Service Manual
Level 3

MOTOROLA™

DIGITAL WIRELESS TELEPHONE

Model C357

CDMA 800MHz, & Analog 800MHz

CONTENTS

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Preface

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Scope of Manual

This manual is intended for use by experienced technicians familiar with similar types of equipment. It is intended primarily to support basic servicing, which consists primarily of mechanical repairs and circuit board replacement.

Authorized distributors may opt to receive additional training to become authorized to perform limited component repairs.

Contact your regional Customer Support Manager for details.

Model and Kit Identification

MOTOROLA products are specifically identified by an overall model number on the FCC label. In most cases, assemblies and kits which make up the equipment also have kit model numbers stamped on them.

Service

MOTOROLA regional Cellular Subscriber Support Centers offer some of the finest repair capabilities available to MOTOROLA Subscriber equipment users.

The Cellular Subscriber Support Centers are able to perform computerized adjustments and repair most defective transceivers and boards.

Contact your regional Customer Support Manager for more information about MOTOROLA's repair capabilities and policy for in-warranty and out-of-warranty repairs in your region.

General Safety Information

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Portable Operation

DO NOT hold the radio so that the antenna is very close to, or touching, exposed parts of the body, especially the face or eyes, while transmitting. The radio will perform best if it is held in the same manner as you would hold a telephone handset, with the antenna angled up and over your shoulder.

Speak directly into the mouthpiece.

DO NOT operates the telephone in an airplane.

DO NOT allows children to play with any radio equipment containing a transmitter.

Mobile Operation (Vehicle Adaptor)

As with other mobile radio transmitting equipment, users are advised that for satis-factory operation of the equipment and for the safety of personnel, it is recommended that no part of the human body shall be allowed to come within 20 centimeters of the antenna during operation of the equipment.

DO NOT operate this equipment near electrical blasting caps or in an explosive atmosphere. Mobile telephones are under certain conditions capable of interfering with blasting operations. When in the vicinity of construction work, look for and observe signs cautioning against mobile radio transmission. If transmission is prohibited the cellular telephone **must be turned off** to prevent any transmission. In standby mode, the mobile telephone will automatically transmit to acknowledge a call if it is not turned off.

All equipment must be properly grounded according to installation instructions for safe operation.

Portable/Mobile Telephone Use and Driving

Safety is every driver's business.

The portable telephone should only be used in situations in which the driver considers it safe to do so. Use of a cellular portable while driving may be illegal in some areas. Refer to the appropriate section of the product service manual for additional pertinent safety information.

Specifications

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General Information

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Name of equipment		C-357 (CDMA/AMPS DUAL MODE)	
Mode		CDMA	AMPS
Working Frequency Range		Tx: 824.64~848.37MHz Rx: 869.64~893.37MHz	Tx : 824.04~848.97MHz Rx : 869.04~893.97MHz
Duplex Frequency Separation		45MHz	45MHz
Modulation		HPSK	Analog FM, 8KHz Dev
Chip Rate		1.2288Mbps	N/A
RF Bandwidth per Carrier		1.23MHz	30KHz
RF Output Power		330mW max	500mW max
Battery Type		Standard Capacity : 1Cell Li-ion (700mA/H)	
Battery Working Hour	Talk-Time	IS95 A/B 160 mins IS2000 160 mins (Full rate,Tx :7.5dBm)	65 Minutes(Power Level 0)
	Standby	IS95 A/B 200hous IS2000 230hours (SCI:2 ,Sector power:-80dBm)	12 Hours (FM slot mode in fixed position)
Operation Temperature		-30°C ~ +60°C	
Size		99.5 X 44 X 19	
Weight		85g (Standard Battery)	
Antenna		Stub Antenna	

Specification of Transmitting Section

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Frequency Range	CDMA	824.64 ~ 848.37MHz
	AMPS	824.04 ~ 848.97MHz
Lo Frequency Range	824.04MHz ~ 848.97MHz	
Intermediate Frequency	Zero-IF	
Output	CDMA	330mW max
	AMPS	500mW max
Frequency Stability	CDMA	±300Hz
	AMPS	±2.5PPM
Open Loop Output Power Range	@ RX = -25dBm	- 48 dBm ± 9.5 dB
	@ RX = -65dBm	- 8 dBm ± 9.5 dB
	@ RX = -93.5dBm	+ 20 dBm ± 9.5 dB
Open Loop Power Control Time Response	20dB/100ms	

Specification of Receiving Section

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Frequency Range	CDMA	869.64 ~ 893.37MHz
	AMPS	869.04 ~ 893.97MHz
Lo Frequency Range	1738.08MHz ~ 1787.94MHz	
Sensitivity	CDMA	-104 dBm (FER 0.5 % or less)
	AMPS	-116 dBm (12dB SINAD)
Intermediate Frequency	Zero-IF	
Single Tone	CDMA	30dB C/N Degration (at Fch, 900KHz : -30dBm)
	AMPS	16dB at Fch ±30KHz, 60dB at Fch ±60KHz
CDMA Input Signal	In 1.23MHz, –105dBm to –25dBm 80dB or more Dynamic Range	
Conductive Spurious Radiation	At the time of RX	< -81 dBm
	At the time of TX	< -61dBm
	Others	< -47dBm
Spurious Suppression	Max –80dBm	
Interference Rejection	Single Tone	-30dBm at ±900KHz
	Two Tone	-43dBm at ±900KHz& ±1700KHz -32dBm at ±900KHz& ±1700KHz -21dBm at ±900KHz& ±1700KHz

NAM Programming

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NAM Programming Instruction

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1. Introduction

The Number Assignment Module(NAM) is a section of memory that retains information about the phone's characteristics, such as the assigned telephone number, system identification number, and options information.

Regardless of the method used, the NAM must be programming before the phone can be placed into service. This chapter covers the NAM programming steps for Easy NAM Programming and NAM Programming.

2. Entering NAM Programming

(1) To enter the Easy NAM Programming mode :
enter [#] [#] [0] [7] [4] [6] [6] [3] [#] [#] [END] for NAM1 and,
enter [#] [#] [1] [7] [4] [6] [6] [3] [#] [#] [END] for NAM2.

(2) To enter the NAM Programming mode :
enter [#] [#] [7] [3] [8] [8] [7] [#] [#] [END].

3. NAM Programming Steps

There are several steps in the Easy NAM Programming for each NAM and extend NAM Programming. For each step, the display shows stored NAM data. When new data is entered via the keypad the display scrolls form right to left.

Use the left navigation key to sequentially step through the NAM data fields, entering new data as required, or skipping past values for parameters that do not need to be changed.

Table 1, "NAM Programming Sequence" lists all NAM Programming steps complete with parameters and definitions. NAM programming requires a special key sequence to enter but can be accomplished through the telephone keypad without the use of any specialized hardware.

4. NAM Parameters

The NAM parameters are specified by the system operator. For most NAM steps, the information specified the system operator is the same as factory default data. The factory system ID and User Telephone Number must always be changed. Other portions of the factory default NAM data must sometimes be modified to confirm to special system requirements or to enable/disable certain features.

5. NAM Programming Sequence

Operation key	Description
[►]	Advances to the next programming step; also programs the NAM after the last programming step is exited.
[DELETE]	Clears the entered information and displays previously entered data for the current programming step.
[OK]	Stores the entered information and exits the programming mode
[END]	Exits the NAM programming mode without programming the NAM
[▲], [▼]	Changing the value “True” or “False” of function for Preferred Mode, Preferred System. Changing the list index of CDMA Home SID/NID, CDMA SID Lock List, and Analog SID Lock List

6. Description of NAM Mode

Step	Factory Default	Description
01	0000000	**CDMA : Mobile Identification Number1(MIN1).**
02	000	**CDMA : Mobile Identification Number2(MIN2).**
03	4369	**AMPS : Home System ID(SID).** Up to 5 decimal digits.
04	0	**CDMA : Home System ID(SID).** Up to 5 decimal digits.
05	01101010	**Station Class Mark(SCM) :** A 8 binary digits number assigned by the system operator. Indicates maximum power step, VOX capability, and number of channels used. This value should not be changed.
06	2	**CDMA : Slot Cycle Index(SCI) :** Indicate index of Slot mode. The range of this value is 0 to 7, but initial value 2 is recommended. 0 means non-slotted mode.
07	False	**NEW_SCAN :** the New channel-scanning to acquire a service after power-up/call-release .(Motorola Specific Function)
08	False	**LOST_CHANNEL_SCAN :** This item is concerned with Load Balance of operator. In other words, this feature is needed to balance the loading on two networks of which the entire netrwork is composed(the network of Telefonica is composed of two separate networks, Lucent and NEC infrastructure implement elements).
09	0	**Active NAM** : Current Activated NAM
10	12345	**Security Code :** A 5 digits number supplied by the user. This number is used by the user to access or change “security” features.
11	1234	**Lock Code :** A 4 digits number supplied by the user. If the lock feature is enabled by the user, the phone can be operated only by individuals who know the lock code.
12	450	**Mobile Country Code(MCC)**
13	00	**IMSI 11**(first digit) **and IMSI 12**(second digit)
14	False	**Preferred Roaming List(PRL) Enabled :** This item is used for enabling or disabling roaming list in NV memory.

15	00000000000	**Mobile Directory Number :** 10 digits mobile phone number. Number is assigned by system operator.
16	410	**CDMA : Primary Channel.** System A up to 4 decimal digits.
17	410	**CDMA : Primary Channel.** System B up to 4 decimal digits.
18	410	**CDMA : Secondary Channel.** System A up to 4 decimal digits.
19	410	**CDMA : Secondary Channel.** System B up to 4 decimal digits.
20	Automatic	**CDMA : Preferred Mode.** Select preferred system. - Automatic - Digital Only
21	Standard	**CDMA : Preferred System.** Applies to units capable of operating on two service systems (A or B). - Standard - SCAN A - SCAN B - Home Only
22	65535	**CDMA : Network ID Number(NID).** Up to 5 decimal digits.
23	0	**CDMA : SID Lock List.** The range of this value is 0 to 5.
24	65535	**CDMA : NID Lock List.** The range of this value is 0 to 5.
25	0000000	**AMPS : Mobile Identification Number1(MIN1).**
26	000	**AMPS : Mobile Identification Number2(MIN2).**
27	00	**CDMA : Access Overload Class.** Specifies the level of priority assigned to the phone when accessing the system. Assigned by system operator.
28	00	**AMPS : Access Overload Class.** Specifies the level of priority assigned to the phone when accessing the system. Assigned by system operator.
29	True	**CDMA : Config bit for mob term using home SID, NID pair.** - True = Allow mobile terminated call while using a home SID, NID pair. - False = Disallow mobile terminated call while using a home SID, NID pair.
30	True	**AMPS : Config bit for mob term using home SID, NID pair.** - True = Allow mobile terminated call while using a home SID, NID pair. - False = Disallow mobile terminated call while using a home SID, NID pair
31	True	**CDMA : Config bit for mob term while SID roamer.** - True = Allow mobile terminated call while a SID roamer. - False = Disallow mobile terminated call while a SID roamer.
32	True	**AMPS : Config bit for mob term while SID roamer.** - True = Allow mobile terminated call while a SID roamer. - False = Disallow mobile terminated call while a SID roamer.
33	True	**CDMA : Config bit for mob term while NID roamer.** - True = Allow mobile terminated call while a NID roamer. - False = Disallow mobile terminated call while a NID roamer.
34	True	**AMPS : Config bit for mob term while NID roamer.** - True = Allow mobile terminated call while a NID roamer. - False = Disallow mobile terminated call while a NID roamer.

Usage of "Easy NAM Programming" Setup Method

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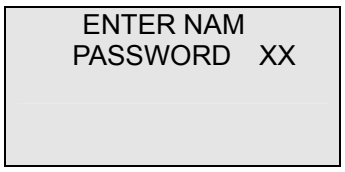
When entering the Easy NAM Programming,

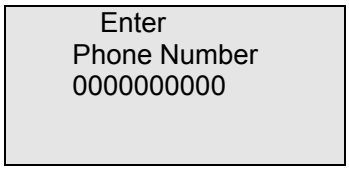
- If OTSL(One Time Subsidy Lock) is activated, the OTSL code programmed in the phone is required and MSL(Master Subsidy Lock) shall be ignored.
- If OTSL is deactivated and MSL is programmed, the MSL code is required.

In case that OTSL is required, OTSL is deactivated after user enters the correct OTSL code. In the next attempt to enter the Easy NAM Programming, OTSL is no more required and MSL is considered and, If MSL is not activated, skip the step 1.

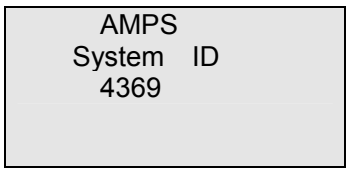
1. Press "[#] [#] [0] [7] [4] [6] [6] [3] [#] [#] [END]" keys to enter the Easy NAM programming mode.
   (For NAM 2, Press "[#] [#] [1] [7] [4] [6] [6] [3] [#] [#] [END]" keys and other procedure is as same as for NAM 1.)
   The following "Enter NAM password" menu will be shown and the possible retrial number is indicated(marked with 'XX' below). Enter password and press [SELECT] key. Password is OTSL code at the first time when OTSL is activated but in the later trial, MSL code. If its password is correct, then NAM program setup starts. Otherwise the retrial number is decremented by one and menu remains in this step.
   - If incorrect password is entered maximum retrial number times, Easy NAM Programming is finished.
   - If maximum retrial number is not activated, it is possible to retry correct code infinitely.
   - If maximum retrial number comes or sets to zero, it is impossible to enter the Easy NAM Programming.



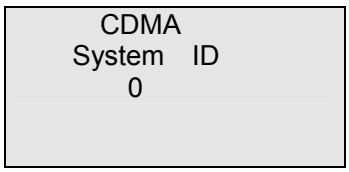
2. Enter the Phone Number of NAM1 by digit number



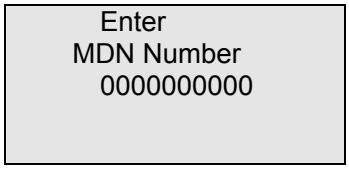
3. Enter the Analog home system ID of NAM1 by digit number



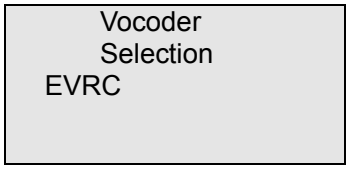
4. Enter the CDMA home system ID of NAM1 by digit number



5. Enter the Phone Number of NAM1 by digit number



6. Enter the Vocoder Selection by using up/down keys (EVRC and QCELP 13K).



7. Press [OK] key to execute and then finish Easy NAM Programming.

8. The phone will be turn off by itself when arrives the end of this Easy NAM programming mode.

Usage of "NAM Programming" Setup Method

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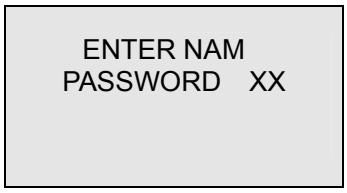
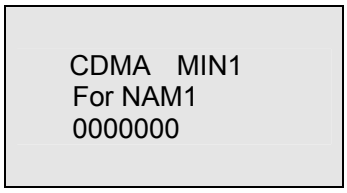
When entering the NAM Programming, SPC code is required instead of OTSL or MSL.

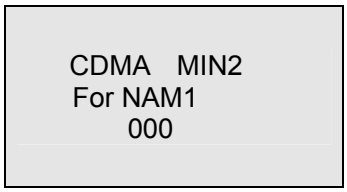
1. Press "[#] [#] [7] [3] [8] [8] [7] [#] [#] [END]" keys to enter the NAM programming mode.
   - The following "Enter NAM password" menu will be shown and the possible retrial number is indicated(marked with 'XX' below). Enter password and press [OK] key (Password is SPC code). If its password is corrected then NAM program setup starts. Otherwise the retrial number is decremented by one and menu remains in this step. If incorrect password is entered (retrial number) times, NAM Programming is finished.
   - If maximum retrial number is not activated, it is possible to retry correct code infinitely.
   - If maximum retrial number comes or sets to zero, it is impossible to enter the NAM Programming.



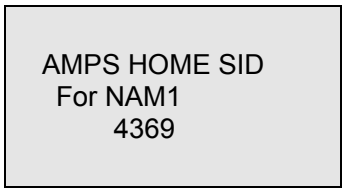
2. Enter the CDMA Mobile Identification Number1(MIN1) of NAM1 by digit number



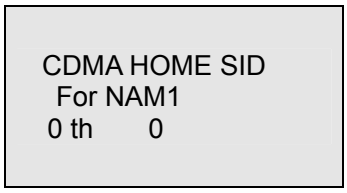
3. Enter the CDMA Mobile Identification Number2(MIN2) of NAM1 by digit number.



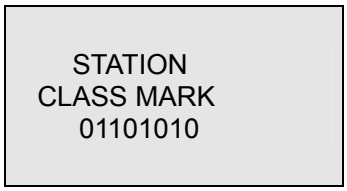
4. Enter Home System ID(SID) of NAM1 by up to 5 decimal digits number.



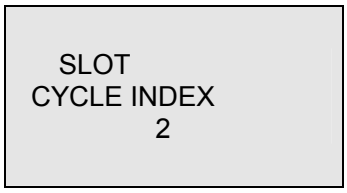
5. Enter the CDMA Home System ID(SID) of NAM1 by up to 5 decimal digits(0 ~ 19)



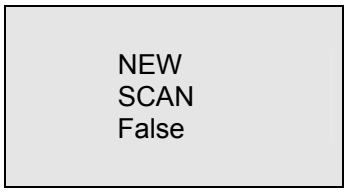
6. Enter SCM value by digit number. This value should not be changed.



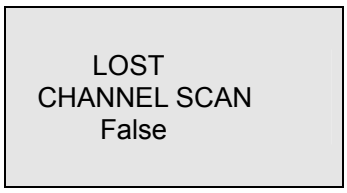
7. Enter Slot Cycle Index by digit number. The range of this value is 0 to 7.



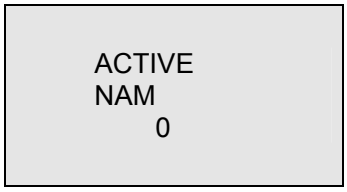
8. Enable or Disable NEW SCAN by selecting “True or False” using up/down keys (default value is “True”)



9. Enable or Disable Lost Channel Scan Enable by selecting “True or False” using up/down keys(default value is “False”)



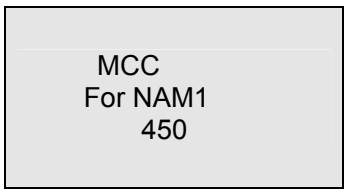
10. Select current NAM by enter digit number(0 : NAM1, 1 : NAM2)



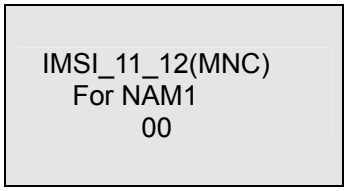
11. Enter Security Code by 6 digits number

12. Enter Lock Code by 4 digits number

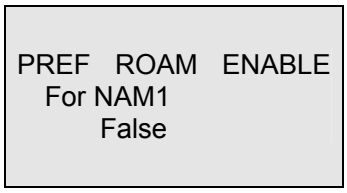
13. Enter Mobile Country Code of NAM1 by 3 digits number



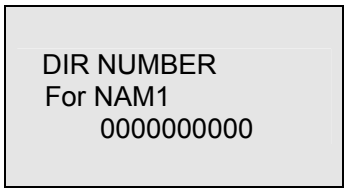
14. Enter IMSI_11(first digit) and INSI_12(second digit) of NAM1



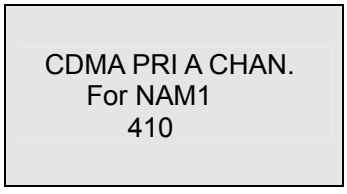
15. Enable or Disable “Preferred Roaming List Enable” of NAM1 by selecting “True or False” using up/down keys



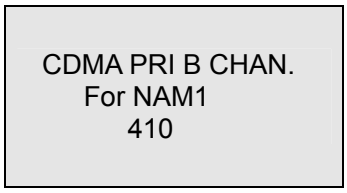
16. Enter the mobile phone number of NAM1 by 10 digits number.



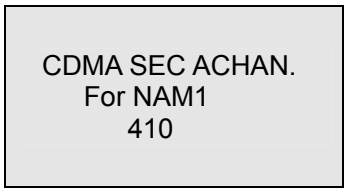
17. Enter the Primary Channel System A of NAM1 by up to 4 digits number.



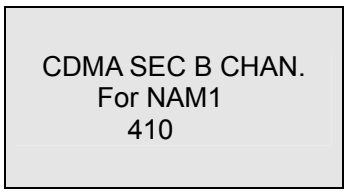
18. Enter the Primary Channel System B of NAM1 by up to 4 digits number.



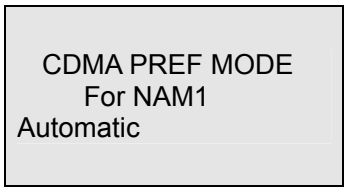
19. Enter the Secondary Channel System A of NAM1 by up to 4 digits number



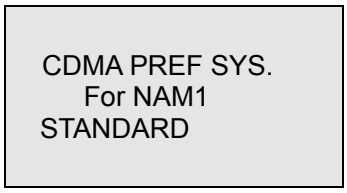
20. Enter the Secondary Channel System B of NAM1 by up to 4 digits number



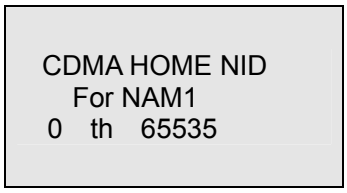
21. Select the CDMA Preferred Mode of NAM1 by using up/down keys (Automatic, DIGITAL only)



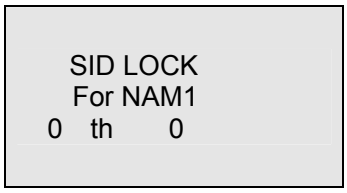
22. Select the CDMA Preferred System of NAM1 by using up/down keys (Standard, SCAN A, SCAN B, Home Only)



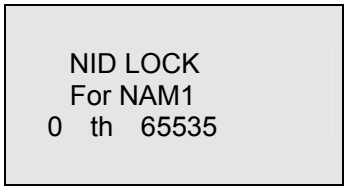
23. Enter the CDMA Network ID(NID) number of NAM1 by up to 5 decimal digits(0 – 19)



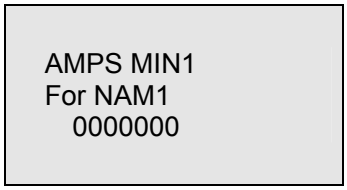
24. Enter SID Lock List of NAM1 (the range of this value is 0 to 5)



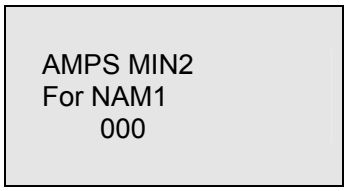
25. Enter NID Lock List of NAM1 (the range of this value is 0 to 5)



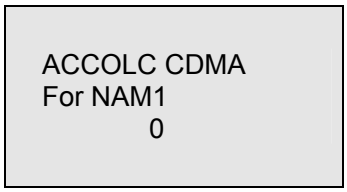
26. Enter the AMPS Mobile Identification Number1(MIN1) of NAM1 by digit number



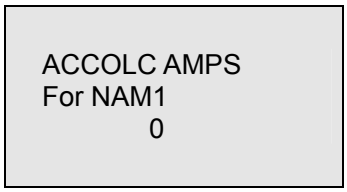
27. Enter the AMPS Mobile Identification Number2(MIN2) of NAM1 by digit number



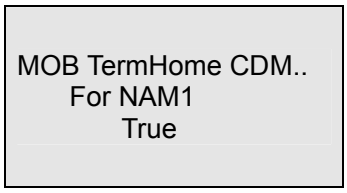
28. Enter the assigned CDMA Access Overload Class of NAM1 by digit number



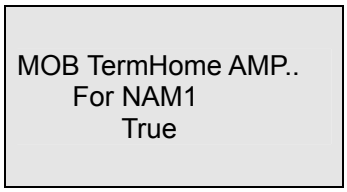
29. Enter the assigned AMPS Access Overload Class of NAM1 by digit number



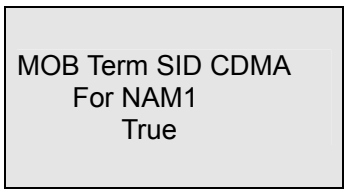
30. Select the CDMA Config bit for mob term using home SID, NID pair of NAM1 by using up/down keys (True, False)



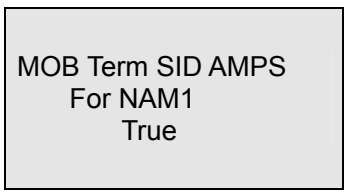
31. Select the AMPS Config bit for mob term using home SID, NID pair of NAM1 by using up/down keys (True, False)



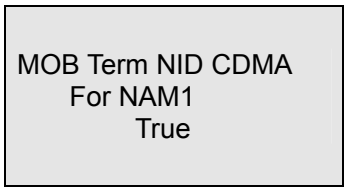
32. Select the CDMA Config bit for mob term while SID roamer of NAM1 by using up/down keys (True, False)



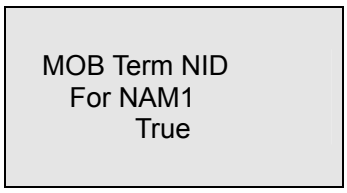
33. Select the AMPS Config bit for mob term while SID roamer of NAM1 by using up/down keys (True, False)



34. Select the CDMA Config bit for mob term while NID roamer of NAM1 by using up/down keys (True, False)



35. Select the AMPS Config bit for mob term while NID roamer of NAM1 by using up/down keys (True, False)



36. Repeat from 2 to 5 and from 13 to 35 change the NAM2.

37. Press [OK] key to finish the NAM programming mode.

39. The phone will be turn off by itself when arrives the end of this NAM programming mode.

□. Enter the A-key

1. Enter [#] [#] [2] [5] [3] [9] [END] keys and select [A-Key Entry] .
2. Enter the 6 digits SPC code and then Select [AKEY].
3. Enter the A-key value of about 26 digit numbers.
4. Press [SELECT to save A-key.
5. When you enter wrong number, If you want to clear, press left navigation key.
6. If press [END] key not to save at any step and exit the A-key input mode.
7. Automatically the phone reboot.

Manual Test Mode

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1. Introduction

Manual test mode software allows service personal to monitor the telephone status on the display, and manually control telephone functions via the keypad. Manual test mode operates at two levels; 1) call status display which allows the phone to operate normally while providing status indications in the display, and 2) Service level which disables normal call processing and allows commands to be entered through the keypad to manually control operation of the keypad.

2. Entering Call Status Screen

Call Status Screen is entered by entering the following keypad sequence;
[#] [#] [3] [3] [2] [8] [4] [#] [#] [END]

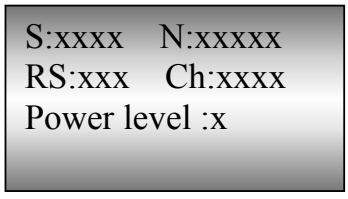
The Call Status Screen will display information about the current status of the unit while in service. In this level, the phone will place and receive calls as normal, but the display shows three lines of status information.

The displayed status information are as following;

- PN Offset
- RSSI
- Current RF Channel
- SID and NID
- Slot Cycle Index
- Mobile's state
- Vocoder Rate
- Ec/Io

The format of this status information is shown in Figure 1:"Call Status Screen (Analog Mode)" and Figure 2:" Call Status Screen (CDMA Mode)" in next page. When dialing the phone number, the status display erases when the first digit of the phone number is entered. The telephone number is then displayed as it is entered. When the [SEND] key is pressed, the status information display resumes.

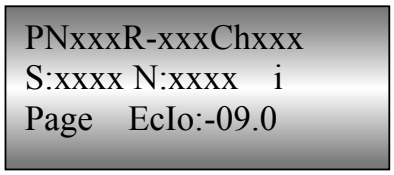
Figure 1. Call Status Screen (Analog Mode)



where

S	SID
N	NID
RS	RSSI
Ch	Current RF channel
Power level	Power level

Figure 2. Call Status Screen (CDMA Mode)



where

PN PN OFFSET strongest active pilot
R RSSI
Ch Current RF Channel.

If the current RF channel is more than 3 digits, the “C” is erased then display 4 digits of channel.

S SID
N NID
i Slot cycle index
Page Mobile’s state. i.e. Sync/Page/Traf(traffic)
EcIo Best Active Pilot Energy (Ec/Io)

If call connected, the voice option is displayed in this field instead of mobile’s state.
The voice option supported are as following;

- Q13K : 13K Vocoder
- EV8K : 8K EVRC
- OMA8 : Markov Call 8K (old)
- NMA8 : Markov Call 8K (new)
- OM13 : Markov Call 13K (old)
- NM13 : Markov Call 13K (new)
- LP8K : Loop back 8K
- LP13 : Loop back 13K

3. Servicing Level

The Servicing Level of Manual Test Mode allows service personnel to manually control operation of a phone by entering commands through the telephone keypad. Parameters such as operating channel, output power selected by entering the corresponding commands.

In the Servicing Level, automatic call processing functions are disabled, and the phone is instead controlled manually by keypad commands.

Table 1, “Test Commands For Manual Test Mode”, 15 lists the commonly used manual test commands and the resulting display and telephone function for each command.

4. Entering CDMA Manual Test Mode

Manual test mode is entered by entering the following keypad sequence;
Press [*] [7] [3] [8] [3] [7] [8] [#] [END]. then [1][1].

4.1 CDMA test command[Table 2] Test Commands for CDMA Manual Test Mode

Keypad Entry	Command Description
[Change Chan] [SELECT]	CDMA Channel Changes.
[Tx Max Pwr] [SELECT]	CDMA Max Power Setting. [BACK] : CDMA Max Power Off

5. Entering AMPS Manual Test Mode

Manual test mode is entered by entering the following keypad sequence;
Press [*] [7] [3] [8] [3] [7] [8] [#] [END] then [1][3][FM Manual Test][SELECT],
[1][1][1][SEND] to initialize for test.

[Notice]
Press [#] [#] [2] [6] [7] [7] [END] before enter manual test mode for all audio test, then LCD window is displayed [FM TEST ON]

5.1 AMPS test command

Each command consists of at least three digits entered form the telephone keypad with the entry terminated using the [SEND] or [SELECT] key.

Table 1: Test Commands for AMPS Manual Test Mode

Keypad Entry	Command Description	Result
[END]	Power OFF	Equivalent to turning power off, then on again.
[1][1][0][X][SELECT]	CHANNEL xxxx	Load the specific channel into the synthesizer. Phone: X – Enter up to 4 digits for the channel number. Channel numbers must be in the range of 1 to 1023.
[1][2][X][SELECT]	Power LEVEL	Set the RF power attenuation to the value specified, where X is a value from 0 to 7
[1][3][#][SELECT]	Carrier ON	Turn carrier on.
[1][3][*][SELECT]	Carrier OFF	Turn carrier off
[1][4][*][SELECT]	Tx AUDIO ON	Unmute the transmit audio
[1][4][#][SELECT]	Tx AUDIO OFF	Mute the transmit audio
[1][5][*][SELECT]	Rx AUDIO ON	Unmute the receive audio
[1][5][#][SELECT]	Rx AUDIO OFF	Mute the receive audio
[1][6][*][SELECT]	Compand ON	Compandor ON
[1][6][#][SELECT]	Compand OFF	Compandor OFF
[1][7][X][SELECT]	SAT X	Enable SAT transponding (analog mode only), Where X is a vale from 0 to 2 X=0:5970Hz X=1:6000Hz X=2:6030Hz
[1][7][#][SELECT]	SAT OFF	Disable the tranponding of SAT
[1][8][*][SELECT]	ST ON	Transmit a continuous signaling tone.
[1][8][#][SELECT]	ST OFF	Stop transmitting signaling tone.
[1][9][#][SELECT]	Data ON	Transmit wideband data on
[1][9][#][SELECT]	Data OFF	Stop transmit wideband data
[1][1][#][SELECT]		Clear fot test setting

Test Procedure

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Hardware Introduction

top

C-357 allows keypad controlled testing.
This chapter includes the keypad button functions and recommended equipment setup to use when testing.

Automatic Call-Processing Tests

Most communications analyzers can simulate site in order to perform automatic call processing tests. Automatic call processing tests can be performed while the phone is in its power-up state. However, it is useful to do the tests with the phone in Test Mode Status Display.

Refer to the communications analyzer's manual for details about performing call processing tests. The following call processing test sequence is recommended:

1. Inbound call, analog mode
2. Outbound call, analog mode
3. Analog-to-Analog channel handoff
4. Analog-to-Digital channel handoff
5. Inbound call, digital mode
6. Outbound call, digital mode
7. Digital-to-Digital channel handoff
8. Digital-to-Analog channel handoff

Handoffs should be performed between low, middle, and high frequency channels.

Analog Test Measurements

- RX Sensitivity (SINAD)
- RX Audio Distortion
- TX Power Out
- TX Frequency Error
- TX Audio Distortion
- TX Maximum Deviation
- TX SAT Deviation
- TX ST Deviation

Digital Test Measurements

- Making a Receiver Sensitivity Measurement
- CDMA Transmitter Tests
- CDMA Code Domain Power +Noise
- CDMA Code Channel Time/Phase Error
- CDMA Average Power &Channel Power
- FER with AWGN Tests

The analog and digital parameters are stored in EEPROM on the Transceiver Board. Each transceiver is shipped from the factory with these parameters already calibrated. However, if a board is repaired, these parameters should be measured and, if necessary, adjusted. Checking and adjusting calibration parameters is also useful as a troubleshooting/diagnostic tool to isolate defective assemblies.

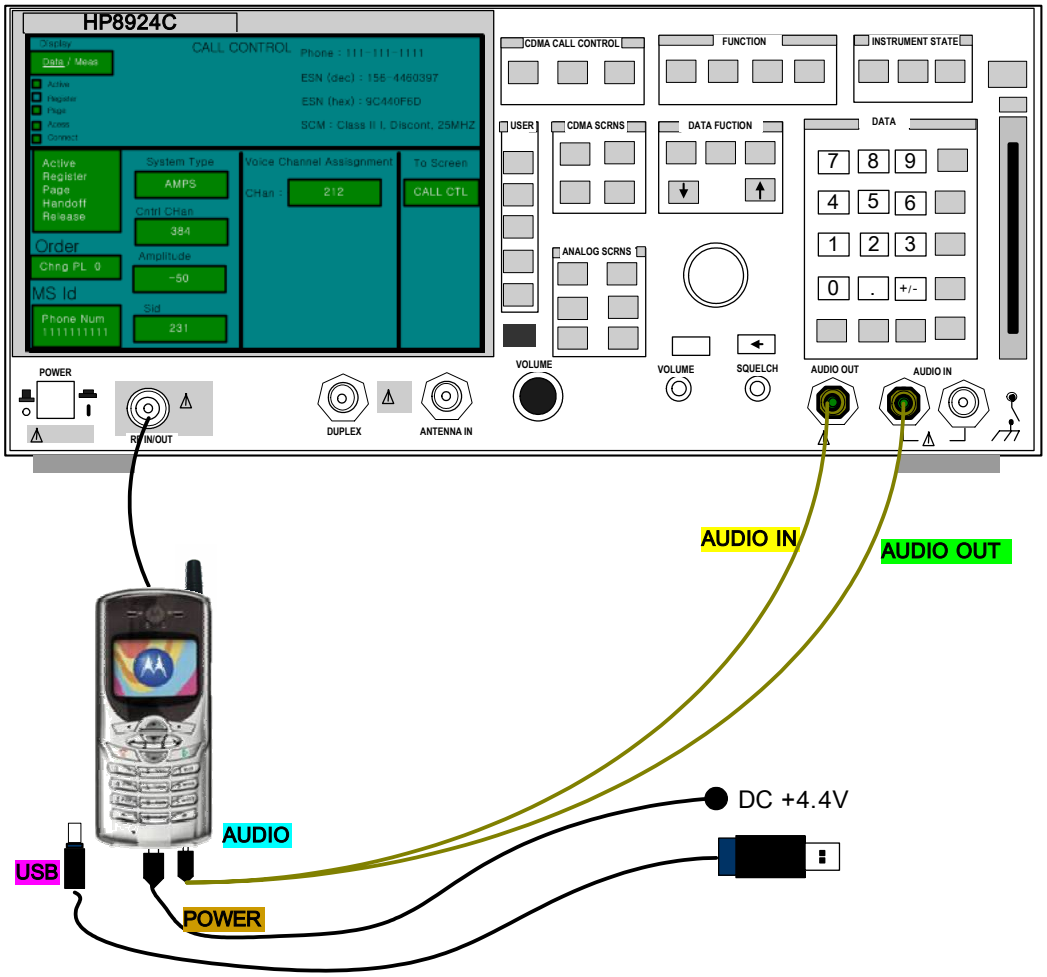
Connections for performing Test (AMPS)

top

The diagram below shows the recommended connections for testing.

A variety of communications analyzers may be used. Refer to the analyzer manufacturer's user manual for proper setup before starting test

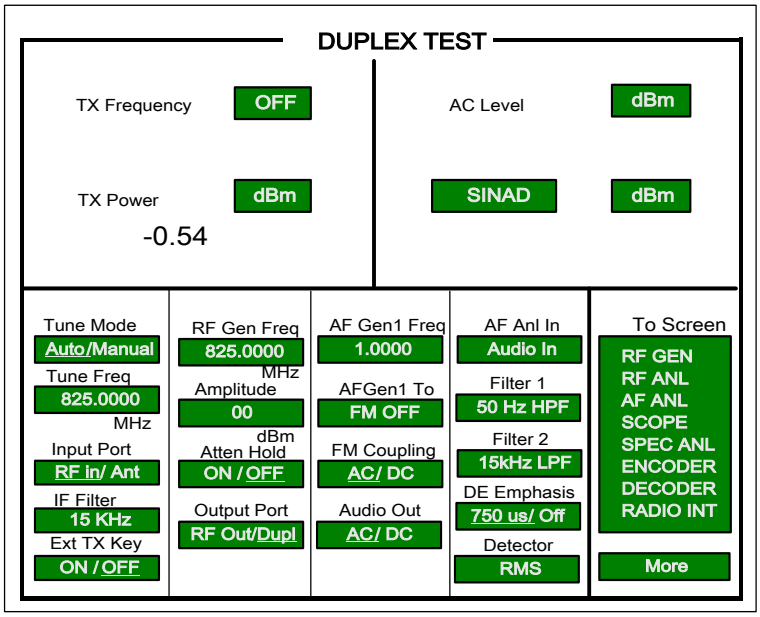
Connections for Testing



※ **The phone turns into charge mode when supplied power over 4.6V.**

RF Cable Test

top



To test the RF cable for proper loss:

- **Tune Freq** should be set to TX frequency: 825 MHz.
- **RF Gen Freq** should be set to same frequency (825MHz).
- **Tx Power** should be set to read in dBm, not Watts.

In order to properly measure and adjust the parameters of a telephone, it is important that you use RF cabling that has minimal loss.
Therefore, it is important that you test the RF cable for proper loss. This can easily be done by using the DUPLEX TEST screen of your HP8924C. To test the cable, set up the DUPLEX screen as shown above.

Action:

Take the cable under test and connect it from the RF in/out port to the Duplex Out port. At this point you will be getting some type of power reading for cable loss.

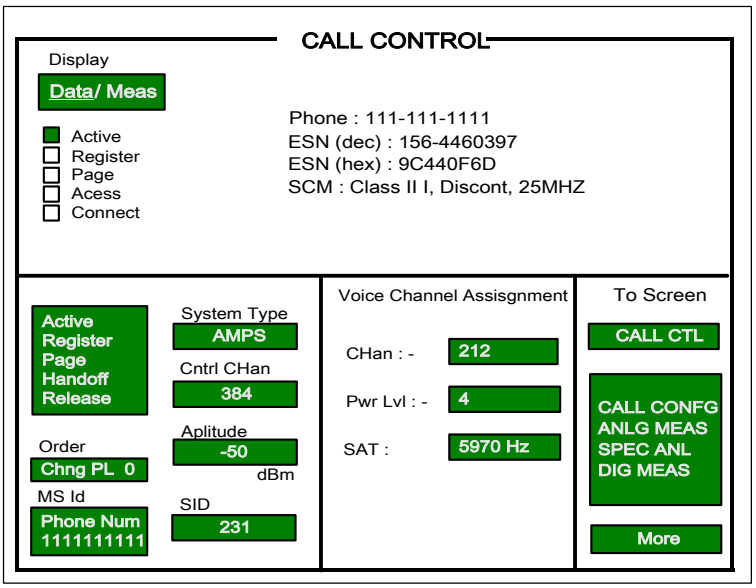
Good range: -0.2 dBm through -0.8 dBm

Bad cable: More than -0.8 dBm
If the reading you are getting shows gain (positive number,) you may need to zero the power meter. This may happen on an HP8924C whose memory has just been cleared.

To zero the meter, press the **TX** button on the 8924C panel. Bring the cursor down to the field under **TX Pwr Zero** where it reads **Zero**.
Tap the cursor on the Zero field and it will highlight for a moment as it zeroes the meter. Set up the screen as shown above, and test your cable.

Set up for Analog call

top



Select CALL CNTL button from the Analog Screen Control panel

- Select System type: **AMPS**
- Zero the RF Power meter in the: **Call**

Config Screen

- Set Amplitude to: **-50 dBm**
- Set SID: **Your phone System ID**
- Select: **Active**
- **Voice Channel Assignment Type:**
- Chan: **212**
- Pwr Lvl: **4**
- SAT: **5970Hz**

Registration

1. Put the Test Set in Active state by selecting **Active** from the list on the left side of the screen.
2. Select **Data** from the **Data/Meas** field. This is the default mode.
3. Select **Register** from the list to register phone.
4. If the registration message has been received, the Test Set will display registration data in the upper half of the screen as shown in the sample screen above.

Page

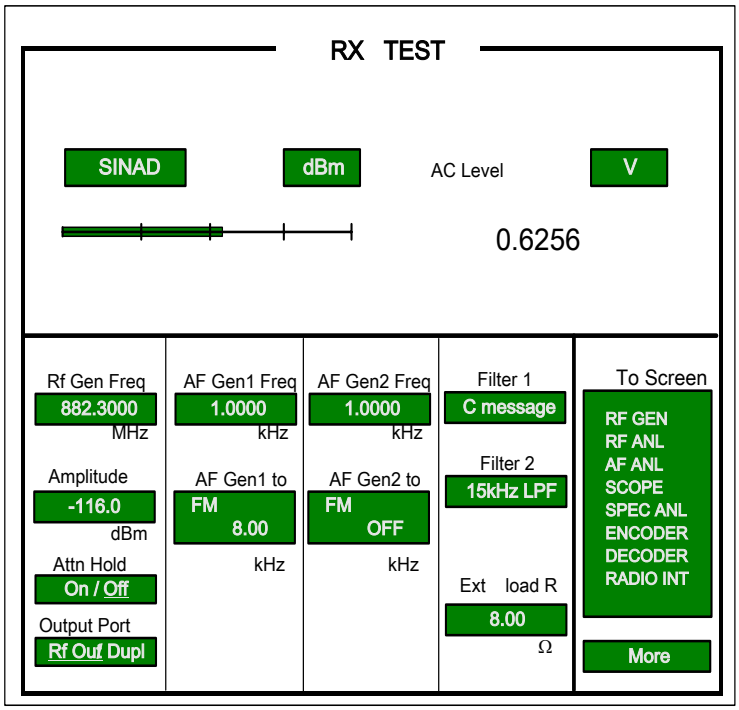
1. Select page from the list on the left side of the screen.
2. If the mobile responds, you will see the Access annunciator light briefly.
3. Answer the call by raising the flip or press SEND on the mobile to start the conversation.
4. The Connect annunciator lights. This is the Connect state.

Origination

1. Dial the desired phone number on the mobile station and press SEND.
2. The Access annunciator will light while the Test Set signals the mobile on the assigned voice channel.
3. The connect annunciator will light if the mobile properly signals the Test Set.

RX Sensitivity Test (SINAD)

top



Communications Analyzer Setup:

- Select **RX TEST** button from the Analog Screen Control panel
- Set **RX frequency** to **882.3 MHz**
- Set **Amplitude** to **-116 dBm**
- Set **AF gen1** to **1 kHz frequency** at **8 kHz deviation**, using **FM modulation** (PLEASE NOTE: this is for AMPS only; NAMPS uses much lower deviation)
- Set **AF Filter 1** set to **C message filtering**
- Set **AF Filter 2** to **15 kHz**

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100410 Send Load synthesizer to channel 410
15* Send Rx audio on
16* Send Turn on compandor

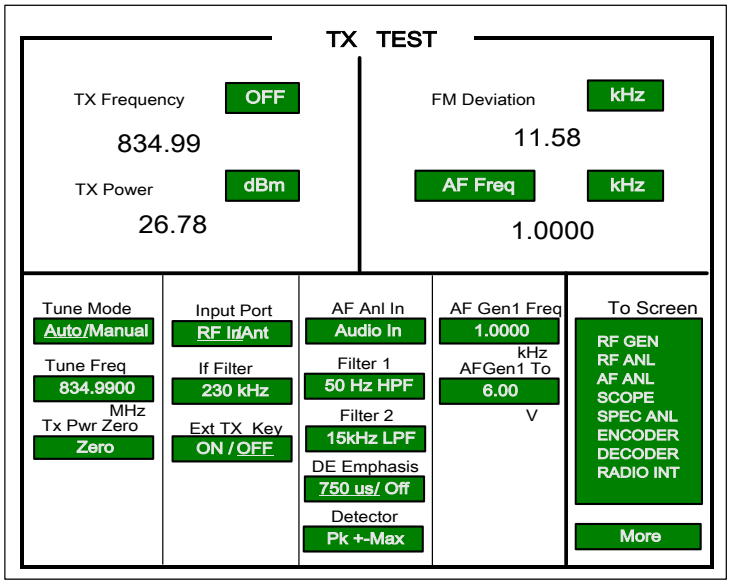
- ZIG Setting : Switch Ext in AUDIO

SINAD measured on the communications analyzer must be more than 12dB.

Duplex SINAD can be measured with the same Setup by entering 13*[SEND] and 122 [SEND] the test command, which turns on the transmitter at power step 2. Refer to the RX troubleshooting section for radios not within the pass specifications.

TX Power Out Test

top



Communications Analyzer Setup:

- Select **TX TEST** button from the Analog Screen Control panel
- **PWR** is measured in **dBm** Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **834.990 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
12X Send Set power level to step X, where X is a power level from 1 to 7.

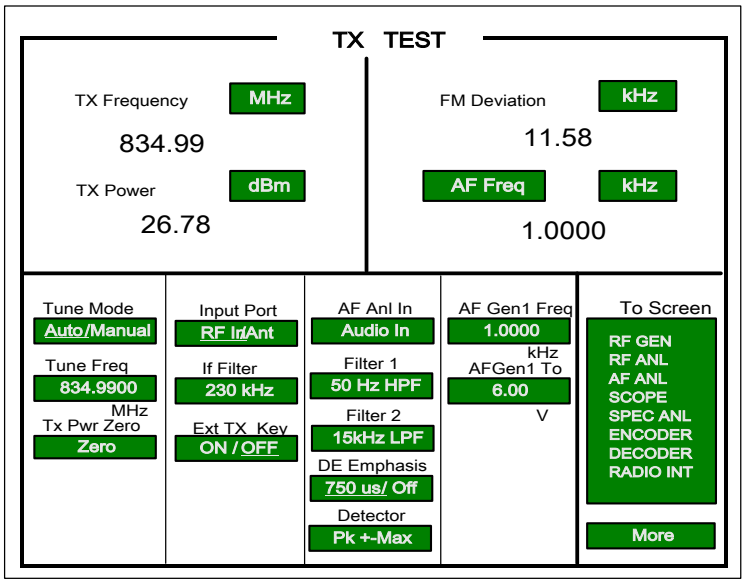
The TX Power Out specification for each portable power level is as follows:

Power Step 0	25dBm ~ 29dBm
Power Step 1	25dBm ~ 29dBm
Power Step 2	25dBm ~ 29dBm
Power Step 3	21.5dBm ~ 25.5dBm
Power Step 4	17.5dBm ~ 21.5dBm
Power Step 5	13.5dBm ~17.5dBm
Power Step 6	9.5dBm ~ 13.5dBm
Power Step 7	5.3dBm ~ 9.5dBm

Refer to the TX troubleshooting section for radios not within the pass specifications.
Note: When taking measurements, remember to compensate for cable loss.

TX Frequency Error Test

top



Communications Analyzer Setup:

- Select **TX TEST** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **834.990 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **6V level** (output will go to the **audio** port)

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
122 Send Set power level to step 2

The frequency error measured on the communications analyzer must be less than ±1 kHz.

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TX Modulation Deviation Limiting Test

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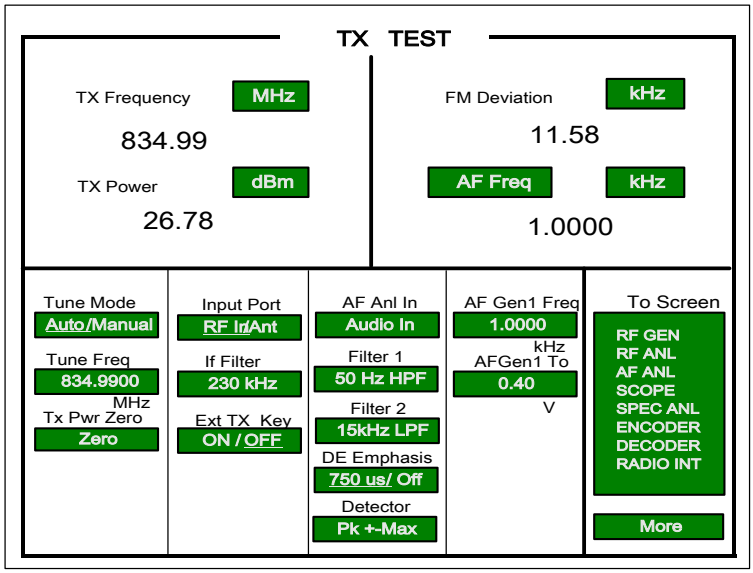

Communications Analyzer Setup:

- Select **TX TEST** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **834.990 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency** at **0.4V level** (output will go to the **audio** port)

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
122 Send Set power level to step 2
14* Send TX Audio on
16* Send Turn on compandor
171 Send Enable 6000 Hz SAT tone

The AF gen1 is stepped from 300 Hz to 3 kHz while the level is maintained at the 20dB (4V) override. The size of the Freq. Steps is 500 Hz.

View FM Deviation for reading.

TX Modulation Deviation Limiting Pass Specifications: 12 kHz as the upper limit.

TX SAT Deviation Test

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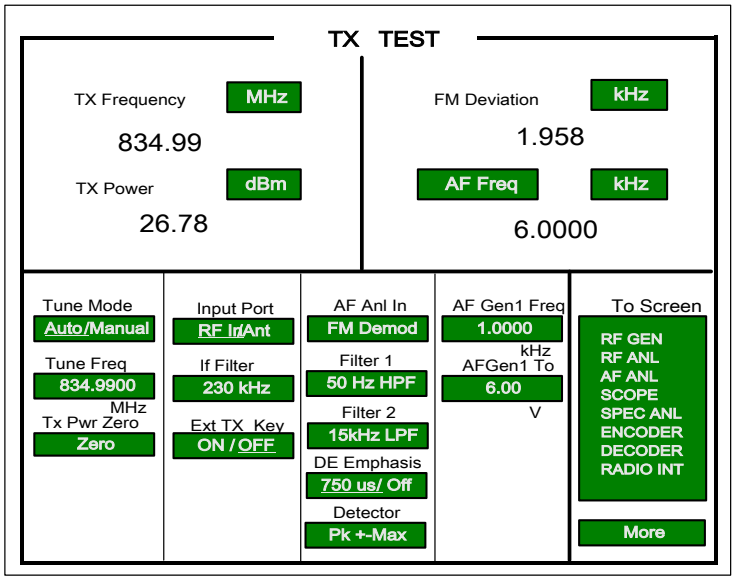


Communications Analyzer Setup:

- Select **TX TEST** button from the Analog Screen Control panel
- **PWR** is measured in **dBm**
- Set **Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- Set **TX frequency** to **834.990 MHz**
- Set **IF filter** to **230 kHz**
- Set **AF Filter 1** to **50 Hz**
- Set **AF Filter 2** to **15 kHz**
- Set **AF gen1** for **1 kHz frequency**

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
122 Send Set power level to step 2
171 Send Enable 6000 Hz SAT tone

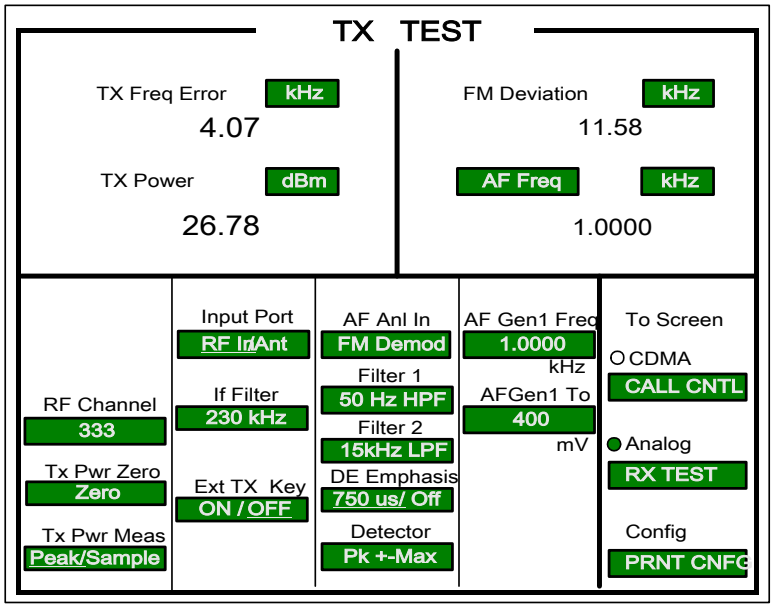
View FM Deviation for the reading.

The transponded peak SAT FM deviation should be 2 kHz ±200 Hz.

The demodulated signal on the communications analyzer should have an audio frequency of 6000 Hz.

TX ST Deviation Test

top



CommunicationsAnalyzer Setup:

- ¢Ã SelectTX TEST button from the Analog Screen Control panel
- ¢Ã PWR is measured in dBm
- ¢Ã SetFrequency Measurement to auto or manual (display will show TX Freq. Error)
- ¢Ã SetTX frequency to 834.990 MHz
- ¢Ã SetIF filter to 230 kHz
- ¢Ã SetAF Filter 1 to 50 Hz
- ¢Ã SetAF Filter 2 to 15 kHz
- ¢Ã Set AF gen1 for1 kHz frequency at 400 mV level (output will go to the audio port)

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
122 Send Set power level to step 2
18* Send Enable signaling tone

View FM Deviation for reading.

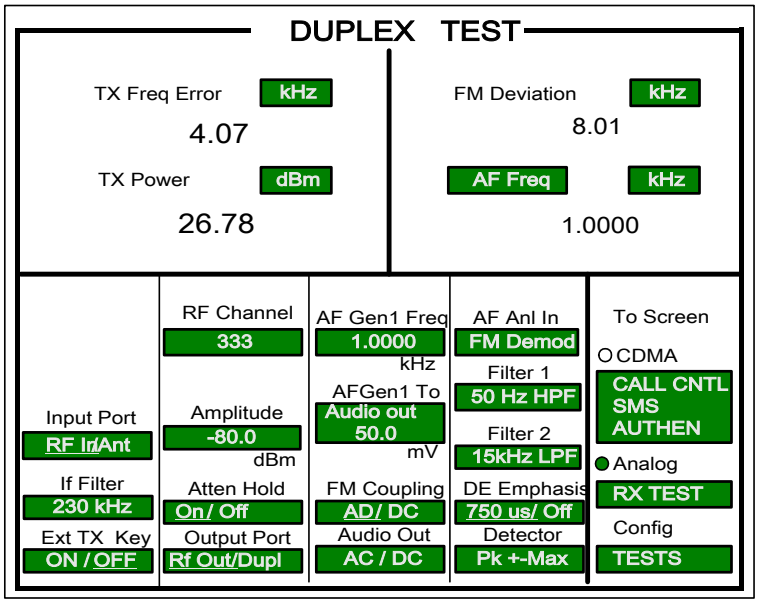
The peak ST deviation measured on the communications analyzer should be 8 kHz ±800 Hz deviation.

The demodulated signal on the communications analyzer should have an audio frequency of 10 kHz.

top

TX FM Hum and Noise Test

top



CommunicationsAnalyzer Setup:

- ¢Ã SelectDUPLEX TEST button from the Analog Screen Control panel
- ¢Ã **PWR** is measured in **dB**m
- ¢Ã Set**Frequency Measurement** to **auto or manual** (display will show TX Freq. Error)
- ¢Ã Set**TX frequency** to **834.990 MHz**
- ¢Ã Set**IF filter** to **230 kHz**
- ¢Ã Set**AF Filter 1** to **50 Hz**
- ¢Ã Set**A**F Filter 2 to **15 kHz**
- ¢Ã Set AF gen1 for**1 kHz frequency**

Test Mode Commands:

*738378# End Enter Test Mode
13 Enter FM Test Mode
UP SELECT Enter FM Manual Test Mode
111 Send Initialize Test Mode
1100333 Send Load synthesizer to channel 333
13* Send Turn on transmit carrier
122 Send Set power level to step 2
14* Send Unmute TX Audio path
16* Send Turn on compandor
171 Send Enable 6000 Hz SAT tone

1. Adjust AF Genl to voltage to get 8 kHz peak deviation. (about 400mV)

2. Set AF Filter1 to C-MESSAGE
   Set Detector to RMS.

3. Put the cursor on the unit of FM Deviation in the screen.
Press SHIFT, REF SET and knob.

We can see the change of the unit from kHz to dB. It is setting 0 reference.

4. Remove the audio cable which connects with AUDIO OUT in 8924C. Or change to 0mV at audio out level.
Measure the change in dB at FM Deviation on the screen.

TX Hum and Noise Pass Specifications: -32dBm as the upper limit.

Connections for performing Tests (CDMA IS-2000)

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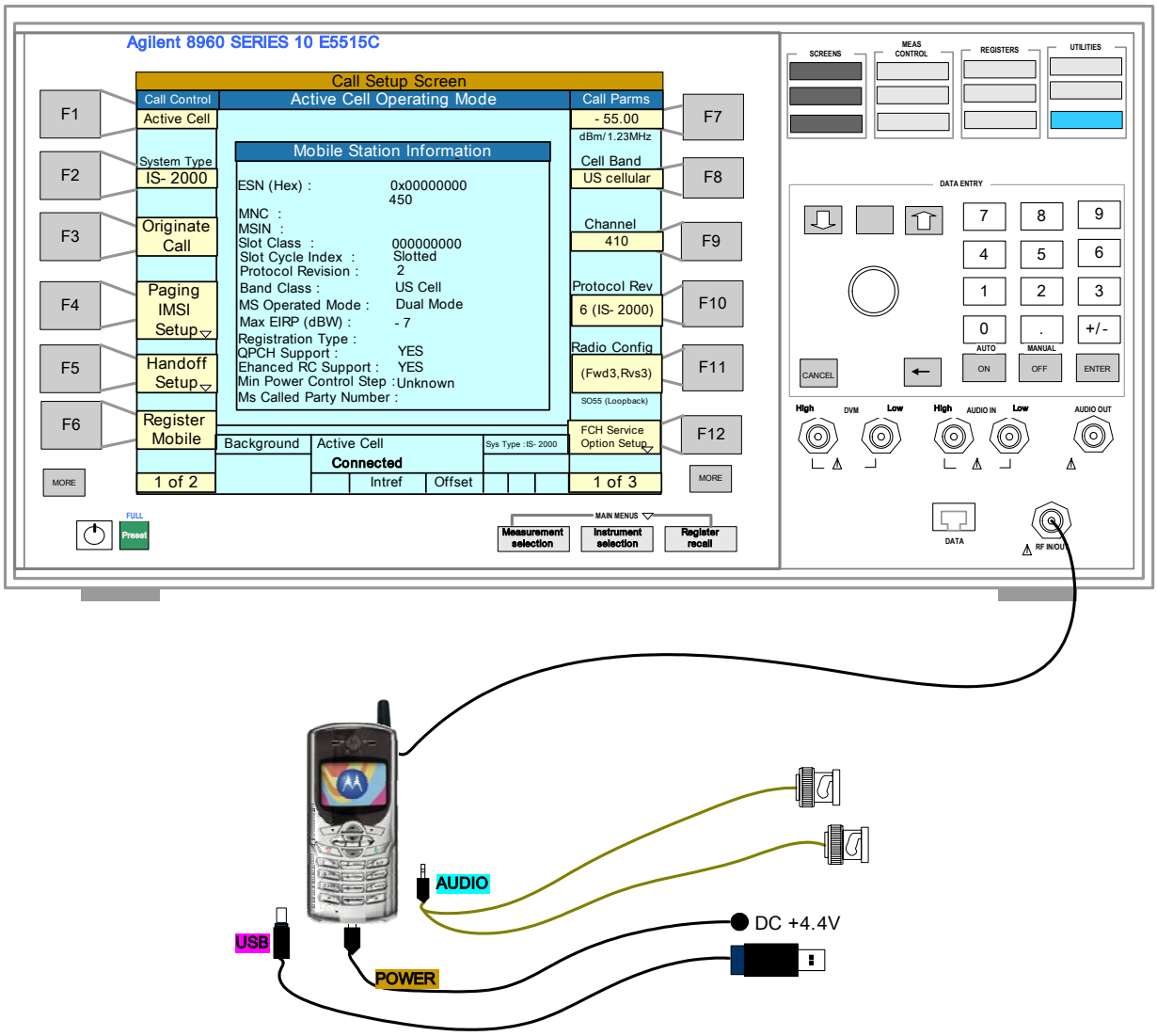
The diagram below shows the recommended connections for testing.

A variety of communications analyzers may be used. Refer to the manufacturer's user manual for proper setup before starting test

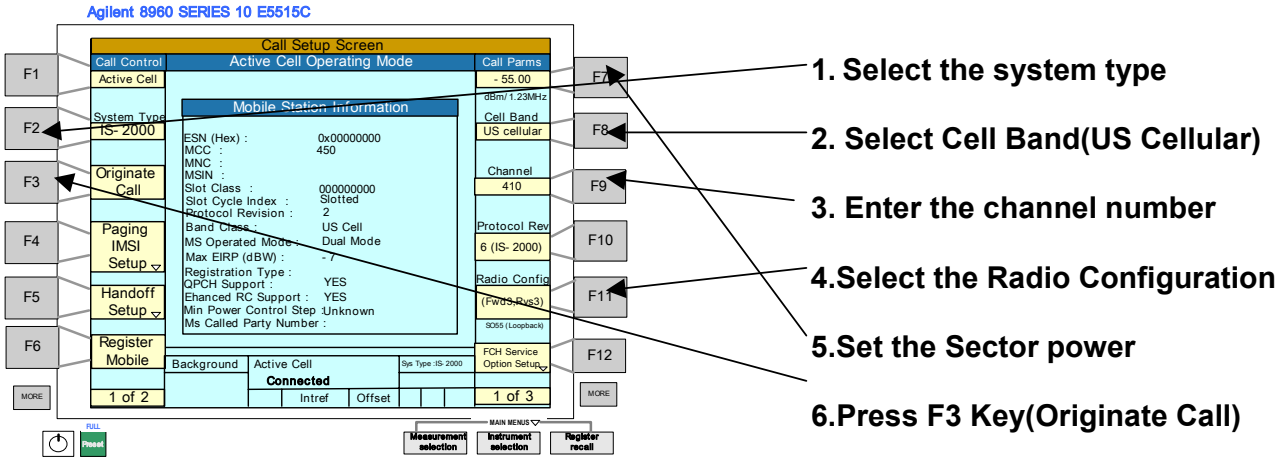
Connections for Testing



※ **The phone turns into charge mode when supplied power over 4.6V.**

Set up for CDMA call & Making CDMA Call

top



1. Select the system type(For this demo we select IS-2000) and Cell Band(US Cellular) and Enter the channel number that the CDMA phone expects to find a CDMA system on. A CDMA phone will only look for a CDMA system on power-up at its programmed primary or secondary channels. The 8960 E5515C defaults to channel 384. The phone you are using is set to a primary channel 410

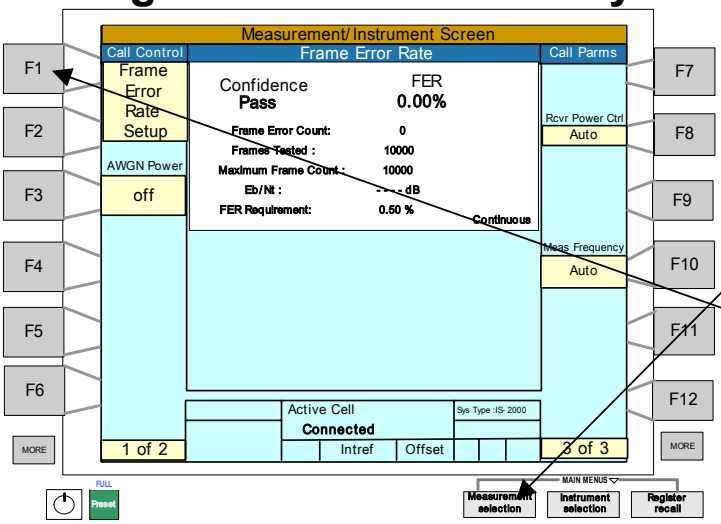
2. Select the Radio Configuration.
   IS-2000 is necessary
   (Fwd1,Rvs1)
   (Fwd2,Rvs2)
   (Fwd3,Rvs3)
   (Fwd4,Rvs3)
   (Fwd5,Rvs4)

3. Finally, set the Sector A power to -55 dBm/1.23 MHz. You are now ready to make a CDMA phone call.
4. Register the phone. This step is not required for mobile initiated calls. The MS database should now show an ESN value
5. Press F3 Key and Then Call is connected

top

Making a Receiver Sensitivity Measurement

top



1.Press Measurement selection key and Select Frame Error Rate Measurement

2.Press F1 Key Frame Error Rate Setup and Enter 10,000 into the Max frames field and Check Confidence field and FER spec.

Now that you call connected, you are ready to make parametric receiver and transmitter measurements
To perform receiver measurements:

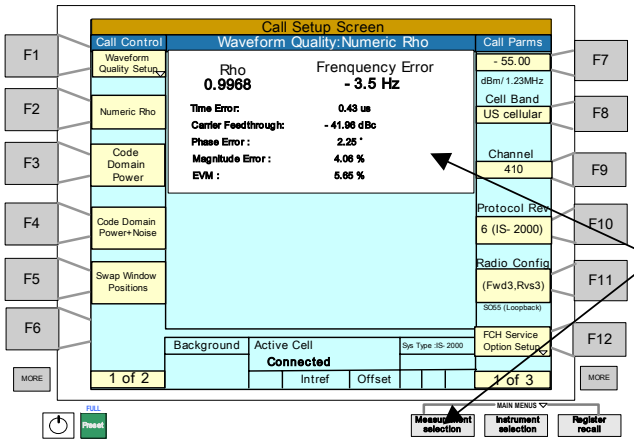
1. Press Measurement selection Key
2. Select the Frame Error Rate Measurement
3. Press F1 Key Frame Error Rate Setup
4. Enter 10,000 into the Max frames field. This sets an upper bound to the time limit of the test.

5.Enter 95% into the Confidence field. This field sets the desired confidence limit for the test. If confidence limit testing is not desired, you can turn this field off

6.Enter 0.5% into the FER spec field. This field sets the desired FER specification to test

CDMA Transmitter Tests

top



4
4

1.Press Measurement Selection key and Select Waveform Quality +Code Domain

2.Read Rho, Frequency Error, Time Error, Carrier Feedthrough, Phase Error Magnitude Error, EVM

Simultaneous measurements results in much reduced test time.

Note)The Specifications are
Rho 0.944<Rho<1
Frequency Error -300Hz<FE.<300Hz
Time Error -1us<Time Error<1us
Carrier Feedthrough under 0dB
Phase Error under 90 deg.
Magnitude Error under 100%
EVM under 25%

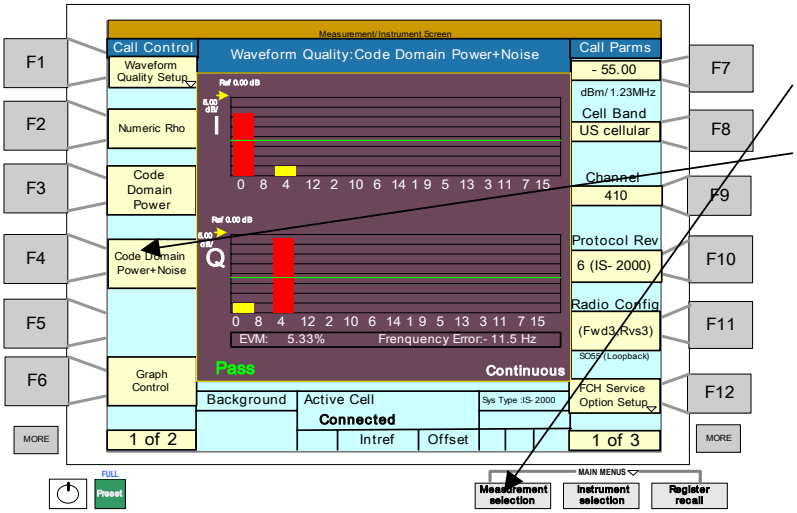
1. Press Measurement Selection Key

2.Select Waveform Quality + Code Domain

3.Read Rho, Frequency Error, Time Error Carrier Feedthrough, Phase Error, Magnitude Error, EVM**2**

CDMA Code Domain Power +Noise

top



1.Press Measurement Selection key and Select Waveform Quality +Code Domain

2.Press CodeDomain Power+Noise Key(F4)

Note) This measurements can be made only when one of the following radio configuration

(Fwd3,Rvs3)
(Fwd4,Rvs3)
(Fwd5,Rvs4)

1. Press Measurement Selection Key

2 Select Waveform Quality + Code Domain

3.Press Key F4 Code Domain Power + Noise Key, typical display is shown

The red bars indicate power levels
The yellow bars indicate noise levels

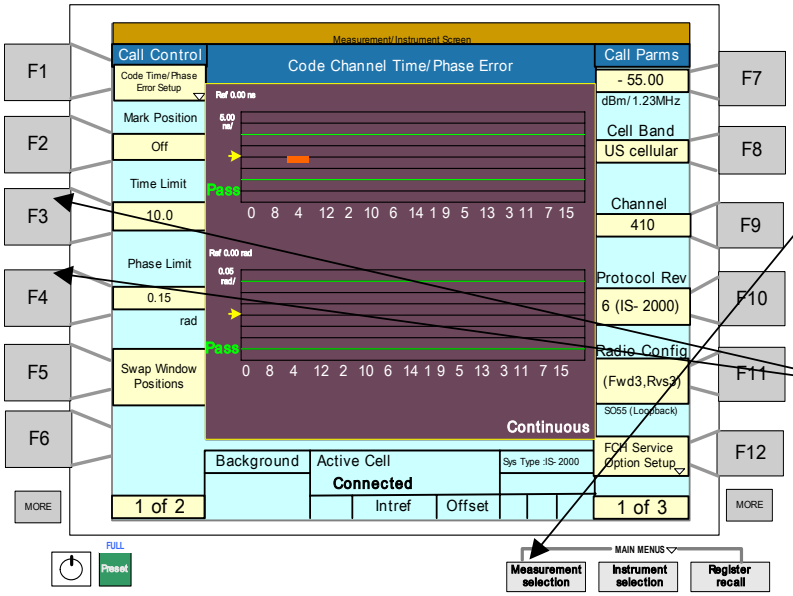
That both green lines, indicating the I and Q channel noise limits, move Together

The noise level specification is under -23dB

If you want to change the limit field
Select key F6 Graph Control key

CDMA Code Channel Time/ Phase Error

top



1.Press Measurement Selection key and Select Code Channel Time/Phase Error

2. Set up The Time Limit and Phase Limit using the F3 and F4 Keys

Note) This measurements can be made only when one of the following radio configuration

(Fwd3,Rvs3)
(Fwd4,Rvs3)
(Fwd5,Rvs4)

The code channel time specification is ±10 ns

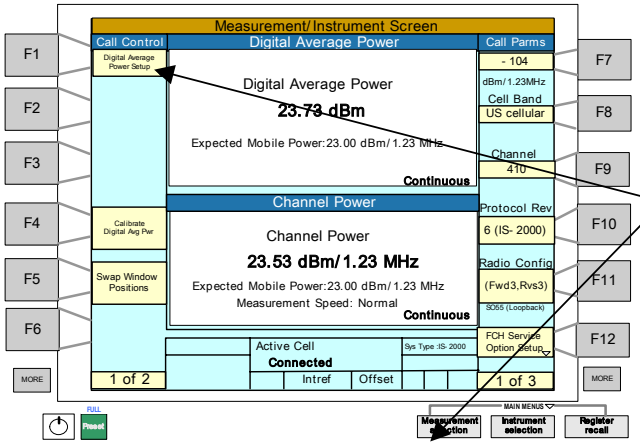
The phase error specification is under 0.15 radians

1. Press Measurement Selection Key

2.Select the Code Channel Time/PhaseError measurement

2. Set up The Time Limit and Phase Limit using the F3 and F4 Keys

CDMA Average Power & Channel Power



1.Press Measurement Selection key and Select Digital Average Power & Channel Power ,respectively display

2.Press Digital Average Power Setup

1. Press Measurement Selection Key

2.Select the Digital Average Power & Channel Power measurement,
respectively display is shown

FER with AWGN Tests

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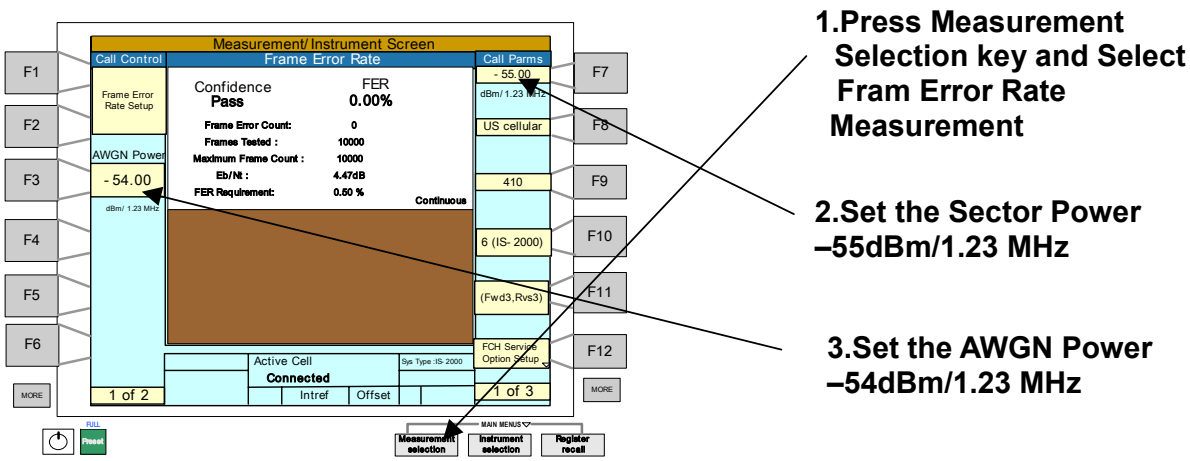

1.Press Measurement Selection key and Select Fram Error Rate Measurement

2.Set the Sector Power –55dBm/1.23 MHz

3.Set the AWGN Power –54dBm/1.23 MHz

In this test, large amounts of uncorrelated noise is added to operate the actual conditions encountered by a CDMA phone in actual use. To make this measurement:

1. Press Measurement Selection Key

2. Select Frame Error Rate Measurement

3.Set the Sector A Power to -55 dBm/1.23 MHz.

4.Set the AWGN power to -54 dBm/1,23 MHz

5.Under these conditions, a CDMA phone should meet 0.5% FER with 95% confidence. Standards specify other tests for other rates. These can be performed by changing the Traffic Data Rate

Circuit Description

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Receiving Section

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The receiver section occupies a frequency band of 869MHz~ 894MHz.

The Cellular receive signal is amplified by the RFR6120 LNA. The cellular path consists of a four-stage variable-gain LNA, an external RF filter with single-ended input and differential output, a pair of RF-to-baseband inputs (configured differentially with two-stage gain adjustments). The cellular amplifiers drive the RF ports of the quadrature RF-to-baseband downconverters (a dedicated downconverter for each band). The VCO used in generating the downconverter LO depends upon the operating band. The active VCO is buffered on-chip and routed to the RFT6102 IC as the Rx PLL feedback signal. The downconverted baseband signals are multiplexed and routed to lowpass filters (one I and one Q) whose passband and stopband characteristics are mode dependent. The filter outputs are buffered and passed on to the MSM for further processing.

Transmitting Section

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The MSM provides I and Q differential baseband signals (FM or CDMA) to the RFT6102 IC via the proprietary analog interface. The analog input signals are amplified and applied to the upconverter mixers.

A single upconverter plus RF path supports the Cellular band. The path includes multiple variable gain stages that provide transmit AGC control. Greater than 85-dB gain control range is realized using an MSM-adjusted pulse density modulated (PDM) signal that is RC-lowpass filtered at the RFT input to generate the analog VCONTROL signal.

The RF signal is routed to the Cellular driver amplifier. The single output (CELL_OUT) is sufficient for all Cellular applications. The driver amplifier output includes an integrated matching inductor. The addition of one external capacitor creates a 50-ohm nominal output impedance.

The driver amplifier output level depends upon the operating mode. The specified levels are achieved while supporting the appropriate standard's requirements for ACPR, spurious emissions, Rx-band noise, etc.

The RFT6102 output driver stages deliver fairly high-level signals that are filtered and applied to the Power Amplifier(PA). The PA output should be routed to the antenna through a duplexer.

Baseband Section

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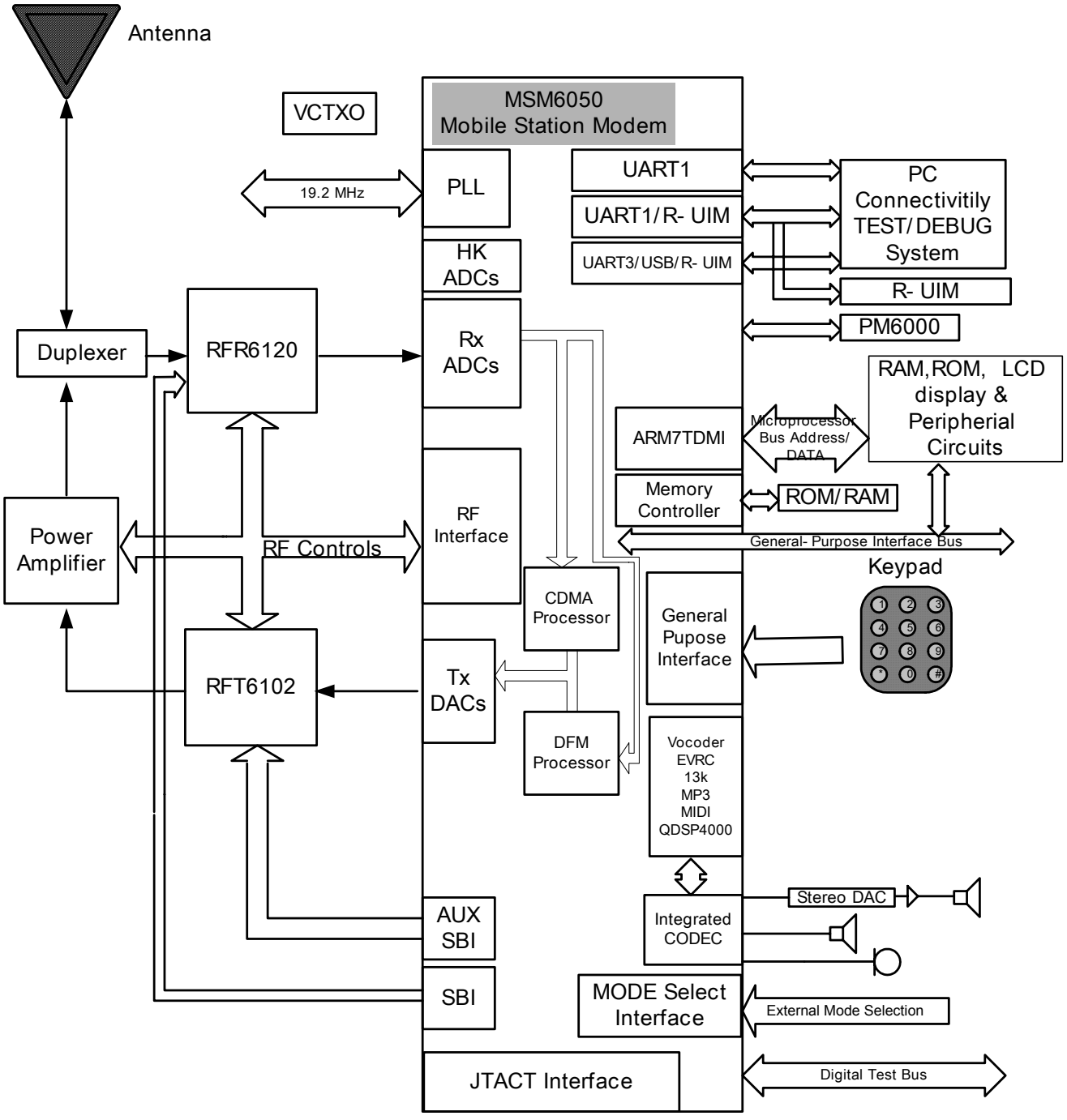


The logic part consists of MSM6050

- **ARM Microprocessor & Memory Interface**

The MSM6050 device contains an embedded ARM7TDMI microprocessor and supporting peripherals. The support peripherals include the Memory and Peripheral Interface Controller, Sleep Controller, Clock Controller, Watchdog Controller, and Watchdog circuit. The ARM7TDMI used in the MSM6050 device is a high-performance, low-power microprocessor. Some of the features of the ARM microprocessor include a 3-stage pipelined RISC architecture, both 32-bit ARMand 16-bit THUMB instruction sets, a 32-bit address bus, and a 32-bit internal data bus.
The Memory and Peripheral Interface Controller (MPIC) is used to configure the interface between the ARM microprocessor and external peripherals. The Memory and Peripheral Interface Controller contains the chip select generator, wait state generator, and bus-sizer circuits for the external memory and peripheral devices selected by the chip selects. The seven chip selects are ROM_CS1_N, ROM_CS0_N, RAM_CS1_N, RAM_CS0_N, LCD_CS_N, GP_CS1_N, and GP_CS0_N, which are memory mapped into the ARM address space.
In the MSM6050 device, the external memory interface is upgraded to support page mode memories and NAND flash memories, and allows access to external memories by the ADSP QDSP4 processor. The ADSP uses the direct memory exchange (DME) interface for that purpose.

- **UART**

The Universal Asynchronous Receiver Transmitter (UART) communicates with serial data that conforms to RS-232 interface protocol. The UART can be used as a serial data port in Mobile Station testing and debugging with a properly written, user-defined download program.
If the Mobile Station uses EEPROM or Flash memory, the serial data port can be used to load and/or upgrade the system software. The serial data port can also be used to run Mobile Station diagnostic tests during the manufacturing process.
The serial data port is a UART channel. The UART processes both the transmit and the receive data, and interrupt control circuits, a clock generator, a bit rate generator (BRG), and a microprocessor interface.
The UART has a 512-byte transmit (Tx) FIFO and a 512-byte receive (Rx) FIFO. The UART features hardware handshaking,programmable data sizes (5, 6, 7, or 8 bits), programmable stop bits (0.563, 1.000, 1.563, and 2.000), and odd, even, space, or no parity. The UART operates at a 230.4 kbps maximum bit rate.

- **USB Interface**

The MSM6050 device contains a Universal Serial Bus (USB) interface to provide an efficient interconnect between the mobile phone and a personal computer (PC). The USB interface of the MSM6050 device was designed to comply with the definition of a peripheral as specified in USB Specification, Revision 1.1. Therefore, by definition, the USB interface is also compliant as a peripheral with the USB Specification, Revision 2.0. The USB Specification Revision 1.1 defines two speeds of operation, namely low-speed (1.5 Mbps) and full-speed (12 Mbps), both of which are supported by the MSM6050 device. The USB Specification Revision 2.0 defines an optional high-speed (480 Mbps) mode of operation for peripherals, which is not supported by the MSM6050 device.
The MSM6050 device has ten different USB endpoints to support these various types of control and data transfers. An external USB transceiver and 48 MHz resonator or crystal oscillator are required to implement the USB interface.

- **User Interface**

Keypad Interface : The KEYSENSE[4:0] pins can be used to connect a matrix keypad to the MSM6050 device. The KEYSENSE[4:0] inputs assert a KEYSENSE_INT if any of the pins are pulled low.

Ringer : The Ringer generation circuit is programmed to output single tones or DTMF

tone pairs on the RINGER pin. The Ringer generation circuit produces and sums two different user-programmable frequencies. Single tones can be generated by programming two tones of the same frequency. The Ringer function is disabled when RESOUT is asserted.

- **HKADC**

The MSM6050 device has an on-chip 8-bit analog-to-digital converter (HKADC) which is intended to digitize DC signals corresponding to analog parameters such as battery voltage, temperature, and RF power levels.
The MSM6050 device has seven analog input pins (HKADC[6:0]) which are multiplexed to the input of the internal HKADC. An eighth analog input is connected to an internally generated 1.826 Volt source. The analog multiplexer is switched by three control bits, MUX_SEL_N found in the HKADC_CNTL2 SBI register. Conversion must be done for the HKADC to complete initialization. This requires that a dummy conversion be done rior to using HKADC.

- **Clock Regime**

The MSM6050 device derives all of its internal clock sources from three clock inputs, TCXO, SLEEP_XTAL, and 48XTAL. The TCXO clock input supports 19.2 MHz. An integrated PLL and M/N counter is used to create the required clock sources when the TCXO frequency is 19.2 MHz. The SLEEP_XTAL can support a 32.768 kHz clock source to drive the sleep controller during periods when most of the MSM6050 device is powered down and the TCXO is disabled. A 48 MHz crystal oscillator is used to generate the clock source for the USB interface and is not required for any other subsystem of the MSM6050 device. It is recommended that the USB clock source be shut down when the USB interface is not being used.

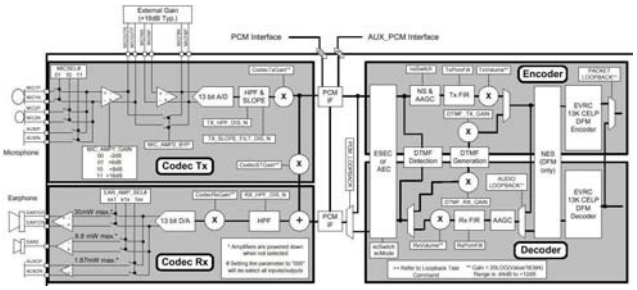
- **General-Purpose Interface Bus**

TheMSM6050 device has general-purpose bidirectional input/output pins. Some of the GPIO pins have alternate functions supported on them. The alternate functions include USB interface, additional RAM, ROM, general-purpose chip selects, parallel LCD interface, and a UART interface. The function of these pins is documented in the various software releases.

- **Mode Select and JTAG Interfaces**

The mode pins to the MSM6050 device determine the overall operating mode of the ASIC. The options under the control of the mode inputs are Native mode, which is the normal subscriber unit operation, ETM mode, which enable the built-in trace mode, and test mode for factory testing. The MSM6050 device meets the intent of ANSI/IEEE 1149.1A-1993 feature list. The JTAG interface can be used to test digital interconnects between devices within the mobile station during manufacture.

The Audio Section of MSM6050



The MSM6050 device integrates a wideband audio CODEC into the Mobile Station Modem. The wideband codec allows the MSM device to support music/ringer Melody applications in addition to the 8 kHz voice band applications on the forward link. In the audio transmit path, the device operates as 13-bit linear converter with software selectable 8 kHz and 16 kHz sampling rate. In the audio receive path, the device operates as a software selectable 13-bit or 16-bit linear converter with software selectable 8 kHz, 16 kHz, 22.05 kHz, 24 kHz, 32 kHz, 44.1 kHz, or 48 kHz sampling rate. On the reverse link, an I2S slave interface is implemented for receiving stereo data input.

- **Transmit Path Processing**

The microphone interface consists of two differential microphone inputs, one differential auxiliary input and a two-stage audio amplifier. The microphone input is selected by the Codec Configuration command (MIC_SEL). Only one of the inputs is active at any given time and the other inputs are powered down.

The gain for the first stage amplifier can be set to either –2 db, +6 dB, +8 dB or +16 dB by the Codec Configuration command (MIC_AMP1_GAIN). The outputs of the first stage are the output pins MICOUTP and MICOUTN.

The gain of the second stage amplifier is set externally. Additional filtering for the microphone can be designed into the external gain circuit in order to enhance the audio performance of the transmit channel. The second stage amplifier can also be bypassed internally by setting Codec Configuration command (MIC_AMP2_BYP). The MICINP and MICINN are the inputs to the second stage amplifier and MICFBN and MICFBP are the feedback outputs. In addition to the gain stage, the circuit contains a highpass filter that suppresses low frequencies.

- **Receive Path Processing**

The MSM6050 device includes the capability of adding a portion of the Tx audio into the receive path. This sidetone is added with a programmable gain stage, with a range of 0 dB to –96 dB, controlled by the QDSP4000 DMA parameter CodecSTGain.

A user selectable highpass filter is available for rejection of low frequency noise. This filter provides at least 30 dB of attenuation below 120 Hz.

The Rx audio path contains a programmable gain stage, with a range of +15 dB to –81 dB, after the QDSP4000 and prior to the Digital-to-Analog conversion. The QDSP4000 DMA parameter CodecRxGain sets the Rx gain.

The receive path is digitally filtered with an ITU G.712 compliant filter. The filter response has a flat passband out to 3400 Hz and offers attenuation of at least 14 dB at 3.98 kHz to allow adequate image rejection.

The receive path can be directed to either one of two earphone amplifiers or the auxiliary output. The outputs earphone1 (EAR1OP, EAR1ON) and Auxiliary out (AUXOP, AUXON) are differential outputs. Earphone2 (EAR2O) is a single-ended output stage designed to drive a headset speaker. Selection of the active amplifier is accomplished by sending the QDSP4000 Codec configuration command (AMP_SEL). The earphone amplifiers that are not selected are disabled and the output is in a high-Z state.

The Power Section

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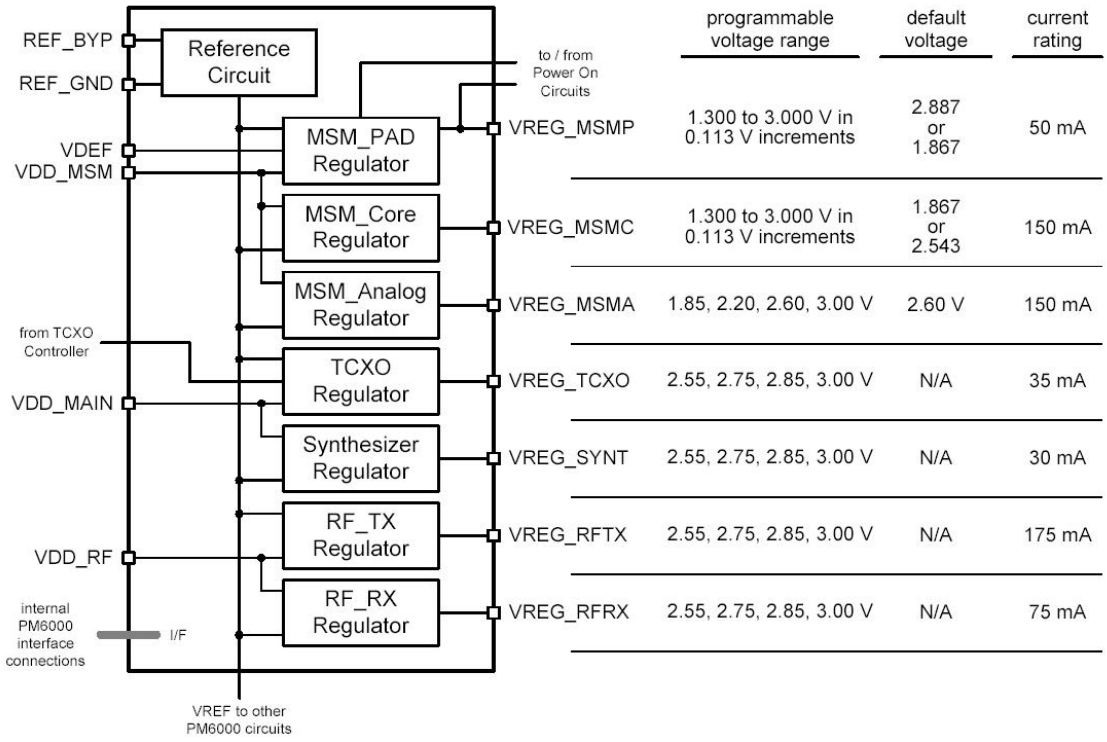
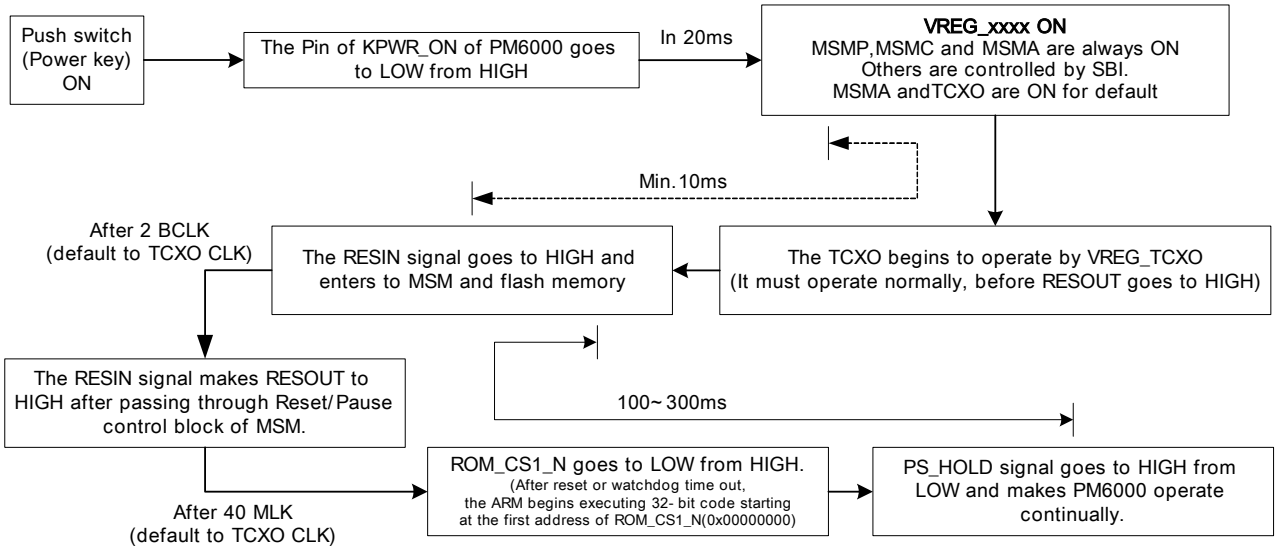


	programmable voltage range	default voltage	current rating
VREG_MSMP	1.300 to 3.000 V in 0.113 V increments	2.887 or 1.867	50 mA
VREG_MSMC	1.300 to 3.000 V in 0.113 V increments	1.867 or 2.543	150 mA
VREG_MSMA	1.85, 2.20, 2.60, 3.00 V	2.60 V	150 mA
VREG_TCXO	2.55, 2.75, 2.85, 3.00 V	N/A	35 mA
VREG_SYNT	2.55, 2.75, 2.85, 3.00 V	N/A	30 mA
VREG_RFTX	2.55, 2.75, 2.85, 3.00 V	N/A	175 mA
VREG_RFRX	2.55, 2.75, 2.85, 3.00 V	N/A	75 mA

Operating Mode		VREG_MSMP	VREG_MSMC	VREG_MSMA	VREG_TCXO	VREG_SYNT	VREG_RFTX	VREG_RFRX
CDMA	Rx/Tx	ON	ON	ON	ON	ON	ON	ON
	Rx	ON	ON	ON	ON	ON	ON	ON
	Sleep	ON	ON	ON	OFF	OFF	OFF	OFF
FM	Rx/Tx	ON	ON	ON	ON	ON	ON	ON
	Rx	ON	ON	ON	ON	ON	ON	ON



Troubleshooting

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Introduction

Known good Parts List should be available to be used for troubleshooting by substitution, and for Parts List of defective parts. Defective circuit boards should be for-warded to the appropriate MOTOROLA service facility for repair.

Refer to the “C357 Parts List” section of this manual for a list of part descriptions and part numbers.

Troubleshooting

The troubleshooting chart in page , “Assembly Replacement Level Trouble-shooting and Repair Chart,” shows some typical malfunction symptoms and the corresponding verification and repair procedures.

Refer to the disassembly instructions located in the “Disassembly” section of this manual for instructions on removing parts/assemblies.

Most of the troubleshooting procedures on the following pages require temporarily connecting DC power to the battery connector with the phone disassembled.

Logic Part Troubleshooting

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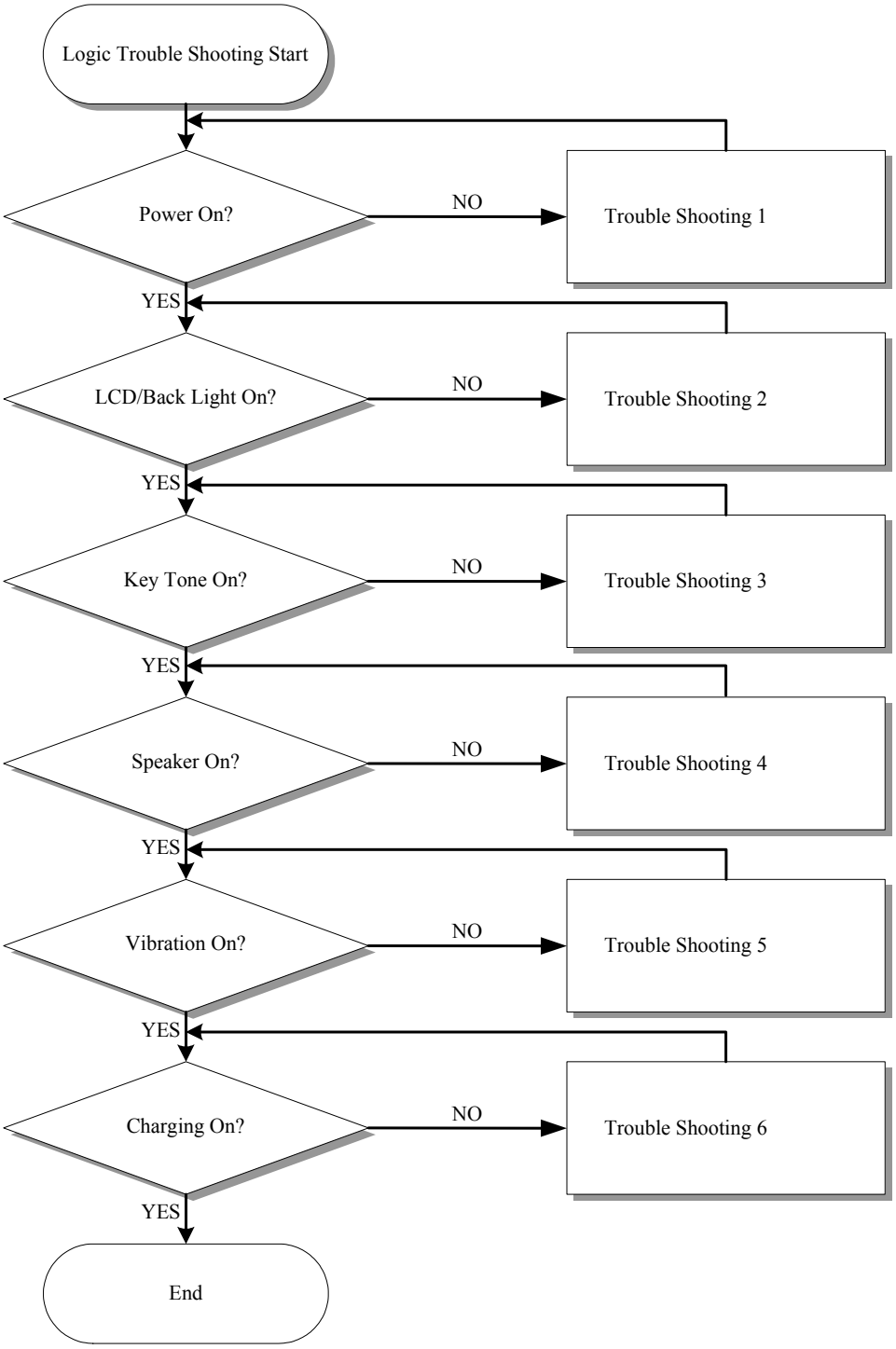

Troubleshooting1

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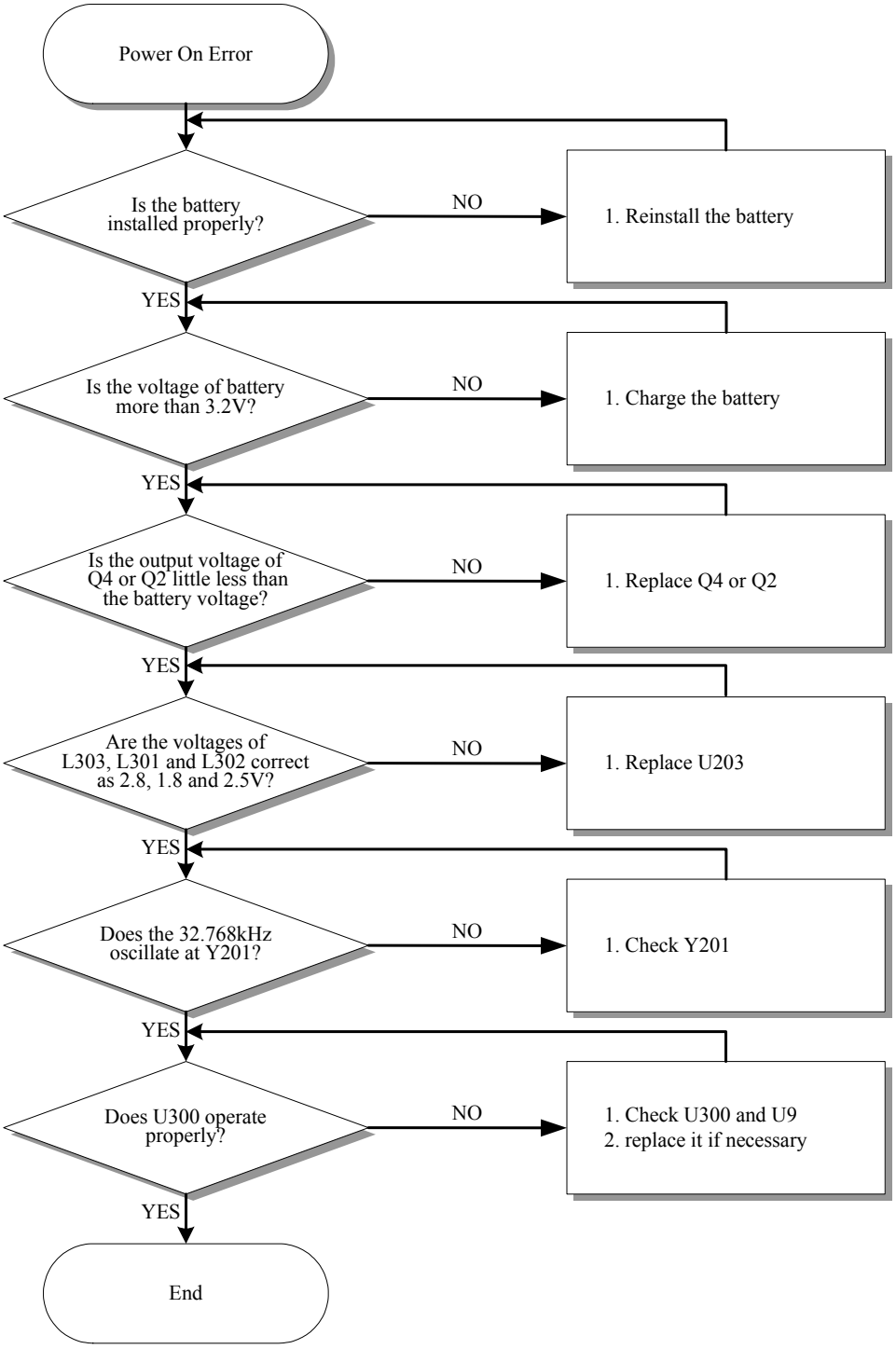
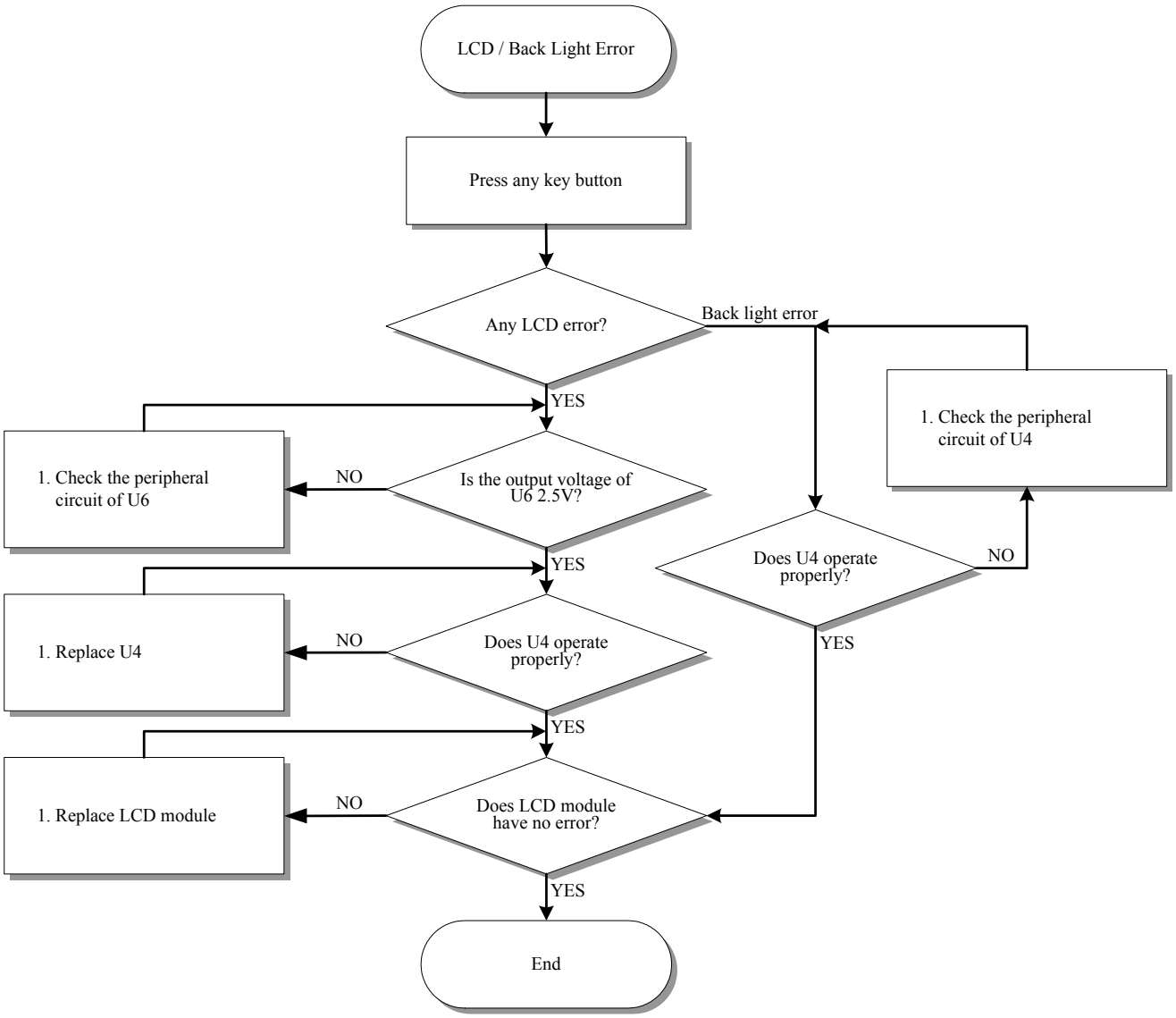


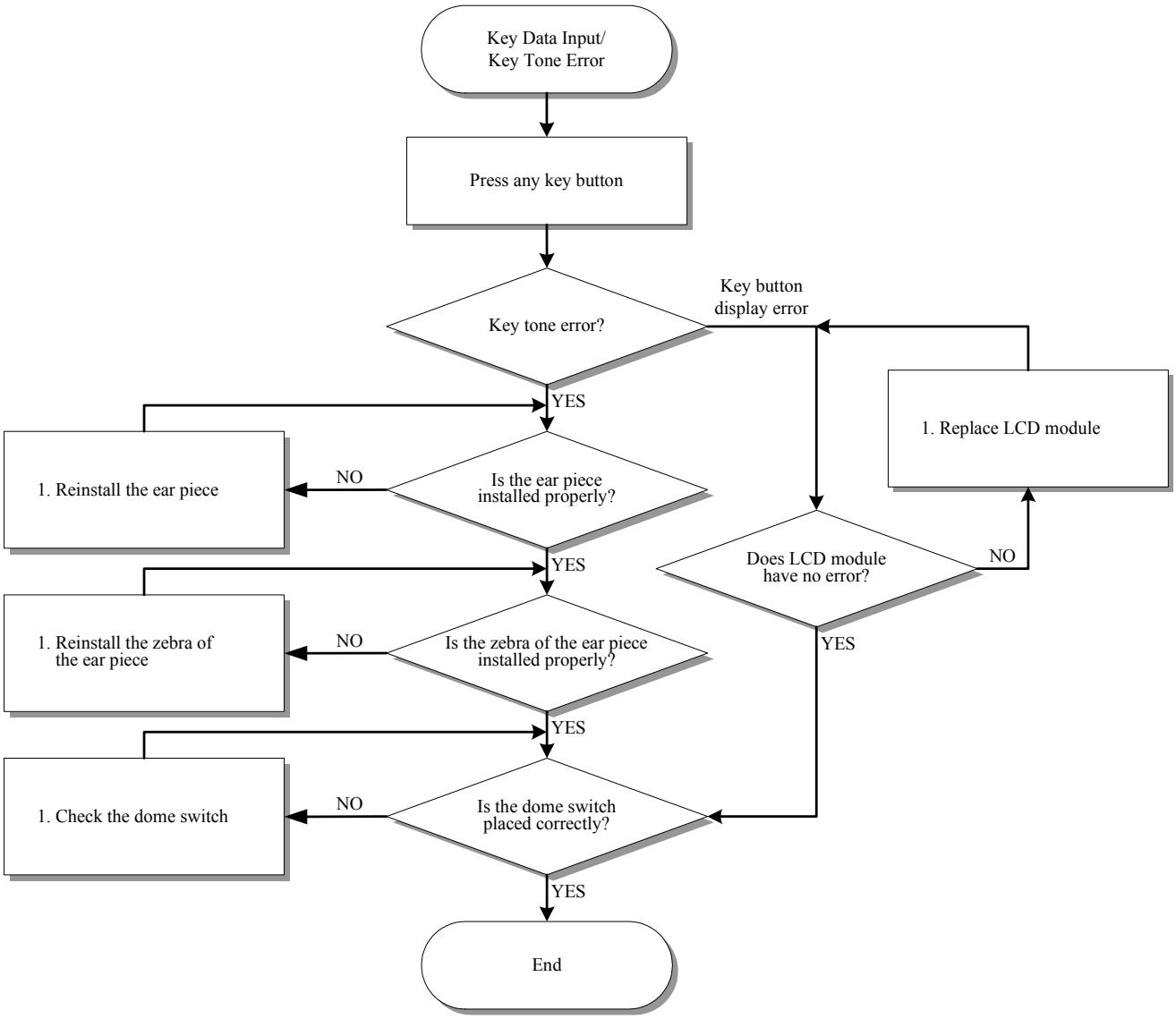
Troubleshooting2

top



Troubleshooting3

top



Troubleshooting4

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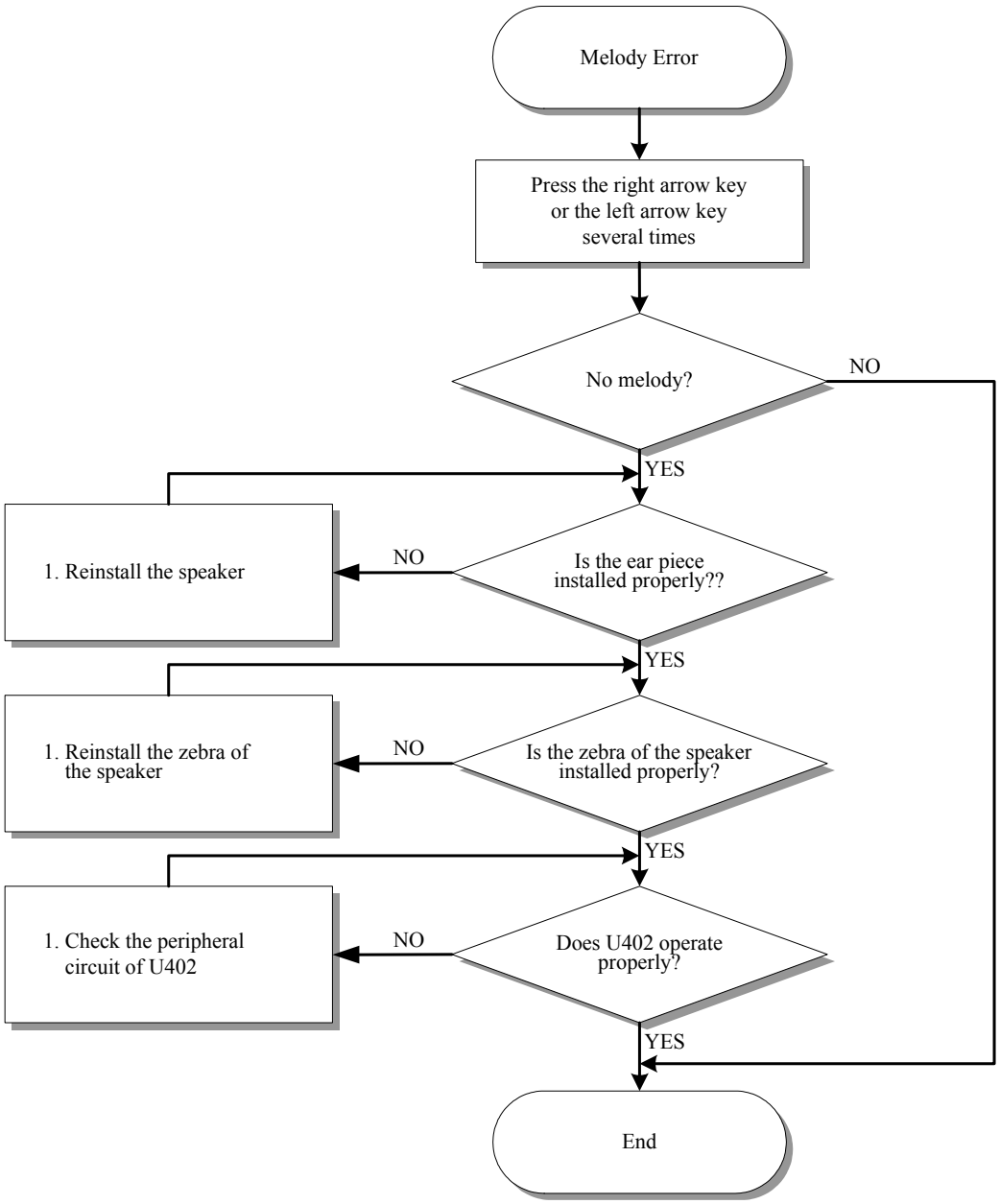

Troubleshooting5

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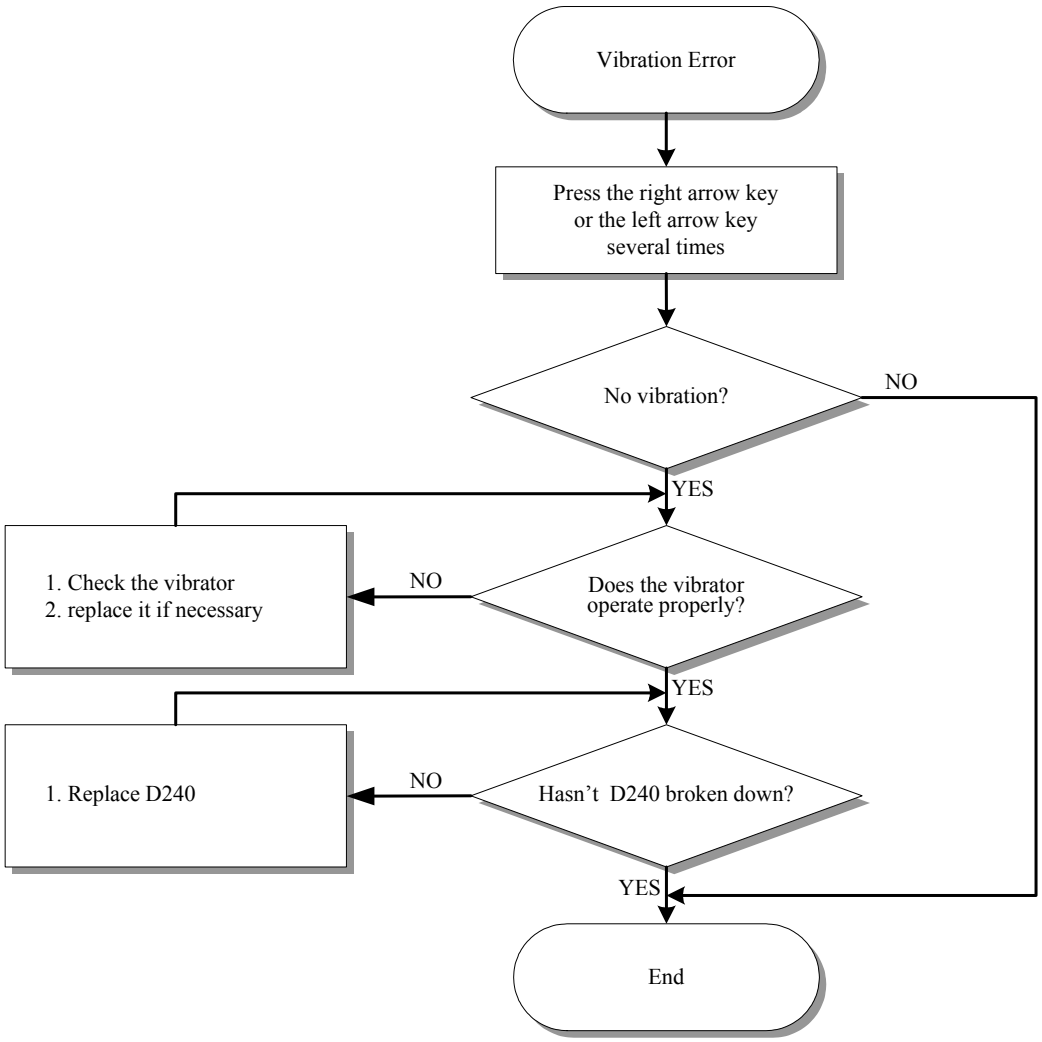
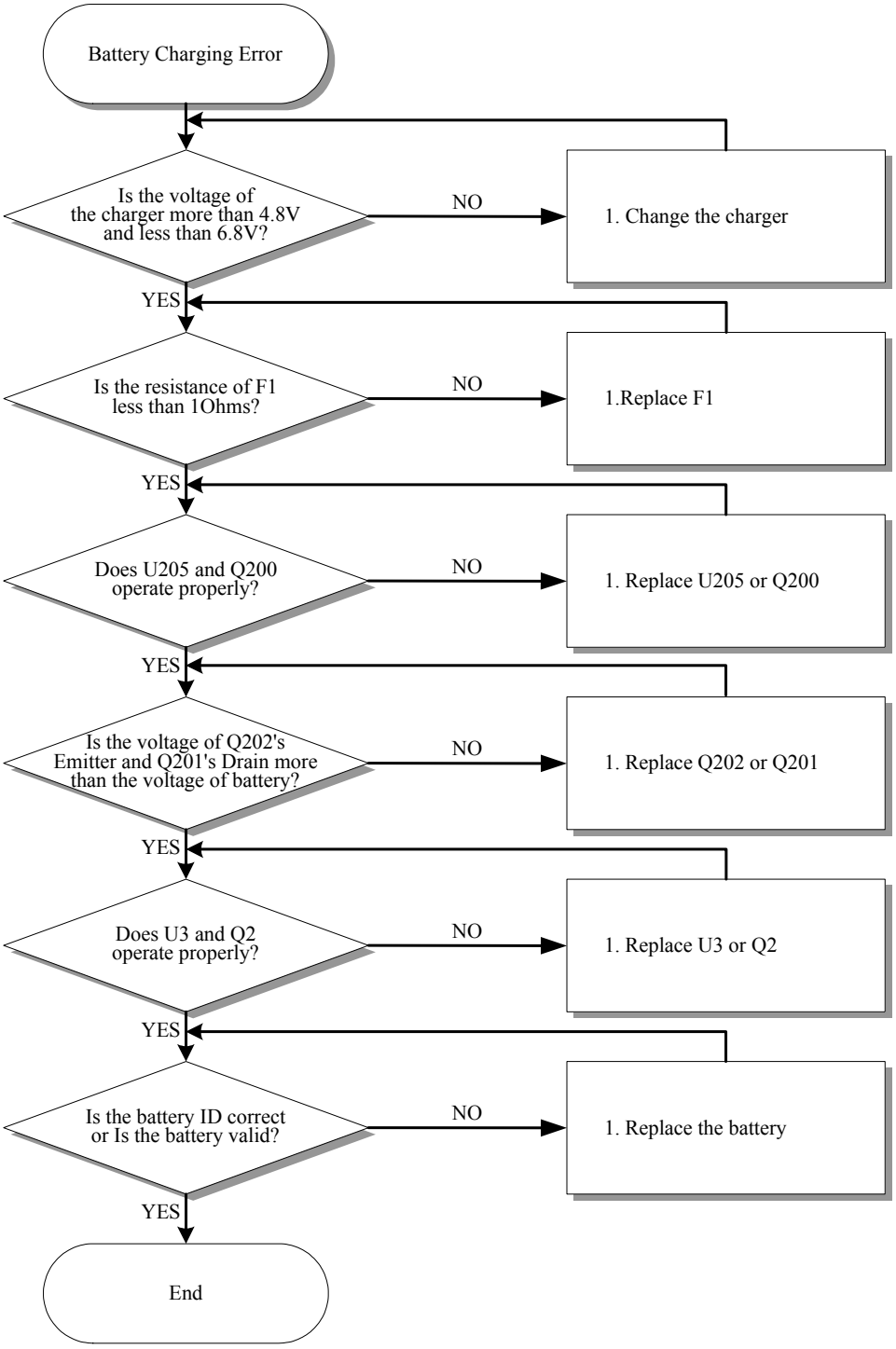


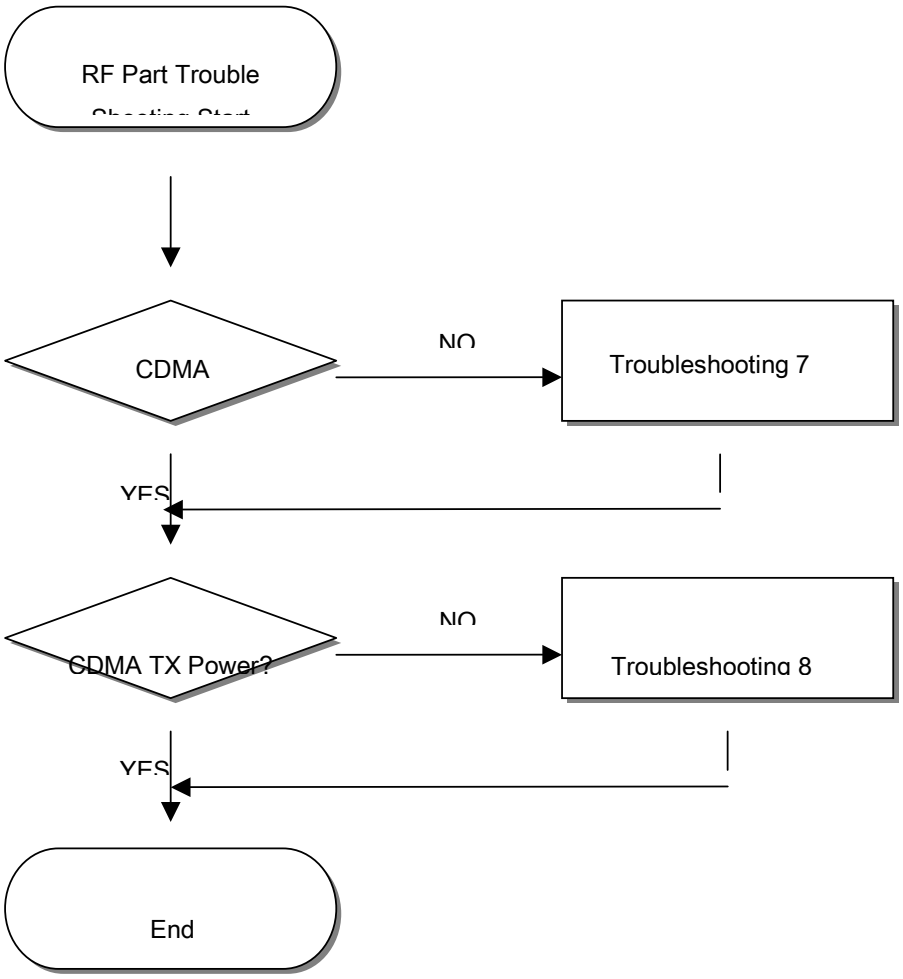
Troubleshooting6

top



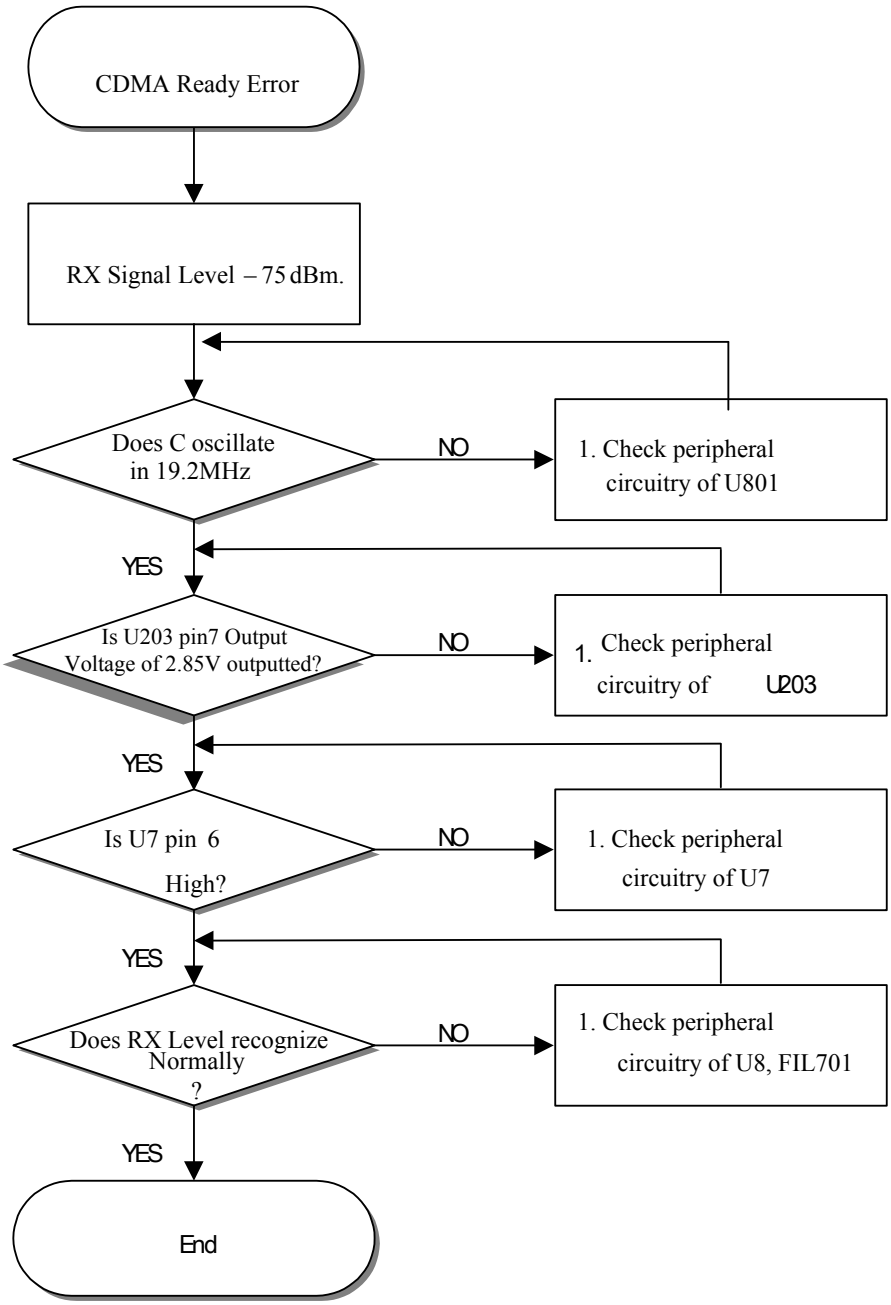
RF Part Troubleshooting

top



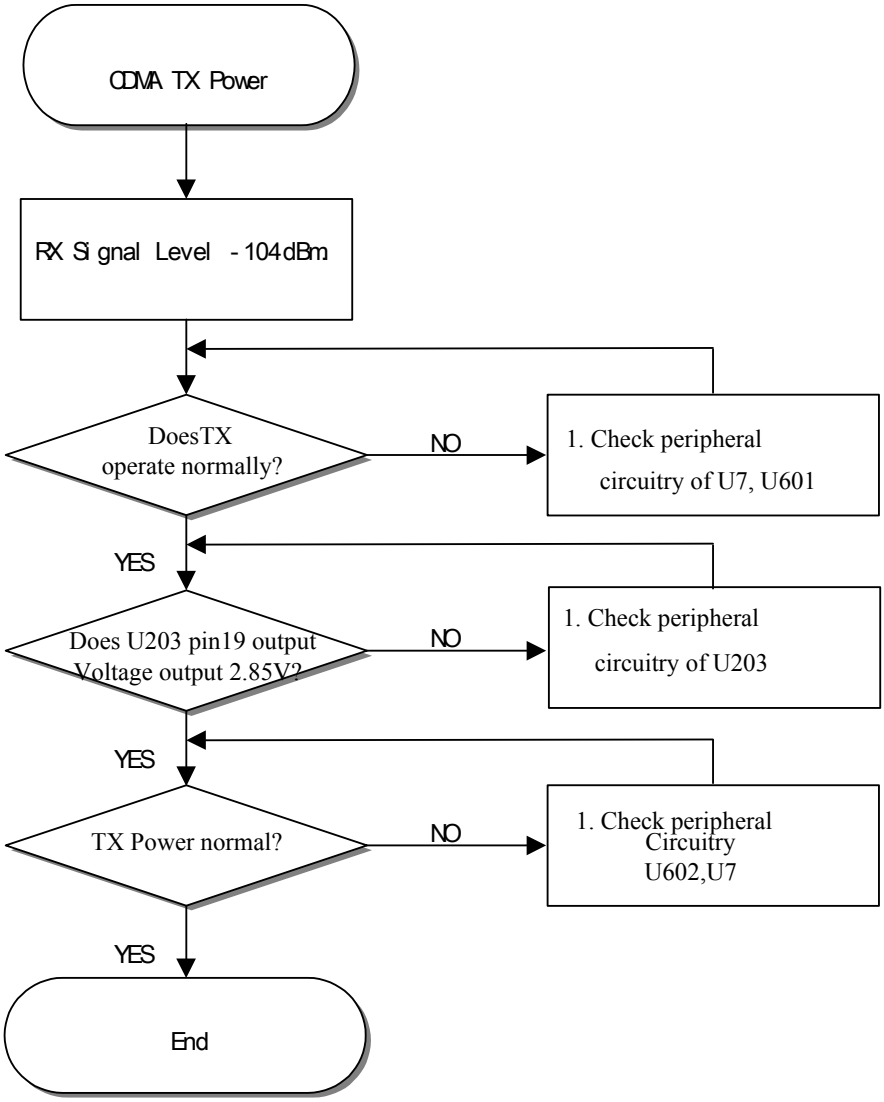
Troubleshooting7

top



Troubleshooting8

top



Service Diagram

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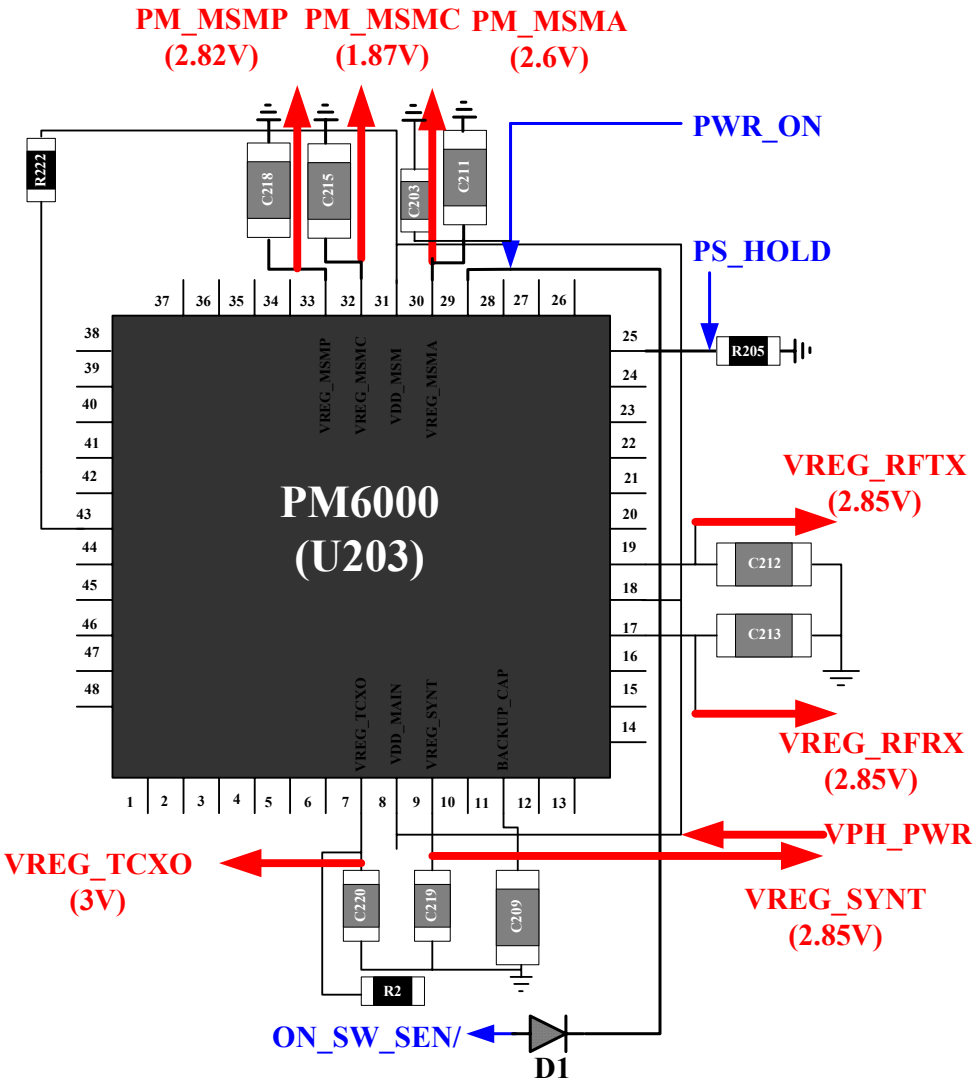
C357 Power Management

top



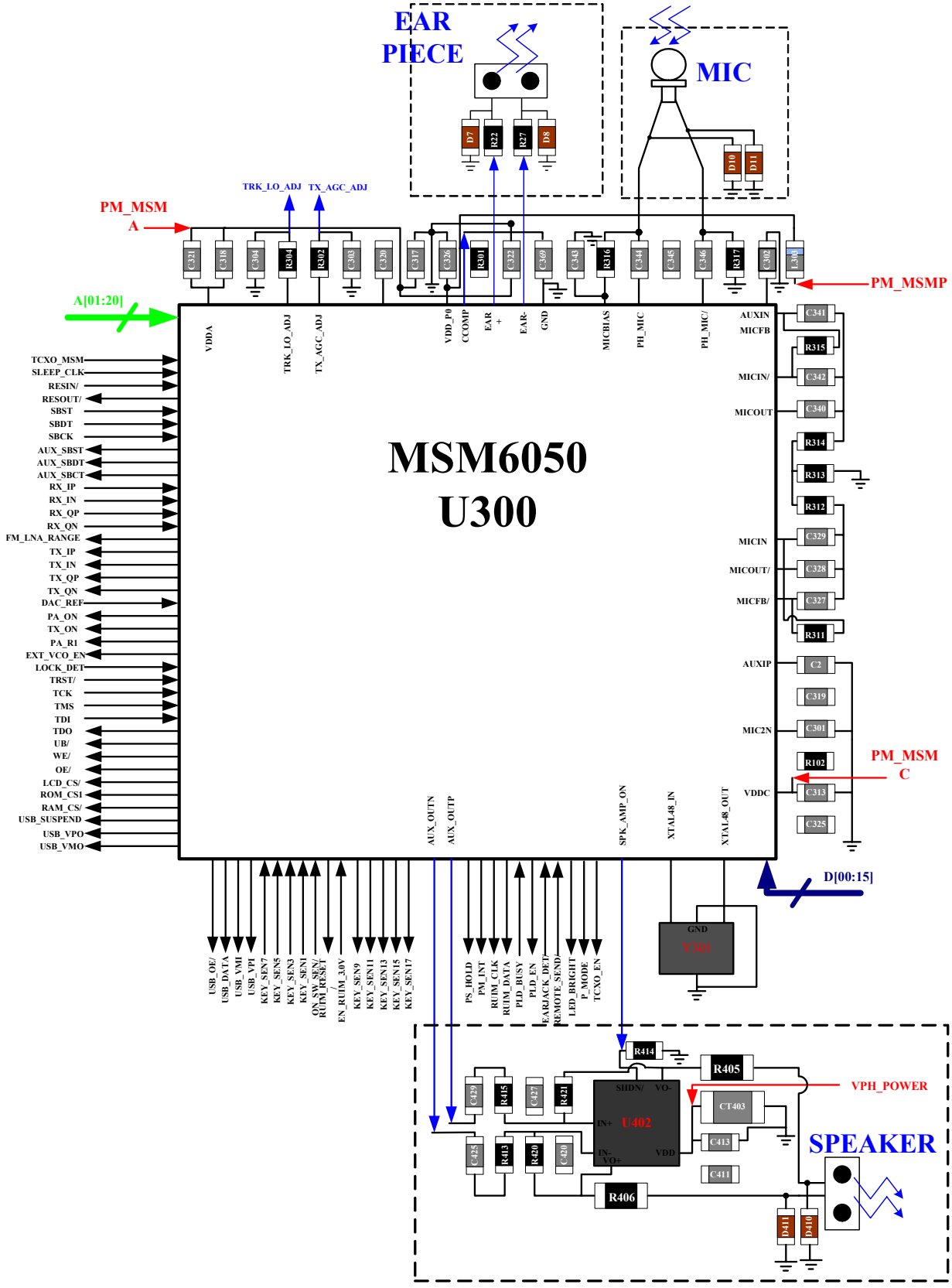
When the PS_HOLD signal from the MSM is low the PM6000 IC is in one of its off states. Under this condition, the power-on circuits continually monitor three events that could trigger a power-on Three events are SMPL, Keypad power_on, External supply detection.

PM 6000(U203) is consisted of seven low dropout regulators with programmable output voltages They use VPH_PWR(Battery Voltage) as a voltage source.
They are PM_MSMP and PM_MSMC, PM_MSMA, VREG_TCXO, VREG_RFRX, VREG_RFTX, VREG_SYNT,.

Only the MSMP, MSMC, and MSMA outputs are truly dedicated to particular functions powering specific MSM circuits and setting the digital input thresholds and output voltage swings.
The TCXO and the MSMA regulator operations can be sequenced by the TCXO Controller to minimize power dissipation.

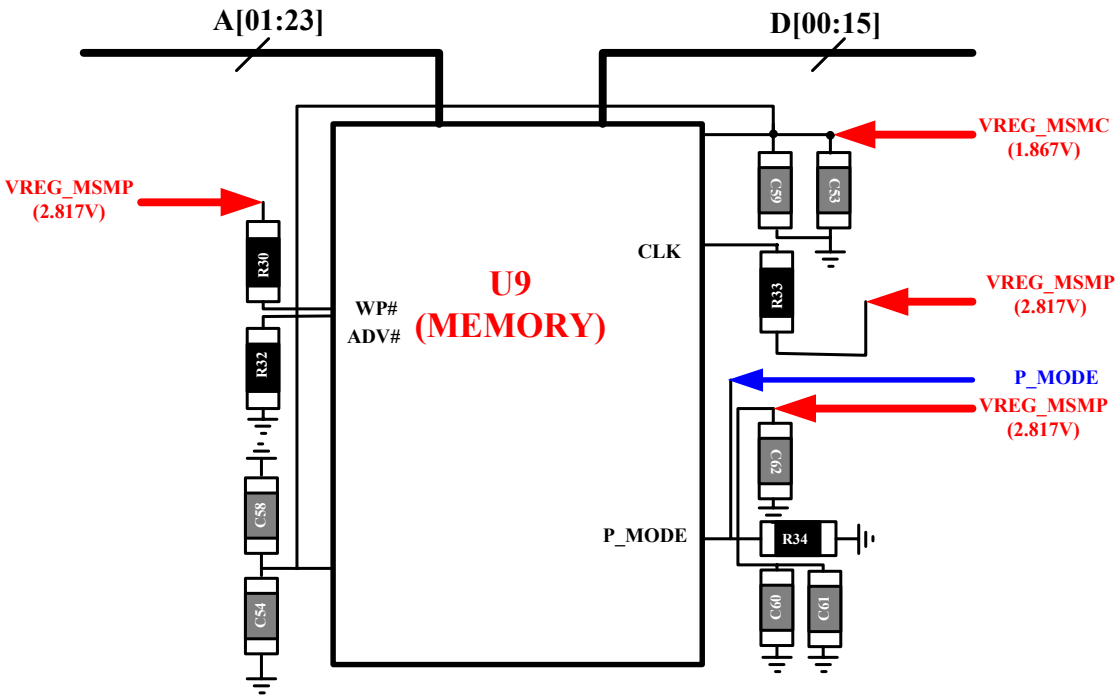
MSM6050

top



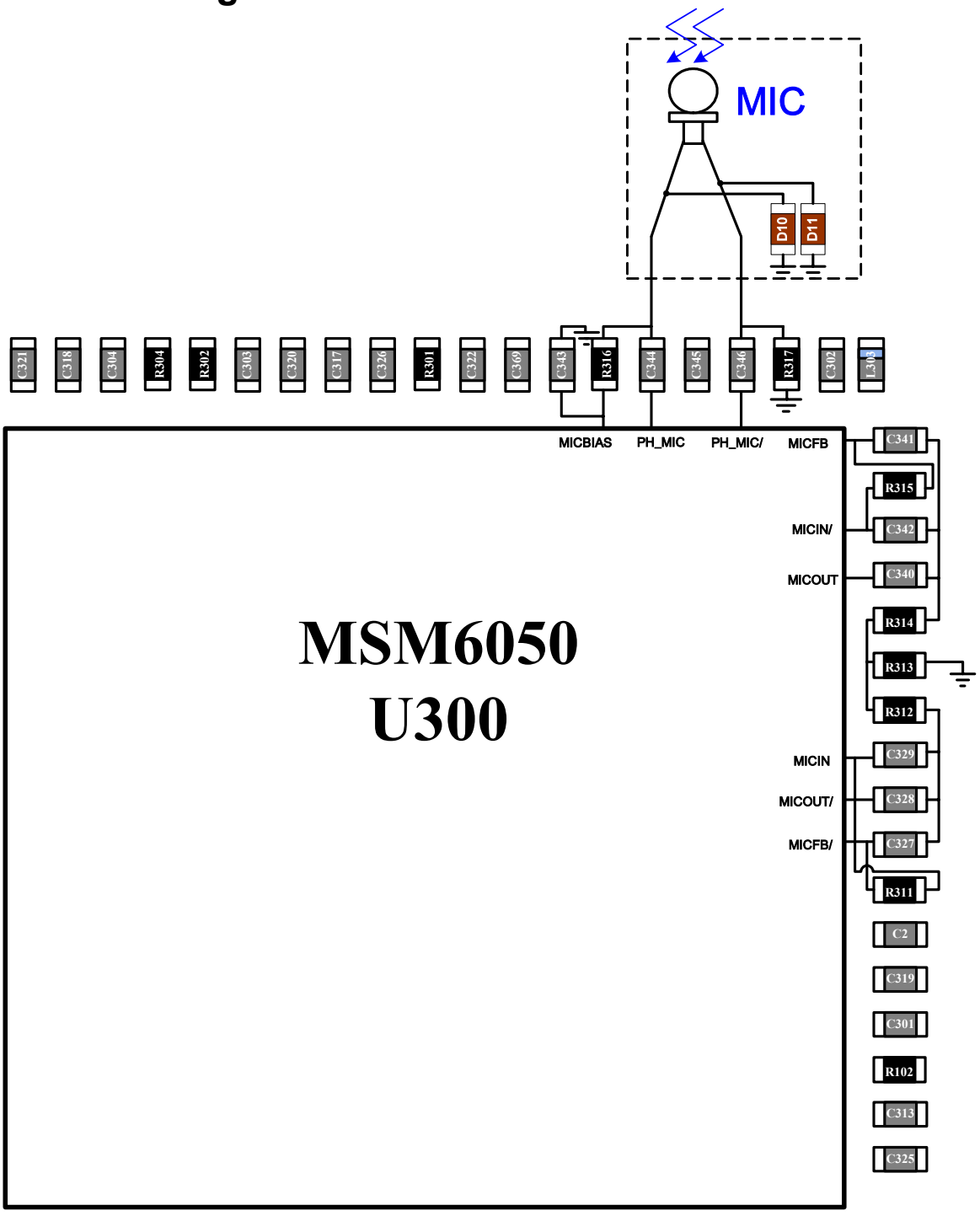
Memory

top



Audio Configuration & Schemetic

top



The Quality of audio is concerned with C329 and C342.
The Level of audio is concerned with C327,C328,C240 and C341.
If it is wanted to enlarge the audio level, apply high value to C328 and C340, and low value to C327 and C341.
If it is wanted to emphasize the high frequency, apply all R & C to low value except C344 and C346. And then, HPF can move to high frequency area.

Microphone and Earphone Interface

The MICBIAS output pin is designed to provide 1 mA of current at 1.8 Volts DC.
The output power for the differential EAR1 output is typically 35 mW for a full-scale +3 dBm0 sine wave into a 32 OHM speaker.

Transmit Path Processing

Configuration command (MIC_AMP2_BYP). The MICINP and MICINN are the inputs to the second stage amplifier and MICFBN and MICFBP are the feedback outputs. Above Picture shows a typical external circuit with a gain of 18 dB. In addition to the gain stage, the circuit contains a highpass filter that suppresses low frequencies.
The transmit data from the microphone input is digitally filtered with an ITU G.712 compliant filter. The filter attenuates the input signals outside the 3400 Hz baseband and decimates the data rate to 8 kHz.

Receive Path Processing

The receive path is digitally filtered with an ITU G.712 compliant filter. The filter response has a flat passband out to 3400 Hz and offers attenuation of at least 14 dB at 3.98 kHz to allow adequate image rejection.
The receive path can be directed to either one of two earphone amplifiers or the auxiliary output.
The outputs earphone1 (EAR1OP, EAR1ON) and Auxiliary out (AUXOP, AUXON) are differential outputs. Earphone2 (EAR2O) is a single-ended output stage designed to drive a headset speaker.

LED and LCD B/L Driver

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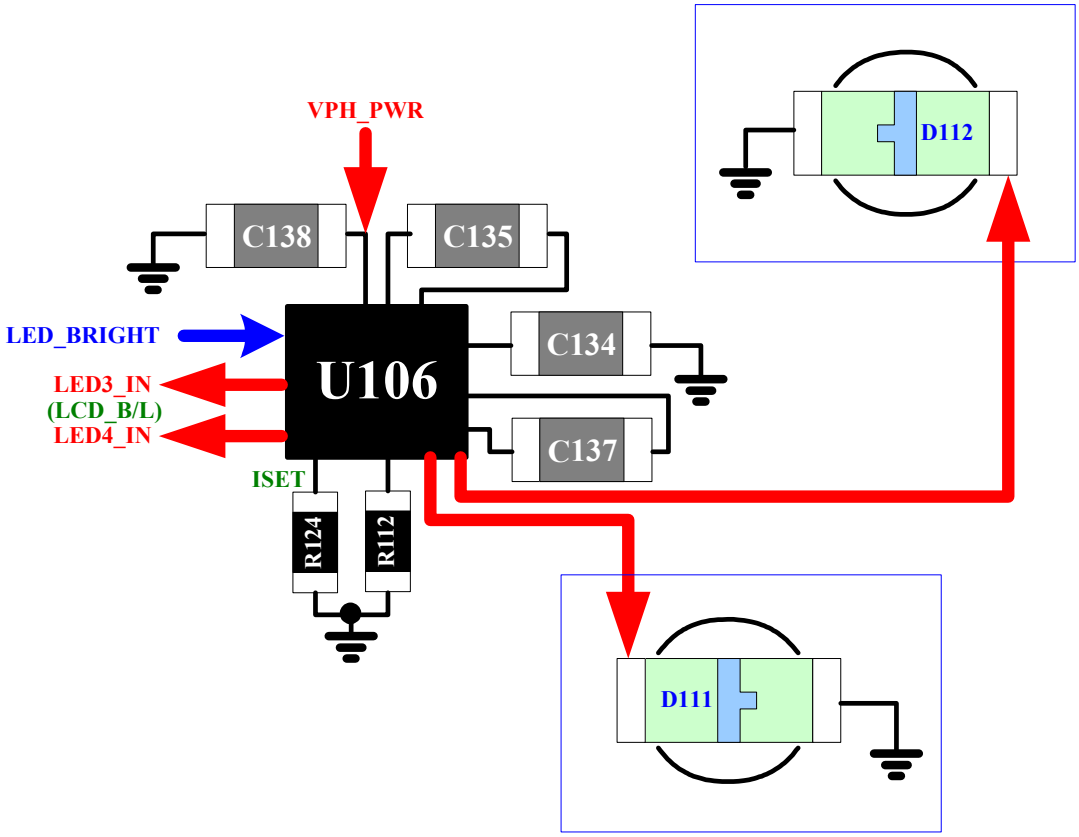

U106, LM2794 is a charge pump IC, that can double the input voltage, the VPH_PWR. C135 and C137 are used for doubling voltage, C138 and C134 for stabilizing the input or output voltage. U106 supplies constant current to 4 LEDs, two of them are keypad LEDs and the others are for LCD B/L, and its current is set by the resistor, R124.

The value of R124 is 120Ω and the current of any LED has set by 15mA, currently.

PLD and LCD Connector

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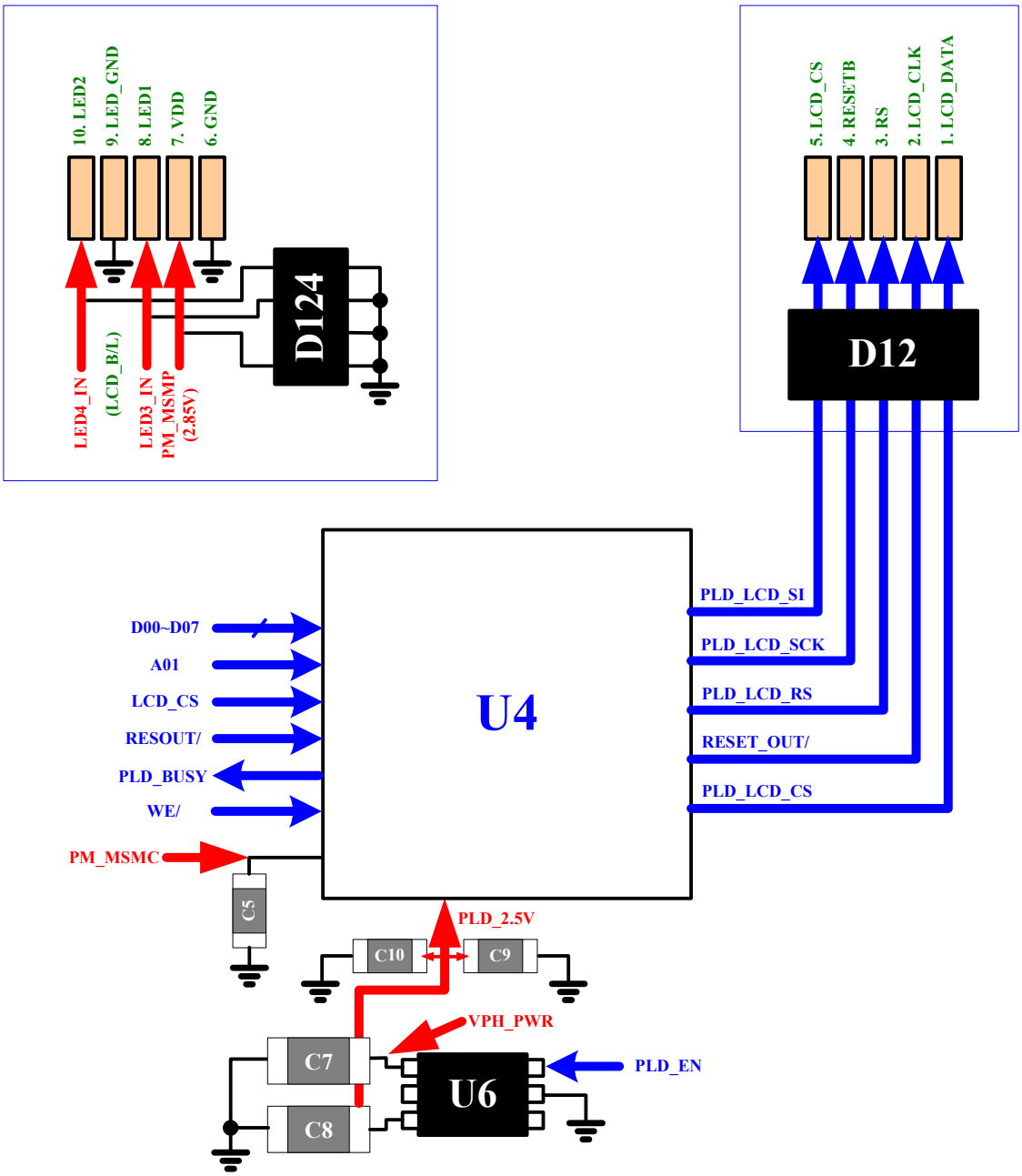

U4, XC2C32-6CP56I is a PLD than can make parallel data to serial data, because the main LCD supports serial data only. U6, XC6209B252DR is a LDO regulator and it generates 2.5V that is used for driving PLD.
D12 and D124 are used for ESD protection.

Vibrator Circuits

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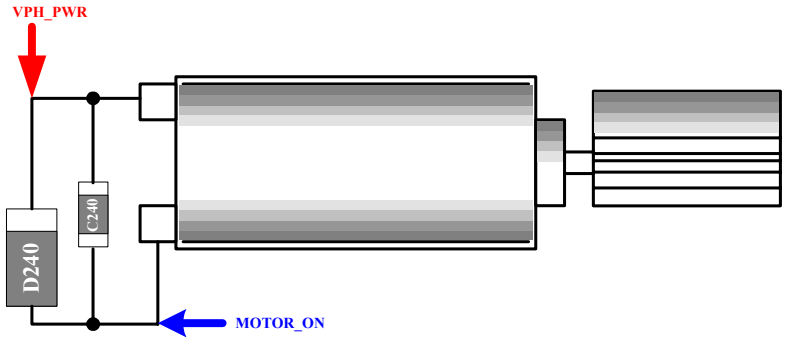
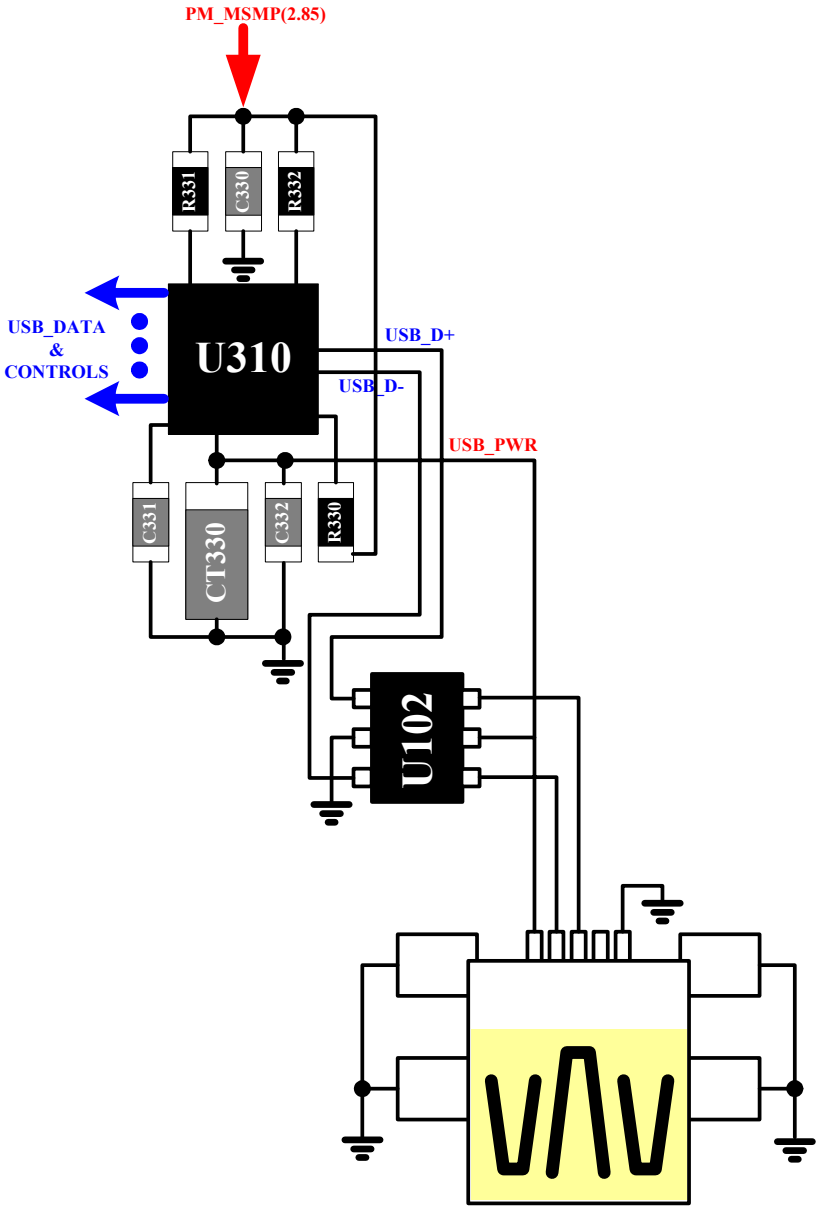


D240, KDS160 and C240 are used for protecting unstable voltage that may caused by vibrating. The vibrator rotates by 10300±1500 rpm and the average current for the vibrator is about 130mA and the peak current is 175mA.

Mini USB Connector

top



U310, ISP1105 is a USB driver IC that can translator from original USB data format of computers to another USB data format of QUALCOMM chips and can translate reversely, too.
U102, STF203-22 is used for ESD protection.

Power Jack

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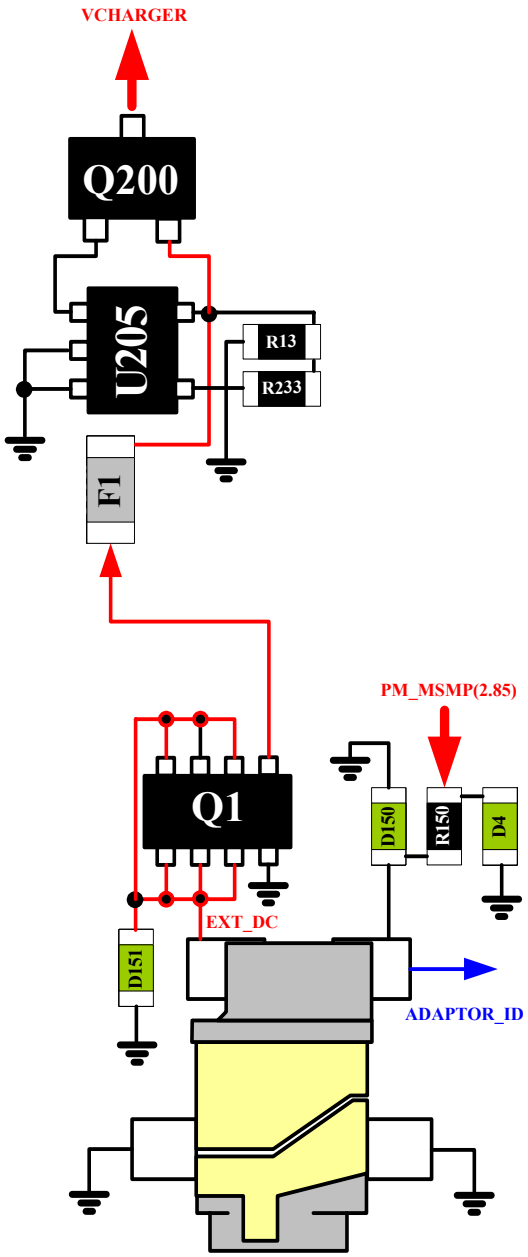

Q1, SI5435DC is used to protect negative voltage, If negative voltage were to flow in, The voltage of Q1's gate would get higher than those of Q1's drain, so the current cannot pass through Q1.
F1, FCC16-501AB-TP is a simple fuse, that is used for over-current protection, Over-current will burn it and will not recover until new one is replaced.
U205, NCP345SNT1 and Q200, SI23DS-T1 are used for over-voltage protection. U205 can sense over-voltage and switch Q200.
D4, D151 and D150, AVLC18S02015s are used for ESD protection.

Audio Jack

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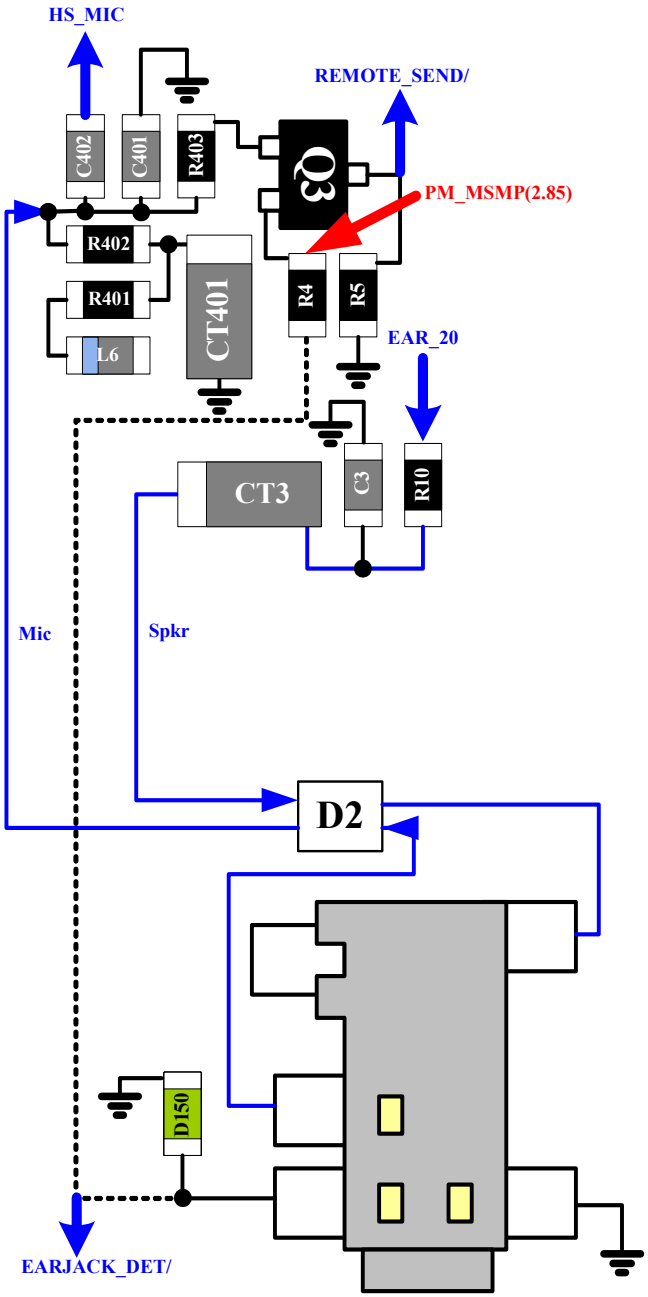

The phone knows that an earjack is connected, by the voltage of EARJACK_DET/ line turning low. Q3, 2SJ347 and resistors around Q3 make the phone know that remote-send key is pressed or not. D2, CSPEMI204 and D150, AVLC18S02015 are used for ESD protection.

Inner Charger

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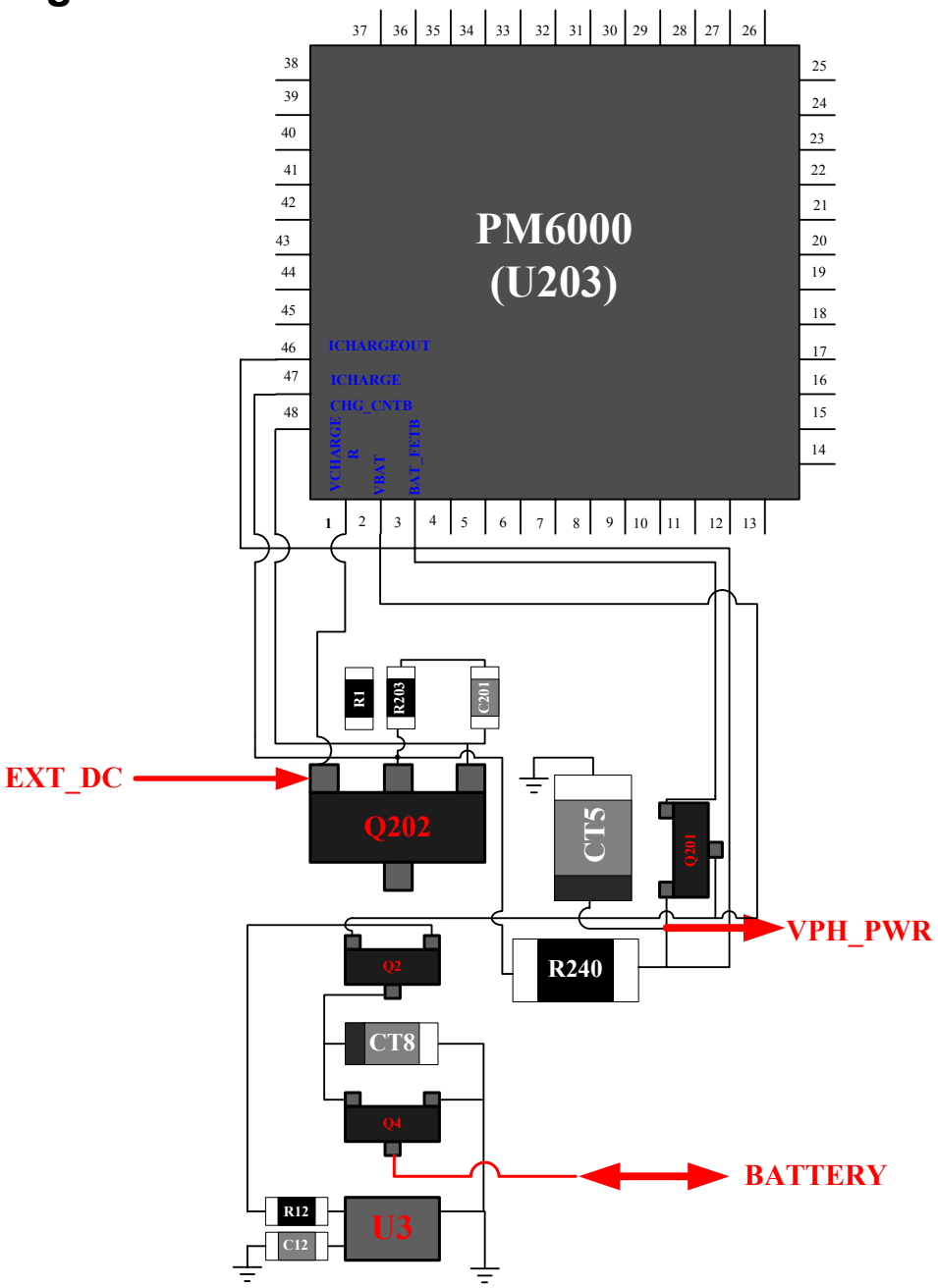

The PM6000, U203 has a inner charger circuit that can charge a Li-ion or Li-polimer battery with methods such like trickle charge, constant current charge, constant voltage charge and pulse charge. The PM6000 charges the main battery by controlling the charger pass transistor and the battery transistor, but the charging current should be set by the external supply through its current limiting to minimize internal handset dissipation and heat. The external supply could be regulated or unregulated.

ADC_PA_TEMP

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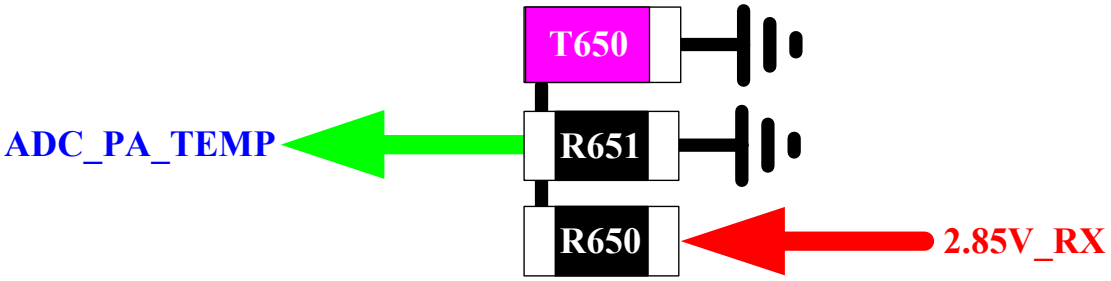

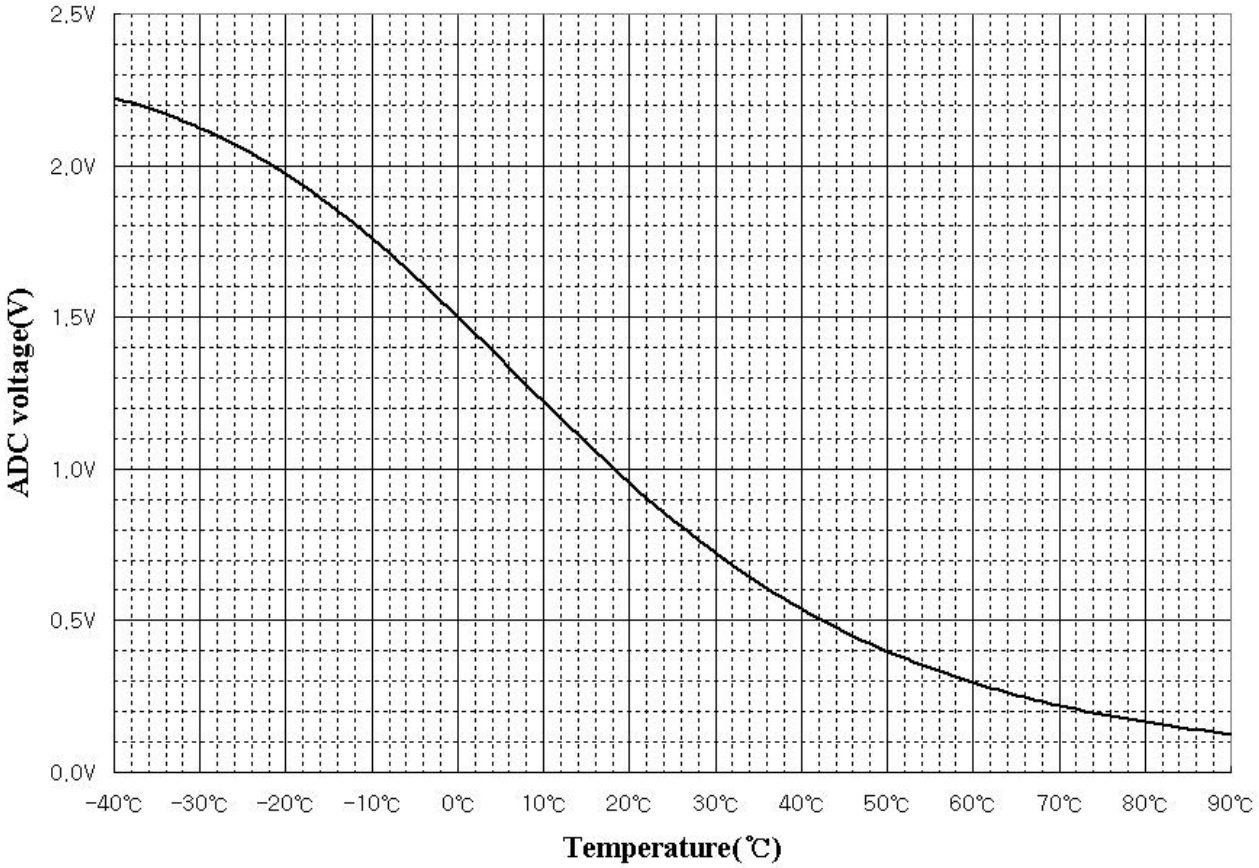

The PM6000, U203 makes the range of ADC voltage, 0V~2.5V to 0~1023, but generally 2 LSB is abandoned and PM uses not all 10bit-ADC value but 8bit-ADC value only.

RFR6120

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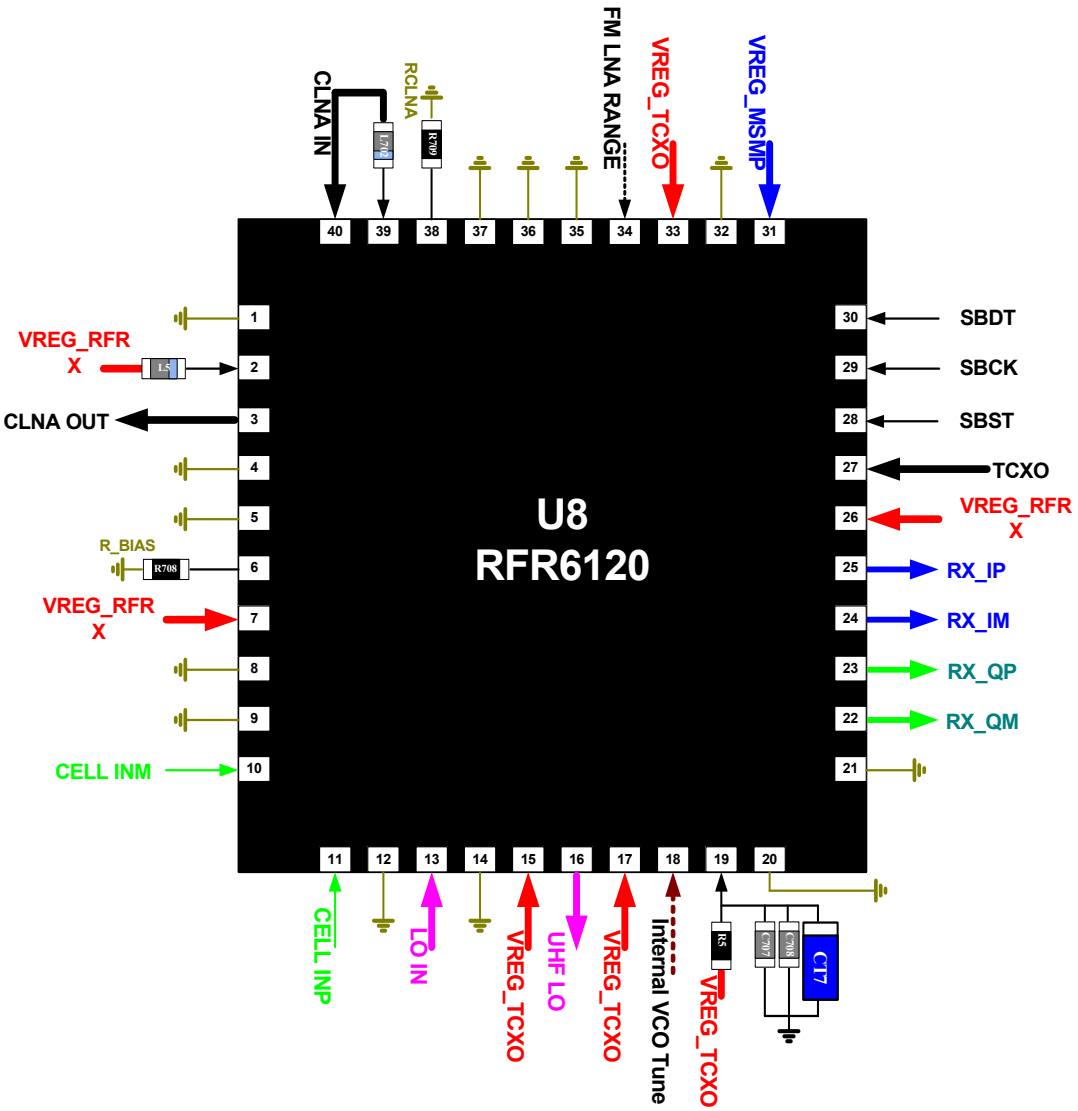

The RFR6120 IC provides the Zero-IF receiver signal paths for Cellular handsets. The Cellular path begins with a four gain-state LNA, followed by the external Cellular bandpass filter that provides transformation between the single-ended 50-Ohm LNA output and the differential second-stage amplifier input. The second-stage amplifier is a two gain-state circuit that supplements the LNA gain steps to further extend the Cellular receiver dynamic range. This Cellular second-stage input must be driven differentially.

Amplifier outputs drive the RF ports of the quadrature RF-to-baseband downconverters (a dedicated downconverter for each band). The downconverted baseband outputs are multiplexed and routed to lowpass filters (one I and one Q) whose passband and stopband characteristics are mode dependent. The filter outputs are buffered and routed to the MSM device for further processing.

Numerous secondary functions are integrated on-chip as well: the Rx LO generation and distribution circuits, Cellular-CDMA circuits, and various interface, control and status circuits

Although the RFR6120 includes an on-chip Cellular VCO, an external Rx VCO is required to

support AMPS. An LO input pin (LO_IN) is driven by the external VCO. All VCOs, the on-chip Cellular-CDMA VCO and external AMPS(CDMA and AMPS) VCO, are tuned via the RFT6102's Rx PLL when active, and share an output buffer amplifier to deliver the PLL feedback signal to the RFT device.

The active VCO signal is processed by the LO generation and distribution circuits to create the appropriate LO signal (Cellular-CDMA, AMPS). In all cases, the LO signals applied at the mixer ports are at a frequency different than the VCO frequency. This assures that the VCO frequency is different than the RF frequency, an important consideration for Zero-IF processing.

One of QUALCOMM's Mobile Station Modem (MSM6XXX) devices provides status and control signaling, employing Rx power reduction features (such as selective circuit power-down, gain control, and bias control) to extend handset standby time.

RFT6102

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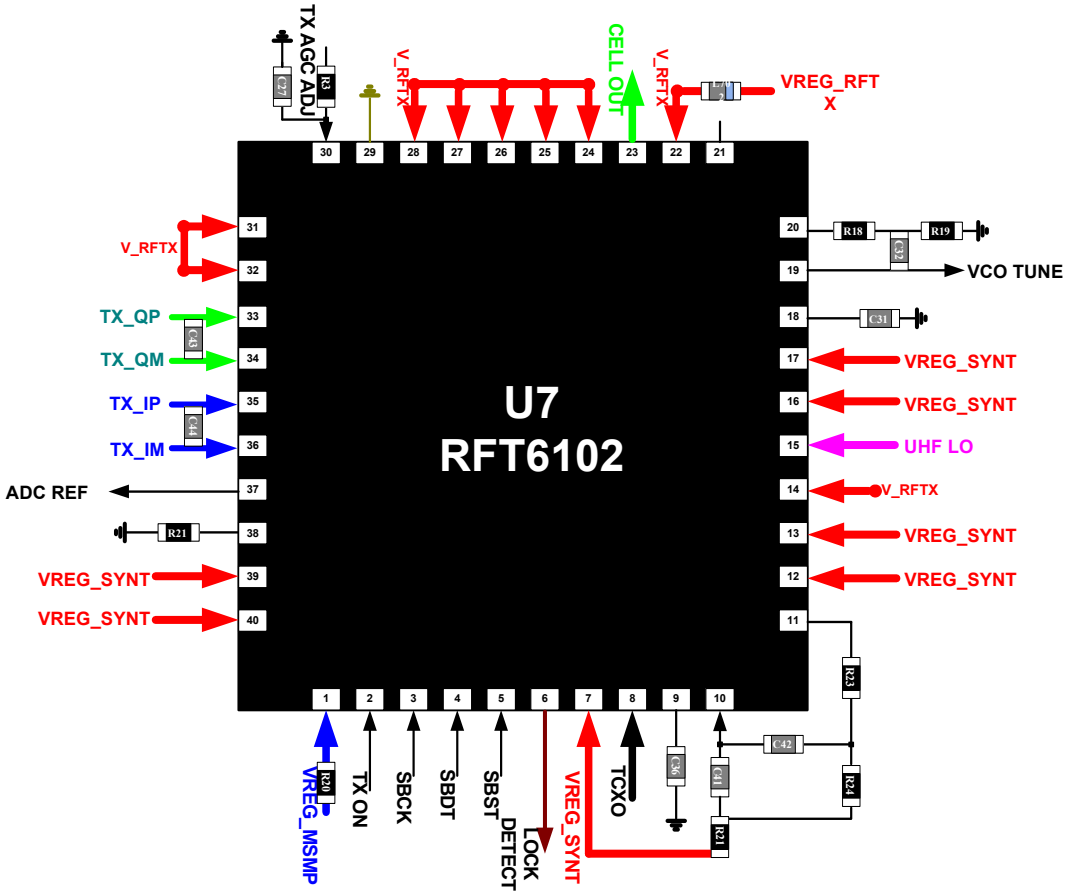

The RFT6102 IC provides the Zero-IF transmitter signal path, from analog baseband to RF driver amplifiers, for Cellular with AMPS handsets. The MSM device provides I and Q differential baseband signals (CDMA and AMPS); these analog input signals are amplified and applied to the upconverter mixers. The RF circuits include multiple variable gain stages that provide transmit AGC under MSM device control.

A single output (CELL_OUT) is sufficient for all Cellular applications, and includes an integrated matching inductor. Adding only one external series capacitor achieves the desired 50-Ohm nominal output impedance.

The RFT6102 IC includes a number of secondary functions in addition to the transmit signal path: a reference for the transmit DACs, two phase-locked loop circuits (Tx LO and Rx LO), the Tx VCO circuit, Tx LO generation and distribution circuits, and various interface, control and status circuits.

Virtually the entire transmitter LO synthesizer is included within the RFT6102 IC; only the loop filter is off-chip. The phase-locked loop (PLL) circuits include a reference divider, phase detector, charge pump, feedback divider, and digital logic that generate LOCK status. The entire Tx VCO is on-chip as well.

The RFT6102 IC integrates significant Tx LO generation and distribution circuits on-chip. These circuits operate in various modes to yield a highly flexible quadrature Tx LO output that drives the Cellular upconverter. A separate phase-locked loop circuit, identical to the PLL portion of the Tx LO synthesizer, is integrated on-chip to support the receivers' RF-to-baseband downconverters.

A QUALCOMM Mobile Station Modem (MSM6XXX) device provides status and control signaling,

employing Tx power reduction features (such as selective circuit power-down, gain control, and transmit puncturing) to extend handset talk-time.

VCTCXO Circuit

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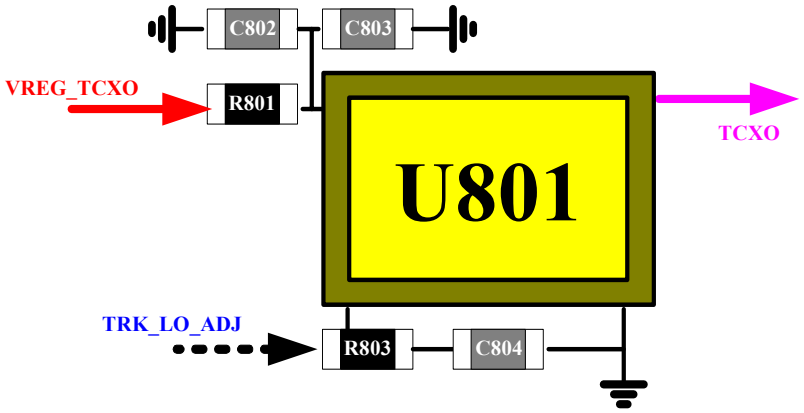

The Voltage Controlled Temperature Compensated Crystal Oscillator (VCTCXO) provides the reference frequency for all RFIC synthesizers as well as clock generation functions within the MSM6050 IC. The Cellular with AMPS 61XX-series chipset requires a 19.2 MHz nominal VCTCXO frequency.

The oscillator frequency is controlled by the MSM6050's TRK_LO_ADJ pulse density modulated signal in the same manner as the transmit gain control.

External VCO

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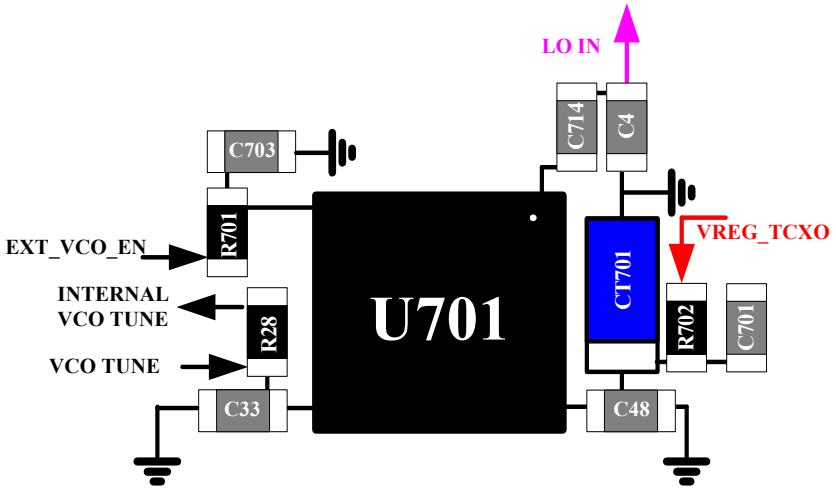

Cellular receiver operation is supported using an external VCO; the on-chip RFR Cellular VCO is not recommended for AMPS applications. Although the RFT6102 Rx PLL tunes this VCO, the MSM control and API software turns it off when EXT_VCO_EN is LOW; HIGH turns it on.

RX SAW Filter

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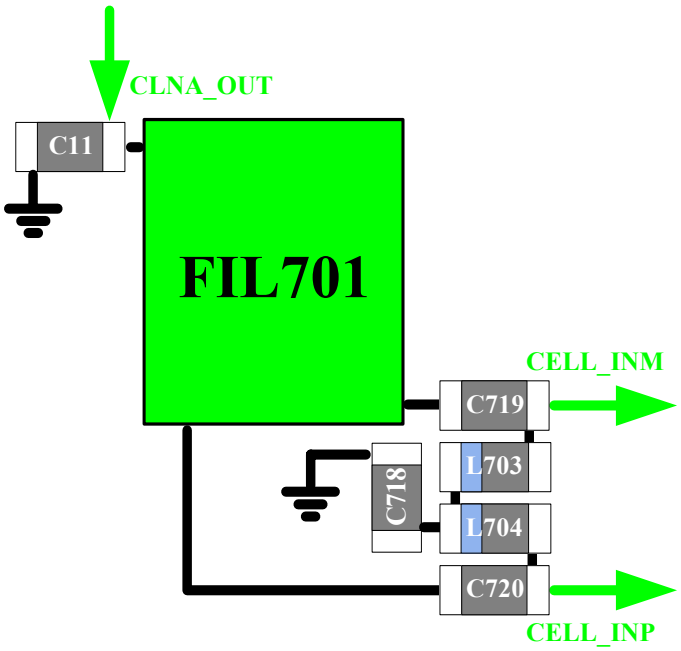

A Cellular RF filter is located between its LNA and mixer. Insertion loss is important, but not as critical as losses before the LNA. The most important parameters of this component include:
Out-of-band rejection or attenuation levels, usually specified to meet these conditions:

- Tx-band leakage
- Phase and amplitude balance

POWERAMP

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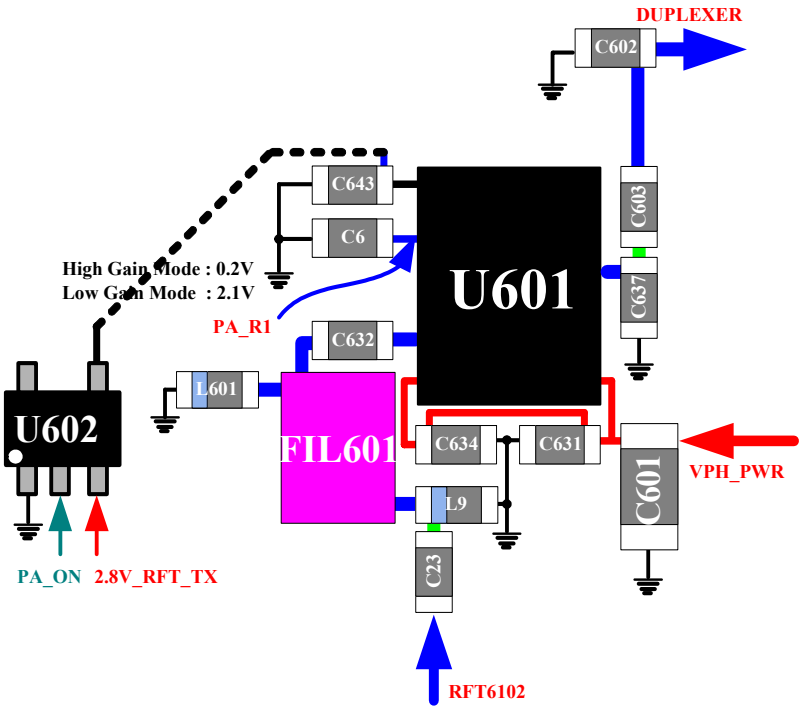

This is a key component in the transmitter chain and must complement the RFT6102 IC; jointly they dominate the transmitter performance characteristics. Parameters such as gain, output power level, ACPR, harmonics, Rx-band noise, and power supply current are critical. The gain must be sufficient to deliver the desired transmitter output power given the RFT6102 output level and the passive devices' losses. The transmitter output power depends upon the operating band class and mobile station class per the applicable standard. The transmitter ACPR and Rx-band noise, both dominated by the PA, is also specified by the applicable standard.

The transmitter RF filter rejects out-of-band spurious signals and RFT6102 broadband noise to assure compliance with the applicable emissions standards. Important filter parameters include:

- Insertion loss – critical to the overall gain and output power objectives of the transmitter.
- Out-of-band rejection or attenuation levels
  - Receiver passband – limits the wideband noise that could leak into the receiver and degrade sensitivity.
  - Other frequencies of particular concern – bands known to include other wireless receivers; limits this handset's interference level.

Return loss, passband ripple, and power handling are secondary concerns for the usual reasons.

DUPLEXER CIRCUIT High Power Dectector

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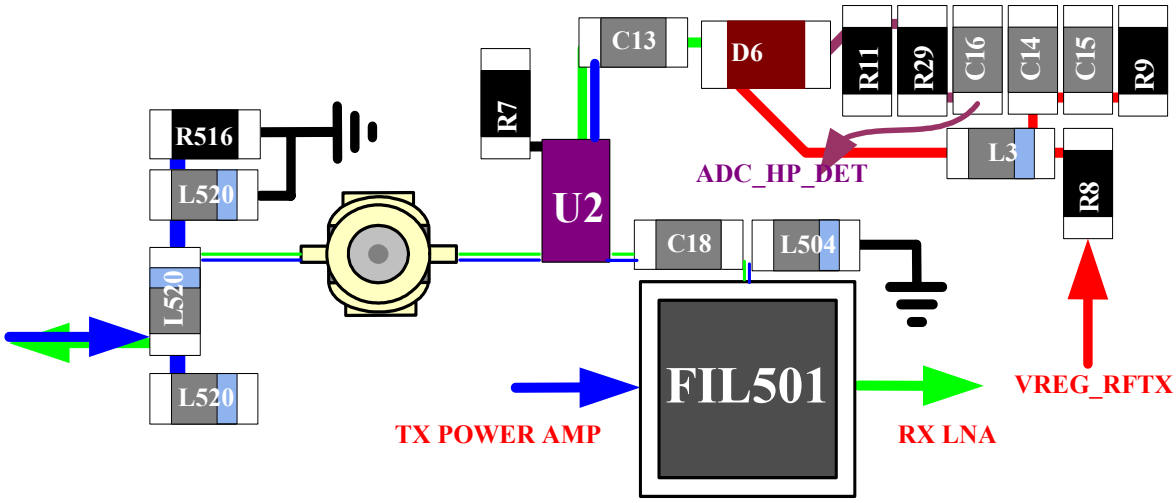

A duplexer splits a single operating band into receive and transmit paths. Important requirements:

- Insertion loss : Cellular Tx = 2.3 dB, Cellular Rx = 2.7 dB.
- Out-of-band rejection or attenuation
  - Rx-band isolation : 45 to 50 dB.
  - Tx-band isolation : 55 to 60 dB.
- Passband ripple : 10 dB or more (2:1 VSWR).
- Power handling – high power levels in the transmit path must be accommodated without degraded performance.

Appendix

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A. Disassembly

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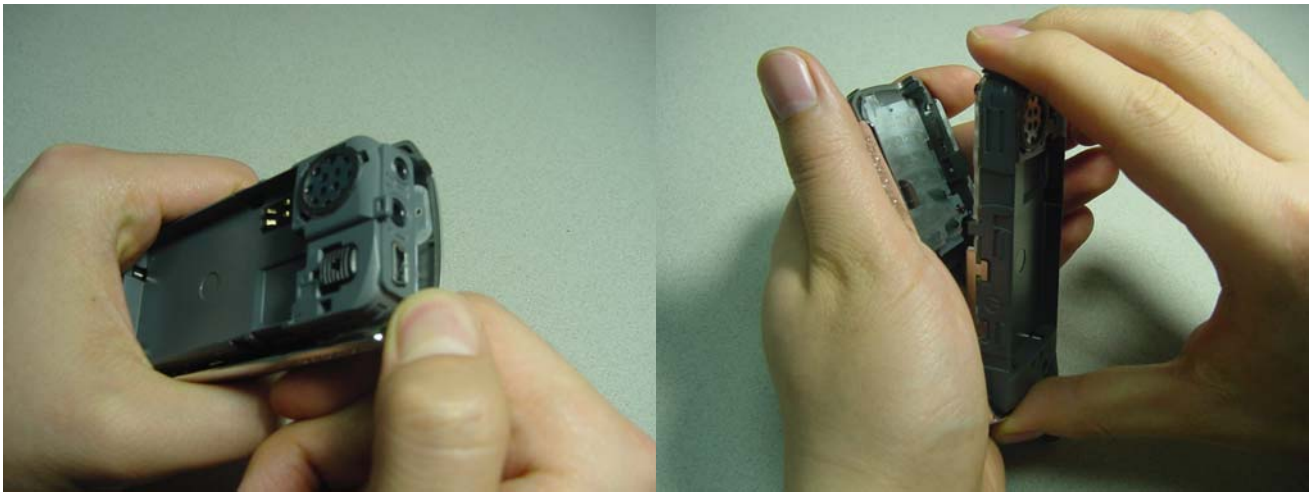
Opening Housing :

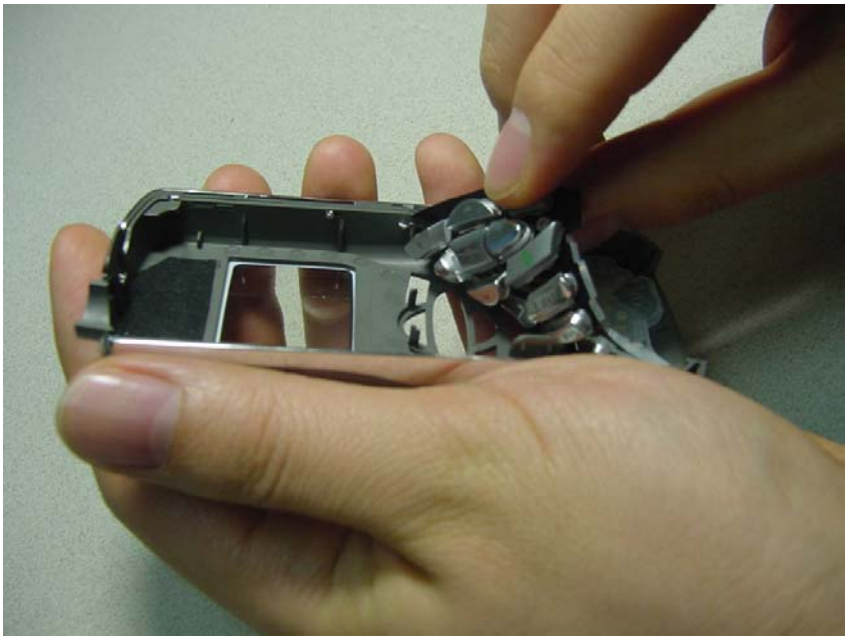
Step 1 : Press down on the FRONT CASE release button at the top of your phone with the right thumb, holding up the ANTENNA with the left thumb and pull the top of the phone's BACK CASE to release it.

Step 2 : Push the BATTERY forward and lift it out to remove the BATTERY.

Step 3 : Push out the hooks of the corner in the bottom side of the FRONT CASE and pull out the ENDO BACK to separate the ENDO BACK from the FRONT CASE.

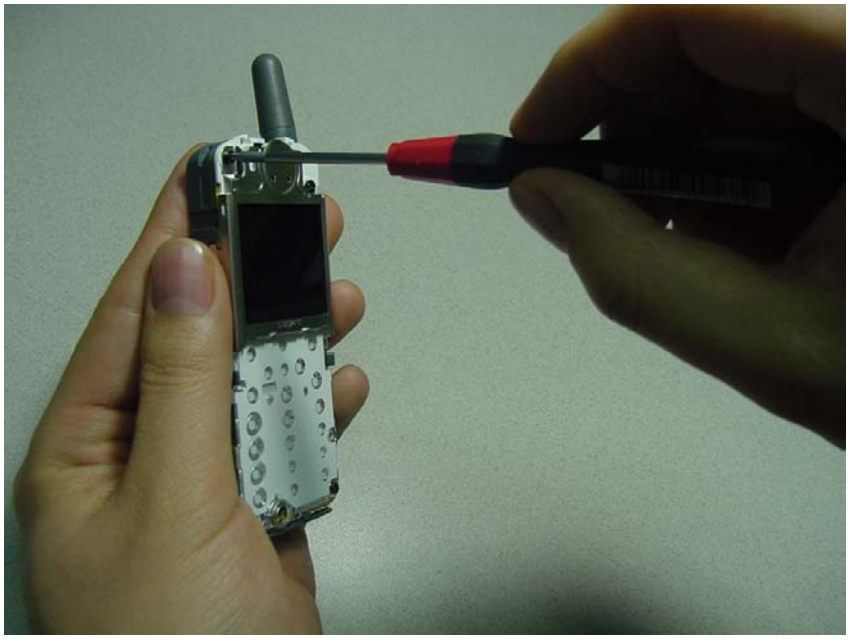


Step 4 : Remove the KEYPAD.

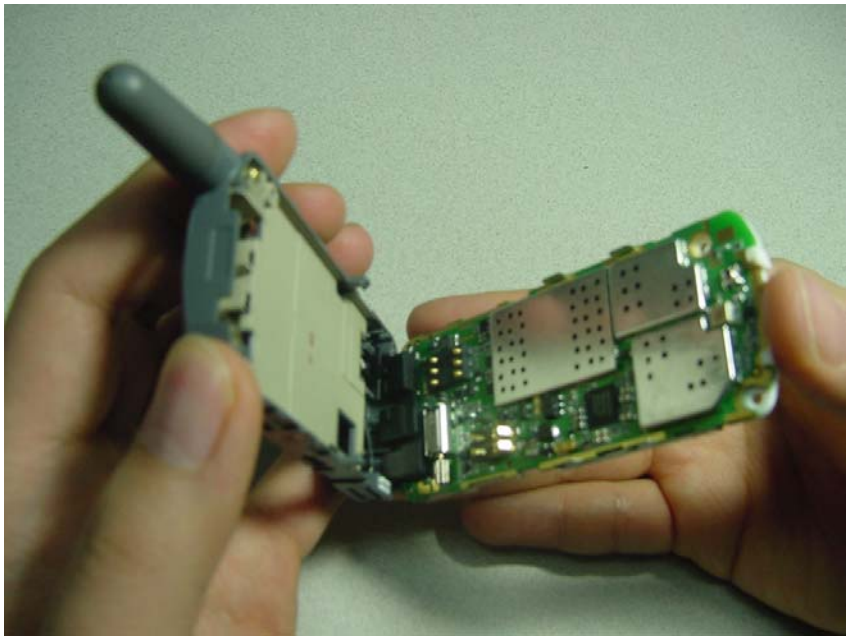


Board Removal :

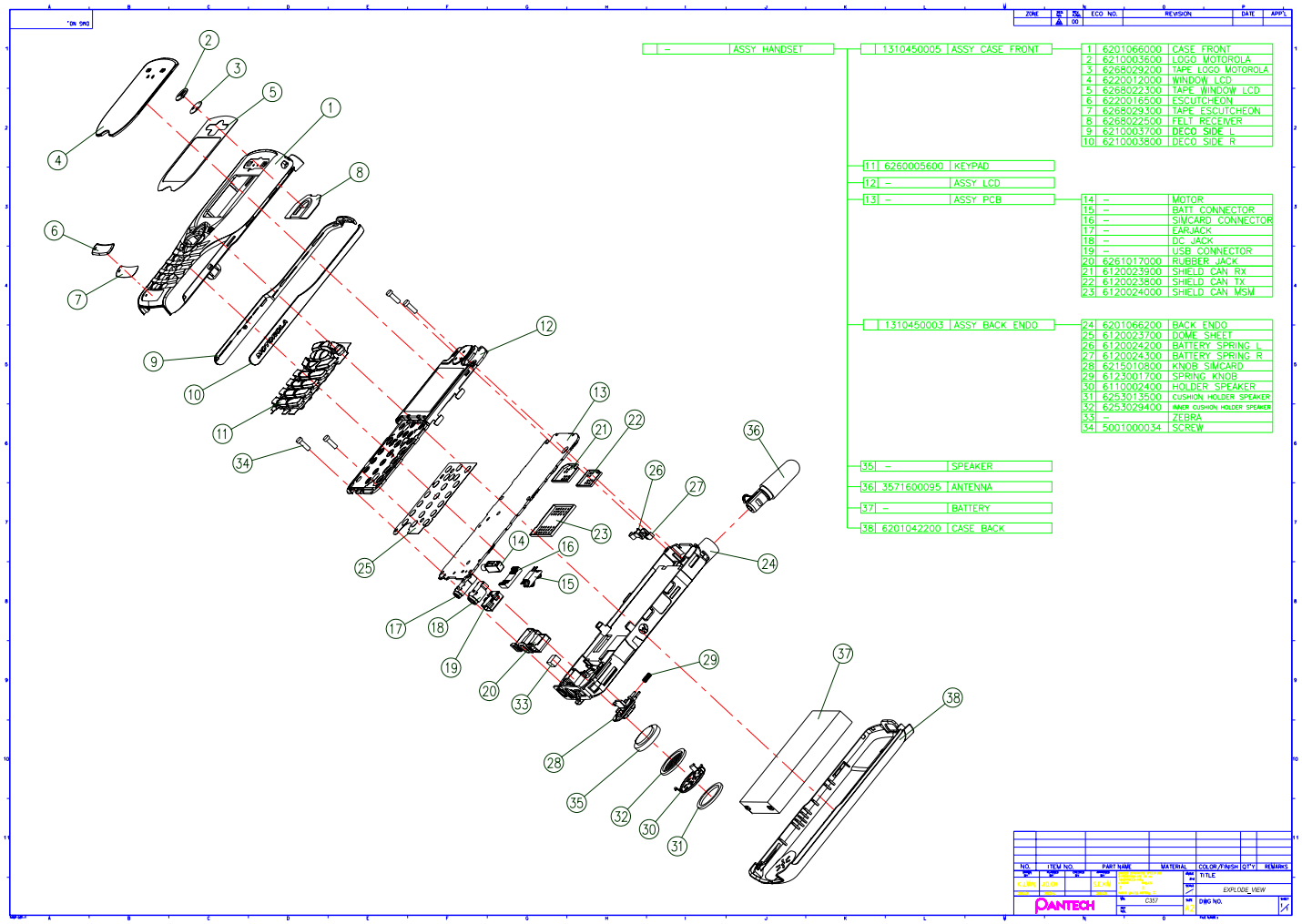
Step 1 : Unscrew all 4 screws from the ENDO BACK with using toxe driver T6.



Step 2 : Open the hooks on the mid area of the ENDO BACK and pull out the PCB to separate it from ENDO BACK.



B. Replacement Part



C. C357 Part List

Ass'y	Pantech PN	Description		Q'ty	
	TBD	C357		1	
A	TBD	Main B'D ASS'Y		1	
B	TBD	Mechanical ASS'Y		1	
C	TBD	PACKING		1	
A	TBD	MAIN B'D ASS'Y		1	
A-1	TBD	MAIN B'D_BOTTOM			
No	Pantech PN	Description	Vendor PN	Q'ty	Location
1	3041000020	BATTERY CONNECTOR	DL-4P031002	1	J200
2	3721100067	DC JACK CONNECTOR	HEC2921	1	J105
3	3721100021	RF CONNECTOR	MM8430-2600RA1	1	J501
4	3725000073	MINI USB CONNECTOR	MNC2B-5K5310	1	J103
5	3725000070	SIM CONNECTOR	67687-2301	1	U104
6	3530200019	SLEEP CRYSTAL	SM-14J/32.768kHz	1	Y201
7	3200100311	MSM6050	MSM6050	1	U300
8	3200100417	RFR6120	RFR6120	1	U8
9	3200100468	RFT6102	RFT6102	1	U7
10	3200100335	POWER MANAGEMENT	PM6000	1	U203
11	3200100361	AUDIO AMP	TPA6203A1	1	U402
12	3012000083	POWER AMP	RF6100-1	1	U601
13	3411100020	VARISTOR	AVLC18S02015P	5	D7,D8,D151,D410,D411
14	3411100021	VARISTOR	AVLC5S02100P	1	D9
15	3411100022	VARISTOR	AVLC5S02050P	10	D4, D10,D11,D103,D104,D105,D106,D107,D122, D150
16	3100500014	SWITCHING DIODE	1SS400	2	D1,D3
17	3104100016	SHOTTKY DIODE	1SS315	1	D6

18	3330600062	KEYPAD LED	QSMW-C269	2	D111,D112
19	3530500028	VCTCXO	KT21A-DCV28B-19.200M-T	1	U801
20	3411200005	THERMISTOR	TH05-3T103F/10kΩ	1	T650
21	3114000048	P-CH FET	SI2323DS	4	Q2, Q4, Q200, Q201
22	3100500019	SWITCHING DIODE	KDS160E	1	D240
23	3104200026	TVS DIODE	ESDA6V1-5P6	1	D125
24	3104200031	TVS DIODE	LC0408FC05C	1	D124
25	3110100051	PNP TRANSISTOR	2SB1424	1	Q202
26	3110100016	TRANSISTOR	UMC5NTR	1	U602
27	3114000055	MOSFET	Si5435DC	1	Q1
28	3110100041	VOLTAGE DETECTOR	XC61CC4302NR	1	U3
29	3620200012	FUSE	FCC16-501AD-TP	1	F1
30	3530600037	VCO	VC-2R8Z81-1751F	1	U701
31	3200100490	WHITE LED DRIVER	LM2794TLX	1	U106
32	3200100491	FLASH MEMORY	38F3040L0ZBQ0	1	U9
33	3200100363	OVER VOLTAGE PROTECTION	NCP345SNT1	1	U205
34	3520100010	ESD FILTER	PACUSB-U3	1	U102
35	3520100007	ESD FILTER	CSPEMI204	1	D2
36	3520100004	TVS DIODE	CSPESD304	1	U1
37	3520100001	ESD FILTER	CSPEMI306A	1	D12
38	3600100020	COUPLER	LDC18836M15B-320	1	U2
39	3200100451	PLD CONTROLLER	XC2C32-6CP56I	1	U4
40	3530100002	RESONATOR	CSTCW48MOX11047-R0	1	Y301
41	3520700172	TX-RF SAW	855923	1	FIL601
42	3520700173	RX-RF SAW	SF16-0881M5UB01	1	FIL701
43	3520700174	DUPLEXER	EFSD836MD2	1	FIL501

44	3200100285	USB CONTROLLER	ISP1105WHBCC16	1	U310
45	3200100492	LDO	XC6209B252DR	1	U6
46	3200100292	LDO	XC6204B302DR	1	U5
47	3721100095	EAR JACK	AJR45-5K2010	1	J401
48	3011400030	MOTOR	MR-2300A	1	J202
49	3114000053	MOSFET	2SJ347	1	Q3
50	3012000105	MAIN PCB		1	
51	2120100002	CAPACITOR	GRP155F50J1R0CZ01E/1pF	1	C501
52	2122290001	CAPACITOR	GRP1555C1H2R2CZ01E/2.2pF	4	C602,C637, C719, C720
53	2128080001	CAPACITOR	GRP1555C1H8R0DZ01E/8pF	1	C23
54	2121500001	CAPACITOR	GRP1555C1H150DZ01E/ 15pF	1	C632
55	2123000002	CAPACITOR	GRP1555C1H300JZ01E/30pF	2	C223,C224
56	2124700001	CAPACITOR	GRP1555C1H470JZ01E/47pF	10	C24,C28,C29,C30,C37,C45,C47,C48,C709,C714
57	2126800003	CAPACITOR	GRP1555C1H680JZ01E/68pF	1	C4
58	2128200002	CAPACITOR	GRP1555C1H820JZ01E/82pF	1	C721
59	2121010002	CAPACITOR	GRP1555C1H101JD01E/100pF	14	C13,C16,C25,C26,C46,C49,C50,C52,C401,C702,C706,C707,C713,C717
60	2122010004	CAPACITOR	GRP1556C1E221JD01E/220pF	2	C43,C44
61	2121020004	CAPACITOR	GRP155R71H102KA01E/1000pF	3	C18,C40,C715
62	2122220004	CAPACITOR	GRP155R71H222KA01E/2200pF	1	C41
63	2124720006	CAPACITOR	GRP155R71E472KA01E/4700pF	2	C27,C201
64	2125620003	CAPACITOR	GRP155R71E562KA01E/5600pF	1	C33
65	2121030003	CAPACITOR	GRP155R71C103KA01E/0.01uF	11	C6,C15,C31,C36,C202,C205,C303,C320,C643,C802,C804
66	2121530002	CAPACITOR	GRP155F51H153ZA01E/0.015uF	2	C327,C341
67	2122230005	CAPACITOR	GRP155R61C223KD01E/0.022uF	3	C344,C346,C402
68	2126830001	CAPACITOR	GRP155F51C683ZA01E/0.068uF	1	C42
69	2128230001	CAPACITOR	GRP155R61A823KA01E/0.082uF	1	C32

70	2121040003	CAPACITOR	GRP155F51C104ZA01E/0.1uF	59	C2,C3,C5,C9,C10,C12,C22,C34,C35,C38,C39,C51,C53,C54,C58,C59 ,C60,C61,C62,C121,C203,C204,C206,C208,C210,C214,C232,C240 ,C301,C302,C311,C313,C314,C317,C318,C319,C321,C322,C324, C325,C326,C328,C329,C330,C331,C332,C340,C342,C343,C369, C413 ,C425,C429,C701,C703,C705, C708,C712,C718
71	2126803002	CAPACITOR	GRP155F50J684ZD02E/0.68uF	1	C304
72	2121050008	CAPACITOR	GRP155F50J105ZD02E/1uF	3	C631, C634, C803
73	2121050020	CAPACITOR	GRM188R61C105KA12D/1uF	11	C1,C7,C8,C134,C135,C137,C138,C219,C220,C241,C242
74	2123350001	CAPACITOR	GRM219F51A335ZA01D/3.3uF	1	C209
75	2124750010	CAPACITOR	GRM219R60J475KE01D/4.7 uF	1	C218
76	2121890013	CAPACITOR	GRM21BR60J106KE19L/10uF	8	C211,C212,C213,C215,C601,C704,C710,C711
77	TBD	CAPACITOR	OPEN	9	C14,C64,C65,C345,C411,C412,C420,C421,C427
78	2034750002	TANTAL CAPACITOR	TPM0J475PSSR/4.7uF(6.3V)	2	CT330,CT403
79	2031000003	TANTAL CAPACITOR	TPM0J106PSSR/10uF(6.3V)	5	CT1,CT2,CT3,CT8,CT401
80	2031000013	FPCAP	FP-6R3-CS-100M-PR/10uF	1	CT6
81	2031000014	FPCAP	FP-6R3-CS-330M-B2R/33uF	1	CT5
82	3500100022	INDUCTOR	HK10053N9S-T/3.9nH	1	L705
83	3500100037	INDUCTOR	HK10055N6S-T/5.6nH	1	L603
84	3500100458	INDUCTOR	HK100510NJ-T/10nH	5	L502,L601, L703, L704, L707
85	3500100254	INDUCTOR	HK100522NJ-T/22nH	1	L716
86	3500100583	INDUCTOR	HK100547NJ/47nH	1	L5
87	3500100588	INDUCTOR	HK100556NJ/56nH	1	L706
88	3500100118	INDUCTOR	HK 100582NJ-T/82nH	2	L3,L702
89	TBD	INDUCTOR	OPEN	4	L1, L4, L9, L504
90	3540200013	BEAD(600OHM)	BLM15AG601SN1D	8	L6,L7,L301,L302,L303,L701, L708, L801
91	2520000001	RESISTOR	MCR01MZSJ000/0Ω	8	R10, R12,R13, R22, R27, R32, R103, R220

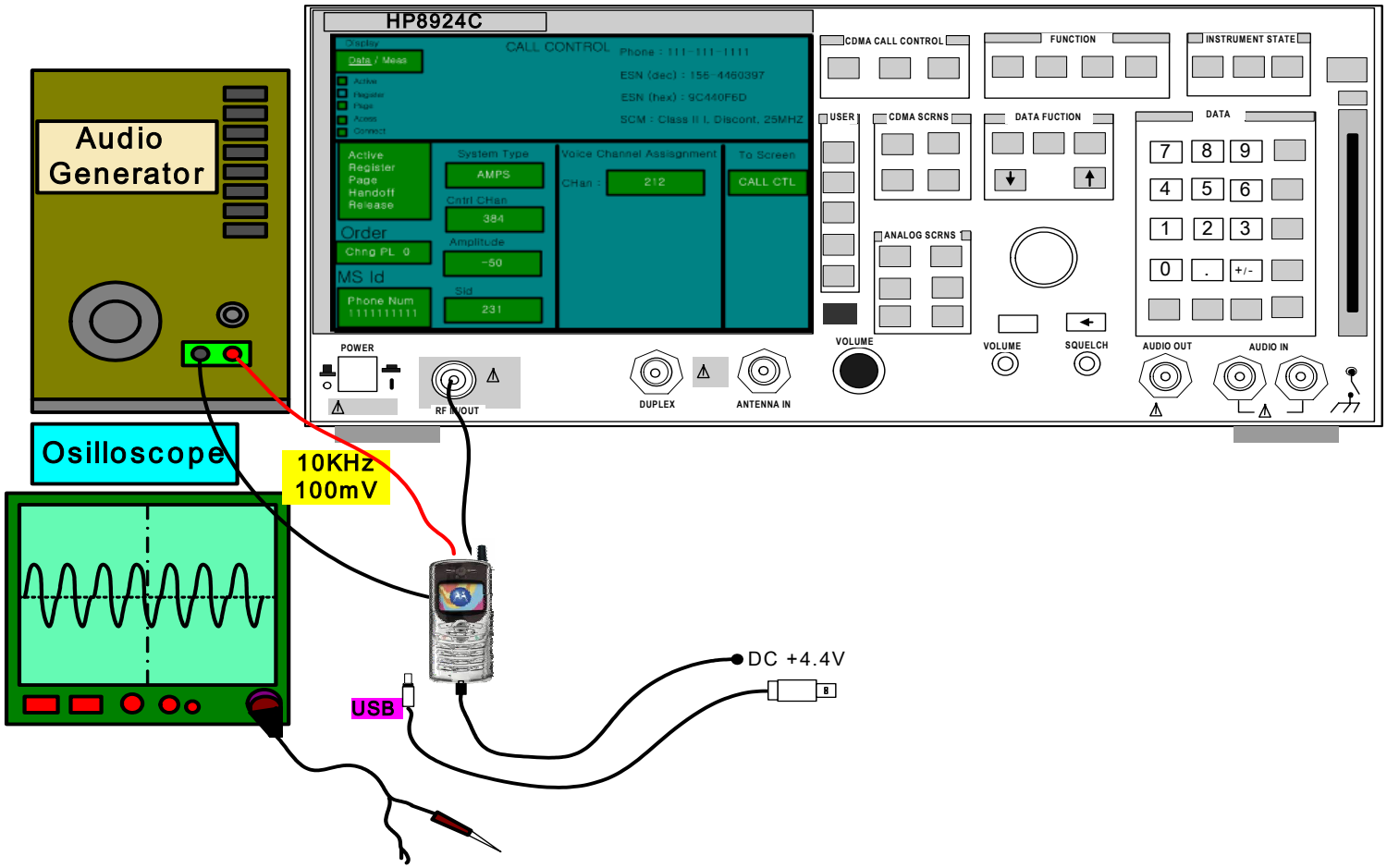
92	2526808005	RESISTOR	MCR01MZSJ6R8/6.8Ω	1	R2
93	2521009001	RESISTOR	MCR01MZSJ100/10Ω	2	R26, R710
94	2524999005	RESISTOR	RC1005F49R9CS/49.9(1%)	1	R238
95	2525109001	RESISTOR	MCR01MZSJ510/51Ω	1	R7
96	2521000001	RESISTOR	MCR01MZSJ101/100Ω	4	R20,R304,R704,R803
97	2529109004	RESISTOR	RC1005F111CS/110Ω(1%)	1	R501
98	2521200001	RESISTOR	MCR01MZSJ121/120Ω	1	R124
99	2523300001	RESISTOR	MCR01MZSJ331/330Ω	1	R203
100	2521001001	RESISTOR	MCR01MZSJ102/1kΩ	5	R3,R34,R302,R401,R701
101	2521520001	RESISTOR	RC1005F152CS/1.5k(1%)	1	R9
102	2520182001	RESISTOR	MCR01MZSJ182/1.8kΩ	1	R18
103	2522201001	RESISTOR	MCR01MZSJ222/2.2kΩ	4	R23,R316,R317,R402
105	2523901001	RESISTOR	MCR01MZSJ392/3.9kΩ	1	R19
106	2524701003	RESISTOR	MCR01MZSJ472/4.7kΩ	2	R24,R414
107	2525101001	RESISTOR	MCR01MZSJ512/5.1kΩ	1	R150
108	2525761003	RESISTOR	RC1005F5761CS/5.76kΩ (1%)	3	R705,R706,R709
109	2521002011	RESISTOR	RC1005F103CS/10kΩ (1%)	3	R8,R413,R415
110	2521002001	RESISTOR	MCR01MZSJ103/10kΩ	13	R1,R14,R21,R29,R30,R33,R219,R224,R312,R314,R330,R331,R332
111	2521132001	RESISTOR	RC1005F1132CS/11.3kΩ (1%)	2	R25,R708
112	2520223001	RESISTOR	MCR01MZSJ223/22kΩ	1	R104
113	2522202008	RESISTOR	RC1005F223CS/22kΩ (1%)	1	R650
114	2520333001	RESISTOR	MCR01MZSJ333/33kΩ	1	R5
115	2525102001	RESISTOR	MCR01MZSJ513/51kΩ	1	R112
116	2525130001	RESISTOR	RC1005F513CS /51kΩ (1%)	2	R420,R421
104	2520563001	RESISTOR	MCR01MZSJ563/56kΩ	1	R6
117	2521003001	RESISTOR	MCR01MZSJ104/100kΩ	5	R11,R101,R102,R222,R403

118	2521003010	RESISTOR	RC1005F104CS/100kΩ (1%)	1	R651
119	2520184001	RESISTOR	MCR01MZSJ184/180kΩ	2	R311,R315
120	2522003002	RESISTOR	MCR01MZSJ204/200kΩ	1	R205
121	2520244001	RESISTOR	MCR01MZSJ244/240kΩ	1	R4
122	2520514001	RESISTOR	MCR01MZSJ514/510kΩ	1	R313
123	2521500901	RESISTOR	RLC32R150FTP/0.15Ω (1%)	1	R240
124	2521508001	RESISTOR	MCR03EZHJ1R5/1.5Ω	2	R405,R406
125	TBD	RESISTOR	OPEN	4	R28,R211,R233,R301
126	6120029400	SHIELD CASE RX		1	SH101
127	6120029500	SHIELD CASE TX		1	SH102
128	6120029600	SHIELD CASE MSM		1	SH103
129	3550100019	SPEAKER	DS-569A	1	J3
130	3330500061	LCD+MIC+EAR PIECE MODULE	LEU3S504XA-1	1	J101
131	3571600095	ANTENNA	110035-11	1	A501

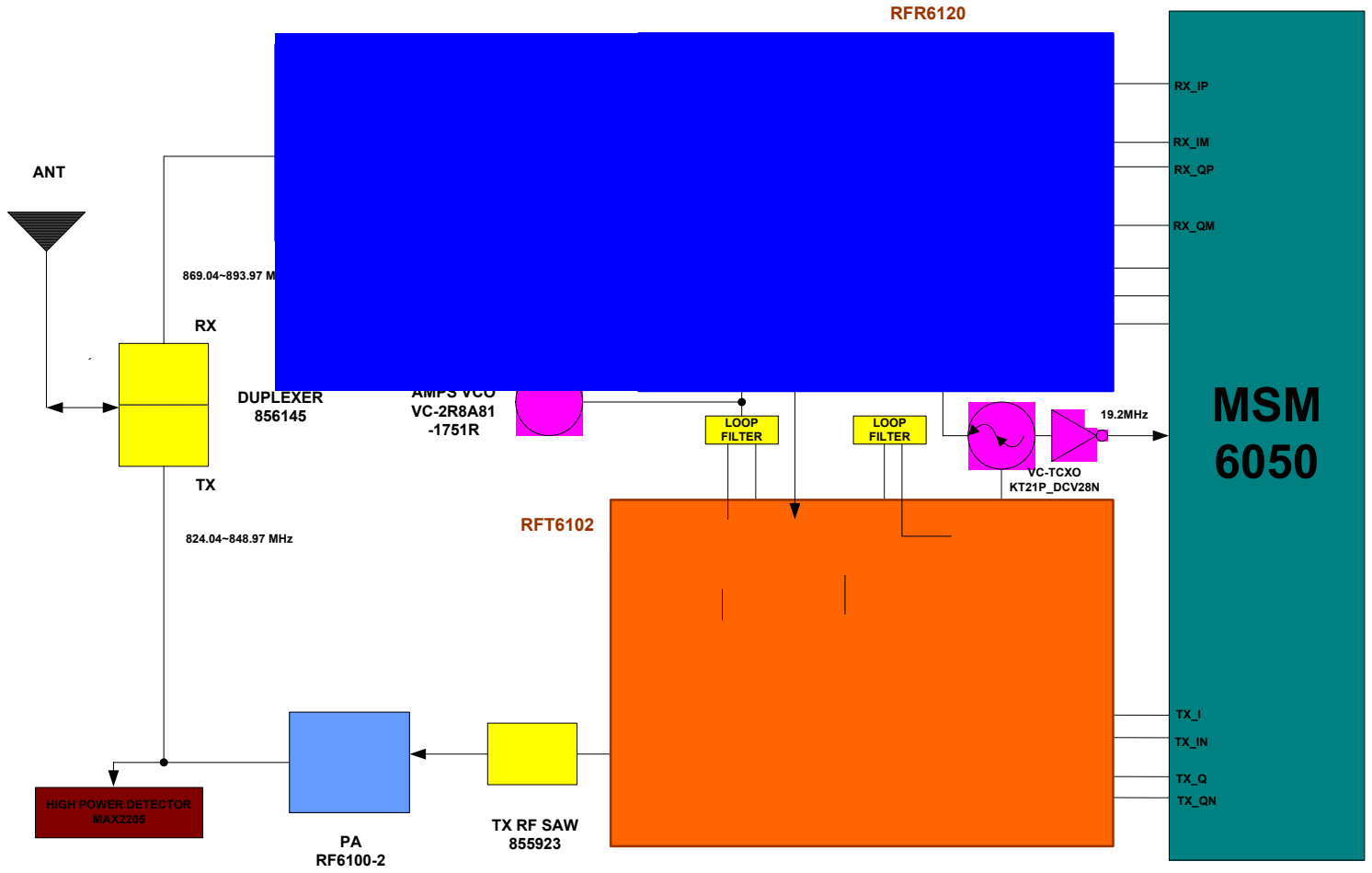
B		Mechanical ASS'Y		1	
NO	Part Name	Part Name	Description	Q'ty	Location
B-1	1310450005	ASSY CASE FRONT		1	
B-2	6260005600	KEYPAD		1	
B-3	1310450003	ASSY BACK ENDO		1	
B-4	1310450004	ASSY BACK		1	
B-5		ASSY PCB			
B-1	1310450005	ASSY FRONT			
NO	Part Name	Part Name	Description	Q'ty	Location
1	6201066000	CASE FRONT	PC LEXAN ML6339R - 70652, UV COATING	1	
2	6268022300	TAPE WINDOW LCD	NITTO 5000 0.17t	1	
3	6210003600	LOGO MOTOROLA	PC LEXAN ML6339R - 70652, UV COATING	1	
4	6268029200	TAPE LOGO MOTOROLA	NITTO 5000 0.17t	1	
5	6220012000	WINDOW LCD	PC OQ1030, Silkscreen backside	1	
6	6220016500	ESCUTCHEON	Epoxy , Silkscreen backside	1	
7	6268029300	TAPE ESCUTCHEON	NITTO 5000 0.17t	1	
8	6268022500	FELT RECEIVER	KOREL 0.2t + FELT SungWoo 220B	1	
9	6210003700	DOCO SIDE "L"	PC LEXAN 141R - 80024, vacuum plating	1	
10	6210003800	DOCO SIDE "R"	PC LEXAN 141R - 80024, vacuum plating	1	
B-2		KEYPAD			
NO	Part Name	Part Name	Description	Q'ty	Location
1	6260005600	KEYPAD		1	
B-3	1310450003	ASSY BACK ENDO			
NO	Part Name	Part Name	Description	Q'ty	Location

1	6201066200	BACK ENDO	PC LEXAN 141R - 70531	1	
2	6120023700	DOME SHEET		1	
3	6120024200	BATTERY SPRING "L"	SMC50 0.2t	1	
4	6120024300	BATTERY SPRING "R"	SMC50 0.2t	1	
5	6215010800	KNOB SIMCARD	PC LEXAN 141R	1	
6	6123001700	KNOB SPRING	SUS304WPB	1	
7	6110002400	HOLDER SPEAKER	SUS 0.2t	1	
8	6253013500	CUSHION HOLDER SPEAKER	KOREL 0.5t	1	
9	6253029400	INNER CUSHION HOLDER SPEAKER	KOREL 0.38t + #180	1	
10	5001000034	SCREW	T 1.9 * 6	4	
11	6316017100	WATER INDICATOR	3M 5557	1	
B-4	1310450004	ASSY CASE BACK			
NO	Part Name	Part name	Description	Q'ty	Location
1	6201042200	CASE BACK	PC LEXAN ML6339R - 70652, UV COATING	1	
B-5		ASSY PCB			
NO	Part Name	Part name	Description	Q'ty	Location
1	6261017000	RUBBER JACK	CR50	1	
C		**PACKING**		**1**	
No	**Pantech PN**	**Description**	**Vendor PN**	**Q'ty**	**Location**
1	3612600332	BATTERY ASS'Y	SNN5691A	1	
2	3610200058	CHARGER ASS'Y	SPN5161A	1	

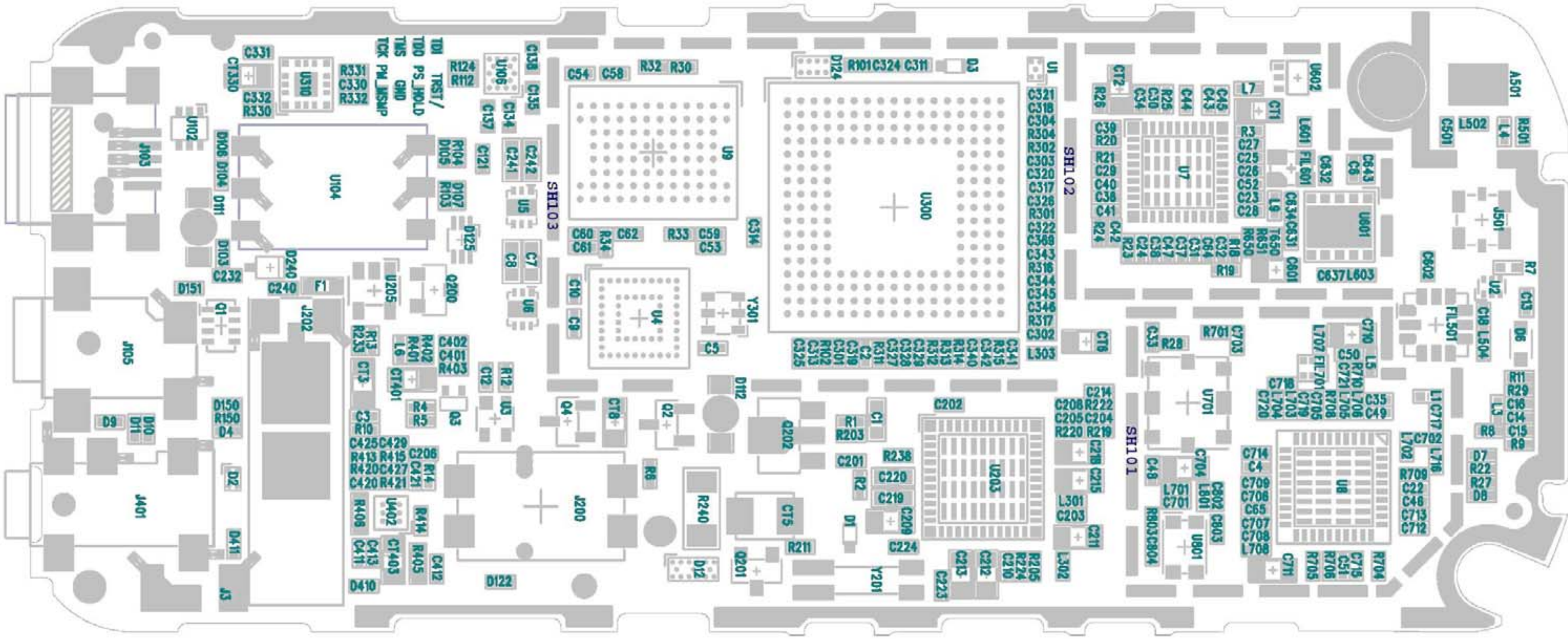
D. Audio Test Configuration



E. C357 RF Block (Zero IF) Diagram



F. Board Location Map



G. Schematics