MOTOROLA

Professional Radio
GP Series

Detailed Service Manual
6866558D03-O

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Contents

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SAFETY INFORMATION

Read this information before using the radio.

PRODUCT SAFETY AND RF EXPOSURE FOR PORTABLE TWO-WAY RADIOS.

This document provides information and instructions for the safe and efficient operation of Motorola Portable Two-Way Radios. The information provided in this document supersedes information contained in user guides published prior to **February 2002.**

RF Energy Exposure Awareness and Control Information and Operational Instructions for Occupational Use

Note: This Radio is intended for use in occupational/controlled applications, where users have been made aware of the potential for exposure and can exercise control over their exposure. This radio device is NOT authorized for general population, consumer or similar use.

This two-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses radio frequency (RF) energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, sunlight and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which when used improperly, can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health, and industry work with organizations to develop standards for safe exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection.

All Motorola two-way radios are designed, manufactured, and tested to ensure they meet government-established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of two-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it.

Please refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits:

http://www.fcc.gov/oet/rfsafety/rf-faqs.html
http://www.osha.gov/SLTC/radiofrequencyradiation/index.html

Federal Communication Commission (FCC) Regulations (US markets only)

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for portable two-way radios before they can be marketed in the U.S. When two-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a product label directing users to specific user awareness information. Your Motorola two-way radio has a RF Exposure Product Label. Do not remove this RF Exposure Label from the device. Also, your Motorola user manual, or separate safety booklet includes information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

Compliance with RF Exposure Standards

Your Motorola two-way radio is designed and tested to comply with a number of national and International standards and guidelines (listed below) for human exposure to radio frequency electromagnetic energy. **This radio complies with the IEEE (FCC) and ICNIRP exposure limits for occupational/controlled RF exposure environments at operating duty factors of up to 50% talk-50% listen and is authorized by the IEEE/ICNIRP for occupational use only.**

In terms of measuring RF energy for compliance with these exposure guidelines, **your radio generates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.**

Note: The approved batteries, supplied with this radio, are rated for a 5-5-90 duty cycle (5% talk–5% listen–90% standby), even though this radio complies with IEEE/ICNIRP occupational exposure limits at usage factors of up to 50% talk.

Your Motorola two-way radio complies with the following RF energy exposure standards and guidelines:

- 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 Electronic Engineers (IEEE) C95. 1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 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 Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard 2003
- ANATEL ANNEX to Resolution No. 303 of July 2, 2002 "Regulation of limitation of exposure to electrical, magnetic and electromagnetic fields in the radio frequency range between 9 KHz and 300 GHz" and "Attachment to resolution # 303 from July 2, 2002"

RF Exposure Compliance and Control Guidelines and Operating Instructions

To control your exposure and ensure compliance with the occupational/controlled environment exposure limits, always adhere to the following procedures:

Guidelines:

- User awareness instructions should accompany device when transferred to other users.
- Do not use this device if the operational requirements described herein are not met.

Operating Instructions

- Transmit no more than the rated duty factor of 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button.
  Transmitting 50% of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of measuring for standards compliance).
- When worn on the body, always place the radio in a Motorola-approved clip, holder, holster, case, or body harness for this product. Using approved body-worn accessories is important because the use of non-Motorola-approved accessories may result in exposure levels, which exceed the IEEE/ICNIRP occupational/controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position, along side the head in the phone mode (TETRA only), in front of the face in the hand held mode, then ensure the antenna and the radio are kept 2.5 cm (one inch) from the body when transmitting. Keeping the radio at a proper distance is important because RF exposures decrease with increasing distance from the antenna.

Hand-held Mode - Operating Instructions

- Hold the radio in a vertical position in front of the face with the microphone (and other parts of the radio including the antenna) at least 2.5 cm (one inch) away from the nose or lips. Antenna should be kept away from the eye. Keeping the radio at a proper distance is important since RF exposures decrease with increasing distance from the antenna.

Phone Mode (TETRA only) - Operating Instructions

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

Approved Accessories

- Use only Motorola-approved supplied or replacement antennas, batteries, and accessories. Use of non–
  Motorola - approved antennas, batteries and accessories may exceed IEEE/ICNIRP RF exposure guidelines.
  For a list of Motorola-approved antennas, batteries, and other accessories please see your dealer or local Motorola contact. Your nearest dealer can be found at the following web site:

http://www.motorola.com/cgiss/emea/dealerlocator.html

Additional Information

For additional information on exposure requirements or other training information, visit http://www.motorola.com/rfhealth.

ELECTROMAGNETIC INTERFERENCE/COMPATIBILITY

NOTE: Nearly every electronic device is susceptible to electromagnetic interference (EMI) if inadequately shielded, designed or otherwise configured for electromagnetic compatibility.

Facilities

To avoid electromagnetic interference and/or compatibility conflicts, turn off your radio in any facility where posted notices instruct you to do so. Hospitals or health care facilities may be using equipment that is sensitive to external RF energy.

Aircraft

When instructed to do so, turn off your radio when on board an aircraft. Any use of a radio must be in accordance with applicable regulations per airline crew instructions.

Medical Devices

Pacemakers

The Advanced Medical Technology Association (AdvaMed) recommends that a minimum separation of 15 cms (6 inches) be maintained between a handheld wireless radio and a pacemaker.These recommendations are consistent with those of the U.S. Food and Drug Administration.

Persons with pacemakers should:

- ALWAYS keep the radio more than 15 cms from their pacemaker when the radio is turned ON.
- Not carry the radio in the breast pocket.
- Use the ear opposite the pacemaker to minimize the potential for interference.
- Turn the radio OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids

Some digital wireless radios may interfere with some hearing aids. In the event of such interference, you may want to consult your hearing aid manufacturer to discuss alternatives.

Other Medical Devices

If you use any other personal medical device, consult the manufacturer of your device to determine if it is adequately shielded from RF energy. Your physician may be able to assist you in obtaining this information.

Use of Communication Devices While Driving

Always check the laws and regulations on the use of radios in the areas where you drive.

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

OPERATIONAL WARNINGS

Vehicles with an air bag

Refer to vehicle manufacturer's manual prior to installation of electronic equipment to avoid interference with air bag wiring.

WARNING: Do not place a portable radio in the area over an air bag or in the air bag deployment area. Air bags inflate with great force. If a portable radio is placed in the air bag deployment area and the air bag inflates, the radio may be propelled with great force and cause serious injury to occupants of the vehicle.

Potentially explosive atmospheres

WARNING: Turn off your radio prior to entering any area with a potentially explosive atmosphere, unless it is a radio type especially qualified for use in such areas as "Intrinsically Safe" (for example, Factory Mutual, CSA, UL, CENELEC or ATEX Approved). Do not remove, install, or charge batteries in such areas. Sparks in a potentially explosive atmosphere can cause an explosion or fire resulting in bodily injury or even death.

NOTE The areas with potentially explosive atmospheres referred to above include fuelling areas such as below decks on boats, fuel or chemical transfer or storage facilities, areas where the air contains chemicals or particles, such as grain, dust or metal powders. Areas with potentially explosive atmospheres are often but not always posted.

Blasting caps and areas

WARNING: To avoid possible interference with blasting operations, turn off your radio when you are near electrical blasting caps, in a blasting area, or in areas posted: "Turn off two-way radio". Obey all signs and instructions.

OPERATIONAL CAUTIONS

Antennas

CAUTION: Do not use any portable radio that has a damaged antenna. If a damaged antenna comes into contact with your skin, a minor burn can result.

Batteries

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

INTRINSICALLY SAFE RADIO INFORMATION

The Intrinsically safe approval unit refers to a product that has been approved as intrinsically safe by an approval agency (for example FM Approvals, CSA, UL, CENELEC or ATEX) and certifies that a particular product meets the Agency's applicable intrinsic safety standards for specific types of hazardous classified locations. A portable radio that has been approved for intrinsic safety will have Approval label attached to the radio to identify the unit as being Approved for specified hazardous atmospheres. This label specifies the hazardous Class/Division/Group along with the part number of the battery that must be used. The Intrinsically Safe Approval Label will be located on the portable radio unit.

Operational Cautions for Intrinsic Safe Equipment

- Do not operate radio communications equipment in a hazardous atmosphere unless it is a type especially qualified (for example, FM, UL, CSA, or CENELEC or ATEX approved). An explosion or fire may result.
- Do not operate a radio unit that has been approved as intrinsically safe product in a hazardous atmosphere if it has been physically damaged (for example, cracked housing). An explosion or fire may result.
- Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion or fire.

Warnings for Radios Approved as Intrinsically Safe

Radios must ship from the Motorola manufacturing facility with the hazardous atmosphere capability and the intrinsic safety approval labelling (FM, UL, CSA, CENELEC or ATEX). Radios will not be upgraded to this capability and labeled once they have been shipped to the field.

A modification changes the unit’s hardware from its original design configuration. Modifications can only be made by the original product manufacturer.

- **Do not replace or changeaccessories in a hazardous atmosphere. Contact sparking may occur while installing or removing accessories and cause an explosion or fire.**
- **Turn the radio off before removing or installing a battery or accessory**.
- **Do not disassemble an intrinsically safe product in any way that exposes the internal circuits of the unit.**
- **Failure to use an intrinsically safe approved battery or Approved accessories specifically approved for the radio unit may result in the dangerously unsafe condition of an unapproved radio combination being used in a hazardous location.**
- **Unauthorized or incorrect modification of the intrinsically safe approved Product will negate the approval rating of the product.**
- **Incorrect repair or relabeling of any intrinsically safe Agency-approved radio could adversely affect the Approval rating of the unit.**
- **Use of a radio that is not intrinsically safe in a hazardous atmosphere could result in serious injury or death.**

Repair

REPAIRS FOR MOTOROLA PRODUCTS WITH INTRINSICALLY SAFE APPROVAL ARE THE RESPONSIBILITY OF THE USER.

- **Repairs to a Motorola FM approved radio product should only be done at a location that has been FM audited under the FM 3605 repairs and service standard.**
- **Contact Motorola for assistance regarding repairs and service of Motorola intrinsically safe equipment.**

A repair constitutes something done internally to the unit that would bring it back to its original condition.

Items not considered as repairs are those in which an action is performed on a unit which does not require the outer casing of the unit to be opened in a manner which exposes the internal electrical circuits of the unit.

Do Not Substitute Options or Accessories

The Motorola communications equipment certified as intrinsically safe by the approving agency, (FM, UL, CSA, CENELEC or ATEX) is tested as a complete system which consists of the listed agency Approved portable, Approved battery, and Approved accessories or options, or both. This Approved portable and battery combination must be strictly observed. There must be no substitution of items, even if the substitute has been previously Approved with a different Motorola communications equipment unit. Approved configurations are listed by the Approving Agency (FM, UL, CSA, CENELEC or ATEX).

The Intrinsically Safe Approval Label affixed to radio refers to the intrinsically safe classification of that radio product, and the approved batteries that can be used with that system.

The manual PN referenced on the Intrinsically Safe Approval Label identifies the approved Accessories and or options that can be used with that portable radio unit.

Using a non Motorola intrinsically safe battery and or accessory with the Motorola approved radio unit will void the intrinsically safe approval of that radio unit.

MOTOROLA

Professional Radio

GP Series

UHF2 (450 - 527MHz)

Service Information

Issue: November 2004

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Chapter 1

MODEL CHART AND TECHNICAL SPECIFICATIONS

1.0 GP640/GP680 Model Chart

Professional GP600 Series (UHF2)				
Model				**Description**
MDH25SDC9CK3_E				GP640 UHF2 450-527 MHz 4W
	MDH25SDH9CK6_E			GP680 UHF2 450-527 MHz 4W
			Item	**Description**
X			PMLE4122_	GP640 UHF2 Back Cover Kit
	X		PMLE4123_	GP680 UHF2 Back Cover Kit
X			6864110B14	GP640 Basic User Guide
	X		6864110B19	GP680 Basic User Guide
X	X		PMAE4008_	UHF 14cm (465-527 MHz) Antenna
X	X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

2.0 GP1280 Model Chart

Professional GP1280 (UHF2)			
Model			**Description**
MDH25SDN9CK8_E			GP1280 UHF 450-527 MHz 4W
		Item	**Description**
X		PMLE4142_	GP1280 UHF2 Back Cover Kit
X		6864110B20	GP1280 Basic User Guide
X		PMAE4008_	UHF 14cm (465-527MHz) Antenna
X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

3.0 Technical Specifications

Data is specified for +25°C unless otherwise stated.

General Specifications		
Channel Capacity		
GP640	16 (Conventional)	
GP680	16 (Conventional)	
GP1280	16 (Conventional)	
Power Supply	Rechargeable battery 7.5v	
Dimensions: H x W x D (mm) Height excluding knobs	**GP640/680**	
With standard high capacity NiMH battery	137 x 57.5 x 37.5	
With ultra high capacity NiMH battery	137 x 57.5 x 40.0	
With NiCD battery	137 x 57.5 x 40.0	
With Lilon battery	137 x 57.5 x 33.0	
	GP1280	
With standard high capacity NiMH battery	152 x 57.5 x 37.5	
With ultra high capacity NiMH battery	152 x 57.5 x 37.5	
With NiCD battery	152 x 57.5 x 37.5	
With Lilon battery	152 x 57.5 x 37.5	
Weight: (gm)	**GP640**	**GP680**
With Standard high capacity NiMH battery	420	428
With Ultra high capacity NiMH battery	500	508
With NiCD battery	450	458
With Lilon battery	350	358
	GP1280	
With Standard high capacity NiMH battery	460	
With Ultra high capacity NiMH battery	535	
With NiCD battery	485	
With Lilon battery	390	
Average Battery Life @5/5/90 Cycle:	Low Power	High Power
With Standard high capacity NiMH battery	11 hours	8 hours
With Ultra high capacity NiMH battery	14 hours	11 hours
With NiCD battery	12 hours	9 hours
With Lilon battery	11 hours	8 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54	
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E and TIA/EIA 603	
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E and TIA/EIA 603	

Transmitter	UHF2
*Frequencies - Full Bandsplit	450-527 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-25°C to +55°C, +25° Ref.)	±2.5 ppm
Power	450 - 527 MHz: 1-4W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB typical
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000 Hz)	+1 to -3 dB
Audio Distortion	<5% typical

Receiver	UHF2
*Frequencies - Full Bandsplit	450-527 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD) EIA Sensitivity (20 dB SINAD) ETS	0.25 µV typical 0.50 µV typical
Intermodulation EIA	-65 dB
Adjacent Channel Selectivity	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Spurious Rejection	>70 dB
Rated Audio	0.5W
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-45 dB @ 12.5 kHz -50 dB @ 20/25 kHz
Audio Response (300 - 3000 Hz)	+1 to -3 dB
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz ETS 300 086

*Availability subject to the laws and regulations of individual countries.

Chapter 2

THEORY OF OPERATION

1.0 Introduction

This Chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and trouble shooting for the the associated Controller circuits refer to the Controller Section of this manual.

2.0 UHF Transmitter

(*Refer to Figure 2-1 and the UHF Transmitter schematic diagram*)

The UHF transmitter consists of the following basic circuits:

1. Power amplifier (PA).
2. Antenna switch/harmonic filter.
3. Antenna matching network.
4. Power Control Integrated Circuit (PCIC).

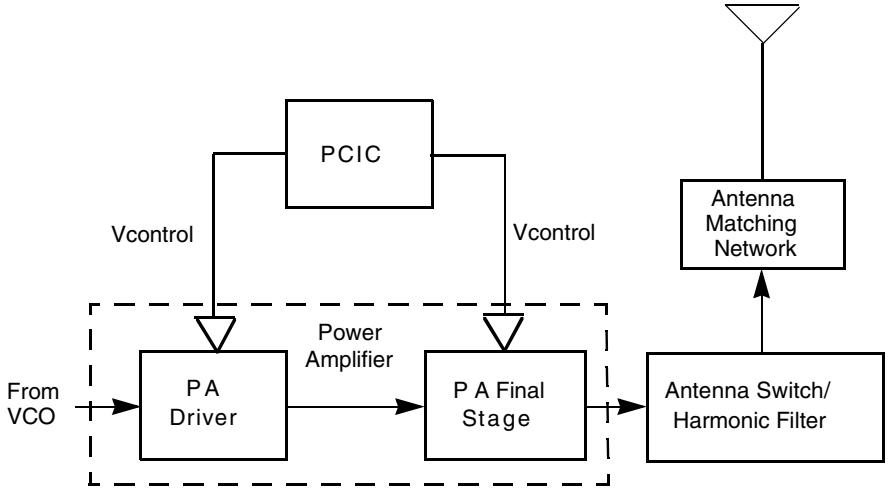


Figure 2-1 UHF Transmitter Block Diagram.

2.1 Power Amplifier

The power amplifier (PA) consists of two principle devices:

1. LDMOS PA driver IC, U101.
2. LDMOS PA final stage, Q110.

The LDMOS driver IC provides 2-stage amplification using a supply voltage of 7.3V. The amplifier is capable of supplying an output power of 0.3W (pins 6 and 7) with an input signal of 2mW at 3dBm (pin16). The current drain is typically 160mA while operating in the frequency range of 450-527MHz.

The LDMOS PA is capable of supplying an output power of 7W with an input signal of 0.3W. The current drain is typically 1300mA while operating in the frequency range of 450-527MHz. The power output can be varied by changing the bias voltage.

2.2 Antenna Switch

The antenna switch circuit consists of two pin diodes (CR101 and CR102), a pi network (C107, L104 and C106), and two current limiting resistors (R101 and R170). In the transmit mode, B+ at PCIC (U102) pin 23 goes low turning on Q111 which applies a B+ bias to the antenna switch circuit to bias the diodes “on”. The shunt diode (CR102) shorts out the receiver port and the pi network. This operates as a quarter wave transmission line to transform the low impedance of the shunt diode to a high impedance at the input of the harmonic filter. In the receive mode, the diodes are both off, creating a low attenuation path between the antenna and receiver ports.

2.3 Harmonic Filter

The harmonic filter consists of components C104, L102, C103, L101 and C102. The harmonic filter for UHF is a modified Zolotarev design optimized for efficiency of the power module. This type of filter has the advantage that it can give a greater attenuation in the stop-band for a given ripple level. The harmonic filter insertion loss is typically less than 1.2dB.

2.4 Antenna Matching Network

The antenna matching network is made up of inductor L116. This component matches the antenna impedance to the harmonic filter to optimize the performance of the transmitter and receiver.

2.5 Power Control Integrated Circuit (PCIC)

The transmitter uses PCIC, U102, to regulate the power output of the radio. The current to the final stage of the power module is supplied through R101 to provide a voltage proportional to the current drain. This voltage is then fedback to the Automatic Level Control (ALC) within the PCIC to regulate the output power of the transmitter.

The PCIC contains internal digital to analog converters (DACs) that provide a programmable control loop reference voltage through the SPI line of the PCIC.

The PCIC internal resistors, integrators, and external capacitors (C133, C134 and C135) control the transmitter rise and fall times to reduce the power splatter into adjacent channels.

Diode CR105 and its associated components are part of a temperature cut back circuit. This circuit senses the printed circuit board temperature around the transmitter circuits and outputs a DC voltage to the PCIC. If the DC voltage produced exceeds the set threshold of the PCIC, the transmitter output power decreases to reduce the transmitter temperature.

3.0 UHF Receiver (all models except those with PCB 8486686Z02)

The UHF receiver consists of a front end, back end, and automatic gain control circuits. A block diagram of the receiver is shown in Figure 2-2. Detailed descriptions of these features are contained in the paragraphs that follow.

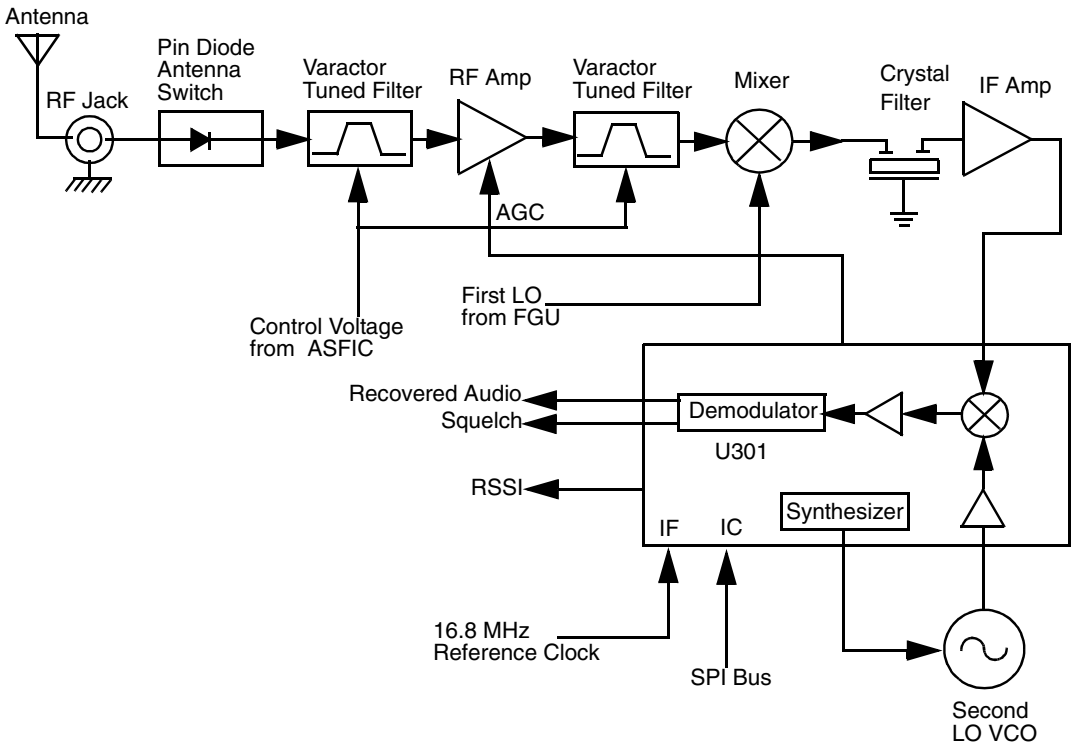


Figure 2-2 UHF Receiver Block Diagram.

3.1 Receiver Front-End

(*Refer to Figure 2-2 and the UHF Receiver Front End schematic diagram)*

The RF signal received by the antenna is applied to a low-pass filter. For UHF, the filter consists of components L101, L102, C102, C103, and C104. The filtered RF signal is passed through the antenna switch circuit consisting of two pin diodes (CR101 and CR102) and a pi network (C106, L104, and C107). The signal is then applied to a varactor tuned bandpass filter.

The UHF bandpass filter consists of components L301, L302, C302, C303, C304, CR301, and CR302. The filter is electronically tuned by DACRx from IC404 which supplies a control voltage to the varactor diodes (CR301 and CR302) in the filter as determined by the microprocessor depending on the carrier frequency. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

The output of the bandpass filter is coupled to the RF amplifier transistor Q301 via C307. After being amplified by the RF amplifier, the RF signal is further filtered by a second varactor tuned bandpass filter, consisting of L306, L307, C313, C317, CR304 and CR305.

Both the pre and post-RF amplifier varactor tuned filters have similar responses. The 3 dB bandwidth of the filter is approximately 50 MHz. This enables the filters to be electronically controlled by using a single control voltage from DACRx.

The output of the post-RF amplifier filter is connected to the passive double balanced mixer consisting of components T301, T302, and CR306. Matching of the filter to the mixer is provided by C381. After mixing with the first local oscillator (LO) signal from the voltage controlled oscillator (VCO) using low side injection, the RF signal is down-converted to a 45.1 MHz IF signal.

The IF signal coming out of the mixer is transferred to the crystal filter (FL301) through a resistor pad and a diplexer (C322 and L310). Matching to the input of the crystal filter is provided by C324 and L311. The crystal filter provides the necessary selectivity and intermodulation protection.

3.2 Receiver Back-End

(*Refer to Figure 2-2 and the UHF Receiver Back End schematic diagram*)

The output of crystal filter FL301 is matched to the input of IF amplifier transistor Q302 by components L322 and C325. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The IF amplifier provides a gain of about 7dB. The amplified IF signal is then coupled into U301 (pin 3) via C330, C338 and L330 which provides matching for the IF amplifier and U301.

The IF signal applied to pin 3 of U301 is amplified, down-converted, filtered, and demodulated, to produce recovered audio at pin 27 of U301. This IF IC is electronically programmable, and the amount of filtering, which is dependent on the radio channel spacing, is controlled by the microprocessor. Additional filtering, once externally provided by the conventional ceramic filters, is replaced by internal filters in IF module U301.

The IF IC uses a type of direct conversion process, whereby the externally generated second LO frequency is divided by two in U301 so that it is very close to the first IF frequency. The IF IC (U301) synthesizes the second LO and phase-locks the VCO to track the first IF frequency. The second LO is designed to oscillate at twice the first IF frequency because of the divide-by-two function in the IF IC.

In the absence of an IF signal, the VCO searches for a frequency, or its frequency will vary close to twice the IF frequency. When an IF signal is received, the VCO locks onto the IF signal. The second LO/VCO is a Colpitts oscillator built around transistor Q320. The VCO has a varactor diode, CR310, to adjust the VCO frequency. The control signal for the varactor is derived from a loop filter consisting of components C362, C363, C364, R320 and R321.

The IF IC (U301) also performs several other functions. It provides a received signal-strength indicator (RSSI) and a squelch output. The RSSI is a dc voltage monitored by the microprocessor, and used as a peak indicator during the bench tuning of the receiver front-end varactor filter. The RSSI voltage is also used to control the automatic gain control (AGC) circuit at the front-end.

The demodulated signal on pin 27 of U301 is also used for squelch control. The signal is routed to U404 (ASFIC) where squelch signal shaping and detection takes place. The demodulated audio signal is also routed to U404 for processing before going to the audio amplifier for amplification.

3.3 Automatic Gain Control (AGC)

(*Refer to the UHF Receiver Front End and Receiver Back End schematic diagrams*)

The front end automatic gain control circuit provides automatic reduction of gain, of the front end RF amplifier via feedback. This action is necessary to prevent overloading of backend circuits. This is achieved by drawing some of the output power from the RF amplifier output. At high radio frequencies, capacitor C331 provides a low impedance path to ground for this purpose. CR308 is a pin diode used for switching the path on or off. A certain amount of forward biasing current is needed to turn the pin diode on. Transistors Q315 and Q311 provide for this current. When Q315 is turned on, current flows via R323, collector and emitter of Q315, and R319 before going to ground. Q315 is an NPN transistor used for switching.

The Radio Signal Strength Indicator (RSS I) voltage signal is used to drive Q315 to saturation, i.e., turned on. RSSI is produced by U301 and is proportional to the gain of the RF amplifier and the input power to the radio.

Resistors R318 and R316 are voltage dividers designed to turn on Q315 at certain RSSI levels. To turn on Q315, the voltage across R318 must be greater or equal to the voltage across R319 + Vbe. Capacitor C397 dampens any instability while the AGC is turning on.

Diode D300 is to ensure that C397 only discharges towards the transistor and not back to U301. The current flowing into the base of Q311, a high current gain PNP transistor, is amplified and fed to the pin diode to turn it on. Maximum current flowing through the pin is limited by resistors R347 and R317. Feedback capacitor C333 provides some stability to this high gain stage. Q316, R325, R326, R327, R338, R339 and R341 make up the temperature compensation circuit for this AGC. RSSI generated by U301 is lower at cold compared to normal operation at room temperature. Q316 is designed to turn on only at cold temperature. When Q316 is turned on, current flows through the collector-emitter junction to ground. Current through R319 and hence voltage across it is reduced. The turn on voltage is lower and this accommodates for the reduction of the RSSI at cold temperature.

4.0 UHF Receiver (Models with PCB 8486686Z02)

The UHF receiver consists of a front and back end. A block diagram of the receiver is shown in Figure 2-3. Detailed descriptions of these features are contained in the paragraphs that follow.

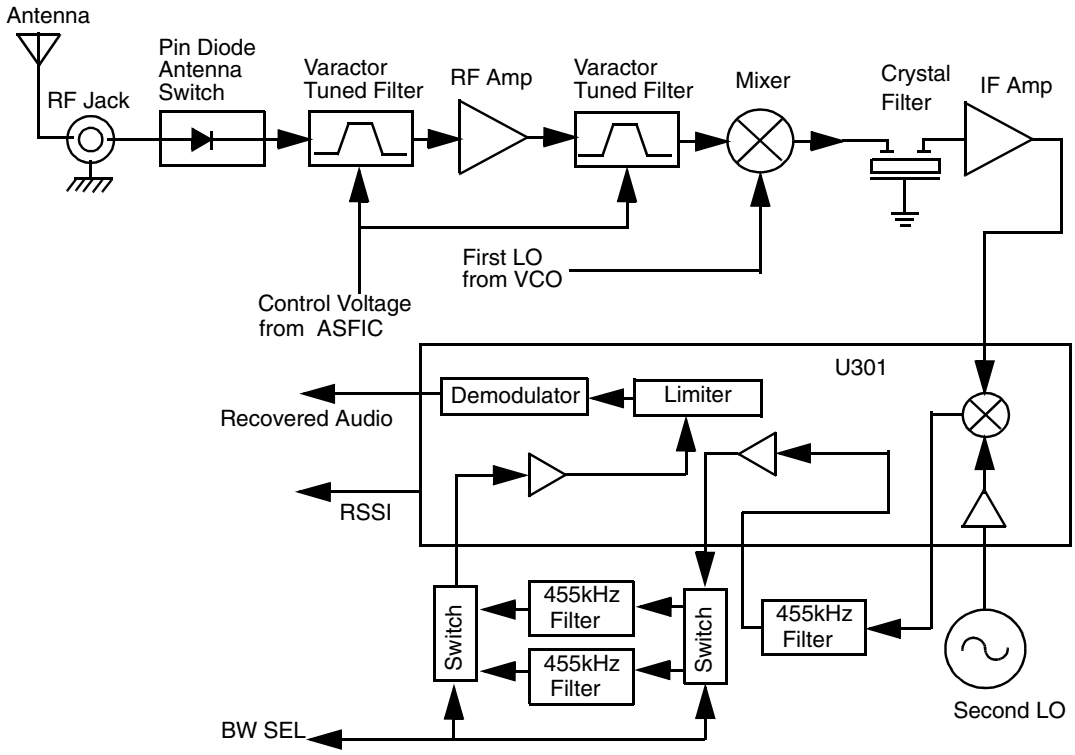


Figure 2-3 UHF Receiver Block Diagram.

4.1 Receiver Front-End

(*Refer to Figure 2-3 and the UHF Receiver Front End schematic diagram for PCB 8486686Z02)*

The RF signal is received by the antenna and applied to a low-pass filter. For UHF, the filter consists of L101, L102, C102, C103, C104. The filtered RF signal is passed through the antenna switch. The antenna switch circuit consists of two PIN diodes(CR101 and CR102) and a pi network (C106, L104 and C107).The signal is then applied to a varactor tuned bandpass filter. The UHF bandpass filter comprises of L301, L302, C302, C303, C304, CR301 and CR302. The bandpass filter is tuned by applying a control voltage to the varactor diodes(CR301 and CR302) in the filter.

The bandpass filter is electronically tuned by the DACRx from IC404 which is controlled by the microprocessor. Depending on the carrier frequency, the DACRx will supply the tuned voltage to the varactor diodes in the filter. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

The output of the bandpass filter is coupled to the RF amplifier transistor Q301 via C307. After being amplified by the RF amplifier, the RF signal is further filtered by a second varactor tuned bandpass filter, consisting of L306, L307, C313, C317, CR304 and CR305.

Both the pre and post-RF amplifier varactor tuned filters have similar responses. The 3 dB bandwidth of the filter is about 50 MHz. This enables the filters to be electronically controlled by using a single control voltage which is DACRx .

The output of the post-RF amplifier filter which is connected to the passive double balanced mixer consists of T301, T302 and CR306. Matching of the filter to the mixer is provided by C381. After mixing with the first LO signal from the voltage controlled oscillator (VCO) using low side injection, the RF signal is down-converted to the 44.85 MHz IF signal.

The IF signal coming out of the mixer is transfered to the crystal filter (FL301) through a resistor pad and a diplexer (C322 and L310). Matching to the input of the crystal filter is provided by C324 and L311. The crystal filter provides the necessary selectivity and intermodulation protection.

4.2 Receiver Back-End

(*Refer to Figure 2-3 and the UHF Receiver Back End schematic diagram for PCB 8486686Z02*)

The output of crystal filter FL301 is matched to the input of first IF amplifier transistor Q302 by L330. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The IF amplifer provides a gain of about 16dB. The amplified first IF signal is then coupled into U301 (pin 1) via C360 and L332 which provides the matching for the first IF amplifier and U301.

Within U301, the first IF 44.85 MHz signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the second IF signal at 455 kHz. The 2nd LO signal frequency is determined by crystal Y300. The second IF signal (455 kHz) is then filtered by an external ceramic filter FL302 before being amplified by the second IF amplifier within U301. Again, the signal is filtered by a second external ceramic filter FL303 or FL304 depending on the selected channel spacing. FL303 is used for 20/25 kHz channel spacing whereas FL304, for 12.5 kHz channel spacing. The simple circuit consisting of U302, CR312, CR313 and resistors R345, R360, R321 and R324 divert the second IF signal according to the BW_SEL line. The filtered output of the second IF signal is applied to the limiter input pin of U301.

The IF IC (U301) contains a quadrature detector using a ceramic phase-shift element (Y301) to provide audio detection. Internal amplification provides an audio output level around 120mVrms (@60% deviation) from pin 8 of U301. This demodulated audio is fed to the ASFIC_CMP IC (U404) in the controller section.

The IF IC (U301) also performs several other functions. It provides a received signal-strength indicator (RSSI) with a dynamic range of 70 dB. The RSSI is a dc voltage monitored by the microprocessor, and used as a peak indicator during the bench tuning of the receiver front-end varactor filter.

5.0 Frequency Generation Circuit

(*Refer to Figure 2-4 and the UHF Frequency Synthesizer schematic diagram*)

The frequency generation circuit, shown in Figure 2-4, is composed of Fractional-N synthesizer U201 and VCO/Buffer IC U241. Designed in conjunction to maximize compatibility, the two ICs provide many of the functions that normally require additional circuitry. The synthesizer block diagram illustrates the interconnect and support circuitry used in the region. Refer to the schematic for the reference designator.

The synthesizer is powered by regulated 5V and 3.3V which are provided by ICs U247 and U248 respectively. The 5V signal goes to pins 13 and 30 while the 3.3V signal goes to pins 5, 20, 34 and 36 of U201. The synthesizer in turn generates a superfiltered 5V which powers U241.

In addition to the VCO, the synthesizer also interfaces with the logic and ASFIC circuitry. Programming for the synthesizer is accomplished through the data, clock and chip select lines (pins 7, 8 and 9) from the microprocessor, U409. A 3.3V dc signal from pin 4 indicates to the microprocessor that the synthesizer is locked.

Transmit modulation from the ASFIC is supplied to pin10 of U201. Internally the audio is digitized by the Fractional-N and applied to the loop divider to provide the low-port modulation. The audio runs through an internal attenuator for modulation balancing purposes before going out at pin 41 to the VCO.

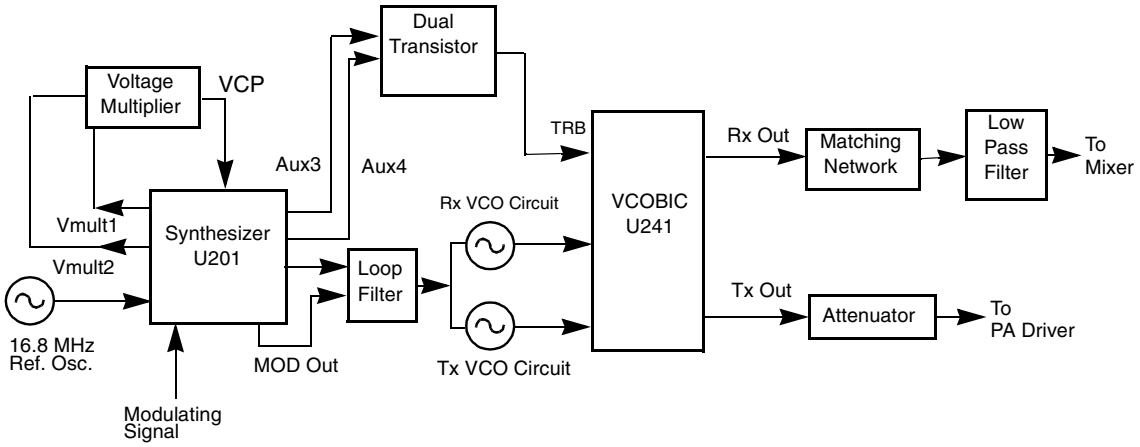


Figure 2-4 UHF Frequency Generation Unit Block Diagram

5.1 Synthesizer

(*Refer to Figure 2-5 and the UHF Synthesizer schematic diagram)*

The Fractional-N synthesizer, shown in Figure 2-5, uses a 16.8MHz crystal (FL201) to provide a reference for the system. The LVFractN IC (U201) further divides this to 2.1MHz, 2.225MHz, and 2.4MHz to be used as reference frequencies. Together with C206, C207, C208, R204 and CR203, they build up the reference oscillator which is capable of 2.5ppm stability over temperatures of -30 to 85°C. It also provides 16.8MHz at pin 19 of U201 for use by the ASFIC and IF.

The loop filter consists of components C231, C232, C233, R231, R232 and R233. This circuit provides the necessary dc steering voltage for the VCO and determines the amount of noise and spur passing through.

To achieve fast locking for the synthesizer, an internal adapt charge pump provides higher current at pin 45 of U201 to put the synthesizer within lock range. The required frequency is then locked by normal mode charge pump at pin 43.

Both the normal and adapt charge pumps get their supply from the capacitive voltage multiplier made up of C258, C259, C228, triple diode CR201, and level shifters U210 and U211. Two 3.3V square waves, 180 degrees out of phase, are first shifted to 5V, then along with regulated 5V, put through arrays of diodes and capacitors to build up 13.3V at pin 47 of U201.

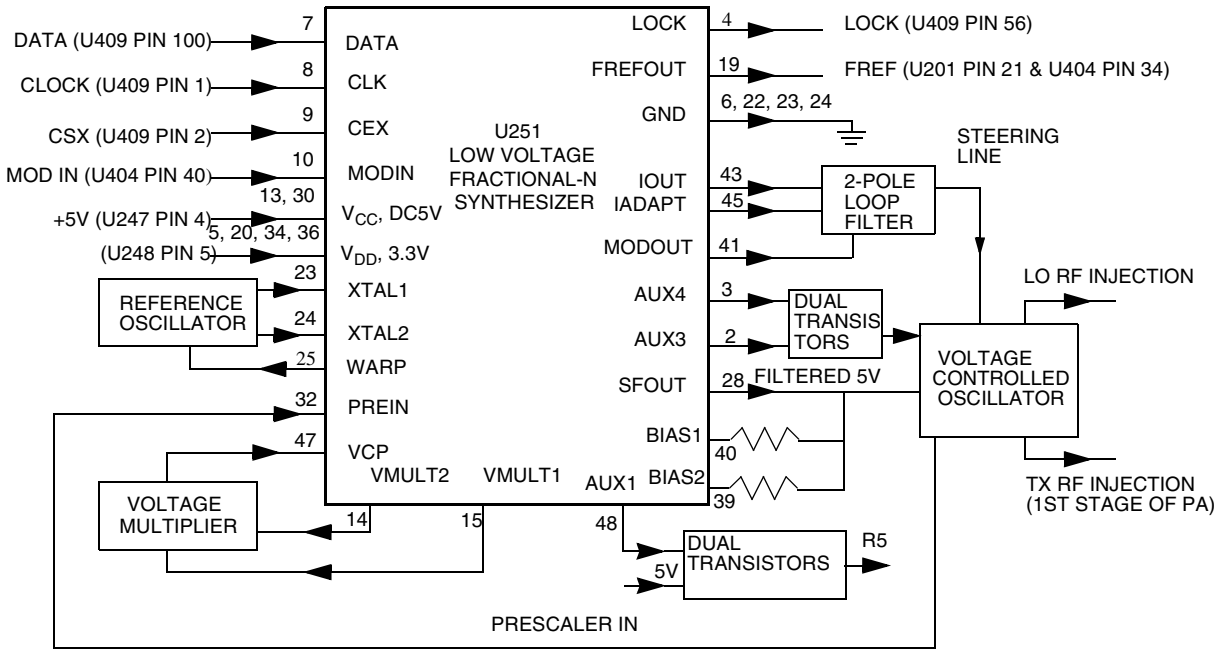


Figure 2-5 UHF Synthesizer Block Diagram

5.2 Voltage Controlled Oscillator (VCO)

(*Refer to Figure 2-6 and the UHF Voltage Controlled Oscillator schematic diagram)*

The VCOB IC (U241), shown in Figure 2-6, in conjunction with the Fractional-N synthesizer (U201) generates RF in both the receive and the transmit modes of operation. The TRB line (U241 pin 19) determines which oscillator and buffer are enabled. A sample of the RF signal from the enabled oscillator is routed from U241, pin 12, through a low pass filter, to the prescaler input (U201 pin 32). After frequency comparison in the synthesizer, a resultant CONTROL VOLTAGE is received at the VCO. This voltage is a DC voltage between 3.5V and 9.5V when the PLL is locked on frequency.

The VCOB IC is operated at 4.54V (VSF) and Fractional-N synthesizer (U201) at 3.3V. This difference in operating voltage requires a level shifter consisting of Q260 and Q261 on the TRB line. The operation logic is shown in Table 2-1.

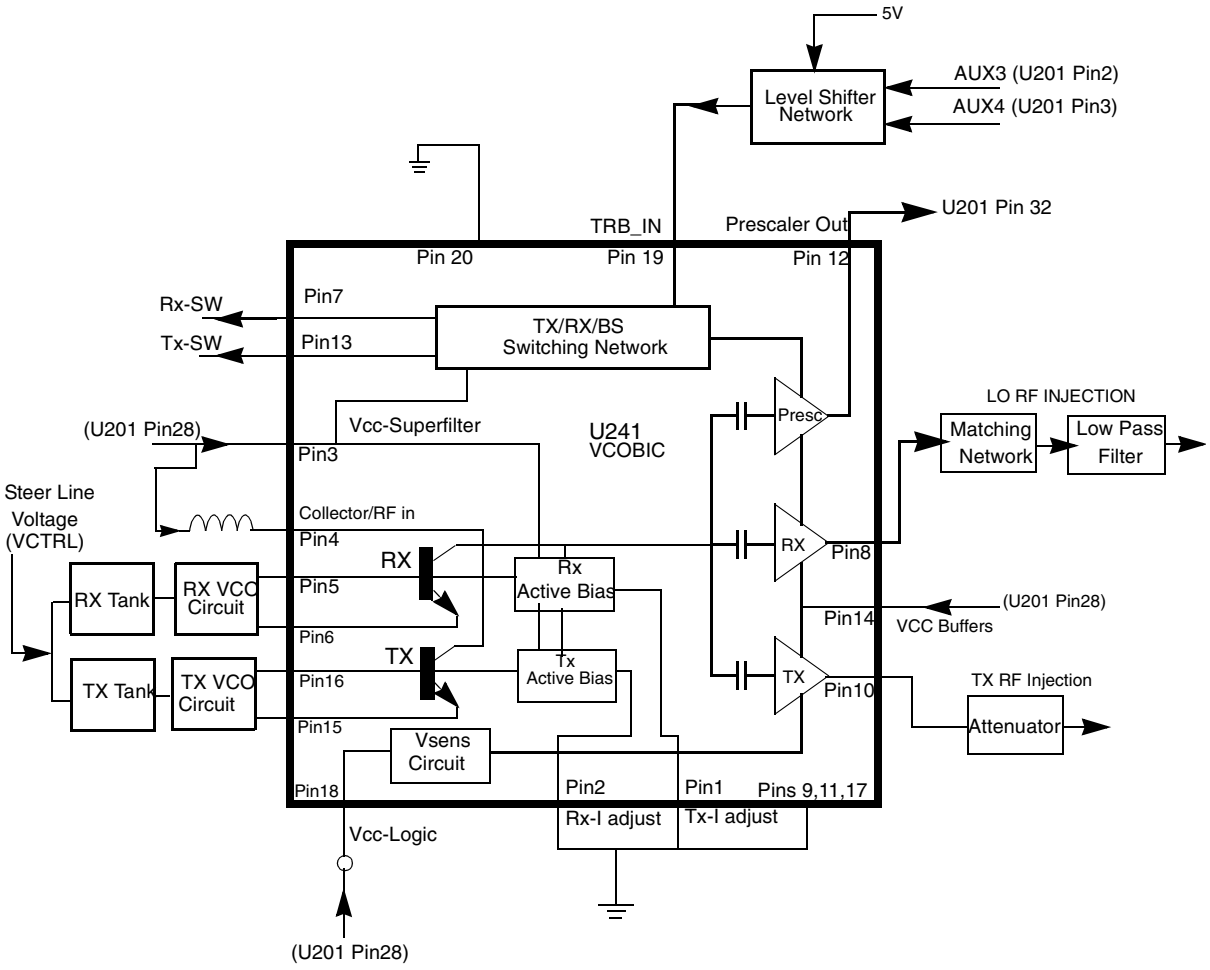


Figure 2-6 UHF VCO Block Diagram

Table 2-1 Level Shifter Logic

Desired Mode	AUX 4	AUX 3	TRB
Tx	Low	High (@3.2V)	High (@4.8V)
Rx	High	Low	Low
Battery Saver	Low	Low	Hi-Z/Float (@2.5V)

In the receive mode, U241 pin 19 is low or grounded. This activates the receive VCO by enabling the receive oscillator and the receive buffer of U241. The RF signal at U241 pin 8 is run through a matching network. The resulting LO RF INJECTION signal is applied to the mixer at T302.

During the transmit condition, when PTT is pressed, five volts is applied to U241 pin 19. This activates the transmit VCO by enabling the transmit oscillator and the transmit buffer of U241. The RF signal at U241 pin 10 is injected into the input of the PA module (U101 pin16). This RF signal is the TX RF INJECTION. Also in transmit mode, the audio signal to be frequency modulated onto the carrier is received through U201, pin 41.

When a high impedance is applied to U241 pin19, the VCO is operating in BATTERY SAVER mode. In this case, both the receive and transmit oscillators as well as the receive transmit and prescaler buffer are turned off.

6.0 Voice Storage (GP1280 Only)

(*Refer to Figure 2-7 and the UHF Voice Storage schematic diagram)*

The Voice Storage feature is offered as standard in the GP1280 and as an Option board for GP340/GP360/GP380 and GP640/GP680 models.

The Voice Storage feature enables users to:

- Record and Playback Personal Memo (Reminders, Notes, etc.).
- Send over-the-air an “Out-Of-Office” message when an incoming call is received but is not available to take up call.
- Over-the-air recording of important voice message being received.

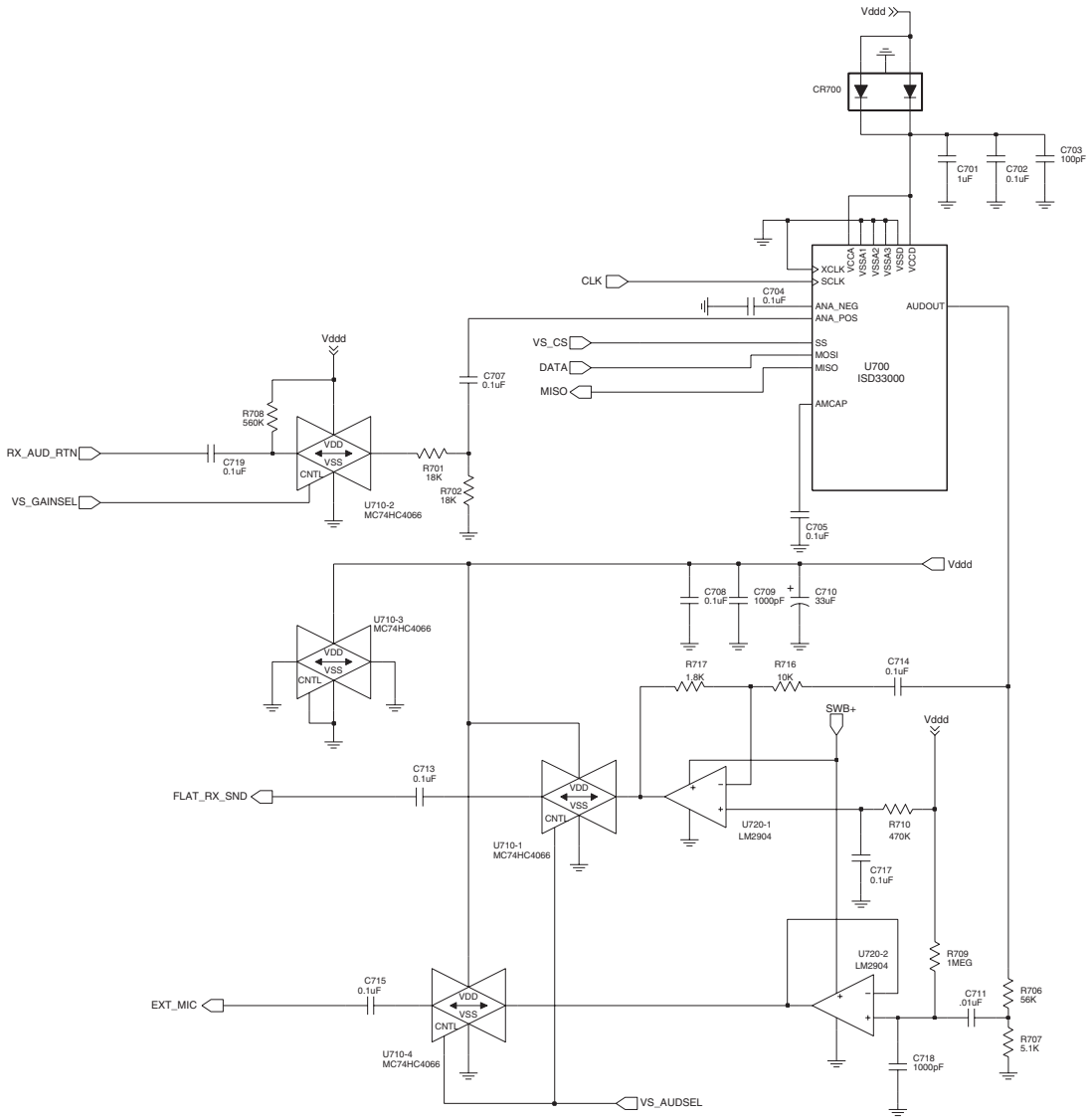


Figure 2-7 Audio path for voice storage connection to interface connector

Audio routing to the Voice Storage circuitry during receive message recording, message playback, personal memo recording and voice prompt transmit over the air are as follows:

Received Message Recording

The receive audio is tapped from the Rx_Aud_Rtn pin of the ASFIC_CMP during receive mode.

Message Playback

Message playback is via the FLAT_RX_SND pin of ASFIC_CMP. In the ASFIC_CMP, the signal is routed via the Side-Tone path to the Receive path where playback audio is routed to the speaker.

Personal Memo Recording

In this mode, voice is pick-up at the Mic. and via the Side-Tone path will be directed to the Rx_Aud_Rtn pin, which is then routed to the voice recording chip.

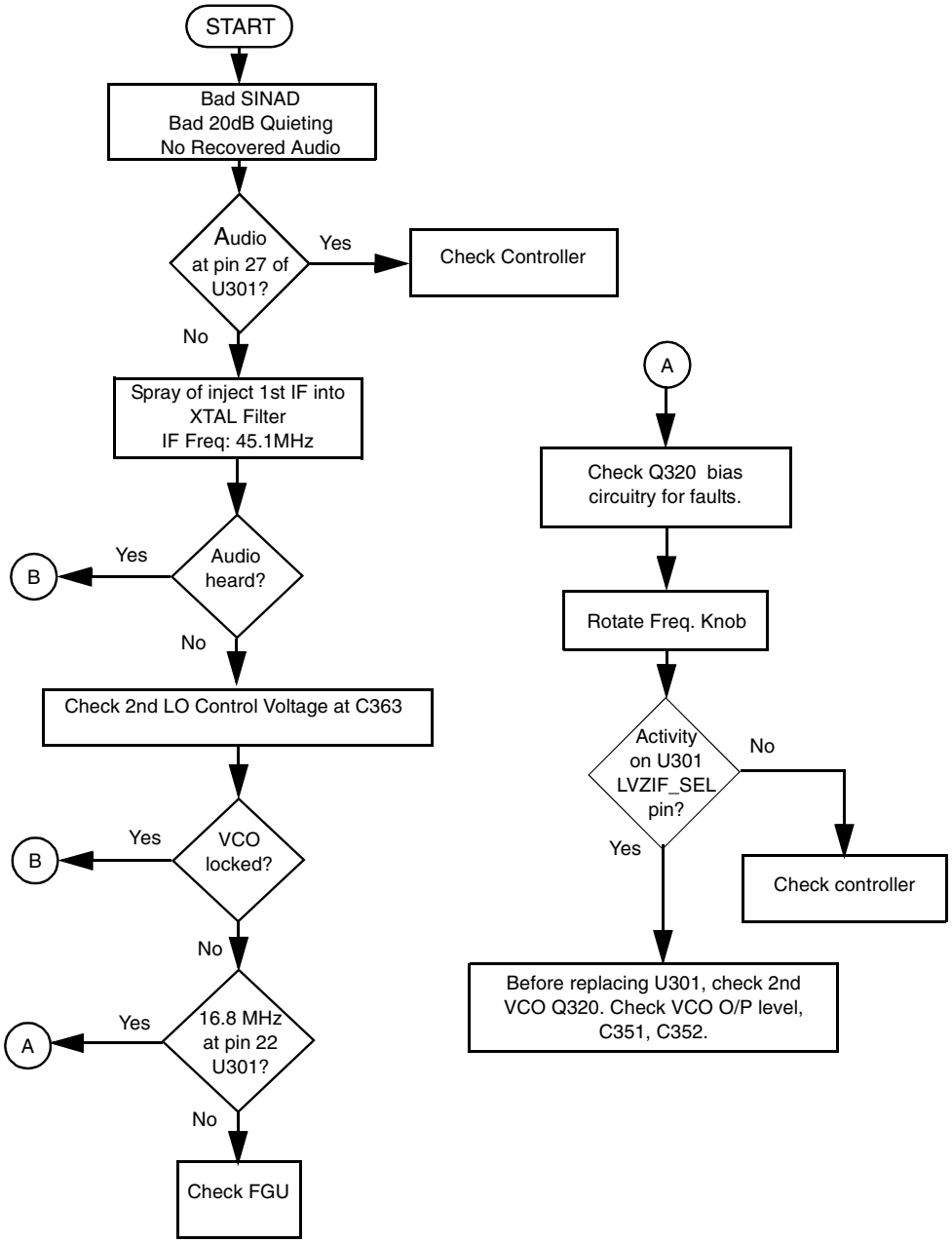
Voice Prompt transmit over the air

A personal voice prompt or Out-Of-Office Message which is stored in the IC can be transmitted over the air through mic path in the ASFIC_CMP to the calling party. This feature is similar to the Telephone Answering Machine feature when the person called is not available to attend the call.

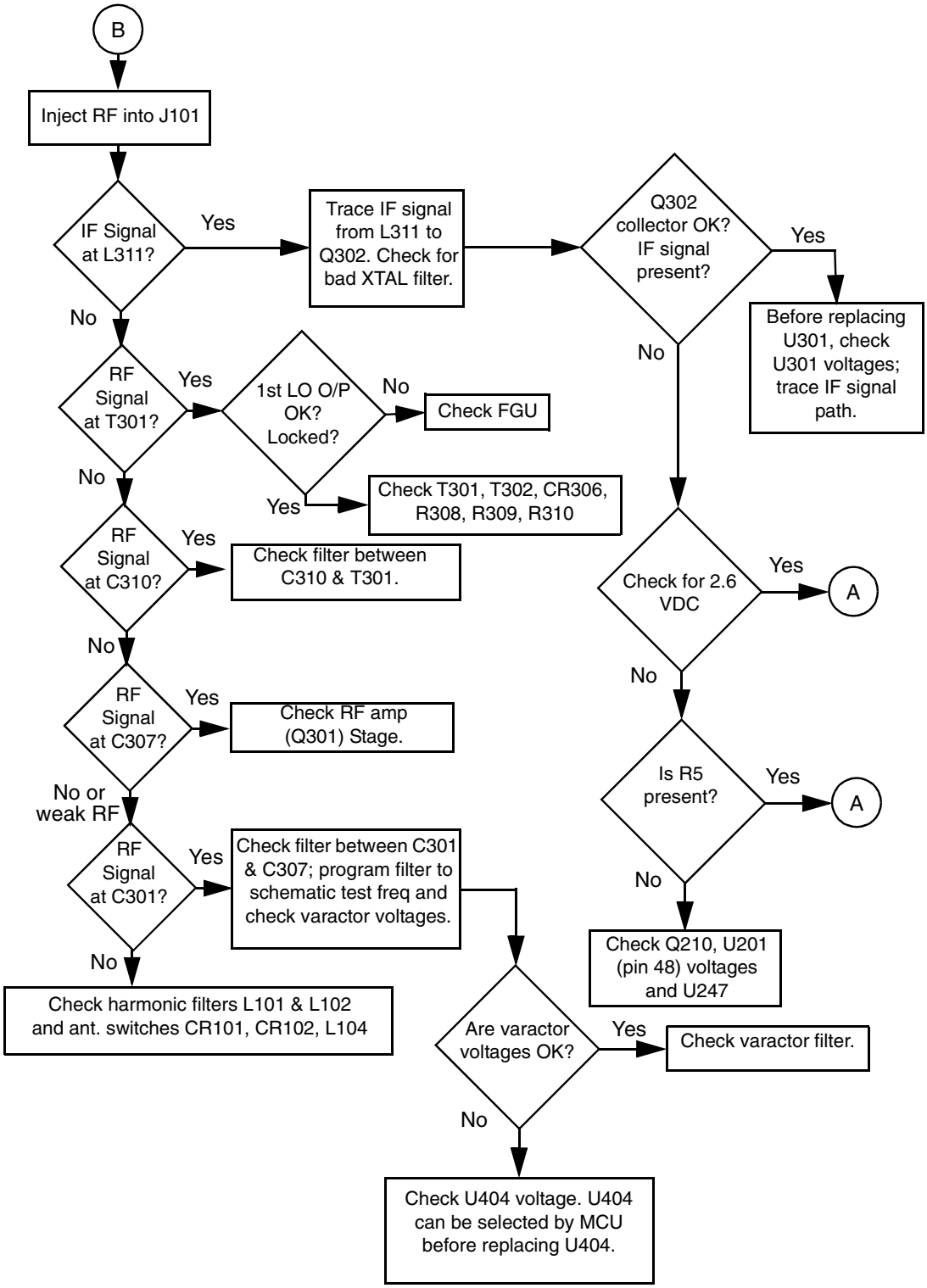
Chapter 3

TROUBLESHOOTING CHARTS

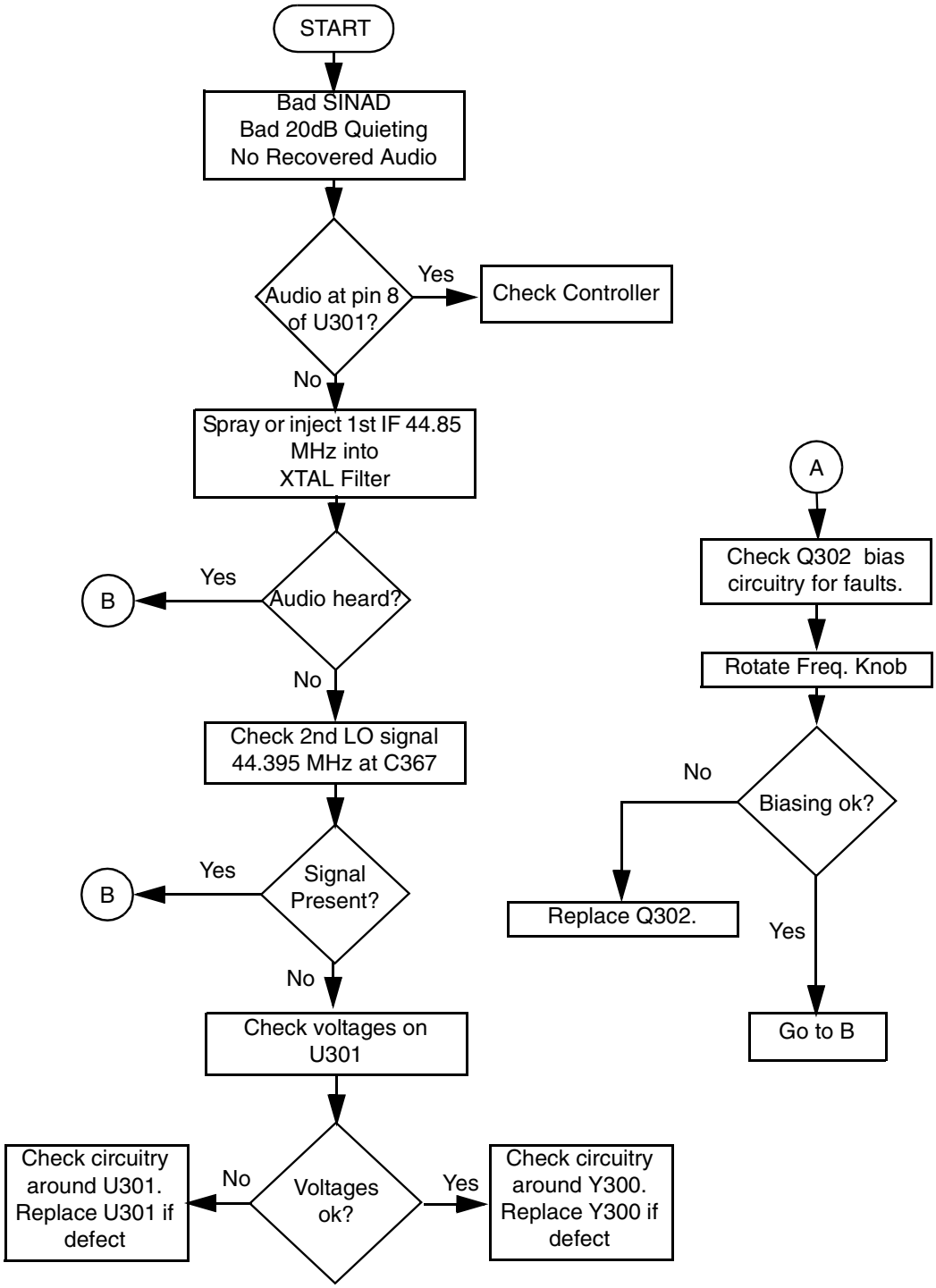
1.0 Troubleshooting Flow Chart for Receiver (All models except those with PCB 8486686Z02) (Sheet 1 of 2)



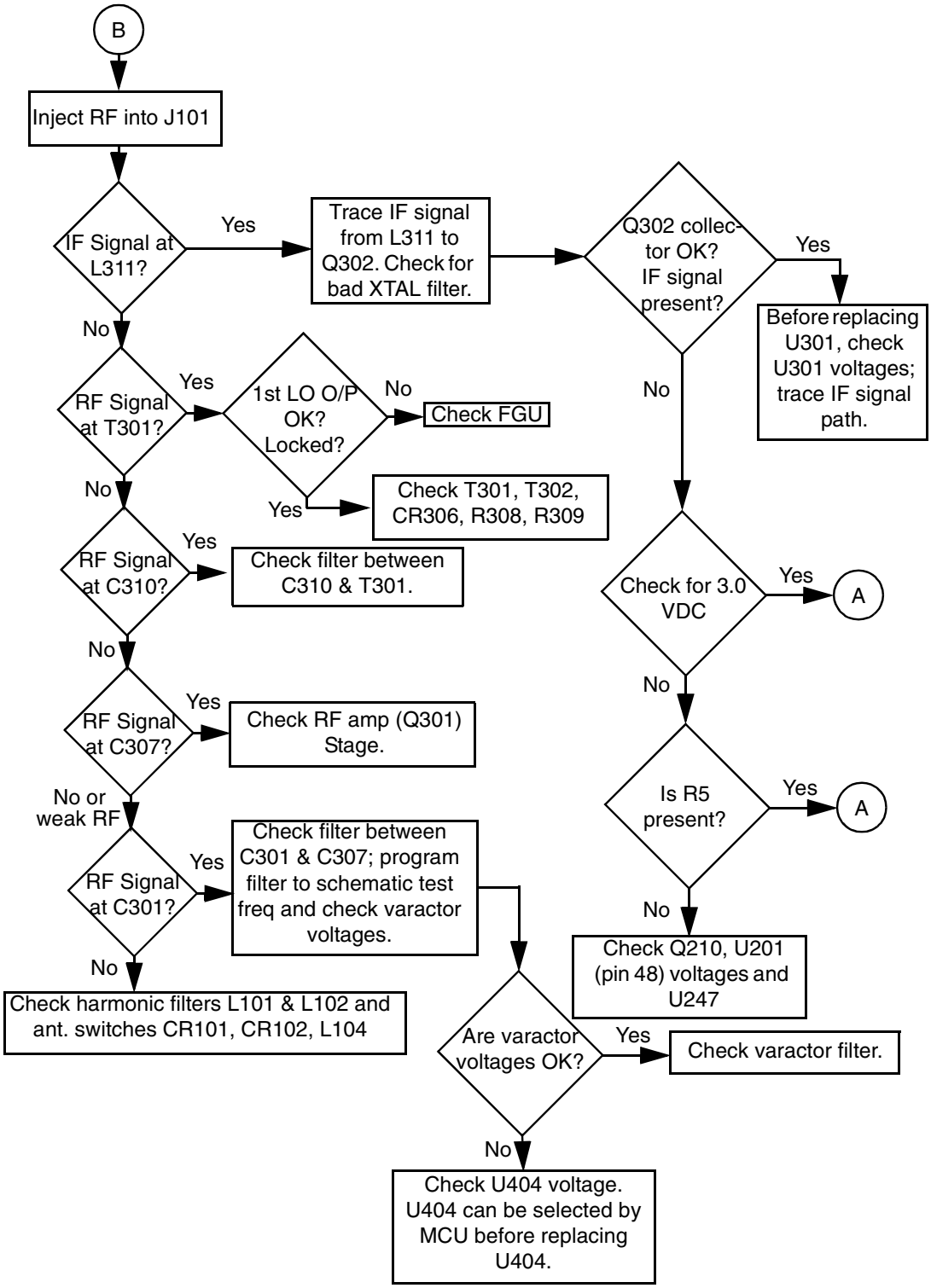
2.0 Troubleshooting Flow Chart for Receiver (All models except those with PCB 8486686Z02) (Sheet 2 of 2)



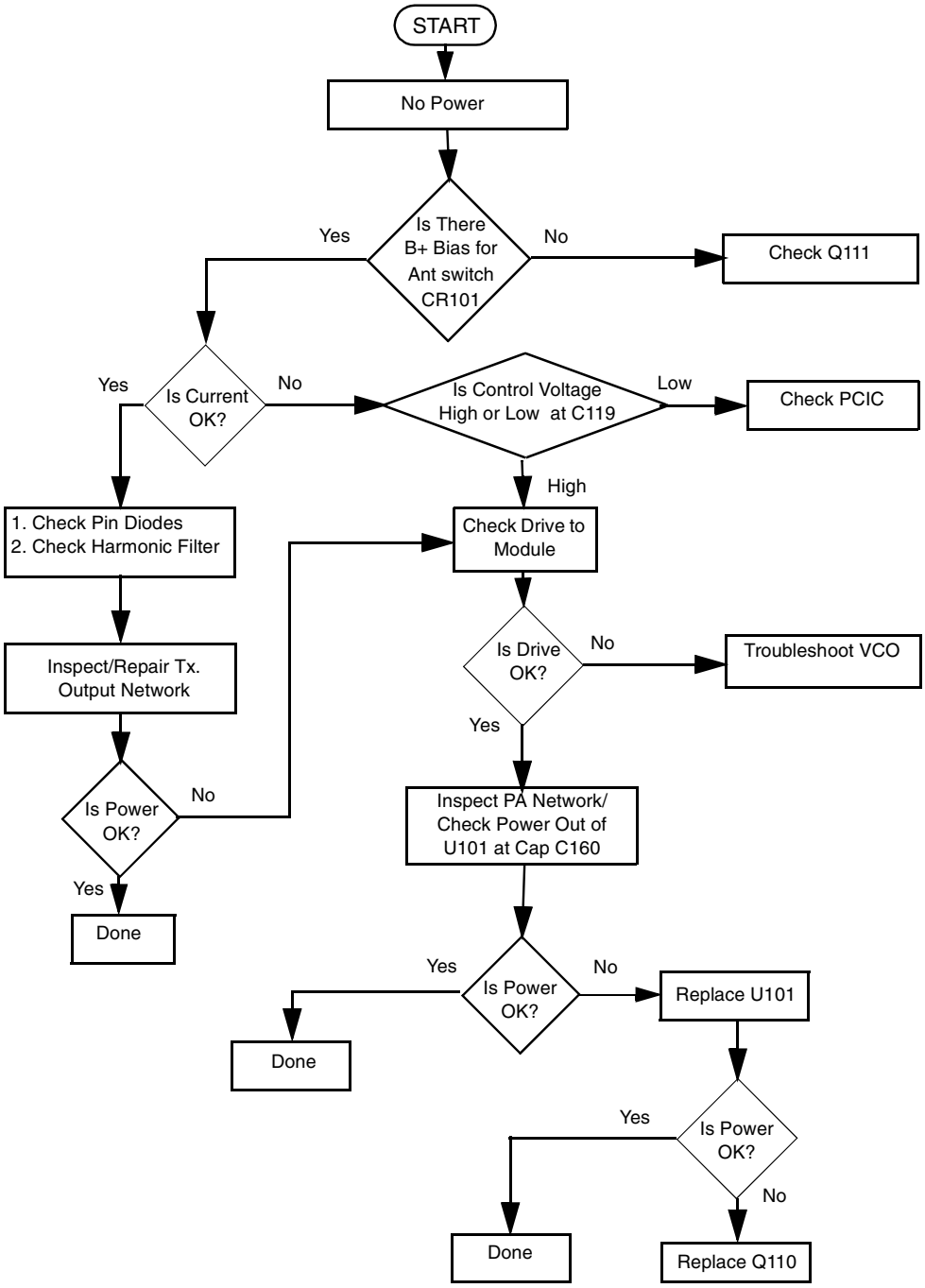
3.0 Troubleshooting Flow Chart for Receiver (Models with PCB 8486686Z02) (Sheet 1 of 2)



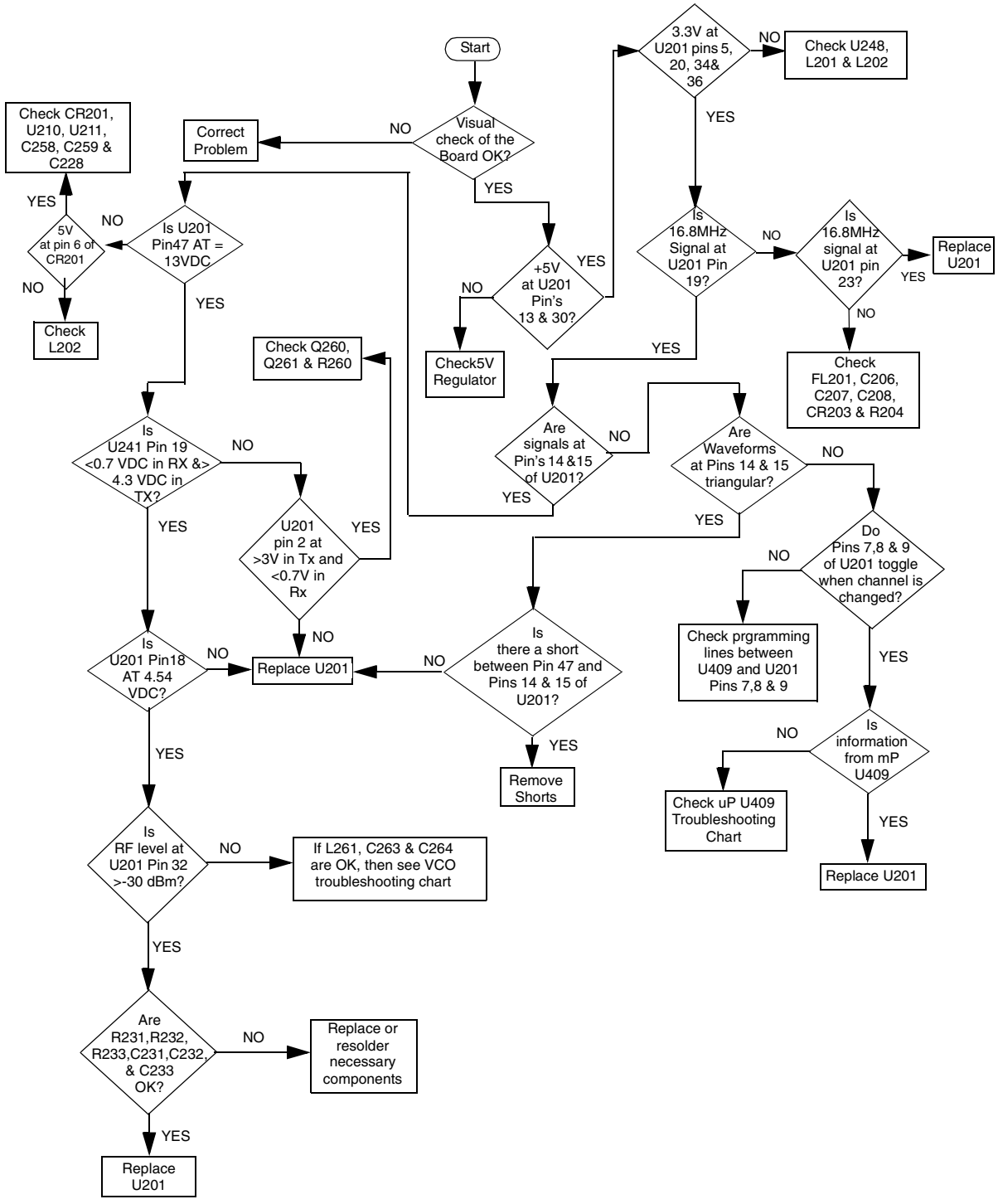
4.0 Troubleshooting Flow Chart for Receiver (Models with PCB 8486686Z02) (Sheet 2 of 2)



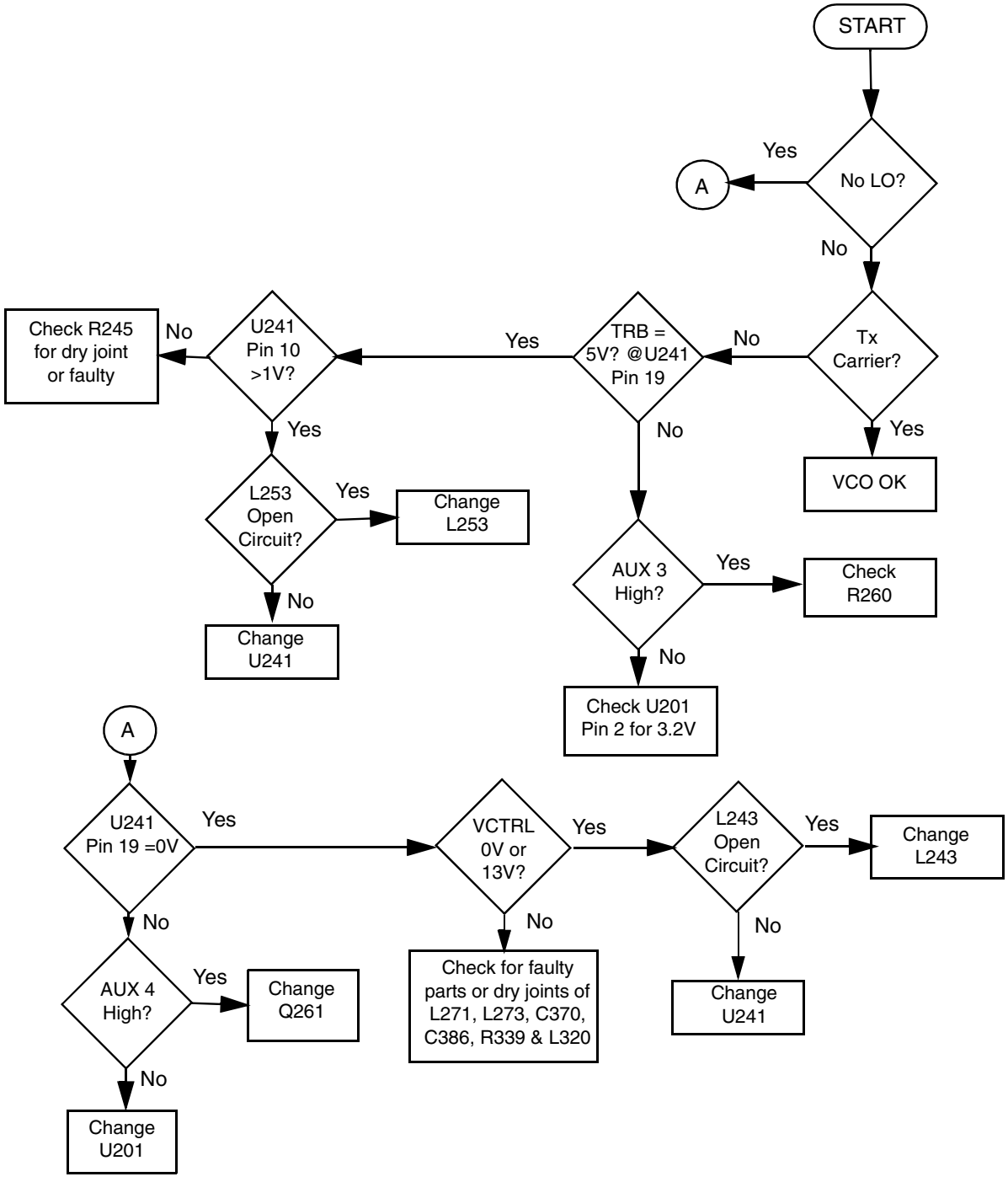
5.0 Troubleshooting Flow Chart for Transmitter



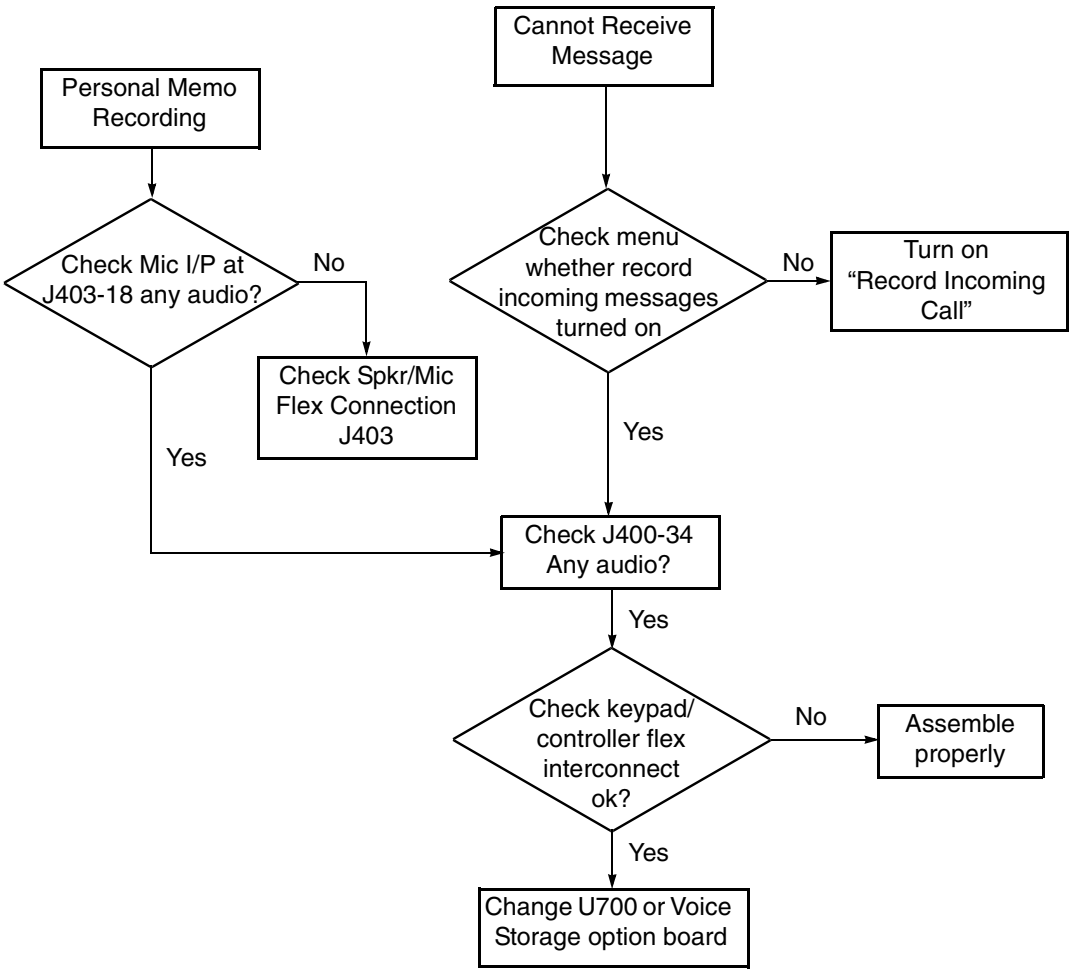
6.0 Troubleshooting Flow Chart for Synthesizer



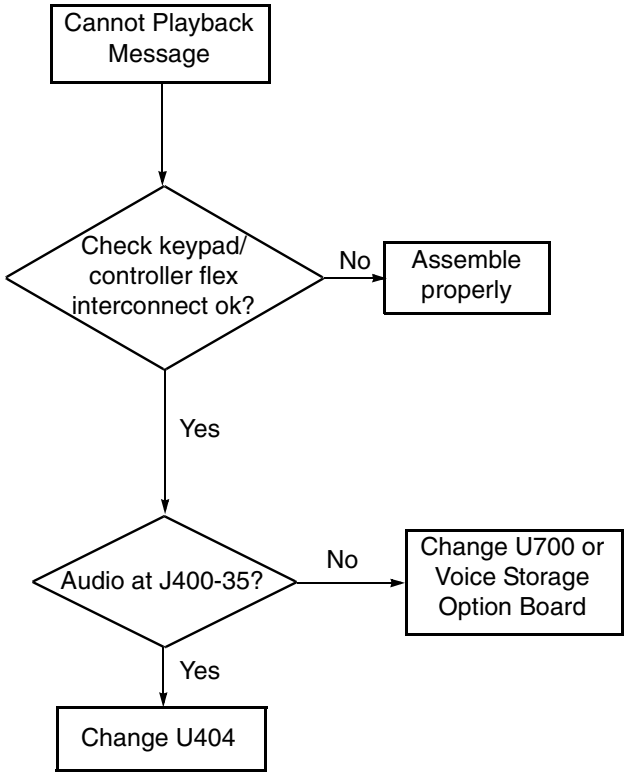
7.0 Troubleshooting Flow Chart for VCO



8.0 Troubleshooting Flow Chart for Receive Message/Personal Memo Recording



9.0 Troubleshooting Flow Chart for Message Playback



Chapter 4

UHF2 PCB/SCHEMATICS/PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The UHF2 circuits are contained on the printed circuit board (PCB) which also contains the Controller circuits. This Chapter shows the schematics for the UHF2 circuits only, refer to the Controller section for details of the related Controller circuits.The PCB component layouts and the Parts Lists in this Chapter show both the Controller and UHF2 circuit components. The UHF2 schematics and the related PCB and parts list are shown in the tables below.

1.2 Voice Storage Facility

The Voice Storage facility is fitted to the GP1280 radio as standard and the schematics, component layout and parts list for these circuits are shown in this Chapter. The Voice Storage facility may be fitted to other radios in the GP Series as an option board; reference must be made to the Option Board manual in this case. The Voice Storage schematic and the related PCBs are shown in Tables 4-3 and 4-4 below.

Table 4-1 UHF2 Drawings and Parts Lists

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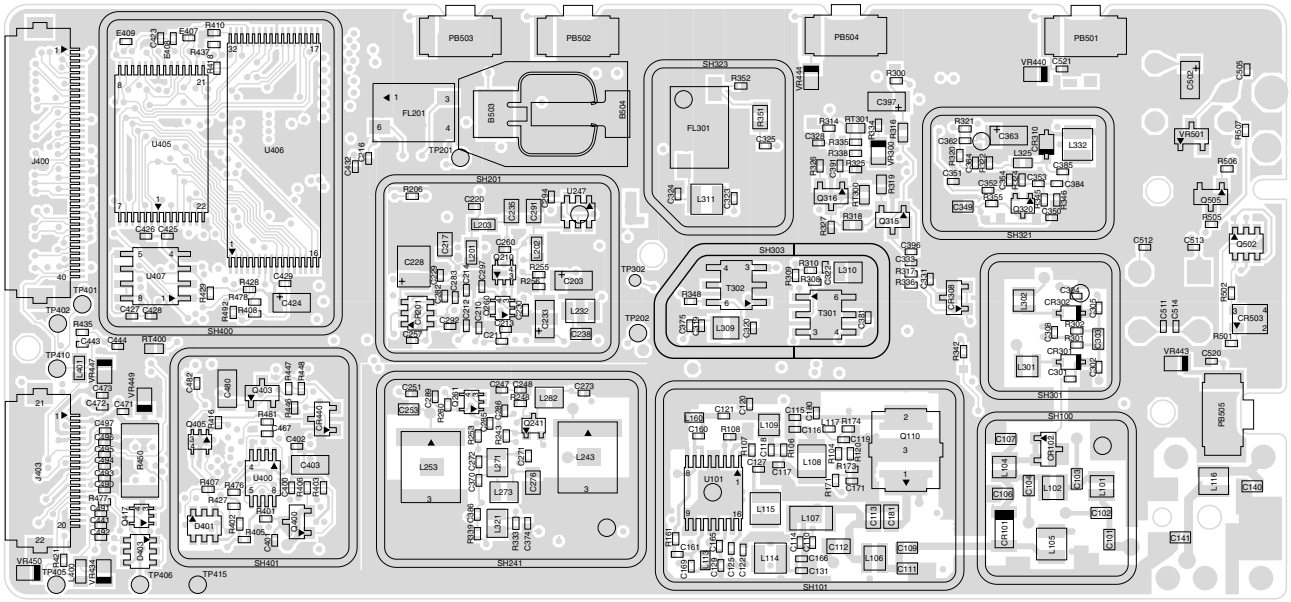
Table 4-2 UHF2 Drawings and Parts Lists

Table 4-3 UHF2 GP1280 Drawings and Parts Lists

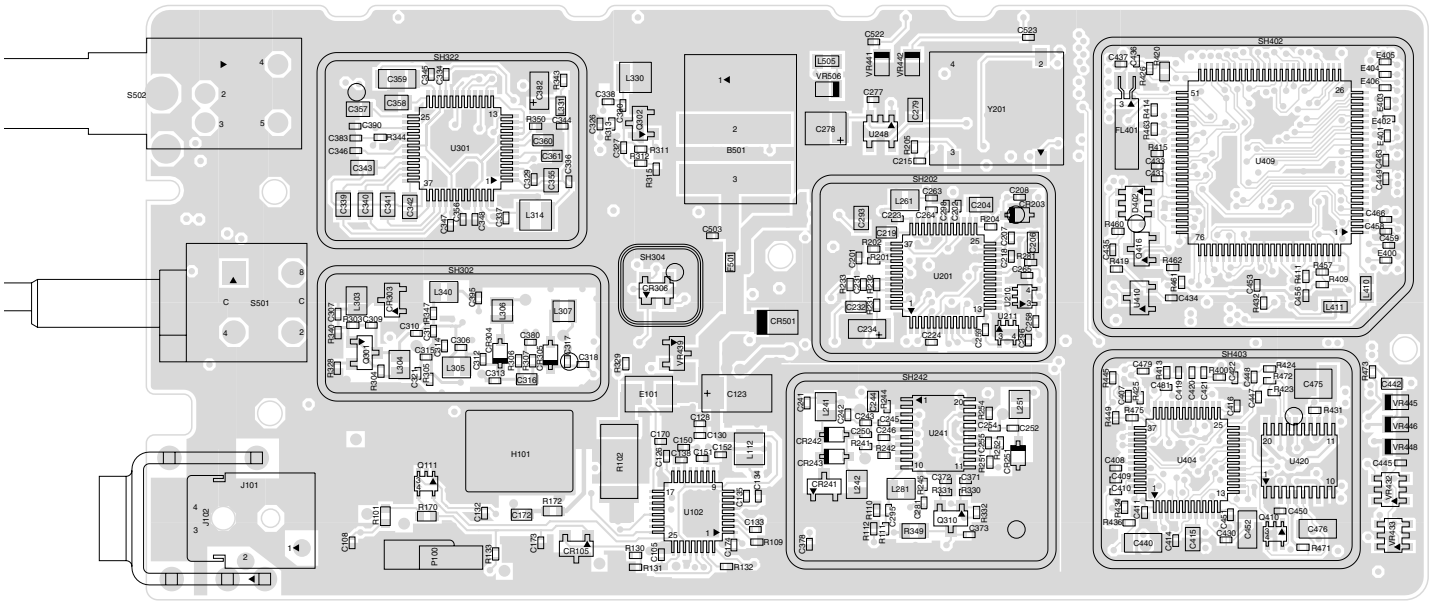
Table 4-4 UHF2 GP1280 Drawings and Parts Lists

Table 4-5 UHF2 Drawings and Parts Lists

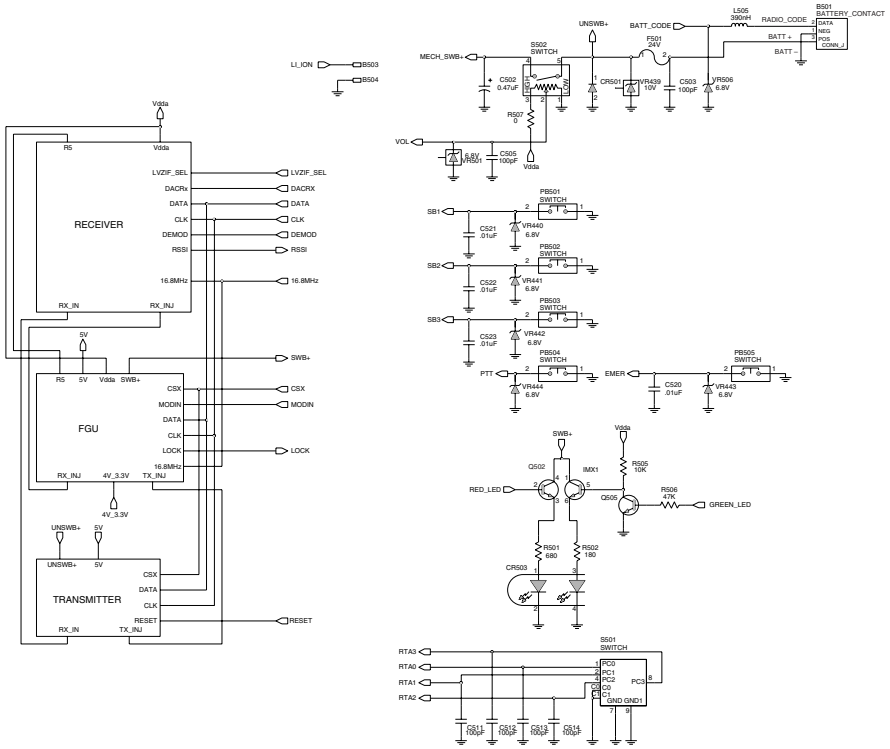
2.0 UHF2 PCB 8485641Z02 Schematics



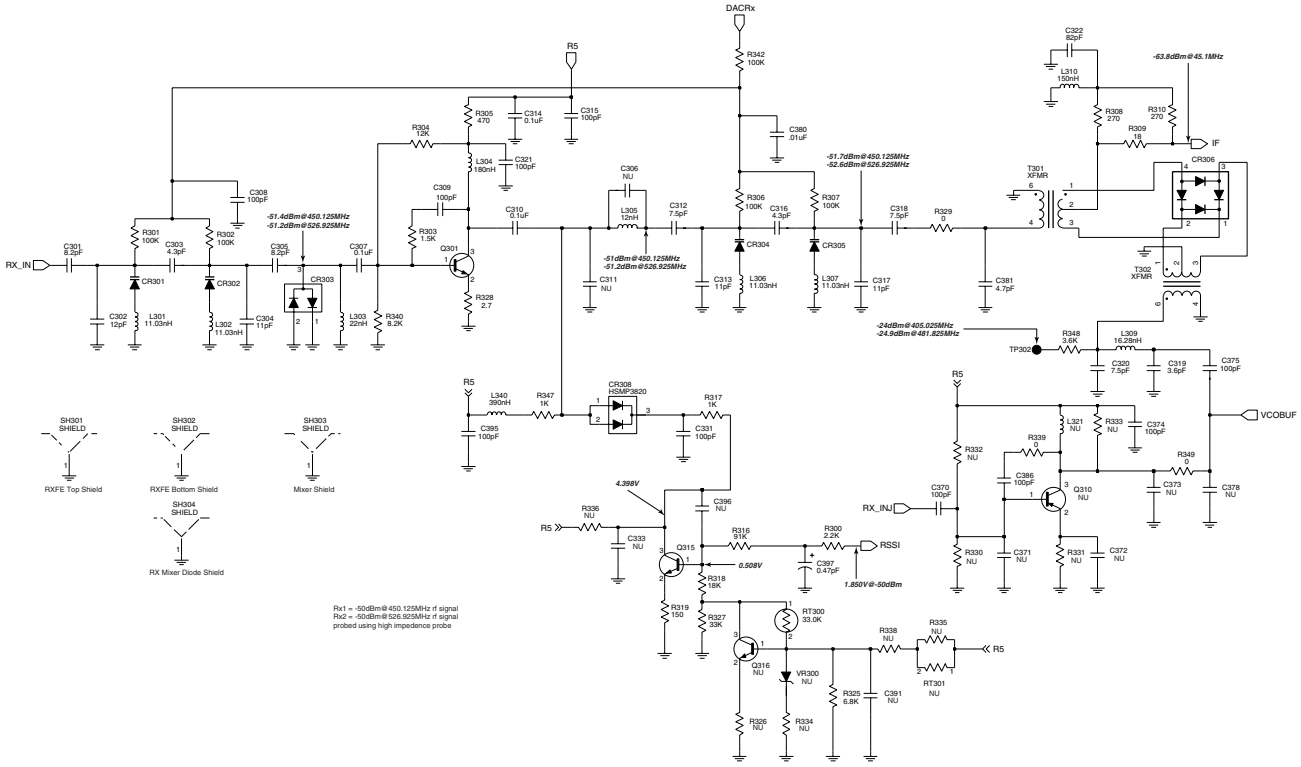
UHF2 (450-527MHz) Main Board Top Side



UHF2 (450-527 MHz) Main Board Bottom Side

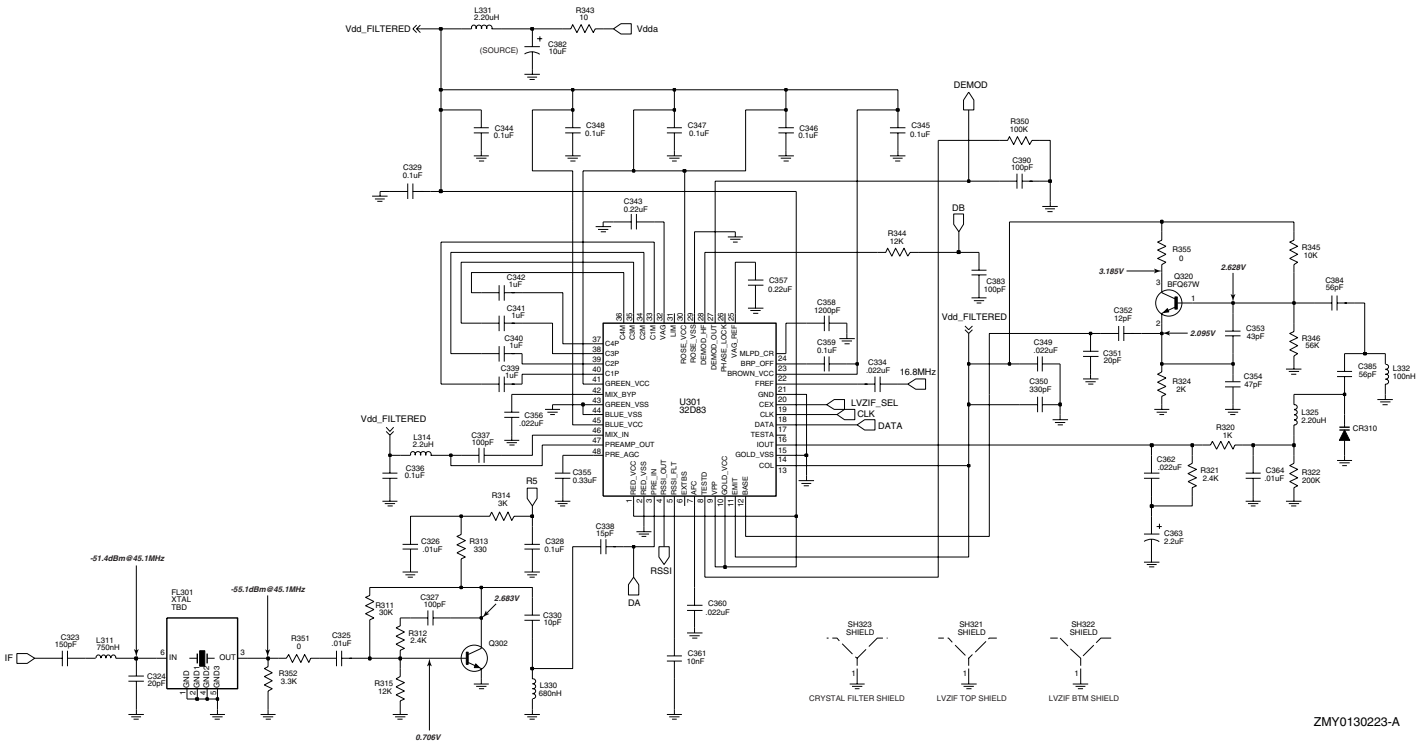


UHF2 (450-527 MHz) Controls and Switches

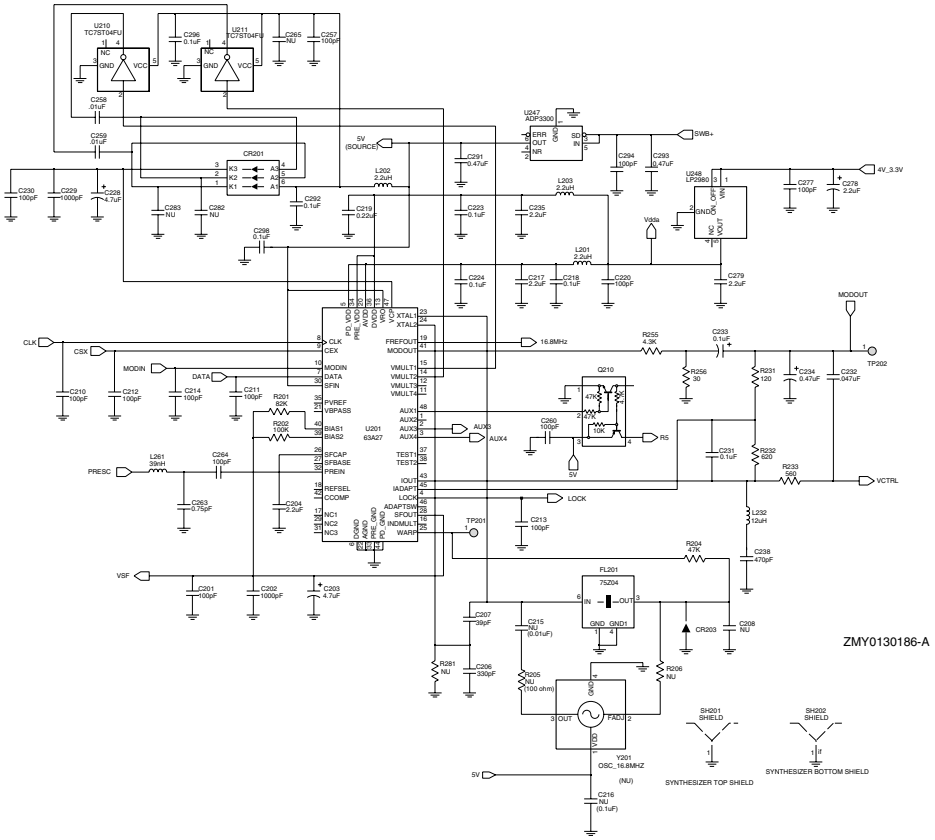


ZMY0130222-O

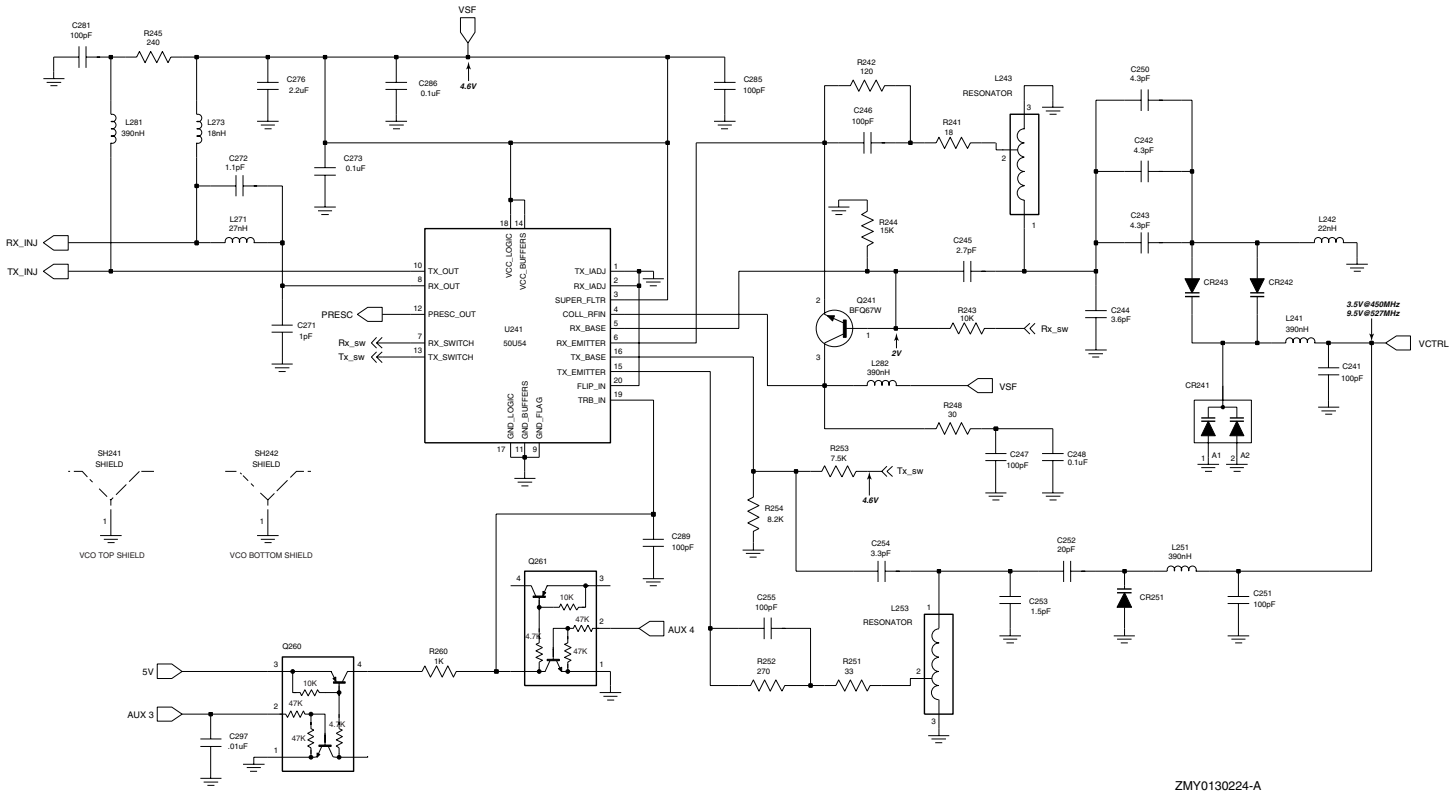
UHF2 (450-527 MHz) Receiver Front End



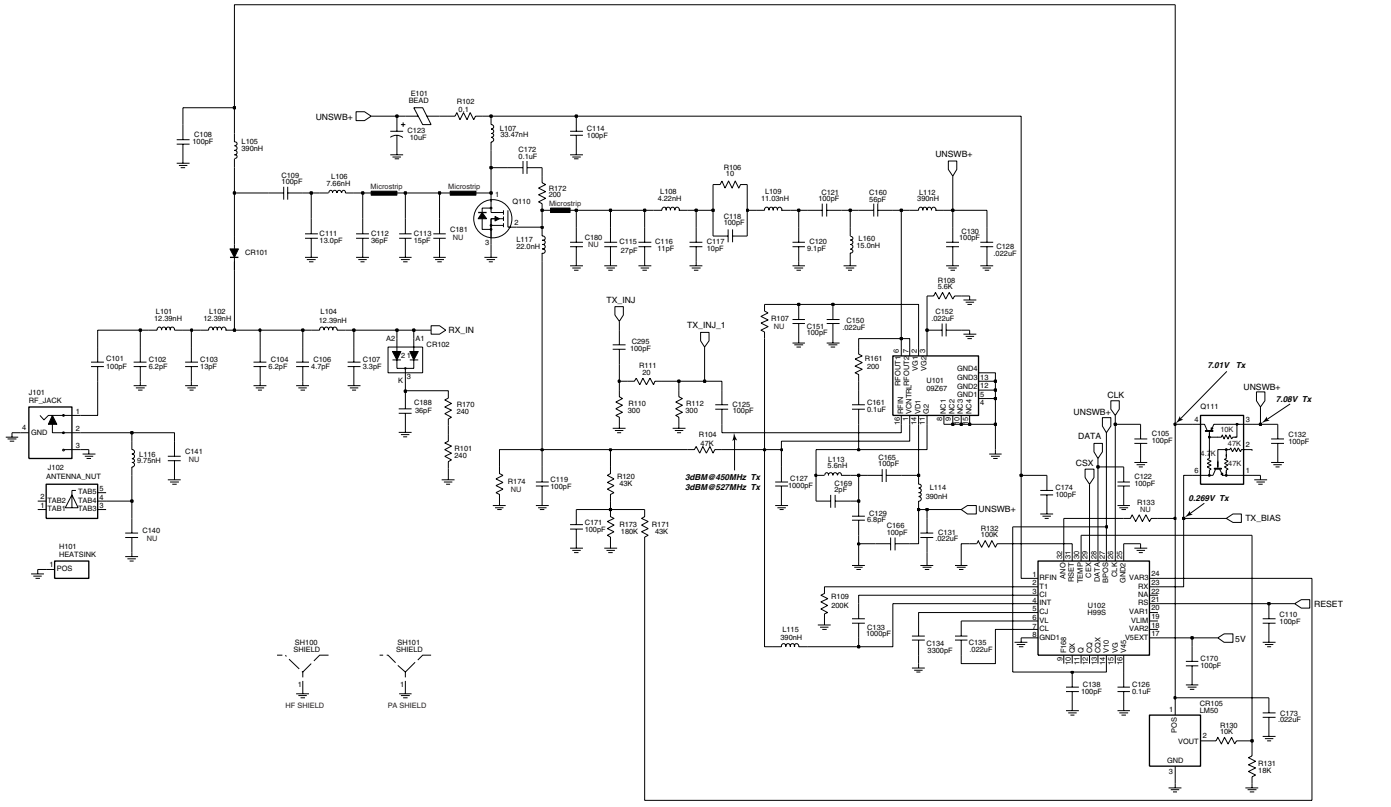
UHF2 (450-527 MHz) Receiver Back End



UHF2 (450-527 MHz) Synthesizer



UHF2 (450-527 MHz) Voltage Controlled Oscillator



UHF2 (450-527 MHz) Transmitter

ZMY0130225-O

3.0 UHF2 PCB8485641Z02 / PCB8485677Z02 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A01	Battery Contact Module
B503	3980502Z01	Backup Batt Contact+
B504	3980501Z01	Backup Batt Contact-
C101	2113740F51	100pF
C102	2113740F22	6.2pF, 0.1
C103	2113740F30	13pF
C104	2113740F22	6.2pF, 0.1
C105	2113743N50	100pF
C106	2113740F19	4.7pF, 0.1
C107	2113740F15	3.3pF, 0.1
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2103689A23	13pF, ±0.05
C112	2180605Z29	36pF
C113	2180605Z20	15pF
C114	2113743N50	100pF
C115	2113743N36	27pF
C116	2113743N27	11pF
C117	2113743N26	10pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N25	9.1pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF, 10%; 16V
C125	2113743N50	100pF
C126	2113743M24	0.1uF, +80%/-20%
C127	2113743L17	1000pF, 10%
C128	2113743M08	.022uF, +80%/-20%
C129	2113743N22	6.8pF, 0.5
C130	2113743N50	100pF
C131	2113743M08	.022uF, +80%/-20%
C132	2113743N50	100pF
C133	2113743L17	1000pF, 10%
C134	2113743L29	3300pF, 10%
C135	2113743M08	.022uF, +80%/-20%
C138	2113743N50	100pF
C140	Not Placed	
C141	Not Placed	
C150	2113743M08	.022uF, +80%/-20%
C151	2113743N50	100pF
C152	2113743M08	.022uF, +80%/-20%
C160	2113743N44	56pF
C161	2113743M24	0.1uF, +80%/-20%
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N09	2pF, 0.25
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113743E20	0.1uF, 10%
C173	2113743M08	.022uF, +80%/-20%
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF, 10%
C203	2311049A56	4.7uF, 20%; 10V
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N44	56pF
C208	2113743N08	1.6pF
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF, +80%/-20%
C219	2113743K16	0.22uF, +80%/-20%
C220	2113743N50	100pF
C223	2113743M24	0.1uF, +80%/-20%
C224	2113743M24	0.1uF, +80%/-20%
C228	2311049J11	4.7uF, 10%; 16V
C229	2113743L17	1000pF, 10%
C230	2113743N50	100pF
C231	2113743M24	0.1uF, +80%/-20%
C232	2113743E12	.047uF, 10%
C233	2311049A01	0.1uF, 10%; 35V
C234	2311049A05	0.47uF, 10%; 25V
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N18	4.7pF, 0.5
C243	2113743N18	4.7pF, 0.5
C244	2113740F14	3pF, 0.25
C245	2113743N12	2.7pF, 0.25
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF, +80%/-20%
C250	2113743N18	4.7pF, 0.5
C251	2113743N50	100pF
C252	2113743N33	20pF
C253	2113740F07	1.5pF, 0.25
C254	2113743N14	3.3pF, 0.25
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	.01uF, 10%
C259	2113743L41	.01uF, 10%
C260	2113743N50	100pF
C263	2113743N02	0.75pF, 0.25
C264	2113743N50	100pF
C265	Not Placed	
C271	2113743N03	1pF, 0.25
C272	2113743N04	1.1pF, 0.25
C273	2113743M24	0.1uF, +80%/-20%
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF, 10%; 20V
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF, +80%/-20%
C289	2113743N50	100pF
C291	2113743A27	0.47uF, 10%
C292	2113743M24	0.1uF, +80%/-20%
C293	2113743A27	0.47uF, 10%
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF, +80%/-20%
C297	2113743L41	.01uF, 10%
C298	2113743M24	0.1uF, +80%/-20%
C301	2113743N24	8.2pF, 0.25
C302	2113743N28	12pF
C303	2113740L09	4.3pF, 0.1
C304	2113743N27	11pF, 0.5
C305	2113743N24	8.2pF
C306	Not Placed	
C307	2113743M24	0.1uF, +80%/-20%
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF, +80%/-20%
C311	Not Placed	
C312	2113743N23	7.5pF, 0.5
C313	2113743N27	11pF
C314	2113743M24	0.1uF, +80%/-20%
C315	2113743N50	100pF
C316	2113740L09	4.3pF, 0.1
C317	2113743N27	11pF, 0.5
C318	2113743N23	7.5pF, 0.5
C319	2113743N15	3.6pF, 0.5
C320	2113743N23	7.5pF, 0.5
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	.01uF, 10%
C326	2113743L41	.01uF, 10%
C327	2113743N50	100pF
C328	2113743M24	0.1uF, +80%/-20%
C329	2113743M24	0.1uF, +80%/-20%
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	Not Placed	
C334	2113743M08	.022uF, +80%/-20%
C336	2113743M24	0.1uF, +80%/-20%
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1.0uF, 10%
C340	2180478Z20	1.0uF, 10%
C341	2180478Z20	1.0uF, 10%
C342	2180478Z20	1.0uF, 10%
C343	2113743A23	0.22uF, 10%
C344	2113743M24	0.1uF, +80%/-20%
C345	2113743M24	0.1uF, +80%/-20%
C346	2113743M24	0.1uF, +80%/-20%
C347	2113743M24	0.1uF, +80%/-20%
C348	2113743M24	0.1uF, +80%/-20%
C349	2113743E07	.022uF, 10%
C350	2113743L05	330pF, 10%
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.33uF, 10%
C356	2113743M08	.022uF, +80%/-20%
C357	2113743A23	0.22uF, 10%
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	.022uF, 10%
C361	2113741F49	0.1uF, 10%
C362	2113743M08	0.022uF
C363	2311049A40	2.2uF, 10%; 16V
C364	2113743L41	0.01uF
C370	2113743N50	100pF
C371	Not Placed	
C372	Not Placed	
C373	Not Placed	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	Not Placed	
C380	2113743L41	.01uF, 10%
C381	2113743N18	4.7pF, 0.5
C382	2311049A59	10uF, 10%; 6V
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	Not Placed	
C395	2113743N50	100pF
C396	Not Placed	
C397	2311049A07	1uF, 10%; 16V

Circuit Ref	Motorola Part No.	Description
C400	2113743L41	.01uF, 10%
C401	2113743M24	0.1uF, +80%/-20%
C402	2113743M24	0.1uF, +80%/-20%
C403	2113928D08	10uF, +80%/-20%
C407	2113928N01	0.1uF, 10%
C408	2113743N50	100pF
C409	2113743M24	0.1uF, +80%/-20%
C410	2113928N01	0.1uF, 10%
C411	2113743M24	0.1uF, +80%/-20%
C414	2113743M24	0.1uF, +80%/-20%
C415	2109720D01	.01uF, 10%
C416	2113928N01	0.1uF, 10%
C419	Not Placed	
C420	2113743L41	.01uF, 10%
C421	2113928N01	0.1uF, 10%
C422	2113743M24	0.1uF, +80%/-20%
C423	2113743N50	100pF
C424	2311049A59	10uF, 10%; 6V
C425	2113743M24	0.1uF, +80%/-20%
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	0.1uF, +80%/-20%
C429	2113743M24	0.1uF, +80%/-20%
C430	2113928N01	0.1uF, 10%
C431	2113743N50	100pF
C432	Not Placed	
C433	2113743L41	.01uF, 10%
C434	2113743M24	0.1uF, +80%/-20% not used in GP640
C435	2113743M24	0.1uF, +80%/-20%
C436	2113743N34	22pF not used in GP640
C437	2113743N34	22pFnot used in GP640
C440	2113743G26	4.7uF, +80%/-20%
C441	2113743N50	100pF
C442	2113743E20	0.1uF, 10%
C443	2113928N01	0.1uF, 10%
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	0.22uF, 10%
C448	2113928N01	0.1uF, 10%
C449	2113743N50	100pF
C450	2113743M24	0.1uF, +80%/-20%
C451	2113743M08	.022uF, +80%/-20%
C452	2113743G26	4.7uF, +80%/-20%
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF, 10%

Circuit Ref	Motorola Part No.	Description
C471	2113743LN50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF, +80%/-20%
C476	2113928D08	10uF, +80%/-20%
C479	2113928N01	0.1uF, 10%
C480	2113928D08	10uF, +80%/-20%
C481	2113928N01	0.1uF, 10%
C482	2113928N01	0.1uF, 10%
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C502	2311049A05	0.47uF, 10%; 25V
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	.01uF, 10%
C521	2113743L41	.01uF, 10%
C522	2113743L41	.01uF, 10%
C523	2113743L41	.01uF, 10%
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sense
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor
CR241	4805649Q13	Dual Varactor
CR242	4862824C01	Varactor
CR243	4862824C01	Varactor
CR251	4862824C01	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual Comm Anode-Cathode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad Diode
CR308	4802245J41	Pin Diode
CR310	4862824C01	Varactor
CR411	4802245J47	Schottky Diode
CR412	4802245J47	Schottky Diode
CR413	4802245J47	Schottky Diode
CR440	4813833C02	Dual Diode Common Cathode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yel

Circuit Ref	Motorola Part No.	Description
D401	4802245J62	Diode Schottky, RB731U
D402	4802245J62	Diode Schottky, RB731U
D403	4802245J62	Diode Schottky, RB731U
E101	2484657R01	Ferrite Bead
E400	2480640Z01	Ferrite Bead
E401	2480640Z01	Ferrite Bead
E402	2480640Z01	Ferrite Bead
E403	2480640Z01	Ferrite Bead
E404	2480640Z01	Ferrite Bead
E405	2480640Z01	Ferrite Bead
E406	2480640Z01	Ferrite Bead
E407	2480640Z01	Ferrite Bead
E408	2480640Z01	Ferrite Bead
E409	2480640Z01	Ferrite Bead
F501	6580542Z01	Fuse 3A
FL201	4805875Z04	16.8MHz Xtal (SMD)
FL301	4802245J43	Xtal Filter 45.1MHz
FL401	4870368G02	Osc Xtal 38.4kHz not used in GP640
H101	2680499Z01	Heat Spreader
J101	0180117S05	RF Jack Assembly
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-pins Connector
J403	0905505Y02	20-pins Connector
L101	2460591B24	12.39nH, 10%
L102	2460591B24	12.39nH, 10%
L104	2460591B24	12.39nH, 10%
L105	2462587N22	390nH, 10%
L106	2460591A11	7.66nH, 10%
L107	2460591G24	33.47nH, 10%
L108	2460591A01	4.22nH, 10%
L109	2460591B04	11.03nH, 10%
L112	2462587N22	390nH, 10%
L113	2413926H09	5.6nH, 5%
L114	2462587N22	390nH, 10%
L115	2462587N22	390nH, 10%
L116	2460591A50	9.75nH, 10%
L160	2413926H14	15.0nH, 5%
L201	2462587Q20	2.2uH, 20%
L202	2462587Q20	2.2uH, 20%
L203	2462587Q20	2.2uH, 20%
L232	2462587P25	12uH, 5%
L241	2462587V41	390nH, 10%
L242	2462587V26	22nH, 5%
L243	2460593C03	Teflon Resonator
L251	2462587V41	390nH, 5%
L253	2460593C03	Teflon Resonator
L261	2462587V29	39nH, 5%
L271	2462587V27	27nH, 5%
L273	2462587V25	18nH, 5%
L281	2462587V41	390nH, 10%

Circuit Ref	Motorola Part No.	Description
L282	2462587V41	390nH, 10%
L301	2460591B04	11.03nH, 10%
L302	2460591B04	11.03nH, 10%
L303	2462587V26	22nH, 5%
L304	2462587V37	180nH, 5%
L305	2462587V23	12nH, 5%
L306	2460591B04	11.03nH, 10%
L307	2460591B04	11.03nH, 10%
L309	2460591C16	16.28nH, 10%
L310	2462587V36	150nH,5%
L311	2462587N65	750nH,5%
L314	2462587N72	2.2uH, 5%
L321	Not Placed	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH, 5%
L331	2480646Z20	2.2uH
L332	2462587N53	100nH, 5%
L340	2462587V41	390nH, 10%
L400	2462587Q42	390nH, 10%
L401	2462587Q42	390nH, 10%
L410	2462587Q42	390nH, 10%
L411	2462587Q42	390nH, 10%
L505	2462587Q42	390nH, 10%
P100	3905643V01	Gnd Contact Finger
PB501	4080523Z01	Tactile, Pushbutton
PB502	4080523Z01	Tactile, Pushbutton
PB503	4080523Z01	Tactile, Pushbutton
PB504	4080523Z01	Tactile, Pushbutton
PB505	4080523Z01	Tactile, Pushbutton
Q110	4802245J55	RF Power FET
Q111	4802245J50	Dual NPN/PNP
Q210	4802245J50	Dual NPN/PNP
Q241	4805218N63	NPN
Q260	4802245J50	Dual NPN/PNP
Q261	4802245J50	Dual NPN/PNP
Q301	4802245J44	NPN
Q302	4802245J44	NPN
Q310	Not Placed	
Q315	4880214G02	NPN
Q316	Not Placed	
Q320	4805218N63	NPN
Q400	4809579E18	MOSFET P-Chan
Q403	4880214G02	NPN
Q405	4802245J54	Dual NPN
Q410	4802245J54	Dual NPN
Q416	4809579E18	MOSFET P-Chan not used in GP640
Q417	4802245J50	Dual NPN/PNP
Q502	5180159R01	Dual NPN
Q505	4880214G02	NPN
R101	0662057A34	240

Circuit Ref	Motorola Part No.	Description
R102	0680539Z01	0.1, 1%
R103	Not Placed	
R104	0662057N15	47K
R106	0662057M26	10
R107	Not Placed	
R108	0662057M92	5.6K
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N23	100K
R133	Not Placed	
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M52	120
R243	0662057M98	10K
R244	0662057N03	15K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M38	33
R252	0662057M60	270
R253	0662057M95	7.5K
R254	0662057M96	8.2K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R281	Not Placed	-
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M78	1.5K
R304	0662057N01	12K
R305	0662057M66	470
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270

Circuit Ref	Motorola Part No.	Description
R311	0662057N10	30K
R312	0662057M83	2.4K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	36K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R326	Not Placed	
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R330	Not Placed	
R331	Not Placed	
R332	Not Placed	
R333	Not Placed	
R334	Not Placed	
R335	Not Placed	
R336	Not Placed	
R338	Not Placed	
R339	0662057M01	0
R340	0662057M96	8.2K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	Not Placed	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K

Circuit Ref	Motorola Part No.	Description
R413	0662057M01	0
R414	0662057V34	180K, 1%
R415	0662057V26	91K, 1%
R416	0662057N13	39K
R418	0662057M01	0
R419	0662057M67	510 not used in GP640
R420	0662057B46	10MEG not used in GP640
R421	0662057M81	2K
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K not used in GP640
R427	0662057M84	2.7K
R428	0662057M10	2.2
R429	0662057M98	10K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330K
R435	0662057M81	2K
R436	0662057M01	0
R437	Not Placed	
R445	0662057N08	24K
R446	0662057N31	220K
R447	0662057N51	1.5M
R448	0662057N33	270K
R449	0662057N08	24K
R450	0683962T45	68, 1W
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057M56	180 not used in GP640
R462	0662057M98	10K not used in GP640
R463	0662057M61	300
R471	0662057M92	5.6K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R477	0662057M74	1K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT300	0680590Z01	Thermistor 33K
RT301	Not Placed	
RT400	0680590Z01	Thermistor 33K
* S501	4080710Z01	Channel Switch
S502	1880619Z01	Volume Switch

Circuit Ref	Motorola Part No.	Description
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthersizer Top Shield
SH202	2680511Z01	Synthersizer Bottom Shield
SH241	2680513Z01	VCO Top Shield
SH242	2680514Z01	VCO Bottom Shield
SH301	2680554Z01	Rx Pre-filter shield\
SH302	2680555Z01	Rx Post-filter/RF Amp Shield
SH303	2680509Z01	Mixer Shield
SH304	2680624Z01	Mixer Diode Shield
SH321	2680508Z01	Zif 2nd LO Shield
SH322	2680514Z01	ZIF Shield
SH323	2680553Z01	Xtal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On/Off Shield
SH402	2680515Z01	Controller Microp Shield
SH403	2680516Z01	Cntl AsficCmp/Audi PA Shield
T301	2580541Z01	XFMR Coil
T302	2580541Z01	XFMR Coil
U101	5105109Z67	LDMOS Driver
U102	5185765B01	Power Control IC
U201	5185963A27	LVFRACN
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer
U247	5105739X05	Regulator Linear
U248	5102463J58	3.3V Reg
U301	5109632D83	LVZIF
U400	5102463J40	3.3V Reg
U404	5185963A53	AsficCmp
U405	Not Placed	
* U406	5102463J59	Flash ROM 256K
* U407	5102463J64	EEPROM 16Kx8
U409	5102226J56	up HC11FL0
U410	5102463J57	3.3V Reg not used in GP640
U420	5102463J44	Audio PA
VR300	Not Placed	
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

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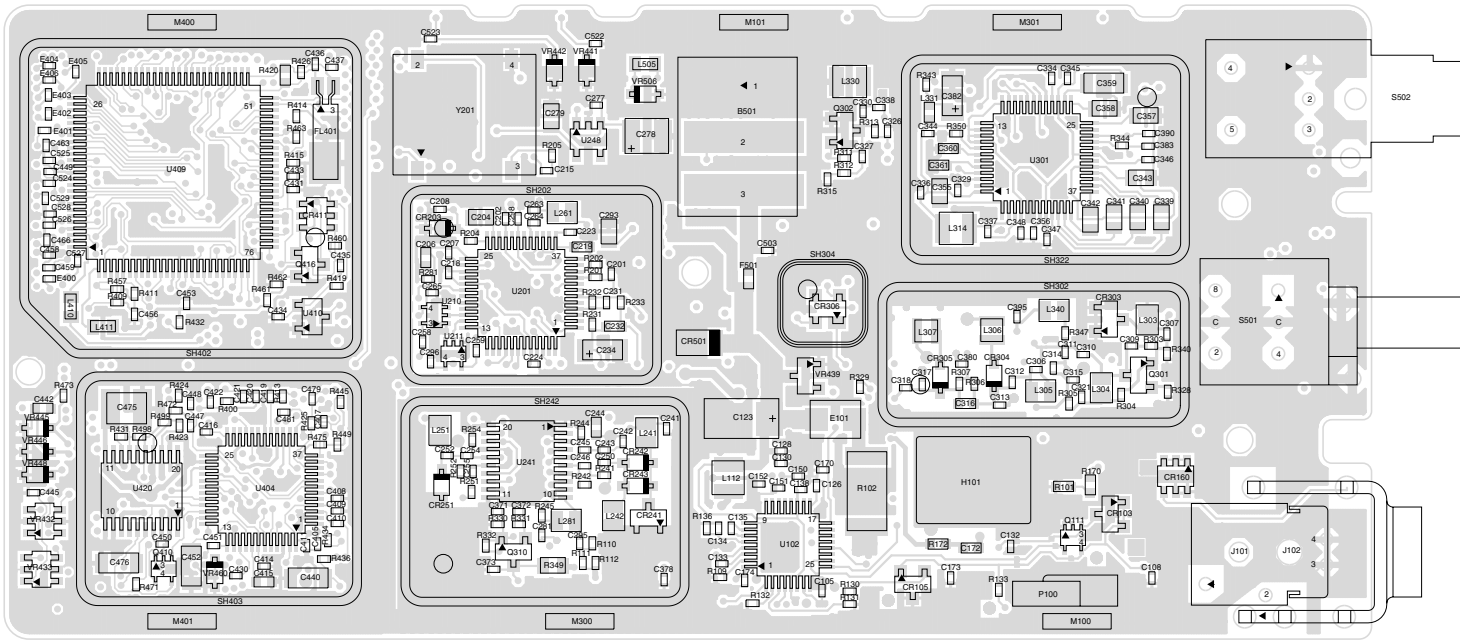
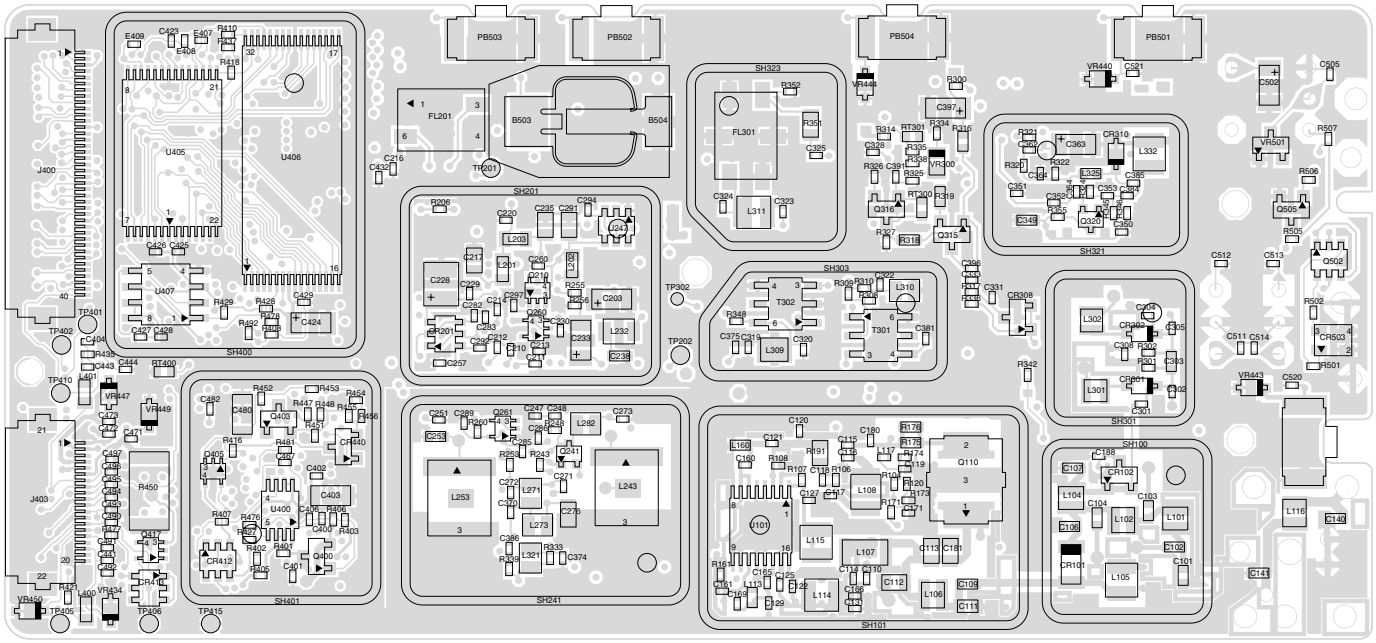
4.0 UHF2 PCB 8485641Z06 Schematics



UHF2 (450-527MHz) Main Board Top Side



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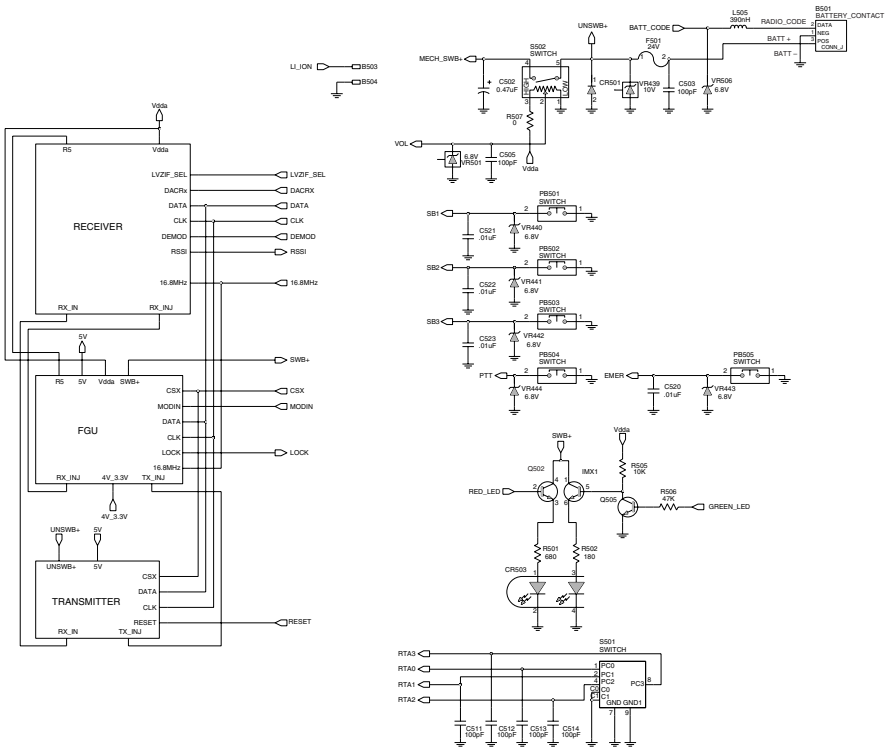
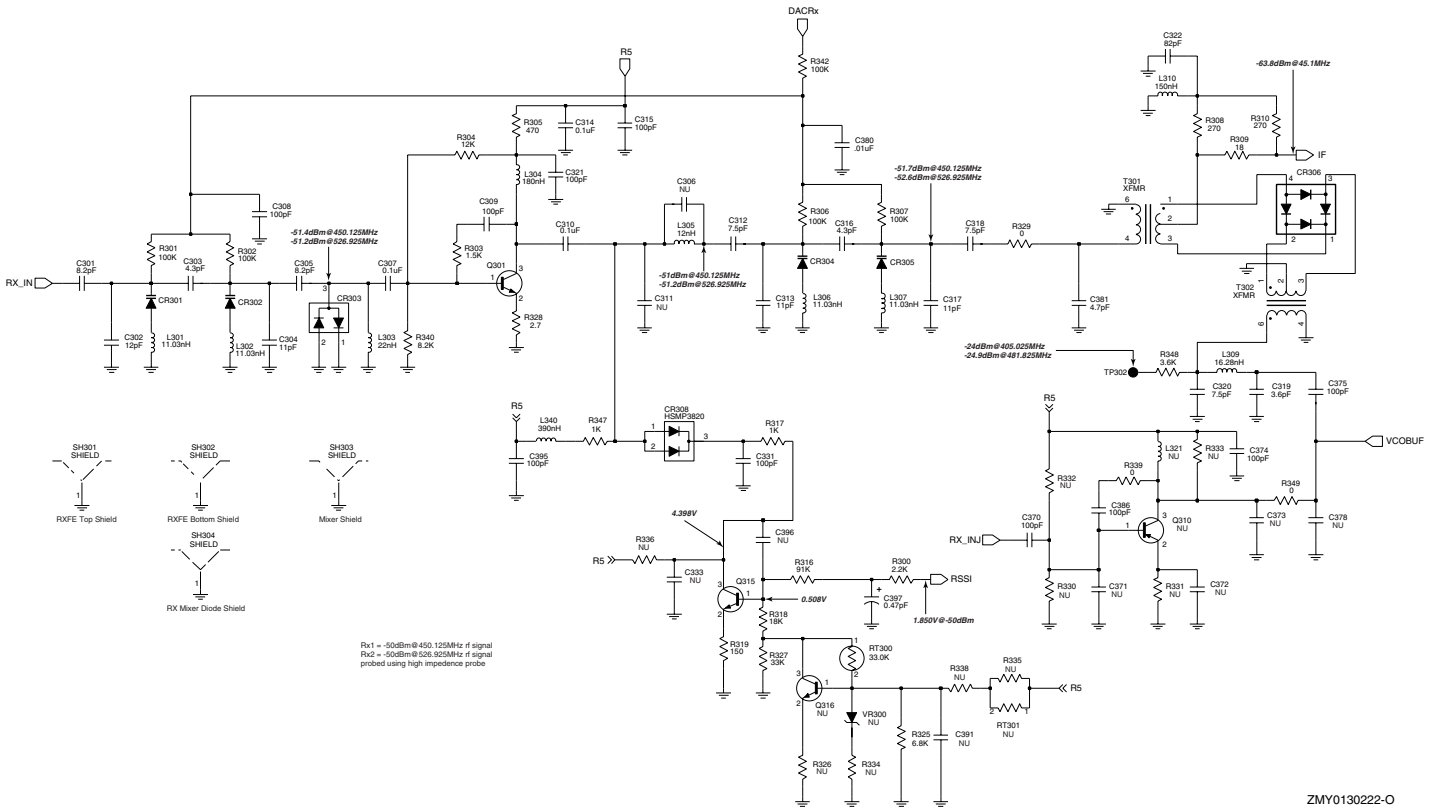
UHF2 (450-527 MHz) Main Board Bottom Side

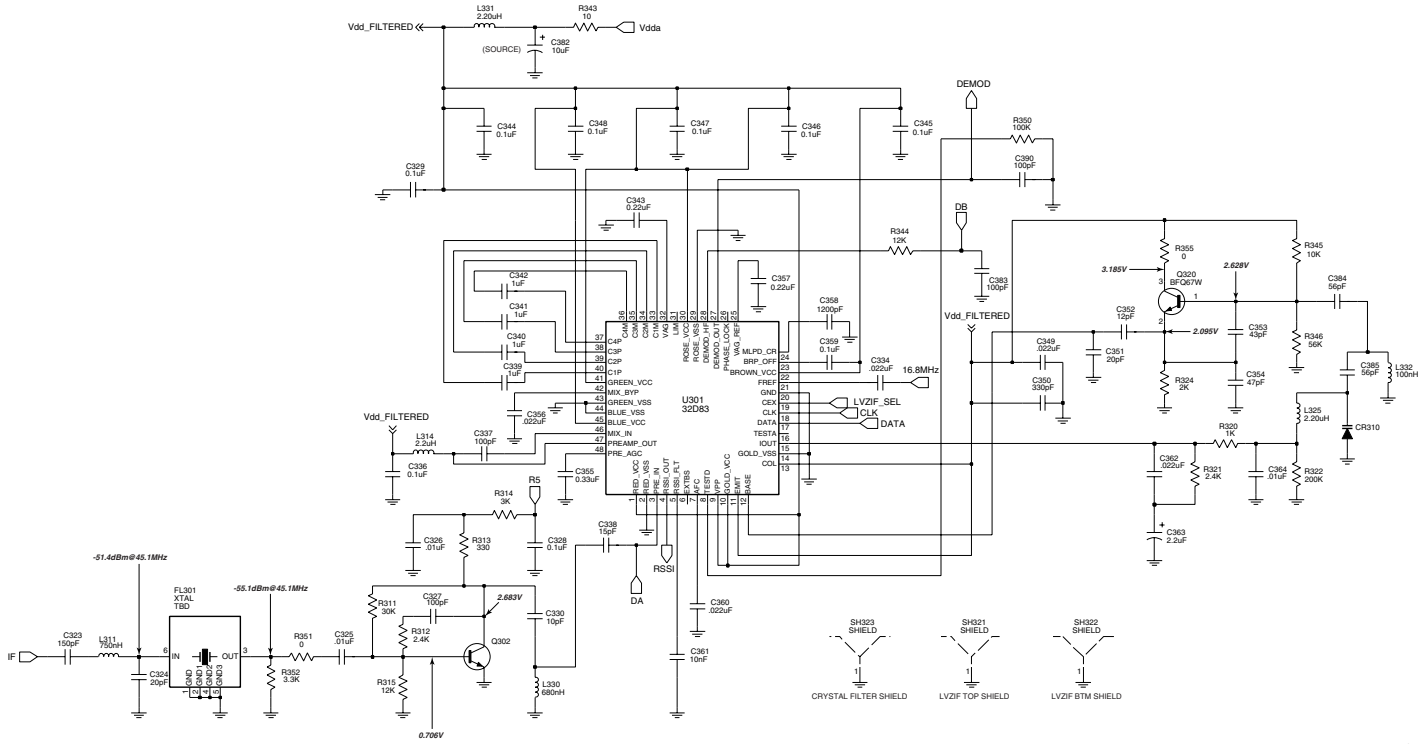


ZMY0130015-A

UHF2 (450-527 MHz) Controls and Switches

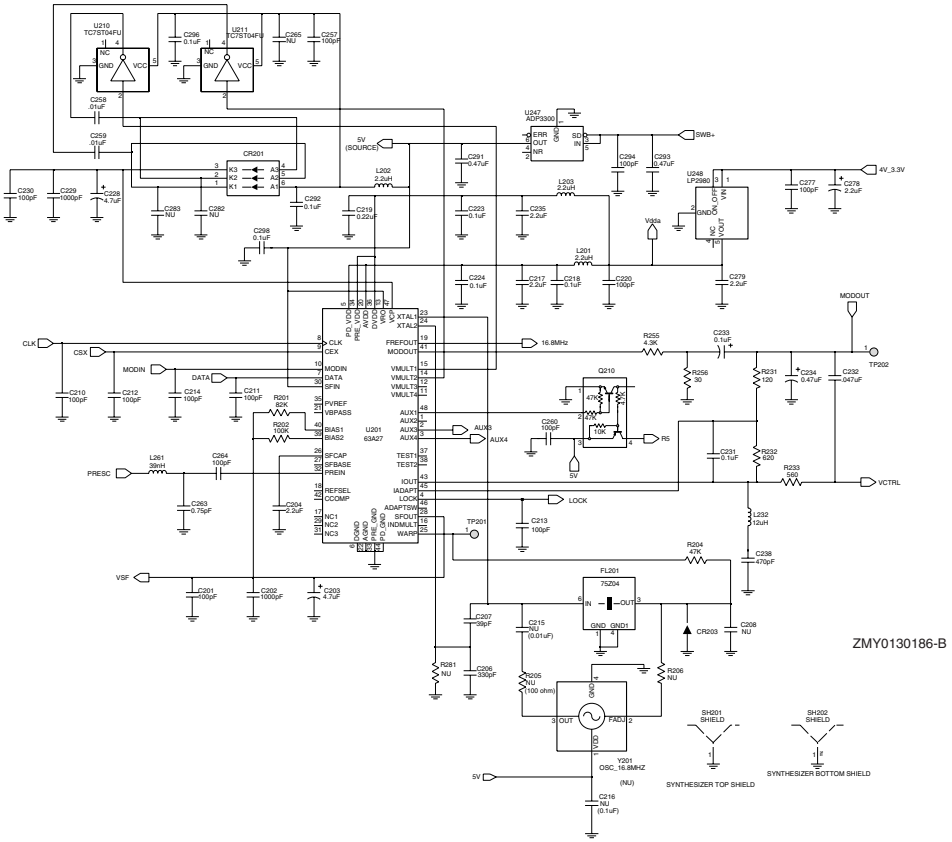


UHF2 (450-527 MHz) Receiver Front End

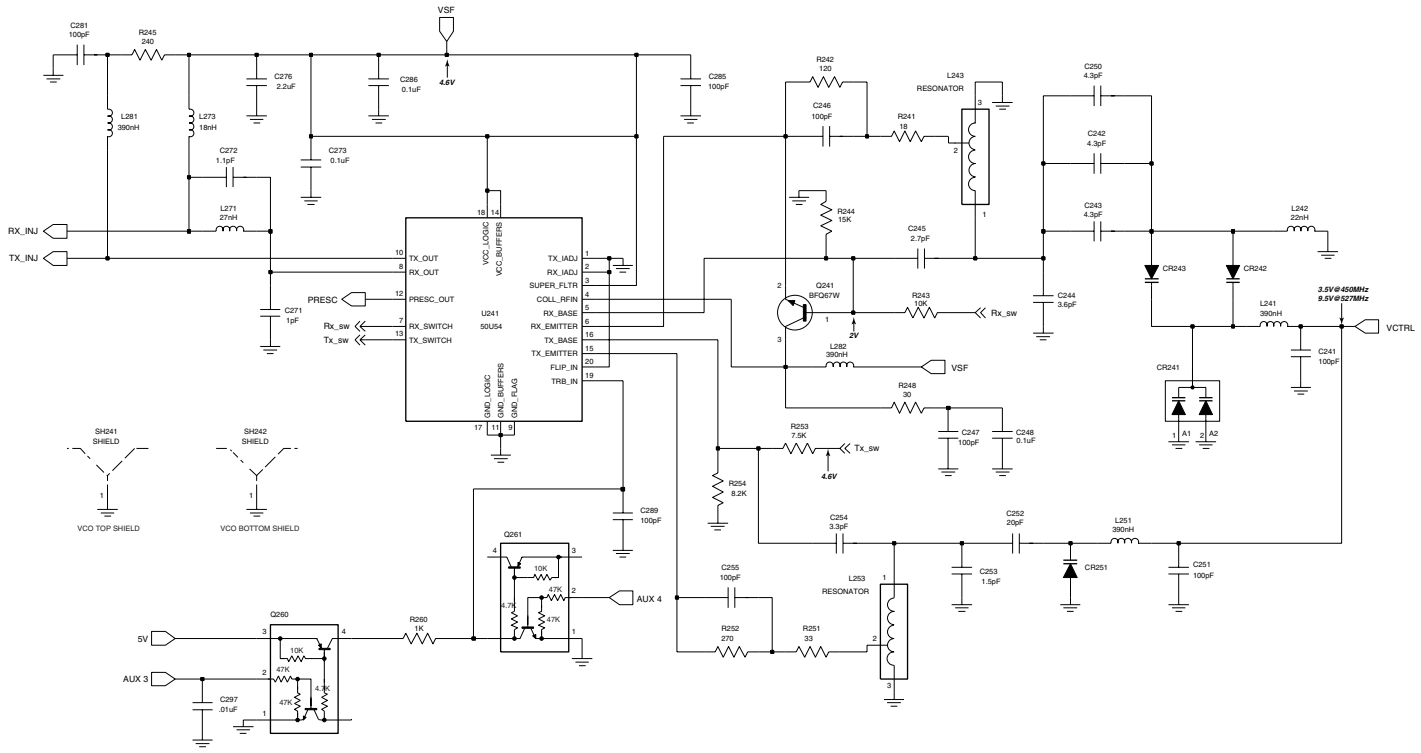


ZMY0130223-O

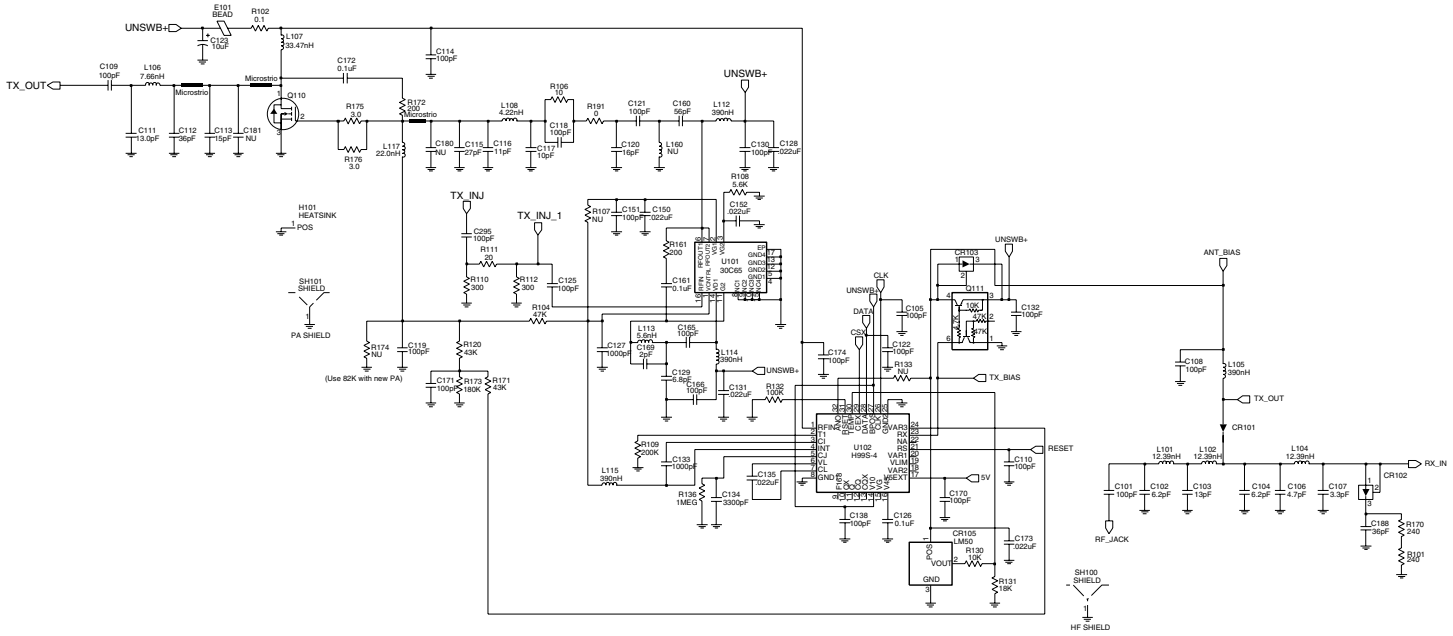
UHF2 (450-527 MHz) Receiver Back End



UHF2 (450-527 MHz) Synthesizer



UHF2 (450-527 MHz) Voltage Controlled Oscillator



5.0 UHF2 PCB8485641Z06 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup battery B+ (not used in GP640 non-display)
B504	3980501Z01	Backup battery B- (not used in GP640 non-display)
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F28	11pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2103689A22	11pF
C112	2180605Z28	33pF
C113	2180605Z22	18pF
C114	2113743N50	100pF
C115	2113743N36	27pF
C116	2113743N27	11pF
C117	NOT PLACED	
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N23	7.5pF, 0.5
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF, 10%, 16V
C125	2113743N50	100pF
C126	2113743M24	100000pF, +80%/-20%
C127	2113743L17	1000pF, 10%
C128	2113743M08	22000pF, +80%/-20%
C129	2113743N22	6.8pF, 0.5
C130	2113743N50	100pF
C131	2113743M08	22000pF, +80%/-20%
C132	2113743N50	100pF
C133	2113743L17	1000pF, 10%
C134	2113743L29	3300pF, 10%
C135	2113743M08	22000pF, +80%/-20%
C138	2113743N50	100pF
C140	NOT PLACED	
C141	2113740F25	8.2pF
C150	2113743M08	22000pF, +80%/-20%
C151	2113743N50	100pF
C152	2113743M08	22000pF, +80%/-20%
C160	2113743N44	56pF
C161	2113743M24	100000pF, +80%/-20%
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N09	2.0pF, 0.25
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113743E20	0.10uF, 10%
C173	2113743M08	22000pF, +80%/-20%
C174	2113743N50	100pF
C180	NOT PLACED	
C181	NOT PLACED	
C188	2113743N39	36pF
C201	2113743N50	100pF
C202	2113743L17	1000pF, 10%
C203	2311049A56	4.7uF, 20%, 10V
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	NOT PLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C215	NOT PLACED	
C216	NOT PLACED	
C217	2104993J02	2.2uF
C218	2113743M24	100000pF, +80%/-20%
C219	2113743K16	0.220uF, +80%/-20%
C220	2113743N50	100pF
C223	2113743M24	100000pF, +80%/-20%
C224	2113743M24	100000pF, +80%/-20%
C228	2311049J11	4.7uF, 10%, 16V
C229	2113743L17	1000pF, 10%
C230	2113743N50	100pF
C231	2113743M24	100000pF, +80%/-20%
C232	2113743E12	0.047uF, 10%
C233	2311049A01	0.1uF, 10%, 35V
C234	2311049A05	0.47uF, 10%, 25V
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N17	4.3pF, 0.25
C243	2113743N17	4.3pF, 0.25
C244	2113740F14	3.0pF
C245	2113743N12	2.7pF, 0.25
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF, +80%/-20%
C250	2113743N17	4.3pF, 0.25
C251	2113743N50	100pF
C252	2113743N33	20pF
C253	2113740F07	1.5pF
C254	2113743N14	3.3pF, 0.25
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	10000pF, 10%
C259	2113743L41	10000pF, 10%
C260	2113743N50	100pF
C263	2113743N02	0.75pF, 0.25
C264	2113743N50	100pF
C265	NOT PLACED	
C271	2113743N03	1.0pF, 0.25
C272	2113743N04	1.1pF, 0.25
C273	2113743M24	100000pF, +80%/-20%
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF, 10%, 20V
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C282	NOT PLACED	
C283	NOT PLACED	
C285	2113743N50	100pF
C286	2113743M24	100000pF, +80%/-20%
C289	2113743N50	100pF
C291	2311049A69	10uF, 20%, 6.3V
C292	2113743M24	100000pF, +80%/-20%
C293	2113743A27	0.470uF, 10%
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF, +80%/-20%
C297	2113743L41	10000pF, 10%
C298	2113743M24	100000pF, +80%/-20%
C301	2113743N24	8.2pF, 0.5
C302	2113743N28	12pF
C303	2113740L09	4.3pF, 0.1
C304	2113743N27	11pF
C305	2113743N24	8.2pF, 0.5
C306	NOT PLACED	
C307	2113743M24	100000pF, +80%/-20%
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	100000pF, +80%/-20%
C311	NOT PLACED	
C312	2113743N23	7.5pF, 0.5
C313	2113743N27	11pF
C314	2113743M24	100000pF, +80%/-20%
C315	2113743N50	100pF
C316	2113740L09	4.3pF, 0.1
C317	2113743N27	11pF
C318	2113743N23	7.5pF, 0.5
C319	2113743N15	3.6pF, 0.25
C320	2113743N23	7.5pF, 0.5
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	10000pF, 10%
C326	2113743L41	10000pF, 10%
C327	2113743N50	100pF
C328	2113743M24	100000pF, +80%/-20%
C329	2113743M24	100000pF, +80%/-20%
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	NOT PLACED	
C334	2113743M08	22000pF, +80%/-20%
C336	2113743M24	100000pF, +80%/-20%
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1uF
C340	2180478Z20	1uF
C341	2180478Z20	1uF
C342	2180478Z20	1uF
C343	2113743A23	0.220uF, 10%
C344	2113743M24	100000pF, +80%/-20%
C345	2113743M24	100000pF, +80%/-20%
C346	2113743M24	100000pF, +80%/-20%
C347	2113743M24	100000pF, +80%/-20%
C348	2113743M24	100000pF, +80%/-20%
C349	2113743E07	0.022uF
C350	2113743L05	330pF, 10%
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.330uF, 10%
C356	2113743M08	22000pF, +80%/-20%
C357	2113743A23	0.220uF, 10%
C358	2113741A23	1200pF
C359	2109720D14	0.1uF, low distortion
C360	2113743E07	0.022uF
C361	2113741F49	10nF
C362	2113743M08	22000pF, +80%/-20%
C363	2311049A40	2.2uF, 10%, 10V
C364	2113743L41	10000pF, 10%
C370	2113743N50	100pF
C371	NOT PLACED	
C372	NOT PLACED	
C373	NOT PLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOT PLACED	
C380	2113743L41	10000pF, 10%
C381	2113743N18	4.7pF, 0.25
C382	2311049A59	10uF, 10%, 6V
C383	2113743N50	100pF
C384	2113743N44	56pF

Circuit Ref	Motorola Part No.	Description
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	NOT PLACED	
C395	2113743N50	100pF
C396	NOT PLACED	
C397	2311049A07	1uF, 10%, 16V
C400	2113743L41	10000pF, 10%
C401	2113743M24	100000pF, +80%/-20%
C402	2113743M24	100000pF, +80%/-20%
C403	2113928D08	10uF, +/-80%/-20%
C404	NOT PLACED	GCAM DUMMY PART No
C405	NOT PLACED	
C406	NOT PLACED	
C407	2113928N01	0.1uF , 10%
C408	2113743N50	100pF
C409	2113743M24	100000pF, +80%/-20%
C410	2113928N01	0.1uF , 10%
C411	2113743M24	100000pF, +80%/-20%
C414	2113743M24	100000pF, +80%/-20%
C415	2185895Z01	0.01uF, low distortion
C416	2113928N01	0.1uF , 10%
C419	NOT PLACED	
C420	2113743L41	10000pF, 10%
C421	2113928N01	0.1uF , 10%
C422	2113743M24	100000pF, +80%/-20%
C423	2113743N50	100pF
C424	2311049A59	10uF, 10%, 6V
C425	2113743M24	100000pF, +80%/-20%
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF, +80%/-20%
C429	2113743M24	100000pF, +80%/-20%
C430	2113928N01	0.1uF , 10%
C431	2113743N50	100pF
C432	NOT PLACED	
C433	2113743L41	10000pF, 10%
C434	2113928N01	0.1uF, 10%(not used in GP640 non-display)
C435	2113743M24	100000pF, +80%/-20%
C436	2113743N34	22pF (not used in GP640 non-display)
C437	2113743N34	22pF (not used in GP640 non-display)
C440	2113743G26	4.7uF, +80%/-20%
C441	2113743N50	100pF
C442	2113743E20	0.10uF, 10%
C443	2113928N01	0.1uF , 10%
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF, +80%/-20%

Circuit Ref	Motorola Part No.	Description
C448	2113928N01	0.1uF , 10%
C449	2113743N50	100pF
C450	NOT PLACED	
C451	2113743M08	22000pF, +80%/-20%
C452	2113743B29	1uF, 10%
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF , 10%
C471	2113743N50	100pF
C472	2113743L09	470pF, 10%
C473	2113743L09	470pF, 10%
C475	2113743H14	10uF, +80%/-20%
C476	2113928D08	10uF, +/-80%/-20%
C479	2113928N01	0.1uF , 10%
C480	2113928D08	10uF, +/-80%/-20%
C481	2113928N01	0.1uF , 10%
C482	2113928N01	0.1uF , 10%
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C502	2311049A05	0.47uF, 10%, 25V
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	10000pF, 10%
C521	2113743L41	10000pF, 10%
C522	2113743L41	10000pF, 10%
C523	2113743L41	10000pF, 10%
C524	2113743N50	100pF
C525	2113743N50	100pF
C526	2113743N50	100pF
C527	2113743N50	100pF
C528	2113743N50	100pF
C529	NOT PLACED	
CR101	4880973Z02	Pin diode
CR102	4802245J41	Pin diode
CR103	4802245J41	Pin diode
CR105	5185963A15	Temperature sensor
CR160	NOT PLACED	

Circuit Ref	Motorola Part No.	Description
CR201	4802233J09	Triple diode (SOT 25)
CR203	4862824C03	Varactor
CR241	4805649Q13	Varactor
CR242	4862824C01	Varactor
CR243	4862824C01	Varactor
CR251	4862824C01	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual common anode-cathode diode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad diode (SOT-143)
CR308	4802245J41	Pin diode
CR310	4862824C01	Varactor
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual common cathode diode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yellow
E101	2484657R01	Ferrite bead
E400	2480640Z01	Ferrite bead
E401	2480640Z01	Ferrite bead
E402	2480640Z01	Ferrite bead
E403	2480640Z01	Ferrite bead
E404	2480640Z01	Ferrite bead
E405	2480640Z01	Ferrite bead
E406	2480640Z01	Ferrite bead
E407	2480640Z01	Ferrite bead
E408	2480640Z01	Ferrite bead
E409	2480640Z01	Ferrite bead
F501	6580542Z01	3A fuse
FL201	4805875Z04	16.8MHz Xtal oscillator (not field serviceable)
FL301	4802245J43	Xtal Filter 45.1MHz
FL401	4870368G02	Xtal Oscillator 38.4kHz (not used in GP640 non-display)
H101	2680499Z01	Heat spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna nut
J403	0905505Y02	20-pin connector
L101	2460591B28	13.37nH
L102	2460591B28	13.37nH
L104	2460591B48	15.22nH
L105	2462587N22	390nH
L106	2460591A19	8.71nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L112	2462587N42	12nH, 5%
L113	2413926H09	5.6nH, 0.3

Circuit Ref	Motorola Part No.	Description
L114	2462587N42	12nH, 5%
L115	2462587N22	390nH
L116	2479990C02	16.28nH
L117	2409154M17	22nH
L160	2413926H14	15nH, 5%
L201	2462587Q20	2200nH, 20%
L202	2462587Q20	2200nH, 20%
L203	2462587Q20	2200nH, 20%
L232	2462587P25	12000nH, 5%
L241	2462587V41	390nH
L242	2462587V26	22nH, 5%
L243	2460593C03	Multi-layered Teflon resonator, Rx
L251	2462587V41	390nH
L253	2460593C03	Multi-layered Teflon resonator, Tx
L261	2462587V29	39nH, 5%
L271	2462587V27	27nH, 5%
L273	2462587V25	18nH, 5%
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990B01	11.03nH
L302	2479990B01	11.03nH
L303	2462587V26	22nH, 5%
L304	2462587V37	180nH, 5%
L305	2462587V23	12nH, 5%
L306	2479990B01	11.03nH
L307	2479990B01	11.03nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH, 5%
L311	2462587N65	750nH, 5%
L314	2462587N72	2200nH, 5%
L321	NOT PLACED	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH, 5%
L331	2480646Z20	2.2uH
L332	2462587N53	100nH, 5%
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	Ground contact finger
PB501	4080523Z01	Tactile switch, pushbutton
PB502	4080523Z01	Tactile switch, pushbutton
PB503	4080523Z01	Tactile switch, pushbutton
PB504	4080523Z01	Tactile switch, pushbutton
PB505	4080523Z01	Tactile switch, pushbutton
Q110	4813828A09	RF Power Amplifier
Q111	4802245J50	Dual NPN/PNP transistor

Circuit Ref	Motorola Part No.	Description
Q210	4802245J50	Dual NPN/PNP transistor
Q241	4805218N63	RF NPN transistor
Q260	4802245J50	Dual NPN/PNP transistor
Q261	4802245J50	Dual NPN/PNP transistor
Q301	4802245J44	NPN Transistor
Q302	4802245J44	NPN Transistor
Q310	NOT PLACED	
Q315	4880214G02	NPN Transistor
Q316	NOT PLACED	
Q320	4805218N63	RF NPN transistor
Q400	4809579E18	Mosfet P - channel
Q403	4813824A17	Bipolar Transistor, PNP
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	Mosfet P - channel (not used in GP640 non-display)
Q417	4802245J50	Dual NPN/PNP transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
R101	0662057A34	240
R102	0680539Z01	0.1
R104	0662057N15	47K
R106	0662057M26	10
R107	NOT PLACED	
R108	0662057M92	5600
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	NOT PLACED	
R136	0662057N47	1M
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R175	0662057B59	3
R176	0662057B59	3
R191	0662057C01	0
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R205	NOT PLACED	
R206	NOT PLACED	
R231	0662057M52	120
R232	0662057M69	620

Circuit Ref	Motorola Part No.	Description
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M52	120
R243	0662057M98	10K
R244	0662057N03	15K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M38	33
R252	0662057M60	270
R253	0662057M95	7500
R254	0662057M96	8200
R255	0662057M89	4300
R256	0662057M37	30
R260	0662057M74	1000
R281	NOT PLACED	
R300	0662057M82	2200
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M78	1500
R304	0662057N01	12K
R305	0662057M66	470
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M83	2400
R313	0662057M62	330
R314	0662057M85	3000
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1000
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1000
R321	0662057M83	2400
R322	0662057N30	200K
R324	0662057M81	2000
R325	0662057M94	6800
R326	NOT PLACED	
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R330	NOT PLACED	
R331	NOT PLACED	
R332	NOT PLACED	
R333	NOT PLACED	
R334	NOT PLACED	
R335	NOT PLACED	
R336	NOT PLACED	

Circuit Ref	Motorola Part No.	Description
R338	NOT PLACED	
R339	0662057M01	0
R340	0662057M96	8200
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1000
R348	0662057M87	3600
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3300
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	NOT PLACED	
R403	NOT PLACED	
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	NOT PLACED	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K, 1%
R415	0662057V26	91K, 1%
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10M (not used in GP640 non-display)
R421	0662057M81	2000
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K (not used in GP640 non-display)
R427	0662057M84	2700
R428	0662057M10	2.2
R429	0662057M98	10K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2000
R436	0662057M01	0
R437	NOT PLACED	
R445	0662057N08	24K
R447	0662057N23	100K

Circuit Ref	Motorola Part No.	Description
R448	0662057M98	10K
R449	0662057N08	24K
R450	0683962T45	68 ohms, 1W
R451	0662057N03	15K
R452	0662057N23	100K
R453	NOT PLACED	
R454	NOT PLACED	
R455	NOT PLACED	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4700
R461	0662057M56	180 (not used in GP640 non-display)
R462	0662057M98	10K (not used in GP640 non-display)
R463	0662057M61	300
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R477	0662057M74	1000
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT300	0680590Z01	THERMISTOR_33K
RT301	NOT PLACED	
RT400	0680590Z01	THERMISTOR_33K
S501	4080710Z01	Frequency switch
S502	1880619Z02	Volume/on-off switch
SH100	2680507Z01	Harmonic Filter shield
SH101	2680510Z01	RF PA shield
SH201	2680511Z01	Synthesizer top shield
SH202	2680511Z01	Synthesizer bottom shield
SH241	2680513Z01	Resonators shield
SH242	2680514Z01	VCO Buffer IC shield
SH301	2680554Z01	Receiver front end shield
SH302	2680555Z01	Receiver front end bottom shield
SH303	2680509Z01	Mixer shield
SH304	2680624Z01	Mixer diode shield
SH321	2680508Z01	LVZIF 2nd LO shield
SH322	2680514Z01	LVZIF shield
SH323	2680553Z01	Crystal Filter shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller on-off shield

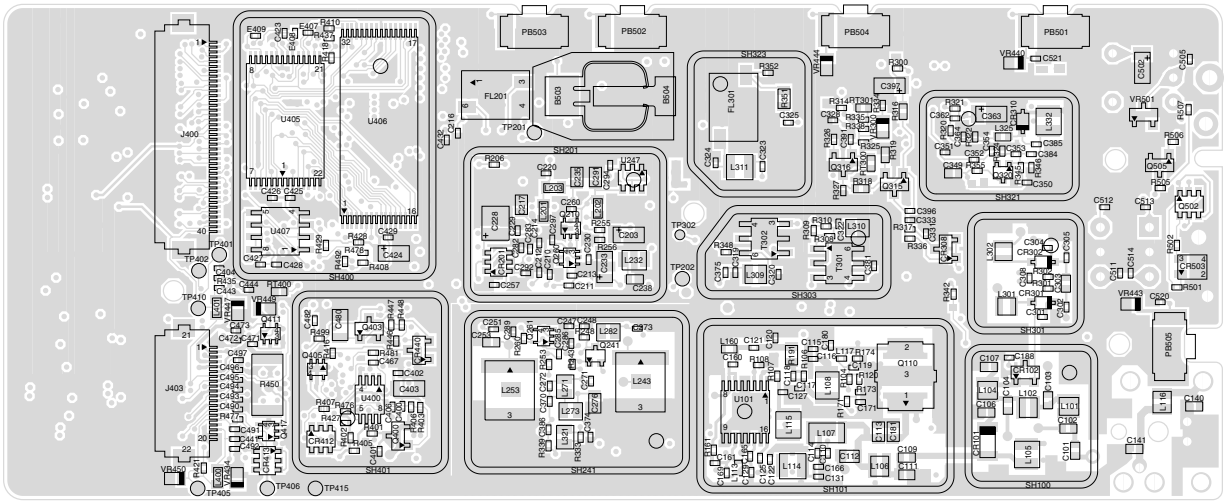
Circuit Ref	Motorola Part No.	Description
SH402	2680515Z01	Microprocessor shield
SH403	2680516Z01	Asfic_Cmp/Audio PA shield
T301	2580541Z02	Balun transformer
T302	2580541Z02	Balun transformer
U101	5185130C65	IC VHF/UHF/800 MHZ LDMOS DRIVER
U102	5185765B28	PCIC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO BUFFER IC
U247	5105739X05	SOT 5V Regulator
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF IC
U400	5102463J40	3.3V Regulator
U404	5185963A53	ASFIC_CMP IC
U405	5102463J36	Static Ram 31Kx8
U406	5102463J60	512Kx8 Flash Memory
U407	5102463J64	16K X 8 EEPROM
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Regulator (not used in GP640 non-display)
U420	5102463J44	Audio PA
VR300	NOT PLACED	
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J73	ZENER DIODE-6.8V
VR439	4880140L17	Zener diode-12V
VR440	4802245J73	ZENER DIODE-6.8V
VR441	4802245J73	ZENER DIODE-6.8V
VR442	4802245J73	ZENER DIODE-6.8V
VR443	4802245J73	ZENER DIODE-6.8V
VR444	4802245J73	ZENER DIODE-6.8V
VR445	4802245J53	ZENER DIODE-10V
VR446	4802245J74	ZENER DIODE-10V
VR447	4802245J74	ZENER DIODE-10V
VR448	4802245J74	ZENER DIODE-10V
VR449	4802245J74	ZENER DIODE-10V
VR450	4802245J75	ZENER DIODE-12V
VR460	4802245J73	ZENER DIODE-6.8V
VR501	4813830A18	6.8V Zener
VR506	4802245J73	ZENER DIODE-6.8V
Y201	NOT PLACED	
	8485641Z06	UHF B2 main PC board

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

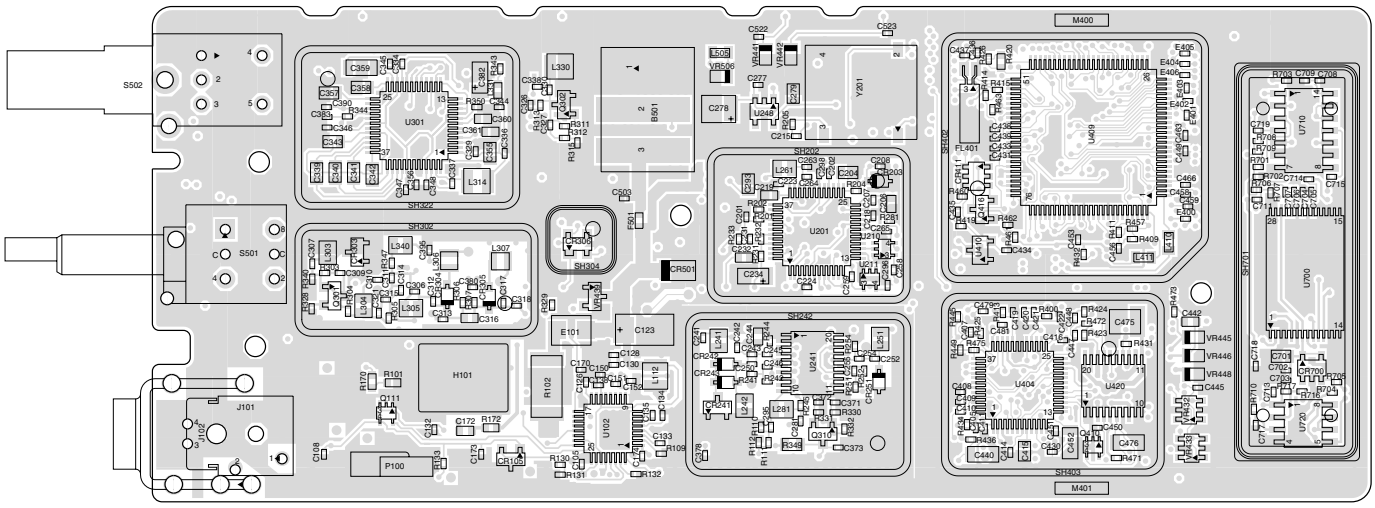
Note: Tolerance
Capacitor - 5% unless specified otherwise
Inductor - 10% unless specified otherwise
Resistor - 5% unless specified otherwise

6.0 UHF2 PCB 8485677Z02 (GP1280) Schematics

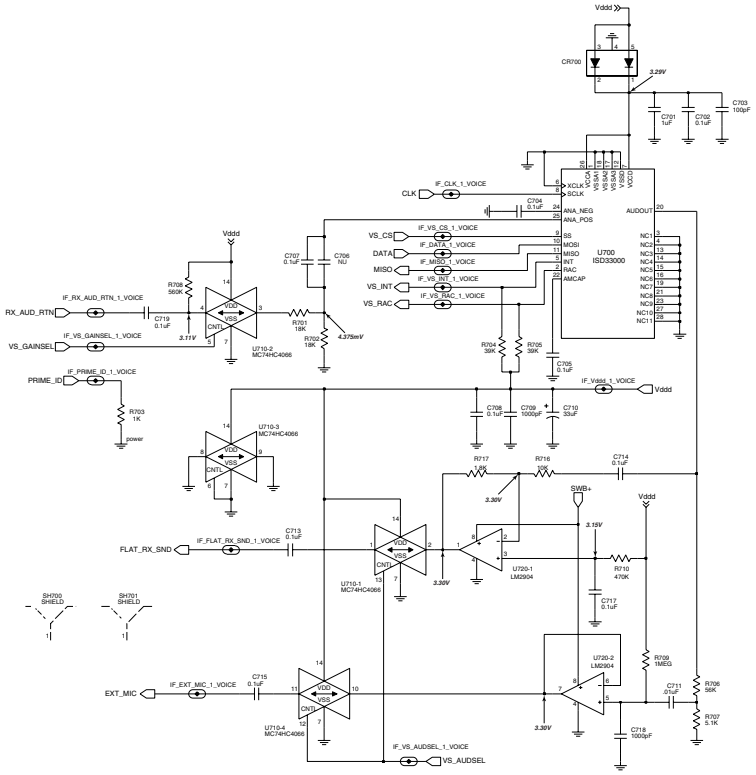


ZMY0130258-O

UHF2 (450-527 MHz) GP1280 Main Board Top Side



UHF2 (450-527 MHz) GP1280 Main Board Bottom Side



ZMY0130190-A

UHF2 (450-527 MHz) GP1280 - Voice Storage Schematic

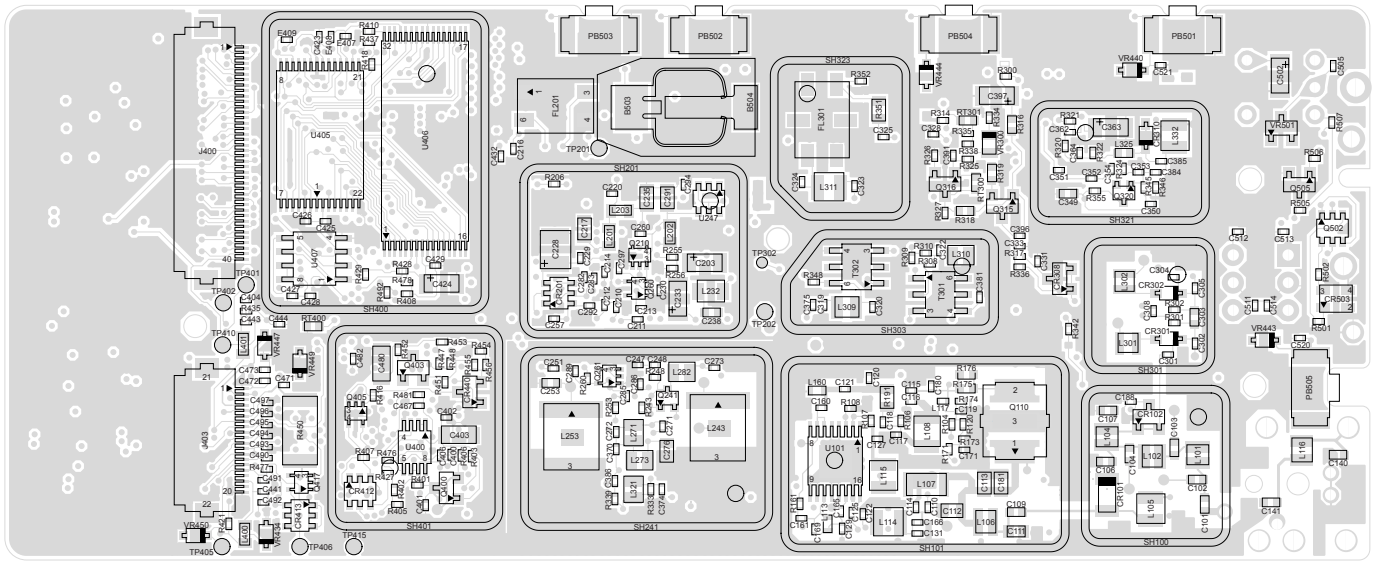
7.0 Voice Storage Parts List (GP1280)

Circuit Ref	Motorola Part No.	Description
C601	2311049A57	10uF
C602	2113743L41	.01uF
C603	2311049C07	100uF
C701	2180478Z20	1uF
C702	2113928N01	0.1uF
C703	2113743N50	100pF
C704	2113928N01	0.1uF
C705	2113928N01	0.1uF
C706	2113928N01	0.1uF
C707	2113928N01	0.1uF
C708	2113928N01	0.1uF
C709	2113743N50	100pF
C710	2311049A30	33uF
C711	2113928N01	0.1uF
C713	2113928N01	0.1uF
C714	2113928N01	0.1uF
C715	2113928N01	0.1uF
C716	2113928N01	0.1uF
C717	2180478Z20	1uF
C718	2180478Z20	1uF
CR601	4805129M76	
CR700	4802245J47	
L601	2480570Z01	68uH
R625	0662057M01	
R626	0662057M83	2.4K
R627	0662057M74	1K
R701	0662057N10	30K
R702	0662057M91	5.1K
R703	0662057N15	47K
R704	0662057N23	100K
R705	0662057N23	100K
R706	0662057N17	56K
R707	0662057M91	5.1K
R716	0662057N15	47K
R717	0662057N15	47K
U601	5105109Z74	LM2675
U700	5102463J53	ISD33000
U710	5102463J52	MC74HC4066
U720	5180932W01	LM2904

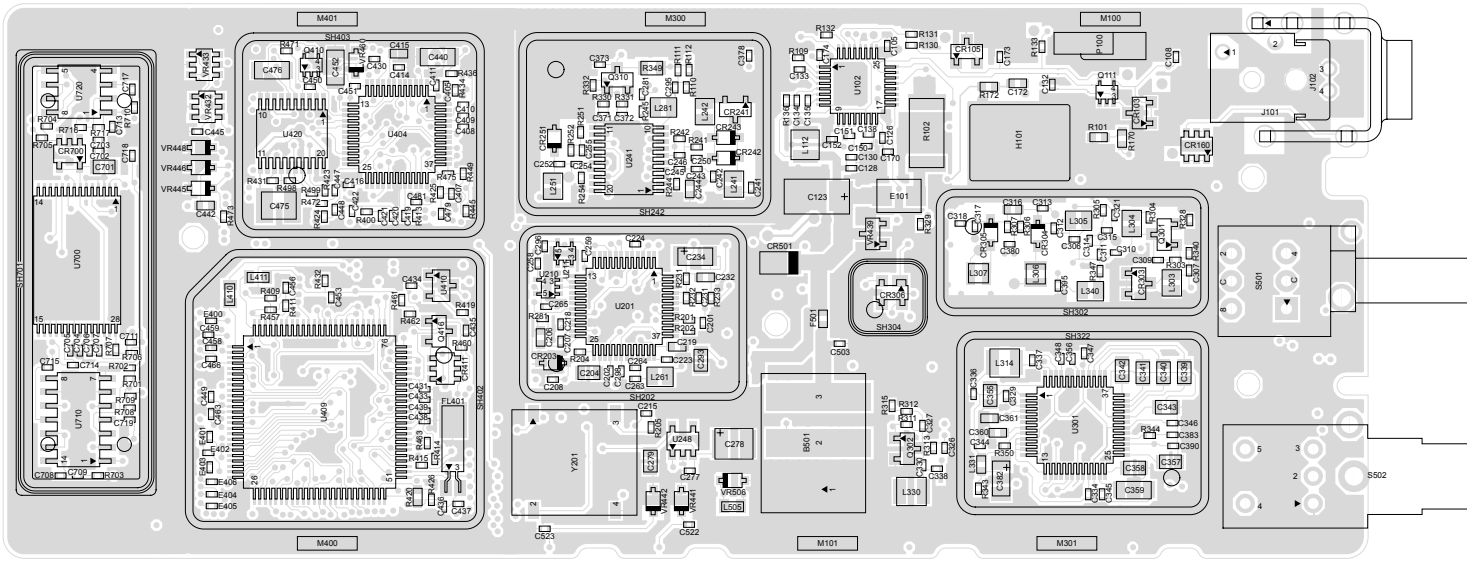
* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

8.0 UHF2 PCB 8485677Z03 (GP1280) Schematics



UHF2 (450-527 MHz) GP1280 Main Board Top Side



UHF2 (450-527 MHz) GP1280 Main Board Bottom Side

9.0 UHF2 PCB 8485677Z03 (GP1280) Parts List

Circuit Ref.	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup Contact, B +
B504	3980501Z01	Backup Contact, B -
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F28	11pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2103689A22	11pF
C112	2180605Z28	33pF
C113	2180605Z20	15pF
C114	2113743N50	100pF
C115	2113743N31	16pF
C116	2113743N27	11pF
C117	NOTPLACED	
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N23	7.5pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A96	33uF
C125	2113743N50	100pF
C126	2113743M24	100000pF
C127	2113743L17	1000pF
C128	2113743M08	22000pF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	22000pF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	22000pF
C138	2113743N50	100pF
C140	0662057A67	5600pF
C141	2113740F25	8.2pF
C150	2113743M08	22000pF
C151	2113743N50	100pF
C152	2113743M08	22000pF
C160	2113743N44	56pF
C161	2113743M24	100000pF
C165	2113743N44	56pF
C166	2113743N50	100pF
C169	2113743N09	2pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113743E20	0.1uF
C173	2113743M08	22000pF
C174	2113743N50	100pF
C180	NOTPLACED	
C181	NOTPLACED	
C188	2113743N39	36pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	NOTPLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C215	NOTPLACED	
C216	NOTPLACED	
C217	2104993J02	2.2uF
C218	2113743M24	100000pF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	100000pF
C224	2113743M24	100000pF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	100000pF
C232	2113743E12	0.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N17	4.3pF
C243	2113743N17	4.3pF
C244	2113740F14	3.0pF
C245	2113743N12	2.7pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF
C250	2113743N17	4.3pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N26	10pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	10000pF
C259	2113743L41	10000pF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	NOTPLACED	
C271	2113743N03	1pF
C272	2113743N04	1.1pF
C273	2113743M24	100000pF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A57	10uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C282	NOTPLACED	
C283	NOTPLACED	
C285	2113743N50	100pF
C286	2113743M24	100000pF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	100000pF
C293	2113743A27	0.470uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF
C297	2113743L41	10000pF
C298	2113743M24	100000pF
C301	2113743N24	8.2pF
C302	2113743N28	12pF
C303	2113740L09	4.3pF
C304	2113743N27	11pF
C305	2113743N24	8.2pF
C306	NOTPLACED	
C307	2113743M24	100000pF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	100000pF
C311	NOTPLACED	
C312	2113743N23	7.5pF
C313	2113743N27	11pF
C314	2113743M24	100000pF
C315	2113743N50	100pF
C316	2113740L09	4.3pF
C317	2113743N27	11pF
C318	2113743N23	7.5pF
C319	2113743N15	3.6pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF

Circuit Ref.	Motorola Part No.	Description
C324	2113743N33	20pF
C325	2113743L41	10000pF
C326	2113743L41	10000pF
C327	2113743N50	100pF
C328	2113743M24	100000pF
C329	2113743M24	100000pF
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	NOTPLACED	
C334	2113743M08	22000pF
C336	2113743M24	100000pF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1uF
C340	2180478Z20	1uF
C341	2180478Z20	1uF
C342	2180478Z20	1uF
C343	2113743A23	0.22uF
C344	2113743M24	100000pF
C345	2113743M24	100000pF
C346	2113743M24	100000pF
C347	2113743M24	100000pF
C348	2113743M24	100000pF
C349	2113743E07	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.33uF
C356	2113743M08	22000pF
C357	2113743A23	0.22uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	0.022uF
C361	2113741F49	10000pF
C362	2113743M08	22000pF
C363	2311049A40	2.2uF

Circuit Ref.	Motorola Part No.	Description
C364	2113743L41	10000pF
C370	2113743N50	100pF
C371	NOTPLACED	
C372	NOTPLACED	
C373	NOTPLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOTPLACED	
C380	2113743L41	10000pF
C381	2113743N18	4.7pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	NOTPLACED	
C395	2113743N50	100pF
C396	NOTPLACED	
C397	2311049A07	1uF
C400	2113743L41	10000pF
C4001	NOTPLACED	
C4002	NOTPLACED	
C4003	NOTPLACED	
C4004	NOTPLACED	
C4005	NOTPLACED	
C4007	NOTPLACED	
C4008	NOTPLACED	
C4009	NOTPLACED	
C401	2113743M24	100000pF
C4010	NOTPLACED	
C4011	NOTPLACED	
C4012	NOTPLACED	
C4013	NOTPLACED	
C4014	NOTPLACED	
C4015	NOTPLACED	
C4016	NOTPLACED	
C402	2113743M24	100000pF

Circuit Ref.	Motorola Part No.	Description
C403	2113743G24	2.2uF
C404	NOTPLACED	
C405	2113743N50	100pF
C406	NOTPLACED	
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	100000pF
C410	2113743M08	CAP CHIP 22000PF +80-20% Y5V
C411	2113743M24	100000pF
C414	2113743M24	100000pF
C415	2185895Z01	0.01uF
C416	2113928N01	0.1uF
C419	NOTPLACED	
C420	2113743L41	10000pF
C421	2113928N01	0.1uF
C422	2113743M24	100000pF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	100000pF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF
C429	2113743M24	100000pF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	NOTPLACED	
C433	2113743L41	10000pF
C434	2113928N01	0.1uF
C435	2113743M24	100000pF
C436	2113743N34	22pF
C437	2113743N34	22pF
C438	2113743L17	1000pF
C439	2113743L17	1000pF
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	0.1uF
C443	2113928N01	0.1uF

Circuit Ref.	Motorola Part No.	Description
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C450	NOTPLACED	
C451	2113743M08	22000pF
C452	2113743B29	1uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF

Circuit Ref.	Motorola Part No.	Description
C514	2113743N50	100pF
C520	2113743L41	10000pF
C521	2113743L41	10000pF
C522	2113743L41	10000pF
C523	2113743L41	10000pF
C601	NOTPLACED	
C602	NOTPLACED	
C603	NOTPLACED	
C701	2180478Z20	1uF
C702	2113928N01	0.1uF
C703	2113743N50	100pF
C704	2113928N01	0.1uF
C705	2113928N01	0.1uF
C706	NOTPLACED	
C707	2113928N01	0.1uF
C708	2113928N01	0.1uF
C709	2113743L17	1000pF
C711	2113743L41	10000pF
C713	2113928N01	0.1uF
C714	2113928N01	0.1uF
C715	2113928N01	0.1uF
C717	2113928N01	0.1uF
C718	2113743L17	1000pF
C719	2113928N01	0.1uF
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR103	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sensor
CR160	NOTPLACED	
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor
CR241	4805649Q13	Varactor
CR242	4862824C01	Varactor
CR243	4862824C01	Varactor
CR251	4802245J22	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual Schottky Diode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad Diode
CR308	4802245J41	Pin Diode
CR310	4862824C01	Varactor
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual Common Cathode Diode
CR501	4880107R01	Rectifier
CR503	4805729G49	Red/Yellow LED
CR601	NOTPLACED	
CR700	4802245J47	Diode Schottky
E101	2484657R01	FERRITE BEAD
E400	2480640Z01	FERRITE BEAD
E401	2480640Z01	FERRITE BEAD
E402	2480640Z01	FERRITE BEAD
E403	2480640Z01	FERRITE BEAD
E404	2480640Z01	FERRITE BEAD
E405	2480640Z01	FERRITE BEAD
E406	2480640Z01	FERRITE BEAD
E407	2480640Z01	FERRITE BEAD
E408	2480640Z01	FERRITE BEAD
E409	2480640Z01	FERRITE BEAD
F501	6580542Z01	Fuse 3A
FL201	4805875Z04	16.8 MHZ Xtal Filter
FL301	9186153B01	Xtal Filter 45.1MHz
FL401	4870368G02	Real Time Clock Xtal Oscillator 38.4kHz
H101	2680499Z01	Heat Spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-Pin Connector
J403	0905505Y02	20-Pin Connector
L101	2460591B28	13.37nH
L102	2460591B28	13.37nH
L104	2460591B48	15.22nH
L105	2462587N22	390nH
L106	2460591A19	8.71nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L112	2462587N42	12nH
L113	2413926H09	5.6nH
L114	2462587N42	12nH
L115	2462587N22	390nH
L116	2479990C02	16.28nH
L117	2409154M17	22nH
L160	2413926H14	15nH
L201	2462587Q20	2,200nH
L202	2462587Q20	2,200nH
L203	2462587Q20	2,200nH
L232	2462587P25	12000nH
L241	2462587V41	390nH
L242	2462587V26	22nH
L243	2485776Z02	RESONATOR
L251	2462587V41	390nH
L253	2460593C03	RESONATOR
L261	2462587V29	39nH
L271	2462587V27	27nH
L273	2462587V25	18nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990B01	11.03nH
L302	2479990B01	11.03nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V23	12nH
L306	2479990B01	11.03nH
L307	2479990B01	11.03nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2200nH
L321	NOTPLACED	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH
L331	2480646Z20	2.2uH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
L601	NOTPLACED	
P100	3905643V01	Ground Contact Finger
PB501	4080523Z02	Tactile Switch
PB502	4080523Z02	Tactile Switch
PB503	4080523Z02	Tactile Switch
PB504	4080523Z02	Tactile Switch
PB505	4080523Z02	Tactile Switch
Q110	4813828A09	RF PA
Q111	4809939C05	DUAL NPN/PNP Transistor
Q210	4809939C05	DUAL NPN/PNP Transistor
Q241	4805218N63	RF NPN Transistor
Q260	4809939C05	DUAL NPN/PNP Transistor
Q261	4809939C05	DUAL NPN/PNP Transistor
Q301	4802245J44	NPN Transistor
Q302	4802245J44	NPN Transistor
Q310	NOTPLACED	
Q315	4880214G02	NPN Transistor
Q316	NOTPLACED	
Q320	4805218N63	RF NPN Transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	MOSFET P-Channel
Q417	4809939C05	DUAL NPN/PNP Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
R101	0662057A34	240
R102	0680539Z01	0.1

Circuit Ref.	Motorola Part No.	Description
R104	0662057N15	47K
R106	0662057M26	10
R107	NOTPLACED	
R108	0662057M92	5.6K
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	NOTPLACED	
R136	NOTPLACED	
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R175	0662057B59	3
R176	0662057B59	3
R191	0662057C01	0
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R205	NOTPLACED	
R206	NOTPLACED	
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M52	120
R243	0662057M98	10K
R244	0662057N03	15K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M38	33
R252	0662057M60	270
R253	0662057M95	7.5K
R254	0662057M96	8.2K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R281	NOTPLACED	
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M78	1.5K
R304	0662057N01	12K
R305	0662057M66	470
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M83	2.4K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R326	NOTPLACED	
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R330	NOTPLACED	
R331	NOTPLACED	
R332	NOTPLACED	
R333	NOTPLACED	
R334	NOTPLACED	
R335	NOTPLACED	
R336	NOTPLACED	
R338	NOTPLACED	
R339	0662057M01	0
R340	0662057M96	8.2K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	NOTPLACED	
R403	NOTPLACED	
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	NOTPLACED	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10M
R421	0662057M81	2K
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K
R427	0662057M84	2.7K
R428	0662057M10	2.2
R429	0662057M98	10K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2K
R436	0662057M95	7500
R437	NOTPLACED	
R445	0662057N08	24K
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R450	0683962T45	68
R451	0662057N03	15K
R452	0662057N23	100K
R453	NOTPLACED	
R454	NOTPLACED	
R455	NOTPLACED	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057M56	180
R462	0662057M98	10K
R463	0662057M61	300
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N35	330K
R477	0662057M74	1K
R478	0662057M98	10K
R481	0662057N08	24K

Circuit Ref.	Motorola Part No.	Description
R492	0662057M01	0
R498	0662057M98	10K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R625	NOTPLACED	
R626	NOTPLACED	
R627	NOTPLACED	
R701	0662057N05	18K
R702	0662057N05	18K
R703	0662057M74	1K
R704	0662057N13	39K
R705	0662057N13	39K
R706	0662057N17	56K
R707	0662057M91	5.1K
R708	0662057N41	560K
R709	0662057N47	1M
R710	0662057N39	470K
R716	0662057N01	12K
R717	0662057M82	2.2K
RT300	0680590Z01	THERMISTOR_33K
RT301	NOTPLACED	
RT400	0680590Z01	THERMISTOR_33K
S501	4080710Z02	Frequency Switch
S502	1880619Z02	Volume / On-off Switch
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthesizer Top Shield
SH202	2680511Z01	Synthesizer Bottom Shield
SH241	2680513Z01	VCO Resonators Shield
SH242	2680514Z01	VCO Buffer IC Shield
SH301	2680554Z01	Receiver Front-End Shield
SH302	2680555Z01	Receiver Back-End Bottom Shield
SH303	2680509Z01	Mixer Shield

Circuit Ref.	Motorola Part No.	Description
SH304	2680624Z01	Mixer Diode Shield
SH321	2680508Z01	LVZIF 2nd LO Shield
SH322	2680514Z01	LVZIF Shield
SH323	2680553Z01	Crystal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On-off Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	Asfic_Cmp, Audio PA Shield
SH701	2680677Z01	Voice Storage Shield
T301	2580541Z02	Balun Transformer
T302	2580541Z02	Balun Transformer
U101	5185130C65	LDMOS PA Driver
U102	5185765B26	PCIC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer IC
U247	5105739X05	5V Regulator
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF IC
U400	5102463J40	3.3V Regulator
U404	5185130C53	ASFIC_CMP IC
U405	5102463J36	Static RAM_32K X 8
* U406	5102463J60	Flash ROM_512K X 8
* U407	5102495J05	EEPROM_16K X 8
U409	5102226J56	Micro Processor
U410	5102463J57	3.3V Regulator
U420	5102463J44	Audio PA
U601	NOTPLACED	
U700	5185770M01	IC VOICE STORAGE 2 MIN
U710	5102463J52	QUAD ANALOG SWITCH IC
U720	5113818A01	SING Supply IC
VR300	NOTPLACED	
VR432	4805656W08	Zener Diode
VR433	4805656W08	Zener Diode
VR434	4802245J73	Zener Diode 6.8V
VR439	4880140L17	Zener Diode
VR440	4802245J73	Zener Diode 6.8V

Circuit Ref.	Motorola Part No.	Description
VR441	4802245J73	Zener Diode 6.8V
VR442	4802245J73	Zener Diode 6.8V
VR443	4802245J73	Zener Diode 6.8V
VR444	4802245J73	Zener Diode 6.8V
VR445	4802245J74	Zener Diode 10V
VR446	4802245J74	Zener Diode 10V
VR447	4802245J74	Zener Diode 10V
VR448	4802245J74	Zener Diode 10V
VR449	4802245J74	Zener Diode 10V
VR450	4802245J75	Zener Diode 12V
VR460	4802245J73	Zener Diode 6.8V
VR501	4813830A18	DIODE 6.8V
VR506	4802245J73	Zener Diode 6.8V

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

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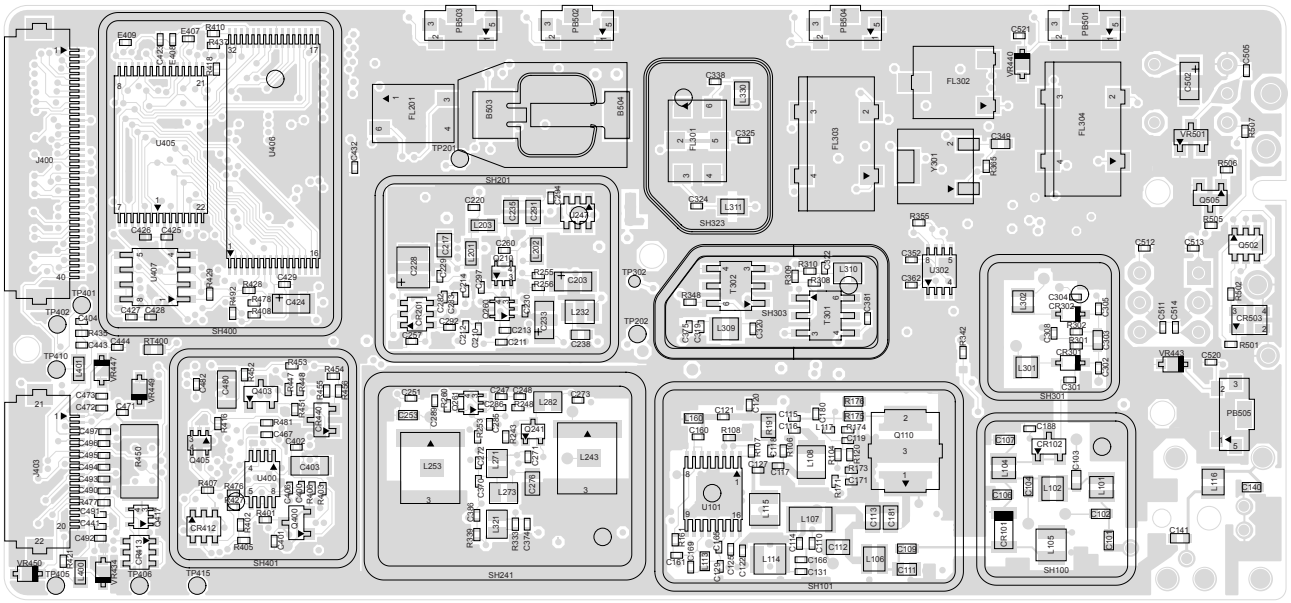
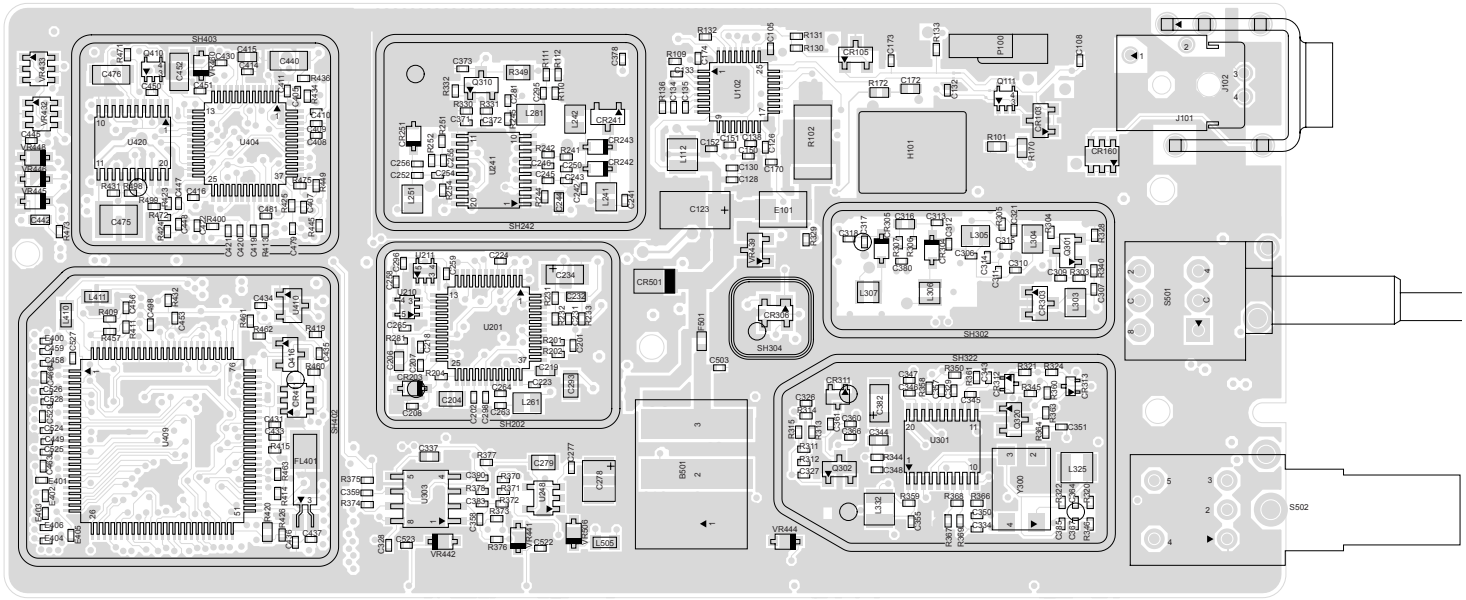
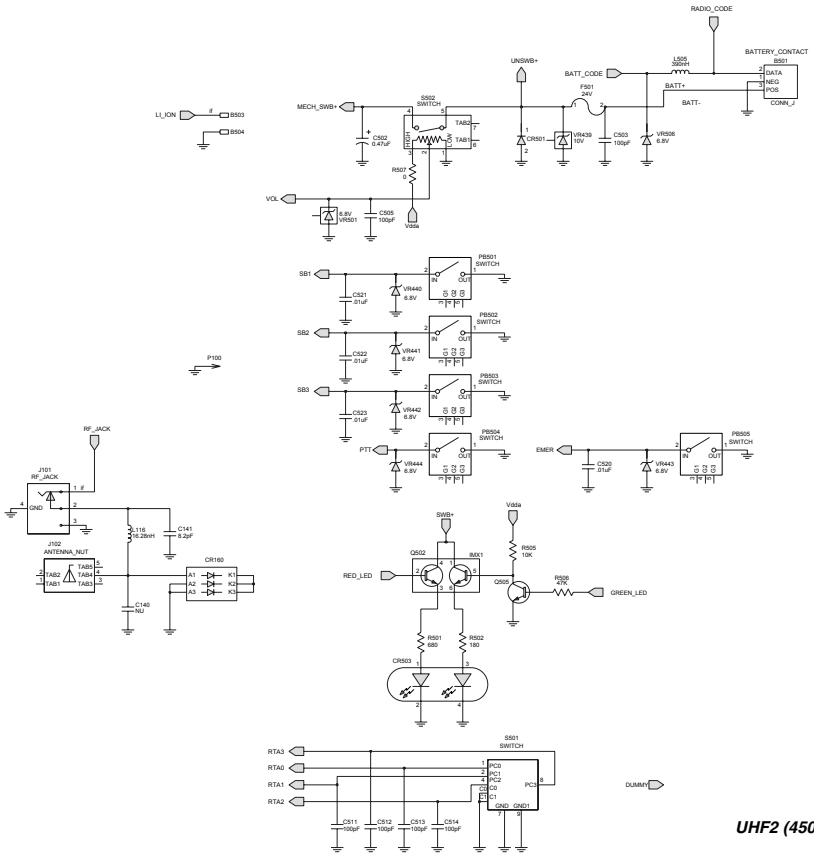
10.0 UHF2 PCB 8486686Z02 Schematics



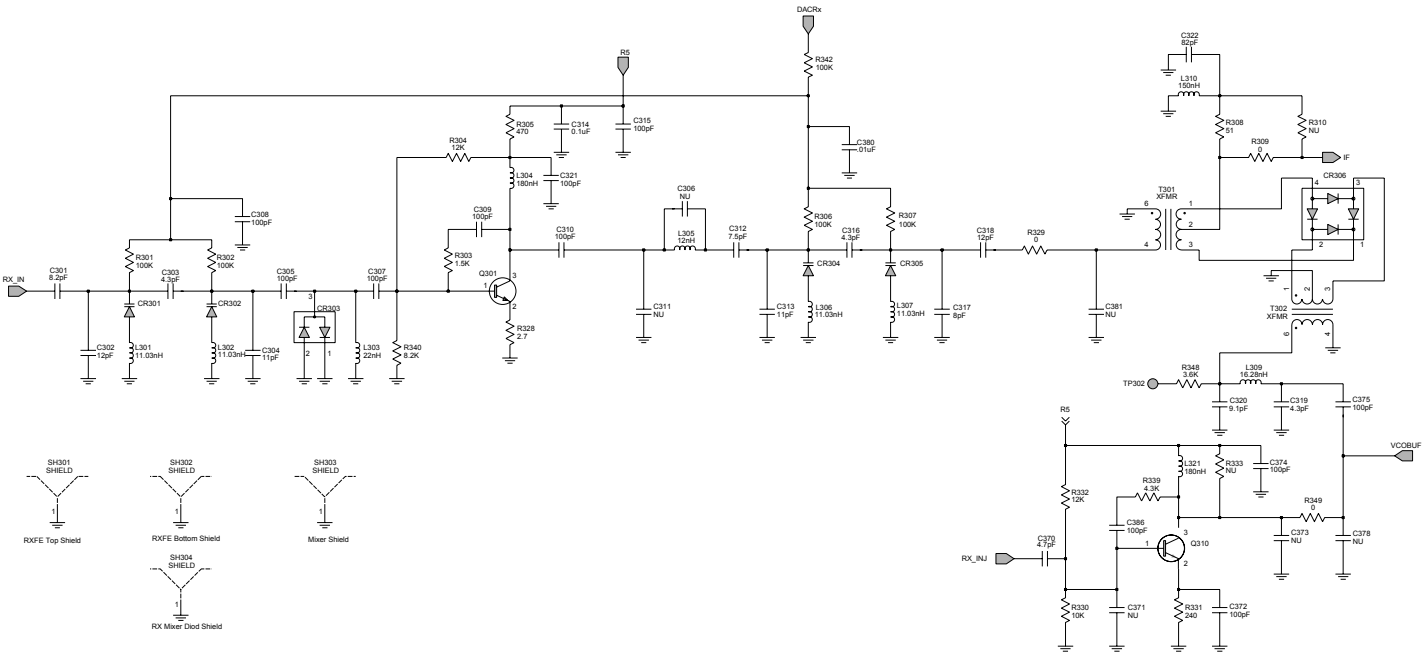
UHF2 (450-527MHz) Main Board Top Side



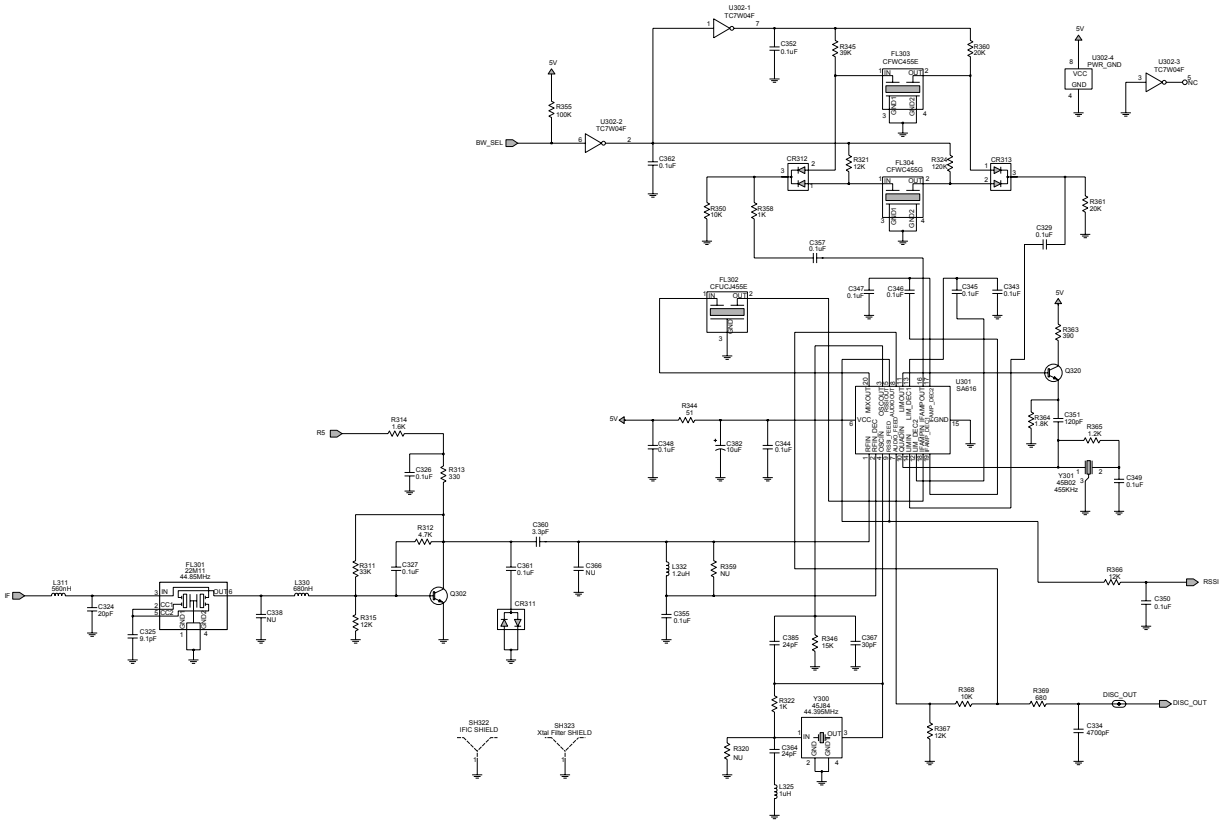
UHF2 (450-527 MHz) Main Board Bottom Side



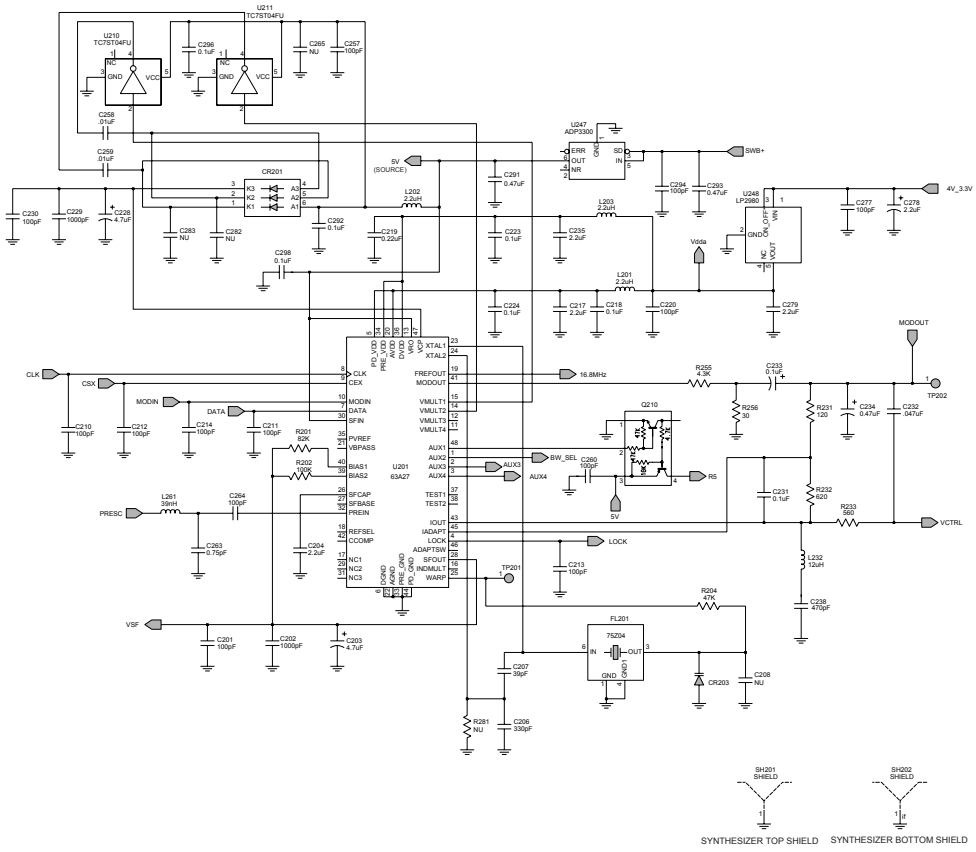
UHF2 (450-527 MHz) Controls and Switches



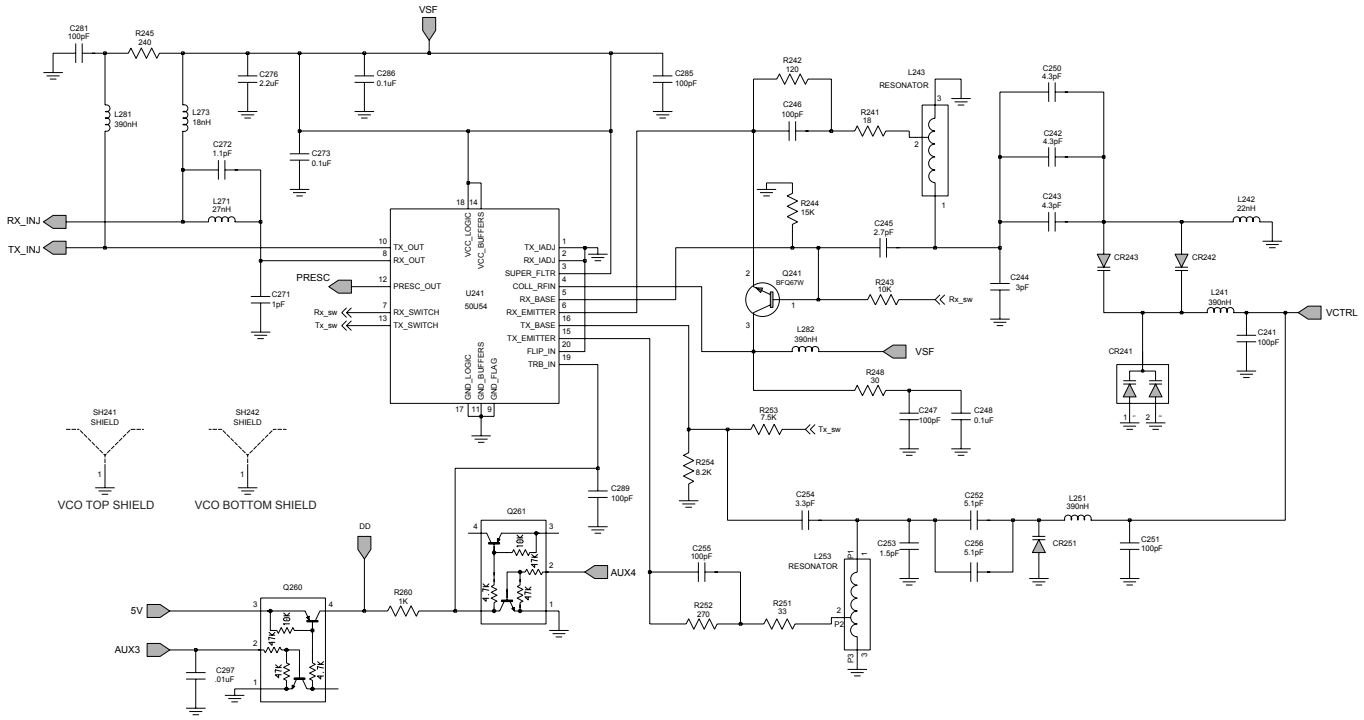
UHF2 (450-527 MHz) Receiver Front End



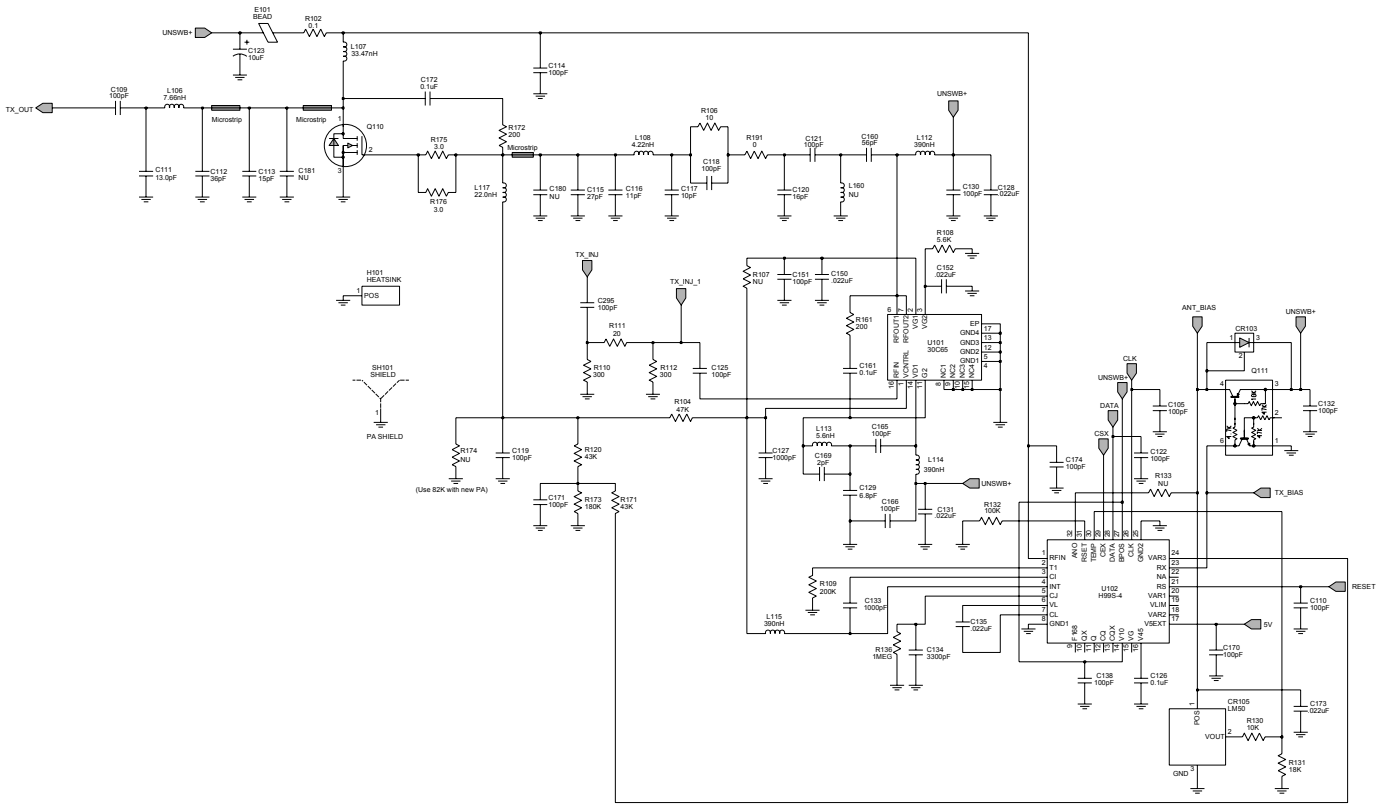
UHF2 (450-527 MHz) Receiver Back End



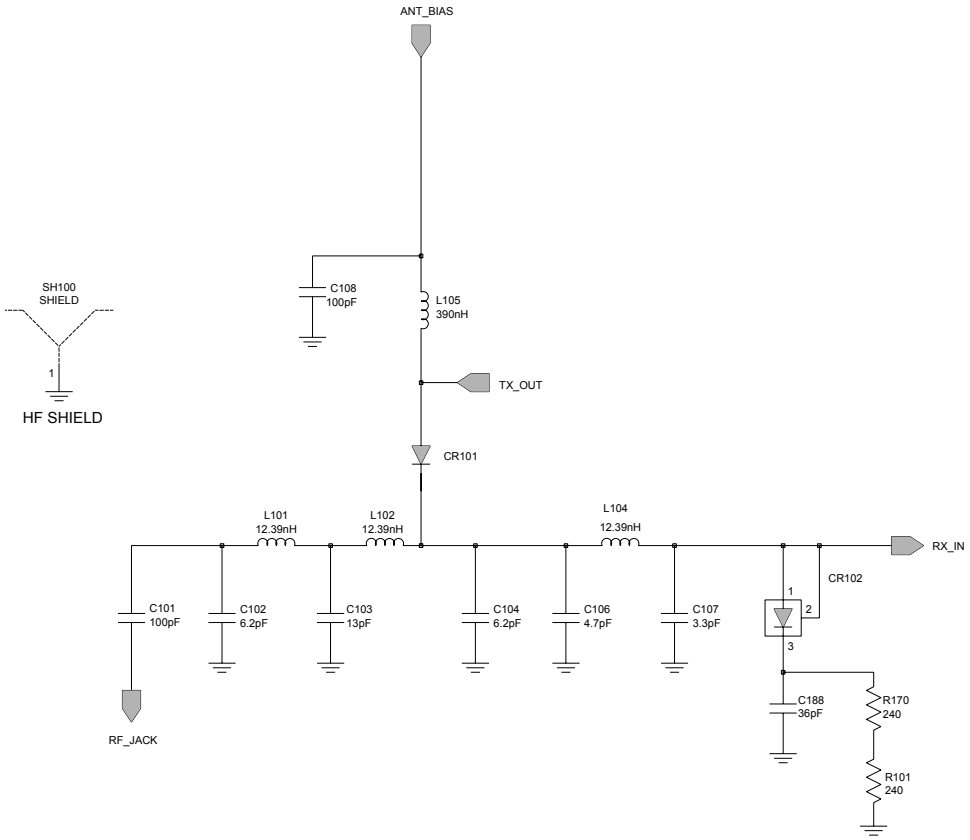
UHF2 (450-527 MHz) Synthesizer



UHF2 (450-527 MHz) Voltage Controlled Oscillator



UHF2 (450-527 MHz) Transmitter



UHF2 (450-527 MHz) Harmonic Filter

11.0 UHF PCB 8486686Z02 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup Contact, B + (not placed in GP640)
B504	3980501Z01	Backup Contact, B - (not placed in GP640)
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F28	11pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2103689A22	11pF
C112	2180605Z28	33pF
C113	2180605Z20	15pF
C114	2113743N50	100pF
C115	2113743N31	16pF
C116	2113743N27	11pF
C117	NOTPLACED	
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N23	7.5pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A96	33uF
C125	2113743N50	100pF
C126	2113743M24	100000pF
C127	2113743L17	1000pF
C128	2113743M08	22000pF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	22000pF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	22000pF
C138	2113743N50	100pF
C140	0662057A67	5600
C141	2113740F25	8.2pF
C150	2113743M08	22000pF
C151	2113743N50	100pF
C152	2113743M08	22000pF
C160	2113743N44	56pF
C161	2113743M24	100000pF
C165	2113743N44	56pF
C166	2113743N50	100pF
C169	2113743N09	2pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113743E20	0.1uF
C173	2113743M08	22000pF
C174	2113743N50	100pF
C180	NOTPLACED	
C181	NOTPLACED	
C188	2113743N39	36pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	NOTPLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	100000pF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	100000pF
C224	2113743M24	100000pF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	100000pF
C232	2113743E12	0.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N17	4.3pF
C243	2113743N17	4.3pF
C244	2113740F14	3pF
C245	2113743N12	2.7pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF
C250	2113743N17	4.3pF
C251	2113743N50	100pF
C252	2113743N19	5.1pF
C253	2113740F09	1.8pF
C254	2113743N26	10pF
C255	2113743N50	100pF
C256	2113743N19	5.1pF
C257	2113743N50	100pF
C258	2113743L41	10000pF
C259	2113743L41	10000pF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	NOTPLACED	
C271	NOTPLACED	
C272	2109445U01	0.5pF
C273	2113743M24	100000pF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A57	10uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C282	NOTPLACED	
C283	NOTPLACED	
C285	2113743N50	100pF
C286	2113743M24	100000pF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	100000pF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF
C297	2113743L41	10000pF
C298	2113743M24	100000pF
C301	2113743N24	8.2pF
C302	2113743N28	12pF
C303	2113740L09	4.3pF
C304	2113743N27	11pF
C305	2113743N50	100pF
C306	NOTPLACED	
C307	2113743N50	100pF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743N50	100pF
C311	NOTPLACED	
C312	2113743N23	7.5pF
C313	2113743N27	11pF
C314	2113743M24	100000pF
C315	2113743N50	100pF
C316	2113740L09	4.3pF
C317	2113743N65	8pF
C318	2113743N28	12pF
C319	2113743N17	4.3pF
C320	2113743N25	9.1pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C324	2109445U40	20pF
C325	2109445U26	9.1pF
C326	2113743M24	100000pF
C327	2113743M24	100000pF
C328	2113743M24	100000pF
C329	2113743M24	100000pF
C334	2113743L33	4700pF
C337	NOTPLACED	
C338	NOTPLACED	
C343	2113743M24	100000pF
C344	2113743E20	0.1uF
C345	2113743M24	100000pF
C346	2113743M24	100000pF
C347	2113743M24	100000pF
C348	2113743M24	100000pF
C349	2113743E20	0.1uF
C350	2113743M24	100000pF
C351	2113743N52	120pF
C352	2113743M24	100000pF
C355	2113743M24	100000pF
C357	2113743M24	100000pF
C358	NOTPLACED	
C359	NOTPLACED	
C360	2113743N14	3.3pF
C361	2113743M24	100000pF
C362	2113743M24	100000pF
C364	2113743N35	24pF
C366	NOTPLACED	
C367	2113743N37	30pF
C370	2109445U18	4.3pF
C371	NOTPLACED	
C372	2113743N50	100pF
C373	NOTPLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOTPLACED	
C380	2113743L41	10000pF
C381	NOTPLACED	
C382	2311049A59	10uF
C383	NOTPLACED	
C385	2113743N35	24pF
C386	2113743N50	100pF
C390	NOTPLACED	
C400	2113743L41	10000pF
C401	2113743M24	100000pF
C402	2113743M24	100000pF
C403	2113743G24	2.2uF
C404	NOTPLACED	
C405	2113743N50	100pF
C406	NOTPLACED	
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	100000pF

Circuit Ref	Motorola Part No.	Description
C410	2113928N01	0.1uF
C411	2113743M24	100000pF
C414	2113743M24	100000pF
C415	2185895Z01	0.01uF
C416	2113928N01	0.1uF
C419	NOTPLACED	
C420	2113743L41	10000pF
C421	2113928N01	0.1uF
C422	2113743M24	100000pF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	100000pF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF
C429	2113743M24	100000pF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	NOTPLACED	
C433	2113743L41	10000pF
C434	2113928N01	0.1uF (not placed in GP640)
C435	2113743M24	100000pF
C436	2113743N34	22pF (not placed in GP640)
C437	2113743N34	22pF (not placed in GP640)
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	0.1uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C450	NOTPLACED	
C451	2113743M08	22000pF
C452	2113743B29	1uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF

Circuit Ref	Motorola Part No.	Description
C482	2113928N01	0.1uF
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C498	NOTPLACED	
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	10000pF
C521	2113743L41	10000pF
C522	2113743L41	10000pF
C523	2113743L41	10000pF
C524	2113743N50	100pF
C525	2113743N50	100pF
C526	2113743N50	100pF
C527	2113743N50	100pF
C528	2113743N50	100pF
C529	2113743N50	100pF
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR103	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sensor
CR160	NOTPLACED	
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor
CR241	4805649Q13	Varactor
CR242	4862824C01	Varactor
CR243	4862824C01	Varactor
CR251	4802245J22	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual Schottky Diode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad Diode
CR311	4813825A19	Diode Schottky
CR312	4802245J97	Switch Diode
CR313	4802245J97	Switch Diode
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual Common Cathode Diode

Circuit Ref	Motorola Part No.	Description
CR501	4880107R01	Rectifier
CR503	4805729G49	Red/Yellow LED
E101	2484657R01	Ferrite Bead
E400	2480640Z01	Ferrite Bead
E401	2480640Z01	Ferrite Bead
E402	2480640Z01	Ferrite Bead
E403	2480640Z01	Ferrite Bead
E404	2480640Z01	Ferrite Bead
E405	2480640Z01	Ferrite Bead
E406	2480640Z01	Ferrite Bead
E407	2480640Z01	Ferrite Bead
E408	2480640Z01	Ferrite Bead
E409	2480640Z01	Ferrite Bead
F501	6580542Z01	Fuse 3A
FL201	4805875Z04	16.8 MHz Xtal Filter
FL301	9180022M11	Xtal Filter 44.85MHz
FL302	9180468V05	455kHz 4-pole ceramic filter
FL303	9180469V05	455kHz 6-pole ceramic filter
FL304	9180469V03	455kHz 6-pole ceramic filter
FL401	4870368G02	Real Time Clock Xtal Oscillator 38.4kHz (not placed in GP640)
H101	2680499Z01	Heat Spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-Pin Connector
J403	0905505Y02	20-Pin Connector
L101	2460591B28	13.37nH
L102	2460591B28	13.37nH
L104	2460591B48	15.22 nH
L105	2462587N22	390nH
L106	2460591A19	8.71nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L112	2462587N42	12nH
L113	2413926H09	5.6nH
L114	2462587N42	12nH
L115	2462587N22	390nH
L116	2479990C02	16.28nH
L117	2409154M17	22nH
L160	2413926H14	15nH
L201	2462587Q20	2200nH
L202	2462587Q20	2200nH
L203	2462587Q20	2200nH
L232	2462587P25	12000nH
L241	2462587V41	390nH
L242	2462587V26	22nH
L243	2485776Z02	Multi-layered Teflon resonator, Rx
L251	2462587V41	390nH
L253	2460593C03	Multi-layered Teflon resonator, Tx

Circuit Ref	Motorola Part No.	Description
L261	2462587V29	39nH
L271	2462587V27	27nH
L273	2462587V32	68nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990B01	11.03nH
L302	2479990B01	11.03nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V23	12nH
L306	2479990B01	11.03nH
L307	2479990B01	11.03nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2413926K32	560nH
L321	2462587V37	180nH
L325	2462587N68	1000nH
L330	2413926K33	680nH
L332	2413923A25	1200nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	Ground Contact Finger
PB501	4086470Z01	Tactile Switch
PB502	4086470Z01	Tactile Switch
PB503	4086470Z01	Tactile Switch
PB504	4086470Z01	Tactile Switch
PB505	4086470Z01	Tactile Switch
Q110	4813828A09	RF PA
Q111	4809939C05	Dual NPN/PNP Transistor
Q210	4809939C05	Dual NPN/PNP Transistor
Q241	4805218N63	RF NPN Transistor
Q260	4809939C05	Dual NPN/PNP Transistor
Q261	4809939C05	Dual NPN/PNP Transistor
Q301	4802245J44	NPN Transistor
Q302	4802197J95	NPN Transistor
Q310	4802245J44	NPN Transistor
Q320	4813824A10	RF NPN transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	MOSFET P-Channel (not placed in GP640)
Q417	4809939C05	DUAL NPN/PNP Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
R101	0662057A34	240
R102	0680539Z01	0.1

Circuit Ref	Motorola Part No.	Description
R104	0662057N15	47K
R106	0662057M26	10
R107	NOTPLACED	
R108	0662057M92	5600
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	NOTPLACED	
R136	NOTPLACED	
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R175	0662057B59	3
R176	0662057B59	3
R191	0662057C01	0
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M34	22
R242	0662057M52	120
R243	0662057M98	10K
R244	0662057N03	15K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M38	33
R252	0662057M60	270
R253	0662057M95	7500
R254	0662057M96	8200
R255	0662057M89	4300
R256	0662057M37	30
R260	0662057M74	1000
R281	NOTPLACED	
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M78	1500
R304	0662057N01	12K
R305	0662057M66	470
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M43	51

Circuit Ref	Motorola Part No.	Description
R309	0662057M01	0
R310	NOTPLACED	
R311	0662057N11	33K
R312	0662057M90	4700
R313	0662057M62	330
R314	0662057M79	1600
R315	0662057N01	12K
R320	NOTPLACED	
R321	0662057N01	12K
R322	0662057M74	1000
R324	0662057N25	120K
R328	0662057M12	2.7
R329	0662057M01	0
R330	0662057M98	10K
R331	0662057M57	200
R332	0662057N01	12K
R333	NOTPLACED	
R339	0662057M89	4300
R340	0662057M96	8200
R342	0662057N23	100K
R344	0662057M43	51
R345	0662057N13	39K
R346	0662057N03	15K
R348	0662057M87	3600
R349	0662057C01	0
R350	0662057M98	10K
R355	0662057N23	100K
R358	0662057M74	1000
R359	NOTPLACED	
R360	0662057N06	20K
R361	0662057N06	20K
R363	0662057M64	390
R364	0662057M80	1800
R365	0662057M76	1200
R366	0662057N01	12K
R367	0662057V04	12K
R368	0662057V02	10K
R369	0662057M70	680
R370	0662057M01	0
R371	NOTPLACED	
R372	NOTPLACED	
R373	NOTPLACED	
R374	NOTPLACED	
R375	NOTPLACED	
R376	NOTPLACED	
R377	NOTPLACED	
R378	NOTPLACED	
R400	0662057N15	47K
R401	0662057M01	0
R402	NOTPLACED	
R403	NOTPLACED	

Circuit Ref	Motorola Part No.	Description
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	NOTPLACED	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10M (not placed in GP640)
R421	0662057M81	2000
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K (not placed in GP640)
R427	0662057M84	2700
R428	0662057M10	2.2
R429	0662057N20	75K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2000
R436	0662057M01	0
R437	NOTPLACED	
R445	0662057N08	24K
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R450	0683962T45	68
R451	0662057N03	15K
R452	0662057N23	100K
R453	NOTPLACED	
R454	NOTPLACED	
R455	NOTPLACED	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4700
R461	0662057M56	180 (not placed in GP640)
R462	0662057M98	10K (not placed in GP640)
R463	0662057M61	300
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N35	330K
R477	0662057M74	1000
R478	0662057M98	10K

Circuit Ref	Motorola Part No.	Description
R481	0662057N08	24K
R492	0662057M01	0
R498	0662057M98	10K
R499	0662057M98	10K (not placed in GP640)
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT400	0680590Z01	Thermistor_33K
S501	4080710Z01	Frequency Switch (For GP640 Only)
S501	4080710Z02	Frequency Switch (For GP680 Only)
S502	1880619Z02	Volume / On-off Switch
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthesizer Top Shield
SH202	2680511Z01	Synthesizer Bottom Shield
SH241	2604120G01	VCO Resonators Shield
SH242	2680514Z01	VCO Buffer IC Shield
SH301	2686583Z01	Receiver Front-End Shield
SH302	2680555Z01	Receiver Back-End Bottom Shield
SH303	2680509Z01	Mixer Shield
SH304	2680624Z01	Mixer Diode Shield
SH322	2686528Z01	IFIC Shield
SH323	2686527Z01	Crystal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On-off Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	Asfic_Cmp, Audio PA Shield
T301	2580541Z02	Balun Transformer
T302	2580541Z02	Balun Transformer
U101	5185130C65	LDMOS PA Driver
U102	5185765B26	PCIC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer IC
U247	5105739X05	5V Regulator
U248	5102463J58	3.3V Regulator
U301	5186144B01	FM IFIC SA616
U302	5109522E10	LMOS Inverter
U303	NOTPLACED	
U400	5102463J40	3.3V Regulator
U404	5185130C53	ASFIC_CMP IC
U405	5102463J36	Static RAM 32K X 8
* U406	5102463J60	Flash ROM 512K X 8
* U407	5102495J05	EEPROM 16K X 8
U409	5102226J56	Micro Processor

Circuit Ref	Motorola Part No.	Description
U410	5102463J57	3.3V Regulator (not placed in GP640)
U420	5102463J44	Audio PA
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J73	Zener Diode 6.8V
VR439	4880140L17	Zener Diode 12V
VR440	4802245J73	Zener Diode 6.8V
VR441	4802245J73	Zener Diode 6.8V
VR442	4802245J73	Zener Diode 6.8V
VR443	4802245J73	Zener Diode 6.8V
VR444	4802245J73	Zener Diode 6.8V
VR445	4802245J74	Zener Diode 10V
VR446	4802245J74	Zener Diode 10V
VR447	4802245J74	Zener Diode 10V
VR448	4802245J74	Zener Diode 10V
VR449	4802245J74	Zener Diode 10V
VR450	4802245J75	Zener Diode 12V
VR460	4802245J73	Zener Diode 6.8V
VR501	4813830A18	Diode 6.8V
VR506	4802245J73	Zener Diode 6.8V
Y300	4802245J84	Xtal Oscillator 44.395MHz
Y301	9186145B02	455kHz Ceramic Discriminator
	1485777Z01	Insulator (KAPTON)
	8486686Z02	UHF B2 PC Board

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

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MOTOROLA

Professional Radio
GP Series

Service Maintainability

Issue: November 2004

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Chapter 2 MAINTENANCE

Chapter 3 SERVICE AIDS

Chapter 1
INTRODUCTION

1.0 Scope of Manual

This manual is intended for use by service technicians familiar with similar types of equipment. It contains service information required for the equipment described and is current as of the printing date. Changes which occur after the printing date may be incorporated by a complete Manual revision or alternatively as additions.

NOTE Before operating or testing these units, please read the Safety Information Section in the front of this manual.

2.0 Warranty and Service Support

Motorola offers long term support for its products. This support includes full exchange and/or repair of the product during the warranty period, and service/ repair or spare parts support out of warranty. Any "return for exchange" or "return for repair" by an authorised Motorola Dealer must be accompanied by a Warranty Claim Form. Warranty Claim Forms are obtained by contacting an Authorised Motorola Dealer.

2.1 Warranty Period and Return Instructions

The terms and conditions of warranty are defined fully in the Motorola Dealer or Distributor or Reseller contract. These conditions may change from time to time and the following notes are for guidance purposes only.

In instances where the product is covered under a "return for replacement" or "return for repair" warranty, a check of the product should be performed prior to shipping the unit back to Motorola. This is to ensure that the product has been correctly programmed or has not been subjected to damage outside the terms of the warranty.

Prior to shipping any radio back to the appropriate Motorola warranty depot, please contact Customer Resources (Please see page 2 and page 3 in this Chapter). All returns must be accompanied by a Warranty Claim Form, available from your Customer Services representative. Products should be shipped back in the original packaging, or correctly packaged to ensure no damage occurs in transit.

2.2 After Warranty Period

After the Warranty period, Motorola continues to support its products in two ways.

1. Motorola's Radio Aftermarket and Accessory Division (AAD) offers a repair service to both end users and dealers at competitive prices.
2. AAD supplies individual parts and modules that can be purchased by dealers who are technically capable of performing fault analysis and repair.

2.3 European Radio Support Centre (ERSC)

The ERSC Customer Information Desk is available through the following service numbers:

Austria:	08 00 29 75 41	Italy:	80 08 77 387
Belgium:	08 00 72 471	Luxemburg:	08 00 23 27
Denmark:	80 88 05 72	Netherlands:	08 00 22 45 13
Finland:	08 00 11 49 910	Norway:	80 01 11 15
France:	08 00 90 30 90	Portugal:	08 00 84 95 70
Germany:	08 00 18 75 240	Spain:	90 09 84 902
Greece:	00 80 04 91 29 020	Sweden:	02 07 94 307
UK :	08 00 96 90 95	Switzerland:	08 00 55 30 82
Ireland:	18 00 55 50 21	Iceland:	80 08 147

Or dial the European Repair and Service Centre:

Tel: +49 30 6686 1555

Please use these numbers for repair enquiries only

2.4 Piece Parts

Some replacement parts, spare parts, and/or product information can be ordered directly. If a complete Motorola part number is assigned to the part, it is available from Motorola Radio Aftermarket and Accessory Division (AAD). If no part number is assigned, the part is not normally available from Motorola. If the part number is appended with an asterisk, the part is serviceable by Motorola Depot only. If a parts list is not included, this generally means that no user-serviceable parts are available for that kit or assembly.

All part orders should be directed to :

Motorola GmbH
Customer Care
AM Borsigturm 130
13507 Berlin
Germany.

EMEA Test Equipment Support

Information related to support and service of Motorola Test Equipment is available via Motorola Online (Extranet), through the Customer Care organisation of Motorola's local area representation or by calling the the European Repair and Service Centre: Tel: +49 30 6686 1555.

2.5 Technical Support

Motorola Product Services is available to assist the dealer/distributors in resolving any malfunctions which may be encountered.

UK/Ireland - Richard Russell
Telephone: +44 (0) 1256 488 082
Fax: +44 01256 488 080
Email: BRR001@email.mot.com

Central/East Europe
Siggy Punzenberger
Telephone: +49 (0) 6128 70 2342
Fax: +49 (0) 6128 95 1096
Email: TFG003@email.mot.com

Scandinavia
Telephone: +46 8 735 9282
Fax: +46 8 735 9280
Email: C14749@email.mot.com

Germany - Customer Connect Team
Telephone: +49 (0) 30 6686 1539
Fax: +49 (0) 30 6686 1916
Email: cgiss.emea@europe.mot.com

France - Lionel Lhermitte
Telephone: +33 1 6929 5722
Fax: +33 1 6929 5904
Email: TXE037@email.mot.com

Italy - Ugo Gentile
Telephone: +39 0 2822 0325
Fax: +39 0 2822 0334
Email: C13864@email.mot.com

Africa & Middle East - Armand Roy
Telephone: +33 1 6929 5715
Fax: +33 1 6929 5778
Email: armand.roy@Motorola.com

2.6 Related Documents

The following documents are directly related to the use and maintainability of this product.

Title	Language	Part Number
GP140 Product Manual	English Russian	ENLN4071 ENLN4072
GP300 Series Product Manual	English German French Italian Spanish Russian	ENLN4073 ENLN4074 ENLN4075 ENLN4076 ENLN4130 ENLN4077
GP600 Series Product Manual	English German French Russian	ENLN4078 ENLN4079 ENLN4080 ENLN4081
GP1280 Product Manual	English German French	ENLN4082 ENLN4083 ENLN4084
GP240/280/540/580 Service Kit	English	ENLN5000

3.0 Radio Model Information

The model number and serial number are located on a label attached to the back of your radio. You can determine the RF output power, frequency band, protocols, and physical packages. The example below shows one portable radio model number and its specific characteristics.

Table 1-1 Radio Model Number (Example: MDH25KDC9AA3AE)

	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level	Model Revision	Model Package
MD = Motorola Internal Use	**H** = Portable	**25**	**K** VHF (136-174MHz)	**D** 4-5W	**C** GP140, GP320, GP240, GP340, GP540. GP640.	**9** Program-mable	**AA** Conventional MDC	**O** GP320	**A**	**E**
			R UHF 1 (403-470MHz)	**E** 5-6W	**H** GP280, GP380, GP580, GP680	**6** Non Program-mable	**AN** Conventional 5 Tone	**3** GP140, GP240 GP340, GP540 GP640.		
			S UHF 2 (450-527MHz)	C 2-2.5W	**N** GP1280		**CK** MPT	**5** GP360		
			B LB1 29-42MHz		**F** GP360		**PW** MPT/5T	**6** GP280 GP380, GP580 GP680		
			C LB2 35-50MHz				**FB** Privacy Plus	**8** GP1280		
			E 300R1 (300-350MHz)				**FC** SmartZone			
			U 800 MHz (806-870MHz)							

Chapter 2

MAINTENANCE

1.0 Introduction

This chapter of the manual describes:

- ❏ preventive maintenance
- ❏ safe handling of CMOS devices
- ❏ repair procedures and techniques

2.0 Preventive Maintenance

The radios do not require a scheduled preventive maintenance program; however, periodic visual inspection and cleaning is recommended.

2.1 Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. It is not recommended to inspect the interior electronic circuitry.

2.2 Cleaning

The following procedures describe the recommended cleaning agents and the methods to be used when cleaning the external and internal surfaces of the radio. External surfaces include the front cover, housing assembly, and battery case. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime.

NOTE Internal surfaces should be cleaned only when the radio is disassembled for servicing or repair.

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent in water. The only factory recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (70% by volume).

CAUTION: The effects of certain chemicals and their vapors can have harmful results on certain plastics. Aerosol sprays, tuner cleaners, and other chemicals should be avoided.

1. Cleaning External Plastic Surfaces
   The detergent-water solution should be applied sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. A soft, absorbent, lintless cloth or tissue should be used to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.
2. Cleaning Internal Circuit Boards and Components
   Isopropyl alcohol may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure

air to hasten the drying process since this could cause the liquid to collect in unwanted places. Upon completion of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

NOTE Always use a fresh supply of alcohol and a clean container to prevent contamination by dissolved material (from previous usage).

3.0 Safe Handling of CMOS and LDMOS

Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios. CMOS characteristics make them susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions. DO NOT attempt to disassemble the radio without first referring to the CMOS CAUTION paragraph in the Disassembly and Reassembly section of the manual.

4.0 General Repair Procedures and Techniques

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement component is not locally available, check the parts list for the proper Motorola part number and order the component from the nearest Motorola Communications parts center listed in the “Piece Parts” section of this manual.

Rigid Circuit Boards

The family of radios uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The through-plated holes may interconnect multiple layers of the printed circuit. Therefore, care should be exercised to avoid pulling the plated circuit out of the hole.

When soldering near the 20-pin and 40-pin connectors:

- ❏ avoid accidentally getting solder in the connector.
- ❏ be careful not to form solder bridges between the connector pins
- ❏ closely examine your work for shorts due to solder bridges.

Flexible Circuits

The flexible circuits are made from a different material than the rigid boards and different techniques must be used when soldering. Excessive prolonged heat on the flexible circuit can damage the material. Avoid excessive heat and excessive bending.

For parts replacement, use the ST-1087 Temperature-Controlled Solder Station with a 600-700 degree tip, and use small diameter solder such as ST-633. The smaller size solder will melt faster and require less heat to be applied to the circuit.

To replace a component on a flexible circuit:

1. grasp the edge of the flexible circuit with seizers (hemostats) near the part to be removed
2. pull gently
3. apply the tip of the soldering iron to the component connections while pulling with the seizers.

NOTE Do not attempt to puddle out components. Prolonged application of heat may damage the flexible circuit.

Chip Components

Use either the RLN4062 Hot-Air Repair Station or the Motorola 0180381B45 Repair Station for chip component replacement. When using the 0180381B45 Repair Station, select the TJ-65 mini-thermojet hand piece. On either unit, adjust the temperature control to 370 °C (700 °F), and adjust the airflow to a minimum setting. Airflow can vary due to component density.

❑ **To remove a chip component**:

1. Use a hot-air hand piece and position the nozzle of the hand piece approximately 0.3 cm (1/8") above the component to be removed.
2. Begin applying the hot air. Once the solder reflows, remove the component using a pair of tweezers.
3. Using a solder wick and a soldering iron or a power desoldering station, remove the excess solder from the pads.

❑ **To replace a chip component using a soldering iron**:

1. Select the appropriate micro-tipped soldering iron and apply fresh solder to one of the solder pads.
2. Using a pair of tweezers, position the new chip component in place while heating the fresh solder.
3. Once solder wicks onto the new component, remove the heat from the solder.
4. Heat the remaining pad with the soldering iron and apply solder until it wicks to the component. If necessary, touch up the first side. All solder joints should be smooth and shiny.

❑ **To replace a chip component using hot air**:

1. Use the hot-air hand piece and reflow the solder on the solder pads to smooth it.
2. Apply a drop of solder paste flux to each pad.
3. Using a pair of tweezers, position the new component in place.
4. Position the hot-air hand piece approximately 0.3 cm (1/8”) above the component and begin applying heat.
5. Once the solder wicks to the component, remove the heat and inspect the repair. All joints should be smooth and shiny.

Shields

Removing and replacing shields will be done with the R1070 station with the temperature control set to approximately 215°C (415°F) [230°C (445°F) maximum].

❑ **To remove the shield**:

1. Place the circuit board in the R1070 circuit board holder.
2. Select the proper heat focus head and attach it to the heater chimney.
3. Add solder paste flux around the base of the shield.
4. Position the shield under the heat-focus head.
5. Lower the vacuum tip and attach it to the shield by turning on the vacuum pump.
6. Lower the focus head until it is approximately 0.3 cm (1/8”) above the shield.
7. Turn on the heater and wait until the shield lifts off the circuit board.
8. Once the shield is off, turn off the heat, grab the part with a pair of tweezers, and turn off the vacuum pump.
9. Remove the circuit board from the R1070 circuit board holder.

❑ **To replace the shield:**

1. Add solder to the shield if necessary, using a micro-tipped soldering iron.
2. Next, rub the soldering iron tip along the edge of the shield to smooth out any excess solder. Use solder wick and a soldering iron to remove excess solder from the solder pads on the circuit board.
3. Place the circuit board back in the R1070 circuit board holder.
4. Place the shield on the circuit board using a pair of tweezers.
5. Position the heat-focus head over the shield and lower it to approximately 0.3 cm (1/8”) above the shield.
6. Turn on the heater and wait for the solder to reflow.
7. Once complete, turn off the heat, raise the heat-focus head and wait approximately one minute for the part to cool.
8. Remove the circuit board and inspect the repair. No cleaning should be necessary.

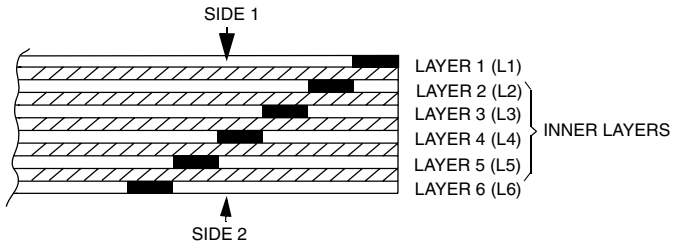
5.0 Notes For All Schematics and Circuit Boards

* Component is frequency sensitive. Refer to the Electrical Parts List for value and usage.

1. Unless otherwise stated, resistances are in Ohms (k = 1000), and capacitances are in picofarads (pF) or microfarads (µF).
2. DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. Transmitter measurements should be made with a 1.2 µF choke in series with the voltage probe to prevent circuit loading.
3. Interconnect Tie Point Legend:

UNSWB+	=	Unswitch Battery Voltage (7.5V)
SWB+	=	Switch Battery Voltage (7.5V)
R5	=	Receiver Five Volts
CLK	=	Clock
Vdda	=	Regulated 3.3 Volts (for analog)
Vddd	=	Regulated 3.3 Volts (for digital)
CSX	=	Chip Select Line (not for LVZIF)
SYN	=	Synthesizer
DACRX	=	Digital to Analog Voltage (For Receiver Front End Filter)
VSF	=	Voltage Super Filtered (5 volts)
VR	=	Voltage Regulator

6-LAYER CIRCUIT BOARD DETAIL VIEWING
COPPER STEPS IN PROPER LAYER SEQUENCE



Chapter 3

SERVICE AIDS

1.0 Recommended Test Tools

Table 3-1 lists the service aids recommended for working on the radio. While all of these items are available from Motorola, most are standard workshop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 3-1 Service Aids

Motorola Part Number	Description	Application
RLN4460_	Portable & Mobile Test Set	Enables connection to the audio/ accessory jack. Allows switching for radio testing.
RKN4074_	RIB/Radio/Test Set Interconnect Cable (for all Models except GP1280).	Connects radio to Computer.
RKN4075_	Programming Cable with internal RIB (for all Models except GP1280).	Connects radio to Computer.
RLN4008_	Radio Interface Box (RIB).	Enables communications between the radio and the computer's serial communications adapter.
5885705M01	BNC Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
5880384G68	SMA to BNC Adaptor	Adapts radio's antenna port to BNC cabling of test equipment, 800MHz only.
HKN9743_	MAP27 Cable (for GP1280 only).	Connects radio to computer for MAP27 applications in MPT requirements.
HLN9742_	Flash Upgrade Adapter	Provides connections to the computer or RIB programming /test cable.
RLN4510_	Battery Elliminator 7.5 VDC	Includes protection circuit.
0180305G54	Battery Adapter to RLN4510	Connects radio to Battery Elliminator.
8180384F68	Bench Test Housing Eliminator (for all Models except GP1280).	Provides for troubleshooting of the radio when the housing is removed.
8180384F66	Bench Test Housing Eliminator (long housing, GP1280 only).	Provides for troubleshooting of the radio when the housing is removed.
EPN4040_	Wall-Mounted Power Supply (UK).	for RLN4008
EPN4041_	Wall-Mounted Power Supply (220VAC).	for RLN4008
3080369B71	Computer Interface Cable	25 to 9 pin (RLN4008_ to IBM PC).
3080369B72	Computer Interface Cable	9 to 9 pin (RLN4008_ to IBM PC).

Table 3-2 lists the recommended tools used for maintaining this family of radios. These tools are also available from Motorola..

Table 3-2 Recommended Test Tools

Motorola Part Number	Description	Application
6680702Z01	Chassis opener and knob removal tool.	Disassembly tool
RSX4043_	Torx Driver	Tighten and remove chassis screws.
6680387A70	T-6 Torx Bit	Removable Torx driver bit (2 pcs).
WADN4055_ 6604008K01 6604008K02	Portable soldering station 0.4mm replacement tip 0.8mm replacement tip	Digitally controlled For WADN4055_ soldering Iron For WADN4055_ soldering Iron
1010041A86	Solder (RMA type), 63/37, 0.5mm diameter 1 lb. spool.	
0180386A78	Illuminated magnifying glass with lens attachment.	
0180386A82	Anti-static grounding kit.	Used during all radio assembly and disassembly procedures.
0180303E45	SMD tool kit incl. probers and brush.	
R1321_	Shields and surface-mounted component and IC removal/rework station (order all heat-focus heads separately).	Removal and assembly of surface-mounted integrated circuits and shields.
6680332E82 6680332E84 6680333E55 6680332E90	Nozzle 20.3 x 20.3 mm Nozzle 12.7 x 12.7 mm Nozzle 16.5 x 25.4 mm Nozzle 24.1 x 24.1 mm	Heat-focus heads for R1321_ work station.

2.0 Test Equipment

Table 3-3 lists test equipment required to service the radio and other two-way radios.

Table 3-3 Recommended Test Equipment

Motorola Part Number	Description	Characteristics	Application
R2600_	Comms System Analyzer (non MPT).	This monitor will substitute for items with an asterisk*	Frequency/deviation meter and signal generator for widerange troubleshooting and alignment.
RLN5069_	Tracking Generator Option.		Option for R2600_
RLN4361_	CCITT Filter.	with 600 Ohm Meter Load.	Option for R2600_
RLN4423_	Spectrum Analyzer and Oscilloscope with Markers.	High Performance option.	Option for R2600_
RLN4485_	Test Set Ups Memory.	Programmable	Allows storage of complete screen values.
1580357B77	Canvas Case	Protects Units	When used in the Field.
or			
R2680_HS	Comms System Analyzer (MPT1327)	This monitor will substitute for items with an asterisk*.	Frequency/deviation meter and signal generator for widerange troubleshooting and alignment.
RLN1022_	MPT1327 Hardware		Option for R2680_HS
RLN1023_	MPT1327 Software		Option for R2680_HS
RLN4361_	CCITT Filter	with 600 ohm Meter Load	Option for R2680_HS
RLN4423_	Spectrum Analyzer and Oscilloscope with Markers	High Performance option.	Option for R2680_HS
1580357B77	Canvas Case	Protects Units	When used in the Field.
or			
R2670_	Comms System Analyzer with FDMA.	This monitor will substitute for items with an asterisk*.	Frequency/deviation meter and signal generator for widerange troubleshooting and alignment.
RLN4498_	Analog Trunking Smartnet/Zone.		Option for R2670_
1580357B77	Canvas Case	Protects Units	When used in the Field.
* WADN4133_	Oscilloscope	Analog 2 Channel 40MHz bandwidth, 5mV/cm - 20 V/cm.	Waveform measurements.
* R1072_	Digital Multimeter		AC/DC voltage and current measurements.
* R1377_	AC Voltmeter	100µV to 300V, 5Hz - 1MHz, 10Mohm input impedance.	Audio voltage measurements.

Motorola Part Number	Description	Characteristics	Application
* R1440_ * 0180305F14 * 0180305F29 * 0180305F38 * 0180305F46 * RLN5417 * T1013_	Wattmeter, Plug-in Element Plug-in Element Plug-in Element Plug-in Element Carry case for Wattmeter RF Dummy Load	Thruline 50-Ohm, ±5% accuracy 10W, 25 - 60MHz 5W, 100-250MHz 5W, 200-500MHz 5W, 400-1000MHz plus elements	Transmitter power output measurements.
WADN4243_	Power Supply (220V)	Bench top	Programmable
S1339_/220	RF Millivolt Meter	100mV to 3 V RF. 10kHz to 1.2GHz	RF level measurements.
0100855414	RF Cable	2 male BNC Conn. 1.5m (3 pcs needed)	

MOTOROLA

Professional Radio
GP Series

Keypad and Flex
Service Information

Issue: November 2004

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Table of Contents

Chapter 1 THEORY OF OPERATION

Chapter 2 PCB / SCHEMATICS / PARTS LISTS

Chapter 1

THEORY OF OPERATION

1.0 Keypad and Flexible Connectors

1.1 Keypad

The keypad block diagram is shown in Figure 1-1. U602 is a comparator that will compare the voltage when any one of the keypad row or keypad column keys is being pressed. Therefore when a key is being pressed, it will send a message to the microprocessor through the output (KEY_INT) telling it that a key has been pressed. The microprocessor then sample the analog to digital voltages at the keypad row and keypad column and map it with a table so that the key pressed being can be identified. Once the key has been identified, the message that corresponds to the key will show up at the display.

The LED_EN setting is set by the codeplug. When the value is set to high, the LED does not light up during power up and vice versa.

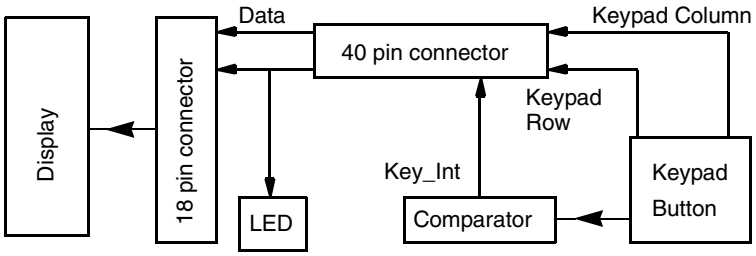


Figure 1-1 Keypad Block Diagram

1.2 Flexible Connectors

Flexible ribbon circuits (flexes) are used to connect the keypad and radio front panel components with the circuit boards. The flexes are locked into place in their connectors by latches which must be released before the flexes may be disconnected during maintenence disassembly.

Two types of flexible ribbon circuits are used in the radios:

- Keypad/Controller Interconnect flex - used for connecting the keypad with the main board circuits.
- Universal Flex connector - used to make connections to the Speaker, Microphone and accessory connector.

2.0 Troubleshooting Chart

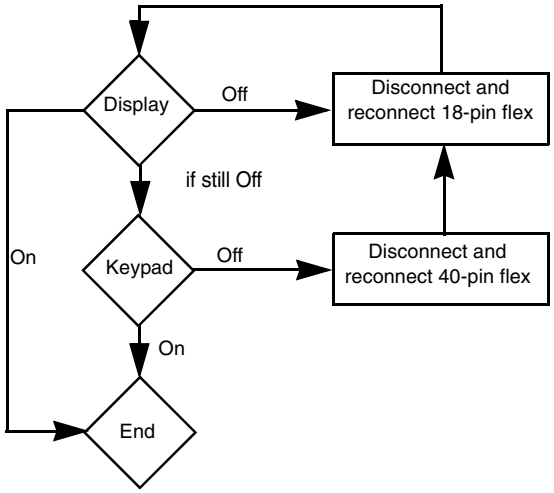


Figure 1-2 Keypad Board Troubleshooting Chart

Chapter 2

PCB / SCHEMATICS / PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

The printed circuit boards (PCB) and schematic diagrams related to the Flexible Connectors and the Keypads are shown in the tables below:

1.1 Flexible Connectors

Table 2-1: Keypad /Controller Flex

Flex : 8480475Z02	
Flex	Page 2-3
Schematic	Page 2-3

Table 2-2: Universal Speaker/Microphone Flex

Flex : 8480549Z05	
Flex	Page 2-4
Schematic	Page 2-4

1.2 Keypad PCBs

Table 2-3: Standard Keypad

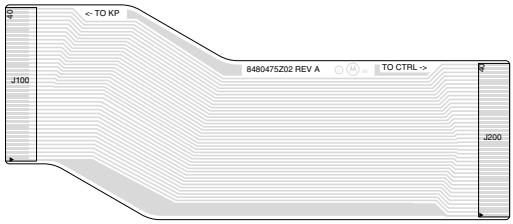
PCB : 8480574Z06	
PCB Layout	Page 2-5
Schematic	Page 2-6
Parts List	Page 2-7

Table 2-4: GP1280 Keypad

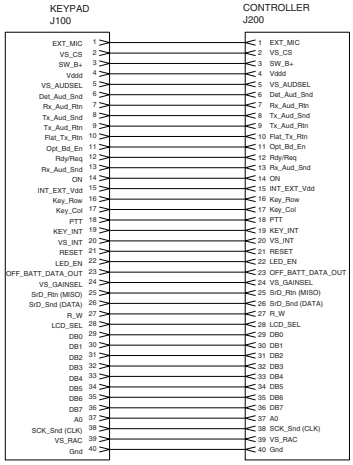
PCB : 8480682Z04	
Flex	Page 2-8
Schematic	Page 2-9
Parts List	Page 2-10

2.0 PCB/Schematic Diagrams and Parts List: Flexes

2.1 Keypad - Controller Flex



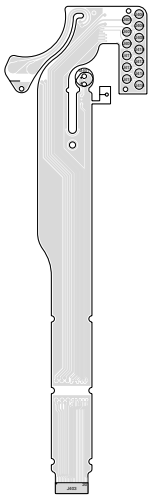
Keypad/Controller Interconnect Flex - Assembly



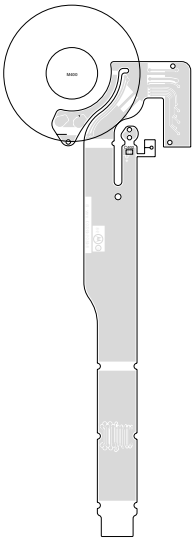
Keypad/Controller Interconnect Flex - Schematic Diagram

Keypad - Controller Interconnect Flex (PCB No. 8480475Z02)

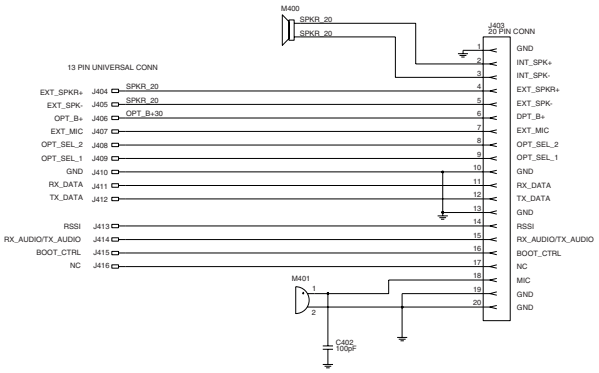
2.2 Universal Connector Flex



View from Top Side



View from Bottom Side

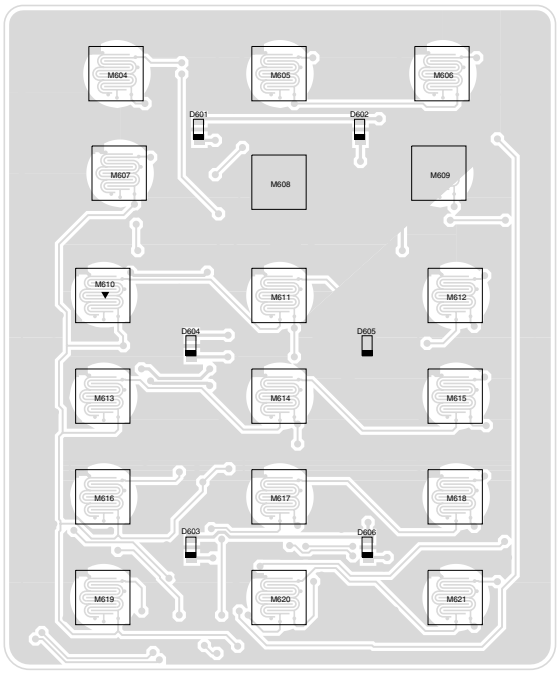


Universal Connector Flex - Schematic Diagram

Universal Connector Flex (8480549Z05)

3.0 PCB/Schematic Diagrams and Parts List: Keypad

3.1 PCB 8480574Z06 - Diagram



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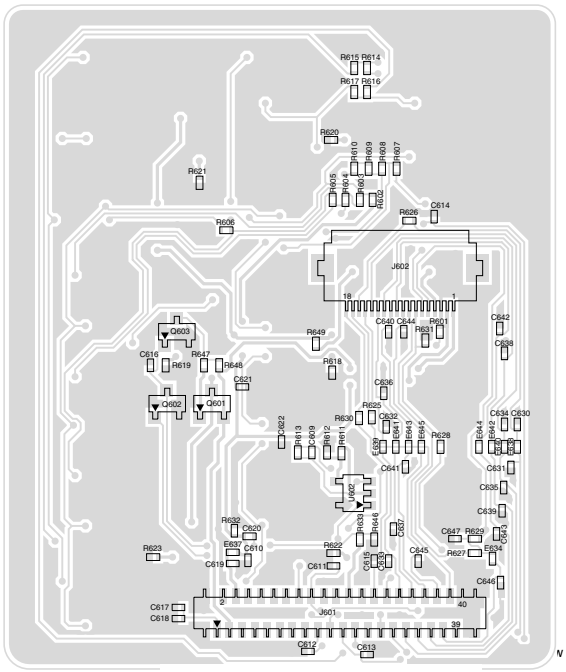
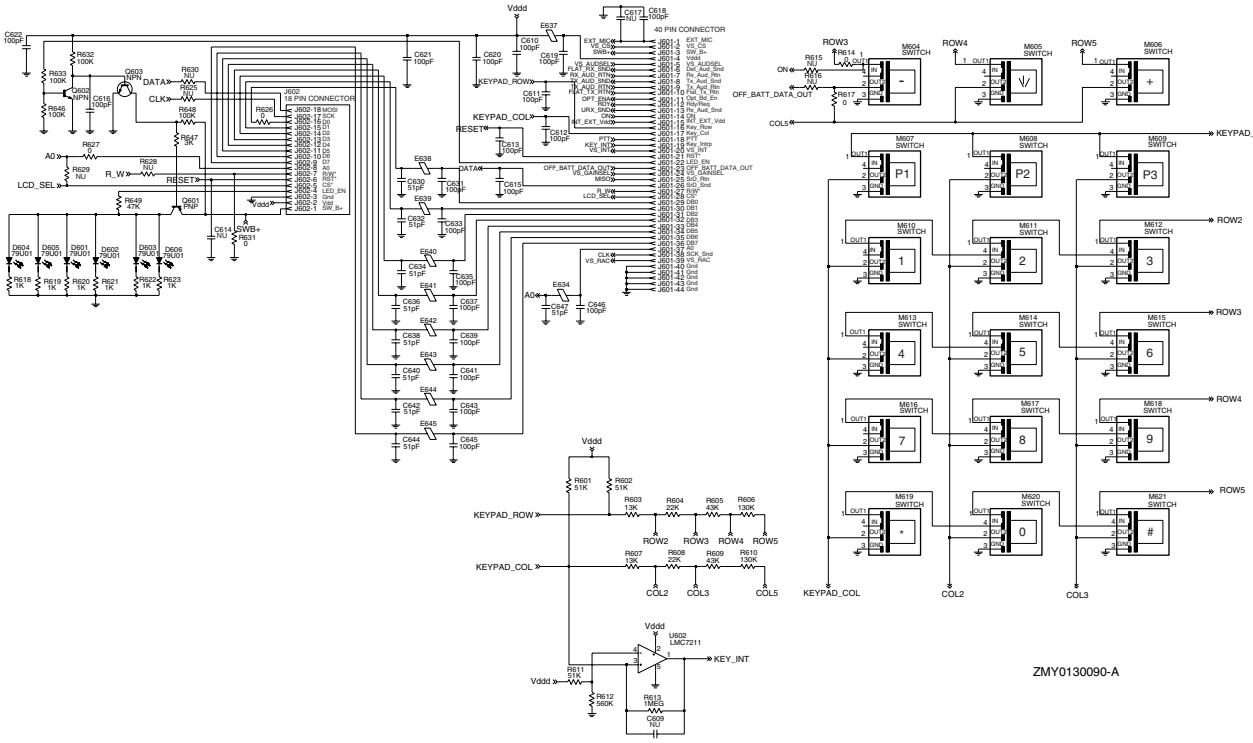


ZMY0130094-B

Keypad Board (PCB No. 8480574Z06)

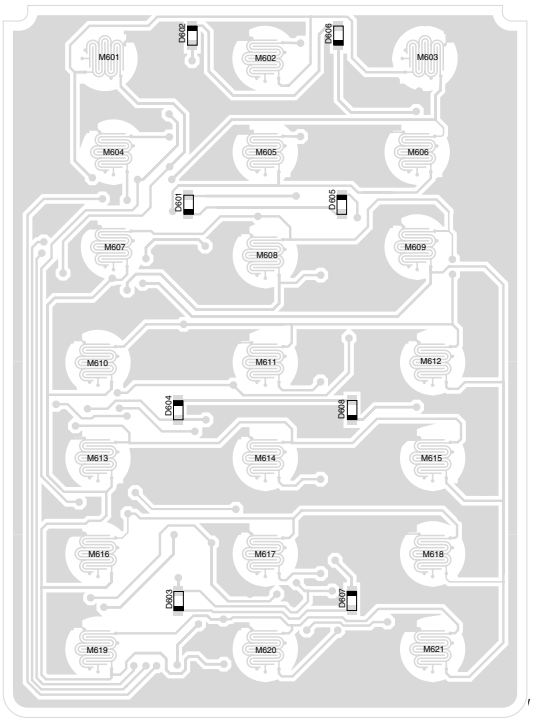


Keypad Schematic Diagram (PCB No. 8480574Z06)

3.2 PCB 8480574Z06 - Parts List

Circuit Ref	Motorola Part No.	Description
C610	2113743N50	100 PF 5% COG
C611	2113743N50	100 PF 5% COG
C612	2113743N50	100 PF 5% COG
C613	2113743N50	100 PF 5% COG
C615	2113743N50	100 PF 5% COG
C616	2113743N50	100 PF 5% COG
C618	2113743N50	100 PF 5% COG
C619	2113743N50	100 PF 5% COG
C620	2113743N50	100 PF 5% COG
C621	2113743N50	100 PF 5% COG
C622	2113743N50	100 PF 5% COG
C630	2113743N43	51.0 PF 5% COG
C631	2113743N50	100 PF 5% COG
C632	2113743N43	51.0 PF 5% COG
C633	2113743N50	100 PF 5% COG
C634	2113743N43	51.0 PF 5% COG
C635	2113743N50	100 PF 5% COG
C636	2113743N43	51.0 PF 5% COG
C637	2113743N50	100 PF 5% COG
C638	2113743N43	51.0 PF 5% COG
C639	2113743N50	100 PF 5% COG
C640	2113743N43	51.0 PF 5% COG
C641	2113743N50	100 PF 5% COG
C642	2113743N43	51.0 PF 5% COG
C643	2113743N50	100 PF 5% COG
C644	2113743N43	51.0 PF 5% COG
C645	2113743N50	100 PF 5% COG
C646	2113743N50	100 PF 5% COG
C647	2113743N43	51.0 PF 5% COG
D601	4880479U01	LED
D602	4880479U01	LED
D603	4880479U01	LED
D604	4880479U01	LED
D605	4880479U01	LED
D606	4880479U01	LED
E634	2480640Z01	C/IND BK1005HM471 BEAD
E637	2480640Z01	C/IND BK1005HM471 BEAD
E638	2480640Z01	C/IND BK1005HM471 BEAD
E639	2480640Z01	C/IND BK1005HM471 BEAD
E640	2480640Z01	C/IND BK1005HM471 BEAD
E641	2480640Z01	C/IND BK1005HM471 BEAD
E642	2480640Z01	C/IND BK1005HM471 BEAD
E643	2480640Z01	C/IND BK1005HM471 BEAD
E644	2480640Z01	C/IND BK1005HM471 BEAD
E645	2480640Z01	C/IND BK1005HM471 BEAD
J601	0980521Z01	ZIF VERTICAL,40 PIN
J602	0905505Y03	ZIF HORIZONTAL
Q601	4805128M67	SOT STR RH LOW PROFILE MMBT
Q602	4880214G02	TSTR MMBT3904
Q603	4880214G02	TSTR MMBT3904
R601	0662057V20	51K 1% 1/16W
R602	0662057V20	51K 1% 1/16W
R603	0662057V05	13K 1% 1/16W
R604	0662057V11	22K 1% 1/16W
R605	0662057V18	43K 1% 1/16W
R606	0662057V30	130K 1% 1/16W
R607	0662057V05	13K 1% 1/16W
R608	0662057V11	22K 1% 1/16W
R609	0662057V18	43K 1% 1/16W
R610	0662057V30	130K 1% 1/16W
R611	0662057N16	51K 5% 20X40
R612	0662057N41	560K 5% 20X40
R613	0662057N47	1.0 MEG 5% 20X40
R614	0662057M01	0 5% 20X40
R617	0662057M01	0 5% 20X40
R618	0662057M74	1000 5% 20X40
R619	0662057M74	1000 5% 20X40
R620	0662057M74	1000 5% 20X40
R621	0662057M74	1000 5% 20X40
R622	0662057M74	1000 5% 20X40
R623	0662057M74	1000 5% 20X40
R626	0662057M01	0 5% 20X40
R627	0662057M01	0 5% 20X40
R631	0662057M01	0 5% 20X40
R632	0662057N23	100K 5% 20X40
R633	0662057N23	100K 5% 20X40
R646	0662057N23	100K 5% 20X40
R647	0662057M85	3000 5% 20X40
R648	0662057N23	100K 5% 20X40
R649	0662057N15	47K 5% 20X40
U602	5102463J49	COMPARATOR CMOS LM7211
	8480574Z06	BOARD, P.C. KEYPAD

3.3 PCB 8480682Z04 - Diagrams



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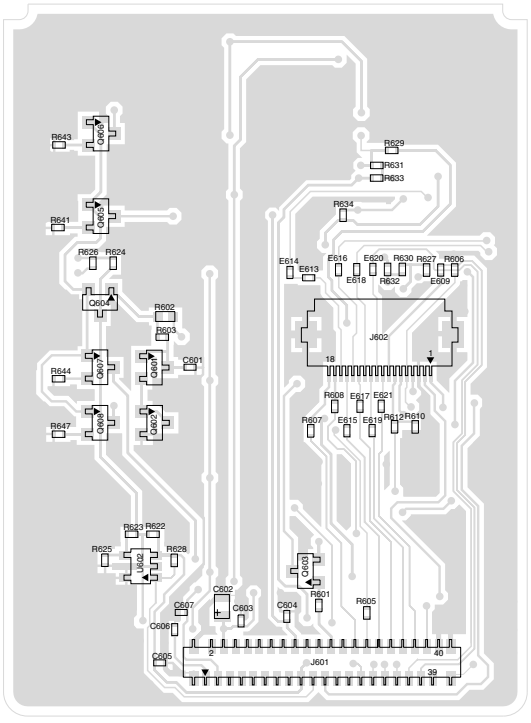

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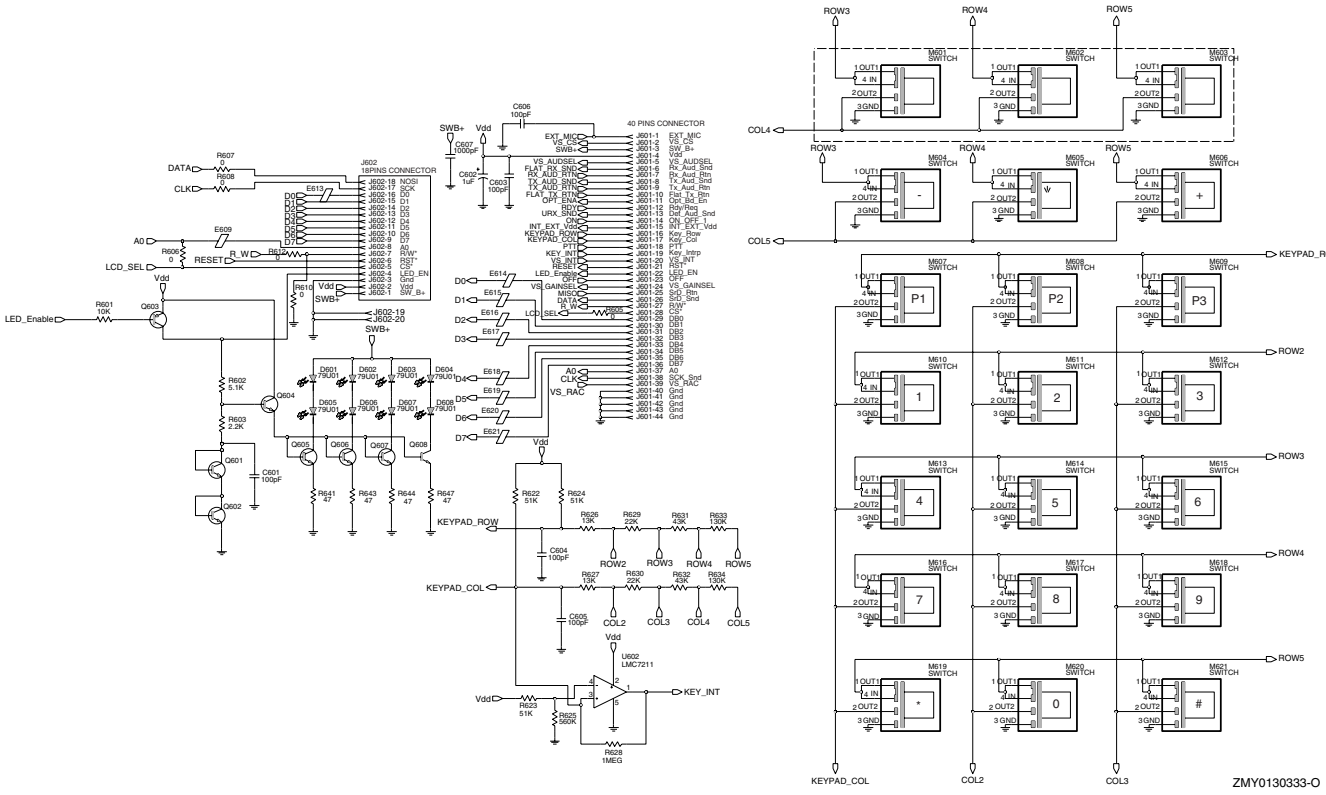
Keypad Board (PCB No. 8480682Z04)



Keypad Schematic Diagram (PCB No. 8480682Z04)

3.4 PCB 8480682Z04 - Parts List

Circuit Ref	Motorola Part No.	Description
C601	2113743N50	100 PF 5%
C602	2311049A86	1UF 20% 10V
C603	2113743N50	100 PF 5%
C604	2113743N50	100 PF 5%
C605	2113743N50	100 PF 5%
C606	2113743N50	100 PF 5%
C607	2113743L17	1000 PF 10%
C608	2113743N50	100 PF 5%
C609	2113743N50	100 PF 5%
C610	2113743N50	100 PF 5%
C611	2113743N50	100 PF 5%
C612	2113743N50	100 PF 5%
C613	2113743N50	100 PF 5%
D601	4880479U01	LED
D602	4880479U01	LED
D603	4880479U01	LED
D604	4880479U01	LED
D605	4880479U01	LED
D606	4880479U01	LED
D607	4880479U01	LED
D608	4880479U01	LED
E609	2480640Z01	C/IND BK1005HM471 BEAD
E613	2480640Z01	C/IND BK1005HM471 BEAD
E614	2480640Z01	C/IND BK1005HM471 BEAD
E615	2480640Z01	C/IND BK1005HM471 BEAD
E616	2480640Z01	C/IND BK1005HM471 BEAD
E617	2480640Z01	C/IND BK1005HM471 BEAD
E618	2480640Z01	C/IND BK1005HM471 BEAD
E619	2480640Z01	C/IND BK1005HM471 BEAD
E620	2480640Z01	C/IND BK1005HM471 BEAD
E621	2480640Z01	C/IND BK1005HM471 BEAD
J601	0980521Z01	ZIF VERTICAL,40 PIN
J602	0905505Y03	ZIF HORIZONTAL
Q601	4813824A10	NPN 40V .2A GEN PURP
Q602	4813824A10	NPN 40V .2A GEN PURP
Q603	4813824A17	PNP40V .2A GENPB=100-300
Q604	4813824A10	NPN 40V .2A GEN PURP
Q605	4813824A10	NPN 40V .2A GEN PURP
Q606	4813824A10	NPN 40V .2A GEN PURP
Q607	4813824A10	NPN 40V .2A GEN PURP
Q608	4813824A10	NPN 40V .2A GEN PURP
R601	0662057M98	10K 5% 20X40
R602	0662057A66	5100 5 1/8
R603	0662057M82	2200 5% 20X40
R605	0662057M01	0 5% 20X40
R610	0662057M01	0 5% 20X40
R622	0662057V20	51K 1% 1/16W
R623	0662057N16	51K 5% 20X40
R624	0662057V20	51K 1% 1/16W
R625	0662057N41	560K 5% 20X40
R626	0662057V05	13K 1% 1/16W
R627	0662057V05	13K 1% 1/16W
R628	0662057N47	1.0 MEG 5% 20X40
R629	0662057V11	22K 1% 1/16W
R630	0662057V11	22K 1% 1/16W
R631	0662057V18	43K 1% 1/16W
R632	0662057V18	43K 1% 1/16W
R633	0662057V30	130K 1% 1/16W
R634	0662057V30	130K 1% 1/16W
R641	0662057M42	47 5% 20X40
R643	0662057M42	47 5% 20X40
R644	0662057M42	47 5% 20X40
R647	0662057M42	47 5% 20X40
U602	5102463J49	COMPARATOR CMOS LM7211
	8480682Z04	PCB, KEYPAD

MOTOROLA

Professional Radio
GP Series

Power Distribution and Controller
Service Information

Issue: November 2004

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Chapter 1 THEORY OF OPERATION

Chapter 2 TROUBLESHOOTING CHARTS

Chapter 3 CONTROLLER SCHEMATICS

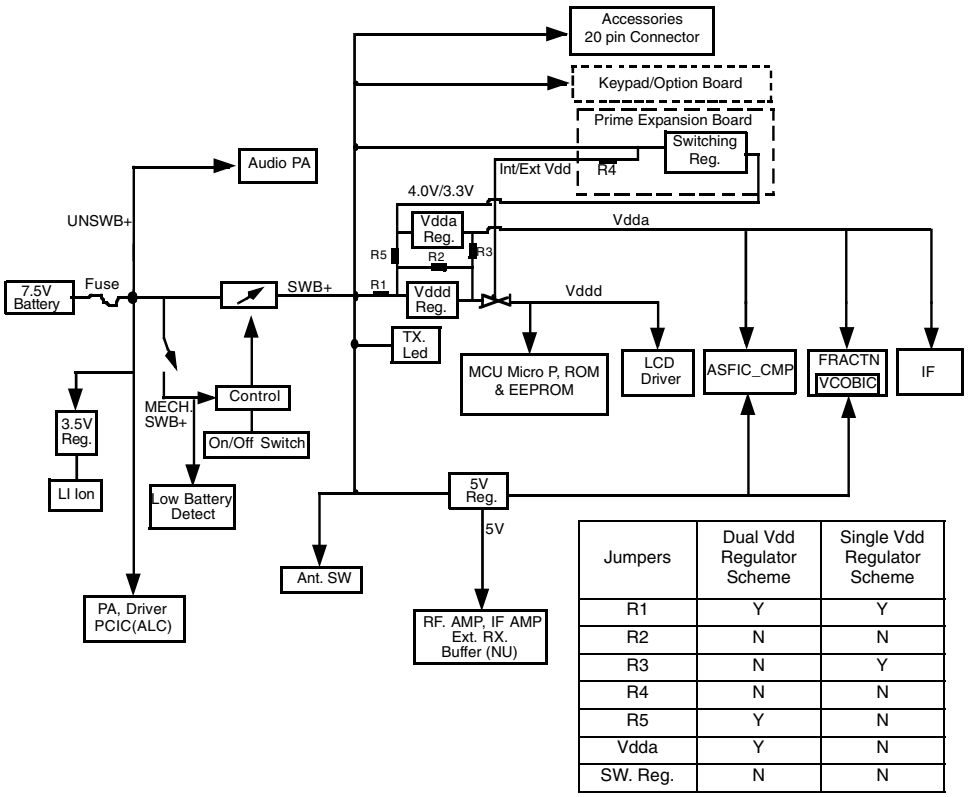
Chapter 1

THEORY OF OPERATION

1.0 Overview

This Chapter provides a detailed theory of operation for the power distribution and controller circuits in the radio. The components for these circuits are contained on the Main Board. Refer to the RF sections of this manual for the component location details and the parts lists for these circuits.

2.0 Radio Power Distribution



Jumpers	Dual Vdd Regulator Scheme	Single Vdd Regulator Scheme
R1	Y	Y
R2	N	N
R3	N	Y
R4	N	N
R5	Y	N
Vdda	Y	N
SW. Reg.	N	N

Figure 1-1 DC Power Distribution Block Diagram

Figure 1-1 illustrates the DC distribution throughout the radio board. A 7.5V battery (BATT 7.5V) supplies power directly to the electronic on/off control as UNSWB+. When the radio is turned on, MECH_SWB+ (on/off/volume control) will trigger the electronic on/off control (momentary-on path), then SWB+ is distributed as shown in Figure1-1. Vdda from 3.3V Vdda regulator will then supply the microprocessor. Data is then sent to ASFIC_CMP to turn on GCB4(DAC). GCB4 will take over the momentary-on path within 12ms. SWB+ will continue to support the whole board until the radio is turned off.

Radio will be turned-off on two conditions;

1. MECH_SWB+ turned off
2. Low battery

When low battery level is detected by the microprocessor through both conditions above, it will store the radio personality data to EEPROM before turning off.

3.0 Controller Circuits

3.1 Controller Architecture

The controller board is the central interface between the various subsystems of the radio. It is separated into MCU digital and audio/signalling architectures as shown in Figure 1-2.

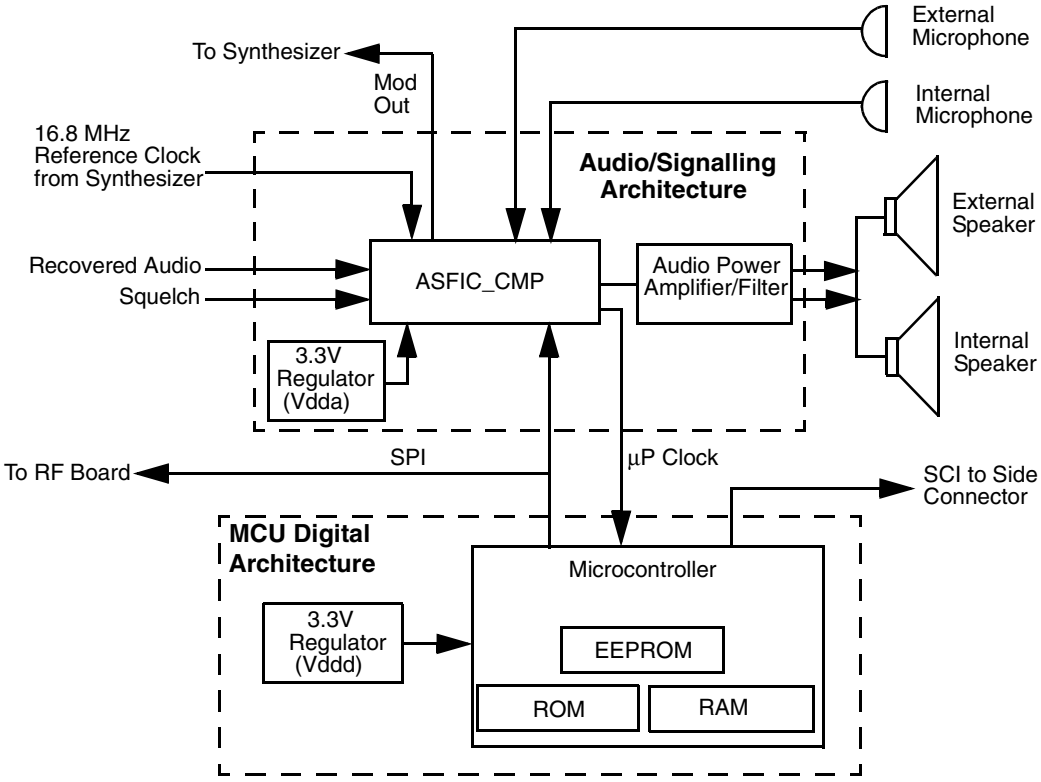


Figure 1-2 Controller Block Diagram

3.2 MCU Digital Architecture

(*Refer to Figure 1-2, the Microprocessor and the Memory schematic diagrams*)

The digital architecture portion consists of a microcontroller and associated EEPROM, RAM, and ROM memories. The architecture is commonly used for both low-tier and high-tier products and also includes conventional and trunking portables. Combinations of different size RAM and ROM are available to support various application software. RAM supports 8KB and 32KB sizes. ROM supports 128KB, 256KB, and 512KB sizes. Table 1-1 shows the ROM, RAM and EEPROM requirements for different applications.

Table 1-1 Radio Memory Requirements

RADIO		ROM (KB)	EXT RAM (KB)	EEPROM (KB)
Conventional MDC	GP140	128K	-	8K
Conventional 5 Tone	GP320, GP340	512K	16K	16K
Conventional 5 Tone	GP360, GP380	512K	16K	16K
Privacy Plus	GP240, GP280	512K	16K	16K
SmartZone	GP540, GP580	512K	16K	16K
MPT	GP640, GP680	512K	16K	16K
MPT	GP1280	512K	16K	16K

3.3 Real Time Clock

(*Refer to Figure 1-3 and the Microprocessor schematic diagram*)

Radios with displays support a Real Time Clock (RTC) module for purposes of message time stamping and time keeping. The RTC module resides in the microcontroller.The clock uses a back-up Lithium Ion battery for operating power when the primary battery is removed.

3.3.1 Circuit Description

The RTC module circuit, shown in Figure 1-3, is powered by the ModB/Vstby pin and PI6/PI7 from the crystal oscillator circuit. A clock frequency of 38.4kHz from a crystal oscillator provides the reference signal which is divided down to 1 Hz in the processor.

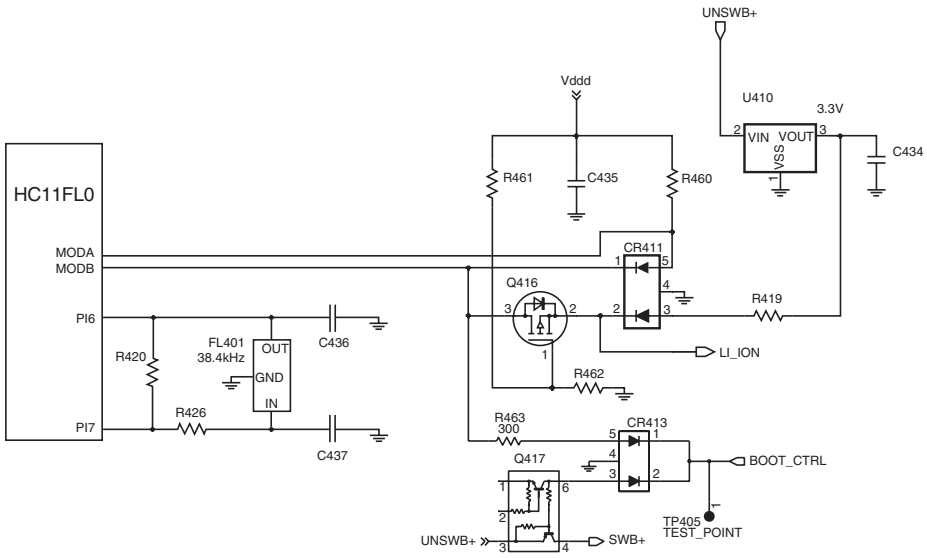


Figure 1-3 RTC Circuit

As the RTC module is powered separately from the processor Vdd, the RTC is kept active through the ModB / Vstby pin which provides the Lithium battery back-up power when the radio is switched off.

A MOSFET Q416 switches in the LiO supply when Vdd is removed. Q416 also provides isolation from BOOT_CTRL function in the event of radio program flashing. The 3.3V regulator charges the Lithium battery.

3.4 ModB/Vstby Supply

The supply to the ModB/Vstby pin varies depending on the conditions listed in Table 1-2.

Table 1-2 ModB/Vstby Supply Modes

Condition	Circuit Operation
Radio On	Vdd supply voltage via CR411
Radio Off	• Vdd turned off • Q416 gate pulled low by R462 • Q416 switched on • U410 supplies 3.2V to ModB/Vstby
Primary battery removed	• Vdd turned off • Q416 gate pulled low by R462 • Q416 switched on • Lithium battery provides 3.2V to ModB/Vstby
Flash Mode	• Boot_Ctrl line pulled low • ModA & ModB go low • Processor in boot-strap mode

3.5 Audio/Signalling Architecture

(*Refer to Figure 1-2 and the ASFIC/ON_OFF and Audio Power Amplifier schematic diagrams*)

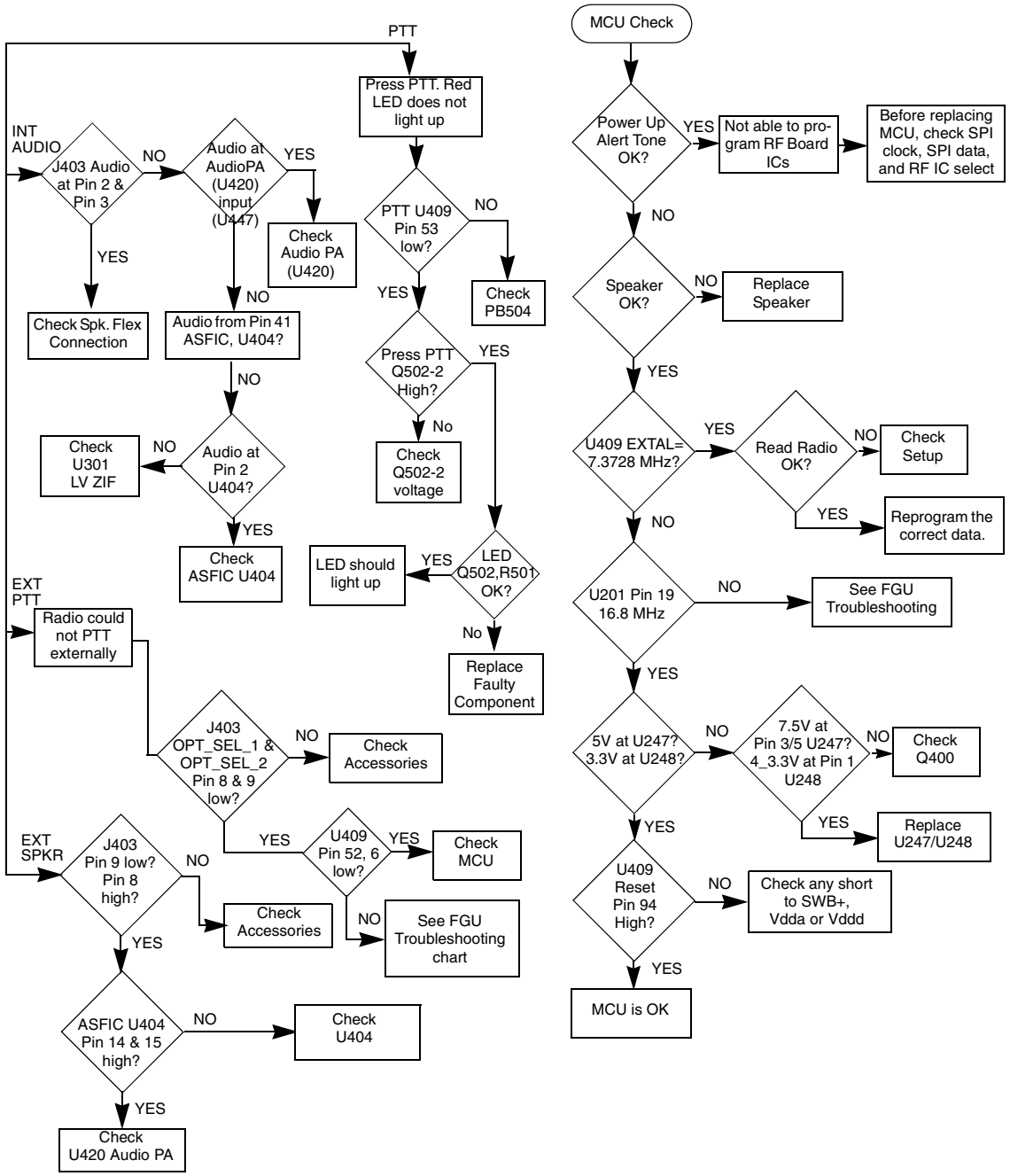
The audio/signalling/filter/companding IC (ASFIC_CMP) and the audio power amplifier, shown in Figure 1-2, form the main components of the audio/signalling architecture section of the controller board. Inputs include a 16.8 MHz clock from the synthesizer, recovered audio and squelch, MCU control signals, and external or internal microphones. Outputs include a microprocessor clock (uP), modulator output to the synthesizer, and amplified audio signals to an internal or external speaker.

Chapter 2

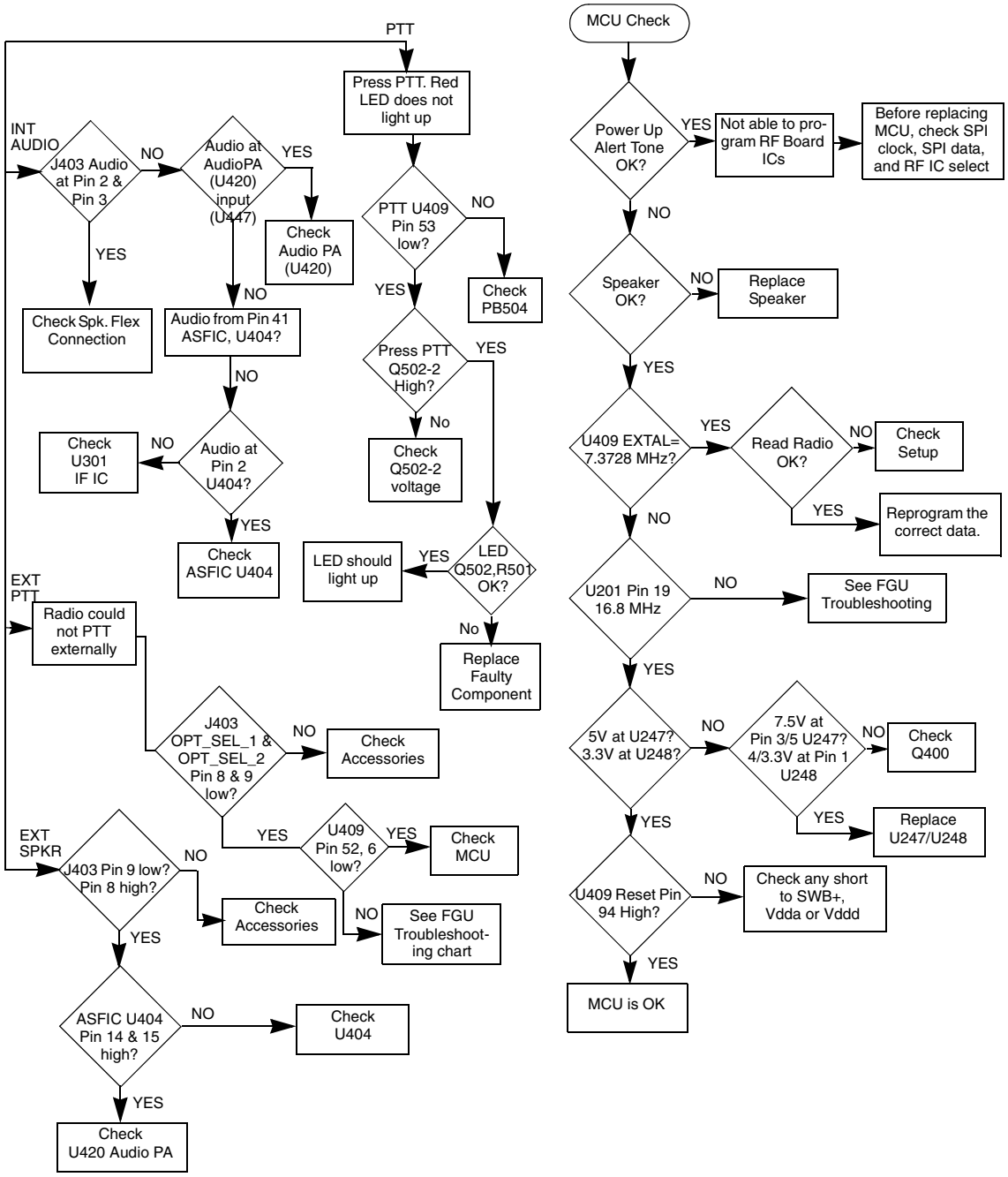
TROUBLESHOOTING CHARTS

1.0 UHF/ UHF2/ 800MHz Controller

1.1 All models except those with PCB 8486458Z03



1.2 Models with PCB 8486458Z03



Chapter 3

CONTROLLER SCHEMATICS

1.0 Allocation of Schematics and Circuit Boards

The Controller circuits are contained on the printed circuit board (PCB) containing the RF circuits. This Chapter shows the schematics for the Controller circuits only, refer to the relevant RF section for details of the related RF circuits, the PCB component layouts and the Parts Lists. The Controller schematic diagrams and the related PCB and parts list are shown in the tables below:

Table 3-1 Schematics - Set 1

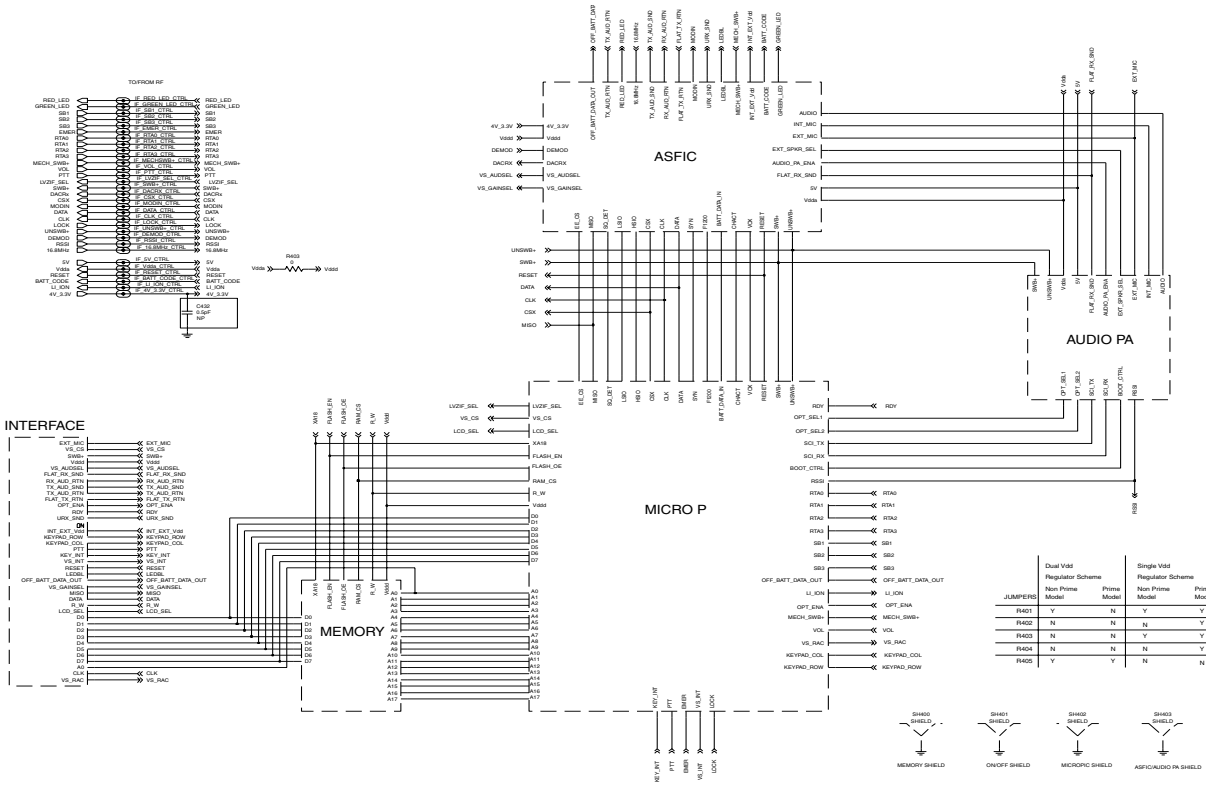
PCBs :	
8480450Z03	**UHF**
8485641Z02	**UHF2**
8480587Z01	**UHF GP1280**
8485677Z01	**UHF2 GP1280**
8480641Z03	**800 MHz**
SCHEMATICS	
Overall Controller Schematic	Page 3-3
ASFIC/ ON_OFF	Page 3-4
Microprocessor	Page 3-5
Interface	Page 3-6
Memory	Page 3-6
Audio Power Amplifer	Page 3-7

Table 3-2 Schematics - Set 2

PCBs :	
8480450Z13/14	**UHF**
8485641Z06	**UHF2**
SCHEMATICS	
Overall Controller Schematic	Page 3-9
ASFIC ON_OFF	Page 3-10
Microprocessor	Page 3-10
Memory	Page 3-11
Interface	Page 3-12
Audio Power Amplifer	Page 3-13

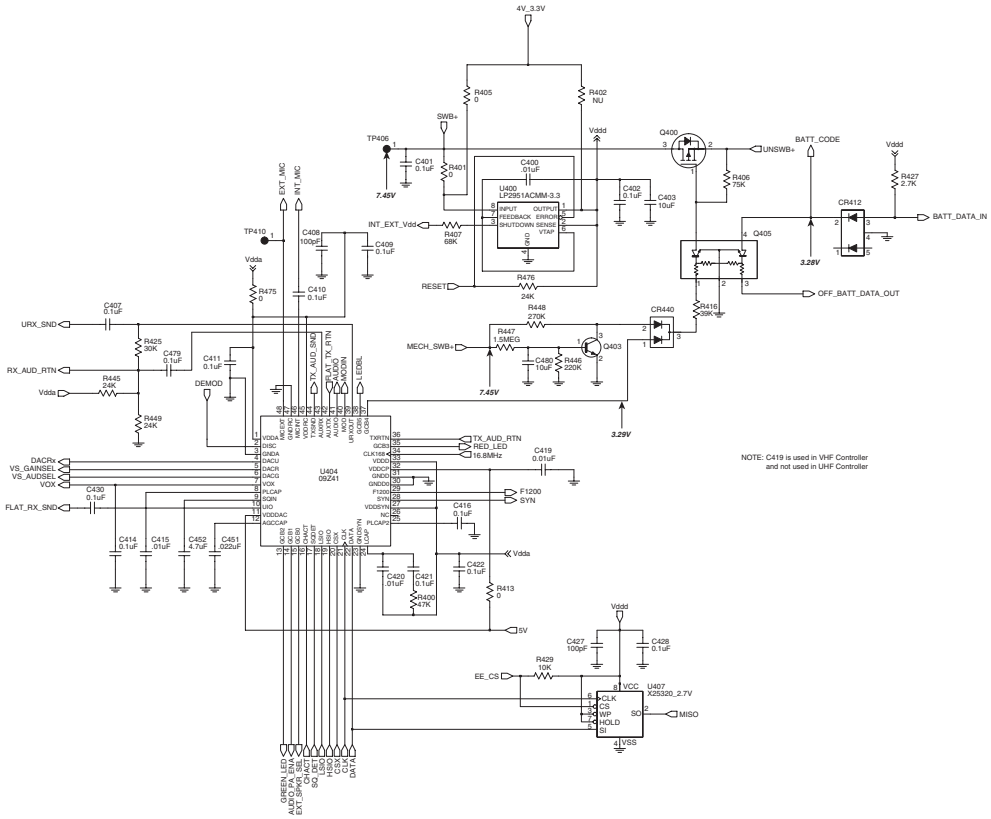
Table 3-3 Schematics - Set 3

2.0 Controller - Set 1 (PCB 8480450Z03, 8485641Z02, 8480587Z01, 8485677Z01, 8480641Z03)

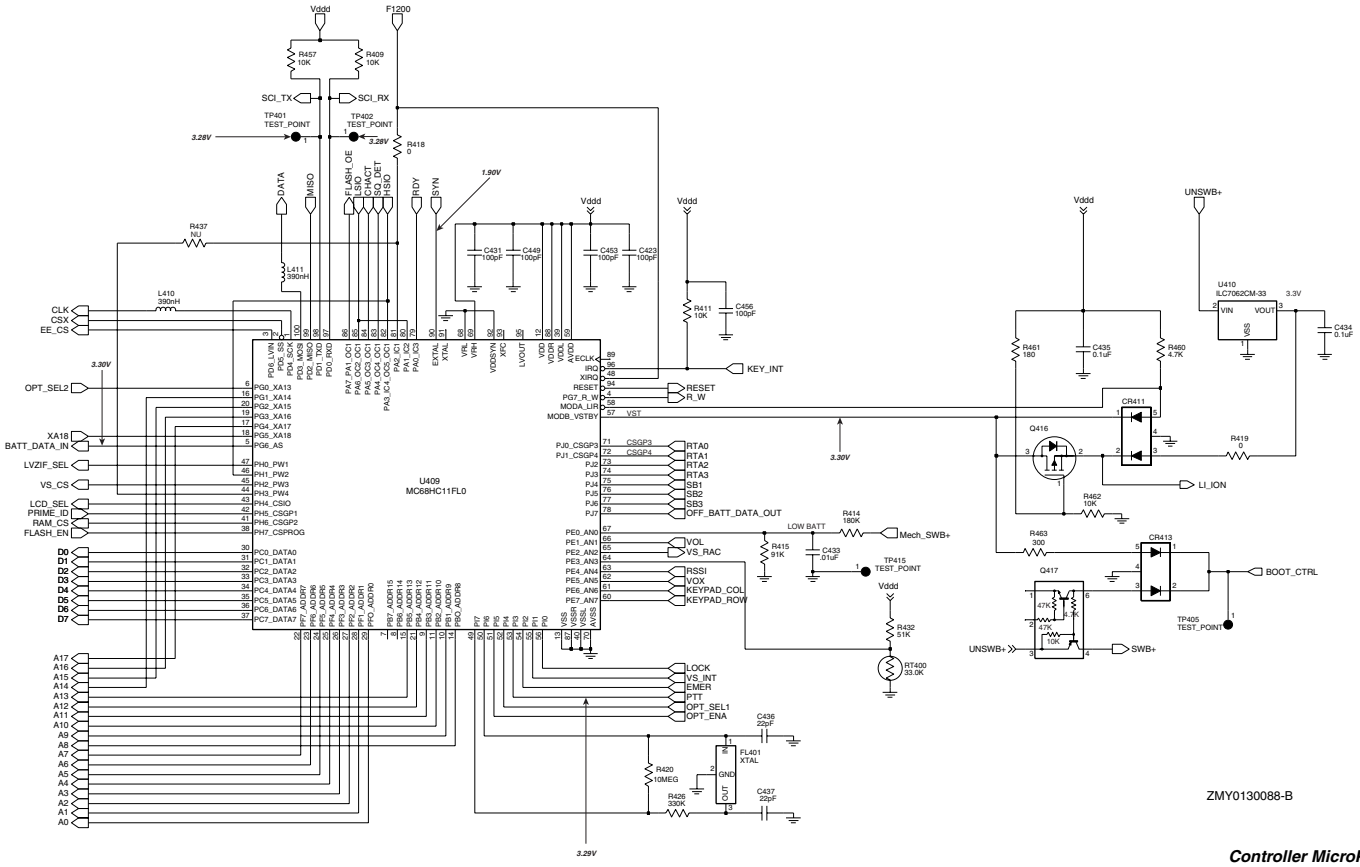


FL0830275-O

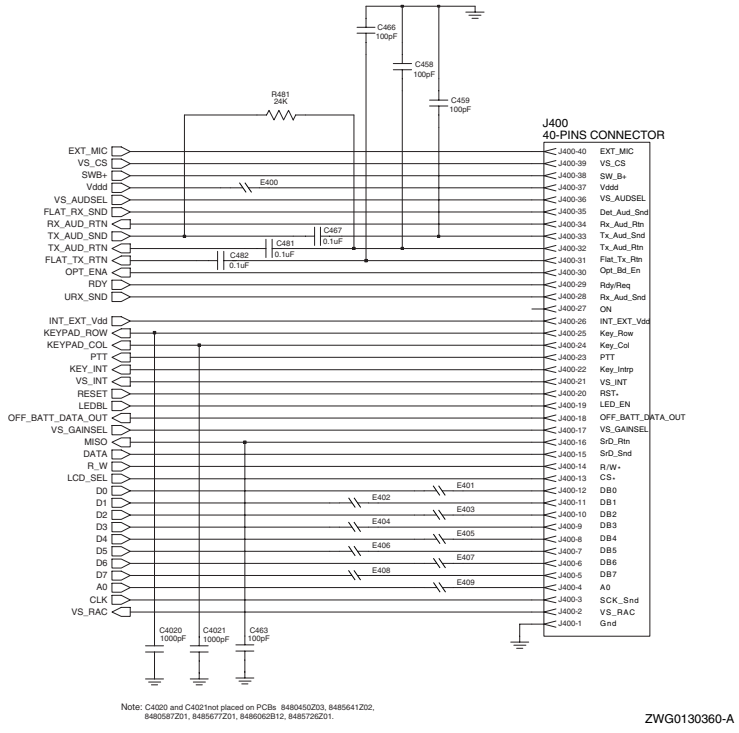
Overall Controller Schematic



Controller ASFIC / ON-OFF ZWG0130109-A



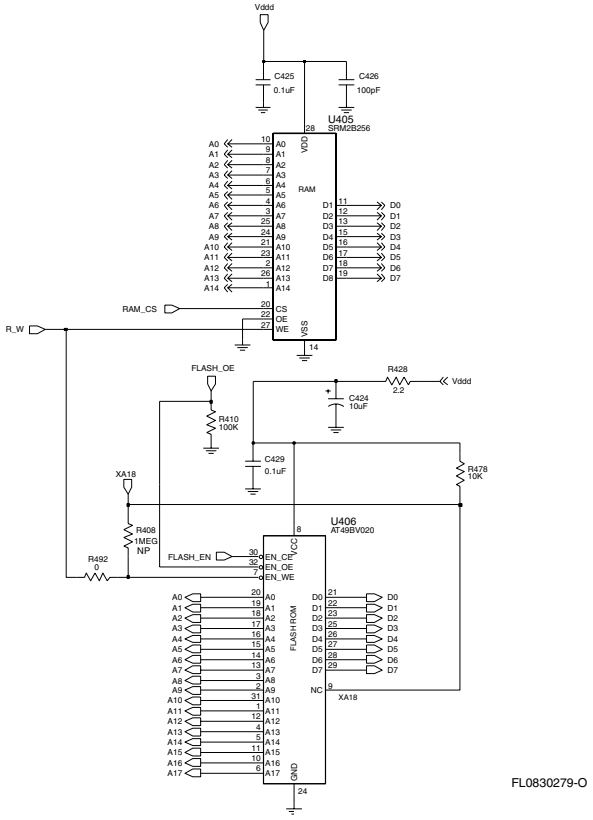
Controller MicroProcessor



Note: C4020 and C4021not placed on PCBs 8480450Z03, 8485641Z02, 8480587Z01, 8485677Z01, 8486062B12, 8485726Z01.

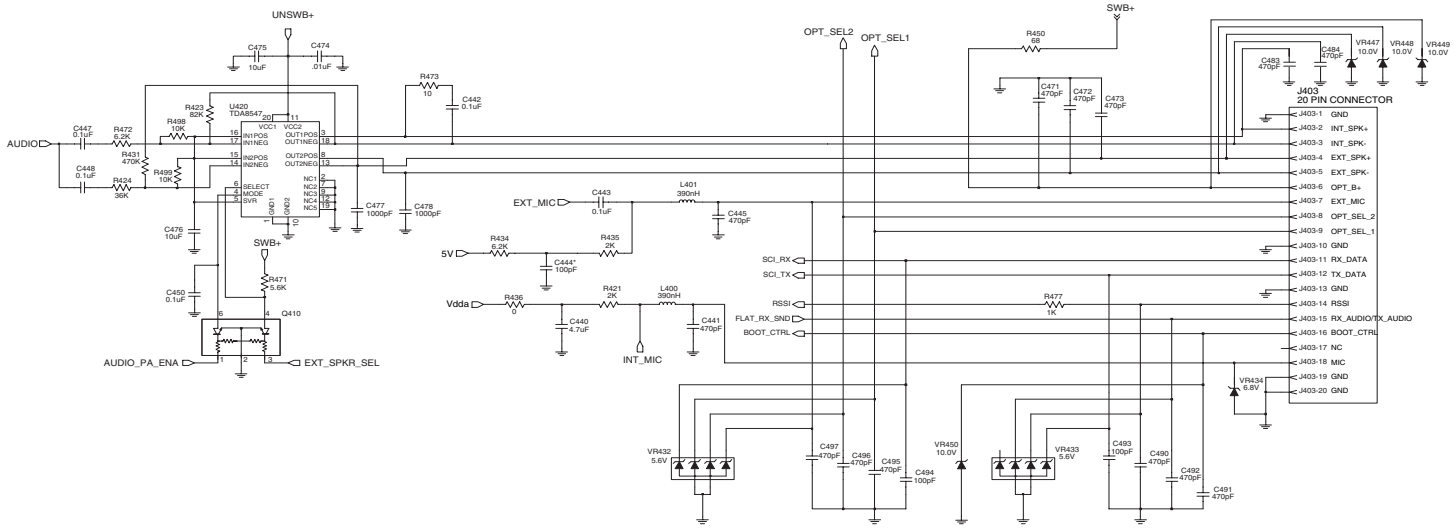
ZWG0130360-A

Controller Interface



FL0830279-O

Controller Memory



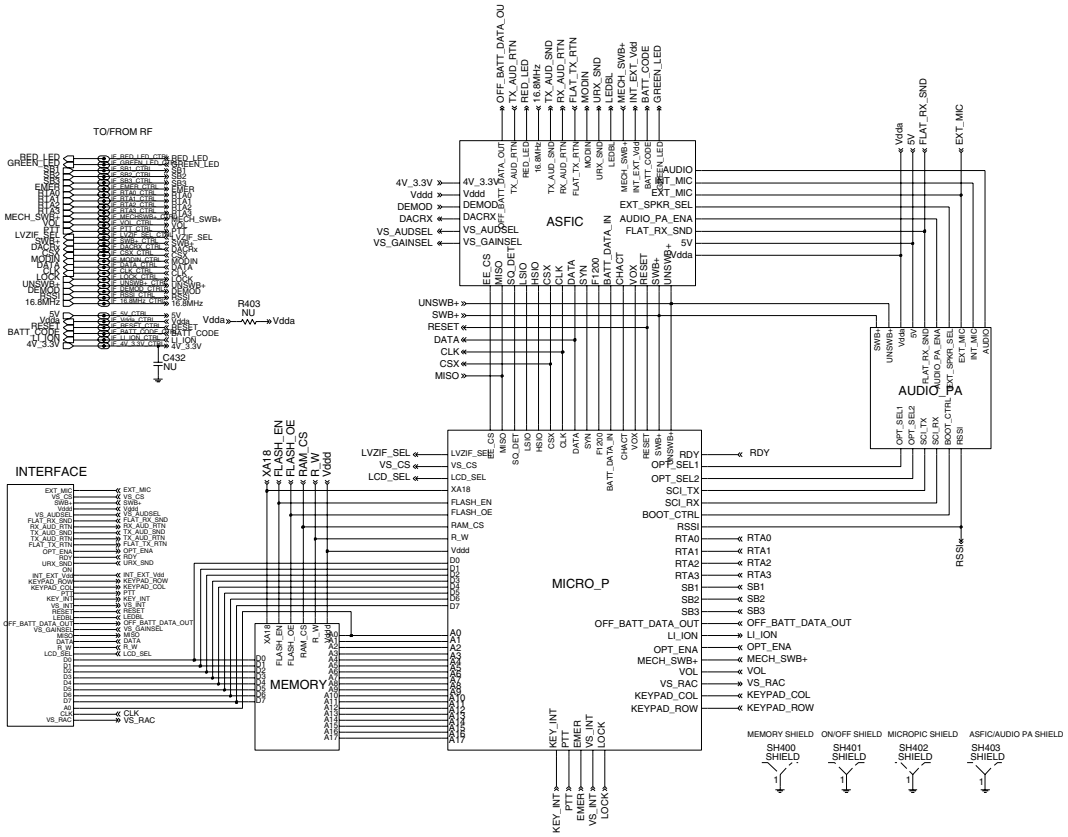
Band PCB	R472	R423	C474	C477	C478	C445	C441	C471	C472	C473	C483	C484	C490	C491	C492	C495	C496	C497	VR445	VR446	R498	R499
UHF B1 8480450Z03 UHF B2 8485641Z02	36K	470K	not placed	not placed	not placed	100pF	100pF	100pF	470pF	470pF	not placed	not placed	100pF	100pF	100pF	100pF	100pF	100pF	10.0V	10.0V	not placed	not placed
300R1 8485726Z04 GP1280 UHF B1 8480587Z01 UHF B2 8485677Z01	6.2K	82K	.01uF	1000pF	1000pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	not placed	not placed	10K	10K
VHF 8486062B12	6.2K	82K	.01uF	1000pF	1000pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	not placed	not placed	not placed	not placed
VHF 8486062B14	6.2K	82K	.01uF	1000pF	1000pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	470pF	not placed	not placed	10K	10K
300R1 8485726Z01	3.6K	47K	not placed	not placed	not placed	100pF	100pF	100pF	100pF	100pF	not placed	not placed	100pF	100pF	100pF	100pF	100pF	100pF	10.0V	10.0V	not placed	not placed
800 MHz 8480641Z03	36K	470K	not placed	not placed	not placed	68pF	68pF	68pF	68pF	68pF	not placed	not placed	68pF	68pF	68pF	68pF	68pF	68pF	10.0V	10.0V	not placed	not placed
UHF B1 8480450Z13 8480450Z14	36K	470K	not placed	not placed	not placed	100pF	100pF	100pF	470pF	470pF	not placed	not placed	100pF	100pF	100pF	100pF	100pF	100pF	10.0V	10.0V	10K	10K

ZWG0130110-D

Controller Audio Power Amplifier

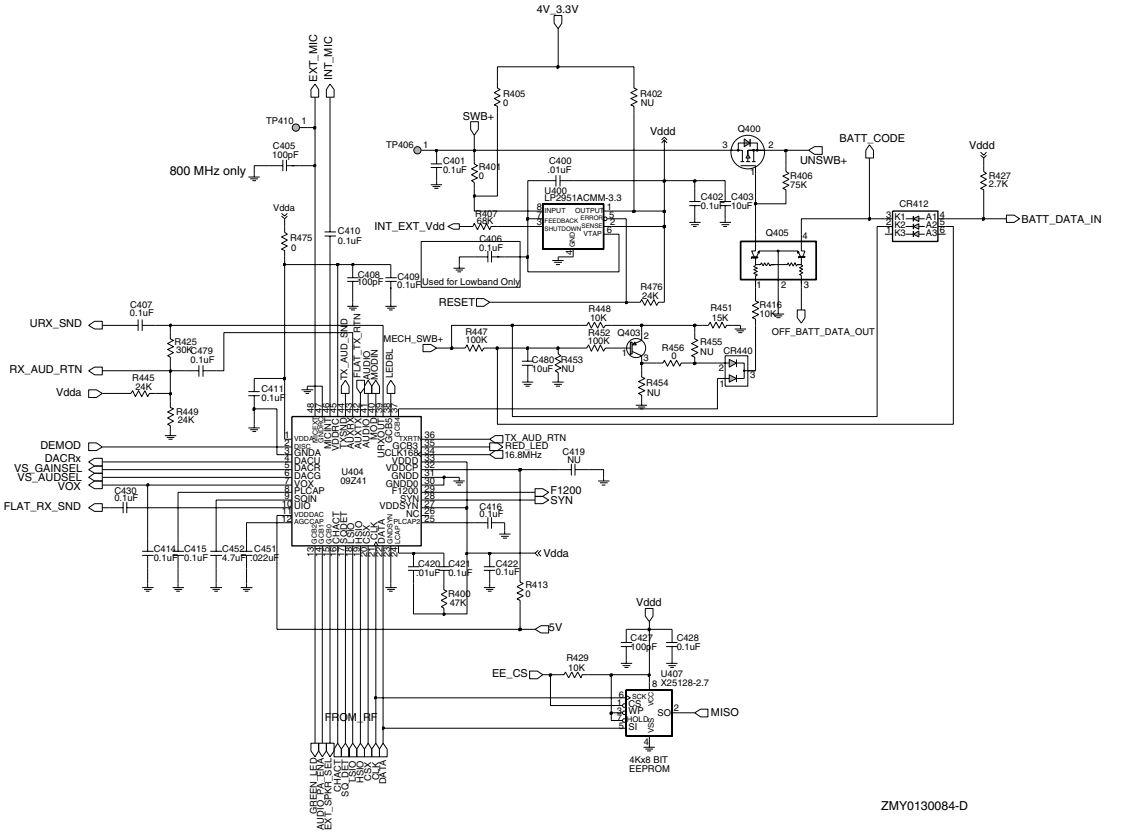
Intentionally left blank

3.0 Controller - Set 2 (PCB 8480450Z13/14, 8485641Z06)



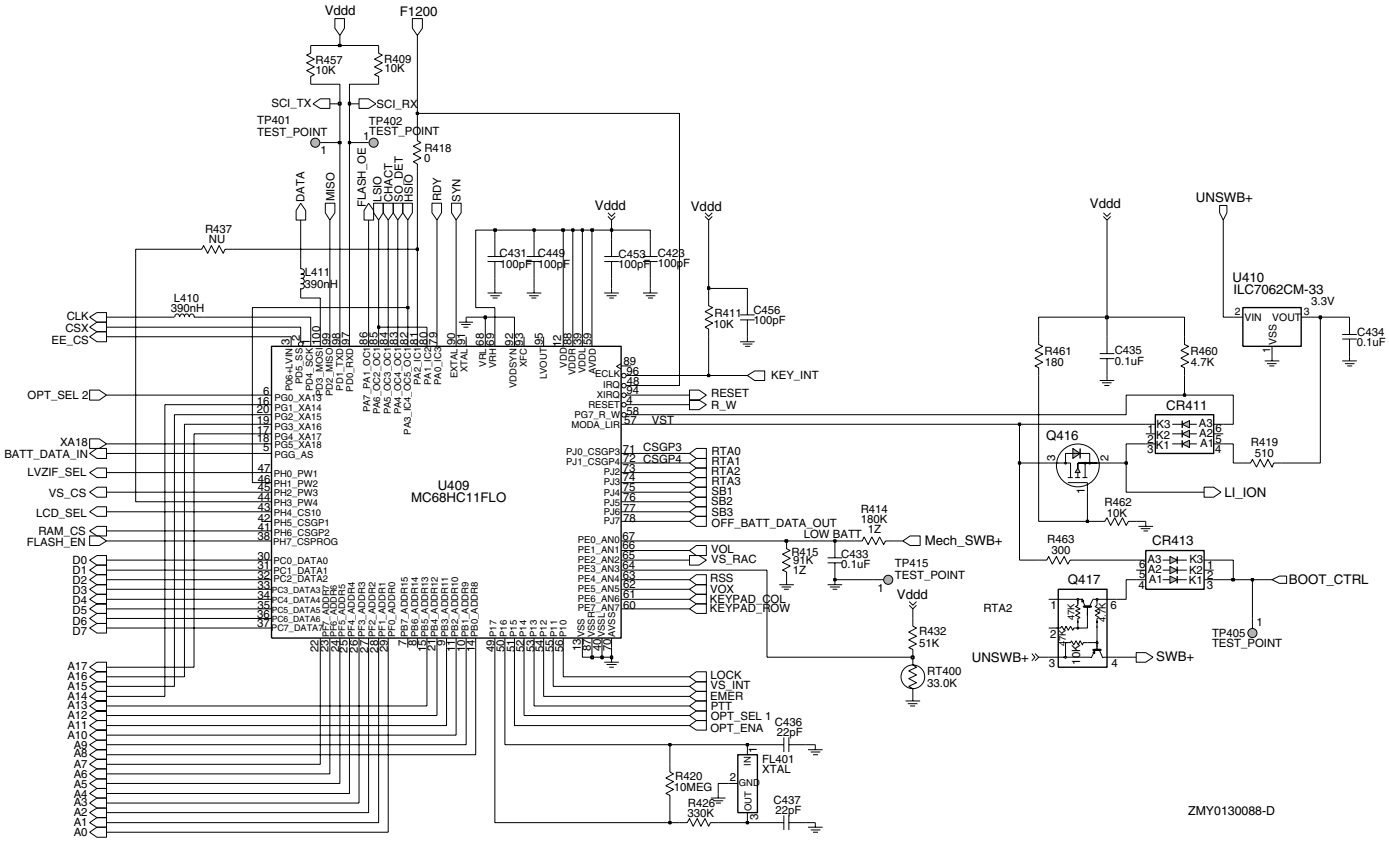
ZMY0130086-B

Overall Controller Schematic

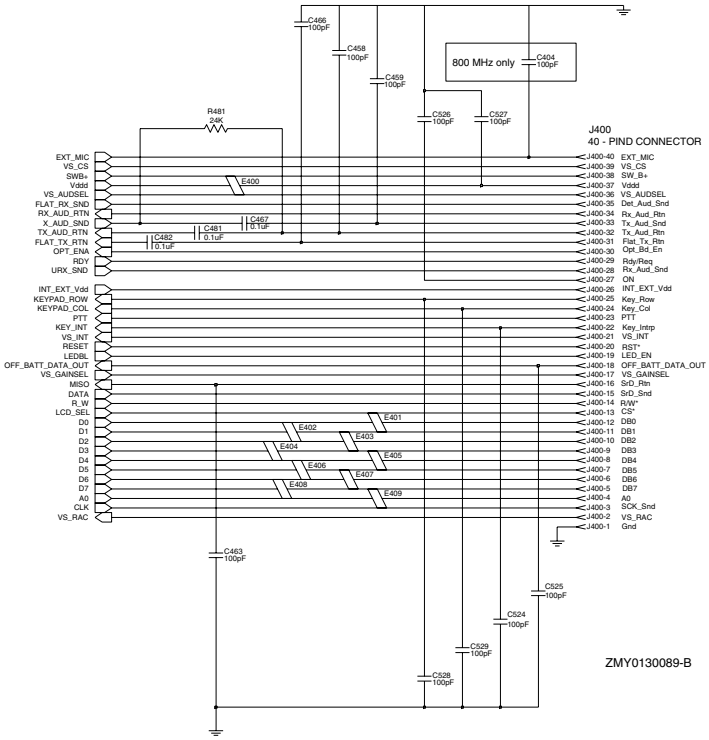


ZMY0130084-D

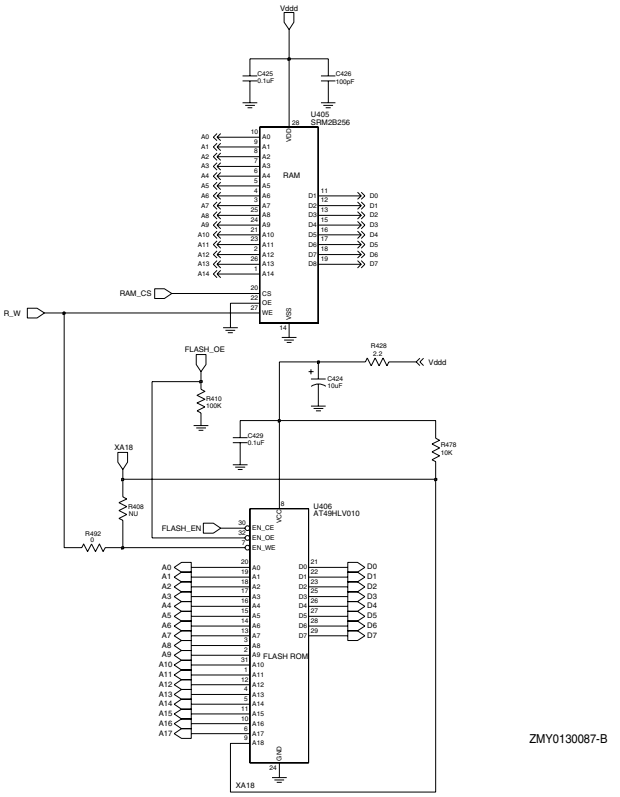
Controller ASFIC / ON-OFF



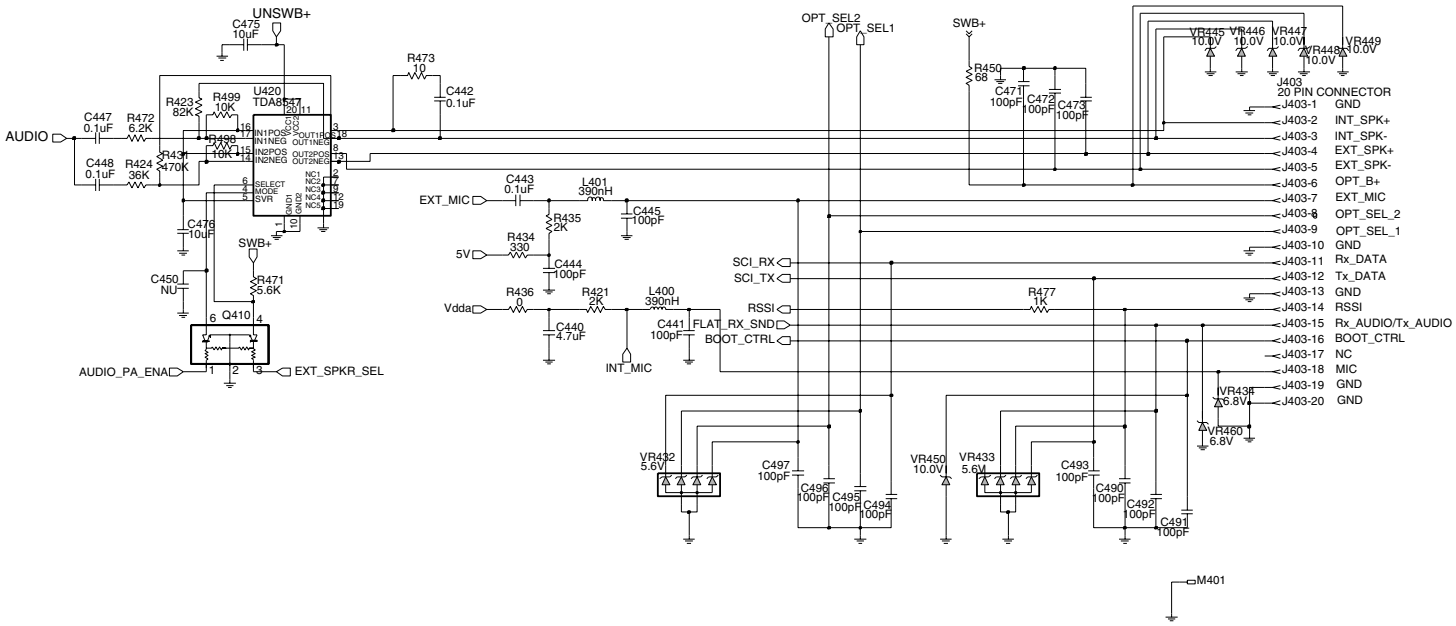
Controller Micro Processor



Controller Interface



Controller Memory



ZMY0130079-D

Controller Audio Power Amplifier

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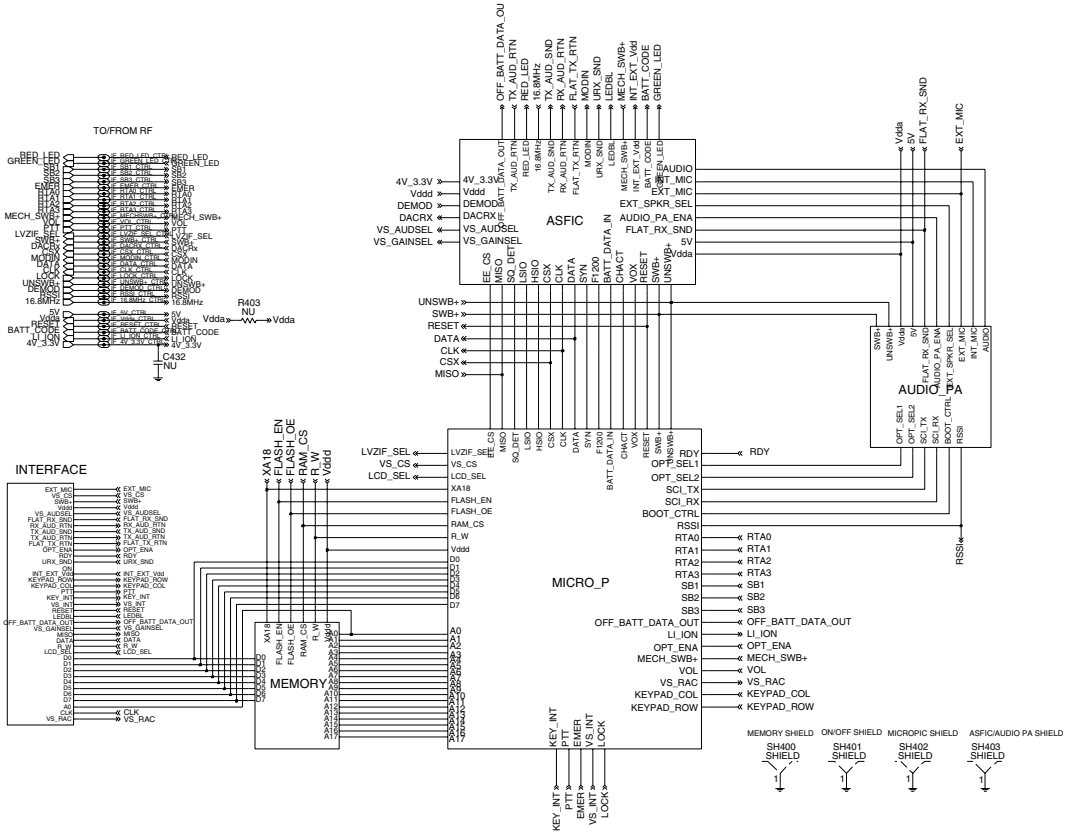
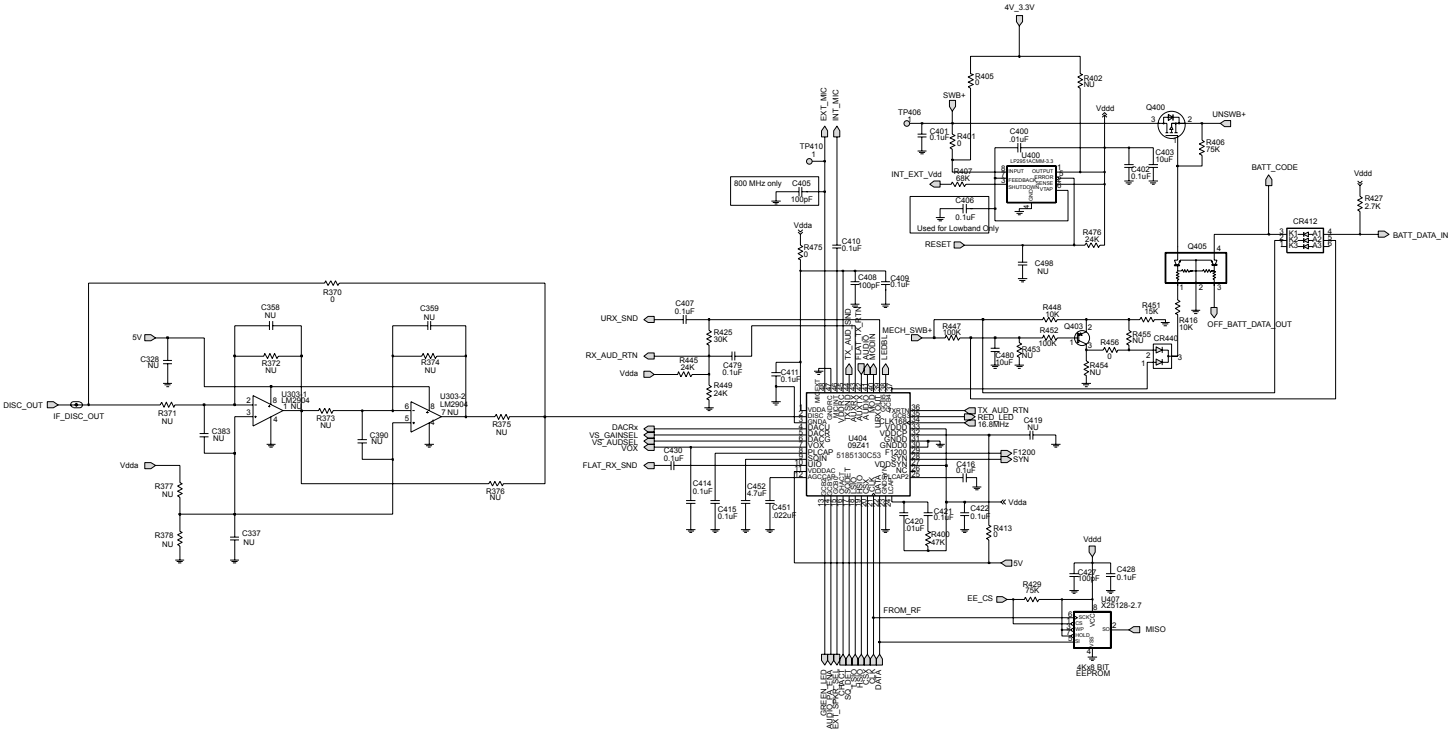
4.0 Controller - Set 3 (PCB 8486458Z03, 8486686Z02)

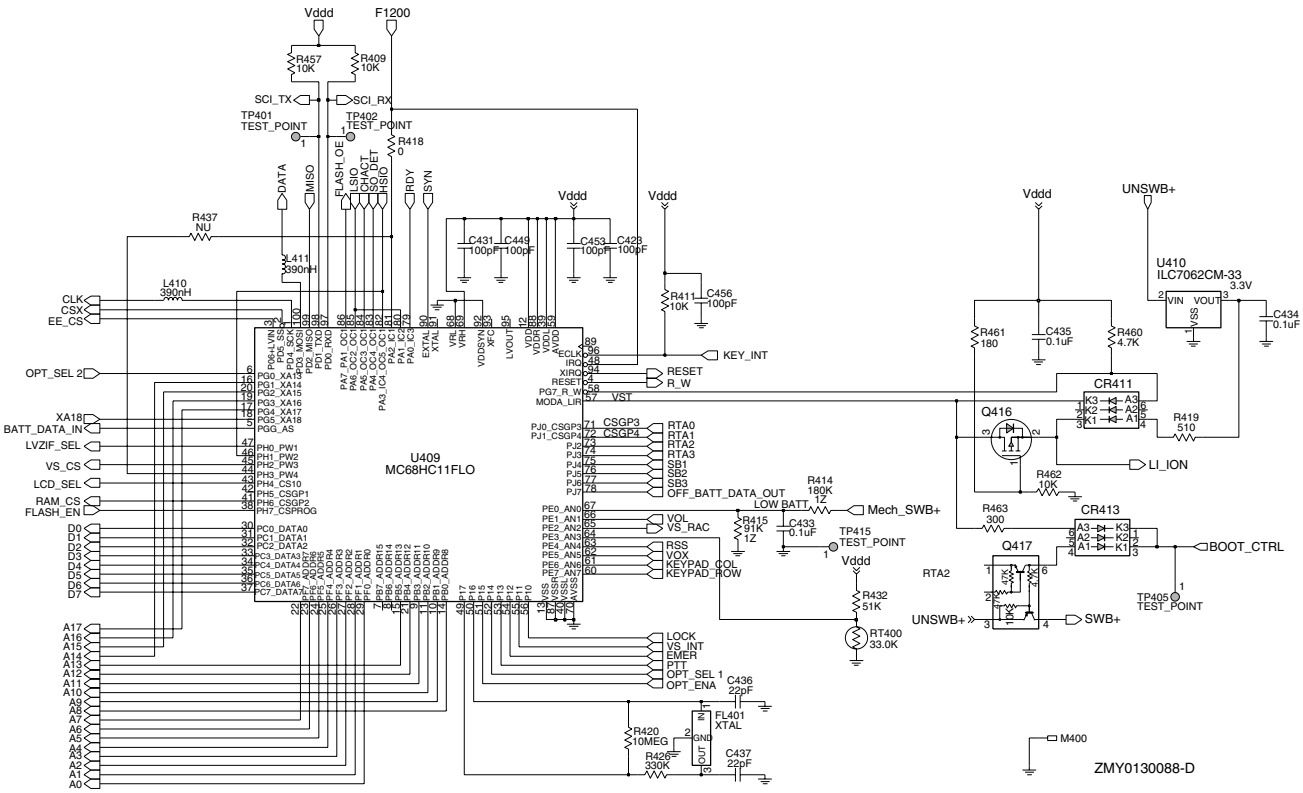


ZMY0130086-B

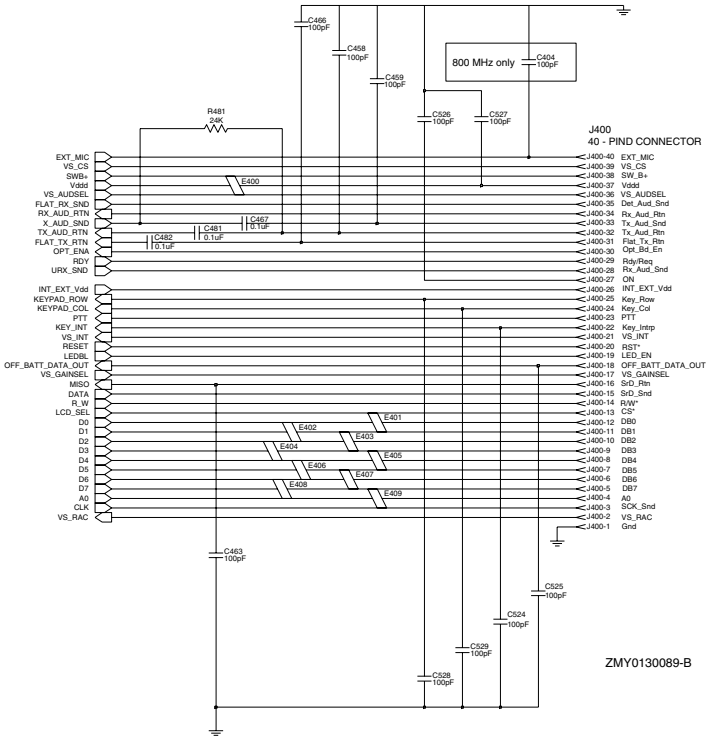
Overall Controller Schematic



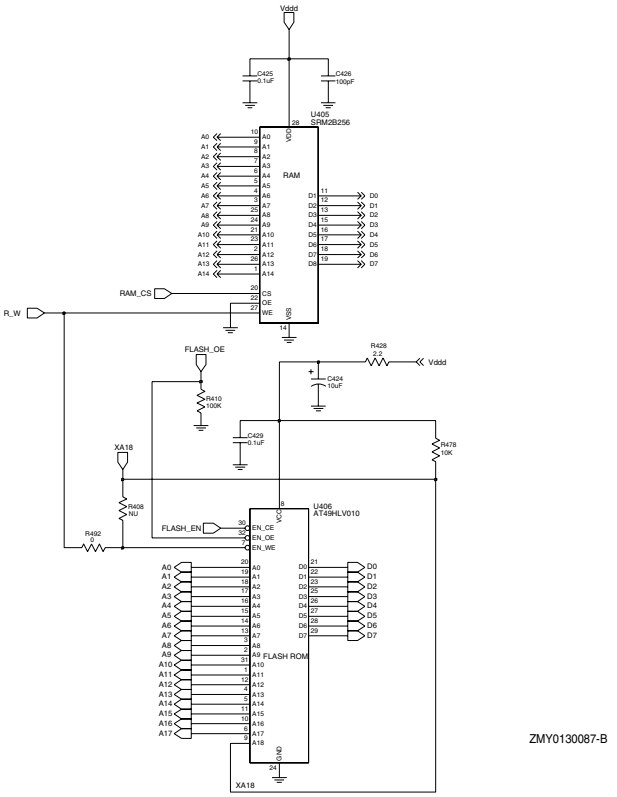
Controller ASFIC / ON-OFF



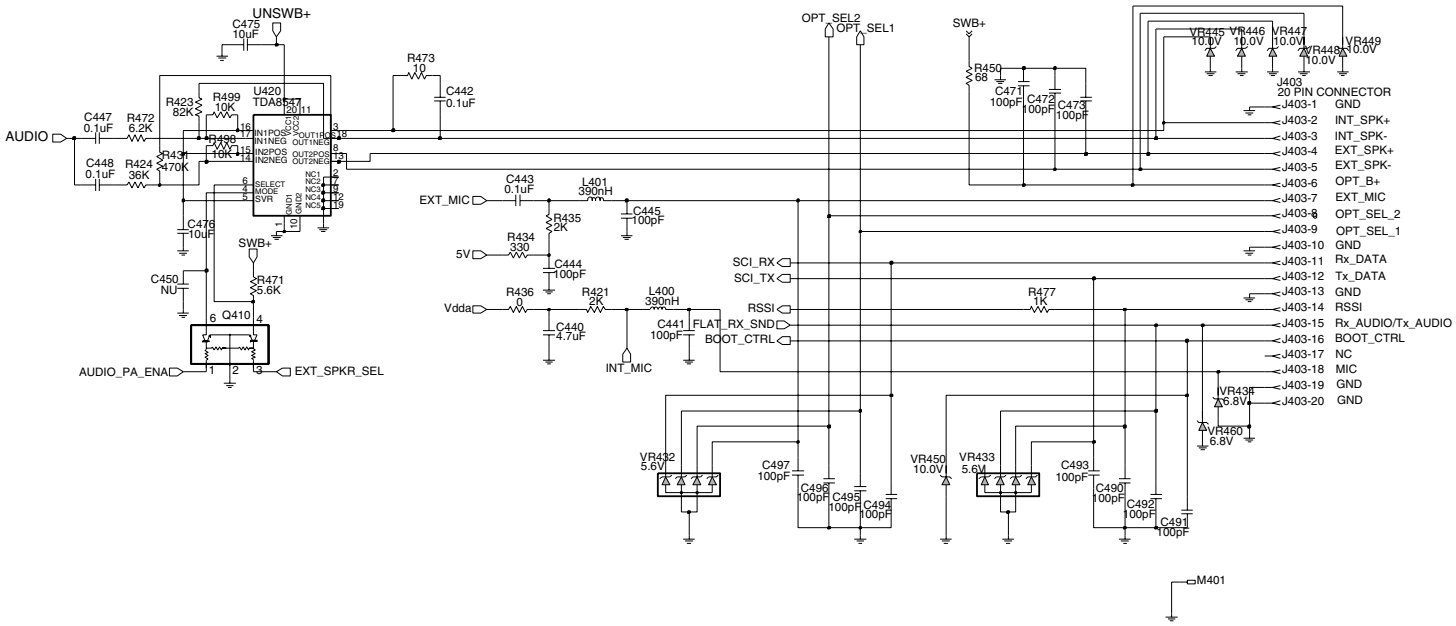
Controller Microprocessor



Controller Interface



Controller Memory



ZMY0130079-D

Controller Audio Power Amplifier

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MOTOROLA

Professional Radio

GP Series

UHF (403 - 470MHz)

Service Information

Issue: November 2004

Computer Software Copyrights

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Chapter 1

MODEL CHART AND TECHNICAL SPECIFICATIONS

1.0 GP320/GP340/GP360/GP380 Model Chart

Professional GP300 Series (UHF)						
Model						Description
MDH25RDC9AN0_E						GP320 UHF 403-470MHz 4W 1-Ch
	MDH25RDC9AN3_E					GP340 UHF 403-470MHz 4W 16-Ch
		MDH25RDF9AN5_E				GP360 UHF 403-470MHz 4W 255-Ch
			MDH25RDH9AN6_E			GP380 UHF 403-470MHz 4W 255-Ch
					Item	Description
X					PMLE4140_	*GP320 UHF Back Cover Kit
	X				PMLE4137_	*GP340 UHF Back Cover Kit
		X			PMLE4141_	*GP360 UHF Back Cover Kit
			X		PMLE4138_	*GP380 UHF Back Cover Kit
X					6864110B12	GP320 Basic User Guide
	X				6864110B13	GP340 Basic User Guide
		X			6864110B16	GP360 Basic User Guide
			X		6864110B18	GP380 Basic User Guide
X	X	X	X		NAE6483_	UHF Whip (403-470 MHz) Antenna
X	X	X	X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

* = Service replacement boards.

2.0 GP140 Model Chart

Professional GP140 (UHF)			
Model			**Description**
MDH25RDC9AA3_E			GP140 UHF 403-470 MHz 4W 16 Ch
		Item	**Description**
X		PMLE4130_	*GP140 UHF Back Cover Kit
X		6864110B25	GP140 Basic User Guide
X		NAE6483_	UHF Whip (403-470 MHz) Antenna
X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

* = Service replacement boards.

3.0 GP640/GP680 Model Chart

Professional GP600 Series (UHF)				
Model				**Description**
MDH25RDC9CK3_E				GP640 UHF 403-470 MHz 4W
	MDH25RDH9CK6_E			GP680 UHF 403-470 MHz 4W
			Item	**Description**
X			PMLE4133_	*GP640 UHF Back Cover Kit
	X		PMLE4134_	*GP680 UHF Back Cover Kit
X			6864110B14	GP640 Basic User Guide
	X		6864110B19	GP680 Basic User Guide
X	X		NAE6483_	UHF Whip (403-470 MHz) Antenna
X	X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

* = Service replacement boards.

4.0 GP1280 Model Chart

Professional GP1280 (UHF)			
Model			**Description**
MDH25RDN9CK8_E			GP1280 UHF 403-470 MHz 4W
		Item	**Description**
X		PMLE4142_	*GP1280 UHF Back Cover Kit
X		6864110B20	GP1280 Basic User Guide
X		NAE6483_	UHF Whip (403-470 MHz) Antenna
X		HNN9008_	Battery, NiMH Standard

x = Indicates one of each is required.

* = Service replacement boards.

5.0 GP240/GP540/GP280/GP580 Model Chart

Professional GP200/GP500 Series (UHF)						
Model						Description
MDH25RDC9GC3						GP540 UHF 403-470 MHz 4W
	MDH25RDH9GC6					GP580 UHF 403-470 MHz 4W
		MDH25RDC9GB3				GP240 UHF 403-470 MHz 4W
			MDH25RDH9GB6			GP280 UHF 403-470 MHz 4W
					Item	Description
X		X			*PMLE4192_	GP240/GP540 UHF Back Cover Kit
	X		X		*PMLE4193_	GP280/GP580 UHF Back Cover Kit
X		X			*PMLN4216_	GP240/GP540 UHF Front Housing Kit
	X		X		*PMLN4373_	GP280/GP580 UHF Front Housing Kit
		X	X		6864120B15	GP240/GP280 User Guide (English)
		X	X		6864120B16	GP240/GP280 User Guide (ENG, RUS, FR, TUR)
		X	X		6864120B17	GP240/GP280 User Guide (GER, SPA, POR, IT)
		X	X		6864120B18	GP240/GP280 User Guide (SWE,NL, DAN, FIN)
		X	X		6864120B19	GP240/GP280 User Guide (CZ, PL, HU, RO)
X	X				6864120B20	GP540/GP580 User Guide (English)
X	X				6864120B21	GP540/GP580 User Guide (ENG, RUS, FR, TUR)
X	X				6864120B22	GP540/GP580 User Guide (GER, SPA, POR, IT)
X	X				6864120B23	GP540/GP580 User Guide (SWE,NL, DAN, FIN)
X	X				6864120B24	GP540/GP580 User Guide (CZ, PL, HU, RO)
X	X	X	X		NAE6483_	Antenna (403-433 MHz) Stubby
X	X	X	X		HNN9008_	Battery, NiMH Standard

One user guide is selectable via option.

x = Indicates one of each is required.

* = Service replacement boards.

6.0 Technical Specifications

Data is specified for +25°C unless otherwise stated.

General Specifications		
Channel Capacity		
GP140	16	
GP240, GP280	128 in conventional Mode	
GP320	1	
GP340	16	
GP360, GP380	255	
GP540, GP580	128 in conventional Mode	
GP640, GP680, GP1280	16 (Conventional)	
Power Supply	Rechargeable battery 7.5v	
Dimensions: H x W x D (mm) Height excluding knobs	**GP140/GP240/320/340/360/380/ GP580/640/680**	
With standard high capacity NiMH battery	137 x 57.5 x 37.5	
With ultra high capacity NiMH battery	137 x 57.5 x 40.0	
With NiCD battery	137 x 57.5 x 40.0	
With Lilon battery	137 x 57.5 x 33.0	
	GP1280	
With standard high capacity NiMH battery	152 x 57.5 x 37.5	
With ultra high capacity NiMH battery	152 x 57.5 x 37.5	
With NiCD battery	152 x 57.5 x 37.5	
With Lilon battery	152 x 57.5 x 37.5	
Weight: (gm)	**GP140/GP240/ GP320/GP340/ GP540/GP640**	**GP360/GP280 GP380/GP580 GP680**
With Standard high capacity NiMH battery	420	428
With Ultra high capacity NiMH battery	500	508
With NiCD battery	450	458
With Lilon battery	350	358
	GP1280	
With Standard high capacity NiMH battery	460	
With Ultra high capacity NiMH battery	535	
With NiCD battery	485	
With Lilon battery	390	
Average Battery Life @5/5/90 Cycle:	Low Power	High Power
With Standard high capacity NiMH battery	11 hours	8 hours
With Ultra high capacity NiMH battery	14 hours	11 hours
With NiCD battery	12 hours	9 hours
With Lilon battery	11 hours	8 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54	
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E and TIA/EIA 603	
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E and TIA/EIA 603	

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-25°C to +55°C, +25° Ref.)	±1.5 ppm
Power	403 - 470 MHz:1-4W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB typical
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000 Hz)	+1 to -3 dB
Audio Distortion	<5% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD) EIA Sensitivity (20 dB SINAD) ETS	0.25 µV typical 0.50 µV typical
Intermodulation EIA	65 dB
Adjacent Channel Selectivity	60 dB @ 12.5 kHz 70 dB @ 25 kHz
Spurious Rejection	>70 dB
Rated Audio	0.5W
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-45 dB @ 12.5 kHz -50 dB @ 20/25 kHz
Audio Response (300 - 3000 Hz)	+1 to -3 dB
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz ETS 300 086

*Availability subject to the laws and regulations of individual countries.

Chapter 2

THEORY OF OPERATION

1.0 Introduction

This Chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and trouble shooting for the the associated Controller circuits refer to the Controller Section of this manual.

2.0 UHF Transmitter

(*Refer to Figure 2-1 and the UHF Transmitter schematic diagram*)

The UHF transmitter consists of the following basic circuits:

1. Power amplifier (PA).
2. Antenna switch/harmonic filter.
3. Antenna matching network.
4. Power Control Integrated Circuit (PCIC).

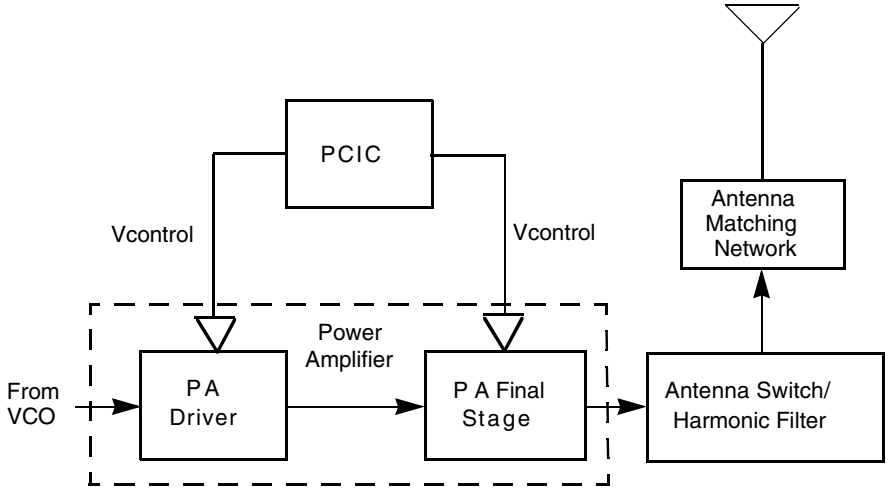


Figure 2-1 UHF Transmitter Block Diagram.

2.1 Power Amplifier

The power amplifier (PA) consists of two principle devices:

1. LDMOS PA driver IC, U101.
2. LDMOS PA final stage, Q110.

The LDMOS driver IC provides 2-stage amplification using a supply voltage of 7.3V. The amplifier is capable of supplying an output power of 0.3W (pins 6 and 7) with an input signal of 2mW at 3dBm (pin16). The current drain is typically 160mA while operating in the frequency range of 403-470MHz.

The LDMOS PA is capable of supplying an output power of 7W with an input signal of 0.3W. The current drain is typically 1300mA while operating in the frequency range of 403-470MHz. The power output can be varied by changing the bias voltage.

2.2 Antenna Switch

The antenna switch circuit consists of two pin diodes (CR101 and CR102), a pi network (C107, L104 and C106), and two current limiting resistors (R101 and R170). In the transmit mode, B+ at PCIC (U102) pin 23 goes low turning on Q111 which applies a B+ bias to the antenna switch circuit to bias the diodes “on”. The shunt diode (CR102) shorts out the receiver port and the pi network. This operates as a quarter wave transmission line to transform the low impedance of the shunt diode to a high impedance at the input of the harmonic filter. In the receive mode, the diodes are both off, creating a low attenuation path between the antenna and receiver ports.

2.3 Harmonic Filter

The harmonic filter consists of components C104, L102, C103, L101 and C102. The harmonic filter for UHF is a modified Zolotarev design optimized for efficiency of the power module. This type of filter has the advantage that it can give a greater attenuation in the stop-band for a given ripple level. The harmonic filter insertion loss is typically less than 1.2dB.

2.4 Antenna Matching Network

The antenna matching network is made up of inductor L116. This component matches the antenna impedance to the harmonic filter to optimize the performance of the transmitter and receiver.

2.5 Power Control Integrated Circuit (PCIC)

The transmitter uses PCIC, U102, to regulate the power output of the radio. The current to the final stage of the power module is supplied through R101 to provide a voltage proportional to the current drain. This voltage is then fedback to the Automatic Level Control (ALC) within the PCIC to regulate the output power of the transmitter.

The PCIC contains internal digital to analog converters (DACs) that provide a programmable control loop reference voltage through the SPI line of the PCIC.

The PCIC internal resistors, integrators, and external capacitors (C133, C134 and C135) control the transmitter rise and fall times to reduce the power splatter into adjacent channels.

Diode CR105 and its associated components are part of a temperature cut back circuit. This circuit senses the printed circuit board temperature around the transmitter circuits and outputs a DC voltage to the PCIC. If the DC voltage produced exceeds the set threshold of the PCIC, the transmitter output power decreases to reduce the transmitter temperature.

3.0 UHF Receiver (all models except those with PCB 8486458Z03)

The UHF receiver consists of a front end, back end, and automatic gain control circuits. A block diagram of the receiver is shown in Figure 2-2. Detailed descriptions of these features are contained in the paragraphs that follow.

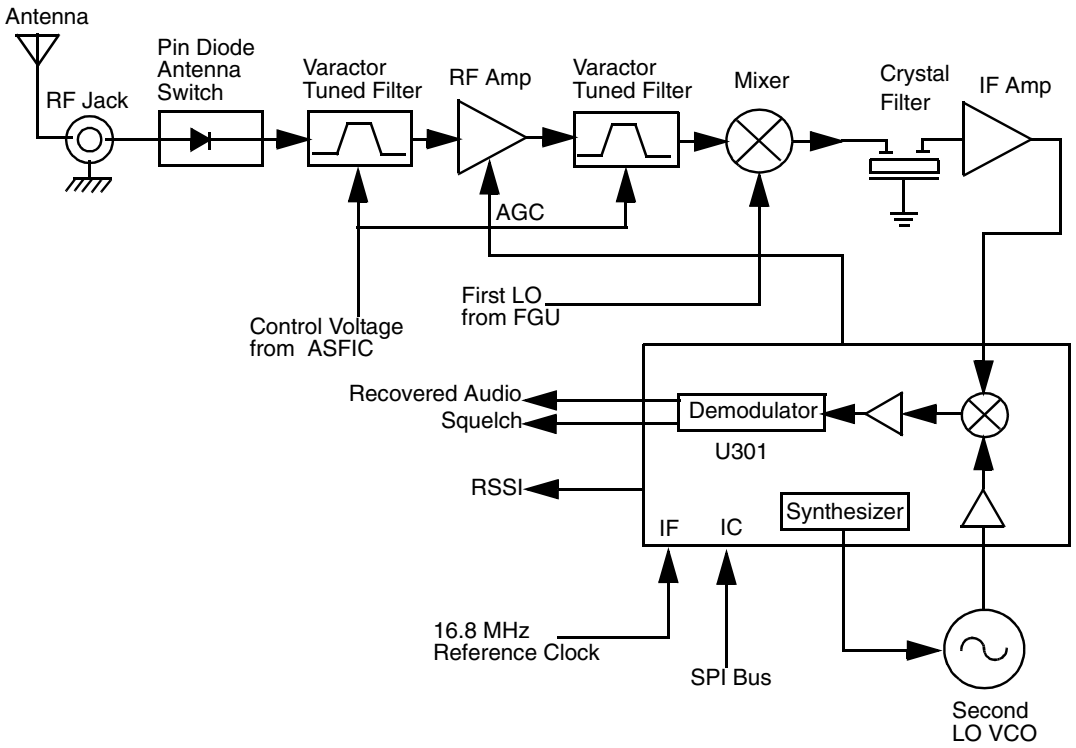


Figure 2-2 UHF Receiver Block Diagram.

3.1 Receiver Front-End

(*Refer to Figure 2-2 and the UHF Receiver Front End schematic diagram)*

The RF signal received by the antenna is applied to a low-pass filter. For UHF, the filter consists of components L101, L102, C102, C103, and C104. The filtered RF signal is passed through the antenna switch circuit consisting of two pin diodes (CR101 and CR102) and a pi network (C106, L104, and C107). The signal is then applied to a varactor tuned bandpass filter.

The UHF bandpass filter consists of components L301, L302, C302, C303, C304, CR301, and CR302. The filter is electronically tuned by DACRx from IC 404 which supplies a control voltage to the varactor diodes (CR301 and CR302) in the filter as determined by the microprocessor depending on the carrier frequency. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

The output of the bandpass filter is coupled to the RF amplifier transistor Q301 via C307. After being amplified by the RF amplifier, the RF signal is further filtered by a second varactor tuned bandpass filter, consisting of L306, L307, C313, C317, CR304 and CR305.

Both the pre and post-RF amplifier varactor tuned filters have similar responses. The 3 dB bandwidth of the filter is approximately 50 MHz. This enables the filters to be electronically controlled by using a single control voltage from DACRx.

The output of the post-RF amplifier filter is connected to the passive double balanced mixer consisting of components T301, T302, and CR306. Matching of the filter to the mixer is provided by C381. After mixing with the first local oscillator (LO) signal from the voltage controlled oscillator (VCO) using low side injection, the RF signal is down-converted to a 45.1 MHz IF signal.

The IF signal coming out of the mixer is transferred to the crystal filter (FL301) through a resistor pad and a diplexer (C322 and L310). Matching to the input of the crystal filter is provided by C324 and L311. The crystal filter provides the necessary selectivity and intermodulation protection.

3.2 Receiver Back-End

(*Refer to Figure 2-2 and the UHF Receiver Back End schematic diagram*)

The output of crystal filter FL301 is matched to the input of IF amplifier transistor Q302 by components L322 and C325. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The IF amplifier provides a gain of about 7dB. The amplified IF signal is then coupled into U301(pin 3) via C330, C338 and L330 which provides matching for the IF amplifier and U301.

The IF signal applied to pin 3 of U301 is amplified, down-converted, filtered, and demodulated, to produce recovered audio at pin 27 of U301. This IF IC is electronically programmable, and the amount of filtering, which is dependent on the radio channel spacing, is controlled by the microprocessor. Additional filtering, once externally provided by the conventional ceramic filters, is replaced by internal filters in IF module U301.

The IF IC uses a type of direct conversion process, whereby the externally generated second LO frequency is divided by two in U301 so that it is very close to the first IF frequency. The IF IC (U301) synthesizes the second LO and phase-locks the VCO to track the first IF frequency. The second LO is designed to oscillate at twice the first IF frequency because of the divide-by-two function in the IF IC.

In the absence of an IF signal, the VCO searches for a frequency, or its frequency will vary close to twice the IF frequency. When an IF signal is received, the VCO locks onto the IF signal. The second LO/VCO is a Colpitts oscillator built around transistor Q320. The VCO has a varactor diode, CR310, to adjust the VCO frequency. The control signal for the varactor is derived from a loop filter consisting of components C362, C363, C364, R320 and R321.

The IF IC (U301) also performs several other functions. It provides a received signal-strength indicator (RSSI) and a squelch output. The RSSI is a dc voltage monitored by the microprocessor, and used as a peak indicator during the bench tuning of the receiver front-end varactor filter. The RSSI voltage is also used to control the automatic gain control (AGC) circuit at the front-end.

The demodulated signal on pin 27 of U301 is also used for squelch control. The signal is routed to U404 (ASFIC) where squelch signal shaping and detection takes place. The demodulated audio signal is also routed to U404 for processing before going to the audio amplifier for amplification.

3.3 Automatic Gain Control (AGC)

(*Refer to the UHF Receiver Front End and Receiver Back End schematic diagrams*)

The front end automatic gain control circuit provides automatic reduction of gain, of the front end RF amplifier via feedback. This action is necessary to prevent overloading of backend circuits. This is achieved by drawing some of the output power from the RF amplifier output. At high radio frequencies, capacitor C331 provides a low impedance path to ground for this purpose. CR308 is a pin diode used for switching the path on or off. A certain amount of forward biasing current is needed to turn the pin diode on. Transistors Q315 and Q311 provide for this current. When Q315 is turned on, current flows via R323, collector and emitter of Q315, and R319 before going to ground. Q315 is an NPN transistor used for switching.

The Radio Signal Strength Indicator (RSS I) voltage signal is used to drive Q315 to saturation, i.e., turned on. RSSI is produced by U301 and is proportional to the gain of the RF amplifier and the input power to the radio.

Resistors R318 and R316 are voltage dividers designed to turn on Q315 at certain RSSI levels. To turn on Q315, the voltage across R318 must be greater or equal to the voltage across R319 + Vbe. Capacitor C397 dampens any instability while the AGC is turning on.

Diode D300 is to ensure that C397 only discharges towards the transistor and not back to U301. The current flowing into the base of Q311, a high current gain PNP transistor, is amplified and fed to the pin diode to turn it on. Maximum current flowing through the pin is limited by resistors R347 and R317. Feedback capacitor C333 provides some stability to this high gain stage. Q316, R325, R326, R327, R338, R339 and R341 make up the temperature compensation circuit for this AGC. RSSI generated by U301 is lower at cold compared to normal operation at room temperature. Q316 is designed to turn on only at cold temperature. When Q316 is turned on, current flows through the collector-emitter junction to ground. Current through R319 and hence voltage across it is reduced. The turn on voltage is lower and this accommodates for the reduction of the RSSI at cold temperature.

4.0 UHF Receiver (Models with PCB 8486458Z03)

The UHF receiver consists of a front end, back end, and automatic gain control circuits. A block diagram of the receiver is shown in Figure 2-3. Detailed descriptions of these features are contained in the paragraphs that follow.

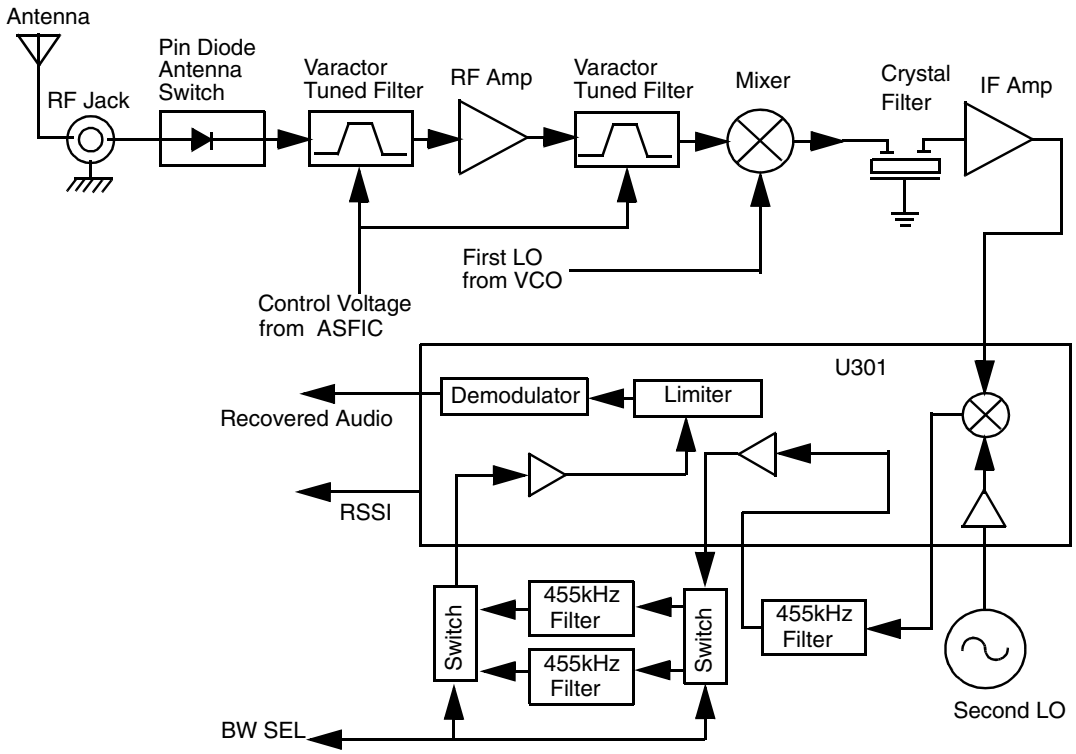


Figure 2-3 UHF Receiver Block Diagram.

4.1 Receiver Front-End

(*Refer to Figure 2-3 and the UHF Receiver Front End schematic diagram for PCB 8486458Z03)*

The RF signal is received by the antenna and applied to a low-pass filter. For UHF, the filter consists of L101, L102, C102, C103, C104. The filtered RF signal is passed through the antenna switch. The antenna switch circuit consists of two PIN diodes(CR101 and CR102) and a pi network (C106, L104 and C107).The signal is then applied to a varactor tuned bandpass filter. The UHF bandpass filter comprises of L301, L302, C302, C303, C304, CR301 and CR302. The bandpass filter is tuned by applying a control voltage to the varactor diodes(CR301 and CR302) in the filter.

The bandpass filter is electronically tuned by the DACRx from IC404 which is controlled by the microprocessor. Depending on the carrier frequency, the DACRx will supply the tuned voltage to the varactor diodes in the filter. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

The output of the bandpass filter is coupled to the RF amplifier transistor Q301 via C307. After being amplified by the RF amplifier, the RF signal is further filtered by a second varactor tuned bandpass filter, consisting of L306, L307, C313, C317, CR304 and CR305.

Both the pre and post-RF amplifier varactor tuned filters have similar responses. The 3 dB bandwidth of the filter is about 50 MHz. This enables the filters to be electronically controlled by using a single control voltage which is DACRx .

The output of the post-RF amplifier filter which is connected to the passive double balanced mixer consists of T301, T302 and CR306. Matching of the filter to the mixer is provided by C381. After mixing with the first LO signal from the voltage controlled oscillator (VCO) using low side injection, the RF signal is down-converted to the 44.85 MHz IF signal.

The IF signal coming out of the mixer is transfered to the crystal filter (FL301) through a resistor pad and a diplexer (C322 and L310). Matching to the input of the crystal filter is provided by C324 and L311. The crystal filter provides the necessary selectivity and intermodulation protection.

4.2 Receiver Back-End

(*Refer to Figure 2-3 and the UHF Receiver Back End schematic diagram for PCB 8486458Z03*)

The output of crystal filter FL301 is matched to the input of first IF amplifier transistor Q302 by L330. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The IF amplifer provides a gain of about 16dB. The amplified first IF signal is then coupled into U301(pin 1) via C360 and L332 which provides the matching for the first IF amplifier and U301.

Within U301, the first IF 44.85 MHz signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the second IF signal at 455 kHz. The 2nd LO signal frequency is determined by crystal Y300. The second IF signal (455 kHz) is then filtered by an external ceramic filter FL302 before being amplified by the second IF amplifier within U301. Again, the signal is filtered by a second external ceramic filter FL303 or FL304 depending on the selected channel spacing. FL303 is used for 20/25 kHz channel spacing whereas FL304, for 12.5 kHz channel spacing. The simple circuit consisting of U302, CR312, CR313 and resistors R345, R360, R321 and R324 divert the second IF signal according to the BW_SEL line. The filtered output of the second IF signal is applied to the limiter input pin of U301.

The IF IC (U301) contains a quadrature detector using a ceramic phase-shift element (Y301) to provide audio detection. Internal amplification provides an audio output level around 120mVrms (@60% deviation) from pin 8 of U301. This demodulated audio is fed to the ASFIC_CMP IC (U404) in the controller section.

The IF IC (U301) also performs several other functions. It provides a received signal-strength indicator (RSSI) with a dynamic range of 70 dB. The RSSI is a dc voltage monitored by the microprocessor, and used as a peak indicator during the bench tuning of the receiver front-end varactor filter.

5.0 Frequency Generation Circuit

(*Refer to Figure 2-4 and the UHF Frequency Synthesizer schematic diagram*)

The frequency generation circuit, shown in Figure 2-4, is composed of Fractional-N synthesizer U201 and VCO/Buffer IC U241. Designed in conjunction to maximize compatibility, the two ICs provide many of the functions that normally require additional circuitry. The synthesizer block diagram illustrates the interconnect and support circuitry used in the region. Refer to the schematic for the reference designator.

The synthesizer is powered by regulated 5V and 3.3V which are provided by ICs U247 and U248 respectively. The 5V signal goes to pins 13 and 30 while the 3.3V signal goes to pins 5, 20, 34 and 36 of U201. The synthesizer in turn generates a superfiltered 5V which powers U241.

In addition to the VCO, the synthesizer also interfaces with the logic and ASFIC circuitry. Programming for the synthesizer is accomplished through the data, clock and chip select lines (pins 7, 8 and 9) from the microprocessor, U409. A 3.3V dc signal from pin 4 indicates to the microprocessor that the synthesizer is locked.

Transmit modulation from the ASFIC is supplied to pin10 of U201. Internally the audio is digitized by the Fractional-N and applied to the loop divider to provide the low-port modulation. The audio runs through an internal attenuator for modulation balancing purposes before going out at pin 41 to the VCO.

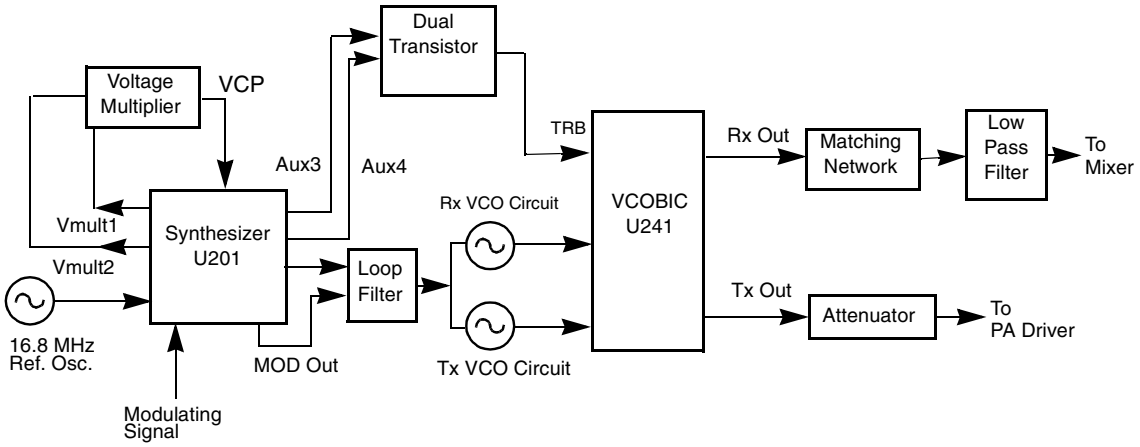


Figure 2-4 UHF Frequency Generation Unit Block Diagram

5.1 Synthesizer

(*Refer to Figure 2-5 and the UHF Synthesizer schematic diagram)*

The Fractional-N synthesizer, shown in Figure 2-5, uses a 16.8MHz crystal (FL201) to provide a reference for the system. The LVFractN IC (U201) further divides this to 2.1MHz, 2.225MHz, and 2.4MHz to be used as reference frequencies. Together with C206, C207, C208, R204 and CR203, they build up the reference oscillator which is capable of 2.5ppm stability over temperatures of -30 to 85°C. It also provides 16.8MHz at pin 19 of U201 for use by the ASFIC and IF.

The loop filter consists of components C231, C232, C233, R231, R232 and R233. This circuit provides the necessary dc steering voltage for the VCO and determines the amount of noise and spur passing through.

To achieve fast locking for the synthesizer, an internal adapt charge pump provides higher current at pin 45 of U201 to put the synthesizer within lock range. The required frequency is then locked by normal mode charge pump at pin 43.

Both the normal and adapt charge pumps get their supply from the capacitive voltage multiplier made up of C258, C259, C228, triple diode CR201, and level shifters U210 and U211. Two 3.3V square waves, 180 degrees out of phase, are first shifted to 5V, then along with regulated 5V, put through arrays of diodes and capacitors to build up 13.3V at pin 47 of U201.

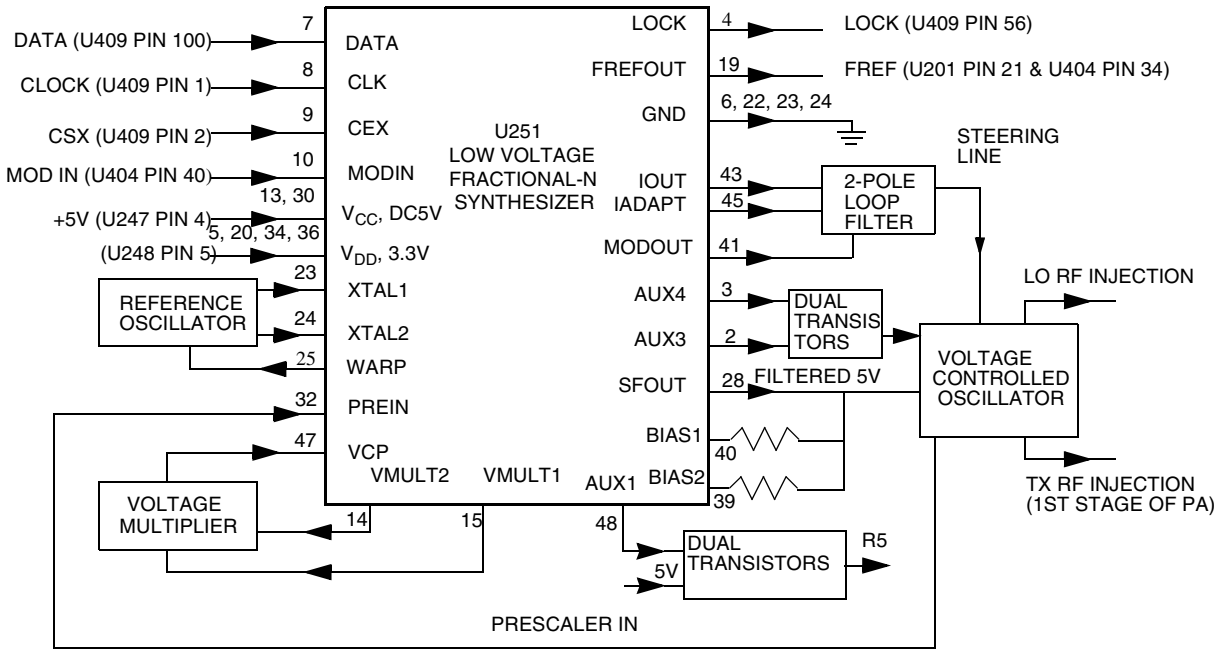


Figure 2-5 UHF Synthesizer Block Diagram

5.2 Voltage Controlled Oscillator (VCO)

(*Refer to Figure 2-6 and the UHF Voltage Controlled Oscillator schematic diagram)*

The VCOB IC (U241), shown in Figure 2-6, in conjunction with the Fractional-N synthesizer (U201) generates RF in both the receive and the transmit modes of operation. The TRB line (U241 pin 19) determines which oscillator and buffer are enabled. A sample of the RF signal from the enabled oscillator is routed from U241, pin 12, through a low pass filter, to the prescaler input (U201 pin 32). After frequency comparison in the synthesizer, a resultant CONTROL VOLTAGE is received at the VCO. This voltage is a DC voltage between 3.5V and 9.5V when the PLL is locked on frequency.

The VCOB IC is operated at 4.54 V (VSF) and Fractional-N synthesizer (U201) at 3.3V. This difference in operating voltage requires a level shifter consisting of Q260 and Q261 on the TRB line. The operation logic is shown in Table 2-1.

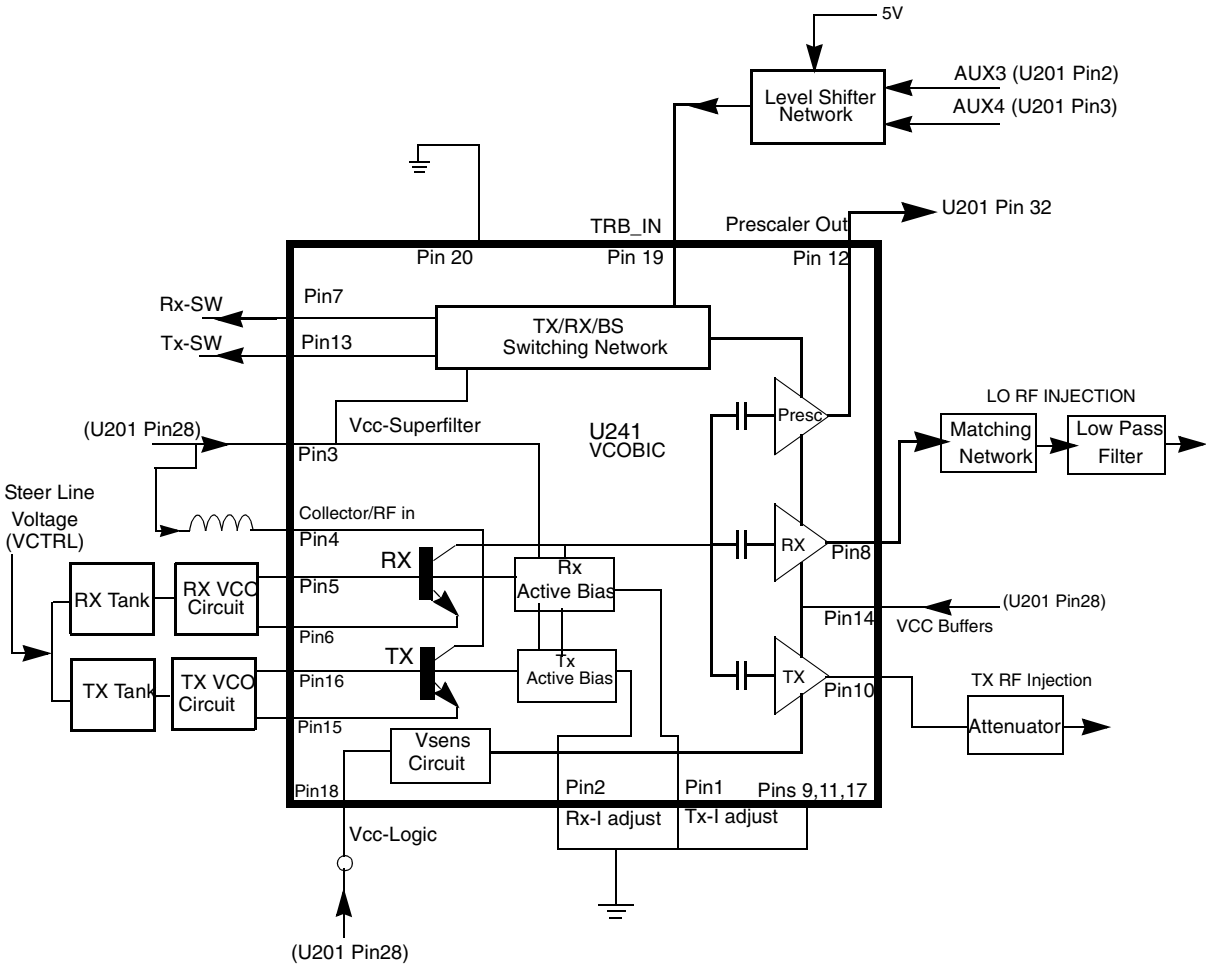


Figure 2-6 UHF VCO Block Diagram

Table 2-1 Level Shifter Logic

Desired Mode	AUX 4	AUX 3	TRB
Tx	Low	High (@3.2V)	High (@4.8V)
Rx	High	Low	Low
Battery Saver	Low	Low	Hi-Z/Float (@2.5V)

In the receive mode, U241 pin 19 is low or grounded. This activates the receive VCO by enabling the receive oscillator and the receive buffer of U241. The RF signal at U241 pin 8 is run through a matching network. The resulting LO RF INJECTION signal is applied to the mixer at T302.

During the transmit condition, when PTT is pressed, five volts is applied to U241 pin 19. This activates the transmit VCO by enabling the transmit oscillator and the transmit buffer of U241. The RF signal at U241 pin 10 is injected into the input of the PA module (U101 pin16). This RF signal is the TX RF INJECTION. Also in transmit mode, the audio signal to be frequency modulated onto the carrier is received through U201, pin 41.

When a high impedance is applied to U241 pin19, the VCO is operating in BATTERY SAVER mode. In this case, both the receive and transmit oscillators as well as the receive transmit and prescaler buffer are turned off.

6.0 Voice Storage (GP1280 Only)

(*Refer to Figure 2-7 and the UHF Voice Storage schematic diagram)*

The Voice Storage feature is offered as standard in the GP1280 and as an Option board for GP340/GP360/GP380 and GP640/GP680 models.

The Voice Storage feature enables users to:

- Record and Playback Personal Memo (Reminders, Notes, etc.).
- Send over-the-air an “Out-Of-Office” message when an incoming call is received but is not available to take up call.
- Over-the-air recording of important voice message being received.

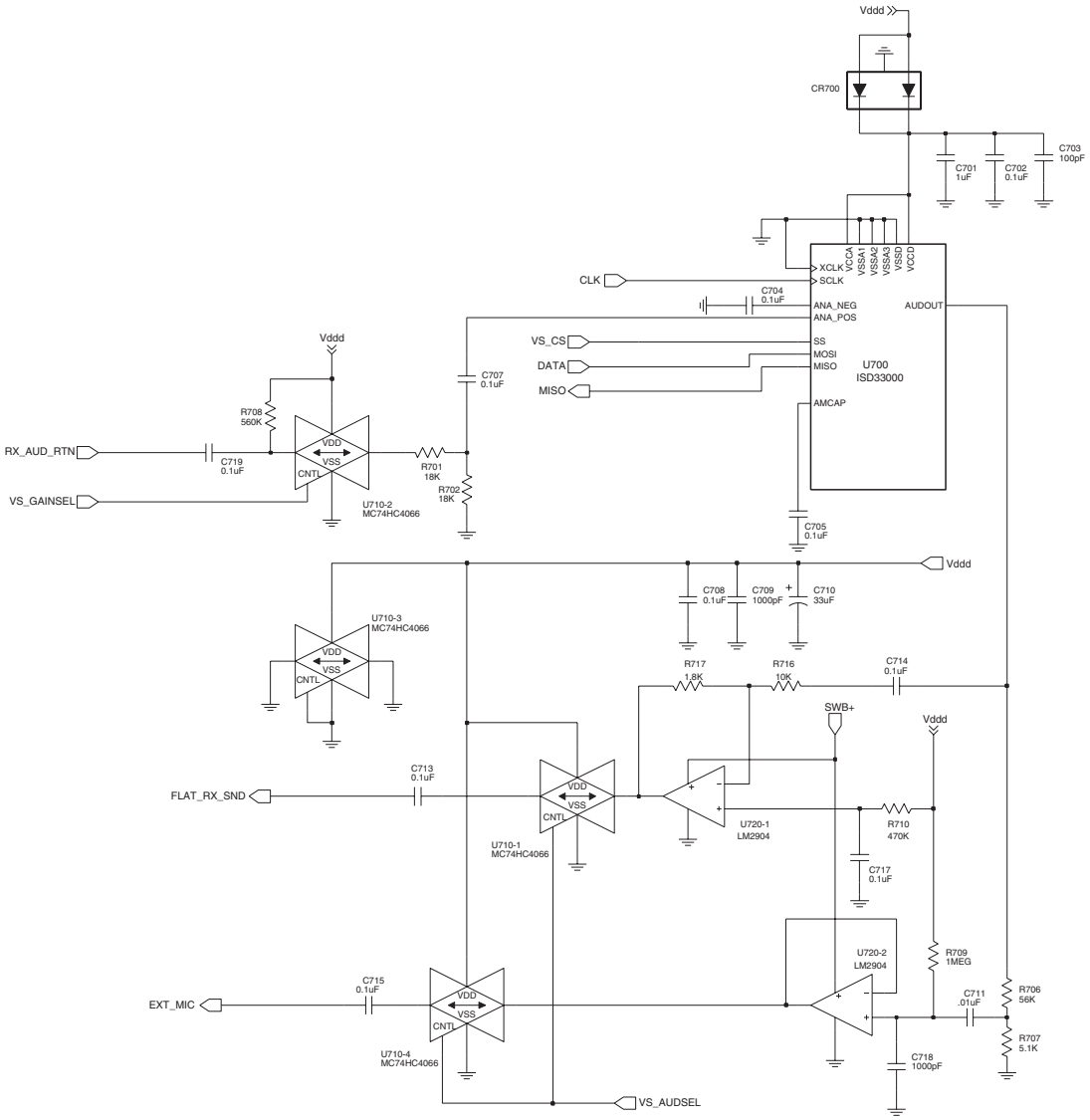


Figure 2-7 Audio path for voice storage connection to interface connector

Audio routing to the Voice Storage circuitry during receive message recording, message playback, personal memo recording and voice prompt transmit over the air are as follows:

Received Message Recording

The receive audio is tapped from the Rx_Aud_Rtn pin of the ASFIC_CMP during receive mode.

Message Playback

Message playback is via the FLAT_RX_SND pin of ASFIC_CMP. In the ASFIC_CMP, the signal is routed via the Side-Tone path to the Receive path where playback audio is routed to the speaker.

Personal Memo Recording

In this mode, voice is pick-up at the Mic. and via the Side-Tone path will be directed to the Rx_Aud_Rtn pin, which is then routed to the voice recording chip.

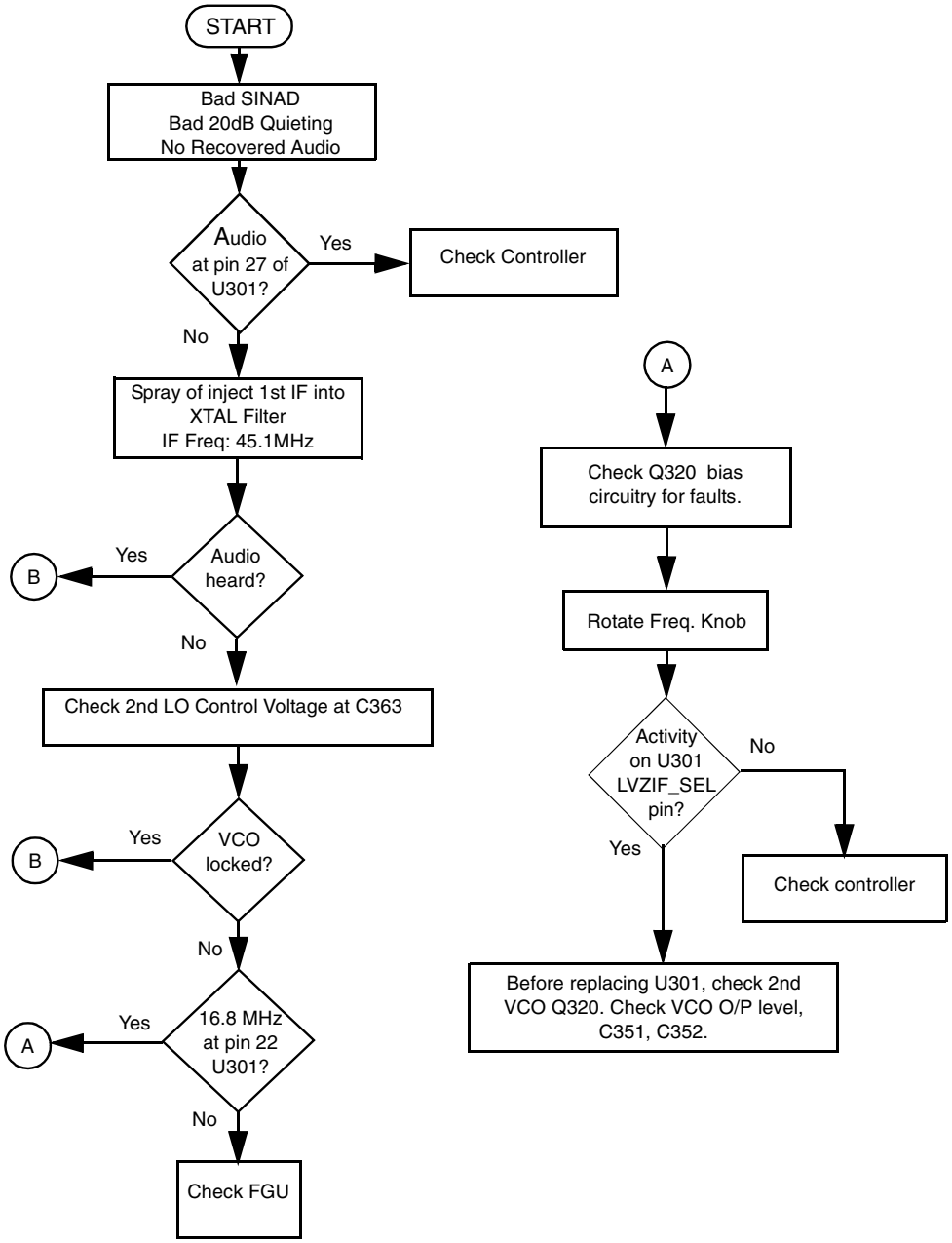
Voice Prompt transmit over the air

A personal voice prompt or Out-Of-Office Message which is stored in the IC can be transmitted over the air through mic path in the ASFIC_CMP to the calling party. This feature is similar to the Telephone Answering Machine feature when the person called is not available to attend the call.

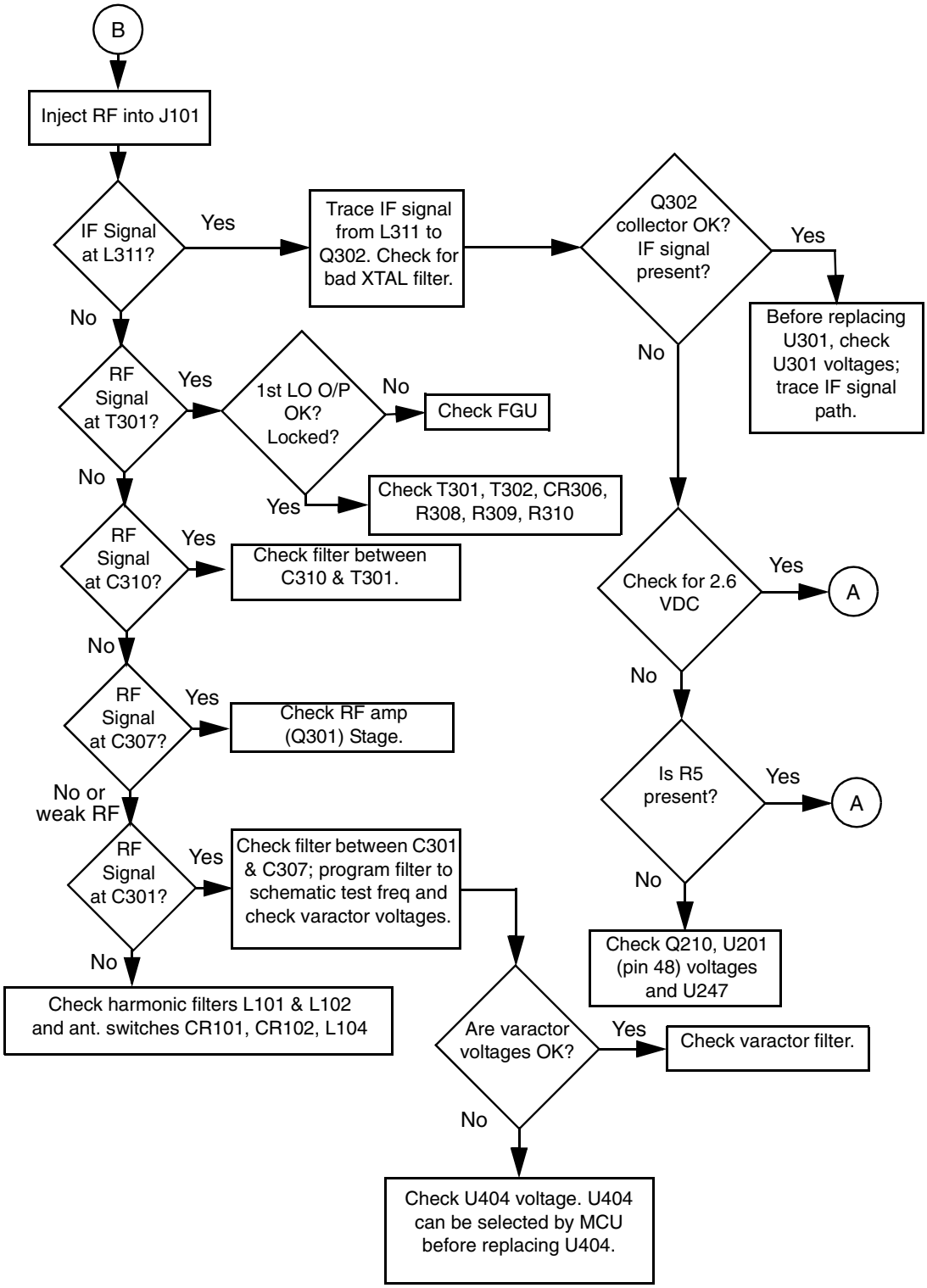
Chapter 3

TROUBLESHOOTING CHARTS

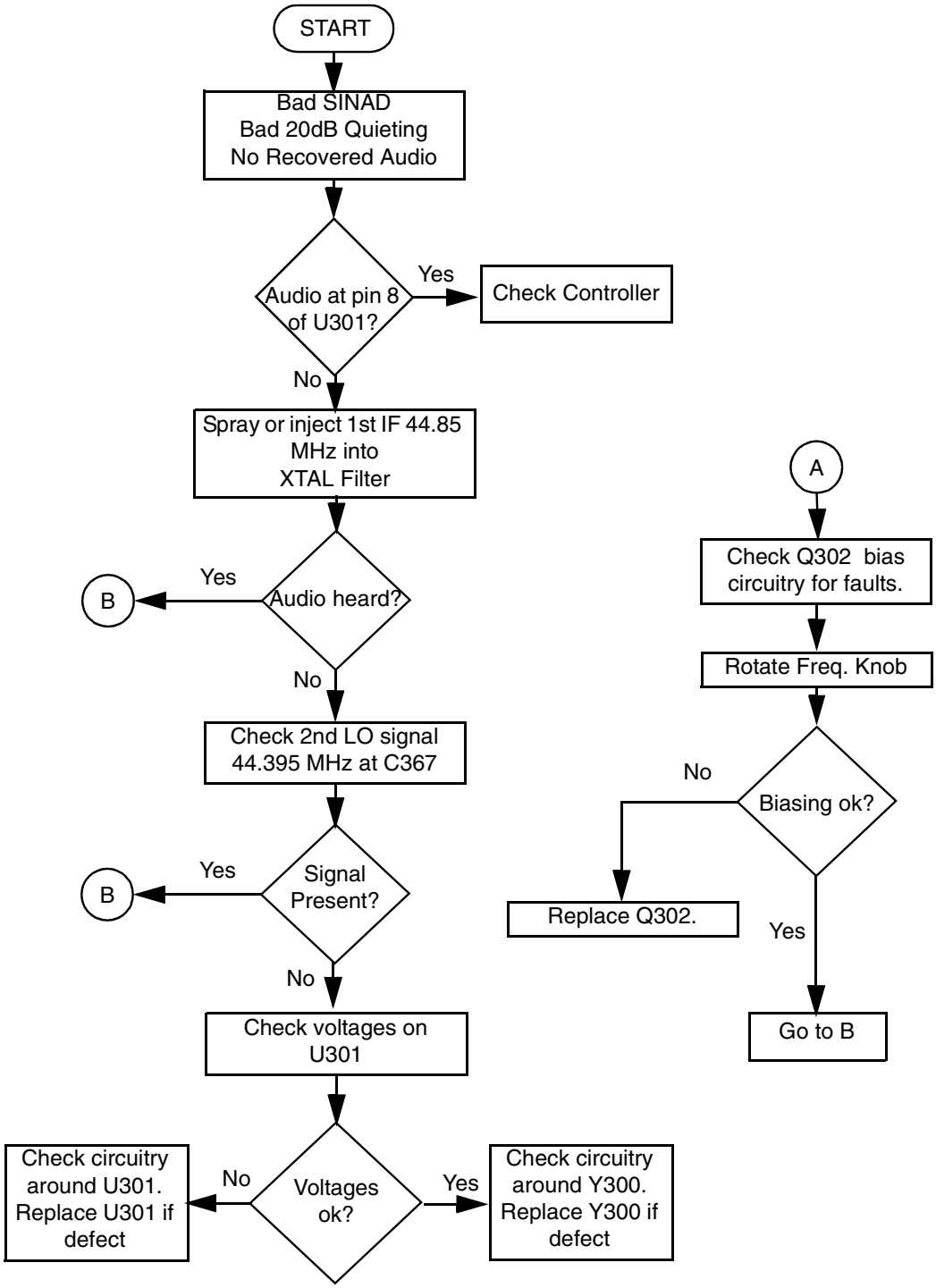
1.0 Troubleshooting Flow Chart for Receiver (All models except those with PCB 8486458Z03) (Sheet 1 of 2)



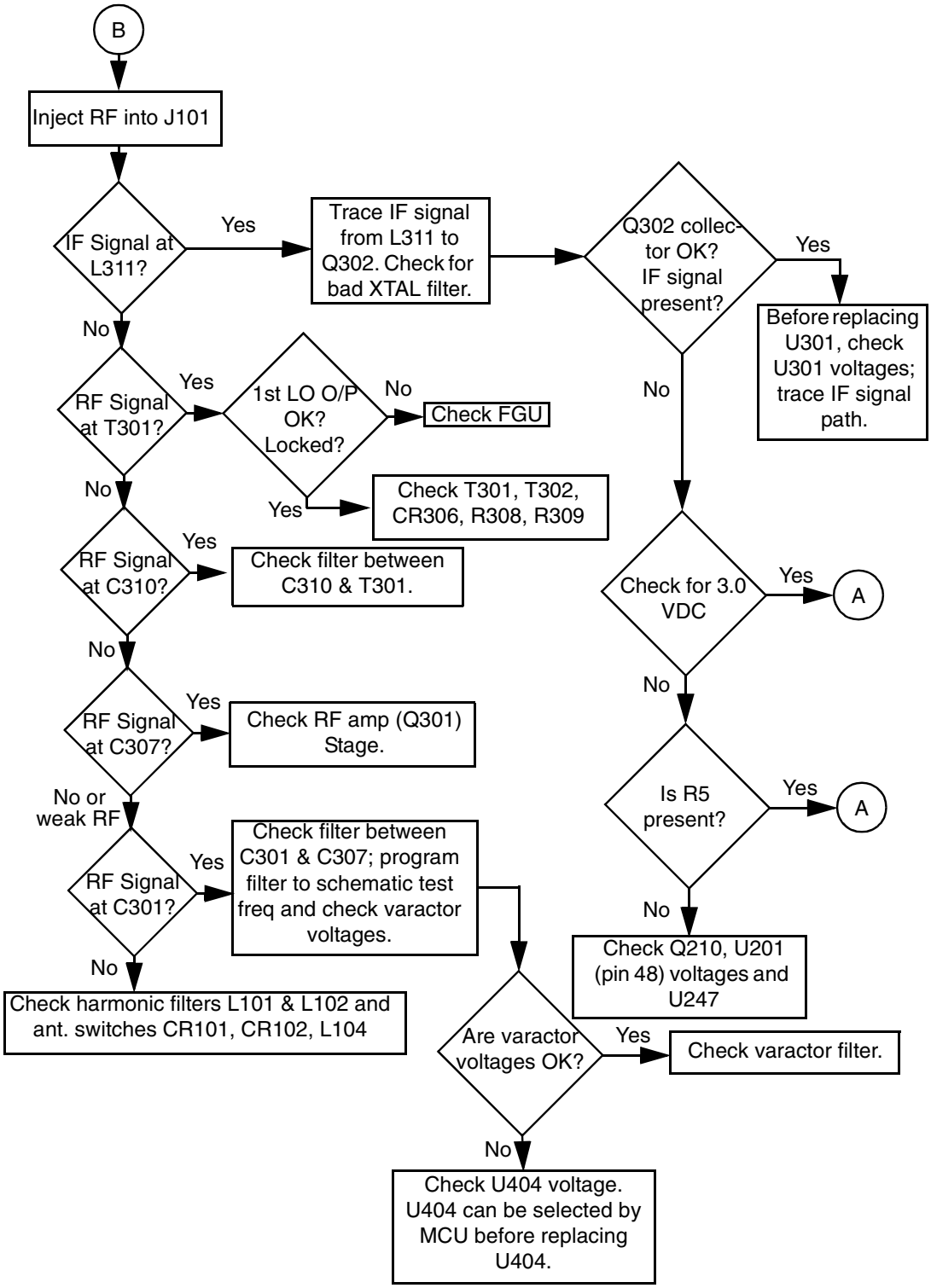
2.0 Troubleshooting Flow Chart for Receiver (All models except those with PCB 8486458Z03) (Sheet 2 of 2)



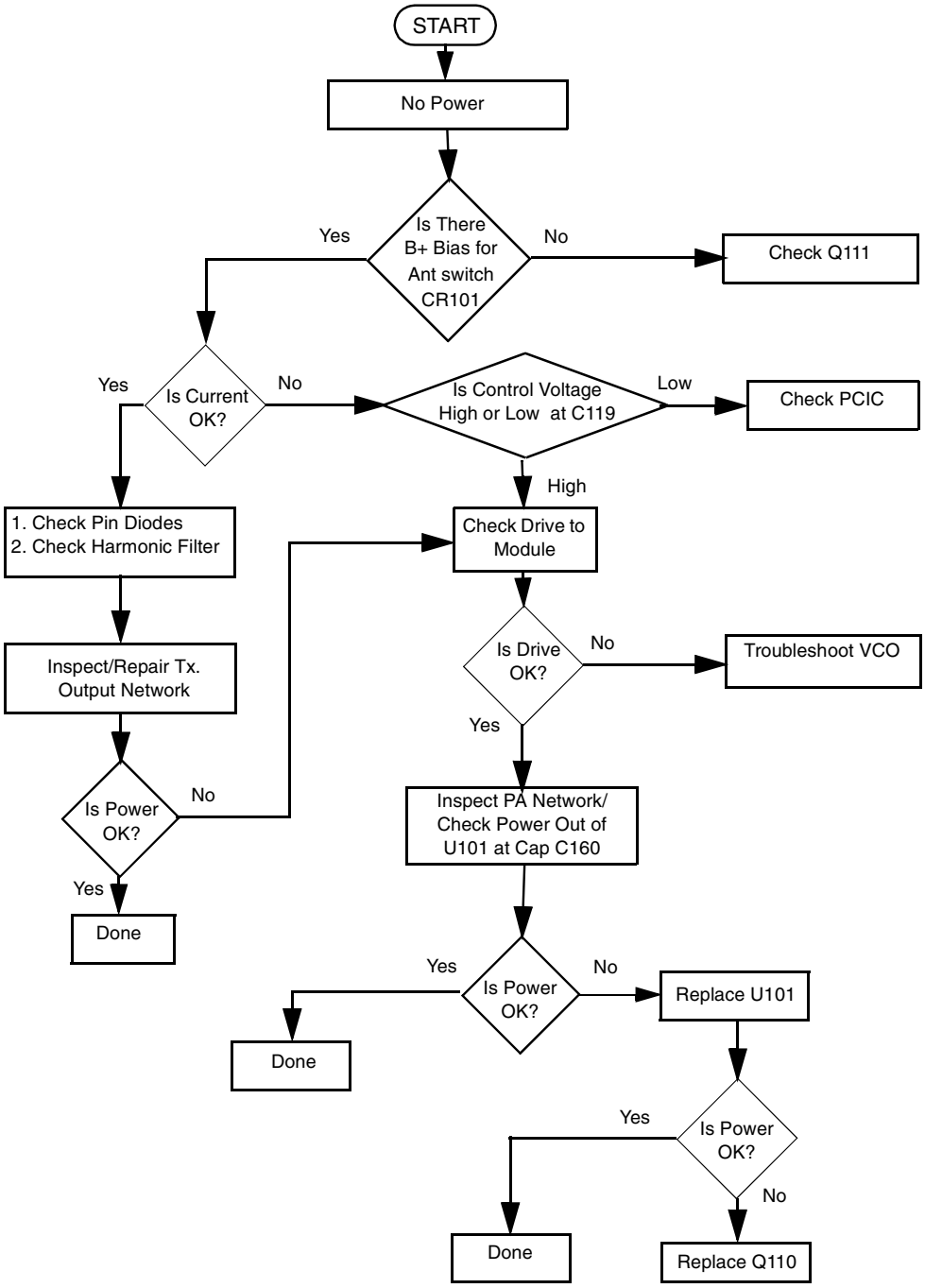
3.0 Troubleshooting Flow Chart for Receiver (Models with PCB 8486458Z03) (Sheet 1 of 2)



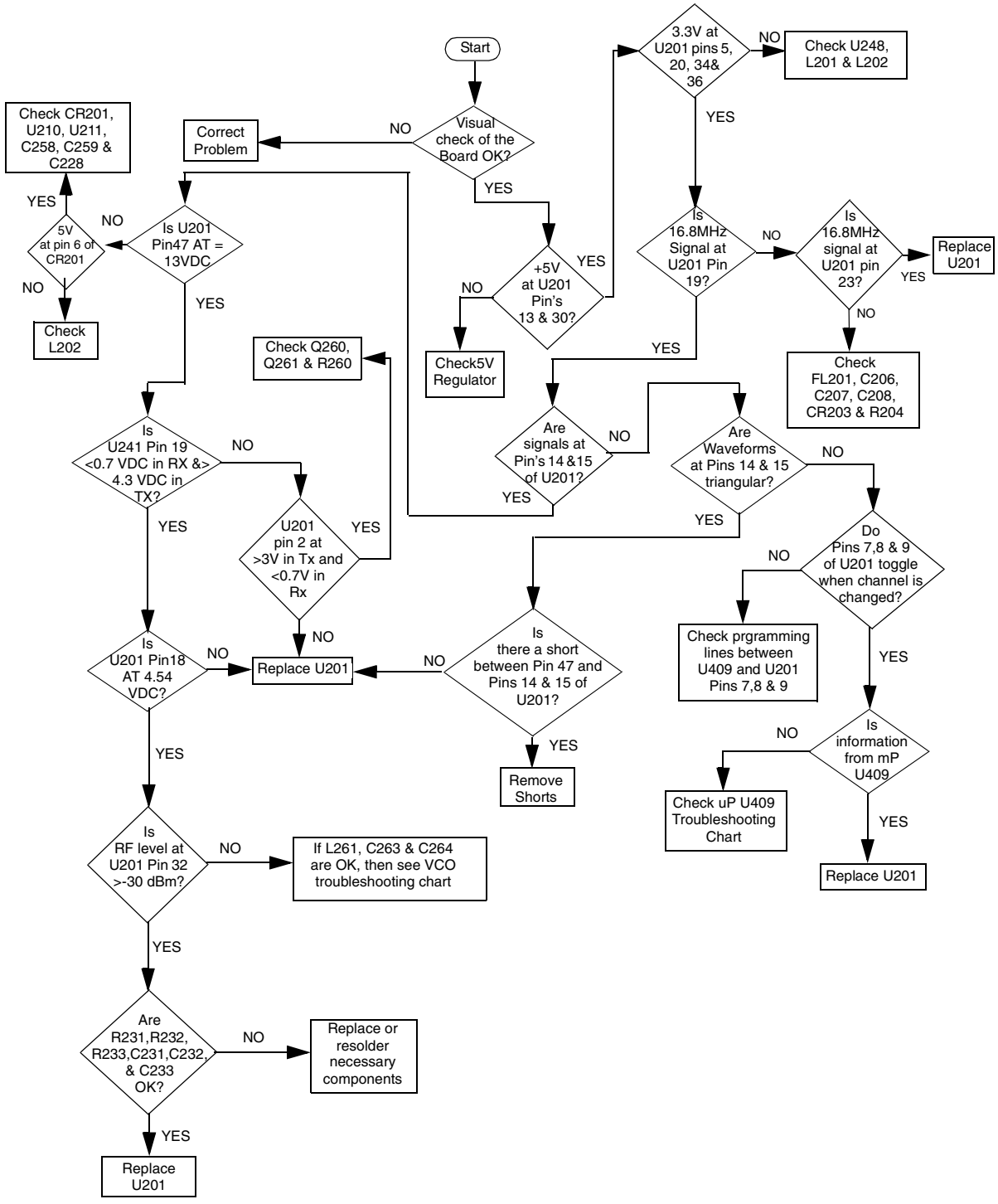
4.0 Troubleshooting Flow Chart for Receiver (Models with PCB 8486458Z03) (Sheet 2 of 2)



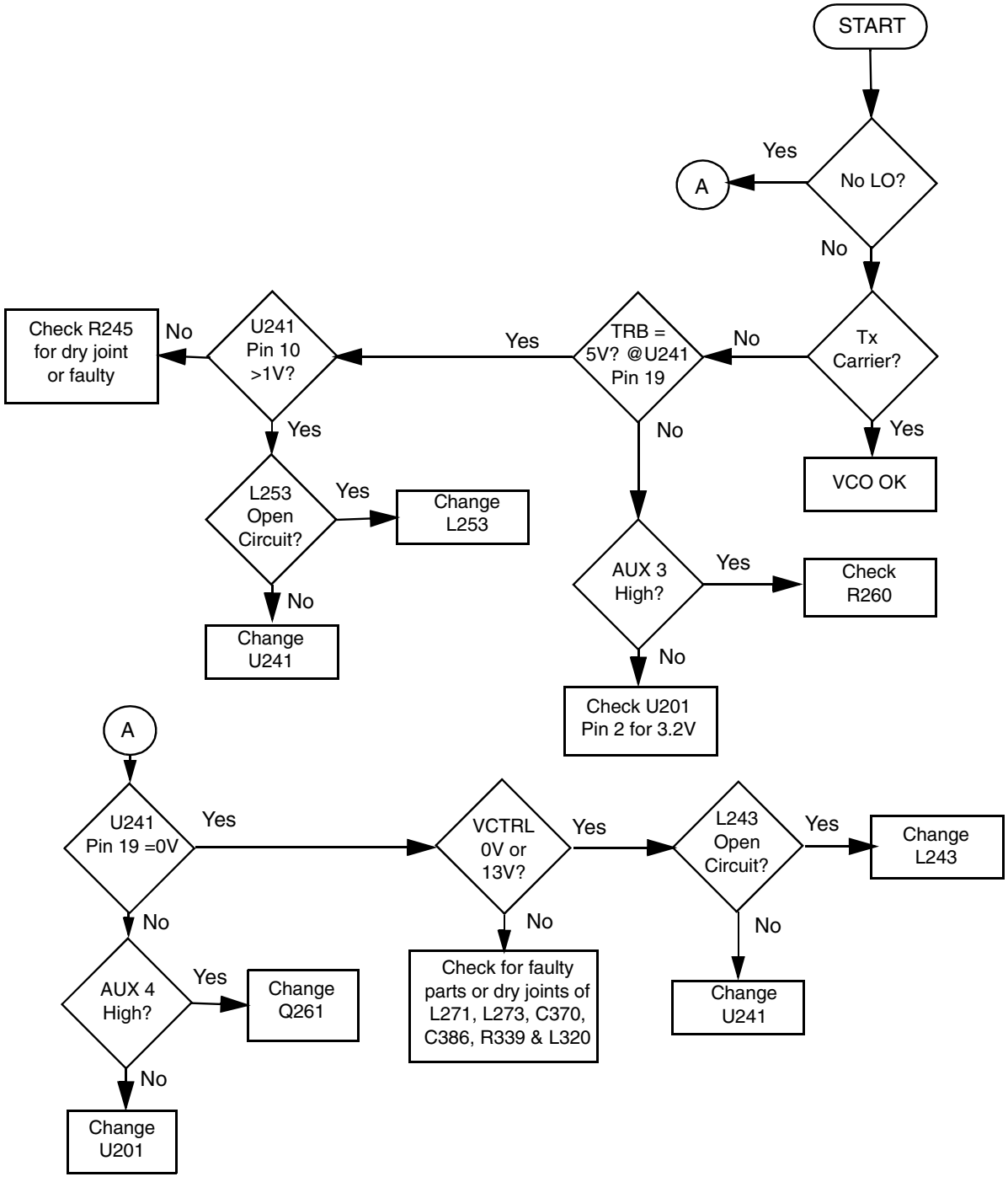
5.0 Troubleshooting Flow Chart for Transmitter



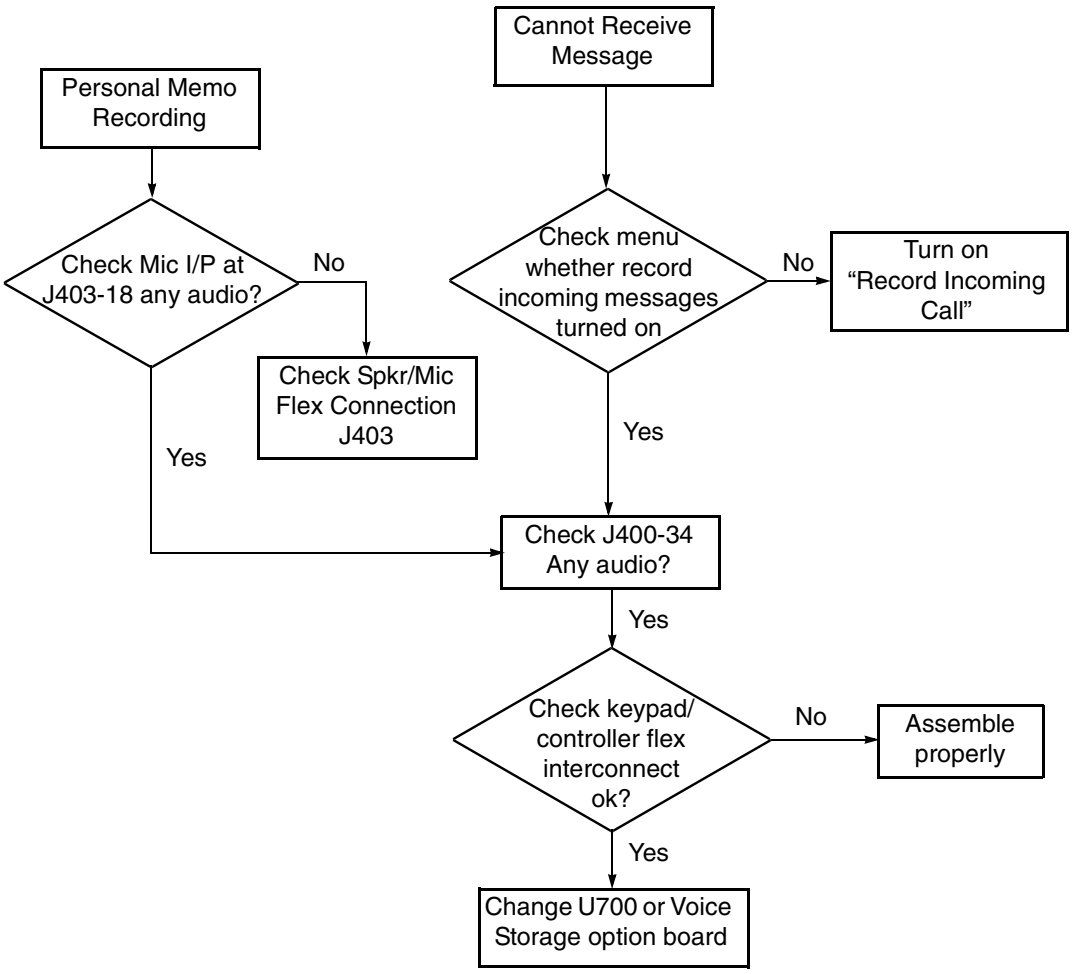
6.0 Troubleshooting Flow Chart for Synthesizer



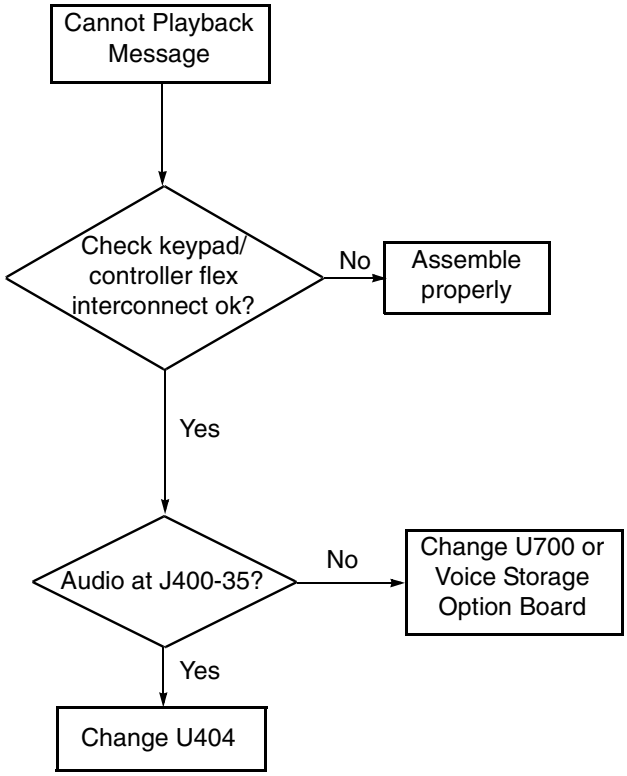
7.0 Troubleshooting Flow Chart for VCO



8.0 Troubleshooting Flow Chart for Receive Message/Personal Memo Recording



9.0 Troubleshooting Flow Chart for Message Playback



Chapter 4

UHF PCB/SCHEMATICS/PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The UHF circuits are contained on the printed circuit board (PCB) which also contains the Controller circuits. This Chapter shows the schematics for the UHF circuits only, refer to the Controller section for details of the related Controller circuits.The PCB component layouts and the Parts Lists in this Chapter show both the Controller and UHF circuit components. The UHF schematics and the related PCB and parts list are shown in the tables below.

1.2 Voice Storage Facility

The Voice Storage facility is fitted to the GP1280 radio as standard and the schematics, component layout and parts list for these circuits are shown in this Chapter. The Voice Storage facility may be fitted to other radios in the GP Series as an option board; reference must be made to the Option Board manual in this case. The Voice Storage schematic and the related PCBs are shown in Tables 4-2, 4-3 and 4-4 below.

Table 4-1 UHF Diagrams and Parts Lists

Table 4-2 UHF GP1280 Diagrams and Parts Lists

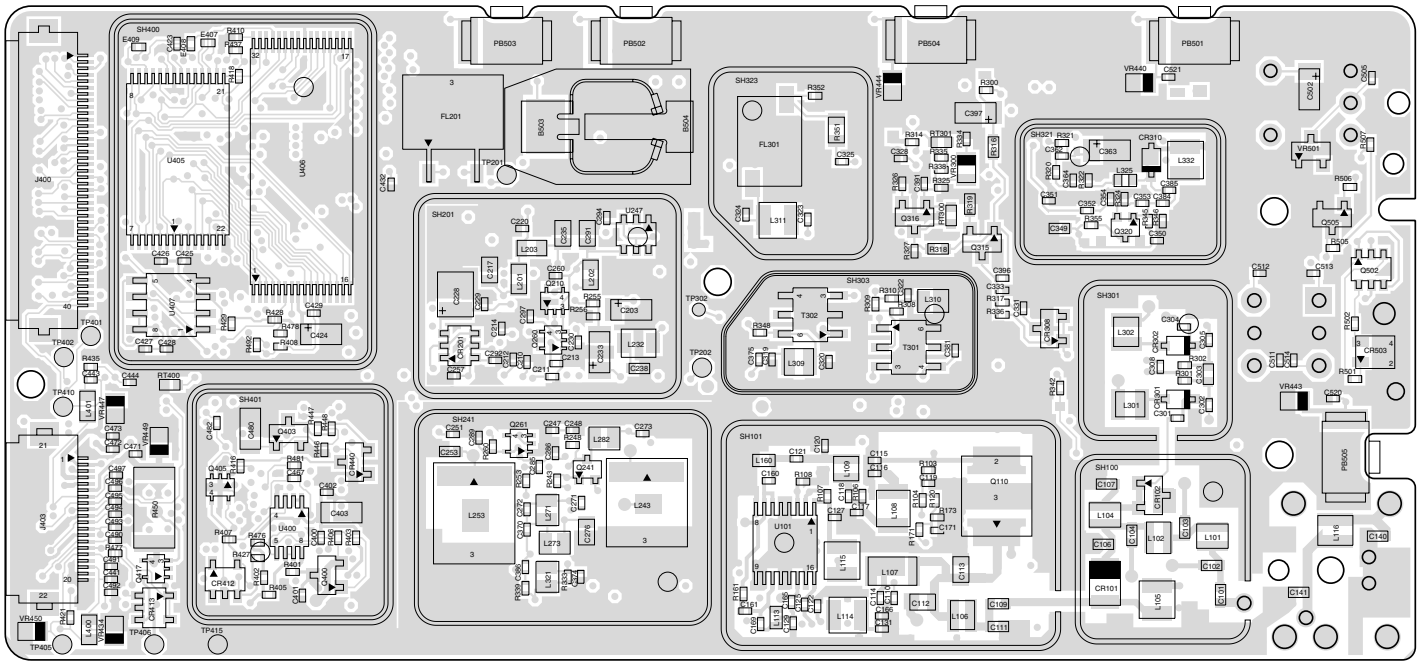
Table 4-3 UHF GP1280 Diagrams and Parts Lists

Table 4-4 UHF GP1280 Diagrams and Parts Lists

Table 4-5 UHF Diagrams and Parts Lists

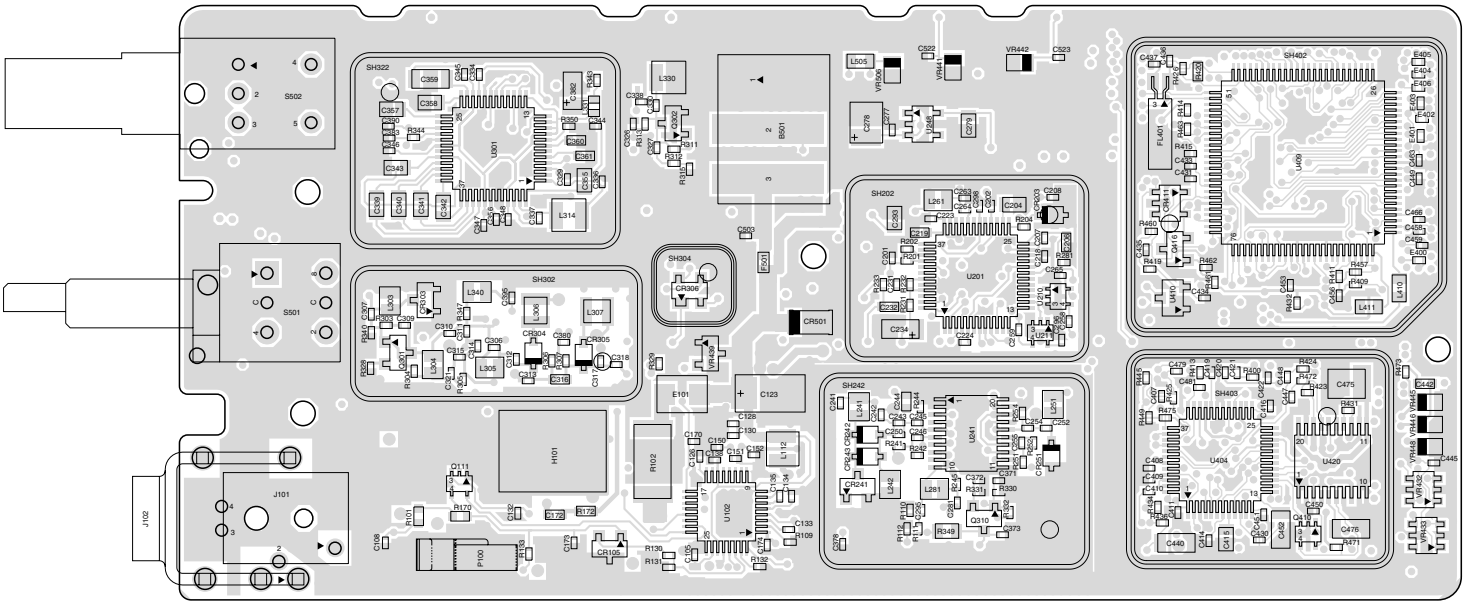
Table 4-6 UHF Diagrams and Parts Lists

2.0 UHF PCB 8480450Z03 Schematics



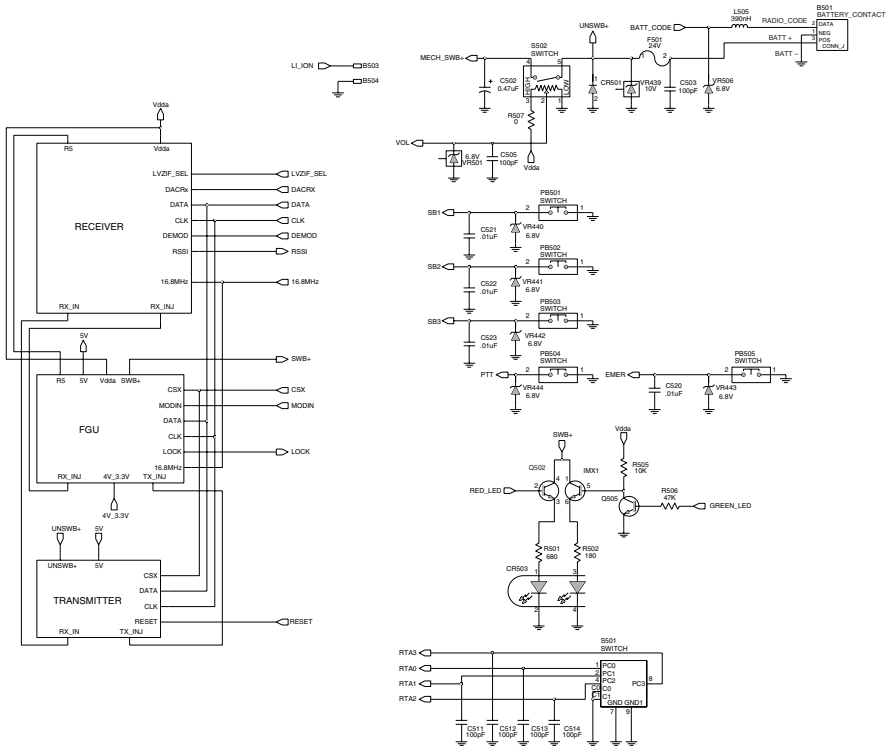
ZMY0130047-C

UHF (403-470MHz) Main Board Top Side



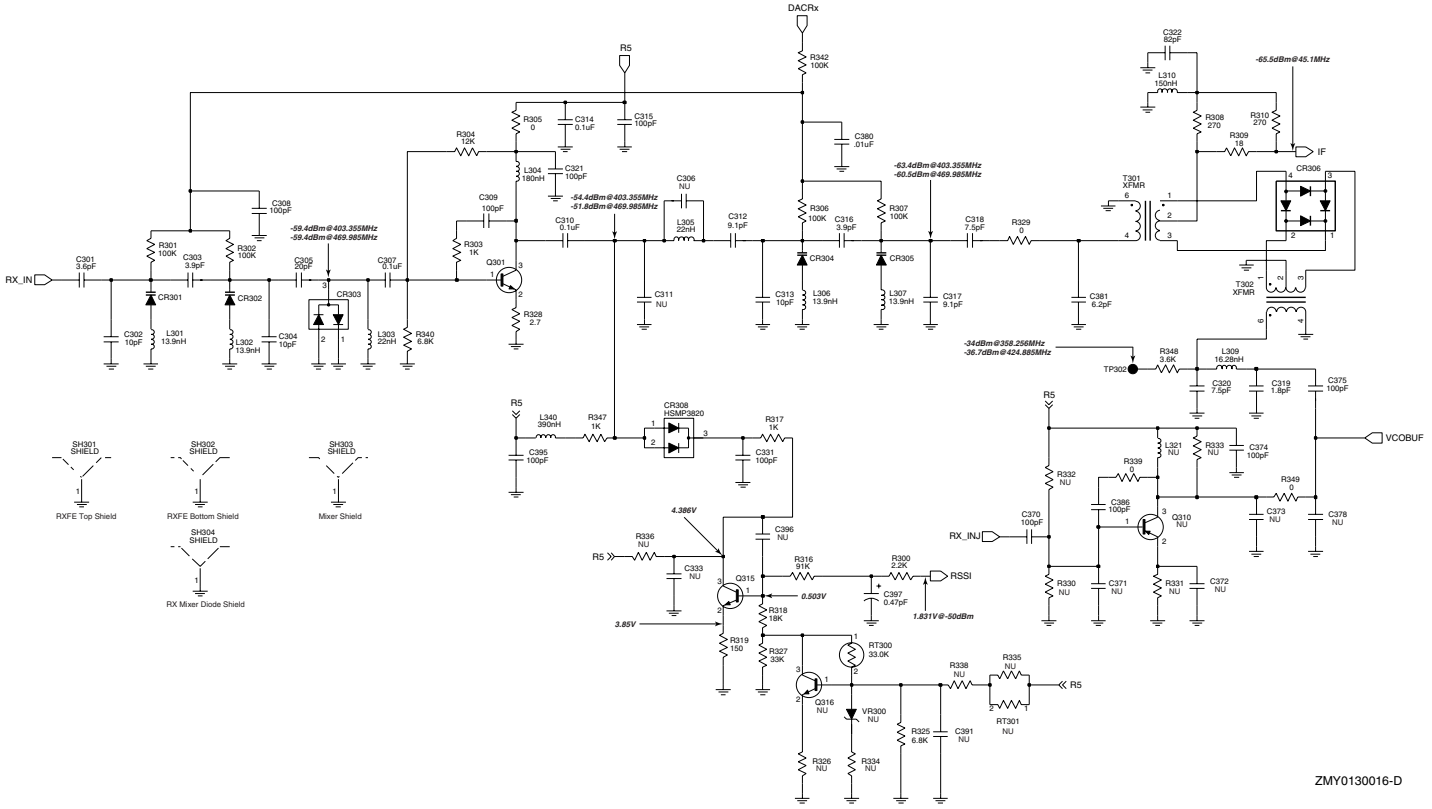
ZMY0130046-A

UHF (403-470 MHz) Main Board Bottom Side



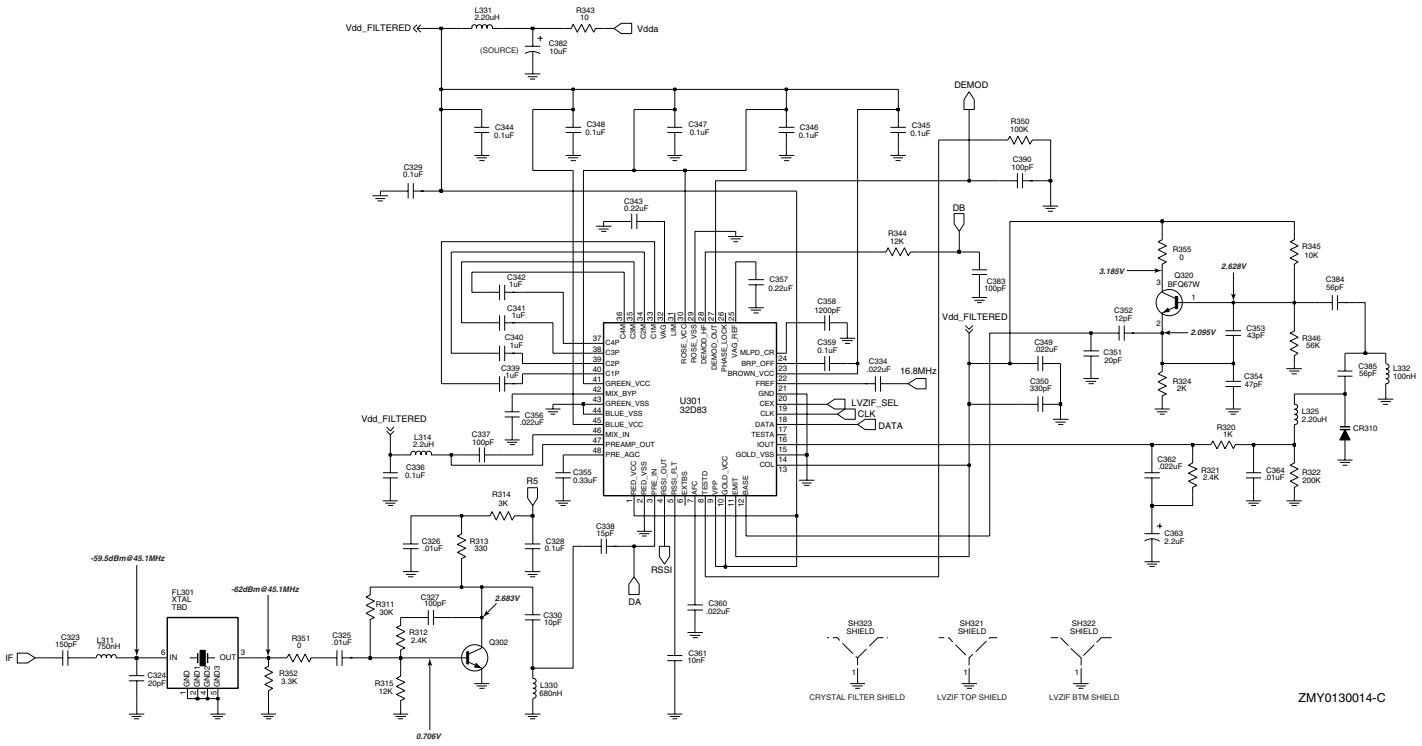
ZMY0130015-A

UHF (403-470 MHz) Controls and Switches

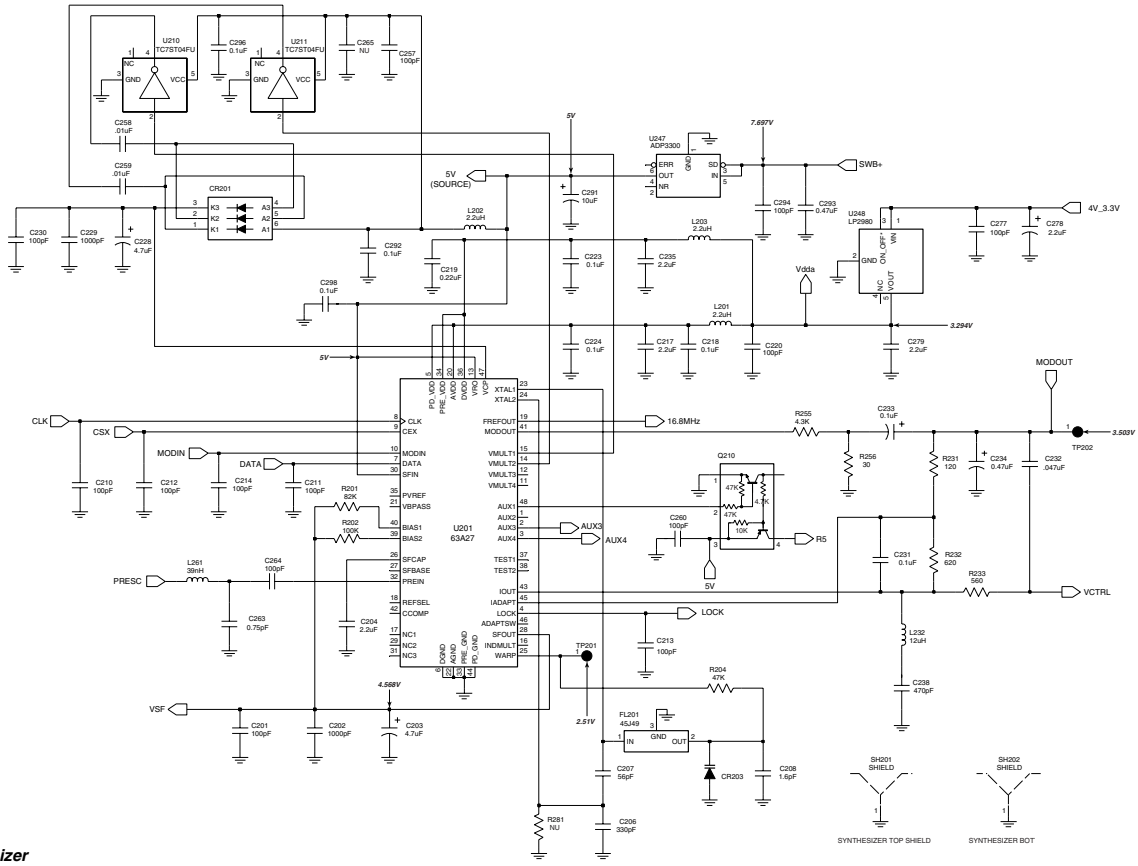


ZMY0130016-D

UHF (403 - 470 MHz) Receiver Front End

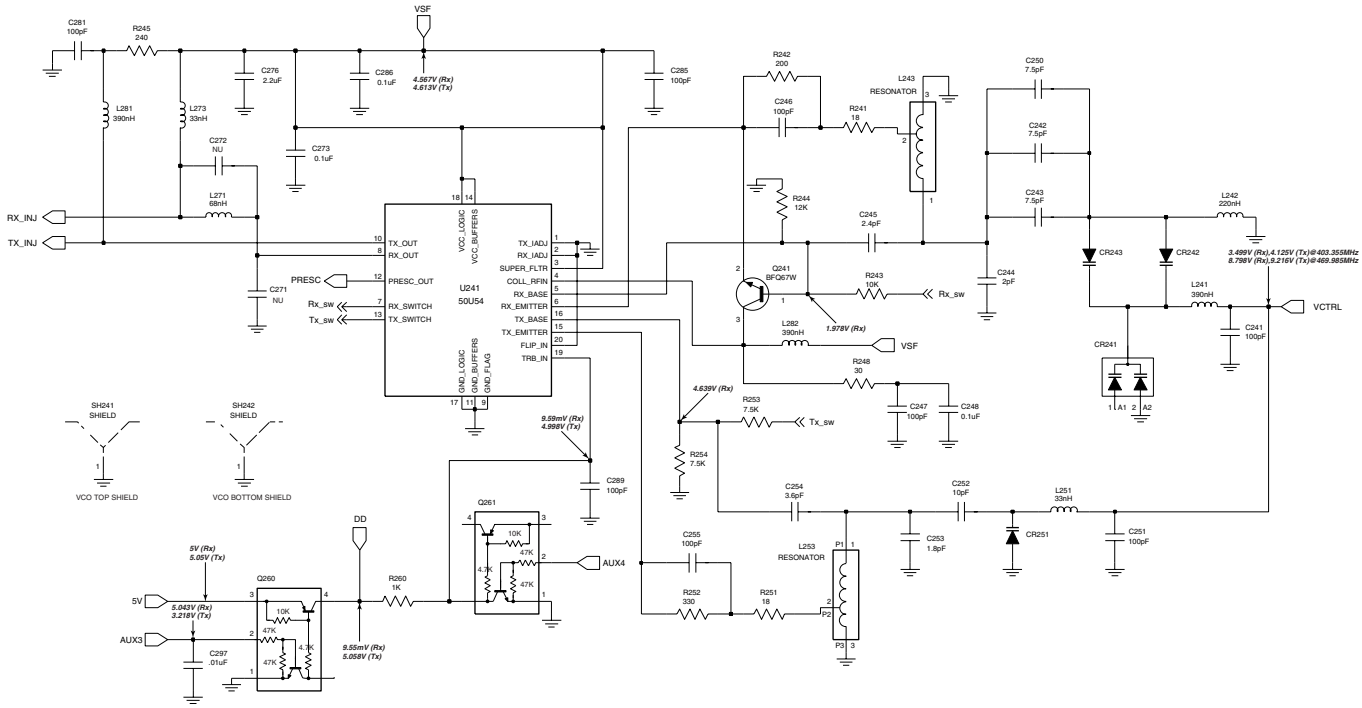


UHF (403-470 MHz) Receiver Back End

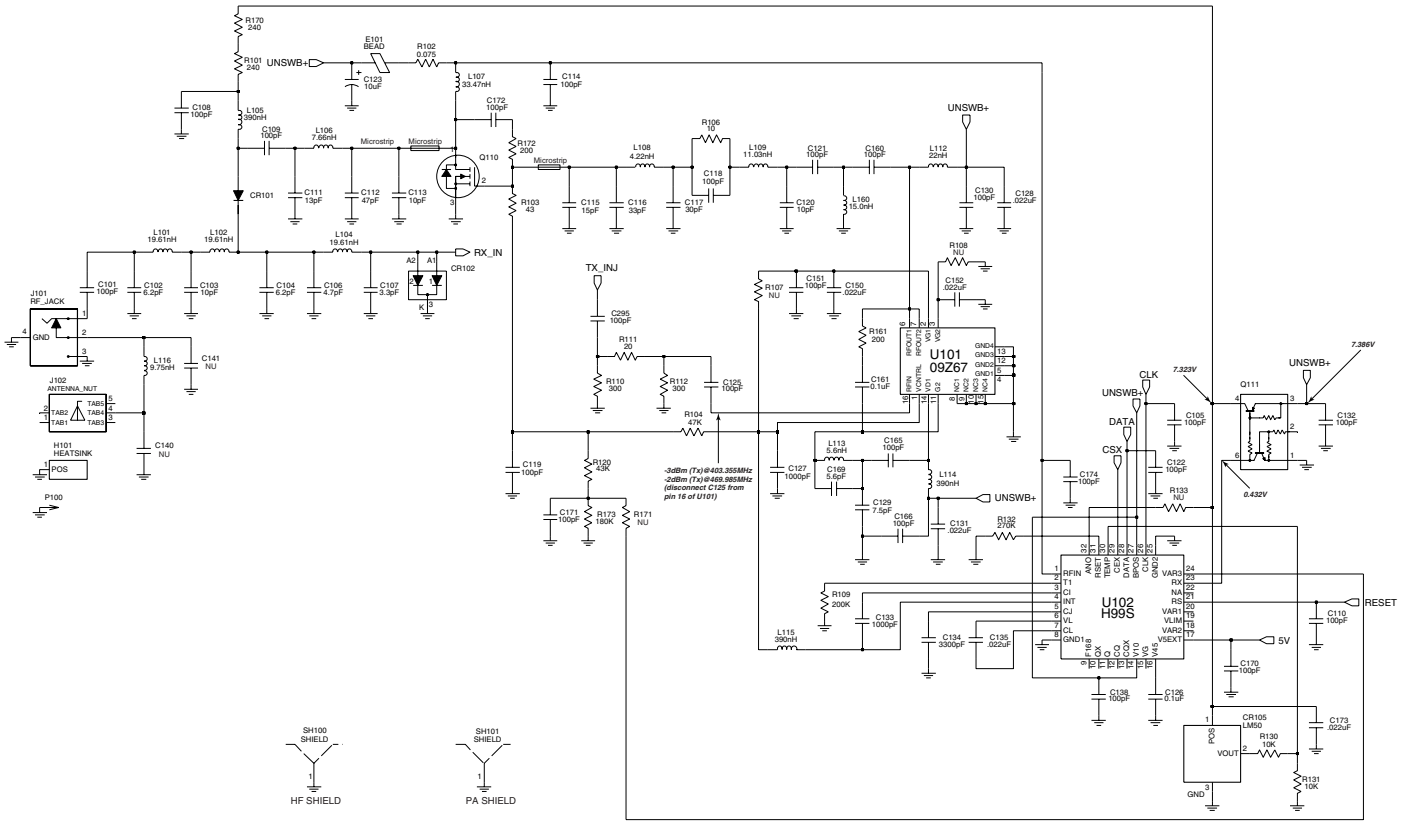


UHF (403-470 MHz) Synthesizer

ZMY0130017-C



UHF (403-470 MHz) Voltage Controlled Oscillator



UHF (403-470 MHz) Transmitter

ZMY0130018-D

3.0 UHF PCB 8480450Z03 / PCB 8480587Z01 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A01	Battery Contact Module
B503	3980502Z01	Backup Batt Contact+ (not placed non-display radios)
B504	3980501Z01	Backup Batt Contact- (not placed non-display radios)
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F27	10pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF,
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F30	13pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N30	15pF
C116	2113743N38	33pF
C117	2113743N37	30pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N26	10pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	0.1uF
C127	2113743L17	1000pF
C128	2113743M08	.022uF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	.022uF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	.022uF
C138	2113743N50	100pF
C140	Not Placed	
C141	Not Placed	
C150	2113743M08	.022uF
C151	2113743N50	100pF
C152	2113743M08	.022uF
C160	2113743N50	100pF
C161	2113743M24	0.1uF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N16	3.9pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113743E20	0.1uF
C173	2113743M08	.022uF
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N44	56pF
C208	2113743N08	1.6pF
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	0.1uF
C224	2113743M24	0.1uF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	0.1uF
C232	2113743E12	.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F07	1.5pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	.01uF
C259	2113743L41	.01uF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	Not Placed	
C271	Not Placed	
C272	Not Placed	
C273	2113743M24	0.1uF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF
C289	2113743N50	100pF
C291	2113743A27	0.47uF
C292	2113743M24	0.1uF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF
C297	2113743L41	.01uF
C298	2113743M24	0.1uF
C301	2113743N15	3.6pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N25	9.1pF
C305	2113743N33	20pF
C306	Not Placed	
C307	2113743M24	0.1uF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF
C311	Not Placed	
C312	2113743N22	6.8pF
C313	2113743N26	10pF
C314	2113743M24	0.1uF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	.01uF
C326	2113743L41	.01uF
C327	2113743N50	100pF
C328	2113743M24	0.1uF
C329	2113743M24	0.1uF
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	Not Placed	
C334	2113743M08	.022uF
C336	2113743M24	0.1uF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1.0uF
C340	2180478Z20	1.0uF
C341	2180478Z20	1.0uF
C342	2180478Z20	1.0uF

Circuit Ref	Motorola Part No.	Description
C343	2113743A23	0.22uF
C344	2113743M24	0.1uF
C345	2113743M24	0.1uF
C346	2113743M24	0.1uF
C347	2113743M24	0.1uF
C348	2113743M24	0.1uF
C349	2113743E07	.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A21	0.15uF
C356	2113743M08	.022uF
C357	2113743A23	0.22uF,
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	.022uF
C361	2113741F49	0.1uF
C362	2113928N01	0.5pF
C363	2311049A07	1uF
C364	2113743L39	8200 pF
C370	2113743N50	100pF
C371	Not Placed	
C372	Not Placed	
C373	Not Placed	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	Not Placed	
C380	2113743L41	.01uF, 10%
C381	2113743N25	9.1pF, 0.5
C382	2311049A59	10uF, 10%; 6V
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	Not Placed	
C395	2113743N50	100pF
C396	Not Placed	
C397	2311049A07	1uF, 10%; 16V

Circuit Ref	Motorola Part No.	Description
C400	2113743L41	.01uF, 10%
C401	2113743M24	0.1uF
C402	2113743M24	0.1uF
C403	2113928D08	10uF
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	0.1uF
C410	2113928N01	0.1uF
C411	2113743M24	0.1uF
C414	2113743M24	0.1uF
C415	2109720D01	.01uF
C416	2113928N01	0.1uF
C419	Not Placed	
C420	2113743L41	.01uF
C421	2113928N01	0.1uF
C422	2113743M24	0.1uF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	0.1uF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	0.1uF
C429	2113743M24	0.1uF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	Not Placed	
C433	2113743L41	.01uF
C434	2113743M24	0.1uF (not placed non-display radios)
C435	2113743M24	0.1uF
C436	2113743N34	22pF (not placed non-display radios)
C437	2113743N34	22pF (not placed non-display radios)
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	0.1uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113928N01	0.1uF, 10%

Circuit Ref	Motorola Part No.	Description
C448	2113928N01	0.1uF, 10%
C449	2113743N50	100pF
C450	2113743M24	0.1uF, +80%/-20%
C451	2113743M08	.022uF, +80%/-20%
C452	2113743G26	4.7uF, +80%/-20%
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF, 10%
C471	2113743N50	100pF
C472	2113743N50	100pF
C473	2113743N50	100pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490 -		
C497	2113743N50	100pF
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	.01uF, 10%
C521	2113743L41	.01uF, 10%
C522	2113743L41	.01uF, 10%
C523	2113743L41	.01uF, 10%
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sense
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor
CR241	4805649Q13	Dual Varactor
CR242	4862824C01	Varactor

Circuit Ref	Motorola Part No.	Description
CR243	4862824C01	Varactor
CR251	4802245J22	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual Comm Anode-Cathode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad Diode
CR308	4802245J41	Pin Diode
CR310	4862824C01	Varactor
CR411	4802245J47	Schottky Diode
CR412	4802245J47	Schottky Diode
CR413	4802245J47	Schottky Diode
CR440	4813833C02	Dual Diode Common Cathode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yel
E101	2484657R01	Ferrite Bead
E400 -		
E409	2480640Z01	Ferrite Bead
F501	6580542Z01	Fuse 3A
FL201	-	16.8MHz Xtal (Clip)
FL301	4802245J43	Xtal Filter 45.1MHz
FL401	4870368G02	Osc Xtal 38.4kHz (not placed non-display radios)
H101	2680499Z01	Heat Spreader
J101	0180117S05	RF Jack Assembly
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-pins Connector
J403	0905505Y02	20-pins Connector
L101	2460591B80	19.61nH
L102	2460591B80	19.61nH
L104	2460591B80	19.61nH
L105	2462587N22	390nH
L106	2460591A11	7.66nH
L107	2460591G24	33.47nH
L108	2460591A01	4.22nH
L109	2460591B04	11.03nH
L112	2462587N22	390nH
L113	2413926H09	5.6nH
L114	2462587N22	390nH
L115	2462587N22	390nH

Circuit Ref	Motorola Part No.	Description
L116	2460591A50	9.75nH
L160	2413926H14	15.0nH
L201	2462587Q20	2.2uH
L202	2462587Q20	2.2uH
L203	2462587Q20	2.2uH
L232	2462587P25	12uH
L241	2462587V41	390nH
L242	2462587V38	220nH
L243	2460593C01	Teflon Resonator
L251	2462587V28	33nH
L253	2460593C02	Teflon Resonator
L261	2462587V29	39nH
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2460591C04	13.9nH
L302	2460591C04	13.9nH
L303	2462587V38	220nH
L304	2462587V37	180nH
L305	2462587V27	27nH
L306	2460591C04	13.9nH
L307	2460591C04	13.9nH
L309	2460591C16	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2.2uH
L321	Not Placed	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH
L331	2480646Z20	2.2uH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	Gnd Contact Finger
PB501	4080523Z01	Tactile, Pushbutton
PB502	4080523Z01	Tactile, Pushbutton

Circuit Ref	Motorola Part No.	Description
PB503	4080523Z01	Tactile, Pushbutton
PB504	4080523Z01	Tactile, Pushbutton
PB505	4080523Z01	Tactile, Pushbutton
Q110	4802245J55	RF Power FET
Q111	4802245J50	Dual NPN/PNP
Q210	4802245J50	Dual NPN/PNP
Q241	4805218N63	NPN
Q260	4802245J50	Dual NPN/PNP
Q261	4802245J50	Dual NPN/PNP
Q301	4802245J44	NPN
Q302	4802245J44	NPN
Q310	Not Placed	
Q315	4880214G02	NPN
Q316	Not Placed	
Q320	4805218N63	NPN
Q400	4809579E18	MOSFET P-Chan
Q403	4880214G02	NPN
Q405	4802245J54	Dual NPN
Q410	4802245J54	Dual NPN
Q416	4809579E18	MOSFET P-Chan (not placed non-display radios)
Q417	4802245J50	Dual NPN/PNP
Q502	5180159R01	Dual NPN
Q505	4880214G02	NPN
R101	0662057A34	240
R102	0680539Z01	0.1
R103	0662057M41	43
R104	0662057M81	2K
R106	0662057M26	10
R107	Not Placed	
R108	Not Placed	
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057M01	0
R130	0662057M98	10K
R131	0662057M98	10K
R132	0662057N39	470K
R133	Not Placed	
R161	0662057M57	200

Circuit Ref	Motorola Part No.	Description
R170	0662057A34	240
R171	0662057M92	5.6K
R172	0662057A32	200
R173	0662057N47	1MEG
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7.5K
R254	0662057M95	7.5K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R281	0662057M01	0
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M74	1K
R304	0662057N01	12K
R305	0662057M67	510
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M83	2.4K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	36K

Circuit Ref	Motorola Part No.	Description
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M88	3.9K
R321	0662057M74	1K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R326	Not Placed	
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R330	Not Placed	
R331	Not Placed	
R332	Not Placed	
R333	Not Placed	
R334	Not Placed	
R335	Not Placed	
R336	Not Placed	
R338	Not Placed	
R339	0662057M01	0
R340	0662057M94	6.8K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K

Circuit Ref	Motorola Part No.	Description
R408	Not Placed	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057N13	39K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10MEG (not placed non-display radios)
R421	0662057M81	2K
R423	0662057N15	47K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K (not placed non-display radios)
R427	0662057M84	2.7K
R428	0662057M10	2.2
R429	0662057M98	10K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M93	6.2K
R435	0662057M81	2K
R436	0662057M01	0
R437	Not Placed	
R445	0662057N08	24K
R446	0662057N31	220K
R447	0662057N50	1.3M
R448	0662057N33	270K
R449	0662057N08	24K
R450	0683962T45	68
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057M56	180 (not placed non-display radios)
R462	0662057M98	10K (not placed non-display radios)
R463	0662057M61	300
R471	0662057M92	5.6K

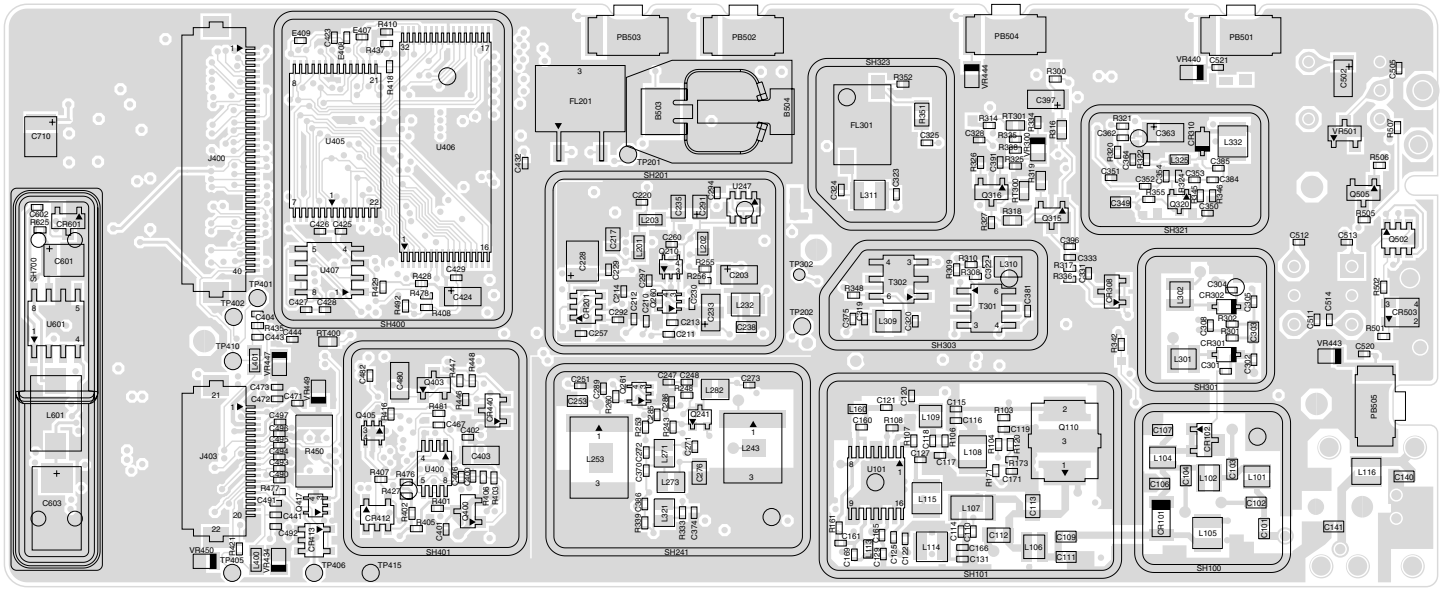
Circuit Ref	Motorola Part No.	Description
R472	0662057M87	3.6K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R477	0662057M74	1K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT300	0680590Z01	Thermistor 33K
RT301	Not Placed	
RT400	0680590Z01	Thermistor 33K
S501	4080502B03	Channel Switch
S502	1880619Z01	Volume Switch
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthersizer Top Shield
SH202	2680511Z01	Synthersizer Bottom Shield
SH241	2680513Z01	VCO Top Shield
SH242	2680514Z01	VCO Bottom Shield
SH301	2680554Z01	Rx Pre-filter shield\
SH302	2680555Z01	Rx Post-filter/RF Amp Shield
SH303	2680509Z01	Mixer Shield
SH304	2680624Z01	Mixer Diode Shield
SH321	2680508Z01	Zif 2nd LO Shield
SH322	2680514Z01	ZIF Shield
SH323	2680553Z01	Xtal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On/Off Shield
SH402	2680515Z01	Controller Microp Shield
SH403	2680516Z01	Cntl AsficCmp/Audi PA Shield
T301	2580541Z01	XFMR Coil
T302	2580541Z01	XFMR Coil
U101	5105109Z67	LDMOS Driver
U102	5185765B01	Power Control IC
U201	5185963A27	LVFRACN
U210	5102463J61	Inverter

Circuit Ref	Motorola Part No.	Description
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer
U247	5105739X05	Regulator Linear
U248	5102463J58	3.3V Reg
U301	5109632D83	LVZIF
U400	5102463J40	3.3V Reg
U404	5185963A53	AsficCmp
U405	Not Placed	
U406	*5102463J59	ROM 128K **Conventional MDC**
U406	*5102463J60	ROM 512K **Conventional 5Tone / MPT**
U407	*5102463J62	EEPROM 8Kx8 **Conventional MDC**
U407	*5102463J64	EEPROM 16Kx8 **Conventional 5Tone / MPT**
U409	5102226J55	Microcontroller
U410	5102463J57	3.3V Reg (not placed non-display radios)
U420	5102463J44	Audio PA
VR300	Not Placed	
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J51	6.8V Zener
VR439	4880140L15	10V Zener
VR440	4802245J51	6.8V Zener
VR441	4802245J51	6.8V Zener
VR442	4802245J51	6.8V Zener
VR443	4802245J51	6.8V Zener
VR444	4802245J51	6.8V Zener
VR445	4802245J53	10V Zener
VR446	4802245J53	10V Zener
VR447	4802245J53	10V Zener
VR448	4802245J53	10V Zener
VR449	4802245J53	10V Zener
VR450	4802245J53	10V Zener
VR501	4813830A18	6.8V Zener
VR506	4802245J51	6.8V Zener

* Motorola Depot Servicing only

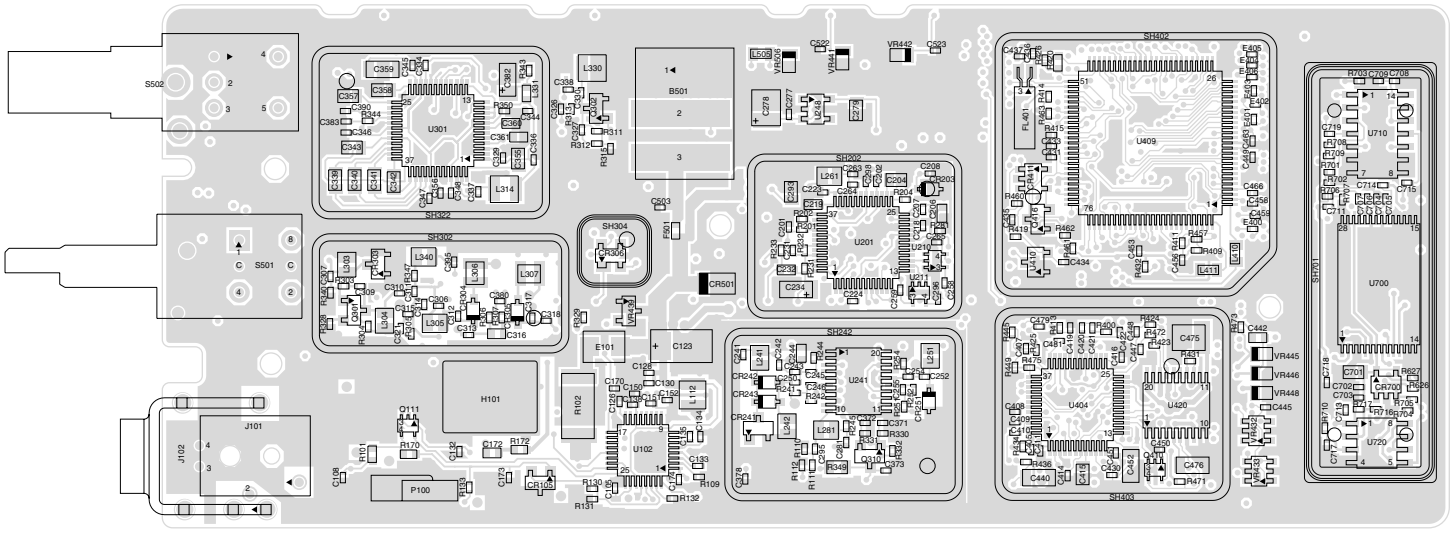
Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

4.0 UHF PCB 8480587Z01 (GP1280) Schematics



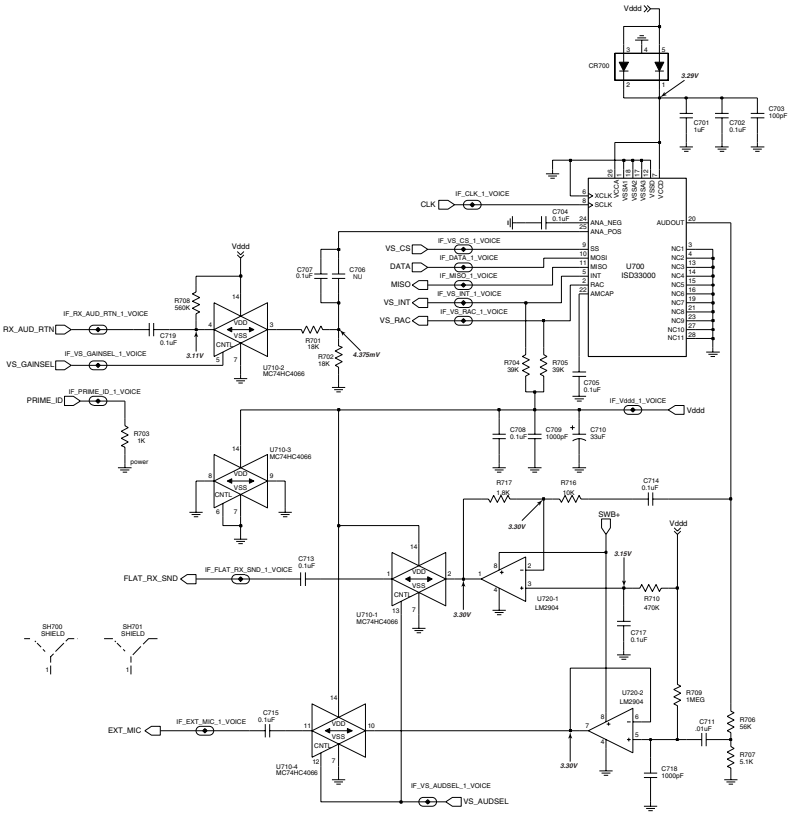
ZMY0130183-O

UHF (403-470MHz) GP1280 Main Board Top Side



ZMY0130182-O

UHF (403-470MHz) GP1280 Main Board Bottom Side



ZMY0130190-A

UHF (403-470 MHz) GP1280 - Voice Storage Schematic

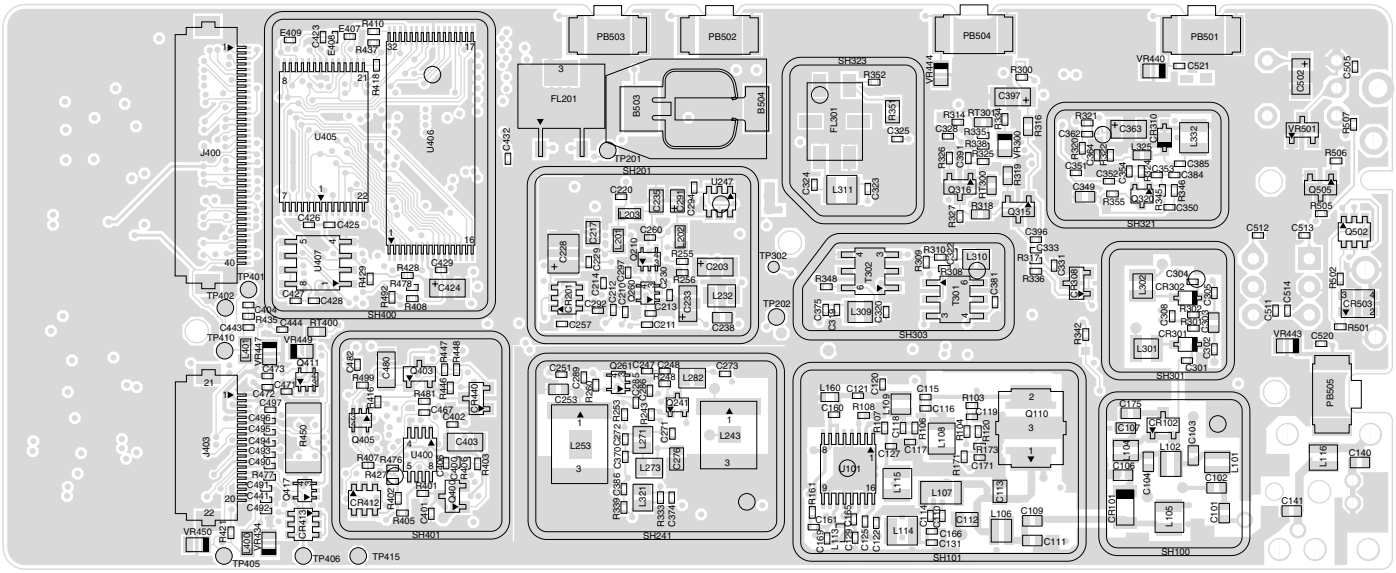
5.0 Voice Storage Parts List (GP1280)

Circuit Ref	Motorola Part No.	Description
C601	2311049A57	10uF
C602	2113743L41	.01uF
C603	2311049C07	100uF
C701	2180478Z20	1uF
C702	2113928N01	0.1uF
C703	2113743N50	100pF
C704	2113928N01	0.1uF
C705	2113928N01	0.1uF
C706	2113928N01	0.1uF
C707	2113928N01	0.1uF
C708	2113928N01	0.1uF
C709	2113743N50	100pF
C710	2311049A30	33uF
C711	2113928N01	0.1uF
C713	2113928N01	0.1uF
C714	2113928N01	0.1uF
C715	2113928N01	0.1uF
C716	2113928N01	0.1uF
C717	2180478Z20	1uF
C718	2180478Z20	1uF
CR601	4805129M76	
CR700	4802245J47	
L601	2480570Z01	68uH
R625	0662057M01	
R626	0662057M83	2.4K
R627	0662057M74	1K
R701	0662057N10	30K
R702	0662057M91	5.1K
R703	0662057N15	47K
R704	0662057N23	100K
R705	0662057N23	100K
R706	0662057N17	56K
R707	0662057M91	5.1K
R716	0662057N15	47K
R717	0662057N15	47K
U601	5105109Z74	LM2675
U700	5102463J53	ISD33000
U710	5102463J52	MC74HC4066
U720	5180932W01	LM2904

* Motorola Depot Servicing only

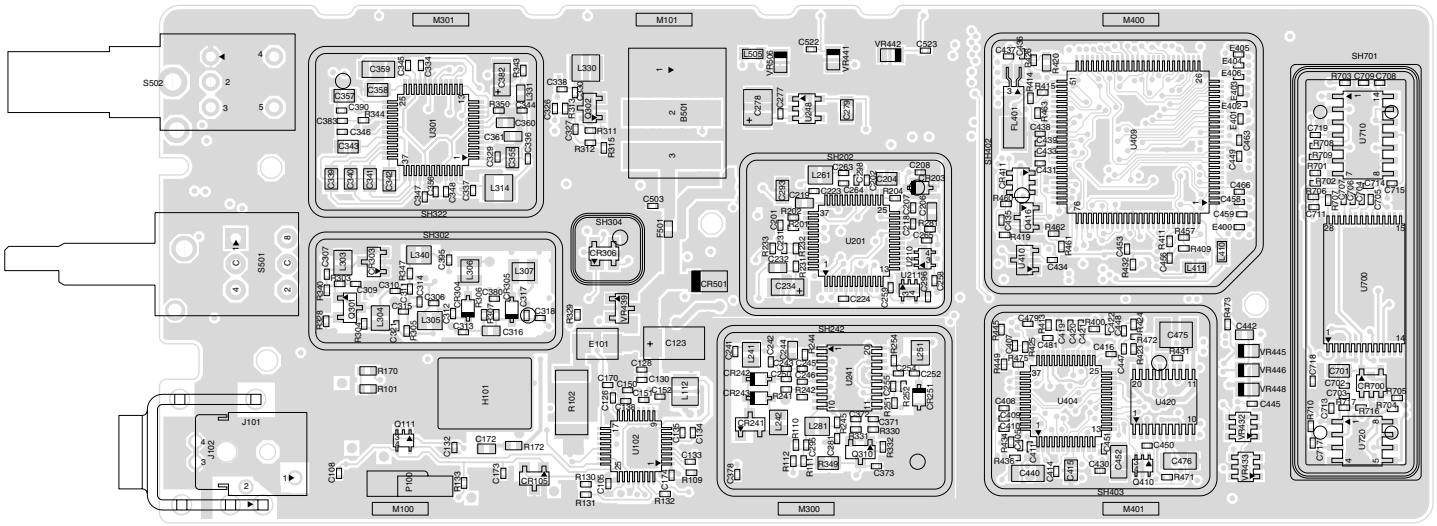
Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

6.0 UHF PCB 8480587Z03 Schematics

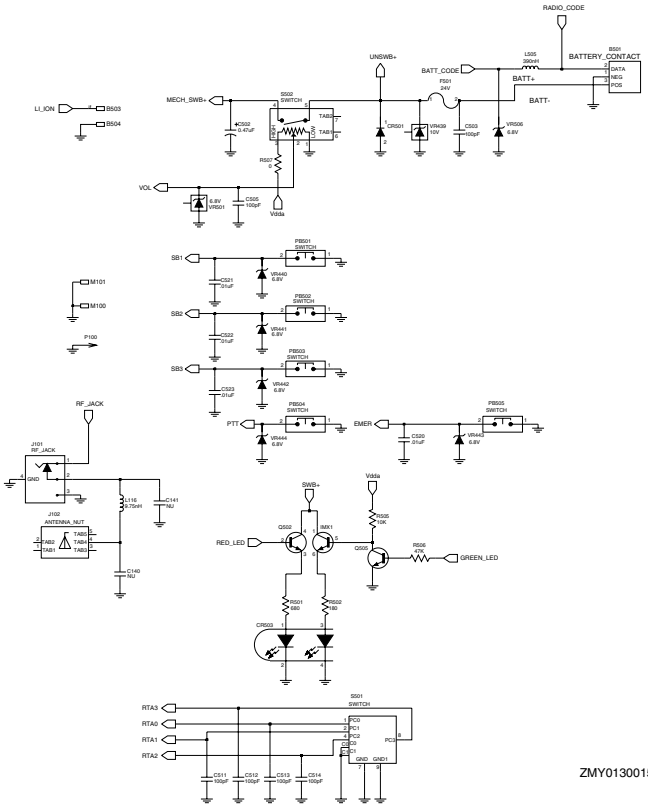


ZMY0130183-A

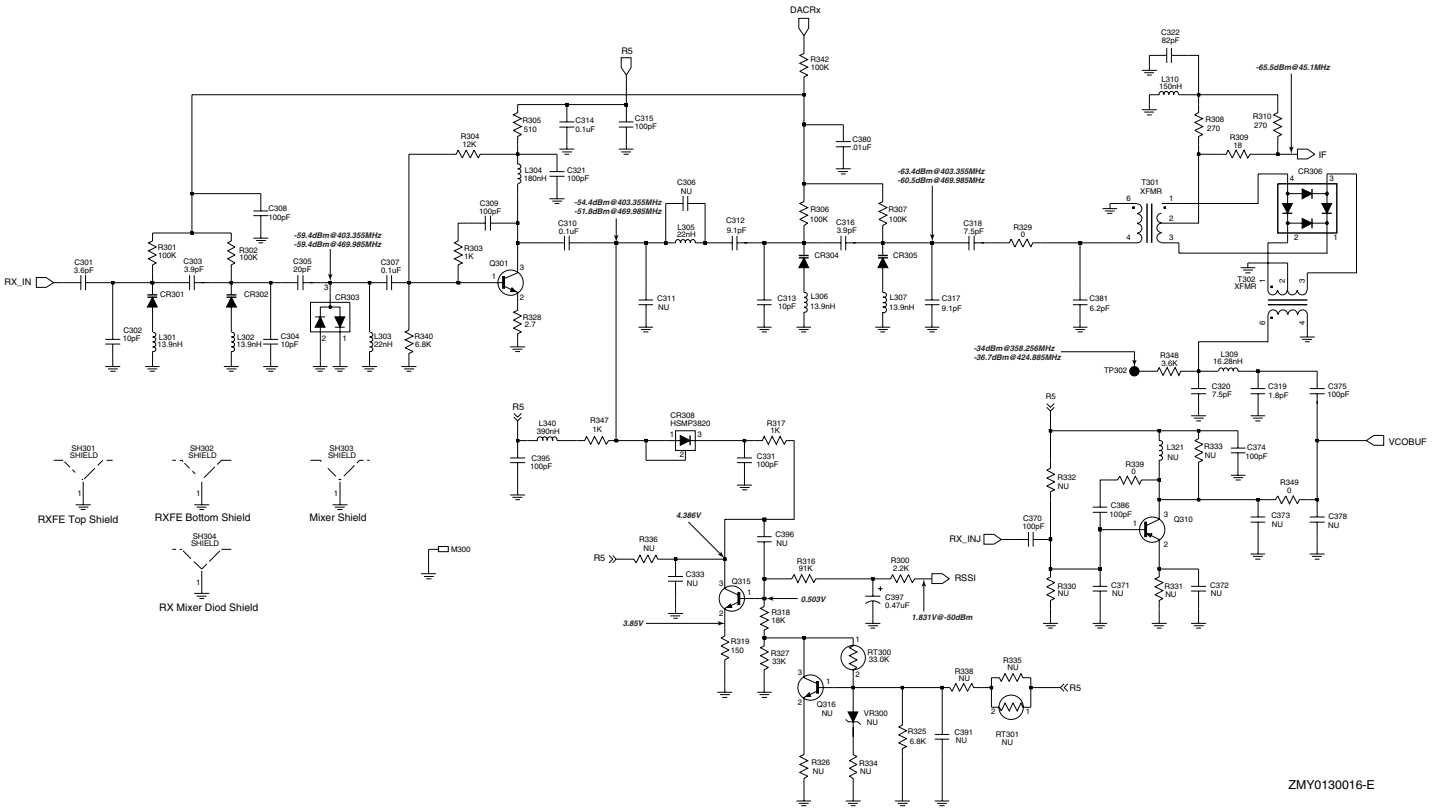
UHF (403-470MHz) GP1280 Main Board Top Side



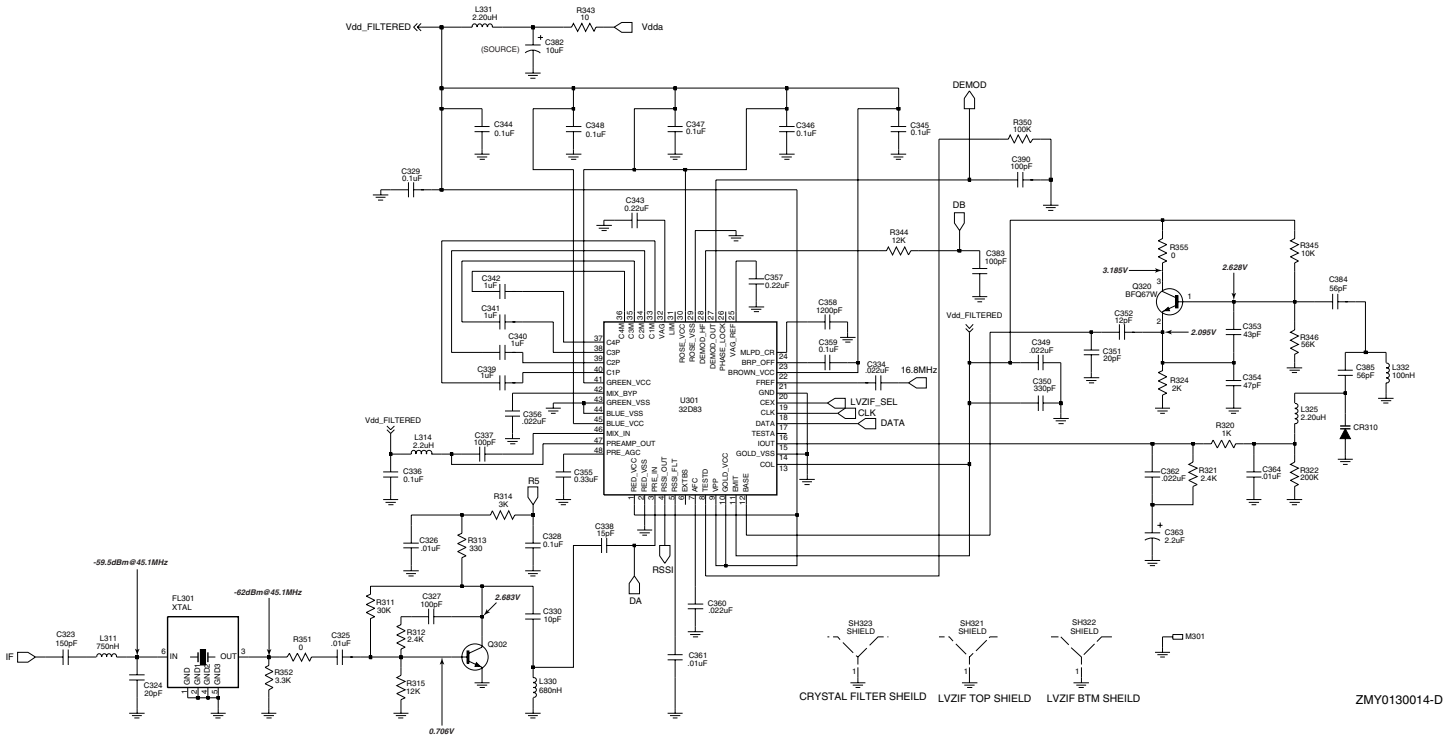
UHF (403-470MHz) GP1280 Main Board Bottom Side



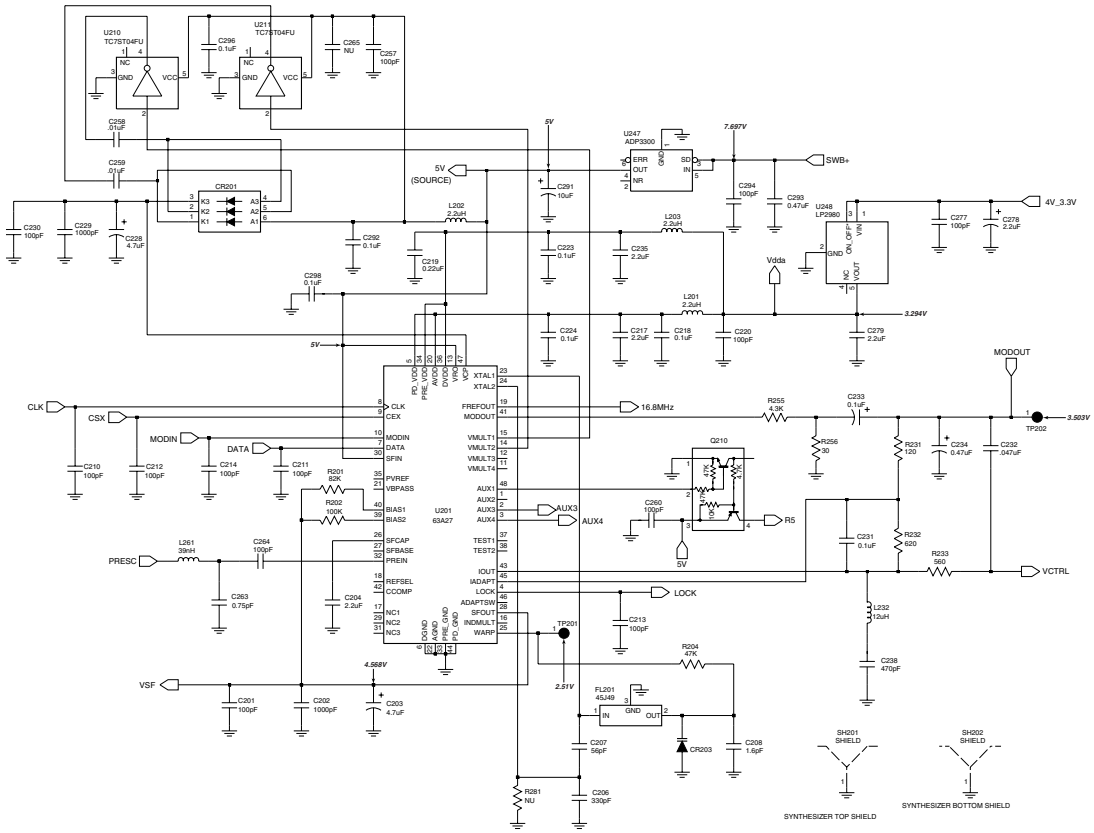
UHF (403-470 MHz) Controls and Switches



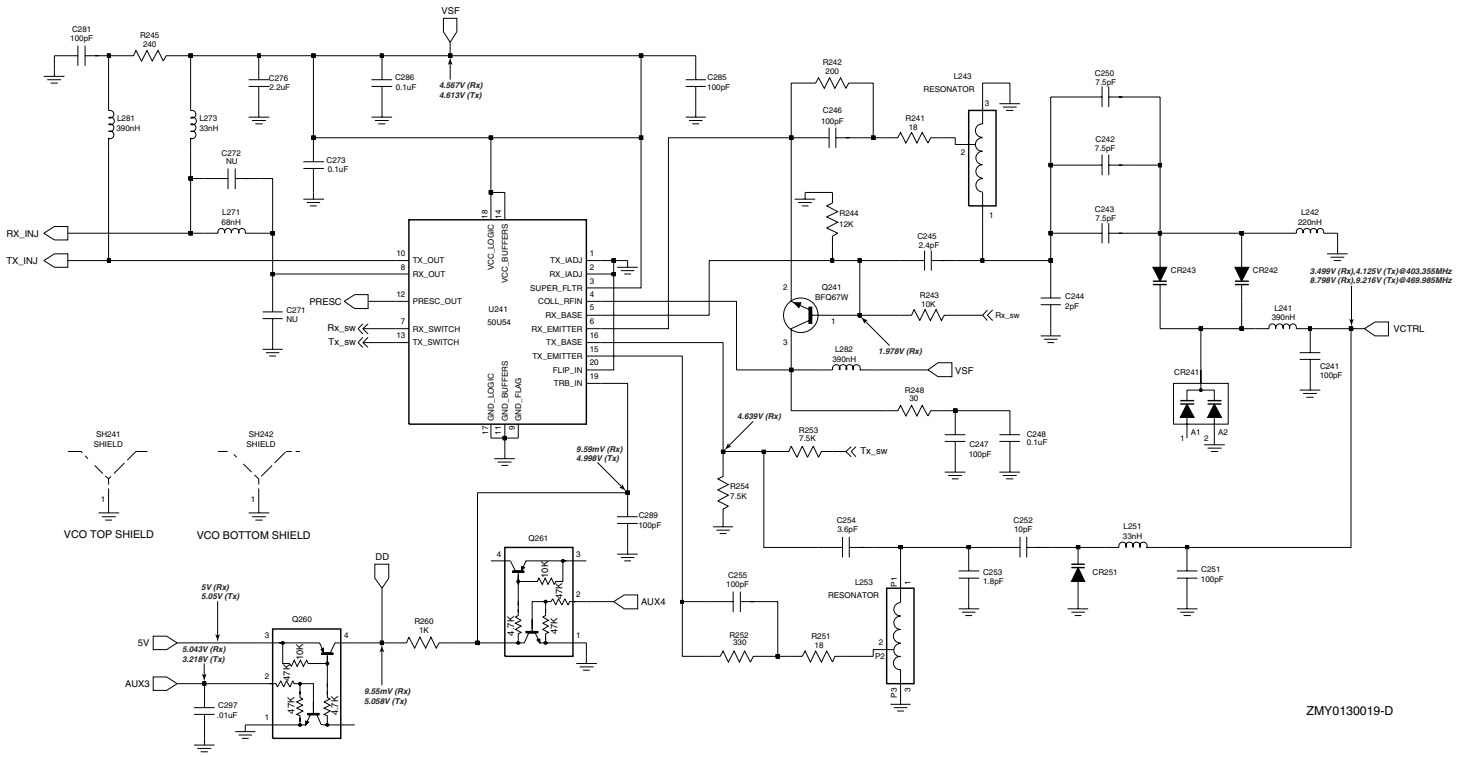
UHF (403-470 MHz) Receiver Front End



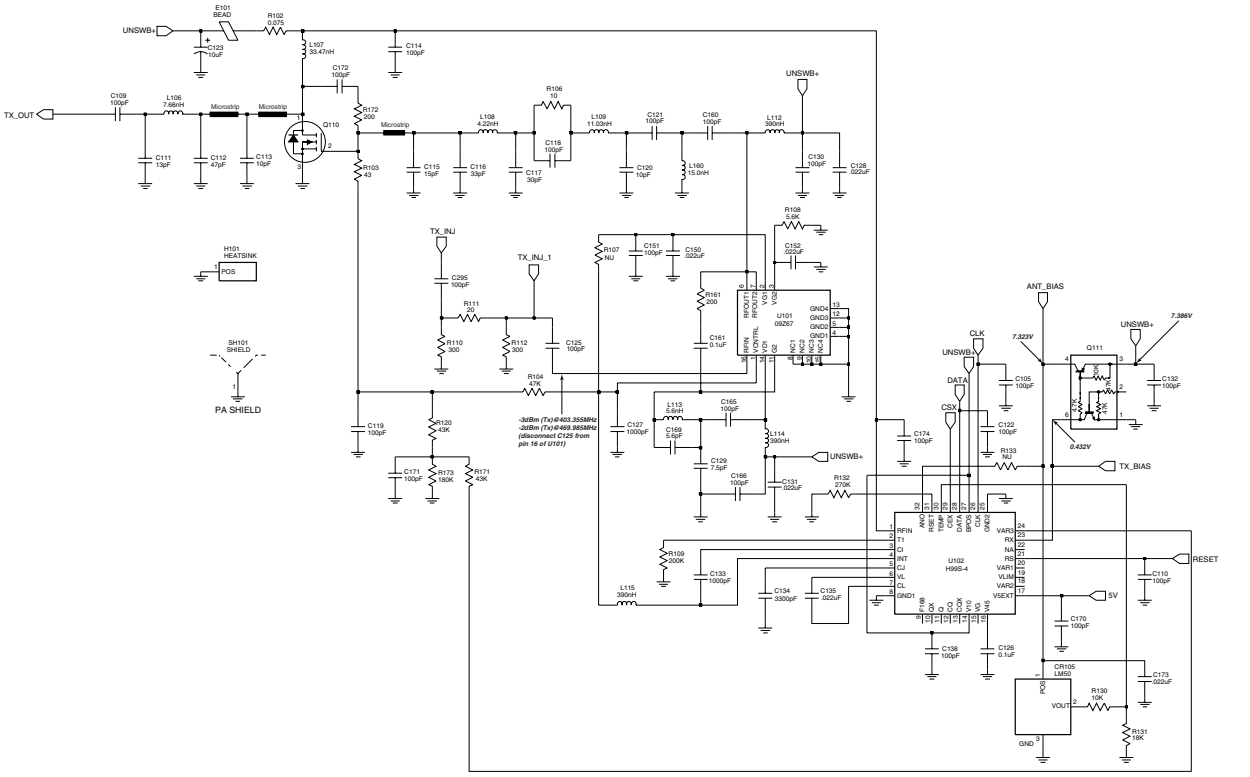
UHF (403-470 MHz) Receiver Back End



UHF (403-470 MHz) Synthesizer

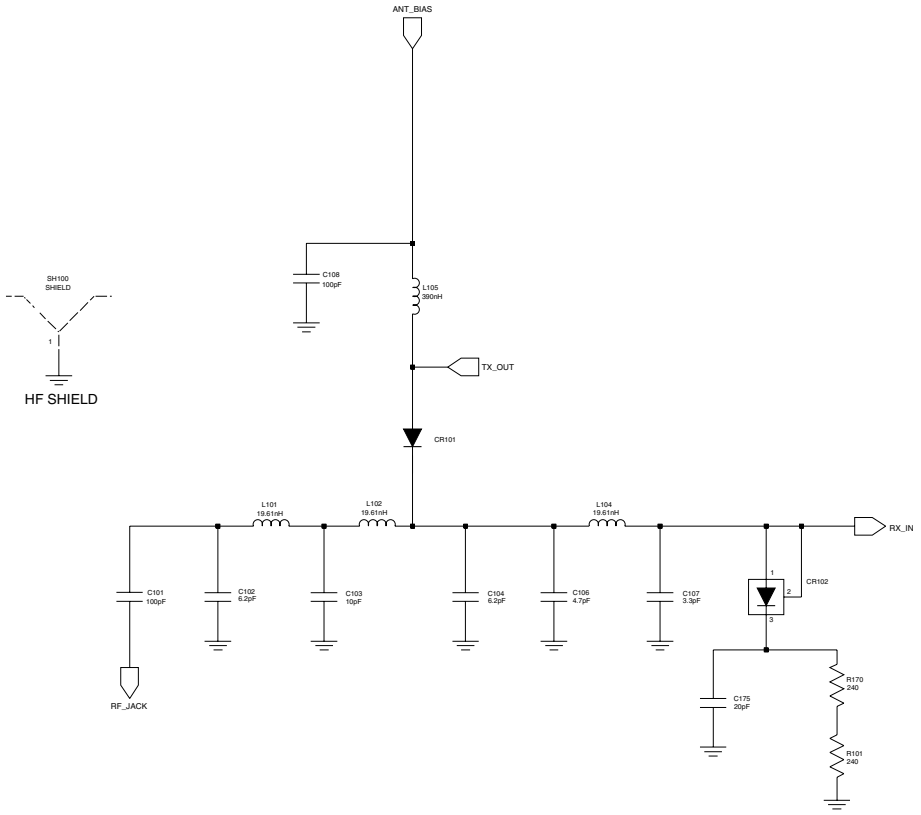


UHF (403-470 MHz) Voltage Controlled Oscillator



ZMY0130018-E

UHF (403-470 MHz) Transmitter



UHF (403-470 MHz) Harmonic Filter

7.0 UHF PCB 8480587Z03 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A01	CONN, CONTACT BATTERY
B503	3980502Z01	CONTACT, BACKUP B+
B504	3980501Z01	CONTACT, BACKUP B-
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F27	10pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F30	13pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N30	15.0pF
C116	2113743N38	33.0pF
C117	2113743N37	30.0pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N26	10pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	0.1uF
C127	2113743L17	1000pF
C128	2113743M08	0.022uF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	0.022uF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	0.022uF
C138	2113743N50	100pF
C150	2113743M08	0.022uF
C151	2113743N50	100pF
C152	2113743M08	0.022uF
C160	2113743N50	100pF
C161	2113743M24	0.1uF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113740F51	100pF
C173	2113743M08	0.022uF
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7pF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N44	56.0pF
C208	2113743N08	1.6pF
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF
C219	2113743K16	0.220uF
C220	2113743N50	100pF
C223	2113743M24	0.1uF
C224	2113743M24	0.1uF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	0.1uF
C232	2113743E12	0.047uF
C233	2311049A01	0.1pF
C234	2311049A05	0.47pF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	0.01uF
C259	2113743L41	0.01uF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C273	2113743M24	0.1uF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF
C289	2113743N50	100pF
C291	2311049A69	10.0uF
C292	2113743M24	0.1uF
C293	2113743A27	0.470uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF
C297	2113743L41	0.01uF
C298	2113743M24	0.1uF
C301	2113743N15	3.6pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N26	10pF
C305	2113743N33	20.0pF
C307	2113743M24	0.1uF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF
C312	2113743N25	9.1pF
C313	2113743N26	10pF
C314	2113743M24	0.1uF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82.0pF
C323	2113743N54	150pF
C324	2113743N33	20.0pF
C325	2113743L41	0.01uF
C326	2113743L41	0.01uF
C327	2113743N50	100pF
C328	2113743M24	0.1uF
C329	2113743M24	0.1uF
C330	2113743N26	10pF
C331	2113743N50	100pF
C334	2113743M08	0.022uF
C336	2113743M24	0.1uF
C337	2113743N50	100pF
C338	2113743N30	15.0pF
C339	2180478Z20	1.0uF
C340	2180478Z20	1.0uF
C341	2180478Z20	1.0uF
C342	2180478Z20	1.0uF
C343	2113743A23	0.220uF
C344	2113743M24	0.1uF
C345	2113743M24	0.1uF
C346	2113743M24	0.1uF
C347	2113743M24	0.1uF
C348	2113743M24	0.1uF
C349	2113743E07	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20.0pF
C352	2113743N28	12.0pF
C353	2113743N41	43.0pF
C354	2113743N42	47.0pF
C355	2113743A24	0.330uF
C356	2113743M08	0.022uF
C357	2113743A23	0.220uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	0.022uF
C361	2113741F49	10nF
C362	2113743M08	0.022uF
C363	2311049A40	2.2uF
C364	2113743L41	0.01uF
C370	2113743N50	100pF
C374	2113743N50	100pF
C375	2113743N50	100pF
C380	2113743L41	0.01uF
C381	2113743N21	6.2pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56.0pF
C385	2113743N44	56.0pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C395	2113743N50	100pF
C397	2311049A05	0.47pF
C400	2113743L41	0.01uF
C401	2113743M24	0.1uF
C402	2113743M24	0.1uF
C403	2113928D08	10.0uF
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	0.1uF
C410	2113928N01	0.1uF
C411	2113743M24	0.1uF
C414	2113743M24	0.1uF
C415	2109720D01	0.01uF
C416	2113928N01	0.1uF
C420	2113743L41	0.01uF
C421	2113928N01	0.1uF
C422	2113743M24	0.1uF
C423	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C424	2311049A59	10uF
C425	2113743M24	0.1uF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	0.1uF
C429	2113743M24	0.1uF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C433	2113743L41	0.01uF
C434	2113743M24	0.1uF
C435	2113743M24	0.1uF
C436	2113743N34	22.0pF
C437	2113743N34	22.0pF
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	10uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	0.022uF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C451	2113743M08	0.022uF
C452	2113743G26	4.7uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10.0uF
C476	2113928D08	10.0uF
C479	2113928N01	0.1uF
C480	2113928D08	10.0uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C502	2311049A05	0.47pF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	0.01uF
C521	2113743L41	0.01uF
C522	2113743L41	0.01uF
C523	2113743L41	0.01uF
C701	2180478Z20	1.0uF
C702	2113928N01	0.1uF
C703	2113743N50	100 pF
C704	2113928N01	0.1uF
C705	2113928N01	0.1uF
C707	2113928N01	0.1uF
C708	2113928N01	0.1uF
C709	2113743L17	1000 pF
C710	2311049A30	33 uF
C711	2113743L41	0.1 uF
C713	2113928N01	0.1 uF
C714	2113928N01	0.1 uF
C715	2113928N01	0.1 uF
C717	2113928N01	0.1 uF
C718	2113743L17	1000pF
C719	2113928N01	0.1uF
CR101	4880973Z02	PIN DIODE
CR102	4802245J41	PIN DIODES
CR105	5185963A15	TEMPERATURE SENSE
CR201	4802233J09	DIODE TRIPLE
CR203	4862824C03	VARACTOR
CR241	4805649Q13	DUAL VARACTOR
CR242	4862824C01	VARACTOR
CR243	4862824C01	VARACTOR
CR251	4802245J22	VARACTOR
CR301	4862824C01	VARACTOR
CR302	4862824C01	VARACTOR
CR303	4880154K03	DUAL COMMON ANODE-CATHODE
CR304	4862824C01	VARACTOR
CR305	4862824C01	VARACTOR
CR306	4802245J42	RING QUAD DIODE
CR308	4802245J41	PIN DIODES
CR310	4862824C01	VARACTOR
CR411	4802245J47	DIODE SCHOTTKY
CR412	4802245J47	DIODE SCHOTTKY
CR413	4802245J47	DIODE SCHOTTKY
CR440	4813833C02	DUAL DIODE COMMON CATHODE
CR501	4880107R01	RECTIFIER
CR503	4805729G49	LED RED/YEL
CR700	4802245J47	DIODE SCHOTTKY
E101	2484657R01	FERRITE BEAD
E400-		
E409	2480640Z01	FERRITE BEAD
F501	6580542Z01	FUSE 3A
FL201	4802245J49	CRYSTAL 16.8MHZ CLIP
FL301	4802245J43	XTAL FILTER 45.1MHZ
FL401	4870368G02	CLOCK OSC XTAL
H101	2680499Z01	HEAT SPREADER
J101	0180117S05	RF JACK ASSEMBLY
J102	0280519Z02	NUT, ANTENNA
J400	0905505Y04	40 PINS CONNECTOR
J403	0905505Y02	20 PINS CONNECTOR
L101	2479990B02	19.61nH
L102	2479990B02	19.61nH
L104	2479990B02	19.61nH
L105	2462587N22	390nH
L106	2479990A02	7.66nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L109	2479990B01	11.03nH
L112	2462587N45	22nH
L113	2413926H09	5.6nH
L114	2462587N22	390nH
L115	2462587N22	390nH
L116	2479990A03	9.75nH
L160	2413926H14	15.0nH
L201	2462587Q20	2.2UH
L202	2462587Q20	2.2UH
L203	2462587Q20	2.2UH
L232	2462587P25	12UH
L241	2462587V41	390nH
L242	2462587V38	220nH
L243	2460593C01	TEFLON RESONATOR
L251	2462587V28	33nH
L253	2460593C02	TEFLON RESONATOR
L261	2462587V29	39nH
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990C01	13.9nH
L302	2479990C01	13.9nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V26	22nH
L306	2479990C01	13.9nH
L307	2479990C01	13.9nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2.2UH
L325	2480646Z20	2.20UH
L330	2462587N64	680nH
L331	2480646Z20	2.20UH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	GND CONTACT FINGER
PB501	4080523Z01	TACTILE PUSH BUTTON
PB502	4080523Z01	TACTILE PUSH BUTTON
PB503	4080523Z01	TACTILE PUSH BUTTON
PB504	4080523Z01	TACTILE PUSH BUTTON
PB505	4080523Z01	TACTILE PUSH BUTTON
Q110	4802245J55	RF POWER FET
Q111	4802245J50	DUAL NPN/PNP
Q210	4802245J50	DUAL NPN/PNP
Q241	4805218N63	NPN
Q260	4802245J50	DUAL NPN/PNP
Q261	4802245J50	DUAL NPN/PNP
Q301	4802245J44	NPN
Q302	4802245J44	NPN
Q315	4880214G02	NPN
Q320	4805218N63	NPN
Q400	4809579E18	MOSFET P-CHAN
Q403	4880214G02	NPN
Q405	4802245J54	DUAL NPN
Q410	4802245J54	DUAL NPN
Q416	4809579E18	MOSFET P-CHAN
Q417	4802245J50	DUAL NPN/PNP
Q502	5180159R01	DUAL NPN
Q505	4880214G02	NPN
R101	0662057A34	240
R102	0680735Z01	0.075
R103	0662057M41	43
R104	0662057N15	47K
R106	0662057M26	10
R108	0662057M92	5.6K
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200

Circuit Ref	Motorola Part No.	Description
R173	0662057N29	180K
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7.5K
R254	0662057M95	6.8K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M74	1K
R304	0662057N01	12K
R305	0662057M67	0
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M83	2.4K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R339	0662057M01	0
R340	0662057M94	6.8K
R342	0662057N23	100K

Circuit Ref	Motorola Part No.	Description
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057N13	39K
R418	0662057M01	0
R419	0662057M67	0
R420	0662057B46	10.0 MEG
R421	0662057M81	2K
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K
R427	0662057M84	2.7K
R428	0662057M10	2.2
R429	0662057M98	10K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2K
R436	0662057M01	0
R445	0662057N08	24K
R446	0662057N31	220K
R447	0662057N51	1.5MEG
R448	0662057N33	270K
R449	0662057N08	24K
R450	0683962T45	68
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057M56	180
R462	0662057M98	10K
R463	0662057M61	300
R471	0662057M92	5.6K

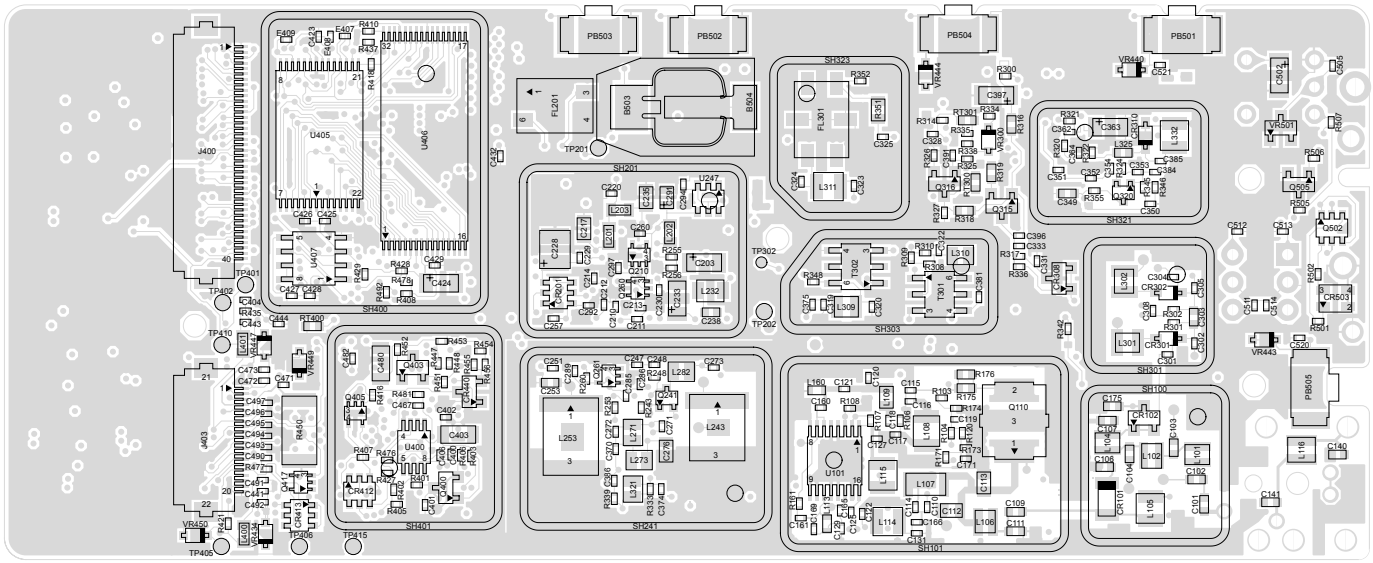
Circuit Ref	Motorola Part No.	Description
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R477	0662057M74	1K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R701	0662057N05	18K
R702	0662057N05	18K
R703	0662057M74	1K
R704	0662057N13	39K
R705	0662057N13	39K
R706	0662057N17	56K
R707	0662057M91	5.1K
R708	0662057N41	560K
R709	0662057N47	1.0 MEG
R710	0662057N39	470K
R716	0662057N01	12K
R717	0662057M82	2.2K
RT300	0680590Z01	THERMISTOR_33K
RT400	0680590Z01	THERMISTOR_33K
S501	4080710Z02	CHANNEL SWITCH
S502	1880619Z01	VOLUME SWITCH
SH100	2680507Z01	SHIELD, HARMONIC FILTER
SH101	2680510Z01	SHIELD, PA
SH201	2680511Z01	SYNTHESIZER TOP SHIELD
SH202	2680511Z01	SYNTHESIZER BOT SHIELD
SH241	2680513Z01	SHIELD, VCO TOP
SH242	2680514Z01	SHIELD, VCO BOT/LVZIF
SH301	2680554Z01	RX PRE FILTER SHIELD
SH302	2680555Z01	RX POST FILTER/RX AMP
SH303	2680509Z01	SHIELD, MIXER
SH304	2680624Z01	SHIELD, MIXER DIODE
SH321	2680508Z01	SHIELD,LVZIF 2ND LO
SH322	2680514Z01	ZIF SHIELD
SH323	2680553Z01	SHIELD, CRYSTAL FILTER
SH400	2680505Z01	CNTRL MEMORY SHIELD
SH401	2680506Z01	ON/OFF CNTRL SHIELD
SH402	2680515Z01	MICROP CNTRL SHIELD
SH403	2680516Z01	ASFIC CMP/AUDIO PA CONTROLLER SHIELD
SH701	2680677Z01	SHIELD (VOICE STORAGE BOTTOM)
T301	2580541Z01	XFMR COIL
T302	2580541Z01	XFMR COIL

Circuit Ref	Motorola Part No.	Description
U101	5105109Z67	LDMOS DRIVER UHF IC
U102	5185765B01	POWER CONTROL IC
U201	5185963A27	LVFRACN
U210	5102463J61	INVERTER
U211	5102463J61	INVERTER
U241	5105750U54	VCO BuFFER
U247	5105739X05	REGULATOR LINEAR
U248	5102463J58	3.3V REGULATOR
U301	5109632D83	LVZIF 2.2
U400	5102463J40	3.3V REGULATOR
U404	5185963A53	ASFIC CMP
U405	5102463J36	STATIC_RAM_32KX8 I
* U406	*5102463J60	FLASH ROM 512KX8
* U407	*5102463J64	16K X 8 EEPROM
U409	5102226J56	UP HC11FLO
U410	5102463J57	REGULATOR 3.3V
U420	5102463J44	AUDIO PA
U700	5109152M01	IC EEPROM ANLOG
U710	5102463J52	QUAD ANALOG SWITCH IC
U720	5113818A01	SING SPLY IC
VR432	4805656W08	5.6V ZENER
VR433	4805656W08	5.6V ZENER
VR434	4802245J51	ZENER 6.8V
VR439	4880140L15	10V ZENER
VR440	4802245J51	ZENER 6.8V
VR441	4802245J51	ZENER 6.8V
VR442	4802245J51	ZENER 6.8V
VR443	4802245J51	ZENER 6.8V
VR444	4802245J51	ZENER 6.8V
VR445	4802245J53	ZENER_10V
VR446	4802245J53	ZENER_10V
VR447	4802245J53	ZENER_10V
VR448	4802245J53	ZENER_10V
VR449	4802245J53	ZENER_10V
VR450	4802245J53	ZENER_10V
VR501	4813830A18	6.8V ZENER
VR506	4802245J51	ZENER 6.8V
	7580671Z01	PAD (FLEXIBLE CIRCUIT)
	7580671Z01	PAD (FLEXIBLE CIRCUIT)
	8480587Z03	BOARD, PC EXTENDED MAIN

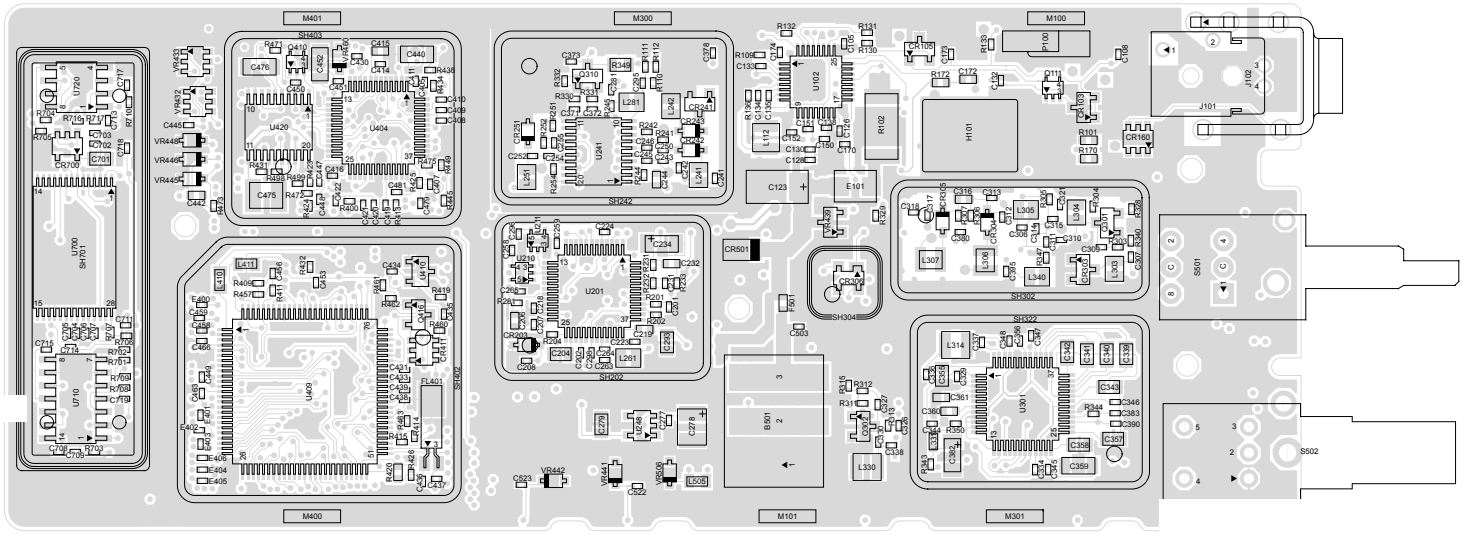
* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

8.0 UHF PCB 8480587Z05 Schematics



UHF (403-470MHz) GP1280 Main Board Top Side



UHF (403-470 MHz) GP1280 Main Board Bottom Side

9.0 UHF PCB 8480587Z05 Parts List

Circuit Ref.	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup Contact, B +
B504	3980501Z01	Backup Contact, B -
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F27	10pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F31	15pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N35	24pF
C116	2113743N35	24pF
C117	2113743N34	22pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N27	11pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A96	33uF
C125	2113743N50	100pF
C126	2113743M24	100000pF
C127	2113743L17	1000pF
C128	2113743M08	22000pF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	22000pF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	22000pF
C138	2113743N50	100pF
C140	0662057A67	5.6K
C141	NOTPLACED	
C150	2113743M08	22000pF
C151	2113743N50	100pF
C152	2113743M08	22000pF
C160	2113743N50	100pF
C161	2113743M24	100000pF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113740F51	100pF
C173	2113743M08	22000pF
C174	2113743N50	100pF
C175	2113740F51	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2113928L05	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N42	47pF
C208	NOTPLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	100000pF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	100000pF
C224	2113743M24	100000pF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	100000pF
C232	2113743E12	0.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	10000pF
C259	2113743L41	10000pF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	NOTPLACED	
C271	NOTPLACED	
C272	NOTPLACED	
C273	2113743M24	100000pF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A57	10uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	100000pF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	100000pF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF
C297	2113743L41	10000pF
C298	2113743M24	100000pF
C301	2113743N15	3.6pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N26	10pF
C305	2113743N33	20pF
C306	NOTPLACED	
C307	2113743M24	100000pF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	100000pF
C311	NOTPLACED	
C312	2113743N25	9.1pF
C313	2113743N26	10pF
C314	2113743M24	100000pF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	10000pF
C326	2113743L41	10000pF
C327	2113743N50	100pF
C328	2113743M24	100000pF
C329	2113743M24	100000pF
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	NOTPLACED	
C334	2113743M08	22000pF
C336	2113743M24	100000pF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1uF
C340	2180478Z20	1uF
C341	2180478Z20	1uF
C342	2180478Z20	1uF
C343	2113743A23	0.22uF

Circuit Ref.	Motorola Part No.	Description
C344	2113743M24	100000pF
C345	2113743M24	100000pF
C346	2113743M24	100000pF
C347	2113743M24	100000pF
C348	2113743M24	100000pF
C349	2113743E07	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.33uF
C356	2113743M08	22000pF
C357	2113743A23	0.22uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	0.022uF
C361	2113741F49	10000pF
C362	2113743M08	22000pF
C363	2311049A40	2.2uF
C364	2113743L41	10000pF
C370	2113743N50	100pF
C371	NOTPLACED	
C372	NOTPLACED	
C373	NOTPLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOTPLACED	
C380	2113743L41	10000pF
C381	2113743N21	6.2pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	NOTPLACED	
C395	2113743N50	100pF
C396	NOTPLACED	
C397	2311049A05	0.47uF
C400	2113743L41	10000pF

Circuit Ref.	Motorola Part No.	Description
C4001	NOTPLACED	
C4002	NOTPLACED	
C4003	NOTPLACED	
C4004	NOTPLACED	
C4005	NOTPLACED	
C4007	NOTPLACED	
C4008	NOTPLACED	
C4009	NOTPLACED	
C401	2113743M24	100000pF
C4010	NOTPLACED	
C4011	NOTPLACED	
C4012	NOTPLACED	
C4013	NOTPLACED	
C4014	NOTPLACED	
C4015	NOTPLACED	
C4016	NOTPLACED	
C402	2113743M24	100000pF
C403	2113743G24	2.2uF
C404	NOTPLACED	
C405	NOTPLACED	
C406	NOTPLACED	
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	100000pF
C410	2113743M08	22000pF
C411	2113743M24	100000pF
C414	2113743M24	100000pF
C415	2185895Z01	0.01uF
C416	2113928N01	0.1uF
C419	NOTPLACED	
C420	2113743L41	10000pF
C421	2113928N01	0.1uF
C422	2113743M24	100000pF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	100000pF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF
C429	2113743M24	100000pF
C430	2113928N01	0.1uF

Circuit Ref.	Motorola Part No.	Description
C431	2113743N50	100pF
C432	NOTPLACED	
C433	2113743L41	10000pF
C434	2113928N01	0.1uF
C435	2113743M24	100000pF
C436	2113743N34	22pF
C437	2113743N34	22pF
C438	2113743L17	1000pF
C439	2113743L17	1000pF
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	0.1uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C450	NOTPLACED	
C451	2113743M08	22000pF
C452	2113743B29	1uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490	2113743N50	100pF
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF

Circuit Ref.	Motorola Part No.	Description
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	10000pF
C521	2113743L41	10000pF
C522	2113743L41	10000pF
C523	2113743L41	10000pF
C601	NOTPLACED	
C602	NOTPLACED	
C603	NOTPLACED	
C701	2180478Z20	1uF
C702	2113928N01	0.1uF
C703	2113743N50	100pF
C704	2113928N01	0.1uF
C705	2113928N01	0.1uF
C706	NOTPLACED	
C707	2113928N01	0.1uF
C708	2113928N01	0.1uF
C709	2113743L17	1000pF
C711	2113743L41	10000pF
C713	2113928N01	0.1uF
C714	2113928N01	0.1uF
C715	2113928N01	0.1uF
C717	2113928N01	0.1uF
C718	2113743L17	1000pF
C719	2113928N01	0.1uF
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR103	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sensor
CR160	NOTPLACED	
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor

Circuit Ref.	Motorola Part No.	Description
CR241	4805649Q13	Varactor
CR242	4862824C08	Varactor
CR243	4862824C08	Varactor
CR251	4802245J22	Varactor
CR301	4862824C08	Varactor
CR302	4862824C08	Varactor
CR303	4880154K03	Dual Schottky Diode
CR304	4862824C08	Varactor
CR305	4862824C08	Varactor
CR306	4802245J42	Ring Quad Diode
CR308	4802245J41	Pin Diode
CR310	4862824C08	Varactor
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual Common Cathode Diode
CR501	4880107R01	Rectifier
CR503	4805729G49	Red/Yellow LED
CR601	NOTPLACED	
CR700	4802245J47	Diode Schottky
E101	2484657R01	FERRITE BEAD
E400	2480640Z01	FERRITE BEAD
E401	2480640Z01	FERRITE BEAD
E402	2480640Z01	FERRITE BEAD
E403	2480640Z01	FERRITE BEAD
E404	2480640Z01	FERRITE BEAD
E405	2480640Z01	FERRITE BEAD
E406	2480640Z01	FERRITE BEAD
E407	2480640Z01	FERRITE BEAD
E408	2480640Z01	FERRITE BEAD
E409	2480640Z01	FERRITE BEAD
F501	6580542Z01	Fuse 3A
FL201	4805875Z04	16.8 MHZ Xtal Filter
FL301	9186153B01	Xtal Filter 45.1MHz
FL401	4870368G02	Real Time Clock Xtal Oscillator 38.4kHz
H101	2680499Z01	Heat Spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-Pin Connector
J403	0905505Y02	20-Pin Connector
L101	2479990B02	19.61nH
L102	2479990B02	19.61nH
L104	2479990B02	19.61nH
L105	2462587N22	390nH
L106	2479990A02	7.66nH
L107	2479990G01	33.47nH
L108	2479990A01	4.2nH
L109	2479990B01	11.03nH
L112	2462587N45	22nH
L113	2413926H09	5.6nH
L114	2462587N45	22nH
L115	2462587N22	390nH
L116	2479990A03	9.75nH
L160	2413926H14	15nH
L201	2462587Q20	2200nH
L202	2462587Q20	2200nH
L203	2462587Q20	2200nH
L232	2462587P25	12000nH
L241	2462587V41	390nH
L242	2462587V38	220nH
L243	2485776Z01	RESONATOR
L251	2462587V28	33nH
L253	2460593C02	RESONATOR
L261	2462587V29	39nH
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990C01	13.9nH
L302	2479990C01	13.9nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V26	22nH
L306	2479990C01	13.9nH
L307	2479990C01	13.9nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2200nH
L321	NOTPLACED	
L325	2480646Z20	2.20uH
L330	2462587N64	680nH
L331	2480646Z20	2.20uH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
L601	NOTPLACED	
M100	7585651Z01	PAD, EMI, SMT
M101	7585651Z01	PAD, EMI, SMT
M300	7585651Z01	PAD, EMI, SMT
M301	7585651Z01	PAD, EMI, SMT
M400	7585651Z01	PAD, EMI, SMT
M401	7585651Z01	PAD, EMI, SMT
P100	3905643V01	Ground Contact Finger
PB501	4080523Z02	Tactile Switch
PB502	4080523Z02	Tactile Switch
PB503	4080523Z02	Tactile Switch
PB504	4080523Z02	Tactile Switch
PB505	4080523Z02	Tactile Switch
Q110	4813828A09	RF PA
Q111	4809939C05	DUAL NPN/PNP Transistor
Q210	4809939C05	DUAL NPN/PNP Transistor
Q241	4805218N63	RF NPN Transistor
Q260	4809939C05	DUAL NPN/PNP Transistor
Q261	4809939C05	DUAL NPN/PNP Transistor
Q301	4802245J44	NPN Transistor
Q302	4802245J44	NPN Transistor
Q310	NOTPLACED	
Q315	4880214G02	NPN Transistor
Q316	NOTPLACED	
Q320	4805218N63	RF NPN Transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	MOSFET P-Channel
Q417	4809939C05	DUAL NPN/PNP Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
R101	0662057A34	240
R102	0680539Z01	0.1
R103	0662057M41	43
R104	0662057N15	47K
R106	0662057M26	10
R107	NOTPLACED	
R108	0662057M92	5.6K
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	NOTPLACED	
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R175	0662057B59	3
R176	0662057B59	3
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7.5K

Circuit Ref.	Motorola Part No.	Description
R254	0662057M95	7.5K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R281	NOTPLACED	
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M74	1K
R304	0662057N01	12K
R305	0662057M67	510
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M83	2.4K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R326	NOTPLACED	
R327	0662057N11	33K
R328	0662057M12	2.7
R329	0662057M01	0
R330	NOTPLACED	
R331	NOTPLACED	
R332	NOTPLACED	
R333	NOTPLACED	
R334	NOTPLACED	
R335	NOTPLACED	
R336	NOTPLACED	

Circuit Ref.	Motorola Part No.	Description
R338	NOTPLACED	
R339	0662057M01	0
R340	0662057M94	6.8K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	NOTPLACED	
R403	NOTPLACED	
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	NOTPLACED	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10M
R421	0662057M81	2K
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K
R427	0662057M84	2.7K
R428	0662057M10	2.2
R429	0662057M98	10K

Circuit Ref.	Motorola Part No.	Description
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2K
R436	0662057M95	7500
R437	NOTPLACED	
R445	0662057N08	24K
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R450	0683962T45	68
R451	0662057N03	15K
R452	0662057N23	100K
R453	NOTPLACED	
R454	NOTPLACED	
R455	NOTPLACED	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057M56	180
R462	0662057M98	10K
R463	0662057M61	300
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N35	330K
R477	0662057M74	1K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R498	0662057M98	10K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R625	NOTPLACED	
R626	NOTPLACED	
R627	NOTPLACED	

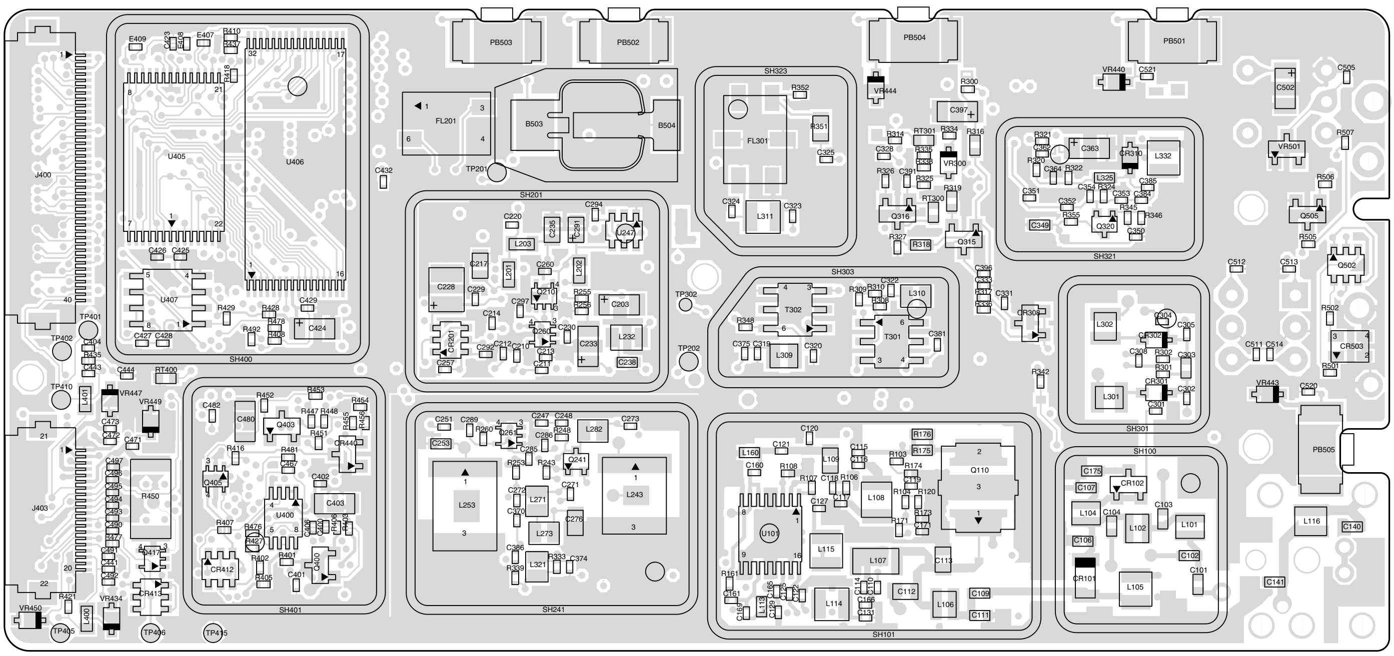
Circuit Ref.	Motorola Part No.	Description
R701	0662057N05	18K
R702	0662057N05	18K
R703	0662057M74	1K
R704	0662057N13	39K
R705	0662057N13	39K
R706	0662057N17	56K
R707	0662057M91	5.1K
R708	0662057N41	560K
R709	0662057N47	1M
R710	0662057N39	470K
R716	0662057N01	12K
R717	0662057M82	2.2K
RT300	0680590Z01	THERMISTOR_33K
RT301	NOTPLACED	
RT400	0680590Z01	THERMISTOR_33K
S501	4080710Z02	Frequency Switch
S502	1880619Z02	Volume / On-off Switch
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthesizer Top Shield
SH202	2680511Z01	Synthesizer Bottom Shield
SH241	2680513Z01	VCO Resonators Shield
SH242	2680514Z01	VCO Buffer IC Shield
SH301	2680554Z01	Receiver Front-End Shield
SH302	2680555Z01	Receiver Back-End Bottom Shield
SH303	2680509Z01	Mixer Shield
SH304	2680624Z01	Mixer Diode Shield
SH321	2680508Z01	LVZIF 2nd LO Shield
SH322	2680514Z01	LVZIF Shield
SH323	2680553Z01	Crystal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On-off Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	Asfic_Cmp, Audio PA Shield
SH701	2680677Z01	Voice Storage Shield
T301	2580541Z02	Balun Transformer
T302	2580541Z02	Balun Transformer
U101	5185130C65	LDMOS PA Driver
U102	5185765B26	PCIC
U201	5185963A27	LVFRACN Synthesizer IC

Circuit Ref.	Motorola Part No.	Description
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer IC
U247	5105739X05	5V Regulator
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF IC
U400	5102463J40	3.3V Regulator
U404	5185130C53	ASFIC_CMP IC
U405	5102463J36	Static RAM 32K X 8
* U406	5102463J60	Flash ROM 512K X 8
* U407	5102495J05	EEPROM 16K X 8
U409	5102226J56	Micro Processor
U410	5102463J57	3.3V Regulator
U420	5102463J44	Audio PA
U601	NOTPLACED	
U700	5185770M01	IC Voice Storage
U710	5102463J52	QUAD ANALOG SWITCH IC
U720	5113818A01	SING Supply IC
VR300	NOTPLACED	
VR432	4805656W08	Zener Diode
VR433	4805656W08	Zener Diode
VR434	4802245J73	Zener Diode 6.8V
VR439	4880140L17	Zener Diode
VR440	4802245J73	Zener Diode 6.8V
VR441	4802245J73	Zener Diode 6.8V
VR442	4802245J73	Zener Diode 6.8V
VR443	4802245J73	Zener Diode 6.8V
VR444	4802245J73	Zener Diode 6.8V
VR445	4802245J74	Zener Diode 10V
VR446	4802245J74	Zener Diode 10V
VR447	4802245J74	Zener Diode 10V
VR448	4802245J74	Zener Diode 10V
VR449	4802245J74	Zener Diode 10V
VR450	4802245J75	Zener Diode 12V
VR460	4802245J73	Zener Diode 6.8V
VR501	4813830A18	DIODE 6.8V
VR506	4802245J73	Zener Diode 6.8V

* Motorola Depot Servicing only

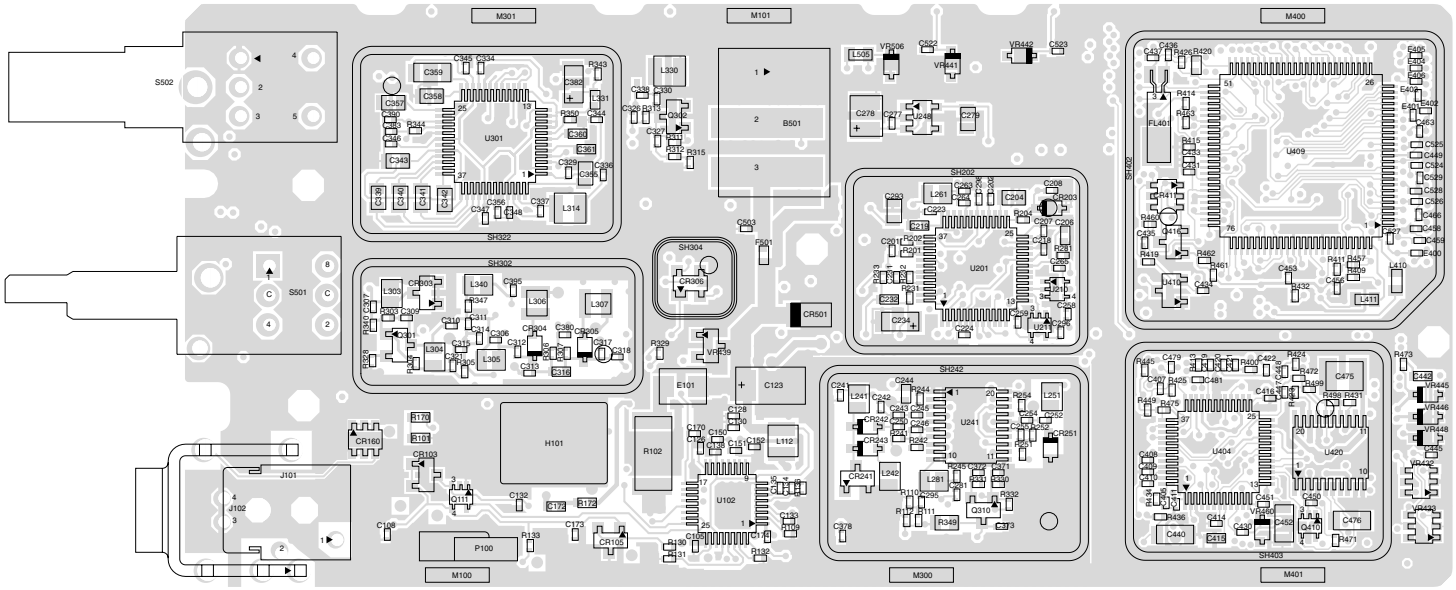
Reference designators with an asterisk indicate components which are not field replaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

10.0 UHF PCB 8480450Z13/14 Schematics



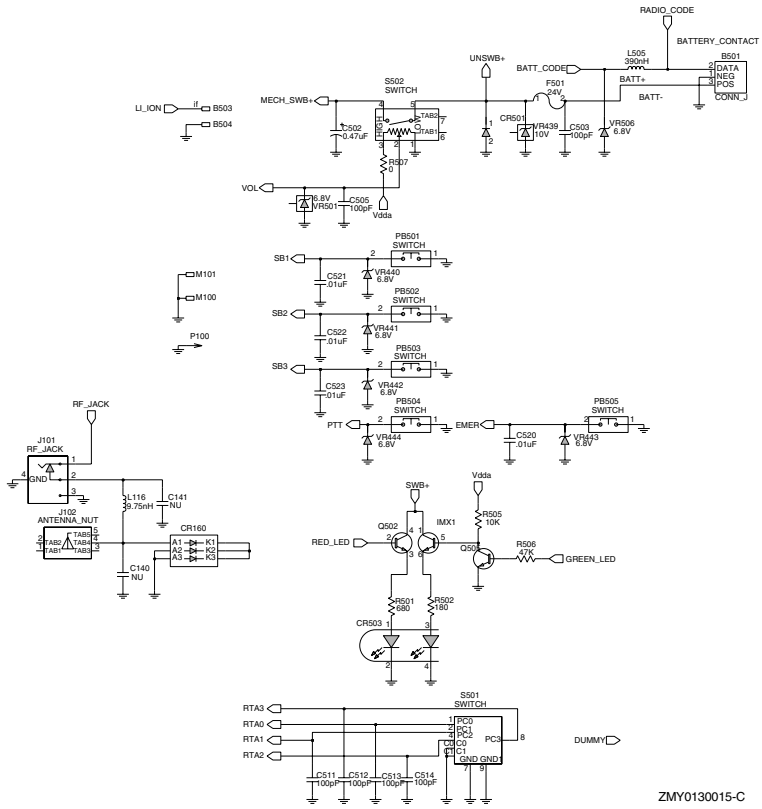
ZMY0130183-B

UHF (403-470MHz) Main Board Top Side

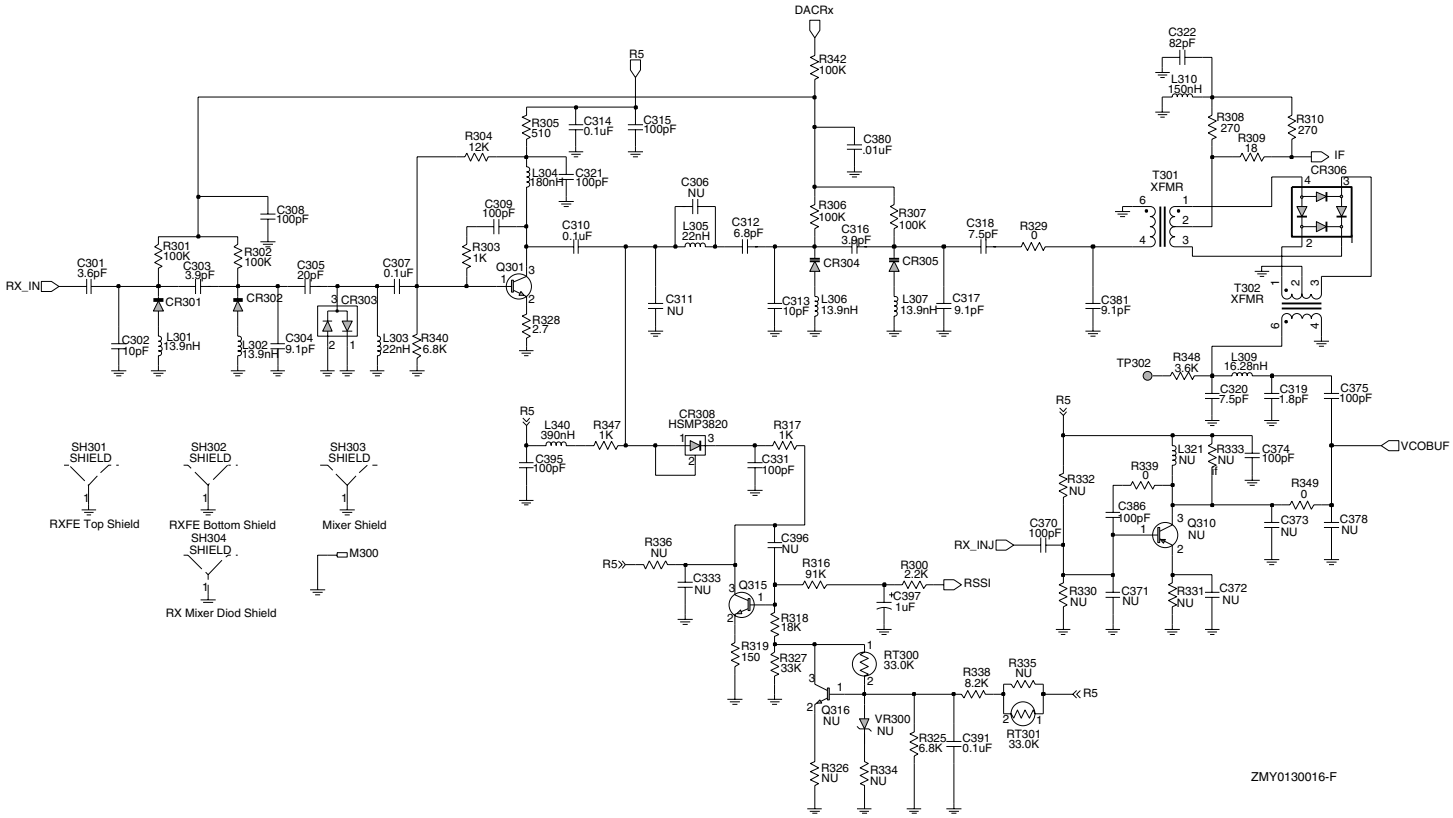


ZMY0130182-B

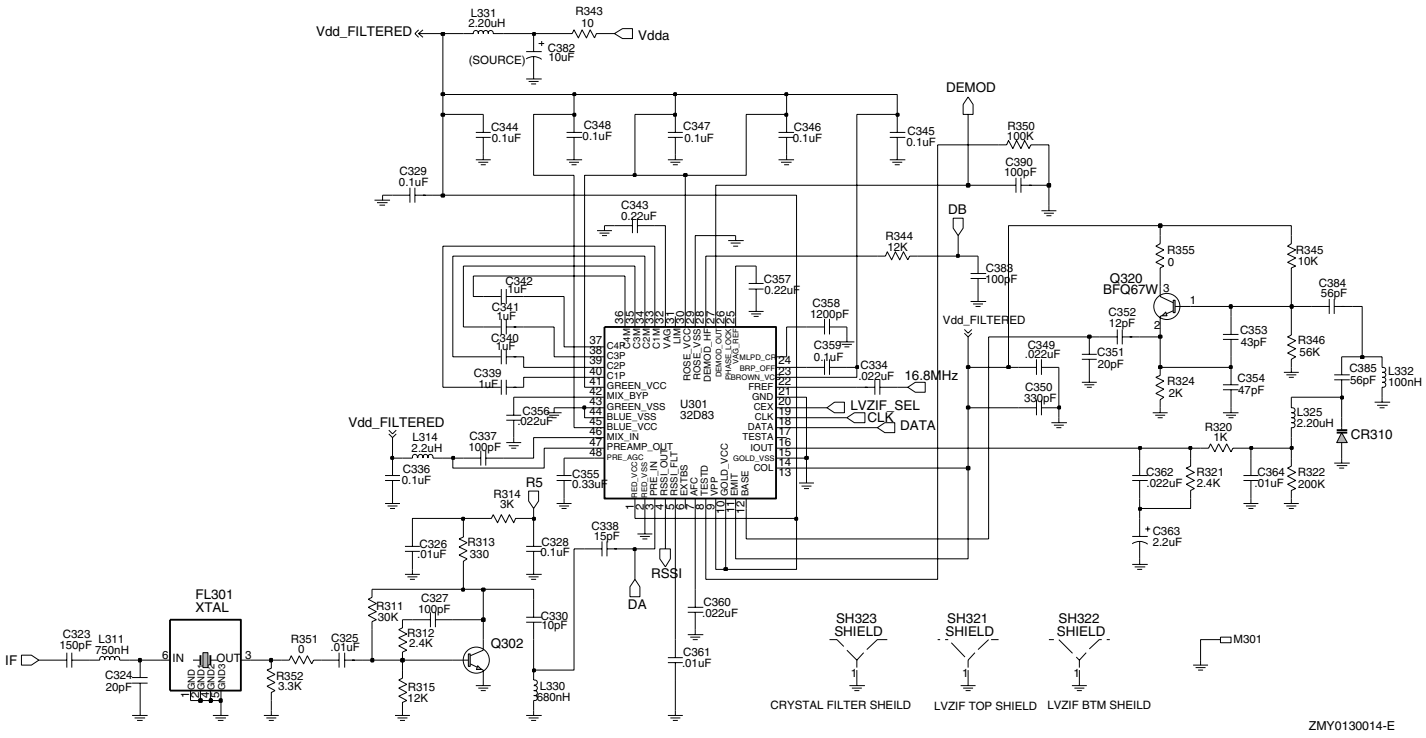
UHF (403-470 MHz) Main Board Bottom Side



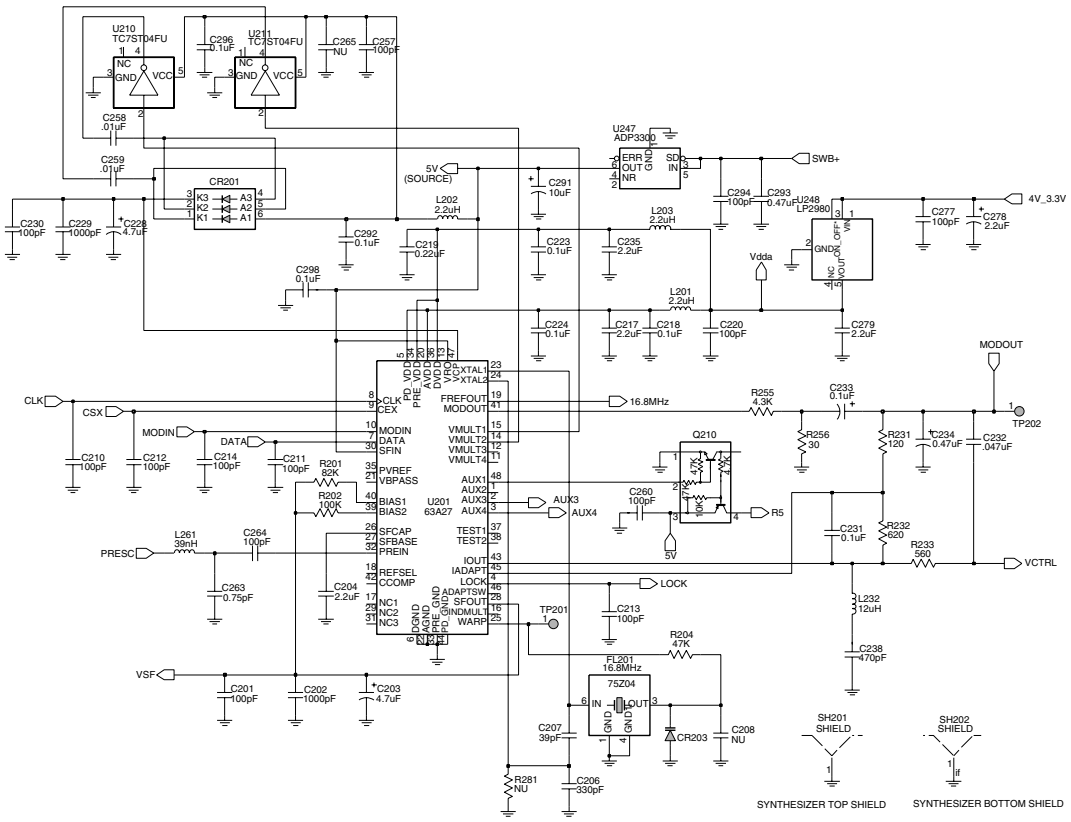
UHF (403-470 MHz) Controls and Switches



UHF (403 - 470 MHz) Receiver Front End

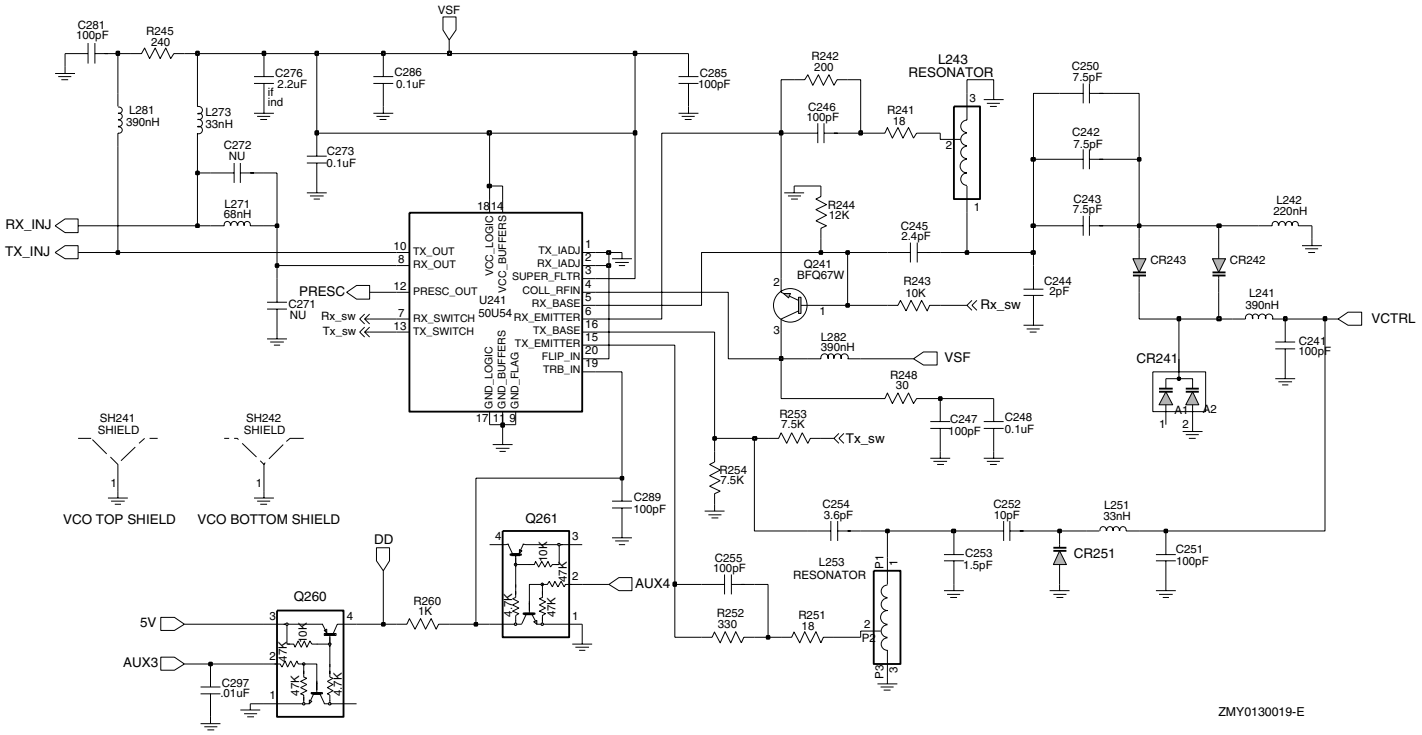


UHF (403-470 MHz) Receiver Back End

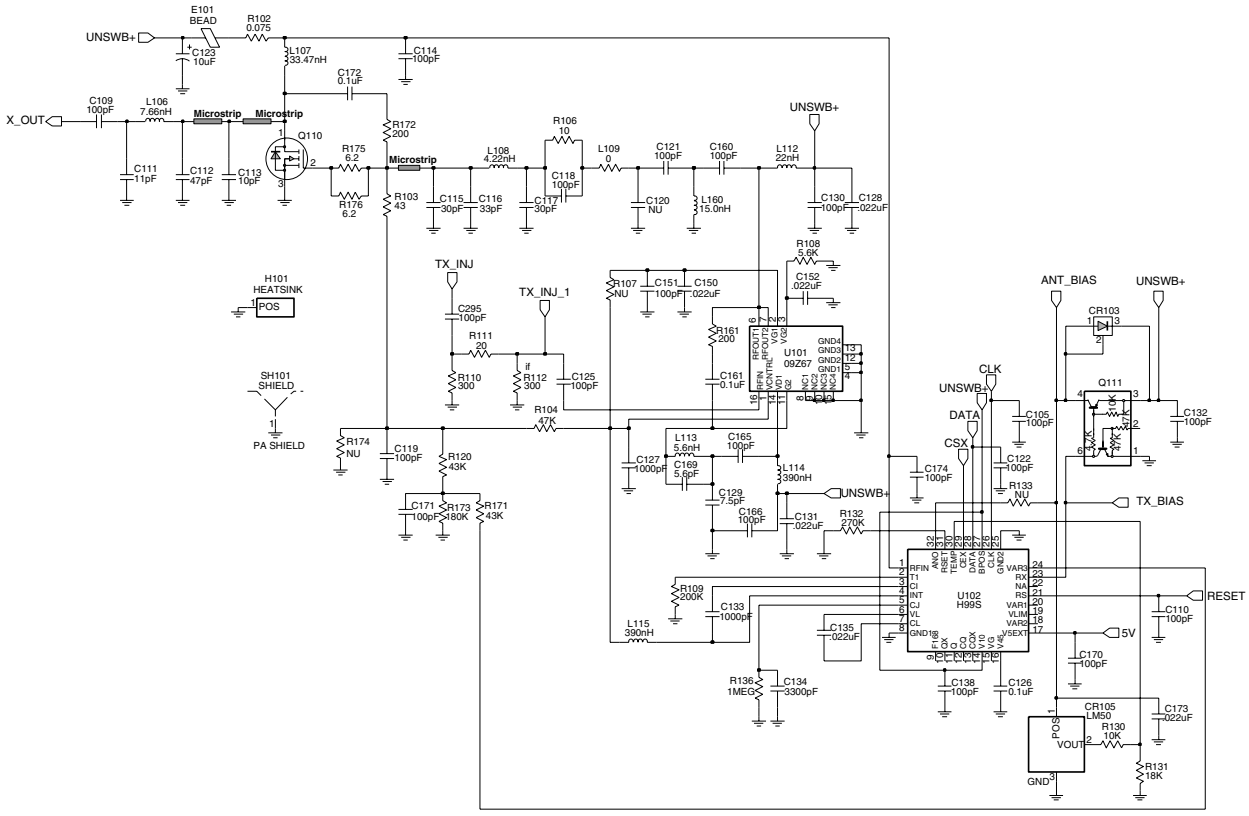


ZMY0130017-E

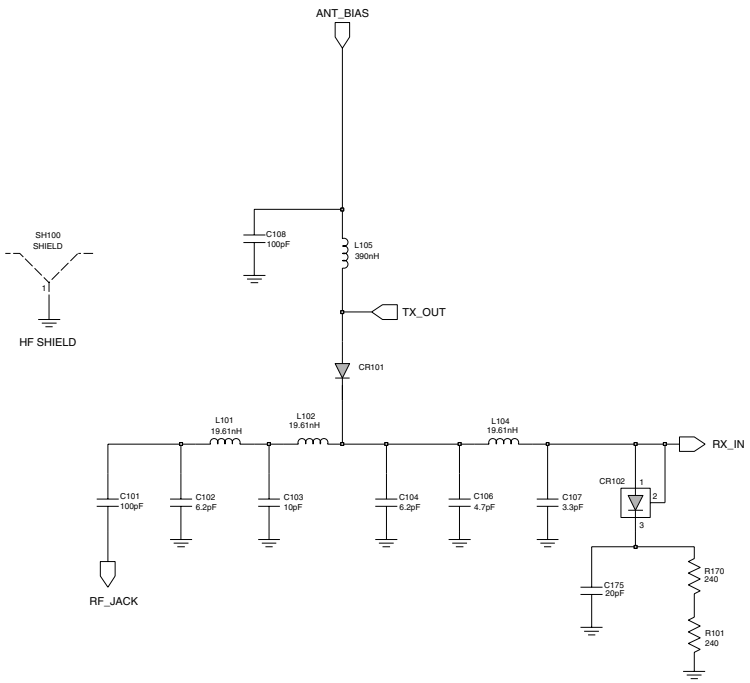
UHF (403-470 MHz) Synthesizer



UHF (403-470 MHz) Voltage Controlled Oscillator



UHF (403-470 MHz) Transmitter ZMY0130018-F



UHF (403-470 MHz) Harmonic Filter

11.0 UHF PCB 8480450Z13/14 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup battery B+ (not placed non-display radios)
B504	3980501Z01	Backup battery B- (not placed non-display radios)
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F27	10pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F30	13pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N30	15pF
C116	2113743N38	33pF
C117	2113743N37	30pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	NOT PLACED	GCAM DUMMY PART No.
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	100000pF
C127	2113743L17	1000pF
C128	2113743M08	22000pF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	22000pF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	22000pF
C138	2113743N50	100pF
C140	NOT PLACED	
C141	NOT PLACED	
C150	2113743M08	22000pF
C151	2113743N50	100pF
C152	2113743M08	22000pF
C160	2113743N50	100pF
C161	2113743M24	100000pF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6 pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113740F51	100pF
C173	2113743M08	22000pF
C174	2113743N50	100pF
C175	2113740L25	20pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	NOT PLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	100000pF
C219	2113743K16	0.220uF
C220	2113743N50	100pF
C223	2113743M24	100000pF
C224	2113743M24	100000pF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	100000pF
C232	2113743E12	0.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	10000pF
C259	2113743L41	10000pF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	NOT PLACED	
C271	NOT PLACED	
C272	NOT PLACED	
C273	2113743M24	100000pF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	100000pF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	100000pF
C293	2113743A27	0.470uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF
C297	2113743L41	10000pF
C298	2113743M24	100000pF
C301	2113743N15	3.6pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N26	10pF
C305	2113743N33	20pF
C306	NOT PLACED	
C307	2113743M24	100000pF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	100000pF
C311	NOT PLACED	
C312	2113743N25	9.1pF
C313	2113743N26	10pF
C314	2113743M24	100000pF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	10000pF
C326	2113743L41	10000pF
C327	2113743N50	100pF
C328	2113743M24	100000pF
C329	2113743M24	100000pF
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	NOT PLACED	
C334	2113743M08	22000pF
C336	2113743M24	100000pF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339 -		
C342	2180478Z20	1uF
C343	2113743A23	0.220uF
C344 -		
C348	2113743M24	100000pF
C349	2113743E07	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.330uF
C356	2113743M08	22000pF
C357	2113743A23	0.220uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	0.022uF
C361	2113741F49	10nF
C362	2113743M08	22000pF
C363	2311049A40	2.2uF
C364	2113743L41	10000pF
C370	2113743N50	100pF
C371	NOT PLACED	
C372	NOT PLACED	
C373	NOT PLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOT PLACED	
C380	2113743L41	10000pF
C381	2113743N21	6.2pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	NOT PLACED	
C395	2113743N50	100pF
C396	NOT PLACED	
C397	2311049A05	0.47uF
C400	2113743L41	10000pF
C401	2113743M24	100000pF
C402	2113743M24	100000pF
C403	2113928D08	10uF
C404	NOT PLACED	
C405	NOT PLACED	
C406	NOT PLACED	
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	100000pF
C410	2113928N01	0.1uF
C411	2113743M24	100000pF
C414	2113743M24	100000pF
C415	2185895Z01	0.01uF

Circuit Ref	Motorola Part No.	Description
C416	2113928N01	0.1uF
C419	NOT PLACED	
C420	2113743L41	10000pF
C421	2113928N01	0.1uF
C422	2113743M24	100000pF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	100000pF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF
C429	2113743M24	100000pF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	NOT PLACED	
C433	2113743L41	10000pF
C434	2113928N01	0.1uF (not placed non-display radios)
C435	2113743M24	100000pF
C436	2113743N34	22pF (not placed non-display radios)
C437	2113743N34	22pF (not placed non-display radios)
C440	2113743G26	4.7F
C441	2113743N50	100pF
C442	2113743E20	0.10uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C450	NOT PLACED	
C451	2113743M08	22000pF
C452	2113743B29	1uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490 -		
C497	2113743N50	100pF
C502	2311049A05	0.47uF

Circuit Ref	Motorola Part No.	Description
C503	2113743N50	100pF
C505	2113743N50	100pF
C511 -		
C514	2113743N50	100pF
C520	2113743L41	10000pF
C521	2113743L41	10000pF
C522	2113743L41	10000pF
C523	2113743L41	10000pF
C524 -		
C529	2113743N50	100pF
CR101	4880973Z02	Pin diode
CR102	4802245J41	Pin diode
CR103	4802245J41	Pin diode
CR105	5185963A15	Temperature sensor
CR160	NOT PLACED	
CR201	4802233J09	Triple diode (SOT 25)
CR203	4862824C03	Varactor
CR241	4805649Q13	Varactor
CR242	4862824C08	Varactor
CR243	4862824C08	Varactor
CR251	4802245J22	Varactor
CR301	4862824C08	Varactor
CR302	4862824C08	Varactor
CR303	4880154K03	Dual common anode-cathode
CR304	4862824C08	Varactor
CR305	4862824C08	Varactor
CR306	4802245J42	Ring Quad diode (SOT-143)
CR308	4802245J41	Pin diode
CR310	4862824C08	Varactor
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual common cathode diode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yellow
E101	2484657R01	Ferrite bead
E400 -		
E409	2480640Z01	Ferrite bead
F501	6580542Z01	3A fuse
FL201	4805875Z04	16.8MHz Xtal oscillator
FL301	4802245J43	Xtal Filter 45.1MHz
FL401	4870368G02	Xtal Oscillator 38.4kHz (not placed non-display radios)
H101	2680499Z01	Heat spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna nut
J400	0905505Y04	40-pin connector
J403	0905505Y02	20-pin connector
L101	2479990B02	19.61nH
L102	2479990B02	19.61nH
L104	2479990B02	19.61nH
L105	2462587N22	390nH
L106	2479990A02	7.66nH
L107	2479990G01	33.47nH

Circuit Ref	Motorola Part No.	Description
L108	2479990A01	4.22nH
L109	0662057C01	0
L112	2462587N45	22nH
L113	2413926H09	5.6nH
L114	2462587N45	22nH
L115	2462587N22	390nH
L116	2479990A03	9.75nH
L160	2413926H14	15nH
L201	2462587Q20	2200nH
L202	2462587Q20	2200nH
L203	2462587Q20	2200nH
L232	2462587P25	12000nH
L241	2462587V41	390nH
L242	2462587V38	220nH
L243	2460593C01	Multilayer Teflon resonator, Rx
L251	2462587V28	33nH
L253	2460593C02	Multilayer Teflon resonator, Tx
L261	2462587V29	39nH
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990C01	13.9nH
L302	2479990C01	13.9nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V26	22nH
L306	2479990C01	13.9nH
L307	2479990C01	13.9nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2200nH
L321	NOT PLACED	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH
L331	2480646Z20	2.2uH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	Ground contact finger
PB501 -		
PB505	4080523Z01	Tactile switch, pushbutton
Q110	4813828A09	RF PA
Q111	4802245J50	Dual NPN/PNP transistor
Q210	4802245J50	Dual NPN/PNP transistor
Q241	4805218N63	RF NPN transistor
Q260	4802245J50	Dual NPN/PNP transistor
Q261	4802245J50	Dual NPN/PNP transistor
Q301	4802245J44	NPN Transistor

Circuit Ref	Motorola Part No.	Description
Q302	4802245J44	NPN Transistor
Q310	NOT PLACED	
Q315	4880214G02	NPN
Q316	NOT PLACED	
Q320	4805218N63	RF NPN transistor
Q400	4809579E18	Mosfet P - channel
Q403	4813824A17	Bipolar Transistor, PNP
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	Mosfet P - channel (not placed non-display radios)
Q417	4802245J50	Dual NPN/PNP transistor
Q502	5180159R01	DUAL TRANS NPNS
Q505	4880214G02	NPN
R101	0662057A34	240
R102	0680539Z01	0.1
R103	0662057M41	43
R104	0662057N15	47k
R106	0662057M26	10
R107	NOT PLACED	
R108	0662057M92	5600
R109	0662057N30	200k
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43k
R130	0662057M98	10k
R131	0662057N05	18k
R132	0662057N33	270k
R133	NOT PLACED	
R136	0662057N47	1M
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43k
R172	0662057A32	200
R173	0662057N29	180k
R174	0662057N15	47k
R175	0662057B67	6.2
R176	0662057B67	6.2
R201	0662057N21	82k
R202	0662057N23	100k
R204	0662057N15	47k
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10k
R244	0662057N01	12k
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7500

Circuit Ref	Motorola Part No.	Description
R254	0662057M95	7500
R255	0662057M89	4300
R256	0662057M37	30
R260	0662057M74	1000
R281	NOT PLACED	
R300	0662057M82	2200
R301	0662057N23	100k
R302	0662057N23	100k
R303	0662057M74	1000
R304	0662057N01	12k
R305	0662057M67	510
R306	0662057N23	100k
R307	0662057N23	100k
R308	0662057M60	270
R309	0662057M32	18
R310	0662057M60	270
R311	0662057N10	30k
R312	0662057M83	2400
R313	0662057M62	330
R314	0662057M85	3000
R315	0662057N01	12k
R316	0662057A96	91K
R317	0662057M74	1000
R318	0662057A79	18
R319	0662057A29	150
R320	0662057M74	1000
R321	0662057M83	2400
R322	0662057N30	200k
R324	0662057M81	2000
R325	0662057M94	6800
R326	NOT PLACED	
R327	0662057N11	33k
R328	0662057M12	2.7
R329	0662057M01	0
R330 -		
R336	NOT PLACED	
R338	NOT PLACED	
R339	0662057M01	0
R340	0662057M94	6800
R342	0662057N23	100k
R343	0662057M26	10
R344	0662057N01	12k
R345	0662057M98	10k
R346	0662057N17	56k
R347	0662057M74	1000
R348	0662057M87	3600
R349	0662057C01	0
R350	0662057N23	100k
R351	0662057C01	0
R352	0662057M86	3300
R355	0662057M01	0
R400	0662057N15	47k
R401	0662057M01	0
R402	NOT PLACED	

Circuit Ref	Motorola Part No.	Description
R403	NOT PLACED	
R405	0662057M01	0
R406	0662057N20	75k
R407	0662057N19	68k
R408	NOT PLACED	
R409	0662057M98	10k
R410	0662057N23	100k
R411	0662057M98	10k
R413	0662057M01	0
R414	0662057V34	180k
R415	0662057V26	91k
R416	0662057M98	10k
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10MEG (not placed non-display radios)
R421	0662057M81	2000
R423	0662057N39	470k
R424	0662057N12	36k
R425	0662057N10	30k
R426	0662057N35	330k (not placed non-display radios)
R427	0662057M84	2700
R428	0662057M10	2.2
R429	0662057M98	10k
R431	0662057N39	470k
R432	0662057N16	51k
R434	0662057M62	330
R435	0662057M81	2000
R436	0662057M01	0
R445	0662057N08	24k
R447	0662057N23	100k
R448	0662057M98	10k
R449	0662057N08	24k
R450	0683962T45	68 ohms, 1W
R451	0662057N03	15k
R452	0662057N23	100k
R453	NOT PLACED	
R454	NOT PLACED	
R455	NOT PLACED	
R456	0662057M01	0
R457	0662057M98	10k
R460	0662057M90	4700
R461	0662057M56	180 (not placed non-display radios)
R462	0662057M98	10k (not placed non-display radios)
R463	0662057M61	300
R471	0662057N06	20k
R472	0662057N12	36k
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24k
R477	0662057M74	1000

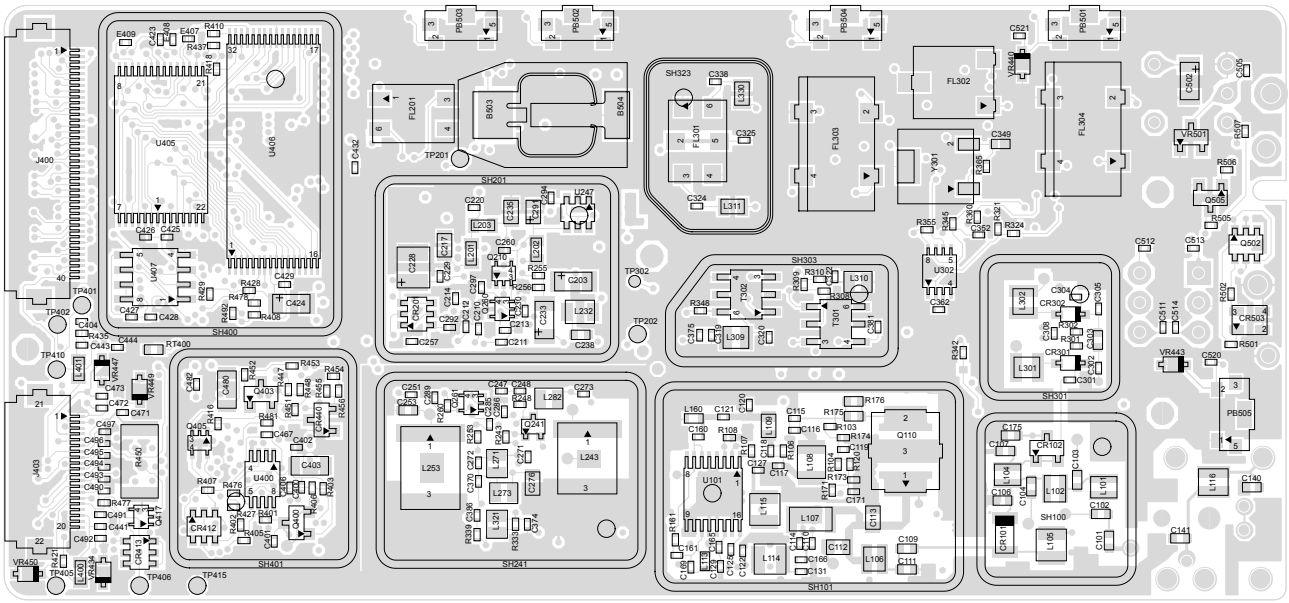
Circuit Ref	Motorola Part No.	Description
R478	0662057M98	10k
R481	0662057N08	24k
R492	0662057M01	0
R498	0662057M98	10k
R499	0662057M98	10k (not placed non-display radios)
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10k
R506	0662057N15	47k
R507	0662057M01	0
RT300	0680590Z01	THERMISTOR_33K
RT301	NOT PLACED	
RT400	0680590Z01	THERMISTOR_33K
S501	4080710Z01	Frequency switch
S502	1880619Z02	Volume/on-off switch
SH100	2680507Z01	Harmonic Filter shield
SH101	2680510Z01	RF PA shield
SH201	2680511Z01	Synthesizer top shield
SH202	2680511Z01	Synthesizer bottom shield
SH241	2680513Z01	Resonators shield
SH242	2680514Z01	VCO Buffer IC shield
SH301	2680554Z01	Receiver front end shield
SH302	2680555Z01	Receiver front end bot shield
SH303	2680509Z01	Mixer shield
SH304	2680624Z01	Mixer diode shield
SH321	2680508Z01	LVZIF 2nd LO shield
SH322	2680514Z01	LVZIF shield
SH323	2680553Z01	Crystal Filter shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller on-off shield
SH402	2680515Z01	Microprocessor shield
SH403	2680516Z01	Asfic_Cmp/Audio PA shield
T301	2580541Z01	Balun transformer
T302	2580541Z01	Balun transformer
U101	5185130C65	VHF/UHF/800 MHZ LDMOS DRIVER
U102	5185765B28	PCIC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO BUFFER IC
U247	5105739X05	SOT 5V Regulator
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF IC
U400	5102463J40	3.3V Regulator
U404	5185963A53	ASFIC_CMP IC
U405	NOT PLACED	
* U406	5102463J59	Flash ROM 128k **Conventional MDC**
* U406	5102463J60	Flash ROM 512k **Conventional 5Tone/MPT**
* U407	5102463J62	8k X 8 EEPROM **Conventional MDC**

Circuit Ref	Motorola Part No.	Description
* U407	5102463J64	16k X 8 EEPROM **Conventional 5Tone/MPT**
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Regulator (not placed non-display radios)
U420	5102463J44	Audio PA
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J73	Zener diode-6.8V
VR439	4880140L17	Zener diode-12V
VR440 -		
VR444	4802245J73	Zener diode-6.8V
VR445	4802245J53	Zener diode-10V
VR446	4802245J74	Zener diode-10V
VR447 -		
VR449	4802245J74	Zener diode-10V
VR450	4802245J75	Zener diode-12V
VR460	4802245J73	Zener diode-6.8V
VR501	4813830A18	6.8V Zener
VR506	4802245J73	Zener diode-6.8V
	1485777Z01	INSULATOR (KAPTON)
	8480450Z13	UHF B1 main PC board

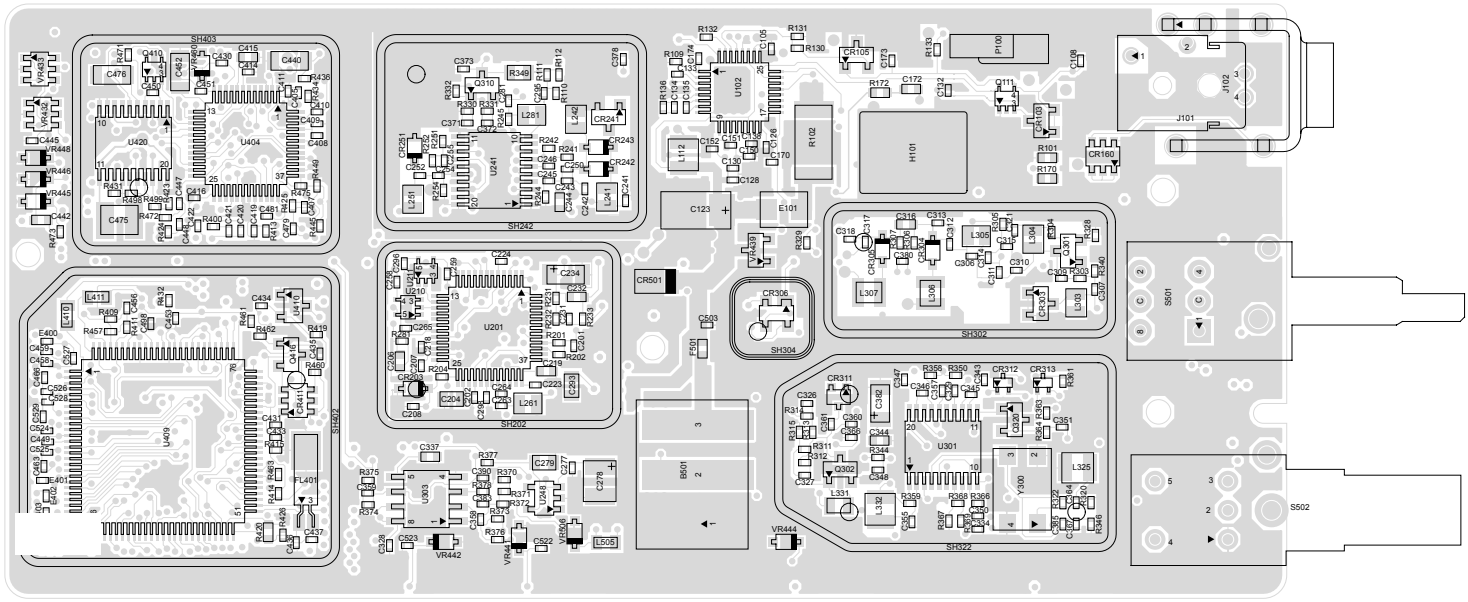
* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not field replaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

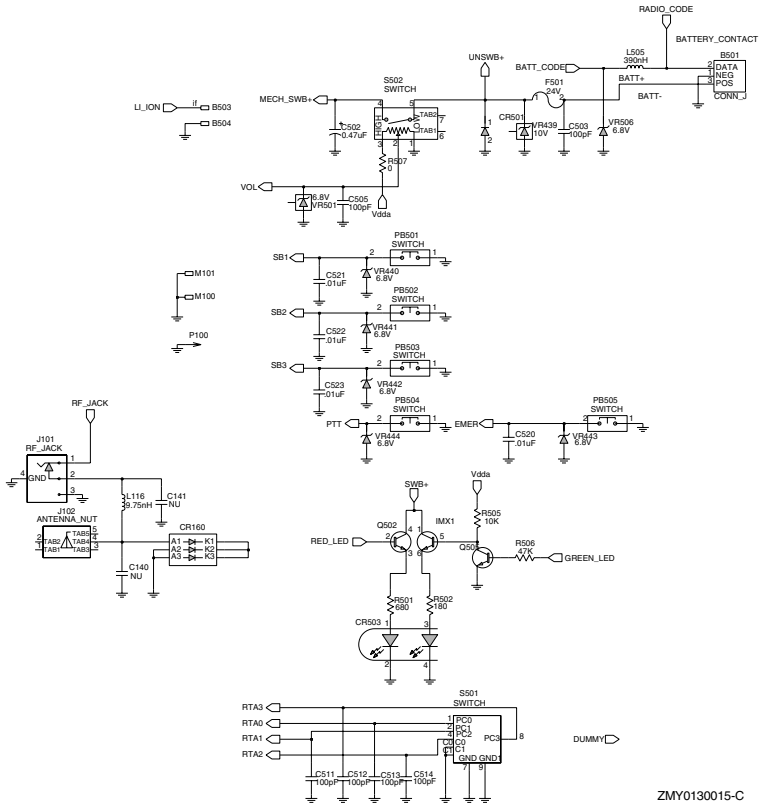
12.0 UHF PCB 8486458Z03 Schematics



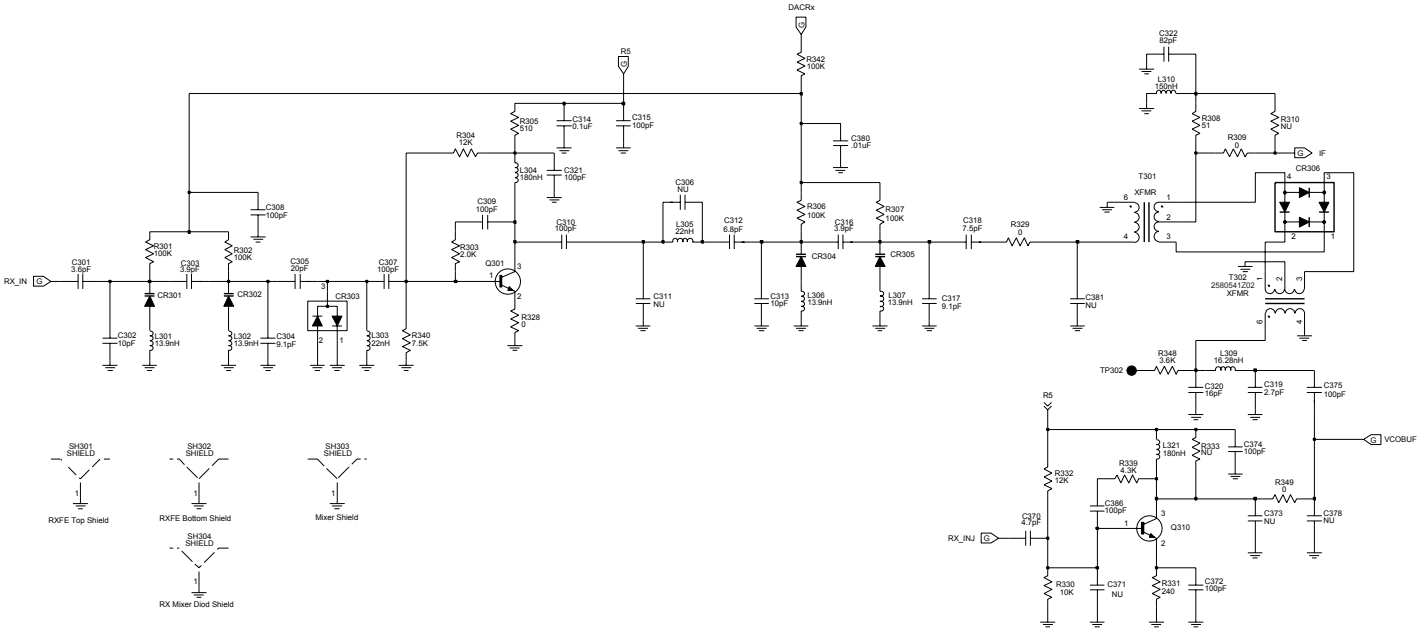
UHF (403-470MHz) Main Board Top Side



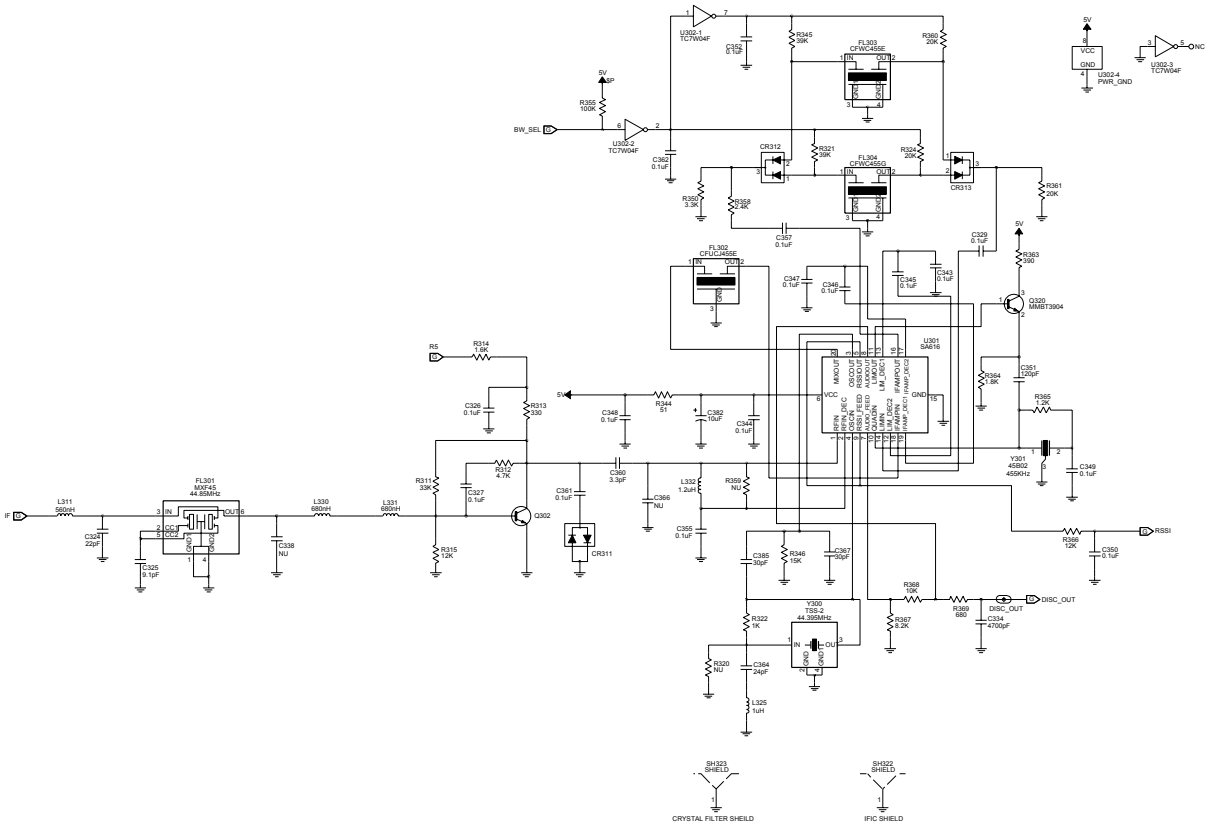
UHF (403-470 MHz) Main Board Bottom Side



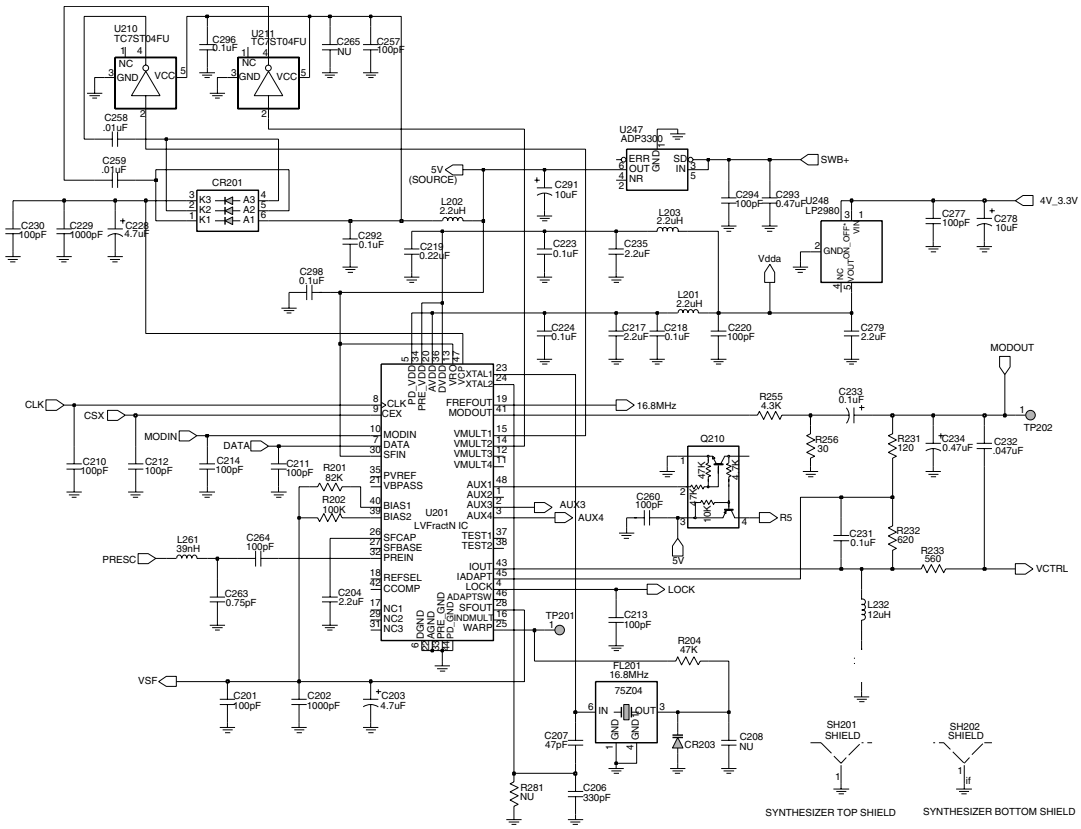
UHF (403-470 MHz) Controls and Switches



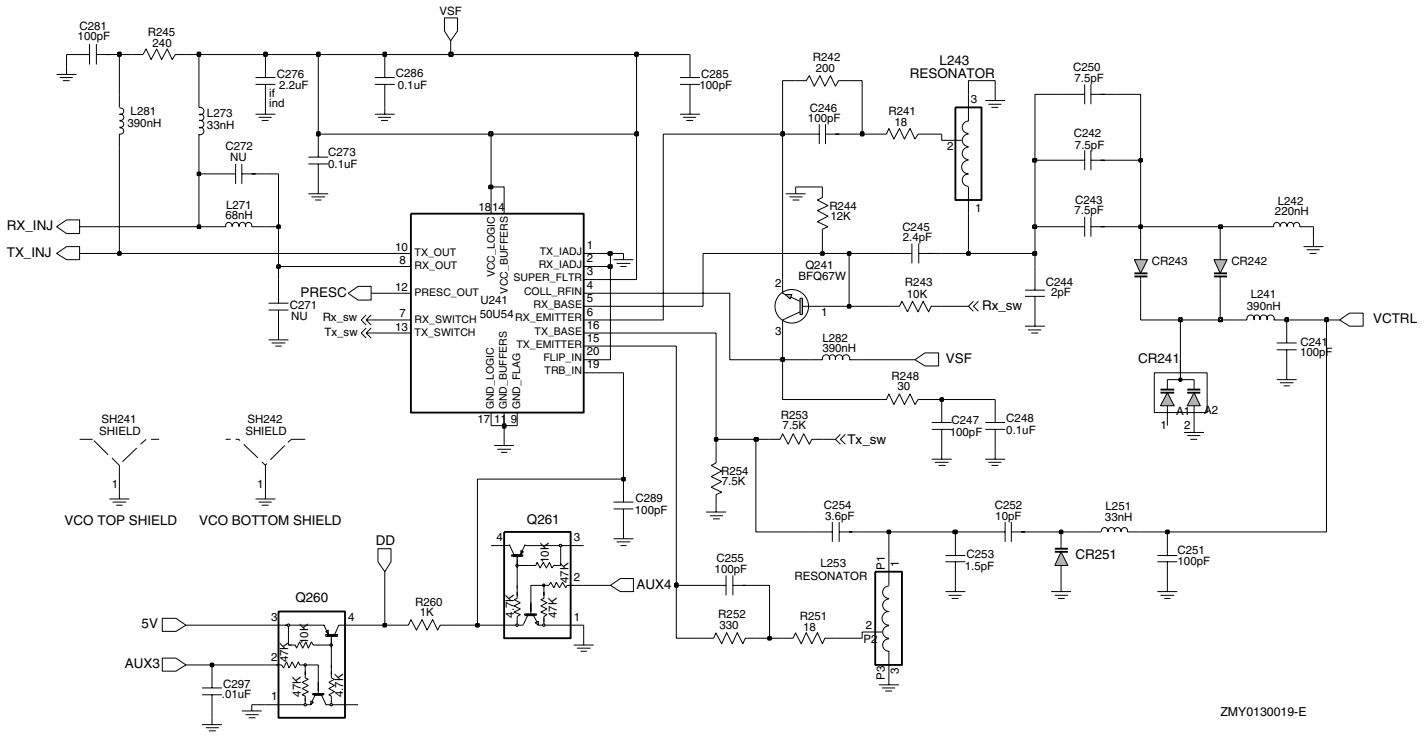
UHF (403 - 470 MHz) Receiver Front End



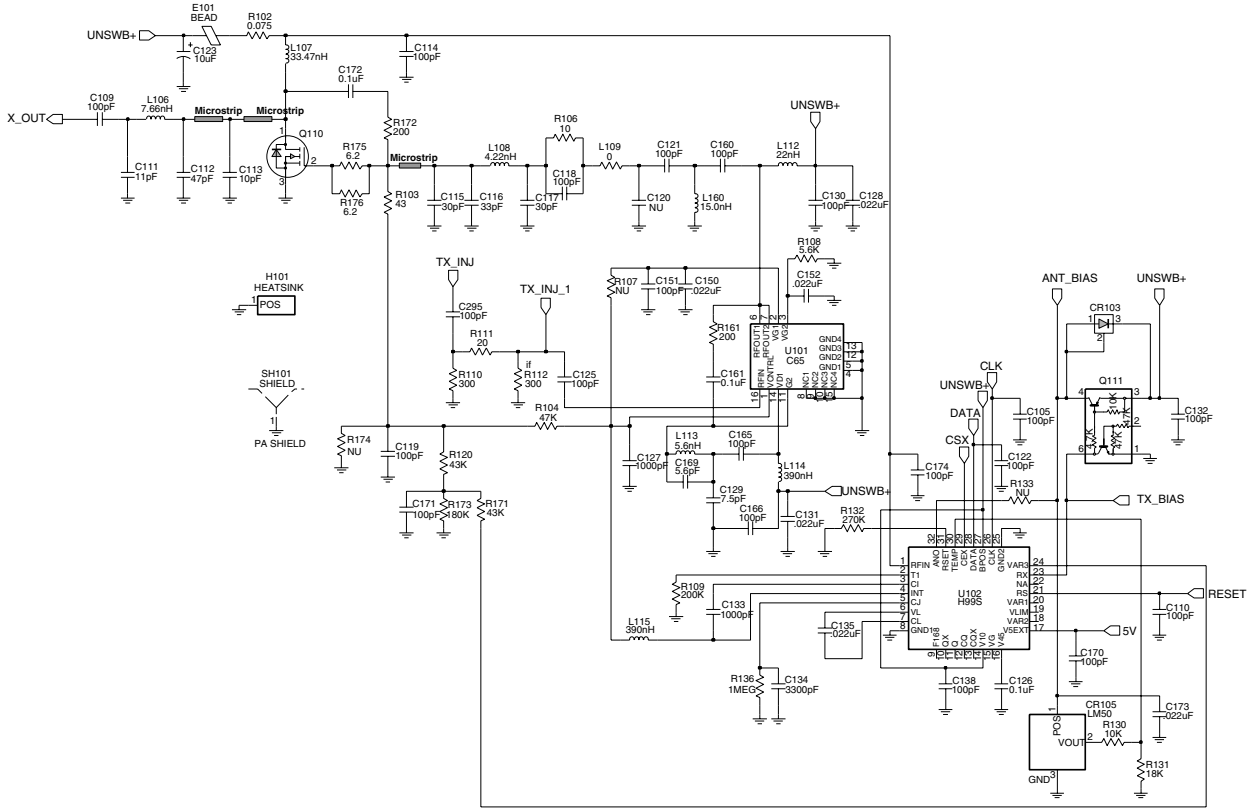
UHF (403-470 MHz) Receiver Back End



UHF (403-470 MHz) Synthesizer

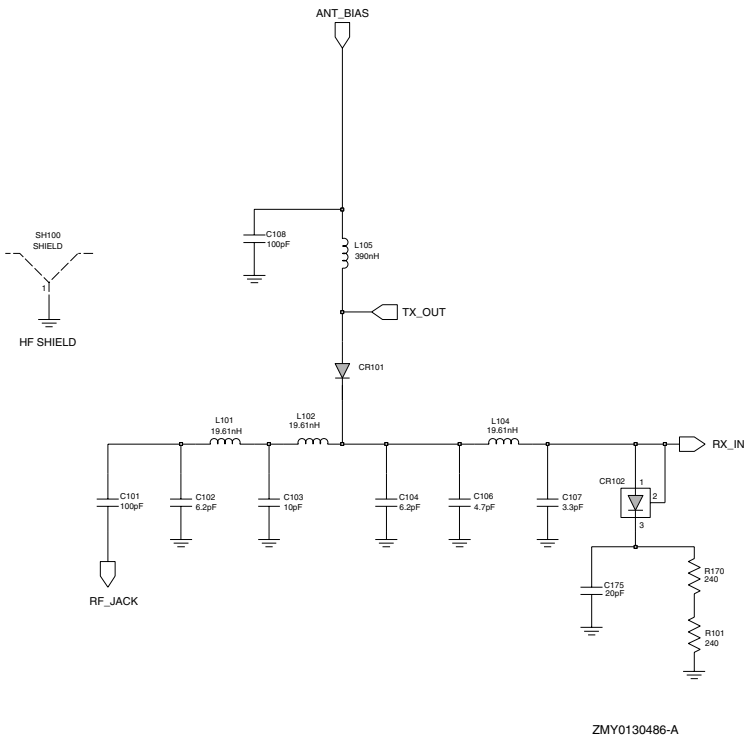


UHF (403-470 MHz) Voltage Controlled Oscillator



UHF (403-470 MHz) Transmitter

ZMY0130018-F



UHF (403-470 MHz) Harmonic Filter

13.0 UHF PCB 8486458Z03 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact Module
B503	3980502Z01	Backup Contact, B + (not placed non-display radios)
B504	3980501Z01	Backup Contact, B - (not placed non-display radios)
C101	2113740F51	100pF
C102	2113740F22	6.2pF
C103	2113740F27	10pF
C104	2113740F22	6.2pF
C105	2113743N50	100pF
C106	2113740F19	4.7pF
C107	2113740F15	3.3pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F31	15pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N35	24pF
C116	2113743N35	24pF
C117	2113743N34	22pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N27	11pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A96	33uF
C125	2113743N50	100pF
C126	2113743M24	100000pF
C127	2113743L17	1000pF
C128	2113743M08	22000pF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	22000pF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	22000pF
C138	2113743N50	100pF
C140	0662057A67	5600
C141	NOT PLACED	
C150	2113743M08	22000pF
C151	2113743N50	100pF
C152	2113743M08	22000pF
C160	2113743N50	100pF
C161	2113743M24	100000pF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF
C172	2113740F51	100pF
C173	2113743M08	22000pF
C174	2113743N50	100pF
C175	2113740F51	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2113928L05	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N42	47pF
C208	NOT PLACED	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	100000pF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	100000pF
C224	2113743M24	100000pF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	100000pF
C232	2113743E12	0.047uF
C233	2311049A01	0.1uF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	100000pF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	10000pF
C259	2113743L41	10000pF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C265	NOT PLACED	
C271	NOT PLACED	
C272	NOT PLACED	
C273	2113743M24	100000pF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A57	10uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	100000pF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	100000pF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	100000pF
C297	2113743L41	10000pF
C298	2113743M24	100000pF
C301	2113743N15	3.6pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N26	10pF
C305	2113743N33	20pF
C306	NOT PLACED	
C307	2113743N50	100pF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743N50	100pF
C311	NOT PLACED	
C312	2113743N25	9.1pF
C313	2113743N26	10pF
C314	2113743M24	100000pF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N12	2.7pF
C320	2113743N31	16pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C324	2113743N34	22pF
C325	2109445U26	9.1pF
C326	2113743M24	100000pF
C327	2113743M24	100000pF
C328	2113743M24	100000pF
C329	2113743M24	100000pF
C334	2113743L33	4700pF
C337	NOT PLACED	
C338	NOT PLACED	
C343	2113743M24	100000pF
C344	2113743E20	0.1uF
C345	2113743M24	100000pF
C346	2113743M24	100000pF
C347	2113743M24	100000pF
C348	2113743M24	100000pF
C349	2113743E20	0.1uF
C350	2113743M24	100000pF
C351	2113743N52	120pF
C352	2113743M24	100000pF
C355	2113743M24	100000pF
C357	2113743M24	100000pF
C358	NOT PLACED	
C359	NOT PLACED	
C360	2113743N14	3.3pF
C361	2113743M24	100000pF
C362	2113743M24	100000pF
C364	2113743N35	24pF
C366	NOT PLACED	
C367	2113743N37	30pF
C370	2113743N18	4.7pF
C371	NOT PLACED	
C372	2113743N50	100pF
C373	NOT PLACED	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	NOT PLACED	
C380	2113743L41	10000pF
C381	NOT PLACED	
C382	2311049A59	10uF
C383	NOT PLACED	
C385	2113743N37	30pF
C386	2113743N50	100pF
C390	NOT PLACED	
C400	2113743L41	10000pF
C401	2113743M24	100000pF
C402	2113743M24	100000pF
C403	2113743G24	2.2uF
C404	NOT PLACED	
C405	2113743N50	100pF
C406	NOT PLACED	
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	100000pF
C410	2113928N01	0.1uF
C411	2113743M24	100000pF
C414	2113743M24	100000pF
C415	2185895Z01	0.01uF
C416	2113928N01	0.1uF

Circuit Ref	Motorola Part No.	Description
C419	NOT PLACED	
C420	2113743L41	10000pF
C421	2113928N01	0.1uF
C422	2113743M24	100000pF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	100000pF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	100000pF
C429	2113743M24	100000pF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	NOT PLACED	
C433	2113743L41	10000pF
C434	2113928N01	0.1uF(not placed non-display radios)
C435	2113743M24	100000pF
C436	2113743N34	22pF (not placed non-display radios)
C437	2113743N34	22pF (not placed non-display radios)
C440	2113743G26	4.7uF
C441	2113743N50	100pF
C442	2113743E20	0.1uF
C443	2113928N01	0.1uF
C444	2113743N50	100pF
C445	2113743N50	100pF
C447	2113743M08	22000pF
C448	2113928N01	0.1uF
C449	2113743N50	100pF
C450	NOT PLACED	
C451	2113743M08	22000pF
C452	2113743B29	1uF
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C471	2113743N50	100pF
C472	2113743L09	470pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C490	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C491	2113743N50	100pF
C492	2113743N50	100pF
C493	2113743N50	100pF
C494	2113743N50	100pF
C495	2113743N50	100pF
C496	2113743N50	100pF
C497	2113743N50	100pF
C498	NOT PLACED	
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C505	2113743N50	100pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C520	2113743L41	10000pF
C521	2113743L41	10000pF
C522	2113743L41	10000pF
C523	2113743L41	10000pF
C524	2113743N50	100pF
C525	2113743N50	100pF
C526	2113743N50	100pF
C527	2113743N50	100pF
C528	2113743N50	100pF
C529	2113743N50	100pF
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR103	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sensor
CR160	NOT PLACED	
CR201	4802233J09	Triple Diode
CR203	4862824C03	Varactor
CR241	4805649Q13	Varactor
CR242	4862824C08	Varactor
CR243	4862824C08	Varactor
CR251	4802245J22	Varactor
CR301	4862824C08	Varactor
CR302	4862824C08	Varactor
CR303	4880154K03	Dual Schottky Diode
CR304	4862824C08	Varactor
CR305	4862824C08	Varactor
CR306	4802245J42	Ring Quad Diode
CR311	4813825A19	Diode Schottky
CR312	4802245J97	Switch Diode
CR313	4802245J97	Switch Diode
CR411	4802245J62	Diode Schottky
CR412	4802245J62	Diode Schottky
CR413	4802245J62	Diode Schottky
CR440	4813833C02	Dual Common Cathode Diode
CR501	4880107R01	Rectifier
CR503	4805729G49	Red/Yellow LED

Circuit Ref	Motorola Part No.	Description
E101	2484657R01	Ferrite Bead
E400	2480640Z01	Ferrite Bead
E401	2480640Z01	Ferrite Bead
E402	2480640Z01	Ferrite Bead
E403	2480640Z01	Ferrite Bead
E404	2480640Z01	Ferrite Bead
E405	2480640Z01	Ferrite Bead
E406	2480640Z01	Ferrite Bead
E407	2480640Z01	Ferrite Bead
E408	2480640Z01	Ferrite Bead
E409	2480640Z01	Ferrite Bead
F501	6580542Z01	Fuse 3A
FL201	4805875Z04	16.8 MHz Xtal Filter
FL301	9180022M11	Xtal Filter 44.85MHz
FL302	9180468V05	455kHz 4-pole ceramic filter
FL303	9180469V05	455kHz 6-pole ceramic filter
FL304	9180469V03	455kHz 6-pole ceramic filter
FL401	4870368G02	Real Time Clock Xtal Oscillator 38.4kHz (not placed non-display radios)
H101	2680499Z01	Heat Spreader
J101	0985613Z01	RF Jack
J102	0280519Z02	Antenna Nut
J400	0905505Y04	40-Pin Connector
J403	0905505Y02	20-Pin Connector
L101	2479990B02	19.61nH
L102	2479990B02	19.61nH
L104	2479990B02	19.61nH
L105	2462587N22	390nH
L106	2479990A02	7.66nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L109	2479990B01	11.03nH
L112	2462587N45	22nH
L113	2413926H09	5.6nH
L114	2462587N45	22nH
L115	2462587N22	390nH
L116	2479990A03	9.75nH
L160	2413926H14	15nH
L201	2462587Q20	2200nH
L202	2462587Q20	2200nH
L203	2462587Q20	2200nH
L232	2462587P25	12000nH
L241	2462587V41	390nH
L242	2462587V38	220nH
L243	2485776Z01	Multi-layered Teflon resonator, Rx
L251	2462587V28	33nH
L253	2460593C02	Multi-layered Teflon resonator, Tx
L261	2462587V29	39nH

Circuit Ref	Motorola Part No.	Description
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990C01	13.9nH
L302	2479990C01	13.9nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V26	22nH
L306	2479990C01	13.9nH
L307	2479990C01	13.9nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2413926K32	560nH
L321	2462587V37	180nH
L325	2462587N68	1000nH
L330	0662057C01	0
L331	2413926K33	680nH
L332	2413923A25	1200nH
L400	2462587Q42	390nH
L401	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
P100	3905643V01	Ground Contact Finger
PB501	4086470Z01	Tactile Switch
PB502	4086470Z01	Tactile Switch
PB503	4086470Z01	Tactile Switch
PB504	4086470Z01	Tactile Switch
PB505	4086470Z01	Tactile Switch
Q110	4813828A09	RF PA
Q111	4809939C05	Dual NPN/PNP Transistor
Q210	4809939C05	Dual NPN/PNP Transistor
Q241	4805218N63	RF NPN Transistor
Q260	4809939C05	Dual NPN/PNP Transistor
Q261	4809939C05	Dual NPN/PNP Transistor
Q301	4802245J44	NPN Transistor
Q302	4802197J95	NPN Transistor
Q310	4802245J44	NPN Transistor
Q320	4813824A10	RF NPN transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q416	4809579E18	MOSFET P-Channel (not placed non-display radios)
Q417	4809939C05	Dual NPN/PNP Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
R101	0662057A34	240
R102	0680539Z01	0.1

Circuit Ref	Motorola Part No.	Description
R103	0662057M41	43
R104	0662057N15	47K
R106	0662057M26	10
R107	NOT PLACED	
R108	0662057M92	5600
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	NOT PLACED	
R136	NOT PLACED	
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R175	0662057B59	3
R176	0662057B59	3
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7500
R254	0662057M95	7500
R255	0662057M89	4300
R256	0662057M37	30
R260	0662057M74	1000
R281	NOT PLACED	
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M81	2000
R304	0662057N01	12K
R305	0662057M67	510
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M43	51

Circuit Ref	Motorola Part No.	Description
R309	0662057M01	0
R310	NOT PLACED	
R311	0662057N11	33K
R312	0662057M90	4700
R313	0662057M62	330
R314	0662057M79	1600
R315	0662057N01	12K
R320	NOT PLACED	
R321	0662057N13	39K
R322	0662057M74	1000
R324	0662057N06	20K
R328	0662057M01	0
R329	0662057M01	0
R330	0662057M98	10K
R331	0662057M57	200
R332	0662057N01	12K
R333	NOT PLACED	
R339	0662057M89	4300
R340	0662057M95	7500
R342	0662057N23	100K
R344	0662057M43	51
R345	0662057N13	39K
R346	0662057N03	15K
R348	0662057M87	3600
R349	0662057C01	0
R350	0662057M86	3300
R355	0662057N23	100K
R358	0662057M83	2400
R359	NOT PLACED	
R360	0662057N06	20K
R361	0662057N06	20K
R363	0662057M64	390
R364	0662057M80	1800
R365	0662057M76	1200
R366	0662057N01	12K
R367	0662057V04	12K
R368	0662057V02	10K
R369	0662057M70	680
R370	0662057M01	0
R371	NOT PLACED	
R372	NOT PLACED	
R373	NOT PLACED	
R374	NOT PLACED	
R375	NOT PLACED	
R376	NOT PLACED	
R377	NOT PLACED	
R378	NOT PLACED	
R400	0662057N15	47K
R401	0662057M01	0
R402	NOT PLACED	
R403	NOT PLACED	

Circuit Ref	Motorola Part No.	Description
R405	0662057M01	0
R406	0662057N20	75K
R407	0662057N19	68K
R408	NOT PLACED	
R409	0662057M98	10K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M67	510
R420	0662057B46	10M (not placed non-display radios)
R421	0662057M81	2000
R423	0662057N39	470K
R424	0662057N12	36K
R425	0662057N10	30K
R426	0662057N35	330K (not placed non-display radios)
R427	0662057M84	2700
R428	0662057M10	2.2
R429	0662057N20	75K
R431	0662057N39	470K
R432	0662057N16	51K
R434	0662057M62	330
R435	0662057M81	2000
R436	0662057M01	0
R437	NOT PLACED	
R445	0662057N08	24K
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R450	0683962T45	68
R451	0662057N03	15K
R452	0662057N23	100K
R453	NOT PLACED	
R454	NOT PLACED	
R455	NOT PLACED	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4700
R461	0662057M56	180 (not placed non-display radios)
R462	0662057M98	10K (not placed non-display radios)
R463	0662057M61	300
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10

Circuit Ref	Motorola Part No.	Description
R475	0662057M01	0
R476	0662057N35	330K
R477	0662057M74	1000
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R498	0662057M98	10K
R499	0662057M98	10K (not placed non-display radios)
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT400	0680590Z01	Thermistor_33K
S501	4080710Z01	Frequency Switch (For Non-display radios Only)
S501	4080710Z02	Frequency Switch (For Display radios Only)
S502	1880619Z02	Volume / On-off Switch
SH100	2680507Z01	Harmonic Filter Shield
SH101	2680510Z01	PA Shield
SH201	2680511Z01	Synthesizer Top Shield
SH202	2680511Z01	Synthesizer Bottom Shield
SH241	2680513Z01	VCO Resonators Shield
SH242	2680514Z01	VCO Buffer IC Shield
SH301	2686583Z01	Receiver Front-End Shield
SH302	2680555Z01	Receiver Back-End Bottom Shield
SH303	2680509Z01	Mixer Shield
SH304	2680624Z01	Mixer Diode Shield
SH322	2686528Z01	IFIC Shield
SH323	2686527Z01	Crystal Filter Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On-off Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	Asfic_Cmp, Audio PA Shield
T301	2580541Z02	Balun Transformer
T302	2580541Z02	Balun Transformer
U101	5185130C65	LDMOS PA Driver
U102	5185765B26	PCIC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer IC
U247	5105739X05	5V Regulator
U248	5102463J58	3.3V Regulator
U301	5186144B01	FM IFIC SA616
U302	5109522E10	LMOS Inverter
U303	NOT PLACED	
U400	5102463J40	3.3V Regulator

Circuit Ref	Motorola Part No.	Description
U404	5185130C53	ASFIC_CMP IC
U405	5102463J36	Static RAM 32K X 8
U406	*5102463J60	Flash ROM 512K X 8
U407	*5102495J05	EEPROM 16K X 8
U409	5102226J56	Micro Processor
U410	5102463J57	3.3V Regulator (not placed non-display radios)
U420	5102463J44	Audio PA
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J73	Zener Diode 6.8V
VR439	4880140L17	Zener Diode 12V
VR440	4802245J73	Zener Diode 6.8V
VR441	4802245J73	Zener Diode 6.8V
VR442	4802245J73	Zener Diode 6.8V
VR443	4802245J73	Zener Diode 6.8V
VR444	4802245J73	Zener Diode 6.8V
VR445	4802245J74	Zener Diode 10V
VR446	4802245J74	Zener Diode 10V
VR447	4802245J74	Zener Diode 10V
VR448	4802245J74	Zener Diode 10V
VR449	4802245J74	Zener Diode 10V
VR450	4802245J75	Zener Diode 12V
VR460	4802245J73	Zener Diode 6.8V
VR501	4813830A18	Diode 6.8V
VR506	4802245J73	Zener Diode 6.8V
Y300	4802245J84	Xtal Oscillator 44.395MHz
Y301	9186145B02	455kHz Ceramic Discriminator
	1485777Z01	Insulator (KAPTON)
	8486458Z03	UHF B1 PC Board

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not field replaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

MOTOROLA

Professional Radio

GP Series

800 MHz (806 - 870MHz)

Service Information

Issue: November 2004

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Chapter 1

MODEL CHART AND TECHNICAL SPECIFICATIONS

1.0 GP240/GP280/GP540/GP580 Model Chart

Professional GP200/GP500 Series (800 MHz)						
Model						Description
MDH25UCC6FC3						GP540 800MHz 806-870MHz 2.5W
	MDH25UCH6FC6					GP580 800MHz 806-870MHz 2.5W
		MDH25UCC6FB3				GP240 800MHz 806-870MHz 2.5W
			MDH25UCH6FB6			GP280 800MHz 806-870MHz 2.5W
					Item	Description
X		X			*PMLF4020_	GP240/GP540 800MHz Back Cover Kit
	X		X		*PMLF4021_	GP280/GP580 800MHz Back Cover Kit
X		X			*PMLN4216_	GP240/GP540 800MHz Front Housing Kit
	X		X		*PMLN4373_	GP280/GP580 800MHz Front Housing Kit
X	X	X	X		NAF5037_	800MHz Whip Antenna
		X	X		6864120B15	GP240/GP280 User Guide (English)
		X	X		6864120B16	GP240/GP280 User Guide (ENG, RUS, FR, TUR)
		X	X		6864120B17	GP240/GP280 User Guide (GER, SPA, POR, IT)
		X	X		6864120B18	GP240/GP280 User Guide (SWE,NL, DAN, FIN)
		X	X		6864120B19	GP240/GP280 User Guide (CZ, PL, HU, RO)
X	X				6864120B20	GP540/GP580 User Guide (English)
X	X				6864120B21	GP540/GP580 User Guide (ENG, RUS, FR, TUR)
X	X				6864120B22	GP540/GP580 User Guide (GER, SPA, POR, IT)
X	X				6864120B23	GP540/GP580 User Guide (SWE,NL, DAN, FIN)
X	X				6864120B24	GP540/GP580 User Guide (CZ, PL, HU, RO)
X	X	X	X		HNN9008_	Battery, High Capacity NiMH, Standard

One user guide is selectable via option.

x = Indicates one of each is required.

* = Service replacement boards.

2.0 Technical Specifications

Data is specified for +25°C unless otherwise stated.

General Specifications		
Channel Capacity **GP240** **GP280** **GP540** **GP580**	128 in conv. Mode	
Power Supply	Rechargeable battery 7.5Volts ±20%	
Dimensions: H x W x D (mm) Height excluding knobs With standard high capacity NiMH battery With ultra high capacity NiMH battery With NiCD battery With Lilon battery	**GP240/280/540/580** 137 x 57.5 x 37.5 137 x 57.5 x 40.0 137 x 57.5 x 40.0 137 x 57.5 x 33.0	
Weight: (gm) With Standard high capacity NiMH battery With Ultra high capacity NiMH battery With NiCD battery With Lilon battery	**GP240/GP540** 420 500 450 350	**GP280/GP580** 428 508 458 358
Average Battery Life @5/5/90 Cycle: With Standard high capacity NiMH battery With Ultra high capacity NiMH battery With NiCD battery With Lilon battery	Low Power 11 hours 14 hours 12 hours 11 hours	High Power 8 hours 11 hours 9 hours 8 hours
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54	
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E and TIA/EIA 603	
Dust and Humidity:	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E and TIA/EIA 603	

Transmitter	800 MHz
*Frequencies - Full Bandsplit	806 - 825 MHz 851 - 870 MHz
Channel Spacing	25 and 20 kHz
Frequency Stability (-30°C to +60°C)	±1.5PPM
RF Output NiMH @ 7.5V:	806 - 825 MHz: 1-2.5W 851 - 870 MHz: 1-2.0W
Audio Distortion: @ 1000Hz, 60% Rated Max. Dev.	<5%
FM Noise	-40 dB
Spurs/Harmonics: (Conducted/Radiated Emission)	-36 dBm
Audio Response (from 6dB/oct. Pre-Emphasis, 300 - 3000 Hz)	+1 to -3 dB

Receiver	800 MHz
*Frequencies - Full Bandsplit	851- 870 MHz
Channel Spacing	25 and 20 kHz
Sensitivity (12 dB SINAD) EIA	0.35 µV
Intermodulation	-65 dB
Adjacent Channel Selectivity	-70 dB
Spurious Rejection	-70 dB
Image Rejection	-70 dB
Audio Distortion @ Rated Audio	<3% typical
Frequency Stability (-30°C to +60°C)	±1.5PPM
Audio Output @ <5% Distortion	500 mW

*Availability subject to the laws and regulations of individual countries.

Chapter 2

THEORY OF OPERATION

1.0 Introduction

This Chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and trouble shooting for the the associated Controller circuits refer to the Controller Section of this manual.

2.0 800 MHz Transmitter

(*Refer to Figure 2-1 and the 800 MHz Transmitter schematic diagram*)

The 800 MHz transmitter consists of the following basic circuits:

1. Power amplifier (PA).
2. Antenna switch.
3. Harmonic filter.
4. Power Control Integrated Circuit (PCIC).

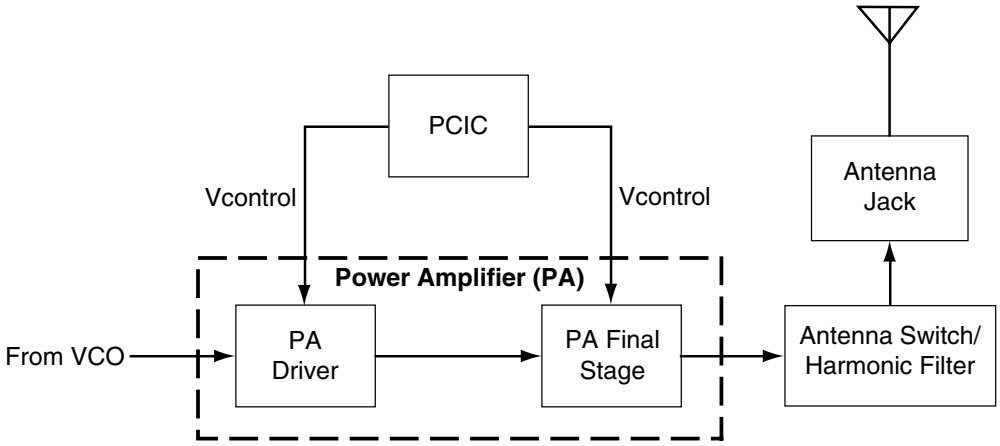


Figure 2-1 800 MHz Transmitter Block Diagram.

2.1 Power Amplifier

The power amplifier (PA) consists of two principle devices:

1. 63J66 driver IC (U101).
2. 85Y73 LDMOS PA (Q101).

The 63J66 driver IC contains a 2 stage amplification with a supply voltage of 7.5V.

This RF driver IC is capable of supplying an output power of 0.3W (pin 13 and 14) with an input signal of 2.5mW (4dBm) (pin16). The current drain would typically be 200mA while operating in the frequency range of 806-870MHz.

The 85Y73 LDMOS PA is capable of supplying an output power of 4.5W with an input signal of 0.3W. The current drain would typically be 1100mA while operating in the frequency range of 806-870MHz. The power out can be varied by changing the biasing voltage and the drive level from the driver IC.

2.2 Antenna Switch

The antenna switch circuit consists of two PIN diodes (CR101 and CR102), a pi network (C109, L103 and C110), and three current limiting resistors (R101, R102, R103). In the transmit mode, B+ at PCIC (U102) pin32 will go high, applying a B+ bias to the antenna switch circuit to bias the diodes “on”. The shunt diode (CR102) shorts out the receiver port, and the pi network, which operates as a quarter wave transmission line, transforms the low impedance of the shunt diode to a high impedance at the input of the harmonic filter. In the receive mode, the diodes are both off, and hence, there exists a low attenuation path between the antenna and receiver ports.

2.3 Harmonic Filter

The harmonic filter consists of C104, L102, C105, C106,C107, L101 and C109. It has been optimized for efficiency of the power amplifier. This type of filter has the advantage that it can give a greater attenuation in the stop-band for a given ripple level. The harmonic filter insertion loss is typically less than 1.2dB.

2.4 Antenna Matching Network

The antenna matching network is made up of inductor L116. This component matches the antenna impedance to the harmonic filter to optimize the performance of the transmitter and receiver.

2.5 Power Control Integrated Circuit (PCIC)

The transmitter uses the Power Control IC (PCIC), U102 to regulate the power output of the radio. The current to the final stage of the power module is supplied through R104, which provides a voltage proportional to the current drain. This voltage is then fed back to the Automatic Level Control (ALC) within the PCIC to regulate the output power of the transmitter.

The PCIC has internal digital to analog converters (DACs) which provide the reference voltage of the control loop. The reference voltage level is programmable through the SPI line of the PCIC.

There are resistors and integrators within the PCIC, and external capacitors (C126, C130 and C132) in controlling the transmitter rising and falling time. These are necessary in reducing the power splatter into adjacent channels.

U103 and its associated components are part of the temperature cut back circuitry. It senses the printed circuit board temperature around the transmitter circuits and provides a DC voltage to the PCIC. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

3.0 800 MHz Receiver

The receiver functions are shown in Figure 2-20 and are described in the paragraphs that follow.

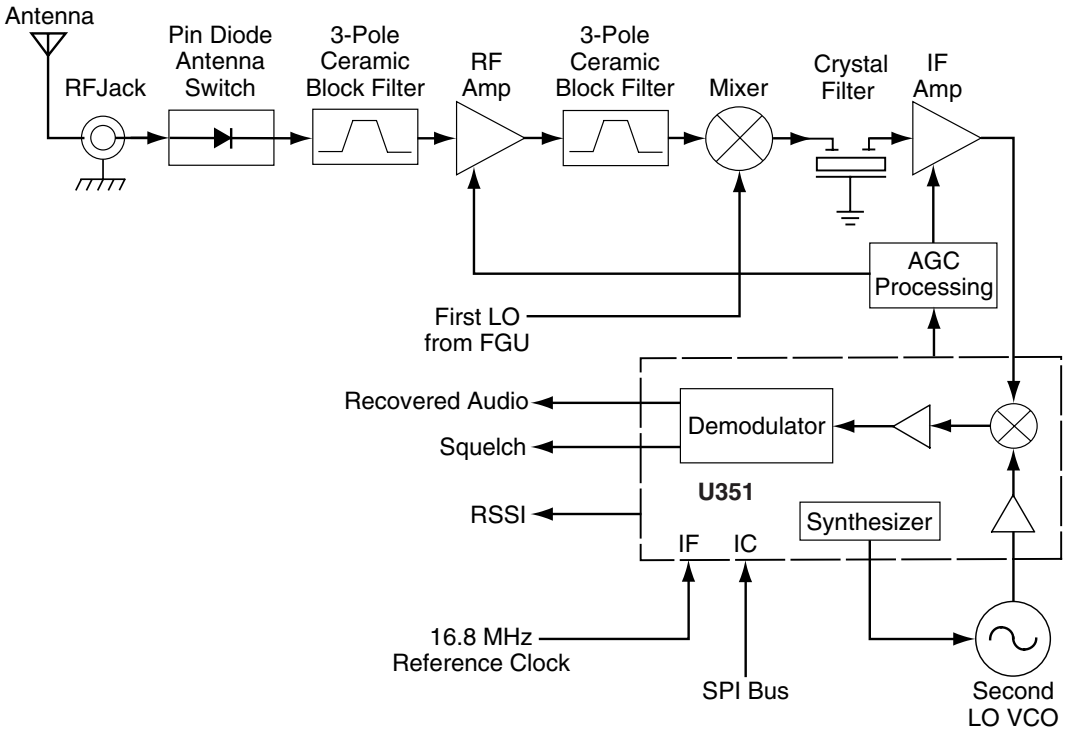


Figure 2-2 800 MHz Receiver Block Diagram.

3.1 Receiver Front-End

(*Refer to Figure 2-2 and the UHF Receiver Front End schematic diagram)*

The RF signal is received by the antenna and applied to a low-pass filter. For 800MHz, the filter consists of L101, L102, C104, C105, C106, C107, C109. The filtered RF signal is passed through the antenna switch. The antenna switch circuit consists of two PIN diodes(CR101 and CR102) and a pi network (C109, L103 and C110).The signal is then applied to a fixed tuned ceramic bandpass filter, FL300.

The output of the bandpass filter is coupled to the RF amplifier transistor Q302 via C300. The RF amplifier provides a gain of approximately 12 dB. After being amplified by the RF amplifier, the RF signal is further filtered by a second fixed tuned ceramic bandpass filter, FL301.

Both the pre and post-RF amplifier ceramic filters have similar responses. The insertion loss of each filter across the 851-870MHz band is typically 1.8dB.

The output of the post-RF amplifier filter is connected to the passive double balanced mixer, U301. After mixing with the first LO signal from the voltage controlled oscillator (VCO) using low side injection, the RF signal is down-converted to the 109.65MHz IF signal.

The IF signal coming out of the mixer is transferred to the crystal filter (FL350) through a resistive pad and a diplexer (C312 and L306). Matching to the input of the crystal filter is provided by L353,L354, C377, and C378. The crystal filter provides the necessary selectivity and intermodulation protection.

3.2 Receiver Back-End

(*Refer to Figure 2-2 and the 800 MHz Receiver Back End schematic diagram*)

The output of crystal filter FL350 is matched to the input of the dual gate MOSFET IF amplifier transistor U352 by components L355, R359 and C376. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). AGC voltage is applied to the second gate of U352. The IF amplifier provides a gain of about 11 dB. The amplified IF signal is then coupled into U351(pin 3) via L352, R356 and C365 which provides the matching for the IF amplifier and U351.

The IF signal applied to pin 3 of U351 is amplified, down-converted, filtered, and demodulated, to produce the recovered audio at pin 27 of U351. This IF IC is electronically programmable, and the amount of filtering (which is dependent on the radio channel spacing) is controlled by the microprocessor. Additional filtering, once externally provided by the conventional ceramic filters, is replaced by internal filters in the IF module (U351).

The IF IC uses a type of direct conversion process, whereby the externally generated second LO frequency is divided by two in U351 so that it is very close to the first IF frequency. The IF IC (U351) synthesizes the second LO and phase-locks the VCO to track the first IF frequency. The second LO is designed to oscillate at twice the first IF frequency because of the divide-by-two function in the IF IC.

In the absence of an IF signal, the VCO will “search” for a frequency, or its frequency will vary close to twice the IF frequency. When an IF signal is received, the VCO will lock onto the IF signal. The second LO/VCO is a Colpitts oscillator built around transistor Q350. The VCO has a varactor diode, CR350, to adjust the VCO frequency. The control signal for the varactor is derived from a loop filter consisting of R365, C391, and C392.

The IF IC (U351) also performs several other functions. It provides a received signal-strength indicator (RSSI) and a squelch output. The RSSI is a dc voltage monitored by the microprocessor, and used to control the automatic gain control (AGC) circuit in both the front-end and the IF.

The demodulated signal on pin 27 of U351 is also used for squelch control. The signal is routed to U404 (ASFIC) where squelch signal shaping and detection takes place. The demodulated audio signal is also routed to U404 for processing before going to the audio amplifier for amplification.

3.3 Automatic Gain Control (AGC)

(*Refer to the 800 MHz Receiver Front End and Receiver Back End schematic diagrams*)

The automatic gain control circuit provides automatic gain reduction of both the low noise amplifier in the receiver front end and the IF amplifier in the receiver backend. This action is necessary to prevent overloading of the backend IF IC.

The IF automatic gain control circuit provides approximately 50 dB of attenuation range. The signal strength indicator (RSSI) output of the IF IC produces a voltage that is proportional to the RF level at the IF input to the IF IC. This voltage is inverted by U350, R351, R353, R352, R354 and C355 and it determines the RF level at which the backend end AGC is activated as well as the slope of the voltage at the output of U350 vs. the strength of the incoming RF at the antenna. The inverted output of U350 is applied to the second gate of the IF amplifier U352 via R355. As the RF signal into the IF IC increases the following occurs:

- the RSSI voltage increases,
- the output of inverter U350 decreases, and
- the voltage applied to the second gate of the FET is reduced thus reducing the gain of the IF amplifier.

The output of inverter U350 is also used to control the receiver front end AGC.

The receiver front end automatic gain control circuit provides and additional 20 dB of gain reduction. The output of the receiver backend inverter U350 is fed into the receiver front end AGC inverter U302. The components R317, R314, and C318 determine:

- the RF level at which the front end AGC is activated, and
- the slope of the voltage at the output of U302 vs. the strength of the incoming RF at the antenna.

As the RF into the antenna increases the following occurs:

- The output voltage of the receiver backend inverter U350 decreases.
- The voltage at the output of the front end inverter U302 increases.
- The result is the forward biasing of pin diode CR301.

As the diode becomes more and more forward biased the following occurs:

- C310 loads the output of the low noise amplifier Q302 thus reducing the gain of the low noise amplifier.
- R315 and R318 provide a DC path for CR301 and also limit the current through CR301.

The blocking capacitor C317 prevents DC from the AGC stage from appearing at the input of the filter FL301.

4.0 Frequency Generation Circuit

(*Refer to Figure 2-3 and the 800 MHz Frequency Synthesizer schematic diagram*)

The frequency generation circuit is shown in Figure 2-21. The circuit is composed of the two main ICs:

- Fractional-N synthesizer, U201
- VCO/Buffer IC, U250

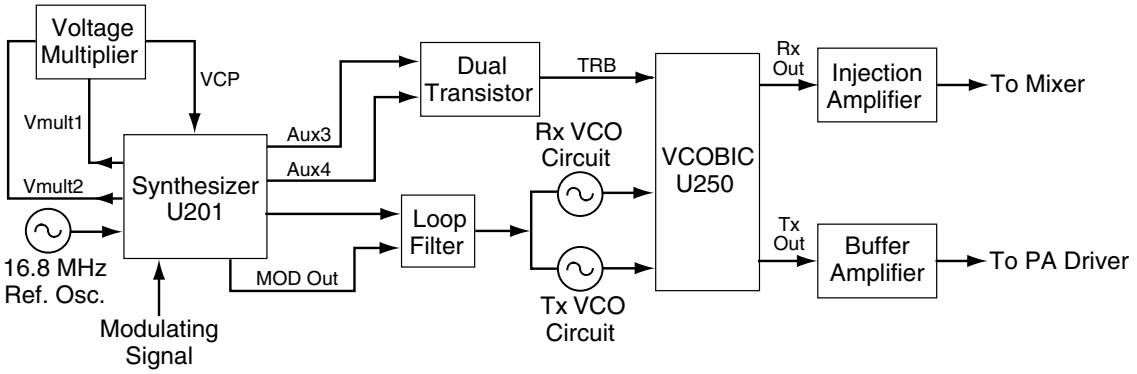


Figure 2-3 800 MHz Frequency Generation Unit Block Diagram

Designed in conjunction to maximize compatibility, the two ICs provide many of the functions that normally would require additional circuitry. The synthesizer block diagram illustrates the interconnect and support circuitry used in the region. Refer to the relevant schematics for the reference designators.

The synthesizer is powered by regulated 5V and 3.3V which come from U247 and U248 respectively. The synthesizer in turn generates a superfiltered 4.5V which powers U250.

In addition to the VCO, the synthesizer must interface with the logic and ASFIC circuitry. Programming for the synthesizer is accomplished through the data, clock and chip select lines from the microprocessor. A 3.3V dc signal from synthesizer lock detect line indicates to the microprocessor that the synthesizer is locked.

Transmit modulation from the ASFIC is supplied to pin10 of U201. Internally the audio is digitized by the Fractional-N and applied to the loop divider to provide the low-port modulation. The audio runs through an internal attenuator for modulation balancing purposes before going out to the VCO.

4.1 Synthesizer

(*Refer to Figure 2-4 and the 800 MHz Synthesizer schematic diagram)*

The Fractional-N Synthesizer uses a 16.8MHz crystal (FL201) to provide a reference for the system. The LVFractN IC (U201) further divides this to 2.1MHz, 2.225MHz, and 2.4MHz as reference frequencies. Together with C235, C236, C237, R211 and CR203, they comprise the reference oscillator which is capable of 2.5ppm stability over temperatures of -30 to 85°C. It also provides 16.8MHz at pin 19 of U201 to be used by ASFIC and LVZIF.

Some models are equipped with a packaged 1.5ppm reference oscillator, Y200. On these models components C235, C236, C237, CR203, FL201, and R211 are not placed. Components C238, C239, C241, R212, R213, R214 and Y200 are placed instead.

The loop filter which consists of C220, C225, C226, R204, R209 and R210 provides the necessary dc steering voltage for the VCO and provides filtering of noise and spurs from U201.

In achieving fast locking for the synthesizer, an internal adapt charge pump provides higher current at pin 45 of U201 to put the synthesizer within the lock range. The required frequency is then locked by the normal mode charge pump at pin 43.

Both the normal and adapt charge pumps get their supply from the capacitive multiplier which is made up of D201, D202, C244, C245, C246, C247, R200, R218, C208, C243, R219, and R220. Two 3.3 V square waves (180 degrees out of phase) are applied to R219 and R220. These square waves switch alternate sets of diodes from D201 and D202, which in turn charge C244, C245, C246, and C247 in a bucket brigade fashion. The resulting output voltage that is applied to pin 47 of U201 is typically 12.8V and allows the steering line voltage (VCO control voltage) to reach 11V.

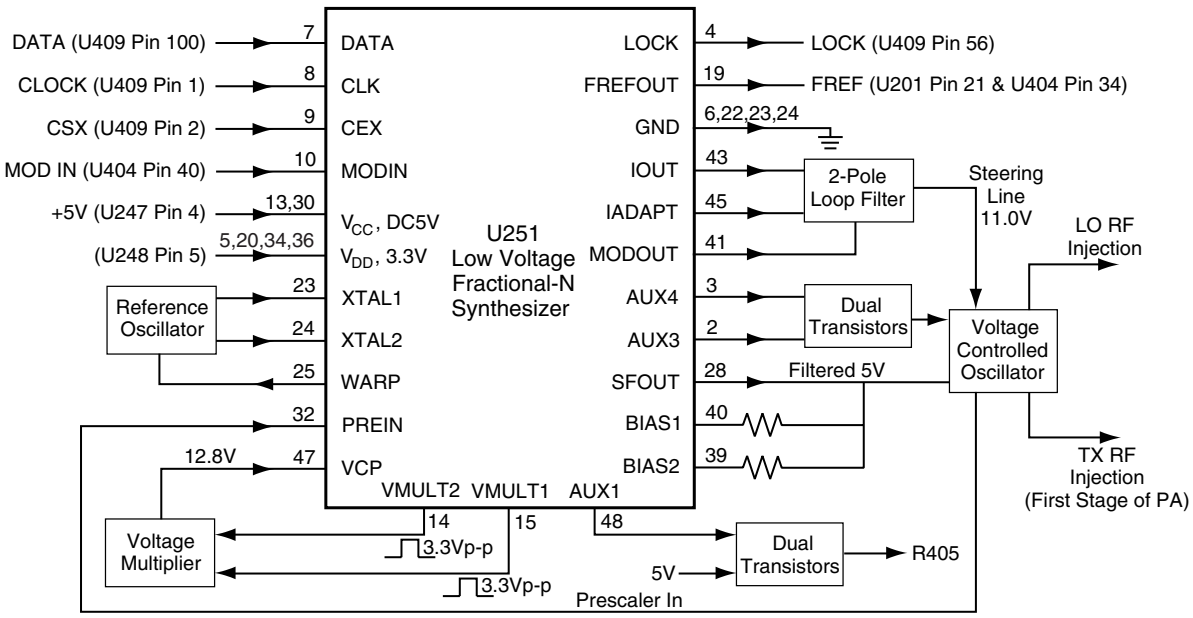


Figure 2-4 800 MHz Synthesizer Block Diagram

4.2 Voltage Controlled Oscillator (VCO)

(*Refer to Figure 2-5 and the 800 MHz Voltage Controlled Oscillator schematic diagram)*

The VCOBIC (U250) in conjunction with the Fractional-N synthesizer (U201) generates RF in both the receive and the transmit modes of operation. The TRB line (U250 pin 19) determines which oscillator and buffer will be enabled. A sample of the RF signal from the enabled oscillator is routed from U250 pin 12, through a low pass filter, to the prescaler input (U201 pin 32). After frequency comparison in the synthesizer, a resultant CONTROL VOLTAGE is received at the VCO. This voltage is a DC voltage between 2.0V (low frequency) and 11.0V (high frequency) when the PLL is locked on frequency.

The VCOBIC(U250) is operated at 4.54 V (VSF) and Fractional-N synthesizer (U201) at 3.3V. This difference in operating voltage requires a level shifter consisting of Q200 and Q252 on the TRB line.

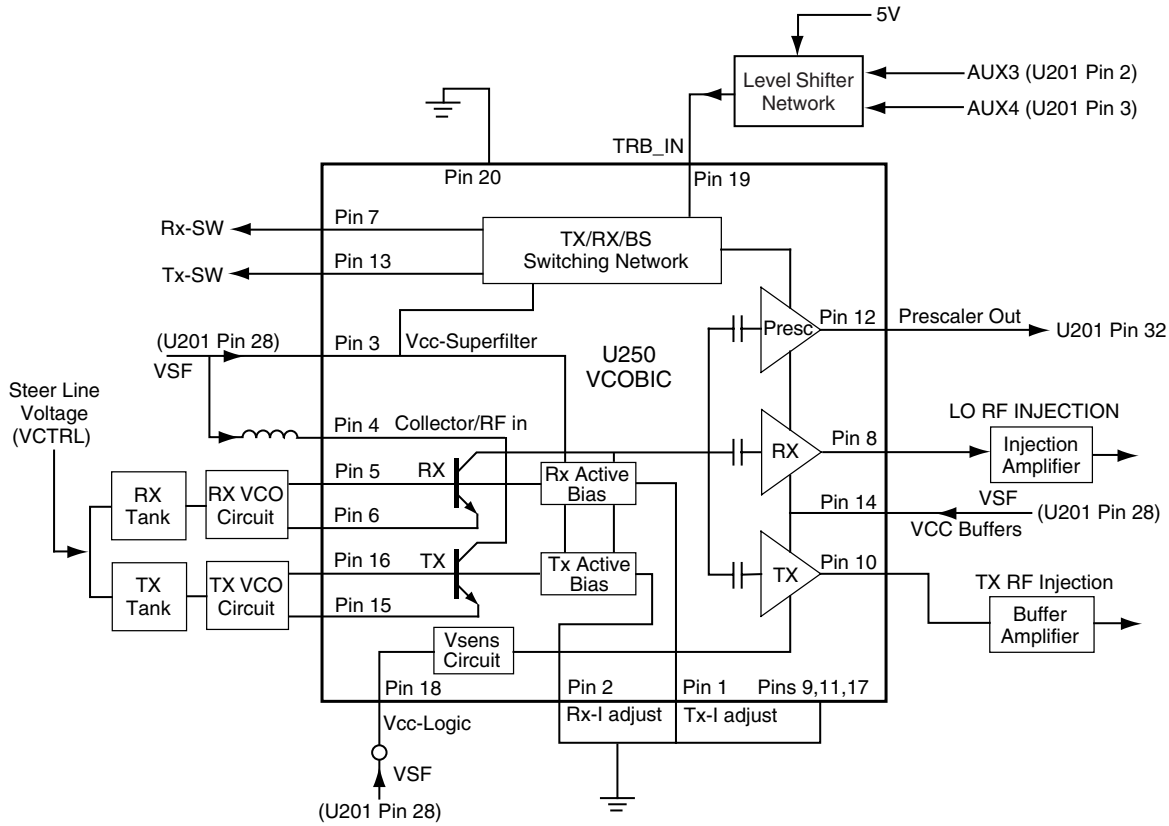


Figure 2-5 UHF VCO Block Diagram

The operation logic is shown in Table 2-1.

Desired Mode	AUX 4	AUX 3	TRB
Tx	Low	High (@3.2V)	High (@4.8V)
Rx	High	Low	Low
Battery Saver	Low	Low	Hi-Z/Float (@2.5V)

Table 2-1 Level Shifter Logic

In the receive mode, U250 pin 19 is low or grounded. This activates the receive VCO by enabling the receive oscillator and the receive buffer of U250. The RF signal at U250 pin 8 is run through an injection amplifier, Q304. The resulting RF signal is the LO RF INJECTION and it is applied to the mixer at U301 (refer to Figure 4-88: 800MHz Receiver Front End Schematic Diagram).

During the transmit condition, when PTT is depressed, five volts is applied to U250 pin 19. This activates the transmit VCO by enabling the transmit oscillator and the transmit buffer of U250. The RF signal at U250 pin 10 is amplified by Q251 and injected into the input of the PA module (U101 pin1). This RF signal is the TX RF INJECTION. Also in transmit mode, the audio signal to be frequency modulated onto the carrier is received through the U201 pin 41.

When a high impedance is applied to U250 pin19, the VCO is operating in BATTERY SAVER mode. In this case, both the receive and transmit oscillators as well as the receive transmit and prescaler buffer are turned off.

4.3 Trunked Radio Systems

Trunked systems allow a large number of users to share a relatively small number of frequencies or repeaters without interfering with each other. The airtime of all the repeaters in a trunked system is pooled, which maximizes the amount of airtime available to any one radio and minimizes channel congestion. A benefit of trunking is that the user is not required to monitor the system before transmitting.

4.3.1 Privacy Plus Trunked Systems

Privacy Plus is a proprietary trunking protocol developed by Motorola which allows a large number of users to share small amounts of frequencies without interfering with each other. The Privacy Plus configuration consists of shared multiple channel repeaters. The Privacy Plus Trunked system includes a Central Controller, which directs the users to the open channels. This kind of Trunked system requires no monitoring of the channel as in conventional systems. The Central Controller places the user in a queue to wait for a free channel. The Central Controller does the monitoring and channels selection for the user.

4.3.2 LTR™ Trunked Systems

LTR is a transmission based trunking protocol developed by the E. F. Johnson Company for primarily single site trunking applications. In transmission trunking, a repeater is used for only the duration of a single transmission. Once a transmission is completed, that repeater becomes available to other users.

4.3.3 MPT Trunked Systems

MPT (Ministry of Post and Telecommunications) developed a signalling standard (MPT1327) for trunked private land mobile radio systems. This standard defines the protocol rules for communication between a trunking system controller (TSC) and user's radio units. The protocol offers a broad range of options which can be implemented in subsets according to user requirements. Also, there is scope for customization for special requirements, and provision made to further standardized features to be added to the protocol in the future. The standard defines only the over-air signalling and imposes only minimum constraints on system design.

4.3.4 PassPort™ Trunked Systems

PassPort is an enhanced trunking protocol developed by Trident Microsystems that supports wide area dispatch networking. A network is formed by linking several trunked sites together to form a single system. This offers users an extended communication coverage area. Additionally, users with PassPort can seamlessly roam among all sites within the network. Seamless roaming means that the radio user does not have to manually change the position on the radio when roaming from site-to-site.

For models which feature PassPort Trunking operation, the standard keypad board is replaced with the PassPort Trunking Controller Board (PTCB). This board also provides advanced voice storage features. Refer to Figure 2-2 for connector and signal routing from, to and through the Radio, PTCB and Liquid Crystal Display (LCD) sub-systems.

Power Supplies

The radio supplies regulated Vdd of 3.3 VDC. This is used to power the Low Speed Data Filter and Voice Storage circuits. The radio also supplies Switched Battery Voltage (SWB+). U612 regulates the SWB+ to 3.3V which is applied to the PTCB microcontroller U601. A filtered voltage (Vdda) of _ Vdd is developed by U603-4 and is used to supply a clean reference bias for the Low Speed Data filter and Voice Storage circuits. The circuit of Q607 which can limit the voltage applied to the Voice Storage chip is not used in portable applications and is disabled by 0 Ohm resistor R614.

Microcontroller (MCU)

PassPort Trunking operation is managed by the reprogrammable FLASH ROM based microcontroller (U601). The MCU clock oscillator uses 8MHz crystal Y601 as a stable resonator. The PTCB communicates with the main radio microcontroller by attaching to the same Serial Peripheral (SPI) bus that passes though the PTCB to the LCD on the CLK, DATA, RDY, and MISO lines. The OPT_EN line is strobed low only for communications with U601.

The MCU includes an on-chip Analog to Digital Converter (ADC). The received and filtered sub-audible low speed trunking data waveform is applied to one of the ADC inputs. The software in the MCU decodes and acts upon the trunking data.

The MCU includes a Digital to Analog Converter (DAC). As required, the MCU software generates appropriate PassPort Low Speed Trunking Data waveforms. These are applied to the Low Speed Data Filter and then to the radio transmitter modulation point. The amplitude of this waveform and the resulting transmitted deviation is controlled by software.

Low Speed Data Filter

This analog circuitry is a 4 pole, 150 Hz cutoff low pass filter comprised of U603-1, U603-2 and associated passive components. In receive mode, it removes noise and voice band signals leaving only the low speed data waveform which is applied to the ADC input of the MCU. U608-4 isolates the receive signal from the filter in transmit mode. When the radio is transmitting PassPort data, the MCU DAC low speed data waveform is applied to the input of the filter which removes harmonics that would interfere with voice and applies the resulting sub-audible data to the radio transmitter modulation point.

Keyboard Circuit

The keyboard consists of a matrix of key switches and resistors as described in section 2.3. U605-2 monitors the column voltage and applies an interrupt signal to the radio microcontroller when any key is pressed.

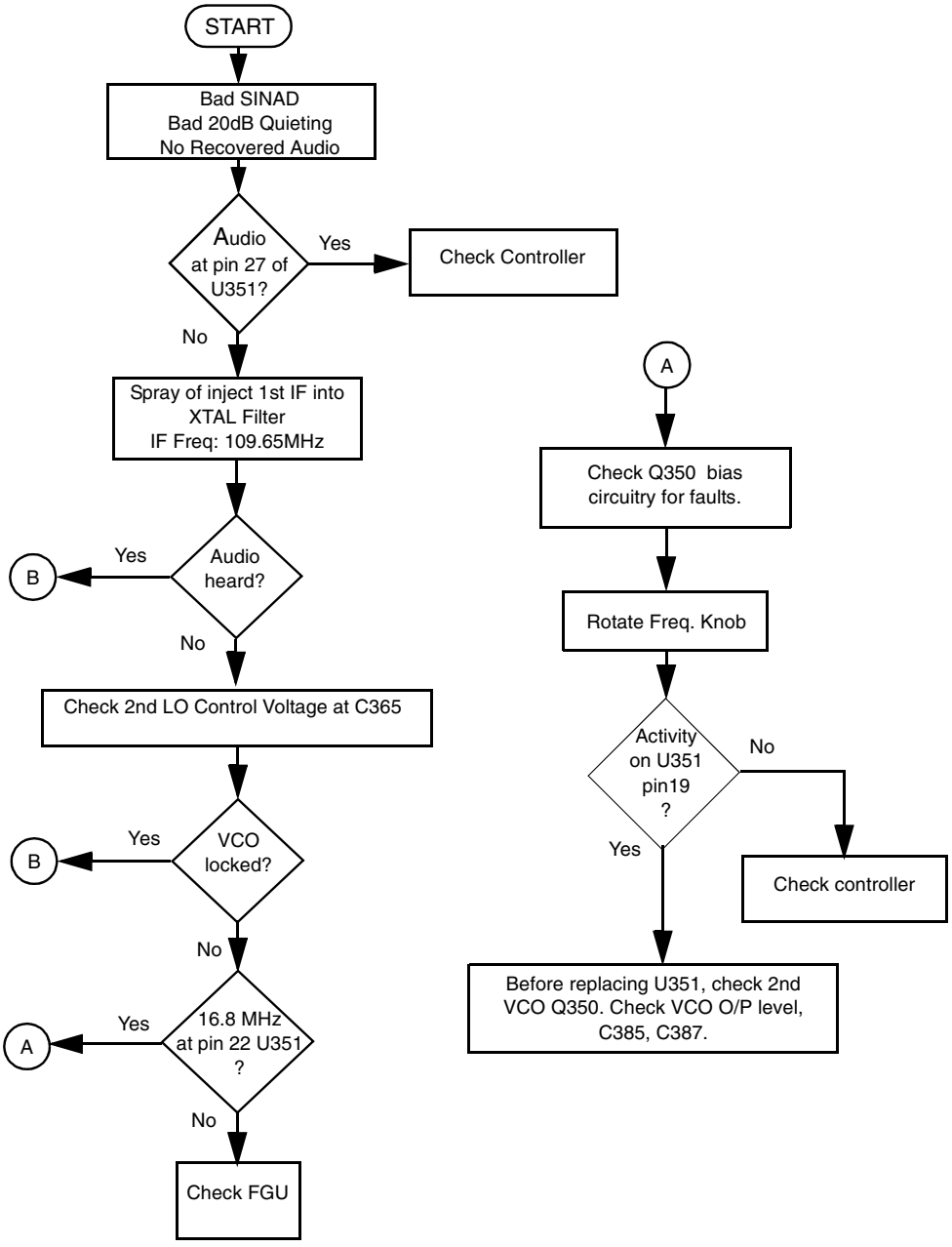
BackLight Driver and LED's

The logic level signal from the radio microcontroller is translated via Q611 and applied to Q610 which uses Switched Battery Voltage (SWB+) to operate the keypad backlight LED’s.

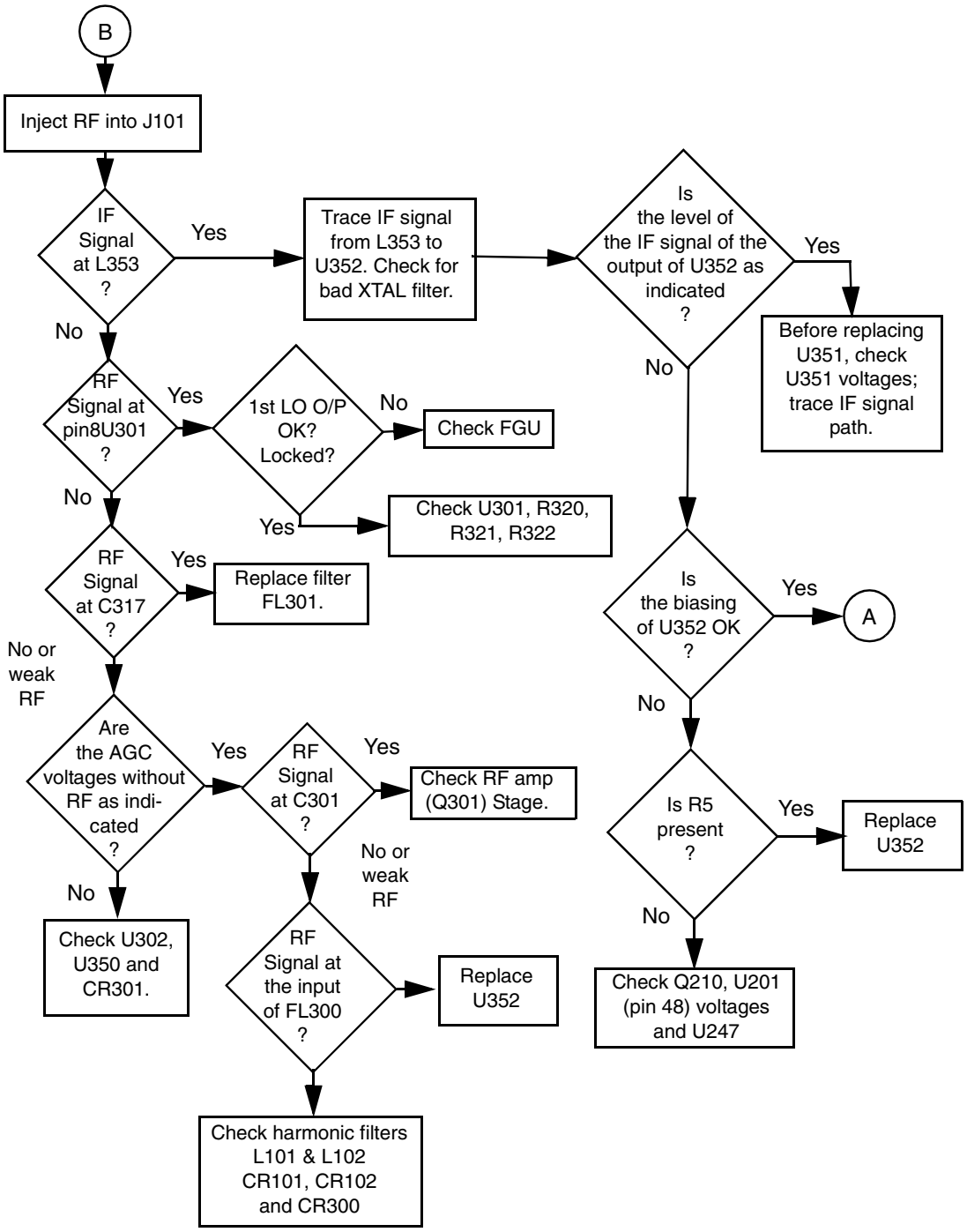
Chapter 3

TROUBLESHOOTING CHARTS

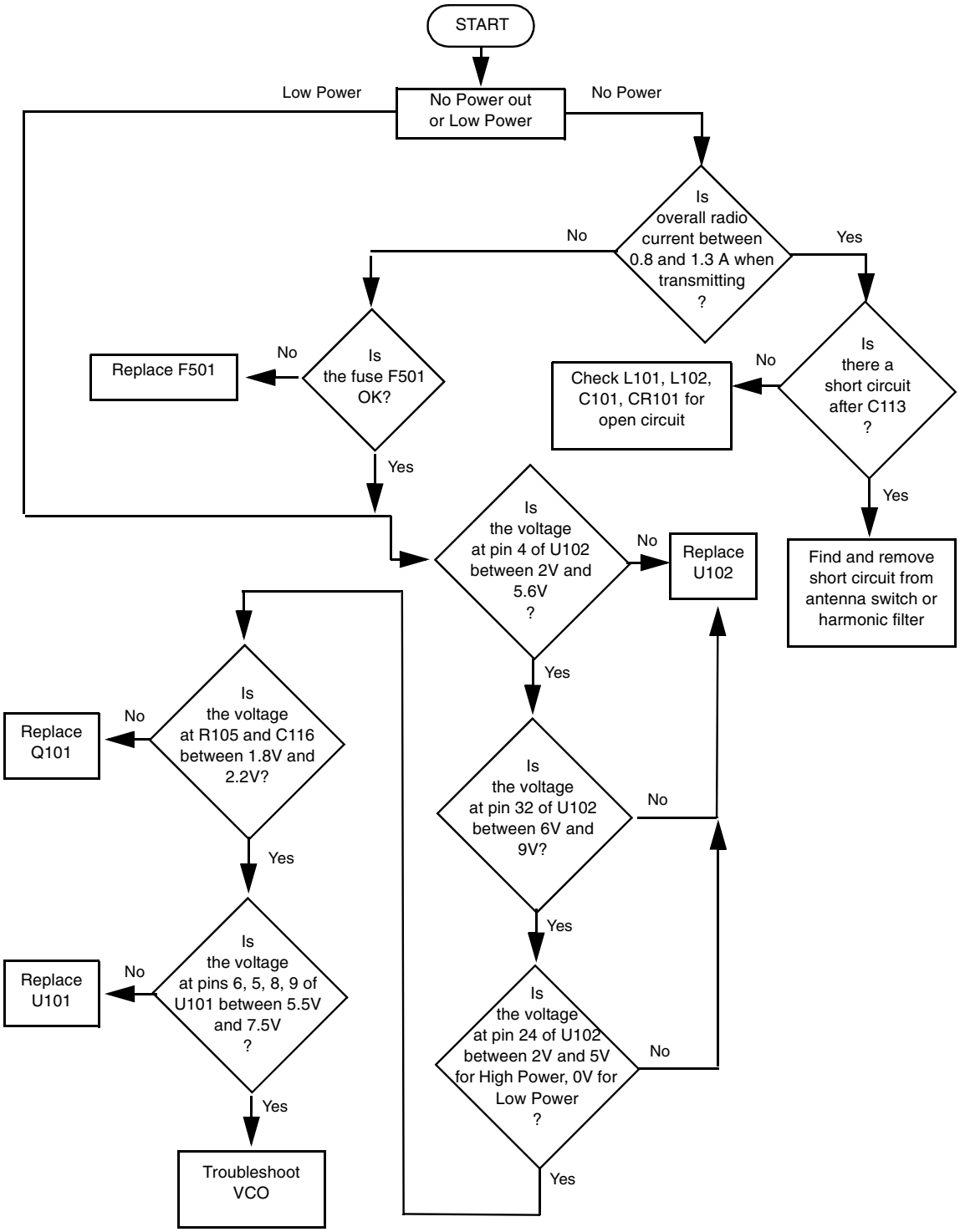
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



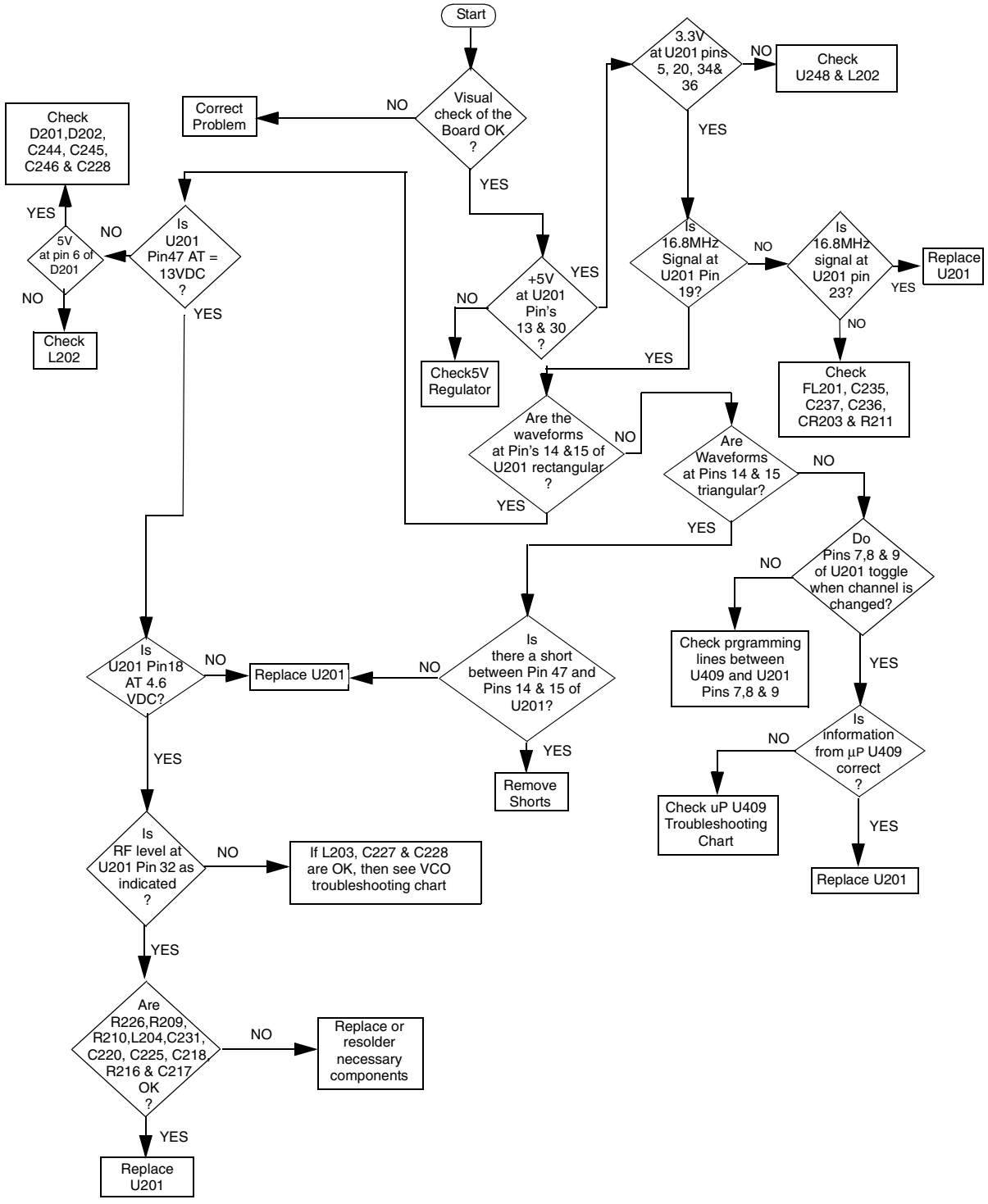
2.0 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



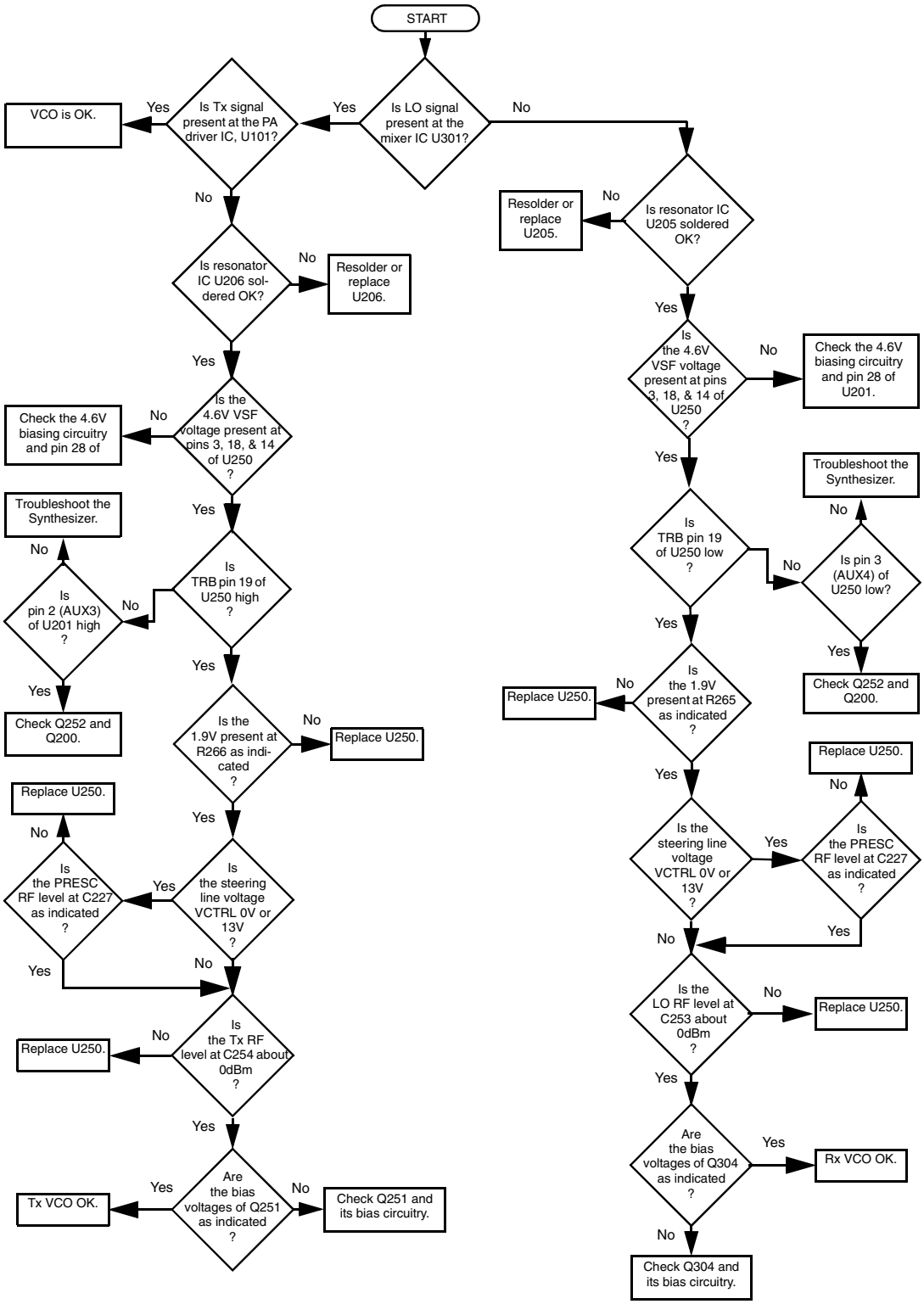
3.0 Troubleshooting Flow Chart for Transmitter



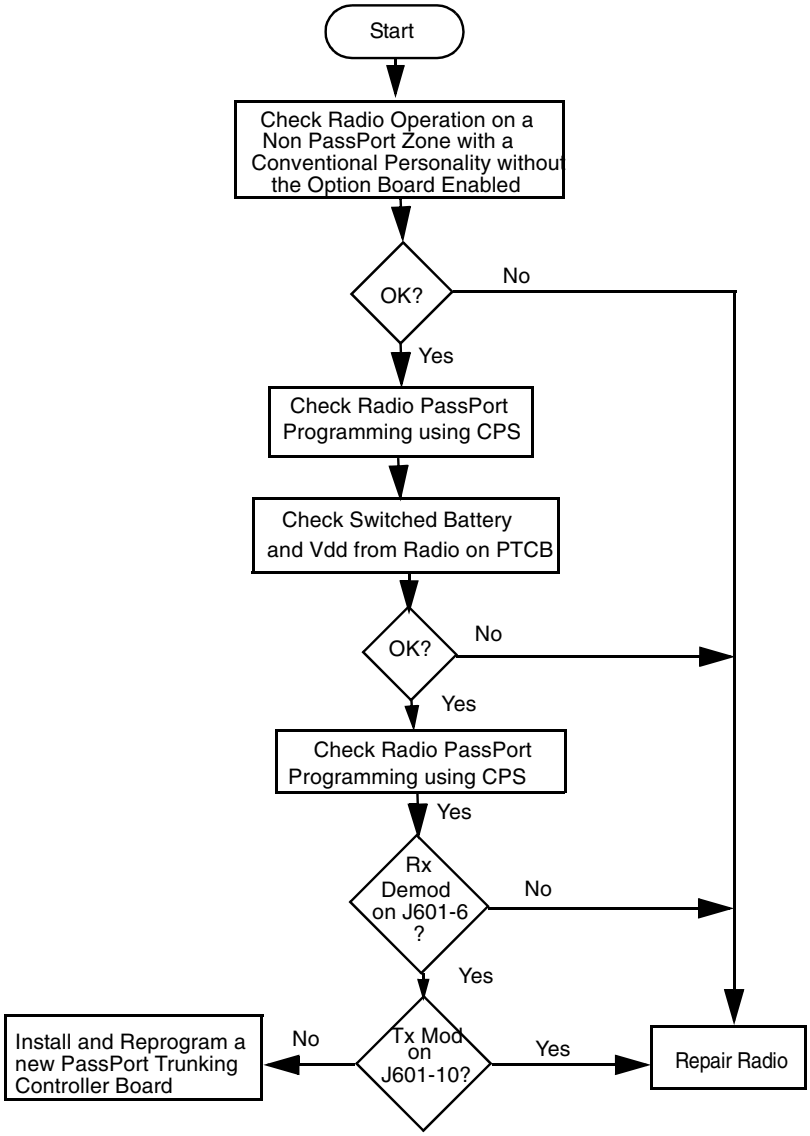
4.0 Troubleshooting Flow Chart for Synthesizer



5.0 Troubleshooting Flow Chart for VCO



6.0 Troubleshooting Flow Chart for PassPort Trunking



Chapter 4

800MHZ /PCB/SCHEMATICS/PARTS LIST

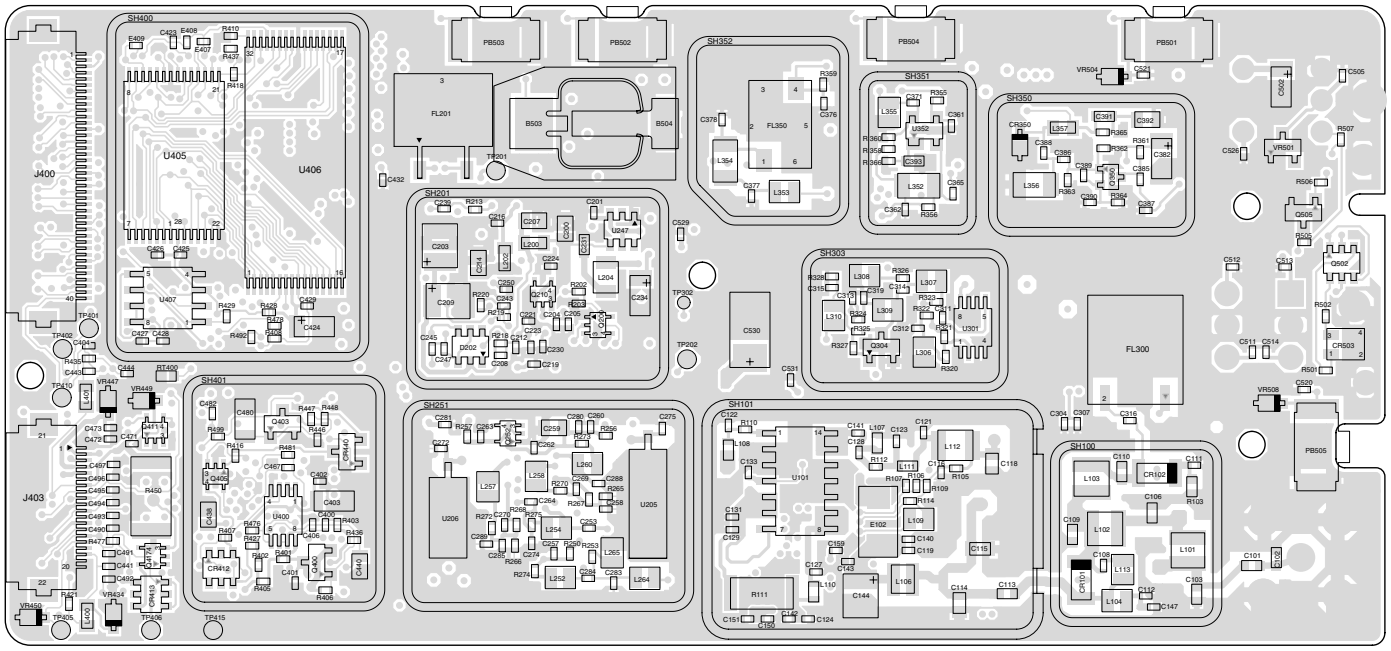
1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The 800MHz circuits are contained on the printed circuit board (PCB) which also contains the Controller circuits. This chapter shows the schematics for the 800MHz circuits only, refer to the Controller section for details of the related Controller circuits.The PCB component layouts and the Parts Lists in this Chapter show both the Controller and UHF circuit components. The 800MHz schematics and the related PCB and parts list are shown in the tables below.

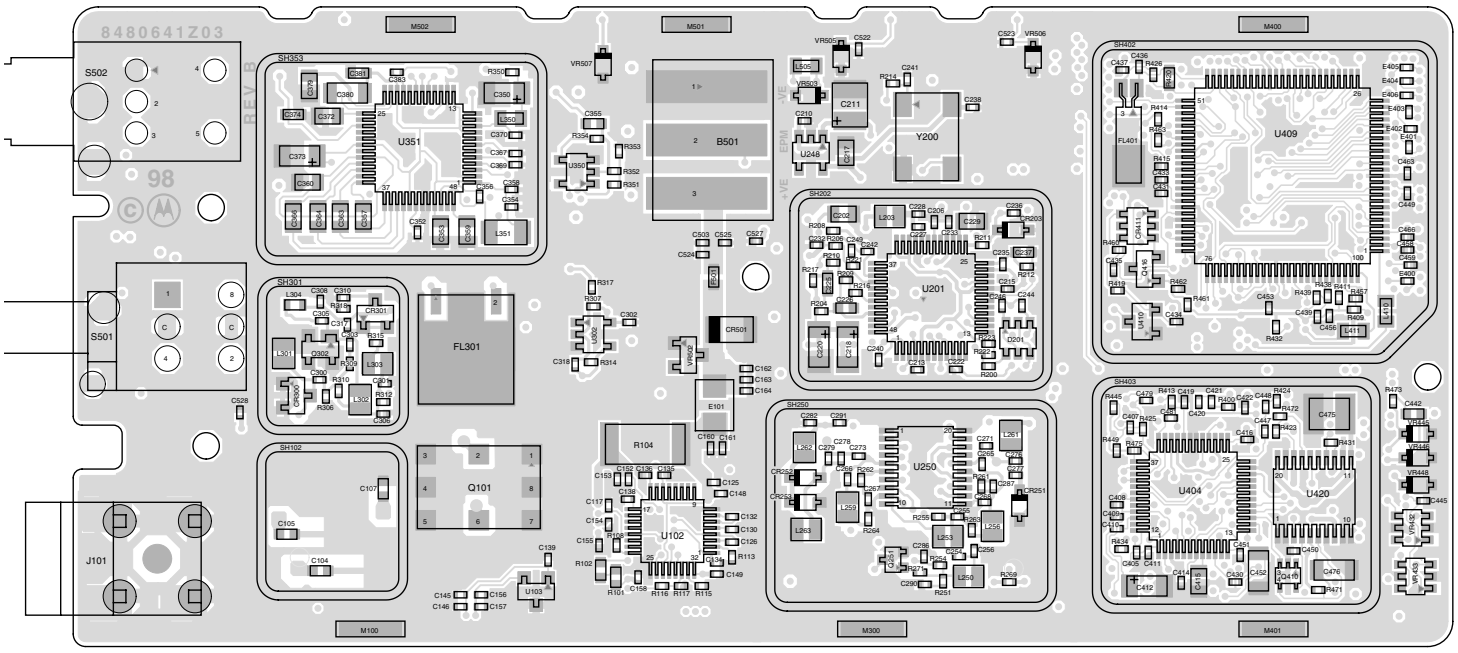
Table 4-1 800MHz Diagrams and Parts Lists

2.0 800MHz PCB 8480641Z03 / Schematics

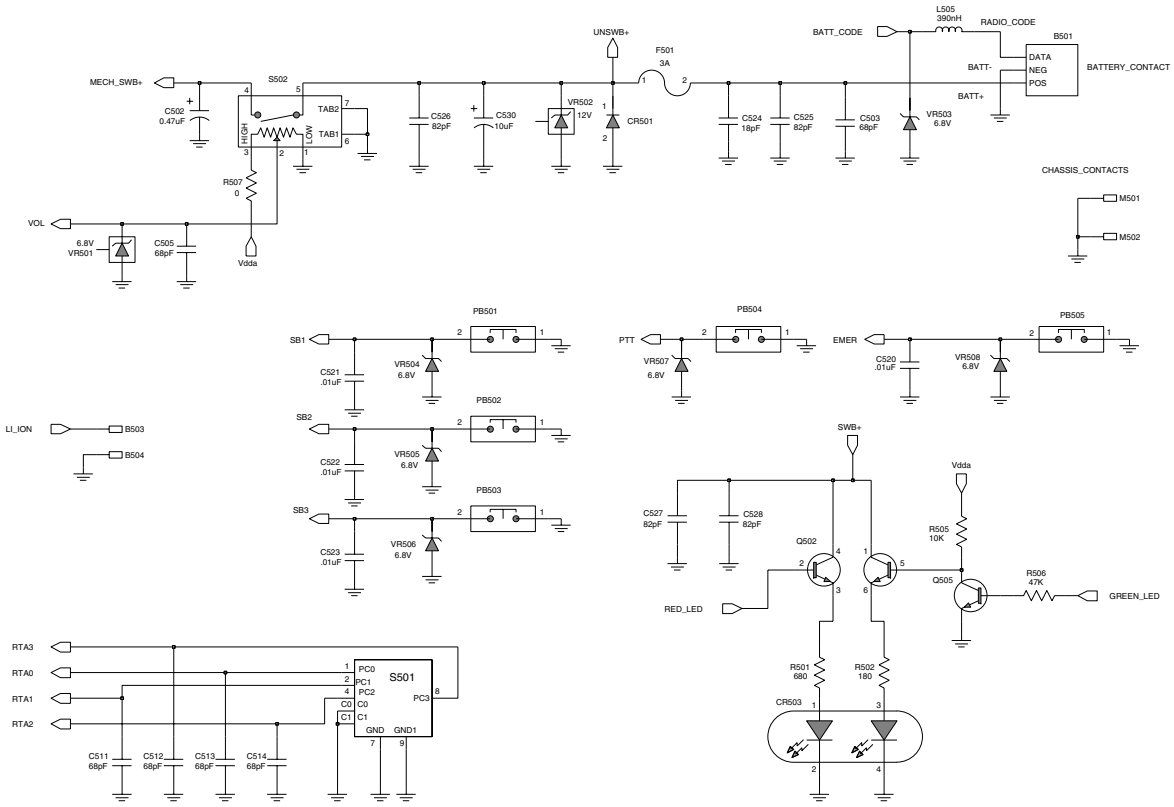


ZMY0130993-O

800MHz (806-870MHz) Main Board Top Side

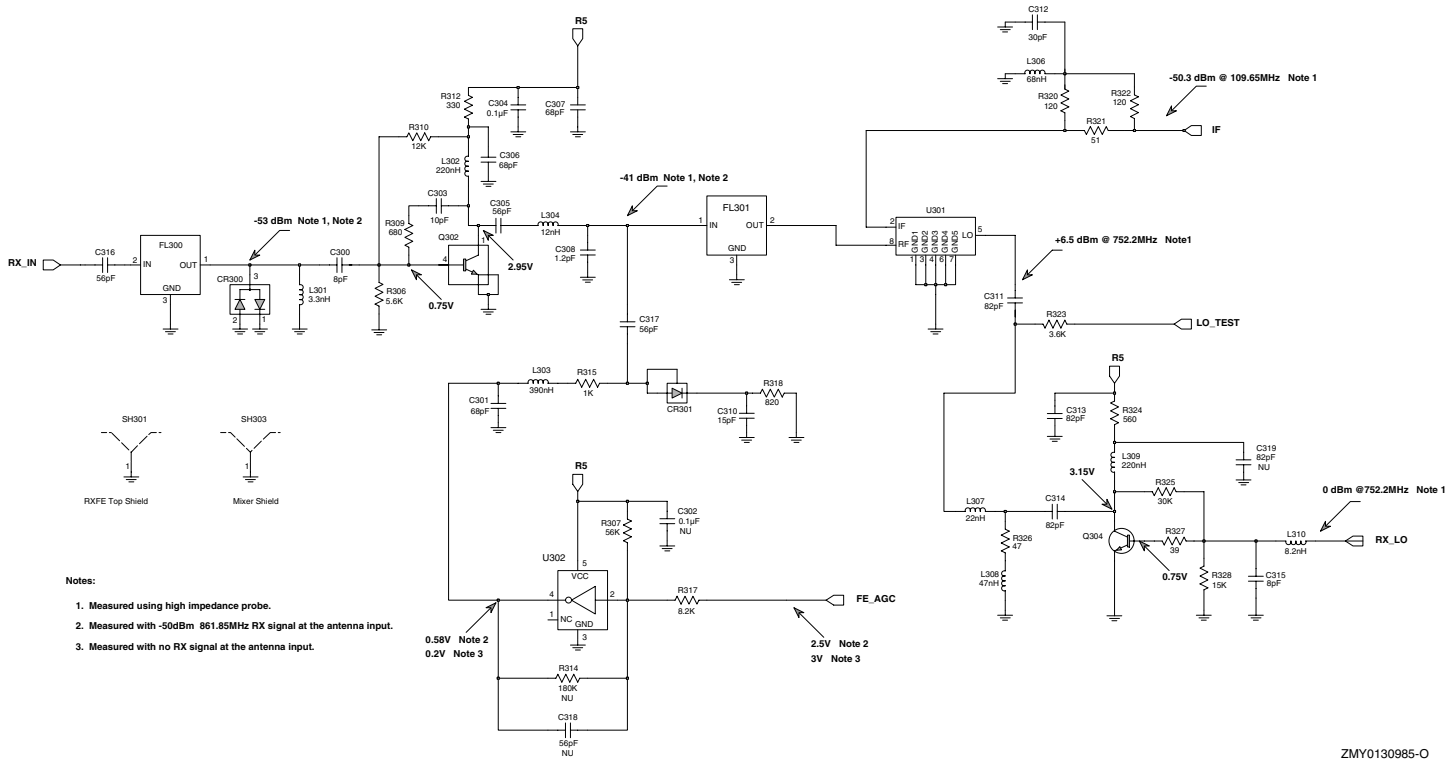


800MHz (806-870 MHz) Main Board Bottom Side



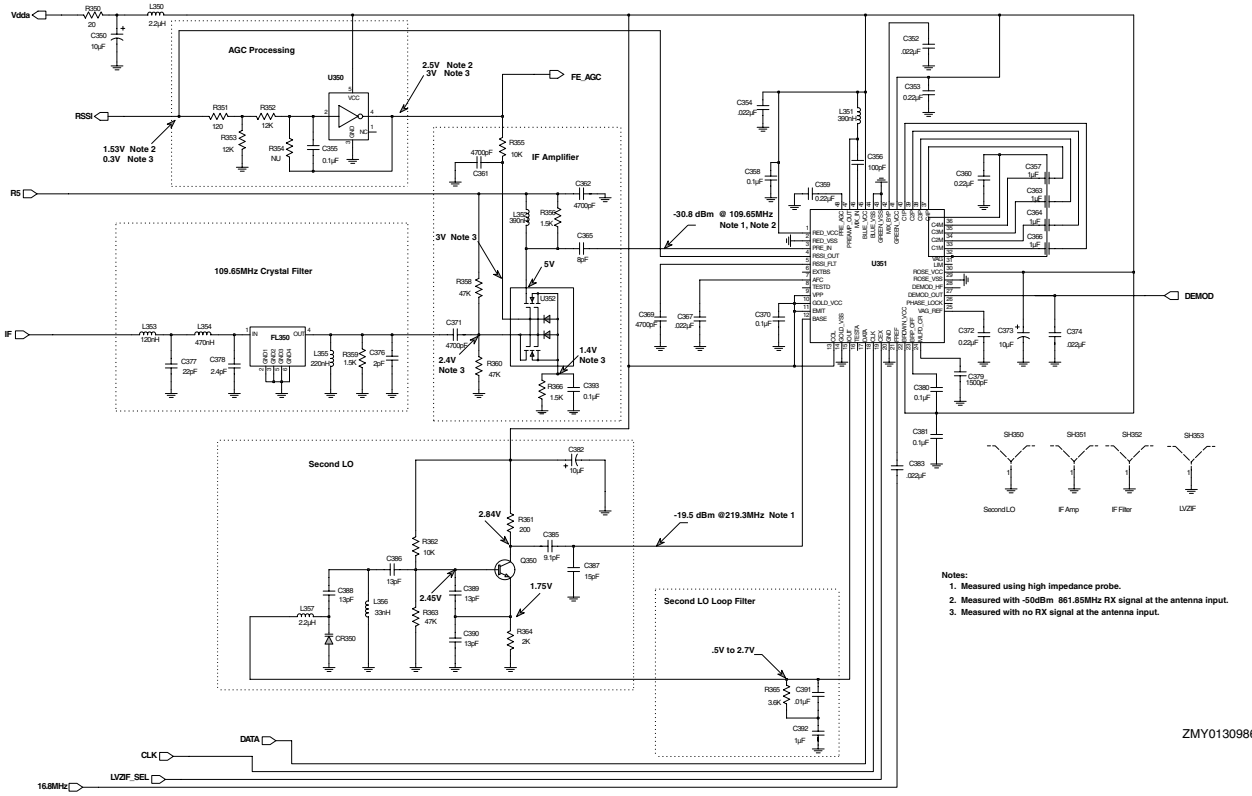
ZMY0130984-O

800MHz (806-870MHz) Controls and Switches

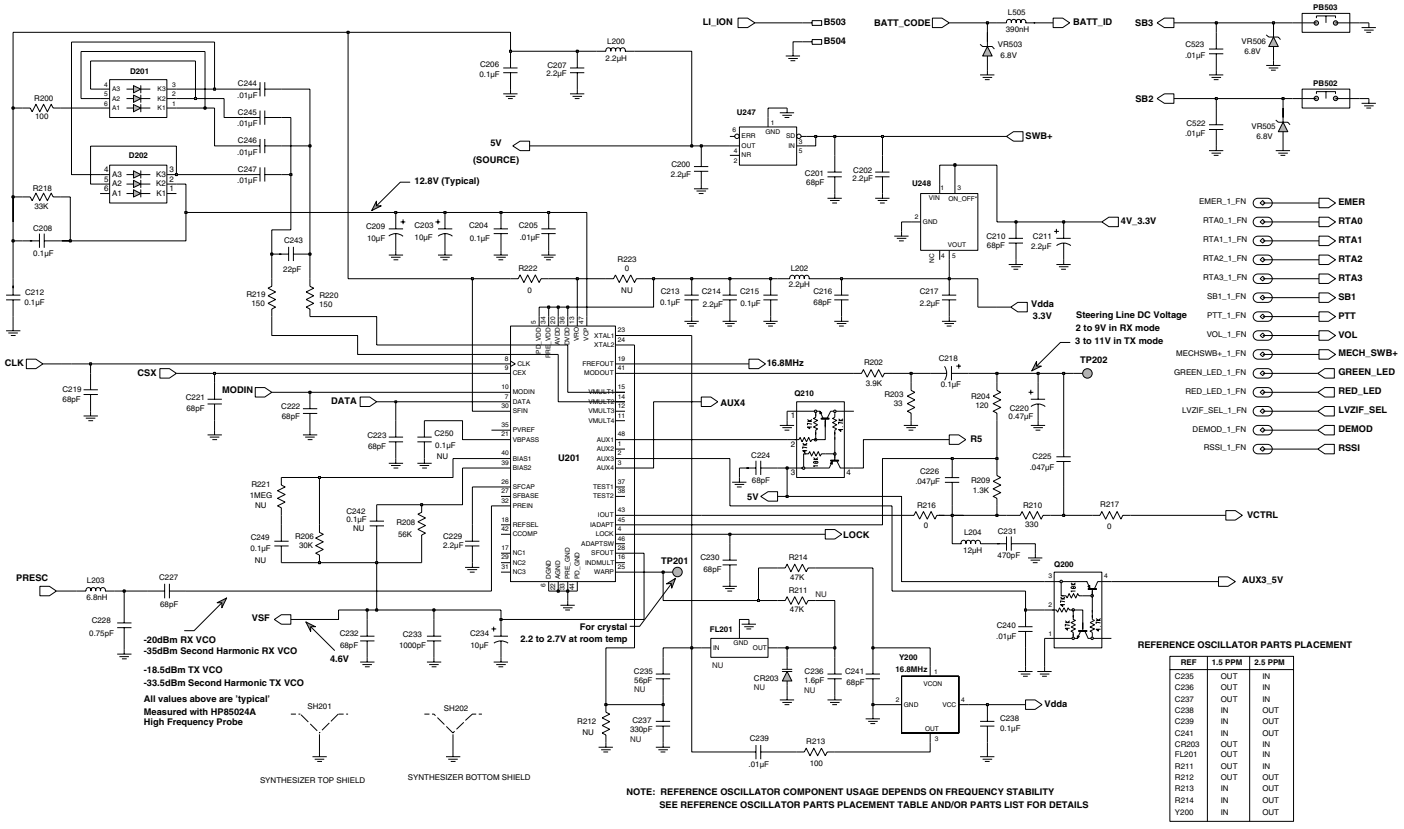


ZMY0130985-O

800MHz (806 - 870 MHz) Receiver Front End



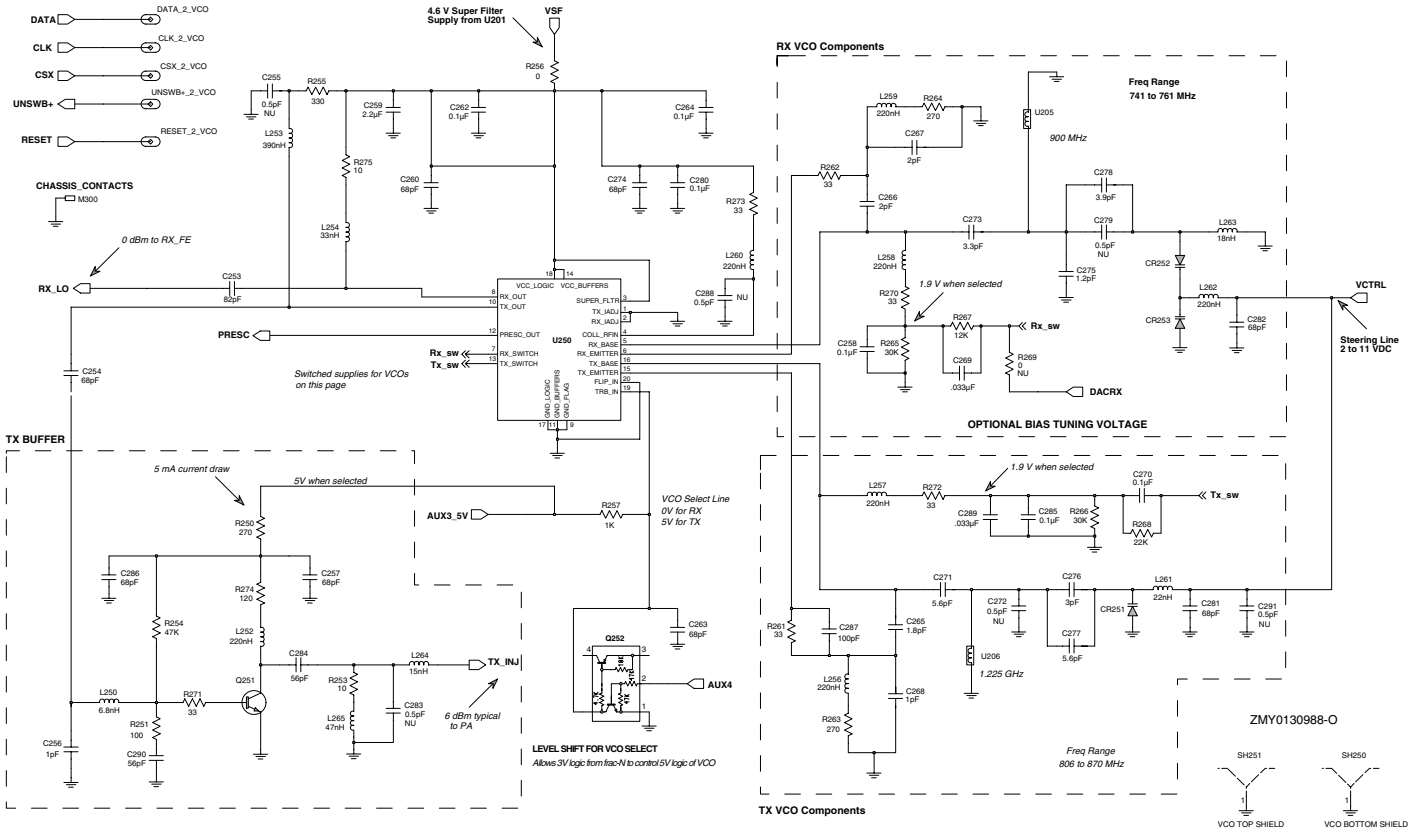
800MHz (806-870MHz) Receiver Back End



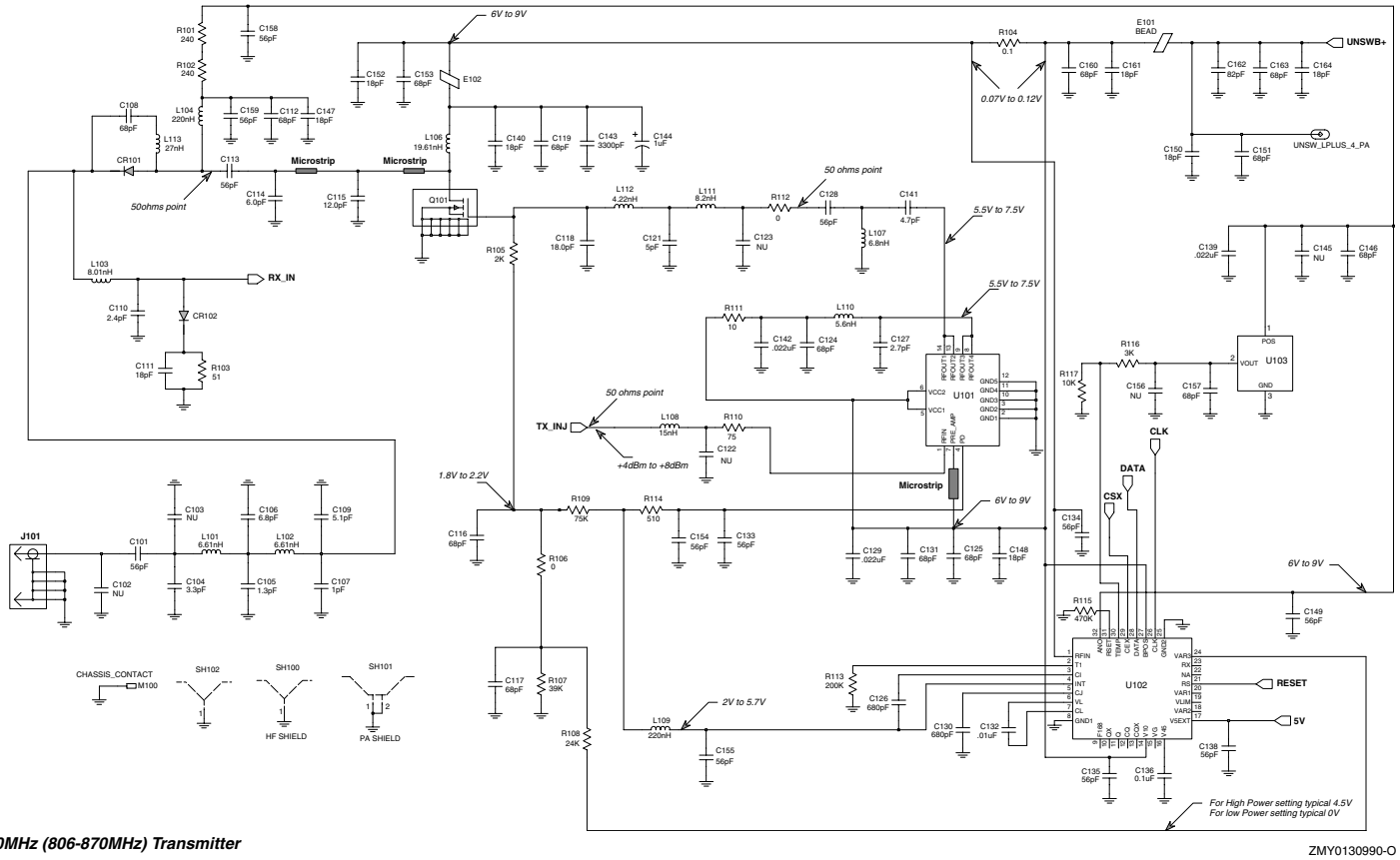
NOTE: REFERENCE OSCILLATOR COMPONENT USAGE DEPENDS ON FREQUENCY STABILITY
SEE REFERENCE OSCILLATOR PARTS PLACEMENT TABLE AND/OR PARTS LIST FOR DETAILS

REFERENCE OSCILLATOR PARTS PLACEMENT

REF	1.5 PPM	2.5 PPM
C235	OUT	IN
C236	OUT	IN
C237	OUT	IN
C238	IN	OUT
C239	IN	OUT
C241	IN	OUT
CR203	OUT	IN
FL201	OUT	IN
R211	OUT	IN
R212	OUT	OUT
R213	IN	OUT
R214	IN	OUT
Y200	IN	OUT



800MHz (806-870MHz) Voltage Controlled Oscillator



800MHz (806-870MHz) Transmitter

ZMY0130990-O

3.0 800MHz PCB 8480641Z03 Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A01	Connector Multi_Pin 37A01
B503	3980502Z01	Mechanical
B504	3980501Z01	Mechanical
C101	2113740F45	Capacitor Chip 56pF
C104	2113740F15	Capacitor Chip 3.3pF
C105	2113740F06	Capacitor Chip 1.3pF
C106	2113740F23	Capacitor Chip 6.8pF
C107	2113740F03	Capacitor Chip 1pF
C108	2113743N46	Capacitor Chip 68pF
C109	2113740F20	Capacitor Chip 5.1pF
C110	2113740F12	Capacitor Chip 2.4pF
C111	2113743N32	Capacitor Chip 18pF
C112	2113743N46	Capacitor Chip 68pF
C113	2113740F45	Capacitor Chip 56pF
C114	2103689A19	Capacitor Chip 6.0pF
C115	2103689A05	Capacitor Chip 12.0pF
C116	2113743N46	Capacitor Chip 68pF
C117	2113743N46	Capacitor Chip 68pF
C118	2103689A08	Capacitor Chip 18.0pF
C119	2113743N46	Capacitor Chip 68pF
C121	2113743N60	Capacitor Chip 5pF
C124	2113743N46	Capacitor Chip 68pF
C125	2113743N46	Capacitor Chip 68pF
C126	2113743L13	Capacitor Chip 680pF
C127	2113743N12	Capacitor Chip 2.7pF
C128	2113743N44	Capacitor Chip 56pF
C129	2113743M08	Capacitor Chip .022µF
C130	2113743L13	Capacitor Chip 680pF
C131	2113743N46	Capacitor Chip 68pF
C132	2113743L41	Capacitor Chip .01µF
C133 to C135	2113743N44	Capacitor Chip 56pF
C136	2113743M24	Capacitor Chip 0.1µF
C138	2113743N44	Capacitor Chip 56pF
C139	2113743M08	Capacitor Chip .022µF
C140	2113743N32	Capacitor Chip 18pF
C141	2113743N18	Capacitor Chip 4.7pF
C142	2113743M08	Capacitor Chip .022µF
C143	2113743L29	Capacitor Chip 3300pF
C144	2311049A08	Capacitor Tantalum 1µF
C146	2113743N46	Capacitor Chip 68pF
C147	2113743N32	Capacitor Chip 18pF
C148	2113743N32	Capacitor Chip 18pF
C149	2113743N44	Capacitor Chip 56pF
C150	2113743N32	Capacitor Chip 18pF
C151	2113743N46	Capacitor Chip 68pF
C152	2113743N32	Capacitor Chip 18pF
C153	2113743N46	Capacitor Chip 68pF
C154	2113743N44	Capacitor Chip 56pF
C155	2113743N44	Capacitor Chip 56pF
C157	2113743N46	Capacitor Chip 68pF
C158	2113743N44	Capacitor Chip 56pF
C159	2113743N44	Capacitor Chip 56pF
C160	2113743N46	Capacitor Chip 68pF
C161	2113743N32	Capacitor Chip 18pF
C162	2113743N48	Capacitor Chip 82pF
C163	2113743N46	Capacitor Chip 68pF
C164	2113743N32	Capacitor Chip 18pF
C200	2113743F18	Capacitor Chip 2.2µF
C201	2113743N46	Capacitor Chip 68pF
C202	2113743F18	Capacitor Chip 2.2µF
C203	2311049A57	Capacitor Tantalum 10µF
C204	2113743M24	Capacitor Chip 0.1µF
C205	2113743L41	Capacitor Chip .01µF
C206	2113743M24	Capacitor Chip 0.1µF
C207	2113743F18	Capacitor Chip 2.2µF
C208	2113743M24	Capacitor Chip 0.1µF
C209	2311049A57	Capacitor Tantalum 10µF
C210	2113743N46	Capacitor Chip 68pF
C211	2311049A09	Capacitor Tantalum 2.2µF
C212	2113743M24	Capacitor Chip 0.1µF
C213	2113743M24	Capacitor Chip 0.1µF
C214	2113743F18	Capacitor Chip 2.2µF
C215	2113743M24	Capacitor Chip 0.1µF
C216	2113743N46	Capacitor Chip 68pF
C217	2113743F18	Capacitor Chip 2.2µF
C218	2311049A01	Capacitor Tantalum 0.1µF
C219	2113743N46	Capacitor Chip 68pF
C220	2311049A05	Capacitor Tantalum 0.47µF
C221 to C224	2113743N46	Capacitor Chip 68pF
C225	2113743E12	Capacitor Chip .047µF
C226	2113743E12	Capacitor Chip .047µF
C227	2113743N46	Capacitor Chip 68pF
C228	2113743N02	Capacitor Chip 0.75pF
C229	2113743F18	Capacitor Chip 2.2µF
C230	2113743N46	Capacitor Chip 68pF
C231	2113741F17	Capacitor Chip 470pF
C232	2113743N46	Capacitor Chip 68pF
C233	2113743L17	Capacitor Chip 1000pF
C234	2311049A59	Capacitor Tantalum 10µF
C238	2113743M24	Capacitor Chip 0.1µF
C239	2113743L41	Capacitor Chip .01µF
C240	2113743L41	Capacitor Chip .01µF
C241	2113743N46	Capacitor Chip 68pF
C243	2113743N34	Capacitor Chip 22pF
C244 to C247	2113743L41	Capacitor Chip .01µF
C253	2113743N48	Capacitor Chip 82pF
C254	2113743N46	Capacitor Chip 68pF
C256	2113743N03	Capacitor Chip 1pF
C257	2113743N46	Capacitor Chip 68pF
C258	2113743M24	Capacitor Chip 0.1µF
C259	2113743F18	Capacitor Chip 2.2µF
C260	2113743N46	Capacitor Chip 68pF
C262	2113743M24	Capacitor Chip 0.1µF
C263	2113743N46	Capacitor Chip 68pF
C264	2113743M24	Capacitor Chip 0.1µF
C265	2113743N69	Capacitor Chip 1.8pF
C266	2113743N09	Capacitor Chip 2pF
C267	2113743N09	Capacitor Chip 2pF
C268	2113743N03	Capacitor Chip 1pF
C269	2113743M12	Capacitor Chip .033µF
C270	2113743M24	Capacitor Chip 0.1µF
C271	2113743N20	Capacitor Chip 5.6pF
C273	2113743N14	Capacitor Chip 3.3pF
C274	2113743N46	Capacitor Chip 68pF
C275	2113743N05	Capacitor Chip 1.2pF
C276	2113743N13	Capacitor Chip 3pF
C277	2113743N20	Capacitor Chip 5.6pF
C278	2113743N16	Capacitor Chip 3.9pF
C280	2113743M24	Capacitor Chip 0.1µF
C281	2113743N46	Capacitor Chip 68pF
C282	2113743N46	Capacitor Chip 68pF
C284	2113743N44	Capacitor Chip 56pF
C285	2113743M24	Capacitor Chip 0.1µF
C286	2113743N46	Capacitor Chip 68pF
C287	2113743N50	Capacitor Chip 100pF
C289	2113743M12	Capacitor Chip .033µF
C290	2113743N44	Capacitor Chip 56pF
C300	2113743N65	Capacitor Chip 8pF
C301	2113743N46	Capacitor Chip 68pF
C303	2113743N26	Capacitor Chip 10pF
C304	2113743M24	Capacitor Chip 0.1µF
C305	2113743N44	Capacitor Chip 56pF
C306	2113743N46	Capacitor Chip 68pF
C307	2113743N46	Capacitor Chip 68pF
C308	2113743N05	Capacitor Chip 1.2pF
C310	2113743N30	Capacitor Chip 15pF
C311	2113743N48	Capacitor Chip 82pF
C312	2113743N37	Capacitor Chip 30pF
C313	2113743N48	Capacitor Chip 82pF
C314	2113743N48	Capacitor Chip 82pF
C315	2113743N65	Capacitor Chip 8pF
C316	2113743N44	Capacitor Chip 56pF
C317	2113743N44	Capacitor Chip 56pF
C350	2311049A59	Capacitor Tantalum 10µF
C352	2113743M08	Capacitor Chip .022µF
C353	2113743A23	Capacitor Chip 0.22µF
C354	2113743M08	Capacitor Chip .022µF
C355	2113743E20	Capacitor Chip 0.1µF
C356	2113743N50	Capacitor Chip 100pF
C357	2113743F16	Capacitor Chip 1µF
C358	2113743M24	Capacitor Chip 0.1µF
C359	2113743A23	Capacitor Chip 0.22µF
C360	2113743A23	Capacitor Chip 0.22µF
C361	2113743R33	Capacitor Chip 4700pF
C362	2113743R33	Capacitor Chip 4700pF
C363	2113743F16	Capacitor Chip 1µF
C364	2113743F16	Capacitor Chip 1µF
C365	2113743N65	Capacitor Chip 8pF
C366	2113743F16	Capacitor Chip 1µF
C367	2113743M08	Capacitor Chip .022µF
C369	2113743R33	Capacitor Chip 4700pF
C370	2113743M24	Capacitor Chip 0.1µF
C371	2113743R33	Capacitor Chip 4700pF
C372	2113743A23	Capacitor Chip 0.22µF
C373	2311049A59	Capacitor Tantalum 10µF
C374	2113743E07	Capacitor Chip .022µF
C376	2113743N09	Capacitor Chip 2pF
C377	2113743N34	Capacitor Chip 22pF
C378	2113743N11	Capacitor Chip 2.4pF
C379	2113740A82	Capacitor Chip 1500pF
C380	2109720D14	Capacitor Chip 0.1µF
C381	2113743E20	Capacitor Chip 0.1µF
C382	2311049A59	Capacitor Tantalum 10µF
C383	2113743M08	Capacitor Chip .022µF
C385	2113743N25	Capacitor Chip 9.1pF
C386	2113743N29	Capacitor Chip 13pF
C387	2113743N30	Capacitor Chip 15pF
C388 to C390	2113743N29	Capacitor Chip 13pF
C391	2113741F49	Capacitor Chip .01µF
C392	2113743F16	Capacitor Chip 1µF
C393	2113743E20	Capacitor Chip 0.1µF
C400	2113743L41	Capacitor Chip .01µF
C401	2113743M24	Capacitor Chip 0.1µF
C402	2113743M24	Capacitor Chip 0.1µF
C403	2113928D08	Capacitor Chip 10µF
C404	2113743N46	Capacitor Chip 68pF
C405	2113743N46	Capacitor Chip 68pF
C407	2113928N01	Capacitor Chip 0.1µF
C408	2113743N46	Capacitor Chip 68pF
C409	2113743M24	Capacitor Chip 0.1µF
C410	2113928N01	Capacitor Chip 0.1µF
C411	2113743M24	Capacitor Chip 0.1µF
C412	2311049A59	Capacitor Tantalum 10µF
C414	2113743M24	Capacitor Chip 0.1µF
C415	2109720D01	Capacitor Chip .01µF
C416	2113928N01	Capacitor Chip 0.1µF
C420	2113743L41	Capacitor Chip .01µF

Circuit Ref	Motorola Part No.	Description
C421	2113928N01	Capacitor Chip 0.1µF
C422	2113743M24	Capacitor Chip 0.1µF
C423	2113743N46	Capacitor Chip 68pF
C424	2311049A59	Capacitor Tantalum 10µF
C425	2113743M24	Capacitor Chip 0.1µF
C426	2113743N46	Capacitor Chip 68pF
C427	2113743N46	Capacitor Chip 68pF
C428	2113743M24	Capacitor Chip 0.1µF
C429	2113743M24	Capacitor Chip 0.1µF
C430	2113928N01	Capacitor Chip 0.1µF
C431	2113743N46	Capacitor Chip 68pF
C433	2113743L41	Capacitor Chip .01µF
C434	2113743M24	Capacitor Chip 0.1µF
C435	2113743M24	Capacitor Chip 0.1µF
C436	2113743N34	Capacitor Chip 22pF
C437	2113743N34	Capacitor Chip 22pF
C438	2113743F18	Capacitor Chip 2.2µF
C439	2113743L17	Capacitor Chip 1000pF
C440	2113743F18	Capacitor Chip 2.2µF
C441	2113743N46	Capacitor Chip 68pF
C442	2113743E20	Capacitor Chip 0.1µF
C443	2113928N01	Capacitor Chip 0.1µF
C444	2113743N46	Capacitor Chip 68pF
C445	2113743N46	Capacitor Chip 68pF
C447	2113743M08	Capacitor Chip .022µF
C448	2113928N01	Capacitor Chip 0.1µF
C449	2113743N46	Capacitor Chip 68pF
C451	2113743M08	Capacitor Chip .022µF
C452	2113743B29	Capacitor Chip 1µF
C453	2113743N46	Capacitor Chip 68pF
C456	2113743N46	Capacitor Chip 68pF
C458	2113743N46	Capacitor Chip 68pF
C459	2113743N46	Capacitor Chip 68pF
C463	2113743N46	Capacitor Chip 68pF
C466	2113743N46	Capacitor Chip 68pF
C467	2113928N01	Capacitor Chip 0.1µF
C471 to C473	2113743N46	Capacitor Chip 68pF
C475	2113743H14	Capacitor Chip 10µF
C476	2113928D08	Capacitor Chip 10µF
C479	2113928N01	Capacitor Chip 0.1µF
C480	2113743G26	Capacitor Chip 4.7µF
C481	2113928N01	Capacitor Chip 0.1µF
C482	2113928N01	Capacitor Chip 0.1µF
C490 to C497	2113743N46	Capacitor Chip 68pF
C502	2311049A05	Capacitor Tantalum 0.47µF
C503	2113743N46	Capacitor Chip 68pF
C505	2113743N46	Capacitor Chip 68pF
C511 to C514	2113743N46	Capacitor Chip 68pF

Circuit Ref	Motorola Part No.	Description
C520 to C523	2113743L41	Capacitor Chip .01µF
C524	2113743N32	Capacitor Chip 18pF
C525 to C529	2113743N48	Capacitor Chip 82pF
C530	2311049A18	Capacitor Tantalum 10µF
C531	2113743N48	Capacitor Chip 82pF
CR101	4880973Z02	Diode PIN MA4PH261
CR102	4880973Z02	Diode PIN MA4PH261
CR251 to CR253	4862824C01	Diode Varactor 1SV229
CR300	4880154K03	Diode Schottky MMBD353LT1
CR301	4802245J41	Diode Switching HSMP3820
CR350	4862824C01	Diode Varactor 1SV229
CR411 to CR413	4802245J62	Diode Array RB731U
CR440	4813833C02	Diode Dual Common Cathode MMBD6100LT1
CR501	4880107R01	Diode Rectifier BYD17D
CR503	4805729G49	Opto-Device LED BRPY1204W
D201	4802233J09	Diode Array IMN10
D202	4802233J09	Diode Array IMN10
E101	2484657R01	2743019447 (for PCB No. 8480641Z03 Rev B only)
E102	2405688Z01	2744044446
E400 to E409	2480640Z01	BK1005HM471
F501	6580542Z01	Protector 1608FF
FL300	9180657Z01	Filter
FL301	9180657Z01	Filter
FL350	4885631B01	Filter 31B01
FL401	4870368G02	Oscillator Crystal 68G02
J101	2880658Z02	Connector
J400	0905505Y04	Connector Multi_pin FH12-40S-0.5SH
J403	0905505Y02	Connector Multi_pin CL586-0524-9
L101	2460591A29	Inductor Airwound 6.61nH
L102	2460591A29	Inductor Airwound 6.61nH
L103	2460591A49	Inductor Airwound 8.01nH
L104	2462587V38	Inductor 220nH
L106	2479990B02	Inductor Airwound 19.61nH
L107	2413926G05	Inductor 6.8nH
L108	2413926G09	Inductor 15nH
L109	2462587V38	Inductor 220nH
L110	2413926G04	Inductor 5.6nH
L111	2413926G06	Inductor 8.2nH
L112	2479990A01	Inductor Airwound 4.22nH

Circuit Ref	Motorola Part No.	Description
L113	2462587V27	Inductor 27nH
L200	2462587Q20	Inductor 2.2µH
L202	2462587Q20	Inductor 2.2µH
L203	2462587V21	Inductor 6.8nH
L204	2462587P25	Inductor 12µH
L250	2462587V21	Inductor 6.8nH
L252	2462587V38	Inductor 220nH
L253	2462587V41	Inductor 390nH
L254	2462587V28	Inductor 33nH
L256 to L260	2462587V38	Inductor 220nH
L261	2462587V26	Inductor 22nH
L262	2462587V38	Inductor 220nH
L263	2462587V25	Inductor 18nH
L264	2462587V24	Inductor 15nH
L265	2462587V30	Inductor 47nH
L301	2462587V20	Inductor 3.3nH
L302	2462587V38	Inductor 220nH
L303	2462587V41	Inductor 390nH
L304	2413926G08	Inductor 12nH
L306	2462587V32	Inductor 68nH
L307	2462587V26	Inductor 22nH
L308	2462587V30	Inductor 47nH
L309	2462587V38	Inductor 220nH
L310	2462587V22	Inductor 8.2nH
L350	2462587Q20	Inductor 2.2µH
L351	2462587T22	Inductor 390nH
L352	2462587T22	Inductor 390nH
L353	2462587V35	Inductor 120nH
L354	2462587T23	Inductor 470nH
L355	2462587V38	Inductor 220nH
L356	2462587T40	Inductor 33nH
L357	2462587Q20	Inductor 2.2µH
L400	2462587Q42	Inductor 390nH
L401	2462587Q42	Inductor 390nH
L410	2462587Q42	Inductor 390nH
L411	2462587Q42	Inductor 390nH
L505	2462587Q42	Inductor 390nH
PB501 to PB505	4080523Z01	Mechanical KSS223G
Q101	5105385Y73	Transistor 85Y73
Q200	4802245J50	Transistor Bipolar
Q210	4802245J50	Transistor Bipolar
Q251	4805218N63	Transistor Bipolar BFQ67W
Q252	4802245J50	Transistor Bipolar
Q302	4802245J56	Transistor Bipolar QSBT0048
Q304	4802245J44	Transistor Bipolar HP415
Q350	4805218N63	Transistor Bipolar BFQ67W
Q400	4809579E18	Transistor FET TP0101T
Q403	4880214G02	Transistor Bipolar MMBT3904L

Circuit Ref	Motorola Part No.	Description
Q405	4802245J54	Transistor Bipolar UMG5N
Q410	4802245J54	Transistor Bipolar UMG5N
Q416	4809579E18	Transistor FET TP0101T
Q417	4802245J50	Transistor Bipolar
Q502	5180159R01	Transistor Bipolar IMX1
Q505	4880214G02	Transistor Bipolar MMBT3904L
R101	0662057A34	Resistor Chip 240
R102	0662057A34	Resistor Chip 240
R103	0662057A18	Resistor Chip 51
R104	0680539Z01	Resistor Chip 0.1
R105	0662057M81	Resistor Chip 2K
R106	0662057M01	Resistor Chip 0
R107	0662057N13	Resistor Chip 39K
R108	0662057N08	Resistor Chip 24K
R109	0662057N20	Resistor Chip 75K
R110	0662057M47	Resistor Chip 75
R111	0680195M01	Resistor Chip 10
R112	0662057M01	Resistor Chip 0
R113	0662057N30	Resistor Chip 200K
R114	0662057M67	Resistor Chip 510
R115	0662057N39	Resistor Chip 470K
R116	0662057M85	Resistor Chip 3K
R117	0662057M98	Resistor Chip 10K
R200	0662057M50	Resistor Chip 100
R202	0662057M88	Resistor Chip 3.9K
R203	0662057M38	Resistor Chip 33
R204	0662057M52	Resistor Chip 120
R206	0662057N10	Resistor Chip 30K
R208	0662057N17	Resistor Chip 56K
R209	0662057M77	Resistor Chip 1.3K
R210	0662057M62	Resistor Chip 330
R213	0662057M50	Resistor Chip 100
R214	0662057N15	Resistor Chip 47K
R216	0662057M01	Resistor Chip 0
R217	0662057M01	Resistor Chip 0
R218	0662057N11	Resistor Chip 33K
R219	0662057M54	Resistor Chip 150
R220	0662057M54	Resistor Chip 150
R222	0662057M01	Resistor Chip 0
R250	0662057M60	Resistor Chip 270
R251	0662057M50	Resistor Chip 100
R253	0662057M26	Resistor Chip 10
R254	0662057N15	Resistor Chip 47K
R255	0662057M62	Resistor Chip 330
R256	0662057M01	Resistor Chip 0
R257	0662057M74	Resistor Chip 1K
R261	0662057M38	Resistor Chip 33
R262	0662057M38	Resistor Chip 33
R263	0662057M60	Resistor Chip 270
R264	0662057M60	Resistor Chip 270

Circuit Ref	Motorola Part No.	Description
R265	0662057N10	Resistor Chip 30K
R266	0662057N10	Resistor Chip 30K
R267	0662057N01	Resistor Chip 12K
R268	0662057N07	Resistor Chip 22K
R270 to R273	0662057M38	Resistor Chip 33
R274	0662057M52	Resistor Chip 120
R275	0662057M26	Resistor Chip 10
R306	0662057M92	Resistor Chip 5.6K
R307	0662057N17	Resistor Chip 56K
R309	0662057M70	Resistor Chip 680
R310	0662057N01	Resistor Chip 12K
R312	0662057M62	Resistor Chip 330
R315	0662057M74	Resistor Chip 1K
R317	0662057M96	Resistor Chip 8.2K
R318	0662057M72	Resistor Chip 820
R320	0662057M52	Resistor Chip 120
R321	0662057M43	Resistor Chip 51
R322	0662057M52	Resistor Chip 120
R323	0662057M87	Resistor Chip 3.6K
R324	0662057M68	Resistor Chip 560
R325	0662057N10	Resistor Chip 30K
R326	0662057M42	Resistor Chip 47
R327	0662057M40	Resistor Chip 39
R328	0662057N03	Resistor Chip 15K
R350	0662057M33	Resistor Chip 20
R351	0662057M52	Resistor Chip 120
R352	0662057N01	Resistor Chip 12K
R353	0662057N01	Resistor Chip 12K
R355	0662057M98	Resistor Chip 10K
R356	0662057M78	Resistor Chip 1.5K
R358	0662057N15	Resistor Chip 47K
R359	0662057M78	Resistor Chip 1.5K
R360	0662057N15	Resistor Chip 47K
R361	0662057M57	Resistor Chip 200
R362	0662057M98	Resistor Chip 10K
R363	0662057N15	Resistor Chip 47K
R364	0662057M81	Resistor Chip 2K
R365	0662057M87	Resistor Chip 3.6K
R366	0662057M78	Resistor Chip 1.5K
R400	0662057N15	Resistor Chip 47K
R401	0662057M01	Resistor Chip 0
R405	0662057M01	Resistor Chip 0
R406	0662057N20	Resistor Chip 75K
R407	0662057N19	Resistor Chip 68K
R409	0662057M98	Resistor Chip 10K
R410	0662057N23	Resistor Chip 100K
R411	0662057M98	Resistor Chip 10K
R413	0662057M01	Resistor Chip 0
R414	0662057V34	Resistor Chip 180K
R415	0662057V26	Resistor Chip 91K

Circuit Ref	Motorola Part No.	Description
R416	0662057M90	Resistor Chip 4.7K
R419	0662057M67	Resistor Chip 510
R420	0662057B46	Resistor Chip 10MEG
R421	0662057M81	Resistor Chip 2K
R423	0662057N39	Resistor Chip 470K
R424	0662057N12	Resistor Chip 36K
R425	0662057N10	Resistor Chip 30K
R426	0662057N35	Resistor Chip 330K
R427	0662057M84	Resistor Chip 2.7K
R428	0662057M10	Resistor Chip 2.2
R429	0662057M98	Resistor Chip 10K
R431	0662057N39	Resistor Chip 470K
R432	0662057N16	Resistor Chip 51K
R434	0662057M62	Resistor Chip 330
R435	0662057M81	Resistor Chip 2K
R436	0662057M74	Resistor Chip 1K
R437	0662057M01	Resistor Chip 0
R438	0662057M54	Resistor Chip 150
R439	0662057M54	Resistor Chip 150
R445	0662057N08	Resistor Chip 24K
R446	0662057N22	Resistor Chip 91K
R447	0662057N38	Resistor Chip 430K
R448	0662057N06	Resistor Chip 20K
R449	0662057N08	Resistor Chip 24K
R450	0683962T45	Resistor Chip 68
R457	0662057M98	Resistor Chip 10K
R460	0662057M90	Resistor Chip 4.7K
R461	0662057M56	Resistor Chip 180
R462	0662057M98	Resistor Chip 10K
R463	0662057M61	Resistor Chip 300
R471	0662057M92	Resistor Chip 5.6K
R472	0662057N12	Resistor Chip 36K
R473	0662057M26	Resistor Chip 10
R475	0662057M01	Resistor Chip 0
R476	0662057N08	Resistor Chip 24K
R477	0662057M74	Resistor Chip 1K
R478	0662057M98	Resistor Chip 10K
R481	0662057N08	Resistor Chip 24K
R492	0662057M01	Resistor Chip 0
R501	0662057M70	Resistor Chip 680
R502	0662057M56	Resistor Chip 180
R505	0662057M98	Resistor Chip 10K
R506	0662057N15	Resistor Chip 47K
R507	0662057M01	Resistor Chip 0
RT400	0680590Z01	Resistor Thermal 33.0K
S501	4080710Z01	Mechanical Rotary Switch (PMUF1063 only)
S501	4080710Z02	Mechanical Rotary Switch (PMUF1064 only)
S502	1880619Z01	Mechanical
SH100	2680507Z01	Mechanical Shield 07Z01

Circuit Ref	Motorola Part No.	Description
SH101	2686081B04	Mechanical Shield 81B04
SH102	2680554Z01	Mechanical Shield 54Z01
SH201	2680511Z01	Mechanical Shield 11Z01
SH202	2680511Z01	Mechanical Shield 11Z01
SH250	2680514Z01	Mechanical Shield 14Z01
SH251	2680513Z01	Mechanical Shield 13Z01
SH301	2680554Z01	Mechanical Shield 54Z01
SH303	2680508Z01	Mechanical Shield 08Z01
SH350	2680508Z01	Mechanical Shield 08Z01
SH351	2680697Z01	Mechanical Shield 97Z01
SH352	2680553Z01	Mechanical Shield 53Z01
SH353	2680514Z01	Mechanical Shield 14Z01
SH400	2680505Z01	Mechanical Shield 05Z01
SH401	2680506Z01	Mechanical Shield 06Z01
SH402	2680515Z01	Mechanical Shield 15Z01
SH403	2680516Z01	Mechanical Shield 16Z01
U101	5102463J66	Analog IC Amp RF2103P
U102	5185765B28	Custom IC H99S-4
U103	5185963A15	Analog IC LM50CIM3X
U201	5185963A27	Custom IC ASIC 63A27
U205	4802245J58	Oscillator DRR030KER900TCT
U206	4802245J57	Oscillator DRR030KE1R225TC
U247	5105739X05	Analog IC ADP3300
U248	5102463J58	Analog IC Voltage Regulator LP2980AIM5
U250	5105750U54	Custom IC Buffer/Driver 50U54
U301	5185963A43	Analog IC MA4EX900L-1226
U302	5185623B01	Digital IC Gate TC7SU04FTE85L
U350	5185623B01	Digital IC Gate TC7SU04FTE85L
U351	5109632D83	Custom IC 32D83
U352	4885622B01	Transistor BF904
U400	5102463J40	Analog IC Voltage Regulator LP2951ACMM-3.3
U404	5185963A53	Custom IC 63A53
U405	5102463J36	Digital IC Memory
* U406	5102463J60	Digital IC Memory AT49LV040-90T1
* U407	5102463J64	Digital IC Memory X25128-2.7
U409	5102226J56	Digital IC Microprocessor MC68HC11FL0PU1
U410	5102463J57	Analog IC Voltage Regulator ILC7062
U420	5102463J44	Analog IC Amp TDA8547TS

Circuit Ref	Motorola Part No.	Description
VR432 to VR433	4805656W08	Diode MMQA5V6T1
VR434	4802245J73	Diode Zener UDZSTE17
VR445 to VR449	4802245J74	Diode Zener UDZSTE17
VR450	4802245J75	Diode Zener UDZSTE17
VR501	4813830A18	Diode Zener MMBZ5235BLT1
VR502	4880140L17	Diode Zener MMBZ5242B
VR503 to VR508	4802245J73	Diode Zener UDZSTE17
Y200	4802245J68	Oscillator Crystal TTS12V

* Motorola Depot Servicing only

Reference designators with an asterisk indicate components which are not fieldreplaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

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