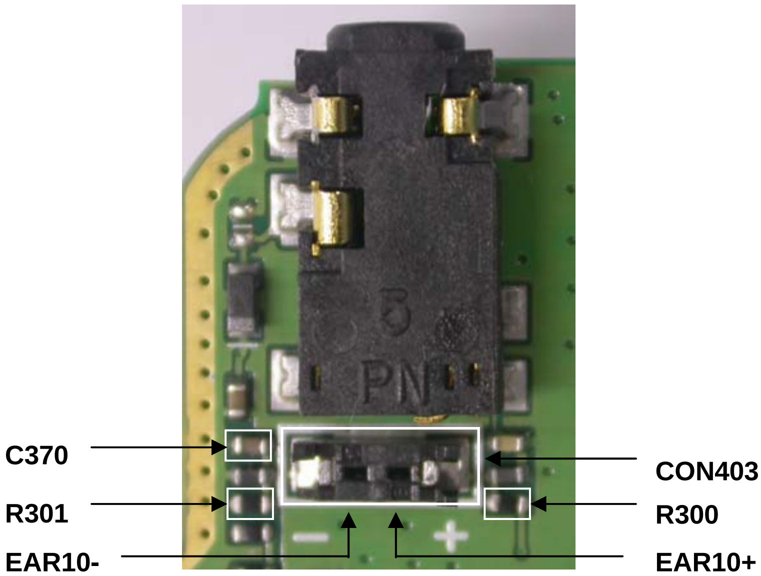
Checking Flow

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



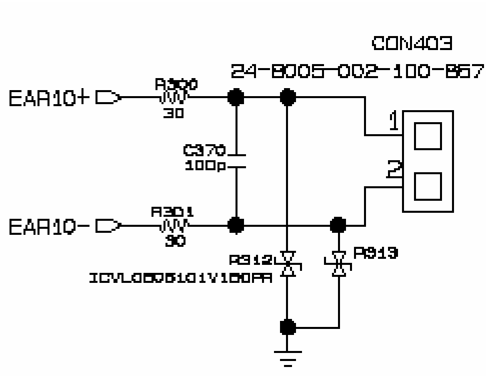
3.3.3 Receiver Trouble

Test Points



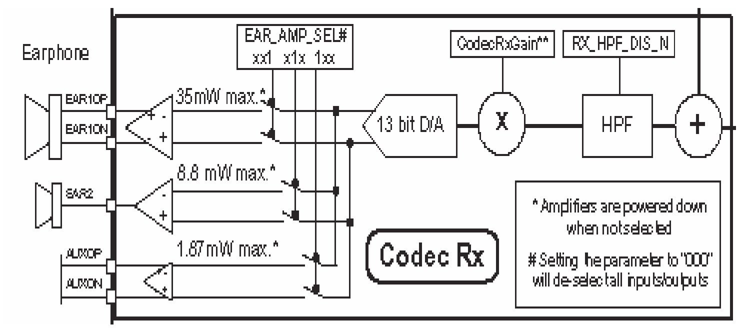
RECEIVER CONNECTOR PART

Circuit Diagram



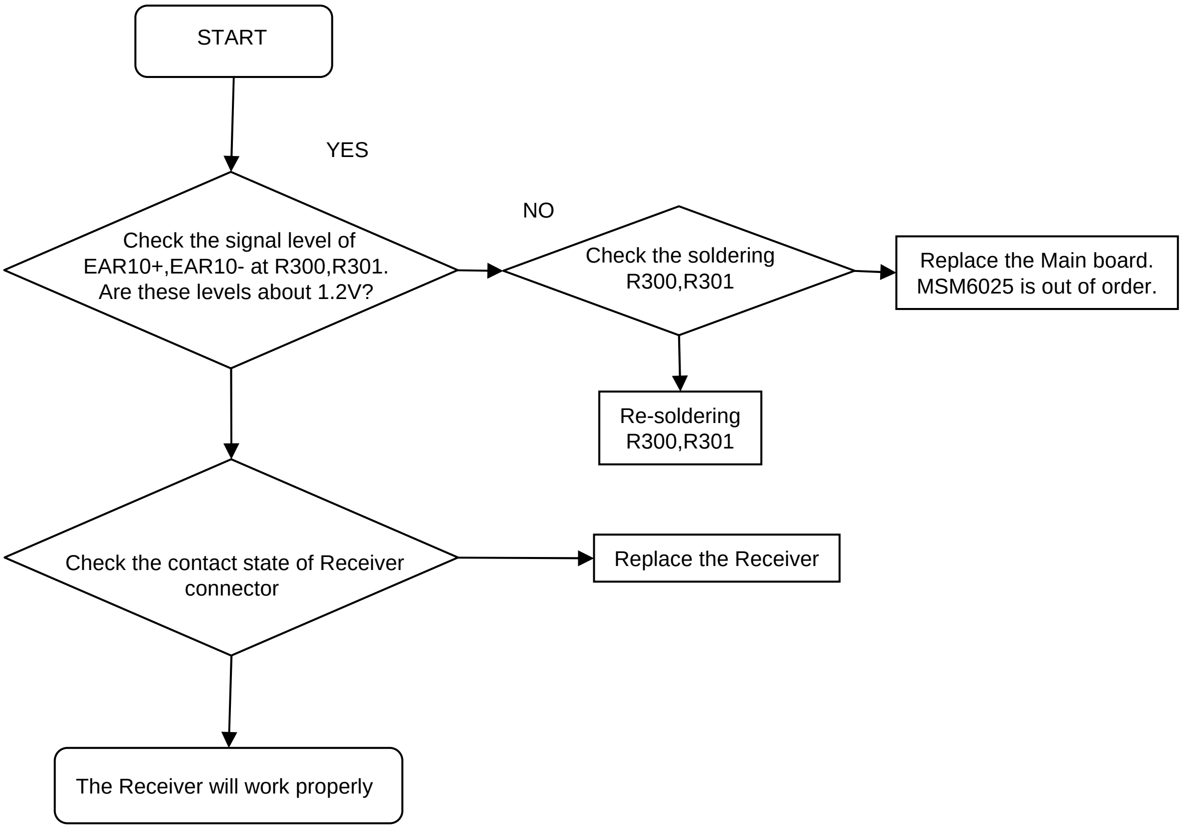
RECEIVER PART

Block Diagram



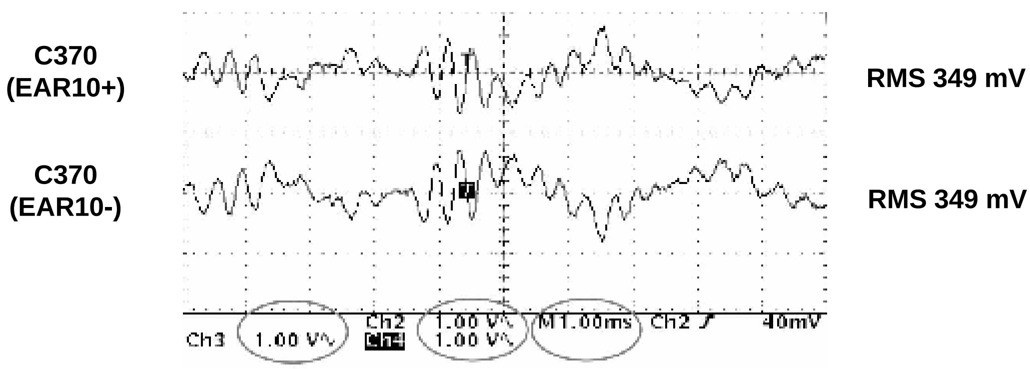
RECEIVER CODEC BLOCK

Checking Flow



Waveform

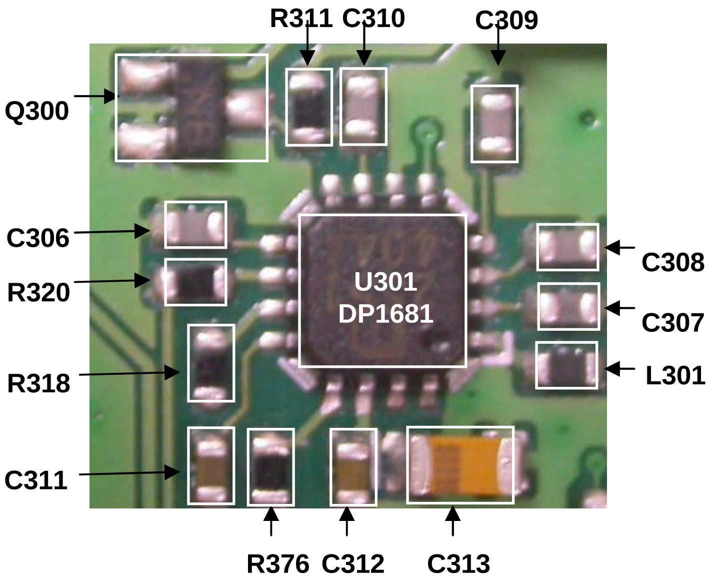
AC voltage of the signals



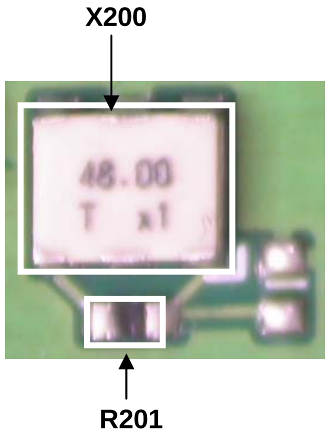
AC VOLTAGE OF THE SIGNALS WAVEFORM

3.3.4 USB Interface Trouble

Test Points

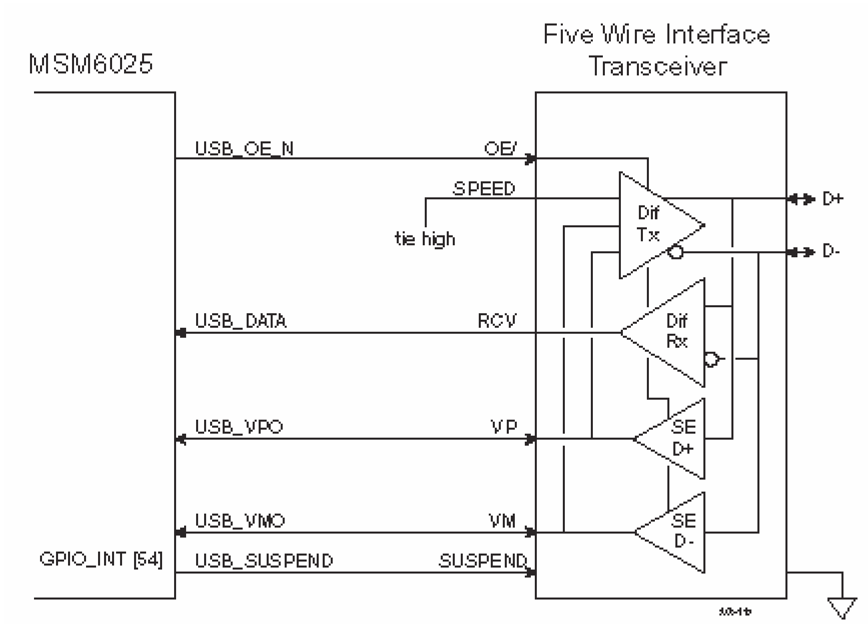


USB TRANCEIVER PART



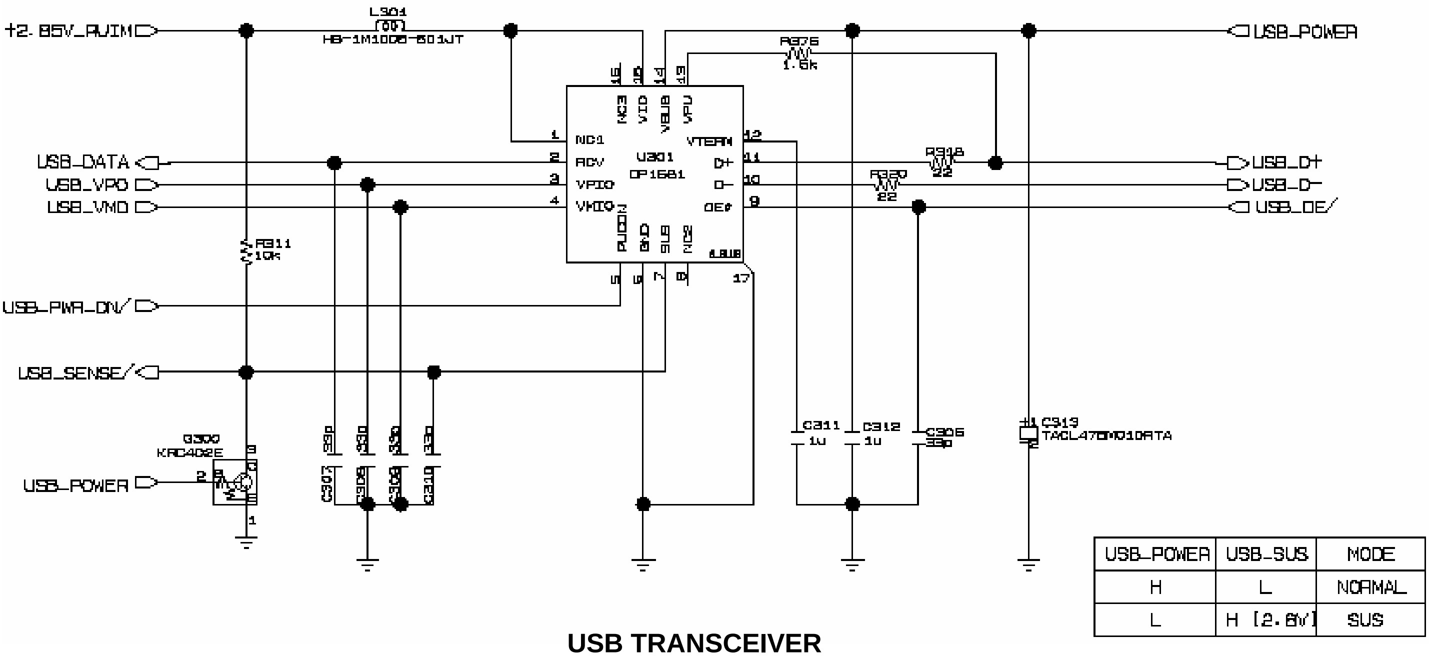
USB RESONATOR

Block Diagram



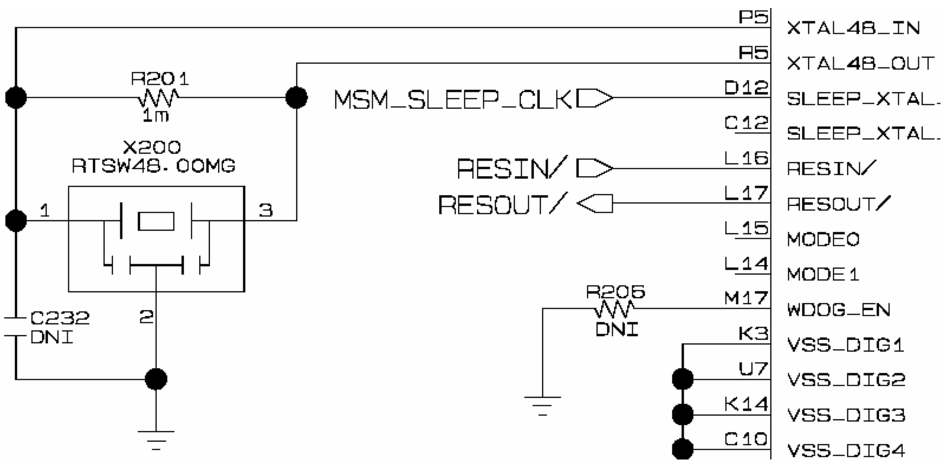
Connecting MSM6025 to Five-Wire Interface Transceiver

Circuit Diagram



USB_POWER	USB_SUS	MODE
H	L	NORMAL
L	H [2.6V]	SUS

USB TRANSCEIVER

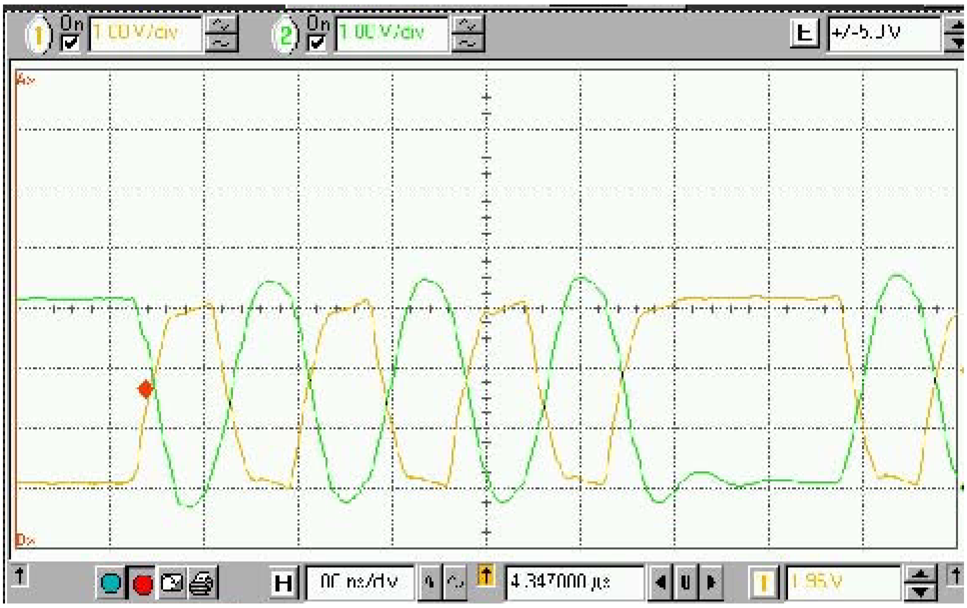


USB RESONATOR

Waveform

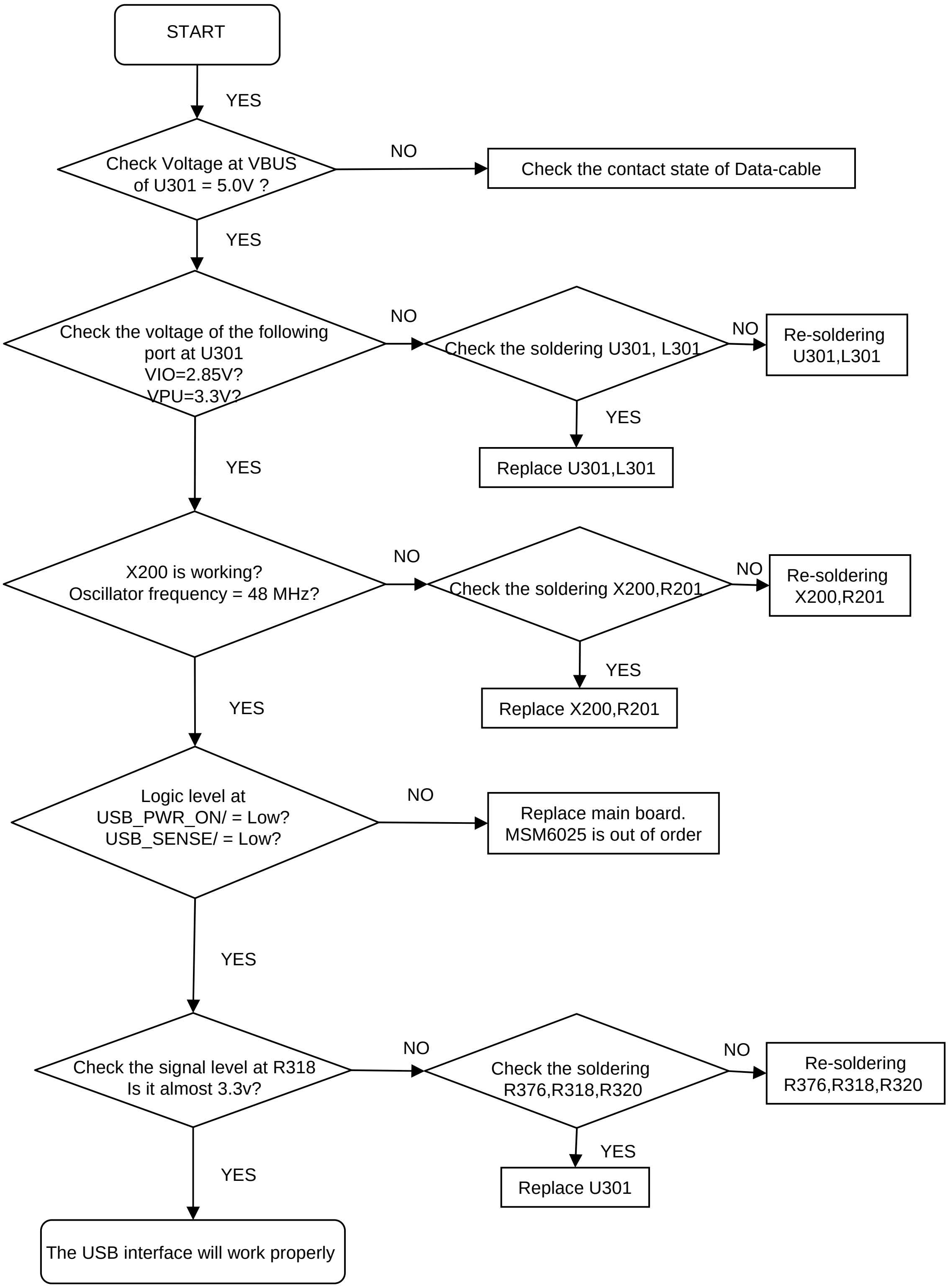
D+

D-



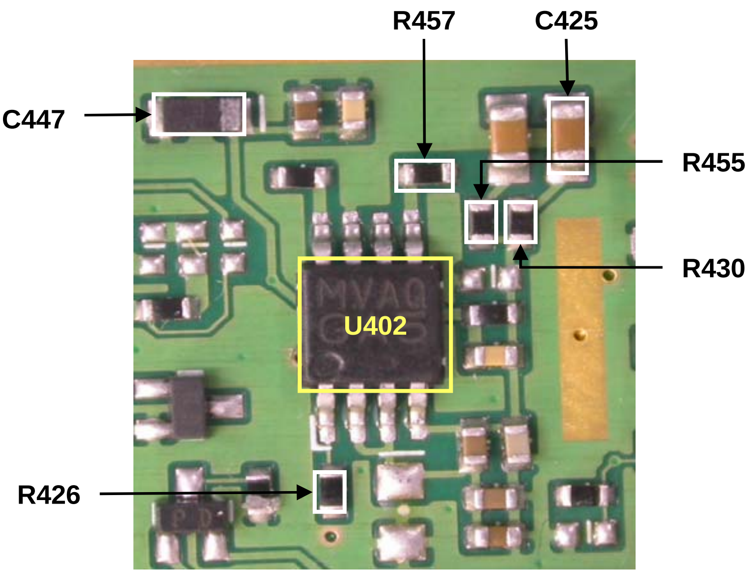
USB Interface waveform

Checking Flow

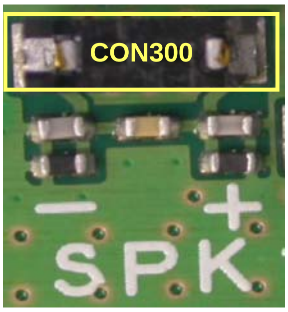


3.3.5 Speaker Trouble

Test points

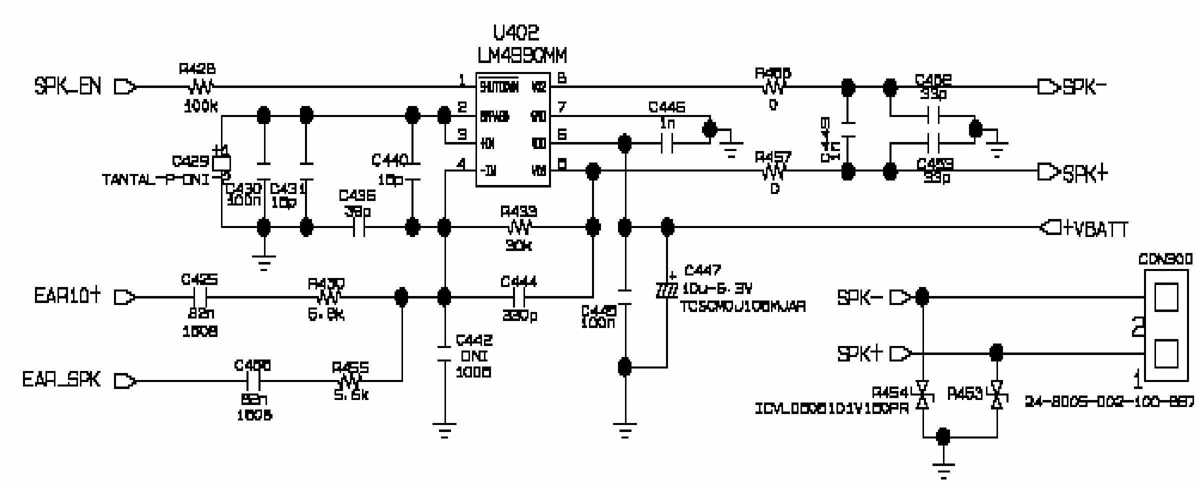


SPK PHONE AUDIO AMP PART



SPK CONNECTOR PART

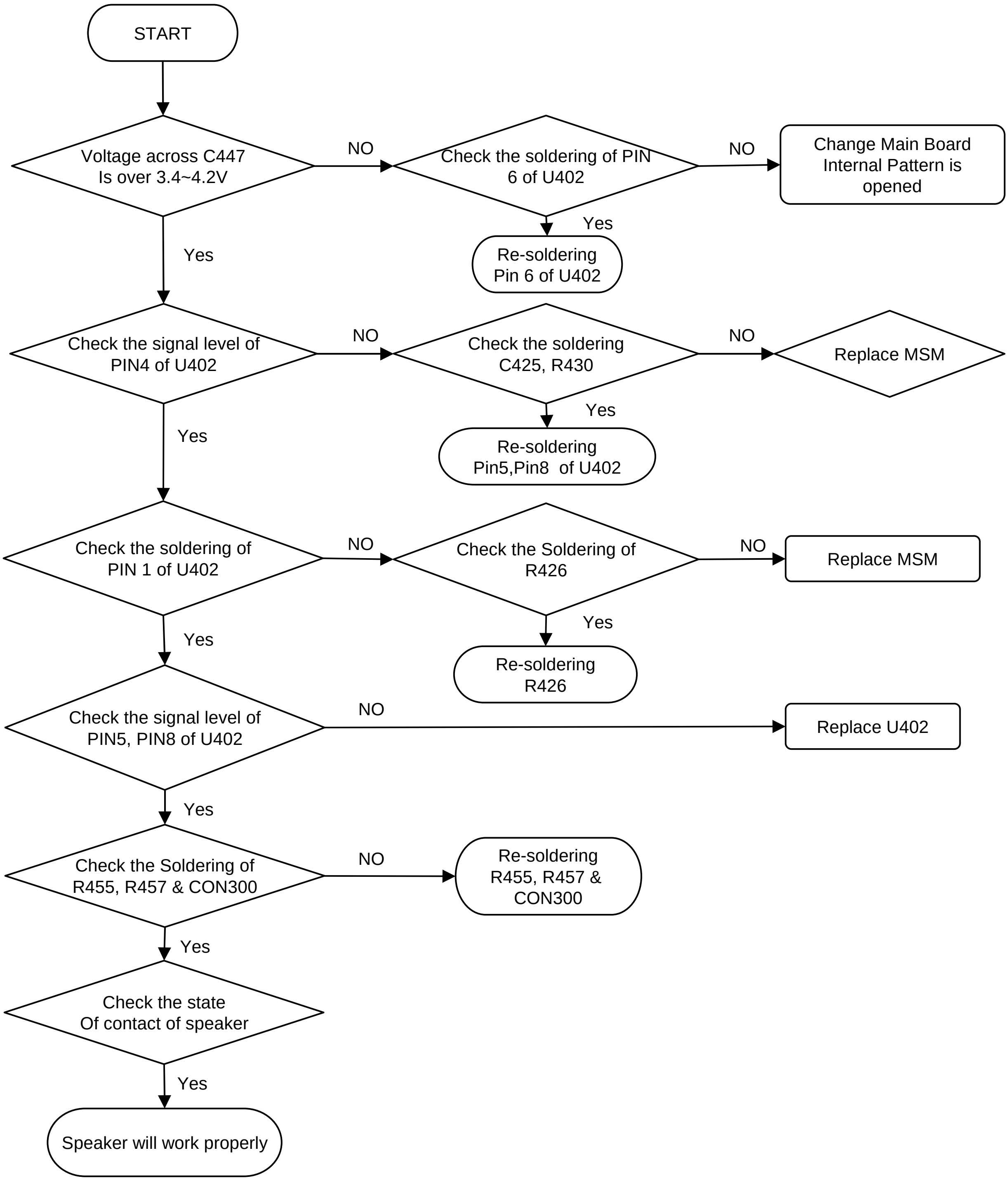
Circuit Diagram



SPK PHONE AUDIO AMP

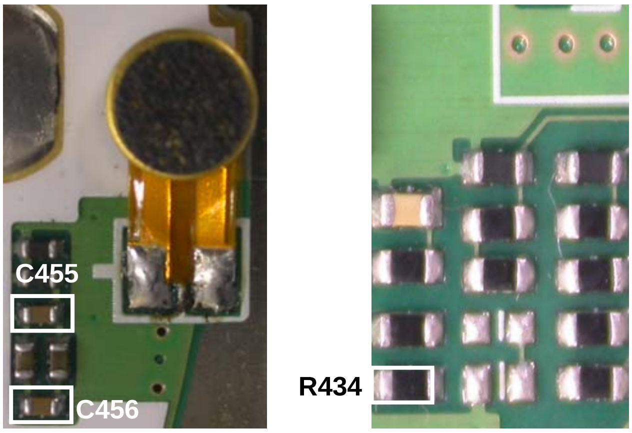
Checking Flow

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

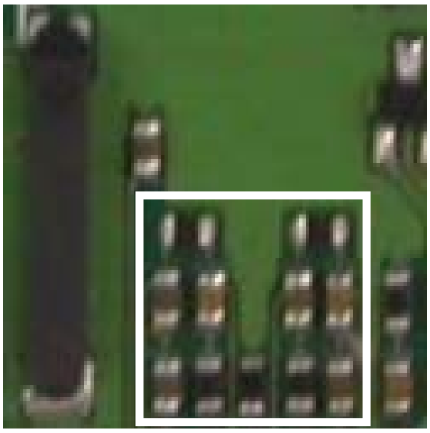


3.3.6 MIC Trouble

Test points

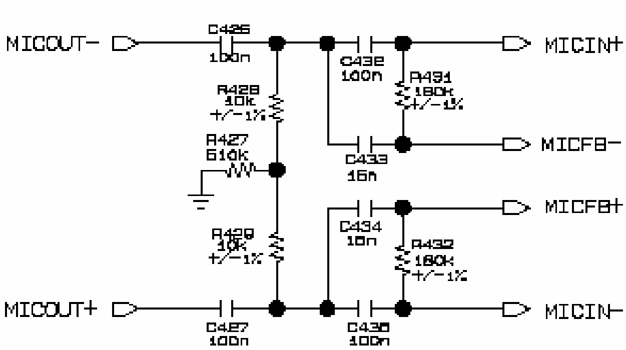


MIC & MIC BIAS PART

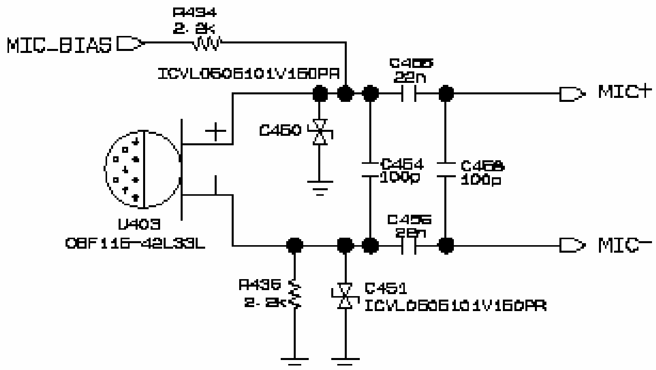


MIC FILTER PART

Circuit Diagram



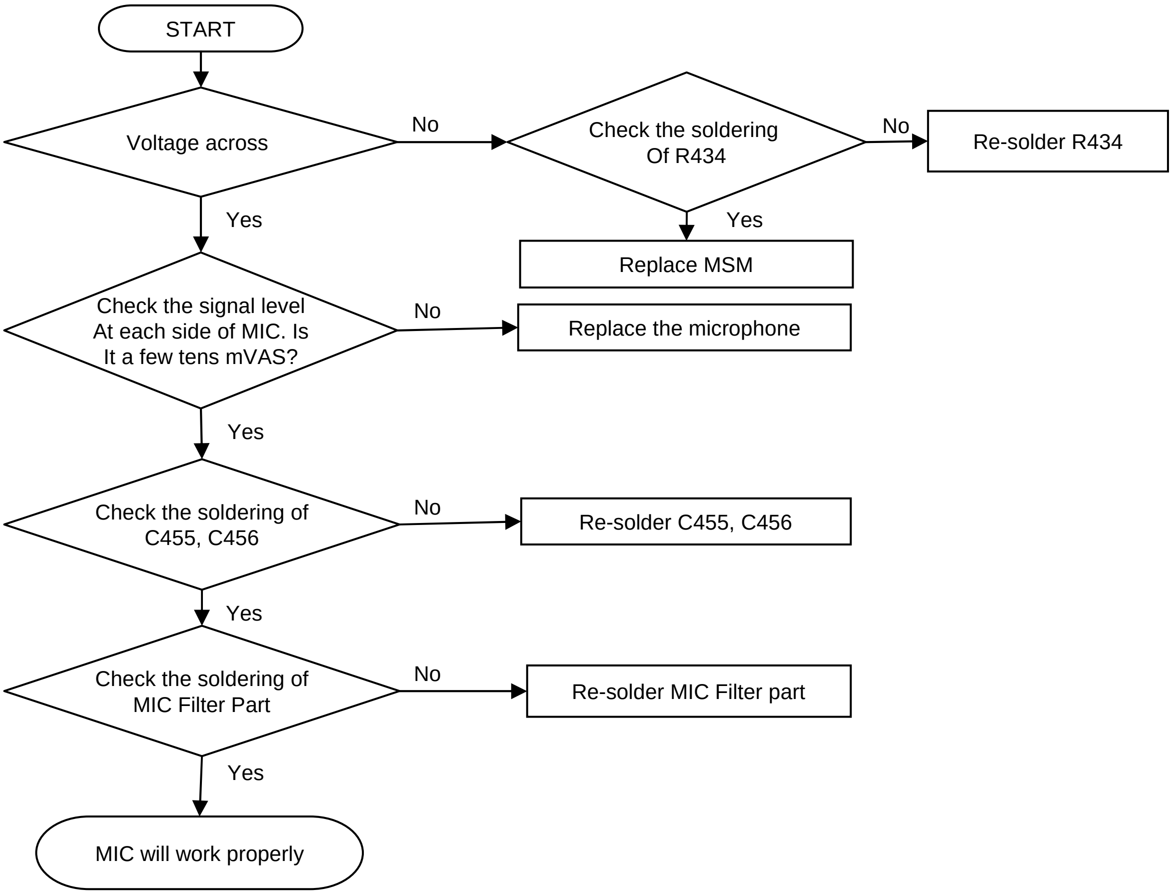
MIC FILTER



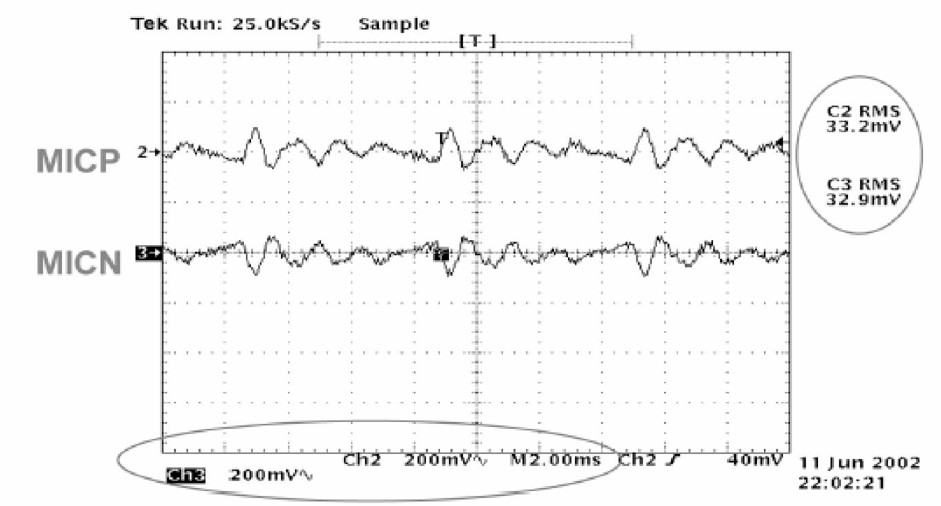
MIC

Checking Flow

SETTING : After initialize 5515C, Test Cellular

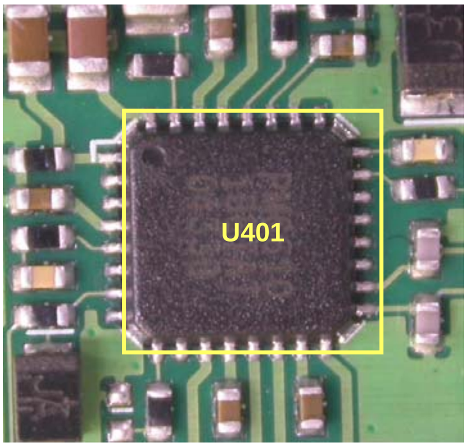


Waveform

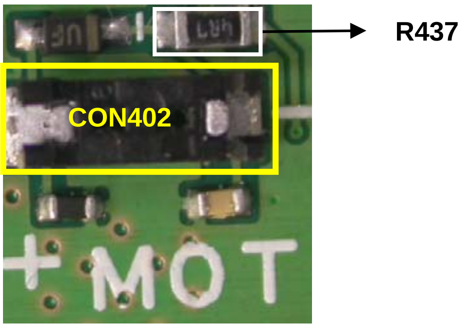


3.3.7 Vibrator Troble

Checking Flow

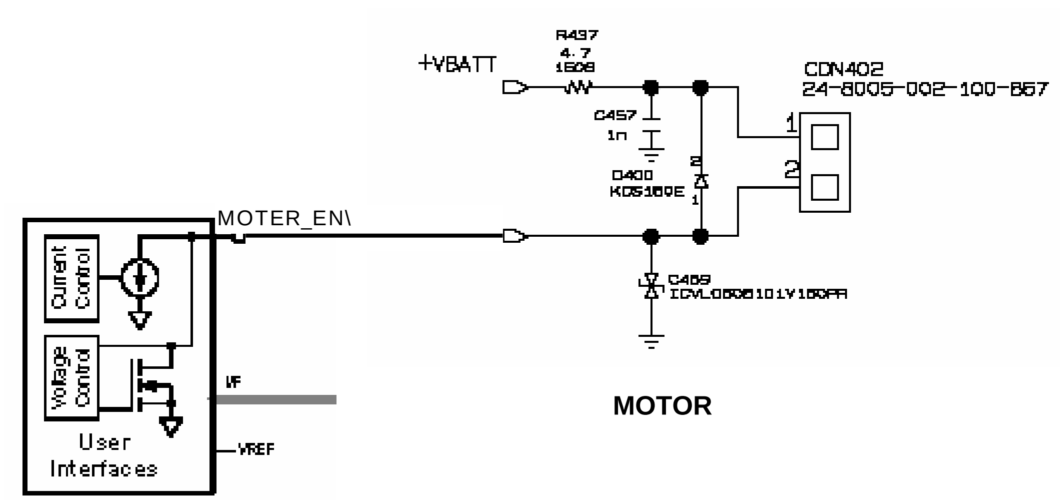


PM6610 PART



MOTOR CONNECTOR PART

Block & Circuit Diagra

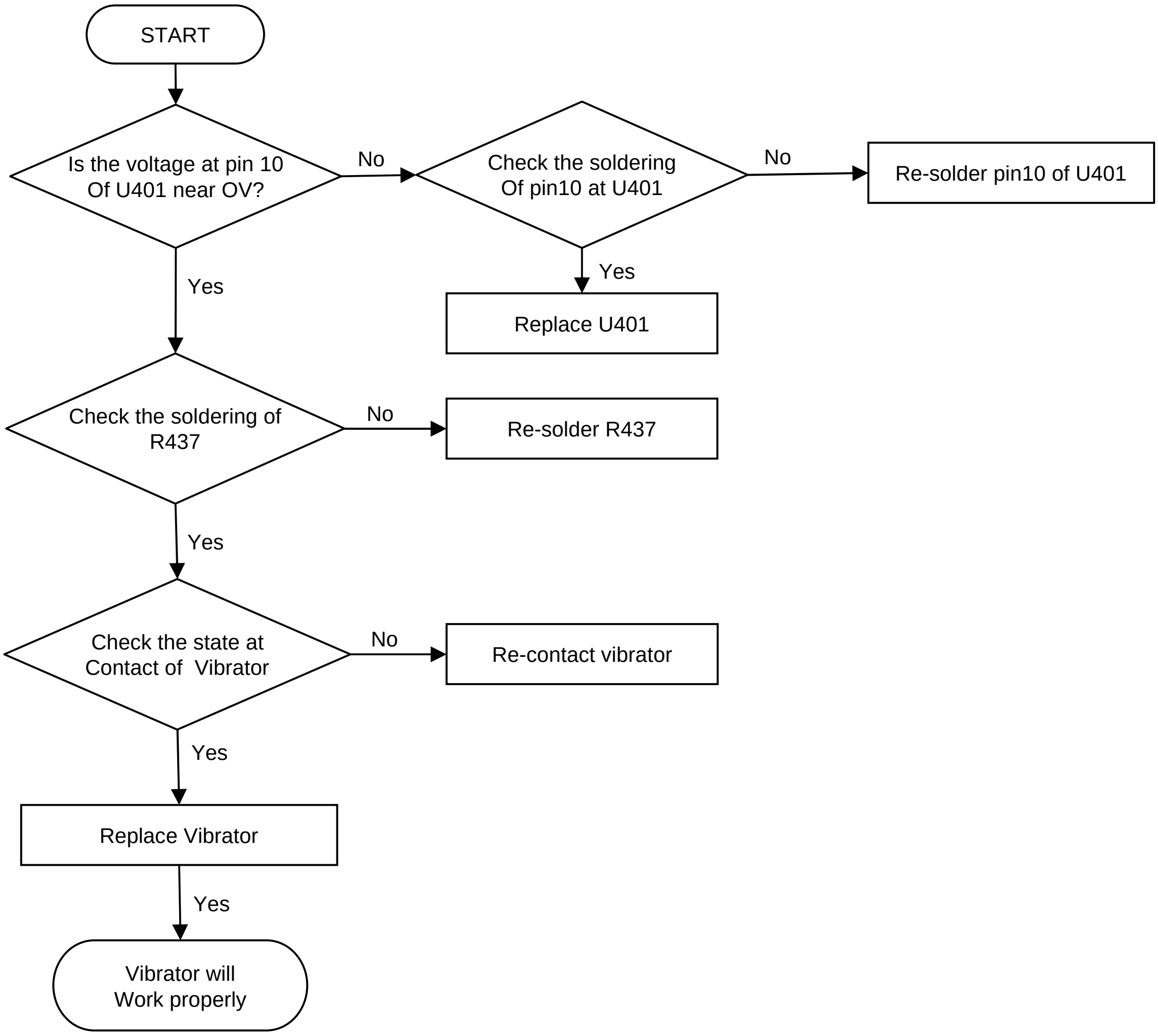


MOTOR

PM6610 VIBRATION CONTROL BLOCK

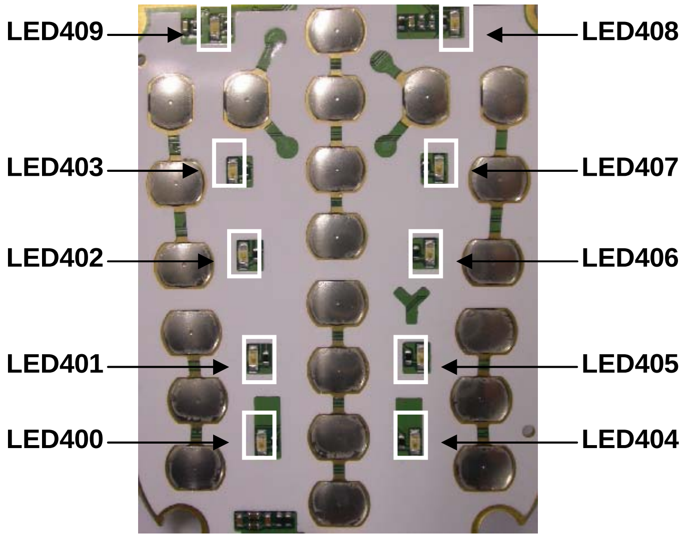
Checking Flow

SETTING : “Vibrator on” at Sounds of test menu



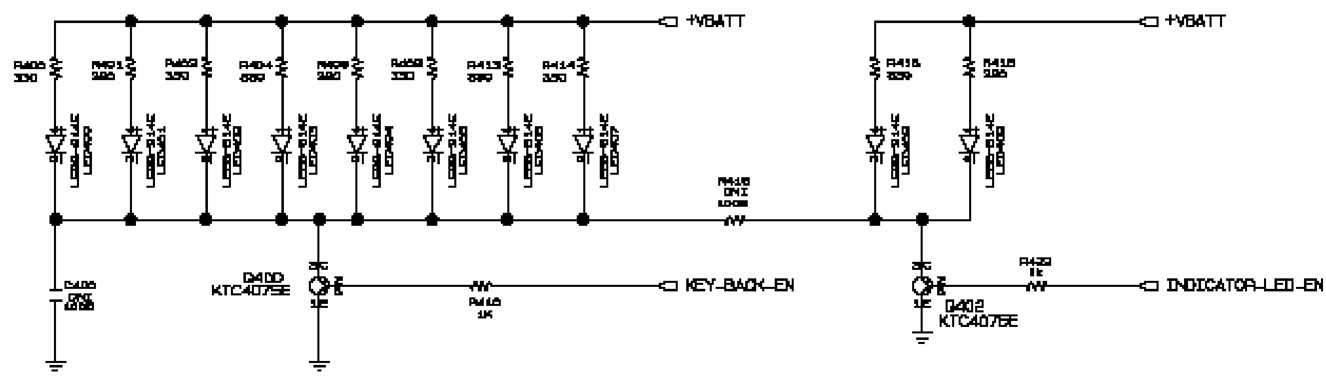
3.3.8 Key Backlight LED Trouble

Test Points



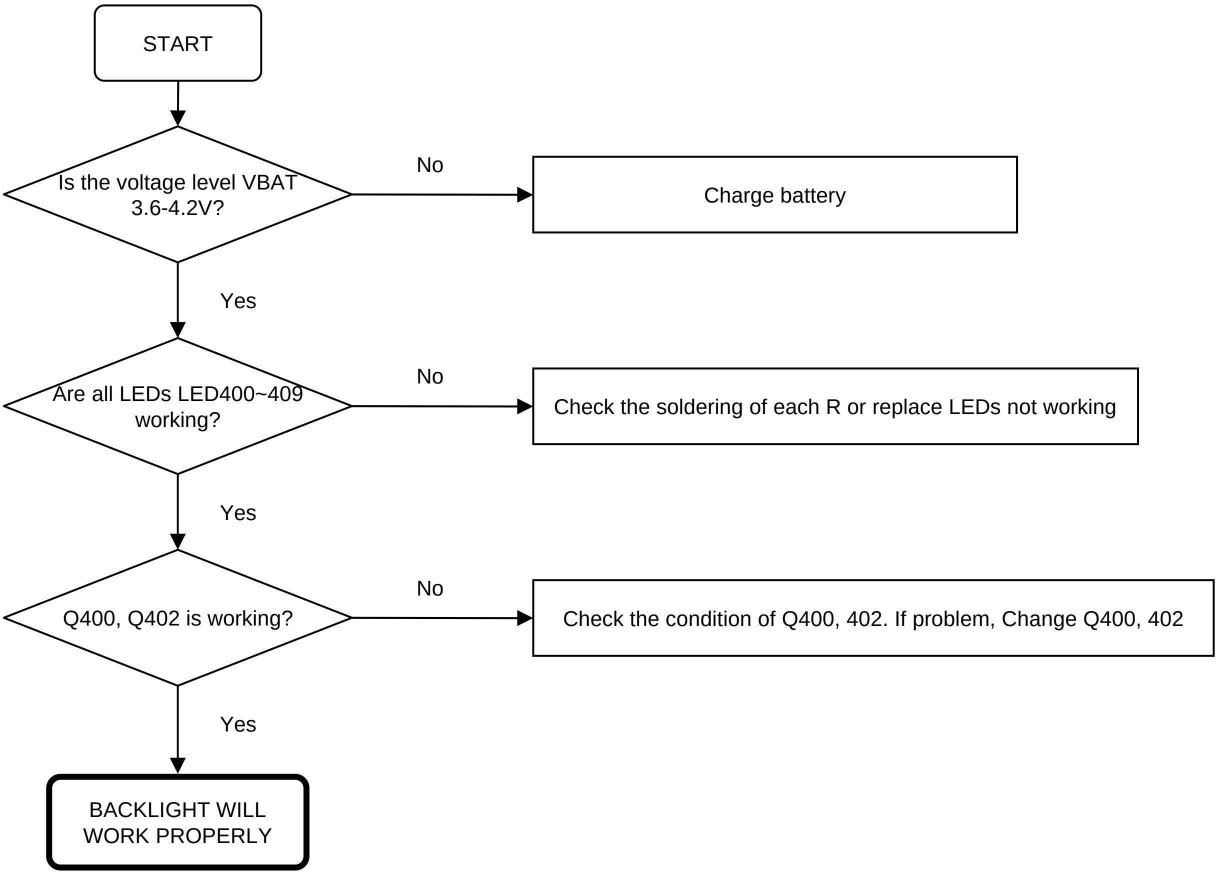
KEYPAD & INDICATOR LIGHT PART

Circuit Diagram



KEYPAD & INDICATOR LIGHT

Checking Flow

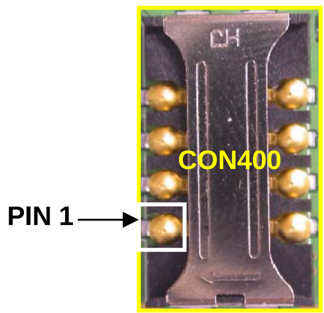


3.3.9 UIM Detect Trouble

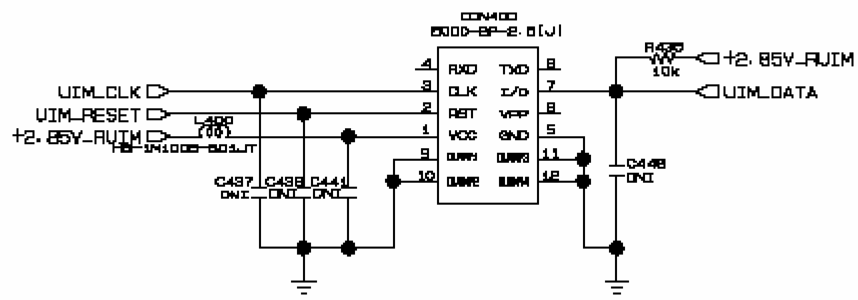
SETTING : Insert UIM CON400, and power on.

Test Points

Circuit Diagram

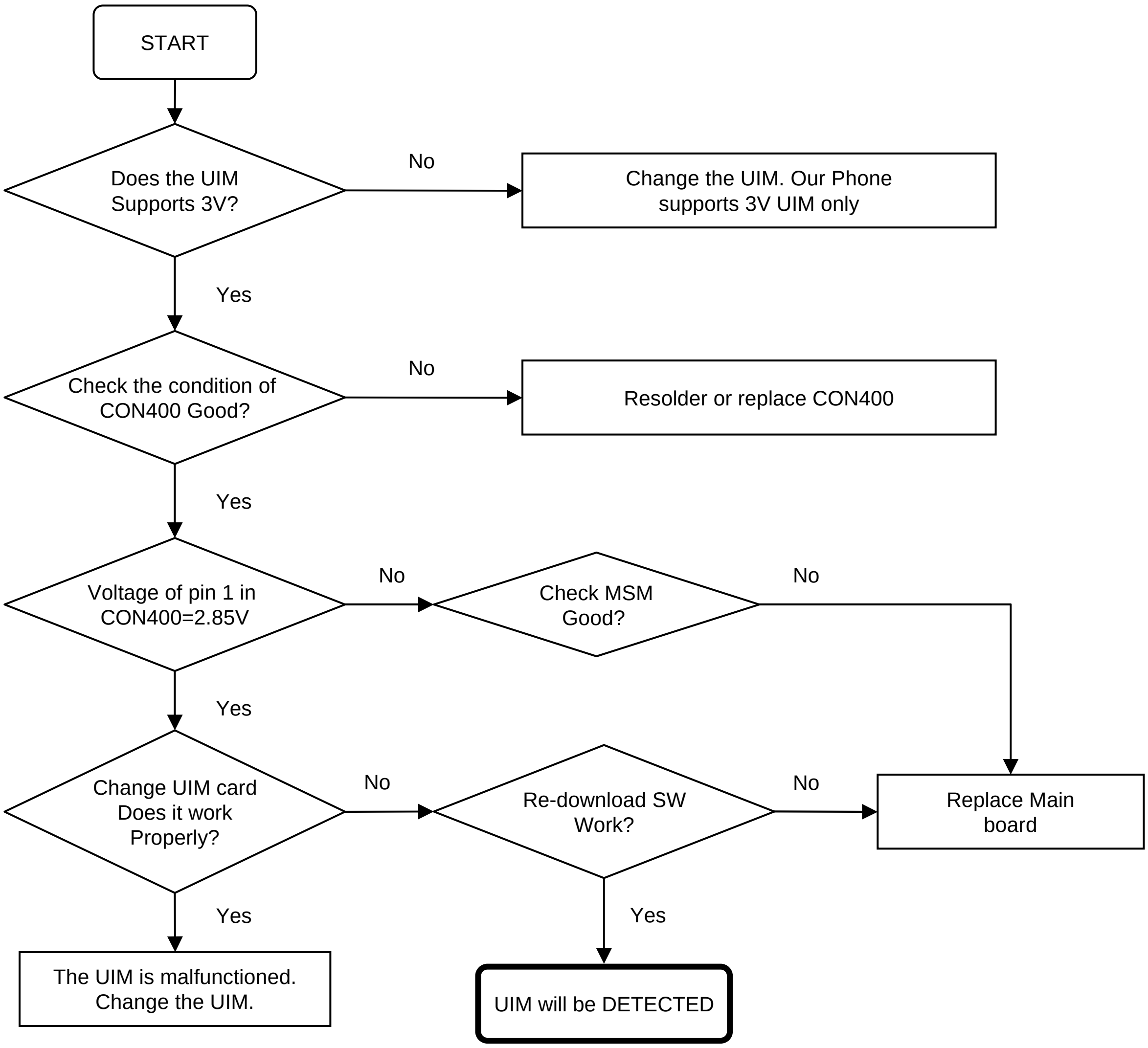


UIM SOCKET PART



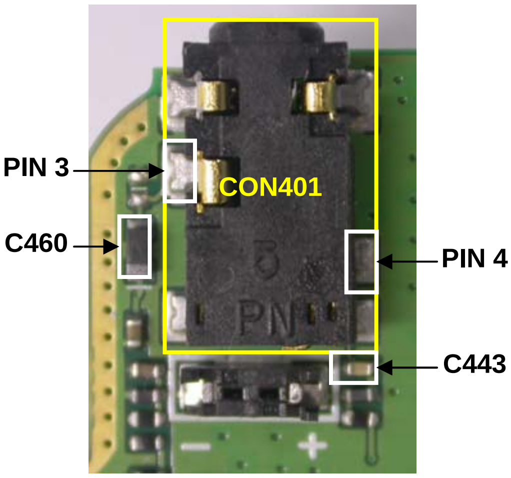
UIM SOCKET

Checking Flow

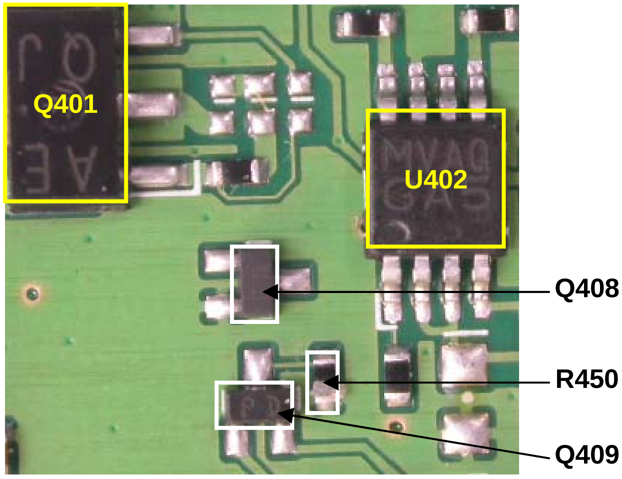


3.3.10 Earphone Trouble

Test Points

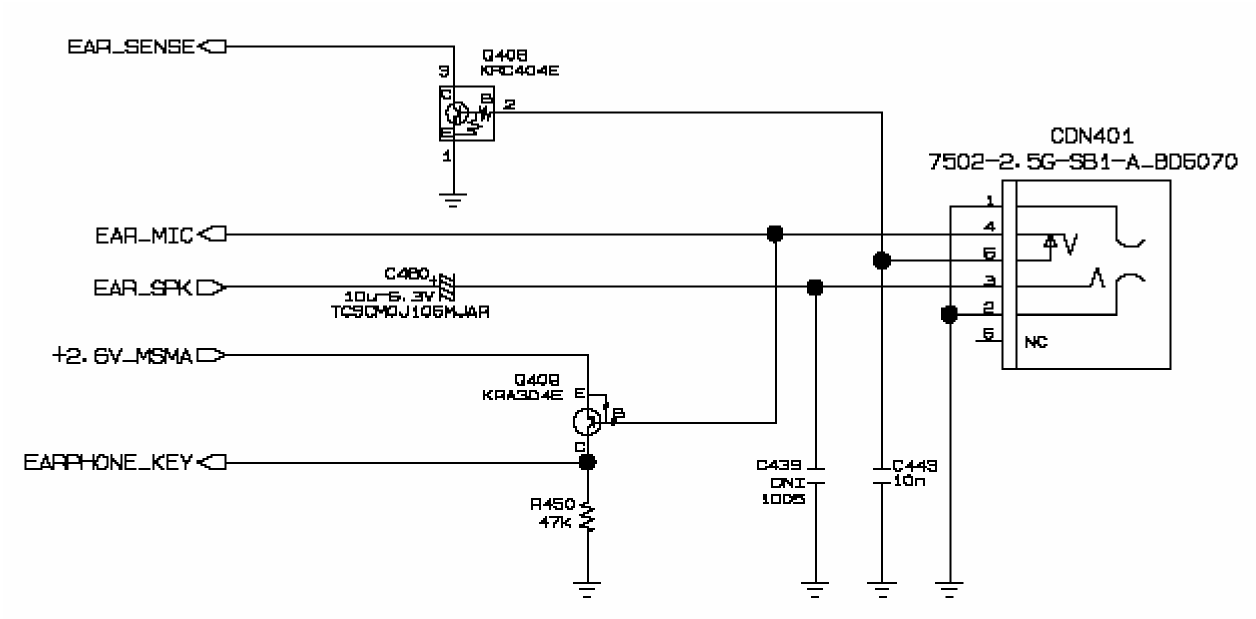


EAR MIC JACK & RADIO PART

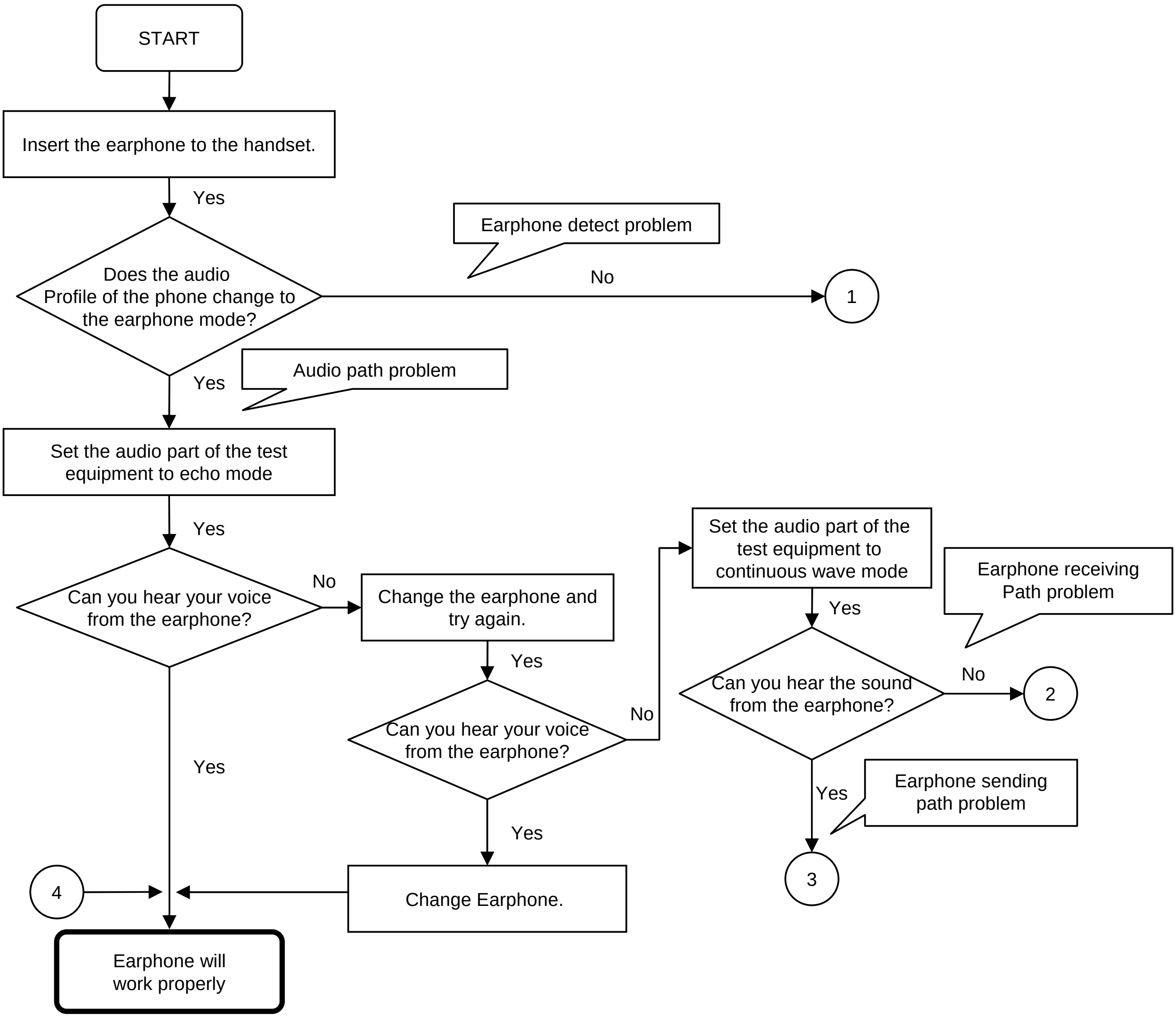


EAR MIC JACK & RADIO

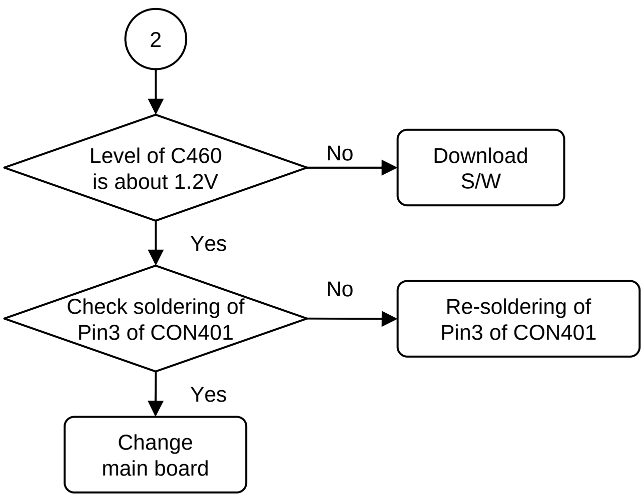
Circuit Diagram



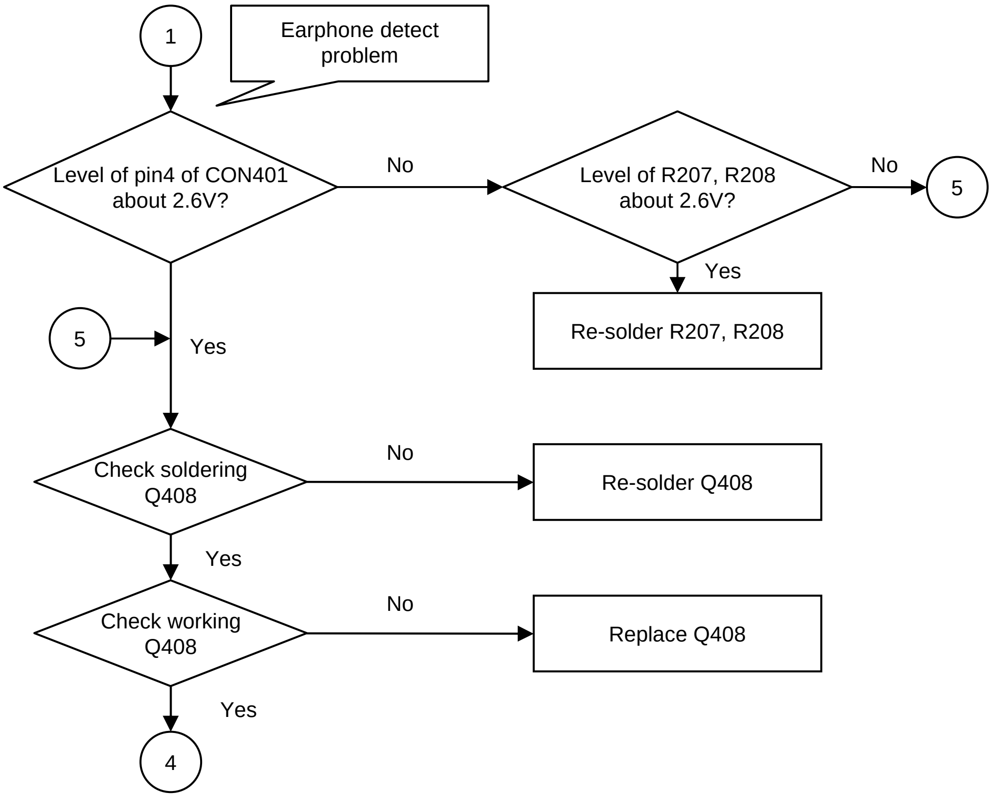
Checking Flow



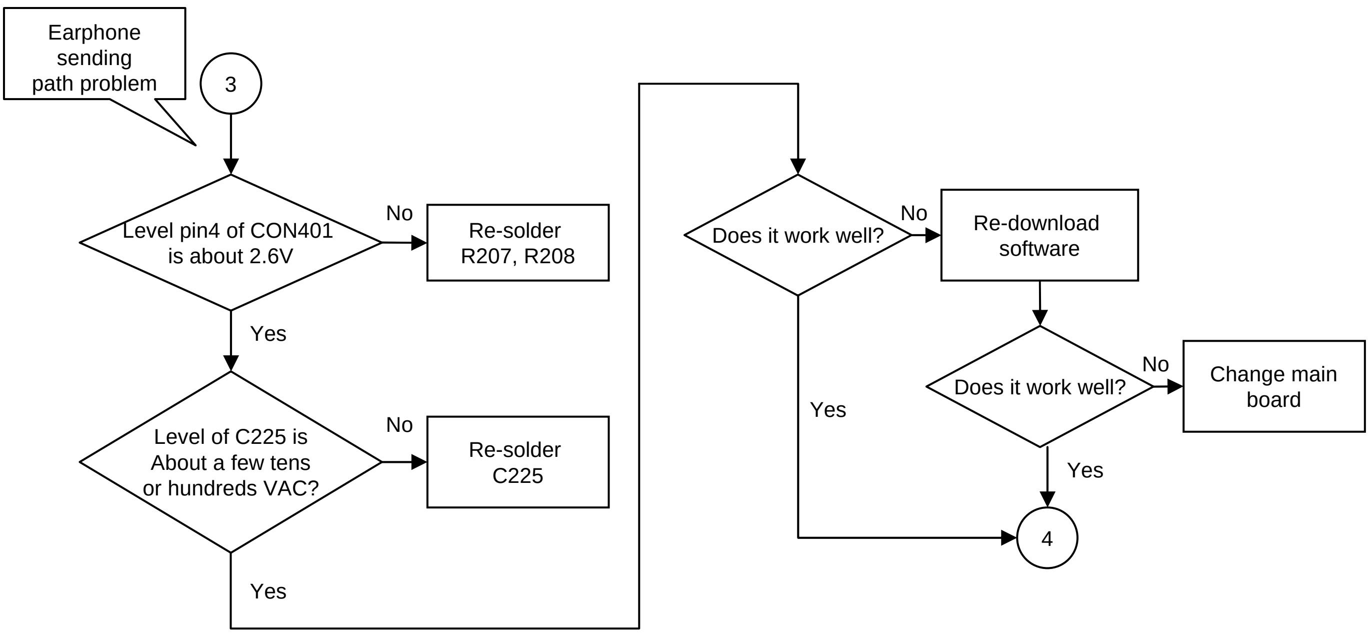
Earphone receiving path problem



Earphone detect problem



Earphone sending path problem



3.3.11 LCD Trouble

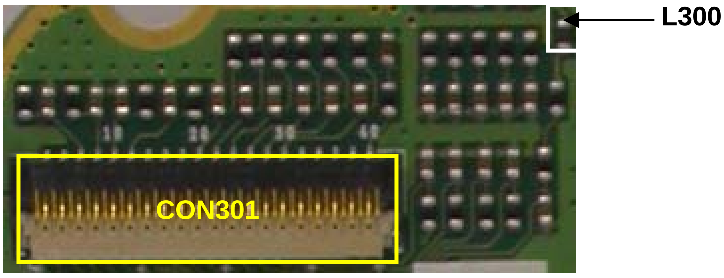
- **LCD Control signals**

  From MSM : D(0:15), LCD_RESET1/, A[1], LCD_CS/, LWR/

- **Check point**

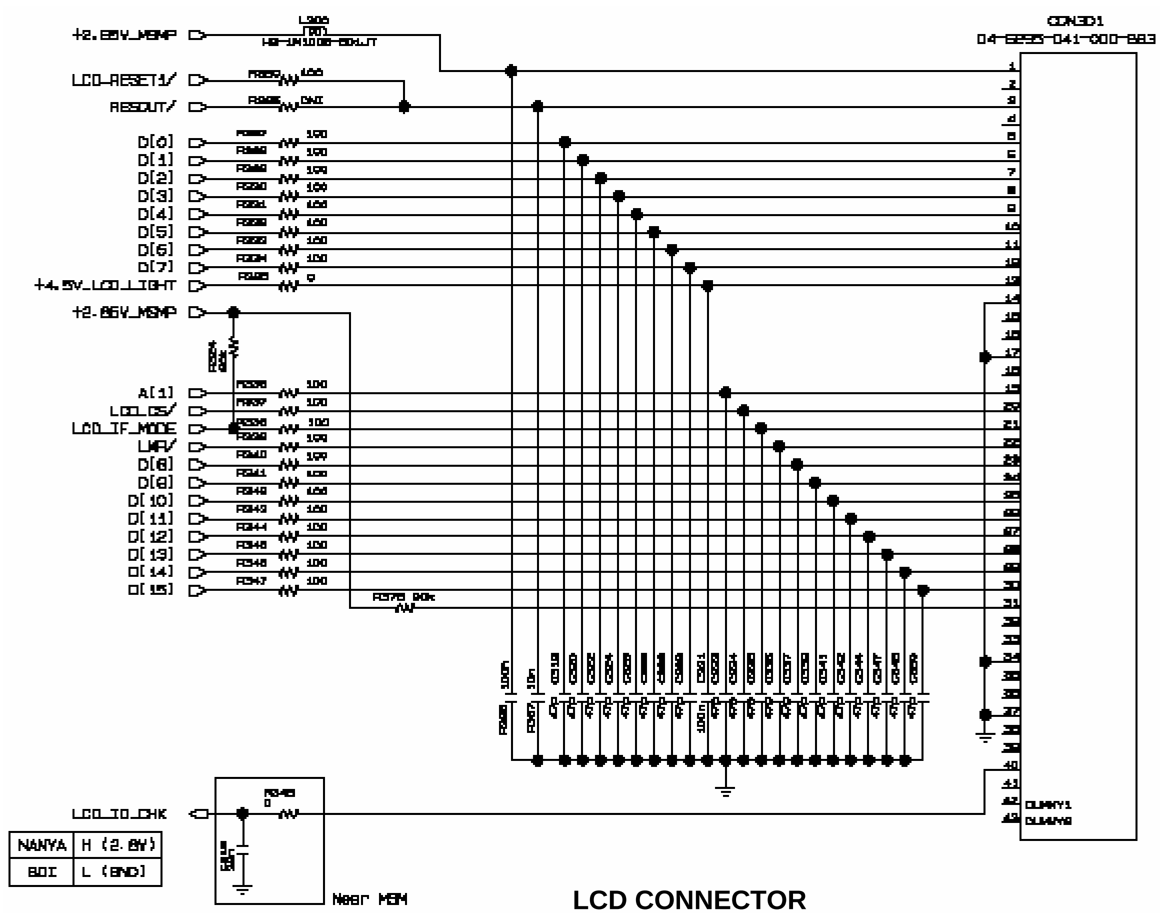
  - The assembly status of the LCD Module
  - The Soldering of connector

Test Points

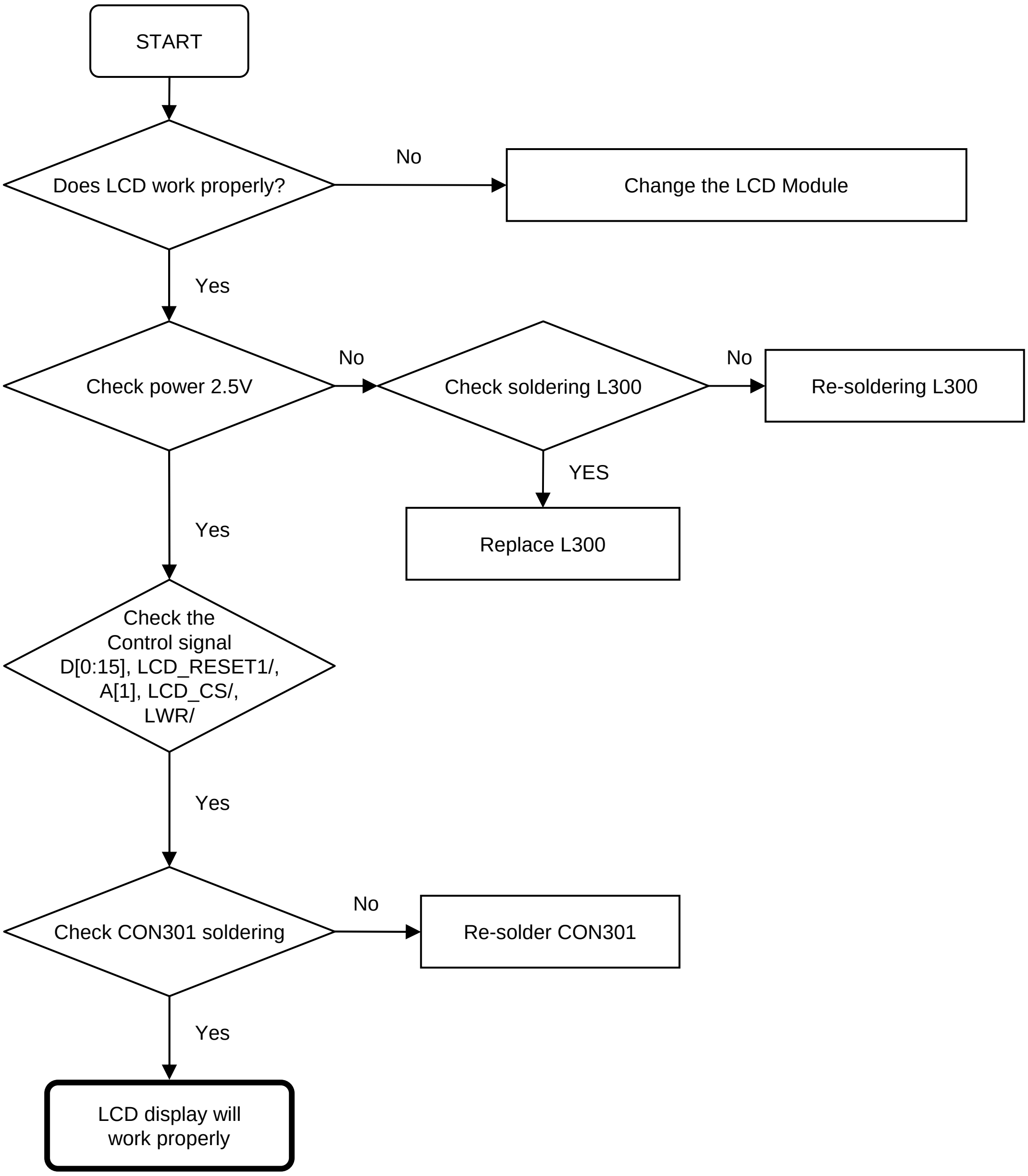


LCD CONNECTOR PART

Circuit Diagram



LCD CONNECTOR


START
Does LCD work properly?
No
Change the LCD Module
Yes
Check power 2.5V
No
Check soldering L300
No
Re-soldering L300
YES
Replace L300
Yes
Check the
Control signal
D[0:15], LCD_RESET1/,
A[1], LCD_CS/,
LWR/
Yes
Check CON301 soldering
No
Re-solder CON301
Yes
LCD display will
work properly

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.