MOTOROLA
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Detailed Service Manual

Detailed Test Procedures

i897

Digital Multi-Service, Data-Capable Portable

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iDEN

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APRIL 2010

Manual Revisions

Changes that occur after this manual is printed are described in the Field Manual Revisions (FMRs). The FMRs provide the most current instructions and component information.

Copyright Information

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SAFETY AND GENERAL INFORMATION

This section contains important information on the safe and efficient operation of your mobile device. Read this information before using your integrated multi-service portable radio.*

Exposure to Radio Frequency (RF) Energy

Your phone contains a transmiter and receiver. When it is ON, it receives and transmits RF energy. When you communicate with your phone, the system handling your call controls the power level at which your phone transmits. Your Motorola phone is designed to comply with local regulatory requirements in your country concerning exposure of human beings to RF energy.

Portable Radio Product Operation and EME Exposure

Your Motorola radio product is designed to comply with the following national and international standards and guidelines regarding exposure of human beings to radio frequency electromagnetic energy (EME):

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR part 2 sub-part J.
- American National Standards Institute (ANSI) / Institute of Electrical and Electronics Engineers (IEEE). C95. 1-1992.
- Institute of Electrical and Electronics Engineers (IEEE). C95. 1-2005 Edition.*
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998.
- Ministry of Health (Canada). Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999.
- Australian Communications Authority Radio communications (Electromagnetic Radiation - Human Exposure) Standard 2003.
- ANATEL, Brazil Regulatory Authority, Resolution 303 (July 2, 2002) "Regulation of the limitation of exposure to electrical, magnetic, and electromagnetic fields in the radio frequency range between 9 kHz and 300 GHz." "Attachment to Resolution 303 from July 2, 2002.

* The information provided in this document supersedes the general safety information in user's guides published prior to May 1, 2006

Operational Precautions

To assure optimal radio product performance and to be sure that human exposure to RF does not exceed the guidelines set forth in the relevant standards, always follow these instructions and precautions :

Two-way radio operation

Your radio product has been designed and tested to comply with national and international standards and guidelines regarding human exposure to RF electromagnetic energy, when operated in the two-way mode (at the face, or at the abdomen when using an audio accessory) at usage factors of up to 50% talk/50% listen.
Transmit no more than the rated duty factor of 50% of the time. To transmit (talk), push the Walkie-Talkie (WT) button. To receive calls, release the WT button. Transmitting 50% of the time or less, is important because this radio generates measurable RF energy only when transmitting (in terms of measuring for standards compliance).

When using your radio product as a traditional two-way radio, hold the radio product in a vertical position with the microphone one to two inches (2.5 to 5 cm) away from the lips.

Product Operation

When placing or receiving a phone call, hold your radio product as you would a wire line telephone. Speak directly into the microphone.

If you wear a radio product on your body when transmitting, always place the radio product in a Motorola approved clip, holder, holster, case or body harness. If you do not use a body-worn accessory supplied or approved by Motorola and are not using the radio product in the intended use positions along side the head in the phone mode or in front of the face in the two-way radio mode—or if you hang your device from a lanyard around your neck—keep the device at least 2.5 centimeters (1 inch) from your body when transmitting.

ALL MODELS WITH FCC ID IHDT56KQ1 MEET THE GOVERNMENT'S REQUIREMENTS FOR EXPOSURE TO RADIO WAVES.

Your wireless phone is a radio transmitter and receiver. It is designed and manufactured not to exceed the emission limits for exposure to radiofrequency (RF) energy set by the Federal Communications Commission of the U.S. Government. These limits are part of comprehensive guidelines and establish permitted levels of RF energy for the general population. The guidelines are based on standards that were developed by independent scientific organizations through periodic and thorough evaluation of scientific studies. The standards include a substantial safety margin designed to assure the safety of all persons, regardless of age and health.

The exposure standard for wireless mobile phones employs a unit of measurement known as the Specific Absorption Rate, or SAR. The SAR limit set by the FCC is 1.6W/kg.[1] Tests for SAR are conducted using standard operating positions reviewed by the FCC with the phone transmitting at its highest certified power level in all tested frequency bands. Although the SAR is determined at the highest certified power level, the actual SAR level of the phone while operating can be well below the maximum value. This is because the phone is designed to operate at multiple power levels so as to use only the power required to reach the network. In general, the closer you are to a wireless base station antenna, the lower the power output.

Before a phone model is available for sale to the public, it must be tested and certified to the FCC that is does not exceed the limit established by the government-adopted requirement for safe exposure. The tests are performed in positions and locations (e.g., at the ear and worn on the body) as required by the FCC for each model. The highest SAR value for this model phone when tested for use at the ear is 0.32 W/kg and when tested on the body, as described in this user guide, is 0.45 W/kg during packet data transmission. (Body-worn measurements differ among phone models, depending upon available accessories and FCC requirements.)[2]

While there may be differences between the SAR levels of various phones and at various positions, they all meet the government requirement for safe exposure.

The FCC has granted an Equipment Authorization for this model phone with all reported SAR levels evaluated as in compliance with the FCC RF exposure guidelines. SAR information on this model phone is on file with the FCC and can be found under the Display Grant section of http://www.fcc.gov/oet/fccid after searching on FCC ID IHDT56KQ1.

Additional information on Specific Absorption Rates (SAR) can be found on the Cellular Telecommunications Industry Association (CTIA) web-site at http://www.wow-com.com.

1 In the United States and Canada, the SAR limit for mobile phones used by the public is 1.6 watts/kg (W/kg) averaged over one gram of tissue. The standard incorporates a substantial margin of safety to give additional protection for the public and to account for any variations in measurements.
2 The SAR information reported to the FCC includes the FCC-accepted Motorola testing protocol, assessment procedure, and measurement uncertainty range for this product.

Approved Accessories

For a list of approved Motorola accessories call 1 -800-453-0920, or visit our website at www.motorola.com/iden.

RF Energy Interference/Compatibility

Nearly every electronic device is subject to RF energy interference from external sources if inadequately shielded, designed or otherwise configured for RF energy compatibility. In some circumstances your handset may cause interference with other devices.

Follow Instructions to Avoid Interference Problems

Turn OFF your radio product where posted notices instruct you to do so.

In an aircraft, turn off your radio product whenever instructed to do so by airline staff. If your radio product offers an airplane mode or similar feature, consult airline staff about using it in flight.

Implantable Medical Devices

If you have an implantable medical devices, such as a pacemaker or defibrillator, consult your physician before using this radio product.
Persons with implantable medical devices should observe the following precautions:

- ALWAYS keep the phone more than 20 centimeters (8 inches) from the implantable medical device when the phone is turned ON.
- DO NOT carry the phone in a breast pocket;
- Use the ear opposite the implantable medical device to minimize the potential for interference.
- Turn OFF the phone immediately if you have any reason to suspect that the interference is taking place.

Read and follow the directions from the manufacturer of your implantable medical device. If you have any questions about using your wireless phone with your implantable medical device, consult your health care provider

Hearing Aids

Some mobile devices may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer or physician to discuss alternatives.

Other Medical Devices and Health Care Facilities

If you use any other personal medical devices, consult your physician or the manufacturer or your device to determine if it is adequately shielded from RF energy. Turn off your radio product when instructed to do so in hospitals or health care facilities that may be using equipment that is sensitive to external RF energy.

Driving Precautions

Check the laws and regulations on the use of radio products in the area where you drive. Always obey them.
When using your radio product while driving, please:

- Give full attention to driving and to the road. Using a mobile device may be distracting. Discontinue a call if you can't concentrate on driving.
- Use hands free operation, if available.
- Pull off the road and park before making or answering a call if driving conditions so require.

- Do not place a handset in the airbag deployment area.

Responsible driving practices can be found in the "Smart Practices While Driving" section at the end of this guide and/or at the Motorola Web site: www.motorola.com/callsmart.

Note: The use of wireless phones while driving may cause distraction. Discontinue a call if you can't concentrate on driving. Additionally, the use of wireless devices and their accessories may be prohibited or restricted in certain areas. Always obey the laws and regulations on the use of these products.

Operational Warnings

Obey all posted signs when using mobile devices in public areas.

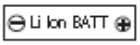
Potentially Explosive Atmospheres

Areas with potentially explosive atmospheres are often but not always posted, and can include fueling areas such as below decks on boats, fuel or chemical transfer or storage facilities, or areas where the air contains chemicals or particles, such as grain, dust or metal powders.
When you are in such area, turn off your handset, and do not remove, install, or charge batteries unless it is a radio product type especially qualified for use in such areas as "Intrinsically Safe" (for example, Factory Mutual, CSA, or UL approved). In such areas, sparks can occur and cause an explosion or fire

Batteries and Chargers

Caution: Improper treatment or use of batteries may present a danger of fire, explosion, leakage, or other hazard. For more information, see the "Battery Use and Battery Safety" section in this user's guide.

Your battery, charger, or portable radio may contain symbols, defined as follows:

Symbol	Definition
	Important safety information follows.
	Do not dispose of your battery or mobile device in a fire.
	Your battery or mobile device may require recycling in accordance with local laws. Contact your local regulatory authorities for more information.
	Do not throw your battery or mobile device in the trash.
	Your mobile device an internal lithium ion battery
	Do not let your battery, charger, or mobile device get wet.
	Listening at full volume to music or voice through a headset may damage your hearing

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Choking Hazards

Your portable radio or its accessories may include detachable parts, which may present a choking hazard to small children. Keep your device and its accessories away from small children.

Glass Parts

Some parts of your mobile device may be made of glass. This glass could break if the product is dropped on a hard surface or receives a substantial impact. If glass breaks, do not touch or attempt to remove. Stop using your mobile device until the glass is replaced by a qualified service center.

Seizures/Blackouts

Some people may be susceptible to epileptic seizures or blackouts when exposed to flashing lights, such as when playing video games. These may occur even if a person has never had a previous seizure or blackout

If you have experienced seizures or blackouts, or if you have a family history of such occurrences, please consult with your physician before playing video games or enabling a flashing-lights feature (if available) on your mobile device. Discontinue use and consult a physician if any of the following symptoms occur: convulsion, eye or muscle twitching, loss of awareness, involuntary movements, or disorientation. It is always a good idea to hold the screen away from your eyes, leave the lights on in the room, take a 15-minute break every hour, and stop use if you are very tired.

Caution About High Volume Usage

Listening at full volume to music or voice through a headset may damage your hearing.

Repetitive Motion

When you repetitively perform actions such as pressing keys or entering finger-written characters, you may experience occasional discomfort in your hands, arms, shoulders, neck, or other parts of your body. If you continue to have discomfort during or after such use, stop use and see a physician.

Service & Repairs

If you have questions or need assistance, we're here to help.

Go to www.motorola.com/iden/support, where you can select from a number of customer care options. You can also contact the Motorola Customer Support Center at 1 -800-453-0920 (United States), 1-877-483-2840 (TTY/TDD United States for hearing impaired)

Battery Use & Battery Safety

- **Motorola recommends you always use Motorola-branded batteries and chargers.** The warranty does not cover damage caused by non-Motorola batteries and/or chargers. **Caution:** Use of an unqualified battery or charger may present a risk of fire, explosion, leakage, or other hazard. Improper battery use, or use of a damaged battery, may result in a fire, explosion, or other hazard.
- Battery usage by children should be supervised.
- **Important:** Motorola mobile devices are designed to work best with qualified batteries. If you see a message on your display such as Invalid Battery or Unable to Charge, take the following steps:
  - Remove the battery and inspect it to confirm that it bears a Motorola "Original Equipment" hologram;
  - If there is no hologram, the battery is not a qualified battery;
  - If there is a hologram, replace the battery and retry charging it;
  - If the message remains, contact a Motorola Authorized Service Center.
  - New batteries or batteries stored for a long time may take more time to charge.

Charging precautions: When charging your battery, keep it near room temperature. Never expose batteries to temperatures below 0°C (32°F) or above 45°C (113°F) when charging. Always take your mobile device with you when you leave your vehicle

- When storing your battery, keep it in a cool, dry place.
- It is normal over time for battery life to decrease, and for the battery to exhibit shorter runtime between charges or require more frequent or longer charging times.
- **Avoid damage to battery and mobile device.** Do not disassemble, open, crush, bend, deform, puncture, shred, or submerge the battery or mobile device. Avoid dropping the battery or mobile device, especially on a hard surface. If your battery or mobile device has been subjected to such damage, take it to a Motorola Authorized Service Center before using. Do **not** attempt to dry it with an appliance or heat source, such as a hair dryer or microwave oven.
- **Use care when handling a charged battery**—particularly when placing it inside a pocket, purse, or other container with metal objects. Contact with metal objects (e.g., jewelry, keys, beaded chains) could complete an electrical circuit (short circuit), causing the battery to become very hot, which could cause damage or injury.

Promptly dispose of used batteries in accordance with local regulation

Contact your local recycling center for proper battery disposal.

Warning: Never dispose of batteries in a fire because they may explode.

MODEL INFORMATION

This manual applies to the following *i*DEN ***i897*** Digital Portable models:

H75XAH6JS5AN 806-940 MHz, Multi-Service, Data-Capable Portable

MODEL NUMBERING SYSTEM

Typical Model Number: H 7 5 X A H 6 J S 5 A N

Position: 1 2 3 4 5 6 7 8 9 10 11 12

Position 1 - Type of Unit

H = Hand-Held Portable
M = Mobile Product

Positions 2 and 3 - Model Series

01 = i365
02 = i776
23 = i9
40 = i85s/i55sr/i50sx Products
41 = i90c Products
45 = i265 Products
48 = i80s Products
56 = i30sx/i30s Products
57 = i95cl Products
58 = i88s/i58sr Products
59 = i60c Products
62 = i205/i305 Products
63 = i530/i730/i710 Products
68 = i325pro Products
69 = i31 5plus Products
73 = i860 Products
74 = i830 Products
75 = i285 / i890 / i897 Products
72 = i930 Products
85 = i870 Products ;
83 = i580 Products ;
92 = i9 Products
94 = i880/i885 Products

Position 4 - Frequency Band

U = 806 to 870 MHz
X = 806 to 941 MHz
*Values given represent range only;
they are not absolute.

Position 5 - Power Level

A = 0 to 0.7 Watts
B = 0.7 to 0.9 Watts
C = 1.0 to 3.9 Watts
D = 4.0 to 5.0 Watts
E = 5.1 to 6.0 Watts
F = 6.1 to 10.0 Watts

Position 6 - Physical Packages

F = Limited Keypad - With Display
H = Full Keypad - With Display
N = Enhanced Controls - Enhanced Display

Position 7 - Channel Spacing

1 = 5 kHz
2 = 6.25 kHz
3 = 10 kHz
4 = 12.5 kHz
5 = 15 kHz
6 = 25 kHz
7 = 30 kHz
9 = Variable Programmable

Position 8 - Primary

N = Digital Dispatch
Q = Low Profile - Basic Display
R = Digital Multi-Service
J = TDMA Digital Dual Mode

Position 9 - Primary System

R = iDEN Shared

Position 10 - Feature level

1 = Basic
2 = Limited Pkg
3 = Limited Plus
4 = Intermediate
5 = Standard Pkg
6 = Standard Plus
7 = Expanded Pkg
8 = Expanded Plus
9 = Full Feature Programmable

Position 11 - Version

Version Letter (Alpha)
Major Change

Position 12 - Unique

Model Variations
N = Standard Package

MODEL SPECIFICATIONS

GENERAL		RECEIVER		TRANMITTER	
FCC Designation:	IHDT56KQ1	Receiver Type	Direct Conversion	Transmitter Type	Single Conversion
Operational Modes	Phone	Frequency Range	851-870 MHz	Frequency Range	806-825 MHz
	Private		935-940 MHz		896-901 MHz
	Group				
	Circuit Data				
	Packet Data				
Temperature Range		Channel Spacing:		Emission Designator	18K3D7W
Operating	–10°C to –60°C	iDEN	25kHz		
Storage (w/o battery)	–40°C to +85°C				
		Frequency Stability		Modulation Type	Quad 16QAM
Battery Type	Lithium Ion	Referenced to base			Quad 64QAM
		station	0.4 ppm		Quad QPSK
Recommended		Sensitivity (10%)BER		Frequency Stability:	
Battery		(M-16 QAM)	-111 dBm	Referenced to base	
Standard Battery	SNN5823			Station	0.4 ppm
				Spurious Emissions:	
Battery Voltage		Spurious Response		Conducted	-13 dBm
Nominal	3.7 Vdc	Immunity:	-51 dBm	Radiated	-13 dBm
Range	3.0 to 4. 2 Vdc				
Dimensions (HxWxD)		Spurious Radiation		RF Pulse Avg Power:	
	100.0 x 52.5	Above 960 MHz	<500µV/m	iDEN (dynamically	
w/Standard Battery	x 18.0 mm	216–960 MHz	<200µV/m	adjusted)	-6 to +28 dBm
		88–216 MHz	<150µV/m		
		30–88 MHz	<100µV/m		
Weight:		Audio Output Power		Adjacent Channel	
With standard battery	125.0 g	&Speakerphone Rating		Power	
		(Private and Group		iDEN (at ±25 kHz in	-55 dB
		Modes only) into		18 kHz BW)	
Volume	67.0 cc	8 ohms at maximum			
		volume (nominal			
		battery voltage)	500mW		
		Distortion at Rated			
		Audio:			
		Electrical Acoustical	5% Max		
		Acoustical	10% Max		

All Specifications +/- 5%

PREFACE

The i897 is *Digital Multi-Service, Data-Capable Portable Field Service Manual* contains the information necessary to identify and fix problems in the Motorola i897 is Digital Portable. This unit is based on digital technology and is designed to operate on *i*DEN systems.

Basic and field-level service for this unit as described in this manual includes troubleshooting, testing, board swapping, and maintenance.

Service for this unit is based on the substitution method: a faulty part is replaced by a working one, providing quicker service to the customer. For example, if the battery is faulty, it is replaced. If the unit requires more complete testing or service than is available at the basic level, it is sent to the field-level service facility, serviced, and returned to the *i*DEN Customer Care Center (ICC).

NOTE: Before operating or testing this unit, please read the **Safety and General Information** section in the front of this manual.

Who Should Use This Manual

This manual is intended for service technicians who should be familiar with the test equipment recommended in Appendix A. To help pinpoint basic problems with the unit, first perform the mechanical checks and self tests as described in Chapter 5; then proceed to field level troubleshooting and testing.

How This Manual Is Organized

This manual contains the following chapters and appendices:

Chapter 1 presents the theory and technology used by the iDEN system and unit.

Chapter 2 describes how to prepare test equipment setups for the iDEN system and how to operate the test equipment. It also contains disassembly and reassembly instructions.

Chapter 3 describes the troubleshooting procedures.

Chapter 4 contains the component board layouts, schematic diagrams and component lists.

Appendix A Provides information on ordering kits and replacement parts. It also contains lists of recommended test equipment.

Conventions Used in This Manual

The following conventions are used throughout this manual:

italics	Used for emphasis and new terms
bold	Defines menu items, fields, and buttons
c o d e	Used for sample input and output

Related Publications

The following publications are available separately:

R-2660 Digital Communications System Analyzer Operator's Manual **68P80386B72**

*i*DEN *i897 Digital Multi-Service Data-Capable Phone User's Guide:*

Motorola User Guides	
Carrier	**User Guide**
Mexico	**NTN2603A**
Peru	**NNTN7946A**
Int'l Generic	**NNTN7947A**
Southern Linc	**NNTN7951A**
Israel	**NTN2581A**
Nextel Argentina	**NNTN7946A**
Brazil Retail	**NNTN7948A**
Carrier	**User Guide**
Mexico	**NTN2603A**
Int'l Generic	**NNTN7947A**
Israel	**NTN2581A**
Brazil Retail	**NNTN7948A**

CONTENTS

Chapter 1
SYSTEM OVERVIEW

To achieve a high spectrum efficiency, the *i897* digital multi-service, data-capable portable unit uses a unique modulation technology and sophisticated voice-compression algorithm. The voice of the person speaking into the microphone is converted into a digital bit stream consisting of zeros (0) and ones (1). The stream then is modulated into a radio-frequency (RF) signal, which is transmitted over the air to another unit. This process is called *digital modulation.*

1.1 iDEN Digital Modulation Technology

The *i897* digital portable is a dual band 806-870 MHz and 896-940 MHz unit. It operates in multiple modes: *phone, private, data,* and *group;* and uses three digital modulation technologies: Quad QAM, Quadrature Phase Shift Keying (QPSK), and Time Division Multiple Access (TDMA).

Quadrature Amplitude Modulation (QAM) is a modulation technique that transmits information by altering the amplitude and phase of the radio frequency (RF) signal. Data is converted into complex symbols, which alter the RF signal and transmit the information. When the signal is received, the amplitude and phase are converted back into symbols and then into the original data.

There are three different QAM modes that are used for different applications: *64QAM, 16QAM,* and *4QAM.* In voice applications, 16QAM is used, while in data applications, 64QAM, 16QAM, and 4QAM are used.

NOTE: The 900 MHz band operates only in 16QAM modulation.

In 64QAM, 64 possible combinations of 6 bits are converted into a unique amplitude and phase. In 16QAM, there are 16 possible combinations of 4 bits, while in 4QAM, there are 4 possible combinations of 2 bits.

The traditional 25 kHz channel used for two-way radios is split into four QAM signals (subcarriers) that are transmitted simultaneously. This technique can transmit 64 Kbps in a single 25 kHz channel

The *i*DEN system requires approximately 10 Kbps to transmit a compressed voice; therefore, 64 Kbps can accommodate 6 voice channels or 3 voice channels in enhanced systems.

The signal spectrum of the Quad 16QAM is shown in Figure 1-1

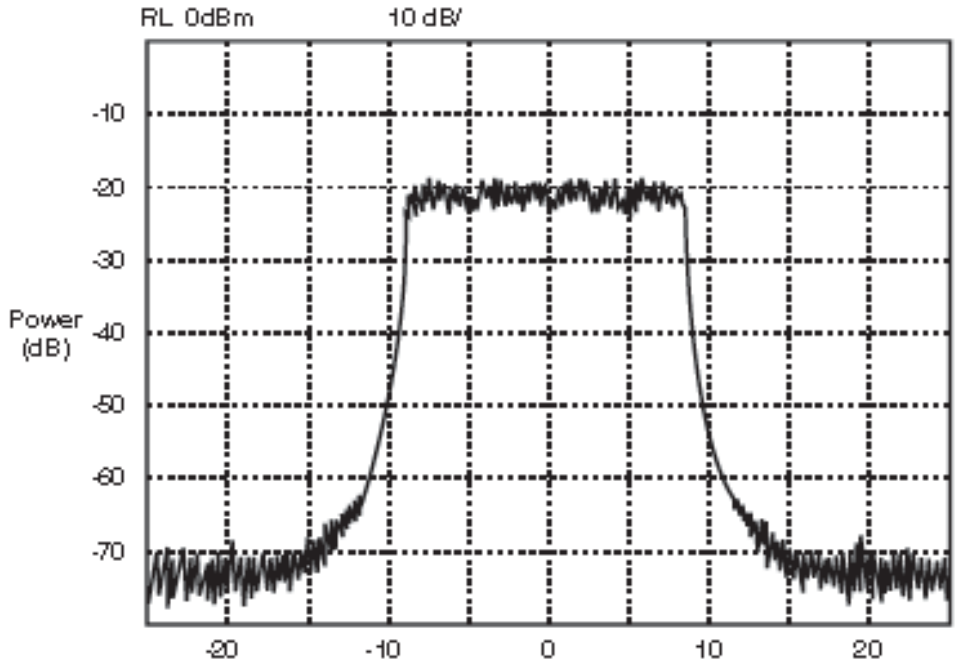


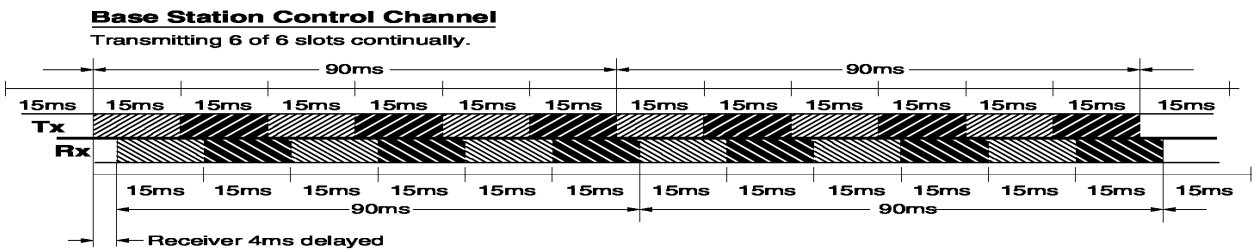
Figure 1-1: Spectrum of iDEN Quad 16QAM

Quadrature Phase Shift Keying (QPSK) is one of the most common modulation techniques for satellite communications. In QPSK, a digital data stream is taken two bits at a time to generate four possible phase states of the transmitted carrier. A characteristic of this technique is its resistance to noise.

Time Division Multiple Access (TDMA) is used to allocate portions of the RF signal by dividing time into 6 slots, one for each unit. Time allocation enables each unit to transmit its voice information without interference from another unit's transmission.

Transmission from a unit or base station is accommodated in time-slot lengths of 15 milliseconds and frame lengths of 90 milliseconds (see Figure 1-2).

Note that **Rx** (outbound) indicates base-to subscriber transmissions; **Tx** (inbound) indicates subscriber-to-base transmissions. The slots are paired and have a fixed offset of 19 milliseconds; their timings are synchronized by the *i*DEN system. The TDMA technique requires sophisticated algorithms and one digital-signal processor (DSP) to perform voice compression/decompression and RF modulation/demodulation



Portable Unit
When turned on, scans for control station, then transmits one slot every six slots.

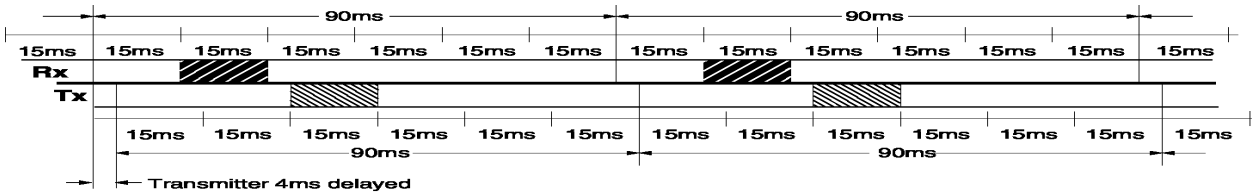


Figure 1 *i*DEN TDMA Format

1.2 iDEN Voice Compression Technology

Voice is converted into a digital bit stream by sampling the voice signal at a high rate and converting the samples into numbers, which are represented by bits. A sample consists of 8 bits. Approximately 8000 samples per second (64 Kbps) are required to maintain a reasonable quality.

Voice compression reduces the number of bits per second while maintaining the voice at an acceptable quality level. The *i*DEN system uses a coding technique called *Vector Sum Excited Linear Prediction (VSELP)* to compress voice to 4.2 or 8.0 Kbps. The compressed voice-data bits modulate the RF signal. The compression rate is based on the type of call (dispatch or interconnect) and the network configuration established by the local service provider.

Adding error-correction bits to the coded-voice bits increases the required RF-transmission bit rate to approximately 7.4 Kbps for the 4.2 Kbps voice coder and 14.8 Kbps for the 8.0 Kbps voice coder.

1.2.1 RF Transmission Bursts

RF transmissions within an *i*DEN system occur in 15 millisecond blocks called bursts. An *i*DEN base station transmits bursts continuously on each RF frequency it uses. Transmission bursts from the stations are synchronized in time by signals received from the global positioning satellite (GPS) system. Each burst is numbered; the number is referred to as the slot number. All bursts occurring at a given time carry the same slot number..

Inbound transmission bursts (sent from the unit) are offset 19 milliseconds from the outbound burst; the inbound burst begins 4 milliseconds after the end of the outbound burst (see Figure 1-2 on page 3). This offset in time allows the unit to appear capable of transmitting and receiving at the same time (it actually is switching rapidly back and forth between receiving and transmitting).

In current iDEN systems, outbound transmissions in the 800 MHz band range from 851-870 MHz; inbound transmissions are 45 MHz lower in frequency. For the 900 MHz band, outbound transmissions range from 935-940 MHz; inbound transmissions are 39 MHz lower in frequency.

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An iDEN channel is created by grouping bursts so that their slot numbers differ by a number referred to as the repetition rate. The *i897* unit uses two repetition rates for interconnect voice calls: 6:1 and 3:1. A single frequency can handle six calls using a 6:1 repetition rate with the 4.2 Kbps coder. Dispatch calls always use this rate. However, the audio quality of the 3:1 repetition rate with the 8.0 Kbps coder is superior to the 6:1 rate with the 4.2 Kbps coder. Most service providers configure the system and unit to allow only the 3:1 rate for interconnect calls.

Calls are set up on a primary control channel (PCCH) in response to a request from a unit or a regular telephone connected to the Public Switch Telephone Network (PSTN). The PCCH is established by the base station equipment; typically, it is a 6:1 channel.

The outbound PCCH carries system information and “pages” to specific subscriber units and asks them to respond if they are available for a call. Inbound PCCH transmissions carry responses to the “pages” and requests by subscriber units to set up calls. Inbound transmissions on the primary control channel only take 7.5 milliseconds and can be timed to occur in either half of a 15-millisecond burst.

The dual band unit will power up in the 800 MHz band and will use these channels for control channels—Primary Control Channel (PCCH) and Broadcast Control Channel (BCCH). The 900 MHz mode will be used only during 3:1 interconnect calls. Every attempt will be made to assign the unit to 900 MHz carriers during new 3:1 interconnect calls, handovers into a cell, and inter-cell handovers. If no resources are available, or if available resources have insufficient channel quality (in the case of a handover), then 800 MHz carriers will be evaluated.

Using the above techniques, the iDEN system can operate six voice channels simultaneously in dispatch mode or 3 voice channels simultaneously in interconnect mode on a single RF carrier at 25 kHz bandwidth

1.2.2 Calling Area Coverage

Area coverage is obtained by dividing the area into a mosaic of cells. Coverage is controlled so that frequencies can be reused with less distance between sites. Each cell is covered by a base station, which is classified as Omni or Sectored. An Omni station connects base transceivers to antennas that have a circular pattern centered at the site. A Sectored station connects base transceivers to directional antennas that point in particular directions. Units that operate in a multi-site system must be able to “hand off” from one coverage area to another as the user moves about during a call. Handoff is controlled by the iDEN system.

In Figure 1-3, the area is divided into several cells, each containing a cell site (base station) operating on a given set of channels, which interfaces radio-telephone subscribers to the switching station.

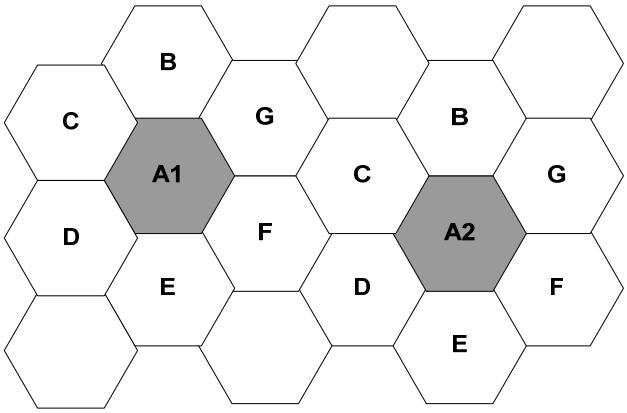


Figure 1-3. Hypothetical iDEN Cell System

The units are capable of operation on any channel in the system. This enables them to operate in any cell. Due to the low power requirements for communications between radio telephones in a particular cell and cell site, operating channels may be repeated in cells that are outside the coverage area of each other.

For example, in Figure 1-3, each letter represents a given frequency. Notice that cells A1 and A2 operate on the same frequency because they are a certain distance apart. Users can simultaneously occupy the same frequency without interfering with each other. This is known as frequency re-use.

The implementation of frequency re-use increases the cell handling capability of the system without increasing the number of available channels. When re-using identical frequencies in a small area, co-channel interference can be a problem. The iDEN system can tolerate higher levels of co-channel interference than analog systems by incorporating digital modulation. This means that cells using identical frequencies can be physically closer than similar cells in analog systems. Therefore, the advantage of frequency re-use can be further enhanced in an iDEN system, enabling greater traffic handling in high-use areas.

Because of TDMA, several calls can share the same carrier. The carrier is divided into a continuous stream of TDMA frames, each of which is split into six time slots (see Figure 1-2 on page 3). When a connection is required, the system allocates the subscriber a dedicated time slot within each TDMA frame. User data (speech or data) for transmission is digitized and sectioned into blocks. The user data blocks are sent as information bursts in the allocated time slot of each TDMA frame. The data blocks are modulated onto the carrier via M16 QAM.

Each unit must be able to move from one cell to another with no detection by the user. The unit itself carries out signal-strength measurements on adjacent cells, and the quality of the traffic channel is measured by both the unit and the base station. The hand-over criteria can be much more accurately determined, and the hand-over made before the channel quality deteriorates to a level that the subscriber can notice.

When a unit is well within a cell, the signal strength measured will be high. As the unit moves toward the edge of the cell, the signal strength and quality measurement decreases.

Signal information provides an indication of the subscriber's distance from the base station. As the unit moves from cell to cell, its control is handed from one base station to another. The change is handled by the unit and the base station, and is completely transparent to the user.

1.2.3 Service Area

Because this is a radio system, there are no exact boundaries that can be drawn on a map. If the unit is outside the coverage area, “No Service” illuminates on the display and calls are unable to be placed or received. If this happens during a conversation, the call will be lost. There also may be small areas within a particular service area in which communications could be lost.

The unit’s identity information is held by its local iDEN system in its Home Location Register (HLR) and Visitor Location Register (VLR). The VLR contains identity information on all local active radio telephones. Should the user roam to another area, the unit’s identity information is sent to the VLR in the new system. The new system will then check the unit's details with the home system for authenticity. If everything is in order, the user will be able to initiate and receive calls while in the new area.

1.3 Radio Architecture Overview

The digital section consists of ZEUS Dual Core Baseband Processor, Host memories (flash and DDR), and the iDEN power management (See Figure 1- 4 below i897 Block Diagram).

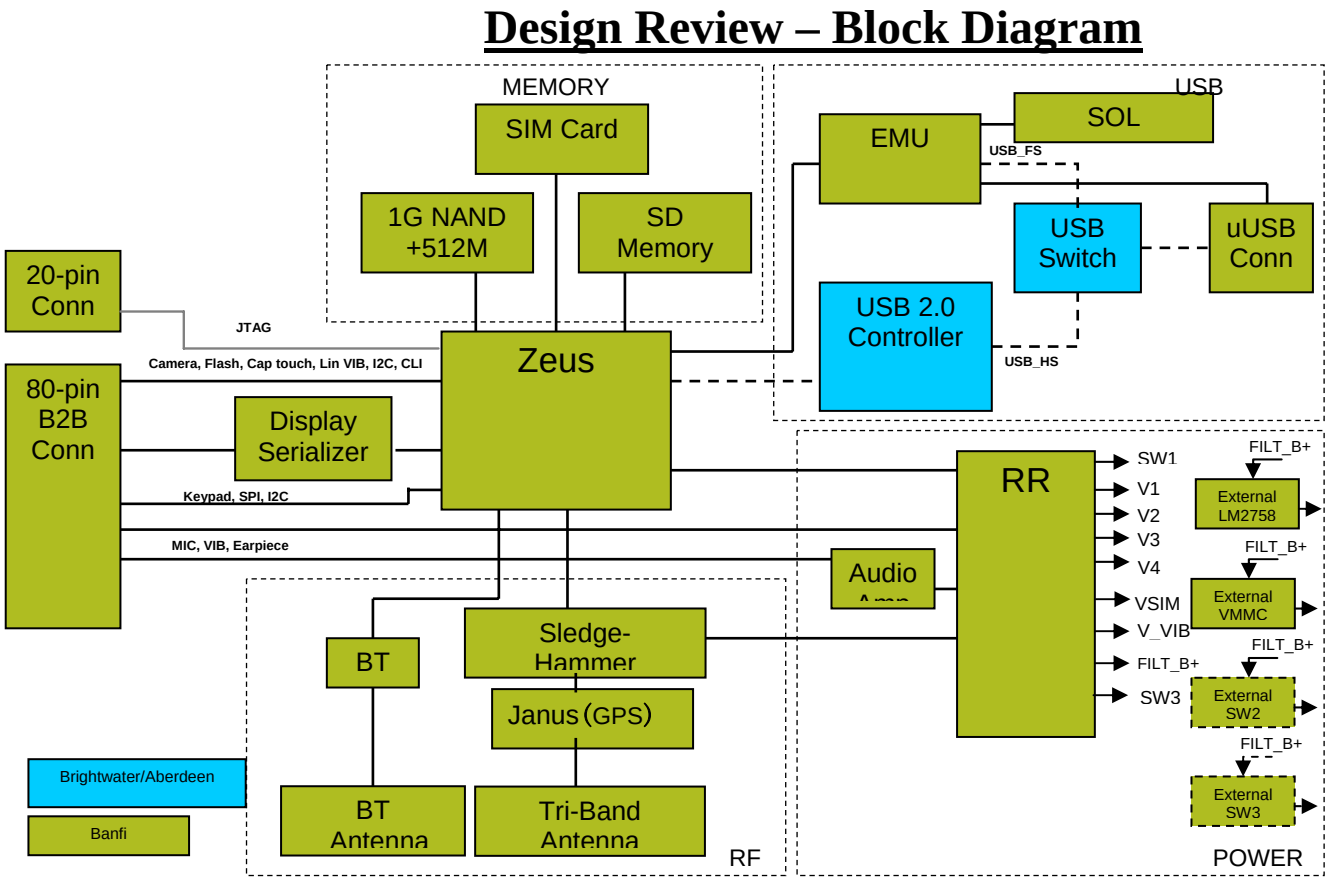


Figure 1-4 i897 Block Diagram

The JANUS front end module contains the RX front end (including switches, SAWs, LNA-Life, and the RX balun), the GPS front end (including the diplexer, SAW, GPS LNA, GPS balun), the TX output stage (including the TX balun, power amplifier, low-pass filter, antenna switch). The main RX VCO module, with all the associated loop filter components, is placed on the radio board.

The SLEDGEHAMMER IC is a multi-band transceiver IC intended to support iDEN and WiDEN protocols. The Sledgehammer IC contains RF and analog baseband paths for iDEN receive and transmit, in addition to a GPS receive RF path. The SLEDGEHAMMER IC also contains two RF synthesizers required to generate local oscillator signals for the iDEN receive and transmit and for GPS receive, as well as an ESCORT loop required to prevent re-modulation of the transmit signal. The SLEDGEHAMMER IC, utilizing a higher level of integration, serves as placement to the TOMAHAWK, Half-Life, GRF2i and JAVELIN ICs. The SLEDGEHAMMER IC is used in conjunction with the Roadrunner IC which will contain the transceiver signal path data converters and digital filtering which were previously parts of TOMAHAWK.

The Roadrunner IC provides the entire radio DC distribution, audio functions, and digital portion of the iDEN transceiver/GPS receiver. The DC distribution will consist of linear and switch mode regulators.

The audio section is composed of microphone amplifiers, speaker amplifiers, a voice codec and a stereo DAC. Previously such functionality was performed with the GCAP/PCAP IC. The receiver ROADRUNNER portion includes circuitry supporting AGC, receiver sequence management, signal path anti-aliasing filters, buffer amplifiers, high dynamic range sigma delta data converters, digital filtering and the RX serial data interface to the baseband processor (previously part of Tomahawk). The TX portion includes circuitry supporting Pulse Shaping FIR, TX DAC, Smoothing filters, PA Gain Control DAC, and the TX serial data interface to the baseband processor (previously part of TOMAHAWK). ROADRUNNER also includes circuitry to support additional features such as GPS AD, USB, RS232, LEDs, etc.

Finally, the baseband processor utilized by i897 is the Zeus Processor.

1.4 Roadrunner Circuitry

The Roadrunner integrated circuit (IC) provides the following:

- DC distribution
- Audio CODEC and amplifiers
- Control logic for power on/off
- A/D converters for monitoring radio thermistors, battery level, LCD calibration, and the Photosensor.
- The Roadrunner IC used is a 223 I/O MAP BGA package.

The i897 unit has the following DC distribution:

- SW1 is a BUCK step-down switching regulator set to 1.2 Vdc at 550 mA. It supplies the Zeus core.
- SW2 is an external BUCK switching regulator set to 1.875Vdc at 600mA..
- SW3 is a BOOST switching regulator set to 5.6 Vdc at 200 mA. It supplies Vusb.
- V1-The V1_LDO (2.775Vdc at 200mA) is used to power the camera, LCD and photo sensor in a Zeus-based platform
- V2 - 2.775 Vdc at 350 mA - will be used to power most of the RF circuits as well as the audio codec and all audio amps.
- SW3 is a BOOST switching regulator set to 5.1Vdc at 200mA.
- V4 supplies 2.775 Vdc at 50 mA to the Thermistor Bias (Battery, Board ID) TCXO.
- V_VIB (3Vdc at 200mA) is used as enable for vibrator alert mode. LM2758 (external LED driver) supplies the vibrator
- External VMMC supplies 2.8Vdc at 200mA for Zeus (Z_VDD_SD) and SD card.
- VSIM supplies 3.0 Vdc at 15 mA to the SIM card
- VHOLD - 1.875 Vdc
- VCO Superfilter is used for the transceiver VCO's. The SF_OUT supply is intended as the power supply for the external VCO and the integrated Escort VCO on Sledgehammer. The input for the VCO superfilter is V2.

The battery supplies Raw_B+ and Filtered_B+. RAW_B+ supplies the RF PA. Filtered_B+ directly supplies Roadrunner and most of its regulators.

The unit operates with a low-level battery voltage of 3.0 Vdc, nominal-level voltage of 3.7 Vdc, and high-level voltage of 4.2 Vdc.

Figure 1-5 illustrates the DC power distribution in the i897 unit. The

Roadrunner IC has the following features:

- Analog/digital portions of a real-time clock (RTC)
- Battery charger
- 14-channel, 10-bit A/D converter
- Control logic
- Audio CODEC with serial interface
- Transducer amplifier
- Speaker amplifier (Hi Audio 0.5 watt into 8-ohm speaker)
- Alert amplifier
- Two amplifiers for (internal and external) microphone.
- Auxiliary amplifier
- SIM card level shifters
- RS232 and USB support
- Internal PMOS pass devices
- Serial peripheral interface (SPI) read/write interface
- Battery feedback switch
- LED Controller

Figure 1-5 illustrates the DC power distribution in the i897 unit.

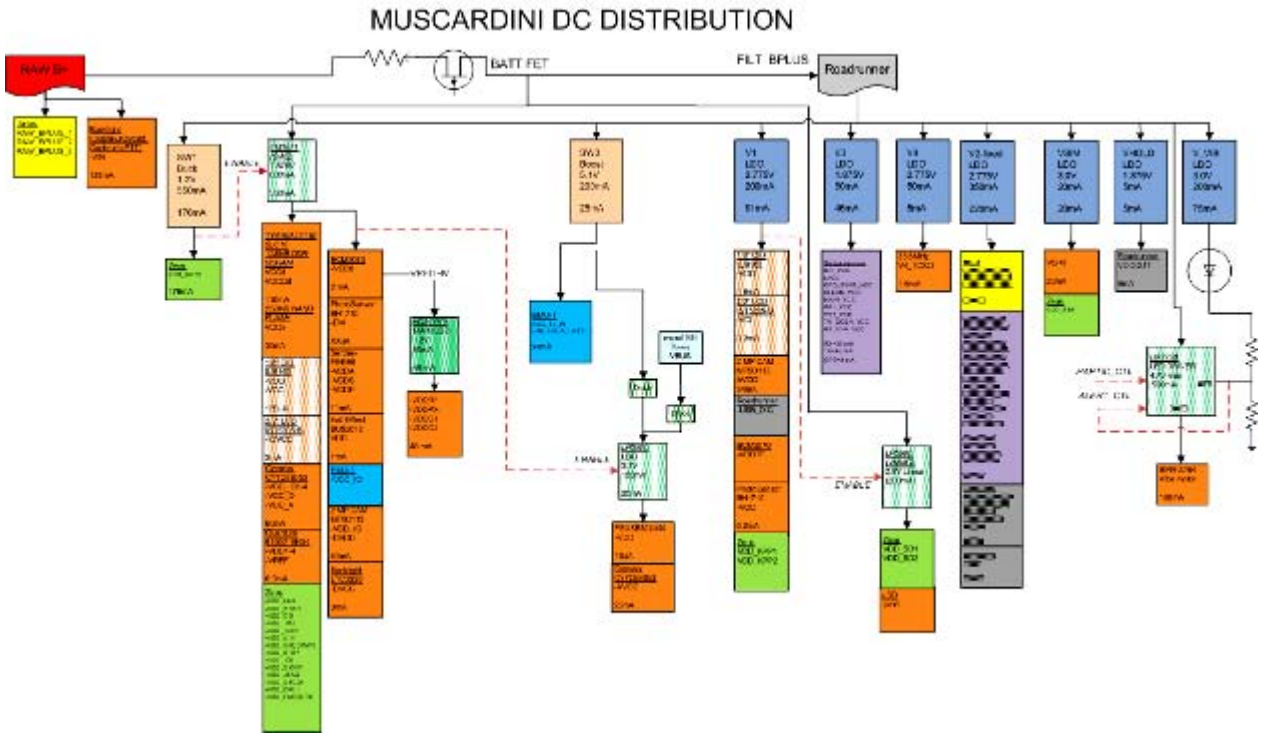


Figure 1-5 DC Power Distribution

The Roadrunner IC is designed to support the needs of portable iDEN cellular telephone products. It provides the necessary control, audio, and regulator functions. The following functions are provided:

- Turn on control signals to properly activate the unit
- Turn off control signals to turn off the unit if an error is detected
- Audio amplification for the speaker
- Audio amplification for the alert
- Audio amplification for the external audio
- Audio amplification of the microphone
- 13-bit, linear audio CODEC
- Band-gap reference voltage
- Linear regulation of DC voltages
- Two switching regulators (BUCK/BOOST)
- Operational amplifiers for use in the battery charger
- Internal D/A conversion for the battery charger
- 14-channel, 10-bit A/D conversion
- PA high-end regulation
- Real-time clock

1.5 Audio Section

Audio components for the i897 consist primarily of the audio amplifiers, a coder/decoder (CODEC), and acoustic transducers such as microphones and speakers. Other components include active RC filters, digital filters, software controlled amplifiers and attenuators, an analog-to-digital converter (ADC), and two digital-to-analog converters (DACs).

1.5.1 Acoustic Transducers

The i897 uses the following acoustic input and output transducers:

- Active internal and external microphones requiring a DC bias
- A dynamic 32-ohm earpiece speaker
- A pair of dynamic high audio 8-ohm speakers

1.5.2 Audio Amplifiers

The i897 uses seven audio amplifiers, five from the Roadrunner and 2 from an external class D amplifier, as shown and further described in the Figure 1-6, Figure 1-7 and Figure 1-1.

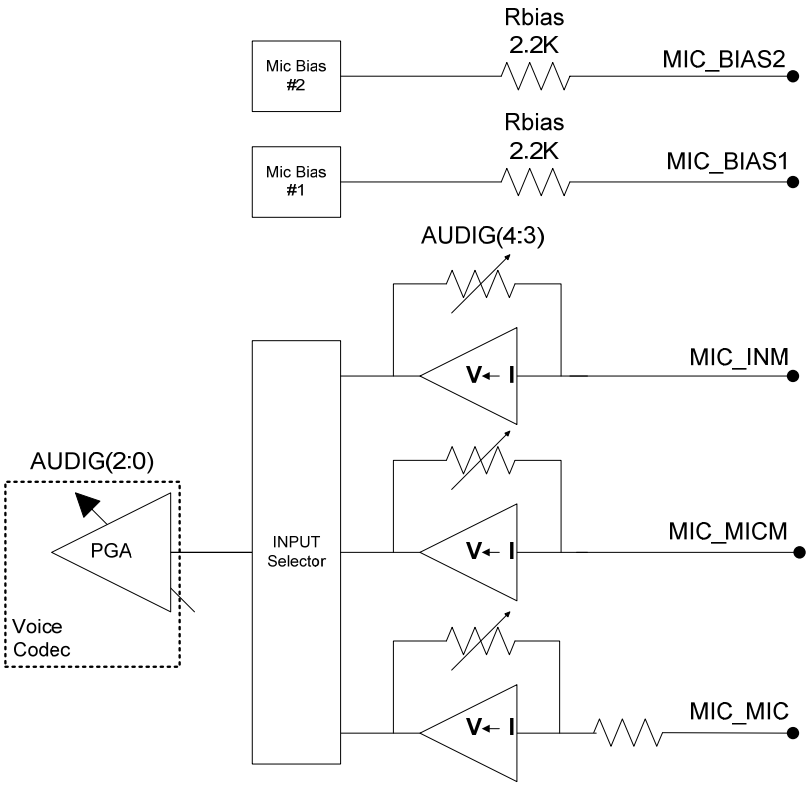


Figure 1-6. System Block Diagram

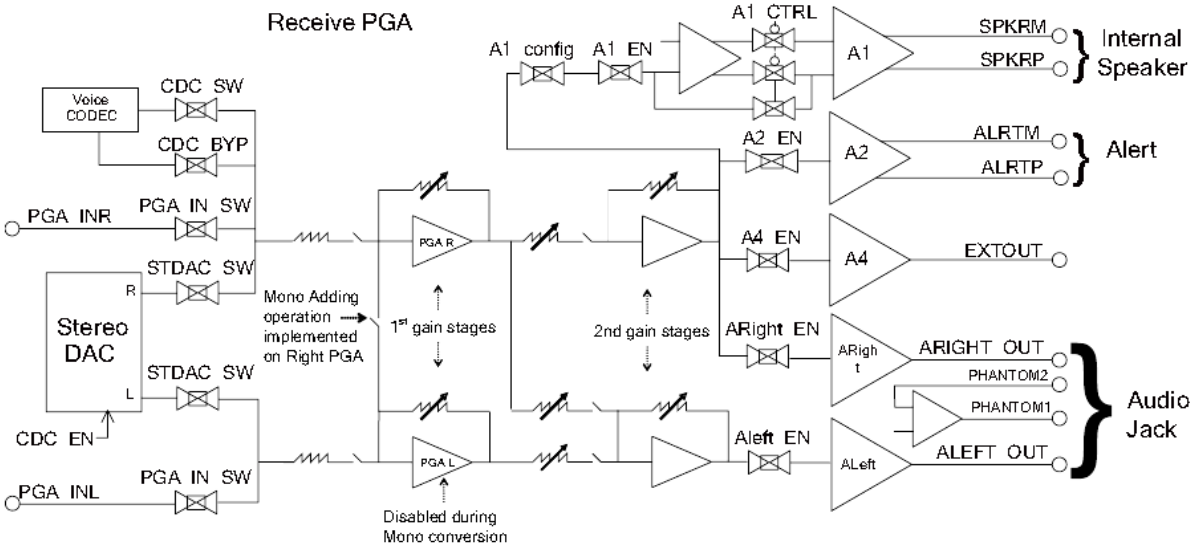


Figure 1-7. System Block Diagram

Table 1-1: Audio Amplifier Outputs and Acoustic Transducers

Outputs	Acoustic Transducer
A1 (RR)	Earpiece speaker output
A2 (RR)	Unused
A3 (RR)	Internal microphone input
A4 (RR)	Audio jack output
A5 (RR)	External microphone input
AL (Ext.)	Left channel output to left channel high audio speaker (stereo) or earpiece speaker (mono)
AR (Ext.)	Right channel output to left channel high audio speaker (stereo) or earpiece speaker (mono)

1.5.3 Audio Modes

The i897 audio circuitry has two basic modes of audio communication operation: interconnect and dispatch. It also has digital audio and digital video with digital audio multimedia playback modes.

In standard interconnect mode, the i897 uses Roadrunner's internal amplifiers to directly drive the dynamic earpiece speaker. It can also drive the two high audio speakers in mono if the speakerphone feature is enabled.

In standard dispatch mode, the i897 uses Roadrunner's internal amplifiers to directly drive the two high audio speakers in mono. It can also drive the dynamic earpiece speaker.

1.5.4 Audio Paths

The i897 can accept audio from the internal or external microphones. Interconnect voice, dispatch voice, dispatch tones, and ringer tones are also generated during audio communication operation. These received audio signals can be transmitted or routed to the earpiece speaker, high audio speakers, output depending on the audio mode of operation and state of the High/Low Speaker key and audio USB device detect circuit.

The High/Low Speaker key toggles the audio output from the high audio speakers to the earpiece speaker. The functionality of the High/Low Speaker key is disabled when there is an audio USB connect detected.

The microphone input can also be muted and unmuted at any time during an interconnect call.

1.5.5 Transmit Paths

The average human voice signal has an audible frequency band of approximately 300 - 3400 Hz. Low pass filters are utilized to provide the optimum voice signal response on the mic signal line by filtering out unnecessary and potentially disruptive higher frequencies. The mic signal is then amplified by the Roadrunner's internal op-amp and then converted from analog to digital in the ADC. The digital mic signal is then digitally filtered, transferred to the DSP for necessary processing, and then sent to SLEDGEHAMMER. Lastly, the data is sent to JANUS and transmitted.

1.5.6 Receive Paths

The received voice signal is first converted to digital by SLEDGEHAMMER and then sent to the DSP for necessary processing. The DSP sends the processed voice signal to the CODEC, where it is converted from digital to analog in its internal DAC. The output of the DAC is then band-pass filtered to attenuate any out-of-band noise.

Next, depending on the audio mode of operation and state of the High/Low Speaker key and audio jack detect circuit, the speaker signal is either sent to the Roadrunner amplifier to drive the earpiece speaker, the external 0.5W amplifier to drive the high audio speakers, or the audio jack output.

1.6 Digital Section

This section includes the Zeus which is a Dual Core Baseband Processor associated and external memories. The Zeus controls the transmit, receive, and synthesize operations of the integrated circuits located in the RF section.

The digital section contains the following (see Figure 1-8):

- Zeus Dual Core Baseband Processor
- Host memories (NAND flash and DDR)
- iDEN Power Management

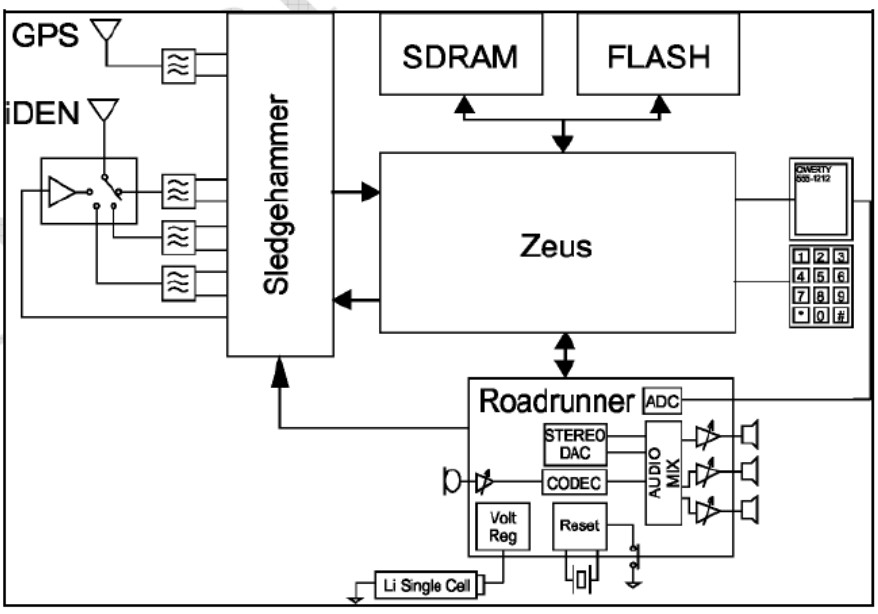


Figure 1-8: iDEN Digital Block Diagram

1.6.1 Zeus Processor

Zeus is a dual core (P2002 Starcore DSP and an ARM-11 Application Processor) processor with a shared memory system (see Figure 1-9).

The following is a summary of the ZEUS key features:

The following is a list of ARM11 core features in the ARM1136JF-S AP subsystem:

- Integer unit with integral Embedded ICE logic
- Eight-stage pipeline
- Branch prediction with return stack
- Low-interrupt latency
- Instruction and data Memory Management Units (MMUs), using MicroTLB structures backed by a unified main TLB
- Instruction and data L1 caches, including a non-blocking data cache with hit-under-miss
- Virtually-indexed/physically-addressed L1 caches
- 64-bit interface to both L1 caches
- Write buffer (by-passable)
- High-Speed Advanced Micro Bus Architecture (AM1BA) L2 interface
- Vector Floating Point co-processor (VFP) hardware for acceleration of 3-D graphics and other floating-point applications.

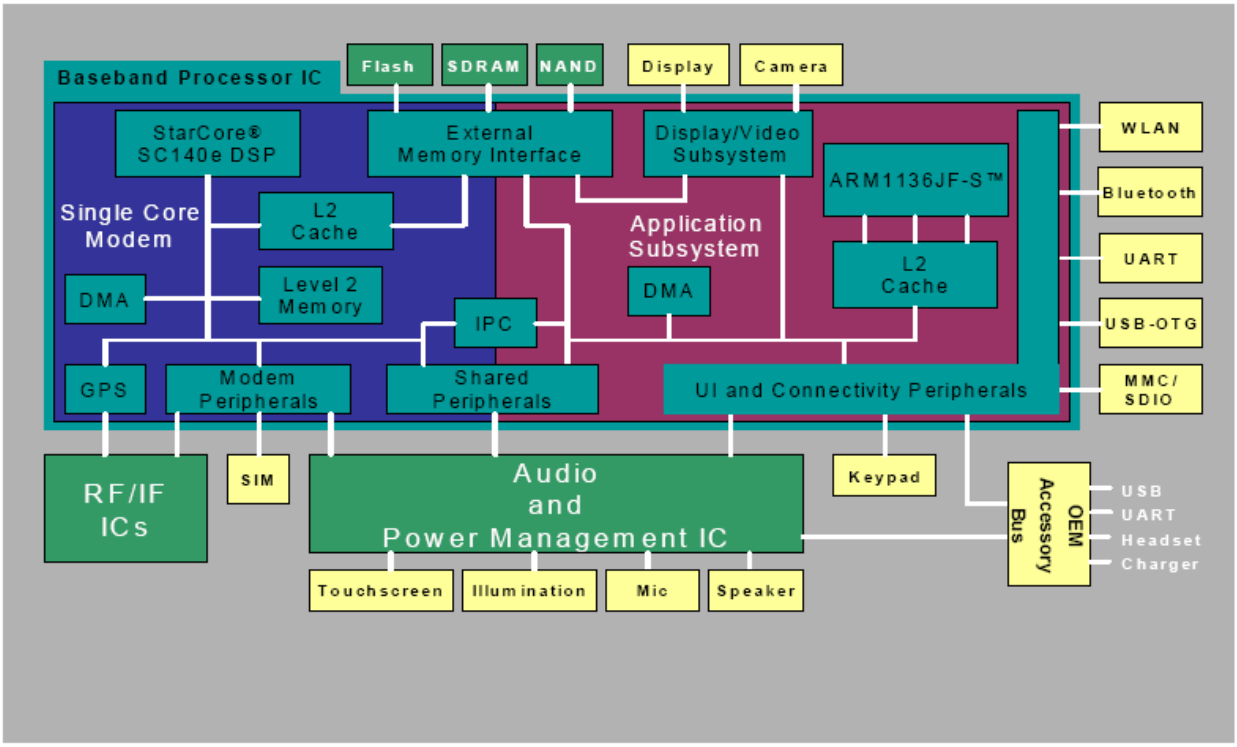


Figure 1-9. Zeus Functional Block Diagram

Zeus performs the following tasks:

- Assists RoadRunner in the control of the power-up and power-down sequence of the unit.
- USB communication with the factory Automated Test Equipment.
- Accesses to the external NAND flash memory and DDR memory.
- Communicates with the RF ICs (ROADRUNNER and SLEDGEHAMMER).
- Memory mappings and accesses Liquid Crystal Display.
- Monitors battery voltage, as well as RF power-amplifier and battery temperature.
- Modifies and stores user-selectable ergonomic preferences.
- Reads and writes iDEN radio-tuning parameters.
- Sends and receives commands with the base station through DSP.
- Re-channels the SLEDGEHAMMER synthesizer during hand off.

1.6.2 MCU Digital Phase Locked Loop (DPLL)

The MCU has a programmable, digital phase locked loop (DPLL) that uses the 16.8 MHz clock as a reference. The MCU initially runs from the external reference at power up. Software programs the MCU DPLL to 399 MHz and switches from the external reference to the MCU DPLL after lock is reached

1.6.3 Host System Clock Synthesizer

There are two iDEN system clocks that are generated by Roadrunner and Sledgehammer. The Roadrunner generates 32.768 kHz using the Roadrunner PLL, and the Sledgehammer generates 33.6 MHz. The MCU Programmable Interrupt Timer (PIT) is run by the 32.768 kHz oscillator. The 33.6 MHz is divided by 2 in the Roadrunner to yield a 16.8 MHz signal, which serves as reference frequency required by the MCU and DSP cores

1.6.4 Host System Clock Synthesizer

The power-on circuitry uses the ROADRUNNER /ON B-pin and the power On/Off button to turn on the unit. When the On/Off button is pressed to turn on the unit, the ON pin is shorted to ground, which turns on ROADRUNNER. The low-voltage detector provides the initial, active low reset to the MCU. When the ROADRUNNER voltages become stable (after a minimum of 450 ms), the ROADRUNNER delays the voltage coming up, and supervisor IC that monitors the voltage on V2, recognizes this and holds off Reset. At this point, the MCU sets the defaults for all the ICs. For instance, the SLEDGEHAMMER default clock is set to 8.4 MHz (16.8 MHz divided by 2). The MCU must reprogram the SLEDGEHAMMER to run off the 16.8 MHz frequency. In addition, the ZEUS boots off of the High Clock, not the Low Clock (CKIL). At this point, the ZEUS begins running the subscriber code. To turn off the unit, the On/Off button is pressed, causing the /ON B-pin of the ROADRUNNER to short to ground. The ROADRUNNER which drives ROADRUNNER SEL_INT on ZEUS and tells the MCU to turn off. The MCU turns off by driving the STO (WDI input to ROADRUNNER) line low, which shuts down the voltage regulators in the ROADRUNNER.

1.6.5 ZEUS Digital Signal Processor

The Zeus digital signal processor contains the DSP Engine SC140e:

The following is a list of SC140e features that make this core ideal for a single core modem:

- StarCore™ SC1000 architecture foundation
- 16-Kbyte instructions and 32-Kbyte Data Level 1 caches
- Supervisor- and user-mode task protection
- Memory Management Unit (MMU) tailored to real-time applications
- Compiled C code density on par with the MCU's
- Branch penalty-minimization with a short, five-stage pipeline
- Low interrupt latency
- Four arithmetic-logic unit (ALU) architecture
- 4-Gbyte linear address range support.

1.6.6 DSP Phase Locked Loop (PLL)

The DSP PLL is programmable and is used to generate a DSP internal clock that is synchronized to the 16.8 MHz reference frequency. In low power mode, the DSP PLL is disabled and the DSP operates directly from the 16.8 MHz clock. The DSP PLL runs at 208 MHz.

1.6.7 Serial Peripheral Interface (SPI)

This interface communicates with RF chips using the SPI bus. This bus includes the following:

- Master Out Slave In (MOSI)
- Master In Slave Out (MISO)
- SPI clock
- Specific chip-select lines

The MCU then sends data to the chip using MOSI and the SPI clock. The MCU also can receive data from all chips by clocking it into MISO using the SPI clock and appropriate chip select.
Table 1-2 shows a diagram of the Chip-Select Line States.

Table 1-2. Chip-Select Line States

IC	Chip-Select Line	Active State
ROADRUNNER Chip Enable	SPI CS0	Low
SLEDGEHAMMER Chip Enable	SPI CS6	Low
ROADRUNNER primary Chip Enable	SPI CS7	Low

1.6.8 System Memory

The following types of memories are used in i897:

1. 256MB (2Gbit) of NAND flash memory used to store unit subscriber and DSP code.
2. 128MB (1Gbit) of DDR memory used by the MCU to load code-plug information, program the flash, and store working parameters. The DDR operates at 266MHz.

Both memories are external to the processor and are stacked in the same package.

1.6.9 USB2.0

I897 supports USB2.0 High Speed rate of 480Mbps. The file transfer throughout rate is about 2MB/s for high speed transfers. The phone also supports USB1.1 Full Speed host.

Basically there are two USB paths in the design, high speed and full speed. Whenever a USB data cable is connected to the phone, it defaults to High Speed mode. In this mode, the USB interface goes through a USB2.0 Controller IC (CY7C68053-56BAXI from Cypress). Only for flashing/programming and RS232 (Y-cable berbug) communication, the USB interface goes through the existing Full Speed EMU IC.

There is a switch on board, controlled by Zeus, to switch between these 2 paths. For the high speed path, the CY7C IC communicates with Zeus through a 16-bit interrupt-driven FIFO interface. The CY7C controller has its own firmware, which is stored in the NAND flash. During power-up, CY7C downloads its firmware from Zeus through an I2C interface.

The USB connector of the unit is a micro USB receptacle and is used to communicate to external devices. There is no external hardware for switching from one protocol to another because ZEUS handles the switching and line multiplexing functions internally.

The following table shows the USB connector pin assignments:

Table 1-3. USB Connector Pin Assignments

Pin	Signal
1	Vbus
2	D-
3	D+
4	ID
5	GND

1.6.10 Battery ID

The battery is equipped with a Dallas 2502 EPROM. A two-wire serial bus allows the i897 unit or the battery charger to communicate with the battery and identify whether or not the battery is compatible. If the battery is determined to be incompatible, the charger does not enter charging mode.

Besides compatibility data, the EPROM also stores such information as the battery type, capacity, fuel-gauging parameters, and voltage thresholds.

1.6.11 Keypad Block

The MCU is responsible for decoding key presses and displaying them properly on the LCD. The keys are arranged into a matrix of five rows and seven columns, which includes the Volume buttons. Athens Key Pad Matrix is formed by Zeus Key Pad port, ED_INT5 for PTT button, Pin R27- GP_AP_B2 for LOCK_SW; and a capacitance sense touch key pad matrix IC. The ON/OFF key is connected directly to Road Runner.

	COLUMN0	COLUMN1	COLUMN2	COLUMN3	COLUMN4	COLUMN5	COLUMN6
ROW0	SEND	SOFT_LEFT	MENU	SOFT_RIGHT	Spare	LEFT_ ARROW	Spare
ROW1	*	7	4	1	SPARE	RIGHT_ ARROW	Spare
ROW2	0	8	5	2	UP_ ARROW	Spare	Spare
ROW3	#	9	6	3	DOWN_ ARROW	SPARE	Spare
ROW4	Boost Live Switch	HI/LOW	VOL_DOWN	VOL_UP	OK	Special Function key/SMART	Spare

Table 1-4. Zeus Keypad Matrix

The On/Off button is not decoded by the MCU; it directly drives the ROADRUNNER, which sends a signal to the MCU through INT1. **The On/Off key has been combined with the END and Home. This key is NOT part of the matrix, as it needs to be connected directly to Roadrunner. Software will monitor the duration of this key press to determine the function desired.** The five row lines are pulled high through four internal 22- Kohm resistors. The five row lines and six column lines are fed to ZEUS I/O pins. The PTT goes into ED_INT5 on Zeus. Pin R27- GP_AP_B2 is connected for LOCK_SW The ZEUS de-bounces the keys by reading them 25 milliseconds later.

The keypad decoding scheme works as follows:

1. ZEUS sets the row pins to inputs; all columns pins are set as outputs and driven to logic low.
2. Rows are pulled logic high. When a key is pressed, one row goes low, which indicates a key press and sends an internal interrupt.
3. ZEUS reads rows. A low on that row indicates a key press. All others are high.
4. ZEUS sets all columns to output logic high.

One column at a time is set to output logic low. ZEUS reads the rows to see which one is now at a logic low level. (A low seen on a row indicates the correct column and row.)

1.6.12 LCD Circuit

The LCD circuit consists of a full-graphics, liquid-crystal display module that has a resolution of 240RGBx320pixels, 262K colors. The data lines for the display module are connected to RGB 6:6:6 (18 bits) and control interface from the IPU section of the Zeus processor. The display module booster voltage is powered by V1 (2.775 V), the I/O is powered by SW2 (1 .875 V). The display module connects to the flip PCB through a 54-pin connector and the flip PCB connects to keypad flex through a 60-pin connector. Then to the keypad flex through a 80-pin connector which in turn connects to the main.

1.6.13 CMOS 2.0 Mega-pixel Focus Camera

The camera is a 2-Megapixel, color CMOS image sensor with Bayer (Green, Red, Green, and Blue) patter filter and no auto focus features. This device provides a finished image at up to 15fps (frames per second) image data at 1200 X 1600 resolutions and up to 320 x 240 resolutions to enable video clip capture. It resides on the camera flex circuit connecting to Flippcb through the 30-pin connector.

Control of the camera settings from Zeus is via I2C serial interface, using 8bits data transfers.

1.7 Transmitter Path Section

This section includes the following lineup Roadrunner (baseband D/A conversion), SledgeHammer (Analog baseband to RF), and JANUS (TX RF back end: power amplifier, etc) for linear modulation of the iDEN portables. When the unit is transmitting, microphone audio is routed to the CODEC, where it is amplified and digitized by the A/D converter in the CODEC. Digital voice is then sent from the CODEC to the DSP for processing. (See i897 Block Diagram Figure 1-10 Below).

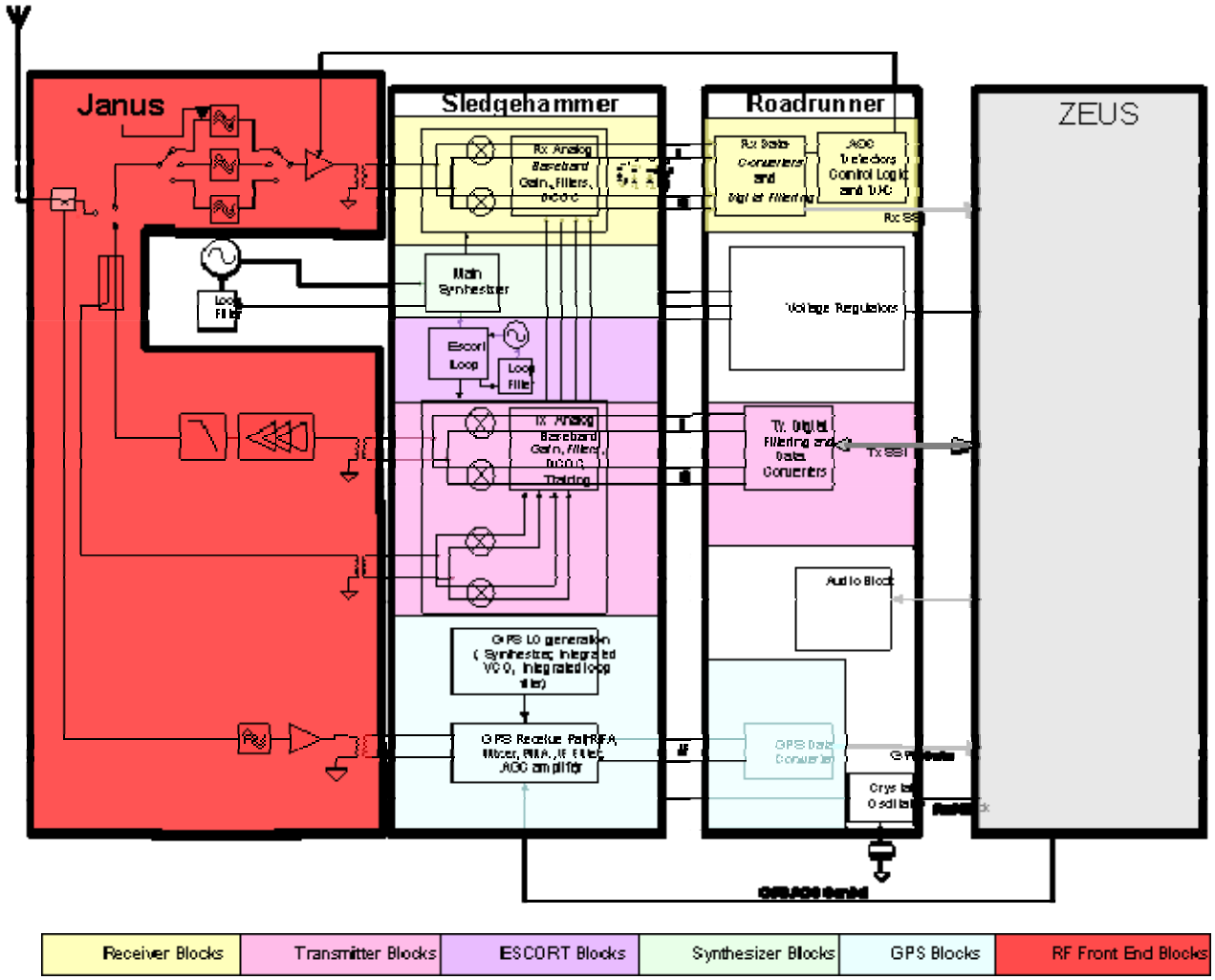


Figure 1-10. i897 Block Diagram

The JANUS transmitter module includes the following:

- Center tapped RF balun for RFPA differential input
- High Power Linear RFPA
- RFPA Load line switch selection mode.
- Reduced quiescent current selection mode.
- Directional coupler.
- Low pass harmonic filter.

The DSP performs VSELP data compression and generates digital I & Q words to be transmitted to the ROADRUNNER. The signal then is sent at a rate of 48 K samples per second. The ROADRUNNER provides the serial clock to the DSP and a frame sync pulse to tell the DSP to send a sample. Each sample is sent as a 16-bit I word followed by a 16-bit Q word and then some meaningless fill bits.

The I word and the Q word are then converted to an analog differential pair by the ROADRUNNER and amplified. The ROADRUNNER also sends a 4.2 MHz reference clock signal to the SLEDGEHAMMER, together when a DMCS and TXE signal are received from the DSP. The TXE transition starts the TX sequence with SLEDGEHAMMER, which entails the training sequences as well as enabling the antenna switch and PA.

DMCS signals the start of data being sent from DSP to ROADRUNNER. Once the transmit burst is finalized, the TX shutdown is done by disabling TXE and DMCS.

1.7.1 ROADRUNNER

The ROADRUNNER IC is designed as a derivative of several other ICs previously used in iDEN products. The ROADRUNNER IC includes the following blocks:

RX:

- ADC
- Digital Filtering

TX:

- **Digital interface** (the transmitter receives inputs from the SSI. The SSI has a single data line).
- **Pulse Shaping FIR** (A programmable waveform generator "FIR" filter provides interpolation of the pre shaped input words).
- **TX DAC** (The transmit DACs have eleven bit resolution and are capable of supporting 8.4 Mbits). Fine step TX attenuation (cutback).

Smoothing filters (programmable RC smoothing filters limit the amount of far out quantization noise and images due to aliasing. The filters incorporate a dc offset correction block).

ROADRUNNER Transmit Operation. The transmitter implemented a Direct Conversion Transmitter (DCT), where base band data is up-converted into RF with only one stage. The ICs that perform the transmit operations are ROADRUNNER and SLEDGEHAMMER. Power cutback control is shared between both ICs, the fine cutback step (1-> 4dB) is performed by ROADRUNNER and the coarse cutback step (5 dB steps up to 35 dB) is performed by SLEDGEHAMMER. To generate the RF signal, the SLEDGEHAMMER IC uses a TX_LO that is centered at the carrier frequency. This TX_LO is generated INSIDE SLEDGEHAMMER.

The digital samples are generated by the DSP and then sent to ROADRUNNER via Transmit SSI (TX_S SI). ROADRUNNER then implements the Digital-to-Analog Conversion function, which provides some power control function. The resulting I!Q analog signals are then sent to the SLEDGEHAMMER IC, which up-converts the base band signal to RF (similar to what the JAVELIN did on previous architectures).

The I!Q path circuits will be similar to the lineup used in the Tomahawk IC. The "main" reconstruction filter for the I!Q paths will be located in the SLEDGEHAMMER IC, and will have programmable BW options of 25, 50, and 100 KHz.

These functions of the IQ modulator consist of the interface to the digital baseband, the digital baseband sub-block, the analog baseband sub-block, and the TX DAC bridging the digital and analog sub-blocks. The ROADRUNNER IC will produce the baseband I and Q signals needed for IQ modulation on the SLEDGEHAMMER IC.

1.7.2 Sledgehammer IC (TX Path)

The SLEDGEHAMMER is the heart of the transmitter; it incorporates all of the circuitry necessary to implement a Cartesian feedback closed-loop system.

The differential baseband signals from the ROADRUNNER are input into the SLEDGEHAMMER. They go through a variable attenuator and are then summed with the down-converted I & Q feedback. The baseband signal is then amplified and sent to the up mixers.

1.7.3 JANUS

JANUS is a RF front end module (FEM) intended to support iDEN and WiDEN protocols.

The JANUS FEM contains the RF front end functions for the iDEN receiver, iDEN transmitter and GPS receiver. The JANUS FEM is intended to be used as part of the iDEN Phoenix Platform, and it is also backwards compatible with the existing Falcon platform.

The transmitter section of Janus comprises a single lineup that support iDEN 800MHz, iDEN 900MHz and Mototalk. The TX balun presents a differential impedance to the modulator on the RFIC, and it also feeds RAW _B+ to the modulator via the TX_IN and TX_INB pins. The nominal differential impedance to the TX balun is 200ohms.

The RFPA also features a 2.5dB load line select line as well as reduced quiescent current mode for low output power operation.

1.7.3.1 TX BALUN

The TX BALUN transforms the RFPA 50ohms single ended input impedance into 200ohms differential (SLEDGEHAMMER's output impedance is 200 ohms differential). The BALUN also feeds RAW_B+ to the TX modulator portion of the RFIC that drives Janus through the TX_IN and TX_INB pins.

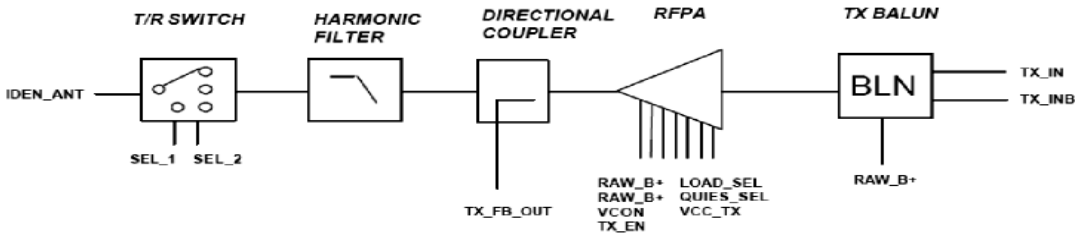


Figure 1-11.TX Balun

1.7.3.2 POWER AMPLIFIER

The signal is then routed to the RF PA. All control signals will be asserted before TX_ENB is asserted, and such control signals will be de-asserted after TX_ENB is de-asserted.

1.7.3.3 QUIESCENT CURRENT SELECTION

The JANUS module is able to select between two discrete steps of RFPA quiescent current to reduce current drain at high levels of TX cut back. Notice that when quiescent is reduced the specification on gain flatness is reduced quite a bit. The threshold to activate the quiescent current selection is 7dB cutback. See table 3.6 to determine the setting of LOAD_SEL and QUIES_SEL vs. the radio cutback level. The quiescent current selection is not intended to be used in the 902-928MHz band.

1.7.3.4 DIRECTIONAL COUPLER

The directional coupler samples the incident power going into the T/R switch and it feeds it back to the RFIC for linearization and power control purposes.

1.7.3.5 HARMONIC FILTER

The harmonic filter is necessary to meet transmitter FCC emissions at the iDEN_ANT pin.

1.7.3.6 T/R SWITCH

The T/R switch selects the path that connects to the iDEN_ANT pin. The possible paths are iDEN transmitter, iDEN receiver 800MHz, iDEN receiver 900MHz and Mototalk.

The switch should be able to maintain very high linearity under high VSWR conditions in order to meet the stringent iDEN adjacent channel specifications as well as the harmonic emissions. The lines SEL_1 and SEL_2 control the switch selection. The Figure 1-14 shows the diagram of the switch.

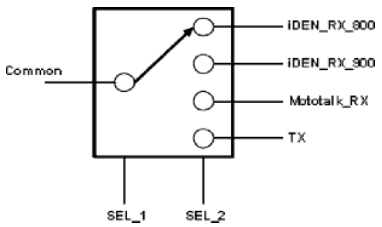


Figure 1-12. T/R Switch

1.7.3.7 TEMPERATURE SENSOR

A temperature sensor is included in the Janus module. The sensor is located close to the SAW filter whose temperature raises the most during TX operation.

The preferred implementation for the sensor is a thermistor Panasonic ERTJZEP473J connected between GND and PA_TEMP.

1.7.4 Cartesian Feedback

The iDEN transmitters use MQAM modulation, which requires a highly linear PA with wide dynamic range. Linear PAs are highly inefficient, so a class AB PA is used for better efficiency and longer battery life. The class AB PA is fairly linear, but not totally, and this causes splatter in the RF spectrum around the transmitted frequency band. To reduce splattering into the adjacent channels and to meet system specifications, the transmitter uses Cartesian feedback to linearize the PA and reduce splatter. Negative feedback is a commonly used method to linearize circuits.

Cartesian feedback is the process of down converting the feedback signal to baseband and summing it with the input signal in the I & Q paths separately. One can control the 180° phase shift at baseband more precisely than at RF frequencies. The SLEDGEHAMMER is the heart of the Cartesian feedback system, and as such, is the heart of the transmitter. There is a forward path and a feedback path in the transmitter. This is a closed loop system and the loop cannot be opened without drastic consequences. (See i897 Block Diagram Figure 1-13 Below). (TX interface between SLEDGEHAMMER and JANUS).

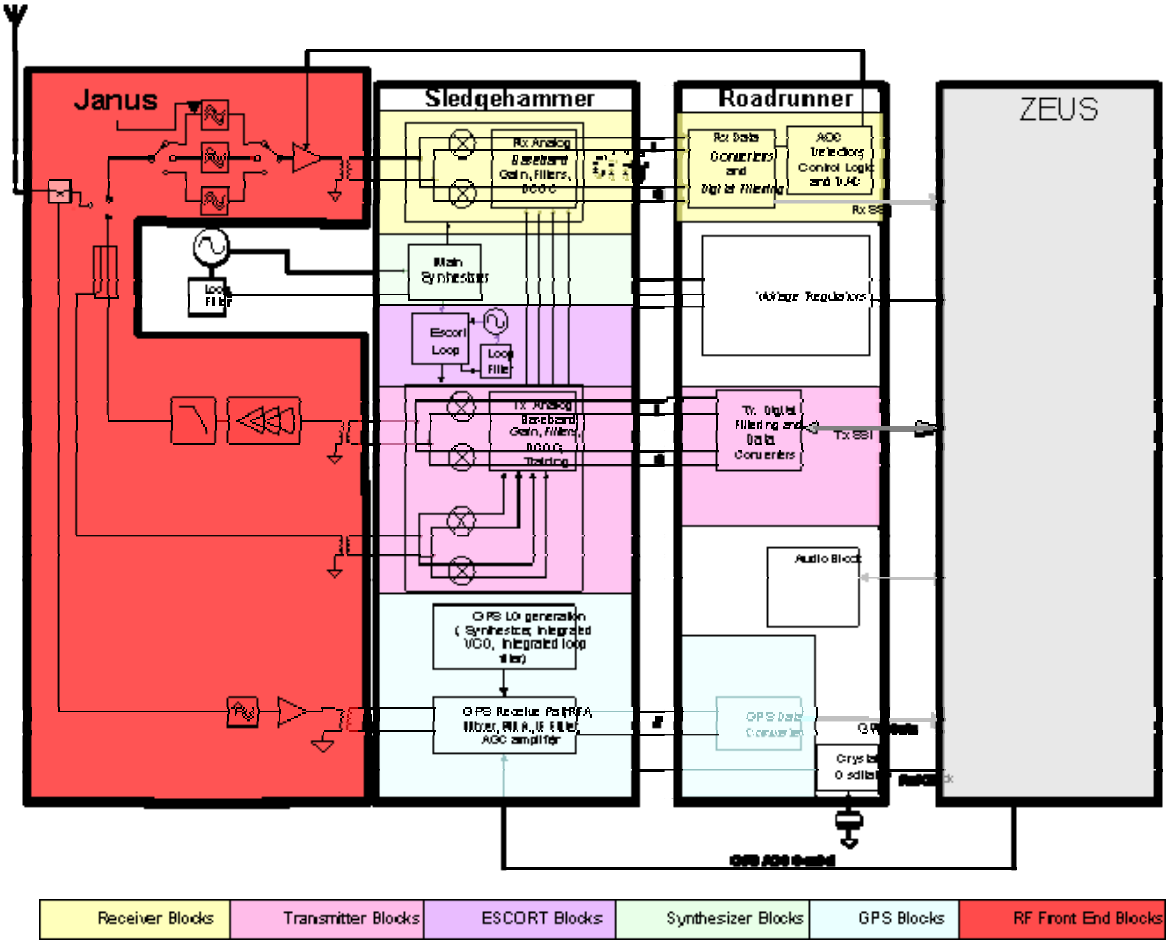


Figure 1-13. i897 Block Diagram

The forward path includes the following:

- SLEDGEHAMMER
- JANUS (Balun, Power amplifier, Coupler)

The feedback path includes the following:

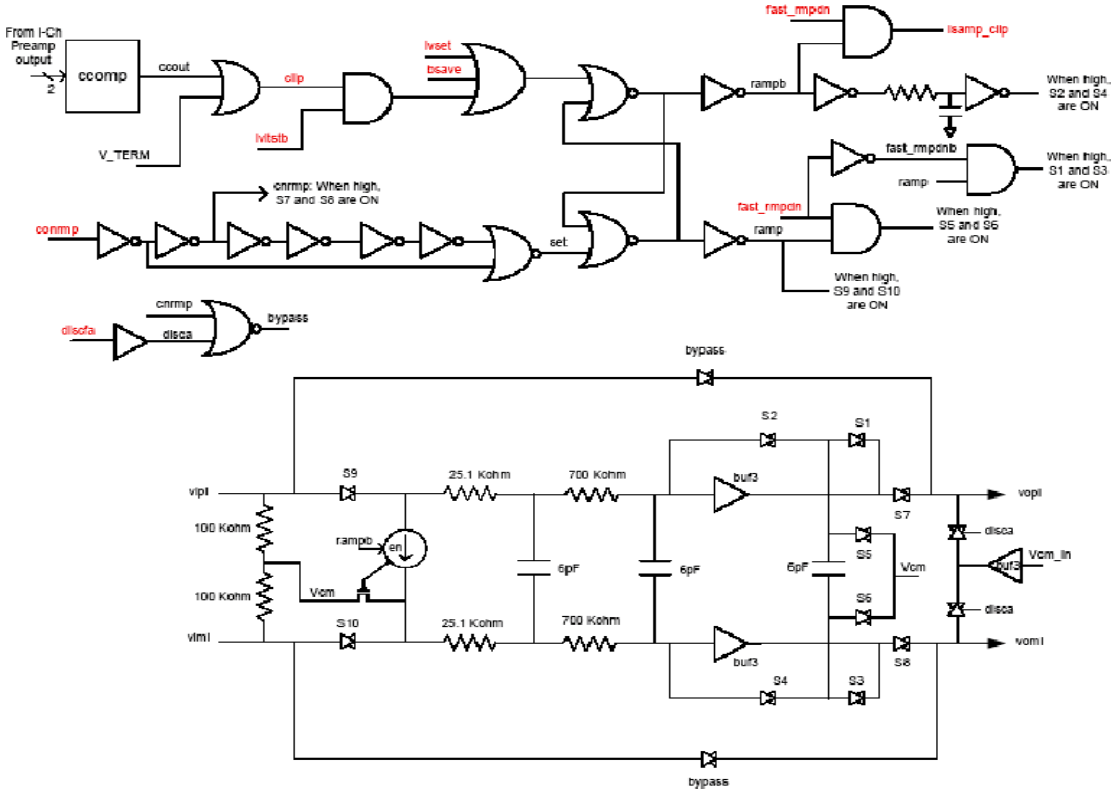
- Coupler
- Feedback attenuation network.
- SLEDGEHAMMER

1.7.5 Level Set and Phase Training

Level set training is performed to ensure that the RF PA is not driven into clip, which would result in excess splatter and out-of-band spurious emissions. During training, the DSP signal is disconnected from the forward path and an internal analog ramp generator is connected. The feedback is monitored and compared to the analog ramp. As the ramp amplitude increases and the RF PA begins to clip, the error voltage increases. See Figure 1-16 on page 33.

The Javelin levelset circuit topology is modified slightly for Sledgehammer. The major difference is that switches are not provided to select the I-channel training waveform to the Q-channel V-I input. Instead, a programmable gain V-I is specified below on the Ichannel for boosting the reference signal level during level training. The "cnrmp" control signal is output from the levelset circuit to the I-channel V-I to control when the gain is changed.

V_TERM is a new signal input that will be OR'ed with the clip comparator output. This signal causes a controlled signal ramp down when the battery current exceeds 3A during level training. V_TERM OR'ed with the clip comparator output is sent back to the digital core to terminate the counter used for the LEVEL _TRAIN read back value



Negative feedback is required to maintain system stability. Phase training is done to ensure that the feedback is negative (180°). The phase shift of the loop consists of the sum of the delays of several modules and components.

Operation of the Sledgehammer in a closed loop system requires the phase of the feedback path to be adjusted with respect to the forward path such that the demodulated feedback signal is the correct phase at the summing junction. This adjustment needs to take place before the loop is closed and data is transmitted, and is referred to as the 'phase training period'.

The maximum peak input signal to Sledgehammer is also scaled via the Roadrunner/DSP to insure that the maximum input signal in the data will not cause clipping to occur in the power amplifier output as a result of temperature/voltage gain variation in the forward path (primarily the power amplifier). The scaling of the input signal is a result of 'level training' which is performed in the transmit slot prior to data transmission. When level set training was implemented on the Tranlin and ODCT IC, training was done autonomously on the IC. Most of the level set circuitry was removed on the JANUS for cost savings. SLEDGEHAMMER training methods will be based on the JANUS design. The scaling of the input signal and the ramping is now performed by the DSP.The ramp signal will be applied from the DSP, and will go through the signal path of the Roadrunner IC with the gain set to maximum. The loop will be closed, but the slew rate limiter will be in a low gain (low slew) mode. A counter on the Sledgehammer will begin counting from the beginning of the timing event associated signal 'LAGC' and its' associated timing parameter "D". The loop will perform an AGC function in the beginning portion of the ramp in order to set the loop gain and then hold this gain value.

When the clip detect comparator determines that the loop can no longer compensate for the PA, it will disconnect the Roadrunner input and allow the slew rate limiter to ramp the signal down in a controlled manner to prevent splatter. After clip has been detected, and before the beginning of data, a SPI read is necessary for the DSP to find out at what point in time the clip occurred. Based on this information, a reference level will be set in the Roadrunner. Providing level set in this manner will require at least two SPI activities. The first activity is to read back the timing value "D" from the Sledgehammer IC. The second is to write the gain setting for the Roadrunner.

Both phase and level training are required at least once before transmission of the data in the first slot, but not necessarily performed in every transmit slot. DC training will be performed at the start of every SLOT. All timer values associated with SLOT rising edge will be increased with respect to JANUS program values to account for the DC training time.

Unlike JANUS, Sledgehammer provides the ability to terminate the level training ramp by either the internal Sledgehammer clip detector or an external control digital signal V_TERM. V_TERM indicates when the battery current exceeds 3 Amps, which is used to terminate the training ramp to avoid an early radio shutdown during level training.

Shutdown is avoided by lowering the transmit power when V_TERM is detected. This signal goes directly to the levelset circuitry.

1.8 Receiver Path Section

The receiver is a direct conversion receiver. It operates in the commercial portion of the land-mobile receiver band (851-870MHz and 935-940). The receiver takes an incoming RF signal, down-converts it to baseband where it is then amplified, filtered, digitized and then provided to the DSP MODEM. The receiver has, automatic gain control (AGC) to maintain good linearity over a wide range of incoming signals.

The receiver has automatic gain control (AGC) to maintain good linearity over a wide range of incoming signals. The AGC circuitry also prevents clipping of high-level signals.

Janus block, which is a receiver circuitry path for TAOS (See i897 Block Diagram Figure 1-14 Below).

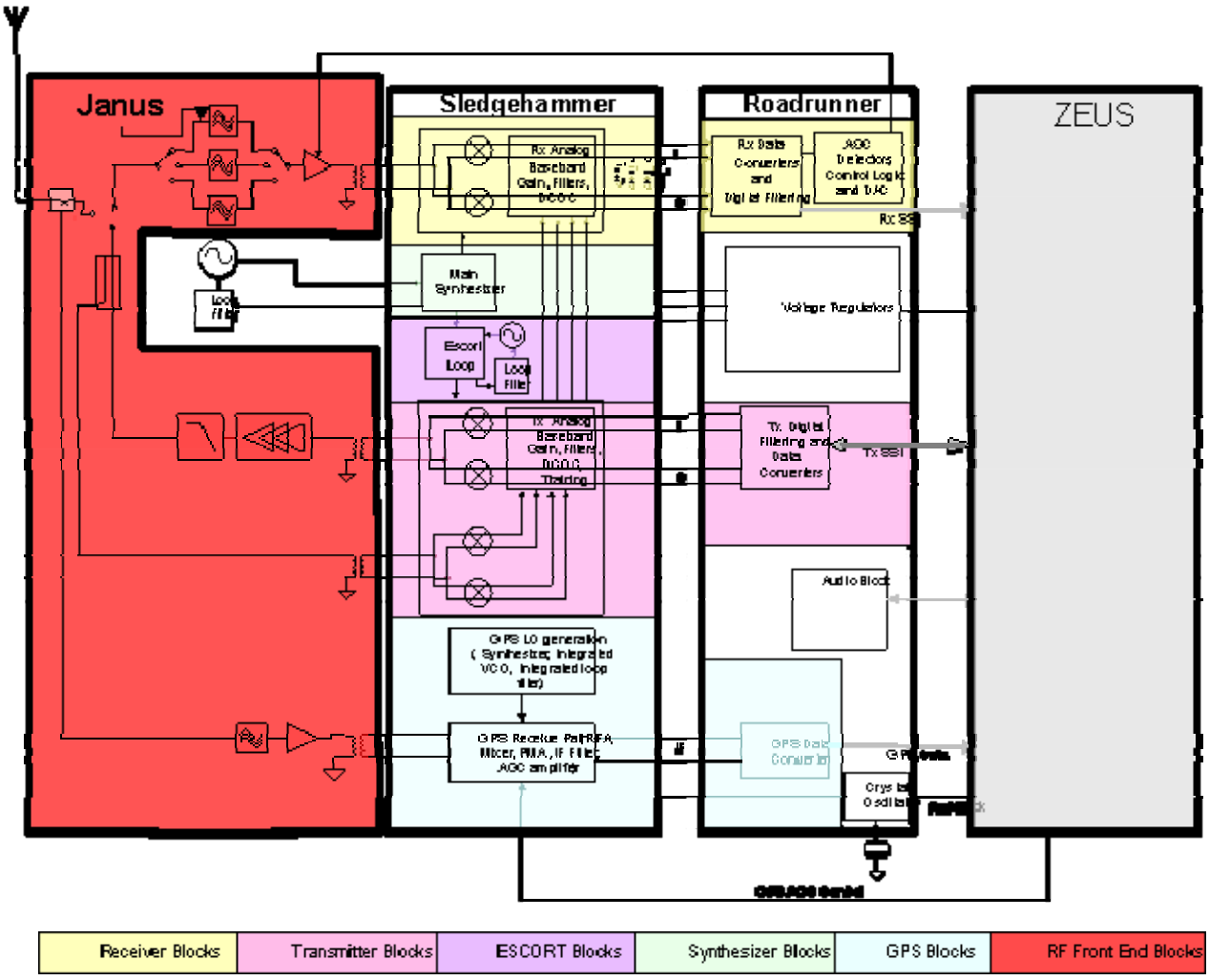


Figure 1-14. i897 Block Diagram

1.8.1 JANUS Module (RXPath)

The Janus Front End module (U500) contains the antenna switch, the passive SAW filters and the associated switches, along with the active LNA and the balun circuit. The antenna switch routes the received signal from the antenna pin input to the receiver block of Janus. During transmit mode, this switch disconnects the receiver path and connects the antenna to the transmit path within Janus. The triple preselector SAW filters protect the RF LNA from strong, out-of band signals. There are three filters (800MHz, 900MHz, and ISM) that are appropriately selected by the RF switches, for the appropriate band of operation. The LNA RF amplifier contains three major blocks: 20dB step attenuator, low noise amplifier and the AGC stage. The low-noise amplifier provides the gain to achieve the necessary receiver system take over gain and the AGC stage provides continuous attenuation to avoid overload of the receiver backend. Finally, the balun is incorporated in the module and facilitates the conversion of the single ended LNA output to a differential signal that is necessary to feed the input block of the Sledgehammer IC.

1.8.2 Sledgehammer IC (RXPath)

The Sledgehammer IC (U600) contains the frequency synthesizer, down-conversion mixers, baseband amplification and filtering stages. The main function of the Sledgehammer IC is to translate the RF input signal in to the two I and Q baseband differential signals. The signal path has a fixed amount of gain and also contains the DC offset correction circuitry. The IC contains basic analog anti-aliasing filtering. The IC also supplies a digital control line to the Janus module that enables the LNA.

1.8.3 Roadrunner IC (RX Path)

The Roadrunner IC (U701) performs the digital conversion, digital filtering, and the AGC control of the radio. The main function of the IC, from an RX perspective is the Analog to Digital conversion performed by the Sigma Delta converter. This digitized output signal is processed by FIR and IIR filtering and then the final output is framed and sent to the Baseband Processor via the Receive Synchronous Serial Interface Bus. The IC also controls both the RF step attenuator and the continuous AGC control lines. The RF step attenuator is enabled via SW and the Roadrunner logic line signals the Janus module to enable the attenuator when the unit receives a desired signal stronger than -50dBm. The continuous AGC functionality is controlled by an analog voltage line which feeds the Janus module. This voltage ranges from approximately 1.3875 V to 2.5 V and increases linearly for signals greater than ~-60dBm at the antenna input.

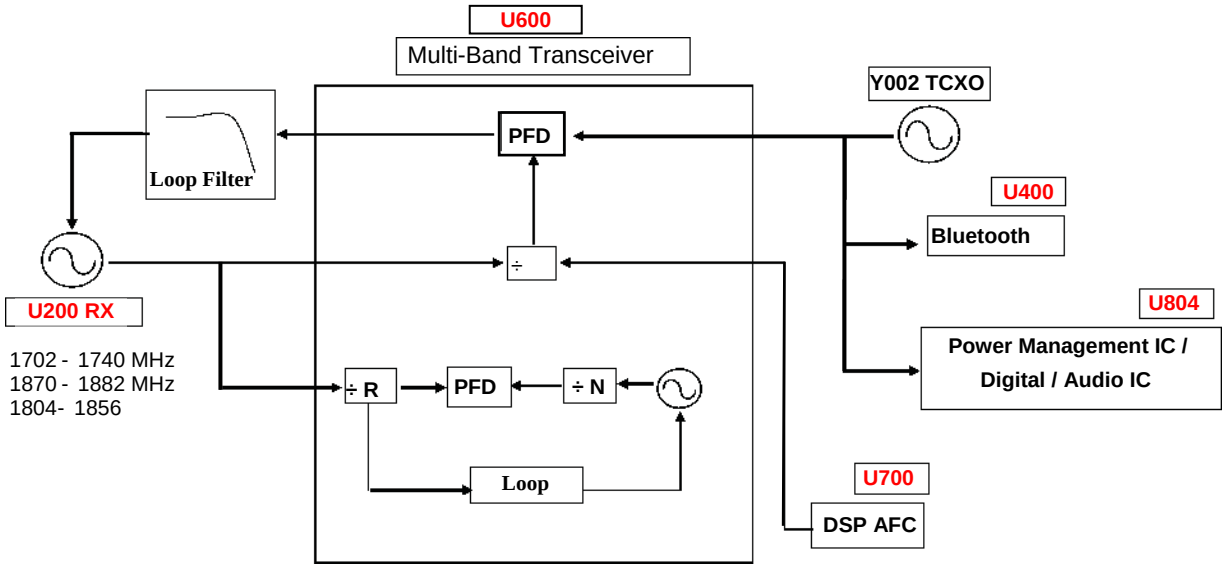
1.9 Frequency Generator (RF) Section

This section contains the following main components of the RF board:

- TCXO based Reference Oscillator Circuit.
- Host system clock synthesizer.
- (SLEDGEHAMMER) Phase Locked Loop synthesizers (Main & Escort).
- Main/RX Voltage Controlled Oscillator (VCO - U300). Note Main/RX VCO output used as source to Main Prescaler input of SLEDGEHAMMER main synthesizer PLL.

All frequencies in the i897 originate from the 33.6 MHz reference frequency provided by SLEDGEHAMMER synthesizer and the TCXO based reference oscillator circuit. The Y002 TCXO generates the 33.6 MHz signal, which is temperature compensated.

Figure 1-18 illustrates the frequency generator circuitry path:



Reference Oscillator

The 33.6 MHz reference is generated by temperature compensated crystal oscillator (TCXO) and fed to SLEDGEHAMMER IC (CLKOUT) output provides a stable and accurate 33.6 MHz reference frequency for the synthesizers. This 33.6 MHz signal is sent to Bluetooth, SLEDGEHAMMER and ROADRUNNER as a reference. This reference is divided down to a 4.2 MHz reference for JANUS (TCLK).

1.10 Global Positioning System (GPS) Section

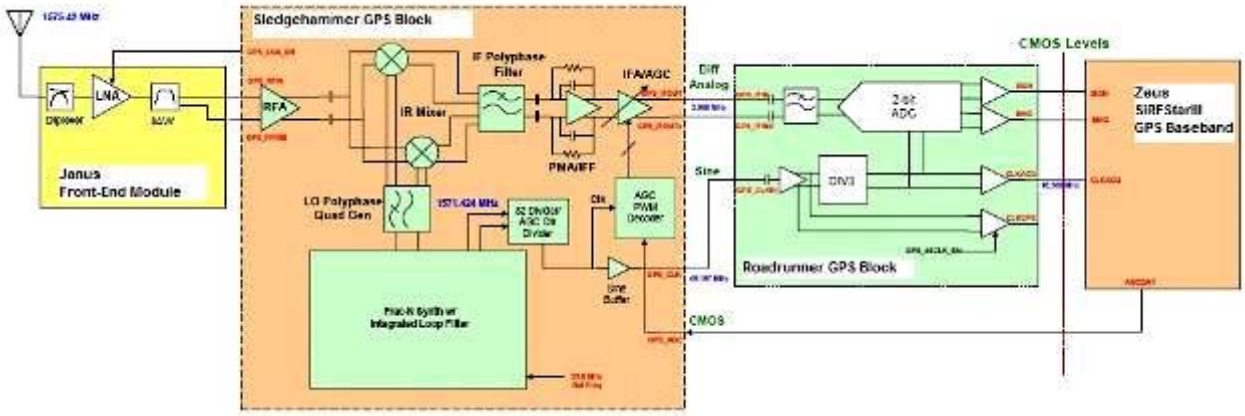
The U.S. Department of Defense (DoD) operates a constellation of 24-satellites, employed for location and/or navigational purposes, on earth. These satellite vehicles (SV) operate in circular orbits, round the earth every 12 hours, at an altitude of 20,200 km. The SVs transmit earth-bound radio signals at a 1575.42 MHz fixed carrier frequency—an L1 band for non-military applications. Since the SVs utilize one carrier frequency, by employing a Spread Spectrum modulation technique, each SV can be uniquely identified from an assigned Pseudo-random Noise (PN) Code.

To determine a location on earth, a receiver must be built that can receive the simultaneous signals from the satellites that are in view of the receiver and use that information to calculate the location of the receiver. The receiver must pick up the signals from 4 satellites. Once the 4 satellites are located, the receiver measures the time it took for the satellite signals to arrive. From this timing information, the distance between the receiver and each satellite can be calculated. The four satellites' ephemeris data provide the satellite's X, Y, and Z positions. The range, R, is the receiver measurement made by calculating the time it took for the signal to reach the receiver. The user's position, (Ux, Uy, Uz), and the clock bias, Cb, is then calculated.

To use the GPS, a receiver that can receive the spread-spectrum signals must be built. The detected signals are then converted from RF signals into appropriate digital input formats. These digital inputs are processed and converted into position information.

1.10.1 GPS Receiver

A block diagram of the receiver for the i897 is shown in Figure 1-19. The GPS receiver is based on the SiRF SiRFStarIII GPS chipset.



1.10.2 GPS Antenna

The GPS antenna is common part of the tri-band antenna common to the iDEN antenna

1.10.3 JANUS IC

The JANUS IC is a multi-purpose IC that host 4 critical parts of the GPS line up.

1.10.3.1 DIPLEXER

This diplexer is used to isolate the GPS signal from the iDEN signal.

1.10.3.2 HIGH PASS FILTER

The high pass filter provides further isolation from the iDEN signal.

1.10.3.3 GPS LNA

GPS LNA is the front end GPS LNA. Expect about 18 dB of gain through this LNA.

1.10.3.4 SAW FILTER

This SAW filter is to enhance the iDEN to GPS isolation and it works as a Balun that converts the signal ended signal to a differential signal.

1.10.4 GPS Receiver

SLEDGEHAMMER IC is a multi-purpose IC that hosts a number of components in the GPS lineup. For GPS, the SLEDGEHAMMER IC mainly mixes down the differential RF signal to differential IF signal and provides the GPS clock to the next stage

1.10.5 GPS Receiver

The ROADRUNNER IC is mainly a DC management IC but also converts the analog GPS IF signal to digital signal ready to be processed by the ZEUS IC.

1.10.6 GPS Receiver

The ZEUS IC is the main processor for the radio. The ZEUS IC also processes the GPS signal to calculate the GPS locations and provides the GPS AGC control to the SH IC.

1.10.7 GPS Receiver

A 33.6 MHz clock signal is used by the SH rf circuit as the frequency reference for its internal local oscillator. This clock is a temperature compensated crystal oscillator whose frequency accuracy is held to within 0.5 ppm. The high accuracy of the clock frequency plays a critical role in determining the time it takes to calculate the position coordinates.

1.10.8 GPS Receiver

The baseband digital signals are input to the SiRF processor circuit (integrated in ZEUS) which in turn computes the position information. Once the position is determined, it is communicated to the handset microprocessor and displayed on the screen for personal use or transmitted to the base station for E911 as required

1.11 Bluetooth® Wireless System

Bluetooth technology is used for short range wireless communications that do not require high data rates. The original usage models included telephone, headsets, low-data rate access point, file transfer, and automatic synchronization. The newer usage models have added human interface devices, remote control, print capability, cable replacements and personal area networks.

Bluetooth devices use GFSK modulation in the 2.4 to 2.4835 GHz band. The channels have a bandwidth of 1 MHz. Frequency hopping is used to provide immunity to interference. The master unit in a pico-net dictates the hopping sequence at a rate of 1600 hops per second. This translates to a 625 uS transmission. The maximum data rate through a Bluetooth device is 3 Mb per second.

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Chapter 2

PREPARING FOR FIELD LEVEL TESTING

Field level testing requires external equipment and support. To conduct field level trouble-shooting and testing of an *i897* unit, you must become familiar with the screen readouts of the recommended test equipment.

Display screens provide information that is useful for troubleshooting purposes. Refer to Chapter 3 for information on the displays, errors, alert tones, and messages associated with this unit.

2.1 Preparing Equipment for Testing

To ensure accurate testing of an *i897* unit, it is important that the test equipment function properly.

2.1.1 Calibrating Equipment

Test equipment should be internally calibrated before being used for testing. Note that the internal calibration does not substitute for a factory calibration. For more information, refer to *R-2660 Digital Communications System Analyzer Operator's Manual.*

2.1.2 Checking the RF Cable

Check the cable connection and quality to ensure that the test results are true. Cable length is criti cal to consistent Rx sensitivity and Tx power measurements. Use a high-quality, shielded, 50-ohm, coaxial cable that is approximately 1.5 feet in length. Place the unit to be tested at least 6 inches from the call box. The cable loss should be less than 2 dB.

2.1.3 Strong-Signal Environments

When using the R-2660 Communications System Analyzer to test a unit in a strong-signal environment (–75 dBm or stronger), change the bandmap of the unit.

For Registration/Call testing: Power up the unit. Immediately after hearing the beep, press **Start** on the R-2660. The unit will lock onto the first strong signal.

2.1.4 Protecting Static-Sensitive Devices

This unit contains static-sensitive devices that must be protected when opening the unit, or storing and transporting any printed-circuit board. Consider the following information to create a proper ground:

- Ground the working surface of your service bench. If possible, use the Motorola Static Protection Assembly (P/N 01803 86A82) to ground your service bench. This assembly contains a wrist strap, two ground cords, a table mat, and a floor mat
- Wear a conductive wrist strap in series with a 100 kΩ resistor to ground.
- Do not wear nylon clothing when handling any printed-circuit board.
- Prior to touching any printed-circuit board, touch an electrical ground to remove any static charge that might have accumulated.

Refer to Service and Repair Note SRN-F 1052 for more information. This note is available through:

Motorola Literature Distribution
Center 2290 Hammond Drive
Schaumburg, IL 60173
847-576-2826

The following should be considered when storing or transporting a circuit board:

- Place the printed-circuit board in conductive, anti-static material.
- Do not insert the printed-circuit board into conventional plastic "snow" trays used for transporting other devices.

2.2 Using RSS

Use *Radio Service Software (RSS)* to program a new software version or to update user information in the codeplug. Refer to "Connecting the Unit to the RSS Workstation" and the *Radio Service Software Read-Me's* for information on the setup and use of RSS.

NOTE: You can use the RSS online Help for locating specific information about RSS dialog boxes and fields. To access online Help, press **F1** while you are viewing an RSS screen.

If you are using the R-2660A Communications System Analyzer in the *i*DEN mode, which is 6:1 capable, use RSS to program an *i897* unit for **Full Rate** operation. Use the **6:1 Interconnect** softkey for all interconnect testing.

If you are using the R-2660B or later, which is 3:1 capable, use RSS to program an *i897* unit for **Half Rate** operation. Use the **3:1 Interconnect** softkey for all interconnect testing.

In the carrier version of RSS (but not the agent version), you can change interleave values. To access the fields where you can change these interleave values, go to the User Ergonomics dialog box, and then click on the **Interleave** tab.

NOTE: After servicing an *i897* unit, use RSS to reprogram the unit back to its original operating state.

Refer to the *R-2660 Digital Communications System Analyzer Operator's Manual* for more information on how to set up this equipment for *i*DEN mode testing.

2.3 Connecting an i897 Unit to the R-2660

The R-2660 Communications System Analyzer enables you to monitor and perform tests on an *i897* unit. Figure 7-1 shows the *i897*/R-2660 test setup.

Equipment Required: R-2660, reference SIM card, SMA to N-type RF coaxial cable, battery eliminator, 5.0-12.0 Vdc power supply.

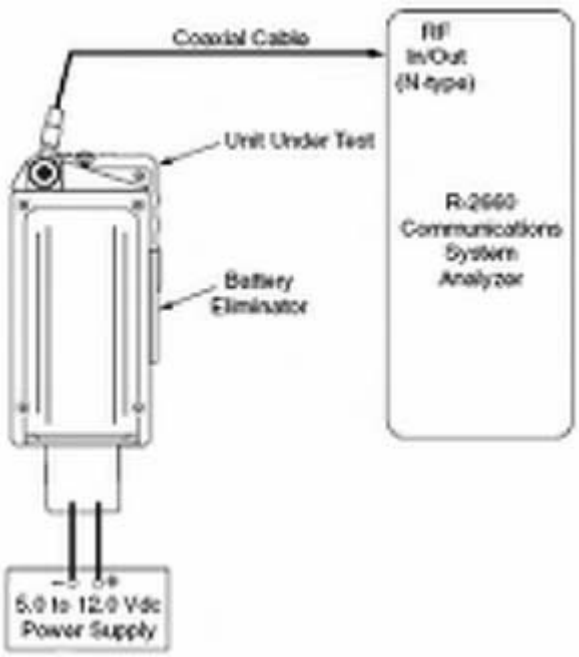


Figure: 7-1. Typical R-2660 Setup

To connect the unit to the R-2660:

1. Ensure the unit is powered off, and then turn on the R-2660.
2. Remove the battery cover and battery from the unit, and insert the reference SIM card.
3. Attach the battery eliminator to the back of the unit.
4. Engage RF.
5. Connect the SMA connector of the RF cable to the RF connector on the battery eliminator.
6. Connect the N-type connector of the RF cable to the R-2660 RF In/Out connector.
7. Attach the power leads on the battery eliminator to the DC power supply.

CAUTION: Be very careful to observe polarity when connecting power to the battery eliminator.

8. Turn on the power supply, and adjust output between 5.0 and 12.0 Vdc. With the correct setting, the regulated battery eliminator will provide 4.0 Vdc to the subject unit.
9. If power supply is capable, set current limit = 4.0 A.
10. Power up the subject unit.

2.4 Operating the R-2660

Refer to the *R-2660 Digital Communications System Analyzer Operator's Manual* for more information on how to use and operate this equipment.

2.5 Dis-Assembly and Assembly of i897 Unit

Motorola recommends the service technician follow a prescribed disassembly sequence to access specific items or components of the unit. This product is an efficiently designed package that incorporates the physical overlap and integration of some modular components. Refer to the Disassembly Sequence Flowchart for a suggested path to reach specific components.

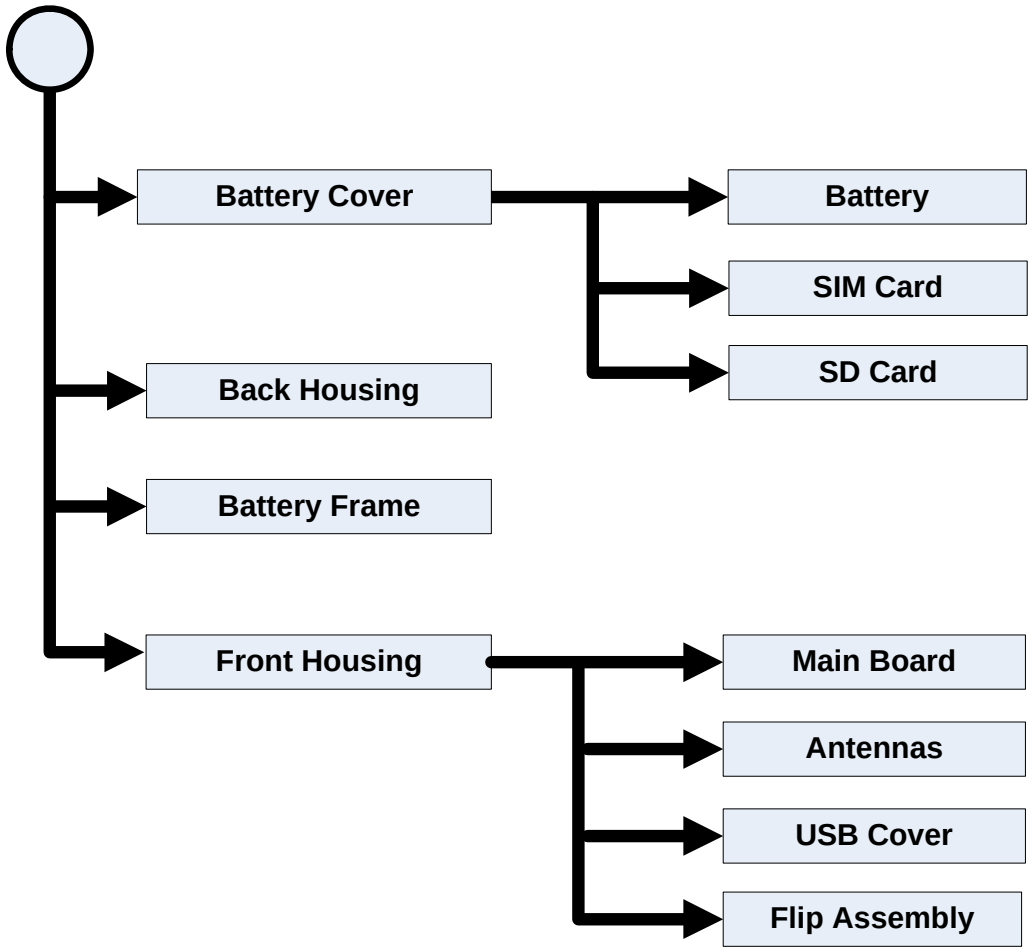
NOTE: In some cases, the technician may not need to remove certain components to reach others.

2.6 Disassembly Procedure

NOTE: Screws used to assemble the i897 main housing are: 1 antenna screw, T-4 drive; 4 housing assembly screws, T-6 drive.

2.6.1 Disassembly Sequence Pane chart

Note: i897 flip components include a Flex Connector ribbon which can be easily torn or damaged if not handled properly. Handle the Flex Ribbon with care especially when working it through the front housing slot.

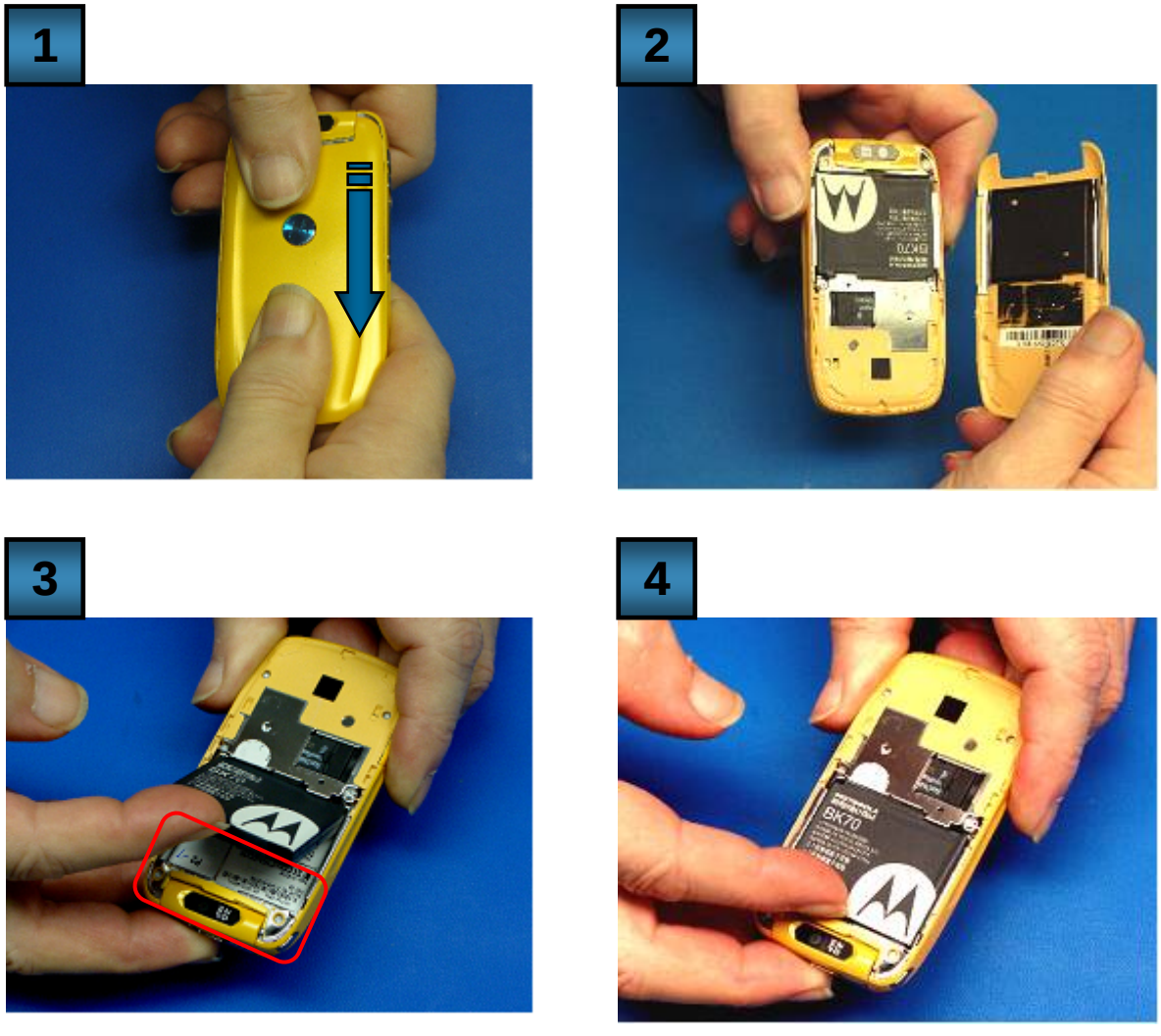


2.6.2 Battery Cover and Battery Removal

Tools Required:

None Required

1. Push the battery door toward the bottom of the Unit.
2. Lift and remove the Battery Dor from the housing.
3. Lift the Top of the battery with fingernail.
4. Remove the Battery from the Back Housing

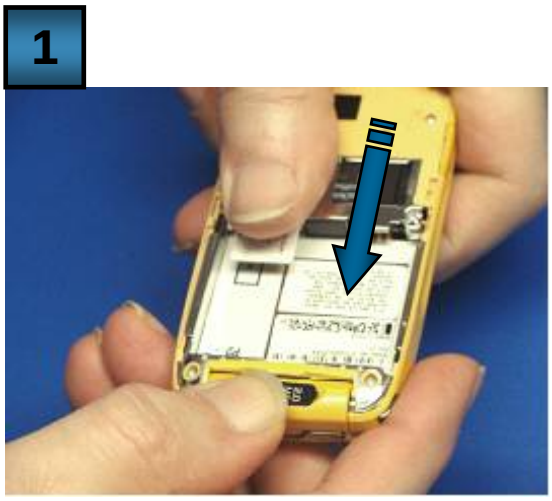


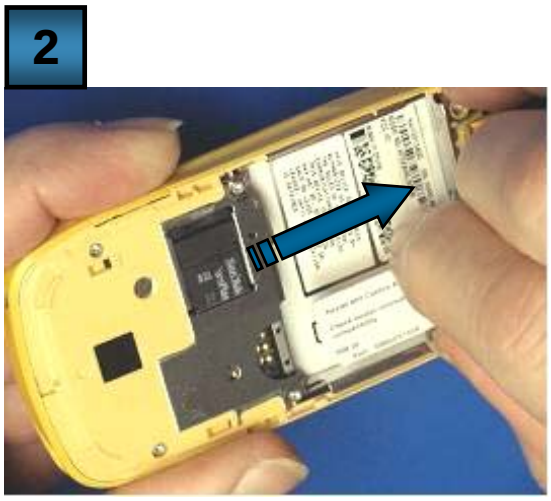
2.6.3 SIM Card and SD Card Removal

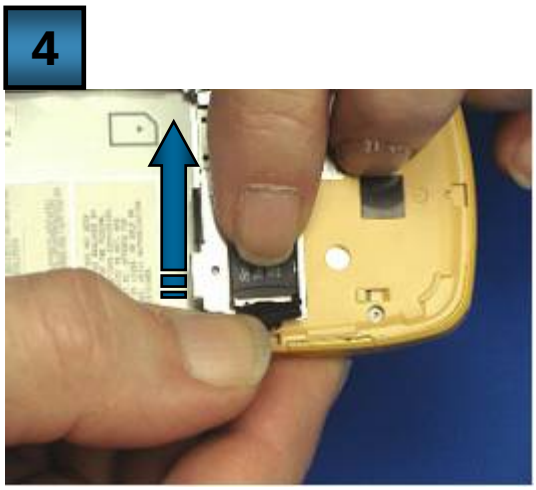
Tools Required:

None Required

1. Push the SIM card toward the top of the unit.
2. Remove the SIM Card Being careful not to touch the contacts.
3. Lift the SD card lock.
4. Slide SD Card outward. Being careful not to touch the contacts.







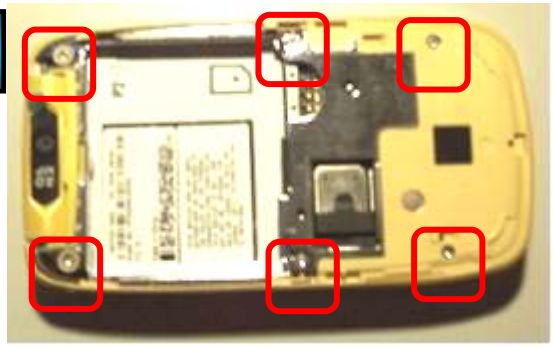
2.6.4 Back Housing Removal

Tools Required:

T-5 Torx Bit and Torx Driver

1. Remove the six T-5 screw from the back housing of the unit.
2. Remove the Back Housing from the unit by lifting from the top and disengaging the snaps on both sides.
3. Remove the Battery Frame from the unit.

1



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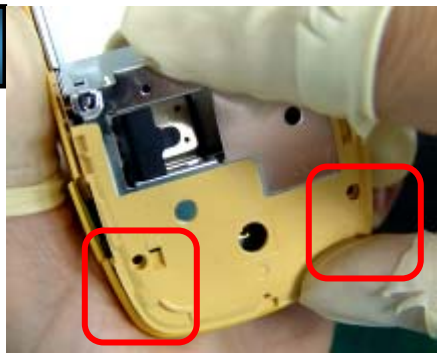


3

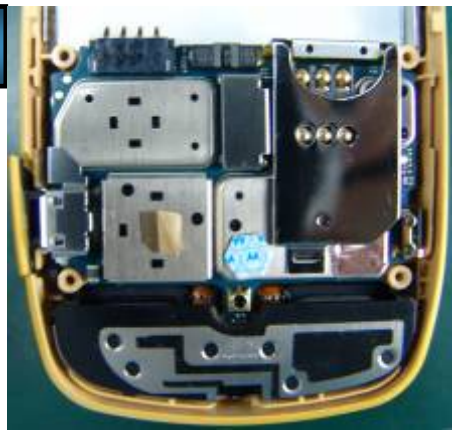
2.6.5 Main Board Removal

Tools Required:

None Required

1. Remove the Bluetooth antenna from the Main Board.
2. Remove the main board from the Front housing and disconnect the flex.
3. Remove the Main Antenna and Bluetooth antenna from the Unit.
4. Remove the USB Cover from the front Housing.

1



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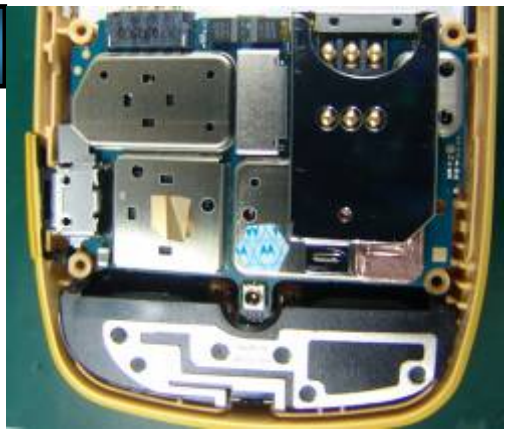

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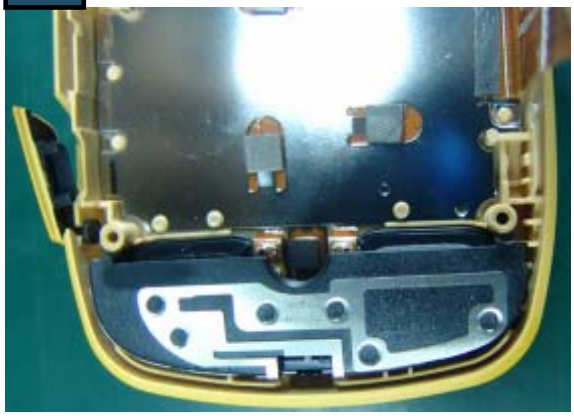

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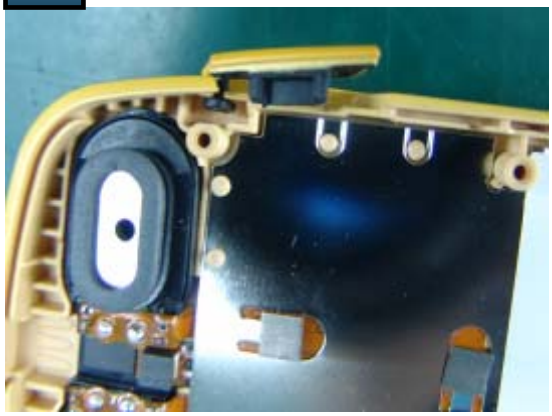
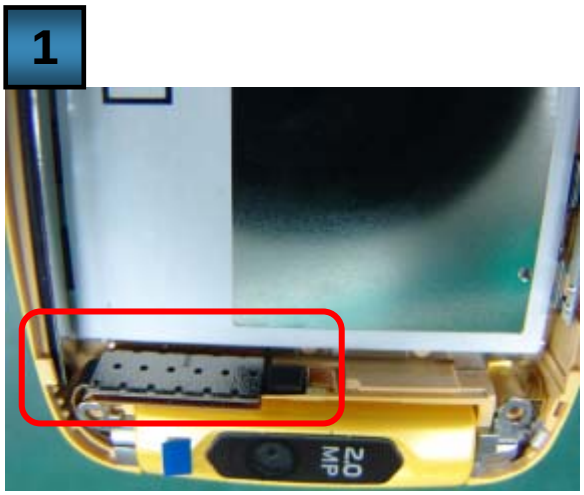


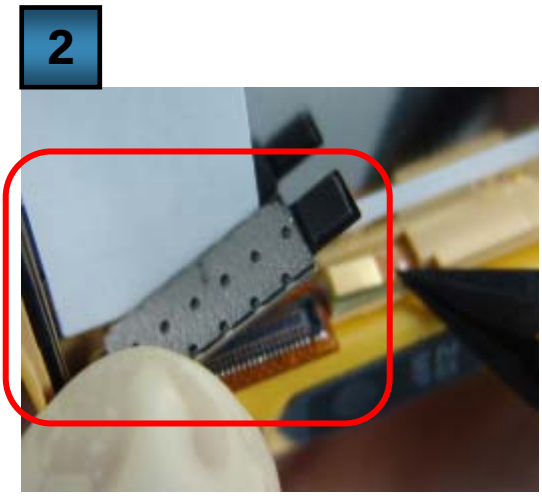
2.6.6 Flip Assembly Access

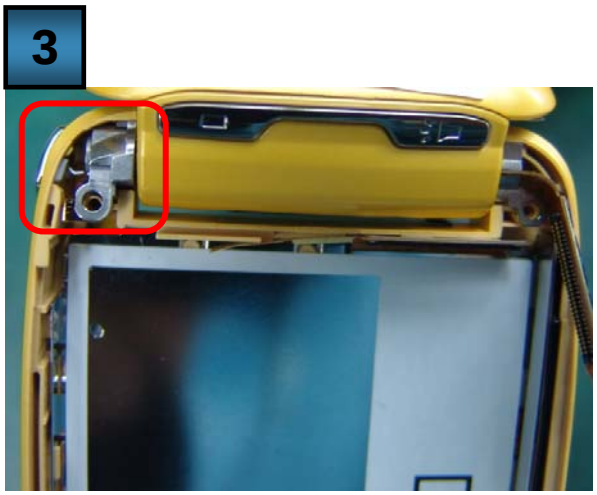
Tools Required:

None Required

1. Separate the Flip Flex from the front housing.
2. Unfold the flex of the front housing.
3. Lift the Hinge out of the front housing.
4. Carefully remove the flip assembly from the front housing using care not to damage the flex.







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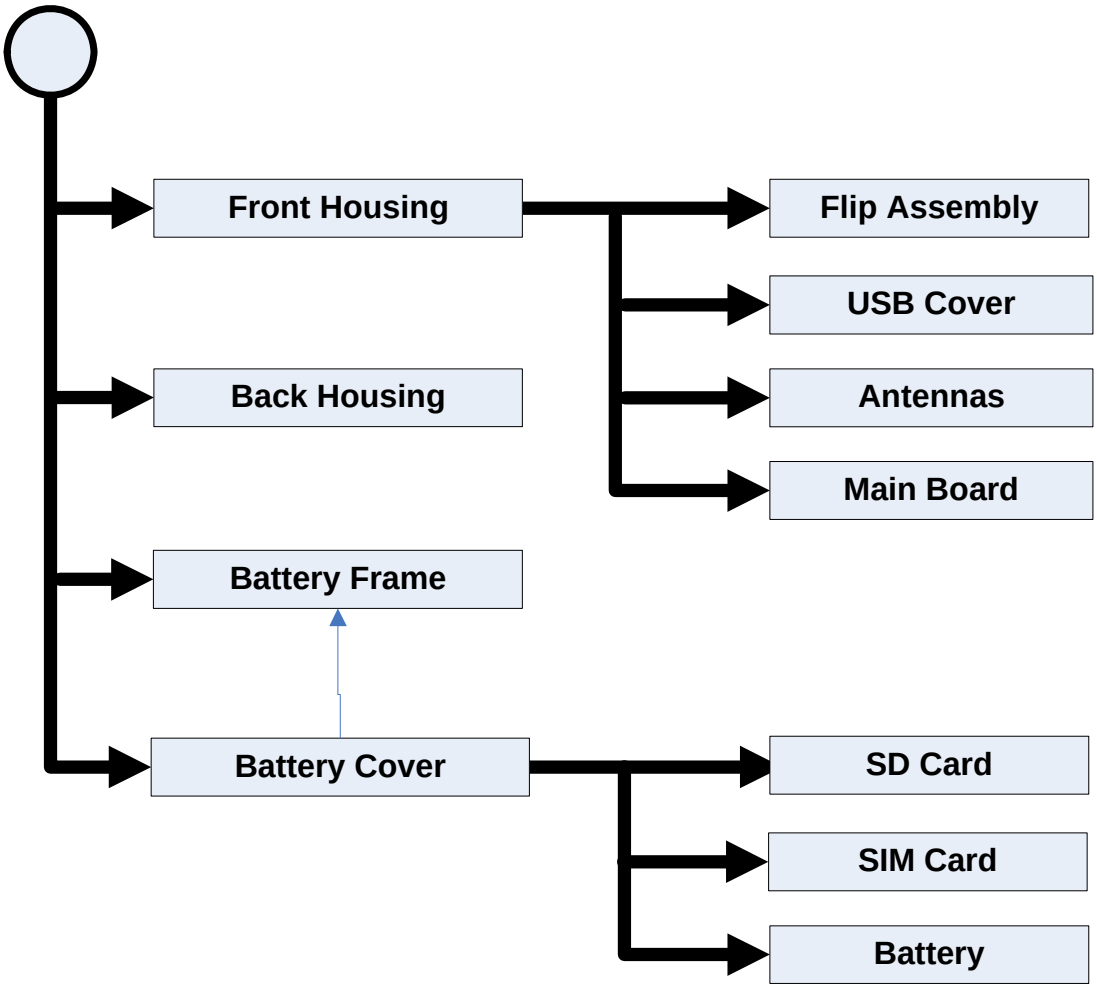
2.7 Assembly Procedure

2.7.1 Assembly Sequence Pane Chart



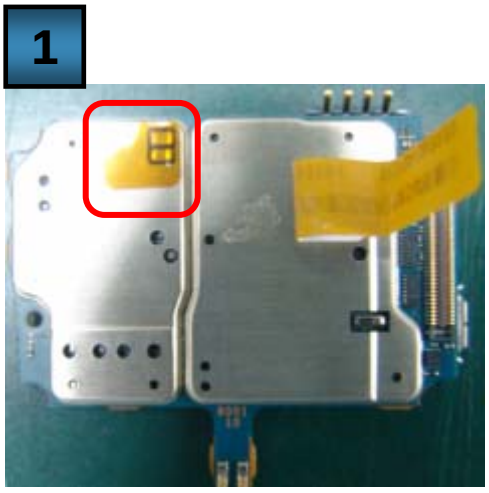
2.7.2 Main Board Preparation

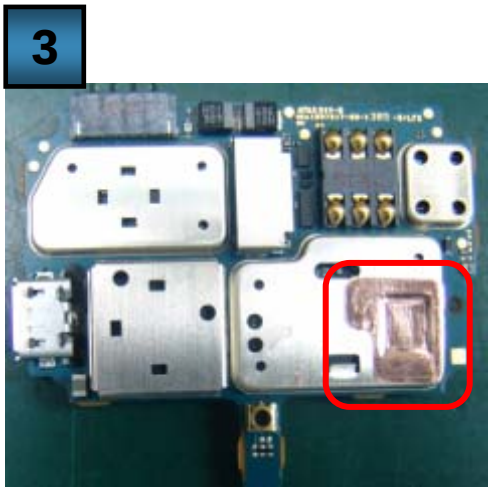
Inspect the Main Board and verify that the following parts are not damaged, bent or defective.

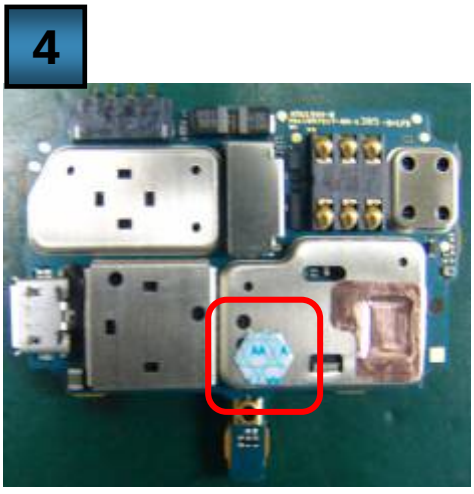
Tools Required:

None Required

1. Lift the left of MB label and apply the Kapton Tape to the Top of the Main Board.
2. Apply the Main Board label.
3. Apply the sledgehammer Shield Cu Tape to the Main Board.
4. Apply the water indicator to the main board and ensure it is in the proper place.





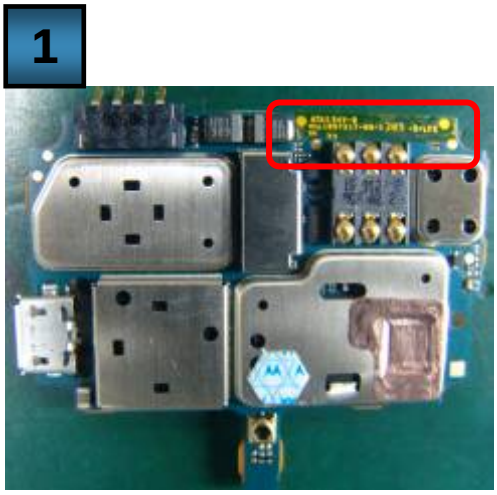


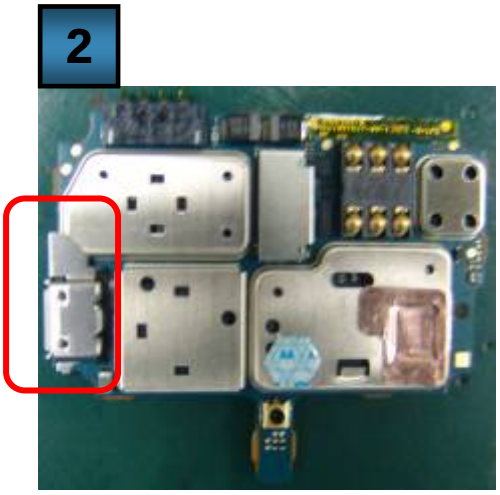
Main Board Preparation (Continued)

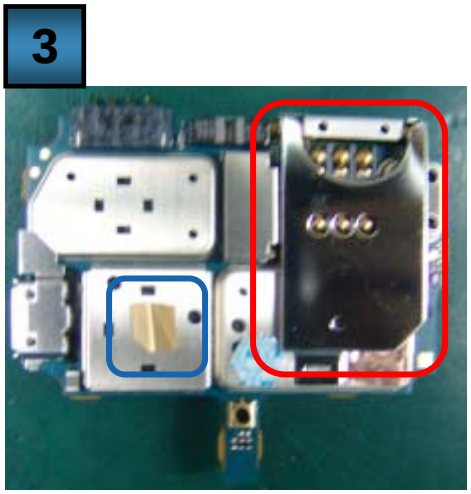
Tools Required:

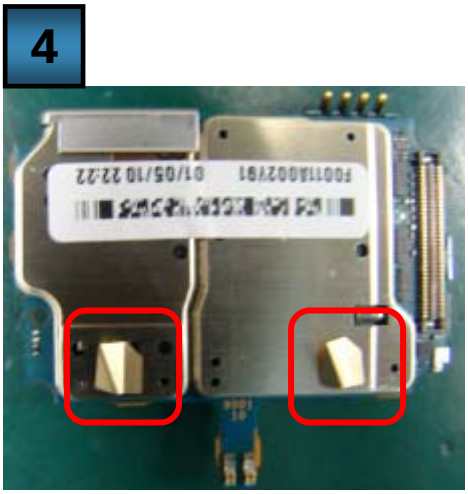
None Required

5. Apply the Kapton tape to the SIM Strap on the main board.
6. Assemble USB strap to the Main Board.
7. Assemble the SIM card strap and Contact EMI shield to the main board and press it to activate the adhesive.
8. Assemble two Contact EMI shield to the point of main board.







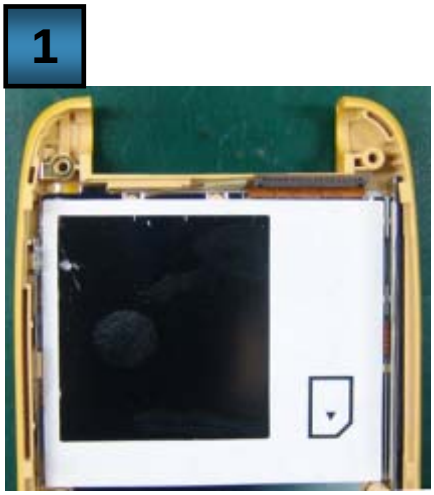


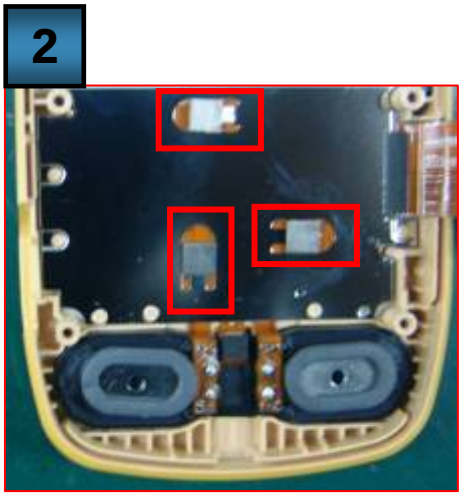
2.7.3 Flip to Front Housing Assembly

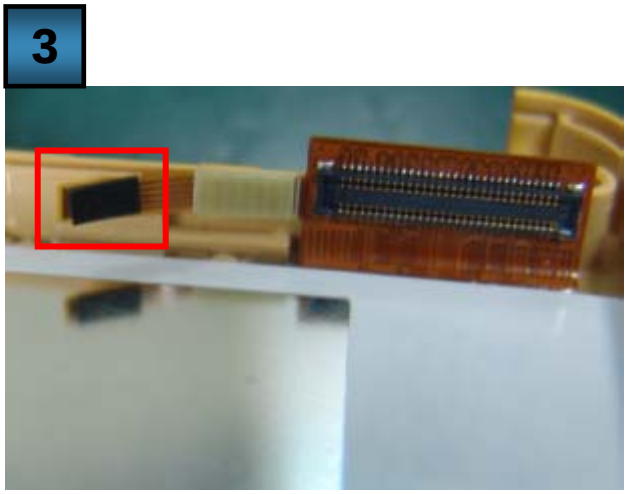
Tools Required:

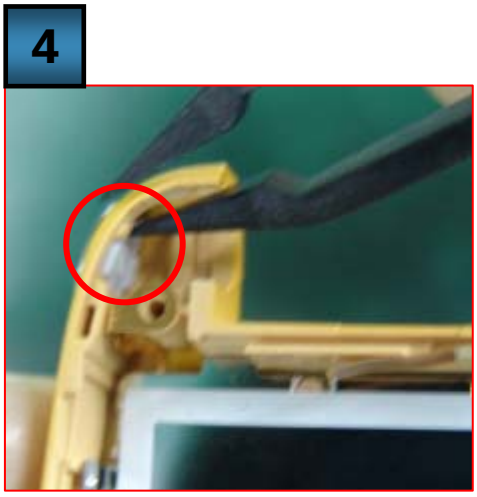
None Required

1. Apply the battery label in the battery cavity.
2. Apply 3 poron pads onto the front housing.
3. Apply a poron pad to the keypad Hinge Flex on the tip of the flex in the front housing.
4. Assemble the hinge button into the front housing with tweezers (Ensure proper direction) as shown.









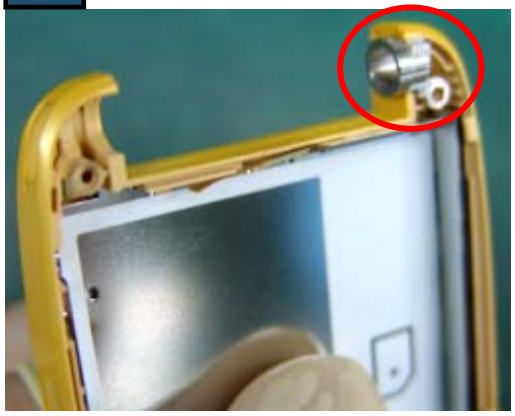
Flip to Front Housing Assembly (Continued)

Tools Required:

None Required

5. Assemble the ring in the FH.
6. Use the bottom of the tweezers to press the ring (Ensure the ridge of the ring is in the slot of Front Housing correctly.
7. Insert the hinge mechanism into the flip housing.
8. Ensure correct orientation.

5



6

7

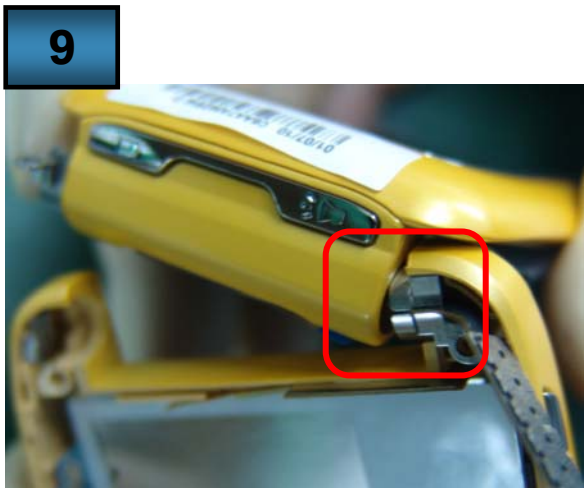
8

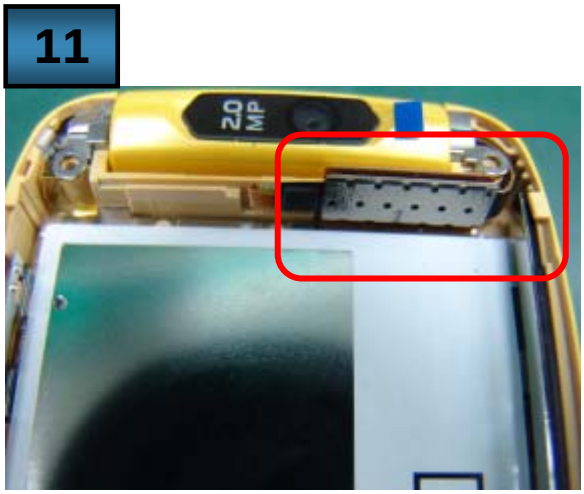
Flip to Front Housing Assembly (Continued)

Tools Required:

None Required

9. Align the Flip with the ring in the Front Housing.
10. Align the hole on the hinge collar against the anchor point on the front housing, then close the flip slowly.
11. Connect the Flex connector to the Front Housing Connector.
12. Apply the conductive poron on the location as shown.





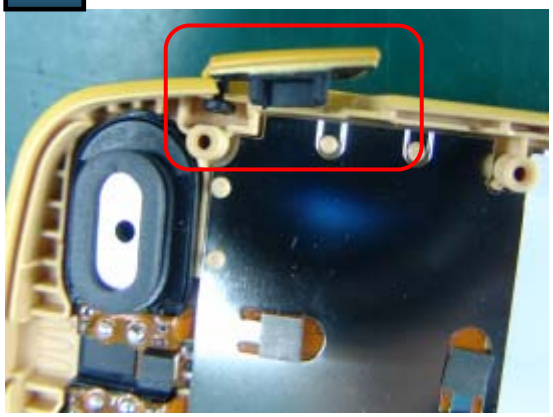
2.7.4 Main Board Assembly

Tools Required:

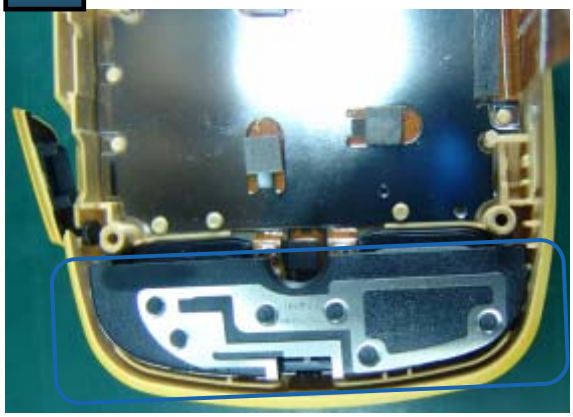
None Required

1. Assemble the USB seal to the front housing.
2. Assemble the Main Antenna into the front housing.
3. Connect the connector in Front Housing to Main Board Connector.
4. Assemble the main board to Front Housing as shown..

1

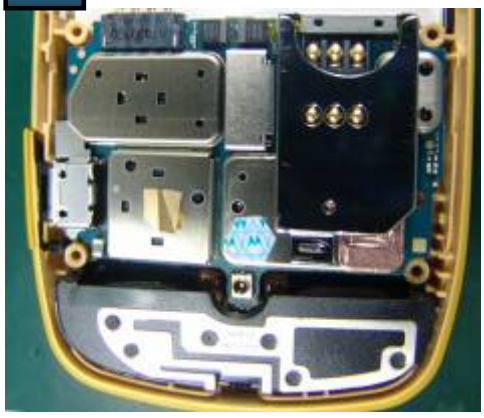


2



3

4



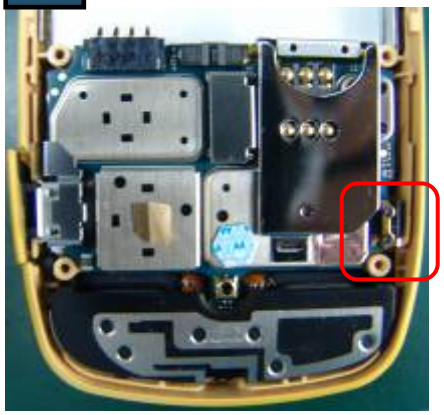
Main Board Assembly (Continued)

Tools Required:

Screw nest D310-40

5. Assemble the Bluetooth Antenna into the Front Housing.
6. Apply the conductive poron pad to the Battery Frame. Ensure the right end of the frame in the proper location.
7. Assemble the Battery Frame to Front Housing from right to left and ensure the hinge connector was covered by frame completely.
8. Apply the radio label on the front housing.

5



6

7

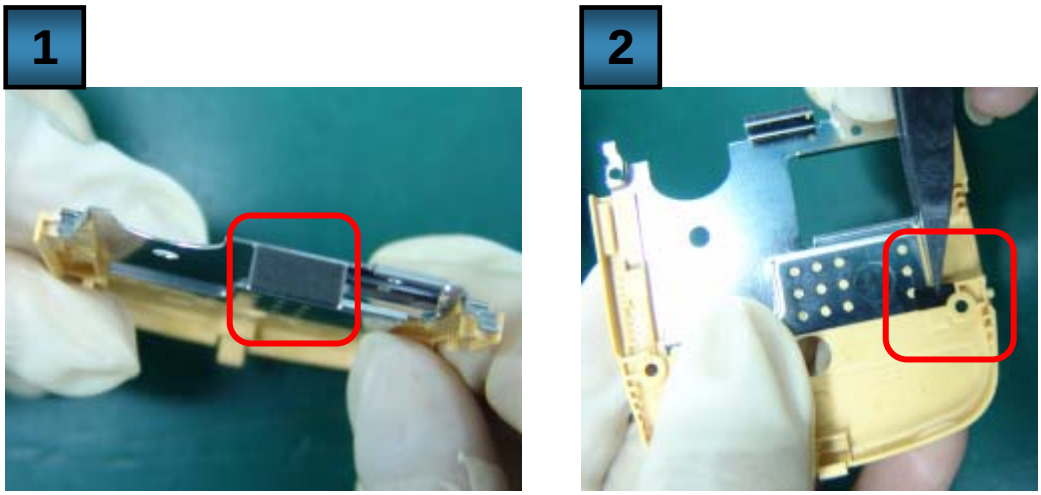
8

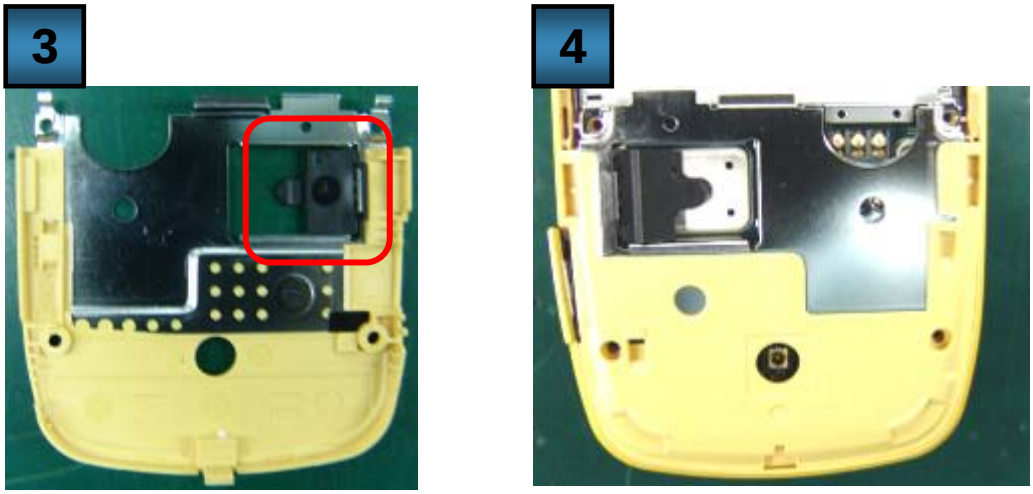
2.7.5 Back Housing Assembly

Tools Required:

None Required

1. Apply the battery pad using tweezers to the Back Housing.
2. Apply the Back Housing Label to the Back Housing using tweezers.
3. Assemble the SD card seal to back housing and ensure the inverse side is up.
4. Assemble the rear housing to the front housing.



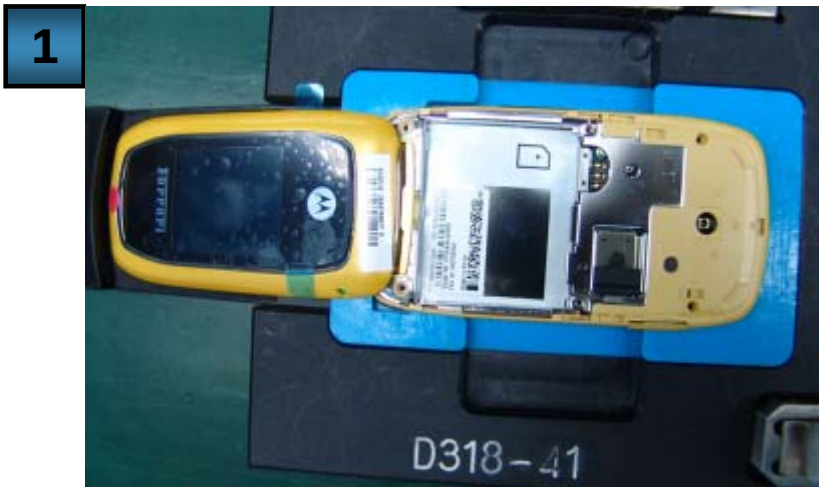


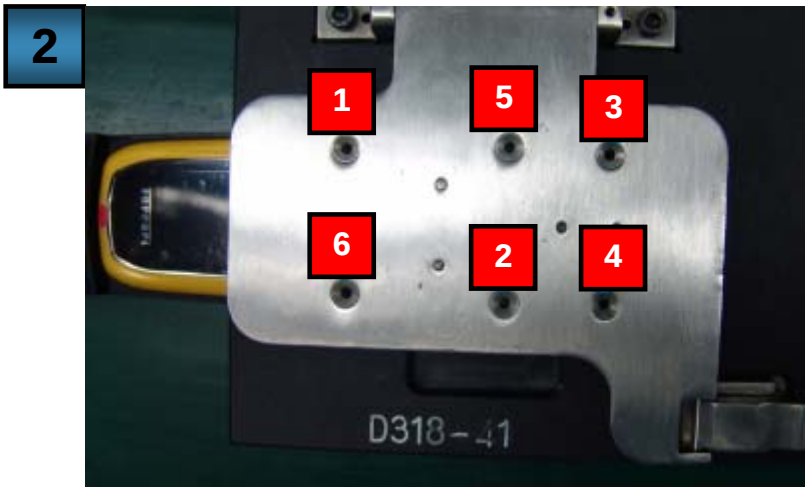
2.7.6 Closing the Unit

Tools Required:

Screw nest D310-40

1. Place the unit into the Screw Nest Fixture D318-41.
2. Insert the Six T-5 Screws and fasten in the order shown.



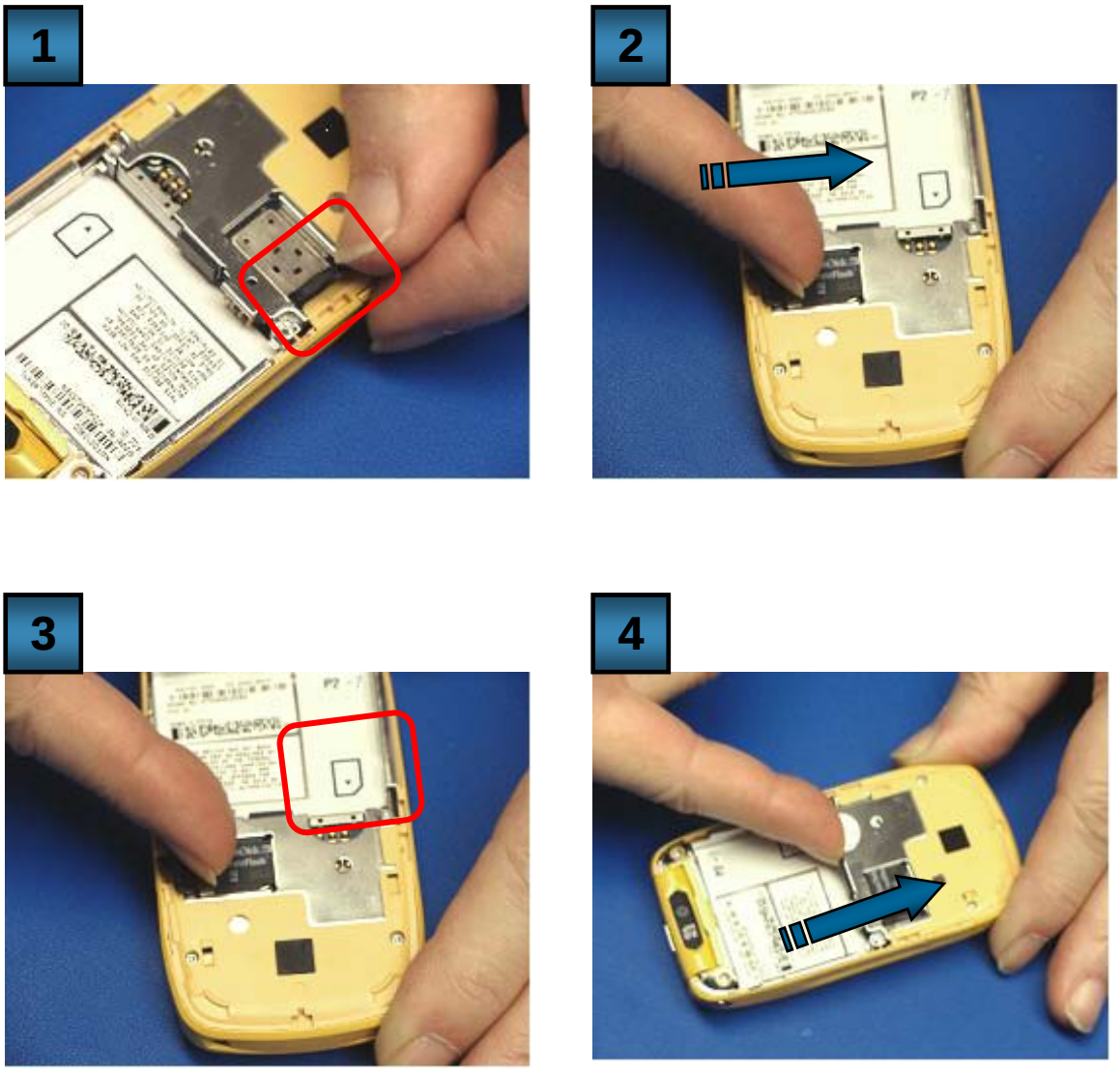


2.7.7 SIM Card and SD Card Installation

Tools Required:

None Required

1. Lift the SD card lock.
2. Slide SD Card inward. Being careful not to touch the contacts.
3. Align the SIM Card as shown
4. Push the SIM card toward the Bottom of the unit.



2.7.8 Battery and Battery Door Installation

Tools Required:

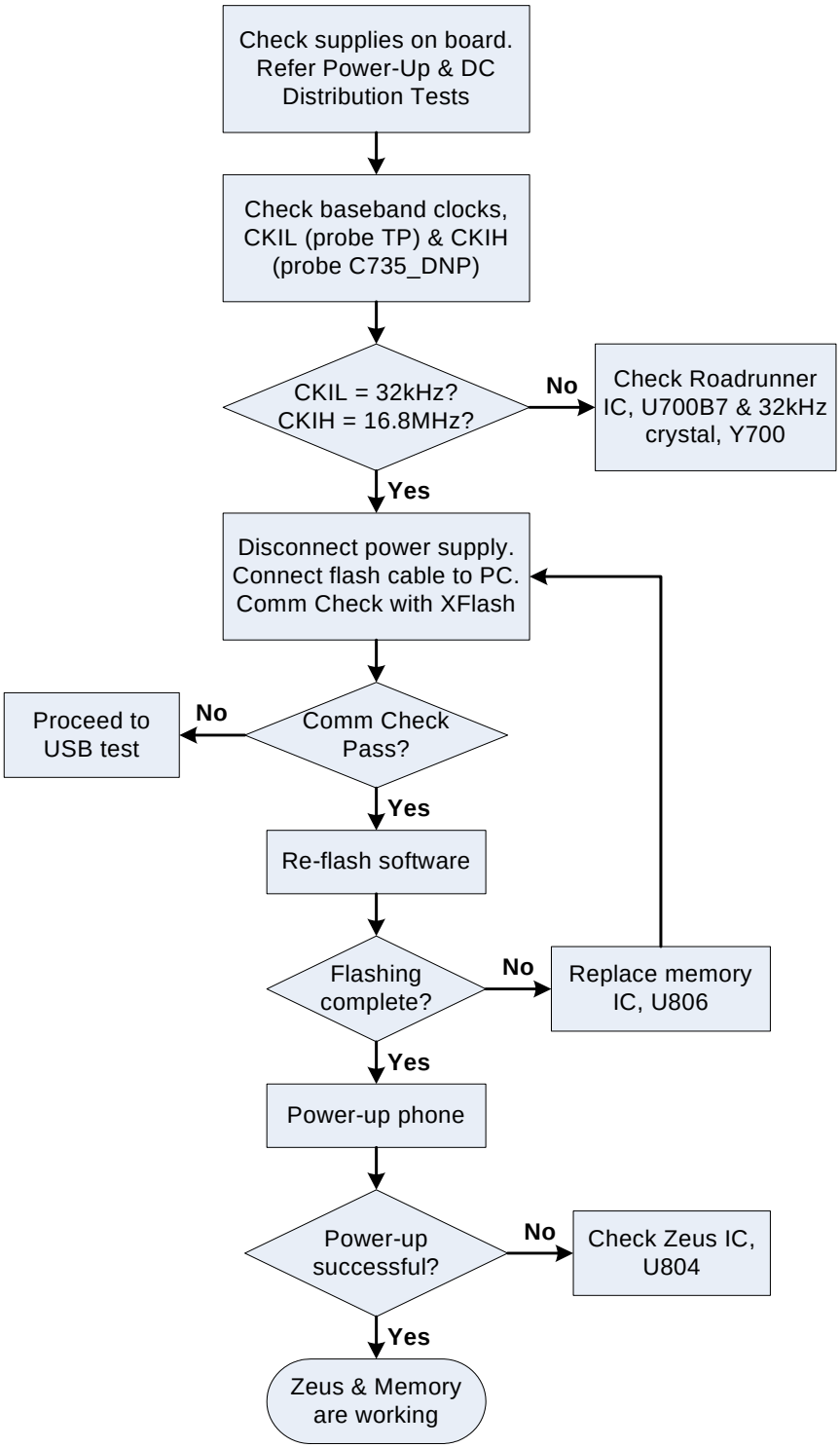
None Required

1. Tilt the back of the battery at approximately a 45 degree angle and insert into the Back Housing.
2. Push the battery toward the bottom of the unit and push the back of the battery down
3. Place the Battery door on the unit where it aligns with the Back Housing.
4. Slide battery door towards Top of unit

Chapter 3

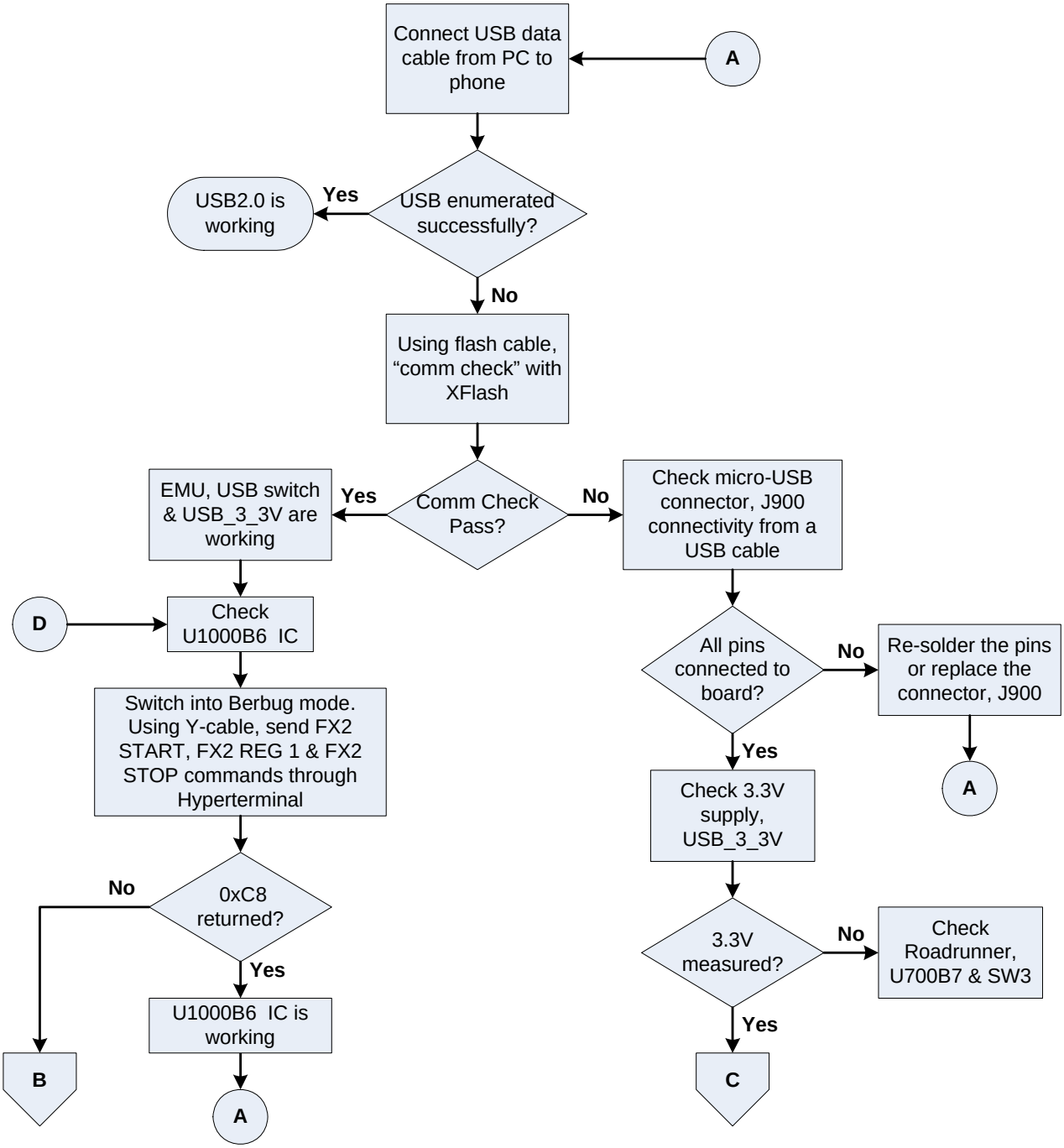
TROUBLESHOOTING

3.1 Digital Analysis Test

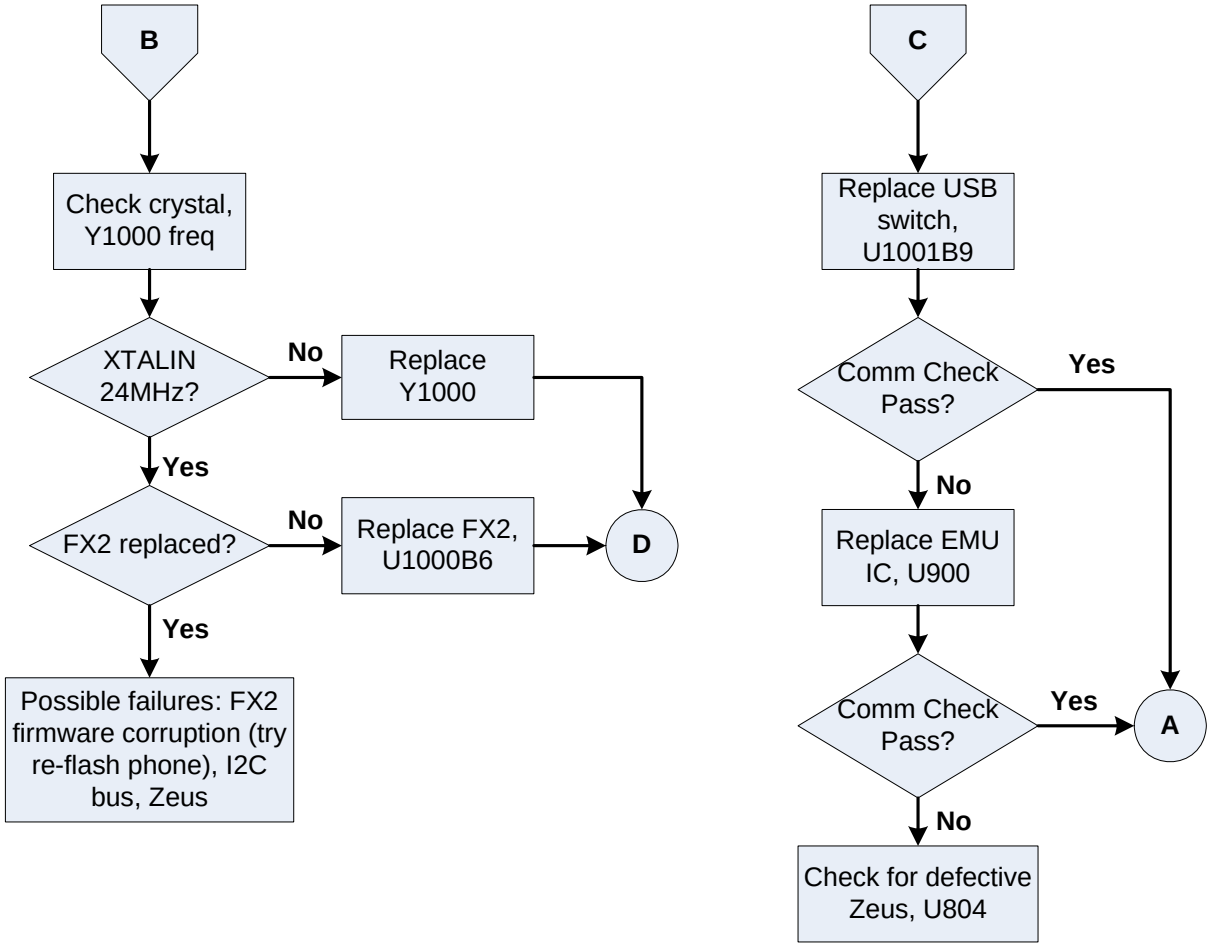


Digital Analysis Test (Continued)

USB Failure Analysis

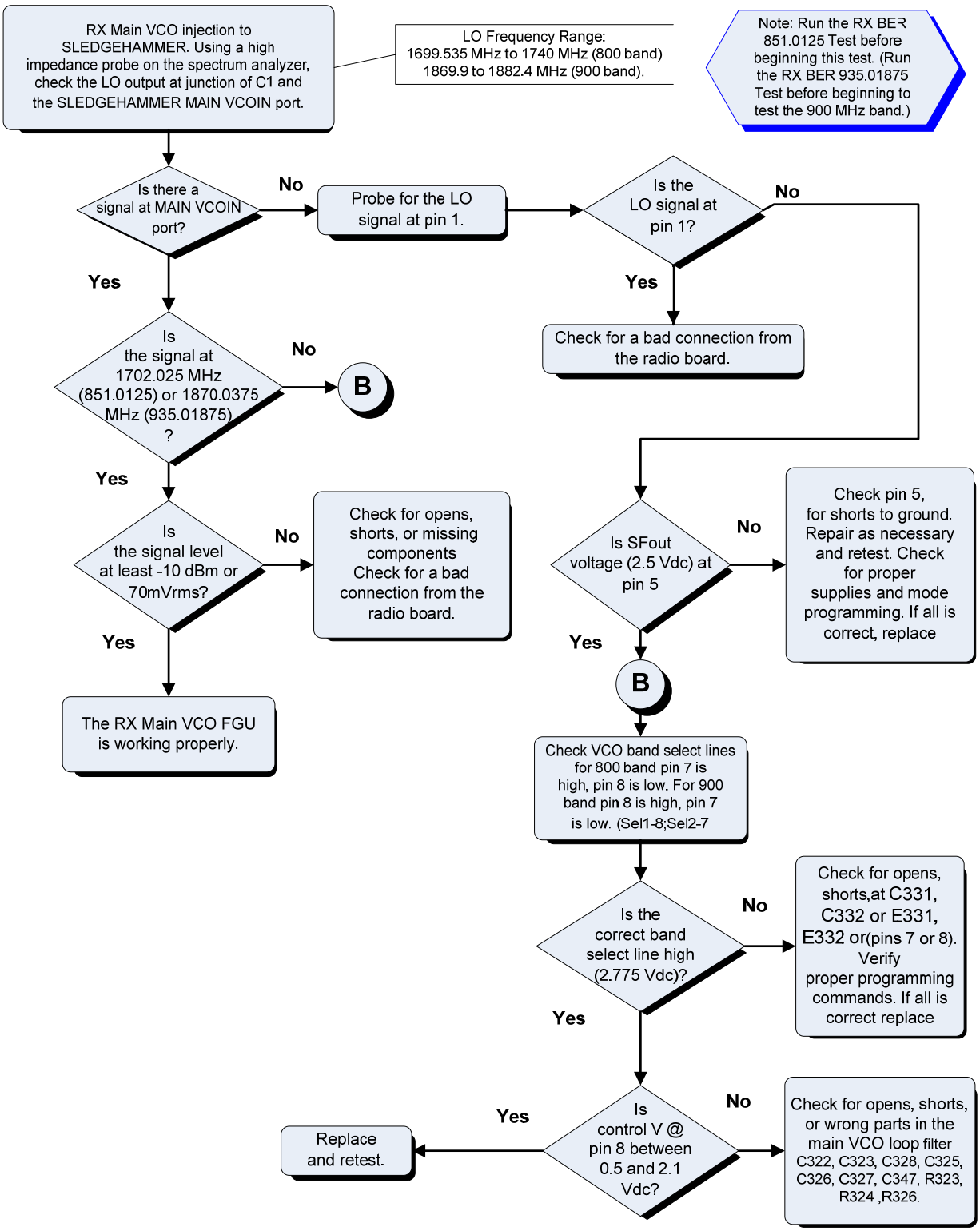


Digital Analysis Test (Continued)



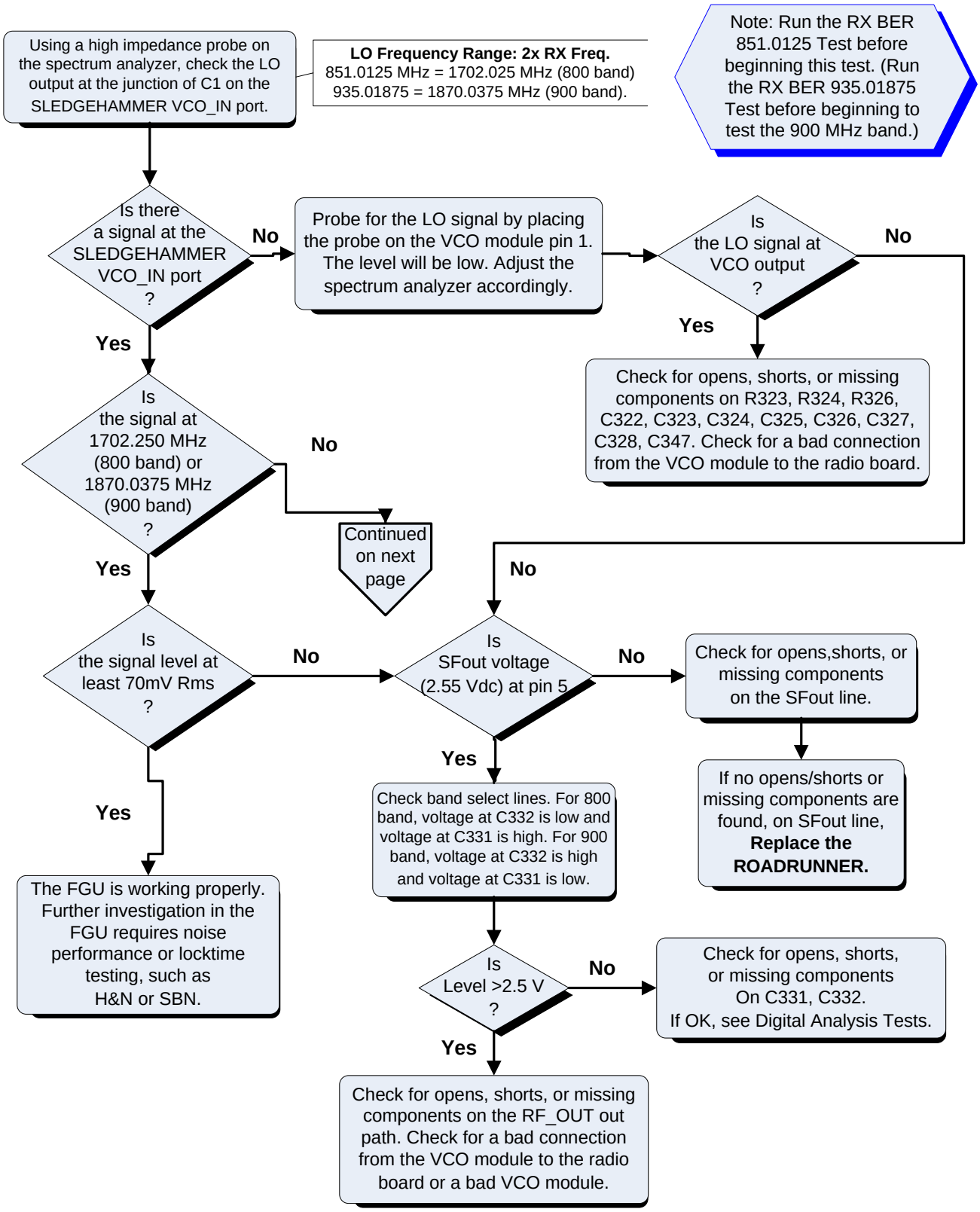
3.2 LO Output Test

Use this test on a unit with the following symptom: no RX.

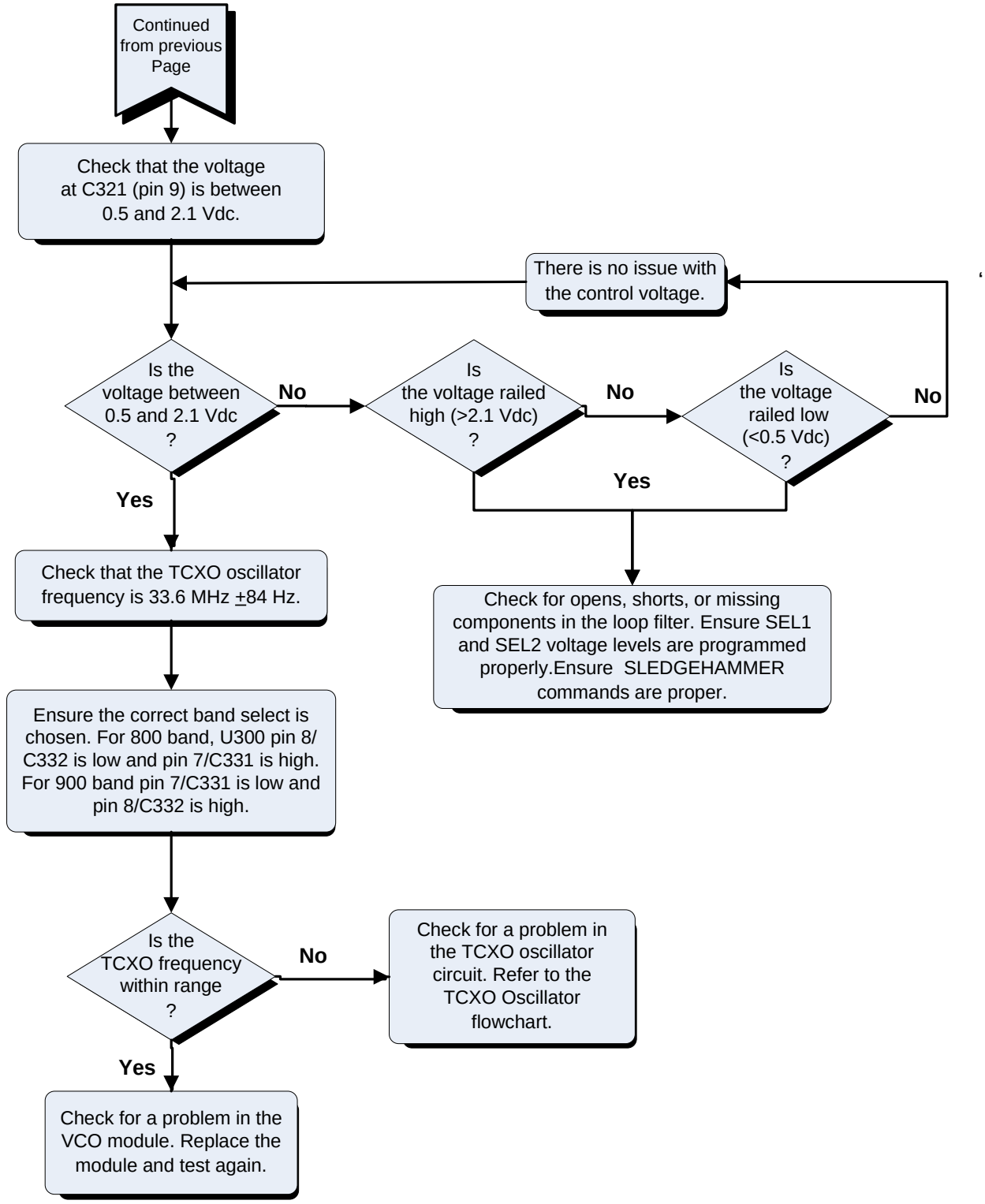


3.3 RX Main VCO Test

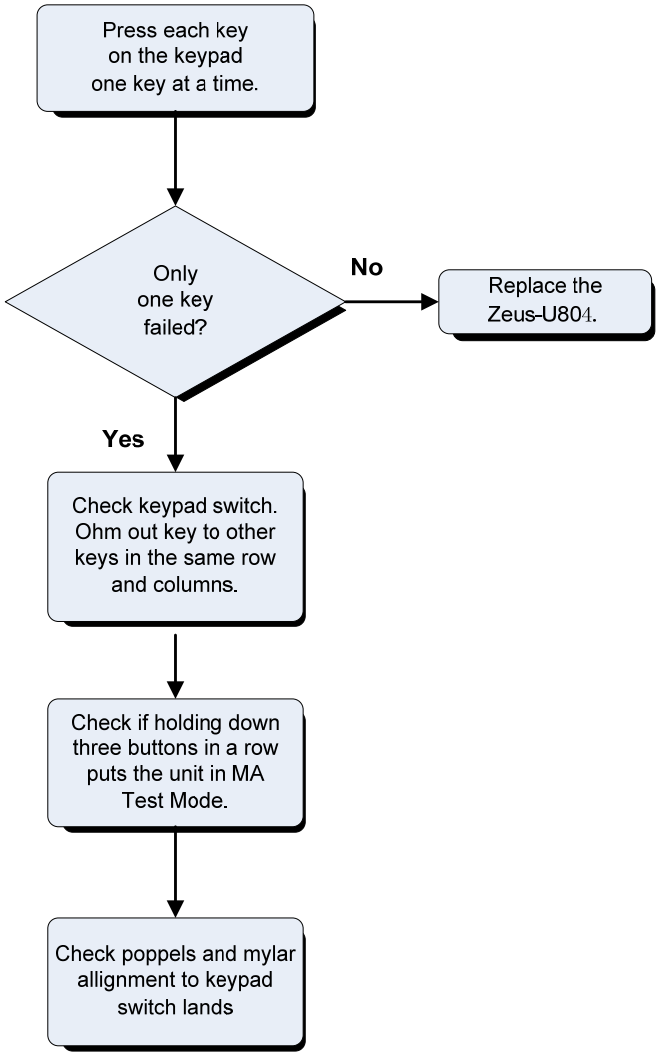
Use this test on a unit with the following symptom: no RX.



RX Main VCO Test (Continued)

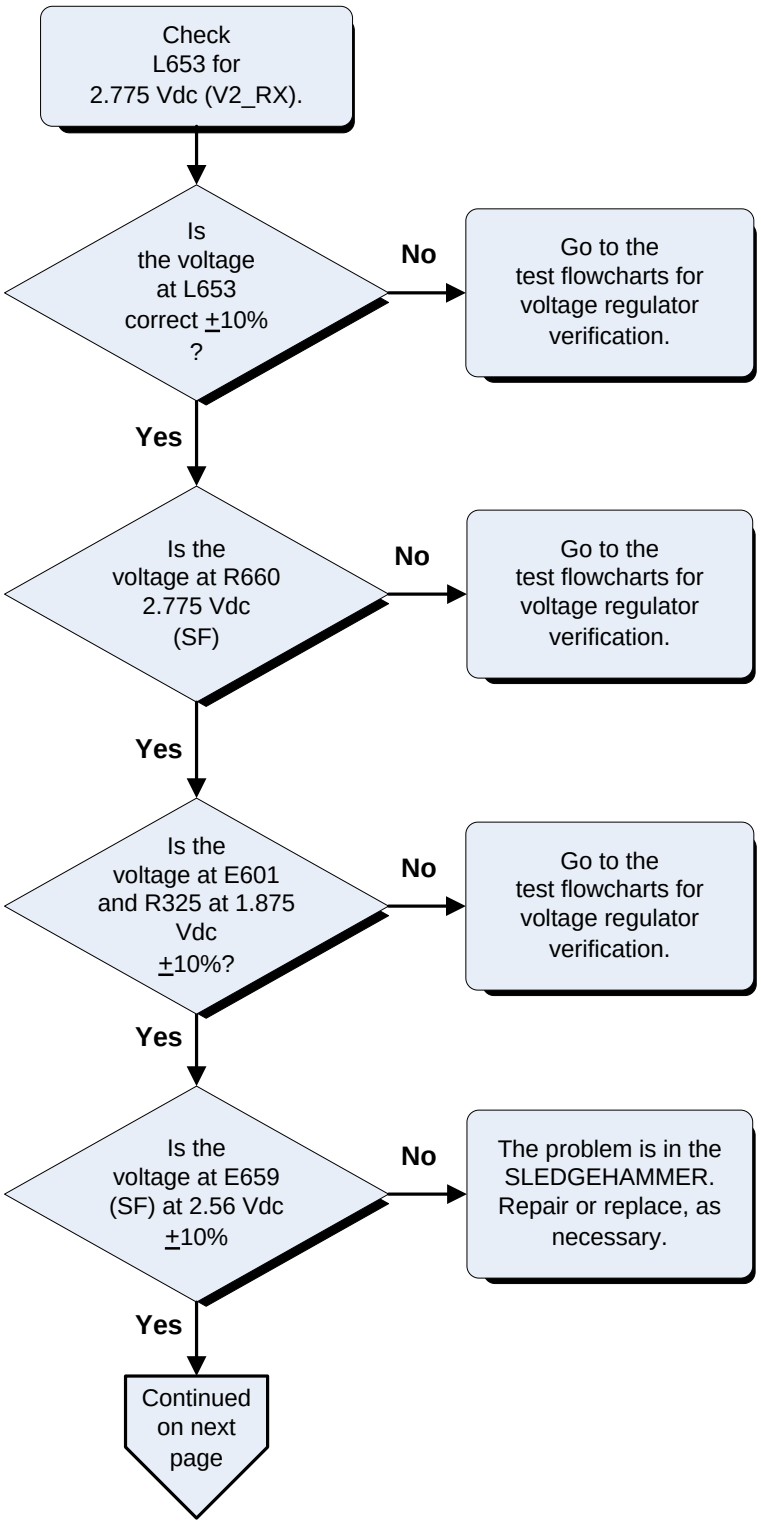


3.4 Keypad Failure Test.

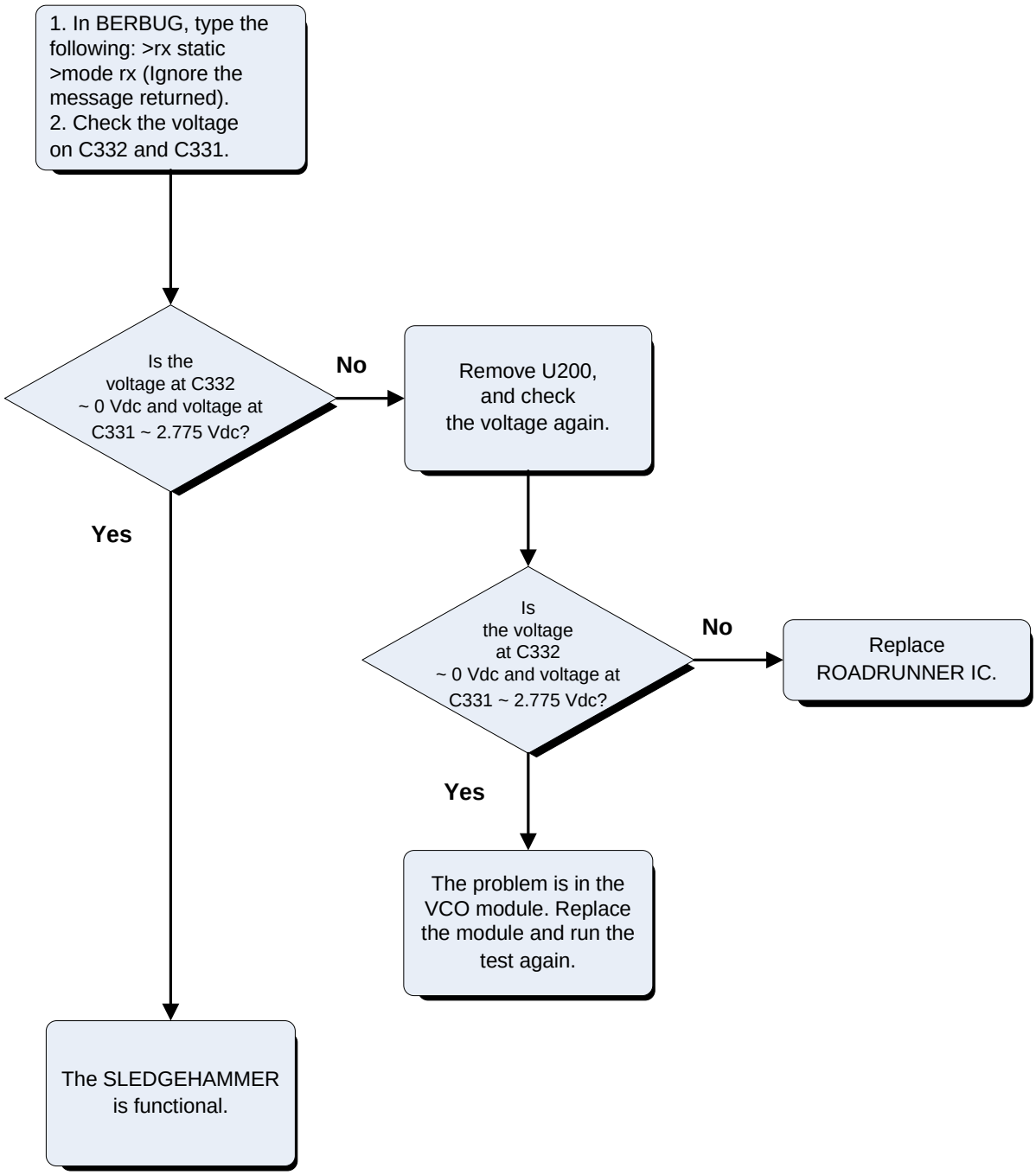


3.5 SLEDGEHAMMER Test

Use this test to check the SLEDGEHAMMER circuitry.



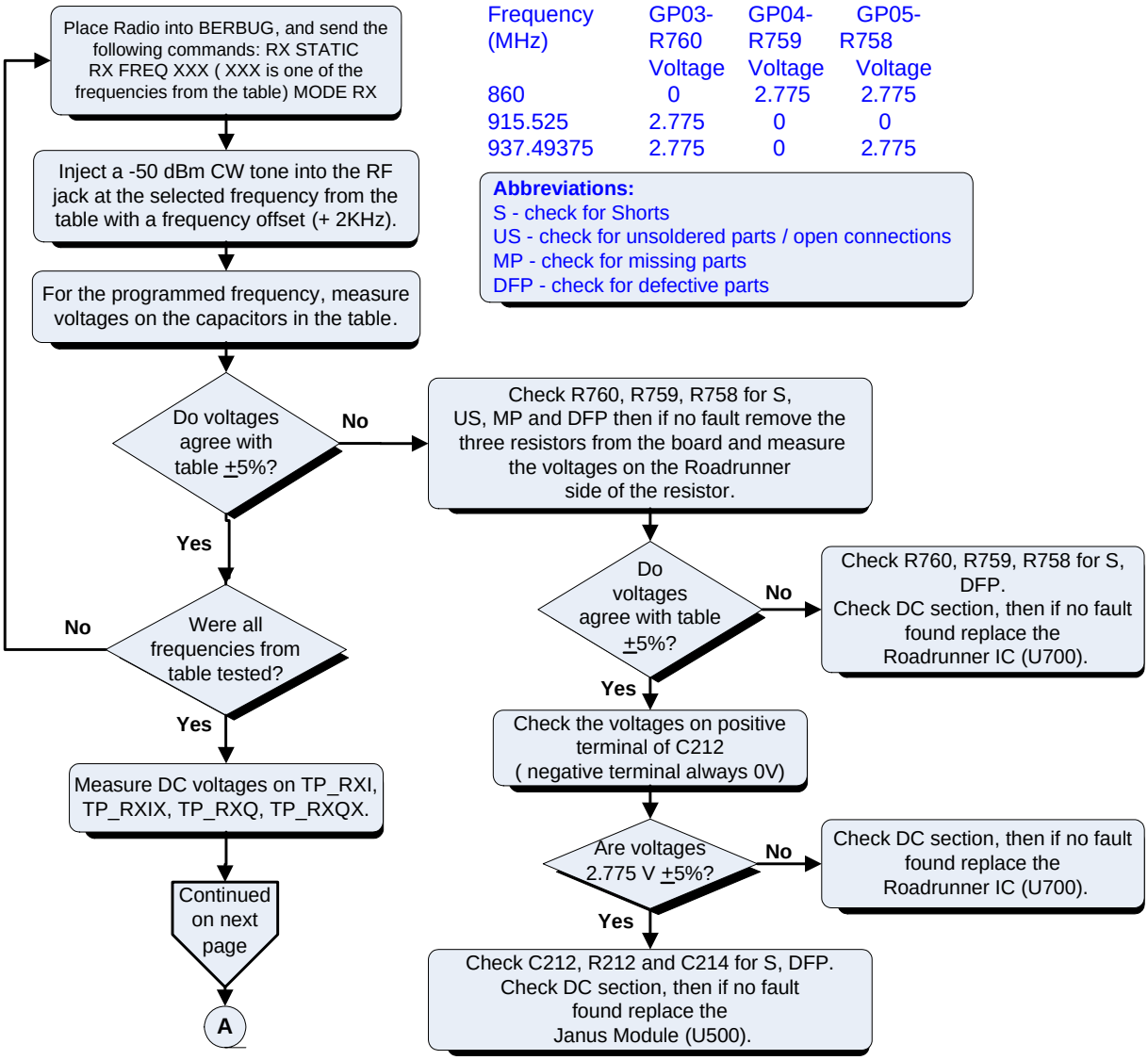
SLEDGEHAMMER Test (Continued)



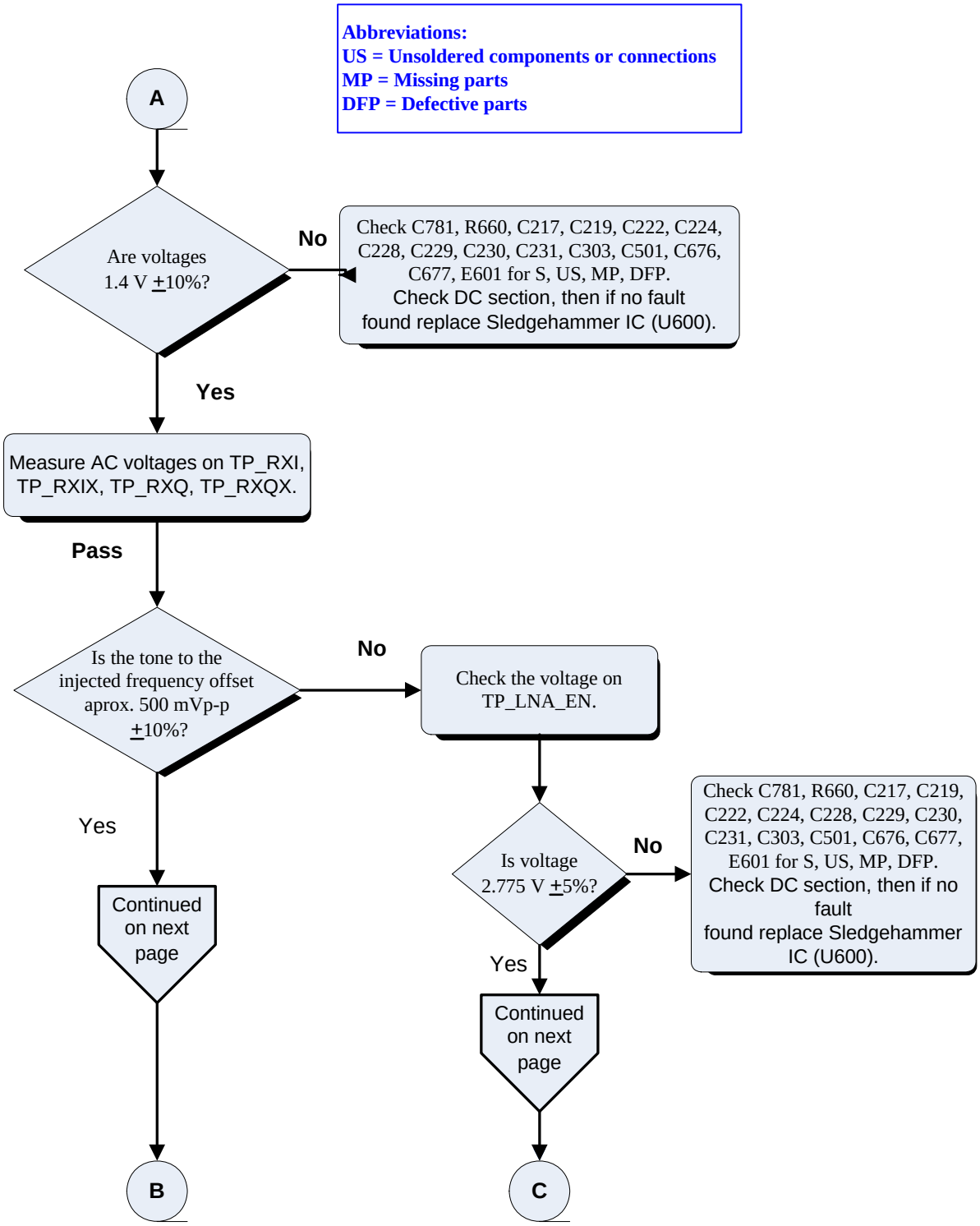
3.6 RX Analysis Test

Use this test on a unit to perform a RX analysis in *i*DEN mode.

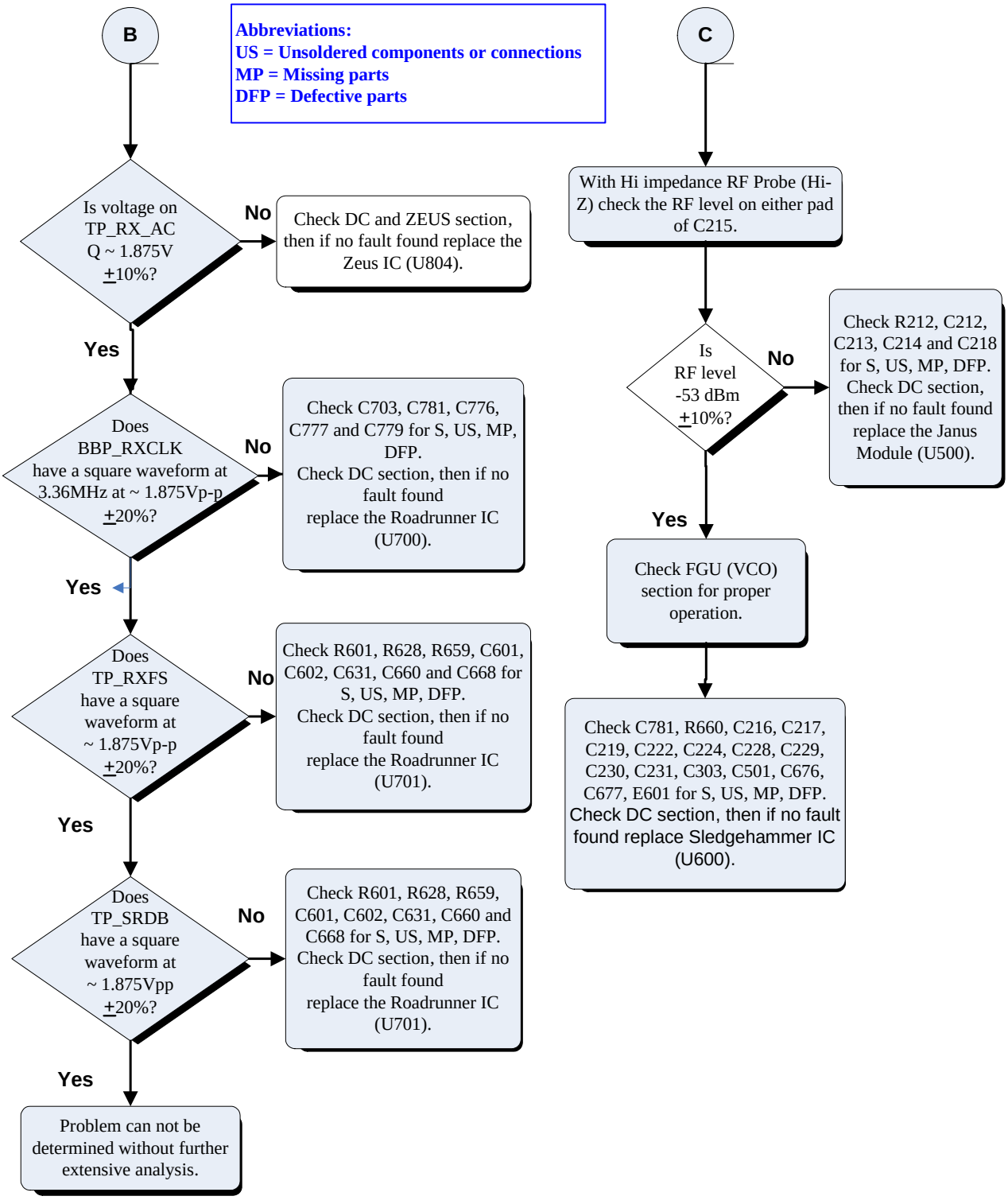
1. Set up the R-2660 as follows: Mode: iDEN Test, Meter: RF DISPLAY, RF Control: GENERATE, FREQ: (See Table) MHz, Gen: OUT6/6, Gen: -60 dBm, RF I/O.
2. Set the spectrum analyzer to Center Freq: 851.000 MHz (935.01875 MHz for 900), Span: 100 kHz, Amplitude: -30 dBm reference level. Set marker to test frequency, and use Trace and Max. Hold to obtain readings. Use Clear before taking each reading.
3. Except as noted, use a 50-ohm probe for all RF measurements. The probe ground must make contact with the board ground during the measurements.
4. Check that signal measurement levels are ±3dB at each test point, unless otherwise stated. A low RSSI level will result in higher BER as the signal becomes weaker.
5. The RF cable from the R-2660 to the unit under test (UUT) should be <18 in. for these measurements in this flowchart.
6. Be sure to check for any defects, such as unsoldered connections, shorts, broken or defective components.
7. Remove the antenna from the UUT before beginning these tests.



RX Analysis Test (Continued)

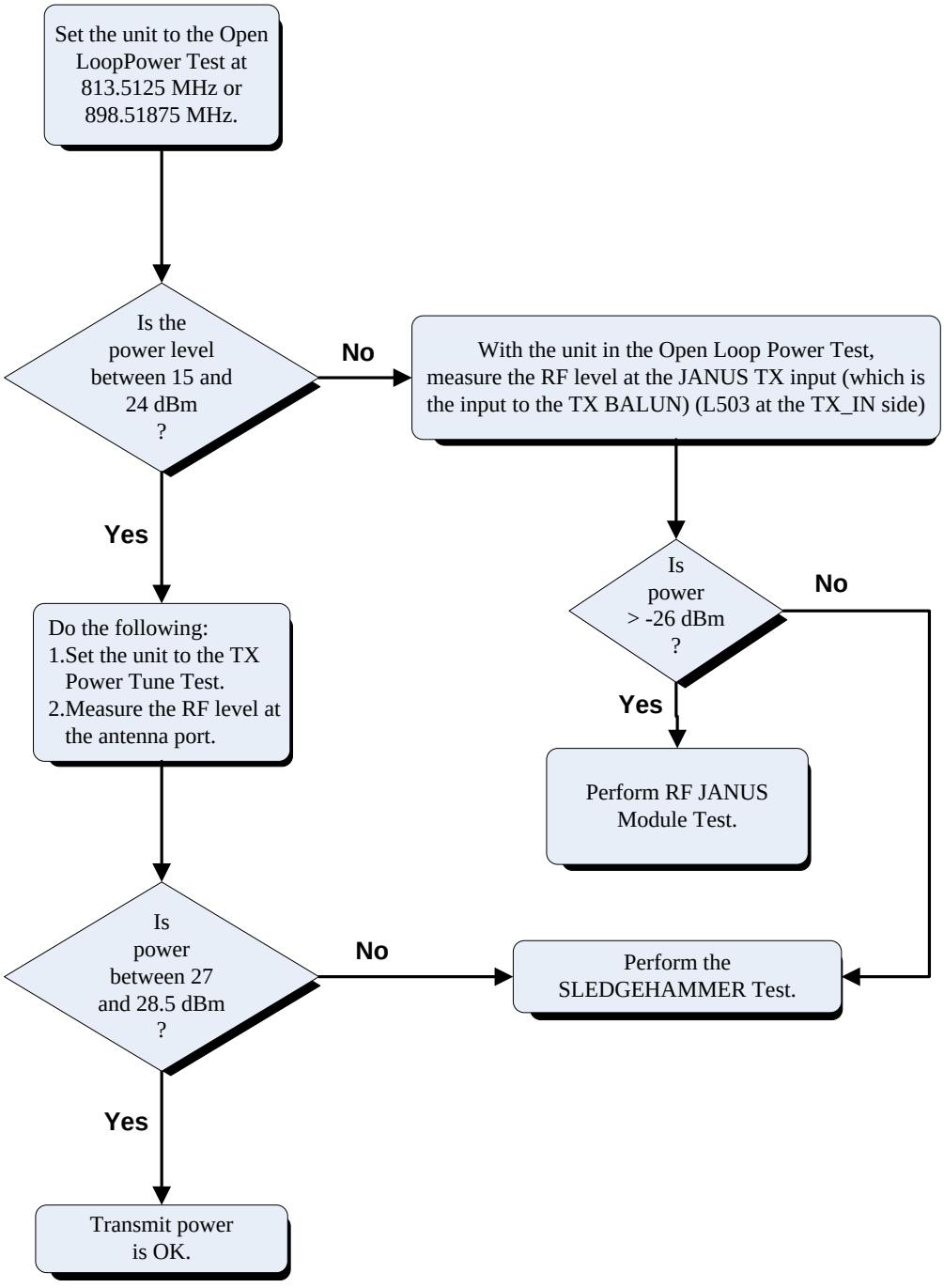


RX Analysis Test (Continued)



3.7 TX Power Test

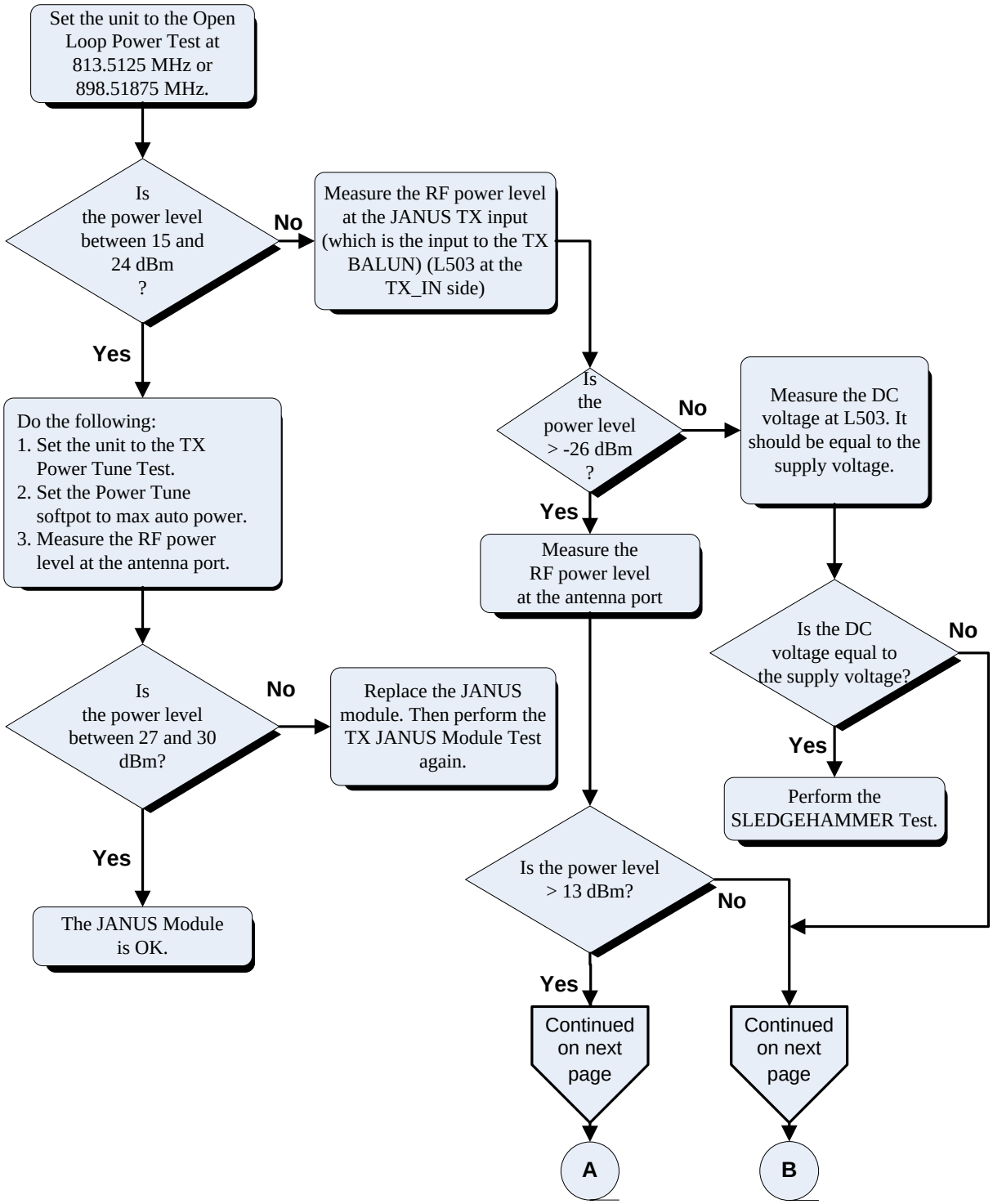
Use this test to check the transmit power circuitry.



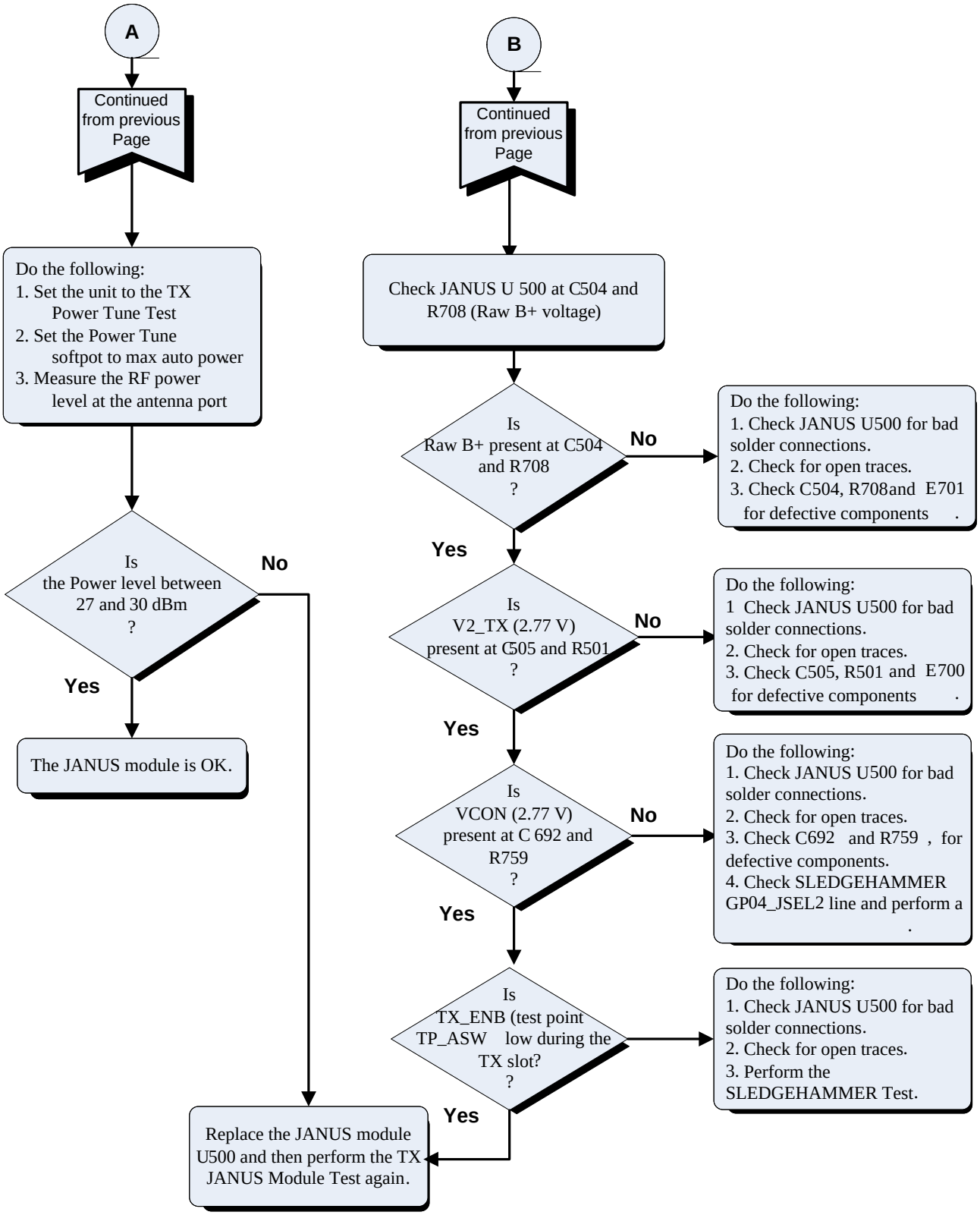
3.8 Tx Janus Module Test

Use this test to check the JANUS Module TX circuitry (TX lineup from BALUN to RX/TX switch included).

Note: Perform the Transmit Power Test before beginning this test.

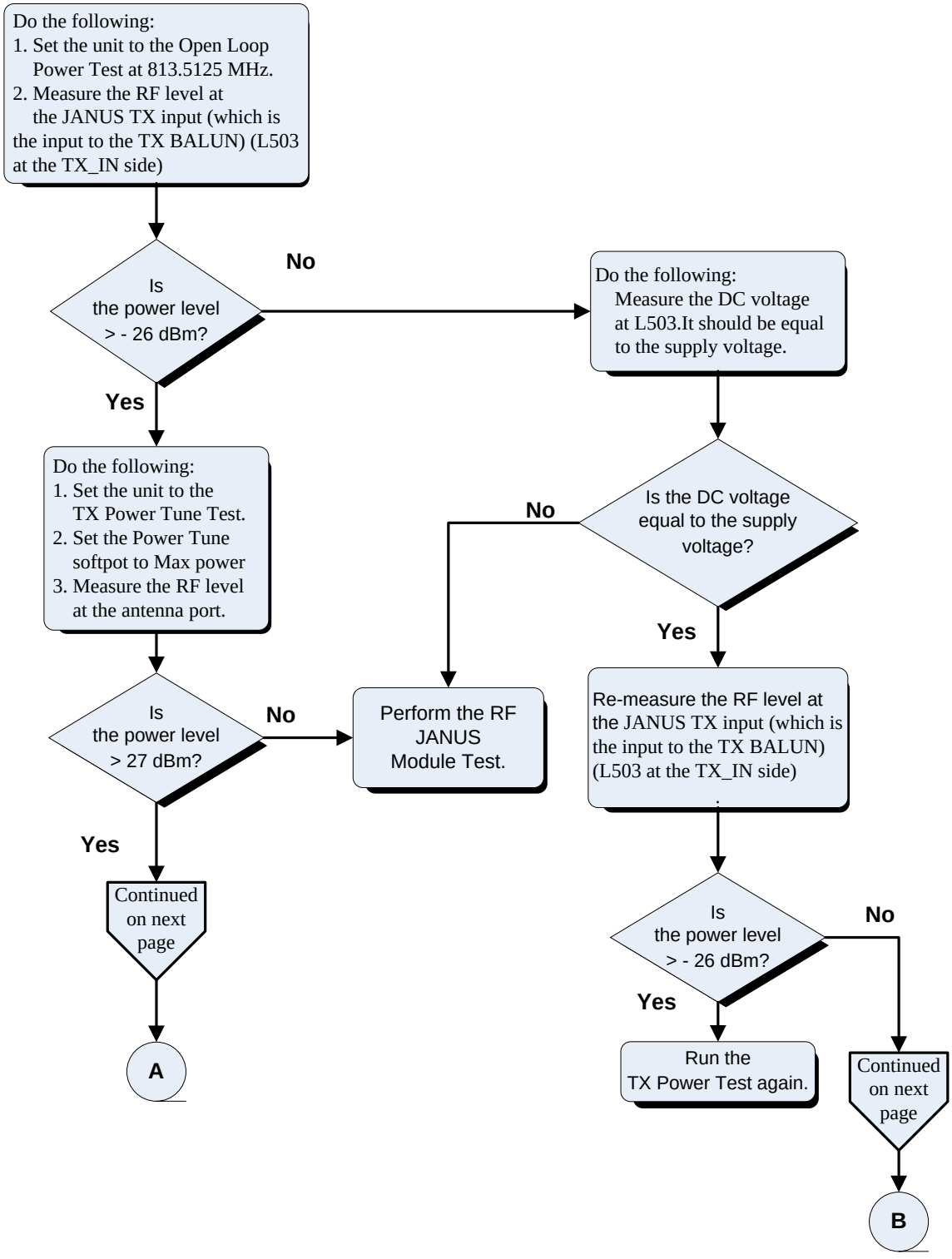


Tx Janus Module Test (Continued)

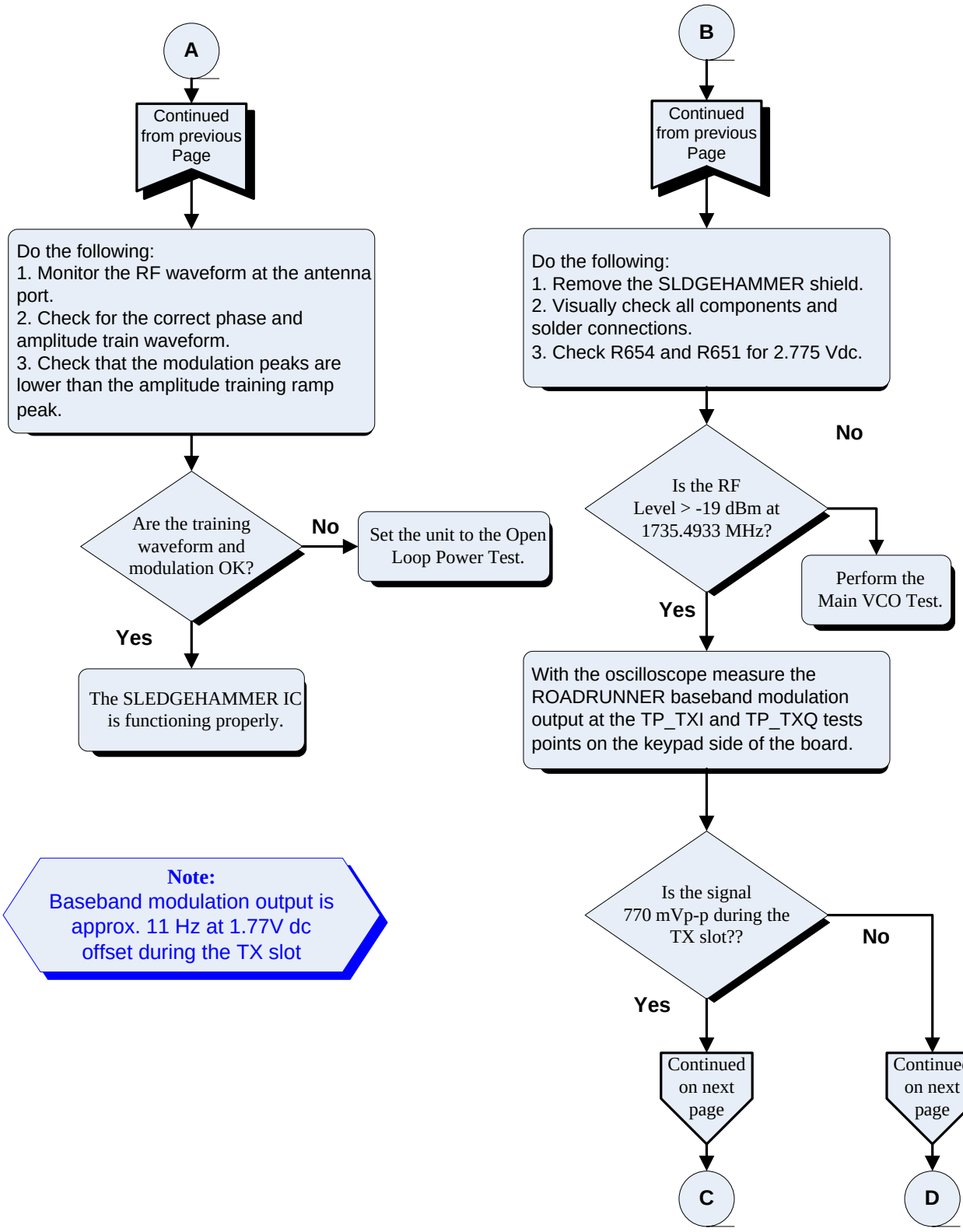


3.9 SLEDGEHAMMER Tx Test

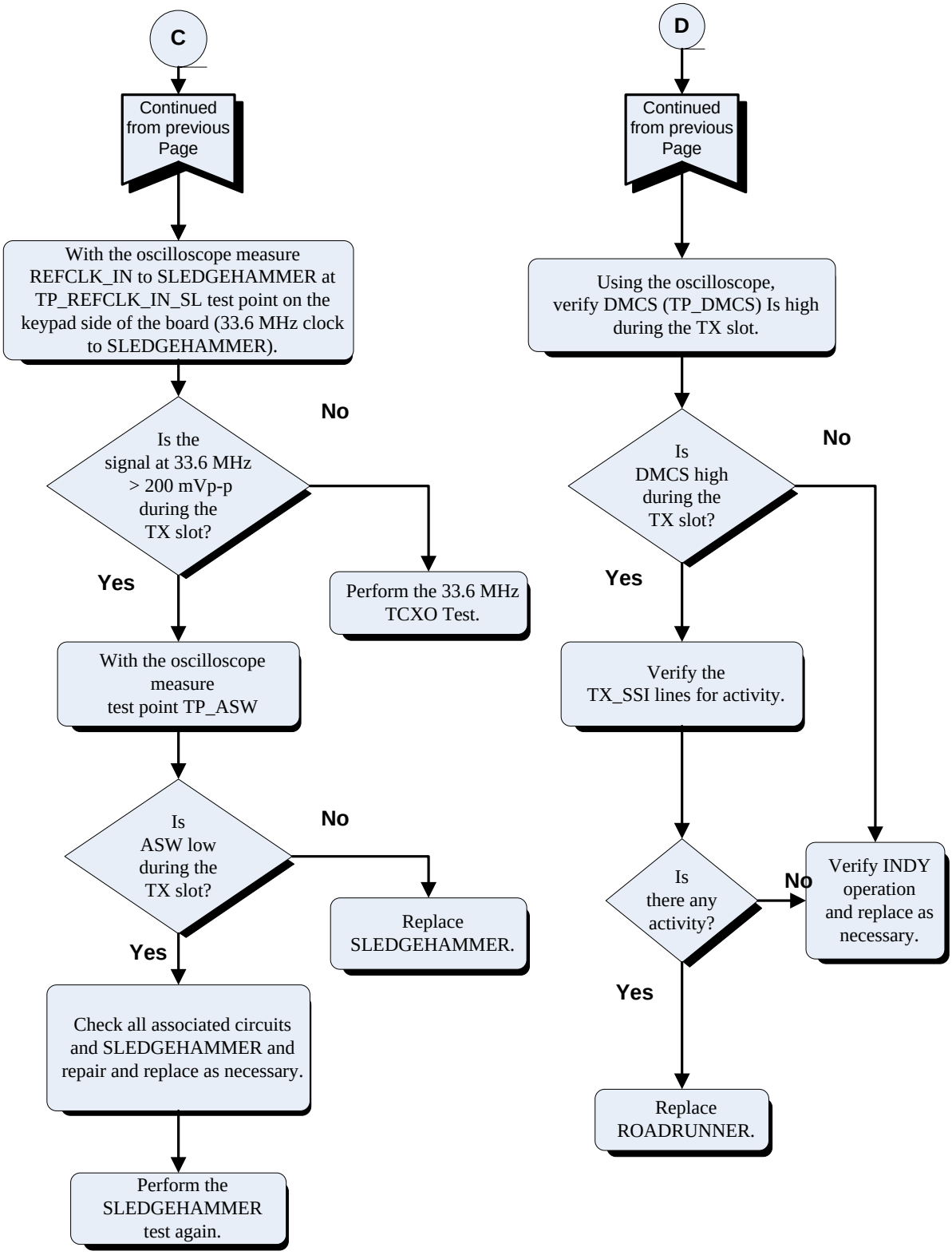
Use this test to check the SLEDGEHAMMER circuitry.



SLEDGEHAMMER Tx Test (Continued)

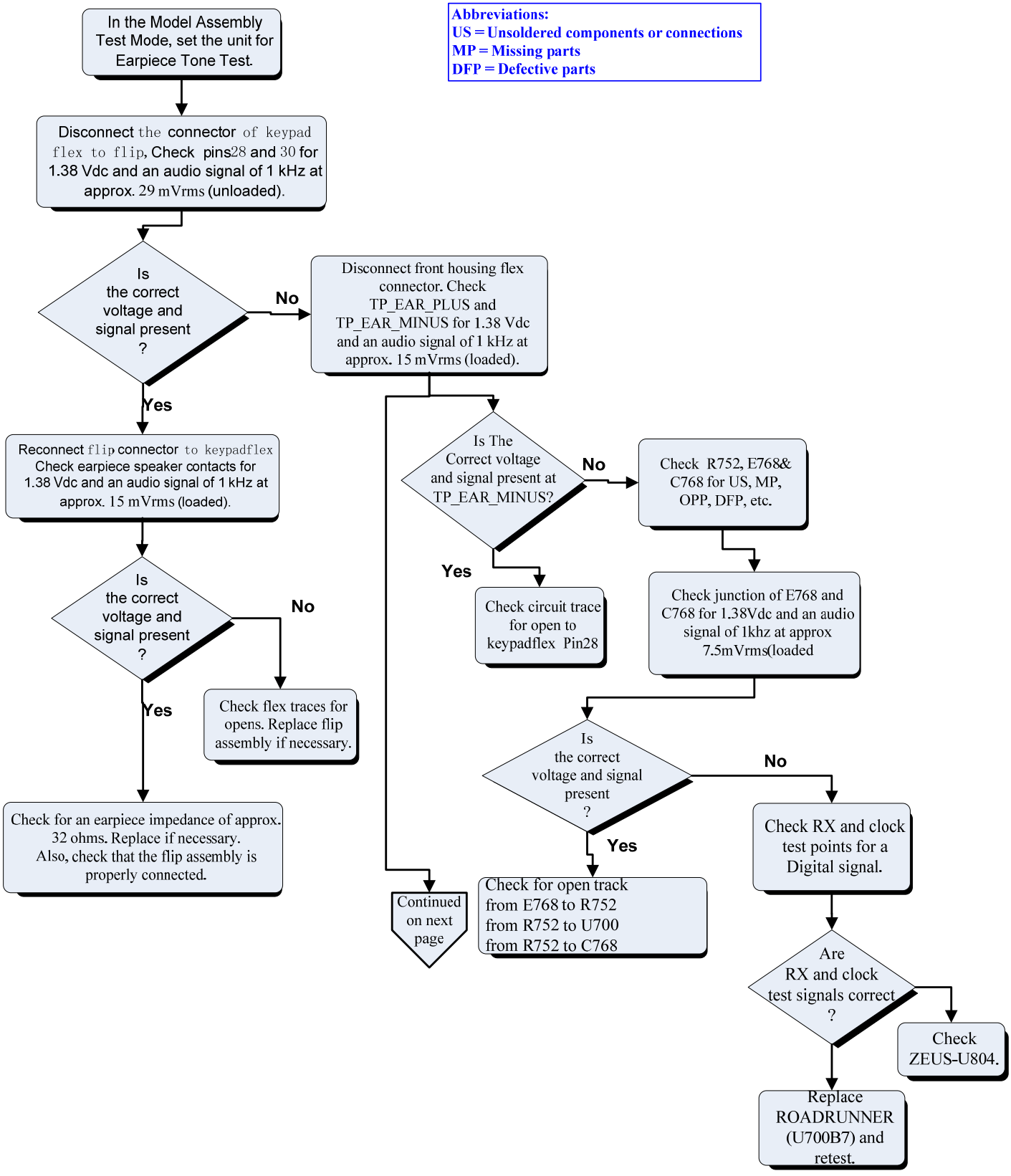


SLEDGEHAMMER Tx Test (Continued)

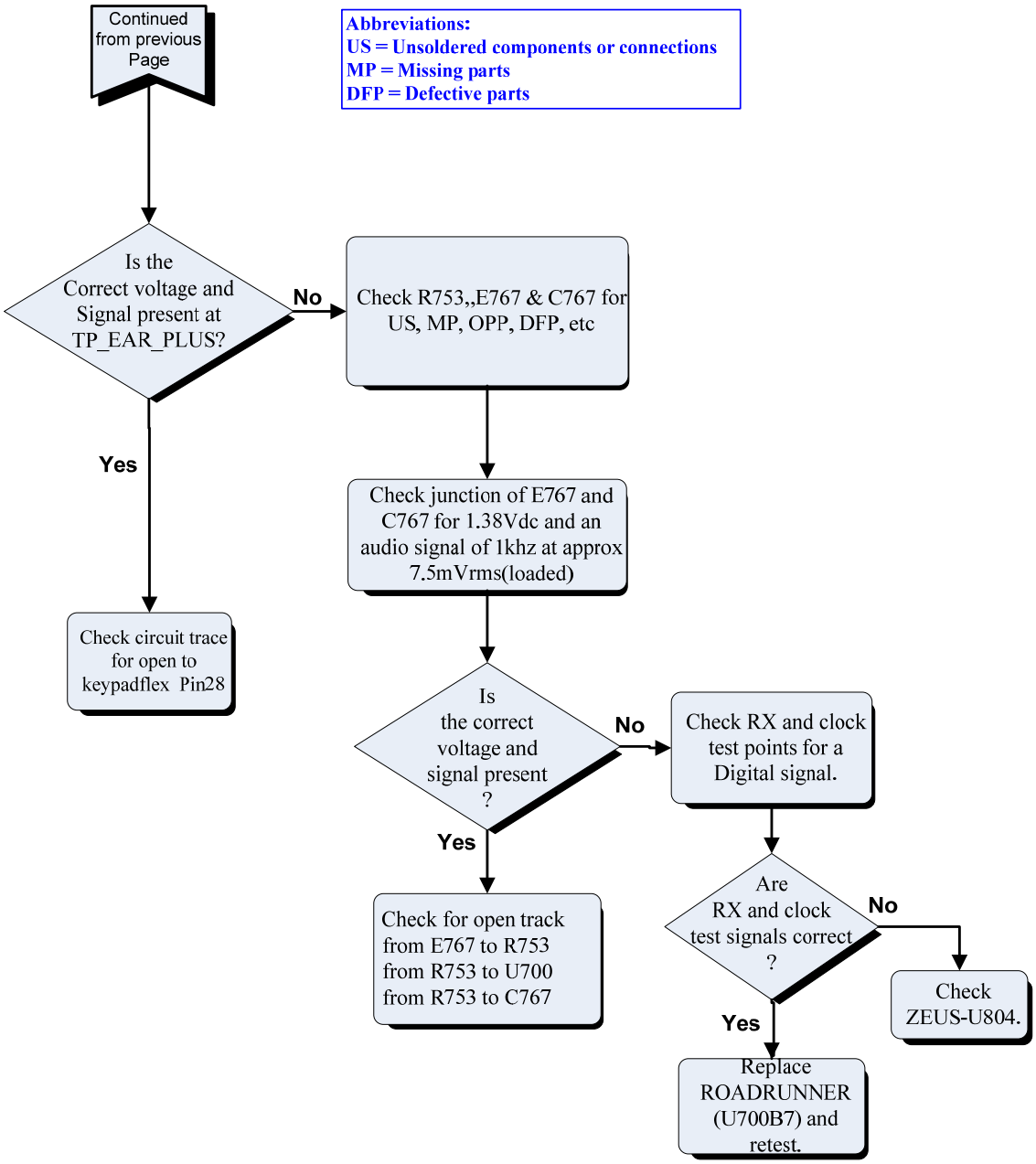


3.10 Earpiece Speaker Test

Use this test on a unit with the following symptom: no earpiece speaker audio.

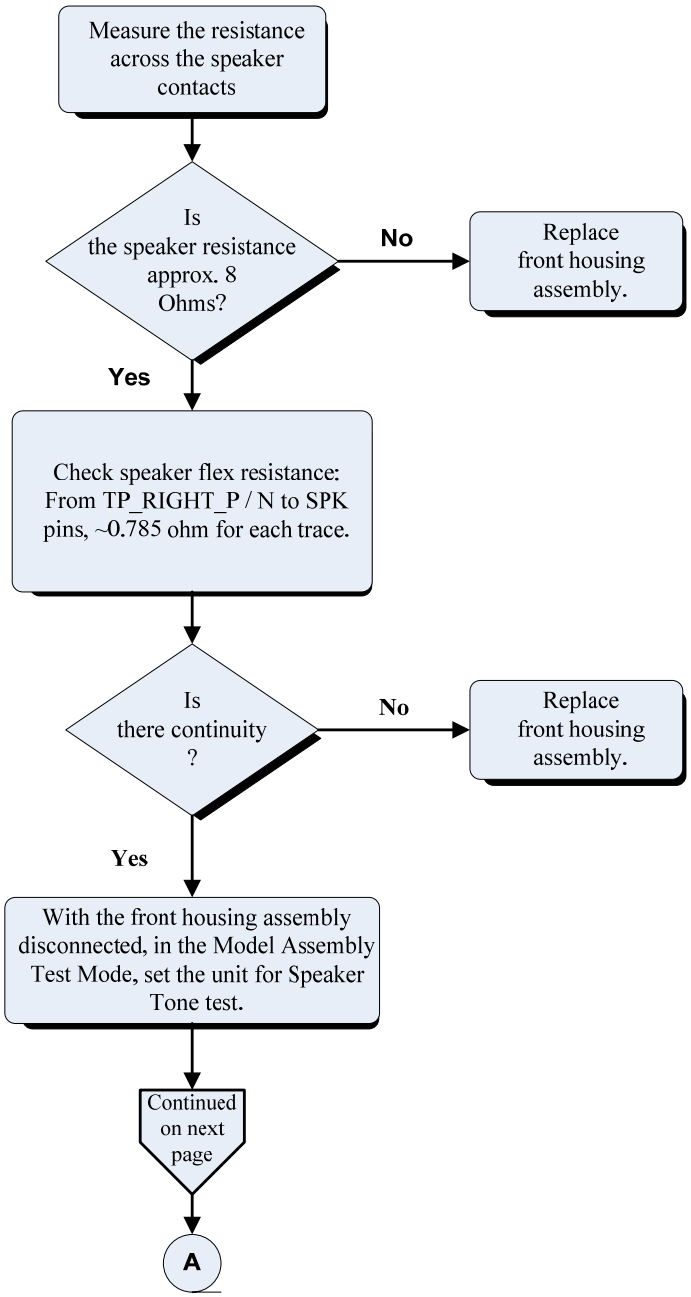


Earpiece Speaker Test (Continued)

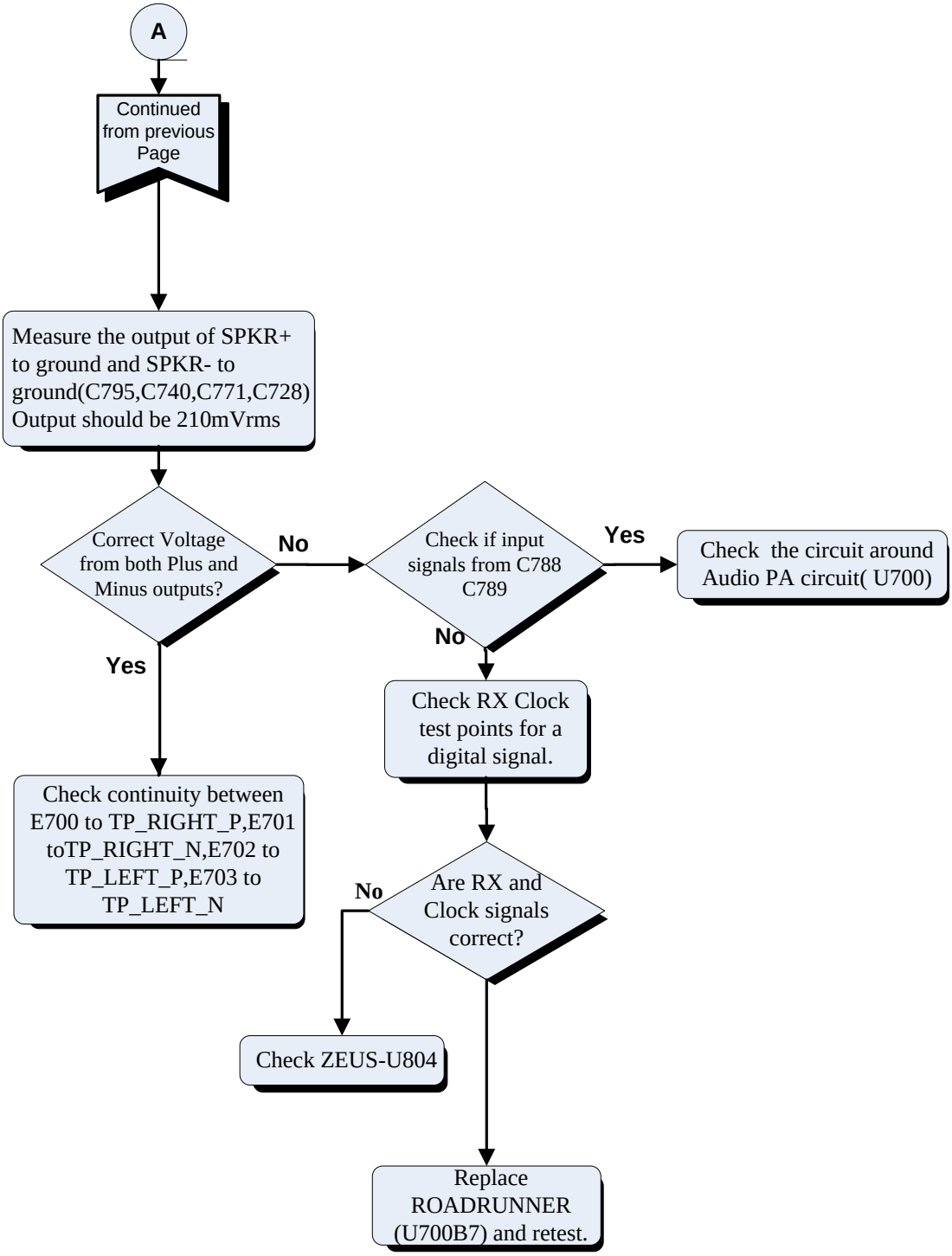


3.11 High Audio Speaker Test

Use this test on a unit with the following symptoms: no high speaker audio

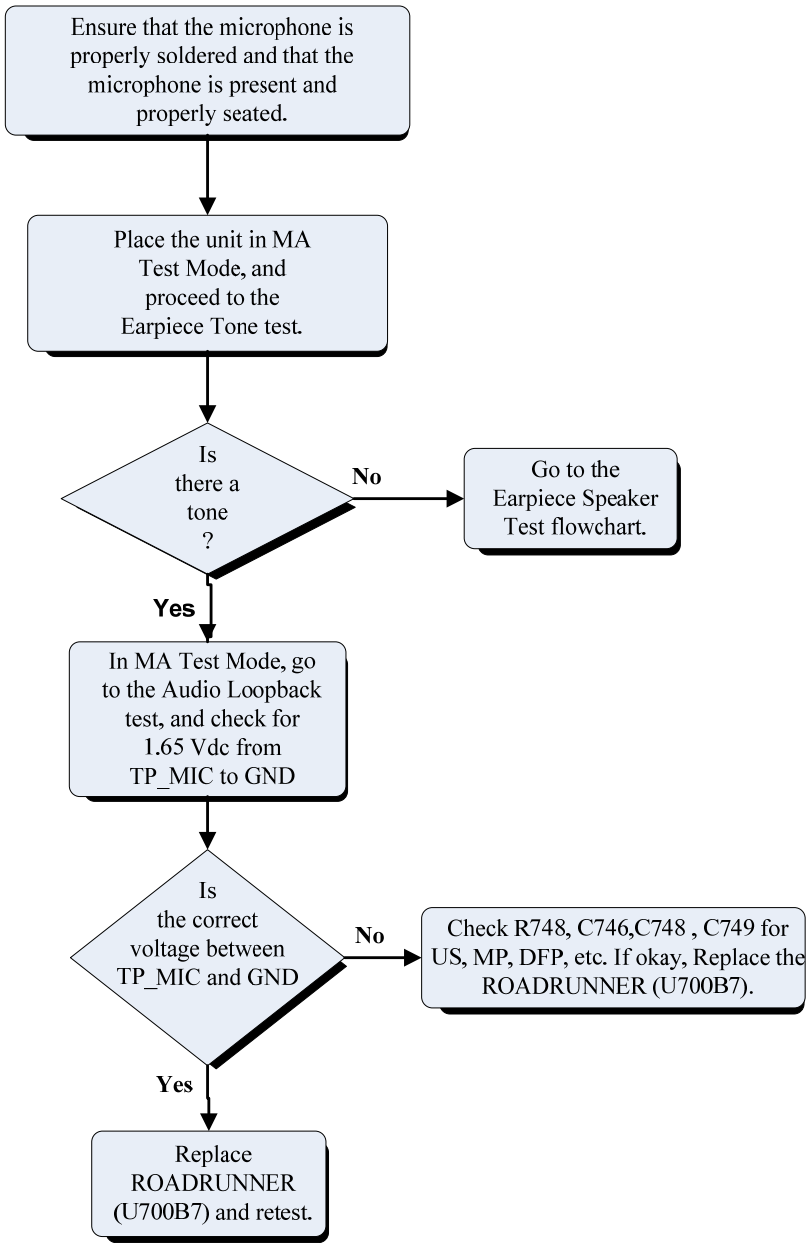


High Audio Speaker Test (Continued)

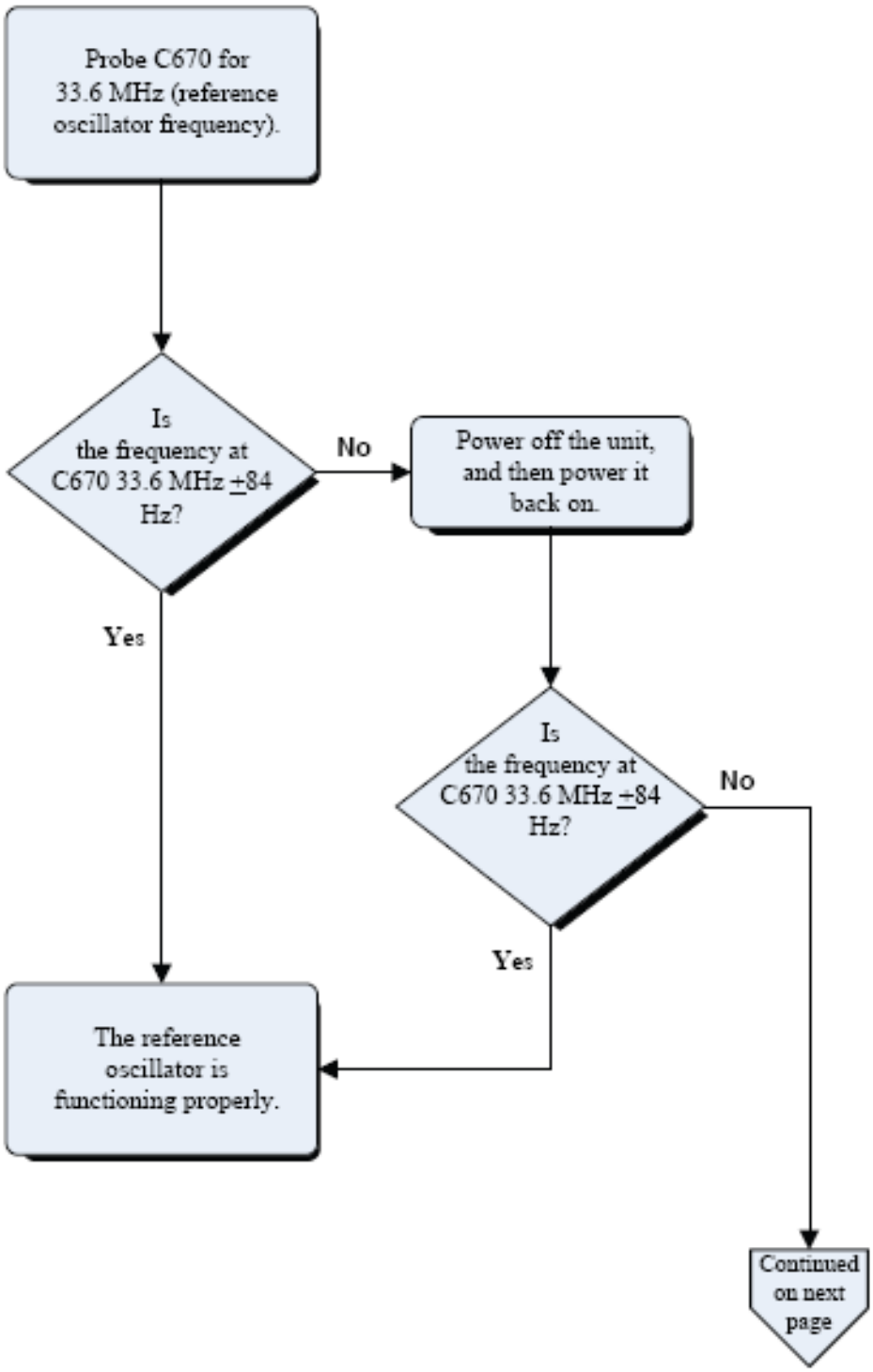


3.12 Audio Loopback Level Test

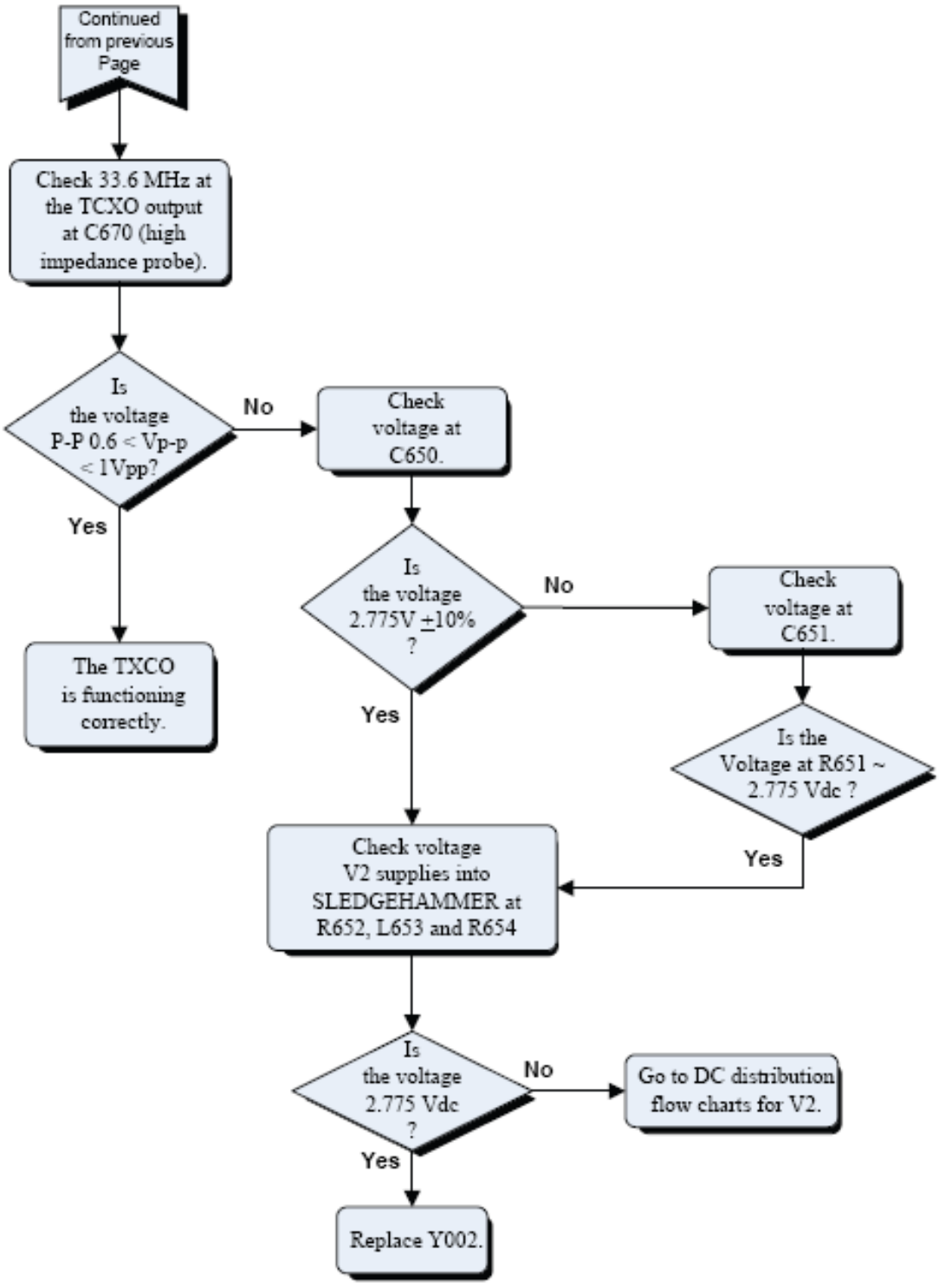
Use this test to check the audio path on a unit with the following symptom: no audio loopback.



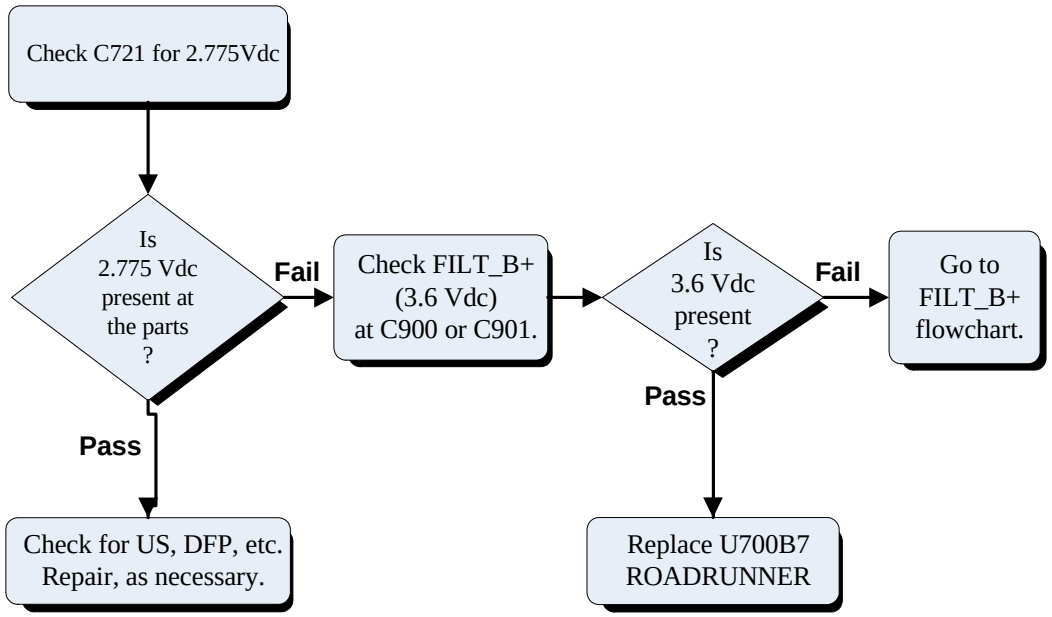
3.13 Reference Oscillator Test



Reference Oscillator Test (Continued)

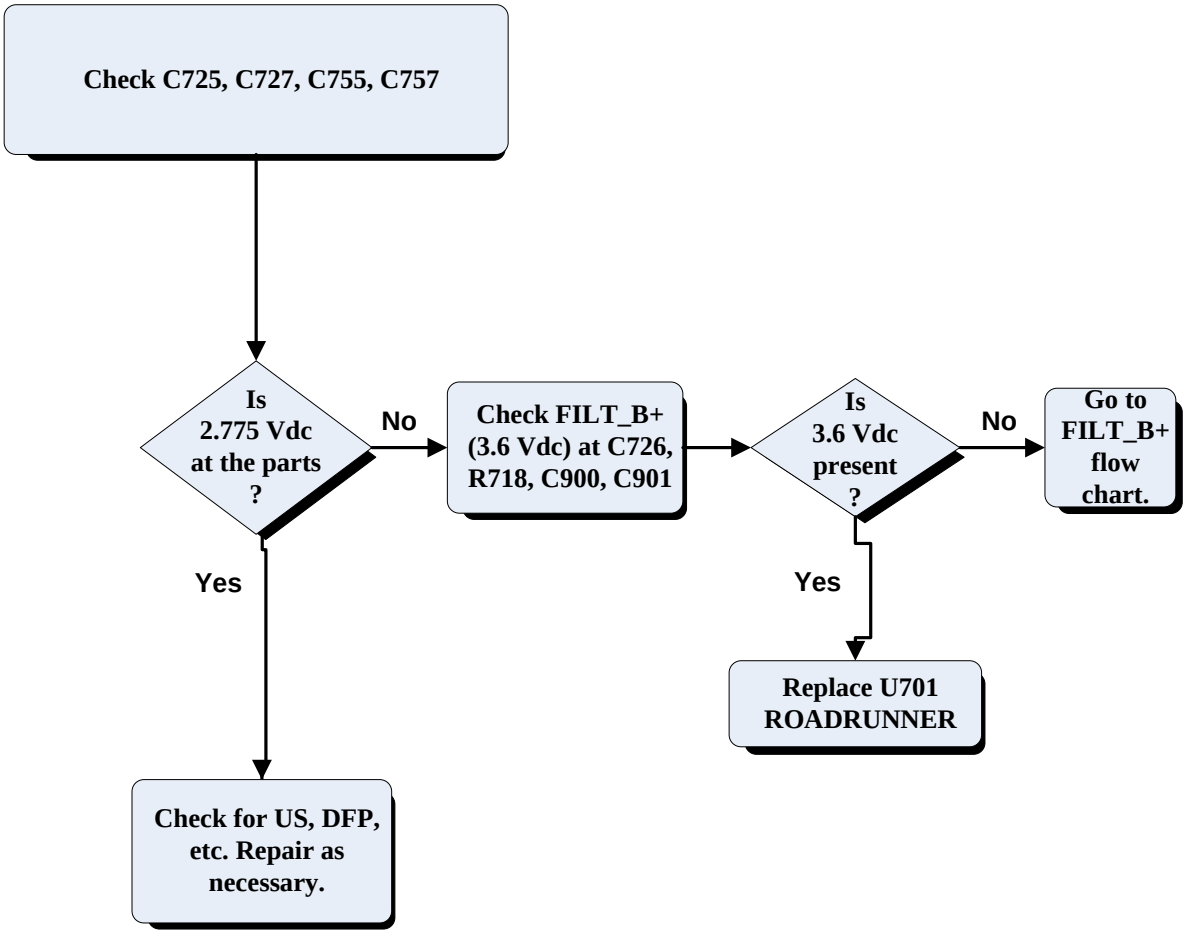


3.14 DC Distribution (V1) Test



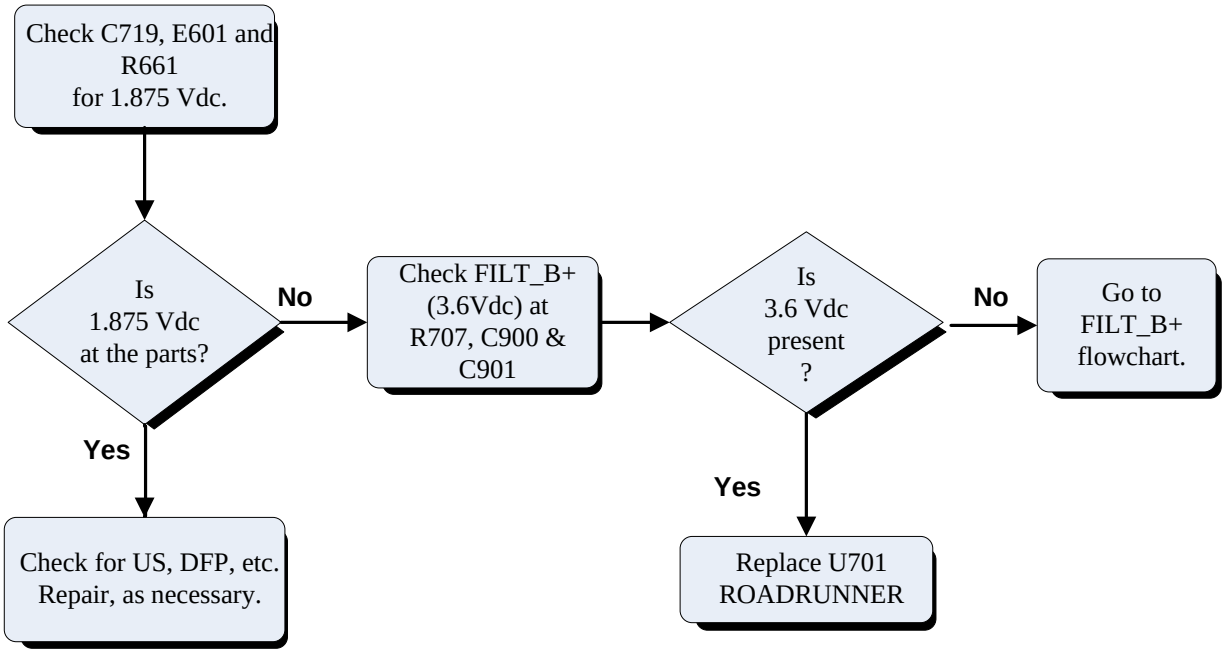
3.15 DC Distribution (V2) Test

Use this test on a unit with the following symptom: no V2 (2.775 Vdc).



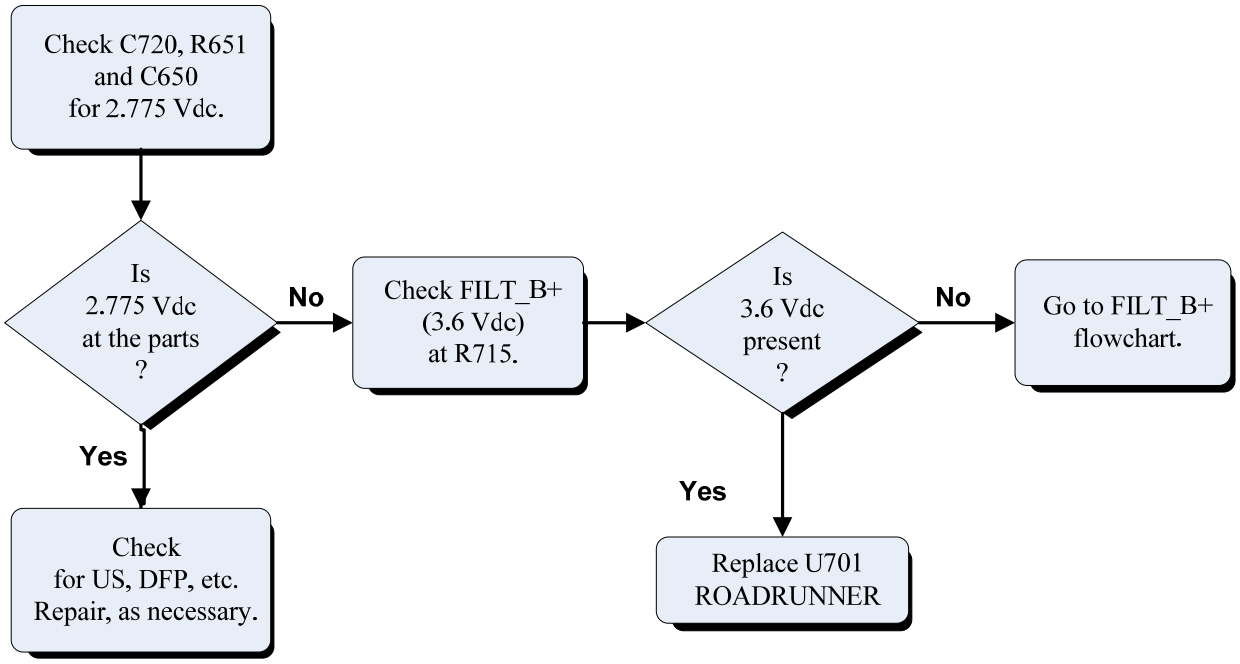
3.16 DC Distribution (V3) Test

Use this test on a unit with the following symptom: no V3 (1.875 Vdc).



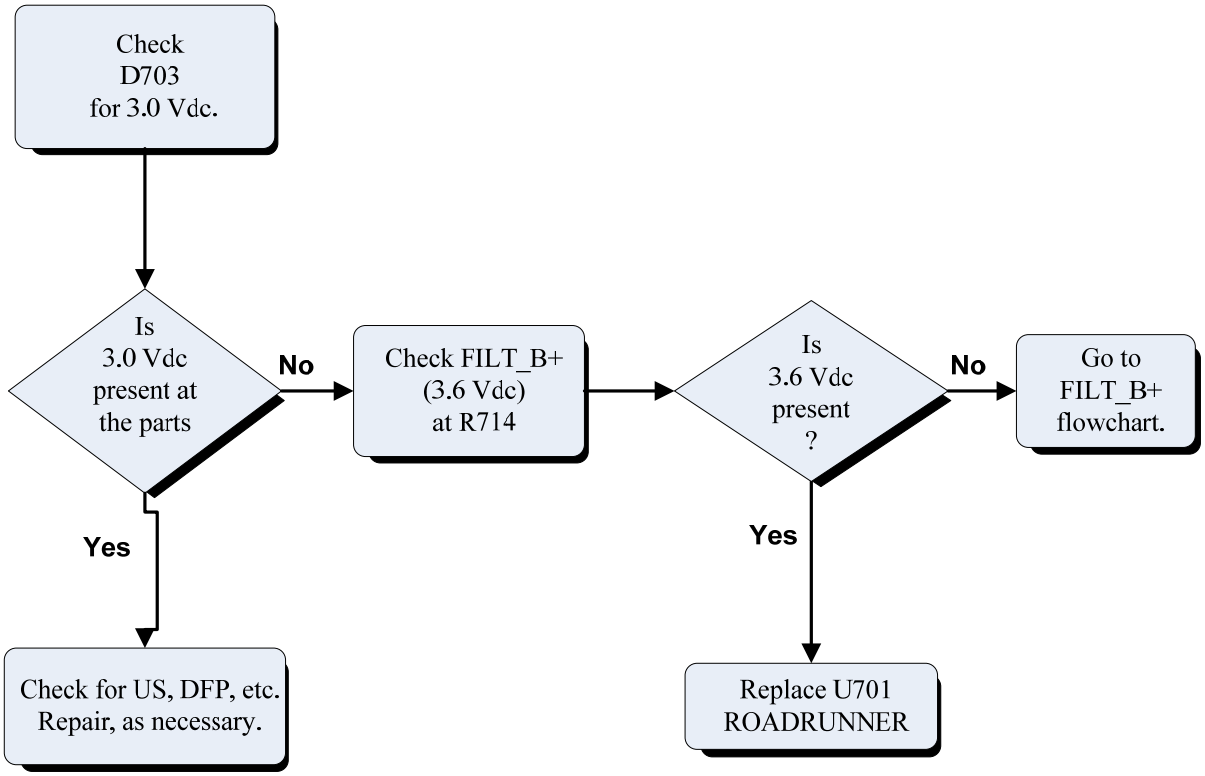
3.17 DC Distribution (V4) Test

Use this test on a unit with the following symptom: no V4 (2.775Vdc).



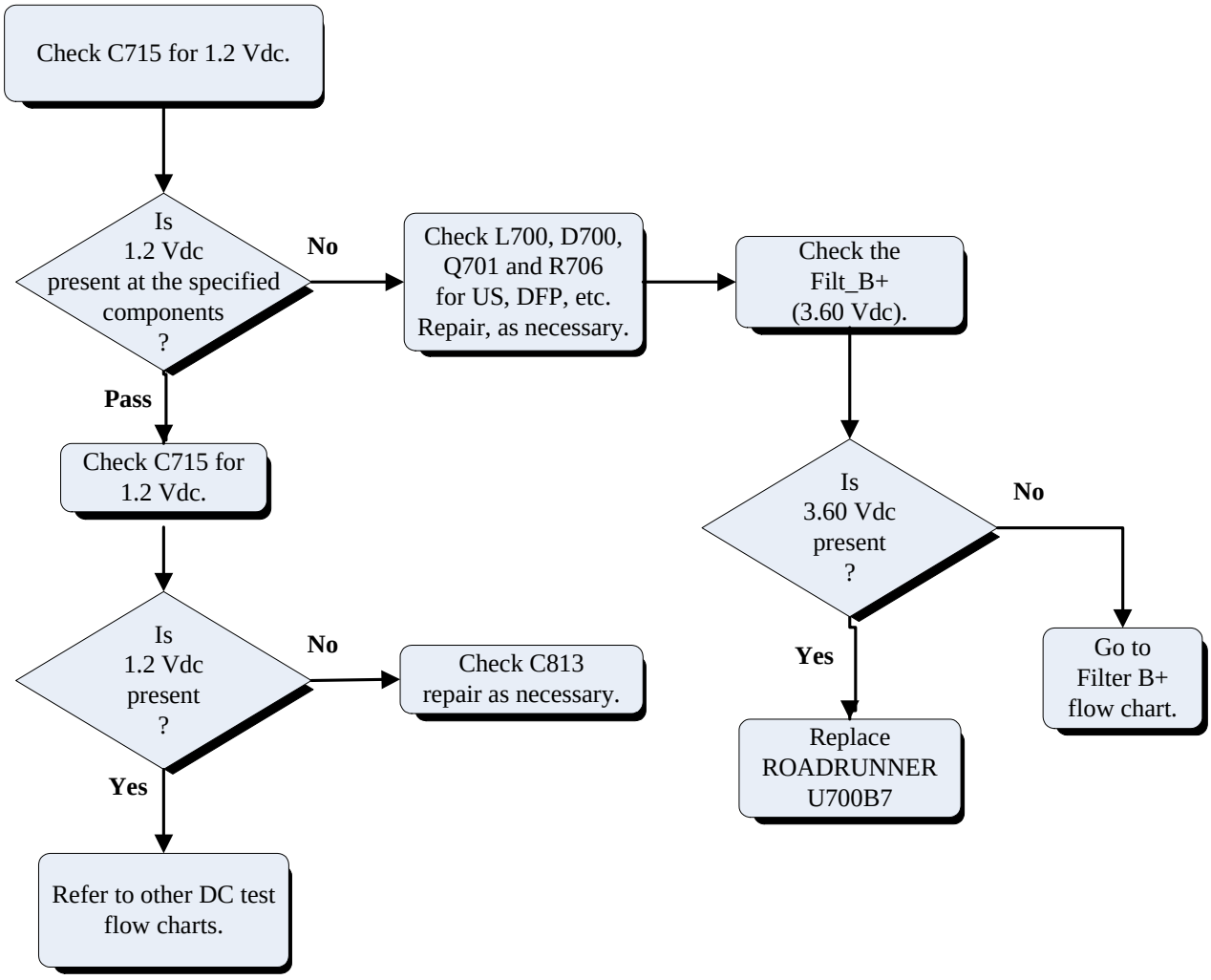
3.18 DC Distribution (V_VIB) Test

Use this test on a unit with the following symptom: no V_VIB (3.0 Vdc).



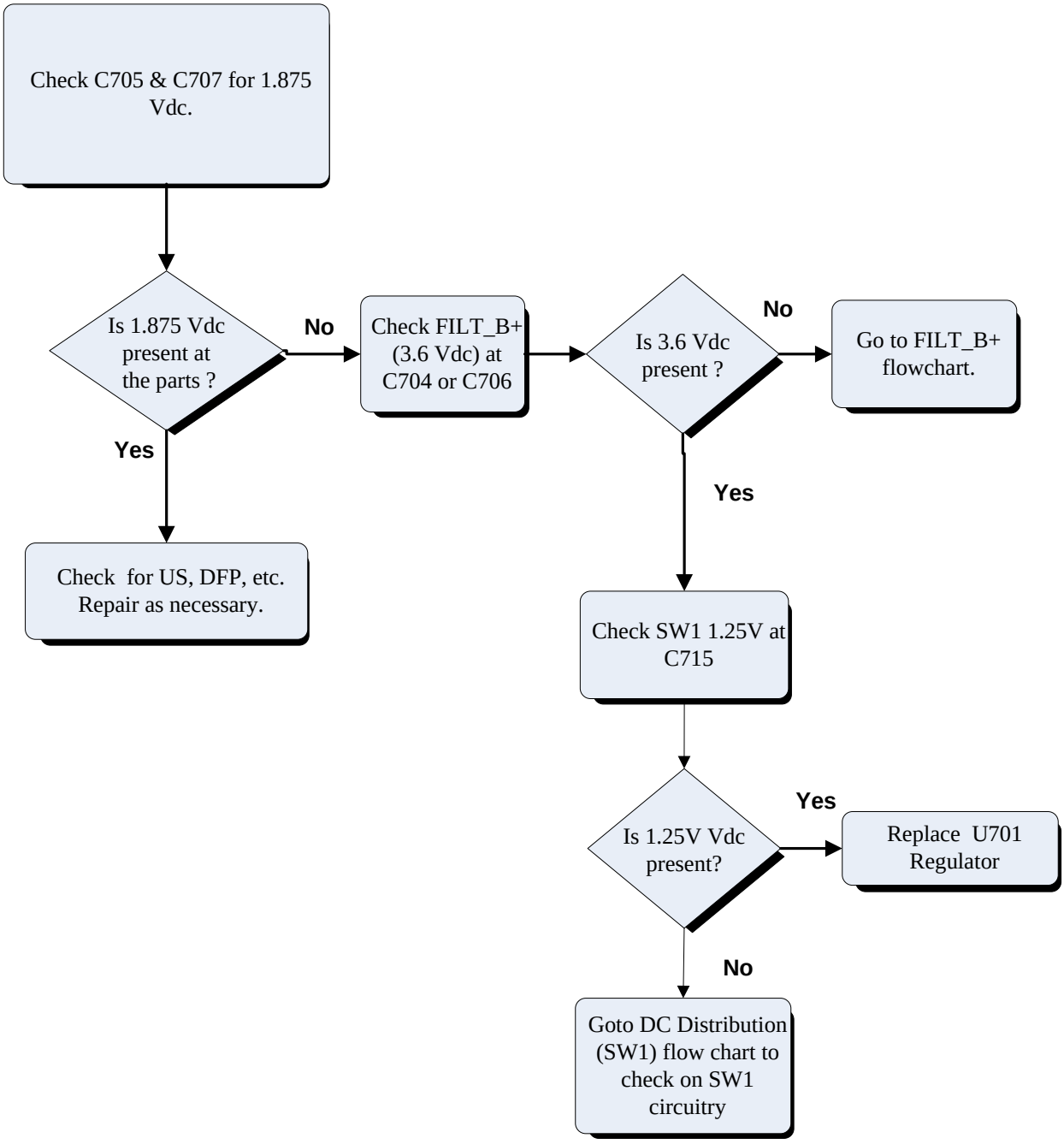
3.19 DC Distribution (SW1) Test

Use this test on a unit with the following symptom: no SW1 (1.2 Vdc).
Check for SW1 after L702 from U701.



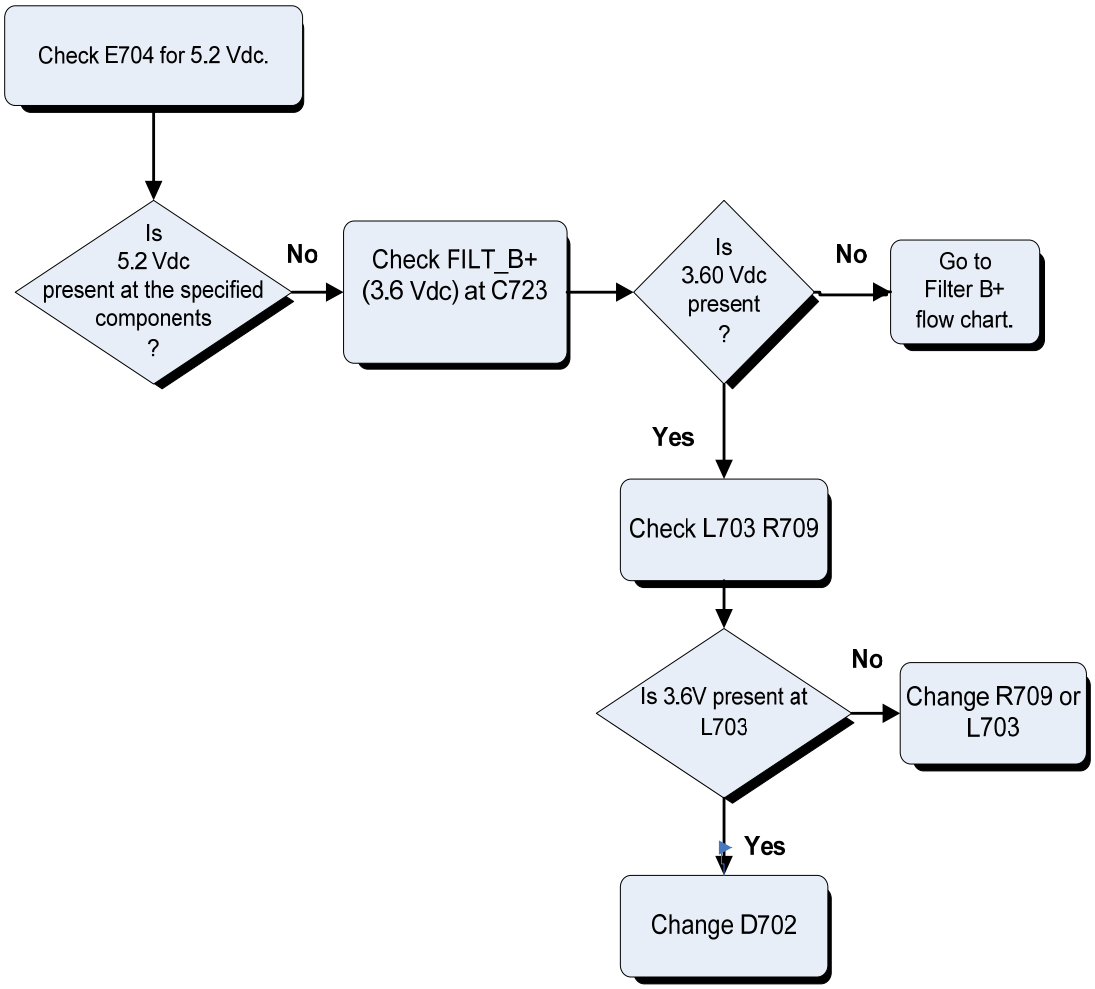
3.20 DC Distribution (SW2) Test

Use this test on a unit with the following symptom: no SW2 (1.875 Vdc).



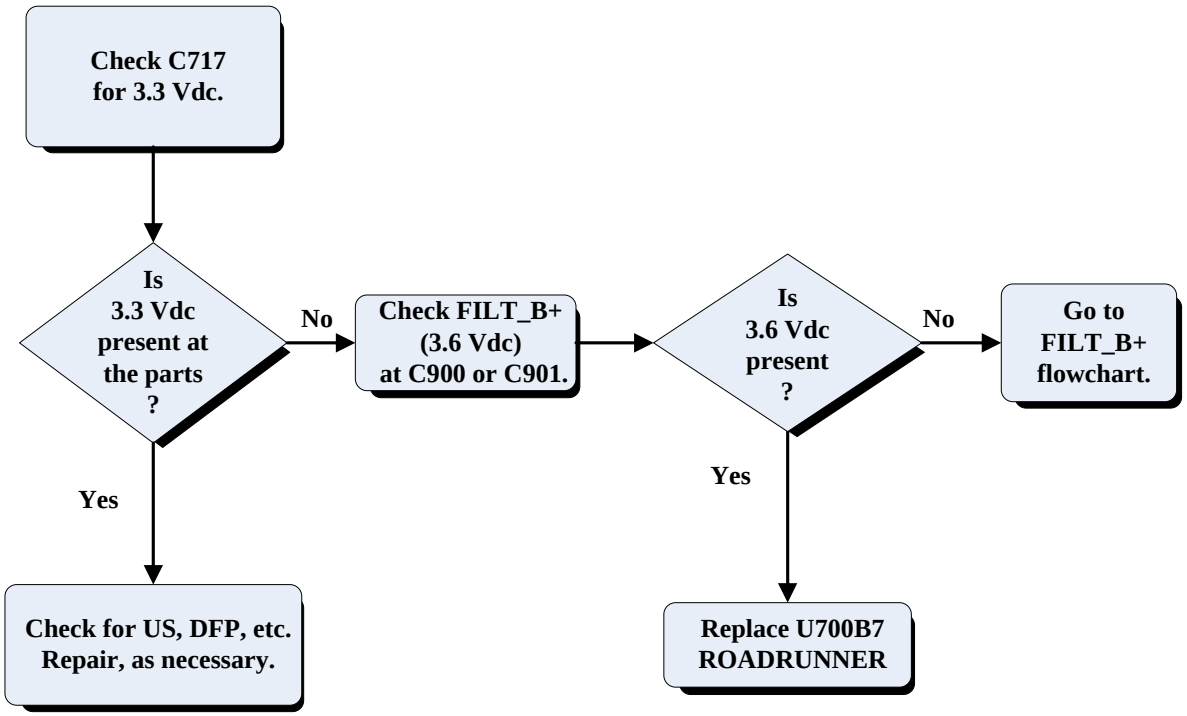
3.21 DC Distribution (SW3) Test

Use this test on a unit with the following symptom: no SW3 (5.2 Vdc).



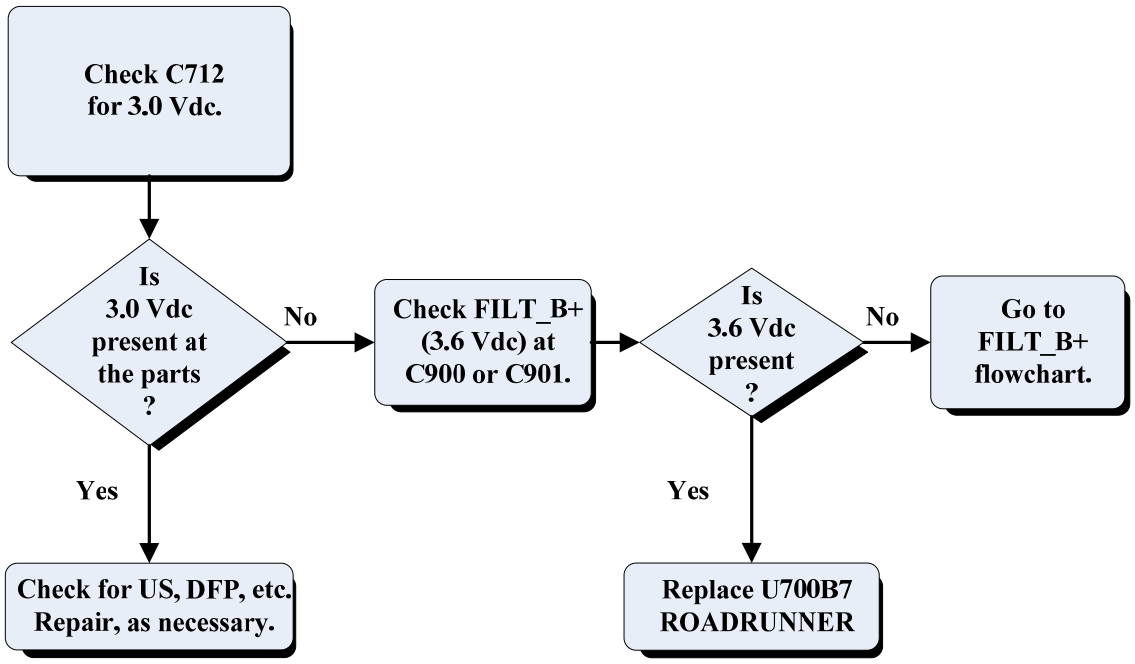
3.22 DC Distribution (VUSB) Test

Use this test on a unit with the following symptom: no VUSB (3.3 Vdc).



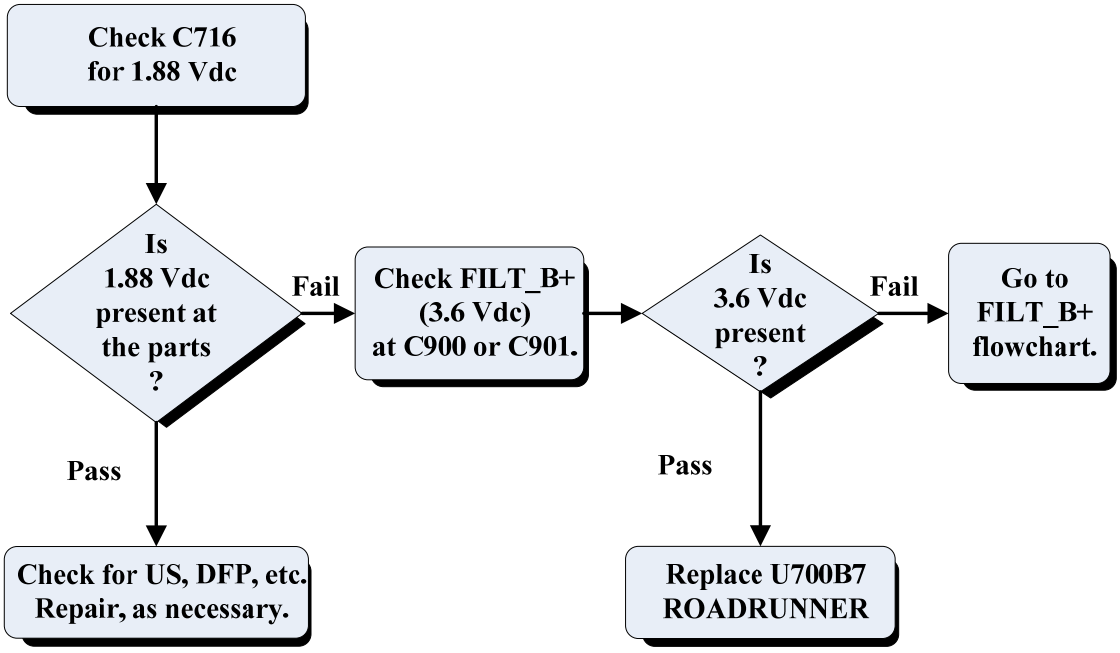
3.23 DC Distribution (VSIM) Test

Use this test on a unit with the following symptom: no VSIM (3.0 Vdc).



3.24 DC Distribution (VHOLD) Test

Use this test on a unit with the following symptom: no VHOLD (1.88 Vdc).



3.25 GPS Receiver Test

The Conducted signal testing described below can be performed to analyze or root cause an issue along the GPS RF subsystem, using a CW signal. The following tests are implemented in Factory Test Mode (BERBUG Mode).

Test Setup

1. Set up the CW generator as follows: Frequency = 1575.42 MHz, Amplitude level = -80 dBm. Amplitude levels above -76 dBm will compress the Janus IC.

2. Remove the antenna and replace it with a 50 OHM coax. Power up the Unit Under Test (UUT), and connect the CW generator to the UUT.

3. Using Hyper Terminal, GPS is turned on as follows:

   BERBUG > gps on

4. Set the Spectrum Analyzer to Center Frequency = 1575.42 MHz, Span = 1 MHz, Amplitude Reference Level = -50 dBm.

5. Use a High Impedance Probe to follow the signal flow along the GPS RF subsystem, block by block.

Block Level Testing of Critical Stages

Below is a list of Critical Stages/Blocks, and their respective RF test points:

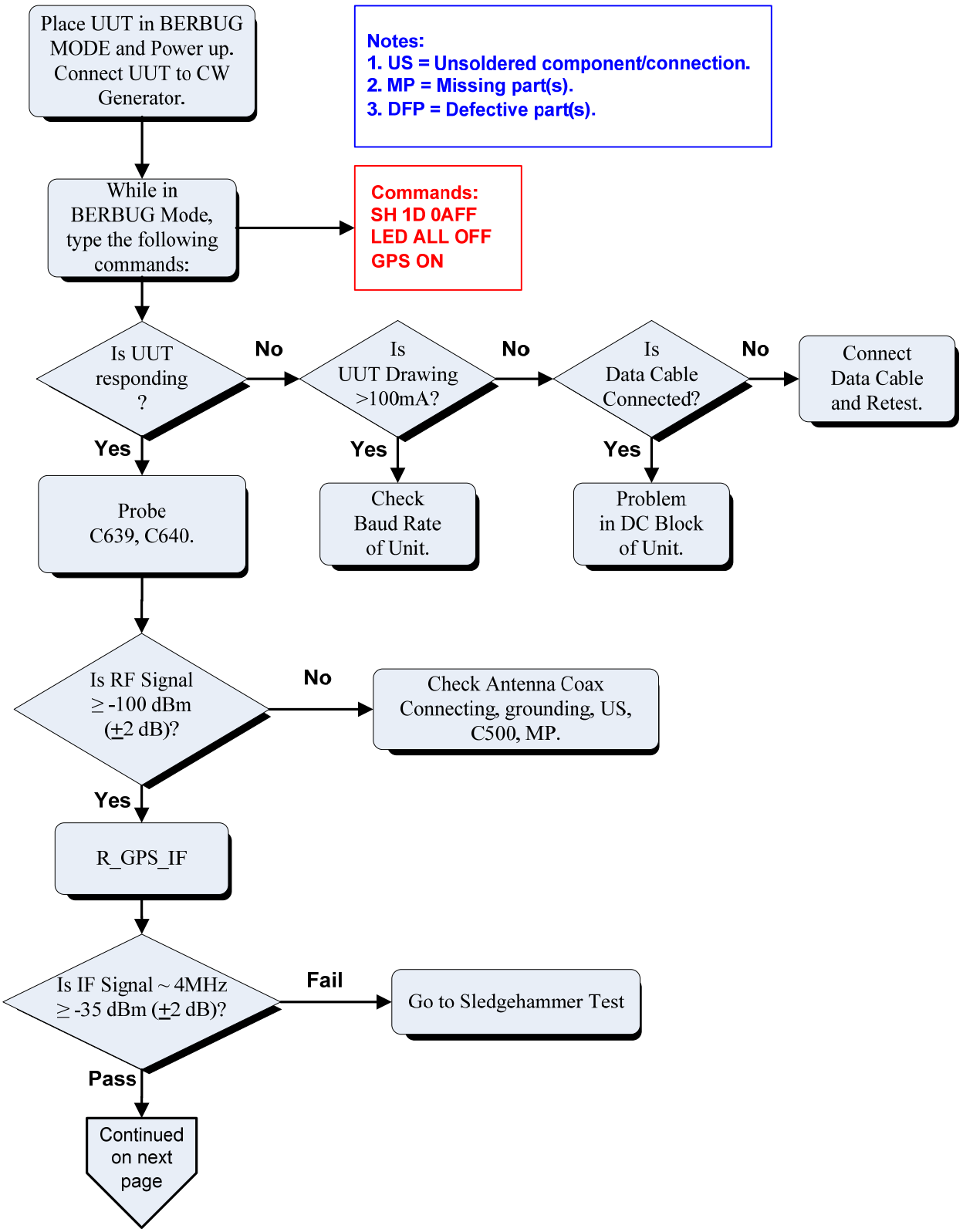
1. GPS (M500B10): GPS antenna port.

2. Sledgehammer IC (U600B10): IF frequency test pad.

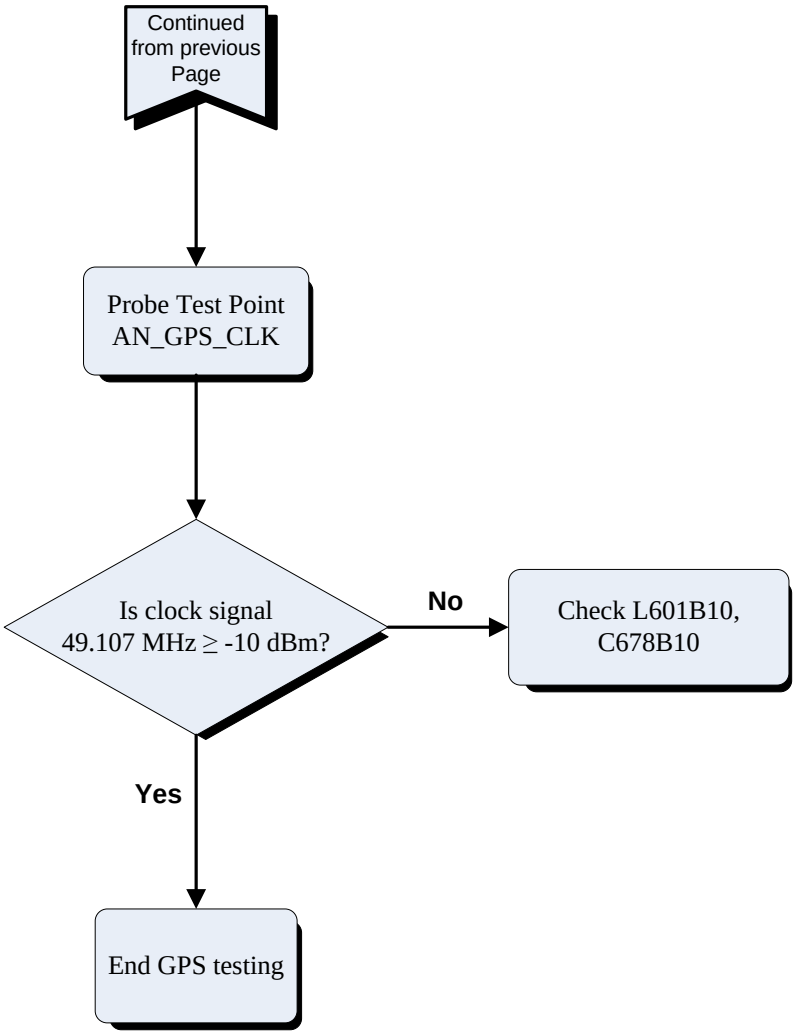
DC Power Supply

When testing, it is advisable to utilize an external DC Power supply set at 4 Volts and a current level of 2A. In BERBUG Mode, the UUT is expected to draw 60 mA to 65 mA at power up. By entering “gps on” the UUT should draw 97 mA to 102 mA

GPS Receiver Test (Continued)



GPS Receiver Test (Continued)



3.26 Mototalk

Since the iDEN Receiver and Transmitter Hardware are used for Dispatch (PTT), Phone Call, and MOTOtalk modes of operation; Hardware failures that occur during MOTOtalk will also occur in Dispatch (PTT) and Phone Call modes. Therefore, the electrical troubleshooting guide for MOTOtalk, Dispatch (PTT), and Phone Call are the same.

3.27 Model Assembly (MA) Test Mode Test

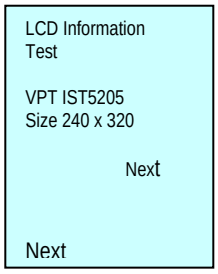
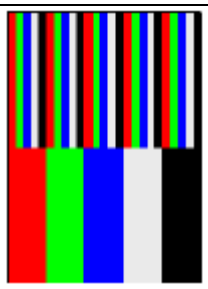
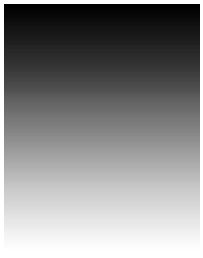
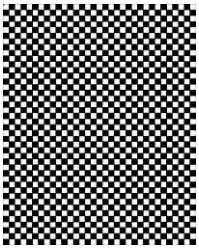
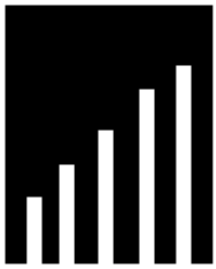
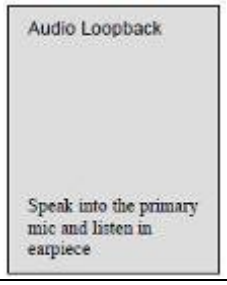
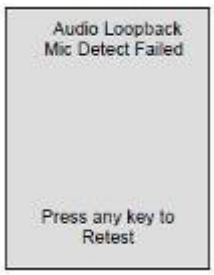
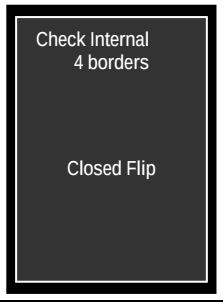
- Model Assembly Test Mode is an embedded series of operational tests of the unit's user interface and functional features.
- Motorola iDEN recommends MA Test Mode be performed after any servicing of the unit.
- An Audio Test Cable is required to complete test mode correctly. See the Required Tools section or contact Motorola’s Aftermarket Accessories Division.

MA Test mode is achieved by starting from a power-down condition:

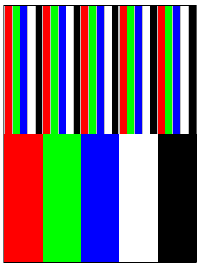
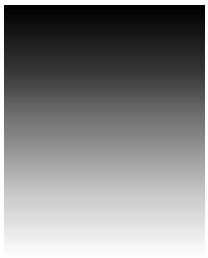
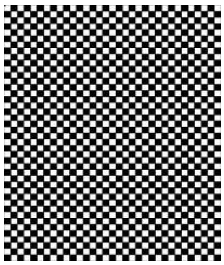
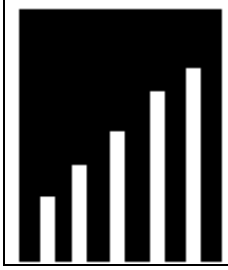
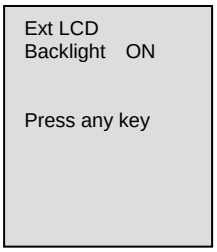
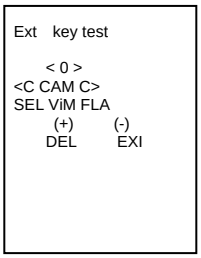
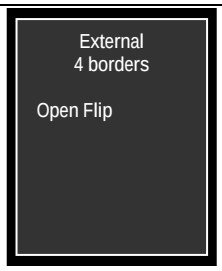
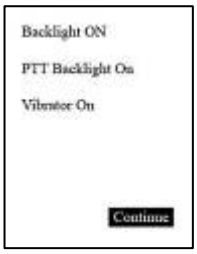
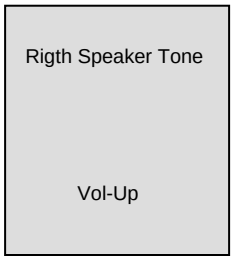
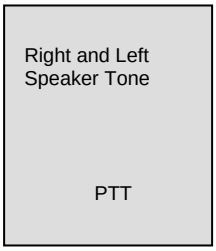
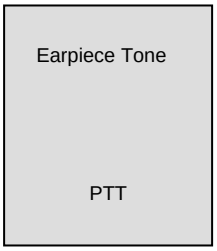
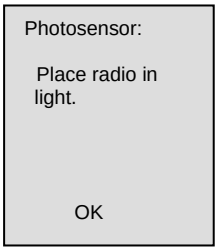
1. Press and hold three keys in a row such as 1-2-3, 4-5-6, 7-8-9, ÷-O-#. Simultaneously, press the Power key
2. Release all keys once the opening screen appears in the main display.
3. Follow instructions as they appear pressing the indicated keys.
4. No instruction? Press any key or Scroll right.
5. No reaction? Power down the unit, check battery condition, and start MA Test again.

Screen displays are depicted as follows:

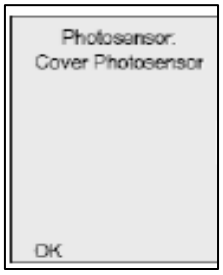
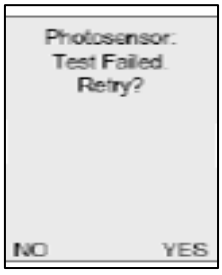
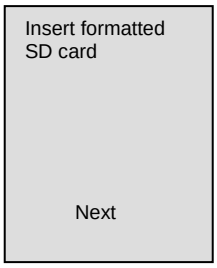
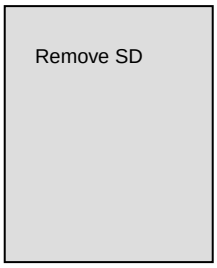
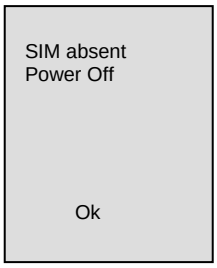
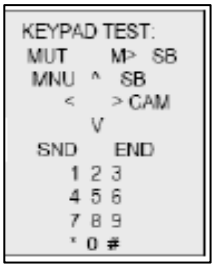
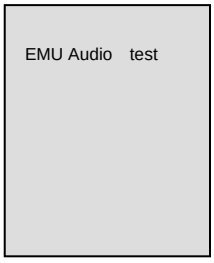
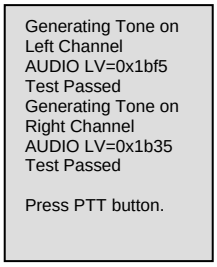
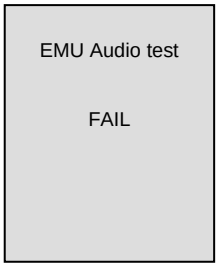
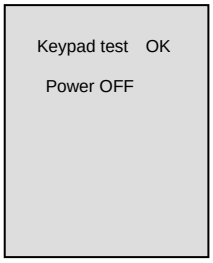
Model Assembly (MA) Test Mode Test (cont.)

				
The LCD manufacturer and size are displayed on the Main LCD. Press NEXT key	Here we test the LCD display with Color Bars. Press any key to advance	Ellipses are displayed on the main screen for Crosstalk test. Press any key to advance	The gray scale test image is from total black to white indicates that the display has no issues. Press any key to advance	Flicker test screen to check for flicker. Press any key to advance.
				
Test the LCD with Checkerboard test. Press any key to advance.	Check for camera I2C address, camera device ID, and camera vendor ID. Press any key to advance.	Speak into the internal microphone and listen to the earpiece.	If microphone has been detected, press any key to advance	If microphone not detected, press any key to retest.
				
Viewfinder test screen to verify image. Press YES key to advance.	Then, the camera data lines will be analyzed.	When the data lines test passed, press OK to advance.	The 4 internal borders are one-pixel wide and white. The rest (except text) are black. Close the flip to continue.	CID displays “External LCD test, vendor name and size”. Press mute key to continue.

Model Assembly (MA) Test Mode Test (cont.)

				
Color bar pattern is displayed on the modules to capture missing colors. Press any key to continue.	Ellipses are displayed on the main screen for Crosstalk test. Press any key to advance	The gray scale test image is from total black to white indicates that the display has no issues. Press any key to advance	Flicker test screen to check for flicker. Press any key to advance.	Test the LCD with Checkerboard test. Press any key to advance.
				
Check for camera I2C address, camera device ID, and camera vendor ID. Press any key to advance.	Ext LED, Ext LED, Backlight On" displayed. Check for the LED functionally. Press any key to continue.	**Morphing key turn on. All keys indicators are turned on. As each key is pressed, a short time vibration is felt and the key symbol on the CID disappeared. Continue until the entire keys have been pressed. Once all keys are pressed all key indicator LEDs on touch pad turn off. Proceed with flip open. If test fail, hit the mute key to skip**	CID displays "Open Flip". And the 4 internal borders are one-pixel wide and white. Open the flip to continue.	Turns on keypad backlight, Main LCD backlight, SOL LED and vibrator. Remove the micro USB seal latch to observe the SOL LED. Verify backlight and vibration
				
"Right Speaker tone" displayed and speaker tone was generated. Verifty speaker tone. Press Volume Up to continue	"Left Speaker tone" displayed and speaker tone was generated. Verifty speaker tone. Press Volume Down to continue.	Right and Left Speaker tone" displayed and speaker tone was generated. Verifty speaker tone. Press PTT to continue.	Verify earpiece audio. Press PTT to continue	Expose photosensor to light and press OK key to advance

Model Assembly (MA) Test Mode Test (cont.)

				
Cover the photosensor from light and press OK key to advance.	.If the photosensor fail to function or user didn't follow the instruction, this screen will appear for retest.	Insert SD card when see "insert formatted SD card".	SDread/writes/erase test pass,instruct user to remove the SD card. Remove the SD card to continue.	The radio will detect if a SIM has been placed in the radio and report the result on the display. If SIM card absent, power off the radio
				
Display all keys (i.e. 1, 2, 3, Menu, #, *, etc) on display. As each key is pressed, the number disappears from the display. When all the keys are pressed, proceed to next test. Close the flip proceed.	EMU Audio test" displayed. A tone is generated automatically.	If pass, the radio should then display the audio value of the left, right channel.	If fail, press power key to exit MA test mode.	After pass,diplay show "**Keypad test OK**", Tht test completed, press power off to exit the MA mode.

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Chapter 4
SCHEMATIC DIAGRAMS AND COMPONENT LOCATION

When ordering component parts, the part number and reference designator should be included.

If the correct numbers cannot be located, call Motorola Parts Identification at 1-847-538-0021.

4.1 Main Board Component Layout

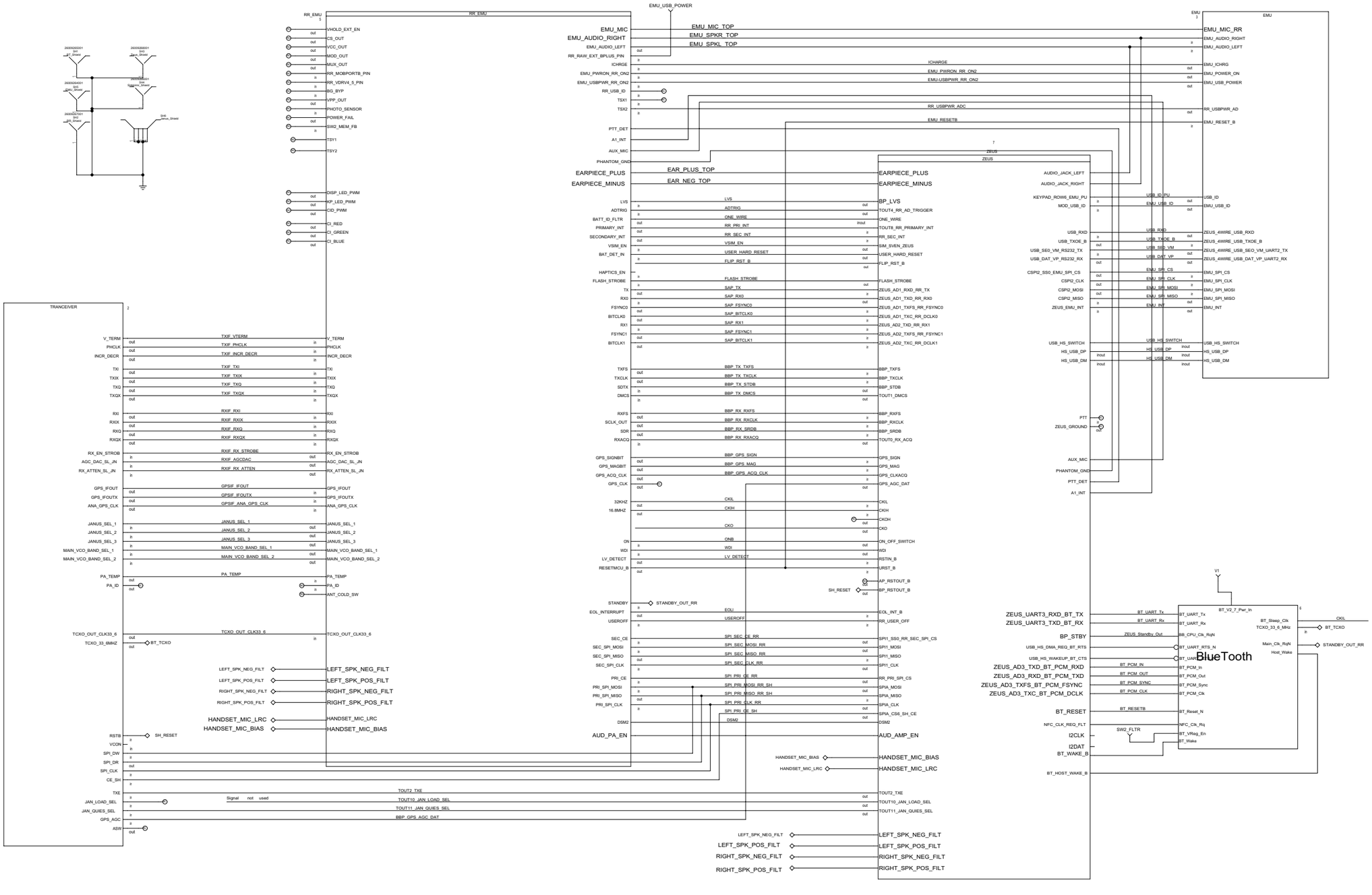
Do not place

Emphasis on inspection

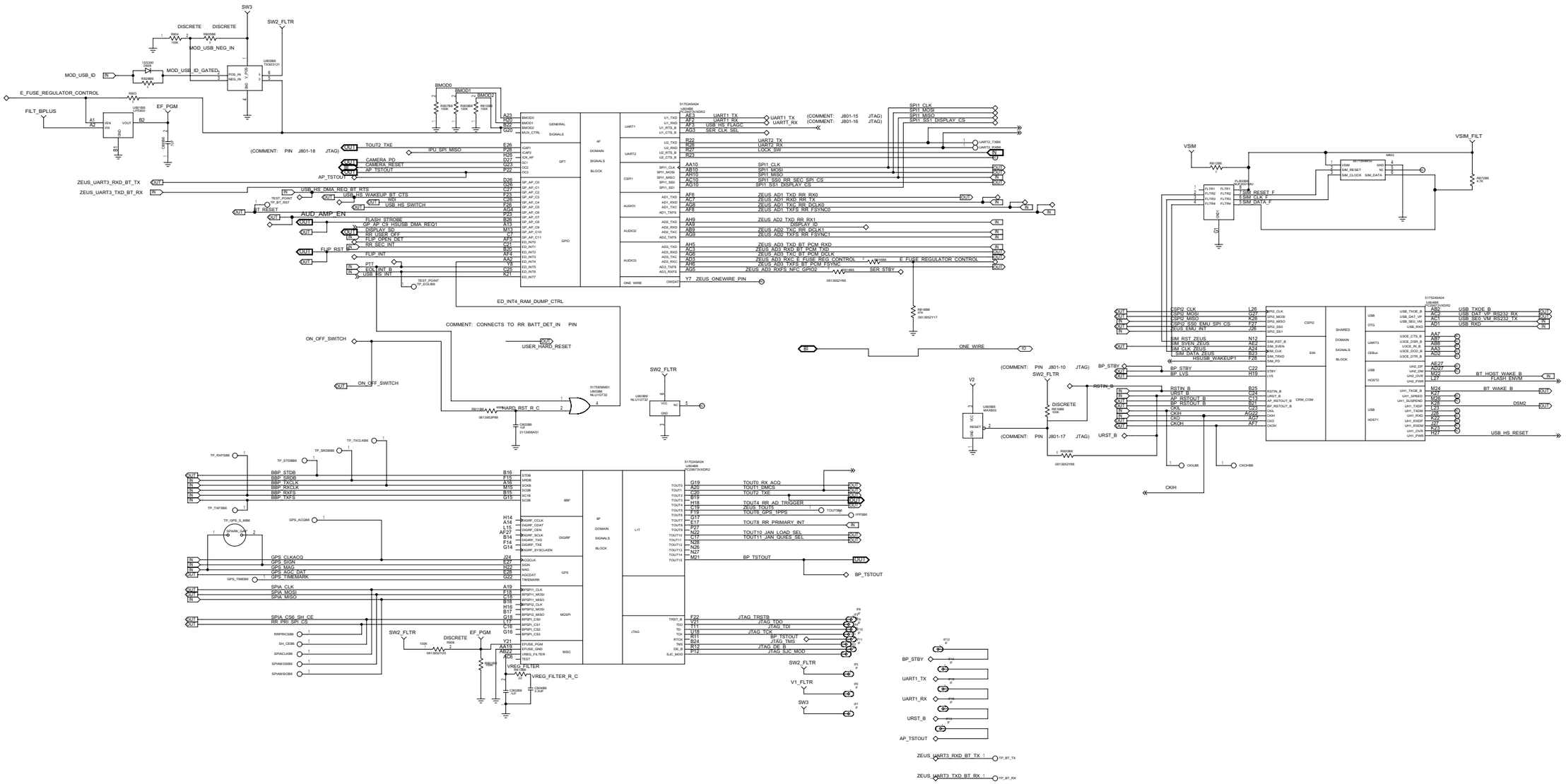
Polarity mark

Hand placed

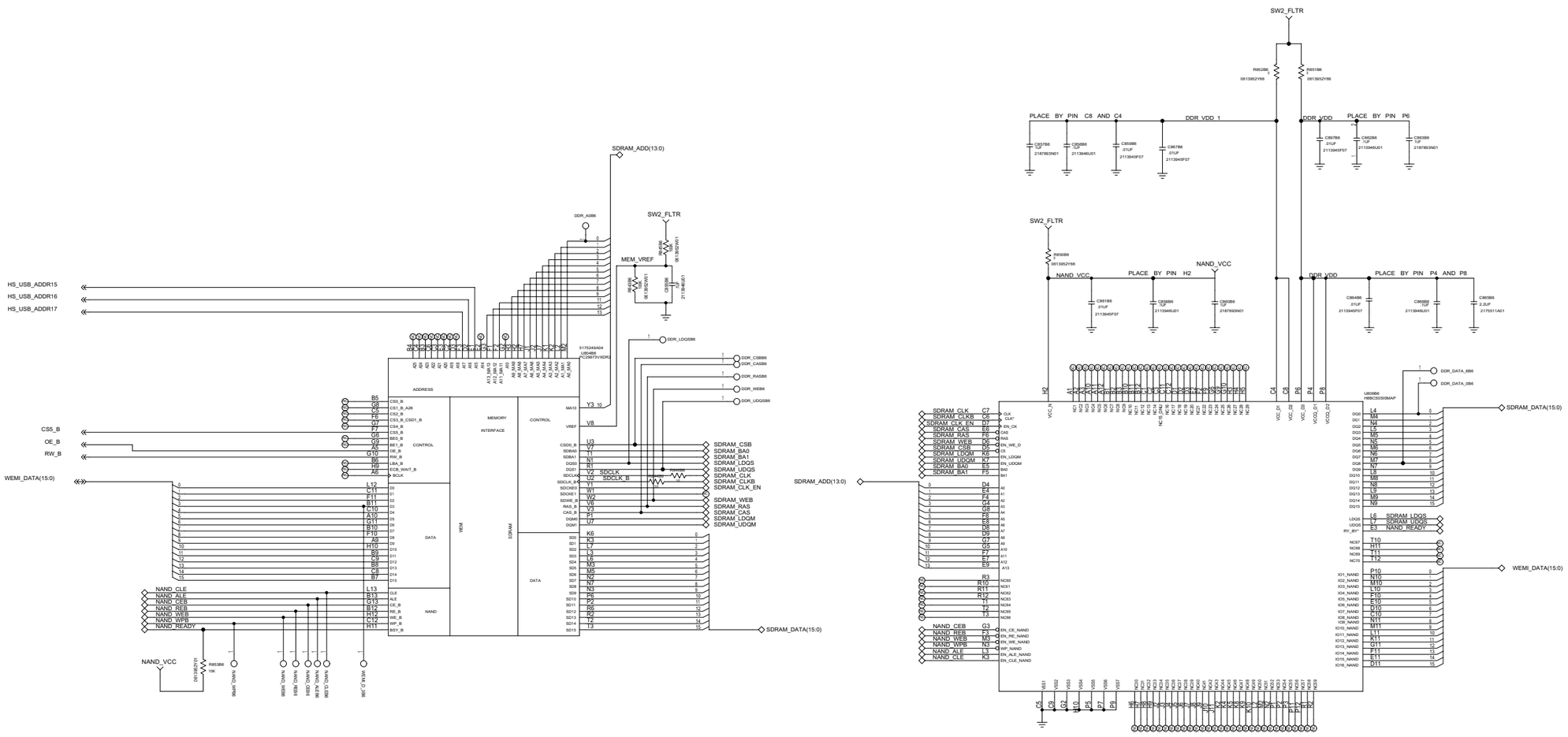
4.2 HIERARCHY - TOP SHEET



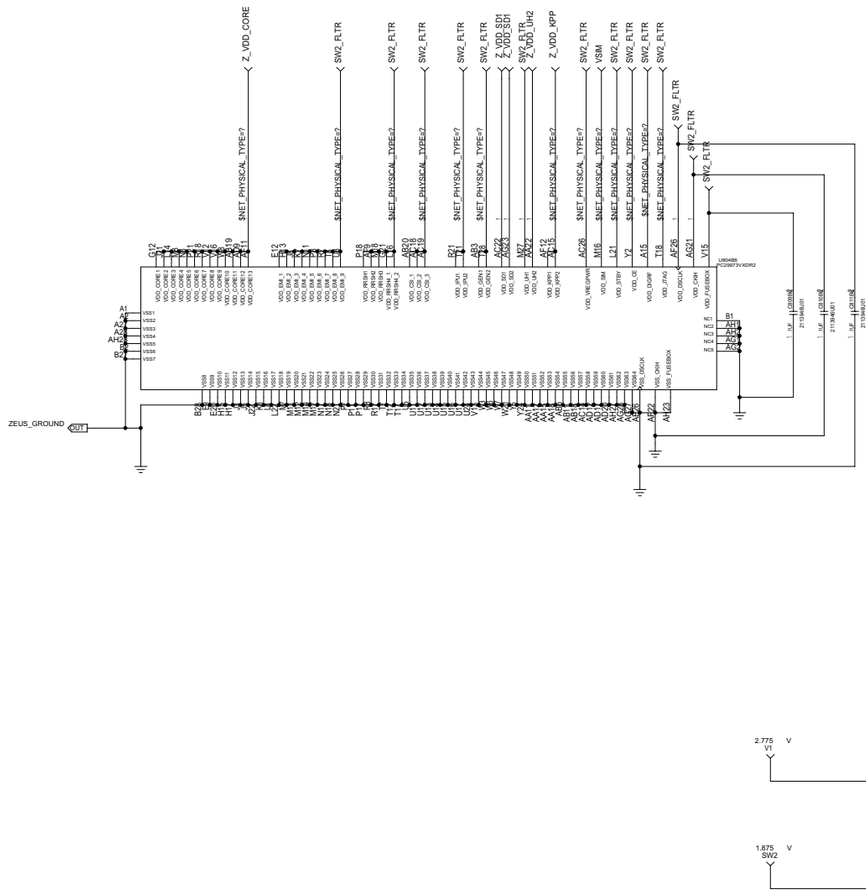
4.3 ZEUS DIGITAL INTERFACE

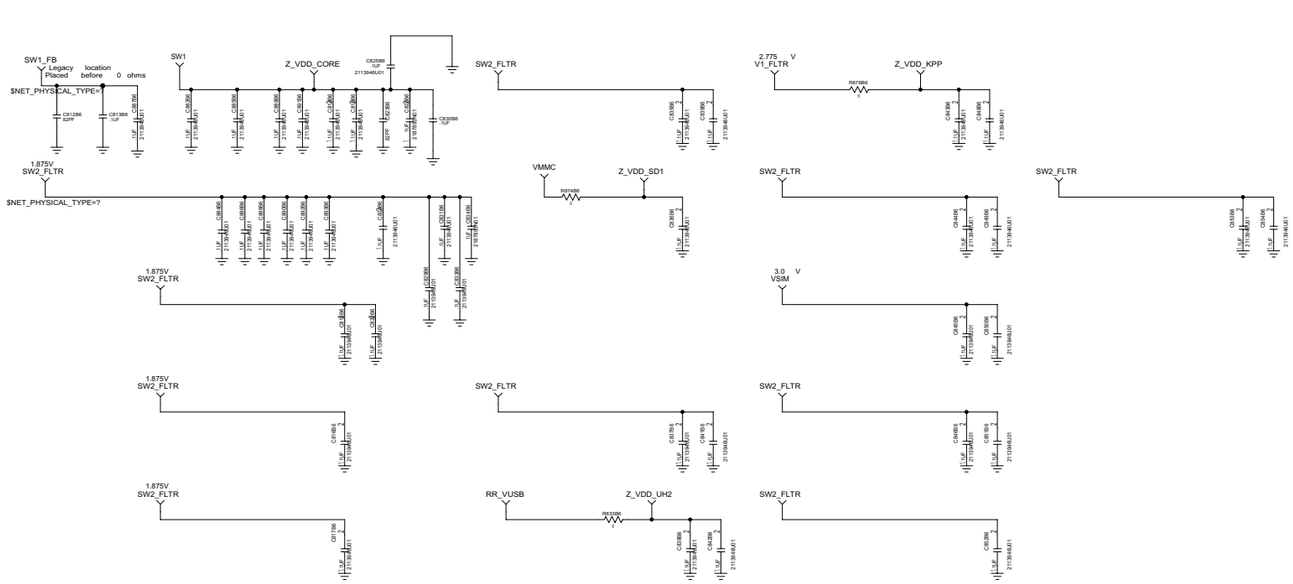


4.4 ZEUS MEMORY INTERFACE

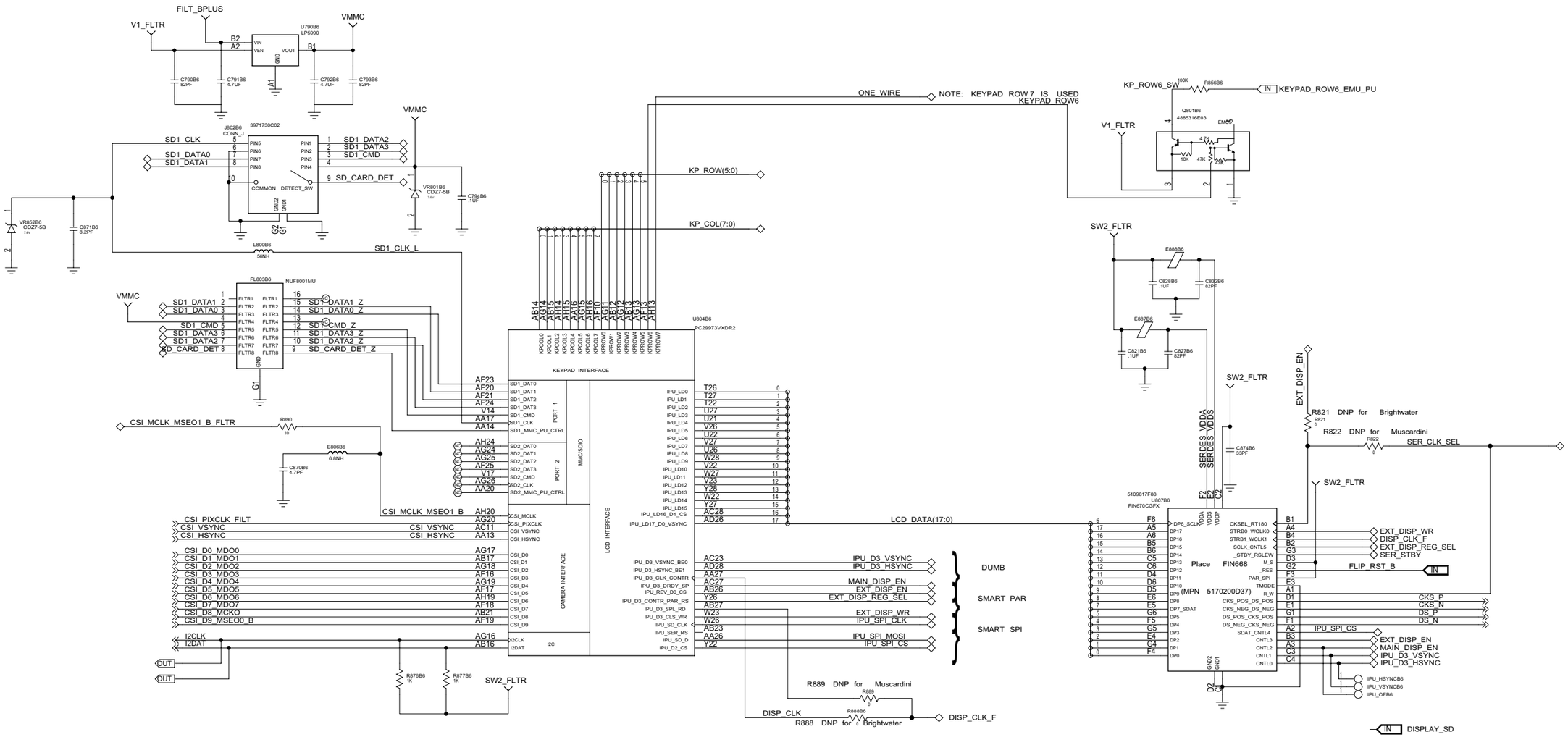


4.5 ZEUS POWER

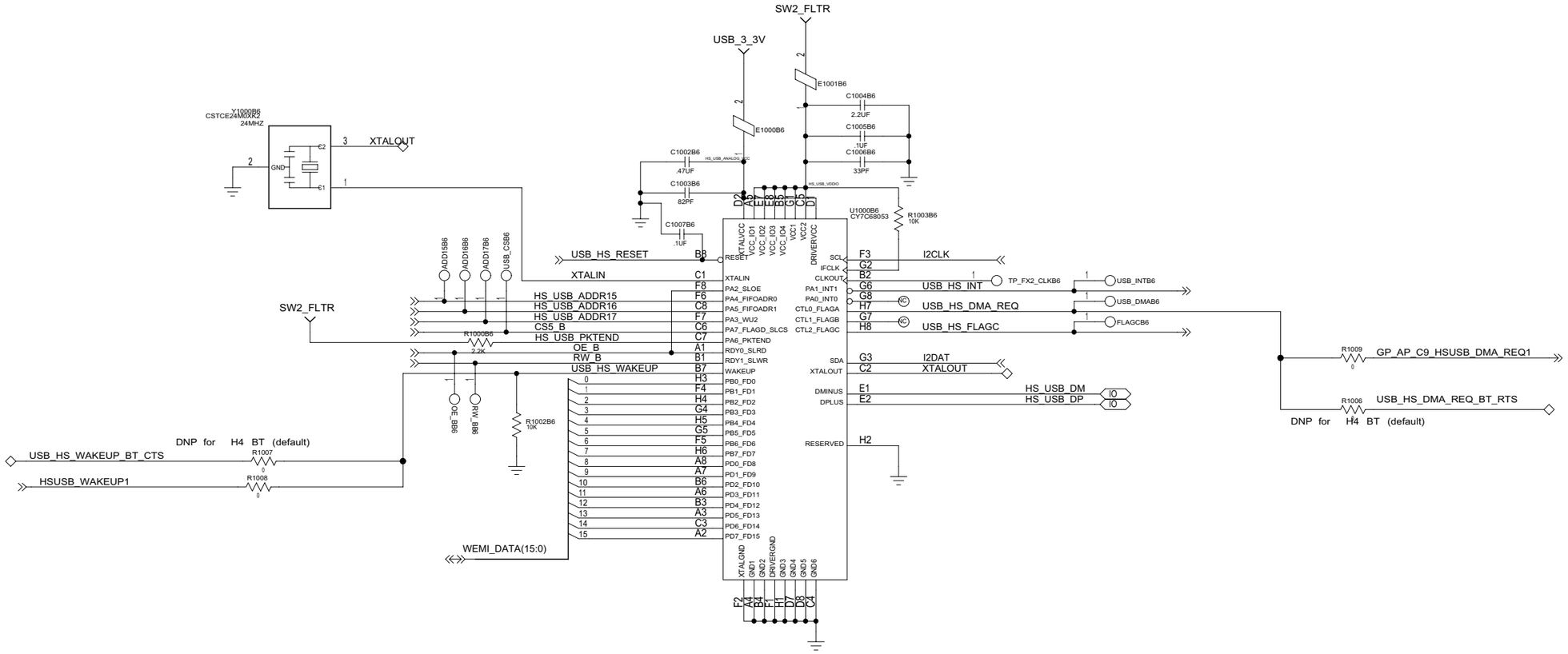




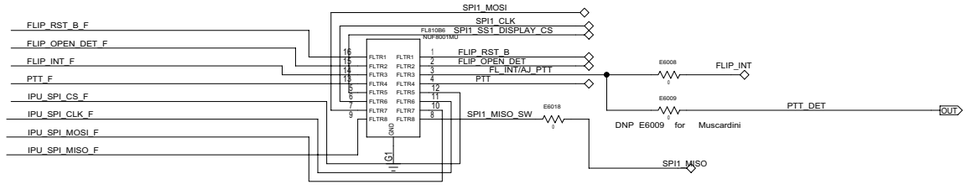
4.6 DISPLAY AND CAMERA INTERFACE



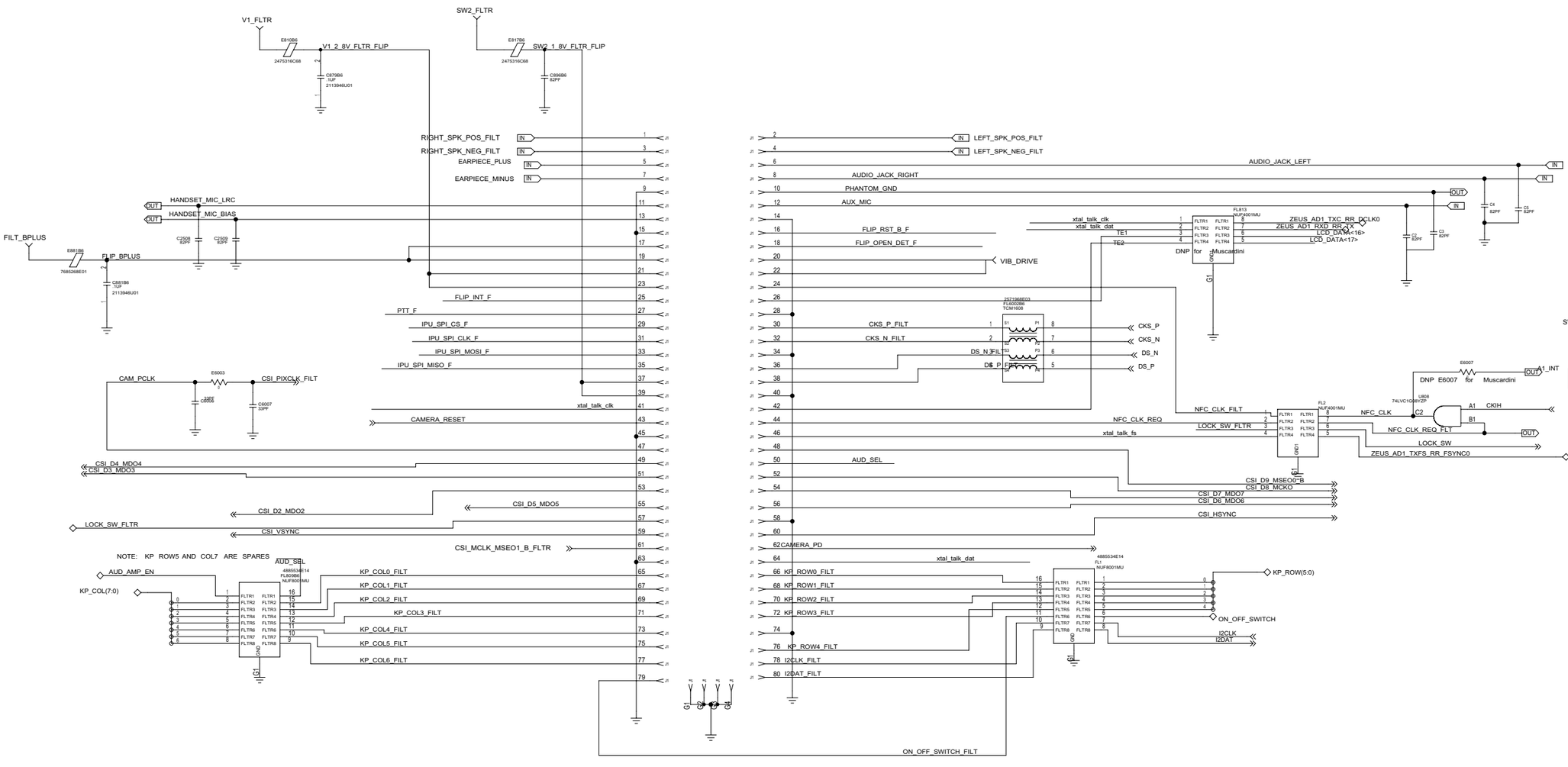
4.7 ZEUS


SW2_FLTR
USB_3_3V
E1001B6
E1000B6
C1004B6
2.2UF
C1005B6
.1UF
C1006B6
33PF
C1002B6
.47UF
C1003B6
82PF
C1007B6
.1UF
X1000B6
CSTCE24M00R5
24MHZ
XTALOUT
C2
C1
GND
U1000B6
CY7C68053
R1003B6
10K
USB_HS_RESET
XTALIN
SW2_FLTR
HS_USB_ADDR15
HS_USB_ADDR16
HS_USB_ADDR17
CS5_B
HS_USB_PKTEND
OE_B
RW_B
USB_HS_WAKEUP
R1000B6
2.2K
R1002B6
10K
ADD15B6
ADD16B6
ADD17B6
USB_CSB6
OE_BB6
RW_BB6
RESET
XTALIN
PA2_SLOE
PA4_FIFOADR0
PA5_FIFOADR1
PA3_WU2
PA7_FLAGD_SLCS
PA6_PKTEND
RDY0_SLRD
RDY1_SLWR
WAKEUP
PB0_FD0
PB1_FD1
PB2_FD2
PB3_FD3
PB4_FD4
PB5_FD5
PB6_FD6
PB7_FD7
PD0_FD8
PD1_FD9
PD2_FD10
PD3_FD11
PD4_FD12
PD5_FD13
PD6_FD14
PD7_FD15
SCL
IFCLK
CLKOUT
PA1_INT1
PA0_INT0
CTL0_FLAGA
CTL1_FLAGB
CTL2_FLAGC
SDA
XTALOUT
DMINUS
DPLUS
RESERVED
I2CLK
TP_FX2_CLKB6
USB_HS_INT
USB_HS_DMA_REQ
FLAGCB6
I2DAT
XTALOUT
HS_USB_DM
HS_USB_DP
H2
USB_INTB6
USB_DMAB6
R1009
GP_AP_C9_HSUSB_DMA_REQ1
R1006
USB_HS_DMA_REQ_BT_RTS
DNP for H4 BT (default)
DNP for H4 BT (default)
USB_HS_WAKEUP_BT_CTS
R1007
HSUSB_WAKEUP1
R1008
WEMI_DATA(15:0)
XTALGND
GND1
GND2
DRIVERGND
GND3
GND4
GND5
GND6

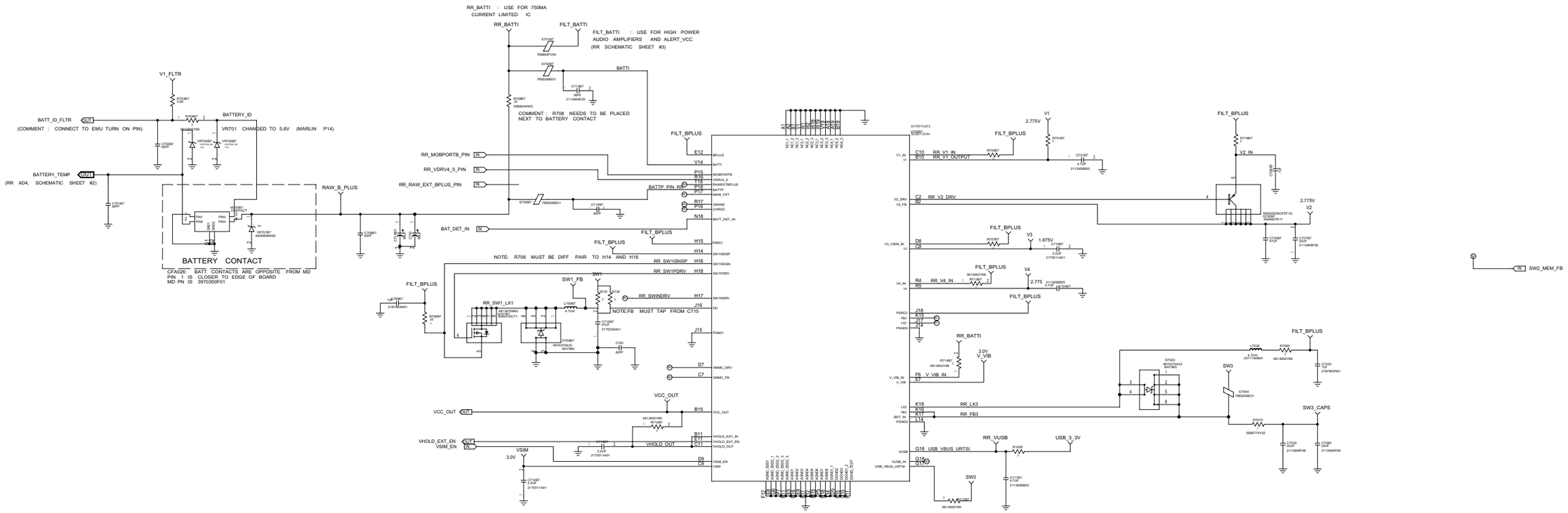
4.8 KEYPAD B2B CONNECTOR



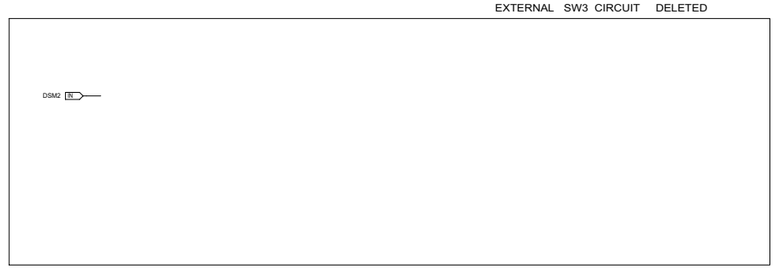
KEYPAD B2B CONNECTOR



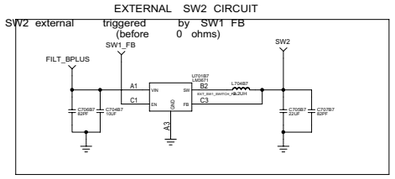
4.9 ROADRUNNER DC



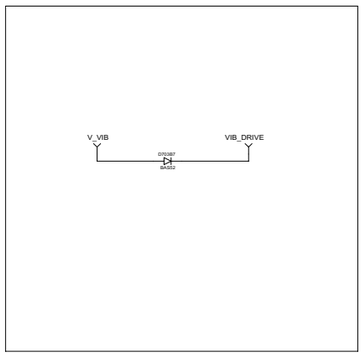
EXTERNAL SW3 CIRCUIT DELETED



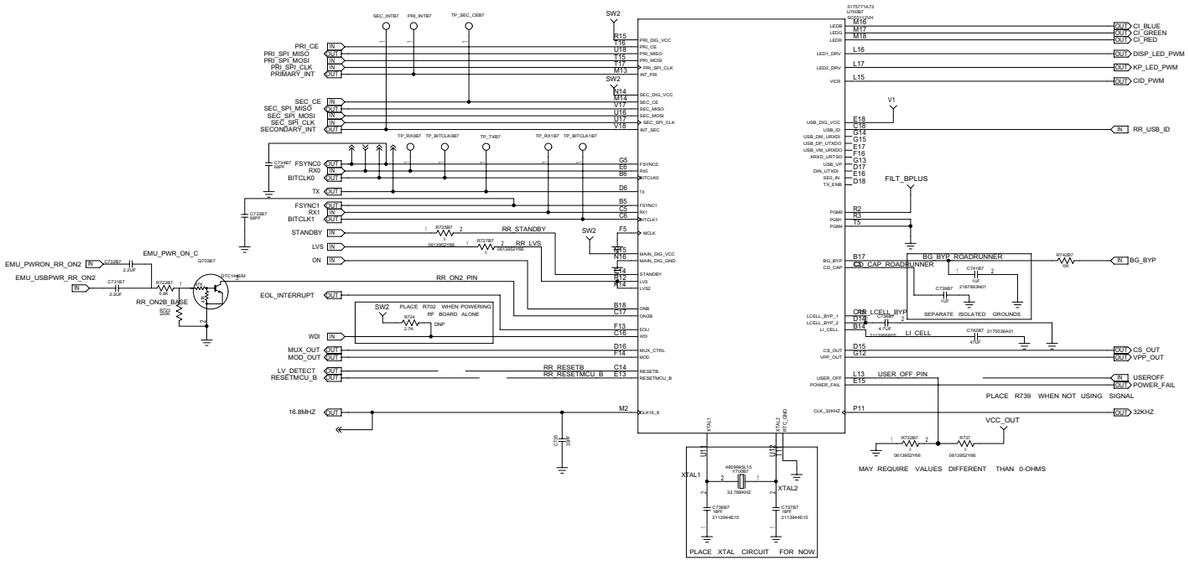
EXTERNAL SW2 CIRCUIT



HAPTICS DRIVE CIRCUIT



4.10 ROADRUNNER INTERFACE



RR PGM[1:0] VOLTAGE SETTINGS

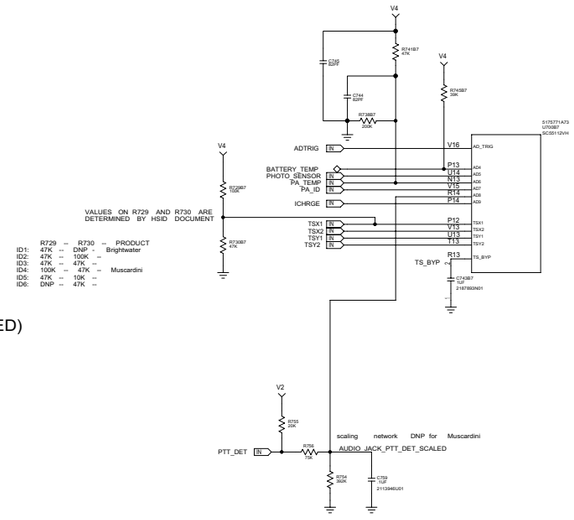
MUSCARDINI=01

	00	01	10	11
RR_SW1	1.55	1.20	1.55	1.20
RR_SW2	1.875	1.875	1.875	1.875
RR_SW3	5.6	5.6	5.6	5.6
RR_V1	1.875	2.775	2.775	1.55
RR_V2	2.775	2.775	2.775	2.775
RR_V3	1.875	1.875	1.875	1.875
RR_V4	2.775	2.775	2.775	2.775
RR_VHOLD	1.875	1.875	1.875	1.875
RR_VMMC	2.80	2.80	2.80	2.80

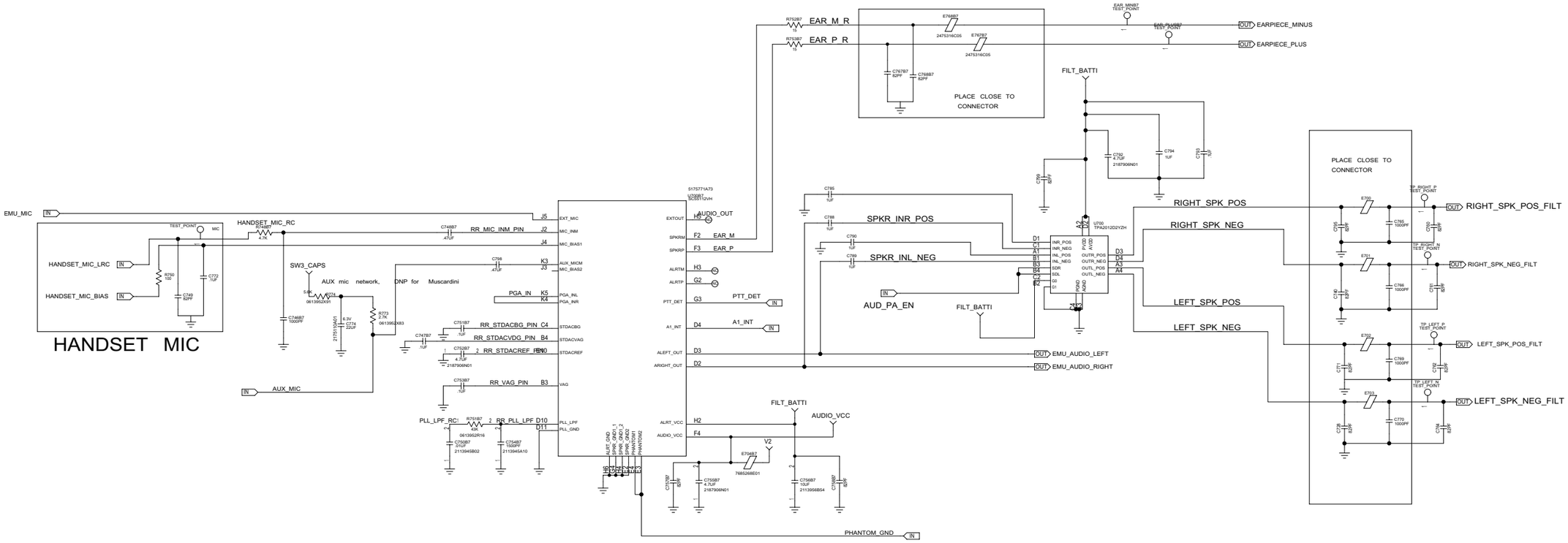
MUSCARDINI SW3 WILL BE PROGRAMMED TO 5.1V

A/D CHANNEL MAPPING

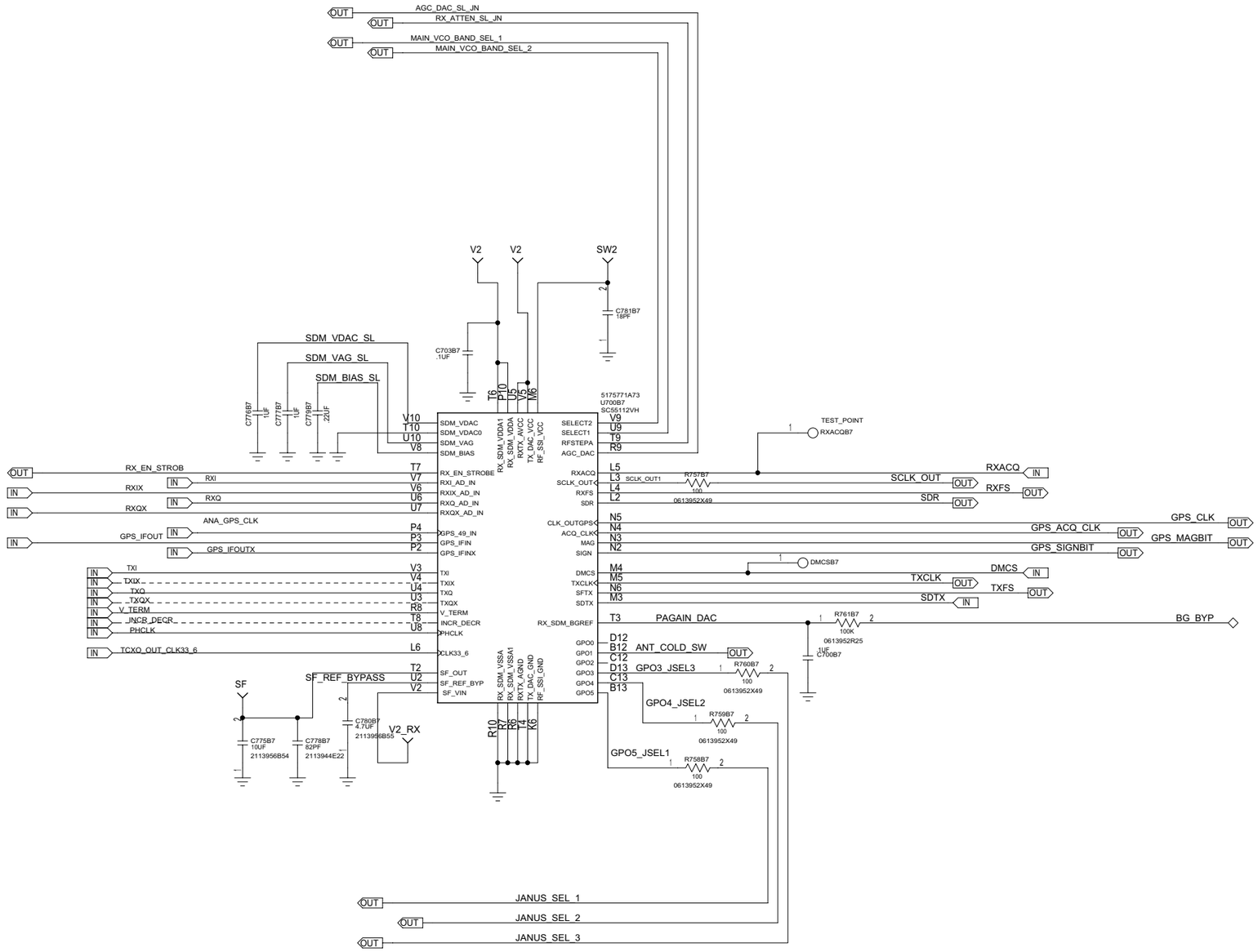
AD0: LI_CELL (INTERNAL)
AD1: RAW_B+ (BATTERY)(INTERNAL)
AD2: RAW_EXT_B+ (INTERNAL)
AD3: MBPSENSE (INTERNAL)
AD4: BATTERY_TEMP
AD5: PHOTO_SENSOR/CHRG_ISENSE (NOT USED)
AD6: PA_TEMP/BATT_I_ADC
AD7: USB_ID (NOT USED)
AD8 (EXT CHANNEL AD7): PA_ID
AD9 (EXT CHANNEL AD8): AUDIO_JACK_PTT (NOT USED)
AD10 (EXT CHANNEL AD9): EMU_ICHRG
TSX1: BOARD_ID
TSX2: USB_VBUS (SCALED)
TSY1: NOT USED
TSY2: NOT USED



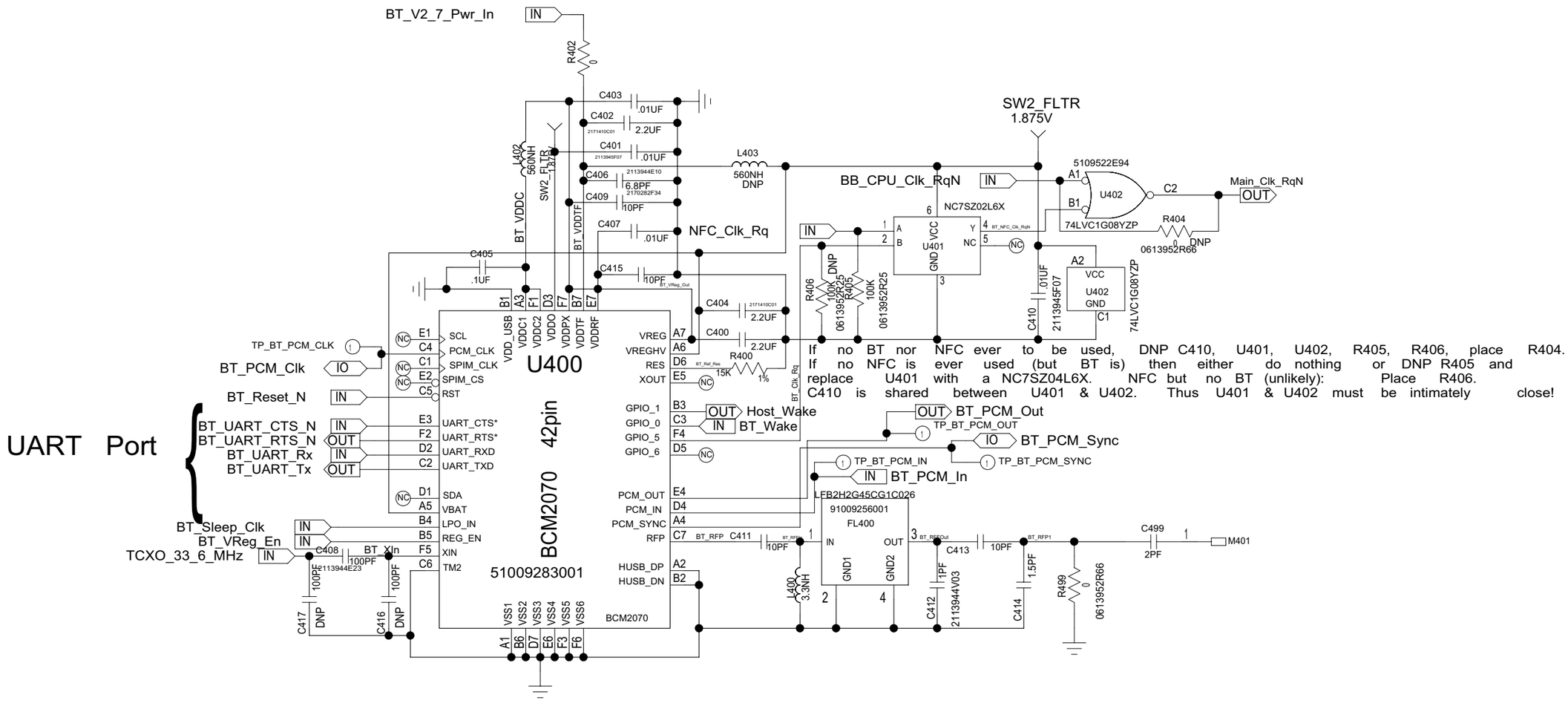
4.11 ROADRUNNER AUDIO



4.12 ROADRUNNER RF INTERFACE - EMU

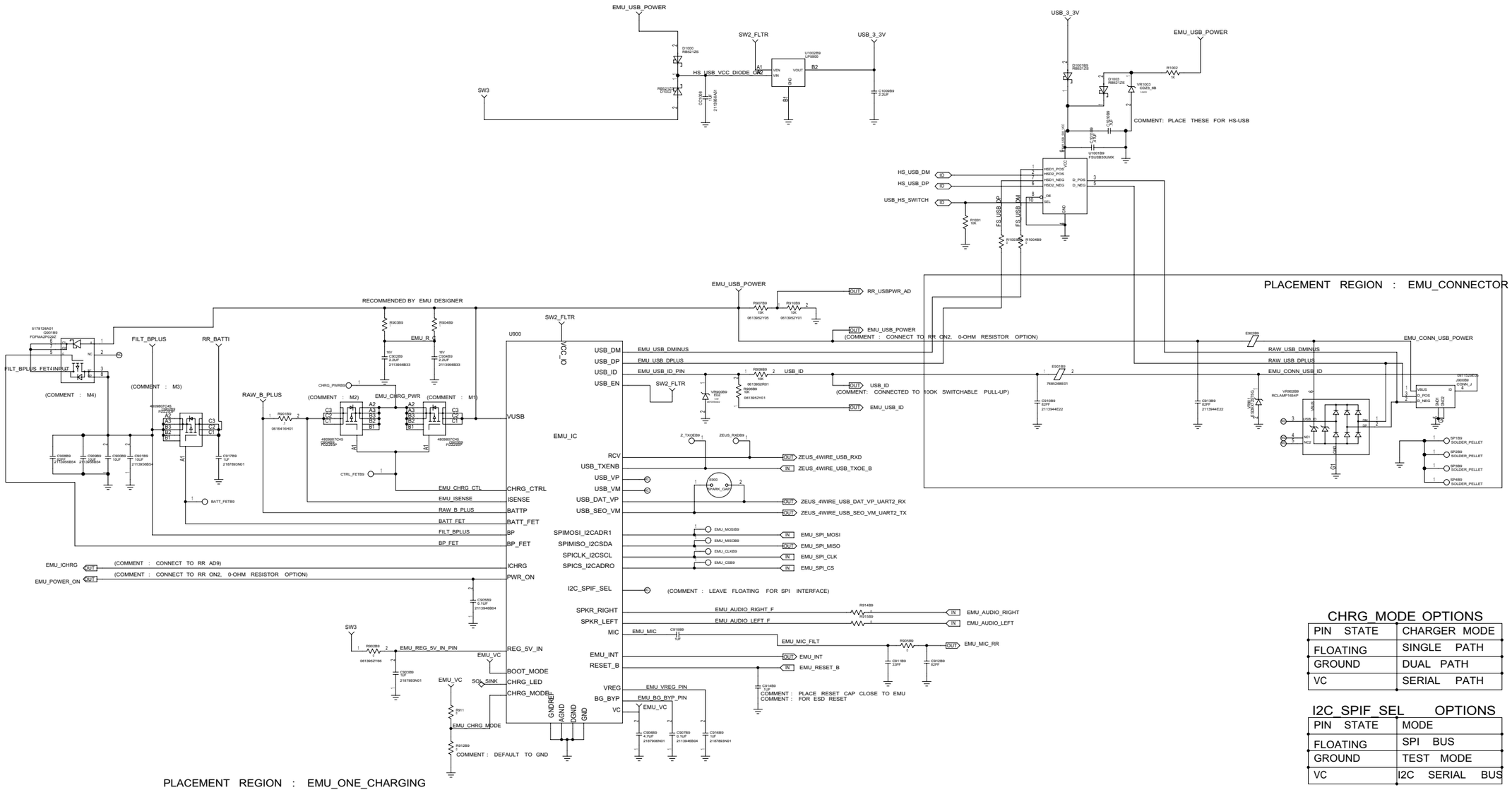


4.13 BLUETOOTH



If no BT nor NFC ever to be used, DNP C410, U401, U402, R405, R406, place R404.
If no NFC is ever used (but BT is) then either do nothing or DNP R405 and replace U401 with a NC7SZ04L6X. NFC but no BT (unlikely): Place R406.
C410 is shared between U401 & U402. Thus U401 & U402 must be intimately close!

4.14 EMU BLOCK



CHRG_MODE OPTIONS

PIN STATE	CHARGER MODE
FLOATING	SINGLE PATH
GROUND	DUAL PATH
VC	SERIAL PATH

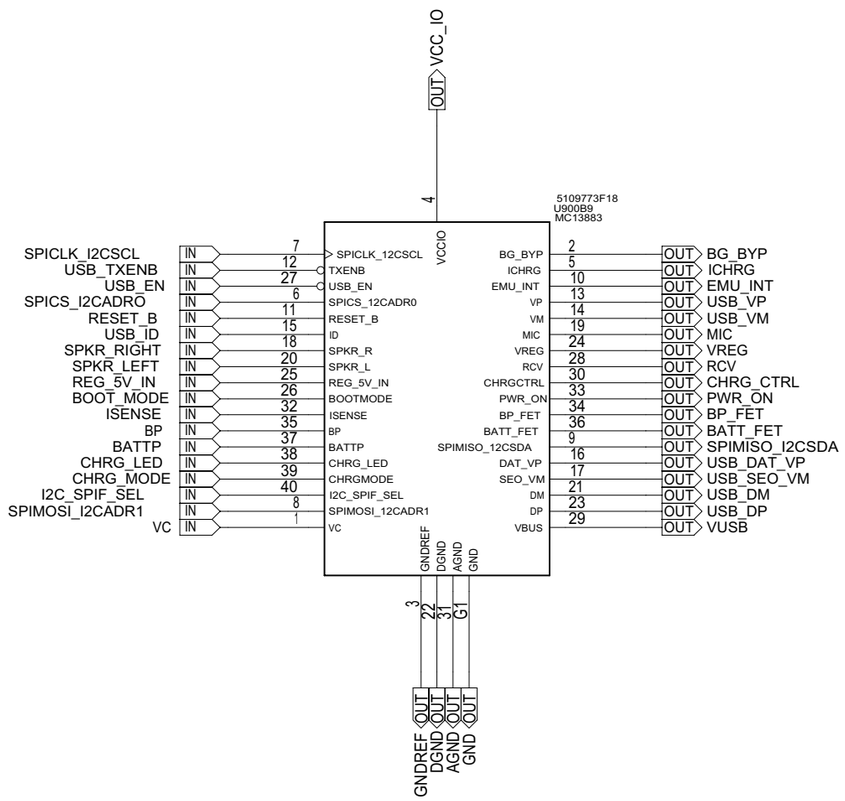
I2C_SPIF_SEL OPTIONS

PIN STATE	MODE
FLOATING	SPI BUS
GROUND	TEST MODE
VC	I2C SERIAL BUS

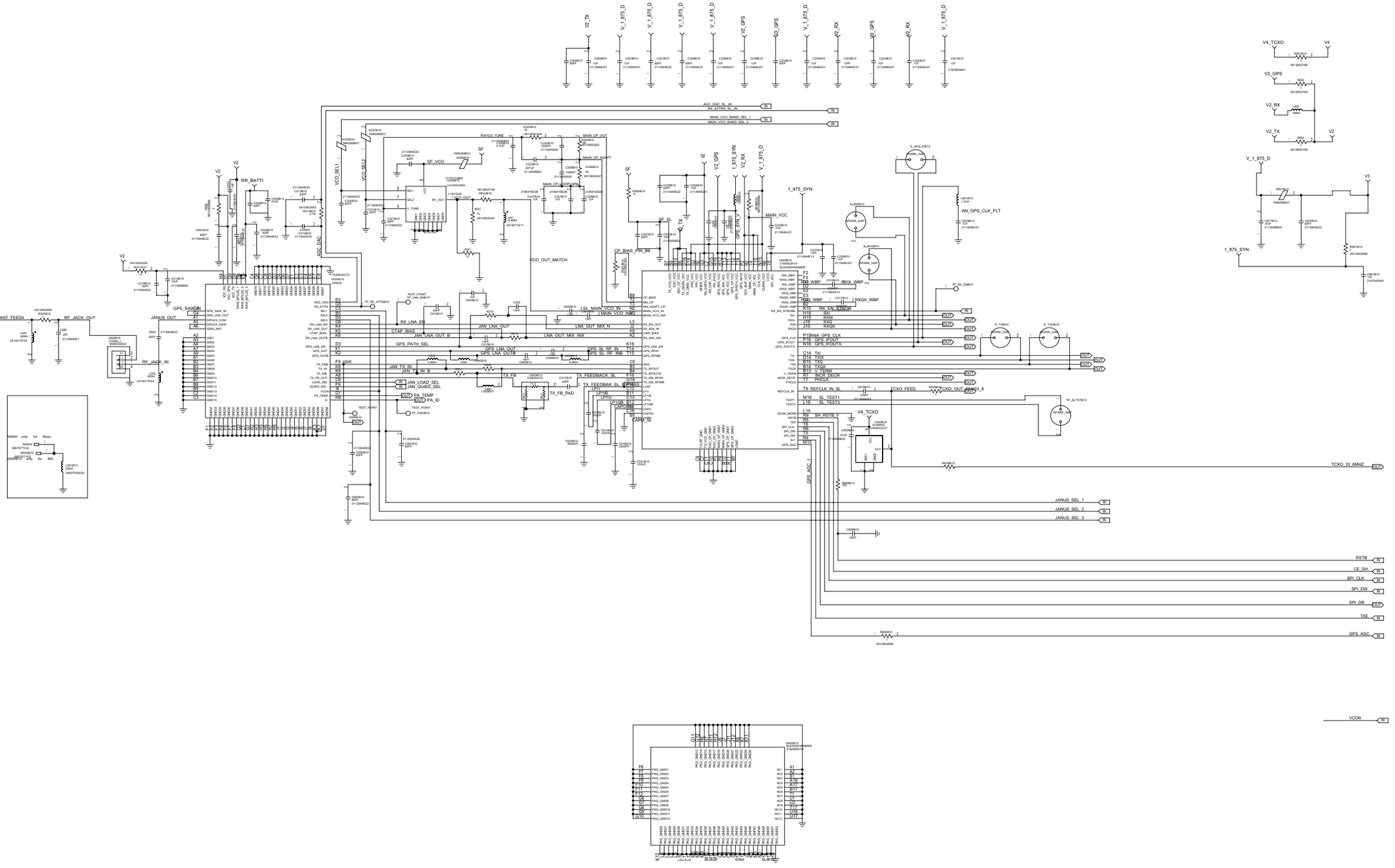
BOOT_MODE OPTIONS

PIN STATE	USB DEFAULT
FLOATING	3 WIRE
GROUND	6 WIRE
VC	4 WIRE

4.15 EMU IC


VCC_IO
OUT
4
VCCIO
5109773F18
U900B9
MC13883
SPICLK_I2CSCL
USB_TXENB
USB_EN
SPICS_I2CADRO
RESET_B
USB_ID
SPKR_RIGHT
SPKR_LEFT
REG_5V_IN
BOOT_MODE
ISENSE
BP
BATTP
CHRG_LED
CHRG_MODE
I2C_SPIF_SEL
SPIMOSI_I2CADR1
VC
IN
7
12
27
6
11
15
18
20
25
26
32
35
37
38
39
40
8
1
SPICLK_12CSCL
TXENB
USB_EN
SPICS_12CADR0
RESET_B
ID
SPKR_R
SPKR_L
REG_5V_IN
BOOTMODE
ISENSE
BP
BATTP
CHRG_LED
CHRGMODE
I2C_SPIF_SEL
SPIMOSI_12CADR1
VC
BG_BYP
ICHRG
EMU_INT
VP
VM
MIC
VREG
RCV
CHRGCTRL
PWR_ON
BP_FET
BATT_FET
SPIMISO_12CSDA
DAT_VP
SEO_VM
DM
DP
VBUS
2
5
10
13
14
19
24
28
30
33
34
36
9
16
17
21
23
29
OUT
BG_BYP
ICHRG
EMU_INT
USB_VP
USB_VM
MIC
VREG
RCV
CHRG_CTRL
PWR_ON
BP_FET
BATT_FET
SPIMISO_I2CSDA
USB_DAT_VP
USB_SEO_VM
USB_DM
USB_DP
VUSB
GNDREF
DGND
AGND
GND
3
22
31
G1

4.16 TRANSCEIVER



4.17 Component Locations

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
C1002B6	2113946U05	CAPACITOR,FIXED,.47UF,+10%,-10	C231B10	2113944E13	CAPACITOR,CHIP,12PF,+5%,-5%,25	C402	2171410C01	CAPACITOR,CERAMIC,2.2UF,+20%,-
C1003B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C233B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C403	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10
C1004B6	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C234B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C404	2171410C01	CAPACITOR,CERAMIC,2.2UF,+20%,-
C1005B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C235B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C405	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C1006B6	2113944E17	CAPACITOR,CHIP,33PF,+5%,-5%,25	C236B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C406	2113944E10	CAPACITOR,CHIP,6.8PF,.5PF+/-,2
C1007B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C2508	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C407	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10
C1009B9	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C2509	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C408	2113944E23	CAPACITOR,CHIP,100PF,+5%,-5%,2
C1010B9	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C3	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C409	2113944E12	CAPACITOR,CHIP,10PF,.5PF+/-,25
C1011B9	2113946U05	CAPACITOR,FIXED,.47UF,+10%,-10	C301B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C410	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10
C2	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C303B10	2113944E13	CAPACITOR,CHIP,12PF,+5%,-5%,25	C411	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW
C212B10	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	C305B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C413	2115153H09	CAPACITOR,FIXED,1.8PF,.1PF+/-,
C213B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C321B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C414	2489532Y01	CHIP INDUCTOR,WIRE WOUND,3.3NH
C214B10	2113945F05	CAPACITOR,FIXED,4700PF,+10%,-1	C322B10	2113945A09	CAPACITOR,CHIP,1000PF,+10%,-10	C415	2113944A25	CAPACITOR,CHIP,10PF,.5PF+/-,50
C216B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C323B10	2113946B02	CAPACITOR,CHIP,.047UF,+10%,-10	C499	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW
C217B10	2113945A12	CAPACITOR,CHIP,3300PF,+10%,-10	C325B10	2113946B04	CAPACITOR,CHIP,.1UF,+10%,-10%,	C5	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C218B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C326B10	2113945A09	CAPACITOR,CHIP,1000PF,+10%,-10	C500	2113944E15	CAPACITOR,FIXED,18PF,+5%,-5%,2
C219B10	2113945A12	CAPACITOR,CHIP,3300PF,+10%,-10	C327B10	2185419D28	CAPACITOR,CHIP,.1UF,+10%,-10%,	C501B10	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%
C221B10	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C328B10	2185419D28	CAPACITOR,CHIP,.1UF,+10%,-10%,	C502B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C222B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C330B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C503B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C223B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C331B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C504B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C224B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C332B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C505B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C225	2113944A05	CAPACITOR,CHIP,1.5PF,.25PF+/-,	C347B10	2185419D28	CAPACITOR,CHIP,.1UF,+10%,-10%,	C506B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C228B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C4	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C507B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C229B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C400	2171410C01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C508B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C230B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C401	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C509B10	2171045R01	CAPACITOR,CERAMIC,47UF,+20%,-2

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
C510	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C700B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C727B7	2113946F08	CAPACITOR,CHIP,22UF,+20%,-20%,
C514B10	2113945B04	CAPACITOR,FIXED,.022UF,+10%,-1	C701B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C730	2360567A11	CAPACITOR,TANTALUM,100UF,+20%,
C515B10	2113945B04	CAPACITOR,FIXED,.022UF,+10%,-1	C702B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C731B7	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-
C517B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C703B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C732B7	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-
C518B10	2113945A11	CAPACITOR,CHIP,2200PF,+10%,-10	C704B7	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	C733B7	2113944E21	CAPACITOR,CHIP,68PF,+5%,-5%,25
C521B10	2113945B05	CAPACITOR,FIXED,.033UF,+10%,-1	C705B7	2113946F08	CAPACITOR,CHIP,22UF,+20%,-20%,	C734B7	2113944E21	CAPACITOR,CHIP,68PF,+5%,-5%,25
C526B10	2113945B01	CAPACITOR,CHIP,6800PF,+10%,-10	C706B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C736B7	2113944E15	CAPACITOR,FIXED,18PF,+5%,-5%,2
C600B10	2113944A26	CAPACITOR,CHIP,12PF,+5%,-5%,50	C707B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C737B7	2113944E15	CAPACITOR,FIXED,18PF,+5%,-5%,2
C601B10	2113944A26	CAPACITOR,CHIP,12PF,+5%,-5%,50	C7080	2113946F08	CAPACITOR,CHIP,22UF,+20%,-20%,	C738B7	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10
C634B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C708B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C739B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C639B10	2113944E12	CAPACITOR,CHIP,10PF,.5PF+/-,25	C709B7	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C741B7	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C640B10	2113944E12	CAPACITOR,CHIP,10PF,.5PF+/-,25	C710B7	2360567A11	CAPACITOR,TANTALUM,100UF,+20%,	C742B7	2175536A01	CAPACITOR,CERAMIC,47UF,+20%,--
C650B10	2113945B02	CAPACITOR,CHIP,.01UF,+10%,-10%	C712B7	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C743B7	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C651B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C713B7	2113944E20	CAPACITOR,CHIP,56PF,+5%,-5%,25	C744	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C661B10	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C714B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C745	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C670B10	2113944A42	CAPACITOR,CHIP,150PF,+5%,-5%,5	C715B7	2171045R01	CAPACITOR,CERAMIC,47UF,+20%,-2	C746B7	2113945E07	CAPACITOR,FIXED,1000PF,+10%,-1
C676B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C716B7	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C747B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C677B10	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	C717B7	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C748B7	2113946U05	CAPACITOR,FIXED,.47UF,+10%,-10
C678B10	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C719B7	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C749	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C691B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C720B7	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C750B7	2113945B02	CAPACITOR,CHIP,.01UF,+10%,-10%
C692B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C721B7	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C751B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C693B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C7220	2113946F08	CAPACITOR,CHIP,22UF,+20%,-20%,	C752B7	2187906N01	CAPACITOR,CHIP,4.7UF,+20%,-20%
C694B10	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C7230	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C753B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C695B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C725B7	2171045R01	CAPACITOR,CERAMIC,47UF,+20%,-2	C754B7	2113945A10	CAPACITOR,CHIP,1500PF,+10%,-10
C696B10	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C726B7	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C755B7	2187906N01	CAPACITOR,CHIP,4.7UF,+20%,-20%

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
C756B7	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	C792B6	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C825B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C757B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C793	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C826B6	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C758B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C793B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C827B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C763	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C794	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C828B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C765	2113945E07	CAPACITOR,FIXED,1000PF,+10%,-1	C794B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C829B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C766	2113945E07	CAPACITOR,FIXED,1000PF,+10%,-1	C799	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C830B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C767B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C800B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C831B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C768B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C802B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C832B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25
C769	2113945E07	CAPACITOR,FIXED,1000PF,+10%,-1	C803B6	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C833B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C770	2113945E07	CAPACITOR,FIXED,1000PF,+10%,-1	C804B6	2113956A64	CAPACITOR,FIXED,3.3UF,+20%,-20	C834B6	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C772	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C808	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C835B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C775B7	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	C809B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C836B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C776B7	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C810B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C837B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C777B7	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C811B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C838B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C778B7	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C812B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C839B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C779B7	2113946B06	CAPACITOR,CHIP,.22UF,+10%,-10%	C813B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C841B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C780B7	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C814B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C842B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C781B7	2113944E15	CAPACITOR,FIXED,18PF,+5%,-5%,2	C815B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C843B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C785	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C816B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C844B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C788	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C817B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C845B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C789	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C819B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C846B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C790	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,	C820B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C848B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C790B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C821B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C849B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C791B6	2113956B55	CAPACITOR,FIXED,4.7UF,+10%,-10	C823B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	C850B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%
C792	2187906N01	CAPACITOR,CHIP,4.7UF,+20%,-20%	C824B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C851B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
C852B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C887B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C916B9	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C853B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C888B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C917B9	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20
C854B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C889B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	CC1008	2113956A51	CAPACITOR,FIXED,1UF,+10%,-10%,
C855B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C890B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	D1001B9	4809924D33	DIODE,RB521ZS-30,SM,100MA,30V,
C856B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C891B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	D1002	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
C857B6	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C892B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	D1003	4809924D33	DIODE,RB521ZS-30,SM,100MA,30V,
C858B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C893B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	D700B7	4870370A33	DIODE,SCHOTTKY,BAT960,1A,20V,S
C859B6	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C896B6	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	D7020	4870370A33	DIODE,SCHOTTKY,BAT960,1A,20V,S
C860B6	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C897B6	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	D703B7	4809924D28	DIODE,SCHOTTKY,EMD2SC79,SMD,50
C861B6	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C900B9	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	E1000B6	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C862B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C901B9	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	E1001B6	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C863B6	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	C902B9	2113956B33	CAPACITOR,FIXED,2.2UF,+10%,-10	E331B10	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C864B6	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C903B9	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	E332B10	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C865B6	2175511A01	CAPACITOR,CERAMIC,2.2UF,+20%,-	C904B9	2113956B33	CAPACITOR,FIXED,2.2UF,+10%,-10	E6003	2475316C68	FILTER,COILS (AIR OR FORMED),
C866B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C905B9	2113946B04	CAPACITOR,CHIP,.1UF,+10%,-10%,	E6008	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
C867B6	2113945F07	CAPACITOR,FIXED,.01UF,+10%,-10	C906B9	2187906N01	CAPACITOR,CHIP,4.7UF,+20%,-20%	E6018	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
C870B6	2113944E08	CAPACITOR,CHIP,4.7PF,.25PF+/-,	C907B9	2113946B04	CAPACITOR,CHIP,.1UF,+10%,-10%,	E601B10	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C871B6	2113944E11	CAPACITOR,CHIP,8.2PF,.5PF+/-,2	C908B9	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	E656B10	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW
C874B6	2113944E17	CAPACITOR,CHIP,33PF,+5%,-5%,25	C909B9	2113956B54	CAPACITOR,FIXED,10UF,+20%,-20%	E659B10	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C879B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C910B9	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	E700	2475316C68	FILTER,COILS (AIR OR FORMED),
C881B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C911B9	2113944E17	CAPACITOR,CHIP,33PF,+5%,-5%,25	E700B7	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
C882B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C912B9	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	E701	2475316C68	FILTER,COILS (AIR OR FORMED),
C884B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C913B9	2113944E22	CAPACITOR,CHIP,82PF,+5%,-5%,25	E701B7	7688697V04	FILTER,EMI/RFI,1.5A,SM,0402,PB
C885B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C914B9	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	E702	2475316C68	FILTER,COILS (AIR OR FORMED),
C886B6	2113946U01	CAPACITOR,FIXED,.1UF,+10%,-10%	C915B9	2187893N01	CAPACITOR,CERAMIC,1UF,+20%,-20	E702B7	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
E703	2475316C68	FILTER,COILS (AIR OR FORMED),	L402	7688697V04	FILTER,EMI/RFI,1.5A,SM,0402,PB	Q904B9	4809807C45	TRANSISTOR,FET GEN PURPOSE POW
E7040	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0	L501B10	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW	Q905B9	4809807C45	TRANSISTOR,FET GEN PURPOSE POW
E704B7	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0	L502	2488090Y15	INDUCTOR,CHIP,15NH,5%,300MA,CE	R1000B6	0613952X81	RESISTOR,METAL FILM,2.2KOHM,5%
E767B7	2471204F06	FILTER,FERRITE,100MA,SM,0603,M	L513	2413954B10	INDUCTOR,CHIP,5.6NH,380MA,.23O	R1002	0613952X73	RESISTOR,METAL FILM,1000OHM,5%
E768B7	2471204F06	FILTER,FERRITE,100MA,SM,0603,M	L601B10	2471042E13	INDUCTOR,RF,1.2NH,10%,10MA,1.2	R1002B6	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,
E806B6	2414017P11	INDUCTOR,CHIP,6.8NH,5%,300MA,.	L639B10	2414017P11	INDUCTOR,CHIP,6.8NH,5%,300MA,.	R1003B6	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,
E810B6	2475316C68	FILTER,COILS (AIR OR FORMED),	L640B10	2414017P14	INDUCTOR,CHIP,12NH,5%,300MA,.6	R1003B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
E817B6	2475316C68	FILTER,COILS (AIR OR FORMED),	L641	2470327G23	INDUCTOR,CHIP,5.6NH,3%,CERAMIC	R1004B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
E881B6	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0	L653	2489828Y22	CHIP INDUCTOR,RF,56NH,5%,130MA	R1008	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
E887B6	2475316C02	FILTER,COILS (AIR OR FORMED),	L694B10	2489828Y22	CHIP INDUCTOR,RF,56NH,5%,130MA	R1009	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
E888B6	2475316C02	FILTER,COILS (AIR OR FORMED),	L700B7	2564933H01	FIXED INDUCTOR,FIXED,4.7UH,20%	R211B10	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0
E901B9	7685268E01	FILTER,FERRITE BEAD,650MA,SM,0	L7030	2571104B04	INDUCTOR,WIRE WOUND,4.7UH,20%,	R212B10	0613952X83	RESISTOR,METAL FILM,2.7KOHM,5%
E902B9	7688697V04	FILTER,EMI/RFI,1.5A,SM,0402,PB	L704B7	2564933H02	INDUCTOR,FIXED,2.2UH,20%,2.3A,	R215	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
FL1	4885534E14	FILTER,EMI FILTER,LOWPASS,110M	L800B6	2488090Y22	INDUCTOR,CHIP,56NH,5%,200MA,CE	R216	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
FL2	9175524C01	EMI FILTER,EMI,LOW CAPACITANCE	M500B10	3987977Y02	CONTACT,CONNECTOR,1CONT,ANTENN	R323B10	0613952Q36	RESISTOR,METAL FILM,30OHM,5%,.
FL400	91009256001	FILTER,MISCELLANEOUS,BANDPASS,	M502B10	3987977Y02	CONTACT,CONNECTOR,1CONT,ANTENN	R324B10	0613952Q52	RESISTOR,METAL FILM,130OHM,5%,
FL6002B6	2571968E03	FILTER,EMI/RFI,COMMON MODE,5V-	M700B7	39009255001	CONNECTOR,BATTERY CONNECTOR AS	R326B10	0613952Q47	RESISTOR,METAL FILM,82OHM,5%,.
FL800B6	9175524C01	EMI FILTER,EMI,LOW CAPACITANCE	M803	3971599M02	CONTACT,6CONT,CONN, SIM	R357B10	0613952Z43	RESISTOR,METAL FILM,3KOHM,1%,.
FL803B6	4885534E14	FILTER,EMI FILTER,LOWPASS,110M	PCB	84009289002	PWB,MAIN PCB	R400	0613952V18	RESISTOR,METAL FILM,15KOHM,1%,
FL809B6	4885534E14	FILTER,EMI FILTER,LOWPASS,110M	Q701B7	4813970M62	TRANSISTOR,FET GEN PURPOSE POW	R402	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
FL810B6	4885534E14	FILTER,EMI FILTER,LOWPASS,110M	Q702B7	4809607E17	TRANSISTOR,BIP GENERAL PURPOSE	R405	0613952R25	RESISTOR,METAL FILM,100KOHM,5%
J1	09009289001	CONNECTOR,RECEPTACLE,80CONT,CO	Q703B7	4885316E13	TRANSISTOR,BIP GENERAL PURPOSE	R503B10	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW
J500B10	0985502E02	RF CONNECTOR,MISC,FEMALE,SM,NU	Q801B6	4885316E03	TRANSISTOR,BIP,SM,SOT-553,.5W,	R530	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
J802B6	3971730C02	CONNECTOR,1 ROW,RECEPTACLE,9CO	Q901B9	5178126A01	TRANSISTOR,FET GEN PURPOSE POW	R531	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
J900B9	0971529E05	CONNECTOR USB,RECEPTACLE,5CONT	Q902B9	4809807C45	TRANSISTOR,FET GEN PURPOSE POW	R629B10	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
R630B10	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R725B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R810B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%
R632B10	2470327G27	INDUCTOR,CHIP,8.2NH,3%,CERAMIC	R727B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R812B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R641	0613952X42	RESISTOR,METAL FILM,51OHM,5%,G	R729B7	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%	R813B6	0688733Z01	RESISTOR,CARBON FILM,.22OHM,1%
R650B10	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW	R730B7	0613952Y17	RESISTOR,METAL FILM,47KOHM,5%,	R814B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R651B10	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R735	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R816B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R652	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R736	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R818B6	0613952Y17	RESISTOR,METAL FILM,47KOHM,5%,
R654	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R737	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R819B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%
R660B10	0613952Q25	RESISTOR,METAL FILM,10OHM,5%,.	R738B7	0613952Y32	RESISTOR,METAL FILM,200KOHM,5%	R820B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R661B10	0613952R66	RESISTOR,METAL FILM,0OHM,5%,GW	R741B7	0613952Y17	RESISTOR,METAL FILM,47KOHM,5%,	R821	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R696B10	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R742B7	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,	R828B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R700B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R745B7	0613952Y15	RESISTOR,METAL FILM,39KOHM,5%,	R833B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R701B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R748B7	0613952X89	RESISTOR,METAL FILM,4.7KOHM,5%	R843B6	0613952W01	RESISTOR,METAL FILM,100KOHM,1%
R703B7	0613952X91	RESISTOR,METAL FILM,5.6KOHM,5%	R750	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R844B6	0613952X25	RESISTOR,METAL FILM,10OHM,5%,G
R704B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R751B7	0613952R16	RESISTOR,METAL FILM,43KOHM,5%,	R845B6	0613952W01	RESISTOR,METAL FILM,100KOHM,1%
R706B7	06009255001	RESISTOR,METAL FILM,.05OHM,1%,	R752B7	0613952X29	RESISTOR,METAL FILM,15OHM,5%,G	R846B6	0613952X25	RESISTOR,METAL FILM,10OHM,5%,G
R7070	0689774Y02	RESISTOR,METAL FILM,.1OHM,5%,.	R753B7	0613952X29	RESISTOR,METAL FILM,15OHM,5%,G	R850B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R707B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R757B7	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R851B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R708B7	0688044N01	RESISTOR,METAL STRIP,.015OHM,1	R758B7	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R852B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R7090	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R759B7	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R853B6	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,
R712B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R760B7	0613952X49	RESISTOR,METAL FILM,100OHM,5%,	R856B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%
R713B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R761B7	0613952R25	RESISTOR,METAL FILM,100KOHM,5%	R872B6	0613952X89	RESISTOR,METAL FILM,4.7KOHM,5%
R714B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R801B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%	R874B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW
R715B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R805B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R876B6	0613952X73	RESISTOR,METAL FILM,1000OHM,5%
R718B7	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	R807B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%	R877B6	0613952X73	RESISTOR,METAL FILM,1000OHM,5%
R722B7	0613952X91	RESISTOR,METAL FILM,5.6KOHM,5%	R809B6	0613952Y25	RESISTOR,METAL FILM,100KOHM,5%	R878B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW

Component Locations [Continued]

Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description	Ref. Des.	Part No.	Description
R888B6	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U1001B9	5188160Y03	IC,SWITCH,HIGH SPEED,QFN,DUAL	VR852B6	4809788E25	DIODE,ZENER,CDZ7.5B,SM,7.6V,.1
R890	0613952X25	RESISTOR,METAL FILM,10OHM,5%,G	U1002B9	5175771A37	IC,LINEAR VOLTAGE REGULATOR,FI	VR900B9	4870359A02	DIODE ARRAY,ZENER,EDZTE615.6B,
R901B9	0616416H01	RESISTOR,METAL FILM,.1OHM,1%,.	U200B10	51009337002	IC,CUSTOM,IC VCO	VR901	4809788E41	DIODE,ZENER,ESD9X12ST5G,SOD-92
R902B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U400	51009283001	IC,BLUETOOTH RADIO & BB CNTLR,	VR902B9	4888581Y04	DIODE,SUPPRESSOR,5.5V,100W,RCL
R903B9	0613952X01	RESISTOR,METAL FILM,1OHM,5%,.0	U401	5170200A64	IC,NOR,2-INPUT,1PER PKG,SM,1.4	Y002B10	5185633C78	OSCILLATOR,TEMP COMPENSATED CR
R904B9	0613952X01	RESISTOR,METAL FILM,1OHM,5%,.0	U402	5109522E94	GATE,AND,1PER PKG,SM,2 INPUT I	Y1000B6	4888040N03	RESONATOR,CERAMIC,24MHZ,THIRD
R905B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U500B10	5185633C72	IC,RF AMPLIFIER,RF FRONT END,8	Y700B7	4809995L15	RESONATOR,32.768KHZ,30PPM TOL,
R906B9	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,	U505B10	5887694L13	ATTENUATOR,FIXED,10DBATTEN,50O			
R907B9	0613952Y05	RESISTOR,METAL FILM,15KOHM,5%,	U600B10	5164852H14	IC,CUSTOM,RF TRANSCEIVER,BGA,I			
R909B9	0613952R01	RESISTOR,METAL FILM,10KOHM,5%,	U700	5109731C49	IC,AUDIO AMPLIFIER,POWER AMPLI			
R910B9	0613952Y01	RESISTOR,METAL FILM,10KOHM,5%,	U700B7	5175771A73	IC,CUSTOM,BGA,IC, ROADRUNNER (			
R912B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U701B7	5175771A47	IC,SWITCHING VOLTAGE REGULATOR			
R914B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U790B6	5109512F91	IC,LINEAR VOLTAGE REGULATOR,FI			
R915B9	0613952Y66	RESISTOR,METAL FILM,0OHM,5%,GW	U800B6	5175772B28	IC,COMPARATOR,TSX03121,SM,1PER			
SH1	26009265001	SHIELD,SHIELD BT	U801B6	5175771A37	IC,LINEAR VOLTAGE REGULATOR,FI			
SH2	26009267003	SHIELD,SLEDGEHAMMER SHIELD	U804B6	5175249A04	IC,CUSTOM,DIGITAL PROCESSING,B			
SH3	26009268002	SHIELD,SHLD,SHLD DIG (NO SLOTS	U805B6	5175772B22	IC,VOLTAGE DETECTOR,MAX803,SC7			
SH4	26009266001	SHIELD,SHIELD VCO	U806B6	51012014001	IC,FLASH/SDRAM,2GBNAND, 1GBDDR			
SH5	26009264001	SHIELD,SHIELD EMU	U807B6	5170200D37	IC,SERIALIZER,DESERIALIZER,BGA			
SH6	26009263001	SHIELD,SHIELD JANUS	U900B9	5109773F18	IC,INTERFACE,QFN,ONE CHIP FOR			
SP1B9	1088791Y02	SOLDER,TAPE AND REEL,PELLETS,	VR1003	48009295001	DIODE ARRAY,ZENER,SM,3.78V,.2W			
SP2B9	1088791Y02	SOLDER,TAPE AND REEL,PELLETS,	VR700B7	4805656W99	DIODE,ZENER,SM,5.6V,5.6V,.1W,Z			
SP3B9	1088791Y02	SOLDER,TAPE AND REEL,PELLETS,	VR701B7	4805656W46	DIODE,ZENER,SM,16V,SINGLE			
SP4B9	1088791Y02	SOLDER,TAPE AND REEL,PELLETS,	VR704B7	4805656W99	DIODE,ZENER,SM,5.6V,5.6V,.1W,Z			
U1000B6	5187970L83	IC,MICROCONTROLLER,CY7C68053,V	VR801B6	4809788E25	DIODE,ZENER,CDZ7.5B,SM,7.6V,.1			

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APPENDIX A

ORDERING REPLACEMENT PARTS AND KITS

Parts should be replaced with identical replacement parts. Replacement parts and kits for i897 units can be ordered directly from the Motorola Accessories and Aftermarket Division (AAD) at 1-800-422-4210 and listen to the prompts; or FAX 800-622-6210.

A.1 Customer Service

For warranty and customer service assistance, call:

1-800-453-0920 U.S./Canada
1-954-723-3000 FAX
1-954-723-4910 International (outside U.S ./Canada)

A.2 Replacement Parts

When ordering replacement and accessory parts, the complete part number should be included. If the correct part number cannot be located, call Motorola Parts Identification at 1-800-422-4210.

A.3 Domestic Orders

Send written orders for replacement parts, test equipment, or manuals to:

Motorola, Inc.
Accessories and Aftermarket Division
Attn: Order Processing 1313 E.
Algonquin Road Schaumburg, IL
60196

Call, fax, or telex orders to:

1-800-422-4210
1-847-538-8198 FAX
280 127 TELEX

A.4 International Orders

For international orders:

Motorola, Inc.
Accessories and Aftermarket Division Attn:
International Order Processing 1313 E.
Algonquin Road
Schaumburg, IL 60196

Call, fax, or telex orders to:
1-847-538-8023
1-847-576-3023 FAX
403305 TELEX

A.5 Replacement Kits

When ordering replacement kits, the complete kit number should be included. If the correct number cannot be located, call Motorola Parts Identification at 1-800-422-4210. Refer to the exploded view and parts list in Chapter 7.

MobileME Description	Kit Number	Product Category
Automotive & Navigation		
Bluetooth Car Kit / Speakerphone - High Tier, Self Install, T505 (Americas)	SYN1717	Automotive & Navigation
Bluetooth Car Kit, T305 Portable Hands-Free Speaker	SYN1716	Automotive & Navigation
BT Pro-Install CarkIt IHF1000r	98676L	Automotive & Navigation
Pro Install Bluetooth Carkit T605 Americas	98799N	Automotive & Navigation
Universal Dash Mount System (iDEN)	NNTN7295	Automotive & Navigation
Bluetooth Car Kit, T307 Portable Hands-Free Speaker	SYN2715	Automotive & Navigation
Portable Navigation Device, TN30	89293N	Automotive & Navigation
IHF1700 Music OEM BT Carkit	CKG181xxxx	Automotive & Navigation
Bluetooth ProInstall Carkit IHF1700 OEM	CKG171V010	Automotive & Navigation
Data & Business Communications		
512MB microSD card & Mot SD adapter	SYN1405	Data & Business Communications
1GB microSD card & Mot SD adapter	SYN1406	Data & Business Communications
2GB microSD card & Mot SD adapter	SYN1407	Data & Business Communications
4GB microSD card & Mot SD adapter	SYN1408	Data & Business Communications
8GB microSD memory card	SYN2508	Data & Business Communications
MobileVoice (Wireless BT Headsets)		
Bluetooth Headset - H700 (silver)	SYN1311	MobileVoice (Wireless BT Headsets)
Bluetooth Headset (Pearl Dark Gray) - H300	SYN1297	MobileVoice (Wireless BT Headsets)
Bluetooth Headset Black H375 ROM BLK	SYN2162	MobileVoice (Wireless BT Headsets)
Bluetooth Headset -Black Licorice-H800	SYN1626	MobileVoice (Wireless BT Headsets)
Bluetooth Headset H350 Black	SYN1439	MobileVoice (Wireless BT Headsets)
Bluetooth Headset H550 Silver (SLVR)	SYN1822	MobileVoice (Wireless BT Headsets)
Bluetooth Headset H710	SYN2305	MobileVoice (Wireless BT Headsets)
Bluetooth Mono Headset, Nickel- H500	SYN1290	MobileVoice (Wireless BT Headsets)
ASSY,MOB/VOICE,BT HSET,H390 , BLACK	SYN2644	MobileVoice (Wireless BT Headsets)
H780 Kit Contains Mono Bluetooth headset kit and Cushions, brushed(PHONE TEAMS LINK TO THIS)	SYN2708	MobileVoice (Wireless BT Headsets)
BT Headset and Charging case H680 Midnight	SYN2168	MobileVoice (Wireless BT Headsets)
BT HSET,H375,FLSH BLK	SYN2257	MobileVoice (Wireless BT Headsets)
MOTOPURE H12 Bluetooth headset KIT	SYN2487	MobileVoice (Wireless BT Headsets)
H15, BT,HIGH TIER,BOOM FLIP MONO HS Midnight	SYN2530	MobileVoice (Wireless BT Headsets)
Bluetooth Headset H560 Black	SYN2518	MobileVoice (Wireless BT Headsets)
Bluetooth Headset H620 Black	SYN2259	MobileVoice (Wireless BT Headsets)
H690 Bluetooth Headset Kit	SYN2616	MobileVoice (Wireless BT Headsets)
ASSY, Mob/Voice, BT Hset, H270	SYN2646	MobileVoice (Wireless BT Headsets)

Replacement Kits (Continued)

Music & Entertainment		
Wired MonoHeadset (mUSB)	SYN1472	Music & Entertainment
microUSB Stereo Headset	SYN1458	Music & Entertainment
microUSB Stereo Headset-FM Optimized	SYN2357	Music & Entertainment
microUSB Stereo Headset-FM Optimized (Cost reduced)	SYN2809	Music & Entertainment
Adapter uUSB (m) to 2.5mm stereo/mono/TTY (f)	SYN2112	Music & Entertainment
Prodigy EQ7 - MOT+JBL Bluetooth Shelf Speaker	SYN1759	Music & Entertainment
EQ5 Ultra-Portable Wireless Speaker	SYN2379	Music & Entertainment
BT Stereo Headphones & Controller S705 SoundPilot (Black, Global)	SYN1711	Music & Entertainment
Bluetooth DJ Headset - Music and Telephony - S805	SYN1673	Music & Entertainment
S9-HD Gloss Black	SYN2516	Music & Entertainment
Bluetooth Stereo Headset HT820	SYN0948	Music & Entertainment
Bluetooth Stereo Transceiver DC800	SYN1001	Music & Entertainment
BT ACTIVE STEREO HDST, S9, BLACK/RED	SYN1902	Music & Entertainment
Bluetooth Stereo Headset, Ear Hook Style, JAY-Z	SYN2801	Music & Entertainment
S605 Bluetooth Stereo Clip with FM (Gorillaz)	SYN2527	Music & Entertainment
Personalization		
Holster for Inbox	NNTN7841A	Personalization
Power		
Battery BK70 Li-ion 1140 mAh	SNN5823	Power
High Performance Battery	SNN5793	Power
Battery Door -Standard (BX50)	NTN2555NIIA	Power
Battery Door -Extended (BX80)	NTN2555MOTA	Power
Charger Adapter - Aust/NZ Plug	SYN8127	Power
Charger Adapter - Euro Plug	SYN7456	Power
Charger Adapter - UK Plug	SYN7455	Power
Charger Adapter REFRESH - EMU/MU	SKN6252	Power
Data cable Micro USB	SKN6238	Power
P313 Standard Car Charger Micro Connector	SYN1830	Power
P513 VPA MicroUSB High Performance "Loop"	SPN5400	Power
Travel Charger USBA Fast Rate Fixed - US	SPN5504	Power
Travel Charger USBA Fast Rate Fixed- MEX	SPN5517	Power
Travel Charger USBA Fast Rate Fixed- SPRINT HEAT SEALED	SPN5505	Power
Travel Charger USBA Fast Rate Fixed - BRAZIL BREURO- Made in China	SPN5506	Power
Travel Charger USBA Fast Rate Fixed - EURO	SPN5507	Power
Travel Charger USBA Fast Rate Fixed- ARG	SPN5508	Power
Travel Charger USBA Fast Rate Fixed- INDIA	SPN5510	Power
Travel Charger USBA Fast Rate Fixed- KOREA	SPN5511	Power
Data Cable MicroUSB Unique USBA SPRINT - Heat Sealed - UPC	SKN6268	Power
Data Cable MicroUSB Unique USBA Global	SKN6254	Power

Replacement Kits (Continued)

Travel Charger MicroUSB Fast Rate Fixed Blade- ARG	SPN5370	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- Brazil US Blades- MADE IN CHINA - PORTUGUESE LABEL	SPN5403	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- EURO	SPN5383	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- INDIA	SPN5372	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- KOREA	SPN5373	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- MEX	SPN5362	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- SPRINT	SPN5374	Power
Travel Charger MicroUSB Fast Rate Fixed Blade- US	SPN5358	Power
Travel Charger MicroUSB Rapid - ARG	SPN5327	Power
Travel Charger MicroUSB Rapid - MEX	SPN5329	Power
Travel Charger MicroUSB Rapid - SPRINT	SPN5355	Power
Travel Charger MicroUSB Rapid - US	SPN5328	Power
Travel Charger MicroUSB Standard- ARG	SPN5339	Power
Travel Charger MicroUSB Standard- Brazil US Blades - MADE IN CHINA - PORTUGUES LABEL	SPN5402	Power
Travel Charger MicroUSB Standard- EURO	SPN5342	Power
Travel Charger MicroUSB Standard- INDIA	SPN5346	Power
Travel Charger MicroUSB Standard- KOREA	SPN5343	Power
Travel Charger MicroUSB Standard- MEX	SPN5337	Power
Travel Charger MicroUSB Standard- SPRINT	SPN5356	Power
Travel Charger MicroUSB Standard- US	SPN5334	Power
In Box		
Key Ring:	SJYNO454A	
Carry Case:	SJYN0483A	
Ferrari branded car charger:	SPN5492A	

A.6 Recommended Test Equipment and Tools

The following table lists the standard test equipment recommended for troubleshooting i897 units at the field level of service.

Table: A-2. Recommended Test Tools

Description	Part Number
Battery Eliminator, Regulated	NNTN5590A
Black Stick	SLN7223A
Cable, Audio Jack Test	NNTN5171A
Cable, SMA to N-Type RF	Contact Motorola
Communications System Analyzer	Motorola R-2660
Data Cable, Flash	MYA2003B
Data Cable, Micro-USB	SKN6238
Digital Volt-Ohm Meter	Keithly 2001 or eq.
Power Supply, 0-15VDC, 0-3A	S1348D
SIM Card, Reference	5185956E60
Torx Bit, T-4	Commercially available
Torx Bit, T-6	6680387A70
Torx Driver, calibrated	RSX4043
Wrist Strap, Static ground	NTN98 12

A.7 Recommended Programming Equipment

The following tables list the programming equipment and software recommended for troubleshooting i897 units at the field level of service.

Table: A-3. Recommended Programming Equipment

Name	Part Number	Description
Cable, Data, codeplug Cable, Data, USB	RJD2005A SKN6371A	Connects unit to the computer for monitoring the codeplug.

Table A-3. Recommended Programming Equipment (Continued)

Cable, Data (2.5mm)	TTY	Connects unit to a teletypewriter (TTY) device for making phone calls.
Cable, Data (for GPS interface)	GPS - SKN6371A	Connects unit to a laptop or other device for sending location information.
Computer, IBM PC-Compatible (RSS Workstation)	N/A	Pentium microprocessor with: 32MB RAM min.; 4MB hard disk space min.; Two serial ports and one parallel port; network-capability; Microsoft Windows 2000, Windows 98, or Windows NT 3.5.1 or later

Table: A-4. Recommended Software

Name	Part Number	Description
Radio Service Software (RSS) Carrier Version Super Agent Version	 RVN4 121 RVN4 122	Monitors the unit's code plug parameters.
iDEN Wireless Data Services Software		Programs a laptop, handheld device, or desktop computer to use the i897 unit as a modem to transfer circuit or packet data.
Interactive Map Software (such as that made by DeLorme or Microsoft) that supports NEMA 3.0 format		Allows i897 unit's GPS feature to provide approximate location data to a laptop computer or other device.