

ASTRO[®]

XTS[™] 4000

Portable Radio

Detailed Service Manual





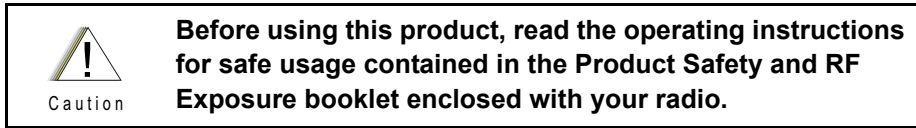
ASTRO® XTS™ 4000
Digital Portable Radios
Detailed Service Manual

Foreword

The information contained in this manual relates to all ASTRO® XTS™ 4000 digital portable radios, unless otherwise specified. This manual provides sufficient information to enable qualified service shop technicians to troubleshoot and repair an ASTRO XTS 4000 digital portable radio to the component level.

For details on the operation of the radio or level 1 or 2 maintenance procedures, refer to the applicable manuals, which are available separately. A list of related publications is provided in the section, “[Related Publications](#),” on page x.

Product Safety and RF Exposure Compliance



ATTENTION!

This radio is restricted to occupational use only to satisfy FCC RF energy exposure requirements. Before using this product, read the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet enclosed with your radio (Motorola Publication part number 6881095C98) to ensure compliance with RF energy exposure limits.

For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site which lists approved accessories: <http://www.motorola.com/governmentandenterprise>

Manual Revisions

Changes which occur after this manual is printed are described in FMRs (Florida Manual Revisions). These FMRs provide complete replacement pages for all added, changed, and deleted items, including pertinent parts list data, schematics, and component layout diagrams. To obtain FMRs, contact the Customer Care and Services Division (refer to “Appendix A Replacement Parts Ordering”).

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Document History

The following major changes have been implemented in this manual since the previous edition:

Edition	Description	Date
6871620L01-A	Initial edition	Mar 2007
6871620L01-B	Added UHF info	Jan 2008
6871620L01-C	Added Parts List for NUE7350B	May 2008

Table of Contents

Foreword	ii
Product Safety and RF Exposure Compliance	ii
Manual Revisions	ii
Computer Software Copyrights.....	ii
Document Copyrights	ii
Disclaimer	ii
Trademarks.....	ii
 Document History	 iii
 List of Figures	 vii
 List of Tables	 ix
 Commercial Warranty	 xi
Limited Warranty.....	xi
 Chapter 1 Introduction	 1-1
1.1 General	1-1
1.2 Notations Used in This Manual	1-2
1.3 General Repair Procedures and Techniques.....	1-3
 Chapter 2 Radio Power	 2-1
2.1 General	2-1
2.2 DC Power Routing—Transceiver Section	2-2
2.3 DC Power Routing—VOCON Section	2-2
 Chapter 3 Theory of Operation.....	 3-1
3.1 Transceiver Section	3-2
3.2 VOCON Section.....	3-13
3.3 Encryption Module	3-29

Chapter 4 Troubleshooting Procedures 4-1

4.1	Handling Precautions.....	4-1
4.2	Recommended Service Tools.....	4-2
4.3	Voltage Measurement and Signal Tracing.....	4-3
4.4	Standard Bias Table	4-4
4.5	Power-Up Self-Check Errors	4-5
4.6	Power-Up Self-Check Diagnostics and Repair (Not for Field Use).....	4-6

Chapter 5 Troubleshooting Charts 5-1

5.1	List of Troubleshooting Charts.....	5-1
5.2	Main Troubleshooting Flowchart.....	5-2
5.3	Power-Up Failure	5-3
5.4	DC Supply Failure.....	5-6
5.5	Display Failure	5-10
5.6	Volume Set Error	5-13
5.7	Button Test	5-14
5.8	Top/Side Button Test.....	5-15
5.9	VCO TX/RX Unlock	5-16
5.10	VOCON TX Audio.....	5-17
5.11	VOCON RX Audio	5-19
5.12	RX RF	5-21
5.13	TX RF	5-26
5.14	Keyload Failure	5-29
5.15	Secure Hardware Failure	5-30

Chapter 6 Troubleshooting Waveforms 6-1

6.1	List of Waveforms	6-1
6.2	24.576 MHz Clock	6-2
6.3	16.8 MHz Buffer Input and Output.....	6-3
6.4	32.768 kHz Clock Outputs	6-4
6.5	Receive Serial Audio Port (SAP)	6-5
6.6	Receive Baseband Interface Port (RX BBP)	6-6
6.7	Transmit Baseband Interface Port (TX BBP).....	6-7

Chapter 7 Troubleshooting Tables 7-1

7.1	List of Board and IC Signals	7-1
-----	------------------------------------	-----

Chapter 8 Schematics, Board Overlays, and Parts Lists – VHF..... 8-1

8.1	List of Schematics and Boards Overlays	8-1
8.2	List of Partslist	8-1
8.3	General Section	8-2
8.4	Transceiver (RF) Section.....	8-5
8.5	VOCON Section.....	8-12
8.6	Main Board (NUD7115B) Parts List.....	8-18

Chapter 9 Schematics, Board Overlays, and Parts Lists – UHF 9-1

9.1	List of Schematics and Boards Overlays	9-1
9.2	List of Partslist.....	9-1
9.3	General Section	9-2
9.4	Transceiver (RF) Section	9-5
9.5	VOCON Section.....	9-13
9.6	Main Board (NUE7350A) Parts List	9-18
9.7	Main Board (NUE7350B) Parts List	9-28

Appendix A Replacement Parts Ordering.....A-1

A.1	Basic Ordering Information	A-1
A.2	Motorola Online.....	A-1
A.3	Mail Orders	A-1
A.4	Telephone Orders	A-1
A.5	Fax Orders	A-2
A.6	Parts Identification	A-2
A.7	Product Customer Service	A-2

Appendix B Motorola Service CentersB-1

B.1	Servicing Information	B-1
B.2	Motorola Service Center	B-1
B.3	Motorola Federal Technical Center.....	B-1
B.4	Motorola Canadian Technical Logistics Center	B-1

Glossary Glossary-1

Index Index-1

List of Figures

Figure 2-1. DC Power Distribution – VHF/ UHF Radio.....	2-1
Figure 3-1. XTS 4000 Overall Block Diagram	3-1
Figure 3-2. RF Transceiver Block Diagram	3-2
Figure 3-3. Receiver Block Diagram	3-4
Figure 3-4. Abacus III (AD9864) Functional Block Diagram (from data sheet)	3-6
Figure 3-5. Transmitter Block Diagram	3-7
Figure 3-6. VOCON Section Connections.....	3-13
Figure 3-7. Patriot EIM and Memory Block Diagram.....	3-18
Figure 3-8. CE Connector	3-23
Figure 3-9. Control Top Flex.....	3-25
Figure 3-10. VOCON Transmit Audio Path	3-26
Figure 3-11. VOCON Receive Audio Path	3-27
Figure 3-12. Radio ON/OFF Circuitry.....	3-28
Figure 6-1. 24.576 MHz Clock Waveform	6-2
Figure 6-2. 16.8 MHz Buffer Input and Output Waveforms	6-3
Figure 6-3. 32.768 kHz Clock Outputs Waveforms	6-4
Figure 6-4. Receive Serial Audio Port (SAP) Waveforms	6-5
Figure 6-5. Receive Baseband Interface Port (RX BBP) Waveforms	6-6
Figure 6-6. Transmit Baseband Interface Port (TX BBP) Waveforms	6-7
Figure 8-1. Main Board Layout (NUD7115B) – Side 1	8-2
Figure 8-2. Main Board Layout (NUD7115B) – Side 2	8-3
Figure 8-3. VHF Main Board Overall Schematic	8-4
Figure 8-4. VHF Transceiver (RF) Board Overall Circuit Schematic.....	8-5
Figure 8-5. VHF Transceiver (RF) Antenna Switch and Harmonic Filter Circuits	8-6
Figure 8-6. VHF Transceiver (RF) Receiver Front End Circuit.....	8-7
Figure 8-7. VHF Transceiver (RF) Receiver Back End Circuit.....	8-8
Figure 8-8. VHF Transceiver (RF) Transmitter Circuit	8-9
Figure 8-9. VHF Frequency Generation Unit (Synthesizer) Circuit – 1 of 2	8-10
Figure 8-10. VHF Frequency Generation Unit (VCO) Circuit – 2 of 2	8-11
Figure 8-11. VOCON: Overall Circuit Schematic	8-12
Figure 8-12. VOCON: Audio, Connector Interface Circuits	8-13
Figure 8-13. VOCON: Controller and Memory Circuits	8-14
Figure 8-14. VOCON: DC Power, Clocks and ON/OFF Circuit.....	8-15
Figure 8-15. VOCON: Audio and Accessory Interface Circuits	8-16
Figure 8-16. VOCON: Miscellaneous Circuits	8-17
Figure 9-1. Main Board Layout (NUE7350A/B) – Side 1	9-2
Figure 9-2. Main Board Layout (NUE7350A/B) – Side 2	9-3
Figure 9-3. UHF Main Board Overall Schematic	9-4
Figure 9-4. UHF Transceiver (RF) Board Overall Circuit Schematic.....	9-5
Figure 9-5. UHF Transceiver (RF) Antenna Switch and Harmonic Filter Circuits	9-6
Figure 9-6. UHF Transceiver (RF) Receiver Front End Circuit	9-7
Figure 9-7. UHF Transceiver (RF) Receiver Back End Circuit.....	9-8
Figure 9-8. UHF Transceiver (RF) Transmitter Circuit	9-9
Figure 9-9. UHF Frequency Generation Unit (Synthesizer) Circuit – 1 of 3	9-10
Figure 9-10. UHF Frequency Generation Unit (TX VCO) Circuit – 2 of 3	9-11
Figure 9-11. UHF Frequency Generation Unit (RX VCO) Circuit – 3 of 3	9-12
Figure 9-12. VOCON: Overall Circuit Schematic	9-13
Figure 9-13. VOCON: Audio, Connector Interface Circuits	9-14

Figure 9-14. VOCON: Controller and Memory Circuits	9-15
Figure 9-15. VOCON: DC Power, Clocks and ON/OFF Circuit	9-16
Figure 9-16. VOCON: Audio and Accessory Interface Circuits	9-17

List of Tables

Table 1-1.	Lead Free Solder Wire Part Number List.....	1-3
Table 1-2.	Lead Free Solder Paste Part Number List.....	1-3
Table 2-1.	Conventional Batteries.....	2-1
Table 2-2.	Transceiver Voltage Regulators.....	2-2
Table 2-3.	VOCON Section DC Power Distribution	2-3
Table 3-1.	Battery Connector M1705.....	3-2
Table 3-2.	Transceiver – VOCON Interface Signals	3-3
Table 3-3.	Power Control IC (U104) Pin Descriptions.....	3-9
Table 3-4.	Option-Select Functions	3-23
Table 3-5.	ON/OFF Operation Truth Table.....	3-29
Table 3-6.	Encryption Module Software Kits and Algorithms	3-29
Table 4-1.	Recommended Service Tools	4-2
Table 4-2.	Standard Operating Bias.....	4-4
Table 4-3.	Power-Up Self-Check Error Codes	4-5
Table 4-4.	Power-Up Self-Check Diagnostic Actions.....	4-6
Table 5-1.	Troubleshooting Charts List	5-1
Table 6-1.	List of Waveforms	6-1
Table 7-1.	List of Tables of Board and IC Signals	7-1
Table 7-2.	J1 Mainboard to Keypad Flex and Display Module.....	7-2
Table 7-3.	J2 Mainboard to UCM, CE and Audio Jack Board.....	7-4
Table 7-4.	J3 Mainboard to Top and Side Control Flex.....	7-5
Table 7-5.	U1410 FLASH Pinouts.....	7-6
Table 7-6.	U1409 SRAM Pinouts.....	7-8
Table 7-7.	U1401 Patriot MCU/DSP IC Pinouts.....	7-10
Table 7-8.	U1304 MAKO Pinouts.....	7-19
Table 8-1.	List of Mainboard Schematics and Board Overlays.....	8-1
Table 8-2.	List of Partslist.....	8-1
Table 9-1.	List of Mainboard Schematics and Board Overlays.....	9-1
Table 9-2.	List of Partslist.....	9-1

Related Publications

XTS 4000 Digital Portable Radio User Guide.....	6871618L01
XTS 4000 Digital Portable Radios Basic Service Manual	6871619L01
XTS 4000 Digital Portable Radio User Guide (CD)	PMLN5057_
Chassis Eliminator Leaflet.....	6871568M01

Commercial Warranty

Limited Warranty

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ASTRO XTS 4000 Digital Portable Units	One (1) Year
Product Accessories	One (1) Year

Motorola, at its option, will at no charge either repair the Product (with new or reconditioned parts), replace it (with a new or reconditioned Product), or refund the purchase price of the Product during the warranty period provided it is returned in accordance with the terms of this warranty. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All replaced parts of Product shall become the property of MOTOROLA.

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- G. Rechargeable batteries if:
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 - the damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.
- H. Freight costs to the repair depot.
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VII. Governing Law

This Warranty is governed by the laws of the State of Illinois, USA.

Notes

Chapter 1 Introduction

1.1 General

This manual includes all the information needed to maintain peak product performance and maximum working time for the ASTRO XTS 4000 radio. This detailed level of service (component level) is typical of the service performed by some service centers, self-maintained customers, and distributors.

Use this manual in conjunction with the *ASTRO XTS 4000 Digital Portable Radios Basic Service Manual* (Motorola part number 6871619L01), which can help in troubleshooting a problem to a particular printed circuit (PC) board.

Conduct the basic performance checks outlined in the basic service manual first to verify the need to analyze the radio and to help pinpoint the functional problem area. In addition, you will become familiar with the radio test mode of operation, which is a helpful tool. If any basic receive or transmit parameters fail to be met, the radio should be aligned according to the radio alignment procedure.

Included in other areas of this manual are functional block diagrams, detailed theory of operation, troubleshooting charts and waveforms, schematics, and parts lists. You should become familiar with these sections to aid in determining circuit problems. Also included are component location diagrams to aid in locating individual circuit components and some IC diagrams, which identify some convenient probe points.

[“Chapter 3, Theory of Operation,” on page 3-1](#), contains detailed descriptions of the operations of many circuits. Once you locate the problem area, review the troubleshooting flowchart for that circuit to fix the problem.

1.2 Notations Used in This Manual

Throughout the text in this publication, you will notice the use of warnings, cautions, and notes. These notations are used to emphasize that safety hazards exist, and care must be taken and observed.

NOTE: An operational procedure, practice, or condition that is essential to emphasize.



Caution

CAUTION indicates a potentially hazardous situation which, if not avoided, might result in equipment damage.



WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or injury.



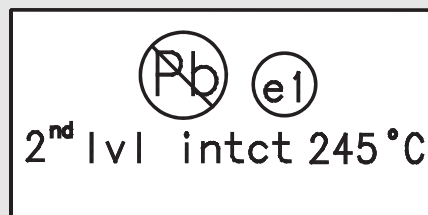
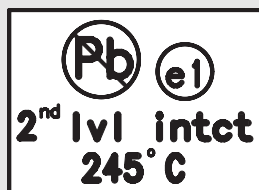
DANGER

DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or injury.

1.3 General Repair Procedures and Techniques

NOTE

Environmentally Preferred Products (EPP) (refer to the marking on the printed circuit boards — examples shown below) were developed and assembled using environmentally preferred components and solder assembly techniques to comply with the European Union's **Restriction of Hazardous Substances (ROHS) Directive 2002/95/EC** and **Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC**. To maintain product compliance and reliability, use only the Motorola specified parts in this manual.



Any rework or repair on Environmentally Preferred Products must be done using the appropriate lead-free solder wire and lead-free solder paste as stated in the following table:

Table 1-1. Lead Free Solder Wire Part Number List

Motorola Part Number	Alloy	Flux Type	Flux Content by Weight	Melting Point	Supplier Part number	Diameter	Weight
1088929Y01	95.5Sn/3.8Ag/0.7Cu	RMA Version	2.7-3.2%	217C	52171	0.015"	1lb spool

Table 1-2. Lead Free Solder Paste Part Number List

Motorola Part Number	Manufacturer Part Number	Viscosity	Type	Composition & Percent Metal	Liquid Temperature
1085674C03	NC-SMQ230	900-1000KCPs Brookfield (5rpm)	Type 3 (-325/+500)	(95.5%Sn-3.8%Ag-0.7%Cu) 89.3%	217°C

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 Radio Products and Solutions Organization listed in [Appendix A](#) of this manual.

1.3.1 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 connector pins:

- 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.

1.3.2 Chip Components

Use the RLN4062 Hot-Air Repair Station for chip component replacement. Adjust the temperature control to 390 °C (735 °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.

NOTE Parts U1401 and U1304 are not field repairable. For failures relating to U1401 and U1304, the mainboard has to be replaced.

1.3.3 Shields

Removing and replacing shields is recommended to be done with the Air Blower, BOSCH GHG 600-3 or equivalent.

- **To remove the shield:**
 1. Place the circuit board in the circuit board holder.
 2. Add solder paste flux around the base of the shield.
 3. Position the heat-focus head onto the shield.
 4. Turn on the heater and wait until the shield lifts off the circuit board.
 5. Once the shield is off, turn off the heat, and grab the part with a pair of tweezers.
 6. Remove the circuit board from the 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 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.
 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.

Notes

Chapter 2 Radio Power

This chapter provides a detailed circuit description of the power distribution of an ASTRO XTS 4000 radio.

2.1 General

In the ASTRO XTS 4000 radio, power (B+) is distributed to two sections: the transceiver (RF) section and the VOCON section (see Figure 2-1.)

Power for the radio is provided through a battery supplying a nominal 7.5 Vdc directly to the mainboard. The following battery types and capacities are available:

Table 2-1. Conventional Batteries

Part Number	Description
NNTN6944	630mAH Li-Ion Battery

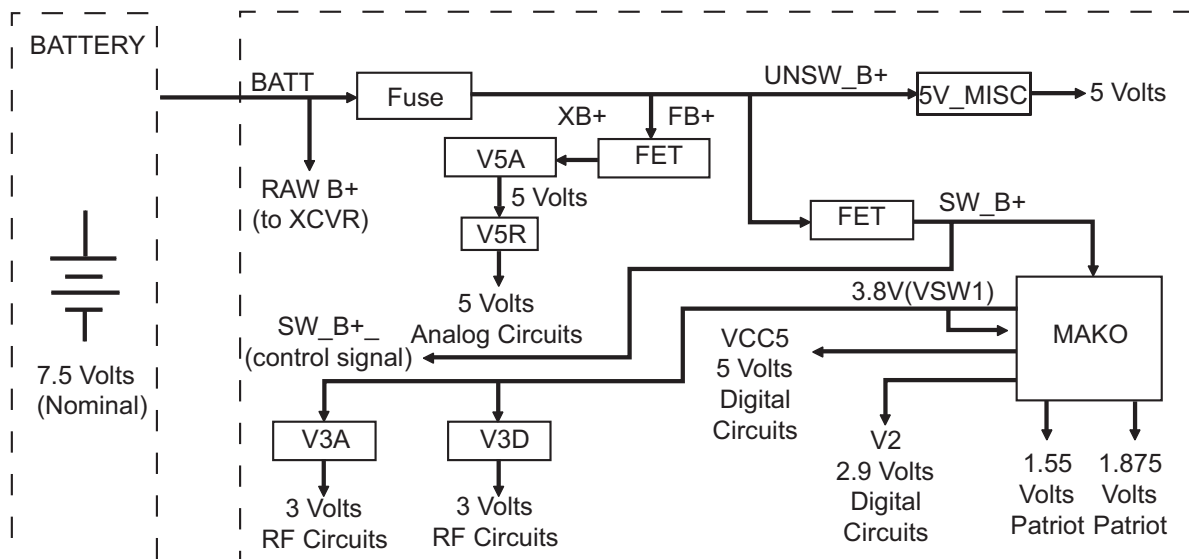


Figure 2-1. DC Power Distribution – VHF/ UHF Radio

B+ from the battery is electrically switched to most of the radio. The electrical switching of B+ supports a *keep-alive* mode. Under software control, even when the radio is turned off, power remains on until the MCU completes its power-down, at which time the radio is physically powered down.

2.2 DC Power Routing—Transceiver Section

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of schematics showing the transceiver board DC power routing components.

Contact M1705, the B-plus assembly, connects the battery to the mainboard. Capacitors C20 and C24 provide protection against momentary breaks at the B-plus connector due to contact bounce when the radio is dropped.

VHF/ UHF: Components C4, C6 and E101 forms a power-line filter for signal RAWB+, which supplies battery voltage to the transmitter PA.

Transistor Q1301, controlled by signal FET_ENX from the MAKO IC, turns on XSWB+2, which supplies to the 5-V linear regulator, U1 and TX_ALC block.

Fuse F901 and filter E1104, C1128 and C1129 supply fused B-plus to the VOCON section. In turn, the VOCON section supplies VSW1, regulated 3.8 Vdc, from the MAKO (Audio, Power & Accessory Interface IC) switching regulator to the XCVR. VSW1 supplies to the 3V linear regulators in the transceiver section. The XCVR regulated power supplies are summarized in [Table 2-2](#).

Table 2-2. Transceiver Voltage Regulators

Ref. Desig.	IC Name	Output Signal Name	Description
U1	LP2989	V5A	Regulated 5.0 Vdc
U2	LP3985	V3D	Regulated 3.0 Vdc digital
U3	LP3985	V3A	Regulated 3.0 Vdc analog for synthesizer

2.3 DC Power Routing—VOCON Section

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of schematics showing the VOCON section DC power routing components.

UNSW_B+, or unswitched B+, is routed to Q1301, Q1302 and the MAKO on the VOCON section.

The ON/OFF circuitry block is made up of Q9906, U9901, U9902, U9918, U9903 and Q9904. The ON_OFF signal triggers the ON/OFF circuitry block which pulls the MECH_SW pin of the MAKO low, enabling the routing of SWB+ to the XCVR and VOCON sections and the encryption module. SW B+ and UNSW B+ are also supplied to the encryption module through connector J701.

Transistor Q9906 is also under the control of the microcontroller unit (MCU) via V2_FIL from MAKO. This allows the MCU detect the pressing of the ON/OFF button and to follow an orderly power-down sequence when it senses that SWB+ is off. This sense is provided through MECH_SW.

The digital circuits in the VOCON section are powered from regulators located in the MAKO IC (U1304). The MAKO IC provides five supplies: VSW1, V2, V1.55, V1.875 and VCC5. These regulators are software programmable except for VCC5. [Table 2-3](#) lists the supply voltages and the circuits that use these voltages.

Table 2-3. VOCON Section DC Power Distribution

Supply Name	Output Voltage	Supply Type	Unprogrammed Output Voltage	Circuits Supplied
UNSW_B+	9 to 6 Vdc 7.5 Vdc nominal	Battery	N/A	MAKO IC 5V Misc. Regulator
SW_B+	9 to 6 Vdc 7.5 Vdc nominal	Battery	N/A	MAKO XCVR 5V Regulator CE Interface Encryption Module
VCC5	5Vdc	Linear Regulator	N/A	MAKO Int. / ext. microphone bias MAKO Audio preamplifier
VSW1	3.8 Vdc	Switching regulator software programmable	3.2 Vdc	3-V regulators (XCVR) VSW2 input V2 input
V1.875	1.875 Vdc	Switching regulator software programmable	1.9 Vdc	Patriot core FLASH IC SRAM Display module
V2	2.9 Vdc	Linear regulator software programmable	2.775 Vdc	Patriot I/O ring Display module 16.8 MHz buffer
V1.55	1.55 Vdc	Linear regulator	N/A	Patriot core

Notes

Chapter 3 Theory of Operation

This chapter provides a detailed circuit description of the ASTRO XTS 4000 mainboard (contains RF transceiver and VOCON sections). When reading the theory of operation, refer to the appropriate schematic and component location diagrams located in the back of this manual. This detailed theory of operation can help isolate the problem to a particular component.

The ASTRO XTS 4000 digital portable radio is a microcontroller-based transceiver incorporating a digital signal processor (DSP). The microcontroller handles the general radio control, monitors status, and processes commands input from the keypad or other user controls. The DSP processes the typical analog signals, and generates the standard signaling digitally to provide compatibility with existing analog systems. In addition, the DSP provides digital modulation techniques, utilizing voice encoding techniques with error correction schemes. This provides the user with enhanced range and audio quality, all in a reduced bandwidth channel requirement. It allows embedded signaling, which can mix system information and data with digital voice to support a multitude of system features.

The ASTRO XTS 4000 radio (see [Figure 3-1](#)) consists of the following:

- Band-dependent mainboard (contains RF Transceiver and VOCON sections)
- Front Flip Assembly (containing Display, Keypad and Encryption Module)
- Radio Chassis Assembly (containing Audio Jack, CE Interface Connector and Controls)

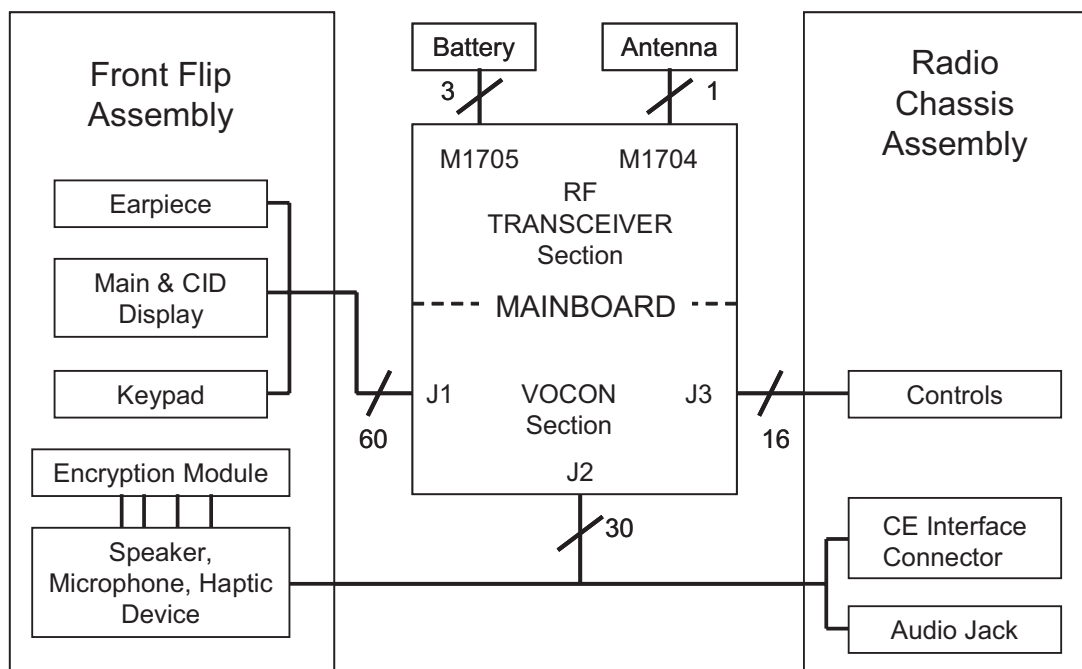


Figure 3-1. XTS 4000 Overall Block Diagram

3.1 Transceiver Section

The transceiver (XCVR) section performs the transmitter and receiver functions necessary to translate between voice and data from the VOCON section and the modulated radio-frequency (RF) carrier at the antenna. The transceiver section contains all the radio's RF circuits for the following major components:

- Receiver
- Transmitter
- Frequency Generation Unit (FGU)

Figure 3-2 illustrates the transceiver board block diagram.

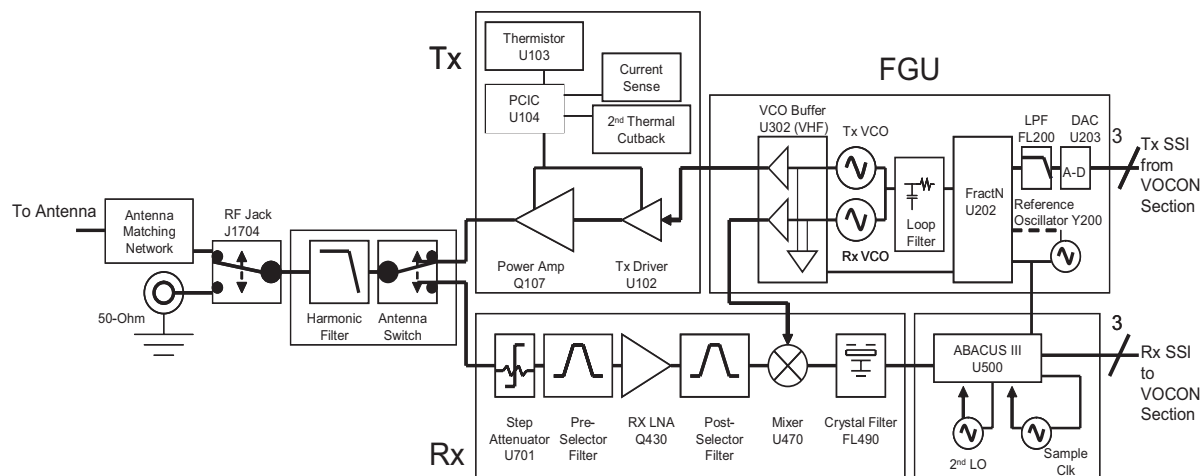


Figure 3-2. RF Transceiver Block Diagram

3.1.1 Connections

This section describes the various connections to and from the transceiver section.

3.1.1.1 Battery Connector M1705

Battery connector M1705 consists of three gold-plated contacts on the printed circuit board that mate with the battery. Signal descriptions are in Table 3-1.

Table 3-1. Battery Connector M1705

Pin No.	Signal	Description
1	POS	Battery positive terminal, nominally 7.5 Vdc
2	DATA	Battery status, from battery to VOCON section
3	NEG	Battery negative terminal, tied to PCB GROUND

3.1.1.2 Transceiver and VOCON Section Interface

The transceiver and VOCON section interface is a digital interface carrying DC power, control, and data between the XCVR and VOCON sections.

Table 3-2 lists the interface connections, their signals, and functions. SPI refers to serial peripheral interface, which is the control bus from the microprocessor. SSI is the serial synchronous interface bus for data to and from the DSP. There is a RX SSI bus for demodulated data from the receiver and a TX SSI bus for modulation data to the transmitter.

Table 3-2. Transceiver – VOCON Interface Signals

VOCON Signal	XCVR Signal	XCVR I/O	Type	Description
XRFUNSWB+1	FUB+	O	dc	Fused B+ to VOCON
XLOCK	LOCK	O	status	FGU lock detect
XTX_DATA	TXTD	O	ssi	TX SSI data
XSSI_CLK	RXCK	O	ssi	RX SSI clock
XSSI_FSYNC	RXFS	O	ssi	RX SSI frame sync
X16.8MHz	F168	O	RF	16.8 MHz reference clock
XSWB+2	XCVR_SWB+	I	dc	Switch control
XTX_SSFS	TXFS	I	ssi	TX SSI frame sync
XTS_SSCK	TXCK	I	ssi	TX SSI clock
XRX_DATA	RXDO	O	ssi	RX SSI data
XABACUS3_CS	ABCS	I	ssi	SPI Abacus chip select
XRF_VSW1	VSW1	I	dc	Regulated 3.8 V
XRF_SCKA	SPCK	I	spi	SPI clock
XRF_BAT_STAT	DATA	O	dc	Battery status
XRF_MOSIA	MOSI	I/O	spi	SPI data I/O
XFN_PC_SEL	USEL	I	spi	SPI universal chip select
XRF_POR	RSTL	I/O	control	asynchronous reset, active low

3.1.1.3 Antenna Contact M1704

Antenna contact M1704 is a surface mount, leaf spring contact which comes into contact with the antenna pin on the radio chassis assembly. This contact routes the RF power to/from the transceiver to the antenna.

3.1.1.4 Power Conditioning Components

DC power-conditioning components include zener diodes, capacitors, ferrite beads, a power inductor, and the fuse. Diode VR3 provides over-voltage protection. Ferrite beads (designated E1104, etc.) and capacitors suppress electromagnetic interference from the transceiver. The power-line filter consisting of C4, C6, C20 and C24, suppresses digital noise from the VOCON section switching power supplies that could degrade the transmitter spectral purity.

Pass transistor Q1301 switches the battery voltage to the transceiver when control signal SWB+ or XSWB+2 from the VOCON section is asserted high. This increases the transceiver's immunity to conducted interference that might be present on SWB+ or XSWB+2, such as from switching voltage regulators on the VOCON section.

The gold plated perimeter of the PC Board surfaces are critical to the GROUNDing of the radio system. The front flip assembly and radio chassis assembly sandwiches the PC Board to create a clam-like shielding design for the radio. The arrangement creates a good GROUNDing connection for the entire radio assembly. The radio GROUNDing is a necessary electrical reference point to complete the antenna circuit path. Shields SH01 through SH11 appear on the schematic to show their connection to GROUND.

3.1.2 Receiver

The XTS 4000 transceiver has a dual-conversion superheterodyne receiver. [Figure 3-3](#) illustrates the major receiver components:

- Receiver Front End
- Receiver Back End

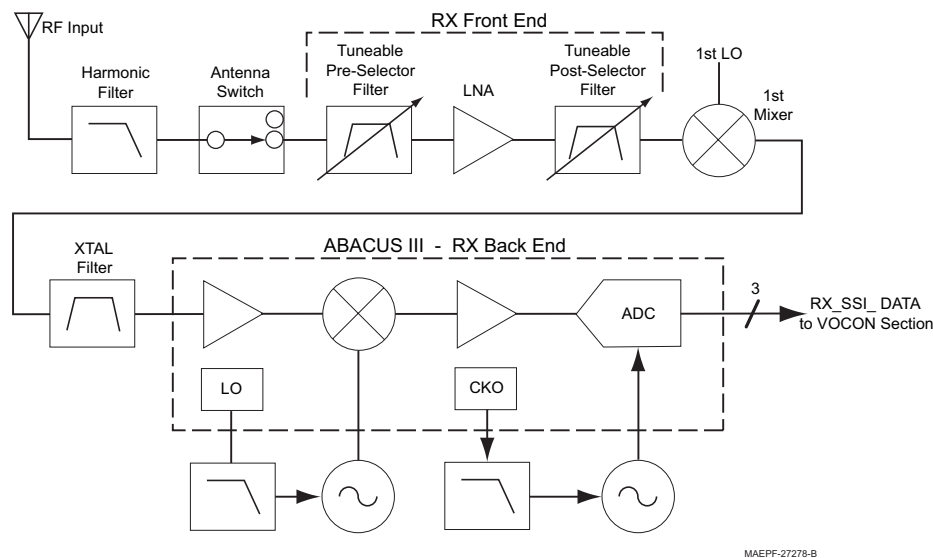


Figure 3-3. Receiver Block Diagram

3.1.2.1 Receiver Front End

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,”](#) on [page 8-1](#) for a listing of receiver front end schematics.

The receiver front end tunes to the desired channel and down converts the RF signal to the first intermediate frequency (IF). Channel selection is by way of a tuneable local oscillator, RXLO, from the FGU.

The receiver front end consists of a pre-selector filter, an RF amplifier, a post-selector filter, mixer, and an IF crystal filter. A switchable attenuator is also inserted between the antenna switch and the pre-selector filter. The RF amplifier is a discrete RF transistor with associated circuitry. The mixer is a double-balanced, active mixer IC, coupled by transformers. The receiver (RX) local oscillator (LO) is provided by the FGU.

3.1.2.1.1 Pre-Selector and Post-Selector Filters

VHF/ UHF: The receiver front end uses two discrete, tunable, bandpass filters to achieve its required out-of-band rejection. The pre-selector filter precedes the RF amplifier, while the post-selector filter follows the RF amplifier. DAC2, from the PCIC, is used to simultaneously tune both the pre-selector and post-selector filters by applying voltage to the varactors.

3.1.2.1.2 LNA (Low-Noise Amplifier)

The XTS 4000 radio uses a discrete transistor for the low-noise amplifier Q430. A feedback network between the collector and base improves stability and gain balance across the frequency band. Input and output LC networks match the LNA impedance to 50 ohms.

A diode limiter D703 protects the amplifier damage by strong input signals.

3.1.2.1.3 Mixer

The mixer U470 down-converts the received RF to the first intermediate frequency (IF). The IF is 44.85 MHz (VHF) and 73.35 MHz (UHF). High-side LO injection is used for the VHF whereas low-side LO injection is used for the UHF. Transformers are used as baluns to convert signals from single-ended to balanced at pins RFN and RFP. An output transformer converts the balanced signal at pins IFN and IFP to a single-ended output.

3.1.2.1.4 IF Filter (Crystal Filter)

The IF filter FL490 is a leadless, surface-mount, 3-pole, quartz crystal filter. This narrow bandpass filter gives the radio its adjacent-channel and alternate-channel rejection performance.

An input LC network matches the filter impedance to 50 ohms. The output match for the filter matches the IF Filter output port to the ABACUS III input.

3.1.2.2 Receiver Back End

The receiver back end, which consists of the Abacus III (AD9864 IF digitizing subsystem) IC and its associated circuitry, processes the down-converted IF signal to produce digital data for final processing by the VOCON DSP.

NOTE: Refer to [Table 8.1, "List of Schematics and Boards Overlays," on page 8-1](#) for a listing of receiver back end schematics.

3.1.2.2.1 Abacus III IC U500

The AD9864 ([see Figure 3-4 on page 3-6](#)) is a general-purpose, IF subsystem that digitizes a low-level 10–300 MHz IF input with a bandwidth up to 270 kHz. The output of the Abacus III IC is SSI data to the VOCON.

The signal chain of the AD9864 consists of a low-noise amplifier, a mixer, a bandpass sigma-delta A/D converter, and a decimation filter with programmable decimation factor. An automatic gain control (AGC) circuit provides the AD9864 with 12 dB of continuous gain adjustment. The high dynamic range and inherent anti-aliasing provided by the bandpass sigma-delta converter allow the AD9864 to cope with blocking signals 80 dB stronger than the desired signal.

Auxiliary blocks include frequency synthesizers for the second LO and sampling clock LO, as well as an SPI port. The second LO uses a discrete external loop filter and VCO. The clock oscillator has an external loop filter and resonator.

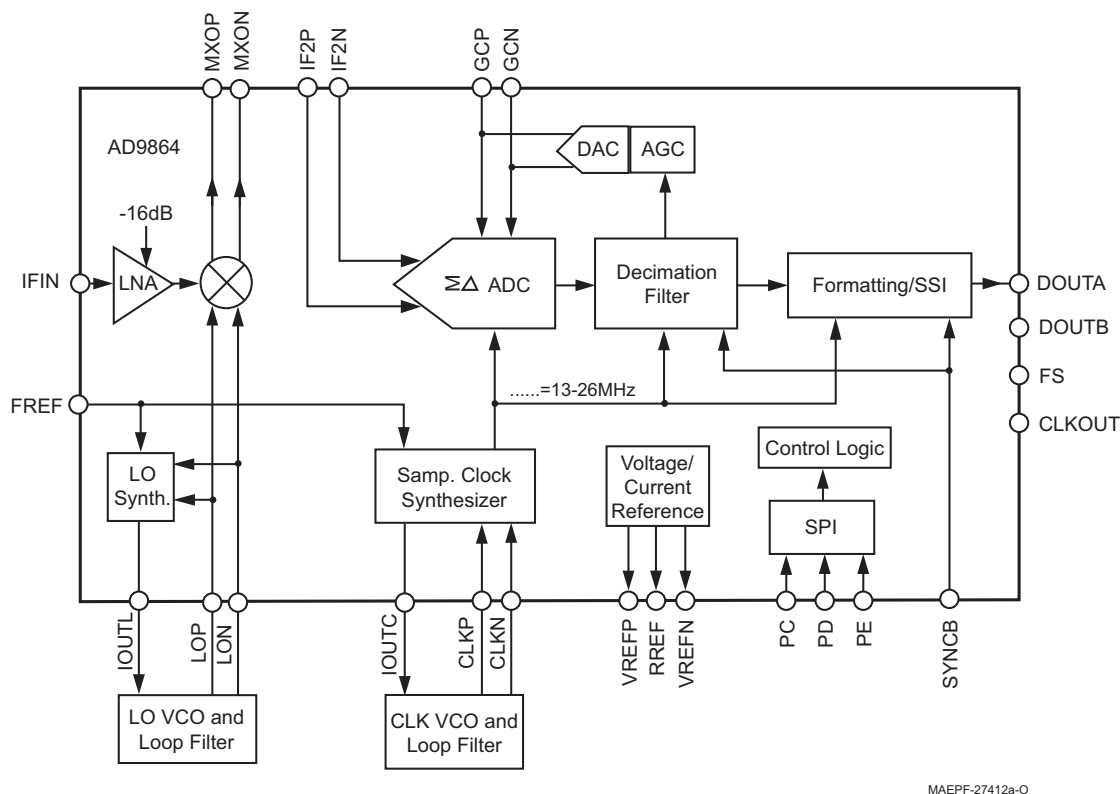


Figure 3-4. Abacus III (AD9864) Functional Block Diagram (from data sheet)

Input signal RXIF is the 44.85 MHz (VHF) and 73.35 MHz (UHF) IF from crystal filter FL490 in the receiver front end.

VHF: Components L491 and C491 match the input impedance of the ABACUS III to the IF Filter.

UHF: Components C584 and C491 match the input impedance of the ABACUS III to the IF Filter.

3.1.2.2.2 Second Local Oscillator

The second LO is controlled by the Abacus LO synthesizer, which mixes with IFIN to produce a 2.25 MHz final IF. The external VCO consists of Q550 and its bias network and frequency-determining elements. Signal FREF is the 16.8 MHz reference from the FGU. Darlington transistor Q551 with C583 and R552 form an active power-line filter.

The second LO frequency is 42.6 MHz (VHF) and 71.1 MHz (UHF) by default, or 47.1 MHz (VHF) and 75.6 MHz (UHF) in special cases as needed to avoid radio self-quieters. The loop filter is composed of R551, C551, C552, and C553.

3.1.2.2.3 Sampling Clock Oscillator

The Abacus sampling clock synthesizer operates at 18 MHz = 8 x 2.25 MHz. The VCO uses an internal transistor and external resonator. The resonator is composed of L570, C573, and D570.

The loop filter is composed of R571, C570, C571, and C572.

3.1.3 Transmitter

The transmitter takes modulated RF from the FGU and amplifies it to the radio's rated output power to produce the modulated transmitter carrier at the antenna.

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of transmitter-related schematics that will aid in the following discussion.

The transmitter (see [Figure 3-5](#)) consists of an RF driver IC that receives its input signal from the voltage-controlled oscillator (VCO) and a high-power output transistor. Transmitter power is controlled by a power-control IC (PCIC) that senses the total current drawn by the transmit gain stages and adjusts PA control voltages to maintain a constant power level. The signal passes through an antenna switch and harmonic filter to the antenna.

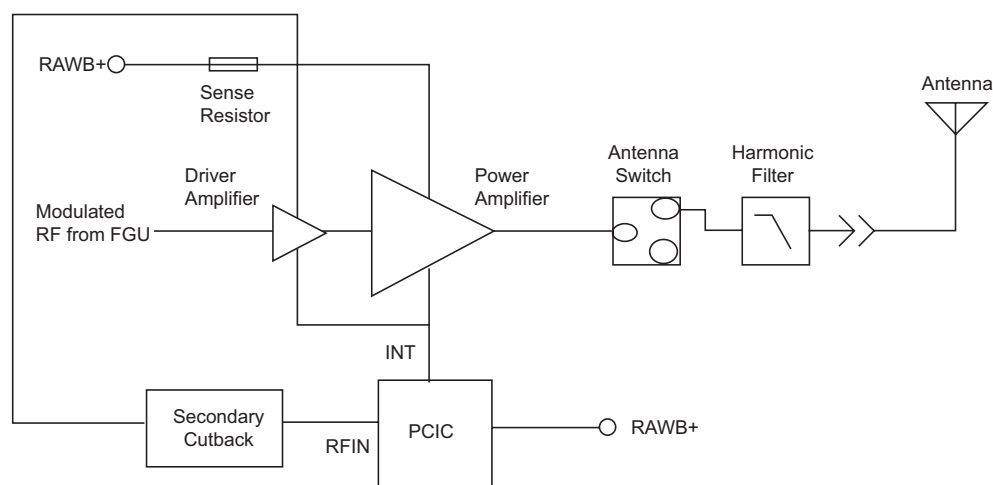


Figure 3-5. Transmitter Block Diagram

3.1.3.1 Power Distribution

To minimize voltage drop to the power amplifiers, net RAWB+ connects to power module Q107 and the second stage of driver amplifier U102 through components having minimal series resistance – ferrite beads and chokes only. During receive, no RF or DC bias is applied, and leakage current through U102 and Q107 is less than 100 microamps.

At a transmitter power of 2 Watts, the radio consumes approximately 1100 mA.

3.1.3.2 Driver Amplifier

The driver amplifier IC (U102) contains two LDMOS FET amplifier stages and two internal resistor bias networks. Pin 16 is the RF input. Modulated RF from the FGU, at a level of +3 dBm $\pm$ 2 dB, is coupled through a blocking capacitor to the gate of FET-1. An LC interstage matching network connects the first stage output VD1 to the second stage input G2. The RF output from the drain of FET-2 is pin 6 (RFOUT1). Gain control is provided by a voltage applied to pin 1 (VCNTRL). Typical output power is about +26 dBm (400 mW) with VCNTRL at 4.5 V.

L101 and C102 are the interstage matching network; capacitor C111 is a DC block.

VHF: Components C112–C115 and L103–L104 match the output impedance to maximize power transfer to Q107.

UHF: Components C114 and L113 match the output impedance to maximize power transfer to Q107.

3.1.3.3 Power Amplifier Transistor Q107

The power amplifier transistor, Q107, is an LDMOS FET housed in a high-power, surface-mount package. To prevent thermal damage, it is essential that the heat sink of the power module be held in place against the radio chassis. The input impedance-matching network uses discrete inductors and capacitors. The low-pass output matching network uses lumped LCs. Drain bias is applied through E101, R130 and L105. Gain is dynamically controlled by adjusting the gate bias. The gate is insulated from the drain and source so that gate bias current is essentially zero. Gate bias is applied through R102, R105, and R106.

VHF: The input and output impedance-matching networks consist of C112–C115, C120–C124, L103–L104, L106–L108.

UHF: The input and output impedance-matching networks consist of C114, C120–C122, C124, C141, L108 and L113.

3.1.3.4 Antenna Switch

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of schematics that will aid in the following discussion.

The antenna switch is a single-pole, double-throw, positive-intrinsic-negative (PIN) diode, transmit/receive (T/R) antenna switch. Forward DC bias (via Q104) turn the diodes ON, reverse or zero bias turns them OFF.

VHF: PIN diodes D707 and D717 form a narrow-band, quarter-wave, T/R switch.

UHF: PIN diodes D701 and D702 form a narrow-band, quarter-wave, T/R switch.

In transmit mode, both diodes are forward-biased, and the signal goes from the transmitter to the antenna through the low resistance of the series PIN diode, while the low resistance of the shunt diode shorts the receiver. In receive mode, neither diode is biased and both behave as small-value capacitors, creating a high blocking impedance, in effect disconnecting the transmitter circuitry from the antenna.

3.1.3.5 Harmonic Filter

The harmonic filter is a high-power, low-loss, low-pass filter. Its purpose is to suppress transmitter harmonics. The filter also improves receiver out-of-band rejection. Shield SH07 must be in place to achieve the required stop band rejection. The harmonic filter uses discrete components.

VHF: The pass band is up to 190 MHz, and the stop band is above 260 MHz.

UHF: The pass band is up to 490 MHz, and the stop band is above 760 MHz.

3.1.3.6 Power-Control IC (PCIC) U104

The PCIC, U104, contains all of the digital, and most of the analog, circuits needed to control the transmitter power amplifier. Host control is through a 3-wire, smart SPI interface. Pin descriptions are shown in [Table 3-3](#).

Table 3-3. Power Control IC (U104) Pin Descriptions

Pin	Name	Description
1	RFIN	Detector voltage input to ALC
2	T1	Test point
3	CI	External capacitor for integrator time constant
4	INT	Integrator output; control voltage to amplifiers
5	CJ	External capacitor for PA rise and fall times
6, 7	VL, CL	External capacitor for PA rise and fall times
8	GND1	GROUND
9	F168	Reference clock input, 2.1 MHz
10, 13	QX, CQX	External capacitor for voltage multiplier
11, 12	Q, CQ	External capacitor for voltage multiplier
14	V10	Voltage multiplier output
15	VG	Internal band-gap reference voltage
16	V45	Regulated 4.5 Vdc output
17	V5EXT	Power supply input for internal voltage regulator
18	VAR2	Buffered D/A output
19	VLIM	Test point for internal D/A No.2 voltage
20	VAR1	Buffered D/A output
21	RS	Asynchronous reset input
22	NA	Spare pin
23	RX	RX/TX mode control-bit output
24	VAR3	Buffered D/A output
25	GND2	GROUND
26	CLK	SPI clock input
27	BPOS	Power supply input
28	DATA	SPI data input/output
29	CEX	SPI chip select input
30	TEMP	Temperature sensor input
31	RSET	External resistor; used to set the temperature cutback rate
32	ANO	Switched BPOS output

3.1.3.6.1 Power and Control

Since U104 is powered from switched B+, it makes its own regulated 4.5 Vdc to power the internal logic. The supply input is V5EXT at pin 17, and the output is V45 at pin 16. RX at pin 23 is the control signal to the antenna switch control circuit.

3.1.3.6.2 Voltage Multiplier

The PCIC contains an internal voltage multiplier. This multiplier produces signal V10 (pin 14), a 10-V supply for the PCIC D/A converters (DACs). This enables the DACs outputs to reach 8 V. The FREF signal is a 2.1 MHz clock used to switch the multiplier. The voltage multiplier is not used in the radio.

3.1.3.6.3 Automatic Level Control (ALC)

In TX mode, the PCIC disables the receiver, turns on the transmitter, and controls the TX power level. The automatic level control (ALC) circuit operates as follows:

The power level is set by programming an internal DAC to a calibrated reference voltage. D/A settings for the power set points were determined during radio tuning and stored in Flash ROM. An internal op-amp compares the D/A reference voltage to the detector voltage at pin 1(RFIN) and produces an error signal output. This signal is buffered by another op-amp, configured as a low-pass filter, or integrator, to produce the INT output at pin 4 (TP104). This signal drives the base of voltage follower Q101.

Transistor Q101 supplies current to drive the gain control pins of amplifiers U102 and Q107. Resistors R105 and R106 determine the voltage ratio between U102 pin 2 (VCNTRL) and the Q107 gate. Transient response during key-up and key-down is controlled by the power amplifier rise and fall times. External capacitors at pins CI, CJ, and CL, along with internal programmable resistors, determine the ALC time constants.

3.1.3.6.4 Temperature Cut Back

The PCIC contains a temperature cut-back circuit to protect the power amplifier (PA) from thermal damage that might result from incorrect assembly of the radio. External sensor U103 is a linear temperature-to-voltage transducer, placed near the hottest spot in the radio: power module Q107. The output is a DC voltage at pin 2 (VOUT) proportional to the temperature at pin 3 (GND). VOUT is 750 mV at 25°C and increases by 10 mV/°C. The PCIC temperature cut-back threshold is programmed to correspond to 85 or 90°C. Above this threshold, the ALC gradually cuts back the transmitter until it is fully turned off at 110°C. The slope of cut-back versus temperature is set by external resistor R111. Diode D104 clamps TEMP to a voltage not much less than VG (pin 15), about 1.3 V, to improve the transient response of the cut-back circuit. A secondary temperature cut back circuitry is also included for enhanced thermal protection due to the small form factor of the radio. Q102 along with RT150 and the surrounding support circuitry realizes the circuit. This extra protection acts independently of the cut-back circuit within the PCIC and ensures the radio's conformance to thermal safety limits.

3.1.3.6.5 D/A Outputs

In RX mode, the PCIC shuts down the transmitter, turns on the receiver, and tunes the RX front-end pre-selector filters.

Signal VAR2 supplies the voltage used to tune both front-end pre-selector and post-selector filters. The voltage range varies from 0.8 V to 2.2 V across the VHF band.

3.1.4 Frequency Generation Unit (FGU)

The frequency-generation function is performed by several ICs; multiple, discrete, voltage-controlled oscillators (VCOs); and associated circuitry.

VHF: The reference oscillator provides a frequency standard to the fractional-N frequency synthesizer (FracN) IC, which controls the VCOs and VCO buffer IC (VCOBIC). The VCOBIC amplifies the VCO signal to the correct level for the next stage.

UHF: The reference oscillator provides a frequency standard to the fractional-N frequency synthesizer (FracN) IC, which controls the VCOs and VCO discrete buffer. The buffer amplifies the VCO signal to the correct level for the next stage.

Two VCOs are employed – one to generate the first LO and the other to generate the transmit-injection signals.

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of FGU-related schematics that will aid in the following discussion.

3.1.4.1 Reference Oscillator Y200

The radio's frequency stability and accuracy derive from the Voltage-Controlled Temperature-Compensated Crystal Oscillator (VCTCXO), Y200. This 16.8 MHz oscillator is controlled by the voltage from the WARP pin of the FracN (fractional-N frequency synthesizer) IC, U202, that can be programmed through a serial peripheral interface (SPI). The oscillator output at pin 3 is coupled through capacitor C234 to the FracN synthesizer reference oscillator input and through C236 to the non-invertive input of the op-amp, U201.

Op-amp U201 buffers the 16.8 MHz output to the VOCON section. Components L205 and C214 form a low-pass filter to reduce harmonics of the 16.8 MHz.

The Digital-to-Analog Converter (DAC) IC, U203, and Switched Capacitors Filter (SCF) IC, FL200, form the interface between radio's DSP and the analog modulation input of the FracN IC.

3.1.4.2 Fractional-N Frequency Synthesizer (FracN) IC U202

The FracN IC, U202, is a mixed-mode, Motorola-proprietary, CMOS, fractional-N frequency synthesizer with built-in dual-port modulation. The XTS 4000 radio uses a low-voltage version of the device, sometimes called LVFracN, for compatibility with the 3 V logic used throughout the radio.

The FracN IC incorporates frequency division and comparison circuitry to keep the VCO signals stable. The FracN IC is controlled by the MCU through a serial bus. All of the synthesizer circuitry is enclosed in rigid metal cans on the transceiver board to reduce interference effects.

Separate power supply inputs are used for the various functional blocks on the IC. Inductors L203 and L204 provide isolation between supply pins 20 (AVDD) and 36 (DVDD) connected to V3A. Host control is through a three-wire, smart SPI interface (pins 7, 8, and 9) with a bi-directional data pin. FracN functions include frequency synthesis, reference clock generation, modulation control, voltage multiplication and filtering, and auxiliary logic outputs.

3.1.4.2.1 Synthesizer

Frequency synthesis functions include a dual-modulus prescaler, a phase detector, a programmable loop divider and its control logic, a charge pump, and a lock detector output. Fractional-N synthesizer IC principles of operation are covered in detail in the manufacturers' literature. No similar discussion will be attempted here.

3.1.4.2.2 Clocks

U202, pin 23 (XTAL1), is the 16.8 MHz reference oscillator input from the VCTCXO (Y200).

3.1.4.2.3 Modulation

To support many voice, data, and signaling protocols, XTS 4000 radios must modulate the transmitter carrier frequency over a wide audio frequency range, from less than 10 Hz up to more than 6 kHz. The FracN supports audio frequencies down to zero Hz by using dual-port modulation. The audio signal at pin 10 (MODIN) is internally divided into high- and low-frequency components, which modify both the synthesizer dividers and the external VCOs through signal MODOUT (pin 41). The IC is adjusted to achieve flat modulation frequency response during transmitter modulation balance calibration using a built-in modulation attenuator.

3.1.4.2.4 Voltage Multiplier and Superfilter

Pins 12 (VMULT3) and 11 (VMULT4) together with diode arrays D201 and D202 and their associated capacitors form the voltage multiplier. The voltage multiplier generates 11.5 Vdc to supply the phase detector and charge-pump output stage at pin 47 (VCP).

The superfilter is an active filter that provides a low-noise supply for the VCOs and VCOBIC. The input is regulated 5 Vdc from V5A at pin 30 (SFIN). The output is superfiltered voltage FSF at pin 28 (SFOUT).

The output from pin 15 (VMULT1) is used as a clock for the SCF IC, FL200.

3.1.4.3 Loop Filter

The components connected to pins 43 (IOUT) and 45 (IADAPT) form a 3rd-order, RC low-pass filter. Current from the charge-pump output, IOUT, is transformed to voltage VCTRL, which modulates the VCOs. Extra current is supplied by IADAPT for rapid phase-lock acquisition during frequency changes. The lock detector output pin 4 (LOCK) goes to a logic “1” to indicate when the phased-lock loop is *in lock*.

3.1.4.4 VCO Buffer IC (VCOBIC) – VHF only

The VCOBIC (U302) is an analog IC containing two NPN transistors for use as oscillators, an active-bias circuit, transmitter and receiver buffer amplifiers, and switching circuitry. The VCOBIC has three RF outputs:

- TX_OUT (pin 10) – the modulated transmitter carrier
- RX_OUT (pin 8) – the receiver first LO
- PRESC_OUT (pin 12) – connected to FracN pin 32 (PREIN) through a matching circuit

Transmit/receive control is a single 5.0 Vdc logic input, TRB_IN (pin 19). When TRB_IN is low, the receiver buffer is active and the transmitter circuits are disabled. The converse is also true.

The VCOs in VHF radios use the VCOBIC internal transistors and implement the active bias via resistors R304 and R305. Bias to TX_OUT is supplied through resistor R313. Components L309 and C316 form a matching circuit for the TX_OUT impedance. C315 acts as a DC block, and resistors R314, R315, and R316 attenuate an output signal to an optimum level for the PA.

L312 form a low-pass bias supply filter for the RX_OUT. L310 and C317 are the RX_OUT impedance-matching circuit. C322 is a DC block, and resistors R317 and R318 attenuate an output signal to an optimum level for the mixer IC.

An NPN/PNP-packaged transistor, Q310, together with the supporting components R310 and C330, form the 3.3 Vdc-to-5 Vdc logic-level shifter between the AUX3 pin of the FracN IC, U202, and VCOBIC, U302.

3.2 VOCON Section

This section provides a detailed circuit description of the ASTRO XTS 4000 VOCON section.

The VOCON section (see [Figure 3-6](#)) is divided into the following sections:

- Controller and Memory
- Audio and Power
- Accessory and CE Interface Connector Support

3.2.1 Connections

The VOCON section (see [Figure 3-6](#)) contains three functional blocks and three connector symbols.

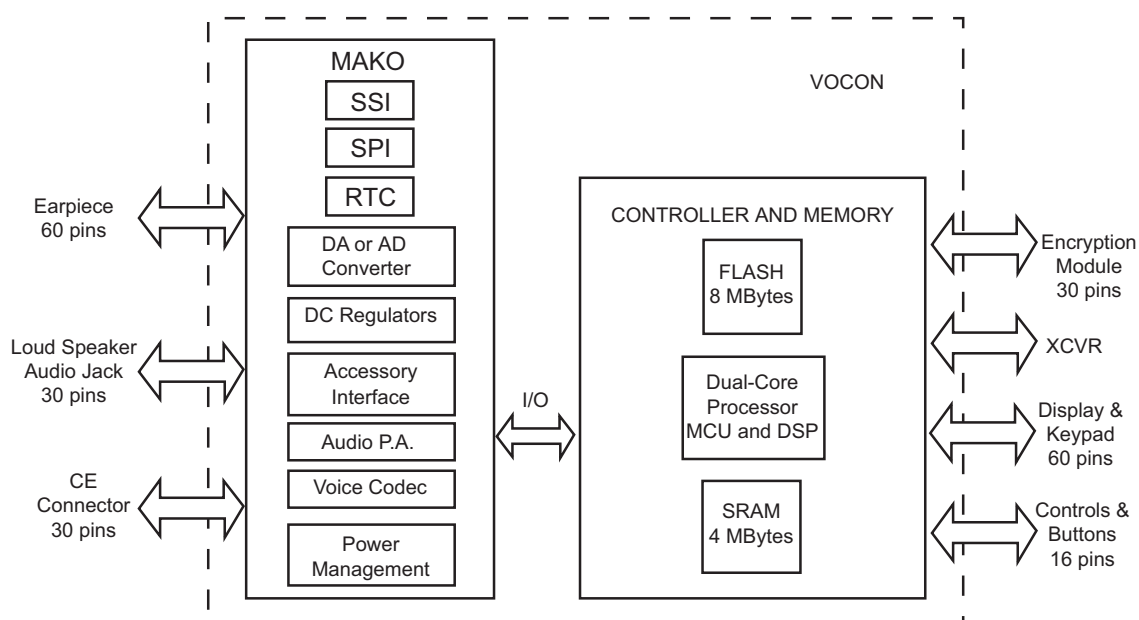


Figure 3-6. VOCON Section Connections

The functional blocks consist of the following:

- **Controller and Memory:** The Patriot (U1401), the dual-core processor with the microcontroller unit (MCU) and a digital signal processor (DSP), the 4MB SRAM (U1409) and 8MB Flash (U1410) memory devices.
- **Audio and Power:** The MAKO IC (U1304), a 5Vdc linear regulator (U1101), an audio switch IC (U20) and a single-ended gain stage (U9904)
- **Accessory and CE Interface Connector Support:** The MAKO IC (U1304), ESD protection circuitry, and CE connector interface circuitry.

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,”](#) on page 8-1 for a listing of VOCON schematics that will aid in the following discussion.

3.2.1.1 Connector J1 (Display and Keypad)

This is a 60-pin connector that mates with the Front-Flip flex on the front housing. The 60 connections on the connector J1 consists of Display (control and data) lines (28), Keypad lines (15), Earpiece audio lines (2), DC supplies and radio GROUND connections.

3.2.1.2 Connector J2 (Encryption Module, CE Interface Connection and Audio Jack Connection)

This 30-pin connector mates with the UCM-CE-Audio Jack flex and provides the connections from the VOCON section to the Encryption Module, the CE Accessory Interface and the 2.5mm Audio Jack.

Two voltages are provided to the encryption module: UNSWB+ and SWB+. The SAP SSI lines, serial communication data lines and general purpose I/O lines from the Patriot IC are routed through this connector.

Connections to the CE accessory connector, which include serial data communication and UCM are present at pins 18 and 17.

The external audio jack consists of a microphone, audio jack interrupt, PTT line and single-ended audio.

3.2.1.3 Connector J3 (Buttons and Controls Connection)

This 16-pin connector mates the VOCON section (on the mainboard) to the volume controls and user buttons (PTT, EMERGENCY, SECURE mode and programmable buttons etc.).

3.2.2 Controller and Memory

The controller and memory section contains the following components:

- Patriot IC (U1401)
- Static RAM (SRAM) IC (U1409)
- Flash memory IC (U1410)

The Patriot IC acts as both the microcontroller unit (MCU) and the digital signal processor (DSP) for the radio. The MCU controls receive/transmit frequencies, power levels, display programming, user interface (PTT, keypad, menu select, etc.), and programming of ICs, as well as other functions. The DSP performs voice encoding and decoding, audio filtering, volume control, PL/DPL encode and alert-tone generation, squelch control, and receiver/transmitter filtering, as well as other functions.

The Patriot IC executes a stored program located in the Flash memory device. The SRAM, a volatile device, is used as working memory and shares the address and data bus with the Flash memory device.

NOTE: Refer to [Table 8.1, "List of Schematics and Boards Overlays," on page 8-1](#) for a listing of VOCON schematics that will aid in the following discussion.

3.2.2.1 Patriot IC U1401

The Patriot IC U1401 is a dual-core processor that contains both a 32-bit microcontroller unit (MCU) and a 16-bit digital signal processor (DSP) in one IC package. It comes in a 256-pin, ball-grid array (BGA) package with 0.3mm pitch solder balls. The dual-core processor is supplied with two voltages: 1.875 V and 1.55 V. The 1.55 V supply is used as the core voltage while the 1.875V is used as the interface to the memory devices and display module. Most of the pins on the Patriot IC operate from the 2.9 V supply.

Two main clocks are provided to the Patriot IC. The CKIH pin (C1402) is provided a 16.8 MHz sine wave. This is the most important clock since it is internally used to generate the clocks for both the MCU and DSP cores, as well as most of the peripherals. A 3 V peak-to-peak 32 kHz square wave (32 kHz test point) is generated by the oscillator Y1301 and the buffer U1301, and supplied to the CKIL pin on the Patriot IC. While not as widely used as the 16.8 MHz clock, the 32 kHz clock is needed by some components in the Patriot including the reset circuitry.

3.2.2.1.1 Microcontroller Unit (MCU)

The MCU portion of the Patriot IC has 16k x 32 bits of internal RAM and 28k x 32 bits of internal ROM, which is used for the bootstrapping code. The MCU has several peripherals including an External Interface Module (EIM), the Multiple Queue Serial Peripheral Interface (MQSPI), two Universal Asynchronous Receiver/Transmitter (UART) modules, and the One-Wire Interface module. The MCU communicates internally to the DSP through the MCU/DSP Interface (MDI).

External Interface Module (EIM)

The External Interface Module (EIM) is the MCU interface to the SRAM U1409 and Flash Memory U410, as well as the display module. The EIM lines include 24 external address lines, 16 external bi-directional data lines, 6 chip selects lines, read/write line, and output enable line among others. All of the EIM lines operate at 1.875-V logic levels, and the EIM operates at the MCU clock speed.

Multiple Queue Serial Peripheral Interface (MQSPI)

The Multiple Queue Serial Peripheral Interface (MQSPI) is the MCUs programming interface to other ICs. The Patriot IC has two independent SPI busses, and each has its own clock line (test points SCKA and SCKB), data-out line (test points MOSIA and MOSIB), and data-in line (test points MISOA and MISOB). There are 10 SPI chip selects (SPICS) that are programmable to either SPI A, the transceiver board SPI bus, or to SPI B, the dedicated VOCON SPI bus.

The devices on the SPI A bus include the PCIC and FracN IC on the SPICS4 (R1118), the Abacus III IC on SPICS5 (R1119), and an analog-to-digital converter (ADC) on SPICS6 (R1120). One SPI B chip select is used for the MAKO IC (U1304). All of the SPI module lines operate at GPIO voltage logic levels.

Universal Asynchronous Receiver/Transmitter (UART)

The Patriot IC has two Universal Asynchronous Receiver/Transmitter (UART) modules. UART1 handles the RS232 lines while UART 2 is connected to the SB9600 lines. Each UART has a receive data line (URXD), a transmit data line (UTXD), and hardware flow control signals (RTS—request to send) and (CTS—clear to send). All UART lines operate at GPIO voltage logic levels. The translation to 5 V logic levels for the accessory side connector is discussed in the MAKO section.

One-Wire Interface

The MCU has a One-Wire Interface module that is used to communicate to a One-Wire device like a USB cable or a smart battery using the Dallas Semiconductor protocol. This module uses a GPIO voltage logic level.

3.2.2.1.2 Digital Signal Processor (DSP)

The DSP portion of the Patriot IC has 84k x 24 bits of program RAM and 62k x 16 bits of data RAM. The DSP has its own set of peripherals including the Baseband Interface Port (BBP), the DSP Timer module, and the Serial Audio CODEC Port (SAP). Additionally, the DSP shares some peripherals with the MCU, including the USB interface and the General Purpose Input/Output module (GPIO).

Baseband Interface Port (BBP)

The Baseband Interface Port (BBP) module is the DSP's serial synchronous interface (SSI) to the transceiver section. The BBP has independent sections for the receiver and the transmitter. The receiver BBP pins include the receive data pin SRDB (R1110), the receive clock signal pin SC0B (R1109), and the receive frame synchronization (sync) signal pin SC1B (R1111). The transmitter's BBP pins include the transmit data pin STDB (R1113), the transmit clock signal pin either SCKB (R1112), and the transmit frame sync signal pin either SC2B (R1114). All BBP lines use GPIO voltage logic levels.

DSP Timer Module

While the BBP receive clock and frame sync signals are supplied by the Abacus III IC from the transceiver section, the BBP transmit clock and frame sync signals are generated by the DSP Timer. The BBP receive clock, connected to the DSP Timer input pin T10, is reference used to generate the BBP transmit clock and frame sync signals. These two signals, along with the BBP transmit data signal, are connected to the DAC on the transceiver section.

Serial Audio CODEC Port (SAP)

The Serial Audio CODEC Port (SAP) module is the DSP's serial synchronous interface (SSI) to the audio CODEC on the MAKO IC. The SAP also interfaces with the encryption module.

The SAP interface consists of four signals including the SAP clock line pin SCKA (component R1410), the SAP frame sync line pin SC2A (component R1411), the SAP receive data line pin SRDA (component U1408), and the transmit data line pin STDA (component R1338).

The SAP clock is generated by the dual-core processor U1401, and is a 256 kHz, 2.9 V peak-to-peak square wave. The SAP frame sync signal is generated by the dual-core processor U1401, and is an 8 kHz, 2.9 V peak-to-peak square wave.

Universal Serial Bus (USB)

The Patriot IC USB peripheral, shared by the MCU and the DSP, provides the required buffering and protocol to communicate on the Universal Serial Bus. The Patriot IC supports USB slave functionality.

For receive data, the USB differentially decoded data comes from the MAKO IC USB2_OE_RCV_RTS pin into the Patriot URTS1 pin, while the single-ended USB data positive signal goes to pin PA2_USB_VPIN, and the single-ended USB data minus signal goes to pin URXD1. The two data lines are used to detect the single-ended zero state.

For transmit data, the USB data comes out of the Patriot IC UTXD1 pin and goes to MAKO IC USB1_DAT_TXD pin. The USB transmit single-ended zero signal is generated from the Patriot IC PC0_USB_VMOUT pin.

General-Purpose Input/Output (GPIO) Module

The General-Purpose Input/Output (GPIO) module is shared by the MCU and the DSP. This module consists of four 16-pin bi-directional ports and a 15 pin bi-directional port. While some of the pins on these ports are being used for other functions (UART, SPI, SAP, BBP, and Interrupt pins), the remaining pins can be programmed to become GPIOs that can be used by either the DSP or the MCU. Each GPIO pin has up to 8 alternate output functions and up to 4 alternate input functions. This allows for the GPIO pins to be routed internally to pertinent Patriot IC modules. Additionally, the GPIO module adds selectable edge-triggered or level-sensitive interrupt functionality to the GPIO pins. Some examples of GPIO pins include the Display module backlight brightness control signals (DISP_BRIGHT1 and DISP_BRIGHT2), the Keypad backlight enable signal (KP_BLEN) and the Flip Assembly Open/Close Sense Signal (FLIP_SENSE).

3.2.2.2 Static RAM (SRAM) U1409

The static RAM (SRAM) IC U1409 is an asynchronous, 4 MB, CMOS device that is capable of 70 ns access speed. It is supplied with 1.875 volts. The SRAM has its 19 address lines and 16 data lines connected to the EIM of the Patriot IC through the Address(23:0) and Data(15:0) busses.

The SRAM has an active-high chip select CE2 that is tied directly to the 1.875 V supply and an active-low chip select EN_CE that is connected to the EIM CS2_N pin. When the SRAM EN_CE pin is not asserted, the SRAM is in standby mode, which reduces current consumption.

Two other control signals from the EIM that change the mode of the SRAM are the read/write signal, R/W, and the output enable signal, OE. The R/W of the EIM is connected to the SRAM EN_WE pin, while the OE signal from the EIM is connected to the SRAM EN_OE pin. The SRAM is in read mode when the EN_WE pin is not asserted and the EN_OE pin is asserted. The SRAM is in write mode when the EN_WE pin is asserted, regardless of the state of the EN_OE pin.

The other SRAM pins are the lower-byte enable pin EN_BLE and the upper-byte enable pin EN_BHE. These pins are used to determine which byte (BLE controls data lines 0-7 and BHE controls data lines 8-15) is being used when there is a read or a write request from the Patriot IC. The EN_BLE pin is controlled by the EIM EB1_N signal, while the EN_BHE pin is controlled by the EB0_N signal.

3.2.2.3 FLASH Memory U1410

The Flash memory IC is an 8 MB CMOS device with simultaneous read/write or simultaneous read/erase operation capabilities with 70 ns access speed. It is supplied with 1.875 volts. The Flash memory has its 23 address lines and 16 data lines connected to the EIM of the Patriot IC through the Address(23:0) and Data(15:0) busses. The Flash memory contains host firmware, DSP firmware, codeplug data and the transceiver section's tuning values. The Flash memory IC is not field repairable.

The RESET_OUT of the Patriot IC is at a GPIO voltage logic level. Components D1401 and R1437 are used to convert the voltage down to a 1.875 V logic level, and this 1.875 V reset signal is fed to the Flash RESET pin. When this pin is asserted (active low logic), the Flash is in reset mode. In this mode, the internal circuitry powers down, and the outputs become high-impedance connections.

The Flash active-low chip select pin, EN_CE, is connected to the active-low CS0_N pin (CS0 test point) of the EIM. When the EN_CE is not asserted, the Flash is in standby mode, which reduces current consumption.

Several other active-low control pins determine what mode the Flash memory is in: the address valid pin ADV that is connected to the EIM LBA_N signal, the output enable pin EN_OE that is connected to the EIM OE_N signal, and the write enable pin EN_WE that is connected to the EIM EB1_N signal. For read mode, the ADV and EN_OE pins are asserted while the EN_WE pin is not asserted. When the EN_WE is asserted and the EN_OE pin is unasserted, the Flash operates in the write mode.

Figure 3-7 illustrates the EIM and memory ICs block diagram.

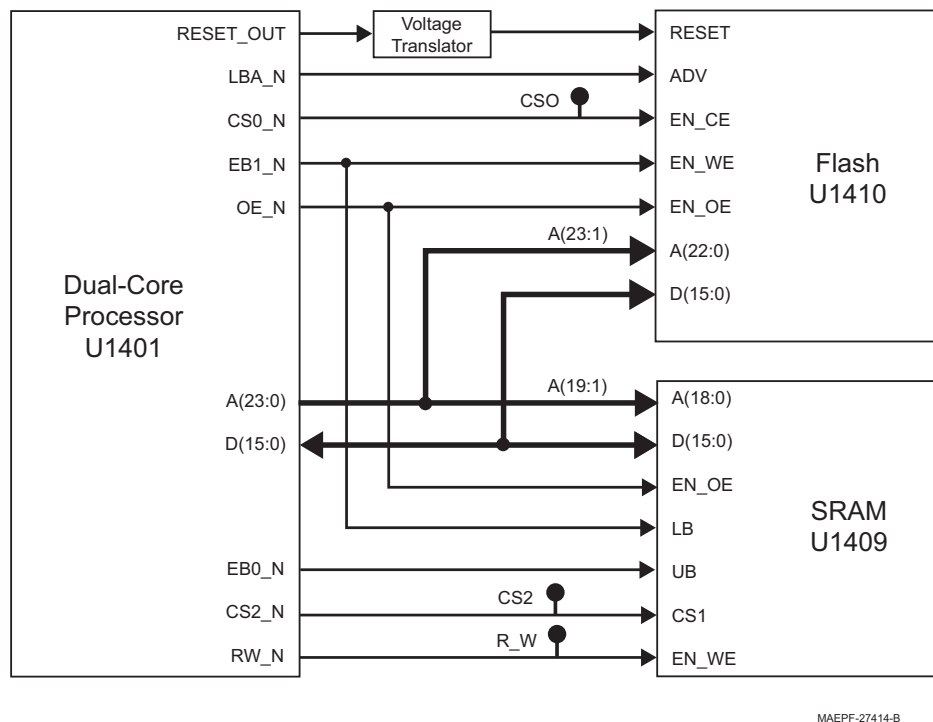


Figure 3-7. Patriot EIM and Memory Block Diagram

3.2.3 Audio and Power

The audio and power section contains the following components:

- MAKO IC U1304
- 5 V regulator U1101
- Audio Switch U20
- Single-ended Audio Gain stage U9904

The MAKO IC contains a CODEC, amplification, filtering and multiplexing capability for receive and transmit audio, voltage regulators, an analog-to-digital converter (ADC), and a real-time clock (RTC). The MAKO IC is programmed by the Patriot IC.

The MAKO IC also contains an audio preamplifier and an audio power amplifier to condition the received audio signal. Programmable preamplifiers also sets the gain of the microphone audio signal. These devices internal to the MAKO are programmed by the Patriot IC.

NOTE: Refer to [Table 8.1, “List of Schematics and Boards Overlays,” on page 8-1](#) for a listing of audio and power-related schematics that will aid in the following discussion.

3.2.3.1 MAKO IC U1304

The MAKO IC is a mixed-signal (analog and digital) IC that provides control, audio, and voltage regulation functionality. It comes in a 176-pin, ball-grid array (BGA) package with 0.8 mm pitch solder balls. The MAKO IC is supplied with switched battery voltage UNSW_B+ (R1309).

3.2.3.1.1 Voltage Regulation

The MAKO IC contains several voltage regulators that are used in the design of the VOCON section: VSW1, V2, VCC5, V1.55 and V1.875. The VSW1 regulator is a programmable switching regulator that uses the switched battery voltage as its input. The output voltage of VSW1 (R1319) is programmable by the Patriot IC U1401 through the SPI bus. The initial output of VSW1 is 3.2 volts, which is then programmed to 3.8 volts. The VSW1 voltage is supplied to the RF transceiver section and to the input pins of the V2 regulator.

The V2 regulator is a SPI programmable linear regulator that uses VSW1 as its supply. The initial output of V2 (L1302) is 2.775 volts, which is then programmed to 2.9 volts for the VOCON section. The V2 voltage is supplied to the Patriot IC (I/O ring - SPI, BBP, SAP, UART, GPIO, etc.), the display module via connector J1, and the many discrete components that interface with the Patriot IC and the MAKO IC.

The VCC5 regulator is a fixed linear regulator that outputs 5Vdc. VCC5 is used by the accessory I/O lines and the audio switch U20.

The V1.55 is a SPI programmable linear regulator. V1.55 is used by the Patriot MCU Core. The V1.875 is a SPI programmable linear regulator. V1.875 is used by the EIM, Memory, Display and I/O ring.

3.2.3.1.2 MCU Interface

The MAKO IC has a four-wire, SPI connection to the Patriot IC (SPI B). The SPI B clock is connected to the SPI_CLK pin (SCKB). The SPI B MOSI line is connected to the SPI_DI pin. The SPI B MISO line is connected to the SPI_DO pin. The MAKO SPI B chip-select signal is connected to the SPI_CS pin (R1334). Through this interface, the Patriot IC can program the voltage regulators, the CODEC, the transmit and receive audio filters and amplifiers, as well as read information from the ADC and the real-time clock.

The MAKO IC has an 10-bit ADC with 11 channels. Some of the ADC channels are used for general purpose voltage monitoring: Emergency Button (ATOD_2), board type (ATOD_5) and the board identification voltage (ATOD_6). Battery voltage is also monitored by the ADC. The Patriot IC activates and reads the A/D values through the SPI bus.

3.2.3.1.3 Audio Circuitry

A 16-bit CODEC, internal to the MAKO IC and programmable by the Patriot IC through the SPI bus, converts microphone audio into a digital bit stream for processing by the DSP. The CODEC also converts receive audio data that was processed by the DSP into an analog audio signal for amplification to a speaker. The CODEC interfaces to the DSP through the 4-wire SAP bus. The CODEC clock, which is 256 kHz is supplied to the DCLK pin. The CODEC 8 kHz CODEC frame synchronization signal is supplied to the FSYNC pin. The CODEC transmit data signal is on the TX pin, while the CODEC receive data signal is on the RX pin. For the CODEC to operate with those clock and frame sync signals, a 24.576MHz clock, generated by Y1302 is supplied to the MAKO IC.

The MAKO IC contains internal amplification, filtering, and multiplexing functionality for both receive and transmit audio. These functions are Patriot IC-programmable through the SPI bus. The input for the internal microphone audio (C1350) is the INT_MIC_P pin, while the input for the external microphone audio (C1347) is the EXT_MIC_P pin.

The MAKO contains two internal audio power amplifiers for internal and external speaker routing and the outputs are available at pins INT_SPKR_P and INT_SPKR_M (internal speaker) and EXT_SPKR_P and EXT_SPKR_M (external speaker). [Section 3.2.5.2 on page 3-27](#) details the audio routings to the various transducers. The audio routing selection is controlled by the Patriot IC.

3.2.3.2 5 V Regulator U1101

The 5 V regulator, U1101, uses UNSW_B+ as its input voltage. This regulator supplies 5Vdc to the keypad circuitry, the radio ON/OFF circuitry and the display backlight control circuitry.

3.2.3.3 Audio Switch U20

The audio switch U20 is a single-pole, double-throw analog switch that switches amplified audio from the MAKO external speaker terminals (EXT_SPKR_P and EXT_SPKR_M) to the earpiece (on the flip assembly) or the single ended audio gain stage for the 2.5mm audio jack earpiece. The U20 is supplied from VCC5.

3.2.3.4 Single-Ended Audio Gain Stage U9904

U9904 is the single-ended audio gain stage for the 2.5mm audio jack earpiece. It consists of a non-inverting operational amplifier and DC biasing circuitry. One of the outputs of the audio switch (U20) is channelled to U9904.

3.2.4 Accessory and CE Interface Connector Support

The accessory and CE interface connector support section consists of the following:

- MAKO IC U1304
- ESD protection circuitry
- CE connector interface circuitry

The MAKO IC contains a RS232 and USB transceiver, switching logic between RS232 and boot data path, One-Wire side connector support, and several supporting circuitry. The MAKO IC is programmed by the Patriot IC.

ESD protection devices include zener diodes and low-capacitance ESD suppressors.

CE interface connector circuitry includes current-limiting resistors and noise-suppressing shunt capacitors.

3.2.4.1 MAKO IC U1304

[See Figure 8-14, "VOCON: DC Power, Clocks and ON/OFF Circuit," on page 8-15](#) for schematic details of the following discussion.

The MAKO IC U1304 also contains the circuitry and blocks to support radio accessories and test/programming service aids. The block supports many functions including radio CE connector interface, bi-directional logic level translation, boot data path control, USB transceiver and One Wire option detect support.

3.2.4.1.1 Radio CE Connector Interface, Logic Level Translation, and Boot Data Path Control

The MAKO IC facilitates the interface to the radio's CE connector. Some of the CE connector lines are at 5 V logic levels, so the MAKO IC converts those lines to GPIO voltage logic levels to interface to the Patriot IC, as well as the encryption module. These lines include the SB9600 bus busy line LH_BUSY, the RS 232 CTS and RTS lines, the RS232 data-out line, and the RS232 data-in line.

Another function that the MAKO IC provides with these lines is boot data path control. The boot data path is as follows: boot data-in is multiplexed onto the RS232 data-out line while the boot data-out is multiplexed with the SB9600 data line. This alternate data path is used only to Flash code into a radio for the first time. The Patriot IC, through the SPI bus, controls this feature.

3.2.4.1.2 USB Transceiver

The USB transceiver, internal to the MAKO IC, is capable of transmitting and receiving serial data at a rate of 12 megabits per second. The differential USB data comes from the CE connector, through the 33-ohm resistors R1206 and R1207, and then to the USB1_DP and USB1_DM pins on the MAKO IC. The USB receive interface from the MAKO IC to the Patriot IC is as follows: USB1_DP routed to USB1_DAT_TXD, USB1_DM routed to USB2_SE0_VM_RXD.

The USB transmitter is enabled when the RS232_USB and USB_TXENAB signals are both driven low by the Patriot IC. The single-ended data is output from the Patriot IC on the UTXD1_USB_VPO pin and goes to the MAKO USB1_DAT_TXD pin. The data is driven out differentially on the USB1_DP and USB1_DM, which go to the CE connector. The Patriot IC sends the single-ended zero signal from pin USB_VMO to the MAKO IC USB1_SE0 pin.

When a USB cable is attached, pin CTS_CABLE_DET_5V is driven low and goes through level translation in U701 and the output of CTS_CABLE_DET_3V is pulsed low and sent to the dual-core processor. This line controls the USB and RS232 modes so that the data that is on those lines are routed to the USB transceiver when a cable is detected. If a USB cable is not detected, CTS_CABLE_DET_3V is high, the USB transceiver is put in suspend mode and the DP and DM pins can now handle 5V tolerance for RS232 mode of operation.

3.2.4.1.3 One-Wire Support

New options and accessories that attach to the CE connector are identified by the Patriot IC using the One-Wire protocol. The Option Select 2 pin on the CE connector also serves as the One-Wire data pin. This signal is connected to the ONE_WIRE_OPT pin. This pin is connected to the dual-core processor one-wire bus (ONE_WIRE_UP) through the MAKO IC internal isolation switch which is controlled by the SPI commands sent from the dual-core processor. This isolation is needed to prevent possible contention on the One-Wire bus when a smart battery is attached to the radio.

These new accessories are to GROUND pin CTS, of the CE connector. When this occurs, the MAKO IC pin ONE_WIRE_OPT is asserted and the Patriot IC detects the change. The Patriot IC then instructs the MAKO IC (via SPI) to connect the CE connector One-Wire line to the Patriot IC One-Wire bus. In the case of the USB cable, the Patriot IC reads the One-Wire data from the cable and, upon determining that a USB cable is attached, programs the MAKO IC for USB mode.

3.2.4.1.4 Watchdog Timer

The watchdog timer is a 125ms counter that is integrated into the MAKO IC and used during the power down sequence. The MAKO IC will begin the power down sequence when a low-to-high transition occurs on MECH_SW pin. Once this transition occurs, the MAKO IC begins the watchdog timer. Upon expiration of the timer, the RESETX pin is asserted and all MAKO regulators are shutdown. The dual-core processor can refresh the watchdog timer so that the software has enough time to complete its tasks before the power is taken away completely.

3.2.4.1.5 24.576 MHz Reference Generation for MAKO

The 24.576 MHz reference is required by the MAKO IC for the CODEC time base and the SSI clock generator module internal to the MAKO IC. The clock is generated by crystal oscillator Y1302 and load capacitors C1316 and C1317.

3.2.4.1.6 SSI Clock and Frame Sync Generator

The MAKO IC generates the SSI clock and frame sync signals for the SAP bus used by the Patriot IC and encryption module. These signals are generated from the 24.576 MHz reference. The SSI clock output pin is labeled SSI_CLK, and the frequency is 512 kHz. The SSI frame sync output pin is SSI_SYNC, and the frequency is 8 kHz. These signals are not active when the MAKO IC comes out of reset, so they are programmed by the Patriot IC through the SPI bus.

3.2.4.2 ESD Protection Circuitry

See [Figure 8-12, "VOCON: Audio, Connector Interface Circuits," on page 8-13](#) for schematic details of the following discussion.

Several components on the VOCON section protect the circuitry from ESD. The CE connector signal lines have ESD protection components on them since they are exposed. These protection components include:

- 5.6-V zeners VR1301 on the BAT_STATUS line, 5.6-V zener diode on reset line (UHF), VR1202 and VR1203 on the RS232 and USB data lines
- 6.8V zeners on the OPT_SEL lines, the ONE_WIRE line and the Audio Jack lines
- 12V zeners on the MAKO audio outputs

Spark Gaps are also present on the mainboard layout as a back-up defense mechanism against ESD.

3.2.4.3 Radio CE Interface Connector Circuitry

See [Figure 8-12, "VOCON: Audio, Connector Interface Circuits," on page 8-13](#) for schematic details of the following discussion.

An important circuit in the CE interface connector is the Option Select 2 (OPT_SEL2) line comparator. The opamp (U1201) is used as a comparator for the option select 2 line. The voltage divider network of R1227 and R1229 determines the comparator threshold. The remaining components on the CE interface connector consist of current-limiting serial resistors and noise-suppressing shunt capacitors.

3.2.4.3.1 Radio CE Connector and Option Selects

The CE connector is located on the bottom side of the radio. It is the external port or interface to the outside and is used for programming and interfacing to external accessories. The CE connector connects to the VOCON section at connector J2 via a flex circuit (UCM-CE-Audio Jack Flex) that is routed inside the external housing. Pin assignments on the CE connector are shown in [Figure 3-8](#).

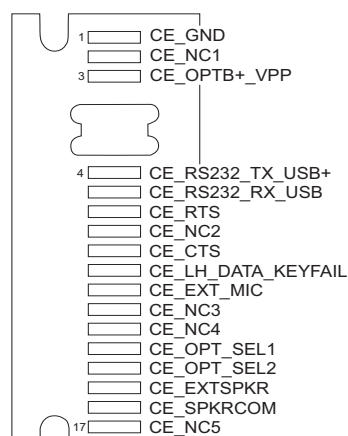


Figure 3-8. CE Connector

Most of the signals are extensions of circuits described in other areas of this manual. However, there are two option select pins (see [Table 3-4](#)) used to configure special modes: Option Select 1 and Option Select 2. These pins are controlled by accessories connected to the universal connector. [Table 3-4](#) outlines their functions as defined at the universal connector.

Table 3-4. Option-Select Functions

Function	Option Select 1	Option Select 2
External PTT	0	0
No Function (Normal)	1	1
External Speaker	0	1

3.2.4.4 Dual Display Module

The XTS4000 radio has a dual display module within the front-flip assembly of the radio. The dual display consists of a main display and a caller identification CID display. The main display is a 130 x 130 dot matrix liquid crystal display (LCD) whereas the CID display is a 112 x 32 dot matrix LCD. The display module uses chip on film technology and is not field repairable.

3.2.4.5 Keypad

The keypad on the XTS4000 radio is a 3 x 3 Menu Keypad (with 4-way navigation button) and a 3 x 4 alphanumeric keypad. This keypad is realized through a flex circuit design which is housed within the front-flip assembly of the radio. The keypad is connected to the VOCON section through connector J1.

The keypad lines are read through a row and column matrix made up of 7 row lines (UC_KP_ROW0 to UC_KP_ROW6) and 3 column lines (UC_KP_COLUMN0 to UC_KP_COLUMN2). A separate line connects the ON/OFF button on the keypad to the ON/OFF Circuitry on the VOCON section (UC_KP_ONOFF)

Keypad backlighting is supplied by the 5V Misc Regulator (U1101) and the backlight is controlled by the Patriot IC GPIO KP_BLEN.

3.2.4.6 Buttons and Controls

The XTS4000 radio has the following buttons and controls:

- PTT button (PTT)
- Clear/ Secure mode button (P1)
- Emergency button (P2)
- Programmable button (P3)
- Volume Controls (VOL)

The P1, P2 and P3 buttons are connected to a resistor divider network, biased between V2 and GROUND. The network, made up of R9913, R9914 and R9915 provides a DC voltage level, controlled by whichever button is pressed, to pin 3 of buffer U1305. The output of buffer U1305 goes to the MAKO ATOD_2 pin. The Patriot IC reads the MAKO A/D value through the SPI bus and uses the read data to determine which button was pressed.

The PTT button is connected to the Patriot IC INT0 Interrupt pin for fast action of the Patriot IC to execute the PTT operation.

Volume controls for the radio are set by up and down controls. These controls share the UC_KP_COLUMN0, UC_KP_COLUMN1 and UC_KP_ROW7 lines. The Patriot IC uses these three lines to determine whether the volume up or volume down button was pressed.

[Figure 3-9](#) shows the buttons and controls implementation.

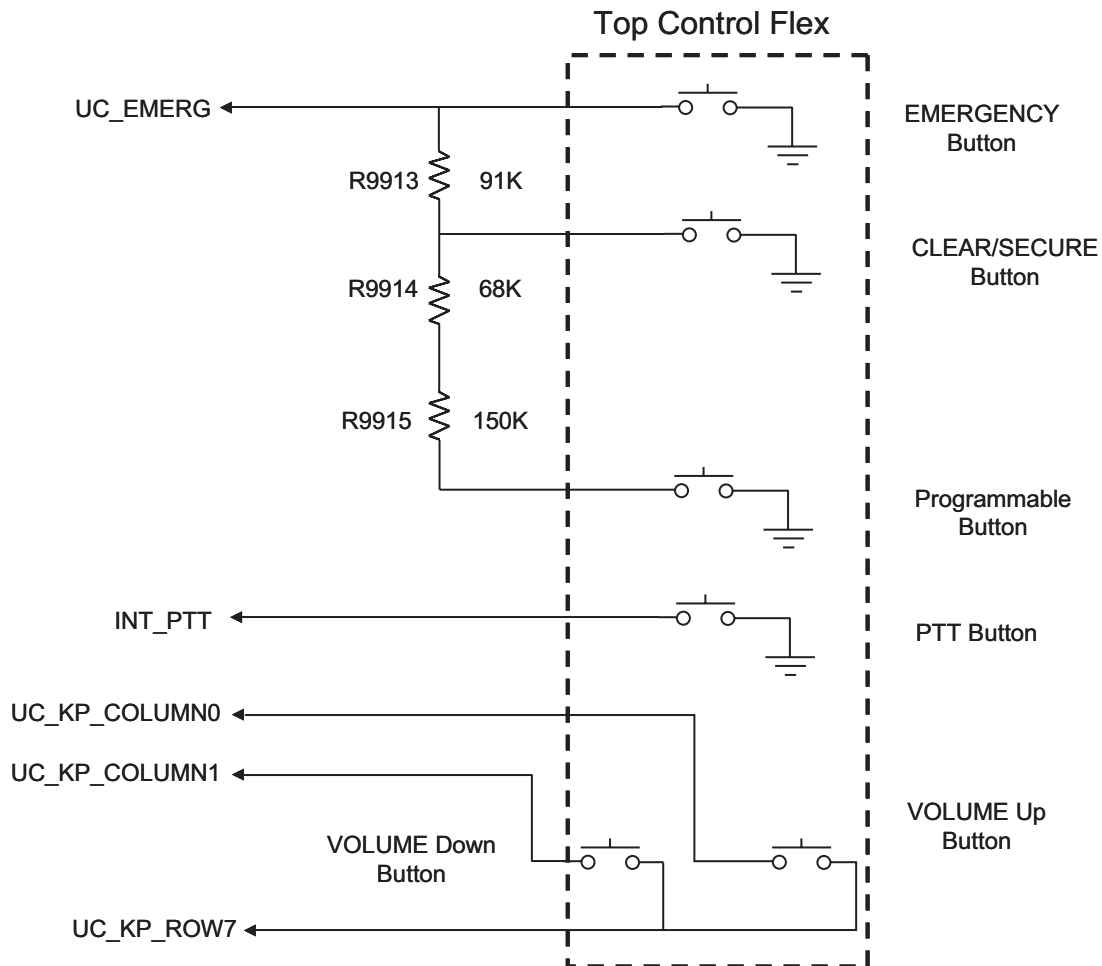


Figure 3-9. Control Top Flex

3.2.4.7 System Clocks

The Patriot is supplied with two clocks:

1. The first clock, a 16.8 MHz sine wave, comes from the RF transceiver portion of the radio. It is conditioned by the clock buffer circuit, which includes Q1402, R1416, R1417, R1418, R1415, C1402, C1403 and C1404.
2. The other clock supplied to Patriot is a 32.768 kHz square wave. This clock is generated by the external 32.768kHz crystal Y1301, and a clock buffer circuit that includes U1302, R1304, R1305 and C1303. This signal is supplied to the CKIL pin on the dual-core processor.

3.2.5 VOCON Audio Paths

This section describes the VOCON transmit and receive audio paths. See [Figure 8-15 and Figure 8-16 on page 8-16 and page 8-17](#) for schematic details of the following discussion.

3.2.5.1 Transmit Audio Path

The single-ended internal microphone audio enters the VOCON section through the 30 pin connector (J2), and the internal microphone bias is set by circuitry that includes R1324, R1325, C1349, C1350 and C1351. The internal microphone signal is connected to the INT_MIC_P pin, which is the input terminal on the MAKO IC internal op-amp G1 after the signal is multiplexed. The gain is programmed by the dual-core processor via SPI lines.

The external microphone audio enters the VOCON section through the 30 pin connector J2 as well and the external microphone bias is set by circuitry that includes R1322, R1323, C1346, C1347 and C1348. The external microphone signal is connected to the EXT_MIC_P pin, which is an input terminal on the MAKO IC internal op-amp G1 after the signal is multiplexed. The gain is programmed by dual-core processor via SPI lines.

The dual-core processor, through the SPI bus, programs a multiplexer internal to the MAKO IC to select one of the microphone signals. Then, the selected microphone signal goes through the G1 pre-amplifier stage and on to a programmable gain amplifier (G2) before it goes to the CODEC for A/D conversion. The resulting digital data is filtered and sent to the DSP on the CODEC_TX line from the MAKO IC VC_TX3V pin. After additional filtering and processing, the DSP sends the data out from the STDB pin, labeled TX_SSI_DATA to the RF transceiver section.

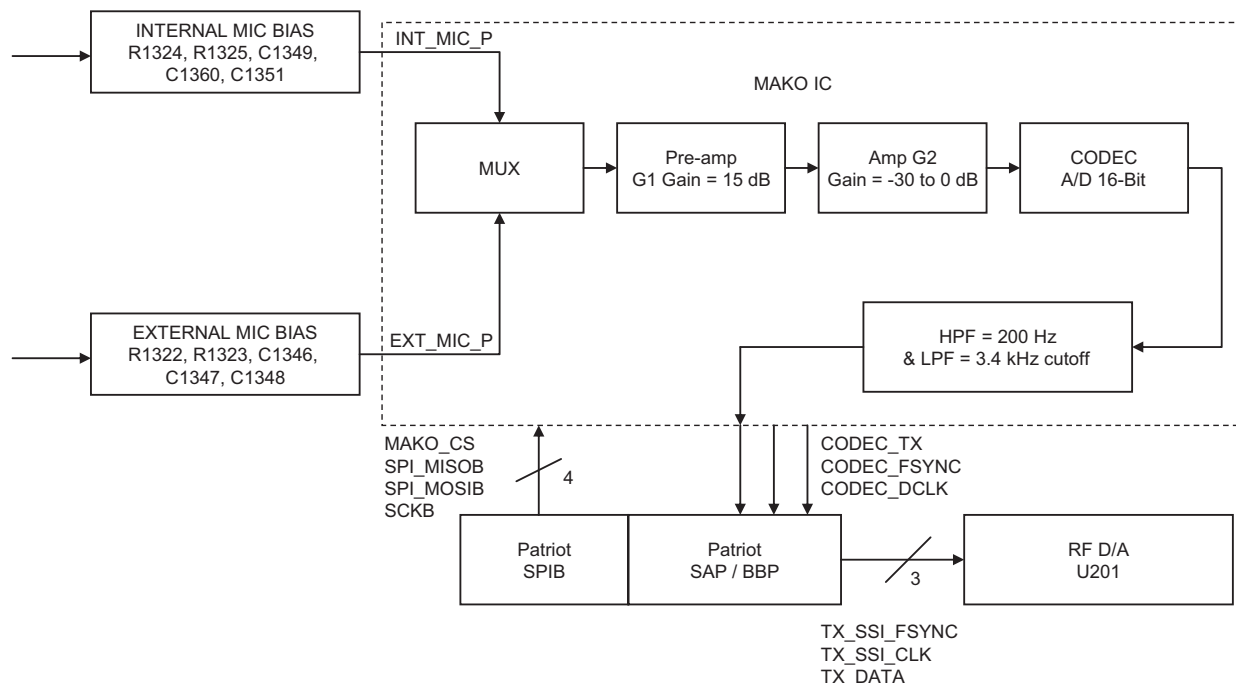


Figure 3-10. VOCON Transmit Audio Path

3.2.5.2 Receive Audio Path

Refer to [Figure 3-11](#). The receive audio data comes from the Abacus III IC (DOUTA) to the dual-core processor SRDB pin. The DSP decodes the data and sends it out through the CODEC_RX line to the MAKO IC VC_RX pin. The CODEC filters, adds digital programmable gain G1, then converts the digital data into an analog audio signal, which in turn is sent to programmable attenuator G3. The signal is then sent through an internal programmable differential preamplifier (G4). The preamplifier outputs are on pins VC_OUT_P and VC_OUT_M of the MAKO IC.

This output from the preamp is first filtered through the circuitries R1326, R1327, C1355, C1356 and C1357, and then sent back to two independent internal BTL differential power amplifiers, G5 & G6, of the MAKO IC. The power amplifiers are programmed to a fixed gain through the dual-core processor SPI lines and PA control registers.

The dual-core processor selects whether the amplified audio is routed to the internal speaker or the external speaker through the SPI lines based upon which amplifier is turned on as shown in the PA control block. The output audio is routed on MAKO IC pins INT_SPKR_P and INT_SPKR_M for internal and EXT_SPKR_P and EXT_SPKR_M for external speaker lines. The external audio is then routed to an audio switch (U20) where it switches the audio between the flip earpiece and the audio jack earpiece. The logic behind the audio routing is set by the Patriot IC (depending on the user's operating mode).

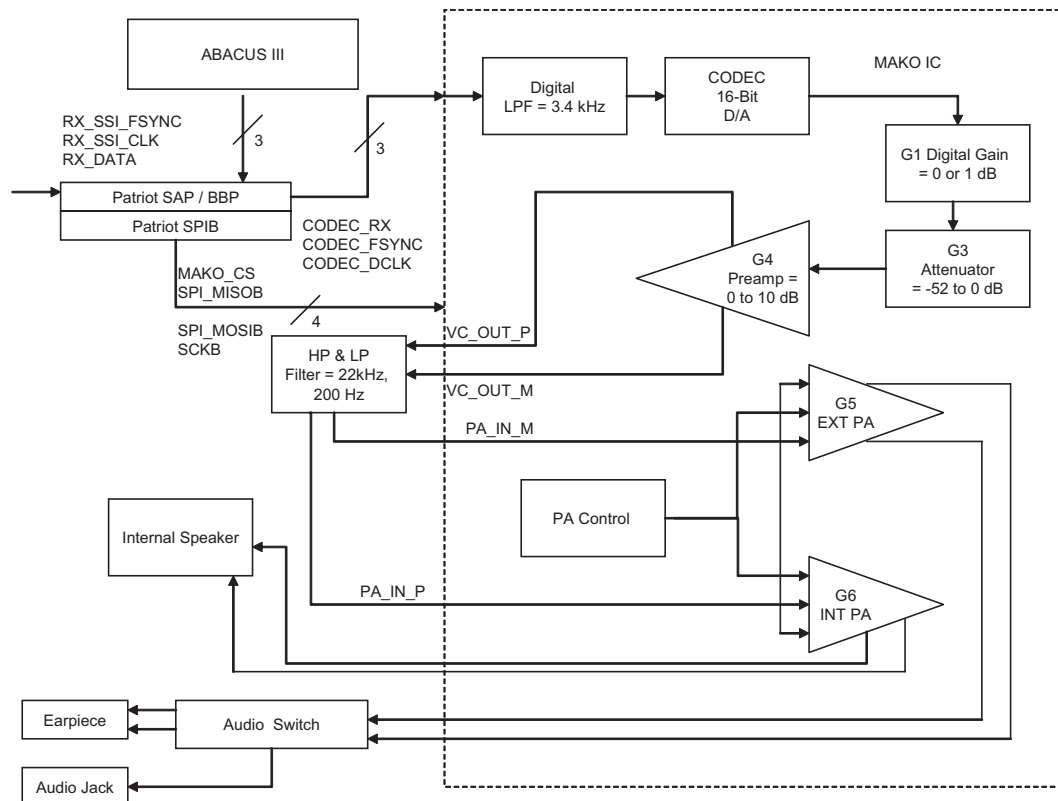


Figure 3-11. VOCON Receive Audio Path

Table 3-5. ON/OFF Operation Truth Table

Condition	INVERTER O/P (Pin 4)	AND GATE INB (Pin 1)	AND GATE INB (Pin 2)	AND GATE O/P (Pin 4)	OR GATE (Pin 1)	OR GATE (Pin 2)	OR GATE (Pin 4)	Mech SW
Initial State	0	0	1	0	0	0	0	0
Press ON	1	1	1	1	1	0	1	1
Press<3 Sec	1	1	0	0	0	0	0	1
Press=3 Sec	1	1	0	0	0	1	1	0
Press>3 Sec	1	1	1	1	1	1	1	0

3.3 Encryption Module

The encryption module connects directly to the VOCON section and interfaces directly with the vocoder digital circuitry. It contains an independent microcontroller to perform digital, numerical, encryption algorithms.

The encryption module is designed to digitally encrypt and decrypt voice and ASTRO data in ASTRO XTS 4000 radios.

NOTE: The encryption modules are NOT serviceable. The information contained in this section is only intended to help determine whether a problem is due to a encryption module or the radio itself.

The encryption module uses a custom encryption IC and an encryption key variable to perform its encode/decode function. The encryption key variable is loaded into the encryption module, via the radio's CE connector, from a hand-held, key variable loader (KVL). The encryption IC corresponds to the particular encryption algorithm purchased. [Table 3-6](#) lists the encryption algorithms and their corresponding kit numbers.

Table 3-6. Encryption Module Software Kits and Algorithms

Software Kit Number	Algorithm
NNTN7056	ADP, AES
NNTN7057	ADP, DES-XL, OFB
NNTN7058	ADP, DVP-XL

The encryption module operates from two power supplies (UNSW_B+ and SW_B+). The SW_B+ is turned on and off by the radio's On/Off switch. The UNSW_B+ provides power to the encryption module as long as the radio battery is in place.

Key variables are loaded into the encryption module. Depending on the type of encryption module, up to 16 keys can be stored in the module at a time. The key can be infinite key retention or 30-seconds key retention, depending on how the codeplug is set up.

The radio's host processor communicates with the encryption module on the Synchronous Serial Interface (SSI) bus. The SSI bus consists of five signal lines. A communication failure between the host processor and the secure module will be indicated as an *ERROR 09/10* message on the display.

To troubleshoot the encryption module, refer to the flowcharts in [Chapter 5 "Troubleshooting Charts."](#)

Notes

Chapter 4 Troubleshooting Procedures

The purpose of this chapter is to aid in troubleshooting problems with the ASTRO XTS 4000 radio. It is intended to be detailed enough to localize the malfunctioning circuit and isolate the defective component. It also contains a listing of service tools recommended for PC board repair at the component level.



Caution

Most of the ICs are static sensitive devices. Do not attempt to disassemble the radio or troubleshoot a board without first referring to the following Handling Precautions section.

4.1 Handling Precautions

Complementary metal-oxide semiconductor (CMOS) devices, and other high-technology devices, are used in this family of radios. While the attributes of these devices are many, their characteristics make them susceptible to damage by electrostatic discharge (ESD) 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 this radio, and are especially important in low-humidity conditions. DO NOT attempt to disassemble the radio without observing the following handling precautions.

1. Eliminate static generators (plastics, Styrofoam, etc.) in the work area.
2. Remove nylon or double-knit polyester jackets, roll up long sleeves, and remove or tie back loose-hanging neckties.
3. Store and transport all static-sensitive devices in ESD-protective containers.
4. Disconnect all power from the unit before ESD-sensitive components are removed or inserted unless otherwise noted.
5. Use a static-safeguarded workstation, which can be accomplished through the use of an anti-static kit. This kit includes a wrist strap, two GROUND cords, a static-control table mat and a static-control floor mat.

4.2 Recommended Service Tools

Table 4-1 lists recommended service tools that can be used for PC board repairs at the component level. For listings of additional service tools, service aids, and test equipment that are recommended for all levels of service, refer to the XTS 4000 Basic Service Manual (see “[Related Publications](#)” on page x).

Table 4-1. Recommended Service Tools

Motorola Part Number	Description	Application
RLN4062	Hot-air workstation, 120V	Tool for hot-air soldering/desoldering of surface-mounted integrated circuits
0180302E51	Master lens system	
6684253C72	Straight prober	
6680384A98	Brush	
0180303E45	SMD tool kit (included with R1319A)	
R1319	ChipMaster (110 V)	Surface-mount removal and assembly of surface-mounted integrated circuits and/or rework station shields. Includes 5 nozzles.
R1321	ChipMaster (220 V)	
6680309B53	Rework equipment catalog	Contains application notes, procedures, and technical references used to rework equipment
0182297T15	XTS 4000 Keyload Cable	Used to load encryption key into radio. Connects to radio's CE connector and key-variable loader (KVL).
NKN1027	RS232 Cable Kit	Connects radio to RLN-4460 Portable Test Set for radio performance checks, and to serial port on personal computer for CPS programming and tuner alignments.
NKN1029	USB Cable Kit	Connects radio to RLN-4460 Portable Test Set for radio performance checks, and to Universal Serial Bus (USB) port on personal computer for CPS programming and tuner alignments.
NNTN7151	Housing Eliminator	Fixture that allows radio's internal board to be mounted externally. Provides easy access to electronic circuits, required for board-level troubleshooting.
NNTN7152	Regulated Battery Eliminator, XTS 4000	Used in place of battery to connect radio to an external power supply.
NNTN7153	SMA Conversion RF Adapter	Adapts radio's antenna port to RF cabling of test equipment.

Table 4-1. Recommended Service Tools (Continued)

Motorola Part Number	Description	Application
RLN4460	Portable Test Set	Used for radio performance checks. Connects to radio's CE connector and allows remote switching and signal injection/outputs for test equipment measurements.
RVN4181	Customer Programming Software (CPS) and Tuner Software	CPS allows customer-specific programming of modes and features. Tuner software required to perform alignment of radio parameters. Can be used for XTS 5000, XTS 4000 and XTS 2500 products.

NOTE Parts U1401 and U1304 are not field repairable. For failures relating to U1401 and U1304, the mainboard has to be replaced.

4.3 Voltage Measurement and Signal Tracing

It is always a good idea to check the battery voltage under load. This can be done by checking the OPT_B+_VPP pin at the radio CE connector (pin 3). The battery voltage should remain at or above 7.0 Vdc. If the battery voltage is less than 7.0 Vdc, then it should be recharged or replaced as necessary prior to analyzing the radio.

In most instances, the problem circuit may be identified using a multimeter, an RF millivoltmeter, oscilloscope (preferably with 100 MHz bandwidth or more), and a spectrum analyzer.



Caution

When checking a transistor or module, either in or out of circuit, do not use an ohmmeter having more than 1.5 Vdc appearing across test leads or use an ohms scale of less than x100.

4.4 Standard Bias Table

Table 4-2 outlines some standard supply voltages and system clocks which should be present under normal operation. These should be checked as a first step to any troubleshooting procedure.

Table 4-2. Standard Operating Bias

Signal Name	Nominal Value	Tolerance	VOCON Board Source
24.576 MHz	24.576 MHz	±1000 ppm	C1317
32.768 kHz	32.768 kHz	±400 ppm	C1303
GATED_32_kHz	32.768 kHz	±400 ppm	C1301
CKIH	16.8 MHz		C1402
X_16.8 MHz	16.8 MHz		R1418
POR	3.0 Vdc	±5%	R1121
RESET_OUT	3.0 Vdc	±5%	R1105
VSW1	3.85 Vdc	±5%	R1319
RAWB+	7.5 Vdc	6.0-9.0 Vdc	C20
V2	2.9 Vdc	±5%	C1324
BAT_7V5	7.5 Vdc	6.0-9.0 Vdc	R1309
UNSW_B+	7.5 Vdc	6.0-9.0 Vdc	C1129
SW_B+	7.5 Vdc	6.0-9.0 Vdc	C1343
VCC5	5.0 Vdc	±5%	C1319
V1.55	1.55 Vdc	±5%	C1328

4.5 Power-Up Self-Check Errors

Each time the radio is turned on, the MCU and DSP perform a series of internal diagnostics. These diagnostics consist of checking such programmable devices as the FLASH ROMs, and SRAM devices.

Problems detected during the power-up self-check routines are presented as error codes on the radio's display. For non-display radios, the problem is presented at power up by a single, low-frequency tone. [Table 4-3](#) lists possible error codes, a description of each error code, and a recommended corrective action.

Table 4-3. Power-Up Self-Check Error Codes

Error Code	Description	Corrective Action
01/02	FLASH ROM codeplug Checksum Non-Fatal Error	Reprogram the codeplug
01/12	Security Partition Checksum Non-Fatal Error	Send radio to depot
01/20	ABACUS Tune Failure Non-Fatal Error	Turn radio off, then on
01/22	Tuning Codeplug Checksum Non-Fatal Error	Send radio to depot
01/81	Host ROM Checksum Fatal Error	Send radio to depot
01/82	FLASH ROM Codeplug Checksum Fatal Error	Reprogram the codeplug
01/88	External RAM Fatal Error — Note: Not a checksum error	Send radio to depot
01/90	General Hardware Failure Fatal Error	Turn radio off, then on
01/92	Security Partition Checksum Fatal Error	Send radio to depot
01/93	FLASHport Authentication Code Failure	Send radio to depot
01/98	Internal RAM Fail Fatal Error	Send radio to depot
01/A2	Tuning Codeplug Checksum Fatal Error	Send radio to depot
02/81	DSP ROM Checksum Fatal Error	Send radio to depot
02/88	DSP RAM Fatal Error — Note: Not a checksum error	Turn radio off, then on
02/90	General DSP Hardware Failure (DSP startup message not received correctly)	Turn radio off, then on
09/10	Secure Hardware Failure	Turn radio off, then on
09/90	Secure Hardware Fatal Error	Turn radio off, then on

4.6 Power-Up Self-Check Diagnostics and Repair (Not for Field Use)

Table 4-4 lists additional action items that can be used for the diagnosis and resolution of the error codes listed in Table 4-3 on page 4-5.

Table 4-4. Power-Up Self-Check Diagnostic Actions

Error Code	Diagnostic Actions
01/02	This non-fatal error will likely recover if the radio's power is cycled. In the event that this does not resolve the issue, the radio should be reflashed. As a last resort, the FLASH ROM U1410 should be replaced.
01/12	The radio should be sent to the depot for reflashing of the security codeplug.
01/20	Cycling radio power should resolve this issue.
01/22	The radio should be sent to the depot for reflash of the tuning codeplug followed by retuning of the radio.
01/81	The radio should be sent to the depot for reflashing of the host code.
01/82	The radio should be sent to the depot for reflashing of the radio codeplug.
01/88	Reflashing of the radio should first be performed. If this fails to resolve the issue, then replacement of the SRAM U1409 is necessary.
01/90	Cycle power to radio. Continued failure indicates a likely IC failure (MAKO, PCIC, ABACUS). In this event, radio should be sent to the depot for isolation and repair of the problem IC.
01/92	The radio should be sent to the depot for reprogramming of the security codeplug.
01/93	The radio should be sent to the depot for reflashing of the host code.
01/98	Send radio to the depot for replacement of the SRAM U1409.
01/A2	The radio should be sent to the depot for reflashing of the tuning codeplug followed by re-tuning of the radio.
02/81	The radio should be sent to the depot for examination and/or replacement of either the FLASH U1410, or the PATRIOT MCU/DSP U1401.
02/88	Cycle power to the radio. If this does not fix the problem, then the radio should be sent to the depot for reflashing of the DSP code. Continued failure requires examination and/or replacement of the SRAM U1409.
02/90	Cycle power to the radio. If this fails to fix the problem, then the radio should be sent to the depot for reflashing of the DSP code. Continued failure may require replacement of U1401, the PATRIOT MCU/DSP.
09/10	Cycle power to the radio. If this fails then follow instructions in the secure hardware failure troubleshooting flowchart.
09/90	Cycle power to the radio. If this fails then follow instructions in the secure hardware failure troubleshooting flowchart.

Chapter 5 Troubleshooting Charts

This section contains detailed troubleshooting flowcharts. These charts should be used as a guide in determining the problem areas. They are not a substitute for knowledge of circuit operation and astute troubleshooting techniques. It is advisable to refer to the related detailed circuit descriptions in the theory of operation sections prior to troubleshooting a radio.

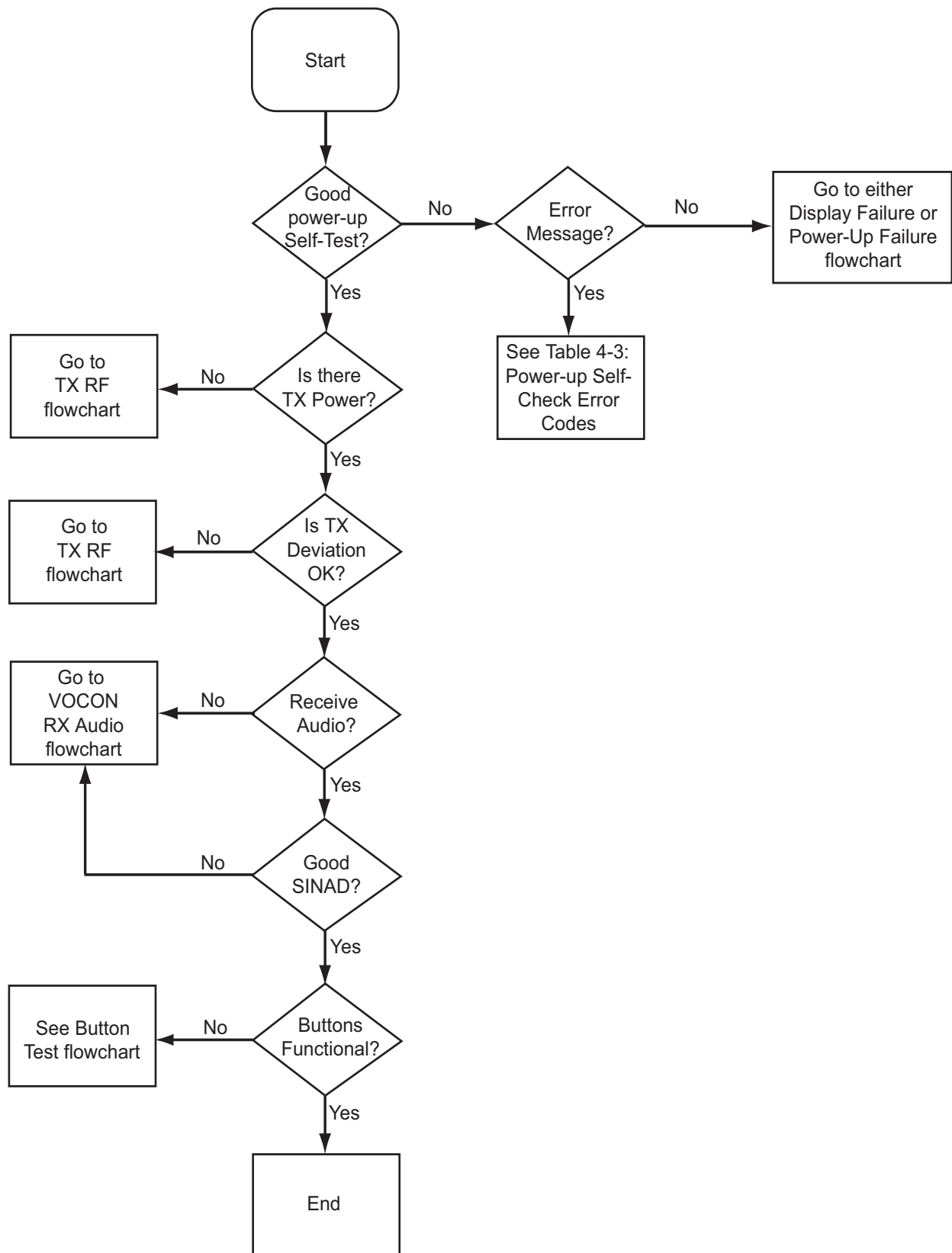
5.1 List of Troubleshooting Charts

Most troubleshooting charts (see [Table 5-1](#)) end up by pointing to an IC to replace. **It is not always noted, but it is good practice to verify supplies and GROUNDs to the affected IC and to trace continuity to the malfunctioning signal and related circuitry before replacing any IC.** For instance, if a clock signal is not available at a destination, continuity from the source IC should be checked before replacing the source IC.

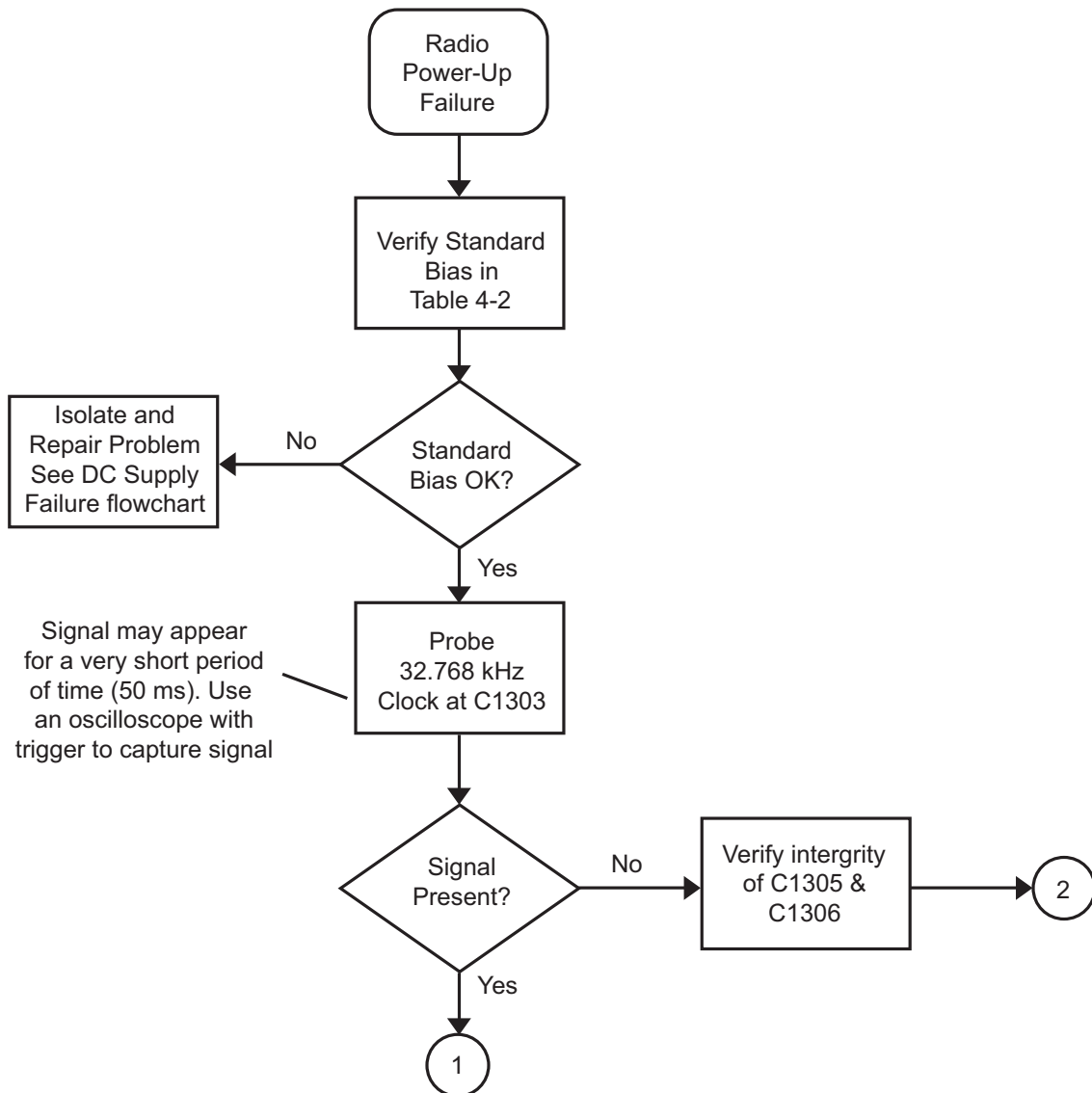
Table 5-1. Troubleshooting Charts List

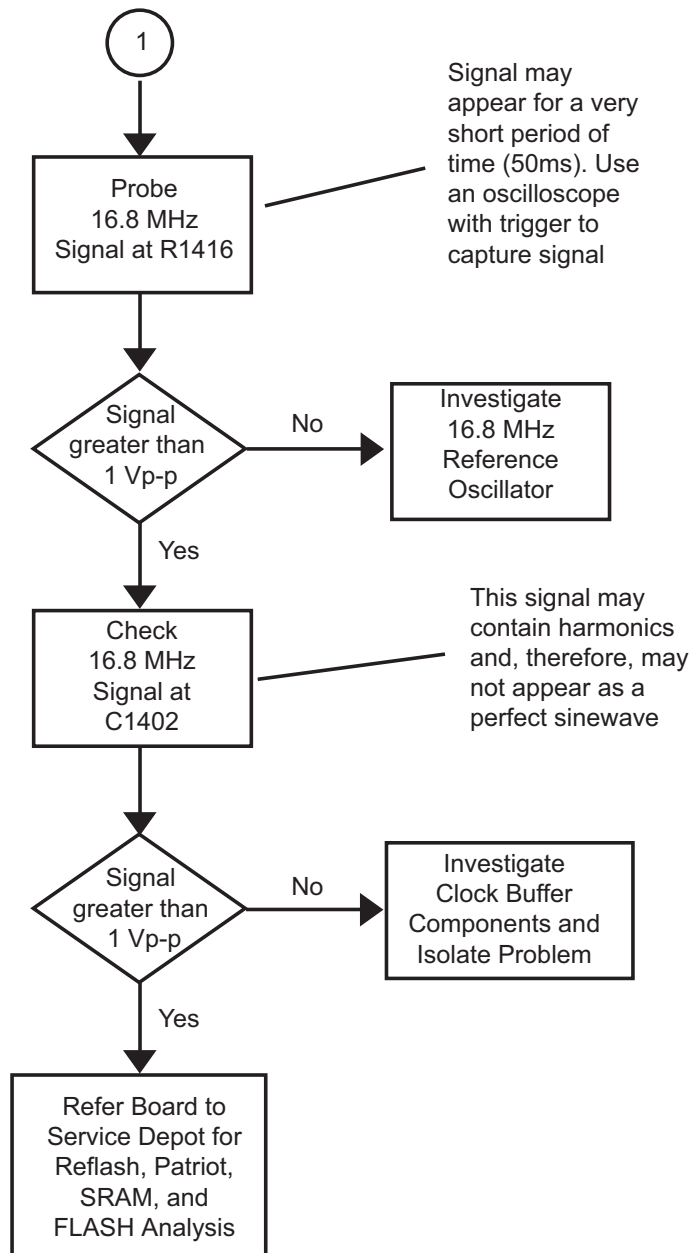
Chart Title	Page No.
Main Troubleshooting Flowchart	5-2
Power-Up Failure	5-3
DC Supply Failure	5-6
Display Failure	5-10
Volume Set Error	5-13
Button Test	5-14
Top/Side Button Test	5-15
VCO TX/RX Unlock	5-16
VOCON TX Audio	5-17
VOCON RX Audio	5-19
RX RF	5-21
TX RF	5-26
Keyload Failure	5-29
Secure Hardware Failure	5-30

5.2 Main Troubleshooting Flowchart

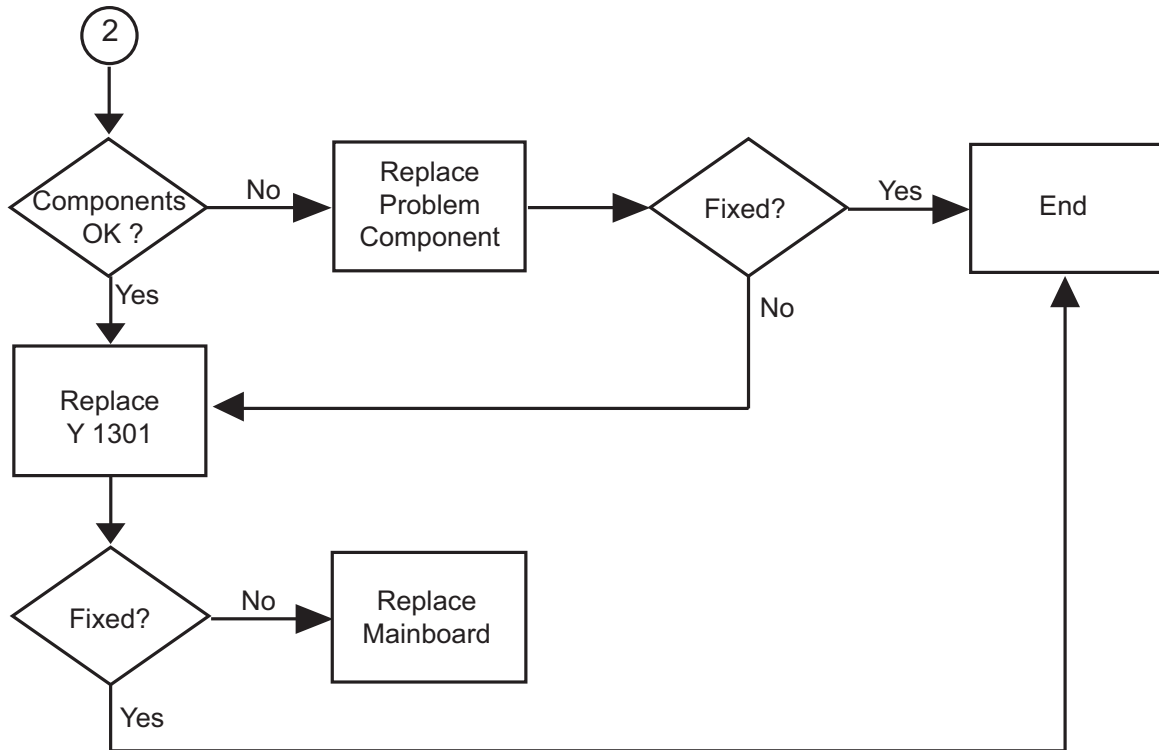


5.3 Power-Up Failure—Page 1



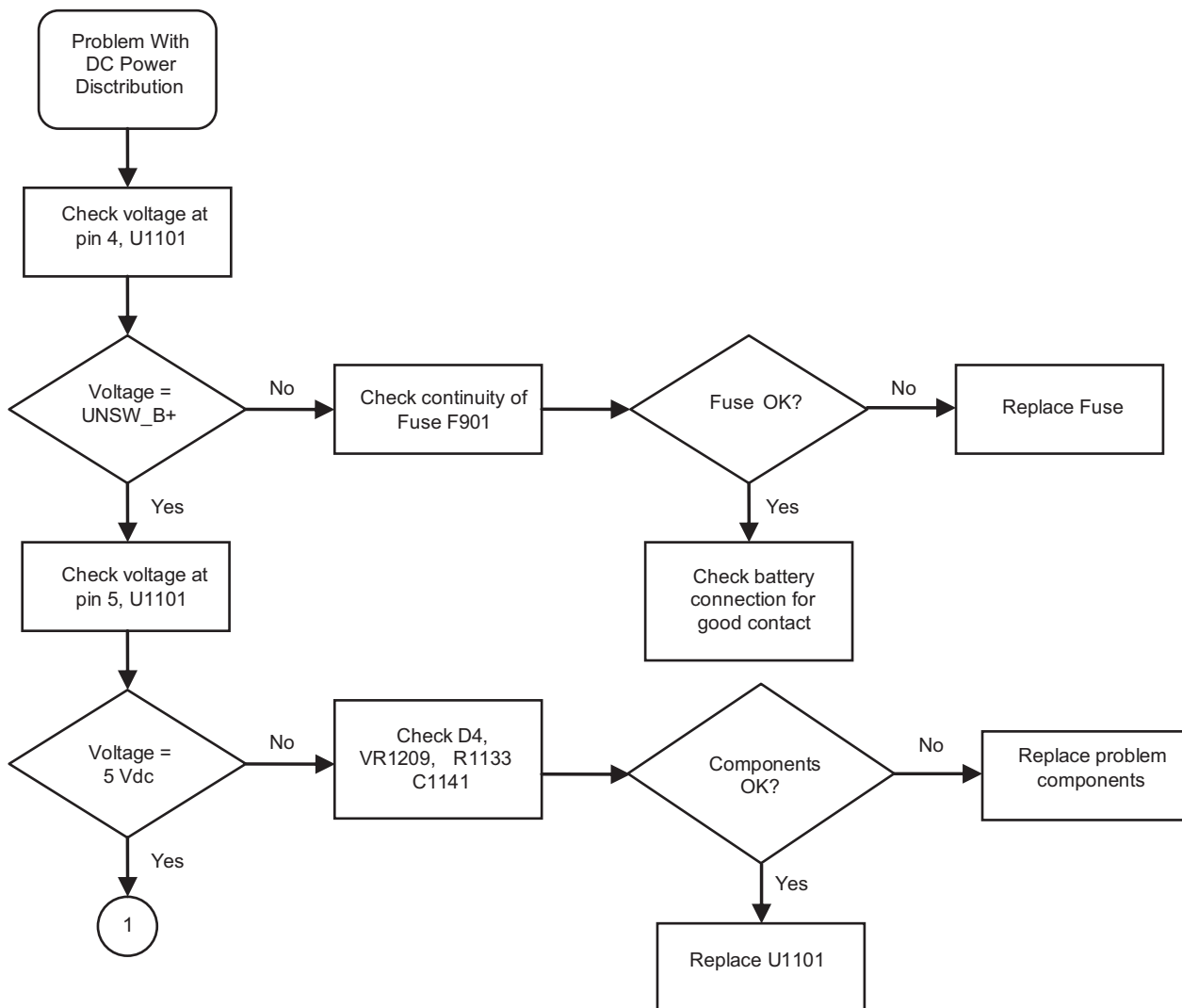
Power-Up Failure–Page 2

Power-Up Failure–Page 3

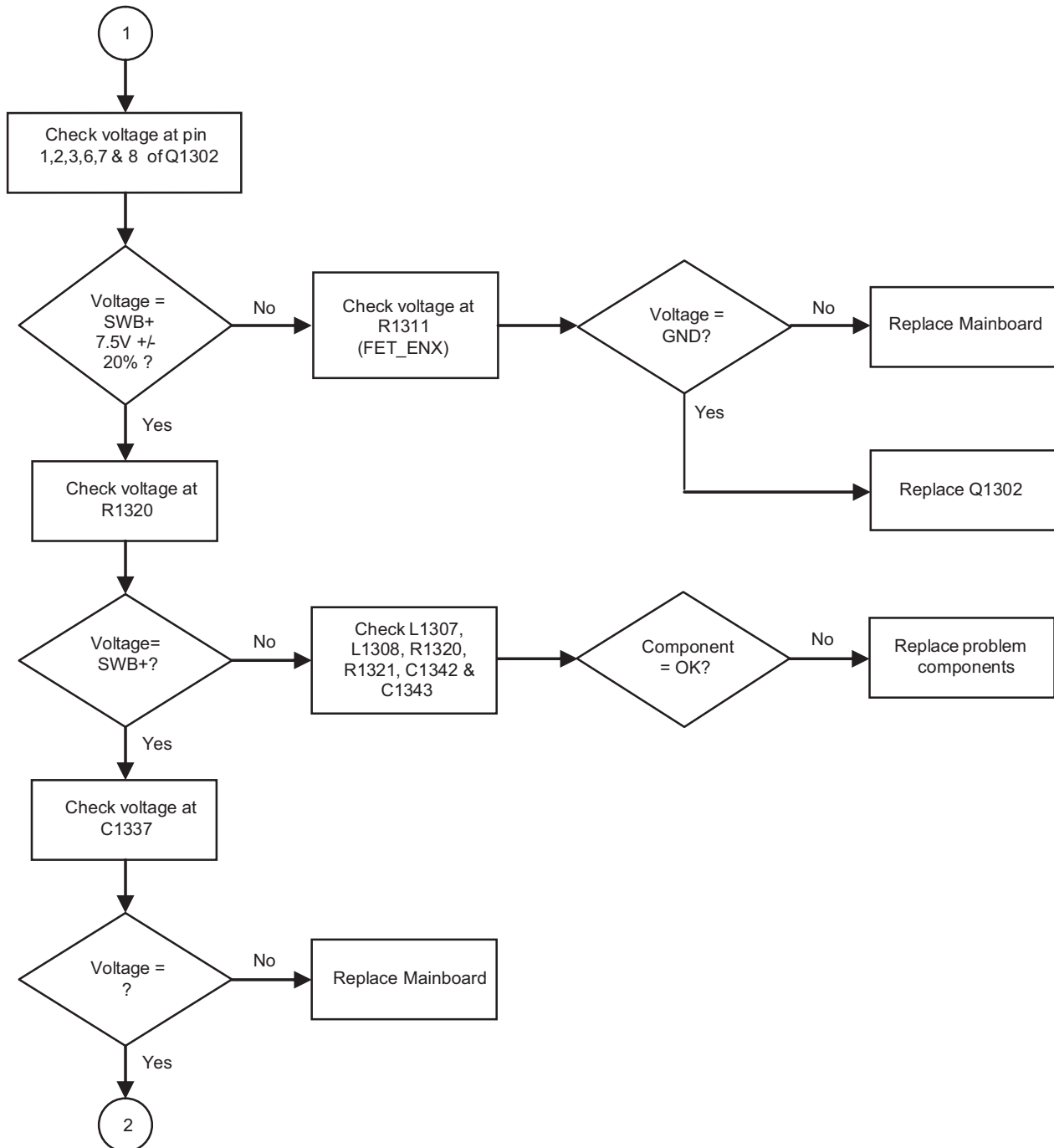


5.4 DC Supply Failure—Page 1

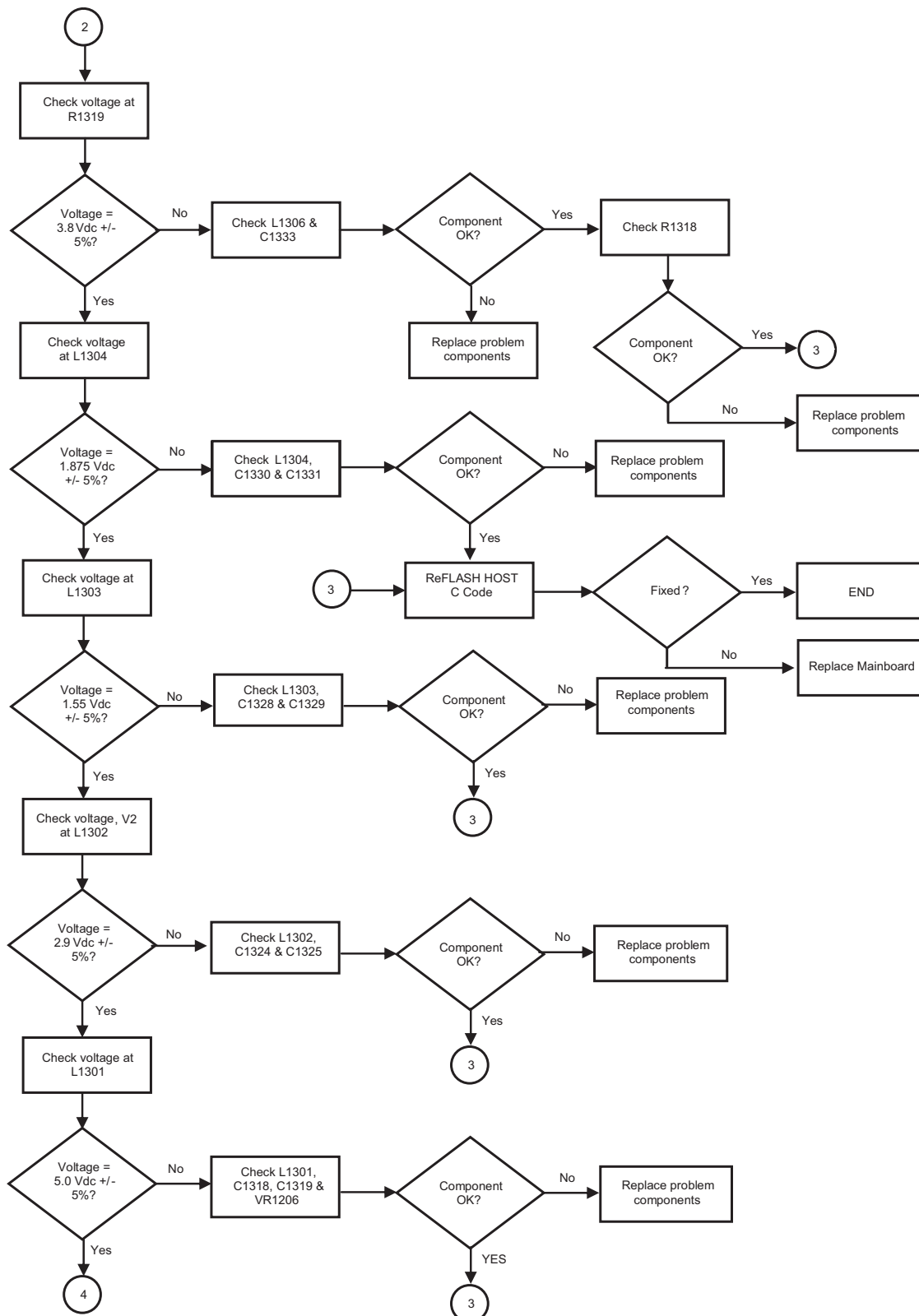
NOTE: Since the failure of a critical voltage supply might cause the radio to automatically power down, supply voltages should first be probed with a multimeter. If all the board voltages are absent, then the voltage test point should be retested using a rising-edge-triggered oscilloscope. If the voltage is still absent, then another voltage should be tested using the oscilloscope. If that voltage is present, then the original voltage supply in question is defective and requires investigation of associated circuitry.



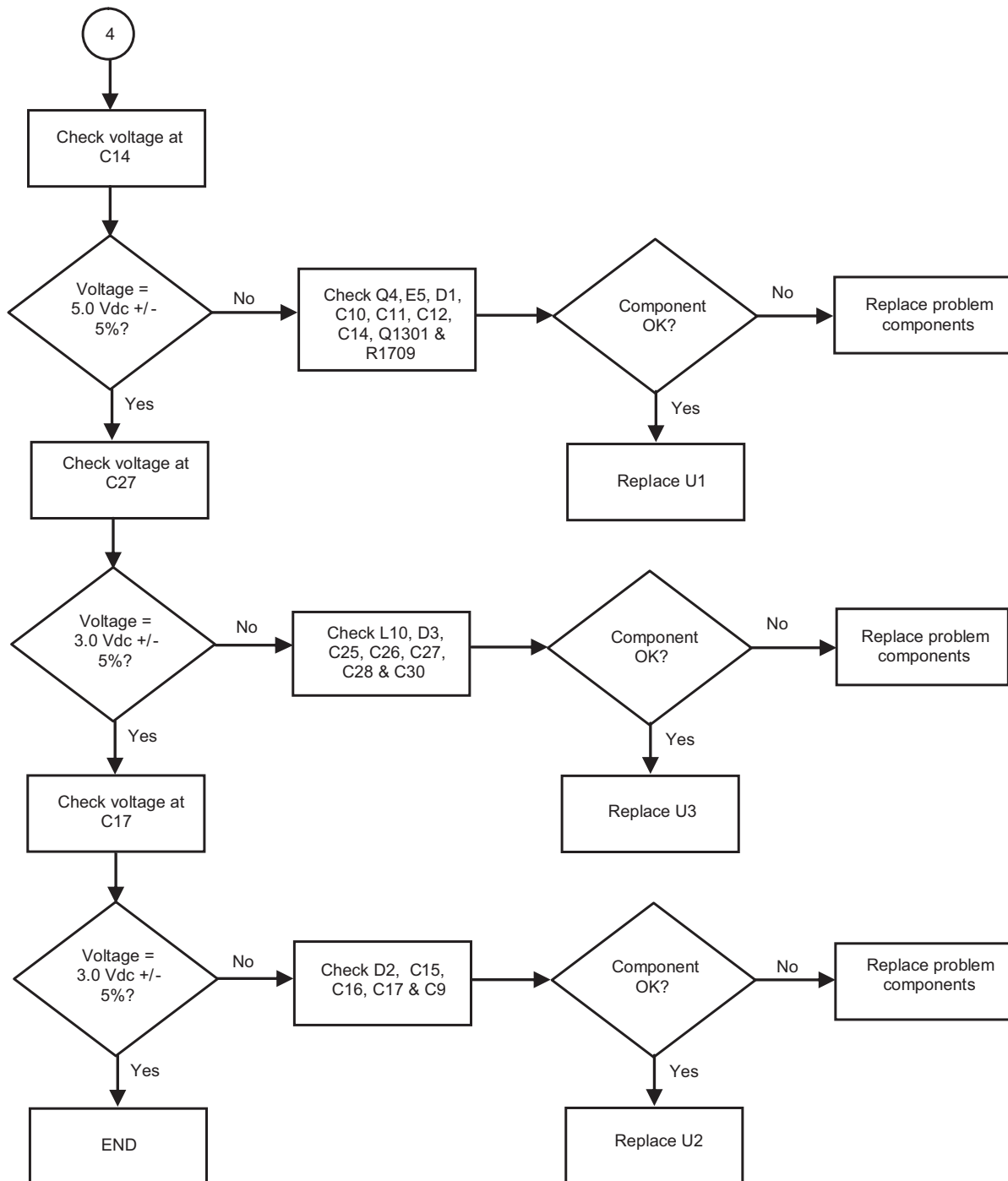
DC Supply Failure–Page 2



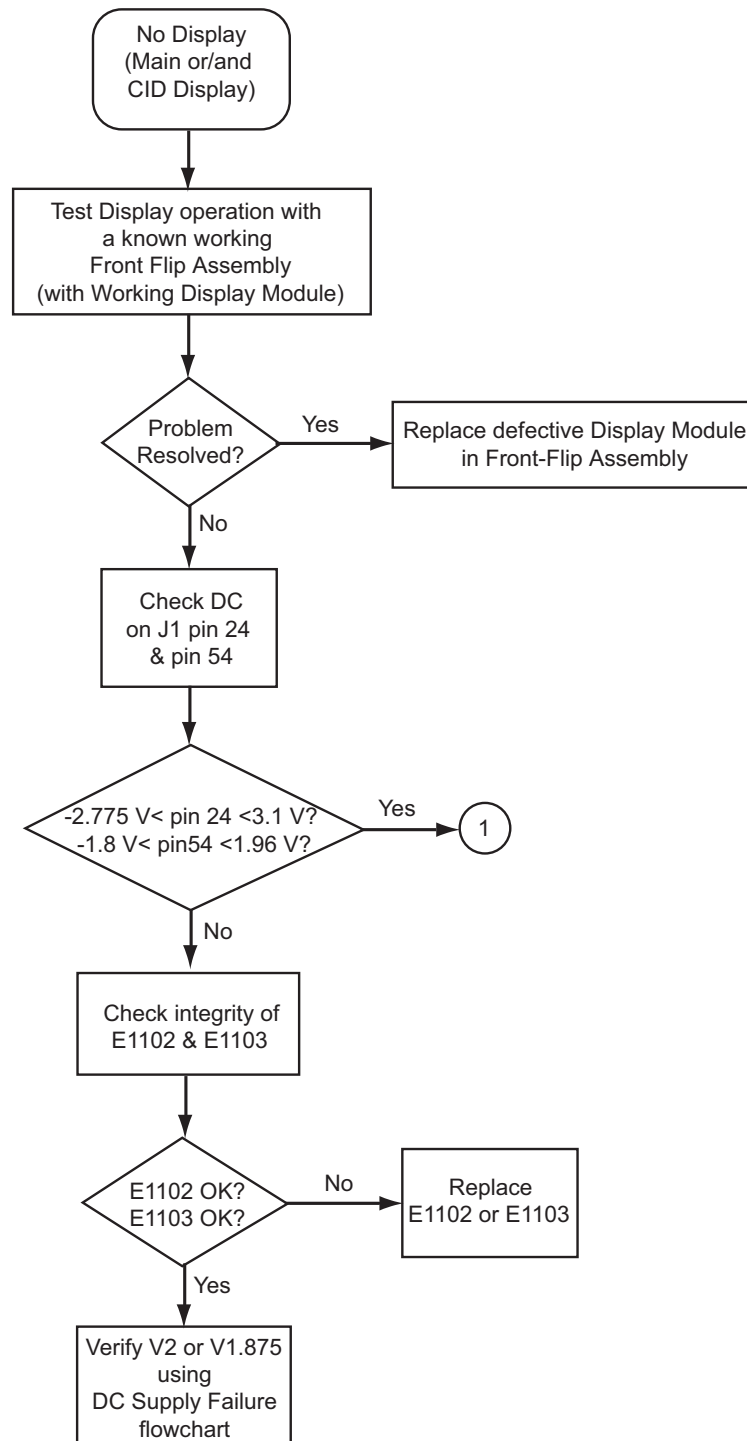
DC Supply Failure—Page 3



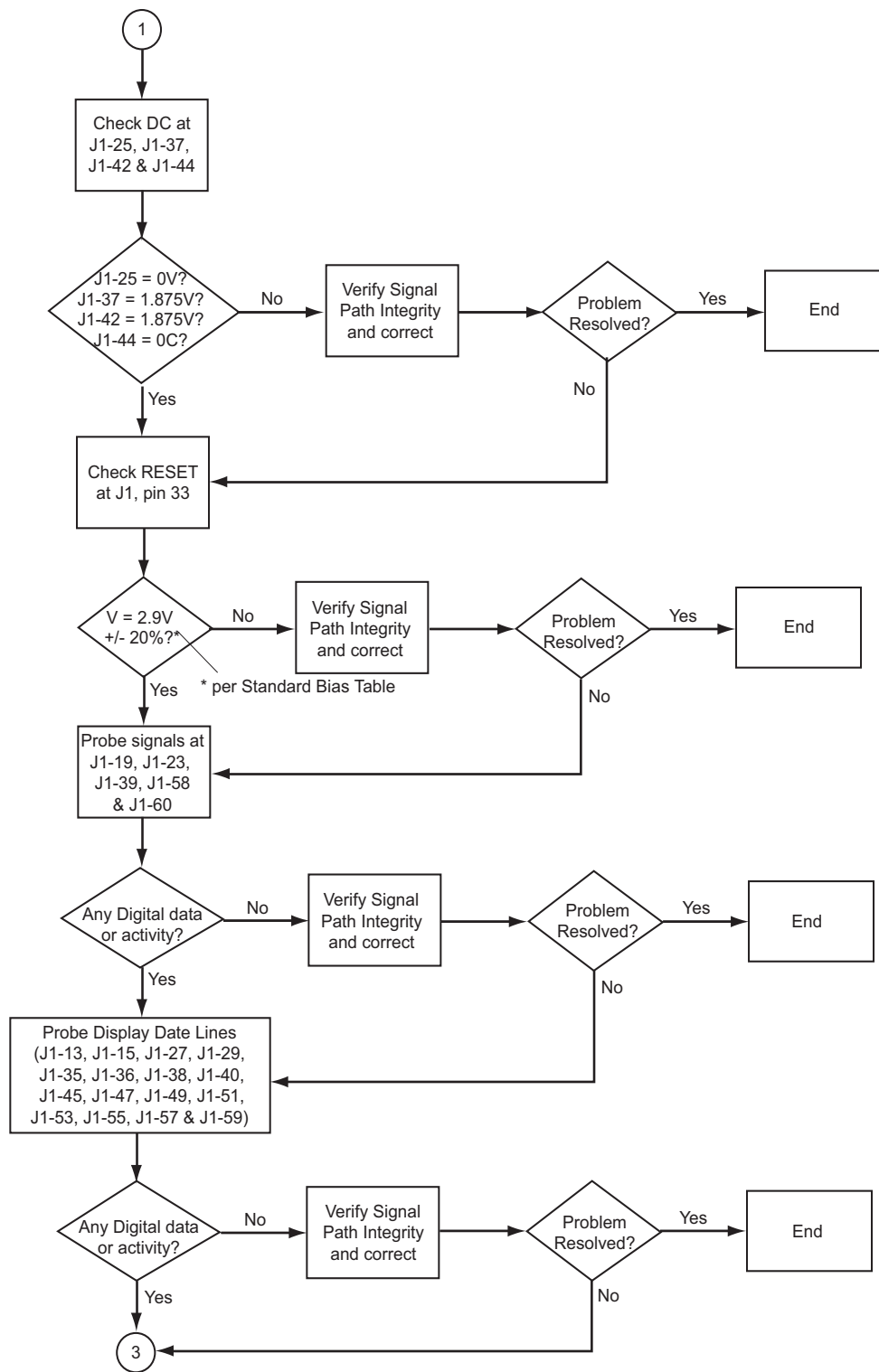
DC Supply Failure–Page 4



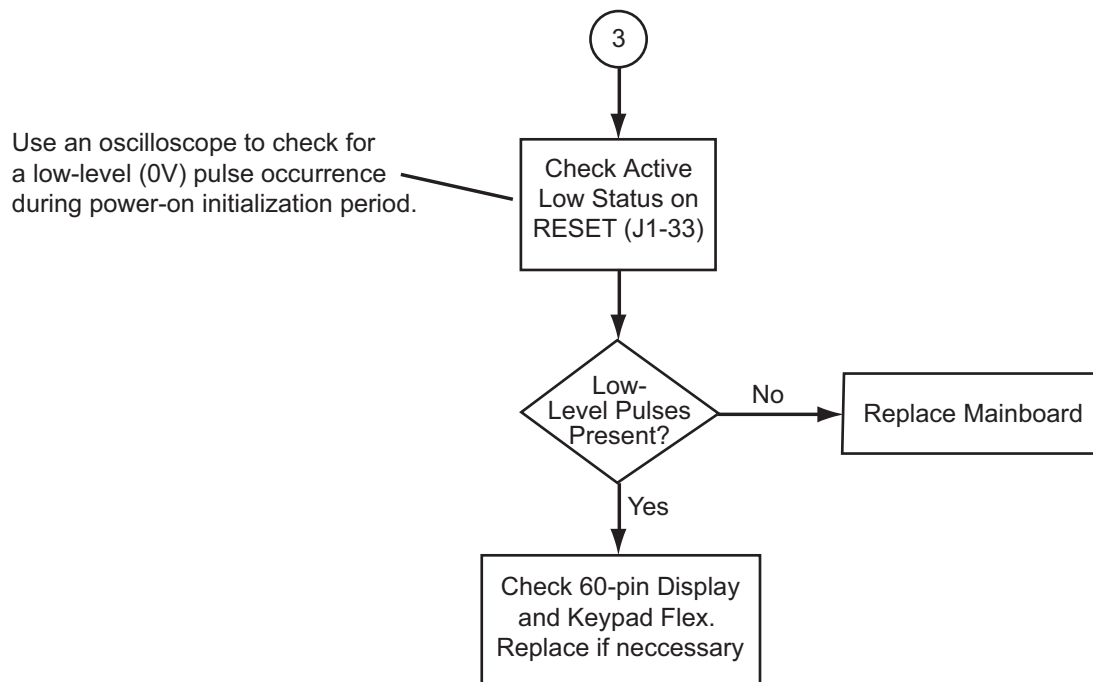
5.5 Display Failure—Page 1



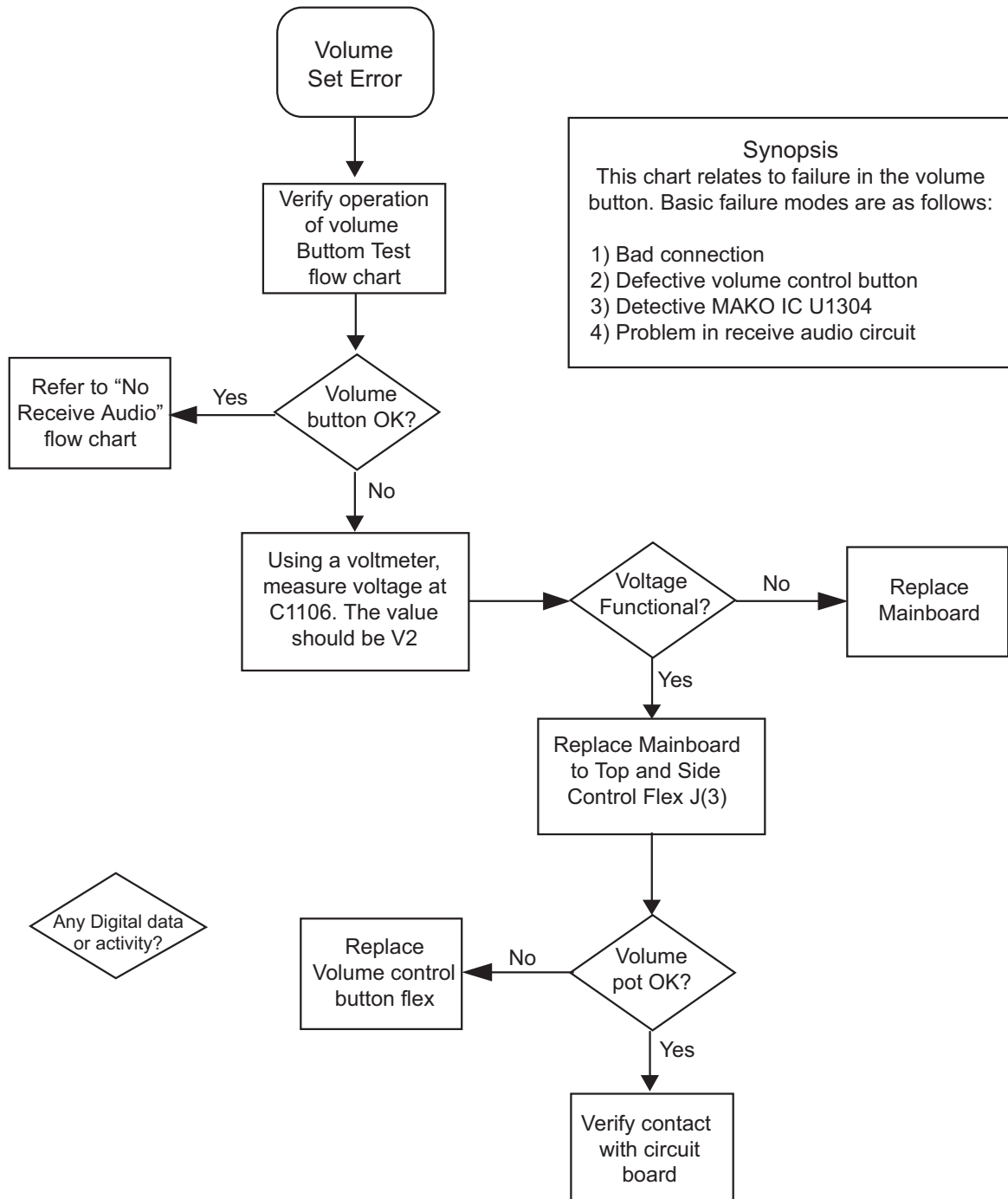
Display Failure–Page 2



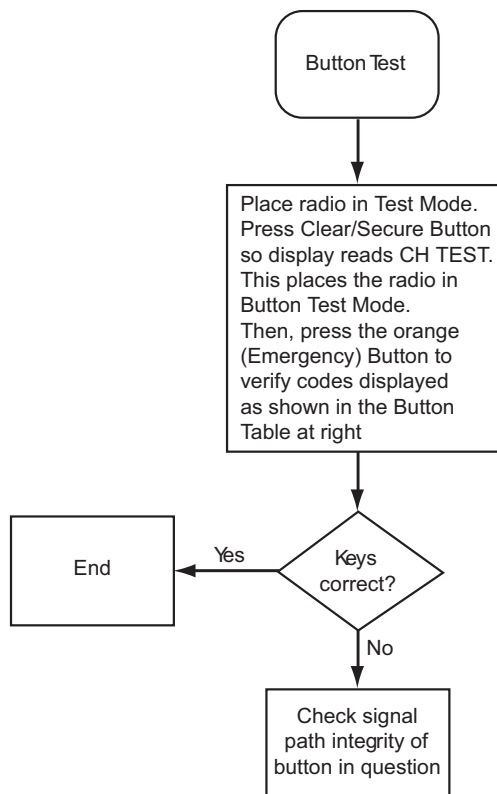
Display Failure—Page 3



5.6 Volume Set Error



5.7 Button Test



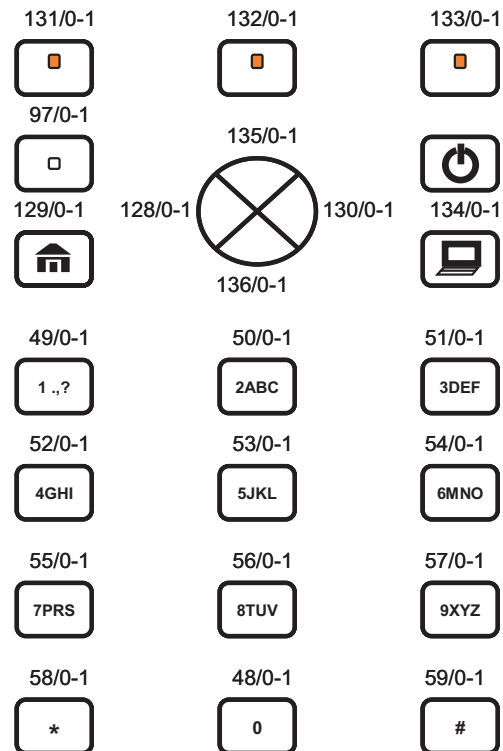
Synopsis

This chat relates to a failure in the button functions. Basic Failure modes are as follows:

- 1) Failure in Keypad Flex & Connectors within the Front Flip Assembly
- 2) Failure in Top Control Flex & Connectors within the Radio Chassis Assembly
- 3) Bad connections
- 4) Defective Patriot IC

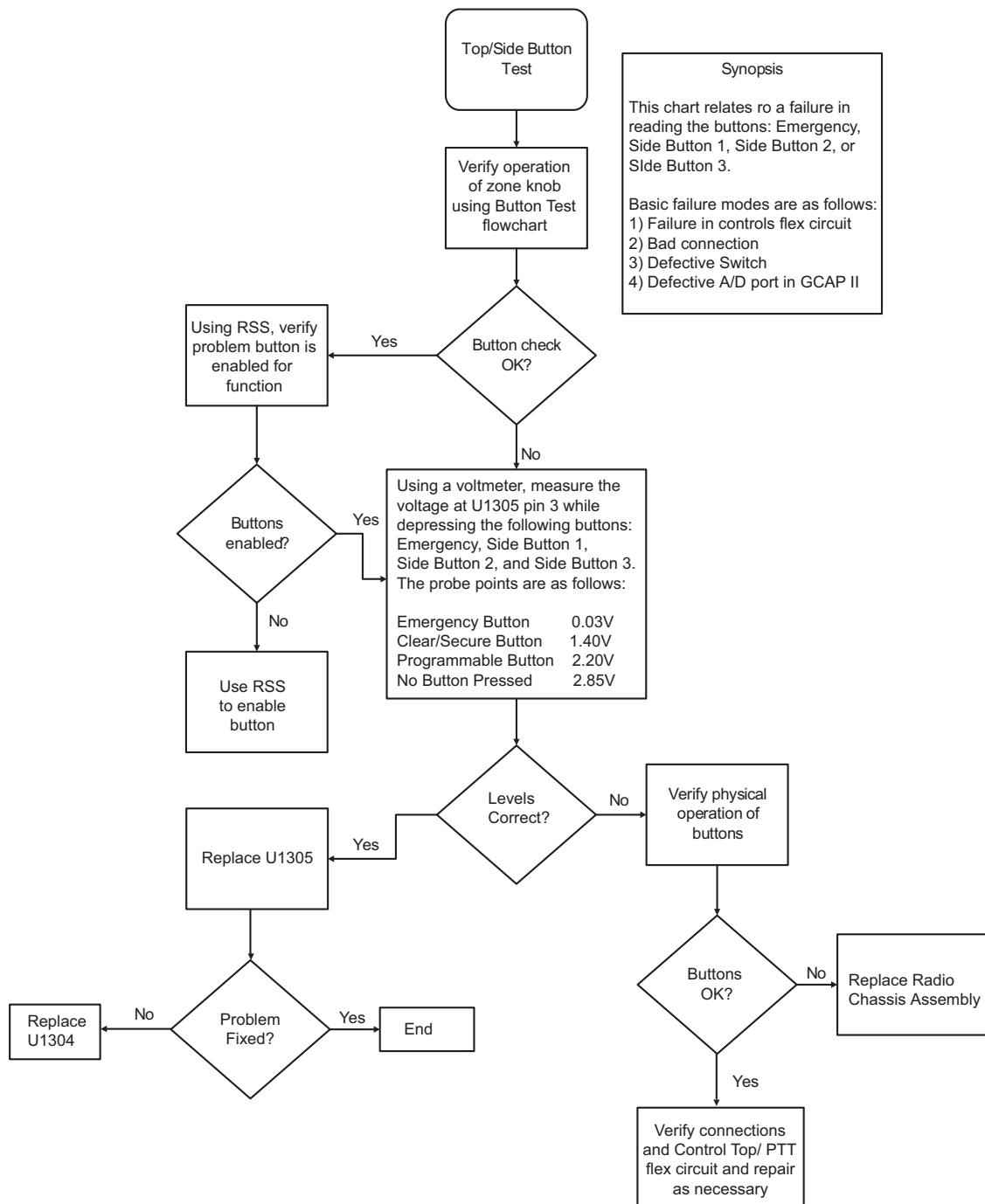
Button Table

Button	Code
PTT	1/ 0-1
Emergency Button	3/ 0-1
Clear/ Secure Button	96/ 0-1
Volume Up Button	80/ 0-1
Volume Down Button	81/ 0-1
Programmable Button	98/ 0-1

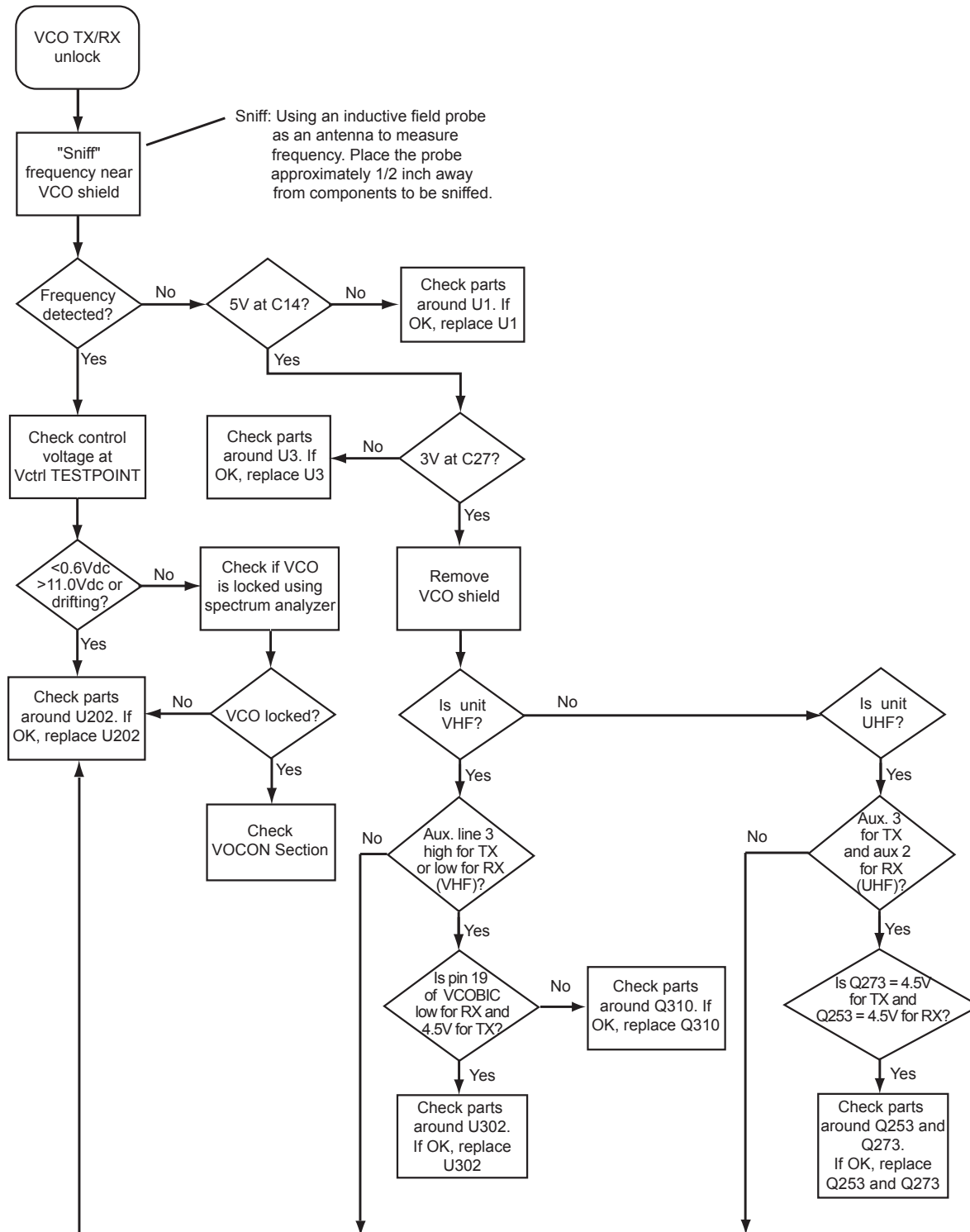


* Note: The Button Test applies to all buttons on the radio EXCEPT the ON/OFF button on the keypad. This button solely serves radio Power-Up/ Power-Down functionality.

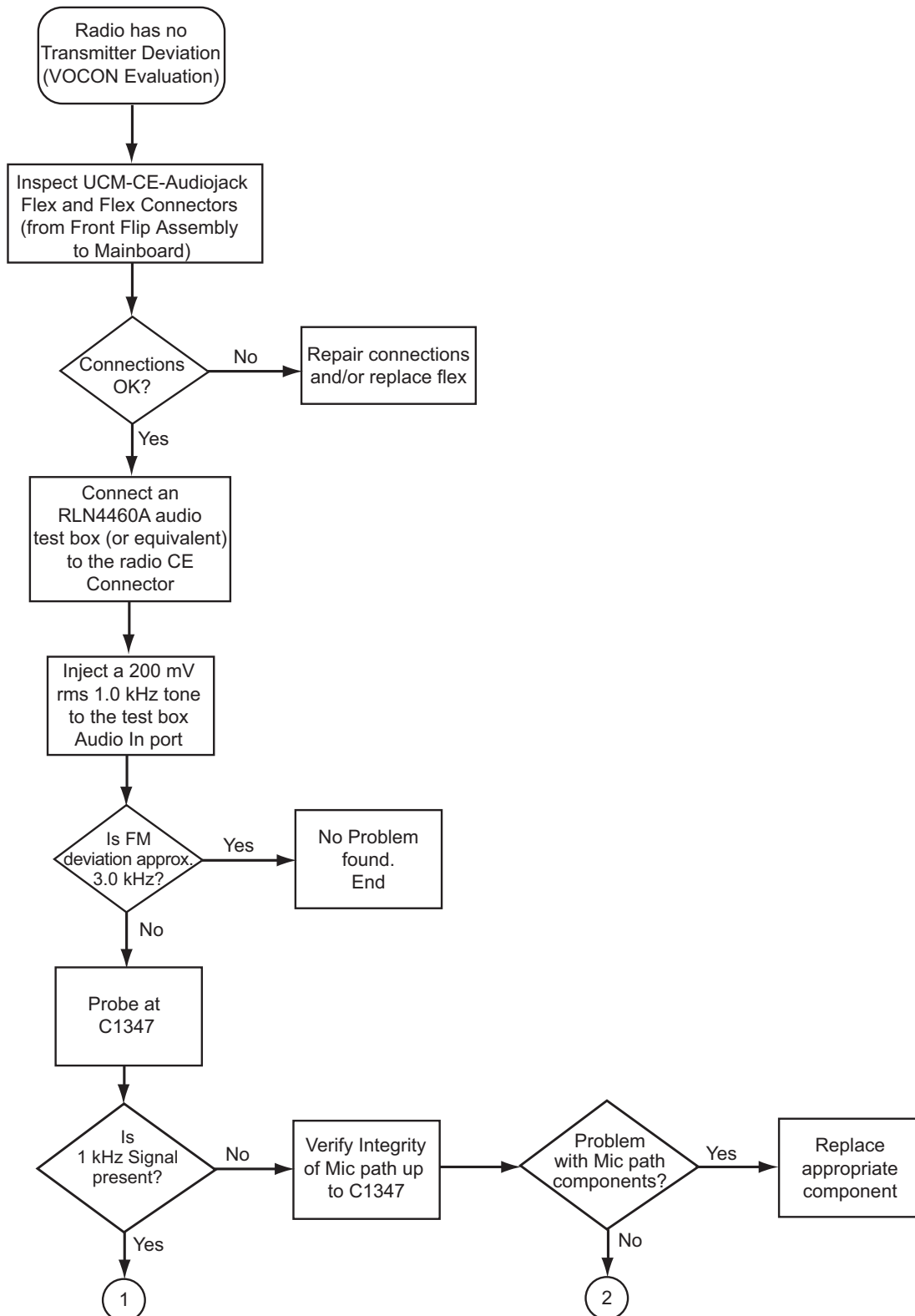
5.8 Top/Side Button Test

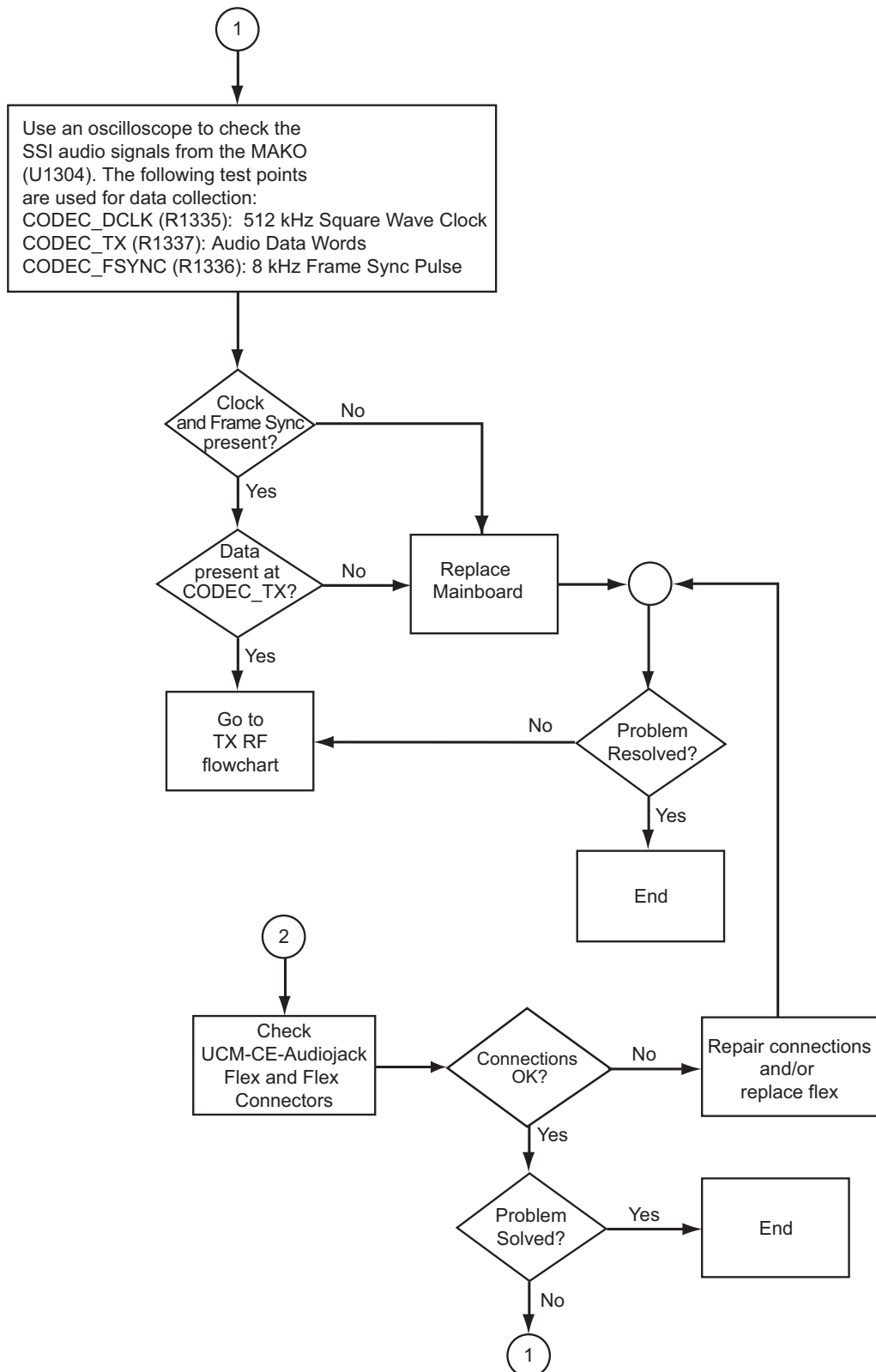


5.9 VCO TX/RX Unlock

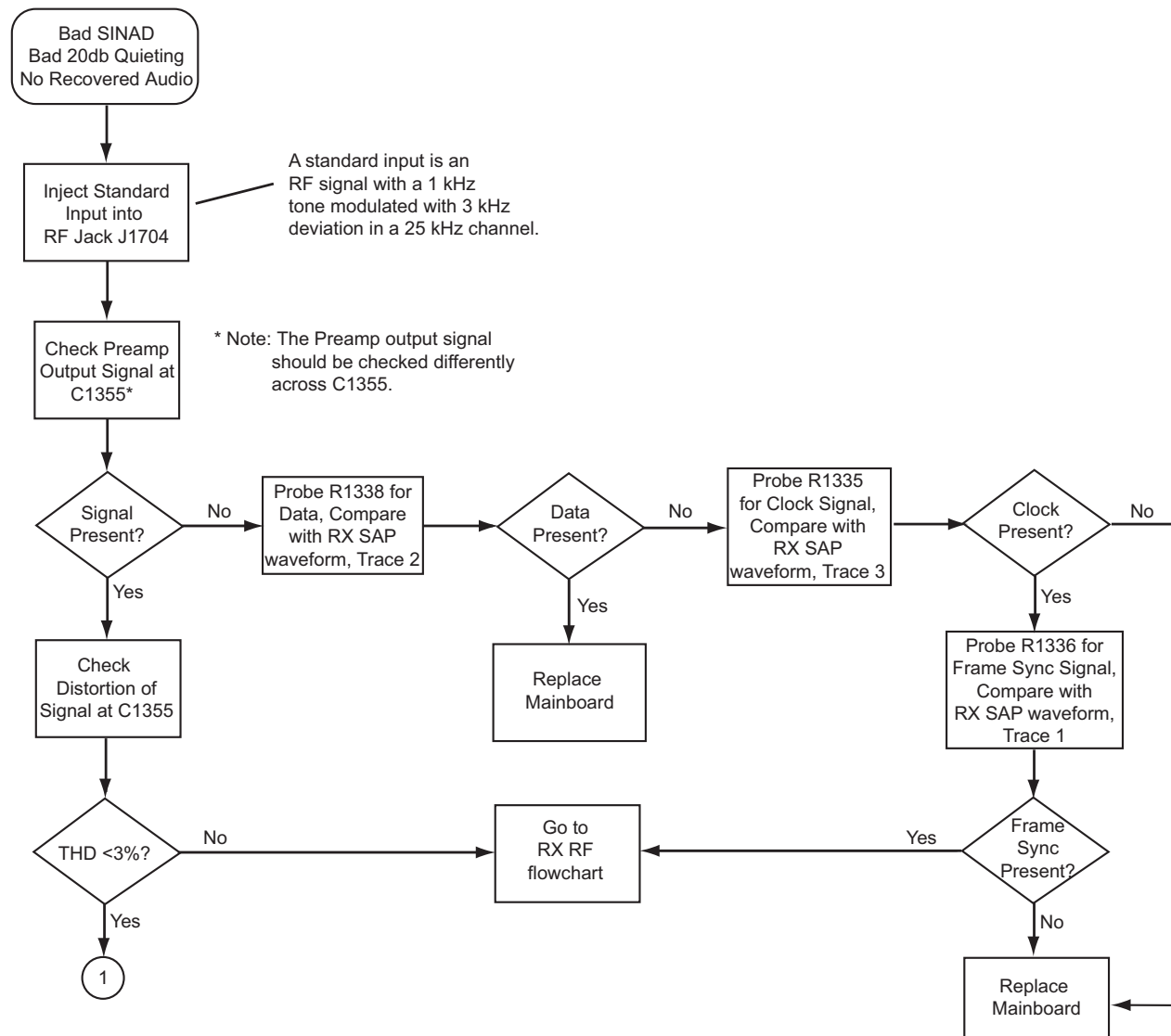


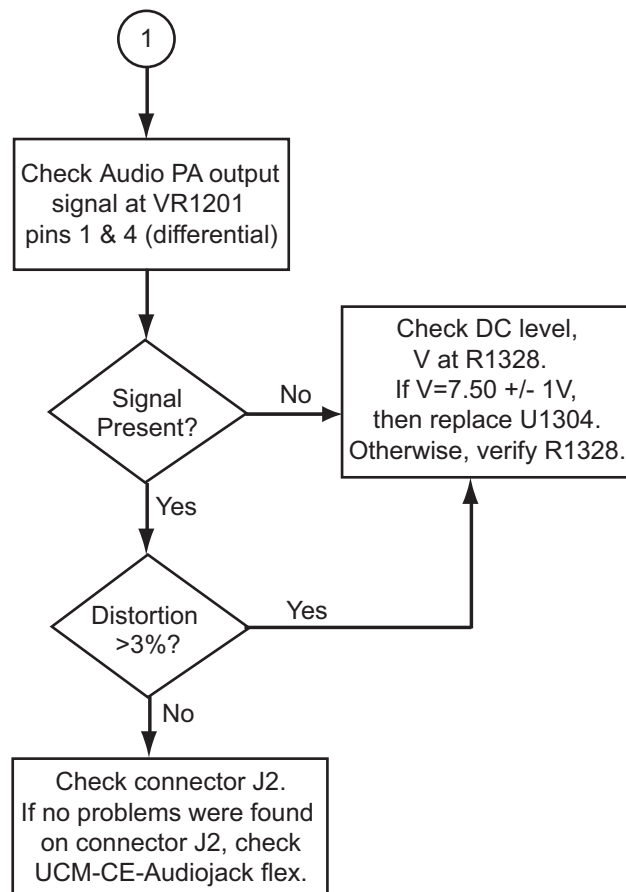
5.10 VOCON TX Audio–Page 1



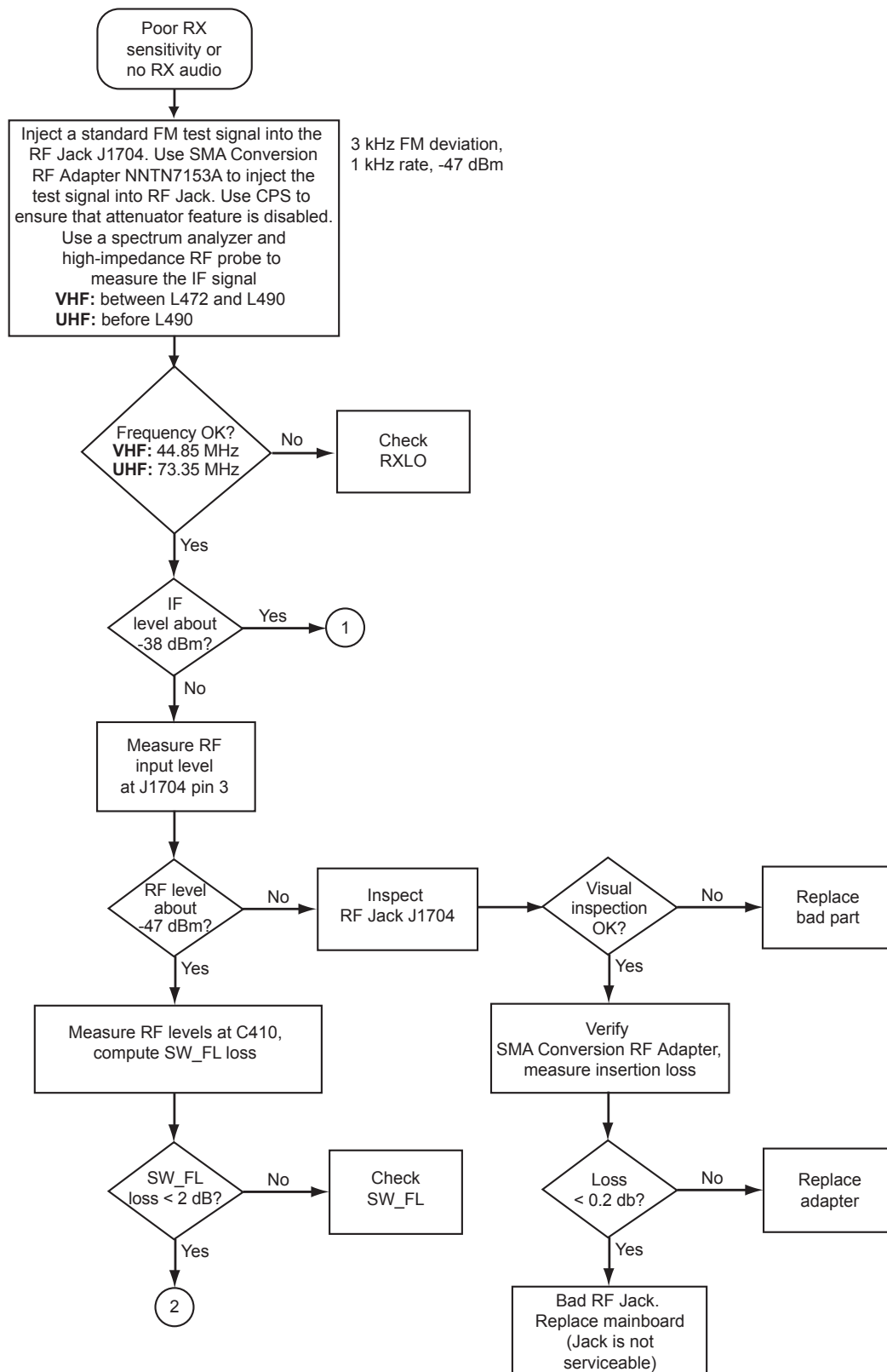
VOCON TX Audio–Page 2

5.11 VOCON RX Audio–Page 1

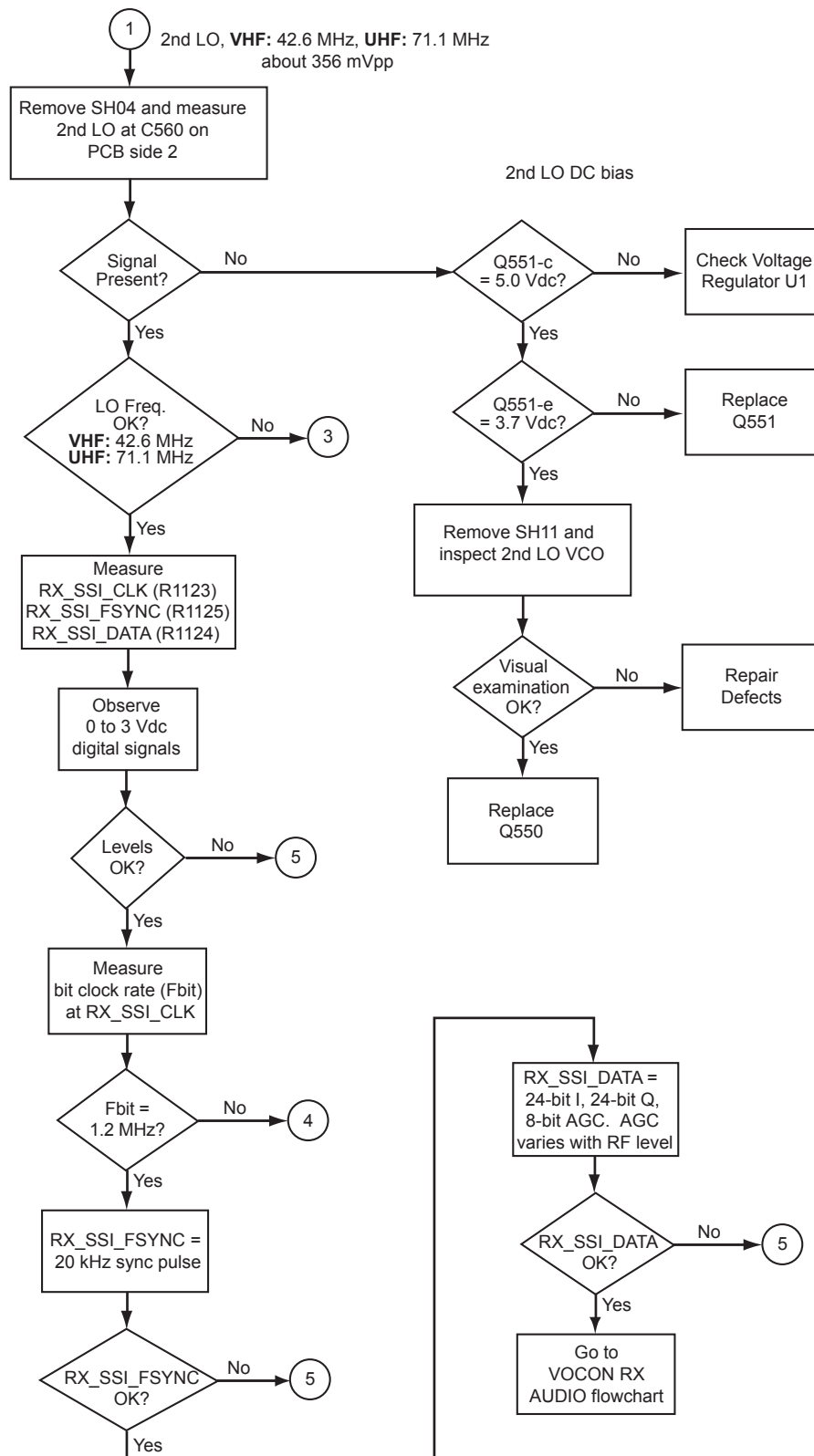


VOCON RX Audio—Page 2

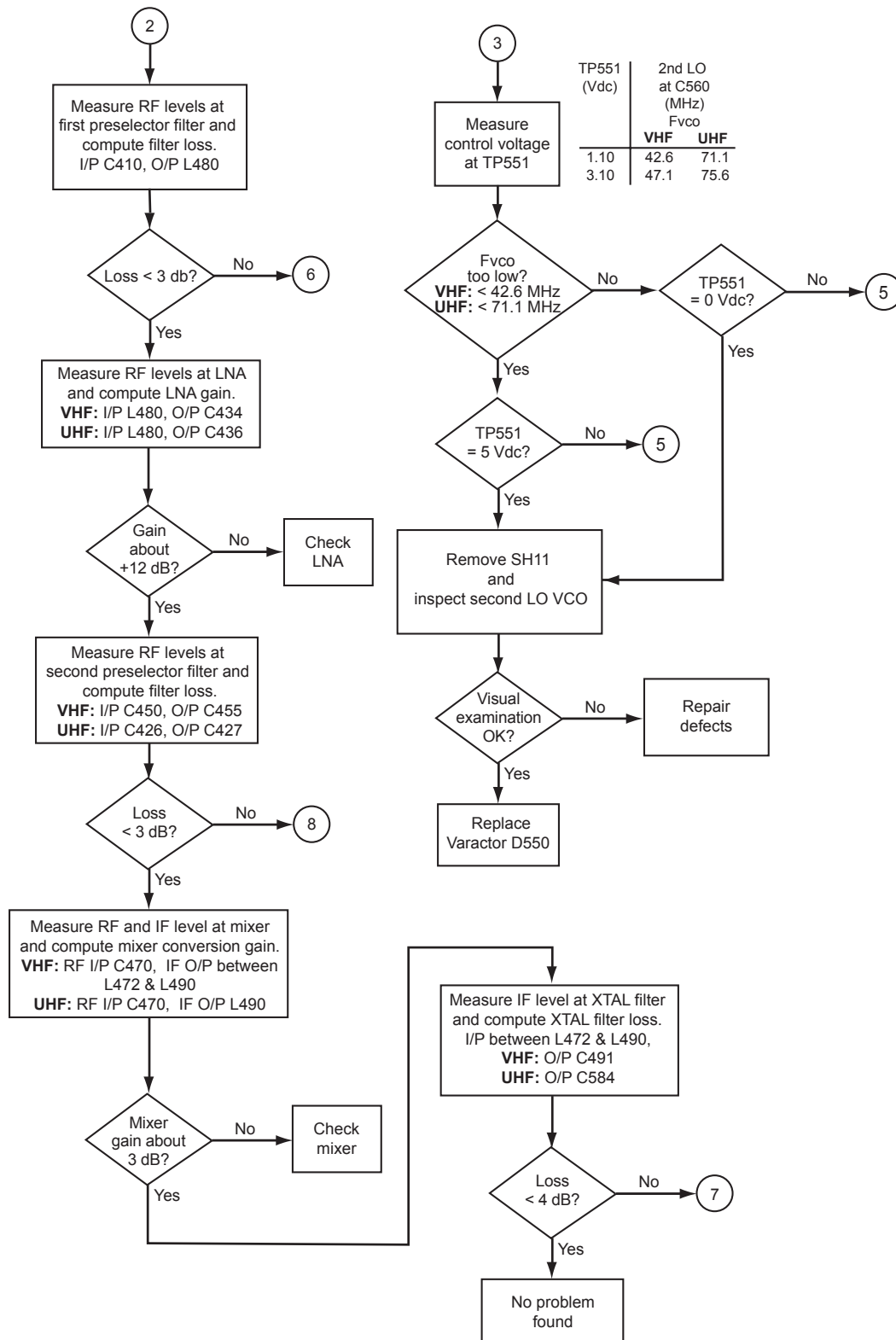
5.12 RX RF–Page 1

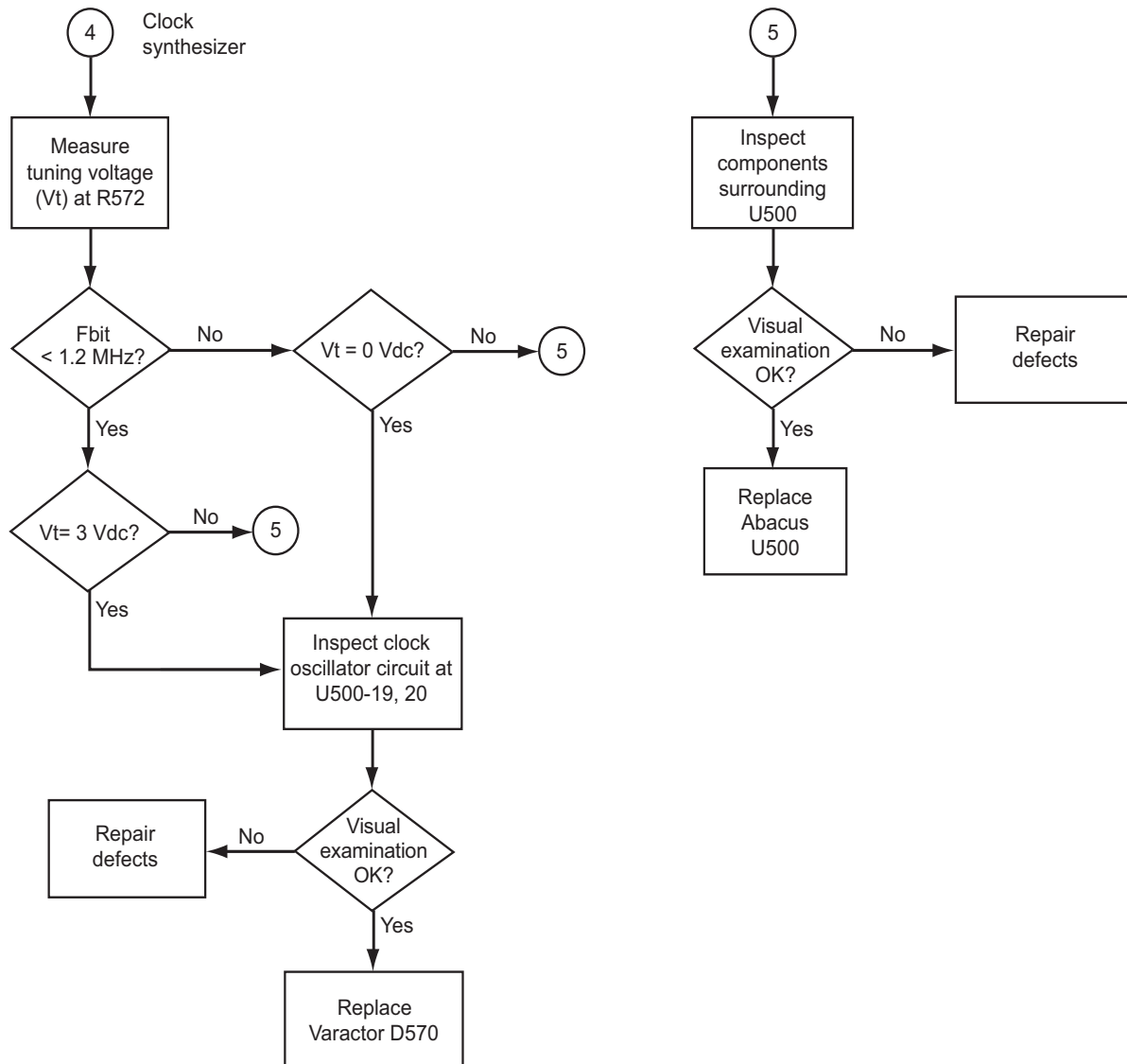


RX RF–Page 2

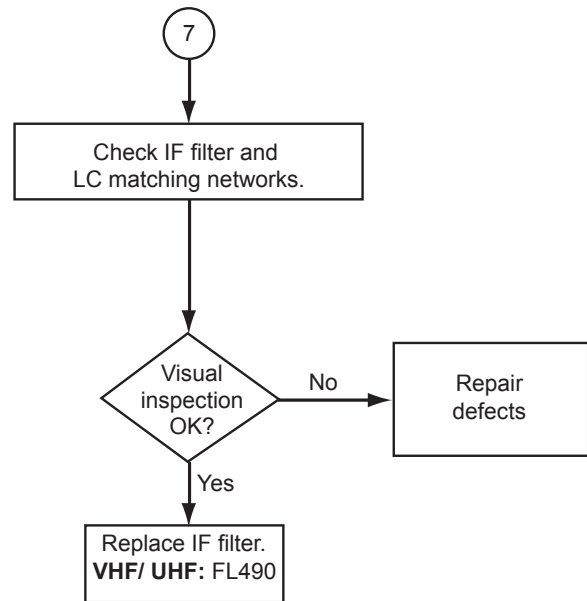
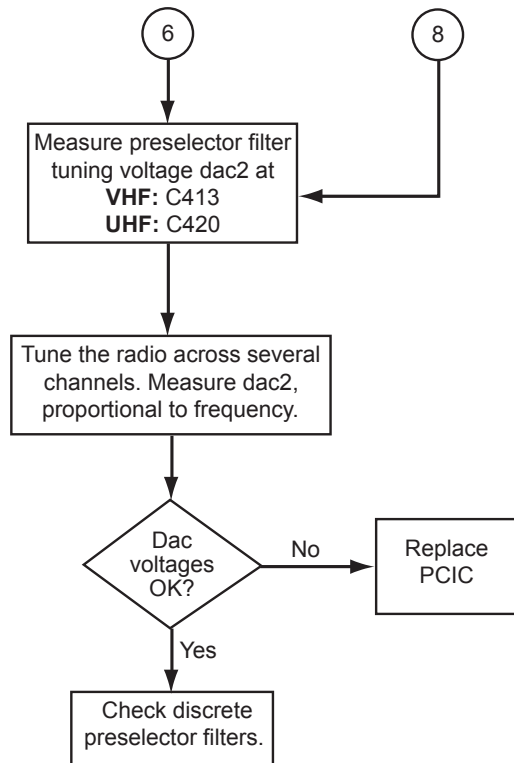


RX RF–Page 3



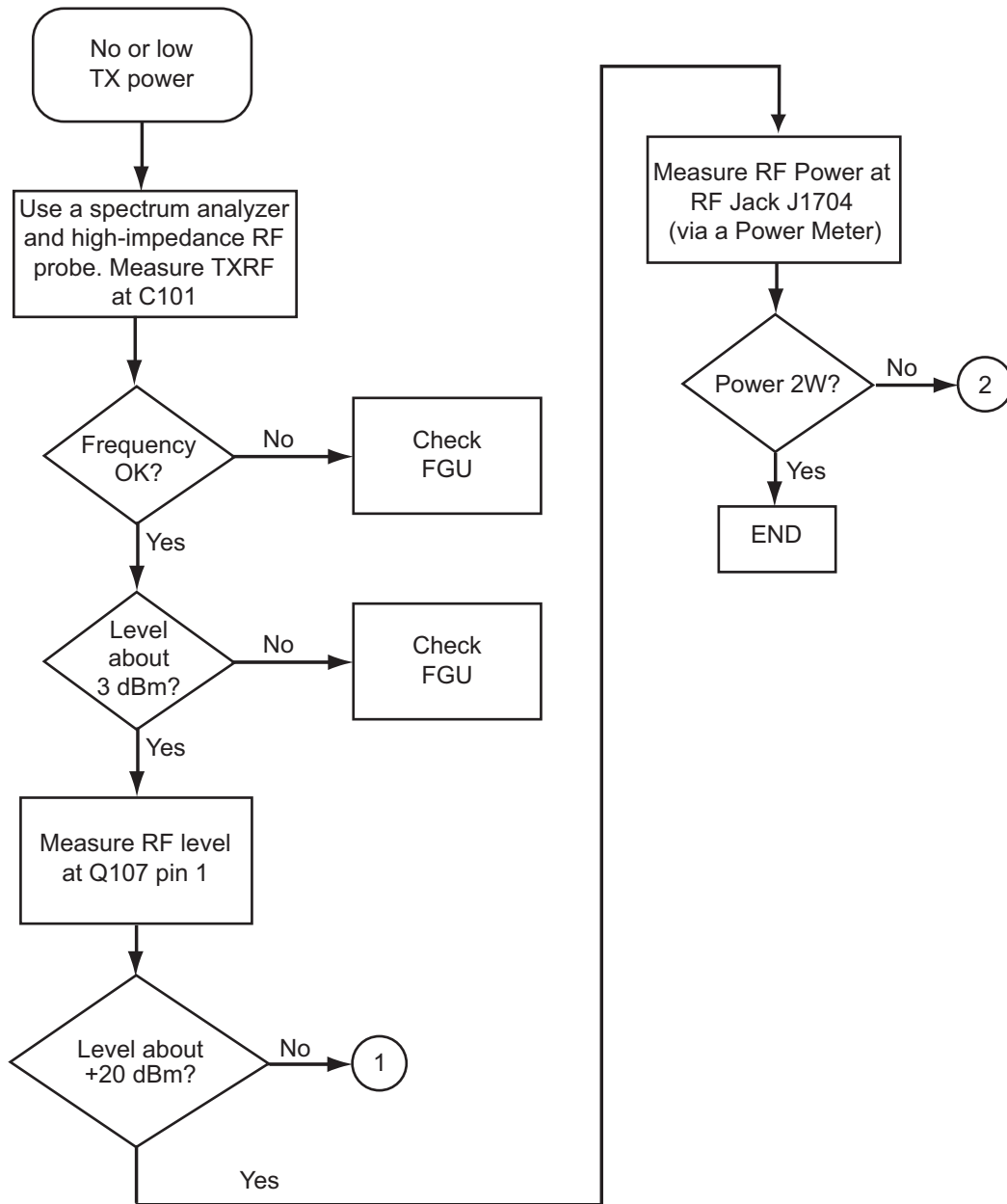
RX RF–Page 4

RX RF–Page 5

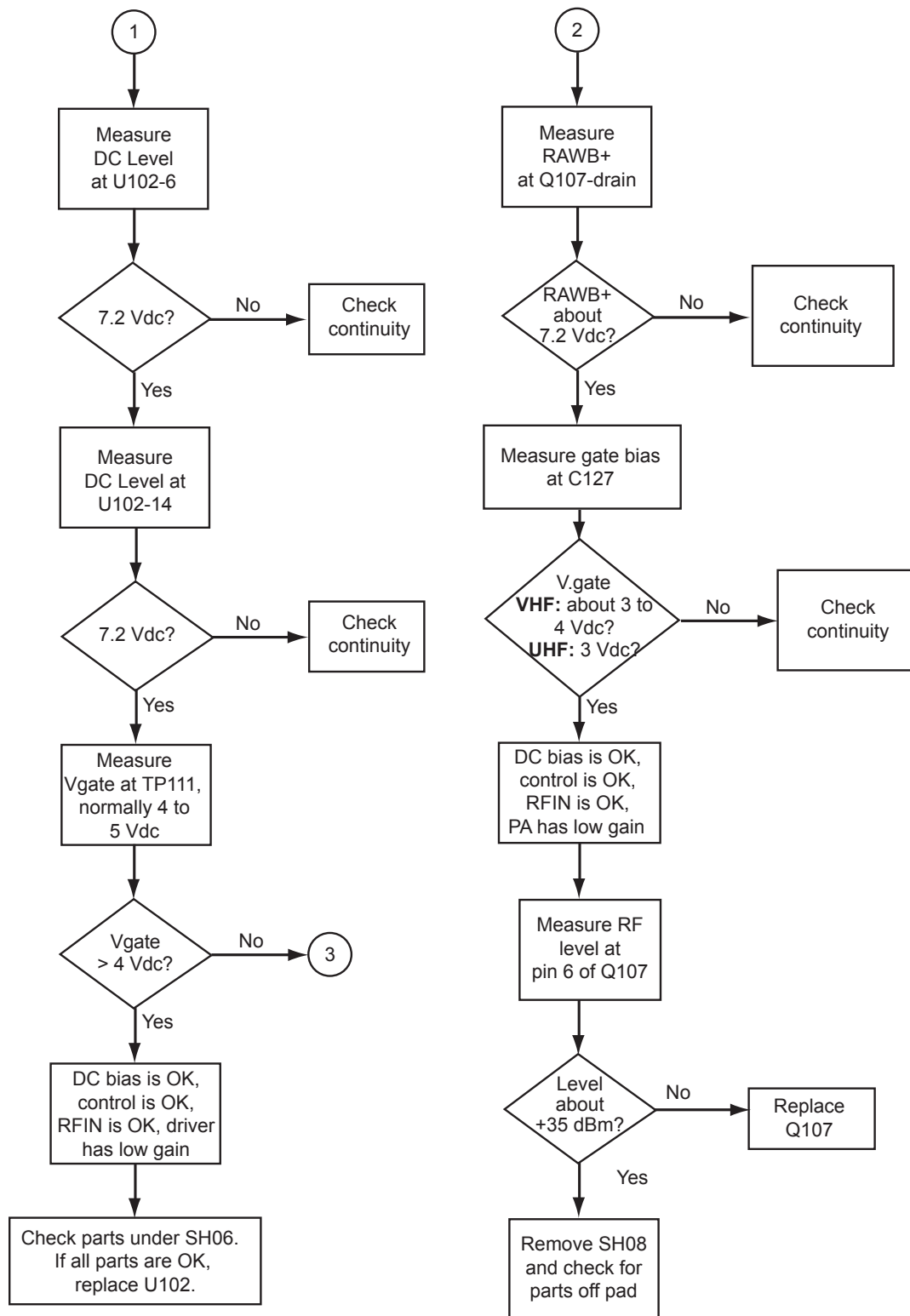


Band	F (MHz)	dac2 (Vdc)
VHF	136	0.9
	174	2.1
UHF	380	0.9
	470	3.1

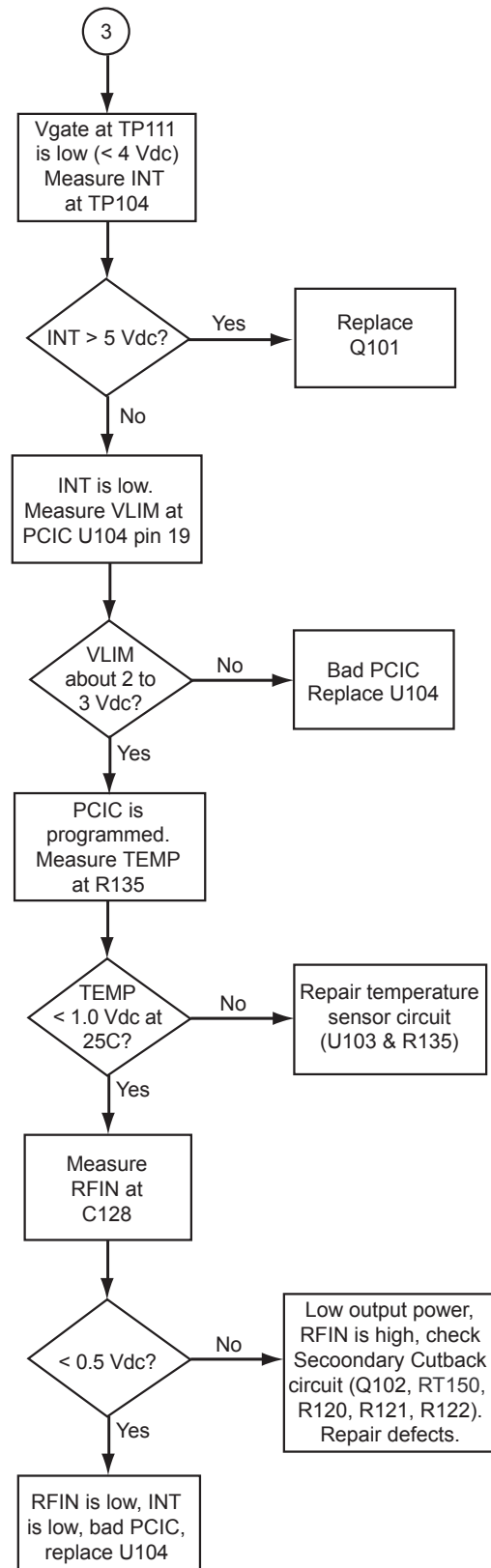
5.13 TX RF—Page 1



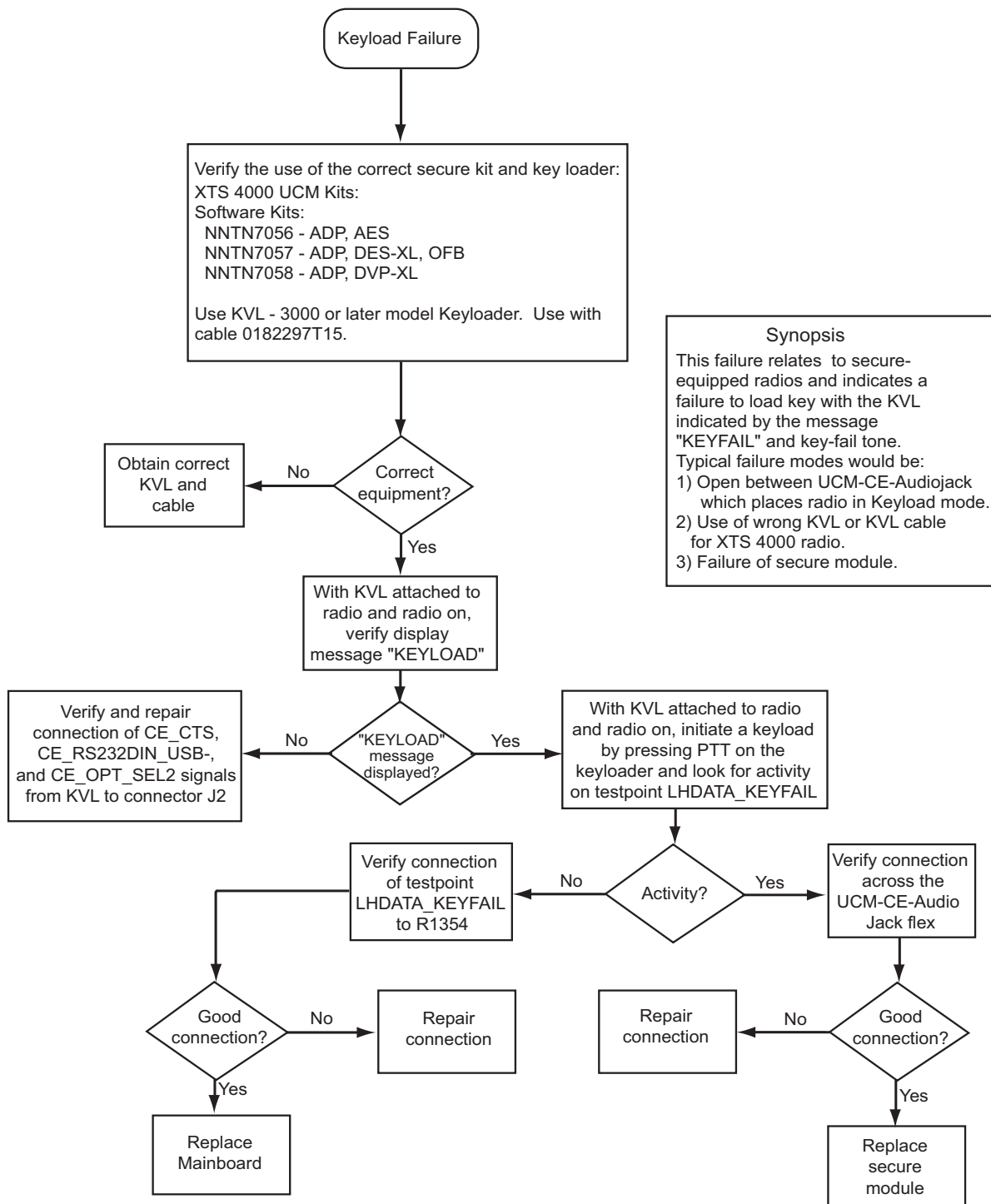
TX RF–Page 2



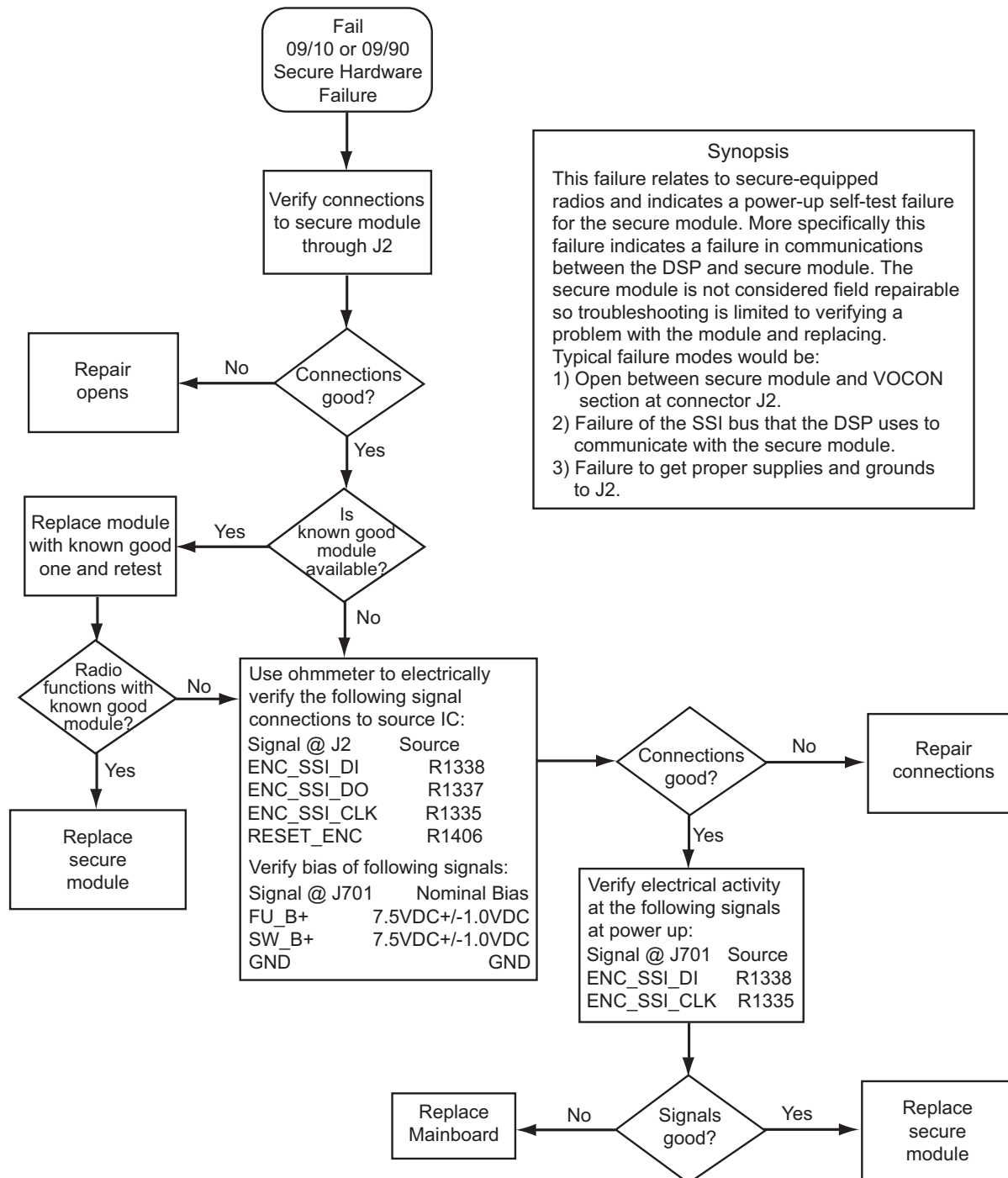
TX RF—Page 3



5.14 Keyload Failure



5.15 Secure Hardware Failure



Chapter 6 Troubleshooting Waveforms

This chapter contains images of waveforms that might be useful in verifying operation of certain parts of the circuitry. These waveforms are for reference only; the actual data depicted will vary depending on operating conditions.

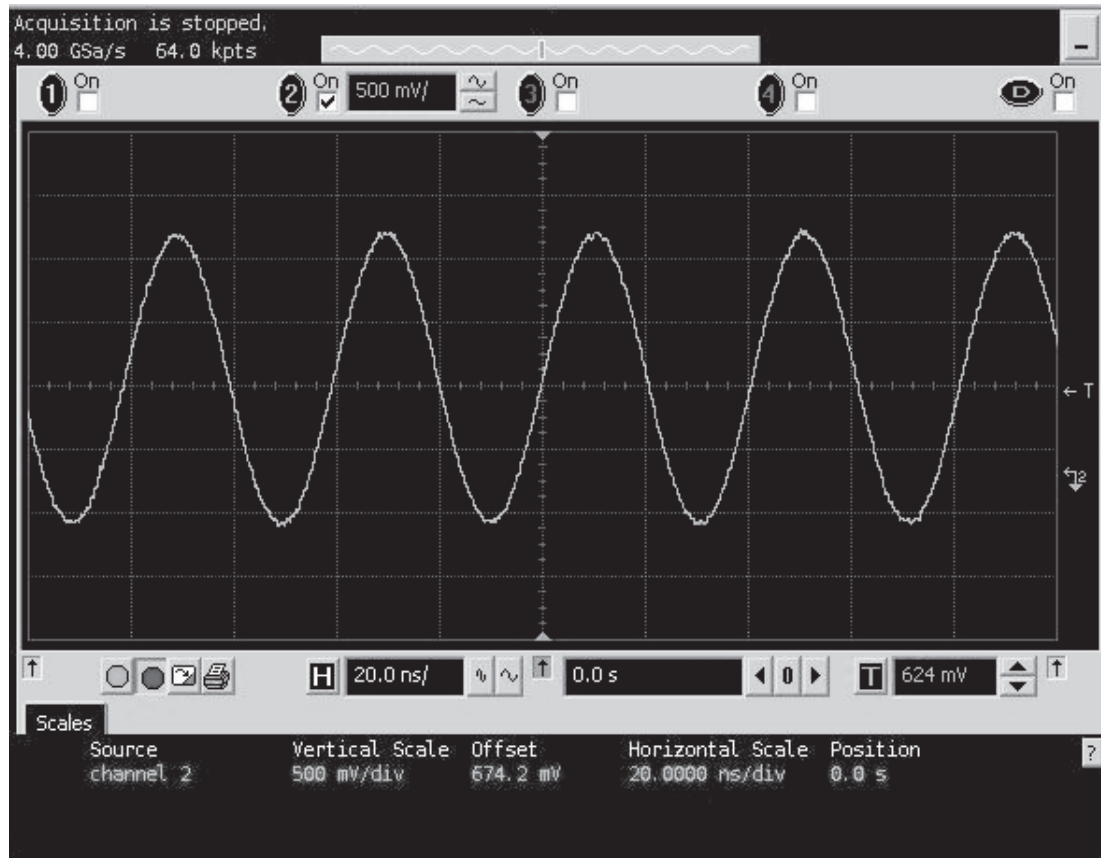
6.1 List of Waveforms

[Table 6-1](#) lists each waveform and the page on which the waveform can be found.

Table 6-1. List of Waveforms

Waveform	Page No.
24.576 MHz Clock	6-2
16.8 MHz Buffer Input and Output	6-3
32.768 kHz Clock Outputs	6-4
Receive Serial Audio Port (SAP)	6-5
Receive Baseband Interface Port (RX BBP)	6-6
Transmit Baseband Interface Port (TX BBP)	6-7

6.2 24.576 MHz Clock

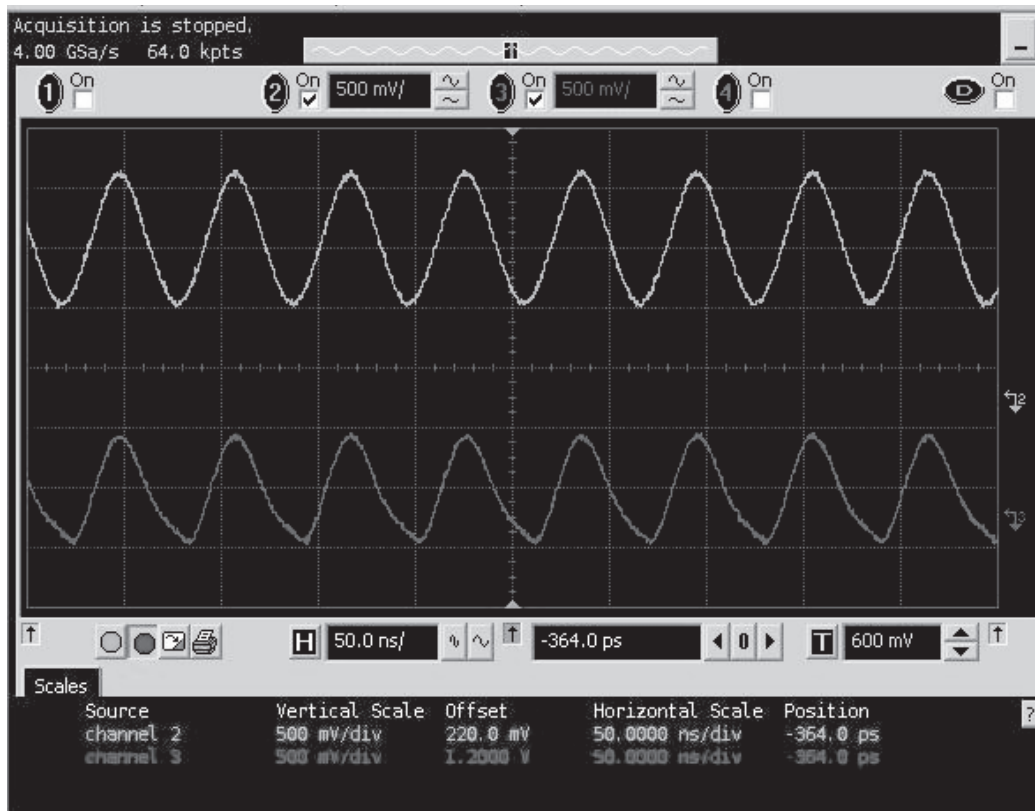


24.576 MHz clock from Y1302.

Trace 1 (Channel 2): Trace recorded at C1317.

Figure 6-1. 24.576 MHz Clock Waveform

6.3 16.8 MHz Buffer Input and Output

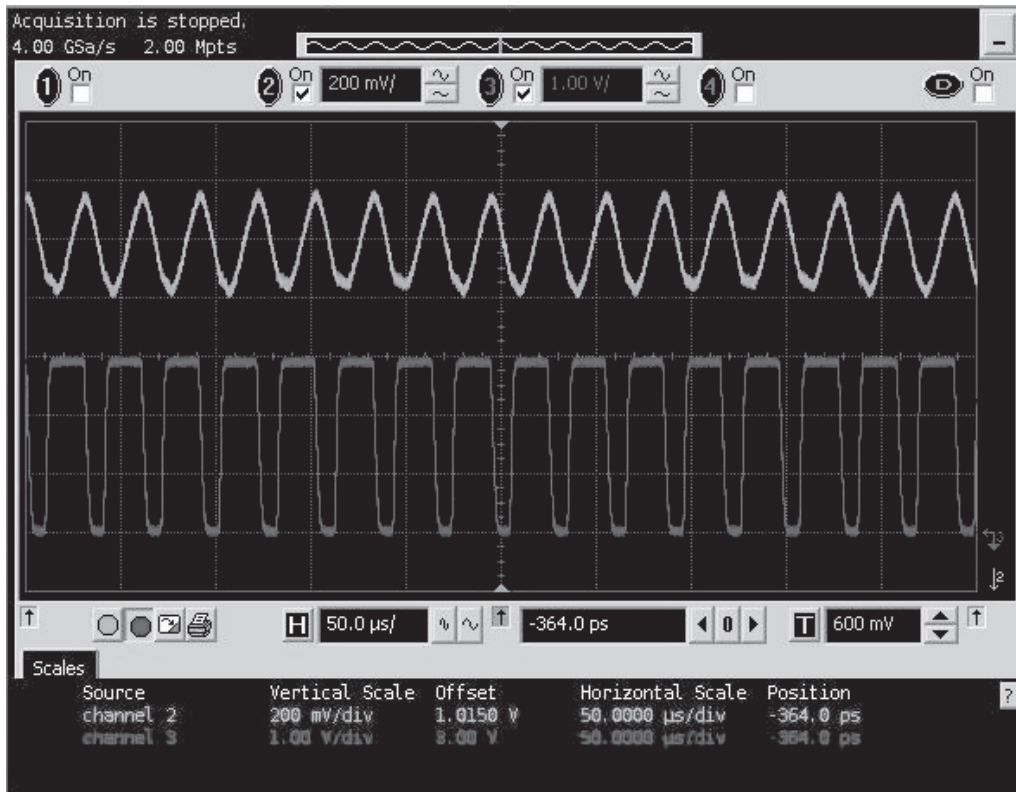


Trace 1 (Channel 2): Buffer input at R1416.

Trace 2 (Channel 3): Buffer output at C1402.

Figure 6-2. 16.8 MHz Buffer Input and Output Waveforms

6.4 32.768 kHz Clock Outputs

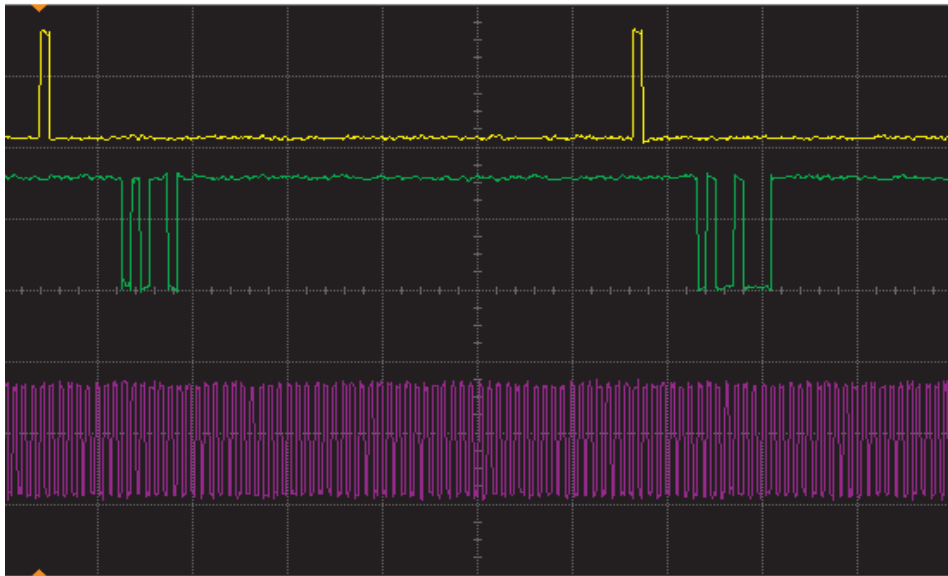


Trace 1 (Channel 2): Output at C1303 (from Y1301).

Trace 2 (Channel 3): Output at C1301 (to Patriot IC CKIL input).

Figure 6-3. 32.768 kHz Clock Outputs Waveforms

6.5 Receive Serial Audio Port (SAP)



Acquisition	Sampling mode real time Configuration 4GSa/s Memory depth automatic Memory depth 1004pts Sampling rate automatic Sampling rate 5.00 MSa/s Averaging off 9-bit BW Filter off Interpolation on
Channel 1	Scale 1.99 V/div Offset -4.21 V Coupling DC Impedance 1M Ohm Attenuation 10.00 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Channel 2	Scale 2.00 V/div Offset -210 mV Coupling DC Impedance 1M Ohm Attenuation 10.00 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Channel 3	Scale 2.00 V/div Offset 5.55 V Coupling DC Impedance 1M Ohm Attenuation 10.00 : 1 Atten units ratio Skew 0.0 s Ext adapter None Ext coupler None Ext gain 1.00E+00 Ext offset 0.0E+00
Time base	Scale 20.0 μ s/div Position 92.181816 μ s Reference center
Trigger	Mode edge Sweep auto Hysteresis normal Holdoff time 60 ns Coupling DC Source channel 1 Trigger level 810 mV Slope rising

Trace 1: 8 kHz frame sync at R1336 (each word is 13 bits after falling edge of FSYNC).

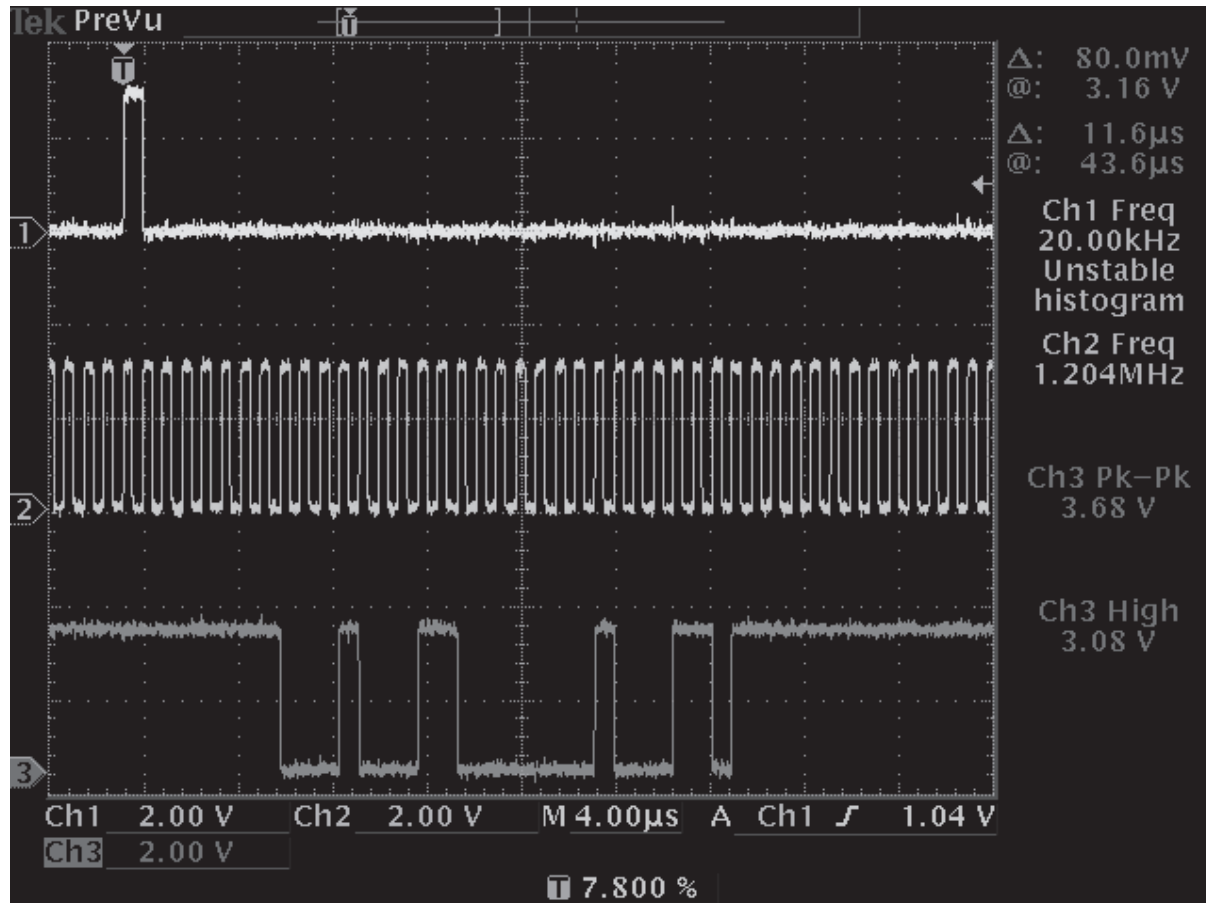
Trace 2: SAP data at R1338 (audio data from MAKO IC CODEC to Patriot IC DSP).

Note: Transmit is identical, except data acquired at R1337.

Trace 3: 512 kHz bit clock at R1335.

Figure 6-4. Receive Serial Audio Port (SAP) Waveforms

6.6 Receive Baseband Interface Port (RX BBP)



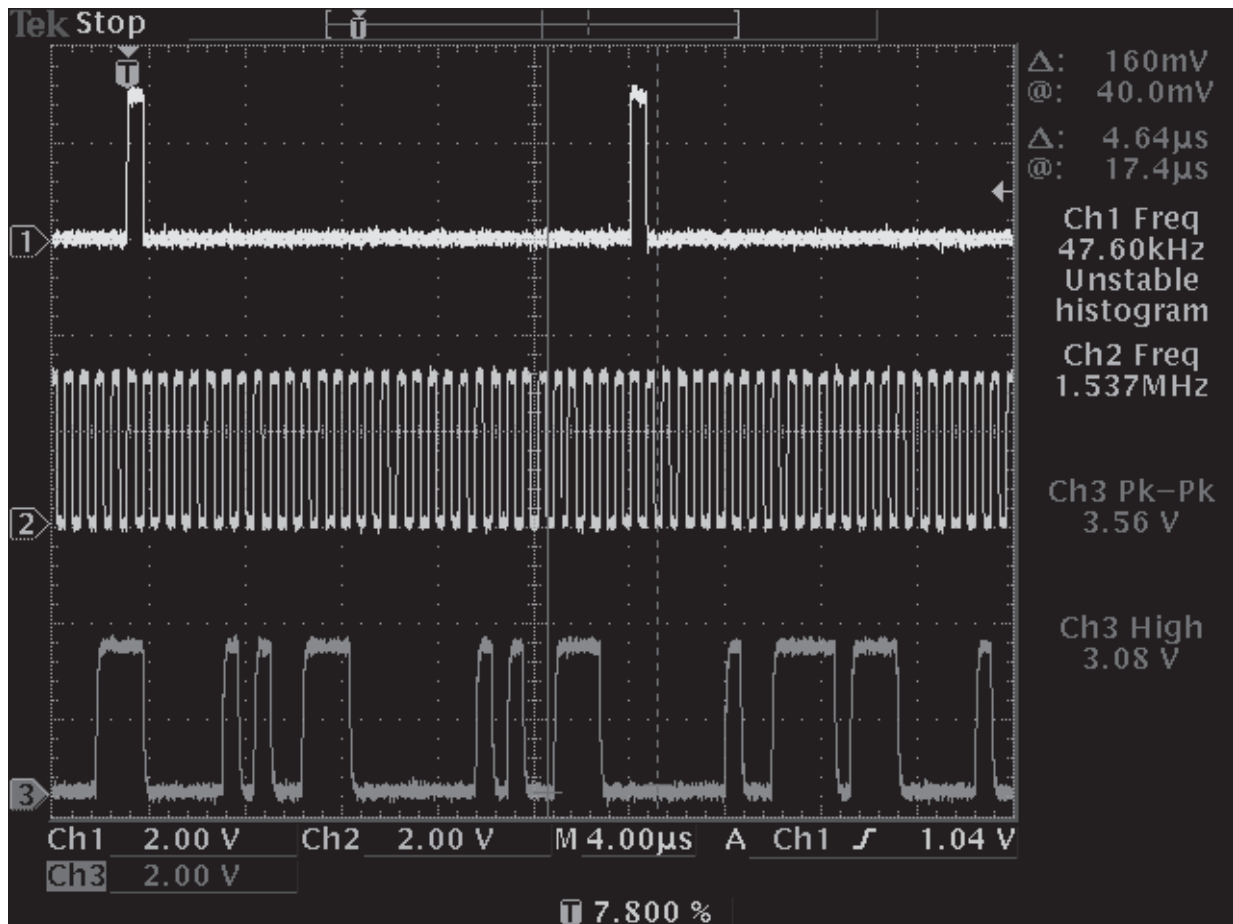
Trace 1: BBP RX frame sync signal at R1111.

Trace 2: BBP RX clock signal at R1109.

Trace 3: BBP RX data signal at R1110.

Figure 6-5. Receive Baseband Interface Port (RX BBP) Waveforms

6.7 Transmit Baseband Interface Port (TX BBP)



Trace 1: BBP TX frame sync signal at R1114.

Trace 2: BBP TX clock signal at R1112.

Trace 3: BBP TX data signal at R1113.

Figure 6-6. Transmit Baseband Interface Port (TX BBP) Waveforms

Notes

Chapter 7 Troubleshooting Tables

7.1 List of Board and IC Signals

Due to the nature of the schematic-generating program, signal names might be different when they are not directly connected to the same point. The tables in this chapter provide a cross reference to the various pinouts for these signals. [Table 7-1](#) lists and provides links to each of the tables in this chapter.

Table 7-1. List of Tables of Board and IC Signals

Table No.	Table Name	Page No.
7-2	J1 Mainboard to Keypad Flex and Display Module	7-2
7-3	J2 Mainboard to UCM, CE and Audio Jack Board	7-4
7-4	J3 Mainboard to Top and Side Control Flex	7-5
7-5	U1410 FLASH Pinouts	7-6
7-6	U1409 SRAM Pinouts	7-8
7-7	U1401 Patriot MCU/DSP IC Pinouts	7-10
7-8	U1304 MAKO Pinouts	7-19

Table 7-2. J1 Mainboard to Keypad Flex and Display Module

J1 Pin No.	Description	To/From	Accessible on Mainboard?
1	GND	GROUND	No
2	GND	GROUND	No
3	GND	GROUND	No
4	UC_KP_ROW6	C1107	Yes
5	NC	No Connect	No
6	UC_KP_ROW5	C1108	Yes
7	NC	No Connect	No
8	UC_KP_ROW4	C1109	Yes
9	GND	GROUND	No
10	UC_KP_ROW3	C1110	Yes
11	GND	GROUND	No
12	UC_KP_ROW2	C1111	Yes
13	COV_D14	E1124	Yes
14	UC_KP_ROW1	C1112	Yes
15	COV_D13	E1123	Yes
16	UC_KP_ROW0	C1113	Yes
17	GND	GROUND	No
18	UC_KP_COLUMN2	C1114	Yes
19	DISP_REG_SEL_A1	E1126	Yes
20	UC_KP_COLUMN1	C1115	Yes
21	VOUT	No Connect	No
22	UC_KP_COLUMN0	C1116	Yes
23	DISP_CS_SUB	E1127	Yes
24	V2.9	E1103	Yes
25	DISP_CS_MAIN	R9902	Yes
26	FLIP_SENSE	R1106	Yes
27	COV_D3	E1113	Yes
28	KP_PROG_BUTTON	R9914	Yes
29	COV_D4	E1114	Yes
30	UC_KP_LEDK	R9909	Yes

Table 7-2. J1 Mainboard to Keypad Flex and Display Module (Continued)

J1 Pin No.	Description	To/From	Accessible on Mainboard?
31	DISP_ID	No Connect	No
32	UC_KP_5V1	5V_MISC	Yes
33	DISP_RESET	D1000	Yes
34	UC_KP_ONOFF	R9923	Yes
35	COV_D0	E1110	Yes
36	COV_D5	E1115	Yes
37	E_SUB	R9917	Yes
38	COV_D6	E1116	Yes
39	E_MAIN	R1467	Yes
40	COV_D7	E1117	Yes
41	GND	GROUND	No
42	IM0	R9904	Yes
43	GND	GROUND	No
44	IM1	R9919	Yes
45	COV_D12	E1122	Yes
46	LEDK	R9912	Yes
47	COV_D11	E1121	Yes
48	LEDA	5V_MISC	Yes
49	COV_D10	E1120	Yes
50	EAR+	Pin 5 of U20	Yes
51	COV_D8	E1118	Yes
52	EAR-	Pin 7 of U20	Yes
53	COV_D9	E1119	Yes
54	DISP_V1.875	C9970	Yes
55	COV_D1	E1111	Yes
56	DISP_V2.9	E1103	Yes
57	COV_D2	E1112	Yes
58	DISP_R_W	E1129	Yes
59	COV_D15	E1125	Yes
60	DISP_REG_SEL_A0	E1130	Yes

Table 7-3. J2 Mainboard to UCM, CE and Audio Jack Board

J2 Pin No.	Description	To/From	Accessible on Mainboard?
1	GND	GROUND	No
2	FU_B+	F901	Yes
3	GND	GROUND	No
4	UC_KEYFAIL_LH_BDMDATA	R1344	Yes
5	UC_WAKEUP	Pin N3 of U1401	No
6	SW_B+	C1118	Yes
7	UC_INT_MIC	C73	Yes
8	UC_INT_SPKR+	C72	Yes
9	UC_INT_SPKR-	C71	Yes
10	V_VIBE	R735	Yes
11	UC_UCM_SS	R1101	Yes
12	UC_ENC_SSI_CLK	R1335	Yes
13	UC_ENC_SSI_DI	R1338	Yes
14	UC_ENC_SSI_DO	R1337	Yes
15	CE_OPT_SEL2	OPTSEL2 (TP)	Yes
16	CE_OPTB+_VPP	OPTB+_VPP (TP)	Yes
17	CE_RS232DOUT_USB+	RS232DOUT (TP)	Yes
18	CE_RS232DOUT_USB-	RS232DIN (TP)	Yes
19	CE_CTS	CTS (TP)	Yes
20	CE_RTS	RTS (TP)	Yes
21	CE_OPT_SEL1	C55	Yes
22	UC_RESET_ENC	R1406	Yes
23	CE_LHDATA_KEYFAIL	LHDATA_KEYFAIL (TP)	Yes
24	CE_SPKRCOM	SPKR_COM (TP)	Yes
25	CE_SPKR+	SPK+ (TP)	Yes
26	AUD_JACK_MIC	EXT_MIC (TP)	Yes
27	AUD_JACK_SPKR_OUT	R9999	Yes
28	AUD_JACK_PTT	C53	Yes
29	AUD_JACK_INT	R9998	Yes
30	GND	GROUND	No

Table 7-4. J3 Mainboard to Top and Side Control Flex

J3 Pin No.	Description	To/From	Accessible on Mainboard?
1	UC_EMERG	R9913	Yes
2	SECURE	R9914	Yes
3	SIDE_BUTTON	R9914	Yes
4	UC_INT_PTT	C1220	Yes
5	UC_KP_ROW7	C1106	Yes
6	UC_KP_COLUMN1	C1115	Yes
7	UC_KP_COLUMN2	C1114	Yes
8	GND	GROUND	No
9	GND	GROUND	No
10	GND	GROUND	No
11	GND	GROUND	No
12	GND	GROUND	No
13	GND	GROUND	No
14	GND	GROUND	No
15	GND	GROUND	No
16	GND	GROUND	No

Table 7-5. U1410 FLASH Pinouts

U1410 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
B4	CLK			No
E7	EN_CE			No
F8	EN_OE			No
C5	EN_WE			No
D6	WP	GROUND		No
C4	ADV			No
B5	RESET	D1401, pin 2	1.875V	Yes
E8	Address 0	E1126		Yes
D8	Address 1			No
C8	Address 2			No
B8	Address 3			No
A8	Address 4			No
B7	Address 5			No
A7	Address 6			No
C7	Address 7			No
A2	Address 8			No
B2	Address 9			No
C2	Address 10			No
A1	Address 11			No
B1	Address 12			No
C1	Address 13			No
D2	Address 14			No
D1	Address 15			No
D4	Address 16			No
B6	Address 17			No
A6	Address 18			No
C6	Address 19			No
B3	Address 20			No
C3	Address 21			No
D7	Address 22	R1423		Yes

Table 7-5. U1410 FLASH Pinouts (Continued)

U1410 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
A3	GND	GROUND		No
F1	GND	GROUND		No
G2	GND	GROUND		No
G8	GND	GROUND		No
E2	Data 15	E1110		Yes
F2	Data 14	E1111		Yes
F3	Data 13	E1112		Yes
D5	Data 12	E1113		Yes
F4	Data 11	E1114		Yes
F5	Data 10	E1115		Yes
F6	Data 9	E1116		Yes
G7	Data 8	E1117		Yes
G1	Data 7	E1118		Yes
E3	Data 6	E1119		Yes
G3	Data 5	E1120		Yes
E4	Data 4	E1121		Yes
G5	Data 3	E1122		Yes
E5	Data 2	E1123		Yes
E6	Data 1	E1124		Yes
F7	Data 0	E1125		Yes
D3	WAIT	E1126		Yes
A5	VPP	Pin 1 of D1402	1.875V	Yes
G6	VCCQ2	C1431	1.875V	Yes
E1	VCCQ1	C1431	1.875V	Yes
G4	VCC2	C1431	1.875V	Yes
A4	VCC1	C1431	1.875V	Yes

Table 7-6. U1409 SRAM Pinouts

U1409 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
A1	EN_BLE			No
A2	EN_OE			No
B2	EN_BHE			No
B5	EN_CE			No
G5	EN_WE			No
A6	CE2	R1422	1.875V	Yes
A3	Address 0	E1130		Yes
A4	Address 1	E1126		Yes
A5	Address 2			No
B3	Address 3			No
B4	Address 4			No
C3	Address 5			No
C4	Address 6			No
D4	Address 7			No
H2	Address 8			No
H3	Address 9			No
H4	Address 10			No
H5	Address 11			No
G3	Address 12			No
G4	Address 13			No
F3	Address 14			No
F4	Address 15			No
E4	Address 16			No
D3	Address 17			No
H1	Address 18	R1421		Yes
D1	VSS	GROUND		No
E6	VSSQ	GROUND		No
H6	NC2	R1708		Yes
G2	NC1	R1438		Yes
E3	DNU	R9990		Yes

Table 7-6. U1409 SRAM Pinouts (Continued)

U1409 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
G1	Data 15	E1125		Yes
F1	Data 14	E1124		Yes
F2	Data 13	E1123		Yes
E2	Data 12	E1122		Yes
D2	Data 11	E1121		Yes
C2	Data 10	E1120		Yes
C1	Data 9	E1119		Yes
B1	Data 8	E1118		Yes
G6	Data 7	E1117		Yes
F6	Data 6	E1116		Yes
F5	Data 5	E1115		Yes
E5	Data 4	E1114		Yes
D5	Data 3	E1113		Yes
C6	Data 2	E1112		Yes
C5	Data 1	E1111		Yes
B6	Data 0	E1110		Yes
D6	VCCQ	R1440	1.875V	Yes
E1	VCC	R1440	1.875V	Yes

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
N22	Not Connect			No
R20	Not Connect			No
C18	Not Connect			No
C16	SIM_PD1_PB15_DSP_DBG_PAW	R1401	2.89V	Yes
M2	ONE_WIRE_UP	R1339		Yes
C3	32K_SEL	Pin 6 of U1301		Yes
U2	INT_PTT	R1215	Active Low	Yes
U3	MAKO_INT*	MAKO_INT (TP)*	MAKO Interrupt	Yes
T7	OPT_SEL1_IN	Pin 1 of U1201		Yes
V4	Not Connect	No Connect		No
G21	INT4_PA6_OPTION_SELECT_1_IC1A	Pin 2 of U1406		Yes
G22	INT45_PA7_OPTION_SELECT_2_IC1B	Pin 9 of U1201		Yes
R4	KP_ROW0	C1113		Yes
R3	KP_ROW1	C1112		Yes
R7	KP_ROW2	C1111		Yes
T8	KP_ROW3	C1110		Yes
T4	KP_ROW4	C1109		Yes
T2	KP_ROW5	C1108		Yes
T3	KP_ROW6	C1107		Yes
U4	KP_ROW7	C1106		Yes
M3	KP_COL0	C1116		Yes
N4	KP_COL1	C1115		Yes
N22	KP_COL2	C1114		Yes
N7	ENC_RESET	R1406		Yes
P3	BOOT*	R1403		Yes
N3	WAKEUP	Pin 5 of J2		No
P4	SPARE2_ENC_PTT	R1404		Yes
P7	COV_DISP_ID	No Connect		No
B7	VIBRATE_CONT	R731		Yes

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
D8	HAB_MOD	R1221		Yes
G8	MISOA_SEL	Pin 2 of U1406		Yes
B8	Patriot_ONOFF	R9924		Yes
G4	ON_OFF_det	R9922		Yes
G2	FLIP_SENSE	R1106		Yes
G3	LOCK_DET	R1122		Yes
H7	DISP_BRIGHT2	C1104		Yes
F4	Not Connect			No
F3	KP_BLEN	R9911		Yes
E4	GPIO	Pin 2 of U9918		Yes
E3	Not Connect			No
C9	Not Connect			No
D9	Not Connect			No
D10	Not Connect			No
C10	Not Connect			No
C4	DISP_BRIGHT1	R9905		Yes
D17	Not Connect			No
C17	RS232_USB*	R1341		Yes
D18	RX_SSI_CLK	R1109	1.204 MHz	Yes
C19	OPT_SEL2_OUT	R1231		Yes
P17	Not Connect			No
N21	Not Connect			No
P20	Not Connect			No
N20	Not Connect			No
G16	Q7VDD	V1.55	1.55V	Yes
G11	Q6VDD	V1.55	1.55V	Yes
N17	Q2_Q8VDD	V1.55	1.55V	Yes
U12	Q4VDD	V1.55	1.55V	Yes
M7	Q3_Q1VDD	V2	1.55V	Yes
G17	PVDD	V2	2.89V	Yes

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
H17	LVDD	V2	2.89V	Yes
L7	KVDD	V2	2.89V	Yes
R8	J2VDD	V2	2.89V	Yes
N8	J1VDD	V2	2.89V	Yes
J7	I2VDD	V2	2.89V	Yes
G7	I1VDD	V2	2.89V	Yes
G9	H2VDD	V2	2.89V	Yes
G10	H1VDD	V2	2.89V	Yes
G13	EVDD	V2	2.89V	Yes
T17	DVDD	V2	2.89V	Yes
G15	C2VDD	V2	2.89V	Yes
J17	C1VDD	V2	2.89V	Yes
M17	B2VDD	V2	2.89V	Yes
R17	B1VDD	V2	2.89V	Yes
U17	A5VDD	V1.875	1.875V	Yes
U15	A4VDD	V1.875	1.875V	Yes
U13	A3VDD	V1.875	1.875V	Yes
U9	A2VDD	V1.875	1.875V	Yes
U8	A1VDD	V1.875	1.875V	Yes
C2	VCCA	V1.55	1.55V	Yes
D2	GNDA	GROUND		No
T10	A1VSS	GROUND		No
T11	A2VSS	GROUND		No
T14	A3VSS	GROUND		No
U16	A4VSS	GROUND		No
T15	A5VSS	GROUND		No
N16	B1VSS	GROUND		No
K16	B2VSS	GROUND		No
J16	C1VSS	GROUND		No
H13	C2VSS	GROUND		No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
P16	DVSS	GROUND		No
H12	EVSS	GROUND		No
H10	H1VSS	GROUND		No
H8	H2VSS	GROUND		No
J8	I1VSS	GROUND		No
L8	I2VSS	GROUND		No
P8	J1VSS	GROUND		No
T9	J2VSS	GROUND		No
H9	VSS1	GROUND		No
L16	VSS2	GROUND		No
H16	LVSS	GROUND		No
H15	PVSS	GROUND		No
M8	K_QVSS	GROUND		No
T12	Q4VSS	GROUND		No
M16	Q2_Q8VSS	GROUND		No
H11	Q6VSS	GROUND		No
H14	Q7VSS	GROUND		No
U20	URXD1_USB_VMI	Pin C9 of U1304		No
T21	URTS1_XRXD	URTS1_XRXD (TP)*		Yes
H22	AUDIO_JACK_PTT	C53		Yes
F21	URXD2	Pin 4 of U1306		Yes
B20	BSY_IN_RTS	Pin C12 of U1304		No
B13	RX_SSI_DATA	R1124	Data from Abacus to DSP	Yes
B12	TX_SSI_CLK	R1112	1.537 Mhz	Yes
C12	TX_SSI_FSYNC	R1114		Yes
T22	CODEC_TX	R1337	TX Audio to DSP	Yes
P21	CODEC_DCLK	R1335	512 kHz	Yes
T20	CODEC_FSYNC	R1336	8 kHz Pulse	Yes
D7	SPI_MISOA	Pin 4 of U1404	SPI A Data Out	No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
H2	SPI_MISOB	Pin C6 of U1304	SPI B Data Out	No
C7	ABACUS3_CS	Pin 25 of U500		Yes
C6	AD_CS	R1120		Yes
C5	EEPROM_SEL	No Connect		No
B4	ADTRIG	Pin B11 of U1304		No
D5	AUDIO_SW	C1216		Yes
K7	UNI_SEL	R1118		Yes
K3	Not Connect	No Connect		No
K8	MAKO_CE	R1334		Yes
J4	D_REG_SEL	No Connect		No
J3	D_CS	No Connect		No
H3	SCKB	Pin E6 of U1304	SPI B Clock	No
H4	SPI_MOSIB	Pin B6 of U1304	SPI B Data	No
C8	SCKA	R1115	SPI A Clock	Yes
D6	MOSIA	Pin 2 of U1405	SPI A Data	Yes
M21	UCM_SS_BRAVO	R1101		Yes
M22	OPT_SEL1_OUT	C1221		Yes
R21	CODEC_RX	R1338	RX Audio from DSP	Yes
C13	RX_SSI_FSYNC	R1111		Yes
D13	RX_SSI_CLK	R1109	1.204 MHz	Yes
G12	TX_SSI_DATA	R1113		Yes
B21	BSY_OUT_CTS	Pin E11 of U1304		Yes
F20	UTXD2	Pin E9 of U1304		Yes
G20	USB_SUSP	No Connect		No
H21	BOOT_NORM	R1342		Yes
H20	AUDIO_JACK_INT	R9998		Yes
J21	UCTS1_USB_SPEED	Pin B10 of U1304		No
T16	UTXD1_USB_VPO	UTXD1_USB_VPO (TP)*		Yes
Y22	CKO	CKO (TP)*		Yes
R16	USB_VMO	Pin D8 of U1304		No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
U22	USB_TXENAB	Pin B8 of U1304		No
B3	CODEC_FSYNC	R1411		Yes
L20	NC	No Connect		No
Y3	MAKO_RESET	C1425		Yes
K20	NC	No Connect		No
W4	OC3_PC13_FRAME_TICK	R1412		Yes
D3	CKIH_VOCON	C1402	16.8 MHz	Yes
V3	GATED_32_KHZ	C1301	32.768 kHz Square Wave	Yes
J20	NC	No Connect		No
U7	MOD	R1224		Yes
D14	TEST	No Connect		No
K4	MMC_OD_EN	No Connect		No
L3	MMC_CMD	No Connect		No
L20	MMC_DAT	No Connect		No
L4	MMC_CLK	No Connect		No
D22	CLKGPS	R1466		Yes
D21	PECLREF	R1465		Yes
C22	MAG	R1464		Yes
C21	SIGN	R1463		Yes
E21	CLKACQ	R1462		Yes
C20	NC	No Connect		No
D19	NC	No Connect		No
E20	NC	No Connect		No
B11	ONE_WIRE_EN	No Connect		No
K17	KVL_USB_DET	Pin D10 of U1304		No
K21	16out	16out (TP)*		Yes
Y22	BAT_BUS_EN	No Connect		No
W3	USB_ENUM	No Connect		No
L17	RESET	Pin 1 of D1401		Yes
AA2	USB_VPI	Pin B9 of U1304		No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
L21	BL_FREQ	No Connect		No
L22	NC	No Connect		No
G14	DSP_DE	DSP_DE (TP)*	JTAG	Yes
C14	MCU_DE	MCU_DE (TP)*	JTAG	Yes
D15	TCK	TCK (TP)*	JTAG	Yes
C15	TMS	TMS (TP)*	JTAG	Yes
D16	TRST	TRST (TP)*	JTAG	Yes
B16	TDO	TDO (TP)*	JTAG	Yes
B17	TDI	TDI (TP)*	JTAG	Yes
Y17	Address 0	E1130		Yes
AA17	Address 1	E1126		Yes
AB17	Address 2			No
AB16	Address 3			No
AB21	Address 4			No
Y16	Address 5			No
AA15	Address 6			No
AA19	Address 7			No
Y15	Address 8			No
Y14	Address 9			No
Y13	Address 10			No
AA14	Address 11			No
AB13	Address 12			No
AA13	Address 13			No
Y13	Address 14			No
AB12	Address 15			No
AA12	Address 16			No
AB11	Address 17			No
AA11	Address 18			No
Y11	Address 19			No
Y10	Address 20			No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
AA10	Address 21			No
U11	Address 22			No
U10	Address 23			No
AB3	Data 15	E1125		Yes
AA3	Data 14	E1124		Yes
AB4	Data 13	E1123		Yes
AA4	Data 12	E1122		Yes
Y5	Data 11	E1121		Yes
AA5	Data 10	E1120		Yes
AA6	Data 9	E1119		Yes
Y6	Data 8	E1118		Yes
Y7	Data 7	E1117		Yes
AA7	Data 6	E1116		Yes
AB7	Data 5	E1115		Yes
AB8	Data 4	E1114		Yes
AA8	Data 3	E1113		Yes
Y8	Data 2	E1112		Yes
Y9	Data 1	E1111		Yes
AA9	Data 0	E1110		Yes
Y18	R_W_N	E1129		Yes
U14	CS5	R1467		Yes
Y19	CS4_N	No Connect		No
AA20	CS3_N	E1127		Yes
AB20	CS2_N	Pin B4 of U1409		No
AA16	CS1_N	No Connect		No
AA21	CS0_N	Pin E7 of U1410		No
U21	OE_N	Pin A2 of U1409		No
V21	EB1_N	Pin A1 of U1409		No
AA18	EB0_N	Pin B2 of U1409		No
V20	SEB_N_PA5	No Connect		No

Table 7-7. U1401 Patriot MCU/DSP IC Pinouts (Continued)

U1401 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
W20	ECB_N_PA4	Pin D3 of U1410		No
W21	SOE_N_PE15	No Connect		No
AA22	LBA_N	Pin C4 of U1410		No
Y21	BURSTCLK	Pin B4 of U1410		No

* (TP) = Test Point

Table 7-8. U1304 MAKO Pinouts

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
B1	XTAL32_OUT	C1305	32.768 kHz Square Wave	Yes
C1	XTAL32_IN	C1306		Yes
F3	BAT_RTC	No Connect		No
C2	VSAVE	C1307		Yes
D1	BAT_7V5	R1309		Yes
D2	BAT_3V6	C1308		Yes
D3	REG_3V6	C1308		Yes
B2	BAT_TYPE	GROUND		No
G4	HV_BG	C1309		Yes
E2	FET_ENX	R1311		Yes
F4	EMERG_PB	No Connect		No
E4	MECH_SW	MECH_SW (TP)*	Active Low	Yes
B3	SW_TYPE	R1370		Yes
B4	IGN_X	No Connect		No
C5	RESETX	C1425		Yes
F5	GATED_32K_CLK	R1314		Yes
D5	INT_X	MAKO_INT (TP)*	MAKO Interrupt	Yes
A12	XOUT	C1316	24.576 MHz	Yes
A13	XIN	C1317	24.576 MHz	Yes
D4	TCXO_SEL_16_24	GROUND		No
M1	TCXO_IN	CKIH_VOCON	16.8 MHz	Yes
P5	GND1	GROUND		No
M7	GND2	GROUND		No
J4	GND3	GROUND		No
G5	GND4	GROUND		No
K9	GND5	GROUND		No
L4	GND6	GROUND		No
D14	GND7	GROUND		No
H5	GND8	GROUND		No
D9	GND9	GROUND		No
D12	VBUS2	No Connect		No
C13	VBUS2_CMD	No Connect		No

Table 7-8. U1304 MAKO Pinouts (Continued)

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
F11	VBUS2_SENS	No Connect		No
H10	VBUS1	No Connect		No
C14	VBUS1_CMD	No Connect		No
E12	VBUS1_SENS	No Connect		No
B13	VBUS_SUPPLY	No Connect		No
K4	V08_O	VCC5	5V	Yes
K3	V08_I	SWB+	Battery Voltage Level +/- 5%	Yes
L9	V10_GND	GROUND		No
M6	V10_O	C1321		Yes
J10	V10_I	C1333		Yes
L1	V09_O	C1322		Yes
P6	V07_O	C1323		Yes
P3	V06_O	V2	2.89V	Yes
N5	V04_O	C1326		Yes
P4	V03_O	V1.55	1.55V	Yes
N4	V02_O	V1.875	1.875V	Yes
F12	SW5_VOUT	No Connect		No
G11	SW5_PHASE	No Connect		No
E13	SW5_SUMCOMP	No Connect		No
E14	SW5_VSENSE	No Connect		No
F13	SW5_VDDHV	No Connect		No
D13	SW5_VDD	No Connect		No
L14	SW2_GND	GROUND		No
J13	SW2_VOUT	VSW2	1.875V	Yes
J14	SW2_LX	VSW2	1.875V	Yes
K14	SW2_VCCS	VSW1	3.8V	Yes
J12	SW2_VCC	R1317		Yes
H14	SW1_GND	GROUND		No
H12	SW1_VOUT	VSW1	3.8V	Yes
F14	SW1_PHASE	L1306	229.682 kHz Square Wave	Yes
H13	SW1_DH	No Connect		No

Table 7-8. U1304 MAKO Pinouts (Continued)

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
G14	SW1_SUMCOMP_DL	C1337	229.682 kHz Square Wave	Yes
J11	SW1_VSEN_BST	No Connect		No
H11	SW1_VSEN_BUK	C1336		Yes
G12	SW1_VDDHV	C1341		Yes
G13	SW1_VDD	C1335		Yes
A2	PGLDO3	C1307		Yes
C3	PGLDO2	GROUND		No
B14	NC6	No Connect		No
M5	NC5	No Connect		No
P14	NC4	No Connect		No
P14	NC3	No Connect		No
A14	NC2	No Connect		No
A1	NC1	No Connect		No
B11	AD_TRIG	Pin B4 of U1401		No
A11	TX_RX	No Connect		No
L2	MIC_BIAS	R1324	5V	Yes
K2	INT_MIC_P	C1350	AC Mic signal	Yes
K1	INT_MIC_M	C1352	AC Mic signal	Yes
J2	EXT_MIC_P	C1347	AC Mic signal (Accessory)	Yes
J1	EXT_MIC_M	C1353	AC Mic signal (Accessory)	Yes
J3	VCM1	C1354		Yes
H3	VC_OUT_P	R1326		Yes
H2	VC_OUT_M	R1327		Yes
E3	BPLUS	UNSW_B+	Battery Voltage Level	Yes
E1	PA_BPLUS	R1328		Yes
G3	PA_IN_M	C1357		Yes
G2	PA_IN_P	C1356		Yes
F1	INT_SPKR_P	C72		Yes
F2	INT_SPKR_M	C71		Yes
H1	EXT_SPKR_P	SPK+ (TP)*		Yes

Table 7-8. U1304 MAKO Pinouts (Continued)

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
G1	EXT_SPKR_M	SPK_COM (TP)*		Yes
H4	VCM2	C1362		Yes
A4	VREF	C1363		Yes
E8	VFUSE	GROUND		No
A3	TEST	GROUND		No
C4	SCAN_EN	GROUND		No
N1	PWR_CTRL	No Connect		No
M2	FE_TUNE2	No Connect		No
L3	FE_TUNE1	No Connect		No
K13	ATOD_8	No Connect		No
K12	ATOD_7	No Connect		No
K11	ATOD_6	R1329		Yes
L13	ATOD_5	R1331		Yes
L12	ATOD_4	R1351		Yes
M14	ATOD_3	No Connect		No
L11	ATOD_2	Pin 1 of U1305		Yes
M13	ATOD_1	No Connect		No
M14	ATOD_0	V2	2.89V	Yes
M12	ADC_VREF	C1365		Yes
L10	VMES	C1364		Yes
A5	BBP_CLK	R1112		Yes
B5	BBP_SYNC	R1114		Yes
E6	SPI_CLK	SCKB	SPI B Clock	No
D6	SPI_CS	R1334		Yes
B6	SPI_DI	SPI_MOSIB	SPI B Data to MAKO	No
C6	SPI_DO	SPI_MISOB	SPI B Data From MAKO	Yes
E7	CODEC_DCLK	R1335		Yes
D7	CODEC_FSYNC	R1336		Yes
B7	VC_TX	No Connect		No
M4	CODEC_TX	R1337	TX Audio to DSP	Yes

Table 7-8. U1304 MAKO Pinouts (Continued)

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
A7	CODEC_RX	R1338	RX Audio from DSP	Yes
N3	UCM_SS	R1101		Yes
A6	LOGIC_VDD	V2	2.89V	Yes
B8	USB_TXENAB	Pin U22 of U1401		No
C8	UTXD1_USB_VPO	UTXD1_USB_VPO (TP)*		Yes
D8	USB_VMO	Pin R16 of U1401		No
A9	URTS1_XRXD	URTS1_XRXD (TP)*		Yes
B9	USB_VPI	Pin AA2 of U1401		No
C9	URXD1_USB_VMI	Pin U20 of U1401		No
E9	UTXD2	Pin F20 of U1401		No
A10	UCM_KF_MAKO	R1344		Yes
B10	UCTS_USB_SPEED	Pin J21 of U1401		No
C10	USB_INTX	No Connect		No
P2	RXDIN_3V	R1345		Yes
J5	TXDO_BDI_UP_3V	R1343		Yes
C7	BOOT_NORM	R1342		Yes
A8	RS232_USB	R1341		Yes
L5	APCO	R1340		Yes
N8	SB96D_BDO_KF_3V	R1344		Yes
L7	ONE_WIRE_UP	R1339		Yes
K6	TXDO_BDI_ENC_3V	R1343		Yes
N2	RXDIN_ENC_3V	R1345		Yes
M3	RTS_FILLSEN_3V	No Connect		No
C12	BUSY_IN_RTS	Pin B20 of U1401		No
E11	BUSY_OUT_CTS	Pin B21 of U1401		No
D10	KVL_USB_DET	Pin K17 of U1401		No
F10	OPT_GPIO0	No Connect		No
C11	OPT_GPIO1	No Connect		No
G10	OPT_GPIO2	No Connect		No
D11	OPT_GPIO3	No Connect		No
B12	OPTION_INTX	No Connect		No
N11	OPTB_SEL3	No Connect		No

Table 7-8. U1304 MAKO Pinouts (Continued)

U1304 Pin No.	Description	To/From	Comment	Accessible on Mainboard?
P12	OPTB_SEL2	No Connect		No
K8	OPTB_SEL1	No Connect		No
P11	OPTB_SEL0	No Connect		No
N10	OPTA_SEL3	No Connect		No
M9	OPTA_SEL2	No Connect		No
K7	OPTA_SEL1	No Connect		No
P10	OPTA_SEL0	No Connect		No
P13	CTS	R1356	Clear to Send	Yes
M11	RTS	R1349	Request to Send	Yes
N12	RS232_DI_USB-	R1350	RS232 Data In / USB Data -	Yes
M10	RS232_DO_USB+	R1347	RS232 Data Out / USB Data +	Yes
L8	BAT_STATUS	R1351	Battery Bar Status	Yes
M8	ONE_WIRE_2	No Connect		No
P9	ONE_WIRE_OPT	R1353		Yes
N9	LHDATA_KEYFAIL	R1354	Longhorn Data	Yes
N13	SB9600_BUSY	R1348		Yes
L6	USB_CONNECT	No Connect		No
P8	USB2_DM	No Connect		No
N7	USB2_DP	No Connect		No
P7	USB1_DM	R1357		Yes
N6	USB1_DP	R1358		Yes

* (TP) = Test Point

Chapter 8 Schematics, Board Overlays, and Parts Lists – VHF

This chapter contains the schematics, board overlays, and parts lists for the VHF XTS 4000 radio. Use them in conjunction with the theory of operation and the troubleshooting procedures, charts, and waveforms to isolate a problem to the component level.

The following tables list the pages where the schematics and board overlays for the XTS 4000 radio are found.

8.2 List of Partslist

Table 8-2. List of Partslist

PCB Board Main	Page No.
VHF Main Board Parts List (NUD7115B)	8-18

8.1 List of Schematics and Boards Overlays

Table 8-1. List of Mainboard Schematics and Board Overlays

Board Schematic/Board Layout	Page No.
General Section	
Main Board Layout (NUD7115B) – Side 1	8-2
Main Board Layout (NUD7115B) – Side 2	8-3
Main Board Overall Schematic	8-4
Transceiver (RF) Section	
Transceiver (RF) Board Overall Circuit Schematic	8-5
Antenna Switch and Harmonic Filter Circuits	8-6
Receiver Front End Circuit	8-7
Receiver Back End Circuit	8-8
Transmitter Circuits	8-9
Frequency Generation Unit (Synthesizer) Circuit	8-10
Frequency Generation Unit (VCO) Circuit	8-11
VOCON Section	
Overall Circuit Schematic	8-12
Audio, Connector Interface Circuit	8-13
Controller and Memory Circuits	8-14
DC Power, Clocks and ON/OFF Circuit	8-15
Audio, and Accessory Interface Circuit	8-16
Miscellaneous Circuits	8-17

May 28, 2008 6871620L01-C

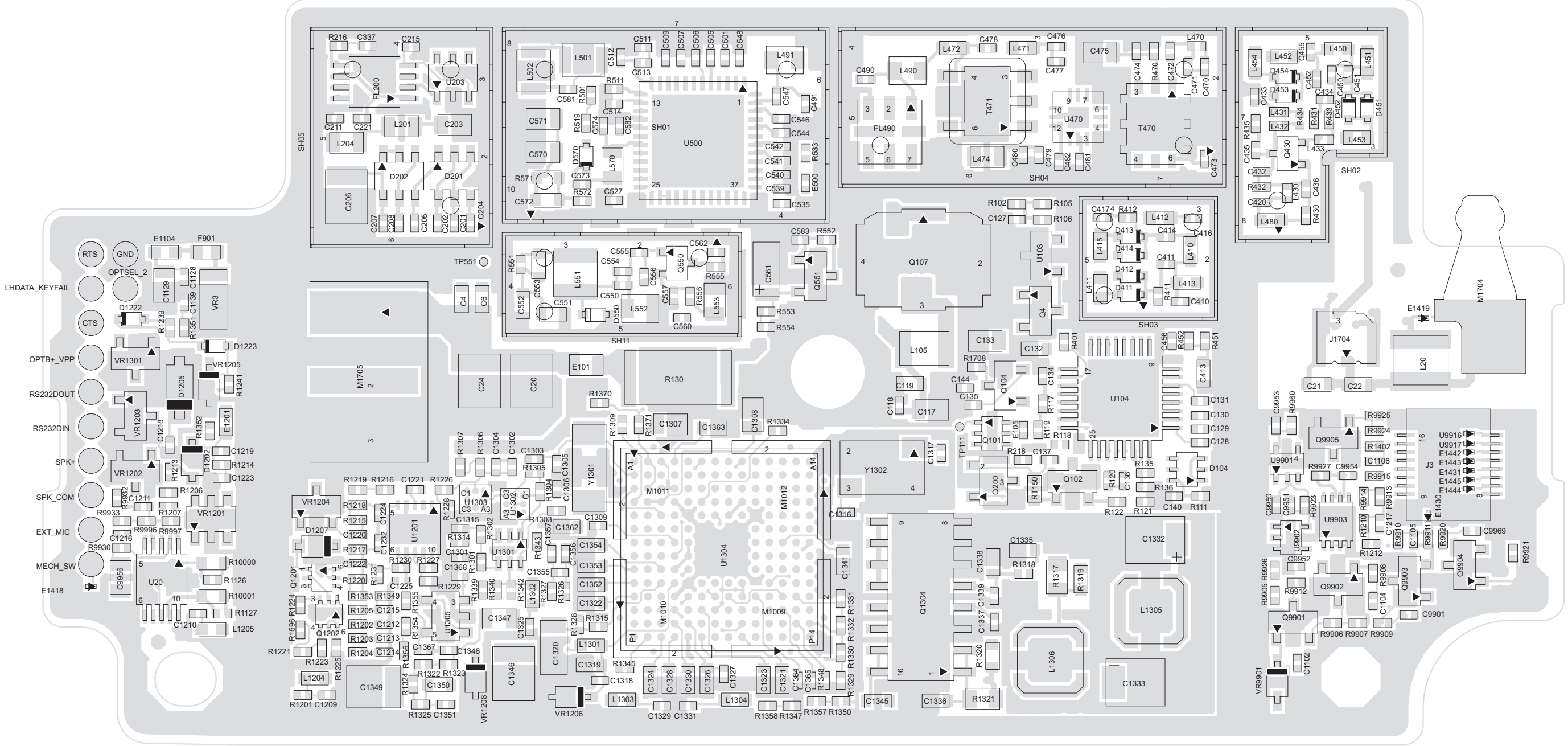


Figure 8-2. Main Board Layout (NUD7115B) – Side 2



8.4 Transceiver (RF) Section

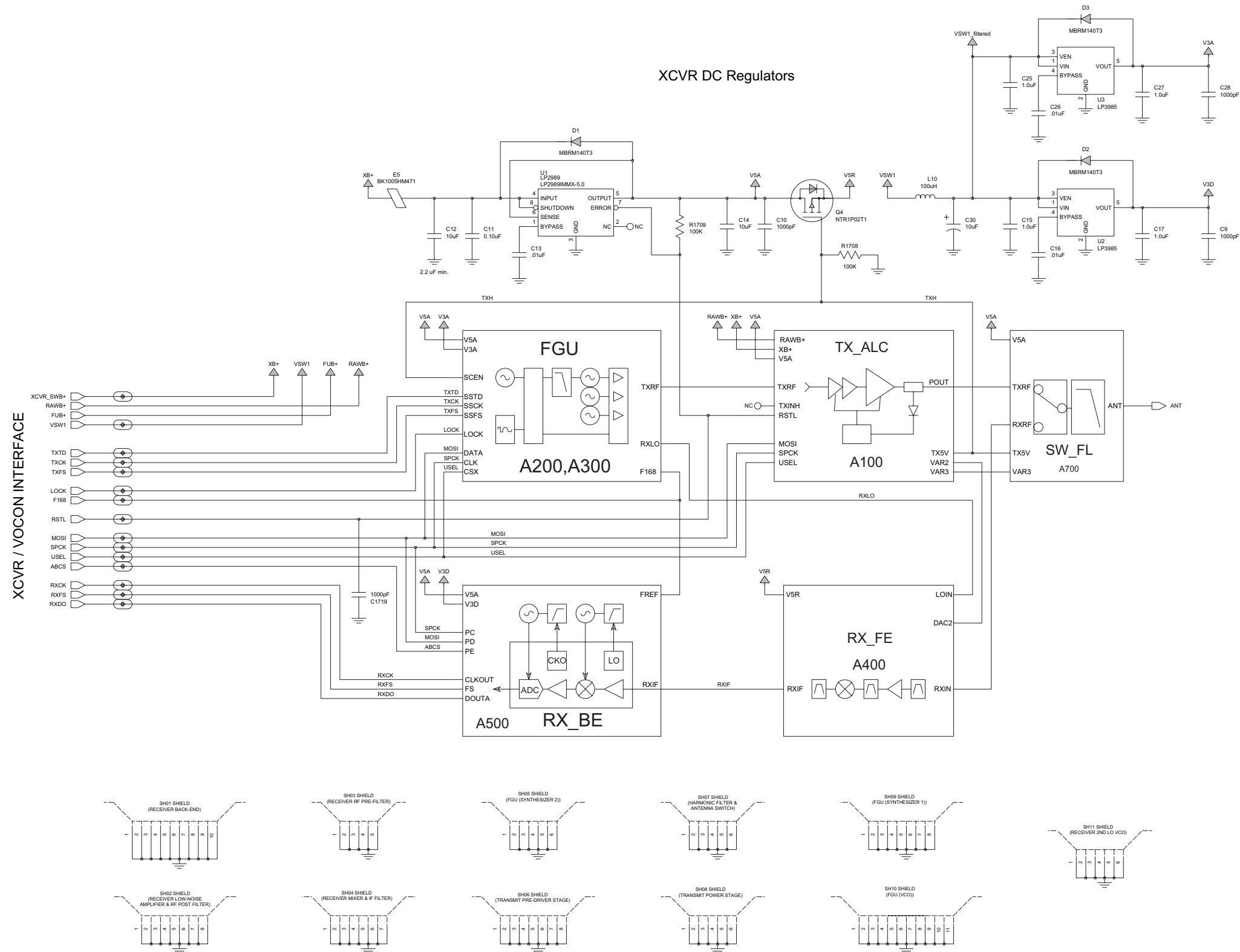


Figure 8-4. VHF Transceiver (RF) Board Overall Circuit Schematic

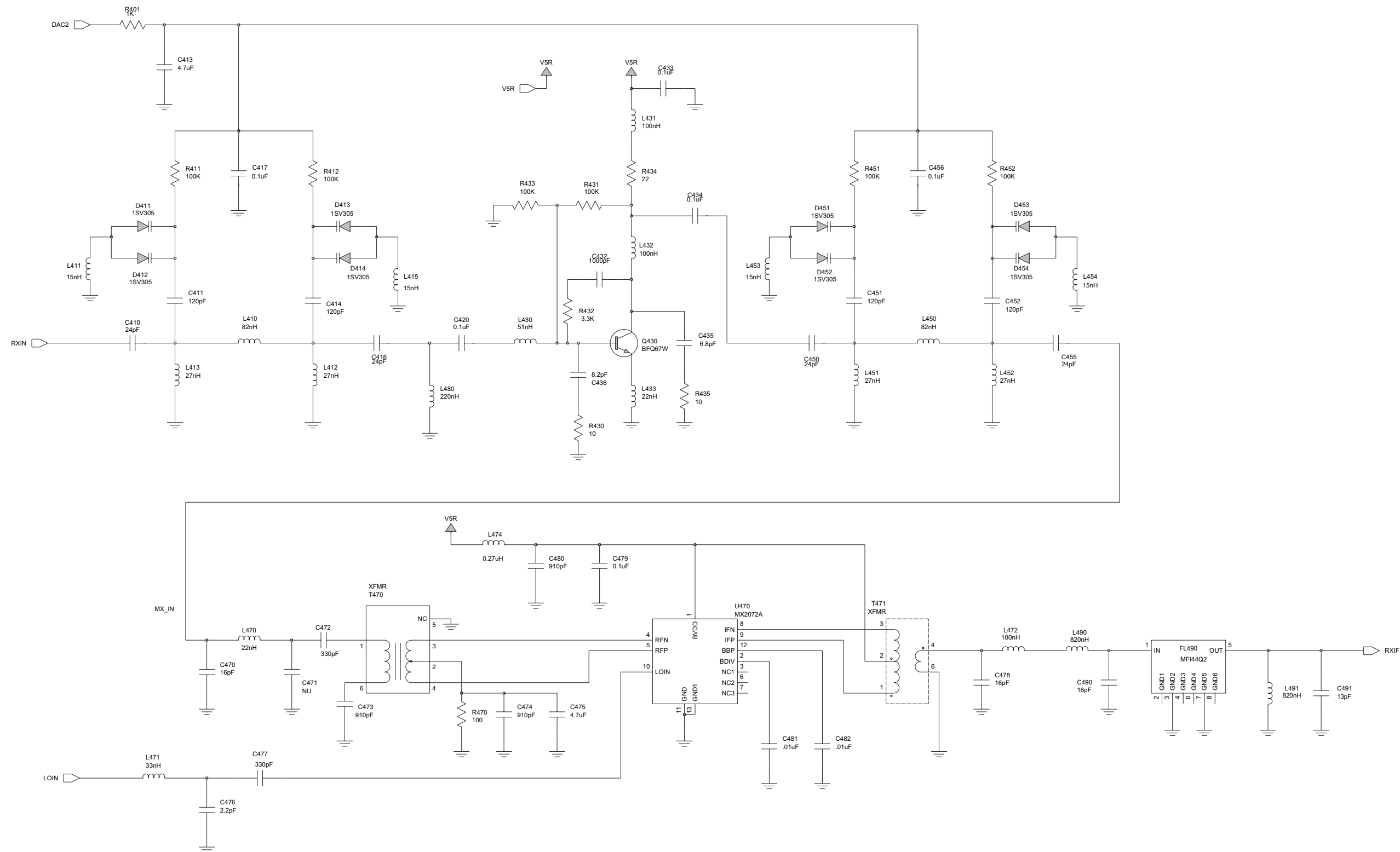


Figure 8-6. VHF Transceiver (RF) Receiver Front End Circuit

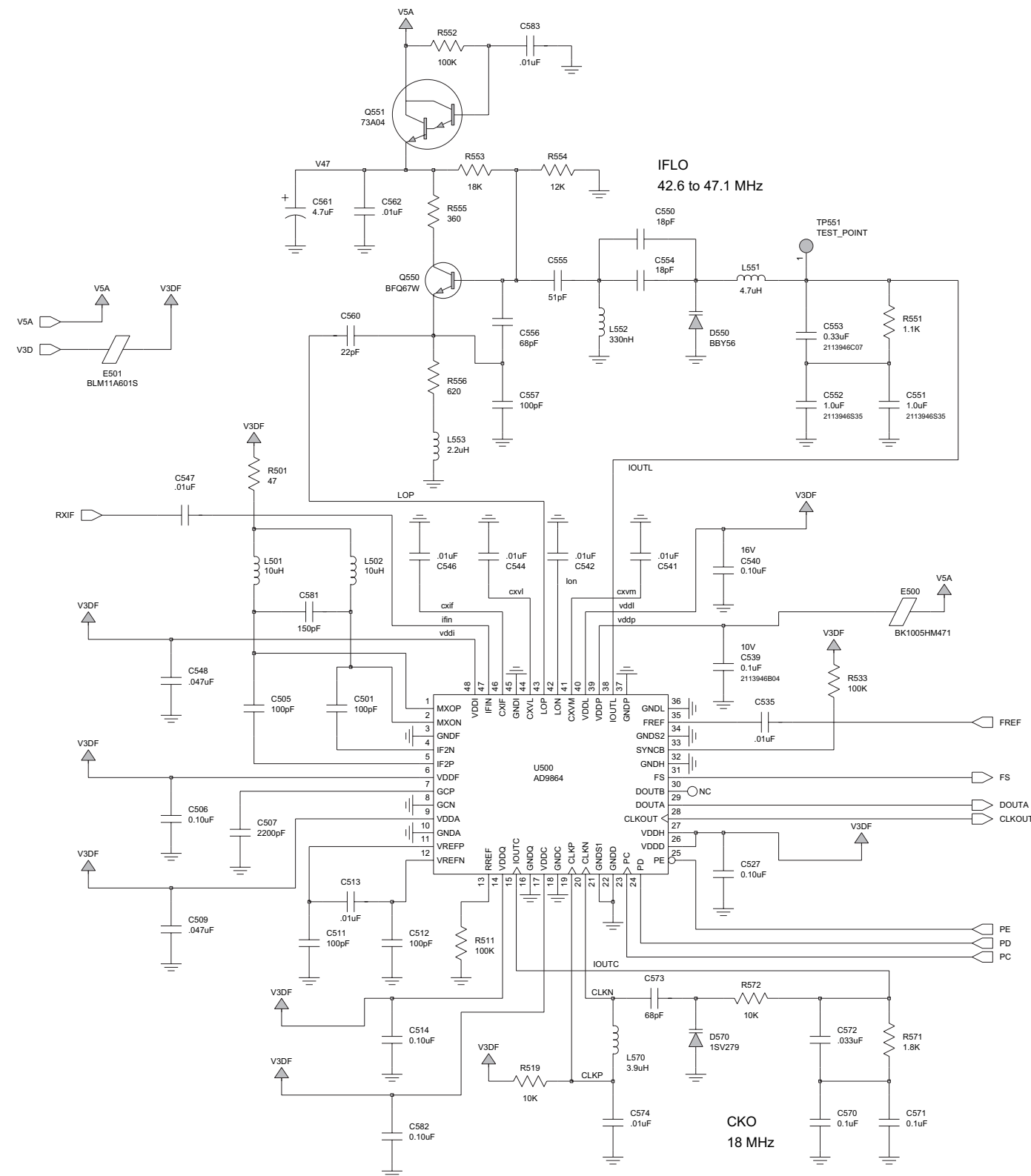


Figure 8-7. VHF Transceiver (RF) Receiver Back End Circuit



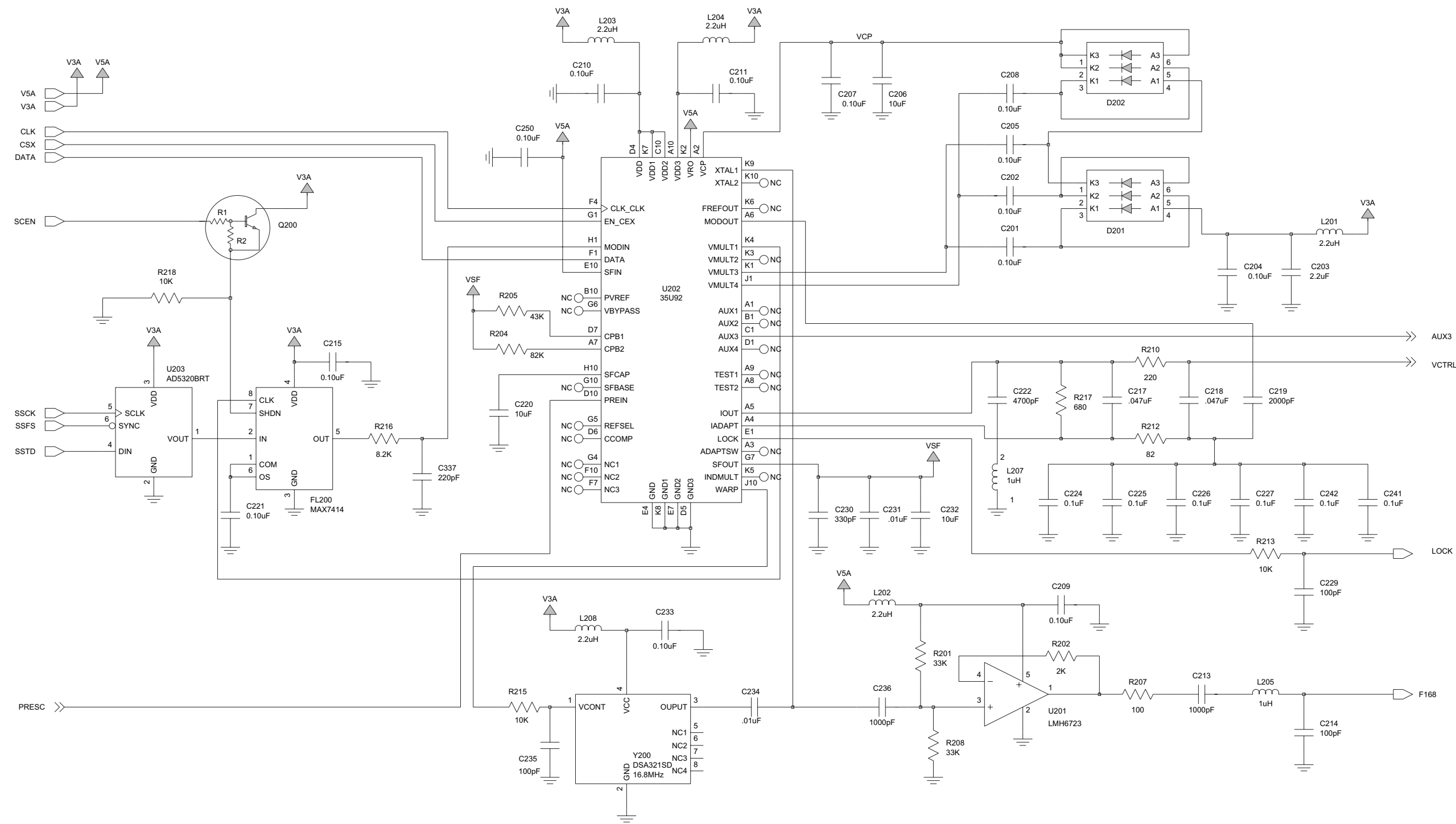


Figure 8-9. VHF Frequency Generation Unit (Synthesizer) Circuit – 1 of 2

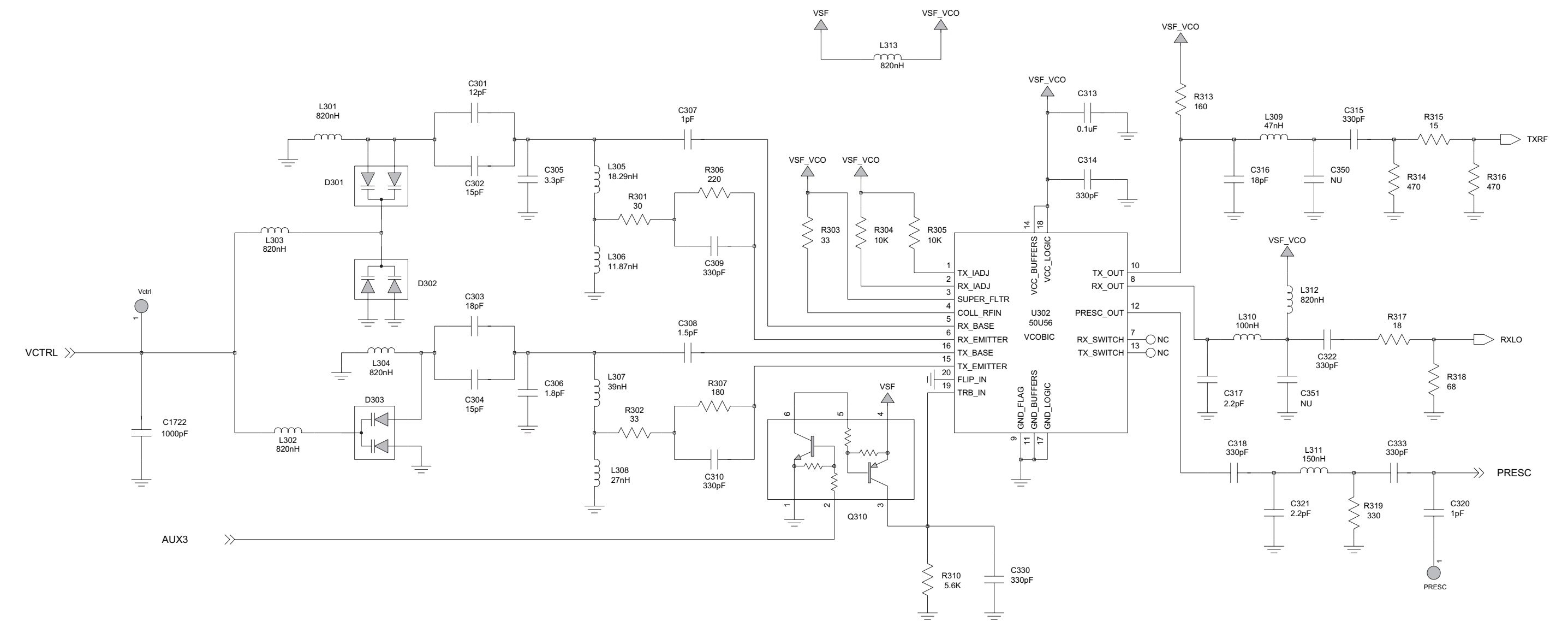


Figure 8-10. VHF Frequency Generation Unit (VCO) Circuit – 2 of 2

Figure 8-11. VOCON: Overall Circuit Schematic

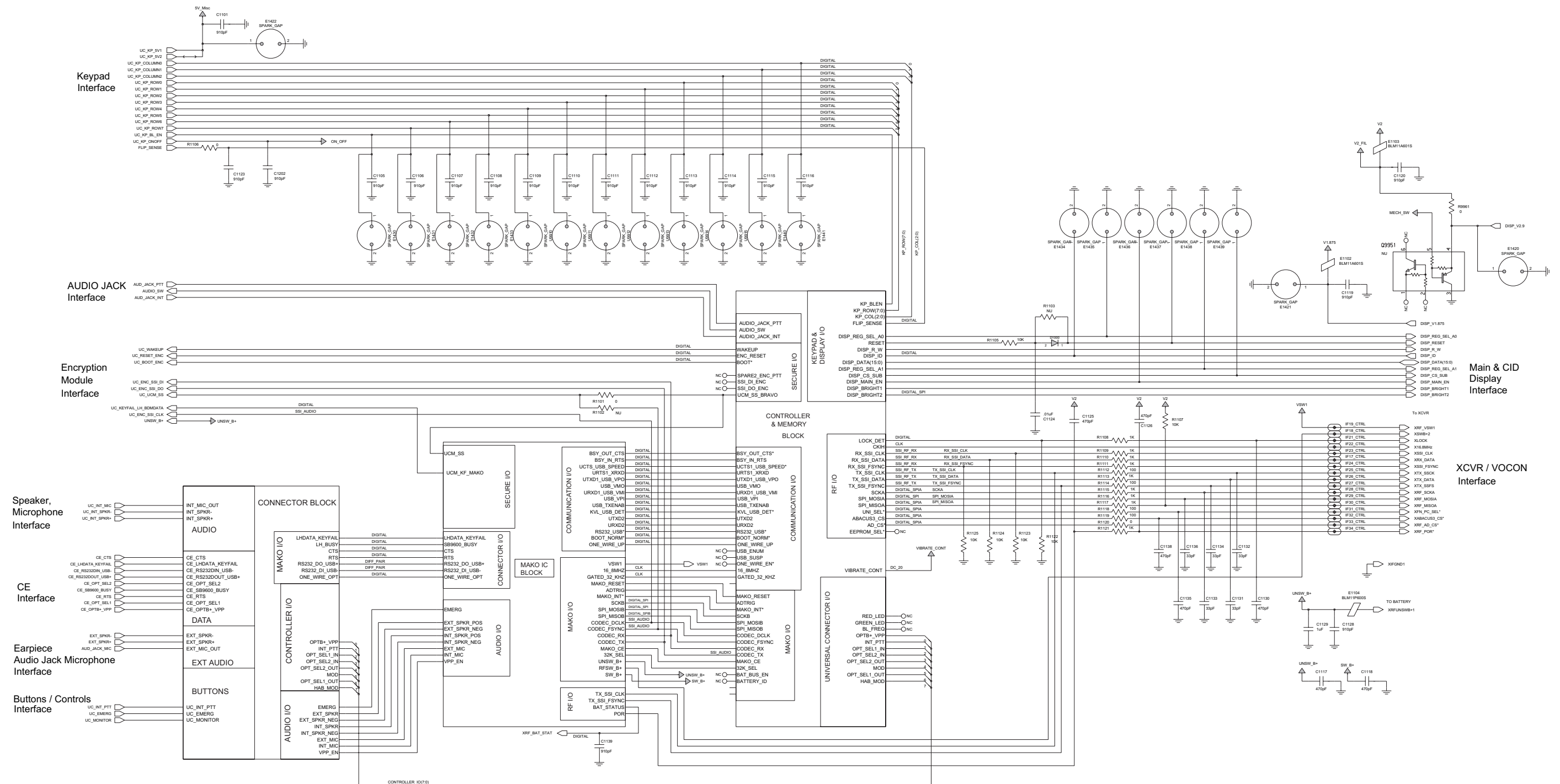


Figure 8-11. VOCON: Overall Circuit Schematic

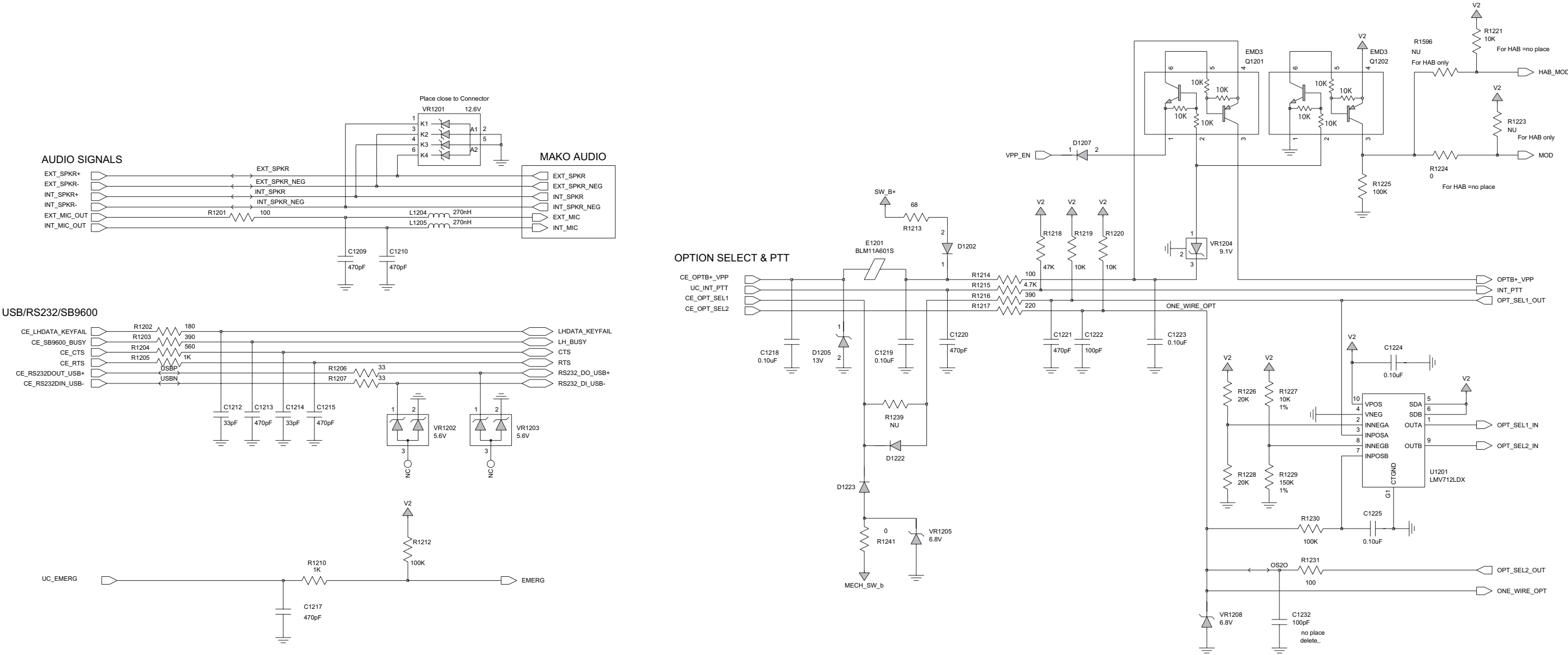


Figure 8-12. VOCON: Audio, Connector Interface Circuits

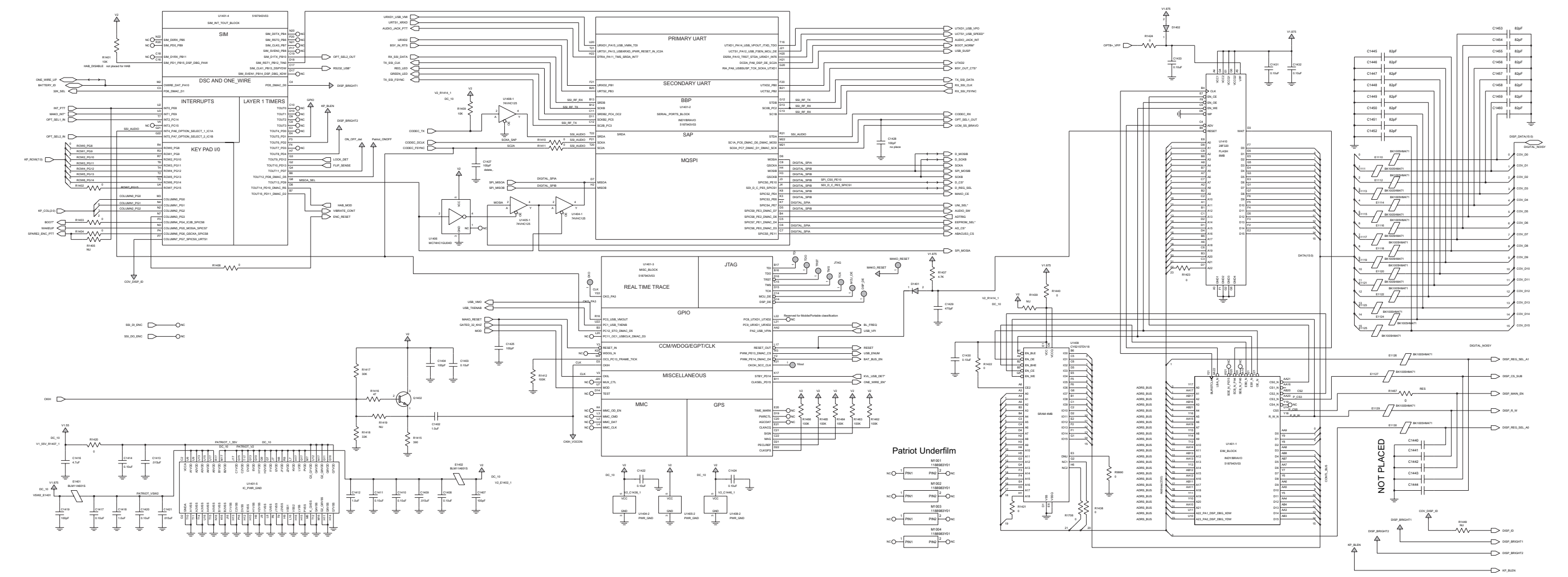
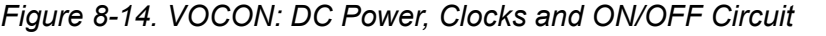


Figure 8-13. VOCON: Controller and Memory Circuits



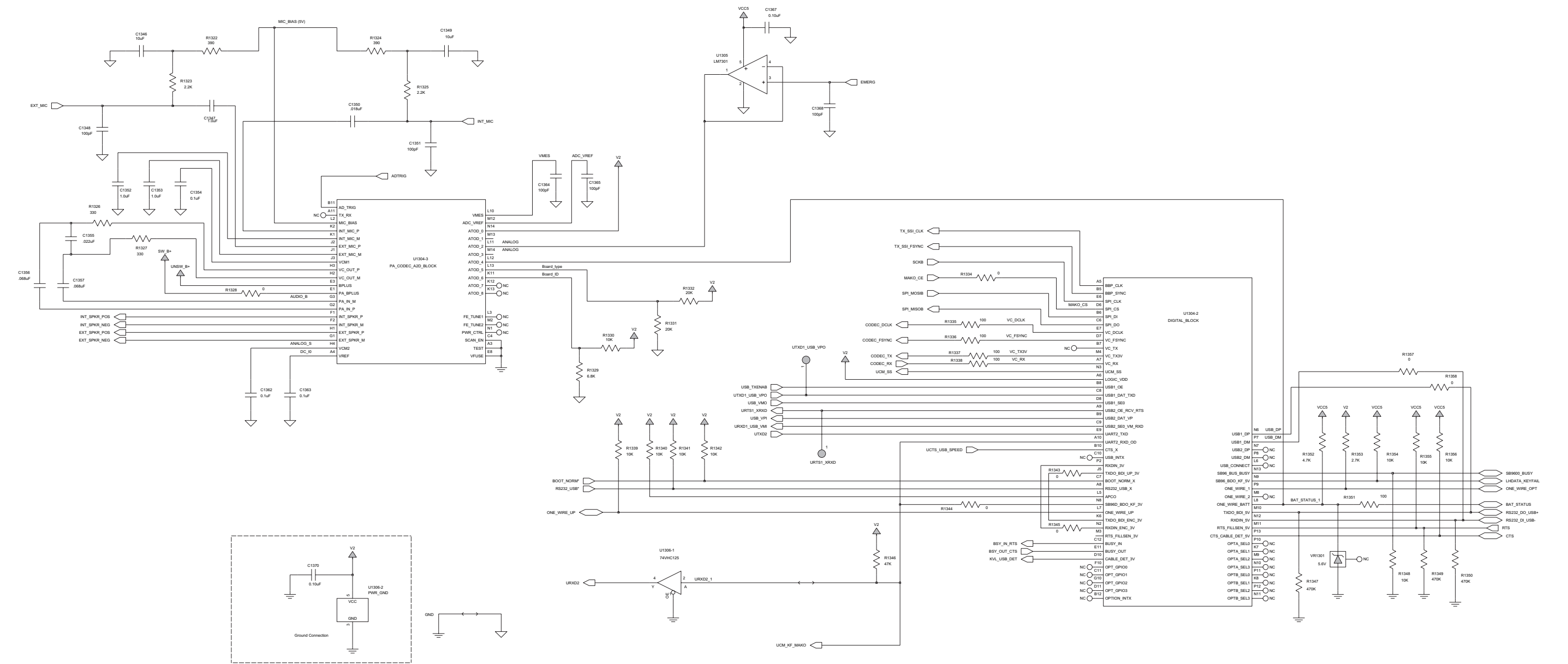


Figure 8-15. VOCON: Audio and Accessory Interface Circuits

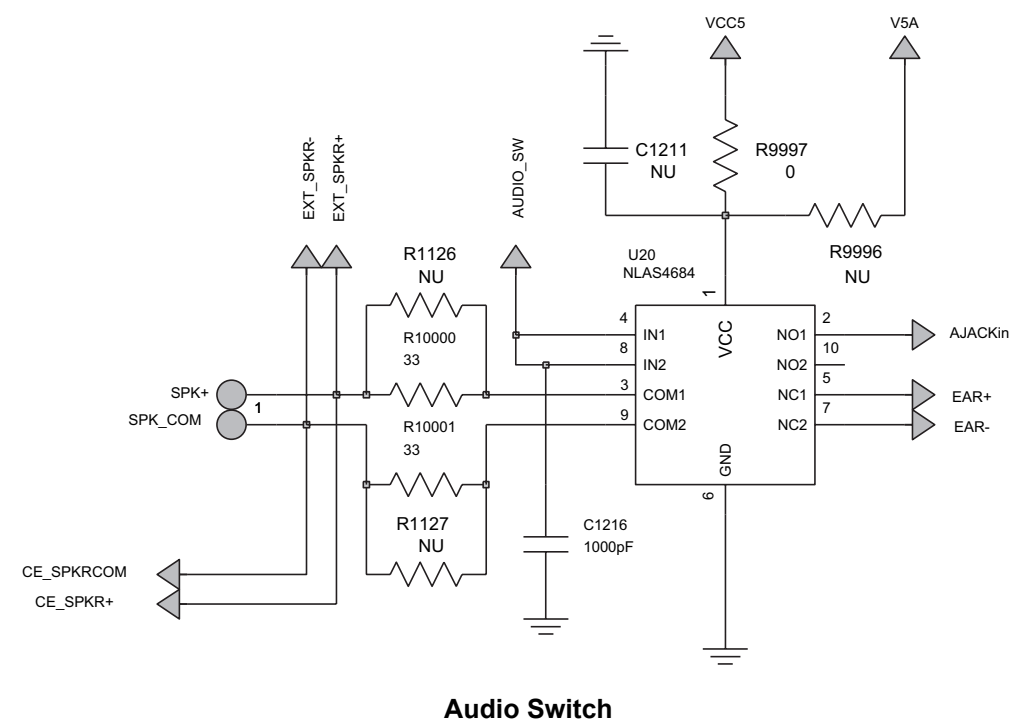
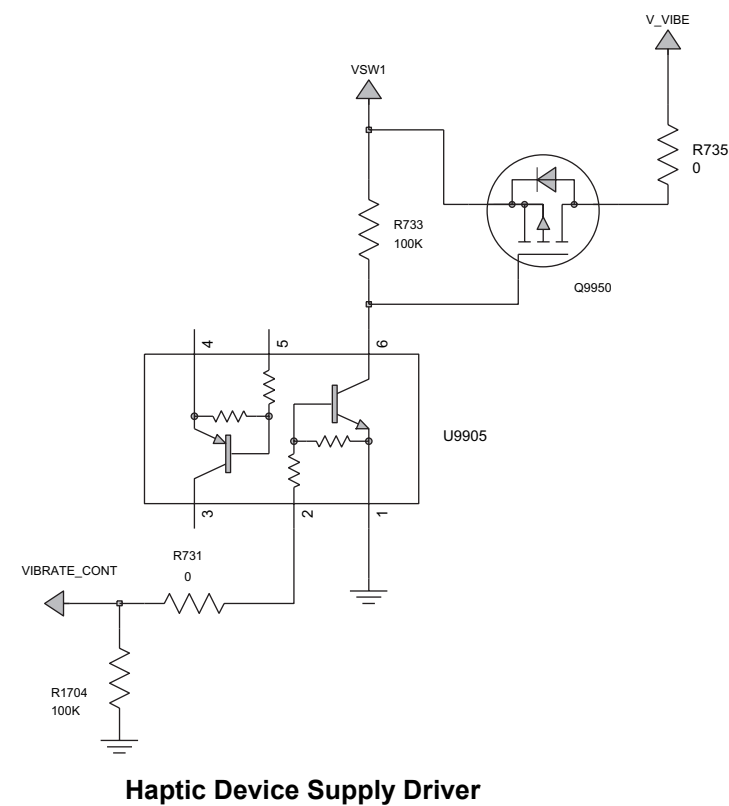
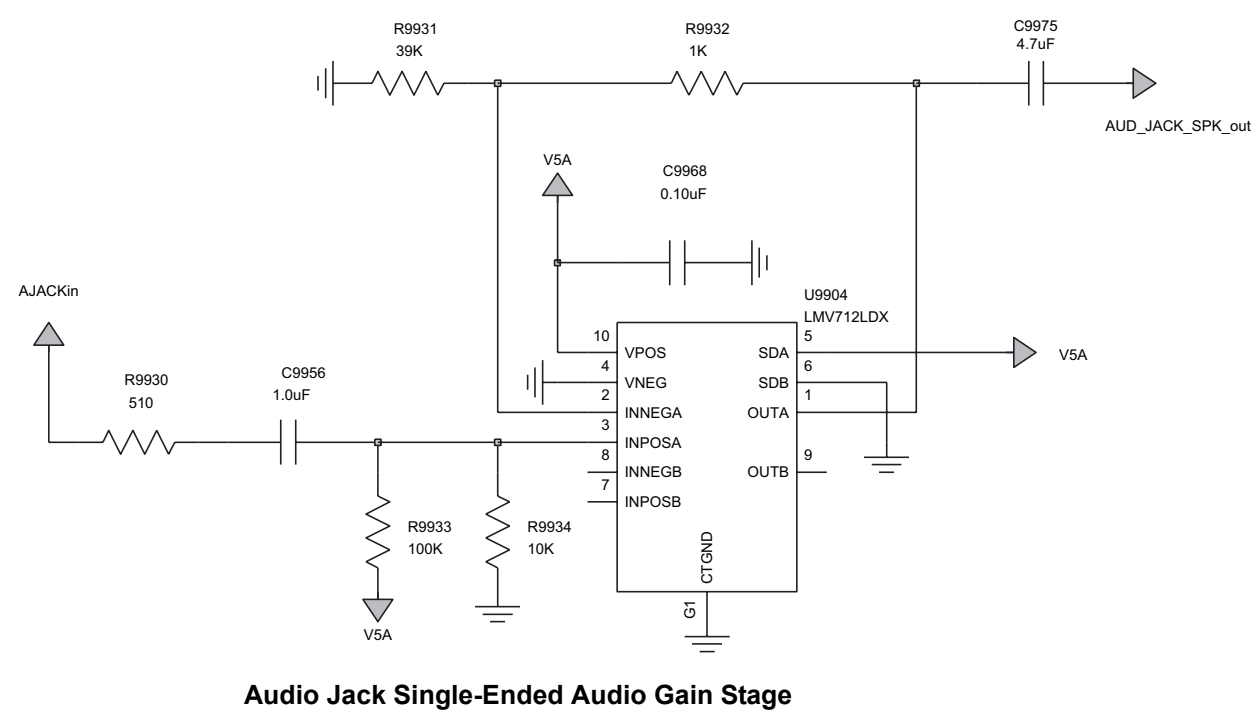
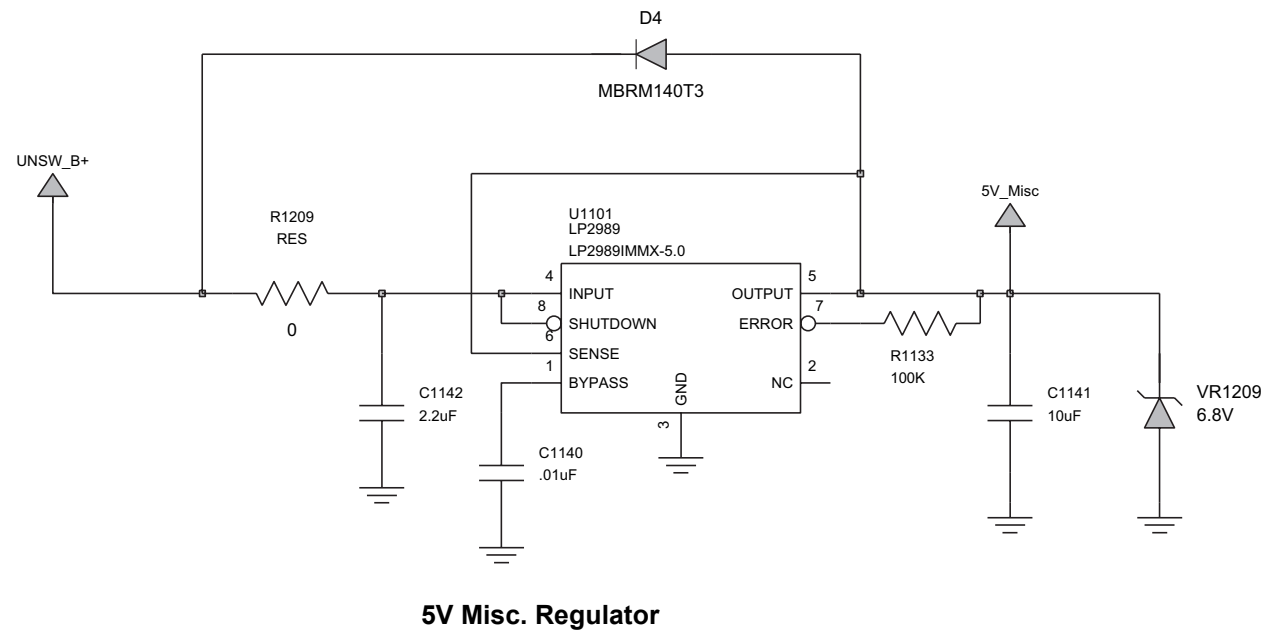


Figure 8-16. VOCON: Miscellaneous Circuits

8.6 Main Board (NUD7115B) Parts List

Ref. Des.	Part Number	Description
C4	2113945L49	CAP,FXD,.01UF,+5%,-5%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C6	2113944C51	CAP CER CHP 1000.OPF 50V 5
C9	2113945A09	CAP CER CHP 1000PF 50V 10%
C10	2113945A09	CAP CER CHP 1000PF 50V 10%
C11	2113946K02	CAP CER CHP 0.10UF 16V
C12	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C13	2113945B02	CAP CER CHP 10,000PF 25V 10%
C14	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C15	2113946E02	CAP CER CHP 1.0UF 16V 10%
C16	2113945B02	CAP CER CHP 10,000PF 25V 10%
C17	2113946E02	CAP CER CHP 1.0UF 16V 10%
C20	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C21	2113944C14	CAP CER CHP 2.2PF 50V +/- 0.25PF
C22	2113944C32	CAP CER CHP 15.0PF 50V 5%
C24	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C25	2113946E02	CAP CER CHP 1.0UF 16V 10%
C26	2113945B02	CAP CER CHP 10,000PF 25V 10%
C27	2113946E02	CAP CER CHP 1.0UF 16V 10%
C28	2113945A09	CAP CER CHP 1000PF 50V 10%

Ref. Des.	Part Number	Description
C30	2313960B57	CAP,FXD,10UF,+10%,-10%, 6.3V-DC,SM,-55DEG CMIN, 125DEG CMAX, 137MA
C52	2113945A09	CAP CER CHP 1000PF 50V 10%
C53	2113945A09	CAP CER CHP 1000PF 50V 10%
C54	2113945A09	CAP CER CHP 1000PF 50V 10%
C55	2113945A09	CAP CER CHP 1000PF 50V 10%
C56	2113945A09	CAP CER CHP 1000PF 50V 10%
C57	2113945A09	CAP CER CHP 1000PF 50V 10%
C71	2113945A09	CAP CER CHP 1000PF 50V 10%
C72	2113945A09	CAP CER CHP 1000PF 50V 10%
C73	2113945A09	CAP CER CHP 1000PF 50V 10%
C101	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C102	2113944C39	CAP CER CHP 56.0PF 50V 5%
C103	2113945B02	CAP CER CHP 10,000PF 25V 10%
C104	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C105	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C106	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C107	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C108	2113945B02	CAP CER CHP 10,000PF 25V 10%

Ref. Des.	Part Number	Description
C110	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C111	2113944C06	CAP CER CHP 470.0PF 50V 5%
C112	2113944C70	CAP,FXD,5.1PF,.25PF+/-, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C113	2113944C82	CAP,FXD,30PF,+5%,-5%, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C114	2113944C78	CAP,FXD,13PF,+5%,-5%, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C115	2113944C43	CAP CER CHP 82.0PF 50V 5%
C116	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C117	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C118	2113945B02	CAP CER CHP 10,000PF 25V 10%
C119	2113944C06	CAP CER CHP 470.0PF 50V 5%
C120	2113944F52	CAP,FXD,27PF,+5%,-5%, 50V-DC,0805,C0G,-55DEG CMIN,125DEG CMAX,PB
C121	2113944F52	CAP,FXD,27PF,+5%,-5%, 50V-DC,0805,C0G,-55DEG CMIN,125DEG CMAX,PB
C122	2113944F52	CAP,FXD,27PF,+5%,-5%, 50V-DC,0805,C0G,-55DEG CMIN,125DEG CMAX,PB
C123	2113944C74	CAP,FXD,7.5PF,.25PF+/-, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C124	2113944F48	CAP,FXD,18PF,+5%,-5%, 50V-DC,0805,C0G,-55DEG CMIN,125DEG CMAX,PB
C125	2113944C06	CAP CER CHP 470.0PF 50V 5%
C127	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C128	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C129	2113945A10	CAP CER CHP 1500PF 50V 10%
C130	2113945A05	CAP CER CHP 470PF 50V 10%
C131	2113946A01	CAP CER CHP 0.015UF 16V 10%
C132	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C133	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C134	2113945B02	CAP CER CHP 10,000PF 25V 10%
C135	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C136	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C137	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C140	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C144	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C201	2113946K02	CAP CER CHP 0.10UF 16V
C202	2113946K02	CAP CER CHP 0.10UF 16V
C203	2113946N03	CAP CER CHP 2.2UF 16V
C204	2113946K02	CAP CER CHP 0.10UF 16V
C205	2113946K02	CAP CER CHP 0.10UF 16V
C206	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C207	2113946K02	CAP CER CHP 0.10UF 16V

Ref. Des.	Part Number	Description
C208	2113946K02	CAP CER CHP 0.10UF 16V
C209	2113946K02	CAP CER CHP 0.10UF 16V
C210	2113946K02	CAP CER CHP 0.10UF 16V
C211	2113946K02	CAP CER CHP 0.10UF 16V
C213	2113945A09	CAP CER CHP 1000PF 50V 10%
C214	2113944A40	CAP CER CHP 100.0PF 50V 5%
C215	2113946K02	CAP CER CHP 0.10UF 16V
C217	2113945C27	CAP,FXD,.047UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C218	2113945C27	CAP,FXD,.047UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C219	2109720D20	CAP CHIP LOW DIST 2000 SOV
C220	2113955E37	CAP,FXD,10UF,+10%,-10%,16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C221	2113946K02	CAP CER CHP 0.10UF 16V
C222	2113945L41	CAP,FXD,4700PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C224	2185419D06	CAP CER SUPER L/D 0.1UF
C225	2185419D06	CAP CER SUPER L/D 0.1UF
C226	2185419D06	CAP CER SUPER L/D 0.1UF
C227	2185419D06	CAP CER SUPER L/D 0.1UF
C229	2113944A40	CAP CER CHP 100.0PF 50V 5%
C230	2113945A03	CAP CER CHP 330PF 50V 10%
C231	2113945B02	CAP CER CHP 10,000PF 25V 10%
C232	2113955E37	CAP,FXD,10UF,+10%,-10%,16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C233	2113946K02	CAP CER CHP 0.10UF 16V
C234	2113945B02	CAP CER CHP 10,000PF 25V 10%

Ref. Des.	Part Number	Description
C235	2113944A40	CAP CER CHP 100.0PF 50V 5%
C236	2113945A09	CAP CER CHP 1000PF 50V 10%
C241	2185419D06	CAP CER SUPER L/D 0.1UF
C242	2185419D06	CAP CER SUPER L/D 0.1UF
C250	2113946K02	CAP CER CHP 0.10UF 16V
C301	2113944A26	CAP CER CHP 12.0PF 50V 5%
C302	2113944A27	CAP CER CHP 15.0PF 50V 5%
C303	2113944A28	CAP CER CHP 18.0PF 50V 5%
C304	2113944A27	CAP CER CHP 15.0PF 50V 5%
C305	2113944A13	CAP CER CHP 3.3PF 50V +/- 0.25PF
C306	2188881Y12	CAPACITOR CERAMIC NPO HIGH FREQUENCY 16 VOLT (REPLACES 2104801Z12)
C307	2113944V03	CAP,FXD,1PF,.1PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C308	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C309	2113945A03	CAP CER CHP 330PF 50V 10%
C310	2113945A03	CAP CER CHP 330PF 50V 10%
C313	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C314	2113945A03	CAP CER CHP 330PF 50V 10%
C315	2113945A03	CAP CER CHP 330PF 50V 10%
C316	2113944A28	CAP CER CHP 18.0PF 50V 5%
C317	2113944V11	CAP,FXD,2.2PF,.1PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C318	2113945A03	CAP CER CHP 330PF 50V 10%

Ref. Des.	Part Number	Description
C320	2113944V03	CAP,FXD,1PF,.1PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C321	2113944V11	CAP,FXD,2.2PF,.1PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C322	2113945A03	CAP CER CHP 330PF 50V 10%
C330	2113945A03	CAP CER CHP 330PF 50V 10%
C333	2113945A03	CAP CER CHP 330PF 50V 10%
C337	2113945A01	CAP CER CHP 220PF 50V 10,
C350	NOT PLACED	–
C351	NOT PLACED	–
C410	2113944A81	CAP,FXD,24PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C411	2113944A41	CAP CER CHP 120.0PF 50V 5%
C413	2113946D07	CAP,CHIP,4.7UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C414	2113944A41	CAP CER CHP 120.0PF 50V 5%
C416	2113944A81	CAP,FXD,24PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C417	2113946B04	CAP CER CHP 0.10UF 10V 10%
C420	2113946B04	CAP CER CHP 0.10UF 10V 10%
C432	2113945A09	CAP CER CHP 1000PF 50V 10%
C433	2113946B04	CAP CER CHP 0.10UF 10V 10%
C434	2113946B04	CAP CER CHP 0.10UF 10V 10%
C435	2113944A21	CAP CER CHP 6.8PF 50V +/- 0.5PF
C436	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C450	2113944A81	CAP,FXD,24PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB

Ref. Des.	Part Number	Description
C451	2113944A41	CAP CER CHP 120.0PF 50V 5%
C452	2113944A41	CAP CER CHP 120.0PF 50V 5%
C455	2113944A81	CAP,FXD,24PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C456	2113946B04	CAP CER CHP 0.10UF 10V 10%
C470	2113944A79	CAP,FXD,16PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C471	NOT PLACED	–
C472	2113945A03	CAP CER CHP 330PF 50V 10%
C473	2113945A58	CAP,FXD,910PF,+10%,-10%,50V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C474	2113945A58	CAP,FXD,910PF,+10%,-10%,50V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C475	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C476	2113944A09	CAP CER CHP 2.2PF 50V +/- 0.25PF
C477	2113945A03	CAP CER CHP 330PF 50V 10%
C478	2113944A79	CAP,FXD,16PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C479	2113946B04	CAP CER CHP 0.10UF 10V 10%
C480	2113945A58	CAP,FXD,910PF,+10%,-10%,50V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C481	2113945B02	CAP CER CHP 10,000PF 25V 10%
C482	2113945B02	CAP CER CHP 10,000PF 25V 10%
C490	2113944A28	CAP CER CHP 18.0PF 50V 5%
C491	2113944A78	CAP,FXD,13PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB

Ref. Des.	Part Number	Description
C501	2113944A40	CAP CER CHP 100.0PF 50V 5%
C505	2113944A40	CAP CER CHP 100.0PF 50V 5%
C506	2113946K02	CAP CER CHP 0.10UF 16V
C507	2113945A11	CAP CER CHP 2200PF 50V 10%
C509	2113946B02	CAP CER CHP 0.047UF 10V 10,
C511	2113944A40	CAP CER CHP 100.0PF 50V 5%
C512	2113944A40	CAP CER CHP 100.0PF 50V 5%
C513	2113945B02	CAP CER CHP 10,000PF 25V 10%
C514	2113946K02	CAP CER CHP 0.10UF 16V
C527	2113946K02	CAP CER CHP 0.10UF 16V
C535	2113945B02	CAP CER CHP 10,000PF 25V 10%
C539	2113946B04	CAP CER CHP 0.10UF 10V 10%
C540	2113946K02	CAP CER CHP 0.10UF 16V
C541	2113945B02	CAP CER CHP 10,000PF 25V 10%
C542	2113945B02	CAP CER CHP 10,000PF 25V 10%
C544	2113945B02	CAP CER CHP 10,000PF 25V 10%
C546	2113945B02	CAP CER CHP 10,000PF 25V 10%
C547	2113945B02	CAP CER CHP 10,000PF 25V 10%
C548	2113946B02	CAP CER CHP 0.047UF 10V 10,
C550	2113944A28	CAP CER CHP 18.0PF 50V 5%
C551	2113946S35	CAP CER CHP 1.0UF 16V 10%
C552	2113946S35	CAP CER CHP 1.0UF 16V 10%
C553	2113946C07	CAP,FXD,.33UF,+10%, -10%,10V-DC,0603,X5R, -55DEG CMIN,85DEG CMAX
C554	2113944A28	CAP CER CHP 18.0PF 50V 5%

Ref. Des.	Part Number	Description
C555	2113944A85	CAP,FXD,51PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C556	2113944A36	CAP CER CHP 68.0PF 50V 5%
C557	2113944A40	CAP CER CHP 100.0PF 50V 5%
C560	2113944A29	CAP CER CHP 22.0PF 50V 5%
C561	2313960B30	CAP,FXD,4.7UF,+10%, -10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,122MA
C562	2113945B02	CAP CER CHP 10,000PF 25V 10%
C570	2113945G91	CAP,FXD,.1UF,+10%, -10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C571	2113945G91	CAP,FXD,.1UF,+10%, -10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C572	2113945C25	CAP,FXD,.033UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C573	2113944A36	CAP CER CHP 68.0PF 50V 5%
C574	2113945B02	CAP CER CHP 10,000PF 25V 10%
C581	2113944A42	CAP CER CHP 150.0PF 50V 5%
C582	2113946K02	CAP CER CHP 0.10UF 16V
C583	2113945B02	CAP CER CHP 10,000PF 25V 10%
C704	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C705	2113944C81	CAP,FXD,24PF,+5%,-5% ,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C706	2113944C30	CAP CER CHP 10.0PF 50V +/- 0.5PF
C707	2113944C79	CAP,FXD,16PF,+5%,-5%, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C709	2113944C24	CAP CER CHP 5.6PF 50V +/- 0.5PF

Ref. Des.	Part Number	Description
C710	2113944C80	CAP,FXD,20PF,+5%,-5%, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C711	2113944C33	CAP CER CHP 18.0PF 50V 5%
C712	2113945A09	CAP CER CHP 1000PF 50V 10%
C713	2113944A11	CAP CER CHP 2.7PF 50V +/- 0.25PF
C715	2113945A09	CAP CER CHP 1000PF 50V 10%
C716	2113945A09	CAP CER CHP 1000PF 50V 10%
C717	2113946K02	CAP CER CHP 0.10UF 16V
C720	2113944C77	CAP,FXD,11PF,+5%,-5%, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C1101	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1102	2113945A09	CAP CER CHP 1000PF 50V 10%
C1104	2113945A09	CAP CER CHP 1000PF 50V 10%
C1105	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1106	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1107	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1108	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1109	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1110	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C1111	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1112	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1113	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1114	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1115	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1116	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1117	2113945A05	CAP CER CHP 470PF 50V 10%
C1118	2113945A05	CAP CER CHP 470PF 50V 10%
C1119	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1120	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1123	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1124	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1125	2113945A05	CAP CER CHP 470PF 50V 10%
C1126	2113945A05	CAP CER CHP 470PF 50V 10%
C1128	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C1129	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C1130	2113945A05	CAP CER CHP 470PF 50V 10%
C1131	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1132	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1133	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1134	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1135	2113945A05	CAP CER CHP 470PF 50V 10%
C1136	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1138	2113945A05	CAP CER CHP 470PF 50V 10%
C1139	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1140	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1141	2113946F05	CAP,CHIP,10UF,+10%, -10%,6.3V-DC,0805,X5R, -55DEG CMIN,85DEG CMAX
C1142	2113956C43	CAP,FXD,2.2UF,+10% ,-10%,10V-DC,0805,X5R ,-55DEG CMIN,85DEG CMAX
C1202	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C1209	2113945A05	CAP CER CHP 470PF 50V 10%
C1210	2113945A05	CAP CER CHP 470PF 50V 10%
C1211	NOT PLACED	-
C1212	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1213	2113945A05	CAP CER CHP 470PF 50V 10%

Ref. Des.	Part Number	Description
C1214	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1215	2113945A05	CAP CER CHP 470PF 50V 10%
C1216	2113945A09	CAP CER CHP 1000PF 50V 10%
C1217	2113945A05	CAP CER CHP 470PF 50V 10%
C1218	2113946K02	CAP CER CHP 0.10UF 16V
C1219	2113946K02	CAP CER CHP 0.10UF 16V
C1220	2113945A05	CAP CER CHP 470PF 50V 10%
C1221	2113945A05	CAP CER CHP 470PF 50V 10%
C1222	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1223	2113946K02	CAP CER CHP 0.10UF 16V
C1224	2113946K02	CAP CER CHP 0.10UF 16V
C1225	2113946K02	CAP CER CHP 0.10UF 16V
C1232	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1301	2113945A05	CAP CER CHP 470PF 50V 10%
C1302	2113946K02	CAP CER CHP 0.10UF 16V
C1303	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C1304	2113946K02	CAP CER CHP 0.10UF 16V
C1305	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1306	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1307	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1308	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1309	2113945A09	CAP CER CHP 1000PF 50V 10%
C1310	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1312	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1313	2113945A03	CAP CER CHP 330PF 50V 10%
C1314	2113945A03	CAP CER CHP 330PF 50V 10%

Ref. Des.	Part Number	Description
C1315	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1316	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1317	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1318	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1319	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1320	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1321	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1322	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1323	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1324	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1325	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1326	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1327	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1328	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1329	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1330	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1331	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1332	2371572L01	POSCAD 47UF
C1333	2371572L01	POSCAD 47UF
C1335	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1336	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1337	2113945A09	CAP CER CHP 1000PF 50V 10%

Ref. Des.	Part Number	Description
C1338	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1339	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1340	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1341	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1342	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1343	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1345	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1346	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1347	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1348	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1349	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1350	2113945C21	CAP,FXD,.018UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C1351	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1352	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1353	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1354	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1355	2113946A02	CAP CER CHP 0.022UF 16V 10,
C1356	2113946B03	CAP CER CHP 0.068UF 10V 10
C1357	2113946B03	CAP CER CHP 0.068UF 10V 10

Ref. Des.	Part Number	Description
C1362	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1363	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1364	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1365	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1367	2113946K02	CAP CER CHP 0.10UF 16V
C1368	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1370	2113946K02	CAP CER CHP 0.10UF 16V
C1402	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1403	2113946K02	CAP CER CHP 0.10UF 16V
C1404	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1407	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1408	2113946K02	CAP CER CHP 0.10UF 16V
C1409	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1410	2113946K02	CAP CER CHP 0.10UF 16V
C1411	2113946K02	CAP CER CHP 0.10UF 16V
C1412	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1413	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1414	2113946K02	CAP CER CHP 0.10UF 16V
C1416	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C1417	2113946K02	CAP CER CHP 0.10UF 16V
C1418	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1419	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1420	2113946K02	CAP CER CHP 0.10UF 16V
C1421	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1422	2113946K02	CAP CER CHP 0.10UF 16V
C1424	2113946K02	CAP CER CHP 0.10UF 16V
C1425	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C1427	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1428	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1429	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1430	2113946K02	CAP CER CHP 0.10UF 16V
C1431	2113946K02	CAP CER CHP 0.10UF 16V
C1432	2113946K02	CAP CER CHP 0.10UF 16V
C1433	2113946K02	CAP CER CHP 0.10UF 16V
C1440	NOT PLACED	–
C1441	NOT PLACED	–
C1442	NOT PLACED	–
C1443	NOT PLACED	–
C1444	NOT PLACED	–
C1445	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1446	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1447	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1448	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1449	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1450	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1451	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1452	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1453	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1454	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1455	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1456	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1457	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1458	2113944A38	CAP CER CHP 82.0PF 50V 5%

Ref. Des.	Part Number	Description
C1459	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1460	2113944A38	CAP CER CHP 82.0PF 50V 5%
C1719	2113945A09	CAP CER CHP 1000PF 50V 10%
C1722	2113945A09	CAP CER CHP 1000PF 50V 10%
C9901	2113945A09	CAP CER CHP 1000PF 50V 10%
C9950	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9951	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9952	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9953	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9954	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9956	2113946E02	CAP CER CHP 1.0UF 16V 10%
C9966	2113945A58	CAP,FXD,910PF,+10%, -10%,50V-DC,0402,X7R, -55DEG CMIN,125DEG CMAX
C9968	2113946K02	CAP CER CHP 0.10UF 16V
C9969	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9970	2113945A09	CAP CER CHP 1000PF 50V 10%
C9975	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C9980	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
D1	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D2	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE

Ref. Des.	Part Number	Description
D3	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D4	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D104	4813978A26	DIODE ARRAY,DET, SOT-363/SC-88,30V,.12W,2
D201	4815011H01	DIODE TRIPLE
D202	4815011H01	DIODE TRIPLE
D301	4885094Y01	DIODE VARACTOR ISV228 W18
D302	4885094Y01	DIODE VARACTOR ISV228 W18
D303	4885094Y01	DIODE VARACTOR ISV228 W18
D411	4815096H01	VARACTOR DIODE 1SV305
D412	4815096H01	VARACTOR DIODE 1SV305
D413	4815096H01	VARACTOR DIODE 1SV305
D414	4815096H01	VARACTOR DIODE 1SV305
D451	4815096H01	VARACTOR DIODE 1SV305
D452	4815096H01	VARACTOR DIODE 1SV305
D453	4815096H01	VARACTOR DIODE 1SV305
D454	4815096H01	VARACTOR DIODE 1SV305
D550	4805656W41	DIODE VARACTOR 40PFV 15PFV
D570	4805656W87	DIODE,VCTR, @ 15V, 1SV279,SOD-523/SC-79
D701	4871607L01	PIN DIODE SMD
D702	4871607L01	PIN DIODE SMD
D703	4808115L27	DIODE,PIN,DH50037,SM,S OT-323,30V
D1000	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V PB FREE
D1202	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1205	4813977C23	DIODE,ZEN,MMSZ5243,SM ,SOD-123,13V, 10MA,.5W, ZEN,PB-FREE

Ref. Des.	Part Number	Description
D1207	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1222	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1223	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1301	4805129M90	DIODE SOT PKGD
D1401	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1402	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
E5	2480640Z01	SURFACE MOUNT FERRITE BEAD
E101	7686949J14	FLTR,FERRITE BEAD,2A, SM,0805,CHIP,220OHM
E104	2480574F01	IND FERRITE CHIP 60OHM 0603
E105	2480640Z01	SURFACE MOUNT FERRITE BEAD
E500	2480640Z01	SURFACE MOUNT FERRITE BEAD
E501	2480574F01	IND FERRITE CHIP 60OHM 0603
E1102	2480574F01	IND FERRITE CHIP 60OHM 0603
E1103	2480574F01	IND FERRITE CHIP 60OHM 0603
E1104	2462586G33	INDUCTOR CHIP FERRITE BEADS
E1110	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1111	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1112	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1113	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1114	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1115	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1116	2480640Z01	SURFACE MOUNT FERRITE BEAD

Ref. Des.	Part Number	Description
E1117	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1118	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1119	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1120	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1121	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1122	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1123	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1124	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1125	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1126	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1127	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1129	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1130	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1201	2480574F01	IND FERRITE CHIP 60OHM 0603
E1401	2480574F01	IND FERRITE CHIP 60OHM 0603
E1402	2480574F01	IND FERRITE CHIP 60OHM 0603
F901	6515076H01	FUSE CHIP SMT 0603FA3-R
FL200	9116848H01	FLTR SW CAP 3 POLE BUTTERW, W18
FL490	9171859L01	CRYSTAL FILTER
J1	0970312N01	CONN,BTB,RCPT,60CONT, .4MM,GLD,1 STACK HGT
J2	0987817K04	30PIN RECPT MATING CNTCR 1.5MM
J3	0987817K02	RECP 0.5 PITCH 16 CKT
J1704	0971876L01	MINIATURE INTERFACE COAXIAL SWITCH

Ref. Des.	Part Number	Description
L10	2489669V01	IDCTR,WW,100UH,5%, 40MA,100OHM,20 Q,10MHZ SRF,SM,1210,PB-FREE
L20	2460591E81	COIL AIR WOUND INDUC 52.29
L101	2414017N10	IDCTR,CHIP,6.8NH,5%, 600MA,.22OHM,CER,12 Q,2.7GHZ SRF,SM,0603
L102	2414032D30	IDCTR,WW,1UH,5%,320MA ,2.8OHM,CER,28 Q, 340MHZ SRF,SM,LEAD-FR
L103	2414017N18	IDCTR,CHIP,33NH,5%, 600MA,.71OHM,CER,15 Q, 1.1GHZ SRF,SM,0603
L104	2414017N16	IDCTR,CHIP,22NH,5%, 600MA,.54OHM,CER,13 Q, 1.3GHZ SRF,SM,0603
L105	2479990E01	COIL AIR WOUND/GREEN CLR 23.75
L106	2479990B01	AIR WND COIL/GREEN COLOR 11.03
L107	2415428H01	AIR WOUND INDUCTOR
L108	2479990E01	COIL AIR WOUND/GREEN CLR 23.75
L201	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L202	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L203	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L204	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L205	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB
L207	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB
L208	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L301	2415718H37	CHIP INDUCTOR
L302	2415718H37	CHIP INDUCTOR

Ref. Des.	Part Number	Description
L303	2415718H37	CHIP INDUCTOR
L304	2415718H37	CHIP INDUCTOR
L305	2460591D12	COIL AIR WOUND INDUC 18.29
L306	2460591C03	COIL AIR WOUND INDUC 11.87
L307	2414032B48	IDCTR,WW,39NH,5%,1A, .15OHM,CER,50 Q,1.5GHZ SRF,SM,PB-FREE
L308	2414032B46	IDCTR,WW,27NH,5%,1A, .13OHM,CER,50 Q,1.5GHZ SRF,SM,PB-FREE
L309	2415429H30	CHIP INDUCTOR
L310	2415429H36	CHIP INDUCTOR
L311	2415429H39	CHIP INDUCTOR
L312	2415718H37	CHIP INDUCTOR
L313	2415718H37	CHIP INDUCTOR
L410	2415429H35	CHIP INDUCTOR
L411	2415429H18	CHIP INDUCTOR
L412	2415429H24	CHIP INDUCTOR
L413	2415429H24	CHIP INDUCTOR
L415	2415429H18	CHIP INDUCTOR
L430	2415427H42	CHIP INDUCTOR
L431	2415427H46	CHIP INDUCTOR
L432	2415427H46	CHIP INDUCTOR
L433	2415427H31	CHIP INDUCTOR
L450	2415429H35	CHIP INDUCTOR
L451	2415429H24	CHIP INDUCTOR
L452	2415429H24	CHIP INDUCTOR
L453	2415429H18	CHIP INDUCTOR
L454	2415429H18	CHIP INDUCTOR
L470	2415427H31	CHIP INDUCTOR
L471	2414017G13	IDCTR,CHIP,33NH,5%, 300MA,.65OHM,CER,8 Q, SM,0603,PB-FREE
L472	2414017N27	IDCTR,CHIP,180NH,5%, 150MA,2.7OHM,CER,11 Q, 500MHZ SRF,SM,0603
L474	2414017Q40	IDCTR,FXD,270NH,10%, 250MA,.5OHM,FERR,20 Q, 150MHZ SRF,SM,0805
L480	2415429H43	CHIP INDUCTOR

Ref. Des.	Part Number	Description
L490	2414015B32	IDCTR,FXD,820NH,2%,180MA,2.35OHM,CER,23 Q, 300MHZ SRF,SM,0805
L491	2414015B32	IDCTR,FXD,820NH,2%,180MA,2.35OHM,CER,23 Q,300MHZ SRF,SM,0805
L501	2466505A01	COIL INDUCTOR
L502	2466505A01	COIL INDUCTOR
L551	2414032B76	IDCTR,WW,4.7UH,5%,330MA,4OHM,CER,20 Q,60MHZ SRF,SM,LEAD
L552	2414015B26	IDCTR,FXD,330NH,2%,310MA,1.4OHM,CER,48 Q,600MHZ SRF,SM,0805
L553	2414017Q51	IDCTR,FXD,2.2UH,10%,30MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L570	2414017Q54	IDCTR,FXD,3.9UH,10%,30MA,.9OHM,FERR,45 Q,38MHZ SRF,SM,0805,P
L702	2414032D30	IDCTR,WW,1UH,5%,320MA,2.8OHM,CER,28 Q,340MHZ SRF,SM,LEAD-FR
L703	2460591G24	COIL AIR WOUND INDUC 33.47
L704	2460591D81	COIL AIR WOUND INDUC 43.41
L705	2460591E81	COIL AIR WOUND INDUC 52.29
L1204	2415429H45	CHIP INDUCTOR
L1205	2415429H45	CHIP INDUCTOR
L1301	2464675H01	IDCTR,WW,560NH,5%,550MA
L1302	2464675H01	IDCTR,WW,560NH,5%,550MA
L1303	2464675H01	IDCTR,WW,560NH,5%,550MA
L1304	2464675H01	IDCTR,WW,560NH,5%,550MA
L1305	2471189M01	SHIELDED SMT POWER INDUCTORS
L1306	2471189M01	SHIELDED SMT POWER INDUCTORS
L1307	2464675H01	IDCTR,WW,560NH,5%,550MA
L1308	2464675H01	IDCTR,WW,560NH,5%,550MA

Ref. Des.	Part Number	Description
M1001	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1002	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1003	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1004	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1009	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1010	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1011	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1012	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1704	4271868L01	CLIP, ANTENNA
M1705	3971751L01	CONNECTOR, B-PLUS
PCB	8416742H03	BOARD, PC, MAIN
Q4	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q101	4871006L02	MUN53XX NPN/PNP DIGITAL TRANSISTOR
Q102	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q104	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q107	4816698H02	TRANSISTOR,FET RF POWER,N-CHANNEL, RD12MVP1-T122,SM,60V, MOD,XSTR,FET RF PWR,VHF
Q200	4813973A42	XSTR,BIP GP SS,NPN, SM,SC-59,SMT,50V ,.23W,100MA,PB-FREE
Q310	4871006L01	MUN53XX NPN/PNP DIGITAL TRANSISTOR
Q430	4805218N63	RF TRANS SOT 323 BFQ67W
Q550	4805218N63	RF TRANS SOT 323 BFQ67W
Q551	4813973A04	XSTR,BIP GP SS,NPN, TA13,SM,SOT-23,SMT,30V,.225W,300MA,125MHZ,P
Q1201	4809939C31	TSTR DUAL NPN/PNP EMD3T

Ref. Des.	Part Number	Description
Q1202	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q1301	4813970A62	XSTR,FET GP PWR ,MOSFET,P-CH,ENHN,CF, -20V,1.3W,PB-FREE
Q1302	4813970A62	XSTR,FET GP PWR, MOSFET,P-CH,ENHN,CF, -20V,1.3W,PB-FREE
Q1304	5185956E76	IC,CONV,SM,SO16,0-30 VINPUT RANGE,6.5A,3.8V, HI SPD SWTH DR
Q1402	4805793Y10	XSTR,BIP RF SMALL SIGNAL,SLCN,NPN,NE685 19-A,SM,SMT,125W,1
Q9901	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9902	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9903	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q9904	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9905	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q9906	4813973A42	XSTR,BIP GP SS,NPN, SM,SC-59,SMT,50V,.23W,100MA,PB-FREE
Q9950	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q9951	NOT PLACED	–
R102	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R105	0613952R01	CER CHIP RES 10K OHM 5% 0402
R106	0613952R17	CER CHIP RES 47K OHM 5% 0402
R109	NOT PLACED	–
R111	0613952R41	CER CHIP RES 470K OHM 5% 0402
R117	0613952Q25	CER CHIP RES 10.0 OHM 5 0402

Ref. Des.	Part Number	Description
R118	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R119	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R120	0613952Q49	CER CHIP RES 100 OHM 5 0402
R121	0613952Q62	CER CHIP RES 360 OHM 5 0402
R122	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R130	0671856L01	POWER METAL STRIP RESISTOR 0.15 OHM
R135	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R136	NOT PLACED	–
R201	0613952R13	CER CHIP RES 33K OHM 5% 0402
R202	0613952Q80	CER CHIP RES 2000 OHM 5 0402
R204	0613952R23	CER CHIP RES 82K OHM 5% 0402
R205	0613952R16	CER CHIP RES 43K OHM 5 0402
R207	0613952Q49	CER CHIP RES 100 OHM 5 0402
R208	0613952R13	CER CHIP RES 33K OHM 5% 0402
R210	0613952Q57	CER CHIP RES 220 OHM 5 0402
R212	0613952Q47	CER CHIP RES 82.0 OHM 5% 0402
R213	0613952R01	CER CHIP RES 10K OHM 5% 0402
R215	0613952R01	CER CHIP RES 10K OHM 5% 0402
R216	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R217	0613952Q69	CER CHIP RES 680 OHM 5 0402
R218	0613952R01	CER CHIP RES 10K OHM 5% 0402
R301	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R302	0613952Q37	CER CHIP RES 33.0 OHM 5 0402

Ref. Des.	Part Number	Description
R303	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R304	0613952R01	CER CHIP RES 10K OHM 5% 0402
R305	0613952R01	CER CHIP RES 10K OHM 5% 0402
R306	0613952Q57	CER CHIP RES 220 OHM 5 0402
R307	0613952Q55	CER CHIP RES 180 OHM 5 0402
R310	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R313	0613952Q54	CER CHIP RES 160 OHM 5 0402
R314	0613952Q65	CER CHIP RES 470 OHM 5 0402
R315	0613952Q29	CER CHIP RES 15.0 OHM 5 0402
R316	0613952Q65	CER CHIP RES 470 OHM 5 0402
R317	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R318	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R319	0613952Q61	CER CHIP RES 330 OHM 5 0402
R401	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R411	0613952R25	CER CHIP RES 100K OHM 5% 0402
R412	0613952R25	CER CHIP RES 100K OHM 5% 0402
R430	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R431	0613952R25	CER CHIP RES 100K OHM 5% 0402
R432	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R433	0613952R25	CER CHIP RES 100K OHM 5% 0402
R434	0613952Q33	CER CHIP RES 22.0 OHM 5 0402
R435	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R451	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R452	0613952R25	CER CHIP RES 100K OHM 5% 0402
R470	0613952Q49	CER CHIP RES 100 OHM 5 0402
R501	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R511	0613952R25	CER CHIP RES 100K OHM 5% 0402
R519	0613952R01	CER CHIP RES 10K OHM 5% 0402
R533	0613952R25	CER CHIP RES 100K OHM 5% 0402
R551	0613952Q74	RES,MF,1.1KOHM,5%,.0625W,SM,0402,200PPM/CEL,PB-FREE
R552	0613952R25	CER CHIP RES 100K OHM 5% 0402
R553	0613952R07	CER CHIP RES 18K OHM 5% 0402
R554	0613952R03	CER CHIP RES 12K OHM 5% 0402
R555	0613952Q62	CER CHIP RES 360 OHM 5 0402
R556	0613952Q68	CER CHIP RES 620 OHM 5 0402
R571	0613952H79	CER CHIP RES 1800 OHM 5% 0603
R572	0613952R01	CER CHIP RES 10K OHM 5% 0402
R701	0613958H57	CER CHIP RES 220 OHM 5% 0805
R703	0613952R25	CER CHIP RES 100K OHM 5% 0402
R731	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R733	0613952R25	CER CHIP RES 100K OHM 5% 0402
R735	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R10000	0613952H37	CER CHIP RES 33.0 OHM 5% 0603
R10001	0613952H37	CER CHIP RES 33.0 OHM 5% 0603
R1101	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1102	NOT PLACED	–

Ref. Des.	Part Number	Description
R1103	NOT PLACED	–
R1105	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1106	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1107	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1108	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1109	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1110	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1111	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1112	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1113	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1114	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1115	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1116	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1117	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1118	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1119	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1120	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1121	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1122	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1123	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1124	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1125	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1126	NOT PLACED	–
R1127	NOT PLACED	–

Ref. Des.	Part Number	Description
R1133	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1201	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1202	0613952Q55	CER CHIP RES 180 OHM 5 0402
R1203	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1204	0613952Q67	CER CHIP RES 560 OHM 5 0402
R1205	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1206	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1207	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1209	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1210	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1212	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1213	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R1214	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1215	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1216	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1217	0613952Q57	CER CHIP RES 220 OHM 5 0402
R1218	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1219	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1220	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1221	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1223	NOT PLACED	–
R1224	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1225	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R1226	0613952R08	CER CHIP RES 20K OHM 5 0402
R1227	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1228	0613952R08	CER CHIP RES 20K OHM 5 0402
R1229	0613952P18	CER CHIP RES 150K OHM 1 0402
R1230	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1231	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1239	NOT PLACED	–
R1241	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1301	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1302	NOT PLACED	–
R1303	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1304	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1305	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1306	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1307	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1308	0613952R19	CER CHIP RES 56K OHM 5% 0402
R1309	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1310	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1311	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1314	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1315	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1317	0688044N04	RES,METAL STRIP, 0.1 OHM, 1%,0.125W,SMD, 0805,75PPM/CEL,PKG
R1318	0613952Q49	CER CHIP RES 100 OHM 5 0402

Ref. Des.	Part Number	Description
R1319	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1320	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1321	0688044N04	RES,METAL STRIP, 0.1 OHM, 1%,0.125W,SMD, 0805,75PPM/CEL,PKG
R1322	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1323	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1324	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1325	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1326	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1327	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1328	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1329	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R1330	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1331	0613952R08	CER CHIP RES 20K OHM 5 0402
R1332	0613952R08	CER CHIP RES 20K OHM 5 0402
R1334	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1335	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1336	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1337	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1338	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1339	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1340	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1341	0613952R01	CER CHIP RES 10K OHM 5% 0402

Ref. Des.	Part Number	Description
R1342	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1343	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1344	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1345	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1346	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1347	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1348	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1349	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1350	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1351	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1352	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1353	NOT PLACED	–
R1354	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1355	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1356	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1357	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1358	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1370	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1371	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1401	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1402	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1403	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1404	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1405	NOT PLACED	–

Ref. Des.	Part Number	Description
R1406	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1409	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1410	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1411	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1412	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1415	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1416	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R1417	0613952R12	CER CHIP RES 30K OHM 5 0402
R1418	0613952R13	CER CHIP RES 33K OHM 5% 0402
R1419	NOT PLACED	–
R1420	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1421	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1422	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1423	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1424	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1437	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1438	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1439	NOT PLACED	–
R1440	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1449	NOT PLACED	–
R1462	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1463	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1464	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1465	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R1466	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1467	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1596	NOT PLACED	–
R1704	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1706	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1708	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1709	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9901	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R9902	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9903	NOT PLACED	–
R9904	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9905	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9906	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R9907	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R9908	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9909	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9910	0613952R11	CER CHIP RES 27K OHM 5% 0402
R9911	0613952R09	CER CHIP RES 22K OHM 5% 0402
R9912	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9913	0613952R24	CER CHIP RES 91K OHM 5 0402
R9914	0613952R21	CER CHIP RES 68K OHM 5% 0402
R9915	0613952R29	CER CHIP RES 150K OHM 5% 0402
R9916	NOT PLACED	–
R9917	0613952Q73	CER CHIP RES 1000 OHM 5 0402

Ref. Des.	Part Number	Description
R9918	NOT PLACED	–
R9919	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9920	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9921	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9922	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9923	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9924	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9925	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9926	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9927	0613952R12	CER CHIP RES 30K OHM 5 0402
R9930	0613952Q66	CER CHIP RES 510 OHM 5 0402
R9931	0613952R15	CER CHIP RES 39K OHM 5% 0402
R9932	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9933	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9934	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9960	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9961	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9990	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9996	NOT PLACED	–
R9997	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9998	0613952Q49	CER CHIP RES 100 OHM 5 0402
R9999	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
RT150	0680590Z01	THERMISTOR_33K
SH01	2671728L01	SHIELD, BOTTOM BACK END 1

Ref. Des.	Part Number	Description
SH02	2671818L01	SHIELD, BOTTOM FRONT END 1
SH03	2671819L01	SHIELD, BOTTOM FRONT END 2
SH04	2671820L01	SHIELD, BOTTOM MIXER
SH05	2671821L01	SHIELD, BOTTOM SYNTHESIZER
SH06	2671822L01	SHIELD, TOP DRIVER
SH07	2671823L01	SHIELD, TOP HARMONIC FILTER
SH08	2671824L01	SHIELD, TOP PA
SH09	2671825L01	SHIELD, TOP SYNTHESIZER
SH10	2671826L01	SHIELD, TOP VCO
SH11	2671817L01	SHIELD, BOTTOM BACK END 2
T470	2515396H01	BALUN, TRANSFORMER
T471	2516320H01	XFMR SMALL SIGNAL SURFACE MT
U1	5188493T01	IC,VREG/SWG,LP2989, SM,IC MINI SO-8 HI PRCN REG 5V
U2	5185941F35	IC, VREG, NOPB
U3	5185941F35	IC, VREG, NOPB
U20	5171025M01	DUAL SPDT ANALOG SWITCHES, LOW R
U102	5115678H01	VHF/UHF/800/900 MHZ LD MOS DRIVER IC
U103	5115022H01	IC TEMPERATURE SENSOR
U104	5185765B26	IC PWR CTRL IN MOS20
U201	5116411H01	IC,OP AMP,
U202	5116245H01	CC LVFRACN
U203	5185941F40	IC, 12 BIT DAC
U302	5105750U56	IC PKG DIE VCO BUFFER
U470	5164015H81	IC,MXR,DBL BAL GILBERT,CELL,SM
U500	5102495J14	IC,IF,IF DIGITILIZING SUBSYSTEM IC,AD9864, QFN
U701	5185941F45	ATTEN,VAR,14.4DBMIN, 15.6DBMAX,0-2000 MHZFREQ, 50OHM,PCMT, SOT

Ref. Des.	Part Number	Description
U702	5116349H01	DUAL INVERTER IC
U1101	5188493T01	IC,VREG/SWG,LP2989, SM,IC MINI SO-8 HI PRCN REG 5V
U1201	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE
U1301	5188691V01	IC,MUX/DEMUX, NC7SB3157P6X,SM, SC70-6,1PER PKG,BUS,PB FREE
U1302	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1303	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1304 ⁺	5185143E77	IC, MAKO ASIC, CMOS PWR MGMT
U1305	5185941F22	IC,OPAMP,SGL,OPA237, SOT23,NOPB
U1306	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1401 ⁺	5187943V03	IC,PGM,1.2.3C,BRAVO CGISS ROM3 12X12 PAT OSP
U1404	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1405	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1406	5114000A48	IC,INVTR,1GU04,1PER PKG, SOT-353,PB-FREE
U1408	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1409	5171905L01	IIC,SRAM,32MB,2MX16, 70NS,SM,BGA48,1
U1410	5185956E69	IC,DRAM,64MB,60NS,IC 1.8V 64
U9901	5114000A48	IC,INVTR,1GU04,1PER PKG,SOT-353,PB-FREE
U9902	5109522E99	IC, SINGLE AND GATE TC7S08FU
U9903	5114007M28	IC,F-F/D,1PER PKG, 17SZ74,N-I,SM,SOIC8, PB-FREE
U9904	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE
U9905	4871006L01	MUN53XX NPN/PNP DIGITAL TRANSISTOR

Ref. Des.	Part Number	Description
U9918	5114007A47	IC,OR,17SZ32,1PER PKG, SOT-353,PB FREE
VR3	4815155H01	RECTIFIER
VR4	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR51	4805656W99	ZENER DIODE 5.6V
VR1201	4813979P12	DIODE ARRAY,TRANSIENT PROTECTION,SM, SOT-457,12V,.225W, ZEN, 4,PB
VR1202	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1203	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1204	4813977M18	DIODE,ZEN,MBZ5239,SM, SOT-23,9.1V,10MA, .225W, ZEN,PB-FREE
VR1205	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1206	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1208	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1209	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1301	4813977M11	DIODE,ZEN,MBZ5232,SM, SOT-23,5.6V,10MA, .225W, ZEN,PB-FREE
VR9901	4815821H01	ZENER VOLTAGE REGULATOR 2.4V 200MW
Y200	4816748H01	CRYSTAL OSCILLATOR
Y1301	4809995L05	XTAL QUARTZ 32.768KHZ CC4V-T1
Y1302	4864005H01	RESONATOR, CRYSTAL 24.576 MHZ

NOTE

* Parts U1401 and U1304 are not field repairable. For failures relating to U1401 and U1304, the mainboard has to be replaced.

Chapter 9 Schematics, Board Overlays, and Parts Lists – UHF

This chapter contains the schematics, board overlays, and parts lists for the UHF XTS 4000 radio. Use them in conjunction with the theory of operation and the troubleshooting procedures, charts, and waveforms to isolate a problem to the component level.

The following tables list the pages where the schematics and board overlays for the XTS 4000 radio are found.

9.1 List of Schematics and Boards Overlays

Table 9-1. List of Mainboard Schematics and Board Overlays

Board Schematic/Board Layout	Page No.
General Section	
Main Board Layout (NUE7350A/B) – Side 1	9-2
Main Board Layout (NUE7350A/B) – Side 2	9-3
Main Board Overall Schematic	9-4
Transceiver (RF) Section	
Transceiver (RF) Board Overall Circuit Schematic	9-5
Antenna Switch and Harmonic Filter Circuits	9-6
Receiver Front End Circuit	9-7
Receiver Back End Circuit	9-8
Transmitter Circuits	9-9
Frequency Generation Unit (Synthesizer) Circuit	9-10
Frequency Generation Unit (TX VCO) Circuit	9-11
Frequency Generation Unit (RX VCO) Circuit	9-12
VOCON Section	
Overall Circuit Schematic	9-13
Audio, Connector Interface Circuit	9-14
Controller and Memory Circuits	9-15
DC Power, Clocks and ON/OFF Circuit	9-16
Audio, and Accessory Interface Circuit	9-17

9.2 List of Partslist

Table 9-2. List of Partslist

PCB Board Main	Page No.
UHF Main Board Parts List (NUE7350A)	9-18
UHF Main Board Parts List (NUE7350B)	9-28

9.3 General Section

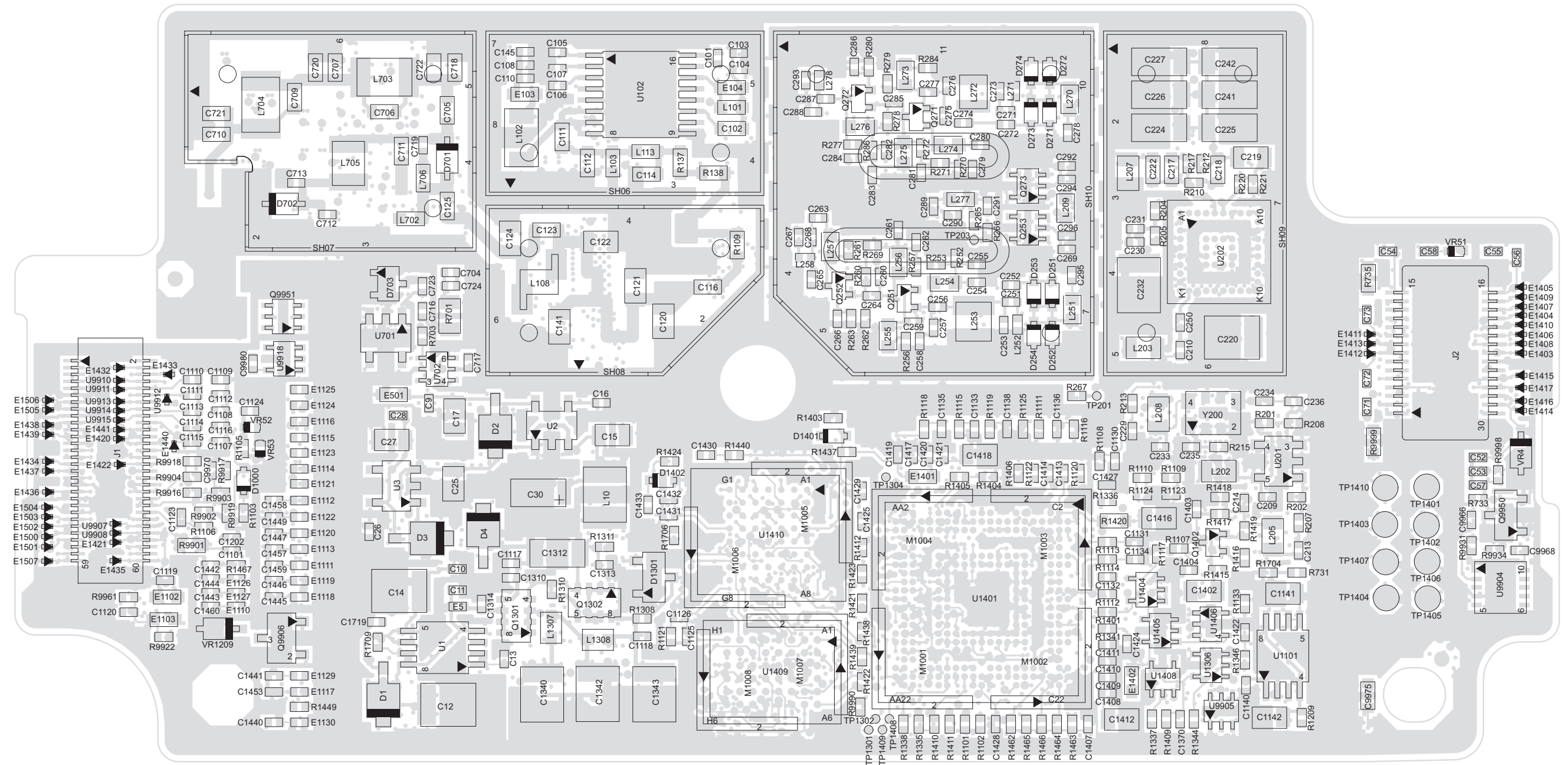


Figure 9-1. Main Board Layout (NUE7350A/B) – Side 1

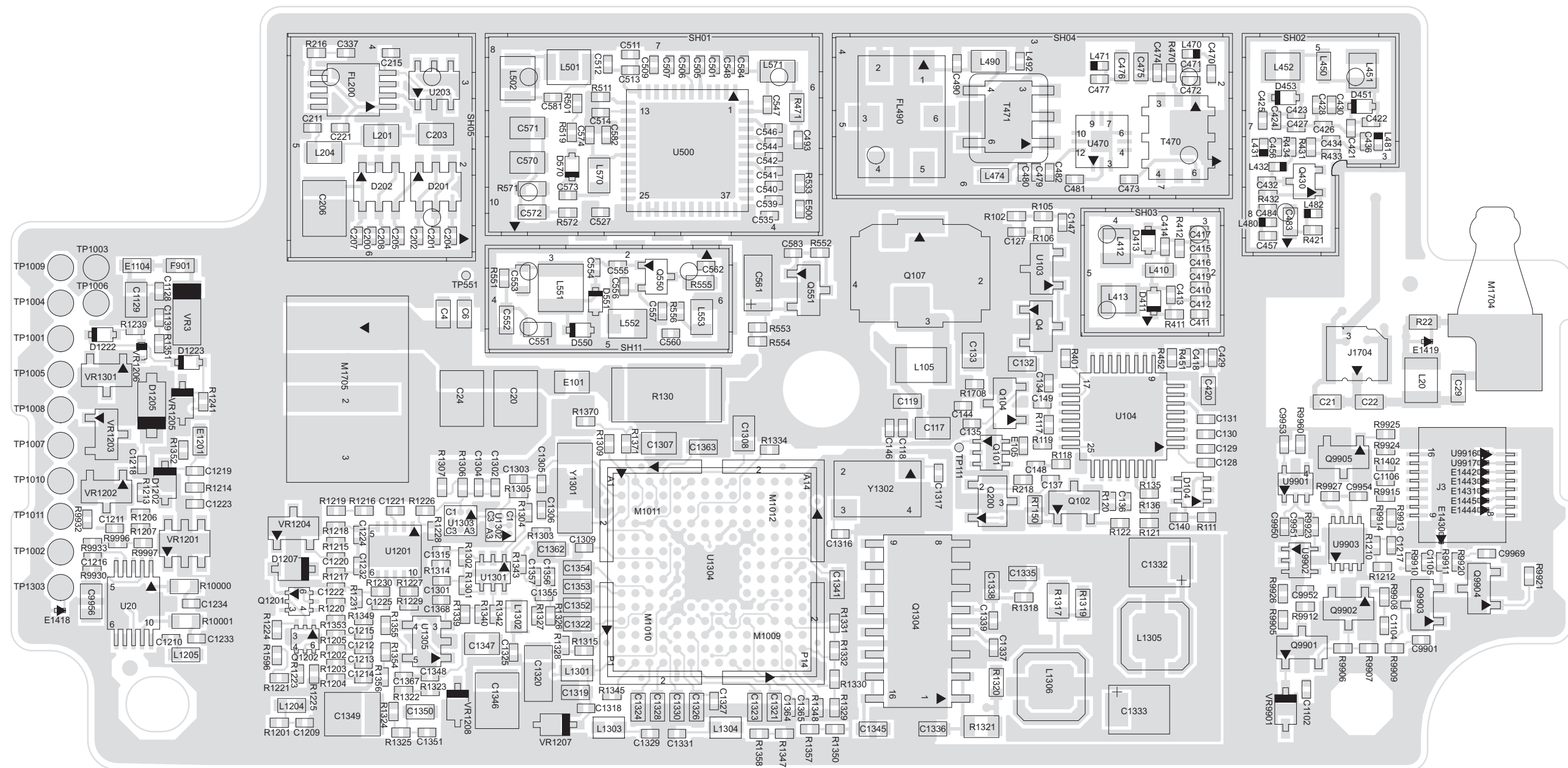


Figure 9-2. Main Board Layout (NUE7350A/B) – Side 2

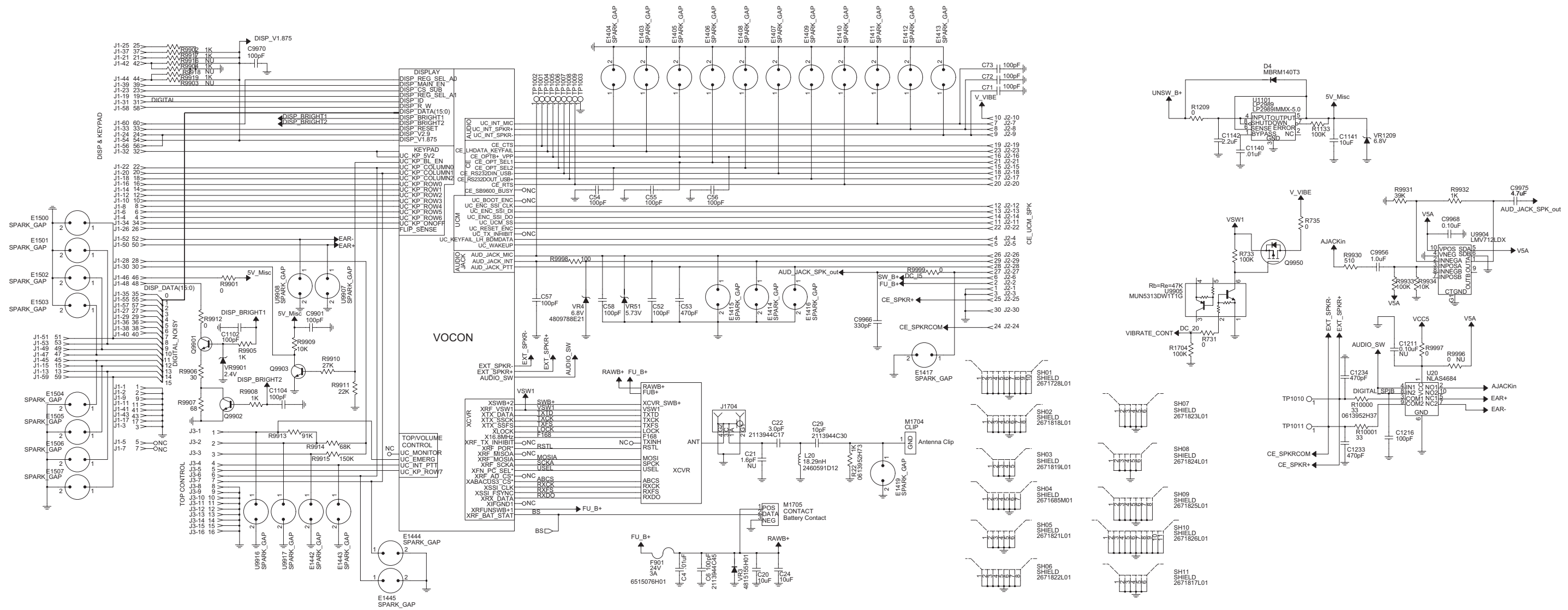


Figure 9-3. UHF Main Board Overall Schematic

9.4 Transceiver (RF) Section

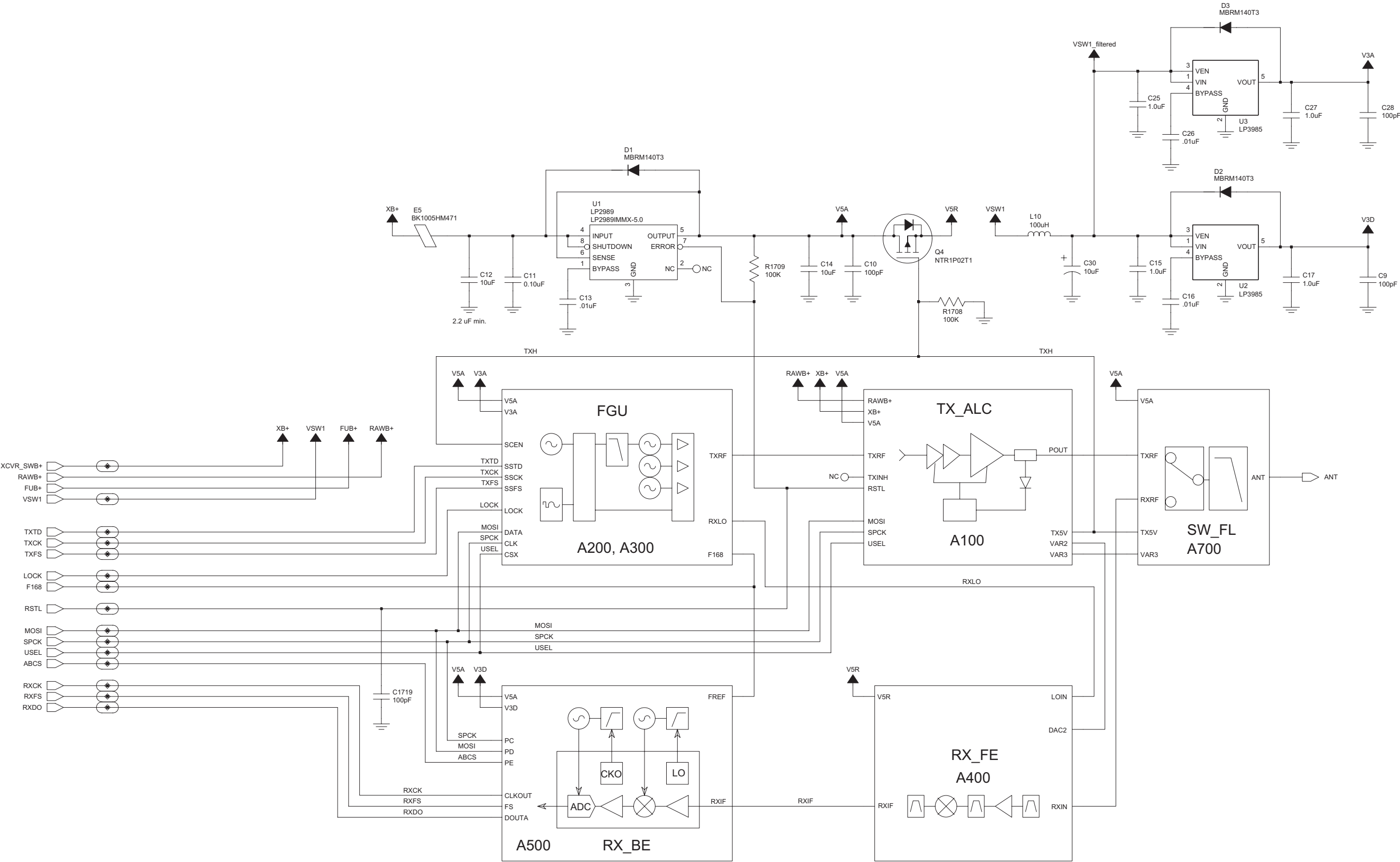


Figure 9-4. UHF Transceiver (RF) Board Overall Circuit Schematic

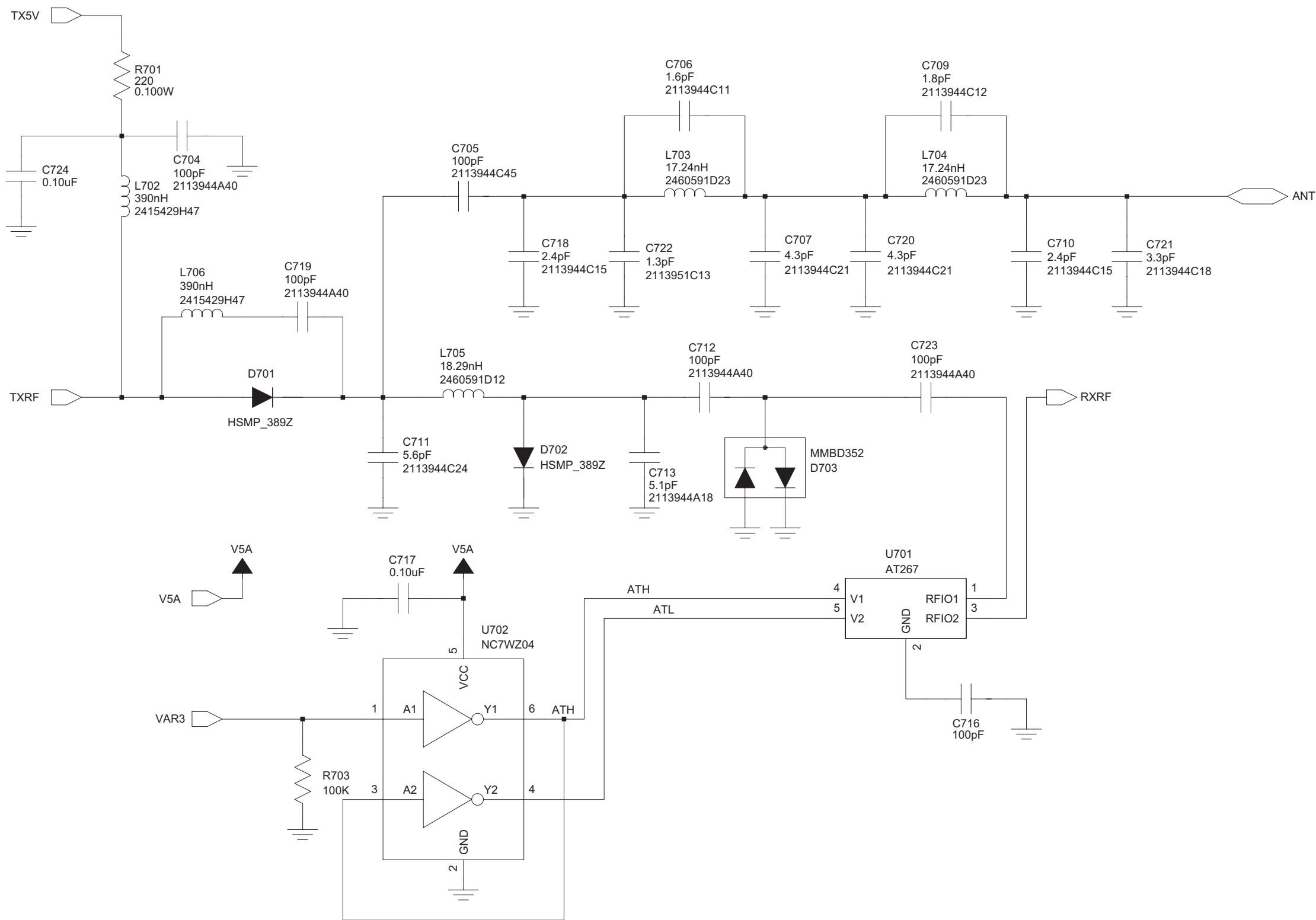


Figure 9-5. UHF Transceiver (RF) Antenna Switch and Harmonic Filter Circuits

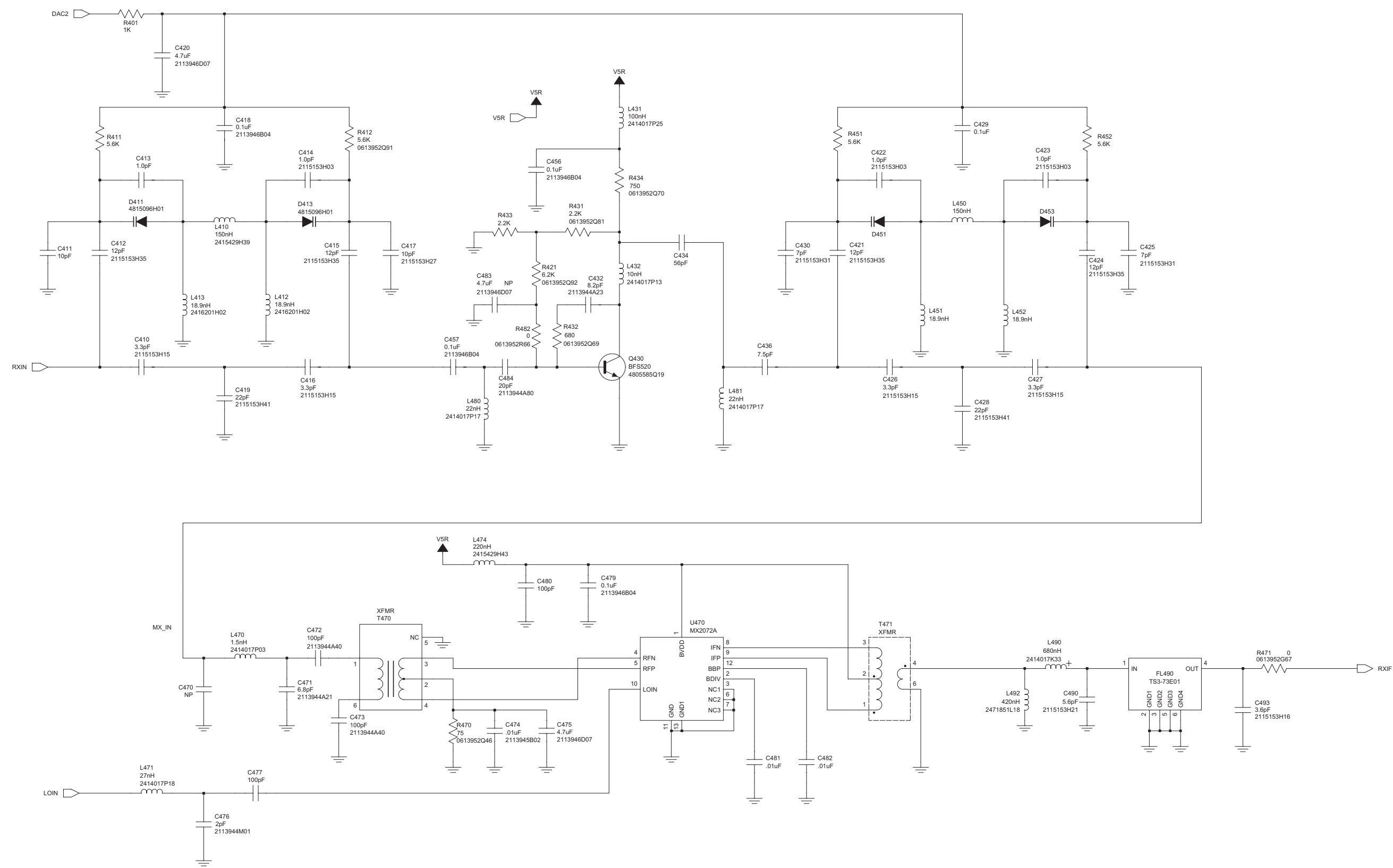


Figure 9-6. UHF Transceiver (RF) Receiver Front End Circuit

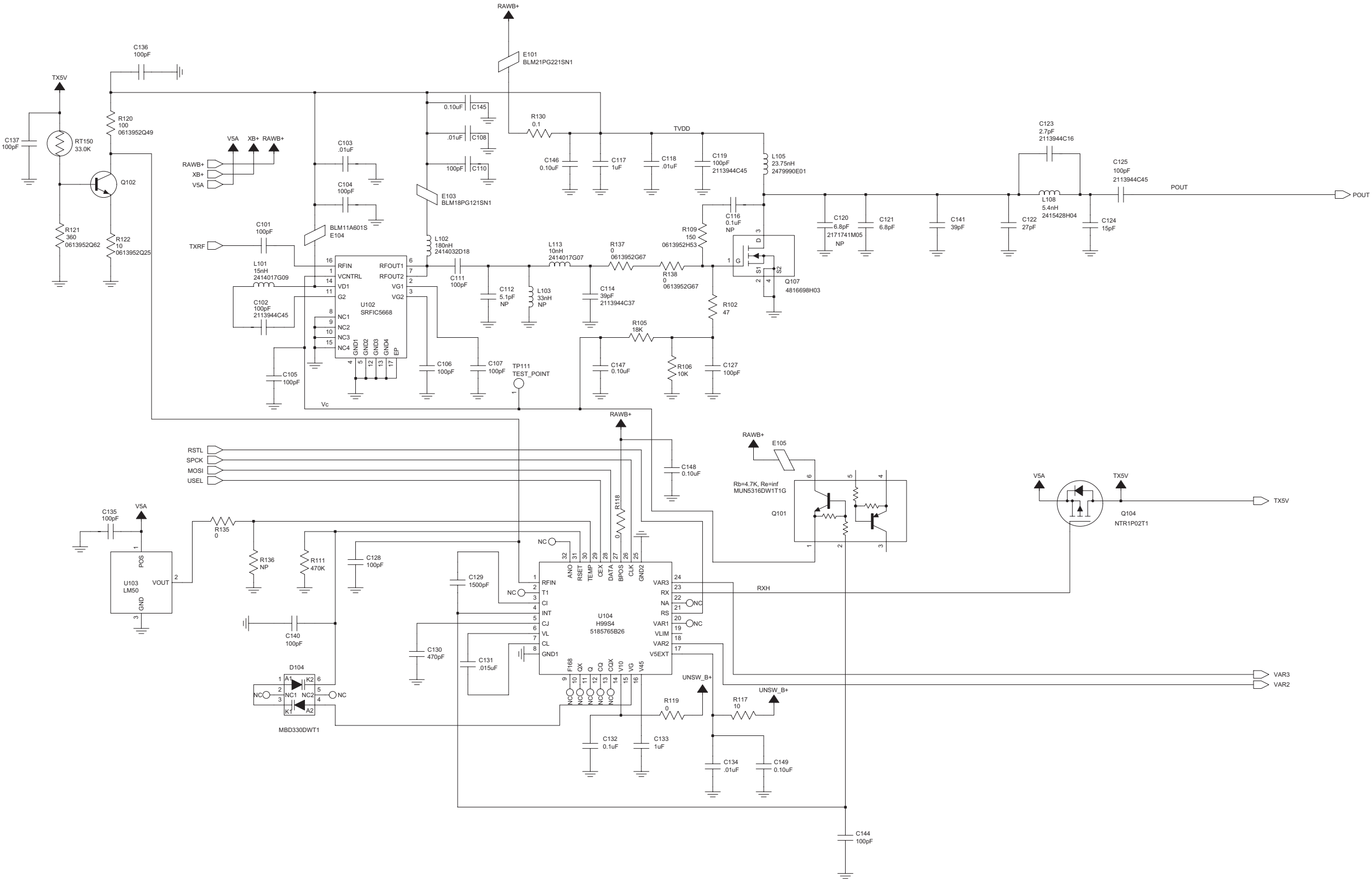


Figure 9-8. UHF Transceiver (RF) Transmitter Circuit

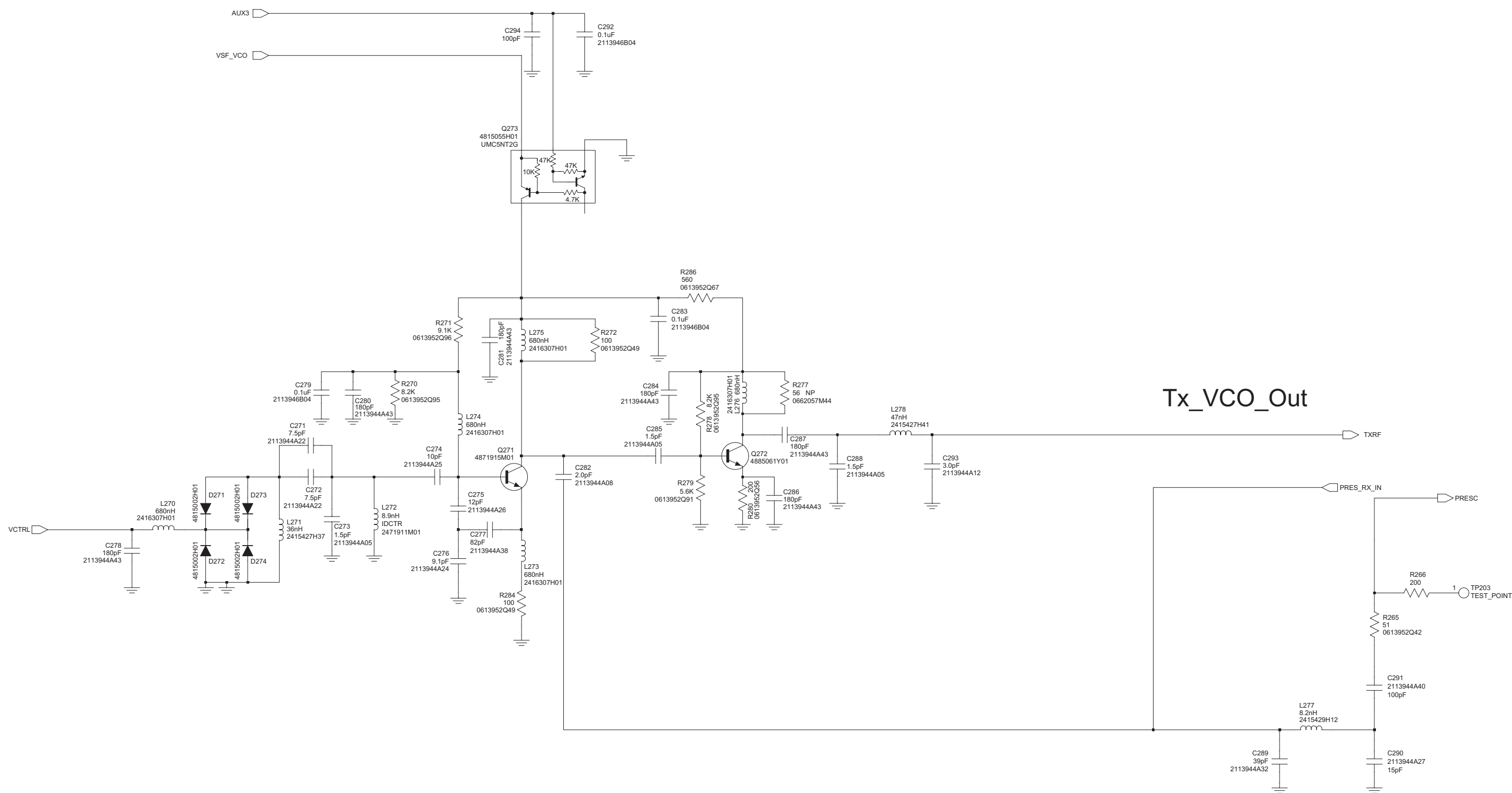


Figure 9-10. UHF Frequency Generation Unit (TX VCO) Circuit – 2 of 3

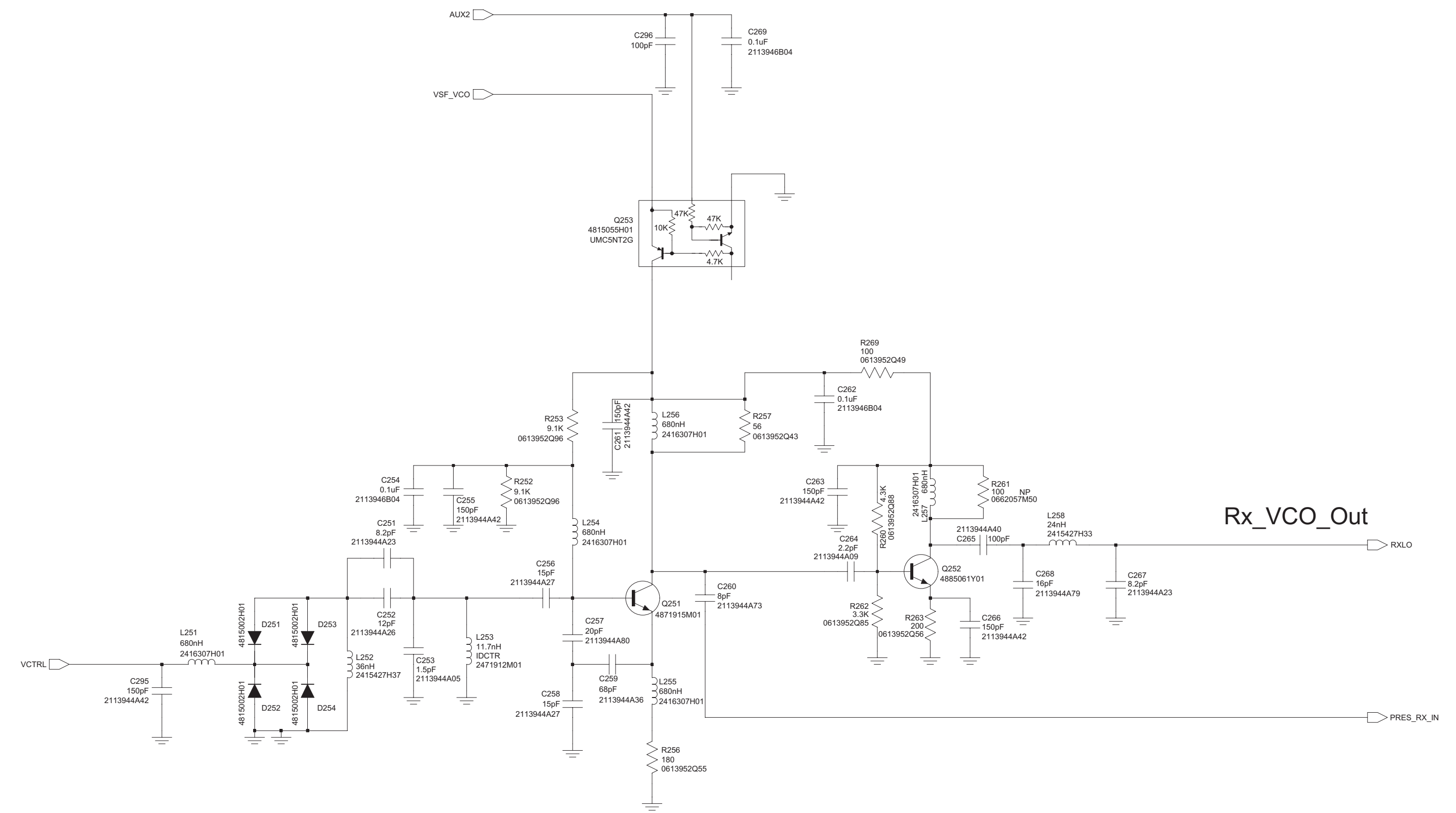


Figure 9-11. UHF Frequency Generation Unit (RX VCO) Circuit – 3 of 3

Figure 9-12. VOCON: Overall Circuit Schematic

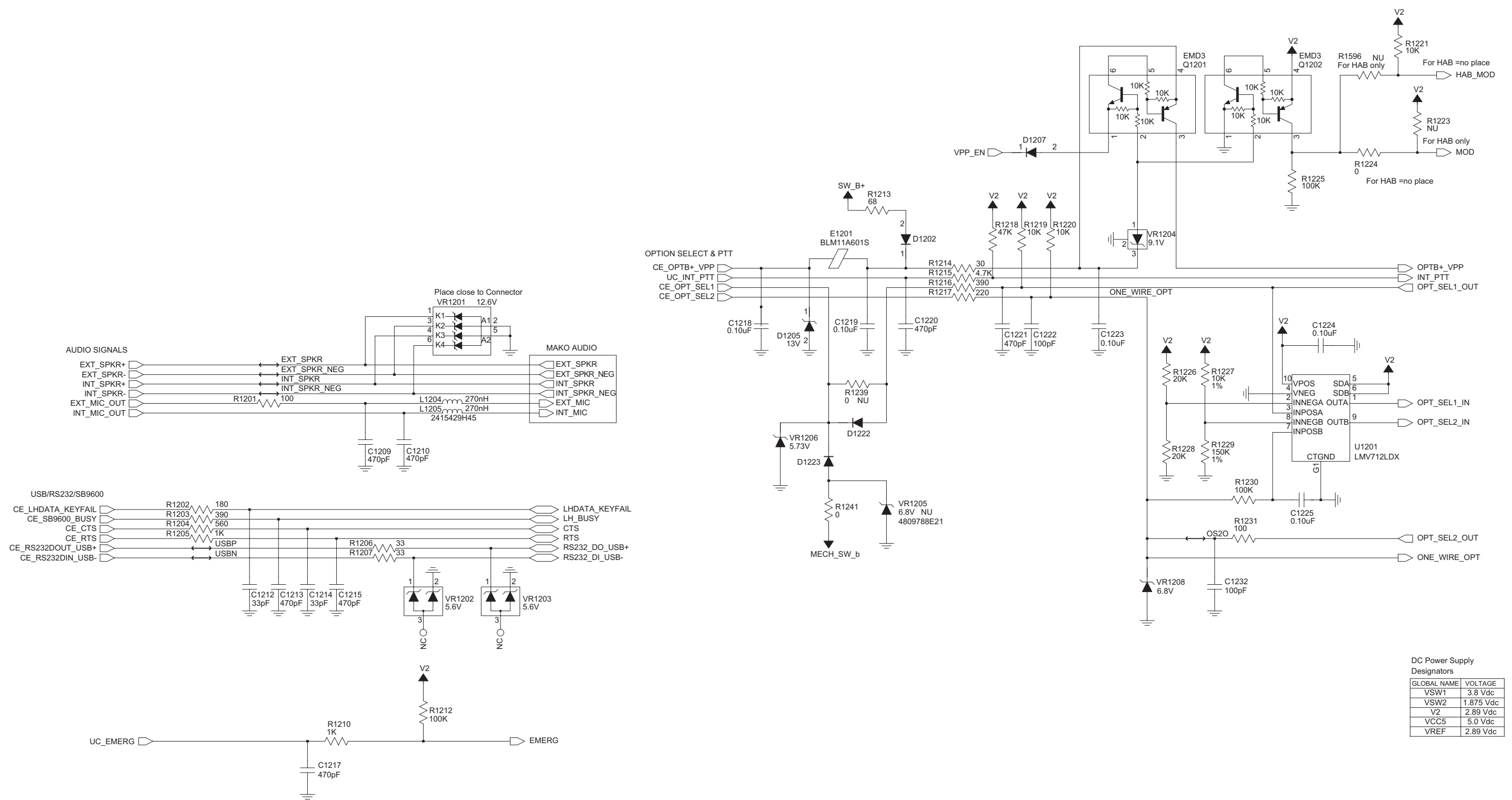


Figure 9-13. VOCON: Audio, Connector Interface Circuits



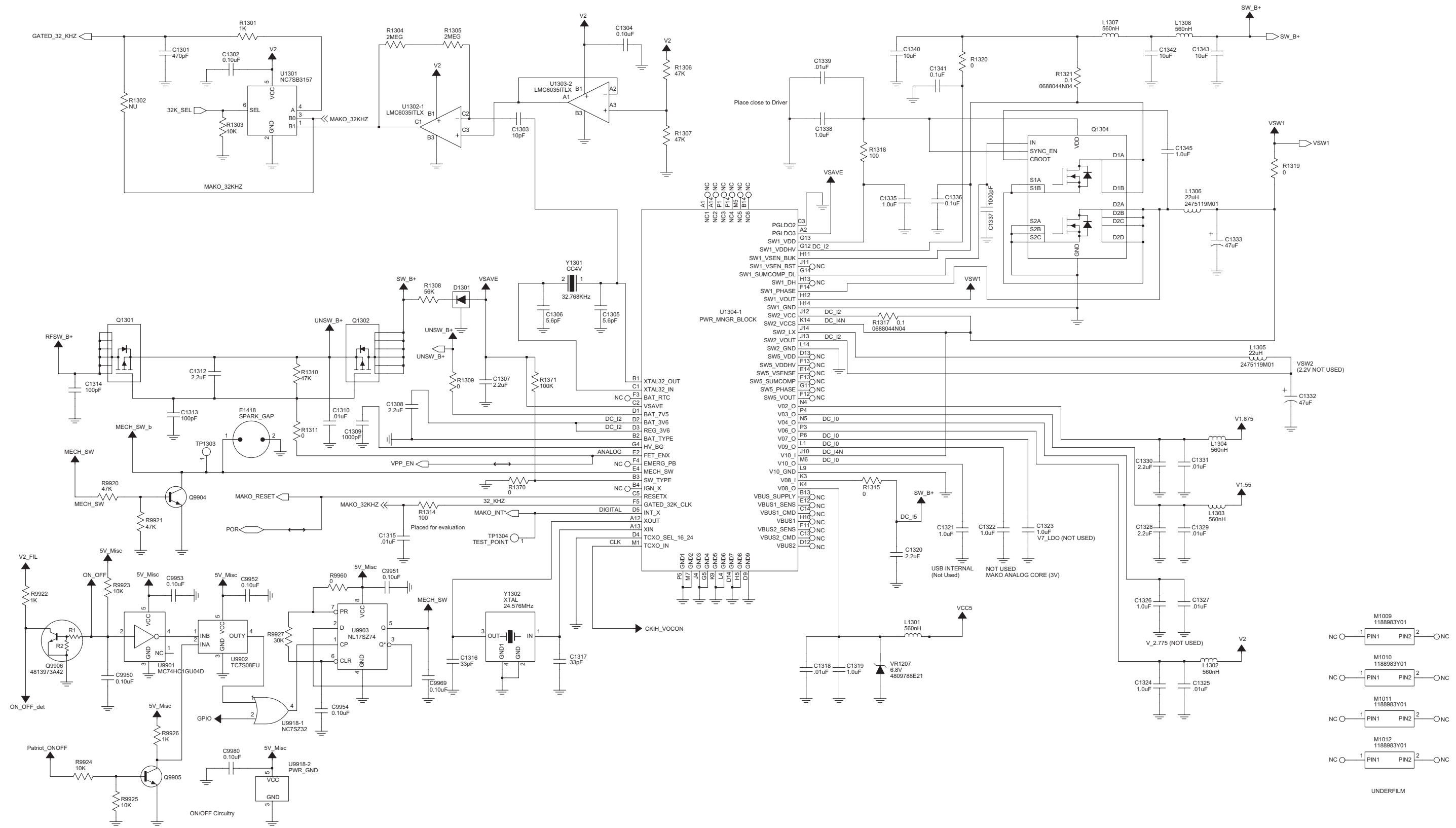
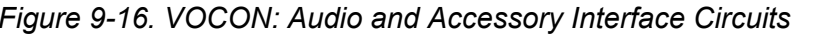


Figure 9-15. VOCON: DC Power, Clocks and ON/OFF Circuit



9.6 Main Board (NUE7350A) Parts List

Ref. Des.	Part Number	Description
C4	2113945L49	CAP,FXD,.01UF,+5%,-5%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C6	2113944C45	CAP CER CHP 100.0PF 50V 5%
C9	2113944A40	CAP CER CHP 100.0PF 50V 5%
C10	2113944A40	CAP CER CHP 100.0PF 50V 5%
C11	2113946K02	CAP CER CHP 0.10UF 16V
C12	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C13	2113945B02	CAP CER CHP 10,000PF 25V 10%
C14	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C15	2113946E02	CAP CER CHP 1.0UF 16V 10%
C16	2113945B02	CAP CER CHP 10,000PF 25V 10%
C17	2113946E02	CAP CER CHP 1.0UF 16V 10%
C20	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C21	NOT PLACED	–
C22	2113944C17	CAP CER CHP 3.0PF 50V +/- 0.25PF
C24	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C25	2113946E02	CAP CER CHP 1.0UF 16V 10%
C26	2113945B02	CAP CER CHP 10,000PF 25V 10%
C27	2113946E02	CAP CER CHP 1.0UF 16V 10%
C28	2113944A40	CAP CER CHP 100.0PF 50V 5%
C29	2113944C30	CAP CER CHP 10.0PF 50V +/- 0.5PF

Ref. Des.	Part Number	Description
C30	2313960B57	CAP,FXD,10UF,+10%,-10%, 6.3V-DC,SM,-55DEG CMIN, 125DEG CMAX,137MA
C52	2113944A40	CAP CER CHP 100.0PF 50V 5%
C53	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C54	2113944A40	CAP CER CHP 100.0PF 50V 5%
C55	2113944A40	CAP CER CHP 100.0PF 50V 5%
C56	2113944A40	CAP CER CHP 100.0PF 50V 5%
C57	2113944A40	CAP CER CHP 100.0PF 50V 5%
C58	2113944A40	CAP CER CHP 100.0PF 50V 5%
C71	2113944A40	CAP CER CHP 100.0PF 50V 5%
C72	2113944A40	CAP CER CHP 100.0PF 50V 5%
C73	2113944A40	CAP CER CHP 100.0PF 50V 5%
C101	2113944A40	CAP CER CHP 100.0PF 50V 5%
C102	2113944C45	CAP CER CHP 100.0PF 50V 5%
C103	2113945B02	CAP CER CHP 10,000PF 25V 10%
C104	2113944A40	CAP CER CHP 100.0PF 50V 5%
C105	2113944A40	CAP CER CHP 100.0PF 50V 5%
C106	2113944A40	CAP CER CHP 100.0PF 50V 5%
C107	2113944A40	CAP CER CHP 100.0PF 50V 5%
C108	2113945B02	CAP CER CHP 10,000PF 25V 10%
C110	2113944A40	CAP CER CHP 100.0PF 50V 5%
C111	2113944C45	CAP CER CHP 100.0PF 50V 5%
C112	NOT PLACED	–
C114	2113944C37	CAP CER CHP 39.0PF 50V 5%

Ref. Des.	Part Number	Description
C116	NOT PLACED	–
C117	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C118	2113945B02	CAP CER CHP 10,000PF 25V 10%
C119	2113944C45	CAP CER CHP 100.0PF 50V 5%
C120	2171741M05	HIGH Q CAP, 6.8 PF
C121	2171741M05	HIGH Q CAP, 6.8 PF
C122	2171741M02	HIGH Q CAP
C123	2113944C16	CAP CER CHP 2.7PF 50V +/- 0.25PF
C124	2171741M07	HIGH Q CAP, 15 PF
C125	2113944C45	CAP CER CHP 100.0PF 50V 5%
C127	2113944A40	CAP CER CHP 100.0PF 50V 5%
C128	2113944A40	CAP CER CHP 100.0PF 50V 5%
C129	2113945A10	CAP CER CHP 1500PF 50V 10%
C130	2113945A05	CAP CER CHP 470PF 50V 10%
C131	2113946A01	CAP CER CHP 0.015UF 16V 10%
C132	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C133	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C134	2113945B02	CAP CER CHP 10,000PF 25V 10%
C135	2113944A40	CAP CER CHP 100.0PF 50V 5%
C136	2113944A40	CAP CER CHP 100.0PF 50V 5%
C137	2113944A40	CAP CER CHP 100.0PF 50V 5%
C140	2113944A40	CAP CER CHP 100.0PF 50V 5%
C141	2171741M06	HIGH Q CAP, 39 PF

Ref. Des.	Part Number	Description
C144	2113944A40	CAP CER CHP 100.0PF 50V 5%
C145	2113946K02	CAP CER CHP 0.10UF 16V
C146	2113946K02	CAP CER CHP 0.10UF 16V
C147	2113946K02	CAP CER CHP 0.10UF 16V
C148	2113946K02	CAP CER CHP 0.10UF 16V
C149	2113946K02	CAP CER CHP 0.10UF 16V
C200	2113944A40	CAP CER CHP 100.0PF 50V 5%
C201	2113946K02	CAP CER CHP 0.10UF 16V
C202	2113946K02	CAP CER CHP 0.10UF 16V
C203	2113946N03	CAP CER CHP 2.2UF 16V
C204	2113946K02	CAP CER CHP 0.10UF 16V
C205	2113946K02	CAP CER CHP 0.10UF 16V
C206	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C207	2113946K02	CAP CER CHP 0.10UF 16V
C208	2113946K02	CAP CER CHP 0.10UF 16V
C209	2113946K02	CAP CER CHP 0.10UF 16V
C210	2113946K02	CAP CER CHP 0.10UF 16V
C211	2113946K02	CAP CER CHP 0.10UF 16V
C213	2113945A09	CAP CER CHP 1000PF 50V 10%
C214	2113944A40	CAP CER CHP 100.0PF 50V 5%
C215	2113946K02	CAP CER CHP 0.10UF 16V
C217	2113945C27	CAP,FXD,.047UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C218	2113945C25	CAP,FXD,.033UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C219	2171115L01	CHIP MONOLITHIC CERAMIC CAPACITOR
C220	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C221	2113946K02	CAP CER CHP 0.10UF 16V
C222	2113945L41	CAP,FXD,4700PF,+5%,-5%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C224	2185419D06	CAP CER SUPER L/D 0.1UF
C225	2185419D06	CAP CER SUPER L/D 0.1UF
C226	2185419D06	CAP CER SUPER L/D 0.1UF
C227	2185419D06	CAP CER SUPER L/D 0.1UF
C229	2113944A40	CAP CER CHP 100.0PF 50V 5%
C230	2113944A40	CAP CER CHP 100.0PF 50V 5%
C231	2113945B02	CAP CER CHP 10,000PF 25V 10%
C232	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C233	2113946K02	CAP CER CHP 0.10UF 16V
C234	2113945B02	CAP CER CHP 10,000PF 25V 10%
C235	2113944A40	CAP CER CHP 100.0PF 50V 5%
C236	2113945A09	CAP CER CHP 1000PF 50V 10%
C241	2185419D06	CAP CER SUPER L/D 0.1UF
C242	2185419D06	CAP CER SUPER L/D 0.1UF
C250	2113946K02	CAP CER CHP 0.10UF 16V
C251	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C252	2113944A26	CAP CER CHP 12.0PF 50V 5%
C253	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C254	2113946B04	CAP CER CHP 0.10UF 10V 10%
C255	2113944A42	CAP CER CHP 150.0PF 50V 5%
C256	2113944A27	CAP CER CHP 15.0PF 50V 5%
C257	2113944A80	CAP,FXD,20PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C258	2113944A27	CAP CER CHP 15.0PF 50V 5%

Ref. Des.	Part Number	Description
C259	2113944A36	CAP CER CHP 68.0PF 50V 5%
C260	2113944A73	CAP,FXD,8PF,.5PF+/-, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C261	2113944A42	CAP CER CHP 150.0PF 50V 5%
C262	2113946B04	CAP CER CHP 0.10UF 10V 10%
C263	2113944A42	CAP CER CHP 150.0PF 50V 5%
C264	2113944A09	CAP CER CHP 2.2PF 50V +/- 0.25PF
C265	2113944A40	CAP CER CHP 100.0PF 50V 5%
C266	2113944A42	CAP CER CHP 150.0PF 50V 5%
C267	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C268	2113944A79	CAP,FXD,16PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C269	2113946B04	CAP CER CHP 0.10UF 10V 10%
C271	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C272	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C273	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C274	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C275	2113944A26	CAP CER CHP 12.0PF 50V 5%
C276	2113944A24	CAP CER CHP 9.1PF 50V +/- 0.5PF
C277	2113944A38	CAP CER CHP 82.0PF 50V 5%
C278	2113944A43	CAP CER CHP 180.0PF 50V 5%
C279	2113946B04	CAP CER CHP 0.10UF 10V 10%
C280	2113944A43	CAP CER CHP 180.0PF 50V 5%
C281	2113944A43	CAP CER CHP 180.0PF 50V 5%

Ref. Des.	Part Number	Description
C282	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C283	2113946B04	CAP CER CHP 0.10UF 10V 10%
C284	2113944A43	CAP CER CHP 180.0PF 50V 5%
C285	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C286	2113944A43	CAP CER CHP 180.0PF 50V 5%
C287	2113944A43	CAP CER CHP 180.0PF 50V 5%
C288	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C289	2113944A32	CAP CER CHP 39.0PF 50V 5%
C290	2113944A27	CAP CER CHP 15.0PF 50V 5%
C291	2113944A40	CAP CER CHP 100.0PF 50V 5%
C292	2113946B04	CAP CER CHP 0.10UF 10V 10%
C293	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C294	2113944A40	CAP CER CHP 100.0PF 50V 5%
C295	2113944A42	CAP CER CHP 150.0PF 50V 5%
C296	2113944A40	CAP CER CHP 100.0PF 50V 5%
C337	2113945A01	CAP CER CHP 220PF 50V 10,
C410	2115153H15	CAP, CERAMIC, COG
C411	2115153H27	CAP, CERAMIC, COG
C412	2115153H35	CAP, CERAMIC, COG
C413	2115153H03	CAP, CERAMIC, COG
C414	2115153H03	CAP, CERAMIC, COG
C415	2115153H35	CAP, CERAMIC, COG
C416	2115153H15	CAP, CERAMIC, COG
C417	2115153H27	CAP, CERAMIC, COG
C418	2113946B04	CAP CER CHP 0.10UF 10V 10%
C419	2115153H41	CAP,CERAMIC CHIP,22PF,+1%,-1%,50V-

Ref. Des.	Part Number	Description
C420	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C421	2115153H35	CAP, CERAMIC, COG
C422	2115153H03	CAP, CERAMIC, COG
C423	2115153H03	CAP, CERAMIC, COG
C424	2115153H35	CAP, CERAMIC, COG
C425	2115153H31	CAP, CERAMIC, COG
C426	2115153H15	CAP, CERAMIC, COG
C427	2115153H15	CAP, CERAMIC, COG
C428	2115153H41	CAP,CERAMIC CHIP,22PF, +1%,-1%,50V-
C429	2113946B04	CAP CER CHP 0.10UF 10V 10%
C430	2115153H31	CAP, CERAMIC, COG
C432	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C434	2113944A34	CAP CER CHP 56.0PF 50V 5%
C436	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C456	2113946B04	CAP CER CHP 0.10UF 10V 10%
C457	2113946B04	CAP CER CHP 0.10UF 10V 10%
C470	NOT PLACED	–
C471	2113944A21	CAP CER CHP 6.8PF 50V +/- 0.5PF
C472	2113944A40	CAP CER CHP 100.0PF 50V 5%
C473	2113944A40	CAP CER CHP 100.0PF 50V 5%
C474	2113945B02	CAP CER CHP 10,000PF 25V 10%
C475	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C476	2113944M01	CAP,FXD,2PF,.1PF+/-, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C477	2113944A40	CAP CER CHP 100.0PF 50V 5%
C479	2113946B04	CAP CER CHP 0.10UF 10V 10%

Ref. Des.	Part Number	Description
C480	2113944A40	CAP CER CHP 100.0PF 50V 5%
C481	2113945B02	CAP CER CHP 10,000PF 25V 10%
C482	2113945B02	CAP CER CHP 10,000PF 25V 10%
C483	NOT PLACED	–
C484	2113944A80	CAP,FXD,20PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C490	2115153H21	CAP, CERAMIC, COG
C493	2115153H16	CAP, CERAMIC, COG
C501	2113944A40	CAP CER CHP 100.0PF 50V 5%
C505	2113944A40	CAP CER CHP 100.0PF 50V 5%
C506	2113946K02	CAP CER CHP 0.10UF 16V
C507	2113945A11	CAP CER CHP 2200PF 50V 10%
C509	2113946B02	CAP CER CHP 0.047UF 10V 10,
C511	2113944A40	CAP CER CHP 100.0PF 50V 5%
C512	2113944A40	CAP CER CHP 100.0PF 50V 5%
C513	2113945B02	CAP CER CHP 10,000PF 25V 10%
C514	2113946K02	CAP CER CHP 0.10UF 16V
C527	2113946K02	CAP CER CHP 0.10UF 16V
C535	2113945B02	CAP CER CHP 10,000PF 25V 10%
C539	2113946B02	CAP CER CHP 0.047UF 10V 10,
C540	2113946K02	CAP CER CHP 0.10UF 16V
C541	2113945B02	CAP CER CHP 10,000PF 25V 10%
C542	2113945B02	CAP CER CHP 10,000PF 25V 10%
C544	2113945B02	CAP CER CHP 10,000PF 25V 10%
C546	2113945B02	CAP CER CHP 10,000PF 25V 10%
C547	2113945B02	CAP CER CHP 10,000PF 25V 10%

Ref. Des.	Part Number	Description
C548	2113946B02	CAP CER CHP 0.047UF 10V 10,
C551	2113946S35	CAP CER CHP 1.0UF 16V 10%
C552	2113946S35	CAP CER CHP 1.0UF 16V 10%
C553	2113946C07	CAP,FXD,.33UF,+10%,-10%,10V-DC,0603,X5R,-55DEG CMIN,85DEG CMAX
C554	2113944A79	CAP,FXD,16PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C555	2113944A20	CAP CER CHP 6.2PF 50V +/- 0.5PF
C556	2113944A34	CAP CER CHP 56.0PF 50V 5%
C557	2113944A34	CAP CER CHP 56.0PF 50V 5%
C560	2113944A28	CAP CER CHP 18.0PF 50V 5%
C561	2313960B30	CAP,FXD,4.7UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,122MA
C562	2113945B02	CAP CER CHP 10,000PF 25V 10%
C570	2113945G91	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C571	2113945G91	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C572	2113945C25	CAP,FXD,.033UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C573	2113944A36	CAP CER CHP 68.0PF 50V 5%
C574	2113945B02	CAP CER CHP 10,000PF 25V 10%
C581	2113944B02	CAP CER CHP 220.0PF 25V 5%
C582	2113946K02	CAP CER CHP 0.10UF 16V
C583	2113945B02	CAP CER CHP 10,000PF 25V 10%
C584	2115153H24	CAP, CERAMIC, COG

Ref. Des.	Part Number	Description
C704	2113944A40	CAP CER CHP 100.0PF 50V 5%
C705	2113944C45	CAP CER CHP 100.0PF 50V 5%
C706	2113944C11	CAP CER CHP 1.6PF 50V +/- 0.25PF
C707	2113944C21	CAP CER CHP 4.3PF 50V +/- 0.25PF
C709	2113944C12	CAP CER CHP 1.8PF 50V +/- 0.25PF
C710	2113944C15	CAP CER CHP 2.4PF 50V +/- 0.25PF
C711	2113944C24	CAP CER CHP 5.6PF 50V +/- 0.5PF
C712	2113944A40	CAP CER CHP 100.0PF 50V 5%
C713	2113944A18	CAP CER CHP 5.1PF 50V +/- 0.5PF
C716	2113944A40	CAP CER CHP 100.0PF 50V 5%
C717	2113946K02	CAP CER CHP 0.10UF 16V
C718	2113944C15	CAP CER CHP 2.4PF 50V +/- 0.25PF
C719	2113944A40	CAP CER CHP 100.0PF 50V 5%
C720	2113944C21	CAP CER CHP 4.3PF 50V +/- 0.25PF
C721	2113944C18	CAP CER CHP 3.3PF 50V +/- 0.25PF
C722	2113951C13	CAP,FXD,1.3PF,.05PF+/-, 250V-DC,0603,C0G,-55DEG CMIN,125DEG CMA
C723	2113944A40	CAP CER CHP 100.0PF 50V 5%
C724	2113946K02	CAP CER CHP 0.10UF 16V
C1101	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1102	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1104	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1105	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1106	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C1107	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1108	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1109	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1110	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1111	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1112	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1113	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1114	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1115	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1116	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1117	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1118	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1119	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1120	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1123	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1124	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1125	2113945A05	CAP CER CHP 470PF 50V 10%
C1126	2113945A05	CAP CER CHP 470PF 50V 10%
C1128	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1129	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C1130	2113945A05	CAP CER CHP 470PF 50V 10%
C1131	2113944A31	CAP CER CHP 33.0PF 50V 5%

Ref. Des.	Part Number	Description
C1132	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1133	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1134	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1135	2113945A05	CAP CER CHP 470PF 50V 10%
C1136	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1138	2113945A05	CAP CER CHP 470PF 50V 10%
C1139	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1140	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1141	2113946F05	CAP,CHIP,10UF,+10%, -10%,6.3V-DC,0805,X5R, -55DEG CMIN,85DEG CMAX
C1142	2113956C43	CAP,FXD,2.2UF,+10%, -10%,10V-DC,0805,X5R , -55DEG CMIN,85DEG CMAX
C1202	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1209	2113945A05	CAP CER CHP 470PF 50V 10%
C1210	2113945A05	CAP CER CHP 470PF 50V 10%
C1211	NOT PLACED	–
C1212	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1213	2113945A05	CAP CER CHP 470PF 50V 10%
C1214	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1215	2113945A05	CAP CER CHP 470PF 50V 10%
C1216	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1217	2113945A05	CAP CER CHP 470PF 50V 10%
C1218	2113946K02	CAP CER CHP 0.10UF 16V
C1219	2113946K02	CAP CER CHP 0.10UF 16V

Ref. Des.	Part Number	Description
C1220	2113945A05	CAP CER CHP 470PF 50V 10%
C1221	2113945A05	CAP CER CHP 470PF 50V 10%
C1222	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1223	2113946K02	CAP CER CHP 0.10UF 16V
C1224	2113946K02	CAP CER CHP 0.10UF 16V
C1225	2113946K02	CAP CER CHP 0.10UF 16V
C1232	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1233	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1234	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1301	2113945A05	CAP CER CHP 470PF 50V 10%
C1302	2113946K02	CAP CER CHP 0.10UF 16V
C1303	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C1304	2113946K02	CAP CER CHP 0.10UF 16V
C1305	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1306	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1307	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1308	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1309	2113945A09	CAP CER CHP 1000PF 50V 10%
C1310	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1312	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1313	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1314	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1315	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1316	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1317	2113944A31	CAP CER CHP 33.0PF 50V 5%

Ref. Des.	Part Number	Description
C1318	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1319	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1320	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1321	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1322	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1323	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1324	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1325	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1326	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1327	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1328	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1329	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1330	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1331	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1332	2371572L01	POSCAD 47UF
C1333	2371572L01	POSCAD 47UF
C1335	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1336	2113945C31	CAP,FXD,.1UF,+10%, -10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1337	2113945A09	CAP CER CHP 1000PF 50V 10%
C1338	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1339	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1340	2113955E37	CAP,FXD,10UF,+10%, -10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C1341	2113945C31	CAP,FXD,.1UF,+10%, -10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1342	2113955E37	CAP,FXD,10UF,+10%, -10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1343	2113955E37	CAP,FXD,10UF,+10%, -10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1345	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1346	2113955E37	CAP,FXD,10UF,+10%, -10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1347	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1348	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1349	2113955E37	CAP,FXD,10UF,+10%, -10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1350	2113945C21	CAP,FXD,.018UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C1351	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1352	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1353	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1354	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1355	2113946A02	CAP CER CHP 0.022UF 16V 10,
C1356	2113946B03	CAP CER CHP 0.068UF 10V 10
C1357	2113946B03	CAP CER CHP 0.068UF 10V 10
C1362	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1363	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1364	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1365	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C1367	2113946K02	CAP CER CHP 0.10UF 16V
C1368	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1370	2113946K02	CAP CER CHP 0.10UF 16V
C1402	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1403	2113946K02	CAP CER CHP 0.10UF 16V
C1404	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1407	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1408	2113946K02	CAP CER CHP 0.10UF 16V
C1409	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1410	2113946K02	CAP CER CHP 0.10UF 16V
C1411	2113946K02	CAP CER CHP 0.10UF 16V
C1412	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1413	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1414	2113946K02	CAP CER CHP 0.10UF 16V
C1416	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C1417	2113946K02	CAP CER CHP 0.10UF 16V
C1418	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1419	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1420	2113946K02	CAP CER CHP 0.10UF 16V
C1421	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1422	2113946K02	CAP CER CHP 0.10UF 16V
C1424	2113946K02	CAP CER CHP 0.10UF 16V
C1425	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1427	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1428	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1429	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1430	2113946K02	CAP CER CHP 0.10UF 16V
C1431	2113946K02	CAP CER CHP 0.10UF 16V

Ref. Des.	Part Number	Description
C1432	2113946K02	CAP CER CHP 0.10UF 16V
C1433	2113946K02	CAP CER CHP 0.10UF 16V
C1440	NOT PLACED	–
C1441	NOT PLACED	–
C1442	NOT PLACED	–
C1443	NOT PLACED	–
C1444	NOT PLACED	–
C1445	NOT PLACED	–
C1446	NOT PLACED	–
C1447	NOT PLACED	–
C1449	NOT PLACED	–
C1453	NOT PLACED	–
C1457	NOT PLACED	–
C1458	NOT PLACED	–
C1459	NOT PLACED	–
C1460	NOT PLACED	–
C1719	2113944A40	CAP CER CHP 100.0PF 50V 5%
C9901	2113944A40	CAP CER CHP 100.0PF 50V 5%
C9950	2113946K02	CAP CER CHP 0.10UF 16V
C9951	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9952	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9953	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9954	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9956	2113946E02	CAP CER CHP 1.0UF 16V 10%
C9966	2113945A03	CAP CER CHP 330PF 50V 10%
C9968	2113946K02	CAP CER CHP 0.10UF 16V
C9969	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9970	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C9975	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C9980	2113945Y02	CAP,FXD,.1UF,+10%, -10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
D1	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D2	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D3	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D4	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D104	4813978A26	DIODE ARRAY,DET, SOT-363/SC-88,30V,.12W,2
D201	4815011H01	DIODE TRIPLE
D202	4815011H01	DIODE TRIPLE
D251	4815002H01	VARACTOR DIODE
D252	4815002H01	VARACTOR DIODE
D253	4815002H01	VARACTOR DIODE
D254	4815002H01	VARACTOR DIODE
D271	4815002H01	VARACTOR DIODE
D272	4815002H01	VARACTOR DIODE
D273	4815002H01	VARACTOR DIODE
D274	4815002H01	VARACTOR DIODE
D411	4815096H01	VARACTOR DIODE 1SV305
D413	4815096H01	VARACTOR DIODE 1SV305
D451	4815096H01	VARACTOR DIODE 1SV305
D453	4815096H01	VARACTOR DIODE 1SV305
D550	4815096H01	VARACTOR DIODE 1SV305
D551	4815096H01	VARACTOR DIODE 1SV305
D570	4805656W87	DIODE,VCTR, @ 15V, 1SV279,SOD-523/SC-79
D701	4871607L01	PIN DIODE SMD
D702	4871607L01	PIN DIODE SMD

Ref. Des.	Part Number	Description
D703	4813974A19	DIODE ARRAY,MXR, SM, SOT-323,7V,.2W, SHTK,2, PB-FREE
D1000	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1202	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1205	4813977C23	DIODE,ZEN,MMSZ5243,SM ,SOD-123,13V,10MA, .5W,ZEN,PB-FREE
D1207	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1222	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1223	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1301	4805129M90	DIODE SOT PKGD
D1401	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1402	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
E5	2480640Z01	SURFACE MOUNT FERRITE BEAD
E101	7686949J14	FLTR,FERRITE BEAD,2A, SM,0805,CHIP, 220OHM
E103	7686949J15	FLTR,FERR,2A,SM,0603
E104	2480574F01	IND FERRITE CHIP 60OHM 0603
E105	2480640Z01	SURFACE MOUNT FERRITE BEAD
E500	2480640Z01	SURFACE MOUNT FERRITE BEAD
E501	2480574F01	IND FERRITE CHIP 60OHM 0603
E1102	2480574F01	IND FERRITE CHIP 60OHM 0603
E1103	2480574F01	IND FERRITE CHIP 60OHM 0603
E1104	2462586G33	INDUCTOR CHIP FERRITE BEADS
E1110	2480640Z01	SURFACE MOUNT FERRITE BEAD

Ref. Des.	Part Number	Description
E1111	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1112	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1113	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1114	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1115	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1116	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1117	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1118	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1119	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1120	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1121	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1122	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1123	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1124	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1125	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1126	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1127	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1129	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1130	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1201	2480574F01	IND FERRITE CHIP 60OHM 0603
E1401	2480574F01	IND FERRITE CHIP 60OHM 0603
E1402	2480574F01	IND FERRITE CHIP 60OHM 0603
F901	6515076H01	FUSE CHIP SMT TR/ 1608FF 3A

Ref. Des.	Part Number	Description
FL200	9116848H01	FLTR SW CAP 3 POLE BUTTERW, W18
FL490	9185924B01	FILTER, 73.35 MHZ 3-POLE CRYST
J1	0970312N01	CONN,BTB,RCPT,60CONT, .4MM,GLD,1 STACK HGT
J2	0987817K04	30PIN RECPT MATING CNTCR 1.5MM
J3	0987817K02	RECP 0.5 PITCH 16 CKT
J1704	0971876L01	MINIATURE INTERFACE COAXIAL SWITCH
L10	2489669V01	IDCTR,WW,100UH,5%, 40MA,10OHM,20 Q,10MHZ SRF,SM,1210,PB-FREE
L20	2460591D12	COIL AIR WOUND INDUC 18.29
L101	2414017G09	IDCTR,CHIP,15NH,5%, 300MA,.45OHM,CER,8 Q, SM,0603,PB-FREE
L102	2414032D18	IDCTR,WW,180NH,5%,700 MA,.43OHM,CER,35 Q, 780MHZ SRF,SM,PB-FR
L103	NOT PLACED	–
L105	2479990E01	COIL AIR WOUND/GREEN CLR 23.75
L108	2415428H04	AIR WOUND INDUCTOR
L113	2414017G07	IDCTR,CHIP,10NH,5%, 300MA,.35OHM,CER,8 Q, SM,0603,PB-FREE
L201	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q ,50MHZ SRF,SM,0805
L202	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L203	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L204	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L205	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB
L207	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB

Ref. Des.	Part Number	Description
L208	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L209	2416307H01	IDCTR,WW,680NH,5%,060 3
L251	2416307H01	IDCTR,WW,680NH,5%,060 3
L252	2415427H37	CHIP INDUCTOR
L253	2471912M01	11.7NH,SQUARE AIR WOUND INDUCTORS
L254	2416307H01	IDCTR,WW,680NH,5%,060 3
L255	2416307H01	IDCTR,WW,680NH,5%,060 3
L256	2416307H01	IDCTR,WW,680NH,5%,060 3
L257	2416307H01	IDCTR,WW,680NH,5%,060 3
L258	2415427H33	CHIP INDUCTOR
L270	2416307H01	IDCTR,WW,680NH,5%,060 3
L271	2415427H37	CHIP INDUCTOR
L272	2471911M01	SQUARE AIR CORE INDUCTORS
L273	2416307H01	IDCTR,WW,680NH,5%,060 3
L274	2416307H01	IDCTR,WW,680NH,5%,060 3
L275	2416307H01	IDCTR,WW,680NH,5%,060 3
L276	2416307H01	IDCTR,WW,680NH,5%,060 3
L277	2415429H12	CHIP INDUCTOR
L278	2415427H41	CHIP INDUCTOR
L410	2415429H39	CHIP INDUCTOR
L412	2416201H02	WIRE WOUND IDCTR,19NJ
L413	2416201H02	WIRE WOUND IDCTR,19NJ
L431	2414017P25	IDCTR,CHIP,100NH,5%, 100MA,5.5OHM,CER,8 Q, 650MHZ SRF,SM,0402
L432	2414017P13	IDCTR,CHIP,10NH,5%, 300MA,.46OHM,CER,9 Q, 2.5GHZ SRF,SM,0402,P
L450	2415429H39	CHIP INDUCTOR
L451	2416201H02	WIRE WOUND IDCTR,19NJ

Ref. Des.	Part Number	Description
L452	2416201H02	WIRE WOUND IDCTR,19NJ
L470	2414017P03	IDCTR,CHIP,1.5NH,300MA, .13OHM,CER,8 Q,6GHZ SRF,SM,0402,PB-F
L471	2414017P18	IDCTR,CHIP,27NH,5%, 300MA,1.04OHM,CER,9 Q, 1.5GHZ SRF,SM,0402
L474	2415429H43	CHIP INDUCTOR
L480	2414017P17	IDCTR,CHIP,22NH,5%, 300MA,.88OHM,CER,9 Q, 1.8GHZ SRF,SM,0402,P
L481	2414017P17	IDCTR,CHIP,22NH,5%, 300MA,.88OHM,CER,9 Q , 1.8GHZ SRF,SM,0402,P
L490	2414017K33	IDCTR,CHIP,680NH,5%, 50MA,5.5OHM,CER,11 Q, 120MHZ SRF,SM,0805
L492	2471851L18	CHIP INDUCTOR
L501	2466505A01	COIL INDUCTOR
L502	2466505A01	COIL INDUCTOR
L551	2414032B76	IDCTR,WW,4.7UH,5%, 330MA,4OHM,CER,20 Q, 60MHZ SRF,SM,PB-FREE
L552	2414015B26	IDCTR,FXD,330NH,2%, 310MA,1.4OHM,CER,48 Q, 600MHZ SRF,SM,0805
L553	2414017Q51	IDCTR,FXD,2.2UH,10%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L570	2414017Q54	IDCTR,FXD,3.9UH,10%, 30MA,.9OHM,FERR,45 Q, 38MHZ SRF,SM,0805,P
L571	2414017Q46	IDCTR,FXD,820NH,10%, 150MA,1OHM,FERR,25 Q, 100MHZ SRF,SM,0805
L702	2415429H47	CHIP INDUCTOR
L703	2460591D23	COIL AIR WOUND INDUC 17.24
L704	2460591D23	COIL AIR WOUND INDUC 17.24
L705	2460591D12	COIL AIR WOUND INDUC 18.29
L706	2415429H47	CHIP INDUCTOR
L1204	2415429H45	CHIP INDUCTOR
L1205	2415429H45	CHIP INDUCTOR

Ref. Des.	Part Number	Description
L1301	2464675H01	IDCTR,WW,560NH,5%,550MA
L1302	2464675H01	IDCTR,WW,560NH,5%,550MA
L1303	2464675H01	IDCTR,WW,560NH,5%,550MA
L1304	2464675H01	IDCTR,WW,560NH,5%,550MA
L1305	2475119M01	INDUCTOR,POWER,22UH,SMT POWER INDUCTOR
L1306	2475119M01	INDUCTOR,POWER,22UH,SMT POWER INDUCTOR
L1307	2464675H01	IDCTR,WW,560NH,5%,550MA
L1308	2464675H01	IDCTR,WW,560NH,5%,550MA
M1001	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1002	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1003	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1004	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1005	NOT PLACED	–
M1006	NOT PLACED	–
M1007	NOT PLACED	–
M1008	NOT PLACED	–
M1009	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1010	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1011	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1012	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1704	4271868L01	CLIP, ANTENNA
M1705	3971751L02	CONNECTOR, B-PLUS
PASTE	1085674C03	PASTE/NC-SMQ230
PCB	8471997L01	PCB
Q4	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q101	4871006L02	MUN53XX NPN/PNP DIGITAL TRANSISTOR

Ref. Des.	Part Number	Description
Q102	4813973A08	XSTR,BIP GP SS,NPN,T2222,SM,SOT-23,SMT,40V,.225W,600MA,300MHZ
Q104	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q107	4816698H03	MITSUBISHI RD09MUP2-T112 UHF RFPA
Q200	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,PB-FREE
Q251	4871915M01	XSTR,BIP RF SML SGNL,NPN,SM,4.5GHZ
Q252	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q253	4815055H01	TSTR DUAL NPN/PNP UMH 5
Q271	4871915M01	XSTR,BIP RF SML SGNL,NPN,SM,4.5GHZ
Q272	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q273	4815055H01	TSTR DUAL NPN/PNP UMH 5
Q430	4805585Q19	TRANSISTOR
Q550	4805218N63	RF TRANS SOT 323 BFQ67W
Q551	4813973A04	XSTR,BIP GP SS,NPN,TA13,SM,SOT-23,SMT,30V,.225W,300MA,125MHZ,P
Q1201	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q1202	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q1301	4813970A62	XSTR,FET GP PWR,MOSFET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q1302	4813970A62	XSTR,FET GP PWR,MOSFET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q1304	5185956E76	IC,CONV,SM,SO16,0-30 VINUT RANGE,6.5A,3.8V,HI SPD SWTH DR
Q1402	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q9901	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ

Ref. Des.	Part Number	Description
Q9902	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
Q9903	4813973A08	XSTR,BIP GP SS,NPN,T2222,SM,SOT-23,SMT,40V,.225W,600MA,300MHZ
Q9904	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
Q9905	4813973A08	XSTR,BIP GP SS,NPN,T2222,SM,SOT-23,SMT,40V,.225W,600MA,300MHZ
Q9906	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,PB-FREE
Q9950	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q9951	NOT PLACED	–
R22	0613952H73	CER CHIP RES 1000 OHM 5% 0603
R102	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R105	0613952R07	CER CHIP RES 18K OHM 5% 0402
R106	0613952R01	CER CHIP RES 10K OHM 5% 0402
R109	0613952H53	CER CHIP RES 150 OHM 5% 0603
R111	0613952R41	CER CHIP RES 470K OHM 5% 0402
R117	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R118	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R119	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R120	0613952Q49	CER CHIP RES 100 OHM 5 0402
R121	0613952Q62	CER CHIP RES 360 OHM 5 0402
R122	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R130	0615043C01	RES POWER METAL STRIP W18 COMPLIANT
R135	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R136	NOT PLACED	–

Ref. Des.	Part Number	Description
R137	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R138	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R201	0613952R13	CER CHIP RES 33K OHM 5% 0402
R202	0613952Q80	CER CHIP RES 2000 OHM 5 0402
R204	0613952R20	CER CHIP RES 62K OHM 5 0402
R205	0613952R19	CER CHIP RES 56K OHM 5% 0402
R207	0613952Q49	CER CHIP RES 100 OHM 5 0402
R208	0613952R13	CER CHIP RES 33K OHM 5% 0402
R210	0613952L51	CER CHIP RES 332 OHM 1% 0402
R212	0613952L26	CER CHIP RES 182 OHM 1% 0402
R213	0613952R01	CER CHIP RES 10K OHM 5% 0402
R215	0613952R01	CER CHIP RES 10K OHM 5% 0402
R216	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R217	0613952L51	CER CHIP RES 332 OHM 1% 0402
R218	0613952R01	CER CHIP RES 10K OHM 5% 0402
R220	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R221	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R252	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R253	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R256	0613952Q55	CER CHIP RES 180 OHM 5 0402
R257	0613952Q43	CER CHIP RES 56.0 OHM 5 0402
R260	0613952Q88	CER CHIP RES 4300 OHM 5 0402
R261	NOT PLACED	–

Ref. Des.	Part Number	Description
R262	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R263	0613952Q56	CER CHIP RES 200 OHM 5 0402
R265	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R266	0613952Q56	CER CHIP RES 200 OHM 5 0402
R267	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R269	0613952Q49	CER CHIP RES 100 OHM 5 0402
R270	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R271	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R272	0613952Q49	CER CHIP RES 100 OHM 5 0402
R277	NOT PLACED	–
R278	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R279	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R280	0613952Q56	CER CHIP RES 200 OHM 5 0402
R284	0613952Q49	CER CHIP RES 100 OHM 5 0402
R286	0613952Q67	CER CHIP RES 560 OHM 5 0402
R401	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R411	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R412	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R421	0613952Q92	CER CHIP RES 6200 OHM 5 0402
R431	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R432	0613952Q69	CER CHIP RES 680 OHM 5 0402
R433	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R434	0613952Q70	CER CHIP RES 750 OHM 5 0402

Ref. Des.	Part Number	Description
R451	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R452	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R470	0613952Q46	CER CHIP RES 75.0 OHM 5 0402
R471	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R482	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R501	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R511	0613952R25	CER CHIP RES 100K OHM 5% 0402
R519	0613952R01	CER CHIP RES 10K OHM 5% 0402
R533	0613952R25	CER CHIP RES 100K OHM 5% 0402
R551	0613952Q74	RES,MF,1.1KOHM,5%,.0625W,SM,0402,200PPM/CEL,PB-FREE
R552	0613952R19	CER CHIP RES 56K OHM 5% 0402
R553	0613952R01	CER CHIP RES 10K OHM 5% 0402
R554	0613952R01	CER CHIP RES 10K OHM 5% 0402
R555	0613952H55	CER CHIP RES 180 OHM 5% 0603
R556	0613952Q61	CER CHIP RES 330 OHM 5 0402
R571	0613952H79	CER CHIP RES 1800 OHM 5% 0603
R572	0613952R01	CER CHIP RES 10K OHM 5% 0402
R701	0613958H57	CER CHIP RES 220 OHM 5% 0805
R703	0613952R25	CER CHIP RES 100K OHM 5% 0402
R731	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R733	0613952R25	CER CHIP RES 100K OHM 5% 0402
R735	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM

Ref. Des.	Part Number	Description
R1101	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1102	NOT PLACED	–
R1103	NOT PLACED	–
R1105	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1106	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1107	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1108	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1109	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1110	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1111	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1112	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1113	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1114	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1115	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1116	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1117	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1118	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1119	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1120	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1121	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1122	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1123	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1124	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1125	0613952R01	CER CHIP RES 10K OHM 5% 0402

Ref. Des.	Part Number	Description
R1133	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1201	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1202	0613952Q55	CER CHIP RES 180 OHM 5 0402
R1203	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1204	0613952Q67	CER CHIP RES 560 OHM 5 0402
R1205	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1206	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1207	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1209	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1210	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1212	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1213	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R1214	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R1215	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1216	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1217	0613952Q57	CER CHIP RES 220 OHM 5 0402
R1218	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1219	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1220	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1221	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1223	NOT PLACED	–
R1224	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1225	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R1226	0613952R08	CER CHIP RES 20K OHM 5 0402
R1227	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1228	0613952R08	CER CHIP RES 20K OHM 5 0402
R1229	0613952P18	CER CHIP RES 150K OHM 1 0402
R1230	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1231	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1239	NOT PLACED	–
R1241	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1301	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1302	NOT PLACED	–
R1303	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1304	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1305	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1306	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1307	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1308	0613952R19	CER CHIP RES 56K OHM 5% 0402
R1309	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1310	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1311	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1314	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1315	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1317	0688044N04	RES,METAL STRIP, 0.1 OHM,1%,0.125W,SMD, 0805,75PPM/CEL,PKG
R1318	0613952Q49	CER CHIP RES 100 OHM 5 0402

Ref. Des.	Part Number	Description
R1319	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1320	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1321	0688044N04	RES,METAL STRIP, 0.1 OHM, 1%,0.125W,SMD, 0805,75PPM/CEL,PKG
R1322	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1323	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1324	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1325	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1326	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1327	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1328	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1329	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R1330	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1331	0613952R08	CER CHIP RES 20K OHM 5 0402
R1332	0613952R08	CER CHIP RES 20K OHM 5 0402
R1334	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1335	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1336	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1337	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1338	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1339	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1340	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1341	0613952R01	CER CHIP RES 10K OHM 5% 0402

Ref. Des.	Part Number	Description
R1342	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1343	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1344	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1345	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1346	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1347	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1348	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1349	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1350	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1351	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1352	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1353	NOT PLACED	–
R1354	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1355	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1356	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1357	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1358	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1370	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1371	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1401	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1402	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1403	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1404	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1405	NOT PLACED	–

Ref. Des.	Part Number	Description
R1406	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1409	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1410	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1411	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1412	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1415	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1416	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R1417	0613952R12	CER CHIP RES 30K OHM 5 0402
R1418	0613952R13	CER CHIP RES 33K OHM 5% 0402
R1419	NOT PLACED	–
R1420	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1421	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1422	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1423	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1424	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1437	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1438	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1439	NOT PLACED	–
R1440	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1449	NOT PLACED	–
R1462	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1463	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1464	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1465	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R1466	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1467	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1596	NOT PLACED	–
R1704	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1706	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1708	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1709	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9901	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R9902	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9903	NOT PLACED	–
R9904	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9905	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9906	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R9907	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R9908	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9909	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9910	0613952R11	CER CHIP RES 27K OHM 5% 0402
R9911	0613952R09	CER CHIP RES 22K OHM 5% 0402
R9912	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9913	0613952R24	CER CHIP RES 91K OHM 5 0402
R9914	0613952R21	CER CHIP RES 68K OHM 5% 0402
R9915	0613952R29	CER CHIP RES 150K OHM 5% 0402
R9916	NOT PLACED	–
R9917	0613952Q73	CER CHIP RES 1000 OHM 5 0402

Ref. Des.	Part Number	Description
R9918	NOT PLACED	–
R9919	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9920	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9921	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9922	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9923	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9924	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9925	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9926	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9927	0613952R12	CER CHIP RES 30K OHM 5 0402
R9930	0613952Q66	CER CHIP RES 510 OHM 5 0402
R9931	0613952R15	CER CHIP RES 39K OHM 5% 0402
R9932	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9933	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9934	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9960	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9961	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9990	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9996	NOT PLACED	–
R9997	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9998	0613952Q49	CER CHIP RES 100 OHM 5 0402
R9999	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R10000	0613952H37	CER CHIP RES 33.0 OHM 5% 0603
R10001	0613952H37	CER CHIP RES 33.0 OHM 5% 0603

Ref. Des.	Part Number	Description
RT150	0680590Z01	THERMISTOR_33K
SH01	2671728L01	SHIELD, BOTTOM BACK END 1
SH02	2671818L01	SHIELD, BOTTOM FRONT END 1
SH03	2671819L01	SHIELD, BOTTOM FRONT END 2
SH04	2671685M01	SHIELD, BOTTOM MIXER U1
SH05	2671821L01	SHIELD, BOTTOM SYNTHESIZER
SH06	2671822L01	SHIELD, TOP DRIVER
SH07	2671823L01	SHIELD, TOP HARMONIC FILTER
SH08	2671824L01	SHIELD, TOP PA
SH09	2671825L01	SHIELD, TOP SYNTHESIZER
SH10	2671826L01	SHIELD, TOP VCO
SH11	2671817L01	SHIELD, BOTTOM BACK END 2
T470	2515396H01	BALUN, TRANSFORMER
T471	2516320H01	XFMR SMALL SIGNAL SURFACE MT
U1	5188493T01	IC,VREG/SWG,LP2989, SM,MINI SO-8 HI PRCN REG 5V
U2	5185941F35	IC, VREG, NOPB
U3	5185941F35	IC, VREG, NOPB
U20	5171025M01	DUAL SPDT ANALOG SWITCHES, LOW R
U102	5115678H01	VHF/UHF/800/900 MHZ LDMOS DRIVER IC
U103	5115022H01	IC TEMPERATURE SENSOR
U104	5185765B26	IC PWR CTRL IN MOS20
U201	5116411H01	IC,OP AMP,
U202	5116245H01	CC LVFRACN
U203	5185941F40	IC, 12 BIT DAC
U470	5164015H81	IC,MXR,DBL BAL GILBERT,CELL,SM
U500	5102495J14	IC,IF,IF DIGITILIZING SUBSYSTEM IC,AD9864, QFN

Ref. Des.	Part Number	Description
U701	5185941F45	ATTEN,VAR,14.4DBMIN, 15.6DBMAX,0-2000 MHZFREQ,50OHM,PCMT, SOT
U702	5116349H01	DUAL INVERTER IC
U1101	5188493T01	IC,VREG/SWG,LP2989, SM,MINI SO-8 HI PRCN REG 5V
U1201	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE
U1301	5188691V01	IC,MUX/DEMUX, NC7SB3157P6X,SM, SC70-6,1PER PKG,BUS, PB FREE
U1302	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1303	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1304	5185143E77	IC, MAKO ASIC, CMOS PWR MGMT
U1305	5185941F22	IC,OPAMP,SGL,OPA237, SOT23,NOPB
U1306	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1401	5171266M01	BRAVO IC
U1404	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1405	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1406	5114000A48	IC,INVTR,1GU04,1PER PKG,SOT-353,PB-FREE
U1408	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1409	5175358M01	IC,SRAM,32MB,2MBX16, 70NS
U1410	5185956E69	IC,DRAM,64MB,60NS,IC 1.8V 64
U9901	5114000A48	IC,INVTR,1GU04,1PER PKG, SOT-353,PB-FREE
U9902	5102495J14	IC, SINGLE AND GATE TC7S08FU
U9903	5114007M28	IC,F-F/D,1PER PKG, 17SZ74,N-I,SM,SOIC8, PB-FREE
U9904	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE

Ref. Des.	Part Number	Description
U9905	4871006L01	MUN53XX NPN/PNP DIGITAL TRANSISTOR
U9918	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
VR3	4815155H01	RECTIFIER
VR4	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR51	4805656W99	ZENER DIODE 5.6V
VR52	4805656W99	ZENER DIODE 5.6V
VR53	4805656W99	ZENER DIODE 5.6V
VR1201	4813979P12	DIODE ARRAY,TRANSIENT PROTECTION,SM, SOT-457,12V,.225W,ZEN, 4,PB
VR1202	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1203	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1204	4813977M18	DIODE,ZEN,MBZ5239,SM, SOT-23,9.1V,10MA, .225W,ZEN,PB-FREE
VR1205	NOT PLACED	–
VR1206	4805656W99	ZENER DIODE 5.6V
VR1207	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1208	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1209	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1301	4813977M11	DIODE,ZEN,MBZ5232,SM, SOT-23,5.6V,10MA,.225W, ZEN,PB-FREE
VR9901	4815821H01	ZENER VOLTAGE REGULATOR 2.4V 200MW
Y200	4816748H01	CRYSTAL OSCILLATOR
Y1301	4809995L05	XTAL QUARTZ 32.768KHZ CC4V-T1
Y1302	4864005H01	RESONATOR, CRYSTAL 24.576 MHZ

NOTE * Parts U1401 and U1304 are not field repairable. For failures relating to U1401 and U1304, the mainboard has to be replaced.

9.7 Main Board (NUE7350B) Parts List

Ref. Des.	Part Number	Description
C4	2113945L49	CAP,FXD,.01UF,+5%,-5%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C6	2113944C45	CAP CER CHP 100.0PF 50V 5%
C9	2113944A40	CAP CER CHP 100.0PF 50V 5%
C10	2113944A40	CAP CER CHP 100.0PF 50V 5%
C11	2113946K02	CAP CER CHP 0.10UF 16V
C12	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C13	2113945B02	CAP CER CHP 10,000PF 25V 10%
C14	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C15	2113946E02	CAP CER CHP 1.0UF 16V 10%
C16	2113945B02	CAP CER CHP 10,000PF 25V 10%
C17	2113946E02	CAP CER CHP 1.0UF 16V 10%
C20	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C21	NOT PLACED	–
C22	2113944C17	CAP CER CHP 3.0PF 50V +/- 0.25PF
C24	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C25	2113946E02	CAP CER CHP 1.0UF 16V 10%
C26	2113945B02	CAP CER CHP 10,000PF 25V 10%
C27	2113946E02	CAP CER CHP 1.0UF 16V 10%
C28	2113944A40	CAP CER CHP 100.0PF 50V 5%
C29	2113944C30	CAP CER CHP 10.0PF 50V +/- 0.5PF

Ref. Des.	Part Number	Description
C30	2313960B57	CAP,FXD,10UF,+10%,-10%, 6.3V-DC,SM,-55DEG CMIN, 125DEG CMAX,137MA
C52	2113944A40	CAP CER CHP 100.0PF 50V 5%
C53	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C54	2113944A40	CAP CER CHP 100.0PF 50V 5%
C55	2113944A40	CAP CER CHP 100.0PF 50V 5%
C56	2113944A40	CAP CER CHP 100.0PF 50V 5%
C57	2113944A40	CAP CER CHP 100.0PF 50V 5%
C58	2113944A40	CAP CER CHP 100.0PF 50V 5%
C71	2113944A40	CAP CER CHP 100.0PF 50V 5%
C72	2113944A40	CAP CER CHP 100.0PF 50V 5%
C73	2113944A40	CAP CER CHP 100.0PF 50V 5%
C101	2113944A40	CAP CER CHP 100.0PF 50V 5%
C102	2113944C45	CAP CER CHP 100.0PF 50V 5%
C103	2113945B02	CAP CER CHP 10,000PF 25V 10%
C104	2113944A40	CAP CER CHP 100.0PF 50V 5%
C105	2113944A40	CAP CER CHP 100.0PF 50V 5%
C106	2113944A40	CAP CER CHP 100.0PF 50V 5%
C107	2113944A40	CAP CER CHP 100.0PF 50V 5%
C108	2113945B02	CAP CER CHP 10,000PF 25V 10%
C110	2113944A40	CAP CER CHP 100.0PF 50V 5%
C111	2113944C45	CAP CER CHP 100.0PF 50V 5%
C112	NOT PLACED	–
C114	2113944C37	CAP CER CHP 39.0PF 50V 5%

Ref. Des.	Part Number	Description
C116	NOT PLACED	–
C117	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C118	2113945B02	CAP CER CHP 10,000PF 25V 10%
C119	2113944C45	CAP CER CHP 100.0PF 50V 5%
C120	2171741M05	HIGH Q CAP, 6.8 PF
C121	2171741M05	HIGH Q CAP, 6.8 PF
C122	2171741M02	HIGH Q CAP
C123	2113944C16	CAP CER CHP 2.7PF 50V +/- 0.25PF
C124	2171741M07	HIGH Q CAP, 15 PF
C125	2113944C45	CAP CER CHP 100.0PF 50V 5%
C127	2113944A40	CAP CER CHP 100.0PF 50V 5%
C128	2113944A40	CAP CER CHP 100.0PF 50V 5%
C129	2113945A10	CAP CER CHP 1500PF 50V 10%
C130	2113945A05	CAP CER CHP 470PF 50V 10%
C131	2113946A01	CAP CER CHP 0.015UF 16V 10%
C132	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C133	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C134	2113945B02	CAP CER CHP 10,000PF 25V 10%
C135	2113944A40	CAP CER CHP 100.0PF 50V 5%
C136	2113944A40	CAP CER CHP 100.0PF 50V 5%
C137	2113944A40	CAP CER CHP 100.0PF 50V 5%
C140	2113944A40	CAP CER CHP 100.0PF 50V 5%
C141	2171741M06	HIGH Q CAP, 39 PF

Ref. Des.	Part Number	Description
C144	2113944A40	CAP CER CHP 100.0PF 50V 5%
C145	2113946K02	CAP CER CHP 0.10UF 16V
C146	2113946K02	CAP CER CHP 0.10UF 16V
C147	2113946K02	CAP CER CHP 0.10UF 16V
C148	2113946K02	CAP CER CHP 0.10UF 16V
C149	2113946K02	CAP CER CHP 0.10UF 16V
C200	2113944A40	CAP CER CHP 100.0PF 50V 5%
C201	2113946K02	CAP CER CHP 0.10UF 16V
C202	2113946K02	CAP CER CHP 0.10UF 16V
C203	2113946N03	CAP CER CHP 2.2UF 16V
C204	2113946K02	CAP CER CHP 0.10UF 16V
C205	2113946K02	CAP CER CHP 0.10UF 16V
C206	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C207	2113946K02	CAP CER CHP 0.10UF 16V
C208	2113946K02	CAP CER CHP 0.10UF 16V
C209	2113946K02	CAP CER CHP 0.10UF 16V
C210	2113946K02	CAP CER CHP 0.10UF 16V
C211	2113946K02	CAP CER CHP 0.10UF 16V
C213	2113945A09	CAP CER CHP 1000PF 50V 10%
C214	2113944A40	CAP CER CHP 100.0PF 50V 5%
C215	2113946K02	CAP CER CHP 0.10UF 16V
C217	2113945C27	CAP,FXD,.047UF,+10%, -10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C218	2113945C25	CAP,FXD,.033UF,+10%, -10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C219	2171115L01	CHIP MONOLITHIC CERAMIC CAPACITOR
C220	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C221	2113946K02	CAP CER CHP 0.10UF 16V
C222	2113945L41	CAP,FXD,4700PF,+5%,-5%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C224	2185419D06	CAP CER SUPER L/D 0.1UF
C225	2185419D06	CAP CER SUPER L/D 0.1UF
C226	2185419D06	CAP CER SUPER L/D 0.1UF
C227	2185419D06	CAP CER SUPER L/D 0.1UF
C229	2113944A40	CAP CER CHP 100.0PF 50V 5%
C230	2113944A40	CAP CER CHP 100.0PF 50V 5%
C231	2113945B02	CAP CER CHP 10,000PF 25V 10%
C232	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C233	2113946K02	CAP CER CHP 0.10UF 16V
C234	2113945B02	CAP CER CHP 10,000PF 25V 10%
C235	2113944A40	CAP CER CHP 100.0PF 50V 5%
C236	2113945A09	CAP CER CHP 1000PF 50V 10%
C241	2185419D06	CAP CER SUPER L/D 0.1UF
C242	2185419D06	CAP CER SUPER L/D 0.1UF
C250	2113946K02	CAP CER CHP 0.10UF 16V
C251	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C252	2113944A26	CAP CER CHP 12.0PF 50V 5%
C253	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C254	2113946B04	CAP CER CHP 0.10UF 10V 10%
C255	2113944A42	CAP CER CHP 150.0PF 50V 5%
C256	2113944A27	CAP CER CHP 15.0PF 50V 5%
C257	2113944A80	CAP,FXD,20PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C258	2113944A27	CAP CER CHP 15.0PF 50V 5%

Ref. Des.	Part Number	Description
C259	2113944A36	CAP CER CHP 68.0PF 50V 5%
C260	2113944A73	CAP,FXD,8PF,.5PF+/-, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C261	2113944A42	CAP CER CHP 150.0PF 50V 5%
C262	2113946B04	CAP CER CHP 0.10UF 10V 10%
C263	2113944A42	CAP CER CHP 150.0PF 50V 5%
C264	2113944A09	CAP CER CHP 2.2PF 50V +/- 0.25PF
C265	2113944A40	CAP CER CHP 100.0PF 50V 5%
C266	2113944A42	CAP CER CHP 150.0PF 50V 5%
C267	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C268	2113944A79	CAP,FXD,16PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C269	2113946B04	CAP CER CHP 0.10UF 10V 10%
C271	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C272	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C273	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C274	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C275	2113944A26	CAP CER CHP 12.0PF 50V 5%
C276	2113944A24	CAP CER CHP 9.1PF 50V +/- 0.5PF
C277	2113944A38	CAP CER CHP 82.0PF 50V 5%
C278	2113944A43	CAP CER CHP 180.0PF 50V 5%
C279	2113946B04	CAP CER CHP 0.10UF 10V 10%
C280	2113944A43	CAP CER CHP 180.0PF 50V 5%
C281	2113944A43	CAP CER CHP 180.0PF 50V 5%

Ref. Des.	Part Number	Description
C282	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C283	2113946B04	CAP CER CHP 0.10UF 10V 10%
C284	2113944A43	CAP CER CHP 180.0PF 50V 5%
C285	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C286	2113944A43	CAP CER CHP 180.0PF 50V 5%
C287	2113944A43	CAP CER CHP 180.0PF 50V 5%
C288	2113944A05	CAP CER CHP 1.5PF 50V +/- 0.25PF
C289	2113944A32	CAP CER CHP 39.0PF 50V 5%
C290	2113944A27	CAP CER CHP 15.0PF 50V 5%
C291	2113944A40	CAP CER CHP 100.0PF 50V 5%
C292	2113946B04	CAP CER CHP 0.10UF 10V 10%
C293	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C294	2113944A40	CAP CER CHP 100.0PF 50V 5%
C295	2113944A42	CAP CER CHP 150.0PF 50V 5%
C296	2113944A40	CAP CER CHP 100.0PF 50V 5%
C337	2113945A01	CAP CER CHP 220PF 50V 10,
C410	2115153H14	CAP, CERAMIC, COG
C411	2115153H27	CAP, CERAMIC, COG
C412	2115153H36	CAP, CERAMIC, COG
C413	2115153H03	CAP, CERAMIC, COG
C414	2115153H03	CAP, CERAMIC, COG
C415	2115153H36	CAP, CERAMIC, COG
C416	2115153H14	CAP, CERAMIC, COG
C417	2115153H27	CAP, CERAMIC, COG
C418	2113946B04	CAP CER CHP 0.10UF 10V 10%
C419	2115153H41	CAP,CERAMIC CHIP,22PF,+1%,-1%,50V-

Ref. Des.	Part Number	Description
C420	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C421	2115153H36	CAP, CERAMIC, COG
C422	2115153H03	CAP, CERAMIC, COG
C423	2115153H03	CAP, CERAMIC, COG
C424	2115153H36	CAP, CERAMIC, COG
C425	2115153H31	CAP, CERAMIC, COG
C426	2115153H14	CAP, CERAMIC, COG
C427	2115153H14	CAP, CERAMIC, COG
C428	2115153H41	CAP,CERAMIC CHIP,22PF, +1%,-1%,50V-
C429	2113946B04	CAP CER CHP 0.10UF 10V 10%
C430	2115153H31	CAP, CERAMIC, COG
C432	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C434	2113944A34	CAP CER CHP 56.0PF 50V 5%
C436	2113944A22	CAP CER CHP 7.5PF 50V +/- 0.5PF
C456	2113946B04	CAP CER CHP 0.10UF 10V 10%
C457	2113946B04	CAP CER CHP 0.10UF 10V 10%
C470	NOT PLACED	–
C471	2113944A21	CAP CER CHP 6.8PF 50V +/- 0.5PF
C472	2113944A40	CAP CER CHP 100.0PF 50V 5%
C473	2113944A40	CAP CER CHP 100.0PF 50V 5%
C474	2113945B02	CAP CER CHP 10,000PF 25V 10%
C475	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C476	2113944M01	CAP,FXD,2PF,.1PF+/-, 50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C477	2113944A40	CAP CER CHP 100.0PF 50V 5%
C479	2113946B04	CAP CER CHP 0.10UF 10V 10%

Ref. Des.	Part Number	Description
C480	2113944A40	CAP CER CHP 100.0PF 50V 5%
C481	2113945B02	CAP CER CHP 10,000PF 25V 10%
C482	2113945B02	CAP CER CHP 10,000PF 25V 10%
C483	NOT PLACED	–
C484	2113944A80	CAP,FXD,20PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C490	2115153H21	CAP, CERAMIC, COG
C493	2115153H16	CAP, CERAMIC, COG
C501	2113944A40	CAP CER CHP 100.0PF 50V 5%
C505	2113944A40	CAP CER CHP 100.0PF 50V 5%
C506	2113946K02	CAP CER CHP 0.10UF 16V
C507	2113945A11	CAP CER CHP 2200PF 50V 10%
C509	2113946B02	CAP CER CHP 0.047UF 10V 10,
C511	2113944A40	CAP CER CHP 100.0PF 50V 5%
C512	2113944A40	CAP CER CHP 100.0PF 50V 5%
C513	2113945B02	CAP CER CHP 10,000PF 25V 10%
C514	2113946K02	CAP CER CHP 0.10UF 16V
C527	2113946K02	CAP CER CHP 0.10UF 16V
C535	2113945B02	CAP CER CHP 10,000PF 25V 10%
C539	2113946B02	CAP CER CHP 0.047UF 10V 10,
C540	2113946K02	CAP CER CHP 0.10UF 16V
C541	2113945B02	CAP CER CHP 10,000PF 25V 10%
C542	2113945B02	CAP CER CHP 10,000PF 25V 10%
C544	2113945B02	CAP CER CHP 10,000PF 25V 10%
C546	2113945B02	CAP CER CHP 10,000PF 25V 10%
C547	2113945B02	CAP CER CHP 10,000PF 25V 10%

Ref. Des.	Part Number	Description
C548	2113946B02	CAP CER CHP 0.047UF 10V 10,
C551	2113946S35	CAP CER CHP 1.0UF 16V 10%
C552	2113946S35	CAP CER CHP 1.0UF 16V 10%
C553	2113946C07	CAP,FXD,.33UF,+10%, -10%,10V-DC,0603,X5R, -55DEG CMIN,85DEG CMAX
C554	2113944A79	CAP,FXD,16PF,+5%,-5%, 50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C555	2113944A20	CAP CER CHP 6.2PF 50V +/- 0.5PF
C556	2113944A34	CAP CER CHP 56.0PF 50V 5%
C557	2113944A34	CAP CER CHP 56.0PF 50V 5%
C560	2113944A28	CAP CER CHP 18.0PF 50V 5%
C561	2313960B30	CAP,FXD,4.7UF,+10%, -10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,122MA
C562	2113945B02	CAP CER CHP 10,000PF 25V 10%
C570	2113945G91	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C571	2113945G91	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C572	2113945C25	CAP,FXD,.033UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C573	2113944A36	CAP CER CHP 68.0PF 50V 5%
C574	2113945B02	CAP CER CHP 10,000PF 25V 10%
C581	2113944B02	CAP CER CHP 220.0PF 25V 5%
C582	2113946K02	CAP CER CHP 0.10UF 16V
C583	2113945B02	CAP CER CHP 10,000PF 25V 10%
C584	2115153H24	CAP, CERAMIC, COG

Ref. Des.	Part Number	Description
C704	2113944A40	CAP CER CHP 100.0PF 50V 5%
C705	2113944C45	CAP CER CHP 100.0PF 50V 5%
C706	2113944C11	CAP CER CHP 1.6PF 50V +/- 0.25PF
C707	2113944C21	CAP CER CHP 4.3PF 50V +/- 0.25PF
C709	2113944C12	CAP CER CHP 1.8PF 50V +/- 0.25PF
C710	2113944C15	CAP CER CHP 2.4PF 50V +/- 0.25PF
C711	2113944C24	CAP CER CHP 5.6PF 50V +/- 0.5PF
C712	2113944A40	CAP CER CHP 100.0PF 50V 5%
C713	2113944A18	CAP CER CHP 5.1PF 50V +/- 0.5PF
C716	2113944A40	CAP CER CHP 100.0PF 50V 5%
C717	2113946K02	CAP CER CHP 0.10UF 16V
C718	2113944C15	CAP CER CHP 2.4PF 50V +/- 0.25PF
C719	2113944A40	CAP CER CHP 100.0PF 50V 5%
C720	2113944C21	CAP CER CHP 4.3PF 50V +/- 0.25PF
C721	2113944C18	CAP CER CHP 3.3PF 50V +/- 0.25PF
C722	2113951C13	CAP,FXD,1.3PF,.05PF+/-, 250V-DC,0603,C0G,-55DEG CMIN,125DEG CMA
C723	2113944A40	CAP CER CHP 100.0PF 50V 5%
C724	2113946K02	CAP CER CHP 0.10UF 16V
C1101	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1102	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1104	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1105	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1106	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C1107	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1108	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1109	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1110	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1111	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1112	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1113	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1114	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1115	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1116	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1117	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1118	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1119	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1120	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1123	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1124	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1125	2113945A05	CAP CER CHP 470PF 50V 10%
C1126	2113945A05	CAP CER CHP 470PF 50V 10%
C1128	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1129	2113955C31	CAP,FXD,1UF,+10%,-10%, 16V-DC,X7R,-55DEG CMIN,125DEG CMAX, LEAD-
C1130	2113945A05	CAP CER CHP 470PF 50V 10%
C1131	2113944A31	CAP CER CHP 33.0PF 50V 5%

Ref. Des.	Part Number	Description
C1132	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1133	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1134	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1135	2113945A05	CAP CER CHP 470PF 50V 10%
C1136	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1138	2113945A05	CAP CER CHP 470PF 50V 10%
C1139	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1140	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1141	2113946F05	CAP,CHIP,10UF,+10%, -10%,6.3V-DC,0805,X5R, -55DEG CMIN,85DEG CMAX
C1142	2113956C43	CAP,FXD,2.2UF,+10%, -10%,10V-DC,0805,X5R , -55DEG CMIN,85DEG CMAX
C1202	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1209	2113945A05	CAP CER CHP 470PF 50V 10%
C1210	2113945A05	CAP CER CHP 470PF 50V 10%
C1211	NOT PLACED	–
C1212	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1213	2113945A05	CAP CER CHP 470PF 50V 10%
C1214	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1215	2113945A05	CAP CER CHP 470PF 50V 10%
C1216	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1217	2113945A05	CAP CER CHP 470PF 50V 10%
C1218	2113946K02	CAP CER CHP 0.10UF 16V
C1219	2113946K02	CAP CER CHP 0.10UF 16V

Ref. Des.	Part Number	Description
C1220	2113945A05	CAP CER CHP 470PF 50V 10%
C1221	2113945A05	CAP CER CHP 470PF 50V 10%
C1222	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1223	2113946K02	CAP CER CHP 0.10UF 16V
C1224	2113946K02	CAP CER CHP 0.10UF 16V
C1225	2113946K02	CAP CER CHP 0.10UF 16V
C1232	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1233	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1234	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1301	2113945A05	CAP CER CHP 470PF 50V 10%
C1302	2113946K02	CAP CER CHP 0.10UF 16V
C1303	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C1304	2113946K02	CAP CER CHP 0.10UF 16V
C1305	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1306	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C1307	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1308	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C1309	2113945A09	CAP CER CHP 1000PF 50V 10%
C1310	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1312	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1313	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1314	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1315	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1316	2113944A31	CAP CER CHP 33.0PF 50V 5%
C1317	2113944A31	CAP CER CHP 33.0PF 50V 5%

Ref. Des.	Part Number	Description
C1318	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1319	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1320	2113946G01	CAP CER CHP 2.2UF 16V 10%
C1321	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1322	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1323	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1324	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1325	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1326	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1327	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1328	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1329	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1330	2113946D05	CAP,CHIP,2.2UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C1331	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1332	2371572L01	POSCAD 47UF
C1333	2371572L01	POSCAD 47UF
C1335	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1336	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1337	2113945A09	CAP CER CHP 1000PF 50V 10%
C1338	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1339	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1340	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX

Ref. Des.	Part Number	Description
C1341	2113945C31	CAP,FXD,.1UF,+10%,-10%, 50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C1342	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1343	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1345	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1346	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1347	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1348	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1349	2113955E37	CAP,FXD,10UF,+10%,-10%, 16V-DC,1210,X7R,-55DEG CMIN,125DEG CMAX
C1350	2113945C21	CAP,FXD,.018UF,+10%, -10%,50V-DC,0603,X7R, -55DEG CMIN,125DEG CMA
C1351	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1352	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1353	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C1354	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1355	2113946A02	CAP CER CHP 0.022UF 16V 10,
C1356	2113946B03	CAP CER CHP 0.068UF 10V 10
C1357	2113946B03	CAP CER CHP 0.068UF 10V 10
C1362	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1363	2113945D04	CAP CER CHP 100,000PF 25V 10%
C1364	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1365	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C1367	2113946K02	CAP CER CHP 0.10UF 16V
C1368	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1370	2113946K02	CAP CER CHP 0.10UF 16V
C1402	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1403	2113946K02	CAP CER CHP 0.10UF 16V
C1404	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1407	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1408	2113946K02	CAP CER CHP 0.10UF 16V
C1409	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1410	2113946K02	CAP CER CHP 0.10UF 16V
C1411	2113946K02	CAP CER CHP 0.10UF 16V
C1412	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1413	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1414	2113946K02	CAP CER CHP 0.10UF 16V
C1416	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C1417	2113946K02	CAP CER CHP 0.10UF 16V
C1418	2113946E02	CAP CER CHP 1.0UF 16V 10%
C1419	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1420	2113946K02	CAP CER CHP 0.10UF 16V
C1421	2113946A01	CAP CER CHP 0.015UF 16V 10%
C1422	2113946K02	CAP CER CHP 0.10UF 16V
C1424	2113946K02	CAP CER CHP 0.10UF 16V
C1425	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1427	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1428	2113944A40	CAP CER CHP 100.0PF 50V 5%
C1429	2113944A48	CAP CER CHP 470.0 PF 50V 5%
C1430	2113946K02	CAP CER CHP 0.10UF 16V
C1431	2113946K02	CAP CER CHP 0.10UF 16V

Ref. Des.	Part Number	Description
C1432	2113946K02	CAP CER CHP 0.10UF 16V
C1433	2113946K02	CAP CER CHP 0.10UF 16V
C1440	NOT PLACED	–
C1441	NOT PLACED	–
C1442	NOT PLACED	–
C1443	NOT PLACED	–
C1444	NOT PLACED	–
C1445	NOT PLACED	–
C1446	NOT PLACED	–
C1447	NOT PLACED	–
C1449	NOT PLACED	–
C1453	NOT PLACED	–
C1457	NOT PLACED	–
C1458	NOT PLACED	–
C1459	NOT PLACED	–
C1460	NOT PLACED	–
C1719	2113944A40	CAP CER CHP 100.0PF 50V 5%
C9901	2113944A40	CAP CER CHP 100.0PF 50V 5%
C9950	2113946K02	CAP CER CHP 0.10UF 16V
C9951	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9952	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9953	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9954	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9956	2113946E02	CAP CER CHP 1.0UF 16V 10%
C9966	2113945A03	CAP CER CHP 330PF 50V 10%
C9968	2113946K02	CAP CER CHP 0.10UF 16V
C9969	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C9970	2113944A40	CAP CER CHP 100.0PF 50V 5%

Ref. Des.	Part Number	Description
C9975	2113946D07	CAP,CHIP,4.7UF,+10%, -10%,6.3V-DC,0603,X5R, -55DEG CMIN,85DEG CMA
C9980	2113945Y02	CAP,FXD,.1UF,+10%,-10%, 16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
D1	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D2	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D3	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D4	4813978M15	DIODE,RECT,RM140,SM, 1A,40V,SHTK,PB-FREE
D104	4813978A26	DIODE ARRAY,DET, SOT-363/SC-88,30V,.12W,2
D201	4815011H01	DIODE TRIPLE
D202	4815011H01	DIODE TRIPLE
D251	4815002H01	VARACTOR DIODE
D252	4815002H01	VARACTOR DIODE
D253	4815002H01	VARACTOR DIODE
D254	4815002H01	VARACTOR DIODE
D271	4815002H01	VARACTOR DIODE
D272	4815002H01	VARACTOR DIODE
D273	4815002H01	VARACTOR DIODE
D274	4815002H01	VARACTOR DIODE
D411	4815096H01	VARACTOR DIODE 1SV305
D413	4815096H01	VARACTOR DIODE 1SV305
D451	4815096H01	VARACTOR DIODE 1SV305
D453	4815096H01	VARACTOR DIODE 1SV305
D550	4815096H01	VARACTOR DIODE 1SV305
D551	4815096H01	VARACTOR DIODE 1SV305
D570	4805656W87	DIODE,VCTR, @ 15V, 1SV279,SOD-523/SC-79
D701	4871607L01	PIN DIODE SMD
D702	4871607L01	PIN DIODE SMD

Ref. Des.	Part Number	Description
D703	4813974A19	DIODE ARRAY,MXR, SM, SOT-323,7V,.2W, SHTK,2, PB-FREE
D1000	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1202	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1205	4813977C23	DIODE,ZEN,MMSZ5243,SM ,SOD-123,13V,10MA, .5W,ZEN,PB-FREE
D1207	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D1222	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1223	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1301	4805129M90	DIODE SOT PKGD
D1401	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
D1402	4888722V01	DIODE,RB520S,SM, SOD-523/SC-79,200MA, 30V,PB FREE
E5	2480640Z01	SURFACE MOUNT FERRITE BEAD
E101	7686949J14	FLTR,FERRITE BEAD,2A, SM,0805,CHIP, 220OHM
E103	7686949J15	FLTR,FERR,2A,SM,0603
E104	2480574F01	IND FERRITE CHIP 60OHM 0603
E105	2480640Z01	SURFACE MOUNT FERRITE BEAD
E500	2480640Z01	SURFACE MOUNT FERRITE BEAD
E501	2480574F01	IND FERRITE CHIP 60OHM 0603
E1102	2480574F01	IND FERRITE CHIP 60OHM 0603
E1103	2480574F01	IND FERRITE CHIP 60OHM 0603
E1104	2462586G33	INDUCTOR CHIP FERRITE BEADS
E1110	2480640Z01	SURFACE MOUNT FERRITE BEAD

Ref. Des.	Part Number	Description
E1111	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1112	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1113	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1114	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1115	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1116	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1117	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1118	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1119	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1120	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1121	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1122	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1123	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1124	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1125	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1126	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1127	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1129	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1130	2480640Z01	SURFACE MOUNT FERRITE BEAD
E1201	2480574F01	IND FERRITE CHIP 60OHM 0603
E1401	2480574F01	IND FERRITE CHIP 60OHM 0603
E1402	2480574F01	IND FERRITE CHIP 60OHM 0603
F901	6515076H01	FUSE CHIP SMT TR/ 1608FF 3A

Ref. Des.	Part Number	Description
FL200	9116848H01	FLTR SW CAP 3 POLE BUTTERW, W18
FL490	9185924B01	FILTER, 73.35 MHZ 3-POLE CRYST
J1	0970312N01	CONN,BTB,RCPT,60CONT, .4MM,GLD,1 STACK HGT
J2	0987817K04	30PIN RECPT MATING CNTCR 1.5MM
J3	0987817K02	RECP 0.5 PITCH 16 CKT
J1704	0971876L01	MINIATURE INTERFACE COAXIAL SWITCH
L10	2489669V01	IDCTR,WW,100UH,5%, 40MA,100OHM,20 Q,10MHZ SRF,SM,1210,PB-FREE
L20	2460591D12	COIL AIR WOUND INDUC 18.29
L101	2414017G09	IDCTR,CHIP,15NH,5%, 300MA,.45OHM,CER,8 Q, SM,0603,PB-FREE
L102	2414032D18	IDCTR,WW,180NH,5%,700 MA,.43OHM,CER,35 Q, 780MHZ SRF,SM,PB-FR
L103	NOT PLACED	–
L105	2479990E01	COIL AIR WOUND/GREEN CLR 23.75
L108	2415428H04	AIR WOUND INDUCTOR
L113	2414017G07	IDCTR,CHIP,10NH,5%, 300MA,.35OHM,CER,8 Q, SM,0603,PB-FREE
L201	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA, .65OHM,FERR,45 Q ,50MHZ SRF,SM,0805
L202	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L203	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L204	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L205	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB
L207	2414017Q47	IDCTR,FXD,1UH,10%, 50MA,.45OHM,FERR,45 Q, 75MHZ SRF,SM,0805,PB

Ref. Des.	Part Number	Description
L208	2414017Q20	IDCTR,FXD,2.2UH,20%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L209	2416307H01	IDCTR,WW,680NH,5%,060 3
L251	2416307H01	IDCTR,WW,680NH,5%,060 3
L252	2415427H37	CHIP INDUCTOR
L253	2471912M01	11.7NH,SQUARE AIR WOUND INDUCTORS
L254	2416307H01	IDCTR,WW,680NH,5%,060 3
L255	2416307H01	IDCTR,WW,680NH,5%,060 3
L256	2416307H01	IDCTR,WW,680NH,5%,060 3
L257	2416307H01	IDCTR,WW,680NH,5%,060 3
L258	2415427H33	CHIP INDUCTOR
L270	2416307H01	IDCTR,WW,680NH,5%,060 3
L271	2415427H37	CHIP INDUCTOR
L272	2471911M01	SQUARE AIR CORE INDUCTORS
L273	2416307H01	IDCTR,WW,680NH,5%,060 3
L274	2416307H01	IDCTR,WW,680NH,5%,060 3
L275	2416307H01	IDCTR,WW,680NH,5%,060 3
L276	2416307H01	IDCTR,WW,680NH,5%,060 3
L277	2415429H12	CHIP INDUCTOR
L278	2415427H41	CHIP INDUCTOR
L410	2415429H39	CHIP INDUCTOR
L412	2471912M03	SQUARE AIR CORE INDUCTORS
L413	2471912M03	SQUARE AIR CORE INDUCTORS
L431	2414017P25	IDCTR,CHIP,100NH,5%, 100MA,5.5OHM,CER,8 Q, 650MHZ SRF,SM,0402
L432	2414017P13	IDCTR,CHIP,10NH,5%, 300MA,.46OHM,CER,9 Q, 2.5GHZ SRF,SM,0402,P

Ref. Des.	Part Number	Description
L450	2415429H39	CHIP INDUCTOR
L451	2471912M03	SQUARE AIR CORE INDUCTORS
L452	2471912M03	SQUARE AIR CORE INDUCTORS
L470	2414017P03	IDCTR,CHIP,1.5NH,300MA, .13OHM,CER,8 Q,6GHZ SRF,SM,0402,PB-F
L471	2414017P18	IDCTR,CHIP,27NH,5%, 300MA,1.04OHM,CER,9 Q, 1.5GHZ SRF,SM,0402
L474	2415429H43	CHIP INDUCTOR
L480	2414017P17	IDCTR,CHIP,22NH,5%, 300MA,.88OHM,CER,9 Q, 1.8GHZ SRF,SM,0402,P
L481	2414017P17	IDCTR,CHIP,22NH,5%, 300MA,.88OHM,CER,9 Q , 1.8GHZ SRF,SM,0402,P
L490	2414017K33	IDCTR,CHIP,680NH,5%, 50MA,5.5OHM,CER,11 Q, 120MHZ SRF,SM,0805
L492	2471851L18	CHIP INDUCTOR
L501	2466505A01	COIL INDUCTOR
L502	2466505A01	COIL INDUCTOR
L551	2414032B76	IDCTR,WW,4.7UH,5%, 330MA,4OHM,CER,20 Q, 60MHZ SRF,SM,PB-FREE
L552	2414015B26	IDCTR,FXD,330NH,2%, 310MA,1.4OHM,CER,48 Q, 600MHZ SRF,SM,0805
L553	2414017Q51	IDCTR,FXD,2.2UH,10%, 30MA,.65OHM,FERR,45 Q, 50MHZ SRF,SM,0805
L570	2414017Q54	IDCTR,FXD,3.9UH,10%, 30MA,.9OHM,FERR,45 Q, 38MHZ SRF,SM,0805,P
L571	2414017Q46	IDCTR,FXD,820NH,10%, 150MA,1OHM,FERR,25 Q, 100MHZ SRF,SM,0805
L702	2415429H47	CHIP INDUCTOR
L703	2460591D23	COIL AIR WOUND INDUC 17.24
L704	2460591D23	COIL AIR WOUND INDUC 17.24
L705	2460591D12	COIL AIR WOUND INDUC 18.29
L706	2415429H47	CHIP INDUCTOR

Ref. Des.	Part Number	Description
L1204	2415429H45	CHIP INDUCTOR
L1205	2415429H45	CHIP INDUCTOR
L1301	2464675H01	IDCTR,WW,560NH,5%, 550MA
L1302	2464675H01	IDCTR,WW,560NH,5%, 550MA
L1303	2464675H01	IDCTR,WW,560NH,5%, 550MA
L1304	2464675H01	IDCTR,WW,560NH,5%, 550MA
L1305	2475119M01	INDUCTOR,POWER,22UH, SMT POWER INDUCTOR
L1306	2475119M01	INDUCTOR,POWER,22UH, SMT POWER INDUCTOR
L1307	2464675H01	IDCTR,WW,560NH,5%, 550MA
L1308	2464675H01	IDCTR,WW,560NH,5%, 550MA
M1001	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1002	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1003	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1004	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1005	NOT PLACED	–
M1006	NOT PLACED	–
M1007	NOT PLACED	–
M1008	NOT PLACED	–
M1009	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1010	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1011	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1012	1188983Y01	ADHESIVE, CORNER UNDERFILL DIE CUT
M1704	4271868L01	CLIP, ANTENNA
M1705	3971751L02	CONNECTOR, B-PLUS
PASTE	1085674C03	PASTE/NC-SMQ230
PCB	8471997L03	BOARD, PC, UHF1 MAIN
Q4	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R

Ref. Des.	Part Number	Description
Q101	4871006L02	MUN53XX NPN/PNP DIGITAL TRANSISTOR
Q102	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q104	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q107	4816698H03	MITSUBISHI RD09MUP2-T112 UHF RFPA
Q200	4813973A42	XSTR,BIP GP SS,NPN, SM,SC-59,SMT,50V, .23W,100MA,PB-FREE
Q251	4871915M01	XSTR,BIP RF SML SGNL,NPN,SM,4.5GHZ
Q252	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q253	4815055H01	TSTR DUAL NPN/PNP UMH 5
Q271	4871915M01	XSTR,BIP RF SML SGNL,NPN,SM,4.5GHZ
Q272	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q273	4815055H01	TSTR DUAL NPN/PNP UMH 5
Q430	4805585Q19	TRANSISTOR
Q550	4805218N63	RF TRANS SOT 323 Bfq67W
Q551	4813973A04	XSTR,BIP GP SS,NPN, TA13,SM,SOT-23,SMT,30V, .225W,300MA,125MHZ,P
Q1201	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q1202	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q1301	4813970A62	XSTR,FET GP PWR, MOSFET,P-CH,ENHN,CF, -20V,1.3W,PB-FREE
Q1302	4813970A62	XSTR,FET GP PWR, MOSFET,P-CH,ENHN,CF, -20V,1.3W,PB-FREE
Q1304	5185956E76	IC,CONV,SM,SO16,0-30 VINPUT RANGE,6.5A, 3.8V,HI SPD SWTH DR
Q1402	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE

Ref. Des.	Part Number	Description
Q9901	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9902	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9903	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q9904	4813973M07	XSTR,BIP GP SS,NPN, T3904,SM,SOT-23,SMT, 40V,.225W,200MA,300MHZ
Q9905	4813973A08	XSTR,BIP GP SS,NPN, T2222,SM,SOT-23,SMT, 40V,.225W,600MA,300MHZ
Q9906	4813973A42	XSTR,BIP GP SS,NPN, SM,SC-59,SMT,50V, .23W, 100MA,PB-FREE
Q9950	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q9951	NOT PLACED	–
R22	0613952H73	CER CHIP RES 1000 OHM 5% 0603
R102	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R105	0613952R07	CER CHIP RES 18K OHM 5% 0402
R106	0613952R01	CER CHIP RES 10K OHM 5% 0402
R109	0613952H53	CER CHIP RES 150 OHM 5% 0603
R111	0613952R41	CER CHIP RES 470K OHM 5% 0402
R117	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R118	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R119	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R120	0613952Q49	CER CHIP RES 100 OHM 5 0402
R121	0613952Q62	CER CHIP RES 360 OHM 5 0402
R122	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R130	0615043C01	RES POWER METAL STRIP W18 COMPLIANT

Ref. Des.	Part Number	Description
R135	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R136	NOT PLACED	–
R137	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R138	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R201	0613952R13	CER CHIP RES 33K OHM 5% 0402
R202	0613952Q80	CER CHIP RES 2000 OHM 5 0402
R204	0613952R20	CER CHIP RES 62K OHM 5 0402
R205	0613952R19	CER CHIP RES 56K OHM 5% 0402
R207	0613952Q49	CER CHIP RES 100 OHM 5 0402
R208	0613952R13	CER CHIP RES 33K OHM 5% 0402
R210	0613952L51	CER CHIP RES 332 OHM 1% 0402
R212	0613952L26	CER CHIP RES 182 OHM 1% 0402
R213	0613952R01	CER CHIP RES 10K OHM 5% 0402
R215	0613952R01	CER CHIP RES 10K OHM 5% 0402
R216	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R217	0613952L51	CER CHIP RES 332 OHM 1% 0402
R218	0613952R01	CER CHIP RES 10K OHM 5% 0402
R220	0613952Q87	CER CHIP RES 3900 OHM 5 0402
R221	0613952Q86	CER CHIP RES 3600 OHM 5 0402
R252	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R253	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R256	0613952Q55	CER CHIP RES 180 OHM 5 0402
R257	0613952Q43	CER CHIP RES 56.0 OHM 5 0402

Ref. Des.	Part Number	Description
R260	0613952Q88	CER CHIP RES 4300 OHM 5 0402
R261	NOT PLACED	–
R262	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R263	0613952Q56	CER CHIP RES 200 OHM 5 0402
R265	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R266	0613952Q56	CER CHIP RES 200 OHM 5 0402
R267	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R269	0613952Q49	CER CHIP RES 100 OHM 5 0402
R270	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R271	0613952Q96	CER CHIP RES 9100 OHM 5 0402
R272	0613952Q49	CER CHIP RES 100 OHM 5 0402
R277	NOT PLACED	–
R278	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R279	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R280	0613952Q56	CER CHIP RES 200 OHM 5 0402
R284	0613952Q49	CER CHIP RES 100 OHM 5 0402
R286	0613952Q67	CER CHIP RES 560 OHM 5 0402
R401	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R411	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R412	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R421	0613952Q92	CER CHIP RES 6200 OHM 5 0402
R431	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R432	0613952Q69	CER CHIP RES 680 OHM 5 0402
R433	0613952Q81	CER CHIP RES 2200 OHM 5 0402

Ref. Des.	Part Number	Description
R434	0613952Q70	CER CHIP RES 750 OHM 5 0402
R451	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R452	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R470	0613952Q46	CER CHIP RES 75.0 OHM 5 0402
R471	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R482	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R501	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R511	0613952R25	CER CHIP RES 100K OHM 5% 0402
R519	0613952R01	CER CHIP RES 10K OHM 5% 0402
R533	0613952R25	CER CHIP RES 100K OHM 5% 0402
R551	0613952Q74	RES,MF,1.1KOHM,5%,.0625W,SM,0402,200PPM/CEL,PB-FREE
R552	0613952R19	CER CHIP RES 56K OHM 5% 0402
R553	0613952R01	CER CHIP RES 10K OHM 5% 0402
R554	0613952R01	CER CHIP RES 10K OHM 5% 0402
R555	0613952H55	CER CHIP RES 180 OHM 5% 0603
R556	0613952Q61	CER CHIP RES 330 OHM 5 0402
R571	0613952H79	CER CHIP RES 1800 OHM 5% 0603
R572	0613952R01	CER CHIP RES 10K OHM 5% 0402
R701	0613958H57	CER CHIP RES 220 OHM 5% 0805
R703	0613952R25	CER CHIP RES 100K OHM 5% 0402
R731	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R733	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R735	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1101	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1102	NOT PLACED	–
R1103	NOT PLACED	–
R1105	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1106	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1107	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1108	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1109	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1110	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1111	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1112	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1113	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1114	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1115	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1116	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1117	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1118	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1119	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1120	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1121	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1122	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1123	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1124	0613952R01	CER CHIP RES 10K OHM 5% 0402

Ref. Des.	Part Number	Description
R1125	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1133	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1201	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1202	0613952Q55	CER CHIP RES 180 OHM 5 0402
R1203	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1204	0613952Q67	CER CHIP RES 560 OHM 5 0402
R1205	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1206	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1207	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R1209	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1210	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1212	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1213	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R1214	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R1215	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1216	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1217	0613952Q57	CER CHIP RES 220 OHM 5 0402
R1218	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1219	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1220	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1221	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1223	NOT PLACED	–
R1224	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM

Ref. Des.	Part Number	Description
R1225	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1226	0613952R08	CER CHIP RES 20K OHM 5 0402
R1227	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R1228	0613952R08	CER CHIP RES 20K OHM 5 0402
R1229	0613952P18	CER CHIP RES 150K OHM 1 0402
R1230	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1231	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1239	NOT PLACED	–
R1241	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1301	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R1302	NOT PLACED	–
R1303	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1304	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1305	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R1306	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1307	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1308	0613952R19	CER CHIP RES 56K OHM 5% 0402
R1309	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1310	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1311	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1314	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1315	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1317	0688044N04	RES,METAL STRIP, 0.1 OHM,1%,0.125W,SMD, 0805,75PPM/CEL,PKG

Ref. Des.	Part Number	Description
R1318	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1319	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1320	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1321	0688044N04	RES,METAL STRIP, 0.1 OHM, 1%,0.125W,SMD, 0805,75PPM/CEL,PKG
R1322	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1323	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1324	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1325	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R1326	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1327	0613952Q61	CER CHIP RES 330 OHM 5 0402
R1328	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1329	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R1330	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1331	0613952R08	CER CHIP RES 20K OHM 5 0402
R1332	0613952R08	CER CHIP RES 20K OHM 5 0402
R1334	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1335	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1336	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1337	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1338	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1339	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1340	0613952R01	CER CHIP RES 10K OHM 5% 0402

Ref. Des.	Part Number	Description
R1341	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1342	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1343	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1344	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1345	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1346	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1347	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1348	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1349	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1350	0613952R41	CER CHIP RES 470K OHM 5% 0402
R1351	0613952Q49	CER CHIP RES 100 OHM 5 0402
R1352	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1353	NOT PLACED	–
R1354	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1355	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1356	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1357	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1358	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1370	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1371	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1401	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1402	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1403	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM

Ref. Des.	Part Number	Description
R1404	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1405	NOT PLACED	–
R1406	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1409	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1410	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1411	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1412	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1415	0613952Q63	CER CHIP RES 390 OHM 5 0402
R1416	0613952Q41	CER CHIP RES 47.0 OHM 5 0402
R1417	0613952R12	CER CHIP RES 30K OHM 5 0402
R1418	0613952R13	CER CHIP RES 33K OHM 5% 0402
R1419	NOT PLACED	–
R1420	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R1421	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1422	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1423	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1424	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1437	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1438	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1439	NOT PLACED	–
R1440	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1449	NOT PLACED	–
R1462	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1463	0613952R25	CER CHIP RES 100K OHM 5% 0402

Ref. Des.	Part Number	Description
R1464	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1465	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1466	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1467	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1596	NOT PLACED	–
R1704	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1706	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1708	0613952R25	CER CHIP RES 100K OHM 5% 0402
R1709	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9901	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R9902	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9903	NOT PLACED	–
R9904	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9905	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9906	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R9907	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R9908	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9909	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9910	0613952R11	CER CHIP RES 27K OHM 5% 0402
R9911	0613952R09	CER CHIP RES 22K OHM 5% 0402
R9912	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9913	0613952R24	CER CHIP RES 91K OHM 5 0402
R9914	0613952R21	CER CHIP RES 68K OHM 5% 0402
R9915	0613952R29	CER CHIP RES 150K OHM 5% 0402

Ref. Des.	Part Number	Description
R9916	NOT PLACED	–
R9917	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9918	NOT PLACED	–
R9919	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9920	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9921	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9922	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9923	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9924	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9925	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9926	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9927	0613952R12	CER CHIP RES 30K OHM 5 0402
R9930	0613952Q66	CER CHIP RES 510 OHM 5 0402
R9931	0613952R15	CER CHIP RES 39K OHM 5% 0402
R9932	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9933	0613952R25	CER CHIP RES 100K OHM 5% 0402
R9934	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9960	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9961	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9990	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9996	NOT PLACED	–
R9997	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9998	0613952Q49	CER CHIP RES 100 OHM 5 0402
R9999	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM

Ref. Des.	Part Number	Description
R10000	0613952H37	CER CHIP RES 33.0 OHM 5% 0603
R10001	0613952H37	CER CHIP RES 33.0 OHM 5% 0603
RT150	0680590Z01	THERMISTOR_33K
SH01	2671728L01	SHIELD, BOTTOM BACK END 1
SH02	2671818L01	SHIELD, BOTTOM FRONT END 1
SH03	2671819L01	SHIELD, BOTTOM FRONT END 2
SH04	2671685M01	SHIELD, BOTTOM MIXER U1
SH05	2671821L01	SHIELD, BOTTOM SYNTHESIZER
SH06	2671822L01	SHIELD, TOP DRIVER
SH07	2671823L01	SHIELD, TOP HARMONIC FILTER
SH08	2671824L01	SHIELD, TOP PA
SH09	2671825L01	SHIELD, TOP SYNTHESIZER
SH10	2671826L01	SHIELD, TOP VCO
SH11	2671817L01	SHIELD, BOTTOM BACK END 2
T470	2515396H01	BALUN, TRANSFORMER
T471	2516320H01	XFMR SMALL SIGNAL SURFACE MT
U1	5188493T01	IC,VREG/SWG,LP2989, SM,MINI SO-8 HI PRCN REG 5V
U2	5185941F35	IC, VREG, NOPB
U3	5185941F35	IC, VREG, NOPB
U20	5171025M01	DUAL SPDT ANALOG SWITCHES, LOW R
U102	5115678H01	VHF/UHF/800/900 MHZ LDMOS DRIVER IC
U103	5115022H01	IC TEMPERATURE SENSOR
U104	5185765B26	IC PWR CTRL IN MOS20
U201	5116411H01	IC,OP AMP,
U202	5116245H01	CC LVFRACN
U203	5185941F40	IC, 12 BIT DAC
U470	5164015H81	IC,MXR,DBL BAL GILBERT,CELL,SM

Ref. Des.	Part Number	Description
U500	5102495J14	IC,IF,IF DIGITILIZING SUBSYSTEM IC,AD9864, QFN
U701	5185941F45	ATTEN,VAR,14.4DBMIN, 15.6DBMAX,0-2000 MHZFREQ,50OHM,PCMT, SOT
U702	5116349H01	DUAL INVERTER IC
U1101	5188493T01	IC,VREG/SWG,LP2989, SM,MINI SO-8 HI PRCN REG 5V
U1201	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE
U1301	5188691V01	IC,MUX/DEMUX, NC7SB3157P6X,SM, SC70-6,1PER PKG,BUS, PB FREE
U1302	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1303	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U1304	5185143E77	IC, MAKO ASIC, CMOS PWR MGMT
U1305	5185941F22	IC,OPAMP,SGL,OPA237, SOT23,NOPB
U1306	5114000B39	IC,BFR,1PER PKG,SM, SOT-353,PB-FREE
U1401	5171266M01	BRAVO IC
U1404	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1405	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1406	5114000A48	IC,INVTR,1GU04,1PER PKG,SOT-353,PB-FREE
U1408	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U1409	5175358M01	IC,SRAM,32MB,2MBX16, 70NS
U1410	5185956E69	IC,DRAM,64MB,60NS,IC 1.8V 64
U9901	5114000A48	IC,INVTR,1GU04,1PER PKG, SOT-353,PB-FREE
U9902	5102495J14	IC, SINGLE AND GATE TC7S08FU
U9903	5114007M28	IC,F-F/D,1PER PKG, 17SZ74,N-I,SM,SOIC8, PB-FREE

Ref. Des.	Part Number	Description
U9904	5171304L01	DUAL OP AMP, LOW POWER, LOW NOISE
U9905	4871006L01	MUN53XX NPN/PNP DIGITAL TRANSISTOR
U9918	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
VR3	4815155H01	RECTIFIER
VR4	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR51	4805656W99	ZENER DIODE 5.6V
VR52	4805656W99	ZENER DIODE 5.6V
VR53	4805656W99	ZENER DIODE 5.6V
VR1201	4813979P12	DIODE ARRAY,TRANSIENT PROTECTION,SM, SOT-457,12V,.225W,ZEN, 4,PB
VR1202	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1203	4813977A43	PB-FREE, NOT COMPLETELY ENRICHED
VR1204	4813977M18	DIODE,ZEN,MBZ5239,SM, SOT-23,9.1V,10MA, .225W,ZEN,PB-FREE
VR1205	NOT PLACED	–
VR1206	4805656W99	ZENER DIODE 5.6V
VR1207	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1208	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1209	4809788E21	DIODE, ZENER, SOD-323, SMD, W18 COMPLIANT
VR1301	4813977M11	DIODE,ZEN,MBZ5232,SM, SOT-23,5.6V,10MA,.225W, ZEN,PB-FREE
VR9901	4815821H01	ZENER VOLTAGE REGULATOR 2.4V 200MW
Y200	4816748H01	CRYSTAL OSCILLATOR
Y1301	4809995L05	XTAL QUARTZ 32.768KHZ CC4V-T1
Y1302	4864005H01	RESONATOR, CRYSTAL 24.576 MHZ

Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

Crystal orders should specify the crystal type number, crystal and carrier frequency, and the model number in which the part is used.

A.2 Motorola Online

Motorola Online users can access our online catalog at

<https://www.motorola.com/businessonline>

To register for online access, please call 1-800-422-4210 (for U.S. and Canada Service Centers only). International customers can obtain assistance at <https://www.motorola.com/businessonline>

A.3 Mail Orders

Mail orders are only accepted by the US Federal Government Markets Division (USFGMD).

Motorola
7031 Columbia Gateway Drive
3rd Floor – Order Processing
Columbia, MD 21046
U.S.A.

A.4 Telephone Orders

Radio Products and Solutions Organization*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (United States and Canada)

U.S. Federal Government Markets Division (USFGMD)
1-877-873-4668
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

Radio Products and Solutions Organization*

(United States and Canada)

1-800-622-6210

1-847-576-3023 (United States and Canada)

USFGMD

(Federal Government Orders)

1-800-526-8641 (For Parts and Equipment Purchase Orders)

A.6 Parts Identification

Radio Products and Solutions Organization*

(United States and Canada)

1-800-422-4210

A.7 Product Customer Service

Radio Products and Solutions Organisation (United States and Canada)

1-800-927-2744

* The Radio Products and Solutions Organization (RPSO) was formerly known as the Radio Products Services Division (RPSD) and/or the Accessories and Aftermarket Division (AAD).

Appendix B Motorola Service Centers

B.1 Servicing Information

If a unit requires further complete testing, knowledge and/or details of component level troubleshooting or service than is customarily performed at the basic level, please send the radio to a Motorola Service Center as listed below.

B.2 Motorola Service Center

45D Butterfield Trail
El Paso, TX 79906
Tel: 1-800-227-6772

B.3 Motorola Federal Technical Center

4395 Nicole Drive
Lanham, MD 20706
Tel: 1-800-969-6680
Fax: 1-800-784-4133

B.4 Motorola Canadian Technical Logistics Center

Motorola Canada Ltd.
8133 Warden Avenue
Markham, Ontario, L6G 1B3
Tel: 1-800-543-3222
Fax: 1-888-331-9872 or 1-905-948-5970

Notes

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to ASTRO portable and mobile subscriber radio products. All terms do not necessarily apply to all radios, and some terms are merely generic in nature.

Term	Definition
A/D	<i>See analog-to-digital conversion.</i>
Abacus IC	A custom integrated circuit providing a digital receiver intermediate frequency (IF) backend.
ADC	<i>See analog-to-digital converter.</i>
ALC	<i>See automatic level control.</i>
analog	Refers to a continuously variable signal or a circuit or device designed to handle such signals. <i>See also digital.</i>
Analog-to-Digital, Digital-to-Analog and Glue	An integrated circuit designed to be an interface between the radio's DSP, which is digital, and the analog transmitter and receiver ICs.
analog-to-digital conversion	Conversion of an instantaneous dc voltage level to a corresponding digital value. <i>See also D/A.</i>
analog-to-digital converter	A device that converts analog signals into digital data. <i>See also DAC.</i>
automatic level control	A circuit in the transmit RF path that controls RF power amplifier output, provides leveling over frequency and voltage, and protects against high VSWR.
band	Frequencies allowed for a specific purpose.
BBP	<i>See baseband interface port.</i>
baseband interface port	Synchronous serial interface to the transceiver section used to transfer transmit and receive audio data.
BGA	<i>See ball grid array.</i>
ball grid array	A type of IC package characterized by solder balls arranged in a grid that are located on the underside of the package.
CE interface connector	Radio accessory connector used for communication with a computer for radio programming and radio servicing.
CID	Caller ID Display.

Term	Definition
CODEC	<i>See coder/decoder.</i>
codeplug	Firmware that contains the unique personality for a system or device. A codeplug is programmable and allows changes to system and unit parameters. <i>See also firmware.</i>
coder/decoder	A device that encodes or decodes a signal.
CPS	<i>See Customer Programming Software.</i>
Customer Programming Software	Software with a graphical user interface containing the feature set of an ASTRO radio. <i>See also RSS.</i>
D/A	<i>See digital-to-analog conversion.</i>
DAC	<i>See digital-to-analog converter.</i>
Data communication equipment	Definition for device (such as radio) data communications using the RS232 protocol. The correct data communication wiring requires the device's TX pins (output) to connect to the RX pins (input) and the RTS pins (output) to connect to the CTS pins (input). It is incorrect to attach device pins having the same name to each other.
Data terminal equipment	Data terminal equipment; for example, a computer.
DCE	<i>See Data communication equipment.</i>
default	A pre-defined set of parameters.
digital	Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals. <i>See also analog.</i>
digital-to-analog conversion	Conversion of a digital signal to a voltage that is proportional to the input value. <i>See also A/D.</i>
digital-to-analog converter	A device that converts digital data into analog signals. <i>See also ADC.</i>
Digital Private-Line	A type of digital communication that utilizes privacy call, as well as memory channel and busy channel lock-out to enhance communication efficiency.
digital signal processor	A microcontroller specifically designed for performing the mathematics involved in manipulating analog information, such as sound, that has been converted into a digital form. DSP also implies the use of a data compression technique.

Term	Definition
digital signal processor code	Object code executed by the Digital Signal Processor in an ASTRO subscriber radio. The DSP is responsible for computation-intensive tasks, such as decoding ASTRO signaling.
DPL	<i>See Digital Private-Line. See also PL.</i>
DSP	<i>See digital signal processor.</i>
DSP code	<i>See digital signal processor code.</i>
DTE	<i>See Data terminal equipment.</i>
DTMF	<i>See dual tone multi-frequency.</i>
dual tone multi-frequency	The system used by touch-tone telephones. DTMF assigns a specific frequency, or tone, to each key so that it can easily be identified by a microprocessor.
EEPOT	Electrically Programmable Digital Potentiometer.
EEPROM	<i>See Electrically Erasable Programmable Read-Only Memory.</i>
Electrically Erasable Programmable Read-Only Memory	A special type of PROM that can be erased by exposing it to an electrical charge. An EEPROM retains its contents even when the power is turned off.
FCC	Federal Communications Commission.
firmware	Code executed by an embedded processor such as the Host or DSP in a subscriber radio. This type of code is typically resident in non-volatile memory and as such is more difficult to change than code executed from RAM.
FGU	<i>See frequency generation unit.</i>
flash	A non-volatile memory device similar to an EEPROM. Flash memory can be erased and reprogrammed in blocks instead of one byte at a time.
FLASHcode	A 13-digit code which uniquely identifies the System Software Package and Software Revenue Options that are enabled in a particular subscriber radio. FLASHcodes are only applicable for radios which are upgradeable through the FLASHport process.
FLASHport	A Motorola term that describes the ability of a radio to change memory. Every FLASHport radio contains a FLASHport EEPROM memory chip that can be software written and rewritten to, again and again.
FMR	<i>See Florida Manual Revision.</i>
Florida Manual Revision	A document that provides interim updates to a publication until the entire publication can be updated and reissued.

Term	Definition
frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
frequency generation unit	This unit generates ultra-stable, low-phase noise master clock and other derived synchronization clocks that are distributed throughout the communication network.
General-Purpose Input/Output	Pins whose function is programmable.
GPIO	<i>See General-Purpose Input/Output.</i>
host code	Object code executed by the host processor in an ASTRO subscriber radio. The host is responsible for control-oriented tasks such as decoding and responding to user inputs.
IC	<i>See integrated circuit.</i>
IF	Intermediate Frequency.
IMBE	A sub-band, voice-encoding algorithm used in ASTRO digital voice.
inbound signaling word	Data transmitted on the control channel from a subscriber unit to the central control unit.
integrated circuit	An assembly of interconnected components on a small semiconductor chip, usually made of silicon. One chip can contain millions of microscopic components and perform many functions.
ISW	<i>See inbound signaling word.</i>
keep-alive mode	A software-controlled operational mode in which power for the radio remains on after the On/Off/volume control knob is turned off to allow the microcontroller unit to complete its power-down sequence. Then, the radio completely powers off.
key-variable loader	A device used to load encryption keys into a radio.
kHz	<i>See kilohertz.</i>
kilohertz	One thousand cycles per second. Used especially as a radio-frequency unit.
KVL	<i>See key-variable loader.</i>
LCD	<i>See liquid-crystal display.</i>
LED	<i>See Lilon.</i>
light emitting diode	An electronic device that lights up when electricity is passed through it.
Lilon	Lithium-ion.

Term	Definition
liquid-crystal display	An LCD uses two sheets of polarizing material with a liquid-crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.
LO	Local oscillator.
low-speed handshake	150-baud digital data sent to the radio during trunked operation while receiving audio.
LSH	<i>See low-speed handshake.</i>
Master In Slave Out	SPI data line from a peripheral to the MCU.
Master Out Slave In	SPI data line from the MCU to a peripheral.
MCU	<i>See microcontroller unit.</i>
MDC	Motorola Digital Communications.
MDI	MCU/DSP Interface internal to the Patriot IC.
MHz	<i>See Megahertz.</i>
Megahertz	One million cycles per second. Used especially as a radio-frequency unit.
microcontroller unit	Also written as μC . A microprocessor that contains RAM and ROM components, as well as communications and programming components and peripherals.
MISO	<i>See Master In Slave Out.</i>
MOSI	<i>See Master Out Slave In.</i>
multiplexer	An electronic device that combines several signals for transmission on some shared medium (e.g., a telephone wire).
MUX	<i>See multiplexer.</i>
NiCd	Nickel-cadmium.
NiMH	Nickel-metal-hydride.
OMPAC	<i>See over-molded pad-array carrier.</i>
open architecture	A controller configuration that utilizes a microprocessor with extended ROM, RAM, and EEPROM.
oscillator	An electronic device that produces alternating electric current and commonly employs tuned circuits and amplifying components.
OSW	<i>See outbound signaling word.</i>
OTAR	<i>See over-the-air rekeying.</i>

Term	Definition
outbound signaling word	Data transmitted on the control channel from the central controller to the subscriber unit.
over-molded pad-array carrier	A Motorola custom IC package, distinguished by the presence of solder balls on the bottom pads.
over-the-air rekeying	Allows the dispatcher to remotely reprogram the encryption keys in the radio.
PA	Power amplifier.
paging	One-way communication that alerts the receiver to retrieve a message.
Patriot IC	A dual-core processor that contains an MCU and a DSP in one IC package.
PC Board	Printed Circuit Board. Also referred to as a PCB.
phase-locked loop	A circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.
PL	<i>See private-line tone squelch.</i>
PLL	<i>See phase-locked loop.</i>
private-line tone squelch	A continuous sub-audible tone that is transmitted along with the carrier. <i>See also DPL.</i>
Programmable Read-Only Memory	A memory chip on which data can be written only once. Once data has been written onto a PROM, it remains there forever.
PROM	<i>See Programmable Read-Only Memory.</i>
PTT	<i>See Push-to-Talk.</i>
Push-to-Talk	The switch or button usually located on the left side of the radio which, when pressed, causes the radio to transmit. When the PTT is released, the unit returns to receive operation.
radio frequency	The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
radio frequency power amplifier	Amplifier having one or more active devices to amplify radio signals.
Radio Interface Box	A service aid used to enable communications between a radio and the programming software.
Radio Service Software	DOS-based software containing the feature set of an ASTRO radio. <i>See also CPS.</i>
RAM	<i>See random access memory.</i>
random access memory	A type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes.

Term	Definition
read-only memory	A type of computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read.
real-time clock	A module that keeps track of elapsed time even when a computer is turned off.
receiver	Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
registers	Short-term data-storage circuits within the microcontroller unit or programmable logic IC.
repeater	Remote transmit/receive facility that re-transmits received signals in order to improve communications range and coverage (conventional operation).
repeater/talkaround	A conventional radio feature that permits communication through a receive/transmit facility, which re-transmits received signals in order to improve communication range and coverage.
RESET	Reset line: an input to the microcontroller that restarts execution.
RF	<i>See radio frequency.</i>
RF PA	<i>See radio frequency power amplifier.</i>
RIB	<i>See Radio Interface Box.</i>
ROM	<i>See read-only memory.</i>
RPCIC	Regulator/power control IC.
RSS	<i>See Radio Service Software.</i>
RTC	<i>See real-time clock.</i>
RX	Receive.
RX DATA	Recovered digital data line.
SAP	<i>See Serial Audio CODEC Port.</i>
SCI IN	<i>See Serial Communication Interface Input Line.</i>
Serial Audio CODEC Port	SSI to and from the GCAP II IC CODEC used to transfer transmit and receive audio data.
Serial Communication Interface Input Line	A full-duplex (receiver/transmitter) asynchronous serial interface.
Serial Input/Output IC	An integrated circuit that provides SB9600 serial and power-control functions.

Term	Definition
Serial Peripheral Interface	How the microcontroller communicates to modules and ICs through the CLOCK and DATA lines.
signal	An electrically transmitted electromagnetic wave.
Signal Qualifier mode	An operating mode in which the radio is muted, but still continues to analyze receive data to determine RX signal type.
SIO IC	<i>See Serial Input/Output IC.</i>
Smart Radio Interface Box	A service aid containing microcontroller buffered RAM that enhances the speed and capability of programming a radio with programming software.
softpot	<i>See software potentiometer.</i>
software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
software potentiometer	A computer-adjustable electronic attenuator.
spectrum	Frequency range within which radiation has specific characteristics.
SPI	<i>See Serial Peripheral Interface.</i>
squelch	Muting of audio circuits when received signal levels fall below a pre-determined value. With carrier squelch, all channel activity that exceeds the radio's preset squelch level can be heard.
SRAM	<i>See static RAM.</i>
SRIB	<i>See Smart Radio Interface Box.</i>
SSI	<i>See Synchronous Serial Interface.</i>
Standby mode	An operating mode in which the radio is muted but still continues to monitor data.
static RAM	A type of memory used for volatile, program/data memory that does not need to be refreshed.
Synchronous Serial Interface	DSP interface to peripherals that consists of a clock signal line, a frame synchronization signal line, and a data line.
system central controllers	Main control unit of the trunked dispatch system; handles ISW and OSW messages to and from subscriber units (<i>See ISW and OSW</i>).
system select	The act of selecting the desired operating system with the system-select switch (also, the name given to this switch).
talkaround	A conventional radio feature that lets you bypass the repeater and connect directly to another radio. The transmit and receive frequencies are the same.

Term	Definition
thin small-outline package	A type of dynamic random-access memory (DRAM) package that is commonly used in memory applications.
time-out timer	A timer that limits the length of a transmission.
TOT	<i>See time-out timer.</i>
transceiver	Transmitter-receiver. A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.
transmitter	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
TSOP	<i>See thin small-outline package.</i>
TX	Transmit.
UART	<i>See also Universal Asynchronous Receiver Transmitter.</i>
UHF	Ultra-High Frequency.
Universal Asynchronous Receiver Transmitter	A microchip with programming that controls a computer's interface to its attached serial devices.
Universal Serial Bus	An external bus standard that supports data transfer rates of 12 Mbps.
USB	<i>See Universal Serial Bus.</i>
VCO	<i>See voltage-controlled oscillator.</i>
vector sum excited linear predictive coding	A voice-encoding technique used in ASTRO digital voice.
VHF	Very-High Frequency.
VIP	Vehicle Interface Port.
VOCON	<i>See vocoder/controller.</i>
vocoder	An electronic device for synthesizing speech by implementing a compression algorithm particular to voice. <i>See also voice encoder.</i>
vocoder/controller	A PC board that contains an ASTRO radio's microcontroller, DSP, memory, audio and power functions, and interface support circuitry.
voice encoder	The DSP-based system for digitally processing analog signals, and includes the capabilities of performing voice compression algorithms or voice encoding. <i>See also vocoder.</i>
voltage-controlled oscillator	An oscillator in which the frequency of oscillation can be varied by changing a control voltage.
VSELP	<i>See vector sum excited linear predictive coding.</i>

Notes

Index

Numerics

24.576 MHz reference generation, MAKO IC 3-22
5-volt regulator U1101, VOCON 3-20

A

Abacus III IC U500 3-5
algorithms, encryption module 3-29
amplifier
 audio switch U20 3-20
 driver U102 3-7
 power transistor 3-8
antenna contact M1704 3-3
antenna switch, transmitter 3-8
audio
 circuitry, GCAP II IC U501 3-19
 components, VOCON section 3-18
 single-ended gain stage U9904 3-20
 switch U20 3-20
audio path
 receive 3-27
 transmit 3-26
audio, power and accessory interface
 See MAKO IC
automatic level control (ALC), PCIC 3-10

B

baseband interface port (BBP) 3-16
battery
 connector J3 3-2
 types and capacities 2-1
block diagram
 Abacus III IC U500 3-6
 overall 3-1
 power distribution
 UHF 2-1
 VHF 2-1
 receiver 3-4
 transceiver 3-2
board overlays
 main board
 UHF 9-2
 VHF 8-2
 mainboard list 8-1, 9-1
 transceiver list 8-1, 9-1
 VOCON section list 8-1, 9-1
boot data path control, MAKO IC 3-21
buttons and controls, VOCON section 3-24

C

caution symbol meaning 1-2
CE interface connector 3-1
charts, 5-10
charts, troubleshooting
 button test 5-14

DC supply failure 5-6
keyload failure 5-29
list 5-1
 main 5-2
 power-up failure 5-3
 secure hardware failure 5-30
 top/side button test 5-15
VCO Tx/Rx unlock 5-16
VOCON
 Rx audio 5-19
 Rx RF 5-21
 Tx audio 5-17
 Tx RF 5-26
 volume set error 5-13
components
 block diagram 3-1
 controller (VOCON) 3-14
 encryption module 3-29
 keypad module 3-23
connections
 transceiver 3-2
connector
 CE interface connector 3-1
 J1 (display and keypad) 3-14
 J2 (encryption module, CE interface connection and audio jack connection) 3-14
 J3 (buttons and controls connections) 3-14
controller components, VOCON section 3-14
crystal filter (IF filter), receiver front end 3-5
customer service A-2

D

D/A outputs, PCIC 3-10
danger symbol meaning 1-2
detailed theory
 transceiver (RF) section 3-2
 VOCON section 3-13
digital signal processor (DSP)
 baseband interface port (BBP) 3-16
 detailed theory 3-16
 serial audio CODEC port (SAP) 3-16
 timer module 3-16
 universal serial bus (USB) 3-16
driver amplifier U102 3-7
dual display module
 VOCON section 3-23

E

encryption
 module 3-29
 module algorithms 3-29
errors, power-up self-check 4-5
ESD protection circuitry, VOCON section 3-22
external interface module (EIM) 3-15

F

Flash memory IC U1410 3-17
flipper IC U301
 logic level translation 3-21
FracN IC U202 3-11

frequency generator unit (FGU)
 FracN IC U202 3-11
 loop filter 3-12
 reference oscillator Y200 3-11
 VCO buffer IC (VCOBIC) U200 3-12

G

gain
 audio
 single-ended U9904 3-20
 GCAP II IC U501
 audio circuitry 3-19
 MCU interface 3-19
 voltage regulation 3-19
 glossary Glossary-1

H

handling precautions, troubleshooting 4-1
 harmonic filter, transmitter 3-8

I

IC
 Abacus III U500 3-5
 driver amplifier U102 3-7
 Flash memory U1410 3-17
 FracN U202 3-11
 MAKO U1304 3-19, 3-20
 Patriot U401 3-14
 power-control (PCIC) U104 3-9
 static RAM (SRAM) U1409 3-17
 IF filter (crystal filter), receiver front end 3-5
 interconnections
 VOCON section 3-13
 interface support components, VOCON section 3-20

K

keep-alive mode 2-1
 key variable loader (KVL) 3-29
 keypad
 VOCON section 3-23
 keypad module
 description 3-23
 KVL (key variable loader) 3-29

L

LNA, receiver front end 3-5
 logic level translation, flipper IC 3-21
 loop filter, FGU 3-12

M

main board overlays
 UHF 9-2
 VHF 8-2

MAKO
 power routing 2-2
 MAKO IC
 24.576 MHz reference generation 3-22
 boot data path control 3-21
 one-wire support 3-21
 radio ce connector 3-21
 SSI clock and frame sync generator 3-22
 USB transceiver 3-21
 watchdog timer 3-21
 MAKO IC U1304
 detailed theory 3-19, 3-20
 manual
 notations 1-2
 MCU interface, GCAP II IC U501 3-19
 memory components, VOCON section 3-14
 microcontroller unit (MCU)
 description 3-15
 external interface module (EIM) 3-15
 multiple queue serial peripheral interface (MQSPI) 3-15
 one-way interface 3-15
 universal asynchronous receiver/transmitter (UART) 3-15
 mixer, receiver front end 3-5
 mode, keep-alive 2-1
 module
 encryption 3-29
 keypad 3-23
 multiple queue serial peripheral interface (MQSPI) 3-15

N

notations in manual 1-2

O

one-way interface 3-15
 one-wire support, MAKO IC 3-21
 option selects, universal connector 3-23
 ordering replacement parts A-1
 oscillator
 reference Y200, FGU 3-11
 sampling clock 3-6
 second local 3-6
 voltage-controlled (VCO) 3-7
 overview
 keypad module 3-23
 VOCON section 3-13

P

parts, ordering replacement A-1
 partslist
 NUD7115A 8-1
 NUE7350A 9-1
 Patriot IC U401
 description 3-14
 digital signal processor (DSP) 3-16
 microcontroller unit (MCU) 3-15
 PCIC (power-control IC) U104
 automatic level control (ALC) 3-10
 D/A outputs 3-10

- detailed theory 3-9
- purpose 3-7
- temperature cut back 3-10
- voltage multiplier 3-10
- voltage regulator 3-10
- power
 - amplifier transistor 3-8
 - components, VOCON section 3-18
 - conditioning components, transceiver 3-4
- power control IC U104 *See* PCIC (power control IC) U104
- power distribution
 - block diagram
 - UHF 2-1
 - VHF 2-1
 - keep-alive mode 2-1
 - radio 2-1
 - transceiver section 2-2
 - transmitter 3-7
 - VOCON section 2-2
- power-up self-check
 - diagnostics and repair 4-6
 - errors 4-5
- power-up/power-down sequence 3-28
- pre-selector and post-selector filters, receiver front end 3-5

R

- radio
 - keep-alive mode 2-1
 - power distribution 2-1
 - power-up/power-down sequence 3-28
- radio ce connector
 - interface circuitry, VOCON section 3-22
 - location 3-23
- radio ce connector, MAKO IC 3-21
- receive audio path, VOCON section 3-27
- receiver
 - back end
 - Abacus III IC U500 3-5
 - detailed theory 3-5
 - sampling clock oscillator 3-6
 - second LO 3-6
 - block diagram 3-4
 - front end
 - detailed theory 3-4
 - IF filter (crystal filter) 3-5
 - low-noise amplifier (LNA) 3-5
 - mixer 3-5
 - pre-selector and post-selector filters 3-5
- reference oscillator Y200, FGU 3-11
- replacement parts, ordering A-1

S

- sampling clock oscillator 3-6
- schematics
 - mainboard list 8-1, 9-1
 - transceiver (RF) board 8-5, 9-5
 - transceiver board list 8-1, 9-1
 - VOCON section list 8-1, 9-1
- second LO (local oscillator) 3-6

- serial audio CODEC port (SAP) 3-16
- service tools, recommended 4-2
- signal tracing, troubleshooting 4-3
- SSI clock and frame sync generator, MAKO IC 3-22
- standard supply voltages 4-4
- static RAM (SRAM) IC U1409 3-17
- symbols
 - caution 1-2
 - danger 1-2
 - warning 1-2
- system clocks
 - troubleshooting 4-4
 - VOCON section 3-25

T

- temperature cut back, PCIC 3-10
- terms and definitions Glossary-1
- timer module, DSP 3-16
- tools, recommended service 4-2
- transceiver
 - antenna contact M1704 3-3
 - battery connector J3 3-2
 - block diagram 3-2
 - connections 3-2
 - detailed theory 3-2
 - power conditioning 3-4
 - power distribution diagram 2-2
 - schematics 8-5, 9-5
 - VOCON section interface 3-3
 - voltage regulators 2-2
- transmit audio path, VOCON section 3-26
- transmitter
 - antenna switch 3-8
 - driver amplifier U102 3-7
 - harmonic filter 3-8
 - introduction 3-7
 - PCIC (power-control IC) U104 3-9
 - power amplifier transistor 3-8
 - power distribution 3-7
 - power-control IC (PCIC) 3-7
- troubleshooting
 - button test 5-14
 - charts listing 5-1
 - DC supply failure 5-6
 - display failure 5-10
 - handling precautions 4-1
 - keyload failure 5-29
 - main chart 5-2
 - power-up failure 5-3
 - power-up self-check
 - diagnostics and repair 4-6
 - errors 4-5
 - secure hardware failure 5-30
 - service tools 4-2
 - signal tracing 4-3
 - standard supply voltages 4-4
 - system clocks 4-4
 - top/side button test 5-15
 - VCO Tx/Rx unlock 5-16
 - VOCON
 - Rx audio 5-19
 - Rx RF 5-21
 - Tx audio 5-17

- Tx RF 5-26
- voltage measurement 4-3
- volume set error 5-13
- troubleshooting waveforms
 - 16.8 MHz buffer input and output 6-3
 - 24.576 MHz clock 6-2
 - 32.768 kHz clock outputs 6-4
 - list 6-1
- receive baseband interface port (BBP) 6-6
- RX serial audio port (SAP) 6-5
- transmit baseband interface port (BBP) 6-7

U

- UHF R2 2-2
- universal asynchronous receiver/transmitter (UART) 3-15
- universal connector
 - option selects 3-23
- universal serial bus (USB) 3-16
- USB transceiver, MAKO IC 3-21

V

- VCO (voltage-controlled oscillator) 3-7
- VCO buffer IC (VCOBIC) U200, FGU 3-12
- VOCON section
 - 5-volt regulator U1101 3-20
 - audio
 - components 3-18
 - single-ended gain stage U9904 3-20
 - switch U20 3-20
 - buttons and controls 3-24
 - connector J1 (display and keypad) 3-14
 - connector J2 (encryption module, CE interface connection and audio jack connection) 3-14
 - connector J3 (buttons and controls connections) 3-14
 - controller components 3-14

- dual display
 - module 3-23
- ESD protection circuitry 3-22
- Flash memory IC U1410 3-17
- interconnections 3-13
- interface support components 3-20
- keypad 3-23
- MAKO IC U1304 3-19, 3-20
- memory components 3-14
- overview 3-13
- Patriot IC U401 3-14
- power components 3-18
- power distribution 2-2
- radio ce interface connector circuitry 3-22
- receive audio path 3-27
- static RAM (SRAM) IC U1409 3-17
- system clocks 3-25
- transmit audio path 3-26
- VOCON section interface 3-3
- voltage
 - measurement, troubleshooting 4-3
 - multiplier, PCIC 3-10
 - regulation, GCAP II IC U501 3-19
 - regulator, PCIC 3-10
 - regulators, transceiver 2-2
- voltage-controlled oscillator (VCO) 3-7
- voltages, standard supply 4-4

W

- warning symbol meaning 1-2
- watchdog timer, MAKO IC 3-21
- waveforms, troubleshooting
 - 16.8 MHz buffer input and output 6-3
 - 24.576 MHz clock 6-2
 - 32.768 kHz clock outputs 6-4
 - list 6-1
 - receive baseband interface port (BBP) 6-6
 - RX serial audio port (SAP) 6-5
 - transmit baseband interface port (BBP) 6-7



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