Service Manual
Level 3
Preliminary

MOTOROLA™
DIGITAL WIRELESS TELEPHONE

Model E310
CDMA 800, 1900MHz & Analog 800MHz

MOTOROLA

Contents

Introduction

Motorola® Inc. maintains a worldwide organization that is dedicated to provide responsive, full-service customer support. Motorola products are serviced by an international network of company-operated product-care centers as well as authorized independent service firms.

Available on a contract basis, Motorola Inc. offers comprehensive maintenance and installation programs that enable customers to meet requirements for reliable, continuous communications.

To learn more about the wide range of Motorola service programs, contact your local Motorola products representative or the nearest Customer Service Manager.

Product Identification

Motorola products are identified by the model number on the housing. Use the entire model number when inquiring about the product. Numbers are also assigned to chassis and kits. Use these numbers when requesting information or ordering replacement parts.

Product Names

Product names are listed on the front cover. Product names are subject to change without notice. Some product names, as well as some frequency bands, are available only in certain markets.

Regulatory Agency Compliance

This device complies with Part 15 of the FCC Rules. Operation is subject to the following conditions:

- This device may not cause any harmful interference
- This device must accept interference received, including interference that may cause undesired operation

This class B device also complies with all requirements of the Canadian Interference-Causing Equipment Regulations (ICES-003).

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Computer Program Copyrights

The Motorola products described in this manual may include Motorola computer programs stored in semiconductor memories or other media that are copyrighted with all rights reserved worldwide to Motorola. Laws in the United States and other countries preserve for Motorola, Inc. certain exclusive rights to the copyrighted computer programs, including the exclusive right to copy, reproduce, modify, decompile, disassemble, and reverse-engineer the Motorola computer programs in any manner or form without Motorola's prior written consent. Furthermore, the purchase of Motorola products shall not be deemed to grant either directly or by implication, estoppel, or otherwise, any license or rights under the copyrights, patents, or patent applications of Motorola, except for a nonexclusive license to use the Motorola product and the Motorola computer programs with the Motorola product.

About this Service Manual

Using this service manual and the suggestions contained in it assures proper installation, operation, and maintenance. Refer questions about this manual to the nearest Customer Service Manager.

Audience

This service manual aids service personnel in testing and repairing E310 telephones. Service personnel should be familiar with electronic assembly, testing, and troubleshooting methods, and with the operation and use of associated test equipment.

Use of this manual assures proper installation, operation, and maintenance of Motorola products and equipment. It contains all service information required for the equipment described and is current as of the printing date.

Scope

This manual provides basic information relating to E310 telephones, and also to provides procedures and processes for repairing the units at Level 1 and 2 service centers including:
- Unit swap out
- Repairing of mechanical faults
- Basic modular troubleshooting
- Testing and verification of unit functionality
- Initiate warranty claims and send faulty modules to Level 3 or 4 repair centers

Conventions

The following special characters and typefaces are used in this manual to emphasize certain types of information.

Note: Emphasizes additional information pertinent to the subject matter.

Caution: Emphasizes information about actions that may result in equipment damage.

Warning: Emphasizes information about actions that may result in personal injury.

Keys to be pressed are represented graphically. For example, instead of "Press the Menu Key", you will see "Press ☰".

Information from a screen is shown in text as similar as possible to what displays on the screen. For example, ALERTS or ALERTS or ALERTS.

Information that you need to type is printed in **boldface type**.

Warranty Service Policy

The product is sold with the standard 12-month warranty terms and conditions. Accidental damage, misuse, and extended warranties offered by retailers are not supported under warranty. Non warranty repairs are available at agreed fixed repair prices.

Out-of-Box Failure Policy

The standard out of box failure criteria applies. Customer units that fail very early on after the date of sale, are to be returned to Manufacturing for root cause analysis, to guard against epidemic criteria. Manufacturing will bear the costs of early life failure.

Product Support

Customer's original units will be repaired but not refurbished as standard. Appointed Motorola Service Hubs will perform warranty and non-warranty field service for level 2 (assemblies) and level 3 (limited PCB component). The Motorola High Technology Centers will perform level 4 (full component) repairs.

Customer Support

Customer support is available through dedicated Call Centers and in-country help desks. Product Service training is available through the local Motorola Support Center.

Parts Replacement

When ordering replacement parts or equipment, include the Motorola part number and description used in the service manual or supplement.

When the Motorola part number of a component is not known, use the product model number or other related major assembly along with a description of the related major assembly and of the component in question.

In the U.S.A., to contact Motorola, Inc. on your TTY, call: 800-793-7834

Accessories and Aftermarket Division (AAD)

Order replacement parts, test equipment, and manuals from AAD.

U.S.A.	Outside U.S.A.
Phone: 800-422-4210	Phone: 847-538-8023
FAX: 800-622-6210	FAX: 847-576-3023

In EMEA call +49 461 803 1638.

In Asia call +65 648 62995.

Specifications

General Function	Specification
Frequency Range 1900 MHz PCS	1931.250 -1988.750 MHz Rx 1851.250 -1908.750 MHz Tx
Frequency Range 800 MHz CDMA/ AMPS	869.04 - 893.97 Rx 824.04 - 848.97 Tx
Channel Spacing	50 kHz PCS 30 kHz CDMA/AMPS
Channels	1200 PCS 832 CDMA/AMPS
Modulation	1M25D1W (1.25 MHz bandwidth) CDMA 3G1XRTT (1.25 MHz bandwidth) CDMA-1X F3 +12 kHz for 100% at 1 kHz AMPS
Transmitter Phase Accuracy?	5 Degrees RMS, 20 Degrees peak
Duplex Spacing	80 MHz PCS 45 MHz AMPS
Frequency Stability	$\pm$ 300 Hz (CDMA) $\pm$ 2.5 ppm (AMPS)
Power Supply	3.6V Li Ion 860 mAh battery
Average Transmit Current	310 mA at +13 dBm)
Average Stand-by Current	3.40 mA
Dimensions (with 860 mAh Li ion battery)	47.8 x 87 x 22.7(24.2)mm (without antenna)
Size (Volume)	100cc (5.80 in.^{3}) without antenna
Weight	$\leq$100g (3.84 oz) with battery
Temperature Range	-30° C to +60° C (-22° F to +140° F)
Humidity	80% Relative Humidity at 50° C (122° F)
Battery Life, 750 mAh Li Ion Battery	Up to 180 minutes digital talk time (IS 95 A/B) Up to 90 minutes talk time (Analog) Up to 250 hours (IS 95 A/B) standby time Up to 350 hours (IS 2000) standby time Up to 15 hours standby time (Analog)
	All talk and standby times are approximate and depend on network configuration, signal strength, and features selected.

Transmitter Function	Specification
RF Power Output	0.20 watts -23 dBm into 50 ohms (CDMA nominal) .6 watts -27.0 dBm into 50 ohms (AMPS nominal)
Input/Output Impedance	50 ohms (nominal)
Transmit Audio Response	6 dBm/octave pre-emphasis
Modulation	1M25DIW (1.25 MHz bandwidth) CDMA
CDMA Transmit Waveform Quality (Rho)	0.94

Receiver Function	Specification
Receive Sensitivity	-104 dBm (CDMA, 0.5% Static FER) 0.5% or less
Audio Distortion	Less than 5% at 1004 Hz, +/- 8 kHz peak frequency deviation (transmit and receive)

Receiver Function	Specification
Adjacent and Alternate Channel Desensitization	3% BER max at 107 dBm signal; -94 dBm/30 kHz, -65 dBm/60 kHz
IM (AMPS)	Greater than 65 dB

Product Overview

Motorola E310 mobile telephones feature Code Division Multiple Access (CDMA) technology. The mobile telephone uses a simplified icon and Graphical user interface (GUI) for easier operation, allow Short Message Service (SMS) text messaging, and include clock, alarm, datebook, calculator, and caller profiling personal management tools. The phone provides 32 Embedded ring tones including VibraCall vibrating alert and 32 Downloadable/Customizable iMelody ring tones. The E310 is a single band phone that allows roaming within the CDMA 800 MHz bands.

The E310 CDMA phone consists of a main housing assembly and a hinged flip assembly. The phone has the main circuit board, battery, headset jack, alert, vibrator and accessory connector in the main housing assembly. The display is located in the hinged flip assembly.

The flip assembly includes the entire hinge mechanism and is attached to the main housing by four screws. There is a full display on the inside of the flip assembly and an one-line display on the outside of the flip assembly.

The main housing assembly includes a battery cover, chassis, main circuit board, keypad and plastic front housing.

The telephones are made of polycarbonate plastic with a metal enclosure. The display and speaker, as well as the 18-key keypad, transceiver printed-circuit board (PCB), microphone, charger and headphone connectors, and power button are contained within the clam form-factor housing. The 750 mAh Lithium Ion (Li Ion) battery provides up to 178 minutes of talk time in CDMA mode with up to 264 hours of standby time[1]. These telephones feature a large 128 x 128 pixel display and an extendable antenna.

Features

E310 telephones use advanced, self-contained, sealed, custom integrated circuits to perform the complex functions required for CDMA communication. Aside from the space and weight advantage, microcircuits enhance basic reliability, simplify maintenance, and provide a wide variety of operational functions.

Features available in this family of telephones include:

- CDMA 1X voice and data (153 Kbps F/R)
- Supports 2 way SMS, Email MO SMS Messaging, Canned Messaging
- 128 x 128 pixel/CSTN 4096 Color Display
- VibraCall® vibrating alert
- 5-way navigation key
- 19 embedded ring tones (5 embedded + 14 downloadable)
- Calling line identification[2]
- Supports call forwarding for incoming voice calls[2]
- Personal management tools calculator, real-time clock with date, reminders, and caller profiling

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1. All talk and standby times are approximate and depend on network configuration, signal strength, and features selected. Standby times are quoted as a range from DRX=2 to DRX=9. Talk times are quoted as a range from DTX off to DTX on.

2. Network, subscription or service provider dependent feature. Not available in all areas.

- TTY compliant
- Hearing Aid Telephone Interconnection System (HATIS) support
- TrueSync™ Multi-Point Synchronization Capability
- AFLT/aGPS location services[3]

Simplified Text Entry

iTAP™ predictive text entry. Press a key to generate a character and a dynamic dictionary uses this to build and display a set of word or name options. The iTAP™ feature may not be available in all languages.

Caller Line Identification

Upon receipt of a call, the calling party's phone number is compared to the phone book. If the number matches a phone book entry, that name displays. If there is no phone book entry, the incoming phone number displays. If no caller identification information is available, an incoming call message displays.

> *User must subscribe to a caller line identification service through their service provider.*

Personal Information Management

The E310 telephone contains a built in date book with alarm reminders message center and a 100 number capacity phonebook.

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3. Network, subscription or service provider dependent feature. Not available in all areas.

General Operation

Controls, Indicators, and Input/Output (I/O) Connectors

The E310 telephones' controls are on the front and side of the device, and on the keyboard as shown in Figure 1. Indicator icons are displayed on the LCD (see Figure 2).

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Figure 1. E310 Telephone Controls and Indicators Locations

Menu Navigation

E310 telephones have a simple icon and GUI. The phone also features a user-definable Quick Access menu accessed by holding down the Menu key. A 5-way navigation key allows you to move easily through menus.

Liquid Crystal Display (LCD)

The E310 phone features a large 96 x 64 grayscale display offering up to 12 characters per line, 3 lines of text, 1 line of icons, and 1 line of prompts. The display provides constant graphical representations of battery capacity and signal strength, as well as the real-time clock.

Display animation makes the phone's icon menu move smoothly as the user scrolls up and down.

▶ *Whether a phone displays all indicators depends on the programming and services to which the user subscribes.*

Figure 2 shows some common icons displayed on the LCD.

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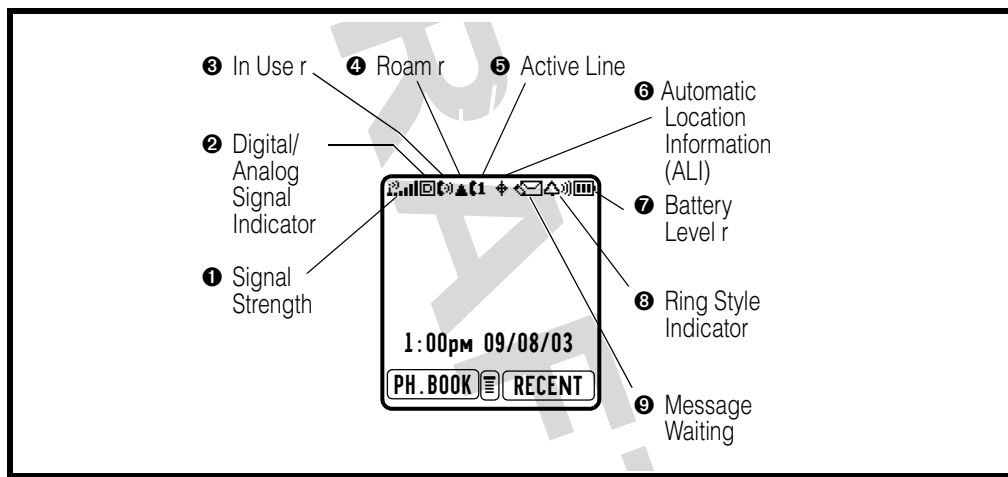
Figure 2. E310 Display Icon Indicators

1. **Signal Strength Indicator** Vertical bars show the strength of the phone's network connection. You cannot make or receive calls when the "no signal" indicator displays.
2. **Digital/Analog Signal Indicator** shows weather you are receiving a digital (▣) or analog (🕻) signal.
3. **In Use Indicator** Shows that a call is in progress.
4. **Roam Indicator** Shows that your phone is seeking or using another network system outside your home network.
5. **Message Waiting Indicator**[4] Displays when you receive a text message.
6. **Voice Message Waiting Indicator**[4] Appears when you receive a voicemail message.
7. **Battery Level Indicator** Shows the amount of charge left in the battery.
8. **Active Line Indicator** Indicates the current active line
9. **ALI Indicator** shows the status of the Automatic Location Information feature:

   ⊛ = ALI on   ⊛⟨ = ALI off

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4. Network, subscription or service provider dependent feature. Not available in all areas.

10. **Ring Style Indicator** indicates the phones current ringer alert setting.

      △⧭ = loud   △» = soft

      ⧭⧭ = vibrate   ⧭△ = vibrate and ring

      △ᴢ = silent

Alert Settings

In addition to preset ring tones, E310 telephones allow the user to download additional ring tones. (Availability is carrier and Network dependant).

Motorola E310 phones incorporate the VibraCall® discreet vibrating alert that avoids disturbing others when a ringing phone is unacceptable.

Alerts can be set to ring only, vibrate only, vibrate then ring, or no ring or vibrate.

Additionally, the profiling feature allows users to identify incoming calls by a specific ringer tone.

Battery Function

Battery Charge Indicator

The telephone displays a battery charge indicator icon in the idle screen to indicate the battery charge level. The gauge shows four levels: 100%, 66%, 33%, and Low Battery.

Battery Removal

Removing the battery causes the device to shut down immediately and loose any pending work (partially entered phone book entries or outgoing messages, for example).

All batteries can cause property damage and / or bodily injury such as burns if a conductive material such as jewelry, keys, or beaded chains touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.

If the battery is removed while receiving a message, the message is lost.

To ensure proper memory retention, turn the phone OFF before removing the battery. Immediately replace the old battery with a fresh battery.

Operation

For detailed operating instructions, refer to the appropriate User Guide listed in the Related Publications section toward the end of this manual.

Theory of Operation

Receiver

The receiver block consists of front end (RFL6000) and back end (RFR6000). Audio signal processing is all achieved under DSP (Digital Signal Processor) control in the Audio/Logic section with the MSM6050.

The received signal from the antenna is fed to antenna matching components, and then routed to the Band Selection Switch (SW1). At this point, the switch is selected by bands (Cellular, USPCS, GPS).

For 800 MHz (Cellular) band operation, the received signal is switched to the antenna port of the duplexer in both analog and digital mode (800MHz CDMA), and then routed to the 800 MHz Low Noise Amplifier (LNA) that is included in RFL6000 through the receive port of the duplexer.

For 1900 MHz PCS (Personal Communications Service) operation, the received signal is switched to the antenna port of the 1900 MHz duplexer and is fed to the 1900 MHz LNA that is contained in RFL6000. For GPS, the GPS band pass filter is fed to the GPS LNA that is comprised of RFR6000. The RFL6000 is a front end IC that contains two sets of LNA's.

The 800 MHz and 1900Mhz receive signal is further filtered through the SAW band pass filters for image rejection, LO leakage attenuation, and TX signal attenuation. The GPS receiver signal is filtered through a GPS filter for noise suppression before being fed to the LNA.

The LO signals for the 800MHz and 1900MHz bands are supplied by the Dual band VCO.

The GPS VCO is embedded in RFR6000.

The 800 MHz (CDMA), 1900 MHz and GPS mixers down-convert the received signal to Baseband frequency. The 800 MHz (analog) signal is down converted to 12KHz.

All mixers typically require a LO input level of -4 dBm at the LO input of RFR6000. The 800 Mhz, 1.9GHz and GPS Quadrature Down converter outputs are combined to allow baseband filtering, and then is routed to MSM6050.

The RFR6000 provides these critical receiver functions for three different operating modes: CDMA, AMPS FM, and GPS position location. It is functionally compatible with the RFL6000, while adding GPS processing capability.
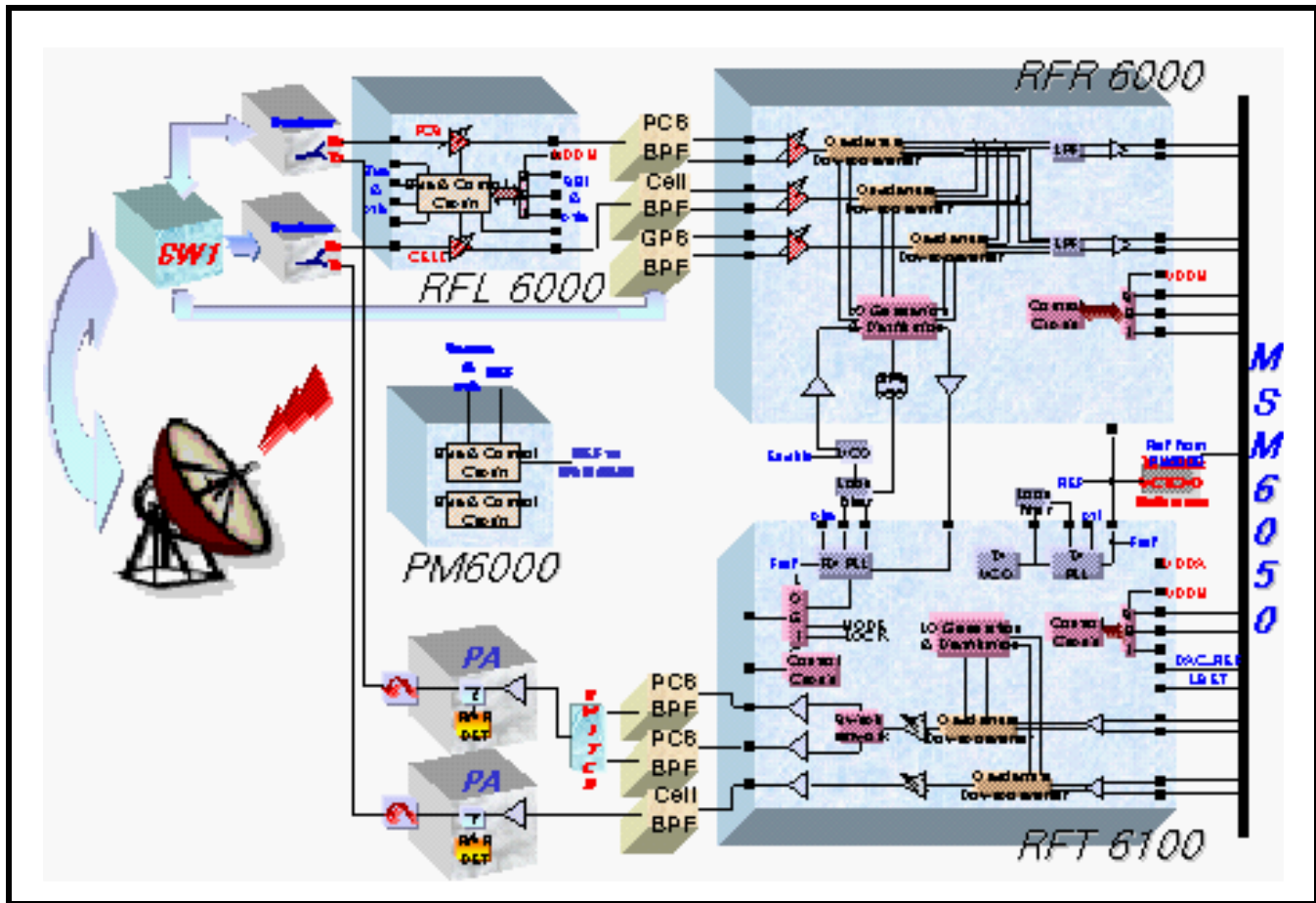
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Figure 3.

Transmitter

800 MHz

For the 800 MHz band, IC 103 (RFT6100) provides the Zero-IF transmitter signal path, from analog baseband to RF driver amplifiers. In analog mode, Zero-IF transmitter signals are also used to generate from MSM6050. In digital mode, the I/Q signals are fed to I/Q modulator to provide QPSK. IC 103 (RFT6100) provides Tx VCO, Tx PLL and Rx PLL.

The final stage of IC 103 (RFT6100) is the Driver Amp. This provides adequate Pout and ACPR to the PA block. According to Tx lineup calculation, Pout is 0.1dBm and ACPR is 56dBc in this stage. After that main signal pass cleanup filter, that has 2.4dB insertion loss for 824~849MHz and 38dB for Rx band rejection. The 800 MHz PA driver, I.C104, I.C 104 has gain of approximately 29dB. We have HBT PA module, Also High/Low power mode in conjunction with digital bias control. The transmitter signal is going to the SAW duplexer TX port, SP3T switch Tx port and finally Antenna port will meet 24dBm for digital mode and 27dBm for analog mode.

1900 MHz

For the 1900 MHz band, RFT6100 output for PCS provides 1.1dBm of Pout and 58dBc of ACPR to the next stage. After that signal pass through Split SAW band pass filter, F105, whose typical insertion loss is 2.4 dB and 38dB for Rx band rejection. SPDT switch control to pass Split band, 1850-1880MHz and 1880-1910MHz, respectively. PA driver, I.C107, whose gain is approximately 28dB. The output of I.C107 is fed to PCS FBAR duplexer and then SP3T switch to Ant, the power level at the feeding point of the antenna is set to the suitable power output levels for each band of operation.

Synthesizer

The RFT6100 consists of the Rx PLL, Tx PLL and Tx VCO.

The external synthesizer block is composed of the RX dual band VCO and other supporting circuits including the loop filter and supports RF RX (Cellular 800Mhz, PCS CDMA and GPS). The TX RF synthesizer is totally internal to RFT6100 except for the loop filter. All synthesizers are programmable via the data from MSM6050

The reference oscillator, TCXO is a temperature compensated crystal oscillator with frequency stability of 2 ppm over temperature extremes. Its frequency is 19.2 MHz. Output of TCXO is supplied to MSM6050, PM6000, RFR6000, and RFT6100.

Main VCO covers the frequency range of 1715MHz to 1788MHz for the 800Mhz mode and 1.9Ghz mode. VCO control voltage range is 0.4 volts to 2.3 volts.

Control Logic Circuitry
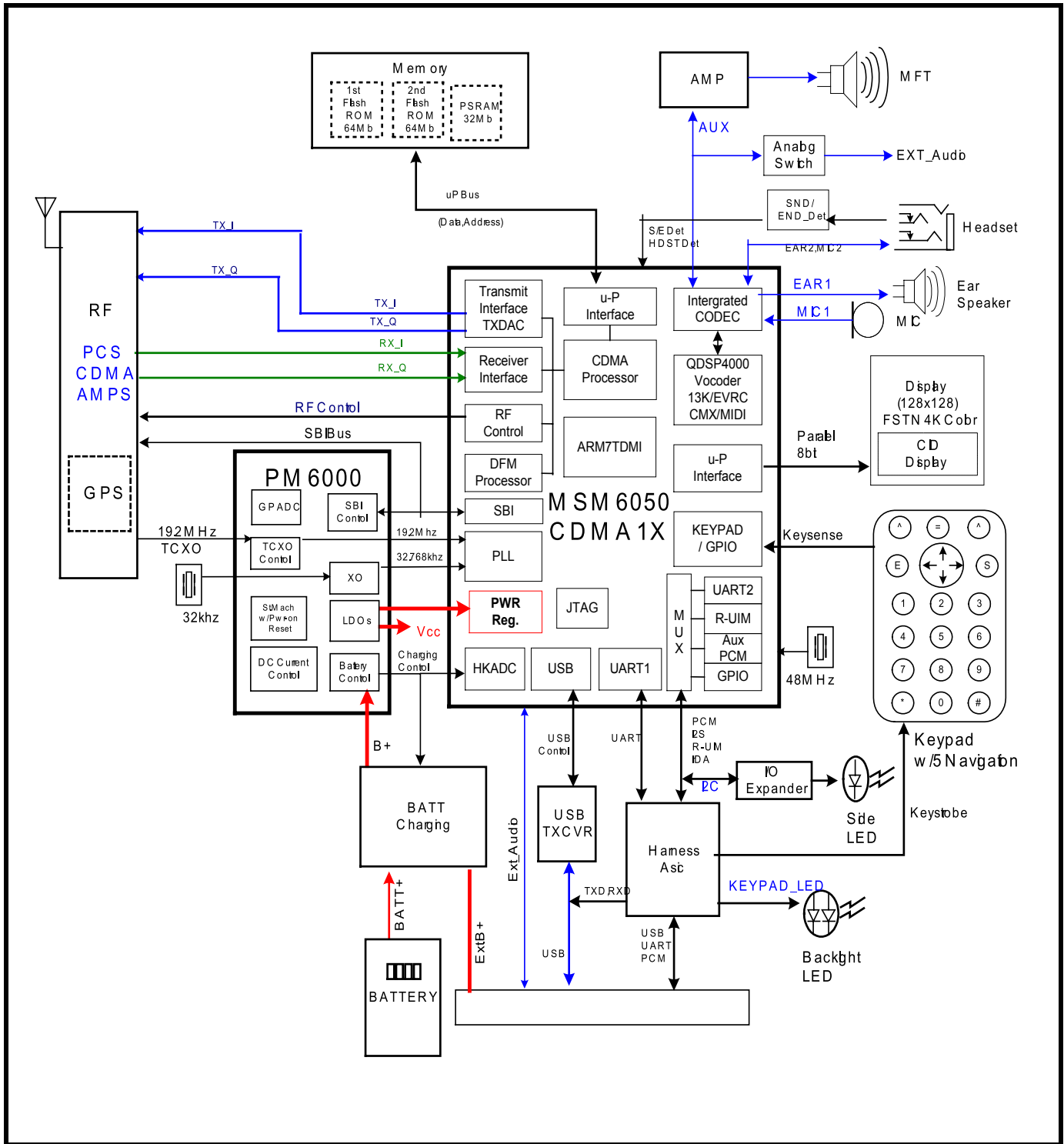
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Figure 4. E310 CDMA 1X Baseband System Block Diagram
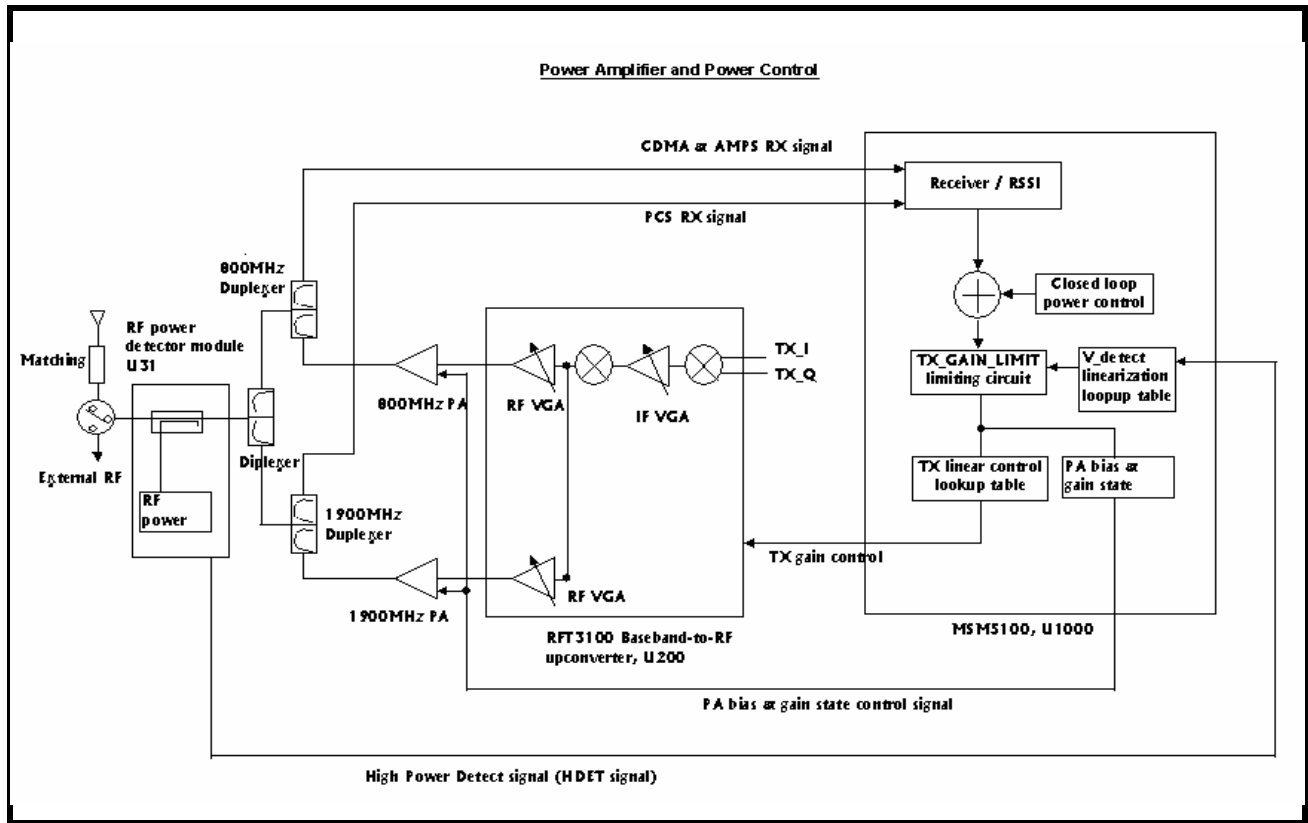
Figure 5. Power Amplifier and Power Control Block Diagram

Overview

The Audio and Control Logic circuitry is based on Qualcomm's baseband IC (MSM6050/ PM6000). MSM6050 is a baseband CDMA Processor that has been optimized for wireless subscriber applications. It executes software that handles state control, MMI control, radio control, network communications, and accessory control. External FLASH/PSRAM (IC201) provides the baseband Processor's MCU program and data memory. The General Control Power IC (IC304) provides the linear voltage regulator and battery charge control. Harness IC (IC300) is Motorola costumed Asic to provide for CE bus Mux and additional GPIO and P-S converter etc.

External interfaces include Motorola's proprietary accessory interface (CN300) called the CE bus and an industry standard 2.5mm headset jack (EAR200). MIDI sound is created in MSM6050(IC200) and MFT (Multi-function Speaker) will be MIDI sound output. A MFT also achieves vibrating operation. A microphone is located in the main board and a receiver speaker is located in the flip assembly. A dual window LCD is located in the flip assembly and main LCD support FSTN color display. White color backlighting is provided for main LCD display windows. Keypad with blue LED backlighting is provided in the main board.

Baseband Processor ICIC200 MSM6050 CDMA 1X baseband Processor integrates functions that support a tri-mode CDMA/FM subscriber unit. Subsystems within

the MSM6050 device include a CDMA processor, a Digital FM (DFM) processor, QUALCOMM-designed DSP for voice compression, and an ARM® ARM7TDMI microprocessor. To provide an optimized system solution for IS2000 -1X services, the MSM6050 device support 153kbps data rate air interface and also integrates a gpsOne Processor to support GPS one solution. Also integrated in the MSM6050 device are functions such as an audio voice codec, PLL, transmit DACs, ADCs, an Universal Serial Bus (USB) device controller, peripheral interfaces, and an enhanced clock and power management architecture. The MSM6050 IC contains the following major features:

- Integrated gpsOne Processor for direct interface to RF chipset
- Integrated 13-bit linear CODEC with multiple inputs (3) and outputs (3) with amplifiers
- Integrated general-purpose ADC for subscriber unit monitoring, e.g., temperature sensor, battery
- Voice mode V1 (EVRC, PureVoice) all radio configurations
- 8x Searcher for CDMA searching
- 8x, 16x and 32x Searcher to support GPS processing
- Integrated PLL to provide additional on-chip clock frequencies
- Supports 19.2 MHz TCXO frequencies
- Supports Radio One ZIF (Zero I/F)
- Integrated Universal Serial Bus (USB) interface for plug-and-play (PC) applications
- 66-pin general-purpose interface (GPIO)
- Supports IS-95-A and IS-95-B compliant CDMA and DFM subscriber units
- Supports low-power, low-frequency crystal to enable TCXO shutoff
- Low Vdc power consumption during operation
- Software-controlled power management features
- ANSI/IEEE 1149.1A-93 compliant JTAG interface for Testability
- Enhanced I/O support for faster RS-232
- Supports page-mode flash memory

PM6000

The PM6000 chip (IC304) is a complete power management system device for CDMA handset applications whose primary functions provide battery management and charger control, and linear voltage regulation with programmable voltages for digital and RF/analog circuits. PM6000 IC contain the following features:

- 7 LDOs
- Serial Interface (SBI bus) to MSM
- TCXO control for Slotted mode operation
- Charging control for Li-Ion battery
- Ten 10-bit A to D converters (5 wired internally, 5 accessible)
- Keyboard/LCD backlight driver (not used)
- Ringer driver (not used)
- Vibrator driver (not used)
- MSM/32K clock driver
- Power On Reset control

FLASH/PSRAM Memory

IC201 Flash/PSRAM(Pseudo SRAM) Memory is mixed multi-chip package containing two 64Mbit Flash memories and one 32Mbit pseudo SRAM. The Flash/PSRAM Memory supports page mode for fast access time. Flash is for boot code,

program code storage and NVM data storage. FLASH memory contains executable code that is executed directly from FLASH. Flash memory also contains configuration parameters, look-up tables, calibration constants, user selectable option settings, phone book data, call history, etc. Pseudo SRAM contains run-time dynamic data storage, software stack/heap data, and other data that is frequently modified during run-time operation. The Baseband Processor accesses FLASH/PSRAM memory via a 16-bit asynchronous bus interface.

Accessory Interface

A 17 pin accessory connector (CN300: called a CE bus connector) is provided at the bottom of the main housing. This interface supports charging accessories, analog and digital audio accessories, and RS-232 data and USB communication accessories. The accessory interface provides for auto-detection of accessories upon insertion. Depending on the accessory, power can be provided to the phone from an external approved power accessory or power can be provided to the accessory for battery powered applications.

Battery Interface

The PM6000 (IC304) will be hardware configured for battery charging, which the external charging power supply is expected to provide the constant voltage and current regulation. Since CE Bus charging accessories do not provide the current and voltage regulation for charging lithium ion batteries, an external voltage/current control circuit is required. Pass Transistor (Q303), Battery Transistor (IC306) and Sense Resistor (R370) will provide the regulated voltage and current that is required for charging lithium-ion batteries.

 The Bipolar PNP Transistor is used for Pass Transistor (Q303) and the P-channel MOSFET for Battery Transistor (IC306). The Sense Resistor (R370) used for current monitoring and protection is 0.15 Ohm. The HKADC AD converter of MSM6000 monitors charging current, that is read and controlled by software.

Chargers for E310 are 2 types: mid rate (400mA capable) and full rate (1.5A capable). Those should be recognized by phone at initial insertion. Charger is connected through CE bus connector pin 15(GND), 16 (BATTFDBK_RTS) and 17 (EXT_B+). Pin 17 is EXT_B+, main charging current path and pin 16 is battery feedback and manual test multiplexed signal. The charger interfaces to MSM6050 and PM6000 through SBI control bus following register: CHG_IMAX, CHG_START and CHG_THRESHOLD. Most of the charging algorithm will be handled by SC801 external charging control IC. PM6000 will monitor battery voltage and charging current for battery icon displaying normal phone operation, without a charger attached

Power Distribution

Voltage regulation is provided by the PM6000 IC. The Low Dropout Regulators output voltages can be controlled by the MSM through the SBI. All of the LDO's outputs can be enabled or disabled with the LDO_ENABLE register, with the exception of the MSMP and MSMC LDOs, there is no provision for the enabling or disabling of the MSMP and MSMC LDOs. The regulators and their load circuitry are described below:
- VREG_MSMC (1.867V) - MSM IC internal
- VREG_MSMP (2.887V) - MSM Digital, Memory, Harness
- VREG_MSMA (2.6V) - MSM Analog
- VREG_TCXO (2.85V) - TCXO supply

- VREG_RF_RX (2.8V) - RFR6000, GPS Filter
- VREG_RF_TX (2.85V) - RFT6100, Tx Filter
- VREG_SYNTH (2.85V) - VCO Synthesizer
- B+ (3.6V) - PA, Backlight LED

AUDIO CONTROL CIRCUITRY

Audio Line-up

The audio routing and gain control will be supported by MSM6050 IC. With the integrated microphone and earpiece amplifiers, the MSM interfaces directly to the microphone and earpiece and greatly reduces the audio interface into a few passive components. The integrated CODEC converts an analog audio signal, either differential or single-ended, from the microphone into digital signals for the MSM6050's Vocoder. The integrated CODEC also converts digital audio data from the Vocoder into an analog audio signal, either differential or single-ended, for the earpiece. The Codec is configured through the QDSP4000 Command types and is not directly controlled by the microprocessor. The Codec Configuration command is sent to the QDSP4000 and then the QDSP4000 executes the command and configures the Codec. The internal Vocoder supports EVRC, QCLEP 13K Vocoders, along with implementing two echo cancellers, an ear seal (ESEC) and an acoustic echo canceller (AEC) for car kit applications. The vocoder also supports digital FM (DFM), DTMF generation and detection, Noise Suppression, audio AGC control, and automatic volume control (AVC). The MSM6050 has an auxiliary Pulse Code Modulation (PCM) interface and programmable Tx and Rx 13-Tap compensation filters to support an auxiliary linear, mu-Law, or A-law CODEC that is typically found in car kit applications. This model uses a MFT. The MFT which is a multi-function speaker/vibrator transducer also handles the Alert function.

Sidetone (DSP)

Sidetone is audio signal from the microphone summed into speaker path. The MSM6050 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 +12 dB to -84 dB, controlled by the QDSP4000 DMA parameter Codec STGain.

Transmit Path Audio

The mobile phone supports three microphone input paths identified as Internal Microphone (MIC 1), Headset Microphone (MIC 2), and External Accessory Microphone (Audio_IN). Headset and External Mic inputs are single ended and Internal MIC is differential Input. The proper Microphone path is selected by the MIC selector and path gain is programmable at the MIC AMP 1, 2 in the MSM. Refer to the following sections and block diagram below.
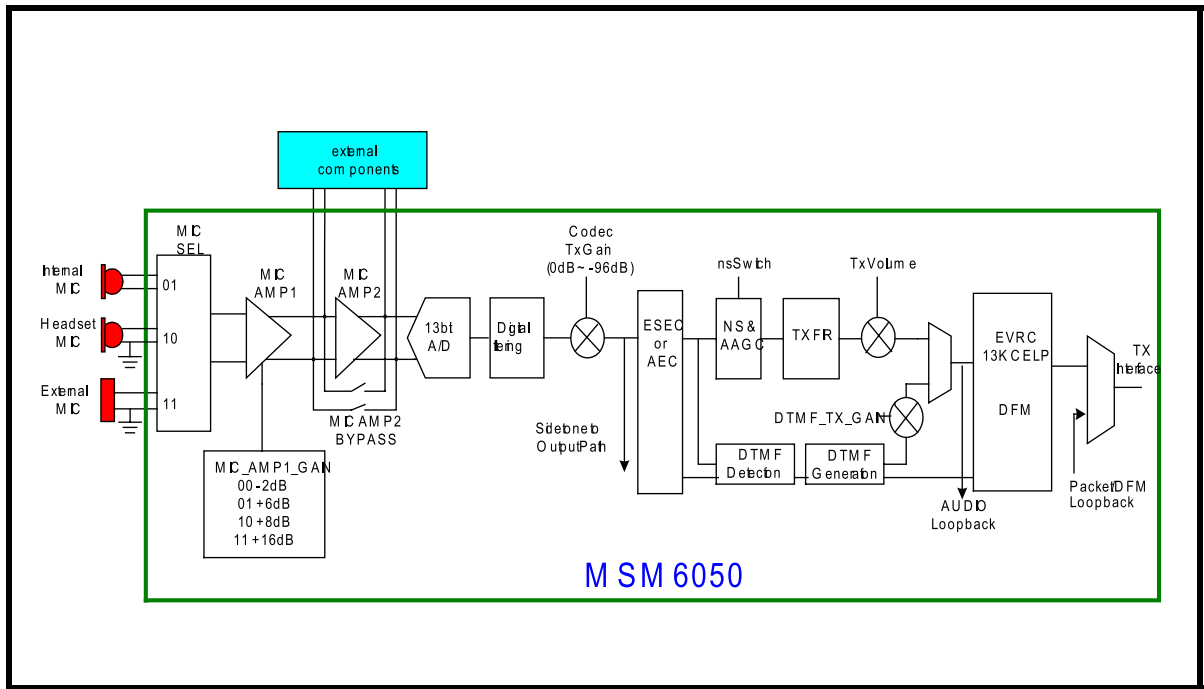
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Figure 6. MSM 6050 Transmit Audio Block Diagram

A/D converter & Filtering

A/D is 13-bit linear two's complement converter. MIC AMP1 and MIC AMP2 gains should be selected to maximize the dynamic range without overloading the A/D (3.63 Vpp max range). 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. The MSM6050 has two optional digital filters on the Tx path prior to the vocoder, a slope filter and a high-pass filter. The slope filter is designed to provide pre-emphasis for the high frequency audio prior to the vocoder.

Tx Volume Control

The Tx and Rx audio path have separate volume controls to adjust the loudness levels on the Tx and Rx audio paths. The Rx and Tx volume controls are programmable multipliers.

Headset Microphone Path

The Headset Microphone is pin 4 of EAR200, which is a 2.5mm jack. MICBIAS 1.8V from MSM is used for headset Mic vias. The single-ended MIC2P signal is fed to MSM headset Mic input and this line is shared as headset SEND/END detect signal from headset.

External Microphone Path

The External Microphone input is connected to pin 16 of CN300 (AUDIO_IN), the accessory connector for the mobile phone. The path is routed through IC301 to protect ESD and to the AUXIP pin on MSM. This single-ended signal feeds directly to the input MIC select multiplexer without an intervening gain stage. The audio signal shall have a nominal level (-27dBv) of 43.5mVrms at 1 kHz, between 300 Hz and 3 kHz.

Receive Path Audio Circuits

The mobile phone supports three audio output paths. The output of MSM's internal DAC drives the internal AMP SEL. The outputs can be routed to one of the three supported outputs via the internal multiplexer. These outputs connect to the EAR1OP, EAR1ON amplifier (Ear Speaker), the EAR2O amplifier (Headset boom speaker), and the AUXOP, AUXON amplifier (Accessory connector output). All outputs use the same D/A converter so only one output can be active at one time. The user can adjust the gain of the audio outputs with the volume control buttons. Forward link audio path block diagram is shown below.

032184o
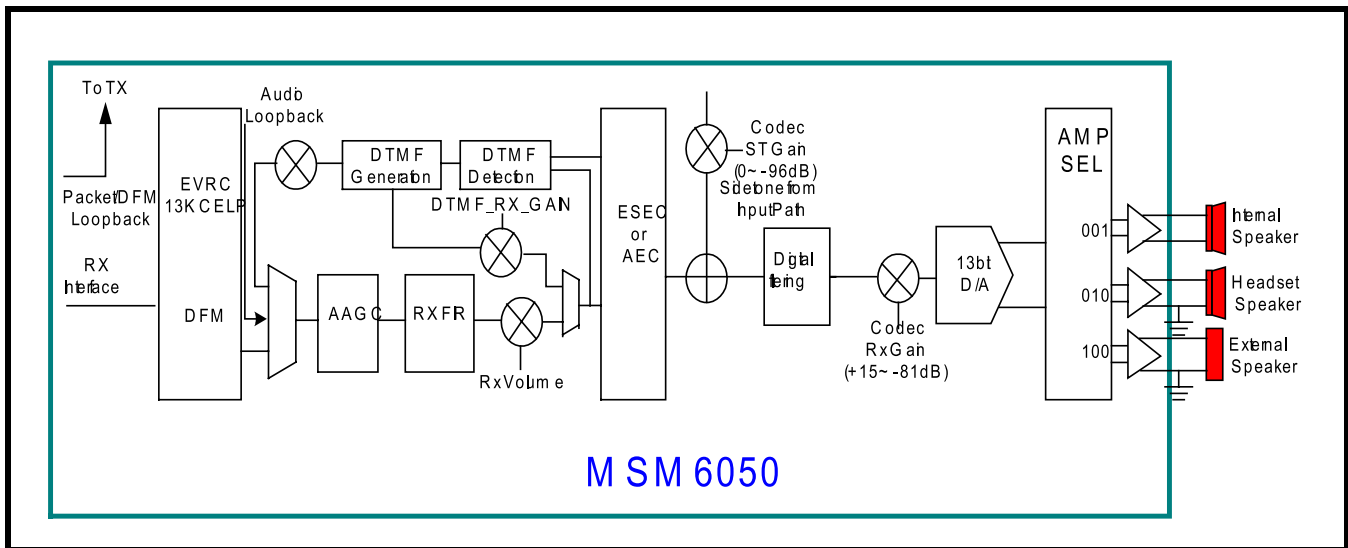
Figure 7. Forward link audio path block diagram

Rx FIR Filter

W A type-I 13-tap FIR (finite impulse response) filter is supported on the Tx and the Rx paths. Both filters are software programmable and can be reconfigured during vocoder or DFM operation. Tx FIR is programmable 13-tap FIR filter whose coefficients can be programmed through the QDSP4000 parameters txPcmFiltLoad and Tx PcmFiltCoeff. Each filter consists of 7 coefficients with the outside taps, h[0] and h[12], h[1] and h[11], h[2] and h[10], h[3] and h[9], h[4] and h[8], and h[5] and h[7], using the same coefficient value. The Rx and Tx filters are intended to equalize the frequency response of the microphone (Tx), the earphone (Rx), and the frequency characteristics of the mechanical housing of the subscriber unit.hen enabling/disabling Receive Audio functions, operations are performed in the following order to reduce audible pops on amplifiers.

Codec Rx Gain

The Rx audio path contains a programmable gain stage, with a range of +15 dB to -81 dB, before the audio front end of the QDSP4000 and after to the Digital-to-Analog conversion. The QDSP4000 DMA parameter Codec Rx Gain sets the Rx gain.

Ear Speaker Path

The Ear Speaker is driven by MSM's internal SPKR differential amplifier. This amplifier is powered by voltage MSM_VREGA Speaker outputs from MSM are routed through 15Ohm R1004, R1005 resistor and following the speaker path EAR1OP(+) and EAR1ON(-), they are routed to main board through 50 pin B-B connector and then connected to the transducer in the flip assembly.

Headset Speaker Path

The headset uses a standard 2.5mm phone jack. The phone will detect the presence of a headset using pin 2 on the headset jack, which is pulled high by R208 and connected to the Headset_DET_N to MSM interrupt. This pin is aligned with the ground sleeve of the headset plug and will be pulled to a logic low whenever the headset plug is inserted into the jack. The headset may contain a momentary switch, which is normally closed and is in series with the microphone cartridge. When the momentary switch is pressed, the bias current being supplied to the microphone will be interrupted. The phone will detect this action and make an appropriate response to this action, which could be to answer a call, end a call, or dial the last number from scratchpad.

The Headset Speaker makes use of the amplifier in MSM and the single-ended EAR2O output audio path is routed through C222 to pin 1 of the Headset Jack (EAR2OO). If an external headphone jack is plugged into the phone, the HEADSET_DET_N pin will be pulled to ground will drive the headset speaker as single-ended off the Speaker- audio path.

External Speaker Path

The External Speaker is connected to pin 15 of SN300 (AUDIO_OUT ON/OFF), the accessory connector for the mobile phone. The audio path is routed through IC302 to protect ESD and connected to MSM AUXOP. The DC level of this Audio_Out signal is also used to externally command the phone to toggle it's ON/OFF state. The Audio_Out signal connects to PM6000 KBDPWR_ON pin via D301 to provide this capability. Audio_out will be routed to MSM GPIO to detect POWER/END key.

MIDI Alert Interface

The NCP2890 (IC202) is an audio amplifier for mobile phone ringing melodies. The NCP2890 provides high quality audio while requiring few external components and minimal power consumption. Due to its excellent PSRR, it can be directly connected to the battery, saving the use of an LDO.

MMI (KEYPAD/DISPLAY)

Keypad Interface

The keypad interface consists of an array of twenty four buttons and multi control switch buttons located in the main board. Multi control switches are provided on the main board for volume control and voice activation. Keypad actuation is detected

by the Baseband processor (MSM6050) through the integrated Keypad Port. Activation of a switch (Keypad or multi control switch) will assert (active low) two array signals that will be decoded by the MSM6050 to determine the active key-press. Key strobe signal is provided from Harness Chip (IC300). Multi key press function is also implemented for BREW service. Keypad back-lighting is provided through an array of 10 LEDs on the main board. ON/OFF control of the LEDs is controlled through the backlight sink circuit in the Harness Chip (IC300).

Flip Open/Close Detection

A Call sensor switch is located on the main board to detect flip open/close status. When flip is closed, the pressure switch is activated (active low) and this FLIP_DET signal is routed to MSM interrupt.

Display Module Interface

The display module is housed in the flip assembly. The display module includes dual window LCD panel, back-light circuitry, and display driver circuitry. The Display Module interfaces to the main board via CN200. 8 bit parallel interface is used for both LCD.

MFT

The MFT (Multi-function Speaker) is a combination of speaker and vibrator. It is designed to be housing mounted. Vibration operation is achieved by using an input stimulus of 150MHz. Acoustic operation is achieved at frequencies above 500 MHz.

LEDs

The Keypad Backlight LED is realized by ten blue color LEDs which part number is LTST-C192TBKT. Eight side view type chip LEDs are used for Side LED. The LED's part number is LNJ123W8HRA and Bi-color (Blue/Red) LED. Harness chip (IC300) generates pulse-width modulated (PWM) signals for controlling the brightness of Keypad Backlight LEDs and Side LEDs by programming On/Off times of LEDs.

I/O Expander

The I/O Expander (IC400) is used for Side LEDs control. I/O Expander provides 16 bits of General purpose parallel input/output (GPIO) expansion using I2C interface accessible to MSM6050. I/O Expander provides a simple solution when additional I/O is needed for LEDs.

Tools and Test Equipment

The following table lists tools and test equipment recommended for disassembly and reassembly of E310 telephones. Use either the listed items or equivalents.

Table 1. General Test Equipment and Tools

Motorola Part Number[1]	Description	Application
RSX4043-A	Torque Driver	Used to remove and replace screws
—	Torque Driver Bit T-6 Plus, Apex 440-6IP Torx Plus or equivalent	Used with torque driver
See Table 7	Rapid Charger	Used to charge battery and power phone
0180386A82	Antistatic Mat Kit (includes 66-80387A95 antistatic mat, 66-80334B36 ground cord, and 42-80385A59 wrist band)	Provides protection from damage to device caused by electrostatic discharge (ESD)
6680388B67	Disassembly tool, plastic with flat and pointed ends (manual opening tool)	Used during assembly/disassembly of phone
6680388B01	Tweezers, plastic	Used during assembly/disassembly
—	Digital Multimeter, HP34401A[2]	Used to measure battery voltage
6688054N01	Flip disassembly tool	Used to disassembly the flip assembly

1. To order in North America, contact Motorola Aftermarket and Accessories Division (AAD) at (800) 422-4210 or FAX (800) 622-6210; Internationally, AAD can be reached by calling (847) 538-8023 or by fax (847) 576-3023.
2. Not available from Motorola. To order, contact Hewlett Packard at (800) 452-4844.

Disassembly

The procedures in this section provide instructions for the disassembly of a E310 telephone. Tools and equipment used for the phone are listed in Table 1, preceding.

⚠ *Many of the integrated devices used in this phone are vulnerable to damage from electrostatic discharge (ESD). Ensure adequate static protection is in place when handling, shipping, and servicing the internal components of this equipment.*

⚠ *Avoid stressing the plastic in any way to avoid damage to either the plastic or internal components.*

Removing the Battery Cover

1. Ensure the phone is turned off.
2. Slide the battery cover as shown in Figure 8.
3. Lift the battery cover away from the phone.

020200o

Figure 8. Removing the Battery Cover

Removing and Replacing the Battery

All batteries can cause property damage and / or bodily injury such as burns if a conductive material such as jewelry, keys, or beaded chains touch exposed terminals. The conductive material may complete an electrical circuit (short circuit) and become quite hot. Exercise care in handling any charged battery, particularly when placing it inside a pocket, purse, or other container with metal objects.

1. Ensure the phone is turned off.
2. Remove the rear housing, as described in the procedures.
3. Slide the battery in the direction of the arrow as shown in Figure 9A.
4. Lift the top of the battery near the alert speaker out of the battery compartment as shown in Figure 9B.
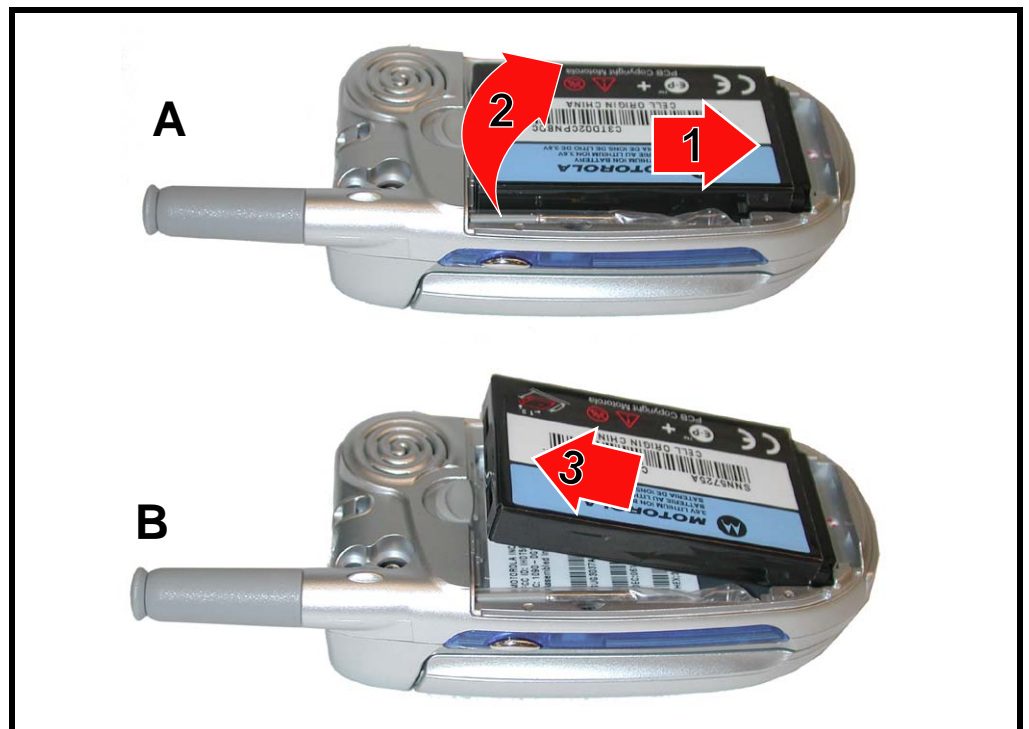
032160o

Figure 9. Removing the Battery

5. Lift the battery housing completely off the phone.
6. To replace, align the battery with the battery compartment so the contacts on the battery match the battery contacts in the phone.
7. Insert the battery, printed arrow first, into the battery compartment and push down.
8. Insert the ridge at the bottom of the battery housing into the base of the phone, then push the cover down and snap it into place.

Removing and Replacing the Antenna

1. Remove the battery cover and battery as described in the procedures.
2. By hand, rotate the antenna base counterclockwise, as indicated by the red arrows until loose. See Figure 10.
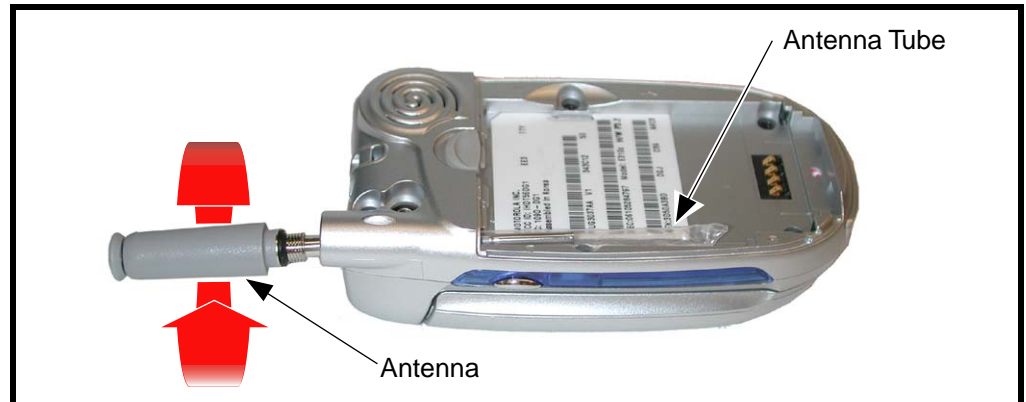
032161o

Figure 10. Removing the Antenna

3. When the antenna threads are completely disengaged, pull the antenna straight out of the plastic antenna tube and out of the phone to remove.
4. Remove the antenna tube from the phone. Retain the plastic antenna tube for re-assembly.

⚠ *Ensure antenna threads are properly engaged before tightening to prevent damage to the antenna or housing.*

5. To replace, insert the threaded end of the antenna carefully into the housing and, after ensuring the threads are properly engaged, rotate clockwise. Tighten firmly by hand.
6. Replace the battery and battery housing as described in the procedures.

Removing and Replacing the Rear Housing Assembly

! *This product contains static-sensitive devices. Use anti-static handling procedures to prevent electrostatic discharge (ESD) and component damage.*

1. Remove the battery housing, battery, and antenna as described in the procedures.
2. Remove the grommet over the RF cap near the antenna.
3. Using a Torx driver with a T-6 bit, remove the 5 screws from the rear housing assembly (See Figure 11). Retain the screws for re-use.
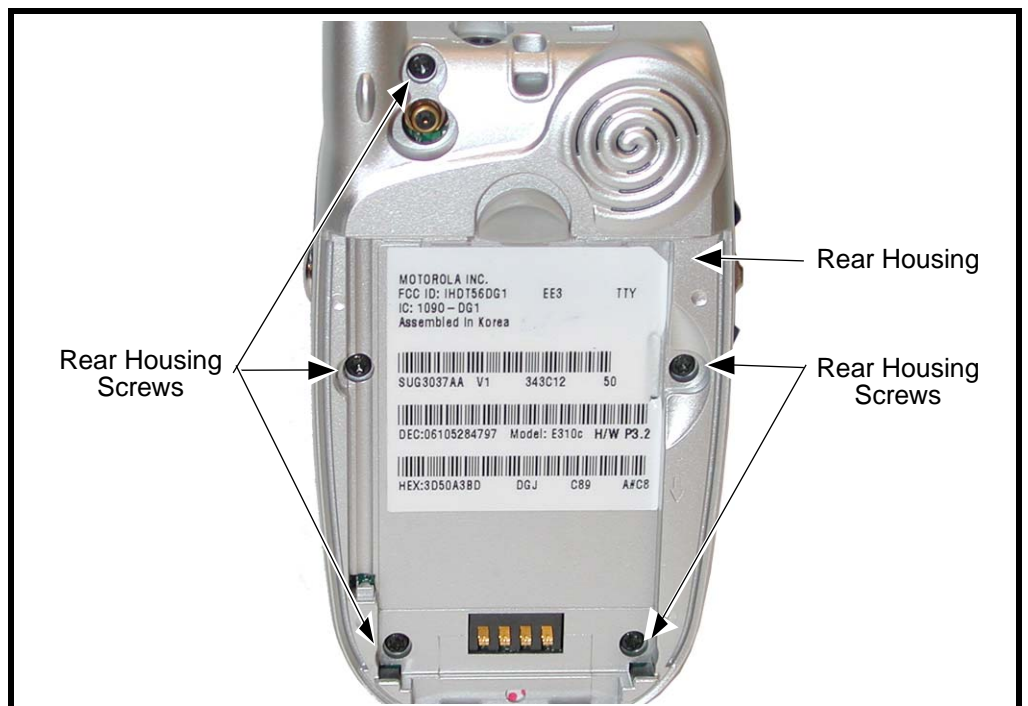
0321620

Figure 11. Removing the rear housing screws
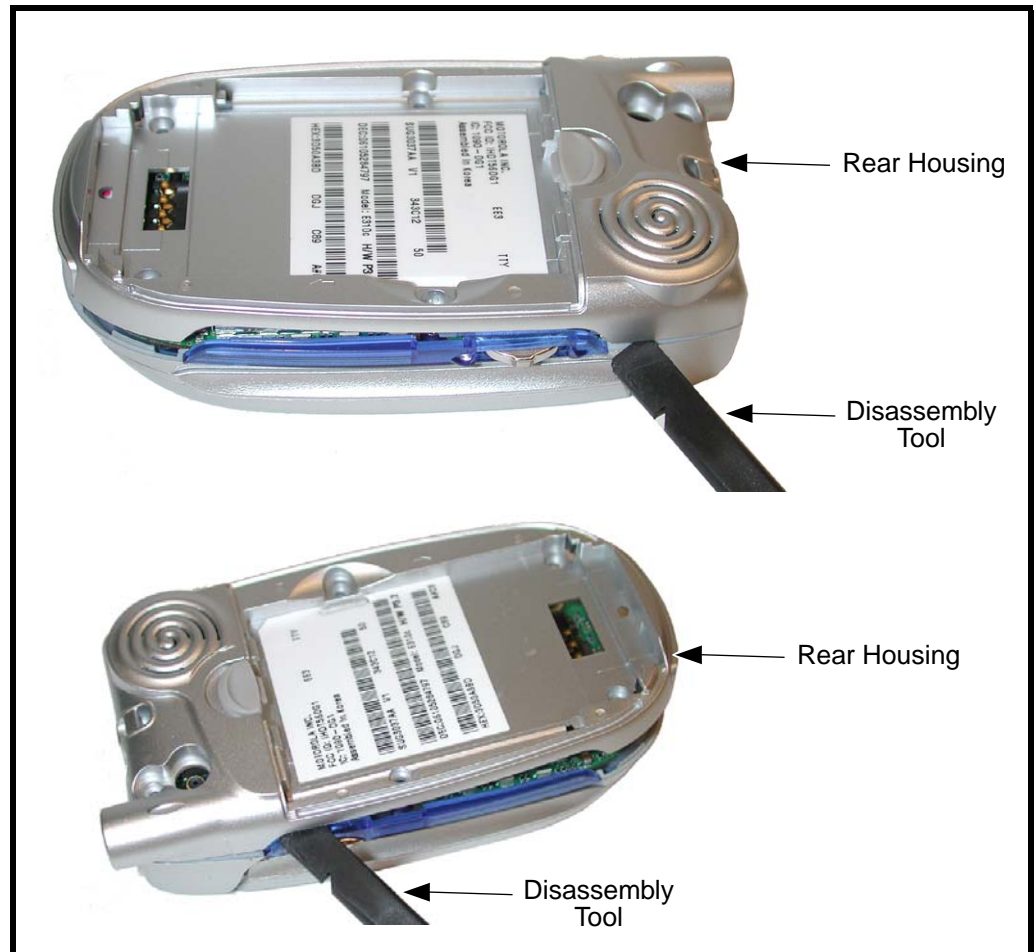
032163oRe

Figure 12. Removing the Rear Housing

4. Carefully slide the flat end of the disassembly tool along the opening between the back and the front housing to release the latches near the buttons on the sides of the phone and the latch on the top of the phone (see Figure 12).

5. Repeat step 4 for the other side of the phone.

6. Carefully and gently move the back housing from side to side to separate the back housing from the front housing. Use the disassembly tool to release the housing catches along the side of the housing near the voice key.

7. Rotate the rear housing assembly and lift it away from the front housing.

8. To replace, carefully align rear housing assembly with the front housing, then press the rear assembly down until the housing catches engage with the corresponding latches on the rear housing. Press the housings together until the catches snap into place.

9. Replace the 5 screws and tighten to a torque setting of 2.0 ± 0.2 Kgf.cm. Do not over tighten.

10. Replace the antenna, battery, and battery cover as described in the procedures.

Removing and Replacing the Transceiver Board Assembly

This product contains static-sensitive devices. Use anti-static handling procedures to prevent electrostatic discharge (ESD) and component damage.

1. Remove the battery cover, battery, antenna, and rear housing assembly as described in the procedures.

The flexible printed cable (FPC) (flex) is easily damaged. Exercise extreme care when handling.

2. Use the flat end of the disassembly tool to disconnect the flex connector from the Transceiver PCB Assembly (see Figure 13A).
3. Use the plastic tweezers to lift the side of the transceiver PCB Assembly.

4.   Carefully remove the transceiver board from the front housing (See Figure 13B).
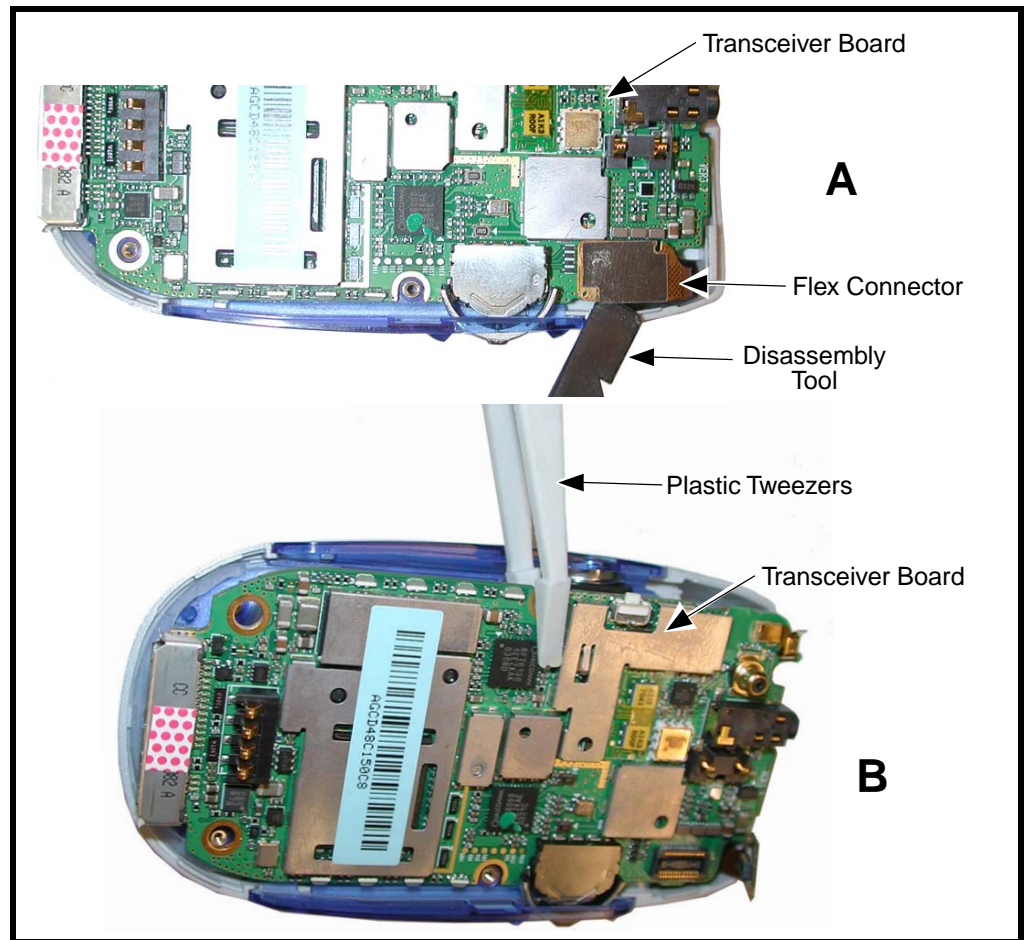
020252o

Figure 13. Removing the Transceiver Board

Removing and Replacing the Keypad

1. Remove the battery cover, battery, antenna, rear housing assembly, and transceiver board assembly as described in the procedures.
2. Use the plastic tweezers to lift the keypad from the front housing as shown in Figure 14.
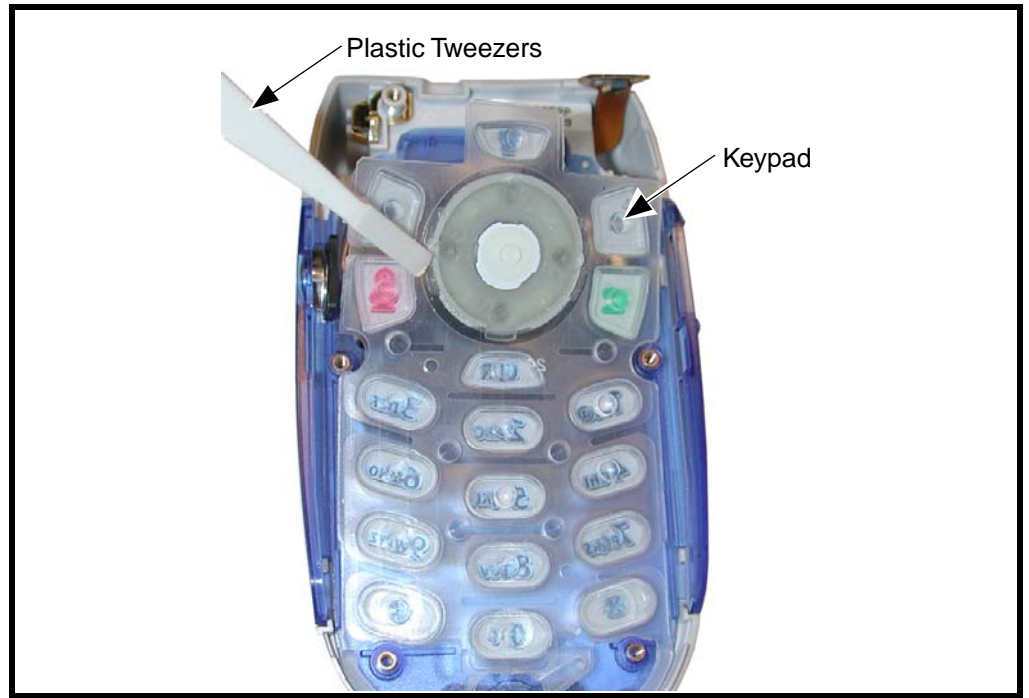
032167o

Figure 14. Removing the Keypad

3. To replace, insert the keypad into the front housing, ensuring the keys align properly with the openings in the front housing.
4. Replace the transceiver board, rear housing assembly, antenna, battery, and battery housing as described in the procedures.

Removing and Replacing the Flip Cover

1. Slide the flip cover toward the bottom edge of the phone as shown in Figure 15.
2. When the flip cover is completely clear of the flip assembly, lift the flip cover away from the flip assembly.

Figure 15. Removing the Flip Cover

3. To replace, align the top corners of the flip cover with the bottom edge of the flip assembly and slide the cover upward until it snaps into place.

Removing and Replacing the Flip Assembly

1. Remove the battery housing, battery, antenna, rear housing assembly, metal sheath, transceiver board, keypad, and flip cover as described in the procedures.

⚠ *The flex is fragile and easily damaged. Be very careful when passing the flex through the front housing opening.*

2. Use the torx driver to remove 4 flip housing screws. Set the screws aside for re-use (see Figure 16).
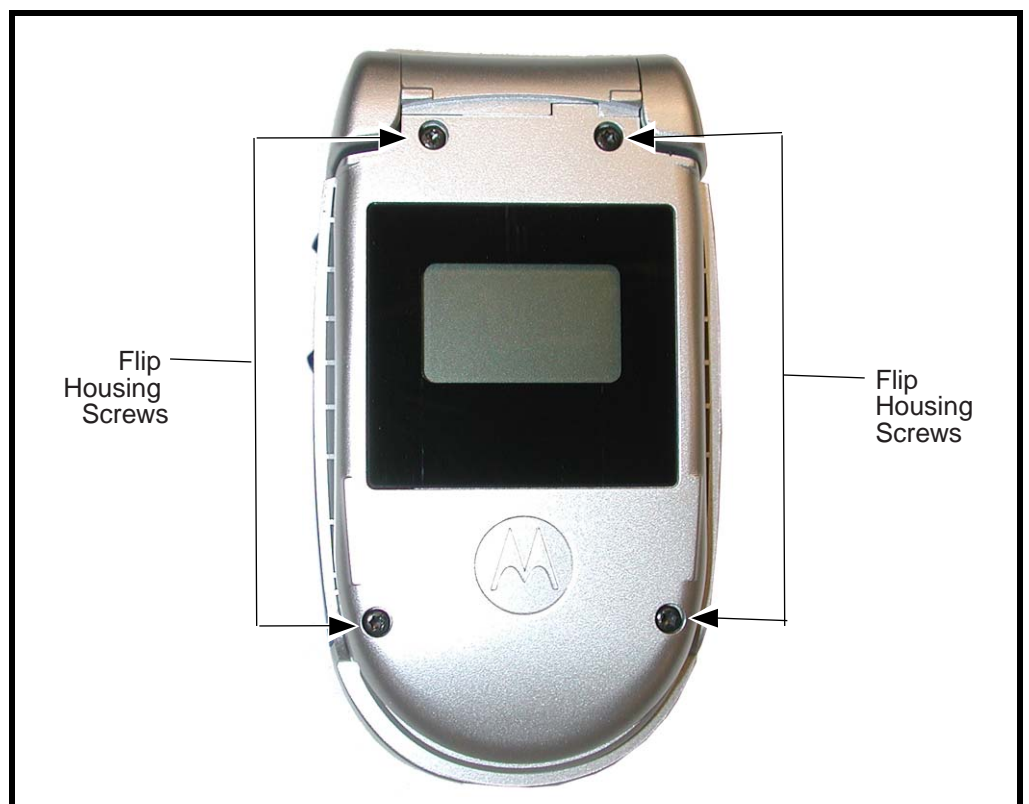
031226o

Figure 16. Removing the Flip Assembly (Step 2)

3.   Carefully slide the disassembly tool between the flip front housing and the flip assembly to disengage the latch on each side of the flip assembly near the hinge. Use caution when releasing the latch on each side of the flip assembly.
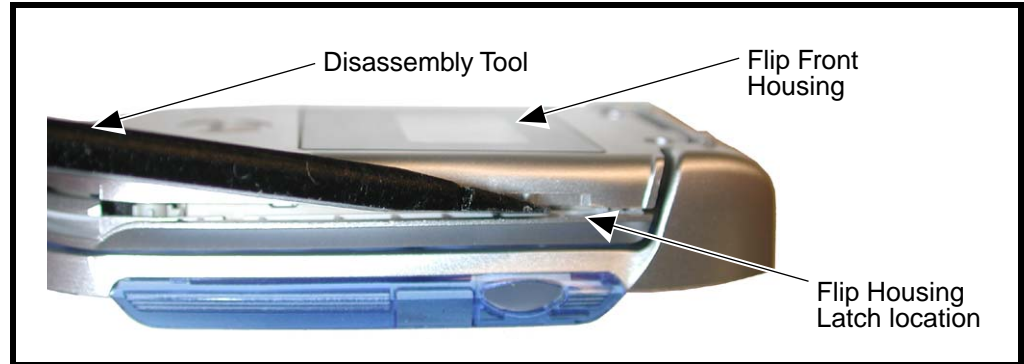
031227o

Figure 17. Removing the Flip Assembly (Step 3)

4.   Lift the flip assembly away from the front housing.
5.   To replace, align the flip housing to the flip assembly.
6.   Carefully and gently press the flip housing onto the flip assembly until the latches engage.
7.   Insert and tighten the 4 flip housing screws to a torque setting of 2.5 ± 0.2 Kgf.cm.
8.   Slide the flip housing cover onto the flip assembly.
9.   Replace the keypad, transceiver board assembly, rear housing, antenna, battery, and battery cover as described in the procedures.

Removing and Replacing the Display Module

1. Remove the flip cover and flip assembly, as described in the procedures.
2. Use the disassembly tool to disconnect the flex connector from the display module assembly (see Figure 18A).
3. Carefully, remove the display module retainer clip with the plastic tweezers. Avoid damage to the retainer clip. (see Figure 18B).
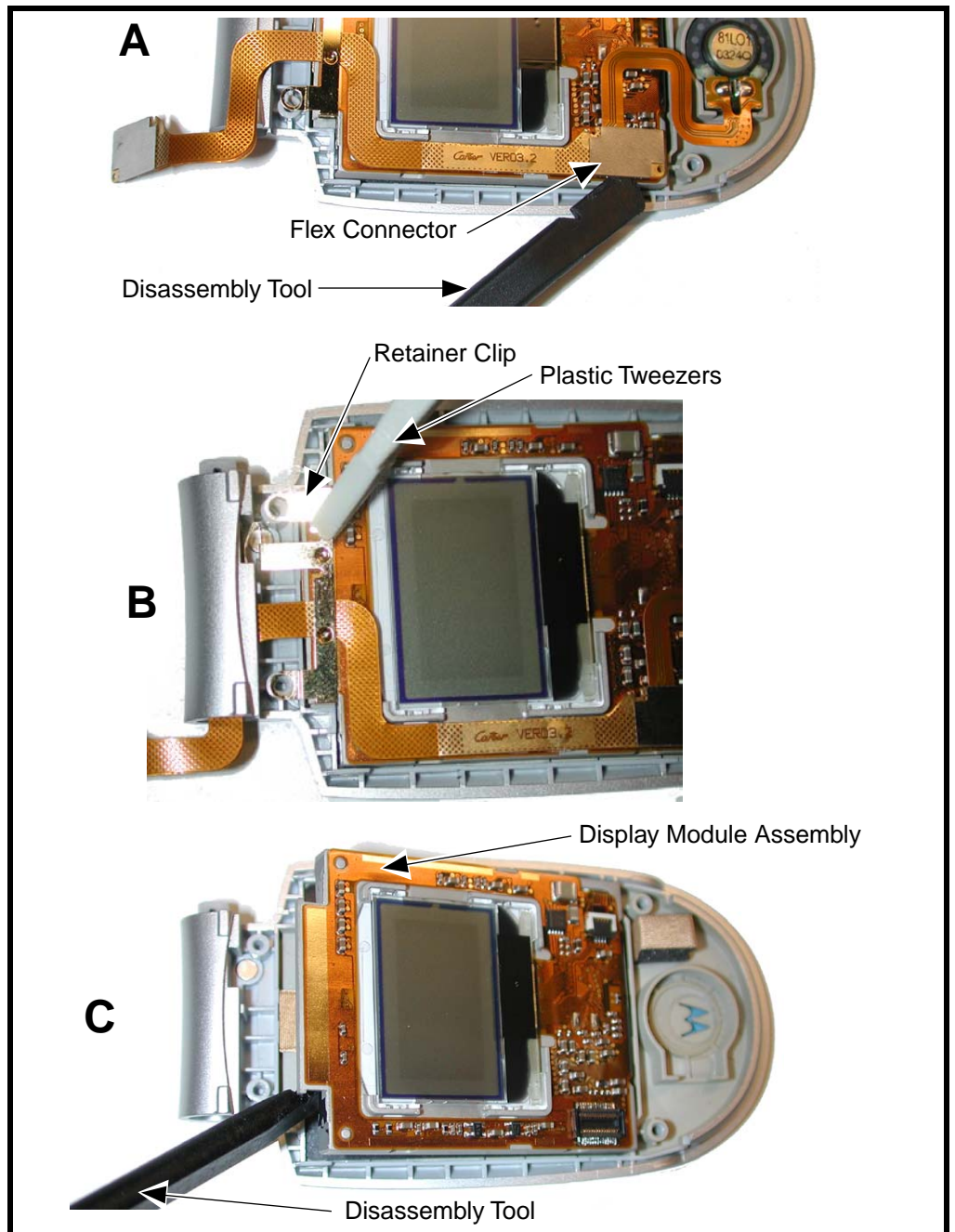
Figure 18. Removing the Display Module

4. Lift the flex away from the display module
5. Lift the display module up and out of the flip housing, being careful to not damage or stress the flex connector.
6. To replace, seat the display module back into the flip front housing.
7. Re-connect the flex connector.
8. Replace the display module retainer bracket.
9. Replace the flip assembly, keypad, transceiver board assembly, housing assembly, antenna, battery, and battery cover as described in the procedures.

Phone Identification

Personality Transfer

A personality transfer is required when a phone is express exchanged or when the main board is replaced. Personality transfers reproduce the customer's original personalized details such as menu and stored memory such as phone books, or even just program a unit with basic user information such as language selection. E310 telephones use TrueSync® synchronization software to effect a personality transfer.

Identification

Each Motorola CDMA phone is labeled with a variety of identifying numbers. Figure 19 describes the current identifying labels.
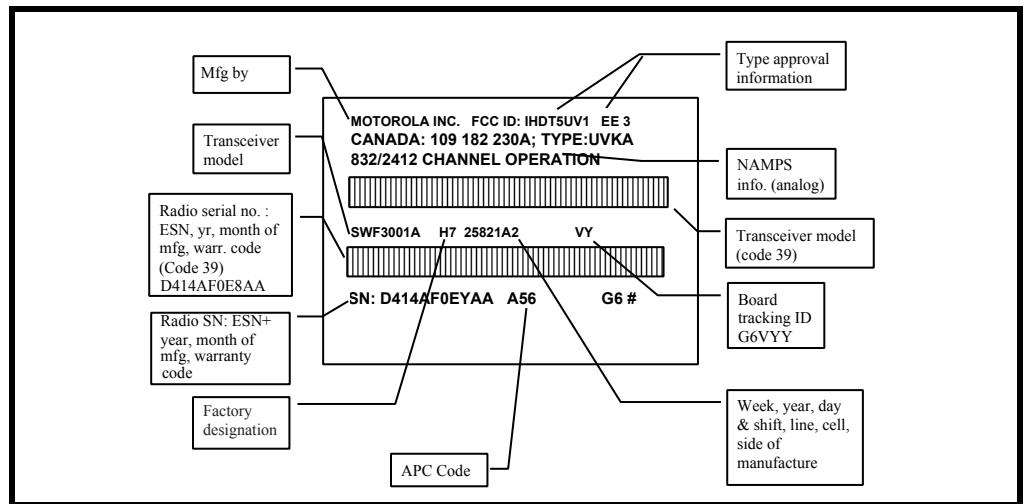
020463o

Figure 19. CDMA Telephone Identification Label

Troubleshooting

Table 2. E310 Telephone: Level 1 and 2 Troubleshooting Chart

Symptom	Probable Cause	Verification and Remedy
1. Telephone will not turn on or stay on.	a) Battery either discharged or defective.	Measure battery voltage across a 50 ohm (>1 Watt) load. If the battery voltage is <3.25 Vdc, recharge the battery using the appropriate battery charger. If the battery will not recharge, replace the battery. If battery is not at fault, proceed to b.
	b) Battery connectors open or misaligned.	Visually inspect the battery connectors on both the battery and the telephone. Realign and, if necessary, either replace the battery or refer to a Level 3 Service Center for the battery connector replacement. If battery connectors are not at fault, proceed to c.
	c) Transceiver board defective.	Remove the transceiver board. Substitute a known good transceiver board and temporarily reassemble the unit. Press the PWR button; if unit turns on and stays on, disconnect the dc power source and reassemble the telephone with the new transceiver board. Verify that the fault has been cleared. If the fault has not been cleared then proceed to d.
	d) keyboard assembly failure.	Replace the keyboard assembly. Temporarily connect a +3.6 Vdc supply to the battery connectors. Depress the PWR button. If unit turns on and stays on, disconnect the dc power source and reassemble with the new keyboard assembly.
2. Telephone exhibits poor reception or erratic operation such as calls frequently dropping or weak or distorted audio.	a) Antenna assembly defective.	Check to make sure that the antenna pin is properly connected to the transceiver board assembly. If connected properly, substitute a known good antenna. If the fault is still present, proceed to b.
	b) Transceiver board defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board.
3. Display is erratic, or provides partial or no display.	a) Connections to or from transceiver board defective.	Check general condition of flex and flex connector. If the flex and connector are good, check that the flex connector is fully connected. If not, check connector to transceiver board connections. If faulty connector, replace the transceiver board. If connector is not at fault, proceed to b.
	b) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to c.
	c) Transceiver board assembly defective.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board.
4. Incoming call alert transducer audio distorted or volume is too low.	Faulty transceiver board assembly.	Replace the transceiver board (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board.
5. Telephone transmit audio is weak. (usually indicated by called parties complaining of difficulty in hearing voice).	a) Microphone connections to the transceiver board assembly defective.	Gain access to the microphone as described in the procedures. Check connections. If connector is faulty proceed to c; if the connector is not at fault, proceed to b.

Table 2. E310 Telephone: Level 1 and 2 Troubleshooting Chart (Continued)

Symptom	Probable Cause	Verification and Remedy
	b) Microphone defective.	Gain access to microphone. Disconnect and substitute a known good microphone. Place a call and verify improvement in transmit signal as heard by called party. If good, reassemble with new microphone. If microphone is not at fault, reinstall original microphone and proceed to c.
	c) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
6. Receive audio from earpiece speaker is weak or distorted.	a) Connections to or from transceiver board assembly defective.	Gain access to the transceiver board assembly as described in the procedures. Check flex and the flex connector from the flip assembly to the transceiver board assembly. If flex is at fault, replace flip assembly. If flex connector is at fault, proceed to d. If connection is not at fault, proceed to b.
	b) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to c.
	c) Antenna assembly defective.	Check to make sure the antenna is installed correctly. If the antenna is installed correctly, substitute a known good antenna assembly. If this does not clear the fault, reinstall the original antenna assembly and proceed to d.
	d) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble with the new transceiver board assembly.
7. Phone does not sense when flip is opened or closed (usually indicated by inability to answer incoming calls by opening the flip, or inability to make outgoing calls).	a) Flip assembly defective.	Temporarily replace the flip assembly with a known good assembly. If fault has been cleared, reassemble with the new flip assembly. If fault not cleared, proceed to b.
	b) Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
8. Vibrator feature not functioning.	Transceiver board assembly defective.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
9. Internal Charger not working.	Faulty charger circuit on transceiver board assembly.	Test a selection of batteries in the rear pocket of the desktop charger. Check LED display for the charging indications. If these are charging properly, then the internal charger is at fault. Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.
11. No or weak audio when using headset.	a) Headset not fully pushed home.	Ensure the headset plug is fully seated in the jack socket. If fault not cleared, proceed to b.
	b) Faulty jack socket on transceiver board assembly.	Replace the transceiver board assembly (refer to 1c). Verify that the fault has been cleared and reassemble the unit with the new transceiver board assembly.

Programming: Software Upgrade and Flexing

Contact your local technical support engineer for information about equipment and procedures for flashing and flexing.

Related Publications

Motorola E310 CDMA User Guide, English   SJJN5285A (6809467A45)

Antenna, SW & Duplexers Circuit:1   E310

BOARD - Ver 3.2

E310

From: PA

To: RFL6000

DPX100

1

2 RX

To: RFL6000

RX   TX

7   ANT

R111

CDMA_SEL

From: MSM

R112   C40 C45   C34

DPX101 3

ANT

RF1

ANT **SW1** RF2

C35

C46

CON100   RF3

L140

L130   IQ100

C53   R115   C51

1 TX

From: PA

C170

C171

L136

A100

To: F103

48

BOARD - Ver 3.2

RFL6000 Circuit:2

E310

From: PM
VREG_MSMP

From: PM
VREG_RF_RX

R100

L10033N

C3 C5

C4

C6 C7

R103 R104

C167

L103

IC101
RFL6000

From: MSM
FM_LNA_RANGE

Pin	Signal		Pin	Signal
6	FM_STEP		15	VDDA
5	GND		9	VDDM
1	CLNA_IN		1	CLNA_OUT
2	CLNA_BIAS		11	PLNA_OUT
4	PLNA_IN		10	SBDT
3	PLNA_BIAS		8	SBST
16	R_BIAS		7	SBCK
			12	GND1
			14	GND2
			17	GNDSLUG

From: Duplexer

L106

C17
NC

C22

L107

C25

L110 C146

L112

C29

C32 R110

From: Duplexer

L105 3

To:: F101

C24

L108

L111

C28

To:: F102

SBDT
SBST
SBCK

BOARD - Ver 3.2

L105   C15

RX FM → To RF FLT

C26

RX PCS → To RF FLT

L111

L103

L108   R103

VREG_RF_RX → From PM

L100

R104

C6

C4

C5

C7

IC101

C3

11

R110

6   R100

L106

1 2 3 4

From Duplexer → RX FM

L107   L112

C146

C25   C32

L110

From Duplexer → RX PCS

FM_LNA_RANGE → From MSM

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BOARD - Ver 3.2

RX BPF Filters Circuit: 3

E310

F101

From RFL6000 → RX Freq ── C15 ──
- 1 IN — OUT1 3 — **RX FM** → To: RFR6000
- C24
- 2 GND1
- 5 GND2 OUT2 4 — **RX FM** → To: RFR6000
  - **RX PCS** → To: RFR6000

F102

From RFL6000 → RX Freq ── C26 ──
- C28
- 3 IN — OUT1 5 — L127
- 2 GND1
- 4 GND2 OUT2 1 —
  - **RX PCS** → To: RFR6000

F103

- 5 GND2 OUT1 3 — **RX GPS** → To: RFR6000
- 2 GND1

From SW1 → RX Freq
- 1 IN — OUT2 4 — **RX GPS** → To: RFR6000

51

BOARD - Ver 3.2

From RFL6000 ▶ RX FM ——— **F101** ┬ C27 ─── **L104** ──▶ To RFR6000
├ C20
└ C19 ─── **L102** ──▶ To RFR6000

From RFL6000 ▶ RX PCS ——— **F102** ┬ C21 ─── **L109** ──▶ To RFR6000
├ C30
└ C31 ─── **L113** ──▶ To RFR6000

From SW1 ▶ RX GPS ——— **F103** ┬ C37 ─── **L134** ──▶ To RFR6000
└ C36 ──▶ To RFR6000

52

BOARD - Ver 3.2

E310

RFR6000 Circuit: 4

IC100

RFR6000

VREG_TCXO
VDDA2_RX
VDDA1_RX VDDA3_RX VREG_RF_RX VREG_MSMP

C169 0.1u
R155 10
L101 33N (1005)
C11 47p
C12 0.1u
R105 100
C23 0.1u

Pin	Signal
4	VDDA1
17	VDDA5
18	VDDA4
29	VDDA22
14	VDDA11
39	VDDA1
20	VDDA3
27	VDDA2
23	VDDM

From: VCO   UHF_LO
From: RFT6100   CP_RX

C9 47p   15 LO_INM
C14 47p   16 LO_INP
               21 GVCO_TUNE
               2   CELL_INP

From: F101 RX FM   C19 4p   L102 8.2N (1005)

From: F101 RX FM   C27 4p   L104 8.2N (1005)   C20 0.1U
                       40 CELL_INM
                       6   PCS_INP

From: F102 RX PCS   C21 47p   L109 8.2N (1005)
L127 8.2N (1005)   36 NC1
                       37 NC2
From: F102 RX PCS   C31 47p   L113 8.2N (1005)   C30 0.1U
                       8   PCS_INM

From: F103 RX GPS   C36 7p   12 GPS_INP
                      L134 10N (1005)

From: F103 RX GPS   C37 7p   10 GPS_INM

From: Ref. Osc   TCXO   28 TCXO
                 1000p C39

                       38 R_BIAS
R114 11.3K 1%   32 GND1
                       35 GND2

19 LO_OUT   UHF_LO_BUFF   To: RFT61000

30 RX_IM   R108 5.76K(1%)   RX_I_M   To: MSM
31 RX-IP   RX_I_P   To: MSM
33 RX_QM   R109 5.76K(1%)   RX_Q_M   To: MSM
34 RX-QP   RX_Q_P   To: MSM

26 SBDT   SBDT
24 SBST   SBST   From: MSM
25 SBCK   SBCK

Pin	GND
1	GND3
5	GND4
7	GND5
9	GND6
11	GND7
13	GND8
22	GND9
3	GND10
41	GND_SLUG

53

BOARD - Ver 3.2

E310

From:Ref.Osc
TCXO

RX_QP → To: MSM
RX_QM → To: MSM
RX_IP → To: MSM
RX_IM → To: MSM

From: F101
RX_FM

From: F101
RX_FM
RX_PCS
From: F102

From: F102
RX_PCS

RX_GPS
From: F103

RX_GPS
From: F103

From: PM
VREG_TCXO
VREG_MSMP
UHF_LO
From: VCO

L115
C42
C44
R114
R109
R108
L114
C41
C43
C39
C12
L101
C23
R105
C11

L104
L102
L109
L113
L134

IC100

C9
C14
R155
C169

54

BOARD - Ver 3.2

From:PM
VREG_TCXO

R117

TCXO100

C56   C57

4 VCC   OUT 3 ── TCXO
                     To:RFR6000
                          PM
                          RFT6100
1 VCON   GND 2   MSM
                          HARNESS

C60

TRK_LO_ADJ
From:MSM

From:PM
VREG_SYNT   VREG_SYNT1

R118

C59   C58

From:PM
VREG_TCXO   VDDA3_RX

R116

+ C141   C54   C55

VCO100

7 VCC

From:RFT6100
CP_RX   5 CO-VOLTAGE

                            OUT 1 ── UHF_LO
                                        To:RFR6000
EXT_VCO_EN   3 SW-SUPPLY
From:MSM

C61

GND1 GND2 GND3 GND4
2   4   6   8

55

BOARD - Ver 3.2

UHF_LO
To RFR6000

19.2Mhz TCXO
To:RFR6000
PM
RFT6100
MSM
HARNESS

From:MSM
EXT_VCO_EN

VCO100

3   2   1

4   8

5   6   7

TCXO100

3   2

4   1

R120

From:MSM
TRK_LO_ADJ

56

CP_RX
From:RFT6100

C141   C55   C54

C56

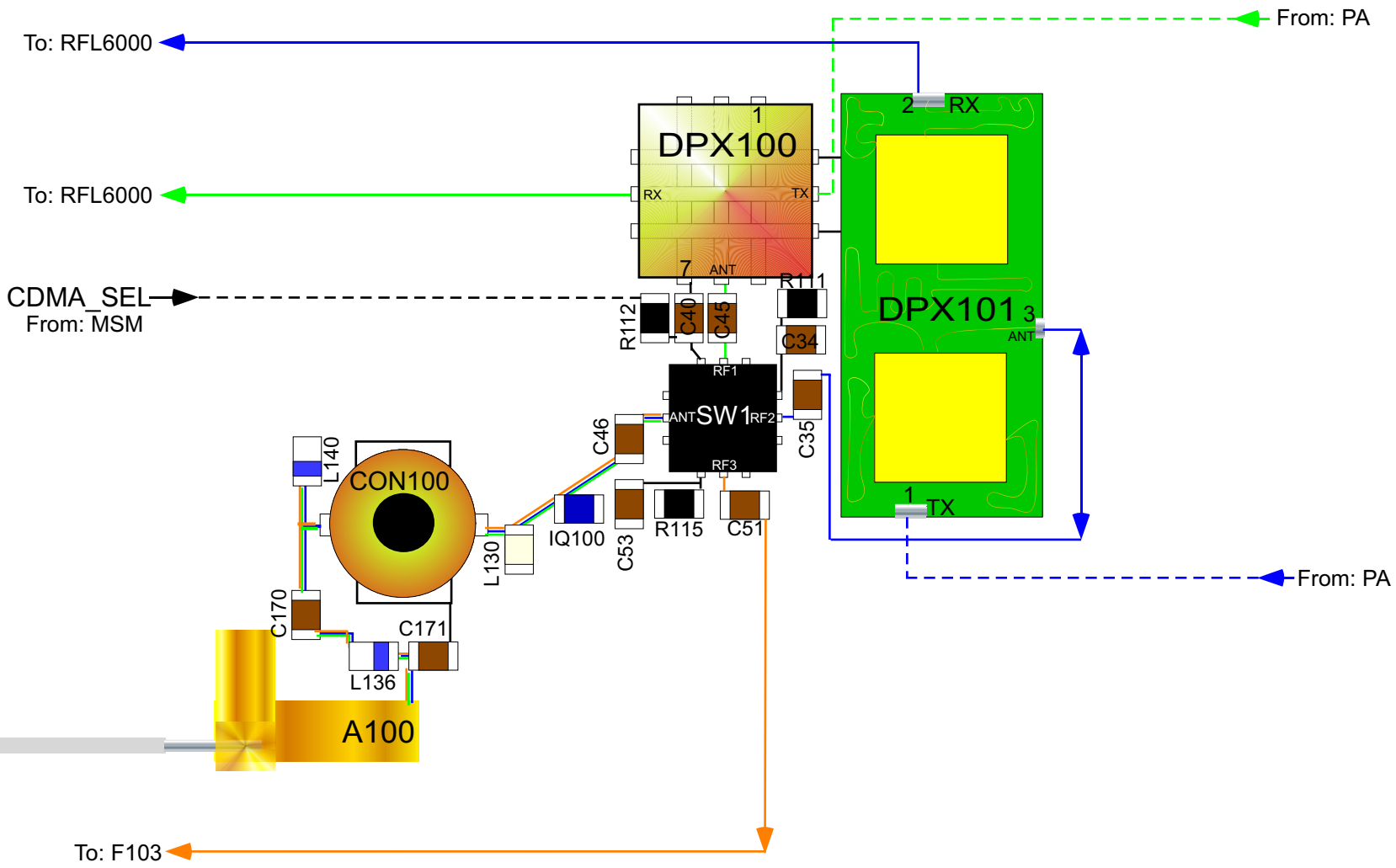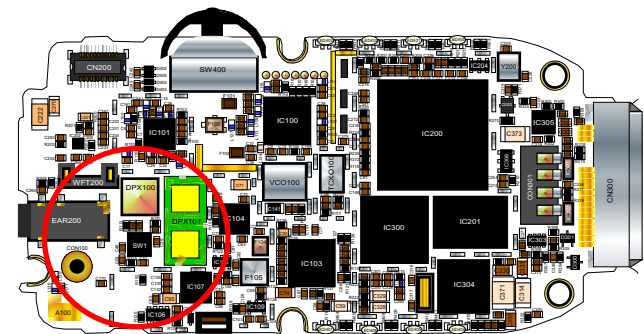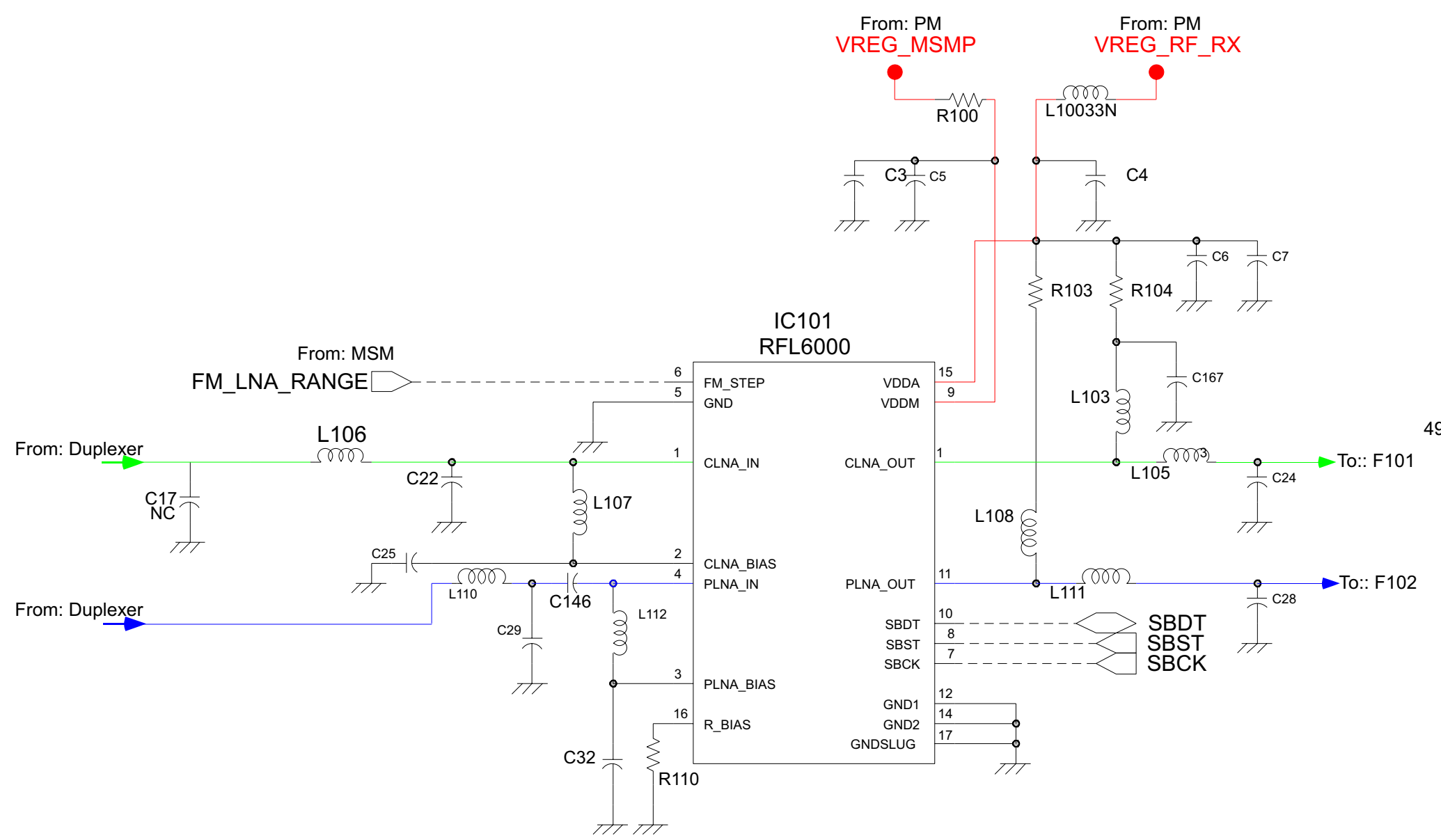C57   C60

R117

R116

VREG_TCXO
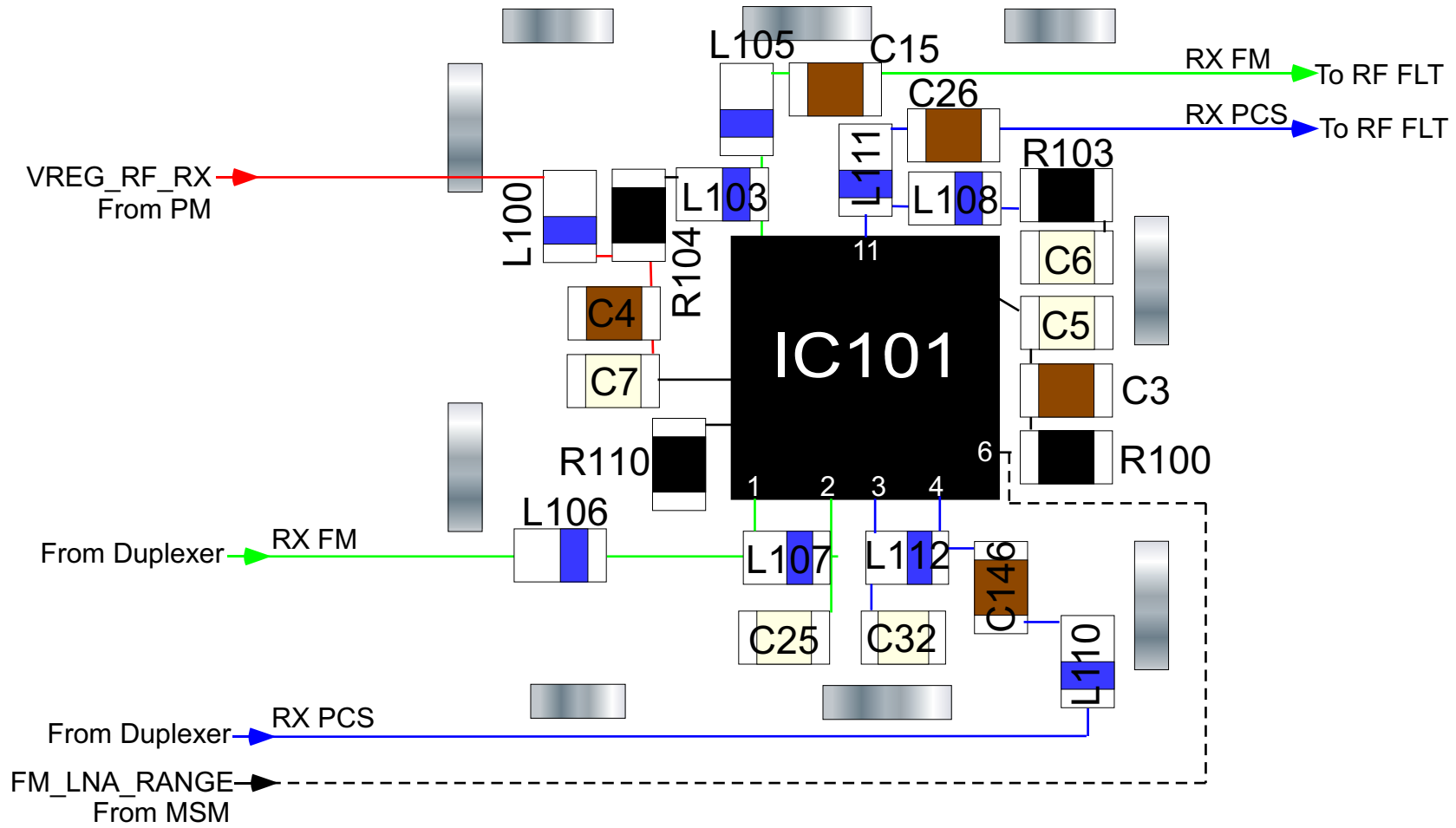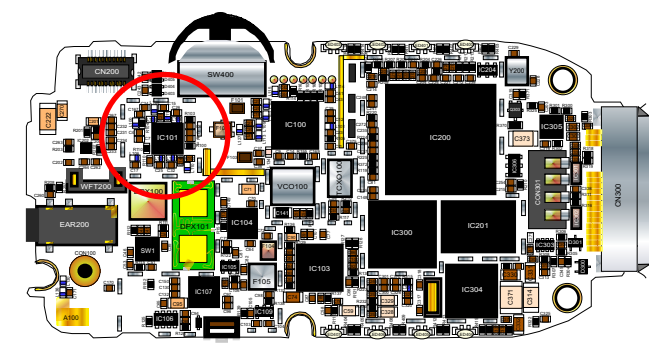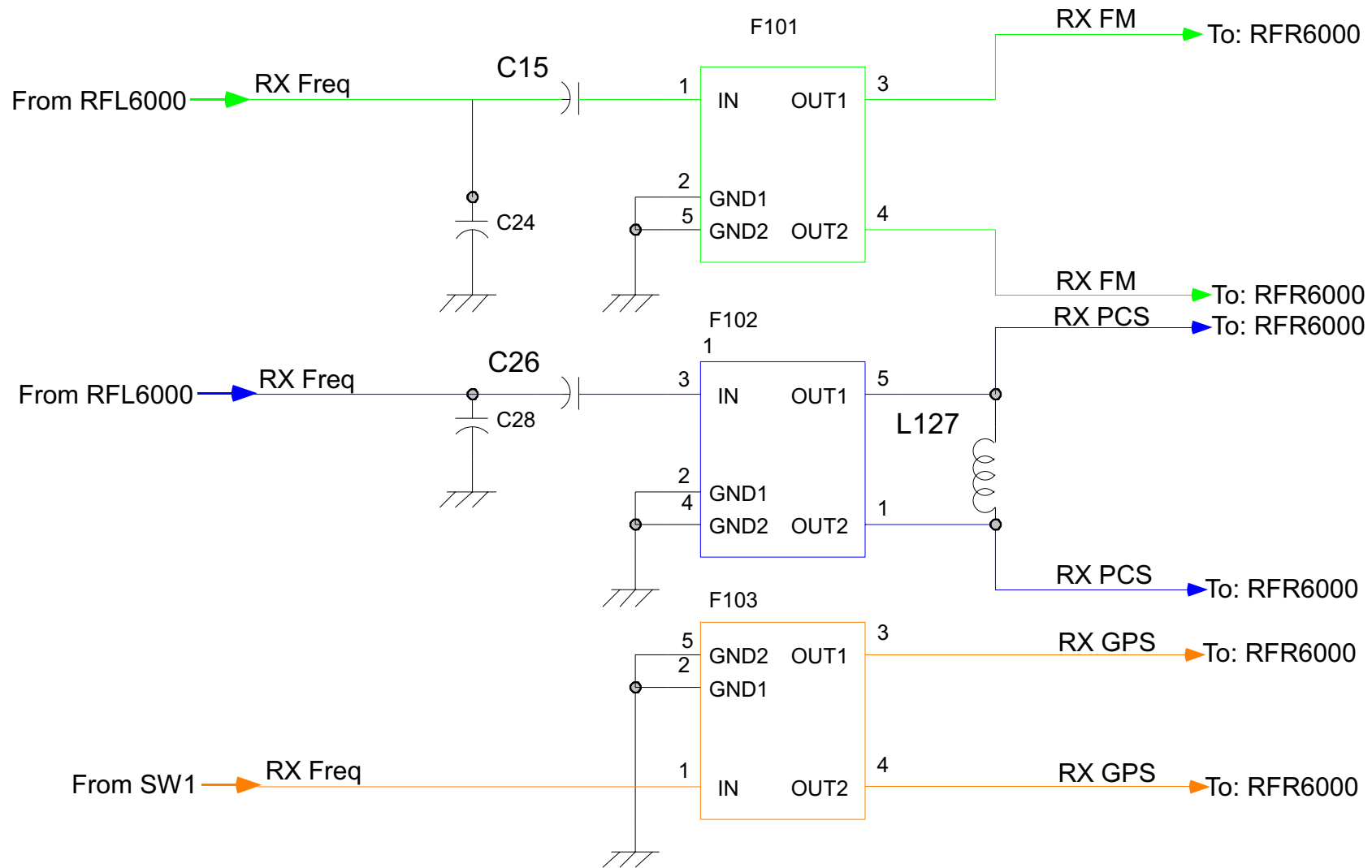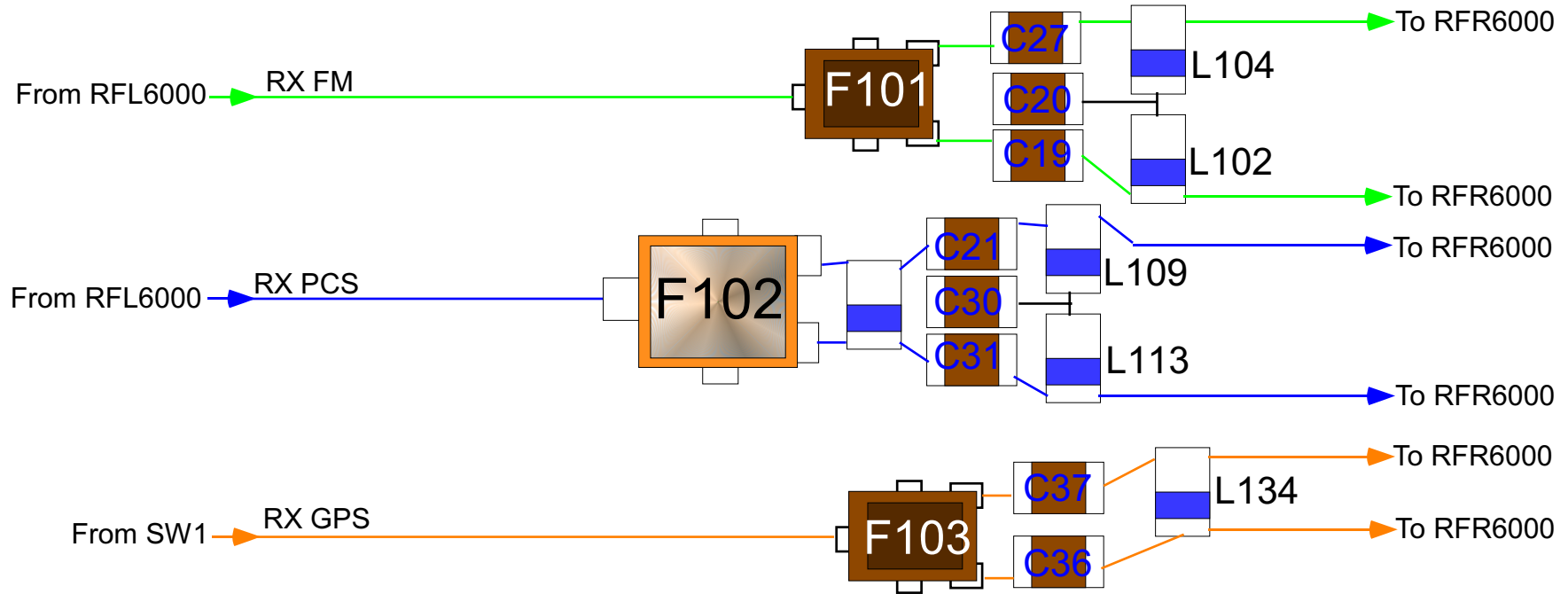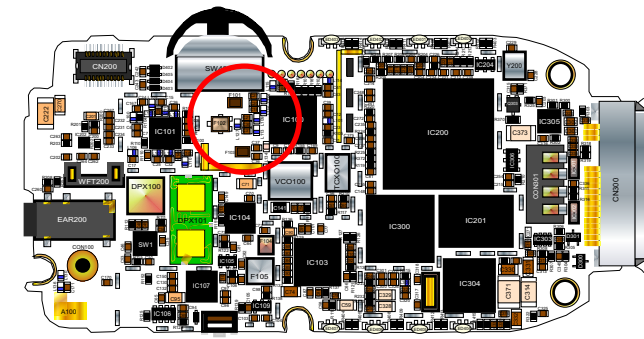From:PM

VREG_TCXO
From:PM

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RFT6100 Circuit: 6 E310

IC103
RFT6100

Pin	Signal		Pin	Signal
39	VDDA11		24	VDDRF1
7	VDDA12		26	VDDRF2
16	VDDA41		28	VDDRF3
17	VDDA42		22	VDDRF4
12	VDDA21		1	VDD_MSM
13	VDDA22			
40	VDDA6			
14	VDDA3			
32	VDDA51		15	RX_LO_IN
31	VDDA52			
			2	TX_ON
23	CELL_OUT		29	GND
25	PCSA_OUT		37	DAC_REF
27	PCSB_OUT		33	TX_Q
10	TX_CP		34	TX_QN
11	TX_FAQTX_I		35	TX_I
19	RX-CP		36	TX_IN
20	RX-FAQ		8	TCXO
6	LOCK		30	VCONTROL
9	TX_CP_HOLD		4	SBDT
18	RX_CP_HOLD		5	SBST
38	R_BIASSBCK		3	
			41	GND_SLUG

VREG_SYNT C77

VREG_MSMP VREG_RF_TX
R121

VREG_RF_TX VREG_SYNT1

VREG_MSMP1 C66 C68

From: RFR6000
UHF_LO_BUFF

TX_ON From: MSM

C74 C78

To F104
TX_800 C83

57

To F105
TX_1900 C84   DAC_IREF From: MSM

TX_1900 C85   TX_Q From: MSM

To F105
VREG_MSMP1 VREG_SYNT1 C86

C87

R126 R127   TX_QN From: MSM
C88   TX_I From: MSM

To RFR6000
CP_RX C89

R130 C91 C90   TX_IN From: MSM
10K   TCXO From: MSM

R129 C92
R132 TX_AGC_ADJ From: MSM

To MSM   C93
LOCK_DET

R136 C101
C100 R137

AUX_SBDT
AUX_SBST From: MSM
AUX_SBCK

BOARD - Ver 3.2

RFT6100 Circuit: 6

E310

From:RFR6000
UHF_LO_BUFF

R136
C90
R129
R101   C77
C88
R127   R126

21 20 19 18 17 16 15 14 13 12 11

C68   22   10   C86
To:F104   TX_800   C83   23   9   C100
To:F105   TX_PCS   C84   25   IC103   8   C92   TCXO
                                           From:Ref.Osc   58
          24   7
          26   6
To:F105   TX_PCS   C85   27   5   R130   LOCK_DET
          28   4   To:PM
C93   29   3
From:MSM 30   2   C66
TX_AGC_ADJ   1   VREG_MSMP
R132   From:PM
From:MSM TX_QN

31 32 33 34 35 36 37 38 39 40

C74   C87 C89   R137   R121
                C78
From:MSM TX_Q
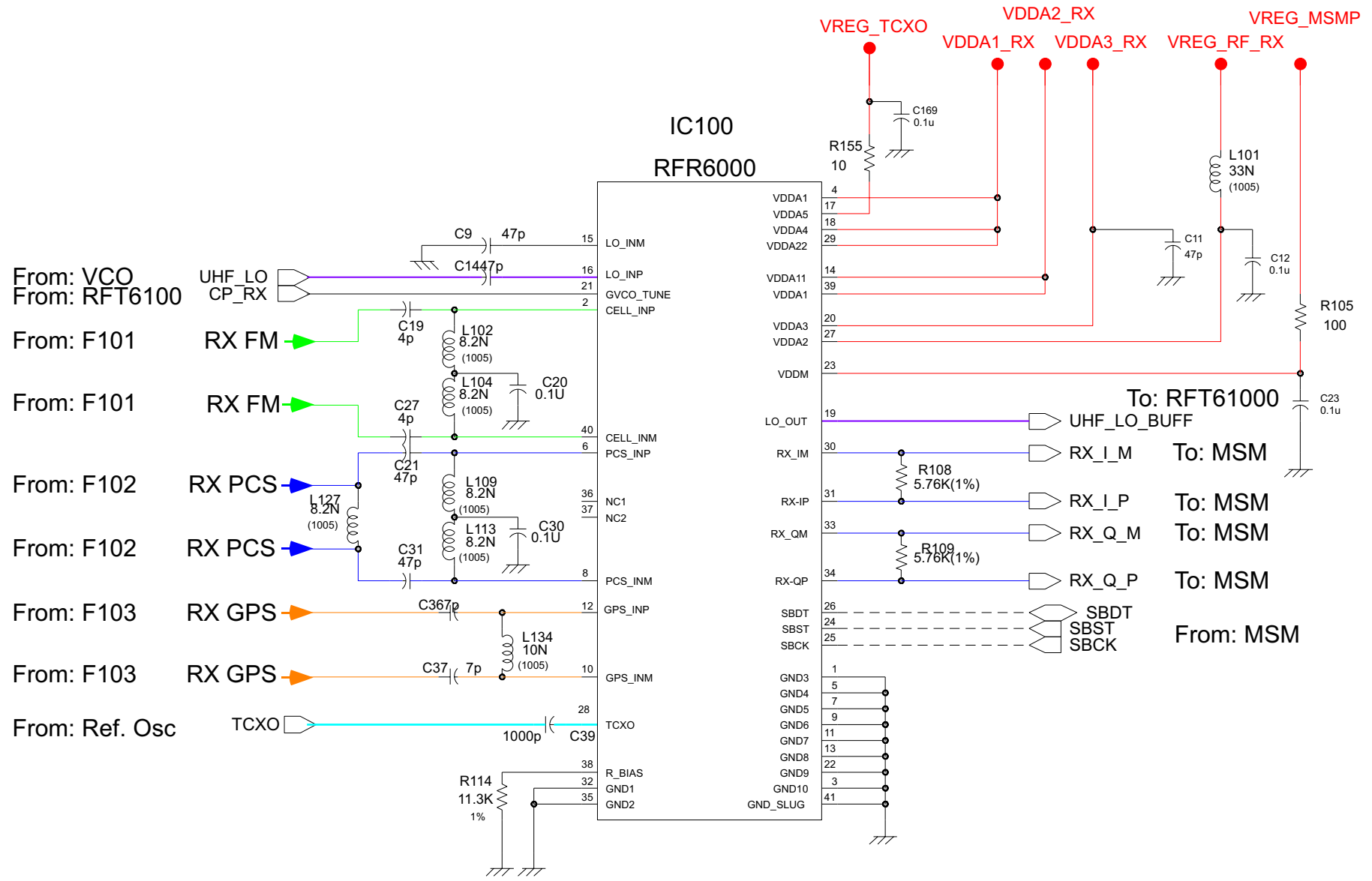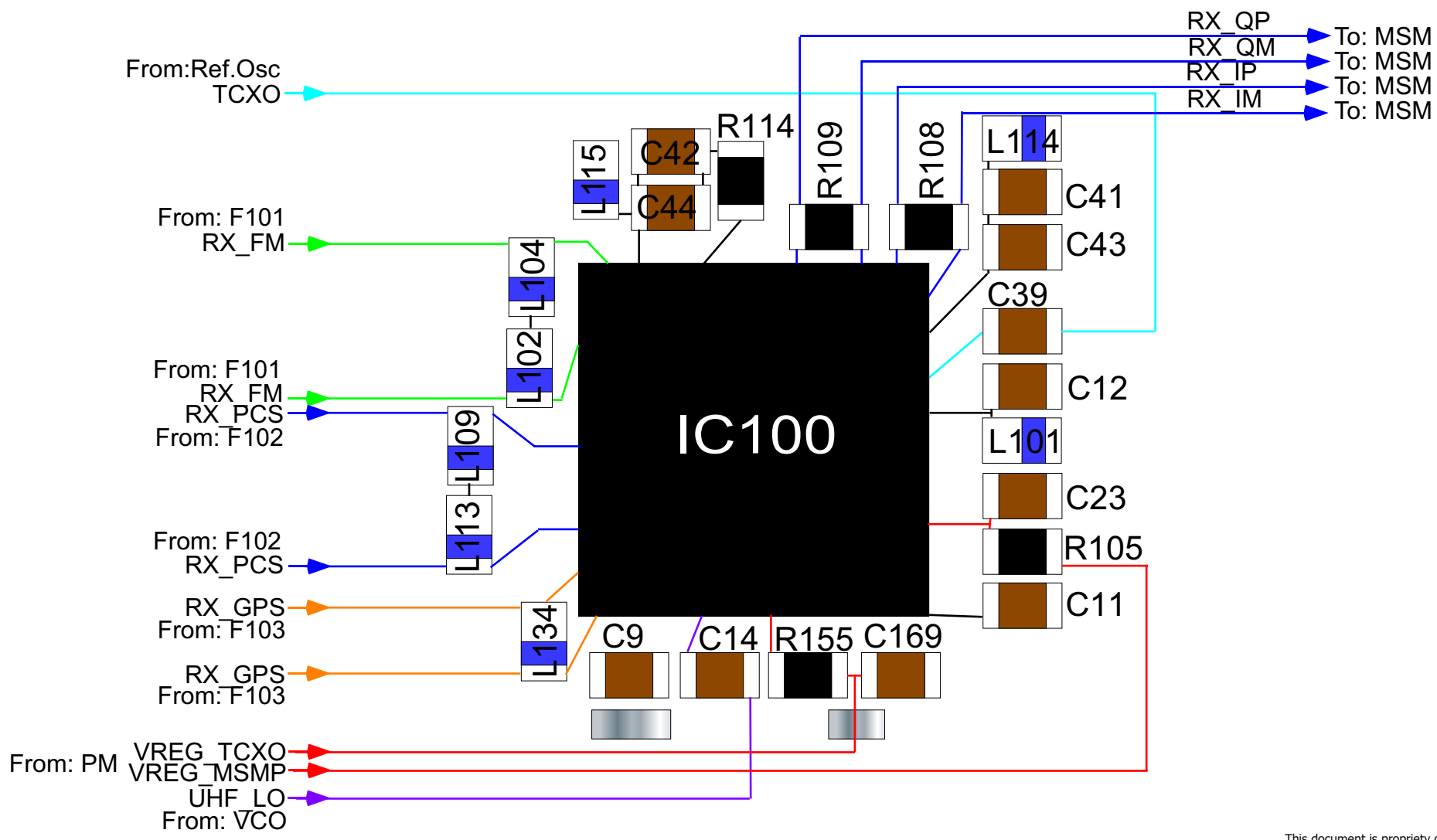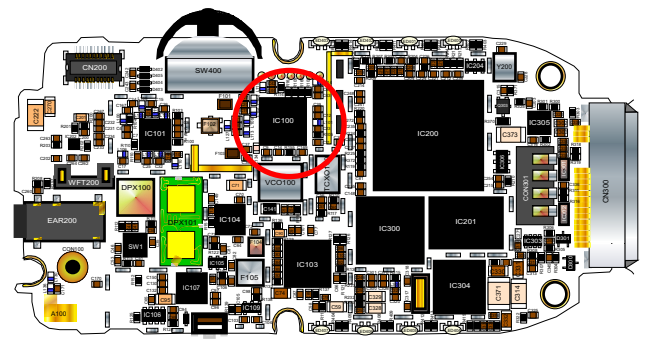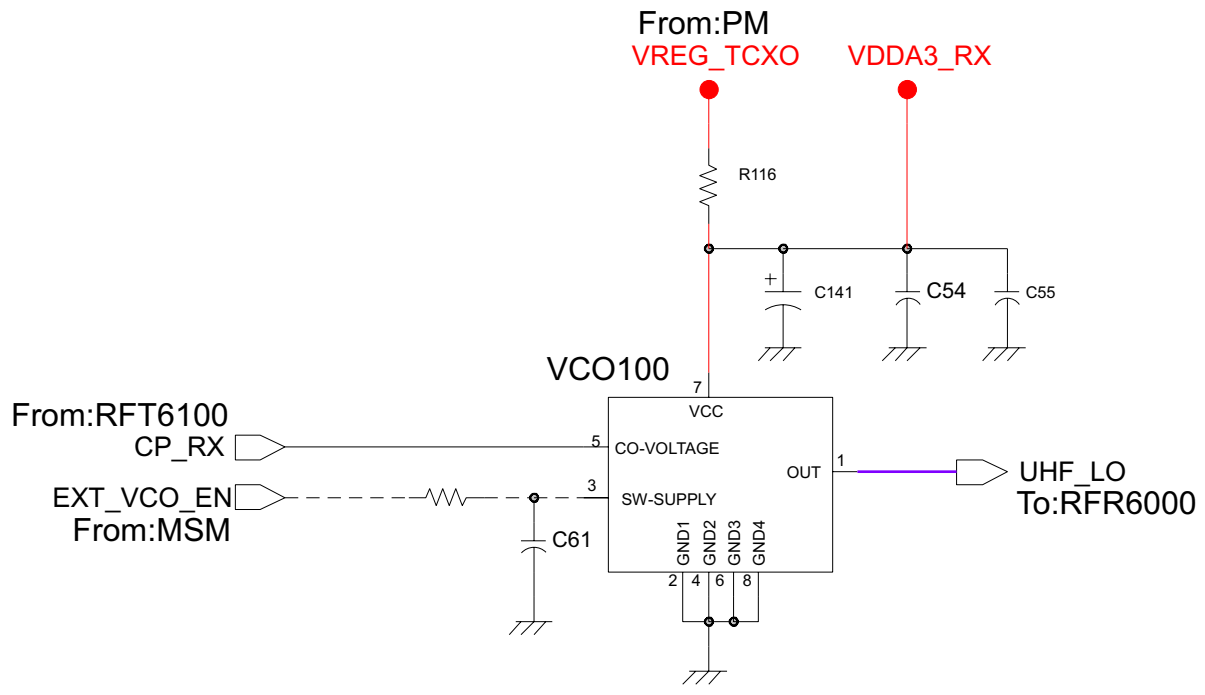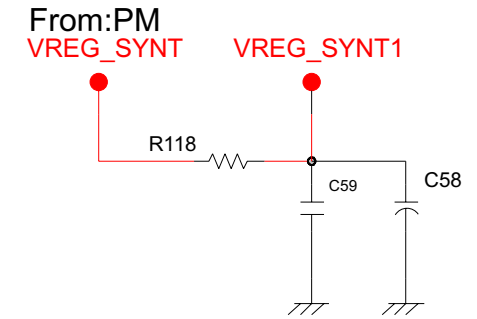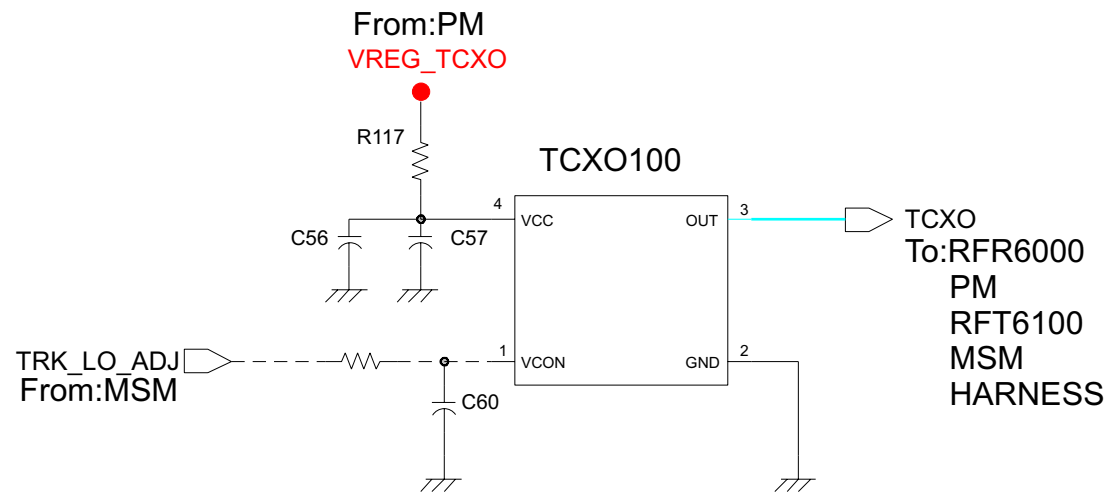From:MSM TX_I
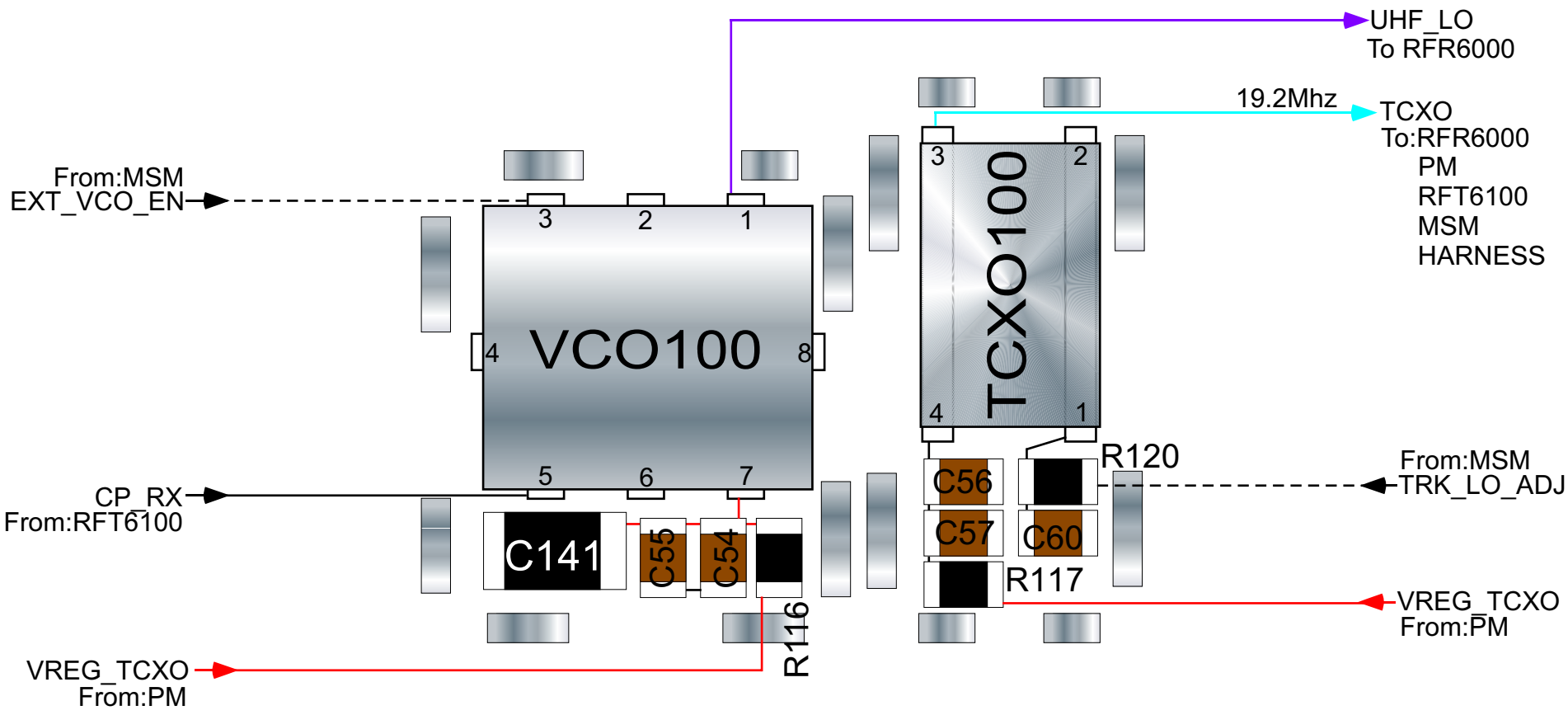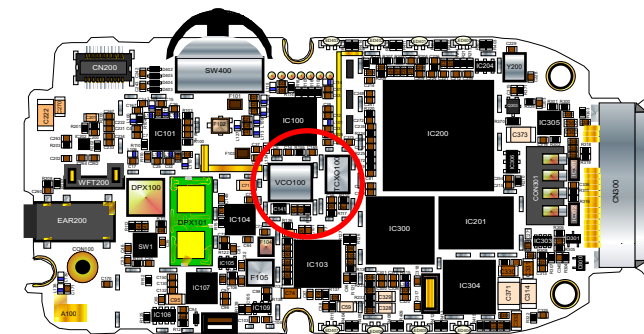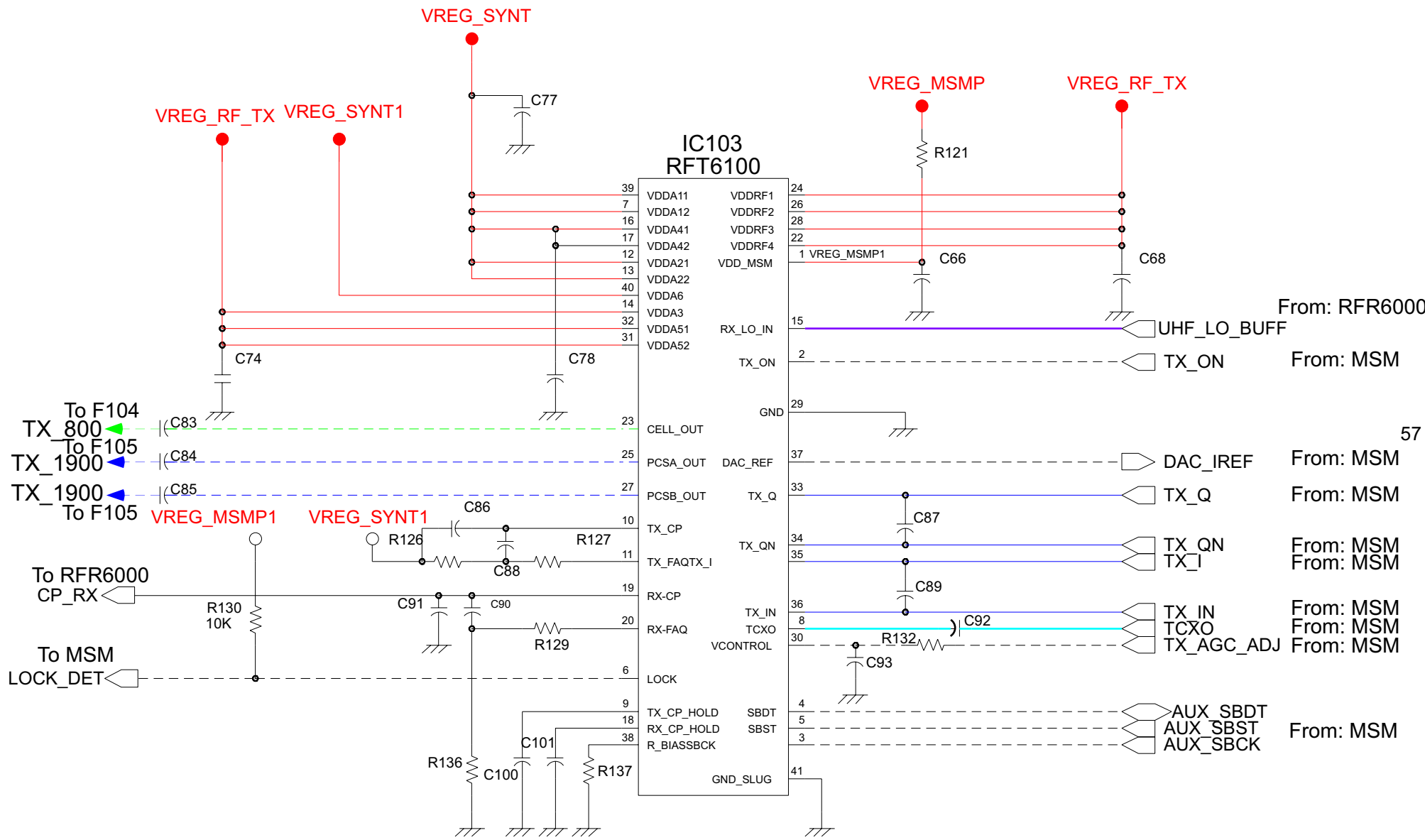From:MSM TX_IN   C58   C59
From:MSM TX_ON
R118

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BOARD - Ver 3.2

E310

TX_1900
To: Duplexer

C132

TX_800
To: Duplexer

L119

C70 C71 C72

IC104

8	RFOUT	RFIN	4
		VCONT	2
5	VCC1		
6	VCC2	VREF	1
	GND1 GND2 GND3 GND4		
	3 7 9 10		

C73 R122

From: MSM
PA_R1   **IC105**

VREG_RF_TX

4		3
		2
5		1

C81 C82

L118

F104

3	OUT	IN	1
2	GND1		
4	GND2		

From: MSM
PA_ON0

From: RFT6100
TX_800

TX_1900
From: RFT6100

TX_1900
From: RFT6100

59

B+_PA

C65 **IC106**

4		2
		3
5		6

From: MSM
PA_ON

R125

C69

R128

IC107

1	VCC1	VCONT	4
10	VCC2		
		RFIN	2
8	RFOUT	VREF	5
	GND1 GND2 GND3 GND4		
	3 6 7 9		

C94 C95 C96

C102 R138

IC109

VREG_RF_TX

44		3
		2
55		1

C103 C104

C97
L124

IC108

5	J1	J3	1
2	GND		
4	V1		
6	V2	J2	3

C98
C99

F105

8	OUT1	IN1	2
6	OUT2	IN2	4
1	GND1	GND3	5
3	GND2	GND4	7

R139
R140

C105 C106

From: MSM
TX_PCS_HI
TX_PCS_LOW
From: MSM

From: MSM
PA_ON1

BOARD - Ver 3.2

E310

60

CELL_DETECT To:MSM

IC112 C71

To:Duplexer
800_TX

C149 L131 C70

To:Duplexer
PCS_TX

8
OUT

IC104
800 PA

R151

IN
2 3 4 5

C72

From:MSM
PA_ON0

C73 C81 C64

F104
OUT

VREG_RF_TX
From:PM

R122

UI

IN

TX_800 From:FRT6100
TX_PCS From:FRT6100
TX_PCS From:FRT6100

IC105

C82

4 IN 3 IN 2

5 F105 1

PCS_DETECT To:MSM

C150 L126

R152 IC113

IC107
PCS PA

5
4
3
2

8

C102

R140

C106

C99

6 OUT 7 OUT 8

TX_PCS_LOW From:MSM

C98

C97 OUT
SW

IC108

R138

C65 C95 C96

TX_PCS_HI From:MSM

B+_PA
From:PM

C94 D406

PA_ON1 From:MSM

R125 IC106

C69

R139 D100

IC109

VREG_RF_TX
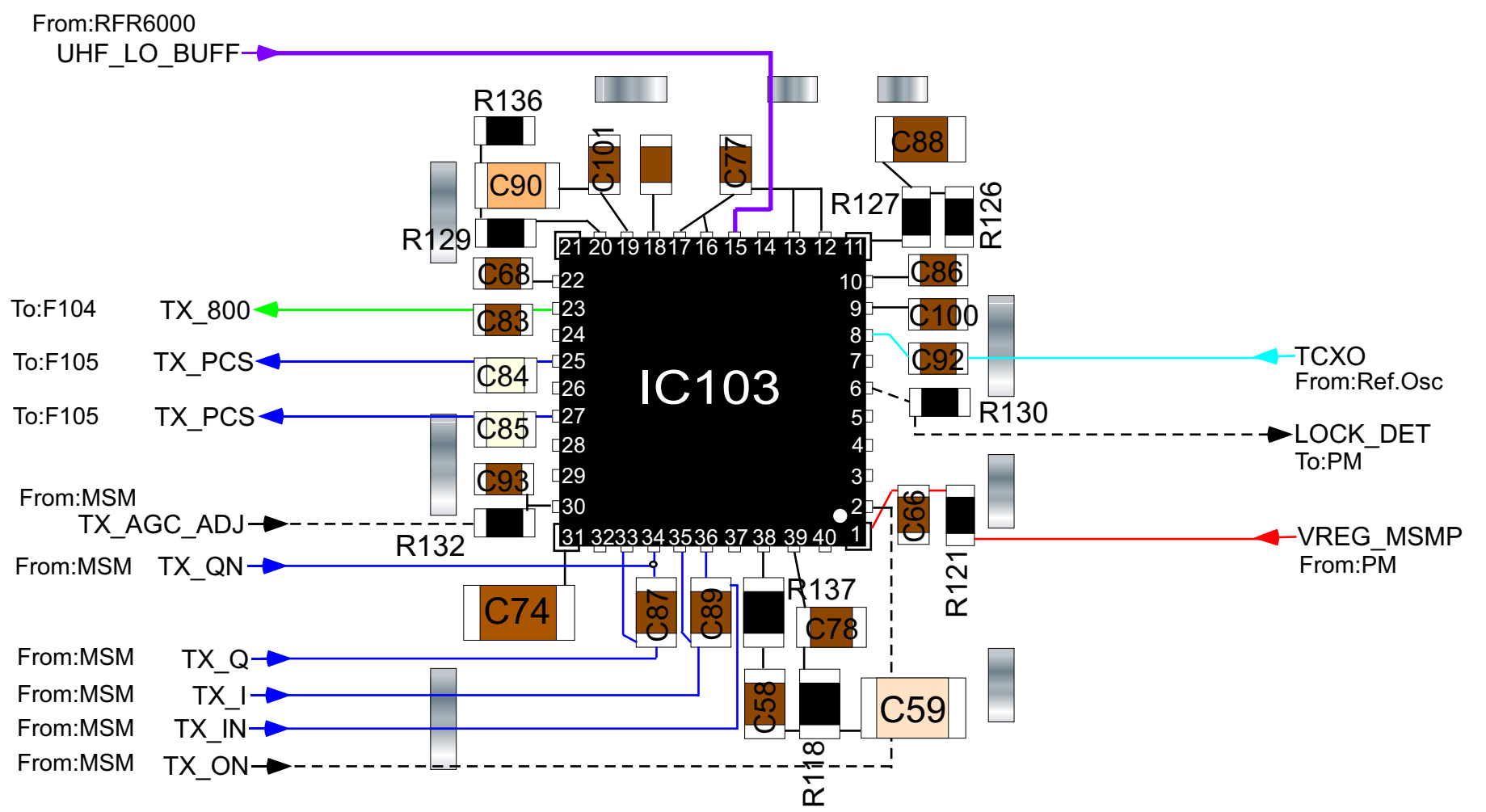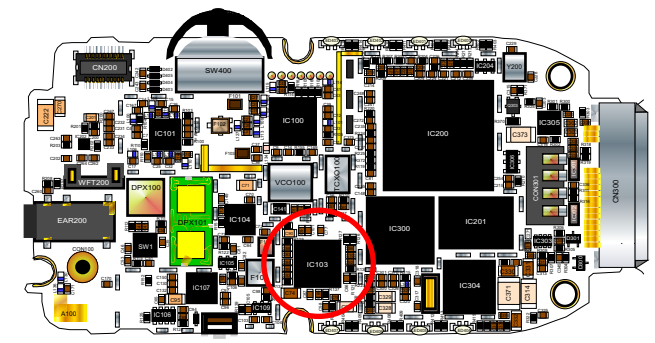From:PM

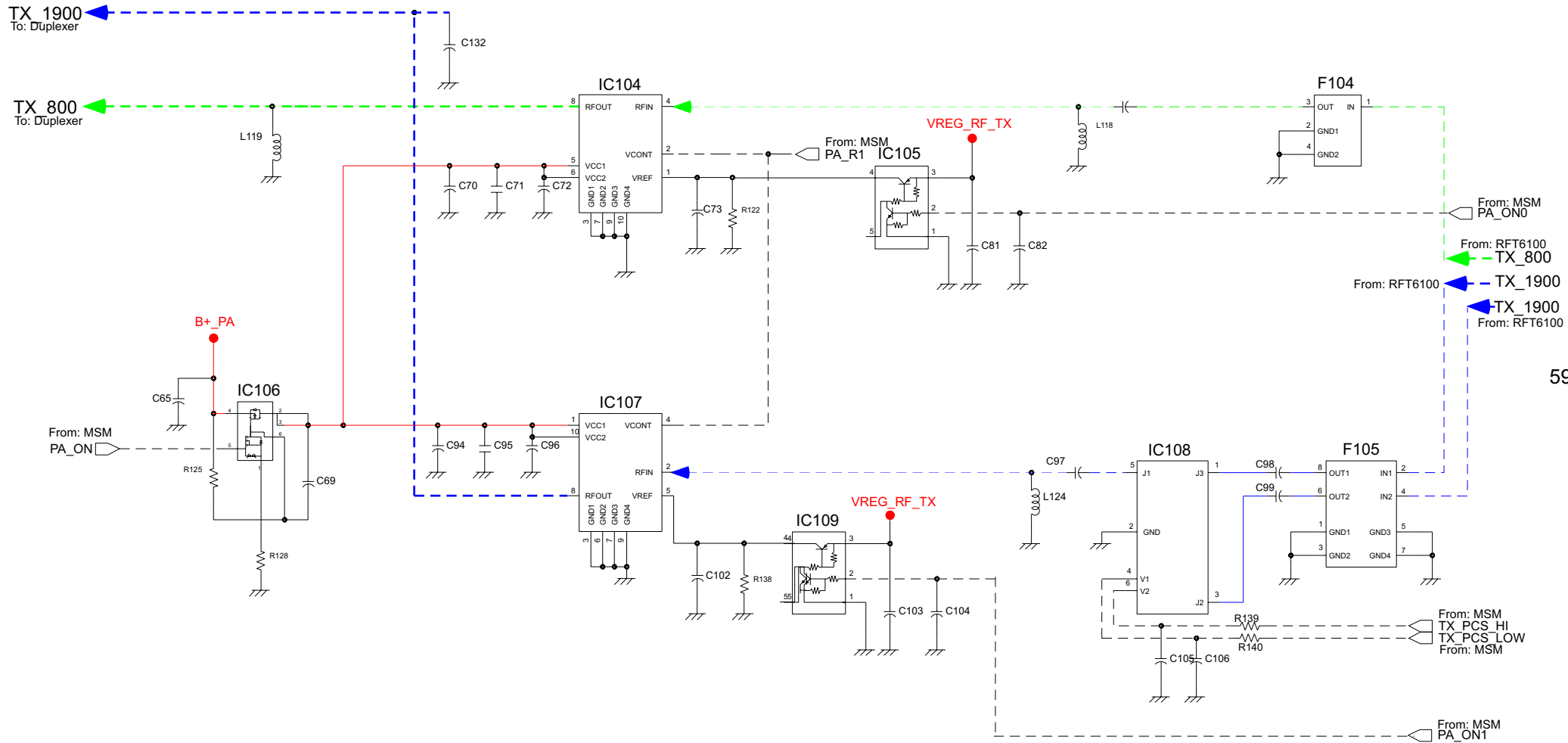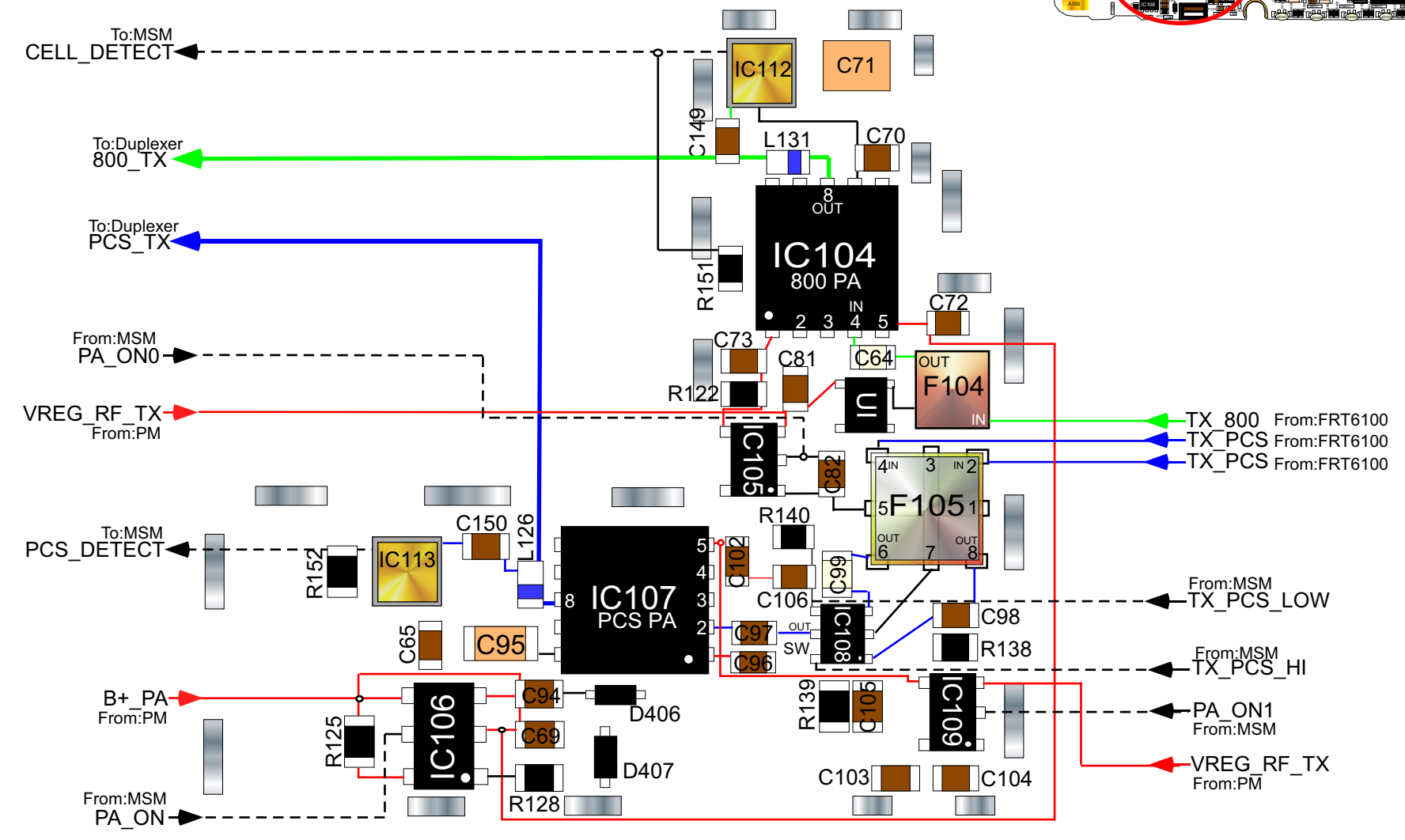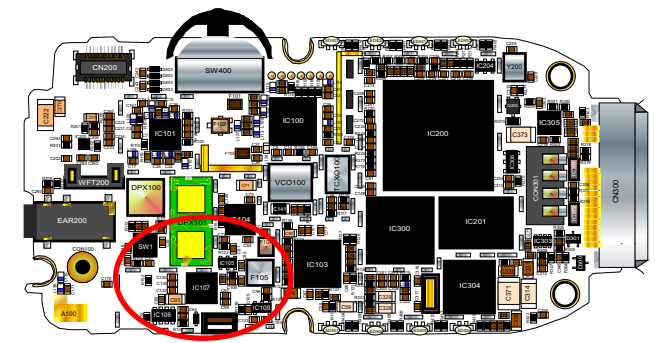D407

C103 C104

From:MSM
PA_ON

R128

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BOARD - Ver 3.2

E310

IC200
MSM6050

A(1:22)

A(22) ... A(1)
D(0:15)
D(15) ... D(0)

ASIC_RXD — DP_RX_DATA
ASIC_TXD — DP_TX_DATA

EAR10P — HPH_R / EAR10P
EAR10N — EAR10N
EAR20 — EAR20
AUXOP — AUXOP
AUXON — AUXON
C204 NC

R204 180K
C207 0.1u R205 10K C206 0.1u MICFBN / MICINP / MICOUTN
C208 0.01u
R206 510K
C209 0.01u R207 10K C210 0.1u
R209 180K C211 0.1u MICINN / MICFBP
AUDIO_IN_FL C212 0.1u AUX0P / AUX0N
VREG_MSMP C213 0.1u
R213 47K R214 10K C214 0.1u CCOMP / GND4
AUDIO_IN_DET_N
C217 1.0u C218 33p MICBIAS
R216 2.2K
MIC_P C221 0.022u MIC1P
MIC_N C224 0.022u MIC1N
C225 33p C226 33p R218 2.2K
MIC2P P13 MIC2P
MIC2N R13 MIC2N

ROM_CS0_N — ROM_CS0_N
RAM_CS0_N — RAM_CS_N
GPIO32 (ROM_CS1_N) — ROM_CS1_N
GPIO33 (RAM_CS1_N) — RF_CON_DET
OE_N — RD_N
WE_N — WE_N
LB_N — LB_N
UB_N — UB_N
RESIN_N — RESOUT_N C272 1u RESET_N
RESOUT_N

GPIO62 (KEY_SENSE0_N) — KEY_SENSE0
GPIO63 (KEY_SENSE1_N) — KEY_SENSE1
GPIO64 (KEY_SENSE2_N) — KEY_SENSE2
GPIO65 (KEY_SENSE3_N) — KEY_SENSE3
GPIO66 (KEY_SENSE4_N) — KEY_SENSE4
GPIO61 — SPK_DRV_EN
GPIO60 — WHITE_LED
GPIO59 — LCD_RESOUT_N
GPIO58 R223 1K PCS_SEL
GPIO57 R2321K C246 0.01u C252 0.01u CDMA_SEL

SCL — GPIO2 (I2C_SCL)
SDA — GPIO3 (I2C_SDA)
GPIO4
GPIO5 (PDM1)
GPIO6 (PDM2)
GPIO7 (GP_MN)
GPIO8, GPIO9, GPIO10
USB_DATA — GPIO11
USB_OE_N — GPIO12
USB_VMO — GPIO13
USB_VPO — GPIO14
ASIC_INT_N — GPIO15
CEBUS_OPTION1 — GPIO16
CEBUS_OPTION2 — GPIO17
ASIC_DSR — GPIO18
ASIC_DTR — GPIO19
ASIC_RI — GPIO21

XTAL48_IN C228 18P Y200 TSX-3225(48M)
XTAL48_OUT C229 18P
SLEEP_XTAL_IN — SLEEP_CLK
SLEEP_XTAL_OUT
GPIO54 — VREG_LED_CNTL
RFR_N — ASIC_RFR_N
CTS_N — ASIC_CTS_N
GPIO44
GPIO45 — USB_DET
GPIO49 — PA_ON
GPIO50 — REMOTE_PWR
WDOG_EN R220 NC

5105_PCM_DOUT — GPIO24
5105_PCM_DIN — GPIO25
5105_PCM_SYNC — GPIO26
5105_PCM_CLK — GPIO27
PCM_DOUT — GPIO28
PCM_DIN — GPIO29
PCM_SYNC — GPIO30
PCM_CLK — GPIO31

ASIC_GP_CS_N — GPIO34
HEADSET_DET_N — GPIO35
SEND_END_DET_N — GPIO36
LCD_CS_N — GPIO37
ASIC_HKSW — GPIO40
AUDIO_OUT_EN — GPIO41
ASIC_IGN — GPIO42
PM_6000_INT_N — GPIO43

TX_PCS_HI — TX_PCS_HI
TX_PCS_LOW — TX_PCS_LOW
GPIO56
GPIO55 — TCXO_EN
EXT_VCO_EN — EXT_VCO_EN
FM_LNA_RANGE — FM_LNA_RANGE
TX_ON — TX_ON
I_OUT — TX_I
I_OUT_N — TX_IN
Q_OUT — TX_Q
Q_OUT_N — TX_QN
R233 1K GPS_SEL C253 0.01u

PS_HOLD — GPIO46
ASIC_DCD — GPIO47
PWR_END_KEY — GPIO48

DAC_IREF — DAC_IREF
I_IP / I_IN — RX_I_P / RX_I_M
Q_IP / Q_IN — RX_Q_P / RX_Q_M C235 1000p VREG_DAC

AUX_SBDT — AUX_SBI_DT
AUX_SBCK — AUX_SBI_CK
AUX_SBST — AUX_SBI_ST

TX_AGC_ADJ R2241K TX_AGC_ADJ
TRK_LO_ADJ R2251 0Ω TRK_LO_ADJ

JTAG_TDO — MODE0/MODE1/TDO
JTAG_TDI — TDI
JTAG_TRST_N — TRST*
JTAG_TMS — TMS
JTAG_TCK — TCK

PA_ON0 — PA_ON0 C237 0.68u C236 0.01u
PA_ON1 — PA_ON1
TCXO_OUT VREG_MSMC

FLIP_TEMP — HKAIN0...HKAIN6

VDD_C1...VDD_C4 C238 0.1u C239 0.01u
VDD_A1...VDD_A7 VREG_DAC C240 0.1u C241 0.01u BF200 600/100uH (1005) VREG_MSMA
VDD_P01/VDD_P02 C247 0.1u C248 0.01u BF202 600/100uH (1005) VREG_MSMP

LOCK_DET — SYNTH_LOCK
PA_R1 — PA_R0 / PA_R1
SBST/SBDT/SBCK
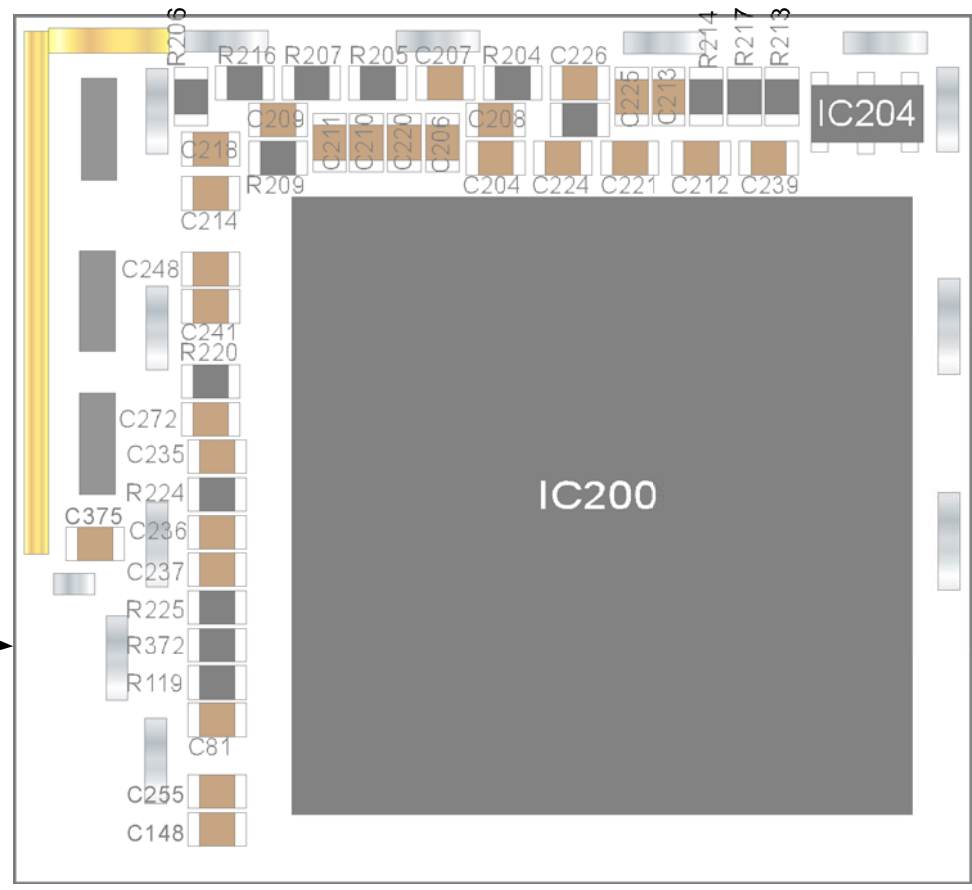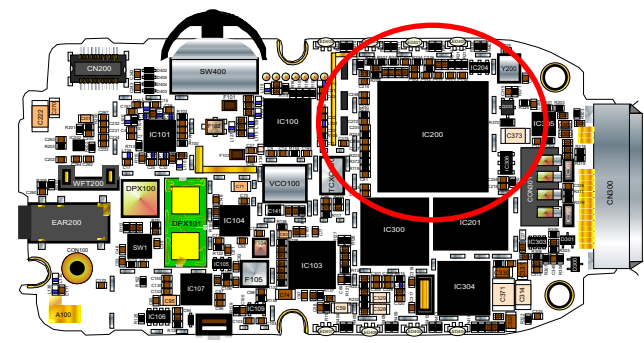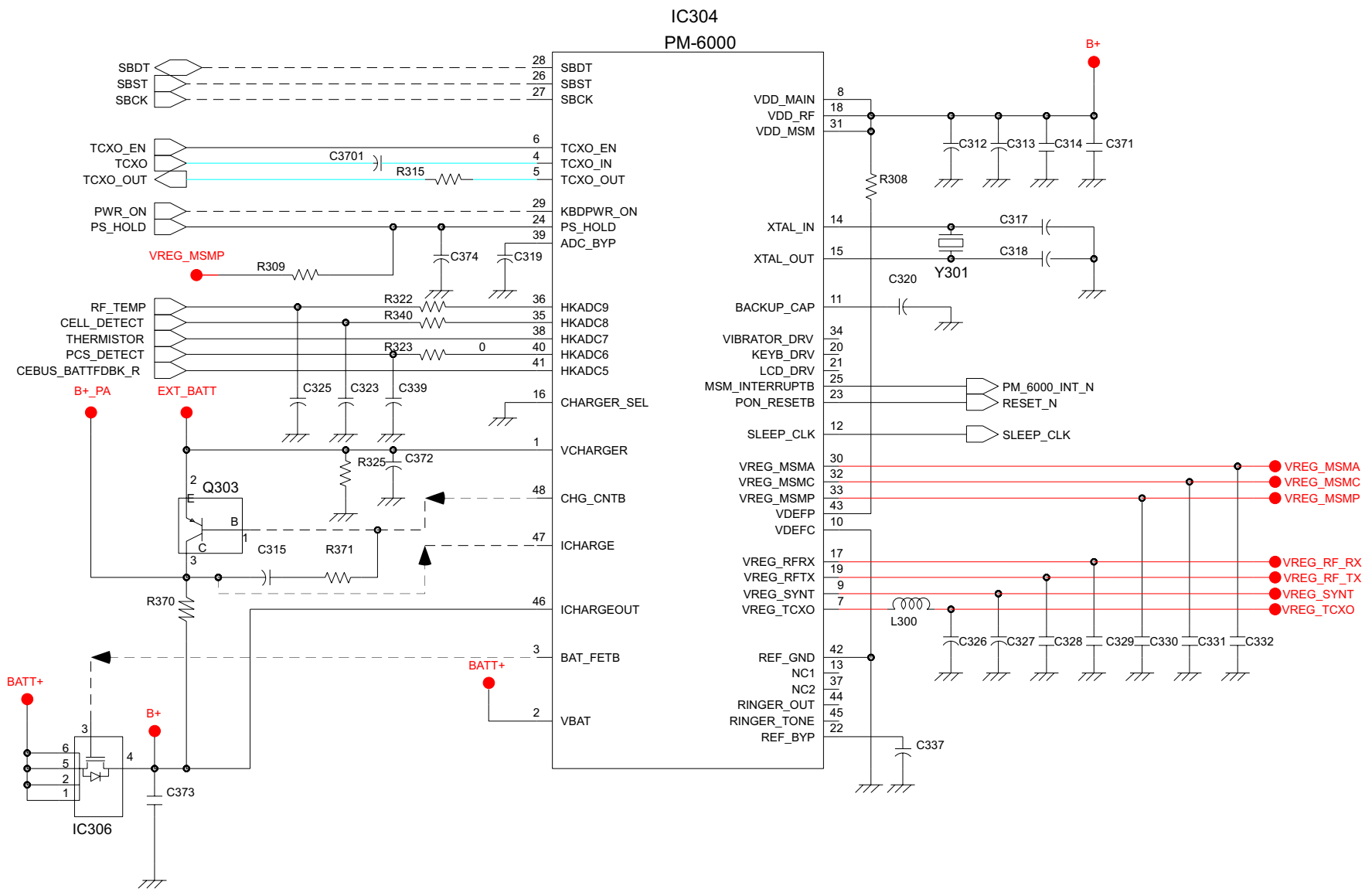
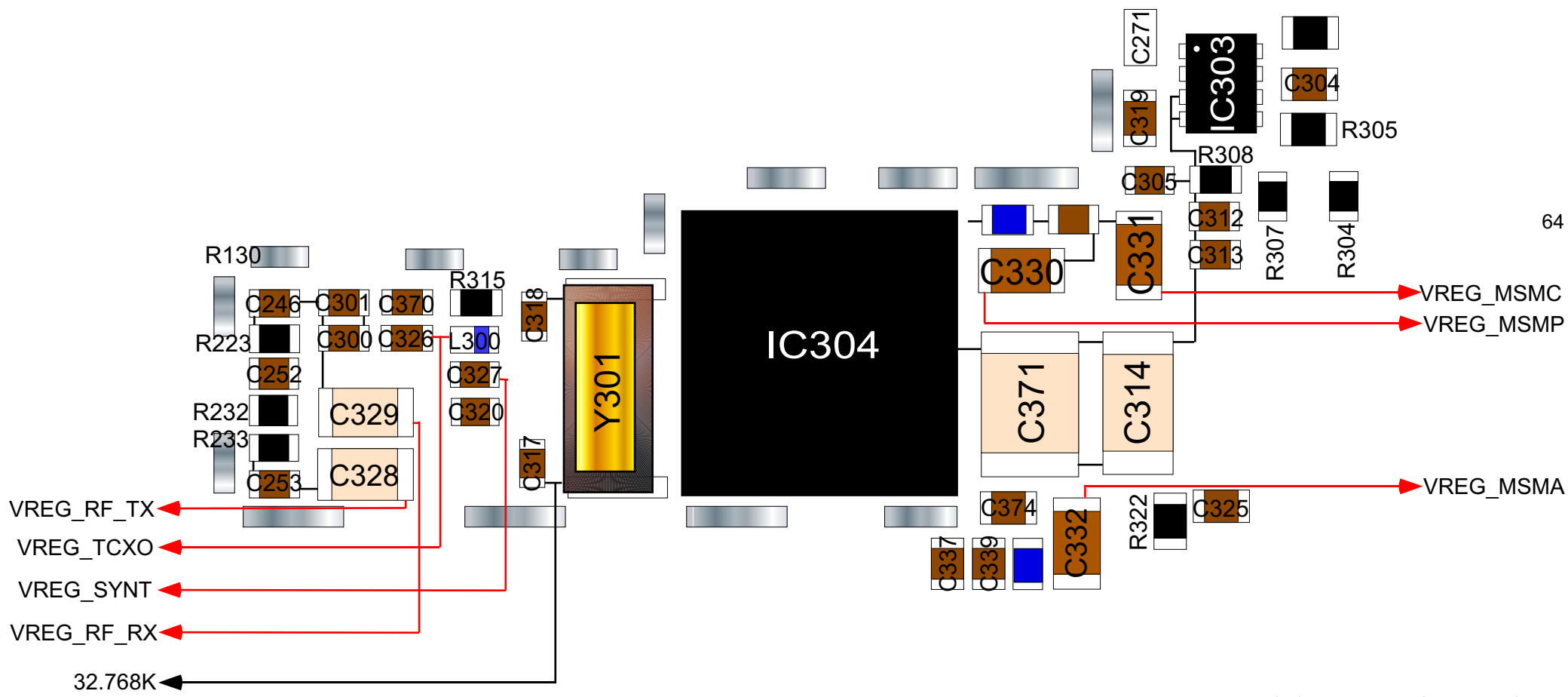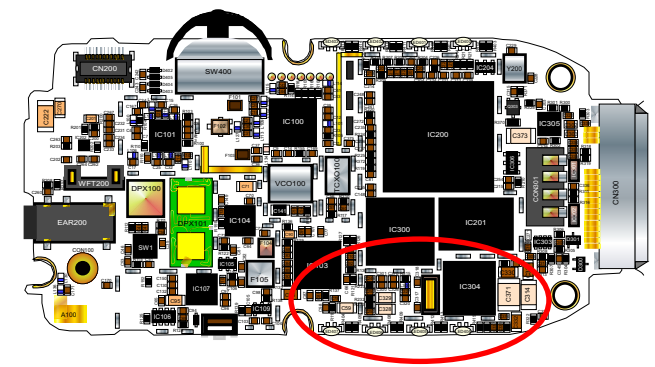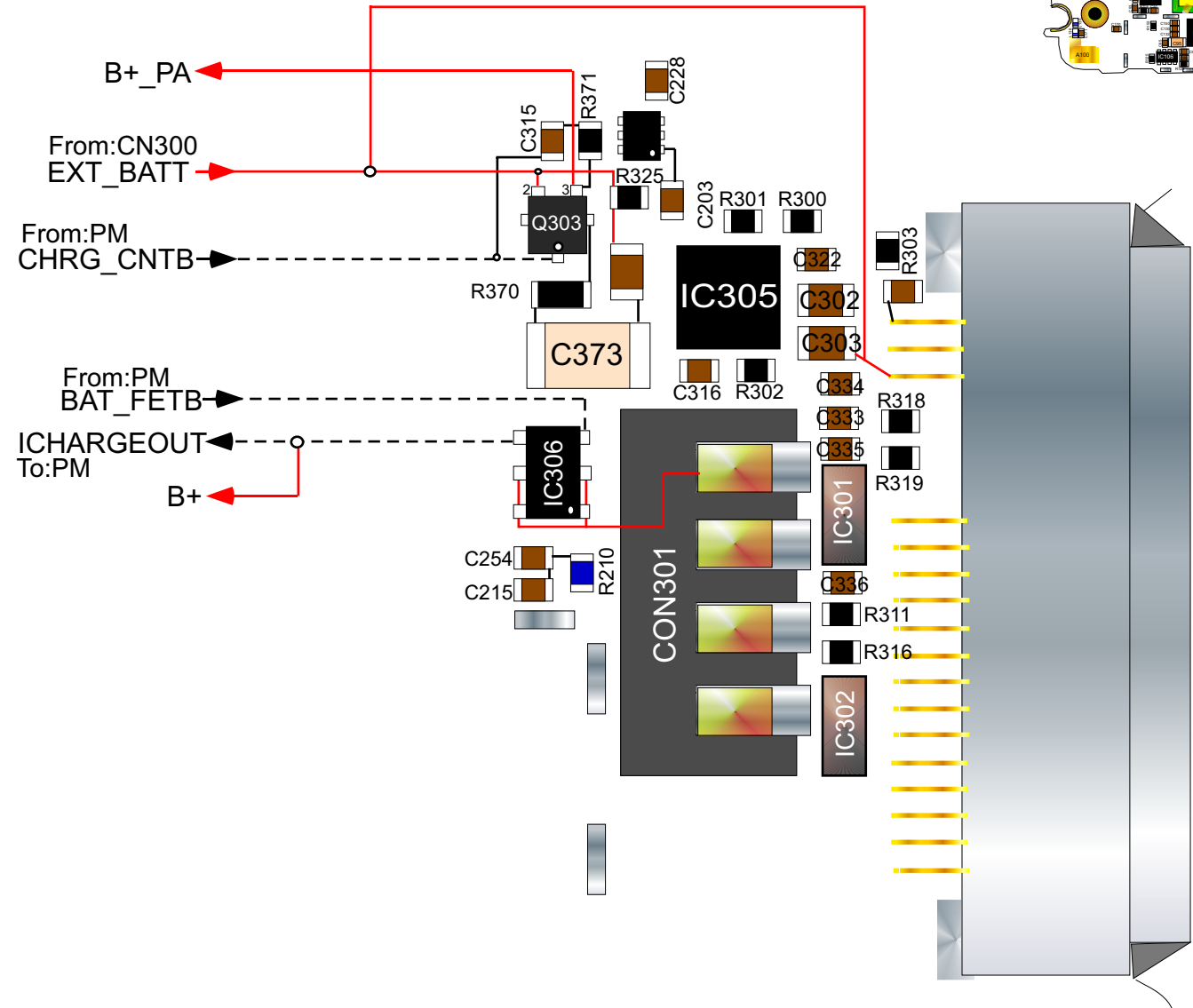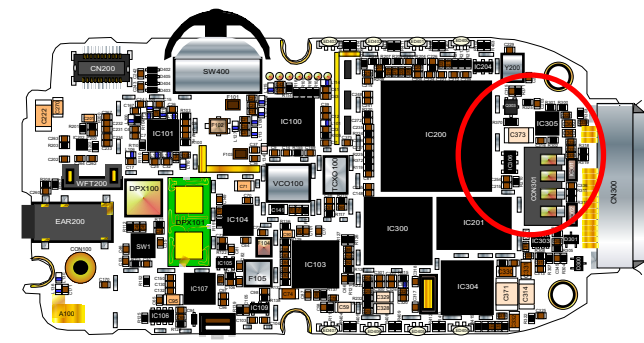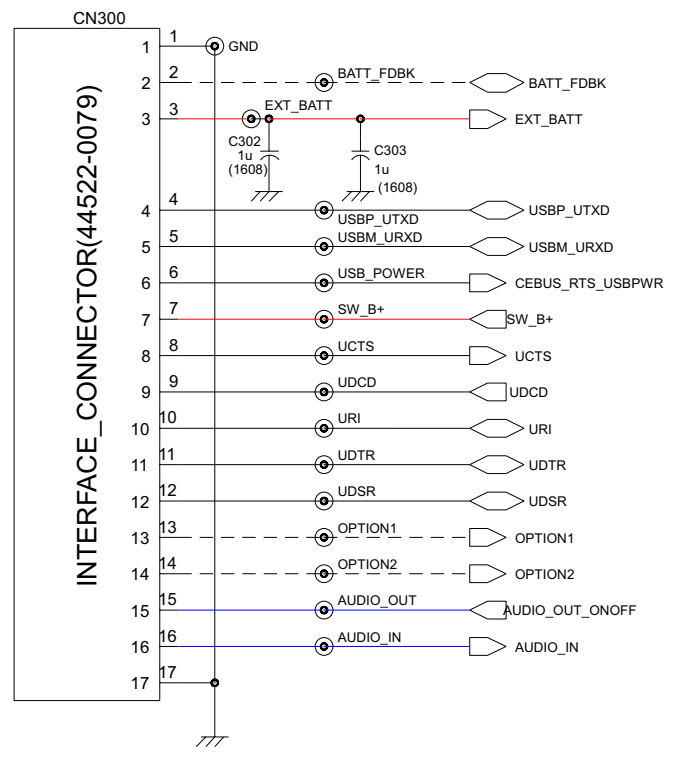NC1/NC2

61

IC206 A3212ELH OUT_VCC GND C230 33p VREG_MSMP

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BOARD - Ver 3.2

E310

IC200

IC204

R216 R207 R205 C207 R204 C226

R206

R214 R217 R213

C225 C213

C209

C211 C210 C220 C206

C208

C218

R209

C204 C224 C221 C212 C239

C214

C248

C241
R220

C272
C235
R224

C375   C236

C237

R225

Epoxy

R372

R119

C81

C255

C148

62

IC304
PM-6000

Pin	Signal
28	SBDT
26	SBST
27	SBCK
6	TCXO_EN
4	TCXO_IN
5	TCXO_OUT
29	KBDPWR_ON
24	PS_HOLD
39	ADC_BYP
36	HKADC9
35	HKADC8
38	HKADC7
40	HKADC6
41	HKADC5
16	CHARGER_SEL
1	VCHARGER
48	CHG_CNTB
47	ICHARGE
46	ICHARGEOUT
3	BAT_FETB
2	VBAT

SBDT
SBST
SBCK

TCXO_EN
TCXO
TCXO_OUT
C3701
R315

PWR_ON
PS_HOLD

VREG_MSMP
R309
C374 C319

RF_TEMP
CELL_DETECT
THERMISTOR
PCS_DETECT
CEBUS_BATTFDBK_R
R322
R340
R323 0

B+_PA EXT_BATT
C325 C323 C339

Q303
2 E
B
C 1
3
C315 R371

R370

R325 C372

BATT+
3
6
5
2
1
4
B+
C373
IC306

BATT+

VDD_MAIN 8
VDD_RF 18
VDD_MSM 31
C312 C313 C314 C371
R308

XTAL_IN 14
C317
XTAL_OUT 15
C318
C320 Y301

BACKUP_CAP 11

VIBRATOR_DRV 34
KEYB_DRV 20
LCD_DRV 21
MSM_INTERRUPTB 25
PON_RESETB 23

SLEEP_CLK 12

VREG_MSMA 30
VREG_MSMC 32
VREG_MSMP 33
VDEFP 43
VDEFC 10

VREG_RFRX 17
VREG_RFTX 19
VREG_SYNT 9
VREG_TCXO 7

REF_GND 42
NC1 13
NC2 37
RINGER_OUT 44
RINGER_TONE 45
REF_BYP 22

B+

PM_6000_INT_N
RESET_N

SLEEP_CLK

VREG_MSMA
VREG_MSMC
VREG_MSMP

VREG_RF_RX
VREG_RF_TX
VREG_SYNT
VREG_TCXO

L300
C326 C327 C328 C329 C330 C331 C332

C337

63

64

IC303

C271
C319
C304
R305
R308
C305
C312
C313
R307
R304

R130
R223
R232
R233

C246 C301 C370
C300 C326
C252
C253
C329
C328

R315
L300
C327
C320

C318
C317

Y301

IC304

C330
C371 C314
C331

VREG_MSMC
VREG_MSMP

C374
C337 C339
C332
R322 C325

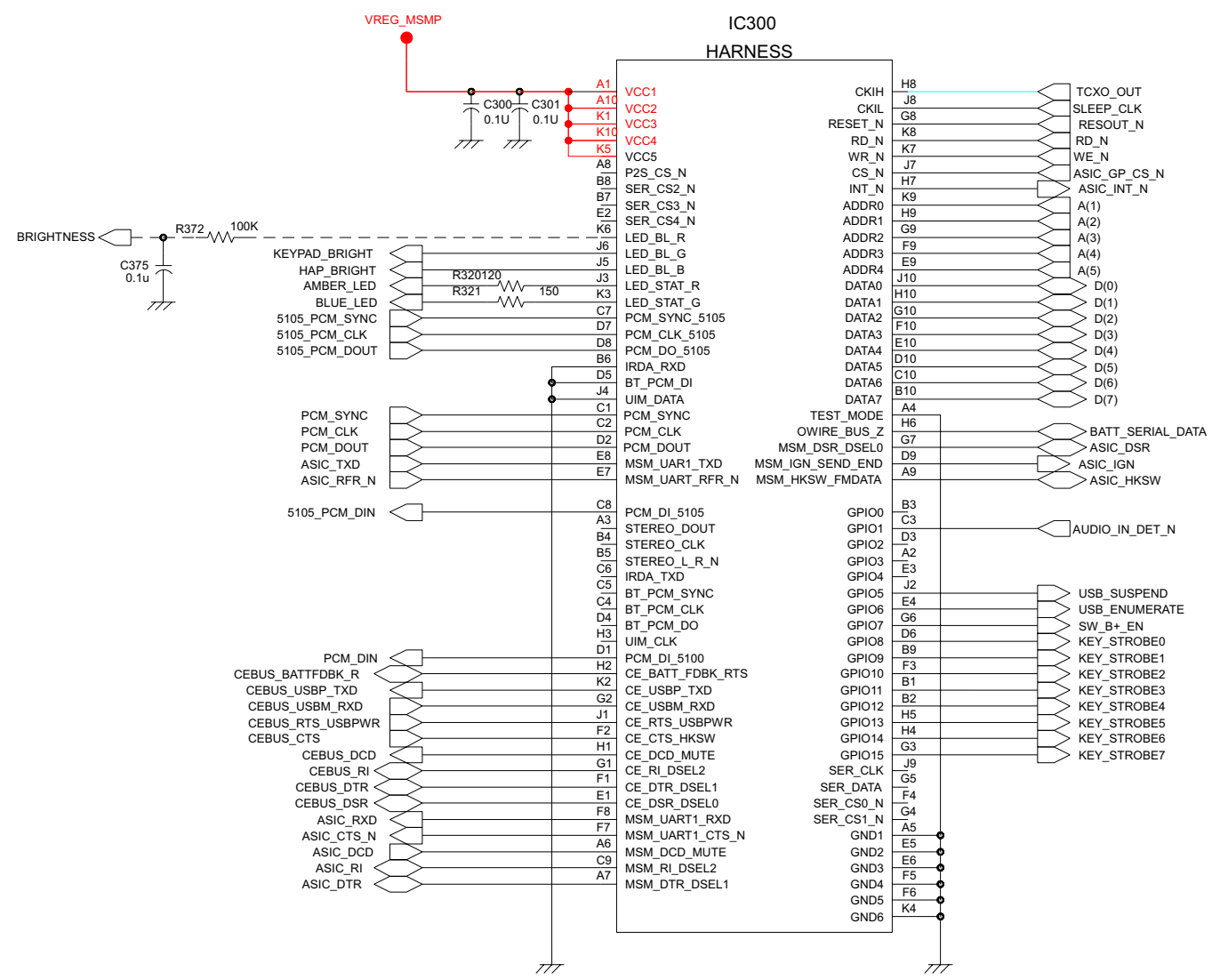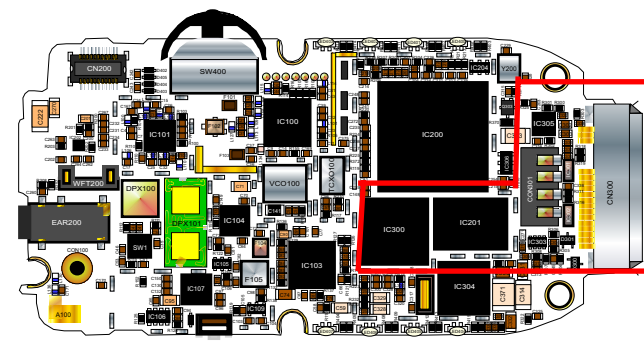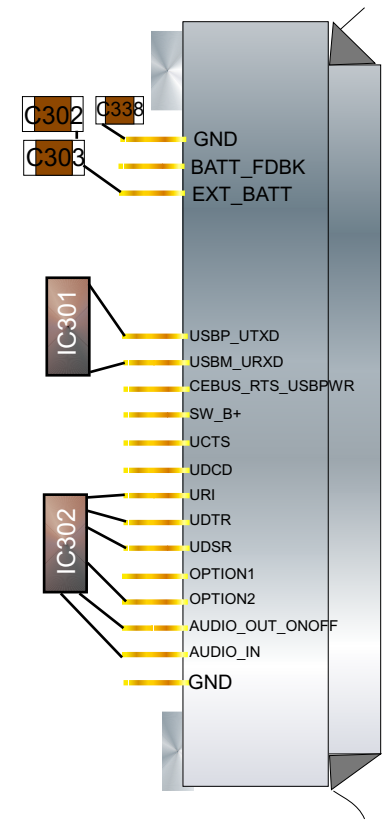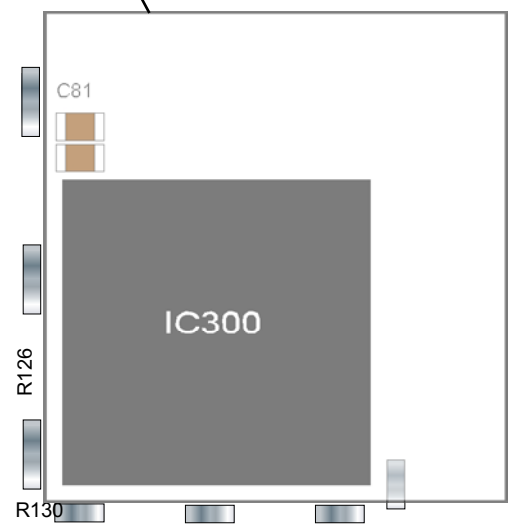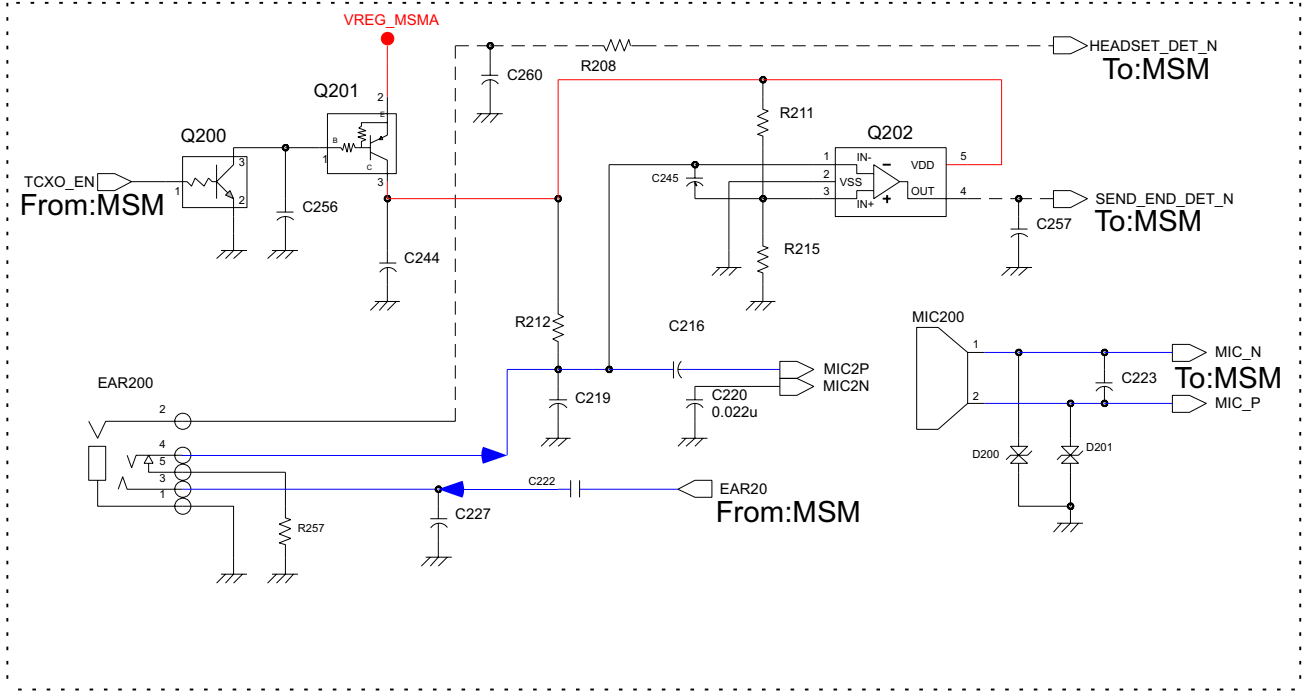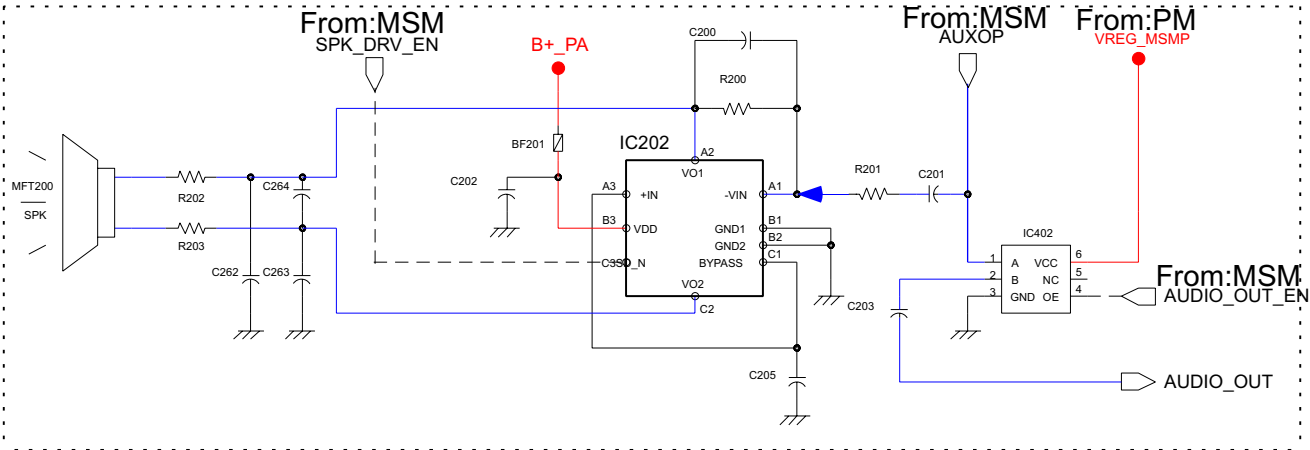VREG_MSMA

VREG_RF_TX
VREG_TCXO
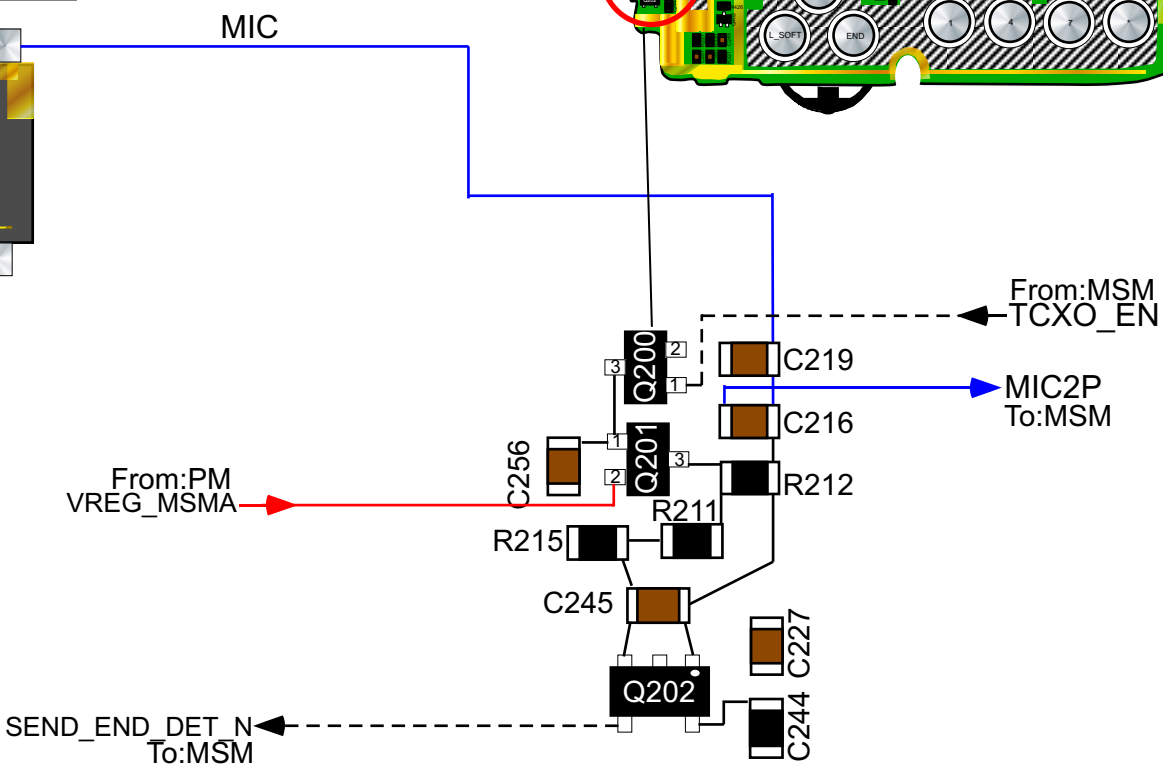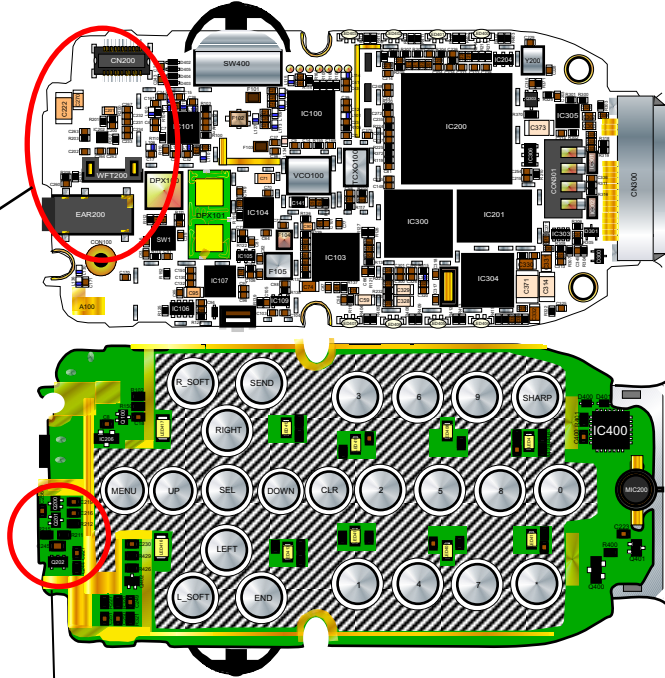VREG_SYNT
VREG_RF_RX

32.768K

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BOARD - Ver 3.2

E310

B+_PA

From:CN300
EXT_BATT

From:PM
CHRG_CNTB

From:PM
BAT_FETB

ICHARGEOUT
To:PM

B+

C315
R371
C228
R325
C203 R301 R300
2 3
Q303
R370
IC305
C322
C302
C303
C373
C316 R302
C334
C333
C335
R318
R319
R303
IC306
IC301
CON301
C254
C215
R210
C336
R311
R316
IC302

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BOARD - Ver 3.2

HARNESS & CEBUS Circuit: 10 | E310

CN300

INTERFACE_CONNECTOR(44522-0079)

Pin	Signal
1	GND
2	BATT_FDBK → BATT_FDBK
3	EXT_BATT → EXT_BATT
4	USBP_UTXD → USBP_UTXD
5	USBM_URXD → USBM_URXD
6	USB_POWER → CEBUS_RTS_USBPWR
7	SW_B+ → SW_B+
8	UCTS → UCTS
9	UDCD → UDCD
10	URI → URI
11	UDTR → UDTR
12	UDSR → UDSR
13	OPTION1 → OPTION1
14	OPTION2 → OPTION2
15	AUDIO_OUT → AUDIO_OUT_ONOFF
16	AUDIO_IN → AUDIO_IN
17	

C302 1u (1608)
C303 1u (1608)

IC300
HARNESS

VREG_MSMP

C300 0.1U
C301 0.1U

Pin	Signal
A1	VCC1
A10	VCC2
K1	VCC3
K10	VCC4
K5	VCC5
A8	P2S_CS_N
B8	SER_CS2_N
B7	SER_CS3_N
E2	SER_CS4_N
K6	LED_BL_R
J6	LED_BL_G
J5	LED_BL_B
J3	LED_STAT_R
K3	LED_STAT_G
C7	PCM_SYNC_5105
D7	PCM_CLK_5105
D8	PCM_DO_5105
B6	IRDA_RXD
D5	BT_PCM_DI
J4	UIM_DATA
C1	PCM_SYNC
C2	PCM_CLK
D2	PCM_DOUT
E8	MSM_UAR1_TXD
E7	MSM_UART_RFR_N
C8	PCM_DI_5105
A3	STEREO_DOUT
B4	STEREO_CLK
B5	STEREO_L_R_N
C6	IRDA_TXD
C5	BT_PCM_SYNC
C4	BT_PCM_CLK
D4	BT_PCM_DO
H3	UIM_CLK
D1	PCM_DI_5100
H2	CE_BATT_FDBK_RTS
K2	CE_USBP_TXD
G2	CE_USBM_RXD
J1	CE_RTS_USBPWR
F2	CE_CTS_HKSW
H1	CE_DCD_MUTE
G1	CE_RI_DSEL2
F1	CE_DTR_DSEL1
E1	CE_DSR_DSEL0
F8	MSM_UART1_RXD
F7	MSM_UART1_CTS_N
A6	MSM_DCD_MUTE
C9	MSM_RI_DSEL2
A7	MSM_DTR_DSEL1

Pin	Signal
H8	CKIH
J8	CKIL
G8	RESET_N
K8	RD_N
K7	WR_N
J7	CS_N
H7	INT_N
K9	ADDR0
H9	ADDR1
G9	ADDR2
F9	ADDR3
E9	ADDR4
J10	DATA0
H10	DATA1
G10	DATA2
F10	DATA3
E10	DATA4
D10	DATA5
C10	DATA6
B10	DATA7
A4	TEST_MODE
H6	OWIRE_BUS_Z
G7	MSM_DSR_DSEL0
D9	MSM_IGN_SEND_END
A9	MSM_HKSW_FMDATA
B3	GPIO0
C3	GPIO1
D3	GPIO2
A2	GPIO3
E3	GPIO4
J2	GPIO5
E4	GPIO6
G6	GPIO7
D6	GPIO8
B9	GPIO9
F3	GPIO10
B1	GPIO11
B2	GPIO12
H5	GPIO13
H4	GPIO14
G3	GPIO15
J9	SER_CLK
G5	SER_DATA
F4	SER_CS0_N
G4	SER_CS1_N
A5	GND1
E5	GND2
E6	GND3
F5	GND4
F6	GND5
K4	GND6

Right-side signals:
TCXO_OUT, SLEEP_CLK, RESOUT_N, RD_N, WE_N, ASIC_GP_CS_N, ASIC_INT_N, A(1), A(2), A(3), A(4), A(5), D(0), D(1), D(2), D(3), D(4), D(5), D(6), D(7), BATT_SERIAL_DATA, ASIC_DSR, ASIC_IGN, ASIC_HKSW, AUDIO_IN_DET_N, USB_SUSPEND, USB_ENUMERATE, SW_B+_EN, KEY_STROBE0, KEY_STROBE1, KEY_STROBE2, KEY_STROBE3, KEY_STROBE4, KEY_STROBE5, KEY_STROBE6, KEY_STROBE7

Left-side signals:
BRIGHTNESS, R372 100K, C375 0.1u, KEYPAD_BRIGHT, HAP_BRIGHT, AMBER_LED, BLUE_LED, R320 120, R321 150, 5105_PCM_SYNC, 5105_PCM_CLK, 5105_PCM_DOUT, PCM_SYNC, PCM_CLK, PCM_DOUT, ASIC_TXD, ASIC_RFR_N, 5105_PCM_DIN, PCM_DIN, CEBUS_BATTFDBK_R, CEBUS_USBP_TXD, CEBUS_USBM_RXD, CEBUS_RTS_USBPWR, CEBUS_CTS, CEBUS_DCD, CEBUS_RI, CEBUS_DTR, CEBUS_DSR, ASIC_RXD, ASIC_CTS_N, ASIC_DCD, ASIC_RI, ASIC_DTR

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BOARD - Ver 3.2

Epoxy

C81

IC300

R126

R130

GND
BATT_FDBK
EXT_BATT

C302 C338
C303

IC301

USBP_UTXD
USBM_URXD
CEBUS_RTS_USBPWR
SW_B+
UCTS
UDCD
URI
UDTR
UDSR
OPTION1
OPTION2
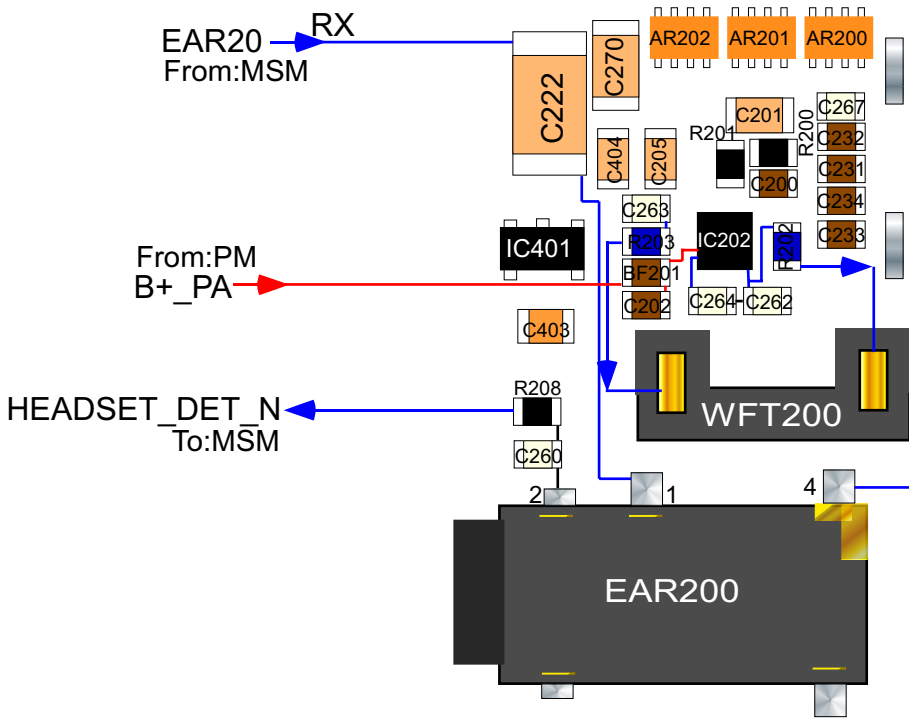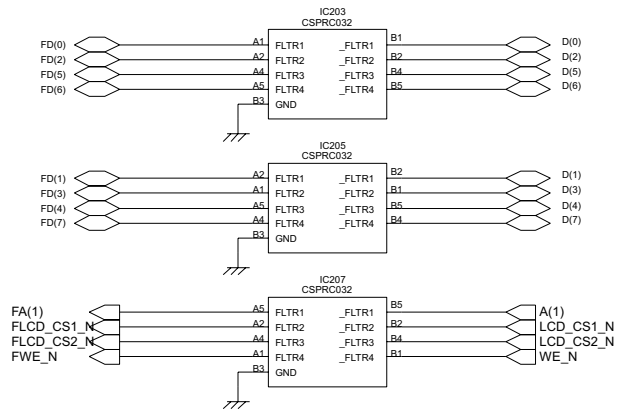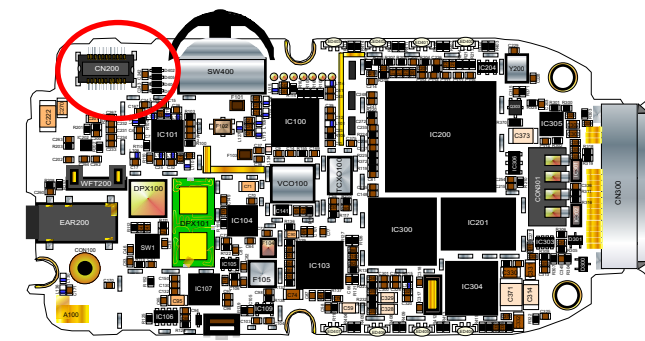AUDIO_OUT_ONOFF
AUDIO_IN
GND

IC302

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BOARD - Ver 3.2

BOARD - Ver 3.2
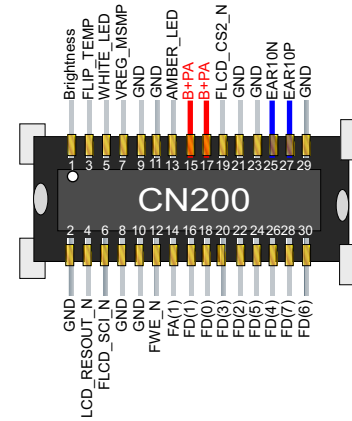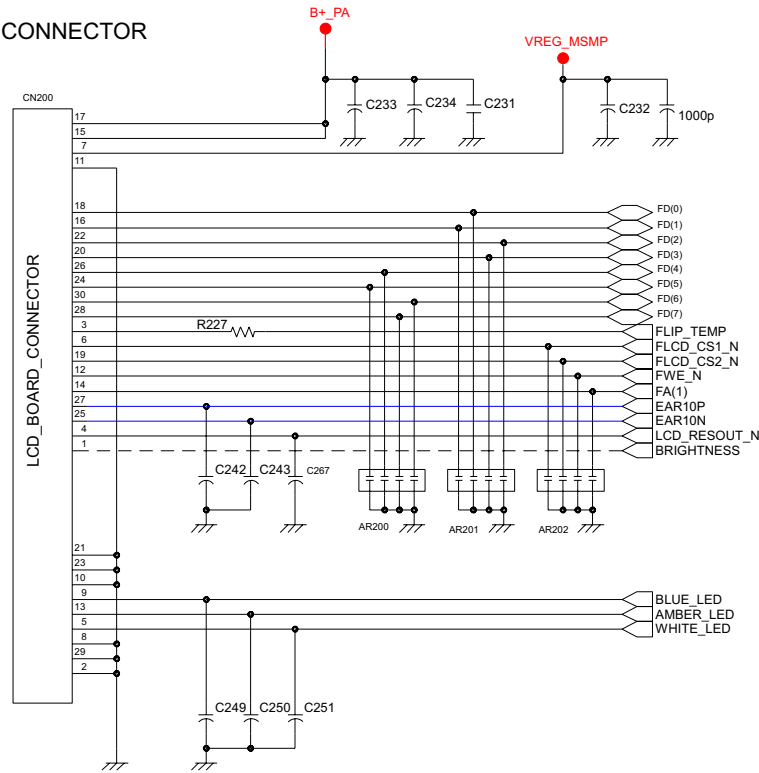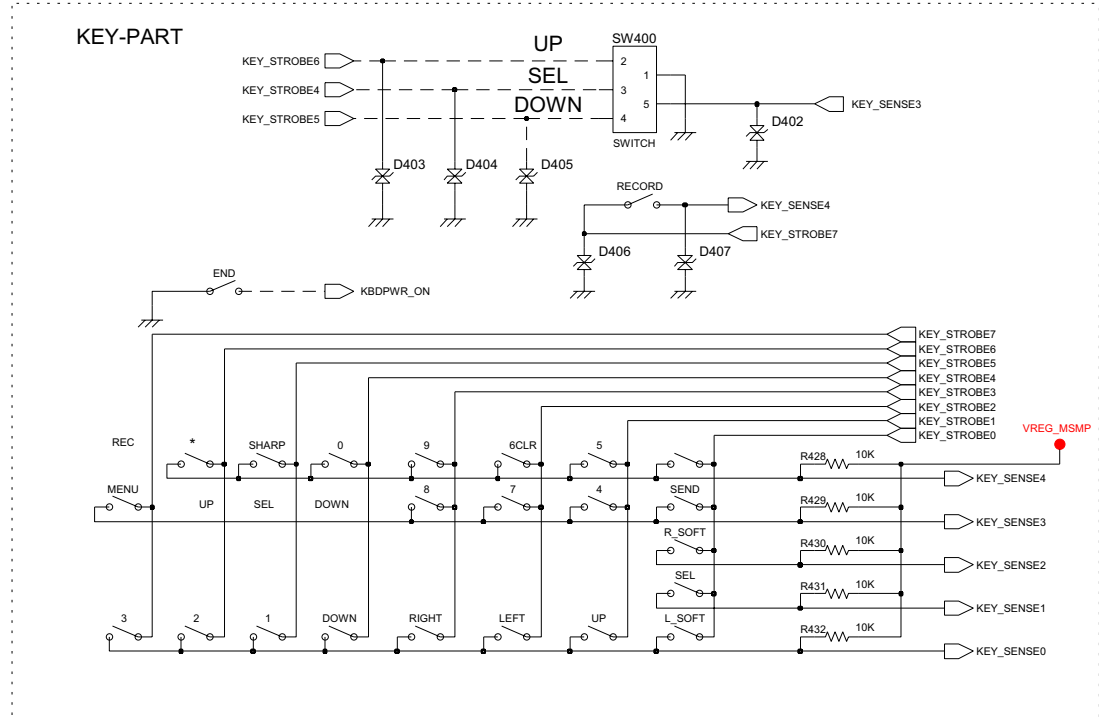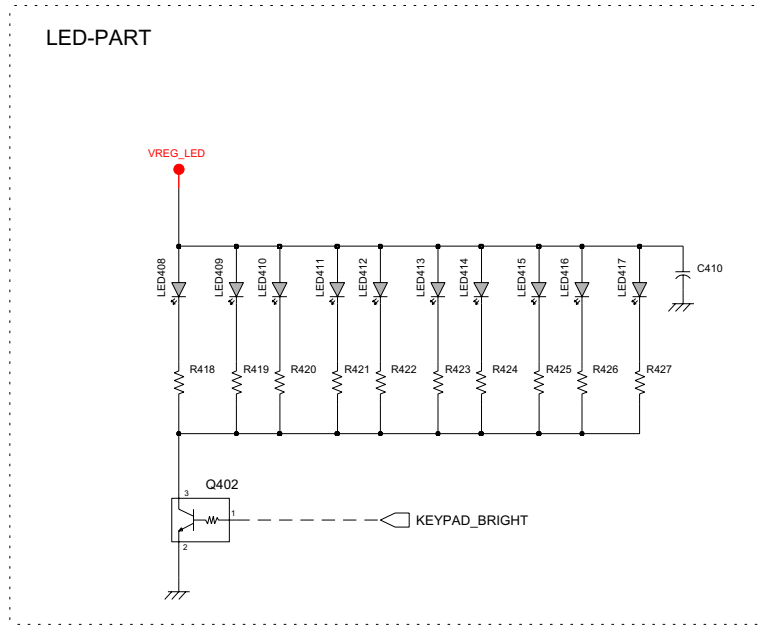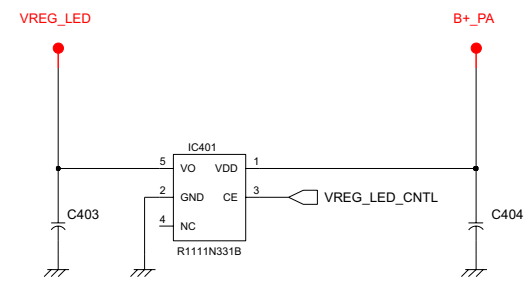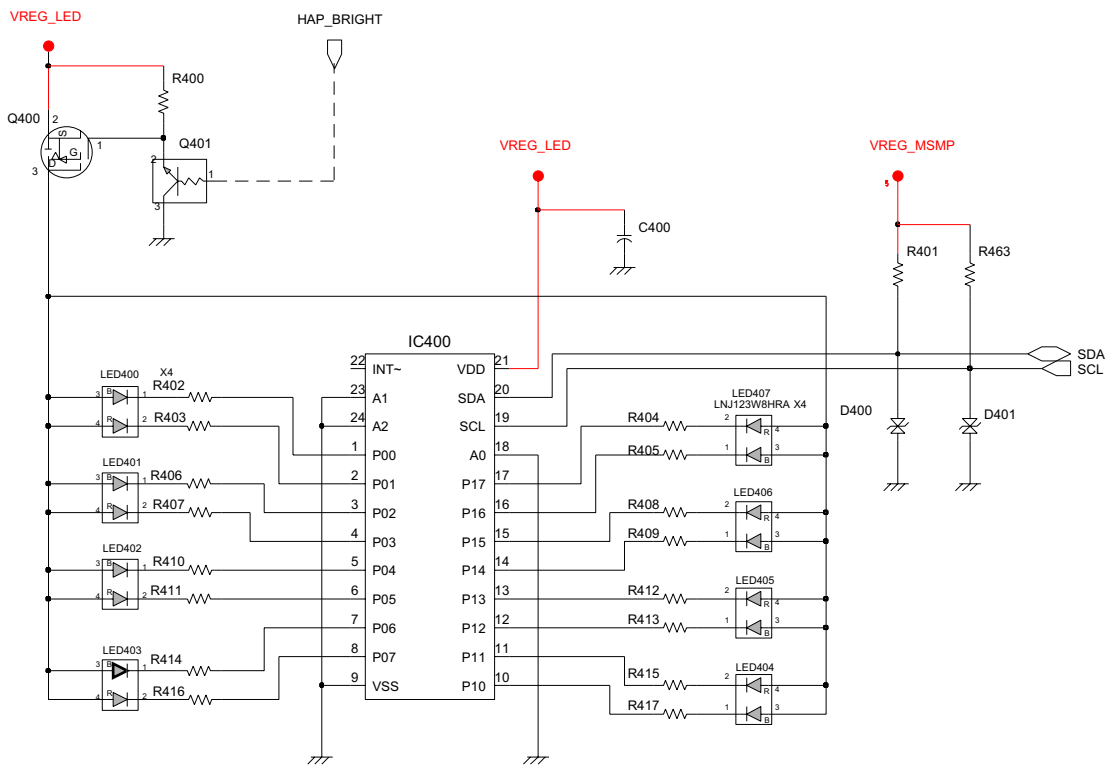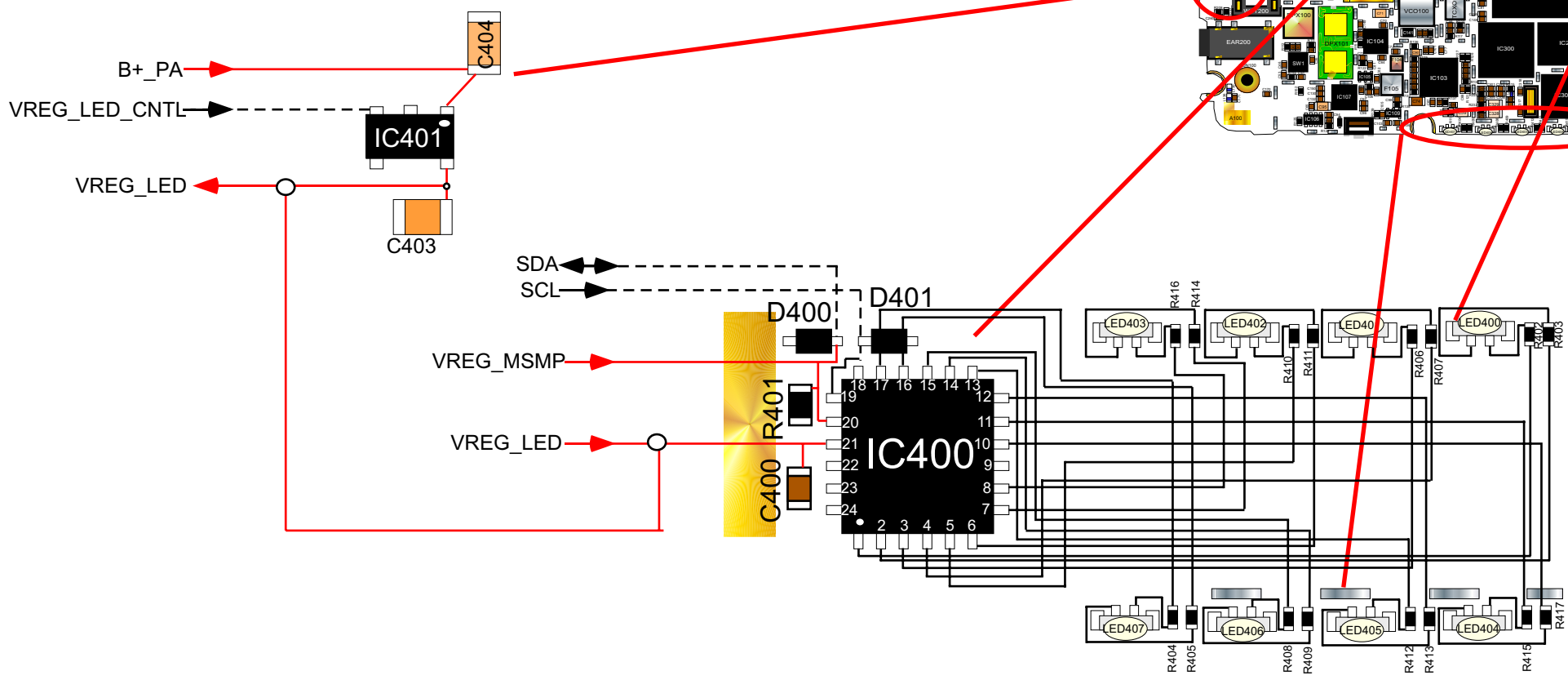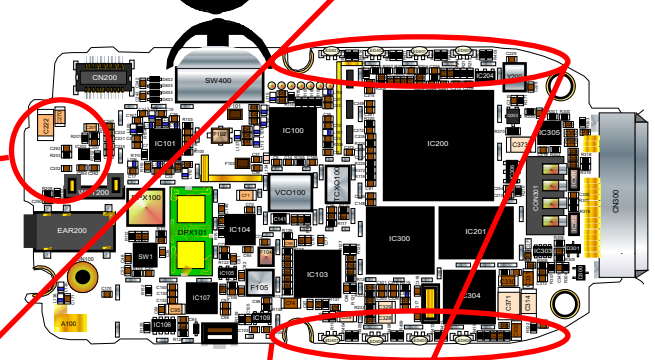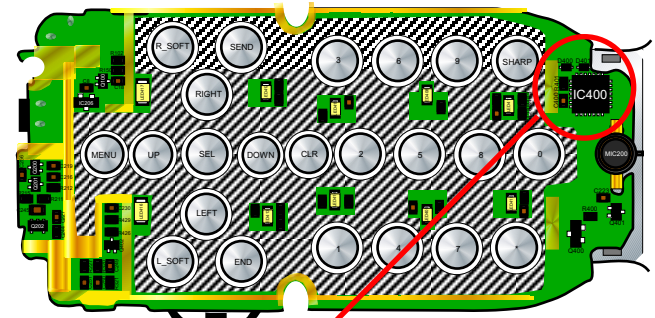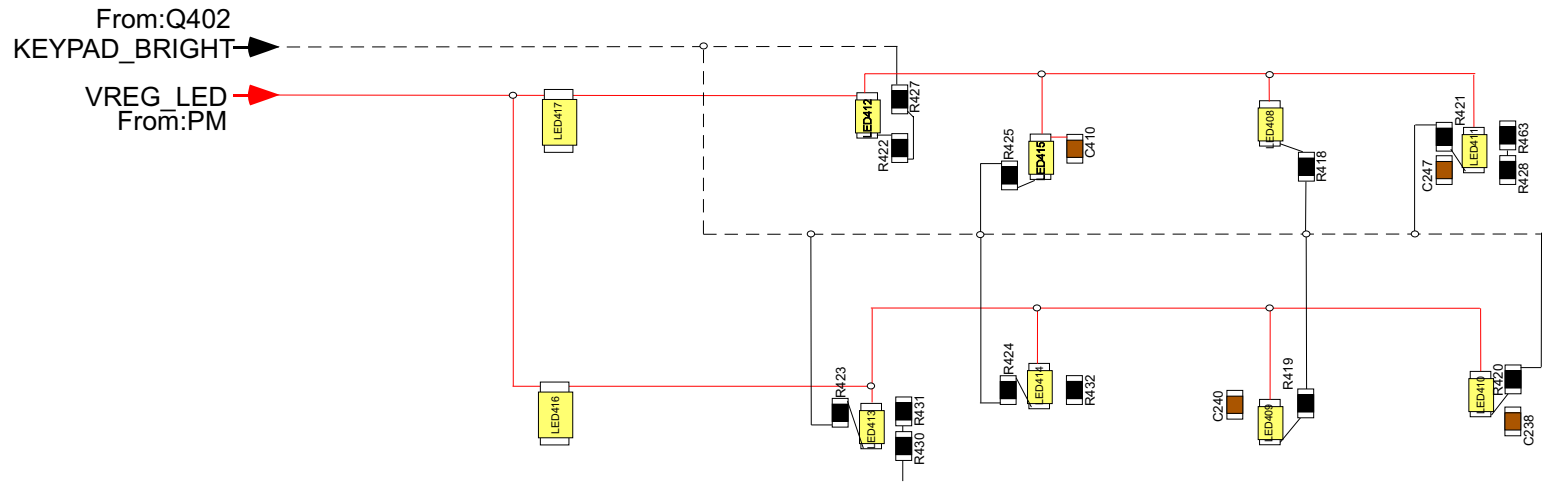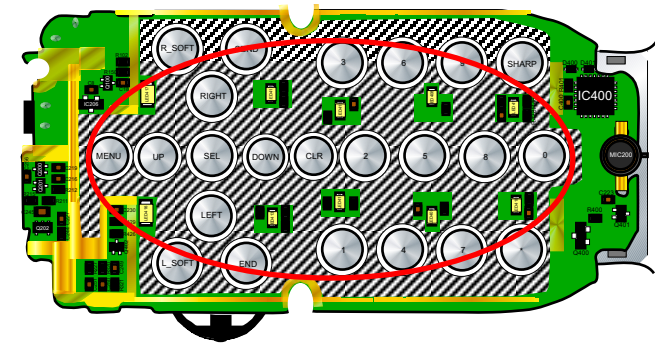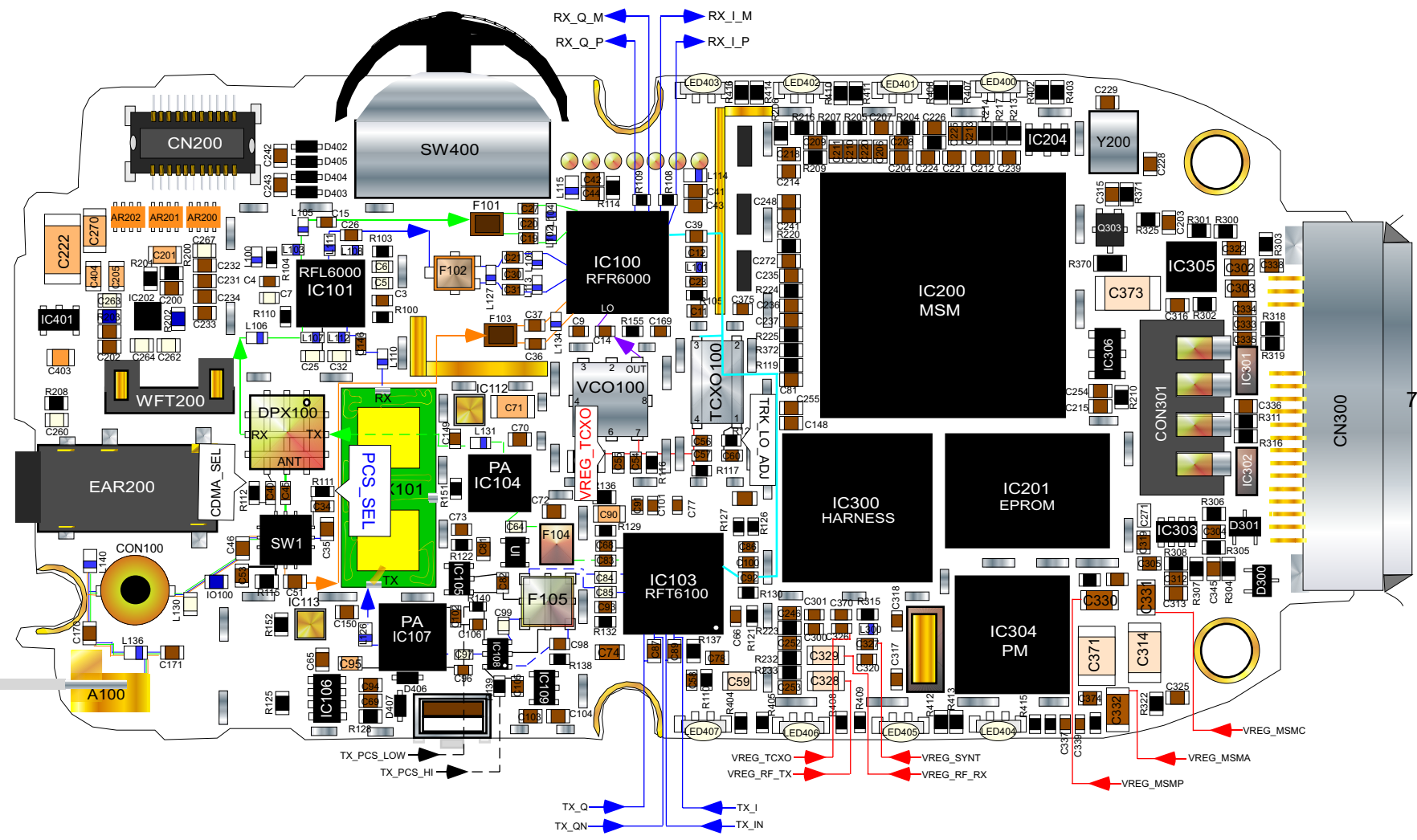
E310

EAR20
From:MSM
RX

From:PM
B+_PA

HEADSET_DET_N
To:MSM

C222
C270
C404
C205
C201
R201
C200
R200
C267
C232
C231
C234
C233

IC401
C263
R203
IC202
BF201
C202
C264
C262

C403

R208

C260

WFT200

EAR200

2 1 4

MIC

69

From:MSM
TCXO_EN

Q200
C219

MIC2P
To:MSM

C216

C256
Q201
R212

From:PM
VREG_MSMA
R211

R215

C245

C227

Q202
C244

SEND_END_DET_N
To:MSM

AR202 AR201 AR200

R SOFT SEND SHARP
RIGHT IC400
MENU UP SEL DOWN CLR
MIC200
LEFT
L SOFT END

BOARD - Ver 3.2

IC203
CSPRC032

FD(0)	A1 FLTR1 _FLTR1 B1	D(0)
FD(2)	A2 FLTR2 _FLTR2 B2	D(2)
FD(5)	A4 FLTR3 _FLTR3 B4	D(5)
FD(6)	A5 FLTR4 _FLTR4 B5	D(6)
	B3 GND	

IC205
CSPRC032

FD(1)	A2 FLTR1 _FLTR1 B2	D(1)
FD(3)	A1 FLTR2 _FLTR2 B1	D(3)
FD(4)	A5 FLTR3 _FLTR3 B5	D(4)
FD(7)	A4 FLTR4 _FLTR4 B4	D(7)
	B3 GND	

IC207
CSPRC032

FA(1)	A5 FLTR1 _FLTR1 B5	A(1)
FLCD_CS1_N	A2 FLTR2 _FLTR2 B2	LCD_CS1_N
FLCD_CS2_N	A4 FLTR3 _FLTR3 B4	LCD_CS2_N
FWE_N	A1 FLTR4 _FLTR4 B1	WE_N
	B3 GND	

FPC CONNECTOR

B+_PA
VREG_MSMP

C233 C234 C231   C232 1000p

CN200

LCD_BOARD_CONNECTOR

Pin	Signal
17	
15	
7	
11	
18	FD(0)
16	FD(1)
22	FD(2)
20	FD(3)
26	FD(4)
24	FD(5)
30	FD(6)
28	FD(7)
3	FLIP_TEMP
6	FLCD_CS1_N
19	FLCD_CS2_N
12	FWE_N
14	FA(1)
27	EAR10P
25	EAR10N
4	LCD_RESOUT_N
1	BRIGHTNESS

R227

C242 C243 C267

AR200   AR201   AR202

Pin	Signal
21	
23	
10	
9	BLUE_LED
13	AMBER_LED
5	WHITE_LED
8	
29	
2	

C249 C250 C251

70

CN200

Brightness
FLIP_TEMP
WHITE_LED
VREG_MSMP
GND
GND
AMBER_LED
B+PA
B+PA
FLCD_CS2_N
GND
GND
EAR10N
EAR10P
GND

1 3 5 7 9 11 13 15 17 19 21 23 25 27 29

CN200

2 4 6 8 10 12 14 16 18 20 22 24 26 28 30

GND
LCD_RESOUT_N
FLCD_SCL_N
GND
GND
FWE_N
FA(1)
FD(1)
FD(0)
FD(3)
FD(2)
FD(5)
FD(4)
FD(7)
FD(6)

BOARD - Ver 3.2

HAPTIC & LED'S Circuit: 13   E310
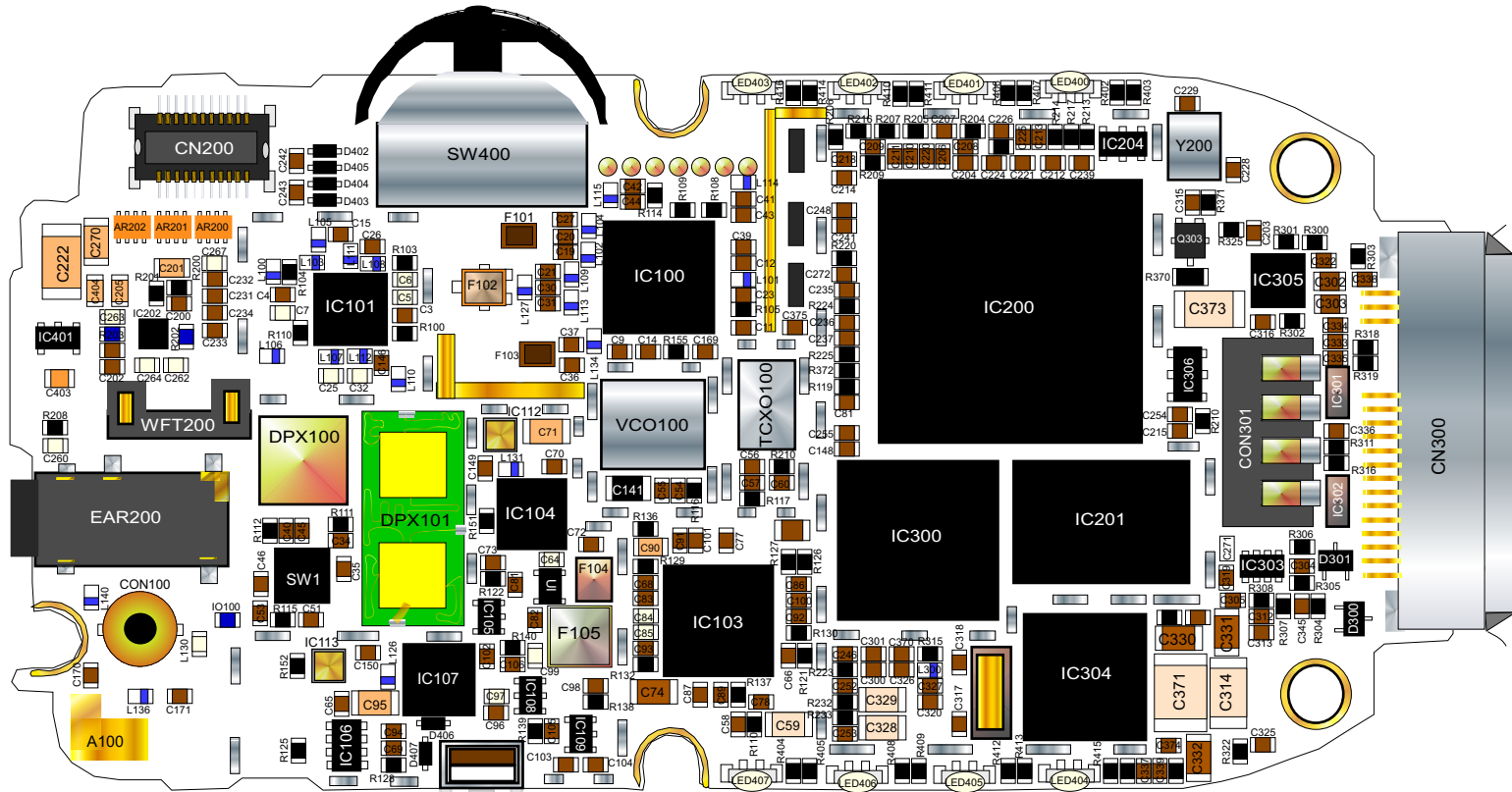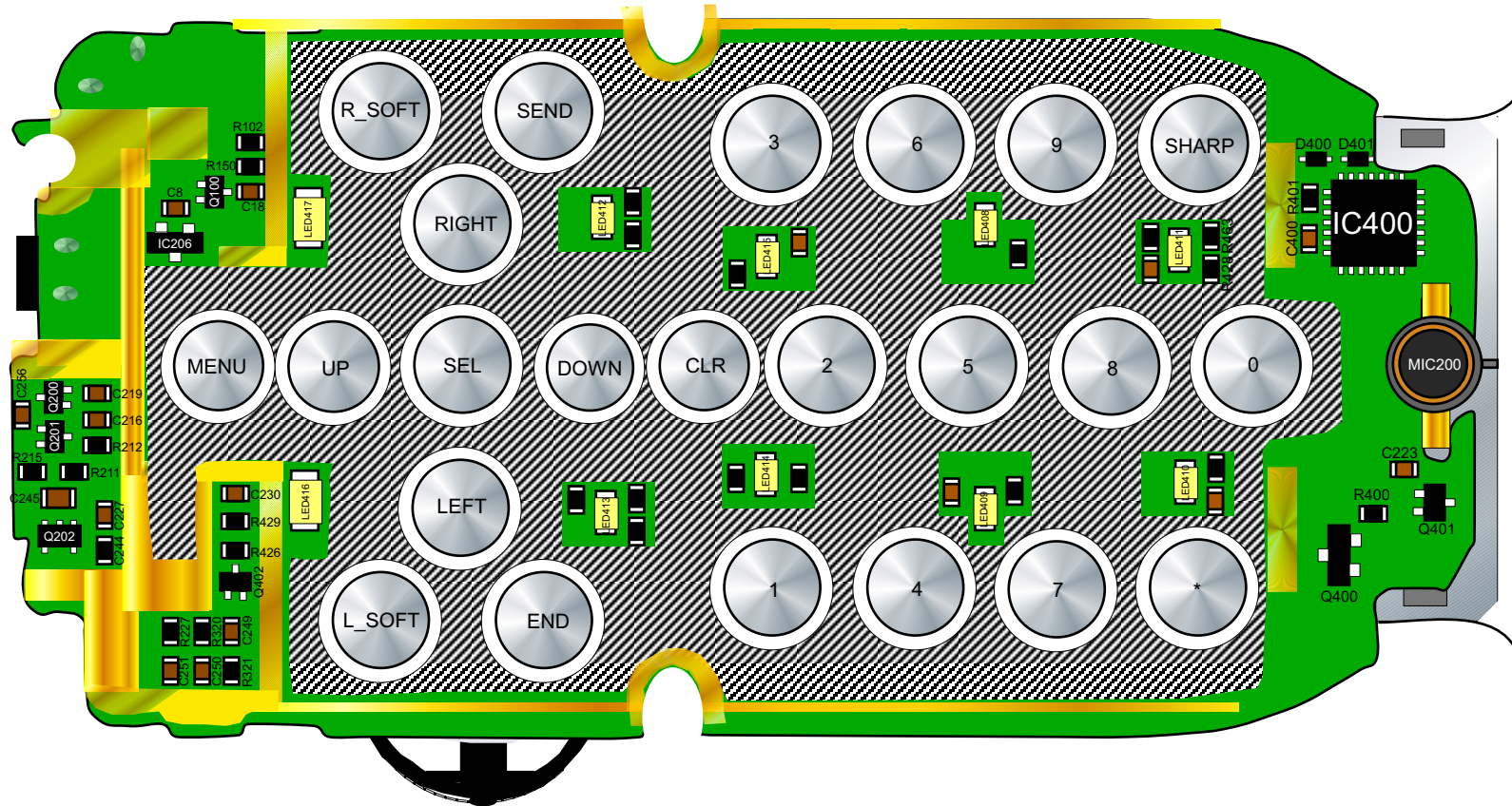

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BOARD - Ver 3.2

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HAPTIC Circuit: 13

E310

72

B+_PA

VREG_LED_CNTL

IC401

VREG_LED

C404

C403

SDA

SCL

D400   D401

VREG_MSMP

VREG_LED

R401

C400

IC400

18 17 16 15 14 13
19   12
20   11
21   10
22   9
23   8
24   7
  1 2 3 4 5 6

LED403 R416 R414 LED402 LED401 LED400 R402 R403

R410 R411   R406 R407

LED407 LED406 LED405 LED404 R417
R404 R405 R408 R409 R412 R413 R415

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BOARD - Ver 3.2

LED'S Circuit: 14

E310

From:Q402
KEYPAD_BRIGHT

VREG_LED
From:PM

LED417
LED416

LED412
R422 R427

LED415 R425 C410

LED408 R418

LED413 R430 R431

LED414 R424 R432

C240 LED409 R419

LED411 R428 R463
C247 R421

LED410 R420 C238

IC400

MIC200

BOARD - Ver 3.2

Signal Flow

Legend:
- TX 800
- RX 800
- RX GPS
- RX PCS
- TX CPS
- UHF_LO
- UHF_LO_BUFF
- REF_OSC

Signal labels:
- RX_Q_M
- RX_Q_P
- RX_I_M
- RX_I_P
- TX_Q
- TX_QN
- TX_I
- TX_IN
- TX_PCS_LOW
- TX_PCS_HI
- VREG_TCXO
- VREG_RF_TX
- VREG_SYNT
- VREG_RF_RX
- VREG_MSMC
- VREG_MSMA
- VREG_MSMP

Major components:
- CN200
- SW400
- IC100 RFR6000
- IC200 MSM
- IC204
- Y200
- IC305
- IC306
- CON301
- IC301
- IC302
- IC303
- IC304 PM
- IC300 HARNESS
- IC201 EPROM
- CN300
- C222
- C270
- RFL6000 IC101
- F101
- F102
- F103
- F104
- F105
- VCO100
- TCXO100
- PA IC104
- PA IC107
- IC103 RFT6100
- DPX100
- SW1
- IC113
- IC106
- IC105
- IC112
- EAR200
- CON100
- WFT200
- IC401
- A100
- AR200, AR201, AR202
- Q303
- PCS_SEL
- CDMA_SEL
- TRK_LO_ADJ
- VREG_TCXO
- RX / TX / ANT (DPX100)
- ED400, ED401, ED402, ED403, ED406, ED407
- LED400, LED401, LED402, LED404, LED405, LED406
- IO100
- D300, D301, D402, D403, D404, D405, D406, D407

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BOARD - Ver 3.2

RX

PCS
Channel 650 (1962.5)
Amplitude -50dbm
LNA "0" (HI)

CDMA
Channel 350 (880.5)
AmplitudeI -50dbm
LNA "0" (HI)

AMPS
Channel 350 (880.5)
Amplitude -50dbm
LNA "0" (HI)

aGPS
Freq (1575.42Mhz)
Amplitude -50dbm

TX

PCS
Channel 650 (1882.5)
Ref Level -20dbm
TX AGC Level 237 (RadioCOmm)

CDMA
Channel 350 (835.5)
Ref Level -20dbm
TX AGC Level 237 (RadioComm)

AMPS
Channel 350 (835.5)
Ref Level -20dbm
Pwr Level #3

RX LO 800 =1761.1Mhz
RX LO 1900 = 1744.4

TX VCO =457.2Mhz (800)
527.2Mhz (PCS)

Ref Osc =19.2 Mhz

RX_I & Q
4.2V p-p

RX
-43
-41 SW400

RX
-45
-

RX
-62
-

RX
-60
-55

TCXO 19.2Mhz
-36

LO
-34
-36

TX
- 4
- 4

TX
- 4
- 4

3.87V

DPX100

DPX101

WF1200

EAR200

CN200

CON100

A100

SW1

IC100
RFR6000

IC103
RFT6100

IC305

CON301

CN300   75

TX
- 4
- 4
- 4

RX
-55
-55
-59
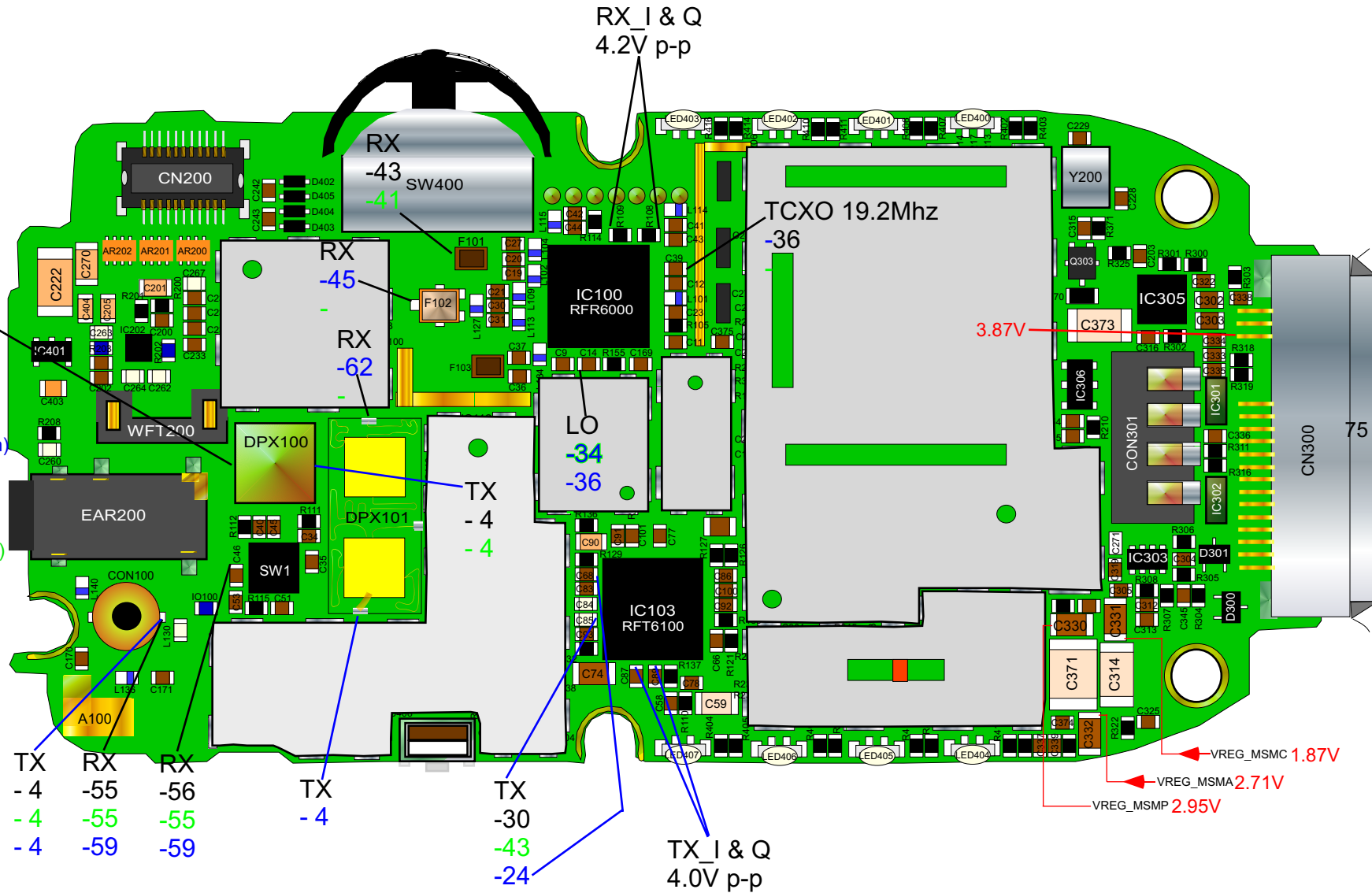
RX
-56
-55
-59

TX
- 4

TX
-30
-43
-24

TX_I & Q
4.0V p-p

VREG_MSMC 1.87V
VREG_MSMA 2.71V
VREG_MSMP 2.95V

BOARD - Ver 3.2

E310

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BOARD - Ver 3.2

E310

BOARD - Ver 3.2

Exploded View Diagram
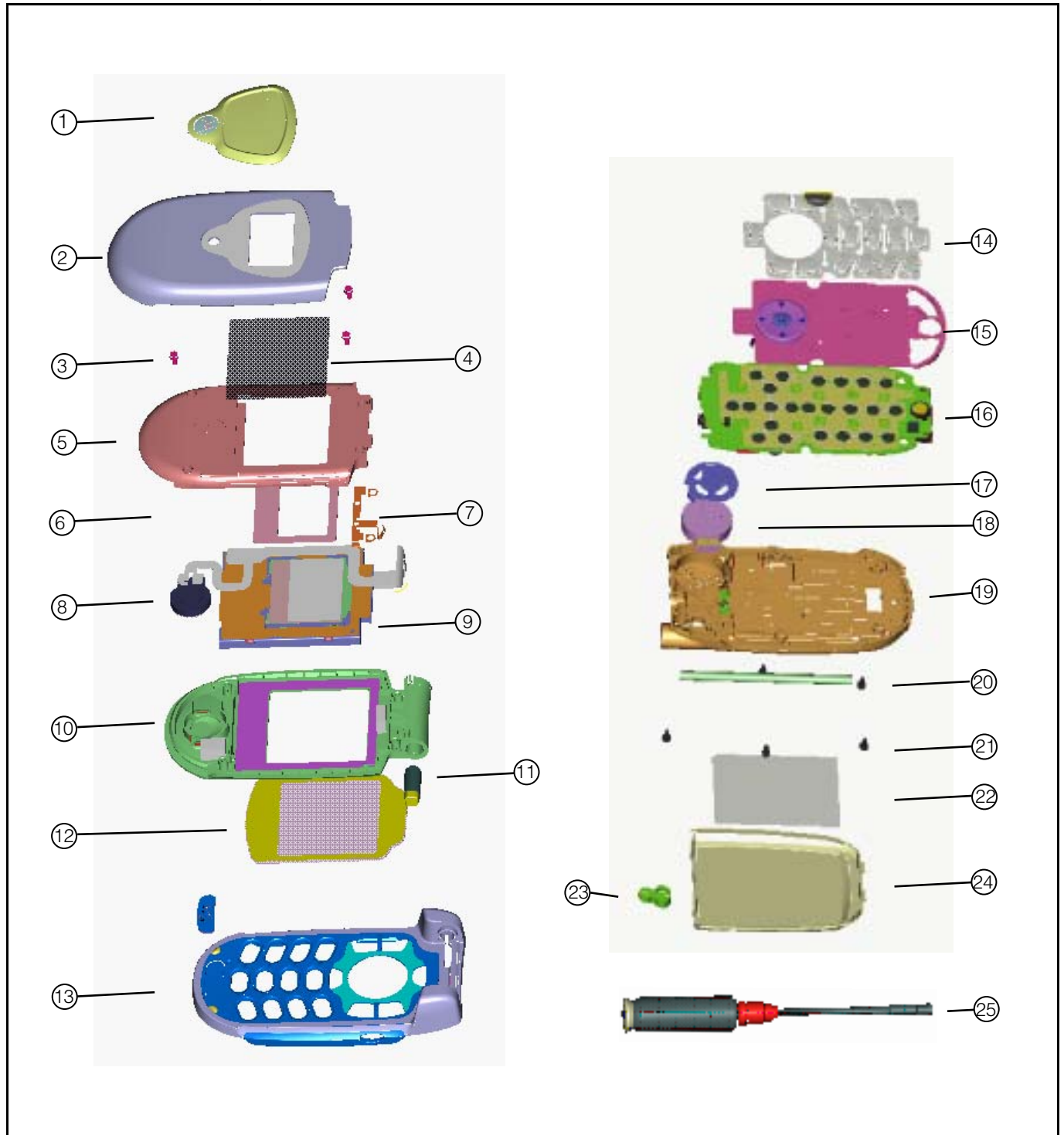
Figure 20. Exploded View

Exploded View Parts List

Table 3. Exploded View Parts List

Item Number	Part Number	Description	Item Number	Part Number	Description
1	61-15000-11	Flip external window	14	37-15000-01	Keypad assembly
2	01-15013-11	Flip cover	15	-	Navigation keypad assembly
3	-	Flip housing screw x4	16	84-15004-01	Main PCB assembly
4	61-15000-11	CLI Lens?	17	-	Speaker cover
5	01-15013-01	Flip cover housing	18	50-01850-01	Polyphonic Speaker
6			19	01-15012-01	Base housing rear
7	-	Display retainer bracket	20	37-44000-01	Antenna tube
8	-	Display flex w/ speaker	21	-	Base housing screw x4
9	72-51689-01	Display module assembly	22	SNN5588	Battery
10	01-15013-21	Flip rear housing assembly	23	-	RF grommet
11	-	Hinge assembly	24	15-15014-21	Battery cover
12	61-15000-01	Main Display lens	25	85-15000-01	Antenna assembly
13	01-15011-31	Base front housing			

There is a danger of explosion if the Lithium Ion battery pack is replaced incorrectly. Replace only with the same type of battery or equivalent as recommended by the battery manufacturer. Dispose of used batteries according to the manufacturer's instructions.

Accessories

Table 4. Accessories

Description	Part Number
Battery - Lithium 750 mAh Battery - Lithium 1100 mAh	SNN5588 SNN5595
Rapid Universal Travel Charger Mid-Rate Wall Charger Linear Wall Charger	SPN4716B SPN4940C SPN4992A
Desktop Charger Base	SPN5019A
Rapid Vehicle Power Adapter	SYN7818A
Easy-Install HF Kit Universal	SYN8597B
Pro-Install car kit USB	S9609B

Table 4. Accessories (Continued)

Description	Part Number
Silver Headset Next Gen. Retractable Headset Boom Headset Retractable Headset Headset w/ Send/End Button FM Stereo Headset	AAYN4264 SYN9050 SYN8908 SYN8284 SYN8419 SYN8609B
Belt Clip Leather Case	SHN7175 SYN9171
Battery 1000 mAh, Silver	SHN8061
USB Cable + CDROM (Connectivity Software) RS232 Cable + Smart Cable Head + CDROM (Connectivity Software) RS232 Cable + Head + Palm III/V Cables + CDROM (Connectivity Software) MP-3 Player	S8951 S8952 S8953 S9117
Clip-on Speaker	SPN5028

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