MOTOROLA



CDM Series™
PRO Series™

Professional Series
Two-Way Mobile Radios

Detailed Service Manual



CDM Series™ and PRO Series™ Two-Way Mobile Radios

Detailed Service Manual

6881091C63-C

Product Safety and RF Exposure Compliance



Before using this product, read the operating instructions for safe usage contained in the Product Safety and RF Exposure booklet enclosed with your radio.

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 6881095C99) 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.

Foreword

The information contained in this manual relates to all CDM Series and PRO Series models of Professional Series two-way mobile radios. This manual provides sufficient information to enable qualified service technicians to troubleshoot and repair a Professional Series two-way mobile radio to the component level.

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 board overlays. To obtain FMRs, please contact the Product Customer Service. (Refer to the Appendix in the back of this manual for contact information.)

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Document History

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

Edition	Description	Date
6881091C63-O	Initial Release	Sep.1999
6881091C63-C	Included info from FMR 2075-1. EPP updates. Updated Controller T12 parts list (EPP) and T9 with 8471224L01 parts list. Added PCB, Schematics. Parts Lists for PCBs 8471234L02 (VHF, 25-45W, LDMOS), 8471223L02 (UHF Band1, 25-40W, LDMOS) 8471235L04 (VHF, 1-25W, LDMOS), 8471224L03 (UHF Band1, 1-25W, LDMOS)	Nov. 2007

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CDM Series™ and PRO Series™ Two-Way Mobile Radios

Detailed Service Manual

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Chapter 1: Service Maintainability

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Section 1
INTRODUCTION

1.0 About this Manual

1.1 Scope

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

NOTE Before operating or testing these units, please read the Product Safety and RF Exposure booklet (Motorola publication part number 6881095C99) enclosed with your radio.

1.2 Organization

This manual is organized such that the first three chapters contain non–band-specific information, and the remaining chapters cover band-specific information (for example, VHF low power, UHF Band 1 high power, etc.).

All data on control heads—including board overlays, schematics, and parts lists—is contained in Chapter 2, and all data on controllers is in Chapter 3.

The band-specific chapters (Chapters 4–13) each contain their own sections on:

- model charts and technical specifications (Section 1)
- theory of operation (Section 2)
- troubleshooting charts (Section 3)
- board overlays, schematics, and parts lists (Section 4)

Every chapter includes its own table of contents. In addition, the introductory page for each schematics section in the manual has allocation charts, indicating the page numbers for each board overlay, schematic and parts list in the section.

1.3 Conventions

“Microprocessor” is abbreviated as “µP”.

2.0 Warranty and Service Support

Motorola offers support which includes full exchange and/or repair of the product during the warranty period (available only in certain countries), and service/repair or spare parts support out of warranty. Any “return for exchange” or “return for repair” to an authorized Motorola Dealer must be accompanied by a Warranty Claim Form. Contact an authorized Motorola dealer for Warranty Claim Forms.

2.1 Warranty Period and Return Instructions

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

In instances where the product is covered under a “return for replacement” or “return for repair” warranty, follow the steps outlined below before shipping the unit back to the appropriate Motorola warranty depot:

1. Check the product to make sure it is correctly programmed or has not been subjected to damage outside the terms of the warranty.
2. Contact Customer Resources to report the problem.
3. Fill out a Warranty Claim Form. (Forms are available from your Customer Resources representative or authorized Motorola dealer.)
4. Ship the product(s) back in the original packaging (or otherwise securely packaged) to ensure it is not damaged in transit. Enclose the Warranty Claim Form in the package.

2.2 After Warranty Period

Motorola continues to support its products in two ways after the Warranty period:

- Motorola's Radio Products and Solutions Organization (RPSO) (formerly CCSD and/or AAD) offers a repair service to both end-users and dealers at competitive prices.
- RPSO supplies individual parts and modules that can be purchased by dealers who are technically capable of performing fault analysis and repair.

2.3 Piece Parts Availability

Some replacement parts, spare parts, and/or product information can be ordered directly.

If...	It means that...
The part has a complete Motorola part number assigned to it	The part can be ordered from Radio Products and Solutions Organization.
The part does not have a part number assigned to it	The part is not normally available from Motorola.
The part number is appended with an asterisk	The part is serviceable only by a Motorola Depot.
A parts list is not included	No user-serviceable parts are available for that kit or assembly.

2.4 Replacement Parts Ordering

When ordering replacement parts and information, be sure to specify the complete Motorola identification number in your order. Direct all part orders to your local Radio Products and Solutions Organization (RPSO) office. Refer to the Appendix A: Replacement Parts Ordering contact information.

2.5 Technical Support

Motorola provides technical support to assist dealers, distributors and self-maintained customers in resolving problems, if any, with their unit. When contacting Motorola Technical Support, keep the radio's **model number** and the unit's **serial number** handy. Technical support contact information is listed below.

United States and Puerto Rico: 1-800-927-2744

Mexico, Caribbean, South and Central America: Go to https://www.motorola.com/businessonline. Log in and click on *Contact Us*.

3.0 Radio Model Information

The radio's model number and serial number are located on a label attached to the back of the unit. The radio's model number indicates the unit's RF output power, frequency band, protocols, and physical packages. The example below shows a mobile radio model number and its characteristics.

Table 1-1 Radio Model Number (**Example:** AAM25KHC9AA1AN)

Motorola Internal Use Only	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level	Model Revision	Model Package
AA or LA	**M** (for Mobile)	**25**	**K** VHF (136-174MHz)	**H** 1-25W	**C** No Display, Basic Keypad	**9** Program-mable	**AA** Conven-tional	**1** 4F	**A**	**N**
			B Low Band, R1 (29.7-36.0MHz)	**K** 25-40W	**A** No Display No Keypad		**DU** LTR	**2** 64F		
			C Low Band, R2 (36.0-42.0MHz)		**D** 1-Line Display, Limited Keypad		**DP** PassPort and LTR	**5** 128F		
			D Low Band, R3 (42.0-50.0MHz)		**F** 1-Line Display, Standard Keypad		**PW** 1.5ppm	**6** 160F LTR		
			R UHF1 (403-470MHz)					**8** 160F		
			S UHF2 (CDM:450-512MHz, PRO,1-25W: 450-527MHz, PRO,25-40W: 450-520MHz							

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Section 2

MAINTENANCE

1.0 Introduction

This chapter of the manual describes:

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

2.0 Preventive Maintenance

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

2.1 Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. We recommend **against** inspecting the interior electronic circuitry.

2.2 Cleaning

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

CAUTION **The effects of certain chemicals and their vapors can have harmful results on certain plastics. Do not use aerosol sprays, tuner cleaners, and other chemicals to clean the radio.**

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

2.2.1 Cleaning External Plastic Surfaces

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent in water. Apply this solution sparingly on the surface with a stiff, non-metallic, short-bristled brush to work all loose dirt out. Use a soft, absorbent, lintless cloth or tissue to remove the solution. Then dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

2.2.2 Cleaning Internal Circuit Boards and Components

The only factory-recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (100% by volume). Apply Isopropyl alcohol with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. Upon completion of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover, or back cover.

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

3.0 Safe Handling of CMOS and LDMOS

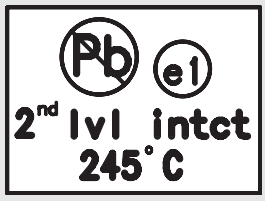
Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios. CMOS characteristics make them susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, take special precautions to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

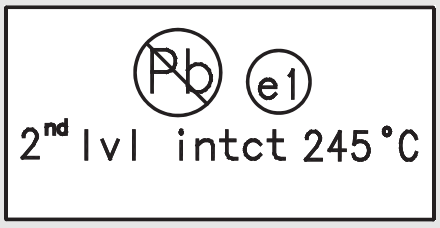
CAUTION DO NOT attempt to disassemble the radio without first referring to the disassembly and reassembly sections in the Basic Service Manual (Motorola Publication part number 6881091C62 [CDM Series models] or 6881092C71 [PRO Series models]).

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions.

4.0 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 2-1 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 2-2 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

4.1 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 Solution Organization listed in Appendix A of this manual.

4.2 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.

4.3 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.

4.4 Shields

Removing and replacing shields is recommended to be done with the Air Blower, BOSCH GHG 603 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.

5.0 Notes For All Schematics and Circuit Boards

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

- Unless otherwise stated, resistances are in Ohms (K = 1000, M = 1,000,000), and capacitances are in picofarads (pF), nanofarads (nF), or microfarads (µF).
- DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. Transmitter measurements should be made with a 1.2 µH (microHenry) choke in series with the voltage probe to prevent circuit loading.
- Interconnect Tie Point Legend:

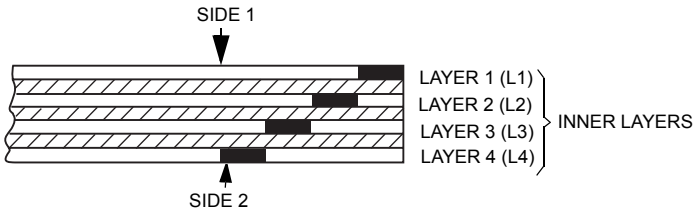
16_8MHz	16.8MHz Reference Frequency
3V3	Regulated 3.3V Supply Voltage for Voice Storage
5V	Regulated 5V Supply Voltage for RF Circuitry
5V	Regulated 5V Supply Voltage (Control Head)
5V RF	Regulated 5V Supply Voltage for RF Circuitry
5V SOURCE	5V Signal to Switch On Control Head
5VD	Regulated 5V Supply Voltage for Digital Circuitry
9V3	Regulated 9.3V Supply Voltage
9V3FLT	Filtered 9.3V Supply Voltage
A+	13.2V Supply Voltage
ADDR	Microprocessor (µP) Address Lines
AN	Analog Lines to Analog-to-Digital Converter
ANALOG INPUT 2	External Keypad Matrix Column Signal
ANALOG INPUT 3	External Keypad Matrix Row Signal
BATTERY VOLTAGE	Battery Voltage Sense Line
BL A GREEN	Back Light Anode Green
BL A RED	Back Light Anode Red
BL GREEN	Green Back Light Control
BL K GREEN	Back Light Cathode Green
BL K RED	Back Light Cathode Red
BL KP Green	Green Keypad Back Light Control
BL KP RED	Red Keypad Back Light Control
BL LCD GREEN	Green Display Back Light Control
BL LCD RED	Red Display Back Light Control
BL RED	Red Back Light Control
BOOT CNTRL	Bootstrap Mode Enable Signal
BOOT MODE	Boot Mode Select
BOOT PWR ON	Control Head Switch On Signal
BOOT SCI RX	Serial Communication Interface Receive Line
BOOT SCI TX	Serial Communication Interface Transmit Line
BOOT VPP	Boot Mode Select
BUS+	Bi-directional Serial Communication Line

BWSELECT	Signal to select between the Ceramic Filter Pairs
CEX	Chip Enable Line
CH ACT	Channel Activity Indicator Signal (Fast Squelch)
CH KP ID	Control Head Keypad ID (Data) Lines
CH REQUEST	Control Head Request from Control Head µP
CLK	Clock Signal
CNTLVLTG	PA Power Control Voltage
CNTR AUDIO	Audio Lines of the Controller
COL x	Keypad Matrix Column x
CSX	Chip Enable Line
DATA	Data Signal
DC POWER ON	Electronic Switching On or Off of the Radio's Voltage Regulators
DISCAUDIO	Audio Output Signal from the Receiver IC
ECLK	Clock (not used)
EE CS	EEPROM Chip Select
EMERGENCY CONTROL	Emergency Line to switch on the Radio's Voltage Regulators
EXP BD REQ	Service Request Line from Expansion Board
EXP1 CS	Expansion Board Chip Select 1
EXP2 CS	Expansion Board Chip Select 2
EXT KP COL	External Keypad Matrix Column Signal
EXT KP ROW	External Keypad Matrix Row Signal
EXT MIC	External (from Accessory Connector) Microphone Input
EXT SWB+	External Switched 13.2V Supply Voltage
F1200	Interrupt Line from ASFIC CMP
FECTRL 1	Control Voltage for Front-End Filter
FECTRL 2	Control Voltage for Front-End Attenuator Switch
FLASH CS	Flash Chip Select
FLASH OE	Flash Output Enable
FLAT RX SND	Option Board Audio Output Signal
FLAT TX RTN	Flat TX Input from Option Board and Accessory Connector
FLT A+	Filtered 13.2 V Supply Voltage
GP x IN	General Purpose Input x
GP x IN ACC y	General Purpose Input x from Accessory Connector Pin y
GP x IN OUT ACC y	General Purpose Input/Output x from Accessory Connector Pin y
GP x OUT	General Purpose Output x

GP x OUT ACC y	General Purpose Input x from Accessory Connector Pin y
GPIO	General Purpose Input Output Lines
HANDSET AUDIO	Handset Audio Output
HOOK	Hang-up Switch Input
HSIO	High Speed Clock In / Data Out
IF	First Intermediate Frequency Signal
IGNITION CONTROL	Ignition Line to switch on the Radio's Voltage Regulators
IN 5V RF REG	Supply Voltage for 5V Regulator in RF Section
INT KP COL	Internal Keypad Matrix Column Signal
INT KP ROW	Internal Keypad Matrix Row Signal
INT MIC	Internal (from Control Head) Microphone Input
INT SWB	Internal Switched 13.2V Supply Voltage
INT SWB+	Internal Switched 13.2V Supply Voltage
IRQ	Interrupt Request from Control Head
K9V1	9.1V in Transmit Mode
KEYPAD ID	Keypad Identification Line
LCD A0	LCD Control / Display Data Select
LCD CS	LCD Chip Select
LCD DATA	LCD Data Lines
LCD E RD	LCD Enable Read
LCD RW WR	LCD Read Write Control
LED CNTRL	LED Control Lines
LED GREEN	Green LED Control
LED RED	Red LED Control
LED YELLOW	Yellow LED Control
LOCK	Lock Detect Signal from Synthesizer
LSIO	Low Speed Clock In / Data Out
LVZIF CS	LVZIF Chip Select (not used)
MIC	Microphone Input
MISO	Serial Peripheral Interface Receive Line
MODIN	Modulation Signal into the Synthesizer
MOSBIAS 2	PA Bias Voltage for Second Stage
MOSBIAS 3	PA Bias Voltage for Third Stage
NOISE BLNKR	Noise Blanker Enable (Low Band only)
ON OFF CONTROL	Service Request Line from Control Head / Manual Switching On of the Radio's Voltage Regulators
ON OFF SENSE (Control Head)	On/Off Sense Line to Control Head µP
ON OFF SENSE (Controller)	Service Request Line from Control Head
OPT CS	Option Board Chip Select

OPT PTT	PTT from Option Board
PA PWR SET	ASFIC Output Voltage to set the Transmitter Power
PA SWB	Switches Supply Voltage for PA Current Control Circuitry
PA SUPVLTG	13.2 V Supply Voltage of the Transmitter PA
PCIC MOSBIAS 1	PA Bias Voltage for First Stage
PRESC	Prescaler Signal from VCO to Synthesizer
PTT IRDEC	Microphone PTT Input
PTT IRDECODER	Microphone PTT Input
R W	Read Write Signal for RAM / Flash
RAM CS	RAM Chip Select
RDY	Service Request Line from Option Board
REF CS	Reference Chip Select (not used)
RESET	Reset Line
ROW x	Keypad Matrix Row x
RSSI	Received Signal Strength Indicator
RX ADAPT	Flat TX Path Disable during Transmitter Key-up
RX AUD RTN	Option Board Input / Output of Receiver Audio Path
RX FLAT FILTERED AUDIO	Flat or Filtered Audio to Accessory Connector
RXIN	RF Signal from Antenna Switch into the Receiver
RXINJ	RF Signal from the VCO into the Mixer
SCI RX	Serial Communication Interface Receive Line
SCI TX	Serial Communication Interface Transmit Line
SPI	Serial Peripheral Interface Bus
SPKR-	Negative Audio PA Speaker Output
SPKR+	Positive Audio PA Speaker Output
SQ DET	Squelch Detect Signal
SYN	µP Clock Signal
TEMP SENSE	Temperature Sense Line for LCD
TEMPSENSE	Temperature Sense Line from PA to µP
TRB	TX/RX VCO Switch Signal
TX AUD RTN	Option Board Output to Transmit Audio Path
TX AUD SND	Microphone Audio to Option Board
TXINJ	RF Signal from the VCO into the Transmitter PA
U DRIVER	Supply Voltage for PA Driver
U PREDRIVER	Supply Voltage for PA Pre-driver
UNSW 5V	Permanent 5V Supply
URX SND	Filtered Audio Signal to Option Board
VAG	2.5V Reference Voltage for Analog Circuitry

VCOBIAS 1	Switch Signal from Synthesizer
VCOBIAS 2	Switch Signal from Synthesizer
VCOMOD	Modulation Signal into VCO
VCTRL	VCO Frequency Control Voltage
VDDA	Regulated 5V for Digital Circuitry in RF Section
VOLTAGE SENSE	Voltage Sense Line from LCD
VOLUME	Volume Pot Output
VOX	Voice Operated Transmit Level
VPP	Boot Mode Select
VS AUDIOSEL	Switch Signal to Enable Option Board Audio Output Signal
VS GAINSEL	Voice Storage Gain Select Line
VS INT	Voice Storage Interrupt Line
VS MIC	Voice Storage Audio Signal into Microphone Path
VS RAC	Voice Storage Row Address Clock Signal
VSF	Voltage Super Filtered (5V)
VSTBY	5V Supply for µP when the Radio is switched off



Four-layer circuit board detail, viewing copper steps in proper layer sequence

Notes

Section 3

SERVICE AIDS

1.0 Recommended Service Tools

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

Table 3-1 Recommended Service Tools

Motorola Part No.	Description	Application
0180302E51 0180386A78	Master lens system Illuminated magnifying glass with lens attachment	Illumination and magnification of components
0180303E45	SMD tool kit (included with R1319_)	
0180357A57	Wall-Mounted Power Supply	Used to supply power to the RIB (120 VAC)
0180358A56	Wall-Mounted Power Supply	Used to supply power to the RIB (220 VAC)
0180386A82	Anti-static Grounding Kit	Used during all radio assembly and disassembly procedures
1010041A86	Solder (RMA type), 63/67, 0.5mm diameter, 1lb. spool	
3080070N01	Programming Cable	Connects RIB to radio microphone input
3080369B71	Computer Interface Cable	Connects the RIB to the computer (25-pin)
3080369B72	Computer Interface Cable	Connects the RIB to the computer 9-pin (Use for IBM PC AT—other IBM models use the B71 cable above)
6680309B53	Rework equipment catalog	Contains application notes, procedures, and technical references used to rework equipment
6680384A98	Brush	
6684253C72	Straight prober	
6686119B01	Removal Tool	Assists in the removal of radio control head
8180384J59	Housing Eliminator (short)	Test fixture used to bench test the radio PCB
8180384J60	Housing Eliminator (medium)	Test fixture used to bench test the radio PCB
8180384J61	Housing Eliminator (long)	Test fixture used to bench test the radio PCB
8180384L95	Housing Eliminator (short + top)	Test fixture used to bench test the radio PCB (radio uses pressure pads to retain PCB)

Motorola Part No.	Description	Application
AARKN4081_	Programming Cable with Internal RIB	Programming cable with internal RIB that provides direct connection from computer to radio microphone connector
AARKN4083_	Mobile Programming/Test Cable	Connects radio to RIB (RLN4008_)
HLN8027_	Mini UHF to BNC Adaptor	Adapts radio antenna port to BNC cabling of test equipment
R1319_	ChipMaster (110V)	Surface-mount removal and assembly of surface-mounted integrated circuits and/or rework station shields. Includes 5 nozzles.
R1321_	ChipMaster (220V)	
ChipMaster options:		
6680370B54	0.710" × 0.710"	Heat-focus heads for R1319_ workstation
6680370B57	0.245" × 0.245"	
6680370B58	0.340" × 0.340"	
6680371B15	0.460" × 0.560"	
ChipMaster nozzles:		
6680332E82	PLCC-44* nozzle	
6680332E83	PLCC-28* nozzle	
6680332E84	SOIC-20 nozzle	
6680332E86	SOIC-14/SOL-16J nozzle	
6680332E87	SOL-20J nozzle	
6680332E88	SOL-28J nozzle	
6680332E89	QFP-80 nozzle	
6680332E90	QFP-100* nozzle	
6680332E91	QFP-132* nozzle	
6680332E93	PLCC-32 nozzle	
6680332E94	PLCC-52 nozzle	
6680332E95	PLCC-68* nozzle	
6680332E96	PLCC-84 nozzle	
6680333E28	PA nozzle	
6680333E45	SOL-24 nozzle	
6680333E46	SOL-18 nozzle	
6680333E54	TSOP-32 nozzle	
6680333E55	TSOP-64 nozzle	
6680334E67	QFP-160 nozzle	
R1364_	Digital heated tweezer system	Chip component removal

Motorola Part No.	Description	Application
R1427_	Board preheater	Reduces heatsink on multi-level boards
R1453_	Digital readout solder station	Digitally controlled soldering iron
RLN4008_	Radio Interface Box	Enables communications between radio and computer's serial communications adapter
RLN4062_	Hot air workstation, 120V	Tool for hot air soldering/desoldering of surface-mounted integrated circuits
RLN4460_	Portable Test Set	Enables connection to audio/accessory jack. Allows switching for radio testing.
RLN4853_	10 to 20 Pin Adapter	Connects RKN4081_ to the radio accessory connector
RSX4043_	TORX screwdriver	Tighten and remove chassis screws
6680387A72	T-8 TORX bit	Removable TORX screwdriver bit
6680387A76	T-20 TORX bit	Removable TORX screwdriver bit

** Included with ChipMaster packages.*

2.0 Recommended Test Equipment

Table 3-2 lists test equipment required to service the mobile radios described in this manual as well as other two-way radios.

Table 3-2 Recommended Test Equipment

Motorola Part Number	Description	Characteristics	Application
*R1013_ or *R1370_	SINAD meter or SINAD meter with RMS	Without RMS audio voltmeter or with RMS audio voltmeter	Receiver sensitivity measurements
*R1074_	Fluke 87 digital multimeter	True RMS metering, 200 kHz frequency counter, 32-segment bar graph with backlit display	Digital voltmeter is recommended for AC/DC voltage and current measurements
*R1377_	AC voltmeter	100µV to 300V, 5Hz - 1MHz, 10Megohm input impedance	Audio voltage measurements
R1439_ or R1440_ (See Table 3-3)	BIRD wattmeter	Power range: 100mW - 100W, 2MHz - 1GHz, UHF-F connector Power range: 100mW - 100W, 2MHz - 1GHz, N-female connector	Transmitter power output measurements
R1611_	Dual channel 100MHz oscilloscope (Agilent)	Two-channel, 100MHz bandwidth, 200M sample rate/sec, 2Mb memory/channel	Waveform measurements
R2600_NT	Comms System Analyzer (non MPT)	This monitor will substitute for items with an asterisk*	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment

Motorola Part Number	Description	Characteristics	Application
S1339_	RF millivoltmeter	100mV to 3 VRF. 10kHz to 1.2GHz	RF level measurements
S1348_	Programmable DC power supply	0–20V DC, 0–5 amps, current limited	Bench supply for 7.5V DC

Table 3-3 Wattmeter Plug-In Elements

Power	25-60MHz	50-125MHz	100-250MHx	200-500MHz	400-1000MHz
5W	—	01-80305F21	01-80305F29	01-80305F38	01-80305F46
10W	—	01-80305F22	01-80305F30	01-80305F39	01-80305F47
25W	01-80305F15	01-80305F23	01-80305F31	01-80305F40	01-80305F48
50W	01-80305F16	01-80305F24	01-80305F32	01-80305F41	01-80305F49
100W	01-80305F17	01-80305F25	01-80305F33	01-80305F42	01-80305F50
250W	01-80305F18	01-80305F26	01-80305F34	01-80305F43	01-80305F51
500W	01-80305F19	01-80305F27	01-80305F35	01-80305F44	01-80305F52
1000W	01-80305F20	01-80305F28	01-80305F36	01-80305F45	01-80305F53

Chapter 2: Control Head Service Information

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Section 1

OVERVIEW

1.0 CDM750 / PRO3100 Model (GCN6112_)

This control head (Model A) contains the internal speaker, the On/Off/Volume knob, the microphone connector, buttons to operate the radio, and indicator Light Emitting Diodes (LEDs) to indicate radio status. The radio uses a Motorola 68HC11E9 microprocessor to control the LEDs and communicate with the host radio.



Model A Control Head (GCN6112_) for CDM750 / PRO3100

2.0 CDM1250 / PRO5100 Model (GCN6113_)

This control head (Model B) contains the internal speaker, the On/Off/Volume knob, the microphone connector, buttons to operate the radio, LEDs to indicate radio status, and a 14-character Liquid Crystal Display (LCD) that displays alphanumerical information (for example, channel number or call address name). The radio uses a Motorola 68HC11E9 microprocessor to control the LEDs and LCD, and communicate with the host radio.



Model B Control Head (GCN6113_) for CDM1250 / PRO5100

3.0 CDM1550 Series / PRO7100 Model (GCN6114_)

This control head (Model C) contains the internal speaker, the On/Off/Volume knob, the microphone connector, buttons to operate the radio, LEDs to indicate radio status, and a 14-character LCD that displays alphanumerical information (for example, channel number or call address name). The radio uses a Motorola 68HC11E9 microprocessor to control the LEDs and the LCD, and communicate with the host radio.



Model C Control Head (GCN6114_) for CDM1550 Series / PRO7100

4.0 Data Radio Series (GCN6116_)

This control head (Model D) does not contain any speakers, knobs, buttons, or connectors. This control head acts as a cosmetic and protective cover for the CDM Data Radios.



Model D Control Head (GCN6116_) for Data Radio Series

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the control head circuits. For troubleshooting information, refer to the related section of this manual.

NOTE From this point on the microprocessor is referred to as “µP”.

2.0 Control Head (CDM750 / PRO3100)

2.1 Power Supplies

The power supply to the control head is taken from the host radio’s FLT A+ voltage via connector J0801, pin 3 and the regulated 5V via connector J0801 pin 7. The voltage FLT A+ is at battery level and is used for the LEDs, the back light and to power up the radio using the On/Off/Volume knob. The stabilized 5V is used for the µP and the keypad buttons. The voltage USW 5V derived from the FLT A+ voltage and stabilized by the series combination of R0822, VR0822 is used to buffer the internal RAM of the µP (U0831). C0822 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Dual diode D0822 prevents radio circuits from discharging this capacitor. When the supply voltage is applied to the radio, C0822 is charged via R0822 and D0822. To avoid the µP entering the wrong mode if the radio is switched on while the voltage across C0822 is still too low, the regulated 5V supply charges C0822 via diode D0822.

2.2 Power On/Off

The On/Off/Volume knob, when pressed, switches the radio’s voltage regulators on by connecting line ON OFF CONTROL to line UNSW 5V via D0821. Additionally, 5V at the base of digital transistor Q0822 informs the control head’s µP about the pressed knob. The µP asserts pin 62 and line CH REQUEST low to hold the line ON OFF CONTROL at 5V via Q0823 and D0821. The high line ON OFF CONTROL also informs the host radio that the control head’s µP wants to send data via the SBEP bus. When the radio returns a data request message, the µP informs the radio about the pressed knob. If the radio is switched off, the radio’s µP switches it on and vice versa. If the On/Off/Volume knob is pressed while the radio is on, the software detects a low state on line ON OFF SENSE, the radio is alerted via line ON OFF CONTROL and sends a data request message. The control head µP informs the radio about the pressed knob and the radio’s µP switches the radio off.

2.3 Microprocessor Circuit

The control head uses the Motorola 68HC11E9 µP (U0831) to control the LEDs and to communicate with the host radio. RAM and ROM are contained within the µP.

The µP generates its clock using the oscillator inside the µP along with a 8 MHz ceramic resonator (U0833) and R0920.

The µP's RAM is always powered to maintain parameters such as the last operating mode. This is achieved by maintaining 5V at µP, pin 25. Under normal conditions, when the radio is off, USW 5V is formed by FLT A+ running to D0822. Capacitor C0822 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Diode D0822 prevents radio circuits from discharging this capacitor.

There are eight analog-to-digital converter ports (A/D) on the µP. They are labeled within the device block as PE0-PE7. These lines sense the voltage level ranging from 0 to 5V of the input line and convert that level to a number ranging from 0 to 255 which can be read by the software to take appropriate action.

Pin VRH is the high reference voltage for the A/D ports on the µP. If this voltage is lower than 5V the A/D reading is incorrect. The VRL signal is the low reference for the A/D ports. This line is normally tied to ground. If this line is not connected to ground, the A/D readings could be incorrect.

The µP determines the used keypad type and the control head ID by reading the levels at ports PC0 – PC7. Connections JU0852/3/4 are provided by the individual keypads.

The MODB / MODA input of the µP must be at a logic "1" to start executing correctly. The XIRQ and the IRQ pins should also be at a logic "1".

Voltage sense device U0832 provides a reset output that goes to 0V if the regulated 5V goes below 4.5 V. This is used to reset the controller to prevent improper operation.

2.4 SBEP Serial Interface

The host radio (master) communicates to the control head µP (slave) through its SBEP bus. This bus uses only line BUS+ for data transfer. The line is bi-directional, that is, either the radio or the control head µP can drive the line. The µP sends serial data via pin 50 and D0831 and it reads serial data via pin 47. Whenever the µP detects activity on the BUS+ line, it starts communication.

When the host radio needs to communicate to the control head µP, it sends data via line BUS+. Any transition on this line generates an interrupt and the µP starts communication. The host radio may send data (for example, LED and back light status) or it may request the control head ID or the keypad ID.

When the control head µP wants to communicate to the host radio, the µP brings the request line CH REQUEST to a logic "0" via µP pin 62. This switches Q0823 on, which pulls line ON OFF CONTROL high through diode D0821. A low-to-high transition on this line informs the radio that the control head requires service. The host radio then sends a data request message via BUS+ and the control head µP replies with the data it wants to send (for example, which key has been pressed or that the volume knob has been rotated).

The control head µP monitors all messages sent via BUS+, but ignores any data communication between the host radio and the CPS or the universal tuner.

2.5 Keypad Keys

The control head keypad is a six-key design. All keys are configured as two analog lines read by µP pins 13 and 15. The voltage on the analog lines varies between 0V and 5V depending on which key is pressed. If no key is pressed, the voltage at both lines is 5V. The key configuration can be thought of as a matrix where the two lines represent one row and one column. Each line is connected to a resistive divider powered by 5V. If a button is pressed, it will connect one specific resistor of each divider line to ground level and thereby reduce the voltages on the analog lines The voltages of the lines are A/D converted inside the µP (ports PE 0 - 1) and specify the pressed button. To determine which key is pressed, the voltage of both lines must be considered.

An additional pair of analog lines and A/D µP ports (PE 3 – 2) are available to support a keypad microphone, connected to the microphone connector J0811. Any microphone key press is processed the same way as a key press on a control head.

2.6 Status LED and Back Light Circuit

All indicator LEDs (red, yellow, and green) are driven by current sources. To change the LED status the host radio sends a data message via SBEP bus to the control head µP. The control head µP determines the LED status from the received message and switches the LEDs on or off via port PB 7 – 0 and port PA4. The LED status is stored in the µP's memory. The LED current is determined by the resistor at the emitter of the respective current source transistor.

The back light for the keypad is controlled by the host radio the same way as the indicator LEDs using µP port PA 5. The µP can switch the back light on and off under software control. The back light current for the keypad is drawn from the FLT A+ source and controlled by two current sources. The LED current is determined by the resistor at the emitter of the respective current source transistor.

2.7 Microphone Connector Signals

Signals BUS+, PTT IRDEC, HOOK, MIC, HANDSET AUDIO, FLT A+, 5V, and two A/D converter inputs are available at the microphone connector J0811. Signal BUS+ (J0811-7) connects to the SBEP bus for communication with the CPS or the Universal Tuner. Line MIC (J0811-5) feeds the audio from the microphone to the radio's controller via connector J0801-4. The Line HANDSET AUDIO (J0811-8) feeds the receiver audio from the controller (J0801-6) to a connected handset. FLT A+, which is at supply voltage level, and 5V are used to supply any connected accessory like a microphone or a handset.

The two A/D converter inputs (J0811-9/10) are used for a microphone with keypad. A pressed key changes the DC voltage on both lines. The voltages depend on which key is pressed. The µP determines from the voltage on these lines which key is pressed and sends the information to the host radio.

Line PTT IRDEC (J0811-6) is used to key up the radio's transmitter. While the PTT button on a connected microphone is released, line PTT IRDEC is pulled to 5V level by R0843. Transistor Q0843 is switched on and causes a low at µP port PA2. When the PTT button is pressed, signal PTT IRDEC is pulled to ground level. This switches Q0843 off and the resulting high level at µP port PA2 signals the µP about the pressed PTT button. The µP signals the host radio about any status change on the PTT IRDEC line via SBEP bus.

When the line PTT IRDEC is connected to FLT A+ level, transistor Q0821 is switched on through diode VR0821 and thereby pulls the level on line ON OFF CONTROL to FLT A+ level. This switches on the radio and puts the radio's µP in bootstrap mode. Bootstrap mode loads the firmware into the radio's flash memory.

When the microphone's hang-up switch is engaged, the HOOK input (J0811-3) signals the µP. Depending on how the radio is programmed using the Customer Programming Software (CPS), the µP may take actions such as turning the audio PA on or off. While the hang-up switch is open, R0841 pulls the line HOOK to a 5V level. Transistor Q0841 is switched on and causes a low at µP port PA1. When the HOOK switch is closed, the HOOK signal is pulled to ground level. This switches R0841 off and the resulting high level at µP port PA1 signals the µP about the closed hang-up switch. The µP signals the host radio about any status change on the HOOK line via the SBEP bus.

2.8 Speaker

The control head contains a speaker for the receiver audio. The receiver audio signal from the differential audio output of the audio amplifier, located on the radio's controller, is fed via connector J0801-10, 11 to the speaker connector P0801, pins 1 and 2. The speaker is connected to the speaker connector P0801. The control head speaker can be disconnected only if an external speaker (connected through the accessory connector) is used.

2.9 Electrostatic Transient Protection

Electrostatic transient protection is provided for the sensitive components in the control head by diodes VR0811, VR00812, and VR0816 - VR0817. The diodes limit any transient voltages. The associated capacitors provide radio frequency interference (RFI) protection.

3.0 Control Head (CDM1250 / PRO5100 / CDM1550 Series / PRO7100)

3.1 Power Supplies

The power supply to the control head is taken from the host radio's FLT A+ voltage via connector J0801 pin 3 and the regulated 5V via connector J0801 pin 7. The voltage FLT A+ is at battery level and is used for the LEDs, the back light and to power up the radio using the On/Off/Volume knob. The stabilized 5V is used for the µP, the display, the display driver and the keypad buttons. The voltage USW 5V derived from the FLT A+ voltage and stabilized by the series combination of R0822, VR0822 is used to buffer the internal RAM of the µP (U0831). C0822 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Dual diode D0822 prevents radio circuitry from discharging this capacitor. When the supply voltage is applied to the radio, C0822 is charged via R0822 and D0822. To avoid the µP entering the wrong mode when the radio is switched on while the voltage across C0822 is still too low, the regulated 5V supply charges C0822 via diode D0822.

3.2 Power On/Off

The On/Off/Volume knob, when pressed, switches the radio's voltage regulators on by connecting line ON OFF CONTROL to line UNSW 5V via D0821. Additionally, 5V at the base of digital transistor Q0822 signals the control head's µP about the pressed knob. The µP asserts pin 62 and line CH REQUEST low to hold line ON OFF CONTROL at 5V via Q0823 and D0821. The high line ON OFF CONTROL also informs the host radio that the control head's µP wants to send data via SBEP bus. When the radio returns a data request message, the µP will inform the radio about the pressed knob. If the radio was switched off, the radio's µP will switch it on and vice versa. If the On/Off/Volume knob is pressed while the radio is on, the software detects a low state on line ON OFF SENSE, the radio is alerted via line ON OFF CONTROL, and sends a data request message. The control head µP will inform the radio about the pressed knob and the radio's µP will switch the radio off.

3.3 Microprocessor Circuit

The control head uses the Motorola 68HC11E9 µP (U0831) to control the LEDs and the LCD and to communicate with the host radio. RAM and ROM are contained within the µP itself.

The µP generates its clock using the oscillator inside the µP along with a 8 MHz ceramic resonator (U0833) and R0920.

The µP's RAM is always powered to maintain parameters such as the last operating mode. This is achieved by maintaining 5V at µP pin 25. Under normal conditions, when the radio is off, USW 5V is

formed by FLT A+ running to D0822. C0822 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Diode D0822 prevents radio circuitry from discharging this capacitor.

There are eight analog-to-digital converter ports (A/D) on the µP. They are labeled within the device block as PE0-PE7. These lines sense the voltage level ranging from 0 to 5V of the input line and convert that level to a number ranging from 0 to 255 which can be read by the software to take appropriate action.

Pin VRH is the high-reference voltage for the A/D ports on the µP. If this voltage is lower than 5V, the A/D readings will be incorrect. Likewise pin VRL is the low reference for the A/D ports. This line is normally tied to ground. If this line is not connected to ground, the A/D readings will be incorrect.

The µP can determine the keypad type and the control head ID by reading the levels at ports PC0 – PC7. Connections JU0852/3/4 are provided by individual keypads.

The MODB / MODA input of the µP must be at a logic “1” for it to start executing correctly. The XIRQ and the IRQ pins should also be at a logic “1”.

Voltage sense device U0832 provides a reset output that goes to 0V if the regulated 5V goes below 4.5 V. This is used to reset the controller to prevent improper operation.

3.4 SBEP Serial Interface

The host radio (master) communicates to the control head µP (slave) through its SBEP bus. This bus uses only line BUS+ for data transfer. The line is bi-directional, that is, either the radio or the control head µP can drive the line. The µP sends serial data via pin 50 and D0831 and it reads serial data via pin 47. Whenever the µP detects activity on the BUS+ line, it starts communication.

When the host radio needs to communicate to the control head µP, it sends data via line BUS+. Any transition on this line generates an interrupt and the µP starts communication. The host radio may send data (for example, display information, LED status, or back light status), or it may request the control head or keypad ID.

When the control head µP wants to communicate to the host radio, the µP brings request line CH REQUEST to a logic “0” via µP pin 62. This switches on Q0823, which pulls line ON OFF CONTROL high through diode D0821. A low-to-high transition on this line informs the radio that the control head requires service. The host radio then sends a data request message via BUS+ and the control head µP replies with the data it wants to send (for example, which key has been pressed or that the volume knob has been rotated).

The control head µP monitors all messages sent via BUS+, but ignores any data communication between host radio and CPS or Universal Tuner.

3.5 Keypad Keys

The control head keypad is a six-key keypad (Model B) or a 10-key keypad (Model C). All keys are configured as two analog lines read by µP pins 13 and 15. The voltage on the analog lines varies between 0V and 5V depending on the key that has been pressed. If no key is pressed, the voltage at both lines will be 5V. The key configuration can be thought of as a matrix where the two lines represent one row and one column. Each line is connected to a resistive divider powered by 5V. If a button is pressed, it will connect one specific resistor of each divider line to ground level and thereby reduce the voltages on the analog lines. The voltages of the lines are A/D converted inside the µP (ports PE 0 - 1) and specify the pressed button. The voltage of both lines must be considered in order to determine which key is pressed.

An additional pair of analog lines and A/D µP ports (PE 3 – 2) is available to support a keypad microphone, connected to the microphone connector J0811. Any microphone key press is processed in the same way as a key press on the control head.

3.6 Status LED and Back Light Circuit

All indicator LEDs (red, yellow, and green) are driven by current sources. To change the LED status the host radio sends a data message via SBEP bus to the control head µP. The control head µP determines the LED status based the received message and switches the LEDs on or off via port PB 7 – 0 and port PA4. The LED status is stored in the µP's memory. The LED current is determined by the resistor at the emitter of the respective current source transistor.

The back light for the LCD and the keypad is controlled by the host radio the same way as the indicator LEDs using µP port PA 5. This port is a Pulse Width Modulator (PWM) output. The output signal charges capacitor C0843 through R0847. By changing the pulse width under software control, the DC voltage of C0843 and, therefore, the brightness of the back light can be changed in four steps. The keypad back light current is drawn from the FLT A+ source and controlled by transistor Q0933. The current flowing through the LEDs causes a proportional voltage drop across the parallel resistors R0947 and R0948. This voltage drop is amplified by the op-amp U0931-2. U0931-2 and Q0934 form a differential amplifier. The voltage difference between the base of Q0934 and the output of U0931-2 determines the current from the base of the LED control transistor Q0933 and in turn the brightness of the LEDs. The µP can control the LEDs by changing the DC level at the base of Q0934. If the base of Q0934 is at ground level, Q0934 is switched off and no current flows through Q0933 and the LEDs. If the base voltage of Q0934 rises, a current flows through Q0934 and in turn through Q0933, causing the LEDs to turn on and a rising voltage drop across R0947 and R0948. The rising voltage causes the output of the op-amp to rise and to reduce the base to emitter voltage of Q0934. This decreases the current of Q0933 until the loop has settled.

3.7 Liquid Crystal Display (LCD)

The LCD H0971 uses the display driver U0971. The display is a single-layer super-twist nematic (STN) LCD display. It has 14 characters and a 5x8 dot matrix to display alphanumerical information and a line with 21 pre-defined icons above the dot matrix.

The driver contains a data interface to the µP, an LCD segment driver, an LCD power circuit, an oscillator, data RAM and control logic. At power up, the driver's control logic is reset by a logic "0" at input SR2 (U0971-15). The driver's internal oscillator is set to about 20 kHz and can be measured at pin 22. The driver's µP interface is configured to accept 8-bit parallel data input (U0971-D0-D7) from the control head µP (U0831 port PC0-PC7).

To write data to the driver's RAM, the µP sets chip select (U0971-20) to logic "0" via U0831-11, RD (U0971-18) to logic "1" via (U0831-10) and WR (U0971-17) to logic "0" via U0831-9. With input A0 (U0971-21) set to logic "0" via U0831-12, the µP writes control data to the driver. Control data includes the RAM start address for the display data. With input A0 set to logic "1", the µP then writes the display data to the display RAM. When data transfer is complete, the µP terminates the chip select, RD and WD activities.

The display driver's power circuit provides the voltage supply for the display. This circuit consists of a voltage multiplier, voltage regulator and a voltage follower. The external capacitors C0971 - C0973 configure the multiplier to double the supply voltage. In this configuration, the multiplier output VOUT (U0971-8) supplies a voltage of –5V (2* –5V below VDD). The multiplied voltage VOUT is sent to the internal voltage regulator. To set the voltage level of the regulator output V5 (U0971-5), this voltage is divided by the resistors R0973 and R0974 and then fed back to the reference input VR (U0971-6). In addition, the regulator output voltage V5 can be controlled electronically by a control command sent to the driver. With the used configuration, the voltage V5 is about –2V. The voltage V5 is resistively divided by the driver's voltage follower to provide the voltages V1 - V4. These

voltages are required to drive the liquid crystals. The level of V5 can be measured by one of the µP's analog-to-digital converters (U0831-20) via resistive divider R0975, R0976. To stabilize the display brightness over a large temperature range, the µP measures the temperature via analog-to-digital converter (U0831-18) using temperature sensor U0834. Based on the measured temperature, the µP adjusts the driver output voltage V5, and in turn the display brightness, via a parallel interface.

3.8 Microphone Connector Signals

Signals BUS+, PTT IRDEC, HOOK, MIC, HANDSET AUDIO, FLT A+, 5V and 2 A/D converter inputs are available at the microphone connector J0811. Signal BUS+ (J0811-7) connects to the SBEP bus for communication with the CPS or the Universal Tuner. Line MIC (J0811-5) feeds the audio from the microphone to the radio's controller via connector J0801-4. Line HANDSET AUDIO (J0811-8) feeds the receiver audio from the controller (J0801-6) to a connected handset. FLT A+, which is at supply voltage level, and 5V are used to supply accessories connected to the radio, if any (for example, a microphone or a handset).

The two A/D converter inputs (J0811-9/10) are used for a microphone with a keypad. When a key is pressed, the DC voltage changes on both lines. The voltages depend on which key is pressed. The µP determines which key is pressed based on the voltage on these lines. It then sends the information to the host radio.

Line PTT IRDEC (J0811-6) is used to key up the radio's transmitter. When the PTT button on a connected microphone is released, line PTT IRDEC is pulled to 5V level by R0843. Transistor Q0843 is switched on and causes a low at µP port PA2. When the PTT button is pressed, signal PTT IRDEC is pulled to ground level. This switches Q0843 off and the resulting high level at µP port PA2 signals the µP about the pressed PTT button. The µP informs the host radio about any change of status on the PTT IRDEC line via SBEP bus.

When line PTT IRDEC is connected to FLT A+ level, transistor Q0821 is switched on through diode VR0821 and thereby pulls the level on line ON OFF CONTROL to FLT A+ level. This switches the radio on and puts the radio's µP in bootstrap mode. Bootstrap mode is the mode used to load the firmware into the radio's flash memory (see the Controller chapter for more details).

The HOOK input (J0811-3) is used to signal the µP when the microphone's hang-up switch is engaged. Depending on the CPS programming the µP may take actions like turning the audio PA on or off. While the hang-up switch is open, line HOOK is pulled to 5V level by R0841. Transistor Q0841 is switched on and causes a low at µP port PA1. When the HOOK switch is closed, signal HOOK is pulled to ground level. This switches off R0841 and the resulting high level at µP port PA1 informs the µP about the closed hang-up switch. The µP will inform the host radio about any status change on the HOOK line via SBEP bus.

3.9 Speaker

The control head contains a speaker for receiver audio. The receiver audio signal from the differential audio output of the audio amplifier (located on the radio's controller) is fed via connector J0801-10, 11 to the speaker connector P0801 pin 1 and pin 2. The speaker is connected to the speaker connector P0801. The control head speaker can be disconnected if an external speaker (connected through the accessory connector) is used.

3.10 Electrostatic Transient Protection

Electrostatic transient protection is provided for the sensitive components in the control head by diodes VR0811, VR00812, and VR0816 - VR0817. The diodes limit any transient voltages to tolerable levels. The associated capacitors provide Radio Frequency Interference (RFI) protection.

3.11 PassPort Trunking Controller Board (PTCB)

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

For models which feature PassPort Trunking operation, the PassPort Trunking Controller Board (PTCB) is added to the top cover of the radio. This board also provides advanced voice storage features. Refer to Figure 2-1 for connector and signal routing from and to the radio and PTCB.

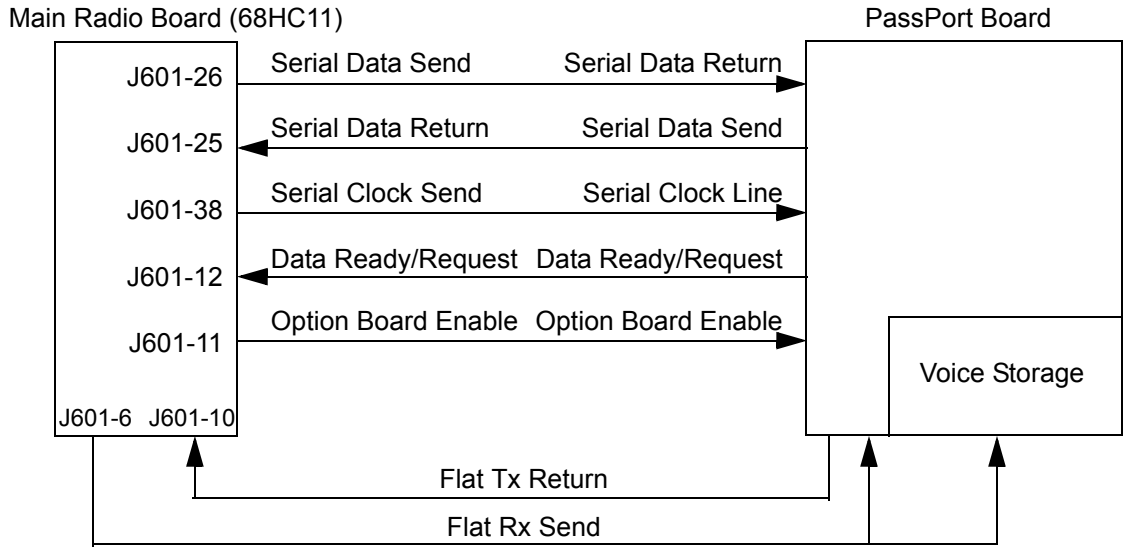


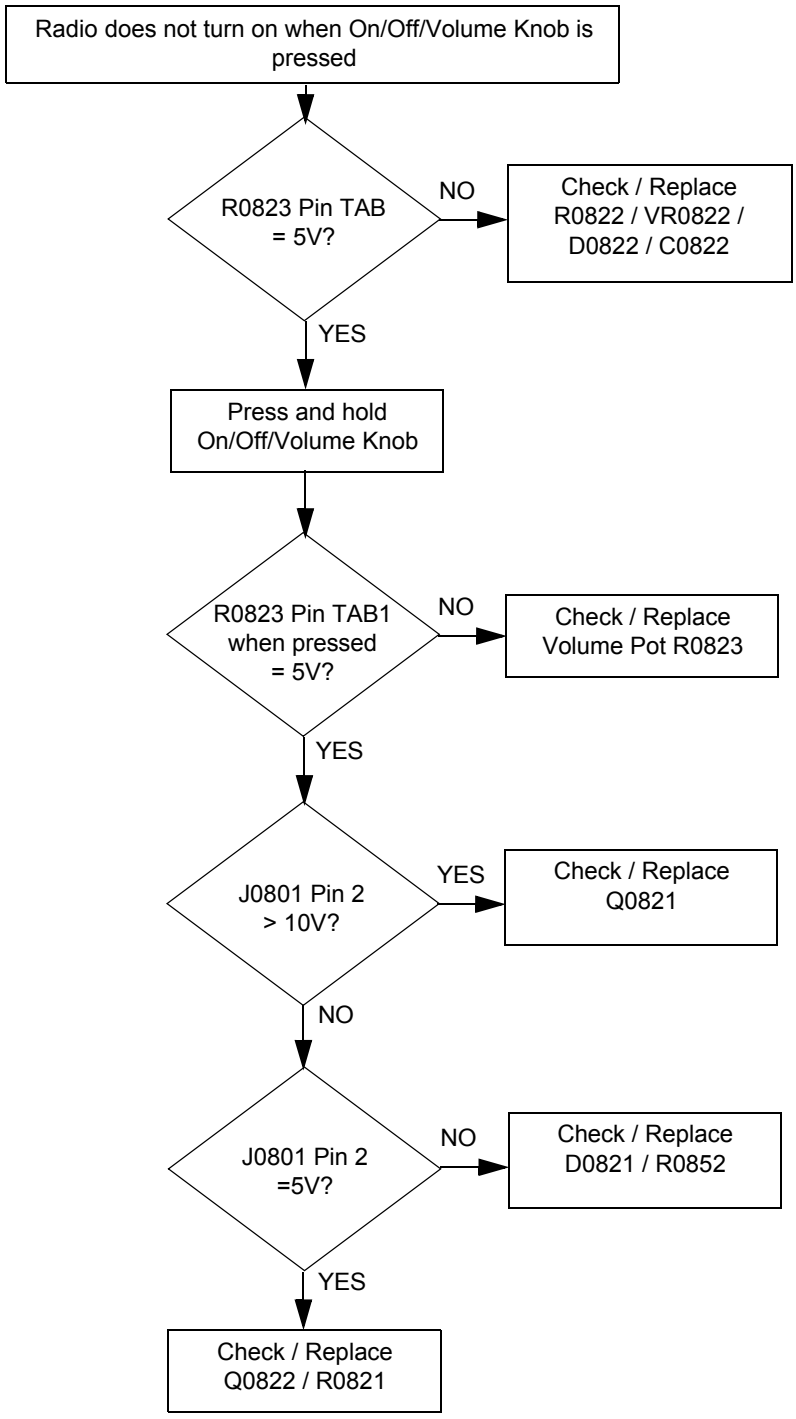
Figure 2-1 Full Serial Interface Lines for PassPort Trunking Controller Board

Section 3

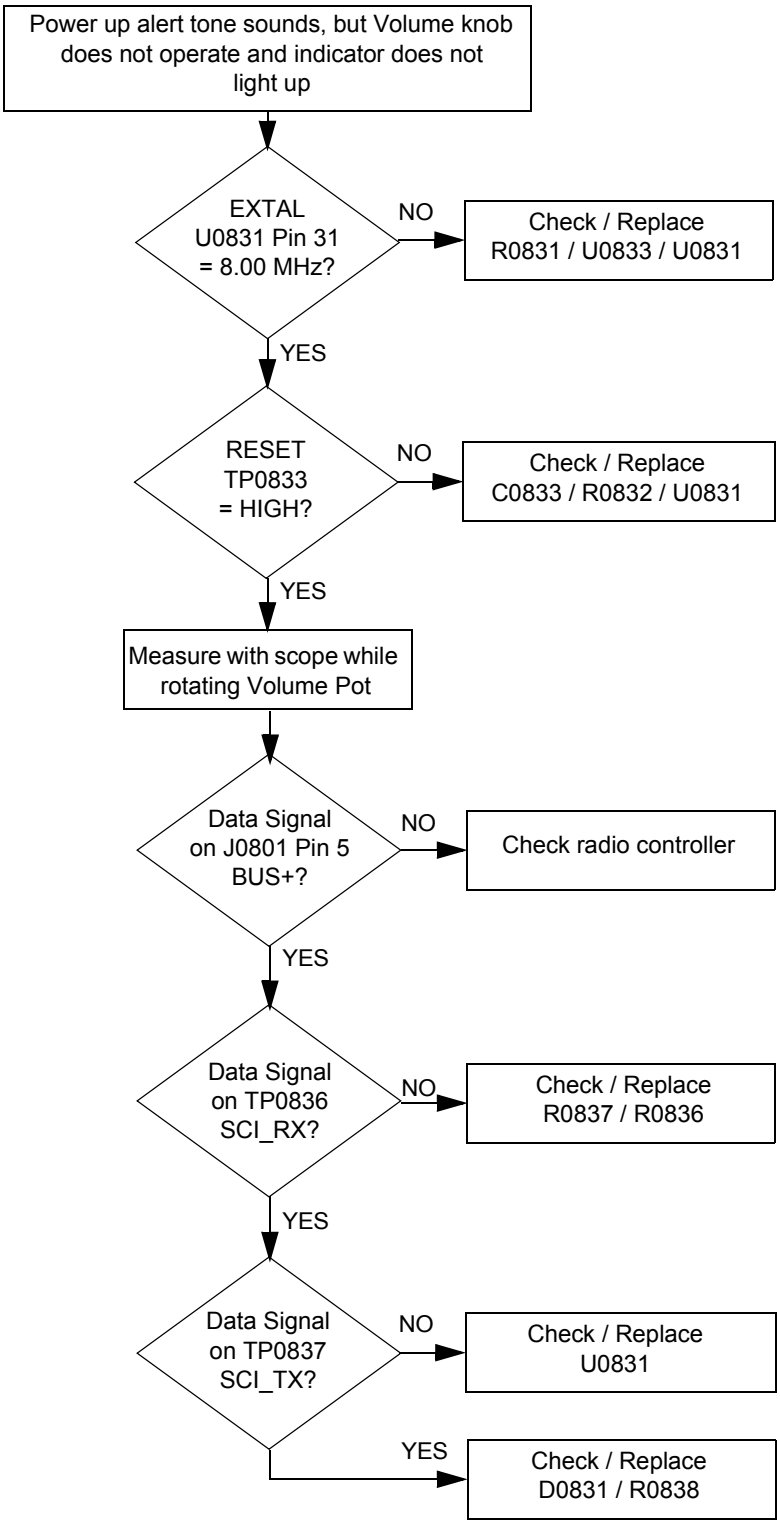
TROUBLESHOOTING CHARTS

1.0 Control Head CDM750 / PRO3100 Troubleshooting Flow Charts

1.1 Troubleshooting Flow Chart for On/Off

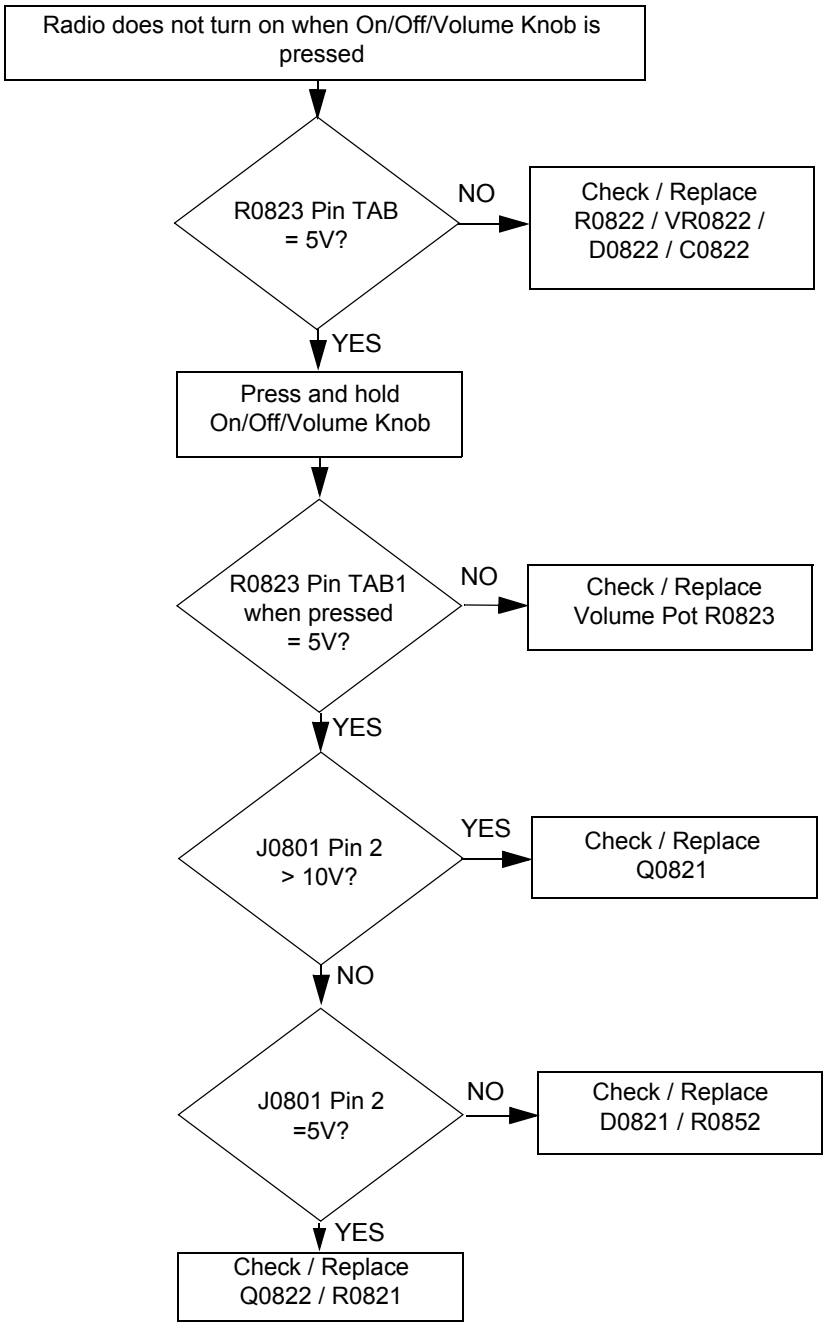


1.2 Troubleshooting Flow Chart for Microprocessor

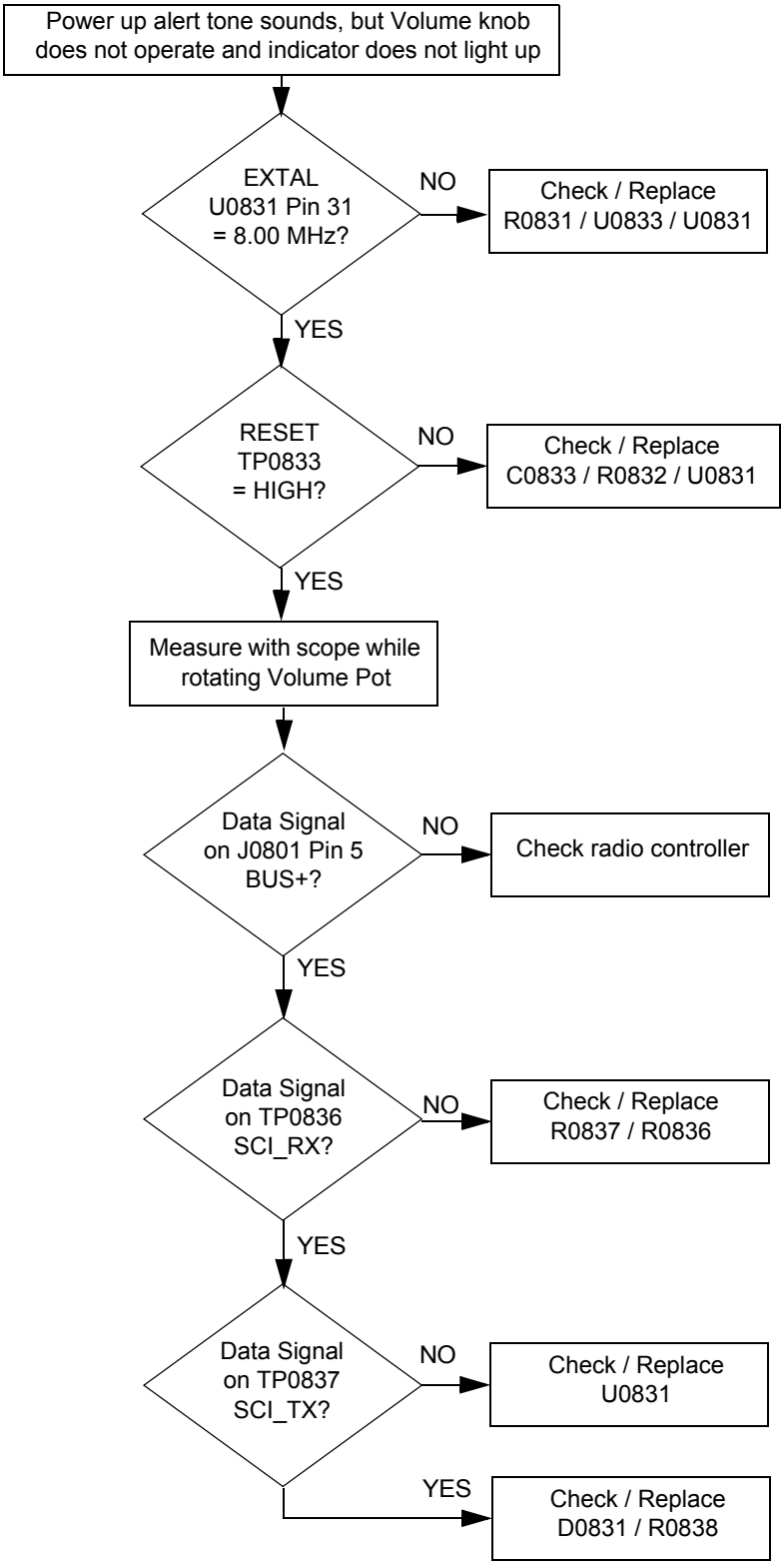


2.0 Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 Troubleshooting Flow Charts

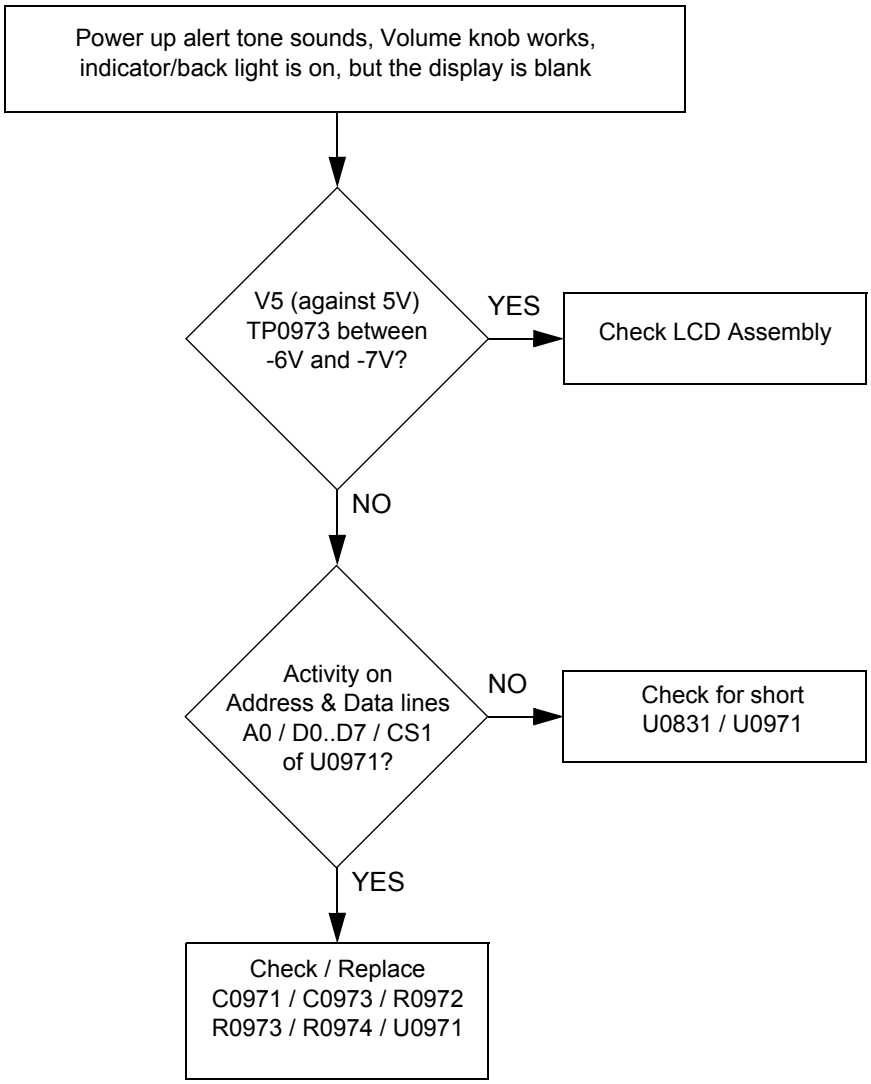
2.1 Troubleshooting Flow Chart for On/Off



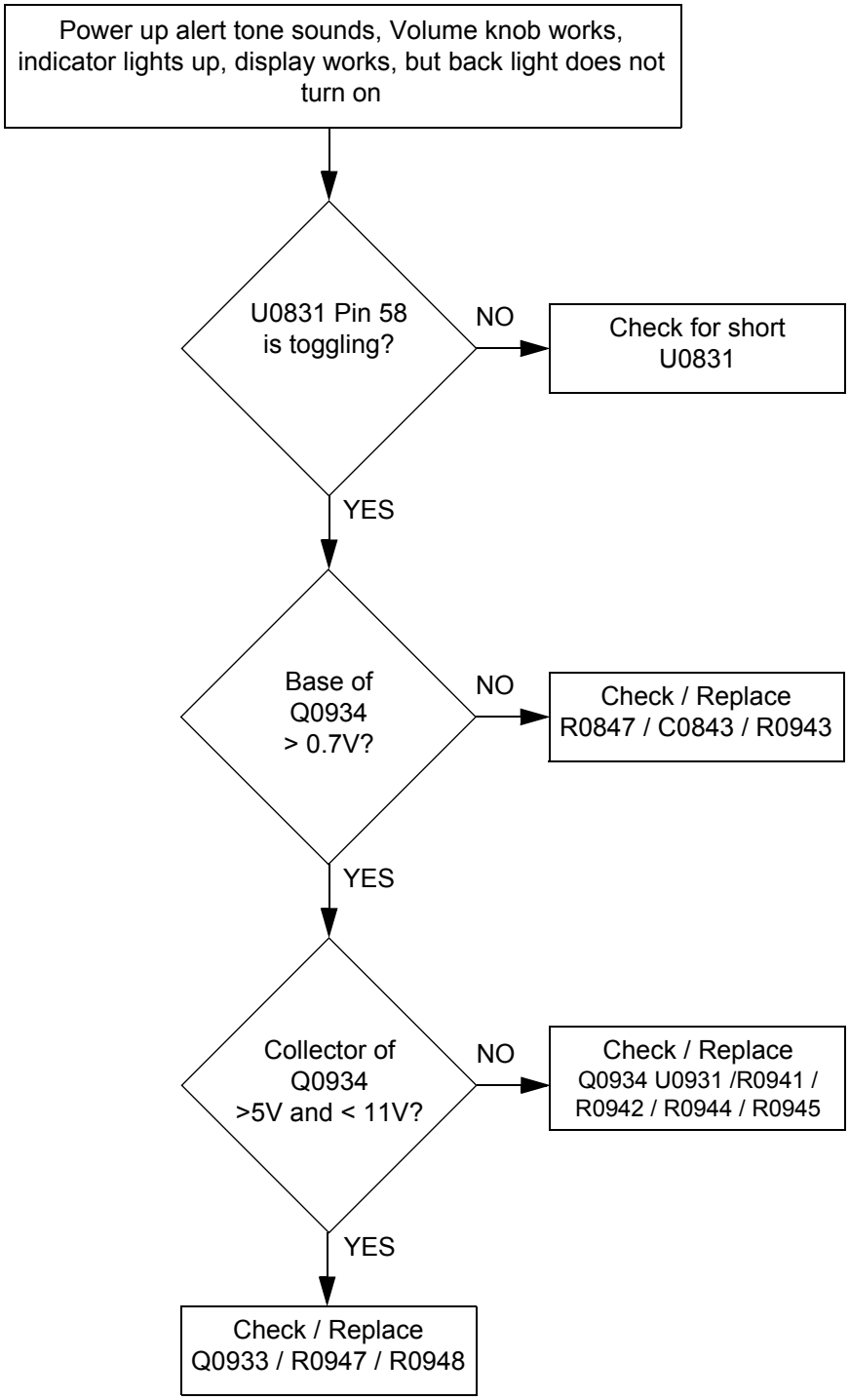
2.2 Troubleshooting Flow Chart for Microprocessor



2.3 Troubleshooting Flow Chart for Display



2.4 Troubleshooting Flow Chart for Back Light



Section 4

CONTROL HEAD PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

Table 2-1 Control Head CDM750 / PRO3100 Diagrams and Parts Lists

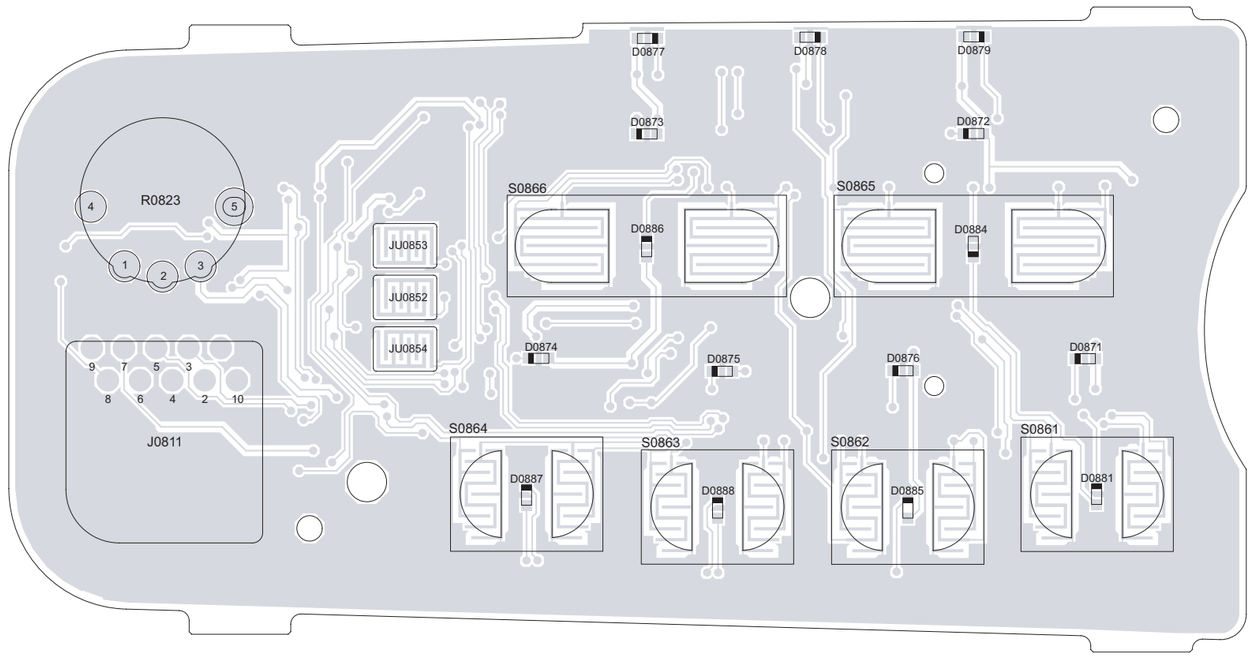
PCB 8486146B07: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **2: 4-3** **2: 4-3**
SCHEMATICS: **Sheet 1 of 2** **Sheet 2 of 2**	 **2: 4-4** **2: 4-5**
Parts List	**2: 4-6**

Table 2-2 Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 Diagrams and Parts Lists

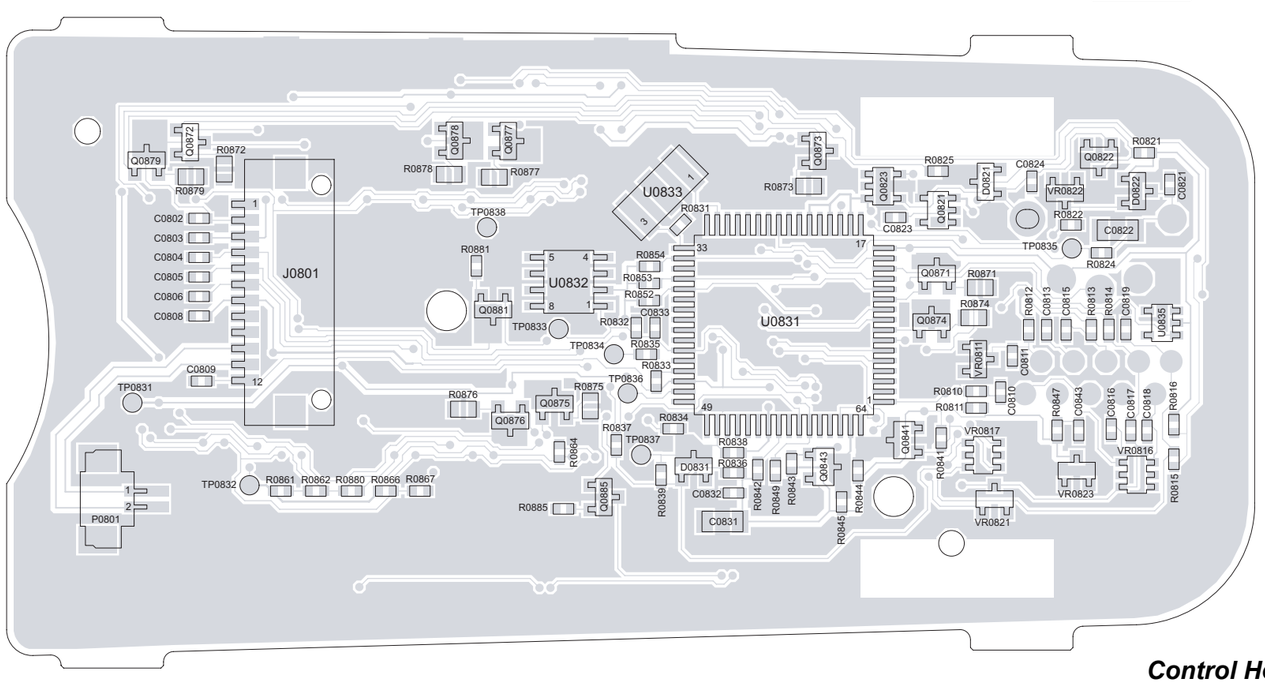
PCB 8486155B06: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **2: 4-7** **2: 4-7**
SCHEMATICS: **Sheet 1 of 4** **Sheet 2 of 4** **Sheet 3 of 4** **Sheet 4 of 4**	 **2: 4-8** **2: 4-9** **2: 4-10** **2: 4-11**
Parts List	**2: 4-12**

Notes

2.0 Control Head CDM750 / PRO3100 PCB 8486146B07, Schematics, and Parts Lists

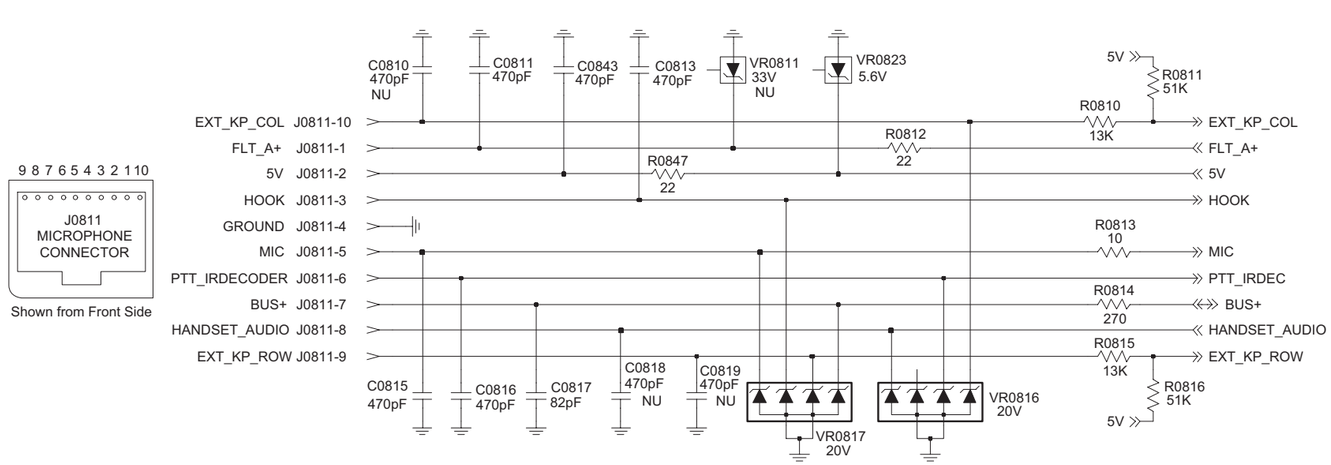


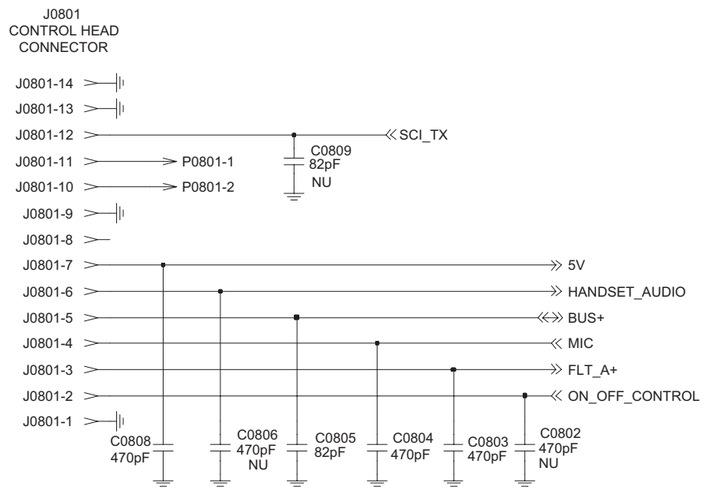
ZWG0130114-A
Top Side

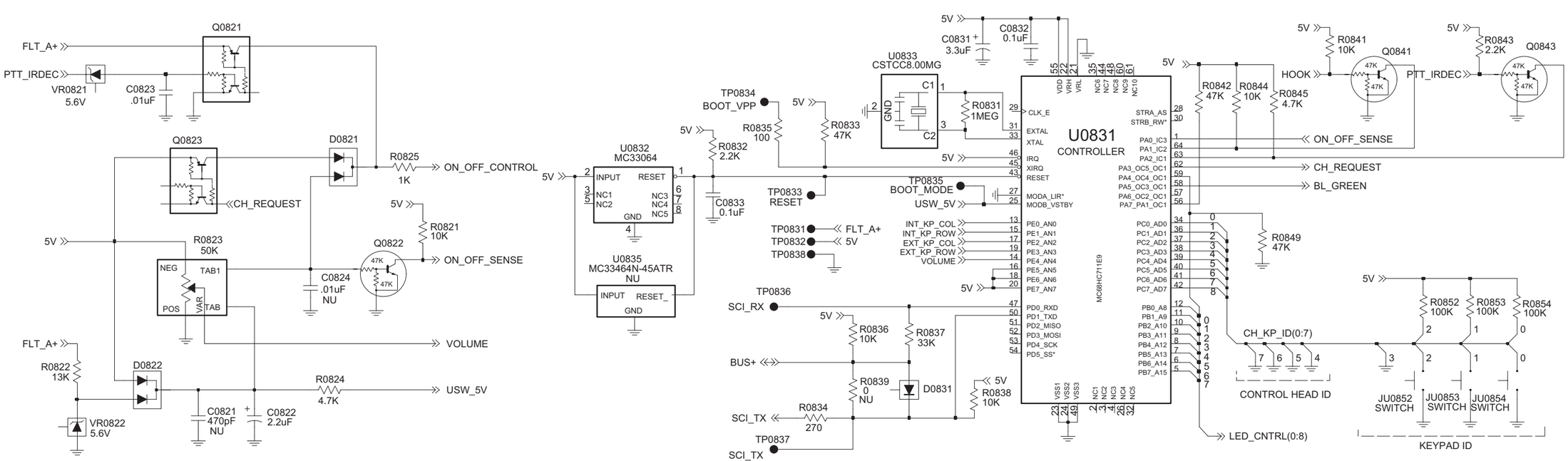


ZWG0130113-B
Bottom Side

Control Head CDM750 / PRO3100 - PCB 8486146B07





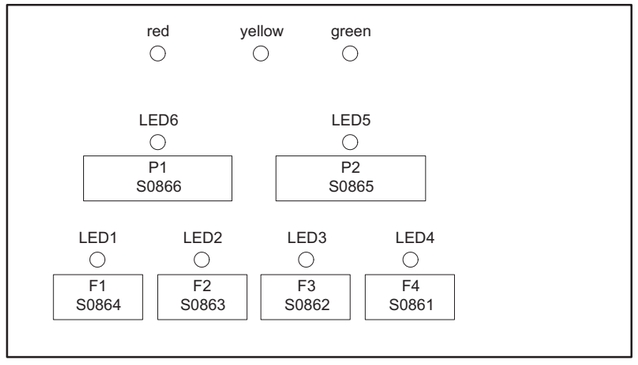


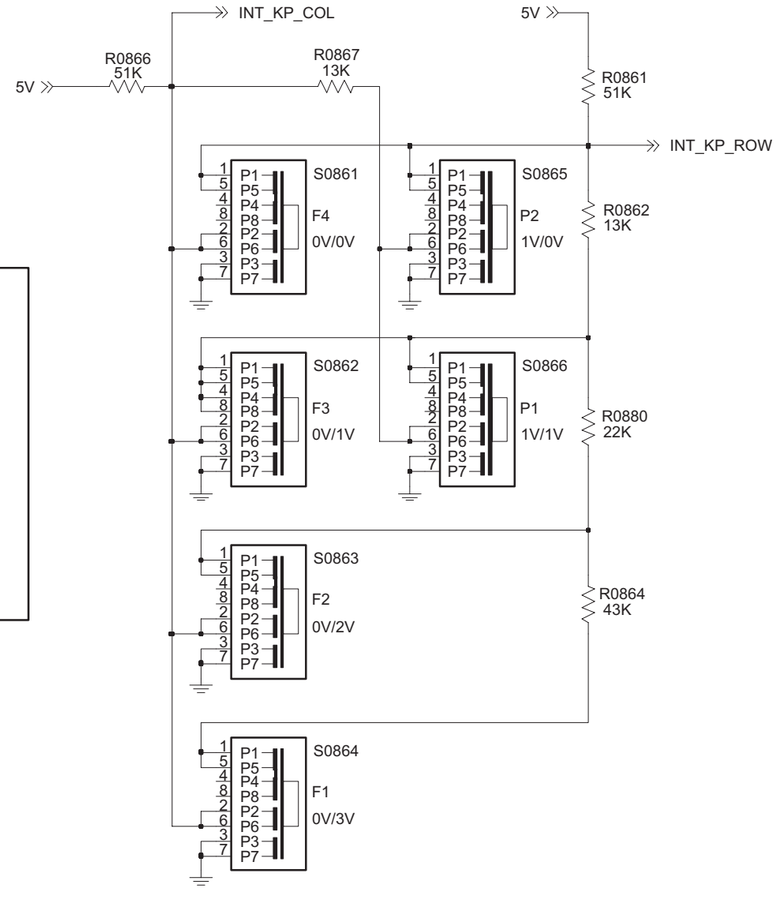
ZWG0130239-B

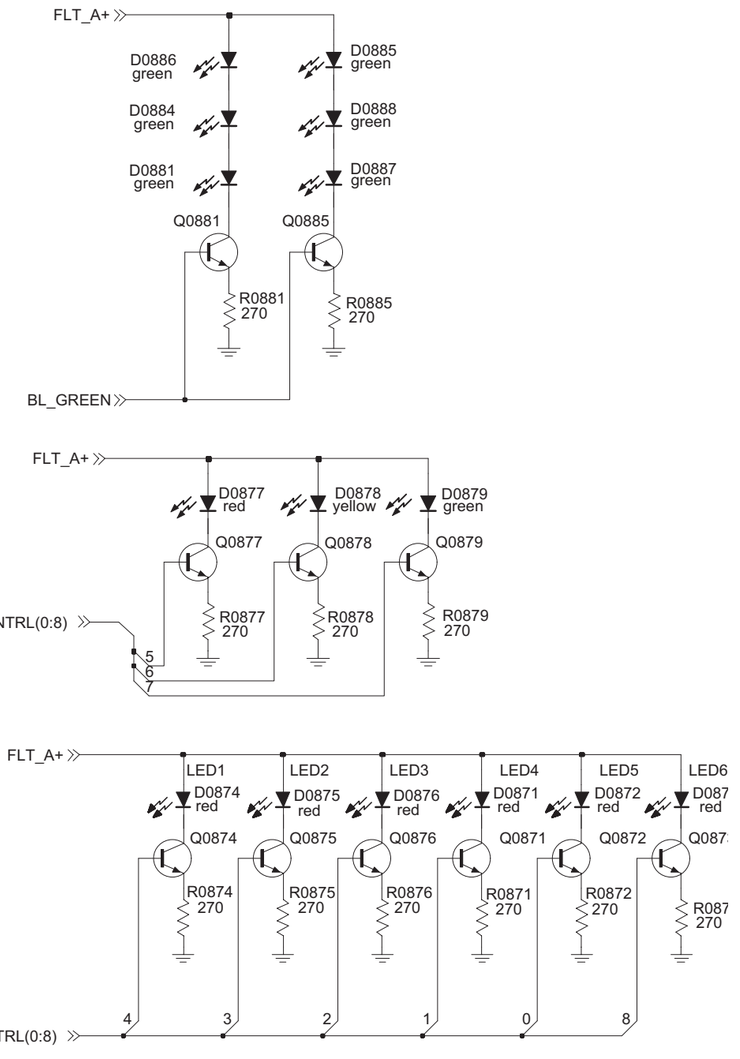
Control Head CDM750 / PRO3100 - Schematic Sheet 1 of 2

6881091C63-C

KEYPAD A LAYOUT







ZWG0130240-A

Control Head CDM750 / PRO3100 - Schematic Sheet 2 of 2

6881091C63-C

Control Head PCB 8486146B07 Parts List†

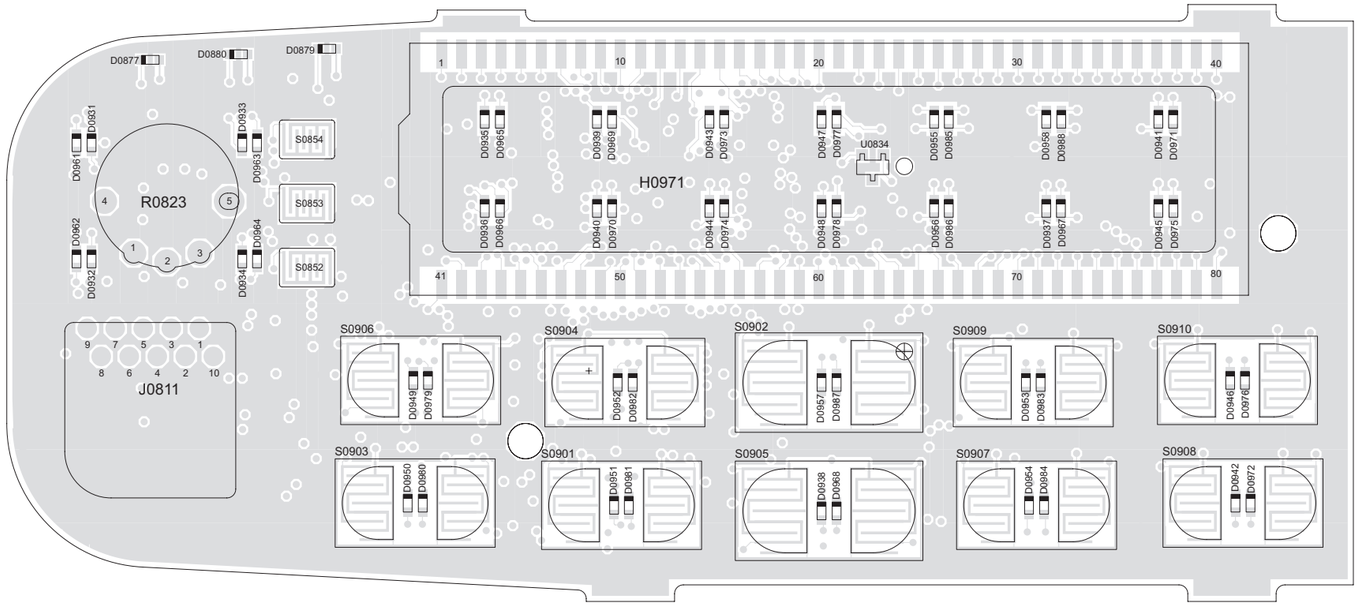
Circuit Ref	Motorola Part No.	Description
C0802	2113741F17	470pF 50V
C0803	2113741F17	470pF 50V
C0804	2113741F17	470pF 50V
C0805	2113740F49	82pF 5% 50V
C0806	2113741F17	470pF 50V
C0808	2113741F17	470pF 50V
C0810	2113741F17	470pF 50V
C0811	2113741F17	470pF 50V
C0813	2113741F17	470pF 50V
C0815	2113741F17	470pF 50V
C0816	2113741F17	470pF 50V
C0817	2113740F49	82pF 5% 50V
C0818	2113741F17	470pF 50V
C0821	2113741F17	470pF 50V
C0822	2311049A40	TANT CP 2.2uF 10% 10V
C0823	2113741F49	10nF 50V
C0824	2113741F49	10nF 50V
C0831	2311049A42	TANT CP 3.3uF 10% 6V
C0832	2113743E20	100nF 16V
C0833	2113743E20	100nF 16V
C0843	2113741F17	470pF 50V
D0821	4813833C02	DUAL SOT MMBD6100
D0822	4813833C02	DUAL SOT MMBD6100
D0831	4880236E05	DIODE CHIP SCHOTTKY
D0871	4886171B01	LED RED
D0872	4886171B01	LED RED
D0873	4886171B01	LED RED
D0874	4886171B01	LED RED
D0875	4886171B01	LED RED
D0876	4886171B01	LED RED
D0877	4886171B01	LED RED
D0878	4886171B03	LED YELLOW
D0879	4886171B04	LED GREEN
D0881	4886171B04	LED GREEN
D0884	4886171B04	LED GREEN
D0885	4886171B04	LED GREEN
D0886	4886171B04	LED GREEN
D0887	4886171B04	LED GREEN
D0888	4886171B04	LED GREEN
J0801	0902636Y02	CONNECTOR FLEX 12 PIN
J0811	2864287B01	CONN TELCO 10 PIN JACK
P0801	2809926G01	CONN 1.25MM 2PIN SURMT
Q0821	4805921T02	TSTR DUAL ROHM FMC2 RH
Q0822	4880048M01	TSTR NPN DIG 47k/47k
Q0823	4805921T02	TSTR DUAL ROHM FMC2 RH
Q0841	4880048M01	TSTR NPN DIG 47k/47k
Q0843	4880048M01	TSTR NPN DIG 47k/47k
Q0871	4813824A10	TSTR NPN 40V .2A B=50-150
Q0872	4813824A10	TSTR NPN 40V .2A B=50-150
Q0873	4813824A10	TSTR NPN 40V .2A B=50-150
Q0874	4813824A10	TSTR NPN 40V .2A B=50-150
Q0875	4813824A10	TSTR NPN 40V .2A B=50-150
Q0876	4813824A10	TSTR NPN 40V .2A B=50-150
Q0877	4813824A10	TSTR NPN 40V .2A B=50-150
Q0878	4813824A10	TSTR NPN 40V .2A B=50-150
Q0879	4813824A10	TSTR NPN 40V .2A B=50-150
Q0881	4813824A10	TSTR NPN 40V .2A B=50-150
Q0885	4813824A10	TSTR NPN 40V .2A B=50-150
R0810	0662057A76	13k 1/16W 5%
R0811	0662057A90	51k 1/16W 5%
R0812	0662057A09	22 1/16W 5%
R0813	0662057A01	10 1/16W 5%
R0814	0662057A35	270 1/16W 5%
R0815	0662057A76	13k 1/16W 5%
R0816	0662057A90	51k 1/16W 5%
R0821	0662057A73	10k 1/16W 5%
R0822	0662057A76	13K 1/16W 5%
R0823	1805911V02	POT VOL
R0824	0662057A65	4700 1/16W 5%
R0825	0662057A49	1k 1/16W 5%
R0831	0662057B22	1M 1/16W 5%
R0832	0662057A57	2k2 1/16W 5%
R0833	0662057A89	47k 1/16W 5%
R0834	0662057A35	270 1/16W 5%
R0835	0662057A25	100 1/16W 5%
R0836	0662057A73	10k 1/16W 5%
R0837	0662057A85	33k 1/16W 5%
R0838	0662057A73	10k 1/16W 5%
R0841	0662057A73	10k 1/16W 5%
R0842	0662057A89	47k 1/16W 5%
R0843	0662057A57	2.2k 1/16W 5%
R0844	0662057A73	10k 1/16W 5%
R0845	0662057A65	4700 1/16W 5%
R0847	0662057A09	22 1/16W 5%
R0849	0662057A89	47k 1/16W 5%
R0852	0662057A97	100k 1/16W
R0853	0662057A97	100k 1/16W
R0854	0662057A97	100k 1/16W
R0861	0662057A90	51k 1/16W 5%
R0862	0662057A76	13k 1/16W 5%
R0864	0662057A88	43k 1/16W 5%
R0866	0662057A90	51k 1/16W 5%
R0867	0662057A76	13k 1/16W 5%
R0873	0660076A35	270 5 1/8
R0874	0660076A35	270 5 1/8
R0875	0660076A35	270 5 1/8
R0876	0660076A35	270 5 1/8
R0877	0660076A35	270 5 1/8
R0878	0660076A35	270 5 1/8
R0879	0660076A35	270 5 1/8
R0880	0662057A81	22k 1/16W 5%
R0881	0662057A35	270 1/16W 5%
R0885	0662057A35	270 1/16W 5%
*U0831	5113802A24	IC 68HC11 W/SCI,SPI,A/D
U0832	5113815A02	IC
U0833	4886061B01	CER RESONATOR 8MHZ CSTCC8.00MG
VR0816	4805656W09	DIODE ZENER QUAD MMQA20VT1
VR0817	4805656W09	DIODE ZENER QUAD MMQA20VT1
VR0821	4813830A15	DIODE 5.6V 5% 225mW
VR0822	4813830A15	DIODE 5.6V 5% 225mW
VR0823	4813830A15	DIODE 5.6V 5% 225mW

* Motorola Depot Servicing only

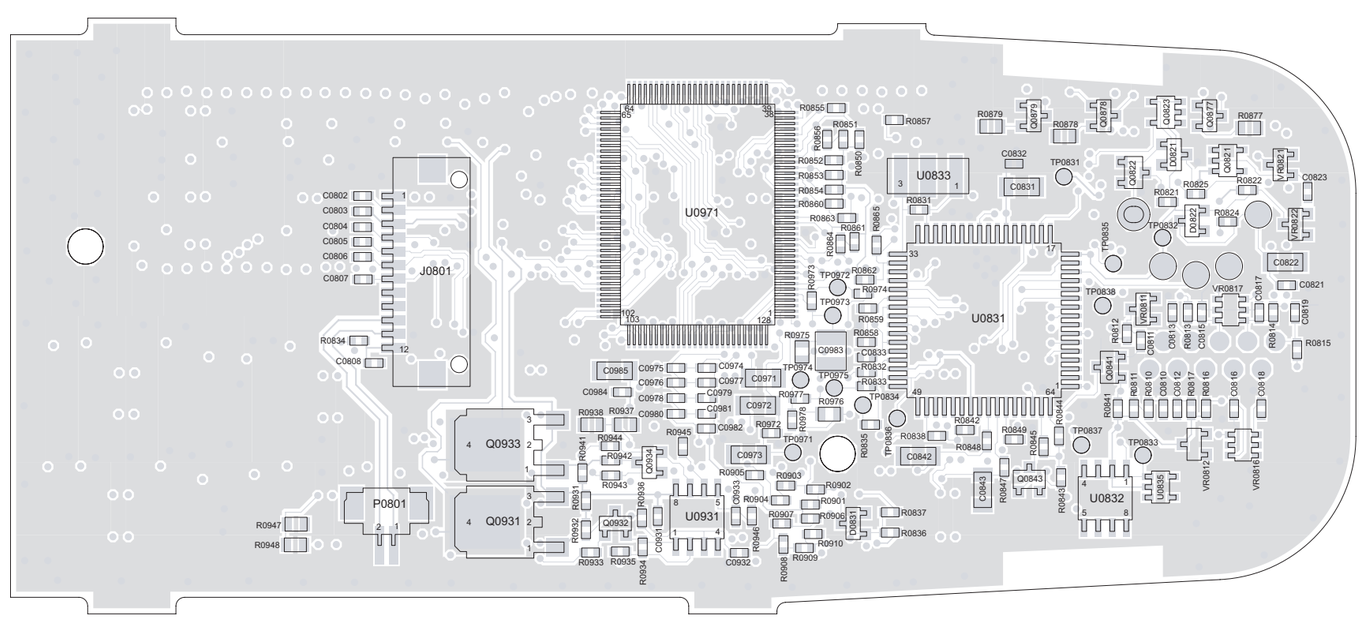
Reference designators with an asterisk indicate components that are not field-replaceable because they need to be calibrated with specialized factory equipment after installation. Radios in which these parts have been replaced in the field will be off frequency at temperature extremes.

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Chapters 4 - 13. Boards are not orderable using the 84- prefixed number.

3.0 Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 PCB 8486155B06, Schematics, and Parts Lists



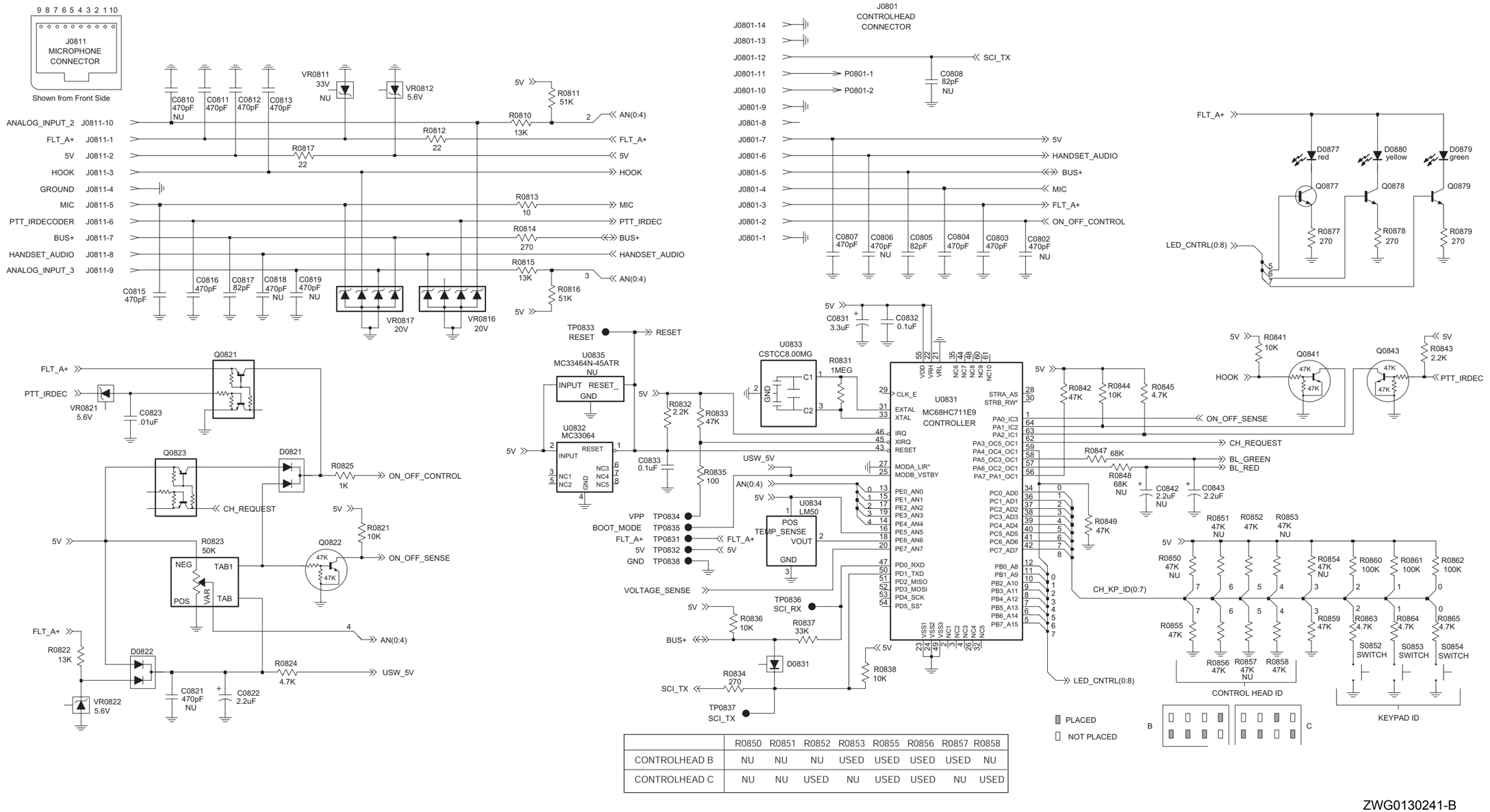
ZWG0130136-A Top Side



ZWG0130137-B Bottom Side

Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 - PCB 8486155B06

6881091C63-C

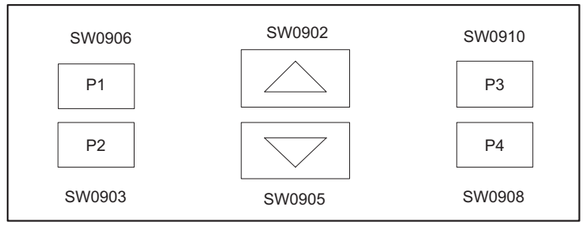


	R0850	R0851	R0852	R0853	R0855	R0856	R0857	R0858
CONTROLHEAD B	NU	NU	NU	USED	USED	USED	USED	NU
CONTROLHEAD C	NU	NU	USED	NU	USED	USED	NU	USED

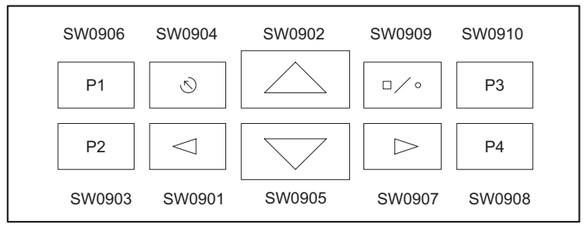
ZWG0130241-B

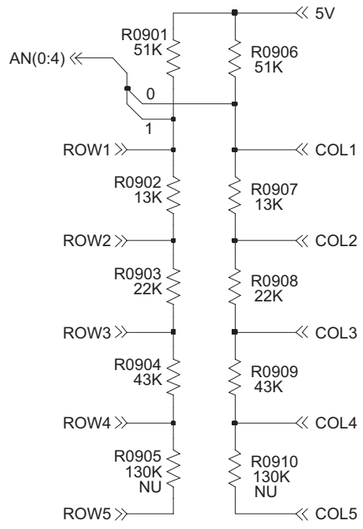
Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 - Schematic Sheet 1 of 4

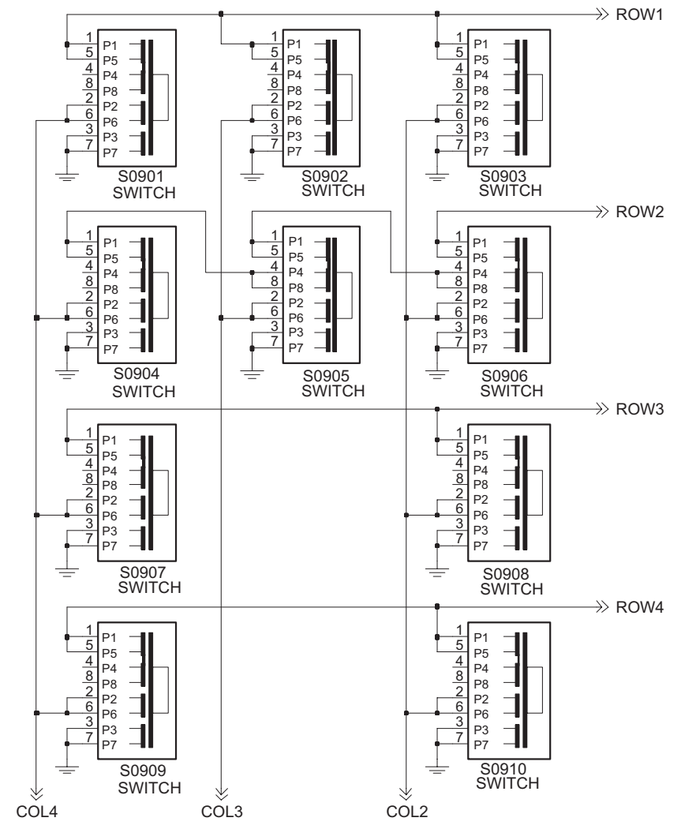
KEYPAD B LAYOUT



KEYPAD C LAYOUT





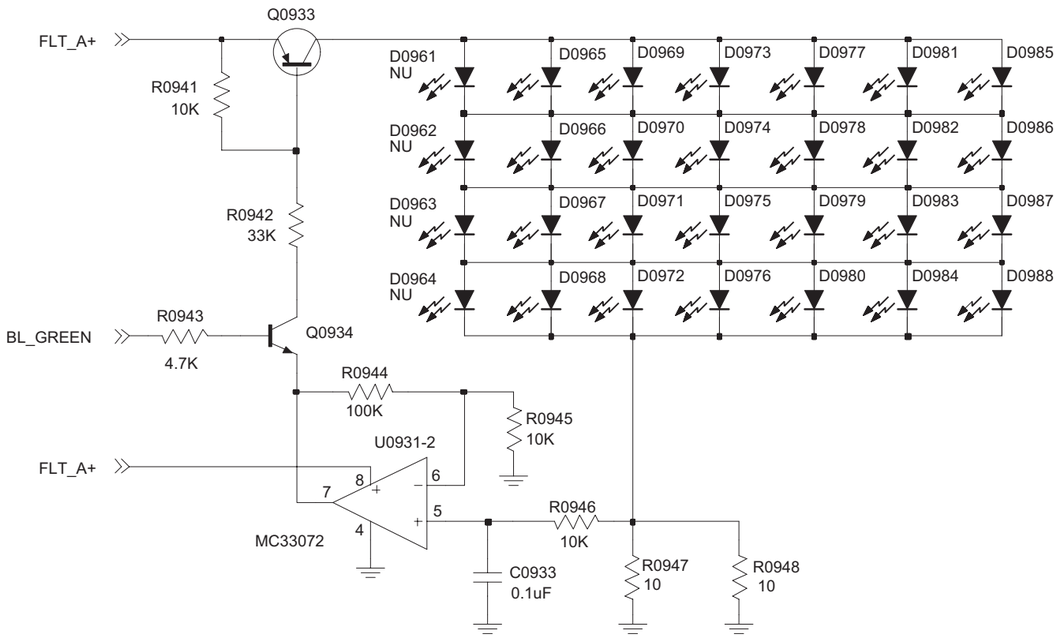


ZWG0130242-A

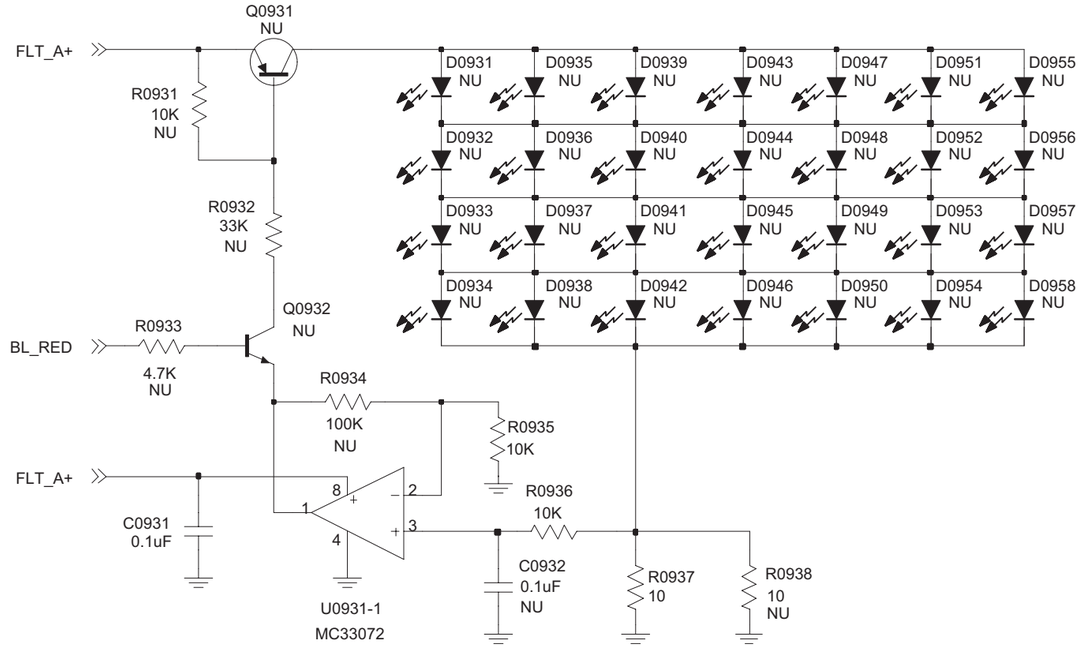
Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 - Schematic Sheet 2 of 4

6881091C63-C

BACKLIGHT GREEN



BACKLIGHT RED

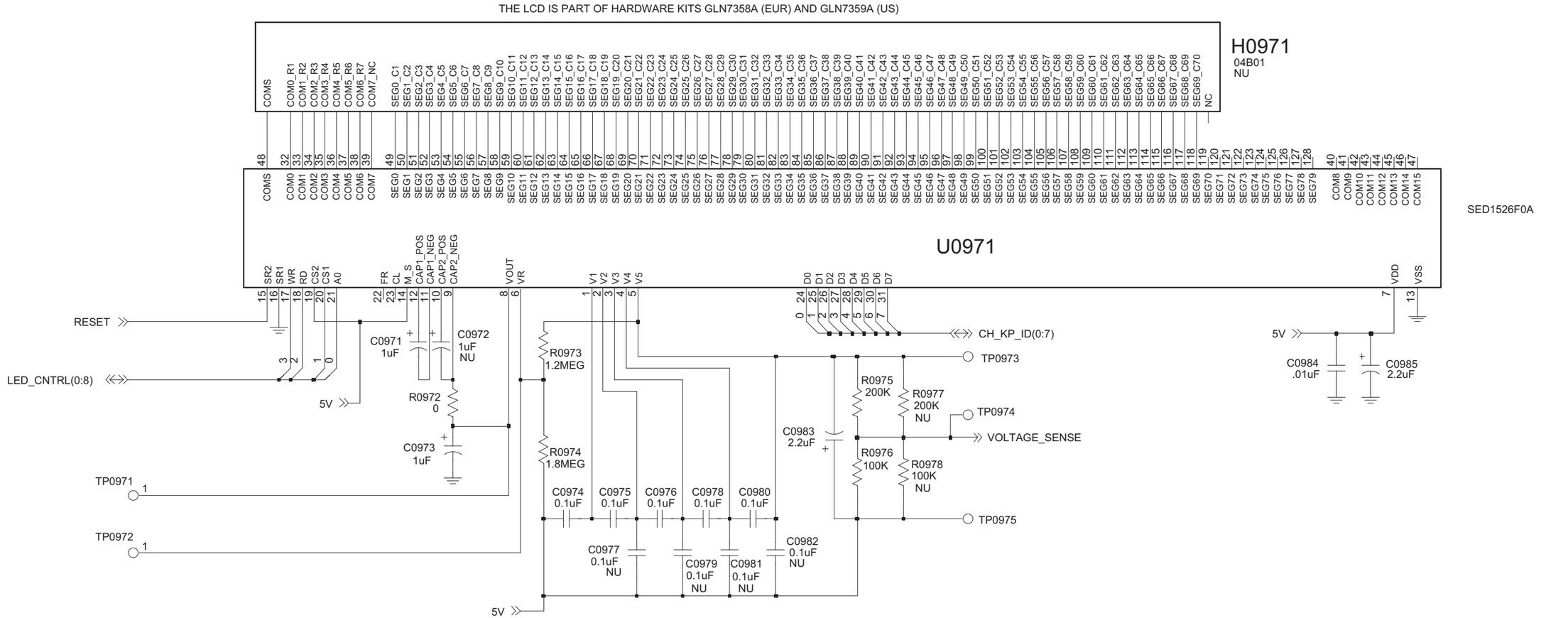


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6881091C63-C

DISPLAY



ZWG0130244-A

Control Head CDM1250 / PRO5100 / CDM1550 Series / PRO7100 - Schematic Sheet 4 of 4

6881091C63-C

Control Head PCB 8486155B06 Parts List†

Circuit Ref	Motorola Part No.	Description
C0803	2113741F17	470pF 50V
C0804	2113741F17	470pF 50V
C0805	2113740F49	82pF 5% 50V NP0
C0807	2113741F17	470pF 50V
C0811	2113741F17	470pF 50V
C0812	2113741F17	470pF 50V
C0813	2113741F17	470pF 50V
C0815	2113741F17	470pF 50V
C0816	2113741F17	470pF 50V
C0817	2113740F49	82pF 5% 50V
C0822	2311049A40	TANT CP 2.2uF 10% 10V
C0823	2113741F49	10nF 50V
C0831	2311049A42	TANT CP 3.3uF 10% 6V
C0832	2113743E20	100nF 16V
C0833	2113743E20	100nF 16V
C0843	2311049A40	TANT CP 2.2uF 10% 10V
C0931	2113743E20	100nF 16V
C0933	2113743E20	100nF 16V
C0971	2311049A07	TANT CP 1uF 10% 16V
C0973	2311049A07	TANT CP 1uF 10% 16V
C0974	2113743E20	100nF 16V
C0975	2113743E20	100nF 16V
C0976	2113743E20	100nF 16V
C0978	2113743E20	100nF 16V
C0980	2113743E20	100nF 16V
C0983	2311049A09	TANT CP 2.2uF 10% 20V
C0984	2113741F49	10nF 50V
C0985	2311049A40	TANT CP 2.2uF 10% 10V
D0821	4813833C02	DIODE DUAL SOT MMBD6100
D0822	4813833C02	DIODE DUAL SOT MMBD6100
D0831	4880236E05	DIODE CHIP SCHOTTKY
D0877	4886171B01	LED RED
D0879	4886171B04	LED GREEN
D0880	4886171B03	LED YELLOW
D0951	4886171B02	LED ORANGE Not used in Control Head B
D0952	4886171B02	LED ORANGE Not used in Control Head B
D0953	4886171B02	LED ORANGE Not used in Control Head B
D0954	4886171B02	LED ORANGE Not used in Control Head B
D0965	4886171B04	LED GREEN
D0966	4886171B04	LED GREEN
D0967	4886171B04	LED GREEN
D0968	4886171B04	LED GREEN
D0969	4886171B04	LED GREEN
D0970	4886171B04	LED GREEN
D0971	4886171B04	LED GREEN
D0972	4886171B04	LED GREEN
D0973	4886171B04	LED GREEN
D0974	4886171B04	LED GREEN
D0975	4886171B04	LED GREEN
D0976	4886171B04	LED GREEN
D0977	4886171B04	LED GREEN
D0978	4886171B04	LED GREEN
D0979	4886171B04	LED GREEN
D0980	4886171B04	LED GREEN
D0981	4886171B04	LED GREEN Not used in Control Head B
D0982	4886171B04	LED GREEN Not used in Control Head B
D0983	4886171B04	LED GREEN Not used in Control Head B
D0984	4886171B04	LED GREEN Not used in Control Head B
D0985	4886171B04	LED GREEN
D0986	4886171B04	LED GREEN
D0987	4886171B04	LED GREEN
D0988	4886171B04	LED GREEN
J0801	0902636Y02	CONNECTOR FLEX 12 PIN
J0811	2864287B01	CONN TELCO 10 PIN JACK
P0801	2809926G01	CONN 1.25MM 2PIN SUR MT
Q0821	4805921T02	TSTR DUAL ROHM FMC2 RH
Q0822	4880048M01	TSTR NPN DIG 47k/47k
Q0823	4805921T02	TSTR DUAL ROHM FMC2 RH
Q0841	4880048M01	TSTR NPN DIG 47k/47k
Q0843	4880048M01	TSTR NPN DIG 47k/47k
Q0877	4813824A10	TSTR NPN 40V .2A B=50-150
Q0878	4813824A10	TSTR NPN 40V .2A B=50-150
Q0879	4813824A10	TSTR NPN 40V .2A B=50-150
Q0933	4813822A08	TSTR PNP 25V 5AMJD210T4
Q0934	4813824A10	TSTR NPN 40V .2A B=50-150
R0810	0662057A76	13k 1/16W 5%
R0811	0662057A90	51k 1/16W 5%
R0812	0662057A09	22 1/16W 5%
R0813	0662057A01	10 1/16W 5%
R0814	0662057A35	270 1/16W 5%
R0815	0662057A76	13k 1/16W 5%
R0816	0662057A90	51k 1/16W 5%
R0817	0662057A09	22 1/16W 5%
R0821	0662057A73	10k 1/16W 5%
R0822	0662057A76	13k 1/16W 5%
R0823	1805911V02	POT VOL
R0824	0662057A65	4700 1/16W 5%
R0825	0662057A49	1k 1/16W 5%
R0831	0662057B22	1M 1/16W 5%
R0832	0662057A57	2200 1/16W 5%
R0833	0662057A89	47k 1/16W 5%
R0834	0662057A35	270 1/16W 5%
R0835	0662057A25	100 1/16W 5%
R0836	0662057A73	10k 1/16W 5%
R0837	0662057A85	33k 1/16W 5%
R0838	0662057A73	10k 1/16W 5%
R0841	0662057A73	10k 1/16W 5%
R0842	0662057A89	47k 1/16W 5%
R0843	0662057A57	2.2k 1/16W 5%
R0844	0662057A73	10k 1/16W 5%
R0845	0662057A65	4700 1/16W 5%
R0847	0662057A93	68k 1/16W 5%
R0849	0662057A89	47k 1/16W 5%
R0852	0662057A89	47k 1/16W 5% Not used in Control Head B
R0853	0662057A89	47k 1/16W 5% Not used in Control Head C
R0855	0662057A89	47k 1/16W 5%
R0856	0662057A89	47k 1/16W 5%
R0857	0662057A89	47k 1/16W 5% Not used in Control Head C
R0858	0662057A89	47k 1/16W 5% Not used in Control Head B
R0859	0662057A89	47k 1/16W 5%
R0860	0662057A97	100k 1/16W
R0861	0662057A97	100k 1/16W
R0862	0662057A97	100k 1/16W
R0863	0662057A65	4700 1/16W 5%
R0864	0662057A65	4700 1/16W 5%
R0865	0662057A65	4700 1/16W 5%
R0877	0660076A35	270 5 1/8
R0878	0660076A35	270 5 1/8
R0879	0660076A35	270 5 1/8
R0901	0662057A90	51k 1/16W 5%
R0902	0662057A76	13k 1/16W 5%
R0903	0662057A81	22k 1/16W 5%
R0904	0662057A88	43k 1/16W 5%
R0906	0662057A90	51k 1/16W 5%
R0907	0662057A76	13k 1/16W 5%
R0908	0662057A81	22k 1/16W 5%
R0909	0662057A88	43k 1/16W 5% Not used in Control Head B
R0935	0662057A73	10k 1/16W 5%
R0936	0662057A73	10k 1/16W 5%
R0937	0660076A01	10 5 1/8
R0941	0662057A73	10k 1/16W 5%
R0942	0662057A85	33k 1/16W 5%
R0943	0662057A65	4700 1/16W 5%
R0944	0662057A97	100k 1/16W
R0945	0662057A73	10k 1/16W 5%
R0946	0662057A73	10k 1/16W 5%
R0947	0660076A01	10 5 1/8
R0948	0660076A01	10 5 1/8
R0972	0662057B47	0 1/16W
R0973	0662057B24	1.2M 1/16W 5%
R0974	0662057B28	1.8M 1/16W 5%
R0975	0662057G29	200k 0.1W 1%
R0976	0662057G13	100k 0.1W 1%
*U0831	5113802A24	IC 68HC11 W/SCI,SPI,A/D
U0832	5113815A02	MC33064 UNDER VLTG SENSING
U0833	4886061B01	CER RESONATOR 8MHZ CSTCC8.00MG
U0834	5185963A15	TEMP SENSOR 1M5
U0931	5113818A03	IC HIGH PERFORMANCE SI
U0971	5186158B01	LCD DRIVER SED1526F0A
VR0812	4813830A15	DIODE 5.6V 5% 225mW
VR0816	4805656W09	DIODE ZENER QUAD MMQA20VT1
VR0817	4805656W09	DIODE ZENER QUAD MMQA20VT1
VR0821	4813830A15	DIODE 5.6V 5% 225mW
VR0822	4813830A15	DIODE 5.6V 5% 225mW

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Chapters 4 - 13. Boards are not orderable using the 84- prefixed number.

Chapter 3: Controller Service Maintainability

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Section 1

THEORY OF OPERATION

1.0 Controller Circuits

1.1 Overview

This section provides a detailed theory of operation for the radio and its components. The main radio is a single-board design, consisting of the transmitter, receiver, and controller circuits. The main board is designed to accept one option board. The option board may provide functions such as secure voice/data, voice storage, or signaling decoder.

A control head is either mounted directly or connected by an extension cable. The control head contains LED indicators, a microphone connector, buttons, and—depending on the radio type—a display and a speaker. These provide the user with interface control over the various features of the radio.

If no control head is mounted directly on the front of the radio, an expansion board containing circuitry for special applications can be mounted on the front of the radio. An additional control head can be connected by an extension cable.

In addition to the power cable and antenna cable, an accessory cable can be attached to a connector on the rear of the radio. The accessory cable enables you to connect accessories to the radio, such as an external speaker, emergency switch, foot-operated PTT, and ignition sensing, etc.

1.2 General

The radio controller consists of three main subsections:

- digital control
- audio processing
- voltage regulation

The digital control section of the radio is based upon an open architecture controller configuration. It consists of a microprocessor, support memory, support logic, signal MUX ICs, the On/Off circuit, and general purpose Input/Output circuitry.

The controller uses the Motorola 68HC11FL0 microprocessor (U0101). The controller also has three external memory devices. These devices consist of a 32KByte SRAM (U0122), a 512KByte FLASH EEPROM (U0121), and a 16KByte EEPROM (U0111).

NOTE From this point on, the 68HC11FL0 microprocessor is referred to as “µP”. References to a control head indicate the control heads with display.

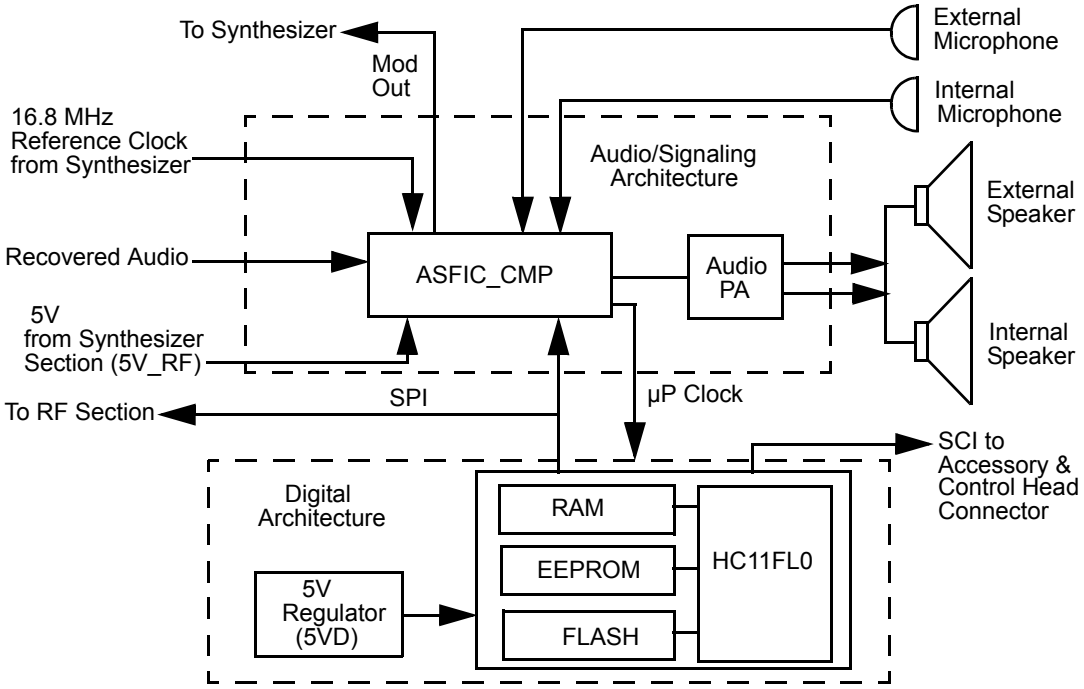


Figure 3-1 Controller Block Diagram

1.3 Radio Power Distribution

The DC power distribution throughout the radio board is shown in Figure 3-2. Voltage regulation for the controller is provided by 4 separate devices; U0651 (MC78M05) 5V, U0641 (LM2941) 9.3V, U0611 (LM2941) SWB+ limited to 16.5V and VSTBY 5V (a combination of R0621 and VR0621). An additional 5V regulator is located on the RF section.

The DC voltage applied to connector J0601 supplies power directly to the electronic on/off control, RF power amplifier, 16.5V limiter, 9.3V regulator, Audio PA and 5.6V stabilization circuit. The 9.3V regulator (U0641) supplies power to the 5V regulator (U0651) and the 6V voltage divider Q0681.

Regulator U0641 is used to generate the 9.3 volts required by some audio circuits, the RF circuitry and power control circuitry. Input and output capacitors (C0641 and C0644 / C0645) are used to reduce high frequency noise. R0642 / R0643 set the output voltage of the regulator. If the voltage at pin 1 is greater than 1.3 volts the regulator output decreases and if the voltage is less than 1.3 volts the regulator output increases. This regulator output is electronically enabled by a 0 volt signal on pin 2. Q0661, Q0641 and R0641 are used to disable the regulator when the radio is turned off.

Voltage regulation providing 5V for the digital circuitry is done by U0651. Operating voltage is from the regulated 9.3V supply. Input and output capacitors (C0651 / C0652 and C0654 / C0655) are used to reduce high frequency noise and provide proper operation during battery transients. Voltage sense device U0652 or alternatively U0653 provides a reset output that goes to 0 volts if the regulator output goes below 4.5 volts. This is used to reset the controller to prevent improper operation. Diode D0651 prevents discharge of C0652 by negative spikes on the 9.3V voltage.

Transistor Q0681 and resistors R0681 / R0682 divide the regulated 9.3V down to about 6 volts. This voltage supplies the 5V regulator, located on the RF section. By reducing the supply voltage of the regulator, the power dissipation is divided between the RF section and the controller section.

The voltage VSTBY, which is derived directly from the supply voltage by components R0621 and VR0621, is used to buffer the internal RAM. C0622 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Dual diode D0621 prevents radio circuitry from discharging this capacitor. When the supply voltage is applied to the radio, C0622 is charged via R0621 and D0621. To avoid the µP entering the wrong mode when the radio is switched on while the voltage across C0622 is still too low, the regulated 5V supply charges C0622 via diode D0621.

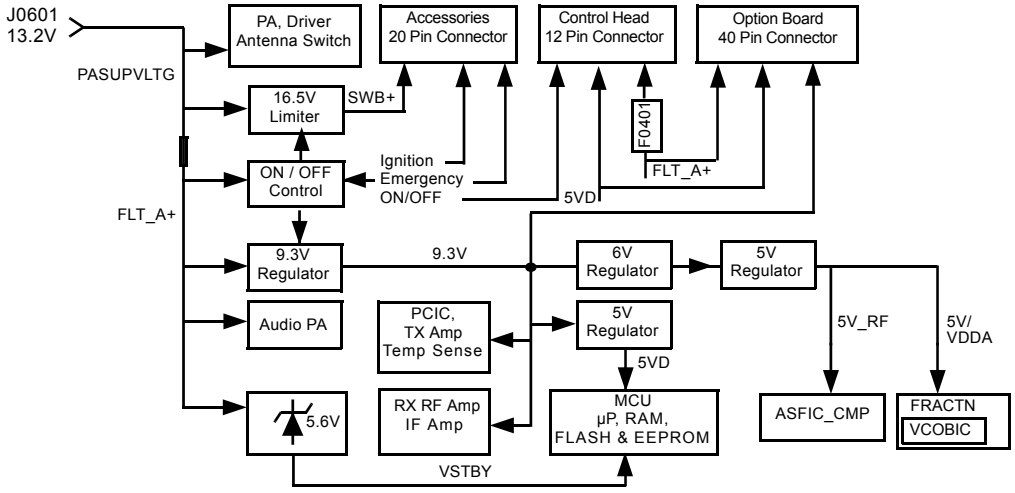


Figure 3-2 DC Power Distribution Block Diagram

The voltage INT SW B+ from switching transistor Q0661 provides power to the circuit controlling the audio PA output. The voltage INT SW B+ voltage is monitored by the µP through voltage divider R0671 / R0672 and line BATTERY VOLTAGE. Diode VR0671 limits the divided voltage to 5.6V to protect the µP.

Regulator U0611 is used to generate the voltage for the switched supply voltage output (SWB+) at the accessory connector J0501 pin 13. U0611 is configured to operate as a switch with voltage and current limit. R0611 / R0612 set the maximum output voltage to 16.5 volts. This limitation is only active at high supply voltage levels. The regulator output is electronically enabled by a 0 volt signal on pin 2. Q0661, Q0641 and R0641 are used to disable the regulator when the radio is turned off. Input and output capacitors (C0603 and C0611 / C0612) are used to reduce high frequency noise.

Diode VR0601 acts as protection against transients and wrong polarity of the supply voltage.

Fuse F0401 prevents damage of the board in case the FLT A+ line is shorted at the control head connector.

1.4 Electronic ON/OFF

The radio has circuitry which allows radio software and/or external triggers to turn the radio on or off without direct user action (for example, automatic turn on when ignition is sensed and off when ignition is off).

Q0661 is used to provide INT SW B+ to the various radio circuits and to enable the voltage regulators via transistor Q0641. Q0661 contains an pnp and an npn transistor and acts as an electronic on/off switch. The switch is on when the collector of the npn transistor within Q0661 is low. When the radio is off the collector is at supply voltage level. This effectively prevents current flow from emitter to collector of the pnp transistor. When the radio is turned on the voltage at the base of the npn transistor is pulled high and the pnp transistor switches on (saturation). With voltage INT SWB+ now at supply voltage level, transistor Q0641 pulls pin 2 of the voltage regulators U0611 and U0641 to ground level and thereby enables their outputs.

The electronic on/off circuitry can be enabled by the µP (through ASFIC CMP port GCB2, line DC POWER ON), the emergency switch (line EMERGENCY CONTROL), the mechanical On/Off/Volume knob on the control head (line ON OFF CONTROL), or the ignition sense circuitry (line IGNITION CONTROL). If any of the 4 paths cause a low at the collector of the npn transistor within Q0661, the electronic “ON” is engaged.

1.5 Emergency

The emergency switch (J0501 pin 9), when engaged, grounds the base of Q0662 via line EMERGENCY CONTROL. This switches Q0662 off and resistor R0662 pulls the collector of Q0662 and the base of Q0663 to levels above 2 volts. Transistor Q0663 switches on and pulls the collector of the npn transistor within Q0661 to ground level and thereby enables the voltage regulators via Q0641. When the emergency switch is released R0541 pulls the base of Q0662 up to 0.6 volts. This causes the collector of transistor Q0662 to go low (0.2V), thereby switching Q0663 off.

While the radio is switched on, the µP monitors the voltage at the emergency input on the accessory connector via pin 60 and line GP5 IN ACC9. Three different conditions are distinguished: no emergency, emergency, and open connection to the emergency switch. If no emergency switch is connected or the connection to the emergency switch is broken, the resistive divider R0541 / R0512 will set the voltage to about 4.7 volts. If an emergency switch is connected, a resistor to ground within the emergency switch will reduce the voltage on line GP5 IN ACC9 to inform the µP that the emergency switch is operational. An engaged emergency switch pulls line GP5 IN ACC9 to ground level. Diode D0179 limits the voltage to protect the µP input.

While EMERGENCY CONTROL is low, INT SW B+ is on, the µP starts execution, reads that the emergency input is active through the voltage level of line GP5 IN ACC9, and sets the DC POWER ON output of the ASFIC CMP pin 13 to a logic high. This high will keep Q0661 and Q0641 switched on. This operation allows a momentary press of the emergency switch to power up the radio. When the µP has finished processing the emergency press, it sets the DC POWER ON line to a logic “0”. This turns off Q0661 and the radio turns off. Notice that the µP is alerted to the emergency condition via line GP5 IN ACC9. If the radio was already on when emergency was triggered then DC POWER ON would already be high.

1.6 Mechanical ON/OFF

This refers to the typical On/Off/Volume knob, located on the control head, and which turns the radio on and off.

If the radio is turned off and the On/Off/Volume knob is pressed, line ON OFF CONTROL (J0401 pin 11) goes high and switches the radio's voltage regulators on as long as the button is pressed. The µP is alerted through line ON OFF SENSE (U0101 pin 6) which is pulled to low by Q0110 while the On/Off/Volume knob is pressed. In addition, an interrupt is generated at µP pin 96. The µP asserts line DC POWER ON via ASFIC CMP, pin 13 high which keeps Q0661 and Q0641, and in turn the radio, switched on. When the On/Off/Volume knob is released again the control head informs the µP via SBEP bus about the knob release. (See SBEP Serial Interface subsection for more details.) This informs the µP to keep the radio switched on and continue with normal operation.

If the On/Off/Volume knob is pressed while the radio is on, the control head informs the µP via SBEP bus about the knob status. (See SBEP Serial Interface subsection for more details.) After a short delay time the µP switches the radio off by setting DC POWER ON to low via ASFIC CMP pin 13.

1.7 Ignition

Ignition sense is used to prevent the radio from draining the vehicle's battery because the engine is not running.

When the IGNITION input (J0501 pin 10) goes above 5 volts Q0661 is turned on via line IGNITION CONTROL. Q0661 turns on INT SW B+ and the voltage regulators by turning on Q0641 and the µP starts execution. The µP is alerted through line GP6 IN ACC10. The voltage at the IGNITION input turns Q0181 on, which pulls µP pin 74 to low. If the software detects a low state it asserts DC POWER ON via ASFIC pin 13 high which keeps Q0661 and Q0641 on, and in turn the radio switched on.

When the IGNITION input goes below 3 volts, Q0181 switches off and R0181 pulls µP pin 74 to high. This alerts the software to switch off the radio by setting DC POWER ON to low. The next time the IGNITION input goes above 5 volts the above process will be repeated.

1.8 Microprocessor Clock Synthesizer

The clock source for the µP system is generated by the ASFIC CMP (U0221). Upon power-up the synthesizer IC (FRAC-N) generates a 16.8 MHz waveform that is routed from the RF section to the ASFIC CMP pin 34. For the main board controller the ASFIC CMP uses 16.8 MHz as a reference input clock signal for its internal synthesizer. The ASFIC CMP, in addition to audio circuitry, has a programmable synthesizer which can generate a synthesized signal ranging from 1200Hz to 32.769MHz in 1200Hz steps.

When power is first applied, the ASFIC CMP will generate its default 3.6864MHz CMOS square wave UP CLK (on U0221 pin 28) and this is routed to the µP (U0101 pin 90). After the µP starts operation, it reprograms the ASFIC CMP clock synthesizer to a higher UP CLK frequency (usually 7.3728 or 14.7456 MHz) and continues operation.

The ASFIC CMP may be reprogrammed to change the clock synthesizer frequencies at various times depending on the software features that are executing. In addition, the clock frequency of the synthesizer is changed in small amounts if there is a possibility of harmonics of the clock source interfering with the desired radio receive frequency.

The ASFIC CMP synthesizer loop uses C0245, C0246 and R0241 to set the switching time and jitter of the clock output. If the synthesizer cannot generate the required clock frequency it will switch back to its default 3.6864MHz output.

Because the ASFIC CMP synthesizer and the µP system will not operate without the 16.8 MHz reference clock it (and the voltage regulators) should be checked first when debugging the system.

The µP uses XTAL Y0131 and associated components to form a Real Time Clock (RTC). It may be used to display the time on control heads with display or as time stamp for incoming calls or messages. The real time clock is powered from the voltage VSTBY to keep it running while the radio is switched off. When the radio is disconnected from its supply voltage, the time must be set again.

1.9 Serial Peripheral Interface (SPI)

The µP communicates to many of the ICs through its SPI port. This port consists of SPI TRANSMIT DATA (MOSI) (U0101-100), SPI RECEIVE DATA (MISO) (U0101-99), SPI CLK (U0101-1) and chip select lines going to the various ICs, connected on the SPI PORT (BUS). This BUS is a synchronous bus, in that the timing clock signal CLK is sent while SPI data (SPI TRANSMIT DATA or SPI RECEIVE DATA) is sent. Therefore, whenever there is activity on either SPI TRANSMIT DATA or SPI RECEIVE DATA there should be a uniform signal on CLK. The SPI TRANSMIT DATA is used to send serial from a µP to a device, and SPI RECEIVE DATA is used to send data from a device to a µP.

On the controller there are two ICs on the SPI BUS, ASFIC CMP (U0221-22), and EEPROM (U0111-5). In the RF sections there are 2 ICs on the SPI BUS, the FRAC-N Synthesizer, and the Power Control IC (PCIC). The SPI TRANSMIT DATA and CLK lines going to the RF section are filtered by L0481 / R0481 and L0482 / R0482 to minimize noise. The chip select line CSX from U0101 pin 2 is shared by the ASFIC CMP, FRAC-N Synthesizer and PCIC. Each of these ICs check the SPI data and when the sent address information matches the IC's address, the following data is processed. The chip select lines for the EEPROM (EE CS), Voice Storage (VS CS), expansion board (EXP1 CS, EXP2 CS) and option board (OPT CS) are decoded by the address decoder U0141.

When the µP needs to program any of these ICs it brings the chip select line CSX to a logic "0" and then sends the proper data and clock signals. The amount of data sent to the various ICs are different; e.g., the ASFIC CMP can receive up to 19 bytes (152 bits) while the PCIC can receive up to 6 bytes (48 bits). After the data has been sent the chip select line is returned to logic "1".

The option board interfaces are different in that the µP can also read data back from devices connected.The timing and operation of this interface is specific to the option connected, but generally follows the pattern:

1. an option board device generates a service request via J0551-29, line RDY and µP pin 79,
2. the main board asserts a chip select for that option board device via U0141-14, line OPT CS, J0551-30,
3. the main board µP generates the CLK (J0551-3),
4. the main board µP writes serial data via J0551-15 and reads serial data via J0551-16 and,
5. when data transfer is complete the main board terminates the chip select and CLK activity.

1.10 SBEP Serial Interface

The SBEP serial interface allows the radio to communicate with the Customer Programming Software (CPS), or the Universal Tuner via the Radio Interface Box (RIB) or the cable with internal RIB. This interface connects to the microphone connector via control head connector (J0401-8) and to the accessory connector J0501-17 and comprises BUS+. The line is bi-directional, meaning that either the radio or the RIB can drive the line. The µP sends serial data via pin 98 and D0101 and it reads serial data via pin 97. Whenever the µP detects activity on the BUS+ line, it starts communication.

In addition, the SBEP serial interface is used to communicate with a connected control head. When a control head key is pressed or the volume knob is rotated, the line ON OFF CONTROL goes high. This turns on transistor Q0110 which pulls line ON OFF SENSE and µP pin 6 to ground level. In addition, an interrupt is generated at µP pin 96. This indicates that the control head wants to start SBEP communication. The µP then requests the data from the control head. The control head starts sending and after all data has been sent, the ON OFF CONTROL line goes low. The control head ignores any data on BUS+ during SBEP communication with the CPS or Universal Tuner.

1.11 General Purpose Input/Output

The controller provides eight general purpose lines (DIG1 through DIG8) available on the accessory connector J0501 to interface to external options. Lines DIG IN 1, 3, 5, 6 are inputs, DIG OUT 2 is an output and DIG IN OUT 4, 7, 8 are bi-directional. The software and the hardware configuration of the radio model define the function of each port.

- DIG IN 1 can be used as external PTT input, DATA PTT input or others, set by the CPS. The µP reads this port via pin 77 and Q0171.
- DIG OUT 2 can be used as normal output or external alarm output, set by the CPS. Transistor Q0173 is controlled by the µP via ASFIC CMP pin 14.
- DIG IN 3 is read by µP pin 61 via resistor R0176
- DIG IN 5 can be used as normal input or emergency input, set by the CPS. The µP reads this port via R0179 and µP pin 60. Diode D0179 limits the voltage to protect the µP input.
- DIG IN 6 can be used as normal input, set by the CPS. The µP reads this port via pin 74 and Q0181.
- DIG IN OUT 4,7,8 are bi-directional and use the same circuit configuration. Each port uses an output transistor Q0177, Q0183, Q0185 controlled by µP pins 46, 47, 53. The ports are read by µP pins 75, 54, 76. To use one of the ports as input the µP must turn off the corresponding output transistor.

In addition the signals from DIG IN 1, DIG IN OUT 4 are fed to the option board connector J0551 and the expansion board connector J0451.

1.12 Normal Microprocessor Operation

For this radio, the µP is configured to operate in one of two modes, expanded and bootstrap. In expanded mode the µP uses external memory devices to operate, whereas in bootstrap operation the µP uses only its internal memory. In normal operation of the radio the µP is operating in expanded mode as described below.

In expanded mode on this radio, the µP (U0101) has access to 3 external memory devices; U0121 (FLASH EEPROM), U0122 (SRAM), U0111 (EEPROM). Also, within the µP there are 3 KBytes of internal RAM, as well as logic to select external memory devices.

The external EEPROM (U0111) space contains the information in the radio which is customer specific, referred to as the codeplug. This information consists of items such as: 1) what band the radio operates in, 2) what frequencies are assigned to what channel, and 3) tuning information. (See the particular device subsection for more details.)

The external SRAM (U0122) as well as the µP's own internal RAM space are used for temporary calculations required by the software during execution. All of the data stored in both of these locations is lost when the radio powers off. (See the particular device subsection for more details.)

The FLASH EEPROM contains the actual Radio Operating Software. This software is common to all open architecture radios within a given model type. For example, trunking radios may have a different version of software in the FLASH EEPROM than non-trunking radios. (See the particular device subsection for more details.)

The µP provides an address bus of 16 address lines (ADDR 0 - ADDR 15), and a data bus of 8 data lines (DATA 0 - DATA 7). There are also 3 control lines; CSPROG (U0101-38) to chip select U0121-30 (FLASH EEPROM), CSGP2 (U0101-41) to chip select U0122-20 (SRAM) and PG7 R W (U0101-4) to select whether to read or to write. The external EEPROM (U0111-1), the OPTION BOARD and EXPANSION BOARD are selected by 3 lines of the µP using address decoder U0141. The chips ASFIC CMP / FRAC-N / PCIC are selected by line CSX (U0101-2).

When the µP is functioning normally, the address and data lines should be toggling at CMOS logic levels. Specifically, the logic high levels should be between 4.8 and 5.0V, and the logic low levels should be between 0 and 0.2V. No other intermediate levels should be observed, and the rise and fall times should be <30ns.

The low-order address lines (ADDR 0 - ADDR 7) and the data lines (DATA 0-DATA 7) should be toggling at a high rate, e.g., you should set your oscilloscope sweep to 1us/div. or faster to observe individual pulses. High speed CMOS transitions should also be observed on the µP control lines.

On the µP the lines XIRQ (U0101-48), MODA LIR (U0101-58), MODB VSTPY (U0101-57) and RESET (U0101-94) should be high at all times during normal operation. Whenever a data or address line becomes open or shorted to an adjacent line, a common symptom is that the RESET line goes low periodically, with the period being in the order of 20ms. In the case of shorted lines you may also detect the line periodically at an intermediate level, i.e. around 2.5V when 2 shorted lines attempt to drive to opposite rails.

The MODA LIR (U0101-58) and MODB VSTPY (U0101-57) inputs to the µP must be at a logic "1" for it to start executing correctly. After the µP starts execution it will periodically pulse these lines to determine the desired operating mode. While the Central Processing Unit (CPU) is running, MODA LIR is an open-drain CMOS output which goes low whenever the µP begins a new instruction (an instruction typically requires 2-4 external bus cycles, or memory fetches). However, since it is an open-drain output, the waveform rise assumes an exponential shape similar to an RC circuit.

There are 8 analog-to-digital converter ports (A/D) on U0101. They are labeled within the device block as PE0-PE7. These lines sense the voltage level ranging from 0 to 5V of the input line and convert that level to a number ranging from 0 to 255 which can be read by the software to take appropriate action.

For example U0101-67 is the battery voltage detect line. R0671 and R0672 form a resistor divider on INT SWB+. With 30K and 10K and a voltage range of 11V to 17V, that A/D port would see 2.74V to 4.24V which would then be converted to ~140 to 217 respectively.

U0101-69 is the high reference voltage for the A/D ports on the µP. Capacitor C0101 filters the 5V reference. If this voltage is lower than 5V the A/D readings will be incorrect. Likewise U0101-68 is the low reference for the A/D ports. This line is normally tied to ground. If this line is not connected to ground, the A/D readings will be incorrect.

1.13 FLASH Electronically Erasable Programmable Memory (FLASH EEPROM)

The 512K Byte FLASH EEPROM (U0121) contains the radio's operating software. This software is common to all open architecture radios within a given model type. For example, trunking radios may have a different version of software in the FLASH EEPROM than non-trunking radios. This is, as opposed to the codeplug information stored in EEPROM (U0111) which could be different from one user to another in the same company.

In normal operating mode, this memory is read-only; it cannot be written to. The memory access signals (CE, OE and WE) are generated by the µP.

To upgrade/reprogram the FLASH software, the µP must be set in bootstrap operating mode. This is done by pulling µP pins MODA LIR (U0101-58) and MODB VSTBY (U0101-57) to low during power up. When accessory connector pin 18 is at ground level, diode D0151 will pull both µP pins to low. The same can be done by a level of 12 volts on line ON OFF CONTROL from the control head. Q0151 pulls diode D0151 and in turn both µP pins to low. Diode VR0151 prevents entering bootstrap operating mode during normal power up.

In bootstrap operating mode the µP controls the FLASH EN OE (U0121-32) input by µP pin 86. Chip select (U0121-30) and read or write operation (U0121-7) are controlled by µP pins 38 and 4.

The FLASH device may be reprogrammed 1,000 times without issue. It is not recommended to reprogram the FLASH device at a temperature below 0°C.

Capacitor C0121 serves to filter out any AC noise which may ride on 5V at U0121.

1.14 Electrically Erasable Programmable Memory (EEPROM)

The external 16 KByte EEPROM (U0111) contains additional radio operating parameters such as operating frequency and signaling features, commonly know as the codeplug. It is also used to store radio operating state parameters such as current mode and volume. This memory can be written to in excess of 100,000 times and will retain the data when power is removed from the radio. The memory access signals (SI, SO and SCK) are generated by the µP and chip select (CS) is generated by address decoder U0141-15.

1.15 Static Random Access Memory (SRAM)

The SRAM (U0121) contains temporary radio calculations or parameters that can change very frequently, and which are generated and stored by the software during its normal operation. The information is lost when the radio is turned off.

The device allows an unlimited number of write cycles. SRAM accesses are indicated by the CS signal U0122-20 (which comes from U0101-CSGP2) going low. U0122 is commonly referred to as the external RAM as opposed to the internal RAM which is the 3 KBytes of RAM which is part of the 68HC11FL0. Both RAM spaces serve the purpose. However, the internal RAM is used for the calculated values which are accessed most often.

Capacitor C0122 serves to filter out any AC noise which may ride on 5V at U0122.

2.0 Controller Board Audio and Signaling Circuits

2.1 Audio Signaling Filter IC with Compander (ASFIC CMP)

The ASFIC CMP (U0221) used in the controller has 4 functions:

1. RX/TX audio shaping, i.e. filtering, amplification, attenuation
2. RX/TX signaling, PL/DPL/HST/MDC
3. Squelch detection
4. µP clock signal generation (see Section 1.8: Microprocessor Clock Synthesizer)

The ASFIC CMP is programmable through the SPI BUS (U0221-20/21/22), normally receiving 19 bytes. This programming sets up various paths within the ASFIC CMP to route audio and/or signaling signals through the appropriate filtering, gain and attenuator blocks. The ASFIC CMP also has 6 General Control Bits GCB0-5 which are CMOS level outputs and used for NOISE BLANKER (GCB0) in Low Band radios, EXTERNAL ALARM (GCB1) and DC POWER ON (GCB2) to switch the voltage regulators (and the radio) on and off. GCB3 controls U0251 pin 11 to output either RX FLAT AUDIO or RX FILTERED AUDIO on the accessory connector pin 11. GCB4 controls U0251 pin 10 to use either the external microphone input or the voice storage playback signal. GCB5 is used to switch the audio PA on and off.

2.2 Transmit Audio Circuits

Refer to Figure 3-3 for reference for the following sections.

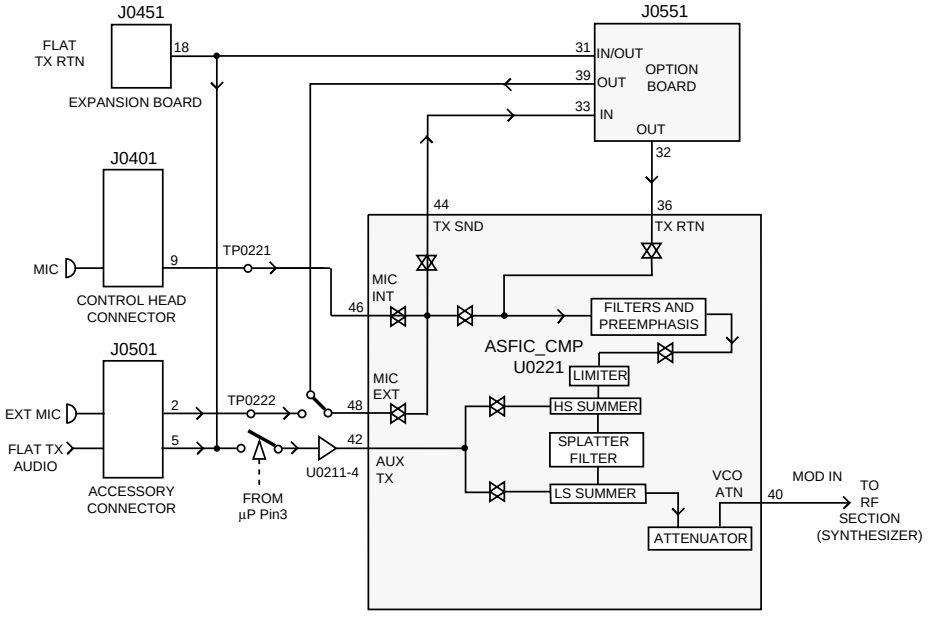


Figure 3-3 Transmit Audio Paths

2.2.1 Mic/Data Input Path

The radio supports 2 distinct microphone paths known as internal (from control head) and external mic (from accessory connector J0501-2) and an auxiliary path (FLAT TX AUDIO, from accessory connector J0501-5). The microphones used for the radio require a DC biasing voltage provided by a resistive network.

These two microphone audio input paths enter the ASFIC CMP at U0221-48 (external mic) and U0221-46 (internal mic). Following the internal mic path; the microphone is plugged into the radio control head and is connected to the controller board via J0401-9.

From here the signal is routed via R0409 and line INT MIC to R0205. R0201 and R0202 provide the 9.3VDC bias. Resistive divider R0205 / R0207 divide the input signal by 5.5 and provide input protection for the CMOS amplifier input. R0202 and C0201 provide a 560 ohm AC path to ground that sets the input impedance for the microphone and determines the gain based on the emitter resistor in the microphone's amplifier circuit.

C0204 serves as a DC blocking capacitor. The audio signal at U0221-46 (TP0221) should be approximately 14mV for 1.5kHz or 3kHz of deviation with 12.5kHz or 25kHz channel spacing.

The external microphone signal enters the radio on accessory connector J0501 pin 2 and is routed via line EXT MIC to R0206. R0203 and R0204 provide the 9.3VDC bias. Resistive divider R0206 / R0208 divide the input signal by 5.5 and provide input protection for the CMOS amplifier input.

R0204 and C0202 provide a 560 ohm AC path to ground that sets the input impedance for the microphone and determines the gain based on the emitter resistor in the microphone's amplifier circuit.

C0254 serves as a DC blocking capacitor. Multi switch U0251 controlled by ASFIC CMP port GCB4 selects either the external microphone input signal or the voice storage playback signal for entering the ASFIC CMP at pin 48. The audio signal at U0221-48 (TP0222) should be approximately 14mV for 1.5kHz or 3kHz of deviation with 12.5kHz or 25kHz channel spacing.

The FLAT TX AUDIO path is used for transmitting data signals and has therefore no limiter or filters enabled inside the ASFIC CMP. When this path is enabled via CPS and DATA PTT is asserted, any signal on this path is directly fed to the modulator. Signals applied to this path either via accessory connector J0501, expansion board connector J0451 or option board connector J0551 must be filtered and set to the correct level externally or on the option board in order not to exceed the maximum specified transmit deviation and transmitted power in the adjacent channels. The attenuator inside the ASFIC CMP changes the FM deviation of the data signal according to the channel spacing of the active transmit channel.

The FLAT TX AUDIO signal from accessory connector J0501-5 is fed to the ASFIC CMP (U0221) pin 42 through C0541 and line FLAT TX RTN, switch U0251 and buffer U0211-4. When the radio switches from receive to transmit mode the µP opens switch U0251 for a short period to prevent that any applied signal can cause a transmit frequency offset. Buffer U0211-4 sets the correct DC level and ensures a short settle period when the radio is switched on. Inside the ASFIC CMP the signal is routed directly to the attenuator, which sets the FM deviation according to the channel spacing of the active transmit channel and emerges from the ASFIC CMP at U0221-40, at which point it is routed to the RF section.

The ASFIC has an internal AGC that can control the gain in the mic audio path. The AGC can be disabled / enabled by the µP. Another feature that can be enabled or disabled in the ASFIC is the VOX. This circuit, along with the capacitor at U0221-7, provides a DC voltage that can allow the µP to detect microphone audio. The ASFIC can also be programmed to route the microphone audio to the speaker for public address operation.

2.2.2 PTT Sensing and TX Audio Processing

Microphone PTT coming from the control head is sent via SBEP bus to the µP. An external PTT can be generated by grounding pin 3 on the accessory connector if this input is programmed for PTT by the CPS. When microphone PTT is sensed, the µP will always configure the ASFIC CMP for the "internal" mic audio path, and external PTT will result in the external mic audio path being selected.

Inside the ASFIC CMP, the mic audio is filtered to eliminate frequency components outside the 300-3000Hz voice band, and pre-emphasized if pre-emphasis is enabled. The signal is then limited to prevent the transmitter from over deviating. The limited mic audio is then routed through a summer, which is used to add in signaling data, and then to a splatter filter to eliminate high frequency spectral components that could be generated by the limiter. The audio is then routed to an attenuator, which is tuned in the factory or the field to set the proper amount of FM deviation. The TX audio emerges from the ASFIC CMP at U0221-40 MOD IN, at which point it is routed to the RF section.

Dependent on the radio model, input pin 3 on the accessory connector can be programmed for DATA PTT by the CPS. When DATA PTT is sensed, the µP will always configure the ASFIC CMP for the flat TX audio path. Limiter and any filtering will be disabled. The signal is routed directly to the attenuator, which sets the FM deviation according to the channel spacing of the active transmit

channel and emerges from the ASFIC CMP at U0221-40, at which point it is routed to the RF section.

2.2.3 TX Secure Audio (Optional)

The audio follows the normal transmit audio processing until it emerges from the ASFIC CMP TX SND pin (U0221-44), which is fed to the Secure board residing at option connector J0551-33. The Secure board contains circuitry to amplify, encrypt, and filter the audio. The encrypted signal is then fed back from J0551-32 to the ASFIC CMP TX RTN input (U0221-36). The signal level at this pin should be about 65mVrms. The signal is then routed through the TX path in the ASFIC CMP and emerges at MOD IN pin 40.

2.2.4 Option Board Transmit Audio

The audio follows the normal transmit audio processing until it emerges from the ASFIC CMP TX SND pin (U0221-44), which is fed to the option board residing at option connector J0551-33. The option board contains circuitry to process the audio. The processed signal is then fed back from J0551-32 to the ASFIC CMP TX RTN input (U0221-36). The signal level at this pin should be about 65mVrms. The signal is then routed through the TX path in the ASFIC CMP and emerges at MOD IN pin 40.

2.3 Transmit Signaling Circuits

Refer to Figure 3-4 for reference for the following sections.

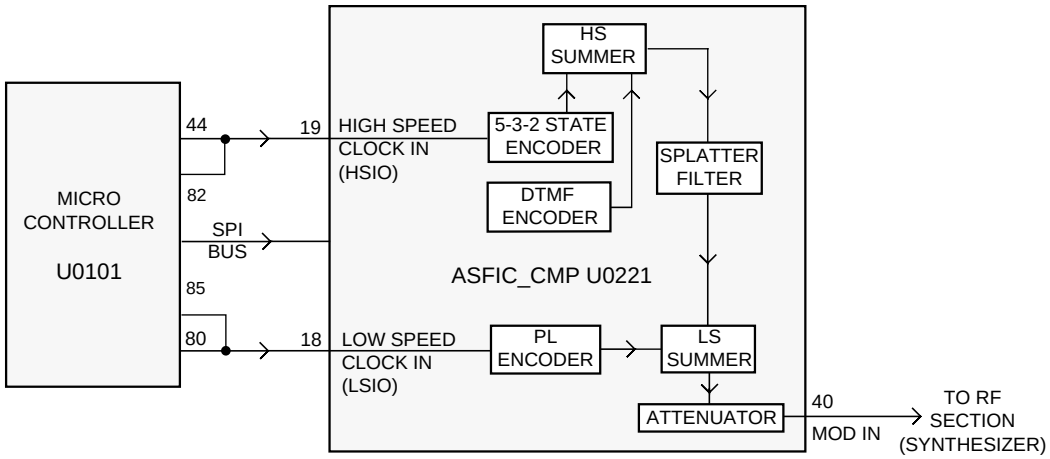


Figure 3-4 Transmit Signaling Paths

From a hardware point of view, there are 3 types of signaling:

- Sub-audible data (PL / DPL / Connect Tone) that gets summed with transmit voice or signaling,
- DTMF data for telephone communication in trunked and conventional systems, and
- Audible signaling including MDC and high-speed trunking.

NOTE All three types are supported by the hardware while the radio software determines which signaling type is available.

2.3.1 Sub-audible Data (PL/DPL)

Sub-audible data implies signaling whose bandwidth is below 300Hz. PL and DPL waveforms are used for conventional operation and connect tones for trunked voice channel operation. The trunking connect tone is simply a PL tone at a higher deviation level than PL in a conventional system. Although it is referred to as “sub-audible data”, the actual frequency spectrum of these waveforms may be as high as 250 Hz, which is audible to the human ear. However, the radio receiver filters out any audio below 300Hz, so these tones are never heard in the actual system.

Only one type of sub-audible data can be generated by U0221 (ASFIC CMP) at any one time. The process is as follows, using the SPI BUS, the µP programs the ASFIC CMP to set up the proper low-speed data deviation and select the PL or DPL filters. The µP then generates a square wave which strobes the ASFIC PL / DPL encode input LSIO U0221-18 at twelve times the desired data rate. For example, for a PL frequency of 103Hz, the frequency of the square wave would be 1236Hz.

This drives a tone generator inside U0221 which generates a staircase approximation to a PL sine wave or DPL data pattern. This internal waveform is then low-pass filtered and summed with voice or data. The resulting summed waveform then appears on U0221-40 (MOD IN), where it is sent to the RF board as previously described for transmit audio. A trunking connect tone would be generated in the same manner as a PL tone.

2.3.2 High Speed Data

High speed data refers to the 3600 baud data waveforms, known as Inbound Signaling Words (ISWs) used in a trunking system for high speed communication between the central controller and the radio. To generate an ISW, the µP first programs the ASFIC CMP (U0221) to the proper filter and gain settings. It then begins strobing U0221-19 (HSIO) with a pulse when the data is supposed to change states. U0221’s 5-3-2 State Encoder (which is in a 2-state mode) is then fed to the post-limiter summer block and then the splatter filter. From that point it is routed through the modulation attenuators and then out of the ASFIC CMP to the RF board. MDC is generated in much the same way as trunking ISW. However, in some cases these signals may also pass through a data pre-emphasis block in the ASFIC CMP. Also these signaling schemes are based on sending a combination of 1200 Hz and 1800 Hz tones only. Microphone audio is muted during high speed data signaling.

2.3.3 Dual Tone Multiple Frequency (DTMF) Data

DTMF data is a dual tone waveform used during phone interconnect operation. It is the same type of tones which are heard when using a “Touch Tone” telephone.

There are seven frequencies, with four in the low group (697, 770, 852, 941Hz) and three in the high group (1209, 1336, 1477Hz).

The high-group tone is generated by the µP (U0101-44) strobing U0221-19 at six times the tone frequency for tones less than 1440Hz or twice the frequency for tones greater than 1440Hz. The low group tone is generated by the ASFIC CMP, controlled by the µP via SPI bus. Inside U0221 the low-group and high-group tones are summed (with the amplitude of the high group tone being approximately 2 dB greater than that of the low group tone) and then pre-emphasized before being routed to the summer and splatter filter. The DTMF waveform then follows the same path as was described for high-speed data.

2.4 Receive Audio Circuits

Refer to Figure 3-5 for reference for the following sections.

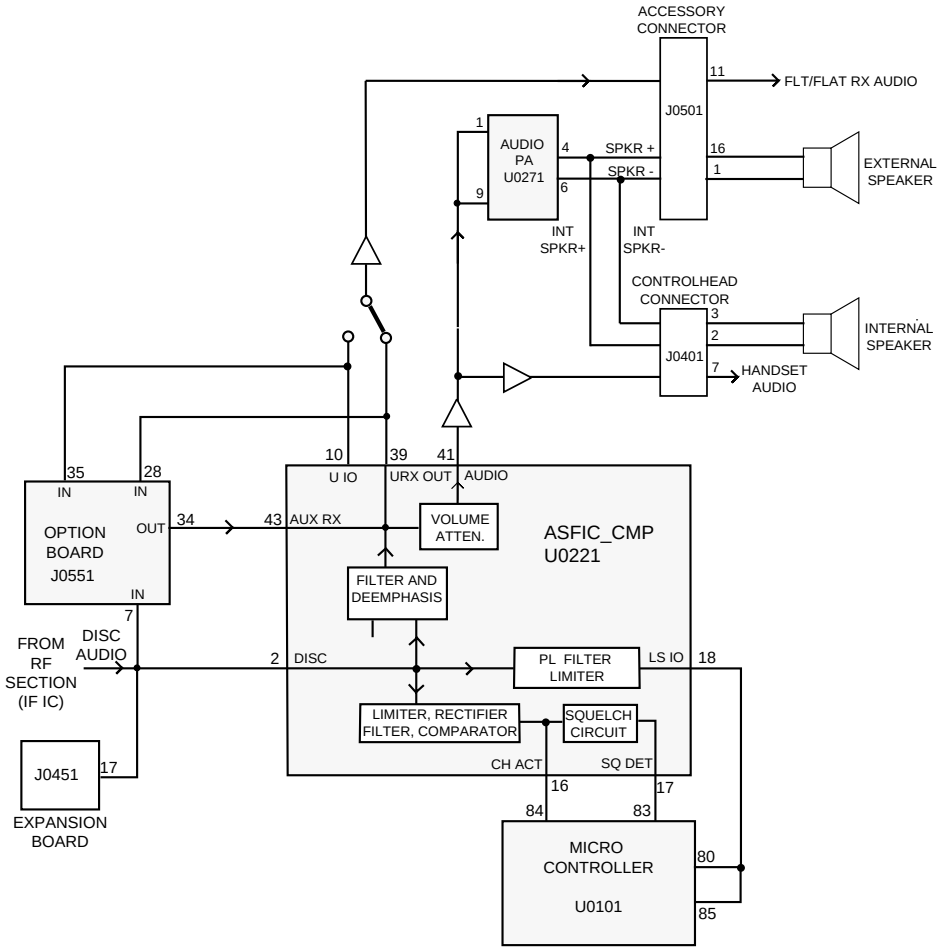


Figure 3-5 Receive Audio Paths

2.4.1 Squelch Detect

The radio's RF circuits are constantly producing an output at the discriminator (IF IC). This signal (DISC AUDIO) is routed to the ASFIC CMP's squelch detect circuitry input DISC (U0221-2). All of the squelch detect circuitry is contained within the ASFIC CMP. Therefore from a user's point of view, DISC AUDIO enters the ASFIC CMP, and the ASFIC CMP produces two CMOS logic outputs based on the result. They are CH ACT (U0221-16) and SQ DET (U0221-17).

The squelch signal entering the ASFIC CMP is amplified, filtered, attenuated, and rectified. It is then sent to a comparator to produce an active high signal on CH ACT. A squelch tail circuit is used to produce SQ DET (U0221-17) from CH ACT. The state of CH ACT and SQ DET is high (logic "1") when carrier is detected, otherwise low (logic "0").

CH ACT is routed to the µP pin 84 while SQ DET is routed to the µP pin 83.

SQ DET is used to determine all audio mute / unmute decisions except for Conventional Scan. In this case CH ACT is a pre-indicator as it occurs slightly faster than SQ DET.

2.4.2 Audio Processing and Digital Volume Control

The receiver audio signal enters the controller section from the IF IC on DISC AUDIO. The signal is DC coupled by R0228 and enters the ASFIC CMP via the DISC pin U0221-2.

Inside the ASFIC CMP, the signal goes through 2 paths in parallel, the audio path and the PL/DPL path.

The audio path has a programmable amplifier, whose setting is based on the channel bandwidth being received, then a LPF filter to remove any frequency components above 3000Hz and then an HPF to strip off any sub-audible data below 300Hz. Next, the recovered audio passes through a de-emphasis filter if it is enabled (to compensate for Pre-emphasis which is used to reduce the effects of FM noise). The IC then passes the audio through the 8-bit programmable attenuator whose level is set depending on the value of the volume control. Finally the filtered audio signal passes through an output buffer within the ASFIC CMP. The audio signal exits the ASFIC CMP at pin AUDIO (U0221-41).

The µP programs the attenuator, using the SPI BUS, based on the volume setting. The minimum / maximum settings of the attenuator are set by codeplug parameters.

Since sub-audible signaling is summed with voice information on transmit, it must be separated from the voice information before processing. Any sub-audible signaling enters the ASFIC CMP from the IF IC at DISC U0221-2. Once inside it goes through the PL/DPL path. The signal first passes through one of 2 low-pass filters, either PL low-pass filter or DPL/LST low-pass filter. Either signal is then filtered and goes through a limiter and exits the ASFIC CMP at LSIO (U0221-18). At this point the signal will appear as a square wave version of the sub-audible signal which the radio received. The µP U0101-80 will decode the signal directly to determine if it is the tone / code which is currently active on that mode.

2.4.3 Audio Amplification Speaker (+) Speaker (–)

The output of the ASFIC CMP's digital volume pot, U0221-41 is routed through DC blocking capacitor C0265 to a buffer formed by U0211-1. Resistors R0265 and R0268 set the correct input level to the audio PA (U0271). This is necessary because the gain of the audio PA is 46 dB, and the ASFIC CMP output is capable of overdriving the PA unless the maximum volume is limited. Resistor R0267 and capacitor C0267 increase frequency components below 350Hz.

The audio then passes through R0269 and C0272 which provides AC coupling and low frequency roll-off. C0273 provides high frequency roll-off as the audio signal is routed to pins 1 and 9 of the audio power amplifier U0271.

The audio power amplifier has one inverted and one non-inverted output that produces the differential audio output SPK+ / SPK- (U0271-4/6). The inputs for each of these amplifiers are pins 1 and 9 respectively; these inputs are both tied to the received audio. The audio PA's DC biases are not activated until the audio PA is enabled at pin 8.

The audio PA is enabled via the ASFIC CMP (U0221-38). When the base of Q0271 is low, the transistor is off and U0271-8 is high, using pull up resistor R0273, and the audio PA is ON. The voltage at U0273-8 must be above 8.5VDC to properly enable the device.

If the voltage is between 3.3 and 6.4V, the device will be active but has its input (U0273-1/9) off. This is a mute condition which is used to prevent an audio pop when the PA is enabled.

The SPK+ and SPK- outputs of the audio PA have a DC bias which varies proportionately with FLT A+ (U0271-7). FLT A+ of 11V yields a DC offset of 5V, and FLT A+ of 17V yields a DC offset of 8.5V. If either of these lines is shorted to ground, it is possible that the audio PA will be damaged. SPK+ and SPK- are routed to the accessory connector (J0501-16 and 1) and to the control head (connector J0401-2 and 3).

2.4.4 Handset Audio

Certain handheld accessories have a speaker within them which require a different voltage level than that provided by U0271. For those devices HANDSET AUDIO is available at control head connector J0401-7.

The received audio from the output of the ASFIC CMP's digital volume attenuator and buffered by U0211-1 is also routed to U0211-3 pin 9 where it is amplified 20 dB; this is set by the 10k/100k combination of R0261 and R0262. This signal is routed from the output of the op-amp U0211-3 pin 8 to J0401-7. The control head sends this signal directly out to the microphone jack. The maximum value of this output is 6.6Vp-p.

2.4.5 Filtered Audio and Flat Audio

The ASFIC CMP has an audio whose output at U0221-39 has been filtered and de-emphasized, but has not gone through the digital volume attenuator. From ASFIC CMP U0221-39 the signal is routed via R0251 through gate U0251-12 and AC coupled to U0211-2. The gate controlled by ASFIC CMP port GCB3 (U0221-35) selects between the filtered audio signal from the ASFIC CMP pin 39 (URXOUT) or the unfiltered (flat) audio signal from the ASFIC CMP pin 10 (UIO). R0251 and R0253 determine the gain of op-amp U0211-2 for the filtered audio while R0252 and R0253 determine the gain for the flat Audio. The output of U0253-7 is then routed to J0501-11 via DC blocking capacitor C0542 and R0531. Note that any volume adjustment of the signal on this path must be done by the accessory.

2.4.6 RX Secure Audio (Optional)

Discriminator audio, which is now encrypted audio, follows the normal receive audio processing until it emerges from the ASFIC CMP UIO pin (U0221-10), which is fed to the Secure board residing at option connector J0551-35. On the Secure board, the encrypted signal is converted back to normal audio format, and then fed back through (J0551-34) to AUX RX of the ASFIC CMP (U0221-43). From then on it follows a path identical to conventional receive audio, where it is filtered (0.3 - 3kHz) and de-emphasized. The signal URX SND from the ASFIC CMP (U0221-39), also routed to option connector J0551-28, is not used for the Secure board but for other option boards.

2.4.7 Option Board Receive Audio

Unfiltered audio from the ASFIC CMP pin UIO (U0221-10) enters the option board at connector J0551-35. Filtered audio from the ASFIC CMP pin URXOUT (U0221-39) enters the option board at connector J0551-28. On the option board, the signal may be processed, and then fed back through J0551-34 to AUX RX of the ASFIC CMP (U0221-43). From then on it follows a path identical to conventional receive audio, where it may be filtered (0.3 - 3kHz) and de-emphasized.

2.5 Receive Signaling Circuits

Refer to Figure 3-6 for reference for the following sections.

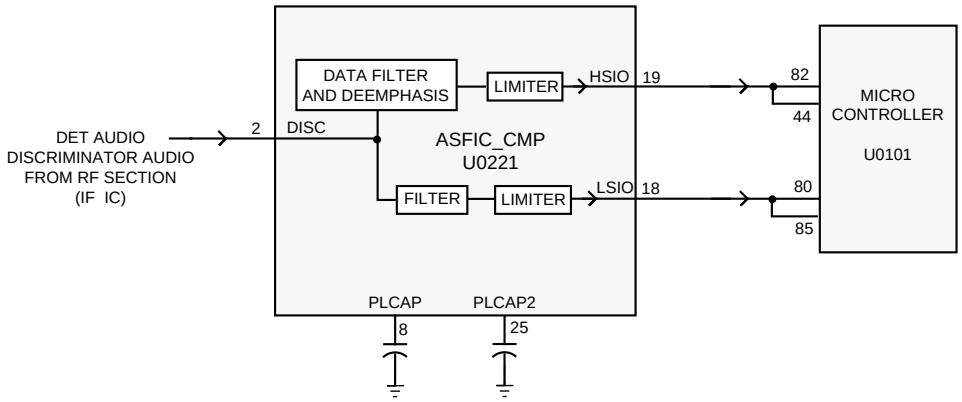


Figure 3-6 Receive Signaling Paths

2.5.1 Sub-audible (PL/DPL) and High Speed Data Decoder

The ASFIC CMP (U0221) is used to filter and limit all received data. The data enters the ASFIC CMP at input DISC (U0221-2). Inside U0221 the data is filtered according to data type (HS or LS), then it is limited to a 0-5V digital level. The MDC and trunking high speed data appear at U0221-19, where it connects to the µP U0101-82

The low speed limited data output (PL, DPL, and trunking LS) appears at U0221-18, where it connects to the µP U0101-80.

The low speed data is read by the µP at twice the frequency of the sampling waveform; a latch configuration in the ASFIC CMP stores one bit every clock cycle. The external capacitors C0236, and C0244 set the low frequency pole for a zero crossings detector in the limiters for PL and HS data. The hysteresis of these limiters is programmed based on the type of received data.

2.5.2 Alert Tone Circuits

When the software determines that it needs to give the operator an audible feedback (for a good key press, or for a bad key press), or radio status (trunked system busy, phone call, circuit failures), it sends an alert tone to the speaker. It does so by sending SPI BUS data to U0221 which sets up the audio path to the speaker for alert tones. The alert tone itself can be generated in one of two ways: internally by the ASFIC CMP, or externally using the µP and the ASFIC CMP.

The allowable internal alert tones are 304, 608, 911, and 1823Hz. In this case a code contained within the SPI BUS load to the ASFIC CMP sets up the path and determines the tone frequency, and at what volume level to generate the tone. (It does not have to be related to the voice volume setting.)

For external alert tones, the µP can generate any tone within the 100-3000Hz audio band. This is accomplished by the µP generating a square wave which enters the ASFIC CMP at U0221-19. Inside the ASFIC CMP this signal is routed to the alert tone generator.

The output of the generator is summed into the audio chain just after the RX audio de-emphasis block. Inside U0221 the tone is amplified and filtered, then passed through the 8-bit digital volume attenuator, which is typically loaded with a special value for alert tone audio. The tone exits at U0221-41 and is routed to the audio PA like receive audio

2.6 Voice Storage (Optional)

The Voice Storage (VS) option can be used to store audio signals coming from the receiver or from the microphone. Any stored audio signal can be played back over the radio's speaker or sent out via the radio's transmitter.

The Voice Storage option can by placed on the controller section or on an additional board which resides on option board connector J0551. Voice Storage is included on the PassPort board. Voice Storage IC U0301 provides all required functionality and is powered from 3.3 volts regulator U0351 which, is powered from the regulated 5 volts. Dual shottky diode D0301 reduces the supply voltage for U0301 to 3 volts. The µP controls U0301 via SPI bus lines CLK (U0301-8), DATA (U0301-10) and MISO (U0301-11). To transfer data, the µP first selects the U0301 via address decoder U0141, line VS CS and U0301 pin 9. Then the µP sends data through line DATA and receives data through line MISO. Pin 2 (RAC) of U0301 indicates the end of a message row by a low state for 12.5 ms and connects to µP pin 52. A low at pin 5 (INT), which is connected to µP pin 55 indicates that the Voice Storage IC requires service from the µP.

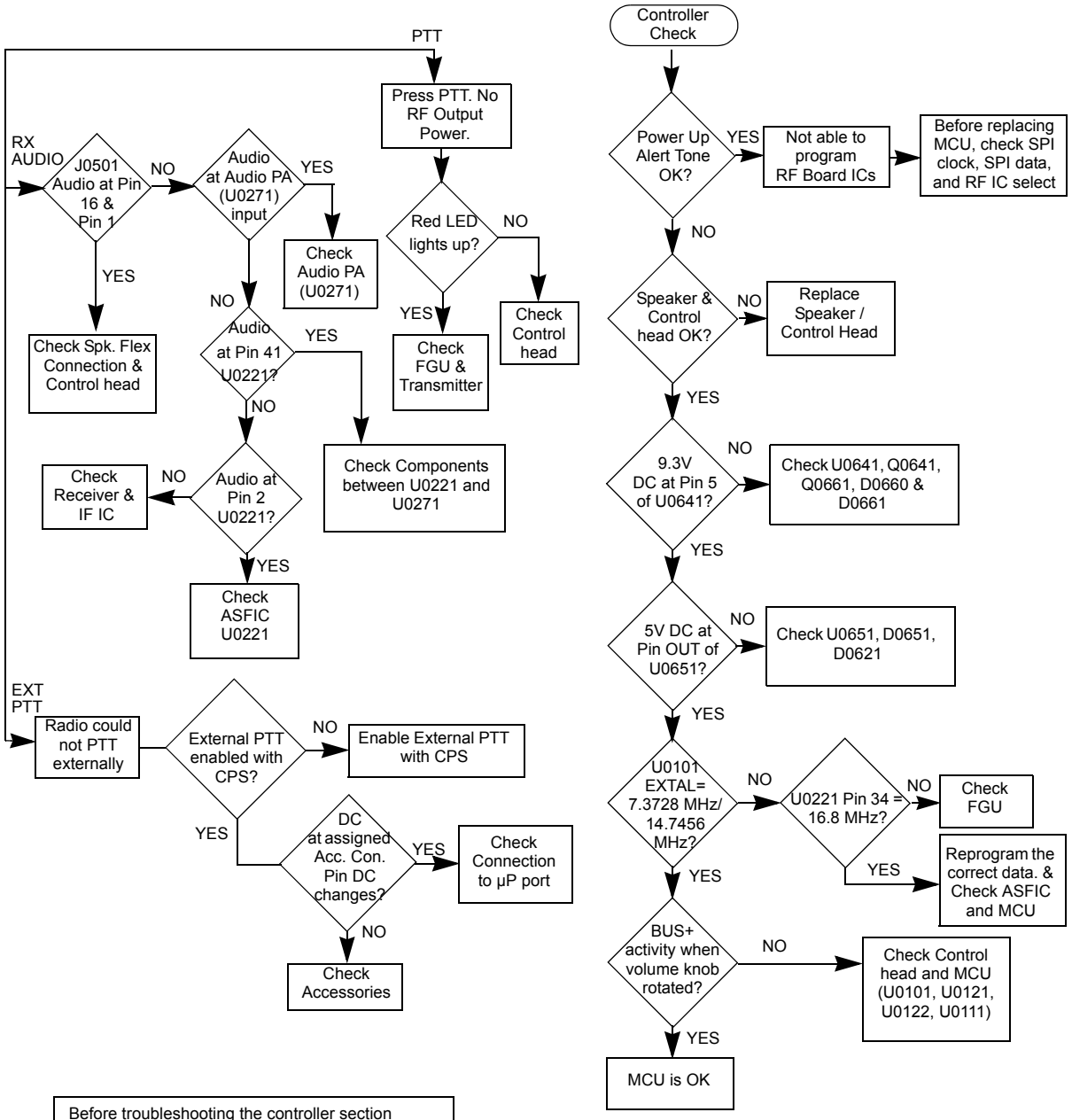
Audio, either from the radio's receiver or from one of the microphone inputs, emerges the ASFIC CMP (U0221) at pin 39, is buffered by op-amp U0341-1 and enters the Voice Storage IC U0301 at pin 25. During playback, the stored audio emerges U0301 at pin 20. To transmit the audio signal it is fed through resistive divider R0344 / R0345 and line VS MIC to input selector IC U0251. When this path is selected by the µP via ASFIC CMP port GCB 4, the audio signal enters the ASFIC CMP at pin 48 and is processed like normal transmit audio. To play the stored audio over the radio's speaker, the audio from U0301 pin 20 is buffered by op-amp U0341-2 and fed via switch U0342 and line FLAT RX SND to ASFIC CMP pin 10 (UIO). In this case, this ASFIC CMP pin is programmed as input and feeds the audio signal through the normal receiver audio path to the speaker or handset. Switch U0342 is controlled by the µP via ASFIC CMP port GCB 4 and feeds the stored audio only to the ASFIC CMP port UIO when it is programmed as input.

Notes

Section 2

TROUBLESHOOTING CHARTS

1.0 Troubleshooting Flow Chart for Controller



Before troubleshooting the controller section according to this chart please check the following:
1. Check tuning and CPS settings
2. Check if Alert Tones are enabled
3. Check if Control Head is OK
4. Check board visually

Notes

Section 3

CONTROLLER SCHEMATICS AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

This chapter shows the schematics and the parts lists for the controller circuits.

1.2 Voice Storage Facility

The Voice Storage facility is an orderable option on all CDM and PRO models except the PassPort model (CDM1550•LS+), on which Voice Storage is a standard feature.

The schematics (including the Voice Storage schematic, where applicable), boards and parts lists for these circuits are shown in this chapter.

Table 3-1 Controller T2 Diagrams and Parts Lists

Controller T2 used on PCB: **8486172B04** VHF, 1-25W	
SCHEMATICS **Controller Overall** **Supply Voltage** **Audio** **I/O** **Microprocessor**	**Page:** **3: 3-5** **3: 3-6** **3: 3-7** **3: 3-8** **3: 3-9**
Parts List	**3: 3-10**

Table 3-2 Controller T5 Diagrams and Parts Lists

Controller T5 used on PCB: **8486172B06** VHF, 1-25W	
SCHEMATICS **Controller Overall** **Supply Voltage** **Audio** **I/O** **Microprocessor** **Voice Storage (if fitted)**	**Page:** **3: 3-12** **3: 3-13** **3: 3-14** **3: 3-15** **3: 3-16** **3: 3-17**
Parts List	**3: 3-18**

Table 3-3 Controller T6/T7/T9 Diagrams and Parts Lists

Controller T6/T7/T9 used on PCB: T6/7 on **8486206B06** LB1, 40-60W T6/7 on **8486207B05** LB2, 40-60W T6/7 on **8486140B12** VHF, 25-45W T6/7 on **8480643Z06** UHF B1, 25-40W T6/7 on **8480645Z04** UHF B2, 25-40W T7 on **8486172B07** VHF, 1-25W T7 on **8485670Z02** UHF B1, 1-25W T9 on **8486172B08** VHF, 1-25W T9 on **8486140B13** VHF, 25-45W T9 on **8485670Z03** UHF B1, 1-25W T9 on **8485671Z03** UHF B2, 1-25W T9 on **8485908Z02** LB3, 40-60W	
SCHEMATICS	**Page:**
T6/7/9/11 Controller Overall	**3: 3-20**
T6/7/9 Supply Voltage	**3: 3-21**
T6/7/9 Audio	**3: 3-22**
T6 I/O	**3: 3-23**
T7 I/O	**3: 3-24**
T9 I/O	**3: 3-25**
T6/7 Microprocessor	**3: 3-26**
T9 Microprocessor	**3: 3-27**
T6/7/9 Voice Storage (if fitted)	**3: 3-28**
T6/7 Parts List	**3: 3-29**
T9 Parts List	**3: 3-31**

Table 3-4 Controller T11 Diagrams and Parts Lists

Controller T11 used on PCB: **8486206B08** LB1, 40-60W **8486207B07** LB2, 40-60W **8485908Z04** LB3, 40-60W	
SCHEMATICS	**Page:**
Controller Overall	**3: 3-20**
Supply Voltage	**3: 3-33**
Audio	**3: 3-34**
I/O	**3: 3-35**
Microprocessor	**3: 3-36**
Parts List	**3: 3-37**

Table 3-5 Controller T12 Diagrams and Parts Lists

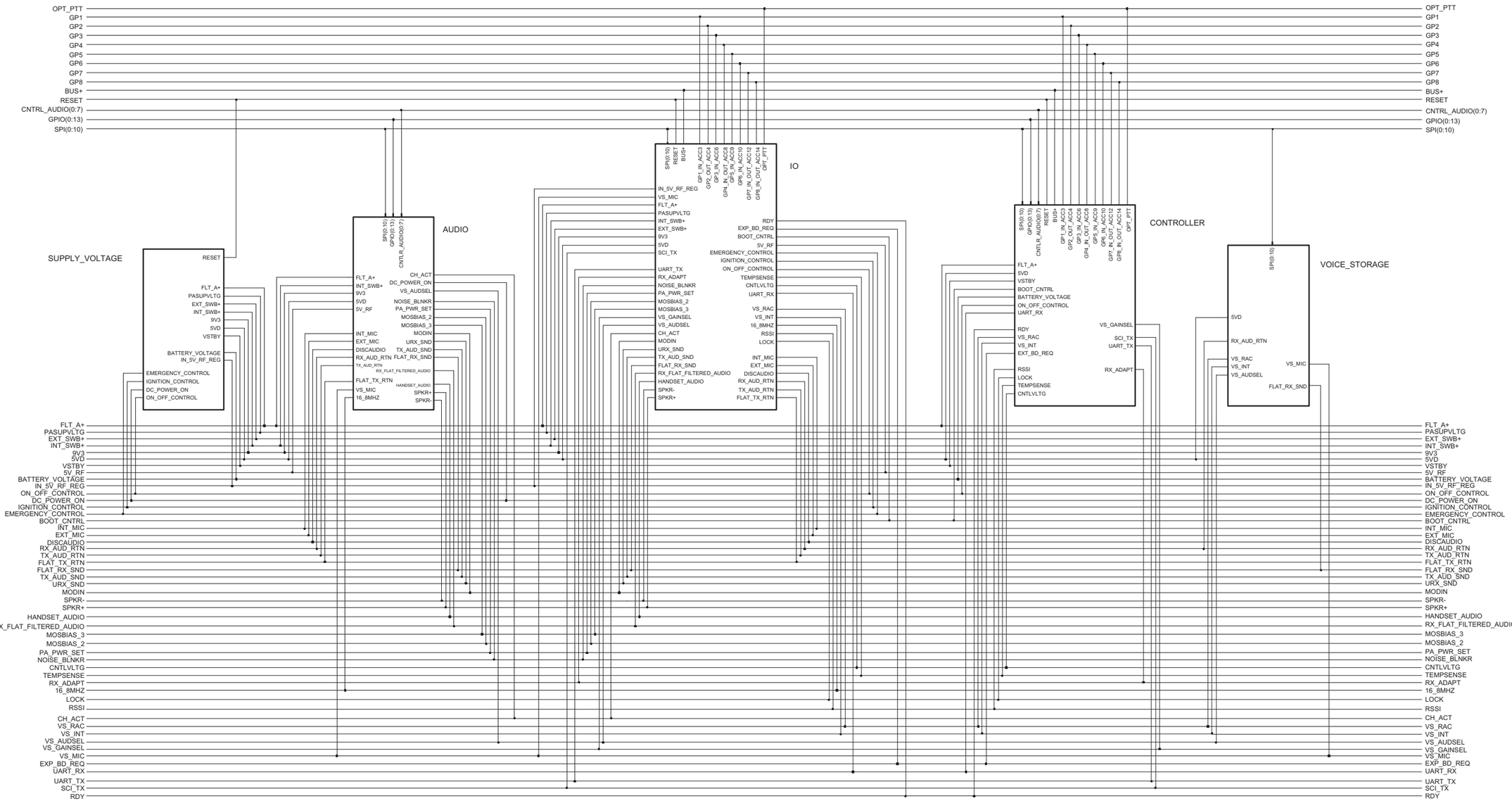
Controller T12 used on PCB: **8486140B15** VHF, 25-45W LDMOS **8471234L02** VHF, 25-45W LDMOS **8486127Z01** UHF B1, 25-40W LDMOS **8471223L02** UHF B1, 25-45W LDMOS **8486250Z02** UHF B2, 25-40W LDMOS	
SCHEMATICS	**Page:**
Controller Overall	**3: 3-39**
Supply Voltage	**3: 3-40**
Audio	**3: 3-41**
I/O	**3: 3-42**
Microprocessor	**3: 3-43**

Table 3-5 Controller T12 Diagrams and Parts Lists

Controller T12 used on PCB: **8486140B15** VHF, 25-45W LDMOS **8471234L02** VHF, 25-45W LDMOS **8486127Z01** UHF B1, 25-40W LDMOS **8471223L02** UHF B1, 25-45W LDMOS **8486250Z02** UHF B2, 25-40W LDMOS	
Parts List	**3: 3-44**

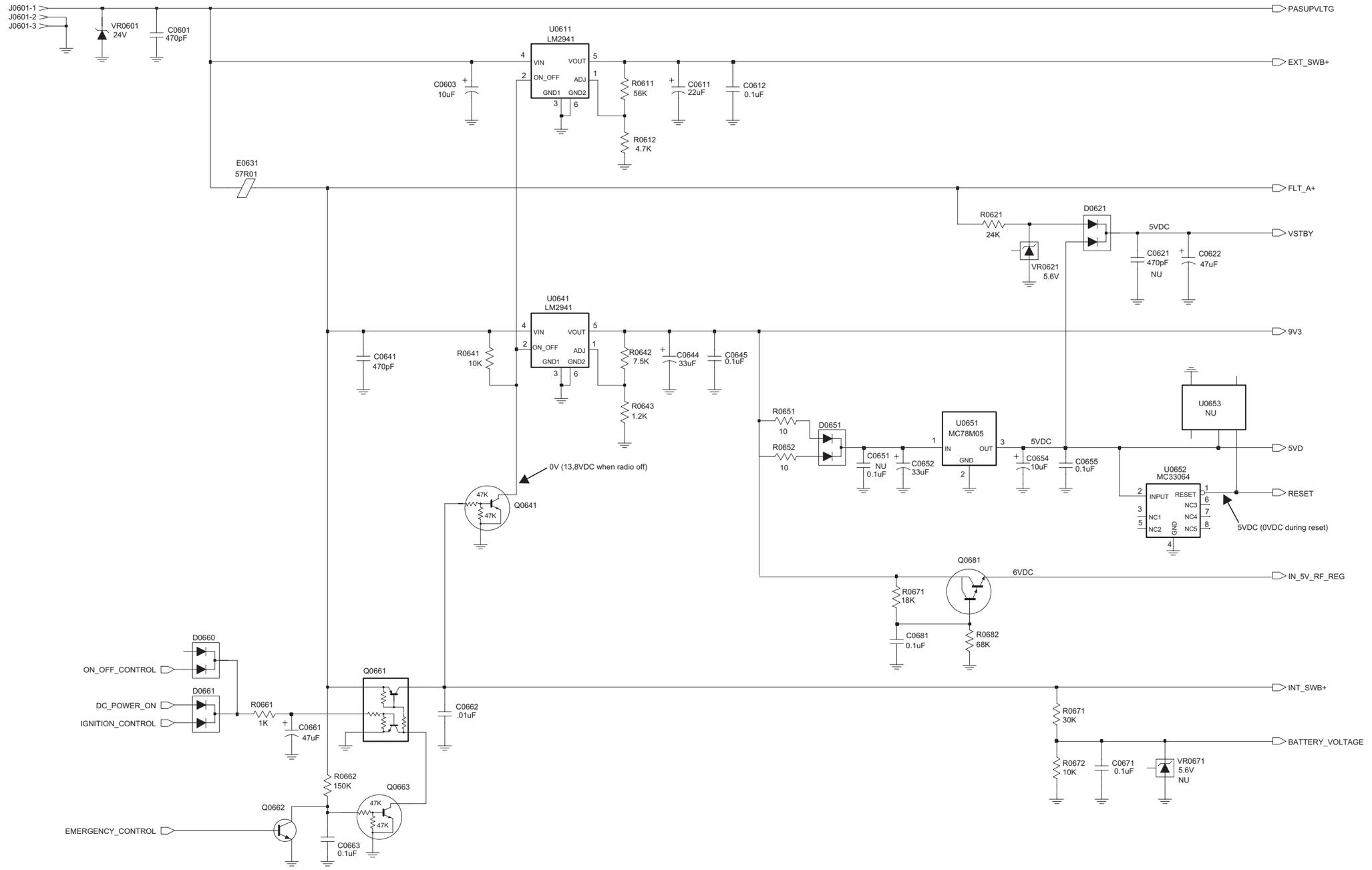
Notes

2.0 Controller T2 Schematics and Parts Lists



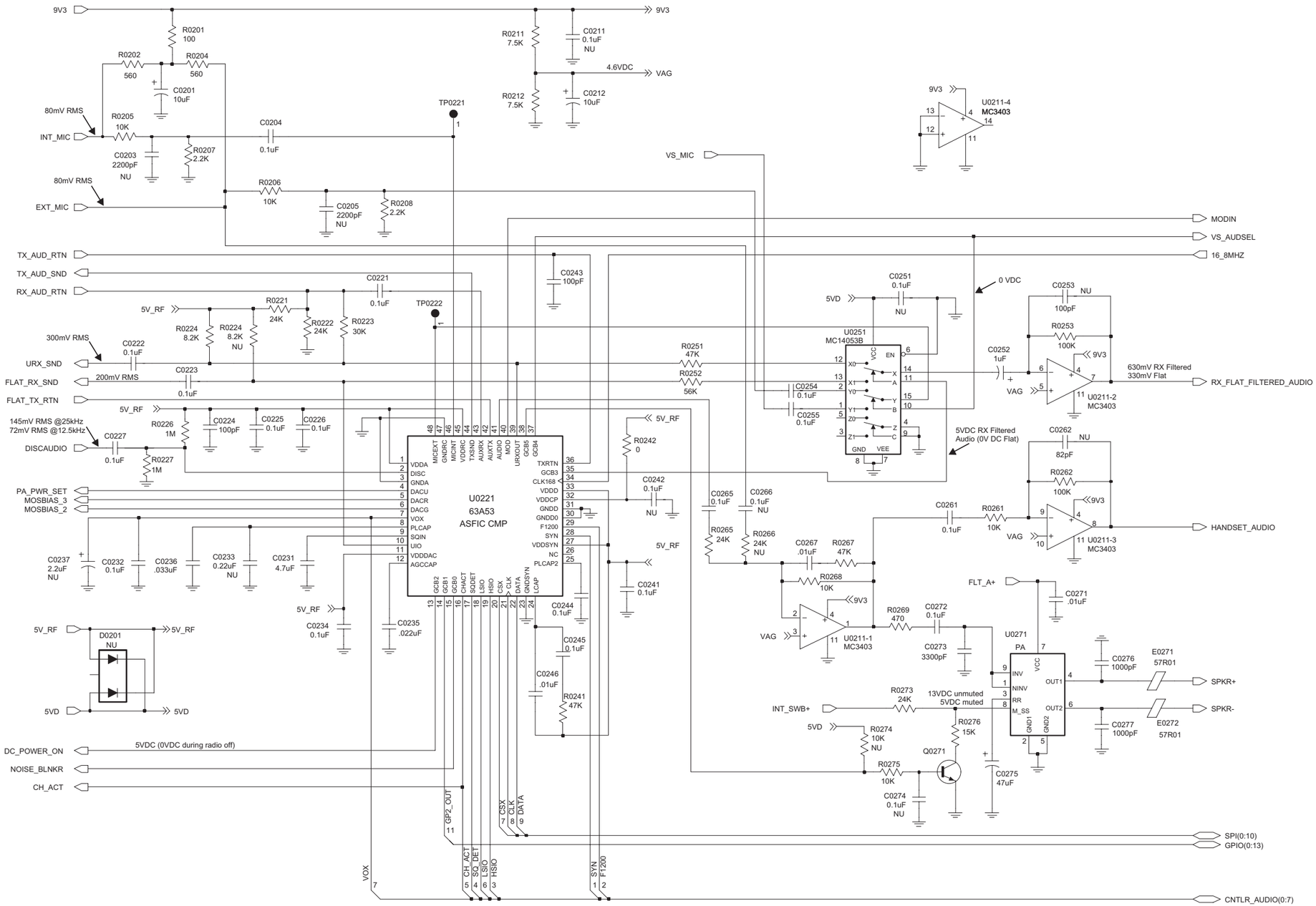
Controller T2 Schematic Diagram - Controller Overall

ZWG0130228-O



Controller T2 Schematic Diagram - Supply Voltage ZWG0130232-A

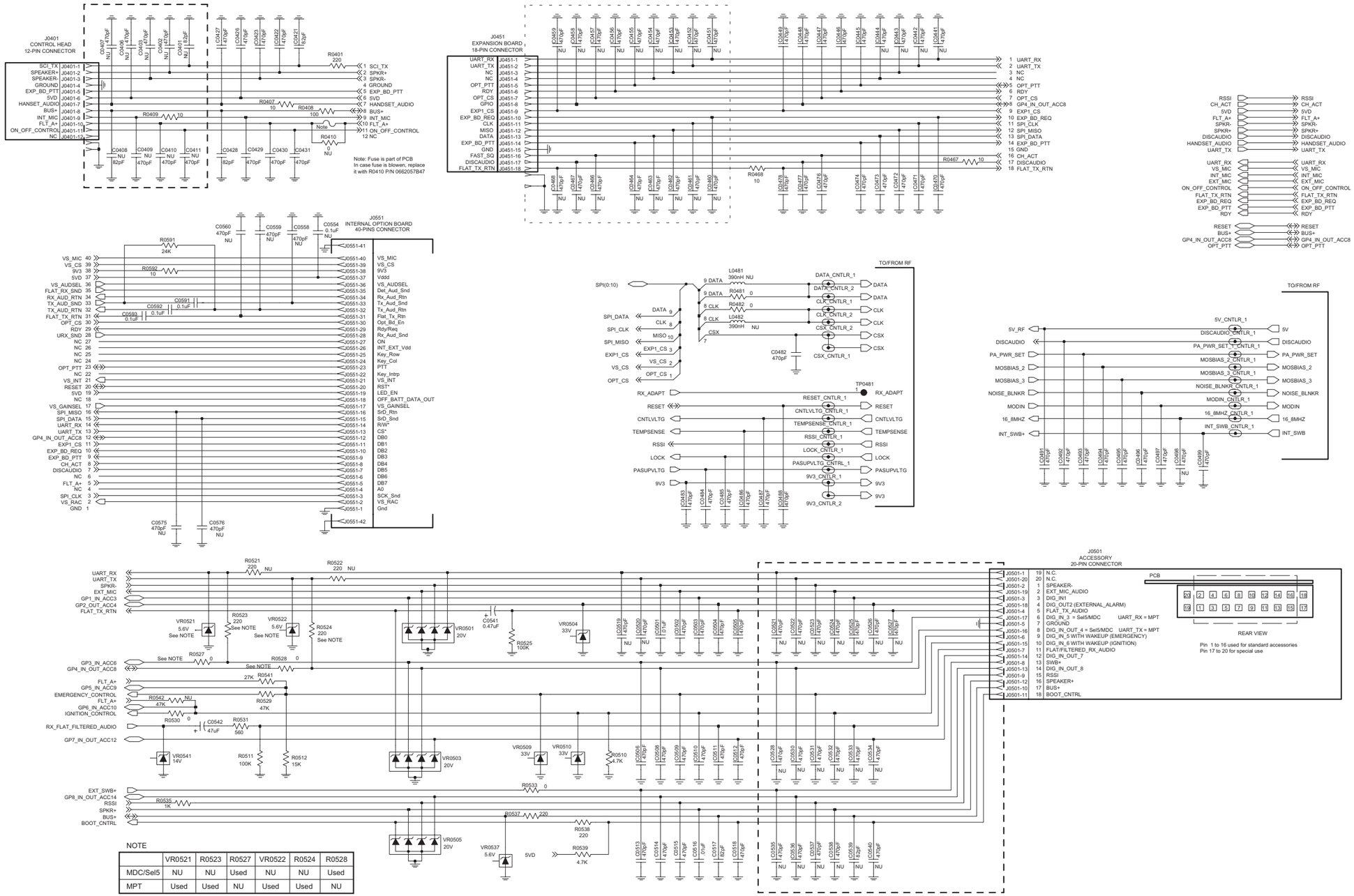
6881091C63-C



Controller T2 Schematic Diagram - Audio

ZWG0130231-A

6881091C63-C



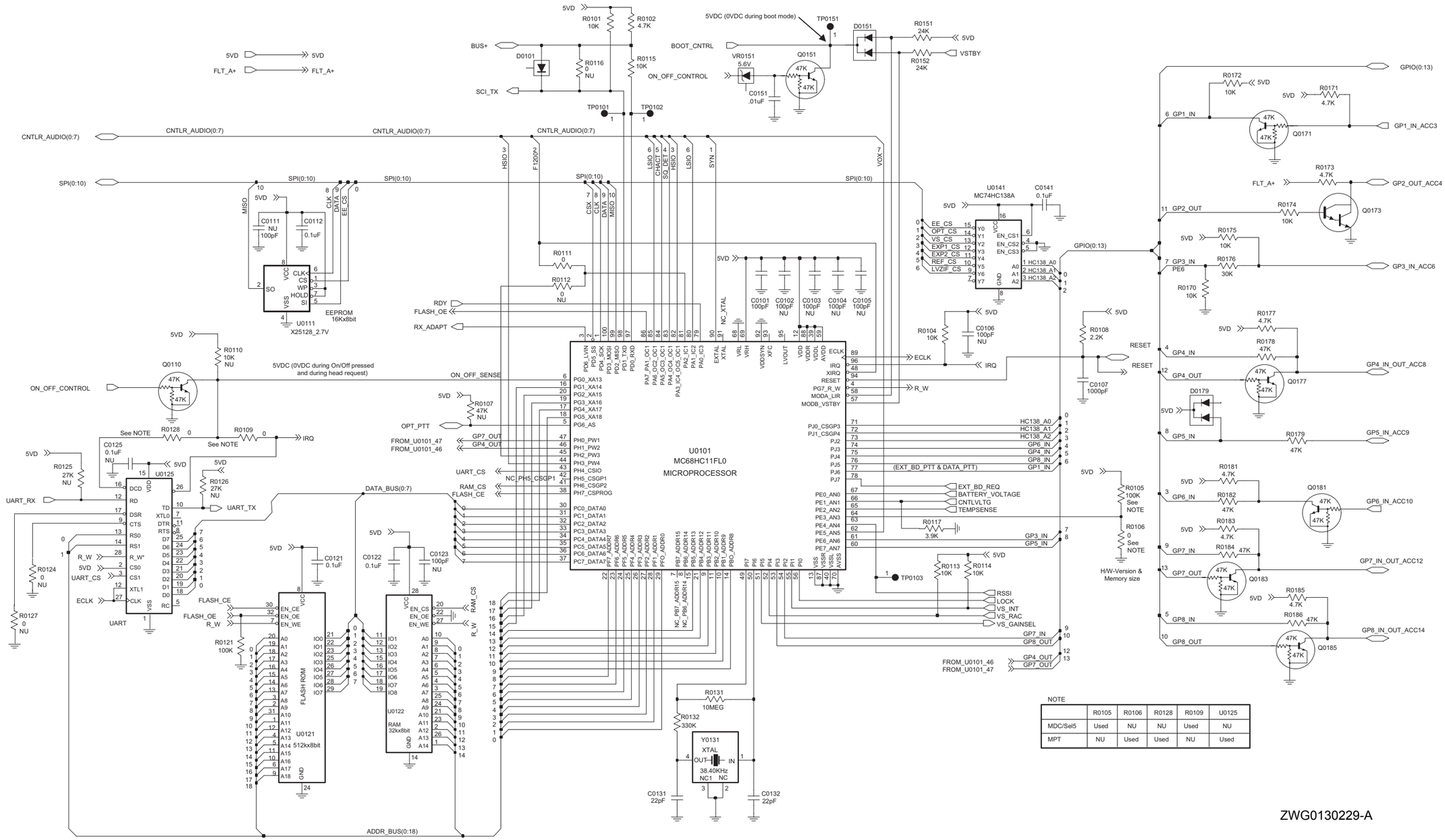
NOTE

	VR0521	R0523	R0527	VR0522	R0524	R0528
MDC/Sel5	NU	NU	Used	NU	NU	Used
MPT	Used	Used	NU	Used	Used	NU

ZWG0130230-A

Controller T2 Schematic Diagram - I/O

6881091C63-C



	R0105	R0106	R0128	R0109	U0125
MDC/Sel5	Used	NU	NU	Used	NU
MPT	NU	Used	Used	NU	Used

ZWG0130229-A

Controller T2 Schematic Diagram - Microprocessor

6881091C63-C

Controller T2 Parts List

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0125	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	.01uF
C0201	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0227	2113743E20	0.1uF
C0231	2113743G24	2.2uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	.022uF
C0236	2113743E10	.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	.01uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	.01uF
C0271	2113741F49	.01uF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0421	2113743N48	82pF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0441	2113743L09	470pF
C0442	2113743L09	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743L09	470pF
C0472	2113743L09	470pF
C0473	2113743L09	470pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	.01uF
C0502	2113743L09	470pF
C0503	2113743L09	470pF
C0504	2113743L09	470pF
C0505	2113743L09	470pF
C0506	2113743L09	470pF
C0508	2113743L09	470pF
C0509	2113743L09	470pF
C0510	2113741F17	470pF
C0511	2113743L09	470pF
C0512	2113743L09	470pF
C0513	2113741F17	470pF
C0514	2113743L09	470pF
C0515	2113743L09	470pF
C0516	2113741F49	.01uF
C0517	2113743N48	82pF
C0518	2113743L09	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	.01uF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
D0101	4880236E05	Chip Schottky
D0151	4813833C02	DUAL SOT MMBD6100
D0179	4813833C02	DUAL SOT MMBD6100
D0621	4813833C02	DUAL SOT MMBD6100
D0651	4813833C02	DUAL SOT MMBD6100
D0660	4813833C02	DUAL SOT MMBD6100
D0661	4813833C02	DUAL SOT MMBD6100
E0271	2484657R01	Ferrite Bead
E0272	2484657R01	Ferrite Bead
E0631	2484657R01	Ferrite Bead
J0401	0902636Y02	CONN FLEX 12 PIN
J0451	0902636Y01	CONN FLEX SIDE ENTRY
J0501	0986105B01	CONN SMD 20 PIN
J0551	0905505Y04	CONN ZIF HORIZONTAL
J0601	0986165B01	DC PWR CONN
Q0110	4880048M01	NPN DIG 47k/47k
Q0151	4880048M01	NPN DIG 47k/47k
Q0171	4880048M01	NPN DIG 47k/47k
Q0173	4880052M01	NPN DRLNGTN MXTA
Q0177	4880048M01	NPN DIG 47k/47k
Q0181	4880048M01	NPN DIG 47k/47k
Q0183	4880048M01	NPN DIG 47k/47k
Q0185	4880048M01	NPN DIG 47k/47k
Q0271	4813824A10	NPN 40V .2A
Q0641	4880048M01	NPN DIG 47k/47k
Q0661	4805921T02	DUAL ROHM FMC2 RH
Q0662	4813824A10	NPN 40V .2A B=50-150
Q0663	4880048M01	NPN DIG 47k/47k
Q0681	4880052M01	NPN DRLNGTN MXTA
R0101	0662057A73	10K 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R0102	0662057A65	4.7K
R0104	0662057A73	10K
R0105	0662057A97	100K
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	100K
R0124	0662057B47	0
R0125	0662057A83	27K
R0126	0662057A83	27K
R0127	0662057B47	0
R0128	0662057B47	0
R0131	0662057B46	10MEG
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K
R0201	0662057A25	100
R0202	0662057A43	560
R0204	0662057A43	560

Circuit Ref	Motorola Part No.	Description
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0226	0662057B22	1MEG
R0227	0662057B22	1MEG
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	100K
R0261	0662057A73	10K
R0262	0662057A97	100K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10
R0467	0662057M26	10
R0468	0662057M26	10
R0481	0662057B47	0
R0482	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	100K
R0512	0662057A77	15K
R0523	0662057A33	220

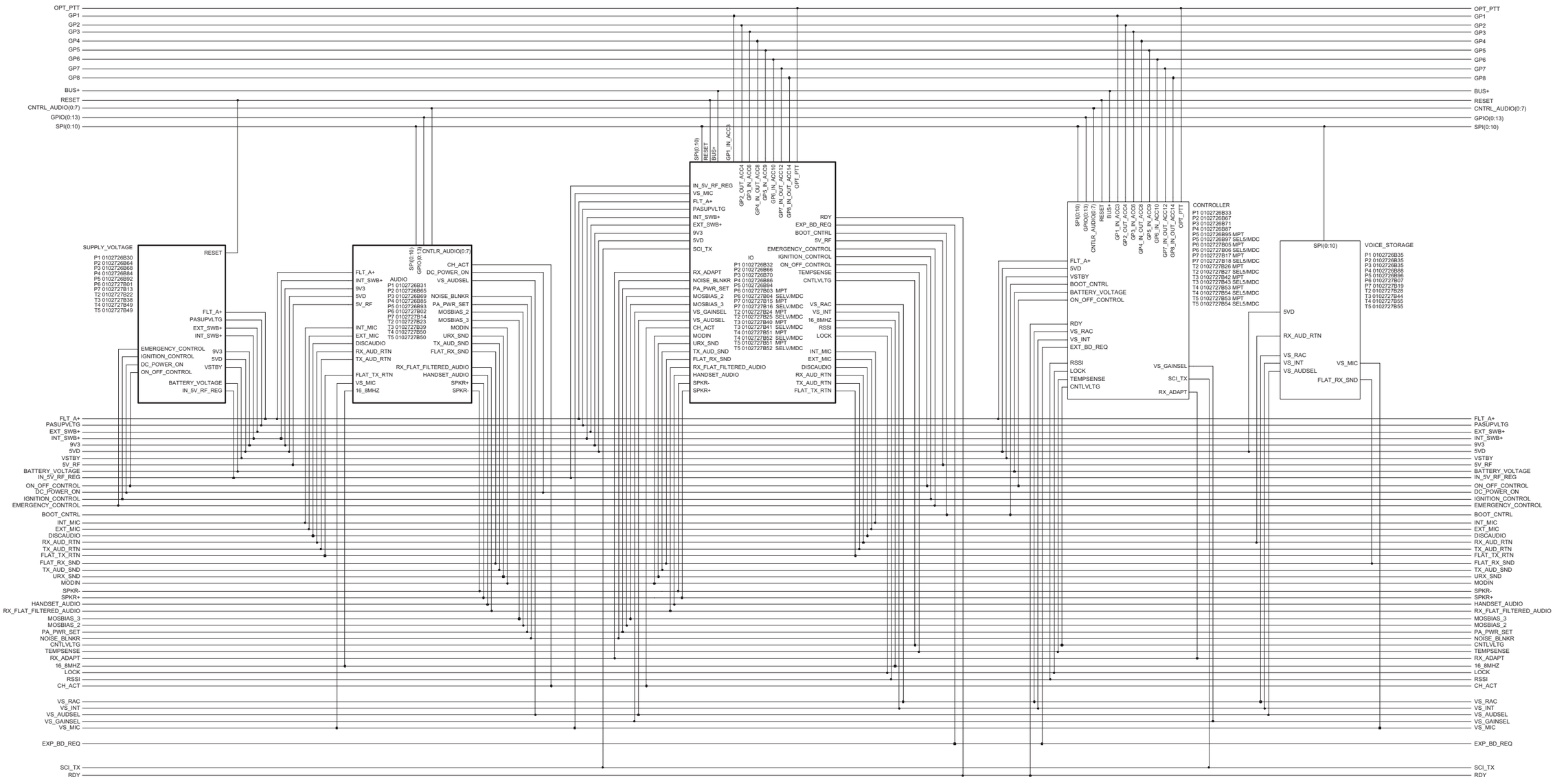
Circuit Ref	Motorola Part No.	Description
R0524	0662057A33	220
R0525	0662057A97	100K
R0529	0662057A89	47K
R0530	0662057B47	0
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0591	0662057A82	24K
R0592	0662057A01	10
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
U0101	5102226J56	MC68HC11FL0 100 PIN
* U0111	5102463J64	16KX8 SPI SERIAL EEPROM
* U0121	5186137B01	512KX8 IC 120NS
U0122	5185963A21	32KX8 SRAM
U0125	5105625U34	IC CMOS ACIA SSOP
U0141	5113805A30	MC74HC138A DCDR/ DEMUX
U0211	5183222M49	MC3403 IC AMP
U0221	5185963A53	IC ASFIC CMP 48 PIN
U0251	5113806A20	MC14053B MUX/DEMUX, TRIPLE 2CH

Circuit Ref	Motorola Part No.	Description
U0271	5109699X01	TDA1519C AUDIO PA
U0611	5183308X01	LM2941 TO DRPOUT RGTR
U0641	5183308X01	LM2941 TO DRPOUT RGTR
U0651	5113816A07	MC78M05BDTRK REG 5V POS 500 MA
U0652	5113815A02	MC33064 UNDERVOLT SENSING
U0653	4805921T02	NU
VR0151	4813830A15	5.6V
VR0501	4805656W09	20V
VR0503	4805656W09	20V
VR0504	4813830A40	33V
VR0505	4805656W09	20V
VR0509	4813830A40	33V
VR0510	4813830A40	33V
VR0521	4813830A15	5.6V
VR0522	4813830A15	5.6V
VR0537	4813830A15	5.6V
VR0541	4813830A27	14V
VR0601	4813832C77	24V
VR0621	4813830A15	5.6V
Y0131	4880113R19	XTAL

* Motorola Depot Servicing only

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

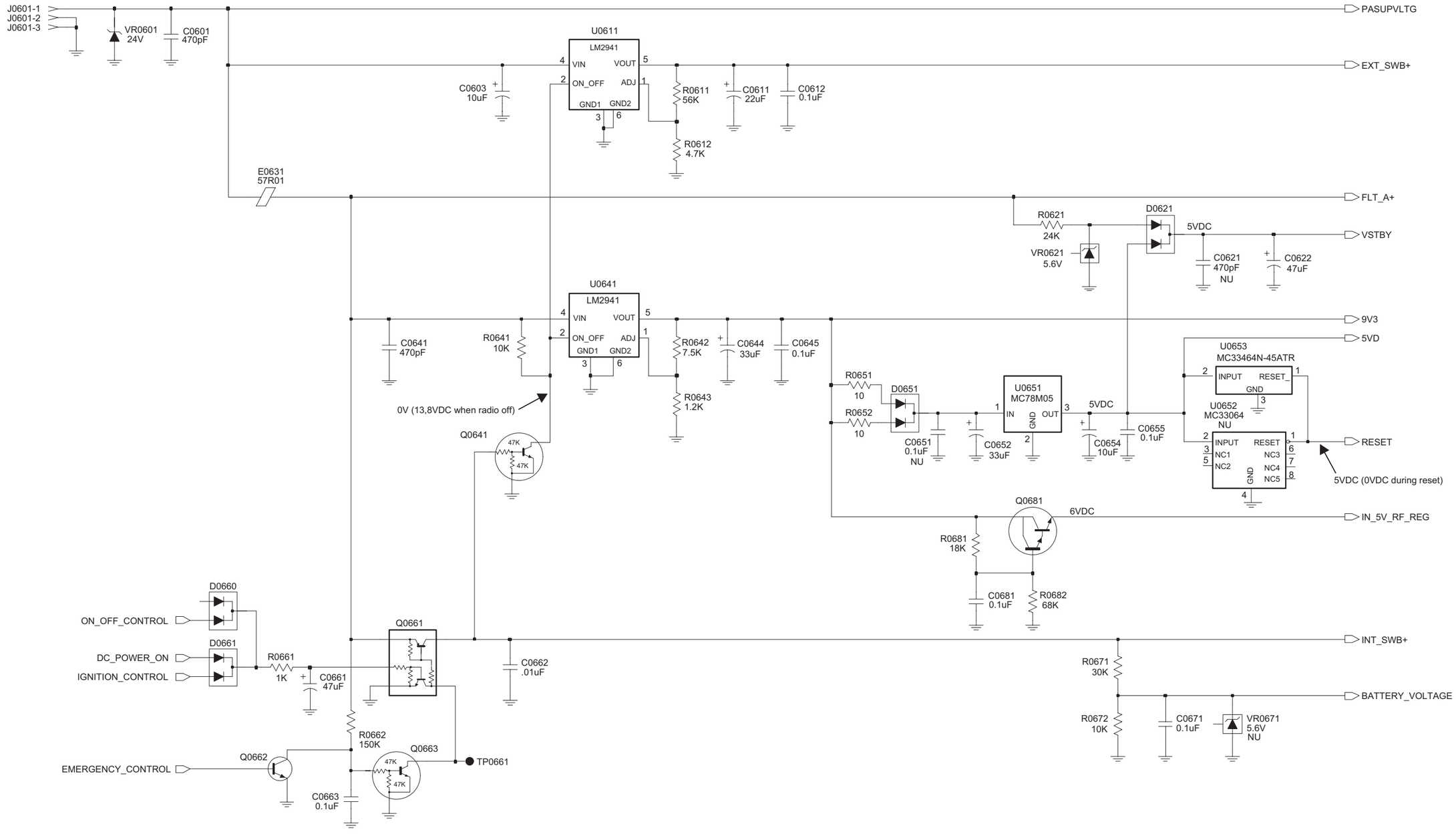
3.0 Controller T5 Schematics and Parts Lists



ZWG013003510-O

Controller T5 Schematic Diagram - Overall

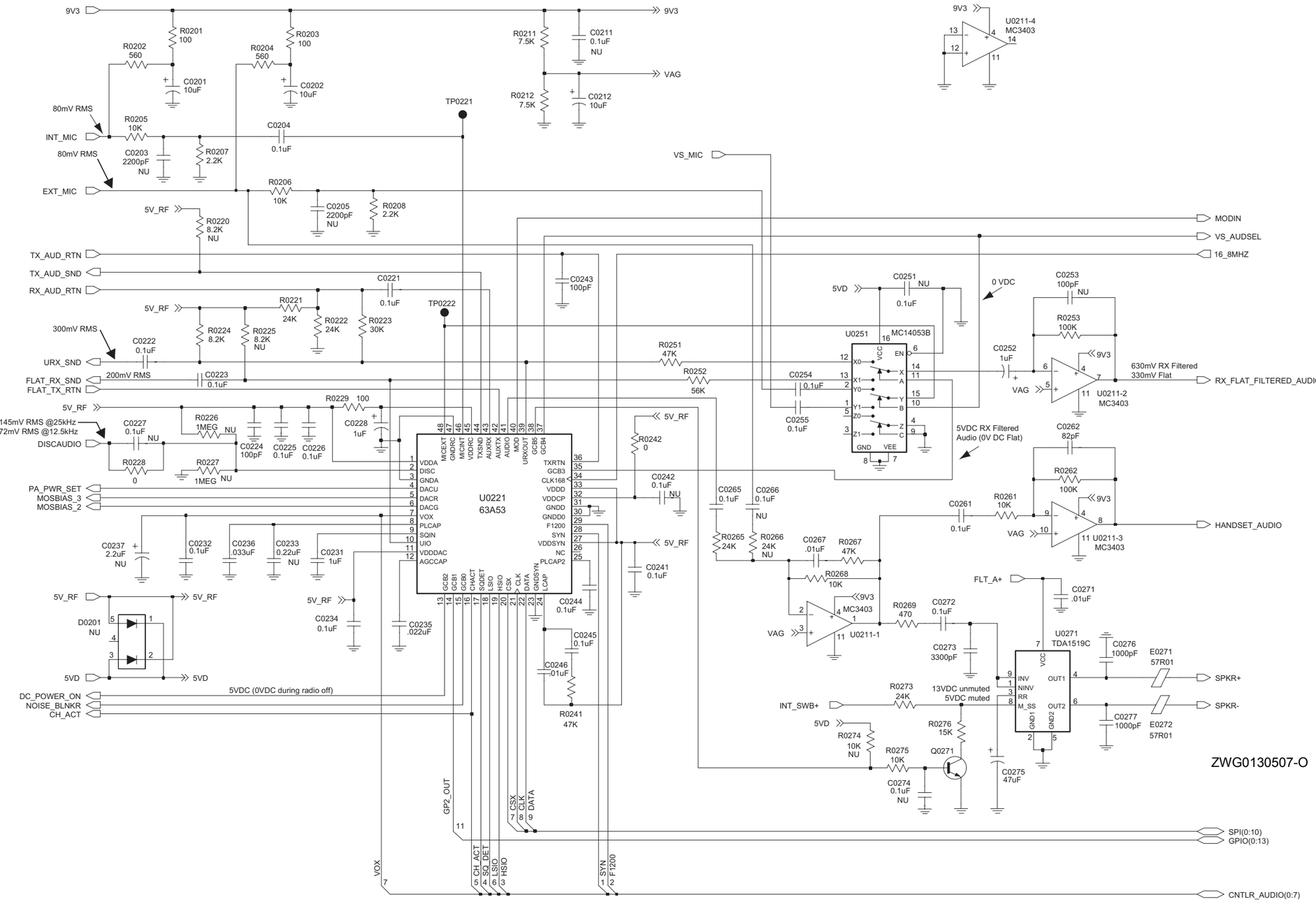
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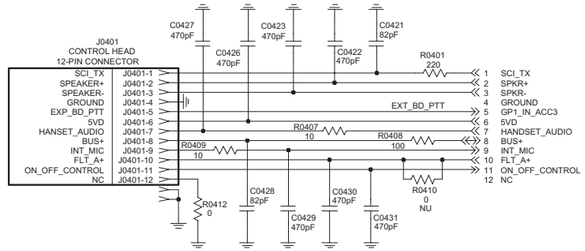
Controller T5 Schematic Diagram - Supply Voltage

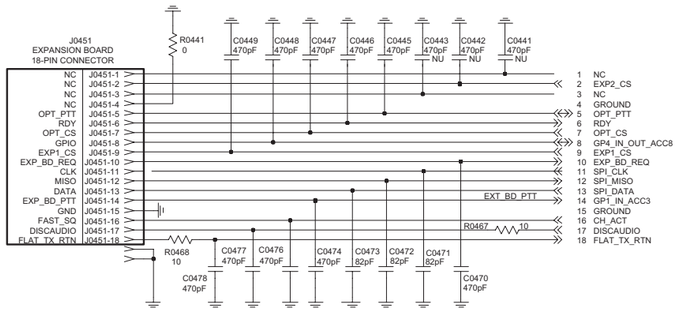
6881091C63-C

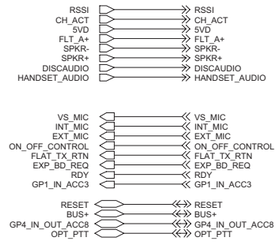


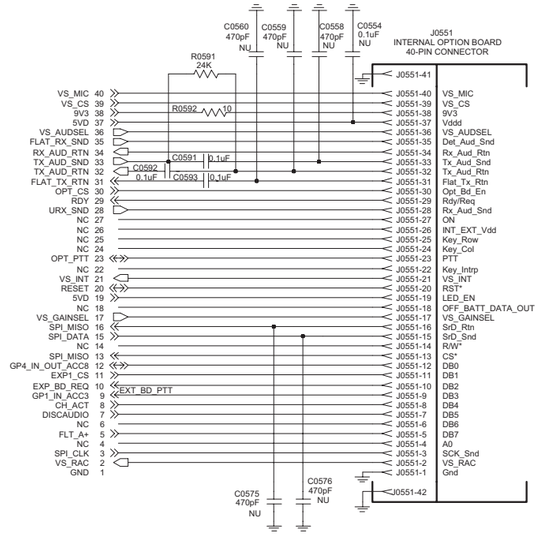
Controller T5 Schematic Diagram - Audio

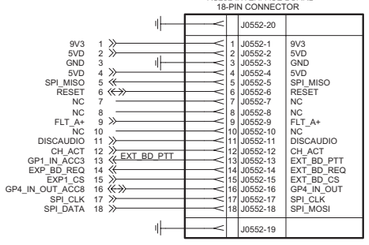
6881091C63-C

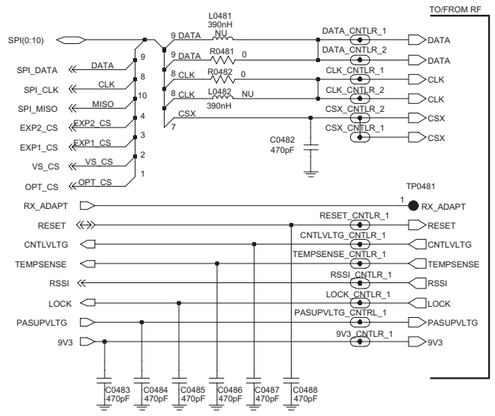


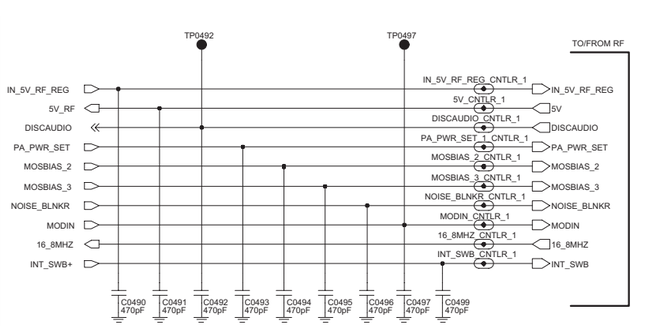


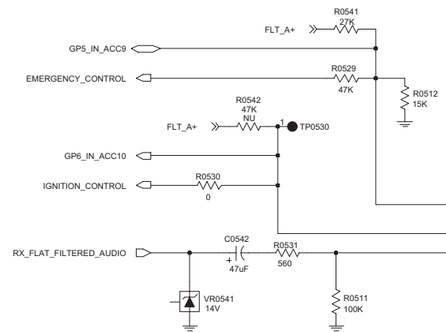


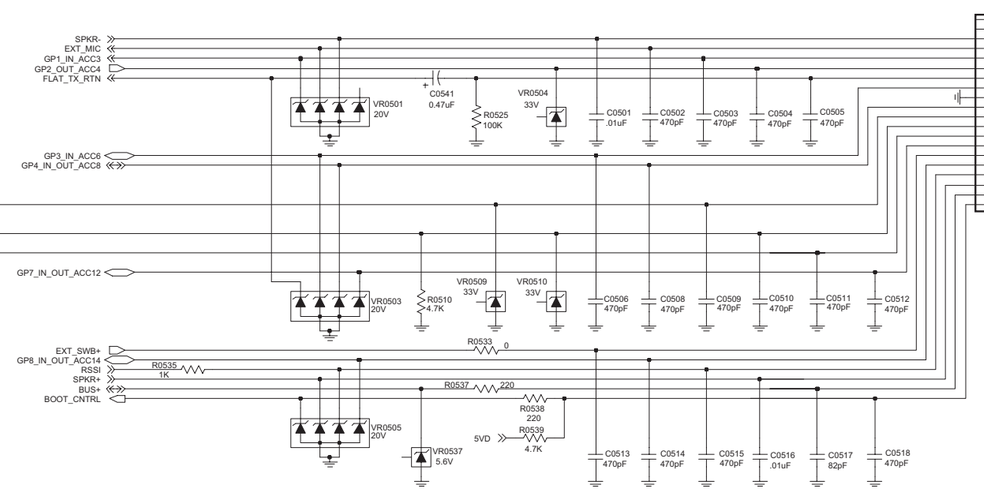


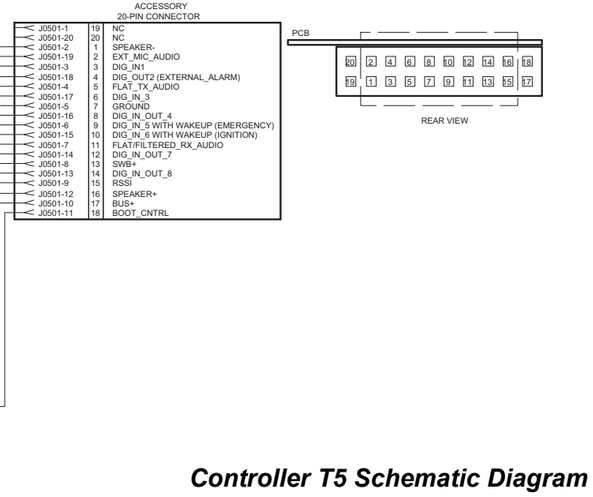








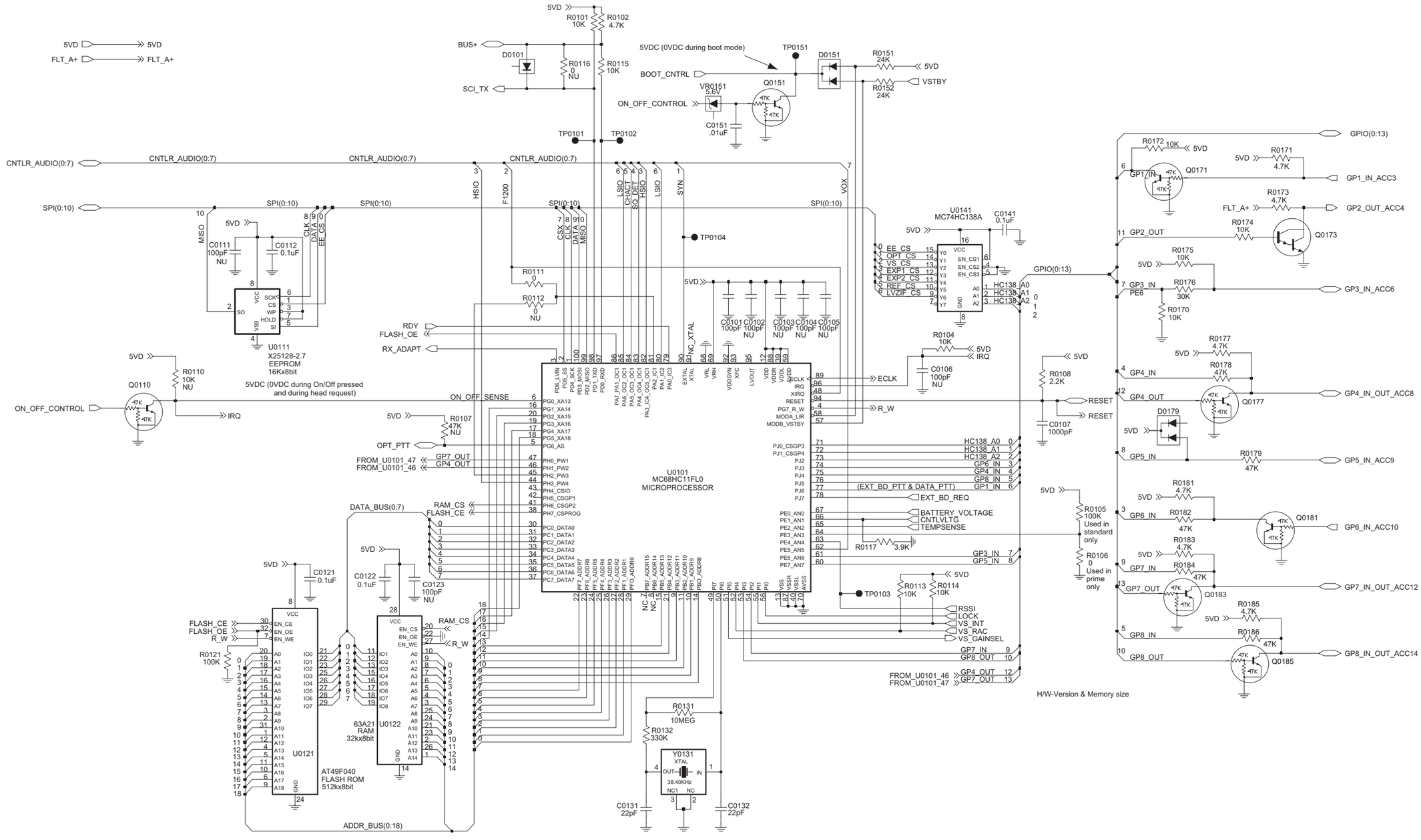




ZWG0130508-O

Controller T5 Schematic Diagram - I/O

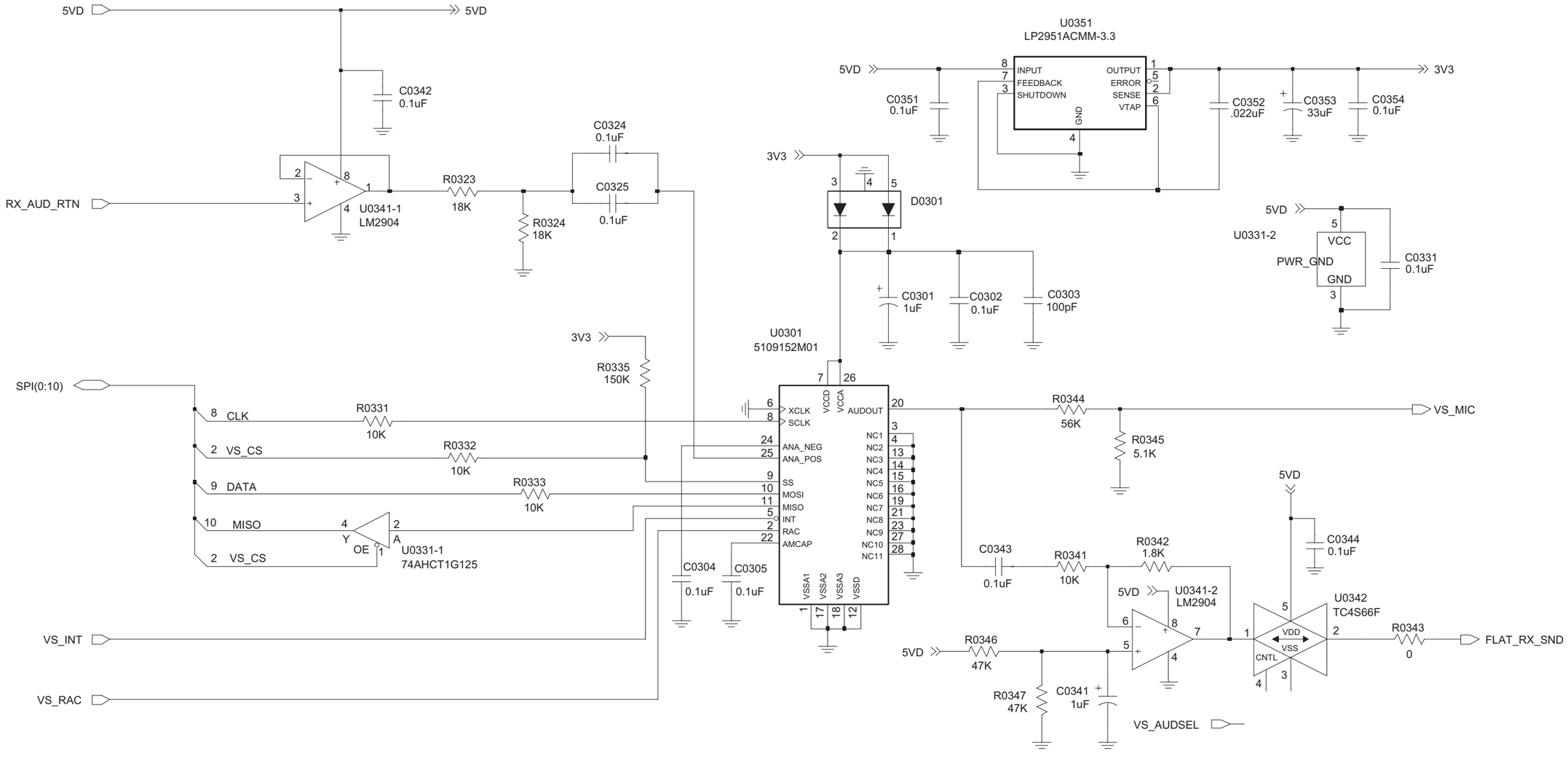
6881091C63-C



ZWG0130509-A

Controller T5 Schematic Diagram - Microprocessor

6881091C63-C



ZWG0130505-O

Controller T5 Schematic Diagram - Voice Storage

6881091C63-C

Controller T5 Parts List

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF 5% 50V
C0107	2113741F25	1nF 50V
C0112	2113743E20	100nF 16V
C0121	2113743E20	100nF 16V
C0122	2113743E20	100nF 16V
C0131	2113740F35	22pF 5% 50V
C0132	2113740F35	22pF 5% 50V
C0141	2113743E20	100nF 16V
C0151	2113741F49	10nF 50V
C0201	2311049A57	TANT CP 10uF 10% 16V
C0202	2311049A57	TANT CP 10uF 10% 16V
C0204	2113743E20	100nF 16V
C0212	2311049A57	TANT CP 10uF 10% 16V
C0221	2113743E20	100nF 16V
C0222	2113743E20	100nF 16V
C0223	2113743E20	100nF 16V
C0224	2113740F51	100pF 5% 50V NP0
C0225	2113743E20	100nF 16V
C0226	2113743E20	100nF 16V
C0228	2311049A07	TANT CP 1uF 10% 16V
C0231	2113743B29	1 uF 10% 16V
C0232	2113743E20	100nF 16V
C0234	2113743E20	100nF 16V
C0235	2113743E07	22nF 16V
C0236	2113743E10	.033uF 10%
C0241	2113743E20	100nF 16V
C0243	2113740F51	100pF 5% 50V
C0244	2113743E20	100nF 16V
C0245	2113743E20	100nF 16V
C0246	2113741F49	10nF 50V
C0252	2311049A07	TANT CP 1uF 10%
C0254	2113743E20	100nF 16V
C0255	2113743E20	100nF 16V
C0261	2113743E20	100nF 16V
C0262	2113740F49	82pF 5% 50V
C0265	2113743E20	100nF 16V
C0267	2113741F49	10nF 50V
C0271	2113741F49	10nF 50V
C0272	2113743E20	100nF 16V
C0273	2113741F37	3.3nF 50V
C0275	2311049A99	TANT CP 47uF 20% 10V
C0276	2113741F25	1nF 50V
C0277	2113741F25	1nF 50V
C0301	2311049A07	1uF 10% 16V Voice storage only
C0302	2113743E20	100nF 16V Voice storage only
C0303	2113740F51	100pF 5% 50V Voice storage only
C0304	2113743E20	100nF 16V Voice storage only
C0305	2113743E20	100nF 16V Voice storage only
C0324	2113743E20	100nF 16V Voice storage only
C0331	2113743E20	100nF 16V Voice storage only
C0341	2311049A07	TANT CP 1uF 10% 16V Voice storage only
C0342	2113743E20	100nF 16V Voice storage only
C0343	2113743E20	100nF 16V Voice storage only
C0344	2113743E20	100nF 16V Voice storage only
C0351	2113743E20	100nF 16V Voice storage only
C0352	2113743E07	22nF 16V Voice storage only
C0353	2311049A97	TANT CHIP 33 uF 16 Voice storage only
C0354	2113743E20	100nF 16V Voice storage only
C0421	2113743N48	82.0 pF 5%
C0422	2113741F17	470pF 50V
C0423	2113741F17	470pF 50V
C0426	2113743L09	470 pF 10%
C0427	2113743L09	470 pF 10%
C0428	2113743N48	82.0 pF 5%
C0429	2113743L09	470 pF 10%
C0430	2113741F17	470pF 50V
C0431	2113741F17	470pF 50V
C0445	2113743L09	470 pF 10%
C0446	2113743L09	470 pF 10%
C0447	2113743L09	470 pF 10%
C0448	2113743L09	470 pF 10%
C0449	2113743L09	470 pF 10%
C0470	2113743L09	470 pF 10%
C0471	2113743N48	82.0 pF 5%
C0472	2113743N48	82.0 pF 5%
C0473	2113743N48	82.0 pF 5%
C0474	2113743L09	470 pF 10%
C0476	2113743L09	470 pF 10%
C0477	2113743L09	470 pF 10%
C0478	2113743L09	470 pF 10%
C0482	2113743L09	470 pF 10%
C0483	2113743L09	470 pF 10%
C0484	2113741F17	470 pF 50V
C0485	2113743L09	470 pF 10%
C0486	2113743L09	470 pF 10%
C0487	2113743L09	470 pF 10%
C0488	2113743L09	470 pF 10%
C0490	2113743L09	470 pF 10%
C0491	2113743L09	470 pF 10%
C0492	2113743L09	470 pF 10%
C0493	2113743L09	470 pF 10%
C0494	2113743L09	470 pF 10%
C0495	2113743L09	470 pF 10%
C0496	2113743L09	470 pF 10%
C0497	2113743L09	470 pF 10%
C0499	2113743L09	470 pF 10%
C0501	2113741F49	10nF 50V
C0502	2113743L09	470 pF 10%
C0503	2113743L09	470 pF 10%
C0504	2113743L09	470 pF 10%
C0505	2113743L09	470 pF 10%
C0506	2113743L09	470 pF 10%
C0508	2113743L09	470 pF 10%
C0509	2113743L09	470 pF 10%
C0510	2113741F17	470 pF 50V
C0511	2113743L09	470 pF 10%
C0512	2113743L09	470 pF 10%
C0513	2113741F17	470 pF 50V
C0514	2113743L09	470 pF 10%
C0515	2113743L09	470 pF 10%
C0516	2113741F49	10nF 50V
C0517	2113743N48	82.0 pF 5%
C0518	2113743L09	470 pF 10%
C0541	2311049A05	TANT CP 470nF 10% 25V
C0542	2311049A99	TANT CP 47uF 20% 10V
C0591	2113743E20	100nF 16V
C0592	2113743E20	100nF 16V
C0593	2113741B69	100nF 50V
C0601	2113741F17	470pF 50V
C0603	2380090M24	LYT 10uF 50V 20%
C0611	2311049C06	TANT CP 22uF 20% 35V
C0612	2113743E20	100nF 16V
C0622	2311049A99	TANT CP 47uF 20% 10V
C0641	2113741F17	470pF 50V
C0644	2311049A97	TANT CHIP 33 uF 16
C0645	2113743E20	100nF 16V
C0652	2311049A97	TANT CHIP 33 uF 16
C0654	2311049A57	TANT CP 10uF 10% 16V
C0655	2113743E20	100nF 16V
C0661	2311049C05	TANT CP 47uF 10% 16V
C0662	2113741F49	10nF 50V
C0663	2113743E20	100nF 16V
C0671	2113743E20	100nF 16V
C0681	2113743E20	100nF 16V
D0101	4880236E05	CHIP SCHOTTKY
D0151	4813833C02	DUAL SOT MMBD6100
D0179	4813833C02	DUAL SOT MMBD6100
D0301	4802245J47	SCHOTTKY BARRIER (RB471E) Voice storage only
D0621	4813833C02	DUAL SOT MMBD6100
D0651	4813833C02	DUAL SOT MMBD6100
D0660	4813833C02	DUAL SOT MMBD6100
D0661	4813833C02	DUAL SOT MMBD6100
E0271	2484657R01	Ferrite Bead
E0272	2484657R01	Ferrite Bead
E0631	2484657R01	Ferrite Bead
J0401	0902636Y02	CONN FLEX 12 PIN
J0451	0902636Y01	CONN FLEX SIDE ENTRY
J0501	0986105B01	CONN SMD 20 PIN
J0551	0905505Y04	CONN ZIF HORIZONTAL
J0552	0905505Y03	CONN ZIF 18PIN
J0601	0986165B01	DC PWR CONN
Q0110	4880048M01	NPN DIG 47k/47k
Q0151	4880048M01	NPN DIG 47k/47k
Q0171	4880048M01	NPN DIG 47k/47k
Q0173	4880052M01	NPN DRLNGTN MXTA
Q0177	4880048M01	NPN DIG 47k/47k
Q0181	4880048M01	NPN DIG 47k/47k
Q0183	4880048M01	NPN DIG 47k/47k
Q0185	4880048M01	NPN DIG 47k/47k
Q0271	4813824A10	NPN 40V .2A
Q0641	4880048M01	NPN DIG 47k/47k
Q0661	4805921T02	DUAL ROHM FMC2 RH
Q0662	4813824A10	NPN 40V .2A B=50-150
Q0663	4880048M01	NPN DIG 47k/47k
Q0681	4880052M01	NPN DRLNGTN MXTA
R0101	0662057A73	10k 1/16W 5%
R0102	0662057A65	4700 1/16W 5%
R0104	0662057A73	10k 1/16W 5%
R0105	0662057A97	100k 1/16W Voice storage only
R0106	0662057B47	0 1/16W Voice storage only

Circuit Ref	Motorola Part No.	Description
R0108	0662057A57	2200 1/16W 5%
R0111	0662057B47	0 1/16W
R0113	0662057A73	10k 1/16W 5%
R0114	0662057A73	10k 1/16W 5%
R0115	0662057A73	10k 1/16W 5%
R0117	0662057A63	3900 1/16W 5%
R0121	0662057A97	100k 1/16W
R0131	0662057B46	10.0 MEG OHMS 5%
R0132	0662057B10	330k 1/16W 5%
R0151	0662057A82	24K 1/16W 5%
R0152	0662057A82	24K 1/16W 5%
R0170	0662057A73	10k 1/16W 5%
R0171	0662057A65	4700 1/16W 5%
R0172	0662057A73	10k 1/16W 5%
R0173	0662057A65	4700 1/16W 5%
R0174	0662057A73	10k 1/16W 5%
R0175	0662057A73	10k 1/16W 5%
R0176	0662057A84	30k 1/16W 5%
R0177	0662057A65	4700 1/16W 5%
R0178	0662057A89	47k 1/16W 5%
R0179	0662057A89	47k 1/16W 5%
R0181	0662057A65	4700 1/16W 5%
R0182	0662057A89	47k 1/16W 5%
R0183	0662057A65	4700 1/16W 5%
R0184	0662057A89	47k 1/16W 5%
R0185	0662057A65	4700 1/16W 5%
R0186	0662057A89	47k 1/16W 5%
R0201	0662057A25	100 1/16W 5%
R0202	0662057A43	560 1/16W 5%
R0203	0662057A25	100 1/16W 5%
R0204	0662057A43	560 1/16W 5%
R0205	0662057A73	10k 1/16W 5%
R0206	0662057A73	10k 1/16W 5%
R0207	0662057A57	2200 1/16W 5%
R0208	0662057A57	2200 1/16W 5%
R0211	0660076E70	FILM 7500
R0212	0660076E70	FILM 7500
R0221	0662057A82	24K 1/16W 5%
R0222	0662057A82	24K 1/16W 5%
R0223	0662057A84	30k 1/16W 5%
R0224	0662057A71	8200 1/16W 5%
R0228	0662057B47	0 1/16W
R0229	0662057A25	100 1/16W 5%
R0241	0662057A89	47k 1/16W 5%
R0242	0662057B47	0 1/16W
R0251	0662057A89	47k 1/16W 5%
R0252	0662057A91	56K 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R0253	0662057A97	100k 1/16W
R0261	0662057A73	10k 1/16W 5%
R0262	0662057A97	100k 1/16W
R0265	0662057A82	24K 1/16W 5%
R0267	0662057A89	47k 1/16W 5%
R0268	0662057A73	10k 1/16W 5%
R0269	0662057A41	470 1/16W 5%
R0273	0662057A82	24K 1/16W 5%
R0275	0662057A73	10k 1/16W 5%
R0276	0662057A77	15k 1/16W 5%
R0323	0662057A79	18k 1/16W 5% Voice storage only
R0324	0662057A79	18k 1/16W 5% Voice storage only
R0331	0662057A73	10k 1/16W 5% Voice storage only
R0332	0662057A73	10k 1/16W 5% Voice storage only
R0333	0662057A73	10k 1/16W 5% Voice storage only
R0335	0662057B02	150k 1/16W Voice storage only
R0341	0662057A73	10k 1/16W 5% Voice storage only
R0342	0662057A55	1800 1/16W 5% Voice storage only
R0343	0662057B47	0 1/16W Voice storage only
R0344	0662057A91	56K 1/16W 5% Voice storage only
R0345	0662057A66	5100 1/16W 5% Voice storage only
R0346	0662057A89	47k 1/16W 5% Voice storage only
R0347	0662057A89	47k 1/16W 5% Voice storage only
R0401	0662057A33	220 1/16W 5%
R0407	0662057M26	10 5%
R0408	0662057A25	100 1/16W 5%
R0409	0662057M26	10 5%
R0412	0662057B47	0 1/16W
R0441	0662057B47	0 1/16W
R0467	0662057M26	10 5%
R0468	0662057M26	10 5%
R0481	0662057B47	0 1/16W
R0482	0662057B47	0 1/16W
R0510	0662057A65	4700 1/16W 5%
R0511	0662057A97	100k 1/16W
R0512	0662057A77	15k 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R0525	0662057A97	100k 1/16W
R0529	0662057A89	47k 1/16W 5%
R0530	0662057B47	0 1/16W
R0531	0662057A43	560 1/16W 5%
R0533	0662057B47	0 1/16W
R0535	0662057A49	1k 1/16W
R0537	0662057A33	220 1/16W 5%
R0538	0662057A33	220 1/16W 5%
R0539	0662057A65	4700 1/16W 5%
R0541	0662057A83	27k 1/16W 5%
R0591	0662057A82	24K 1/16W 5%
R0592	0662057A01	10 1/16W 5%
R0611	0662057A91	56K 1/16W 5%
R0612	0662057A65	4700 1/16W 5%
R0621	0662057A82	24K 1/16W 5%
R0641	0662057A73	10k 1/16W 5%
R0642	0660076E70	FILM 7500 1 1
R0643	0660076E51	FILM 1200 1 1
R0651	0662057A01	10 1/16W 5%
R0652	0662057A01	10 1/16W 5%
R0661	0662057A49	1k 1/16W 5%
R0662	0662057B02	150k 1/16W
R0671	0662057A84	30k 1/16W 5%
R0672	0662057A73	10k 1/16W 5%
R0681	0662057A79	18k 1/16W 5%
R0682	0662057A93	68k 1/16W 5%
U0101	5102226J56	MICRO PROCESSOR MC68HC1
* U0111	5102463J64	EEPROM X25128-2.7 SO8
* U0121	5186137B01	IC 512KX8 FLASH ROM (AT49BV020)
U0122	5185963A21	IC 32K x 8 SRAM
U0141	5113805A30	IC 10F8 DCDR/REMUX 74HC138
U0211	5183222M49	IC QUAD OPAMP __3403
U0221	5185963A53	ASFICCMP 0.5MM TQFP
U0251	5113806A20	MUX/DEMUX,TRIPLE 2-
U0271	5109699X01	AUDIO PA TDA1519C
U0301	5109152M01	EEPROM ANALOG ISD33120EI Voice storage only
U0331	5186204B01	BuFFER/DRIVER 74AHCT1G125 Voice storage only
U0341	5180932W01	LINEAR IC OP AMP Voice storage only
U0342	5105750U28	SNGL ANALOG SWITCH Voice storage only

Circuit Ref	Motorola Part No.	Description
U0351	5102463J40	REGULATOR, 3.3V Voice storage only
U0611	5183308X01	ADJ VLTG REG LM2941 TO263
U0641	5183308X01	ADJ VLTG REG LM2941 TO263
U0651	5113816A07	REG 5V POS 500MA MC78M05
U0653	5186205B01	MC33464N-45ATR SOT23-5-RB
VR0151	4813830A15	5.6V 5% 225mW
VR0501	4805656W09	ZENER QUAD MMQA20VT1
VR0503	4805656W09	ZENER QUAD MMQA20VT1
VR0504	4813830A40	SOC23 AUTO SDN
VR0505	4805656W09	ZENER QUAD MMQA20VT1
VR0509	4813830A40	SOC23 AUTO SDN
VR0510	4813830A40	SOC23 AUTO SDN
VR0537	4813830A15	5.6V 5% 225mW
VR0541	4813830A27	14V 5% 225MW
VR0601	4813832C77	TRANS SUP. 24V HIGPWR
VR0621	4813830A15	DIODE 5.6V 5% 225mW
Y0131	4880113R19	CRYSTAL 38.4KHZ

* Motorola Depot Servicing only

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

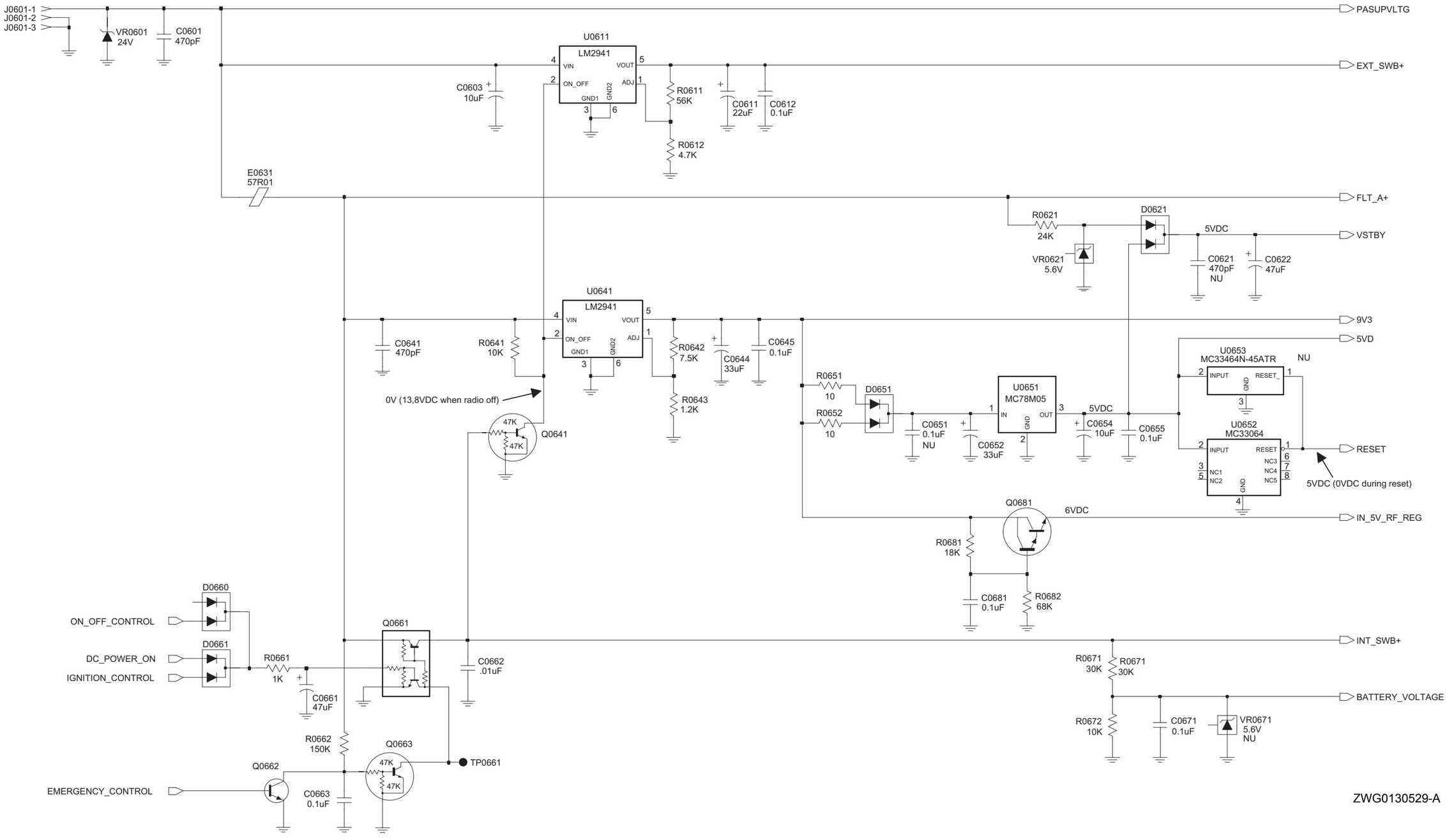
4.0 Controller T6/T7/T9 Schematics and Parts Lists



Controller T6/T7/T9/T11 Schematic Diagram - Overall

ZWG0130525-O

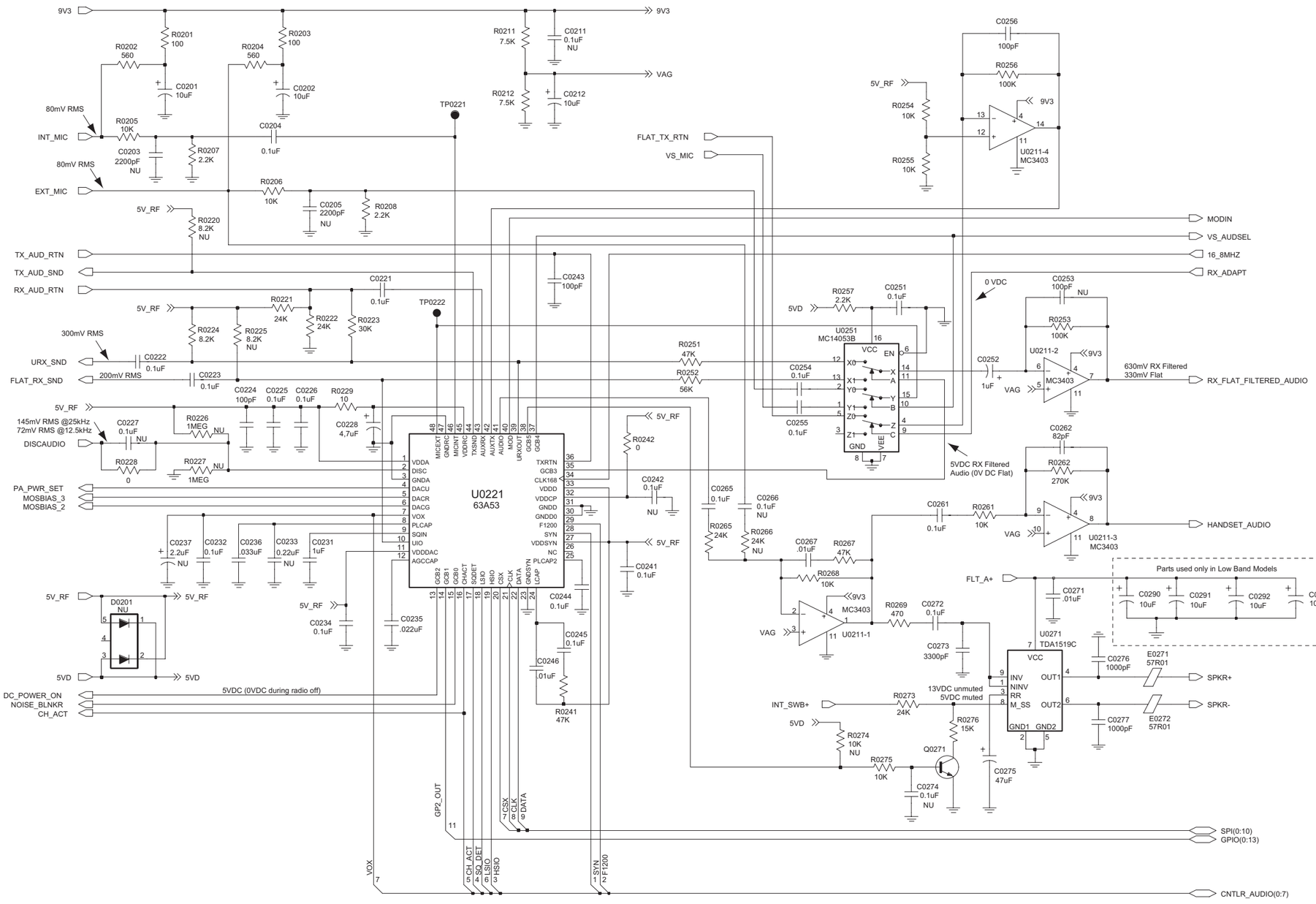
6881091C63-C



ZWG0130529-A

Controller T6/T7/T9 Schematic Diagram - Supply Voltage

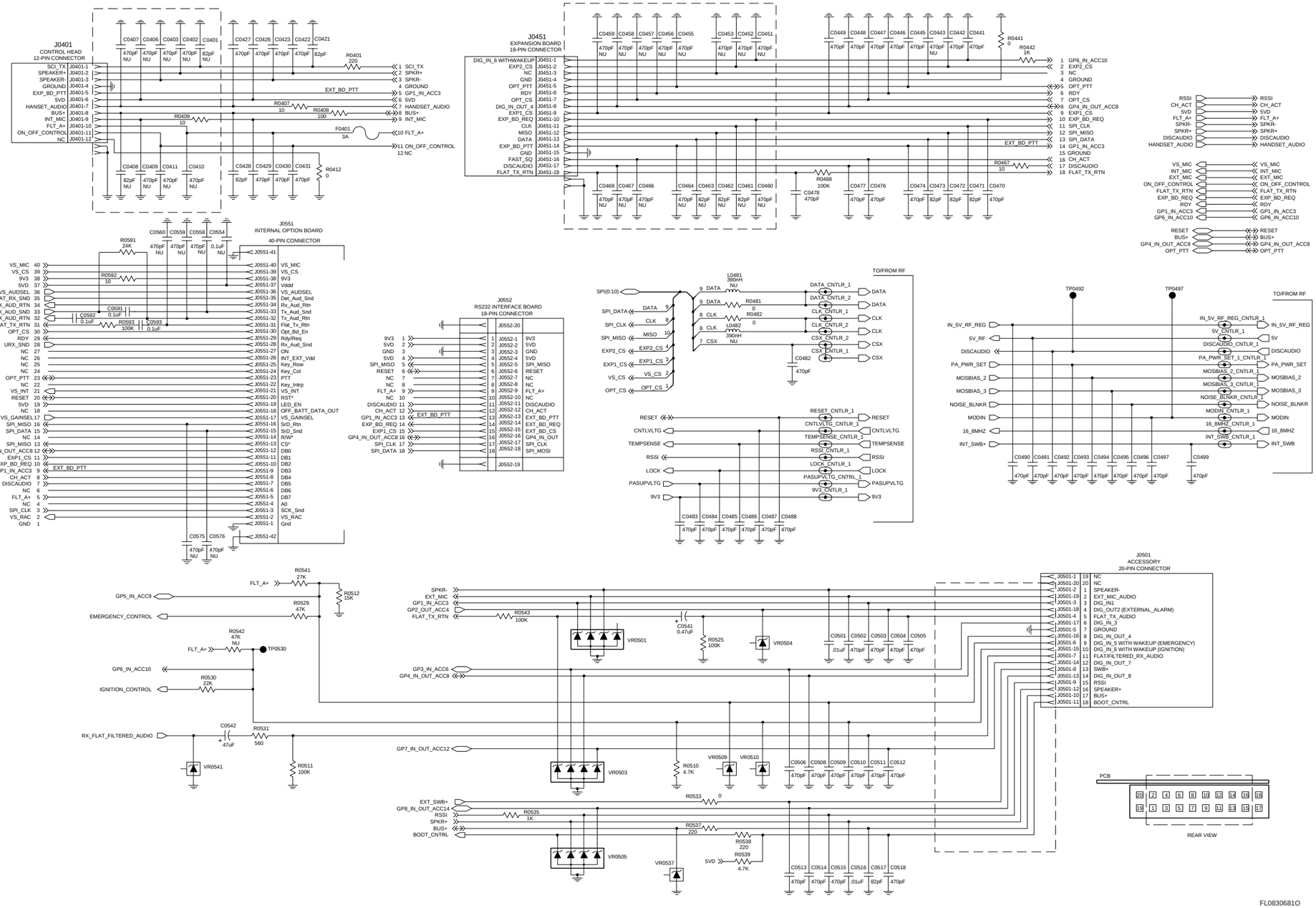
6881091C63-C



Controller T6/T7/T9 Schematic Diagram - Audio

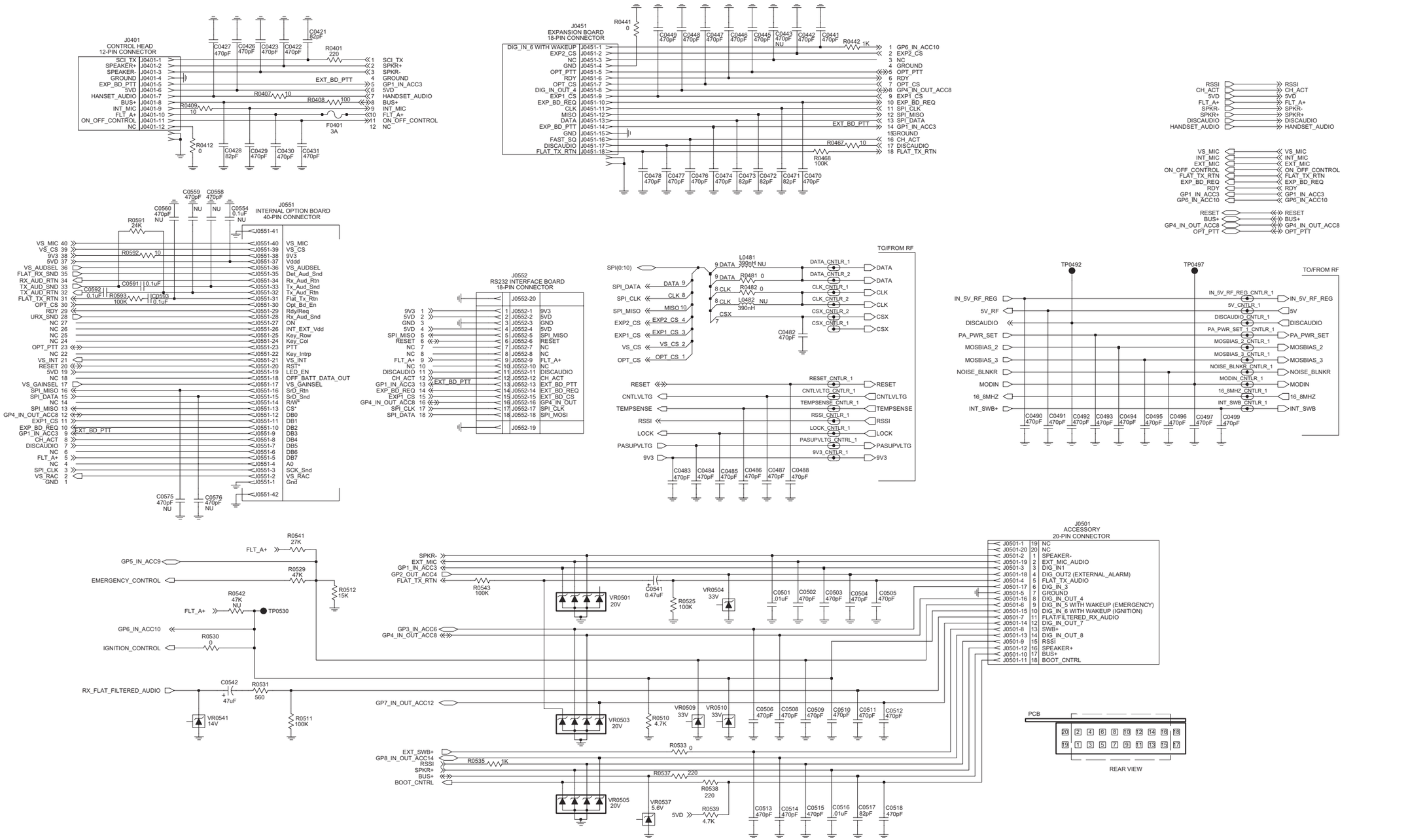
ZWG0130528-B

6881091C63-C



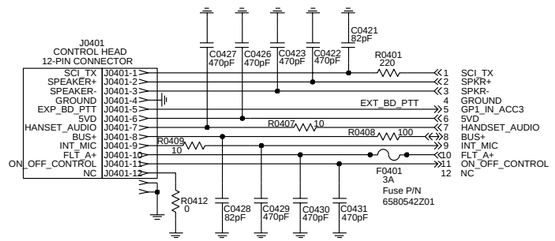
Controller T6 Only Schematic Diagram - I/O

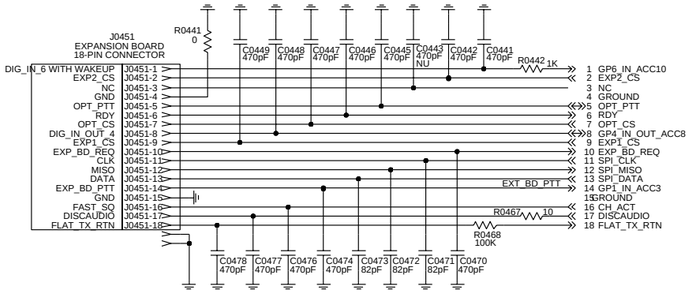
6881091C63-C

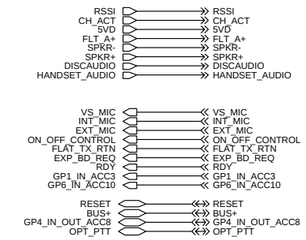


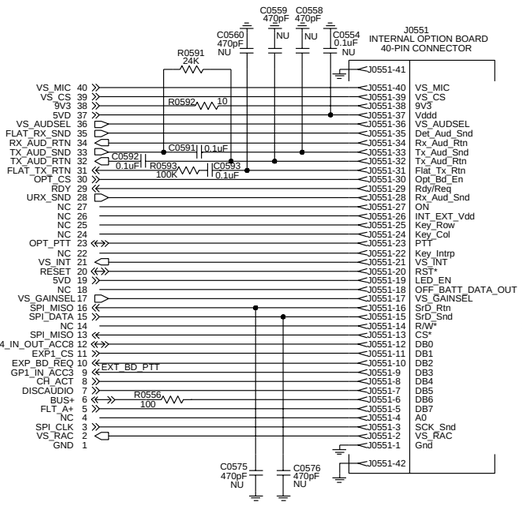
Controller T7 Only Schematic Diagram - I/O

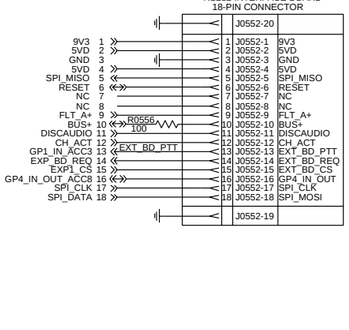
ZWG0130563-A

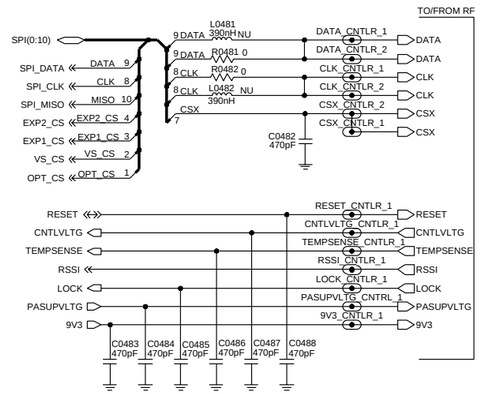


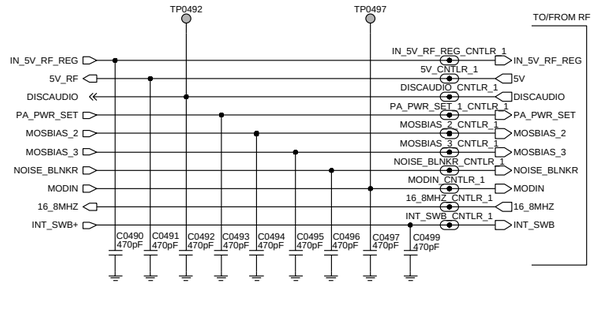


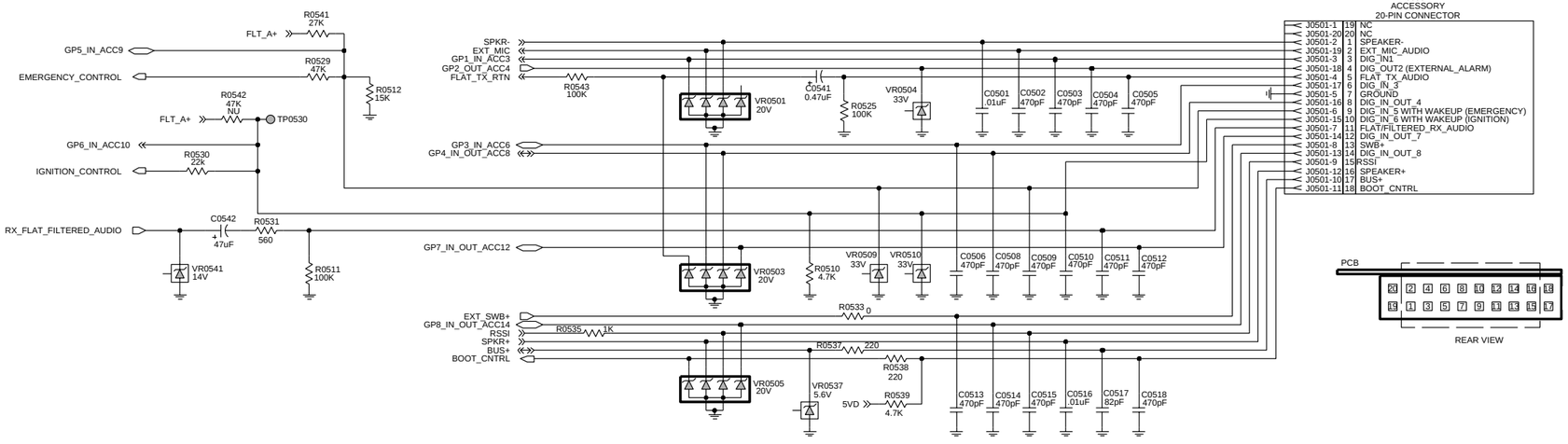








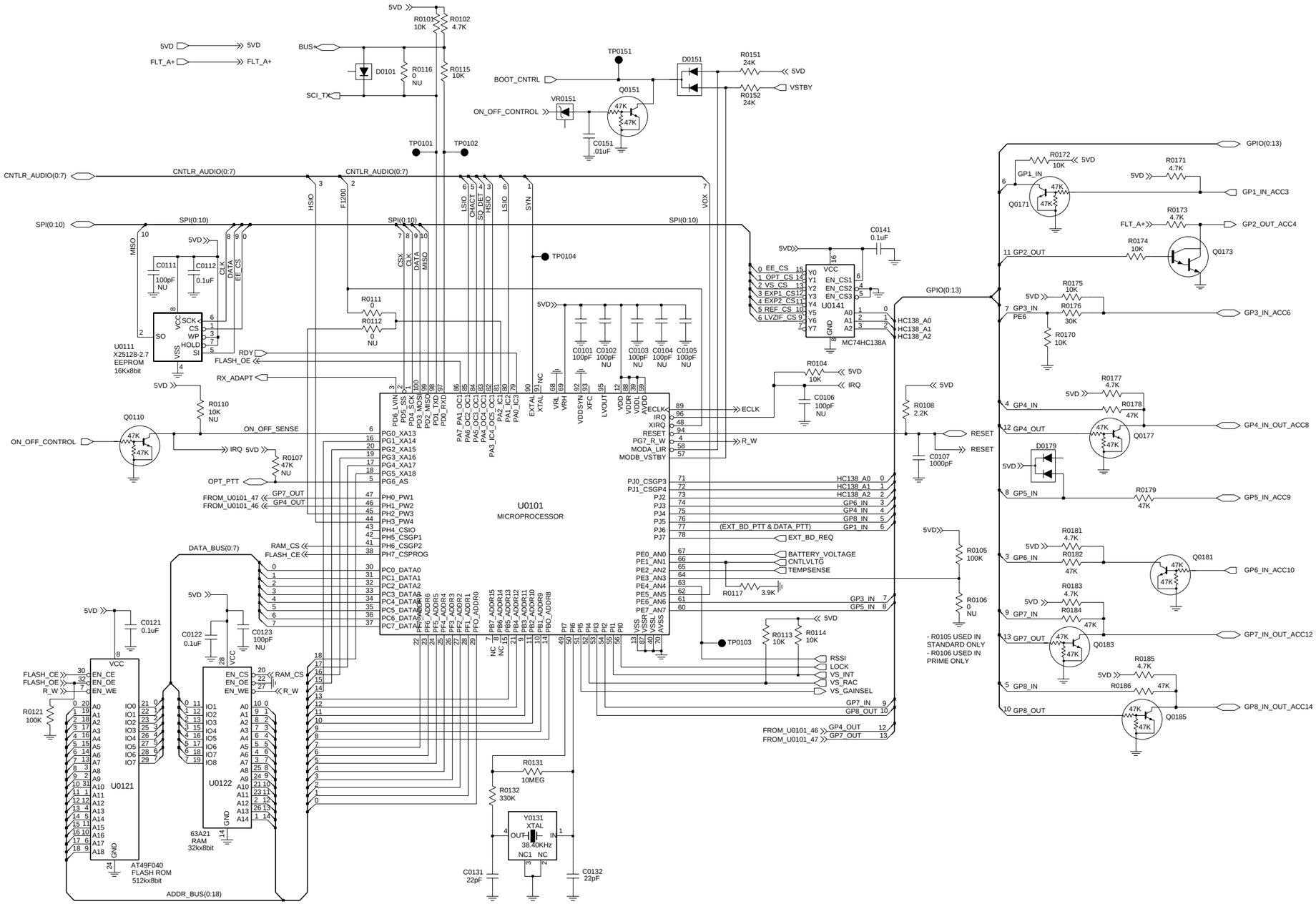




ZWG0130586-A

Controller T9 Only Schematic Diagram - I/O

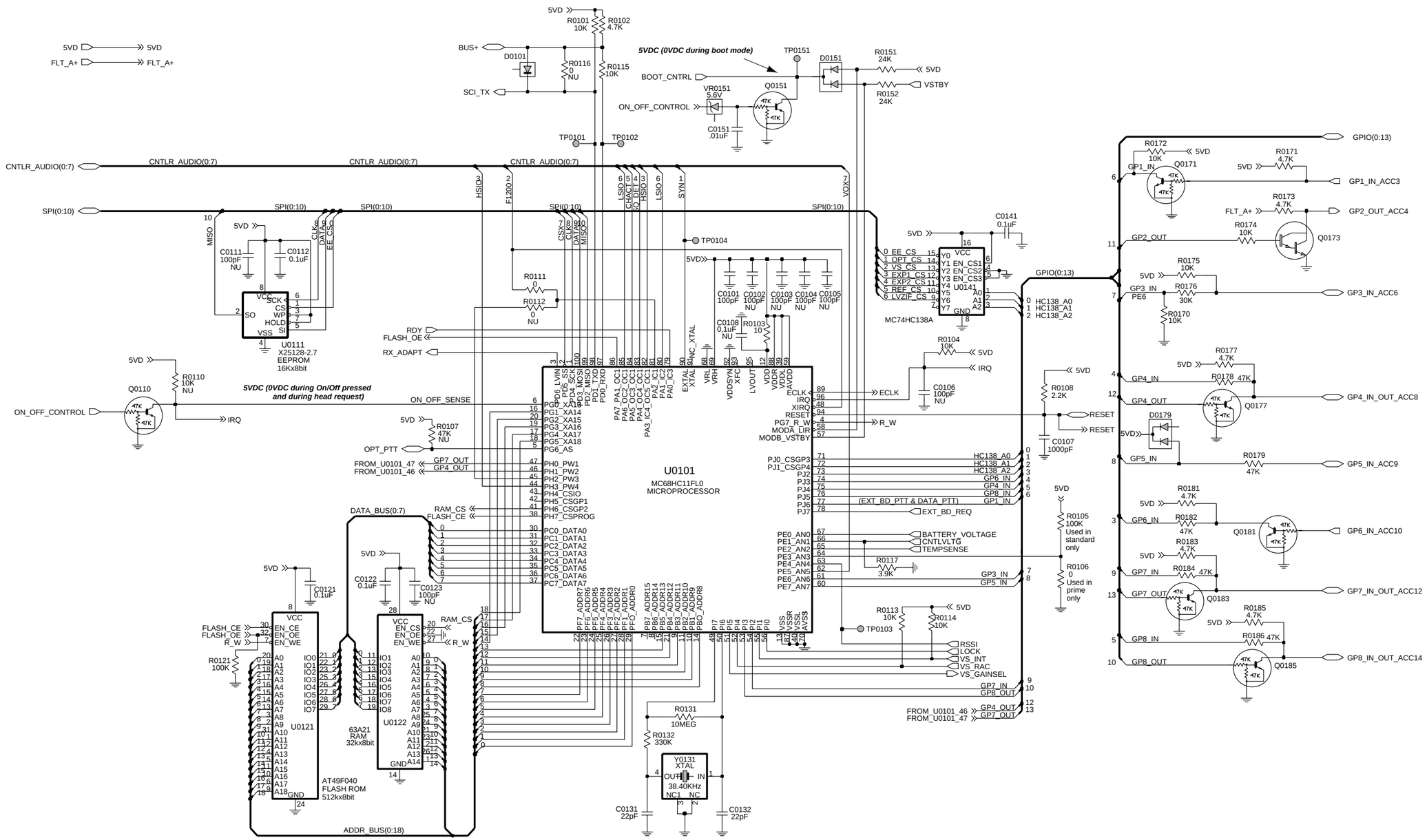
6881091C63-C



Controller T6/T7 Schematic Diagram - Microprocessor

FL0830683-O

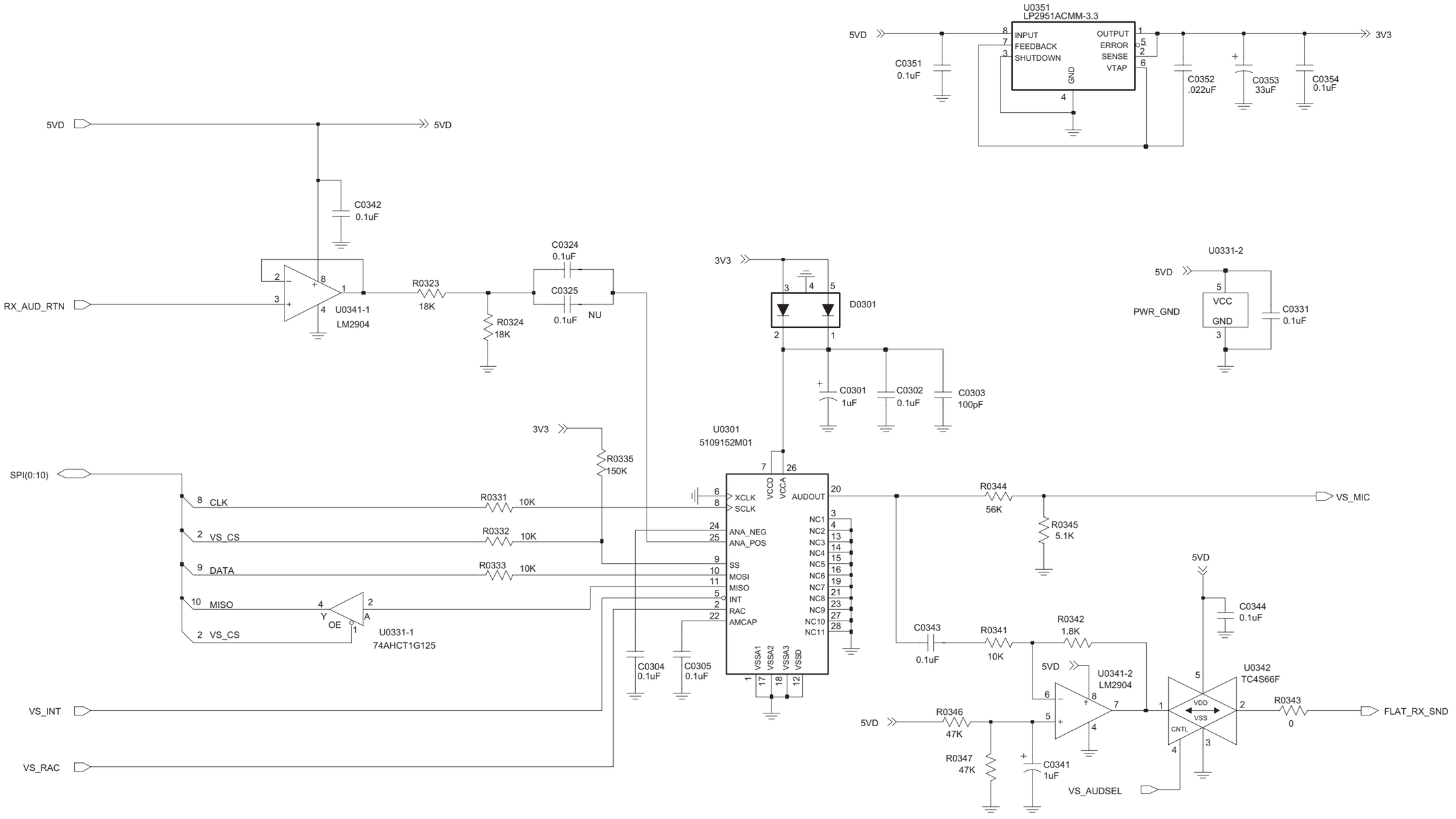
6881091C63-C



ZWG0130585-A

Controller T9 Only Schematic Diagram - Microprocessor

6881091C63-C



Controller T6/T7/T9 Schematic Diagram - Voice Storage

ZWG0130530-O

Controller T6/7 Parts List

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF 5% 50V
C0107	2113741F25	1nF 50V
C0112	2113743E20	100nF 16V
C0121	2113743E20	100nF 16V
C0122	2113743E20	100nF 16V
C0131	2113740F35	22pF 5% 50V
C0132	2113740F35	22pF 5% 50V
C0141	2113743E20	100nF 16V
C0151	2113741F49	10nF 50V
C0201	2311049A57	10uF 10% 16V
C0202	2311049A57	10uF 10% 16V
C0204	2113743E20	100nF 16V
C0212	2311049A57	10uF 10% 16V
C0221	2113743E20	100nF 16V
C0222	2113743E20	100nF 16V
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF 5% 50V
C0225	2113743E20	100nF 16V
C0226	2113743E20	100nF 16V
C0228	2311049A56	4.7uF 10% 16V
C0231	2113743B29	1 uF 10% 16V
C0232	2113743E20	100nF 16V
C0234	2113743E20	100nF 16V
C0235	2113743E07	22nF 16V
C0236	2113743E10	.033uF 10%
C0241	2113743E20	100nF 16V
C0243	2113740F51	100pF 5% 50V
C0244	2113743E20	100nF 16V
C0245	2113743E20	100nF 16V
C0246	2113741F49	10nF 50V
C0251 Used in	2113743E20	100nF 16V CNTRL T7 only
C0252	2311049A07	1uF 10% 16V
C0254	2113743E20	100nF 16V
C0255	2113743E20	100nF 16V
C0256	2113740F51	100pF 5% 50V
C0261	2113743E20	100nF 16V
C0262	2113740F49	82pF 5% 50V NP0
C0265	2113743E20	100nF 16V
C0267	2113741F49	10nF 50V
C0271	2113741F49	10nF 50V
C0272	2113743E20	100nF 16V
C0273	2113741F37	3.3nF 50V
C0275	2311049A99	47uF 20% 10V
C0276	2113741F25	1nF 50V X7R
C0277	2113741F25	1nF 50V X7R
C0290	2311049C01	10uF (only Low Band)
C0291	2311049C01	10uF (only Low Band)
C0292	2311049C01	10uF (only Low Band)
C0293	2311049C01	10uF (only Low Band)
C0301	2311049A07	1uF 10% 16V Voice storage only
C0302	2113743E20	100nF 16V Voice storage only
C0303	2113740F51	100pF 5% 50V Voice storage only
C0304	2113743E20	100nF 16V Voice storage only
C0305	2113743E20	100nF 16V Voice storage only
C0324	2113743E20	100nF 16V Voice storage only
C0331	2113743E20	100nF 16V Voice storage only
C0341	2311049A07	TANT CP 1uF 10% 16V Voice storage only
C0342	2113743E20	100nF 16V Voice storage only
C0343	2113743E20	100nF 16V Voice storage only
C0344	2113743E20	100nF 16V Voice storage only
C0351	2113743E20	100nF 16V Voice storage only
C0352	2113743E07	22nF 16V Voice storage only
C0353	2311049A97	TANT CHIP 33 uF 16 Voice storage only
C0354	2113743E20	100nF 16V Voice storage only
C0421	2113743N48	82.0 pF 5%
C0422	2113741F17	470pF 50V
C0423	2113741F17	470pF 50V
C0426	2113743L09	470 pF 10%
C0427	2113743L09	470 pF 10%
C0428	2113743N48	82.0 pF 5%
C0429	2113743L09	470 pF 10%
C0430	2113741F17	470pF 50V
C0431	2113741F17	470pF 50V
C0441	2113743L09	470 pF 10%
C0442	2113743L09	470 pF 10%
C0445	2113743L09	470 pF 10%
C0446	2113743L09	470 pF 10%
C0447	2113743L09	470 pF 10%
C0448	2113743L09	470 pF 10%
C0449	2113743L09	470 pF 10%
C0470	2113743L09	470 pF 10%
C0471	2113743N48	82.0 pF 5%
C0472	2113743N48	82.0 pF 5%
C0473	2113743N48	82.0 pF 5%
C0474	2113743L09	470 pF 10%
C0476	2113743L09	470 pF 10%
C0477	2113743L09	470 pF 10%
C0478	2113743L09	470 pF 10%
C0482	2113743L09	470 pF 10%
C0483	2113743L09	470 pF 10%
C0484	2113741F17	470pF 50V
C0485	2113743L09	470 pF 10%
C0486	2113743L09	470 pF 10%
C0487	2113743L09	470 pF 10%
C0488	2113743L09	470 pF 10%
C0490	2113743L09	470 pF 10%
C0491	2113743L09	470 pF 10%
C0492	2113743L09	470 pF 10%
C0493	2113743L09	470 pF 10%
C0494	2113743L09	470 pF 10%
C0495	2113743L09	470 pF 10%
C0496	2113743L09	470 pF 10%
C0497	2113743L09	470 pF 10%
C0499	2113743L09	470 pF 10%
C0501	2113741F49	10nF 50V
C0502	2113743L09	470pF 10% (CNTRL T6)
C0502	2113741F17	470pF 50V (CNTRL T7)
C0503	2113743L09	470pF 10% (CNTRL T6)
C0503	2113741F17	470pF 50V (CNTRL T7)
C0504	2113741F17	470pF 50V
C0505	2113743L09	470pF 10% (CNTRL T6)
C0505	2113741F17	470pF 50V (CNTRL T7)
C0506	2113743L09	470pF 10% (CNTRL T6)
C0506	2113741F17	470pF 50V (CNTRL T7)
C0508	2113743L09	470pF 10% (CNTRL T6)
C0508	2113741F17	470pF 50V (CNTRL T7)
C0509	2113743L09	470pF 10% (CNTRL T6)
C0509	2113741F17	470pF 50V (CNTRL T7)
C0510	2113741F17	470pF 50V
C0511	2113743L09	470pF 10% (CNTRL T6)
C0511	2113741F17	470pF 50V (CNTRL T7)
C0512	2113743L09	470pF 10% (CNTRL T6)
C0512	2113741F17	470pF 50V (CNTRL T7)
C0513	2113741F17	470pF 50V
C0514	2113743L09	470pF 10% (CNTRL T6)
C0514	2113741F17	470pF 50V (CNTRL T7)
C0515	2113743L09	470pF 10% (CNTRL T6)
C0515	2113741F17	470pF 50V (CNTRL T7)
C0516	2113741F49	10nF 50V
C0517	2113743N48	82.0 pF 5%
C0518	2113743L09	470pF 10% (CNTRL T6)
C0518	2113741F17	470pF 50V (CNTRL T7)
C0541	2311049A05	470nF 10% 25V
C0542	2311049A99	47uF 20% 10V
C0591	2113743E20	100nF 16V
C0592	2113743E20	100nF 16V
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF 50V
C0603	2380090M24	LYT 10uF 50V 20%
C0611	2311049C06	CP 22uF 20% 35V
C0612	2113743E20	100nF 16V
C0622	2311049A99	CP 47uF 20%
C0641	2113741F17	470pF 50V
C0644	2311049A97	CHIP 33 uF
C0645	2113743E20	100nF 16VD
C0652	2311049A97	CHIP 33 uF 16
C0654	2311049A57	CP 10uF 10% 16V
C0655	2113743E20	100nF 16V
C0661	2311049C05	CP 47uF 10% 16V
C0662	2113741F49	10nF 50V
C0663	2113743E20	100nF 16V
C0671	2113743E20	100nF 16V
C0681	2113743E20	100nF 16V
D0101	4880236E05	CHIP SCHOTTKY
D0151	4813833C02	DUAL SOT MMBD6100
D0179	4813833C02	DUAL SOT MMBD6100
D0301	4802245J47	SCHOTTKY BARRIER (RB471E) Voice storage only
D0621	4813833C02	DUAL SOT MMBD6100
D0651	4813833C02	DUAL SOT MMBD6100
D0660	4813833C02	DUAL SOT MMBD6100
D0661	4813833C02	DUAL SOT MMBD6100
E0271	2484657R01	Ferrite Bead
E0272	2484657R01	Ferrite Bead
E0631	2484657R01	Ferrite Bead
F0401	6580542Z01	3A 24V
J0401	0902636Y02	CONN FLEX 12 PIN
J0451	0902636Y01	CONN FLEX SIDE ENTRY
J0501	0986105B01	CONN SMD 20 PIN
J0551	0905505Y04	CONN ZIF HORIZONTAL
J0552	0905505Y03	CONN ZIF 18PIN
J0601	0986165B01	DC PWR CONN
Q0110	4880048M01	NPN DIG 47k/47k
Q0151	4880048M01	NPN DIG 47k/47k
Q0171	4880048M01	NPN DIG 47k/47k
Q0173	4880052M01	NPN DRLNGTN MXTA
Q0177	4880048M01	NPN DIG 47k/47k
Q0181	4880048M01	NPN DIG 47k/47k
Q0183	4880048M01	NPN DIG 47k/47k
Q0185	4880048M01	NPN DIG 47k/47k
Q0271	4813824A10	NPN 40V .2A
Q0641	4880048M01	NPN DIG 47k/47k
Q0661	4805921T02	DUAL ROHM FMC2 RH
Q0662	4813824A10	NPN 40V .2A B=50-150
Q0663	4880048M01	NPN DIG 47k/47k
Q0681	4880052M01	NPN DRLNGTN MXTA
R0101	0662057A73	10k 1/16W 5%
R0102	0662057A65	4700 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R0104	0662057A73	10k 1/16W 5%
R0105	0662057A97	100k 1/16W
R0106	0662057B47	0 1/16W Voice storage only
R0108	0662057A57	2200 1/16W 5%
R0111	0662057B47	0 1/16W 0306
R0113	0662057A73	10k 1/16W 5%
R0114	0662057A73	10k 1/16W 5%
R0115	0662057A73	10k 1/16W 5%
R0117	0662057A63	3900 1/16W 5%
R0121	0662057A97	100k 1/16W
R0131	0662057B46	10.0 MEG OHMS 5%
R0132	0662057B10	330k 1/16W 5%
R0151	0662057A82	24k 1/16W 5%
R0152	0662057A82	24k 1/16W 5%
R0170	0662057A73	10k 1/16W 5%
R0171	0662057A65	4700 1/16W 5%
R0172	0662057A73	10k 1/16W 5%
R0173	0662057A65	4700 1/16W 5%
R0174	0662057A73	10k 1/16W 5%
R0175	0662057A73	10k 1/16W 5%
R0176	0662057A84	30k 1/16W 5%
R0177	0662057A65	4700 1/16W 5%
R0178	0662057A89	47k 1/16W 5%
R0179	0662057A89	47k 1/16W 5%
R0181	0662057A65	4700 1/16W 5%
R0182	0662057A89	47k 1/16W 5%
R0183	0662057A65	4700 1/16W 5%
R0184	0662057A89	47k 1/16W 5%
R0185	0662057A65	4700 1/16W 5%
R0186	0662057A89	47k 1/16W 5%
R0201	0662057A25	100 1/16W 5%
R0202	0662057A43	560 1/16W 5%
R0203	0662057A25	100 1/16W 5%
R0204	0662057A43	560 1/16W 5%
R0205	0662057A73	10k 1/16W 5%
R0206	0662057A73	10k 1/16W 5%
R0207	0662057A57	2200 1/16W 5%
R0208	0662057A57	2200 1/16W 5%
R0211	0660076E70	FILM 7500
R0212	0660076E70	FILM 7500
R0221	0662057A82	24k 1/16W 5%
R0222	0662057A82	24k 1/16W 5%
R0223	0662057A84	30k 1/16W 5%
R0224	0662057A71	8200 1/16W 5%
R0228	0662057B47	0 1/16W
R0229	0662057A01	10 1/16W 5%
R0241	0662057A89	47k 1/16W 5%
R0242	0662057B47	0 1/16W
R0251	0662057A89	47k 1/16W 5%
R0252	0662057A91	56K 1/16W 5%
R0253	0662057A97	100k 1/16W
R0254	0662057A73	10k 1/16W 5% (CNTRL T7 only)
R0255	0662057A73	10k 1/16W 5% (CNTRL T7 only)
R0256	0662057A97	100k 1/16W (CNTRL T7 only)
R0257	0662057A57	2200 1/16W 5% (CNTRL T7 only)
R0261	0662057A73	10k 1/16W 5%
R0262	0662057A97	100k 1/16W
R0265	0662057A82	24k 1/16W 5%
R0267	0662057A89	47k 1/16W 5%
R0268	0662057A73	10k 1/16W 5%
R0269	0662057A41	470 1/16W 5%
R0273	0662057A82	24k 1/16W 5%
R0275	0662057A73	10k 1/16W 5%
R0276	0662057A77	15k 1/16W 5%
R0323	0662057A79	18k 1/16W 5% Voice storage only
R0324	0662057A79	18k 1/16W 5% Voice storage only
R0331	0662057A73	10k 1/16W 5% Voice storage only
R0332	0662057A73	10k 1/16W 5% Voice storage only
R0333	0662057A73	10k 1/16W 5% Voice storage only
R0335	0662057B02	150k 1/16W Voice storage only
R0341	0662057A73	10k 1/16W 5% Voice storage only
R0342	0662057A55	1800 1/16W 5% Voice storage only
R0343	0662057B47	0 1/16W Voice storage only
R0344	0662057A91	56K 1/16W 5% Voice storage only
R0345	0662057A66	5100 1/16W 5% Voice storage only
R0346	0662057A89	47k 1/16W 5% Voice storage only
R0347	0662057A89	47k 1/16W 5% Voice storage only
R0401	0662057A33	220 1/16W
R0407	0662057M26	10 5% 20X40
R0408	0662057A25	100 1/16W 5%
R0409	0662057M26	10 5% 20X40
R0412	0662057B47	0 1/16W
R0441	0662057B47	0 1/16W
R0442 Used in	0662057A49	1k 1/16W 5% CNTRL T7 only
R0467	0662057M26	10 5% 20X40
R0468	0662057M26	10 5% 20X40 (CNTRL T6)
R0468	0662057A97	100k 1/16W (CNTRL T7)
R0481	0662057B47	0 1/16W
R0482	0662057B47	0 1/16W
R0510	0662057A65	4700 1/16W 5%
R0511	0662057A97	100k 1/16W
R0512	0662057A77	15k 1/16W 5%
R0525	0662057A97	100k 1/16W
R0529	0662057A89	47k 1/16W 5%
R0530	0662057B47	0 1/16W
R0531	0662057A43	560 1/16W 5%
R0533	0662057B47	0 1/16W
R0535	0662057A49	1k 1/16W 5%
R0537	0662057A33	220 1/16W 5%
R0538	0662057A33	220 1/16W 5%
R0539	0662057A65	4700 1/16W 5%
R0541	0662057A83	27k 1/16W 5%
R0543	0662057A97	100k 1/16W (CNTRL T7 only)
R0591	0662057A82	24k 1/16W 5%
R0592	0662057A01	10 1/16W 5%
R0593	0662057A97	100k 1/16W (CNTRL T7 only)
R0611	0662057A91	56K 1/16W
R0612	0662057A65	4700 1/16W
R0621	0662057A82	24k 1/16W
R0641	0662057A73	10k 1/16W
R0642	0660076E70	FILM 7500
R0643	0660076E51	FILM 1200
R0651	0662057A01	10 1/16W 5%
R0652	0662057A01	10 1/16W 5%
R0661	0662057A49	1k 1/16W 5%
R0662	0662057B02	150k 1/16W
R0671	0662057A84	30k 1/16W 5%
R0672	0662057A73	10k 1/16W 5%
R0681	0662057A79	18k 1/16W 5%
R0682	0662057A93	68k 1/16W 5%
U0101	5102226J56	MICRO PROCESSOR MC68HC1 1FLO
* U0111	5102463J64	EEPROM X25128-2.7 SO8
* U0121	5186137B01	512KX8 FLASH ROM (AT49BV020)
U0122	5185963A21	32K x 8 SRAM
U0141	5113805A30	10F8 DCDR/REMUX 74HC138
U0211	5183222M49	QUAD OPAMP __3403
U0221	5185130C53	ASFICCMP 0.5MM TQFP
U0251	5113806A20	MUX/DEMUX,TRIPLE 2-CH
U0271	5109699X01	AUDIO PA TDA1519C
U0301	5109152M01	EEPROM ANALOG ISD33120EI Voice storage only
U0331	5186204B01	BuFFER/DRIVER 74AHCT1G125 Voice storage only
U0341	5180932W01	LINEAR IC OP AMP Voice storage only
U0342	5105750U28	SNGL ANALOG SWITCH Voice storage only
U0351	5102463J40	REGULATOR, 3.3V Voice storage only
U0611	5183308X01	ADJ VLTG REG LM2941 TO263
U0641	5183308X01	ADJ VLTG REG LM2941 TO263
U0651	5113816A07	REG 5V POS 500MA MC78M05
U0652	5113815A02	MC33064
VR0151	4813830A15	5.6V 5% 225mW
VR0501	4805656W09	ZENER QUAD MMQA20VT1
VR0503	4805656W09	ZENER QUAD MMQA20VT1
VR0504	4813830A40	SOC23 AUTO SDN
VR0505	4805656W09	ZENER QUAD MMQA20VT1
VR0509	4813830A40	SOC23 AUTO SDN
VR0510	4813830A40	SOC23 AUTO SDN
VR0537	4813830A15	5.6V 5% 225mW
VR0541	4813830A27	14V 5% 225MW
VR0601	4813832C77	TRANS SUP. 24V HIGH POWER
VR0621	4813830A15	5.6V 5% 225mW
Y0131	4880113R19	CRYSTAL 38.4KHz

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Controller T9 Parts List (8471224L01)

Circuit Ref	Motorola Part No.	Description
C0101	2113944C45	CAP 100 PF
C0107	2113945L25	CAP 1000 PF
C0112	2113945C31	CAP 0.1 UF
C0121	2113945C31	CAP 0.1 UF
C0122	2113945C31	CAP 0.1 UF
C0131	2113944C34	CAP 22 PF
C0132	2113944C34	CAP 22 PF
C0141	2113945C31	CAP 0.1 UF
C0151	2113945L49	CAP 10000 PF
C0201	2313960D07	CAP 10 UF
C0202	2313960D07	CAP 10 UF
C0204	2113945C31	CAP 0.1 UF
C0212	2313960D07	CAP 10 UF
C0221	2113945C31	CAP 0.1 UF
C0222	2113945C31	CAP 0.1 UF
C0223	0613952G67	0 Ohm (SUB on LS+ Models Only)
C0224	2113944C45	CAP 100 PF
C0225	2113945C31	CAP 0.1 UF
C0226	2113945C31	CAP 0.1 UF
C0228	2313960B30	CAP 4.7 UF
C0231	2113955D31	CAP 1 UF
C0232	2113945C31	CAP 0.1 UF
C0234	2113945C31	CAP 0.1 UF
C0235	2113945C04	CAP 0.022 UF
C0236	2113945C25	CAP 0.033 UF
C0241	2113945C31	CAP 0.1 UF
C0243	2113944C45	CAP 100 PF
C0244	2113945C31	CAP 0.1 UF
C0245	2113945C31	CAP 0.1 UF
C0246	2113945L49	CAP 10000 PF
C0251	2113945C31	CAP 0.1 UF
C0252	2313960B01	CAP 1 UF
C0254	2113945C31	CAP 0.1 UF
C0255	2113945C31	CAP 0.1 UF
C0256	2113944C45	CAP 100 PF
C0261	2113945C31	CAP 0.1 UF
C0262	2113944C43	CAP 82 PF
C0265	2113945C31	CAP 0.1 UF
C0267	2113945L49	CAP 10000 PF
C0271	2113945L49	CAP 10000 PF
C0272	2113945C31	CAP 0.1 UF
C0273	2113945L37	CAP 3300 PF
C0275	2313960F30	CAP 47 UF
C0276	2113945L25	CAP 1000 PF
C0277	2113945L25	CAP 1000 PF
C0301	2313960B01	CAP 1 UF
C0302	2113945C31	CAP 0.1 UF
C0303	2113944C45	CAP 100 PF
C0304	2113945C31	CAP 0.1 UF
C0305	2113945C31	CAP 0.1 UF
C0324	2113945C31	CAP 0.1 UF
C0331	2113945C31	CAP 0.1 UF
C0341	2313960B01	CAP 1 UF
C0342	2113945C31	CAP 0.1 UF
C0343	2113945C31	CAP 0.1 UF
C0344	2113945C31	CAP 0.1 UF
C0351	2113945C31	CAP 0.1 UF
C0352	2113945C04	CAP 0.022 UF
C0353	2313960F04	CAP 33 UF
C0354	2113945C31	CAP 0.1 UF
C0421	2113944A38	CAP 82 PF
C0422	2113945L17	CAP 470 PF
C0423	2113945L17	CAP 470 PF
C0426	2113945A05	CAP 470 PF
C0427	2113945A05	CAP 470 PF
C0428	2113944A38	CAP 82 PF
C0429	2113945A05	CAP 470 PF
C0430	2113945L17	CAP 470 PF
C0431	2113945L17	CAP 470 PF
C0441	2113945A05	CAP 470 PF
C0442	2113945A05	CAP 470 PF
C0445	2113945A05	CAP 470 PF
C0446	2113945A05	CAP 470 PF
C0447	2113945A05	CAP 470 PF
C0448	2113945A05	CAP 470 PF
C0449	2113945A05	CAP 470 PF
C0470	2113945A05	CAP 470 PF
C0471	2113944A38	CAP 82 PF
C0472	2113944A38	CAP 82 PF
C0473	2113944A38	CAP 82 PF
C0474	2113945A05	CAP 470 PF
C0476	2113945A05	CAP 470 PF
C0477	2113945A05	CAP 470 PF
C0478	2113945A05	CAP 470 PF
C0482	2113945A05	CAP 470 PF
C0483	2113945A05	CAP 470 PF
C0484	2113945L17	CAP 470 PF
C0485	2113945A05	CAP 470 PF
C0486	2113945A05	CAP 470 PF
C0487	2113945A05	CAP 470 PF
C0488	2113945A05	CAP 470 PF
C0490	2113945A05	CAP 470 PF
C0491	2113945A05	CAP 470 PF
C0492	2113945A05	CAP 470 PF
C0493	2113945A05	CAP 470 PF
C0494	2113945A05	CAP 470 PF
C0495	2113945A05	CAP 470 PF
C0496	2113945A05	CAP 470 PF
C0497	2113945A05	CAP 470 PF
C0499	2113945A05	CAP 470 PF
C0501	2113945L49	CAP 10000 PF
C0502	2113945L17	CAP 470 PF
C0503	2113945L17	CAP 470 PF
C0504	2113945L17	CAP 470 PF
C0505	2113945L17	CAP 470 PF
C0506	2113945L17	CAP 470 PF
C0508	2113945L17	CAP 470 PF
C0509	2113945L17	CAP 470 PF
C0510	2113945L17	CAP 470 PF
C0511	2113945L17	CAP 470 PF
C0512	2113945L17	CAP 470 PF
C0513	2113945L17	CAP 470 PF
C0514	2113945L17	CAP 470 PF
C0515	2113945L17	CAP 470 PF
C0516	2113945L49	CAP 10000 PF
C0517	2113944A38	CAP 82 PF
C0518	2113945L17	CAP 470 PF
C0541	2313960A55	CAP 0.47 UF
C0542	2313960F30	CAP 47 UF
C0560	2113945A09	CAP 1000 PF
C0591	2113945C31	CAP 0.1 UF
C0592	2113945C31	CAP 0.1 UF
C0593	0613958T74	0 Ohm (SUB on LS+ Models Only)
C0601	2113945L17	CAP 470 PF
C0603	2389289U01	CAP 10 UF
C0611	2314030J28	CAP 22 UF
C0612	2113945C31	CAP 0.1 UF
C0622	2313960F30	CAP 47 UF
C0641	2113945L17	CAP 470 PF
C0644	2313960F04	CAP 33 UF
C0645	2113945C31	CAP 0.1 UF
C0652	2313960F04	CAP 33 UF
C0654	2313960D07	CAP 10 UF
C0655	2113945C31	CAP 0.1 UF
C0661	2314030H05	CAP 47 UF
C0662	2113945L49	CAP 10000 PF
C0663	2113945C31	CAP 0.1 UF
C0671	2113945C31	CAP 0.1 UF
C0681	2113945C31	CAP 0.1 UF
D0101	4813974A05	DIODE MMBD301L
D0151	4813978C02	DIODE DUAL 70V
D0179	4813978C02	DIODE DUAL 70V
D0301	4885317Y01	DIODE SCHOTTKY BARRIER
D0621	4813978C02	DIODE DUAL 70V
D0651	4813978C02	DIODE DUAL 70V
D0660	4813978C02	DIODE DUAL 70V
D0661	4813978C02	DIODE DUAL 70V
E0271	2415954H02	INDUCTOR BEAD
E0272	2415954H02	INDUCTOR BEAD
E0631	2415954H02	INDUCTOR BEAD
F0401	6515076H01	FUSE TR/1608FF
J0401	0916162H02	12 POS FLEX CONNECTOR
J0451	0916162H01	18 POS FLEX CONNECTOR
J0501	0966512A01	20 POS FLEX CONNECTOR
J0551	0915064H03	CONN ZIF HORIZONTAL
J0552	0915064H01	CONN ZIF HORIZONTAL
J0601	0986165B02	DC POWER CONNECTOR
Q0110	4813973A42	TRANSISTOR NPN DIGITAL
Q0151	4813973A42	TRANSISTOR NPN DIGITAL
Q0171	4813973A42	TRANSISTOR NPN DIGITAL
Q0173	4816147H01	TTRANSISTOR NPN MXTA27
Q0177	4813973A42	TRANSISTOR NPN DIGITAL
Q0181	4813973A42	TRANSISTOR NPN DIGITAL
Q0183	4813973A42	TRANSISTOR NPN DIGITAL
Q0185	4813973A42	TRANSISTOR NPN DIGITAL
Q0271	4813973M07	TRANSISTOR MMBT3904
Q0641	4813973A42	TRANSISTOR NPN DIGITAL
Q0661	4816097H01	TRANSISTOR FMC2
Q0662	4813973M07	TRANSISTOR MMBT3904
Q0663	4813973A42	TRANSISTOR NPN DIGITAL
Q0681	4816147H01	TTRANSISTOR NPN MXTA27
R0101	0613952J01	RES 10K Ohm
R0102	0613952H89	RES 4700 Ohm
R0103	0613952H25	RES 10 Ohm
R0104	0613952J01	RES 10K Ohm
R0105	0613952J25	RES 100K Ohm
R0106	0613952G67	RES 0 Ohm
R0108	0613952H81	RES 2200 Ohm
R0111	0613952G67	RES 0 Ohm

Circuit Ref	Motorola Part No.	Description
R0113	0613952J01	RES 10K Ohm
R0114	0613952J01	RES 10K Ohm
R0115	0613952J01	RES 10K Ohm
R0117	0613952H87	RES 3900 Ohm
R0121	0613952J25	RES 100K Ohm
R0131	0613952J73	RES 10M Ohm
R0132	0613952J37	RES 330K Ohm
R0151	0613952J10	RES 24K Ohm
R0152	0613952J10	RES 24K Ohm
R0170	0613952J01	RES 10K Ohm
R0171	0613952H89	RES 4700 Ohm
R0172	0613952J01	RES 10K Ohm
R0173	0613952H89	RES 4700 Ohm
R0174	0613952J01	RES 10K Ohm
R0175	0613952J01	RES 10K Ohm
R0176	0613952J12	RES 30K Ohm
R0177	0613952H89	RES 4700 Ohm
R0178	0613952J17	RES 47K Ohm
R0179	0613952J17	RES 47K Ohm
R0181	0613952H89	RES 4700 Ohm
R0182	0613952J17	RES 47K Ohm
R0183	0613952H89	RES 4700 Ohm
R0184	0613952J17	RES 47K Ohm
R0185	0613952H89	RES 4700 Ohm
R0186	0613952J17	RES 47K Ohm
R0201	0613952H49	RES 100 Ohm
R0202	0613952H67	RES 560 Ohm
R0203	0613952H49	RES 100 Ohm
R0204	0613952H67	RES 560 Ohm
R0205	0613952J01	RES 10K Ohm
R0206	0613952J01	RES 10K Ohm
R0207	0613952H81	RES 2200 Ohm
R0208	0613952H81	RES 2200 Ohm
R0211	0613958D85	RES 7500 Ohm
R0212	0613958D85	RES 7500 Ohm
R0221	0613952J10	RES 24K Ohm
R0222	0613952J10	RES 24K Ohm
R0223	0613952J12	RES 30K Ohm
R0224	0613952H95	RES 8200 Ohm
R0228	0613952G67	RES 0 Ohm
R0229	0613952H25	RES 10 Ohm
R0241	0613952J17	RES 47K Ohm
R0242	0613952G67	RES 0 Ohm
R0251	0613952J17	RES 47K Ohm
R0252	0613952J19	RES 56K Ohm
R0253	0613952J25	RES 100K Ohm
R0254	0613952J01	RES 10K Ohm
R0255	0613952J01	RES 10K Ohm
R0256	0613952J25	RES 100K Ohm

Circuit Ref	Motorola Part No.	Description
R0257	0613952H81	RES 2200 Ohm
R0261	0613952J01	RES 10K Ohm
R0262	0613952J35	RES 270K Ohm
R0265	0613952J10	RES 24K Ohm
R0267	0613952J17	RES 47K Ohm
R0268	0613952J01	RES 10K Ohm
R0269	0613952H65	RES 470 Ohm
R0273	0613952J10	RES 24K Ohm
R0275	0613952J01	RES 10K Ohm
R0276	0613952J05	RES 15K Ohm
R0323	0613952J07	RES 18K Ohm
R0324	0613952J07	RES 18K Ohm
R0331	0613952J01	RES 10K Ohm
R0332	0613952J01	RES 10K Ohm
R0333	0613952J01	RES 10K Ohm
R0335	0613952J29	RES 150K Ohm
R0341	0613952J01	RES 10K Ohm
R0342	0613952H79	RES 1800 Ohm
R0343	0613952G67	RES 0 Ohm
R0344	0613952J19	RES 56K Ohm
R0345	0613952H90	RES 5100 Ohm
R0346	0613952J17	RES 47K Ohm
R0347	0613952J17	RES 47K Ohm
R0401	0613952H57	RES 220 Ohm
R0407	0613952Q25	RES 10 Ohm
R0408	0613952H49	RES 100 Ohm
R0409	0613952Q25	RES 10 Ohm
R0412	0613952G67	RES 0 Ohm
R0441	0613952G67	RES 0 Ohm
R0442	0613952H73	RES 1000 Ohm
R0467	0613952Q25	RES 10 Ohm
R0468	0613952J25	RES 100K Ohm
R0481	0613952G67	RES 0 Ohm
R0482	0613952G67	RES 0 Ohm
R0510	0613952H89	RES 4700 Ohm
R0511	0613952J25	RES 100K Ohm
R0512	0613952J05	RES 15K Ohm
R0525	0613952J25	RES 100K Ohm
R0529	0613952J17	RES 47K Ohm
R0530	0613952J09	RES 22K Ohm
R0531	0613952H67	RES 560 Ohm
R0533	0613952G67	RES 0 Ohm
R0535	0613952H73	RES 1000 Ohm
R0537	0613952H57	RES 220 Ohm
R0538	0613952H57	RES 220 Ohm
R0539	0613952H89	RES 4700 Ohm
R0541	0613952J11	RES 27K Ohm
R0543	0613952J25	RES 100K Ohm
R0555	0613952H49	RES 100 Ohm

Circuit Ref	Motorola Part No.	Description
R0556	0613952H49	RES 100 Ohm
R0591	0613952J10	RES 24K Ohm
R0592	0613952H25	RES 10 Ohm
R0593	0613952J25	RES 100K Ohm
R0611	0613952J19	RES 56K Ohm
R0612	0613952H89	RES 4700 Ohm
R0621	0613952J10	RES 24K Ohm
R0641	0613952J01	RES 10K Ohm
R0642	0613958D85	RES 7500 Ohm
R0643	0613958D09	RES 1200 Ohm
R0651	0613952H25	RES 10 Ohm
R0652	0613952H25	RES 10 Ohm
R0661	0613952H73	RES 1000 Ohm
R0662	0613952J29	RES 150K Ohm
R0671	0613952J12	RES 30K Ohm
R0672	0613952J01	RES 10K Ohm
R0681	0613952J07	RES 18K Ohm
R0682	0613952J21	RES 68K Ohm
U0101	5185143E03	68HC11FLO_PASS5 IC
U0111	5116648H01	128KBIT EEPROM
U0121	5115034H01	FLASH 4MBIT IC
U0122	5116096H01	32K X 8 SRAM 28PIN TSOP
U0141	5114000A14	DCDR/DEMUX 74HC138 IC
U0211	5114016A18	AMP_3403_ IC
U0221	5115062H01	ASFIC_CMP_R1 IC
U0251	5184704M60	CMOS 04M60 ANALOS IC
U0271	5102463J95	AUDIO PA TDA1519C
U0301	5116141H01	IC VOICE STORAGE 2 MIN
U0331	5186204B01	BUFFER/LINE DRIVER
U0341	5114005A01	LM2904DRM OP AMP
U0342	5166544A01	CMOS BILATERAL SW IC
U0351	5115012H01	LP2951CMM-3.3 REGULATOR
U0611	5164015H94	LM2941 REGULATOR
U0641	5164015H94	LM2941 REGULATOR
U0651	5114014A07	MC78M05BDTRK REGULATOR
U0652	5114004A02	SENSING CIRCUIT IC
VR0151	4813977M11	DIODE MMBZ5232B_
VR0501	4813979C11	DIODE QUAD 20V
VR0503	4813979C11	DIODE QUAD 20V
VR0504	4813977M36	DIODE MMBZ5232B_
VR0505	4813979C11	DIODE QUAD 20V
VR0509	4813977M36	DIODE MMBZ5232B_
VR0510	4813977M36	DIODE MMBZ5232B_
VR0537	4813977M11	DIODE MMBZ5232B_
VR0541	4813977M23	DIODE MMBZ5232B_
VR0601	4813979C17	TRANSISTOR HIGH POWER

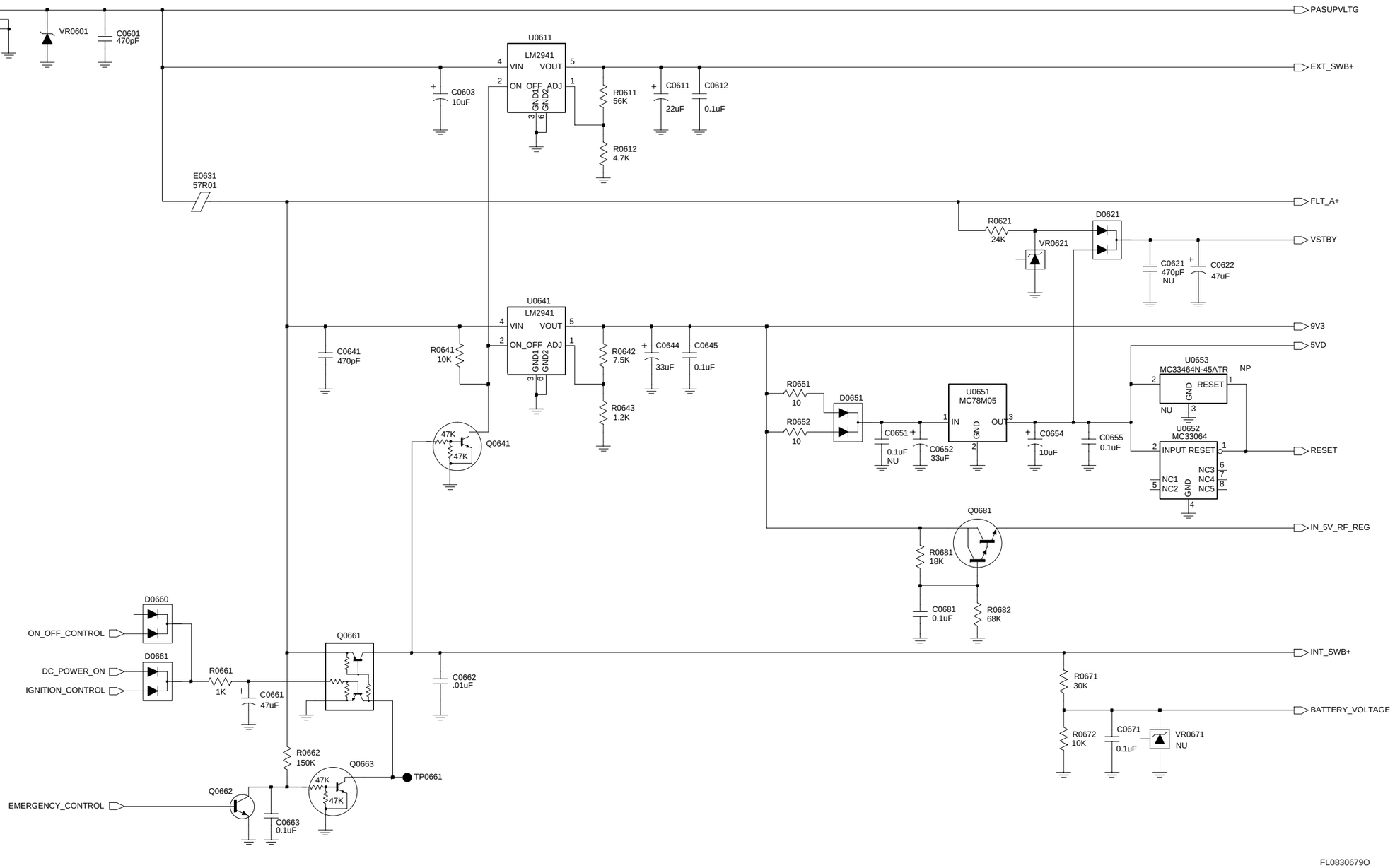
Circuit Ref	Motorola Part No.	Description
VR0621	4813977M11	DIODE MMBZ5232B_
Y0131	4816169H01	CRYSTAL 38.4KHZ

* Motorola Depot Servicing only

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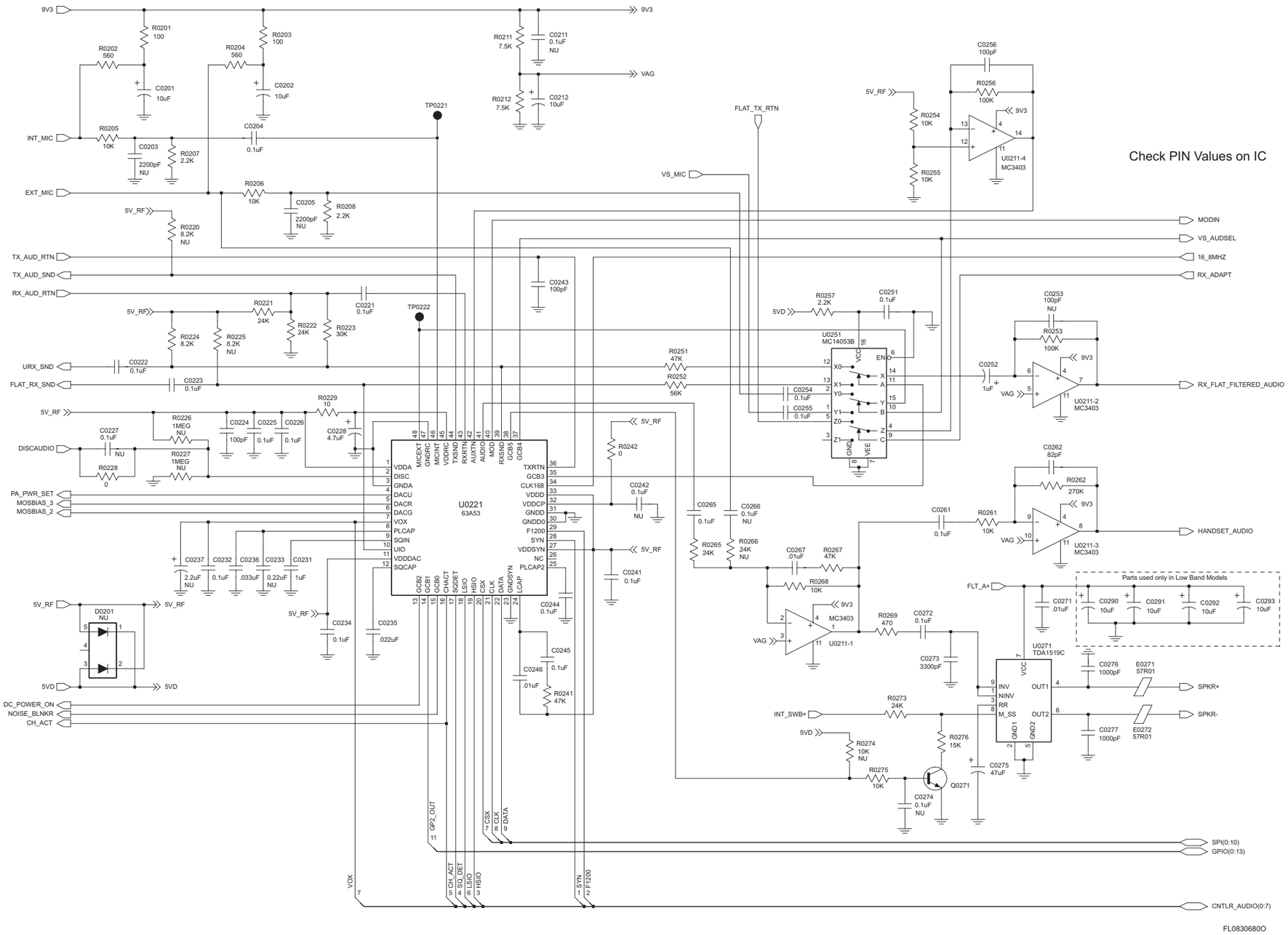
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5.0 Controller T11 Schematics and Parts Lists



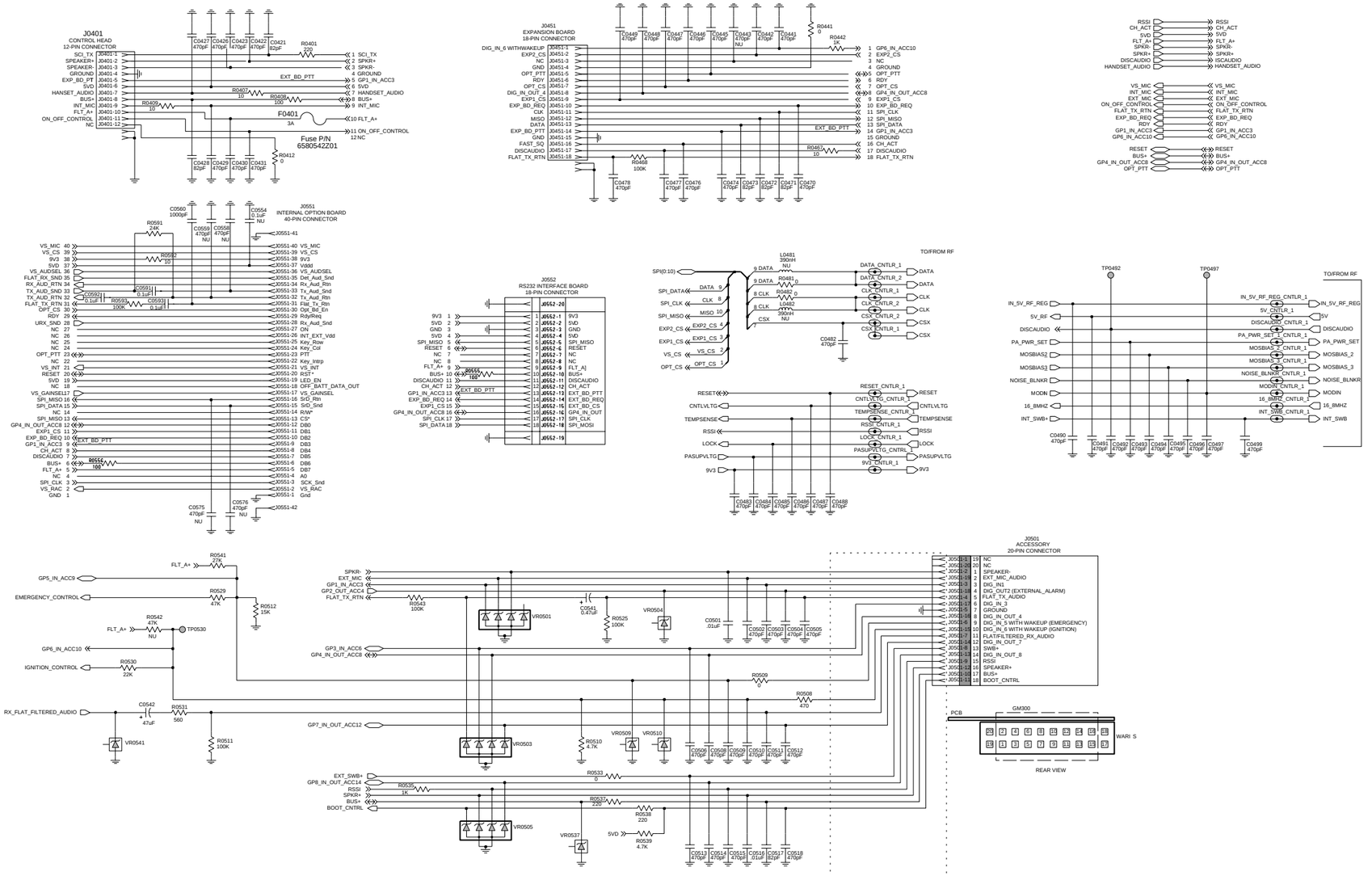
Controller T11 Schematic Diagram - Supply Voltage

6881091C63-C



Controller T11 Schematic Diagram - Audio

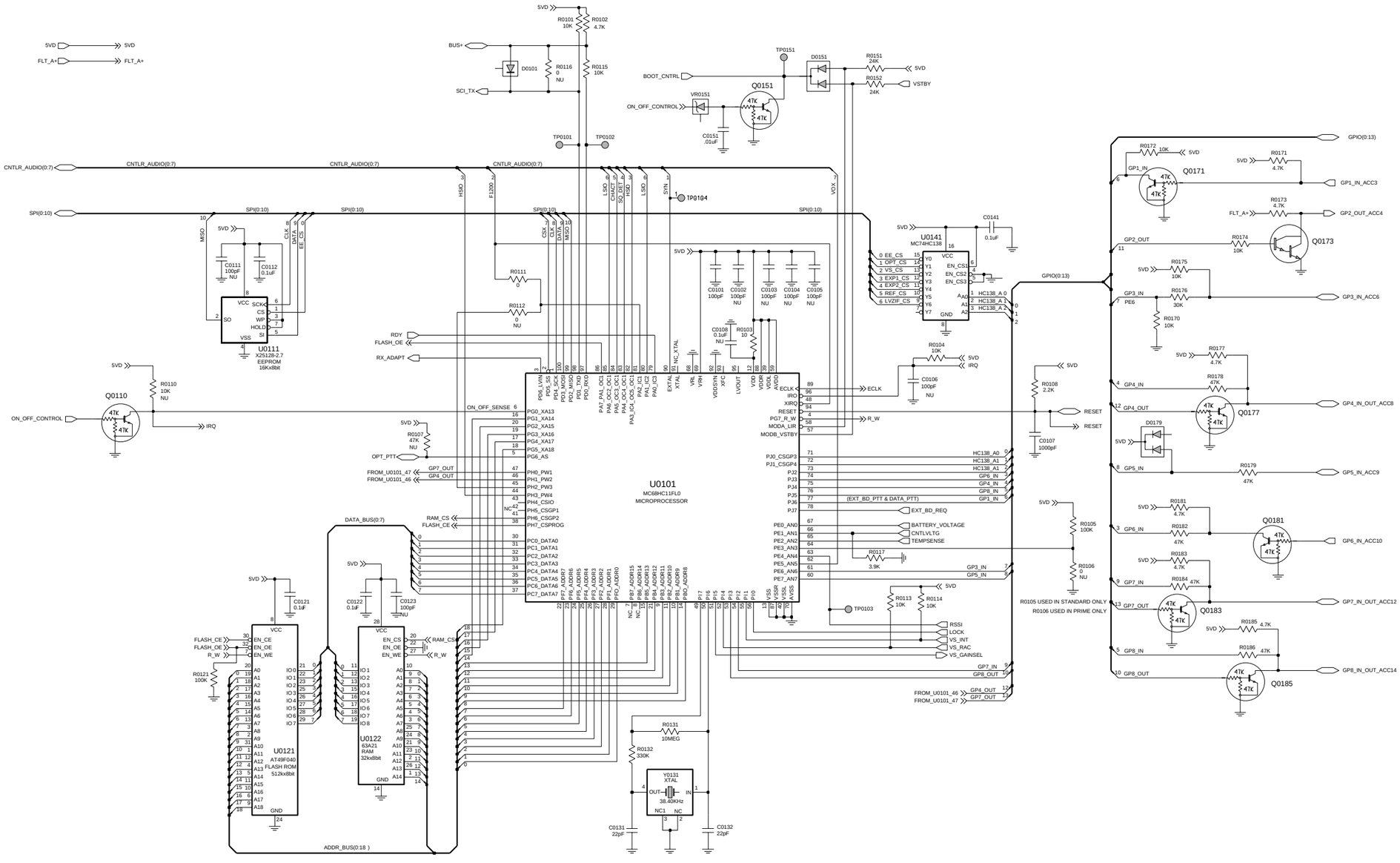
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Controller T11 Schematic Diagram - I/O

6881091C63-C



ZWG0131049-O

Controller T11 Schematic Diagram - Microprocessor

6881091C63-C

Controller T11 Parts List

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	CAP, 100pF
C0107	2113741F25	CAP, 1000pF
C0112	2113743E20	CAP, 0.1uF
C0121	2113743E20	CAP, 0.1uF
C0122	2113743E20	CAP, 0.1uF
C0131	2113740F35	CAP, 22pF
C0132	2113740F35	CAP, 22pF
C0141	2113743E20	CAP, 0.1uF
C0151	2113741F49	CAP, .01uF
C0201	2311049A57	CAP, 10uF
C0202	2311049A57	CAP, 10uF
C0204	2113743E20	CAP, 0.1uF
C0212	2311049A57	CAP, 10uF
C0221	2113743E20	CAP, 0.1uF
C0222	2113743E20	CAP, 0.1uF
C0223	2113743E20	CAP, 0.1uF
C0224	2113740F51	CAP, 100pF
C0225	2113743E20	CAP, 0.1uF
C0226	2113743E20	CAP, 0.1uF
C0228	2311049A56	CAP, 4.7uF
C0231	2113743B29	CAP, 1uF
C0232	2113743E20	CAP, 0.1uF
C0234	2113743E20	CAP, 0.1uF
C0235	2113743E07	CAP, .022uF
C0236	2113743E10	CAP, .033uF
C0241	2113743E20	CAP, 0.1uF
C0243	2113740F51	CAP, 100pF
C0244	2113743E20	CAP, 0.1uF
C0245	2113743E20	CAP, 0.1uF
C0246	2113741F49	CAP, .01uF
C0251	2113743E20	CAP, 0.1uF
C0252	2311049A07	CAP, 1uF
C0254	2113743E20	CAP, 0.1uF
C0255	2113743E20	CAP, 0.1uF
C0256	2113740F51	CAP, 100pF
C0261	2113743E20	CAP, 0.1uF
C0262	2113740F49	CAP, 82pF
C0265	2113743E20	CAP, 0.1uF
C0267	2113741F49	CAP, .01uF
C0271	2113741F49	CAP, .01uF
C0272	2113743E20	CAP, 0.1uF
C0273	2113741F37	CAP, 3300pF
C0275	2311049A99	CAP, 47uF
C0276	2113741F25	CAP, 1000pF
C0277	2113741F25	CAP, 1000pF
C0290	2311049C01	CAP, 10uF (only Low Band)
C0291	2311049C01	CAP, 10uF (only Low Band)
C0292	2311049C01	CAP, 10uF (only Low Band)
C0293	2311049C01	CAP, 10uF (only Low Band)
C0421	2113743N48	CAP, 82pF
C0422	2113741F17	CAP, 470pF
C0423	2113741F17	CAP, 470pF
C0426	2113743L09	CAP, 470pF
C0427	2113743L09	CAP, 470pF
C0428	2113743N48	CAP, 82pF
C0429	2113743L09	CAP, 470pF
C0430	2113741F17	CAP, 470pF
C0431	2113741F17	CAP, 470pF
C0441	2113743L09	CAP, 470pF
C0442	2113743L09	CAP, 470pF
C0445	2113743L09	CAP, 470pF
C0446	2113743L09	CAP, 470pF
C0447	2113743L09	CAP, 470pF
C0448	2113743L09	CAP, 470pF
C0449	2113743L09	CAP, 470pF
C0470	2113743L09	CAP, 470pF
C0471	2113743N48	CAP, 82pF
C0472	2113743N48	CAP, 82pF
C0473	2113743N48	CAP, 82pF
C0474	2113743L09	CAP, 470pF
C0476	2113743L09	CAP, 470pF
C0477	2113743L09	CAP, 470pF
C0478	2113743L09	CAP, 470pF
C0482	2113743L09	CAP, 470pF
C0483	2113743L09	CAP, 470pF
C0484	2113741F17	CAP, 470pF
C0485	2113743L09	CAP, 470pF
C0486	2113743L09	CAP, 470pF
C0487	2113743L09	CAP, 470pF
C0488	2113743L09	CAP, 470pF
C0490	2113743L09	CAP, 470pF
C0491	2113743L09	CAP, 470pF
C0492	2113743L09	CAP, 470pF
C0493	2113743L09	CAP, 470pF
C0494	2113743L09	CAP, 470pF
C0495	2113743L09	CAP, 470pF
C0496	2113743L09	CAP, 470pF
C0497	2113743L09	CAP, 470pF
C0499	2113743L09	CAP, 470pF
C0501	2113741F49	CAP, .01uF
C0502	2113741F17	CAP, 470pF
C0503	2113741F17	CAP, 470pF
C0504	2113741F17	CAP, 470pF
C0505	2113741F17	CAP, 470pF
C0506	2113741F17	CAP, 470pF
C0508	2113741F17	CAP, 470pF
C0509	2113741F17	CAP, 470pF
C0510	2113741F17	CAP, 470pF
C0511	2113741F17	CAP, 470pF
C0512	2113741F17	CAP, 470pF
C0513	2113741F17	CAP, 470pF
C0514	2113741F17	CAP, 470pF
C0515	2113741F17	CAP, 470pF
C0516	2113741F49	CAP, .01uF
C0517	2113743N48	CAP, 82pF
C0518	2113741F17	CAP, 470pF
C0541	2311049A05	CAP, 0.47uF
C0542	2311049A99	CAP, 47uF
C0560	2113741F25	CAP, 1000pF
C0591	2113743E20	CAP, 0.1uF
C0592	2113743E20	CAP, 0.1uF
C0593	2113741B69	CAP, 0.1uF
C0601	2113741F17	CAP, 470pF
C0603	2380090M24	CAP, 10uF
C0611	2311049C06	CAP, 22uF
C0612	2113743E20	CAP, 0.1uF
C0622	2311049A99	CAP, 47uF
C0641	2113741F17	CAP, 470pF
C0644	2311049A97	CAP, 33uF
C0645	2113743E20	CAP, 0.1uF
C0652	2311049A97	CAP, 33uF
C0654	2311049A57	CAP, 10uF
C0655	2113743E20	CAP, 0.1uF
C0661	2311049C05	CAP, 47uF
C0662	2113741F49	CAP, .01uF
C0663	2113743E20	CAP, 0.1uF
C0671	2113743E20	CAP, 0.1uF
C0681	2113743E20	CAP, 0.1uF
D0101	4813825A05	MMBD301
D0151	4813833C02	MMBD6100
D0179	4813833C02	MMBD6100
D0621	4813833C02	MMBD6100
D0651	4813833C02	MMBD6100
D0660	4813833C02	MMBD6100
D0661	4813833C02	MMBD6100
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
F0401	6580542Z01	FUSE
J0401	0902636Y02	CONN, 12-PIN, CONTROL HEAD
J0451	0902636Y01	CONN, 18-PIN, EXPANSION BOARD
J0501	0986105B01	CONN, 20-PIN, ACCESSORY
J0551	0905505Y04	CONN, 40-PIN, INTERNAL OPTION
J0552	0905505Y03	CONN, 18-PIN, RS232
J0601	0986165B01	DC POWER CONNECTOR
Q0110	4880048M01	DTC144EKA
Q0151	4880048M01	DTC144EKA
Q0171	4880048M01	DTC144EKA
Q0173	4880052M01	RXT-A28
Q0177	4880048M01	DTC144EKA
Q0181	4880048M01	DTC144EKA
Q0183	4880048M01	DTC144EKA
Q0185	4880048M01	DTC144EKA
Q0271	4880214G02	MMBT3904
Q0641	4880048M01	DTC144EKA
Q0661	4805921T02	FMC2A
Q0662	4880214G02	MMBT3904
Q0663	4880048M01	DTC144EKA
Q0681	4880052M01	RXT-A28
R0101	0662057A73	RES, 10K
R0102	0662057A65	RES, 4.7K
R0103	0662057A01	RES, 10
R0104	0662057A73	RES, 10K
R0105	0662057A97	RES, 100K
R0108	0662057A57	RES, 2.2K
R0111	0662057B47	RES, 0
R0113	0662057A73	RES, 10K
R0114	0662057A73	RES, 10K
R0115	0662057A73	RES, 10K

Circuit Ref	Motorola Part No.	Description
R0117	0662057A63	RES, 3.9K
R0121	0662057A97	RES, 100K
R0131	0662057B46	RES, 10MEG
R0132	0662057B10	RES, 330K
R0151	0662057A82	RES, 24K
R0152	0662057A82	RES, 24K
R0170	0662057A73	RES, 10K
R0171	0662057A65	RES, 4.7K
R0172	0662057A73	RES, 10K
R0173	0662057A65	RES, 4.7K
R0174	0662057A73	RES, 10K
R0175	0662057A73	RES, 10K
R0176	0662057A84	RES, 30K
R0177	0662057A65	RES, 4.7K
R0178	0662057A89	RES, 47K
R0179	0662057A89	RES, 47K
R0181	0662057A65	RES, 4.7K
R0182	0662057A89	RES, 47K
R0183	0662057A65	RES, 4.7K
R0184	0662057A89	RES, 47K
R0185	0662057A65	RES, 4.7K
R0186	0662057A89	RES, 47K
R0201	0662057A25	RES, 100
R0202	0662057A43	RES, 560
R0203	0662057A25	RES, 100
R0204	0662057A43	RES, 560
R0205	0662057A73	RES, 10K
R0206	0662057A73	RES, 10K
R0207	0662057A57	RES, 2.2K
R0208	0662057A57	RES, 2.2K
R0211	0660076E70	RES, 7.5K
R0212	0660076E70	RES, 7.5K
R0221	0662057A82	RES, 24K
R0222	0662057A82	RES, 24K
R0223	0662057A84	RES, 30K
R0224	0662057A71	RES, 8.2K
R0228	0662057B47	RES, 0
R0229	0662057A01	RES, 10
R0241	0662057A89	RES, 47K
R0242	0662057B47	RES, 0
R0251	0662057A89	RES, 47K
R0252	0662057A91	RES, 56K
R0253	0662057A97	RES, 100K
R0254	0662057A73	RES, 10K

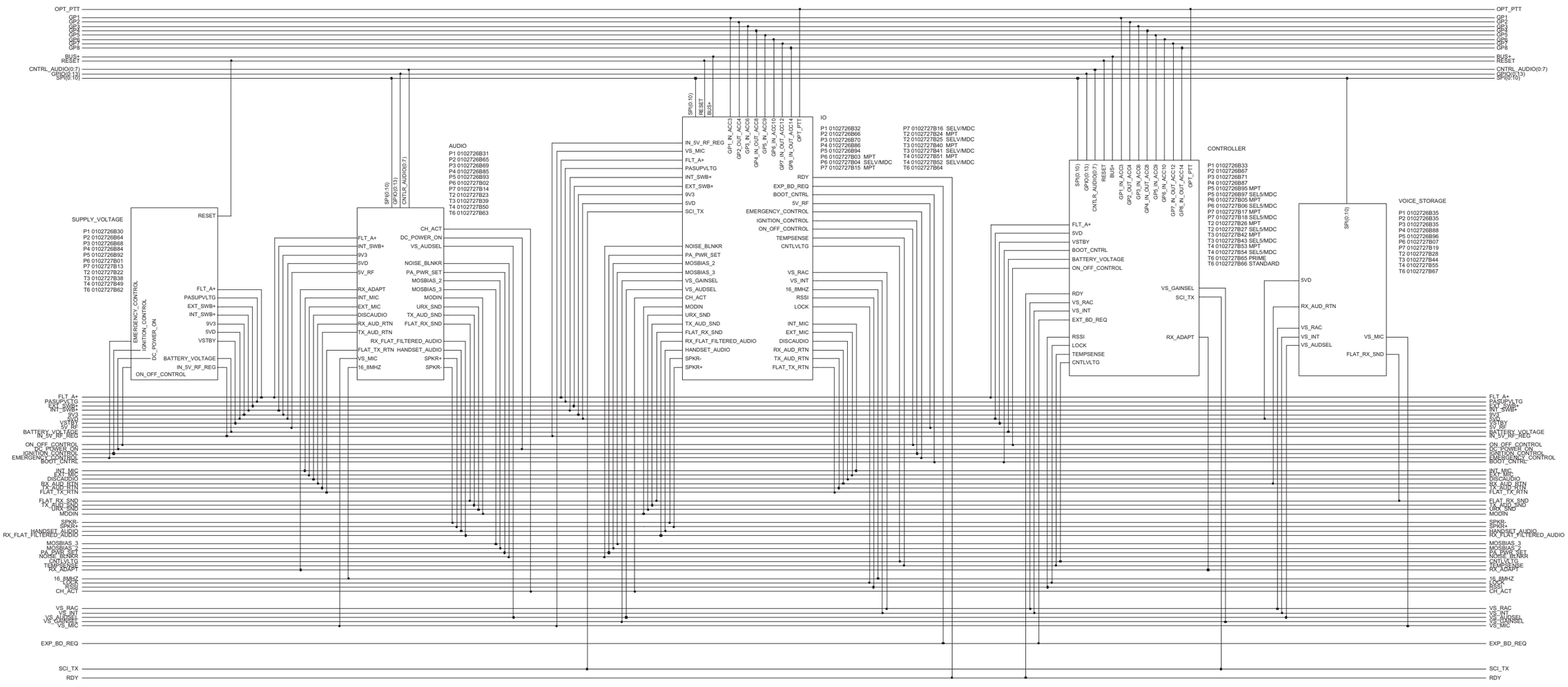
Circuit Ref	Motorola Part No.	Description
R0255	0662057A73	RES, 10K
R0256	0662057A97	RES, 100K
R0257	0662057A57	RES, 2.2K
R0261	0662057A73	RES, 10K
R0262	0662057B08	RES, 270K
R0265	0662057A82	RES, 24K
R0267	0662057A89	RES, 47K
R0268	0662057A73	RES, 10K
R0269	0662057A41	RES, 470
R0273	0662057A82	RES, 24K
R0275	0662057A73	RES, 10K
R0276	0662057A77	RES, 15K
R0401	0662057A33	RES, 220
R0407	0662057M26	RES, 10
R0408	0662057A25	RES, 100
R0409	0662057M26	RES, 10
R0412	0662057B47	RES, 0
R0441	0662057B47	RES, 0
R0442	0662057A49	RES, 1K
R0467	0662057M26	RES, 10
R0468	0662057A97	RES, 100K
R0481	0662057B47	RES, 0
R0482	0662057B47	RES, 0
R0508	0662057A41	RES, 470
R0509	0662057B47	RES, 0
R0510	0662057A65	RES, 4.7K
R0511	0662057A97	RES, 100K
R0512	0662057A77	RES, 15K
R0525	0662057A97	RES, 100K
R0529	0662057A89	RES, 47K
R0530	0662057A81	RES, 22K
R0531	0662057A43	RES, 560
R0533	0662057B47	RES, 0
R0535	0662057A49	RES, 1K
R0537	0662057A33	RES, 220
R0538	0662057A33	RES, 220
R0539	0662057A65	RES, 4.7K
R0541	0662057A83	RES, 27K
R0543	0662057A97	RES, 100K
R0555	0662057A25	RES, 100
R0556	0662057A25	RES, 100
R0591	0662057A82	RES, 24K
R0592	0662057A01	RES, 10
R0593	0662057A97	RES, 100K

Circuit Ref	Motorola Part No.	Description
R0611	0662057A91	RES, 56K
R0612	0662057A65	RES, 4.7K
R0621	0662057A82	RES, 24K
R0641	0662057A73	RES, 10K
R0642	0660076E70	RES, 7.5K
R0643	0660076E51	RES, 1.2K
R0651	0662057A01	RES, 10
R0652	0662057A01	RES, 10
R0661	0662057A49	RES, 1K
R0662	0662057B02	RES, 150K
R0671	0662057A84	RES, 30K
R0672	0662057A73	RES, 10K
R0681	0662057A79	RES, 18K
R0682	0662057A93	RES, 68K
U0101	5102226J56	MC68HC11FL0
U0111	5102463J64	EEPROM
U0121	5186137B01	FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	MC3403
U0221	5185130C53	ASFIC COMPANDER IC
U0251	5184704M60	MUX/DEMUX
U0271	5109699X01	AUDIO PA
U0611	5183308X01	LM2941
U0641	5183308X01	LM2941
U0651	5113816A07	MC78M05
U0652	5113815A02	MC33064
VR0151	4813830A15	MMBZ5232B
VR0501	4805656W09	MMQA20VT1
VR0503	4805656W09	MMQA20VT1
VR0504	4813830A40	MMBZ5257B
VR0505	4805656W09	MMQA20VT1
VR0509	4813830A40	MMBZ5257B
VR0510	4813830A40	MMBZ5257B
VR0537	4813830A15	MMBZ5232B
VR0541	4813830A27	MMBZ5244B
VR0601	4813832C77	TRANSIENT SUPPRESSOR
VR0621	4813830A15	MMBZ5232B
Y0131	4880113R19	CRYSTAL, 38.4 KHZ

* Motorola Depot Servicing only

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

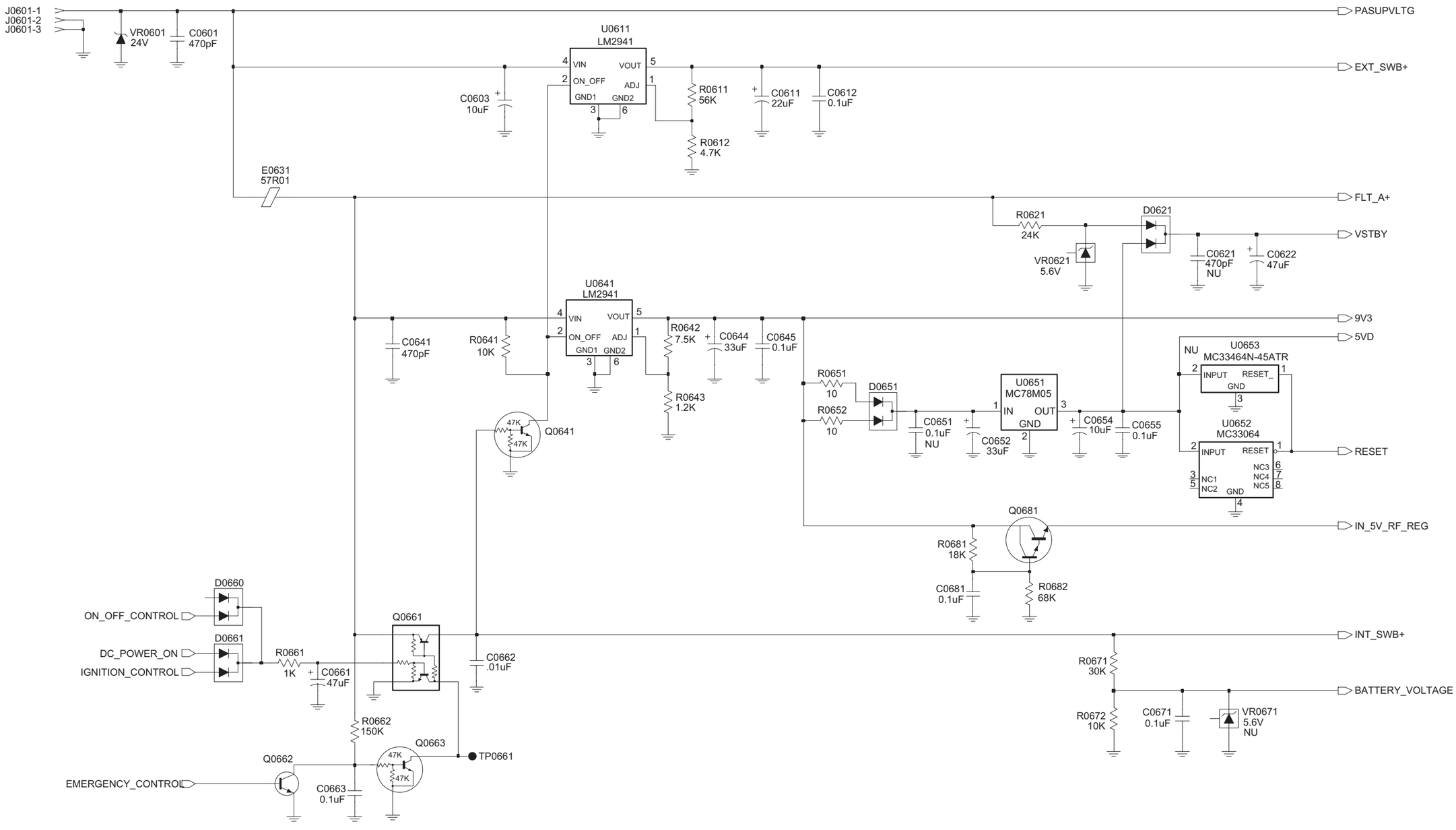
6.0 Controller T12 Schematics and Parts Lists



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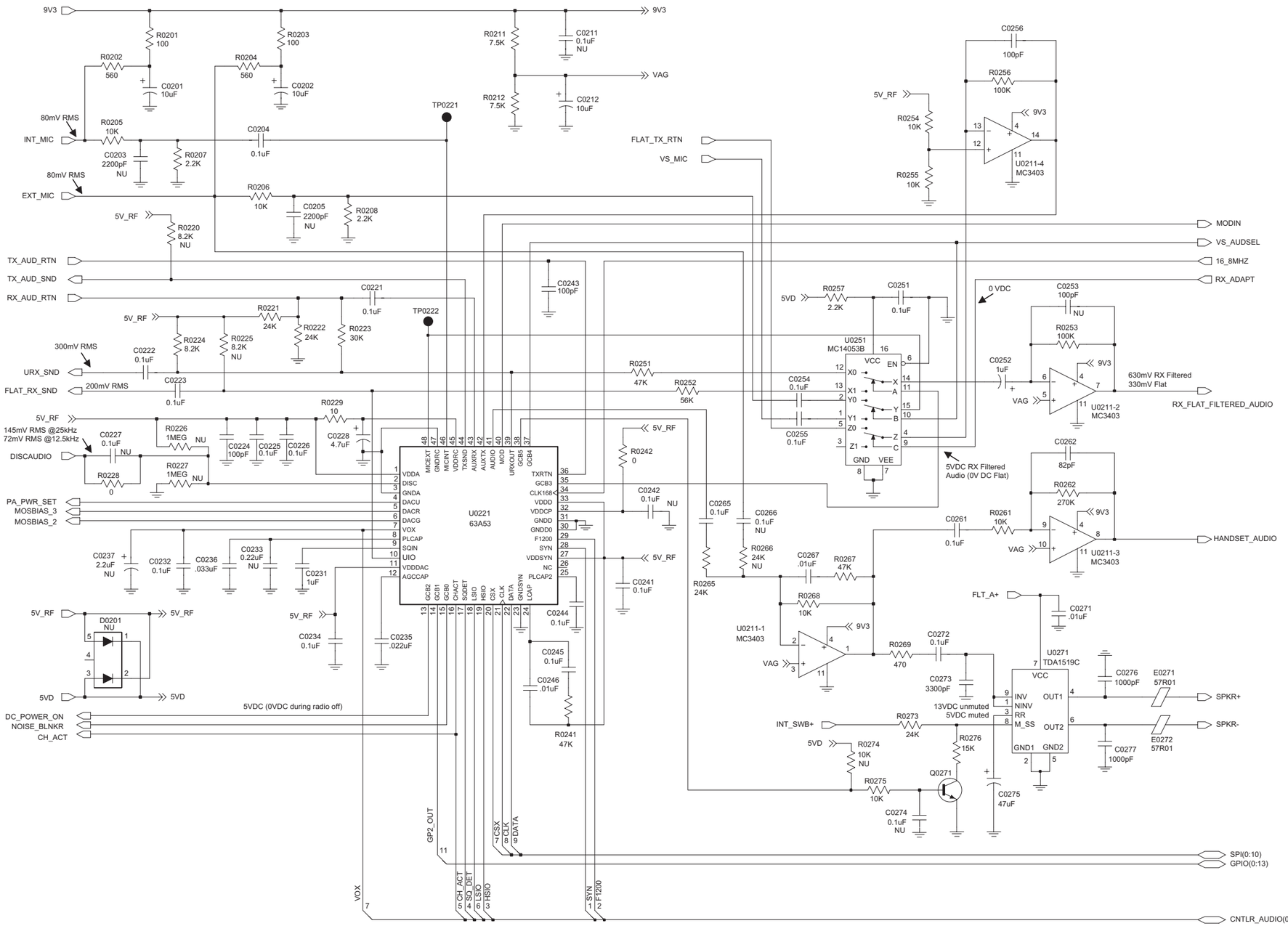
Controller T12 Schematic Diagram - Overall

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Controller T12 Schematic Diagram - Supply Voltage

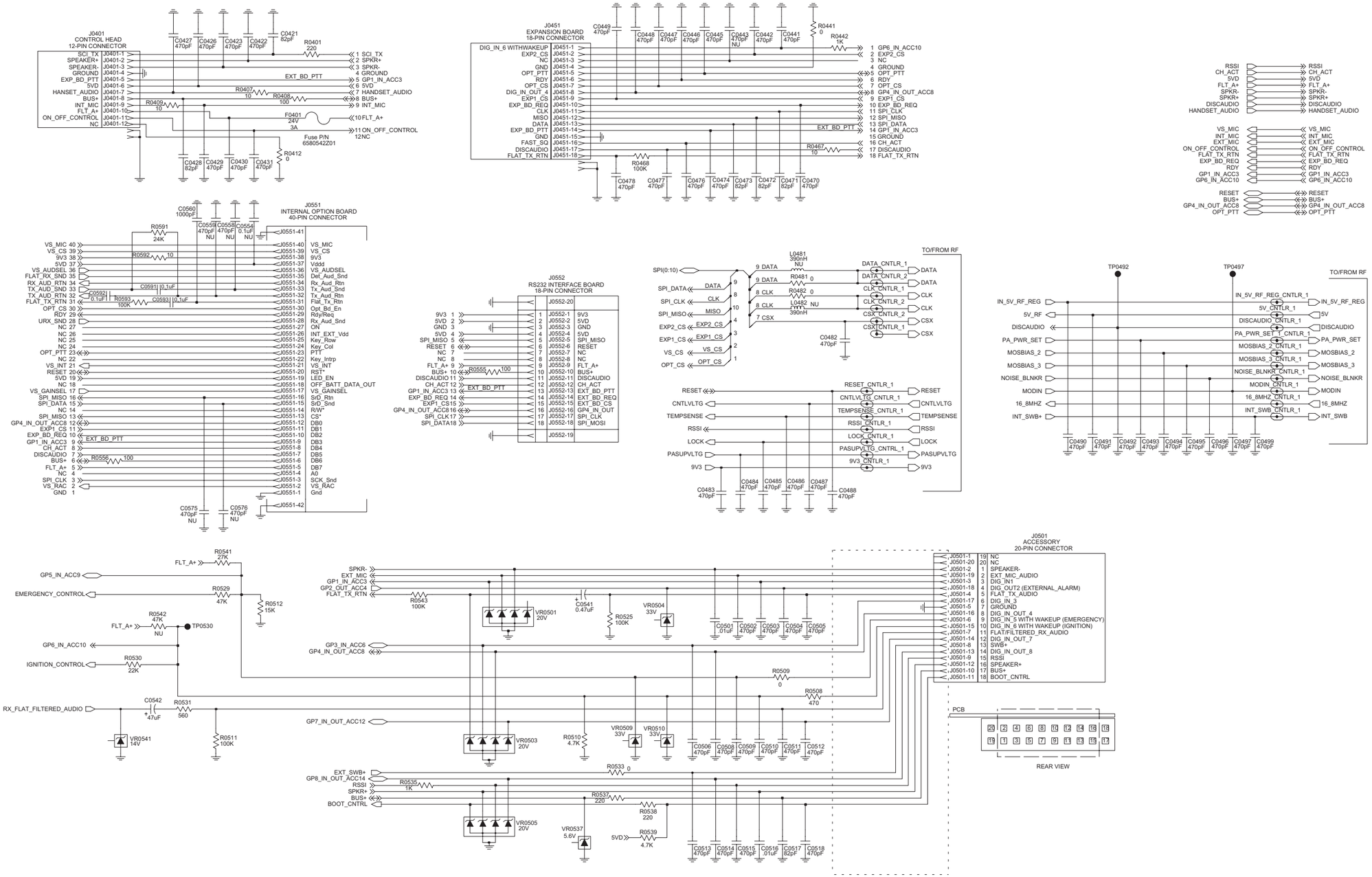
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Controller T12 Schematic Diagram - Audio

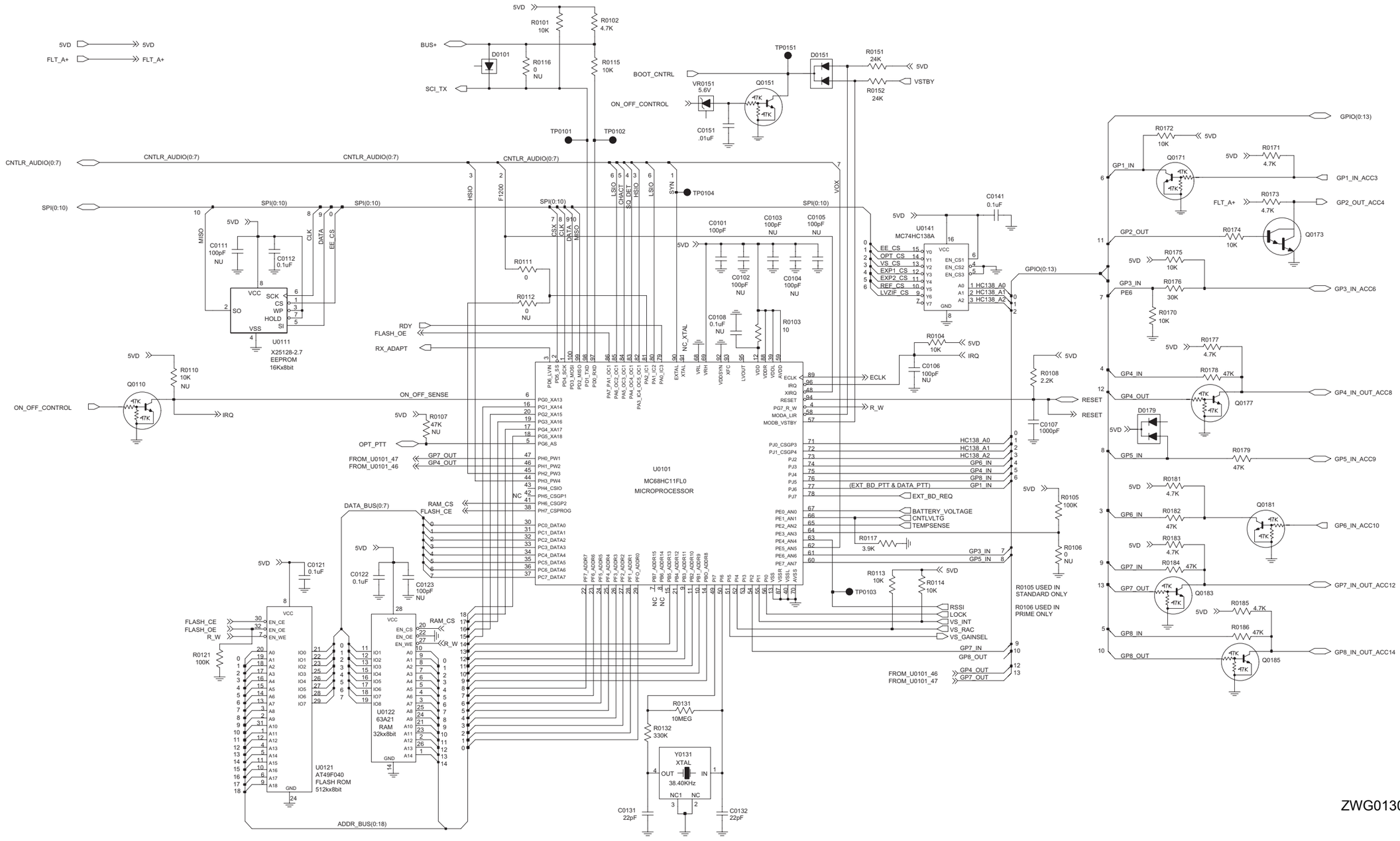
6881091C63-C



Controller T12 Schematic Diagram - I/O

ZWG0131029-O

6881091C63-C



ZWG0130935-O

Controller T12 Schematic Diagram - Microprocessor

6881091C63-C

Controller T12 Parts List

Circuit Ref	Motorola Part No.	Description
C0101	2113944C45	100pF
C0107	2113945L25	1000pF
C0112	2113945C31	0.1uF
C0121	2113945C31	0.1uF
C0122	2113945C31	0.1uF
C0131	2113944C34	22pF
C0132	2113944C34	22pF
C0141	2113945C31	0.1uF
C0151	2113945L49	10000pF
C0201	2313960D07	10uF
C0202	2313960D07	10uF
C0204	2113945C31	0.1uF
C0212	2313960D07	10uF
C0221	2113945C31	0.1uF
C0222	2113945C31	0.1uF
C0223	2113945C31 0613952G67	0.1uF 0 ohm (SUB on LS+ Models Only)
C0224	2113944C45	100pF
C0225	2113945C31	0.1uF
C0226	2113945C31	0.1uF
C0228	2313960B30	4.7uF
C0231	2113955D31	1uF
C0232	2113945C31	0.1uF
C0234	2113945C31	0.1uF
C0235	2113945C04	0.022uF
C0236	2113945C25	0.033uF
C0241	2113945C31	0.1uF
C0243	2113944C45	100pF
C0244	2113945C31	0.1uF
C0245	2113945C31	0.1uF
C0246	2113945L49	10000pF
C0251	2113945C31	0.1uF
C0252	2313960B01	1uF
C0254	2113945C31	0.1uF
C0255	2113945C31	0.1uF
C0256	2113944C45	100pF
C0261	2113945C31	0.1uF
C0262	2113944C43	82pF
C0265	2113945C31	0.1uF
C0267	2113945L49	10000pF
C0271	2113945L49	10000pF
C0272	2113945C31	0.1uF
C0273	2113945L37	3300pF
C0275	2313960F30	47uF
C0276	2113945L25	1000pF
C0277	2113945L25	1000pF
C0421	2113944A38	82pF
C0422	2113945L17	470pF
C0423	2113945L17	470pF
C0426	2113945A05	470pF
C0427	2113945A05	470pF
C0428	2113944A38	82pF
C0429	2113945A05	470pF
C0430	2113945L17	470pF
C0431	2113945L17	470pF
C0441	2113945A05	470pF
C0442	2113945A05	470pF
C0445	2113945A05	470pF
C0446	2113945A05	470pF
C0447	2113945A05	470pF
C0448	2113945A05	470pF
C0449	2113945A05	470pF
C0470	2113945A05	470pF
C0471	2113944A38	82pF
C0472	2113944A38	82pF
C0473	2113944A38	82pF
C0474	2113945A05	470pF
C0476	2113945A05	470pF
C0477	2113945A05	470pF
C0478	2113945A05	470pF
C0482	2113945A05	470pF
C0483	2113945A05	470pF
C0484	2113945L17	470pF
C0485	2113945A05	470pF
C0486	2113945A05	470pF
C0487	2113945A05	470pF
C0488	2113945A05	470pF
C0490	2113945A05	470pF
C0491	2113945A05	470pF
C0492	2113945A05	470pF
C0493	2113945A05	470pF
C0494	2113945A05	470pF
C0495	2113945A05	470pF
C0496	2113945A05	470pF
C0497	2113945A05	470pF
C0499	2113945A05	470pF
C0501	2113945L49	10000pF
C0502	2113945L17	470pF
C0503	2113945L17	470pF
C0504	2113945L17	470pF
C0505	2113945L17	470pF
C0506	2113945L17	470pF
C0508	2113945L17	470pF
C0509	2113945L17	470pF
C0510	2113945L17	470pF
C0511	2113945L17	470pF
C0512	2113945L17	470pF
C0513	2113945L17	470pF
C0514	2113945L17	470pF
C0515	2113945L17	470pF
C0516	2113945L49	10000pF
C0517	2113944A38	82pF
C0518	2113945L17	470pF
C0541	2313960A55	0.47uF
C0542	2313960F30	47uF
C0560	2113945A09	1000pF
C0591	2113945C31	0.1uF
C0592	2113945C31	0.1uF
C0593	2113945H69 0613958T74	0.1uF 0 ohm (SUB on LS+ Models Only)
C0601	2113945L17	470pF
C0603	2389289U01	10uF
C0611	2314030J28	22uF
C0612	2113945C31	0.1uF
C0622	2313960F30	47uF
C0641	2113945L17	470pF
C0644	2375194A03	33uF
C0645	2113945C31	0.1uF
C0652	2313960F04	33uF
C0654	2313960D07	10uF
C0655	2113945C31	0.1uF
C0661	2314030H05	47uF
C0662	2113945L49	10000pF
C0663	2113945C31	0.1uF
C0671	2113945C31	0.1uF
C0681	2113945C31	0.1uF
D0101	4813974A05	DIODE 30V HOT CARRIER
D0151	4813978C02	DIODE DUAL 70V
D0179	4813978C02	DIODE DUAL 70V
D0621	4813978C02	DIODE DUAL 70V
D0651	4813978C02	DIODE DUAL 70V
D0660	4813978C02	DIODE DUAL 70V
D0661	4813978C02	DIODE DUAL 70V
E0271	2415954H02	INDUCTOR BEAD CHIP
E0272	2415954H02	INDUCTOR BEAD CHIP
E0631	2415954H02	INDUCTOR BEAD CHIP
F0401	6515076H01	FUSE 3A
J0401	0916162H02	12 PIN CONNECTOR
J0451	0916162H01	“FLEX CONNECTOR, SIDE””””
J0501	0966512A01	20 PIN CONNECTOR
J0551	0915064H03	40 PIN CONNECTOR
J0552	0915064H01	18 PIN CONNECTOR
J0601	0986165B02	MOBILE DC POWER
Q0110	4813973A42	TSTR NPN
Q0151	4813973A42	TSTR NPN
Q0171	4813973A42	TSTR NPN
Q0173	4816147H01	TSTR NPN
Q0177	4813973A42	TSTR NPN
Q0181	4813973A42	TSTR NPN
Q0183	4813973A42	TSTR NPN
Q0185	4813973A42	TSTR NPN
Q0271	4813973M07	TSTR NPN
Q0641	4813973A42	TSTR NPN
Q0661	4816097H01	XISTOR FMC2 RH
Q0662	4813973M07	TSTR NPN
Q0663	4813973A42	TSTR NPN
Q0681	4816147H01	TSTR NPN
R0101	0613952J01	10K
R0102	0613952H89	4700
R0103	0613952H25	10
R0104	0613952J01	10K
R0105	0613952J25	100K
R0108	0613952H81	2200
R0111	0613952G67	0
R0113	0613952J01	10K
R0114	0613952J01	10K
R0115	0613952J01	10K
R0117	0613952H87	3900
R0121	0613952J25	100K
R0131	0613952J73	10M
R0132	0613952J37	330K
R0151	0613952J10	24K
R0152	0613952J10	24K
R0170	0613952J01	10K
R0171	0613952H89	4700
R0172	0613952J01	10K
R0173	0613952H89	4700
R0174	0613952J01	10K
R0175	0613952J01	10K
R0176	0613952J12	30K
R0177	0613952H89	4700
R0178	0613952J17	47K
R0179	0613952J17	47K
R0181	0613952H89	4700
R0182	0613952J17	47K

Circuit Ref	Motorola Part No.	Description
R0183	0613952H89	4700
R0184	0613952J17	47K
R0185	0613952H89	4700
R0186	0613952J17	47K
R0201	0613952H49	100
R0202	0613952H67	560
R0203	0613952H49	100
R0204	0613952H71	560
R0205	0613952J01	10K
R0206	0613952J01	10K
R0207	0613952H81	2200
R0208	0613952H81	2200
R0211	0613958D85	7500
R0212	0613958D85	7500
R0221	0613952J10	24K
R0222	0613952J10	24K
R0223	0613952J12	30K
R0224	0613952H95	8200
R0228	0613952G67	0
R0229	0613952H25	10
R0241	0613952J17	47K
R0242	0613952G67	0
R0251	0613952J17	47K
R0252	0613952J19	56K
R0253	0613952J25	100K
R0254	0613952J01	10K
R0255	0613952J01	10K
R0256	0613952J25	100K
R0257	0613952H81	2200
R0261	0613952J01	10K
R0262	0613952J35	270K
R0265	0613952J10	24K
R0267	0613952J17	47K
R0268	0613952J01	10K
R0269	0613952H65	470
R0273	0613952J10	24K
R0275	0613952J01	10K
R0276	0613952J05	15K
R0401	0613952H57	220
R0407	0613952Q25	10
R0408	0613952H49	100
R0409	0613952Q25	10
R0412	0613952G67	0
R0441	0613952G67	0
R0442	0613952H73	1000
R0467	0613952Q25	10
R0468	0613952J25	100K

Circuit Ref	Motorola Part No.	Description
R0481	0613952G67	0
R0482	0613952G67	0
R0508	0613952H65	470
R0509	0613952G67	0
R0510	0613952H89	4700
R0511	0613952J25	100K
R0512	0613952J05	15K
R0525	0613952J25	100K
R0529	0613952J17	47K
R0530	0613952J09	22K
R0531	0613952H67	560
R0533	0613952G67	0
R0535	0613952H73	1000
R0537	0613952H57	220
R0538	0613952H57	220
R0539	0613952H89	4700
R0541	0613952J11	27K
R0543	0613952J25	100K
R0555	0613952H49	100
R0556	0613952H49	100
R0591	0613952J10	24K
R0592	0613952H25	10
R0593	0613952J25	100K
R0611	0613952J19	56K
R0612	0613952H89	4700
R0621	0613952J10	24K
R0641	0613952J01	10K
R0642	0613958D85	7500
R0643	0613958D09	1200
R0651	0613952H25	10
R0652	0613952H25	10
R0661	0613952H73	1000
R0662	0613952J29	150K
R0671	0613952J12	30K
R0672	0613952J01	10K
R0681	0613952J07	18K
R0682	0613952J21	68K
U0101	5185143E03	IC MICROPROCESSOR
U0111	5116648H01	128K SERIAL EEPROM
U0121	5115034H01	IC FLASH ROM 4MBIT
U0122	5116096H01	IC 32K X 8 SRAM
U0141	5114000A14	IC DECODER/REMUX
U0211	5114016A18	IC QUAD OP AMP
U0221	5115062H01	IC ASFIC_CMP
U0251	5114002A17	IC-CMOS ANALOG
U0271	5102463J95	AUDIO PA TDA1519C
U0611	5164015H94	IC VOLTAGE RGTR

Circuit Ref	Motorola Part No.	Description
U0641	5164015H94	IC VOLTAGE RGTR
U0651	5114014A07	REG 5V
U0652	5114004A02	IC UNDERVOLTAGE SENSOR
VR0151	4813977M11	TSTR 5.6V
VR0501	4813979C11	DIODE QUAD 20 VOLT
VR0503	4813979C11	DIODE QUAD 20 VOLT
VR0504	4813977M36	ZENER DIODE
VR0505	4813979C11	DIODE QUAD 20 VOLT
VR0509	4813977M36	ZENER DIODE
VR0510	4813977M36	ZENER DIODE
VR0537	4813977M11	TSTR 5.6V
VR0541	4813977M23	DIODE 14V
VR0601	4813979C17	TRANS SUP. 24V HIGH
VR0621	4813977M11	TSTR 5.6V
Y0131	4816169H01	CRYSTAL 38.4KHZ

Notes

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 VHF (136-174 MHz) 1-25W Model Charts

1.1 CDM Series Model Chart

CDM Series, VHF (136-174 MHz) 1-25W

Model						Description
AAM25KHC9AA1AN						CDM750, 136-174 MHz, 1-25W, 12.5/20/25 kHz
	AAM25KHD9AA2AN					CDM1250, 136-174 MHz, 1-25W, 12.5/20/25 kHz
		AAM25KHF9AA5AN				CDM1550, 136-174 MHz, 1-25W, 12.5/20/25 kHz
			AAM25KHF9DP5AN			CDM1550 LS+, 136-174 MHz, 25W, 16CH
				AAM25KHF9DP6AN		CDM1550 LS+, 136-174 MHz, 25W, 160CH w/MDC
					Item	**Description**
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X			IMUD6014	Tanapa, VHF 136-174 MHz, 1-25W, 12.5/20/25 kHz
X	X	X			IMUD6014_S	Replacement Board, VHF 136-174 MHz, 1-25W, 12.5/20/25 kHz
			X		PMUD 2076A	Tanapa, VHF 136-174 MHz, 25W 16CH
				X	PMUD 2077A	Tanapa, VHF 136-174 MHz, 25W 160CH w/MDC
X	X	X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			X	X	6881091C54	User Guide, CDM750
	X		X	X	6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X	X	6881094C79	User Guide, CDM1550 LS+

1.2 PRO Series Model Chart

PRO Series, VHF (136-174 MHz) 1-25W				
Model				Description
LAM25KHC9AA1AN				PRO3100, 136-174 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
	LAM25KHD9AA2AN			PRO5100, 136-174 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
		LAM25KHF9AA5AN		PRO7100, 136-174 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
			Item	Description
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUD6014	Tanapa, VHF 136-174 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	IMUD6014_S	Replacement Board, VHF 136-174 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550/PRO7100** Depth excludes knobs	**1 - 25W:** 2.2 in. x 6.93 in. x 6.97 in. (56 mm x 176 mm x 177 mm) 2.34 in. x 7.05 in. x 7.32 in. (59 mm x 179 mm x 186 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.15 lb. (1430 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E

Transmitter	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	1-25W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB @ 12.5 kHz (TIA) 78 dB @ 25 kHz (TIA) Base Mode: >70dB (1-25W model only)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 75 dB @ 20 kHz 80 dB @ 25 kHz
Spurious Rejection	75 dB @ 12.5 kHz 80 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the VHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 VHF (136-174 MHz) 1-25W Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the VHF range from 136 to 174 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. High-side first injection is used.

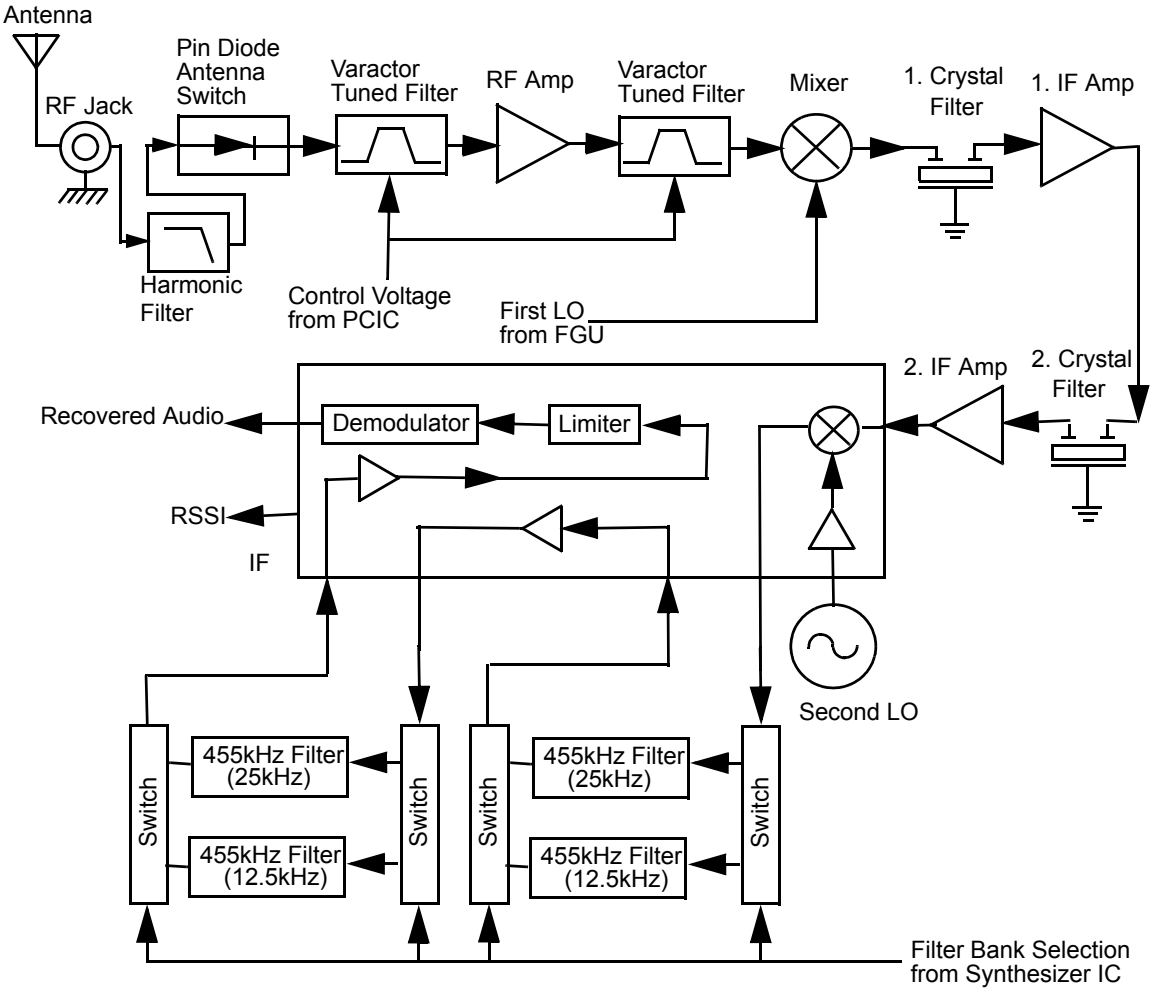


Figure 4-1 VHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the high-IF section and 2 pairs of 455 kHz ceramic filters in the low-IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuitry, before being applied to the receiver pre-selector filter (C3001, C3002, D3001 and associated components). The 2-pole pre-selector filter tuned by the dual varactor diode D3001 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECNTL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U3501) in the Transmitter section. A dual hot carrier diode (D3003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q3001) with collector-base feedback to stabilize gain, impedance, and intermodulation. Transistor Q3002 compares the voltage drop across resistor R3002 with a fixed base voltage from divider R3011, R3000 and R3012, and adjusts the base current of Q3001 as necessary to maintain its collector current constant at approximately 15-20 mA. Operating voltage is from the regulated 9.3V supply (9V3). During transmit, 9.1 volts (K9V1) turns off both transistors Q3002 and Q3001. This protects the RF pre-amplifier from excessive dissipation during transmit mode. A switchable 3dB pad (R3022, R3024, R3016 and R3018) controlled via Line FECNTL_2 and Q3021 stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The dual varactor diode D3004 is controlled by the same signal FECNTL_1, which controls the pre-selector filter.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal coming from the front-end is converted to the high-IF frequency of 44.85 MHz using a passive double-balanced mixer (D3031). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using high side injection. The high-side injection signal (RXINJ) from the frequency synthesizer circuitry has a level of approximately 13 dBm and is injected via matching transformer T3002.

The mixer IF output signal (IF) from transformer T3001 pin 2 is fed to the first two pole crystal filter FL3101. The filter output in turn is matched to the following IF amplifier.

The IF amplifier Q3101 is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the voltage 5V. Its output impedance is matched to the second two pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz high-IF signal from the second IF amplifier feeds the IF IC (U3101) at pin 1. Within the IF IC, the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the low-IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The low IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114

for 20/25 kHz channel spacing or FL3111, FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mVrms (at 60% deviation) from U3101 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the Controller circuitry).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101 pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101 pin 63) and in addition is available at accessory connector J0501-15.

3.0 VHF (136-174 MHz) 1-25W Transmitter Power Amplifier (PA) 25W

The radio's 25W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U3401) and the second stage (Q3421) is adjustable, controlled by pin 4 of PCIC (U3501) via U3402-1 and U3402-2. It is followed by an LDMOS final stage (Q3441).

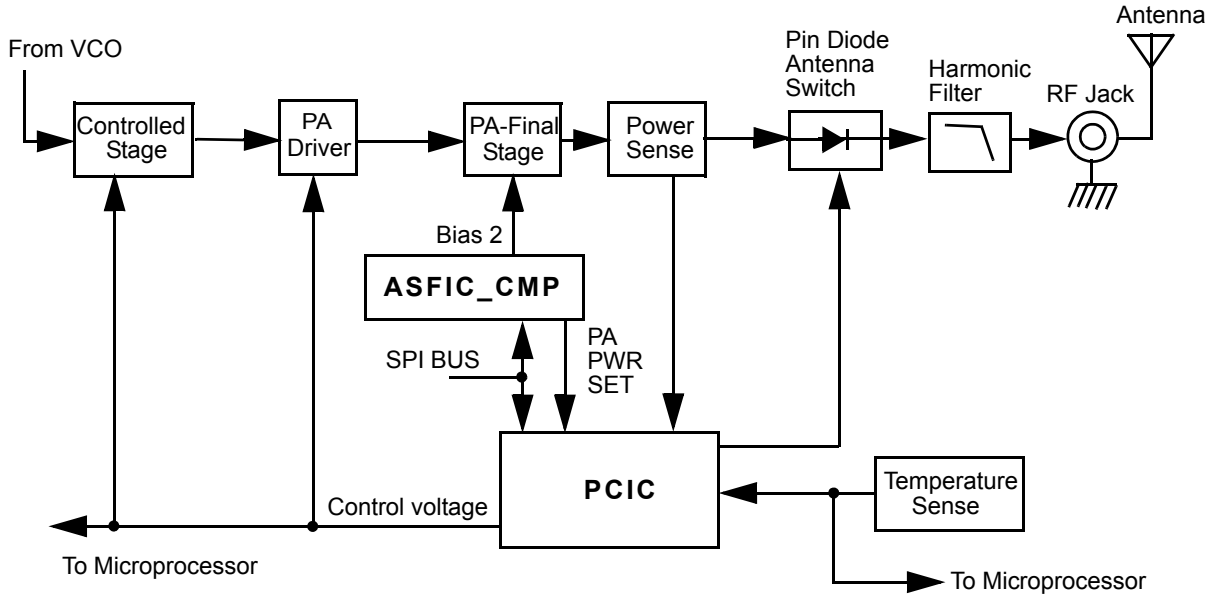


Figure 4-2 VHF Transmitter Block Diagram

Devices U3401, Q3421 and Q3441 are surface mounted. A pressure pad between the board and the radio's cover provides good thermal contact between the devices and the chassis.

3.1 First Power Controlled Stage

The first stage (U3401) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U3401 is controlled by a DC voltage applied to pin 1 from the op-amp U3402-1, pin 1. The control voltage simultaneously varies the bias of two FET stages within U3401. This biasing point determines the

overall gain of U3401 and therefore its output drive level to Q3421, which in turn controls the output power of the PA.

Op-amp U3402-1 monitors the drain current of U3401 via resistor R3444 and adjusts the bias voltage of U3401 so that the current remains constant. The PCIC (U3501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U3402-1 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q3442, which in turn switches off the biasing voltage to U3401.

Switch S3440 is a pressure pad with a conductive strip which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S3440 opens and the resulting high voltage level at the inverting inputs of the current control op-amps U3402-1 & 2 switches off the biasing of U3401 and Q3421. This prevents transmitter key up while the devices do not have proper thermal contact to the chassis.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q3421) providing a gain of 12dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by the drain current control op-amp U3402-2, and fed to the gate of Q3421 via the resistive network R3429, R3418, R3415 and R3416.

Op-amp U3402-2 monitors the drain current of U3421 via resistors R3424-27 and adjusts the bias voltage of Q3421 so that the current remains constant. The PCIC (U3501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U3402-2 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q3422, which in turn switches off the biasing voltage to Q3421.

3.3 Final Stage

The final stage is an LDMOS device (Q3441) providing a gain of 12dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 is set in transmit mode by the ASFIC and fed to the gate of Q3441 via the resistive network R3404, R3406, and R3431-5. This bias voltage is tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Customer Programming Software (CPS). Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. In receive mode U3402-2 pulls the bias voltage to low via D3401. The device's drain current is drawn directly from the radio's DC supply voltage input, PASUPVLTG, via L3436 and L3437.

A matching network consisting of C3441-49, L3443, and two striplines, transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward power delivered by Q3441. The coupled signal is rectified by D3451. The DC voltage is proportional to the RF output power and feeds the RFIN port of the PCIC (U3501 pin 1). The PCIC controls the gain of stage U3401 and Q3421 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

3.5 Antenna Switch

The antenna switch consists of two PIN diodes, D3471 and D3472. In the receive mode, both diodes are off. Signals applied at the antenna jack J3401 are routed, via the harmonic filter, through network L3472, C3474 and C3475, to the receiver input. In the transmit mode, K9V1 turns on Q3471 which enables current sink Q3472, set to 96 mA by R3473 and VR3471. This completes a DC path from PASUPVLTG, through L3437, D3471, L3472, D3472, L3471, R3474 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D3471 to the harmonic filter and antenna jack. D3472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L3472 is selected to appear as a lambda / 4 wave transmission line, making the short circuit presented by D3472 appear as an open circuit at the junction of D3472 and the receiver path.

3.6 Harmonic Filter

Components L3491-L3493 and L3472, C3491-C3499 form a Chebychev low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R3491 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.7 Power Control

The transmitter uses the Power Control IC (PCIC, U3501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the directional coupler and rectified, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC (U0221) has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop to the PCIC via R3505. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit. The PCIC provides a DC output voltage at pin 4 (INT) which sets the drain current of the first (U3401) and second (Q3421) transmitter stage via current control op-amps U3402-1 and U3402-2. This adjusts the transmitter power output to the intended value. Variations in forward transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power. Capacitors C3502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels. U3502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

4.0 VHF (136-174 MHz) 1-25W Frequency Synthesis

The frequency synthesizer subsystem consists of the reference oscillator (Y3261 or Y3263), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U3201), and the voltage-controlled oscillators and buffer amplifiers (U3301, Q3301-2 and associated circuitry).

4.1 Reference Oscillator

The reference oscillator (Y3263) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U3201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U3201 (pin 25) to set the frequency of the oscillator. The output of the oscillator (U3263 pin 3) is applied to pin 23 (XTAL1) of U3201 via R3263 and C3235.

In applications where less frequency stability is required, the oscillator inside U3201 is used along with an external crystal Y3261, varactor diode D3261, C3261, C3262 and R3262. In this case, Y3263, R3263, C3235 and C3251 are not used. When Y3263 is used, Y3261, D3261, C3261, C3262 and R3262 are not used, and C3263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U3201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

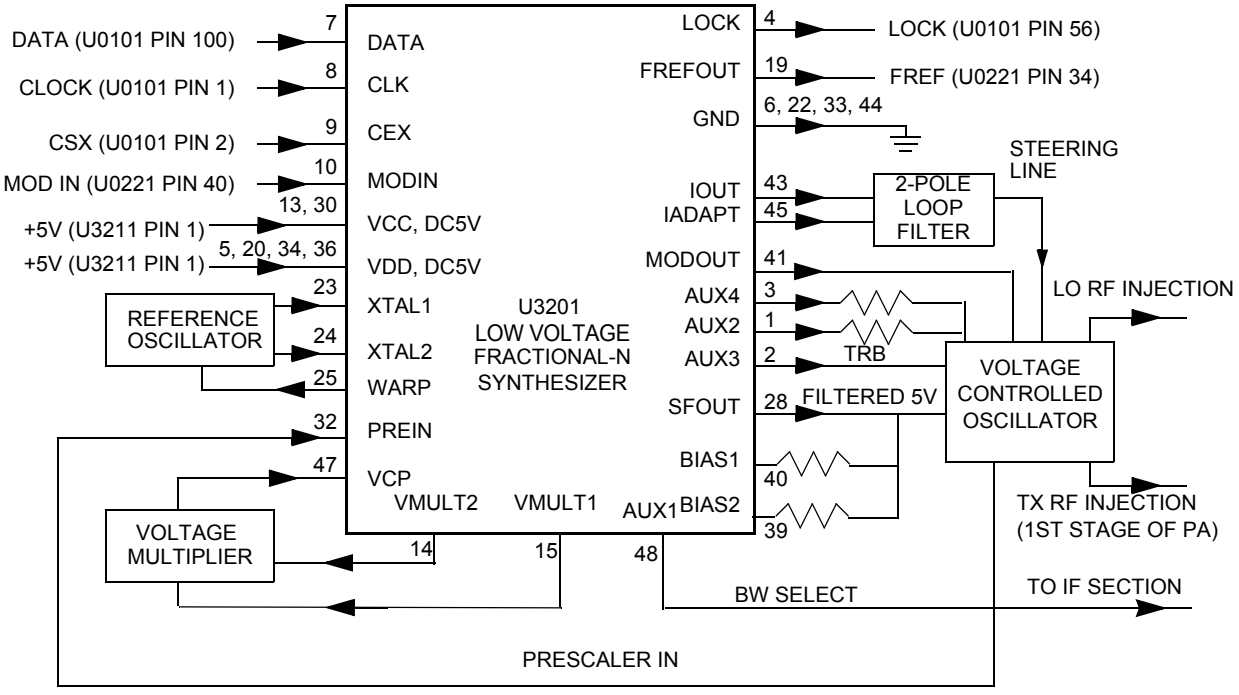


Figure 4-3 VHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U3201 pin 30) supplies an output voltage of 4.5 VDC (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R3363) and the synthesizer charge pump resistor network (R3251, R3252). The synthesizer supply voltage is provided by the 5V regulator U3211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin 47 VCP (U3201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier

circuitry (D3201, C3202, C3203). This voltage multiplier is basically a diode capacitor network driven by two (1.05MHz) 180 degrees out of phase signals (U3201-14 and -15).

Output LOCK (U3201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U3201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U3201-7), clock line CLK (U3201-8), and chip enable line CSX (U3201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U3301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuitry.

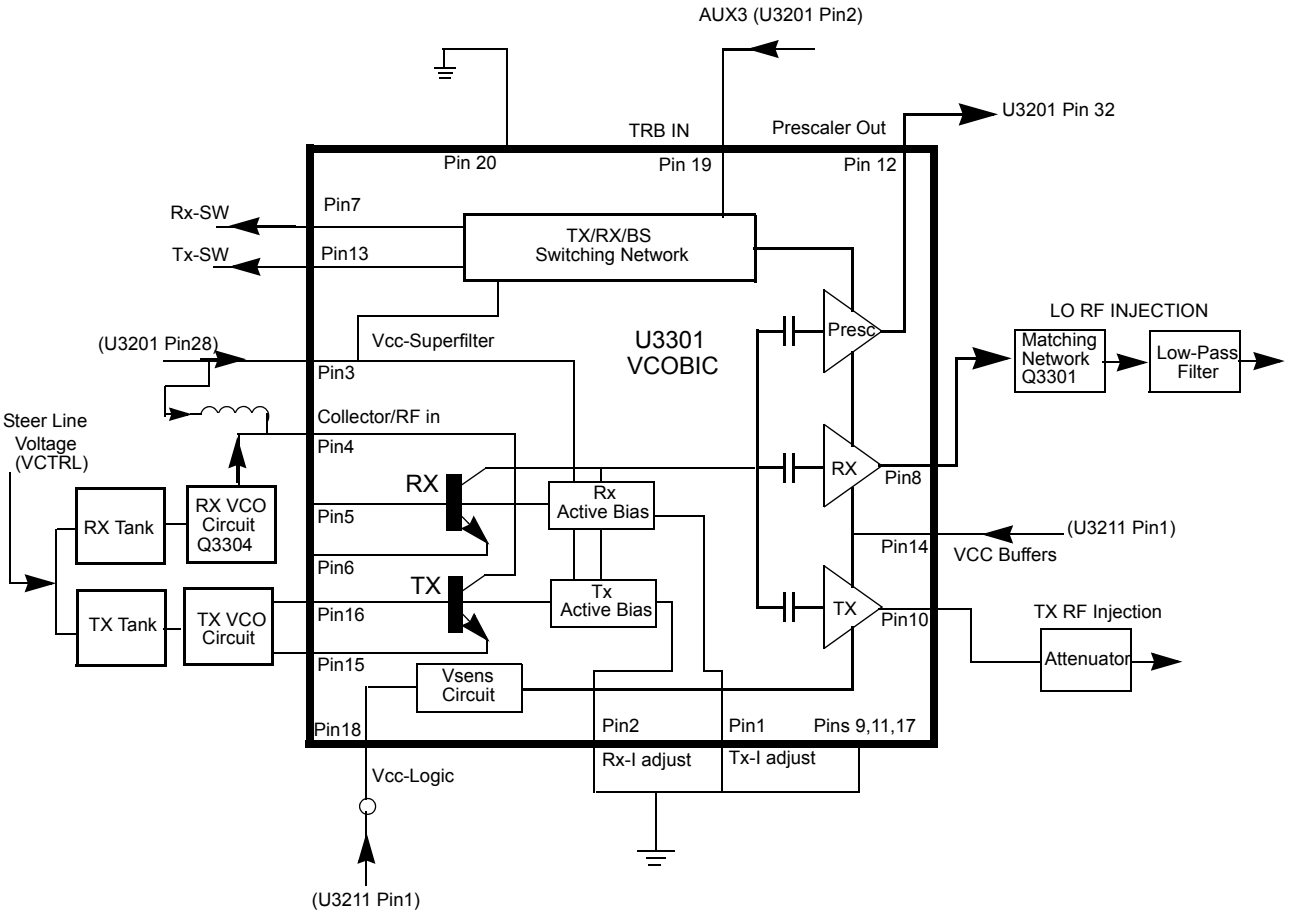


Figure 4-4 VHF VCO Block Diagram

The VCOBIC together with the Fractional-N synthesizer (U3201) generates the required frequencies in both the transmit and receive modes. The TRB line (U3301 pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables the TX tank and TX output (pin 10), and a low enables the RX tank and RX output (pin 8). A sample of the signal from the enabled RF output is routed from U3301 pin 12 (PRESC_OUT), via a low-pass filter, to pin 32 of U3201 (PREIN).

A steering line voltage (VCTRL) between 2.5V and 11V at varactor diode D3361 will tune the full TX frequency range (TXINJ) from 136 MHz to 174 MHz, and at varactor diode D3341 will tune the full RX frequency range (RXINJ) from 181 MHz to 219 MHz. The RX tank circuit uses a Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q3304 is used for better side-band noise.

The external RX buffers (Q3301 and Q3302) are enabled by a high at U3301 pin 7 (RX_SWITCH) via transistor switch Q3303. In the TX mode, the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U3201 pin 41) is applied to varactor diode D3362, which modulates the TX VCO frequency via capacitor C3362. Varactor D3362 is biased for linearity from VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem consists of the low voltage FRAC-N (LVFRACN), the reference oscillator (a crystal oscillator with temperature compensation), charge pump circuitry, loop filter circuitry and a DC supply. The output signal PRESC from the VCOBIC (U3301 pin 12) is fed to U3201 pin 32 (PREIN) via a low-pass filter (C3318, L3318 and C3226) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U3201) is a dual modulus type with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y3261 or Y3263).

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at U3201 pin 43 (IOUT). The loop filter (which consists of R3221-R3223 and C3221-C3224) transforms this current into a voltage that is applied to the varactor diodes (D3361 for transmit, D3341 for receive) to alter the output frequency of the appropriate VCO. The current can be set to a value fixed within the LVFRAC-N IC, or to a value determined by the currents flowing into BIAS 1 (U3201-40) or BIAS 2 (U3201-39). The currents are set by the value of R3251 and R3252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer, the magnitude of the loop current is increased by enabling the IADAPT pin (U3201-45) for a certain software programmable time (adapt mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1 and BIAS 2, or by the internal current source. A settled synthesizer loop is indicated by a high level signal at U3201-4 (LOCK).

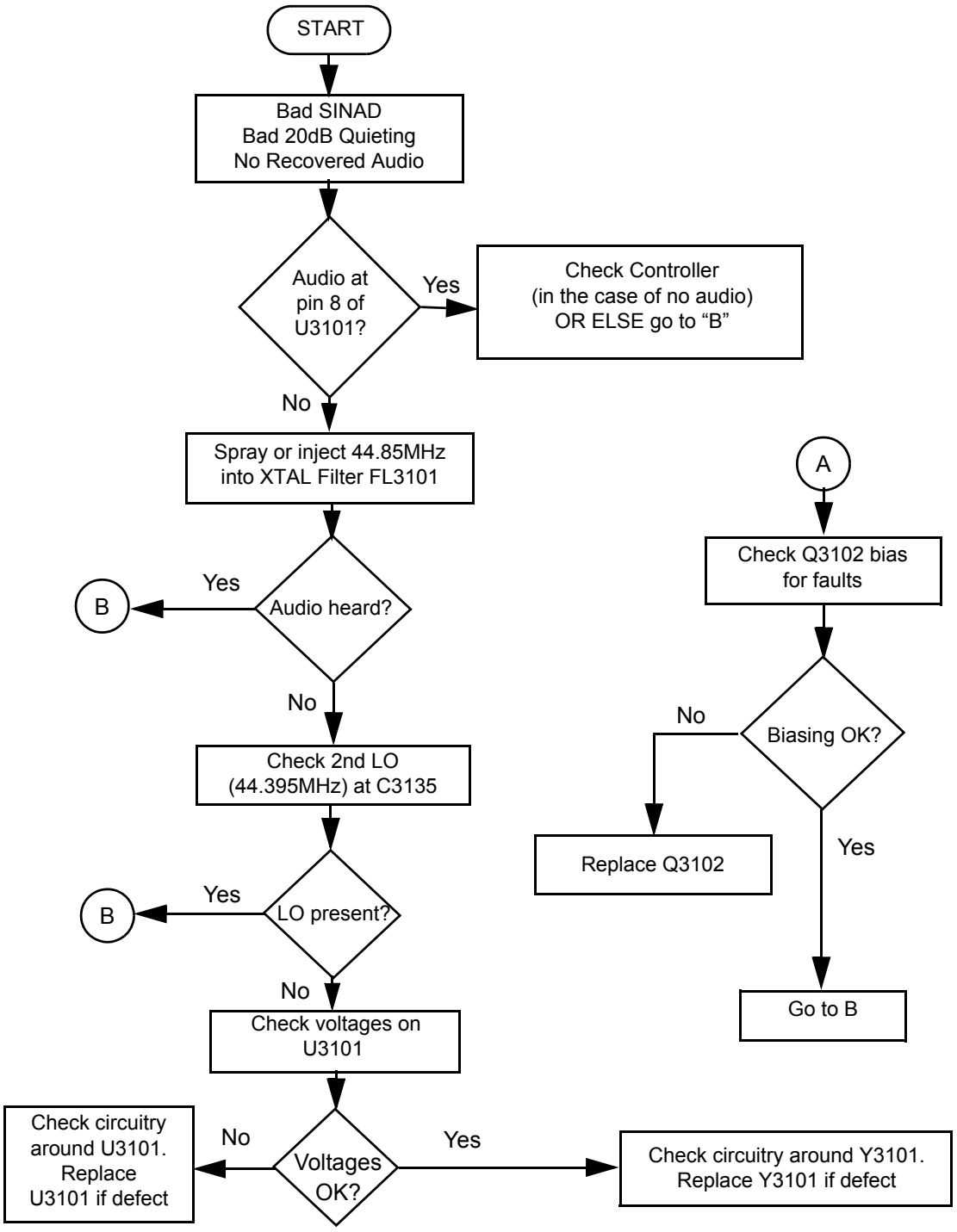
The LOCK signal is routed to one of the µP's ADC inputs (U0101-56). From the measured voltage, the µP determines whether LOCK is active.

In order to modulate the PLL, the two spot modulation method is utilized. Via U3201 pin 10 (MODIN), the audio signal is applied to both the A/D converter (low frequency path) as well as the balance attenuator (high frequency path). The A/D converter changes the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U3201-41) and connected to the VCO modulation diode D3362 via R3364.

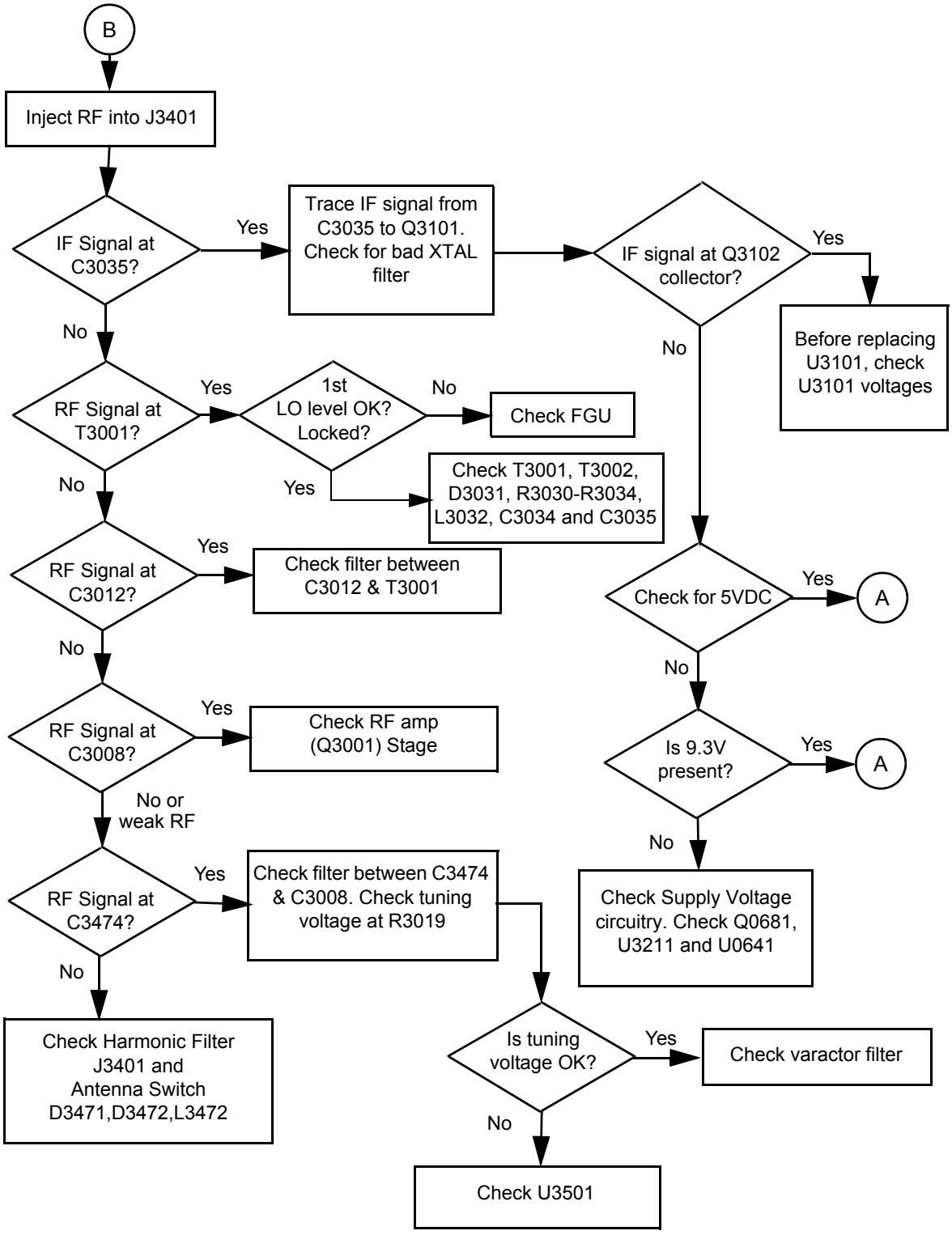
Section 3

TROUBLESHOOTING CHARTS

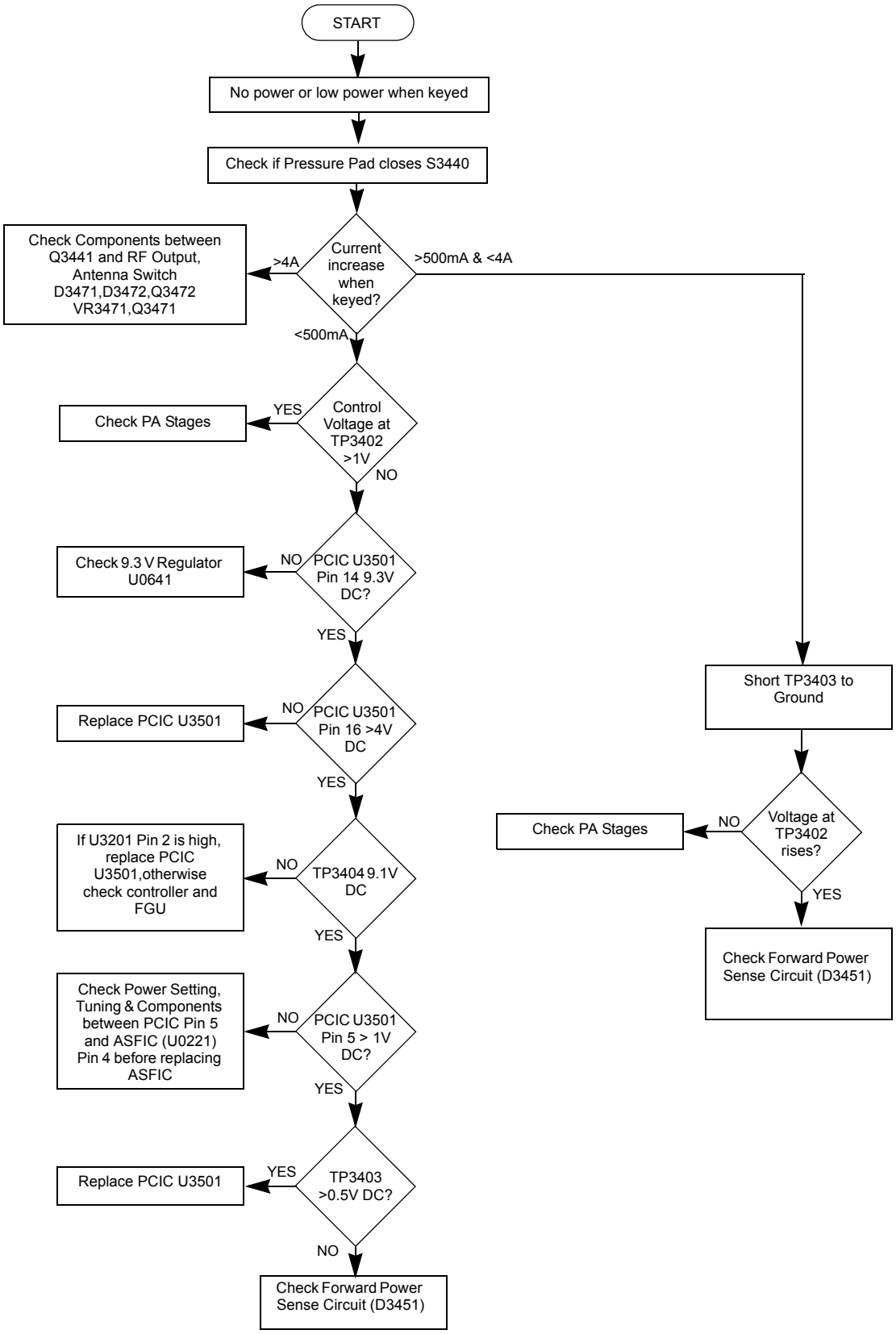
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



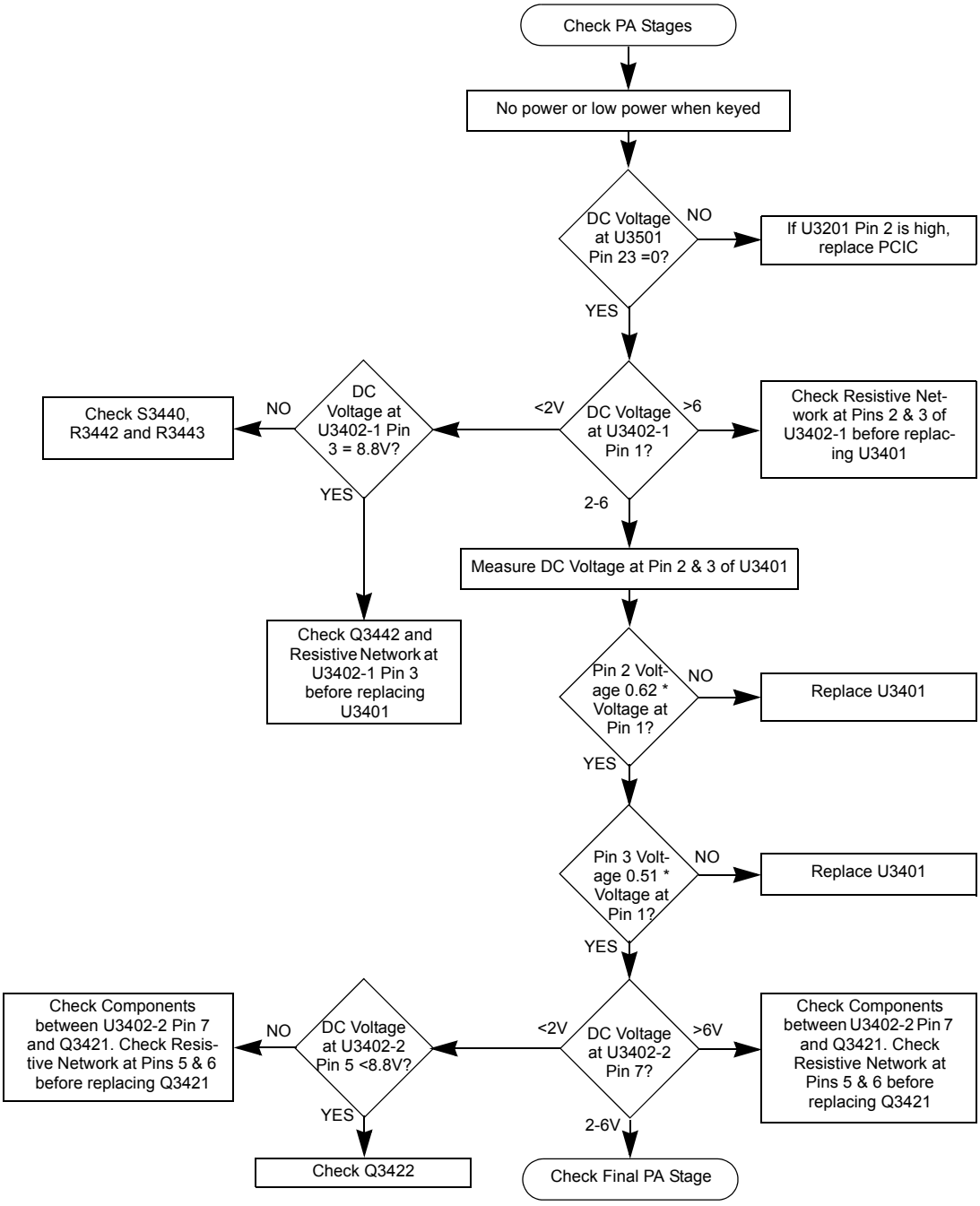
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



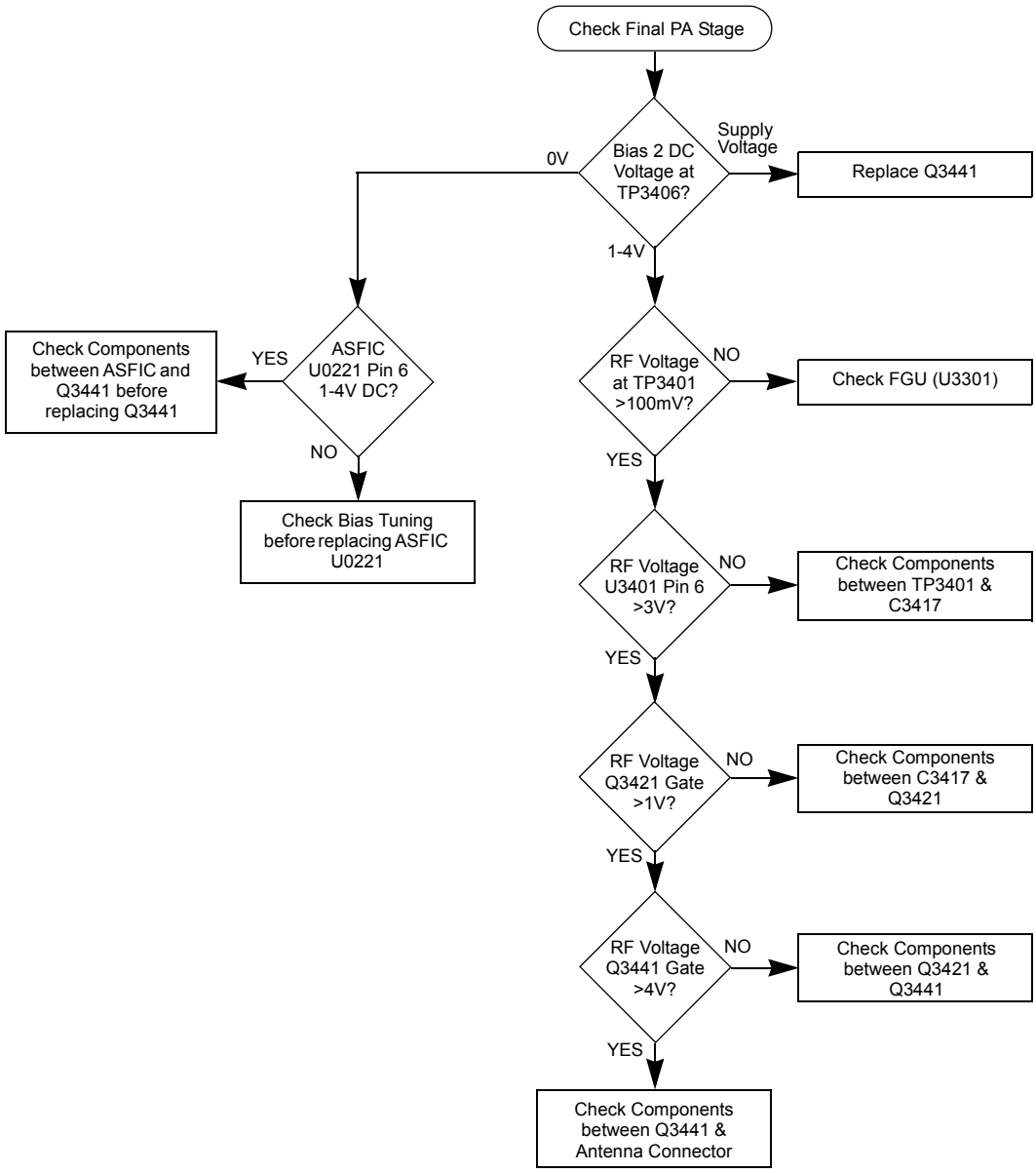
2.0 Troubleshooting Flow Chart for 25W Transmitter (Sheet 1 of 3)



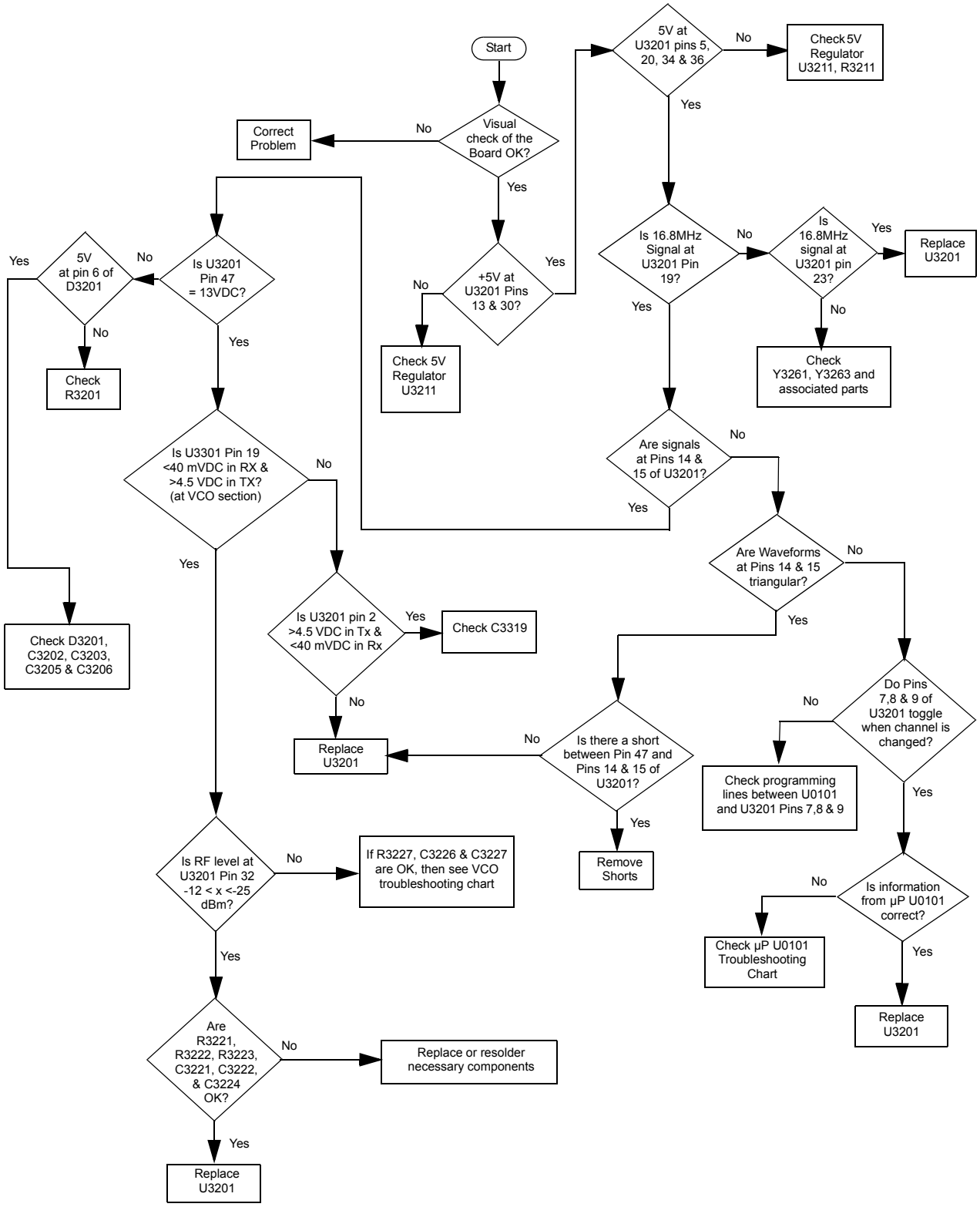
2.1 Troubleshooting Flow Chart for 25W Transmitter (Sheet 2 of 3)



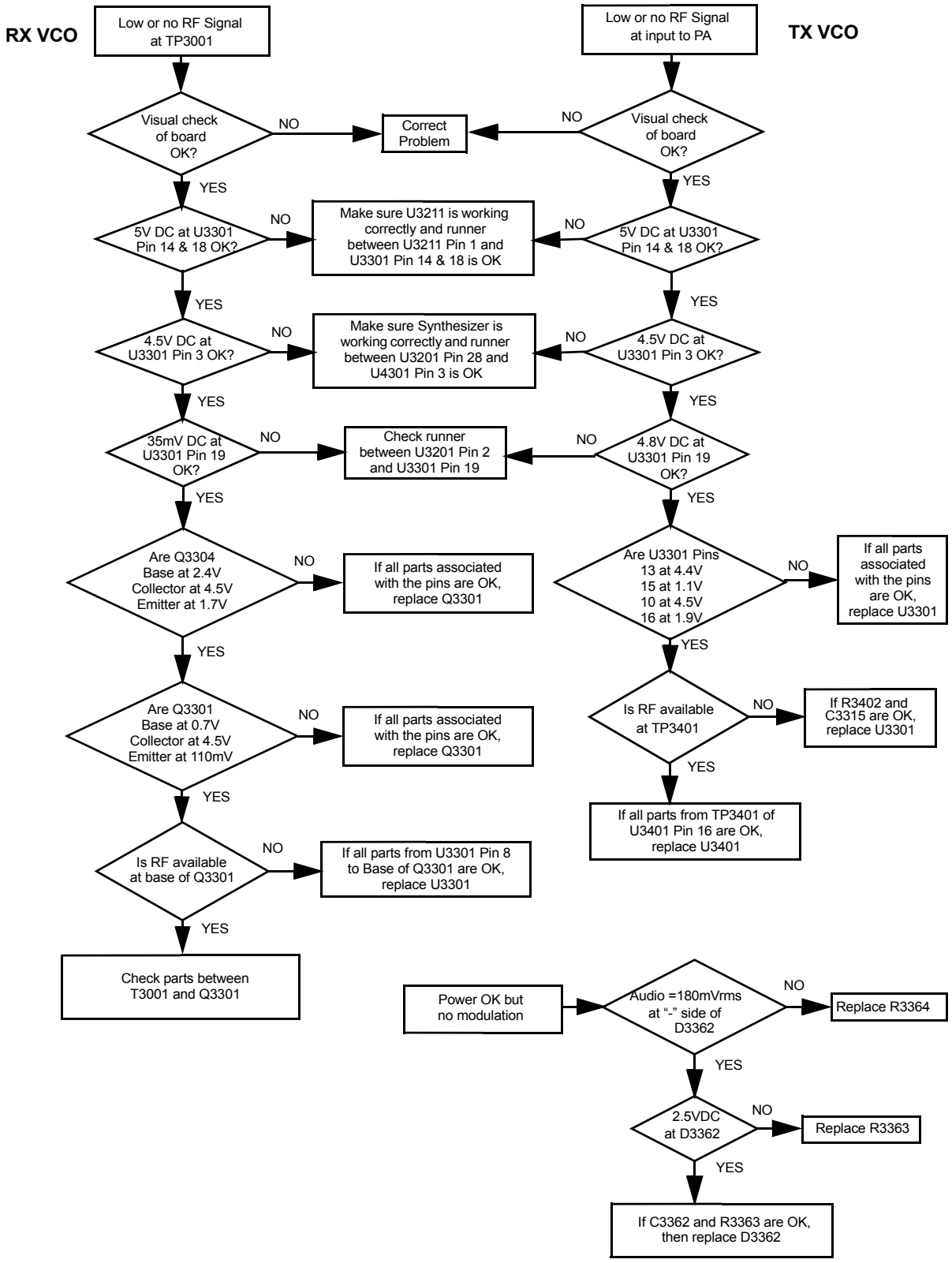
2.2 Troubleshooting Flow Chart for 25W Transmitter (Sheet 3 of 3)



3.0 Troubleshooting Flow Chart for Synthesizer



4.0 Troubleshooting Flow Chart for VCO



Notes

Section 4

VHF (136-174 MHZ) 1-25W PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The VHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the VHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in this chapter show both the controller and VHF circuit components. The VHF schematics and the related PCB and parts list are shown in the tables below.

Table 4-1 VHF 1-25W PCB 8471235L04 Diagrams and Parts Lists

PCB 8471235L04:	**Page:**
Main Board Top Side	**4: 4-3**
Main Board Bottom Side	**4: 4-4**
SCHEMATICS	
Power Amplifier 1 - 25W	**4: 4-5**
FRACN Synthesizer	**4: 4-13**
Voltage Controlled Oscillator	**4: 4-14**
Receiver Front-End	**4: 4-15**
IF	**4: 4-6**
Parts List	**4: 4-17**
Controller version is **T9**	

Table 4-2 VHF 1-25W PCB 8486172B04 Diagrams and Parts Lists

PCB 8486172B04:	**Page:**
Main Board Top Side	**4: 4-10**
Main Board Bottom Side	**4: 4-11**
SCHEMATICS	
Power Amplifier 1 - 25W	**4: 4-12**
FRACN Synthesizer	**4: 4-13**
Voltage Controlled Oscillator	**4: 4-14**
Receiver Front-End	**4: 4-15**
IF	**4: 4-16**
Parts List	**4: 4-17**
Controller version is **T2**	

Table 4-3 VHF 1-25W PCB 8486172B06 Diagrams and Parts Lists

PCB 8486172B06: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **4: 4-20** **4: 4-21**
SCHEMATICS **Power Amplifier 1 - 25W** **FRACN Synthesizer** **Voltage Controlled Oscillator** **Receiver Front-End** **IF**	 **4: 4-22** **4: 4-23** **4: 4-24** **4: 4-25** **4: 4-26**
Parts List	**4: 4-27**
Controller version is **T5**	

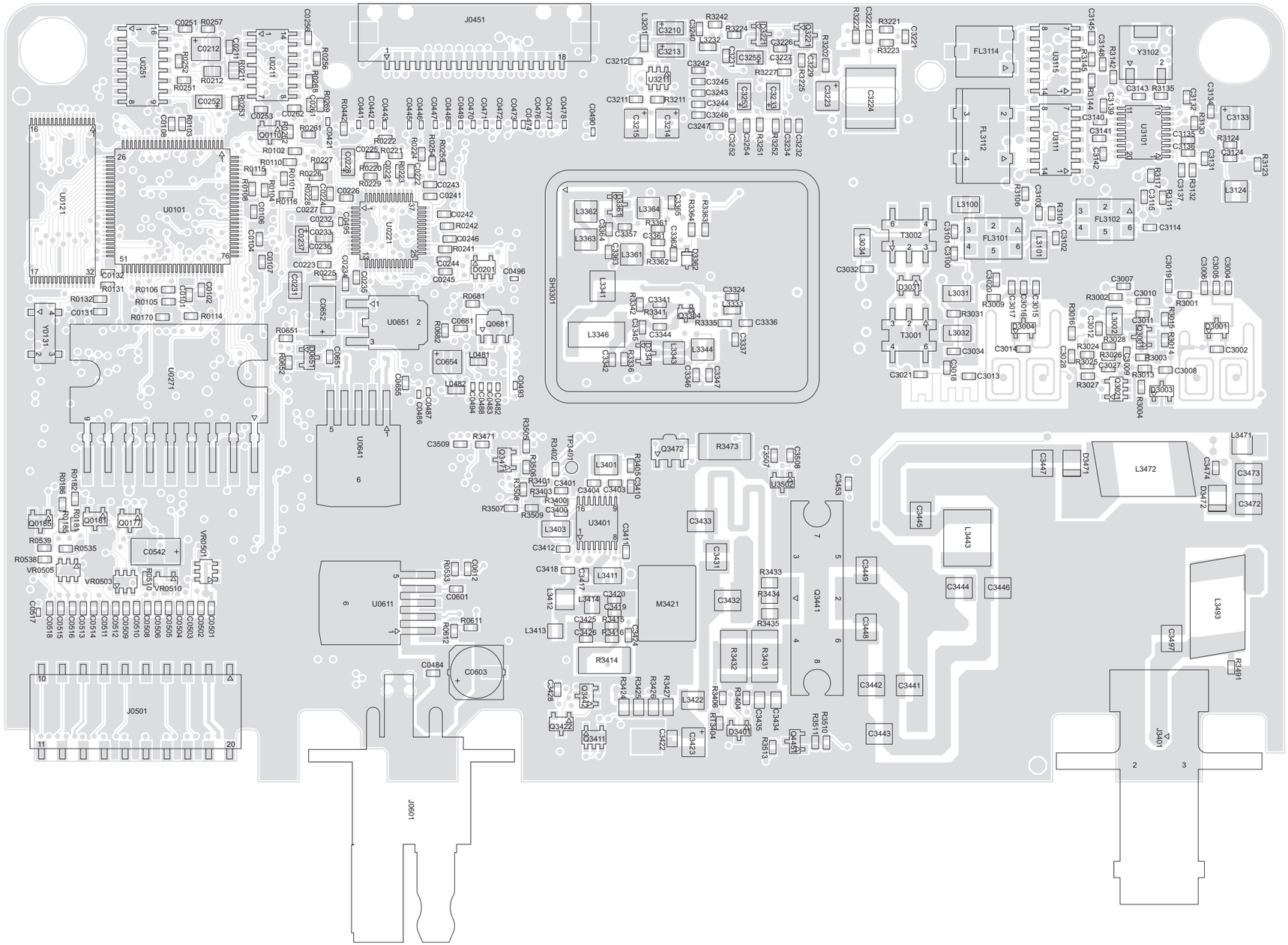
Table 4-4 VHF 1-25W PCB 8486172B07 Diagrams and Parts Lists

PCB 8486172B07: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **4: 4-30** **4: 4-31**
SCHEMATICS **Power Amplifier 1 - 25W** **FRACN Synthesizer** **Voltage Controlled Oscillator** **Receiver Front-End** **IF**	 **4: 4-22** **4: 4-32** **4: 4-24** **4: 4-25** **4: 4-33**
Parts List	**4: 4-34**
Controller version is **T7**	

Table 4-5 VHF 1-25W PCB 8486172B08 Diagrams and Parts Lists

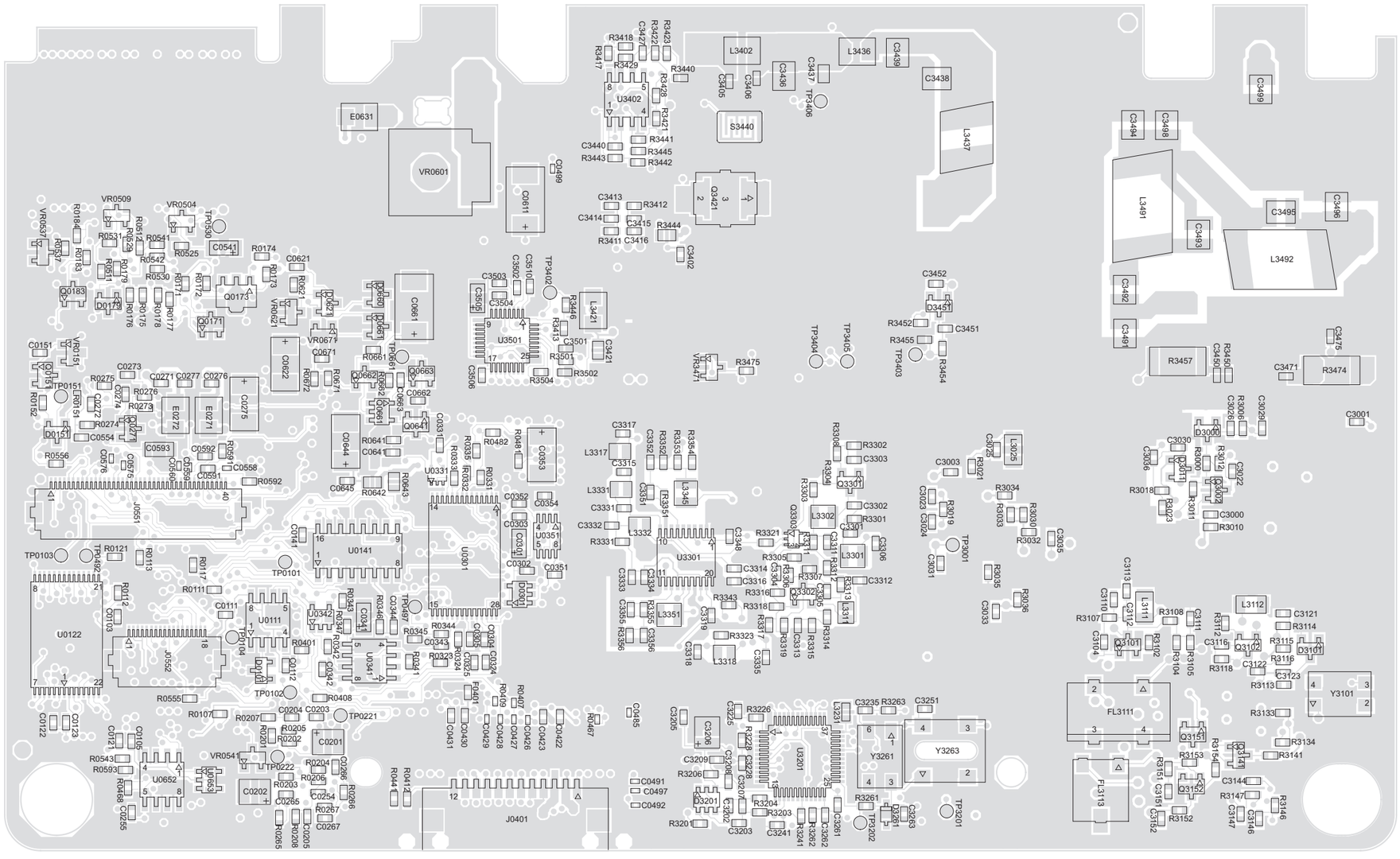
PCB 8486172B08: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **4: 4-37** **4: 4-38**
SCHEMATICS **Power Amplifier 1 - 25W** **FRACN Synthesizer** **Voltage Controlled Oscillator** **Receiver Front-End** **IF**	 **4: 4-39** **4: 4-32** **4: 4-24** **4: 4-25** **4: 4-40**
Parts List	**4: 4-41**
Controller version is **T9**	

2.0 VHF (136-174 MHz) 1-25W LDMOS PCB 8471235L04, Schematics, and Parts Lists



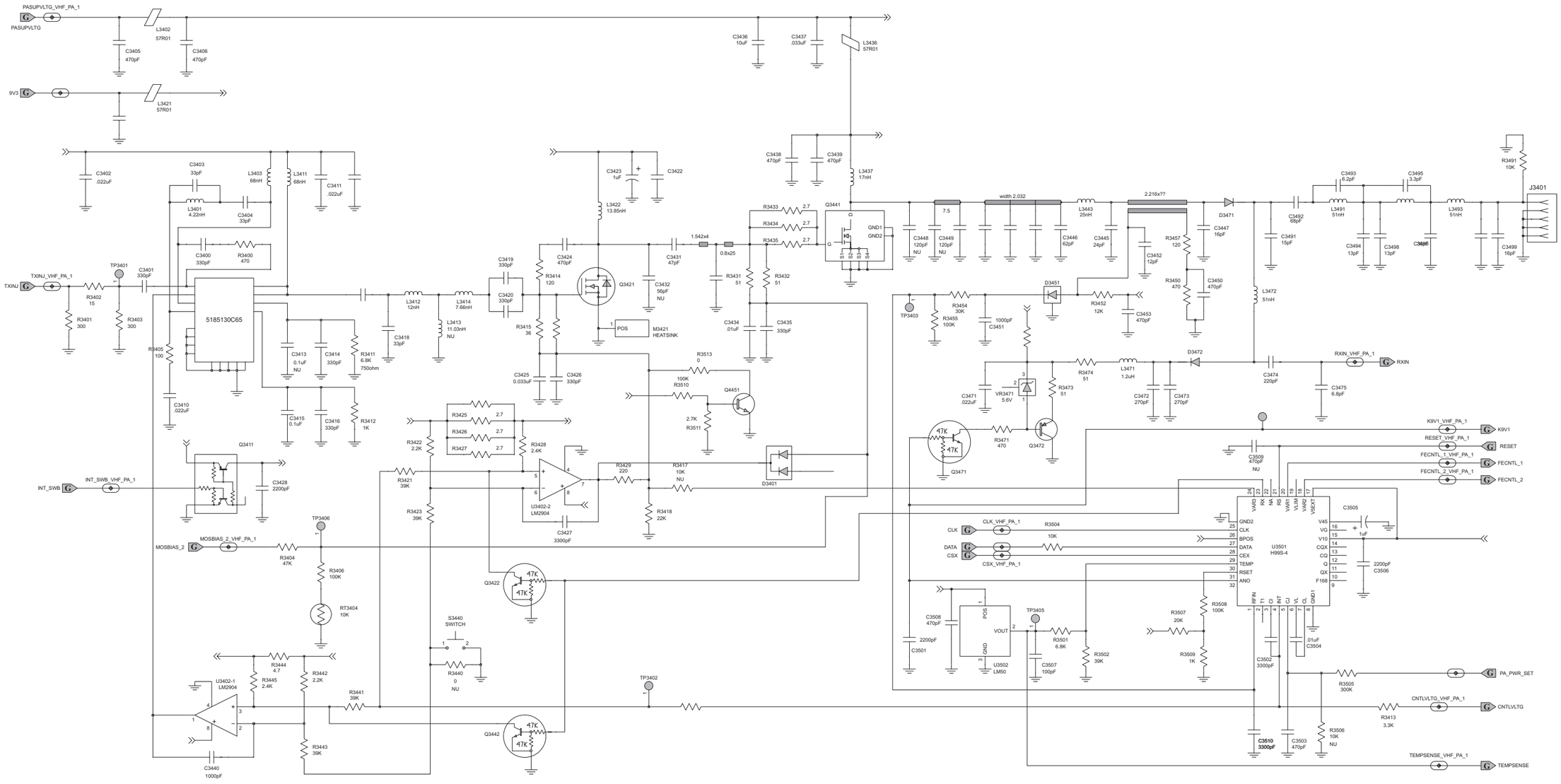
VHF (136-174 MHz) 1-25W LDMOS PCB 8471235L04 Top Side

6881091C63-C



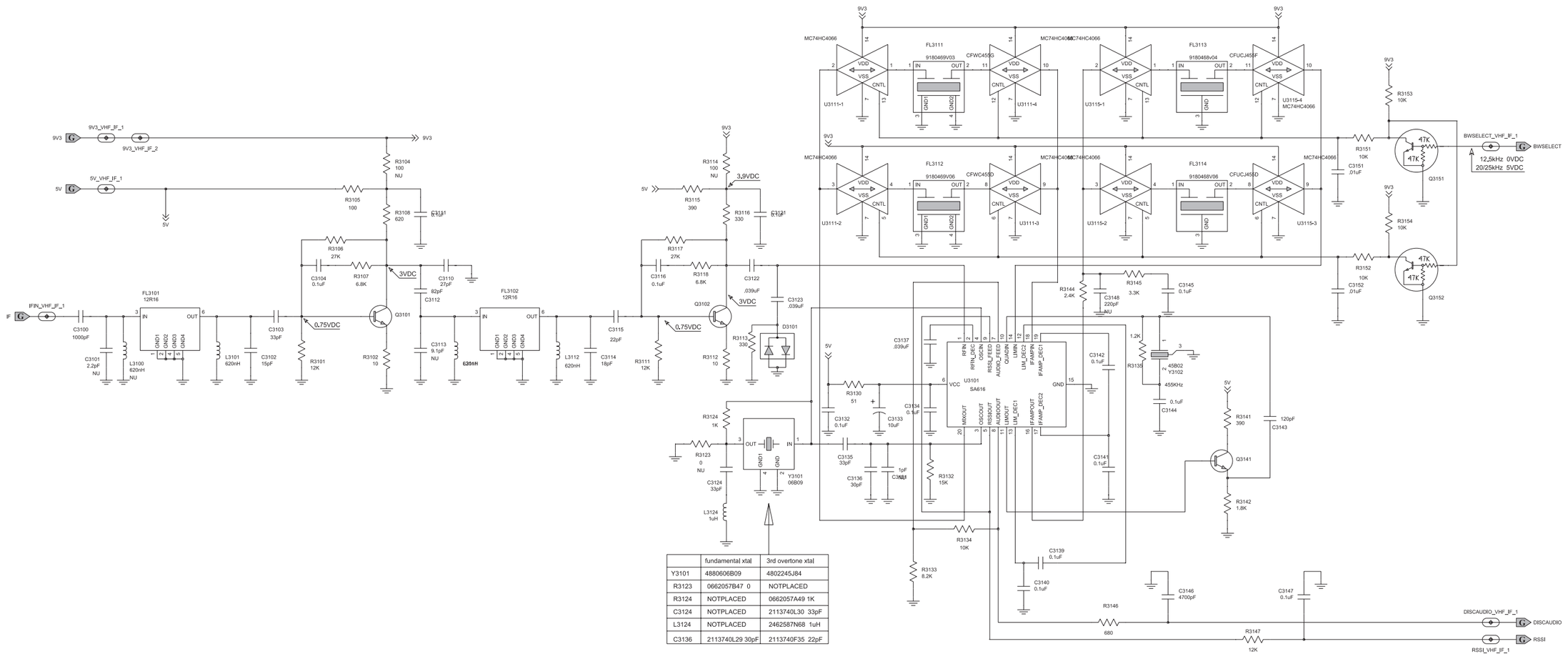
VHF (136-174 MHz) 1-25W LDMOS PCB 8471235L04 Bottom Side

6881091C63-C



VHF (136-174 MHz) 1-25W LDMOS PCB 8471235L04 Power Amplifier

6881091C63-C



	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

VHF (136-174 MHz) 1-25W LDMOS PCB 8471235L04 IF

6881091C63-C

VHF 1-25W PCB 8471235L04 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113945L37	3300pF
C3001	2113944C22	4.7pF
C3002	2113944C76	9.1pF
C3003	2113945L37	3300pF
C3004	2113944C39	56pF
C3005	2113944C45	100pF
C3006	2113944C39	56pF
C3007	2113945L37	3300pF
C3008	2113945L25	1000pF
C3009	2113945L13	330pF
C3010	2113945L13	330pF
C3011	2113945L37	3300pF
C3012	2113945L25	1000pF
C3013	2113944C39	56pF
C3014	2113944C74	7.5pF
C3015	2113944C39	56pF
C3016	2113944C45	100pF
C3017	2113944C84	43pF
C3019	2113945L25	1000pF
C3020	2113945L25	1000pF
C3021	2113944C46	120pF
C3022	2113945L49	.01uF
C3026	2113945C31	.1uF
C3027	2113945L49	.01uF
C3028	2113945L49	.01uF
C3030	2113945L25	1000pF
C3033	2113944C70	5.1pF
C3034	2113944C43	82pF
C3035	2113944C33	18pF
C3036	2113945L25	1000pF
C3100	2113945L25	1000pF
C3102	2113944C32	15pF
C3103	2113944C36	33pF
C3104	2113945C31	.1uF
C3110	2113944C61	.5pF
C3111	2113945C31	.1uF
C3112	2113944C36	33pF
C3113	2113944C75	8.2pF
C3114	2113944C71	5.6pF
C3115	2113944C32	15pF
C3116	2113945C31	.1uF
C3121	2113945C31	.1uF
C3122	2113945C26	.039uF
C3123	2113945C26	.039uF
C3124	2113944M30	33pF
C3132	2113945C31	.1uF
C3133	2313960D07	10uF
C3134	2113945C31	.1uF
C3135	2113944M30	33pF
C3136	2113944C34	22pF
C3137	2113945C26	.039uF
C3139	2113945C31	.1uF
C3140	2113945C31	.1uF
C3141	2113945C31	.1uF
C3142	2113945C31	.1uF
C3143	2113944C46	120pF
C3144	2113945C31	.1uF
C3145	2113945C31	.1uF
C3146	2113945L41	4700pF
C3147	2113945C31	.1uF
C3151	2113945L49	.01uF
C3152	2113945L49	.01uF
C3202	2113945L49	.01uF
C3203	2113945L49	.01uF
C3205	2113945L49	.01uF
C3206	2313960D07	10uF
C3208	2113945C31	.1uF
C3209	2113945C31	.1uF
C3210	2313960B28	2.2uF
C3211	2113945C31	.1uF
C3212	2113945C04	2200pF
C3213	2313960B28	2.2uF
C3214	2313960C78	2.2uF
C3215	2313960C78	2.2uF
C3221	2113945C31	.1uF
C3222	2113945C31	.1uF
C3223	2371444L01	1uF
C3225	2113945C31	.1uF
C3226	2113944C75	8.2pF
C3227	2113944C45	100pF
C3228	2113945C31	.1uF
C3229	2113945C27	.047uF
C3231	2113945L49	.01uF
C3232	2113945L49	.01uF
C3233	2313960B28	2.2uF
C3234	2113945C31	.1uF
C3235	2113945L49	.01uF
C3242	2113944C02	220pF
C3243	2113944C02	220pF
C3244	2113944C02	220pF
C3245	2113944C02	220pF
C3246	2113944C02	220pF
C3247	2113944C30	10pF
C3251	2113945C31	.1uF
C3252	2113945L25	1000pF
C3253	2313960B30	4.7uF
C3254	2113945L49	.01uF
C3255	2313960B28	2.2uF
C3263	2113945C31	.1uF
C3302	2113944C73	6.8pF
C3303	2113945L49	.01uF
C3306	2113944C70	5.1pF
C3311	2113945C04	2200pF
C3314	2113944C73	6.8pF
C3315	2113944C32	15pF
C3316	2113944C18	3.3pF
C3317	2113944C36	33pF
C3318	2113944C71	5.6pF
C3319	2113945L25	1000pF
C3324	2113945L49	.01uF
C3332	2113945C31	.1uF
C3333	2113945C31	.1uF
C3334	2113945C04	2200pF
C3335	2113945L49	.01uF
C3336	2113945L49	.01uF
C3337	2113945C31	.1uF
C3341	2113945L25	1000pF
C3342	2113944M05	3pF0
C3344	2113944C69	1.8pF
C3345	2113944M25	20pF
C3346	2113945L49	.01uF
C3347	2113945L49	.01uF
C3348	2113945L49	.01uF
C3351	2113945L49	.01uF
C3352	2113945C04	2200pF
C3355	2113945L49	.01uF
C3356	2113945C04	2200pF
C3357	2113944C74	7.5pF
C3361	2113945L25	1000pF
C3362	2113944C71	5.6pF
C3363	2113944C41	68pF
C3364	2113944C32	15pF
C3365	2113945L25	1000pF
C3400	2113944C04	330pF
C3401	2113944C04	330pF
C3402	2113945C04	2200pF
C3403	2113944C36	33pF
C3404	2113944C36	33pF
C3405	2113944C06	470pF
C3406	2113944C06	470pF
C3410	2113945C04	2200pF
C3411	2113945C04	2200pF
C3412	2113944C04	330pF
C3413	2113945C31	.1uF
C3414	2113944C04	330pF
C3415	2113945C31	.1uF
C3416	2113944C04	330pF
C3417	2113944C38	56pF
C3418	2113944C36	33pF
C3419	2113944C04	330pF
C3420	2113944C04	330pF
C3421	2113945G57	.033uF
C3422	2113944F04	330pF
C3423	2313960C26	1uF
C3424	2113944C06	470pF
C3425	2113945C25	.033uF
C3426	2113944C04	330pF
C3427	2113945L37	3300pF
C3428	2113945L33	2200pF
C3431	2111078B34	47pF
C3433	2111078B36	56pF
C3434	2113945G45	.01uF
C3435	2113944F04	330pF
C3436	2313960G32	10uF
C3437	2113945G57	.033uF
C3438	2111078B59	470pF
C3439	2111078B59	470pF
C3440	2113945L25	1000pF
C3441	2111078B47	150pF
C3442	2111078B47	150pF
C3444	2111078B36	56pF
C3445	2111078B23	24pF
C3446	2111078B37	62pF
C3447	2111078B19	16pF
C3450	2113944C06	470pF
C3451	2113945L25	1000pF
C3452	2113944C31	12pF
C3453	2113944C06	470pF
C3471	2113945C04	2200pF
C3472	2111078B53	270pF
C3473	2111078B53	270pF
C3474	2113944C02	220pF
C3475	2113944C73	6.8pF
C3491	2111078B18	15pF
C3492	2111078B38	68pF
C3493	2111078B08	6.2pF
C3494	2111078B16	13pF
C3495	2111078B01	3.3pF
C3496	2111078B31	36pF
C3498	2111078B16	13pF
C3499	2111078B19	16pF
C3501	2113945L33	2200pF
C3502	2113945L37	3300pF
C3503	2113944C06	470pF
C3504	2113945L49	.01uF
C3505	2313960B01	1uF
C3506	2113945L33	2200pF
C3507	2113944C45	100pF
C3508	2113944C06	470pF
C3510	2113945L37	3300pF
D3000	4813978C02	DIODE DUAL 70V
D3001	4885094Y01	DIODE VARACTOR
D3003	4815048H01	DIODE DUAL SCHT
D3004	4885094Y01	DIODE VARACTOR
D3011	4813974A06	DIODE
D3031	4886143B01	WM MIXER QUAD RING DIODE
D3101	4815048H01	DIODE DUAL SCHT
D3201	4815011H01	DIODE TRIPLE
D3221	4813974A05	DIODE
D3341	4885094Y01	DIODE VARACTOR
D3361	4885094Y01	DIODE VARACTOR
D3362	4885055Y01	DIODE VARACTOR
D3401	4813978C02	DIODE DUAL 70V
D3451	4813974A05	DIODE
D3471	4802482J02	PIN DIODE SMD
D3472	4802482J02	PIN DIODE SMD
FL3101	9180112R16	44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	44.85 MHZ CRYSTAL FILTER
FL3111	9115811H01	SMD455KHZ 6 ELEMENT
FL3112	9115811H04	SMD455KHZ 6 ELEMENT
FL3113	9180468V04	SMD455KHZ 4 ELEMENT CER FLTR

Circuit Ref	Motorola Part No.	Description
FL3114	9180468V06	SMD455KHZ 4 ELEMENT CER FLTR
J3401	0986166B01	MOBILE RF CONNECTOR (BNC)
L3002	2414032D23	470nH
L3031	2414032D24	560nH
L3032	2414032D17	150nH
L3101	2414032D25	620nH
L3111	2414032D25	620nH
L3112	2414032D25	620nH
L3124	2414032B68	1uH
L3201	2414017Q42	390nH
L3231	2414017Q20	2.2uH
L3301	2414032B44	18nH
L3302	2414032B53	100nH
L3317	2414032F28	33nH
L3318	2414032F34	100nH
L3331	2414032F32	68nH
L3332	2414032F15	100nH
L3333	2414017Q47	1uH
L3341	2415385H01	8nH
L3343	2414032B56	180nH
L3344	2414032B68	1uH
L3345	2414032B68	1uH
L3346	2415385H07	35.5nH
L3351	2414032B68	1uH
L3361	2414032B50	56nH
L3362	2414032B51	68nH
L3363	2414032B50	56nH
L3364	2414032B68	1uH
L3401	2460591A01	4.22nH
L3402	2415954H02	INDUCTOR BEAD
L3403	2414032D13	68nH
L3411	2414032D13	68nH
L3412	2414032B42	12nH
L3414	2460591A11	7.66nH
L3421	2415954H02	INDUCTOR BEAD
L3422	2460591C23	13.85
L3436	2415954H02	INDUCTOR BEAD
L3437	2460592A01	17nH
L3443	2460591X02	INDUCTOR BEAD
L3471	2414032B69	1.2uH
L3472	2460592B01	51nH
L3491	2460592B01	51nH
L3492	2460592B01	51nH
L3493	2460592B01	51nH
M3421	2686201B02	HEATSPREADER
Q3001	4802197J95	RF TRANSISTOR PBR941
Q3002	4813973A13	PNP
Q3021	4816097H01	XISTOR FMC2 RH
Q3101	4802197J95	RF TRANSISTOR PBR941
Q3102	4802197J95	RF TRANSISTOR PBR941
Q3141	4813973M07	PNP
Q3151	4813973A42	PNP
Q3152	4813973A42	PNP
Q3221	4813973A42	PNP
Q3301	4802197J95	RF TRANSISTOR PBR941
Q3303	4815055H01	TSTR DUAL NPN/PNP
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4816097H01	XISTOR FMC2 RH
Q3421	4813976A04	TRANSISTOR MRF1518
Q3422	4813973A42	PNP
Q3441	4816121H01	LD MOS PWR MRF1565
Q3442	4813973A42	PNP
Q3471	4813973A42	PNP
Q3472	4816049H01	MEDIUM PWR TRANSISTOR
Q4451	4813973M07	PNP
R3000	0613952H77	1500 Ohm
R3001	0613952J25	100K Ohm
R3002	0613952H67	560 Ohm
R3003	0613952H73	1000 Ohm
R3004	0613952H77	1500 Ohm
R3006	0613952J01	10K Ohm
R3009	0613952J25	100K Ohm
R3010	0613952H69	680 Ohm
R3011	0613952H89	4700 Ohm
R3012	0613952H73	1000 Ohm
R3013	0613952H85	3300 Ohm
R3014	0613952H42	51.0 Ohm
R3015	0613952H25	10.0 Ohm
R3016	0613952H25	10.0 Ohm
R3018	0613952H57	220 Ohm
R3019	0613952J17	47K Ohm
R3021	0613952H67	560 Ohm
R3024	0613952H63	390 Ohm
R3025	0613952H77	1500 Ohm
R3026	0613952J01	10K Ohm
R3027	0613952J01	10K Ohm
R3028	0613952H63	390 Ohm
R3031	0613952H42	51.0 Ohm
R3033	0613952G67	0.0 Ohm
R3101	0613952J03	12K Ohm
R3102	0613952H25	10.0 Ohm
R3105	0613952H49	100 Ohm
R3106	0613952J11	27K Ohm
R3107	0613952H82	2400 Ohm
R3108	0613952H75	1200 Ohm
R3111	0613952J03	12K Ohm
R3112	0613952H25	10.0 Ohm
R3113	0613952H61	330 Ohm
R3115	0613952H63	390 Ohm
R3116	0613952H81	2200 Ohm
R3117	0613952J11	27K Ohm
R3118	0613952H82	2400 Ohm
R3124	0613952H73	1000 Ohm
R3130	0613952H42	51.0 Ohm
R3132	0613952J05	15K Ohm
R3133	0613952H89	4700 Ohm
R3134	0613952H95	8200 Ohm
R3135	0613952H75	1200 Ohm
R3141	0613952H63	390 Ohm
R3142	0613952H79	1800 Ohm
R3144	0613952H82	2400 Ohm
R3145	0613952H85	3300 Ohm
R3146	0613952H69	680 Ohm
R3147	0613952J03	12K Ohm
R3151	0613952J01	10K Ohm
R3152	0613952J01	10K Ohm
R3153	0613952J01	10K Ohm
R3154	0613952J01	10K Ohm
R3201	0613952H41	47.0 Ohm
R3203	0613952H41	47.0 Ohm
R3204	0613952H41	47.0 Ohm
R3211	0613952G67	0.0 Ohm
R3221	0613952H63	390 Ohm
R3222	0613952H69	680 Ohm
R3223	0613952H49	100 Ohm
R3224	0613952J17	47K Ohm
R3225	0613952J17	47K Ohm
R3227	0613952J25	100K Ohm
R3241	0613952H49	100 Ohm
R3242	0613952G67	0.0 Ohm
R3251	0613952J31	180K Ohm
R3252	0613952J37	330K Ohm
R3261	0613952J17	47K Ohm
R3263	0613952H89	4700 Ohm
R3301	0613952H46	75.0 Ohm
R3302	0613952H49	100 Ohm
R3303	0613952H81	2200 Ohm
R3304	0613952H73	1000 Ohm
R3308	0613952G67	0.0 Ohm
R3311	0613952H49	100 Ohm
R3316	0613952G67	0.0 Ohm
R3318	0613952H33	22.0 Ohm
R3321	0613952J01	10K Ohm
R3323	0613952H73	1000 Ohm
R3331	0613952H41	47.0 Ohm
R3335	0613952H37	33.0 Ohm
R3336	0613952J05	15K Ohm
R3341	0613952H57	220 Ohm
R3342	0613952H39	39.0 Ohm
R3343	0613952H49	100 Ohm
R3351	0613952J08	20K Ohm
R3352	0613952J03	12K Ohm
R3353	0613952J25	100K Ohm
R3354	0613952J29	150K Ohm
R3355	0613952J08	20K Ohm
R3356	0613952J03	12K Ohm
R3361	0613952H57	220 Ohm
R3362	0613952H41	47.0 Ohm
R3364	0613952J17	47K Ohm
R3400	0613952H65	470 Ohm
R3401	0613952H60	300 Ohm
R3402	0613952H29	15.0 Ohm
R3403	0613952H60	300 Ohm
R3404	0613952J17	47K Ohm
R3405	0613952H49	100 Ohm
R3406	0613952J25	100K Ohm
R3407	0613958H18	5.1 Ohm
R3411	0613952H70	750 Ohm
R3412	0613952H73	1000 Ohm
R3413	0613952H85	3300 Ohm
R3414	0613959Y51	120 Ohm
R3415	0613952H38	36.0 Ohm
R3416	0613952H38	36.0 Ohm
R3418	0613952J09	22K Ohm
R3421	0613952J15	39K Ohm
R3422	0613952H81	2200 Ohm
R3423	0613952J15	39K Ohm
R3424	0613958H11	2.7 Ohm
R3425	0613958H11	2.7 Ohm
R3426	0613958H11	2.7 Ohm
R3427	0613958H11	2.7 Ohm
R3428	0613952H82	2400 Ohm
R3429	0613952H57	220 Ohm
R3431	0613959Y42	51 Ohm
R3432	0613959Y42	51 Ohm
R3433	0613958H11	2.7 Ohm
R3434	0613958H11	2.7 Ohm
R3435	0613958H11	2.7 Ohm
R3441	0613952J15	39K Ohm
R3442	0613952H81	2200 Ohm
R3443	0613952J15	39K Ohm
R3444	0613958H17	4.7 Ohm
R3445	0613952H82	2400 Ohm
R3446	0613952G67	0.0 Ohm
R3450	0613952H65	470 Ohm
R3452	0613952J03	12K Ohm
R3454	0613952J12	30K Ohm
R3455	0613952J25	100K Ohm
R3457	0613959Y51	120 Ohm
R3471	0613952H65	470 Ohm
R3473	0613959Y42	51 Ohm
R3474	0613959Y42	51 Ohm
R3475	0613952J01	10K Ohm
R3491	0613952J01	10K Ohm
R3492	2415347H01	1uH
R3501	0613952H93	6800 Ohm
R3502	0613952J15	39K Ohm
R3504	0613952J01	10K Ohm
R3505	0613952J36	300K Ohm
R3507	0613952J08	20K Ohm
R3508	0613952J25	100K Ohm
R3509	0613952H73	1000 Ohm
R3510	0613952J25	100K Ohm
R3511	0613952H81	2200 Ohm
R3513	0613952G67	0.0 Ohm
RT3404	0686462W35	MULTI-LAYER NTC THERMISTOR 10K
SH3301	2602641Y03	SHIELD ARIANE VCO
T3001	2566506A01	BALUN TRANSFORMER
T3002	2566506A02	BALUN TRANSFORMER
U3101	5115281H01	FM IF IC SA616 FROM PHILIPS
U3111	5185291Y01	QUAD ANALOG SWITCH

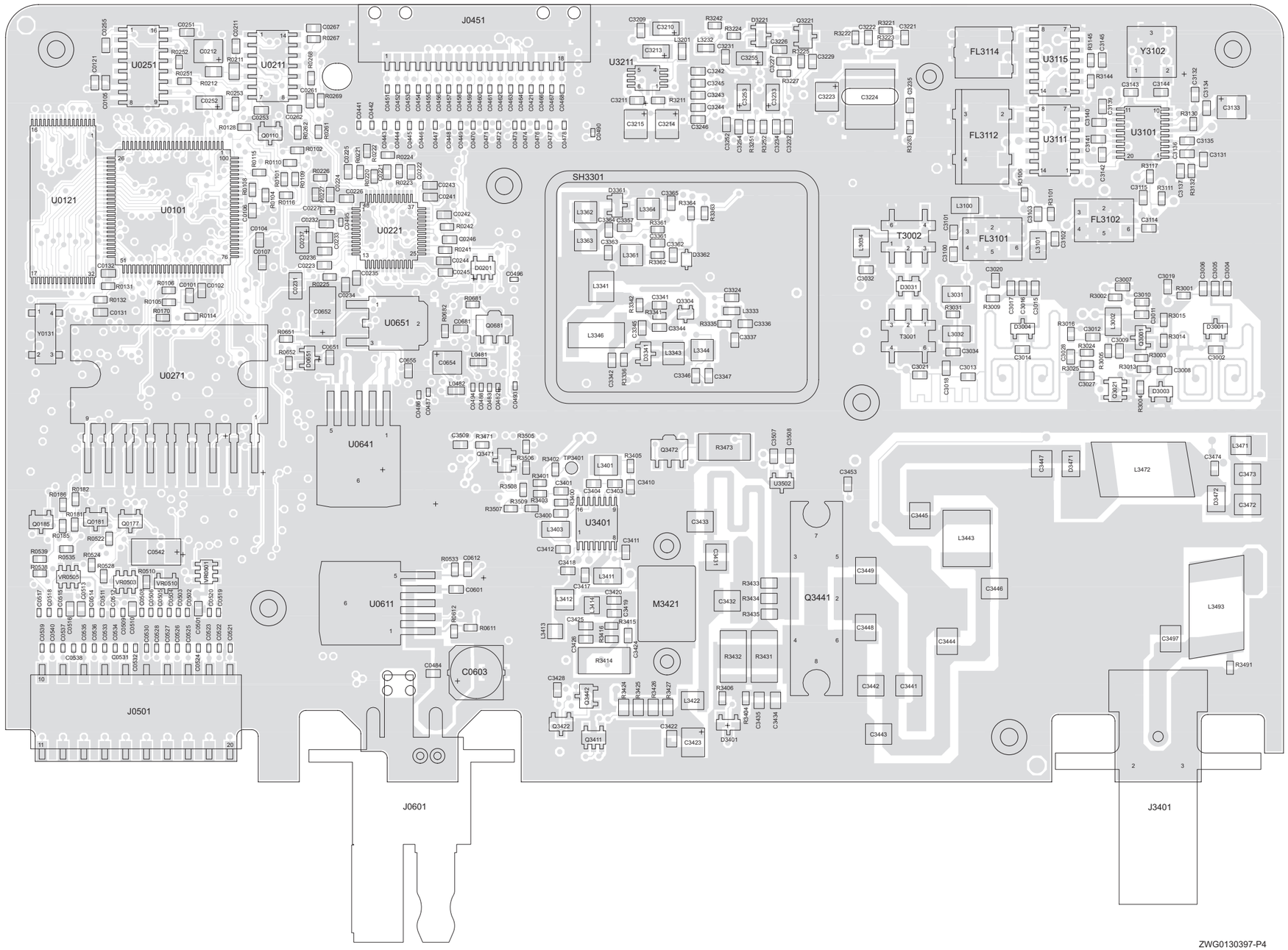
Circuit Ref	Motorola Part No.	Description
U3115	5185291Y01	QUAD ANALOG SWITCH
U3201	5185177Y01	FRACN IC
U3211	5115026H01	MAX SUPPLY VOL 16V
U3301	5171121L01	VCO BUFFER IC
U3401	5115678H01	LDMOS DRIVER IC
U3402	5114005A01	OP AMP
U3501	5185765B26	IC PWR CTRL IN MOS20
U3502	5115022H01	IC TEMPERATURE SENSOR
VR3471	4813977M11	DIODE
Y3101	4802245J84	XTAL 44.395MHZ 3RD OT SMD
Y3102	9186145B02	CER.DISCRIMANATOR
Y3263	4816142H01	REFERENCE OSCILLATOR
	8471235L04	WARIS MOBILE VHF 25W PCB

* Motorola Depot Servicing only

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

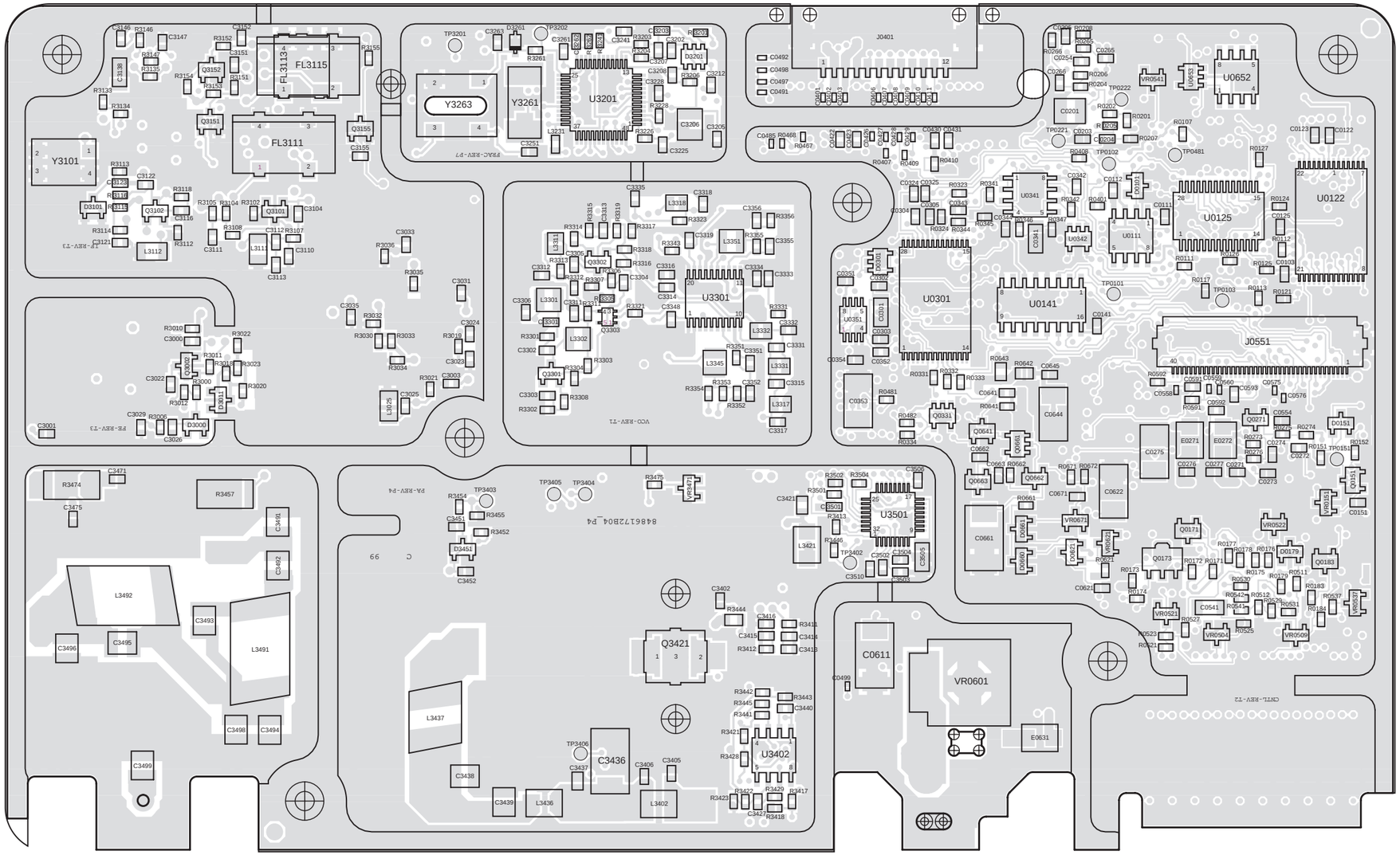
† Replacement boards must be ordered from CCSD (formerly AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

3.0 VHF (136-174 MHz) 1-25W PCB 8486172B04, Schematics, and Parts Lists



VHF (136-174 MHz) 1-25W PCB 8486172B04 Top Side

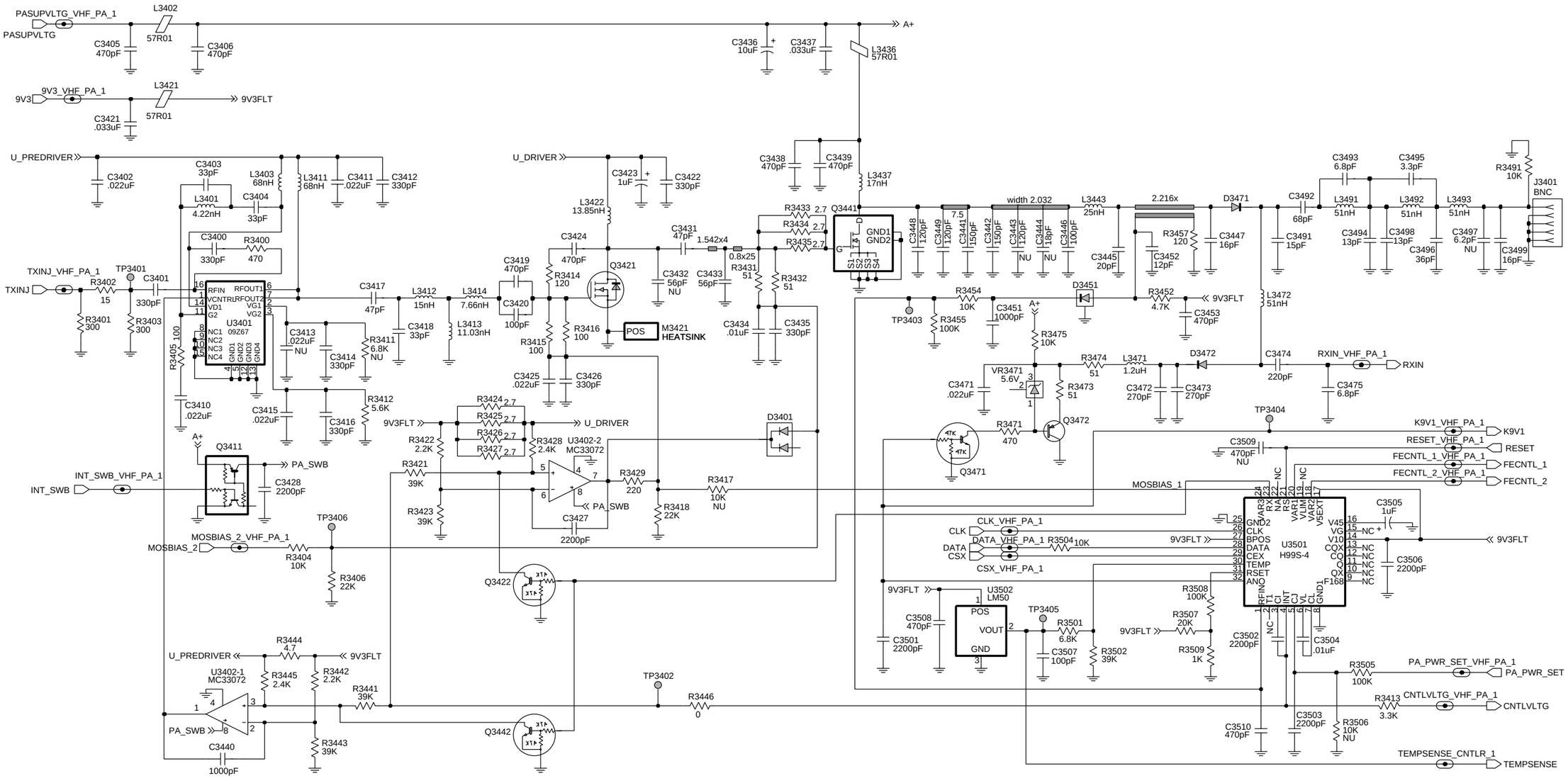
6881091C63-C



ZWG01300398-P4

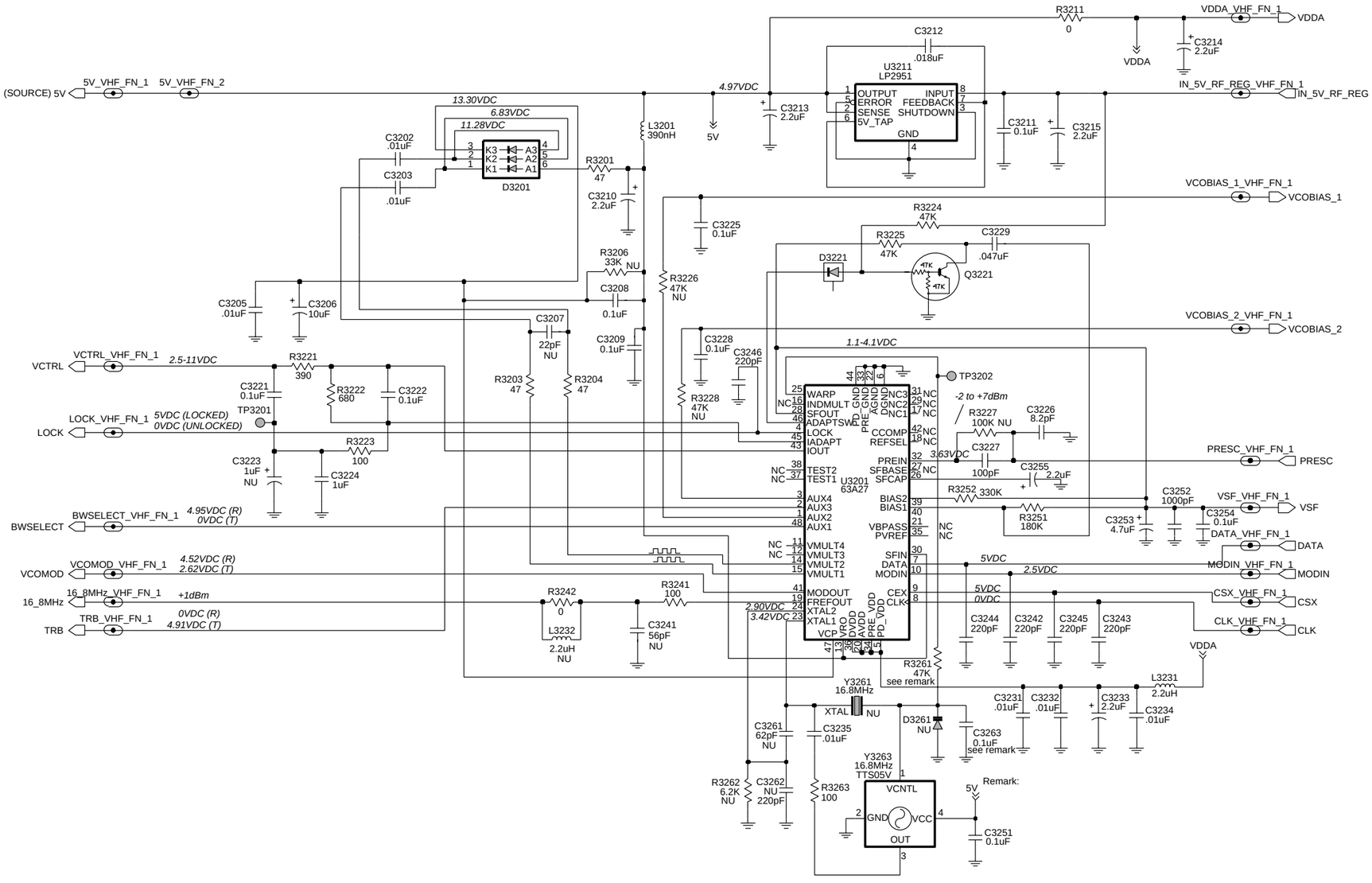
VHF (136-174 MHz) 1-25W PCB 8486172B04 Bottom Side

6881091C63-C



ZWG0130392-P4

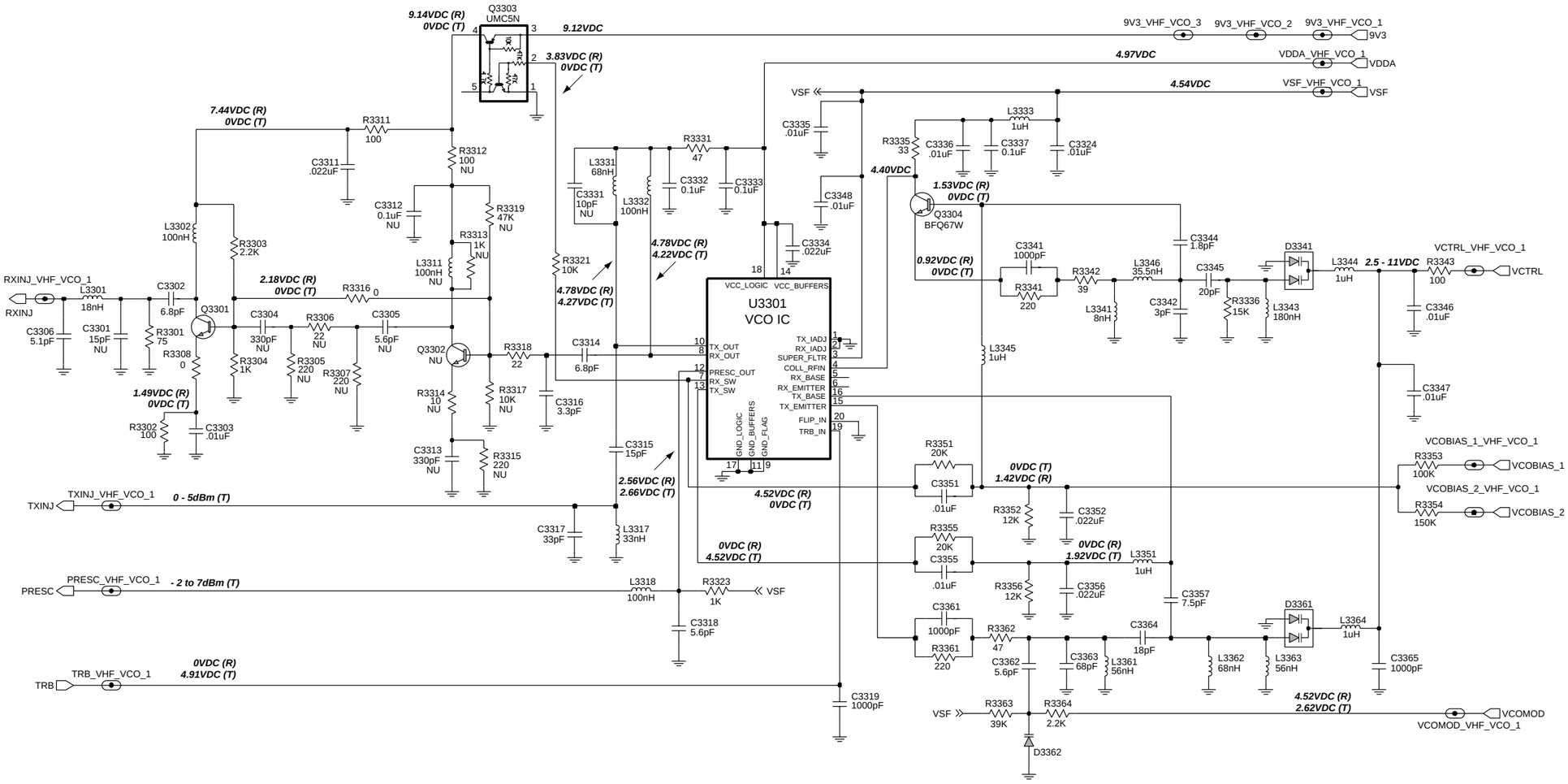
VHF (136-174 MHz) 1-25W Power Amplifier



ZWG0130393-P4

VHF (136-174 MHz) 1-25W FRACN Synthesizer

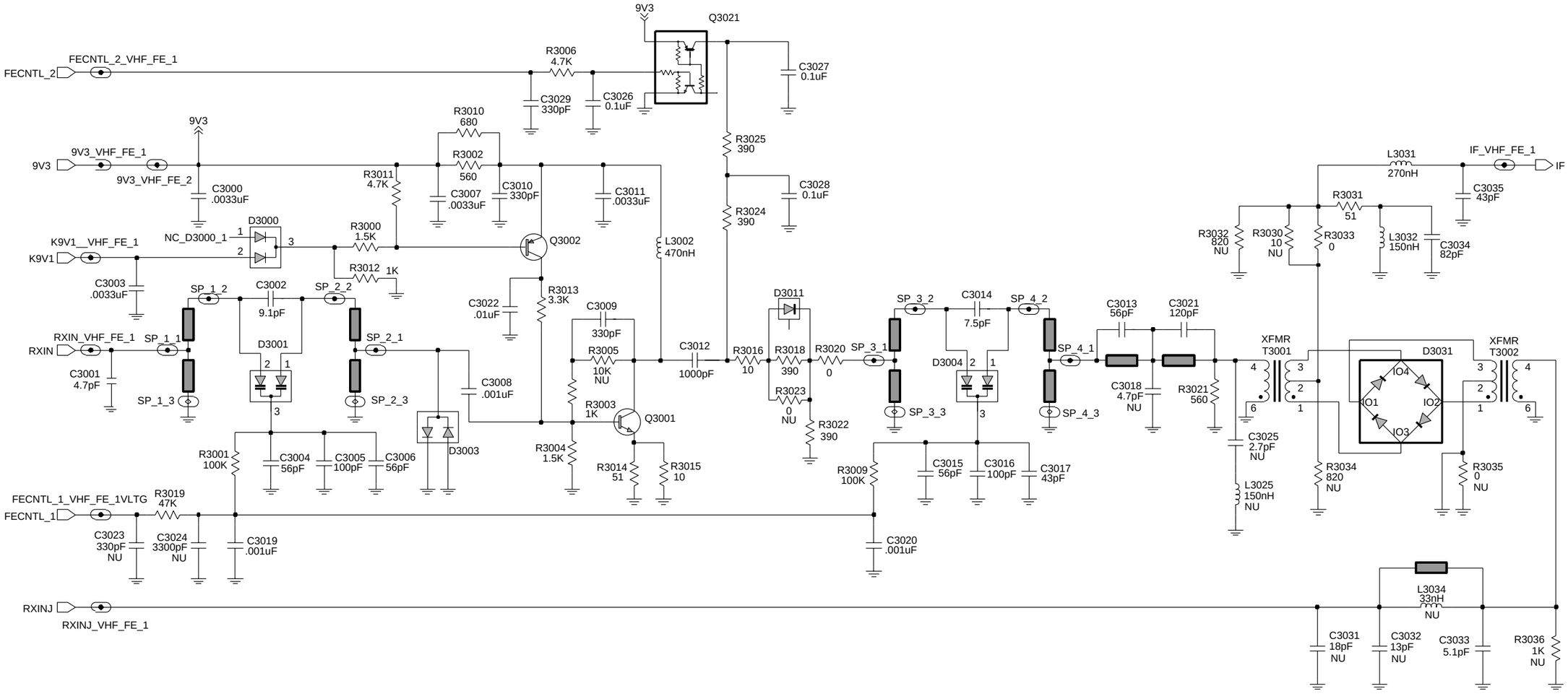
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ZWG0130394-P4

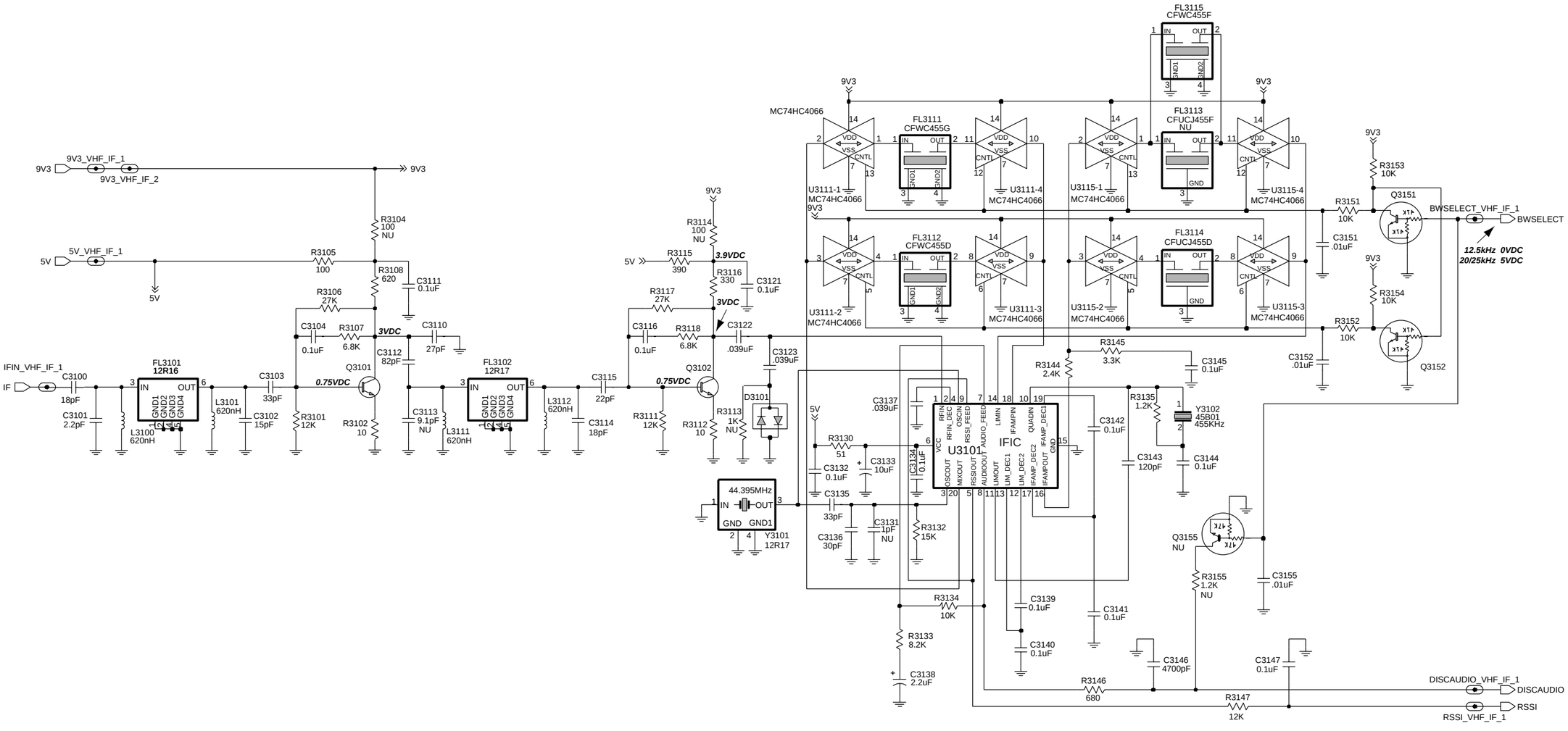
VHF (136-174 MHz) 1-25W Voltage Controlled Oscillator

6881091C63-C



ZWG0130395-P4

VHF (136-174 MHz) 1-25W Receiver Front-End



ZWG0130396-P4

VHF (136-174 MHz) 1-25W IF

6881091C63-C

VHF 1-25W PCB 8486172B04 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5% 50V
C3002	2113740F26	9.1pF 5% 50V
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5% 50V
C3005	2113740F51	100pF 5% 50V
C3006	2113740F45	56pF 5% 50V
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5% 50V
C3014	2113740F24	7.5pF 5% 50V
C3015	2113740F45	56pF 5% 50V
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113741F25	1nF 50V
C3027	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F42	43pF 5% 50V
C3100	2113740F33	18pF 5% 50V
C3101	2113740F11	2.2pF 5% 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF
C3121	2113743E20	100nF
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3132	2113743E20	100nF
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF
C3135	2113740L30	33pF 2%
C3136	2113740L29	30pF 2%
C3137	2113743E11	39nF 10%
C3138	2311049A40	TANT CP 2.2uF 10% 10V
C3139	2113743E20	100nF
C3140	2113743E20	100nF
C3141	2113743E20	100nF
C3142	2113743E20	100nF
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF
C3145	2113743E20	100nF
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3155	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF
C3209	2113743E20	100nF
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF
C3212	2113743E05	18nF
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF
C3222	2113743E20	100nF
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10% 10V
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3251	2113743E20	100nF
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF
C3333	2113743E20	100nF
C3334	2113743E07	22nF
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F33	18pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113740F63	330pF 5% 50V
C3401	2113740F63	330pF 5% 50V
C3402	2113743E07	22nF
C3403	2113740F39	33pF 5% 50V
C3404	2113740F39	33pF 5% 50V
C3405	2113740F67	470pF 5% 50V
C3406	2113740F67	470pF 5% 50V
C3410	2113743E07	22nF
C3411	2113743E07	22nF
C3412	2113740F63	330pF 5% 50V
C3414	2113740F63	330pF 5% 50V
C3415	2113743E07	22nF
C3416	2113740F63	330pF 5% 50V
C3417	2113740F43	47pF 5% 50V
C3418	2113740F39	33pF 5% 50V
C3419	2113741F17	470pF 50V
C3420	2113740F51	100pF 5% 50V
C3421	2113741A57	33nF 50V
C3422	2113740A67	330pF 5% 50V
C3423	2311049A08	TANT CP 1uF 10% 35V
C3424	2113740F67	470pF 5% 50V
C3425	2113743E07	22nF
C3426	2113740F63	330pF 5% 50V
C3427	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3431	2111078B34	HQ 47pF 5%
C3433	2111078B36	HQ 56pF 5%
C3434	2113741A45	10nF 50V
C3435	2113740A67	330pF 5% 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741A57	33nF 50V
C3438	2111078B59	HQ 470pF 5%
C3439	2111078B59	HQ 470pF 5%
C3440	2113741F25	1nF 50V
C3441	2111078B47	HQ 150pF 5%
C3442	2111078B47	HQ 150pF 5%
C3445	2111078B21	HQ 20pF 5%
C3446	2111078B42	HQ 100pF 5%
C3447	2111078B19	HQ 16pF 5%
C3448	2111078B44	HQ 120pF 5%
C3449	2111078B44	HQ 120pF 5%
C3451	2113741F25	1nF 50V
C3452	2113740F29	12pF 5% 50V
C3453	2113740F67	470pF 5% 50V
C3471	2113743E07	22nF
C3472	2111078B53	HQ 270pF 5%
C3473	2111078B53	HQ 270pF 5%
C3474	2113740F59	220pF 5% 50V
C3475	2113740F23	6.8pF 5% 50V
C3491	2111078B18	HQ 15pF 5%
C3492	2111078B38	HQ 68pF 5%
C3493	2111078B09	HQ 6.8pF 5%
C3494	2111078B16	HQ 13pF 5%
C3495	2111078B01	HQ 3.3pF 5%
C3496	2111078B31	HQ 36pF 5%
C3498	2111078B16	HQ 13pF 5%
C3499	2111078B19	HQ 16pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113741F33	2.2nF 50V
C3504	2113741F49	10nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V
C3507	2113740F51	100pF 5% 50V
C3508	2113740F67	470pF 5% 50V
C3510	2113740F67	470pF 5% 50V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER

Circuit Ref	Motorola Part No.	Description
D3101	4880154K03	DUAL SCHOTTKY SOT23
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3401	4813833C02	DUAL SOT MMBD6100
D3451	4880236E05	CHIP SCHOTTKY
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
FL3115	9180469V04	CER FLTR 6EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONNECTOR (MINI UHF)
L3002	2462587T23	COIL CHIP 470nH
L3021	2462587T30	COIL CHIP 1uH
L3031	2462587T20	COIL CHIP 270nH
L3032	2462587T17	COIL CHIP 150nH
L3100	2462587T25	COIL CHIP 620nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINISPRING AW IND 8NH2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2460591A01	SQUARE COIL 4.22nH 3T
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X43	IND CHIP LO-PRO 15.0 N
L3413	2460591B04	SQUARE COIL 11.03nH 4T
L3414	2460591A11	SQUARE COIL 7.66nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C23	SQUARE COIL 16nH 3T
L3436	2484657R01	Ferrite Bead
L3437	2460592A01	COIL AW 17nH 2T
L3443	2460591X02	COIL SQUARE 25nH
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460592B01	COIL AW 51nH 4T
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
M3421	2680499Z01	HEAT SPREADER
Q3001	4813827A07	NPN SML SIG MMBR9
Q3002	4813824A17	PNP 40V .2A B=100-
Q3021	4805921T02	DUAL ROHM FMC2 RH
Q3101	4813827A07	NPN SML SIG MMBR9
Q3102	4813827A07	NPN SML SIG MMBR9
Q3151	4880048M01	NPN DIG 47k/47k
Q3152	4880048M01	NPN DIG 47k/47k
Q3221	4880048M01	NPN DIG 47k/47k
Q3301	4813827A07	NPN SML SIG MMBR9
Q3303	4802245J50	DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4805921T02	DUAL ROHM FMC2 RH
Q3421	4802245J55	MRF1507
Q3422	4880048M01	NPN DIG 47k/47k
Q3441	4886136B01	LDMOS PWR MRF1565
Q3442	4880048M01	NPN DIG 47k/47k
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A39	390 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A39	390 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3020	0662057B47	0 1/16W
R3021	0662057A43	560 1/16W 5%
R3022	0662057A39	390 1/16W 5%
R3024	0662057A47	820 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3241	0662057A25	100 1/16W 5%
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057B02	150k 1/16W
R3263	0662057A25	100 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3363	0662057A87	39k 1/16W 5%
R3364	0662057A57	2200 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A36	300 1/16W 5%
R3402	0662057A05	15 1/16W 5%
R3403	0662057A36	300 1/16W 5%
R3404	0662057A73	10k 1/16W 5%
R3405	0662057A25	100 1/16W 5%
R3406	0662057A81	22k 1/16W 5%
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%
R3414	0683962T51	120 1W 5%
R3415	0662057A25	100 1/16W 5%
R3416	0662057A25	100 1/16W 5%
R3418	0662057A81	22k 1/16W 5%
R3421	0662057A87	39k 1/16W 5%
R3422	0662057A57	2200 1/16W 5%
R3423	0662057A87	39k 1/16W 5%
R3424	0662057C13	2.7 1/10W 5%
R3425	0662057C13	2.7 1/10W 5%
R3426	0662057C13	2.7 1/10W 5%
R3427	0662057C13	2.7 1/10W 5%
R3428	0662057A58	2400 1/16W 5%
R3429	0662057A33	220 1/16W 5%
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C13	2.7 1/10W 5%
R3434	0662057C13	2.7 1/10W 5%

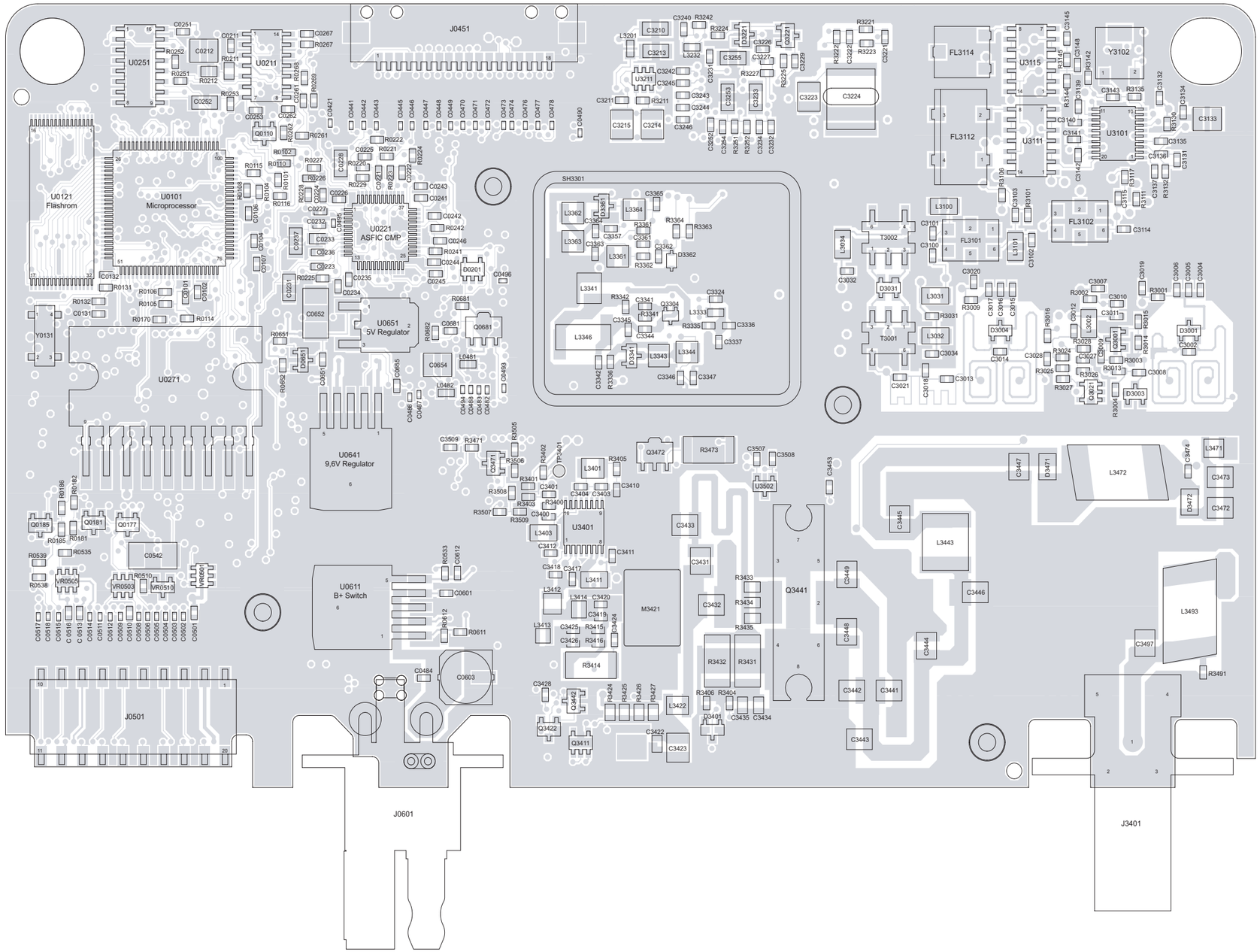
Circuit Ref	Motorola Part No.	Description
R3435	0662057C13	2.7 1/10W 5%
R3441	0662057A87	39k 1/16W 5%
R3442	0662057A57	2200 1/16W 5%
R3443	0662057A87	39k 1/16W 5%
R3444	0662057C19	4.7 1/10W 5%
R3445	0662057A58	2400 1/16W 5%
R3446	0662057B47	0 1/16W
R3452	0662057A65	4700 1/16W 5%
R3454	0662057A73	10k 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0683962T51	120 1W 5%
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3491	0662057A73	10k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3504	0662057A73	10k 1/16W 5%
R3505	0662057A97	100k 1/16W
R3507	0662057A80	20k 1/16W 5%
R3508	0662057A97	100k 1/16W
R3509	0662057A49	1k 1/16W 5%
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5185963A33	VLTG REG LP2951 SO8
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5105109Z67	LDMOS DRIVER VHF/UHF
U3402	5113818A03	IC HIGH PERFORMANCE SI
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
Y3101	4880606B09	CRYSTAL 44.395 MHZ
Y3102	9186145B02	44.85 MHZ XSTAL FLTR 60dB
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

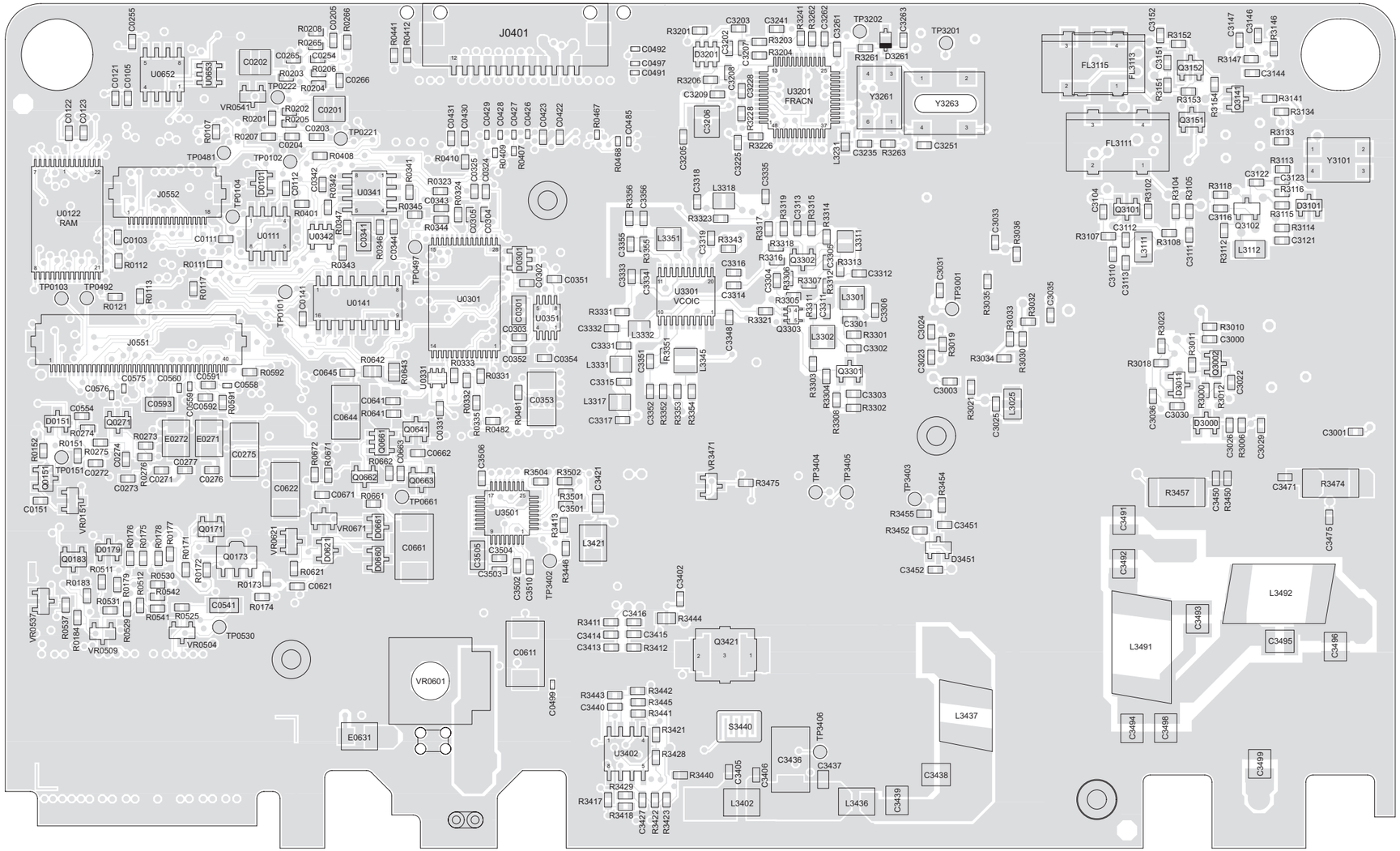
† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

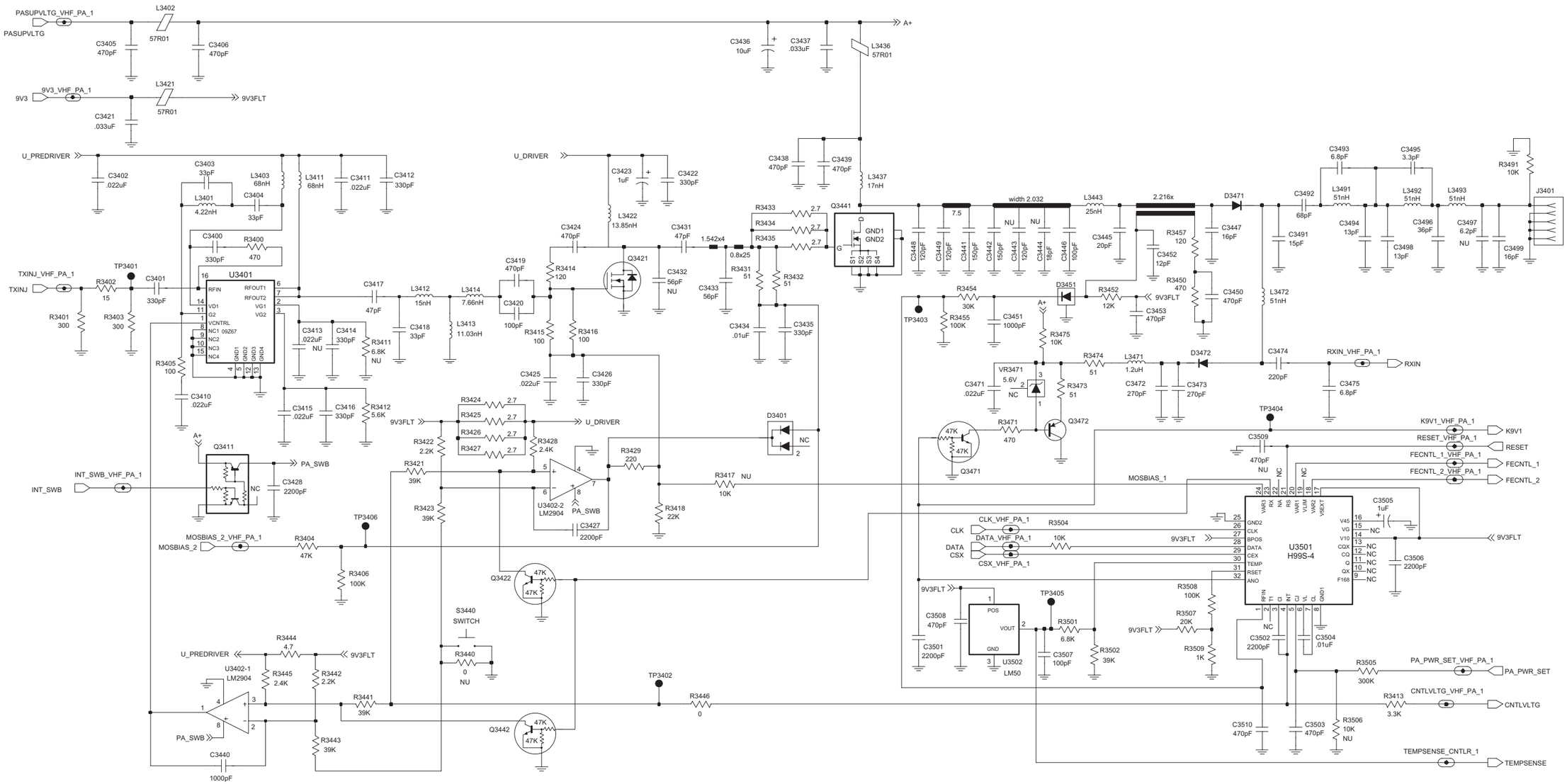
4.0 VHF (136-174 MHz) 1-25W PCB 8486172B06, Schematics, and Parts Lists



VHF (136-174 MHz) 1-25W PCB 8486172B06 Top Side

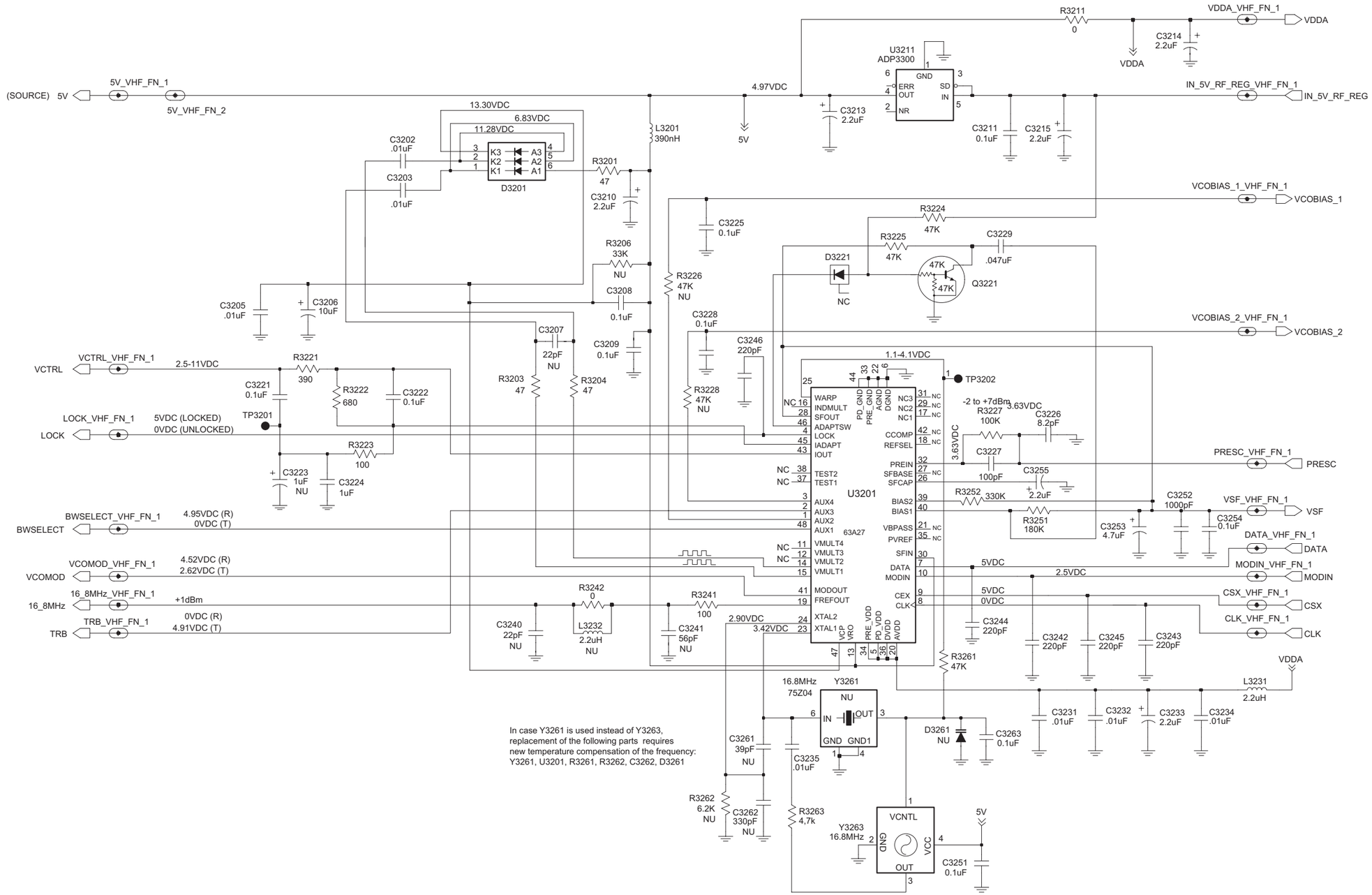
6881091C63-C


J0401
U0122 RAM
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U0351
U3301 VCOIC
U3201 FRACN
U3501
U3402
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VHF (136-174 MHz) 1-25W Power Amplifier for PCBs 8486172B06 and 8486172B07

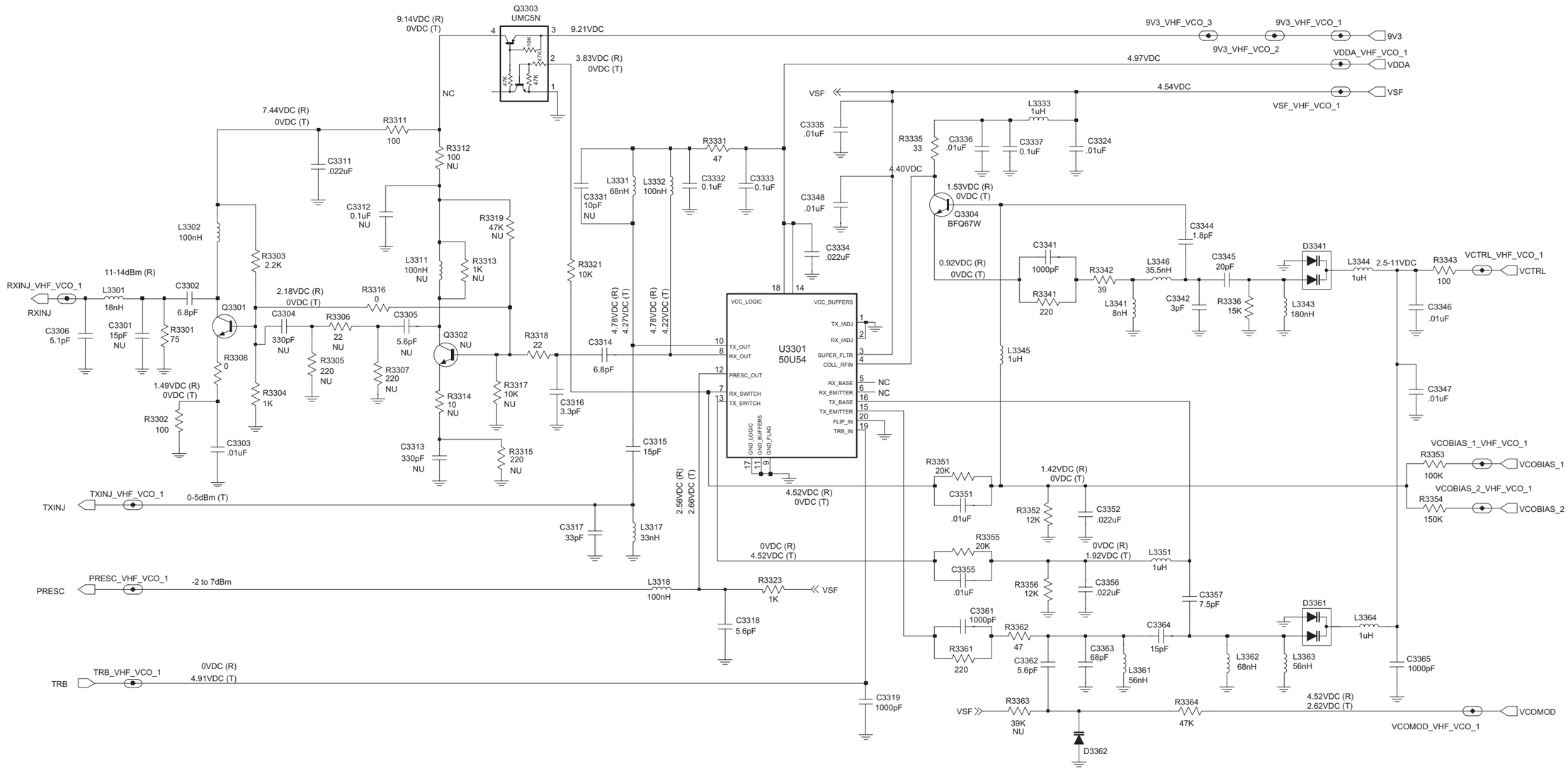
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ZWG0130393-A

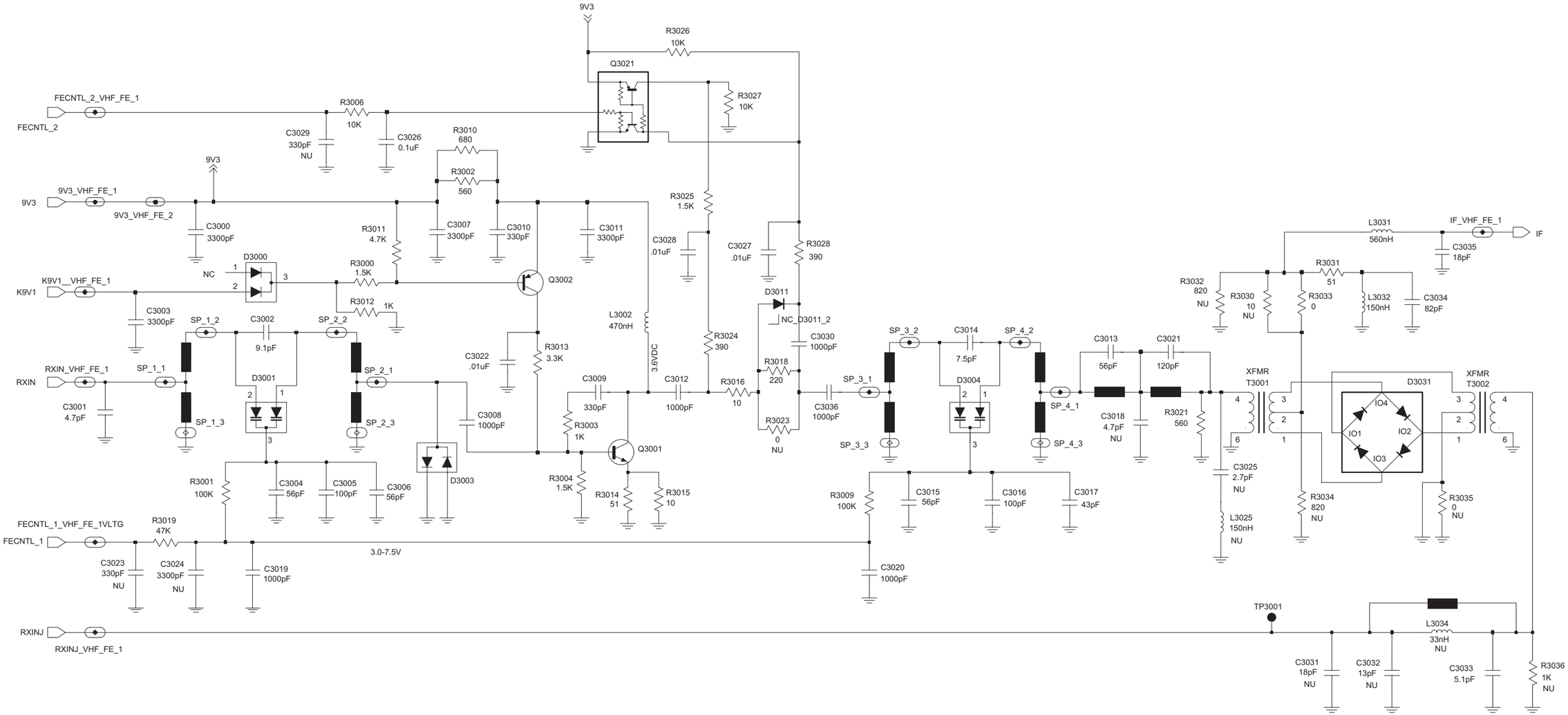
VHF (136-174 MHz) 1-25W FRACN Synthesizer

6881091C63-C



VHF (136-174 MHz) 1-25W Voltage Controlled Oscillator for PCBs 8486172B06, 8486172B07 and 8486172B08

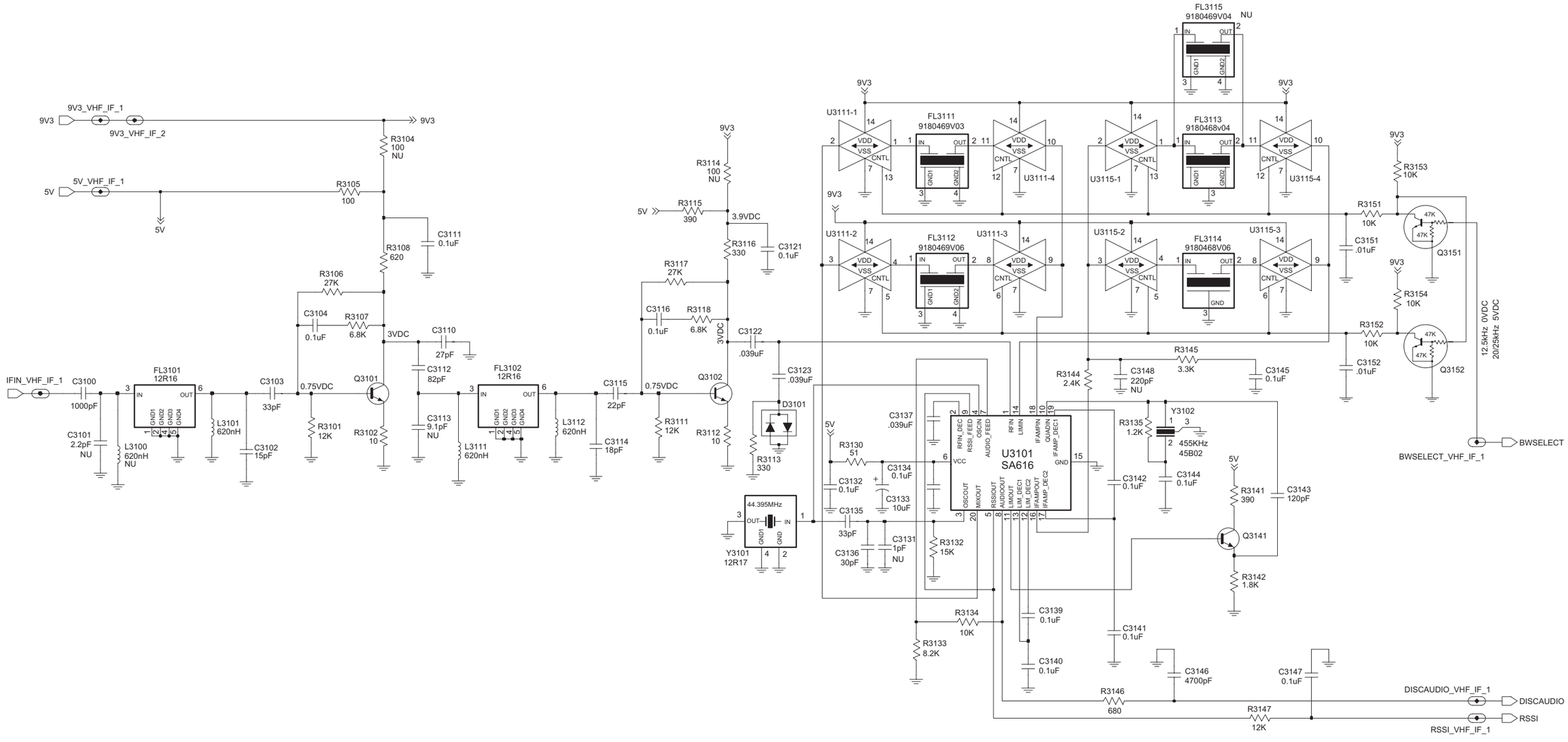
6881091C63-C



ZWG0130395-A

VHF (136-174 MHz) 1-25W Receiver Front-End for PCBs 8486172B06, 8486172B07 and 8486172B08

6881091C63-C



VHF (136-174 MHz) 1-25W IF

ZWG0130396-O

VHF 1-25W PCB 8486172B06 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5%
C3002	2113740F26	9.1pF 5%
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5%
C3005	2113740F51	100pF 5%
C3006	2113740F45	56pF 5%
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5%
C3014	2113740F24	7.5pF 5%
C3015	2113740F45	56pF 5%
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113743E20	100nF 16V
C3027	2113741F49	10nF 50V
C3028	2113741F49	10nF 50V
C3030	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F33	18pF 5% 50V
C3036	2113741F25	1nF 50V
C3100	2113741F25	1nF 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF 16V
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF 16V
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF 16V
C3121	2113743E20	100nF 16V
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3132	2113743E20	100nF 16V
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF 16V
C3135	2113740L30	33pF 2%
C3136	2113740L29	30pF 2%
C3137	2113743E11	39nF 10%
C3139	2113743E20	100nF 16V
C3140	2113743E20	100nF 16V
C3141	2113743E20	100nF 16V
C3142	2113743E20	100nF 16V
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF 16V
C3145	2113743E20	100nF 16V
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF 16V
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF 16V
C3209	2113743E20	100nF 16V
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF 16V
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP 2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF 16V
C3222	2113743E20	100nF 16V
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF 16V
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF 16V
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10%
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3251	2113743E20	100nF 16V
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF 16V
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF 16V
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF 16V
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF 16V
C3333	2113743E20	100nF 16V
C3334	2113743E07	22nF 16V
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF 16V
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF 16V
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF 16V
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F31	15pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113740F63	330pF 5% 50V
C3401	2113740F63	330pF 5% 50V
C3402	2113743E07	22nF 16V
C3403	2113740F39	33pF 5% 50V
C3404	2113740F39	33pF 5% 50V
C3405	2113740F67	470pF 5% 50V
C3406	2113740F67	470pF 5% 50V
C3410	2113743E07	22nF 16V
C3411	2113743E07	22nF 16V
C3412	2113740F63	330pF 5% 50V
C3414	2113740F63	330pF 5% 50V
C3415	2113743E07	22nF 16V
C3416	2113740F63	330pF 5% 50V
C3417	2113740F43	47pF 5% 50V
C3418	2113740F39	33pF 5% 50V
C3419	2113740F57	180pF 5% 50V
C3420	2113740F57	180pF 5% 50V
C3421	2113741A57	33nF 50V
C3422	2113740A67	330pF 5% 50V
C3423	2311049A08	TANT CP 1uF 10% 35V
C3424	2113740F67	470pF 5% 50V
C3425	2113743E07	22nF 16V
C3426	2113740F63	330pF 5% 50V
C3427	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3431	2111078B34	HQ 47pF 5%
C3433	2111078B36	HQ 56pF 5%
C3434	2113741A45	10nF 50V
C3435	2113740A67	330pF 5% 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741A57	33nF 50V
C3438	2111078B59	HQ 470pF 5%
C3439	2111078B59	HQ 470pF 5%
C3440	2113741F25	1nF 50V
C3441	2111078B47	HQ 150pF 5%
C3442	2111078B47	HQ 150pF 5%
C3445	2111078B21	HQ 20pF 5%
C3446	2111078B42	HQ 100pF 5%
C3447	2111078B19	HQ 16pF 5%
C3448	2111078B44	HQ 120pF 5%
C3449	2111078B44	HQ 120pF 5%
C3450	2113740F67	470pF 5% 50V
C3451	2113741F25	1nF 50V
C3452	2113740F29	12pF 5% 50V
C3453	2113740F67	470pF 5% 50V
C3471	2113743E07	22nF 16V
C3472	2111078B53	HQ 270pF 5%
C3473	2111078B53	HQ 270pF 5%
C3474	2113740F59	220pF 5% 50V
C3475	2113740F23	6.8pF 5% 50V
C3491	2111078B18	HQ 15pF 5%
C3492	2111078B38	HQ 68pF 5%
C3493	2111078B09	HQ 6.8pF 5%
C3494	2111078B16	HQ 13pF 5%
C3495	2111078B01	HQ 3.3pF 5%
C3496	2111078B31	HQ 36pF 5%
C3498	2111078B16	HQ 13pF 5%
C3499	2111078B19	HQ 16pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113740F67	470pF 5% 50V
C3504	2113741F49	10nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V X7R
C3507	2113740F51	100pF 5% 50V
C3508	2113740F67	470pF 5% 50V
C3510	2113740F67	470pF 5% 50V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER

Circuit Ref	Motorola Part No.	Description
D3101	4880154K03	DIODE DUAL SCHOTTKY
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3401	4813833C02	DUAL SOT MMBD6100
D3451	4880236E05	CHIP SCHOTTKY
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85 MHZ XTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ XTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3113	9180468V04	CER FLTR 4EL 455 KHZ SMD
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONN MINI UHF
L3002	2462587T23	COIL CHIP 470nH
L3031	2462587T24	COIL CHIP 560nH
L3032	2462587T17	COIL CHIP 150nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINI-SPRING AW IND 8NH 2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2460591A01	SQUARE COIL 4.22nH 3T

Circuit Ref	Motorola Part No.	Description
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X43	IND CHIP LO-PRO 15.0
L3413	2460591B04	SQUARE COIL 11.03nH 4T
L3414	2460591A11	SQUARE COIL 7.66nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C23	SQUARE COIL 16nH 3T
L3436	2484657R01	Ferrite Bead
L3437	2460592A01	COIL AW 17nH 2T
L3443	2460591X02	COIL SQUARE 25nH
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460592B01	COIL AW 51nH 4T
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
M3421	2686201B01	HEAT SPREADER
Q3001	4813827A07	TSTR NPN SML SIG MMBR9
Q3002	4813824A17	TSTR PNP 40V .2A B=100-
Q3021	4805921T02	TSTR DUAL ROHM FMC2
Q3101	4813827A07	TSTR NPN SML SIG MMBR9
Q3102	4813827A07	TSTR NPN SML SIG MMBR9
Q3141	4813824A10	TSTR NPN 40V .2A B=50-150
Q3151	4880048M01	TSTR NPN DIG 47k/47k
Q3152	4880048M01	TSTR NPN DIG 47k/47k
Q3221	4880048M01	TSTR NPN DIG 47k/47k
Q3301	4813827A07	TSTR NPN SML SIG MMBR9
Q3303	4802245J50	TSTR DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4805921T02	DUAL ROHM FMC2 RH
Q3421	4802245J55	MRF1507
Q3422	4880048M01	NPN DIG 47k/47k
Q3441	4886136B01	LDMOS PWR TSTR MRF1565 MRF1550
Q3442	4880048M01	NPN DIG 47k/47k
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A73	10k 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A33	220 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3021	0662057A43	560 1/16W 5%
R3024	0662057A39	390 1/16W 5%
R3025	0662057A53	1500 1/16W 5%
R3026	0662057A73	10k 1/16W 5%
R3027	0662057A73	10k 1/16W 5%
R3028	0662057A39	390 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3113	0662057A37	330 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3141	0662057A39	390 1/16W 5%
R3142	0662057A55	1800 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	CHIP RES 680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3227	0662057A97	100k 1/16W
R3241	0662057A25	100 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057A89	47k 1/16W 5%
R3263	0662057A65	4700 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3364	0662057A89	47k 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A36	300 1/16W 5%
R3402	0662057A05	15 1/16W 5%
R3403	0662057A36	300 1/16W 5%
R3404	0662057A89	47k 1/16W 5%
R3405	0662057A25	100 1/16W 5%
R3406	0662057A97	100k 1/16W
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%
R3414	0683962T51	120 1W 5%
R3415	0662057A25	100 1/16W 5%
R3416	0662057A25	100 1/16W 5%
R3418	0662057A81	22k 1/16W 5%
R3421	0662057A87	39k 1/16W 5%
R3422	0662057A57	2200 1/16W 5%
R3423	0662057A87	39k 1/16W 5%
R3424	0662057C13	2.7 1/10W 5%
R3425	0662057C13	2.7 1/10W 5%
R3426	0662057C13	2.7 1/10W 5%
R3427	0662057C13	2.7 1/10W 5%
R3428	0662057A58	2400 1/16W 5%

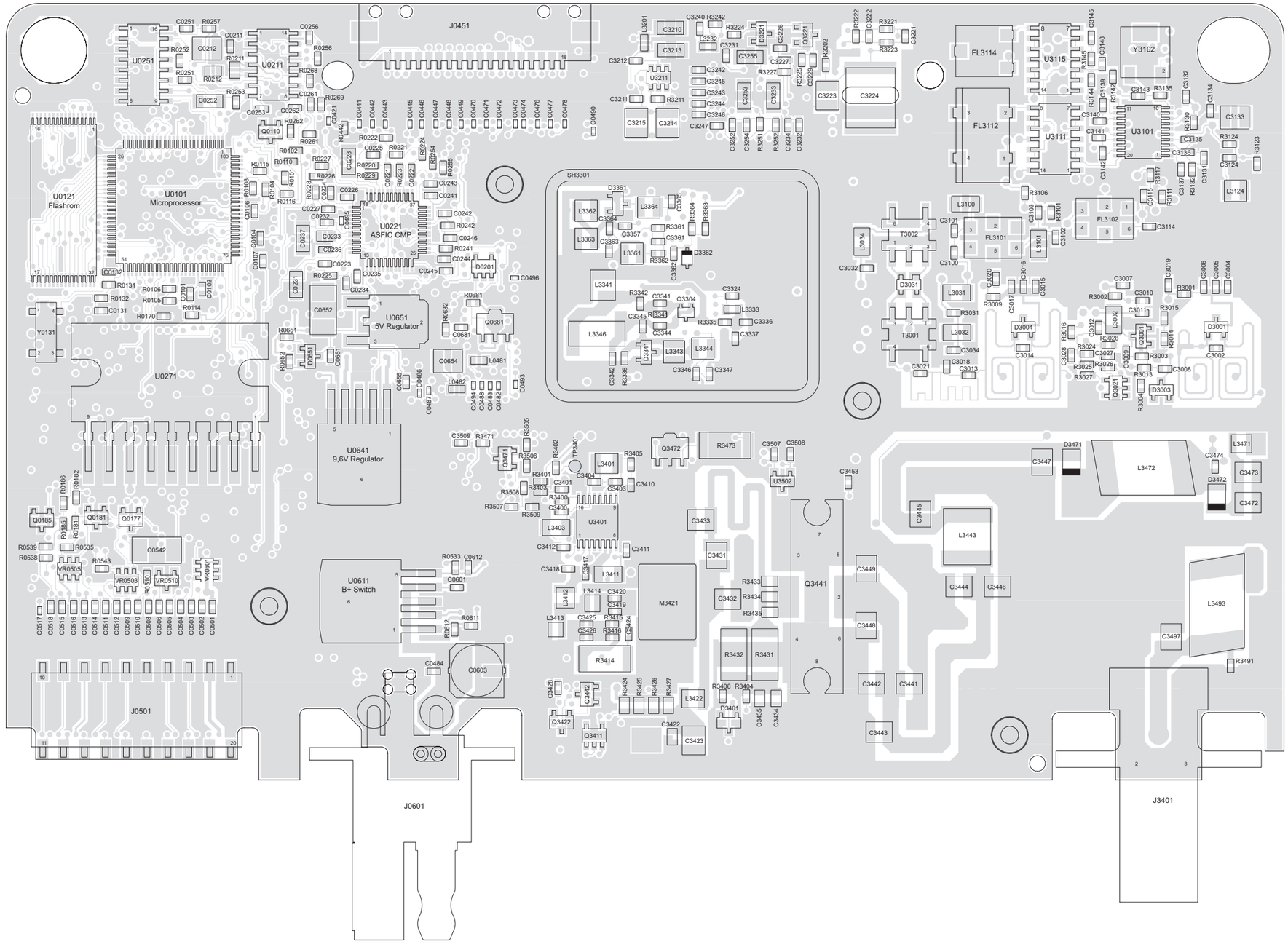
Circuit Ref	Motorola Part No.	Description
R3429	0662057A33	220 1/16W 5%
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C13	2.7 1/10W 5%
R3434	0662057C13	2.7 1/10W 5%
R3435	0662057C13	2.7 1/10W 5%
R3441	0662057A87	39k 1/16W 5%
R3442	0662057A57	2200 1/16W 5%
R3443	0662057A87	39k 1/16W 5%
R3444	0662057C19	4.7 1/10W 5%
R3445	0662057A58	2400 1/16W 5%
R3446	0662057B47	0 1/16W
R3450	0662057A41	470 1/16W 5%
R3452	0662057A75	12k 1/16W 5%
R3454	0662057A84	30k 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0683962T51	120 1W 5%
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3491	0662057A73	10k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3504	0662057A73	10k 1/16W 5%
R3505	0662057B09	300k 1/16W 5%
R3507	0662057A80	20k 1/16W 5%
R3508	0662057A97	100k 1/16W
R3509	0662057A49	1k 1/16W 5%
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3201	5185963A27	IC TESTED AT25016 48PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5105109Z67	LDMOS DRIVER VHF/UHF
U3402	5180932W01	LINEAR IC OP-AMP
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
VR3471	4813830A15	5.6V 5% 225mW
Y3101	4880606B09	CRYSTAL 44.395 MHZ
Y3102	9186145B02	CERAMIC DISCRIMINATOR 455kHz
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD)using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

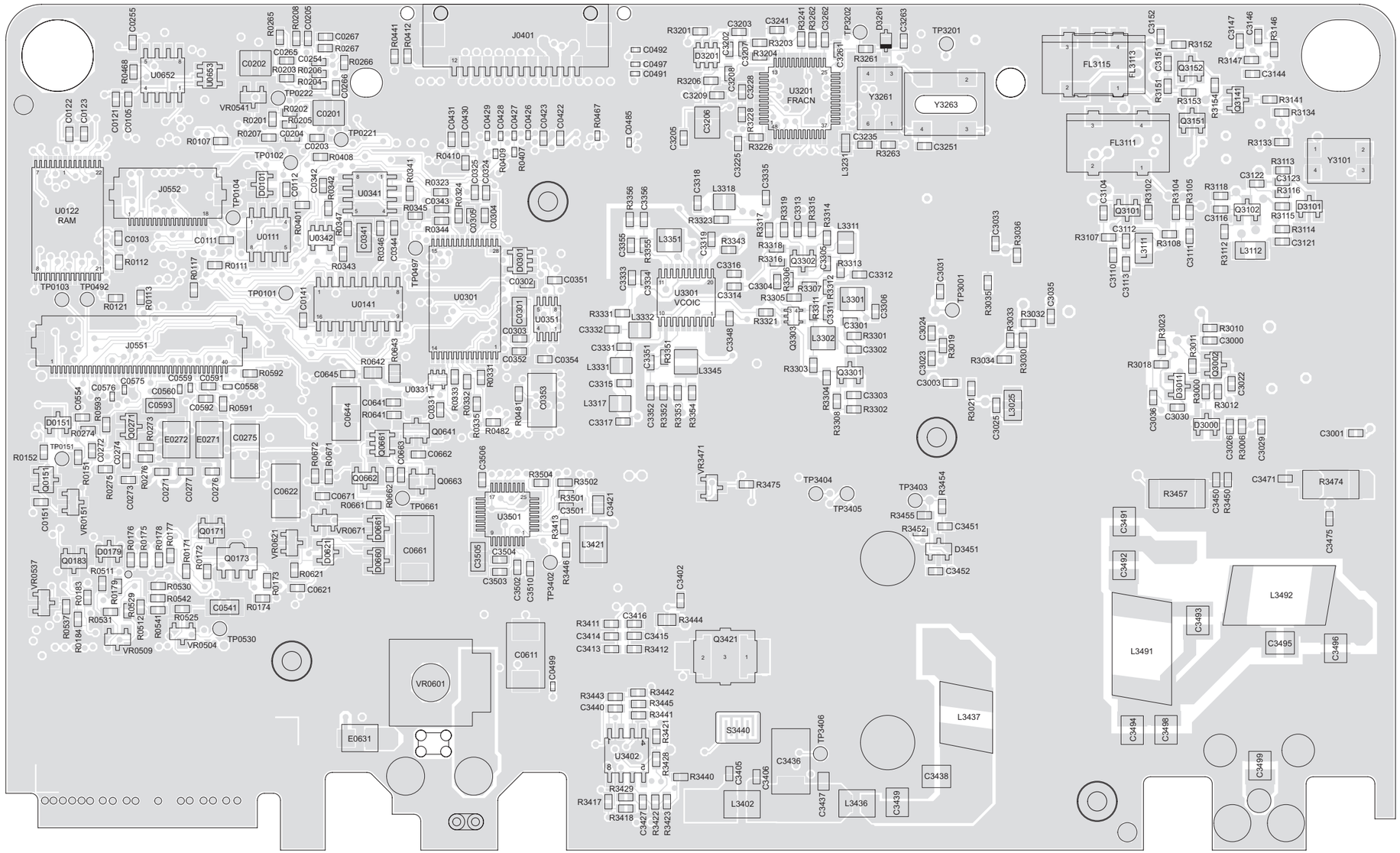
5.0 VHF (136-174 MHz) 1-25W PCB 8486172B07, Schematics, and Parts Lists

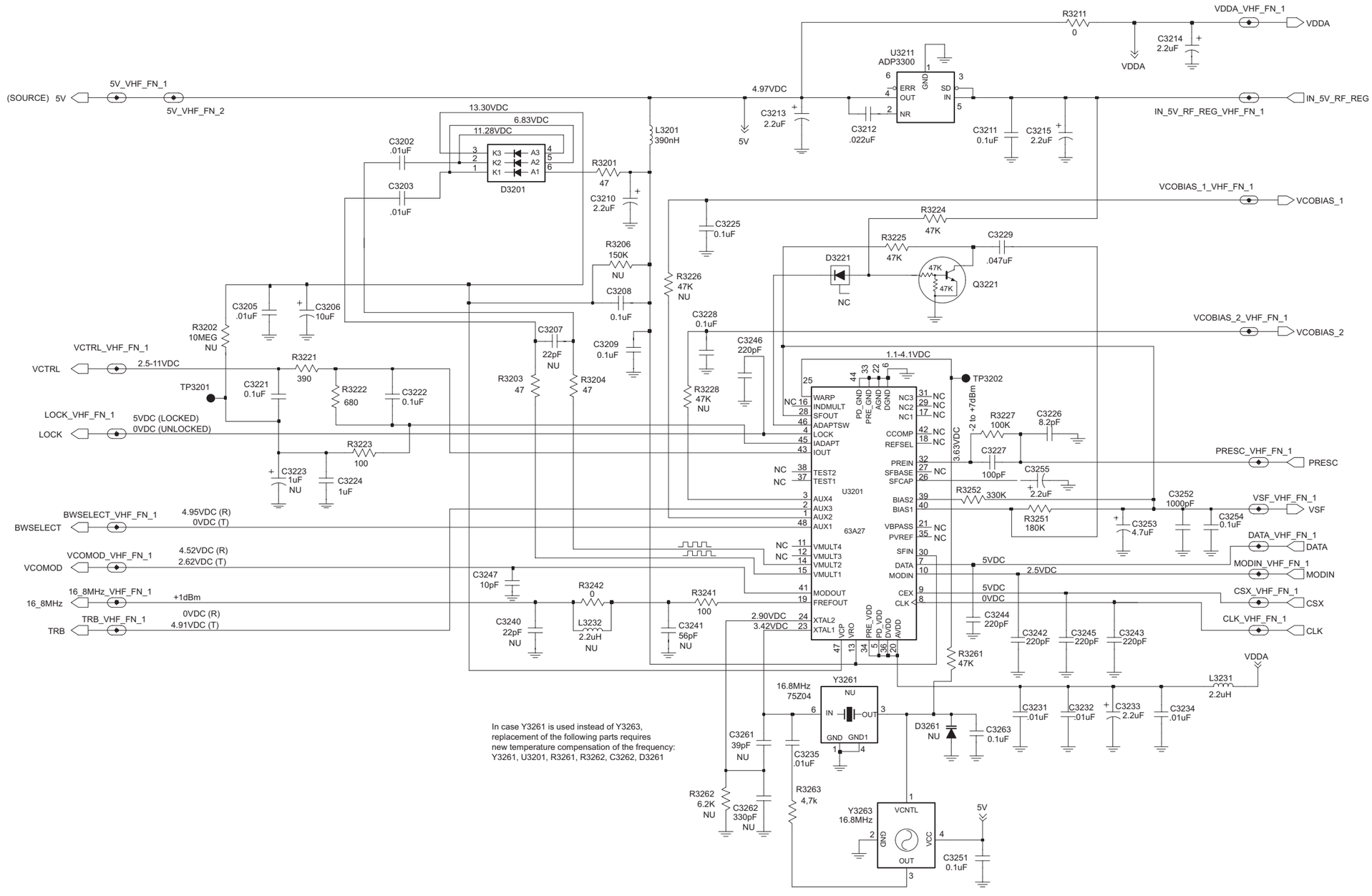


ZWG0130397-A

VHF (136-174 MHz) 1-25W PCB 8486172B07 Top Side

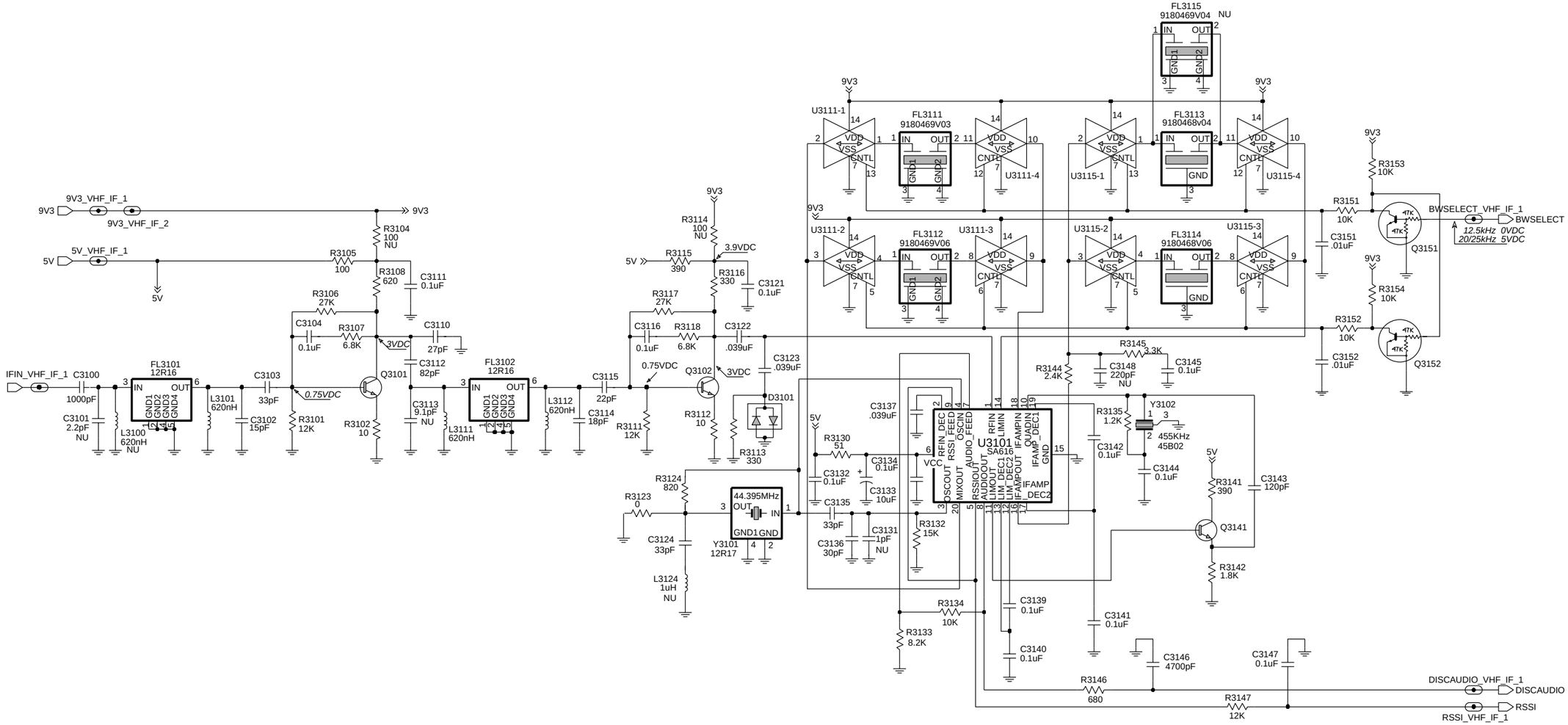
6881091C63-C


J0401
U0652
U0653
VR0541
TP0222
TP0221
TP0102
TP0104
J0552
U0122
RAM
U0111
U0341
U0342
TP0103
TP0492
TP0101
U0141
J0551
U0301
U0351
U0331
TP0497
U3301
VCOIC
U3201
FRACN
Y3261
Y3263
Y3101
FL3115
FL3313
FL3111
TP3202
TP3201
TP3001
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L3436
L3491
L3492
S3440
U3402
U3501
VR0601
E0631
VR0504
VR0509
VR0671
VR0621
VR3471
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VHF (136-174 MHz) 1-25W FRACN Synthesizer

6881091C63-C



ZWG0130565-O

VHF (136-174 MHz) 1-25W IF

6881091C63-C

VHF 1-25W PCB 8486172B07 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5%
C3002	2113740F26	9.1pF 5%
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5%
C3005	2113740F51	100pF 5%
C3006	2113740F45	56pF 5%
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5%
C3014	2113740F24	7.5pF 5%
C3015	2113740F45	56pF 5%
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113743E20	100nF 16V
C3027	2113741F49	10nF 50V
C3028	2113741F49	10nF 50V
C3030	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F33	18pF 5% 50V
C3036	2113741F25	1nF 50V
C3100	2113741F25	1nF 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF 16V
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF 16V
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF 16V
C3121	2113743E20	100nF 16V
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3124	2113740L30	33pF 2%
C3132	2113743E20	100nF 16V
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF 16V
C3135	2113740L30	33pF 2%
C3136	2113740L29	30pF 2%
C3137	2113743E11	39nF 10%
C3139	2113743E20	100nF 16V
C3140	2113743E20	100nF 16V
C3141	2113743E20	100nF 16V
C3142	2113743E20	100nF 16V
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF 16V
C3145	2113743E20	100nF 16V
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF 16V
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF 16V
C3209	2113743E20	100nF 16V
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF 16V
C3212	2113743E07	22nF 16V
C3312	2113743E07	22nF 16V
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP 2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF 16V
C3222	2113743E20	100nF 16V
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF 16V
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF 16V
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10%
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3247	2113740F27	10pF 5% 50V
C3251	2113743E20	100nF 16V
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF 16V
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF 16V
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF 16V
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF 16V
C3333	2113743E20	100nF 16V
C3334	2113743E07	22nF 16V
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF 16V
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF 16V
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF 16V
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F31	15pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113740F63	330pF 5% 50V
C3401	2113740F63	330pF 5% 50V
C3402	2113743E07	22nF 16V
C3403	2113740F39	33pF 5% 50V
C3404	2113740F39	33pF 5% 50V
C3405	2113740F67	470pF 5% 50V
C3406	2113740F67	470pF 5% 50V
C3410	2113743E07	22nF 16V
C3411	2113743E07	22nF 16V
C3412	2113740F63	330pF 5% 50V
C3414	2113740F63	330pF 5% 50V
C3415	2113743E07	22nF 16V
C3416	2113740F63	330pF 5% 50V
C3417	2113740F43	47pF 5% 50V
C3418	2113740F39	33pF 5% 50V
C3419	2113740F57	180pF 5% 50V
C3420	2113740F57	180pF 5% 50V
C3421	2113741A57	33nF 50V
C3422	2113740A67	330pF 5% 50V
C3423	2311049A08	TANT CP 1uF 10% 35V
C3424	2113740F67	470pF 5% 50V
C3425	2113743E07	22nF 16V
C3426	2113740F63	330pF 5% 50V
C3427	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3431	2111078B34	HQ 47pF 5%
C3433	2111078B36	HQ 56pF 5%
C3434	2113741A45	10nF 50V
C3435	2113740A67	330pF 5% 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741A57	33nF 50V
C3438	2111078B59	HQ 470pF 5%
C3439	2111078B59	HQ 470pF 5%
C3440	2113741F25	1nF 50V
C3441	2111078B47	HQ 150pF 5%
C3442	2111078B47	HQ 150pF 5%
C3445	2111078B21	HQ 20pF 5%
C3446	2111078B42	HQ 100pF 5%
C3447	2111078B19	HQ 16pF 5%
C3448	2111078B44	HQ 120pF 5%
C3449	2111078B44	HQ 120pF 5%
C3450	2113740F67	470pF 5% 50V
C3451	2113741F25	1nF 50V
C3452	2113740F29	12pF 5% 50V
C3453	2113740F67	470pF 5% 50V
C3471	2113743E07	22nF 16V
C3472	2111078B53	HQ 270pF 5%
C3473	2111078B53	HQ 270pF 5%
C3474	2113740F59	220pF 5% 50V
C3475	2113740F23	6.8pF 5% 50V
C3491	2111078B18	HQ 15pF 5%
C3492	2111078B38	HQ 68pF 5%
C3493	2111078B09	HQ 6.8pF 5%
C3494	2111078B16	HQ 13pF 5%
C3495	2111078B01	HQ 3.3pF 5%
C3496	2111078B31	HQ 36pF 5%
C3498	2111078B16	HQ 13pF 5%
C3499	2111078B19	HQ 16pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113740F67	470pF 5% 50V
C3504	2113741F49	10nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V X7R
C3507	2113740F51	100pF 5% 50V
C3508	2113740F67	470pF 5% 50V
C3510	2113740F67	470pF 5% 50V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23

Circuit Ref	Motorola Part No.	Description
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER
D3101	4880154K03	DIODE DUAL SCHOTTKY
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3401	4813833C02	DUAL SOT MMBD6100
D3451	4880236E05	CHIP SCHOTTKY
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85MHZ CRYSTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ CRYSTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3113	9180468V04	CER FLTR 4EL 455 KHZ SMD
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONN MINI UHF
L3002	2462587T23	COIL CHIP 470nH
L3031	2462587T24	COIL CHIP 560nH
L3032	2462587T17	COIL CHIP 150nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3124	2462587N68	1uH
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINI-SPRING AW IND 8NH 2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%

Circuit Ref	Motorola Part No.	Description
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2460591A01	SQUARE COIL 4.22nH 3T
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X43	IND CHIP LO-PRO 15.0
L3413	2460591B04	SQUARE COIL 11.03nH 4T
L3414	2460591A11	SQUARE COIL 7.66nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C23	SQUARE COIL 16nH 3T
L3436	2484657R01	Ferrite Bead
L3437	2460592A01	COIL AW 17nH 2T
L3443	2460591X02	COIL SQUARE 25nH
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460592B01	COIL AW 51nH 4T
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
M3421	2686201B01	HEAT SPREADER
Q3001	4813827A07	TSTR NPN SML SIG MMBR9
Q3002	4813824A17	TSTR PNP 40V .2A B=100-
Q3021	4805921T02	TSTR DUAL ROHM FMC2
Q3101	4813827A07	TSTR NPN SML SIG MMBR9
Q3102	4813827A07	TSTR NPN SML SIG MMBR9
Q3141	4813824A10	TSTR NPN 40V .2A B=50-150
Q3151	4880048M01	TSTR NPN DIG 47k/47k
Q3152	4880048M01	TSTR NPN DIG 47k/47k
Q3221	4880048M01	TSTR NPN DIG 47k/47k
Q3301	4813827A07	TSTR NPN SML SIG MMBR9
Q3303	4802245J50	TSTR DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4805921T02	DUAL ROHM FMC2 RH
Q3421	4802245J55	MRF1507
Q3422	4880048M01	NPN DIG 47k/47k
Q3441	4886136B01	LDMOS PWR TSTR MRF1565 MRF1550
Q3442	4880048M01	NPN DIG 47k/47k
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A73	10k 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A33	220 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3021	0662057A43	560 1/16W 5%
R3024	0662057A39	390 1/16W 5%
R3025	0662057A53	1500 1/16W 5%
R3026	0662057A73	10k 1/16W 5%
R3027	0662057A73	10k 1/16W 5%
R3028	0662057A39	390 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3113	0662057A37	330 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%
R3123	0662057B47	0 1/16W
R3124	0662057A47	820 1/16W
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3141	0662057A39	390 1/16W 5%
R3142	0662057A55	1800 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3202	0662057B46	10MEG
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3206	0662057B02	150k 1/16W
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3227	0662057A97	100k 1/16W
R3241	0662057A25	100 1/16W 5%
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057A89	47k 1/16W 5%
R3263	0662057A65	4700 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3364	0662057A89	47k 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A36	300 1/16W 5%
R3402	0662057A05	15 1/16W 5%
R3403	0662057A36	300 1/16W 5%
R3404	0662057A89	47k 1/16W 5%
R3405	0662057A25	100 1/16W 5%
R3406	0662057A97	100k 1/16W
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%

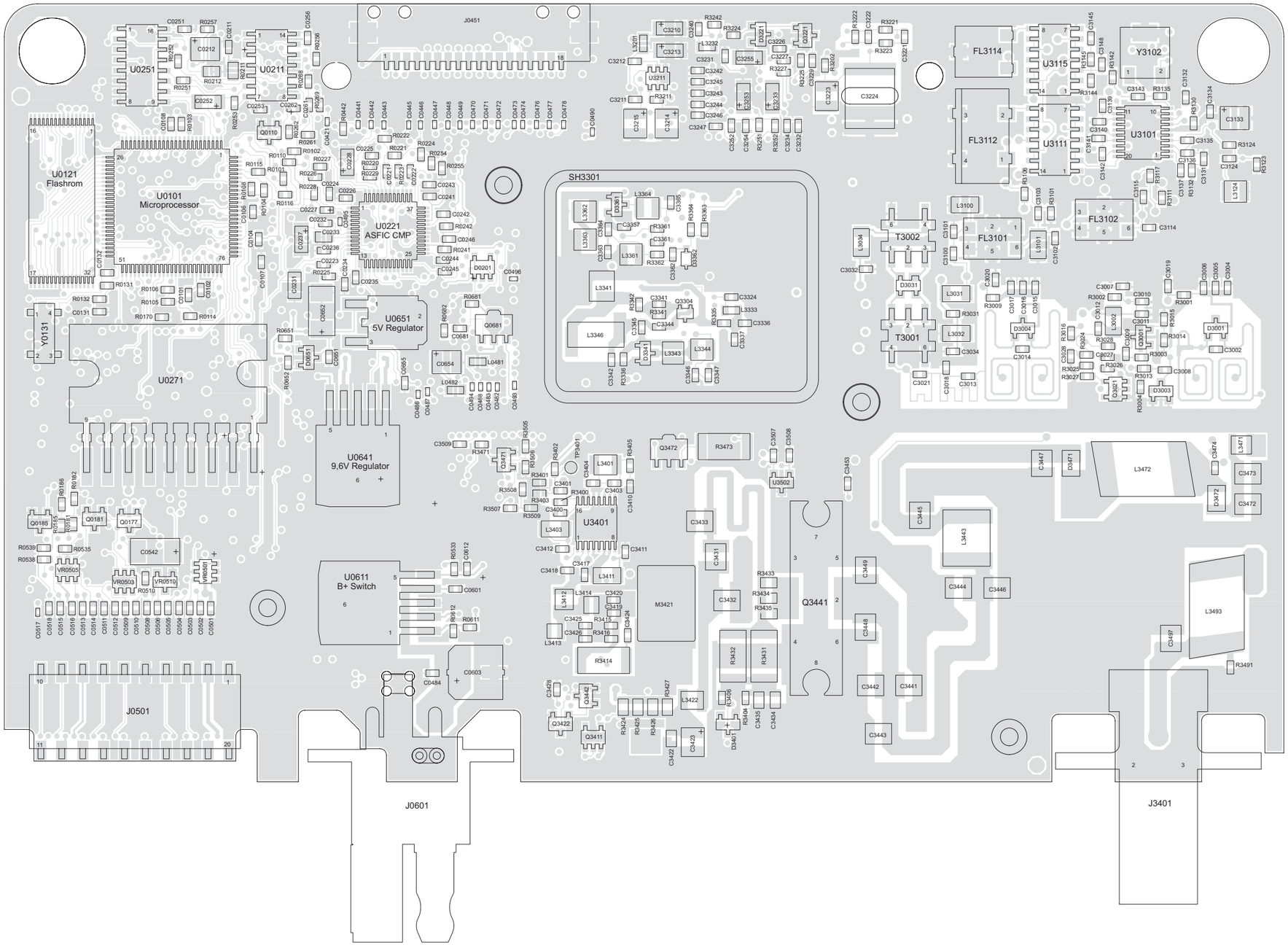
Circuit Ref	Motorola Part No.	Description
R3414	0683962T51	120 1W 5%
R3415	0662057A25	100 1/16W 5%
R3416	0662057A25	100 1/16W 5%
R3418	0662057A81	22k 1/16W 5%
R3421	0662057A87	39k 1/16W 5%
R3422	0662057A57	2200 1/16W 5%
R3423	0662057A87	39k 1/16W 5%
R3424	0662057C13	2.7 1/10W 5%
R3425	0662057C13	2.7 1/10W 5%
R3426	0662057C13	2.7 1/10W 5%
R3427	0662057C13	2.7 1/10W 5%
R3428	0662057A58	2400 1/16W 5%
R3429	0662057A33	220 1/16W 5%
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C13	2.7 1/10W 5%
R3434	0662057C13	2.7 1/10W 5%
R3435	0662057C13	2.7 1/10W 5%
R3441	0662057A87	39k 1/16W 5%
R3442	0662057A57	2200 1/16W 5%
R3443	0662057A87	39k 1/16W 5%
R3444	0662057C19	4.7 1/10W 5%
R3445	0662057A58	2400 1/16W 5%
R3446	0662057B47	0 1/16W
R3450	0662057A41	470 1/16W 5%
R3452	0662057A75	12k 1/16W 5%
R3454	0662057A84	30k 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0683962T51	120 1W 5%
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3491	0662057A73	10k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3504	0662057A73	10k 1/16W 5%
R3505	0662057B09	300k 1/16W 5%
R3507	0662057A80	20k 1/16W 5%
R3508	0662057A97	100k 1/16W
R3509	0662057A49	1k 1/16W 5%
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5105109Z67	LDMOS DRIVER VHF/UHF
U3402	5180932W01	LINEAR IC OP-AMP
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
VR3471	4813830A15	5.6V 5% 225mW
Y3101	4880606B09	CRYSTAL 44.395 MHZ
Y3102	9186145B02	CERAMIC DISCRIMINATOR 455kHz
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD)using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

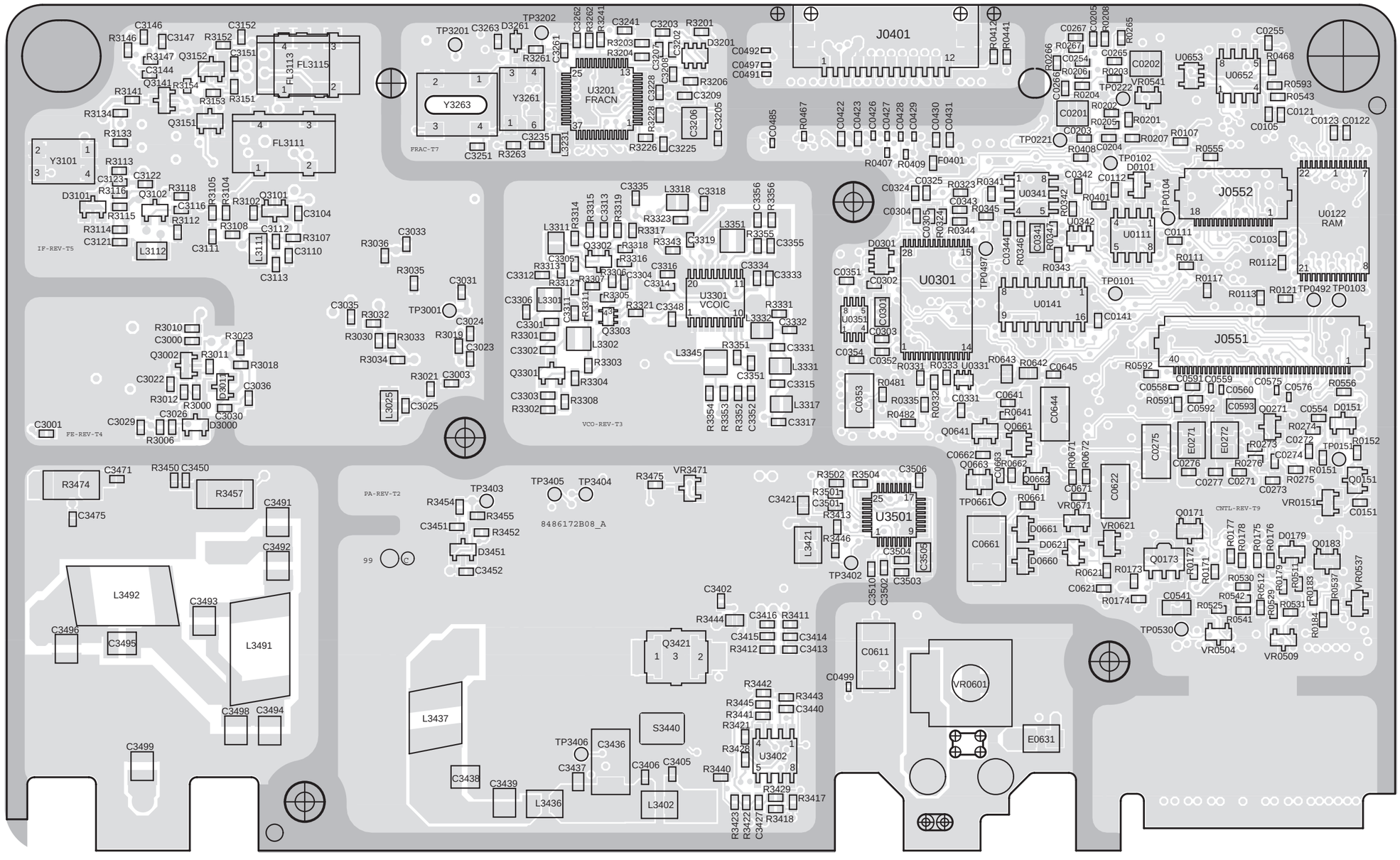
6.0 VHF (136-174 MHz) 1-25W PCB 8486172B08, Schematics, and Parts Lists



ZWG0130591-O

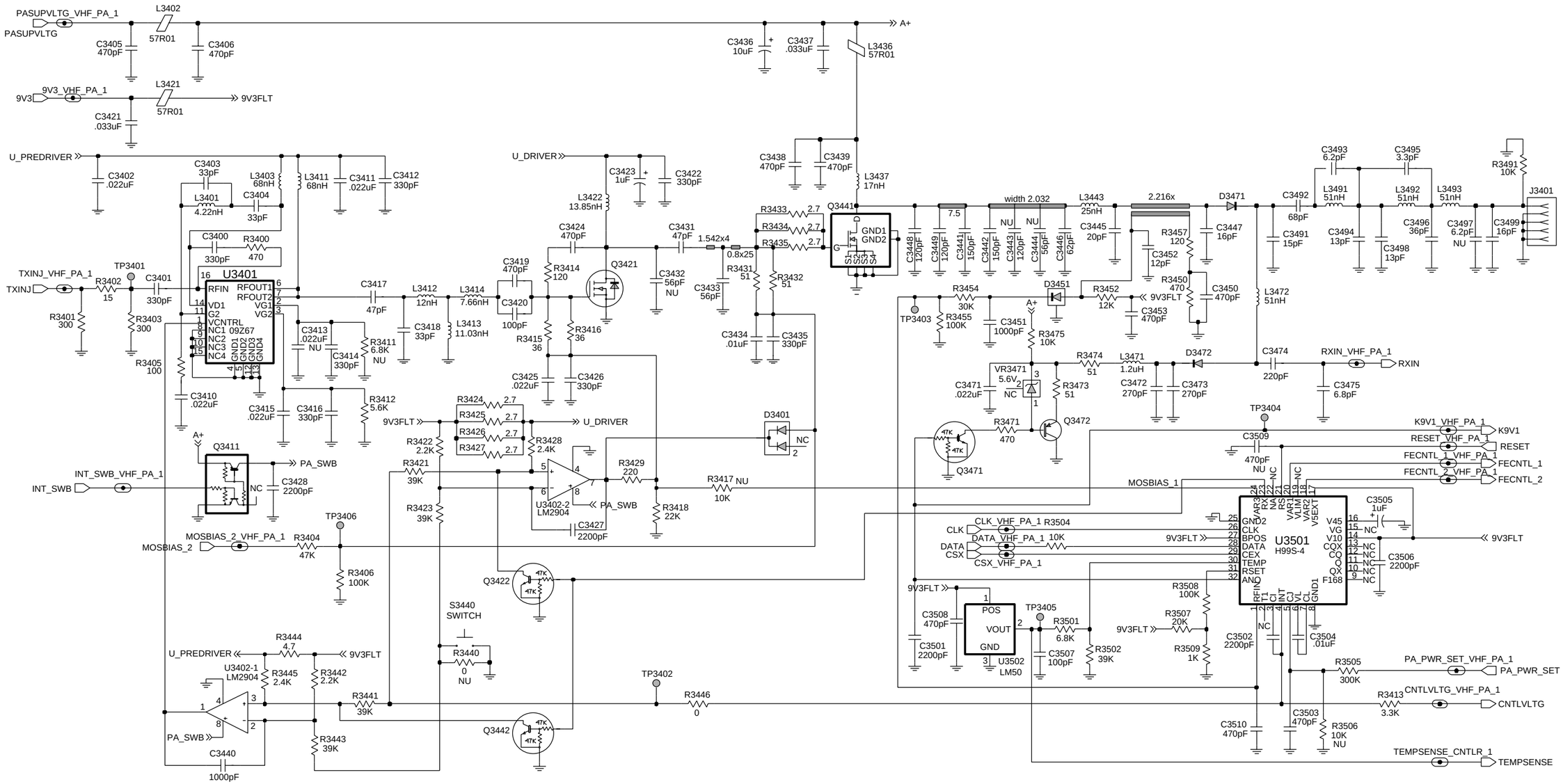
VHF (136-174 MHz) 1-25W PCB 8486172B08 Top Side

6881091C63-C



VHF (136-174 MHz) 1-25W PCB 8486172B08 Bottom Side

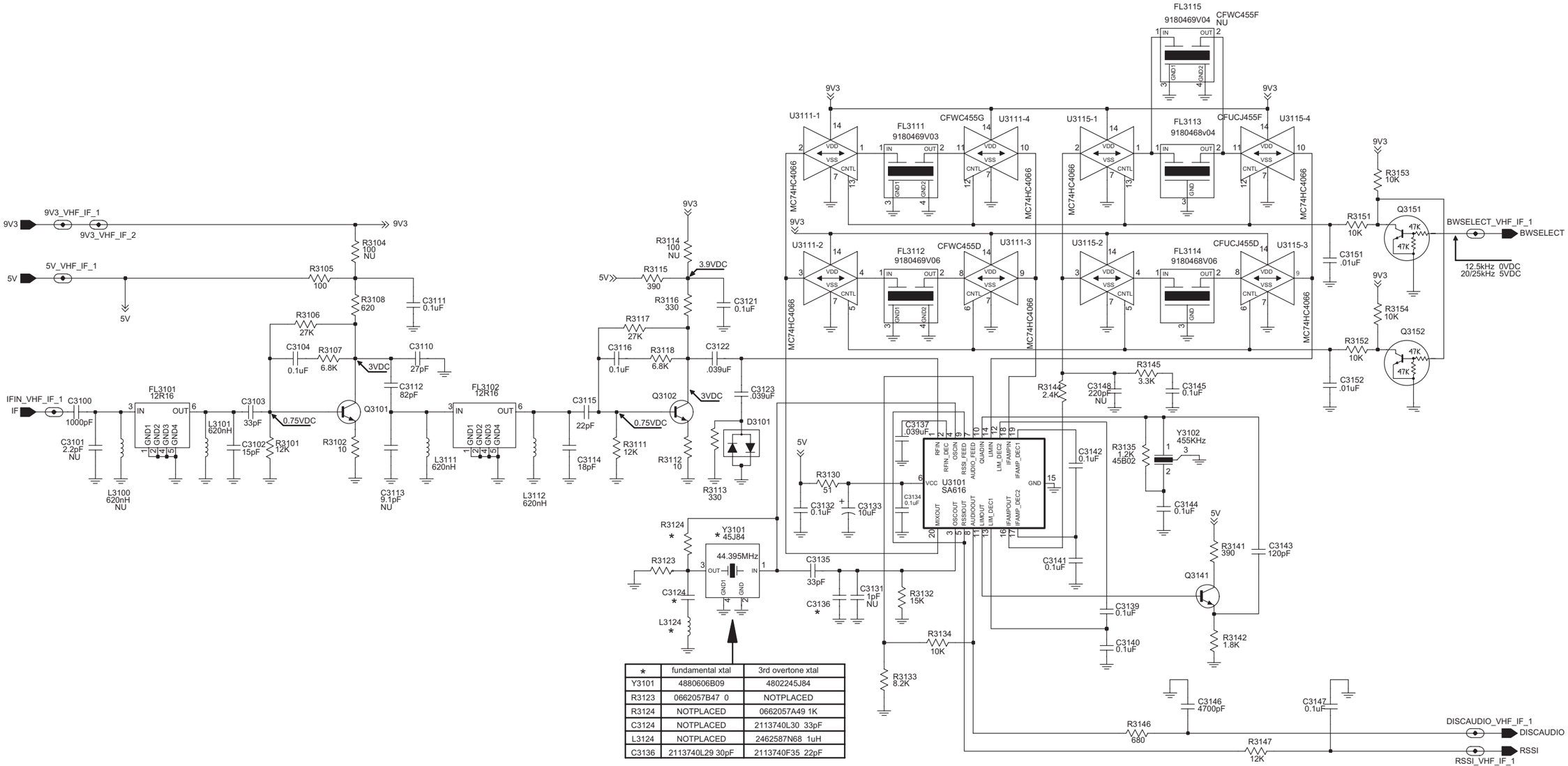
6881091C63-C



ZWG0130628-O

VHF (136-174 MHz) 1-25W Power Amplifier

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

ZWG0130565-B

VHF (136-174 MHz) 1-25W IF

6881091C63-C

VHF 1-25W PCB 8486172B08 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5%
C3002	2113740F26	9.1pF 5%
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5%
C3005	2113740F51	100pF 5%
C3006	2113740F45	56pF 5%
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5%
C3014	2113740F24	7.5pF 5%
C3015	2113740F45	56pF 5%
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113743E20	100nF 16V
C3027	2113741F49	10nF 50V
C3028	2113741F49	10nF 50V
C3030	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F33	18pF 5% 50V
C3036	2113741F25	1nF 50V
C3100	2113741F25	1nF 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF 16V
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF 16V
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF 16V
C3121	2113743E20	100nF 16V
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3124	2113740L30	33pF 2% 3rd overtone crystal
	NU	fundamental crystal
C3132	2113743E20	100nF 16V
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF 16V
C3135	2113740L30	33pF 2%
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	39nF 10%
C3139	2113743E20	100nF 16V
C3140	2113743E20	100nF 16V
C3141	2113743E20	100nF 16V
C3142	2113743E20	100nF 16V
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF 16V
C3145	2113743E20	100nF 16V
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF 16V
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF 16V
C3209	2113743E20	100nF 16V
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF 16V
C3212	2113743E07	22nF 16V
C3312	2113743E07	22nF 16V
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP 2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF 16V
C3222	2113743E20	100nF 16V
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF 16V
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF 16V
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10%
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3247	2113740F27	10pF 5% 50V
C3251	2113743E20	100nF 16V
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF 16V
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF 16V
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF 16V
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF 16V
C3333	2113743E20	100nF 16V
C3334	2113743E07	22nF 16V
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF 16V
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF 16V
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF 16V
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F31	15pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113740F63	330pF 5% 50V
C3401	2113740F63	330pF 5% 50V
C3402	2113743E07	22nF 16V
C3403	2113740F39	33pF 5% 50V
C3404	2113740F39	33pF 5% 50V
C3405	2113740F67	470pF 5% 50V
C3406	2113740F67	470pF 5% 50V
C3410	2113743E07	22nF 16V
C3411	2113743E07	22nF 16V
C3412	2113740F63	330pF 5% 50V
C3414	2113740F63	330pF 5% 50V
C3415	2113743E07	22nF 16V
C3416	2113740F63	330pF 5% 50V
C3417	2113740F43	47pF 5% 50V
C3418	2113740F39	33pF 5% 50V
C3419	2113740F63	330pF 5% 50V
C3420	2113740F63	330pF 5% 50V
C3421	2113741A57	33nF 50V
C3422	2113740A67	330pF 5% 50V
C3423	2311049A08	TANT CP 1uF 10% 35V
C3424	2113740F67	470pF 5% 50V
C3425	2113743E07	22nF 16V
C3426	2113740F63	330pF 5% 50V
C3427	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3431	2111078B34	HQ 47pF 5%
C3433	2111078B36	HQ 56pF 5%
C3434	2113741A45	10nF 50V
C3435	2113740A67	330pF 5% 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741A57	33nF 50V
C3438	2111078B59	HQ 470pF 5%
C3439	2111078B59	HQ 470pF 5%
C3440	2113741F25	1nF 50V
C3441	2111078B47	HQ 150pF 5%
C3442	2111078B47	HQ 150pF 5%
C3444	2111078B36	HQ 56pF 5%
C3445	2111078B23	HQ 24pF 5%
C3446	2111078B37	HQ 62pF 5%
C3447	2111078B19	HQ 16pF 5%
C3450	2113740F67	470pF 5% 50V
C3451	2113741F25	1nF 50V
C3452	2113740F29	12pF 5% 50V
C3453	2113740F67	470pF 5% 50V
C3471	2113743E07	22nF 16V
C3472	2111078B53	HQ 270pF 5%
C3473	2111078B53	HQ 270pF 5%
C3474	2113740F59	220pF 5% 50V
C3475	2113740F23	6.8pF 5% 50V
C3491	2111078B18	HQ 15pF 5%
C3492	2111078B38	HQ 68pF 5%
C3493	2111078B08	HQ 6.2pF 5%
C3494	2111078B16	HQ 13pF 5%
C3495	2111078B01	HQ 3.3pF 5%
C3496	2111078B31	HQ 36pF 5%
C3498	2111078B16	HQ 13pF 5%
C3499	2111078B19	HQ 16pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113740F67	470pF 5% 50V
C3504	2113741F49	10nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V X7R
C3507	2113740F51	100pF 5% 50V
C3508	2113740F67	470pF 5% 50V
C3510	2113740F67	470pF 5% 50V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER
D3101	4880154K03	DIODE DUAL SCHOTTKY
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3401	4813833C02	DUAL SOT MMBD6100
D3451	4880236E05	CHIP SCHOTTKY
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85 MHZ CRYSTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ CRYSTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3113	9180468V04	CER FLTR 4EL 455 KHZ SMD

Circuit Ref	Motorola Part No.	Description
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONN MINI UHF
L3002	2462587T23	COIL CHIP 470nH
L3031	2462587T24	COIL CHIP 560nH
L3032	2462587T17	COIL CHIP 150nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINI-SPRING AW IND 8NH 2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2460591A01	SQUARE COIL 4.22nH 3T
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X42	IND CHIP LO-PRO 12nH 5%
L3414	2460591A11	SQUARE COIL 7.66nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C23	SQUARE COIL 16nH 3T
L3436	2484657R01	Ferrite Bead
L3437	2460592A01	COIL AW 17nH 2T
L3443	2460591X02	COIL SQUARE 25nH
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460592B01	COIL AW 51nH 4T
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
M3421	2686201B01	HEAT SPREADER
Q3001	4813827A07	TSTR NPN SML SIG MMBR9
Q3002	4813824A17	TSTR PNP 40V .2A B=100-

Circuit Ref	Motorola Part No.	Description
Q3021	4805921T02	TSTR DUAL ROHM FMC2
Q3101	4813827A07	TSTR NPN SML SIG MMBR9
Q3102	4813827A07	TSTR NPN SML SIG MMBR9
Q3141	4813824A10	TSTR NPN 40V .2A B=50-150
Q3151	4880048M01	TSTR NPN DIG 47k/47k
Q3152	4880048M01	TSTR NPN DIG 47k/47k
Q3221	4880048M01	TSTR NPN DIG 47k/47k
Q3301	4813827A07	TSTR NPN SML SIG MMBR9
Q3303	4802245J50	TSTR DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4805921T02	DUAL ROHM FMC2 RH
Q3421	4886212B01	LDMOS PWRTSTR MRF1518
Q3422	4880048M01	NPN DIG 47k/47k
Q3441	4886136B01	LDMOS PWR TSTR MRF1565 MRF1550
Q3442	4880048M01	NPN DIG 47k/47k
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A73	10k 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A33	220 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3021	0662057A43	560 1/16W 5%
R3024	0662057A39	390 1/16W 5%
R3025	0662057A53	1500 1/16W 5%
R3026	0662057A73	10k 1/16W 5%
R3027	0662057A73	10k 1/16W 5%
R3028	0662057A39	390 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3113	0662057A37	330 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3141	0662057A39	390 1/16W 5%
R3142	0662057A55	1800 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%
R3202	0662057B46	10MEG
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3206	0662057B02	150k 1/16W
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3227	0662057A97	100k 1/16W
R3241	0662057A25	100 1/16W 5%
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057A89	47k 1/16W 5%
R3263	0662057A65	4700 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W

Circuit Ref	Motorola Part No.	Description
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3364	0662057A89	47k 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A36	300 1/16W 5%
R3402	0662057A05	15 1/16W 5%
R3403	0662057A36	300 1/16W 5%
R3404	0662057A89	47k 1/16W 5%
R3405	0662057A25	100 1/16W 5%
R3406	0662057A97	100k 1/16W
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%
R3414	0683962T51	120 1W 5%
R3415	0662057A14	36 1/16W 5%
R3416	0662057A14	36 1/16W 5%
R3418	0662057A81	22k 1/16W 5%
R3421	0662057A87	39k 1/16W 5%
R3422	0662057A57	2200 1/16W 5%
R3423	0662057A87	39k 1/16W 5%
R3424	0662057C13	2.7 1/10W 5%
R3425	0662057C13	2.7 1/10W 5%
R3426	0662057C13	2.7 1/10W 5%
R3427	0662057C13	2.7 1/10W 5%
R3428	0662057A58	2400 1/16W 5%
R3429	0662057A33	220 1/16W 5%
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C13	2.7 1/10W 5%
R3434	0662057C13	2.7 1/10W 5%
R3435	0662057C13	2.7 1/10W 5%
R3441	0662057A87	39k 1/16W 5%
R3442	0662057A57	2200 1/16W 5%
R3443	0662057A87	39k 1/16W 5%
R3444	0662057C19	4.7 1/10W 5%
R3445	0662057A58	2400 1/16W 5%
R3446	0662057B47	0 1/16W
R3450	0662057A41	470 1/16W 5%
R3452	0662057A75	12k 1/16W 5%
R3454	0662057A84	30k 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0683962T51	120 1W 5%
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3491	0662057A73	10k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3504	0662057A73	10k 1/16W 5%
R3505	0662057B09	300k 1/16W 5%
R3507	0662057A80	20k 1/16W 5%
R3508	0662057A97	100k 1/16W
R3509	0662057A49	1k 1/16W 5%

Circuit Ref	Motorola Part No.	Description
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/DEMUX
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5185130C65	LDMOS DRIVER VHF/UHF/ 800MHz
U3402	5180932W01	LINEAR IC OP-AMP
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
VR3471	4813830A15	5.6V 5% 225mW
Y3101	4802245J84 4880606B09	2ND OSC XTAL 44.395 MHZ 3rd overtone crystal fundamental crystal
Y3102	9186145B02	CERAMIC DISCRIMINATOR 455kHz
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

Chapter 5: UHF Band 1 (403-470 MHz) 1-25W Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 1 (403-470 MHz) 1-25W Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF Band 1 (403-470 MHz) 1-25W (Conventional, LTR/PassPort)

Model						Description
AAM25RHC9AA1AN						CDM750, 403-470 MHz, 1-25W, 12.5/20/25 kHz
	AAM25RHD9AA2AN					CDM1250, 403-470 MHz, 1-25W, 12.5/20/25 kHz
		AAM25RHF9AA5AN				CDM1550, 403-470 MHz, 1-25W, 12.5/20/25 kHz
			AAM25RHF9DU5AN			CDM1550•LS, 403-470 MHz, 1-25W, 12.5/20/25 kHz
				AAM25RHF9DP5AN		CDM1550•LS+, 403-470 MHz, 1-25W, 12.5/20/25 kHz
					Item	**Description**
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X	X		IMUE6027	Tanapa, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	X		IMUE6027_S	Replacement Board, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
				X	PMUE1754	Tanapa CDM1550•LS+, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
				X	PMUE1754_S	Replacement Board CDM1550•LS+, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X					6881091C54	User Guide, CDM750
	X				6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X		6881093C32	User Guide, CDM1550•LS
				X	6881094C79	User Guide, CDM1550•LS+

1.2 PRO Series Model Chart

PRO Series, UHF Band 1 (403-470 MHz) 1-25W				
Model				Description
LAM25RHC9AA1AN				PRO3100, 403-470 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
	LAM25RHD9AA2AN			PRO5100, 403-470 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
		LAM25RHF9AA5AN		PRO7100, 403-470 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6027	Tanapa, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	IMUE6027_S	Replacement Board, UHF 403-470 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**1 - 25W:** 2.2 in. x 6.93 in. x 6.97 in. (56 mm x 176 mm x 177 mm) 2.34 in. x 7.05 in. x 7.32 in. (59 mm x 179 mm x 186 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.15 lb. (1430 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	1-25W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA) Base Mode: >70dB (1-25W model only)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 UHF Band 1 (403-470 MHz) 1-25W Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the UHF range from 403 to 470 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. Low-side first injection is used.

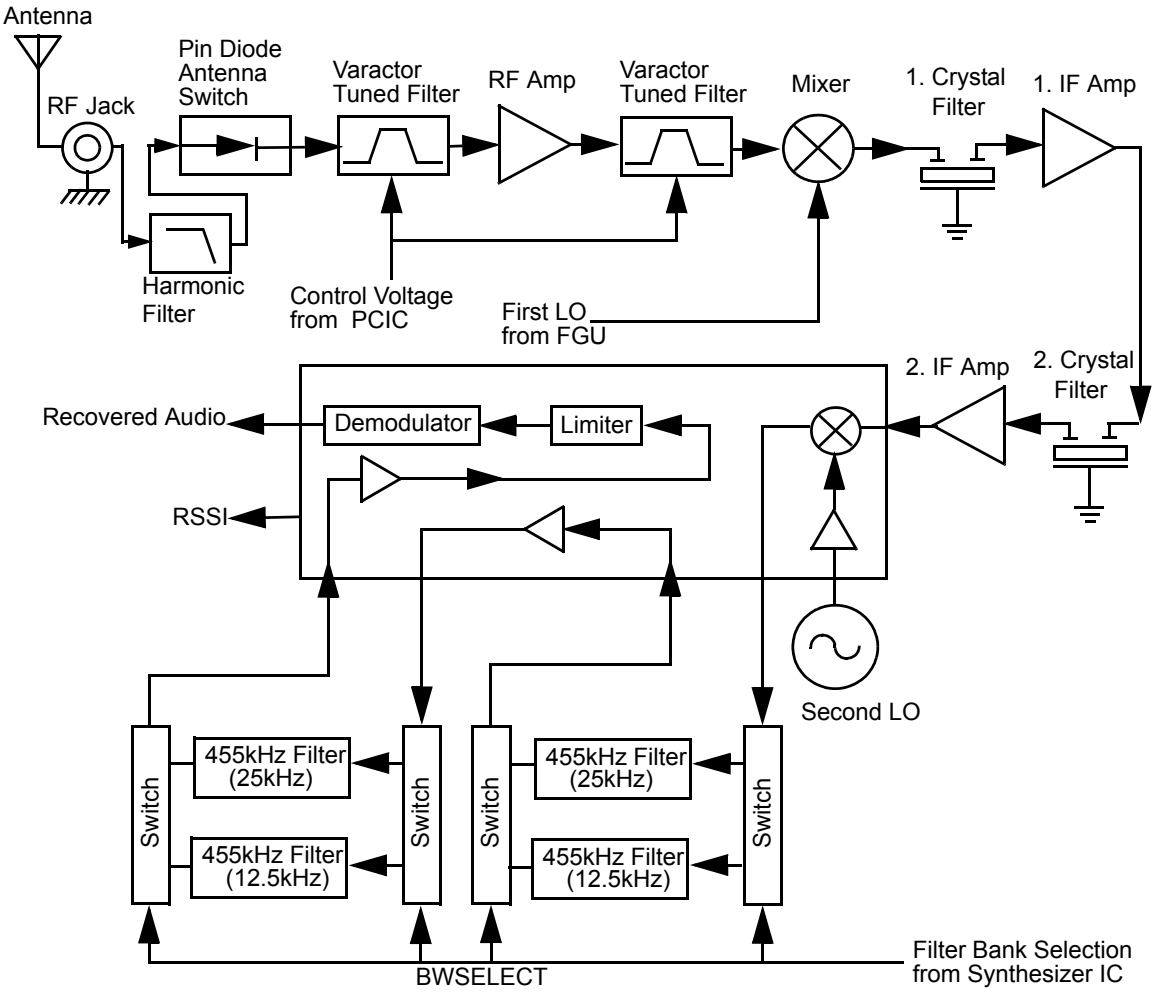


Figure 5-1 UHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the high-IF section and 2 pairs of 455 kHz ceramic filters in the low-IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuitry, before being applied to the receiver pre-selector filter (C4001, C4002, D4001 and associated components). The 2-pole pre-selector filter tuned by the varactor diodes D4001 and D4002 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U4501) in the Transmitter section. A dual hot carrier diode (D4003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q4003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3V supply via L4003 and R4002. A switchable 3dB pad (R4066, R4007, R4063, R4064 and R4070), controlled via line FECTRL_2 and Q4004 stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The varactor diodes D4004 and D4005 are controlled by the same signal FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R4013 - R4015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal coming from the front-end is converted to the first IF (44.85 MHz) using a passive double-balanced mixer (D4051). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T4051 and T4052. The injection signal (RXINJ) coming from the RX VCO buffer (Q4332) is filtered by the low-pass filter consisting of (L4053, L4054, C4053 - C4055) followed by a matching transformer T4052 and has a level of approximately 15dBm.

The mixer IF output signal (IF) from transformer T4501pin 2 is fed to the first two pole crystal filter FL3101. The filter output in turn is matched to the following IF amplifier.

The IF amplifier Q3101 is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the voltage 5V. Its output impedance is matched to the second two pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 high IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the low IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The low IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114 for 20/25 kHz channel spacing or FL3111, FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the Controller circuitry).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101 pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101 pin 63) and in addition is available at accessory connector J0501-15.

3.0 UHF Band 1 (403-470 MHz) 1-25W Transmitter Power Amplifier (PA) 25W

The radio's 25W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U4401) is adjustable, controlled by pin 4 of PCIC (U4501) via U4402-1. It is followed by an LDMOS stage (Q4421) and LDMOS final stage (Q4441).

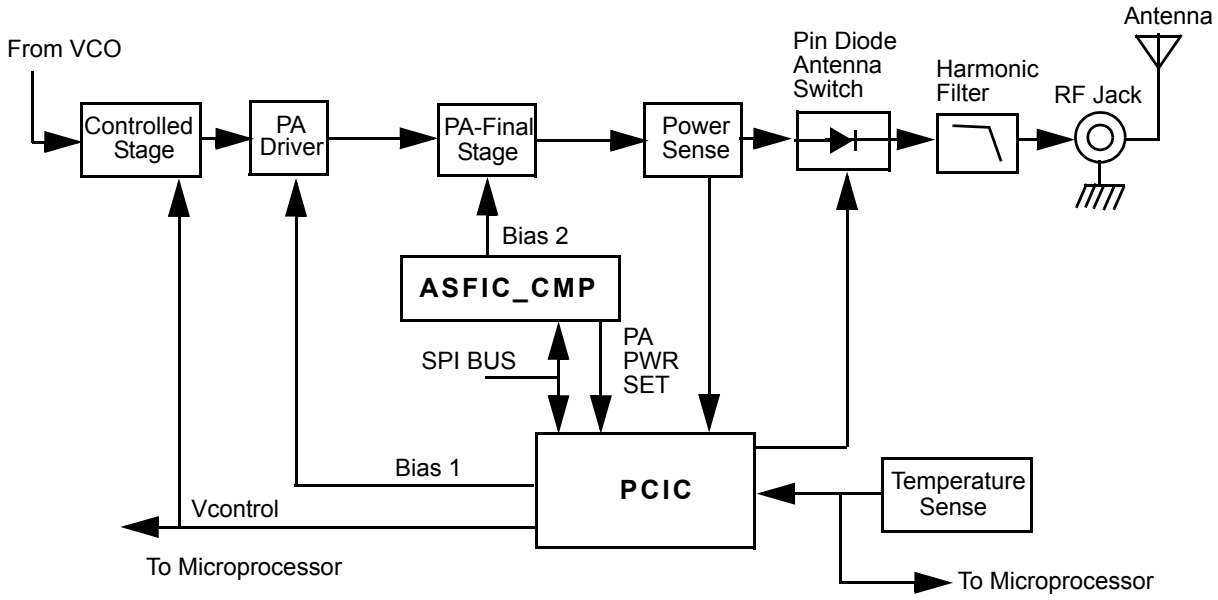


Figure 5-2 UHF Transmitter Block Diagram

Devices U4401, Q4421 and Q4441 are surface mounted. A pressure pad between the board and the radio's cover provides good thermal contact between the devices and the chassis.

3.1 First Power Controlled Stage

The first stage (U4401) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U4401 is controlled by a DC voltage applied to pin 1 from the op-amp U4402-1, pin 1. The control voltage simultaneously varies the bias of two FET stages within U4401. This biasing point determines the overall gain of U4401 and therefore its output drive level to Q4421, which in turn controls the output power of the PA.

Op-amp U4402-1 monitors the drain current of U4401 via resistor R4444 and adjusts the bias voltage of U4401 so that the current remains constant. The PCIC (U4501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U4402-1 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q4442, which in turn switches off the biasing voltage to U4401.

Switch S5440 is a pressure pad with a conductive strip which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S5440 opens and the resulting high voltage level at the inverting inputs of the current control op-amps U4402-1 & 2 switches off the biasing of U4401 and Q4421. This prevents transmitter key up while the devices do not have proper thermal contact to the chassis.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q4421) providing a gain of 12dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by the drain current control op-amp U4402-2, and fed to the gate of Q4421 via the resistive network R4429, R4418, R4415 and R4416.

Op-amp U4402-2 monitors the drain current of U4421 via resistors R4424-27 and adjusts the bias voltage of Q4421 so that the current remains constant. The PCIC (U4501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U4402-2 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q4422, which in turn switches off the biasing voltage to Q4421.

3.3 Final Stage

The final stage is an LDMOS device (Q4441) providing a gain of 12dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 is set in transmit mode by the ASFIC and fed to the gate of Q4441 via the resistive network R4404, R4406, and R4431-2. This bias voltage is tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Global Tuner. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device’s drain current is drawn directly from the radio’s DC supply voltage input, PASUPVLTG, via L4436 and L4437.

A matching network consisting of C4441-49 and striplines transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward power delivered by Q4441. The coupled signal is rectified by D4451. The DC voltage is proportional to the RF output power and feeds the RFIN port of the PCIC (U4501 pin 1). The PCIC controls the gain of stages U4401 and Q4421 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

3.5 Antenna Switch

The antenna switch consists of two PIN diodes, D4471 and D4472. In the receive mode, both diodes are off. Signals applied at the antenna jack J4401 are routed, via the harmonic filter, through network L4472, C4474 and C4475, to the receiver input. In the transmit mode, K9V1 turns on Q4471 which enables current sink Q4472, set to 96 mA by R4473 and VR4471. This completes a DC path from PASUPVLTG, through L4437, D4471, L4472, D4472, L4471, R4474 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D4471 to the harmonic filter and antenna jack. D4472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L4472 is selected to appear as a broadband lambda/4 wave transmission line, making the short circuit presented by D4472 appear as an open circuit at the junction of D4472 and the receiver path.

3.6 Harmonic Filter

Components L4491-L4493 and L4472, C4491, C4496-98 form a Butterworth low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R4491 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.7 Power Control

The transmitter uses the Power Control IC (PCIC, U4501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the directional coupler and rectified, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC (U0221) has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop to the PCIC via R4505. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which sets the drain current of the first (U4401) and second (Q4421) transmitter stage via current control op-amps U3402-1 and U3402-2. This adjusts the transmitter power output to the intended value. Variations in forward transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C4502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U4502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

4.0 UHF Band 1 (403-470 MHz) 1-25W Frequency Synthesis

The synthesizer subsystem consists of the reference oscillator (Y4261 or Y4262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U4201), and the Voltage Controlled Oscillator VCO.

4.1 Reference Oscillator

The reference oscillator (Y4262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U4201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U4201 pin 25 to set the frequency of the oscillator. The output of the oscillator (pin 3 of Y4262) is applied to pin 23 (XTAL1) of U4201 via a RC series combination.

In applications where less frequency stability is required the oscillator inside U4201 is used along with an external crystal Y4261, varactor diode D4261, C4261, C4262 and R4262. In this case, Y4262, R4263, C4235 and C4251 are not used. When Y4262 is used, Y4261, D4261, C4261, C4262 and R4262 are not used, and C4263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U4201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

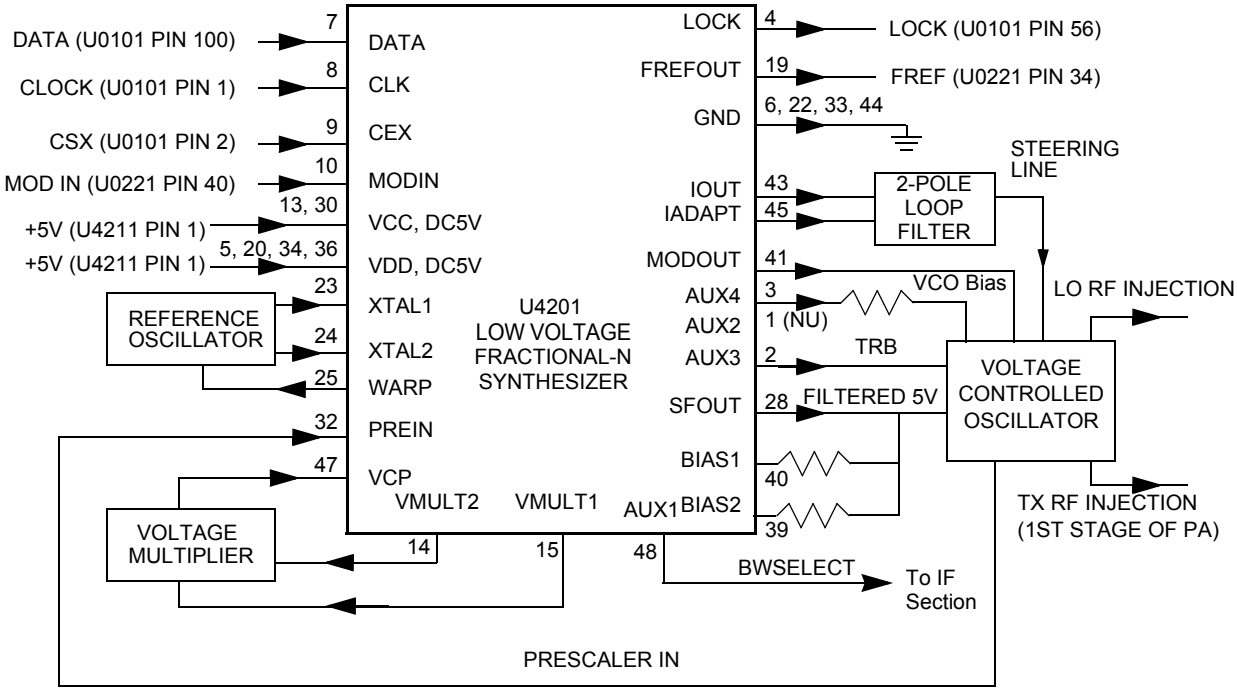


Figure 5-3 UHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U4201 pin 30) supplies an output voltage of 4.5 VDC(VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R4322) and the synthesizer charge pump resistor network (R4251, R4252). The synthesizer supply voltage is provided by the 5V regulator U4211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin 47 VCP (U4201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier circuitry (D4201, C4202, C4203). This voltage multiplier is basically a diode capacitor network driven by two (1.05MHz) 180 degrees out of phase signals (U4201-14 and -15).

Output LOCK (U4201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U4201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U4201-7), clock line CLK (U4201-8), and chip enable line CSX (U4201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U4301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuitry.

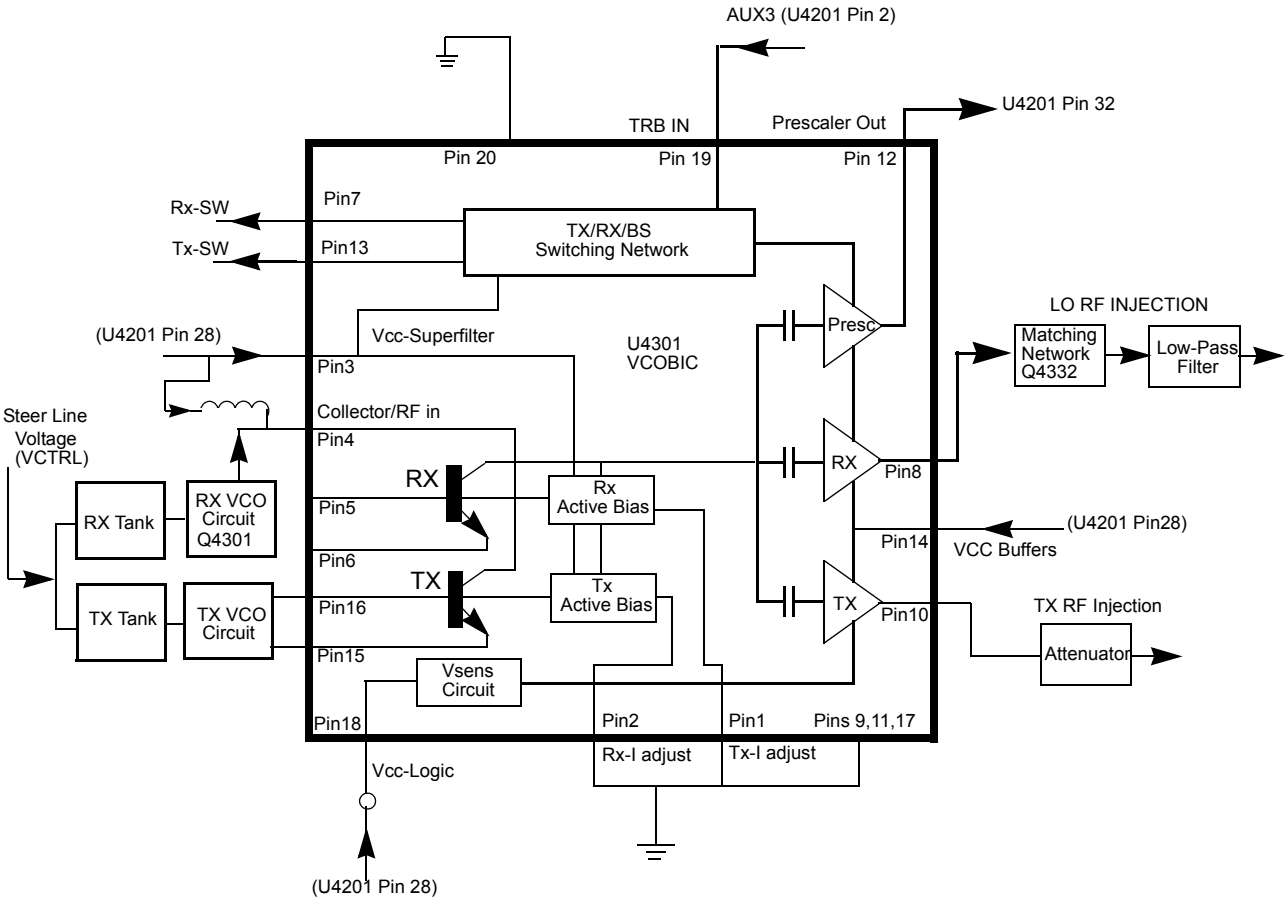


Figure 5-4 UHF VCO Block Diagram

The VCOBIC together with Fractional-N synthesizer (U4201) generates the required frequencies in both transmit and receive modes. The TRB line (U4301 pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U4301 pin 12 (PRESC_OUT), via a low-pass filter, to pin 32 of U4201 (PREIN).

A steering line voltage (VCTRL) between 3.0V and 10.0V at varactor diode CR4311 will tune the full TX frequency range (TXINJ) from 403 MHz to 470 MHz, and at varactor diodes CR4301, CR4302 and CR4303 will tune the full RX frequency range (RXINJ) from 358 MHz to 425 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q4301 is used in conjunction with the internal transistor for better side-band noise.

The external RX buffers (Q4332) are enabled by a high at U4201 pin 3 (AUX4) via transistor switch Q4333. In TX mode the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U4201 pin41) is applied modulation circuitry CR4321, R4321, R4322 and C4324, which modulates the TX VCO frequency via coupling capacitor C4321. Varactor CR4321 is biased for linearity from VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem comprises mainly of low voltage FRAC-N (LVFRACN) IC, Reference Oscillator (crystal oscillator with temperature compensation), charge pump circuitry, loop filter circuitry and DC supply. The output signal PRESC_OUT of the VCOBIC (U4301 pin 12) is fed to pin 32 of U4201 (PREIN) via a low-pass filter (C4229, L4225) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U4201) is basically a dual modulus pre-scaler with selectable divider ratios. This divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y4261 or Y4262).

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at pin 43 of U4201 (IOUT). The loop filter (which consists of R4221-R4223, C4221-C4225,L4221) transforms this current into a voltage that is applied to the varactor diodes CR4311 for transmit, CR4301, CR4302 & CR4303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U4201-40) or BIAS 2 (U4201-39). The currents are set by the value of R4251 or R4252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer the magnitude of the loop current is increased by enabling the IADAPT (U4201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U4201-4).

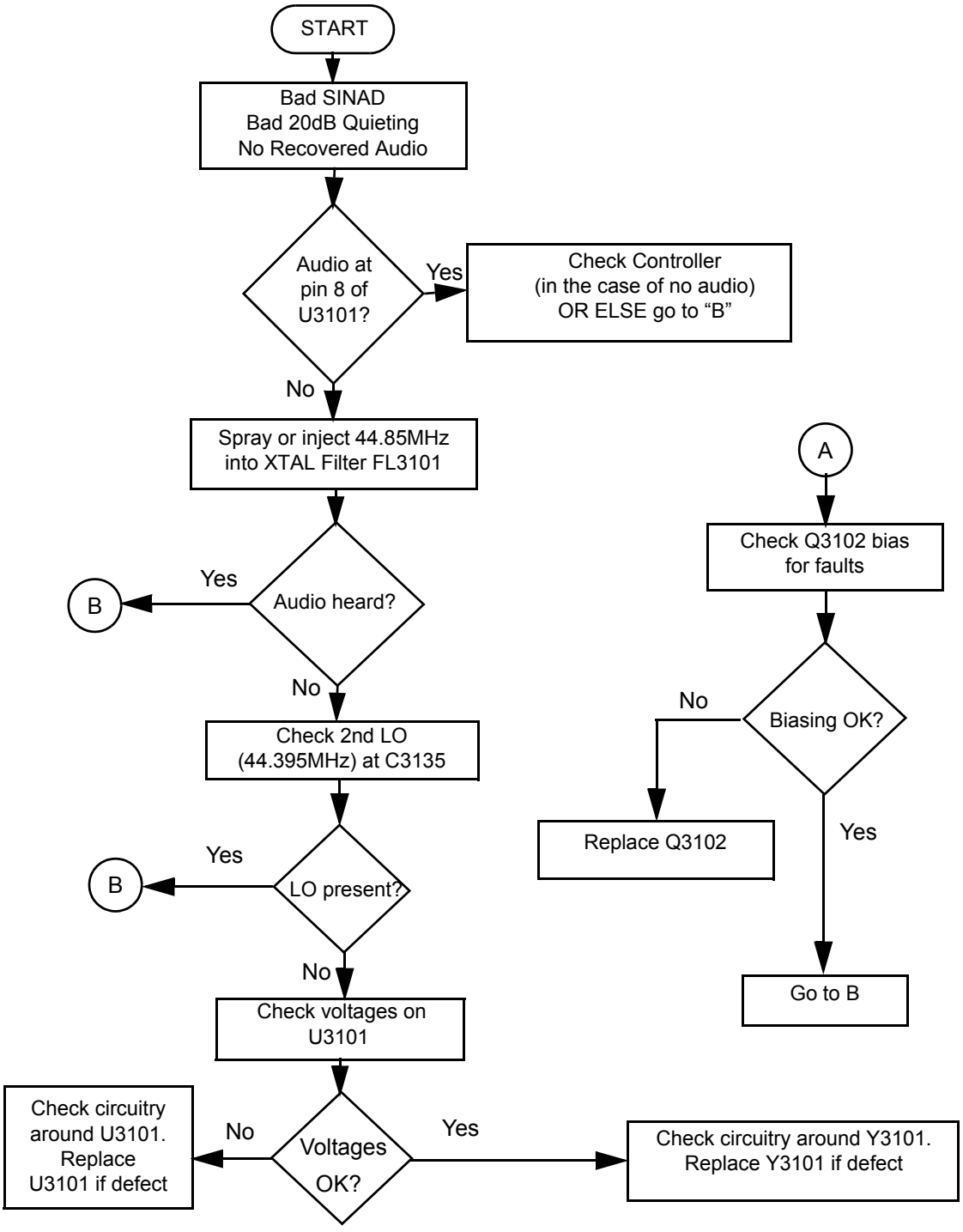
The LOCK (U4201-4) signal is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active. In order to modulate the PLL the two spot modulation method is utilized. Via pin 10 (MODIN) on U4201 the audio signal is applied to both the A/D converter (low freq path) as well as the balance attenuator (high freq path). The A/D converter converts the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U4201-41) and connected to the VCO modulation diode CR4321 via R4321, C4325.

Notes

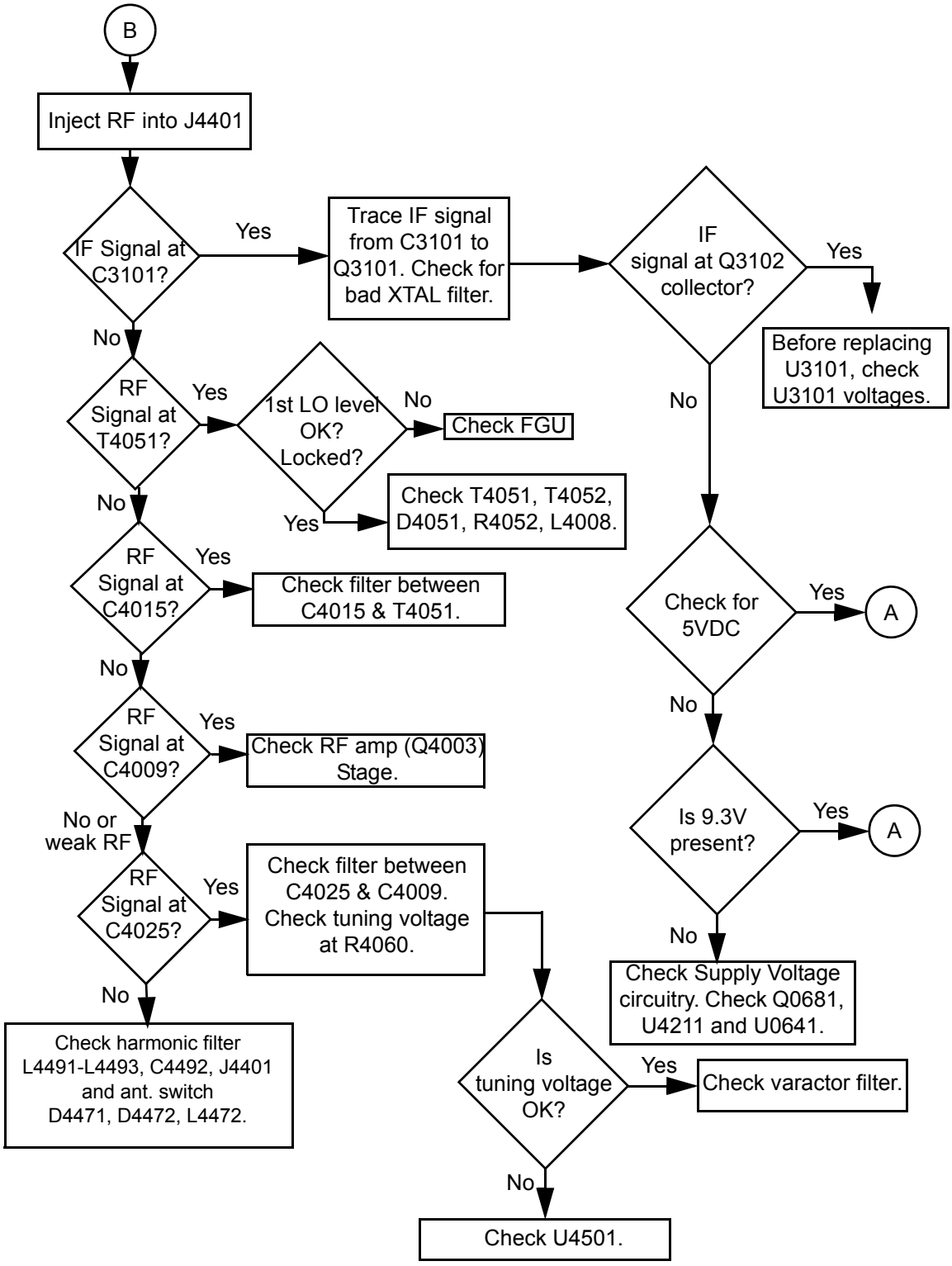
Section 3

TROUBLESHOOTING CHARTS

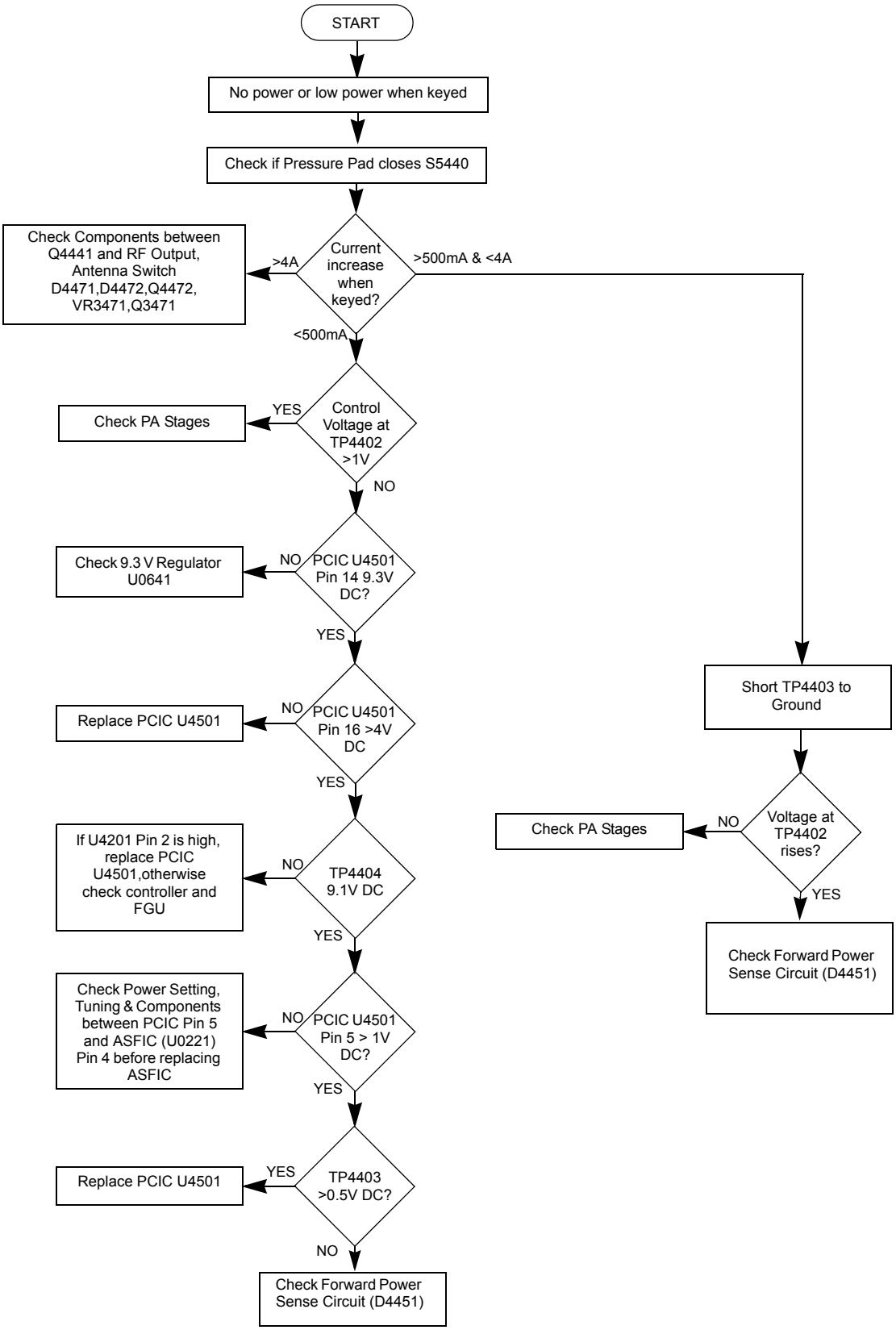
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



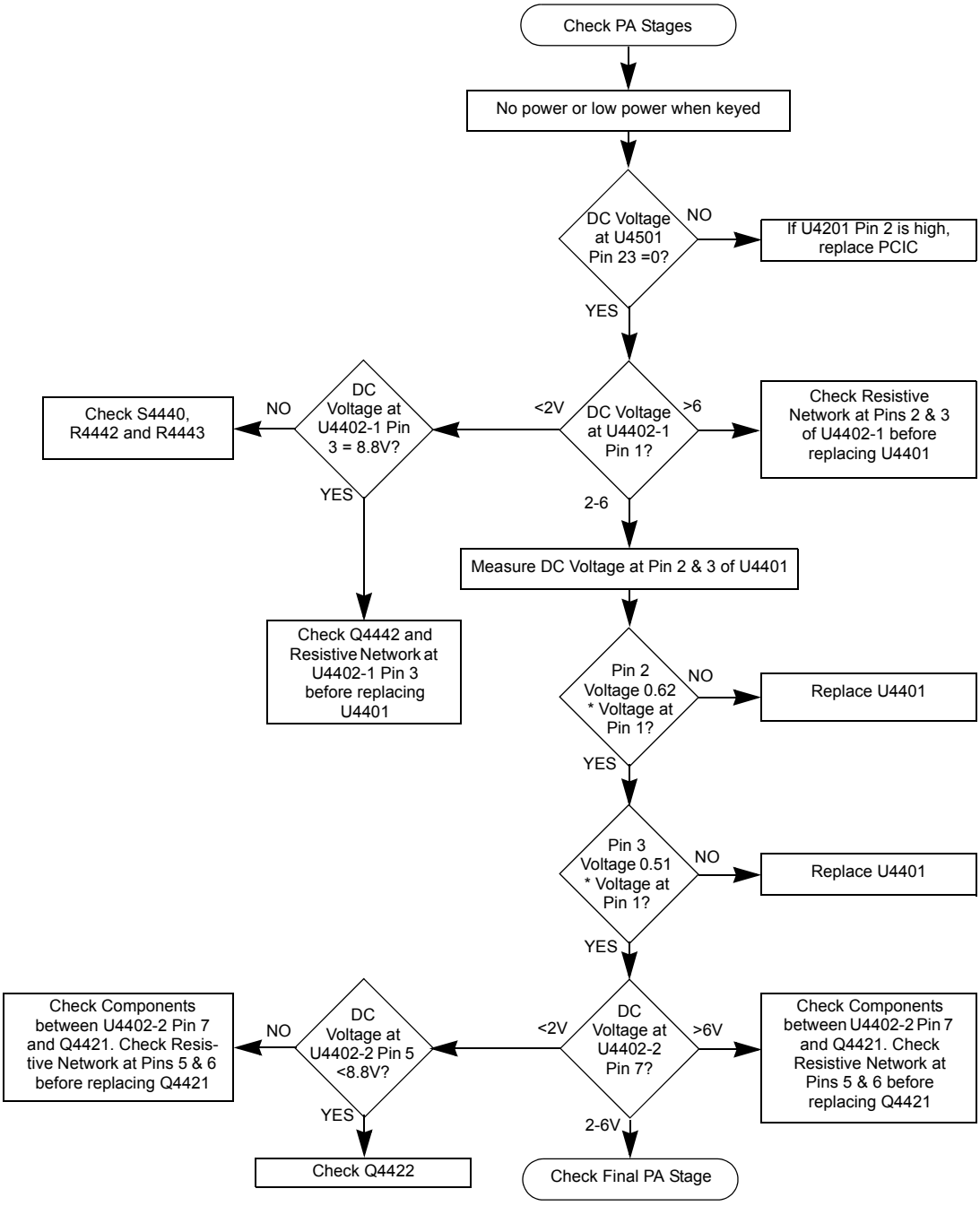
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



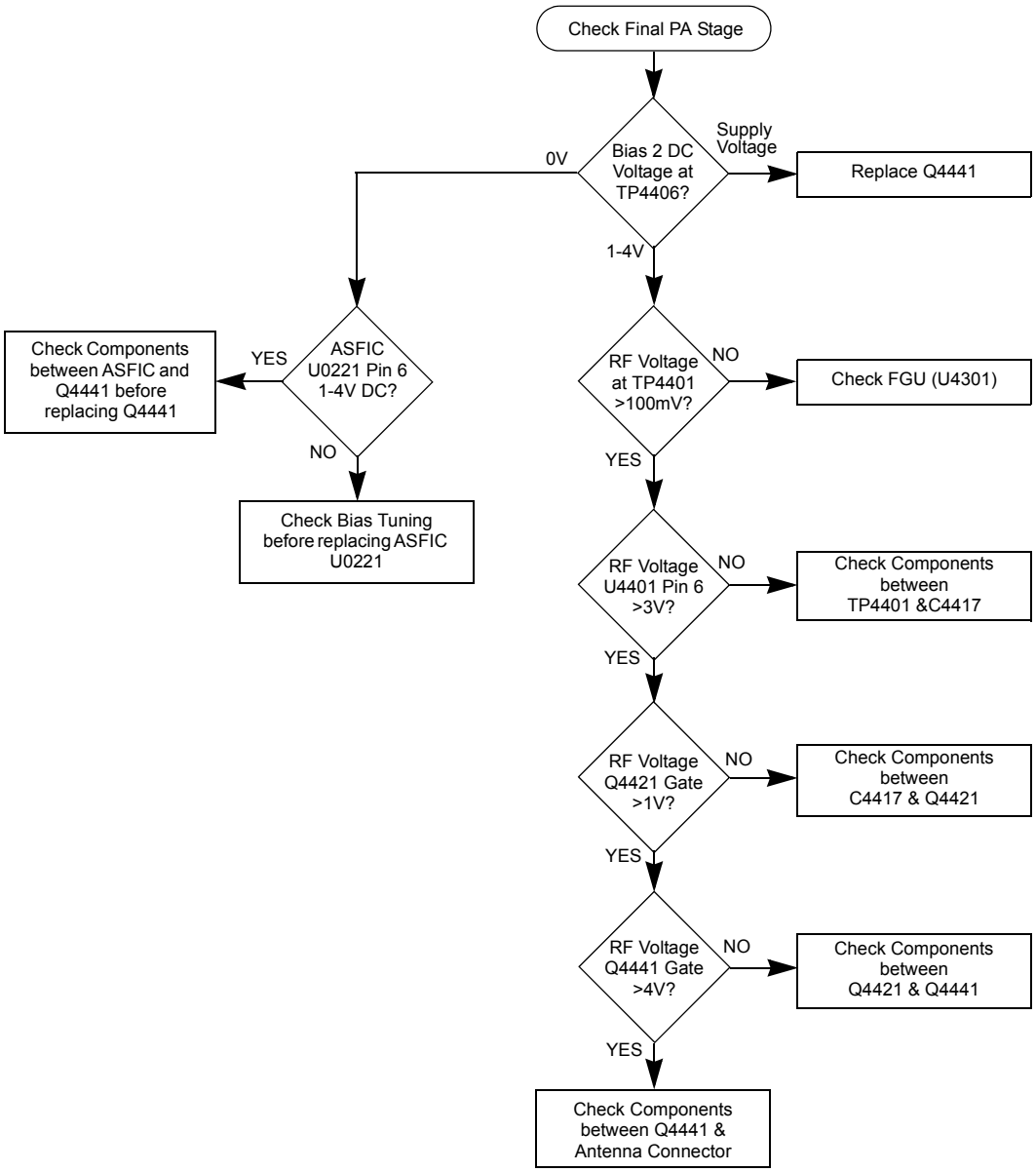
2.0 Troubleshooting Flow Chart for 25W Transmitter (Sheet 1 of 3)



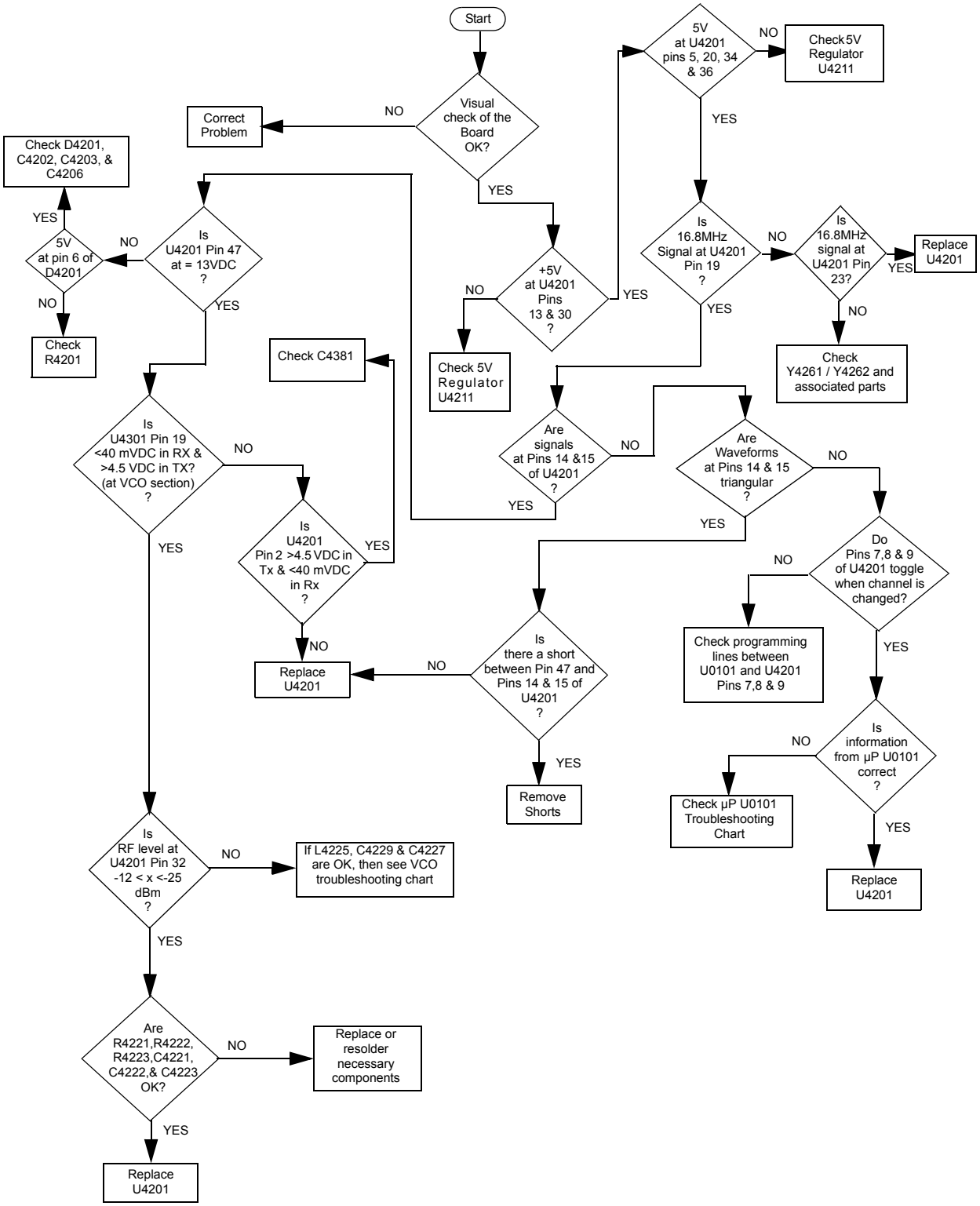
2.1 Troubleshooting Flow Chart for 25W Transmitter (Sheet 2 of 3)



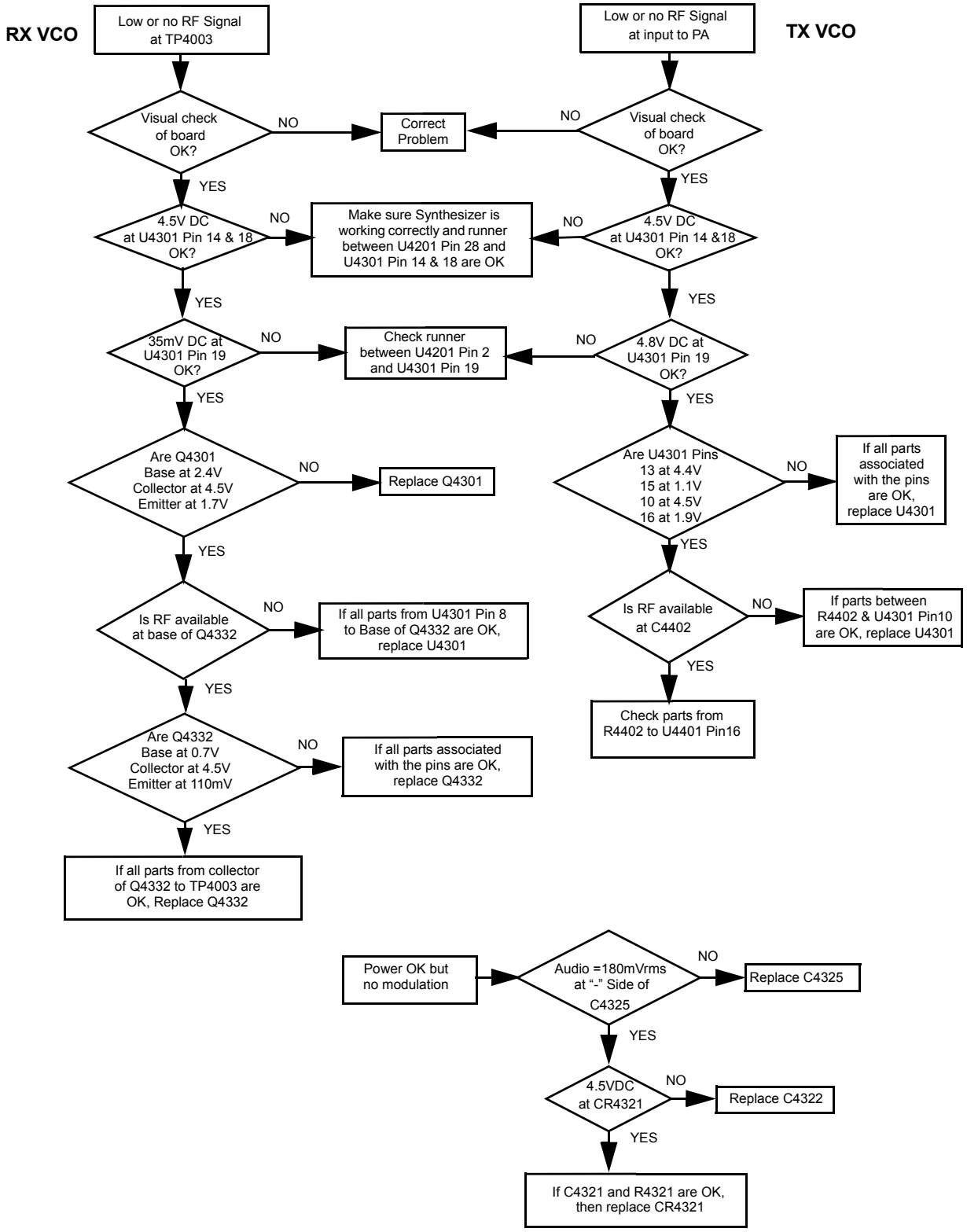
2.2 Troubleshooting Flow Chart for 25W Transmitter (Sheet 3 of 3)



3.0 Troubleshooting Flow Chart for Synthesizer

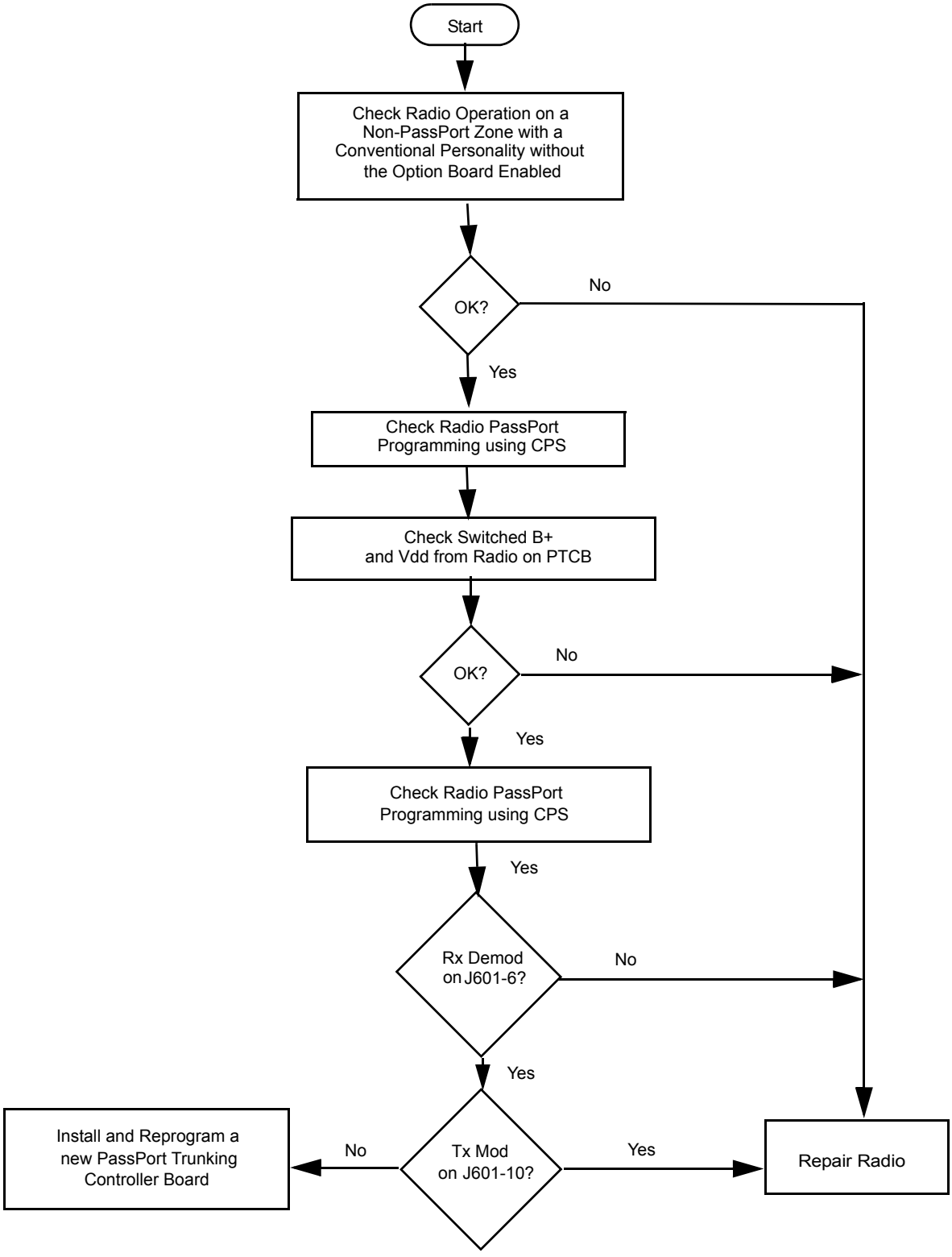


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Section 4

UHF BAND 1 (403-470 MHZ) 1-25W PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

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

Table 5-1 UHF Band 1 1-25W PCB 8471224L03 Diagrams and Parts Lists

PCB 8471224L03:	**Page:**
Main Board Top Side	**5: 4-3**
Main Board Bottom Side	**5: 4-4**
SCHEMATICS	
Power Amplifier 1 - 25W	**5: 4-5**
FRACN Synthesizer	**5: 4-12**
Voltage Controlled Oscillator	**5: 4-13**
Receiver Front-End	**5: 4-14**
IF	**5: 4-15**
Parts List	**5: 4-6**
Controller version is **T9**	

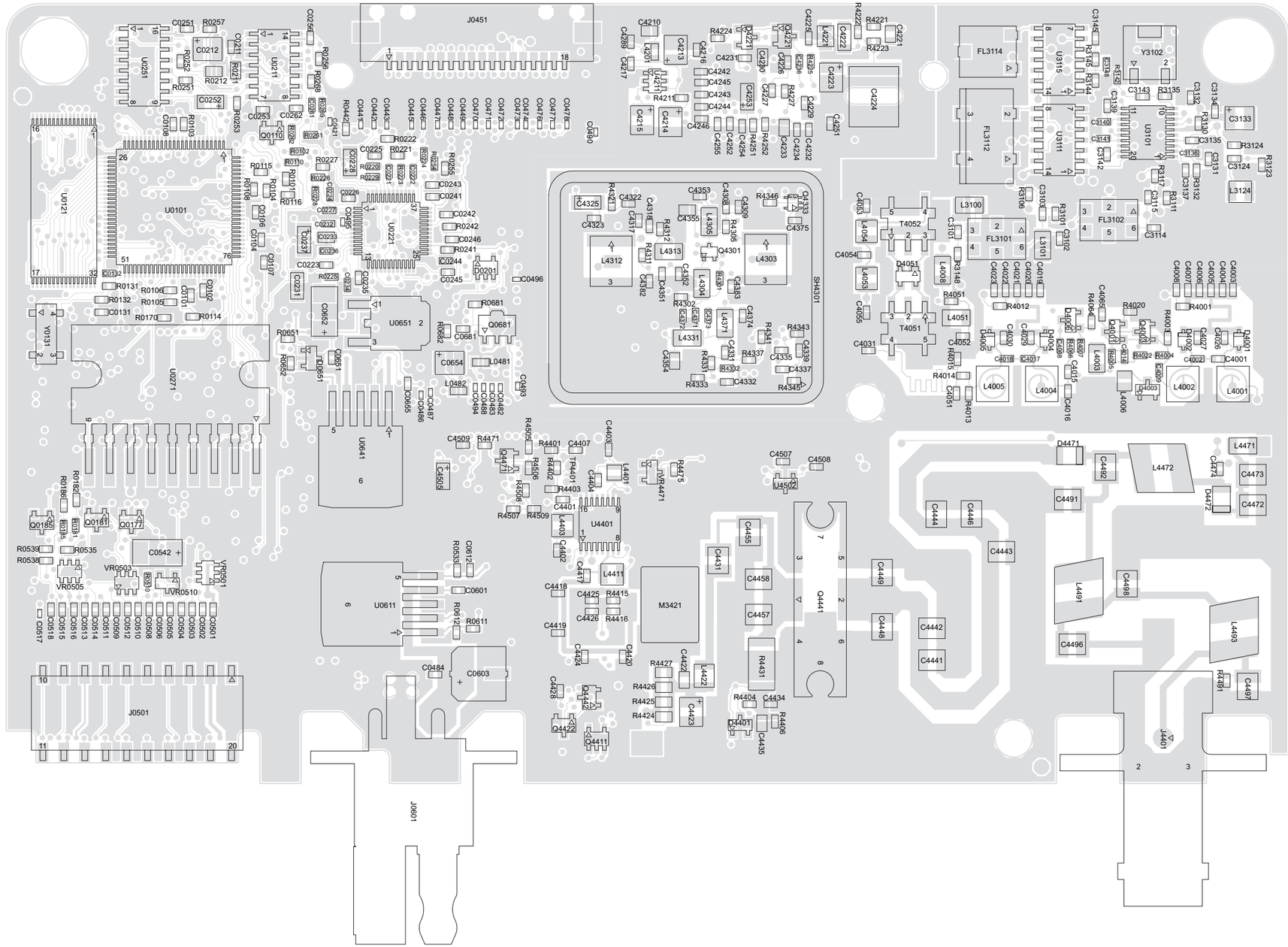
Table 5-2 UHF Band 1 1-25W PCB 8485670Z02 Diagrams and Parts Lists

PCB 8485670Z02:	**Page:**
Main Board Top Side	**5: 4-9**
Main Board Bottom Side	**5: 4-10**
SCHEMATICS	
Power Amplifier 1 - 25W	**5: 4-11**
FRACN Synthesizer	**5: 4-12**
Voltage Controlled Oscillator	**5: 4-13**
Receiver Front-End	**5: 4-14**
IF	**5: 4-15**
Parts List	**5: 4-16**
Controller version is **T7**	

Table 5-3 UHF Band 1 1-25W PCB 8485670Z03 Diagrams and Parts Lists

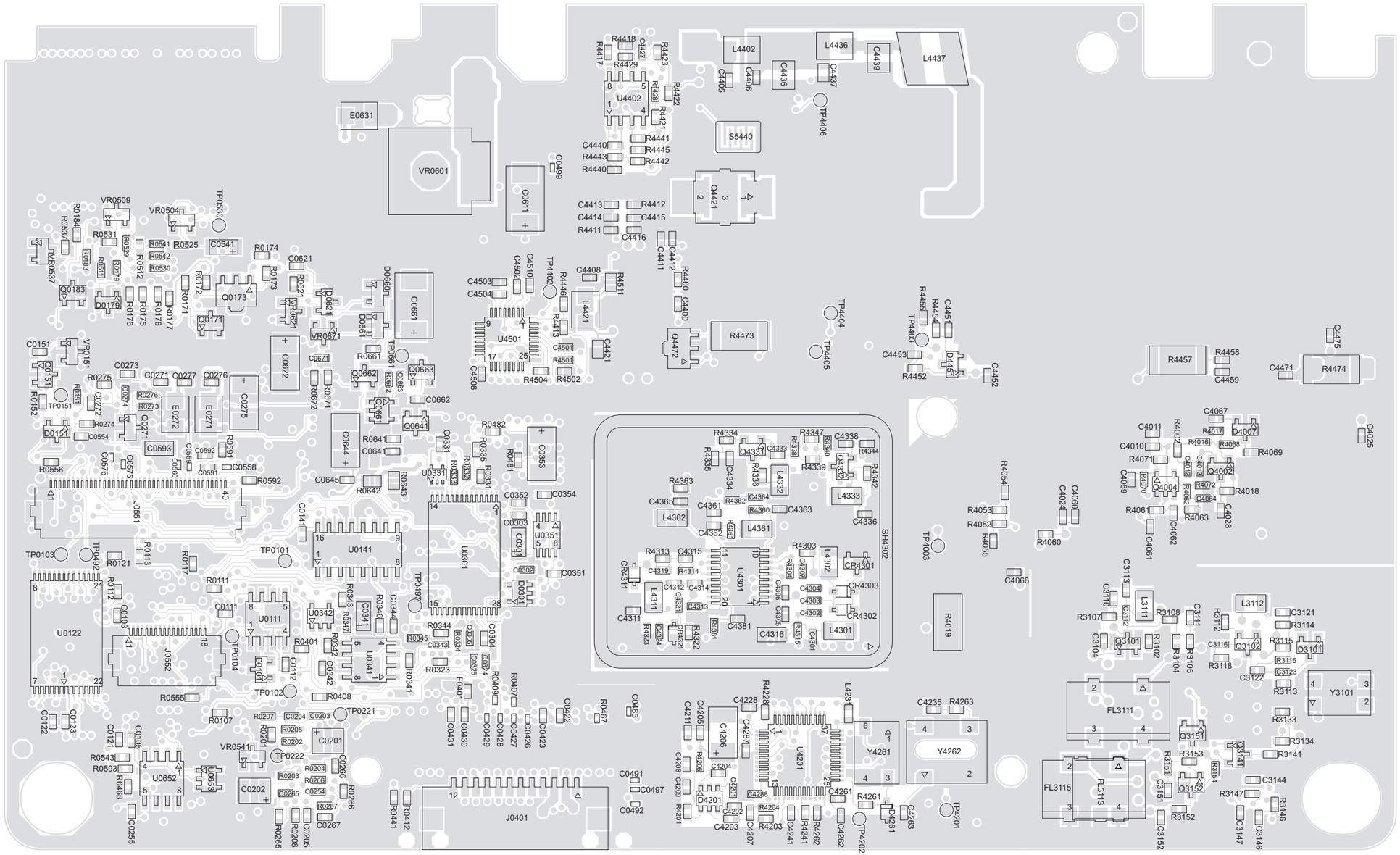
PCB 8485670Z03:	**Page:**
Main Board Top Side	**5: 4-19**
Main Board Bottom Side	**5: 4-20**
SCHEMATICS	
Power Amplifier 1 - 25W	**5: 4-21**
FRACN Synthesizer	**5: 4-22**
Voltage Controlled Oscillator	**5: 4-23**
Receiver Front-End	**5: 4-24**
IF	**5: 4-25**
Parts List	**5: 4-26**
Controller version is **T9**	

2.0 UHF Band 1 (403-470 MHz) 1-25W LDMOS PCB 8471224L03, Schematics, and Parts Lists



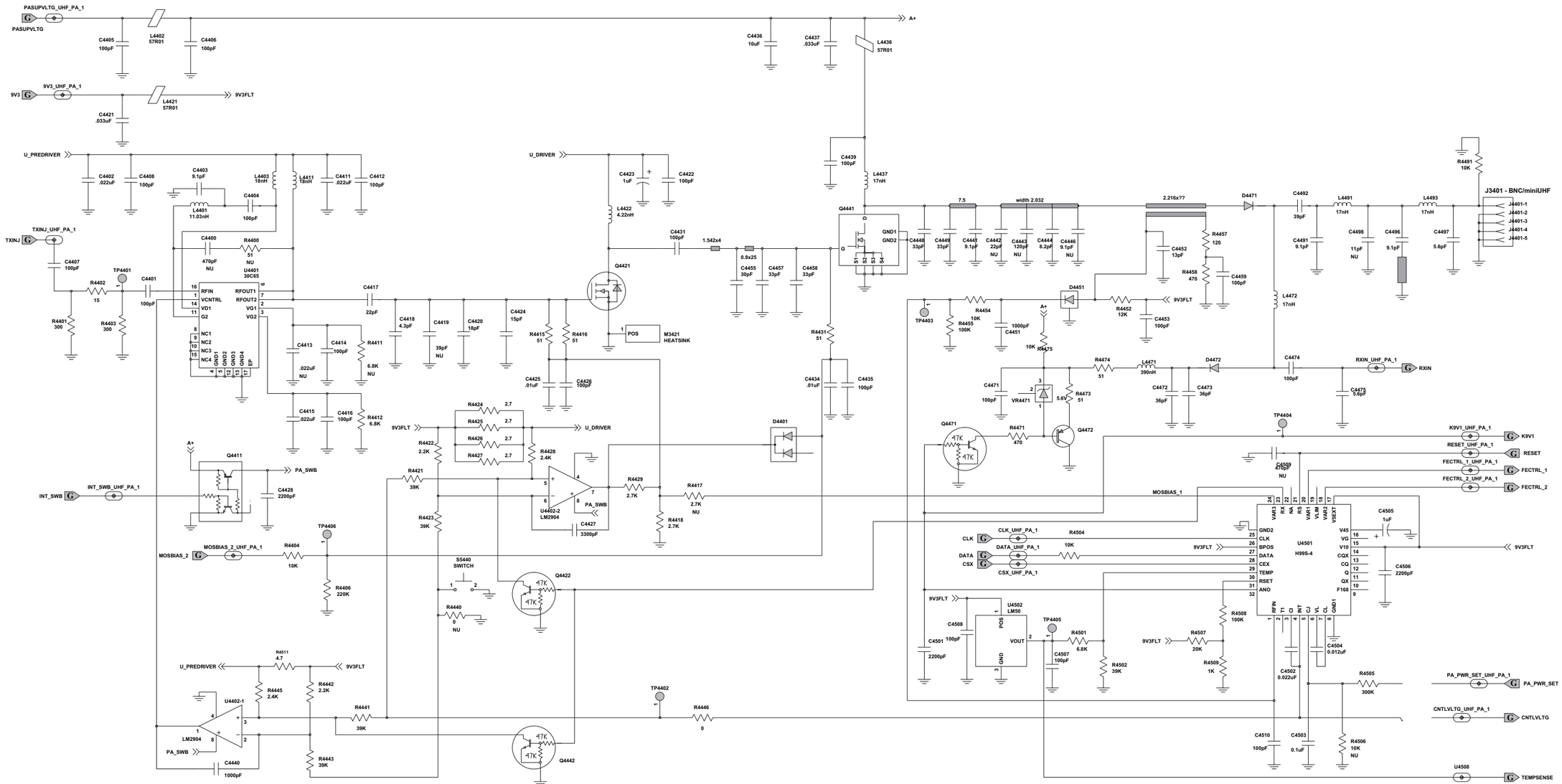
UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8471224L03 Top Side

6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8471224L03 Bottom Side

6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8471224L03 Power Amplifier

6881091C63-C

UHF B1 25-40W PCB 8471224L03 Parts List†

Circuit Ref	Motorola Part No.	Description
C3101	2113944C80	20pF
C3102	2113944C32	15pF
C3103	2113944C36	33pF
C3104	2113945C31	.1uF
C3110	2113944C61	5pF
C3111	2113945C31	.1uF
C3112	2113944C36	33pF
C3113	2113944C75	8.2pF
C3114	2113944C30	10pF
C3115	2113944C32	15pF
C3116	2113945C31	.1uF
C3121	2113945C31	.1uF
C3122	2113945C26	.039uF
C3123	2113945C26	.039uF
C3124	2113944M30	33pF
C3132	2113945C31	.1uF
C3133	2313960D07	10uF
C3134	2113945C31	.1uF
C3135	2113944M30	33pF
C3136	2113944C34	22pF
C3137	2113945C26	.039uF
C3139	2113945C31	.1uF
C3140	2113945C31	.1uF
C3141	2113945C31	.1uF
C3142	2113945C31	.1uF
C3143	2113944C46	120pF
C3144	2113945C31	.1uF
C3145	2113945C31	.1uF
C3146	2113945L41	4700pF
C3147	2113945C31	.1uF
C3151	2113945L49	.01uF
C3152	2113945L49	.01uF
C4001	2113944C69	1.8pF
C4002	2113944C43	82pF
C4003	2113944C33	18pF
C4004	2113944C36	33pF
C4005	2113944C36	33pF
C4006	2113944C36	33pF
C4007	2113944C82	30pF
C4008	2113945L25	1000pF
C4009	2113944C30	10pF
C4010	2113945L13	330pF
C4011	2113945L37	3300pF
C4012	2113945L13	330pF
C4013	2113945L37	3300pF
C4014	2113944C45	100pF
C4015	2113944C45	100pF
C4017	2113944C69	1.8pF
C4018	2113944C80	20pF
C4019	2113944C71	5.6pF
C4020	2113944C36	33pF
C4021	2113944C36	33pF
C4022	2113944C36	33pF
C4023	2113944C31	12pF
C4024	2113945L25	1000pF
C4026	2113944C69	1.8pF
C4027	2113944C69	1.8pF
C4028	2113945L49	.01uF
C4029	2113944C69	1.8pF
C4030	2113944C69	1.8pF
C4031	2113944C78	13pF
C4051	2113944C30	10pF
C4052	2113944C43	82pF
C4053	2113944C79	16pF
C4054	2113944C79	16pF
C4061	2113944C04	330pF
C4062	2113945C31	.1uF
C4064	2113945C31	.1uF
C4065	2113944C45	100pF
C4067	2113945L37	3300pF
C4068	2113944C45	100pF
C4069	2113945L49	.01uF
C4201	2113944C45	100pF
C4202	2113945L49	.01uF
C4203	2113945L49	.01uF
C4204	2113944C45	100pF
C4205	2113945L49	.01uF
C4206	2313960F01	10uF
C4208	2113945C31	.1uF
C4209	2113945C31	.1uF
C4210	2113946N03	2.2uF
C4211	2113945C31	.1uF
C4213	2313960C78	2.2uF
C4214	2313960C78	2.2uF
C4215	2313960C78	2.2uF
C4217	2113945L49	.01uF
C4221	2113944F13	.01uF
C4222	2189705V01	.1uF
C4223	2115358H25	1uF
C4225	2113945L18	510pF
C4226	2113944M03	2.4pF
C4227	2113944C30	10pF
C4230	2113946N03	2.2uF
C4231	2113945L49	.01uF
C4232	2113945L49	.01uF
C4233	2113946N03	2.2uF
C4234	2113945L49	.01uF
C4235	2113945L49	.01uF
C4236	2113945C27	.047uF
C4242	2113944C45	100pF
C4243	2113944C45	100pF
C4244	2113944C45	100pF
C4245	2113944C45	100pF
C4246	2113944C45	100pF
C4251	2113945C31	.1uF
C4252	2113945L25	1000pF
C4253	2313960B30	4.7uF
C4254	2113945C31	.1uF
C4255	2113944C45	100pF
C4263	2113945C31	.1uF
C4287	2113944C45	100pF
C4289	2113945C31	.1uF
C4301	2113944C45	100pF
C4302	2113944M16	8.2pF
C4303	2113944M16	8.2pF
C4304	2113944M08	3.9pF
C4306	2113944M01	2pF
C4307	2113944C45	100pF
C4308	2113945C31	.1uF
C4309	2113944C45	100pF
C4311	2113944C45	100pF
C4312	2113944C31	12pF
C4314	2113944C67	1.5pF
C4315	2113944C45	100pF
C4316	2189705V01	.1uF
C4318	2113945C31	.1uF
C4321	2113944C63	1pF
C4324	2113944M03	2.4pF
C4325	2313960B30	4.7uF
C4331	2113944M14	6.8pF
C4335	2113944C45	100pF
C4336	2113945C04	2200pF
C4337	2113944C85	51pF
C4338	2113944C85	51pF
C4351	2113944C45	100pF
C4352	2113945C31	.1uF
C4353	2113945C31	.1uF
C4354	2113946N03	2.2uF
C4355	2113946N03	2.2uF
C4361	2113945L25	1000pF
C4364	2113944C71	5.6pF
C4365	2113944C67	1.5pF
C4371	2113945C31	.1uF
C4400	2113944C06	470pF
C4401	2113944C45	100pF
C4402	2113945L37	3300pF
C4403	2113944C73	6.8pF
C4404	2113944C45	100pF
C4405	2113944C45	100pF
C4406	2113944C45	100pF
C4407	2113944C45	100pF
C4408	2113944C45	100pF
C4411	2113945L37	3300pF
C4412	2113944C45	100pF
C4414	2113944C45	100pF
C4415	2113945C04	2200pF
C4416	2113944C45	100pF
C4417	2113944C82	30pF
C4419	2113944C33	18pF
C4420	2113944C77	11pF
C4421	2113945G57	.033uF
C4422	2113944F01	100pF
C4423	2313960C26	1uF
C4425	2113945L49	.01uF
C4426	2113944C45	100pF
C4427	2113945L25	1000pF
C4428	2113945L33	2200pF
C4431	2111078B23	24pF
C4434	2113945C25	.033uF
C4435	2113944F01	100pF
C4436	2113955E37	10uF
C4437	2113945G57	.033uF
C4439	2111078B42	100pF
C4440	2113945L25	1000pF
C4441	2111078B18	15pF
C4446	2111078B10	7.5pF
C4448	2111078B25	27pF
C4449	2111078B31	36pF
C4451	2113945L25	1000pF
C4452	2113944C78	13pF
C4453	2113944C45	100pF
C4455	2111078B12	9.1pF
C4457	2111078B27	30pF
C4458	2111078B32	39pF
C4459	2113944C45	100pF
C4471	2113944C45	100pF
C4472	2111078B31	36pF
C4473	2111078B31	36pF
C4474	2113944C45	100pF
C4475	2113944C71	5.6pF
C4491	2111078B12	9.1pF
C4492	2111078B32	39pF
C4496	2111078B09	6.8pF
C4497	2111078B07	5.6pF
C4501	2113945L33	2200pF
C4502	2113945L33	2200pF
C4503	2113944C06	470pF
C4504	2113945L49	.01uF
C4505	2313960B01	1uF
C4506	2113945L33	2200pF
C4507	2113944C45	100pF
C4508	2113944C45	100pF

Circuit Ref	Motorola Part No.	Description
C4510	2113944C45	100pF
C4514	2375194A03	100uF
CR4301	4885094Y01	DIODE VARACTOR ISV228
CR4302	4885055Y01	DIODE VARACTOR
CR4303	4885055Y01	DIODE VARACTOR
CR4311	4815322H01	VHF VARIABLE CAPACITANCE DIODE
CR4321	4885055Y01	DIODE VARACTOR
D3101	4815048H01	SOT MMBD353 DIODE DUAL SCHT
D4001	4885055Y01	DIODE VARACTOR
D4002	4885055Y01	DIODE VARACTOR
D4003	4815048H01	SOT MMBD353 DIODE DUAL SCHT
D4004	4885055Y01	DIODE VARACTOR
D4005	4885055Y01	DIODE VARACTOR
D4006	4813974A06	DIODE
D4007	4813978C02	DUAL DIODE 70V
D4051	4886143B01	WM MIXER QUAD RING DIODE
D4201	4815011H01	DIODE TRIPLE
D4221	4813974A05	DIODE
D4401	4813978C02	DIODE VARACTOR
D4451	4813974A05	DIODE
D4471	4802482J02	PIN DIODE SMD
D4472	4802482J02	PIN DIODE SMD
FL3101	9180112R16	44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	44.85 MHZ CRYSTAL FILTER
FL3111	9115811H01	SMD455KHZ6 ELEMENT
FL3112	9115811H04	SMD455KHZ6 ELEMENT
FL3114	9180468V06	SMD455KHZ4 ELEMENT
FL3115	9115811H02	SMD455KHZ6 ELEMENT
J4401	0986166B01	MOBILE RF CONNECTOR (BNC)
L3101	2414032D25	620nH
L3111	2414032D25	620nH
L3112	2414032D25	620nH
L3124	2414032B68	1uH
L4003	2414032D23	470nH
L4006	2414032F24	15nH
L4008	2414032D23	470nH
L4051	2414032D17	150nH
L4053	2414032B46	27nH
L4054	2414032B43	15nH
L4201	2414017Q42	390nH
L4221	2414032L25	12uH
L4231	2414017Q20	2.2uH
L4301	2414032D22	390nH
L4302	2414032D22	390nH
L4303	2460593C01	COIL MULT LAYERED TAP TEF RESN
L4304	2414032D22	390nH
L4305	2414032D22	390nH
L4311	2414032D22	390nH
L4312	2460593C01	COIL MULT LAYERED TAP TEF RESN
L4313	2414032D22	390nH
L4331	2414032D09	33nH
L4333	2414032D22	390nH
L4361	2414032D09	33nH
L4362	2414032D09	33nH
L4371	2414032D13	68nH
L4401	2460591B04	11.03nH
L4402	2415954H02	INDUCTOR BEAD CHIP
L4403	2414032B50	56nH
L4411	2414032B44	18nH
L4421	2415954H02	INDUCTOR BEAD CHIP
L4422	2460591A01	4.22
L4436	2415954H02	INDUCTOR BEAD CHIP
L4437	2460592A01	17nH
L4471	2414032D22	390nH
L4472	2460592A01	17nH
L4491	2460592A01	17nH
L4493	2460592A01	17nH
M3421	2686201B02	HEATSPREADER
Q3101	4802197J95	RF TRANSISTOR PBR941
Q3102	4802197J95	RF TRANSISTOR PBR941
Q3141	4813973M07	NPN
Q3151	4813973A42	NPN
Q3152	4813973A42	NPN
Q4002	4813973A13	PNP
Q4003	4802197J95	RF TRANSISTOR PBR941
Q4004	4816097H01	XISTOR FMC2 RH
Q4221	4813973A42	NPN
Q4301	4805218N63	DIODE DUAL SCHOTTKY
Q4332	4802197J95	RF TRANSISTOR PBR941
Q4333	4815055H01	TSTR DUAL NPN/PNP UMH5
Q4411	4816097H01	XISTOR FMC2 RH
Q4421	4813976A04	RF POWER LDMOS MRF1518
Q4422	4813973A42	NPN
Q4441	4813976A13	RF POWER LDMOS MRF1535
Q4442	4813973A42	NPN
Q4471	4813973A42	NPN
Q4472	4816049H01	MEDIUM PWR TRANSISTOR
R3101	0613952J03	12K Ohm
R3102	0613952H25	10.0 Ohm
R3105	0613952H49	100 Ohm
R3106	0613952J11	27K Ohm
R3107	0613952H82	2400 Ohm
R3108	0613952H75	1200 Ohm
R3111	0613952J03	12K Ohm
R3112	0613952H25	10.0 Ohm
R3113	0613952H61	330 Ohm
R3115	0613952H63	390 Ohm
R3116	0613952H81	2200 Ohm
R3117	0613952J11	27K Ohm
R3118	0613952H82	2400 Ohm
R3124	0613952H73	1000 Ohm
R3130	0613952H42	51.0 Ohm
R3132	0613952J05	15K Ohm
R3133	0613952H89	4700 Ohm
R3134	0613952H95	8200 Ohm
R3135	0613952H75	1200 Ohm
R3141	0613952H63	390 Ohm
R3142	0613952H79	1800 Ohm
R3144	0613952H82	2400 Ohm
R3145	0613952H85	3300 Ohm
R3146	0613952H69	680 Ohm
R3147	0613952J03	12K Ohm
R3148	2113944C45	100pF
R3151	0613952J01	10K Ohm
R3152	0613952J01	10K Ohm
R3153	0613952J01	10K Ohm
R3154	0613952J01	10K Ohm
R4001	0613952J25	100K Ohm
R4002	0613952H61	330 Ohm
R4003	0613952H87	3900 Ohm
R4004	0613952H83	2700 Ohm
R4005	0613952J01	10K Ohm
R4007	0613952H49	100 Ohm
R4012	0613952J25	100K Ohm
R4013	0613952H59	270 Ohm
R4014	0613952H25	10.0 Ohm
R4016	0613952H85	3300 Ohm
R4018	0613952H85	3300 Ohm
R4022	0613952G67	0.0 Ohm
R4051	0613952H42	51.0 Ohm
R4052	0613952G67	0.0 Ohm
R4060	0613952J37	330K Ohm
R4061	0613952J01	10K Ohm
R4062	0613952H77	1500 Ohm
R4063	0613952H63	390 Ohm
R4064	0613952G67	0.0 Ohm
R4068	0613952H77	1500 Ohm
R4069	0613952H73	1000 Ohm
R4070	0613952H63	390 Ohm
R4071	0613952J01	10K Ohm
R4072	0613952J01	10K Ohm
R4201	0613952H53	150 Ohm
R4203	0613952H41	47.0 Ohm
R4204	0613952H41	47.0 Ohm
R4211	0613952G67	0.0 Ohm
R4221	0613952H53	150 Ohm
R4222	0613952H66	510 Ohm
R4223	0613952H45	68.0 Ohm
R4224	0613952J17	47K Ohm
R4225	0613952J17	47K Ohm
R4228	0613952J01	10K Ohm
R4241	0613952H57	220 Ohm
R4251	0613952J15	39K Ohm
R4252	0613952J12	30K Ohm
R4261	0613952J17	47K Ohm
R4263	0613952H49	100 Ohm
R4301	0613952H91	5600 Ohm
R4302	0613952J01	10K Ohm
R4303	0613952H36	30.0 Ohm
R4304	0613952H55	180 Ohm
R4305	0613952H25	10.0 Ohm
R4311	0613952H94	7500 Ohm
R4312	0613952H91	5600 Ohm
R4313	0613952H36	30.0 Ohm
R4314	0613952H59	270 Ohm
R4315	0613952G67	0.0 Ohm
R4321	0613952J19	56K Ohm
R4322	0613952J01	10K Ohm
R4323	0613952J25	100K Ohm
R4331	0613952H33	22.0 Ohm
R4341	0613952G67	0.0 Ohm
R4342	0613952H81	2200 Ohm
R4343	0613952H73	1000 Ohm
R4344	0613952H25	10.0 Ohm
R4346	0613952J01	10K Ohm
R4347	0613952G67	0.0 Ohm
R4360	0613952H59	270 Ohm
R4361	0613952H55	180 Ohm
R4362	0613952H25	10.0 Ohm
R4363	0613952H73	1000 Ohm
R4381	0613952H65	470 Ohm
R4400	0613952H67	560 Ohm
R4401	0613952H60	300 Ohm
R4402	0613952H29	15.0 Ohm
R4403	0613952H60	300 Ohm
R4404	0613952J17	47K Ohm
R4406	0613952J25	100K Ohm
R4412	0613952H93	6800 Ohm
R4413	0613952H85	3300 Ohm
R4415	0613952H42	51.0 Ohm
R4416	0613952H42	51.0 Ohm
R4418	0613952H83	2700 Ohm
R4421	0613952J29	150K Ohm
R4422	0613952H81	2200 Ohm
R4423	0613952J15	39K Ohm
R4424	0613958H11	2.7 Ohm
R4425	0613958H11	2.7 Ohm

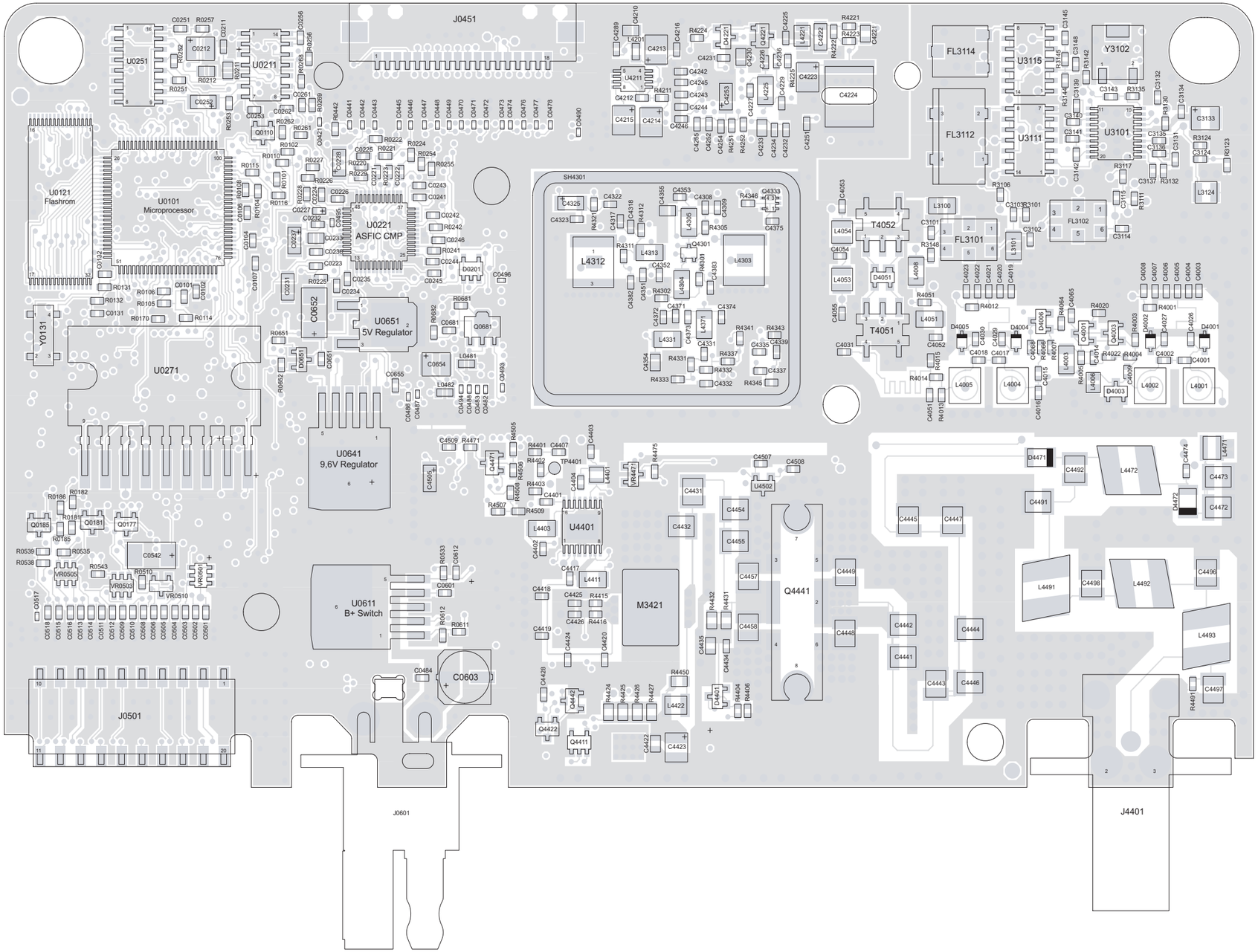
Circuit Ref	Motorola Part No.	Description
R4426	0613958H11	2.7 Ohm
R4427	0613958H11	2.7 Ohm
R4428	0613952J01	10K Ohm
R4429	0613952H67	560 Ohm
R4431	0613959Y42	51 Ohm
R4441	0613952J15	39K Ohm
R4442	0613952H81	2200 Ohm
R4443	0613952J15	39K Ohm
R4445	0613952H82	2400 Ohm
R4446	0613952G67	0.0 Ohm
R4452	0613952J03	12K Ohm
R4454	0613952J01	10K Ohm
R4455	0613952J25	100K Ohm
R4457	0613959Y51	Ohm
R4458	0613952H65	470 Ohm
R4471	0613952H65	470 Ohm
R4473	0613959Y42	51 Ohm
R4474	0613959Y42	51 Ohm
R4475	0613952J01	10K Ohm
R4491	0613952J01	10K Ohm
R4501	0613952H93	6800 Ohm
R4502	0613952J11	27K Ohm
R4504	0613952J01	10K Ohm
R4505	0613952J36	300K Ohm
R4507	0613952J08	20K Ohm
R4508	0613952J25	100K Ohm
R4509	0613952H73	1000 Ohm
R4511	0613958H17	4.7 Ohm
R4592	2415429H47	CHIP INDUCTOR
SH4301	2602641Y03	SHIELD ARIANE VCO
SH4302	2602641Y03	SHIELD ARIANE VCO
T4051	2516149H01	XFMR JEDI MIXER4-1
T4052	2516148H01	XMFR MIXER5-1
U3101	5115281H01	FM IF IC SA616 FROM PHILIPS
U3111	5185291Y01	QUAD ANALOG SWIITCH
U3115	5185291Y01	QUAD ANALOG SWIITCH
U4201	5185177Y01	FRACN IC
U4211	5115026H01	MAX SUPPLY VOL
U4301	5171121L01	VCO BUFFER IC
U4401	5115678H01	LDMOS DRIVER IC
U4402	5114005A01	OP AMP
U4501	5185765B26	IC PWR CTRL IN MOS20
U4502	5115022H01	IC TEMPERATURE SENSOR
VR4471	4813977M11	DIODE
Y3101	4802245J84	XTAL44.395MHZ3RD OT SMD
Y3102	9186145B02	CER.DISCRIMANATOR
Y4262	4816142H01	REFERENCE OSCILLATOR
	8471224L03	WARIS MOBILE U2 25W PCB

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

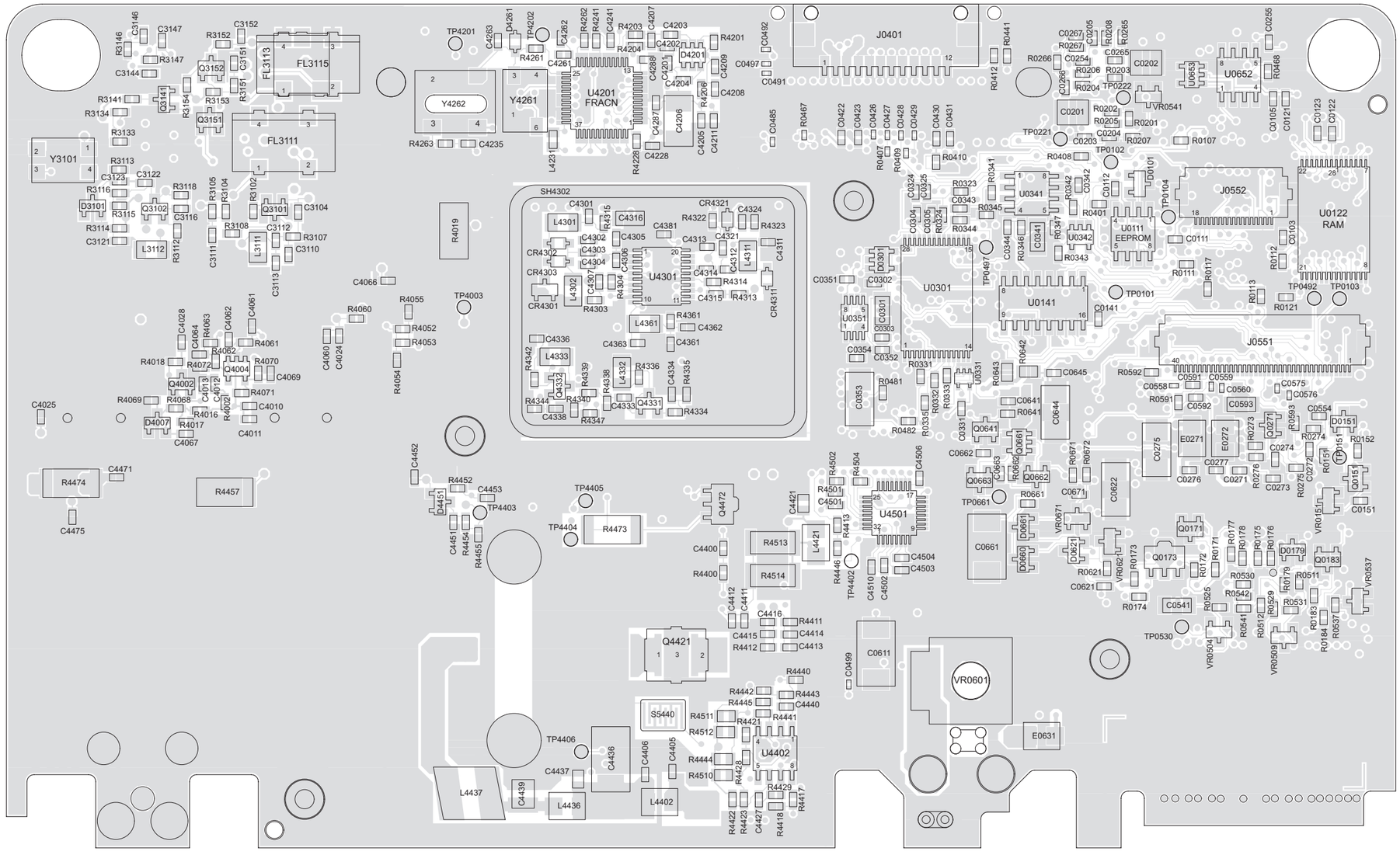
3.0 UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z02, Schematics, and Parts Lists



ZWG0130518-A

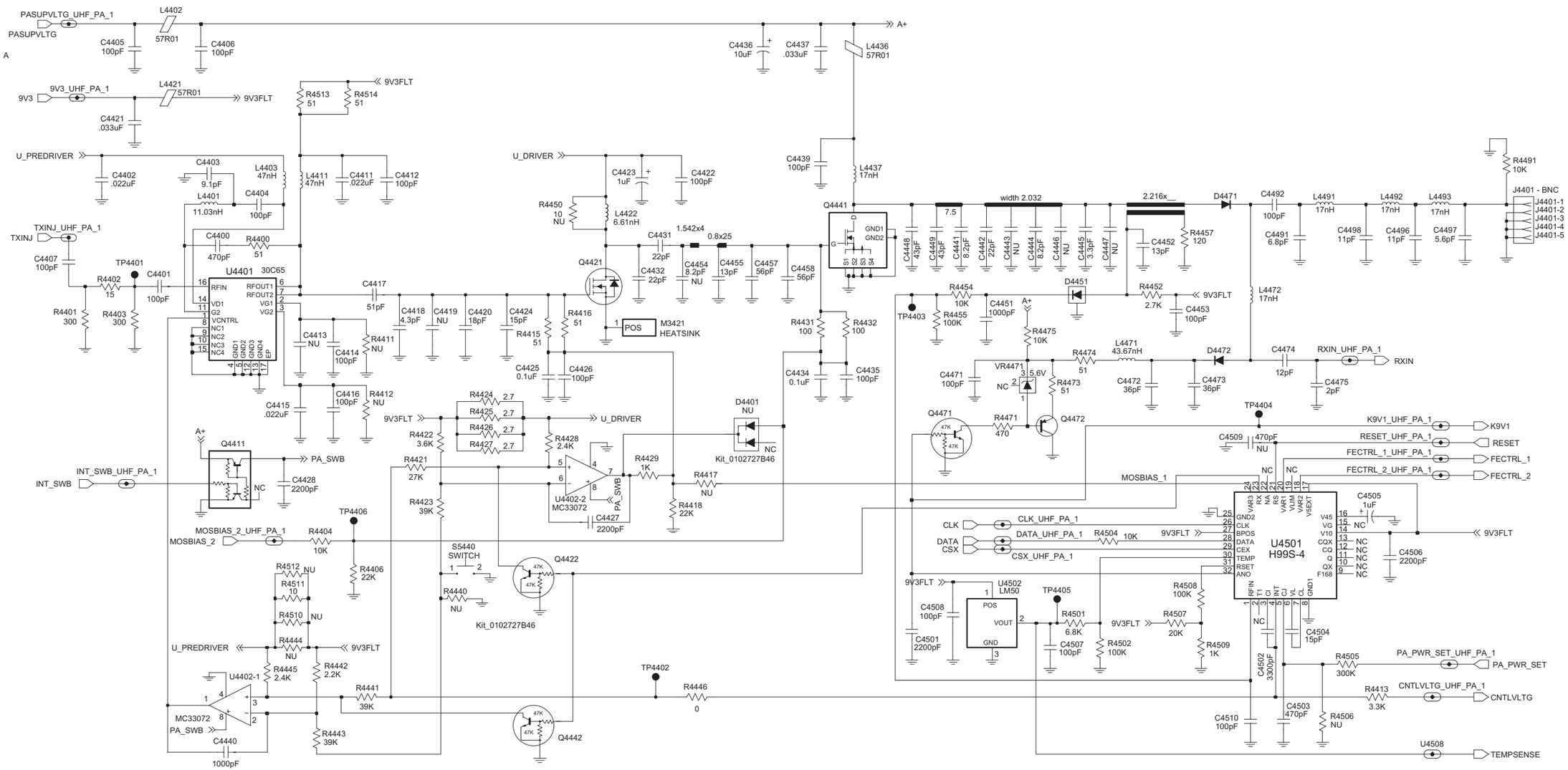
UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z02 Top Side

6881091C63-C



UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z02 Bottom Side

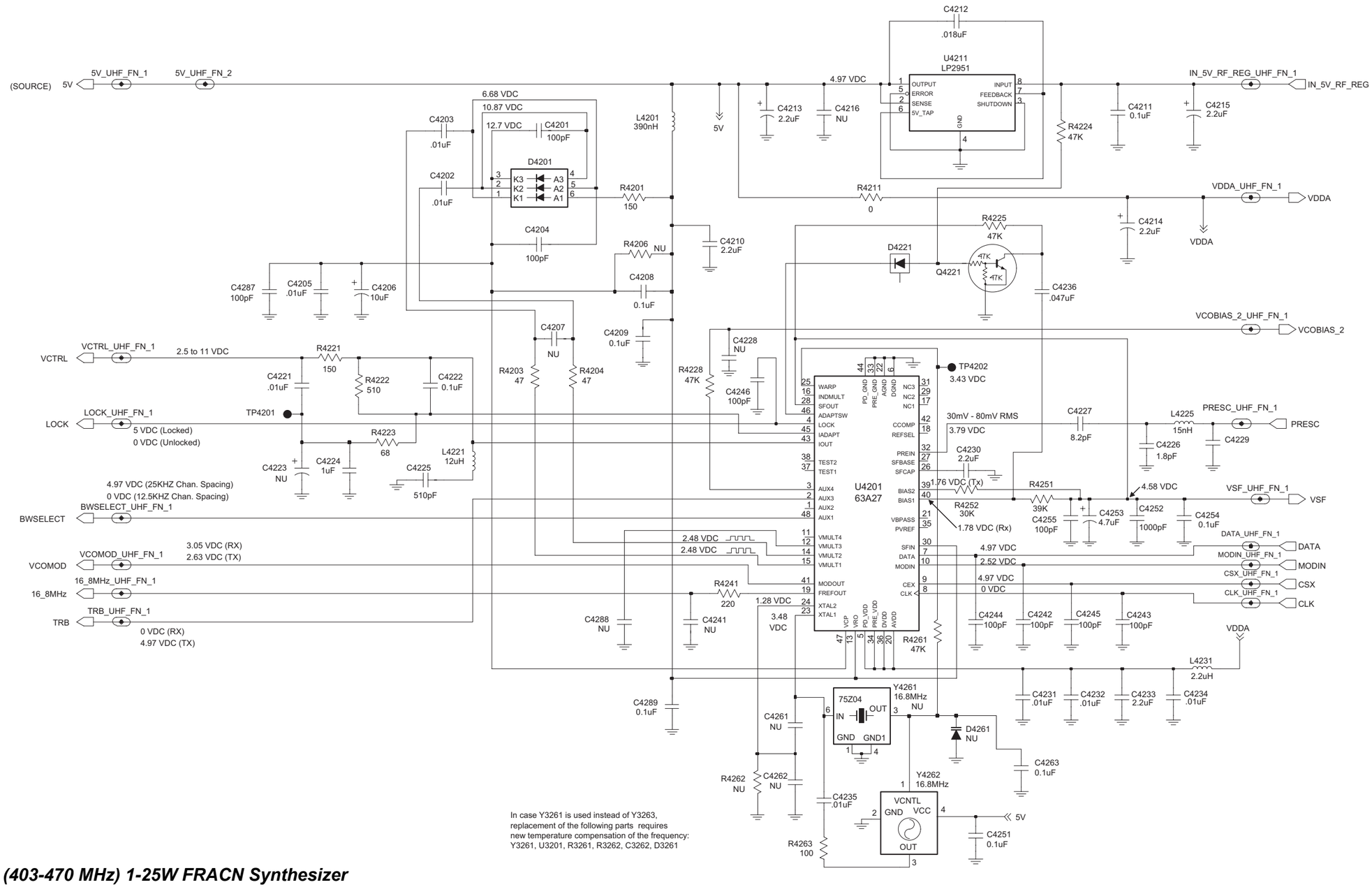
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ZWG0130520-B

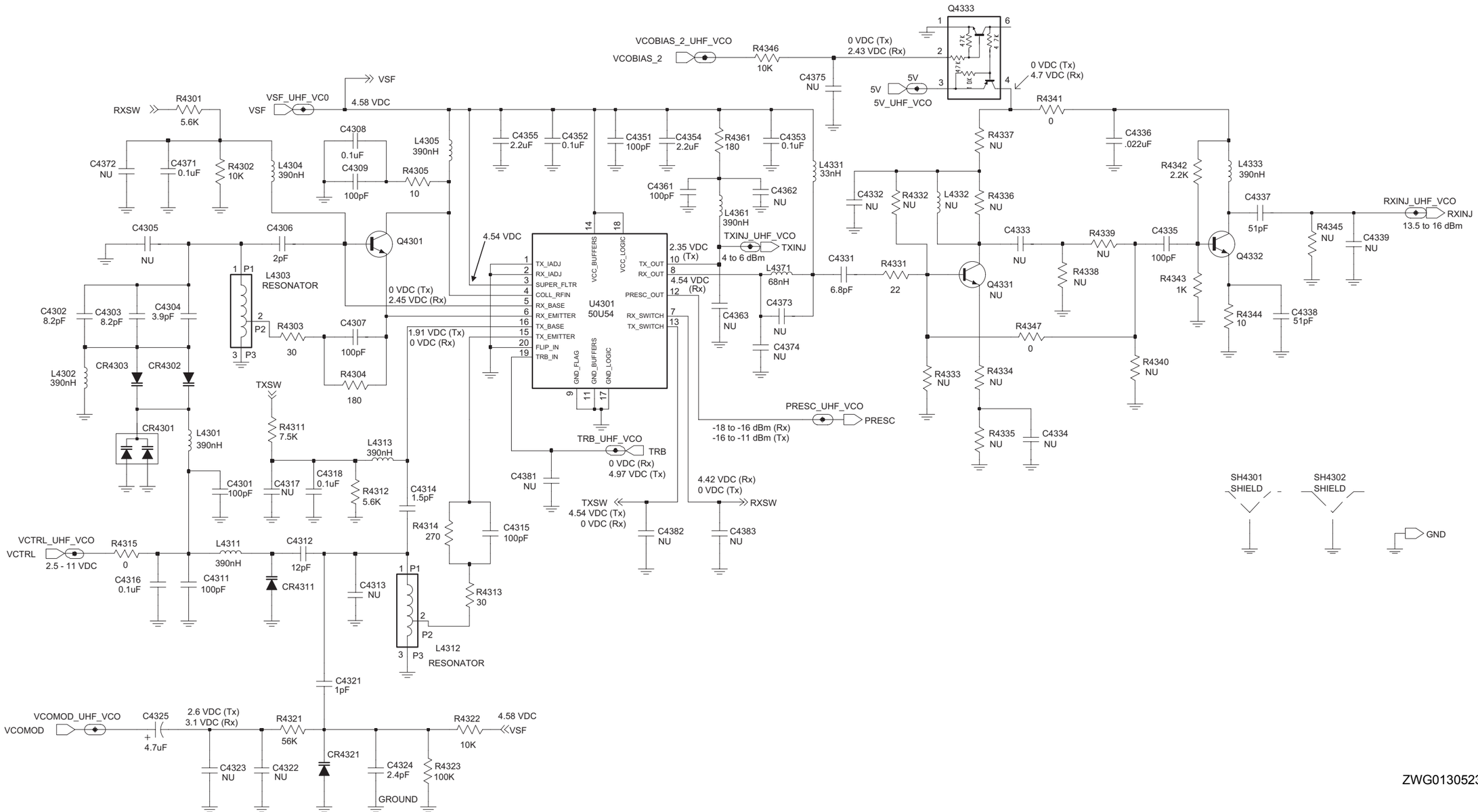
UHF Band 1 (403-470 MHz) 1-25W Power Amplifier

6881091C63-C



UHF Band 1 (403-470 MHz) 1-25W FRACN Synthesizer

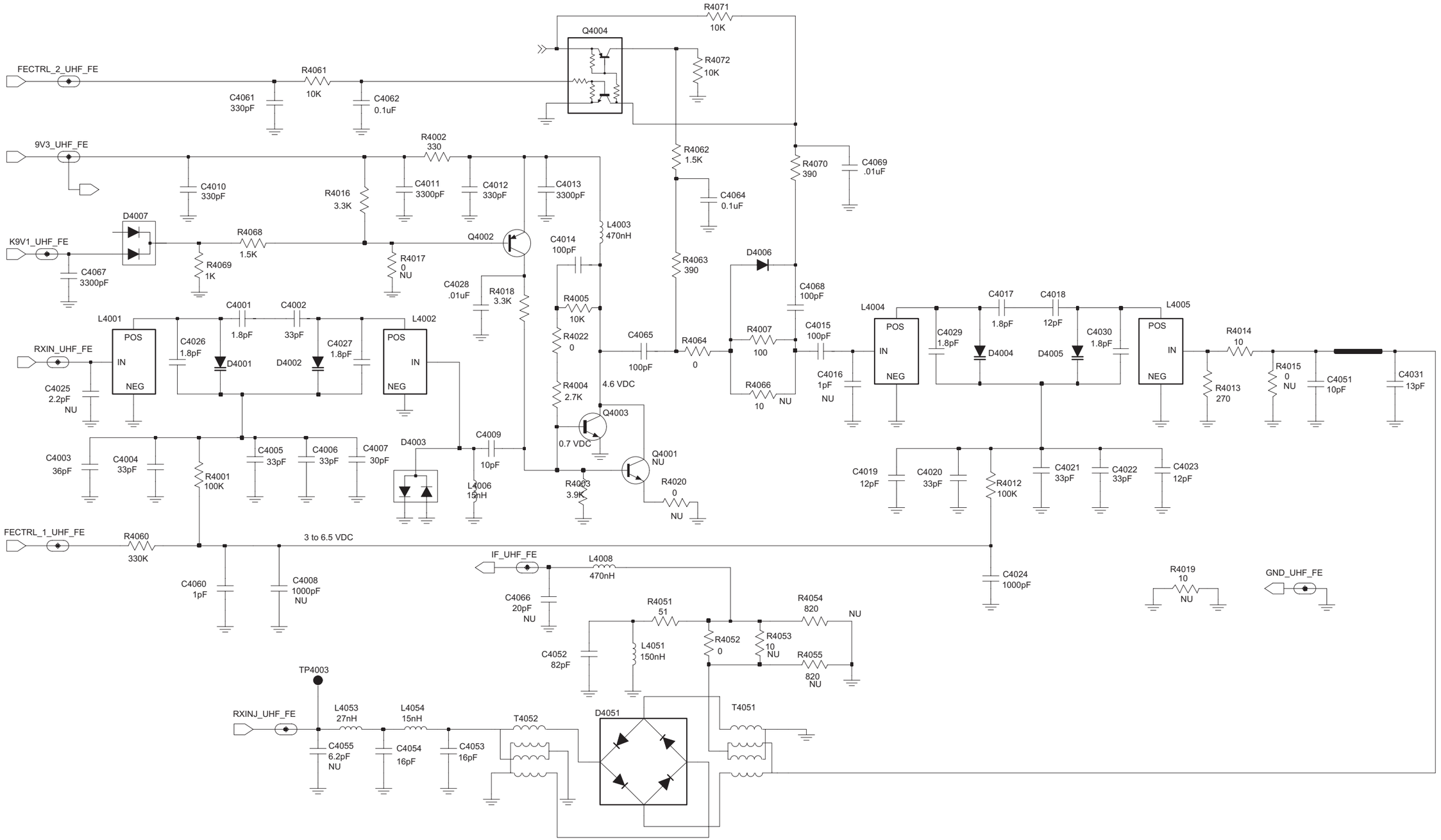
ZWG0130521-B



ZWG0130523-A

UHF Band 1 (403-470 MHz) 1-25W Voltage Controlled Oscillator

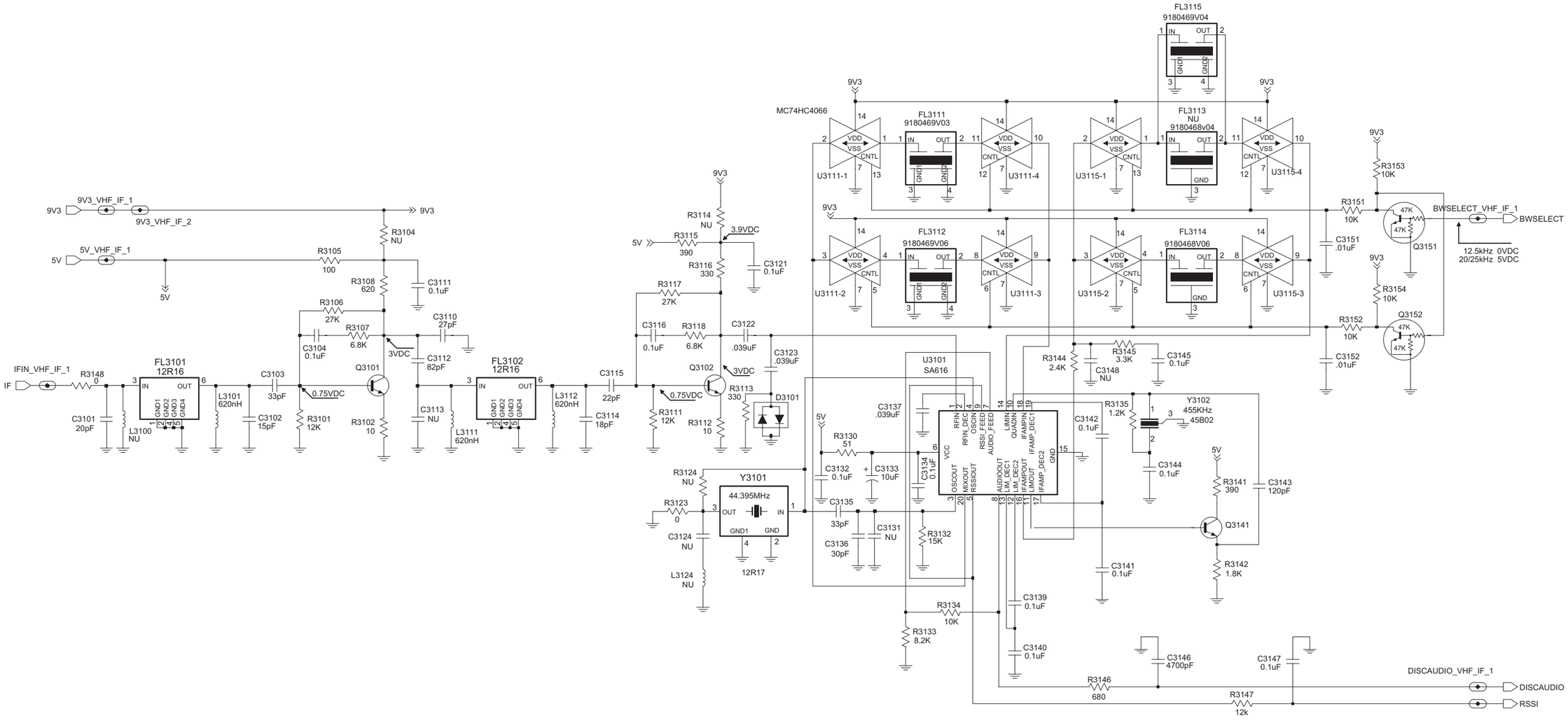
6881091C63-C



UHF Band 1 (403-470 MHz) 1-25W Receiver Front-End

ZWG0130524-B

6881091C63-C



ZWG0130522-A

UHF Band 1 (403-470 MHz) 1-25W IF

6881091C63-C

UHF B1 1-25W PCB 8485670Z02 Parts List†

Circuit Ref	Motorola Part No.	Description
C0223	2113743E20	0.1 uF, 0662057B47 0 Kohm resistor for LS+ models
C0593	2113743E20	0.1 uF, 0662057B47 0 Kohm resistor for LS+ models
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	100nF
C3110	2113740F37	27pF
C3111	2113743E20	100nF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	100nF
C3121	2113743E20	100nF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3132	2113743E20	100nF
C3133	2311049A57	10uF
C3134	2113743E20	100nF
C3135	2113740L30	33pF
C3136	2113740L29	30pF
C3137	2113743E11	0.039uF
C3139	2113743E20	100nF
C3140	2113743E20	100nF
C3141	2113743E20	100nF
C3142	2113743E20	100nF
C3143	2113740F53	120pF
C3144	2113743E20	100nF
C3145	2113743E20	100nF
C3146	2113741F41	4700pF
C3147	2113743E20	100nF
C3151	2113741F49	10nF
C3152	2113741F49	10nF
C4001	2113740F09	1.8pF
C4002	2113740F39	33pF
C4003	2113740F40	36pF
C4004	2113740F39	33pF
C4005	2113740F39	33pF
C4006	2113740F39	33pF
C4007	2113740F38	30pF
C4008	2113741F25	1000pF
C4009	2113740F27	10pF
C4010	2113741F13	330pF
C4011	2113741F37	3300pF
C4012	2113741F13	330pF
C4013	2113741F37	3300pF
C4014	2113740F51	100pF
C4015	2113740F51	100pF
C4017	2113740F09	1.8pF
C4018	2113740F29	12pF
C4019	2113740F29	12pF
C4020	2113740F39	33pF
C4021	2113740F39	33pF
C4022	2113740F39	33pF
C4023	2113740F29	12pF
C4024	2113741F25	1000pF
C4026	2113740F09	1.8pF
C4027	2113740F09	1.8pF
C4028	2113741F49	10nF
C4029	2113740F09	1.8pF
C4030	2113740F09	1.8pF
C4031	2113740F30	13pF
C4051	2113740F27	10pF
C4052	2113740F49	82pF
C4053	2113740F32	16pF
C4054	2113740F32	16pF
C4061	2113740F63	330pF
C4062	2113743E20	0.1uF
C4064	2113743E20	0.1uF
C4065	2113740F51	100pF
C4067	2113741F37	3300pF
C4068	2113740F51	100pF
C4069	2113741F49	10nF
C4201	2113740F51	100pF
C4202	2113741F49	10nF
C4203	2113741F49	10nF
C4204	2113740F51	100pF
C4205	2113741F49	10nF
C4206	2311049J25	10uF
C4208	2113743E20	100nF
C4209	2113743E20	100nF
C4210	2104993J02	2.2uF
C4211	2113743E20	100nF
C4213	2311049A09	2.2uF
C4214	2311049A09	2.2uF
C4215	2311049A09	2.2uF
C4217	2113741F49	10nF
C4221	2109720D01	0.01uF
C4222	2109720D14	0.1uF
C4224	0882422W23	1uF
C4225	2113741F18	510pF
C4227	2113740F51	100pF
C4230	2104993J02	2.2uF
C4231	2113741F49	10nF
C4232	2113741F49	10nF
C4233	2104993J02	2.2uF
C4234	2113741F49	10nF
C4235	2113741F49	10nF
C4236	2113743E12	0.047uF
C4242	2113740F51	100pF
C4243	2113740F51	100pF
C4244	2113740F51	100pF
C4245	2113740F51	100pF
C4246	2113740F51	100pF
C4251	2113743E20	100nF
C4252	2113741F25	1000pF
C4253	2311049A56	4.7uF
C4254	2113743E20	100nF
C4255	2113740F51	100pF
C4263	2113743E20	100nF
C4287	2113740F51	100pF
C4289	2113743E20	100nF
C4301	2113740F51	100pF
C4302	2113740L16	8.2pF
C4303	2113740L16	8.2pF
C4304	2113740L08	3.9pF
C4306	2113740L01	2pF
C4307	2113740F51	100pF
C4308	2113743E20	100nF
C4309	2113740F51	100pF
C4311	2113740F51	100pF
C4312	2113740F29	12pF
C4314	2113740F07	1.5pF
C4315	2113740F51	100pF
C4316	2109720D14	0.1uF
C4318	2113743E20	100nF
C4321	2113740F03	1pF
C4324	2113740L03	2.4pF
C4325	2311049A56	4.7uF
C4331	2113740L14	6.8pF
C4335	2113740F51	100pF
C4336	2113743E07	0.022uF
C4337	2113740F44	51pF
C4338	2113740F44	51pF
C4351	2113740F51	100pF
C4352	2113743E20	100nF
C4353	2113743E20	100nF
C4354	2104993J02	2.2uF
C4355	2104993J02	2.2uF
C4361	2113740F51	100pF
C4371	2113743E20	100nF
C4400	2113740F67	470pF
C4401	2113740F51	100pF
C4402	2113741F37	3300pF
C4403	2113740F23	6.8pF
C4404	2113740F51	100pF
C4405	2113740F51	100pF
C4406	2113740F51	100pF
C4407	2113740F51	100pF
C4411	2113741F37	3300pF
C4412	2113740F51	100pF
C4414	2113740F51	100pF
C4415	2113743E07	0.022uF
C4416	2113740F51	100pF
C4417	2113740F44	51pF
C4419	2113740F33	18pF
C4420	2113740F28	11pF
C4421	2113741A57	33K F
C4422	2113740A55	100pF
C4423	2311049A08	1uF
C4425	2113743E20	100nF
C4426	2113740F51	100pF
C4427	2113741F37	3300pF
C4428	2113741F33	2200pF
C4431	2111078B23	24pF
C4432	2111078B22	22pF
C4434	2113741F49	10nF
C4435	2113740A55	100pF
C4436	2311049A45	10uF
C4437	2113741A57	33K F
C4439	2111078B42	100pF
C4440	2113741F25	1000pF
C4441	2111078B11	8.2pF
C4442	2111078B22	22pF
C4445	2111078B01	3.3pF
C4446	2111078B09	6.8pF
C4447	2111078B01	3.3pF
C4448	2111078B33	43pF
C4449	2111078B29	33pF
C4451	2113741F25	1000pF
C4452	2113740F30	13pF
C4453	2113740F51	100pF
C4454	2111078B11	8.2pF
C4455	2111078B12	9.1pF
C4457	2111078B27	30pF
C4458	2111078B32	39pF
C4471	2113740F51	100pF
C4472	2111078B31	36pF
C4473	2111078B31	36pF
C4474	2113740F29	12pF
C4475	2113740F10	2pF
C4491	2111078B09	6.8pF
C4492	2111078B42	100pF
C4496	2111078B14	11pF
C4497	2111078B07	5.6pF
C4498	2111078B14	11pF
C4501	2113741F33	2200pF
C4502	2113741F33	2200pF
C4503	2113741F33	2.2nF
C4504	2113741F49	10nF
C4505	2311049A07	1uF

Circuit Ref	Motorola Part No.	Description
C4506	2113741F33	2200pF
C4507	2113740F51	100pF
C4508	2113740F51	100pF
C4510	2113740F51	100pF
CR4301	4805649Q13	DIODE, VARACTOR
CR4302	4862824C01	DIODE, VARACTOR
CR4303	4862824C01	DIODE, VARACTOR
CR4311	4802245J22	DIODE, VARACTOR
CR4321	4862824C01	DIODE, VARACTOR
D3101	4880154K03	DIODE DUAL SCHOTTKY
D4001	4862824C01	DIODE VARACTOR
D4002	4862824C01	DIODE VARACTOR
D4003	4880154K03	DIODE DUAL SCHOTTKY
D4004	4862824C01	DIODE VARACTOR
D4005	4862824C01	DIODE VARACTOR
D4006	4880142L01	DIODE
D4007	4813833C02	DIODE, DUAL 70V
D4051	4886143B01	DIODE, MIXER
D4201	4802233J09	DIODE, TRIPLE
D4221	4813825A05	DIODE
D4401	4813833C02	DIODE, DUAL 70V
D4451	4813825A05	DIODE
D4471	4802482J02	DIODE
D4472	4802482J02	DIODE
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	6 ELEMENT CER FILTER, 455KHz
FL3112	9180469V06	6 ELEMENT CER FILTER, 455KHz
FL3114	9180468V06	4 ELEMENT CER FILTER, 455KHz
FL3115	9180469V04	6 ELEMENT CER FILTER, 455KHz
J4401	0986166B01	MOBILE RF CONNECTOR (BNC)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L4003	2462587T23	470nH
L4006	2462587V24	15nH
L4008	2462587T23	470nH
L4051	2462587T17	150nH
L4053	2462587N46	27nH
L4054	2462587N43	15nH
L4201	2462587Q42	390nH
L4221	2462587P25	12000nH
L4225	2462587T40	33nH
L4231	2462587Q20	2200nH

Circuit Ref	Motorola Part No.	Description
L4301	2462587T22	390nH
L4302	2462587T22	390nH
L4303	2460593C01	RESONATOR
L4304	2462587T22	390nH
L4305	2462587T22	390nH
L4311	2462587T22	390nH
L4312	2460593C01	RESONATOR
L4313	2462587T22	390nH
L4331	2462587T09	33nH
L4333	2462587T22	390nH
L4361	2462587T22	390nH
L4371	2462587T13	68nH
L4401	2460591B04	11.03nH
L4402	2484657R01	Ferrite Bead
L4403	2462587T11	68nH
L4411	2462587T11	68nH
L4421	2484657R01	Ferrite Bead
L4422	2460591C23	13.85nH
L4436	2484657R01	Ferrite Bead
L4437	2460592A01	17nH
L4471	2460591N36	43nH
L4472	2460592A01	17nH
L4491	2460592A01	17nH
L4492	2460592A01	17nH
L4493	2460592A01	17nH
M3421	2686201B01	HEAT SPREADER
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q4002	4813824A17	PNP
Q4003	4813827A07	NPN
Q4004	4805921T02	DUAL NPN/PNP
Q4221	4880048M01	NPN
Q4301	4805218N63	DIODE DUAL SCHOTTKY
Q4332	4813827A07	NPN
Q4333	4802245J50	TRANSISTOR DUAL NPN/PNP
Q4411	4805921T02	TRANSISTOR DUAL DIGITAL NPN/PNP
Q4421	4886212B01	MRF1518
Q4422	4880048M01	NPN
Q4441	4886163B01	MRF1535
Q4442	4880048M01	NPN
Q4471	4880048M01	NPN
Q4472	4805128M27	PNP
R3101	0662057A75	12K Ohm
R3102	0662057A01	10 Ohm
R3105	0662057A25	100 Ohm
R3106	0662057A83	27K Ohm
R3107	0662057A69	6800 Ohm

Circuit Ref	Motorola Part No.	Description
R3108	0662057A44	620 Ohm
R3111	0662057A75	12K Ohm
R3112	0662057A01	10 Ohm
R3113	0662057A37	330 Ohm
R3115	0662057A39	390 Ohm
R3116	0662057A37	330 Ohm
R3117	0662057A83	27K Ohm
R3118	0662057A69	6800 Ohm
R3123	0662057B47	0 Ohm
R3130	0662057A18	51 Ohm
R3132	0662057A77	15K Ohm
R3133	0662057A71	8200 Ohm
R3134	0662057A73	10K Ohm
R3135	0662057A51	1200 Ohm
R3141	0662057A39	390 Ohm
R3142	0662057A55	1800 Ohm
R3144	0662057A58	2400 Ohm
R3145	0662057A61	3300 Ohm
R3146	0662057A45	680 Ohm
R3147	0662057A75	12K Ohm
R3148	0662057B47	0 Ohm
R3151	0662057A73	10K Ohm
R3152	0662057A73	10K Ohm
R3153	0662057A73	10K Ohm
R3154	0662057A73	10K Ohm
R4001	0662057A97	100K
R4002	0662057A37	330
R4003	0662057A63	3.9K
R4004	0662057A59	2.7K
R4005	0662057A73	10K
R4007	0662057A25	100
R4012	0662057A97	100K
R4013	0662057A35	270
R4014	0662057A01	10
R4016	0662057A61	3.3K
R4018	0662057A61	3.3K
R4022	0662057B47	0
R4051	0662057A18	51
R4052	0662057B47	0
R4060	0662057B10	330K
R4061	0662057A73	10K
R4062	0662057A53	1.5K
R4063	0662057A39	390
R4064	0662057B47	0
R4068	0662057A53	1.5K
R4069	0662057A49	1K
R4070	0662057A39	390
R4071	0662057A73	10K
R4072	0662057A73	10K
R4201	0662057A29	150 Ohm
R4203	0662057A17	47 Ohm

Circuit Ref	Motorola Part No.	Description
R4204	0662057A17	47 Ohm
R4211	0662057B47	0 Ohm
R4221	0662057A29	150 Ohm
R4222	0662057A42	510 Ohm
R4223	0662057A21	68 Ohm
R4224	0662057A89	47K Ohm
R4225	0662057A89	47K Ohm
R4228	0662057A89	47k
R4241	0662057A33	220 Ohm
R4251	0662057A87	39K Ohm
R4252	0662057A84	30K Ohm
R4261	0662057A89	47K Ohm
R4263	0662057A25	100 Ohm
R4301	0662057A67	5600 Ohm
R4302	0662057A73	10K Ohm
R4303	0662057A12	30 Ohm
R4304	0662057A31	180 Ohm
R4305	0662057A01	10 Ohm
R4311	0662057A70	7500 Ohm
R4312	0662057A67	5600 Ohm
R4313	0662057A12	30 Ohm
R4314	0662057A35	270 Ohm
R4315	0662057B47	0 Ohm
R4321	0662057A91	56K Ohm
R4322	0662057A73	10K Ohm
R4323	0662057A97	100K Ohm
R4331	0662057A09	22 Ohm
R4341	0662057B47	0 Ohm
R4342	0662057A57	2200 Ohm
R4343	0662057A49	1000 Ohm
R4344	0662057A01	10 Ohm
R4346	0662057A73	10K Ohm
R4347	0662057B47	0 Ohm
R4361	0662057A31	180 Ohm
R4400	0662057A43	560 Ohm
R4401	0662057A36	300 Ohm
R4402	0662057A05	15 Ohm
R4403	0662057A36	300 Ohm
R4404	0662057A73	10k
R4406	0662057A81	22k
R4413	0662057A61	3300 Ohm
R4415	0662057A18	51 Ohm
R4416	0662057A18	51 Ohm
R4418	0662057A59	2700 Ohm
R4421	0662057A87	39K Ohm
R4422	0662057A57	2200 Ohm
R4423	0662057A87	39K Ohm
R4424	0662057C13	2.7 Ohm
R4425	0662057C13	2.7 Ohm
R4426	0662057C13	2.7 Ohm
R4427	0662057C13	2.7 Ohm

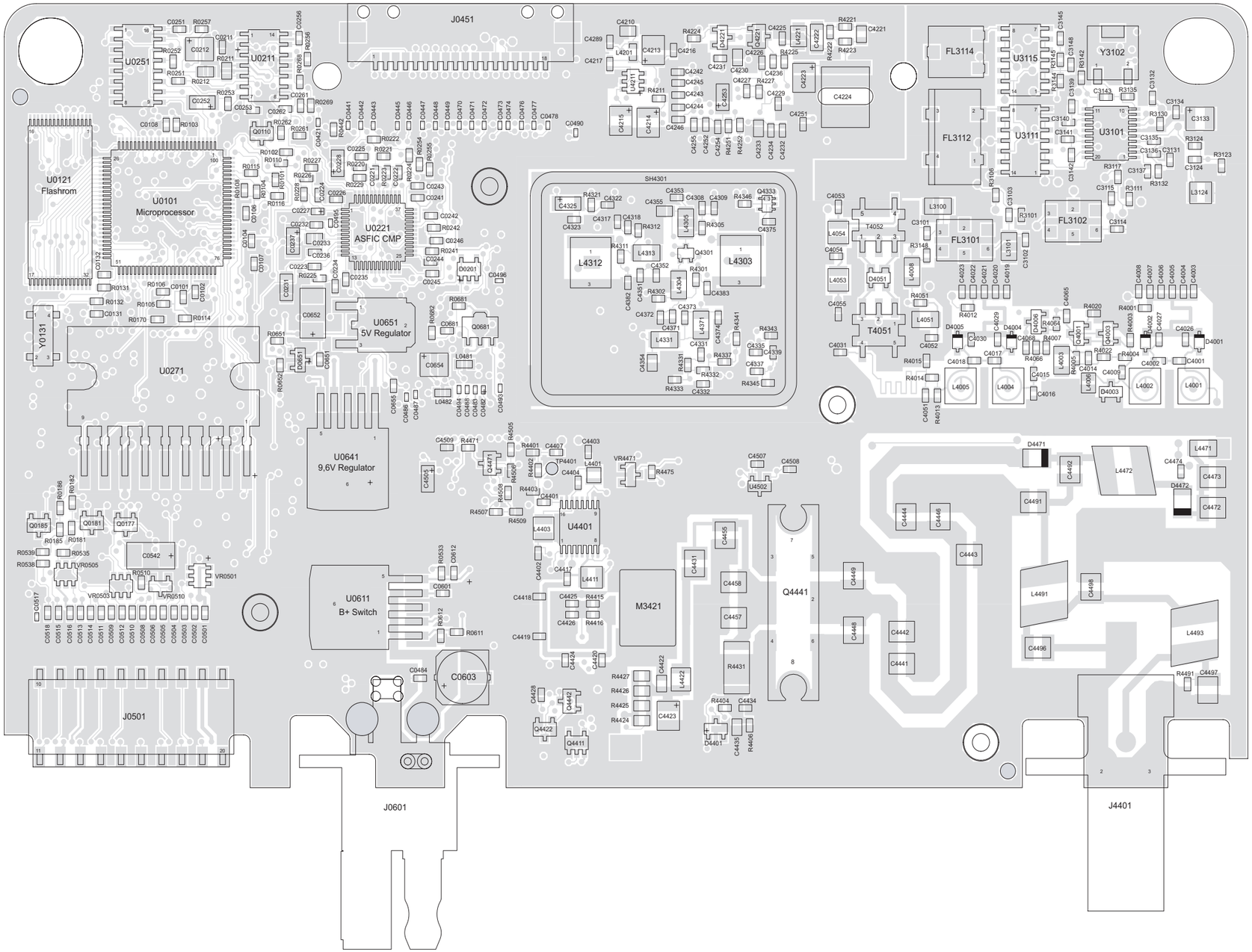
Circuit Ref	Motorola Part No.	Description
R4428	0662057A58	2400 Ohm
R4429	0662057A59	2700 Ohm
R4431	0662057C51	100
R4432	0662057C51	100
R4441	0662057A87	39K Ohm
R4442	0662057A57	2200 Ohm
R4443	0662057A87	39K Ohm
R4444	0611079A69	620
R4445	0662057A58	2400 Ohm
R4446	0662057B47	0 Ohm
R4450	0611079A26	10
R4452	0662057A59	2.7k
R4454	0662057A73	10K Ohm
R4455	0662057A97	100K Ohm
R4457	0683962T51	120 Ohm
R4471	0662057A41	470 Ohm
R4473	0680194M18	51 Ohm
R4474	0680194M18	51 Ohm
R4475	0662057A73	10K Ohm
R4491	0662057A73	10K Ohm
R4501	0662057A69	6800 Ohm
R4502	0662057A83	27K Ohm
R4504	0662057A73	10K Ohm
R4505	0662057A97	100k
R4507	0662057A80	20K Ohm
R4508	0662057A97	100K Ohm
R4509	0662057A49	1000 Ohm
R4510	0611079A69	620
R4511	0662057C19	4.7 Ohm
R4512	0611079A69	620
SH4301	2602641Y02	SHIELD
SH4302	2602641Y02	SHIELD
T4051	2505515V03	TRANSFORMER 4:1
T4052	2505515V04	TRANSFORMER 5:1
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U4201	5185963A27	IC FRACTN
U4211	5105739X05	IC, VOLTAGE REGULATOR
U4301	5105750U54	IC, VCO
U4401	5185130C65	IC LDMOS DRIVER
U4402	5113818A01	LOW POWER SUPPLY
U4501	5185765B28	IC POWER CONTROL
U4502	5185963A15	IC TEMPERATURE SENSOR
VR4471	4813830A15	DIODE, 5.6V
Y3101	4880606B09	2ND OSC XTAL 44.395 MHZ
Y3102	9186145B02	455KHz DISCRIMINATOR
Y4262	4886182B01	TCXO 16.8MHZ

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

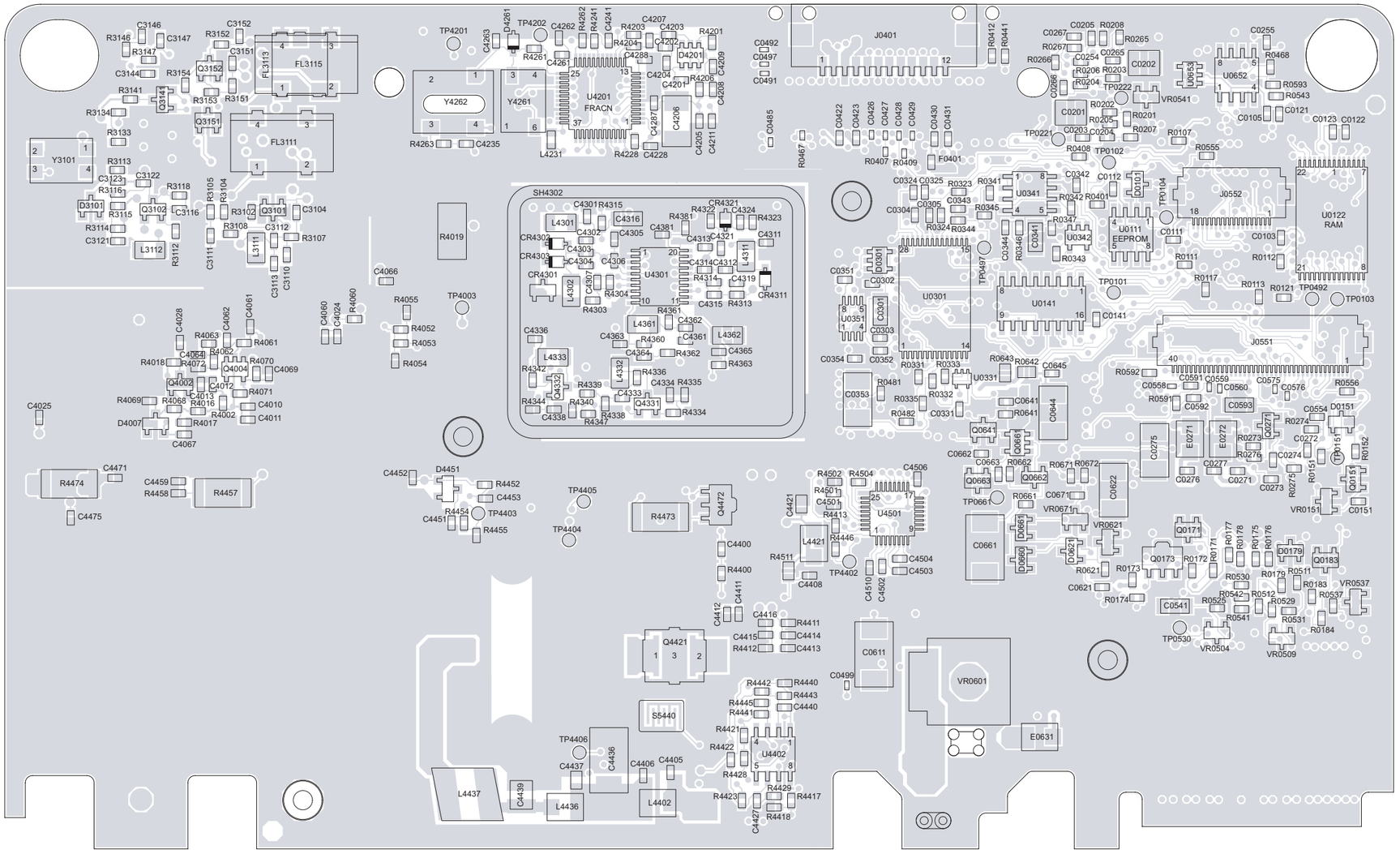
4.0 UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z03, Schematics, and Parts Lists



ZWG0130626-O

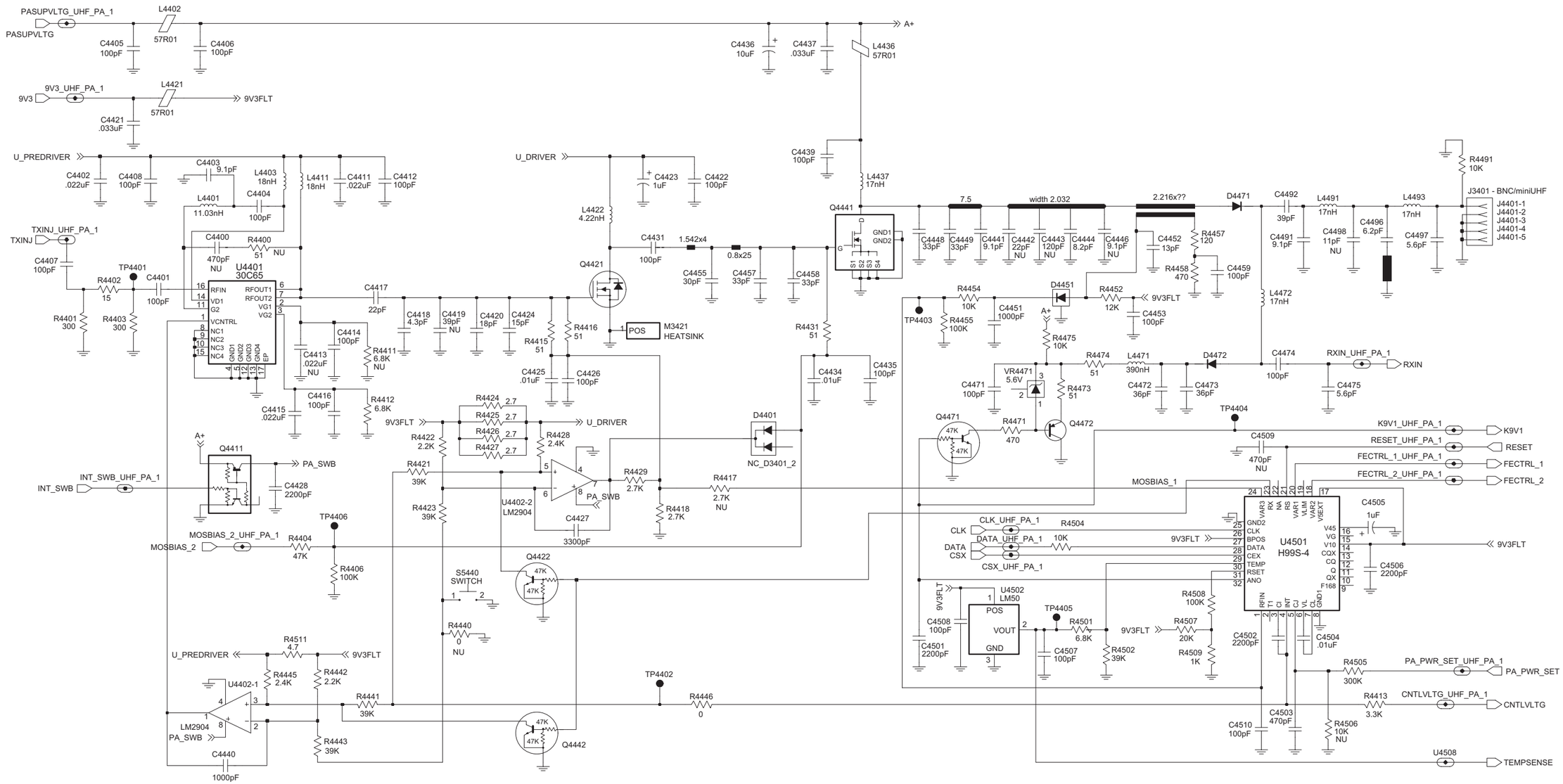
UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z03 Top Side

6881091C63-C



UHF Band 1 (403-470 MHz) 1-25W PCB 8485670Z03 Bottom Side

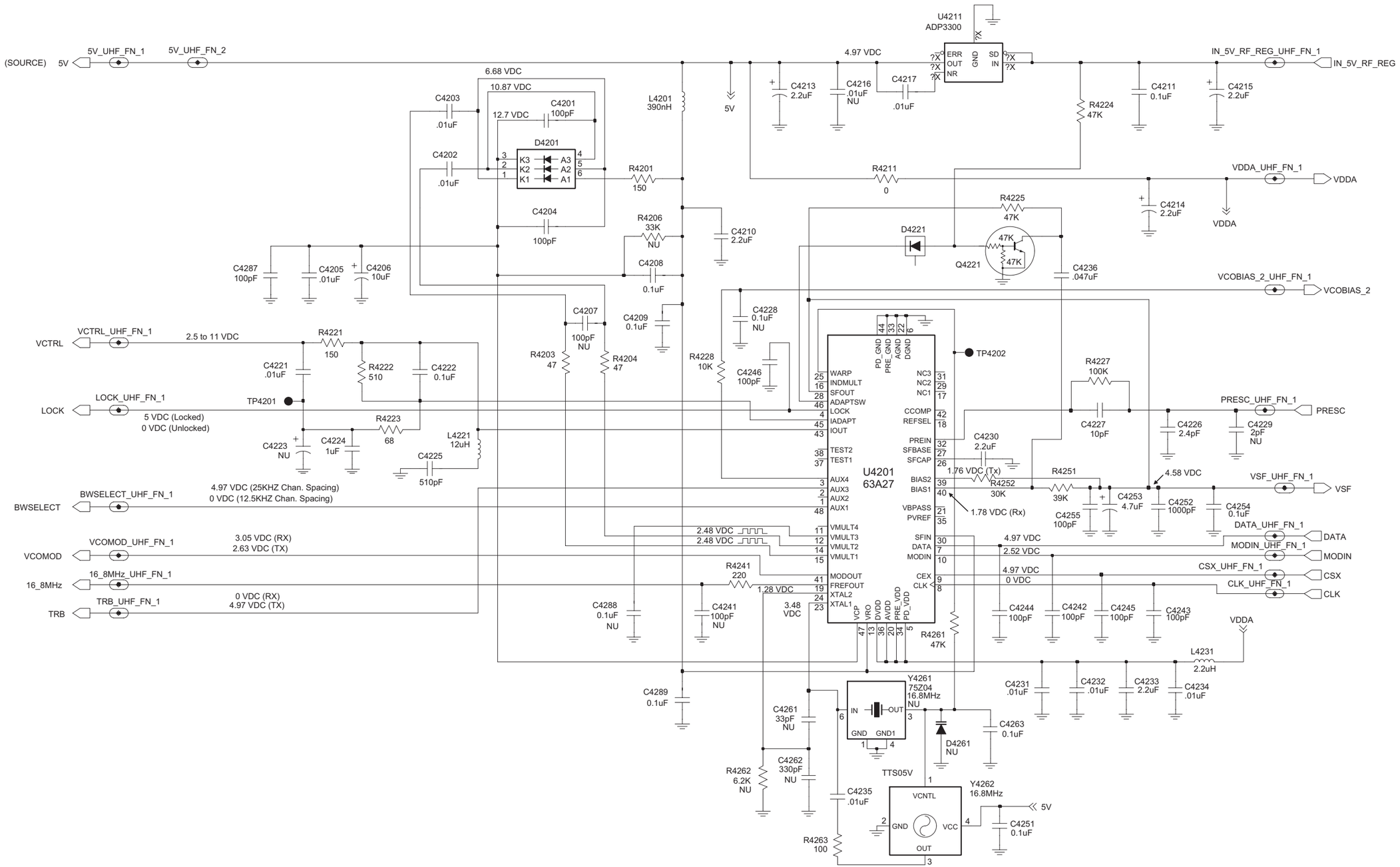
ZWG0130627-O



ZWG0130520-B

UHF Band 1 (403-470 MHz) 1-25W Power Amplifier

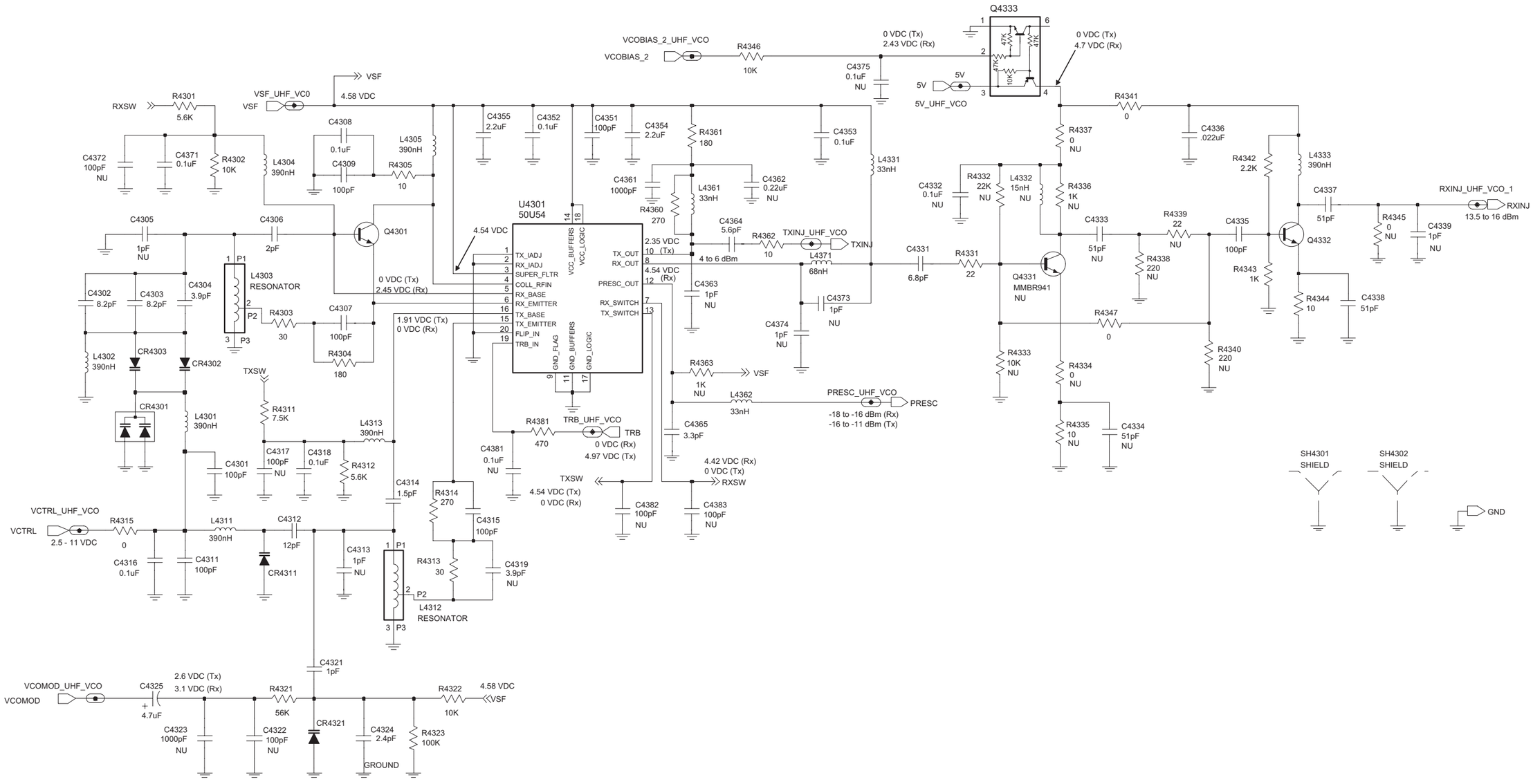
6881091C63-C

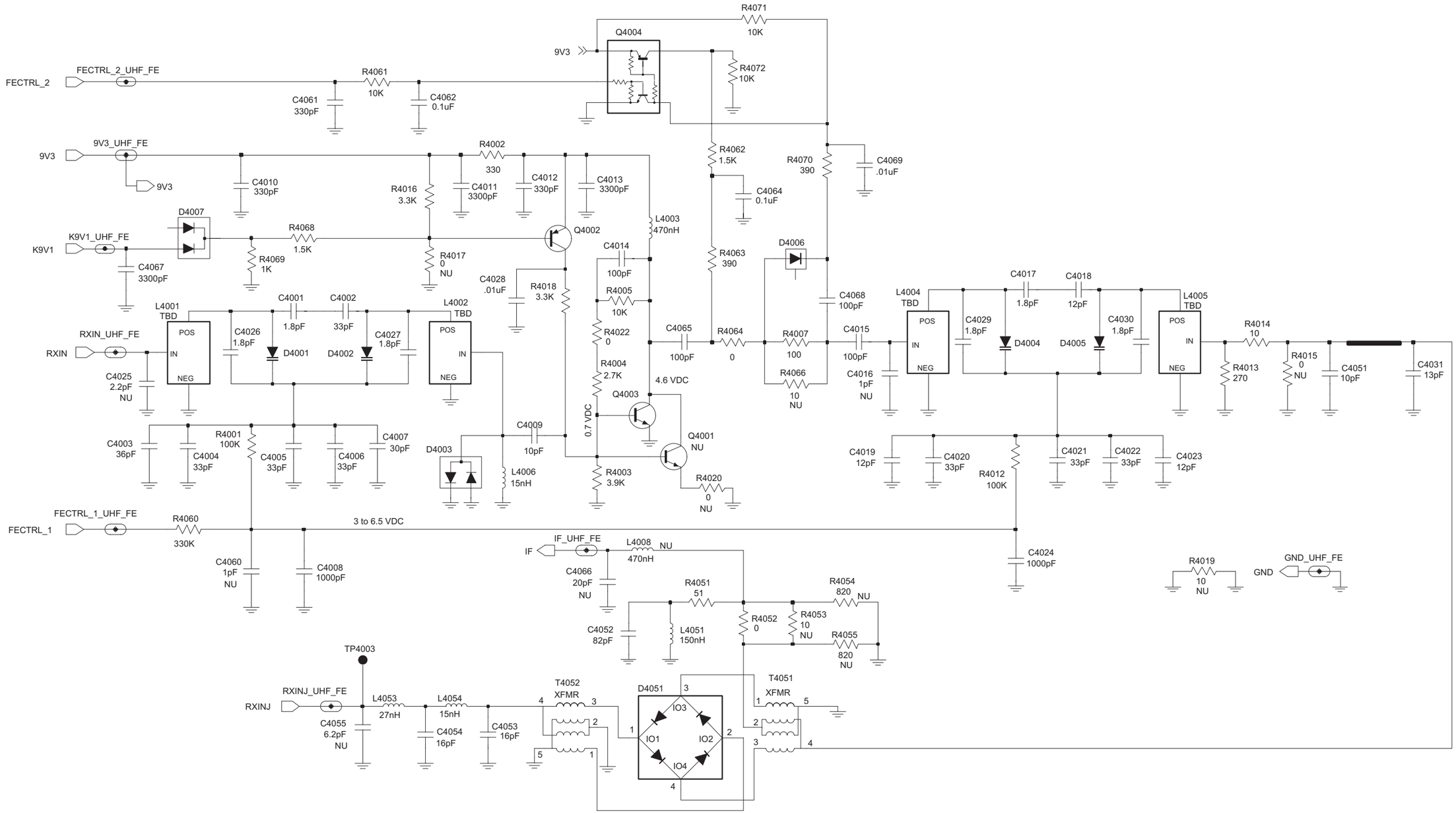


UHF Band 1 (403-470 MHz) 1-25W FRACN Synthesizer

ZWG0130622-O

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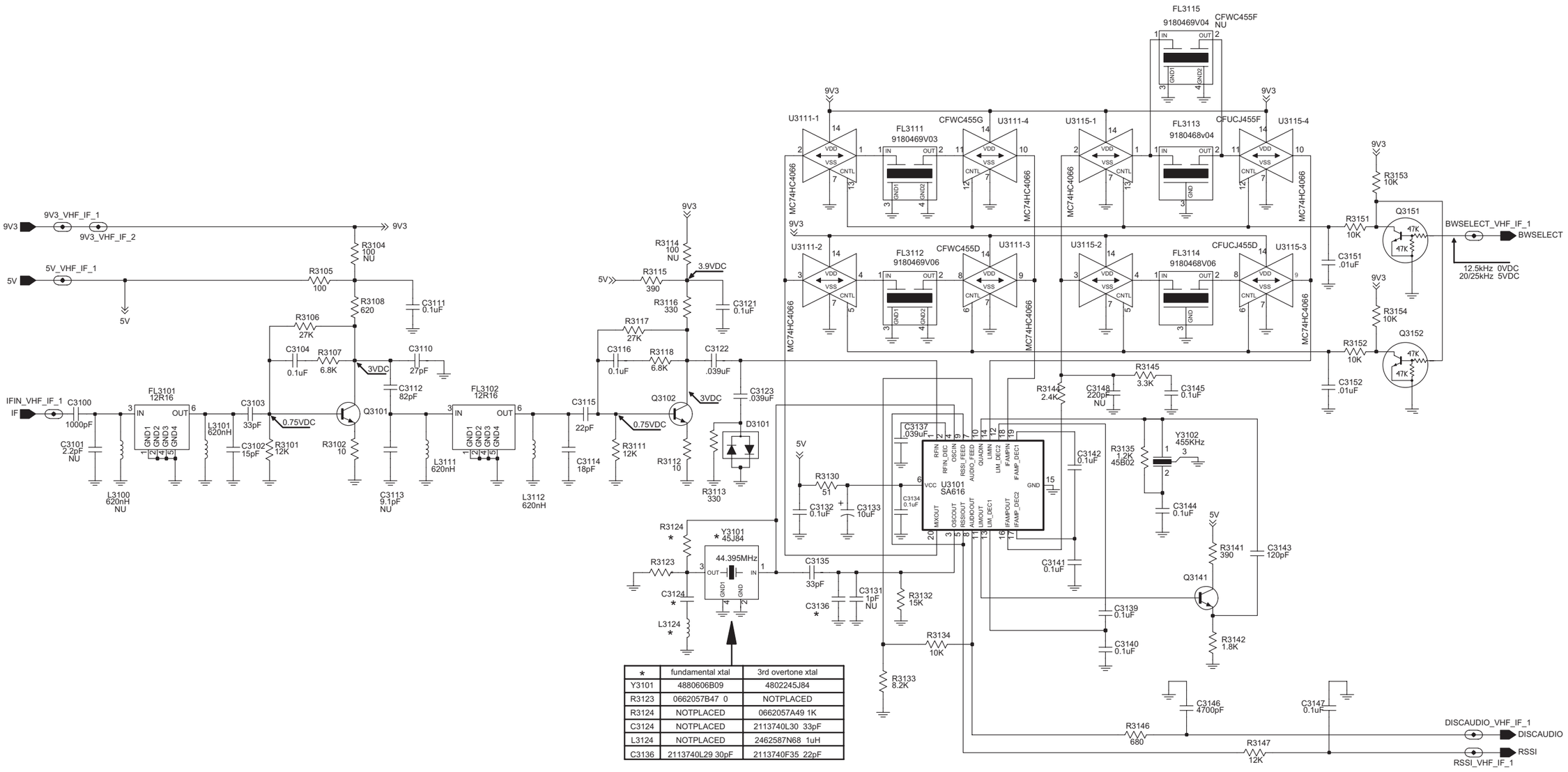

Q4333
VCOBIAS_2_UHF_VCO
VCOBIAS_2
R4346
10K
0 VDC (Tx)
2.43 VDC (Rx)
0 VDC (Tx)
4.7 VDC (Rx)
C4375
0.1uF
NU
5V
5V_UHF_VCO
VSF
VSF_UHF_VC0
4.58 VDC
RXSW
R4301
5.6K
C4372
100pF
NU
C4371
0.1uF
R4302
10K
L4304
390nH
C4308
0.1uF
C4309
100pF
L4305
390nH
R4305
10
C4355
2.2uF
C4352
0.1uF
C4351
100pF
C4354
2.2uF
R4361
180
C4353
0.1uF
L4331
33nH
C4361
1000pF
R4360
270
L4361
33nH
C4362
0.22uF
NU
U4301
50U54
4.54 VDC
C4364
5.6pF
R4362
10
TXINJ_UHF_VCO
TXINJ
2.35 VDC
10 (Tx)
4 to 6 dBm
4.54 VDC
12 (Rx)
L4371
68nH
C4331
6.8pF
R4331
22
Q4331
MMBR941
NU
C4363
1pF
NU
C4373
1pF
NU
C4374
1pF
NU
R4341
0
R4337
0
NU
C4336
.022uF
C4332
0.1uF
NU
R4332
22K
NU
L4332
15nH
NU
R4336
1K
NU
R4342
2.2K
L4333
390nH
C4337
51pF
RXINJ_UHF_VCO_1
RXINJ
13.5 to 16 dBm
R4345
0
NU
C4339
1pF
NU
C4333
51pF
NU
R4339
22
NU
R4338
220
NU
C4335
100pF
R4343
1K
Q4332
R4344
10
C4338
51pF
R4347
0
R4340
220
NU
R4333
10K
NU
R4334
0
NU
R4335
10
NU
C4334
51pF
NU
C4305
1pF
NU
C4306
2pF
Q4301
0 VDC (Tx)
2.45 VDC (Rx)
1.91 VDC (Tx)
0 VDC (Rx)
L4303
RESONATOR
C4302
8.2pF
C4303
8.2pF
C4304
3.9pF
R4303
30
C4307
100pF
R4304
180
L4302
390nH
CR4303
CR4302
CR4301
L4301
390nH
TXSW
R4311
7.5K
C4301
100pF
C4317
100pF
NU
C4318
0.1uF
L4313
390nH
R4312
5.6K
C4314
1.5pF
R4363
1K
NU
VSF
L4362
33nH
PRESC_UHF_VCO
PRESC
-18 to -16 dBm (Rx)
-16 to -11 dBm (Tx)
C4365
3.3pF
R4381
470
TRB_UHF_VCO
TRB
0 VDC (Rx)
4.97 VDC (Tx)
C4381
0.1uF
NU
TXSW
4.54 VDC (Tx)
0 VDC (Rx)
4.42 VDC (Rx)
0 VDC (Tx)
RXSW
C4382
100pF
NU
C4383
100pF
NU
R4314
270
C4315
100pF
R4313
30
C4319
3.9pF
NU
L4312
RESONATOR
VCTRL_UHF_VCO
VCTRL
2.5 - 11 VDC
R4315
0
C4316
0.1uF
L4311
390nH
C4312
12pF
CR4311
C4311
100pF
C4313
1pF
NU
C4321
1pF
VCOMOD_UHF_VCO
VCOMOD
C4325
4.7uF
2.6 VDC (Tx)
3.1 VDC (Rx)
R4321
56K
R4322
10K
4.58 VDC
VSF
C4323
1000pF
NU
C4322
100pF
NU
CR4321
C4324
2.4pF
GROUND
R4323
100K
SH4301
SHIELD
SH4302
SHIELD
GND



UHF Band 1 (403-470 MHz) 1-25W Receiver Front-End

6881091C63-C

ZWG0130625-O



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

ZWG0130623-A

UHF Band 1 (403-470 MHz) 1-25W IF

6881091C63-C

UHF B1 1-25W PCB 8485670Z03 Parts List†

Circuit Ref	Motorola Part No.	Description
C0223	2113743E20	0.1 uF, 0662057B47 0 Kohm resistor for LS+ models
C0593	2113743E20	0.1 uF, 0662057B47 0 Kohm resistor for LS+ models
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	10uF
C3110	2113740F37	27pF
C3111	2113743E20	10uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	10uF
C3121	2113743E20	10uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	10uF
C3133	2311049A57	10uF
C3134	2113743E20	10uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	10uF
C3140	2113743E20	10uF
C3141	2113743E20	10uF
C3142	2113743E20	10uF
C3143	2113740F53	120pF
C3144	2113743E20	10uF
C3145	2113743E20	10uF
C3146	2113741F41	4700pF
C3147	2113743E20	10uF
C3151	2113741F49	10nF
C3152	2113741F49	10nF
C4001	2113740F09	1.8pF
C4002	2113740F39	33pF
C4003	2113740F40	36pF
C4004	2113740F39	33pF
C4005	2113740F39	33pF
C4006	2113740F39	33pF
C4007	2113740F38	30pF
C4008	2113741F25	1000pF
C4009	2113740F27	10pF
C4010	2113741F13	330pF
C4011	2113741F37	3300pF
C4012	2113741F13	330pF
C4013	2113741F37	3300pF
C4014	2113740F51	100pF
C4015	2113740F51	100pF
C4017	2113740F09	1.8pF
C4018	2113740F29	12pF
C4019	2113740F29	12pF
C4020	2113740F39	33pF
C4021	2113740F39	33pF
C4022	2113740F39	33pF
C4023	2113740F29	12pF
C4024	2113741F25	1000pF
C4026	2113740F09	1.8pF
C4027	2113740F09	1.8pF
C4028	2113741F49	10nF
C4029	2113740F09	1.8pF
C4030	2113740F09	1.8pF
C4031	2113740F30	13pF
C4051	2113740F27	10pF
C4052	2113740F49	82pF
C4053	2113740F32	16pF
C4054	2113740F32	16pF
C4061	2113740F63	330pF
C4062	2113743E20	10uF
C4064	2113743E20	10uF
C4065	2113740F51	100pF
C4067	2113741F37	3300pF
C4068	2113740F51	100pF
C4069	2113741F49	10nF
C4201	2113740F51	100pF
C4202	2113741F49	10nF
C4203	2113741F49	10nF
C4204	2113740F51	100pF
C4205	2113741F49	10nF
C4206	2311049J25	10uF
C4208	2113743E20	10uF
C4209	2113743E20	10uF
C4210	2104993J02	2.2uF
C4211	2113743E20	10uF
C4213	2311049A09	2.2uF
C4214	2311049A09	2.2uF
C4215	2311049A09	2.2uF
C4217	2113741F49	10nF
C4221	2109720D01	0.01uF
C4222	2109720D14	0.1uF
C4224	0882422W23	1uF
C4225	2113741F18	510pF
C4226	2113740L03	2.4pF
C4227	2113740F27	10pF
C4230	2104993J02	2.2uF
C4231	2113741F49	10nF
C4232	2113741F49	10nF
C4233	2104993J02	2.2uF
C4234	2113741F49	10nF
C4235	2113741F49	10nF
C4236	2113743E12	0.047uF
C4242	2113740F51	100pF
C4243	2113740F51	100pF
C4244	2113740F51	100pF
C4245	2113740F51	100pF
C4246	2113740F51	100pF
C4251	2113743E20	10uF
C4252	2113741F25	1000pF
C4253	2311049A56	4.7uF
C4254	2113743E20	10uF
C4255	2113740F51	100pF
C4263	2113743E20	10uF
C4287	2113740F51	100pF
C4289	2113743E20	10uF
C4301	2113740F51	100pF
C4302	2113740L16	8.2pF
C4303	2113740L16	8.2pF
C4304	2113740L08	3.9pF
C4306	2113740L01	2pF
C4307	2113740F51	100pF
C4308	2113743E20	10uF
C4309	2113740F51	100pF
C4311	2113740F51	100pF
C4312	2113740F29	12pF
C4314	2113740F07	1.5pF
C4315	2113740F51	100pF
C4316	2109720D14	0.1uF
C4318	2113743E20	10uF
C4321	2113740F03	1pF
C4324	2113740L03	2.4pF
C4325	2311049A56	4.7uF
C4331	2113740L14	6.8pF
C4335	2113740F51	100pF
C4336	2113743E07	0.022uF
C4337	2113740F44	51pF
C4338	2113740F44	51pF
C4351	2113740F51	100pF
C4352	2113743E20	10uF
C4353	2113743E20	10uF
C4354	2104993J02	2.2uF
C4355	2104993J02	2.2uF
C4361	2113741F25	1000pF
C4364	2113740F21	5.6pF
C4365	2113740F07	1.5pF
C4371	2113743E20	10uF
C4400	2113740F67	470pF
C4401	2113740F51	100pF
C4402	2113741F37	3300pF
C4403	2113740F23	6.8pF
C4404	2113740F51	100pF
C4405	2113740F51	100pF
C4406	2113740F51	100pF
C4407	2113740F51	100pF
C4408	2113740F51	100pF
C4411	2113741F37	3300pF
C4412	2113740F51	100pF
C4414	2113740F51	100pF
C4415	2113743E07	0.022uF
C4416	2113740F51	100pF
C4417	2113740F38	30pF
C4419	2113740F33	18pF
C4420	2113740F28	11pF
C4421	2113741A57	33K F
C4422	2113740A55	100pF
C4423	2311049A08	1uF
C4425	2113741F49	10nF
C4426	2113740F51	100pF
C4427	2113741F37	3300pF
C4428	2113741F33	2200pF
C4431	2111078B23	24pF
C4434	2113741F49	10nF
C4435	2113740A55	100pF
C4436	2311049A45	10uF
C4437	2113741A57	33K F
C4439	2111078B42	100pF
C4440	2113741F25	1000pF
C4441	2111078B18	15pF
C4446	2111078B09	6.8pF
C4448	2111078B29	33pF
C4449	2111078B29	33pF
C4451	2113741F25	1000pF
C4452	2113740F30	13pF
C4453	2113740F51	100pF
C4455	2111078B12	9.1pF
C4457	2111078B27	30pF
C4458	2111078B32	39pF
C4459	2113740F51	100pF
C4471	2113740F51	100pF
C4472	2111078B31	36pF
C4473	2111078B31	36pF
C4474	2113740F51	100pF
C4475	2113740F21	5.6pF
C4491	2111078B12	9.1pF
C4492	2111078B32	39pF
C4496	2111078B09	6.8pF
C4497	2111078B07	5.6pF
C4501	2113741F33	2200pF
C4502	2113741F33	2200pF
C4503	2113740F67	470pF

Circuit Ref	Motorola Part No.	Description
C4504	2113741F49	10nF
C4505	2311049A07	1uF
C4506	2113741F33	2200pF
C4507	2113740F51	100pF
C4508	2113740F51	100pF
C4510	2113740F51	100pF
CR4301	4805649Q13	DIODE, VARACTOR
CR4302	4862824C01	DIODE, VARACTOR
CR4303	4862824C01	DIODE, VARACTOR
CR4311	4802245J22	DIODE, VARACTOR
CR4321	4862824C01	DIODE, VARACTOR
D3101	4880154K03	DIODE DUAL SCHOTTKY
D4001	4862824C01	DIODE, VARACTOR
D4002	4862824C01	DIODE, VARACTOR
D4003	4880154K03	DIODE DUAL SCHOTTKY
D4004	4862824C01	DIODE, VARACTOR
D4005	4862824C01	DIODE, VARACTOR
D4006	4880142L01	DIODE
D4007	4813833C02	DIODE, DUAL 70V
D4051	4886143B01	DIODE, MIXER
D4201	4802233J09	DIODE, TRIPLE
D4221	4813825A05	DIODE
D4401	4813833C02	DIODE, DUAL 70V
D4451	4813825A05	DIODE
D4471	4802482J02	DIODE
D4472	4802482J02	DIODE
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	6 ELEMENT CER FILTER, 455KHz
FL3112	9180469V06	6 ELEMENT CER FILTER, 455KHz
FL3114	9180468V06	4 ELEMENT CER FILTER, 455KHz
FL3115	9180469V04	6 ELEMENT CER FILTER, 455KHz
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J4401	0986166B02	RF CONNECTOR (MINI-UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68	1uH 3rd overtone crystal
	NU	fundamental crystal
L4003	2462587T23	470nH
L4006	2462587V24	15nH
L4008	2462587T23	470nH
L4051	2462587T17	150nH
L4053	2462587N46	27nH
L4054	2462587N43	15nH
L4201	2462587Q42	390nH
L4221	2462587P25	12000nH
L4231	2462587Q20	2200nH
L4301	2462587T22	390nH
L4302	2462587T22	390nH
L4303	2460593C01	RESONATOR
L4304	2462587T22	390nH
L4305	2462587T22	390nH
L4311	2462587T22	390nH
L4312	2460593C01	RESONATOR
L4313	2462587T22	390nH
L4331	2462587T09	33nH
L4333	2462587T22	390nH
L4361	2462587T09	33nH
L4362	2462587T09	33nH
L4371	2462587T13	68nH
L4401	2460591B04	11.03nH
L4402	2484657R01	Ferrite Bead
L4403	2462587N50	56nH
L4411	2462587N44	18nH
L4421	2484657R01	Ferrite Bead
L4422	2460591A01	4.22nH
L4436	2484657R01	Ferrite Bead
L4437	2460592A01	17nH
L4471	2462587T22	390nH
L4472	2460592A01	17nH
L4491	2460592A01	17nH
L4493	2460592A01	17nH
M3421	2686201B01	HEAT SPREADER
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q4002	4813824A17	PNP
Q4003	4813827A07	NPN
Q4004	4805921T02	TRANSISTOR DUAL DIGITAL NPN/PNP
Q4221	4880048M01	NPN
Q4301	4805218N63	DIODE DUAL SCHOTTKY
Q4332	4813827A07	NPN
Q4333	4802245J50	TRANSISTOR DUAL NPN/PNP
Q4411	4805921T02	TRANSISTOR DUAL DIGITAL NPN/PNP
Q4421	4886212B01	MRF1518
Q4422	4880048M01	NPN
Q4441	4886163B01	MRF1535
Q4442	4880048M01	NPN
Q4471	4880048M01	NPN
Q4472	4805128M27	PNP
R3101	0662057A75	12K Ohm
R3102	0662057A01	10 Ohm
R3105	0662057A25	100 Ohm
R3106	0662057A83	27K Ohm
R3107	0662057A69	6800 Ohm
R3108	0662057A44	620 Ohm
R3111	0662057A75	12K Ohm
R3112	0662057A01	10 Ohm
R3113	0662057A37	330 Ohm
R3115	0662057A39	390 Ohm
R3116	0662057A37	330 Ohm
R3117	0662057A83	27K Ohm
R3118	0662057A69	6800 Ohm
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51 Ohm
R3132	0662057A77	15K Ohm
R3133	0662057A71	8200 Ohm
R3134	0662057A73	10K Ohm
R3135	0662057A51	1200 Ohm
R3141	0662057A39	390 Ohm
R3142	0662057A55	1800 Ohm
R3144	0662057A58	2400 Ohm
R3145	0662057A61	3300 Ohm
R3146	0662057A45	680 Ohm
R3147	0662057A75	12K Ohm
R3148	0662057B47	0 Ohm
R3151	0662057A73	10K Ohm
R3152	0662057A73	10K Ohm
R3153	0662057A73	10K Ohm
R3154	0662057A73	10K Ohm
R4001	0662057A97	100K Ohm
R4002	0662057A37	330 Ohm
R4003	0662057A63	3900 Ohm
R4004	0662057A59	2700 Ohm
R4005	0662057A73	10K Ohm
R4007	0662057A25	100 Ohm
R4012	0662057A97	100K Ohm
R4013	0662057A35	270 Ohm
R4014	0662057A01	10 Ohm
R4016	0662057A61	3300 Ohm
R4018	0662057A61	3300 Ohm
R4022	0662057B47	0 Ohm
R4051	0662057A18	51 Ohm
R4052	0662057B47	0 Ohm
R4060	0662057B10	330K Ohm
R4061	0662057A73	10K Ohm
R4062	0662057A53	1500 Ohm
R4063	0662057A39	390 Ohm
R4064	0662057B47	0 Ohm
R4068	0662057A53	1500 Ohm
R4069	0662057A49	1000 Ohm
R4070	0662057A39	390 Ohm
R4071	0662057A73	10K Ohm
R4072	0662057A73	10K Ohm
R4201	0662057A29	150 Ohm
R4203	0662057A17	47 Ohm
R4204	0662057A17	47 Ohm
R4211	0662057B47	0 Ohm
R4221	0662057A29	150 Ohm
R4222	0662057A42	510 Ohm
R4223	0662057A21	68 Ohm
R4224	0662057A89	47K Ohm
R4225	0662057A89	47K Ohm
R4228	0662057A73	10K Ohm
R4241	0662057A33	220 Ohm
R4251	0662057A87	39K Ohm
R4252	0662057A84	30K Ohm
R4261	0662057A89	47K Ohm
R4263	0662057A25	100 Ohm
R4301	0662057A67	5600 Ohm
R4302	0662057A73	10K Ohm
R4303	0662057A12	30 Ohm
R4304	0662057A31	180 Ohm
R4305	0662057A01	10 Ohm
R4311	0662057A70	7500 Ohm
R4312	0662057A67	5600 Ohm
R4313	0662057A12	30 Ohm
R4314	0662057A35	270 Ohm
R4315	0662057B47	0 Ohm
R4321	0662057A91	56K Ohm
R4322	0662057A73	10K Ohm
R4323	0662057A97	100K Ohm
R4331	0662057A09	22 Ohm
R4341	0662057B47	0 Ohm
R4342	0662057A57	2200 Ohm
R4343	0662057A49	1000 Ohm
R4344	0662057A01	10 Ohm
R4346	0662057A73	10K Ohm
R4347	0662057B47	0 Ohm
R4360	0662057A35	270 Ohm
R4361	0662057A31	180 Ohm
R4362	0662057A01	10 Ohm
R4363	0662057A49	1000 Ohm
R4381	0662057A41	470 Ohm
R4400	0662057A43	560 Ohm

Circuit Ref	Motorola Part No.	Description
R4401	0662057A36	300 Ohm
R4402	0662057A05	15 Ohm
R4403	0662057A36	300 Ohm
R4404	0662057A89	47K Ohm
R4406	0662057A97	100K Ohm
R4412	0662057A69	6800 Ohm
R4413	0662057A61	3300 Ohm
R4415	0662057A18	51 Ohm
R4416	0662057A18	51 Ohm
R4418	0662057A59	2700 Ohm
R4421	0662057A87	39K Ohm
R4422	0662057A57	2200 Ohm
R4423	0662057A87	39K Ohm
R4424	0662057C13	2.7 Ohm
R4425	0662057C13	2.7 Ohm
R4426	0662057C13	2.7 Ohm
R4427	0662057C13	2.7 Ohm
R4428	0662057A58	2400 Ohm
R4429	0662057A59	2700 Ohm
R4431	0680194M18	51 Ohm
R4441	0662057A87	39K Ohm
R4442	0662057A57	2200 Ohm
R4443	0662057A87	39K Ohm
R4445	0662057A58	2400 Ohm
R4446	0662057B47	0 Ohm
R4452	0662057A75	12K Ohm
R4454	0662057A73	10K Ohm
R4455	0662057A97	100K Ohm
R4457	0683962T51	120 Ohm
R4458	0662057A41	470 Ohm
R4471	0662057A41	470 Ohm
R4473	0680194M18	51 Ohm
R4474	0680194M18	51 Ohm
R4475	0662057A73	10K Ohm
R4491	0662057A73	10K Ohm
R4501	0662057A69	6800 Ohm
R4502	0662057A83	27K Ohm
R4504	0662057A73	10K Ohm
R4505	0662057B09	300K Ohm
R4507	0662057A80	20K Ohm
R4508	0662057A97	100K Ohm
R4509	0662057A49	1000 Ohm
R4511	0662057C19	4.7 Ohm
SH4301	2602641Y02	SHIELD
SH4302	2602641Y02	SHIELD
T4051	2505515V03	XFMR MIXER 4:1
T4052	2505515V04	XMFR MIXER 5:1
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U4201	5185963A27	IC FRACTN
U4211	5105739X05	IC, VOLTAGE REGULATOR
U4301	5105750U54	IC, VCO
U4401	5185130C65	IC LDMOS DRIVER
U4402	5113818A01	LOW POWER SUPPLY
U4501	5185765B28	IC POWER CONTROL
U4502	5185963A15	IC TEMPERATURE SENSOR
VR4471	4813830A15	DIODE, 5.6V
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455KHz DISCRIMINATOR
Y4262	4886182B01	TCXO 16.8MHZ

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Chapter 6: UHF Band 2 (450-512/527 MHz) 1-25W Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 2 (450-512/527 MHz) 1-25W Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF Band 2 (450-512 MHz) 1-25W (Conventional, LTR/PassPort)

Model	Description
AAM25SHC9AA1AN	CDM750, 450-512 MHz, 1-25W, 12.5/20/25 kHz
AAM25SHD9AA2AN	CDM1250, 450-512 MHz, 1-25W, 12.5/20/25 kHz
AAM25SHF9AA5AN	CDM1550, 450-512 MHz, 1-25W, 12.5/20/25 kHz
AAM25SHF9DU5AN	CDM1550•LS, 450-512 MHz, 1-25W, 12.5/20/25 kHz
AAM25SHF9DP5AN	CDM1550•LS^{+}, 450-512 MHz, 1-25W, 12.5/20/25 kHz

					Item	Description
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X	X		IMUE6028	Tanapa, UHF 450-512 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	X		IMUE6028_S	Replacement Board, UHF 450-512 MHz, 1-25W, 12.5/20/25 kHz
				X	PMUE1755	Tanapa, CDM1550•LS^{+}, 450-512 MHz, 1-25W
				X	PMUE1755_S	Replacement Board, CDM1550•LS^{+}, 450-512 MHz, 1-25W
X	X	X	X	X	HAE4003_R	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4004	Antenna, 470-512 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4011_R	Antenna, 450-470 MHz, 3.5dB Gain Roof Mount (Mini U)
X	X	X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5dB Gain Roof Mount (Mini-U)
X	X	X	X	X	HAE4013_	Antenna, 494-512 MHz, 5dB Gain Roof Mount (Mini-U)
X					6881091C54	User Guide, CDM750
	X				6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X		6881093C32	User Guide, CDM1550•LS
				X	6881094C79	User Guide, CDM1550•LS+

1.2 PRO Series Model Chart

PRO Series, UHF Band 2 (450-527 MHz) 1-25W				
Model				Description
LAM25SHC9AA1AN				PRO3100, 450-527 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
	LAM25SHD9AA2AN			PRO5100, 450-527 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
		LAM25SHF9AA5AN		PRO7100, 450-527 MHz, 1-25W, 12.5/20/25 kHz Ch Sp
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6028	Tanapa, UHF 450-527 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	IMUE6028_S	Replacement Board, UHF 450-527 MHz, 1-25W, 12.5/20/25 kHz
X	X	X	HAE4003_R	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4011_R	Antenna, 450-470 MHz, 3.5dB Gain Roof Mount (Mini U)
X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5dB Gain Roof Mount (Mini-U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**1 - 25W:** 2.2 in. x 6.93 in. x 6.97 in. (56 mm x 176 mm x 177 mm) 2.34 in. x 7.05 in. x 7.32 in. (59 mm x 179 mm x 186 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.15 lb. (1430 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D /E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D /E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D /E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-527 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	1-25W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-527 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA) Base Mode: >70dB (1-25W model only)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 UHF Band 2 (450-512/527 MHz) 1-25W Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the UHF range from 450 to 512 MHz (for CDM models) and from 450 to 527 MHz (for PRO models). It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. Low-side first injection is used.

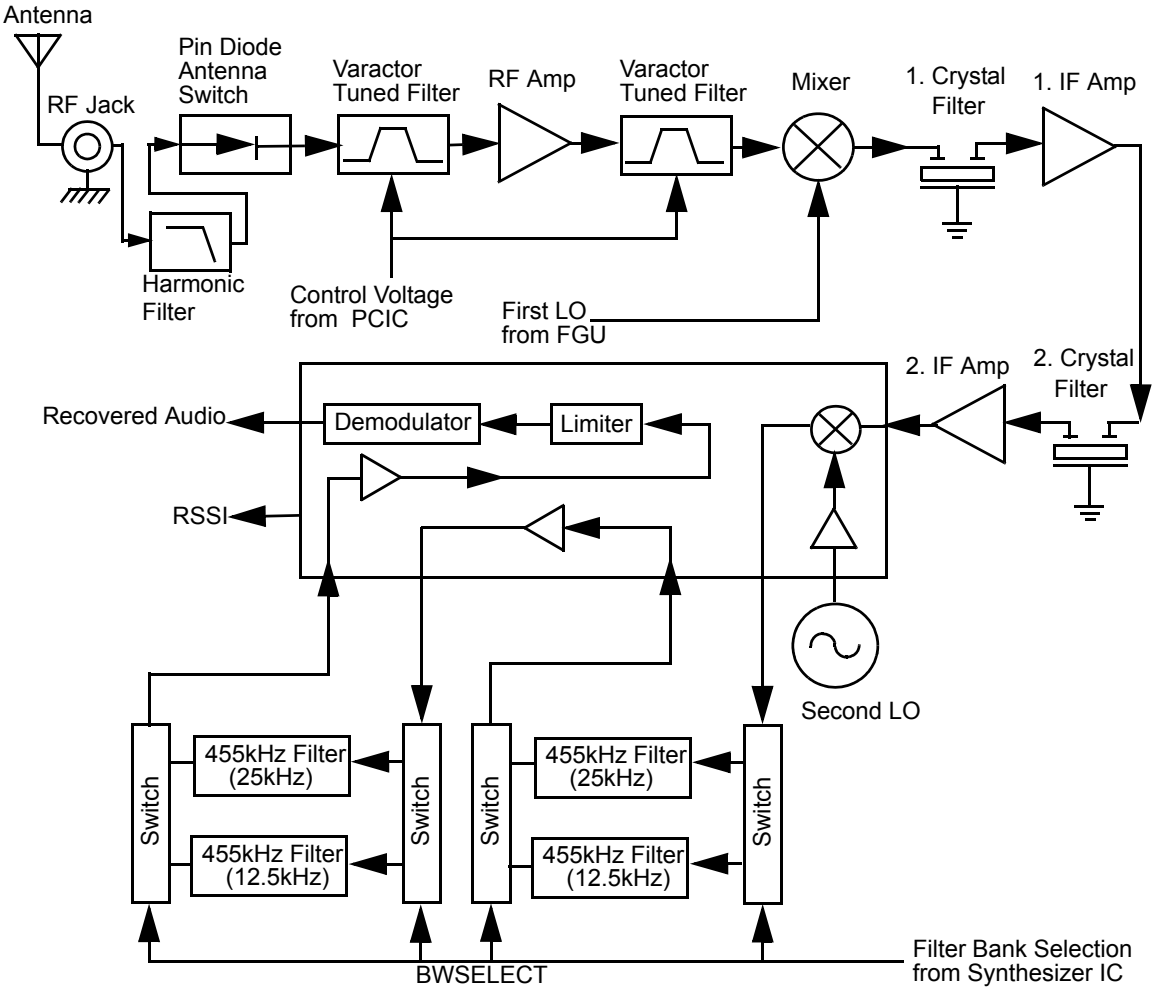


Figure 6-1 UHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the high-IF section and 2 pairs of 455 kHz ceramic filters in the low-IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuitry, before being applied to the receiver pre-selector filter (C5001, C5002, D5001 and associated components). The 2-pole pre-selector filter tuned by the varactor diodes D5001 and D5002 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U5501) in the Transmitter section. A dual hot carrier diode (D5003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q5003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3V supply via L5003 and R5002. A switchable 3dB pad (R5066, R5007, R5063, R5064 and R5070), controlled via line FECTRL_2 and Q5004 stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The varactor diodes D5004 and D5005 are controlled by the same signal FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R5013 - R5015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal coming from the front-end is converted to the first IF (44.85 MHz) using a passive double-balanced mixer (D5051). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T5051 and T5052. The injection signal (RXINJ) coming from the RX VCO buffer (Q5332) is filtered by the low-pass filter consisting of (L5053, L5054, C5053 - C5055) followed by a matching transformer T5052 and has a level of approximately 15dBm.

The mixer IF output signal (IF) from transformer T5501 pin 2 is fed to the first two pole crystal filter FL3101. The filter output in turn is matched to the following IF amplifier.

The IF amplifier Q3101 is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the voltage 5V. Its output impedance is matched to the second 2-pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 high IF signal from the second IF amplifier feeds the IF IC (U3101) at pin 1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the low IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The low IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114 for 20/25 kHz channel spacing or FL3111, FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the Controller circuitry).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101 pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101 pin 63) and in addition is available at accessory connector J0501-15.

3.0 UHF Band 2 (450-512/527 MHz) 1-25W Transmitter Power Amplifier (PA) 25W

The radio's 25W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U5401) is adjustable, controlled by pin 4 of PCIC (U5501) via U5402-1. It is followed by an LDMOS stage (Q5421) and LDMOS final stage (Q5441).

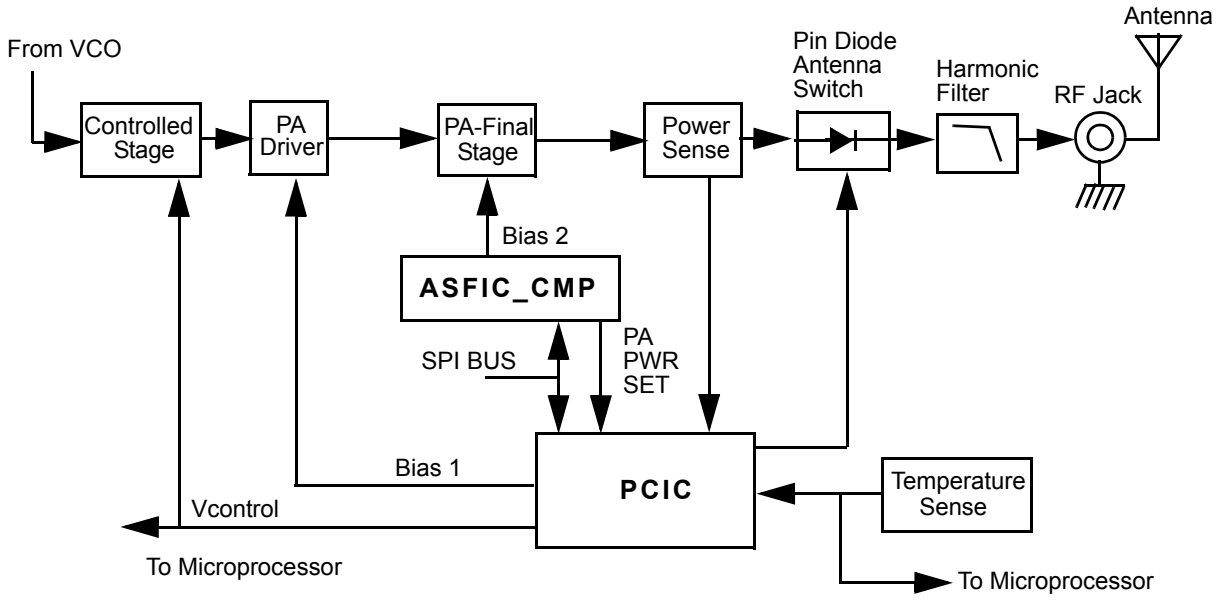


Figure 6-2 UHF Transmitter Block Diagram

Devices U5401, Q5421 and Q5441 are surface mounted. A pressure pad between the board and the radio's cover provides good thermal contact between the devices and the chassis.

3.1 First Power Controlled Stage

The first stage (U5401) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U5401 is controlled by a DC voltage applied to pin 1 from the op-amp U5402-1, pin 1. The control voltage simultaneously varies the bias of two FET stages within U5401. This biasing point determines the overall gain of U5401 and therefore its output drive level to Q5421, which in turn controls the output power of the PA.

Op-amp U5402-1 monitors the drain current of U5401 via resistor R5444 and adjusts the bias voltage of U5401 so that the current remains constant. The PCIC (U5501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U5402-1 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q5442, which in turn switches off the biasing voltage to U5401.

Switch S5440 is a pressure pad with a conductive strip which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S5440 opens and the resulting high voltage level at the inverting inputs of the current control op-amps U5402-1 & 2 switches off the biasing of U5401 and Q5421. This prevents transmitter key up while the devices do not have proper thermal contact to the chassis.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q5421) providing a gain of 12dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by the drain current control op-amp U5402-2, and fed to the gate of Q5421 via the resistive network R5429, R5418, R5415 and R5416.

Op-amp U5402-2 monitors the drain current of U5421 via resistors R5424-27 and adjusts the bias voltage of Q5421 so that the current remains constant. The PCIC (U5501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power output causes the DC voltage from the PCIC to fall, and U5402-2 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q5422, which in turn switches off the biasing voltage to Q5421.

3.3 Final Stage

The final stage is an LDMOS device (Q5441) providing a gain of 12dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 is set in transmit mode by the ASFIC and fed to the gate of Q5441 via the resistive network R5404, R5406, and R5431-2. This bias voltage is tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Global Tuner. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device’s drain current is drawn directly from the radio’s DC supply voltage input, PASUPVLTG, via L5436 and L5437.

A matching network consisting of C5441-49 and striplines transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward power delivered by Q5441. The coupled signal is rectified by D5451. The DC voltage is proportional to the RF output power and feeds the RFIN port of the PCIC (U5501 pin 1). The PCIC controls the gain of stages U5401 and Q5421 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

3.5 Antenna Switch

The antenna switch consists of two PIN diodes, D5471 and D5472. In the receive mode, both diodes are off. Signals applied at the antenna jack J5401 are routed, via the harmonic filter, through network L5472, C5474 and C5475, to the receiver input. In the transmit mode, K9V1 turns on Q5471 which enables current sink Q5472, set to 96 mA by R5473 and VR5471. This completes a DC path from PASUPVLTG, through L5437, D5471, L5472, D5472, L5471, R5474 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D5471 to the harmonic filter and antenna jack. D5472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L5472 is selected to appear as a broadband lambda/4 wave transmission line, making the short circuit presented by D5472 appear as an open circuit at the junction of D5472 and the receiver path.

3.6 Harmonic Filter

Components L5491-L5493 and L5472, C5491, C5496-98 form a Butterworth low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R5491 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.7 Power Control

The transmitter uses the Power Control IC (PCIC, U5501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the directional coupler and rectified, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC (U0221) has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop to the PCIC via R5505. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which sets the drain current of the first (U5401) and second (Q5421) transmitter stage via current control op-amps U5402-1 and U5402-2. This adjusts the transmitter power output to the intended value. Variations in forward transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C5502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U5502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

4.0 UHF Band 2 (450-512/527 MHz) 1-25W Frequency Synthesis

The synthesizer subsystem consists of the reference oscillator (Y5261 or Y5262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U5201), and the Voltage Controlled Oscillator VCO.

4.1 Reference Oscillator

The reference oscillator (Y5262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U5201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U5201 pin 25 to set the frequency of the oscillator. The output of the oscillator (pin 3 of Y5262) is applied to pin 23 (XTAL1) of U5201 via a RC series combination.

In applications where less frequency stability is required the oscillator inside U5201 is used along with an external crystal Y5261, varactor diode D5261, C5261, C5262 and R5262. In this case, Y5262, R5263, C5235 and C5251 are not used. When Y5262 is used, Y5261, D5261, C5261, C5262 and R5262 are not used, and C5263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U5201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

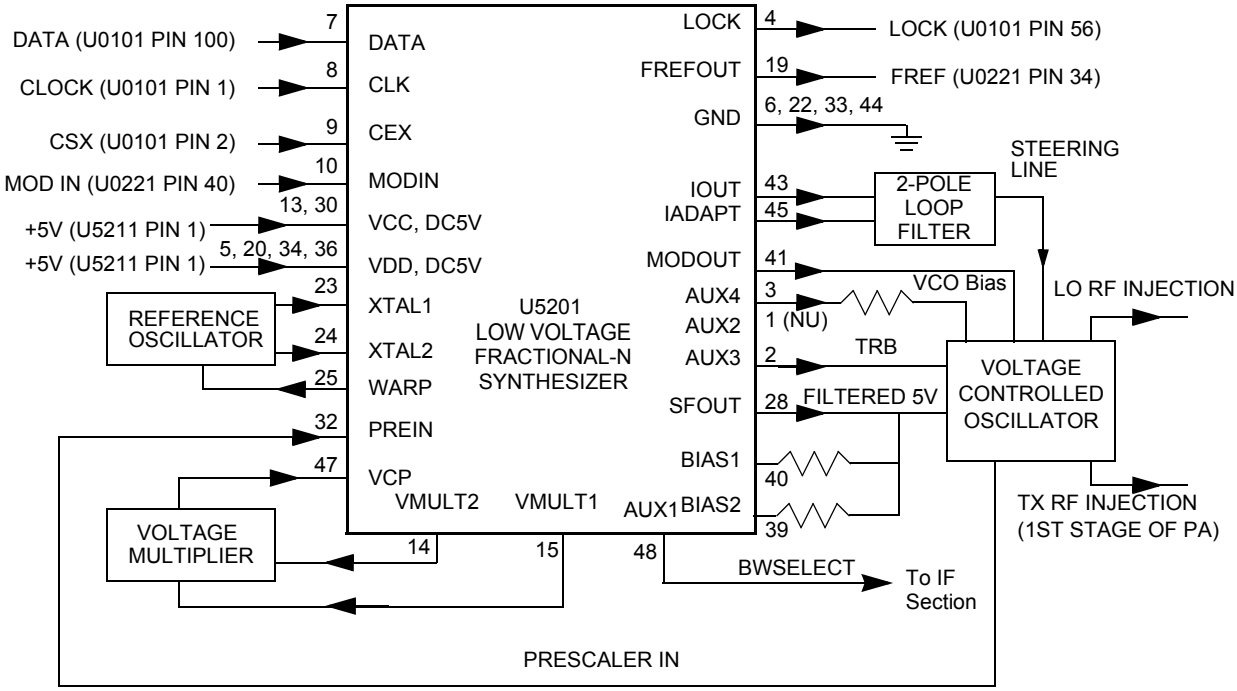


Figure 6-3 UHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U5201 pin 30) supplies an output voltage of 4.5 VDC(VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R5322) and the synthesizer charge pump resistor network (R5251, R5252). The synthesizer supply voltage is provided by the 5V regulator U5211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin 47 VCP (U5201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier circuitry (D5201, C5202, C5203). This voltage multiplier is basically a diode capacitor network driven by two (1.05MHz) 180 degrees out of phase signals (U5201-14 and -15).

Output LOCK (U5201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U5201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U5201-7), clock line CLK (U5201-8), and chip enable line CSX (U5201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U5301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuitry.

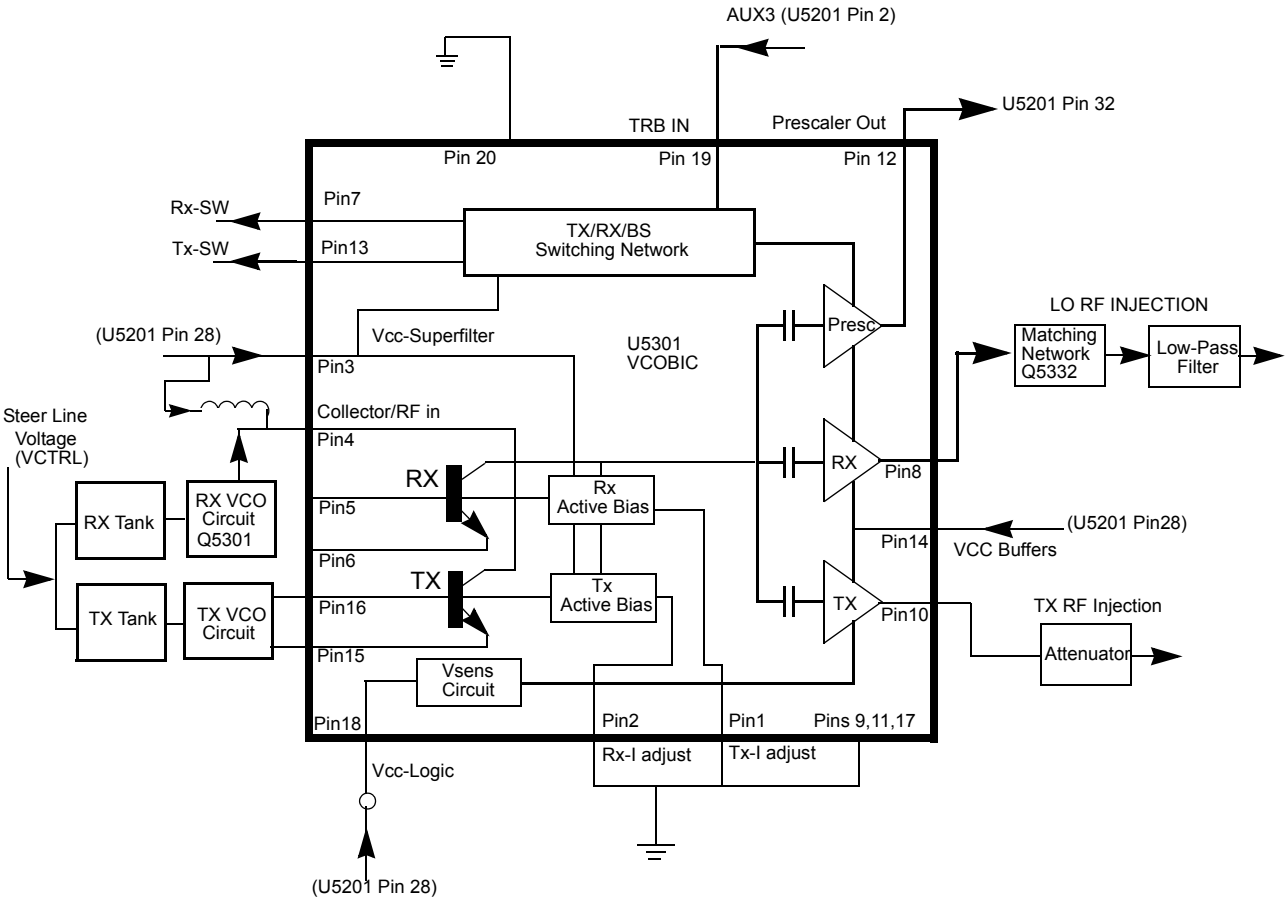


Figure 6-4 UHF VCO Block Diagram

The VCOBIC together with Fractional-N synthesizer (U5201) generates the required frequencies in both transmit and receive modes. The TRB line (U5301 pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U5301 pin 12 (PRESC_OUT), via a low-pass filter, to pin 32 of U5201 (PREIN).

A steering line voltage (VCTRL) between 3.0V and 10.0V at varactor diode CR5311 will tune the full TX frequency range (TXINJ) from 450 MHz to 512 (or 527) MHz, and at varactor diodes CR5301, CR5302 and CR5303 will tune the full RX frequency range (RXINJ) from 405 MHz to 482 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q5301 is used in conjunction with the internal transistor for better side-band noise. Similarly, an external transistor Q5311 is used in the TX tank circuit.

The external RX buffers (Q5332) are enabled by a high at U5201 pin 3 (AUX4) via transistor switch Q5333. In TX mode the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U5201 pin41) is applied modulation circuitry CR5321, R5321, R5322 and C5324, which modulates the TX VCO frequency via coupling capacitor C5321. Varactor CR5321 is biased for linearity from VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem comprises mainly of low voltage FRAC-N (LVFRACN) IC, Reference Oscillator (crystal oscillator with temperature compensation), charge pump circuitry, loop filter circuitry and DC supply. The output signal PRESC_OUT of the VCOBIC (U5301 pin 12) is fed to pin 32 of U5201 (PREIN) via a low-pass filter (C5229, L5225) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U5201) is basically a dual modulus pre-scaler with selectable divider ratios. This divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y5261 or Y5262).

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at pin 43 of U5201 (IOUT). The loop filter (which consists of R5221-R5223, C5221-C5225,L5221) transforms this current into a voltage that is applied to the varactor diodes CR5311 for transmit, CR5301, CR5302 & CR5303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U5201-40) or BIAS 2 (U5201-39). The currents are set by the value of R5251 or R5252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer the magnitude of the loop current is increased by enabling the IADAPT (U5201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U5201-4).

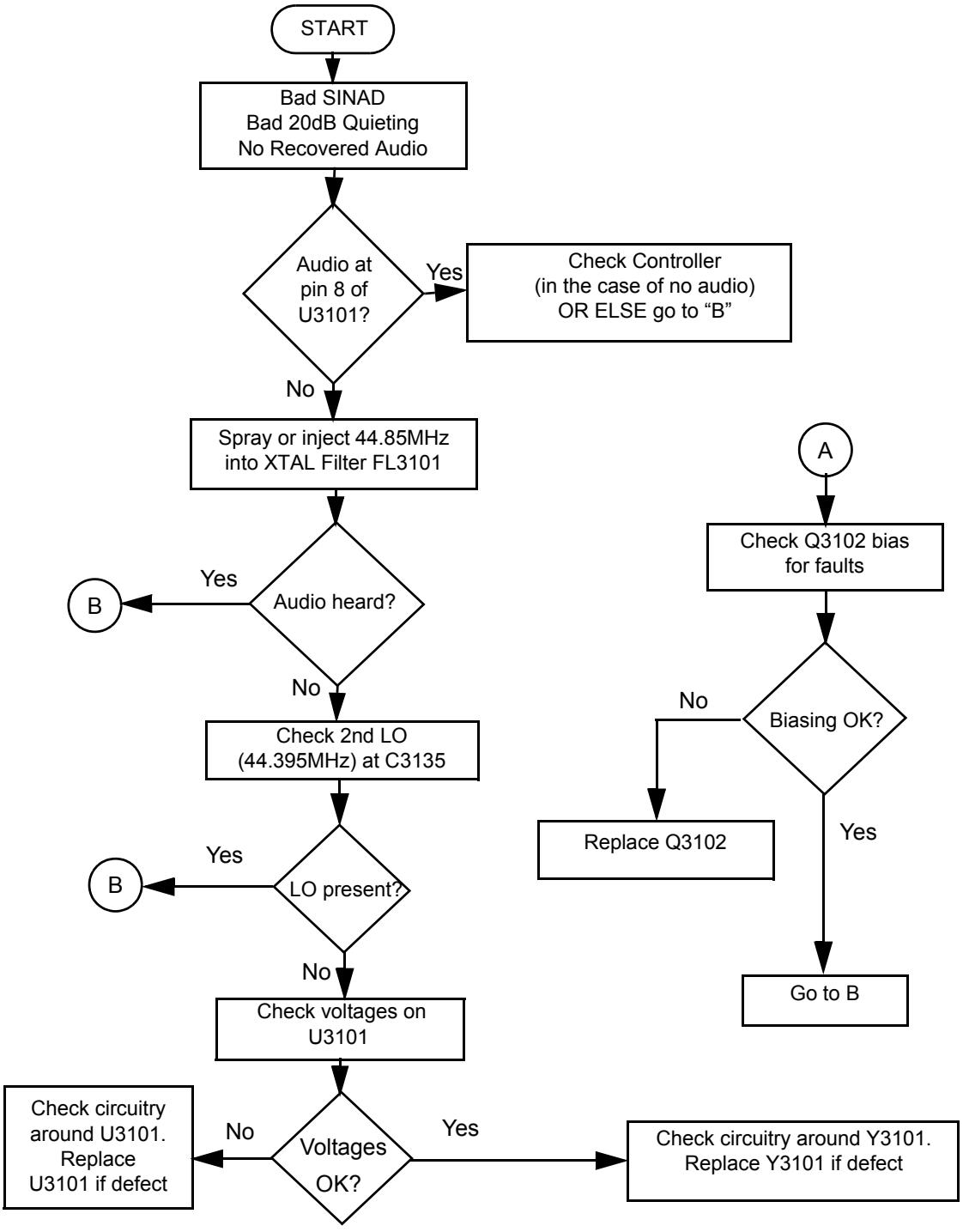
The LOCK (U5201-4) signal is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active. In order to modulate the PLL the two spot modulation method is utilized. Via pin 10 (MODIN) on U5201 the audio signal is applied to both the A/D converter (low freq path) as well as the balance attenuator (high freq path). The A/D converter converts the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U5201-41) and connected to the VCO modulation diode CR5321 via R5321, C5325.

Notes

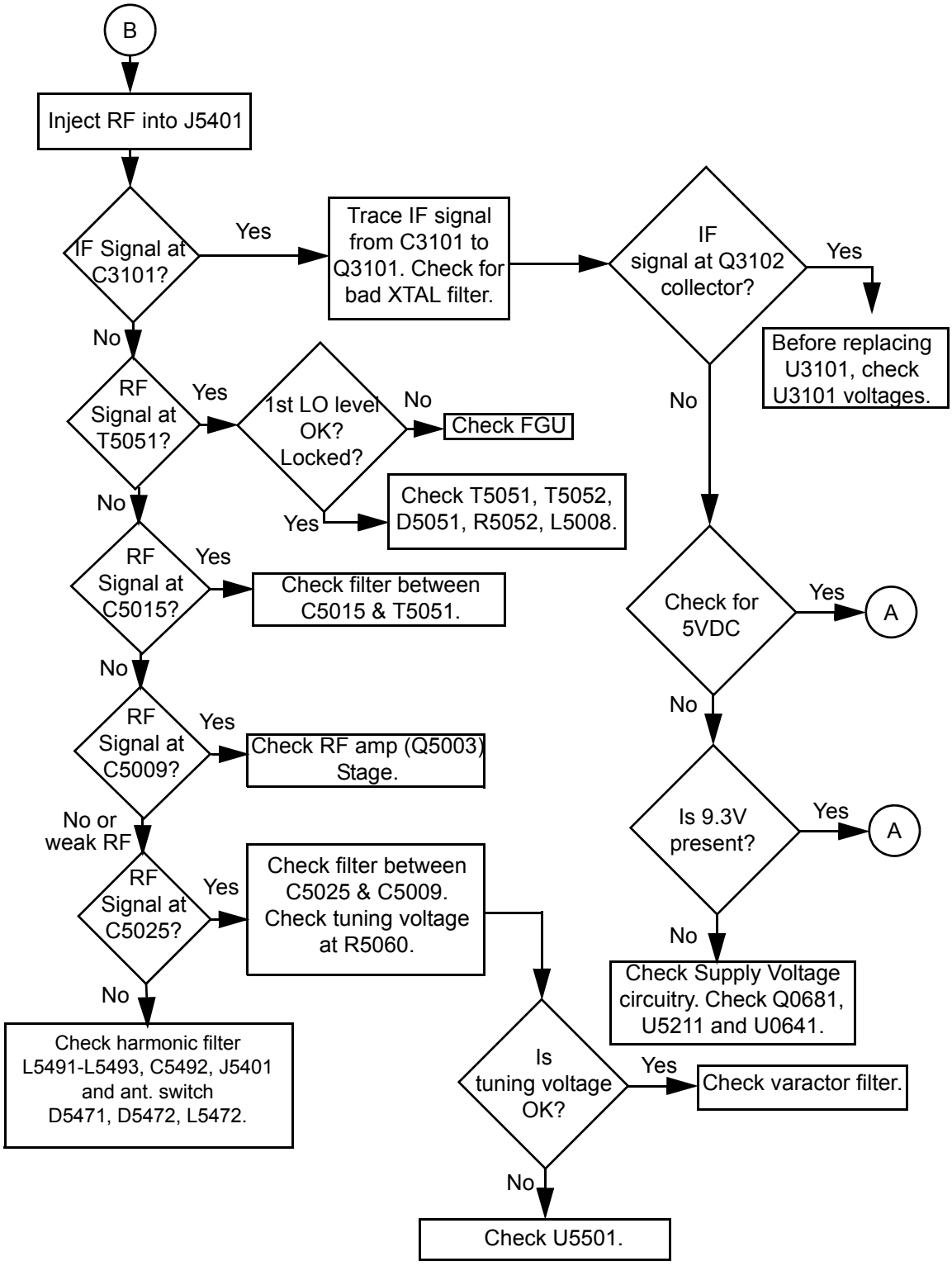
Section 3

TROUBLESHOOTING CHARTS

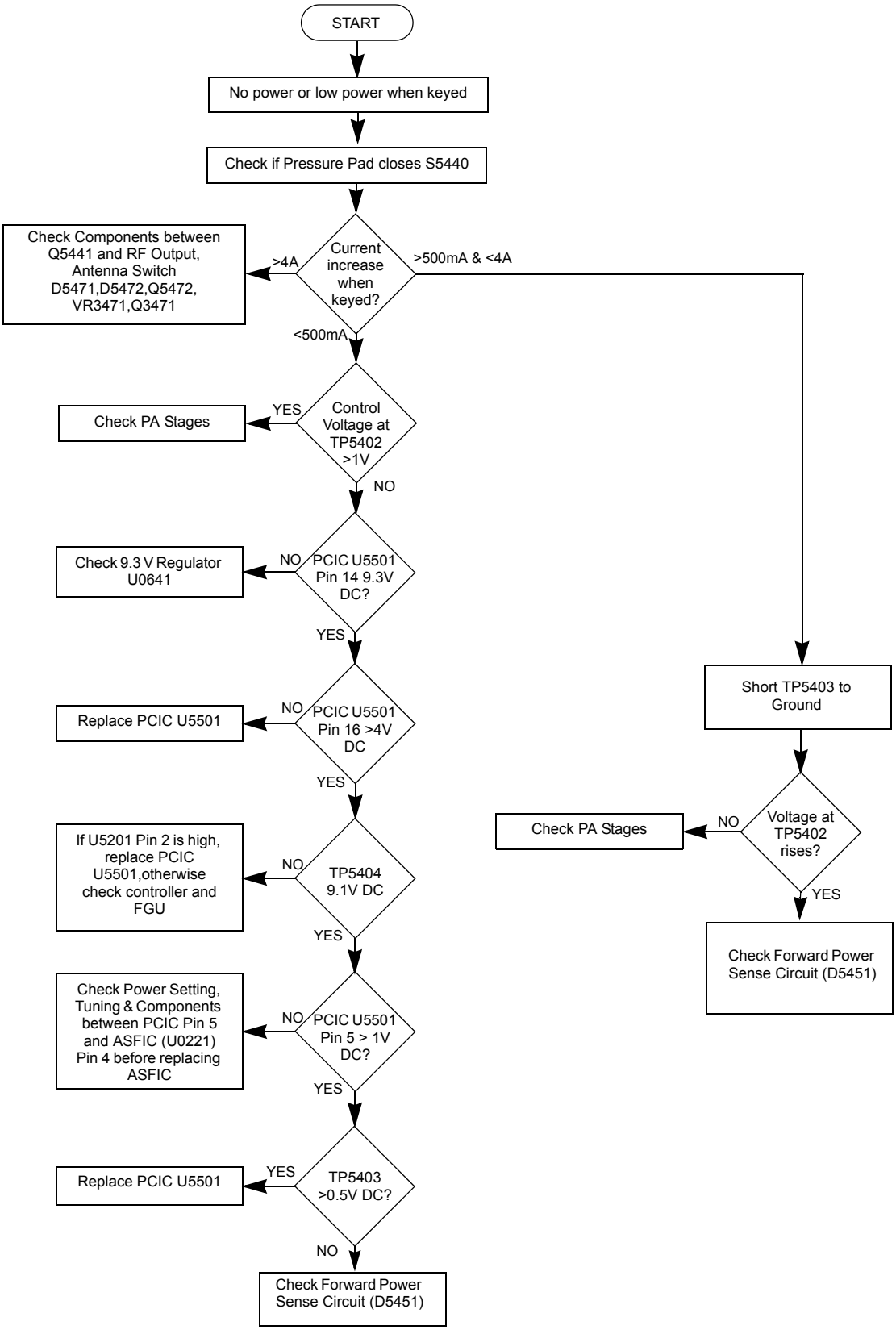
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



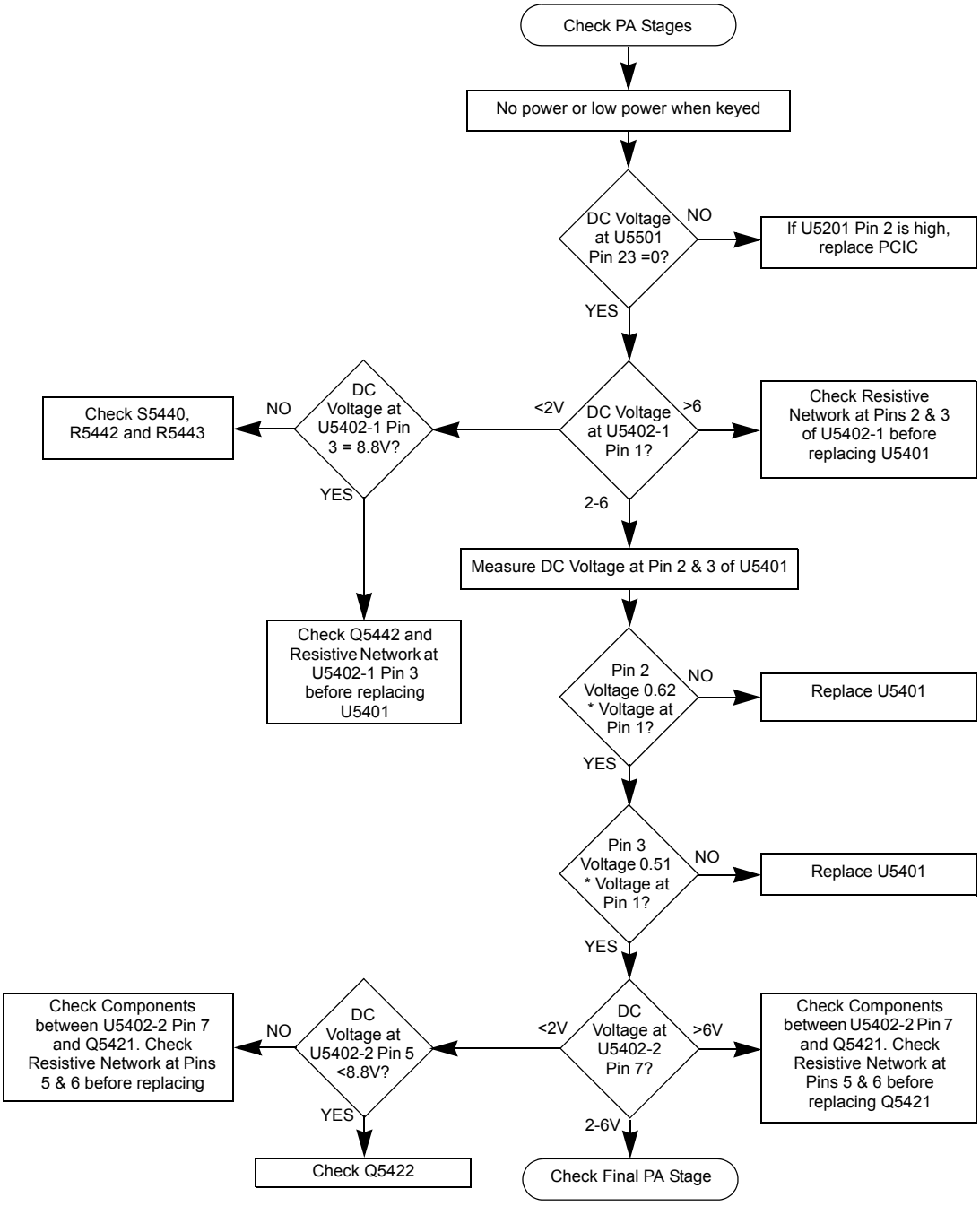
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



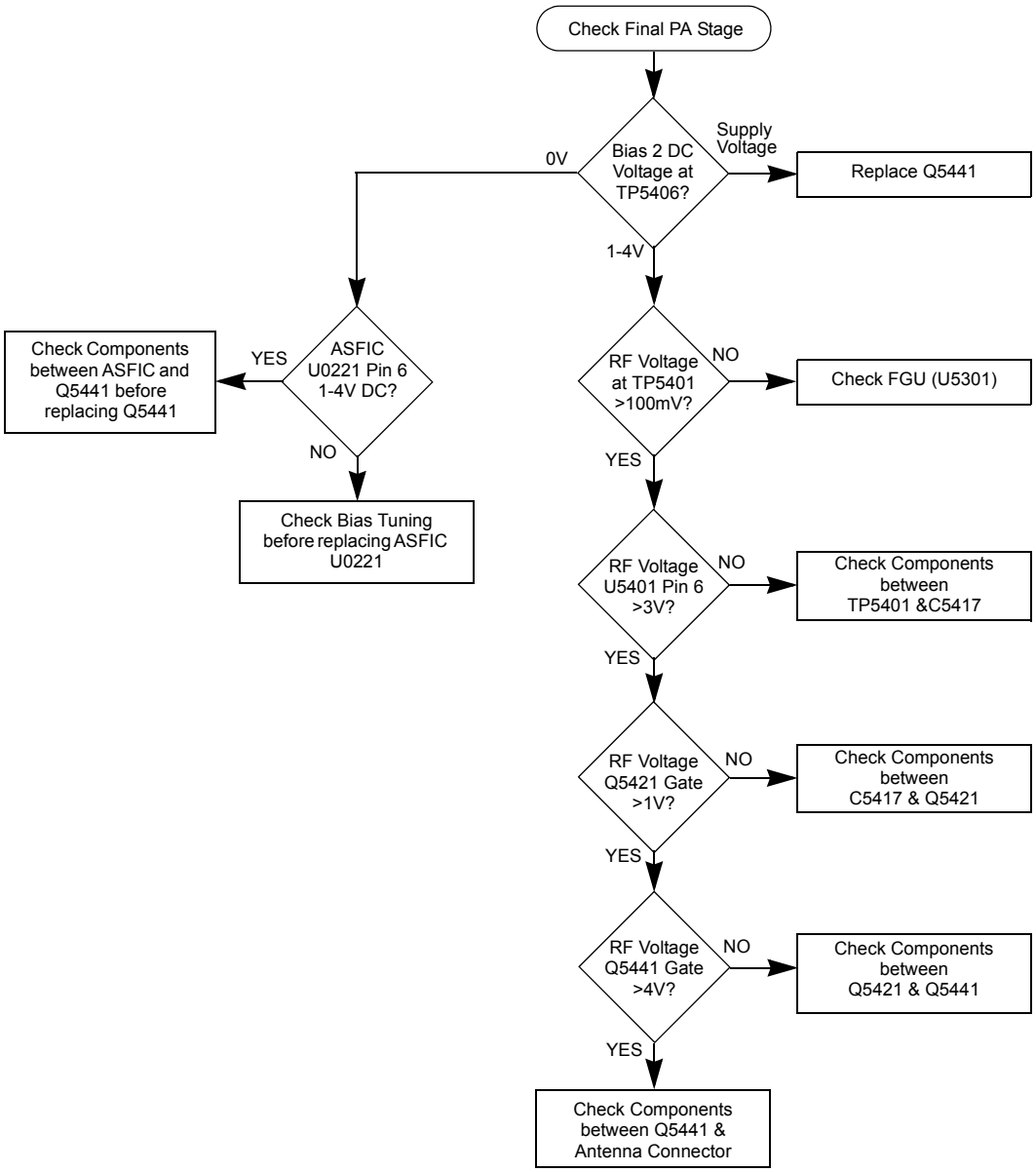
2.0 Troubleshooting Flow Chart for 25W Transmitter (Sheet 1 of 3)



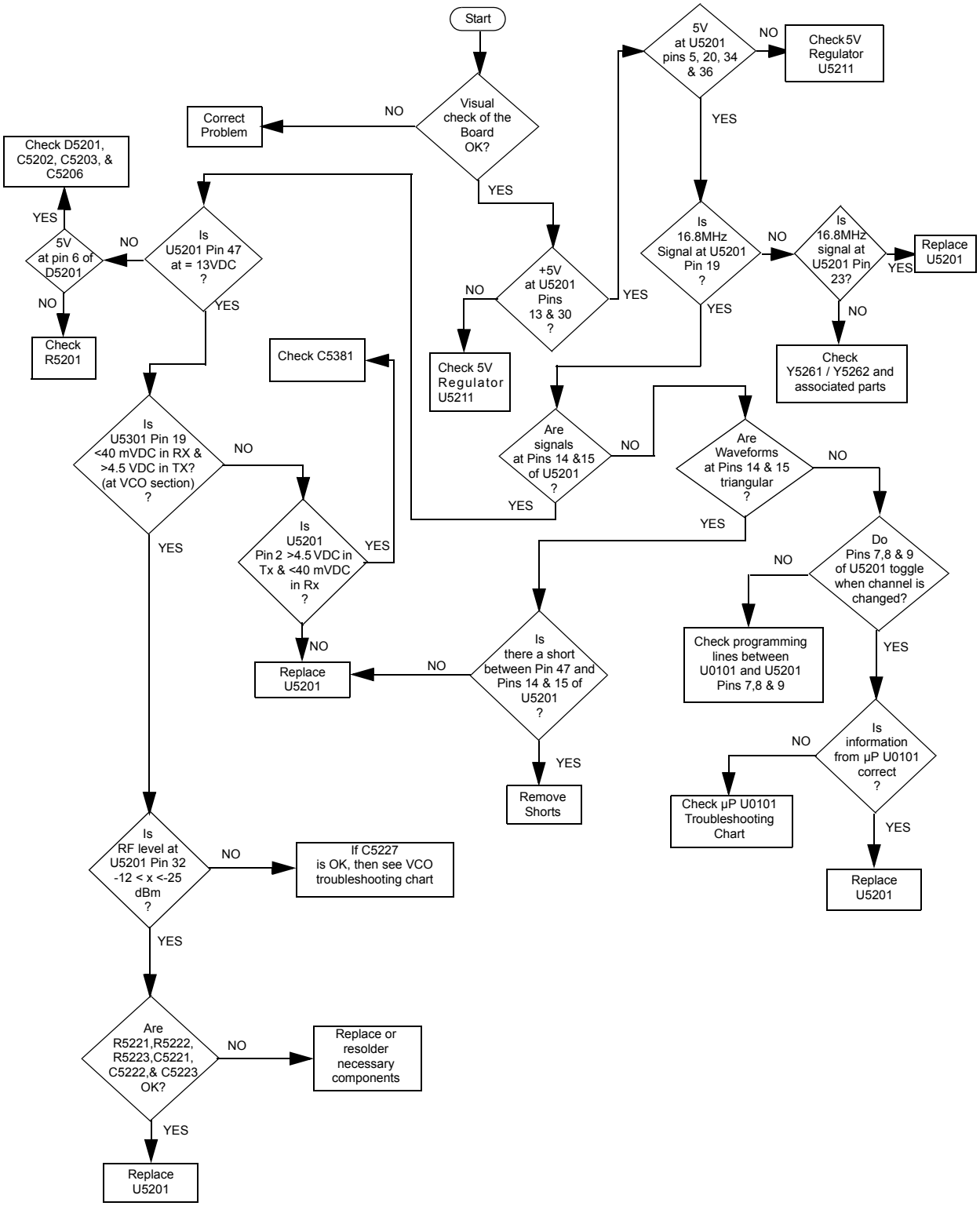
2.1 Troubleshooting Flow Chart for 25W Transmitter (Sheet 2 of 3)



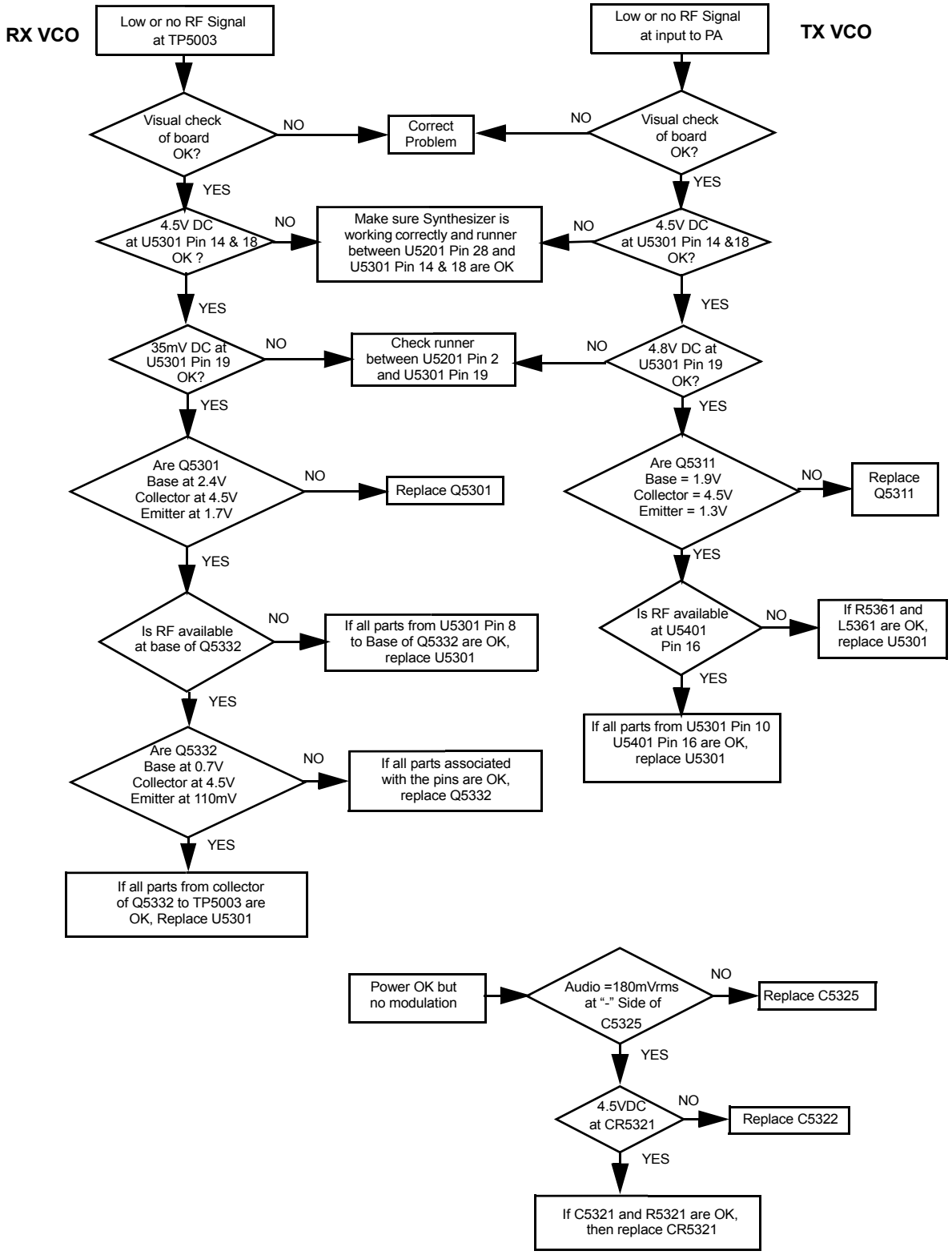
2.2 Troubleshooting Flow Chart for 25W Transmitter (Sheet 3 of 3)



3.0 Troubleshooting Flow Chart for Synthesizer

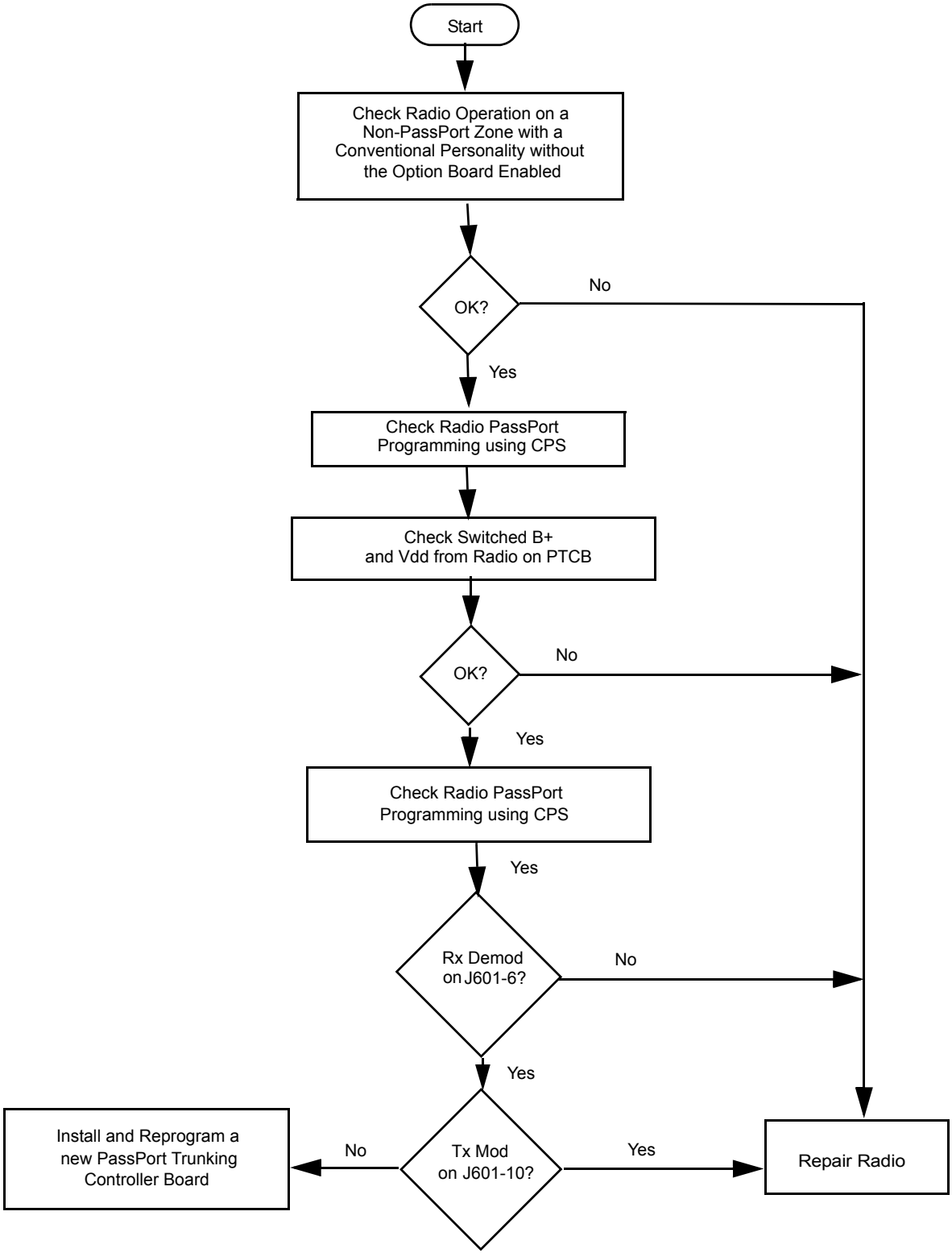


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Section 4

UHF BAND 2 (450-512/527 MHZ) 1-25W PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

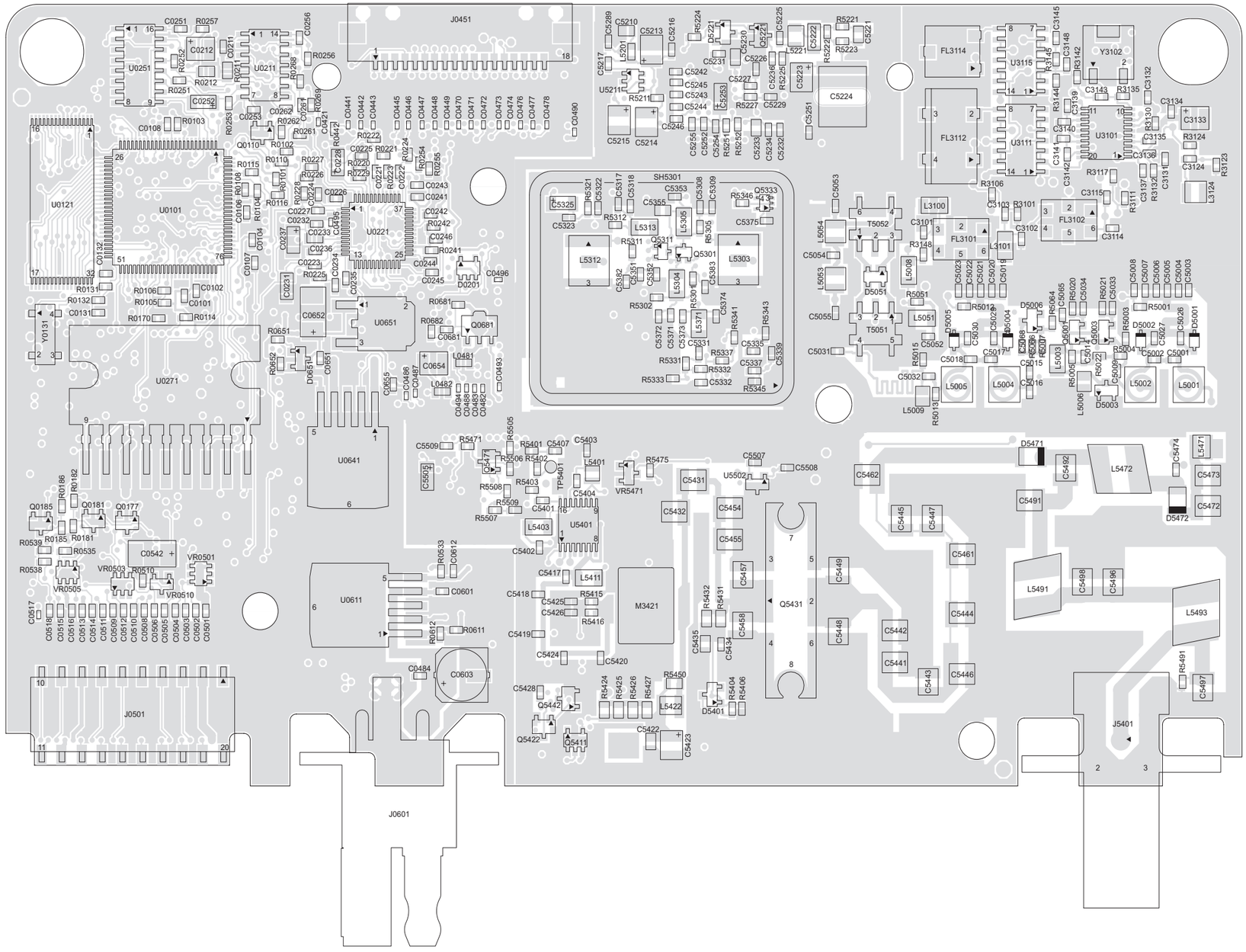
The UHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the UHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in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

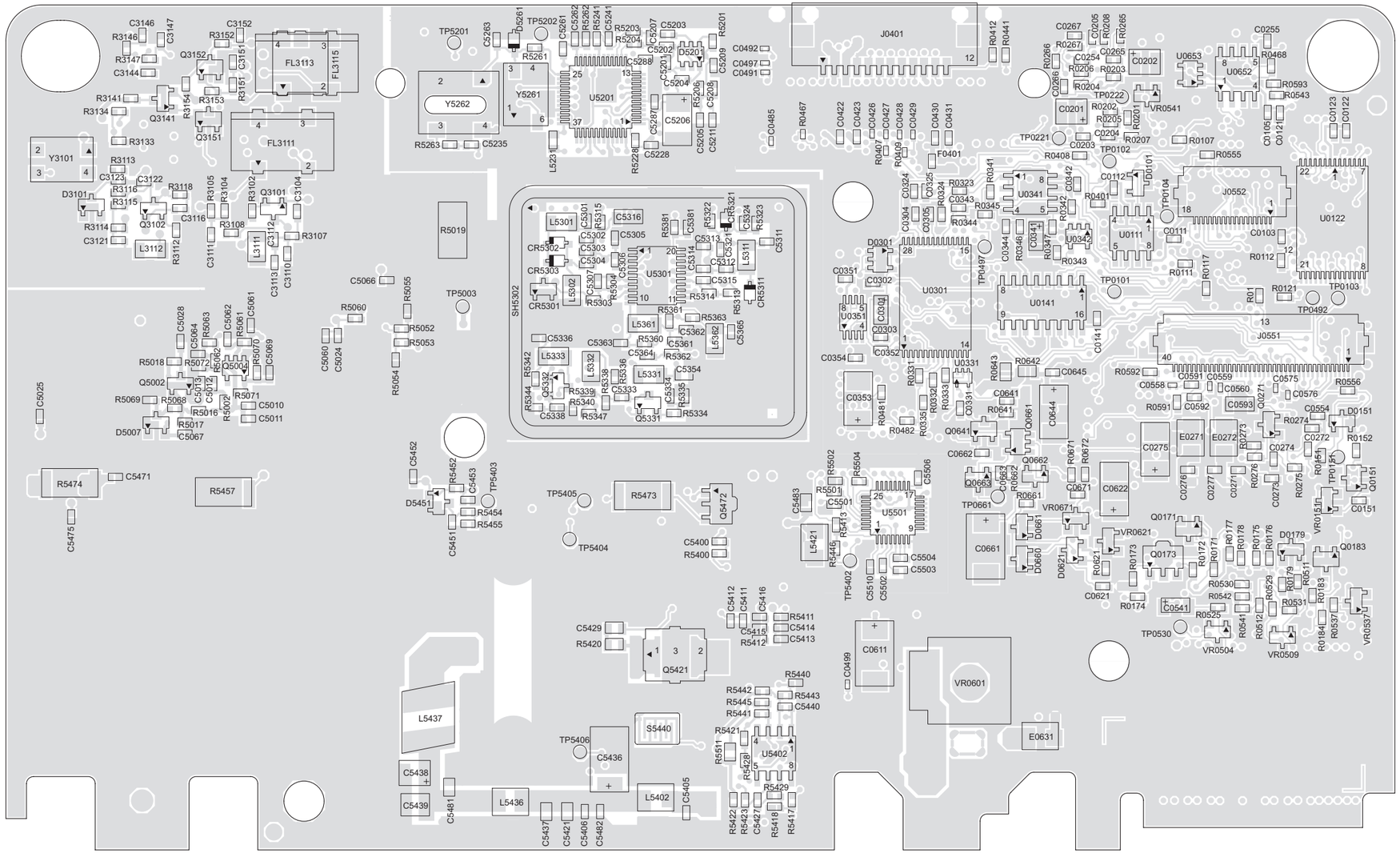
Table 6-1 UHF Band 2 1-25W PCB 8485671Z03 Diagrams and Parts Lists

PCB 8485671Z03:	**Page:**
Main Board Top Side	**6: 4-3**
Main Board Bottom Side	**6: 4-4**
SCHEMATICS	
Power Amplifier 1 - 25W	**6: 4-5**
FRACN Synthesizer	**6: 4-6**
Voltage Controlled Oscillator	**6: 4-7**
Receiver Front-End	**6: 4-8**
IF	**6: 4-9**
Parts List	**6: 4-10**
Controller version is **T9**	

Notes

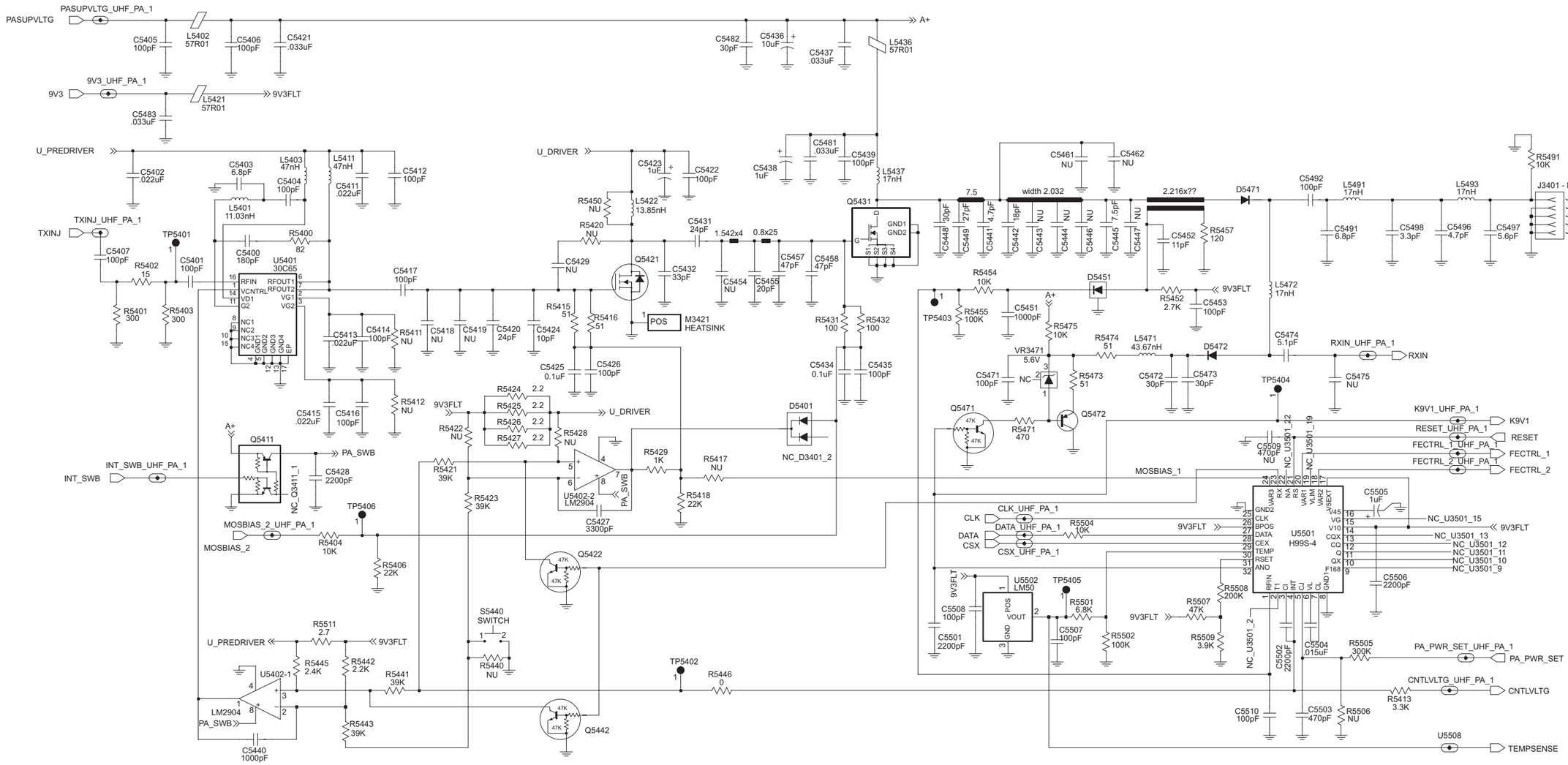
2.0 UHF Band 2 (450-512/527 MHz) 1-25W PCB 8485671Z03, Schematics, and Parts Lists





UHF Band 2 (450-512/527 MHz) 1-25W PCB 8485671Z03 Bottom Side

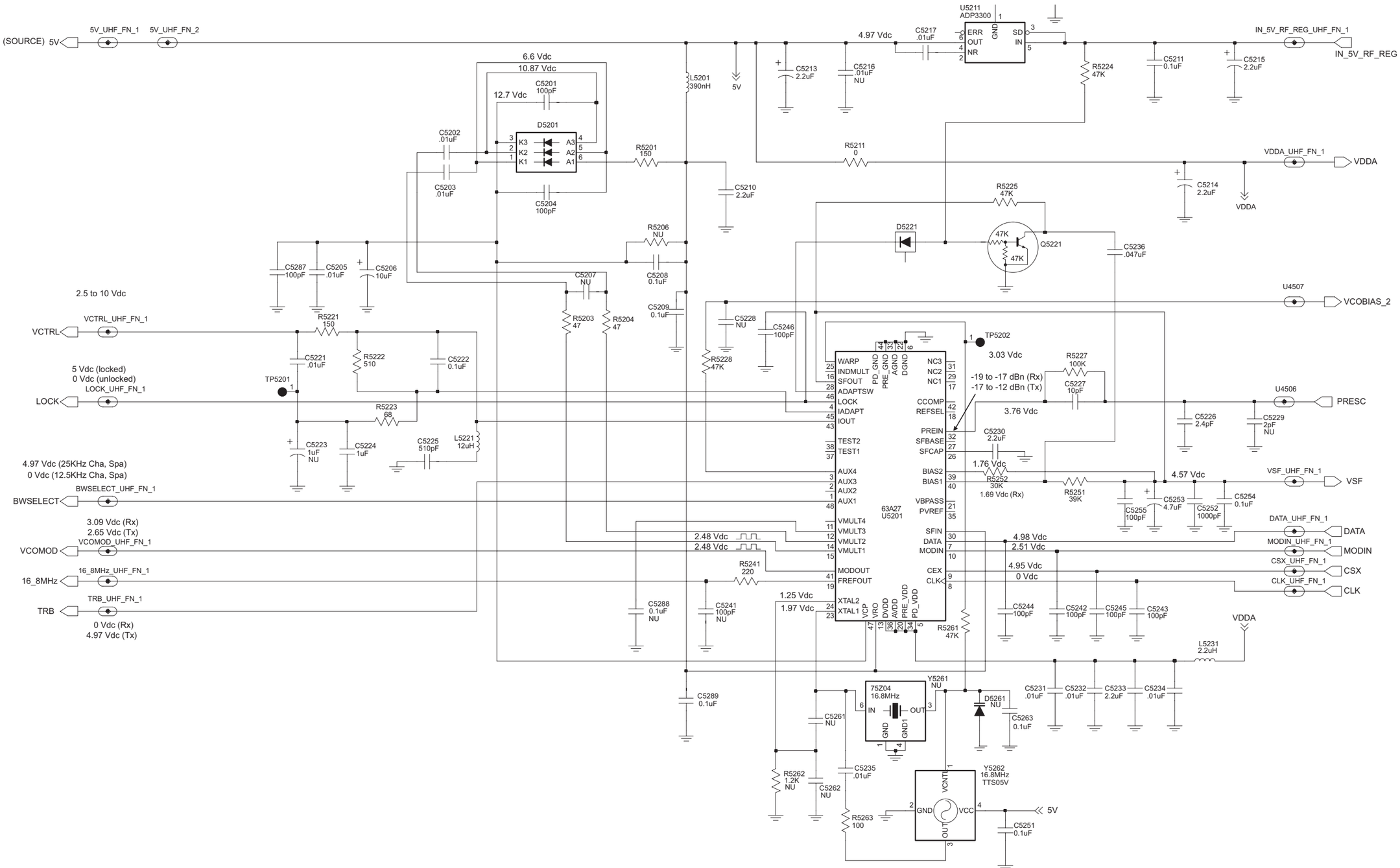
6881091C63-C



ZMY0130676-O

UHF Band 2 (450-512/527 MHz) 1-25W Power Amplifier

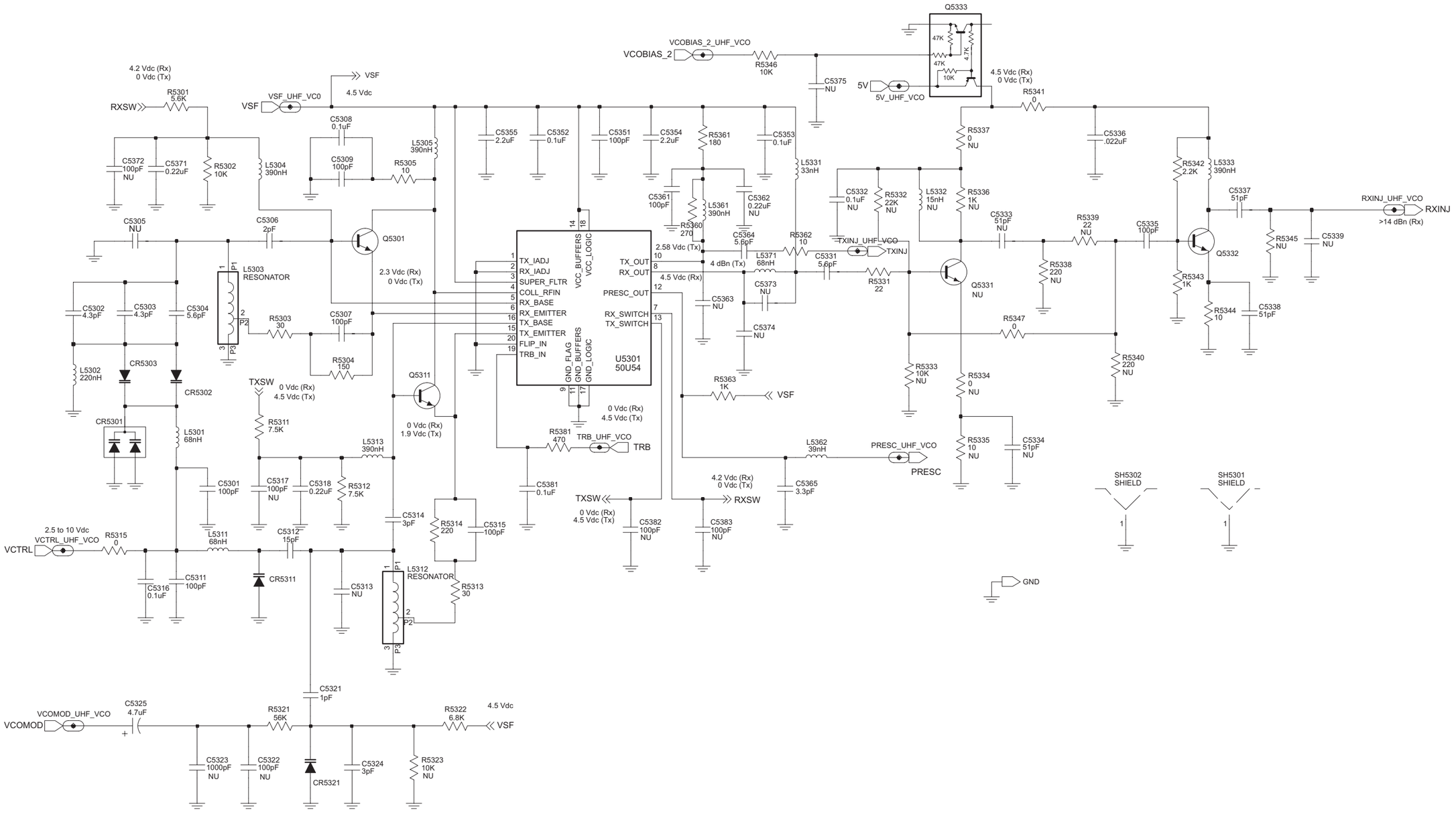
6881091C63-C



UHF Band 2 (450-512/527 MHz) 1-25W FRACN Synthesizer

ZMY0130675-O

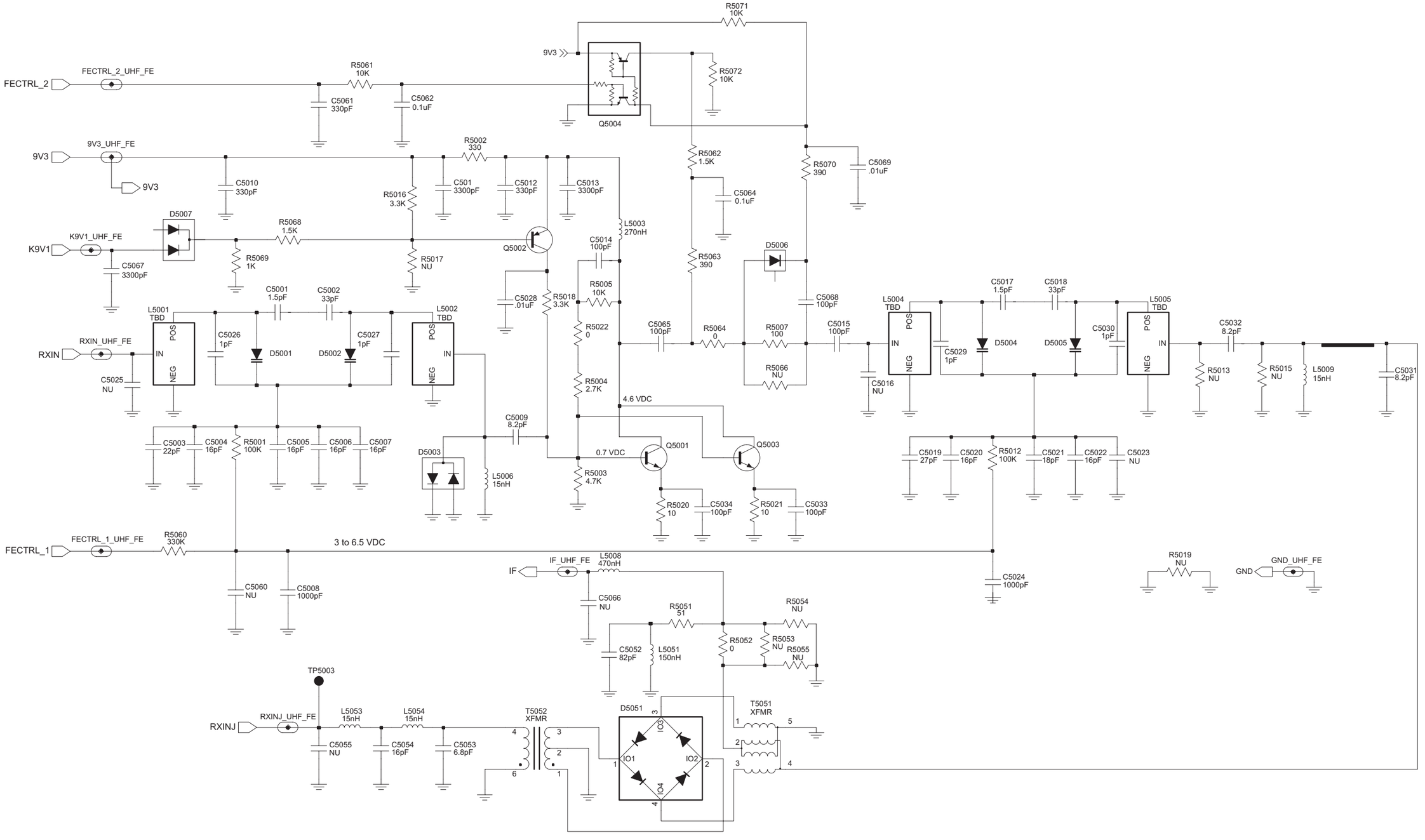
6881091C63-C



ZMY0130674-O

UHF Band 2 (450-512/527 MHz) 1-25W Voltage Controlled Oscillator

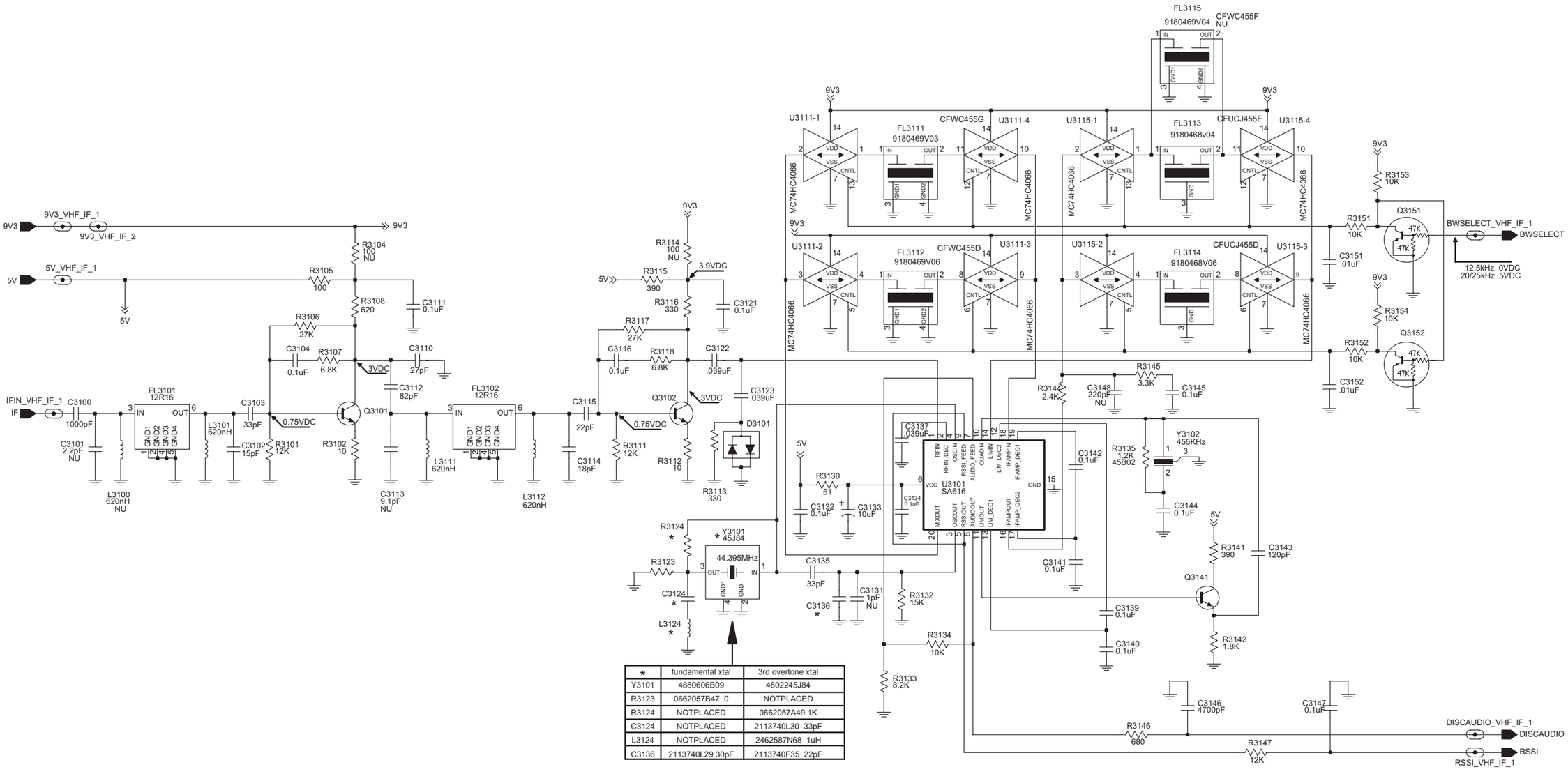
6881091C63-C



UHF Band 2 (450-512/527 MHz) 1-25W Receiver Front-End

ZMY0130672-O

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

UHF Band 2 (450-512/527 MHz) 1-25W IF

ZMY0130673-A

6881091C63-C

UHF B2 1-25W PCB 8485671Z03 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	10nF
C0201	2311049A57	10uF
C0202	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0228	2311049A56	4.7uF
C0231	2113743B29	1uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	0.022uF
C0236	2113743E10	0.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	10nF
C0251	2113743E20	0.1uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0256	2113740F51	100pF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	10nF
C0271	2113741F49	10nF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0301	2311049A07	1uF
C0302	2113743E20	0.1uF
C0303	2113740F51	100pF
C0304	2113743E20	0.1uF
C0305	2113743E20	0.1uF
C0324	2113743E20	0.1uF
C0331	2113743E20	0.1uF
C0341	2311049A07	1uF
C0342	2113743E20	0.1uF
C0343	2113743E20	0.1uF
C0344	2113743E20	0.1uF
C0351	2113743E20	0.1uF
C0352	2113743E07	0.022uF
C0353	2311049A97	33uF
C0354	2113743E20	0.1uF
C0421	2113743N48	82pF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0441	2113743L09	470pF
C0442	2113743L09	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743N48	82pF
C0472	2113743N48	82pF
C0473	2113743N48	82pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	10nF
C0502	2113741F17	470pF
C0503	2113741F17	470pF
C0504	2113741F17	470pF
C0505	2113741F17	470pF
C0506	2113741F17	470pF
C0508	2113741F17	470pF
C0509	2113741F17	470pF
C0510	2113741F17	470pF
C0511	2113741F17	470pF
C0512	2113741F17	470pF
C0513	2113741F17	470pF
C0514	2113741F17	470pF
C0515	2113741F17	470pF
C0516	2113741F49	10nF
C0517	2113743N48	82pF
C0518	2113741F17	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0560	2113743L17	1000pF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	10nF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	0.1uF
C3110	2113740F37	27pF
C3111	2113743E20	0.1uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	0.1uF
C3121	2113743E20	0.1uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3132	2113743E20	0.1uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3133	2311049A57	10uF
C3134	2113743E20	0.1uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	0.1uF
C3140	2113743E20	0.1uF
C3141	2113743E20	0.1uF
C3142	2113743E20	0.1uF
C3143	2113740F53	120pF
C3144	2113743E20	0.1uF
C3145	2113743E20	0.1uF
C3146	2113741F41	4700pF
C3147	2113743E20	0.1uF
C3151	2113741F49	10nF
C3152	2113741F49	10nF
C5001	2113740F07	1.5pF
C5002	2113740F39	33pF
C5003	2113740F35	22pF
C5004	2113740F32	16pF
C5005	2113740F32	16pF
C5006	2113740F32	16pF
C5007	2113740F32	16pF
C5008	2113741F25	1000pF
C5009	2113740F25	8.2pF
C5010	2113741F13	330pF
C5011	2113741F37	3300pF
C5012	2113741F13	330pF
C5013	2113741F37	3300pF
C5014	2113740F51	100pF
C5015	2113740F51	100pF
C5017	2113740F07	1.5pF
C5018	2113740F39	33pF
C5019	2113740F37	27pF
C5020	2113740F32	16pF
C5021	2113740F33	18pF
C5022	2113740F32	16pF
C5024	2113741F25	1000pF
C5026	2113740F03	1pF
C5027	2113740F03	1pF
C5028	2113741F49	10nF
C5029	2113740F03	1pF
C5030	2113740F03	1pF
C5031	2113740F25	8.2pF

Circuit Ref	Motorola Part No.	Description
C5032	2113740F25	8.2pF
C5033	2113740F51	100pF
C5034	2113740F51	100pF
C5052	2113740F49	82pF
C5053	2113740F23	6.8pF
C5054	2113740F32	16pF
C5061	2113740F63	330pF
C5062	2113743E20	0.1uF
C5064	2113743E20	0.1uF
C5065	2113740F51	100pF
C5067	2113741F37	3300pF
C5068	2113740F51	100pF
C5069	2113741F49	10nF
C5201	2113740F51	100pF
C5202	2113741F49	10nF
C5203	2113741F49	10nF
C5204	2113740F51	100pF
C5205	2113741F49	10nF
C5206	2311049J25	10uF
C5208	2113743E20	0.1uF
C5209	2113743E20	0.1uF
C5210	2104993J02	2.2uF
C5211	2113743E20	0.1uF
C5213	2311049A09	2.2uF
C5214	2311049A09	2.2uF
C5215	2311049A09	2.2uF
C5217	2113741F49	10nF
C5221	2109720D01	0.01uF
C5222	2109720D14	0.1uF
C5224	0882422W23	1uF
C5225	2113741F18	510pF
C5227	2113740F27	10pF
C5230	2104993J02	2.2uF
C5231	2113741F49	10nF
C5232	2113741F49	10nF
C5233	2104993J02	2.2uF
C5234	2113741F49	10nF
C5235	2113741F49	10nF
C5236	2113743E12	0.047uF
C5242	2113740F51	100pF
C5243	2113740F51	100pF
C5244	2113740F51	100pF
C5245	2113740F51	100pF
C5246	2113740F51	100pF
C5251	2113743E20	0.1uF
C5252	2113741F25	1000pF
C5253	2311049A56	4.7uF
C5254	2113743E20	0.1uF
C5255	2113740F51	100pF
C5263	2113743E20	0.1uF
C5287	2113740F51	100pF

Circuit Ref	Motorola Part No.	Description
C5289	2113743E20	0.1uF
C5301	2113740F51	100pF
C5302	2113740L09	4.3pF
C5303	2113740L09	4.3pF
C5304	2113740L12	5.6pF
C5306	2113740L01	2pF
C5307	2113740F51	100pF
C5308	2113743E20	0.1uF
C5309	2113740F51	100pF
C5311	2113740F51	100pF
C5312	2113740F33	18pF
C5314	2113740L01	2pF
C5315	2113740F51	100pF
C5316	2109720D14	0.1uF
C5318	2113743E20	0.1uF
C5321	2113740F03	1pF
C5324	2113740F07	1.5pF
C5325	2311049A56	4.7uF
C5331	2113740L12	5.6pF
C5335	2113740F51	100pF
C5336	2113743E07	0.022uF
C5337	2113740F44	51pF
C5338	2113740F44	51pF
C5351	2113740F51	100pF
C5352	2113743E20	0.1uF
C5353	2113743E20	0.1uF
C5354	2104993J02	2.2uF
C5355	2104993J02	2.2uF
C5361	2113740F51	100pF
C5364	0662057B47	0
C5371	2113743E20	0.1uF
C5381	2113743E20	0.1uF
C5400	2113740F57	180pF
C5401	2113740F51	100pF
C5402	2113743E07	0.022uF
C5403	2113740F23	6.8pF
C5404	2113740F51	100pF
C5405	2113740F51	100pF
C5406	2113740F51	100pF
C5407	2113740F51	100pF
C5411	2113743E07	0.022uF
C5412	2113740F51	100pF
C5413	2113743E07	0.022uF
C5414	2113740F51	100pF
C5415	2113743E07	0.022uF
C5416	2113740F51	100pF
C5417	2113740F51	100pF
C5420	2113740F36	24pF
C5421	2113741A57	0.033uF
C5422	2113740A55	100pF
C5423	2311049A08	1uF

Circuit Ref	Motorola Part No.	Description
C5424	2113740F27	10pF
C5425	2113743E20	0.1uF
C5426	2113740F51	100pF
C5427	2113741F37	3300pF
C5428	2113741F33	2200pF
C5431	2111078B25	27pF
C5432	2111078B29	33pF
C5434	2113743E20	0.1uF
C5435	2113740A55	100pF
C5436	2311049A45	10uF
C5437	2113741A57	0.033uF
C5438	2311049A08	1uF
C5439	2111078B42	100pF
C5440	2113741F25	1000pF
C5441	2111078B05	4.7pF
C5442	2111078B19	16pF
C5448	2111078B29	33pF
C5449	2111078B29	33pF
C5451	2113741F25	1000pF
C5452	2113740F28	11pF
C5453	2113740F51	100pF
C5454	2111078B01	3.3pF
C5455	2111078B19	16pF
C5457	2111078B34	47pF
C5458	2111078B35	51pF
C5461	2111078B11	8.2pF
C5471	2113740F51	100pF
C5472	2111078B27	30pF
C5473	2111078B27	30pF
C5474	2113740F18	4.3pF
C5475	2113740F10	2pF
C5481	2113741A57	0.033uF
C5482	2113740F38	30pF
C5483	2113741A57	0.033uF
C5491	2111078B09	6.8pF
C5492	2111078B42	100pF
C5496	2111078B05	4.7pF
C5497	2111078B01	3.3pF
C5498	2111078B01	3.3pF
C5501	2113741F33	2200pF
C5502	2113741F33	2200pF
C5503	2113741F33	2200pF
C5504	2113741F46	7500pF
C5505	2311049A07	1uF
C5506	2113741F33	2200pF
C5507	2113740F51	100pF
C5508	2113740F51	100pF
C5510	2113740F51	100pF
CR5301	4805649Q13	DIODE VCTR ISV 228
CR5302	4862824C01	DIODE VARACTOR
CR5303	4862824C01	DIODE VARACTOR

Circuit Ref	Motorola Part No.	Description
CR5311	4862824C01	DIODE VARACTOR
CR5321	4802245J22	DIODE, VARACTOR
D0101	4813825A05	DIODE
D0151	4813833C02	DIODE, DUAL 70V
D0179	4813833C02	DIODE, DUAL 70V
D0301	4802245J47	DIODE, SCHOTTKY
D0621	4813833C02	DIODE, DUAL 70V
D0651	4813833C02	DIODE, DUAL 70V
D0660	4813833C02	DIODE, DUAL 70V
D0661	4813833C02	DIODE, DUAL 70V
D3101	4880154K03	DIODE DUAL SCHOTTKY
D5001	4862824C01	DIODE VARACTOR
D5002	4862824C01	DIODE VARACTOR
D5003	4880154K03	DIODE DUAL SCHOTTKY
D5004	4862824C01	DIODE VARACTOR
D5005	4862824C01	DIODE VARACTOR
D5006	4880142L01	DIODE
D5007	4813833C02	DIODE, DUAL 70V
D5051	4886143B01	DIODE, MIXER
D5201	4802233J09	DIODE, TRIPLE
D5221	4813825A05	DIODE
D5401	4813833C02	DIODE, DUAL 70V
D5451	4813825A05	DIODE
D5471	4802482J02	DIODE, SMD PIN
D5472	4802482J02	DIODE, SMD PIN
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
F0401	6580542Z01	FUSE 3A
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	CERAMIC FILTER, 455KHz
FL3112	9180469V06	CERAMIC FILTER, 455KHz
FL3114	9180468V06	CERAMIC FILTER, 455KHz
FL3115	9180469V04	CERAMIC FILTER, 455KHz
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J5401	0986166B02	RF CONNECTOR (MINI-UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L5003	2462587T20	270nH
L5006	2462587V24	15nH

Circuit Ref	Motorola Part No.	Description
L5008	2462587T23	470nH
L5009	2462587V24	15nH
L5051	2462587T17	150nH
L5053	2462587N43	15nH
L5054	2462587N43	15nH
L5201	2462587Q42	390nH
L5221	2462587P25	12uH
L5231	2462587Q20	2.2uH
L5301	2462587T13	68nH
L5302	2462587T19	220nH
L5303	2460593C03	RESONATOR
L5304	2462587T22	390nH
L5305	2462587T22	390nH
L5311	2462587T22	390nH
L5312	2460593C03	RESONATOR
L5313	2462587T22	390nH
L5331	2462587T09	33nH
L5333	2462587T22	390nH
L5361	2462587T22	390nH
L5362	2462587T38	22nH
L5371	2462587T13	68nH
L5401	2460591B04	11.03nH
L5402	2484657R01	FERRITE BEAD
L5403	2462587T11	47nH
L5411	2462587T11	47nH
L5421	2484657R01	FERRITE BEAD
L5422	2460591C23	13.85nH
L5436	2484657R01	FERRITE BEAD
L5437	2460592A01	17nH
L5471	2460591N36	43.67nH
L5472	2460592A01	17nH
L5491	2460592A01	17nH
L5493	2460592A01	17nH
M3421	2686201B01	HEAT SPREADER
Q0110	4880048M01	NPN
Q0151	4880048M01	NPN
Q0171	4880048M01	NPN
Q0173	4880052M01	NPN DARLINGTON
Q0177	4880048M01	NPN
Q0181	4880048M01	NPN
Q0183	4880048M01	NPN
Q0185	4880048M01	NPN
Q0271	4880214G02	NPN
Q0641	4880048M01	NPN
Q0661	4805921T02	DUAL NPN/PNP
Q0662	4880214G02	NPN
Q0663	4880048M01	NPN
Q0681	4880052M01	NPN DARLINGTON
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q5001	4813827A07	NPN
Q5002	4813824A17	PNP
Q5003	4813827A07	NPN
Q5004	4805921T02	DUAL NPN/PNP
Q5221	4880048M01	NPN
Q5301	4805218N63	DIODE DUAL SCHOTTKY
Q5311	4805218N63	DIODE DUAL SCHOTTKY
Q5332	4813827A07	NPN
Q5333	4802245J50	DUAL NPN/PNP
Q5411	4805921T02	DUAL NPN/PNP
Q5421	4886212B01	POWER TRANSISTOR - MRF1518
Q5422	4880048M01	NPN
Q5431	4886163B01	POWER TRANSISTOR - MRF1535
Q5442	4880048M01	NPN
Q5471	4880048M01	NPN
Q5472	4805128M27	PNP
R0101	0662057A73	10K
R0102	0662057A65	4.7K
R0103	0662057B47	0
R0104	0662057A73	10K
R0105	0662057A97	10K (used in CDM1550 only)
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	100K
R0131	0662057B46	10M
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K
R0201	0662057A25	100
R0202	0662057A43	560
R0203	0662057A25	100
R0204	0662057A43	560
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0228	0662057B47	0
R0229	0662057A01	10
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	100K
R0254	0662057A73	10K
R0255	0662057A73	10K
R0256	0662057A97	100K
R0257	0662057A57	2.2K
R0261	0662057A73	10K
R0262	0662057B08	270K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0323	0662057A79	18K
R0324	0662057A79	18K
R0331	0662057A73	10K
R0332	0662057A73	10K
R0333	0662057A73	10K
R0335	0662057B02	150K
R0341	0662057A73	10K
R0342	0662057A55	1.8K
R0343	0662057B47	0
R0344	0662057A91	56K
R0345	0662057A66	5.1K
R0346	0662057A89	47K
R0347	0662057A89	47K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10
R0412	0662057B47	0
R0441	0662057B47	0
R0442	0662057A49	1K
R0467	0662057M26	10
R0468	0662057A97	100K
R0481	0662057B47	0
R0482	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	100K
R0512	0662057A77	15K
R0525	0662057A97	100K
R0529	0662057A89	47K
R0530	0662057B47	0
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0543	0662057A97	100K
R0555	0662057A25	100
R0556	0662057A25	100
R0591	0662057A82	24K
R0592	0662057A01	10
R0593	0662057A97	100K
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
R3101	0662057A75	12K
R3102	0662057A01	10
R3105	0662057A25	100
R3106	0662057A83	27K
R3107	0662057A69	6.8K
R3108	0662057A44	620
R3111	0662057A75	12K
R3112	0662057A01	10
R3113	0662057A37	330
R3115	0662057A39	390

Circuit Ref	Motorola Part No.	Description
R3116	0662057A37	330
R3117	0662057A83	27K
R3118	0662057A69	6.8K
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51
R3132	0662057A77	15K
R3133	0662057A71	8.2K
R3134	0662057A73	10K
R3135	0662057A51	1.2K
R3141	0662057A39	390
R3142	0662057A55	1.8K
R3144	0662057A58	2.4K
R3145	0662057A61	3.3K
R3146	0662057A45	680
R3147	0662057A75	12K
R3148	0662057B47	0
R3151	0662057A73	10K
R3152	0662057A73	10K
R3153	0662057A73	10K
R3154	0662057A73	10K
R5001	0662057A97	100K
R5002	0662057A37	330
R5003	0662057A65	4.7K
R5004	0662057A59	2.7K
R5005	0662057A73	10K
R5007	0662057A25	100
R5012	0662057A97	100K
R5016	0662057A61	3.3K
R5018	0662057A61	3.3K
R5020	0662057A01	10
R5021	0662057A01	10
R5022	0662057B47	0
R5051	0662057A18	51
R5052	0662057B47	0
R5060	0662057B10	330K
R5061	0662057A73	10K
R5062	0662057A53	1.5K
R5063	0662057A39	390
R5064	0662057B47	0
R5068	0662057A53	1.5K
R5069	0662057A49	1K
R5070	0662057A39	390
R5071	0662057A73	10K
R5072	0662057A73	10K
R5201	0662057A29	150
R5203	0662057A17	47
R5204	0662057A17	47
R5211	0662057B47	0

Circuit Ref	Motorola Part No.	Description
R5221	0662057A29	150
R5222	0662057A42	510
R5223	0662057A21	68
R5224	0662057A89	47K
R5225	0662057A89	47K
R5228	0662057A89	47K
R5241	0662057A33	220
R5251	0662057A87	39K
R5252	0662057A84	30K
R5261	0662057A89	47K
R5263	0662057A25	100
R5301	0662057A67	5.6K
R5302	0662057A73	10K
R5303	0662057A12	30
R5304	0662057A29	150
R5305	0662057A01	10
R5311	0662057A70	7.5K
R5312	0662057A70	7.5K
R5313	0662057A12	30
R5314	0662057A33	220
R5315	0662057B47	0
R5321	0662057A91	56K
R5322	0662057A69	6.8K
R5323	0662057A97	100K
R5331	0662057A09	22
R5341	0662057B47	0
R5342	0662057A57	2.2K
R5343	0662057A49	1K
R5344	0662057A01	10
R5346	0662057A73	10K
R5347	0662057B47	0
R5361	0662057A31	180
R5362	0662057A01	10
R5363	0662057A49	1K
R5381	0662057A41	470
R5400	0662057A23	82
R5401	0662057A36	300
R5402	0662057A05	15
R5403	0662057A36	300
R5404	0662057A73	10K
R5406	0662057A81	22K
R5411	0662057A67	5.6K
R5413	0662057A61	3.3K
R5415	0662057A18	51
R5416	0662057A18	51
R5418	0662057A57	2.2K
R5421	0662057A86	36K
R5422	0662057A58	2.4K
R5423	0662057A87	39K
R5424	0662057C11	2.2
R5425	0662057C11	2.2

Circuit Ref	Motorola Part No.	Description
R5426	0662057C11	2.2
R5427	0662057C11	2.2
R5428	0662057A58	2.4K
R5429	0662057A49	1K
R5431	0662057C51	100
R5432	0662057C51	100
R5441	0662057A87	39K
R5442	0662057A57	2.2K
R5443	0662057A87	39K
R5445	0662057A58	2.4K
R5446	0662057B47	0
R5452	0662057A59	2.7K
R5454	0662057A73	10K
R5455	0662057A97	100K
R5457	0683962T51	120
R5471	0662057A41	470
R5473	0680194M18	51
R5474	0680194M18	51
R5475	0662057A73	10K
R5491	0662057A73	10K
R5501	0662057A69	6.8K
R5502	0662057A97	100K
R5504	0662057A73	10K
R5505	0662057B09	300K
R5507	0662057A89	47K
R5508	0662057B05	200K
R5509	0662057A63	3.9K
R5511	0662057C13	2.7
SH5301	2602641Y02	SHIELD
SH5302	2602641Y02	SHIELD
T5051	2505515V03	TRANSFORMER 4:1
T5052	2508397X02	TRANSFORMER 1:1
U0101	5102226J56	MICROPROCESSOR
U0111	5102463J64	EEPROM
U0121	5186137B01	IC, FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	IC, QUAD OPAMP
U0221	5185130C53	IC, ASFIC
U0251	5184704M60	IC-CMOS ANALOG
U0271	5109699X01	AUDIO PA
U0301	5109152M01	EEPROM ANALOG
U0331	5186204B01	BUFFER / DRIVER
U0341	5113818A01	LINEAR IC OP-AMP
U0342	5105750U28	IC CMOS SWITCH
U0351	5102463J40	REGULATOR, 3.3V
U0611	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0641	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0651	5113816A07	REGULATOR, 5V

Circuit Ref	Motorola Part No.	Description
U0652	5113815A02	UNDERVOLT SENSOR
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U5201	5185963A27	IC FRACTN
U5211	5105739X05	IC, VOLTAGE REGULATOR
U5301	5105750U54	IC, VCO
U5401	5185130C65	IC LDMOS DRIVER
U5402	5113818A01	DUAL OP-AMP
U5501	5185765B28	IC POWER CONTROL
U5502	5185963A15	IC TEMPERATURE SENSOR
VR0151	4813830A15	DIODE, 5.6V
VR0501	4805656W09	DIODE, ZENER
VR0503	4805656W09	DIODE, ZENER
VR0504	4813830A40	DIODE, ZENER
VR0505	4805656W09	DIODE, ZENER
VR0509	4813830A40	DIODE, ZENER
VR0510	4813830A40	DIODE, ZENER
VR0537	4813830A15	DIODE, 5.6V
VR0541	4813830A27	DIODE, 14V
VR0601	4813832C77	DIODE
VR0621	4813830A15	DIODE, 5.6V
VR5471	4813830A15	DIODE, 5.6V
Y0131	4880113R19	CRYSTAL 38.4KHZ
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455KHz DISCRIMINATOR
Y5262	4886182B01	TCXO 16.8MHZ

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

Chapter 7: Low Band Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 Low Band Range 1 (29.7-36 MHz) Model Charts

1.1 CDM Series Model Chart

CDM Series, Low Band Range 1 (29.7-36 MHz)				
Model				Description
AAM25BKC9AA1AN				CDM750, 29.7-36 MHz, 40-60W, 20 kHz[1]
	AAM25BKD9AA2AN			CDM1250, 29.7-36 MHz, 40-60W, 20 kHz[1]
		AAM25BKF9AA5AN		CDM1550, 29.7-36 MHz, 40-60W, 20 kHz[1]
			Item	Description
X			GCN6112	Control Head, CDM750
	X		GCN6113	Control Head, CDM1250
		X	GCN6114	Control Head, CDM1550
X	X	X	IMUB6000	Tanapa, 29.7-36 MHz, 40-60W, 20 kHz[1]
X	X	X	IMUB6000_S	Replacement Board, 29.7-36 MHz, 40-60 W, 20 kHz[1]
X	X	X	RAB4002_RB	Antenna, 29.7-36 MHz, 1/4 Wave Base Loaded (Mini U)
X			6881091C54	User Guide, CDM750
	X		6881091C55	User Guide, CDM1250
		X	6881091C56	User Guide, CDM1550

1.2 PRO Series Model Chart

PRO Series, Low Band Range 1 (29.7-36 MHz)		
Model		Description
LAM25BKD9AA2AN		PRO5100, 29.7-36 MHz, 40-60W, 20 kHz Ch Sp[1]
	Item	Description
X	GCN6113	Control Head, PRO5100
X	IMUB6000	Tanapa, 29.7-36 MHz, 40-60W, 20 kHz[1]
X	IMUB6000_S	Replacement Board, 29.7-36 MHz, 40-60W, 20 kHz[1]
X	RAB4002_RB	Antenna, 29.7-36 MHz, 1/4 Wave Base Loaded (Mini U)
X	6881091C58	User Guide, PRO5100

2.0 Low Band Range 2 (36-42 MHz) Model Charts

2.1 CDM Series Model Chart

CDM Series, Low Band Range 2 (36-42 MHz)				
Model				Description
AAM25CKC9AA1AN				CDM750, 36-42 MHz, 40-60W, 20 kHz[1]
	AAM25CKD9AA2AN			CDM1250, 36-42 MHz, 40-60W, 20 kHz[1]
		AAM25CKF9AA5AN		CDM1550, 36-42 MHz, 40-60W, 20 kHz[1]
			Item	Description
X			GCN6112	Control Head, CDM750
	X		GCN6113	Control Head, CDM1250
		X	GCN6114	Control Head, CDM1550
X	X	X	IMUB6001	Tanapa, 36-42 MHz, 40-60W, 20 kHz[1]
X	X	X	IMUB6001_S	Replacement Board, 36-42 MHz, 40-60 W, 20 kHz[1]
X	X	X	RAB4003_RB	Antenna, 36-42 MHz, 1/4 Wave Base Loaded (Mini U)
X			6881091C54	User Guide, CDM750
	X		6881091C55	User Guide, CDM1250
		X	6881091C56	User Guide, CDM1550

2.2 PRO Series Model Chart

PRO Series, Low Band Range 2 (36-42 MHz)		
Model		Description
LAM25CKD9AA2AN		PRO5100, 36-42 MHz, 40-60W, 20 kHz Ch Sp[1]
	Item	Description
X	GCN6113	Control Head, PRO5100
X	IMUB6001	Tanapa, 36-42 MHz, 40-60W, 20 kHz[1]
X	IMUB6001_S	Replacement Board, 36-42 MHz, 40-60 W, 20 kHz[1]
X	RAB4003_RB	Antenna, 36-42 MHz, 1/4 Wave Base Loaded (Mini U)
X	6881091C58	User Guide, PRO5100

3.0 Low Band Range 3 (42-50 MHz) Model Charts

3.1 CDM Series Model Chart

CDM Series, Low Band Range 3 (42-50 MHz)				
Model				Description
AAM25DKC9AA1AN				CDM750, 42-50 MHz, 40-60W, 20 kHz[1]
	AAM25DKD9AA2AN			CDM1250, 42-50 MHz, 40-60W, 20 kHz[1]
		AAM25DKF9AA5AN		CDM1550, 42-50 MHz, 40-60W, 20 kHz[1]
			Item	Description
X			GCN6112	Control Head, CDM750
	X		GCN6113	Control Head, CDM1250
		X	GCN6114	Control Head, CDM1550
X	X	X	IMUB6002	Tanapa, 42-50 MHz, 40-60W, 20 kHz[1]
X	X	X	IMUB6002_S	Replacement Board, 42-50 MHz, 40-60 W, 20 kHz[1]
X	X	X	RAB4004_RB	Antenna, 42-50 MHz, 1/4 Wave Base Loaded (Mini U)
X			6881091C54	User Guide, CDM750
	X		6881091C55	User Guide, CDM1250
		X	6881091C56	User Guide, CDM1550

3.2 PRO Series Model Chart

PRO Series, Low Band Range 3 (42-50 MHz)		
Model		Description
LAM25DKD9AA2AN		PRO5100, 42-50 MHz, 40-60W, 20 kHz Ch Sp[1]
	Item	Description
X	GCN6113	Control Head, PRO5100
X	IMUB6002	Tanapa, 42-50 MHz, 40-60W, 20 kHz[1]
X	IMUB6002_S	Replacement Board, 42-50 MHz, 40-60 W, 20 kHz[1]
X	RAB4004_RB	Antenna, 42-50 MHz, 1/4 Wave Base Loaded (Mini U)
X	6881091C58	User Guide, PRO5100

4.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750** **CDM1250/PRO5100** **CDM1550**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750** **CDM1250/PRO5100/CDM1550** Depth excludes knobs	**40-60W:** 2.32 in. x 6.93 in. x 9.48 in. (59 mm x 176 mm x 241 mm) 2.4 in. x 7.05 in. x 9.84 in. (61 mm x 179 mm x 250 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	4.55 lb. (2064 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	Low Band
*Frequencies - Full Bandsplit	Low Band 1 29.7-36.0 MHz Low Band 2 36.0-42.0 MHz Low Band 3 42.0-50.0 MHz
Channel Spacing	12.5/20/30 kHz[1]
Frequency Stability (-30°C to +60°C, +25° Ref.)	±5 ppm
Power	40-60W
Modulation Limiting	±2.5 @ 12.5 kHz ±5.0 @ 20/30 kHz[1]
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/30 kHz[1]
Conducted/Radiated Emission	-26 dBm <1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 20/30 kHz[1]
Audio Response (300 - 3000Hz @ 20/25 kHz[1]) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	Low Band
*Frequencies - Full Bandsplit	Low Band 1 29.7-36.0 MHz Low Band 2 36.0-42.0 MHz Low Band 3 42.0-50.0 MHz
Channel Spacing	12.5/20/30 kHz[1]
Sensitivity (12 dB SINAD)	0.30 µV max (0.25 µV typical)
Intermodulation	75 dB @ 12.5 kHz 80 dB typical @ 20/30 kHz[1]
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 80 dB @ 20/30 kHz[1]
Spurious Rejection	70 dB @ 12.5 kHz 80 dB @ 20/30 kHz[1]
Rated Audio	3W internal, 7.5W external (8 ohms), 13W external (3.2 ohms)
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/30 kHz[1]

Receiver	Low Band
Audio Response (300 - 3000Hz @ 20/25 kHz[1]) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

[1] For Low Band models only, both 20 kHz and 25 kHz channel spacings give the same maximum system deviation of 5 kHz; they can be used interchangeably in this manual as well as in the CPS.

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the low band circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 Low Band Receiver Front-End

2.1 Receiver Front-End

The low band receiver, shown in Figure 7-1, is bandsplit into three ranges depending on radio model, covering frequencies from 29.7 to 36.0 MHz, 36.0 to 42.0 MHz, or 42.0 to 50.0 MHz. The circuitry of the three models is identical except for component value differences. The receiver consists of five major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF and blanker switches, low-IF and receiver back-end, and *"Extender"* (noise blanker). Two fixed-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the high-IF of 10.7 MHz. High-side first injection is used.

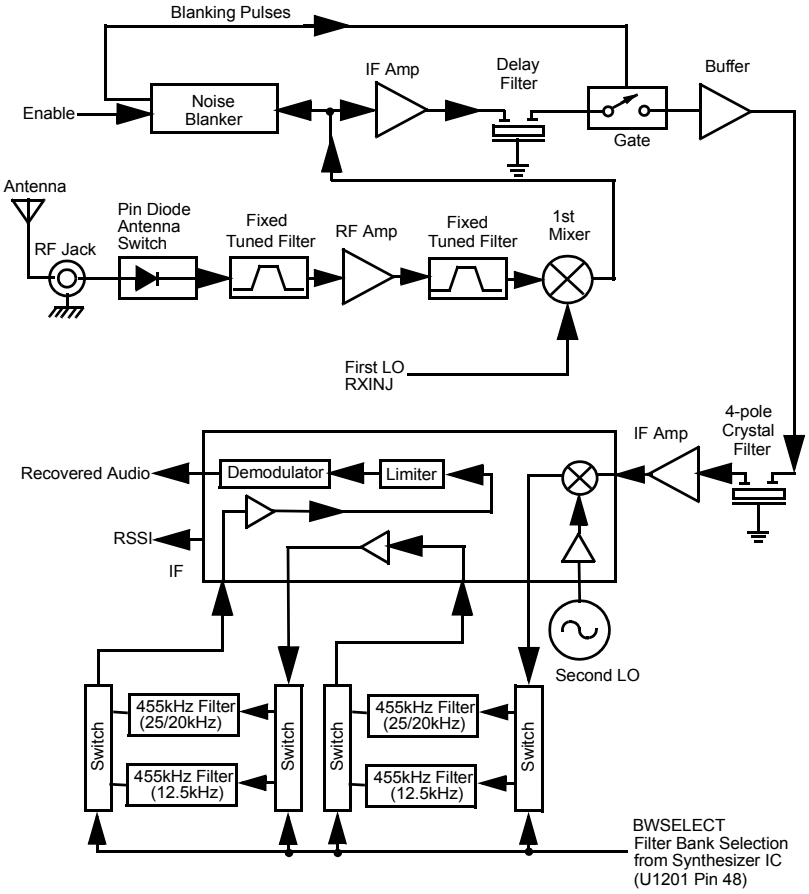


Figure 7-1 Low Band Receiver Block Diagram[1]

There are two 2-pole 10.7 MHz crystal filters in the high-IF section and two switched pairs of 455 kHz ceramic filters in the low-IF section to provide the required adjacent channel selectivity. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver 5-pole antenna filter (L1001-L1005 and associated components). This filter configuration provides more rapid attenuation above the passband to provide better rejection of the half-IF spurious response. A dual hot carrier diode (D1001) limits any inband signal to 0 dBm to prevent damage to the RF pre-amplifier.

The RF pre-amplifier is an SMD device (Q1001) with collector-base feedback to stabilize gain, impedance, and intermodulation. Transistor Q1002 compares the voltage drop across resistor R1005 with a fixed base voltage from divider R1006 and R1007, and adjusts the base current of Q1001 as necessary to maintain its collector current constant at 25 mA. Operating voltage is from the regulated 9.3V supply (9V3). During transmit, 9.1 volts (9T1) turns on both transistors in U1001, turning off Q1003 and therefore Q1001-2. This protects the RF pre-amplifier from excessive dissipation during transmit mode.

A second 5-pole fixed-tuned bandpass filter provides additional filtering of the amplified signal. This filter configuration also provides steeper attenuation above its passband for best half-IF attenuation.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal coming from the front-end is converted to the high-IF frequency of 10.7 MHz using a passive double-balanced mixer (U1051). The high-side injection signal (RXINJ) from the frequency synthesizer circuitry is filtered by a 7-pole low-pass filter (L1012-14 and associated circuitry) which removes second harmonic content from the injection signal and improves half-IF rejection. The 50-ohm output of the first mixer is applied to the input of the high-IF circuit block.

2.4 High Intermediate Frequency (IF) and Blanker Switches

The first mixer IF output signal (IF) is applied to diplexer network consisting of L1101, L1111 and associated components. This network has three functions: it terminates the mixer output at frequencies other than 10.7 MHz into 51-ohm resistor R1101; it matches the 50-ohm mixer output to the first IF amplifier (Q1101) input; and it provides bandpass filtering at 10.7 MHz to prevent the 5.35 MHz half-IF component of the mixer output from creating a second harmonic at 10.7 MHz in Q1101, which degrades half-IF rejection.

The IF amplifier Q1101 uses AC and DC feedback to stabilize gain and quiescent current (approximately 28 mA). Operating voltage is from the regulated 9.3V supply (9V3). Its output is applied to a 10.7 MHz ceramic filter FL1101 which has a 3 dB bandwidth of 270 kHz and provides a time delay of 2.6 usec. This delay allows enough time for the *"Extender"* to respond to impulse noise present at the input of Q1101 and operate the blanker switches Q1102 and Q1103, muting the IF signal for the duration of the noise pulse. L1104 and L1105 also provide additional selectivity and time delay. Operation of the *"Extender"* circuit is explained in Section 2.6 below.

When the blanker switches turn “on” to mute the IF signal, they momentarily change the impedance of resonant circuits L1104 and L1105 from high to very low. This abrupt impedance change, if presented to the high-Q crystal filter FL1102, would cause ringing of the filter response, stretching an otherwise narrow impulse into a long and audible output waveform. Therefore, source follower stage Q1104 isolates the blanker switches from the crystal filters, providing a consistent source impedance via matching network L1106, L1107 and associated components. Q1104 has unity voltage gain in this configuration.

Crystal filter F1102 is a module which consists of two 2-pole, 10.7 MHz units configured to provide an overall 4-pole response having a 3 dB bandwidth of approximately 12 kHz. The output is amplified by second IF amplifier Q1106 and applied to the low-IF circuitry, pin 1 of IF IC (U1103). A dual hot carrier diode (D1101) limits the amplifier output voltage swing to prevent overdriving the IF IC at RF input levels above -27 dBm.

2.5 Low Intermediate Frequency (IF) and Receiver Back-End

The 10.7 MHz high-IF signal from the second IF amplifier feeds the IF IC (U1103) at pin 1. Within the IF IC, the 10.7 MHz high-IF signal mixes with the 10.245 MHz second local oscillator (2nd LO) to produce the low-IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y1101. The low-IF signal is amplified and filtered by external pairs of 455 kHz ceramic filters (FL1105 and FL1107 for 20 kHz[1] channel spacing, or FL1104 and FL1106 for 12.5 kHz channel spacing). Selection of the appropriate filter pair is accomplished by U1101 and U1102, controlled by the BWSELECT line from pin 48 of the synthesizer IC U1201. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y1102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U1103 pin 8 (AUDIOOUT) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the controller circuitry).

A Receive Signal Strength Indicator (RSSI) signal is available at U1103 pin 5, having a dynamic range of 70 dB. The RSSI is interpreted by the µP (U0101 pin 63) and in addition is available at accessory connector J0501-15.

2.6 *“Extender”* (Noise Blanker)

The 10.7 MHz output from the first mixer, which is present at the input of the first IF amp Q1101, is also routed to the input of the *“Extender”* (noise blanker) circuitry and amplified by FET Q1610. The high input impedance of the FET stage minimizes loading of the signal in the receiver path. The output of Q1610 is further amplified by U1601, which is a wide-bandwidth, high gain differential amplifier (used in a single-ended configuration) incorporating an AGC gain control input. This gain block provides linear amplification of the instantaneous amplitude of the 10.7 MHz signal at the first mixer output. The output of U1601 is coupled to biased-detector Q1603. The bias is set so that noise impulses of a significant amplitude cause Q1603 to conduct. The following stages (Q1604 through Q1606) provide additional gain and pulse shaping which slows the turn-on and turn-off waveform applied to IF blanker switches Q1102 and Q1103. The result is that, for each noise impulse, the IF signal is smoothly ramped off and then on again, preventing the pulse from reaching the narrow IF selectivity, where ringing would cause an objectionable spike at the detector of a much longer duration than the original impulse.

If the repetition rate of noise impulses is so rapid that the noise blanker can no longer blank them individually, as indicated by a large increase in high-frequency content at the output of Q1604, stage Q1607 amplifies this level and turns on level detector Q1609. Its output is highly filtered into a DC voltage level which is proportional to the repetition rate of noise impulses, and this is applied to the AGC input pin 5 of U1601, reducing its gain and therefore the amount of noise pulses which are detected and processed.

3.0 Low Band Transmitter Power Amplifier (PA) 60W

The radio's 60W power amplifier (PA), shown in Figure 7-2, is a three-stage amplifier used to amplify the output from the VCO to the radio transmit level. The line-up consists of three stages which utilize LDMOS technology. The first stage is a pre-driver (U1401) that is controlled by pin 4 of PCIC (U1503) via Q1504 and Q1505 (CNTLVLTG). It is followed by driver stage Q1401, and final stage utilizing two devices (Q1402 and Q1403) connected in parallel. Q1402 and Q1403 are in direct contact with the heat sink.

To prevent damage to the final stage devices, a safety switch has been installed to prevent the transmitter from being keyed with the cover removed.

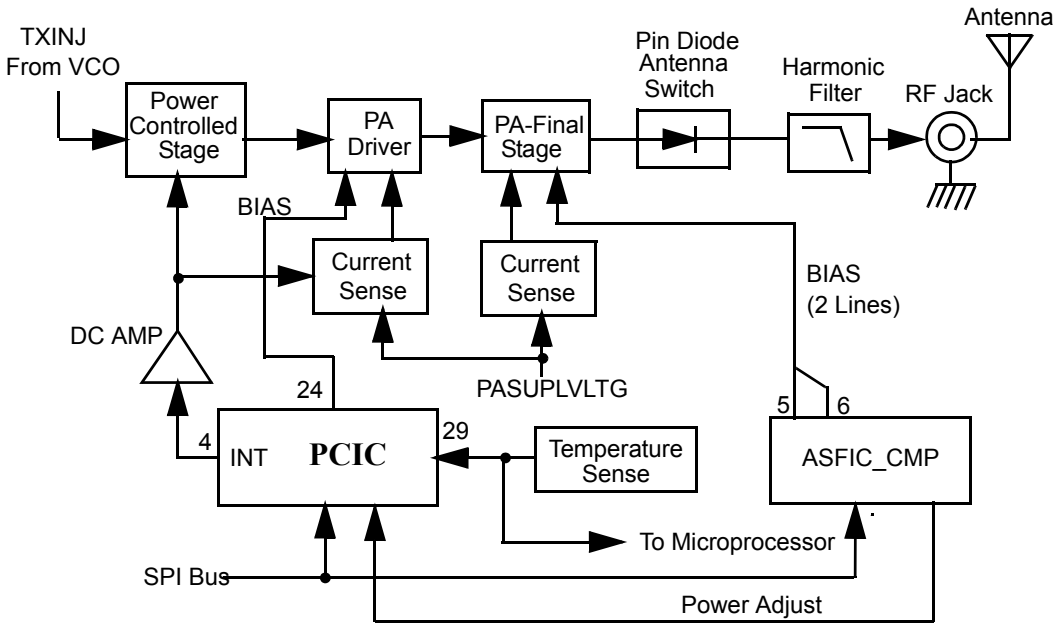


Figure 7-2 Low Band Transmitter Block Diagram

3.1 Power Controlled Stage

The first stage (U1401) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U1401 is controlled by a DC voltage applied to pin 1 from the power control circuit (U1503 pin 4, with transistors Q1504-5 providing current gain and level-shifting). The control voltage simultaneously varies the bias of two FET stages within U1401. This biasing point determines the overall gain of U1401 and therefore its output drive level to Q1401, which in turn controls the output power of the PA.

3.2 Driver Stage

The next stage is an LDMOS device (Q1401) providing a gain of 13dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_1 is set during transmit mode by the PCIC pin 24, and fed to the gate of Q1401 via resistors R1402, R1447, R1449, R1458, R1459, and R1463. The bias voltage is tuned in the factory.

The circuitry associated with U1402-2 and Q1404 limits the variation in the output power of the driver stage resulting from changes in the input impedance of the final stage due to changes at the antenna of the radio. The variation in the driver's output power is limited by controlling its DC current. The driver's DC current is monitored by measuring the voltage drop across current-sense resistors R1473-6, and this voltage is compared to a reference voltage on pin 6 of U1402-2. If the current through the sense resistors decreases, the circuit increases the bias voltage on the gate of Q1401 via Q1404. If the current increases, then the bias voltage decreases in order to keep the driver's current constant. Since the current must increase with increasing control voltage, an input path is provided to U1402-2 pin 5 from control line VCNTRL to enable this.

3.3 Final Stage

The final stage uses two LDMOS FET devices operating in parallel. Each device has its own adjustable gate bias voltage, MOSBIAS_2 and MOSBIAS_3, obtained from D/A outputs of the ASFIC. These bias voltages are also factory-tuned. If these transistors are replaced, the bias voltage must be tuned using the Tuner software. Care must be taken not to damage the device by exceeding the maximum allowed bias current. The device's drain current is drawn directly from the radio's DC supply voltage input, PASUPVLTG, via current-measurement resistor R1409.

A matching network combines the output of the two devices and provides a 50-ohm source for the antenna switch and harmonic filter.

3.4 Antenna Switch

The antenna switch is operated by the 9T1 voltage source which forward biases diodes D1401 and D1402 during transmit, causing them to appear as low impedance. D1401 allows the RF output from final stages Q1402 and Q1403 to be applied to the input of the low-pass harmonic filter (L1421-3 and associated components). D1402 appears as a short circuit at the input of the receiver (RXINJ), preventing transmitter RF power from entering the receiver. L1420 and C1456 appear as a broadband-wave transmission line, making the short circuit presented by D1402 appear as an open circuit at the junction of D1401 and the harmonic filter input.

During receive mode, the 9T1 voltage is not present, and D1401 and D1402 do not conduct and appear as open circuits. This allows signals from the antenna jack to pass to the receiver input, and disconnects the transmitter final stages from this path.

3.5 Harmonic Filter

Components L1421- L1423 and C1449-C1455 form a seven-pole elliptic low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R1411 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.6 Power Control

The transmitter uses the Power Control IC (PCIC, U1503) to control the power output of the radio. A differential DC amplifier U1502-1 compares the voltage drop across current-measuring resistor R1409, which is proportional to the transmitter final stage DC current, with the voltage drop across resistors R1508 and R1535, which is proportional to the current through transistor Q1503. This transistor is controlled by the output of the differential amplifier, which varies the transistor current until equilibrium of the two compared voltages is reached. The current through Q1503 develops a voltage across R1513 which is exactly proportional to the DC current of the final stages. This voltage is applied to the RF IN port of the PCIC (pin 1).

The PCIC has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuitry.

The PCIC provides a DC output voltage at pin 4 (INT) which is amplified and shifted in DC level by stages Q1504 and Q1505. The 0 to 4 volt DC range at pin 4 of U1503 is transferred to a 0 to 8 volt DC range at the output of Q1505, and applied as VCNTRL to the power-adjust input pin of the first transmitter stage U1401. This adjusts the transmitter power output to the intended value. Variations in antenna impedance cause variations in the DC current of the final stages, and the PCIC adjust the control voltage above or below its normal value to reduce power if current drain increases, or raise power if current drain decreases.

Capacitors C1503-4 and C1525, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U1501 is a temperature-sensing device which monitors the circuit board temperature in the vicinity of the transmitter circuits and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

3.7 TX Safety Switch

The TX Safety Switch consists of S1501, Q1506, and diode pairs D1502 and D1503 providing protection to the final stage devices Q1402 and Q1403. These final stage devices can be degraded or destroyed if the radio is keyed without the cover in place due to the lack of a good thermal path to the chassis.

Switch S1501 is closed when the radio's cover is screwed in place by means of the carbonized region on the cover's pressure pad making contact with the finger plating on the radio's PCB. With the cover in place, transistor Q1506 is off, back-biasing diodes D1502 and D1503, enabling proper transmitter operation. When the cover is not in place, S1501 opens, causing Q1506 to turn on, pulling the cathodes of D1502 and D1503 to ground, resulting in the shorting of the transmitter's bias lines and control voltage.

4.0 Low Band Frequency Synthesis

The frequency synthesizer subsystem, shown in Figure 7-3, consists of the reference oscillator crystal (Y1201), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U1201), and the receive and transmit VCOs and buffers (Q1303 through Q1308 and associated components).

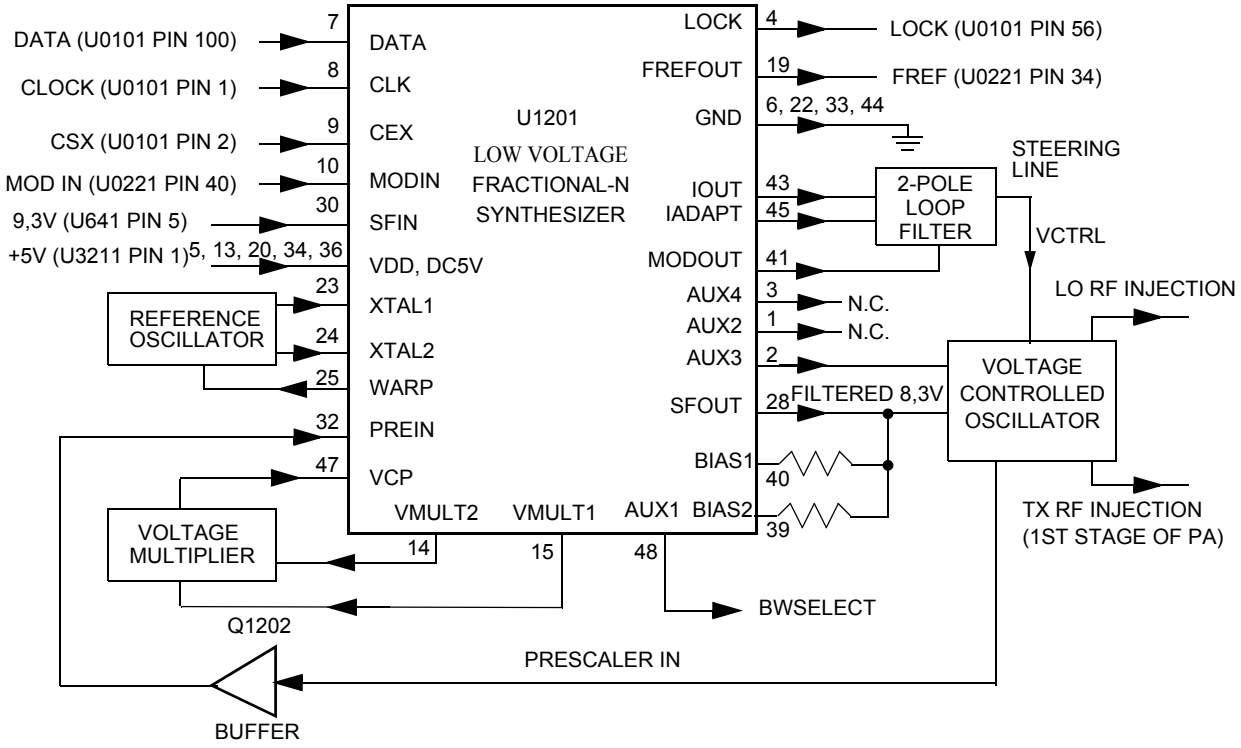


Figure 7-3 Low Band Synthesizer Block Diagram

4.1 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U1201) consists of a reference oscillator, pre-scaler, a programmable loop divider, control divider logic, phase detector, a charge pump, A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 9.3 volt supply.

Regulated 9.3 volts DC applied to the super filter input (U1201, pin 30) delivers a very low noise output voltage of 8.3 volts DC (VSF) at pin 28. External device Q1201 allows greater current sourcing capability. The VSF source supplies the receive and transmit VCOs and first buffer stages. The synthesizer IC supply voltage is provided by a dedicated 5V regulator (U1250) to minimize power supply noise.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U1201 pin 47), a capacitive voltage multiplier circuit (CR1202 and C1209) generates a voltage of 13 volts DC. This multiplier is driven by two 1.05 MHz clock signals from U1201 pins 15 and 14 (VMULTI1 and VMULTI2) which are 180 degrees out of phase.

Output LOCK (U1201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. A buffered output of the 16.8 MHz reference frequency is provided at pin 19.

The operating frequency of the synthesizer is loaded serially from the µP via the data line (DATA, U1201-7), clock line (CLK, U1201-8) and chip select line (CSX, U1201-9).

The reference oscillator circuit within U1201 uses an external 16.8 MHz crystal (Y1201). Varactor CR1201 allows software-controlled frequency adjustments (warp) and temperature compensation of the oscillator frequency. Warp adjustment is performed using serial data from the µP. This controls the setting of an A/D converter, with its output (WARP, pin 25) applied to CR1201.

4.2 Voltage Controlled Oscillator (VCO) and Buffers

Separate voltage controlled oscillator (VCO) and buffer circuits, shown in Figure 7-4, are used for receiver injection and transmitter carrier frequency generation. Since the receiver uses high-side injection, the receiver VCO frequency range is 10.7 MHz above the transmit VCO range. The VCO/buffers are bandsplit into three ranges depending on radio model, covering radio operating frequencies of 29.7 to 36.0 MHz, 36.0 to 42.0 MHz, or 42.0 to 50.0 MHz. The corresponding three frequency ranges from the receive VCO are 40.4 to 46.7 MHz, 46.7 to 52.7 MHz, and 52.7 to 60.7 MHz.

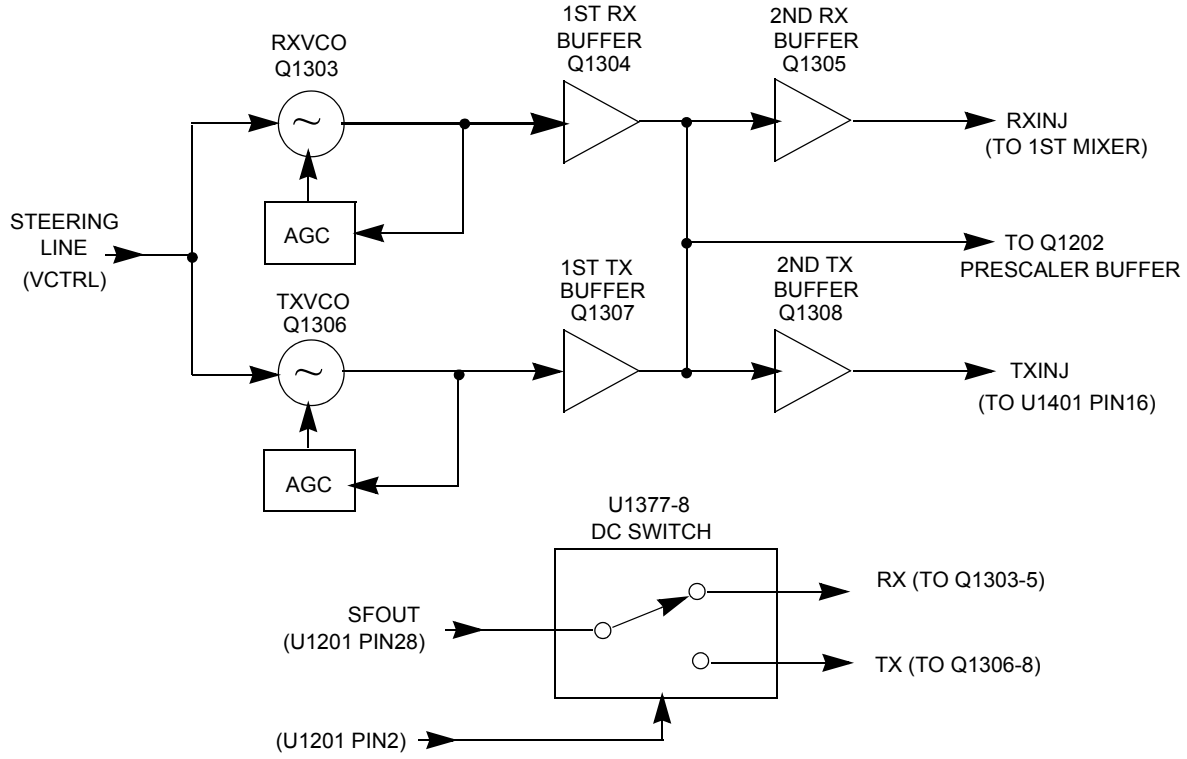


Figure 7-4 Low Band VCO Block Diagram

The VCOs, together with Fractional-N synthesizer U1201, generates the required frequencies for transmit and receive modes. The TRB line (U1201, pin 2) determines which VCO/buffer circuit is to be enabled. A high level on TRB will turn on the transistors in U1378 to turn on via R1376, applying the 8.3 volt VSF source to the receiver VCO and first buffer. The second buffer in each string operates from the 9.3V source and become active when RF is applied to their inputs.

The RF signal at the bases of the second buffers are combined and fed back to the Fractional-N synthesizer via PRE_IN where it is compared to the reference frequency as described below in Section 4.3. The Fractional-N IC provides a DC steering voltage VCTRL to adjust and maintain the VCO at the correct frequency.

With a steering voltage from 2.5V to 11V at the appropriate varactor diode (CR1302 for the RX VCO, or CR1310 for the TX VCO), the full VCO tuning range is obtained. Each VCO uses an AGC circuit to maintain a constant VCO output level across the frequency band. A diode (CR1306 in the receive VCO, or CR1314 in the transmit VCO) is configured as a voltage doubler which rectifies the RF level sampled at the VCO drain and applies a proportional negative DC voltage to the VCO gate. Increased RF level reduces the VCO gain to compensate.

The VCO output is taken from the source and applied to the first buffer transistor (Q1304 receive, Q1307 transmit). The first buffer output is further amplified by the second buffer transistor (Q1305 receive, Q1308 transmit) before being applied to the receiver first mixer or transmitter first stage input.

In TX mode the modulation signal coming from the LVFRAC-N synthesizer IC (MODOUT, U1201 pin 41) is superimposed on the DC steering line voltage by capacitive divider C1215, C1208 and C1212, causing modulation of the TX VCO using the same varactor as used for frequency control.

4.3 Synthesizer Operation

The complete synthesizer subsystem comprises mainly a low voltage LVFRAC-N synthesizer IC, Reference Oscillator (crystal oscillator with temperature compensation), charge pump circuitry, loop filter circuitry, and voltage controlled oscillators and buffers. A sample of the VCO operating signal PRE_IN is amplified by feedback buffer Q1202, low-pass filtered by L1205, C1222 and C1224, and fed to U1201 pin 32 (PREIN).

The pre-scaler in the synthesizer (U1201) is basically a dual modulus pre-scaler with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the serial interface to the µP. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator, whose frequency is controlled by Y1201.

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at pin 43 of U1201 (IOUT). The loop filter (consisting of R1205-6, R1208, and C1212-14) transforms this current into a voltage that is applied to varactor diodes (CR1310 for transmit, CR1302, for receive) and alters the output frequency of the appropriate VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U1201-40) or BIAS 2 (U1201-39). The currents are set by the value of R1211 or R1207 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer the magnitude of the loop current is increased by enabling the IADAPT (U1201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U1201-4).

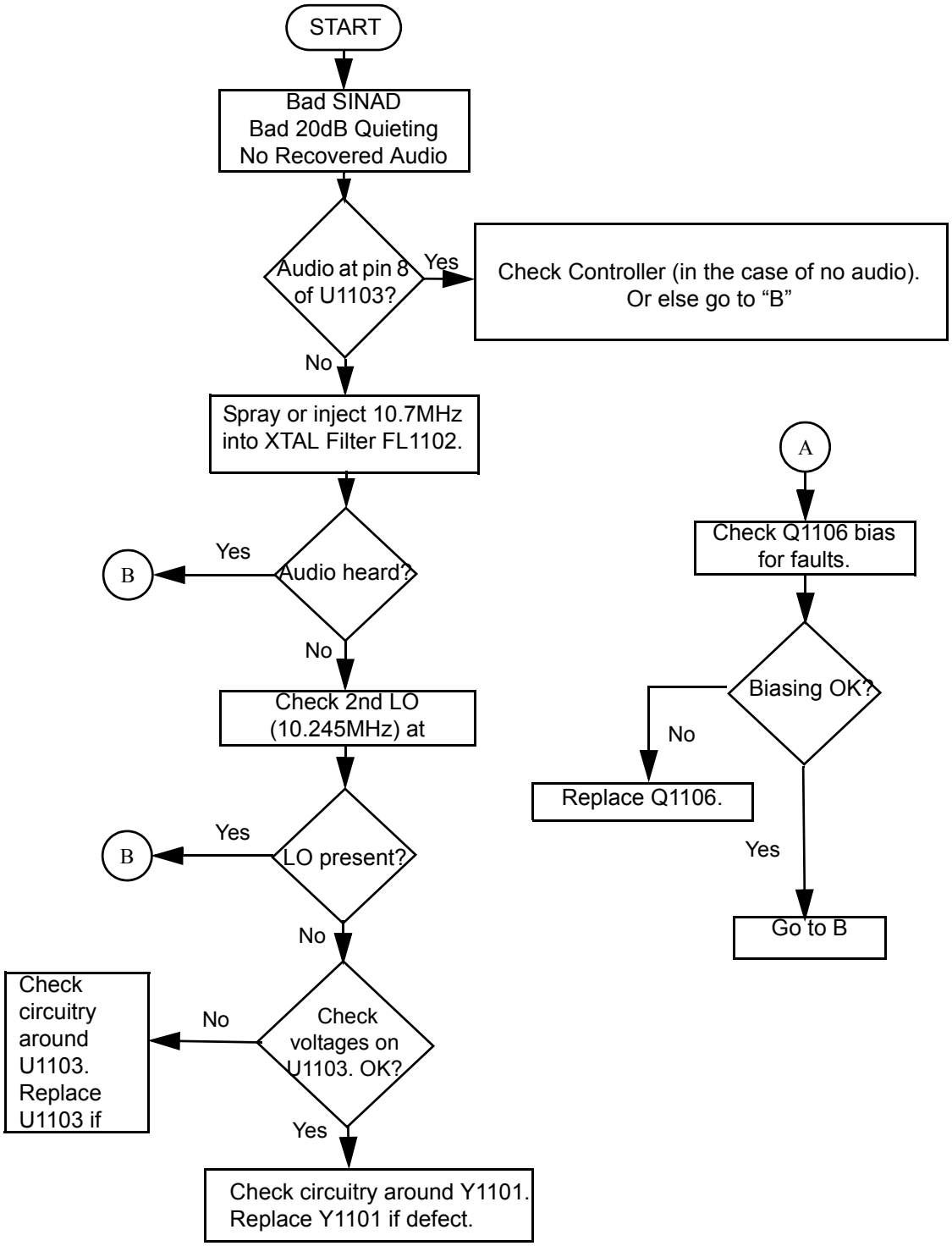
In order to modulate the PLL the two-spot modulation method is utilized. Via pin 10 (MODIN) on U1201, the audio signal is applied to both the A/D converter (low frequency path) and the balanced attenuator (high frequency path). The A/D converter converts the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U1201-41) and superimposed on the VCO steering line voltage by a divider consisting of C1215, C1208 and C1212.

[1] For Low Band models only, both 20 kHz and 25 kHz channel spacings give the same maximum system deviation of 5 kHz; they can be used interchangeably in this manual as well as in the CPS.

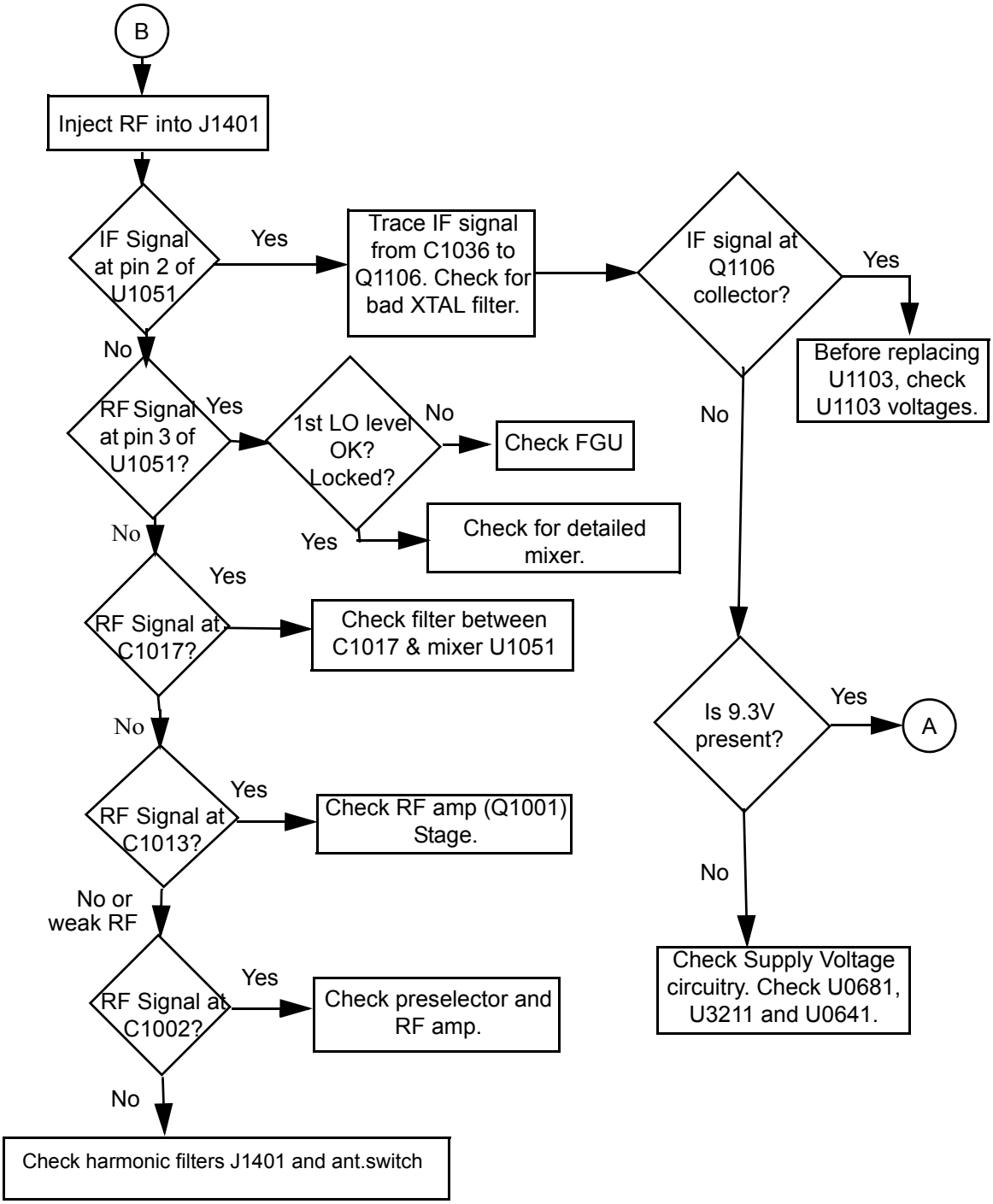
Section 3

TROUBLESHOOTING CHARTS

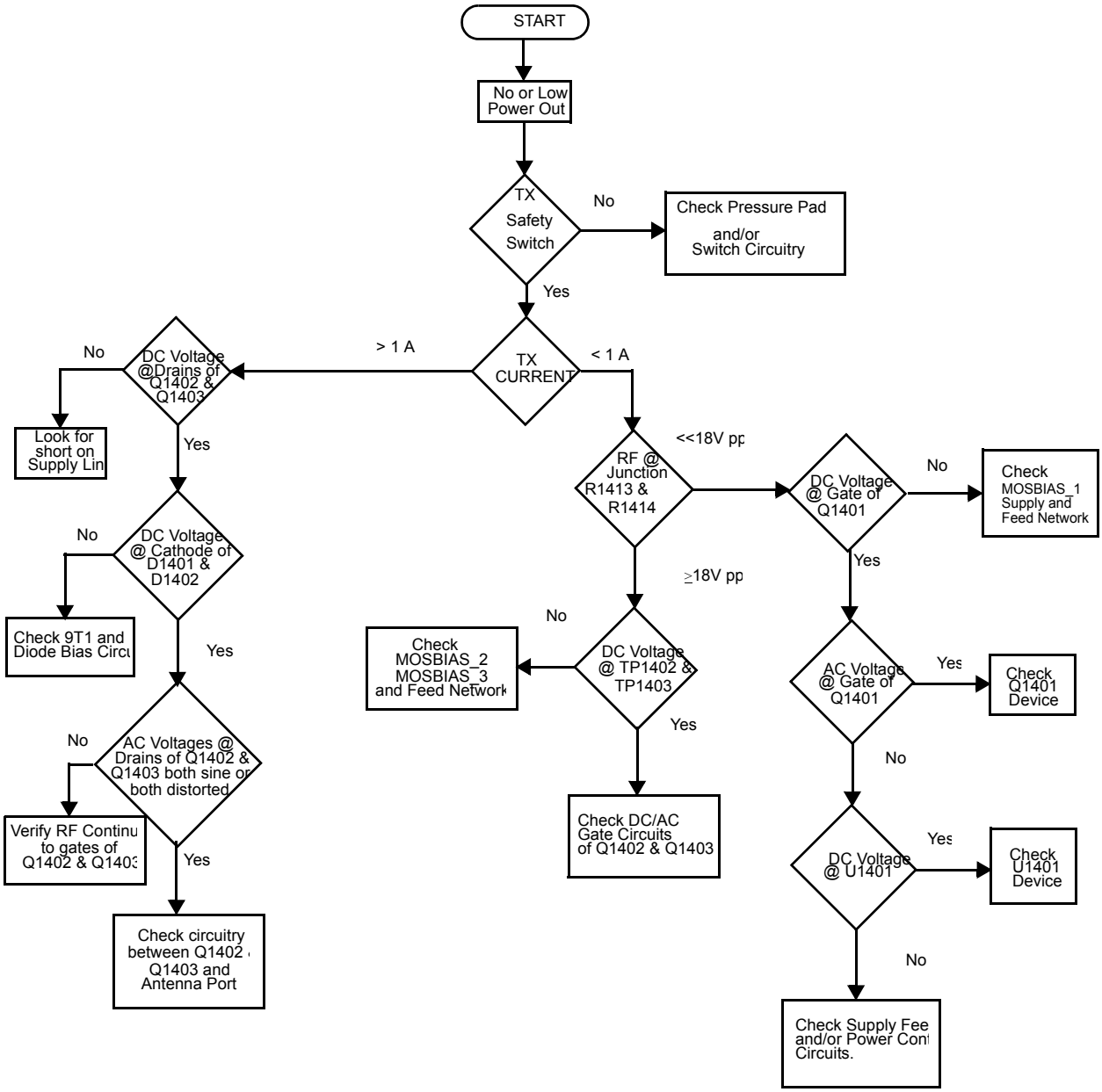
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



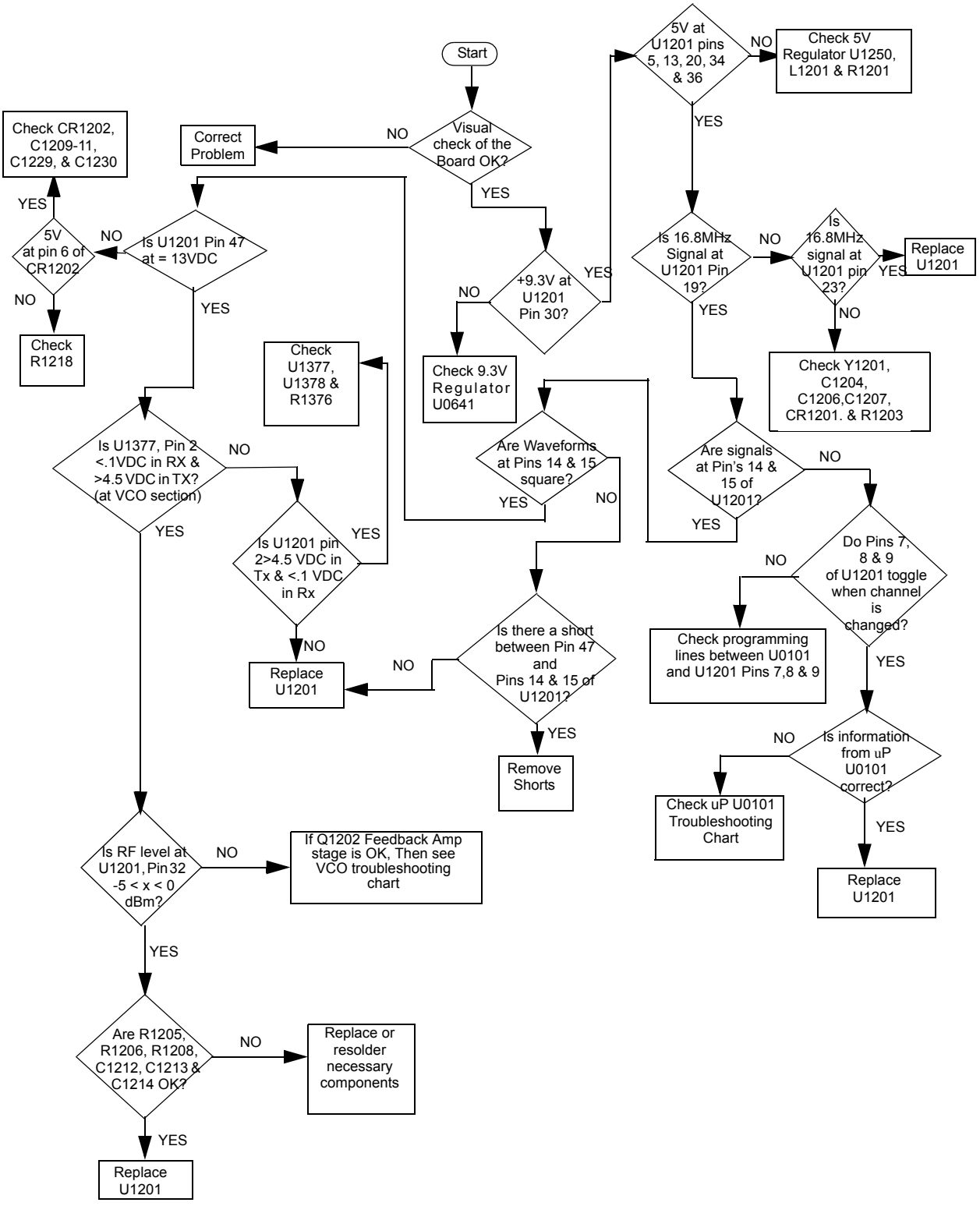
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



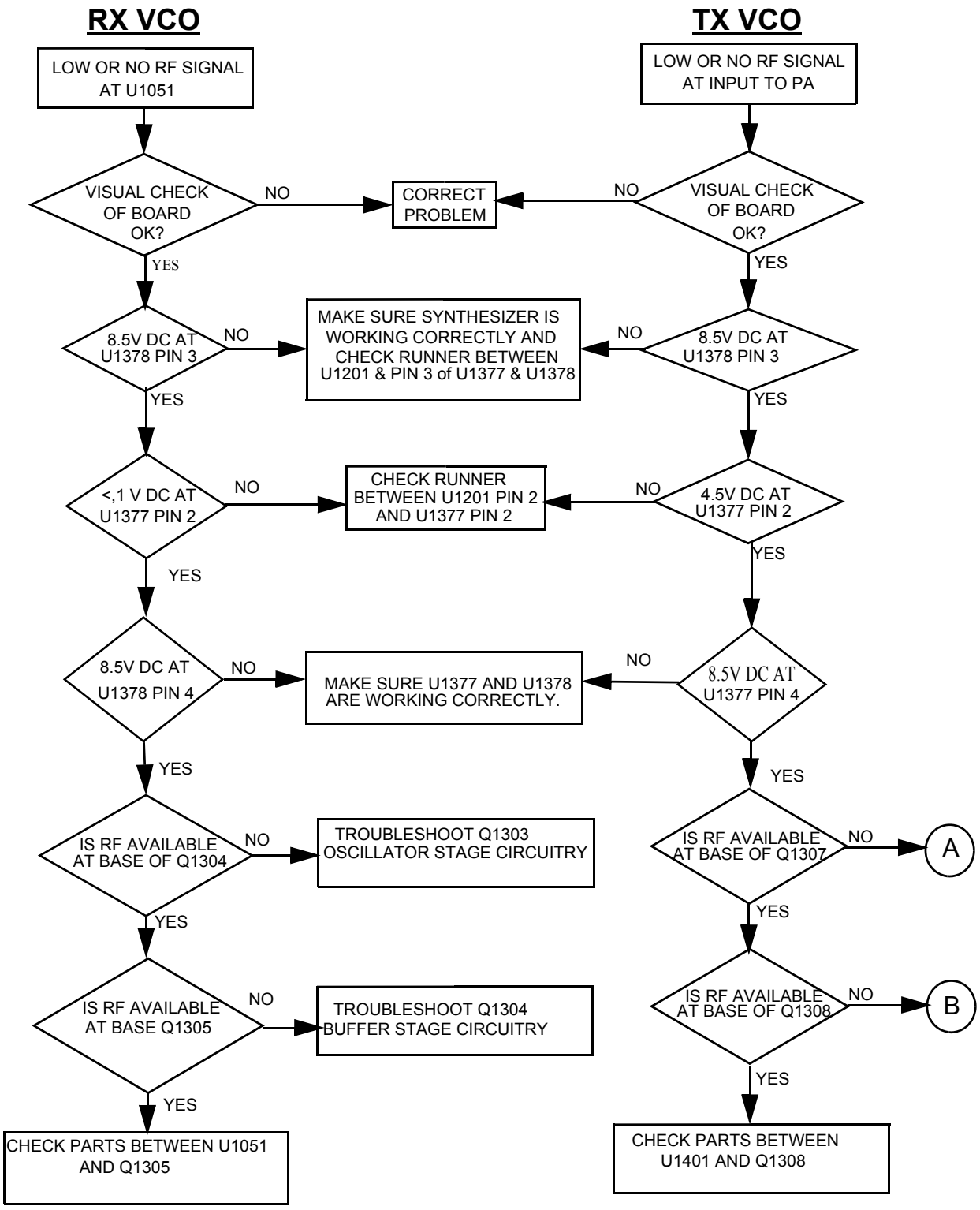
2.0 Troubleshooting Flow Chart for Transmitter



3.0 Troubleshooting Flow Chart for Synthesizer



4.0 Troubleshooting Flow Chart for VCO



Notes

Section 4

LOW BAND PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The low band circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the low band circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in this chapter show both the controller and low band circuit components. The low band schematics and the related PCB and parts lists are shown in the tables below.

Table 7-1 Low Band Range 1 PCB 8486206B06 Diagrams and Parts Lists

PCB 8486206B06: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **7: 4-5** **7: 4-6**
SCHEMATICS **Power Amplifier 40-60W (Sheet 1 of 2)** **Power Amplifier 40-60W (Sheet 2 of 2)** **Voltage Controlled Oscillator** **Receiver Front-End** **IF (Sheet 1 of 2)** **IF (Sheet 2 of 2)** **Noise Blanker** **FRACN Synthesizer**	 **7: 4-9** **7: 4-10** **7: 4-11** **7: 4-12** **7: 4-13** **7: 4-14** **7: 4-17** **7: 4-18**
Parts List	**7: 4-19**
Controller version is **T6/7**	

Table 7-2 Low Band Range 1 PCB 8486206B08 Diagrams and Parts Lists

PCB 8486206B08: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **7: 4-7** **7: 4-8**
SCHEMATICS **Power Amplifier 40-60W (Sheet 1 of 2)** **Power Amplifier 40-60W (Sheet 2 of 2)** **Voltage Controlled Oscillator** **Receiver Front-End** **IF (Sheet 1 of 2)** **IF (Sheet 2 of 2)** **Noise Blanker** **FRACN Synthesizer**	 **7: 4-9** **7: 4-10** **7: 4-11** **7: 4-12** **7: 4-15** **7: 4-16** **7: 4-17** **7: 4-18**
Parts List	**7: 4-22**
Controller version is **T11**	

Table 7-3 Low Band Range 2 PCB 8486207B05 Diagrams and Parts Lists

PCB 8486207B05: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **7: 4-28** **7: 4-29**
SCHEMATICS **Power Amplifier 40-60W (Sheet 1 of 2)** **Power Amplifier 40-60W (Sheet 2 of 2)** **Voltage Controlled Oscillator** **Receiver Front-End** **IF (Sheet 1 of 2)** **IF (Sheet 2 of 2)** **Noise Blanker** **FRACN Synthesizer**	 **7: 4-32** **7: 4-33** **7: 4-34** **7: 4-35** **7: 4-13** **7: 4-14** **7: 4-17** **7: 4-36**
Parts List	**7: 4-37**
Controller version is **T6/7**	

Table 7-4 Low Band Range 2 PCB 8486207B07 Diagrams and Parts Lists

PCB 8486207B07: **Main Board Top Side** **Main Board Bottom Side**	**Page:** **7: 4-30** **7: 4-31**
SCHEMATICS **Power Amplifier 40-60W (Sheet 1 of 2)** **Power Amplifier 40-60W (Sheet 2 of 2)** **Voltage Controlled Oscillator** **Receiver Front-End** **IF (Sheet 1 of 2)** **IF (Sheet 2 of 2)** **Noise Blanker** **FRACN Synthesizer**	 **7: 4-32** **7: 4-33** **7: 4-34** **7: 4-35** **7: 4-15** **7: 4-16** **7: 4-17** **7: 4-36**
Parts List	**7: 4-40**
Controller version is **T11**	

Table 7-5 Low Band Range 3 PCB 8485908Z02 Diagrams and Parts Lists

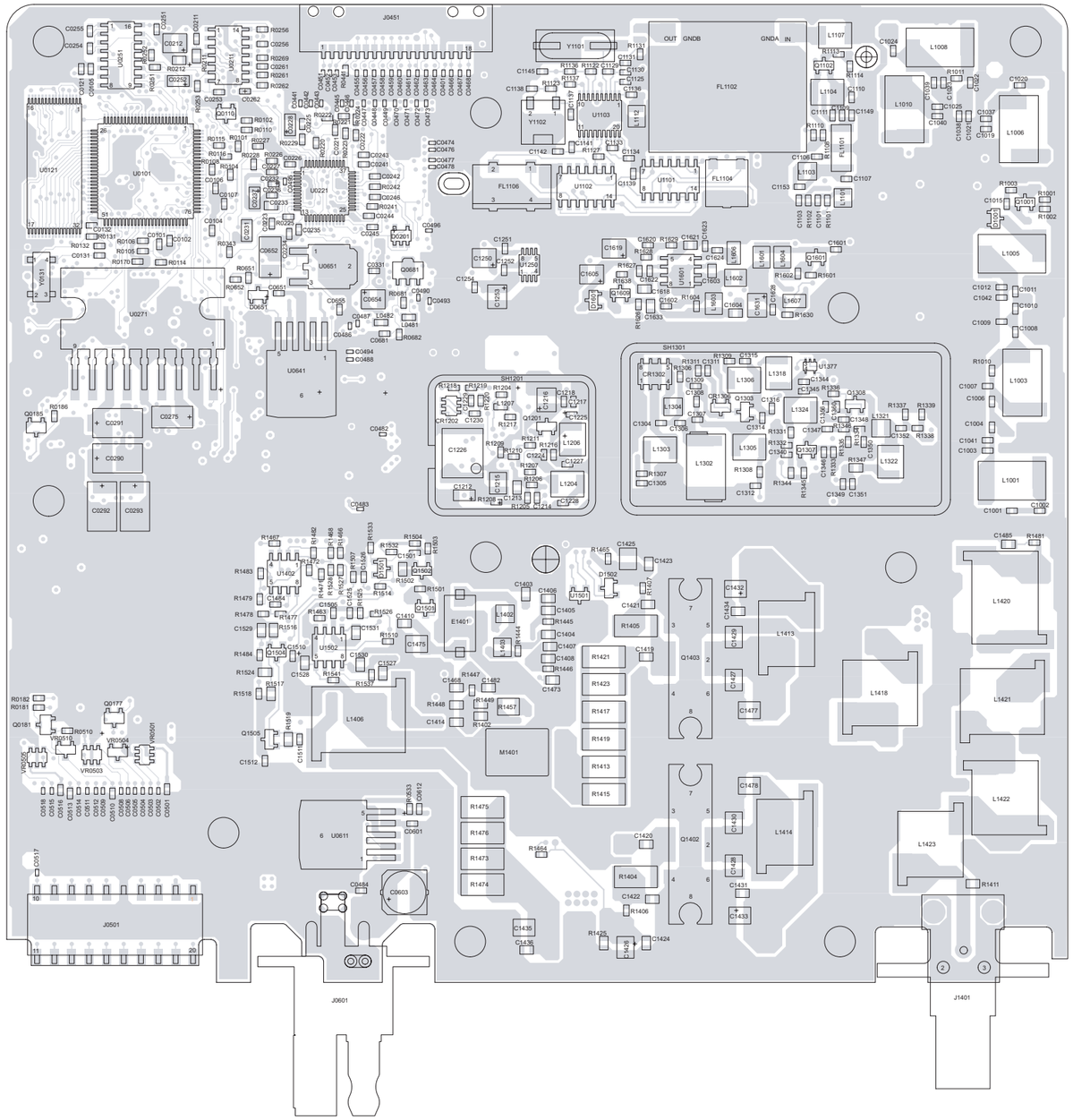
PCB 8485908Z02:	**Page:**
Main Board Top Side	**7: 4-46**
Main Board Bottom Side	**7: 4-47**
SCHEMATICS	
Power Amplifier 40-60W (Sheet 1 of 2)	**7: 4-50**
Power Amplifier 40-60W (Sheet 2 of 2)	**7: 4-51**
Voltage Controlled Oscillator	**7: 4-52**
Receiver Front-End	**7: 4-53**
IF (Sheet 1 of 2)	**7: 4-13**
IF (Sheet 2 of 2)	**7: 4-14**
Noise Blanker	**7: 4-17**
FRACN Synthesizer	**7: 4-54**
Parts List	**7: 4-55**
Controller version is **T9**	

Table 7-6 Low Band Range 3 PCB 8485908Z04 Diagrams and Parts Lists

PCB 8485908Z04:	**Page:**
Main Board Top Side	**7: 4-48**
Main Board Bottom Side	**7: 4-49**
SCHEMATICS	
Power Amplifier 40-60W (Sheet 1 of 2)	**7: 4-50**
Power Amplifier 40-60W (Sheet 2 of 2)	**7: 4-51**
Voltage Controlled Oscillator	**7: 4-52**
Receiver Front-End	**7: 4-53**
IF (Sheet 1 of 2)	**7: 4-15**
IF (Sheet 2 of 2)	**7: 4-16**
Noise Blanker	**7: 4-17**
FRACN Synthesizer	**7: 4-54**
Parts List	**7: 4-58**
Controller version is **T11**	

Notes

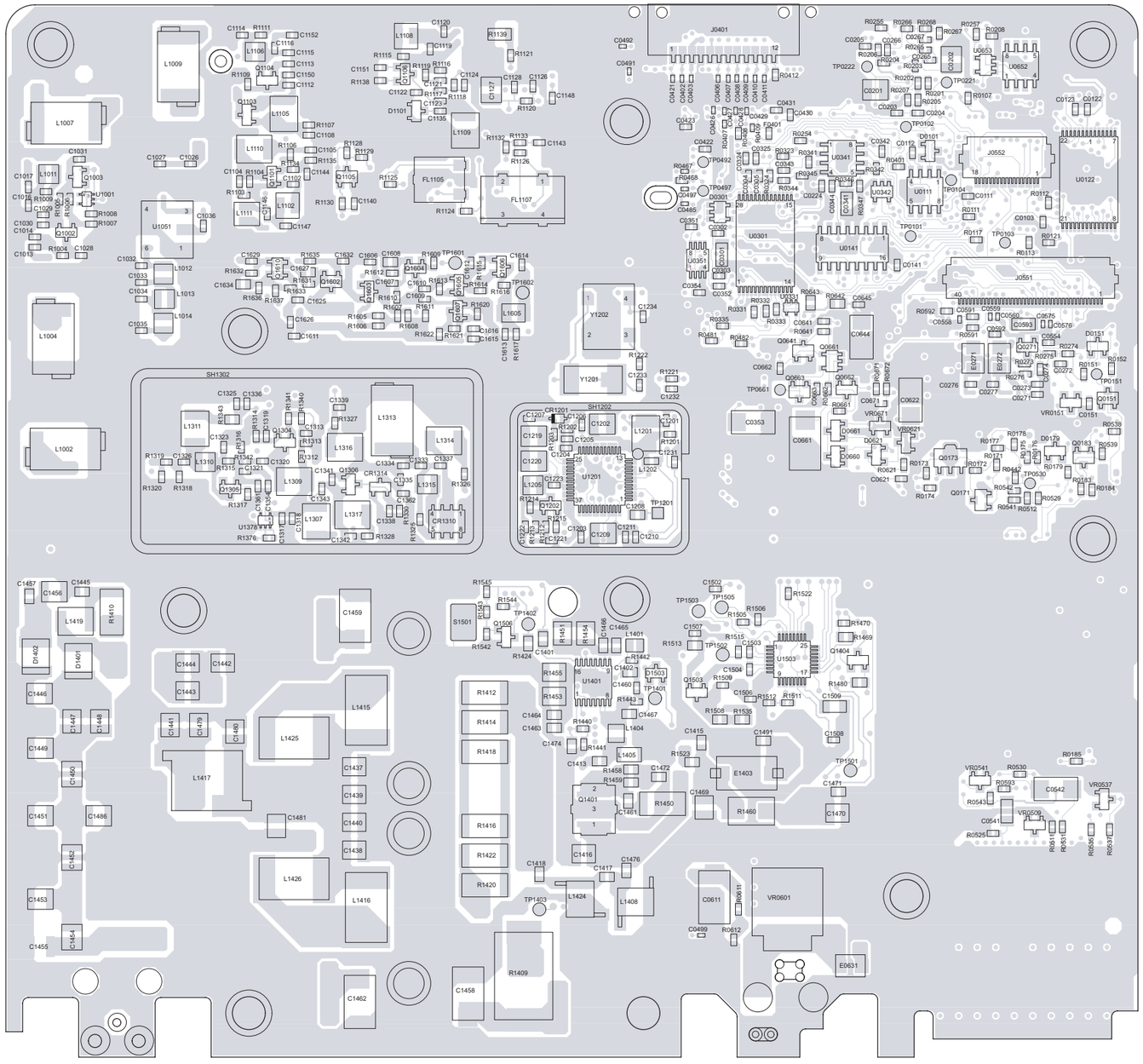
2.0 Low Band Range 1 (29.7-36 MHz) PCBs, Schematics, and Parts Lists



ZWG0130593-O

Low Band Range 1 (29.7-36 MHz) PCB 8486206B06 Top Side

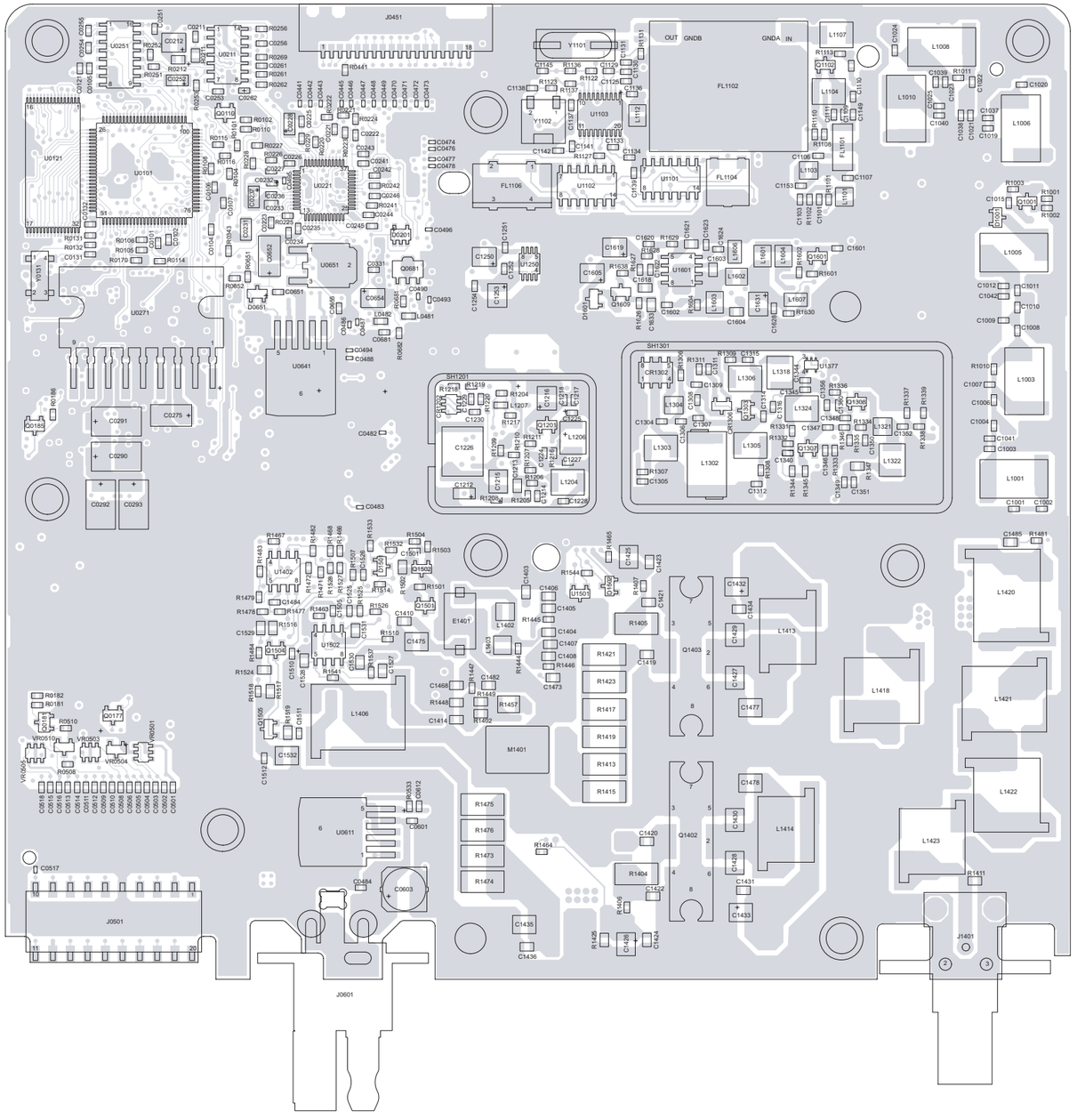
6881091C63-C



ZWG0130594-O

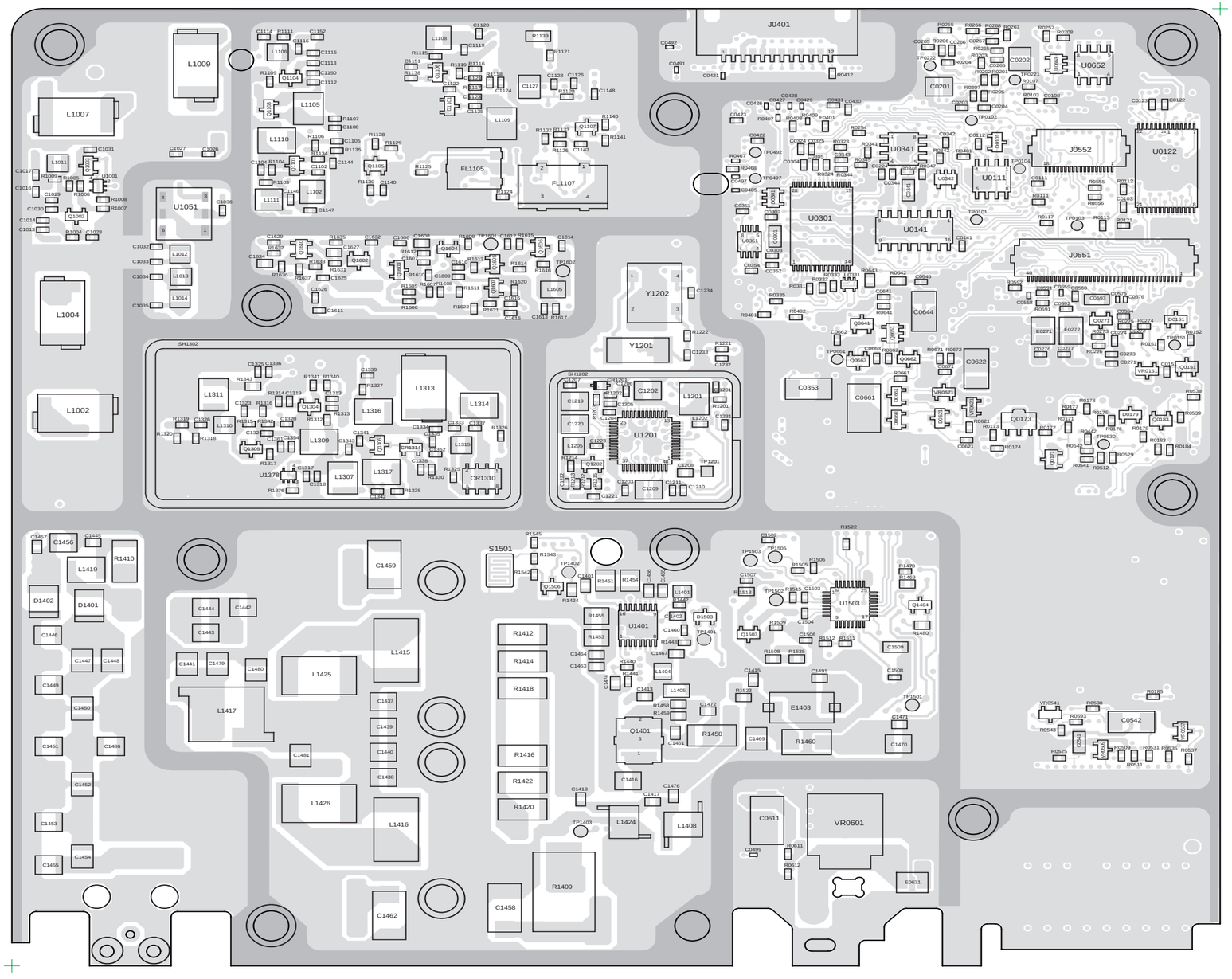
Low Band Range 1 (29.7-36 MHz) PCB 8486206B06 Bottom Side

6881091C63-C



ZWG0131043-O

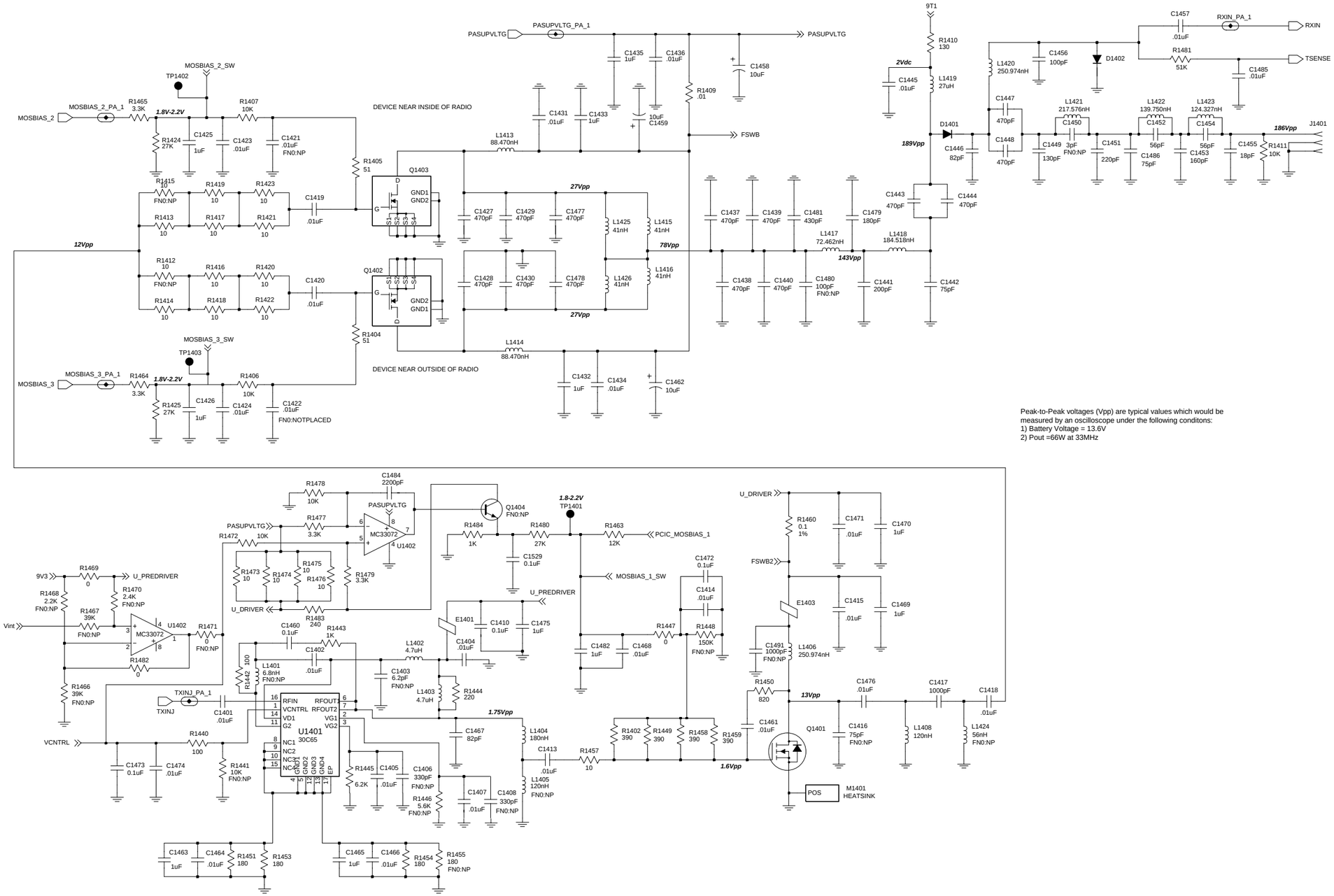
Low Band Range 1 (29.7-36 MHz) PCB 8486206B08 Top Side



ZWG0131044-O

ZWG0131044-O

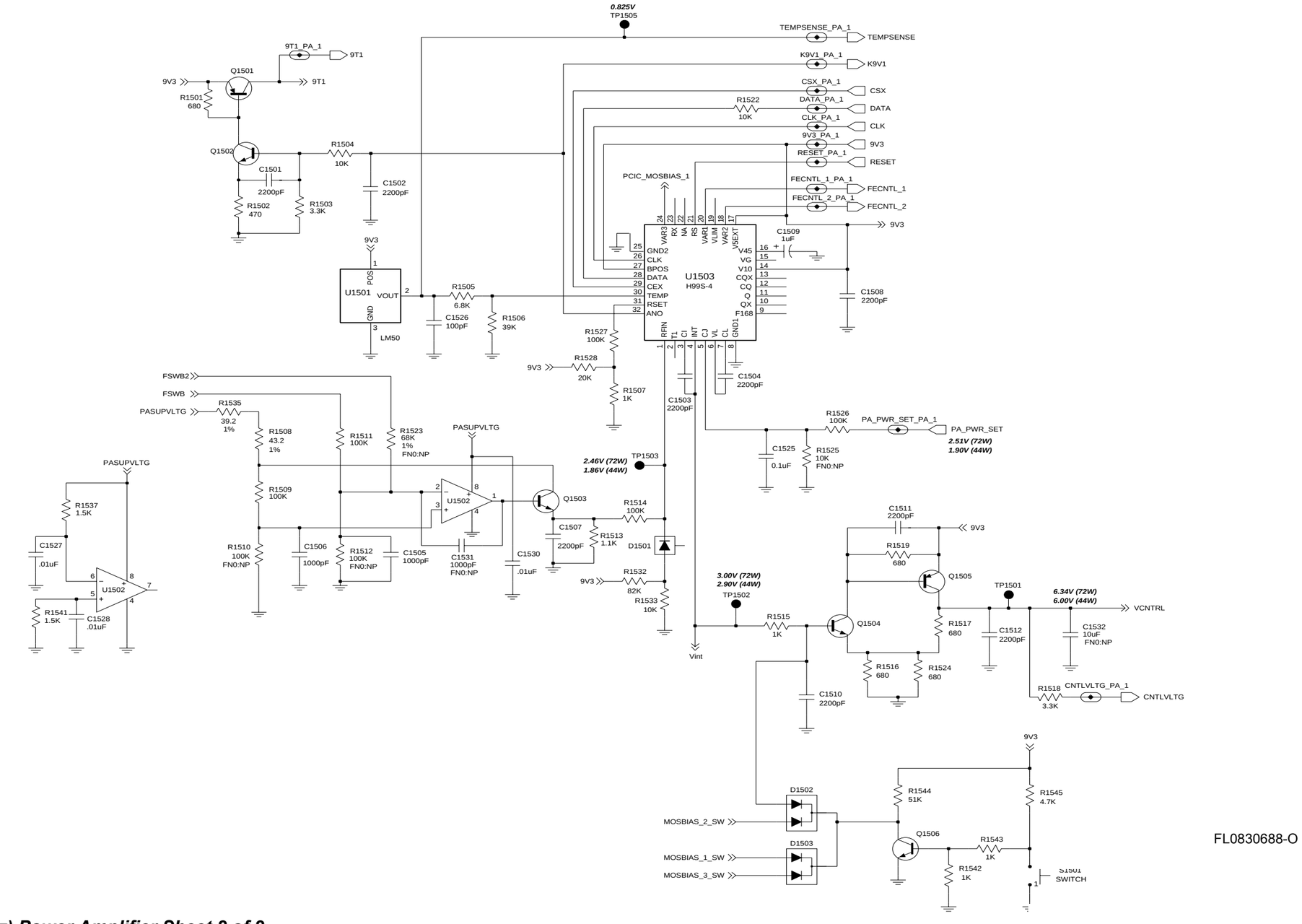
Low Band Range 1 (29.7-36 MHz) PCB 8486206B08 Bottom Side



Peak-to-Peak voltages (Vpp) are typical values which would be measured by an oscilloscope under the following conditons:
1) Battery Voltage = 13.6V
2) Pout =66W at 33MHz

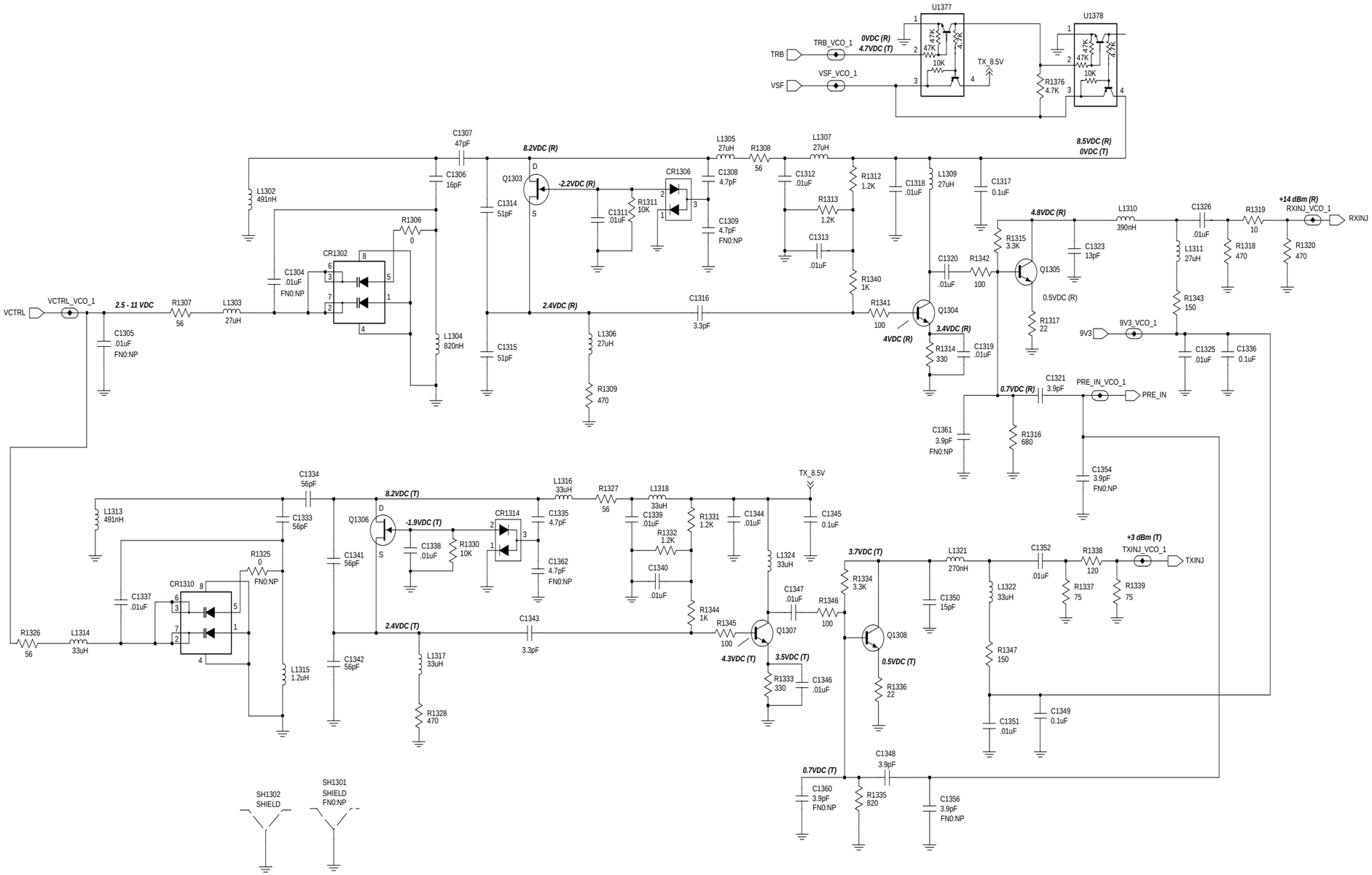
Low Band Range 1 (29.7-36 MHz) Power Amplifier Sheet 1 of 2

FL0830687-O



FL0830688-O

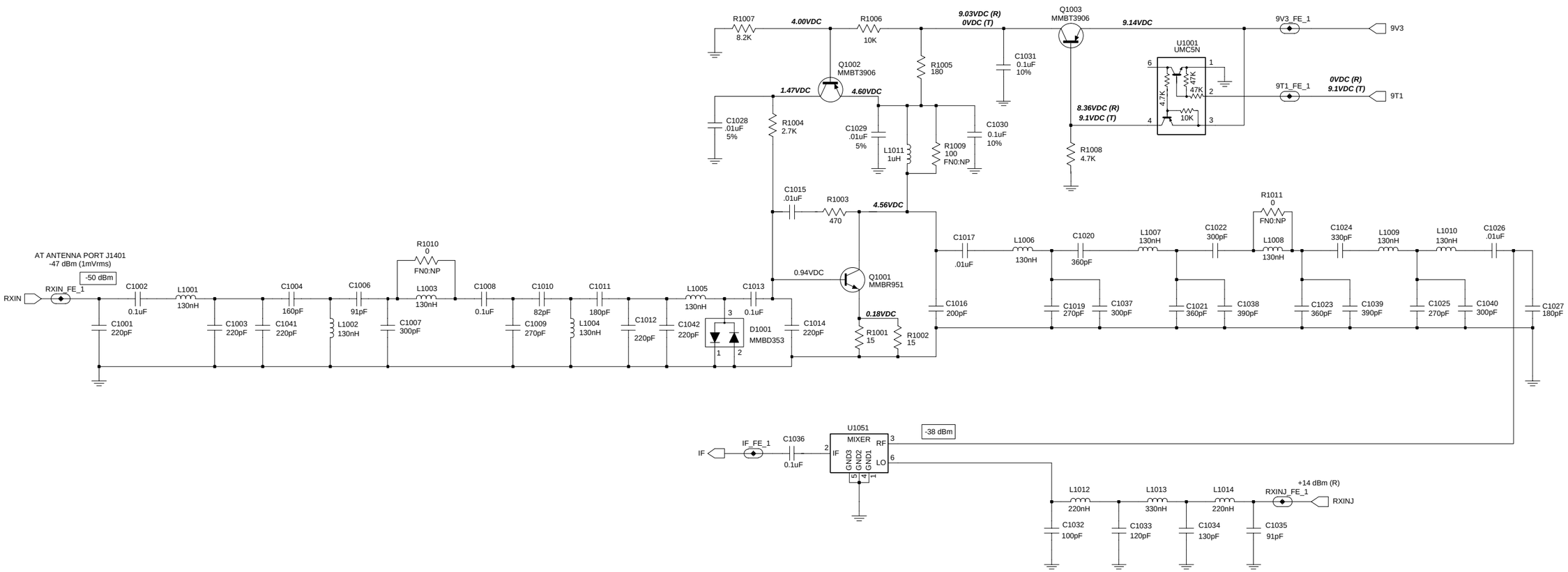
Low Band Range 1 (29.7-36 MHz) Power Amplifier Sheet 2 of 2



FL0830686-O

Low Band Range 1 (29.7-36 MHz) Voltage Controlled Oscillator

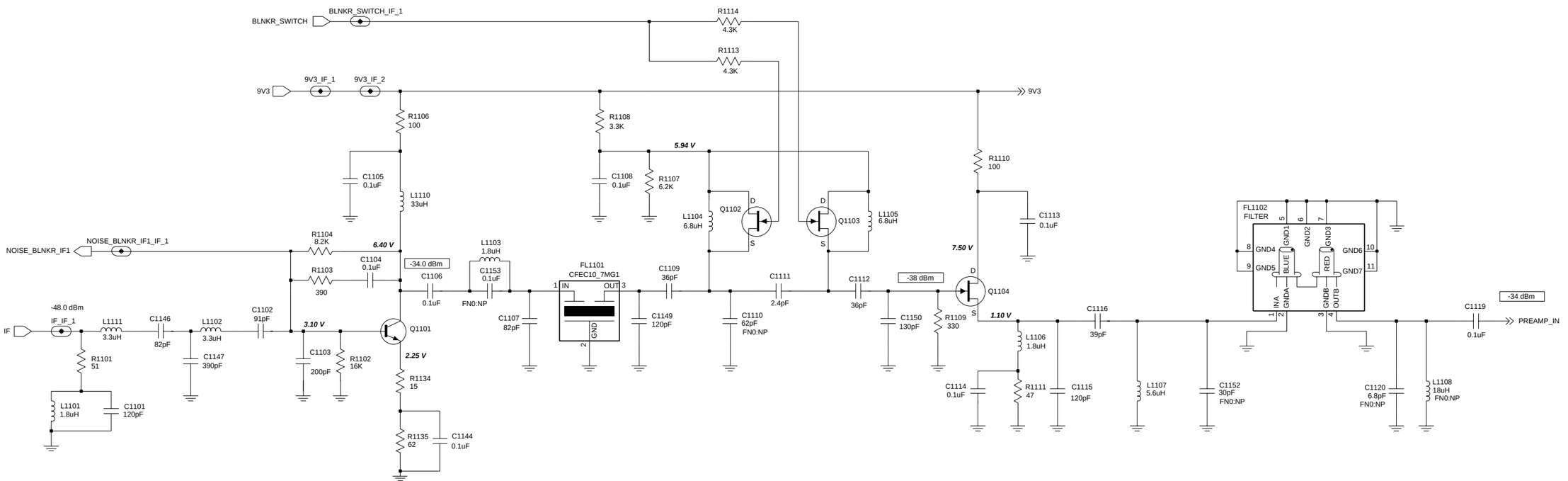
6881091C63-C



FL0830689-O

Low Band Range 1 (29.7-36 MHz) Receiver Front-End

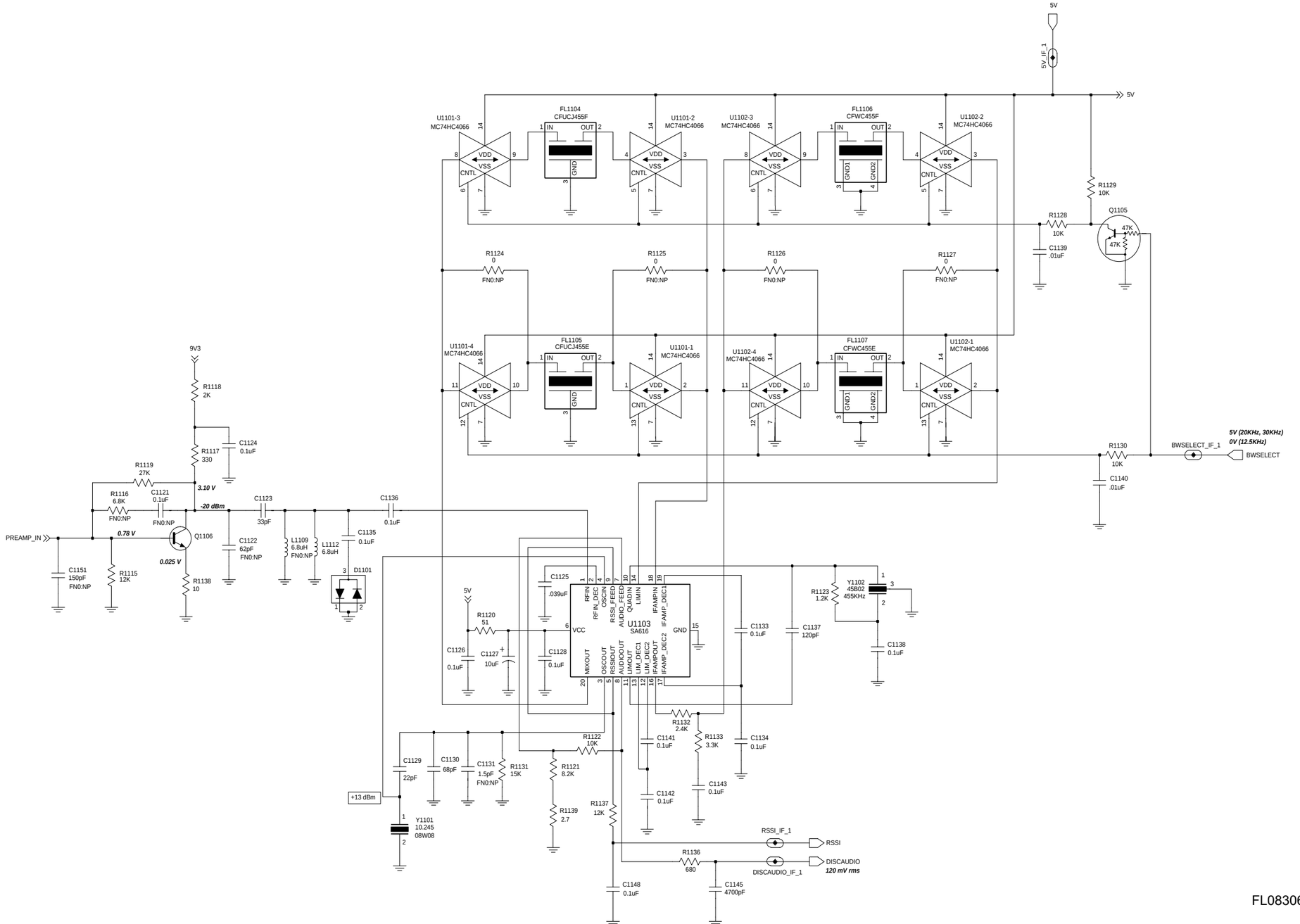
6881091C63-C



FL0830690-O

Low Band Range 1/2/3 IF Sheet 1 of 2 (for PCBs 8486206B06, 8486207B05, and 8486908Z02)

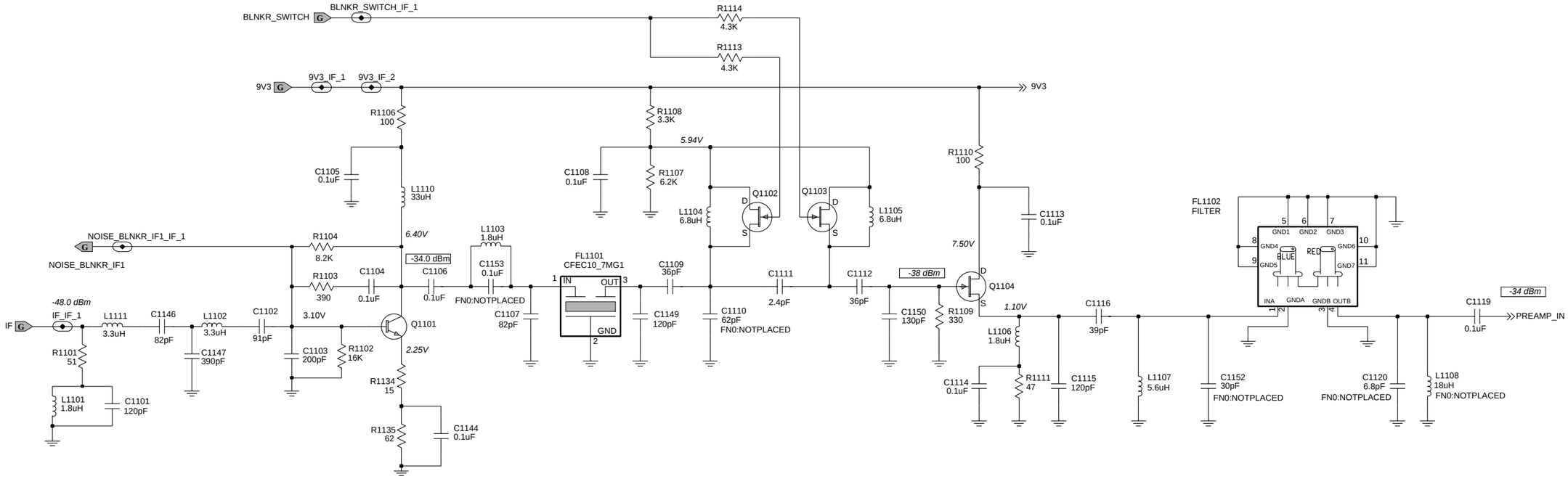
6881091C63-C



FL0830691-O

Low Band Range 1/2/3 IF Sheet 2 of 2 (for PCBs 8486206B06, 8486207B05, and 8486908Z02)

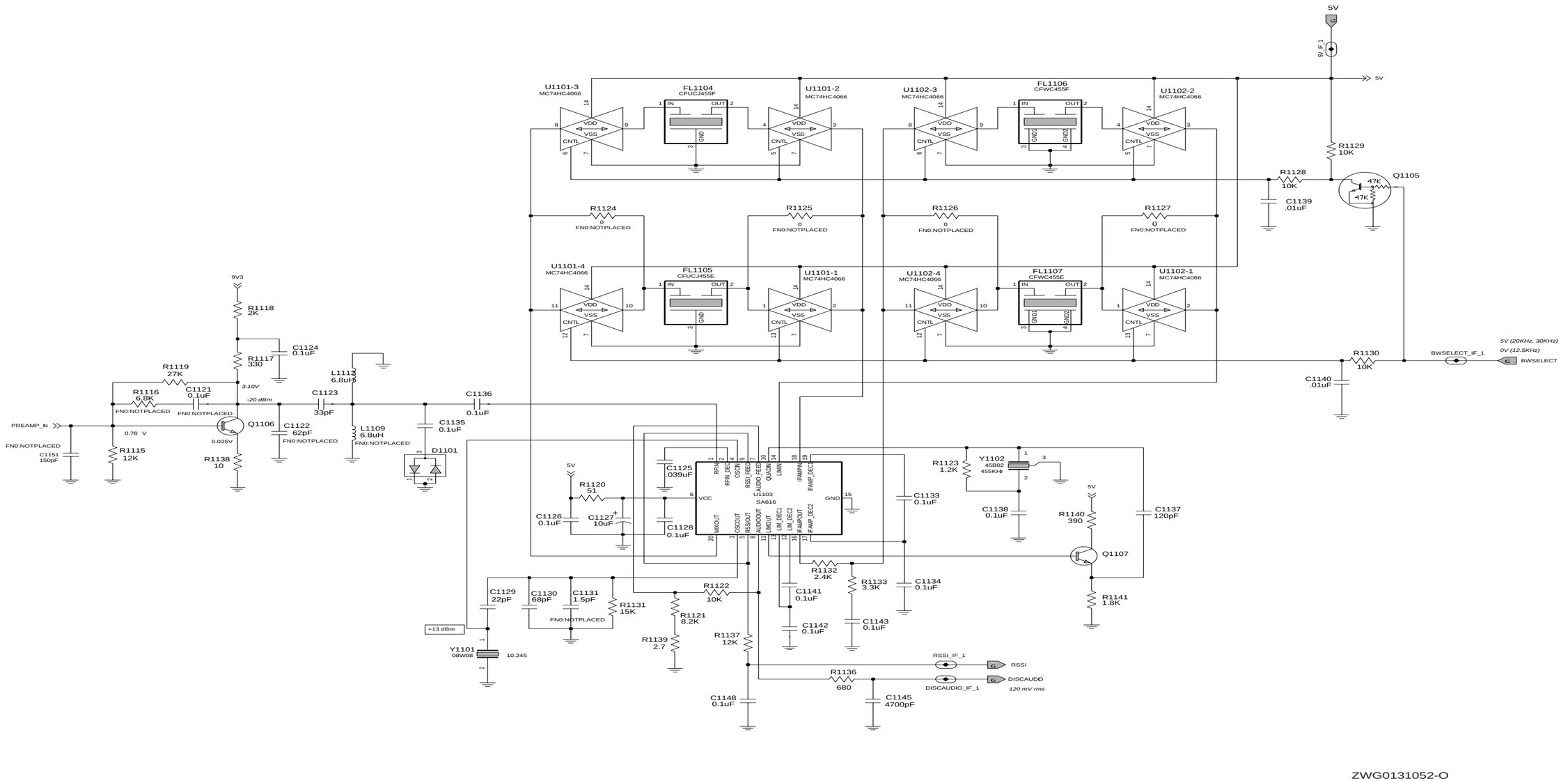
6881091C63-C



ZWG0131051-O

Low Band Range 1/2/3 IF Sheet 1 of 2 (for PCBs 8486206B08, 8486207B07, and 8486908Z04)

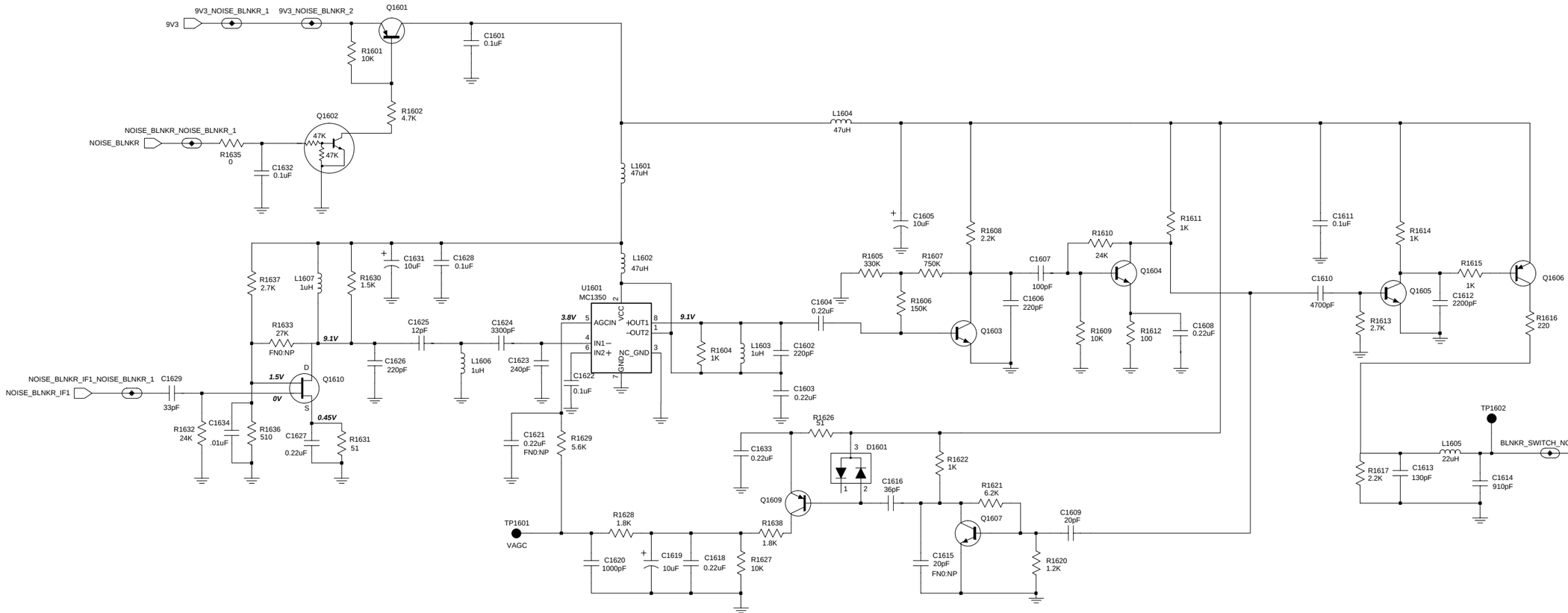
6881091C63-C



ZWG0131052-O

Low Band Range 1/2/3 IF Sheet 2 of 2 (for PCBs 8486206B08, 8486207B07, and 8486908Z04)

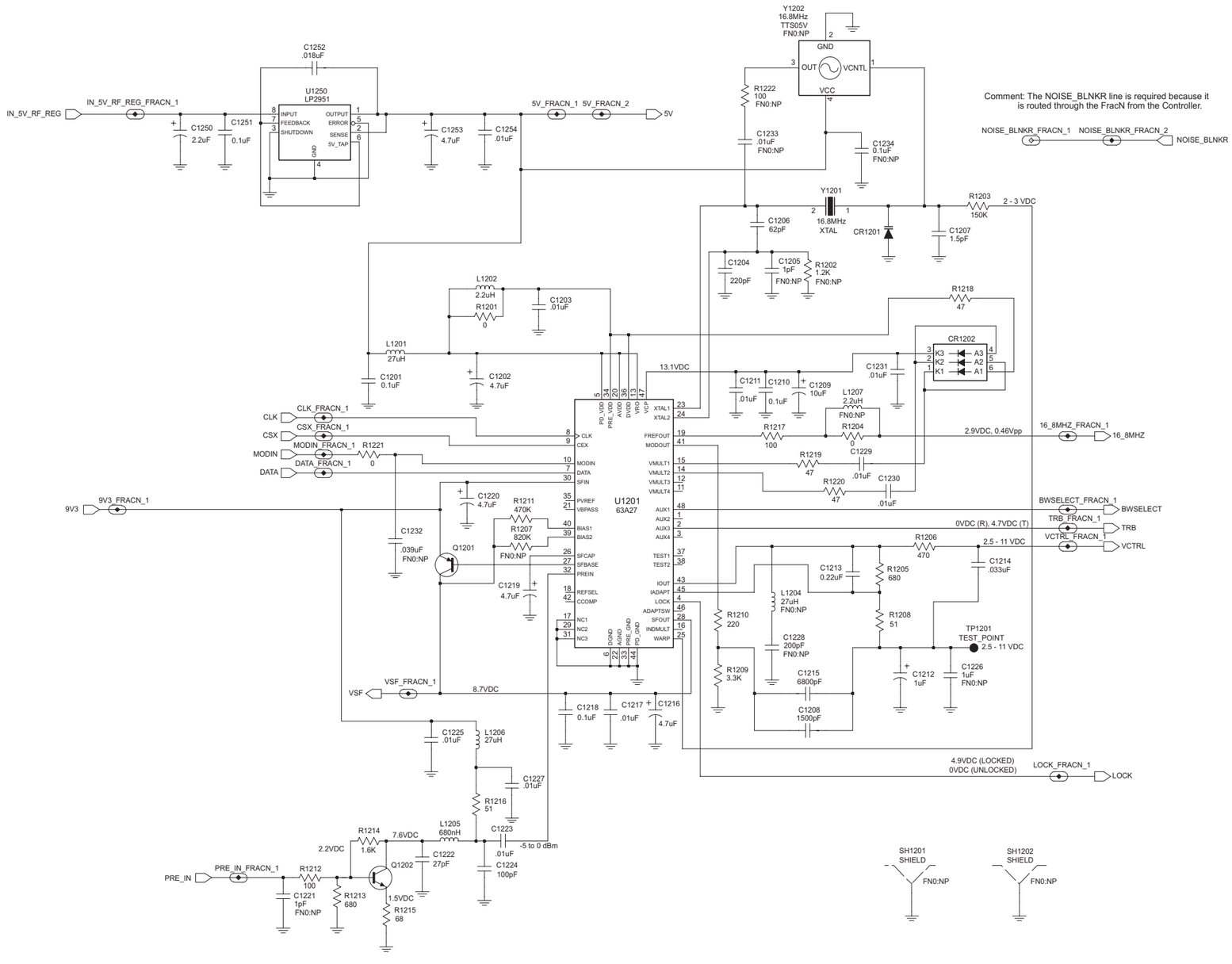
6881091C63-C



FL0830692-O

Low Band Range 1/2/3 Noise Blanker

6881091C63-C



Low Band Range 1 (29.7-36 MHz) FRACN Synthesizer

FL0830685-O

6881091C63-C

Low Band R1 PCB 8486206B06 Parts List†

Circuit Ref	Motorola Part No.	Description
C1001	2113740F59	220pF
C1002	2113743E20	0.1uF
C1003	2113740F59	220pF
C1004	2113740F56	160pF
C1006	2113740F50	91pF
C1007	2113740F62	300pF
C1008	2113743E20	0.1uF
C1009	2113740F61	270pF
C1010	2113740F49	82pF
C1011	2113740F57	180pF
C1012	2113740F59	220pF
C1013	2113743E20	0.1uF
C1014	2113740F59	220pF
C1015	2113741F49	.01uF
C1016	2113740F58	200pF
C1017	2113741F49	.01uF
C1019	2113740F61	270pF
C1020	2113740F64	360pF
C1021	2113740F64	360pF
C1022	2113740F62	300pF
C1023	2113740F64	360pF
C1024	2113740F63	330pF
C1025	2113740F61	270pF
C1026	2113741F49	.01uF
C1027	2113740F57	180pF
C1028	2113741F49	.01uF
C1029	2113741F49	.01uF
C1030	2113743E20	0.1uF
C1031	2113743E20	0.1uF
C1032	2113740F51	100pF
C1033	2113740F53	120pF
C1034	2113740F54	130pF
C1035	2113740F50	91pF
C1036	2113743E20	0.1uF
C1037	2113740F62	300pF
C1038	2113740F65	390pF
C1039	2113740F65	390pF
C1040	2113740F62	300pF
C1041	2113740F59	220pF
C1042	2113740F59	220pF
C1101	2113740F53	120pF
C1102	2113740F50	91pF
C1103	2113740F58	200pF
C1104	2113743E20	0.1uF
C1105	2113743E20	0.1uF
C1106	2113743E20	0.1uF
C1107	2113740F49	82pF
C1108	2113743E20	0.1uF
C1109	2113740F40	36pF
C1111	2113740L03	2.4pF
C1112	2113740F40	36pF
C1113	2113743E20	0.1uF
C1114	2113743E20	0.1uF
C1115	2113740F53	120pF
C1116	2113740F41	39pF
C1119	2113743E20	0.1uF
C1123	2113740F39	33pF
C1124	2113743E20	0.1uF
C1125	2113743E11	.039uF
C1126	2113743E20	0.1uF
C1127	2311049A57	10uF
C1128	2113743E20	0.1uF
C1129	2113740F35	22pF
C1130	2113740F47	68pF
C1133	2113743E20	0.1uF
C1134	2113743E20	0.1uF
C1135	2113743E20	0.1uF
C1136	2113743E20	0.1uF
C1137	2113740F53	120pF
C1138	2113743E20	0.1uF
C1139	2113741F49	.01uF
C1140	2113741F49	.01uF
C1141	2113743E20	0.1uF
C1142	2113743E20	0.1uF
C1143	2113743E20	0.1uF
C1144	2113743E20	0.1uF
C1145	2113741F41	4700pF
C1146	2113740F49	82pF
C1147	2113740F65	390pF
C1148	2113743E20	0.1uF
C1149	2113740F53	120pF
C1150	2113740F54	130pF
C1201	2113743E20	0.1uF
C1202	2311049J11	4.7uF
C1203	2113741F49	.01uF
C1204	2113740F59	220pF
C1206	2113740L37	62pF
C1207	2113740F07	1.5pF
C1208	2113740A82	1500pF
C1209	2311049A57	10uF
C1210	2113743E20	0.1uF
C1211	2113741F49	.01uF
C1212	2311049A07	1uF
C1213	2113743A23	0.22uF
C1214	2113743E10	.033uF
C1215	2113740C37	6800pF
C1216	2311049J11	4.7uF
C1217	2113741F49	.01uF
C1218	2113743E20	0.1uF
C1219	2311049J11	4.7uF
C1220	2311049J11	4.7uF
C1222	2113740F37	27pF
C1223	2113741F49	.01uF
C1224	2113740F51	100pF
C1225	2113741F49	.01uF
C1227	2113741F49	.01uF
C1229	2113741F49	.01uF
C1230	2113741F49	.01uF
C1231	2113741F49	.01uF
C1250	2311049A09	2.2uF
C1251	2113743E20	0.1uF
C1252	2113743E10	.018uF
C1253	2311049J11	4.7uF
C1254	2113741F49	.01uF
C1306	2113740L23	16pF
C1307	2113740L34	47pF
C1308	2113740F19	4.7pF
C1311	2113741F49	.01uF
C1312	2113741F49	.01uF
C1313	2113741F49	.01uF
C1314	2113740L35	51pF
C1315	2113740L35	51pF
C1316	2113740F15	3.3pF
C1317	2113743E20	0.1uF
C1318	2113741F49	.01uF
C1319	2113741F49	.01uF
C1320	2113741F49	.01uF
C1321	2113740F17	3.9pF
C1323	2113740L21	13pF
C1325	2113741F49	.01uF
C1326	2113741F49	.01uF
C1333	2113740L36	56pF
C1334	2113740L36	56pF
C1335	2113740F19	4.7pF
C1336	2113743E20	0.1uF
C1337	2113741F49	.01uF
C1338	2113741F49	.01uF
C1339	2113741F49	.01uF
C1340	2113741F49	.01uF
C1341	2113740L36	56pF
C1342	2113740L36	56pF
C1343	2113740F15	3.3pF
C1344	2113741F49	.01uF
C1345	2113743E20	0.1uF
C1346	2113741F49	.01uF
C1347	2113741F49	.01uF
C1348	2113740F17	3.9pF
C1349	2113743E20	0.1uF
C1350	2113740F31	15pF
C1351	2113741F49	.01uF
C1352	2113741F49	.01uF
C1401	2113741A45	.01uF
C1402	2113741A45	.01uF
C1404	2113741A45	.01uF
C1405	2113741A45	.01uF
C1407	2113741A45	.01uF
C1410	2113741M69	0.1uF
C1413	2113741A45	.01uF
C1414	2113741A45	.01uF
C1415	2113741A45	.01uF
C1417	2113740A79	1000pF
C1418	2113741A45	.01uF
C1419	2113741A45	.01uF
C1420	2113741A45	.01uF
C1423	2113741A45	.01uF
C1424	2113741A45	.01uF
C1425	2113741W01	1uF
C1426	2113741W01	1uF
C1427	2111078B59	470pF
C1428	2111078B59	470pF
C1429	2111078B59	470pF
C1430	2111078B59	470pF
C1431	2113741A45	.01uF
C1432	2113741W01	1uF
C1433	2113741W01	1uF
C1434	2113741A45	.01uF
C1435	2113741W01	1uF
C1436	2113741A45	.01uF
C1437	2111078B59	470pF
C1438	2111078B59	470pF
C1439	2111078B59	470pF
C1440	2111078B59	470pF
C1441	2111078B50	200pF
C1442	2111078B39	75pF
C1443	2111078B59	470pF
C1444	2111078B59	470pF
C1445	2113741A45	.01uF
C1446	2180060M41	82pF
C1447	2111078B59	470pF
C1448	2111078B59	470pF
C1449	2180060M46	130pF
C1451	2180060M51	220pF
C1452	2180060M37	56pF
C1453	2180060M48	160pF
C1454	2180060M37	56pF
C1455	2180060M25	18pF
C1456	2180060M43	100pF
C1457	2113741A45	.01uF
C1458	2311049C01	10uF
C1459	2311049C01	10uF
C1460	2113743E20	0.1uF
C1461	2113741A45	.01uF
C1462	2311049C01	10uF
C1463	2113928E01	1uF
C1464	2113741A45	.01uF
C1465	2113928E01	1uF
C1466	2113741A45	.01uF
C1467	2113740A53	82pF
C1468	2113741A45	.01uF
C1469	2113741W01	1uF
C1470	2113741W01	1uF
C1471	2113741A45	.01uF
C1472	2113741M69	0.1uF
C1473	2113741M69	0.1uF
C1474	2113741A45	.01uF
C1475	2113741W01	1uF
C1476	2113741A45	.01uF
C1477	2111078B59	470pF
C1478	2111078B59	470pF
C1479	2111078B49	180pF
C1481	2111078B58	430pF
C1482	2113928E01	1uF

Circuit Ref	Motorola Part No.	Description
C1484	2113741F33	2200pF
C1485	2113741A45	.01uF
C1486	2180060M40	75pF
C1501	2113741F33	2200pF
C1502	2113741F33	2200pF
C1503	2113741F33	2200pF
C1504	2113741F33	2200pF
C1505	2113741F25	1000pF
C1506	2113741F25	1000pF
C1507	2113741F33	2200pF
C1508	2113741F33	2200pF
C1509	2311049A07	1uF
C1510	2113741F33	2200pF
C1511	2113741F33	2200pF
C1512	2113741F33	2200pF
C1525	2113743E20	0.1uF
C1526	2113740F51	100pF
C1527	2113741A45	.01uF
C1528	2113741A45	.01uF
C1529	2113741M69	0.1uF
C1530	2113741A45	.01uF
C1601	2113743E20	0.1uF
C1602	2113740F59	220pF
C1603	2113743A23	0.22uF
C1604	2113743A23	0.22uF
C1605	2311049A57	10uF
C1606	2113740F59	220pF
C1607	2113740F51	100pF
C1608	2113743A23	0.22uF
C1609	2113740F34	20pF
C1610	2113741F41	4700pF
C1611	2113743E20	0.1uF
C1612	2113741F33	2200pF
C1613	2113740F54	130pF
C1614	2113741F24	910pF
C1616	2113740F40	36pF
C1618	2113743A23	0.22uF
C1619	2311049A57	10uF
C1620	2113741F25	1000pF
C1622	2113743E20	0.1uF
C1623	2113740F60	240pF
C1624	2113741F37	3300pF
C1625	2113740F29	12pF
C1626	2113740F59	220pF
C1627	2113743A23	0.22uF
C1628	2113743E20	0.1uF
C1629	2113740F39	33pF
C1631	2311049A57	10uF
C1632	2113743E20	0.1uF
C1633	2113743A23	0.22uF
C1634	2113741A45	.01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H

Circuit Ref	Motorola Part No.	Description
CR1314	4880154K03	MMBD353
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4880236E05	MMBD301
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100
D1601	4880154K03	MMBD353
E1401	2408380X02	FERRITE BEAD
E1403	2408380X02	FERRITE BEAD
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	CRYSTAL FILTER, 10.7 MHZ
FL1104	9180468V04	CFUCJ455F
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J1401	0986166B02	MINI-U ANTENNA CONN
L1001	2408382A11	130nH
L1002	2408382C11	130nH
L1003	2408382A11	130nH
L1004	2408382C11	130nH
L1005	2408382A11	130nH
L1006	2408382A11	130nH
L1007	2408382C11	130nH
L1008	2408382A11	130nH
L1009	2408382C11	130nH
L1010	2408382A11	130nH
L1011	2462587N68	1uH
L1012	2462587N57	220nH
L1013	2462587N59	330nH
L1014	2462587N57	220nH
L1101	2462587N33	1.8uH
L1102	2408383X07	3.3uH
L1103	2462587N33	1.8uH
L1104	2480289M10	6.8uH
L1105	2480289M10	6.8uH
L1106	2462587N33	1.8uH
L1107	2480289M09	5.6uH
L1110	2480289M18	33uH
L1111	2408383X07	3.3uH
L1112	2483411T35	6.8uH
L1201	2480289M17	27uH
L1202	2462587Q20	2.2uH
L1205	2462587N64	680nH
L1206	2480289M17	27uH
L1302	2408382D19	491nH
L1303	2480289M17	27uH
L1304	2462587N66	820nH
L1305	2480289M17	27uH
L1306	2480289M17	27uH
L1307	2480289M17	27uH
L1309	2480289M17	27uH
L1310	2462587N60	390nH
L1311	2480289M17	27uH

Circuit Ref	Motorola Part No.	Description
L1313	2408382D19	491nH
L1314	2480289M18	33uH
L1315	2462587N69	1.2uH
L1316	2480289M18	33uH
L1317	2480289M18	33uH
L1318	2480289M18	33uH
L1321	2462587N58	270nH
L1322	2480289M18	33uH
L1324	2480289M18	33uH
L1402	2462587U09	4.7uH
L1403	2462587U09	4.7uH
L1404	2462587X56	180nH
L1406	2408381X36	250.974nH
L1408	2408384A10	120nH
L1413	2408381X17	88.470nH
L1414	2408381X17	88.470nH
L1415	2485873L04	41nH
L1416	2485873L04	41nH
L1417	2408381X14	72.462nH
L1418	2408381X30	184.518nH
L1419	2480289M17	27uH
L1420	2408381X36	250.974nH
L1421	2408381X33	217.576nH
L1422	2408381X26	139.750nH
L1423	2408381X23	124.327nH
L1425	2485873L04	41nH
L1426	2485873L04	41nH
L1601	2483411T45	47uH
L1602	2483411T45	47uH
L1603	2483411T73	1uH
L1604	2483411T45	47uH
L1605	2483411T41	22uH
L1606	2462587T30	1uH
L1607	2462587T30	1uH
M1401	2686201B01	HEATSINK
Q1001	4880173R01	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1201	4813824A17	MMBT3906
Q1202	4880173R01	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880173R01	MMBR951
Q1305	4880173R01	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880173R01	MMBR951
Q1308	4880173R01	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	MRF1550
Q1403	4886136B01	MRF1550
Q1501	4880141L03	BCW68G

Circuit Ref	Motorola Part No.	Description
Q1502	4813824A10	MMBT3904
Q1503	4813824A10	MMBT3904
Q1504	4813824A10	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4813824A10	MMBT3904
Q1601	4813824A17	MMBT3906
Q1602	4880048M01	DTC144EKA
Q1603	4813824A10	MMBT3904
Q1604	4813824A10	MMBT3904
Q1605	4813824A10	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4813824A10	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R1001	0662057A05	15
R1002	0662057A05	15
R1003	0662057A41	470
R1004	0662057A59	2.7K
R1005	0662057A31	180
R1006	0662057A73	10K
R1007	0662057A71	8.2K
R1008	0662057A65	4.7K
R1101	0662057A18	51
R1102	0662057A78	16K
R1103	0662057A39	390
R1104	0662057A71	8.2K
R1106	0662057A25	100
R1107	0662057A68	6.2K
R1108	0662057A61	3.3K
R1109	0662057A37	330
R1110	0662057A25	100
R1111	0662057A17	47
R1113	0662057A64	4.3K
R1114	0662057A64	4.3K
R1115	0662057A75	12K
R1117	0662057A37	330
R1118	0662057A56	2K
R1119	0662057A83	27K
R1120	0662057A18	51
R1121	0662057A71	8.2K
R1122	0662057A73	10K
R1123	0662057A51	1.2K
R1128	0662057A73	10K
R1129	0662057A73	10K
R1130	0662057A73	10K
R1131	0662057A77	15K
R1132	0662057A58	2.4K
R1133	0662057A61	3.3K
R1134	0662057A05	15
R1135	0662057A20	62
R1136	0662057A45	680
R1137	0662057A75	12K
R1138	0662057A01	10
R1139	0611077A12	2.7
R1201	0662057B47	0
R1203	0662057B02	150K

Circuit Ref	Motorola Part No.	Description
R1204	0662057B47	0
R1205	0662057A45	680
R1206	0662057A41	470
R1208	0662057A18	51
R1209	0662057A61	3.3K
R1210	0662057A33	220
R1211	0662057B14	470K
R1212	0662057A25	100
R1213	0662057A45	680
R1214	0662057A54	1.6K
R1215	0662057A21	68
R1216	0662057A18	51
R1217	0662057A25	100
R1218	0662057A17	47
R1219	0662057A17	47
R1220	0662057A17	47
R1221	0662057B47	0
R1306	0662057B47	0
R1307	0662057A19	56
R1308	0662057A19	56
R1309	0662057A41	470
R1311	0662057A73	10K
R1312	0662057A51	1.2K
R1313	0662057A51	1.2K
R1314	0662057A37	330
R1315	0662057A61	3.3K
R1316	0662057A45	680
R1317	0662057A09	22
R1318	0662057A41	470
R1319	0662057A01	10
R1320	0662057A41	470
R1326	0662057A19	56
R1327	0662057A19	56
R1328	0662057A41	470
R1330	0662057A73	10K
R1331	0662057A51	1.2K
R1332	0662057A51	1.2K
R1333	0662057A37	330
R1334	0662057A61	3.3K
R1335	0662057A47	820
R1336	0662057A09	22
R1337	0662057A22	75
R1338	0662057A27	120
R1339	0662057A22	75
R1340	0662057A49	1K
R1341	0662057A25	100
R1342	0662057A25	100
R1343	0662057C55	150
R1344	0662057A49	1K
R1345	0662057A25	100
R1346	0662057A25	100
R1347	0662057C55	150
R1376	0662057A65	4.7K
R1402	0611079A64	390
R1404	0680194M18	51
R1405	0680194M18	51

Circuit Ref	Motorola Part No.	Description
R1406	0662057A73	10K
R1407	0662057A73	10K
R1409	0682089V01	.01
R1410	0683962T52	130
R1411	0662057C99	10K
R1413	0680194M01	10
R1414	0680194M01	10
R1416	0680194M01	10
R1417	0680194M01	10
R1418	0680194M01	10
R1419	0680194M01	10
R1420	0680194M01	10
R1421	0680194M01	10
R1422	0680194M01	10
R1423	0680194M01	10
R1424	0662057D10	27K
R1425	0662057D10	27K
R1440	0662057A25	100
R1442	0662057A25	100
R1443	0662057A49	1K
R1444	0662057A33	220
R1445	0662057A68	6.2K
R1447	0662057B47	0
R1449	0611079A64	390
R1450	0683962T71	820
R1451	0662057K31	180
R1453	0662057K31	180
R1454	0662057K31	180
R1457	0662057K01	10
R1458	0611079A64	390
R1459	0611079A64	390
R1460	0680106R01	0.1
R1463	0662057A75	12K
R1464	0662057A61	3.3K
R1465	0662057A61	3.3K
R1469	0662057C01	0
R1472	0662057A73	10K
R1473	0680194M01	10
R1474	0680194M01	10
R1475	0680194M01	10
R1476	0680194M01	10
R1477	0662057A61	3.3K
R1478	0662057A73	10K
R1479	0662057A61	3.3K
R1480	0662057D10	27K
R1481	0662057A90	51K
R1482	0662057B47	0
R1483	0662057A34	240
R1484	0662057A49	1K
R1501	0662057A45	680
R1502	0662057C67	470
R1503	0662057A61	3.3K
R1504	0662057A73	10K
R1505	0662057A69	6.8K
R1506	0662057A87	39K
R1507	0662057A49	1K

Circuit Ref	Motorola Part No.	Description
R1508	0662057R17	43.2
R1509	0662057P95	100K
R1511	0662057P95	100K
R1513	0662057C76	1.1K
R1514	0662057A97	100K
R1515	0662057A49	1K
R1516	0662057C71	680
R1517	0662057C71	680
R1518	0662057A61	3.3K
R1519	0662057C71	680
R1522	0662057A73	10K
R1524	0662057C71	680
R1526	0662057A97	100K
R1527	0662057A97	100K
R1528	0662057A80	20K
R1532	0662057A95	82K
R1533	0662057A73	10K
R1535	0662057R16	39.2
R1537	0662057A53	1.5K
R1541	0662057A53	1.5K
R1542	0662057A49	1K
R1543	0662057A49	1K
R1544	0662057A90	51K
R1545	0662057A65	4.7K
R1601	0662057A73	10K
R1602	0662057A65	4.7K
R1604	0662057A49	1K
R1605	0662057B10	330K
R1606	0662057B02	150K
R1607	0662057B19	750K
R1608	0662057A57	2.2K
R1609	0662057A73	10K
R1610	0662057A82	24K
R1611	0662057A49	1K
R1612	0662057A25	100
R1613	0662057A59	2.7K
R1614	0662057A49	1K
R1615	0662057A49	1K
R1616	0662057A33	220
R1617	0662057A57	2.2K
R1620	0662057A51	1.2K
R1621	0662057A68	6.2K
R1622	0662057A49	1K
R1626	0662057A18	51
R1627	0662057A73	10K
R1628	0662057A55	1.8K
R1629	0662057A67	5.6K
R1630	0662057A53	1.5K
R1631	0662057A18	51
R1632	0662057A82	24K
R1635	0662057B47	0
R1636	0662057A42	510
R1637	0662057A59	2.7K
R1638	0662057A55	1.8K
SH1302	2680473U01	VCO SHIELD
U1001	4802245J50	UMC5N

Circuit Ref	Motorola Part No.	Description
U1051	5108278X01	MIXER
U1101	5113805A86	MC74HC4066
U1102	5113805A86	MC74HC4066
U1103	5186144B01	SA616
U1201	5185963A27	FRACN SYNTHESIZER
U1250	5185963A33	LP2951
U1377	4802245J50	UMC5N
U1378	4802245J50	UMC5N
U1401	5185130C65	LDMOS PRE-DRIVER IC
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5109731C21	LM6142BIM
U1503	5185765B28	POWER CONTROL IC
U1601	5180929W01	MC1350
Y1101	4880908W08	CRYSTAL, 10.245 MHZ
Y1102	9186145B02	DISCRIMINATOR, 455 KHZ
*Y1201	4880114R04	CRYSTAL, 16.8 MHZ
Y1202	NOTPLACED	

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from CCSD (formerly AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Low Band R1 PCB 8486206B08 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	CAP, 100pF
C0102	NOTPLACED	
C0103	NOTPLACED	
C0104	NOTPLACED	
C0105	NOTPLACED	
C0106	NOTPLACED	
C0107	2113741F25	CAP, 1000pF
C0108	NOTPLACED	
C0111	NOTPLACED	
C0112	2113743E20	CAP, 0.1uF
C0121	2113743E20	CAP, 0.1uF
C0122	2113743E20	CAP, 0.1uF
C0123	NOTPLACED	
C0131	2113740F35	CAP, 22pF
C0132	2113740F35	CAP, 22pF
C0141	2113743E20	CAP, 0.1uF
C0151	2113741F49	CAP, .01uF
C0201	2311049A57	CAPP, 10uF
C0202	2311049A57	CAPP, 10uF
C0203	NOTPLACED	
C0204	2113743E20	CAP, 0.1uF
C0205	NOTPLACED	
C0211	NOTPLACED	
C0212	2311049A57	CAPP, 10uF
C0221	2113743E20	CAP, 0.1uF
C0222	2113743E20	CAP, 0.1uF
C0223	2113743E20	CAP, 0.1uF
C0224	2113740F51	CAP, 100pF
C0225	2113743E20	CAP, 0.1uF
C0226	2113743E20	CAP, 0.1uF
C0227	NOTPLACED	
C0228	2311049A56	CAPP, 4.7uF
C0231	2113743B29	CAP, 1uF
C0232	2113743E20	CAP, 0.1uF
C0233	NOTPLACED	
C0234	2113743E20	CAP, 0.1uF
C0235	2113743E07	CAP, .022uF
C0236	2113743E10	CAP, .033uF
C0237	NOTPLACED	
C0241	2113743E20	CAP, 0.1uF
C0242	NOTPLACED	
C0243	2113740F51	CAP, 100pF
C0244	2113743E20	CAP, 0.1uF
C0245	2113743E20	CAP, 0.1uF
C0246	2113741F49	CAP, .01uF
C0251	2113743E20	CAP, 0.1uF
C0252	2311049A07	CAPP, 1uF
C0253	NOTPLACED	
C0254	2113743E20	CAP, 0.1uF
C0255	2113743E20	CAP, 0.1uF
C0256	2113740F51	CAP, 100pF
C0261	2113743E20	CAP, 0.1uF
C0262	2113740F49	CAP, 82pF
C0265	2113743E20	CAP, 0.1uF
C0266	NOTPLACED	
C0267	2113741F49	CAP, .01uF
C0271	2113741F49	CAP, .01uF
C0272	2113743E20	CAP, 0.1uF
C0273	2113741F37	CAP, 3300pF
C0274	NOTPLACED	
C0275	2311049A99	CAPP, 47uF
C0276	2113741F25	CAP, 1000pF
C0277	2113741F25	CAP, 1000pF
C0290	2311049C01	CAPP, 10uF
C0291	2311049C01	CAPP, 10uF
C0292	2311049C01	CAPP, 10uF
C0293	2311049C01	CAPP, 10uF
C0301	NOTPLACED	
C0302	NOTPLACED	
C0303	NOTPLACED	
C0304	NOTPLACED	
C0305	NOTPLACED	
C0324	NOTPLACED	
C0325	NOTPLACED	
C0331	NOTPLACED	
C0341	NOTPLACED	
C0342	NOTPLACED	
C0343	NOTPLACED	
C0344	NOTPLACED	
C0351	NOTPLACED	
C0352	NOTPLACED	
C0353	NOTPLACED	
C0354	NOTPLACED	
C0421	2113743N48	CAP, 82pF
C0422	2113741F17	CAP, 470pF
C0423	2113741F17	CAP, 470pF
C0426	2113743L09	CAP, 470pF
C0427	2113743L09	CAP, 470pF
C0428	2113743N48	CAP, 82pF
C0429	2113743L09	CAP, 470pF
C0430	2113741F17	CAP, 470pF
C0431	2113741F17	CAP, 470pF
C0441	2113743L09	CAP, 470pF
C0442	2113743L09	CAP, 470pF
C0443	NOTPLACED	
C0445	2113743L09	CAP, 470pF
C0446	2113743L09	CAP, 470pF
C0447	2113743L09	CAP, 470pF
C0448	2113743L09	CAP, 470pF
C0449	2113743L09	CAP, 470pF
C0470	2113743L09	CAP, 470pF
C0471	2113743N48	CAP, 82pF
C0472	2113743N48	CAP, 82pF
C0473	2113743N48	CAP, 82pF
C0474	2113743L09	CAP, 470pF
C0476	2113743L09	CAP, 470pF
C0477	2113743L09	CAP, 470pF
C0478	2113743L09	CAP, 470pF
C0482	2113743L09	CAP, 470pF
C0483	2113743L09	CAP, 470pF
C0484	2113741F17	CAP, 470pF
C0485	2113743L09	CAP, 470pF
C0486	2113743L09	CAP, 470pF
C0487	2113743L09	CAP, 470pF
C0488	2113743L09	CAP, 470pF
C0490	2113743L09	CAP, 470pF
C0491	2113743L09	CAP, 470pF
C0492	2113743L09	CAP, 470pF
C0493	2113743L09	CAP, 470pF
C0494	2113743L09	CAP, 470pF
C0495	2113743L09	CAP, 470pF
C0496	2113743L09	CAP, 470pF
C0497	2113743L09	CAP, 470pF
C0499	2113743L09	CAP, 470pF
C0501	2113741F49	CAP, .01uF
C0502	2113741F17	CAP, 470pF
C0503	2113741F17	CAP, 470pF
C0504	2113741F17	CAP, 470pF
C0505	2113741F17	CAP, 470pF
C0506	2113741F17	CAP, 470pF
C0508	2113741F17	CAP, 470pF
C0509	2113741F17	CAP, 470pF
C0510	2113741F17	CAP, 470pF
C0511	2113741F17	CAP, 470pF
C0512	2113741F17	CAP, 470pF
C0513	2113741F17	CAP, 470pF
C0514	2113741F17	CAP, 470pF
C0515	2113741F17	CAP, 470pF
C0516	2113741F49	CAP, .01uF
C0517	2113743N48	CAP, 82pF
C0518	2113741F17	CAP, 470pF
C0541	2311049A05	CAPP, 0.47uF
C0542	2311049A99	CAPP, 47uF
C0554	NOTPLACED	
C0558	NOTPLACED	
C0559	NOTPLACED	
C0560	2113741F25	CAP, 1000pF
C0575	NOTPLACED	
C0576	NOTPLACED	
C0591	2113743E20	CAP, 0.1uF
C0592	2113743E20	CAP, 0.1uF
C0593	2113741B69	CAP, 0.1uF
C0601	2113741F17	CAP, 470pF
C0603	2380090M24	CAPP, 10uF
C0611	2311049C06	CAPP, 22uF
C0612	2113743E20	CAP, 0.1uF
C0621	NOTPLACED	
C0622	2311049A99	CAPP, 47uF
C0641	2113741F17	CAP, 470pF
C0644	2311049A97	CAPP, 33uF
C0645	2113743E20	CAP, 0.1uF
C0651	NOTPLACED	
C0652	2311049A97	CAPP, 33uF
C0654	2311049A57	CAPP, 10uF
C0655	2113743E20	CAP, 0.1uF
C0661	2311049C05	CAPP, 47uF
C0662	2113741F49	CAP, .01uF
C0663	2113743E20	CAP, 0.1uF
C0671	2113743E20	CAP, 0.1uF
C0681	2113743E20	CAP, 0.1uF
C1001	2113740F59	CAP, 220pF
C1002	2113743E20	CAP, 0.1uF
C1003	2113740F59	CAP, 220pF
C1004	2113740F56	CAP, 160pF
C1006	2113740F50	CAP, 91pF
C1007	2113740F62	CAP, 300pF
C1008	2113743E20	CAP, 0.1uF
C1009	2113740F61	CAP, 270pF
C1010	2113740F49	CAP, 82pF
C1011	2113740F57	CAP, 180pF
C1012	2113740F59	CAP, 220pF
C1013	2113743E20	CAP, 0.1uF
C1014	2113740F59	CAP, 220pF
C1015	2113741F49	CAP, .01uF
C1016	2113740F58	CAP, 200pF
C1017	2113741F49	CAP, .01uF
C1019	2113740F61	CAP, 270pF
C1020	2113740F64	CAP, 360pF
C1021	2113740F64	CAP, 360pF
C1022	2113740F62	CAP, 300pF
C1023	2113740F64	CAP, 360pF
C1024	2113740F63	CAP, 330pF
C1025	2113740F61	CAP, 270pF
C1026	2113741F49	CAP, .01uF
C1027	2113740F57	CAP, 180pF
C1028	2113741F49	CAP, .01uF
C1029	2113741F49	CAP, .01uF
C1030	2113743E20	CAP, 0.1uF
C1031	2113743E20	CAP, 0.1uF
C1032	2113740F51	CAP, 100pF
C1033	2113740F53	CAP, 120pF
C1034	2113740F54	CAP, 130pF

Circuit Ref	Motorola Part No.	Description
C1035	2113740F50	CAP, 91pF
C1036	2113743E20	CAP, 0.1uF
C1037	2113740F62	CAP, 300pF
C1038	2113740F65	CAP, 390pF
C1039	2113740F65	CAP, 390pF
C1040	2113740F62	CAP, 300pF
C1041	2113740F59	CAP, 220pF
C1042	2113740F59	CAP, 220pF
C1101	2113740F53	CAP, 120pF
C1102	2113740F50	CAP, 91pF
C1103	2113740F58	CAP, 200pF
C1104	2113743E20	CAP, 0.1uF
C1105	2113743E20	CAP, 0.1uF
C1106	2113743E20	CAP, 0.1uF
C1107	2113740F49	CAP, 82pF
C1108	2113743E20	CAP, 0.1uF
C1109	2113740F40	CAP, 36pF
C1110	NOTPLACED	
C1111	2113740L03	CAP, 2.4pF
C1112	2113740F40	CAP, 36pF
C1113	2113743E20	CAP, 0.1uF
C1114	2113743E20	CAP, 0.1uF
C1115	2113740F53	CAP, 120pF
C1116	2113740F41	CAP, 39pF
C1119	2113743E20	CAP, 0.1uF
C1120	NOTPLACED	
C1121	NOTPLACED	
C1122	NOTPLACED	
C1123	2113740F39	CAP, 33pF
C1124	2113743E20	CAP, 0.1uF
C1125	2113743E11	CAP, .039uF
C1126	2113743E20	CAP, 0.1uF
C1127	2311049A57	CAPP, 10uF
C1128	2113743E20	CAP, 0.1uF
C1129	2113740F35	CAP, 22pF
C1130	2113740F47	CAP, 68pF
C1131	NOTPLACED	
C1133	2113743E20	CAP, 0.1uF
C1134	2113743E20	CAP, 0.1uF
C1135	2113743E20	CAP, 0.1uF
C1136	2113743E20	CAP, 0.1uF
C1137	2113740F53	CAP, 120pF
C1138	2113743E20	CAP, 0.1uF
C1139	2113741F49	CAP, .01uF
C1140	2113741F49	CAP, .01uF
C1141	2113743E20	CAP, 0.1uF
C1142	2113743E20	CAP, 0.1uF
C1143	2113743E20	CAP, 0.1uF
C1144	2113743E20	CAP, 0.1uF
C1145	2113741F41	CAP, 4700pF
C1146	2113740F49	CAP, 82pF
C1147	2113740F65	CAP, 390pF
C1148	2113743E20	CAP, 0.1uF
C1149	2113740F53	CAP, 120pF
C1150	2113740F54	CAP, 130pF
C1151	NOTPLACED	
C1152	NOTPLACED	
C1153	NOTPLACED	
C1201	2113743E20	CAP, 0.1uF
C1202	2311049J11	CAPP, 4.7uF
C1203	2113741F49	CAP, .01uF
C1204	2113740F59	CAP, 220pF
C1205	NOTPLACED	
C1206	2113740L37	CAP, 62pF
C1207	2113740F07	CAP, 1.5pF
C1208	2113740A82	CAP, 1500pF
C1209	2311049A57	CAPP, 10uF
C1210	2113743E20	CAP, 0.1uF
C1211	2113741F49	CAP, .01uF
C1212	2311049A07	CAPP, 1uF
C1213	2113743A23	CAP, 0.22uF
C1214	2113743E10	CAP, .033uF
C1215	2113740C37	CAP, 6800pF
C1216	2311049J11	CAPP, 4.7uF
C1217	2113741F49	CAP, .01uF
C1218	2113743E20	CAP, 0.1uF
C1219	2311049J11	CAPP, 4.7uF
C1220	2311049J11	CAPP, 4.7uF
C1221	NOTPLACED	
C1222	2113740F37	CAP, 27pF
C1223	2113741F49	CAP, .01uF
C1224	2113740F51	CAP, 100pF
C1225	2113741F49	CAP, .01uF
C1226	NOTPLACED	
C1227	2113741F49	CAP, .01uF
C1228	NOTPLACED	
C1229	2113741F49	CAP, .01uF
C1230	2113741F49	CAP, .01uF
C1231	2113741F49	CAP, .01uF
C1232	NOTPLACED	
C1233	NOTPLACED	
C1234	NOTPLACED	
C1250	2311049A09	CAPP, 2.2uF
C1251	2113743E20	CAP, 0.1uF
C1252	2113743E05	CAP, .018uF
C1253	2311049J11	CAPP, 4.7uF
C1254	2113741F49	CAP, .01uF
C1304	NOTPLACED	
C1305	NOTPLACED	
C1306	2113740L23	CAP, 16pF
C1307	2113740L34	CAP, 47pF
C1308	2113740F19	CAP, 4.7pF
C1309	NOTPLACED	
C1311	2113741F49	CAP, .01uF
C1312	2113741F49	CAP, .01uF
C1313	2113741F49	CAP, .01uF
C1314	2113740L35	CAP, 51pF
C1315	2113740L35	CAP, 51pF
C1316	2113740F15	CAP, 3.3pF
C1317	2113743E20	CAP, 0.1uF
C1318	2113741F49	CAP, .01uF
C1319	2113741F49	CAP, .01uF
C1320	2113741F49	CAP, .01uF
C1321	2113740F17	CAP, 3.9pF
C1323	2113740L21	CAP, 13pF
C1325	2113741F49	CAP, .01uF
C1326	2113741F49	CAP, .01uF
C1333	2113740L36	CAP, 56pF
C1334	2113740L36	CAP, 56pF
C1335	2113740F19	CAP, 4.7pF
C1336	2113743E20	CAP, 0.1uF
C1337	2113741F49	CAP, .01uF
C1338	2113741F49	CAP, .01uF
C1339	2113741F49	CAP, .01uF
C1340	2113741F49	CAP, .01uF
C1341	2113740L36	CAP, 56pF
C1342	2113740L36	CAP, 56pF
C1343	2113740F15	CAP, 3.3pF
C1344	2113741F49	CAP, .01uF
C1345	2113743E20	CAP, 0.1uF
C1346	2113741F49	CAP, .01uF
C1347	2113741F49	CAP, .01uF
C1348	2113740F17	CAP, 3.9pF
C1349	2113743E20	CAP, 0.1uF
C1350	2113740F31	CAP, 15pF
C1351	2113741F49	CAP, .01uF
C1352	2113741F49	CAP, .01uF
C1354	NOTPLACED	
C1356	NOTPLACED	
C1360	NOTPLACED	
C1361	NOTPLACED	
C1362	NOTPLACED	
C1401	2113741A45	CAP, .01uF
C1402	2113741A45	CAP, .01uF
C1403	NOTPLACED	
C1404	2113741A45	CAP, .01uF
C1405	2113741A45	CAP, .01uF
C1406	NOTPLACED	
C1407	2113741A45	CAP, .01uF
C1408	NOTPLACED	
C1410	2113741M69	CAP, 0.1uF
C1413	2113741A45	CAP, .01uF
C1414	2113741A45	CAP, .01uF
C1415	2113741A45	CAP, .01uF
C1416	NOTPLACED	
C1417	2113740A79	CAP, 1000pF
C1418	2113741A45	CAP, .01uF
C1419	2113741A45	CAP, .01uF
C1420	2113741A45	CAP, .01uF
C1421	NOTPLACED	
C1422	NOTPLACED	
C1423	2113741A45	CAP, .01uF
C1424	2113741A45	CAP, .01uF
C1425	2113741W01	CAP, 1uF
C1426	2113741W01	CAP, 1uF
C1427	2111078B59	CAP, 470pF
C1428	2111078B59	CAP, 470pF
C1429	2111078B59	CAP, 470pF
C1430	2111078B59	CAP, 470pF
C1431	2113741A45	CAP, .01uF
C1432	2113741W01	CAP, 1uF
C1433	2113741W01	CAP, 1uF
C1434	2113741A45	CAP, .01uF
C1435	2113741W01	CAP, 1uF
C1436	2113741A45	CAP, .01uF
C1437	2111078B59	CAP, 470pF
C1438	2111078B59	CAP, 470pF
C1439	2111078B59	CAP, 470pF
C1440	2111078B59	CAP, 470pF
C1441	2111078B50	CAP, 200pF
C1442	2111078B39	CAP, 75pF
C1443	2111078B59	CAP, 470pF
C1444	2111078B59	CAP, 470pF
C1445	2113741A45	CAP, .01uF
C1446	2180060M41	CAP, 82pF
C1447	2111078B59	CAP, 470pF
C1448	2111078B59	CAP, 470pF
C1449	2180060M46	CAP, 130pF
C1450	NOTPLACED	
C1451	2180060M51	CAP, 220pF
C1452	2180060M37	CAP, 56pF
C1453	2180060M48	CAP, 160pF
C1454	2180060M37	CAP, 56pF
C1455	2180060M25	CAP, 18pF
C1456	2180060M43	CAP, 100pF
C1457	2113741A45	CAP, .01uF
C1458	2311049C01	CAPP, 10uF
C1459	2311049C01	CAPP, 10uF
C1460	2113743E20	CAP, 0.1uF
C1461	2113741A45	CAP, .01uF
C1462	2311049C01	CAPP, 10uF
C1463	2113928E01	CAP, 1uF
C1464	2113741A45	CAP, .01uF
C1465	2113928E01	CAP, 1uF

Circuit Ref	Motorola Part No.	Description
C1466	2113741A45	CAP, .01uF
C1467	2113740A53	CAP, 82pF
C1468	2113741A45	CAP, .01uF
C1469	2113741W01	CAP, 1uF
C1470	2113741W01	CAP, 1uF
C1471	2113741A45	CAP, .01uF
C1472	2113741M69	CAP, 0.1uF
C1473	2113741M69	CAP, 0.1uF
C1474	2113741A45	CAP, .01uF
C1475	2113741W01	CAP, 1uF
C1476	2113741A45	CAP, .01uF
C1477	2111078B59	CAP, 470pF
C1478	2111078B59	CAP, 470pF
C1479	2111078B49	CAP, 180pF
C1480	NOTPLACED	
C1481	2111078B58	CAP, 430pF
C1482	2113928E01	CAP, 1uF
C1484	2113741F33	CAP, 2200pF
C1485	2113741A45	CAP, .01uF
C1486	2180060M40	CAP, 75pF
C1491	NOTPLACED	
C1501	2113741F33	CAP, 2200pF
C1502	2113741F33	CAP, 2200pF
C1503	2113741F33	CAP, 2200pF
C1504	2113741F33	CAP, 2200pF
C1505	2113741F25	CAP, 1000pF
C1506	2113741F25	CAP, 1000pF
C1507	2113741F33	CAP, 2200pF
C1508	2113741F33	CAP, 2200pF
C1509	2311049A07	CAPP, 1uF
C1510	2113741F33	CAP, 2200pF
C1511	2113741F33	CAP, 2200pF
C1512	2113741F33	CAP, 2200pF
C1525	2113743E20	CAP, 0.1uF
C1526	2113740F51	CAP, 100pF
C1527	2113741A45	CAP, .01uF
C1528	2113741A45	CAP, .01uF
C1529	2113741M69	CAP, 0.1uF
C1530	2113741A45	CAP, .01uF
C1531	NOTPLACED	
C1532	NOTPLACED	
C1601	2113743E20	CAP, 0.1uF
C1602	2113740F59	CAP, 220pF
C1603	2113743A23	CAP, 0.22uF
C1604	2113743A23	CAP, 0.22uF
C1605	2311049A57	CAPP, 10uF
C1606	2113740F59	CAP, 220pF
C1607	2113740F51	CAP, 100pF
C1608	2113743A23	CAP, 0.22uF
C1609	2113740F34	CAP, 20pF
C1610	2113741F41	CAP, 4700pF

Circuit Ref	Motorola Part No.	Description
C1611	2113743E20	CAP, 0.1uF
C1612	2113741F33	CAP, 2200pF
C1613	2113740F54	CAP, 130pF
C1614	2113741F24	CAP, 910pF
C1615	NOTPLACED	
C1616	2113740F40	CAP, 36pF
C1618	2113743A23	CAP, 0.22uF
C1619	2311049A57	CAPP, 10uF
C1620	2113741F25	CAP, 1000pF
C1621	NOTPLACED	
C1622	2113743E20	CAP, 0.1uF
C1623	2113740F60	CAP, 240pF
C1624	2113741F37	CAP, 3300pF
C1625	2113740F29	CAP, 12pF
C1626	2113740F59	CAP, 220pF
C1627	2113743A23	CAP, 0.22uF
C1628	2113743E20	CAP, 0.1uF
C1629	2113740F39	CAP, 33pF
C1631	2311049A57	CAPP, 10uF
C1632	2113743E20	CAP, 0.1uF
C1633	2113743A23	CAP, 0.22uF
C1634	2113741A45	CAP, .01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H
CR1314	4880154K03	MMBD353
D0101	4813825A05	MMBD301
D0151	4813833C02	MMBD6100
D0179	4813833C02	MMBD6100
D0201	NOTPLACED	
D0301	NOTPLACED	
D0621	4813833C02	MMBD6100
D0651	4813833C02	MMBD6100
D0660	4813833C02	MMBD6100
D0661	4813833C02	MMBD6100
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4813825A05	MMBD301
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100
D1601	4880154K03	MMBD353
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
E1401	2408380X02	FERRITE BEAD
E1403	2408380X02	FERRITE BEAD
F0401	6580542Z01	FUSE

Circuit Ref	Motorola Part No.	Description
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	CRYSTAL FILTER, 10.7 MHZ
FL1104	9180468V04	CFUCJ455F
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J0401	0902636Y02	CONN, 12-PIN, CONTROL HEAD
J0451	0902636Y01	CONN, 18-PIN, EXPANSION BOARD
J0501	0986105B01	CONN, 20-PIN, ACCESSORY
J0551	0905505Y04	CONN, 40-PIN, INTERNAL OPTION
J0552	0905505Y03	CONN, 18-PIN, RS232
J0601	0986165B01	DC POWER CONNECTOR
J1401	0986166B02	MINI-U ANTENNA CONNECTOR
L0481	NOTPLACED	
L0482	NOTPLACED	
L1001	2408382A11	IDCTR, 130nH
L1002	2408382C11	IDCTR, 130nH
L1003	2408382A11	IDCTR, 130nH
L1004	2408382C11	IDCTR, 130nH
L1005	2408382A11	IDCTR, 130nH
L1006	2408382A11	IDCTR, 130nH
L1007	2408382C11	IDCTR, 130nH
L1008	2408382A11	IDCTR, 130nH
L1009	2408382C11	IDCTR, 130nH
L1010	2408382A11	IDCTR, 130nH
L1011	2462587N68	IDCTR, 1uH
L1012	2462587N57	IDCTR, 220nH
L1013	2462587N59	IDCTR, 330nH
L1014	2462587N57	IDCTR, 220nH
L1101	2462587N33	IDCTR, 1.8uH
L1102	2408383X07	IDCTR, 3.3uH
L1103	2462587N33	IDCTR, 1.8uH
L1104	2480289M10	IDCTR, 6.8uH
L1105	2480289M10	IDCTR, 6.8uH
L1106	2462587N33	IDCTR, 1.8uH
L1107	2480289M09	IDCTR, 5.6uH
L1108	NOTPLACED	
L1109	NOTPLACED	
L1110	2480289M18	IDCTR, 33uH
L1111	2408383X07	IDCTR, 3.3uH
L1112	2483411T35	IDCTR, 6.8uH
L1201	2480289M17	IDCTR, 27uH
L1202	2462587Q20	IDCTR, 2.2uH
L1204	NOTPLACED	
L1205	2462587N64	IDCTR, 680nH
L1206	2480289M17	IDCTR, 27uH
L1207	NOTPLACED	

Circuit Ref	Motorola Part No.	Description
L1302	2408382D19	IDCTR, 491nH
L1303	2480289M17	IDCTR, 27uH
L1304	2462587N66	IDCTR, 820nH
L1305	2480289M17	IDCTR, 27uH
L1306	2480289M17	IDCTR, 27uH
L1307	2480289M17	IDCTR, 27uH
L1309	2480289M17	IDCTR, 27uH
L1310	2462587N60	IDCTR, 390nH
L1311	2480289M17	IDCTR, 27uH
L1313	2408382D19	IDCTR, 491nH
L1314	2480289M18	IDCTR, 33uH
L1315	2462587N69	IDCTR, 1.2uH
L1316	2480289M18	IDCTR, 33uH
L1317	2480289M18	IDCTR, 33uH
L1318	2480289M18	IDCTR, 33uH
L1321	2462587N58	IDCTR, 270nH
L1322	2480289M18	IDCTR, 33uH
L1324	2480289M18	IDCTR, 33uH
L1401	NOTPLACED	
L1402	2462587U09	IDCTR, 4.7uH
L1403	2462587U09	IDCTR, 4.7uH
L1404	2462587N56	IDCTR, 180nH
L1405	NOTPLACED	
L1406	2408381X36	IDCTR, 250.974nH
L1408	2408384A10	IDCTR, 120nH
L1413	2408381X17	IDCTR, 88.470nH
L1414	2408381X17	IDCTR, 88.470nH
L1415	2485873L04	IDCTR, 41nH
L1416	2485873L04	IDCTR, 41nH
L1417	2408381X14	IDCTR, 72.462nH
L1418	2408381X30	IDCTR, 184.518nH
L1419	2480289M17	IDCTR, 27uH
L1420	2408381X36	IDCTR, 250.974nH
L1421	2408381X33	IDCTR, 217.576nH
L1422	2408381X26	IDCTR, 139.750nH
L1423	2408381X23	IDCTR, 124.327nH
L1424	NOTPLACED	
L1425	2485873L04	IDCTR, 41nH
L1426	2485873L04	IDCTR, 41nH
L1601	2483411T45	IDCTR, 47uH
L1602	2483411T45	IDCTR, 47uH
L1603	2483411T73	IDCTR, 1uH
L1604	2483411T45	IDCTR, 47uH
L1605	2483411T41	IDCTR, 22uH
L1606	2462587T30	IDCTR, 1uH
L1607	2462587T30	IDCTR, 1uH
M1401	2686201B01	HEATSINK
Q0110	4880048M01	DTC144EKA
Q0151	4880048M01	DTC144EKA
Q0171	4880048M01	DTC144EKA
Q0173	4880052M01	RXT-A28

Circuit Ref	Motorola Part No.	Description
Q0177	4880048M01	DTC144EKA
Q0181	4880048M01	DTC144EKA
Q0183	4880048M01	DTC144EKA
Q0185	4880048M01	DTC144EKA
Q0271	4880214G02	MMBT3904
Q0641	4880048M01	DTC144EKA
Q0661	4805921T02	FMC2A
Q0662	4880214G02	MMBT3904
Q0663	4880048M01	DTC144EKA
Q0681	4880052M01	RXT-A28
Q1001	4880182D44	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1107	4880214G02	MMBT3904
Q1201	4813824A17	MMBT3906
Q1202	4880182D44	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880182D44	MMBR951
Q1305	4880182D44	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880182D44	MMBR951
Q1308	4880182D44	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	MRF1550
Q1403	4886136B01	MRF1550
Q1404	NOTPLACED	
Q1501	4880141L03	BCW68G
Q1502	4880214G02	MMBT3904
Q1503	4880214G02	MMBT3904
Q1504	4880214G02	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4880214G02	MMBT3904
Q1601	4813824A17	MMBT3906
Q1602	4880048M01	DTC144EKA
Q1603	4880214G02	MMBT3904
Q1604	4880214G02	MMBT3904
Q1605	4880214G02	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4880214G02	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R0101	0662057A73	RES, 10K
R0102	0662057A65	RES, 4.7K
R0103	0662057A01	RES, 10
R0104	0662057A73	RES, 10K
R0105	0662057A97	RES, 100K
R0106	NOTPLACED	
R0107	NOTPLACED	
R0108	0662057A57	RES, 2.2K
R0110	NOTPLACED	
R0111	0662057B47	RES, 0
R0112	NOTPLACED	
R0113	0662057A73	RES, 10K
R0114	0662057A73	RES, 10K
R0115	0662057A73	RES, 10K
R0116	NOTPLACED	
R0117	0662057A63	RES, 3.9K
R0121	0662057A97	RES, 100K
R0131	0662057B46	RES, 10MEG
R0132	0662057B10	RES, 330K
R0151	0662057A82	RES, 24K
R0152	0662057A82	RES, 24K
R0170	0662057A73	RES, 10K
R0171	0662057A65	RES, 4.7K
R0172	0662057A73	RES, 10K
R0173	0662057A65	RES, 4.7K
R0174	0662057A73	RES, 10K
R0175	0662057A73	RES, 10K
R0176	0662057A84	RES, 30K
R0177	0662057A65	RES, 4.7K
R0178	0662057A89	RES, 47K
R0179	0662057A89	RES, 47K
R0181	0662057A65	RES, 4.7K
R0182	0662057A89	RES, 47K
R0183	0662057A65	RES, 4.7K
R0184	0662057A89	RES, 47K
R0185	0662057A65	RES, 4.7K
R0186	0662057A89	RES, 47K
R0201	0662057A25	RES, 100
R0202	0662057A43	RES, 560
R0203	0662057A25	RES, 100
R0204	0662057A43	RES, 560
R0205	0662057A73	RES, 10K
R0206	0662057A73	RES, 10K
R0207	0662057A57	RES, 2.2K
R0208	0662057A57	RES, 2.2K
R0211	0660076E70	RES, 7.5K
R0212	0660076E70	RES, 7.5K
R0220	NOTPLACED	
R0221	0662057A82	RES, 24K
R0222	0662057A82	RES, 24K
R0223	0662057A84	RES, 30K
R0224	0662057A71	RES, 8.2K
R0225	NOTPLACED	
R0226	NOTPLACED	
R0227	NOTPLACED	
R0228	0662057B47	RES, 0
R0229	0662057A01	RES, 10
R0241	0662057A89	RES, 47K
R0242	0662057B47	RES, 0
R0251	0662057A89	RES, 47K
R0252	0662057A91	RES, 56K
R0253	0662057A97	RES, 100K
R0254	0662057A73	RES, 10K
R0255	0662057A73	RES, 10K
R0256	0662057A97	RES, 100K
R0257	0662057A57	RES, 2.2K
R0261	0662057A73	RES, 10K
R0262	0662057B08	RES, 270K
R0265	0662057A82	RES, 24K
R0266	NOTPLACED	
R0267	0662057A89	RES, 47K
R0268	0662057A73	RES, 10K
R0269	0662057A41	RES, 470
R0273	0662057A82	RES, 24K
R0274	NOTPLACED	
R0275	0662057A73	RES, 10K
R0276	0662057A77	RES, 15K
R0323	NOTPLACED	
R0324	NOTPLACED	
R0331	NOTPLACED	
R0332	NOTPLACED	
R0333	NOTPLACED	
R0335	NOTPLACED	
R0341	NOTPLACED	
R0342	NOTPLACED	
R0343	NOTPLACED	
R0344	NOTPLACED	
R0345	NOTPLACED	
R0346	NOTPLACED	
R0347	NOTPLACED	
R0401	0662057A33	RES, 220
R0407	0662057M26	RES, 10
R0408	0662057A25	RES, 100
R0409	0662057M26	RES, 10
R0412	0662057B47	RES, 0
R0441	0662057B47	RES, 0
R0442	0662057A49	RES, 1K
R0467	0662057M26	RES, 10
R0468	0662057A97	RES, 100K
R0481	0662057B47	RES, 0
R0482	0662057B47	RES, 0
R0508	0662057A41	RES, 470
R0509	0662057B47	RES, 0
R0510	0662057A65	RES, 4.7K
R0511	0662057A97	RES, 100K
R0512	0662057A77	RES, 15K
R0525	0662057A97	RES, 100K
R0529	0662057A89	RES, 47K
R0530	0662057A81	RES, 22K
R0531	0662057A43	RES, 560
R0533	0662057B47	RES, 0
R0535	0662057A49	RES, 1K
R0537	0662057A33	RES, 220
R0538	0662057A33	RES, 220
R0539	0662057A65	RES, 4.7K
R0541	0662057A83	RES, 27K
R0542	NOTPLACED	
R0543	0662057A97	RES, 100K
R0555	0662057A25	RES, 100
R0556	0662057A25	RES, 100
R0591	0662057A82	RES, 24K
R0592	0662057A01	RES, 10
R0593	0662057A97	RES, 100K
R0611	0662057A91	RES, 56K
R0612	0662057A65	RES, 4.7K
R0621	0662057A82	RES, 24K
R0641	0662057A73	RES, 10K
R0642	0660076E70	RES, 7.5K
R0643	0660076E51	RES, 1.2K
R0651	0662057A01	RES, 10
R0652	0662057A01	RES, 10
R0661	0662057A49	RES, 1K
R0662	0662057B02	RES, 150K
R0671	0662057A84	RES, 30K
R0672	0662057A73	RES, 10K
R0681	0662057A79	RES, 18K
R0682	0662057A93	RES, 68K
R1001	0662057A05	RES, 15
R1002	0662057A05	RES, 15
R1003	0662057A41	RES, 470
R1004	0662057A59	RES, 2.7K
R1005	0662057A31	RES, 180
R1006	0662057A73	RES, 10K
R1007	0662057A71	RES, 8.2K
R1008	0662057A65	RES, 4.7K
R1009	NOTPLACED	
R1010	NOTPLACED	
R1011	NOTPLACED	
R1101	0662057A18	RES, 51
R1102	0662057A78	RES, 16K
R1103	0662057A39	RES, 390
R1104	0662057A71	RES, 8.2K
R1106	0662057A25	RES, 100
R1107	0662057A68	RES, 6.2K
R1108	0662057A61	RES, 3.3K
R1109	0662057A37	RES, 330
R1110	0662057A25	RES, 100

Circuit Ref	Motorola Part No.	Description
R1111	0662057A17	RES, 47
R1113	0662057A64	RES, 4.3K
R1114	0662057A64	RES, 4.3K
R1115	0662057A75	RES, 12K
R1116	NOTPLACED	
R1117	0662057A37	RES, 330
R1118	0662057A56	RES, 2K
R1119	0662057A83	RES, 27K
R1120	0662057A18	RES, 51
R1121	0662057A71	RES, 8.2K
R1122	0662057A73	RES, 10K
R1123	0662057A51	RES, 1.2K
R1124	NOTPLACED	
R1125	NOTPLACED	
R1126	NOTPLACED	
R1127	NOTPLACED	
R1128	0662057A73	RES, 10K
R1129	0662057A73	RES, 10K
R1130	0662057A73	RES, 10K
R1131	0662057A77	RES, 15K
R1132	0662057A58	RES, 2.4K
R1133	0662057A61	RES, 3.3K
R1134	0662057A05	RES, 15
R1135	0662057A20	RES, 62
R1136	0662057A45	RES, 680
R1137	0662057A75	RES, 12K
R1138	0662057A01	RES, 10
R1139	0611077A12	RES, 2.7
R1140	0662057A39	RES, 390
R1141	0662057A55	RES, 1.8K
R1201	0662057B47	RES, 0
R1202	NOTPLACED	
R1203	0662057B02	RES, 150K
R1204	0662057B47	RES, 0
R1205	0662057A45	RES, 680
R1206	0662057A41	RES, 470
R1207	NOTPLACED	
R1208	0662057A18	RES, 51
R1209	0662057A61	RES, 3.3K
R1210	0662057A33	RES, 220
R1211	0662057B14	RES, 470K
R1212	0662057A25	RES, 100
R1213	0662057A45	RES, 680
R1214	0662057A54	RES, 1.6K
R1215	0662057A21	RES, 68
R1216	0662057A18	RES, 51
R1217	0662057A25	RES, 100
R1218	0662057A17	RES, 47
R1219	0662057A17	RES, 47
R1220	0662057A17	RES, 47
R1221	0662057B47	RES, 0
R1222	NOTPLACED	
R1306	0662057B47	RES, 0
R1307	0662057A19	RES, 56
R1308	0662057A19	RES, 56
R1309	0662057A41	RES, 470
R1311	0662057A73	RES, 10K
R1312	0662057A51	RES, 1.2K
R1313	0662057A51	RES, 1.2K
R1314	0662057A37	RES, 330
R1315	0662057A61	RES, 3.3K
R1316	0662057A45	RES, 680
R1317	0662057A09	RES, 22
R1318	0662057A41	RES, 470
R1319	0662057A01	RES, 10
R1320	0662057A41	RES, 470
R1325	NOTPLACED	
R1326	0662057A19	RES, 56
R1327	0662057A19	RES, 56
R1328	0662057A41	RES, 470
R1330	0662057A73	RES, 10K
R1331	0662057A51	RES, 1.2K
R1332	0662057A51	RES, 1.2K
R1333	0662057A37	RES, 330
R1334	0662057A61	RES, 3.3K
R1335	0662057A47	RES, 820
R1336	0662057A09	RES, 22
R1337	0662057A22	RES, 75
R1338	0662057A27	RES, 120
R1339	0662057A22	RES, 75
R1340	0662057A49	RES, 1K
R1341	0662057A25	RES, 100
R1342	0662057A25	RES, 100
R1343	0662057C55	RES, 150
R1344	0662057A49	RES, 1K
R1345	0662057A25	RES, 100
R1346	0662057A25	RES, 100
R1347	0662057C55	RES, 150
R1376	0662057A65	RES, 4.7K
R1402	0611079A64	RES, 390
R1404	0680194M18	RES, 51
R1405	0680194M18	RES, 51
R1406	0662057A73	RES, 10K
R1407	0662057A73	RES, 10K
R1409	0682089V01	RES, .01
R1410	0683962T52	RES, 130
R1411	0662057C99	RES, 10K
R1412	NOTPLACED	
R1413	0680194M01	RES, 10
R1414	0680194M01	RES, 10
R1415	NOTPLACED	
R1416	0680194M01	RES, 10
R1417	0680194M01	RES, 10
R1418	0680194M01	RES, 10
R1419	0680194M01	RES, 10
R1420	0680194M01	RES, 10
R1421	0680194M01	RES, 10
R1422	0680194M01	RES, 10
R1423	0680194M01	RES, 10
R1424	0662057D10	RES, 27K
R1425	0662057D10	RES, 27K
R1440	0662057A25	RES, 100
R1441	NOTPLACED	
R1442	0662057A25	RES, 100
R1443	0662057A49	RES, 1K
R1444	0662057A33	RES, 220
R1445	0662057A68	RES, 6.2K
R1446	NOTPLACED	
R1447	0662057B47	RES, 0
R1448	NOTPLACED	
R1449	0611079A64	RES, 390
R1450	0683962T71	RES, 820
R1451	0662057K31	RES, 180
R1453	0662057K31	RES, 180
R1454	0662057K31	RES, 180
R1455	NOTPLACED	
R1457	0662057K01	RES, 10
R1458	0611079A64	RES, 390
R1459	0611079A64	RES, 390
R1460	0680106R01	RES, 0.1
R1463	0662057A75	RES, 12K
R1464	0662057A61	RES, 3.3K
R1465	0662057A61	RES, 3.3K
R1466	NOTPLACED	
R1467	NOTPLACED	
R1468	NOTPLACED	
R1469	0662057C01	RES, 0
R1470	NOTPLACED	
R1471	NOTPLACED	
R1472	0662057A73	RES, 10K
R1473	0680194M01	RES, 10
R1474	0680194M01	RES, 10
R1475	0680194M01	RES, 10
R1476	0680194M01	RES, 10
R1477	0662057A61	RES, 3.3K
R1478	0662057A73	RES, 10K
R1479	0662057A61	RES, 3.3K
R1480	0662057D10	RES, 27K
R1481	0662057A90	RES, 51K
R1482	0662057B47	RES, 0
R1483	0662057A34	RES, 240
R1484	0662057A49	RES, 1K
R1501	0662057A45	RES, 680
R1502	0662057C67	RES, 470
R1503	0662057A61	RES, 3.3K
R1504	0662057A73	RES, 10K
R1505	0662057A69	RES, 6.8K
R1506	0662057A87	RES, 39K
R1507	0662057A49	RES, 1K
R1508	0662057R17	RES, 43.2
R1509	0662057P95	RES, 100K
R1510	NOTPLACED	
R1511	0662057P95	RES, 100K
R1512	NOTPLACED	
R1513	0662057C76	RES, 1.1K
R1514	0662057A97	RES, 100K
R1515	0662057A49	RES, 1K
R1516	0662057C71	RES, 680
R1517	0662057C71	RES, 680
R1518	0662057A61	RES, 3.3K
R1519	0662057C71	RES, 680
R1522	0662057A73	RES, 10K
R1523	NOTPLACED	
R1524	0662057C71	RES, 680
R1525	NOTPLACED	
R1526	0662057A97	RES, 100K
R1527	0662057A97	RES, 100K
R1528	0662057A80	RES, 20K
R1532	0662057A95	RES, 82K
R1533	0662057A73	RES, 10K
R1535	0662057R16	RES, 39.2
R1537	0662057A53	RES, 1.5K
R1541	0662057A53	RES, 1.5K
R1542	0662057A49	RES, 1K
R1543	0662057A49	RES, 1K
R1544	0662057A90	RES, 51K
R1545	0662057A65	RES, 4.7K
R1601	0662057A73	RES, 10K
R1602	0662057A65	RES, 4.7K
R1604	0662057A49	RES, 1K
R1605	0662057B10	RES, 330K
R1606	0662057B02	RES, 150K
R1607	0662057B19	RES, 750K
R1608	0662057A57	RES, 2.2K
R1609	0662057A73	RES, 10K
R1610	0662057A82	RES, 24K
R1611	0662057A49	RES, 1K
R1612	0662057A25	RES, 100
R1613	0662057A59	RES, 2.7K
R1614	0662057A49	RES, 1K
R1615	0662057A49	RES, 1K
R1616	0662057A33	RES, 220
R1617	0662057A57	RES, 2.2K
R1620	0662057A51	RES, 1.2K

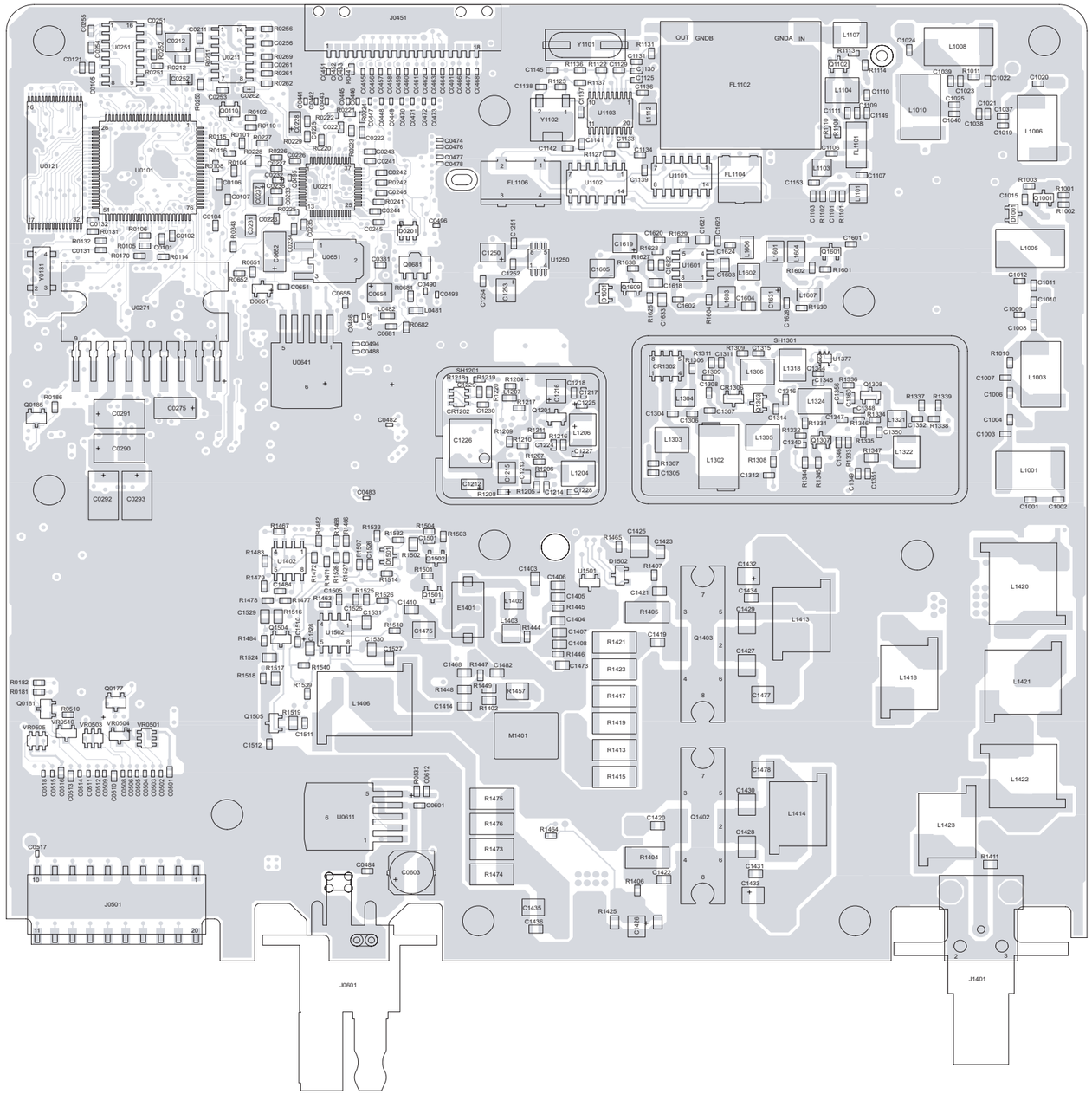
Circuit Ref	Motorola Part No.	Description
R1621	0662057A68	RES, 6.2K
R1622	0662057A49	RES, 1K
R1626	0662057A18	RES, 51
R1627	0662057A73	RES, 10K
R1628	0662057A55	RES, 1.8K
R1629	0662057A67	RES, 5.6K
R1630	0662057A53	RES, 1.5K
R1631	0662057A18	RES, 51
R1632	0662057A82	RES, 24K
R1633	NOTPLACED	
R1635	0662057B47	RES, 0
R1636	0662057A42	RES, 510
R1637	0662057A59	RES, 2.7K
R1638	0662057A55	RES, 1.8K
SH1201	NOTPLACED	
SH1202	NOTPLACED	
SH1301	NOTPLACED	
SH1302	2680473U01	VCO SHIELD
U0101	5102226J56	MC68HC11FL0
U0111	5102463J64	EEPROM
U0121	5186137B01	FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	MC3403
U0221	5185130C53	ASFIC COMPANDER IC
U0251	5184704M60	MUX/DEMUX
U0271	5109699X01	AUDIO PA
U0301	NOTPLACED	
U0331	NOTPLACED	
U0341	NOTPLACED	
U0342	NOTPLACED	
U0351	NOTPLACED	
U0611	5183308X01	LM2941
U0641	5183308X01	LM2941
U0651	5113816A07	MC78M05
U0652	5113815A02	MC33064
U0653	NOTPLACED	
U1001	4809939C05	UMC5N
U1051	5108278X01	MIXER
U1101	5102463J52	MC74HC4066
U1102	5102463J52	MC74HC4066
U1103	5186144B01	SA616
U1201	5185963A27	FRACN SYNTHESIZER IC
U1250	5185963A33	LP2951
U1377	4809939C05	UMC5N
U1378	4809939C05	UMC5N
U1401	5185130C65	LDMOS PREDRIVER IC
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5109731C21	LM6142BIM
U1503	5185765B26	POWER CONTROL IC
U1601	5180929W01	MC1350
VR0151	4813830A15	MMBZ5232B
VR0501	4805656W09	MMQA20VT1
VR0503	4805656W09	MMQA20VT1
VR0504	4813830A40	MMBZ5257B
VR0505	4805656W09	MMQA20VT1
VR0509	4813830A40	MMBZ5257B
VR0510	4813830A40	MMBZ5257B
VR0537	4813830A15	MMBZ5232B
VR0541	4813830A27	MMBZ5244B
VR0601	4813832C77	TRANSIENT SUPPRESSOR
VR0621	4813830A15	MMBZ5232B
VR0671	NOTPLACED	
Y0131	4880113R19	CRYSTAL, 38.4 KHZ
Y1101	4880908W08	CRYSTAL, 10.245 MHZ
Y1102	9186145B02	DISCRIMINATOR, 455 KHZ
*Y1201	4880114R04	CRYSTAL, 16.8 MHZ
Y1202	NOTPLACED	

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

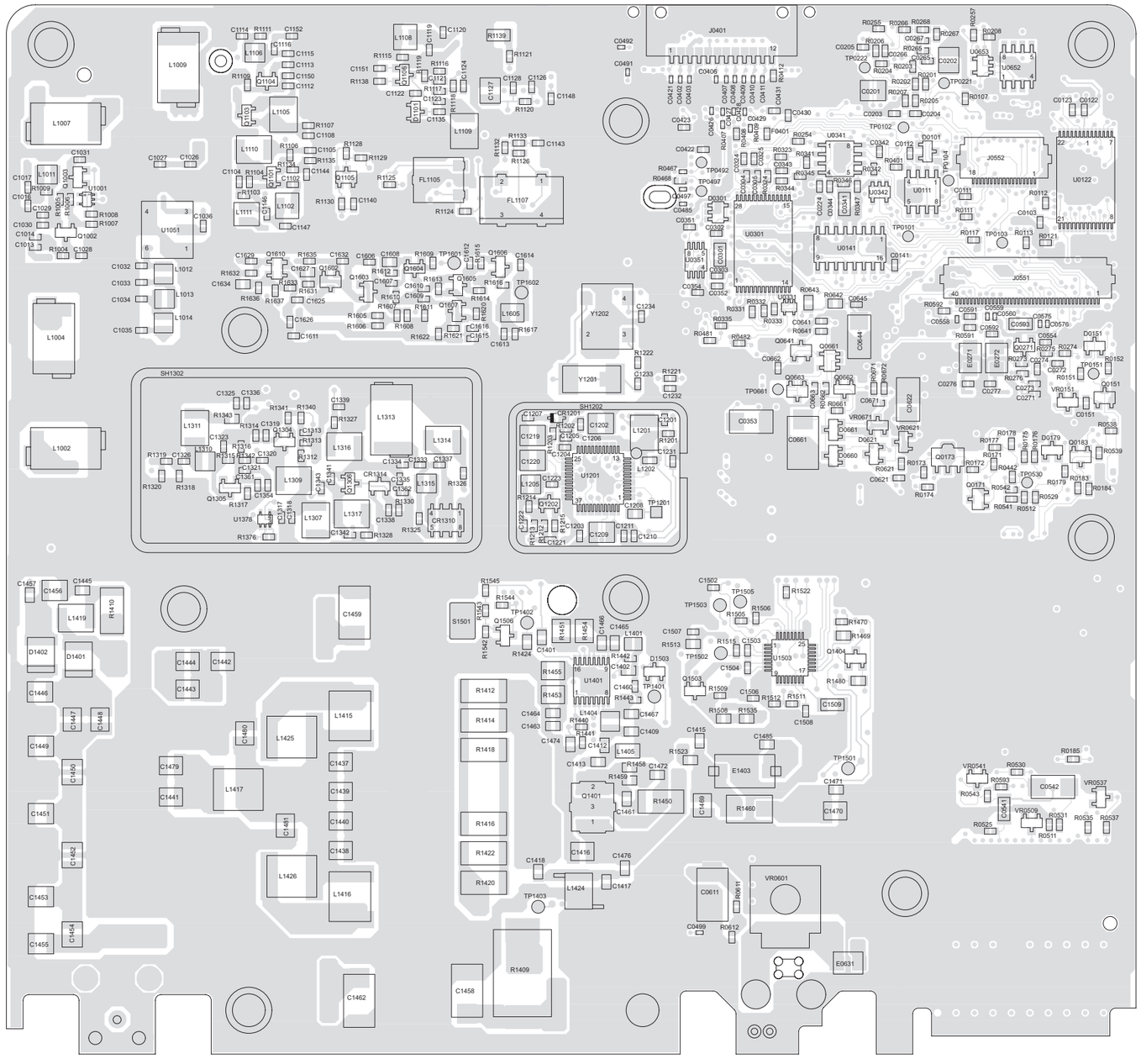
3.0 Low Band Range 2 (36-42 MHz) PCBs, Schematics, and Parts Lists



ZWG0130595-O

Low Band Range 2 (36-42 MHz) PCB 8486207B05 Top Side

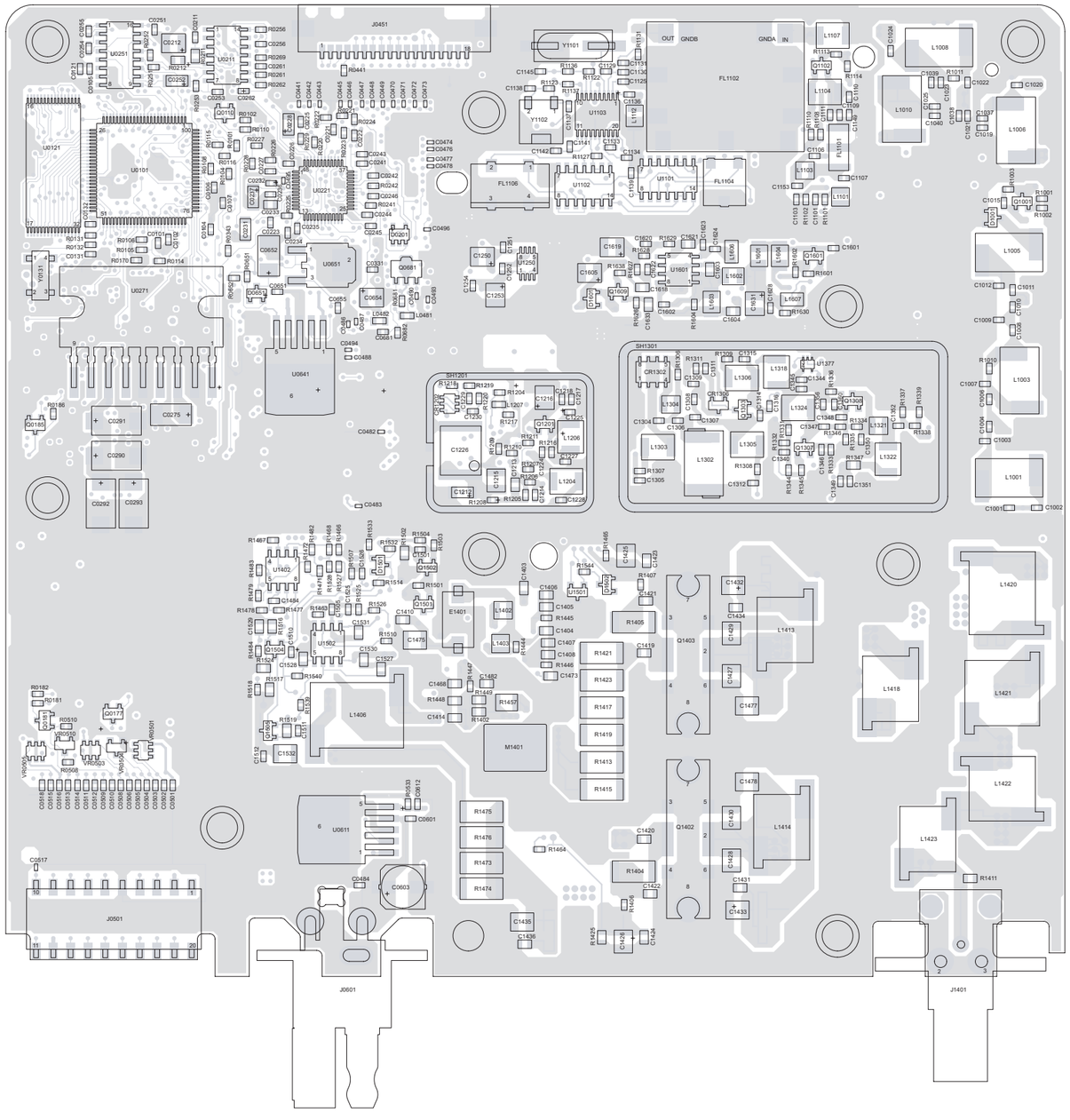
6881091C63-C



ZWG0130596-O

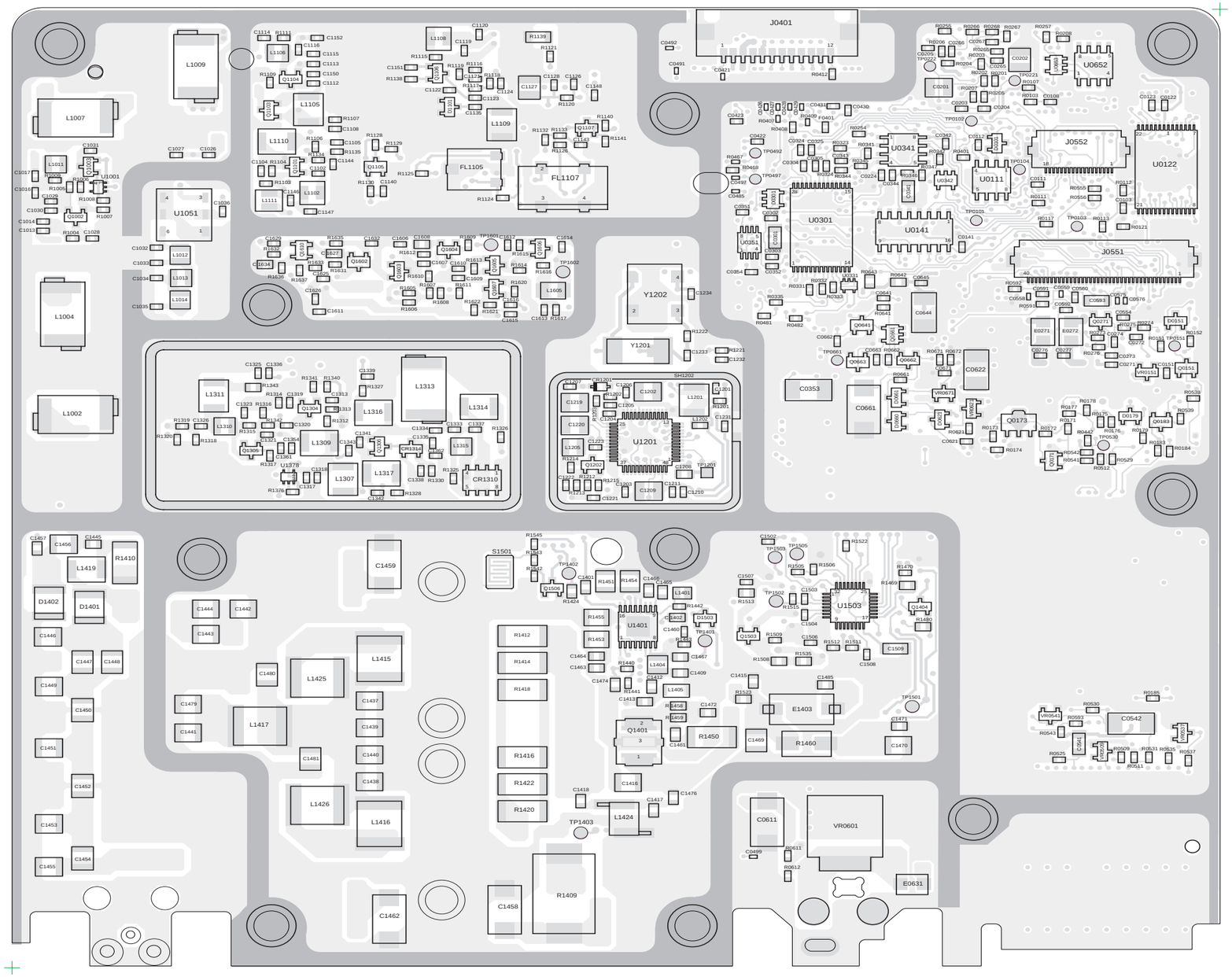
Low Band Range 2 (36-42 MHz) PCB 8486207B05 Bottom Side

6881091C63-C



Low Band Range 2 (36-42 MHz) PCB 8486207B07 Top Side

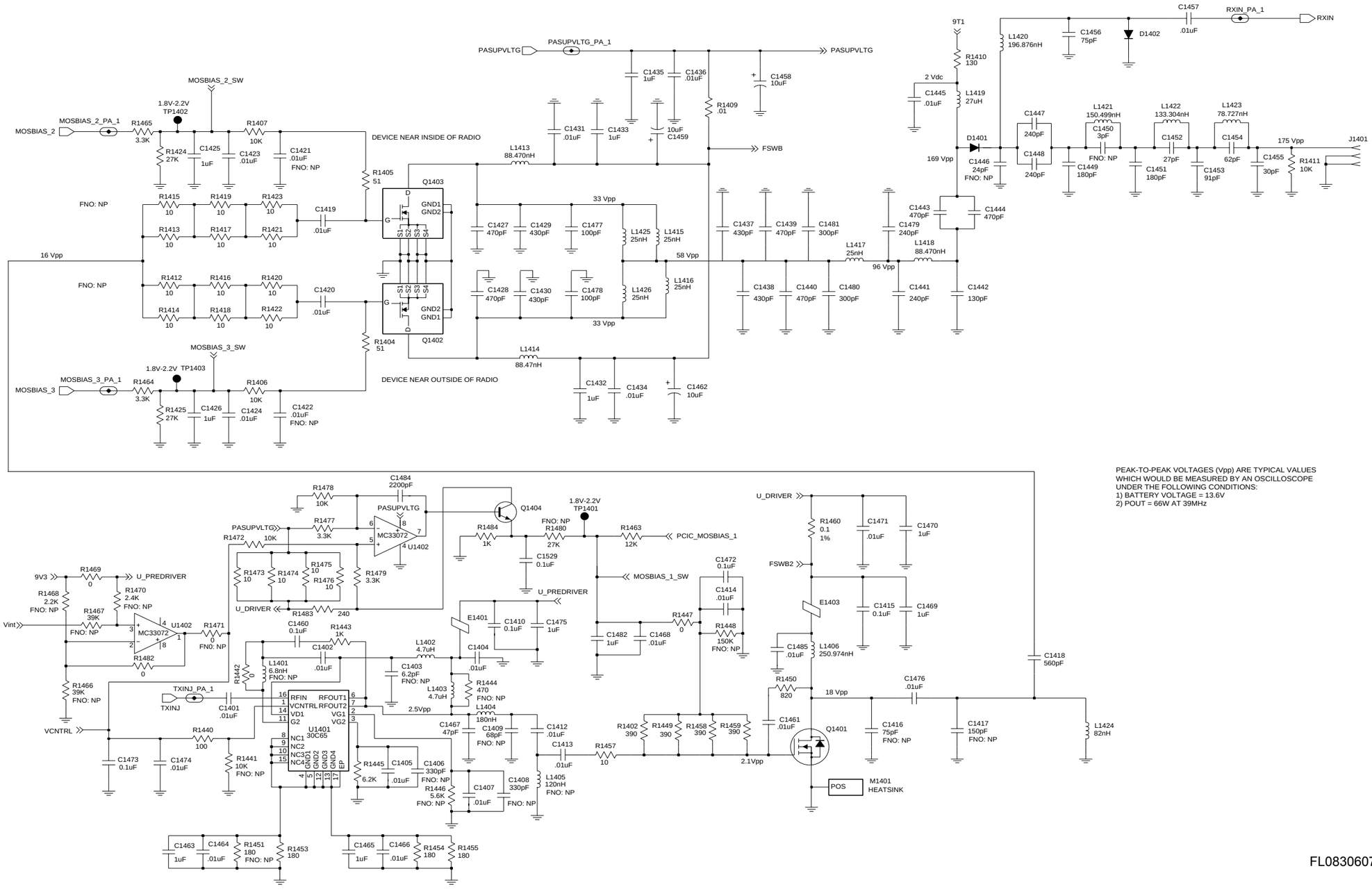
6881091C63-C



ZWG0131046-O

Low Band Range 2 (36-42 MHz) PCB 8486207B07 Bottom Side

6881091C63-C

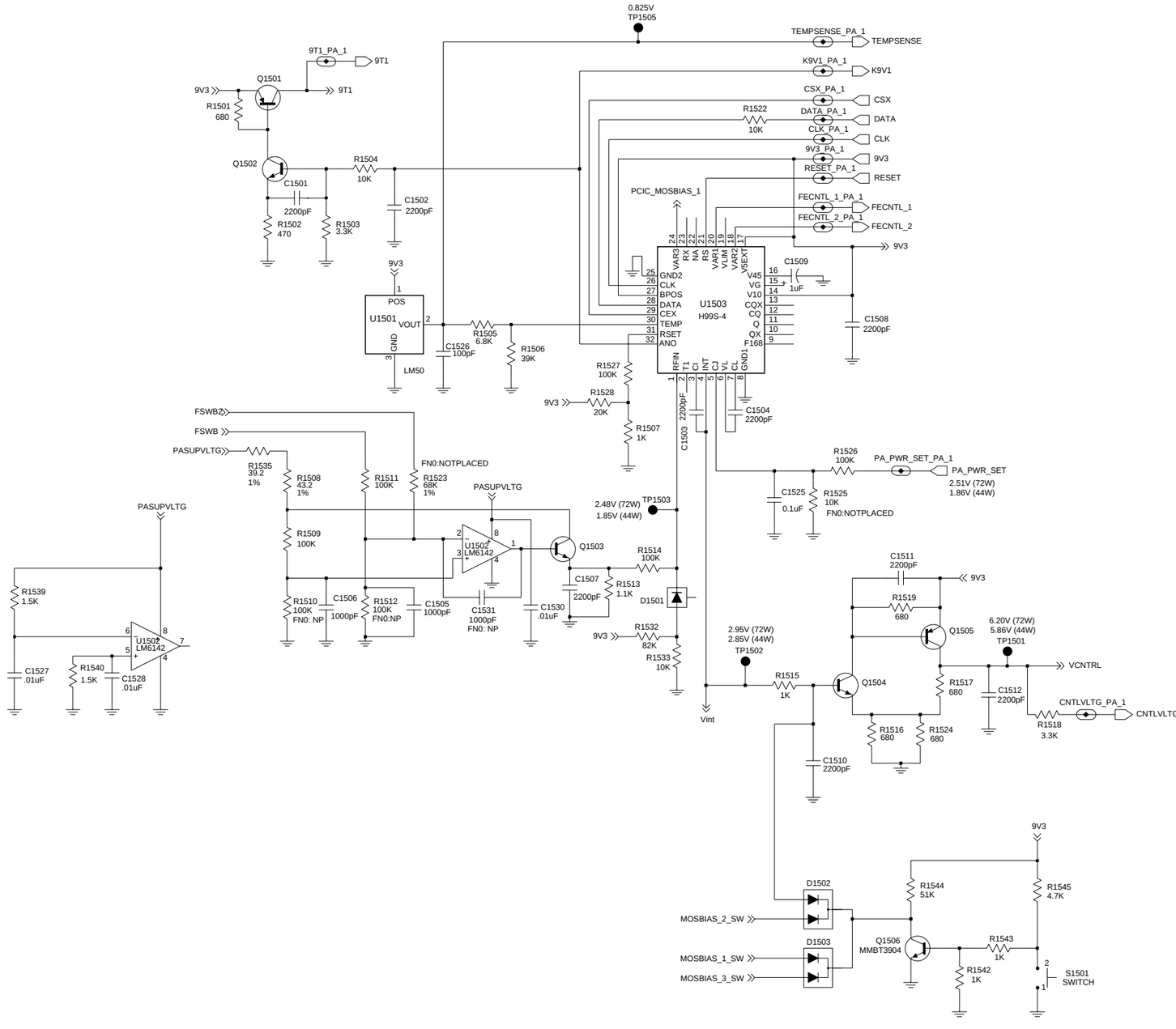


PEAK-TO-PEAK VOLTAGES (Vpp) ARE TYPICAL VALUES
WHICH WOULD BE MEASURED BY AN OSCILLOSCOPE
UNDER THE FOLLOWING CONDITIONS:
1) BATTERY VOLTAGE = 13.6V
2) POUT = 66W AT 39MHz

FL0830607-A Sheet 1

Low Band Range 2 (36-42 MHz) Power Amplifier Sheet 1 of 2

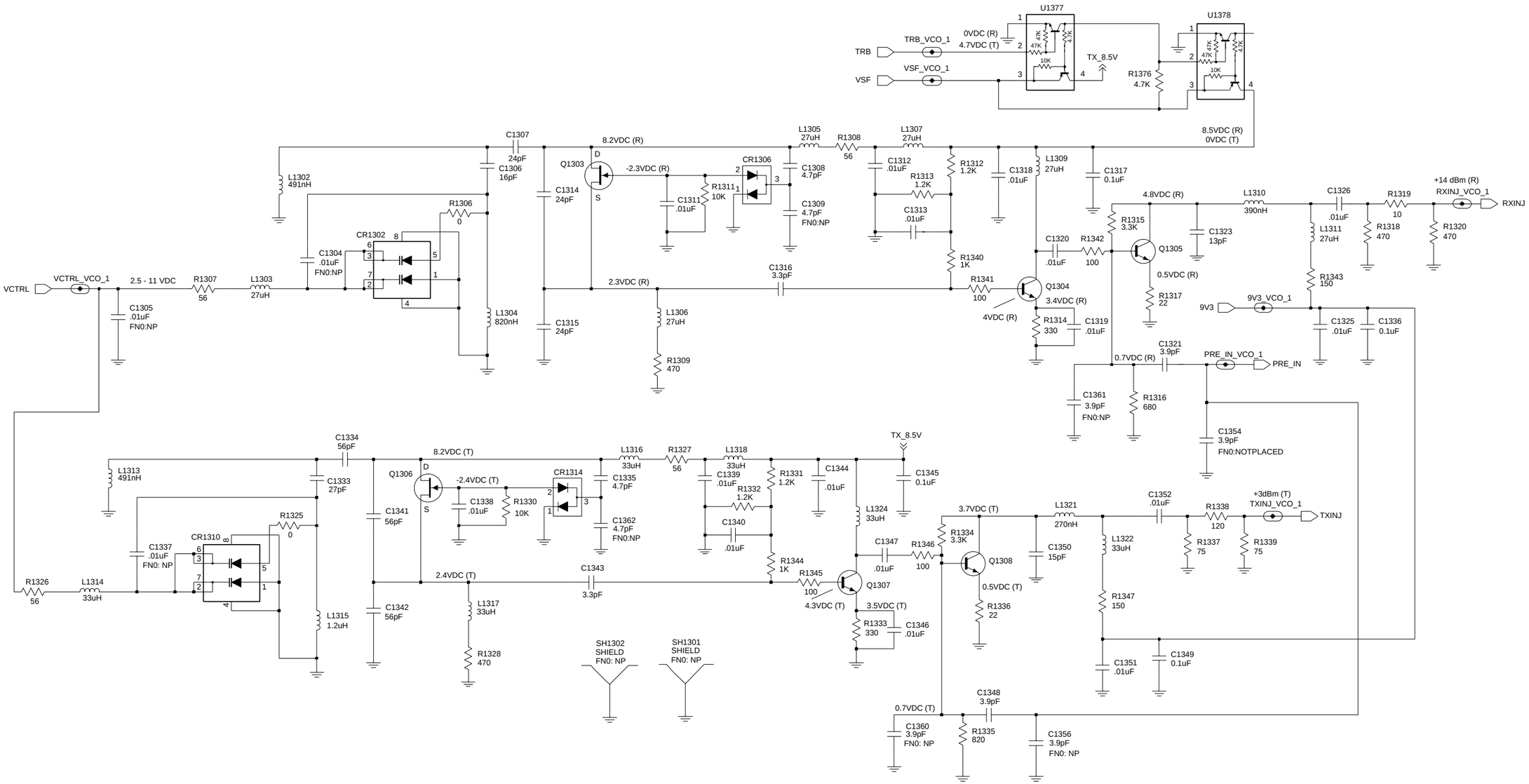
6881091C63-C



FL0830607-O Sheet 2

Low Band Range 2 (36-42 MHz) Power Amplifier Sheet 2 of 2

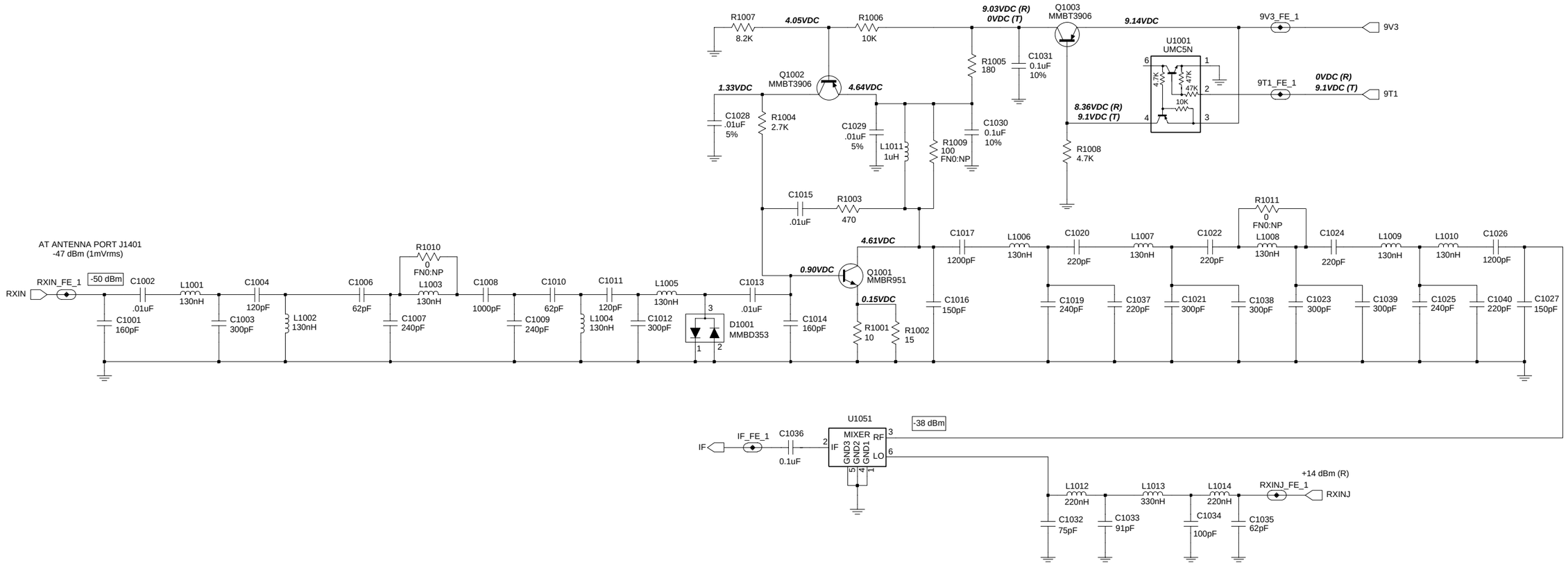
6881091C63-C



FL0830609-O

Low Band Range 2 (36-42 MHz) (36.0-42.0 MHz) Voltage Controlled Oscillator

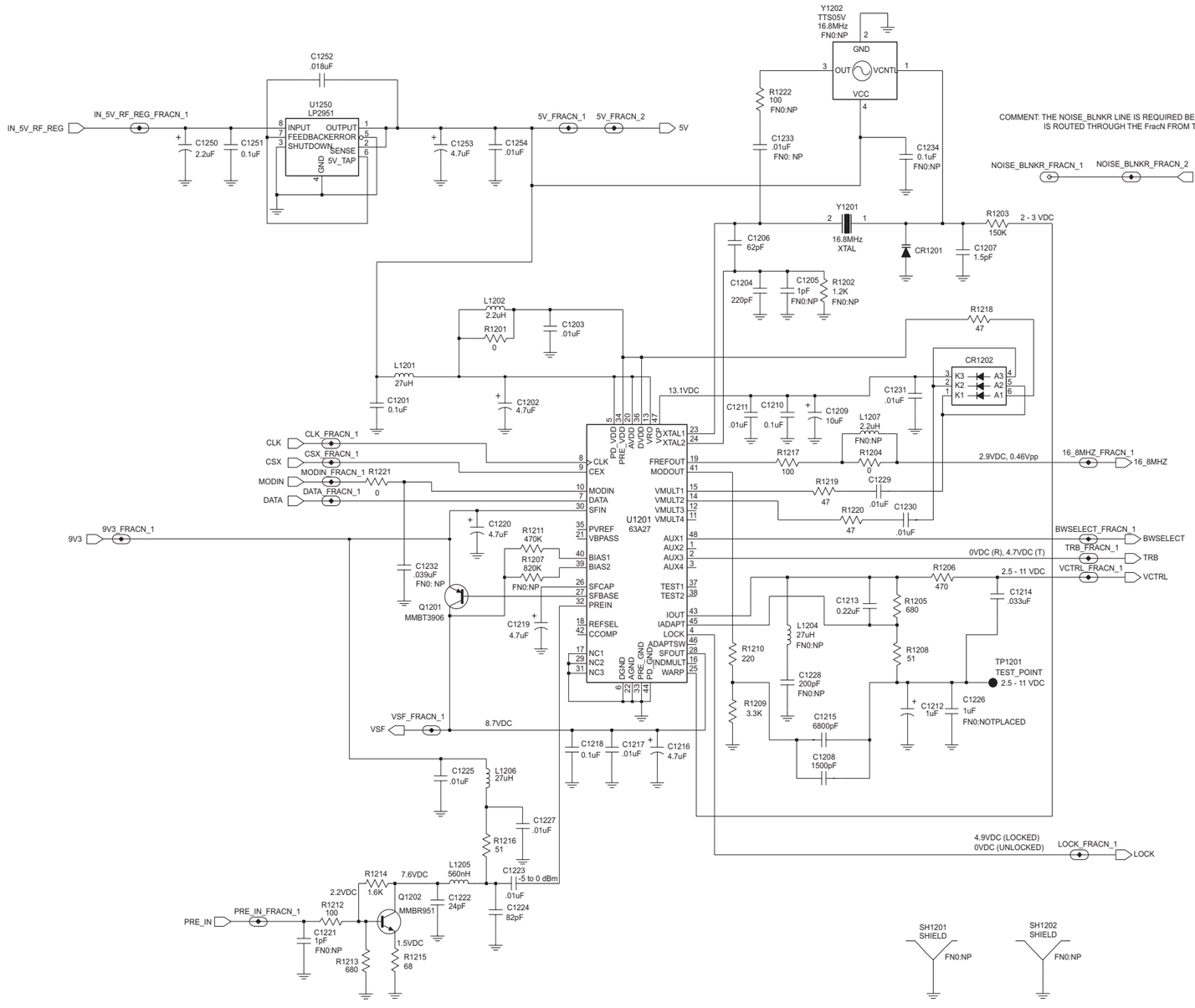
6881091C63-C



FL0830599-A

Low Band Range 2 (36-42 MHz) Receiver Front-End

6881091C63-C



FL0830608-O

Low Band Range 2 (36-42 MHz) FRACN Synthesizer

6881091C63-C

Low Band R2 PCB 8486207B05 Parts List†

Circuit Ref	Motorola Part No.	Description
C1001	2113740F56	160pF
C1002	2113741F49	.01uF
C1003	2113740F62	300pF
C1004	2113740F53	120pF
C1006	2113740F46	62pF
C1007	2113740F60	240pF
C1008	2113741F25	1000pF
C1009	2113740F60	240pF
C1010	2113740F46	62pF
C1011	2113740F53	120pF
C1012	2113740F62	300pF
C1013	2113741F49	.01uF
C1014	2113740F56	160pF
C1015	2113741F49	.01uF
C1016	2113740F55	150pF
C1017	2113741F27	1200pF
C1019	2113740F60	240pF
C1020	2113740F59	220pF
C1021	2113740F62	300pF
C1022	2113740F59	220pF
C1023	2113740F62	300pF
C1024	2113740F59	220pF
C1025	2113740F60	240pF
C1026	2113741F27	1200pF
C1027	2113740F55	150pF
C1028	2113741F49	.01uF
C1029	2113741F49	.01uF
C1030	2113743E20	0.1uF
C1031	2113743E20	0.1uF
C1032	2113740F48	75pF
C1033	2113740F50	91pF
C1034	2113740F51	100pF
C1035	2113740F46	62pF
C1036	2113743E20	0.1uF
C1037	2113740F59	220pF
C1038	2113740F62	300pF
C1039	2113740F62	300pF
C1040	2113740F59	220pF
C1101	2113740F53	120pF
C1102	2113740F50	91pF
C1103	2113740F58	200pF
C1104	2113743E20	0.1uF
C1105	2113743E20	0.1uF
C1106	2113743E20	0.1uF
C1107	2113740F49	82pF
C1108	2113743E20	0.1uF
C1109	2113740F40	36pF
C1111	2113740L03	2.4pF
C1112	2113740F40	36pF
C1113	2113743E20	0.1uF
C1114	2113743E20	0.1uF
C1115	2113740F53	120pF
C1116	2113740F39	33pF
C1119	2113743E20	0.1uF
C1123	2113740F39	33pF
C1124	2113743E20	0.1uF
C1125	2113743E11	.039uF
C1126	2113743E20	0.1uF
C1127	2311049A57	10uF
C1128	2113743E20	0.1uF
C1129	2113740F35	22pF
C1130	2113740F47	68pF
C1133		
C1136	2113743E20	0.1uF
C1137	2113740F53	120pF
C1138	2113743E20	0.1uF
C1139	2113741F49	.01uF
C1140	2113741F49	.01uF
C1141		
C1144	2113743E20	0.1uF
C1145	2113741F41	4700pF
C1146	2113740F49	82pF
C1147	2113740F65	390pF
C1148	2113743E20	0.1uF
C1149	2113740F53	120pF
C1150	2113740F54	130pF
C1201	2113743E20	0.1uF
C1202	2311049J11	4.7uF
C1203	2113741F49	.01uF
C1204	2113740F59	220pF
C1206	2113740L37	62pF
C1207	2113740F07	1.5pF
C1208	2113740A82	1500pF
C1209	2311049A57	10uF
C1210	2113743E20	0.1uF
C1211	2113741F49	.01uF
C1212	2311049A07	1uF
C1213	2113743A23	0.22uF
C1214	2113743E10	.033uF
C1215	2113740C37	6800pF
C1216	2311049J11	4.7uF
C1217	2113741F49	.01uF
C1218	2113743E20	0.1uF
C1219	2311049J11	4.7uF
C1220	2311049J11	4.7uF
C1222	2113740F36	24pF
C1223	2113741F49	.01uF
C1224	2113740F49	82pF
C1225	2113741F49	.01uF
C1227	2113741F49	.01uF
C1229	2113741F49	.01uF
C1230	2113741F49	.01uF
C1231	2113741F49	.01uF
C1250	2311049A09	2.2uF
C1251	2113743E20	0.1uF
C1252	2113743E05	.018uF
C1253	2311049J11	4.7uF
C1254	2113741F49	.01uF
C1306	2113740L23	16pF
C1307	2113740L27	24pF
C1308	2113740F19	4.7pF
C1311	2113741F49	.01uF
C1312	2113741F49	.01uF
C1313	2113741F49	.01uF
C1314	2113740L27	24pF
C1315	2113740L27	24pF
C1316	2113740F15	3.3pF
C1317	2113743E20	0.1uF
C1318	2113741F49	.01uF
C1319	2113741F49	.01uF
C1320	2113741F49	.01uF
C1321	2113740F17	3.9pF
C1323	2113740L21	13pF
C1325	2113741F49	.01uF
C1326	2113741F49	.01uF
C1333	2113740L28	27pF
C1334	2113740L36	56pF
C1335	2113740F19	4.7pF
C1336	2113743E20	0.1uF
C1338	2113741F49	.01uF
C1339	2113741F49	.01uF
C1340	2113741F49	.01uF
C1341	2113740L36	56pF
C1342	2113740L36	56pF
C1343	2113740F15	3.3pF
C1344	2113741F49	.01uF
C1345	2113743E20	0.1uF
C1346	2113741F49	.01uF
C1347	2113741F49	.01uF
C1348	2113740F17	3.9pF
C1349	2113743E20	0.1uF
C1350	2113740F31	15pF
C1351	2113741F49	.01uF
C1352	2113741F49	.01uF
C1401	2113741A45	.01uF
C1402	2113741A45	.01uF
C1404	2113741A45	.01uF
C1405	2113741A45	.01uF
C1407	2113741A45	.01uF
C1410	2113741M69	0.1uF
C1412	2113741A45	.01uF
C1413	2113741A45	.01uF
C1414	2113741A45	.01uF
C1415	2113741M69	0.1uF
C1418	2113740A73	560pF
C1419	2113741A45	.01uF
C1420	2113741A45	.01uF
C1423	2113741A45	.01uF
C1424	2113741A45	.01uF
C1425	2113741W01	1uF
C1426	2113741W01	1uF
C1427	2111078B59	470pF
C1428	2111078B59	470pF
C1429	2111078B58	430pF
C1430	2111078B58	430pF
C1431	2113741A45	.01uF
C1432	2113741W01	1uF
C1433	2113741W01	1uF
C1434	2113741A45	.01uF
C1435	2113741W01	1uF
C1436	2113741A45	.01uF
C1437	2111078B58	430pF
C1438	2111078B58	430pF
C1439	2111078B59	470pF
C1440	2111078B59	470pF
C1441	2111078B52	240pF
C1442	2111078B45	130pF
C1443	2111078B59	470pF
C1444	2111078B59	470pF
C1445	2113741A45	.01uF
C1447	2111078B52	240pF
C1448	2111078B52	240pF
C1449	2180060M49	180pF
C1451	2180060M49	180pF
C1452	2180060M29	27pF
C1453	2180060M42	91pF
C1454	2180060M38	62pF
C1455	2180060M30	30pF
C1456	2180060M40	75pF
C1457	2113741A45	.01uF
C1458	2311049C01	10uF
C1459	2311049C01	10uF
C1460	2113743E20	0.1uF
C1461	2113741A45	.01uF
C1462	2311049C01	10uF
C1463	2113928E01	1uF
C1464	2113741A45	.01uF
C1465	2113928E01	1uF
C1466	2113741A45	.01uF
C1467	2113740A46	47pF
C1468	2113741A45	.01uF
C1469	2113741W01	1uF
C1470	2113741W01	1uF
C1471	2113741A45	.01uF
C1472	2113741M69	0.1uF
C1473	2113741M69	0.1uF
C1474	2113741A45	.01uF
C1475	2113741W01	1uF
C1476	2113741A45	.01uF
C1477	2111078B42	100pF
C1478	2111078B42	100pF
C1479	2111078B52	240pF
C1480	2111078B54	300pF
C1481	2111078B54	300pF
C1482	2113928E01	1uF
C1484	2113741F33	2200pF
C1485	2113741A45	.01uF
C1501	2113741F33	2200pF
C1502	2113741F33	2200pF
C1503	2113741F33	2200pF
C1504	2113741F33	2200pF
C1505	2113741F25	1nF

Circuit Ref	Motorola Part No.	Description
C1506	2113741F25	1nF
C1507	2113741F33	2200pF
C1508	2113741F33	2200pF
C1509	2311049A07	1uF
C1510	2113741F33	2200pF
C1511	2113741F33	2200pF
C1512	2113741F33	2200pF
C1525	2113743E20	0.1uF
C1526	2113740F51	100pF
C1527	2113741A45	.01uF
C1528	2113741A45	.01uF
C1529	2113741M69	0.1uF
C1530	2113741A45	.01uF
C1601	2113743E20	0.1uF
C1602	2113740F59	220pF
C1603	2113743A23	0.22uF
C1604	2113743A23	0.22uF
C1605	2311049A57	10uF
C1606	2113740F59	220pF
C1607	2113740F51	100pF
C1608	2113743A23	0.22uF
C1609	2113740F34	20pF
C1610	2113741F41	4700pF
C1611	2113743E20	0.1uF
C1612	2113741F33	2200pF
C1613	2113740F54	130pF
C1614	2113741F24	910pF
C1616	2113740F40	36pF
C1618	2113743A23	0.22uF
C1619	2311049A57	10uF
C1620	2113741F25	1000pF
C1622	2113743E20	0.1uF
C1623	2113740F60	240pF
C1624	2113741F37	3300pF
C1625	2113740F29	12pF
C1626	2113740F59	220pF
C1627	2113743A23	0.22uF
C1628	2113743E20	0.1uF
C1629	2113740F39	33pF
C1631	2311049A57	10uF
C1632	2113743E20	0.1uF
C1633	2113743A23	0.22uF
C1634	2113741A45	.01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H
CR1314	4880154K03	MMBD353
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4880236E05	MMBD301
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100

Circuit Ref	Motorola Part No.	Description
D1601	4880154K03	MMBD353
E1401	2408380X02	2773037446
E1403	2408380X02	2773037446
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	FILTER
FL1104	9180468V04	CFUCJ455F
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J1401	0986166B02	CONN_J
L1001		
L1010	2408382A11	130nH
L1011	2462587N68	1uH
L1012	2462587N57	220nH
L1013	2462587N59	330nH
L1014	2462587N57	220nH
L1101	2462587N33	1.8uH
L1102	2408383X07	3.3uH
L1103	2462587N33	1.8uH
L1104	2480289M10	6.8uH
L1105	2480289M10	6.8uH
L1106	2462587N33	1.8uH
L1107	2480289M10	6.8uH
L1110	2480289M18	33uH
L1111	2408383X07	3.3uH
L1112	2483411T35	6.8uH
L1201	2480289M17	27uH
L1202	2462587Q20	2.2uH
L1205	2462587N62	560nH
L1206	2480289M17	27uH
L1302	2408382D19	491nH
L1303	2480289M17	27uH"
L1304	2462587N66	820nH
L1305	2480289M17	27uH
L1306	2480289M17	27uH
L1307	2480289M17	27uH
L1309	2480289M17	27uH
L1310	2462587N60	390nH
L1311	2480289M17	27uH
L1313	2408382D19	491nH
L1314	2480289M18	33uH
L1315	2462587N69	1.2uH
L1316	2480289M18	33uH
L1317	2480289M18	33uH
L1318	2480289M18	33uH
L1321	2462587N58	270nH
L1322	2480289M18	33uH
L1324	2480289M18	33uH
L1402	2462587U09	4.7uH
L1403	2462587U09	4.7uH
L1404	2462587N56	180nH
L1406	2408381X36	250.974nH
L1413	2408381X17	88.470nH
L1414	2408381X17	88.470nH
L1415	2485873L02	25nH
L1416	2485873L02	25nH

Circuit Ref	Motorola Part No.	Description
L1417	2485873L02	25nH
L1418	2408381X17	88.470nH
L1419	2480289M17	27uH
L1420	2408381X31	196.876nH
L1421	2408381X27	150.499nH
L1422	2408381X24	133.304nH
L1423	2408381X15	78.727nH
L1424	2408384A08	82nH
L1425	2485873L02	25nH
L1426	2485873L02	25nH
L1601	2483411T45	47uH
L1602	2483411T45	47uH
L1603	2483411T73	1uH
L1604	2483411T45	47uH
L1605	2483411T41	22uH
L1606	2462587T30	1uH
L1607	2462587T30	1uH
M1401	2686201B01	HEATSINK
Q1001	4880173R01	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1201	4813824A17	MMBT3906
Q1202	4880173R01	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880173R01	MMBR951
Q1305	4880173R01	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880173R01	MMBR951
Q1308	4880173R01	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	36B01
Q1403	4886136B01	36B01
Q1501	4880141L03	BCW68G
Q1502	4813824A10	MMBT3904
Q1503	4813824A10	MMBT3904
Q1504	4813824A10	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4813824A10	MMBT3904
Q1601	4813824A17	MMBT3906
Q1602	4880048M01	DTC144EKA
Q1603	4813824A10	MMBT3904
Q1604	4813824A10	MMBT3904
Q1605	4813824A10	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4813824A10	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R1001	0662057A0	10
R1002	0662057A05	15
R1003	0662057A41	470

Circuit Ref	Motorola Part No.	Description
R1004	0662057A59	2.7K
R1005	0662057A31	180
R1006	0662057A73	10K
R1007	0662057A71	8.2K
R1008	0662057A65	4.7K
R1101	0662057A18	51
R1102	0662057A78	16K
R1103	0662057A39	390
R1104	0662057A71	8.2K
R1106	0662057A25	100
R1107	0662057A68	6.2K
R1108	0662057A61	3.3K
R1109	0662057A37	330
R1110	0662057A25	100
R1111	0662057A17	47
R1113	0662057A64	4.3K
R1114	0662057A64	4.3K
R1115	0662057A75	12K
R1117	0662057A37	330
R1118	0662057A56	2K
R1119	0662057A83	27K
R1120	0662057A18	51
R1121	0662057A71	8.2K
R1122	0662057A73	10K
R1123	0662057A51	1.2K
R1128		
R1130	0662057A73	10K
R1131	0662057A77	15K
R1132	0662057A58	2.4K
R1133	0662057A61	3.3K
R1134	0662057A05	15
R1135	0662057A20	62
R1136	0662057A45	680
R1137	0662057A75	12K
R1138	0662057A01	10
R1139	0611077A12	2.7
R1201	0662057B47	0
R1203	0662057B02	150K
R1204	0662057B47	0
R1205	0662057A45	680
R1206	0662057A41	470
R1208	0662057A18	51
R1209	0662057A61	3.3K
R1210	0662057A33	220
R1211	0662057B14	470K
R1212	0662057A25	100
R1213	0662057A45	680
R1214	0662057A54	1.6K
R1215	0662057A21	68
R1216	0662057A18	51
R1217	0662057A25	100
R1218		
R1220	0662057A17	47
R1221	0662057B47	0
R1306	0662057B47	0
R1307	0662057A19	56

Circuit Ref	Motorola Part No.	Description
R1308	0662057A19	56
R1309	0662057A41	470
R1311	0662057A73	10K
R1312	0662057A51	1.2K
R1313	0662057A51	1.2K
R1314	0662057A37	330
R1315	0662057A61	3.3K
R1316	0662057A45	680
R1317	0662057A09	22
R1318	0662057A41	470
R1319	0662057A01	10
R1320	0662057A41	470
R1325	0662057B47	0
R1326	0662057A19	56
R1327	0662057A19	56
R1328	0662057A41	470
R1330	0662057A73	10K
R1331	0662057A51	1.2K
R1332	0662057A51	1.2K
R1333	0662057A37	330
R1334	0662057A61	3.3K
R1335	0662057A47	820
R1336	0662057A09	22
R1337	0662057A22	75
R1338	0662057A27	120
R1339	0662057A22	75
R1340	0662057A49	1K
R1341	0662057A25	100
R1342	0662057A25	100
R1343	0662057C55	150
R1344	0662057A49	1K
R1345	0662057A25	100
R1346	0662057A25	100
R1347	0662057C55	150
R1376	0662057A65	4.7K
R1402	0611079A64	390
R1404	0680194M18	51
R1405	0680194M18	51
R1406	0662057A73	10K
R1407	0662057A73	10K
R1409	0682089V01	.01
R1410	0683962T52	130
R1411	0662057C99	10K
R1413	0680194M01	10
R1414	0680194M01	10
R1416		
R1423	0680194M01	10
R1424	0611079B27	150K
R1425	0611079B27	150K
R1440	0662057A25	100
R1442	0662057B47	0
R1443	0662057A49	1K
R1445	0662057A68	6.2K
R1447	0662057B47	0
R1449	0611079A64	390
R1450	0683962T71	820

Circuit Ref	Motorola Part No.	Description
R1453		
R1455	0662057K31	180
R1457	0662057K01	10
R1458	0611079A64	390
R1459	0611079A64	390
R1460	0680106R01	0.1
R1463	0662057A93	68K
R1464	0662057A73	10K
R1465	0662057A73	10K
R1469	0662057C01	0
R1472	0662057A73	10K
R1473		
R1476	0680194M01	10
R1477	0662057A61	3.3K
R1478	0662057A73	10K
R1479	0662057A61	3.3K
R1480	0611079B27	150K
R1482	0662057B47	0
R1483	0662057A34	240
R1484	0662057A49	1K
R1501	0662057A45	680
R1502	0662057C67	470
R1503	0662057A61	3.3K
R1504	0662057A73	10K
R1505	0662057A69	6.8K
R1506	0662057A87	39K
R1507	0662057A49	1K
R1508	0662057R17	43.2
R1509	0662057P95	100K
R1511	0662057P95	100K
R1513	0662057C76	1.1K
R1514	0662057A97	100K
R1515	0662057A49	1K
R1516	0662057C71	680
R1517	0662057C71	680
R1518	0662057A61	3.3K
R1519	0662057C71	680
R1522	0662057A73	10K
R1524	0662057C71	680
R1526	0662057A97	100K
R1527	0662057A97	100K
R1528	0662057A80	20K
R1532	0662057A95	82K
R1533	0662057A73	10K
R1535	0662057R16	39.2
R1539	0662057A53	1.5K
R1540	0662057A53	1.5K
R1542		
R1544	0662057A49	1K
R1545	0662057A65	4.7K
R1601	0662057A73	10K
R1602	0662057A65	4.7K
R1604	0662057A49	1K
R1605	0662057B10	330K
R1606	0662057B02	150K
R1607	0662057B19	750K

Circuit Ref	Motorola Part No.	Description
R1608	0662057A57	2.2K
R1609	0662057A73	10K
R1610	0662057A82	24K
R1611	0662057A49	1K
R1612	0662057A25	100
R1613	0662057A59	2.7K
R1614	0662057A49	1K
R1615	0662057A49	1K
R1616	0662057A33	220
R1617	0662057A57	2.2K
R1620	0662057A51	1.2K
R1621	0662057A68	6.2K
R1622	0662057A49	1K
R1626	0662057A18	51
R1627	0662057A73	10K
R1628	0662057A55	1.8K
R1629	0662057A67	5.6K
R1630	0662057A53	1.5K
R1631	0662057A18	51
R1632	0662057A82	24K
R1635	0662057B47	0
R1636	0662057A42	510
R1637	0662057A59	2.7K
R1638	0662057A55	1.8K
U1001	4802245J50	UMC5N
U1051	5108278X01	MIXER
U1101	5113805A86	MC74HC4066
U1102	5113805A86	MC74HC4066
U1103	5186144B01	SA616
U1201	5185963A27	63A27
U1250	5185963A33	LP2951
U1377	4802245J50	UMC5N
U1378	4802245J50	UMC5N
U1401	5185130C65	30C65
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5180932W01	LT1490
U1503	5185765B01	H99S-4
U1601	5180929W01	MC1350
Y1101	4880908W08	08W08
Y1102	9186145B02	45B02
*Y1201	4880114R04	XTAL
Y1202	NOTPLACED	

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

* Motorola Depot Servicing only

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

Low Band R2 PCB 8486207B07 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	CAP, 100pF
C0102	NOTPLACED	
C0103	NOTPLACED	
C0104	NOTPLACED	
C0105	NOTPLACED	
C0106	NOTPLACED	
C0107	2113741F25	CAP, 1000pF
C0108	NOTPLACED	
C0111	NOTPLACED	
C0112	2113743E20	CAP, 0.1uF
C0121	2113743E20	CAP, 0.1uF
C0122	2113743E20	CAP, 0.1uF
C0123	NOTPLACED	
C0131	2113740F35	CAP, 22pF
C0132	2113740F35	CAP, 22pF
C0141	2113743E20	CAP, 0.1uF
C0151	2113741F49	CAP, .01uF
C0201	2311049A57	CAPP, 10uF
C0202	2311049A57	CAPP, 10uF
C0203	NOTPLACED	
C0204	2113743E20	CAP, 0.1uF
C0205	NOTPLACED	
C0211	NOTPLACED	
C0212	2311049A57	CAPP, 10uF
C0221	2113743E20	CAP, 0.1uF
C0222	2113743E20	CAP, 0.1uF
C0223	2113743E20	CAP, 0.1uF
C0224	2113740F51	CAP, 100pF
C0225	2113743E20	CAP, 0.1uF
C0226	2113743E20	CAP, 0.1uF
C0227	NOTPLACED	
C0228	2311049A56	CAPP, 4.7uF
C0231	2113743B29	CAP, 1uF
C0232	2113743E20	CAP, 0.1uF
C0233	NOTPLACED	
C0234	2113743E20	CAP, 0.1uF
C0235	2113743E07	CAP, .022uF
C0236	2113743E10	CAP, .033uF
C0237	NOTPLACED	
C0241	2113743E20	CAP, 0.1uF
C0242	NOTPLACED	
C0243	2113740F51	CAP, 100pF
C0244	2113743E20	CAP, 0.1uF
C0245	2113743E20	CAP, 0.1uF
C0246	2113741F49	CAP, .01uF
C0251	2113743E20	CAP, 0.1uF
C0252	2311049A07	CAPP, 1uF
C0253	NOTPLACED	
C0254	2113743E20	CAP, 0.1uF
C0255	2113743E20	CAP, 0.1uF
C0256	2113740F51	CAP, 100pF
C0261	2113743E20	CAP, 0.1uF
C0262	2113740F49	CAP, 82pF
C0265	2113743E20	CAP, 0.1uF
C0266	NOTPLACED	
C0267	2113741F49	CAP, .01uF
C0271	2113741F49	CAP, .01uF
C0272	2113743E20	CAP, 0.1uF
C0273	2113741F37	CAP, 3300pF
C0274	NOTPLACED	
C0275	2311049A99	CAPP, 47uF
C0276	2113741F25	CAP, 1000pF
C0277	2113741F25	CAP, 1000pF
C0290	2311049C01	CAPP, 10uF
C0291	2311049C01	CAPP, 10uF
C0292	2311049C01	CAPP, 10uF
C0293	2311049C01	CAPP, 10uF
C0301	NOTPLACED	
C0302	NOTPLACED	
C0303	NOTPLACED	
C0304	NOTPLACED	
C0305	NOTPLACED	
C0324	NOTPLACED	
C0325	NOTPLACED	
C0331	NOTPLACED	
C0341	NOTPLACED	
C0342	NOTPLACED	
C0343	NOTPLACED	
C0344	NOTPLACED	
C0351	NOTPLACED	
C0352	NOTPLACED	
C0353	NOTPLACED	
C0354	NOTPLACED	
C0421	2113743N48	CAP, 82pF
C0422	2113741F17	CAP, 470pF
C0423	2113741F17	CAP, 470pF
C0426	2113743L09	CAP, 470pF
C0427	2113743L09	CAP, 470pF
C0428	2113743N48	CAP, 82pF
C0429	2113743L09	CAP, 470pF
C0430	2113741F17	CAP, 470pF
C0431	2113741F17	CAP, 470pF
C0441	2113743L09	CAP, 470pF
C0442	2113743L09	CAP, 470pF
C0443	NOTPLACED	
C0445	2113743L09	CAP, 470pF
C0446	2113743L09	CAP, 470pF
C0447	2113743L09	CAP, 470pF
C0448	2113743L09	CAP, 470pF
C0449	2113743L09	CAP, 470pF
C0470	2113743L09	CAP, 470pF
C0471	2113743N48	CAP, 82pF
C0472	2113743N48	CAP, 82pF
C0473	2113743N48	CAP, 82pF
C0474	2113743L09	CAP, 470pF
C0476	2113743L09	CAP, 470pF
C0477	2113743L09	CAP, 470pF
C0478	2113743L09	CAP, 470pF
C0482	2113743L09	CAP, 470pF
C0483	2113743L09	CAP, 470pF
C0484	2113741F17	CAP, 470pF
C0485	2113743L09	CAP, 470pF
C0486	2113743L09	CAP, 470pF
C0487	2113743L09	CAP, 470pF
C0488	2113743L09	CAP, 470pF
C0490	2113743L09	CAP, 470pF
C0491	2113743L09	CAP, 470pF
C0492	2113743L09	CAP, 470pF
C0493	2113743L09	CAP, 470pF
C0494	2113743L09	CAP, 470pF
C0495	2113743L09	CAP, 470pF
C0496	2113743L09	CAP, 470pF
C0497	2113743L09	CAP, 470pF
C0499	2113743L09	CAP, 470pF
C0501	2113741F49	CAP, .01uF
C0502	2113741F17	CAP, 470pF
C0503	2113741F17	CAP, 470pF
C0504	2113741F17	CAP, 470pF
C0505	2113741F17	CAP, 470pF
C0506	2113741F17	CAP, 470pF
C0508	2113741F17	CAP, 470pF
C0509	2113741F17	CAP, 470pF
C0510	2113741F17	CAP, 470pF
C0511	2113741F17	CAP, 470pF
C0512	2113741F17	CAP, 470pF
C0513	2113741F17	CAP, 470pF
C0514	2113741F17	CAP, 470pF
C0515	2113741F17	CAP, 470pF
C0516	2113741F49	CAP, .01uF
C0517	2113743N48	CAP, 82pF
C0518	2113741F17	CAP, 470pF
C0541	2311049A05	CAPP, 0.47uF
C0542	2311049A99	CAPP, 47uF
C0554	NOTPLACED	
C0558	NOTPLACED	
C0559	NOTPLACED	
C0560	2113741F25	CAP, 1000pF
C0575	NOTPLACED	
C0576	NOTPLACED	
C0591	2113743E20	CAP, 0.1uF
C0592	2113743E20	CAP, 0.1uF
C0593	2113741B69	CAP, 0.1uF
C0601	2113741F17	CAP, 470pF
C0603	2380090M24	CAPP, 10uF
C0611	2311049C06	CAPP, 22uF
C0612	2113743E20	CAP, 0.1uF
C0621	NOTPLACED	
C0622	2311049A99	CAPP, 47uF
C0641	2113741F17	CAP, 470pF
C0644	2311049A97	CAPP, 33uF
C0645	2113743E20	CAP, 0.1uF
C0651	NOTPLACED	
C0652	2311049A97	CAPP, 33uF
C0654	2311049A57	CAPP, 10uF
C0655	2113743E20	CAP, 0.1uF
C0661	2311049C05	CAPP, 47uF
C0662	2113741F49	CAP, .01uF
C0663	2113743E20	CAP, 0.1uF
C0671	2113743E20	CAP, 0.1uF
C0681	2113743E20	CAP, 0.1uF
C1001	2113740F56	CAP, 160pF
C1002	2113741F49	CAP, .01uF
C1003	2113740F62	CAP, 300pF
C1004	2113740F53	CAP, 120pF
C1006	2113740F46	CAP, 62pF
C1007	2113740F60	CAP, 240pF
C1008	2113741F25	CAP, 1000pF
C1009	2113740F60	CAP, 240pF
C1010	2113740F46	CAP, 62pF
C1011	2113740F53	CAP, 120pF
C1012	2113740F62	CAP, 300pF
C1013	2113741F49	CAP, .01uF
C1014	2113740F56	CAP, 160pF
C1015	2113741F49	CAP, .01uF
C1016	2113740F55	CAP, 150pF
C1017	2113741F27	CAP, 1200pF
C1019	2113740F60	CAP, 240pF
C1020	2113740F59	CAP, 220pF
C1021	2113740F62	CAP, 300pF
C1022	2113740F59	CAP, 220pF
C1023	2113740F62	CAP, 300pF
C1024	2113740F59	CAP, 220pF
C1025	2113740F60	CAP, 240pF
C1026	2113741F27	CAP, 1200pF
C1027	2113740F55	CAP, 150pF
C1028	2113741F49	CAP, .01uF
C1029	2113741F49	CAP, .01uF
C1030	2113743E20	CAP, 0.1uF
C1031	2113743E20	CAP, 0.1uF
C1032	2113740F48	CAP, 75pF
C1033	2113740F50	CAP, 91pF
C1034	2113740F51	CAP, 100pF

Circuit Ref	Motorola Part No.	Description
C1035	2113740F46	CAP, 62pF
C1036	2113743E20	CAP, 0.1uF
C1037	2113740F59	CAP, 220pF
C1038	2113740F62	CAP, 300pF
C1039	2113740F62	CAP, 300pF
C1040	2113740F59	CAP, 220pF
C1101	2113740F53	CAP, 120pF
C1102	2113740F50	CAP, 91pF
C1103	2113740F58	CAP, 200pF
C1104	2113743E20	CAP, 0.1uF
C1105	2113743E20	CAP, 0.1uF
C1106	2113743E20	CAP, 0.1uF
C1107	2113740F49	CAP, 82pF
C1108	2113743E20	CAP, 0.1uF
C1109	2113740F40	CAP, 36pF
C1110	NOTPLACED	
C1111	2113740L03	CAP, 2.4pF
C1112	2113740F40	CAP, 36pF
C1113	2113743E20	CAP, 0.1uF
C1114	2113743E20	CAP, 0.1uF
C1115	2113740F53	CAP, 120pF
C1116	2113740F41	CAP, 39pF
C1119	2113743E20	CAP, 0.1uF
C1120	NOTPLACED	
C1121	NOTPLACED	
C1122	NOTPLACED	
C1123	2113740F39	CAP, 33pF
C1124	2113743E20	CAP, 0.1uF
C1125	2113743E11	CAP, .039uF
C1126	2113743E20	CAP, 0.1uF
C1127	2311049A57	CAPP, 10uF
C1128	2113743E20	CAP, 0.1uF
C1129	2113740F35	CAP, 22pF
C1130	2113740F47	CAP, 68pF
C1131	NOTPLACED	
C1133	2113743E20	CAP, 0.1uF
C1134	2113743E20	CAP, 0.1uF
C1135	2113743E20	CAP, 0.1uF
C1136	2113743E20	CAP, 0.1uF
C1137	2113740F53	CAP, 120pF
C1138	2113743E20	CAP, 0.1uF
C1139	2113741F49	CAP, .01uF
C1140	2113741F49	CAP, .01uF
C1141	2113743E20	CAP, 0.1uF
C1142	2113743E20	CAP, 0.1uF
C1143	2113743E20	CAP, 0.1uF
C1144	2113743E20	CAP, 0.1uF
C1145	2113741F41	CAP, 4700pF
C1146	2113740F49	CAP, 82pF
C1147	2113740F65	CAP, 390pF
C1148	2113743E20	CAP, 0.1uF
C1149	2113740F53	CAP, 120pF
C1150	2113740F54	CAP, 130pF
C1151	NOTPLACED	
C1152	NOTPLACED	
C1153	NOTPLACED	
C1201	2113743E20	CAP, 0.1uF
C1202	2311049J11	CAPP, 4.7uF
C1203	2113741F49	CAP, .01uF
C1204	2113740F59	CAP, 220pF
C1205	NOTPLACED	
C1206	2113740L37	CAP, 62pF
C1207	2113740F07	CAP, 1.5pF
C1208	2113740A82	CAP, 1500pF
C1209	2311049A57	CAPP, 10uF
C1210	2113743E20	CAP, 0.1uF
C1211	2113741F49	CAP, .01uF
C1212	2311049A07	CAPP, 1uF
C1213	2113743A23	CAP, 0.22uF
C1214	2113743E10	CAP, .033uF
C1215	2113740C37	CAP, 6800pF
C1216	2311049J11	CAPP, 4.7uF
C1217	2113741F49	CAP, .01uF
C1218	2113743E20	CAP, 0.1uF
C1219	2311049J11	CAPP, 4.7uF
C1220	2311049J11	CAPP, 4.7uF
C1221	NOTPLACED	
C1222	2113740F36	CAP, 24pF
C1223	2113741F49	CAP, .01uF
C1224	2113740F49	CAP, 82pF
C1225	2113741F49	CAP, .01uF
C1226	NOTPLACED	
C1227	2113741F49	CAP, .01uF
C1228	NOTPLACED	
C1229	2113741F49	CAP, .01uF
C1230	2113741F49	CAP, .01uF
C1231	2113741F49	CAP, .01uF
C1232	NOTPLACED	
C1233	NOTPLACED	
C1234	NOTPLACED	
C1250	2311049A09	CAPP, 2.2uF
C1251	2113743E20	CAP, 0.1uF
C1252	2113743E05	CAP, .018uF
C1253	2311049J11	CAPP, 4.7uF
C1254	2113741F49	CAP, .01uF
C1304	NOTPLACED	
C1305	NOTPLACED	
C1306	2113740L23	CAP, 16pF
C1307	2113740L27	CAP, 24pF
C1308	2113740F19	CAP, 4.7pF
C1309	NOTPLACED	
C1311	2113741F49	CAP, .01uF
C1312	2113741F49	CAP, .01uF
C1313	2113741F49	CAP, .01uF
C1314	2113740L27	CAP, 24pF
C1315	2113740L27	CAP, 24pF
C1316	2113740F15	CAP, 3.3pF
C1317	2113743E20	CAP, 0.1uF
C1318	2113741F49	CAP, .01uF
C1319	2113741F49	CAP, .01uF
C1320	2113741F49	CAP, .01uF
C1321	2113740F17	CAP, 3.9pF
C1323	2113740L21	CAP, 13pF
C1325	2113741F49	CAP, .01uF
C1326	2113741F49	CAP, .01uF
C1333	2113740L28	CAP, 27pF
C1334	2113740L36	CAP, 56pF
C1335	2113740F19	CAP, 4.7pF
C1336	2113743E20	CAP, 0.1uF
C1337	NOTPLACED	
C1338	2113741F49	CAP, .01uF
C1339	2113741F49	CAP, .01uF
C1340	2113741F49	CAP, .01uF
C1341	2113740L36	CAP, 56pF
C1342	2113740L36	CAP, 56pF
C1343	2113740F15	CAP, 3.3pF
C1344	2113741F49	CAP, .01uF
C1345	2113743E20	CAP, 0.1uF
C1346	2113741F49	CAP, .01uF
C1347	2113741F49	CAP, .01uF
C1348	2113740F17	CAP, 3.9pF
C1349	2113743E20	CAP, 0.1uF
C1350	2113740F31	CAP, 15pF
C1351	2113741F49	CAP, .01uF
C1352	2113741F49	CAP, .01uF
C1354	NOTPLACED	
C1356	NOTPLACED	
C1360	NOTPLACED	
C1361	NOTPLACED	
C1362	NOTPLACED	
C1401	2113741A45	CAP, .01uF
C1402	2113741A45	CAP, .01uF
C1403	NOTPLACED	
C1404	2113741A45	CAP, .01uF
C1405	2113741A45	CAP, .01uF
C1406	NOTPLACED	
C1407	2113741A45	CAP, .01uF
C1408	NOTPLACED	
C1409	NOTPLACED	
C1410	2113741M69	CAP, 0.1uF
C1412	2113741A45	CAP, .01uF
C1413	2113741A45	CAP, .01uF
C1414	2113741A45	CAP, .01uF
C1415	2113741M69	CAP, 0.1uF
C1416	NOTPLACED	
C1417	NOTPLACED	
C1418	2113740A73	CAP, 560pF
C1419	2113741A45	CAP, .01uF
C1420	2113741A45	CAP, .01uF
C1421	NOTPLACED	
C1422	NOTPLACED	
C1423	2113741A45	CAP, .01uF
C1424	2113741A45	CAP, .01uF
C1425	2113741W01	CAP, 1uF
C1426	2113741W01	CAP, 1uF
C1427	2111078B59	CAP, 470pF
C1428	2111078B59	CAP, 470pF
C1429	2111078B58	CAP, 430pF
C1430	2111078B58	CAP, 430pF
C1431	2113741A45	CAP, .01uF
C1432	2113741W01	CAP, 1uF
C1433	2113741W01	CAP, 1uF
C1434	2113741A45	CAP, .01uF
C1435	2113741W01	CAP, 1uF
C1436	2113741A45	CAP, .01uF
C1437	2111078B58	CAP, 430pF
C1438	2111078B58	CAP, 430pF
C1439	2111078B59	CAP, 470pF
C1440	2111078B59	CAP, 470pF
C1441	2111078B52	CAP, 240pF
C1442	2111078B45	CAP, 130pF
C1443	2111078B59	CAP, 470pF
C1444	2111078B59	CAP, 470pF
C1445	2113741A45	CAP, .01uF
C1446	NOTPLACED	
C1447	2111078B52	CAP, 240pF
C1448	2111078B52	CAP, 240pF
C1449	2180060M49	CAP, 180pF
C1450	NOTPLACED	
C1451	2180060M49	CAP, 180pF
C1452	2180060M29	CAP, 27pF
C1453	2180060M42	CAP, 91pF
C1454	2180060M38	CAP, 62pF
C1455	2180060M30	CAP, 30pF
C1456	2180060M40	CAP, 75pF
C1457	2113741A45	CAP, .01uF
C1458	2311049C01	CAPP, 10uF
C1459	2311049C01	CAPP, 10uF
C1460	2113743E20	CAP, 0.1uF
C1461	2113741A45	CAP, .01uF
C1462	2311049C01	CAPP, 10uF
C1463	2113928E01	CAP, 1uF
C1464	2113741A45	CAP, .01uF
C1465	2113928E01	CAP, 1uF

Circuit Ref	Motorola Part No.	Description
C1466	2113741A45	CAP, .01uF
C1467	2113740A46	CAP, 47pF
C1468	2113741A45	CAP, .01uF
C1469	2113741W01	CAP, 1uF
C1470	2113741W01	CAP, 1uF
C1471	2113741A45	CAP, .01uF
C1472	2113741M69	CAP, 0.1uF
C1473	2113741M69	CAP, 0.1uF
C1474	2113741A45	CAP, .01uF
C1475	2113741W01	CAP, 1uF
C1476	2113741A45	CAP, .01uF
C1477	2111078B42	CAP, 100pF
C1478	2111078B42	CAP, 100pF
C1479	2111078B52	CAP, 240pF
C1480	2111078B54	CAP, 300pF
C1481	2111078B54	CAP, 300pF
C1482	2113928E01	CAP, 1uF
C1484	2113741F33	CAP, 2200pF
C1485	2113741A45	CAP, .01uF
C1501	2113741F33	CAP, 2200pF
C1502	2113741F33	CAP, 2200pF
C1503	2113741F33	CAP, 2200pF
C1504	2113741F33	CAP, 2200pF
C1505	2113741F25	CAP, 1000pF
C1506	2113741F25	CAP, 1000pF
C1507	2113741F33	CAP, 2200pF
C1508	2113741F33	CAP, 2200pF
C1509	2311049A07	CAPP, 1uF
C1510	2113741F33	CAP, 2200pF
C1511	2113741F33	CAP, 2200pF
C1512	2113741F33	CAP, 2200pF
C1525	2113743E20	CAP, 0.1uF
C1526	2113740F51	CAP, 100pF
C1527	2113741A45	CAP, .01uF
C1528	2113741A45	CAP, .01uF
C1529	2113741M69	CAP, 0.1uF
C1530	2113741A45	CAP, .01uF
C1531	NOTPLACED	
C1532	NOTPLACED	
C1601	2113743E20	CAP, 0.1uF
C1602	2113740F59	CAP, 220pF
C1603	2113743A23	CAP, 0.22uF
C1604	2113743A23	CAP, 0.22uF
C1605	2311049A57	CAPP, 10uF
C1606	2113740F59	CAP, 220pF
C1607	2113740F51	CAP, 100pF
C1608	2113743A23	CAP, 0.22uF
C1609	2113740F34	CAP, 20pF
C1610	2113741F41	CAP, 4700pF
C1611	2113743E20	CAP, 0.1uF
C1612	2113741F33	CAP, 2200pF

Circuit Ref	Motorola Part No.	Description
C1613	2113740F54	CAP, 130pF
C1614	2113741F24	CAP, 910pF
C1615	NOTPLACED	
C1616	2113740F40	CAP, 36pF
C1618	2113743A23	CAP, 0.22uF
C1619	2311049A57	CAPP, 10uF
C1620	2113741F25	CAP, 1000pF
C1621	NOTPLACED	
C1622	2113743E20	CAP, 0.1uF
C1623	2113740F60	CAP, 240pF
C1624	2113741F37	CAP, 3300pF
C1625	2113740F29	CAP, 12pF
C1626	2113740F59	CAP, 220pF
C1627	2113743A23	CAP, 0.22uF
C1628	2113743E20	CAP, 0.1uF
C1629	2113740F39	CAP, 33pF
C1631	2311049A57	CAPP, 10uF
C1632	2113743E20	CAP, 0.1uF
C1633	2113743A23	CAP, 0.22uF
C1634	2113741A45	CAP, .01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H
CR1314	4880154K03	MMBD353
D0101	4813825A05	MMBD301
D0151	4813833C02	MMBD6100
D0179	4813833C02	MMBD6100
D0201	NOTPLACED	
D0301	NOTPLACED	
D0621	4813833C02	MMBD6100
D0651	4813833C02	MMBD6100
D0660	4813833C02	MMBD6100
D0661	4813833C02	MMBD6100
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4813825A05	MMBD301
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100
D1601	4880154K03	MMBD353
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
E1401	2408380X02	FERRITE BEAD
E1403	2408380X02	FERRITE BEAD
F0401	6580542Z01	FUSE
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	CRYSTAL FILTER, 10.7 MHZ

Circuit Ref	Motorola Part No.	Description
FL1104	9180468V04	CFUCJ455F
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J0401	0902636Y02	CONN, 12-PIN, CONTROL HEAD
J0451	0902636Y01	CONN, 18-PIN, EXPANSION BOARD
J0501	0986105B01	CONN, 20-PIN, ACCESSORY
J0551	0905505Y04	CONN, 40-PIN, INTERNAL OPTION
J0552	0905505Y03	CONN, 18-PIN, RS232
J0601	0986165B01	DC POWER CONNECTOR
J1401	0986166B02	MINI-U ANTENNA CONNECTOR
L0481	NOTPLACED	
L0482	NOTPLACED	
L1001	2408382A11	IDCTR, 130nH
L1002	2408382C11	IDCTR, 130nH
L1003	2408382A11	IDCTR, 130nH
L1004	2408382C11	IDCTR, 130nH
L1005	2408382A11	IDCTR, 130nH
L1006	2408382A11	IDCTR, 130nH
L1007	2408382C11	IDCTR, 130nH
L1008	2408382A11	IDCTR, 130nH
L1009	2408382C11	IDCTR, 130nH
L1010	2408382A11	IDCTR, 130nH
L1011	2462587N68	IDCTR, 1uH
L1012	2462587N57	IDCTR, 220nH
L1013	2462587N59	IDCTR, 330nH
L1014	2462587N57	IDCTR, 220nH
L1101	2462587N33	IDCTR, 1.8uH
L1102	2408383X07	IDCTR, 3.3uH
L1103	2462587N33	IDCTR, 1.8uH
L1104	2480289M10	IDCTR, 6.8uH
L1105	2480289M10	IDCTR, 6.8uH
L1106	2462587N33	IDCTR, 1.8uH
L1107	2480289M09	IDCTR, 5.6uH
L1108	NOTPLACED	
L1109	NOTPLACED	
L1110	2480289M18	IDCTR, 33uH
L1111	2408383X07	IDCTR, 3.3uH
L1112	2483411T35	IDCTR, 6.8uH
L1201	2480289M17	IDCTR, 27uH
L1202	2462587Q20	IDCTR, 2.2uH
L1204	NOTPLACED	
L1205	2462587N62	IDCTR, 560nH
L1206	2480289M17	IDCTR, 27uH
L1207	NOTPLACED	
L1302	2408382D19	IDCTR, 491nH
L1303	2480289M17	IDCTR, 27uH

Circuit Ref	Motorola Part No.	Description
L1304	2462587N66	IDCTR, 820nH
L1305	2480289M17	IDCTR, 27uH
L1306	2480289M17	IDCTR, 27uH
L1307	2480289M17	IDCTR, 27uH
L1309	2480289M17	IDCTR, 27uH
L1310	2462587N60	IDCTR, 390nH
L1311	2480289M17	IDCTR, 27uH
L1313	2408382D19	IDCTR, 491nH
L1314	2480289M18	IDCTR, 33uH
L1315	2462587N69	IDCTR, 1.2uH
L1316	2480289M18	IDCTR, 33uH
L1317	2480289M18	IDCTR, 33uH
L1318	2480289M18	IDCTR, 33uH
L1321	2462587N58	IDCTR, 270nH
L1322	2480289M18	IDCTR, 33uH
L1324	2480289M18	IDCTR, 33uH
L1401	NOTPLACED	
L1402	2462587U09	IDCTR, 4.7uH
L1403	2462587U09	IDCTR, 4.7uH
L1404	2462587N56	IDCTR, 180nH
L1405	NOTPLACED	
L1406	2408381X36	IDCTR, 250.974nH
L1413	2408381X17	IDCTR, 88.470nH
L1414	2408381X17	IDCTR, 88.470nH
L1415	2485873L02	IDCTR, 25nH
L1416	2485873L02	IDCTR, 25nH
L1417	2485873L02	IDCTR, 25nH
L1418	2408381X17	IDCTR, 88.470nH
L1419	2480289M17	IDCTR, 27uH
L1420	2408381X31	IDCTR, 196.876nH
L1421	2408381X27	IDCTR, 150.499nH
L1422	2408381X24	IDCTR, 133.304nH
L1423	2408381X15	IDCTR, 78.727nH
L1424	2408384A08	IDCTR, 82nH
L1425	2485873L02	IDCTR, 25nH
L1426	2485873L02	IDCTR, 25nH
L1601	2483411T45	IDCTR, 47uH
L1602	2483411T45	IDCTR, 47uH
L1603	2483411T73	IDCTR, 1uH
L1604	2483411T45	IDCTR, 47uH
L1605	2483411T41	IDCTR, 22uH
L1606	2462587T30	IDCTR, 1uH
L1607	2462587T30	IDCTR, 1uH
M1401	2686201B01	HEATSINK
Q0110	4880048M01	DTC144EKA
Q0151	4880048M01	DTC144EKA
Q0171	4880048M01	DTC144EKA
Q0173	4880052M01	RXT-A28
Q0177	4880048M01	DTC144EKA
Q0181	4880048M01	DTC144EKA
Q0183	4880048M01	DTC144EKA

Circuit Ref	Motorola Part No.	Description
Q0185	4880048M01	DTC144EKA
Q0271	4880214G02	MMBT3904
Q0641	4880048M01	DTC144EKA
Q0661	4805921T02	FMC2A
Q0662	4880214G02	MMBT3904
Q0663	4880048M01	DTC144EKA
Q0681	4880052M01	RXT-A28
Q1001	4880182D44	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1107	4880214G02	MMBT3904
Q1201	4813824A17	MMBT3906
Q1202	4880182D44	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880182D44	MMBR951
Q1305	4880182D44	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880182D44	MMBR951
Q1308	4880182D44	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	MRF1550
Q1403	4886136B01	MRF1550
Q1404	NOTPLACED	
Q1501	4880141L03	BCW68G
Q1502	4880214G02	MMBT3904
Q1503	4880214G02	MMBT3904
Q1504	4880214G02	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4880214G02	MMBT3904
Q1601	4813824A17	MMBT3906
Q1602	4880048M01	DTC144EKA
Q1603	4880214G02	MMBT3904
Q1604	4880214G02	MMBT3904
Q1605	4880214G02	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4880214G02	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R0101	0662057A73	RES, 10K
R0102	0662057A65	RES, 4.7K
R0103	0662057A01	RES, 10
R0104	0662057A73	RES, 10K
R0105	0662057A97	RES, 100K
R0106	NOTPLACED	
R0107	NOTPLACED	
R0108	0662057A57	RES, 2.2K
R0110	NOTPLACED	
R0111	0662057B47	RES, 0
R0112	NOTPLACED	
R0113	0662057A73	RES, 10K
R0114	0662057A73	RES, 10K
R0115	0662057A73	RES, 10K
R0116	NOTPLACED	
R0117	0662057A63	RES, 3.9K
R0121	0662057A97	RES, 100K
R0131	0662057B46	RES, 10MEG
R0132	0662057B10	RES, 330K
R0151	0662057A82	RES, 24K
R0152	0662057A82	RES, 24K
R0170	0662057A73	RES, 10K
R0171	0662057A65	RES, 4.7K
R0172	0662057A73	RES, 10K
R0173	0662057A65	RES, 4.7K
R0174	0662057A73	RES, 10K
R0175	0662057A73	RES, 10K
R0176	0662057A84	RES, 30K
R0177	0662057A65	RES, 4.7K
R0178	0662057A89	RES, 47K
R0179	0662057A89	RES, 47K
R0181	0662057A65	RES, 4.7K
R0182	0662057A89	RES, 47K
R0183	0662057A65	RES, 4.7K
R0184	0662057A89	RES, 47K
R0185	0662057A65	RES, 4.7K
R0186	0662057A89	RES, 47K
R0201	0662057A25	RES, 100
R0202	0662057A43	RES, 560
R0203	0662057A25	RES, 100
R0204	0662057A43	RES, 560
R0205	0662057A73	RES, 10K
R0206	0662057A73	RES, 10K
R0207	0662057A57	RES, 2.2K
R0208	0662057A57	RES, 2.2K
R0211	0660076E70	RES, 7.5K
R0212	0660076E70	RES, 7.5K
R0220	NOTPLACED	
R0221	0662057A82	RES, 24K
R0222	0662057A82	RES, 24K
R0223	0662057A84	RES, 30K
R0224	0662057A71	RES, 8.2K
R0225	NOTPLACED	
R0226	NOTPLACED	
R0227	NOTPLACED	
R0228	0662057B47	RES, 0
R0229	0662057A01	RES, 10
R0241	0662057A89	RES, 47K
R0242	0662057B47	RES, 0
R0251	0662057A89	RES, 47K
R0252	0662057A91	RES, 56K
R0253	0662057A97	RES, 100K
R0254	0662057A73	RES, 10K
R0255	0662057A73	RES, 10K
R0256	0662057A97	RES, 100K
R0257	0662057A57	RES, 2.2K
R0261	0662057A73	RES, 10K
R0262	0662057B08	RES, 270K
R0265	0662057A82	RES, 24K
R0266	NOTPLACED	
R0267	0662057A89	RES, 47K
R0268	0662057A73	RES, 10K
R0269	0662057A41	RES, 470
R0273	0662057A82	RES, 24K
R0274	NOTPLACED	
R0275	0662057A73	RES, 10K
R0276	0662057A77	RES, 15K
R0323	NOTPLACED	
R0324	NOTPLACED	
R0331	NOTPLACED	
R0332	NOTPLACED	
R0333	NOTPLACED	
R0335	NOTPLACED	
R0341	NOTPLACED	
R0342	NOTPLACED	
R0343	NOTPLACED	
R0344	NOTPLACED	
R0345	NOTPLACED	
R0346	NOTPLACED	
R0347	NOTPLACED	
R0401	0662057A33	RES, 220
R0407	0662057M26	RES, 10
R0408	0662057A25	RES, 100
R0409	0662057M26	RES, 10
R0412	0662057B47	RES, 0
R0441	0662057B47	RES, 0
R0442	0662057A49	RES, 1K
R0467	0662057M26	RES, 10
R0468	0662057A97	RES, 100K
R0481	0662057B47	RES, 0
R0482	0662057B47	RES, 0
R0508	0662057A41	RES, 470
R0509	0662057B47	RES, 0
R0510	0662057A65	RES, 4.7K
R0511	0662057A97	RES, 100K
R0512	0662057A77	RES, 15K
R0525	0662057A97	RES, 100K
R0529	0662057A89	RES, 47K
R0530	0662057A81	RES, 22K
R0531	0662057A43	RES, 560
R0533	0662057B47	RES, 0
R0535	0662057A49	RES, 1K
R0537	0662057A33	RES, 220
R0538	0662057A33	RES, 220
R0539	0662057A65	RES, 4.7K
R0541	0662057A83	RES, 27K
R0542	NOTPLACED	
R0543	0662057A97	RES, 100K
R0555	0662057A25	RES, 100
R0556	0662057A25	RES, 100
R0591	0662057A82	RES, 24K
R0592	0662057A01	RES, 10
R0593	0662057A97	RES, 100K
R0611	0662057A91	RES, 56K
R0612	0662057A65	RES, 4.7K
R0621	0662057A82	RES, 24K
R0641	0662057A73	RES, 10K
R0642	0660076E70	RES, 7.5K
R0643	0660076E51	RES, 1.2K
R0651	0662057A01	RES, 10
R0652	0662057A01	RES, 10
R0661	0662057A49	RES, 1K
R0662	0662057B02	RES, 150K
R0671	0662057A84	RES, 30K
R0672	0662057A73	RES, 10K
R0681	0662057A79	RES, 18K
R0682	0662057A93	RES, 68K
R1001	0662057A01	RES, 10
R1002	0662057A05	RES, 15
R1003	0662057A41	RES, 470
R1004	0662057A59	RES, 2.7K
R1005	0662057A31	RES, 180
R1006	0662057A73	RES, 10K
R1007	0662057A71	RES, 8.2K
R1008	0662057A65	RES, 4.7K
R1009	NOTPLACED	
R1010	NOTPLACED	
R1011	NOTPLACED	
R1101	0662057A18	RES, 51
R1102	0662057A78	RES, 16K
R1103	0662057A39	RES, 390
R1104	0662057A71	RES, 8.2K
R1106	0662057A25	RES, 100
R1107	0662057A68	RES, 6.2K
R1108	0662057A61	RES, 3.3K
R1109	0662057A37	RES, 330
R1110	0662057A25	RES, 100
R1111	0662057A17	RES, 47
R1113	0662057A64	RES, 4.3K
R1114	0662057A64	RES, 4.3K

Circuit Ref	Motorola Part No.	Description
R1115	0662057A75	RES, 12K
R1116	NOTPLACED	
R1117	0662057A37	RES, 330
R1118	0662057A56	RES, 2K
R1119	0662057A83	RES, 27K
R1120	0662057A18	RES, 51
R1121	0662057A71	RES, 8.2K
R1122	0662057A73	RES, 10K
R1123	0662057A51	RES, 1.2K
R1124	NOTPLACED	
R1125	NOTPLACED	
R1126	NOTPLACED	
R1127	NOTPLACED	
R1128	0662057A73	RES, 10K
R1129	0662057A73	RES, 10K
R1130	0662057A73	RES, 10K
R1131	0662057A77	RES, 15K
R1132	0662057A58	RES, 2.4K
R1133	0662057A61	RES, 3.3K
R1134	0662057A05	RES, 15
R1135	0662057A20	RES, 62
R1136	0662057A45	RES, 680
R1137	0662057A75	RES, 12K
R1138	0662057A01	RES, 10
R1139	0611077A12	RES, 2.7
R1140	0662057A39	RES, 390
R1141	0662057A55	RES, 1.8K
R1201	0662057B47	RES, 0
R1202	NOTPLACED	
R1203	0662057B02	RES, 150K
R1204	0662057B47	RES, 0
R1205	0662057A45	RES, 680
R1206	0662057A41	RES, 470
R1207	NOTPLACED	
R1208	0662057A18	RES, 51
R1209	0662057A61	RES, 3.3K
R1210	0662057A33	RES, 220
R1211	0662057B14	RES, 470K
R1212	0662057A25	RES, 100
R1213	0662057A45	RES, 680
R1214	0662057A54	RES, 1.6K
R1215	0662057A21	RES, 68
R1216	0662057A18	RES, 51
R1217	0662057A25	RES, 100
R1218	0662057A17	RES, 47
R1219	0662057A17	RES, 47
R1220	0662057A17	RES, 47
R1221	0662057B47	RES, 0
R1222	NOTPLACED	
R1306	0662057B47	RES, 0
R1307	0662057A19	RES, 56
R1308	0662057A19	RES, 56
R1309	0662057A41	RES, 470
R1311	0662057A73	RES, 10K
R1312	0662057A51	RES, 1.2K
R1313	0662057A51	RES, 1.2K
R1314	0662057A37	RES, 330
R1315	0662057A61	RES, 3.3K
R1316	0662057A45	RES, 680
R1317	0662057A09	RES, 22
R1318	0662057A41	RES, 470
R1319	0662057A01	RES, 10
R1320	0662057A41	RES, 470
R1325	0662057B47	RES, 0
R1326	0662057A19	RES, 56
R1327	0662057A19	RES, 56
R1328	0662057A41	RES, 470
R1330	0662057A73	RES, 10K
R1331	0662057A51	RES, 1.2K
R1332	0662057A51	RES, 1.2K
R1333	0662057A37	RES, 330
R1334	0662057A61	RES, 3.3K
R1335	0662057A47	RES, 820
R1336	0662057A09	RES, 22
R1337	0662057A22	RES, 75
R1338	0662057A27	RES, 120
R1339	0662057A22	RES, 75
R1340	0662057A49	RES, 1K
R1341	0662057A25	RES, 100
R1342	0662057A25	RES, 100
R1343	0662057C55	RES, 150
R1344	0662057A49	RES, 1K
R1345	0662057A25	RES, 100
R1346	0662057A25	RES, 100
R1347	0662057C55	RES, 150
R1376	0662057A65	RES, 4.7K
R1402	0611079A64	RES, 390
R1404	0680194M18	RES, 51
R1405	0680194M18	RES, 51
R1406	0662057A73	RES, 10K
R1407	0662057A73	RES, 10K
R1409	0682089V01	RES, .01
R1410	0683962T52	RES, 130
R1411	0662057C99	RES, 10K
R1412	NOTPLACED	
R1413	0680194M01	RES, 10
R1414	0680194M01	RES, 10
R1415	NOTPLACED	
R1416	0680194M01	RES, 10
R1417	0680194M01	RES, 10
R1418	0680194M01	RES, 10
R1419	0680194M01	RES, 10
R1420	0680194M01	RES, 10
R1421	0680194M01	RES, 10
R1422	0680194M01	RES, 10
R1423	0680194M01	RES, 10
R1424	0662057D10	RES, 27K
R1425	0662057D10	RES, 27K
R1440	0662057A25	RES, 100
R1441	NOTPLACED	
R1442	0662057B47	RES, 0
R1443	0662057A49	RES, 1K
R1444	0662057A33	RES, 220
R1445	0662057A68	RES, 6.2K
R1446	NOTPLACED	
R1447	0662057B47	RES, 0
R1448	NOTPLACED	
R1449	0611079A64	RES, 390
R1450	0683962T71	RES, 820
R1451	NOTPLACED	
R1453	0662057K31	RES, 180
R1454	0662057K31	RES, 180
R1455	0662057K31	RES, 180
R1457	0662057K01	RES, 10
R1458	0611079A64	RES, 390
R1459	0611079A64	RES, 390
R1460	0680106R01	RES, 0.1
R1463	0662057A75	RES, 12K
R1464	0662057A61	RES, 3.3K
R1465	0662057A61	RES, 3.3K
R1466	NOTPLACED	
R1467	NOTPLACED	
R1468	NOTPLACED	
R1469	0662057C01	RES, 0
R1470	NOTPLACED	
R1471	NOTPLACED	
R1472	0662057A73	RES, 10K
R1473	0680194M01	RES, 10
R1474	0680194M01	RES, 10
R1475	0680194M01	RES, 10
R1476	0680194M01	RES, 10
R1477	0662057A61	RES, 3.3K
R1478	0662057A73	RES, 10K
R1479	0662057A61	RES, 3.3K
R1480	0662057D10	RES, 27K
R1482	0662057B47	RES, 0
R1483	0662057A34	RES, 240
R1484	0662057A49	RES, 1K
R1501	0662057A45	RES, 680
R1502	0662057C67	RES, 470
R1503	0662057A61	RES, 3.3K
R1504	0662057A73	RES, 10K
R1505	0662057A69	RES, 6.8K
R1506	0662057A87	RES, 39K
R1507	0662057A49	RES, 1K
R1508	0662057R17	RES, 43.2
R1509	0662057P95	RES, 100K
R1510	NOTPLACED	
R1511	0662057P95	RES, 100K
R1512	NOTPLACED	
R1513	0662057C76	RES, 1.1K
R1514	0662057A97	RES, 100K
R1515	0662057A49	RES, 1K
R1516	0662057C71	RES, 680
R1517	0662057C71	RES, 680
R1518	0662057A61	RES, 3.3K
R1519	0662057C71	RES, 680
R1522	0662057A73	RES, 10K
R1523	NOTPLACED	
R1524	0662057C71	RES, 680
R1525	NOTPLACED	
R1526	0662057A97	RES, 100K
R1527	0662057A97	RES, 100K
R1528	0662057A80	RES, 20K
R1532	0662057A95	RES, 82K
R1533	0662057A73	RES, 10K
R1535	0662057R16	RES, 39.2
R1539	0662057A53	RES, 1.5K
R1540	0662057A53	RES, 1.5K
R1542	0662057A49	RES, 1K
R1543	0662057A49	RES, 1K
R1544	0662057A90	RES, 51K
R1545	0662057A65	RES, 4.7K
R1601	0662057A73	RES, 10K
R1602	0662057A65	RES, 4.7K
R1604	0662057A49	RES, 1K
R1605	0662057B10	RES, 330K
R1606	0662057B02	RES, 150K
R1607	0662057B19	RES, 750K
R1608	0662057A57	RES, 2.2K
R1609	0662057A73	RES, 10K
R1610	0662057A82	RES, 24K
R1611	0662057A49	RES, 1K
R1612	0662057A25	RES, 100
R1613	0662057A59	RES, 2.7K
R1614	0662057A49	RES, 1K
R1615	0662057A49	RES, 1K
R1616	0662057A33	RES, 220
R1617	0662057A57	RES, 2.2K
R1620	0662057A51	RES, 1.2K
R1621	0662057A68	RES, 6.2K
R1622	0662057A49	RES, 1K
R1626	0662057A18	RES, 51
R1627	0662057A73	RES, 10K

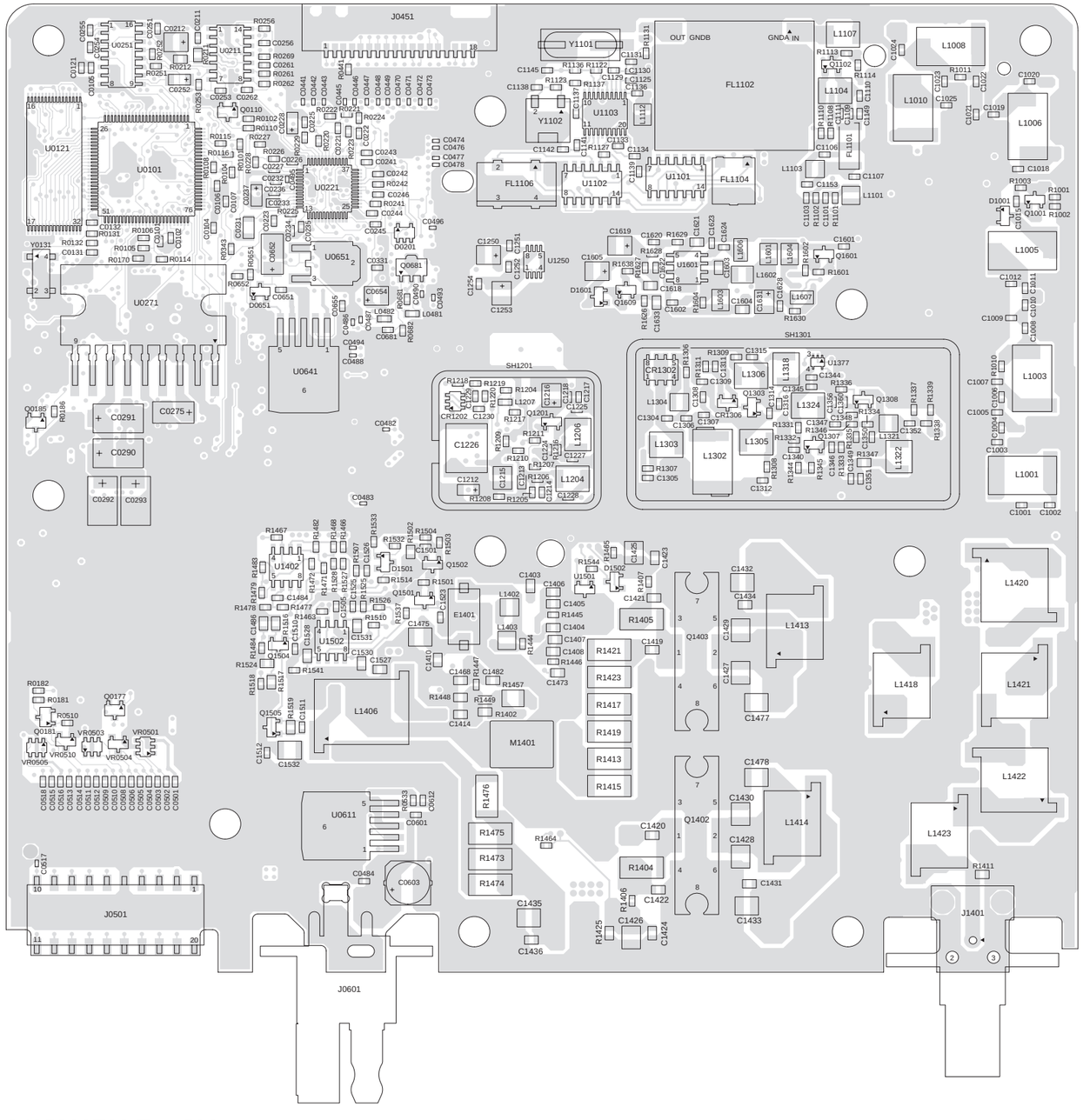
Circuit Ref	Motorola Part No.	Description
R1628	0662057A55	RES, 1.8K
R1629	0662057A67	RES, 5.6K
R1630	0662057A53	RES, 1.5K
R1631	0662057A18	RES, 51
R1632	0662057A82	RES, 24K
R1633	NOTPLACED	
R1635	0662057B47	RES, 0
R1636	0662057A42	RES, 510
R1637	0662057A59	RES, 2.7K
R1638	0662057A55	RES, 1.8K
SH1201	NOTPLACED	
SH1202	NOTPLACED	
SH1301	NOTPLACED	
SH1302	2680473U01	VCO SHIELD
U0101	5102226J56	MC68HC11FL0
U0111	5102463J64	EEPROM
U0121	5186137B01	FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	MC3403
U0221	5185130C53	ASFIC COMPANDER IC
U0251	5184704M60	MUX/DEMUX
U0271	5109699X01	AUDIO PA
U0301	NOTPLACED	
U0331	NOTPLACED	
U0341	NOTPLACED	
U0342	NOTPLACED	
U0351	NOTPLACED	
U0611	5183308X01	LM2941
U0641	5183308X01	LM2941
U0651	5113816A07	MC78M05
U0652	5113815A02	MC33064
U0653	NOTPLACED	
U1001	4809939C05	UMC5N
U1051	5108278X01	MIXER
U1101	5102463J52	MC74HC4066
U1102	5102463J52	MC74HC4066
U1103	5186144B01	SA616
U1201	5185963A27	FRACN SYNTHESIZER IC
U1250	5185963A33	LP2951
U1377	4809939C05	UMC5N
U1378	4809939C05	UMC5N
U1401	5185130C65	LDMOS PREDRIVER IC
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5109731C21	LM6142BIM
U1503	5185765B26	POWER CONTROL IC
U1601	5180929W01	MC1350
VR0151	4813830A15	MMBZ5232B
VR0501	4805656W09	MMQA20VT1
VR0503	4805656W09	MMQA20VT1
VR0504	4813830A40	MMBZ5257B
VR0505	4805656W09	MMQA20VT1
VR0509	4813830A40	MMBZ5257B
VR0510	4813830A40	MMBZ5257B
VR0537	4813830A15	MMBZ5232B
VR0541	4813830A27	MMBZ5244B
VR0601	4813832C77	TRANSIENT SUPPRESSOR
VR0621	4813830A15	MMBZ5232B
VR0671	NOTPLACED	
Y0131	4880113R19	CRYSTAL, 38.4 KHZ
Y1101	4880908W08	CRYSTAL, 10.245 MHZ
Y1102	9186145B02	DISCRIMINATOR, 455 KHZ
*Y1201	4880114R04	CRYSTAL, 16.8 MHZ
Y1202	NOTPLACED	

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from CCSD (formerly AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

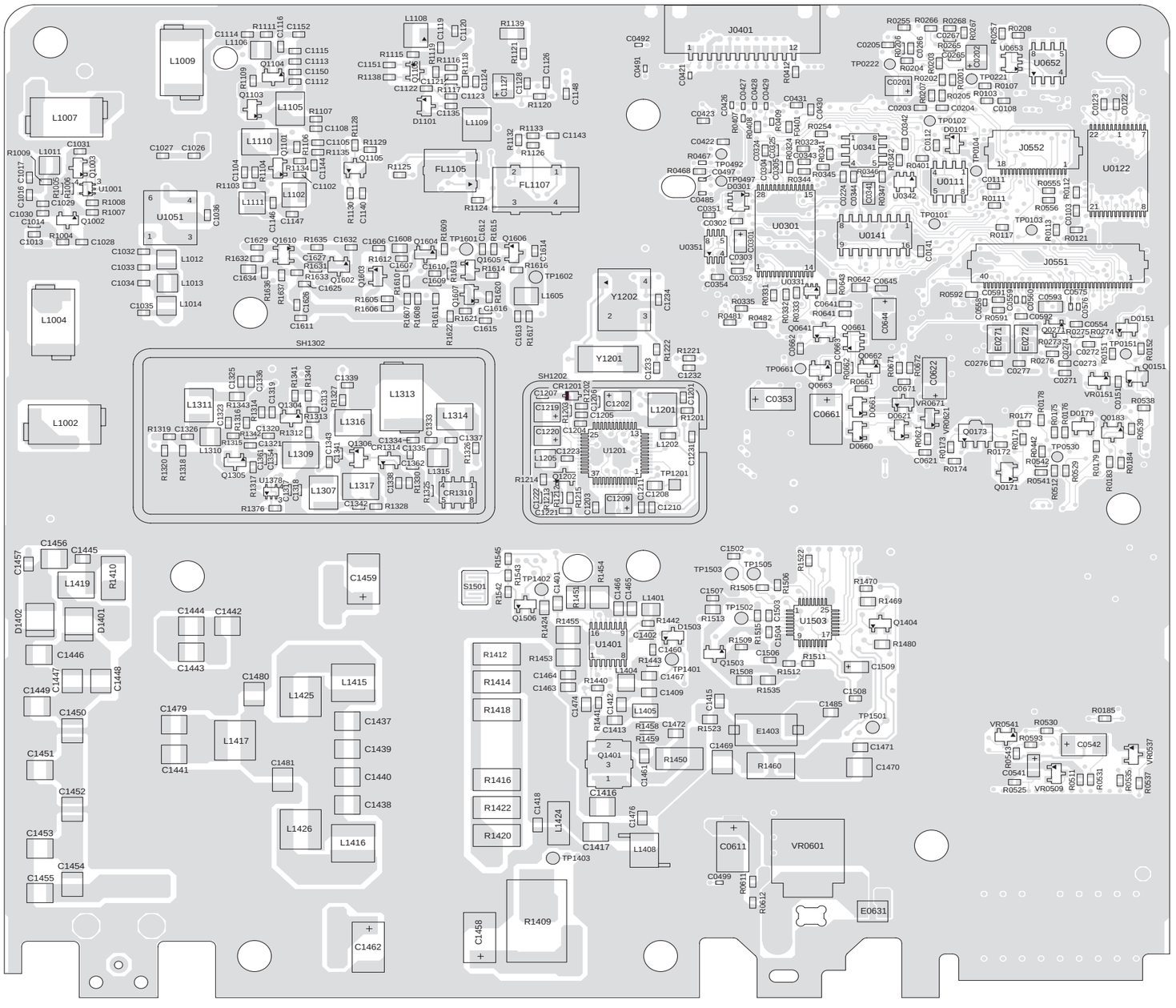
4.0 Low Band Range 3 (42-50 MHz) PCBs, Schematics, and Parts Lists



FL0830651-O

Low Band Range 3 (42-50 MHz) PCB 8485908Z02 Top Side

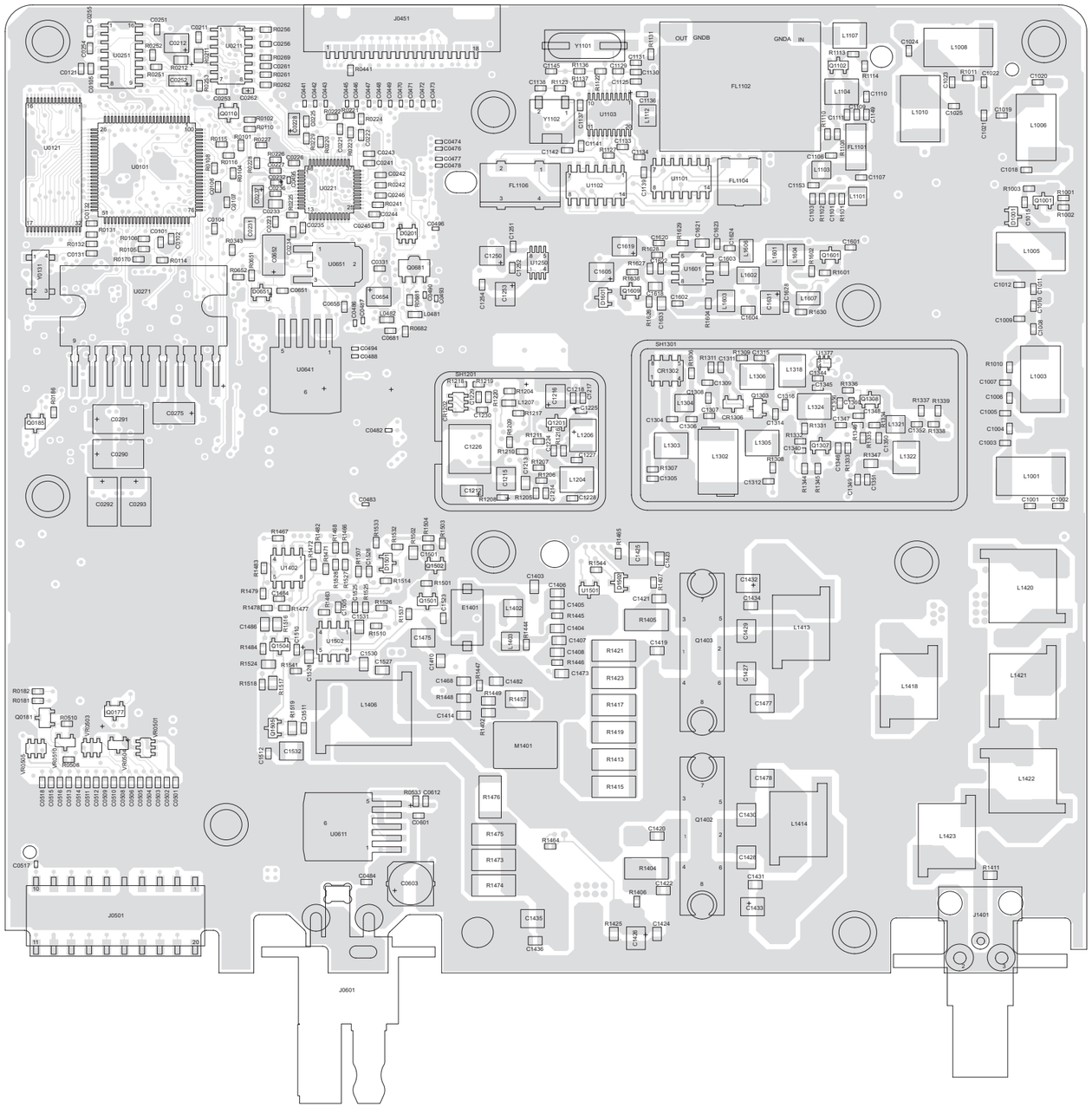
6881091C63-C



FL0830652-O

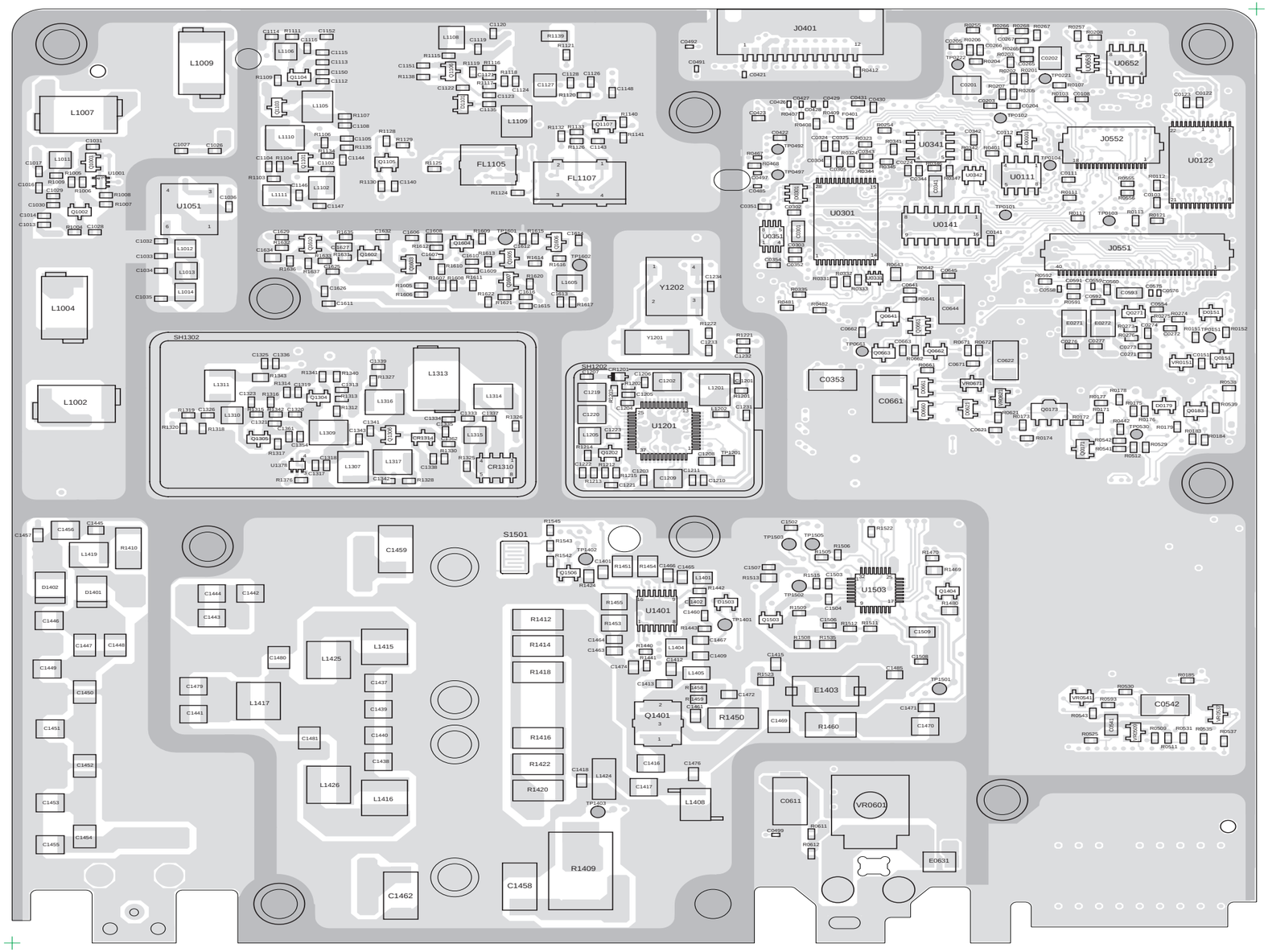
Low Band Range 3 (42-50 MHz) PCB 8485908Z02 Bottom Side

6881091C63-C



Low Band Range 3 (42-50 MHz) PCB 8485908Z04 Top Side

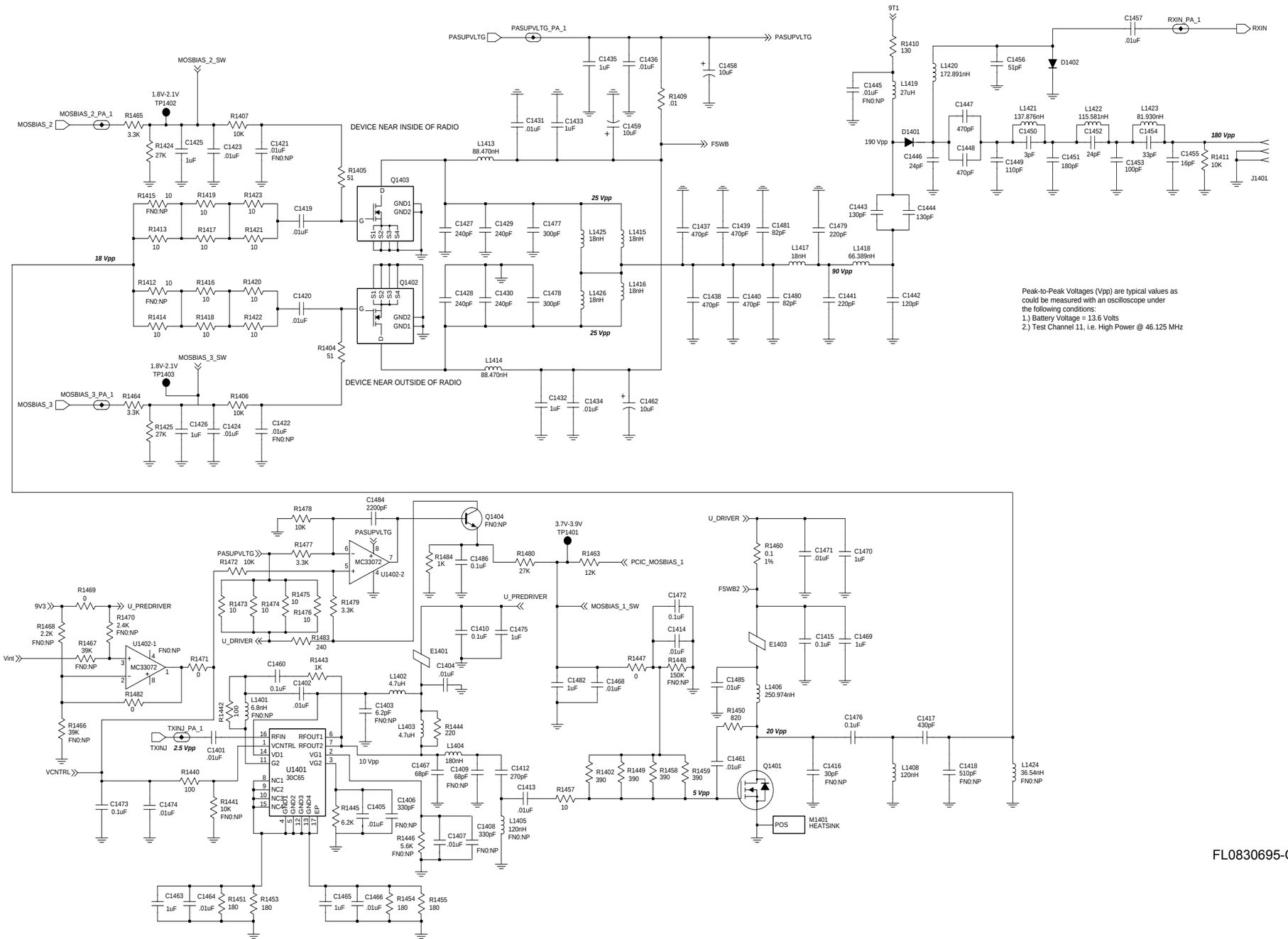
6881091C63-C



ZWG0131048-O

Low Band Range 3 (42-50 MHz) PCB 8485908Z04 Bottom Side

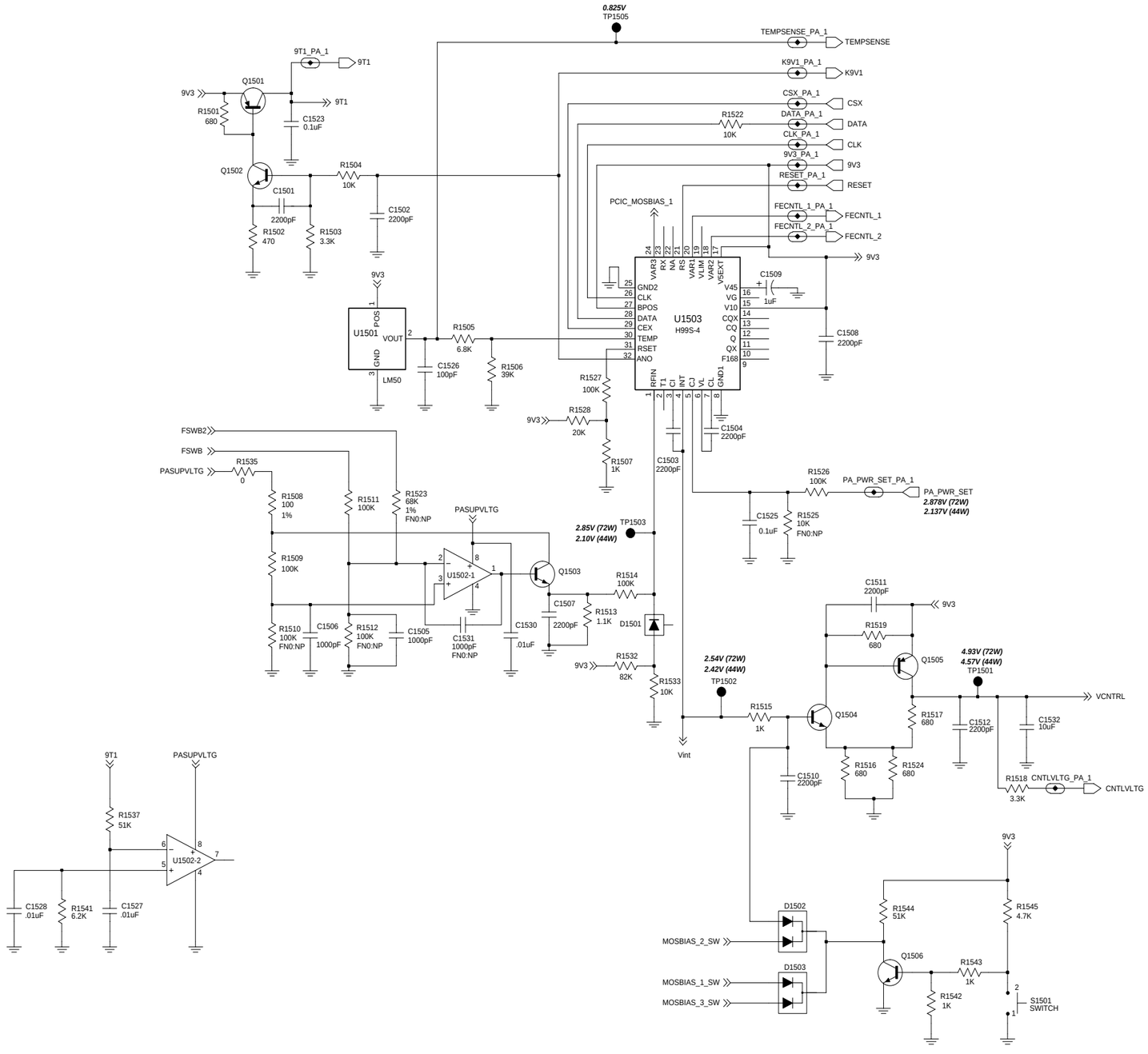
6881091C63-C



FL0830695-O

Low Band Range 3 (42-50 MHz) Power Amplifier Sheet 1 of 2

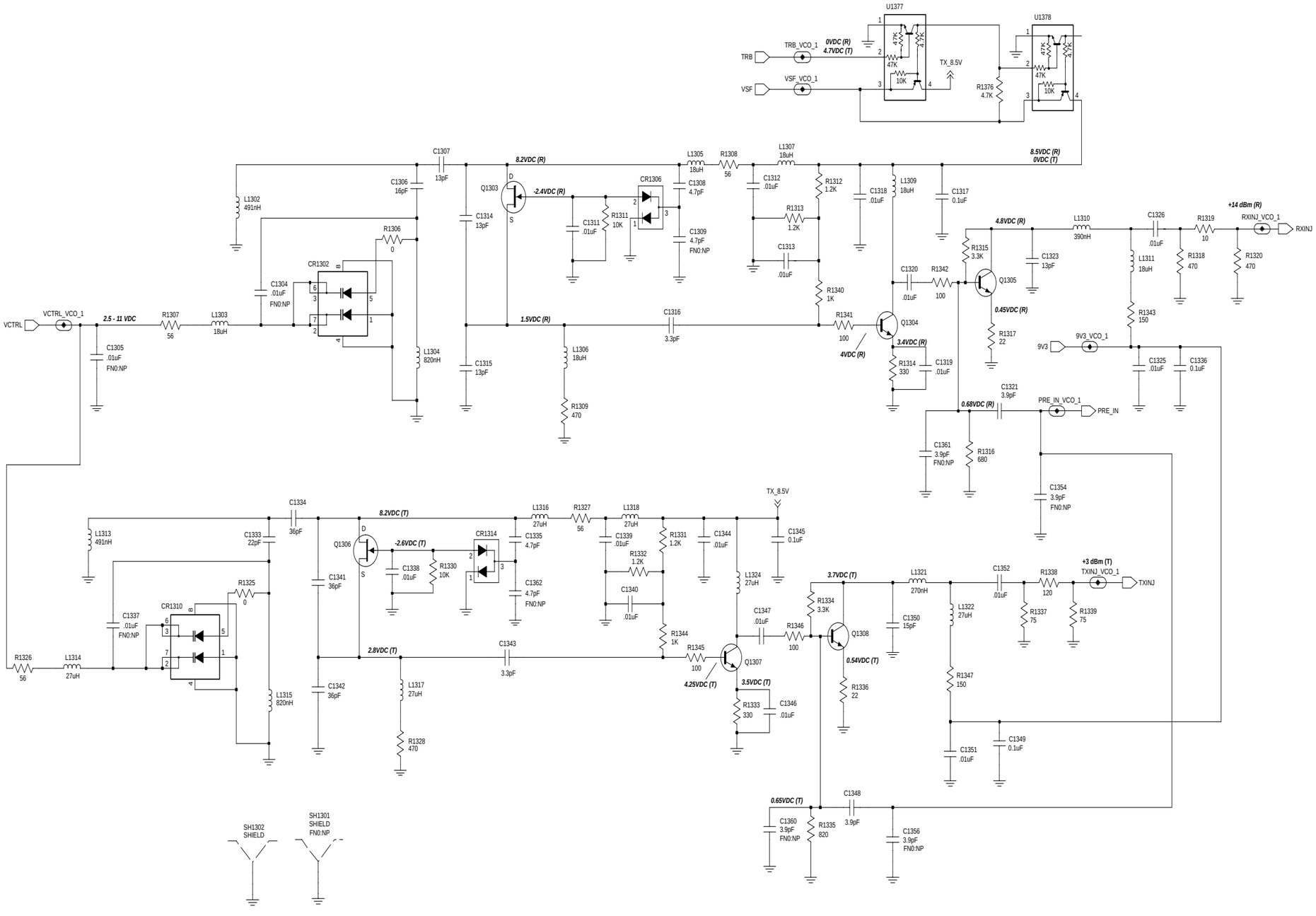
6881091C63-C



FL0830696-O

Low Band Range 3 (42-50 MHz) Power Amplifier Sheet 2 of 2

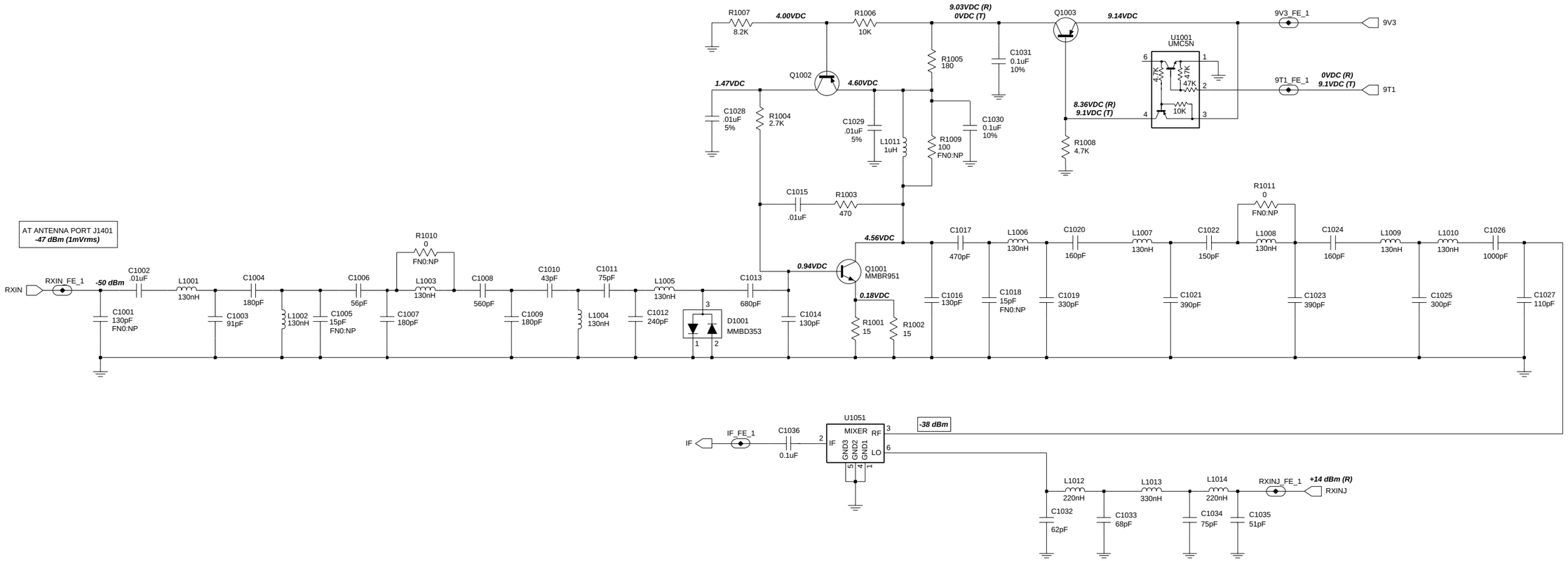
6881091C63-C



Low Band Range 3 (42-50 MHz) Voltage Controlled Oscillator

6881091C63-C

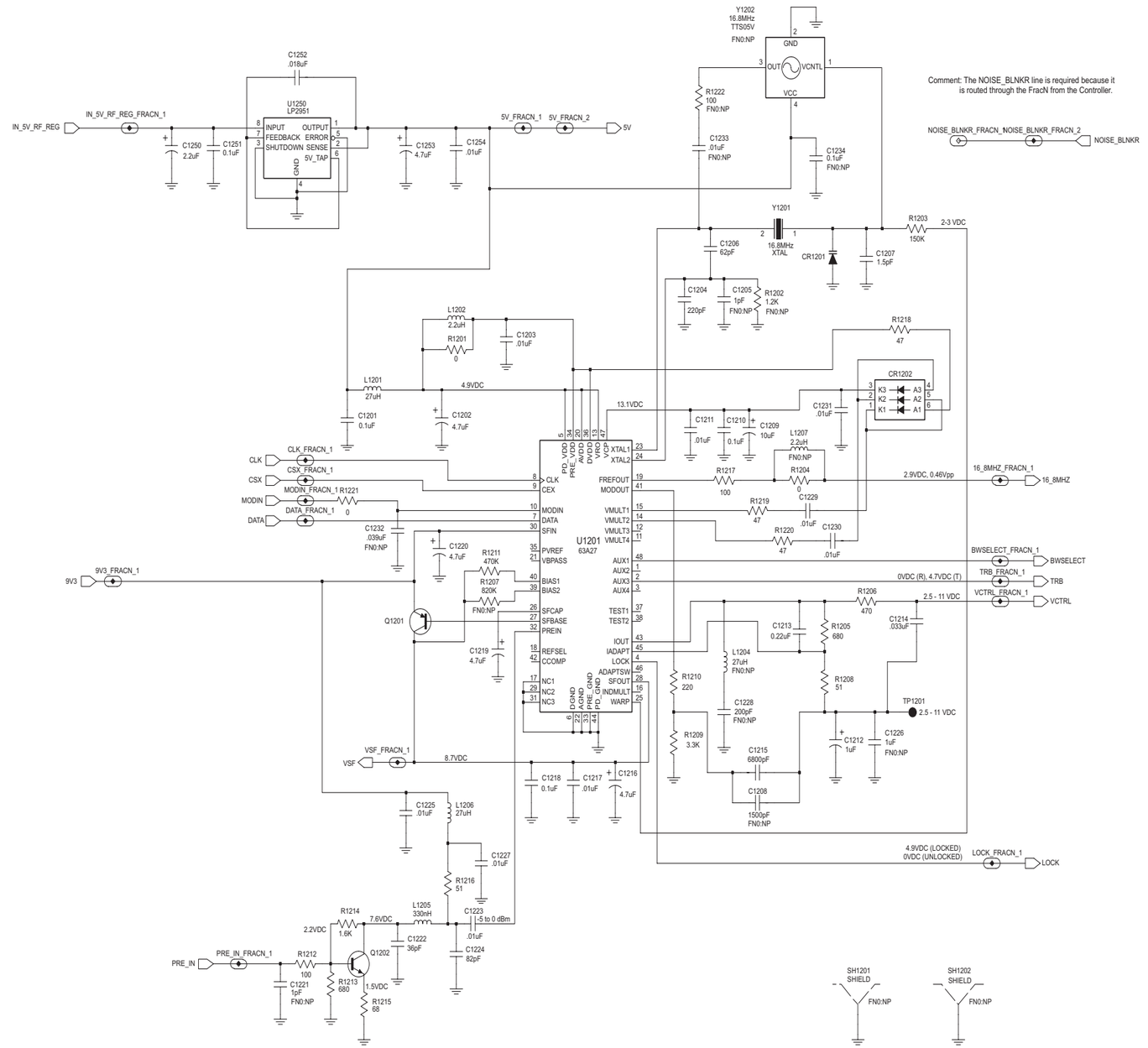
FL0830694-O



FL0830697-O

Low Band Range 3 (42-50 MHz) Receiver Front-End

6881091C63-C



FL0830693-O

Low Band Range 3 (42-50 MHz) FRACN Synthesizer

6881091C63-C

Low Band R3 PCB 8485908Z02 Parts List†

Circuit Ref	Motorola Part No.	Description
C1001	NOTPLACED	
C1002	2113741F49	.01uF
C1003	2113740F50	91pF
C1004	2113740F57	180pF
C1006	2113740F45	56pF
C1007	2113740F57	180pF
C1008	2113740F69	560pF
C1009	2113740F57	180pF
C1010	2113740F42	43pF
C1011	2113740F48	75pF
C1012	2113740F60	240pF
C1013	2113741F21	680pF
C1014	2113740F54	130pF
C1015	2113741F49	.01uF
C1016	2113740F54	130pF
C1017	2113740F67	470pF
C1019	2113740F63	330pF
C1020	2113740F56	160pF
C1021	2113740F65	390pF
C1022	2113740F55	150pF
C1023	2113740F65	390pF
C1024	2113740F56	160pF
C1025	2113740F62	300pF
C1026	2113741F25	1000pF
C1027	2113740F52	110pF
C1028	2113741F49	.01uF
C1029	2113741F49	.01uF
C1030	2113743E20	0.1uF
C1031	2113743E20	0.1uF
C1032	2113740F46	62pF
C1033	2113740F47	68pF
C1034	2113740F48	75pF
C1035	2113740F44	51pF
C1036	2113743E20	0.1uF
C1101	2113740F53	120pF
C1102	2113740F50	91pF
C1103	2113740F58	200pF
C1104	2113743E20	0.1uF
C1105	2113743E20	0.1uF
C1106	2113743E20	0.1uF
C1107	2113740F49	82pF
C1108	2113743E20	0.1uF
C1109	2113740F40	36pF
C1111	2113740L03	2.4pF
C1112	2113740F40	36pF
C1113	2113743E20	0.1uF
C1114	2113743E20	0.1uF
C1115	2113740F53	120pF
C1116	2113740F41	39pF
C1119	2113743E20	0.1uF
C1123	2113740F39	33pF
C1124	2113743E20	0.1uF
C1125	2113743E11	.039uF
C1126	2113743E20	0.1uF
C1127	2311049A57	10uF
C1128	2113743E20	0.1uF
C1129	2113740F35	22pF
C1130	2113740F47	68pF
C1133	2113743E20	0.1uF
C1134	2113743E20	0.1uF
C1135	2113743E20	0.1uF
C1136	2113743E20	0.1uF
C1137	2113740F53	120pF
C1138	2113743E20	0.1uF
C1139	2113741F49	.01uF
C1140	2113741F49	.01uF
C1141	2113743E20	0.1uF
C1142	2113743E20	0.1uF
C1143	2113743E20	0.1uF
C1144	2113743E20	0.1uF
C1145	2113741F41	4700pF
C1146	2113740F49	82pF
C1147	2113740F65	390pF
C1148	2113743E20	0.1uF
C1149	2113740F53	120pF
C1150	2113740F54	130pF
C1201	2113743E20	0.1uF
C1202	2311049J11	4.7uF
C1203	2113741F49	.01uF
C1204	2113740F59	220pF
C1206	2113740L37	62pF
C1207	2113740F07	1.5pF
C1209	2311049A57	10uF
C1210	2113743E20	0.1uF
C1211	2113741F49	.01uF
C1212	2311049A07	1uF
C1213	2113743A23	0.22uF
C1214	2113743E10	.033uF
C1215	2113740C37	6800pF
C1216	2311049J11	4.7uF
C1217	2113741F49	.01uF
C1218	2113743E20	0.1uF
C1219	2311049J11	4.7uF
C1220	2311049J11	4.7uF
C1222	2113740F40	36pF
C1223	2113741F49	.01uF
C1224	2113740F49	82pF
C1225	2113741F49	.01uF
C1227	2113741F49	.01uF
C1229	2113741F49	.01uF
C1230	2113741F49	.01uF
C1231	2113741F49	.01uF
C1250	2311049A09	2.2uF
C1251	2113743E20	0.1uF
C1252	2113743E05	.018uF
C1253	2311049J11	4.7uF
C1254	2113741F49	.01uF
C1306	2113740L23	16pF
C1307	2113740L21	13pF
C1308	2113740F19	4.7pF
C1311	2113741F49	.01uF
C1312	2113741F49	.01uF
C1313	2113741F49	.01uF
C1314	2113740L21	13pF
C1315	2113740L21	13pF
C1316	2113740F15	3.3pF
C1317	2113743E20	0.1uF
C1318	2113741F49	.01uF
C1319	2113741F49	.01uF
C1320	2113741F49	.01uF
C1321	2113740F17	3.9pF
C1323	2113740L21	13pF
C1325	2113741F49	.01uF
C1326	2113741F49	.01uF
C1333	2113740L26	22pF
C1334	2113740L31	36pF
C1335	2113740F19	4.7pF
C1336	2113743E20	0.1uF
C1338	2113741F49	.01uF
C1339	2113741F49	.01uF
C1340	2113741F49	.01uF
C1341	2113740L31	36pF
C1342	2113740L31	36pF
C1343	2113740F15	3.3pF
C1344	2113741F49	.01uF
C1345	2113743E20	0.1uF
C1346	2113741F49	.01uF
C1347	2113741F49	.01uF
C1348	2113740F17	3.9pF
C1349	2113743E20	0.1uF
C1350	2113740F31	15pF
C1351	2113741F49	.01uF
C1352	2113741F49	.01uF
C1401	2113741A45	.01uF
C1402	2113741A45	.01uF
C1404	2113741A45	.01uF
C1405	2113741A45	.01uF
C1407	2113741A45	.01uF
C1410	2113741M69	0.1uF
C1412	2113740A65	270pF
C1413	2113741A45	.01uF
C1414	2113741A45	.01uF
C1415	2113741M69	0.1uF
C1417	2111078B58	430pF
C1419	2113741A45	.01uF
C1420	2113741A45	.01uF
C1423	2113741A45	.01uF
C1424	2113741A45	.01uF
C1425	2113741W01	1uF
C1426	2113741W01	1uF
C1427	2111078B52	240pF
C1428	2111078B52	240pF
C1429	2111078B52	240pF
C1430	2111078B52	240pF
C1431	2113741A45	.01uF
C1432	2113741W01	1uF
C1433	2113741W01	1uF
C1434	2113741A45	.01uF
C1435	2113741W01	1uF
C1436	2113741A45	.01uF
C1437	2111078B59	470pF
C1438	2111078B59	470pF
C1439	2111078B59	470pF
C1440	2111078B59	470pF
C1441	2111078B51	220pF
C1442	2111078B44	120pF
C1443	2111078B45	130pF
C1444	2111078B45	130pF
C1446	2180060M28	24pF
C1447	2111078B59	470pF
C1448	2111078B59	470pF
C1449	2180060M44	110pF
C1450	2180060M05	3pF
C1451	2180060M49	180pF
C1452	2180060M28	24pF
C1453	2180060M43	100pF
C1454	2180060M31	33pF
C1455	2180060M24	16pF
C1456	2180060M36	51pF
C1457	2113741A45	.01uF
C1458	2311049C01	10uF
C1459	2311049C01	10uF
C1460	2113743E20	0.1uF
C1461	2113741A45	.01uF
C1462	2311049C01	10uF
C1463	2113928E01	1uF
C1464	2113741A45	.01uF
C1465	2113928E01	1uF
C1466	2113741A45	.01uF
C1467	2113740A51	68pF
C1468	2113741A45	.01uF
C1469	2113741W01	1uF
C1470	2113741W01	1uF
C1471	2113741A45	.01uF
C1472	2113741M69	0.1uF
C1473	2113741M69	0.1uF
C1474	2113741A45	.01uF
C1475	2113741W01	1uF
C1476	2113741M69	0.1uF
C1477	2111078B54	300pF
C1478	2111078B54	300pF
C1479	2111078B51	220pF
C1480	2111078B40	82pF
C1481	2111078B40	82pF
C1482	2113928E01	1uF
C1484	2113741F33	2200pF
C1485	2113741A45	.01uF
C1486	2113741M69	0.1uF
C1501	2113741F33	2200pF
C1502	2113741F33	2200pF
C1503	2113741F33	2200pF
C1504	2113741F33	2200pF

Circuit Ref	Motorola Part No.	Description
C1505	2113741F25	1000pF
C1506	2113741F25	1000pF
C1507	2113741F33	2200pF
C1508	2113741F33	2200pF
C1509	2311049A07	1uF
C1510	2113741F33	2200pF
C1511	2113741F33	2200pF
C1512	2113741F33	2200pF
C1523	2113743E20	0.1uF
C1525	2113743E20	0.1uF
C1526	2113740F51	100pF
C1527	2113741A45	.01uF
C1528	2113741A45	.01uF
C1530	2113741A45	.01uF
C1532	2113743T19	10uF
C1601	2113743E20	0.1uF
C1602	2113740F59	220pF
C1603	2113743A23	0.22uF
C1604	2113743A23	0.22uF
C1605	2311049A57	10uF
C1606	2113740F59	220pF
C1607	2113740F51	100pF
C1608	2113743A23	0.22uF
C1609	2113740F34	20pF
C1610	2113741F41	4700pF
C1611	2113743E20	0.1uF
C1612	2113741F33	2200pF
C1613	2113740F54	130pF
C1614	2113741F24	910pF
C1616	2113740F40	36pF
C1618	2113743A23	0.22uF
C1619	2311049A57	10uF
C1620	2113741F25	1000pF
C1622	2113743E20	0.1uF
C1623	2113740F60	240pF
C1624	2113741F37	3300pF
C1625	2113740F29	12pF
C1626	2113740F59	220pF
C1627	2113743A23	0.22uF
C1628	2113743E20	0.1uF
C1629	2113740F39	33pF
C1631	2311049A57	10uF
C1632	2113743E20	0.1uF
C1633	2113743A23	0.22uF
C1634	2113741A45	.01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H
CR1314	4880154K03	MMBD353
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4880236E05	MMBD301

Circuit Ref	Motorola Part No.	Description
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100
D1601	4880154K03	MMBD353
E1401	2408380X02	FERRITE BEAD
E1403	2408380X02	FERRITE BEAD
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	CRYSTAL FILTER, 10.7 MHZ
FL1104	9180468V04	CFUCJ455F
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J1401	0986166B02	MINI-U ANTENNA CONN
L1001	2408382A11	130nH
L1002	2408382C11	130nH
L1003	2408382A11	130nH
L1004	2408382C11	130nH
L1005	2408382A11	130nH
L1006	2408382A11	130nH
L1007	2408382C11	130nH
L1008	2408382A11	130nH
L1009	2408382C11	130nH
L1010	2408382A11	130nH
L1011	2462587N68	1uH
L1012	2462587N57	220nH
L1013	2462587N59	330nH
L1014	2462587N57	220nH
L1101	2462587N33	1.8uH
L1102	2408383X07	3.3uH
L1103	2462587N33	1.8uH
L1104	2480289M10	6.8uH
L1105	2480289M10	6.8uH
L1106	2462587N33	1.8uH
L1107	2480289M09	5.6uH
L1110	2480289M18	33uH
L1111	2408383X07	3.3uH
L1112	2483411T35	6.8uH
L1201	2480289M17	27uH
L1202	2462587Q20	2.2uH
L1205	2462587N59	330nH
L1206	2480289M17	27uH
L1302	2408382D19	491nH
L1303	2480289M15	18uH
L1304	2462587N66	820nH
L1305	2480289M15	18uH
L1306	2480289M15	18uH
L1307	2480289M15	18uH
L1309	2480289M15	18uH
L1310	2462587N60	390nH
L1311	2480289M15	18uH
L1313	2408382D19	491nH
L1314	2480289M17	27uH
L1315	2462587N66	820nH
L1316	2480289M17	27uH
L1317	2480289M17	27uH
L1318	2480289M17	27uH

Circuit Ref	Motorola Part No.	Description
L1321	2462587N58	270nH
L1322	2480289M17	27uH
L1324	2480289M17	27uH
L1402	2462587U09	4.7uH
L1403	2462587U09	4.7uH
L1404	2462587N56	180nH
L1406	2408381X36	250.974nH
L1408	2408384A10	120nH
L1413	2408381X17	88.470nH
L1414	2408381X17	88.470nH
L1415	2485873L01	18nH
L1416	2485873L01	18nH
L1417	2485873L01	18nH
L1418	2408381X12	66.389nH
L1419	2480289M17	27uH
L1420	2408381X29	172.891nH
L1421	2408381X25	137.876nH
L1422	2408381X22	115.581nH
L1423	2408381X16	81.930nH
L1425	2485873L01	18nH
L1426	2485873L01	18nH
L1601	2483411T45	47uH
L1602	2483411T45	47uH
L1603	2483411T73	1uH
L1604	2483411T45	47uH
L1605	2483411T41	22uH
L1606	2462587T30	1uH
L1607	2462587T30	1uH
M1401	2686201B01	HEATSINK
Q1001	4880173R01	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1201	4813824A17	MMBT3906
Q1202	4880173R01	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880173R01	MMBR951
Q1305	4880173R01	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880173R01	MMBR951
Q1308	4880173R01	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	MRF1550
Q1403	4886136B01	MRF1550
Q1501	4880141L03	BCW68G
Q1502	4813824A10	MMBT3904
Q1503	4813824A10	MMBT3904
Q1504	4813824A10	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4813824A10	MMBT3904
Q1601	4813824A17	MMBT3906

Circuit Ref	Motorola Part No.	Description
Q1602	4880048M01	DTC144EKA
Q1603	4813824A10	MMBT3904
Q1604	4813824A10	MMBT3904
Q1605	4813824A10	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4813824A10	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R1001	0662057A05	15
R1002	0662057A05	15
R1003	0662057A41	470
R1004	0662057A59	2.7K
R1005	0662057A31	180
R1006	0662057A73	10K
R1007	0662057A71	8.2K
R1008	0662057A65	4.7K
R1101	0662057A18	51
R1102	0662057A78	16K
R1103	0662057A39	390
R1104	0662057A71	8.2K
R1106	0662057A25	100
R1107	0662057A68	6.2K
R1108	0662057A61	3.3K
R1109	0662057A37	330
R1110	0662057A25	100
R1111	0662057A17	47
R1113	0662057A64	4.3K
R1114	0662057A64	4.3K
R1115	0662057A75	12K
R1117	0662057A37	330
R1118	0662057A56	2K
R1119	0662057A83	27K
R1120	0662057A18	51
R1121	0662057A71	8.2K
R1122	0662057A73	10K
R1123	0662057A51	1.2K
R1128	0662057A73	10K
R1129	0662057A73	10K
R1130	0662057A73	10K
R1131	0662057A77	15K
R1132	0662057A58	2.4K
R1133	0662057A61	3.3K
R1134	0662057A05	15
R1135	0662057A20	62
R1136	0662057A45	680
R1137	0662057A75	12K
R1138	0662057A01	10
R1139	0611077A12	2.7
R1201	0662057B47	0
R1202	NOTPLACED	
R1203	0662057B02	150K
R1204	0662057B47	0
R1205	0662057A45	680
R1206	0662057A41	470
R1208	0662057A18	51
R1209	0662057A61	3.3K

Circuit Ref	Motorola Part No.	Description
R1210	0662057A33	220
R1211	0662057B14	470K
R1212	0662057A25	100
R1213	0662057A45	680
R1214	0662057A54	1.6K
R1215	0662057A21	68
R1216	0662057A18	51
R1217	0662057A25	100
R1218	0662057A17	47
R1219	0662057A17	47
R1220	0662057A17	47
R1221	0662057B47	0
R1306	0662057B47	0
R1307	0662057A19	56
R1308	0662057A19	56
R1309	0662057A41	470
R1311	0662057A73	10K
R1312	0662057A51	1.2K
R1313	0662057A51	1.2K
R1314	0662057A37	330
R1315	0662057A61	3.3K
R1316	0662057A45	680
R1317	0662057A09	22
R1318	0662057A41	470
R1319	0662057A01	10
R1320	0662057A41	470
R1325	0662057B47	0
R1326	0662057A19	56
R1327	0662057A19	56
R1328	0662057A41	470
R1330	0662057A73	10K
R1331	0662057A51	1.2K
R1332	0662057A51	1.2K
R1333	0662057A37	330
R1334	0662057A61	3.3K
R1335	0662057A47	820
R1336	0662057A09	22
R1337	0662057A22	75
R1338	0662057A27	120
R1339	0662057A22	75
R1340	0662057A49	1K
R1341	0662057A25	100
R1342	0662057A25	100
R1343	0662057C55	150
R1344	0662057A49	1K
R1345	0662057A25	100
R1346	0662057A25	100
R1347	0662057C55	150
R1376	0662057A65	4.7K
R1402	0611079A64	390
R1404	0680194M18	51
R1405	0680194M18	51
R1406	0662057A73	10K
R1407	0662057A73	10K
R1409	0682089V01	.01
R1410	0683962T52	130

Circuit Ref	Motorola Part No.	Description
R1411	0662057C99	10K
R1413	0680194M01	10
R1414	0680194M01	10
R1416	0680194M01	10
R1417	0680194M01	10
R1418	0680194M01	10
R1419	0680194M01	10
R1420	0680194M01	10
R1421	0680194M01	10
R1422	0680194M01	10
R1423	0680194M01	10
R1424	0662057D10	27K
R1425	0662057D10	27K
R1440	0662057A25	100
R1442	0662057A25	100
R1443	0662057A49	1K
R1444	0662057A33	220
R1445	0662057A68	6.2K
R1447	0662057B47	0
R1449	0611079A64	390
R1450	0683962T71	820
R1451	0662057K31	180
R1453	0662057K31	180
R1454	0662057K31	180
R1455	0662057K31	180
R1457	0662057K01	10
R1458	0611079A64	390
R1459	0611079A64	390
R1460	0680106R01	0.1
R1463	0662057A75	12K
R1464	0662057A61	3.3K
R1465	0662057A61	3.3K
R1469	0662057C01	0
R1472	0662057A73	10K
R1473	0680194M01	10
R1474	0680194M01	10
R1475	0680194M01	10
R1476	0680194M01	10
R1477	0662057A61	3.3K
R1478	0662057A73	10K
R1479	0662057A61	3.3K
R1480	0662057D10	27K
R1482	0662057B47	0
R1483	0662057A34	240
R1484	0662057A49	1K
R1501	0662057A45	680
R1502	0662057C67	470
R1503	0662057A61	3.3K
R1504	0662057A73	10K
R1505	0662057A69	6.8K
R1506	0662057A87	39K
R1507	0662057A49	1K
R1508	0662057R19	100
R1509	0662057P95	100K
R1511	0662057P95	100K
R1513	0662057C76	1.1K

Circuit Ref	Motorola Part No.	Description
R1514	0662057A97	100K
R1515	0662057A49	1K
R1516	0662057C71	680
R1517	0662057C71	680
R1518	0662057A61	3.3K
R1519	0662057C71	680
R1522	0662057A73	10K
R1524	0662057C71	680
R1526	0662057A97	100K
R1527	0662057A97	100K
R1528	0662057A80	20K
R1532	0662057A95	82K
R1533	0662057A73	10K
R1535	0662057C01	0
R1537	0662057A90	51K
R1541	0662057A68	6.2K
R1542	0662057A49	1K
R1543	0662057A49	1K
R1544	0662057A90	51K
R1545	0662057A65	4.7K
R1601	0662057A73	10K
R1602	0662057A65	4.7K
R1604	0662057A49	1K
R1605	0662057B10	330K
R1606	0662057B02	150K
R1607	0662057B19	750K
R1608	0662057A57	2.2K
R1609	0662057A73	10K
R1610	0662057A82	24K
R1611	0662057A49	1K
R1612	0662057A25	100
R1613	0662057A59	2.7K
R1614	0662057A49	1K
R1615	0662057A49	1K
R1616	0662057A33	220
R1617	0662057A57	2.2K
R1620	0662057A51	1.2K
R1621	0662057A68	6.2K
R1622	0662057A49	1K
R1626	0662057A18	51
R1627	0662057A73	10K
R1628	0662057A55	1.8K
R1629	0662057A67	5.6K
R1630	0662057A53	1.5K
R1631	0662057A18	51
R1632	0662057A82	24K
R1635	0662057B47	0
R1636	0662057A42	510
R1637	0662057A59	2.7K
R1638	0662057A55	1.8K
SH1302	2680473U01	VCO SHIELD
U1001	4802245J50	UMC5N
U1051	5108278X01	MIXER
U1101	5113805A86	MC74HC4066
U1102	5113805A86	MC74HC4066
U1103	5186144B01	SA616

Circuit Ref	Motorola Part No.	Description
U1201	5185963A27	FRACN SYNTHESIZER
U1250	5185963A33	LP2951
U1377	4802245J50	UMC5N
U1378	4802245J50	UMC5N
U1401	5185130C65	LDMOS PRE-DRIVER IC
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5109731C21	LM6142BIM
U1503	5185765B28	POWER CONTROL IC
U1601	5180929W01	MC1350
Y1101	4880908W08	CRYSTAL, 10.245 MHZ
Y1102	9186145B02	DISCRIMINATOR, 455 KHZ
*Y1201	4880114R04	CRYSTAL, 16.8 MHZ
Y1202	NOTPLACED	

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from CCSD (formerly AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Low Band R3 PCB 8485908Z04 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	CAP, 100pF
C0102	NOTPLACED	
C0103	NOTPLACED	
C0104	NOTPLACED	
C0105	NOTPLACED	
C0106	NOTPLACED	
C0107	2113741F25	CAP, 1000pF
C0108	NOTPLACED	
C0111	NOTPLACED	
C0112	2113743E20	CAP, 0.1uF
C0121	2113743E20	CAP, 0.1uF
C0122	2113743E20	CAP, 0.1uF
C0123	NOTPLACED	
C0131	2113740F35	CAP, 22pF
C0132	2113740F35	CAP, 22pF
C0141	2113743E20	CAP, 0.1uF
C0151	2113741F49	CAP, .01uF
C0201	2311049A57	CAPP, 10uF
C0202	2311049A57	CAPP, 10uF
C0203	NOTPLACED	
C0204	2113743E20	CAP, 0.1uF
C0205	NOTPLACED	
C0211	NOTPLACED	
C0212	2311049A57	CAPP, 10uF
C0221	2113743E20	CAP, 0.1uF
C0222	2113743E20	CAP, 0.1uF
C0223	2113743E20	CAP, 0.1uF
C0224	2113740F51	CAP, 100pF
C0225	2113743E20	CAP, 0.1uF
C0226	2113743E20	CAP, 0.1uF
C0227	NOTPLACED	
C0228	2311049A56	CAPP, 4.7uF
C0231	2113743B29	CAP, 1uF
C0232	2113743E20	CAP, 0.1uF
C0233	NOTPLACED	
C0234	2113743E20	CAP, 0.1uF
C0235	2113743E07	CAP, .022uF
C0236	2113743E10	CAP, .033uF
C0237	NOTPLACED	
C0241	2113743E20	CAP, 0.1uF
C0242	NOTPLACED	
C0243	2113740F51	CAP, 100pF
C0244	2113743E20	CAP, 0.1uF
C0245	2113743E20	CAP, 0.1uF
C0246	2113741F49	CAP, .01uF
C0251	2113743E20	CAP, 0.1uF
C0252	2311049A07	CAPP, 1uF
C0253	NOTPLACED	
C0254	2113743E20	CAP, 0.1uF
C0255	2113743E20	CAP, 0.1uF
C0256	2113740F51	CAP, 100pF
C0261	2113743E20	CAP, 0.1uF
C0262	2113740F49	CAP, 82pF
C0265	2113743E20	CAP, 0.1uF
C0266	NOTPLACED	
C0267	2113741F49	CAP, .01uF
C0271	2113741F49	CAP, .01uF
C0272	2113743E20	CAP, 0.1uF
C0273	2113741F37	CAP, 3300pF
C0274	NOTPLACED	
C0275	2311049A99	CAPP, 47uF
C0276	2113741F25	CAP, 1000pF
C0277	2113741F25	CAP, 1000pF
C0290	2311049C01	CAPP, 10uF
C0291	2311049C01	CAPP, 10uF
C0292	2311049C01	CAPP, 10uF
C0293	2311049C01	CAPP, 10uF
C0301	NOTPLACED	
C0302	NOTPLACED	
C0303	NOTPLACED	
C0304	NOTPLACED	
C0305	NOTPLACED	
C0324	NOTPLACED	
C0325	NOTPLACED	
C0331	NOTPLACED	
C0341	NOTPLACED	
C0342	NOTPLACED	
C0343	NOTPLACED	
C0344	NOTPLACED	
C0351	NOTPLACED	
C0352	NOTPLACED	
C0353	NOTPLACED	
C0354	NOTPLACED	
C0421	2113743N48	CAP, 82pF
C0422	2113741F17	CAP, 470pF
C0423	2113741F17	CAP, 470pF
C0426	2113743L09	CAP, 470pF
C0427	2113743L09	CAP, 470pF
C0428	2113743N48	CAP, 82pF
C0429	2113743L09	CAP, 470pF
C0430	2113741F17	CAP, 470pF
C0431	2113741F17	CAP, 470pF
C0441	2113743L09	CAP, 470pF
C0442	2113743L09	CAP, 470pF
C0443	NOTPLACED	
C0445	2113743L09	CAP, 470pF
C0446	2113743L09	CAP, 470pF
C0447	2113743L09	CAP, 470pF
C0448	2113743L09	CAP, 470pF
C0449	2113743L09	CAP, 470pF
C0470	2113743L09	CAP, 470pF
C0471	2113743N48	CAP, 82pF
C0472	2113743N48	CAP, 82pF
C0473	2113743N48	CAP, 82pF
C0474	2113743L09	CAP, 470pF
C0476	2113743L09	CAP, 470pF
C0477	2113743L09	CAP, 470pF
C0478	2113743L09	CAP, 470pF
C0482	2113743L09	CAP, 470pF
C0483	2113743L09	CAP, 470pF
C0484	2113741F17	CAP, 470pF
C0485	2113743L09	CAP, 470pF
C0486	2113743L09	CAP, 470pF
C0487	2113743L09	CAP, 470pF
C0488	2113743L09	CAP, 470pF
C0490	2113743L09	CAP, 470pF
C0491	2113743L09	CAP, 470pF
C0492	2113743L09	CAP, 470pF
C0493	2113743L09	CAP, 470pF
C0494	2113743L09	CAP, 470pF
C0495	2113743L09	CAP, 470pF
C0496	2113743L09	CAP, 470pF
C0497	2113743L09	CAP, 470pF
C0499	2113743L09	CAP, 470pF
C0501	2113741F49	CAP, .01uF
C0502	2113741F17	CAP, 470pF
C0503	2113741F17	CAP, 470pF
C0504	2113741F17	CAP, 470pF
C0505	2113741F17	CAP, 470pF
C0506	2113741F17	CAP, 470pF
C0508	2113741F17	CAP, 470pF
C0509	2113741F17	CAP, 470pF
C0510	2113741F17	CAP, 470pF
C0511	2113741F17	CAP, 470pF
C0512	2113741F17	CAP, 470pF
C0513	2113741F17	CAP, 470pF
C0514	2113741F17	CAP, 470pF
C0515	2113741F17	CAP, 470pF
C0516	2113741F49	CAP, .01uF
C0517	2113743N48	CAP, 82pF
C0518	2113741F17	CAP, 470pF
C0541	2311049A05	CAPP, 0.47uF
C0542	2311049A99	CAPP, 47uF
C0554	NOTPLACED	
C0558	NOTPLACED	
C0559	NOTPLACED	
C0560	2113741F25	CAP, 1000pF
C0575	NOTPLACED	
C0576	NOTPLACED	
C0591	2113743E20	CAP, 0.1uF
C0592	2113743E20	CAP, 0.1uF
C0593	2113741B69	CAP, 0.1uF
C0601	2113741F17	CAP, 470pF
C0603	2380090M24	CAPP, 10uF
C0611	2311049C06	CAPP, 22uF
C0612	2113743E20	CAP, 0.1uF
C0621	NOTPLACED	
C0622	2311049A99	CAPP, 47uF
C0641	2113741F17	CAP, 470pF
C0644	2311049A97	CAPP, 33uF
C0645	2113743E20	CAP, 0.1uF
C0651	NOTPLACED	
C0652	2311049A97	CAPP, 33uF
C0654	2311049A57	CAPP, 10uF
C0655	2113743E20	CAP, 0.1uF
C0661	2311049C05	CAPP, 47uF
C0662	2113741F49	CAP, .01uF
C0663	2113743E20	CAP, 0.1uF
C0671	2113743E20	CAP, 0.1uF
C0681	2113743E20	CAP, 0.1uF
C1001	NOTPLACED	
C1002	2113741F49	CAP, .01uF
C1003	2113740F50	CAP, 91pF
C1004	2113740F57	CAP, 180pF
C1005	NOTPLACED	
C1006	2113740F45	CAP, 56pF
C1007	2113740F57	CAP, 180pF
C1008	2113740F69	CAP, 560pF
C1009	2113740F57	CAP, 180pF
C1010	2113740F42	CAP, 43pF
C1011	2113740F48	CAP, 75pF
C1012	2113740F60	CAP, 240pF
C1013	2113741F21	CAP, 680pF
C1014	2113740F54	CAP, 130pF
C1015	2113741F49	CAP, .01uF
C1016	2113740F54	CAP, 130pF
C1017	2113740F67	CAP, 470pF
C1018	NOTPLACED	
C1019	2113740F63	CAP, 330pF
C1020	2113740F56	CAP, 160pF
C1021	2113740F65	CAP, 390pF
C1022	2113740F55	CAP, 150pF
C1023	2113740F65	CAP, 390pF
C1024	2113740F56	CAP, 160pF
C1025	2113740F62	CAP, 300pF
C1026	2113741F25	CAP, 1000pF
C1027	2113740F52	CAP, 110pF
C1028	2113741F49	CAP, .01uF
C1029	2113741F49	CAP, .01uF
C1030	2113743E20	CAP, 0.1uF
C1031	2113743E20	CAP, 0.1uF
C1032	2113740F46	CAP, 62pF

Circuit Ref	Motorola Part No.	Description
C1033	2113740F47	CAP, 68pF
C1034	2113740F48	CAP, 75pF
C1035	2113740F44	CAP, 51pF
C1036	2113743E20	CAP, 0.1uF
C1101	2113740F53	CAP, 120pF
C1102	2113740F50	CAP, 91pF
C1103	2113740F58	CAP, 200pF
C1104	2113743E20	CAP, 0.1uF
C1105	2113743E20	CAP, 0.1uF
C1106	2113743E20	CAP, 0.1uF
C1107	2113740F49	CAP, 82pF
C1108	2113743E20	CAP, 0.1uF
C1109	2113740F40	CAP, 36pF
C1110	NOTPLACED	
C1111	2113740L03	CAP, 2.4pF
C1112	2113740F40	CAP, 36pF
C1113	2113743E20	CAP, 0.1uF
C1114	2113743E20	CAP, 0.1uF
C1115	2113740F53	CAP, 120pF
C1116	2113740F41	CAP, 39pF
C1119	2113743E20	CAP, 0.1uF
C1120	NOTPLACED	
C1121	NOTPLACED	
C1122	NOTPLACED	
C1123	2113740F39	CAP, 33pF
C1124	2113743E20	CAP, 0.1uF
C1125	2113743E11	CAP, .039uF
C1126	2113743E20	CAP, 0.1uF
C1127	2311049A57	CAPP, 10uF
C1128	2113743E20	CAP, 0.1uF
C1129	2113740F35	CAP, 22pF
C1130	2113740F47	CAP, 68pF
C1131	NOTPLACED	
C1133	2113743E20	CAP, 0.1uF
C1134	2113743E20	CAP, 0.1uF
C1135	2113743E20	CAP, 0.1uF
C1136	2113743E20	CAP, 0.1uF
C1137	2113740F53	CAP, 120pF
C1138	2113743E20	CAP, 0.1uF
C1139	2113741F49	CAP, .01uF
C1140	2113741F49	CAP, .01uF
C1141	2113743E20	CAP, 0.1uF
C1142	2113743E20	CAP, 0.1uF
C1143	2113743E20	CAP, 0.1uF
C1144	2113743E20	CAP, 0.1uF
C1145	2113741F41	CAP, 4700pF
C1146	2113740F49	CAP, 82pF
C1147	2113740F65	CAP, 390pF
C1148	2113743E20	CAP, 0.1uF
C1149	2113740F53	CAP, 120pF
C1150	2113740F54	CAP, 130pF
C1151	NOTPLACED	
C1152	NOTPLACED	
C1153	NOTPLACED	
C1201	2113743E20	CAP, 0.1uF
C1202	2311049J11	CAPP, 4.7uF
C1203	2113741F49	CAP, .01uF
C1204	2113740F59	CAP, 220pF
C1205	NOTPLACED	
C1206	2113740L37	CAP, 62pF
C1207	2113740F07	CAP, 1.5pF
C1208	NOTPLACED	
C1209	2311049A57	CAPP, 10uF
C1210	2113743E20	CAP, 0.1uF
C1211	2113741F49	CAP, .01uF
C1212	2311049A07	CAPP, 1uF
C1213	2113743A23	CAP, 0.22uF
C1214	2113743E10	CAP, .033uF
C1215	2113740C37	CAP, 6800pF
C1216	2311049J11	CAPP, 4.7uF
C1217	2113741F49	CAP, .01uF
C1218	2113743E20	CAP, 0.1uF
C1219	2311049J11	CAPP, 4.7uF
C1220	2311049J11	CAPP, 4.7uF
C1221	NOTPLACED	
C1222	2113740F40	CAP, 36pF
C1223	2113741F49	CAP, .01uF
C1224	2113740F49	CAP, 82pF
C1225	2113741F49	CAP, .01uF
C1226	NOTPLACED	
C1227	2113741F49	CAP, .01uF
C1228	NOTPLACED	
C1229	2113741F49	CAP, .01uF
C1230	2113741F49	CAP, .01uF
C1231	2113741F49	CAP, .01uF
C1232	NOTPLACED	
C1233	NOTPLACED	
C1234	NOTPLACED	
C1250	2311049A09	CAPP, 2.2uF
C1251	2113743E20	CAP, 0.1uF
C1252	2113743E05	CAP, .018uF
C1253	2311049J11	CAPP, 4.7uF
C1254	2113741F49	CAP, .01uF
C1304	NOTPLACED	
C1305	NOTPLACED	
C1306	2113740L23	CAP, 16pF
C1307	2113740L21	CAP, 13pF
C1308	2113740F19	CAP, 4.7pF
C1309	NOTPLACED	
C1311	2113741F49	CAP, .01uF
C1312	2113741F49	CAP, .01uF
C1313	2113741F49	CAP, .01uF
C1314	2113740L21	CAP, 13pF
C1315	2113740L21	CAP, 13pF
C1316	2113740F15	CAP, 3.3pF
C1317	2113743E20	CAP, 0.1uF
C1318	2113741F49	CAP, .01uF
C1319	2113741F49	CAP, .01uF
C1320	2113741F49	CAP, .01uF
C1321	2113740F17	CAP, 3.9pF
C1323	2113740L21	CAP, 13pF
C1325	2113741F49	CAP, .01uF
C1326	2113741F49	CAP, .01uF
C1333	2113740L26	CAP, 22pF
C1334	2113740L31	CAP, 36pF
C1335	2113740F19	CAP, 4.7pF
C1336	2113743E20	CAP, 0.1uF
C1337	NOTPLACED	
C1338	2113741F49	CAP, .01uF
C1339	2113741F49	CAP, .01uF
C1340	2113741F49	CAP, .01uF
C1341	2113740L31	CAP, 36pF
C1342	2113740L31	CAP, 36pF
C1343	2113740F15	CAP, 3.3pF
C1344	2113741F49	CAP, .01uF
C1345	2113743E20	CAP, 0.1uF
C1346	2113741F49	CAP, .01uF
C1347	2113741F49	CAP, .01uF
C1348	2113740F17	CAP, 3.9pF
C1349	2113743E20	CAP, 0.1uF
C1350	2113740F31	CAP, 15pF
C1351	2113741F49	CAP, .01uF
C1352	2113741F49	CAP, .01uF
C1354	NOTPLACED	
C1356	NOTPLACED	
C1360	NOTPLACED	
C1361	NOTPLACED	
C1362	NOTPLACED	
C1401	2113741A45	CAP, .01uF
C1402	2113741A45	CAP, .01uF
C1403	NOTPLACED	
C1404	2113741A45	CAP, .01uF
C1405	2113741A45	CAP, .01uF
C1406	NOTPLACED	
C1407	2113741A45	CAP, .01uF
C1408	NOTPLACED	
C1409	NOTPLACED	
C1410	2113741M69	CAP, 0.1uF
C1412	2113740A65	CAP, 270pF
C1413	2113741A45	CAP, .01uF
C1414	2113741A45	CAP, .01uF
C1415	2113741M69	CAP, 0.1uF
C1416	NOTPLACED	
C1417	2111078B58	CAP, 430pF
C1418	NOTPLACED	
C1419	2113741A45	CAP, .01uF
C1420	2113741A45	CAP, .01uF
C1421	NOTPLACED	
C1422	NOTPLACED	
C1423	2113741A45	CAP, .01uF
C1424	2113741A45	CAP, .01uF
C1425	2113741W01	CAP, 1uF
C1426	2113741W01	CAP, 1uF
C1427	2111078B52	CAP, 240pF
C1428	2111078B52	CAP, 240pF
C1429	2111078B52	CAP, 240pF
C1430	2111078B52	CAP, 240pF
C1431	2113741A45	CAP, .01uF
C1432	2113741W01	CAP, 1uF
C1433	2113741W01	CAP, 1uF
C1434	2113741A45	CAP, .01uF
C1435	2113741W01	CAP, 1uF
C1436	2113741A45	CAP, .01uF
C1437	2111078B59	CAP, 470pF
C1438	2111078B59	CAP, 470pF
C1439	2111078B59	CAP, 470pF
C1440	2111078B59	CAP, 470pF
C1441	2111078B51	CAP, 220pF
C1442	2111078B44	CAP, 120pF
C1443	2111078B45	CAP, 130pF
C1444	2111078B45	CAP, 130pF
C1445	NOTPLACED	
C1446	2180060M28	CAP, 24pF
C1447	2111078B59	CAP, 470pF
C1448	2111078B59	CAP, 470pF
C1449	2180060M44	CAP, 110pF
C1450	2180060M05	CAP, 3pF
C1451	2180060M49	CAP, 180pF
C1452	2180060M28	CAP, 24pF
C1453	2180060M43	CAP, 100pF
C1454	2180060M31	CAP, 33pF
C1455	2180060M24	CAP, 16pF
C1456	2180060M36	CAP, 51pF
C1457	2113741A45	CAP, .01uF
C1458	2311049C01	CAPP, 10uF
C1459	2311049C01	CAPP, 10uF
C1460	2113743E20	CAP, 0.1uF
C1461	2113741A45	CAP, .01uF
C1462	2311049C01	CAPP, 10uF
C1463	2113928E01	CAP, 1uF
C1464	2113741A45	CAP, .01uF
C1465	2113928E01	CAP, 1uF
C1466	2113741A45	CAP, .01uF
C1467	2113740A51	CAP, 68pF

Circuit Ref	Motorola Part No.	Description
C1468	2113741A45	CAP, .01uF
C1469	2113741W01	CAP, 1uF
C1470	2113741W01	CAP, 1uF
C1471	2113741A45	CAP, .01uF
C1472	2113741M69	CAP, 0.1uF
C1473	2113741M69	CAP, 0.1uF
C1474	2113741A45	CAP, .01uF
C1475	2113741W01	CAP, 1uF
C1476	2113741M69	CAP, 0.1uF
C1477	2111078B54	CAP, 300pF
C1478	2111078B54	CAP, 300pF
C1479	2111078B51	CAP, 220pF
C1480	2111078B40	CAP, 82pF
C1481	2111078B40	CAP, 82pF
C1482	2113928E01	CAP, 1uF
C1484	2113741F33	CAP, 2200pF
C1485	2113741A45	CAP, .01uF
C1486	2113741M69	CAP, 0.1uF
C1501	2113741F33	CAP, 2200pF
C1502	2113741F33	CAP, 2200pF
C1503	2113741F33	CAP, 2200pF
C1504	2113741F33	CAP, 2200pF
C1505	2113741F25	CAP, 1000pF
C1506	2113741F25	CAP, 1000pF
C1507	2113741F33	CAP, 2200pF
C1508	2113741F33	CAP, 2200pF
C1509	2311049A07	CAPP, 1uF
C1510	2113741F33	CAP, 2200pF
C1511	2113741F33	CAP, 2200pF
C1512	2113741F33	CAP, 2200pF
C1523	2113743E20	CAP, 0.1uF
C1525	2113743E20	CAP, 0.1uF
C1526	2113740F51	CAP, 100pF
C1527	2113741A45	CAP, .01uF
C1528	2113741A45	CAP, .01uF
C1530	2113741A45	CAP, .01uF
C1531	NOTPLACED	
C1532	2113743T19	CAP, 10uF
C1601	2113743E20	CAP, 0.1uF
C1602	2113740F59	CAP, 220pF
C1603	2113743A23	CAP, 0.22uF
C1604	2113743A23	CAP, 0.22uF
C1605	2311049A57	CAPP, 10uF
C1606	2113740F59	CAP, 220pF
C1607	2113740F51	CAP, 100pF
C1608	2113743A23	CAP, 0.22uF
C1609	2113740F34	CAP, 20pF
C1610	2113741F41	CAP, 4700pF
C1611	2113743E20	CAP, 0.1uF
C1612	2113741F33	CAP, 2200pF
C1613	2113740F54	CAP, 130pF

Circuit Ref	Motorola Part No.	Description
C1614	2113741F24	CAP, 910pF
C1615	NOTPLACED	
C1616	2113740F40	CAP, 36pF
C1618	2113743A23	CAP, 0.22uF
C1619	2311049A57	CAPP, 10uF
C1620	2113741F25	CAP, 1000pF
C1621	NOTPLACED	
C1622	2113743E20	CAP, 0.1uF
C1623	2113740F60	CAP, 240pF
C1624	2113741F37	CAP, 3300pF
C1625	2113740F29	CAP, 12pF
C1626	2113740F59	CAP, 220pF
C1627	2113743A23	CAP, 0.22uF
C1628	2113743E20	CAP, 0.1uF
C1629	2113740F39	CAP, 33pF
C1631	2311049A57	CAPP, 10uF
C1632	2113743E20	CAP, 0.1uF
C1633	2113743A23	CAP, 0.22uF
C1634	2113741A45	CAP, .01uF
CR1201	4862824C03	1SV232
CR1202	4802233J09	IMN10
CR1302	4805649Q14	HN1V02H
CR1306	4880154K03	MMBD353
CR1310	4805649Q14	HN1V02H
CR1314	4880154K03	MMBD353
D0101	4813825A05	MMBD301
D0151	4813833C02	MMBD6100
D0179	4813833C02	MMBD6100
D0201	NOTPLACED	
D0301	NOTPLACED	
D0621	4813833C02	MMBD6100
D0651	4813833C02	MMBD6100
D0660	4813833C02	MMBD6100
D0661	4813833C02	MMBD6100
D1001	4880154K03	MMBD353
D1101	4880154K03	MMBD353
D1401	4808379X02	MA4P1450
D1402	4808379X02	MA4P1450
D1501	4813825A05	MMBD301
D1502	4813833C02	MMBD6100
D1503	4813833C02	MMBD6100
D1601	4880154K03	MMBD353
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
E1401	2408380X02	FERRITE BEAD
E1403	2408380X02	FERRITE BEAD
F0401	6580542Z01	FUSE
FL1101	9180656U03	CFEC10_7MG1
FL1102	9180022M09	CRYSTAL FILTER, 10.7 MHZ
FL1104	9180468V04	CFUCJ455F

Circuit Ref	Motorola Part No.	Description
FL1105	9180468V05	CFUCJ455E
FL1106	9180469V04	CFWC455F
FL1107	9180469V05	CFWC455E
J0401	0902636Y02	CONN, 12-PIN, CONTROL HEAD
J0451	0902636Y01	CONN, 18-PIN, EXPANSION BOARD
J0501	0986105B01	CONN, 20-PIN, ACCESSORY
J0551	0905505Y04	CONN, 40-PIN, INTERNAL OPTION
J0552	0905505Y03	CONN, 18-PIN, RS232
J0601	0986165B01	DC POWER CONNECTOR
J1401	0986166B02	MINI-U ANTENNA CONNECTOR
L0481	NOTPLACED	
L0482	NOTPLACED	
L1001	2408382A11	IDCTR, 130nH
L1002	2408382C11	IDCTR, 130nH
L1003	2408382A11	IDCTR, 130nH
L1004	2408382C11	IDCTR, 130nH
L1005	2408382A11	IDCTR, 130nH
L1006	2408382A11	IDCTR, 130nH
L1007	2408382C11	IDCTR, 130nH
L1008	2408382A11	IDCTR, 130nH
L1009	2408382C11	IDCTR, 130nH
L1010	2408382A11	IDCTR, 130nH
L1011	2462587N68	IDCTR, 1uH
L1012	2462587N57	IDCTR, 220nH
L1013	2462587N59	IDCTR, 330nH
L1014	2462587N57	IDCTR, 220nH
L1101	2462587N33	IDCTR, 1.8uH
L1102	2408383X07	IDCTR, 3.3uH
L1103	2462587N33	IDCTR, 1.8uH
L1104	2480289M10	IDCTR, 6.8uH
L1105	2480289M10	IDCTR, 6.8uH
L1106	2462587N33	IDCTR, 1.8uH
L1107	2480289M09	IDCTR, 5.6uH
L1108	NOTPLACED	
L1109	NOTPLACED	
L1110	2480289M18	IDCTR, 33uH
L1111	2408383X07	IDCTR, 3.3uH
L1112	2483411T35	IDCTR, 6.8uH
L1201	2480289M17	IDCTR, 27uH
L1202	2462587Q20	IDCTR, 2.2uH
L1204	NOTPLACED	
L1205	2462587N59	IDCTR, 330nH
L1206	2480289M17	IDCTR, 27uH
L1207	NOTPLACED	
L1302	2408382D19	IDCTR, 491nH
L1303	2480289M15	IDCTR, 18uH
L1304	2462587N66	IDCTR, 820nH

Circuit Ref	Motorola Part No.	Description
L1305	2480289M15	IDCTR, 18uH
L1306	2480289M15	IDCTR, 18uH
L1307	2480289M15	IDCTR, 18uH
L1309	2480289M15	IDCTR, 18uH
L1310	2462587N60	IDCTR, 390nH
L1311	2480289M15	IDCTR, 18uH
L1313	2408382D19	IDCTR, 491nH
L1314	2480289M17	IDCTR, 27uH
L1315	2462587N66	IDCTR, 820nH
L1316	2480289M17	IDCTR, 27uH
L1317	2480289M17	IDCTR, 27uH
L1318	2480289M17	IDCTR, 27uH
L1321	2462587N58	IDCTR, 270nH
L1322	2480289M17	IDCTR, 27uH
L1324	2480289M17	IDCTR, 27uH
L1401	NOTPLACED	
L1402	2462587U09	IDCTR, 4.7uH
L1403	2462587U09	IDCTR, 4.7uH
L1404	2462587N56	IDCTR, 180nH
L1405	NOTPLACED	
L1406	2408381X36	IDCTR, 250.974nH
L1408	2408384A10	IDCTR, 120nH
L1413	2408381X17	IDCTR, 88.470nH
L1414	2408381X17	IDCTR, 88.470nH
L1415	2460591X01	IDCTR, 18nH
L1416	2460591X01	IDCTR, 18nH
L1417	2460591X01	IDCTR, 18nH
L1418	2408381X12	IDCTR, 66.389nH
L1419	2480289M17	IDCTR, 27uH
L1420	2408381X29	IDCTR, 172.891nH
L1421	2408381X25	IDCTR, 137.876nH
L1422	2408381X22	IDCTR, 115.581nH
L1423	2408381X16	IDCTR, 81.930nH
L1424	NOTPLACED	
L1425	2460591X01	IDCTR, 18nH
L1426	2460591X01	IDCTR, 18nH
L1601	2483411T45	IDCTR, 47uH
L1602	2483411T45	IDCTR, 47uH
L1603	2483411T73	IDCTR, 1uH
L1604	2483411T45	IDCTR, 47uH
L1605	2483411T41	IDCTR, 22uH
L1606	2462587T30	IDCTR, 1uH
L1607	2462587T30	IDCTR, 1uH
M1401	2686201B01	HEATSINK
Q0110	4880048M01	DTC144EKA
Q0151	4880048M01	DTC144EKA
Q0171	4880048M01	DTC144EKA
Q0173	4880052M01	RXT-A28
Q0177	4880048M01	DTC144EKA
Q0181	4880048M01	DTC144EKA
Q0183	4880048M01	DTC144EKA

Circuit Ref	Motorola Part No.	Description
Q0185	4880048M01	DTC144EKA
Q0271	4880214G02	MMBT3904
Q0641	4880048M01	DTC144EKA
Q0661	4805921T02	FMC2A
Q0662	4880214G02	MMBT3904
Q0663	4880048M01	DTC144EKA
Q0681	4880052M01	RXT-A28
Q1001	4880182D44	MMBR951
Q1002	4813824A17	MMBT3906
Q1003	4813824A17	MMBT3906
Q1101	4813827A07	MMBR941
Q1102	4813823A05	MMBFU310L
Q1103	4813823A05	MMBFU310L
Q1104	4813823A05	MMBFU310L
Q1105	4880048M01	DTC144EKA
Q1106	4813827A07	MMBR941
Q1107	4880214G02	MMBT3904
Q1201	4813824A17	MMBT3906
Q1202	4880182D44	MMBR951
Q1303	4884235R02	MMBFU310
Q1304	4880182D44	MMBR951
Q1305	4880182D44	MMBR951
Q1306	4884235R02	MMBFU310
Q1307	4880182D44	MMBR951
Q1308	4880182D44	MMBR951
Q1401	4886212B01	MRF1518
Q1402	4886136B01	MRF1550
Q1403	4886136B01	MRF1550
Q1404	NOTPLACED	
Q1501	4880141L03	BCW68G
Q1502	4880214G02	MMBT3904
Q1503	4880214G02	MMBT3904
Q1504	4880214G02	MMBT3904
Q1505	4813824A17	MMBT3906
Q1506	4880214G02	MMBT3904
Q1601	4813824A17	MMBT3906
Q1602	4880048M01	DTC144EKA
Q1603	4880214G02	MMBT3904
Q1604	4880214G02	MMBT3904
Q1605	4880214G02	MMBT3904
Q1606	4813824A17	MMBT3906
Q1607	4880214G02	MMBT3904
Q1609	4813824A17	MMBT3906
Q1610	4805585Q17	NE25139
R0101	0662057A73	RES, 10K
R0102	0662057A65	RES, 4.7K
R0103	0662057A01	RES, 10
R0104	0662057A73	RES, 10K
R0105	0662057A97	RES, 100K
R0106	NOTPLACED	
R0107	NOTPLACED	
R0108	0662057A57	RES, 2.2K
R0110	NOTPLACED	
R0111	0662057B47	RES, 0
R0112	NOTPLACED	
R0113	0662057A73	RES, 10K
R0114	0662057A73	RES, 10K
R0115	0662057A73	RES, 10K
R0116	NOTPLACED	
R0117	0662057A63	RES, 3.9K
R0121	0662057A97	RES, 100K
R0131	0662057B46	RES, 10MEG
R0132	0662057B10	RES, 330K
R0151	0662057A82	RES, 24K
R0152	0662057A82	RES, 24K
R0170	0662057A73	RES, 10K
R0171	0662057A65	RES, 4.7K
R0172	0662057A73	RES, 10K
R0173	0662057A65	RES, 4.7K
R0174	0662057A73	RES, 10K
R0175	0662057A73	RES, 10K
R0176	0662057A84	RES, 30K
R0177	0662057A65	RES, 4.7K
R0178	0662057A89	RES, 47K
R0179	0662057A89	RES, 47K
R0181	0662057A65	RES, 4.7K
R0182	0662057A89	RES, 47K
R0183	0662057A65	RES, 4.7K
R0184	0662057A89	RES, 47K
R0185	0662057A65	RES, 4.7K
R0186	0662057A89	RES, 47K
R0201	0662057A25	RES, 100
R0202	0662057A43	RES, 560
R0203	0662057A25	RES, 100
R0204	0662057A43	RES, 560
R0205	0662057A73	RES, 10K
R0206	0662057A73	RES, 10K
R0207	0662057A57	RES, 2.2K
R0208	0662057A57	RES, 2.2K
R0211	0660076E70	RES, 7.5K
R0212	0660076E70	RES, 7.5K
R0220	NOTPLACED	
R0221	0662057A82	RES, 24K
R0222	0662057A82	RES, 24K
R0223	0662057A84	RES, 30K
R0224	0662057A71	RES, 8.2K
R0225	NOTPLACED	
R0226	NOTPLACED	
R0227	NOTPLACED	
R0228	0662057B47	RES, 0
R0229	0662057A01	RES, 10
R0241	0662057A89	RES, 47K
R0242	0662057B47	RES, 0
R0251	0662057A89	RES, 47K
R0252	0662057A91	RES, 56K
R0253	0662057A97	RES, 100K
R0254	0662057A73	RES, 10K
R0255	0662057A73	RES, 10K
R0256	0662057A97	RES, 100K
R0257	0662057A57	RES, 2.2K
R0261	0662057A73	RES, 10K
R0262	0662057B08	RES, 270K
R0265	0662057A82	RES, 24K
R0266	NOTPLACED	
R0267	0662057A89	RES, 47K
R0268	0662057A73	RES, 10K
R0269	0662057A41	RES, 470
R0273	0662057A82	RES, 24K
R0274	NOTPLACED	
R0275	0662057A73	RES, 10K
R0276	0662057A77	RES, 15K
R0323	NOTPLACED	
R0324	NOTPLACED	
R0331	NOTPLACED	
R0332	NOTPLACED	
R0333	NOTPLACED	
R0335	NOTPLACED	
R0341	NOTPLACED	
R0342	NOTPLACED	
R0343	NOTPLACED	
R0344	NOTPLACED	
R0345	NOTPLACED	
R0346	NOTPLACED	
R0347	NOTPLACED	
R0401	0662057A33	RES, 220
R0407	0662057M26	RES, 10
R0408	0662057A25	RES, 100
R0409	0662057M26	RES, 10
R0412	0662057B47	RES, 0
R0441	0662057B47	RES, 0
R0442	0662057A49	RES, 1K
R0467	0662057M26	RES, 10
R0468	0662057A97	RES, 100K
R0481	0662057B47	RES, 0
R0482	0662057B47	RES, 0
R0508	0662057A41	RES, 470
R0509	0662057B47	RES, 0
R0510	0662057A65	RES, 4.7K
R0511	0662057A97	RES, 100K
R0512	0662057A77	RES, 15K
R0525	0662057A97	RES, 100K
R0529	0662057A89	RES, 47K
R0530	0662057A81	RES, 22K
R0531	0662057A43	RES, 560
R0533	0662057B47	RES, 0
R0535	0662057A49	RES, 1K
R0537	0662057A33	RES, 220
R0538	0662057A33	RES, 220
R0539	0662057A65	RES, 4.7K
R0541	0662057A83	RES, 27K
R0542	NOTPLACED	
R0543	0662057A97	RES, 100K
R0555	0662057A25	RES, 100
R0556	0662057A25	RES, 100
R0591	0662057A82	RES, 24K
R0592	0662057A01	RES, 10
R0593	0662057A97	RES, 100K
R0611	0662057A91	RES, 56K
R0612	0662057A65	RES, 4.7K
R0621	0662057A82	RES, 24K
R0641	0662057A73	RES, 10K
R0642	0660076E70	RES, 7.5K
R0643	0660076E51	RES, 1.2K
R0651	0662057A01	RES, 10
R0652	0662057A01	RES, 10
R0661	0662057A49	RES, 1K
R0662	0662057B02	RES, 150K
R0671	0662057A84	RES, 30K
R0672	0662057A73	RES, 10K
R0681	0662057A79	RES, 18K
R0682	0662057A93	RES, 68K
R1001	0662057A05	RES, 15
R1002	0662057A05	RES, 15
R1003	0662057A41	RES, 470
R1004	0662057A59	RES, 2.7K
R1005	0662057A31	RES, 180
R1006	0662057A73	RES, 10K
R1007	0662057A71	RES, 8.2K
R1008	0662057A65	RES, 4.7K
R1009	NOTPLACED	
R1010	NOTPLACED	
R1011	NOTPLACED	
R1101	0662057A18	RES, 51
R1102	0662057A78	RES, 16K
R1103	0662057A39	RES, 390
R1104	0662057A71	RES, 8.2K
R1106	0662057A25	RES, 100
R1107	0662057A68	RES, 6.2K
R1108	0662057A61	RES, 3.3K
R1109	0662057A37	RES, 330
R1110	0662057A25	RES, 100
R1111	0662057A17	RES, 47
R1113	0662057A64	RES, 4.3K
R1114	0662057A64	RES, 4.3K

Circuit Ref	Motorola Part No.	Description
R1115	0662057A75	RES, 12K
R1116	NOTPLACED	
R1117	0662057A37	RES, 330
R1118	0662057A56	RES, 2K
R1119	0662057A83	RES, 27K
R1120	0662057A18	RES, 51
R1121	0662057A71	RES, 8.2K
R1122	0662057A73	RES, 10K
R1123	0662057A51	RES, 1.2K
R1124	NOTPLACED	
R1125	NOTPLACED	
R1126	NOTPLACED	
R1127	NOTPLACED	
R1128	0662057A73	RES, 10K
R1129	0662057A73	RES, 10K
R1130	0662057A73	RES, 10K
R1131	0662057A77	RES, 15K
R1132	0662057A58	RES, 2.4K
R1133	0662057A61	RES, 3.3K
R1134	0662057A05	RES, 15
R1135	0662057A20	RES, 62
R1136	0662057A45	RES, 680
R1137	0662057A75	RES, 12K
R1138	0662057A01	RES, 10
R1139	0611077A12	RES, 2.7
R1140	0662057A39	RES, 390
R1141	0662057A55	RES, 1.8K
R1201	0662057B47	RES, 0
R1202	NOTPLACED	
R1203	0662057B02	RES, 150K
R1204	0662057B47	RES, 0
R1205	0662057A45	RES, 680
R1206	0662057A41	RES, 470
R1207	NOTPLACED	
R1208	0662057A18	RES, 51
R1209	0662057A61	RES, 3.3K
R1210	0662057A33	RES, 220
R1211	0662057B14	RES, 470K
R1212	0662057A25	RES, 100
R1213	0662057A45	RES, 680
R1214	0662057A54	RES, 1.6K
R1215	0662057A21	RES, 68
R1216	0662057A18	RES, 51
R1217	0662057A25	RES, 100
R1218	0662057A17	RES, 47
R1219	0662057A17	RES, 47
R1220	0662057A17	RES, 47
R1221	0662057B47	RES, 0
R1222	NOTPLACED	
R1306	0662057B47	RES, 0
R1307	0662057A19	RES, 56
R1308	0662057A19	RES, 56
R1309	0662057A41	RES, 470
R1311	0662057A73	RES, 10K
R1312	0662057A51	RES, 1.2K
R1313	0662057A51	RES, 1.2K
R1314	0662057A37	RES, 330
R1315	0662057A61	RES, 3.3K
R1316	0662057A45	RES, 680
R1317	0662057A09	RES, 22
R1318	0662057A41	RES, 470
R1319	0662057A01	RES, 10
R1320	0662057A41	RES, 470
R1325	0662057B47	RES, 0
R1326	0662057A19	RES, 56
R1327	0662057A19	RES, 56
R1328	0662057A41	RES, 470
R1330	0662057A73	RES, 10K
R1331	0662057A51	RES, 1.2K
R1332	0662057A51	RES, 1.2K
R1333	0662057A37	RES, 330
R1334	0662057A61	RES, 3.3K
R1335	0662057A47	RES, 820
R1336	0662057A09	RES, 22
R1337	0662057A22	RES, 75
R1338	0662057A27	RES, 120
R1339	0662057A22	RES, 75
R1340	0662057A49	RES, 1K
R1341	0662057A25	RES, 100
R1342	0662057A25	RES, 100
R1343	0662057C55	RES, 150
R1344	0662057A49	RES, 1K
R1345	0662057A25	RES, 100
R1346	0662057A25	RES, 100
R1347	0662057C55	RES, 150
R1376	0662057A65	RES, 4.7K
R1402	0611079A64	RES, 390
R1404	0680194M18	RES, 51
R1405	0680194M18	RES, 51
R1406	0662057A73	RES, 10K
R1407	0662057A73	RES, 10K
R1409	0682089V01	RES, .01
R1410	0683962T52	RES, 130
R1411	0662057C99	RES, 10K
R1412	NOTPLACED	
R1413	0680194M01	RES, 10
R1414	0680194M01	RES, 10
R1415	NOTPLACED	
R1416	0680194M01	RES, 10
R1417	0680194M01	RES, 10
R1418	0680194M01	RES, 10
R1419	0680194M01	RES, 10
R1420	0680194M01	RES, 10
R1421	0680194M01	RES, 10
R1422	0680194M01	RES, 10
R1423	0680194M01	RES, 10
R1424	0662057D10	RES, 27K
R1425	0662057D10	RES, 27K
R1440	0662057A25	RES, 100
R1441	NOTPLACED	
R1442	0662057A25	RES, 100
R1443	0662057A49	RES, 1K
R1444	0662057A33	RES, 220
R1445	0662057A68	RES, 6.2K
R1446	NOTPLACED	
R1447	0662057B47	RES, 0
R1448	NOTPLACED	
R1449	0611079A64	RES, 390
R1450	0683962T71	RES, 820
R1451	0662057K31	RES, 180
R1453	0662057K31	RES, 180
R1454	0662057K31	RES, 180
R1455	0662057K31	RES, 180
R1457	0662057K01	RES, 10
R1458	0611079A64	RES, 390
R1459	0611079A64	RES, 390
R1460	0680106R01	RES, 0.1
R1463	0662057A75	RES, 12K
R1464	0662057A61	RES, 3.3K
R1465	0662057A61	RES, 3.3K
R1466	NOTPLACED	
R1467	NOTPLACED	
R1468	NOTPLACED	
R1469	0662057C01	RES, 0
R1470	NOTPLACED	
R1471	NOTPLACED	
R1472	0662057A73	RES, 10K
R1473	0680194M01	RES, 10
R1474	0680194M01	RES, 10
R1475	0680194M01	RES, 10
R1476	0680194M01	RES, 10
R1477	0662057A61	RES, 3.3K
R1478	0662057A73	RES, 10K
R1479	0662057A61	RES, 3.3K
R1480	0662057D10	RES, 27K
R1482	0662057B47	RES, 0
R1483	0662057A34	RES, 240
R1484	0662057A49	RES, 1K
R1501	0662057A45	RES, 680
R1502	0662057C67	RES, 470
R1503	0662057A61	RES, 3.3K
R1504	0662057A73	RES, 10K
R1505	0662057A69	RES, 6.8K
R1506	0662057A87	RES, 39K
R1507	0662057A49	RES, 1K
R1508	0662057R19	RES, 100
R1509	0662057P95	RES, 100K
R1510	NOTPLACED	
R1511	0662057P95	RES, 100K
R1512	NOTPLACED	
R1513	0662057C76	RES, 1.1K
R1514	0662057A97	RES, 100K
R1515	0662057A49	RES, 1K
R1516	0662057C71	RES, 680
R1517	0662057C71	RES, 680
R1518	0662057A61	RES, 3.3K
R1519	0662057C71	RES, 680
R1522	0662057A73	RES, 10K
R1523	NOTPLACED	
R1524	0662057C71	RES, 680
R1525	NOTPLACED	
R1526	0662057A97	RES, 100K
R1527	0662057A97	RES, 100K
R1528	0662057A80	RES, 20K
R1532	0662057A95	RES, 82K
R1533	0662057A73	RES, 10K
R1535	0662057C01	RES, 0
R1537	0662057A90	RES, 51K
R1541	0662057A68	RES, 6.2K
R1542	0662057A49	RES, 1K
R1543	0662057A49	RES, 1K
R1544	0662057A90	RES, 51K
R1545	0662057A65	RES, 4.7K
R1601	0662057A73	RES, 10K
R1602	0662057A65	RES, 4.7K
R1604	0662057A49	RES, 1K
R1605	0662057B10	RES, 330K
R1606	0662057B02	RES, 150K
R1607	0662057B19	RES, 750K
R1608	0662057A57	RES, 2.2K
R1609	0662057A73	RES, 10K
R1610	0662057A82	RES, 24K
R1611	0662057A49	RES, 1K
R1612	0662057A25	RES, 100
R1613	0662057A59	RES, 2.7K
R1614	0662057A49	RES, 1K
R1615	0662057A49	RES, 1K
R1616	0662057A33	RES, 220
R1617	0662057A57	RES, 2.2K
R1620	0662057A51	RES, 1.2K
R1621	0662057A68	RES, 6.2K
R1622	0662057A49	RES, 1K
R1626	0662057A18	RES, 51
R1627	0662057A73	RES, 10K

Circuit Ref	Motorola Part No.	Description
R1628	0662057A55	RES, 1.8K
R1629	0662057A67	RES, 5.6K
R1630	0662057A53	RES, 1.5K
R1631	0662057A18	RES, 51
R1632	0662057A82	RES, 24K
R1633	NOTPLACED	
R1635	0662057B47	RES, 0
R1636	0662057A42	RES, 510
R1637	0662057A59	RES, 2.7K
R1638	0662057A55	RES, 1.8K
SH1201	NOTPLACED	
SH1202	NOTPLACED	
SH1301	NOTPLACED	
SH1302	2680473U01	VCO SHIELD
U0101	5102226J56	MC68HC11FL0
U0111	5102463J64	EEPROM
U0121	5186137B01	FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	MC3403
U0221	5185130C53	ASFIC COMPANDER IC
U0251	5184704M60	MUX/DEMUX
U0271	5109699X01	AUDIO PA
U0301	NOTPLACED	
U0331	NOTPLACED	
U0341	NOTPLACED	
U0342	NOTPLACED	
U0351	NOTPLACED	
U0611	5183308X01	LM2941
U0641	5183308X01	LM2941
U0651	5113816A07	MC78M05
U0652	5113815A02	MC33064
U0653	NOTPLACED	
U1001	4809939C05	UMC5N
U1051	5108278X01	MIXER
U1101	5102463J52	MC74HC4066
U1102	5102463J52	MC74HC4066
U1103	5186144B01	SA616
U1201	5185963A27	FRACN SYNTHESIZER IC
U1250	5185963A33	LP2951
U1377	4809939C05	UMC5N
U1378	4809939C05	UMC5N
U1401	5185130C65	POWER CONTROL IC
U1402	5113818A03	MC33072
U1501	5185963A15	LM50
U1502	5109731C21	LM6142BIM
U1503	5185765B26	LDMOS PREDRIVER IC
U1601	5180929W01	MC1350
VR0151	4813830A15	MMBZ5232B
VR0501	4805656W09	MMQA20VT1
VR0503	4805656W09	MMQA20VT1
VR0504	4813830A40	MMBZ5257B
VR0505	4805656W09	MMQA20VT1
VR0509	4813830A40	MMBZ5257B
VR0510	4813830A40	MMBZ5257B
VR0537	4813830A15	MMBZ5232B
VR0541	4813830A27	MMBZ5244B
VR0601	4813832C77	TRANSIENT SUPPRESSOR
VR0621	4813830A15	MMBZ5232B
VR0671	NOTPLACED	
Y0131	4880113R19	CRYSTAL, 38.4 KHZ
Y1101	4880908W08	CRYSTAL, 10.245 MHZ
Y1102	9186145B02	DISCRIMINATOR, 455 KHZ
*Y1201	4880114R04	CRYSTAL, 16.8 MHZ
Y1202	NOTPLACED	

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

Chapter 8: VHF (136-174 MHz) 25-45W Bipolar Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 VHF (136-174 MHz) 25-45W Bipolar Model Charts

1.1 CDM Series Model Chart

CDM Series, VHF (136-174 MHz) 25-45W Bipolar

Model				Description
AAM25KKC9AA1AN				CDM750, 136-174 MHz, 25-45W, 12.5/20/25 kHz
	AAM25KKD9AA2AN			CDM1250, 136-174 MHz, 25-45W, 12.5/20/25 kHz
		AAM25KKF9AA5AN		CDM1550, 136-174 MHz, 25-45W, 12.5/20/25 kHz
			Item	**Description**
X			GCN6112	Control Head, CDM750
	X		GCN6113	Control Head, CDM1250
		X	GCN6114	Control Head, CDM1550
X	X	X	IMUD6015	Tanapa, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			6881091C54	User Guide, CDM750
	X		6881091C55	User Guide, CDM1250
		X	6881091C56	User Guide, CDM1550

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 11, Section 1.0: VHF (136-174 MHz) 25-45W LDMOS Model Charts.)

1.2 PRO Series Model Chart

PRO Series, VHF (136-174 MHz) 25-45W Bipolar				
Model				Description
LAM25KKC9AA1AN				PRO3100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp
	LAM25KKD9AA2AN			PRO5100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp
		LAM25KKF9AA5AN		PRO7100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp
			Item	Description
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUD6015	Tanapa, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 11, Section 1.0: VHF (136-174 MHz) 25-45W LDMOS Model Charts.)

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550/PRO7100** Depth excludes knobs	**25 - 45W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	25-45W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB @ 12.5 kHz (TIA) 78 dB @ 25 kHz (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 75 dB @ 20 kHz 80 dB @ 25 kHz
Spurious Rejection	75 dB @ 12.5 kHz 80 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the VHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 VHF (136-174 MHz) 25-45W Bipolar Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the VHF range from 136 to 174 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, 1st IF, 2nd IF, and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. High-side injection is used.

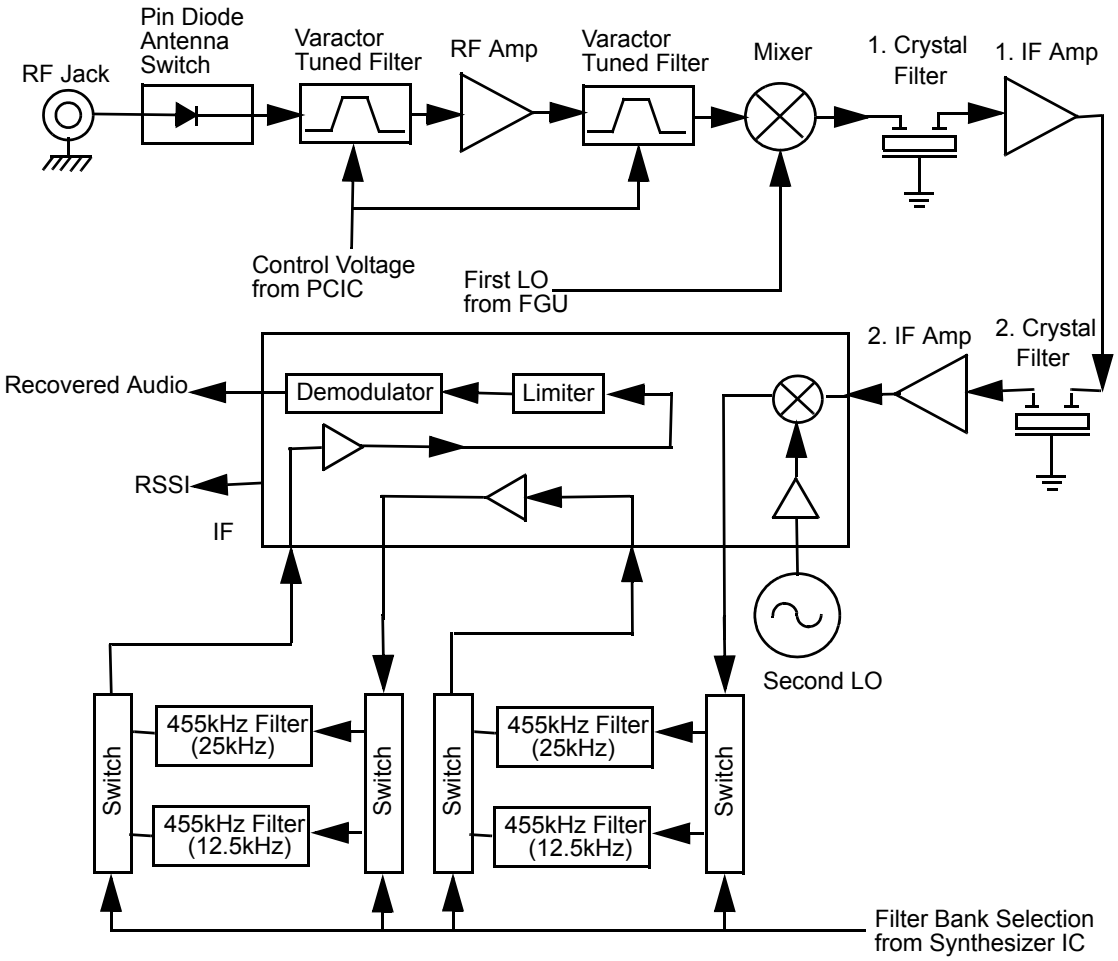


Figure 8-1 VHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the 1st IF section and 2 pairs of 455 kHz ceramic filters in the 2nd IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver pre-selector filter (C3001, C3002, D3001 and associated components). The 2-pole pre-selector filter tuned by the dual varactor diode D3001 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U3501) in the Transmitter section. A dual hot carrier diode (D3003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is a surface mount device (SMD) Q3001 with collector-base feedback to stabilize gain, impedance, and intermodulation. Transistor Q3002 compares the voltage drop across resistor R3002 with a fixed base voltage from divider R3011, R3000 and R3012, and adjusts the base current of Q3001 as necessary to maintain its collector current constant at approximately 15-20 mA. Operating voltage is from the regulated 9.3V supply (9V3). During transmit, 9.1 volts (K9V1) turns off both transistors Q3002 and Q3001. This protects the RF pre-amplifier from excessive dissipation during transmit mode. A following 3dB pad (R3006 – R3008 and R3016 – R3018) stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The dual varactor diode D3004 is controlled by the same signal FECTRL_1, which controls the pre-selector filter.

2.3 First Mixer and 1st Intermediate Frequency (IF)

The signal coming from the front-end is converted to the 1st IF frequency of 44.85 MHz using a passive double-balanced mixer (D3031). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using high side injection. The high-side injection signal (RXINJ) from the frequency synthesizer circuit has a level of approximately +13 dBm and is injected via matching transformer T3002.

The IF output signal (IF) from transformer T3001 pin 2 is fed to the first 2-pole crystal filter FL3101. The filter output in turn is matched to IF amplifier Q3101 which is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the 5 volt supply. Its output impedance is matched to the second 2-pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 2nd Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz 1st IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC, the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the 2nd IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The 2nd IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114 for 20/25 kHz channel spacing or FL3111, FL3113/F3115 for 12.5 kHz channel spacing. These pairs

are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3101 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the Controller circuits).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101, pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101, pin 63) and in addition is available at accessory connector J0501-15.

3.0 VHF (136-174 MHz) 25-45W Bipolar Transmitter Power Amplifier (PA) 45W

The radio's 45W PA is a four-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. The line-up consists of three stages which utilize LDMOS technology, followed by a final stage using a bipolar device. The gain of the first stage (U3401) is adjustable, controlled by pin 4 of PCIC (U3501) via Q3501 and Q3502 (VCONT). It is followed by an LDMOS pre-driver stage (Q3421), an LDMOS driver stage (Q3431) and a bipolar final stage (Q3441).

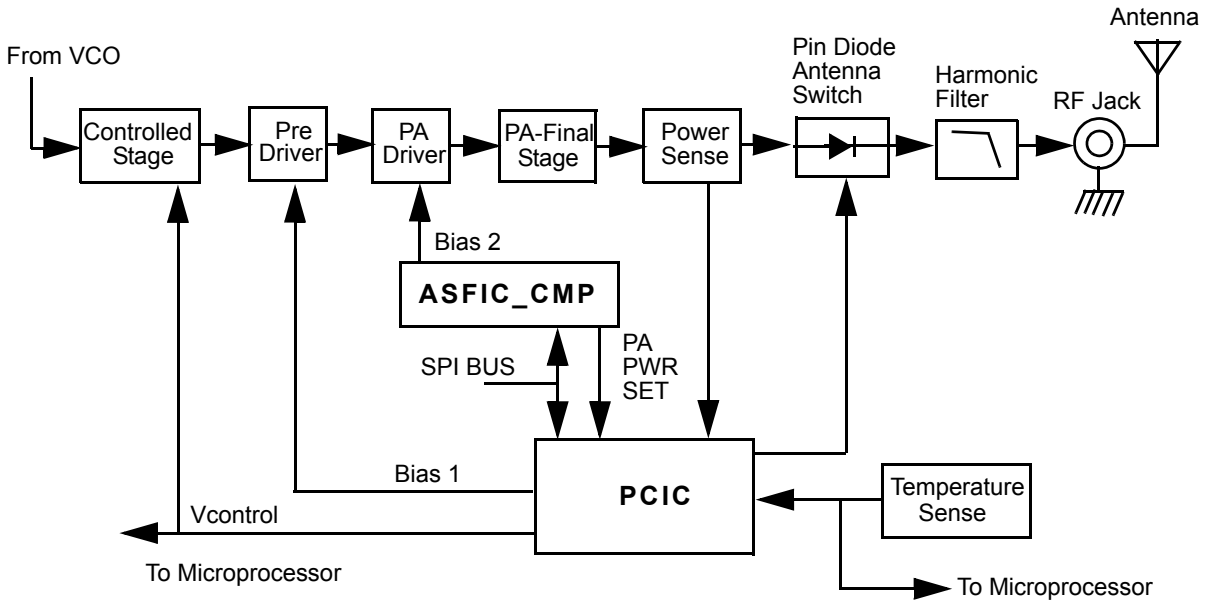


Figure 8-2 VHF Transmitter Block Diagram

Devices U3401 and Q3421 are surface mounted. The remaining devices are directly attached to the heat sink.

3.1 Power Controlled Stage

The first stage (U3401) is a 20 dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U3401 is controlled by a DC voltage applied to pin 1 from the power control circuit (U3501 pin 4, with transistors Q3501 and Q3502 providing current gain and level-shifting). The control voltage

simultaneously varies the bias of two FET stages within U3401. This biasing point determines the overall gain of U3401 and therefore its output drive level to Q3421, which in turn controls the output power of the PA.

In receive mode the voltage control line is at ground level and turns off Q3501-2, which in turn switches off the biasing voltage to U3401.

3.2 Pre-Driver Stage

The next stage is an LDMOS device (Q3421) providing a gain of +13 dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line PCIC_MOSBIAS_1 is set during transmit mode by the PCIC pin 24, and fed to the gate of Q3421 via the resistive network R3410, R3415, and R3416. The bias voltage is factory tuned.

3.3 Driver Stage

The following stage is an enhancement-mode N-Channel MOSFET device (Q3431) providing a gain of 10 dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 is set in transmit mode by the ASFIC and fed to the gate of Q3431 via the resistive network R3404, R3406, and R3431-5. This bias voltage is also tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Customer Programming Software (CPS). Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device's drain current is drawn directly from the radio's DC supply voltage input, PASUPVLTG, via L3431 and L3432.

3.4 Final Stage

The final stage uses bipolar device Q3441. The device's collector current is also drawn from the radio's DC supply voltage input. To maintain class C operation, the base is DC-grounded by a series inductor (L3441) and a bead (L3442). A matching network consisting of C3446-52, C3467, L3444-5, and two striplines, transforms the impedance to approximately 50 ohms and feeds the directional coupler.

3.5 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward and reflected power delivered by Q3441. The coupled signals are rectified by D3451-2 and combined by R3463-4. The resulting DC voltage is proportional to RF output power and feeds the RFIN port of the PCIC (U3501, pin 1). The PCIC controls the gain of stage U3401 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

An abnormally high reflected power level, such as may be caused by a damaged antenna, also causes the DC voltage applied to the PCIC to increase, and this will cause a reduction in the gain of U3401, reducing transmitter output power to prevent damage to the final device due to an improper load.

3.6 Antenna Switch

The antenna switch consists of two PIN diodes, D3471 and D3472. In the receive mode, both diodes are off. Signals applied at the antenna jack J3401 are routed, via the harmonic filter, through network L3472, C3474 and C3475, to the receiver input. In the transmit mode, the keyed 9 volts turns on Q3471 which enables current sink Q3472, set to 96 mA by R3473 and VR3471. This completes a DC path from PASUPVLTG, through L3473, D3471, L3477, L3472, D3472, L3471,

R3474 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D3471 to the harmonic filter and antenna jack. D3472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L3472 is selected to appear as a broadband quarter-wave transmission line, making the short circuit presented by D3472 appear as an open circuit at the junction of D3472 and the receiver path.

3.7 Harmonic Filter

Components L3491-L3494 and C3490-C3498 form a nine-pole Chebychev low-pass filter to attenuate harmonic energy of the transmitter. R3490 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.8 Power Control

The transmitter uses the power control IC (PCIC, U3501) to control the power output of the radio. A portion of the forward and reflected RF power from the transmitter is sampled by the directional coupler, rectified and summed, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC contains a digital-to-analog converter (DAC) which provides a reference voltage of the control loop to the PCIC via R3517. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which is amplified and shifted in DC level by stages Q3501 and Q3502. The 0 to 4 VDC range at U1503, pin 4 is translated to a 0 to 8.5 VDC range at the output of Q3501, and applied as VCONT to the power-adjust input pin of the first transmitter stage U3401. This adjusts the transmitter power output to the intended value. Variations in forward or reflected transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C3502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U3502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 29) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power is reduced so as to reduce the transmitter temperature.

4.0 VHF (136-174 MHz) 25-45W Bipolar Frequency Synthesis

The frequency synthesizer subsystem consists of the reference oscillator (Y3261 or Y3262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U3201), and the voltage-controlled oscillators and buffer amplifiers (U3301, Q3301-2 and associated circuits).

4.1 Reference Oscillator

The reference oscillator (Y3262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U3201 (LVFRAC-N) and

controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U3201 (pin 25) to set the frequency of the oscillator. The output of the oscillator (U3262 pin 3) is applied to pin 23 (XTAL1) of U3201 via R3263 and C3235.

In applications where less frequency stability is required, the oscillator inside U3201 is used along with an external crystal Y3261, varactor diode D3261, C3261, C3262 and R3262. In this case, Y3262, R3263, C3235 and C3251 are not used. When Y3262 is used, Y3261, D3261, C3261, C3262 and R3262 are not used, and C3263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U3201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13 volt positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

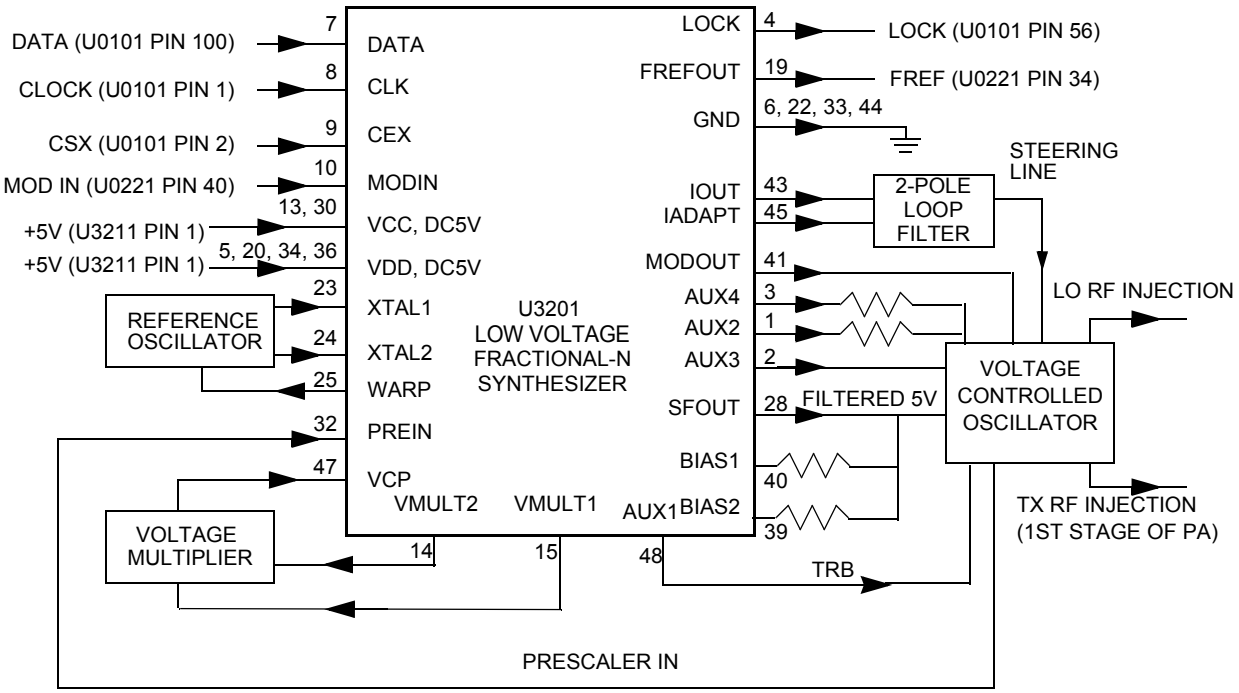


Figure 8-3 VHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U3201 pin 30) supplies an output voltage of 4.5 VDC (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R3363) and the synthesizer charge pump resistor network (R3251, R3252). The synthesizer supply voltage is provided by the 5V regulator U3211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U3201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier circuits (D3201, C3202, C3203). This voltage multiplier is basically a diode capacitor network driven by two signals (1.05MHz) 180 degrees out of phase signals (U3201-14 and -15).

Output LOCK (U3201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U3201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U3201-7), clock line CLK (U3201-8), and chip enable line CSX (U3201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U3301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuits.

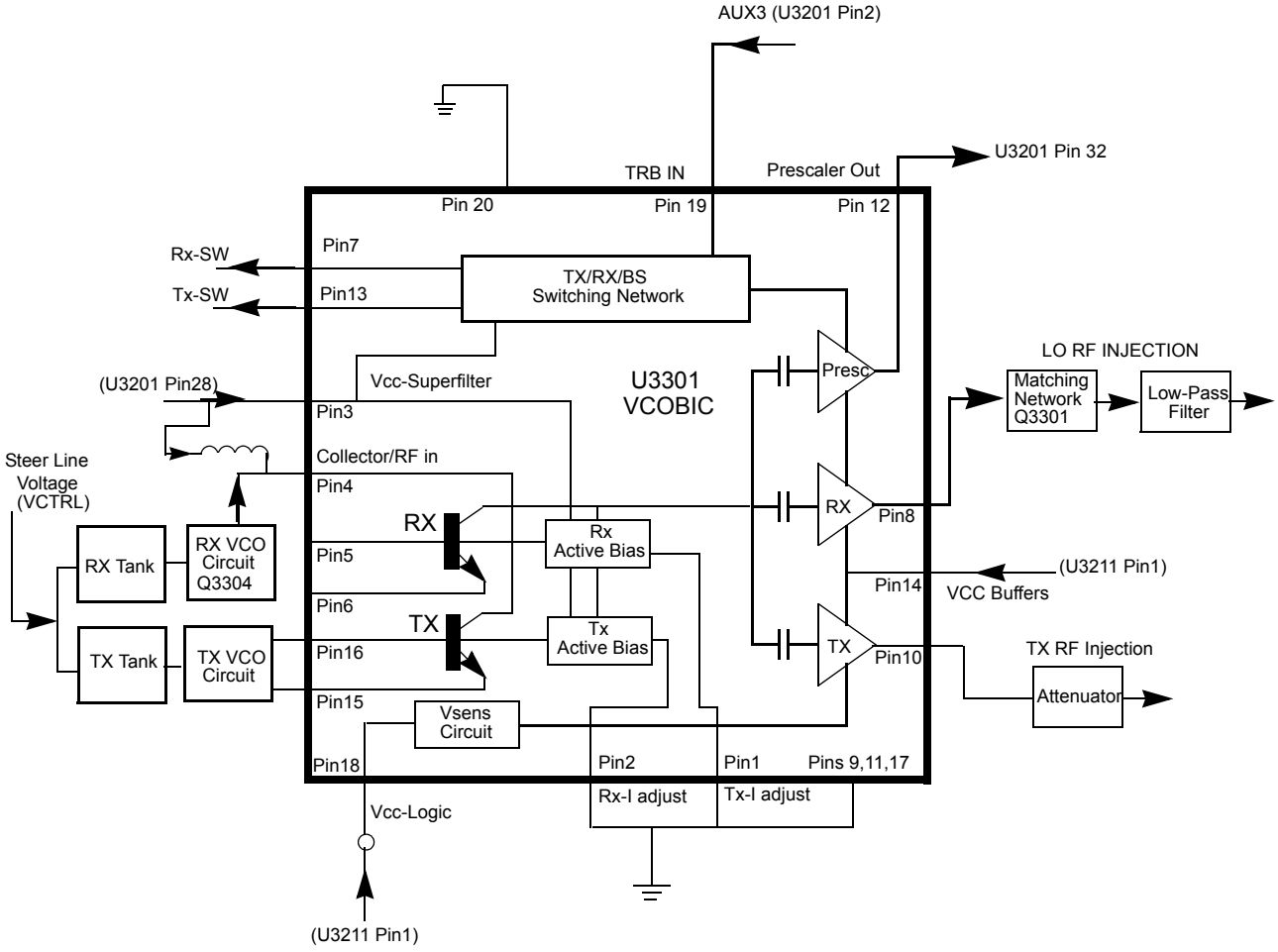


Figure 8-4 VHF VCO Block Diagram

The VCOBIC together with the Fractional-N synthesizer (U3201) generates the required frequencies in both the transmit and receive modes. The TRB line (U3301, pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables the TX tank and TX output (pin 10), and a low enables the RX tank and RX output (pin 8). A sample of the signal from the enabled RF output is routed from U3301, pin 12 (PRESC_OUT), via a low-pass filter, to U3201, pin 32 (PREIN).

A steering line voltage (VCTRL) between 2.5 volts and 11 volts at varactor diode D3361 tune the full TX frequency range (TXINJ) from 136 MHz to 174 MHz, and varactor diode D3341 tunes the full RX frequency range (RXINJ) from 181 MHz to 219 MHz. The RX tank circuit uses a Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q3304 is used for better side-band noise.

The external RX buffers (Q3301 and Q3302) are enabled by a high at U3301, pin 7 (RX_SWITCH) via transistor switch Q3303. In the TX mode, the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U3201 pin 41) is applied to varactor diode D3362, which modulates the TX VCO frequency via capacitor C3362. Varactor D3362 is biased for linearity from the VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem consists of the low voltage FRAC-N (LVFRACN), reference oscillator (a crystal oscillator with temperature compensation), charge pump circuit, loop filter circuit and a DC supply. The output signal PRESC from the VCOBIC (U3301 pin 12) is fed to U3201 pin 32 (PREIN) via a low-pass filter (C3318, L3318 and C3226) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U3201) is a dual modulus type with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of reference oscillator Y3261 or Y3262.

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at U3201 pin 43 (IOUT). The loop filter (which consists of R3221-R3223 and C3221-C3224) transforms this current into a voltage that is applied to the varactor diodes (D3361 for transmit, D3341 for receive) to alter the output frequency of the appropriate VCO. The current can be set to a value fixed within the LVFRAC-N IC, or to a value determined by the currents flowing into BIAS 1 (U3201-40) or BIAS 2 (U3201-39). The currents are set by the value of R3251 and R3252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer, the magnitude of the loop current is increased by enabling the IADAPT pin (U3201-45) for a certain software programmable time (adapt mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1 and BIAS 2, or by the internal current source. A settled synthesizer loop is indicated by a high level signal at U3201-4 (LOCK).

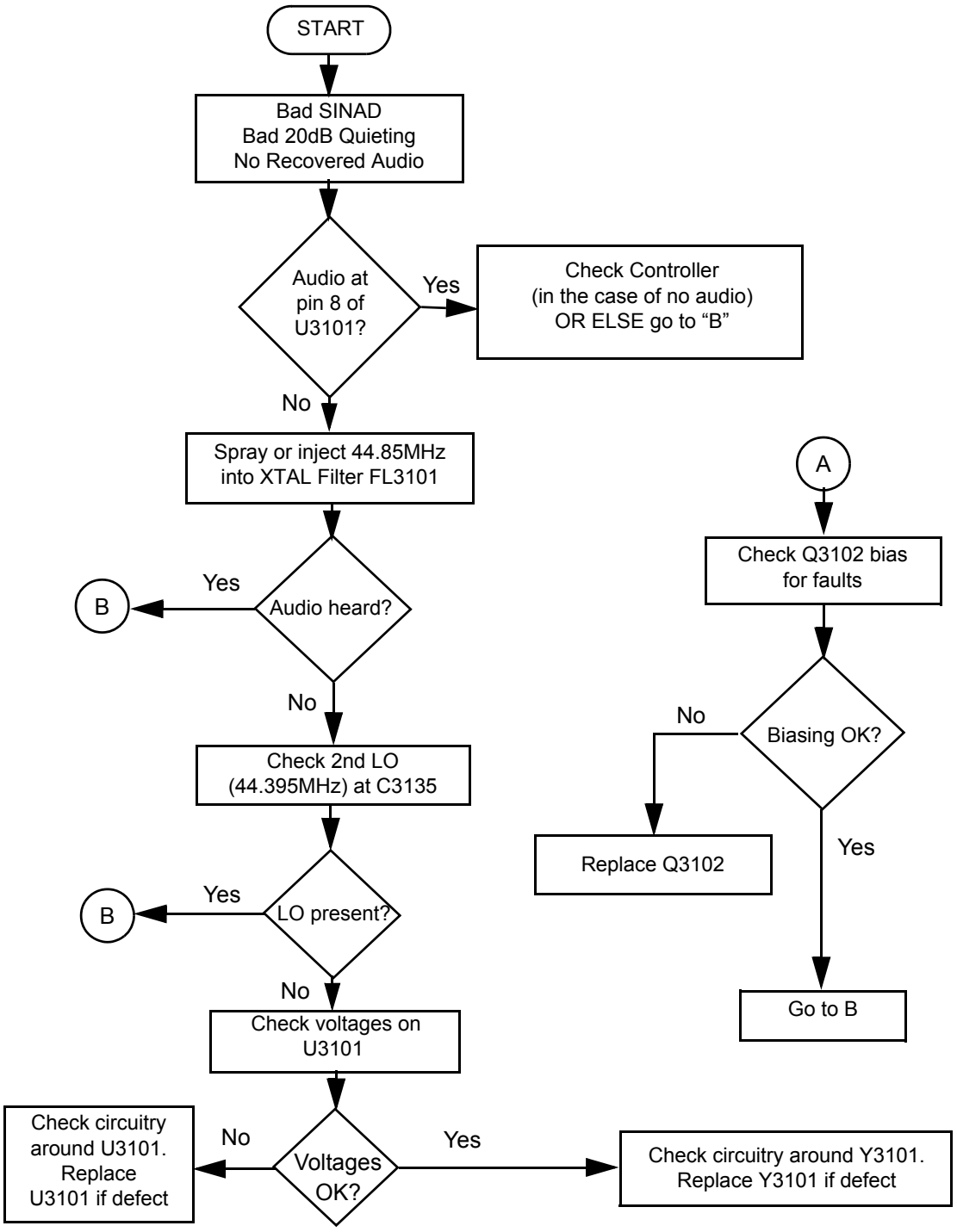
The LOCK signal is routed to one of the µP's ADC inputs (U0101-56). From the measured voltage, the µP determines whether LOCK is active.

To modulate the PLL, the two spot modulation method is utilized. Via U3201, pin 10 (MODIN), the audio signal is applied to both the A/D converter (low frequency path) as well as the balance attenuator (high frequency path). The A/D converter changes the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U3201-41) and connected to the VCO modulation diode D3362 via R3364.

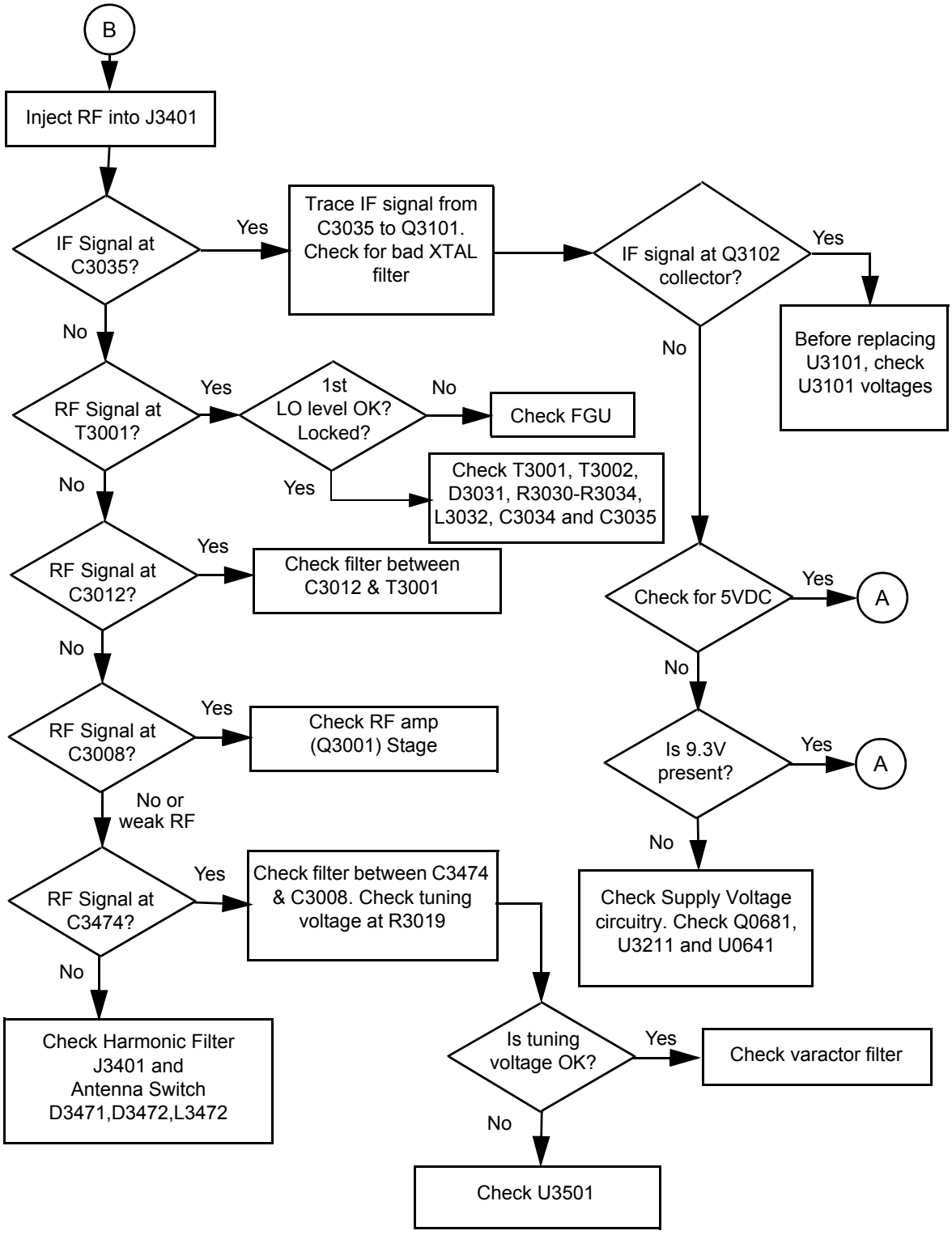
Section 3

TROUBLESHOOTING CHARTS

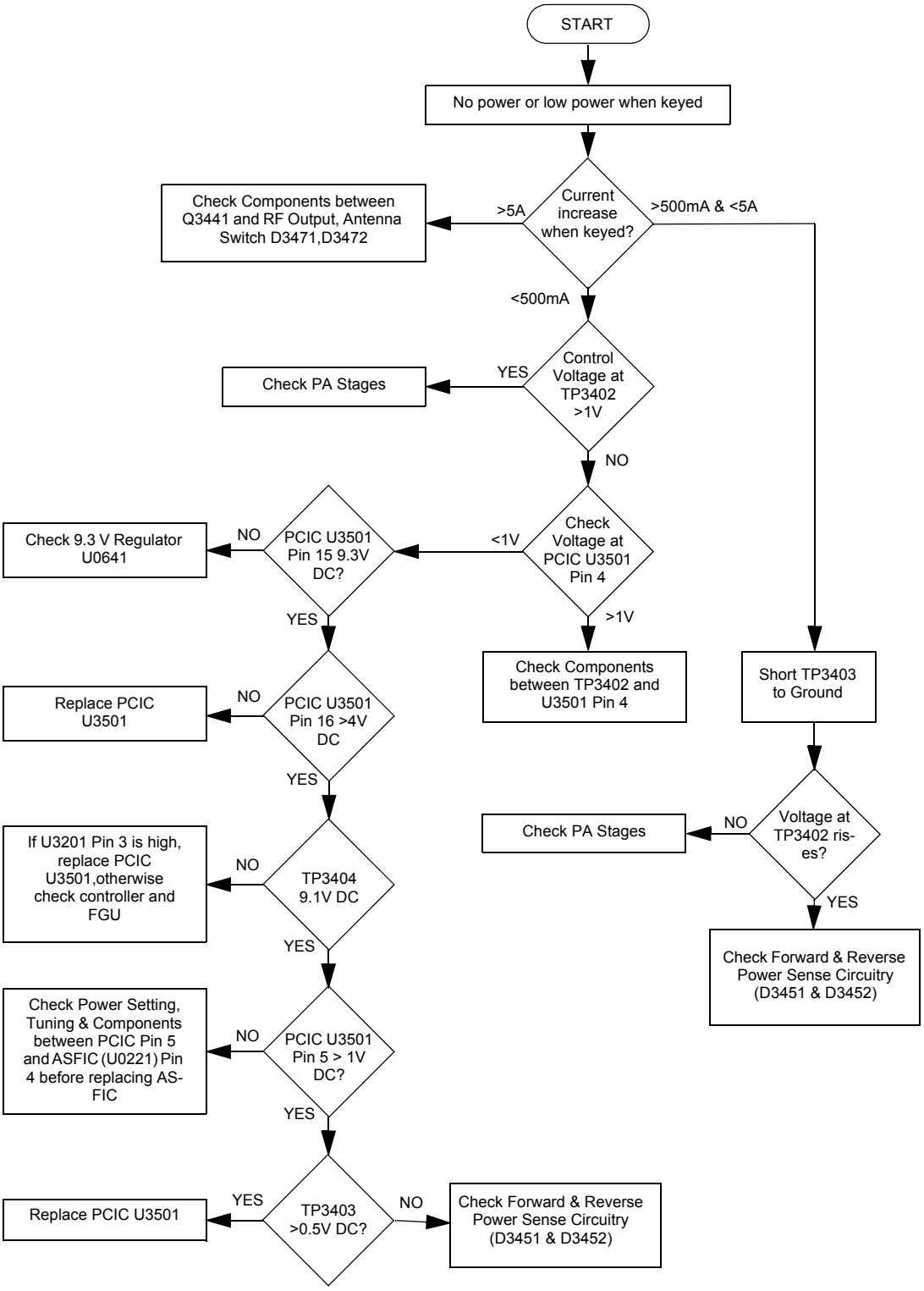
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



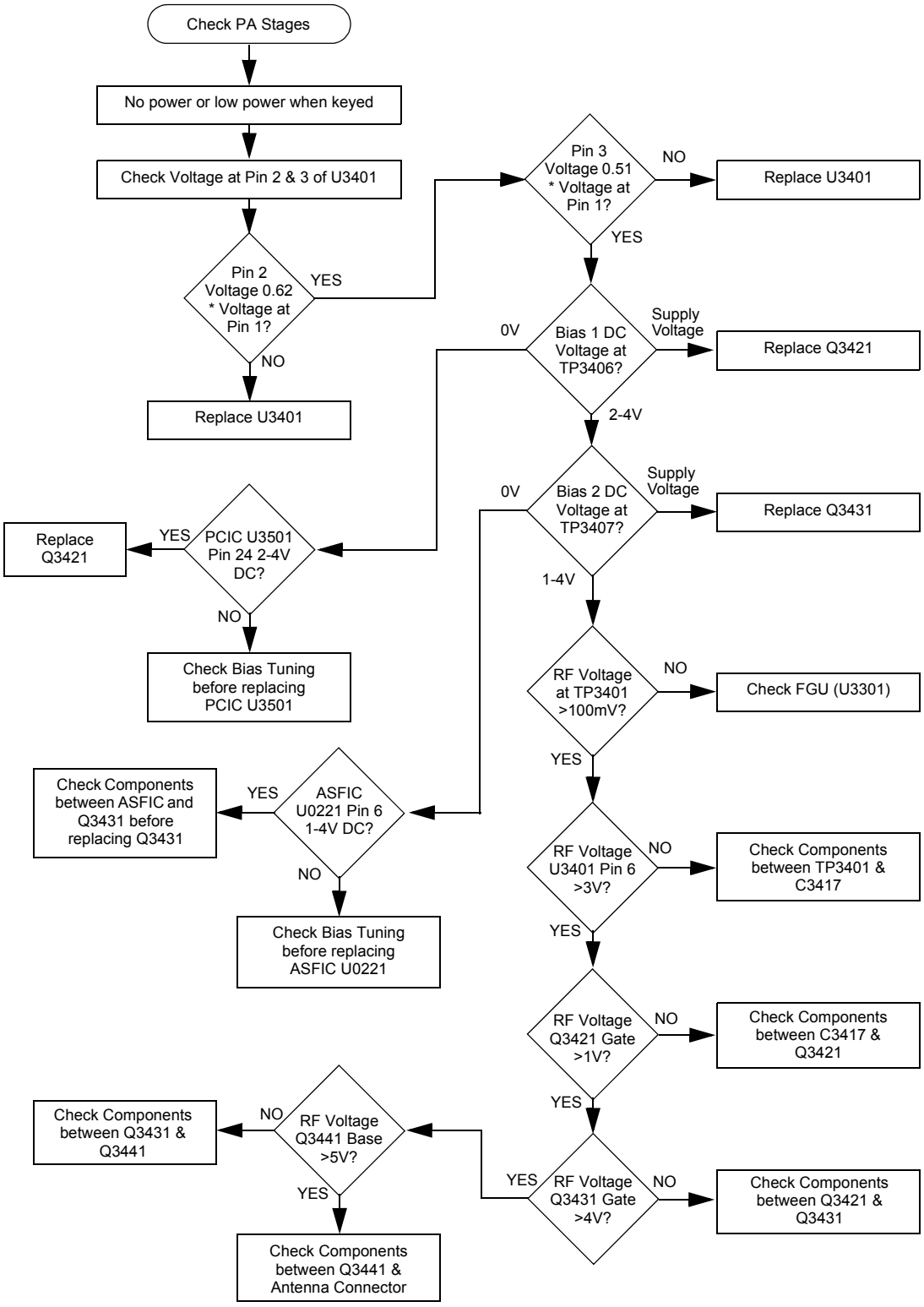
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



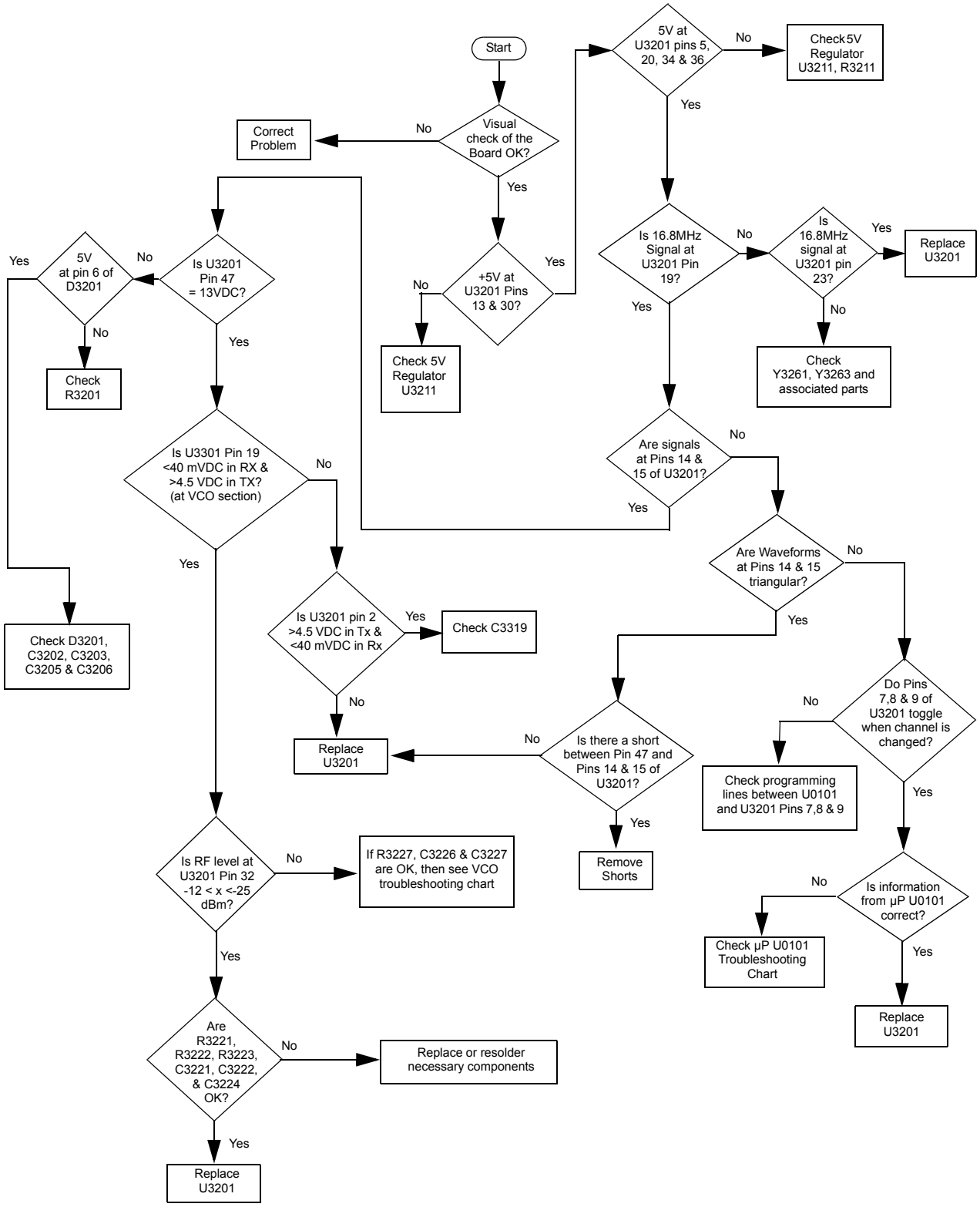
2.0 Troubleshooting Flow Chart for 45W Transmitter (Sheet 1 of 2)



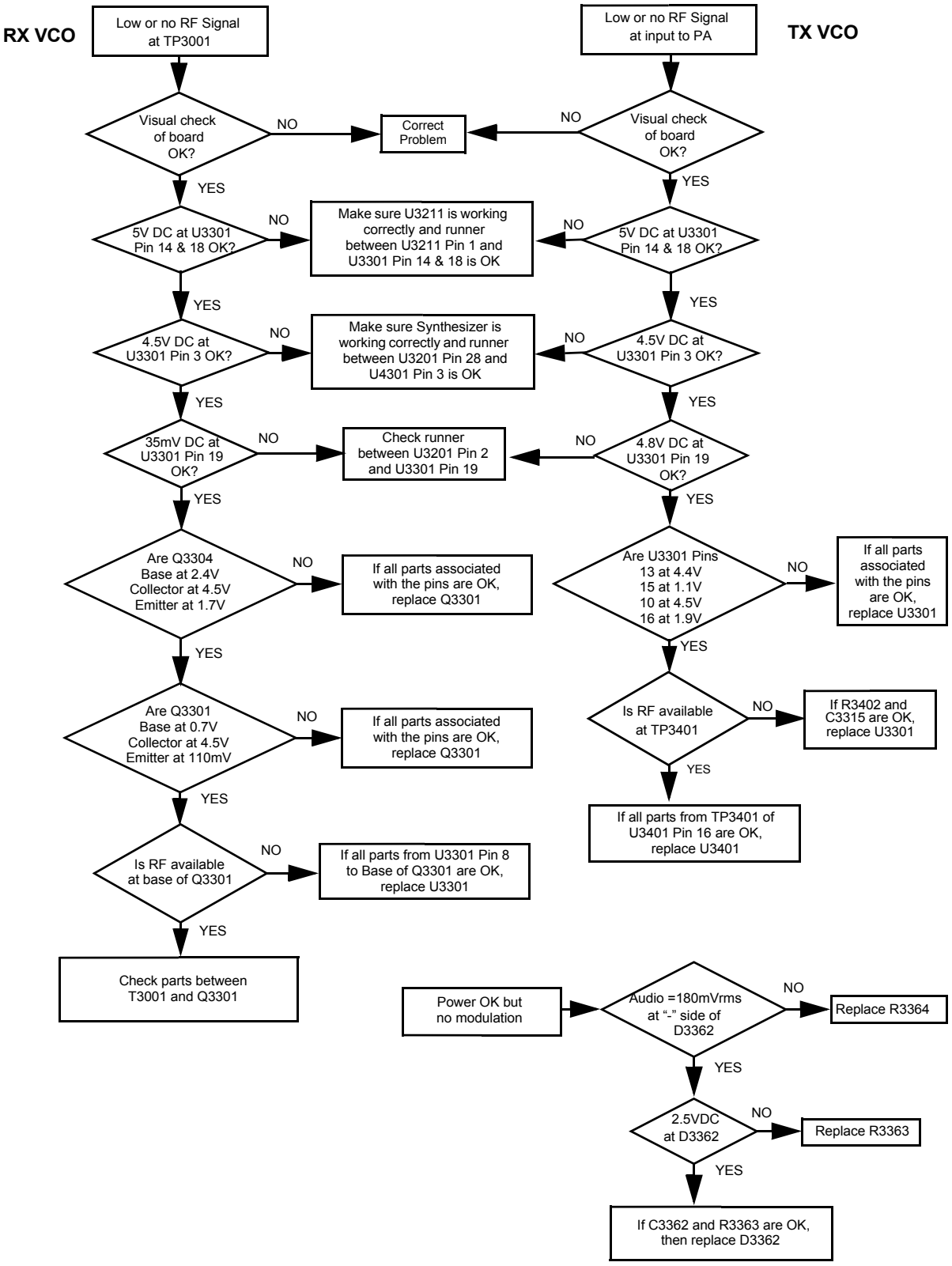
2.1 Troubleshooting Flow Chart for 45W Transmitter (Sheet 2 of 2)



3.0 Troubleshooting Flow Chart for Synthesizer



4.0 Troubleshooting Flow Chart for VCO



Section 4

VHF (136-174 MHZ) 25-45W BIPOLAR PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The VHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the VHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in this chapter show both the controller and VHF circuit components. The VHF schematics and the related PCB and parts lists are shown in the tables below.

Table 8-1 VHF 25-45W PCB 8486140B12 Diagrams and Parts Lists

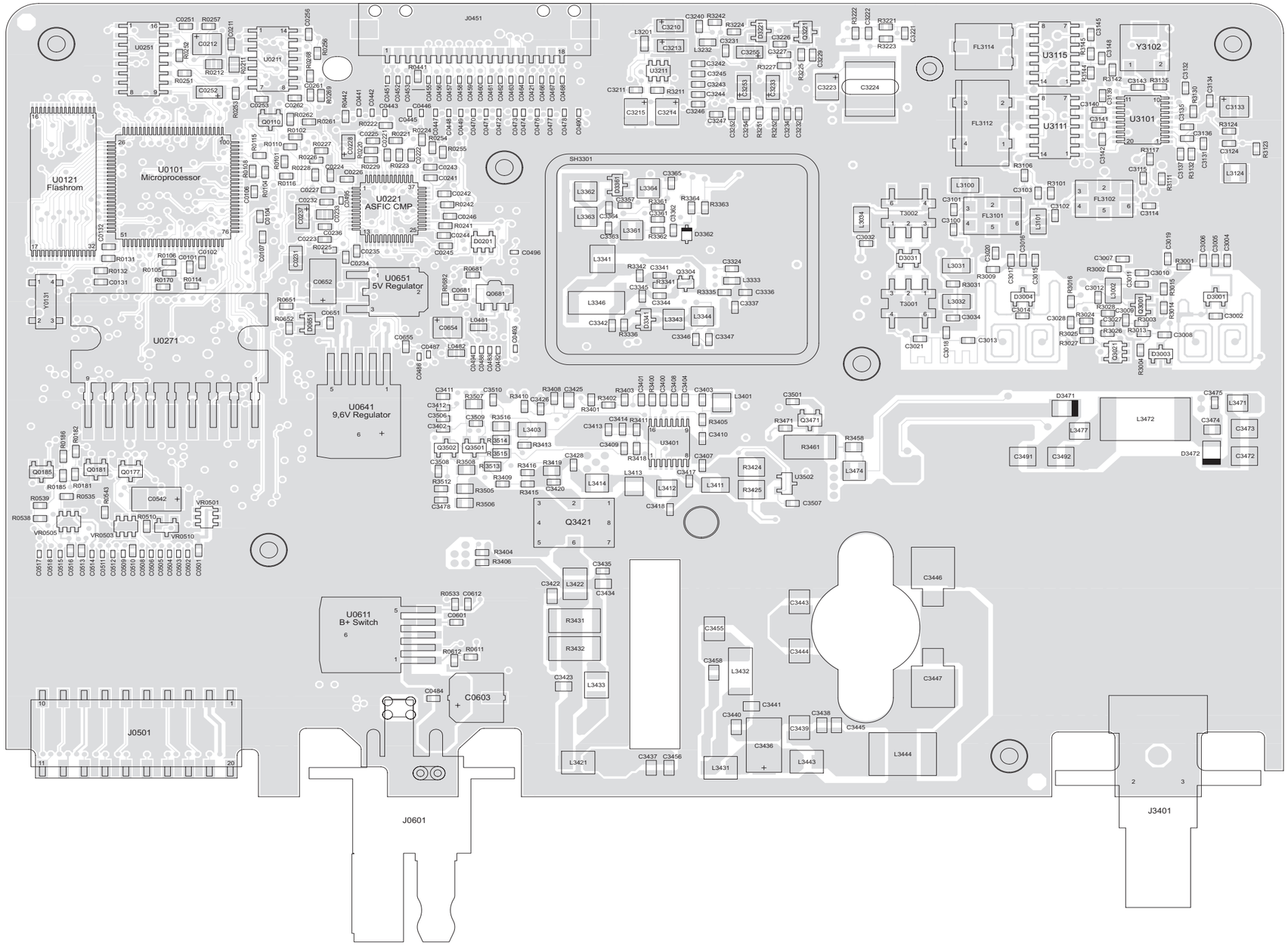
PCB 8486140B12:	**Page:**
Main Board Top Side	**8: 4-3**
Main Board Bottom Side	**8: 4-4**
SCHEMATICS	
Power Amplifier 25 - 45W	**8: 4-5**
FRACN Synthesizer	**8: 4-6**
Voltage Controlled Oscillator	**8: 4-7**
Receiver Front-End	**8: 4-8**
IF	**8: 4-9**
Parts List	**8: 4-10**
Controller version is **T6/7**	

Table 8-2 VHF 25-45W PCB 8486140B13 Diagrams and Parts Lists

PCB 8486140B13:	**Page:**
Main Board Top Side	**8: 4-13**
Main Board Bottom Side	**8: 4-14**
SCHEMATICS	
Power Amplifier 25 - 45W	**8: 4-5**
FRACN Synthesizer	**8: 4-6**
Voltage Controlled Oscillator	**8: 4-7**
Receiver Front-End	**8: 4-8**
IF	**8: 4-15**
Parts List	**8: 4-16**
Controller version is **T9**	

Notes

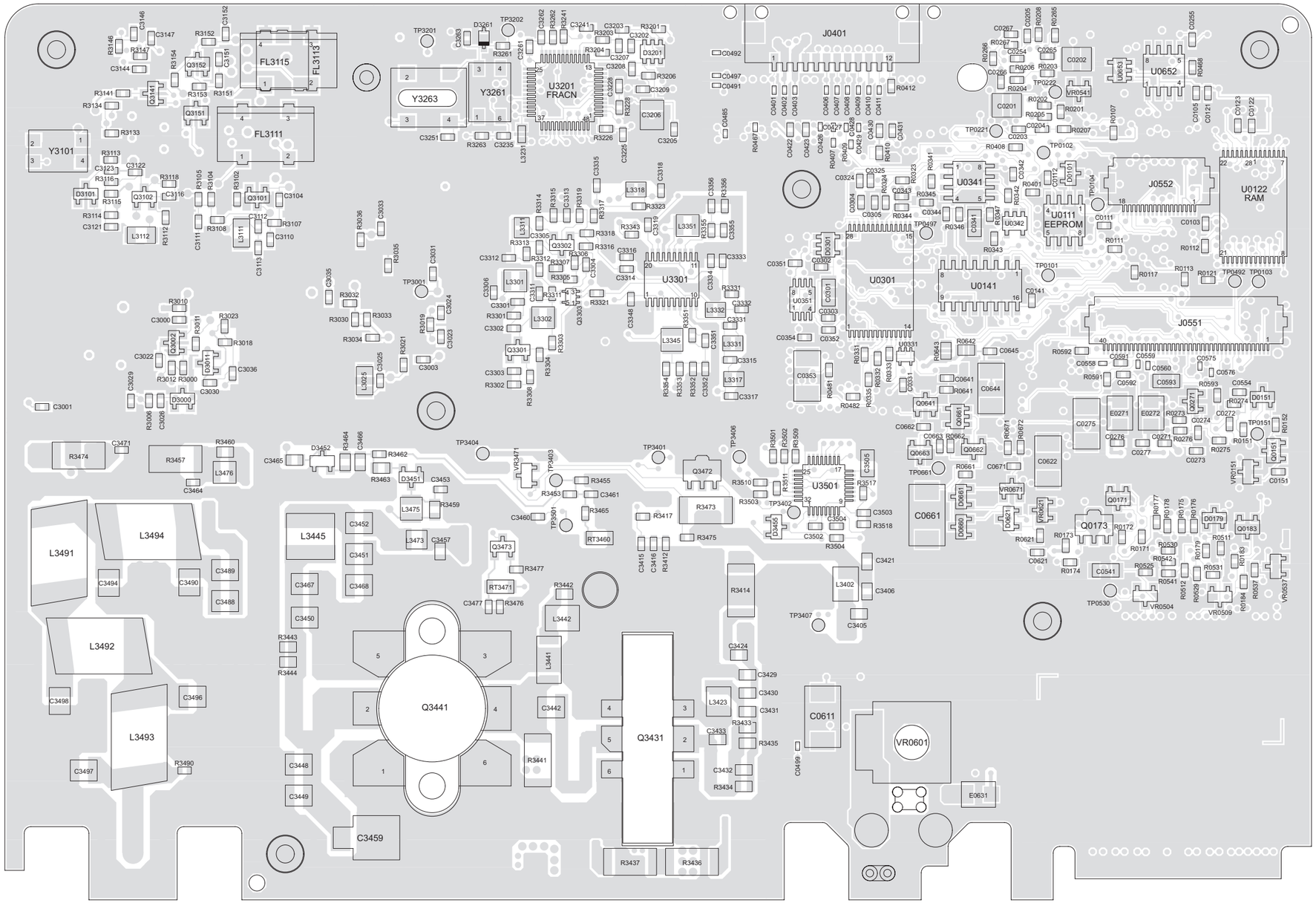
2.0 VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B12, Schematics, and Parts Lists



ZWG0130227-B

VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B12 Top Side

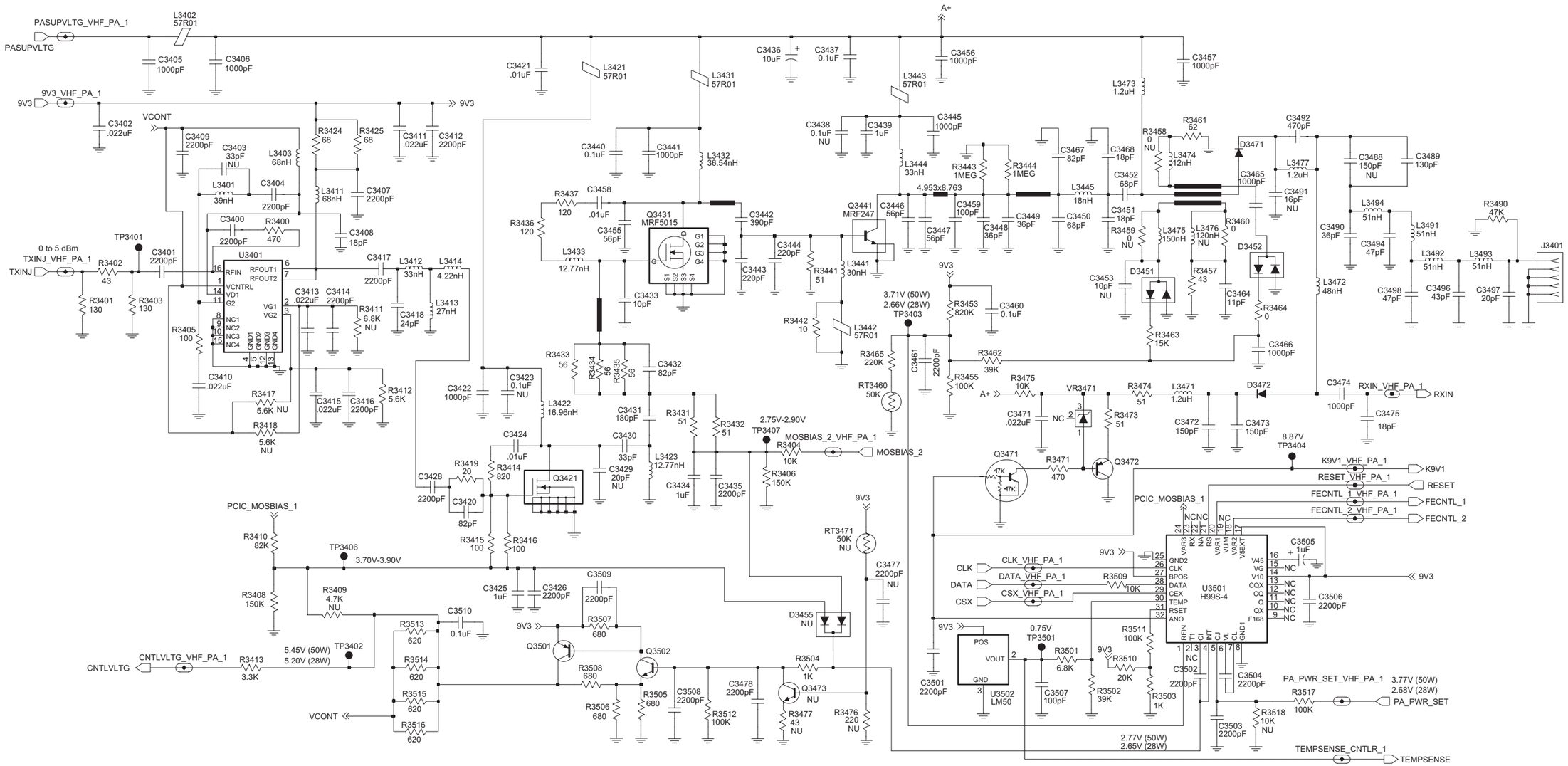
6881091C63-C



VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B12 Bottom Side

ZWG0130226-B

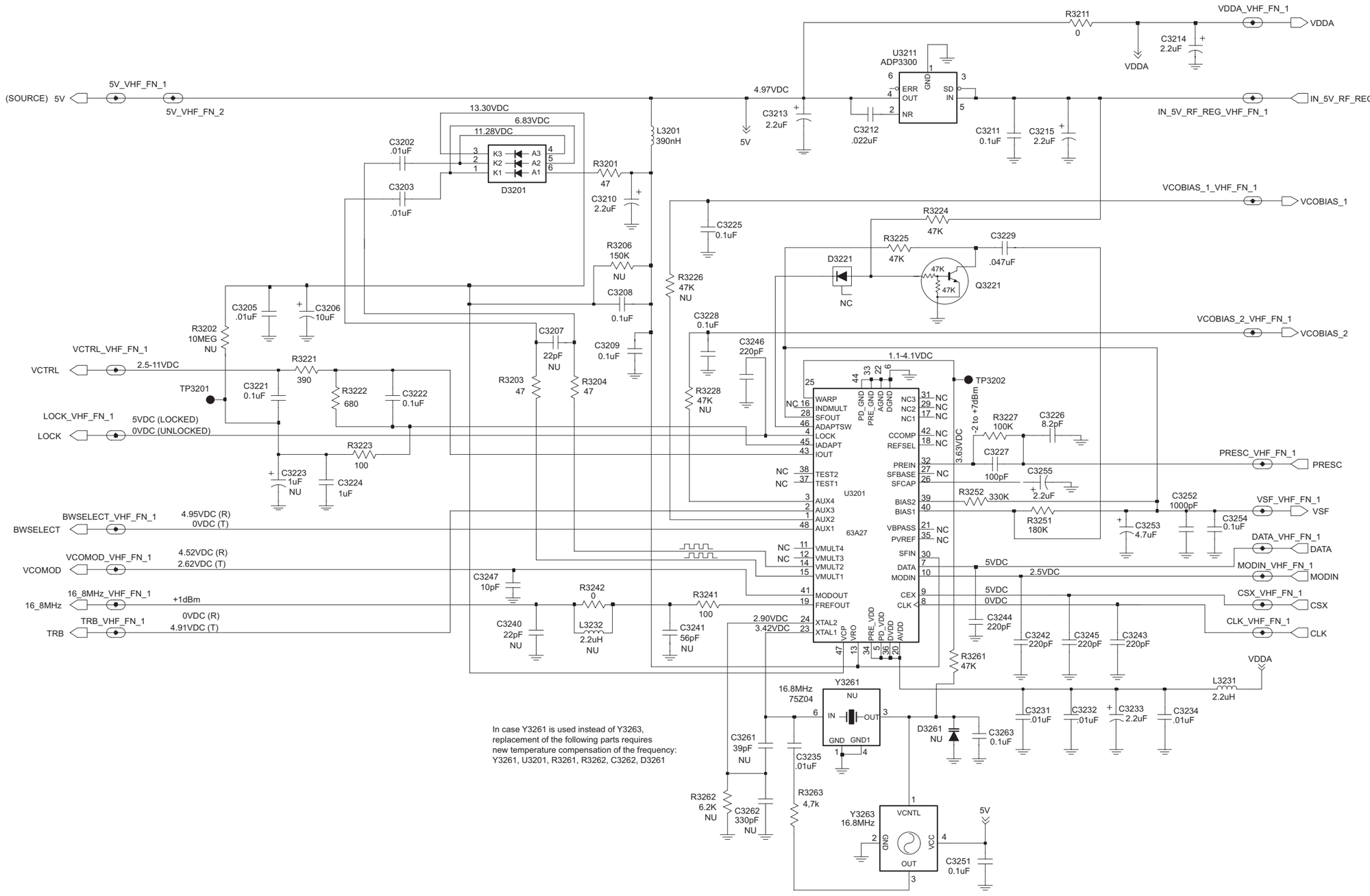
6881091C63-C



ZWG0130512-O

VHF (136-174 MHz) 25-45W Bipolar Power Amplifier

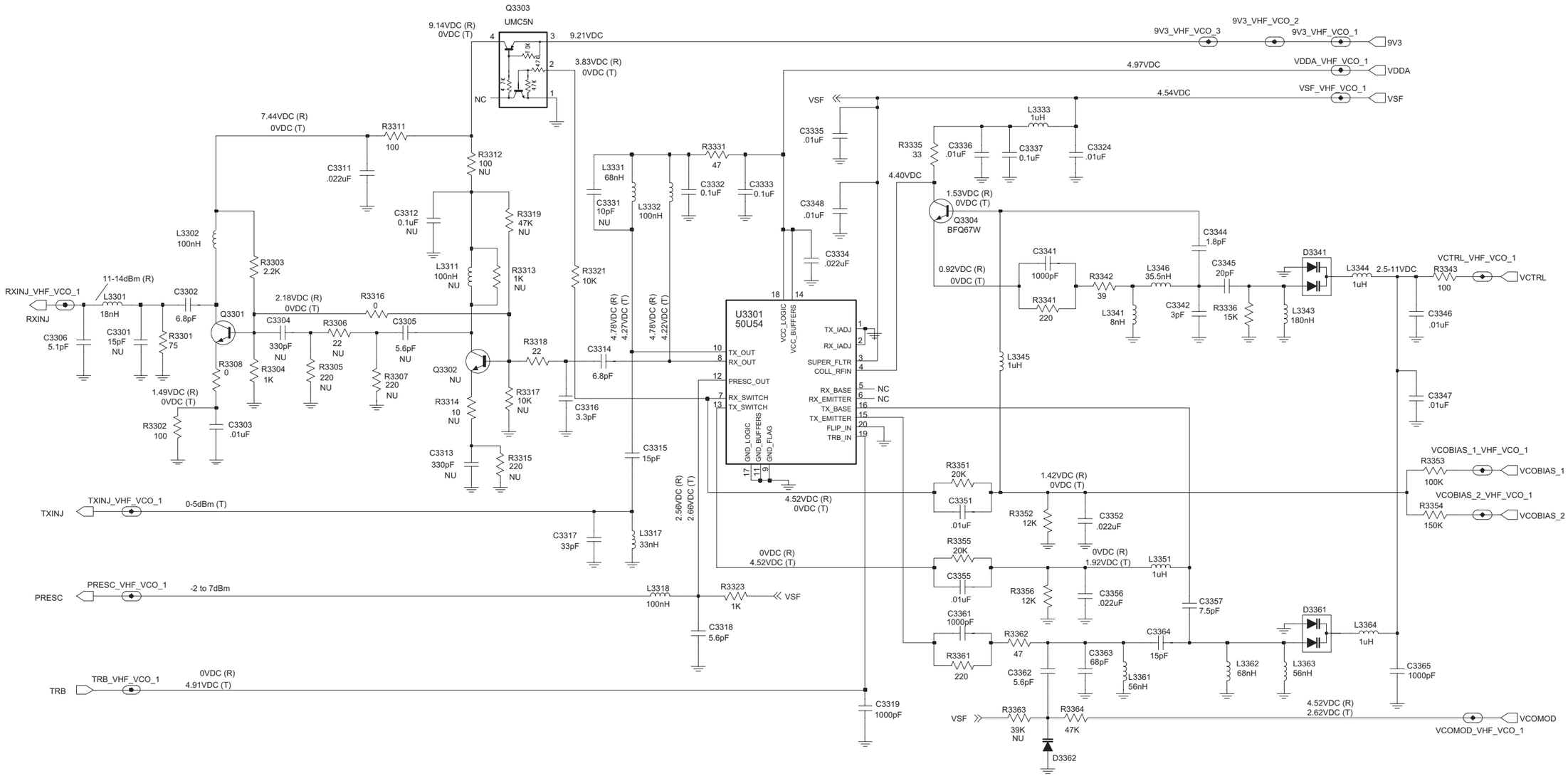
6881091C63-C



VHF (136-174 MHz) 25-45W Bipolar FRACN Synthesizer

ZWG0130564-O

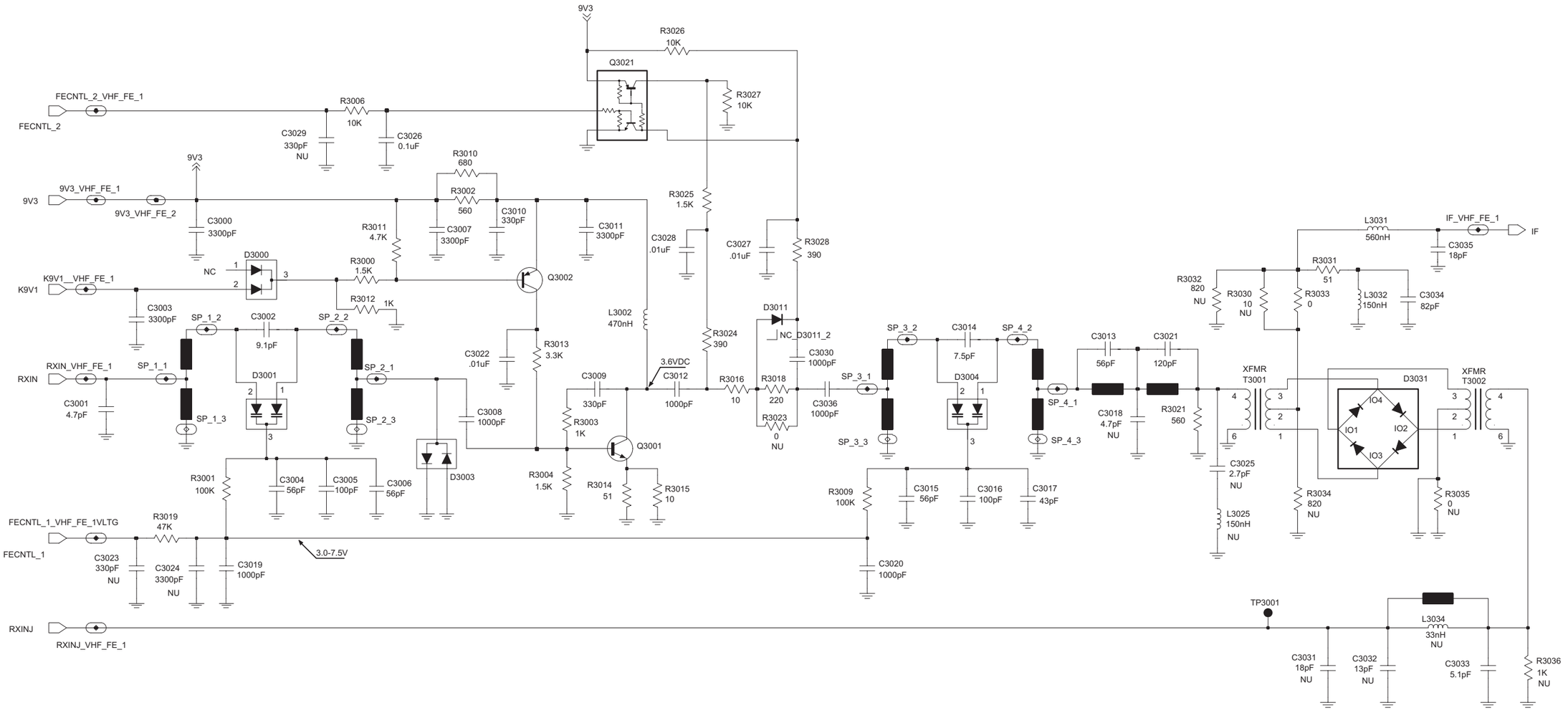
6881091C63-C



ZWG0130394-O

VHF (136-174 MHz) 25-45W Bipolar Voltage Controlled Oscillator

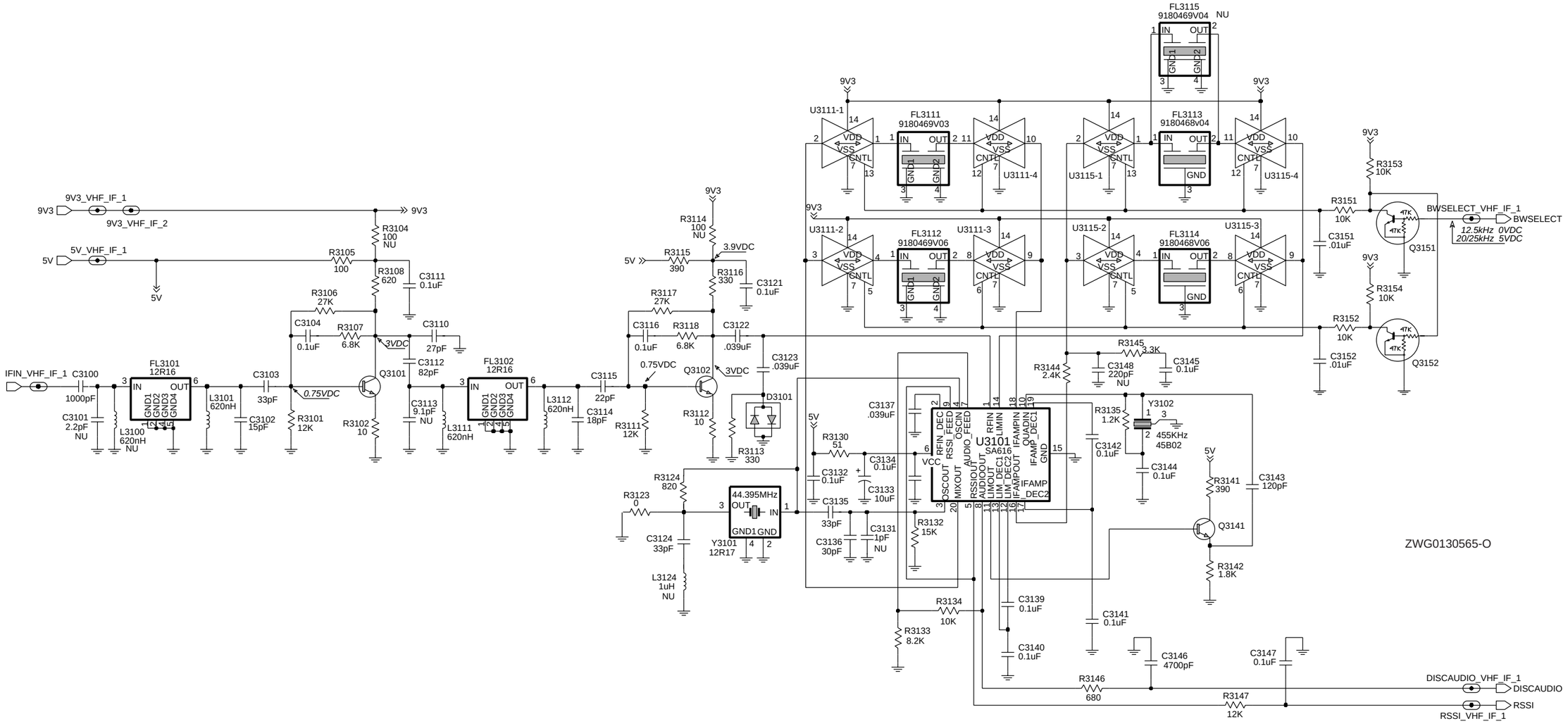
6881091C63-C



VHF (136-174 MHz) 25-45W Bipolar Receiver Front-End

ZWG0130395-A

6881091C63-C



VHF (136-174 MHz) 25-45W Bipolar IF (for PCB 8486140B12)

VHF 25-45W PCB 8486140B12 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5%
C3002	2113740F26	9.1pF 5%
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5%
C3005	2113740F51	100pF 5%
C3006	2113740F45	56pF 5%
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5%
C3014	2113740F24	7.5pF 5%
C3015	2113740F45	56pF 5%
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113743E20	100nF 16V
C3027	2113741F49	10nF 50V
C3028	2113741F49	10nF 50V
C3030	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F33	18pF 5% 50V
C3036	2113741F25	1nF 50V
C3100	2113741F25	1nF 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF 16V
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF 16V
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF 16V
C3121	2113743E20	100nF 16V
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3132	2113743E20	100nF 16V
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF 16V
C3135	2113740L30	33pF 2%
C3136	2113740L29	30pF 2%
C3137	2113743E11	39nF 10%
C3139	2113743E20	100nF 16V
C3140	2113743E20	100nF 16V
C3141	2113743E20	100nF 16V
C3142	2113743E20	100nF 16V
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF 16V
C3145	2113743E20	100nF 16V
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF 16V
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF 16V
C3209	2113743E20	100nF 16V
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF 16V
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP 2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF 16V
C3222	2113743E20	100nF 16V
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF 16V
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF 16V
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10%
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3247	2113740F27	10pF 5% 50V
C3251	2113743E20	100nF 16V
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF 16V
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF 16V
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF 16V
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF 16V
C3333	2113743E20	100nF 16V
C3334	2113743E07	22nF 16V
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF 16V
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF 16V
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF 16V
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F31	15pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113741F33	2.2nF 50V
C3401	2113741F33	2.2nF 50V
C3402	2113743E07	22nF 16V
C3404	2113741F33	2.2nF 50V
C3405	2113740A79	1nF 5% 50V
C3406	2113740A79	1nF 5% 50V
C3407	2113741F33	2.2nF 50V
C3408	2113740F33	18pF 5% 50V
C3409	2113741F33	2.2nF 50V
C3410	2113743E07	22nF 16V
C3411	2113743E07	22nF 16V
C3412	2113741F33	2.2nF 50V
C3413	2113743E07	22nF 16V
C3414	2113741F33	2.2nF 50V
C3415	2113743E07	22nF 16V
C3416	2113741F33	2.2nF 50V
C3417	2113741F33	2.2nF 50V
C3418	2113740F36	24pF 5% 50V
C3420	2113740F49	82pF 5% 50V
C3421	2113741A45	10nF 50V
C3422	2113740A79	1nF 5% 50V
C3424	2113741A45	10nF 50V
C3425	2113928E01	1uF 10% 10V
C3426	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3430	2113740A41	33pF 5% 50V
C3431	2113740A61	180pF 5% 50V
C3432	2113740A53	82pF 5% 50V
C3433	2113740A29	10pF 5% 50V
C3434	2113928E01	1uF 10% 10V
C3435	2113741F33	2.2nF 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741M69	0.1uF 50V
C3439	2113741W01	1uF 10% 25V
C3440	2113741M69	0.1uF 50V
C3441	2113740A79	1nF 5% 50V
C3442	2111078B57	HQ 390pF 5%
C3443	2111078B51	RF 220 5 NPO 100V
C3444	2111078B51	RF 220 5 NPO 100V
C3445	2113740A79	1nF 5% 50V
C3446	2180464E50	56pF 5% 250V
C3447	2180464E50	56pF 5% 250V
C3448	2111078B31	HQ 36pF 5%
C3449	2111078B31	HQ 36pF 5%
C3450	2111078B38	HQ 68pF 5%
C3451	2111078B20	HQ 18pF 5%
C3452	2111078B38	HQ 68pF 5%
C3455	2111078B36	HQ 56pF 5%
C3456	2113740A79	1nF 5% 50V
C3457	2113740A79	1nF 5% 50V
C3458	2113741A45	10nF 50V
C3459	2180464E16	100pF 5% 250V
C3460	2113743E20	100nF 16V
C3461	2113741F33	2.2nF 50V
C3464	2113740F28	11pF 5% 50V
C3465	2113740A79	1nF 5% 50V
C3466	2113740A79	1nF 5% 50V
C3467	2111078B40	HQ 82pF 5%
C3468	2111078B20	HQ 18pF 5%
C3471	2113743E07	22nF 16V
C3472	2111078B47	HQ 150pF 5%
C3473	2111078B47	HQ 150pF 5%
C3474	2113740A79	1nF 5% 50V
C3475	2113740F33	18pF 5% 50V
C3478	2113741F33	2.2nF 50V
C3489	2111078B45	HQ 130pF 5%
C3490	2111078B31	HQ 36pF 5%
C3492	2111078B59	HQ 470pF 5%
C3494	2111078B34	HQ 47pF 5%
C3496	2111078B33	HQ 43pF 5%
C3497	2111078B21	HQ 20pF 5%
C3498	2111078B34	HQ 47pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113741F33	2.2nF 50V
C3504	2113741F33	2.2nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V
C3507	2113740F51	100pF 5% 50V
C3508	2113741F33	2.2nF 50V
C3509	2113741F33	2.2nF 50V
C3510	2113743E20	100nF 16V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER
D3101	4880154K03	DIODE DUAL SCHOTTKY
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23

Circuit Ref	Motorola Part No.	Description
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3451	4882290T02	HOT CARRIER HSMS2802
D3452	4882290T02	HOT CARRIER HSMS2802
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3113	9180468V04	CER FLTR 4EL 455 KHZ SMD
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONN MINI UHF
L3002	2462587T23	COIL CHIP 470nH
L3031	2462587T24	COIL CHIP 560nH
L3032	2462587T17	COIL CHIP 150nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINI-SPRING AW IND 8NH 2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2462587X48	IND CHIP LO-PRO 39nH 5%
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X47	IND CHIP LO-PRO 33.0 N
L3413	2462587X46	IND CHIP LO-PRO 27.0 N
L3414	2460591A01	SQUARE COIL 4.22nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C73	COIL AIRW 16.96nH 10% 5TNS
L3423	2460591B73	SQUARE COIL 12.77nH 10%
L3431	2484657R01	Ferrite Bead
L3432	2460591F77	SQUARE COIL 35.5nH 10% 8T AWG22 U
L3433	2460591B73	SQUARE COIL 12.77nH 10%
L3441	2460591E77	SQUARE COIL 30nH 10% 7T
L3442	2484657R01	Ferrite Bead
L3443	2484657R01	Ferrite Bead
L3444	2460591X03	COIL SQUARE 5 TNS
L3445	2460591X01	COIL SQUARE
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460591X05	COIL SQUARE 48nH 10% 7TNS
L3473	2462587X69	IND CHIP 1.2uH 5%
L3474	2462587N42	CHIP IND 12nH 5%
L3475	2462587N55	CHIP IND 150nH 5%
L3477	2462587X69	IND CHIP 1.2uH 5%
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
L3494	2460592B01	COIL AW 51nH 4T
Q3001	4813827A07	NPN SML SIG MMBR9
Q3002	4813824A17	PNP 40V .2A B=100-
Q3021	4805921T02	DUAL ROHM FMC2
Q3101	4813827A07	NPN SML SIG MMBR9
Q3102	4813827A07	NPN SML SIG MMBR9
Q3141	4813824A10	NPN 40V .2A B=50-150
Q3151	4880048M01	NPN DIG 47k/47k
Q3152	4880048M01	NPN DIG 47k/47k
Q3221	4880048M01	NPN DIG 47k/47k
Q3301	4813827A07	NPN SML SIG MMBR9
Q3303	4802245J50	DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3421	5105385Y91	LDMOS PWR MODULE 16 CELL
Q3431	4805537W01	MRF5015 MOS1
Q3441	4884411L04	RF PWR TSTR MRF247 75W
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
Q3501	4813824A17	PNP 40V .2A B=100-
Q3502	4813824A10	NPN 40V .2A B=50-150
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A73	10k 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A33	220 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3021	0662057A43	560 1/16W 5%
R3024	0662057A39	390 1/16W 5%
R3025	0662057A53	1500 1/16W 5%
R3026	0662057A73	10k 1/16W 5%
R3027	0662057A73	10k 1/16W 5%
R3028	0662057A39	390 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3113	0662057A37	330 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3141	0662057A39	390 1/16W 5%
R3142	0662057A55	1800 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	CHIP RES 680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3227	0662057A97	100k 1/16W
R3241	0662057A25	100 1/16W 5%
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057A89	47k 1/16W 5%
R3263	0662057A65	4700 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3364	0662057A89	47k 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A28	130 1/16W 5%
R3402	0662057A16	43 1/16W
R3403	0662057A28	130 1/16W
R3404	0662057A73	10k 1/16W
R3405	0662057A25	100 1/16W
R3406	0662057B02	150k 1/16W
R3408	0662057B02	150k 1/16W
R3410	0662057A95	82k 1/16W 5%
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%
R3414	0683962T71	820 1W 5%
R3415	0662057A25	100 1/16W 5%
R3416	0662057A25	100 1/16W 5%
R3419	0662057C34	20 1/10W 5%
R3424	0662057K21	68 5% 1210
R3425	0662057K21	68 5% 1210
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C45	56 1/10W 5%
R3434	0662057C45	56 1/10W 5%
R3435	0662057C45	56 1/10W 5%
R3436	0683962T51	120 1W 5%
R3437	0683962T51	120 1W 5%
R3441	0680194M18	51 1W 5%
R3442	0662057C27	10R 1/10W 5%
R3443	0662057D48	1M 1/10W 5%
R3444	0662057D48	1M 1/10W 5%
R3453	0662057B20	820K 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0680194M16	xx 1W 5%
R3460	0662057C01	0 1/10W 5%
R3461	0680194M20	62 1W 5%
R3462	0662057A87	39k 1/16W 5%

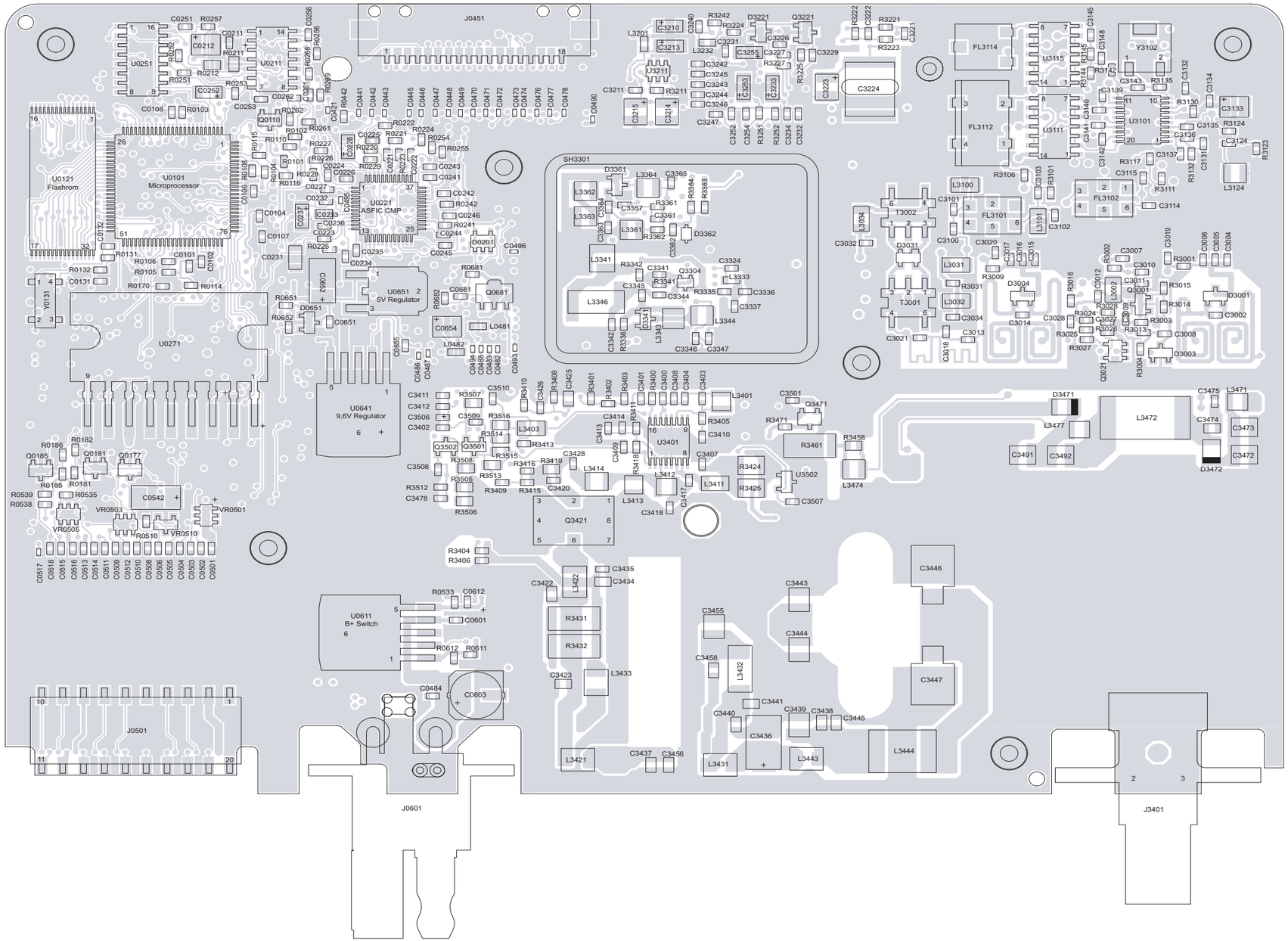
Circuit Ref	Motorola Part No.	Description
R3463	0662057D04	15kK 1/10W 5%
R3464	0662057C01	0 1/10W 5%
R3465	0662057B06	220k 1/16W
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3490	0662057A89	47k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3503	0662057A49	1k 1/16W 5%
R3504	0662057A49	1k 1/16W 5%
R3505	0662057C71	680 1/10W 5%
R3506	0662057C71	680 1/10W 5%
R3507	0662057C71	680 1/10W 5%
R3508	0662057C71	680 1/10W 5%
R3509	0662057A73	10k 1/16W 5%
R3510	0662057A80	20k 1/16W 5%
R3511	0662057A97	100k 1/16W
R3512	0662057A97	100k 1/16W
R3513	0611079A69	6800 1/16W 5%
R3514	0611079A69	6800 1/16W 5%
R3515	0611079A69	6800 1/16W 5%
R3516	0611079A69	6800 1/16W 5%
R3517	0662057A97	100k 1/16W
RT3460	0605621T02	THERMISTOR CHIP
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5105109Z67	LDMOS DRIVER VHF/UHF
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
VR3471	4813830A15	5.6V 5% 225mW
Y3101	4880606B09	CRYSTAL 44.395 MHZ
Y3102	9186145B02	CERAMIC DISCRIMINATOR 455kHz
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

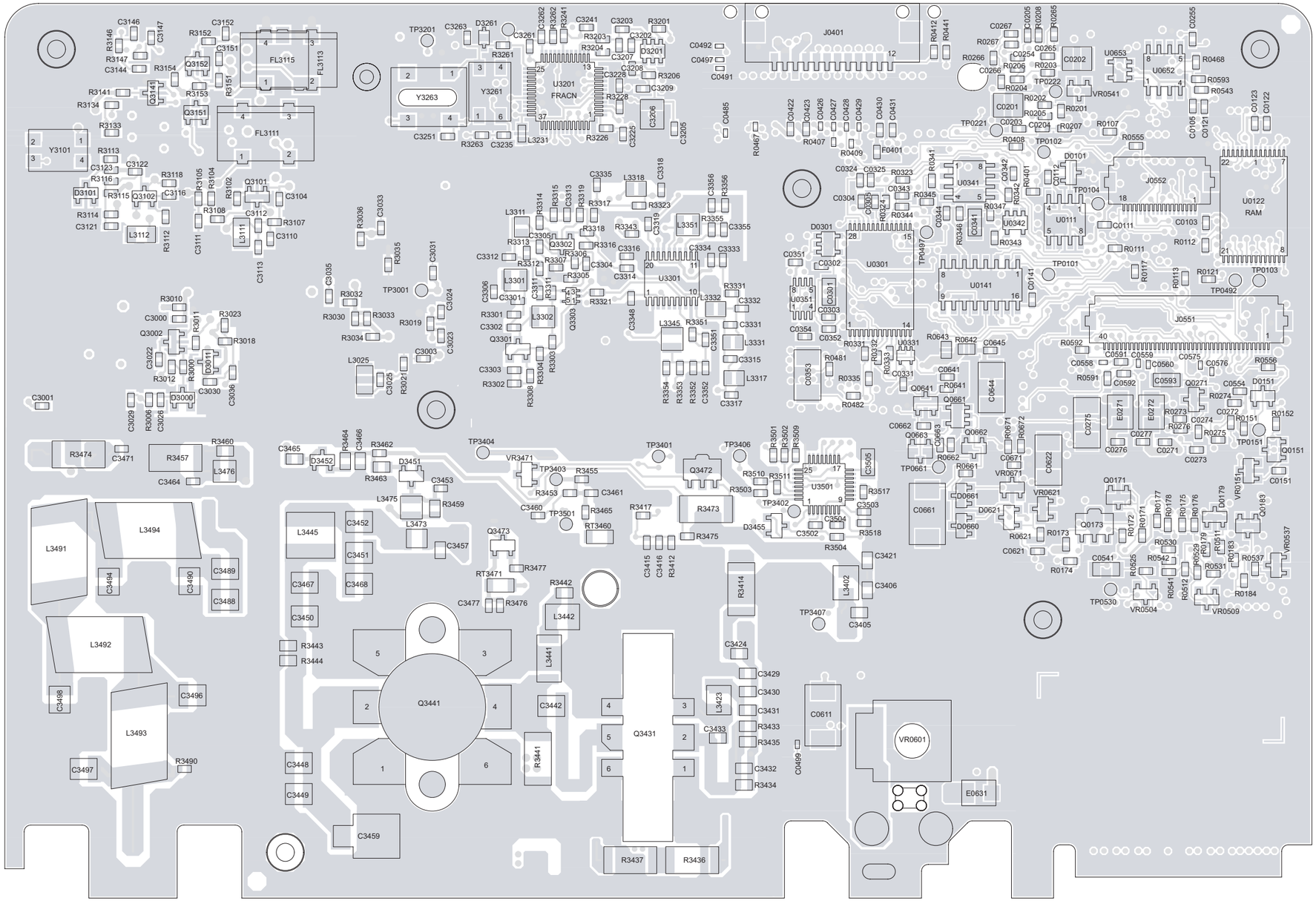
† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

3.0 VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B13, Schematics, and Parts Lists



VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B13 Top Side

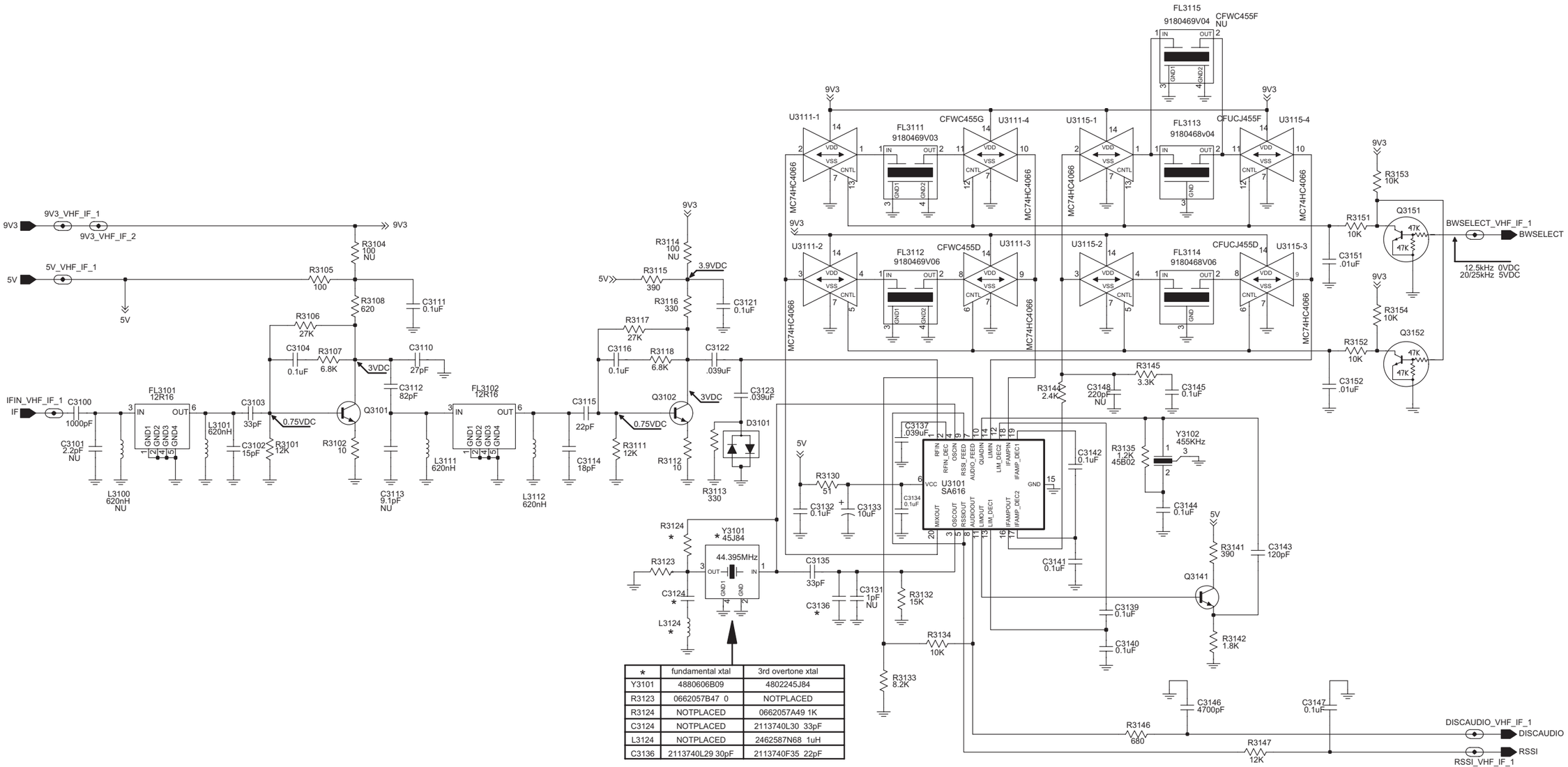
6881091C63-C



VHF (136-174 MHz) 25-45W Bipolar PCB 8486140B13 Bottom Side

ZWG0130590-O

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

VHF 25-45W PCB 8486140B13 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3.3nF 50V
C3001	2113740F19	4.7pF 5%
C3002	2113740F26	9.1pF 5%
C3003	2113741F37	3.3nF 50V
C3004	2113740F45	56pF 5%
C3005	2113740F51	100pF 5%
C3006	2113740F45	56pF 5%
C3007	2113741F37	3.3nF 50V
C3008	2113741F25	1nF 50V
C3009	2113741F13	330pF 50V
C3010	2113741F13	330pF 50V
C3011	2113741F37	3.3nF 50V
C3012	2113741F25	1nF 50V
C3013	2113740F45	56pF 5%
C3014	2113740F24	7.5pF 5%
C3015	2113740F45	56pF 5%
C3016	2113740F51	100pF 5% 50V
C3017	2113740F42	43pF 5% 50V
C3019	2113741F25	1nF 50V
C3020	2113741F25	1nF 50V
C3021	2113740F53	120pF 5% 50V
C3022	2113741F49	10nF 50V
C3026	2113743E20	100nF 16V
C3027	2113741F49	10nF 50V
C3028	2113741F49	10nF 50V
C3030	2113741F25	1nF 50V
C3033	2113740F20	5.1pF 5% 50V
C3034	2113740F49	82pF 5% 50V
C3035	2113740F33	18pF 5% 50V
C3036	2113741F25	1nF 50V
C3100	2113741F25	1nF 50V
C3102	2113740F31	15pF 5% 50V
C3103	2113740F39	33pF 5% 50V
C3104	2113743E20	100nF 16V
C3110	2113740F37	27pF 5% 50V
C3111	2113743E20	100nF 16V
C3112	2113740F49	82pF 5% 50V
C3114	2113740F33	18pF 5% 50V
C3115	2113740F35	22pF 5% 50V
C3116	2113743E20	100nF 16V
C3121	2113743E20	100nF 16V
C3122	2113743E11	39nF 10%
C3123	2113743E11	39nF 10%
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	100nF 16V
C3133	2311049A57	TANT CP 10uF 10% 16V
C3134	2113743E20	100nF 16V
C3135	2113740L30	33pF 2%
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	39nF 10%
C3139	2113743E20	100nF 16V
C3140	2113743E20	100nF 16V
C3141	2113743E20	100nF 16V
C3142	2113743E20	100nF 16V
C3143	2113740F53	120pF 5% 50V
C3144	2113743E20	100nF 16V
C3145	2113743E20	100nF 16V
C3146	2113741F41	4.7nF 50V
C3147	2113743E20	100nF 16V
C3151	2113741F49	10nF 50V
C3152	2113741F49	10nF 50V
C3202	2113741F49	10nF 50V
C3203	2113741F49	10nF 50V
C3205	2113741F49	10nF 50V
C3206	2311049A57	TANT CP 10uF 10% 16V
C3208	2113743E20	100nF 16V
C3209	2113743E20	100nF 16V
C3210	2311049A40	TANT CP 2.2uF 10% 10V
C3211	2113743E20	100nF 16V
C3213	2311049A40	TANT CP 2.2uF 10% 10V
C3214	2311049A09	TANT CP 2.2uF 10% 20V
C3215	2311049A09	TANT CP 2.2uF 10% 20V
C3221	2113743E20	100nF 16V
C3222	2113743E20	100nF 16V
C3224	0882422W23	FILM SM 1.0uF 15V 5%
C3225	2113743E20	100nF 16V
C3226	2113740F25	8.2pF 5% 50V
C3227	2113740F51	100pF 5% 50V
C3228	2113743E20	100nF 16V
C3229	2113743E12	47nF 10%
C3231	2113741F49	10nF 50V
C3232	2113741F49	10nF 50V
C3233	2311049A40	TANT CP 2.2uF 10%
C3234	2113741F49	10nF 50V
C3235	2113741F49	10nF 50V
C3242	2113740F59	220pF 5% 50V
C3243	2113740F59	220pF 5% 50V
C3244	2113740F59	220pF 5% 50V
C3245	2113740F59	220pF 5% 50V
C3246	2113740F59	220pF 5% 50V
C3247	2113740F27	10pF 5% 50V
C3251	2113743E20	100nF 16V
C3252	2113741F25	1nF 50V
C3253	2311049A56	TANT CP 4.7uF 20% 10V
C3254	2113743E20	100nF 16V
C3255	2311049A40	TANT CP 2.2uF 10% 10V
C3263	2113743E20	100nF 16V
C3302	2113740F23	6.8pF 5% 50V
C3303	2113741F49	10nF 50V
C3306	2113740F20	5.1pF 5% 50V
C3311	2113743E07	22nF 16V
C3314	2113740F23	6.8pF 5% 50V
C3315	2113740F31	15pF 5% 50V
C3316	2113740F15	3.3pF 5% 50V
C3317	2113740F39	33pF 5% 50V
C3318	2113740F21	5.6pF 5% 50V
C3319	2113741F25	1nF 50V
C3324	2113741F49	10nF 50V
C3332	2113743E20	100nF 16V
C3333	2113743E20	100nF 16V
C3334	2113743E07	22nF 16V
C3335	2113741F49	10nF 50V
C3336	2113741F49	10nF 50V
C3337	2113743E20	100nF 16V
C3341	2113741F25	1nF 50V
C3342	2113740L05	3.0pF +-0.1pF
C3344	2113740F09	1.8pF 5% 50V
C3345	2113740L25	20pF +-0.25pF
C3346	2113741F49	10nF 50V
C3347	2113741F49	10nF 50V
C3348	2113741F49	10nF 50V
C3351	2113741F49	10nF 50V
C3352	2113743E07	22nF 16V
C3355	2113741F49	10nF 50V
C3356	2113743E07	22nF 16V
C3357	2113740F24	7.5pF 5% 50V
C3361	2113741F25	1nF 50V
C3362	2113740F21	5.6pF 5% 50V
C3363	2113740F47	68pF 5% 50V
C3364	2113740F31	15pF 5% 50V
C3365	2113741F25	1nF 50V
C3400	2113741F33	2.2nF 50V
C3401	2113741F33	2.2nF 50V
C3402	2113743E07	22nF 16V
C3404	2113741F33	2.2nF 50V
C3405	2113740A79	1nF 5% 50V
C3406	2113740A79	1nF 5% 50V
C3407	2113741F33	2.2nF 50V
C3408	2113740F33	18pF 5% 50V
C3409	2113741F33	2.2nF 50V
C3410	2113743E07	22nF 16V
C3411	2113743E07	22nF 16V
C3412	2113741F33	2.2nF 50V
C3413	2113743E07	22nF 16V
C3414	2113741F33	2.2nF 50V
C3415	2113743E07	22nF 16V
C3416	2113741F33	2.2nF 50V
C3417	2113741F33	2.2nF 50V
C3418	2113740F36	24pF 5% 50V
C3420	2113740F49	82pF 5% 50V
C3421	2113741A45	10nF 50V
C3422	2113740A79	1nF 5% 50V
C3424	2113741A45	10nF 50V
C3425	2113928E01	1uF 10% 10V
C3426	2113741F33	2.2nF 50V
C3428	2113741F33	2.2nF 50V
C3430	2113740A41	33pF 5% 50V
C3431	2113740A61	180pF 5% 50V
C3432	2113740A53	82pF 5% 50V
C3433	2113740A29	10pF 5% 50V
C3434	2113928E01	1uF 10% 10V
C3435	2113741F33	2.2nF 50V
C3436	2311049A45	TANT CP 10uF 10% 35V
C3437	2113741M69	0.1uF 50V
C3439	2113741W01	1uF 10% 25V
C3440	2113741M69	0.1uF 50V
C3441	2113740A79	1nF 5% 50V
C3442	2111078B57	HQ 390pF 5%
C3443	2111078B51	RF 220 5 NPO 100V
C3444	2111078B51	RF 220 5 NPO 100V
C3445	2113740A79	1nF 5% 50V
C3446	2180464E50	56pF 5% 250V
C3447	2180464E50	56pF 5% 250V
C3448	2111078B31	HQ 36pF 5%
C3449	2111078B31	HQ 36pF 5%
C3450	2111078B38	HQ 68pF 5%
C3451	2111078B20	HQ 18pF 5%
C3452	2111078B38	HQ 68pF 5%
C3455	2111078B36	HQ 56pF 5%
C3456	2113740A79	1nF 5% 50V
C3457	2113740A79	1nF 5% 50V
C3458	2113741A45	10nF 50V
C3459	2180464E16	100pF 5% 250V
C3460	2113743E20	100nF 16V
C3461	2113741F33	2.2nF 50V
C3464	2113740F28	11pF 5% 50V
C3465	2113740A79	1nF 5% 50V
C3466	2113740A79	1nF 5% 50V
C3467	2111078B40	HQ 82pF 5%
C3468	2111078B20	HQ 18pF 5%
C3471	2113743E07	22nF 16V
C3472	2111078B47	HQ 150pF 5%
C3473	2111078B47	HQ 150pF 5%
C3474	2113740A79	1nF 5% 50V
C3475	2113740F33	18pF 5% 50V
C3478	2113741F33	2.2nF 50V
C3489	2111078B45	HQ 130pF 5%
C3490	2111078B31	HQ 36pF 5%
C3492	2111078B59	HQ 470pF 5%
C3494	2111078B34	HQ 47pF 5%

Circuit Ref	Motorola Part No.	Description
C3496	2111078B33	HQ 43pF 5%
C3497	2111078B21	HQ 20pF 5%
C3498	2111078B34	HQ 47pF 5%
C3501	2113741F33	2.2nF 50V
C3502	2113741F33	2.2nF 50V
C3503	2113741F33	2.2nF 50V
C3504	2113741F33	2.2nF 50V
C3505	2311049A07	TANT CP 1uF 10% 16V
C3506	2113741F33	2.2nF 50V
C3507	2113740F51	100pF 5% 50V
C3508	2113741F33	2.2nF 50V
C3509	2113741F33	2.2nF 50V
C3510	2113743E20	100nF 16V
D3000	4813833C02	DUAL SOT MMBD6100
D3001	4805649Q13	VCTR 1SV228 SOT23
D3003	4880154K03	DUAL SCHOTTKY SOT23
D3004	4805649Q13	VCTR 1SV228 SOT23
D3011	4880142L01	PIN
D3031	4886143B01	MIXER DIODE CROSSOVER
D3101	4880154K03	DIODE DUAL SCHOTTKY
D3201	4802233J09	TRIPLE SOT143-RH
D3221	4880236E05	CHIP SCHOTTKY
D3341	4805649Q13	VCTR 1SV228 SOT23
D3361	4805649Q13	VCTR 1SV228 SOT23
D3362	4862824C01	VARACTOR CHIP
D3451	4882290T02	HOT CARRIER HSMS2802
D3452	4882290T02	HOT CARRIER HSMS2802
D3471	4802482J02	PIN MA/COM
D3472	4802482J02	PIN MA/COM
FL3101	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3102	9180112R16	44.85 MHZ XSTAL FLTR 80dB
FL3111	9180469V03	CER FLTR 6EL 455 KHZ SMD
FL3112	9180469V06	CER FLTR 6EL 455 KHZ SMD
FL3113	9180468V04	CER FLTR 4EL 455 KHZ SMD
FL3114	9180468V06	CER FLTR 4EL 455 KHZ SMD
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONN MINI UHF
L3002	2462587T23	COIL CHIP 470nH
L3031	2462587T24	COIL CHIP 560nH
L3032	2462587T17	COIL CHIP 150nH
L3101	2462587T25	COIL CHIP 620nH
L3111	2462587T25	COIL CHIP 620nH
L3112	2462587T25	COIL CHIP 620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L3201	2462587Q42	IND CHIP 390nH 10%
L3231	2462587Q20	IND CHIP 2.2uH 20%
L3301	2462587N44	CHIP IND 18 NH 5%
L3302	2462587N53	CHIP IND 100 nH 5%
L3317	2462587V28	CHIP IND 33 NH 5%
L3318	2462587V34	IND CHIP 100nH 5%
L3331	2462587V32	CHIP IND 68NH 5%
L3332	2462587V15	IND CHIP 100nH 10%
L3333	2462587Q47	IND CHIP 1uH 10%
L3341	2484562T13	MINI-SPRING AW IND 8NH 2%
L3343	2462587N56	COIL CHIP 180nH 5%
L3344	2462587N68	CHIP IND 1 uH 5%
L3345	2462587N68	CHIP IND 1 uH 5%
L3346	2484562T18	MINI-SPRING AW IND 35.5NH 2%
L3351	2462587N68	CHIP IND 1 uH 5%
L3361	2462587N50	CHIP IND 56 nH 5%
L3362	2462587N51	CHIP IND 68 nH 5%
L3363	2462587N50	CHIP IND 56 nH 5%
L3364	2462587N68	CHIP IND 1 uH 5%
L3401	2462587X48	IND CHIP LO-PRO 39nH 5%
L3402	2484657R01	Ferrite Bead
L3403	2462587T13	COIL CHIP 68nH
L3411	2462587T13	COIL CHIP 68nH
L3412	2462587X47	IND CHIP LO-PRO 33.0 N
L3413	2462587X46	IND CHIP LO-PRO 27.0 N
L3414	2460591A01	SQUARE COIL 4.22nH 3T
L3421	2484657R01	Ferrite Bead
L3422	2460591C73	COIL AIRW 16.96nH 10% 5TNS
L3423	2460591B73	SQUARE COIL 12.77nH 10%
L3431	2484657R01	Ferrite Bead
L3432	2460591F77	SQUARE COIL 35.5nH 10% 8T AWG22 U
L3433	2460591B73	SQUARE COIL 12.77nH 10%
L3441	2460591E77	SQUARE COIL 30nH 10% 7T
L3442	2484657R01	Ferrite Bead
L3443	2484657R01	Ferrite Bead
L3444	2460591X03	COIL SQUARE 5 TNS
L3445	2460591X01	COIL SQUARE
L3471	2462587X69	IND CHIP 1.2uH 5%
L3472	2460591X05	COIL SQUARE 48nH 10% 7TNS
L3473	2462587X69	IND CHIP 1.2uH 5%
L3474	2462587N42	CHIP IND 12nH 5%
L3475	2462587N55	CHIP IND 150nH 5%
L3477	2462587X69	IND CHIP 1.2uH 5%
L3491	2460592B01	COIL AW 51nH 4T
L3492	2460592B01	COIL AW 51nH 4T
L3493	2460592B01	COIL AW 51nH 4T
L3494	2460592B01	COIL AW 51nH 4T
Q3001	4813827A07	NPN SML SIG MMBR9
Q3002	4813824A17	PNP 40V .2A B=100-
Q3021	4805921T02	DUAL ROHM FMC2
Q3101	4813827A07	NPN SML SIG MMBR9
Q3102	4813827A07	NPN SML SIG MMBR9
Q3141	4813824A10	NPN 40V .2A B=50-150
Q3151	4880048M01	NPN DIG 47k/47k
Q3152	4880048M01	NPN DIG 47k/47k
Q3221	4880048M01	NPN DIG 47k/47k
Q3301	4813827A07	NPN SML SIG MMBR9
Q3303	4802245J50	DUAL NPN/PNP UMC5N
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3421	5105385Y91	LDMOS PWR MODULE 16 CELL
Q3431	4805537W01	MRF5015 MOS1
Q3441	4884411L04	RF PWR TSTR MRF247 75W
Q3471	4880048M01	NPN DIG 47k/47k
Q3472	4805128M27	PNP SOT89 BSR33 LH
Q3501	4813824A17	PNP 40V .2A B=100-
Q3502	4813824A10	NPN 40V .2A B=50-150
R3000	0662057A53	1500 1/16W 5%
R3001	0662057A97	100k 1/16W
R3002	0662057A43	560 1/16W 5%
R3003	0662057A49	1k 1/16W 5%
R3004	0662057A53	1500 1/16W 5%
R3006	0662057A73	10k 1/16W 5%
R3009	0662057A97	100k 1/16W
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 1/16W 5%
R3012	0662057A49	1k 1/16W 5%
R3013	0662057A61	3300 1/16W 5%
R3014	0662057A18	51 1/16W 5%
R3015	0662057A01	10 1/16W 5%
R3016	0662057A01	10 1/16W 5%
R3018	0662057A33	220 1/16W 5%
R3019	0662057A89	47k 1/16W 5%
R3021	0662057A43	560 1/16W 5%
R3024	0662057A39	390 1/16W 5%
R3025	0662057A53	1500 1/16W 5%
R3026	0662057A73	10k 1/16W 5%
R3027	0662057A73	10k 1/16W 5%
R3028	0662057A39	390 1/16W 5%
R3031	0662057A18	51 1/16W 5%
R3033	0662057B47	0 1/16W
R3101	0662057A75	12k 1/16W 5%
R3102	0662057A01	10 1/16W 5%
R3105	0662057A25	100 1/16W 5%
R3106	0662057A83	27k 1/16W 5%
R3107	0662057A69	6800 1/16W 5%
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12k 1/16W 5%
R3112	0662057A01	10 1/16W 5%
R3113	0662057A37	330 1/16W 5%
R3115	0662057A39	390 1/16W 5%
R3116	0662057A37	330 1/16W 5%
R3117	0662057A83	27k 1/16W 5%
R3118	0662057A69	6800 1/16W 5%
R3123	NU 0662057B47	3rd overtone crystal 0 fundamental crystal
R3124	0662057A49 NU	1K 3rd overtone crystal fundamental crystal
R3130	0662057A18	51 1/16W 5%
R3132	0662057A77	15k 1/16W 5%
R3133	0662057A71	8200 1/16W 5%
R3134	0662057A73	10k 1/16W 5%
R3135	0662057A51	1200 1/16W 5%
R3141	0662057A39	390 1/16W 5%
R3142	0662057A55	1800 1/16W 5%
R3144	0662057A58	2400 1/16W 5%
R3145	0662057A61	3300 1/16W 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12k 1/16W 5%
R3151	0662057A73	10k 1/16W 5%
R3152	0662057A73	10k 1/16W 5%
R3153	0662057A73	10k 1/16W 5%
R3154	0662057A73	10k 1/16W 5%
R3201	0662057A17	47 1/16W 5%
R3203	0662057A17	47 1/16W 5%
R3204	0662057A17	47 1/16W 5%
R3211	0662057B47	0 1/16W
R3221	0662057A39	390 1/16W 5%
R3222	0662057A45	CHIP RES 680 OHMS 5%
R3223	0662057A25	100 1/16W 5%
R3224	0662057A89	47k 1/16W 5%
R3225	0662057A89	47k 1/16W 5%
R3227	0662057A97	100k 1/16W
R3241	0662057A25	100 1/16W 5%
R3242	0662057B47	0 1/16W
R3251	0662057B04	180k 1/16W 5%
R3252	0662057B10	330k 1/16W 5%
R3261	0662057A89	47k 1/16W 5%
R3263	0662057A65	4700 1/16W 5%
R3301	0662057A22	75 1/16W 5%
R3302	0662057A25	100 1/16W 5%
R3303	0662057A57	2200 1/16W 5%
R3304	0662057A49	1k 1/16W 5%
R3308	0662057B47	0 1/16W
R3311	0662057A25	100 1/16W 5%

Circuit Ref	Motorola Part No.	Description
R3316	0662057B47	0 1/16W
R3318	0662057A09	22 1/16W 5%
R3321	0662057A73	10k 1/16W 5%
R3323	0662057A49	1k 1/16W 5%
R3331	0662057A17	47 1/16W 5%
R3335	0662057A13	33 1/16W 5%
R3336	0662057A77	15k 1/16W 5%
R3341	0662057A33	220 1/16W 5%
R3342	0662057A15	39 1/16W 5%
R3343	0662057A25	100 1/16W 5%
R3351	0662057A80	20k 1/16W 5%
R3352	0662057A75	12k 1/16W 5%
R3353	0662057A97	100k 1/16W
R3354	0662057B02	150k 1/16W
R3355	0662057A80	20k 1/16W 5%
R3356	0662057A75	12k 1/16W 5%
R3361	0662057A33	220 1/16W 5%
R3362	0662057A17	47 1/16W 5%
R3364	0662057A89	47k 1/16W 5%
R3400	0662057A41	470 1/16W 5%
R3401	0662057A28	130 1/16W 5%
R3402	0662057A16	43 1/16W
R3403	0662057A28	130 1/16W
R3404	0662057A73	10k 1/16W
R3405	0662057A25	100 1/16W
R3406	0662057B02	150k 1/16W
R3408	0662057B02	150k 1/16W
R3410	0662057A95	82k 1/16W 5%
R3412	0662057A67	5600 1/16W 5%
R3413	0662057A61	3300 1/16W 5%
R3414	0683962T71	820 1W 5%
R3415	0662057A25	100 1/16W 5%
R3416	0662057A25	100 1/16W 5%
R3419	0662057C34	20 1/10W 5%
R3424	0662057K21	68 5% 1210
R3425	0662057K21	68 5% 1210
R3431	0680194M18	51 1W 5%
R3432	0680194M18	51 1W 5%
R3433	0662057C45	56 1/10W 5%
R3434	0662057C45	56 1/10W 5%
R3435	0662057C45	56 1/10W 5%
R3436	0683962T51	120 1W 5%
R3437	0683962T51	120 1W 5%
R3441	0680194M18	51 1W 5%
R3442	0662057C27	10R 1/10W 5%
R3443	0662057D48	1M 1/10W 5%
R3444	0662057D48	1M 1/10W 5%
R3453	0662057B20	820K 1/16W 5%
R3455	0662057A97	100k 1/16W
R3457	0680194M16	xx 1W 5%
R3460	0662057C01	0 1/10W 5%

Circuit Ref	Motorola Part No.	Description
R3461	0680194M20	62 1W 5%
R3462	0662057A87	39k 1/16W 5%
R3463	0662057D04	15kK 1/10W 5%
R3464	0662057C01	0 1/10W 5%
R3465	0662057B06	220k 1/16W
R3471	0662057A41	470 1/16W 5%
R3473	0680194M18	51 1W 5%
R3474	0680194M18	51 1W 5%
R3475	0662057A73	10k 1/16W 5%
R3490	0662057A89	47k 1/16W 5%
R3501	0662057A69	6800 1/16W 5%
R3502	0662057A87	39k 1/16W 5%
R3503	0662057A49	1k 1/16W 5%
R3504	0662057A49	1k 1/16W 5%
R3505	0662057C71	680 1/10W 5%
R3506	0662057C71	680 1/10W 5%
R3507	0662057C71	680 1/10W 5%
R3508	0662057C71	680 1/10W 5%
R3509	0662057A73	10k 1/16W 5%
R3510	0662057A80	20k 1/16W 5%
R3511	0662057A97	100k 1/16W
R3512	0662057A97	100k 1/16W
R3513	0611079A69	6800 1/16W 5%
R3514	0611079A69	6800 1/16W 5%
R3515	0611079A69	6800 1/16W 5%
R3516	0611079A69	6800 1/16W 5%
R3517	0662057A97	100k 1/16W
RT3460	0605621T02	THERMISTOR CHIP
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3115	5113805A86	IC QUAD ANALOG MUX/ DEMUX
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	VCO BUFFER PKG DIE
U3401	5185130C65	IC VHF/UHF/800MHz LDMOS DRIVER
U3501	5185765B01	IC POWER CONTROL
U3502	5185963A15	TEMP SENSOR 1M5
VR3471	4813830A15	5.6V 5% 225mW
Y3101	4802245J84 4880606B09	2ND OSC XTAL 44.395 MHZ 3rd overtone crystal fundamental crystal
Y3102	9186145B02	CERAMIC DISCRIMINATOR 455kHz

Circuit Ref	Motorola Part No.	Description
Y3263	4886182B01	VCTCXO 16.8MHz 2ppm TTSO5V
* Y3261	Not Used	16.8MHz 75Z04

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Chapter 9: UHF Band 1 (403-470 MHz) 25-40W Bipolar Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 1 (403-470 MHz) 25-40W Bipolar Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF (403-470 MHz) 25-40W Bipolar (Conventional, LTR/PassPort)

Model						Description
AAM25RKC9AA1AN						CDM750, 403-470 MHz, 25-40W, 12.5/20/25 kHz
	AAM25RKD9AA2AN					CDM1250, 403-470 MHz, 25-40W, 12.5/20/25 kHz
		AAM25RKF9AA5AN				CDM1550, 403-470 MHz, 25-40W, 12.5/20/25 kHz
			AAM25RKF9DU5AN			CDM1550•LS, 403-470 MHz, 25-40W, 12.5/20/25 kHz
				AAM25RKF9DP5AN		CDM1550•LS+, 403-470 MHz, 25-40W, 12.5/20/25 kHz
					Item	**Description**
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X	X		IMUE6024	Tanapa, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
				X	PMUE1756	Tanapa CDM1550•LS+, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X					6881091C54	User Guide, CDM750
	X				6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X		6881093C32	User Guide, CDM1550•LS
				X	6881094C79	User Guide, CDM1550•LS+

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 12, Section 1.0: UHF Band 1 (403-470 MHz) 25-40W LDMOS Model Chart.)

1.2 PRO Series Model Chart

PRO Series, UHF (403-470 MHz) 25-40W Bipolar				
Model				**Description**
LAM25RKC9AA1AN				PRO3100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
	LAM25RKD9AA2AN			PRO5100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
		LAM25RKF9AA5AN		PRO7100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6024	Tanapa, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 12, Section 1.0: UHF Band 1 (403-470 MHz) 25-40W LDMOS Model Chart.)

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**25 - 40W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	25-40W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 UHF Band 1 (403-470 MHz) 25-40W Bipolar Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the UHF range from 403 to 470 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, 1st IF, 2nd IF and receiver back-end. Two varactor tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the 1st IF of 44.85 MHz. Low side first injection is used.

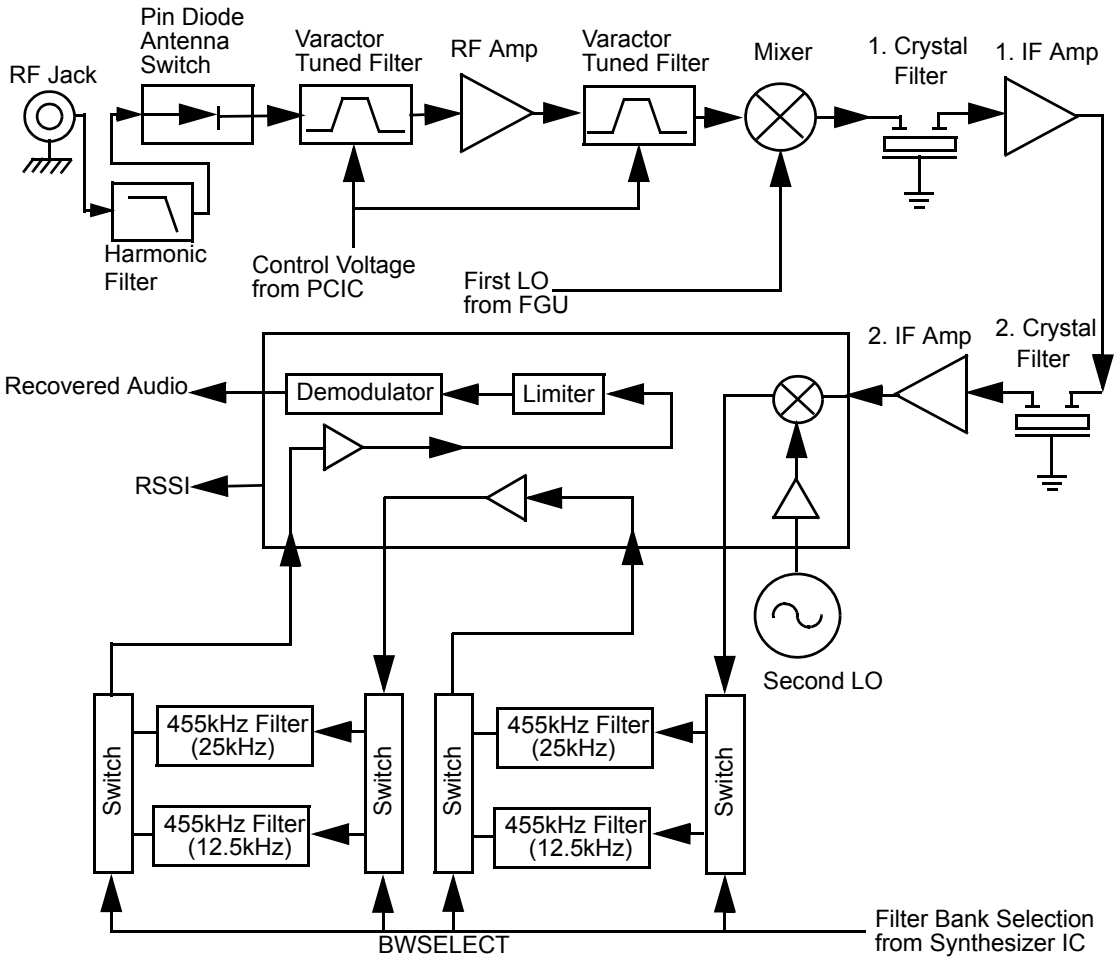


Figure 9-1 UHF Receiver Block Diagram

The 2-pole 44.85 MHz crystal filters in the 1st IF section and two pairs of 455 kHz ceramic filters in the 2nd IF section provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The 2nd IF at 455 kHz is mixed, amplified, and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver pre-selector filter (C4001, C4002, D4001 and associated components). The 2-pole pre-selector filter tuned by the varactor diodes D4001 and D4002 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U4501) in the Transmitter section. A dual hot carrier diode (D4003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q4003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3 volt supply via L4003 and R4002. A 3dB pad (R4006, R4007, R4011 and R4008 - R4010) stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The varactor diodes D4004 and D4005 are controlled by the same signal FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R4013 - R4015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and 1st Intermediate Frequency (IF)

The signal coming from the front-end is converted to the first IF (44.85 MHz) using a passive double-balanced mixer (D4051). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T4051 and T4052. The injection signal (RXINJ) coming from the RX VCO buffer (Q4332) is filtered by the low-pass filter consisting of (L4053, L4054, C4053 - C4055) followed by a matching transformer T4052 and has a level of approximately 15dBm.

The mixer IF output signal (IF) from transformer T4501pin 2 is fed to the first two pole crystal filter FL3101. The filter output in turn is matched to the following IF amplifier.

The IF amplifier Q3101 is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the 5 volt supply. Its output impedance is matched to the second two pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 2nd Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz 1st IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the low IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The

2nd IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters (FL3112, FL3114) for 20/25 kHz channel spacing or FL3111 and FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the controller circuits).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101 pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101 pin 63) and is available at accessory connector J0501-15.

3.0 UHF Band 1 (403-470 MHz) 25-40W Bipolar Transmitter Power Amplifier (PA) 40W

The radio's 40W power amplifier (PA) is a four-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. It consists of the following four stages in the line-up. The first stage is a LDMOS pre-driver (U4401) that is controlled by pin 4 of PCIC (U4501) via Q4473 (CNTLVLTG). It is followed by another LDMOS stage (Q4421), an LDMOS stage (Q4431), and a bipolar final stage (Q4441).

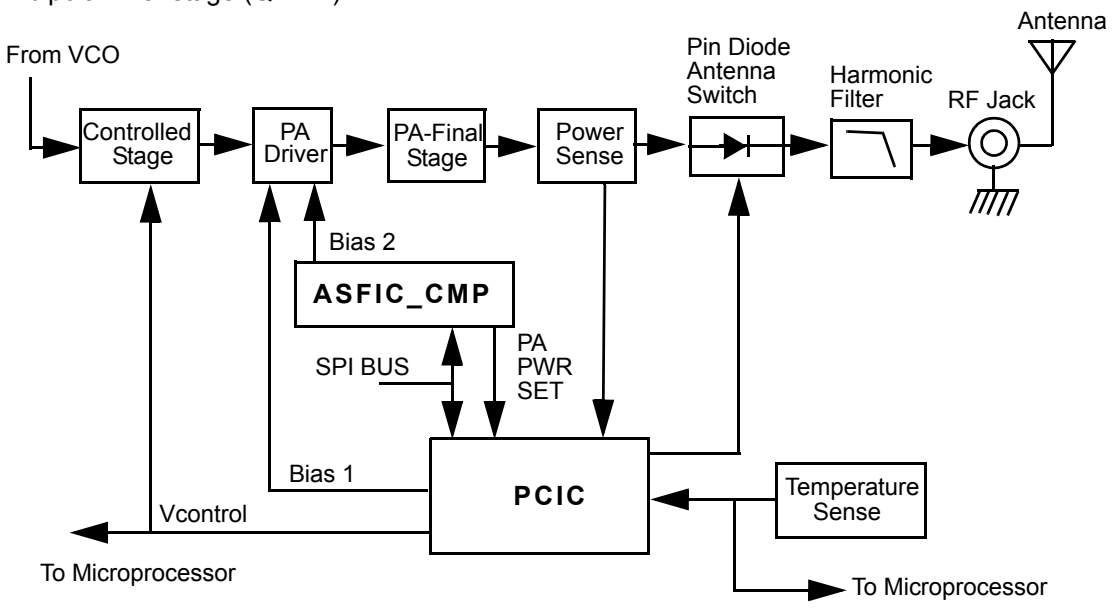


Figure 9-2 UHF Transmitter Block Diagram

Device Q4401 is surface mounted. Q4421, Q4431 and Q4441 are directly attached to the heat sink.

3.1 Power Controlled Stage

The first stage (U4401) amplifies the RF signal from the VCO (TXINJ) and controls the output power of the PA. The output power of the transistor U4401 is controlled by a voltage control line feed from

the PCIC pin4(U4501). The control voltage simultaneously varies the bias of two FET stages within U4401. This biasing point determines the overall gain of U4401 and therefore its output drive level to Q4421, which in turn controls the output power of the PA.

In receive mode the voltage control line is at ground level and turns off Q4473 which in turn switches off the biasing voltage to U4401.

3.2 Pre-Driver Stage

The next stage is a 13dB gain LDMOS device (Q4421) which requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line PCIC_MOSBIAS_1 is set in transmit mode by PCIC pin 24 and fed to the gate of Q4421 via the resistive network R4407, R4408, R4416 and R4415. The bias voltage is tuned in the factory.

3.3 Driver Stage

The following stage is an enhancement-mode N-Channel MOSFET device (Q4431) providing a gain of 10dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line Bias_2_UHF_PA_1 is set in transmit mode by the ASFIC and fed to the gate of Q4431 via the resistive network R4630, R4631, and R4632. This bias voltage is also tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Customer Programming Software (CPS). Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device's drain current is drawn directly from the radio's DC supply voltage input, A+, via L4421.

3.4 Final Stage

The final stage uses the bipolar device Q4441. The device's collector current is also drawn from the radio's DC supply voltage input. To maintain class C operation, the base is DC-grounded by a series inductor (L4441) and a bead (L4440). A matching network consisting of C5541-C5544 and two striplines transform the impedance to 50 Ohms and feeds the directional coupler.

3.5 Bi-directional Coupler

The bi-directional coupler is a microstrip printed circuit, which couples a small amount of the forward and reverse power of the RF power from Q4441. The coupled signal is rectified to an output power proportional DC voltage by the diodes D4451 & D4452 and sent to the RFIN of the PCIC. The PCIC controls the gain of stage U4401 as necessary to hold this voltage constant. This ensures the forward power out of the radio is held to a constant value.

3.6 Antenna Switch

The antenna switch utilizes the existing DC feed (A+) to the last stage device (Q4441). Basic operation is to have both PIN diodes D4471 and D4472 turns on during key-up by forward biasing them. It is achieve by pulling down the voltage at the cathode end of D4472 to around 11.8V (0.7V drop across each diode). The current through the diodes needs to be set around 80mA to fully open the transmit path through resistor R4496. Q4472 is a current source controlled by Q4471 and is eventually connected to pin ANO of PCIC. VR4471 ensures the voltage at the resistor R4511 never exceeds 5.6V.

3.7 Harmonic Filter

Inductors L4491, L4492, L4493 and capacitors C4448, C4493,C4494, C4496 and C4498 form a low-pass filter to attenuate harmonic energy from the transmitter. R4491 is used to drain any electrostatic charges that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.8 Power Control

The transmitter uses the Power Control IC (PCIC, U4501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the bi-directional coupler and rectified, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The PCIC has internal digital-to-analog converters (DACs) which provide the reference voltage of the control loop. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuits.

The PCIC provides a DC output voltage at pin 4 (INT) and applied as CNTLVLTG to the power-adjust input pin of the first transmitter stage U4401. This adjusts the transmitter power output to the intended value. Variations in forward or reflected transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C4502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U4502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 29) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power is reduced so as to reduce the transmitter temperature.

4.0 UHF Band 1 (403-470 MHz) 25-40W Bipolar Frequency Synthesis

The synthesizer subsystem consists of the reference oscillator (Y4261 or Y4262), the low voltage fractional-N synthesizer (LVFRAC-N, U4201), and the Voltage Controlled Oscillator VCO.

4.1 Reference Oscillator

The reference oscillator (Y4262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U4201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U4201, pin 25 to set the frequency of the oscillator. The output of the oscillator (pin 3 of Y4262) is applied to pin 23 (XTAL1) of U4201 via an RC series combination.

In applications where less frequency stability is required the oscillator inside U4201 is used along with an external crystal Y4261, varactor diode D4261, C4261, C4262 and R4262. In this case,

Y4262, R4263, C4235 and C4251 are not used. When Y4262 is used, Y4261, D4261, C4261, C4262 and R4262 are not used, and C4263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U4201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balanced attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

A voltage of 5V applied to the super filter input (U4201 pin 30) supplies an output voltage of 4.5 Vdc (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R4322) and the synthesizer charge pump resistor network (R4251, R4252). The synthesizer supply voltage is provided by the 5V regulator U4211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U5701-32), a voltage of 13 Vdc is being generated by the positive voltage multiplier circuitry (D4201, C4202, C4203). This voltage multiplier is basically a diode capacitor network driven by two signals (1.05MHz) 180 degrees out of phase (U4201-14 and -15).

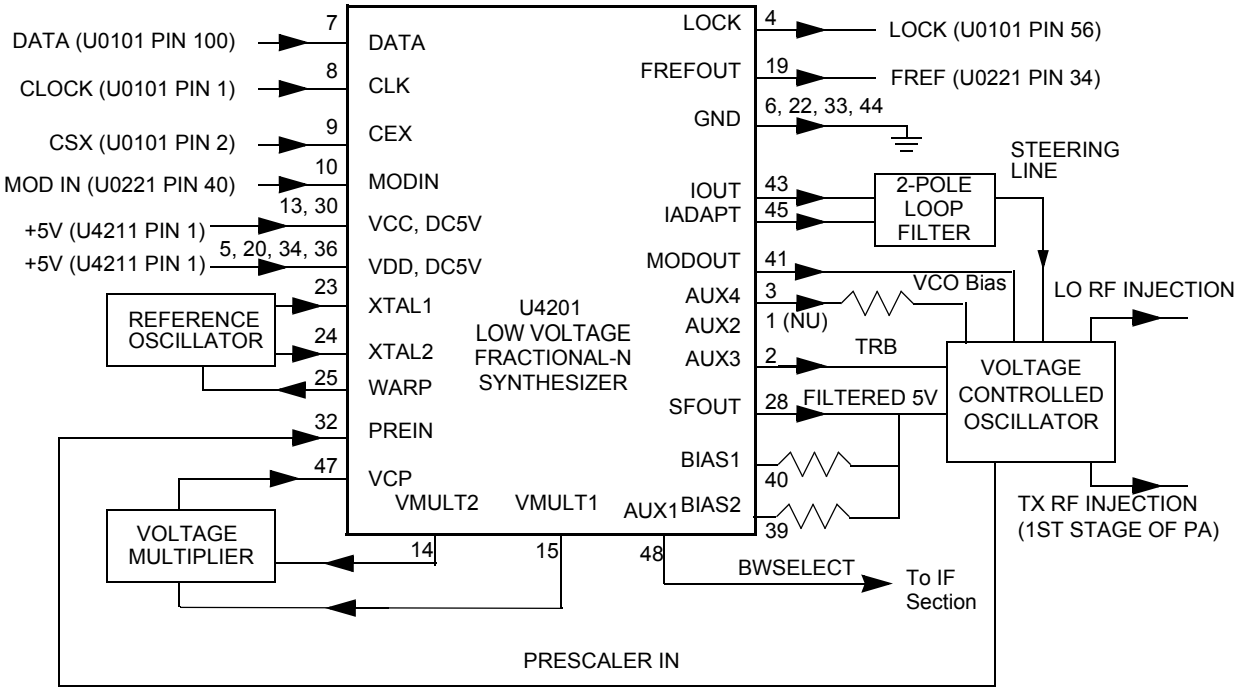


Figure 9-3 UHF Synthesizer Block Diagram

Output LOCK (U4201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U4201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U4201-7), clock line CLK (U4201-8), and chip enable line CSX (U4201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO buffer IC (VCOBIC, U4301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuits.

The VCOBIC together with Fractional-N synthesizer (U4201) generates the required frequencies in both transmit and receive modes. The TRB line (U4301 pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U4301 pin 12 (PRESC_OUT), via a low-pass filter, to pin 32 of U4201 (PREIN).

A steering line voltage (VCTRL) between 3.0V and 10.0V at varactor diode CR4311 will tune the full TX frequency range (TXINJ) from 403 MHz to 470 MHz, and at varactor diodes CR4301, CR4302 and CR4303 will tune the full RX frequency range (RXINJ) from 358 MHz to 425 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q4301 is used in conjunction with the internal transistor for better side-band noise.

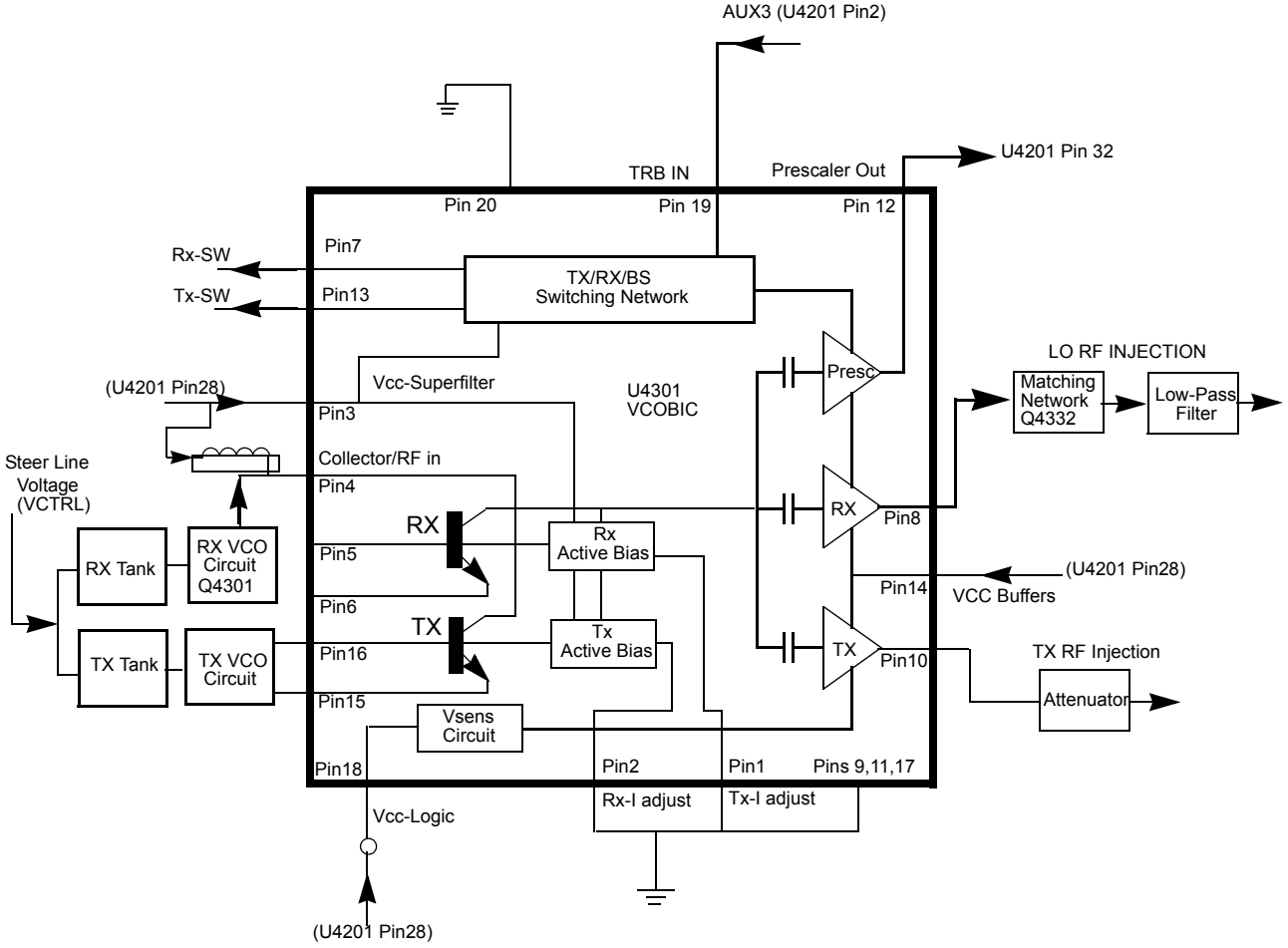


Figure 9-4 UHF VCO Block Diagram

The external RX buffers (Q4332) are enabled by a high at U4201 pin 3 (AUX4) via transistor switch Q4333. In TX mode the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U4201 pin41) is applied to the modulation circuits CR4321, R4321, R4322 and C4324. These modulate the TX VCO frequency via coupling capacitor C4321. Varactor CR4321 is biased for linearity from the VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem comprises mainly of a low voltage FRAC-N (LVFRACN) IC, Reference Oscillator (crystal oscillator with temperature compensation), charge pump circuits, loop filter circuits, and DC supply. The output signal (PRESC_OUT) of the VCOBIC (U4301, pin12) is fed to of U4201, pin 32 (PREIN) via a low-pass filter (C4229,L4225,C4226) which attenuates harmonics and provides correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U4201) is basically a dual modulus pre-scaler with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y4261 or Y4262).

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at pin 43 of U4201 (IOUT). The loop filter (which consists of R4221-R4223, C4221-C4225,L4221) transforms this current into a voltage that is applied to the varactor diodes CR4311 for transmit, CR4301, CR4302 & CR4303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U4201-40) or BIAS 2 (U4201-39). The currents are set by the value of R4251 or R4252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer the magnitude of the loop current is increased by enabling the IADAPT (U4201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U4201-4).

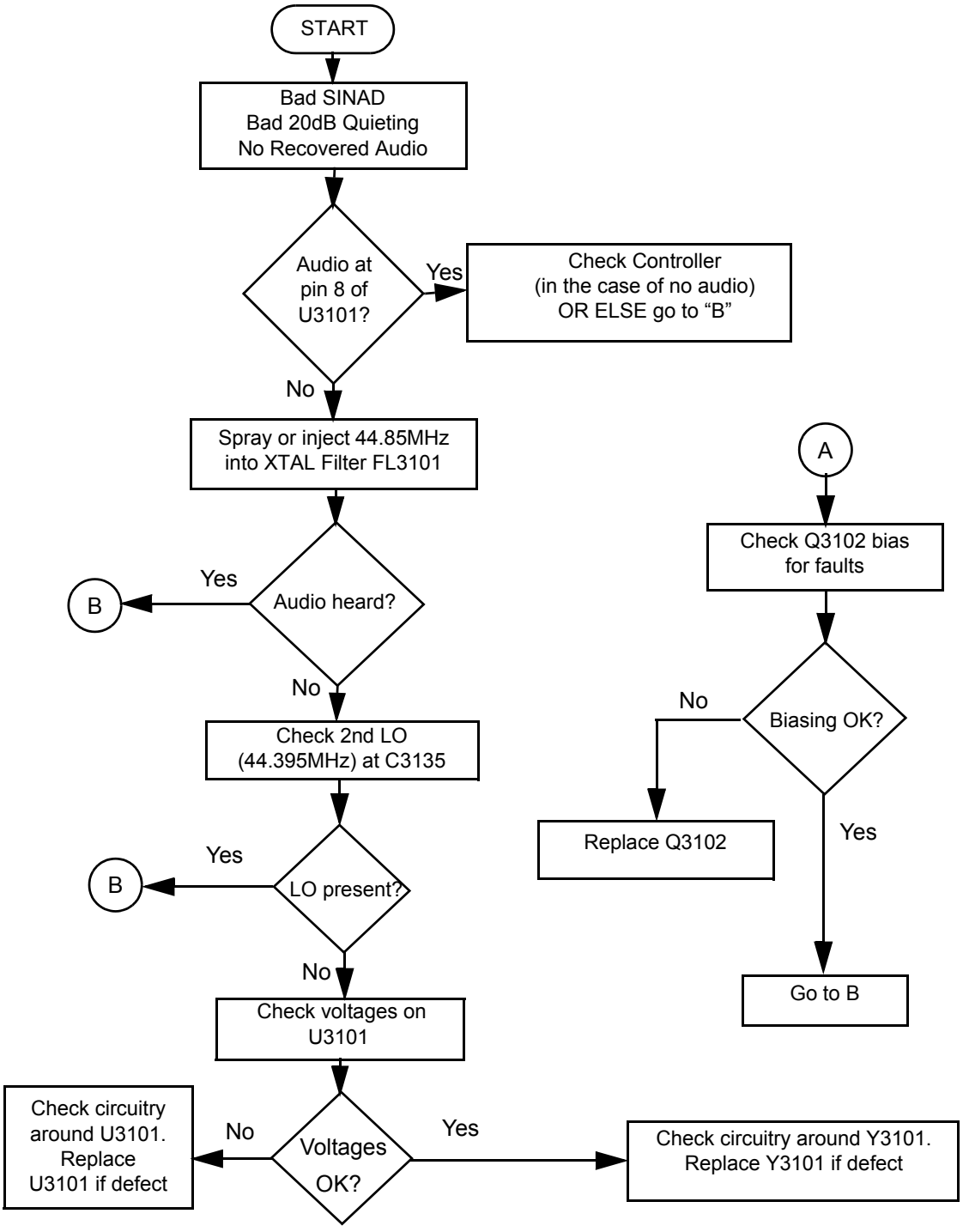
LOCK (U4201-4) signal is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active.

In order to modulate the PLL the two spot modulation method is utilized Via pin 10 (MODIN) on U4201. The audio signal is applied to both the A/D converter (low frequency path) as well as the balanced attenuator (high frequency path). The A/D converter converts the low frequency analog modulating signal into a digital code which is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U4201-41) and connected to the VCO modulation diode CR4321 via R4321, C4325.

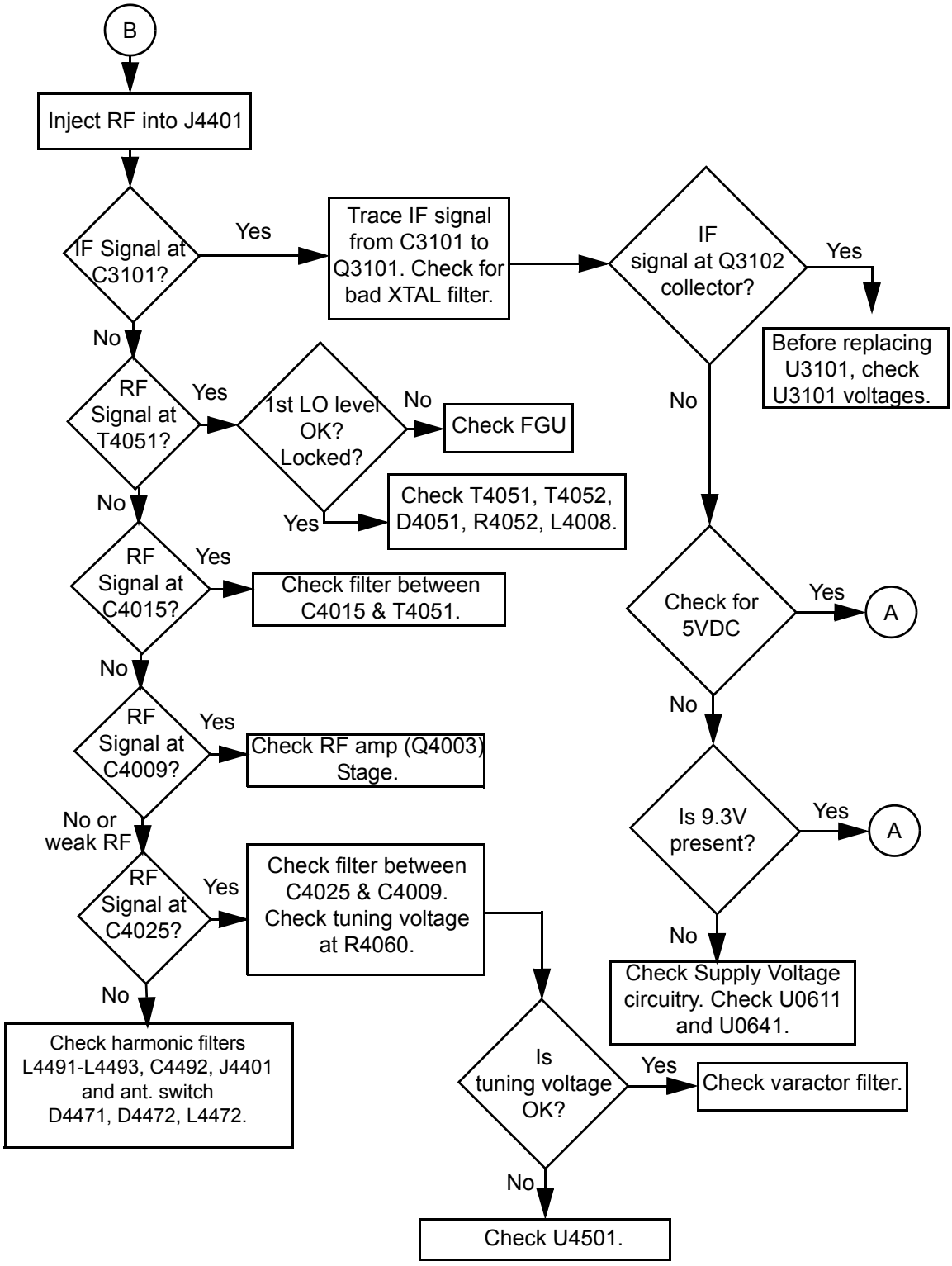
Section 3

TROUBLESHOOTING CHARTS

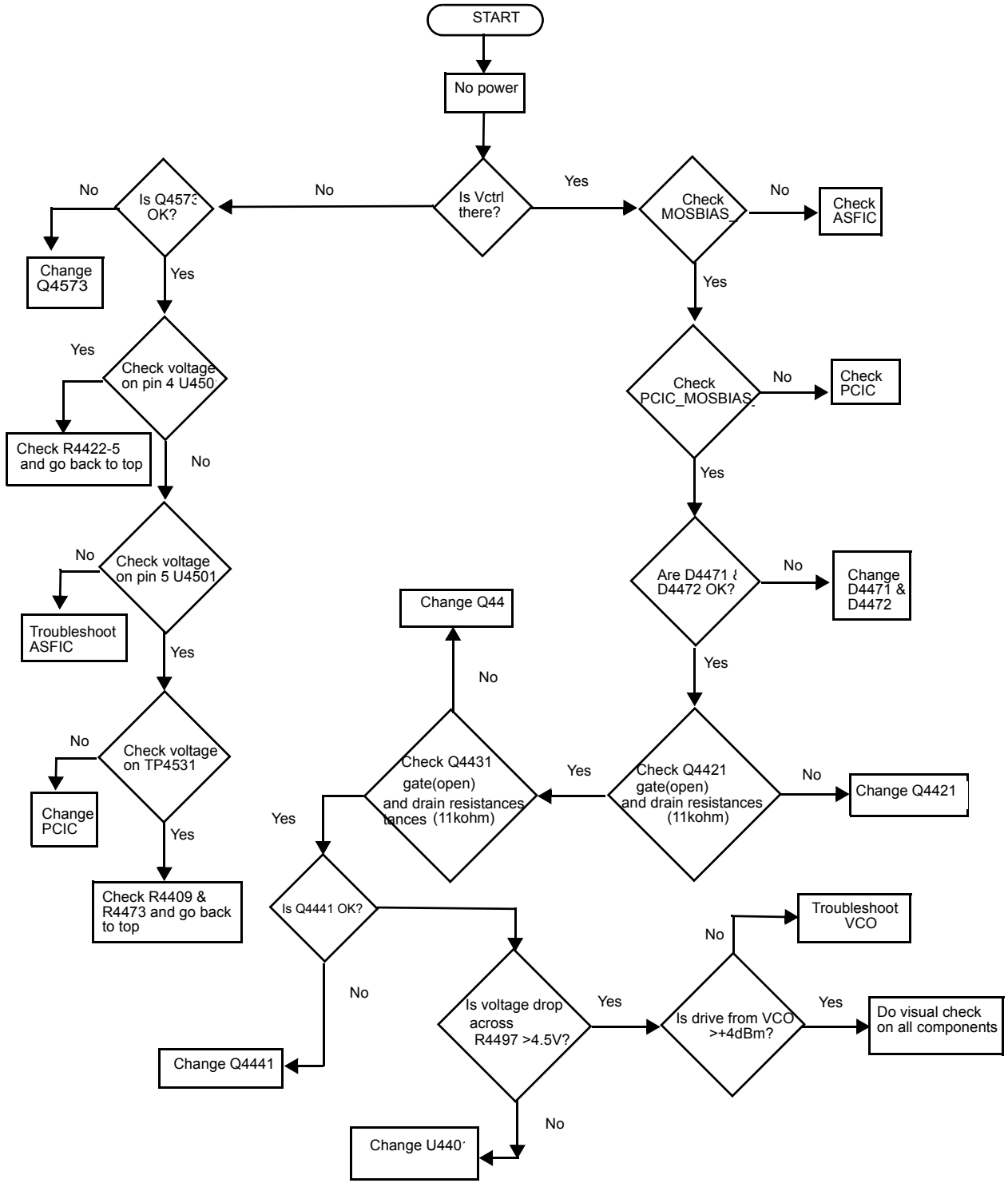
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



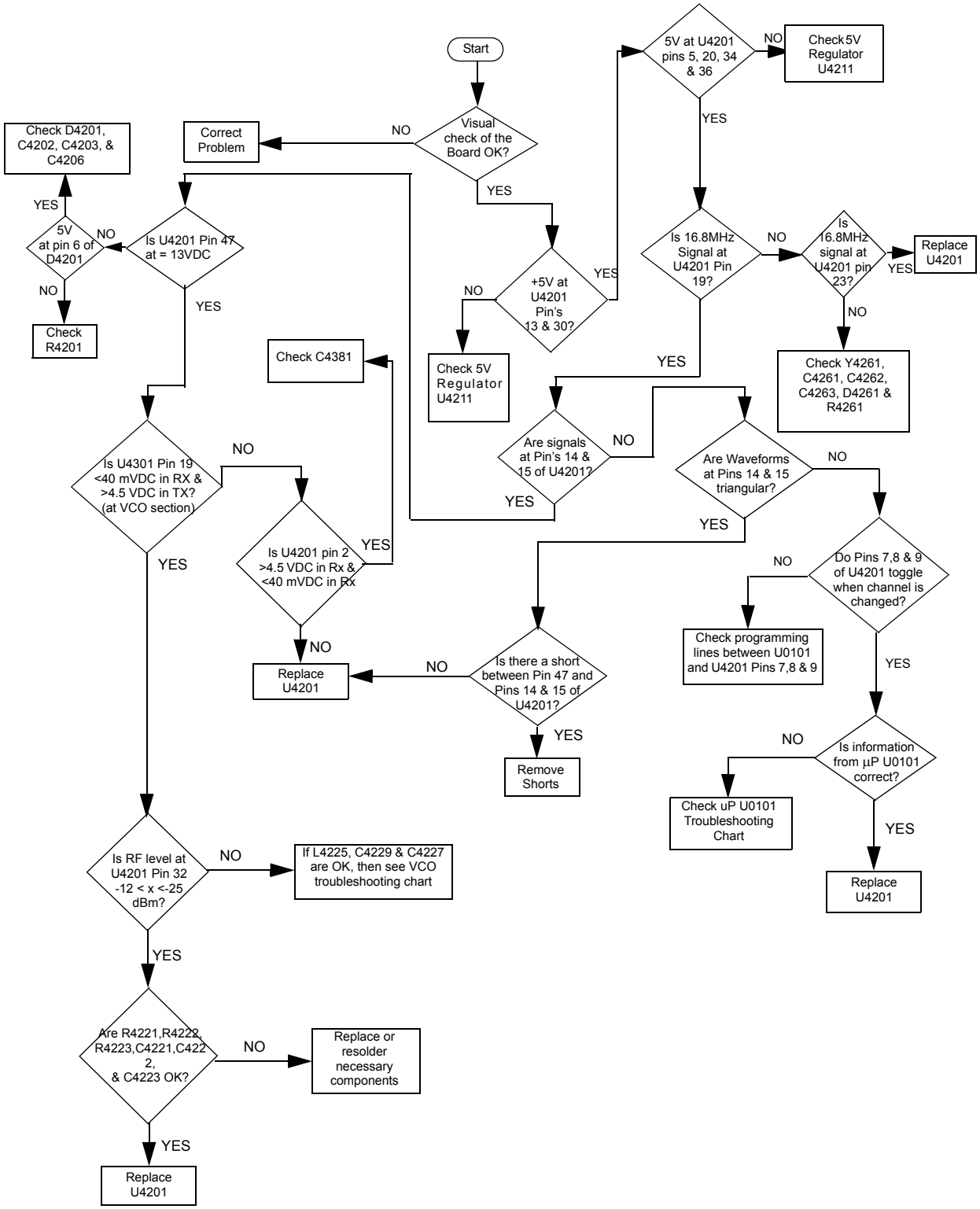
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



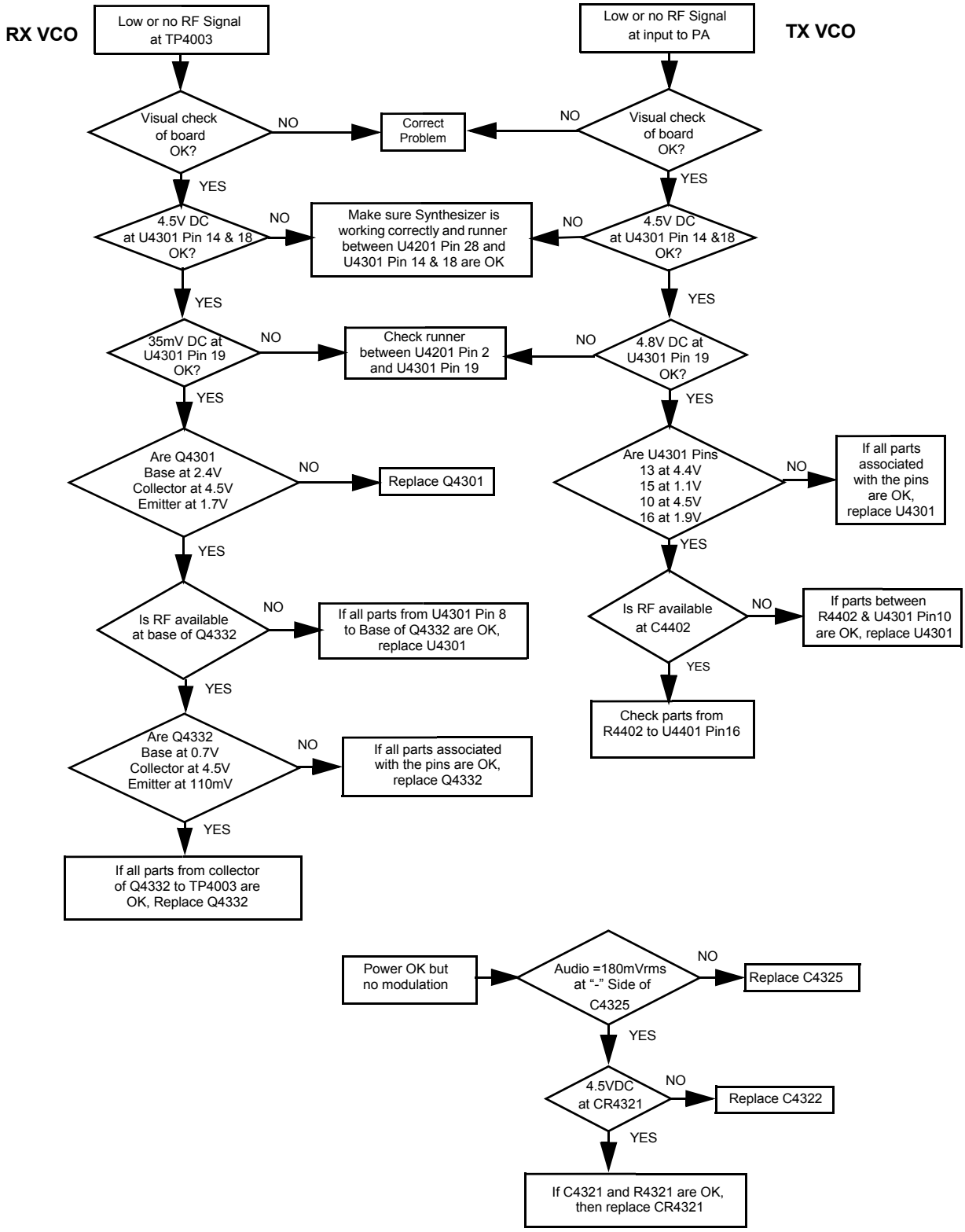
2.0 Troubleshooting Flow Chart for 40W Transmitter



3.0 Troubleshooting Flow Chart for Synthesizer

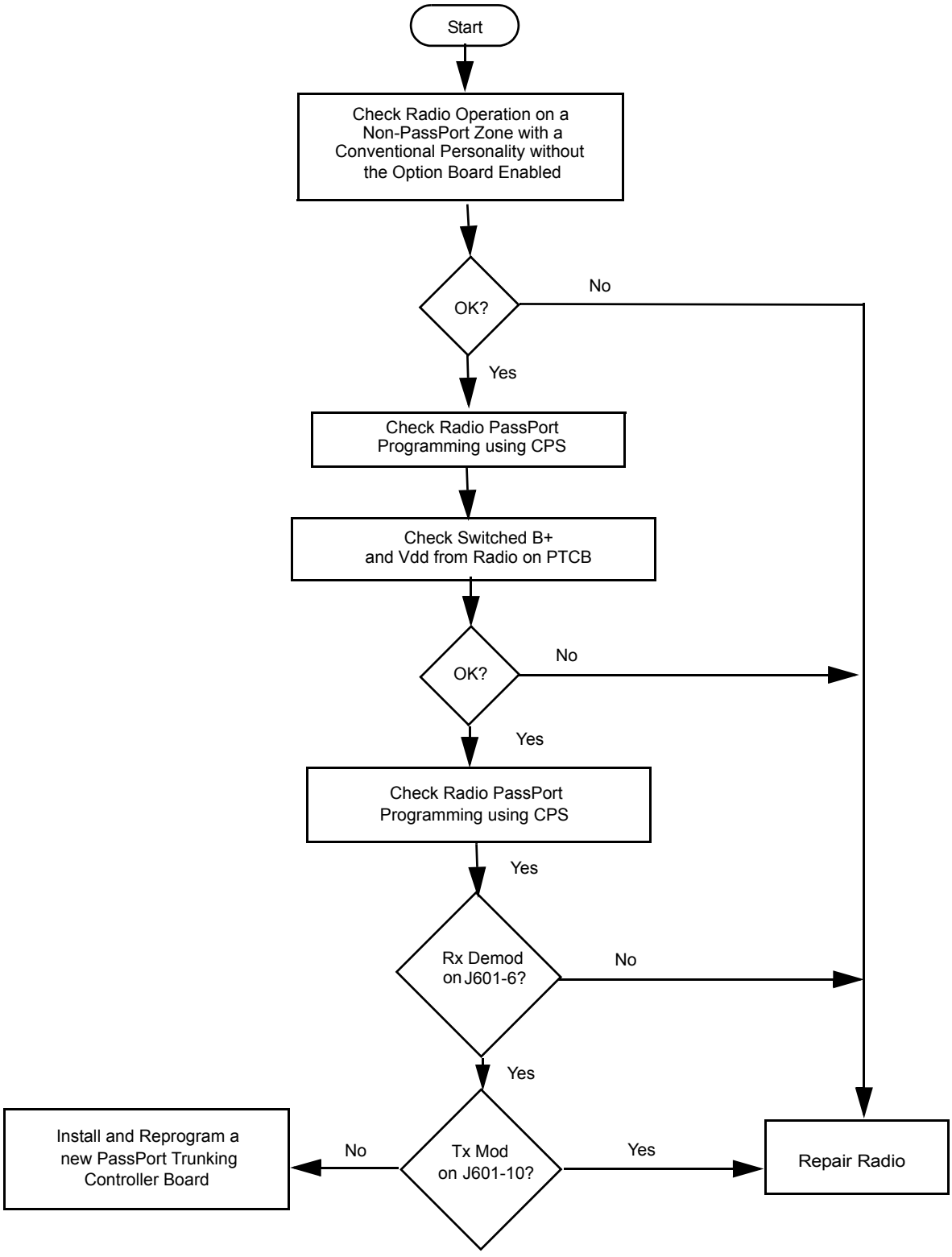


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Section 4

UHF BAND 1 (403-470 MHZ) 25-40W BIPOLAR PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

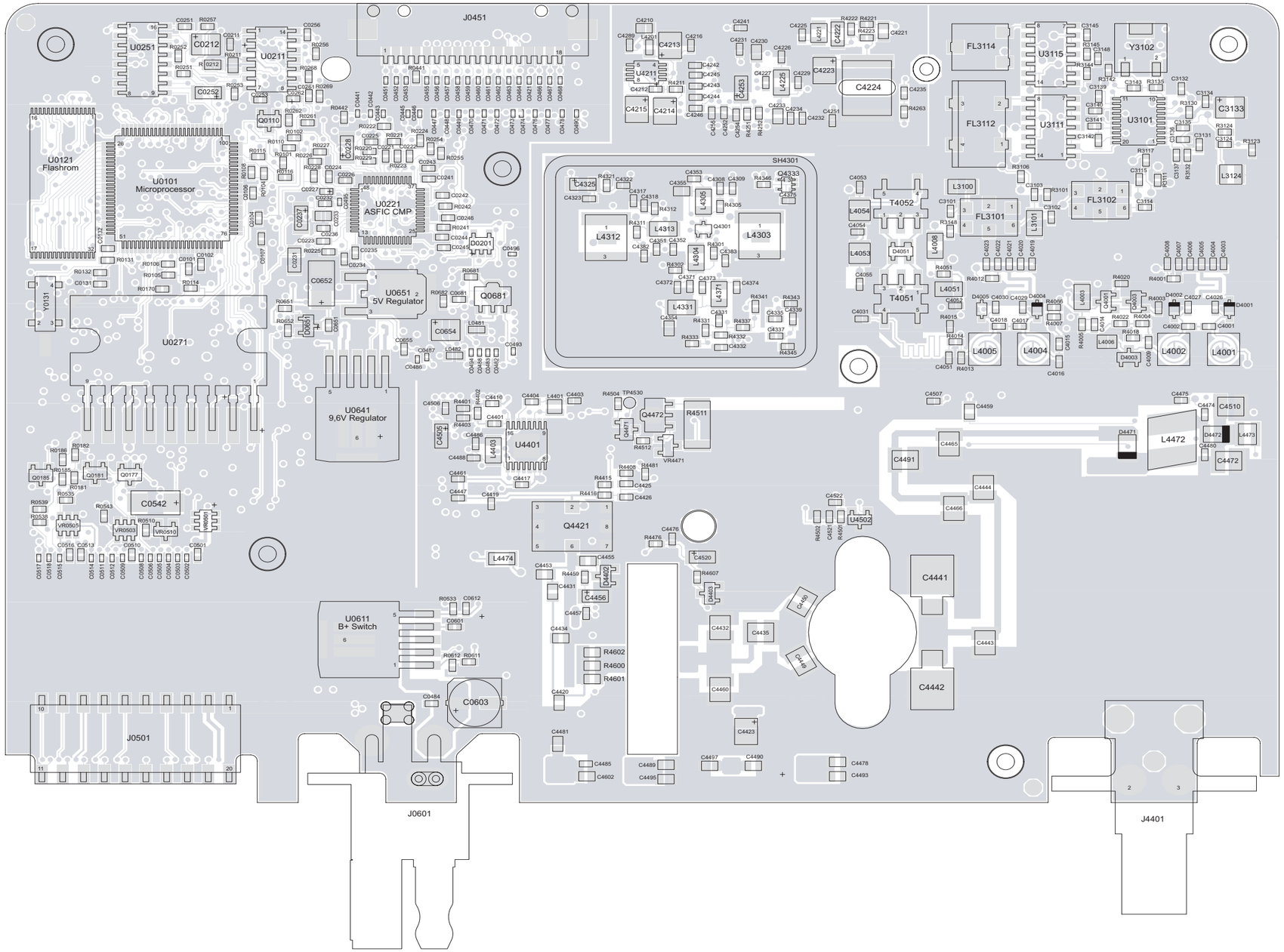
The UHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the UHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in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

Table 9-1 UHF Band 1 25-40W PCB 8480643Z06 Diagrams and Parts Lists

PCB 8480643Z06:	**Page:**
Main Board Top Side	**9: 4-3**
Main Board Bottom Side	**9: 4-4**
SCHEMATICS	
Power Amplifier 25 - 40W	**9: 4-5**
FRACN Synthesizer	**9: 4-6**
Voltage Controlled Oscillator	**9: 4-7**
Receiver Front-End	**9: 4-8**
IF	**9: 4-9**
Parts List	**9: 4-10**
Controller version is **T6/7**	

Notes

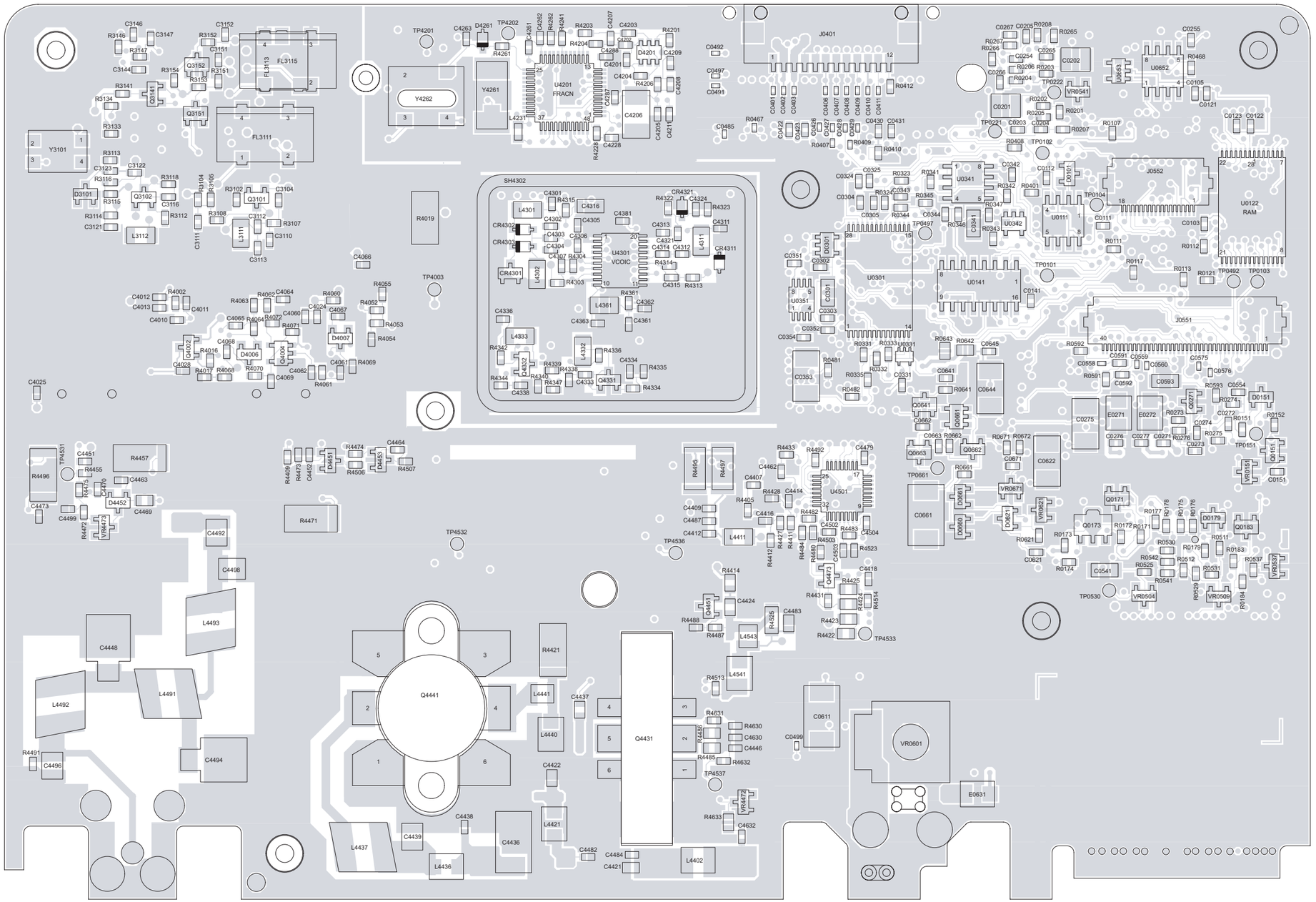
2.0 UHF Band 1 (403-470 MHz) 25-40W Bipolar PCB 8480643Z06, Schematics, and Parts Lists



ZWG0130268-A

UHF Band 1 (403-470 MHz) 25-40W Bipolar PCB 8480643Z06 Top Side

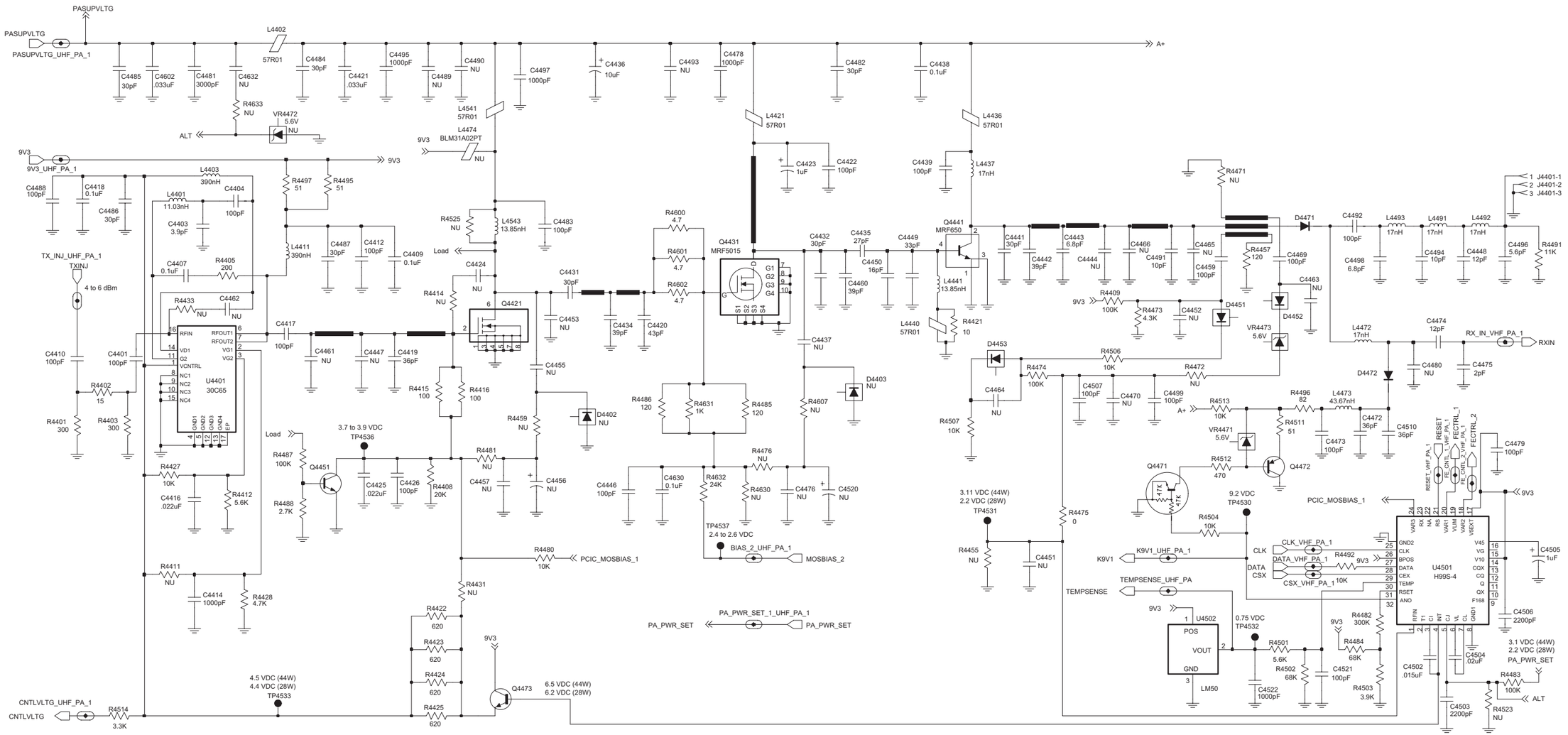
6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W Bipolar PCB 8480643Z06 Bottom Side

ZWG0130267-A

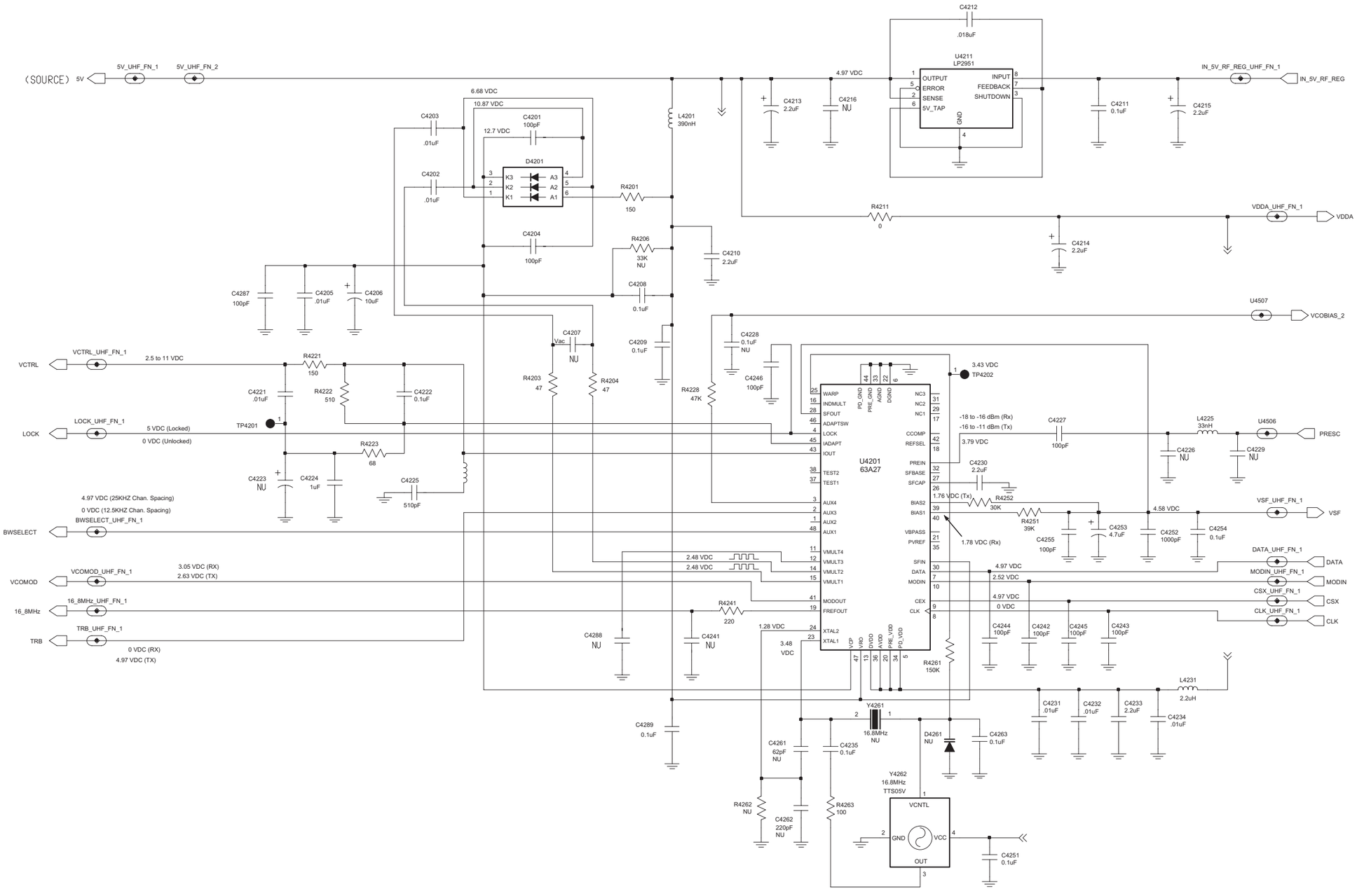
6881091C63-C



ZWG0130271-A

UHF Band 1 (403-470 MHz) 25-40W Bipolar Power Amplifier

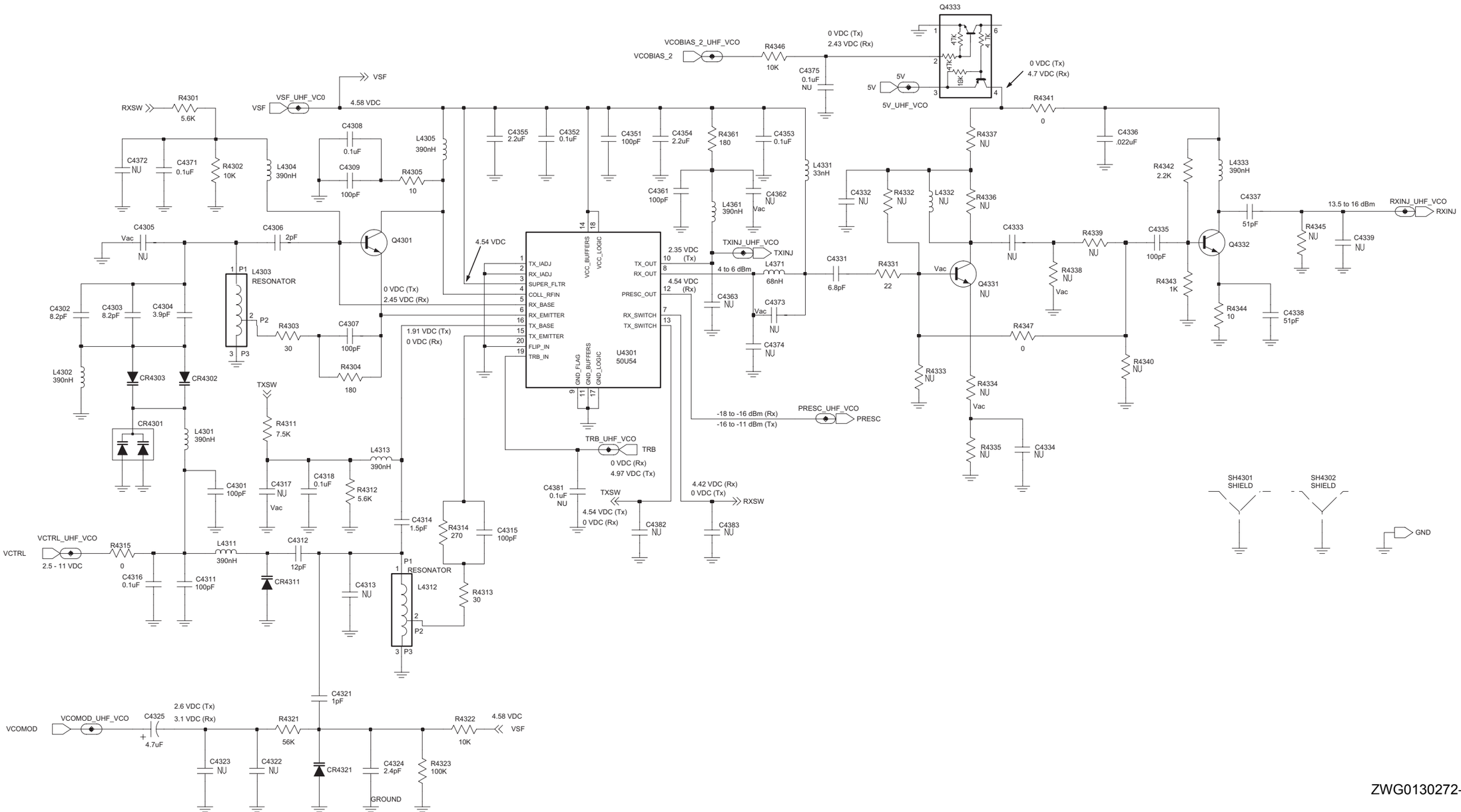
6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W Bipolar FRACN Synthesizer

6881091C63-C

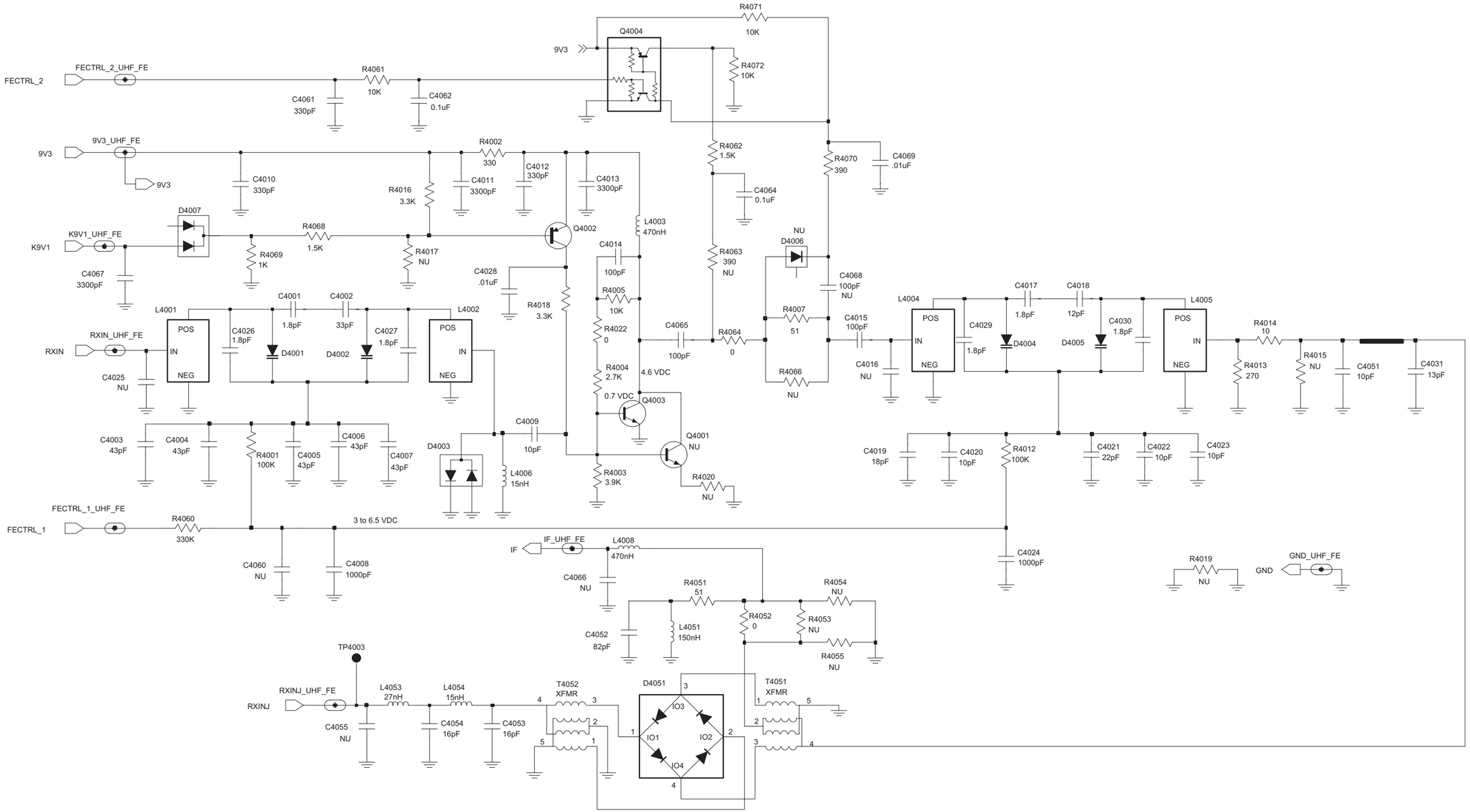
ZWG0130270-B



ZWG0130272-A

UHF Band 1 (403-470 MHz) 25-40W Bipolar Voltage Controlled Oscillator

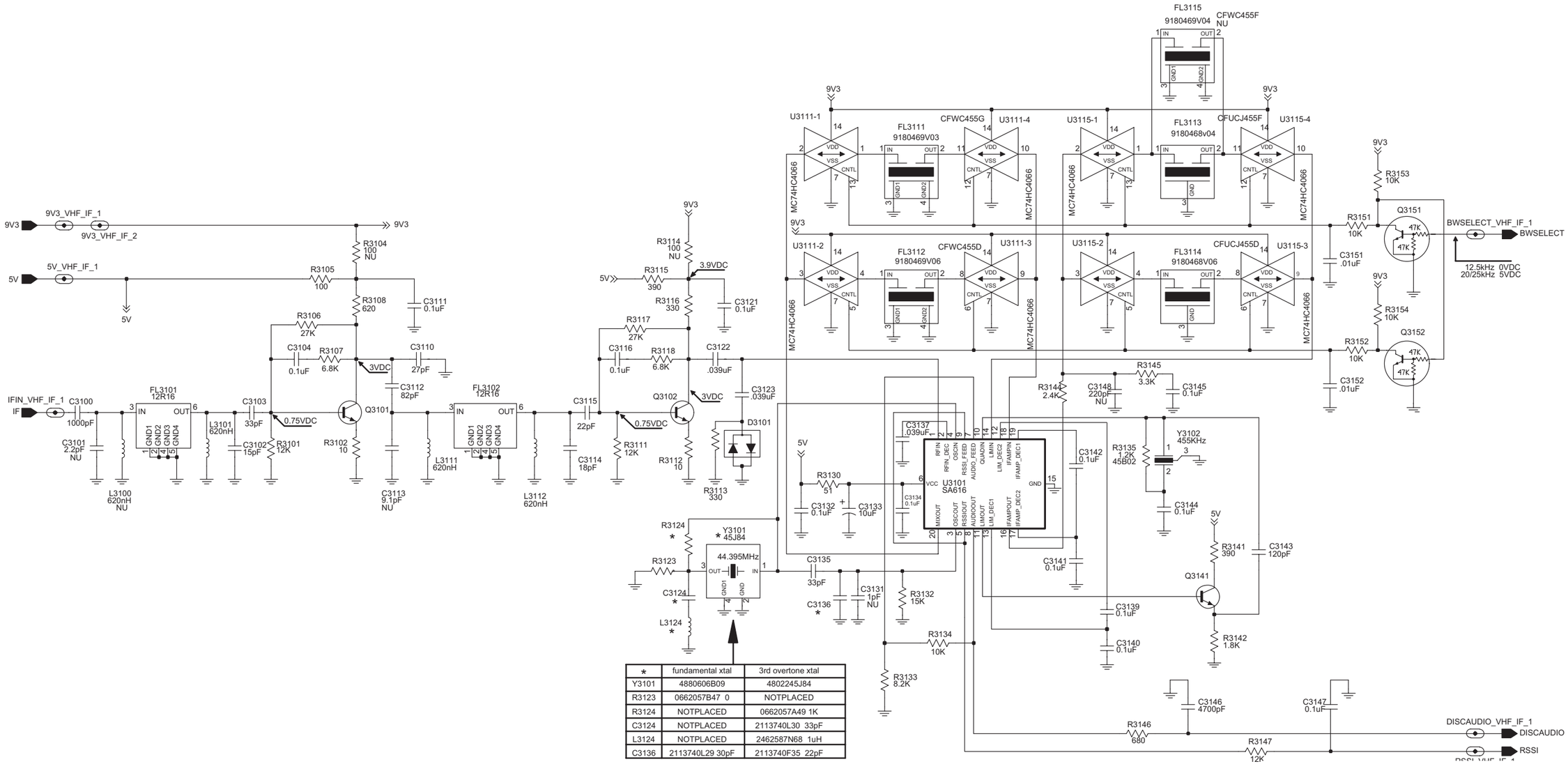
6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W Bipolar Receiver Front-End

ZWG0130269-A

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

UHF Band 1 (403-470 MHz) 25-40W Bipolar IF

ZWG0130236-C

6881091C63-C

UHF B1 25-40W PCB 8480643Z06 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	10000pF
C0201	2311049A57	10uF
C0202	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0228	2311049A56	4.7uF
C0231	2113743B29	1uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	0.022uF
C0236	2113743E10	0.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	10000pF
C0251	2113743E20	0.1uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0256	2113740F51	100pF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	10000pF
C0271	2113741F49	10000pF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0301	2311049A07	1uF
C0302	2113743E20	0.1uF
C0303	2113740F51	100pF
C0304	2113743E20	0.1uF
C0305	2113743E20	0.1uF
C0324	2113743E20	0.1uF
C0331	2113743E20	0.1uF
C0341	2311049A07	1uF
C0342	2113743E20	0.1uF
C0343	2113743E20	0.1uF
C0344	2113743E20	0.1uF
C0351	2113743E20	0.1uF
C0352	2113743E07	0.022uF
C0353	2311049A97	33uF
C0354	2113743E20	0.1uF
C0421	2113743N48	82pF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743N48	82pF
C0472	2113743N48	82pF
C0473	2113743N48	82pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	10000pF
C0502	2113743L09	470pF
C0503	2113743L09	470pF
C0504	2113743L09	470pF
C0505	2113743L09	470pF
C0506	2113743L09	470pF
C0508	2113743L09	470pF
C0509	2113743L09	470pF
C0510	2113741F17	470pF
C0511	2113743L09	470pF
C0512	2113743L09	470pF
C0513	2113741F17	470pF
C0514	2113743L09	470pF
C0515	2113743L09	470pF
C0516	2113741F49	10000pF
C0517	2113743N48	82pF
C0518	2113743L09	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	10000pF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	0.1uF
C3110	2113740F37	27pF
C3111	2113743E20	0.1uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	0.1uF
C3121	2113743E20	0.1uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	0.1uF
C3133	2311049A57	10uF
C3134	2113743E20	0.1uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	0.1uF
C3140	2113743E20	0.1uF
C3141	2113743E20	0.1uF
C3142	2113743E20	0.1uF
C3143	2113740F53	120pF
C3144	2113743E20	0.1uF
C3145	2113743E20	0.1uF
C3146	2113741F41	4700pF
C3147	2113743E20	0.1uF
C3151	2113741F49	10000pF
C3152	2113741F49	10000pF
C4001	2113740F09	1.8pF
C4002	2113740F39	33pF
C4003	2113740F42	43pF
C4004	2113740F42	43pF
C4005	2113740F42	43pF
C4006	2113740F42	43pF
C4007	2113740F42	43pF
C4008	2113741F25	1000pF
C4009	2113740F27	10pF
C4010	2113741F13	330pF
C4011	2113741F37	3300pF
C4012	2113741F13	330pF
C4013	2113741F37	3300pF
C4014	2113740F51	100pF
C4015	2113740F51	100pF
C4017	2113740F09	1.8pF
C4018	2113740F29	12pF
C4019	2113740F33	18pF
C4020	2113740F27	10pF
C4021	2113740F35	22pF
C4022	2113740F27	10pF
C4023	2113740F27	10pF
C4024	2113741F25	1000pF
C4026	2113740F09	1.8pF
C4027	2113740F09	1.8pF
C4028	2113741F49	10000pF
C4029	2113740F09	1.8pF
C4030	2113740F09	1.8pF
C4031	2113740F30	13pF
C4051	2113740F27	10pF
C4052	2113740F49	82pF

Circuit Ref	Motorola Part No.	Description
C4053	2113740F32	16pF
C4054	2113740F32	16pF
C4061	2113740F63	330pF
C4062	2113743E20	10uF
C4064	2113743E20	10uF
C4065	2113740F51	100pF
C4067	2113741F37	3300pF
C4069	2113741F49	10000pF
C4201	2113740F51	100pF
C4202	2113741F49	10000pF
C4203	2113741F49	10000pF
C4204	2113740F51	100pF
C4205	2113741F49	10000pF
C4206	2311049J25	10uF
C4208	2113743E20	10uF
C4209	2113743E20	10uF
C4210	2104993J02	2.2uF
C4211	2113743E20	10uF
C4212	2113743E05	0.018uUF
C4213	2311049A09	2.2uF
C4214	2311049A09	2.2uF
C4215	2311049A09	2.2uF
C4221	2109720D01	0.01uF
C4222	2109720D14	0.1uF
C4224	0882422W23	1uF
C4225	2113741F18	510pF
C4227	2113740F51	100pF
C4230	2104993J02	2.2uF
C4231	2113741F49	10000pF
C4232	2113741F49	10000pF
C4233	2104993J02	2.2uF
C4234	2113741F49	10000pF
C4235	2113741F49	10000pF
C4242	2113740F51	100pF
C4243	2113740F51	100pF
C4244	2113740F51	100pF
C4245	2113740F51	100pF
C4246	2113740F51	100pF
C4251	2113743E20	10uF
C4252	2113741F25	1000pF
C4253	2311049A56	4.7uF
C4254	2113743E20	10uF
C4255	2113740F51	100pF
C4263	2113743E20	10uF
C4287	2113740F51	100pF
C4289	2113743E20	10uF
C4301	2113740F51	100pF
C4302	2113740L16	8.2pF
C4303	2113740L16	8.2pF
C4304	2113740L08	3.9pF
C4306	2113740L01	2.0pF

Circuit Ref	Motorola Part No.	Description
C4307	2113740F51	100pF
C4308	2113743E20	10uF
C4309	2113740F51	100pF
C4311	2113740F51	100pF
C4312	2113740F29	12pF
C4314	2113740F07	1.5pF
C4315	2113740F51	100pF
C4316	2109720D14	0.1uF
C4318	2113743E20	10uF
C4321	2113740F03	1pF
C4324	2113740L03	2.4pF
C4325	2311049A56	4.7uF
C4331	2113740L14	6.8pF
C4335	2113740F51	100pF
C4336	2113743E07	0.022uF
C4337	2113740F44	51pF
C4338	2113740F44	51pF
C4351	2113740F51	100pF
C4352	2113743E20	10uF
C4353	2113743E20	10uF
C4354	2104993J02	2.2uF
C4355	2104993J02	2.2uF
C4361	2113740F51	100pF
C4371	2113743E20	10uF
C4401	2113740F51	100pF
C4403	2113740F17	3.9pF
C4404	2113740F51	100pF
C4407	2113743E20	10uF
C4409	2113743E20	10uF
C4410	2113740F51	100pF
C4412	2113740F51	100pF
C4414	2113741F25	1000pF
C4416	2113743E07	0.022uF
C4417	2113740F51	100pF
C4418	2113743E20	10uF
C4419	2113740F39	33pF
C4420	2113740A48	51pF
C4421	2113741A57	0.033uF
C4422	2113740A55	100pF
C4423	2311049A08	1uF
C4425	2113743E07	0.022uF
C4426	2113740F51	100pF
C4431	2113740A40	30pF
C4432	2111078B27	30pF
C4435	2111078B25	27pF
C4436	2311049A45	10uF
C4438	2113743E20	10uF
C4439	2111078B42	100pF
C4441	2180464E40	30pF
C4442	2180464E34	39pF
C4443	2111078B10	7.5pF

Circuit Ref	Motorola Part No.	Description
C4446	2113740F51	100pF
C4448	2180464E65	12pF
C4449	2111078B29	33pF
C4450	2111078B19	16pF
C4459	2113740A55	100pF
C4460	2111078B32	39pF
C4469	2113740A55	100pF
C4472	2111078B31	36pF
C4473	2113740F51	100pF
C4474	2113740F29	12pF
C4475	2113740F10	2.0pF
C4478	2113741A21	1000pF
C4479	2113740F51	100pF
C4481	2113741A32	3000pF
C4482	2113740F38	30pF
C4483	2113740A55	100pF
C4484	2113740F38	30pF
C4485	2113740F38	30pF
C4486	2113740F38	30pF
C4487	2113740F38	30pF
C4488	2113740F51	100pF
C4491	2111078B14	11pF
C4492	2111078B42	100pF
C4494	2180464E63	10pF
C4495	2113741A21	1000pF
C4496	2111078B07	5.6pF
C4497	2113741A21	1000pF
C4498	2111078B09	6.8pF
C4499	2113740F51	100pF
C4502	2113743E03	0.015uF
C4503	2113741F33	2200pF
C4504	2113743E06	0.020uF
C4505	2311049A07	1uF
C4506	2113741F33	2200pF
C4507	2113740F51	100pF
C4510	2111078B31	36pF
C4521	2113740F51	100pF
C4522	2113741F25	1000pF
C4602	2113741A57	0.033uF
C4630	2113743E20	10uF
C4632	2113741F25	1000pF
CR4301	4805649Q13	DIODE VCTR ISV 228
CR4302	4862824C01	DIODE VARACTOR
CR4303	4862824C01	DIODE VARACTOR
CR4311	4802245J22	DIODE, VARACTOR
CR4321	4862824C01	DIODE VARACTOR
D0101	4813825A05	DIODE
D0151	4813833C02	DIODE, DUAL 70V
D0179	4813833C02	DIODE, DUAL 70V
D0301	4802245J47	DIODE, SCHOTTKY
D0621	4813833C02	DIODE, DUAL 70V

Circuit Ref	Motorola Part No.	Description
D0651	4813833C02	DIODE, DUAL 70V
D0660	4813833C02	DIODE, DUAL 70V
D0661	4813833C02	DIODE, DUAL 70V
D4001	4862824C01	DIODE VARACTOR
D4002	4862824C01	DIODE VARACTOR
D4003	4880154K03	DIODE DUAL SCHOTTKY
D4004	4862824C01	DIODE VARACTOR
D4005	4862824C01	DIODE VARACTOR
D4007	4813833C02	DIODE, DUAL 70V
D4051	4886143B01	DIODE, MIXER
D4201	4802233J09	DIODE, TRIPLE
D4451	4813825A05	DIODE
D4452	4813825A05	DIODE
D4453	4813825A05	DIODE
D4471	4802482J02	DIODE, SMD PIN
D4472	4802482J02	DIODE, SMD PIN
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	CERAMIC FILTER, 455KHz
FL3112	9180469V06	CERAMIC FILTER, 455KHz
FL3114	9180468V06	CERAMIC FILTER, 455KHz
FL3115	9180469V04	CERAMIC FILTER, 455KHz
J0401	0902636Y02	CONNECTOR
J0451	0902636Y01	CONNECTOR
J0501	0986105B01	CONNECTOR
J0551	0905505Y04	CONNECTOR
J0552	0905505Y03	CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J4401	0986166B02	RF CONNECTOR (MINI UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L4003	2462587T23	470nH
L4006	2462587V24	15nH
L4008	2462587T23	470nH
L4051	2462587T17	150nH
L4053	2462587N46	27nH
L4054	2462587N43	15nH
L4201	2462587Q42	390nH
L4221	2462587P25	12000nH
L4225	2462587T40	33nH
L4231	2462587Q20	2,200nH
L4301	2462587T22	390nH
L4302	2462587T22	390nH

Circuit Ref	Motorola Part No.	Description
L4303	2460593C01	RESONATOR
L4304	2462587T22	390nH
L4305	2462587T22	390nH
L4311	2462587T22	390nH
L4312	2460593C01	RESONATOR
L4313	2462587T22	390nH
L4331	2462587T09	33nH
L4333	2462587T22	390nH
L4361	2462587T22	390nH
L4371	2462587T13	68nH
L4401	2460591B04	11.03nH
L4402	2484657R01	FERRITE BEAD
L4403	2462587T22	390nH
L4411	2462587T22	390nH
L4421	2484657R01	FERRITE BEAD
L4436	2484657R01	FERRITE BEAD
L4437	2460592A01	17nH
L4440	2484657R01	FERRITE BEAD
L4441	2460591C23	13.85nH
L4472	2460592A01	17nH
L4473	2460591N36	43.67nH
L4474	2480067M01	FERRITE BEAD
L4491	2460592A01	17nH
L4492	2460592A01	17nH
L4493	2460592A01	17nH
L4543	2460591C23	13.85nH
Q0110	4880048M01	NPN
Q0151	4880048M01	NPN
Q0171	4880048M01	NPN
Q0173	4880052M01	NPN DARLINGTON
Q0177	4880048M01	NPN
Q0181	4880048M01	NPN
Q0183	4880048M01	NPN
Q0185	4880048M01	NPN
Q0271	4880214G02	NPN
Q0641	4880048M01	NPN
Q0661	4805921T02	DUAL NPN/PNP
Q0662	4880214G02	NPN
Q0663	4880048M01	NPN
Q0681	4880052M01	NPN DARLINGTON
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q4002	4813824A17	PNP
Q4003	4813827A07	NPN
Q4004	4805921T02	DUAL NPN/PNP
Q4301	4805218N63	DIODE DUAL SCHOTTKY
Q4332	4813827A07	NPN
Q4333	4809939C05	DUAL NPN/PNP
Q4421	5105385Y91	MRF1508
Q4431	4805537W01	MRF5015
Q4441	4880225C30	MRF650
Q4451	4880214G02	NPN
Q4471	4880048M01	NPN
Q4472	4805128M27	PNP
Q4473	4880214G02	NPN
R0101	0662057A73	10K
R0102	0662057A65	4.7K
R0104	0662057A73	10K
R0105	0662057A97	97K
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	97K
R0131	0662057B46	10M
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K
R0201	0662057A25	100
R0202	0662057A43	560
R0203	0662057A25	100
R0204	0662057A43	560
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0228	0662057B47	0
R0229	0662057A01	10
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	97K
R0254	0662057A73	10K
R0255	0662057A73	10K
R0256	0662057A97	97K
R0257	0662057A57	2.2K
R0261	0662057A73	10K
R0262	0662057B08	270K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0323	0662057A79	18K
R0324	0662057A79	18K
R0331	0662057A73	10K
R0332	0662057A73	10K
R0333	0662057A73	10K
R0335	0662057B02	150K
R0341	0662057A73	10K
R0342	0662057A55	1.8K
R0343	0662057B47	0
R0344	0662057A91	56K
R0345	0662057A66	5.1K
R0346	0662057A89	47K
R0347	0662057A89	47K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10
R0410	6580542Z01	FUSE 3A
R0412	0662057B47	0
R0441	0662057B47	0
R0442	0662057A49	1K
R0467	0662057M26	10
R0468	0662057A97	97K
R0481	0662057B47	0
R0482	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	97K
R0512	0662057A77	15K
R0525	0662057A97	97K
R0529	0662057A89	47K
R0530	0662057B47	0
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0543	0662057A97	97K
R0591	0662057A82	24K
R0592	0662057A01	10
R0593	0662057A97	97K
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
R3101	0662057A75	12K
R3102	0662057A01	10
R3105	0662057A25	100
R3106	0662057A83	27K
R3107	0662057A69	6.8K
R3108	0662057A44	620
R3111	0662057A75	12K
R3112	0662057A01	10
R3113	0662057A37	330
R3115	0662057A39	390
R3116	0662057A37	330
R3117	0662057A83	27K
R3118	0662057A69	6.8K
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51
R3132	0662057A77	15K
R3133	0662057A71	8.2K
R3134	0662057A73	10K
R3135	0662057A51	1.2K
R3141	0662057A39	390
R3142	0662057A55	1.8K
R3144	0662057A58	2.4K

Circuit Ref	Motorola Part No.	Description
R3145	0662057A61	3.3K
R3146	0662057A45	680
R3147	0662057A75	12K
R3148	0662057B47	0
R3151	0662057A73	10K
R3152	0662057A73	10K
R3153	0662057A73	10K
R3154	0662057A73	10K
R4001	0662057A97	100K
R4002	0662057A37	330
R4003	0662057A63	3.9K
R4004	0662057A59	2.7K
R4005	0662057A73	10K
R4007	0662057A18	51
R4012	0662057A97	100K
R4013	0662057A35	270
R4014	0662057A01	10
R4016	0662057A61	3.3K
R4018	0662057A61	3.3K
R4022	0662057B47	0
R4051	0662057A18	51
R4052	0662057B47	0
R4060	0662057B10	330K
R4061	0662057A73	10K
R4062	0662057A53	1.5K
R4064	0662057B47	0
R4068	0662057A53	1.5K
R4069	0662057A49	1K
R4070	0662057A39	390
R4071	0662057A73	10K
R4072	0662057A73	10K
R4201	0662057A29	150
R4203	0662057A17	47
R4204	0662057A17	47
R4211	0662057B47	0
R4221	0662057A29	150
R4222	0662057A42	510
R4223	0662057A21	68
R4228	0662057A89	47K
R4241	0662057A33	220
R4251	0662057A87	39K
R4252	0662057A84	30K
R4261	0662057A89	47K
R4263	0662057A25	100
R4301	0662057A67	5.6K
R4302	0662057A73	10K
R4303	0662057A12	30
R4304	0662057A31	180
R4305	0662057A01	10
R4311	0662057A70	7.5K
R4312	0662057A67	5.6K

Circuit Ref	Motorola Part No.	Description
R4313	0662057A12	30
R4314	0662057A35	270
R4315	0662057B47	0
R4321	0662057A91	56K
R4322	0662057A73	10K
R4323	0662057A97	100K
R4331	0662057A09	22
R4341	0662057B47	0
R4342	0662057A57	2.2K
R4343	0662057A49	1K
R4344	0662057A01	10
R4346	0662057A73	10K
R4347	0662057B47	0
R4361	0662057A31	180
R4401	0662057A36	300
R4402	0662057A05	15
R4403	0662057A36	300
R4405	0662057A32	200
R4408	0662057A80	20K
R4409	0662057A97	100K
R4412	0662057A67	5.6K
R4415	0662057A25	100
R4416	0662057A25	100
R4421	0680194M01	10
R4422	0611079A69	620
R4423	0611079A69	620
R4424	0611079A69	620
R4425	0611079A69	620
R4427	0662057A73	10K
R4428	0662057A65	4.7K
R4457	0683962T51	120
R4473	0662057A64	4.3K
R4474	0662057A97	100K
R4475	0662057B47	0
R4480	0662057A73	10K
R4482	0662057B09	300K
R4483	0662057A97	100K
R4484	0662057A93	68K
R4485	0662057C53	120
R4486	0662057C53	120
R4487	0662057A97	100K
R4488	0662057A59	2.7K
R4491	0662057A74	11K
R4492	0662057A73	10K
R4495	0680195M18	51
R4496	0680194M23	82
R4497	0680195M18	51
R4501	0662057A67	5.6K
R4502	0662057A93	68K
R4503	0662057A63	3.9K
R4504	0662057A73	10K

Circuit Ref	Motorola Part No.	Description
R4506	0662057A73	10K
R4507	0662057A73	10K
R4511	0680194M18	51
R4512	0662057A41	470
R4513	0662057A73	10K
R4514	0662057A61	3.3K
R4600	0662057C19	4.7
R4601	0662057C19	4.7
R4602	0662057C19	4.7
R4631	0662057A49	1K
R4632	0662057A82	24K
SH4301	2602641Y02	SHIELD
SH4302	2602641Y02	SHIELD
T4051	2505515V03	TRANSFORMER 4:1
T4052	2505515V04	TRANSFORMER 5:1
U0101	5102226J56	MICROPROCESSOR
U0111	5102463J64	EEPROM
U0121	5186137B01	IC, FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	IC, QUAD OPAMP
U0221	5185130C53	IC, ASFIC
U0251	5184704M60	IC-CMOS ANALOG
U0271	5109699X01	AUDIO PA
U0301	5109152M01	EEPROM ANALOG
U0331	5186204B01	BUFFER / DRIVER
U0341	5113818A01	LINEAR IC OP-AMP
U0342	5105750U28	IC CMOS SWITCH
U0351	5102463J40	REGULATOR, 3.3V
U0611	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0641	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0651	5113816A07	REGULATOR, 5V
U0652	5113815A02	UNDERVOLT SENSOR
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U4201	5185963A27	IC FRACTN
U4211	5185963A33	IC, VOLTAGE REGULATOR
U4301	5105750U54	IC, VCO
U4401	5185130C65	IC LDMOS DRIVER
U4501	5185765B26	IC POWER CONTROL
U4502	5185963A15	IC TEMPERATURE SENSOR
VR0151	4813830A15	DIODE, 5.6V
VR0501	4805656W09	DIODE, ZENER
VR0503	4805656W09	DIODE, ZENER
VR0504	4813830A40	DIODE, ZENER
VR0505	4805656W09	DIODE, ZENER
VR0509	4813830A40	DIODE, ZENER
VR0510	4813830A40	DIODE, ZENER

Circuit Ref	Motorola Part No.	Description
VR0537	4813830A15	DIODE, 5.6V
VR0541	4813830A27	DIODE, 14V
VR0601	4813832C77	DIODE
VR0621	4813830A15	DIODE, 5.6V
VR4471	4813830A15	DIODE, 5.6V
VR4473	4813830A15	DIODE, 5.6V
Y0131	4880113R19	CRYSTAL 38.4KHZ
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455KHz DISCRIMINATOR
Y4262	4886182B01	TCXO 16.8MHZ

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/ or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

Chapter 10: UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF (450-512 MHz) 25-40W Bipolar (Conventional, LTR/PassPort)

Model						Description
AAM25SKC9AA1AN						CDM750, 450-512 MHz, 25-40W, 12.5/20/25 kHz
	AAM25SKD9AA2AN					CDM1250, 450-512 MHz, 25-40W, 12.5/20/25 kHz
		AAM25SKF9AA5AN				CDM1550, 450-512 MHz, 25-40W, 12.5/20/25 kHz
			AAM25SKF9DU5AN			CDM1550•LS, 450-512 MHz, 25-40W, 12.5/20/25 kHz
				AAM25SKF9DP5AN		CDM1550•LS^{+}, 450-512 MHz, 25-40W, 12.5/20/25 kHz
					Item	**Description**
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X	X		IMUE6025	Tanapa, UHF 450-512 MHz, 25-40W, 12.5/20/25 kHz
				X	PMUE1757	Tanapa, CDM1550•LS^{+}, 450-512 MHz, 25-40W
X	X	X	X	X	HAE4003_R	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4004	Antenna, 470-512 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4011_R	Antenna, 450-470 MHz, 3.5dB Gain Roof Mount (Mini U)
X	X	X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5 dB Gain Roof Mount (Mini-U)
X	X	X	X	X	HAE4013_	Antenna, 494-512 MHz, 5 dB Gain Roof Mount (Mini-U)
X					6881091C54	User Guide, CDM750
	X				6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X		6881093C32	User Guide, CDM1550•LS
				X	6881094C79	User Guide, CDM1550•LS+

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 13, Section 1.0: UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Model Charts.)

1.2 PRO Series Model Chart

PRO Series, UHF (450-520 MHz) 25-40W Bipolar				
Model				Description
LAM25SKC9AA1AN				PRO3100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
	LAM25SKD9AA2AN			PRO5100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
		LAM25SKF9AA5AN		PRO7100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6025	Tanapa, UHF 450-520 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	HAE4003_R	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4011_R	Antenna, 450-470 MHz, 3.5dB Gain Roof Mount (Mini U)
X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5 dB Gain Roof Mount (Mini-U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

NOTE If you wish to replace a bipolar board, you must replace it with the LDMOS tanapa (same item number). (See Chapter 13, Section 1.0: UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Model Charts.)

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**25 - 40W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-520 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	25-40W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-520 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Receiver Front-End

2.1 Receiver Front-End

The UHF receiver, shown in Figure 10-1, is able to cover the UHF range from 450 to 512 MHz (for CDM models) and from 450 to 520 MHz (for PRO models). It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. Low-side first injection is used.

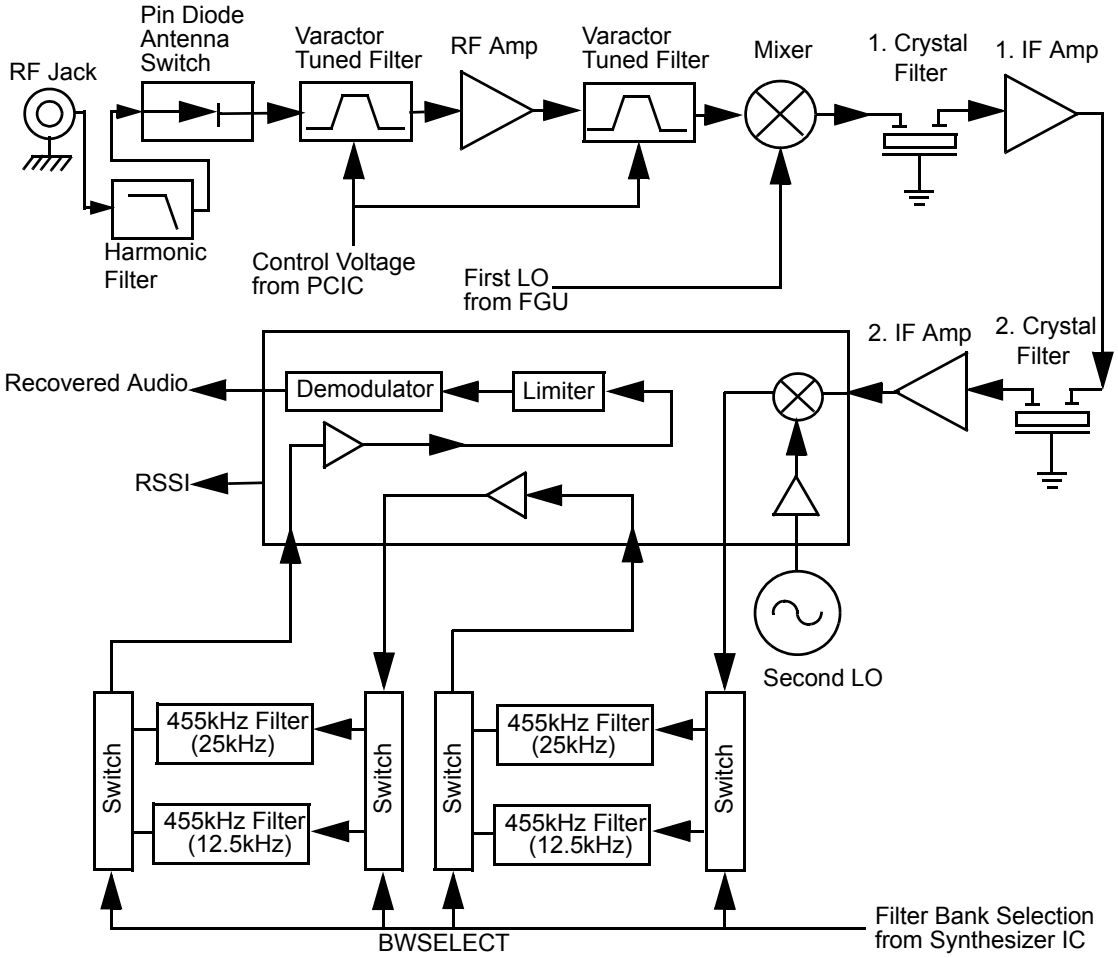


Figure 10-1 UHF Receiver Block Diagram

The two 2-pole 44.85 MHz crystal filters in the high-IF section and two pairs of 455 kHz ceramic filters in the low-IF section provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified, and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver pre-selector filter (C5001, C5002, D5001, and related components). The 2-pole pre-selector filter, tuned by the varactor diodes D5001 and D5002, pre-select the incoming signal (RXIN) from the antenna switch to reduce spurious effects to the stages that follow. The tuning voltage (FECTRL_1), ranging from 2 volts to 8 volts, is controlled by pin 20 of PCIC (U5501) in the transmitter section. A dual hot carrier diode (D5003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q5003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3 volt supply via L5003 and R5002. A 3dB pad (R5006, R5007, R5011, and R5008 - R5010) stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. Varactor diodes D5004 and D5005 are controlled by the same signal, FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R5013 - R5015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal from the front-end is converted to the first IF (44.85 MHz) using passive double-balanced mixer D5051. Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T5051 and T5052. The injection signal (RXINJ) coming from the RX VCO buffer (Q5332) is filtered by the low-pass filter consisting of L5053, L5054, and C5053 - C5055 followed by matching transformer T5052 which has a level of approximately 15dBm.

The mixer IF output signal from transformer T5501, pin 2 is fed to the first two-pole crystal filter (FL3101). The filter output in turn is matched to IF amplifier Q3101 which is actively biased using collector-base feedback resistors R3101and R3106 to provide a current drain of approximately 5 mA drawn from the 5 volt supply. The output impedance of this device is matched to the second two-pole crystal filter FL3102. The signal is further amplified by a pre-amplifier Q3102 before going to pin 1 of IFIC (U3101).

A dual, hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz first IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator to produce a low IF signal of 455 kHz. The second LO frequency is determined by crystal Y3101. The second IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters (FL3112 and FL3114) for 20/25 kHz channel spacing, or FL3111 and FL3113/F3115 for 12.5 kHz channel spacing. These

pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103, pin 8 (DISCAUDIO) which is fed to ASFIC_CMP U0221, pin 2 (part of the controller circuits).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101, pin 5, which has a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101, pin 63) and is available at accessory connector J0501-15.

3.0 UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Transmitter Power Amplifier (PA) 40W

The radio's 40W power amplifier (PA), shown in Figure 10-2, is a four-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. The first stage is an LDMOS pre-driver (U5401) controlled by pin 4 of PCIC (U5501) via Q5473 (CNTLVLTG). This stage is followed by another LDMOS stage (Q5421), LDMOS stage Q5431, and a bipolar final stage (Q5441). Device Q5401 is surface mounted and Q5421, Q5431, and Q5441 are directly attached to the heat sink.

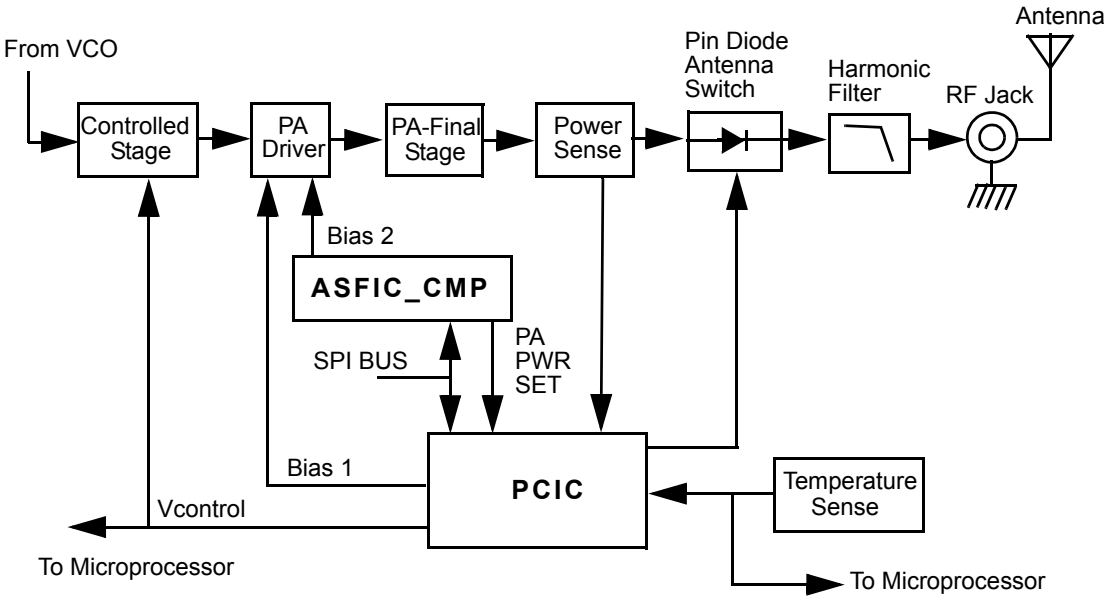


Figure 10-2 UHF Transmitter Block Diagram

3.1 Power Controlled Stage

The first stage (U5401) amplifies the RF signal from the VCO (TXINJ) and controls the output power of the PA. The output power of the transistor U5401 is controlled by a voltage control line feed from the PCIC (U5501, pin 4). The control voltage simultaneously varies the bias of two FET stages within U5401. This biasing point determines the overall gain of U5401 and therefore its output drive level to Q5421, which in turn controls the output power of the PA.

In receive mode, the voltage control line is at ground level and turns off Q5473, which in turn switches off the biasing voltage to U5401.

3.2 Pre-Driver Stage

The next stage is a 13dB gain LDMOS device (Q5421) which requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line PCIC_MOSBIAS_1 is set in transmit mode by PCIC, pin 24 and fed to the gate of Q5421 via the resistive network R5407, R5408, R5416, and R5415. The bias voltage is factory tuned.

3.3 Driver Stage

This stage is an enhancement-mode N-Channel MOSFET device (Q5431) providing a gain of 10dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line Bias_2_UHF_PA_1 is set in transmit mode by the ASFIC and fed to the gate of Q5431 via resistive network R5630, R5631, and R5632. This bias voltage is also factory tuned.

If the transistor is replaced, the bias voltage must be tuned using the Customer Programming Software (CPS). Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device's drain current is drawn directly from the radio's DC supply voltage input, A+ via L5421.

3.4 Final Stage

The final stage uses bipolar device Q5441 whose collector current is also drawn from the radio's DC supply voltage input. To maintain class C operation, the base is DC-grounded by series inductor L5441 and bead L5440. A matching network consisting of C5541-C5544 and two striplines transform the impedance to 50 ohms and also feed the directional coupler.

3.5 Bi-directional Coupler

The bi-directional coupler is a microstrip printed circuit, which couples a small amount of the forward and reverse power of the RF power from Q5441. The coupled signal is rectified to an output power proportional DC voltage by diodes D5451 and D5452 before being sent to the RFIN input of the PCIC. The PCIC controls the gain of stage U5401 as necessary to hold this voltage constant. This ensures the forward power out of the radio is held to a constant value.

3.6 Antenna Switch

The antenna switch utilizes the existing DC feed (A+) to the last stage device (Q5441). Basic operation is to have both PIN diodes (D5471 and D5472) turned on during key-up by forward biasing them. This is achieved by pulling down the voltage at the cathode end of D5472 to around 11.8V (0.7V drop across each diode). The current through the diodes needs to be set around 80mA to fully open the transmit path through resistor R5496. Q5472 is a current source controlled by Q5471 and is eventually connected to pin ANO of PCIC. VR5471 ensures the voltage at resistor R4511 never exceeds 5.6V.

3.7 Harmonic Filter

Inductors L5491, L5492, and L4493 along with capacitors C5448, C5493, C5494, C5496, and C5498 form a low-pass filter to attenuate harmonic energy from the transmitter. Resistor R5491 drains any electrostatic charges that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits to improve spurious response rejection.

3.8 Power Control

The transmitter uses the power control IC (PCIC, U5501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the bi-directional coupler and rectified to provide a DC voltage to the RFIN port of the PCIC (pin 1) that is proportional to the sampled RF power.

The PCIC has internal digital-to-analog converters (DACs) which provide a reference voltage to the control loop. The reference voltage level is programmable through the SPI line of the PCIC and is proportional to the desired power setting of the transmitter. Factory programming at several points across the frequency range of the transmitter is used to offset frequency response variations of the transmitter's power detector circuits.

The PCIC provides a DC output voltage at pin 4 (INT) and applied as CNTLVLTG to the power-adjust input pin of the first transmitter stage U5401. This adjusts the transmitter power output to the intended value. Variations in forward or reflected transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitor C5502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power rise (key-up) and power decay (de-key) characteristic to minimize splatter into adjacent channels.

U5502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 29) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power is reduced to decrease the transmitter temperature.

4.0 UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Frequency Synthesis

The synthesizer, shown in Figure 10-3, consists of a reference oscillator (Y5261 or Y5262), low voltage LVFRAC-N synthesizer (U5201), and a voltage controlled oscillator (VCO).

4.1 Reference Oscillator

The reference oscillator (Y5262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U5201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U5201, pin 25 to set the frequency of the oscillator. The output of the oscillator (Y5262, pin 3) is applied to pin 23 (XTAL1) of U5201 via an RC series combination.

In applications where less frequency stability is required, the oscillator inside U5201 is used along with external crystal Y5261, varactor diode D5261, C5261, C5262, and R5262. In this case, Y5262, R5263, C5235 and C5251 are not used. When Y5262 is used, Y5261, D5261, C5261, C5262 and R5262 are not used, and C5263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U5201) consists of a pre-scaler, programmable loop divider, control divider logic, phase detector, charge pump, A/D converter for low frequency digital modulation, balanced attenuator used to balance high frequency analog modulation and low frequency digital modulation, 13V positive voltage multiplier, serial interface for control, and a super filter for the regulated 5 volts.

A voltage of 5V applied to the super filter input (U5201, pin 30) supplies an output voltage of 4.5 Vdc (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R5322), and synthesizer charge pump resistor network (R5251, R5252). The synthesizer supply voltage is provided by 5V regulator, U5211.

To generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U5701-32), a voltage of 13 Vdc is generated by the positive voltage multiplier circuit (D5201, C5202, and C5203). This voltage multiplier is basically a diode capacitor network driven by two signals (1.05MHz) 180 degrees out of phase (U5201, pins 14 and 15).

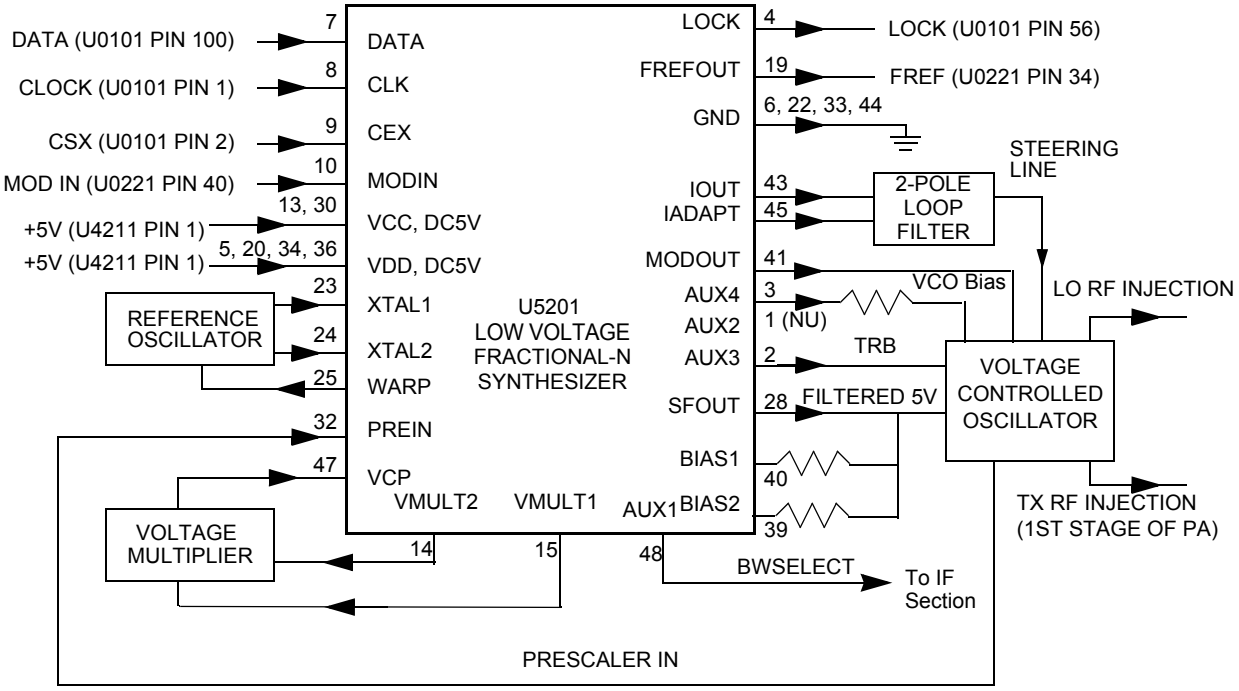


Figure 10-3 UHF Synthesizer Block Diagram

Output LOCK (U5201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U5201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via data line DATA (U5201-7), clock line CLK (U5201-8), and chip enable line CSX (U5201-9).

4.3 Voltage Controlled Oscillator (VCO)

The voltage controlled oscillator (VCO), shown in Figure 10-4, consists of a VCO buffer IC (VCOBIC, U5301), TX and RX tank circuits, external RX buffer stages, and modulation circuits.

The VCOBIC together with Fractional-N synthesizer (U5201) generates the required frequencies in both transmit and receive modes. The TRB line (U5301, pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U5301, pin 12 (PRESC_OUT), via a low-pass filter of U5201, pin 32 (PREIN).

A steering line voltage (VCTRL) between 3.0V and 10.0V at varactor diode CR5311 tunes the full TX frequency range (TXINJ) from 450 MHz to 512 (or 520) MHz, and at varactor diodes CR5301, CR5302, and CR5303 tunes the full RX frequency range (RXINJ) from 405 MHz to 475 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, external transistor Q5301 is used in conjunction with the internal transistor for better side-band noise.

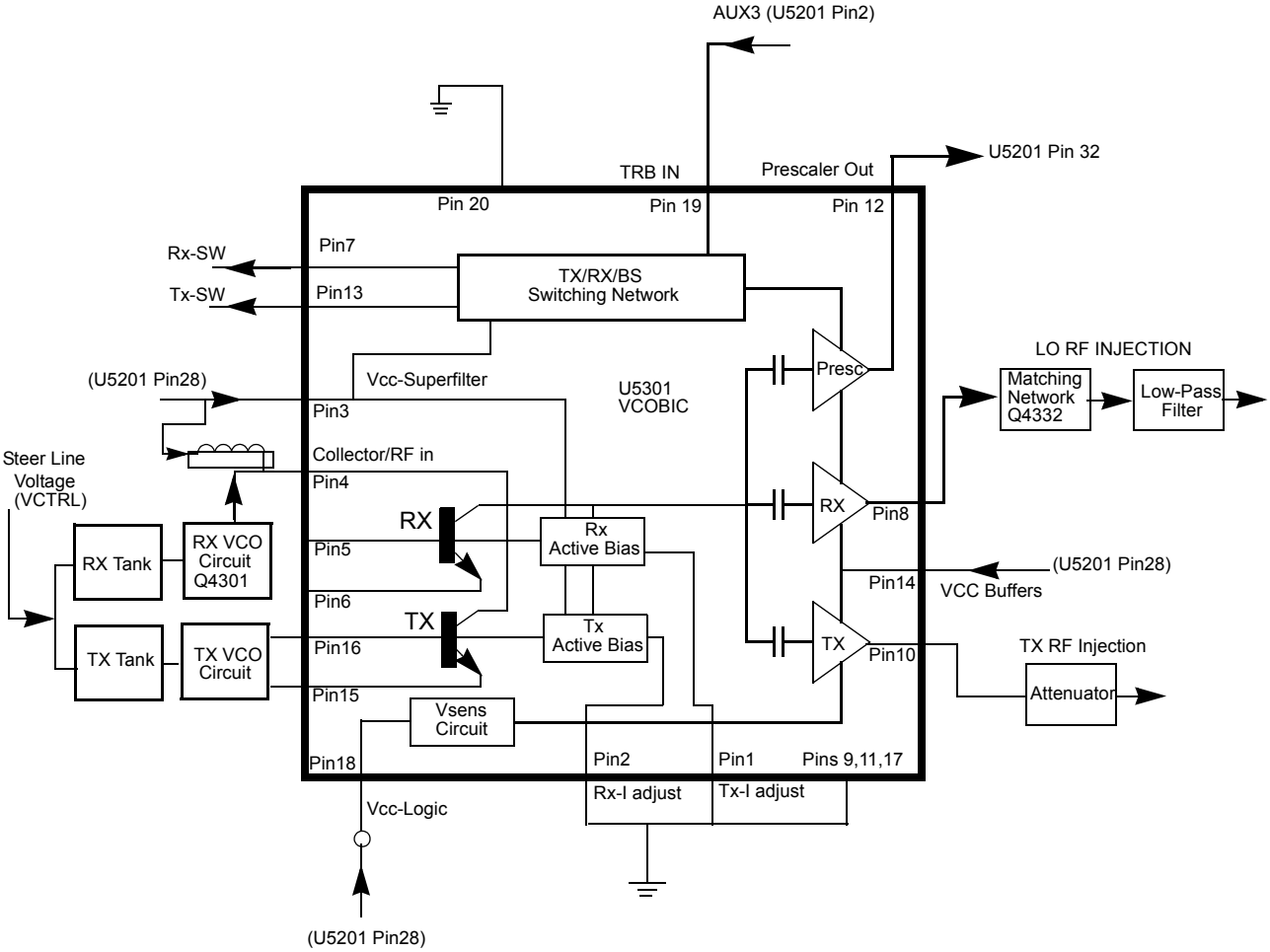


Figure 10-4 UHF VCO Block Diagram

The external RX buffers (Q5332) are enabled by a high at U5201, pin 3 (AUX4) via transistor switch Q5333. In TX mode, the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U5201, pin 41) is applied to the modulation circuits CR5321, R5321, R5322, and C5324. These modulate the TX VCO frequency via coupling capacitor C5321. Varactor CR5321 is biased for linearity from the VSF.

4.4 Synthesizer Operation

The synthesizer consists of a low voltage FRAC-N (LVFRACN) IC, reference oscillator (crystal oscillator with temperature compensation), charge pump circuits, loop filter circuits, and DC supply. The output signal (PRESC_OUT) of the VCOBIC (U5301, pin12) is fed to of U5201, pin 32 (PREIN) via a low-pass filter (C5229,L5225,and C5226) which attenuates harmonics and provides correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U5201) is a dual modulus pre-scaler with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y5261 or Y5262).

The output signal of the phase detector is a pulsed DC signal routed to the charge pump. The charge pump outputs a current at U5201, pin 43 (IOUT). The loop filter (consisting of R5221-R5223, C5221-C5225, and L5221) transforms this current into a voltage that is applied to varactor diodes CR5311 for transmit, CR5301, CR5302 and CR5303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U5201-40) or BIAS 2 (U5201-39). The currents are set by the value of R5251 or R5252 respectively. The selection of the three different bias sources is done by software programming.

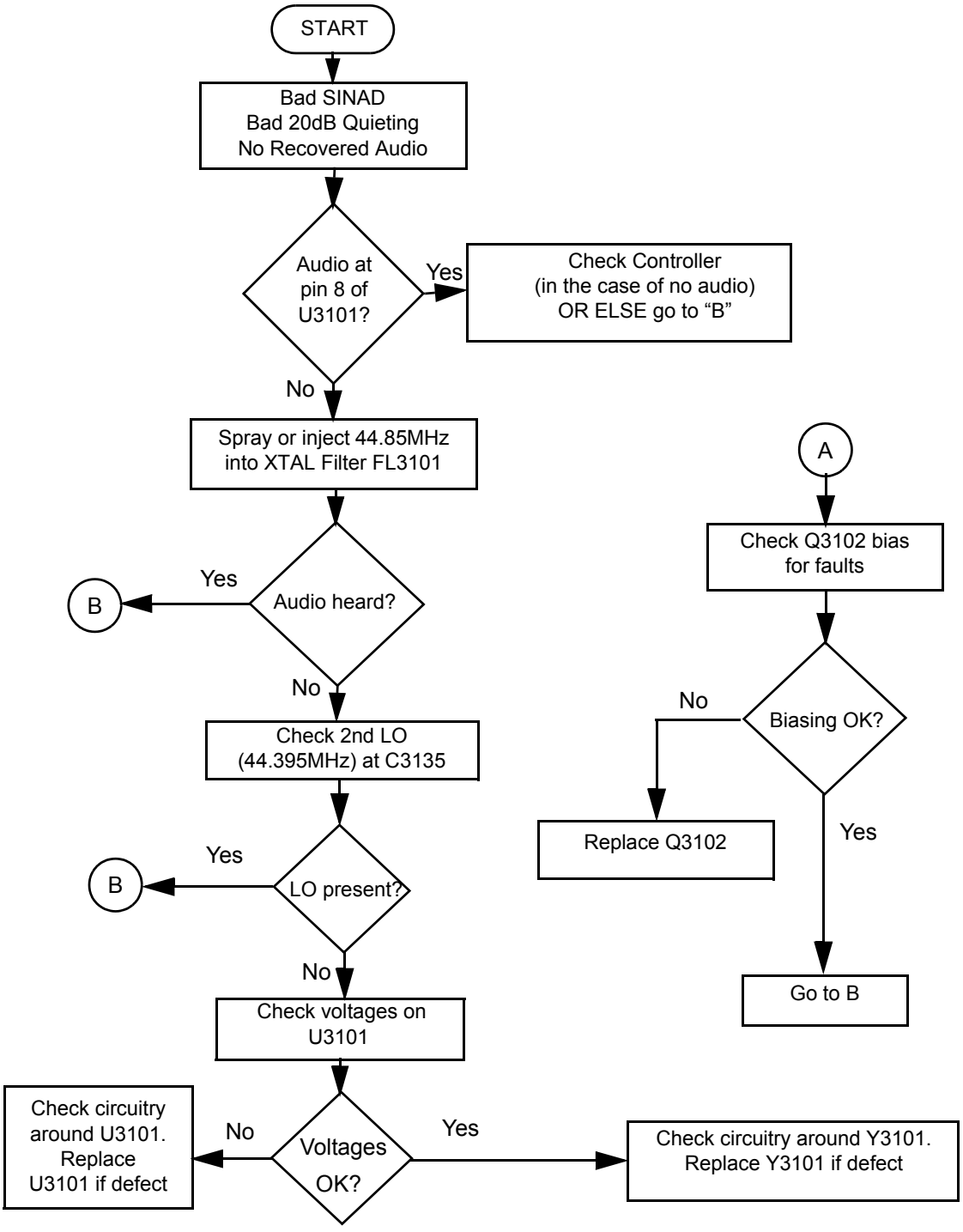
To reduce synthesizer lock time, when new frequency data has been loaded into the synthesizer, the magnitude of the loop current is increased by enabling the IADAPT (U5201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U5201-4) which is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active.

To modulate the PLL, the two-spot modulation method is utilized via pin 10 (MODIN) on U5201. The audio signal is applied to both the A/D converter (low frequency path) and the balanced attenuator (high frequency path). The A/D converter converts the low frequency analog modulating signal into a digital code which is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U5201-41) and connected to the VCO modulation diode CR5321 via R5321 and C5325.

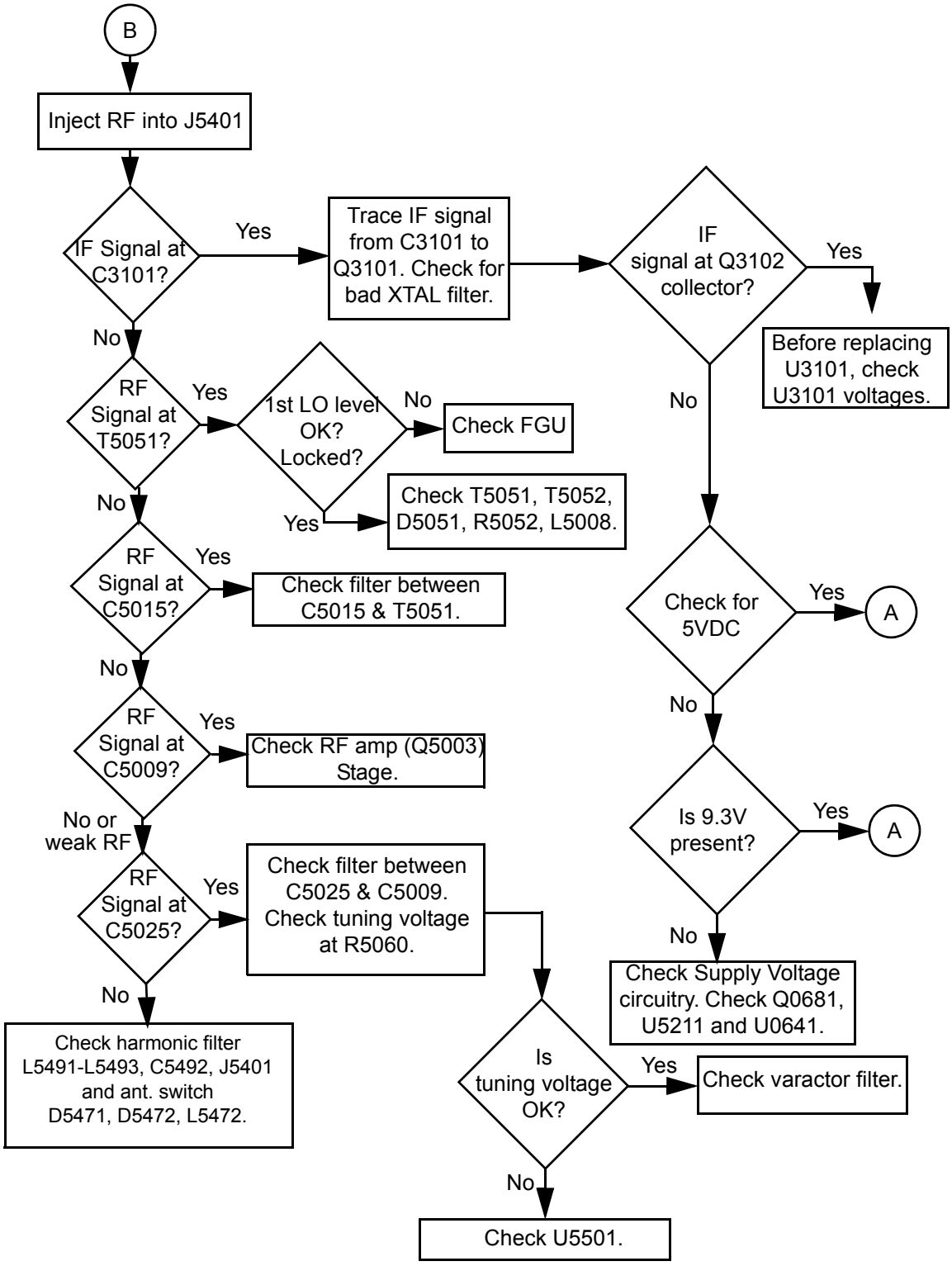
Section 3

TROUBLESHOOTING CHARTS

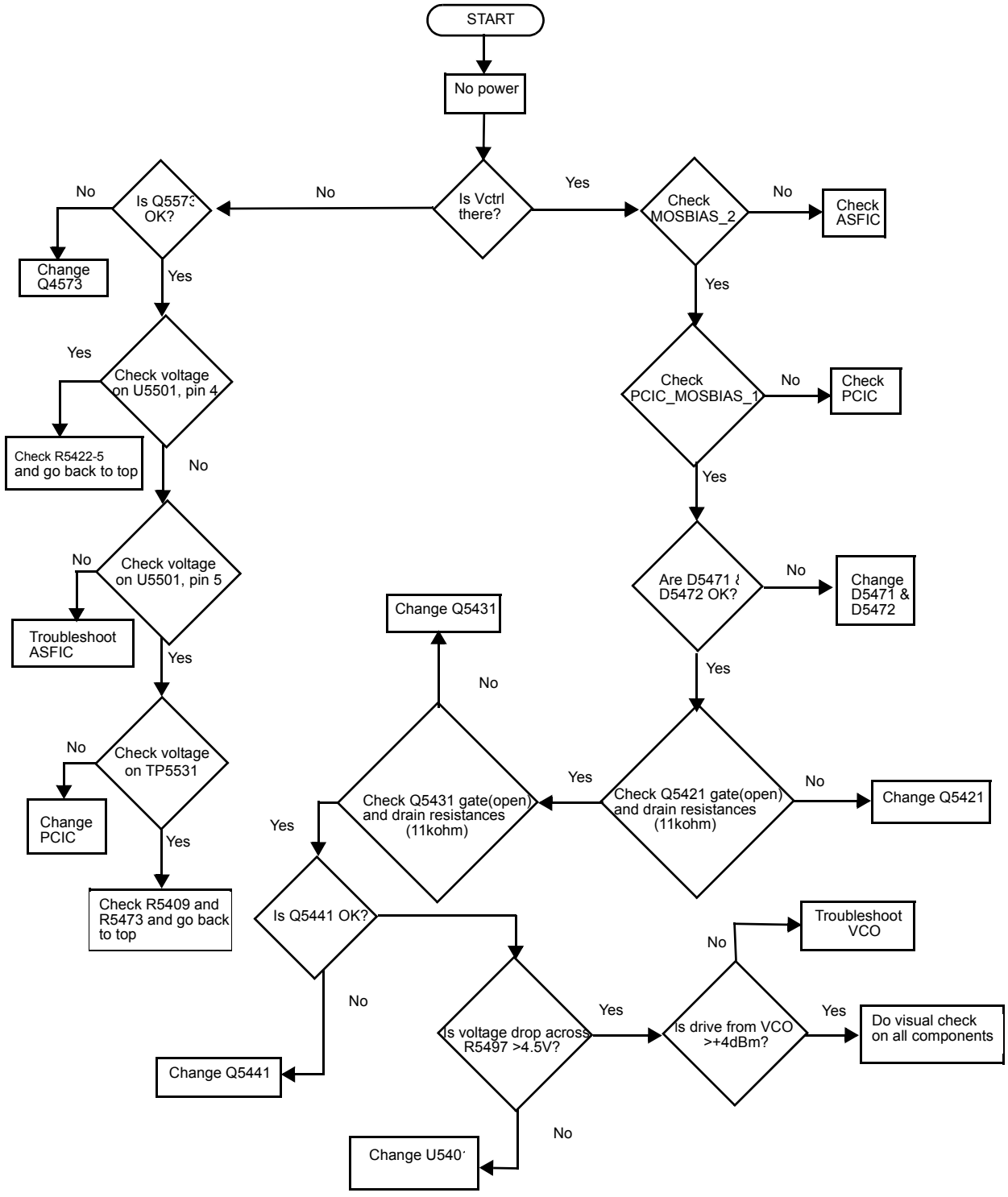
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



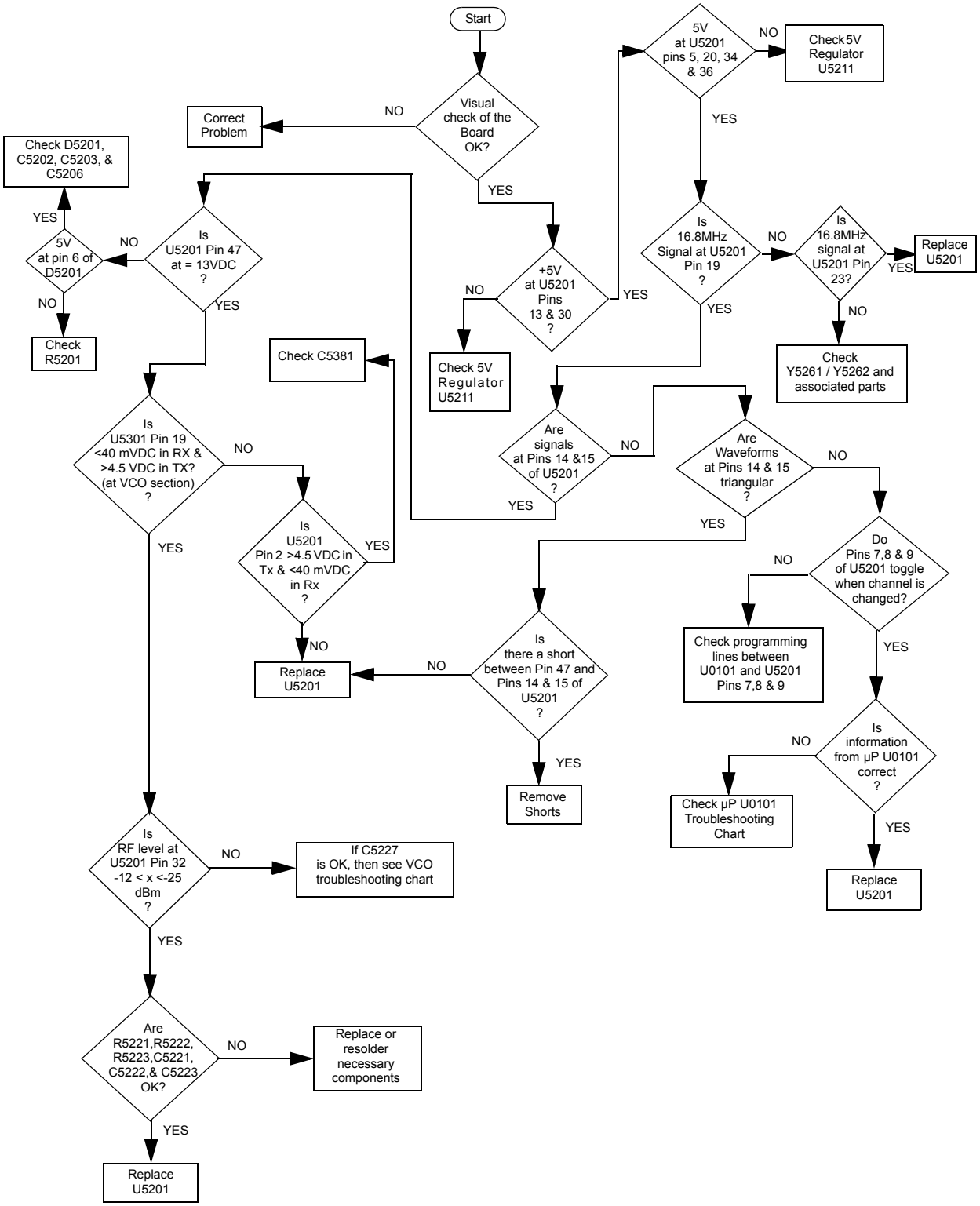
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



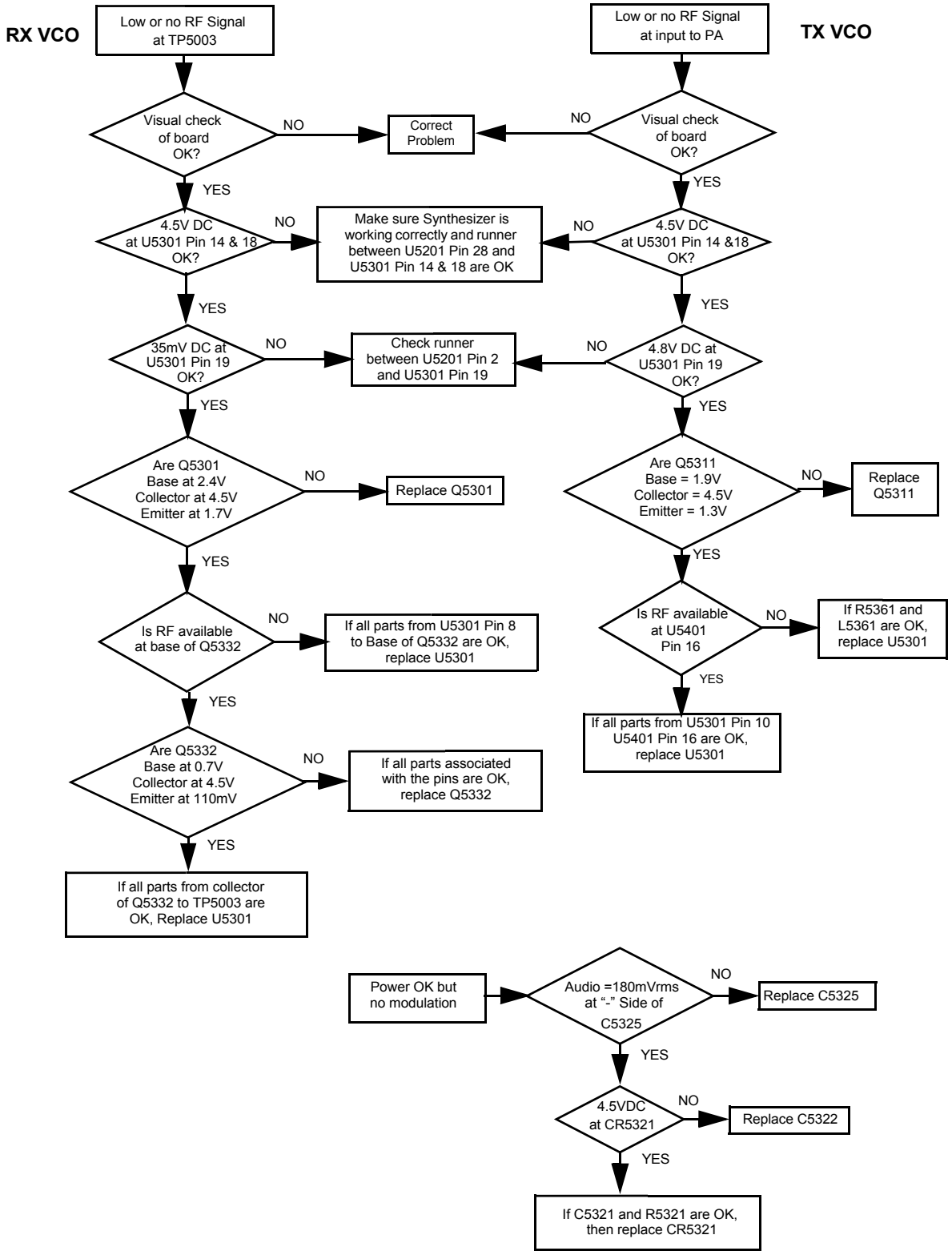
2.0 Troubleshooting Flow Chart for 40W Transmitter



3.0 Troubleshooting Flow Chart for Synthesizer

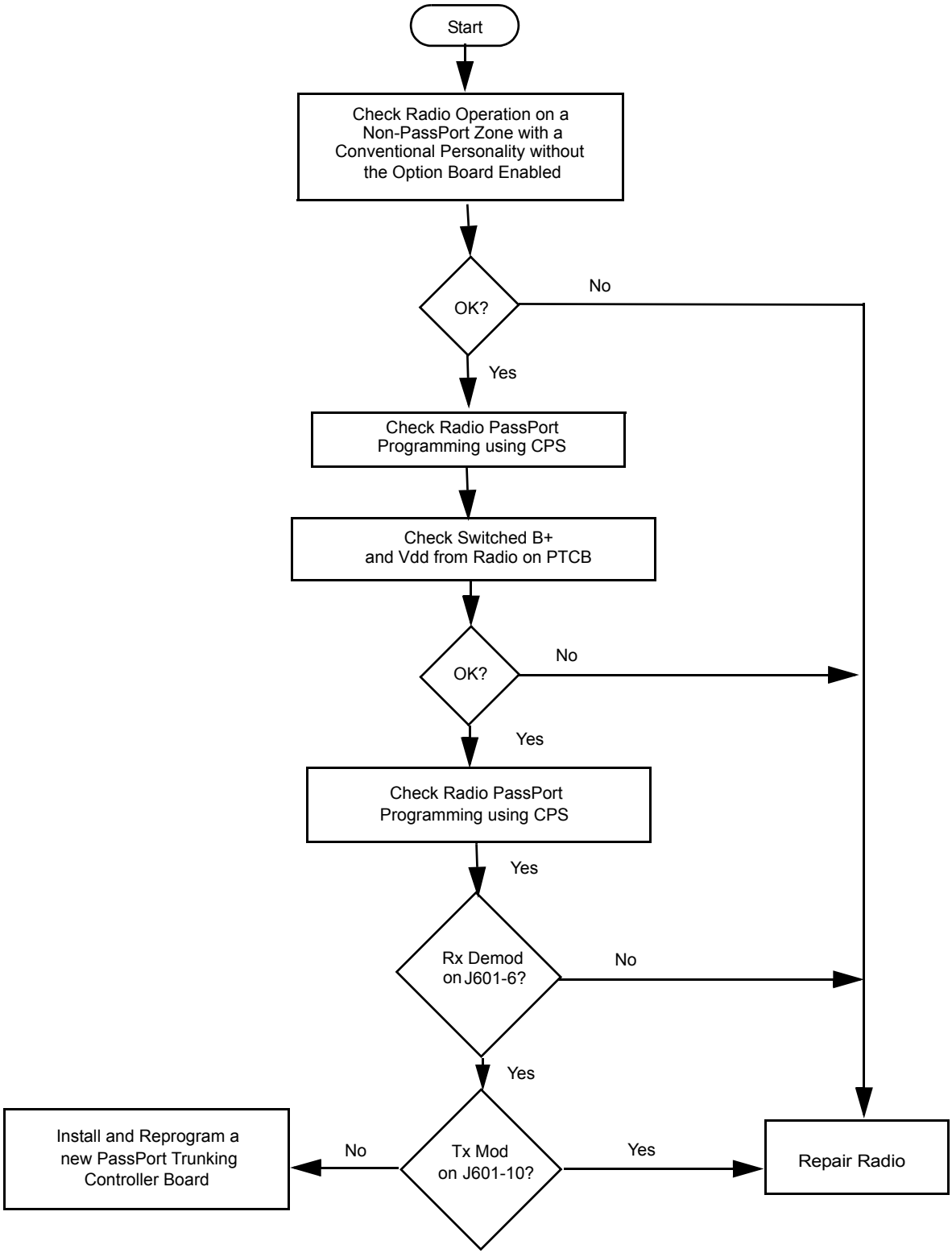


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Section 4

UHF BAND 2 (450-512/520 MHZ) 25-40W BIPOLAR PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

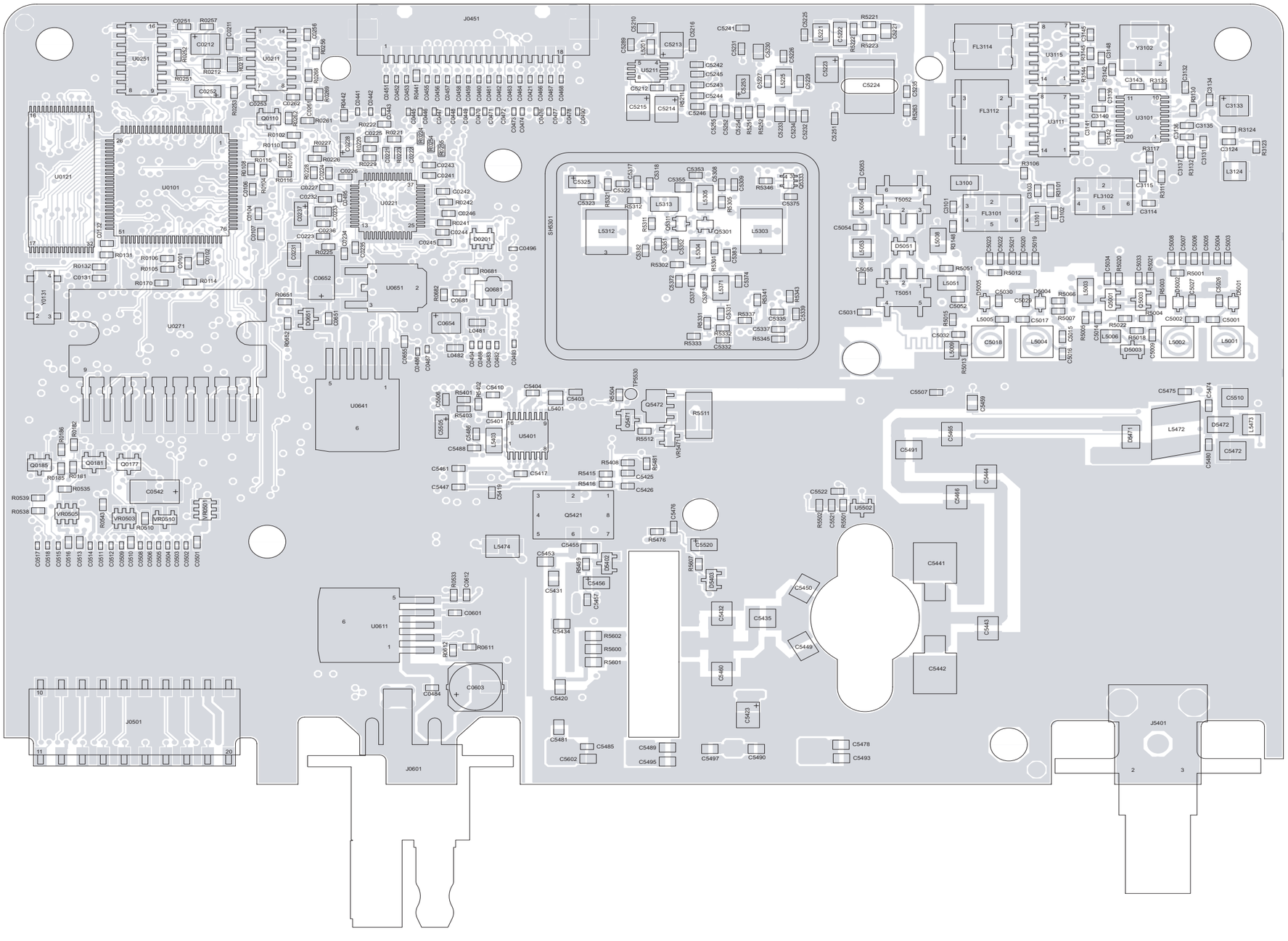
The UHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the UHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in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

Table 10-1 UHF Band 2 25-40W PCB 8480645Z04 Diagrams and Parts Lists

PCB 8480645Z04:	**Page:**
Main Board Top Side	**10: 4-3**
Main Board Bottom Side	**10: 4-4**
SCHEMATICS	
Power Amplifier 40W	**10: 4-5**
FRACN Synthesizer	**10: 4-6**
Voltage Controlled Oscillator	**10: 4-7**
Receiver Front-End	**10: 4-8**
IF	**10: 4-9**
Parts List	**10: 4-10**
Controller version is **T6/7**	

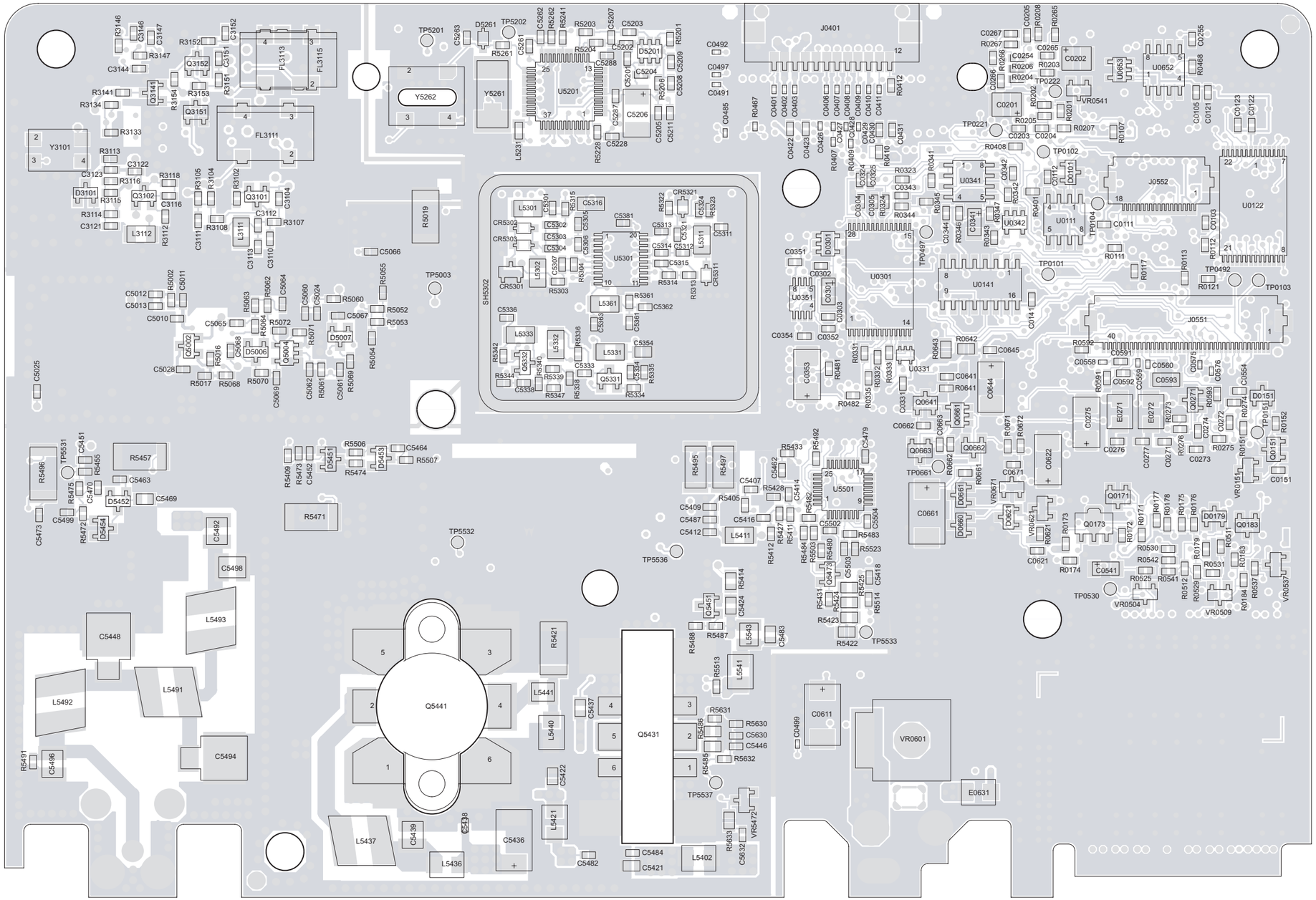
Notes

2.0 UHF Band 2 (450-512/520 MHz) 25-40W Bipolar PCB 8480645Z04, Schematics, and Parts Lists



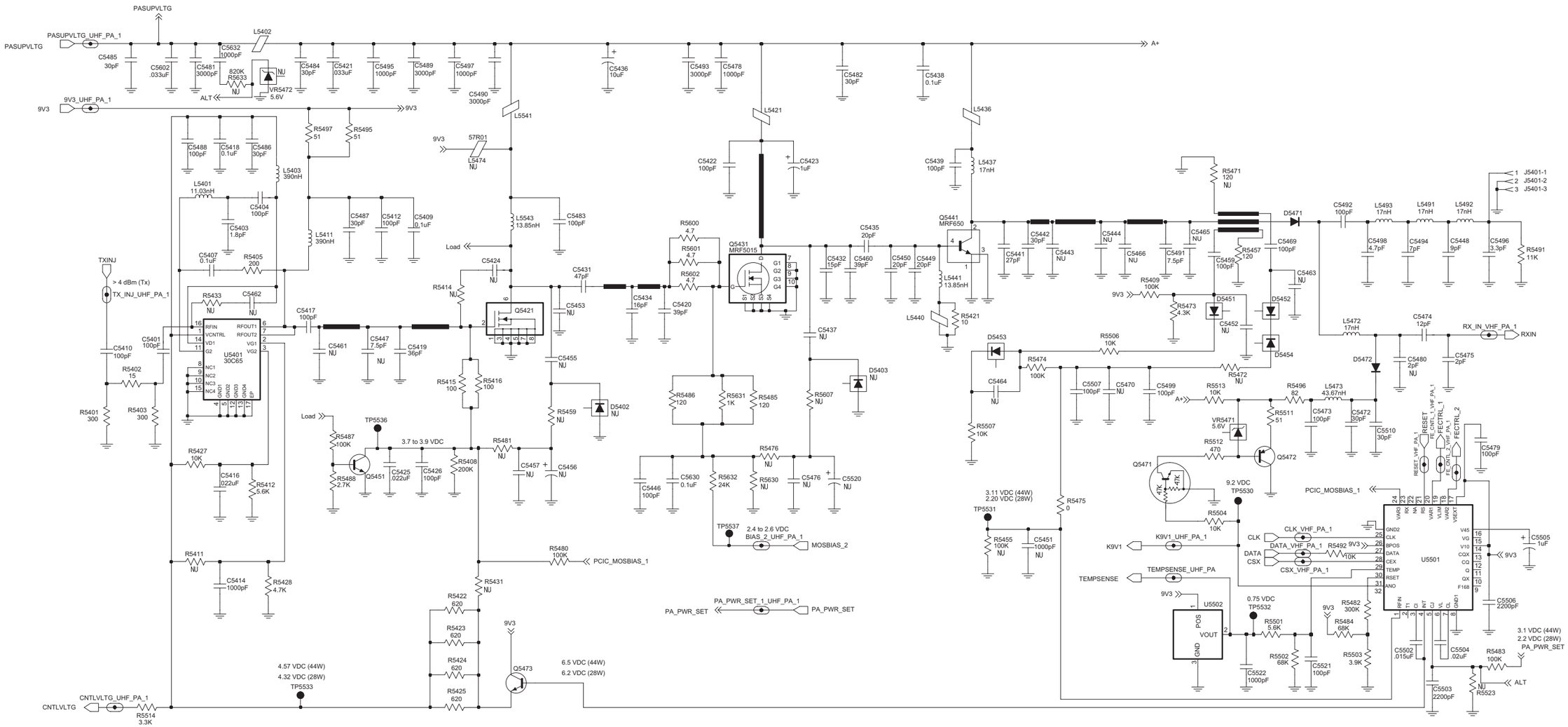
UHF Band 2 (450-512/520 MHz) 25-40W Bipolar PCB 8480645Z04 Top Side

6881091C63-C



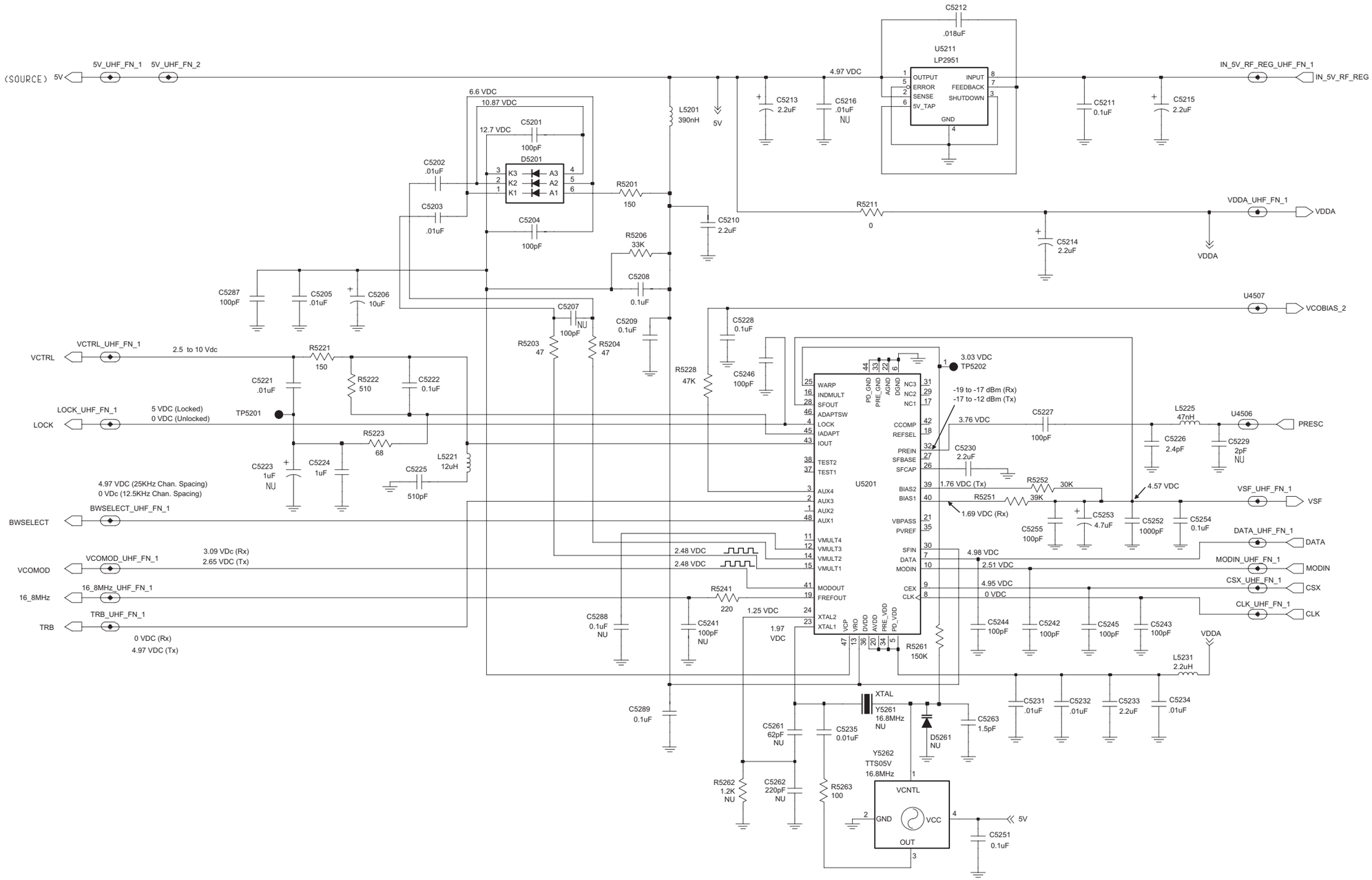
UHF Band 2 (450-512/520 MHz) 25-40W Bipolar PCB 8480645Z04 Bottom Side

6881091C63-C



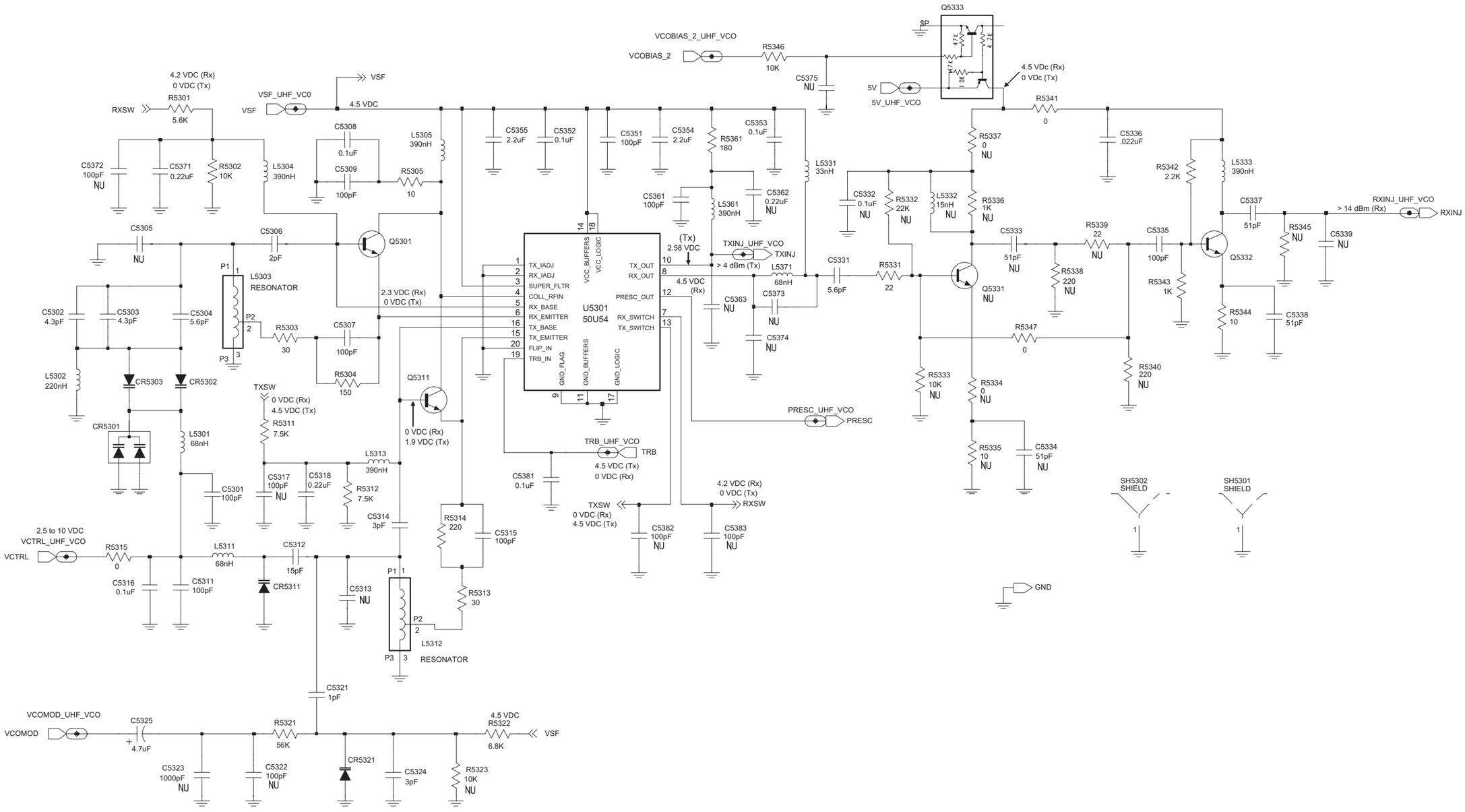
UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Power Amplifier

6881091C63-C



UHF Band 2 (450-512/520 MHz) 25-40W Bipolar FRACN Synthesizer

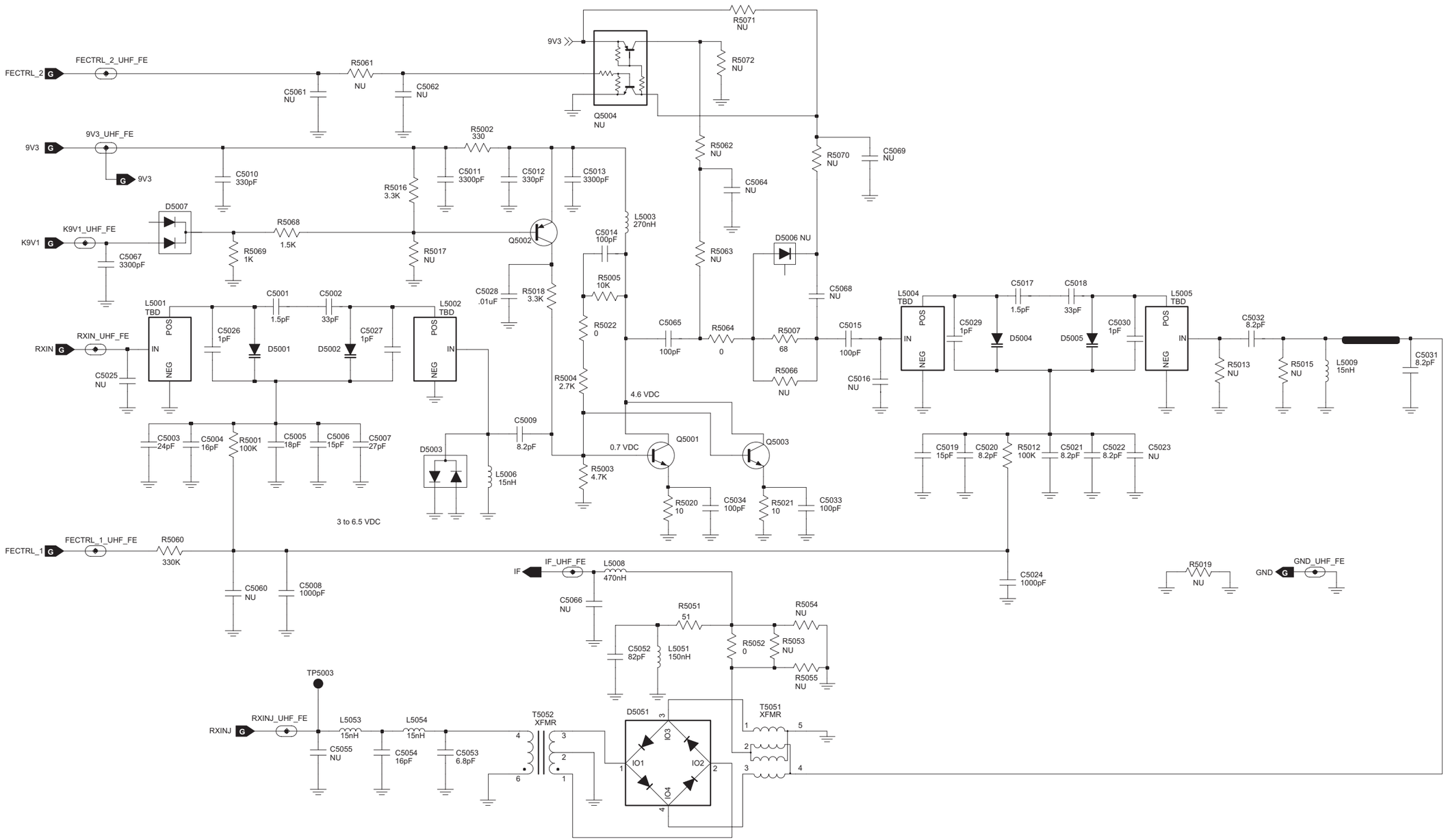
6881091C63-C



ZWG0130365-O

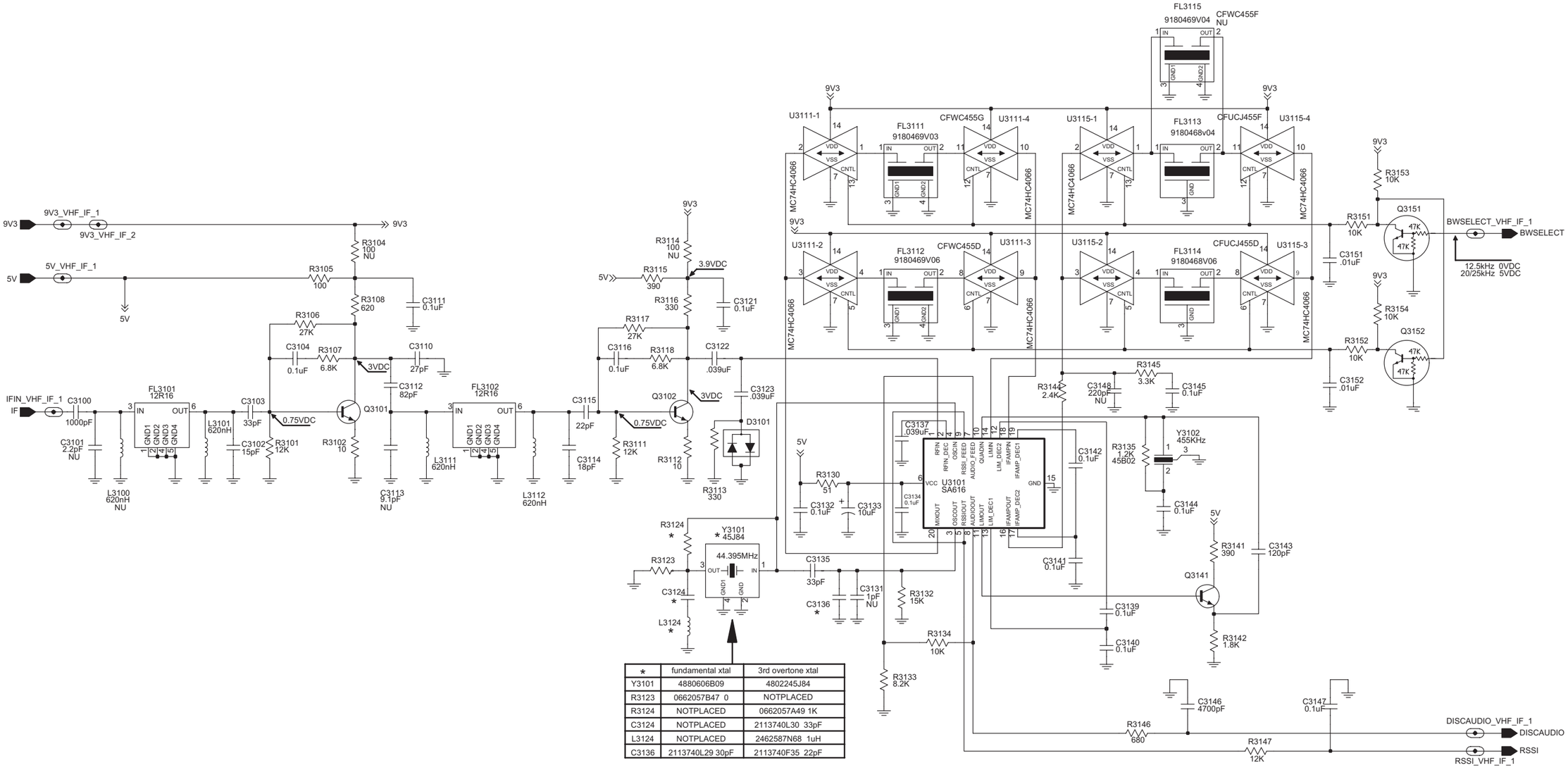
UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Voltage Controlled Oscillator

6881091C63-C



UHF Band 2 (450-512/520 MHz) 25-40W Bipolar Receiver Front-End

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

ZWG0130565-B

UHF Band 2 (450-512/520 MHz) 25-40W Bipolar IF

6881091C63-C

UHF B2 25-40W PCB 8480645Z04 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	10000pF
C0201	2311049A57	10uF
C0202	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0228	2311049A56	4.7uF
C0231	2113743B29	1uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	0.022uF
C0236	2113743E10	0.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	10000pF
C0251	2113743E20	0.1uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0256	2113740F51	100pF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	10000pF
C0271	2113741F49	10000pF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0301	2311049A07	1uF
C0302	2113743E20	0.1uF
C0303	2113740F51	100pF
C0304	2113743E20	0.1uF
C0305	2113743E20	0.1uF
C0324	2113743E20	0.1uF
C0331	2113743E20	0.1uF
C0341	2311049A07	1uF
C0342	2113743E20	0.1uF
C0343	2113743E20	0.1uF
C0344	2113743E20	0.1uF
C0351	2113743E20	0.1uF
C0352	2113743E07	0.022uF
C0353	2311049A97	33uF
C0354	2113743E20	0.1uF
C0421	2113743N48	82pF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743N48	82pF
C0472	2113743N48	82pF
C0473	2113743N48	82pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	10000pF
C0502	2113743L09	470pF
C0503	2113743L09	470pF
C0504	2113743L09	470pF
C0505	2113743L09	470pF
C0506	2113743L09	470pF
C0508	2113743L09	470pF
C0509	2113743L09	470pF
C0510	2113741F17	470pF
C0511	2113743L09	470pF
C0512	2113743L09	470pF
C0513	2113741F17	470pF
C0514	2113743L09	470pF
C0515	2113743L09	470pF
C0516	2113741F49	10000pF
C0517	2113743N48	82pF
C0518	2113743L09	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	10000pF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	0.1uF
C3110	2113740F37	27pF
C3111	2113743E20	0.1uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	0.1uF
C3121	2113743E20	0.1uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	0.1uF
C3133	2311049A57	10uF
C3134	2113743E20	0.1uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	0.1uF
C3140	2113743E20	0.1uF
C3141	2113743E20	0.1uF
C3142	2113743E20	0.1uF
C3143	2113740F53	120pF
C3144	2113743E20	0.1uF
C3145	2113743E20	0.1uF
C3146	2113741F41	4700pF
C3147	2113743E20	0.1uF
C3151	2113741F49	10000pF
C3152	2113741F49	10000pF
C5001	2113740F07	1.5pF
C5002	2113740F39	33pF
C5003	2113740F36	24pF
C5004	2113740F32	16pF
C5005	2113740F33	18pF
C5006	2113740F31	15pF
C5007	2113740F37	27pF
C5008	2113741F25	1000pF
C5009	2113740F25	8.2pF
C5010	2113741F13	330pF
C5011	2113741F37	3300pF
C5012	2113741F13	330pF
C5013	2113741F37	3300pF
C5014	2113740F51	100pF
C5015	2113740F51	100pF
C5017	2113740F07	1.5pF
C5018	2113740F39	33pF
C5019	2113740F31	15pF
C5020	2113740F25	8.2pF
C5021	2113740F25	8.2pF
C5022	2113740F25	8.2pF
C5024	2113741F25	1000pF
C5026	2113740F03	1pF
C5027	2113740F03	1pF
C5028	2113741F49	10000pF
C5029	2113740F03	1pF
C5030	2113740F03	1pF
C5031	2113740F25	8.2pF
C5032	2113740F22	6.2pF
C5033	2113740F51	100pF
C5034	2113740F51	100pF

Circuit Ref	Motorola Part No.	Description
C5052	2113740F49	82pF
C5053	2113740F23	6.8pF
C5054	2113740F32	16pF
C5061	NU	
C5062	NU	
C5064	NU	
C5065	2113740F51	100pF
C5067	2113741F37	3300pF
C5068	NU	
C5069	NU	
C5201	2113740F51	100pF
C5202	2113741F49	10000pF
C5203	2113741F49	10000pF
C5204	2113740F51	100pF
C5205	2113741F49	10000pF
C5206	2311049J25	10uF
C5208	2113743E20	0.1uF
C5209	2113743E20	0.1uF
C5210	2104993J02	2.2uF
C5211	2113743E20	0.1uF
C5212	2113743E05	0.018uF
C5213	2311049A09	2.2uF
C5214	2311049A09	2.2uF
C5215	2311049A09	2.2uF
C5221	2109720D01	0.01uF
C5222	2109720D14	0.1uF
C5224	0882422W23	1uF
C5225	2113741F18	510pF
C5226	2113740L03	2.4pF
C5227	2113740F51	100pF
C5230	2104993J02	2.2uF
C5231	2113741F49	10000pF
C5232	2113741F49	10000pF
C5233	2104993J02	2.2uF
C5234	2113741F49	10000pF
C5235	2113741F49	10000pF
C5242	2113740F51	100pF
C5243	2113740F51	100pF
C5244	2113740F51	100pF
C5245	2113740F51	100pF
C5246	2113740F51	100pF
C5251	2113743E20	0.1uF
C5252	2113741F25	1000pF
C5253	2311049A56	4.7uF
C5254	2113743E20	0.1uF
C5255	2113740F51	100pF
C5263	2113743E20	0.1uF
C5287	2113740F51	100pF
C5289	2113743E20	0.1uF
C5301	2113740F51	100pF
C5302	2113740L09	4.3pF

Circuit Ref	Motorola Part No.	Description
C5303	2113740L09	4.3pF
C5304	2113740L12	5.6pF
C5306	2113740L01	2pF
C5307	2113740F51	100pF
C5308	2113743E20	0.1uF
C5309	2113740F51	100pF
C5311	2113740F51	100pF
C5312	2113740F31	15pF
C5314	2113740L05	3pF
C5315	2113740F51	100pF
C5316	2109720D14	0.1uF
C5318	2113743E20	0.1uF
C5321	2113740F03	1pF
C5324	2113740L05	3pF
C5325	2311049A56	4.7uF
C5331	2113740L12	5.6pF
C5335	2113740F51	100pF
C5336	2113743E07	0.022uF
C5337	2113740F44	51pF
C5338	2113740F44	51pF
C5351	2113740F51	100pF
C5352	2113743E20	0.1uF
C5353	2113743E20	0.1uF
C5354	2104993J02	2.2uF
C5355	2104993J02	2.2uF
C5361	2113740F51	100pF
C5371	2113743E20	0.1uF
C5381	2113743E20	0.1uF
C5401	2113740F51	100pF
C5403	2113740F09	1.8pF
C5404	2113740F51	100pF
C5407	2113743E20	0.1uF
C5409	2113743E20	0.1uF
C5410	2113740F51	100pF
C5412	2113740F51	100pF
C5414	2113741F25	1000pF
C5416	2113743E07	0.022uF
C5417	2113740F51	100pF
C5418	2113743E20	0.1uF
C5419	2113740F40	36pF
C5420	2113740A43	39pF
C5421	2113741A57	0.033uF
C5422	2113740A55	100pF
C5423	2311049A08	1uF
C5425	2113743E07	0.022uF
C5426	2113740F51	100pF
C5431	2113740A46	47pF
C5432	2111078B18	15pF
C5434	2113740A34	16pF
C5435	2111078B21	20pF
C5436	2311049A45	10uF

Circuit Ref	Motorola Part No.	Description
C5438	2113743E20	0.1uF
C5439	2111078B42	100pF
C5441	2180464E42	27pF
C5442	2180464E40	30pF
C5446	2113740F51	100pF
C5448	2180464E62	9pF
C5449	2111078B21	20pF
C5450	2111078B21	20pF
C5459	2113740A55	100pF
C5460	2111078B32	39pF
C5469	2113740A55	100pF
C5472	2111078B27	30pF
C5473	2113740F51	100pF
C5474	2113740F29	12pF
C5475	2113740F10	2pF
C5478	2113741A21	1000pF
C5479	2113740F51	100pF
C5481	2113741A32	3000pF
C5482	2113740F38	30pF
C5483	2113740A55	100pF
C5484	2113740F38	30pF
C5485	2113740F38	30pF
C5486	2113740F38	30pF
C5487	2113740F38	30pF
C5488	2113740F51	100pF
C5489	2113741A32	3000pF
C5490	2113741A32	3000pF
C5491	2111078B10	7.5pF
C5492	2111078B42	100pF
C5493	2113741A32	3000pF
C5494	2180464E60	7pF
C5495	2113741A21	1000pF
C5496	2111078B01	3.3pF
C5497	2113741A21	1000pF
C5498	2111078B05	4.7pF
C5499	2113740F51	100pF
C5502	2113743E03	0.015uF
C5503	2113741F33	2200pF
C5504	2113743E06	0.02uF
C5505	2311049A07	1uF
C5506	2113741F33	2200pF
C5507	2113740F51	100pF
C5510	2111078B27	30pF
C5521	2113740F51	100pF
C5522	2113741F25	1000pF
C5602	2113741A57	0.033uF
C5630	2113743E20	0.1uF
C5632	2113741F25	1000pF
CR5301	4805649Q13	DIODE
CR5302	4862824C01	DIODE VARACTOR
CR5303	4862824C01	DIODE VARACTOR

Circuit Ref	Motorola Part No.	Description
CR5311	4862824C01	DIODE VARACTOR
CR5321	4802245J22	DIODE VARACTOR
D0101	4813825A05	DIODE
D0151	4813833C02	DIODE, DUAL 70V
D0179	4813833C02	DIODE, DUAL 70V
D0301	4802245J47	DIODE, SCHOTTKY
D0621	4813833C02	DIODE, DUAL 70V
D0651	4813833C02	DIODE, DUAL 70V
D0660	4813833C02	DIODE, DUAL 70V
D0661	4813833C02	DIODE, DUAL 70V
D3101	4880154K03	DIODE DUAL SCHOTTKY
D5001	4862824C01	DIODE VARACTOR
D5002	4862824C01	DIODE VARACTOR
D5003	4880154K03	DIODE DUAL SCHOTTKY
D5004	4862824C01	DIODE VARACTOR
D5005	4862824C01	DIODE VARACTOR
D5006	NU	
D5007	4813833C02	DIODE, DUAL 70V
D5051	4886143B01	DIODE, MIXER
D5201	4802233J09	DIODE
D5451	4813825A05	DIODE
D5452	4813825A05	DIODE
D5453	4813825A05	DIODE
D5454	4813825A05	DIODE
D5471	4802482J02	DIODE
D5472	4802482J02	DIODE
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	CERAMIC FILTER, 455KHz
FL3112	9180469V06	CERAMIC FILTER, 455KHz
FL3114	9180468V06	CERAMIC FILTER, 455KHz
FL3115	9180469V04	CERAMIC FILTER, 455KHz
J0401	0902636Y02	CONNECTOR
J0451	0902636Y01	CONNECTOR
J0501	0986105B01	CONNECTOR
J0551	0905505Y04	CONNECTOR
J0552	0905505Y03	CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J5401	0986166B02	RF CONNECTOR (MINI UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L5003	2462587T20	270nH
L5006	2462587V24	15nH

Circuit Ref	Motorola Part No.	Description
L5008	2462587T23	470nH
L5009	2462587V24	15nH
L5051	2462587T17	150nH
L5053	2462587N43	15nH
L5054	2462587N43	15nH
L5201	2462587Q42	390nH
L5221	2462587P25	12000nH
L5225	2462587T42	47nH
L5231	2462587Q20	2,200nH
L5301	2462587T13	68nH
L5302	2462587T19	220nH
L5303	2460593C03	RESONATOR
L5304	2462587T22	390nH
L5305	2462587T22	390nH
L5311	2462587T13	68nH
L5312	2460593C03	RESONATOR
L5313	2462587T22	390nH
L5331	2462587T09	33nH
L5333	2462587T22	390nH
L5361	2462587T22	390nH
L5371	2462587T13	68nH
L5401	2460591B04	11.03nH
L5402	2484657R01	FERRITE BEAD
L5403	2462587T22	390nH
L5411	2462587T22	390nH
L5421	2484657R01	FERRITE BEAD
L5436	2484657R01	FERRITE BEAD
L5437	2460592A01	17nH
L5440	2484657R01	FERRITE BEAD
L5441	2460591C23	13.85nH
L5472	2460592A01	17nH
L5473	2460591N36	43.67nH
L5491	2460592A01	17nH
L5492	2460592A01	17nH
L5493	2460592A01	17nH
L5541	2484657R01	FERRITE BEAD
L5543	2460591C23	13.85nH
Q0110	4880048M01	NPN
Q0151	4880048M01	NPN
Q0171	4880048M01	NPN
Q0173	4880052M01	NPN DARLINGTON
Q0177	4880048M01	NPN
Q0181	4880048M01	NPN
Q0183	4880048M01	NPN
Q0185	4880048M01	NPN
Q0271	4880214G02	NPN
Q0641	4880048M01	NPN
Q0661	4805921T02	DUAL NPN/PNP
Q0662	4880214G02	NPN
Q0663	4880048M01	NPN
Q0681	4880052M01	NPN DARLINGTON

Circuit Ref	Motorola Part No.	Description
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q5001	4813827A07	NPN
Q5002	4813824A17	PNP
Q5003	4813827A07	NPN
Q5004	NU	
Q5301	4805218N63	DIODE DUAL SCHOTTKY
Q5311	4805218N63	DIODE DUAL SCHOTTKY
Q5332	4813827A07	NPN
Q5333	4809939C05	DUAL NPN/PNP
Q5421	5105385Y91	MRF1508
Q5431	4805537W01	MRF5015
Q5441	4880225C30	MRF650
Q5451	4880214G02	NPN
Q5471	4880048M01	NPN
Q5472	4805128M27	PNP
Q5473	4880214G02	NPN
R0101	0662057A73	10K
R0102	0662057A65	4.7K
R0104	0662057A73	10K
R0105	0662057A97	97K
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	97K
R0131	0662057B46	10M
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K

Circuit Ref	Motorola Part No.	Description
R0201	0662057A25	100
R0202	0662057A43	560
R0203	0662057A25	100
R0204	0662057A43	560
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0228	0662057B47	0
R0229	0662057A01	10
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	97K
R0254	0662057A73	10K
R0255	0662057A73	10K
R0256	0662057A97	97K
R0257	0662057A57	2.2K
R0261	0662057A73	10K
R0262	0662057B08	270K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0323	0662057A79	18K
R0324	0662057A79	18K
R0331	0662057A73	10K
R0332	0662057A73	10K
R0333	0662057A73	10K
R0335	0662057B02	150K
R0341	0662057A73	10K
R0342	0662057A55	1.8K
R0343	0662057B47	0
R0344	0662057A91	56K
R0345	0662057A66	5.1K
R0346	0662057A89	47K
R0347	0662057A89	47K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10

Circuit Ref	Motorola Part No.	Description
R0410	6580542Z01	FUSE 3A
R0412	0662057B47	0
R0441	0662057B47	0
R0442	0662057A49	1K
R0467	0662057M26	10
R0468	0662057A97	97K
R0481	0662057B47	0
R0482	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	97K
R0512	0662057A77	15K
R0525	0662057A97	97K
R0529	0662057A89	47K
R0530	0662057B47	0
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0543	0662057A97	97K
R0591	0662057A82	24K
R0592	0662057A01	10
R0593	0662057A97	97K
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
R3101	0662057A75	12K
R3102	0662057A01	10
R3105	0662057A25	100
R3106	0662057A83	27K
R3107	0662057A69	6.8K
R3108	0662057A44	620
R3111	0662057A75	12K
R3112	0662057A01	10
R3113	0662057A37	330
R3115	0662057A39	390
R3116	0662057A37	330
R3117	0662057A83	27K

Circuit Ref	Motorola Part No.	Description
R3118	0662057A69	6.8K
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51
R3132	0662057A77	15K
R3133	0662057A71	8.2K
R3134	0662057A73	10K
R3135	0662057A51	1.2K
R3141	0662057A39	390
R3142	0662057A55	1.8K
R3144	0662057A58	2.4K
R3145	0662057A61	3.3K
R3146	0662057A45	680
R3147	0662057A75	12K
R3148	0662057B47	0
R3151	0662057A73	10K
R3152	0662057A73	10K
R3153	0662057A73	10K
R3154	0662057A73	10K
R5001	0662057A97	97K
R5002	0662057A37	330
R5003	0662057A65	4.7K
R5004	0662057A59	2.7K
R5005	0662057A73	10K
R5007	0662057A21	68
R5012	0662057A97	97K
R5016	0662057A61	3.3K
R5018	0662057A61	3.3K
R5020	0662057A01	10
R5021	0662057A01	10
R5022	0662057B47	0
R5051	0662057A18	51
R5052	0662057B47	0
R5060	0662057B10	330K
R5061	NU	
R5062	NU	
R5063	NU	
R5064	0662057B47	0
R5068	0662057A53	1.5K
R5069	0662057A49	1K
R5070	NU	
R5071	NU	
R5072	NU	
R5201	0662057A29	150
R5203	0662057A17	47
R5204	0662057A17	47
R5211	0662057B47	0
R5221	0662057A29	150
R5222	0662057A42	510
R5223	0662057A21	68
R5228	0662057A89	47K
R5241	0662057A33	220
R5251	0662057A87	39K
R5252	0662057A84	30K
R5261	0662057A89	47K
R5263	0662057A25	100
R5301	0662057A67	5.6K
R5302	0662057A73	10K
R5303	0662057A12	30
R5304	0662057A29	150
R5305	0662057A01	10
R5311	0662057A70	7.5K
R5312	0662057A70	7.5K
R5313	0662057A12	30
R5314	0662057A33	220
R5315	0662057B47	0
R5321	0662057A91	56K
R5322	0662057A69	6.8K
R5331	0662057A09	22
R5341	0662057B47	0
R5342	0662057A57	2.2K
R5343	0662057A49	1K
R5344	0662057A01	10
R5346	0662057A73	10K
R5347	0662057B47	0
R5361	0662057A31	180
R5401	0662057A36	300
R5402	0662057A05	15
R5403	0662057A36	300
R5405	0662057A32	200
R5408	0662057B05	200K
R5409	0662057A97	97K
R5412	0662057A67	5.6K
R5415	0662057A25	100
R5416	0662057A25	100
R5421	0680194M01	10
R5422	0611079A69	620
R5423	0611079A69	620
R5424	0611079A69	620
R5425	0611079A69	620
R5427	0662057A73	10K
R5428	0662057A65	4.7K
R5457	0683962T51	120
R5473	0662057A64	4.3K
R5474	0662057A97	97K
R5475	0662057B47	0
R5480	0662057A97	97K
R5482	0662057B09	300K
R5483	0662057A97	97K
R5484	0662057A93	68K
R5485	0662057C53	120
R5486	0662057C53	120
R5487	0662057A97	97K
R5488	0662057A59	2.7K
R5491	0662057A74	11K
R5492	0662057A73	10K
R5495	0680195M18	51
R5496	0680194M23	82
R5497	0680195M18	51
R5501	0662057A67	5.6K
R5502	0662057A93	68K
R5503	0662057A63	3.9K
R5504	0662057A73	10K
R5506	0662057A73	10K
R5507	0662057A73	10K
R5511	0680194M18	51
R5512	0662057A41	470
R5513	0662057A73	10K
R5514	0662057A61	3.3K
R5600	0662057C19	4.7
R5601	0662057C19	4.7
R5602	0662057C19	4.7
R5631	0662057A49	1K
R5632	0662057A82	24K
SH5301	2602641Y02	SHIELD
SH5302	2602641Y02	SHIELD
T5051	2505515V03	TRANSFORMER 4:1
T5052	2508397X02	TRANSFORMER 1:1
U0101	5102226J56	MICROPROCESSOR
U0111	5102463J64	EEPROM
U0121	5186137B01	IC, FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	IC, QUAD OPAMP
U0221	5185130C53	IC, ASFIC
U0251	5184704M60	IC-CMOS ANALOG
U0271	5109699X01	AUDIO PA
U0301	5109152M01	EEPROM ANALOG
U0331	5186204B01	BUFFER / DRIVER
U0341	5113818A01	LINEAR IC OP-AMP
U0342	5105750U28	IC CMOS SWITCH
U0351	5102463J40	REGULATOR, 3.3V
U0611	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0641	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0651	5113816A07	REGULATOR, 5V
U0652	5113815A02	UNDERVOLT SENSOR
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U5201	5185963A27	IC FRACTN
U5211	5185963A33	IC, VOLTAGE REGULATOR
U5301	5105750U54	IC, VCO
U5401	5185130C65	IC LDMOS DRIVER
U5501	5185765B26	IC POWER CONTROL
U5502	5185963A15	IC TEMPERATURE SENSOR
VR0151	4813830A15	DIODE, 5.6V
VR0501	4805656W09	DIODE, ZENER
VR0503	4805656W09	DIODE, ZENER
VR0504	4813830A40	DIODE, ZENER
VR0505	4805656W09	DIODE, ZENER
VR0509	4813830A40	DIODE, ZENER
VR0510	4813830A40	DIODE, ZENER
VR0537	4813830A15	DIODE, 5.6V
VR0541	4813830A27	DIODE, 14V
VR0601	4813832C77	DIODE
VR0621	4813830A15	DIODE, 5.6V
VR5471	4813830A15	DIODE, 5.6V
Y0131	4880113R19	CRYSTAL 38.4KHZ
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455KHz DISCRIMINATOR
Y5262	4886182B01	TCXO 16.8MHZ

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

Chapter 11: VHF (136-174 MHz) 25-45W LDMOS Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 VHF (136-174 MHz) 25-45W LDMOS Model Charts

1.1 CDM Series Model Chart

CDM Series, VHF (136-174 MHz) 25-45W LDMOS

Model						Description
AAM25KKC9AA1AN						CDM750, 136-174 MHz, 25-45W Conv Pref (LDMOS)
	AAM25KKD9AA2AN					CDM1250, 136-174 MHz, 25-45W Conv Pref (LDMOS)
		AAM25KKF9AA5AN				CDM1550, 136-174 MHz, 25-45W Conv Pref (LDMOS)
			AAM25KKF9DP5AN			CDM1550 LS+, 136-174 MHz, 45W, 16CH
				AAM25KKF9DP6AN		CDM1550 LS+, 136-174 MHz, 45W, 160CH w/MDC
					Item	**Description**
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X			IMUD6015	Tanapa, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
X	X	X			IMUD6015_S	Replacement Board, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
			X		PMUD 2078A	Tanapa, VHF 136-174 MHz, 45W 16CH
				X	PMUD 2079A	Tanapa, VHF 136-174 MHz, 45W 160CH w/MDC
X	X	X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			X	X	6881091C54	User Guide, CDM750
	X		X	X	6881091C55	User Guide, CDM1250
		X			6881091C56	User Gmuide, CDM1550
			X	X	6881094C79	User Guide, CDM1550 LS^{+}

1.2 PRO Series Model Chart

PRO Series, VHF (136-174 MHz) 25-45W LDMOS				
Model				**Description**
LAM25KKC9AA1AN				PRO3100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
	LAM25KKD9AA2AN			PRO5100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
		LAM25KKF9AA5AN		PRO7100, 136-174 MHz, 25-45W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUD6015	Tanapa, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
X	X	X	IMUD6015_S	Replacement Board, VHF 136-174 MHz, 25-45W, 12.5/20/25 kHz
X	X	X	HAD4006	Antenna, 136-144 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4007	Antenna, 146-150.8 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4008	Antenna, 150.8-162 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4009	Antenna, 162-174 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAD4014	Antenna, 146-172 MHz, 3dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550/PRO7100** Depth excludes knobs	**25 - 45W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	25-45W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-26 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	VHF
*Frequencies - Full Bandsplit	VHF 136-174 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB @ 12.5 kHz (TIA) 78 dB @ 25 kHz (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 75 dB @ 20 kHz 80 dB @ 25 kHz
Spurious Rejection	75 dB @ 12.5 kHz 80 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the VHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 VHF (136-174 MHz) 25-45W LDMOS Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the VHF range from 136 to 174 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, 1st IF, 2nd IF, and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. High-side injection is used.

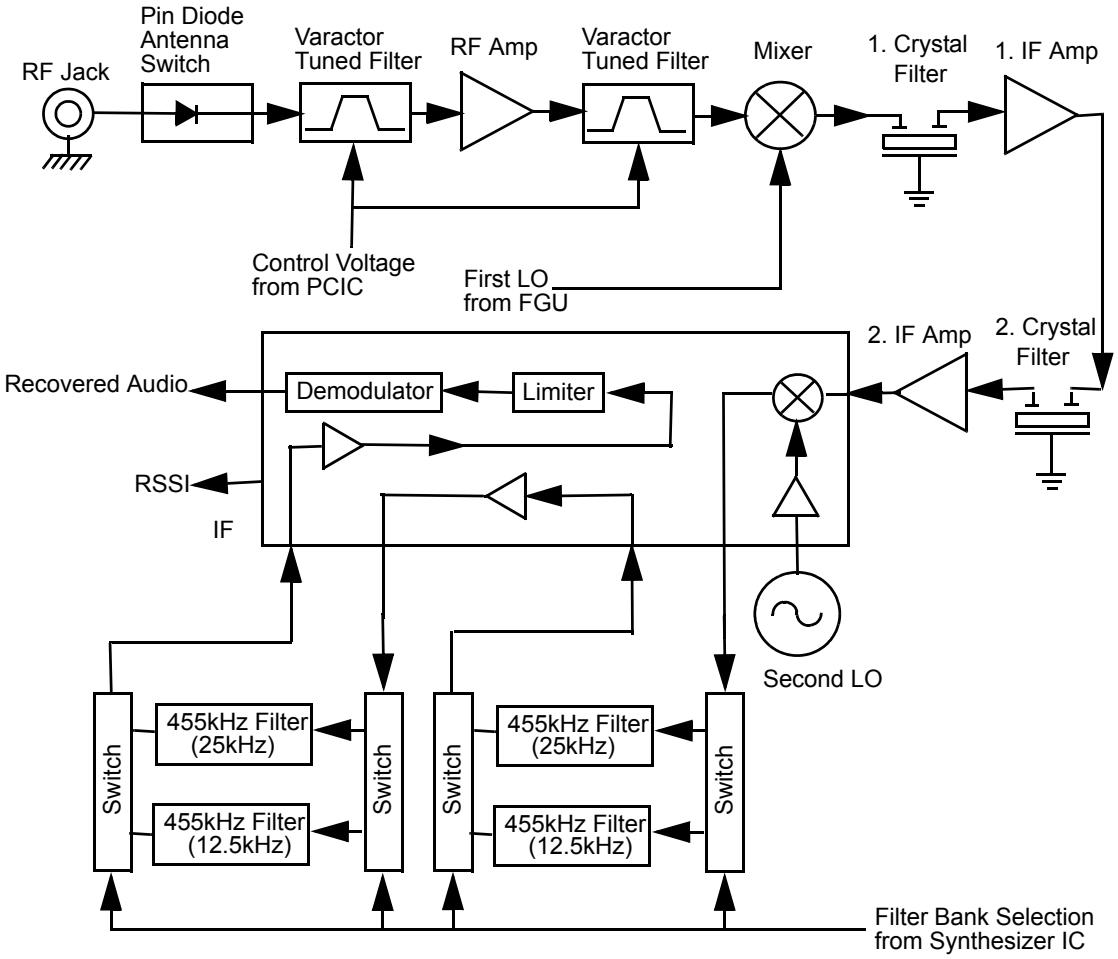


Figure 11-1 VHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the 1st IF section and 2 pairs of 455 kHz ceramic filters in the 2nd IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver pre-selector filter (C3001, C3002, D3001 and associated components). The 2-pole pre-selector filter tuned by the dual varactor diode D3001 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U3501) in the Transmitter section. A dual hot carrier diode (D3003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is a surface mount device (SMD) Q3001 with collector-base feedback to stabilize gain, impedance, and intermodulation. Transistor Q3002 compares the voltage drop across resistor R3002 with a fixed base voltage from divider R3011, R3000 and R3012, and adjusts the base current of Q3001 as necessary to maintain its collector current constant at approximately 15-20 mA. Operating voltage is from the regulated 9.3V supply (9V3). During transmit, 9.1 volts (K9V1) turns off both transistors Q3002 and Q3001. This protects the RF pre-amplifier from excessive dissipation during transmit mode. A following 3dB pad (R3006 – R3008 and R3016 – R3018) stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The dual varactor diode D3004 is controlled by the same signal FECTRL_1, which controls the pre-selector filter.

2.3 First Mixer and 1st Intermediate Frequency (IF)

The signal coming from the front-end is converted to the 1st IF frequency of 44.85 MHz using a passive double-balanced mixer (D3031). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using high side injection. The high-side injection signal (RXINJ) from the frequency synthesizer circuit has a level of approximately +13 dBm and is injected via matching transformer T3002.

The IF output signal (IF) from transformer T3001 pin 2 is fed to the first 2-pole crystal filter FL3101. The filter output in turn is matched to IF amplifier Q3101 which is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the 5 volt supply. Its output impedance is matched to the second 2-pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 2nd Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz 1st IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC, the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the 2nd IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The 2nd IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114 for 20/25 kHz channel spacing or FL3111, FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3101 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the Controller circuits).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101, pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101, pin 63) and in addition is available at accessory connector J0501-15.

3.0 VHF (136-174 MHz) 25-45W LDMOS Transmitter Power Amplifier (PA) 45W

The radio's 45W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U3401) is adjustable, controlled by pin 4 of PCIC (U3501) via U3402-1. It is followed by an LDMOS driver stage (Q3421) and an LDMOS final stage (Q3441). All devices are surface mounted. A pressure pad between the board and the radio's cover provides both closure of the switch and insurance of good thermal contact between the devices and the chassis.

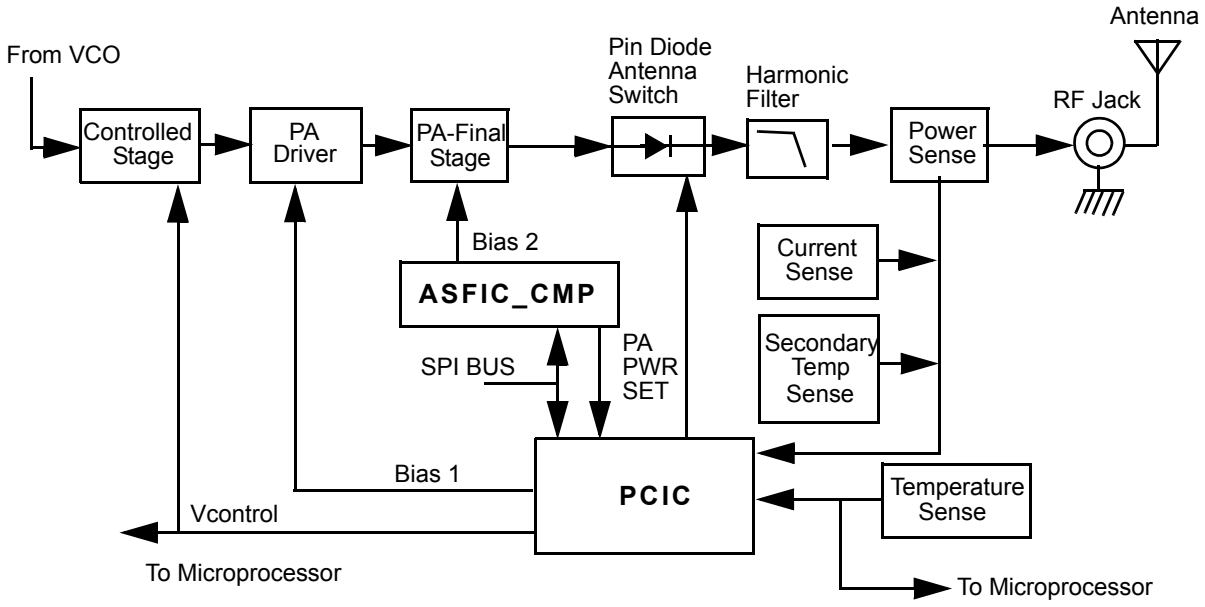


Figure 11-2 VHF LDMOS Transmitter Block Diagram

3.1 Power Controlled Stage

The first stage (U3401) is a 20 dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U3401 is controlled by a DC voltage applied to pin 1 from the power control circuit (U3501 pin 4, with operational amplifier U3402-1, pin 1). The control voltage simultaneously varies the bias of two FET stages within U3401. This biasing point determines the overall gain of U3401 and therefore its output drive level to Q3421, which in turn controls the output power of the PA.

Op-amp U3402-1 monitors the drain current of U3401 via resistor R3444 and adjusts the bias voltage of U3401 so that the current remains constant. The PCIC (U3501) provides a DC output voltage at pin 4 (INT) which sets the reference voltage of the current control loop. A rising power

output causes the DC voltage from the PCIC to fall, and U3402-1 adjusts the bias voltage for a lower drain current to lower the gain of the stage.

In receive mode the DC voltage from PCIC pin 23 (RX) turns on Q3442, which in turn switches off the biasing voltage to U3401.

Switch S3440 is a pressure pad with a conductive strip, which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S3440 opens and the resulting high voltage level at the inverting inputs of the current control op-amps U3402-1 switches off the biasing of U3401. This prevents transmitter key-up while the devices do not have proper thermal contact to the chassis.

3.2 Driver Stage

The next stage is an LDMOS device (Q3421) providing a gain of 13 dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_1 is set during transmit mode by PCIC pin 24 and fed to the gate of Q3421 via the resistive network R3417, R3415, and R3416. This bias voltage is tuned in the factory.

In receive mode, the MOSBIAS_1 supplied to Q3421 is grounded by the PCIC.

3.3 Final Stage

The final stage is an LDMOS MRF1550 device (Q3441). It provides a gain of 10 dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 is set during transmit mode by the ASFIC and fed to the gate of Q3441 via the resistive network R3404, R3406, and R3431-2. This bias voltage is tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using Global Tuner Software. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage.

In receive mode, MOSBIAS_2 voltage is reduced to switch off Q3441.

The drain current of MRF1550 is drawn from the radio DC supply via filtering beads, bypass capacitors and a current-sensing resistor (R3518). A differential DC amplifier U3503-1 compares the voltage drop across R3518, which is proportional to the transmitter final stage DC current, with the voltage across resistors R3511 and R3510, which is proportional to the current through transistor Q1503. This transistor is controlled by the output of the differential amplifier, which varies the transistor current until equilibrium of the two compared voltages is reached. The current through Q1503 develops a voltage across R3517, which is exactly proportional to the DC current of the final stage. This voltage is combined with power-sensing and temperature-sensing inputs and applied to the RFIN port of the PCIC (pin 1).

3.4 Antenna Switch

The antenna switch consists of two PIN diodes, D3471 and D3472. In receive mode, both diodes are off. Signals applied at the antenna jack J3401 are routed, via the coupler and harmonic filter, through network L3511, C3451 and C3475, to the receiver input. In transmit mode, the keyed 9 volts turns on Q3471 which enables current sink Q3472, set to 96 mA by R3473 and VR3471. This completes a DC path from A+, through L3436, R3518, L3437, L3443, D3471, L3510, L3511, D3472, L3471, and R3474 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the PA is routed via D3471, C3561 and C3563 to the harmonic filter, directional coupler and antenna jack. D3472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L3511 is selected to appear as a broadband quarter-wave transmission line, making the short circuit presented by D3472 appear as an open circuit at the junction of D3472 and the receiver path.

3.5 Harmonic Filter

Components L3512-L3515 and C3564-C3568 form a nine-pole Chebychev low-pass filter and attenuate harmonic energy of the transmitter. R3545 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high-level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.6 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward and reflected power delivered by Q3441. The coupled signals are rectified by D3451-2 and combined by R3540-1. The resulting DC voltage is proportional to RF output power. This RF power-sensing signal later is combined with the current-sensing signal from U3503 and Q1503 as well as the temperature-sensing signal from RT3501 and fed to the RFIN port of the PCIC (U3501, pin 1). The PCIC controls the gain of stage U3401 as necessary to hold the sum of these signals constant, thus ensuring the forward power out of the radio to be held to a constant value.

An abnormally high reflected power level, such as may be caused by a damaged antenna, also causes the DC voltage applied to the PCIC to increase, and this will cause a reduction in the gain of U3401, reducing transmitter output power to prevent damage to the final device due to an improper load.

3.7 Power Control

The transmitter uses the power control IC (PCIC, U3501) to control the power output of the radio. A portion of the forward and reflected RF power from the transmitter is sampled by the directional coupler, rectified and summed, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC contains a digital-to-analog converter (DAC) which provides a reference voltage of the control loop to the PCIC via R3505. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which is amplified by U3402-1, and applied to the power-adjust input pin of the first transmitter stage U3401. This adjusts the transmitter power output to the intended value. Variations in forward or reflected transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C3502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U3502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 29) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power is reduced so as to reduce the transmitter temperature.

4.0 VHF (136-174 MHz) 25-45W LDMOS Frequency Synthesis

The frequency synthesizer subsystem consists of the reference oscillator (Y3261 or Y3262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U3201), and the voltage-controlled oscillators and buffer amplifiers (U3301, Q3301-2 and associated circuits).

4.1 Reference Oscillator

The reference oscillator (Y3262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U3201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U3201 (pin 25) to set the frequency of the oscillator. The output of the oscillator (U3262 pin 3) is applied to pin 23 (XTAL1) of U3201 via R3263 and C3235.

In applications where less frequency stability is required, the oscillator inside U3201 is used along with an external crystal Y3261, varactor diode D3261, C3261, C3262 and R3262. In this case, Y3262, R3263, C3235 and C3251 are not used. When Y3262 is used, Y3261, D3261, C3261, C3262 and R3262 are not used, and C3263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U3201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13 volt positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

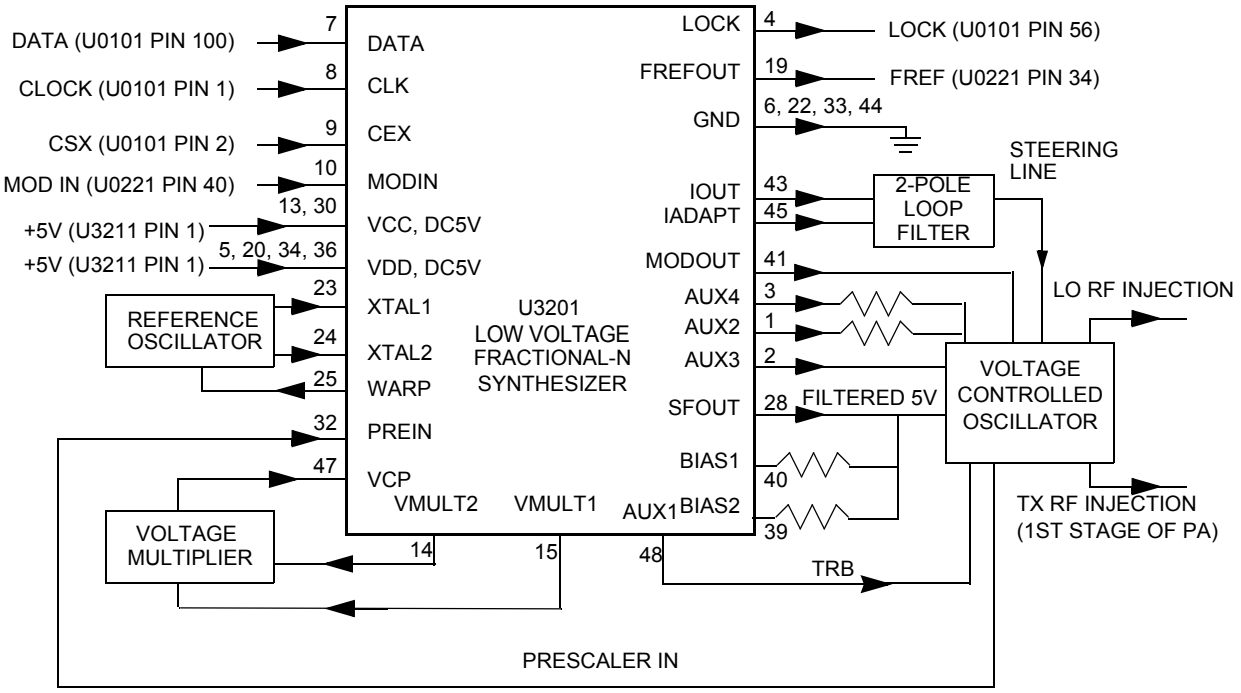


Figure 11-3 VHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U3201 pin 30) supplies an output voltage of 4.5 VDC (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R3363) and the synthesizer charge pump resistor network (R3251, R3252). The synthesizer supply voltage is provided by the 5V regulator U3211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U3201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier circuits (D3201, C3202, C3203). This voltage multiplier is basically a diode capacitor network driven by two signals (1.05MHz) 180 degrees out of phase signals (U3201-14 and -15).

Output LOCK (U3201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U3201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U3201-7), clock line CLK (U3201-8), and chip enable line CSX (U3201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U3301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuits.

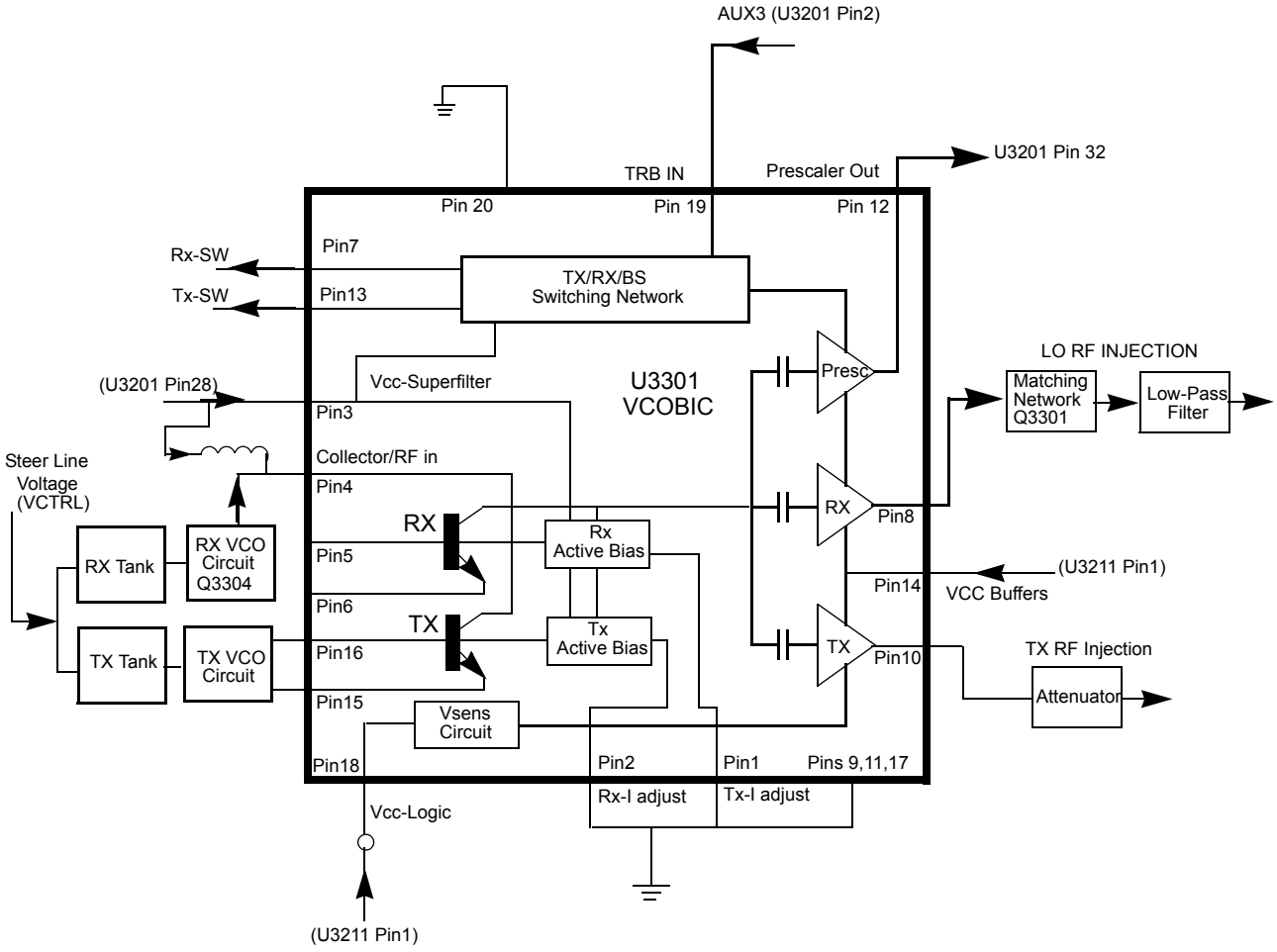


Figure 11-4 VHF VCO Block Diagram

The VCOBIC together with the Fractional-N synthesizer (U3201) generates the required frequencies in both the transmit and receive modes. The TRB line (U3301, pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables the TX tank and TX output (pin 10), and a low enables the RX tank and RX output (pin 8). A sample of the signal from the enabled

RF output is routed from U3301, pin 12 (PRESC_OUT), via a low-pass filter, to U3201, pin 32 (PREIN).

A steering line voltage (VCTRL) between 2.5 volts and 11 volts at varactor diode D3361 tune the full TX frequency range (TXINJ) from 136 MHz to 174 MHz, and varactor diode D3341 tunes the full RX frequency range (RXINJ) from 181 MHz to 219 MHz. The RX tank circuit uses a Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q3304 is used for better side-band noise.

The external RX buffers (Q3301 and Q3302) are enabled by a high at U3301, pin 7 (RX_SWITCH) via transistor switch Q3303. In the TX mode, the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U3201 pin 41) is applied to varactor diode D3362, which modulates the TX VCO frequency via capacitor C3362. Varactor D3362 is biased for linearity from the VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem consists of the low voltage FRAC-N (LVFRACN), reference oscillator (a crystal oscillator with temperature compensation), charge pump circuit, loop filter circuit and a DC supply. The output signal PRESC from the VCOBIC (U3301 pin 12) is fed to U3201 pin 32 (PREIN) via a low-pass filter (C3318, L3318 and C3226) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U3201) is a dual modulus type with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of reference oscillator Y3261 or Y3262.

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at U3201 pin 43 (IOUT). The loop filter (which consists of R3221-R3223 and C3221-C3224) transforms this current into a voltage that is applied to the varactor diodes (D3361 for transmit, D3341 for receive) to alter the output frequency of the appropriate VCO. The current can be set to a value fixed within the LVFRAC-N IC, or to a value determined by the currents flowing into BIAS 1 (U3201-40) or BIAS 2 (U3201-39). The currents are set by the value of R3251 and R3252 respectively. The selection of the three different bias sources is done by software programming.

To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer, the magnitude of the loop current is increased by enabling the IADAPT pin (U3201-45) for a certain software programmable time (adapt mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1 and BIAS 2, or by the internal current source. A settled synthesizer loop is indicated by a high level signal at U3201-4 (LOCK).

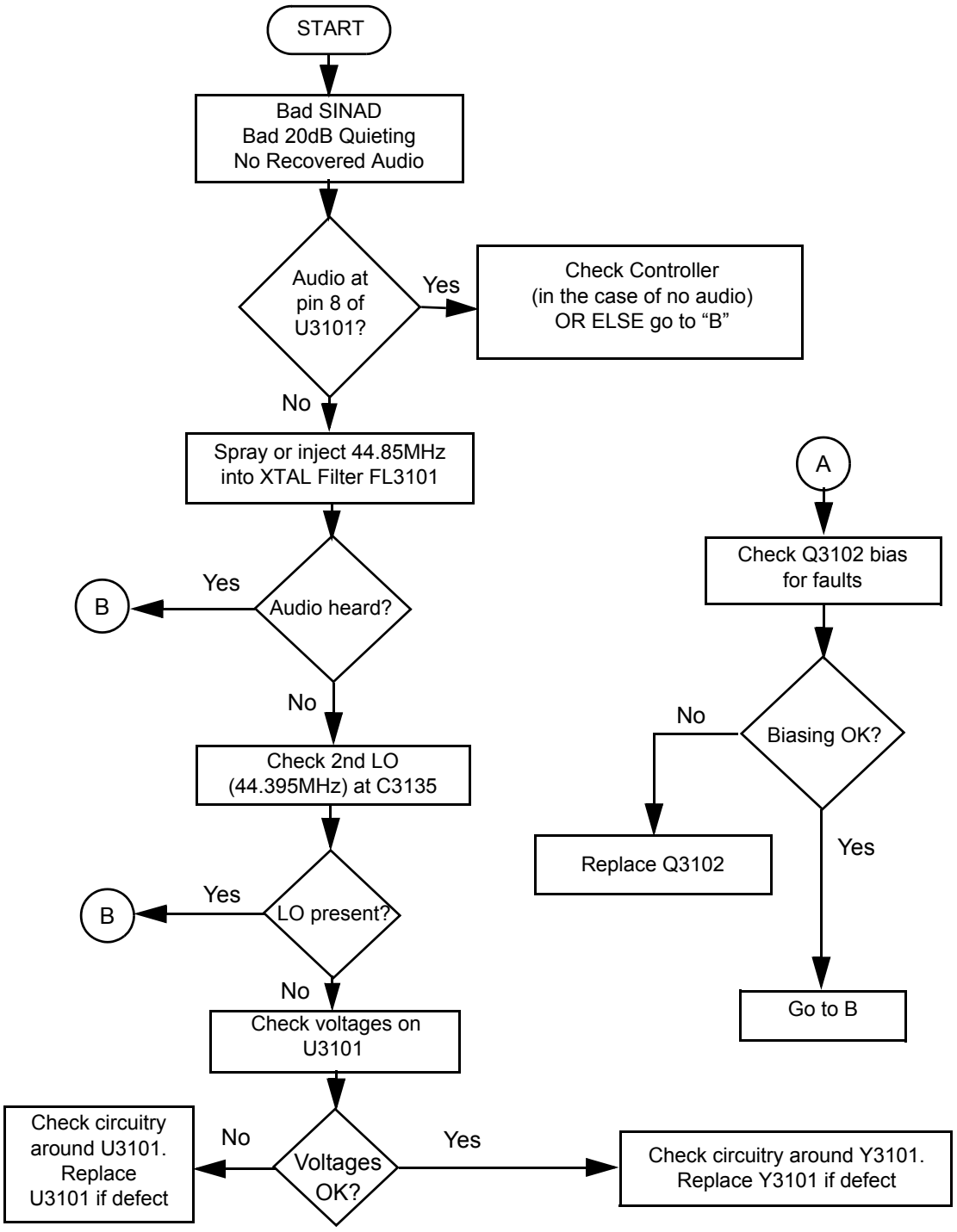
The LOCK signal is routed to one of the µP's ADC inputs (U0101-56). From the measured voltage, the µP determines whether LOCK is active.

To modulate the PLL, the two spot modulation method is utilized. Via U3201, pin 10 (MODIN), the audio signal is applied to both the A/D converter (low frequency path) as well as the balance attenuator (high frequency path). The A/D converter changes the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U3201-41) and connected to the VCO modulation diode D3362 via R3364.

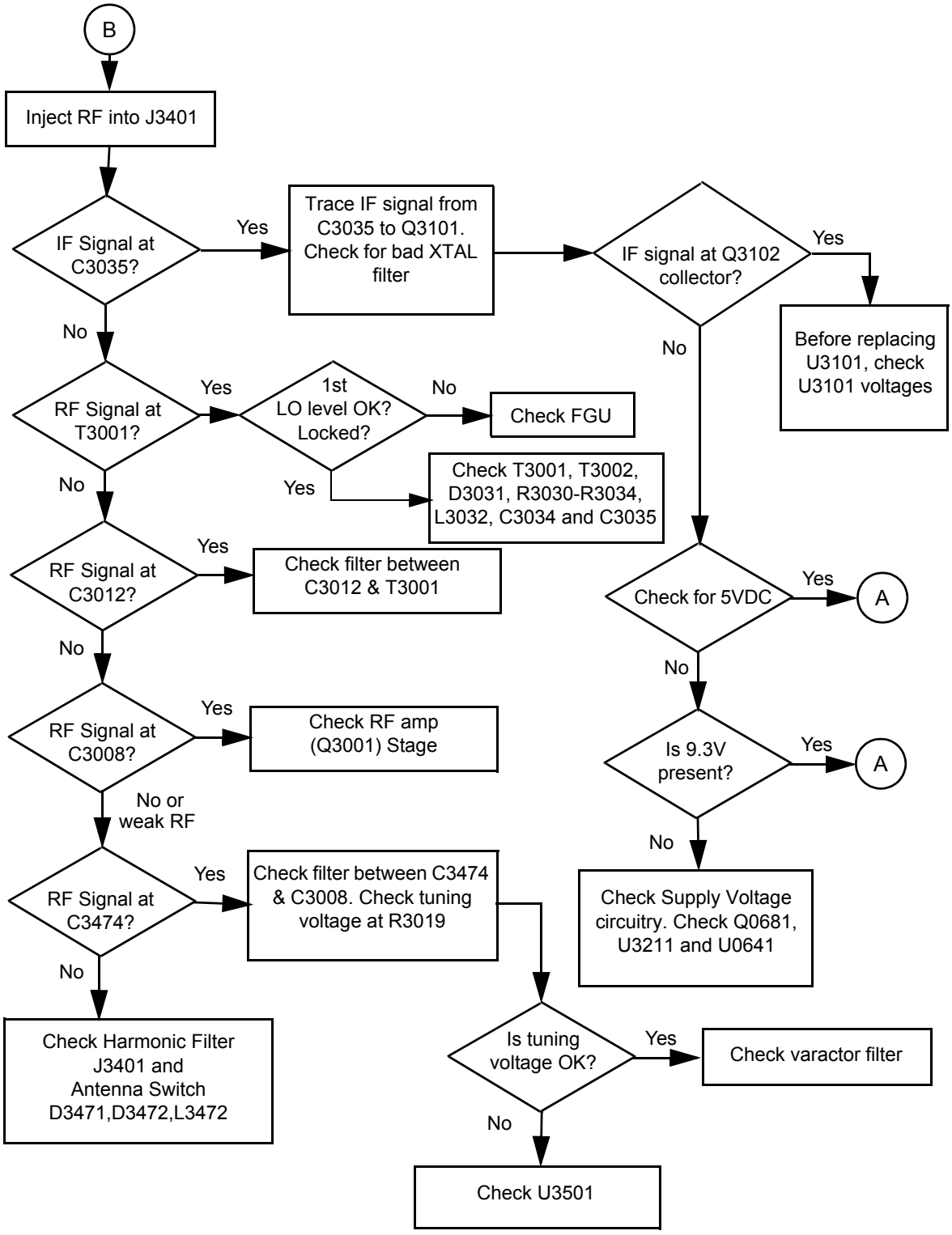
Section 3

TROUBLESHOOTING CHARTS

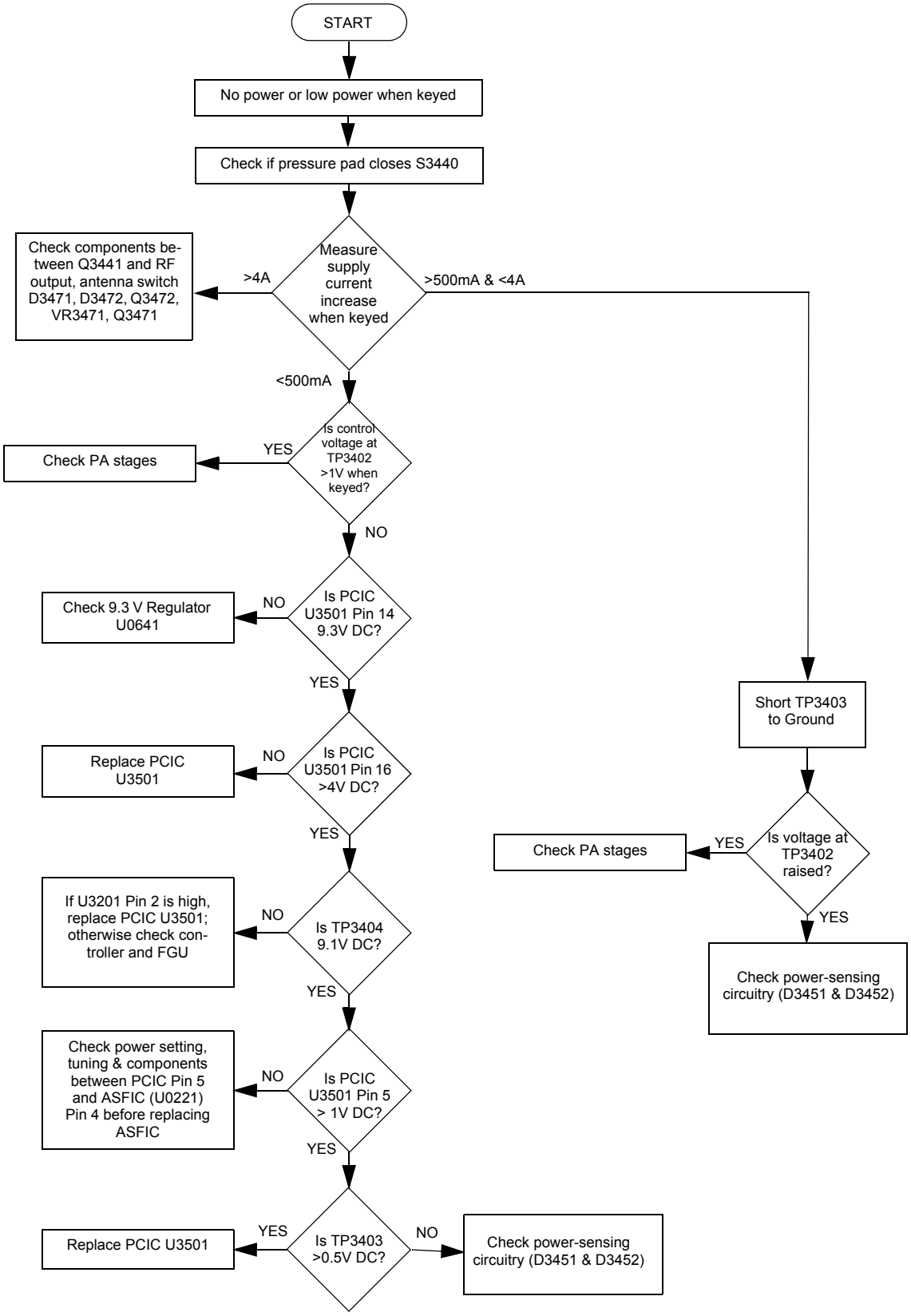
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



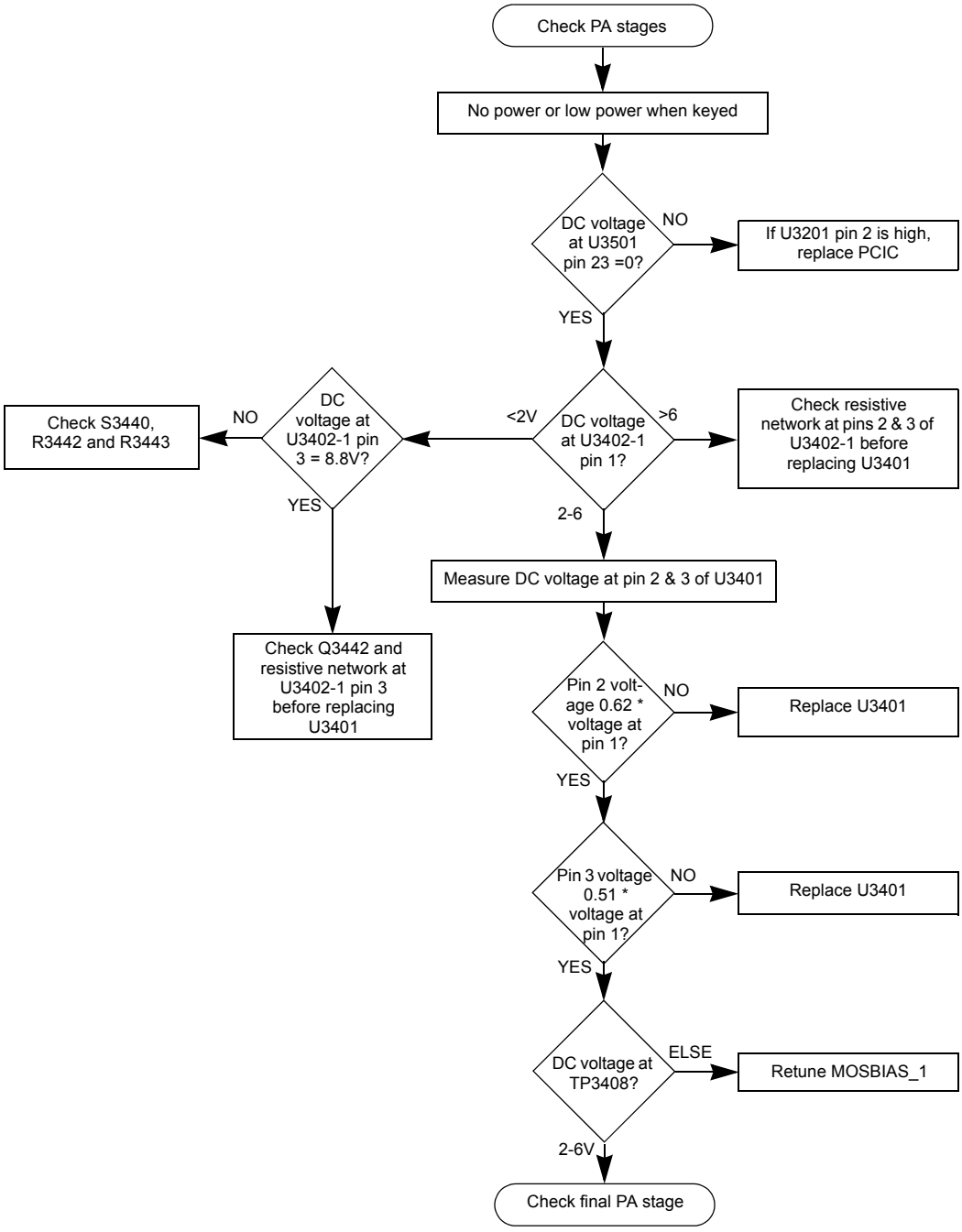
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



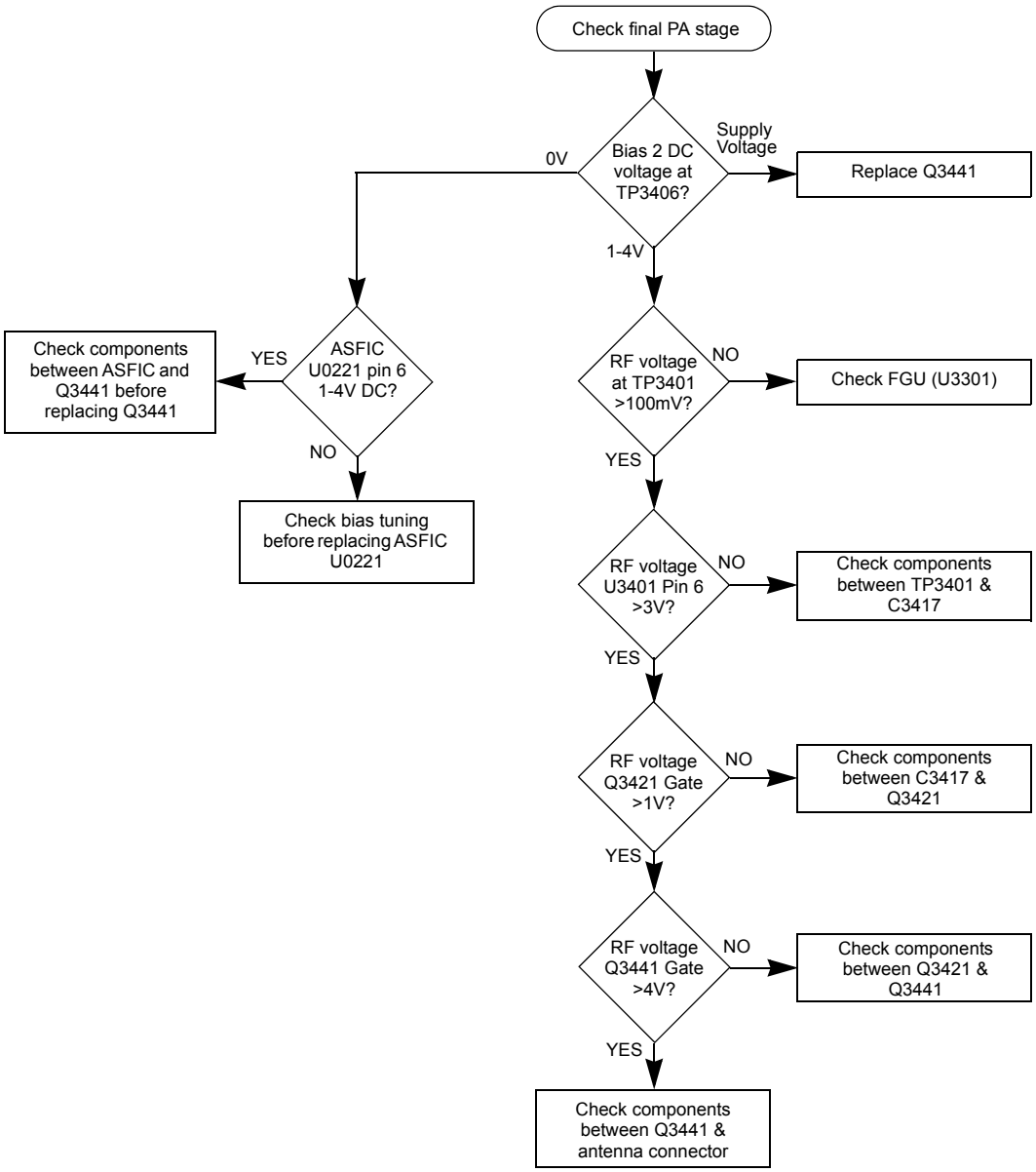
2.0 Troubleshooting Flow Chart for 45W Transmitter (Sheet 1 of 3)



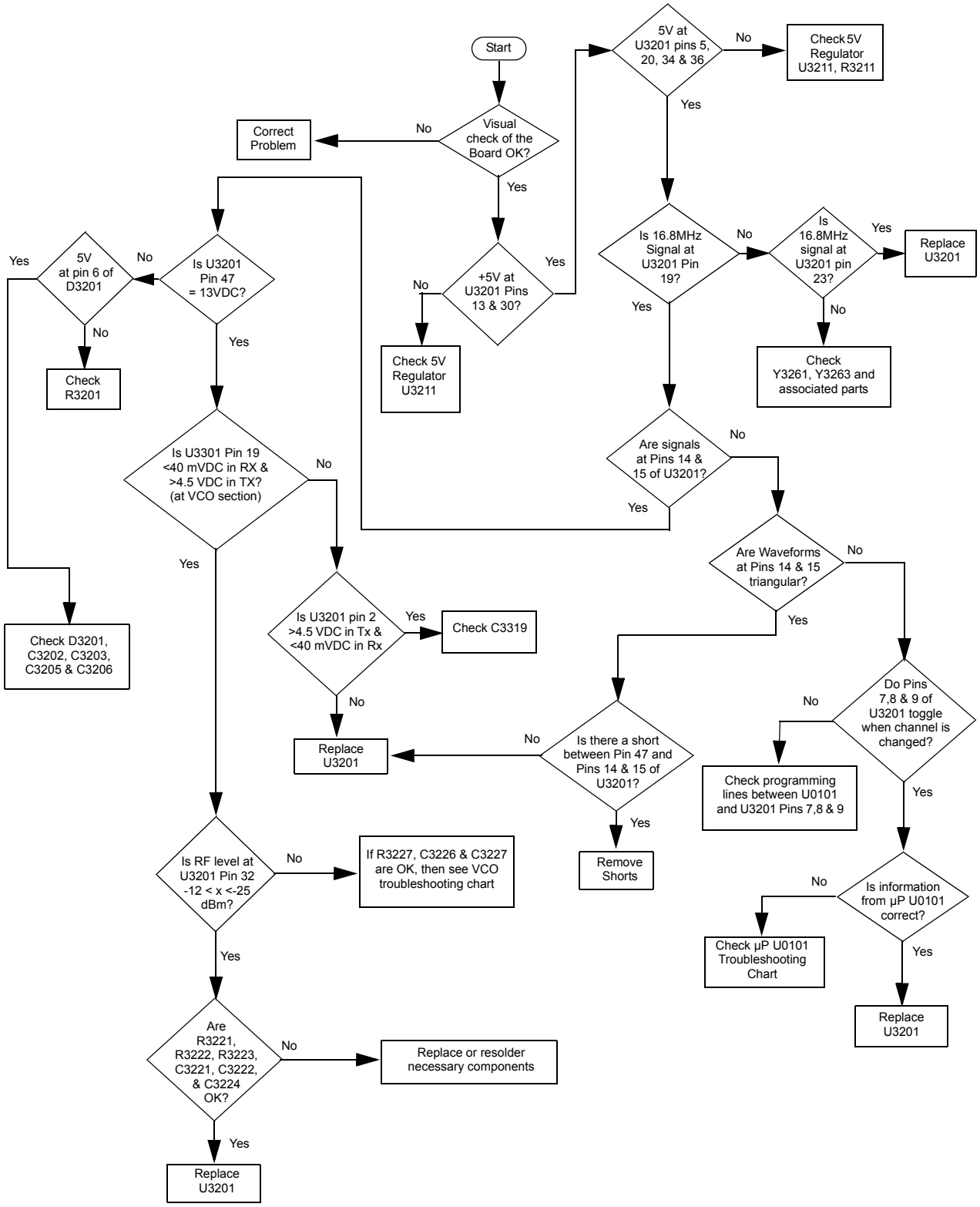
2.1 Troubleshooting Flow Chart for 45W Transmitter (Sheet 2 of 3)



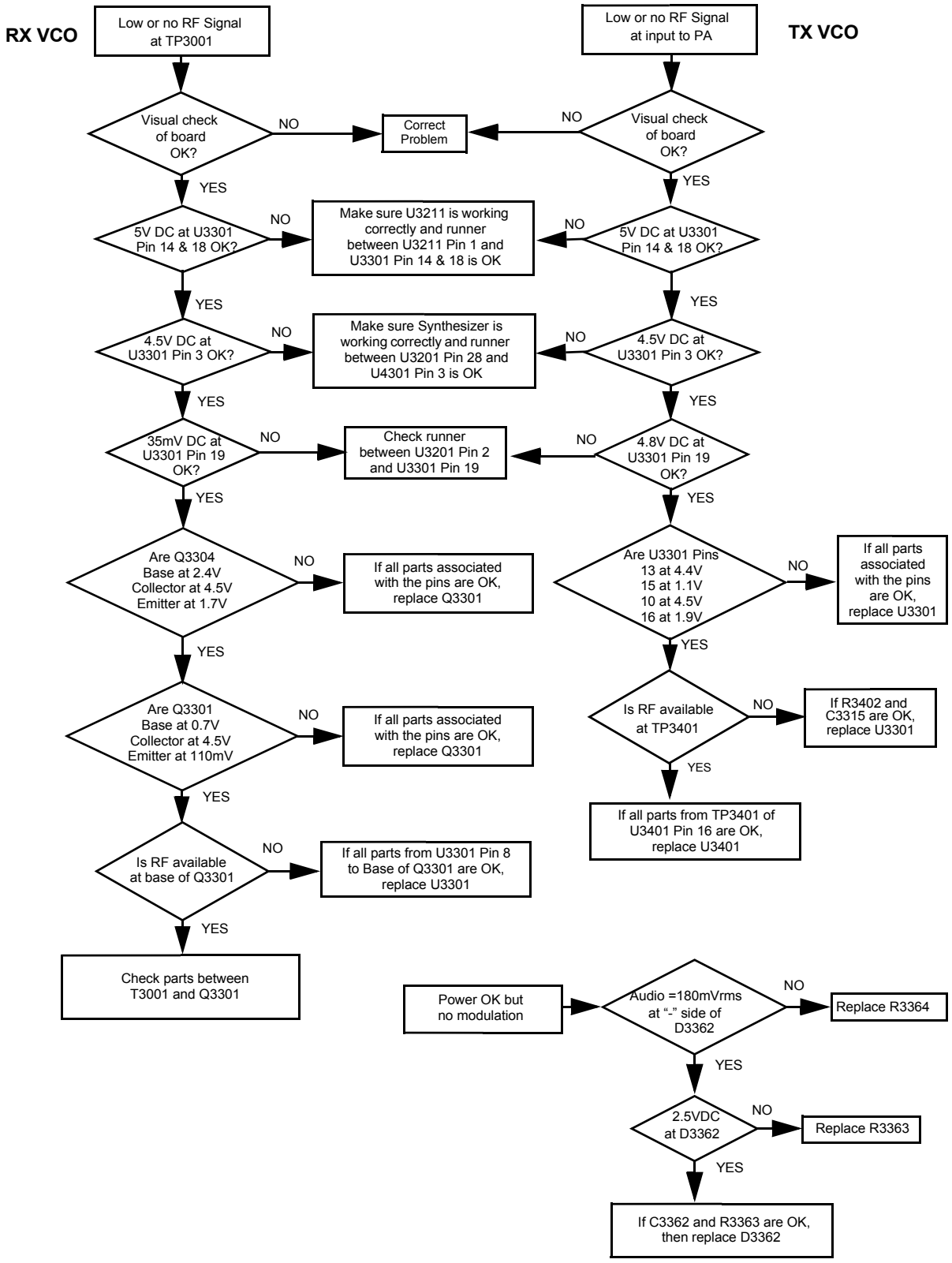
2.2 Troubleshooting Flow Chart for 45W Transmitter (Sheet 3 of 3)



3.0 Troubleshooting Flow Chart for Synthesizer



4.0 Troubleshooting Flow Chart for VCO



Notes

Section 4

VHF (136-174 MHZ) 25-45W LDMOS PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

The VHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the VHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in this chapter show both the controller and VHF circuit components. The VHF schematics and the related PCB and parts lists are shown in the tables below.

Table 11-1 VHF 25-45W PCB 8486140B15 Diagrams and Parts Lists

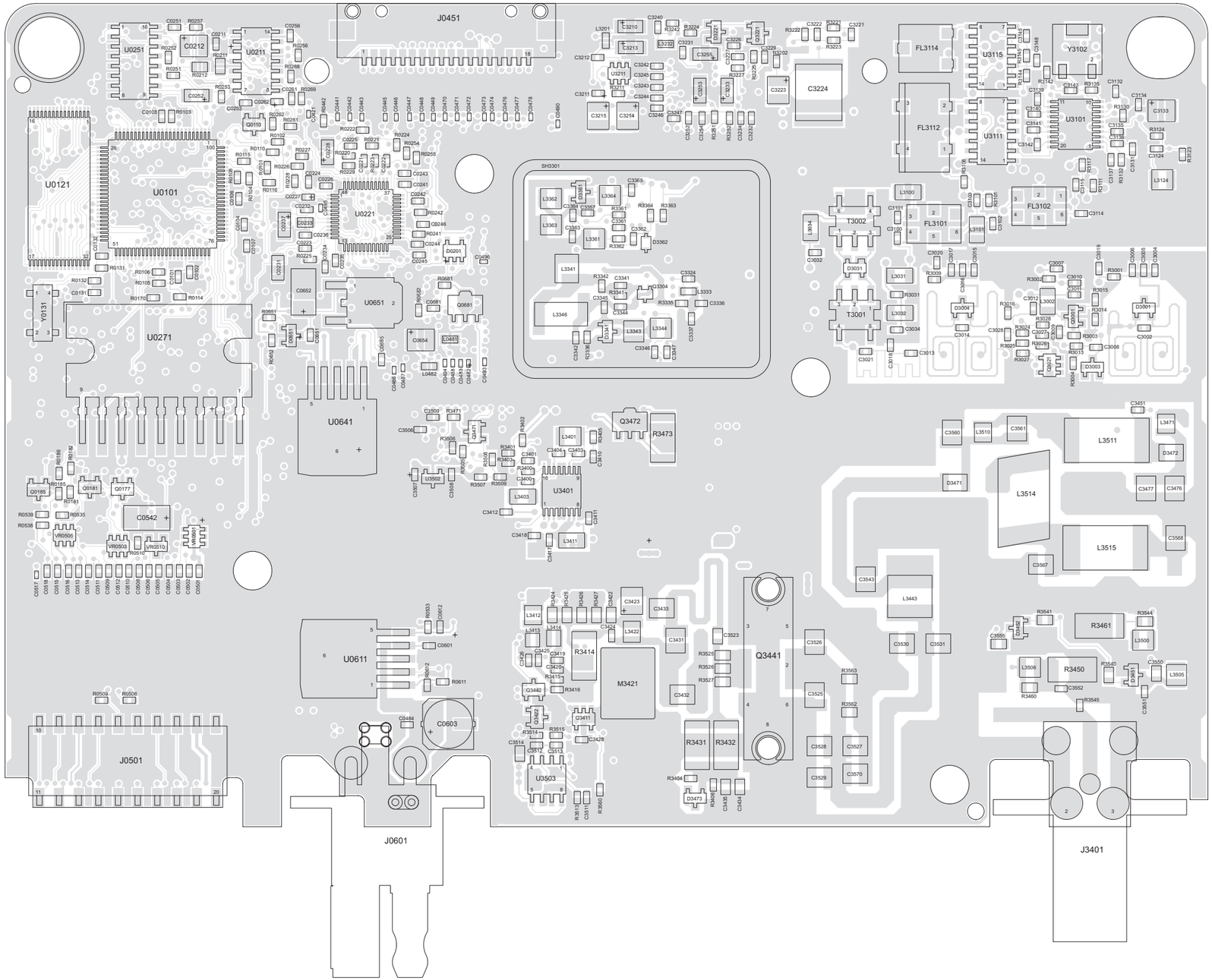
PCB 8486140B15:	**Page:**
Main Board Top Side	**11: 4-3**
Main Board Bottom Side	**11: 4-4**
SCHEMATICS	
Power Amplifier 25 - 45W	**11: 4-5**
FRACN Synthesizer	**11: 4-6**
Voltage Controlled Oscillator	**11: 4-7**
Receiver Front-End	**11: 4-8**
IF	**11: 4-9**
Parts List	**11: 4-10**
Controller version is **T12**	

Table 8-2 VHF 25-45W PCB 8471234L02 Diagrams and Parts Lists

PCB 8471234L02:	**Page:**
Main Board Top Side	**11: 4-13**
Main Board Bottom Side	**11: 4-14**
SCHEMATICS	
Power Amplifier 25 - 45W	**11: 4-15**
FRACN Synthesizer	**11: 4-16**
Voltage Controlled Oscillator	**11: 4-17**
Receiver Front-End	**11: 4-18**
IF	**11: 4-19**
Parts List	**11: 4-20**
Controller version is **T12**	

Notes

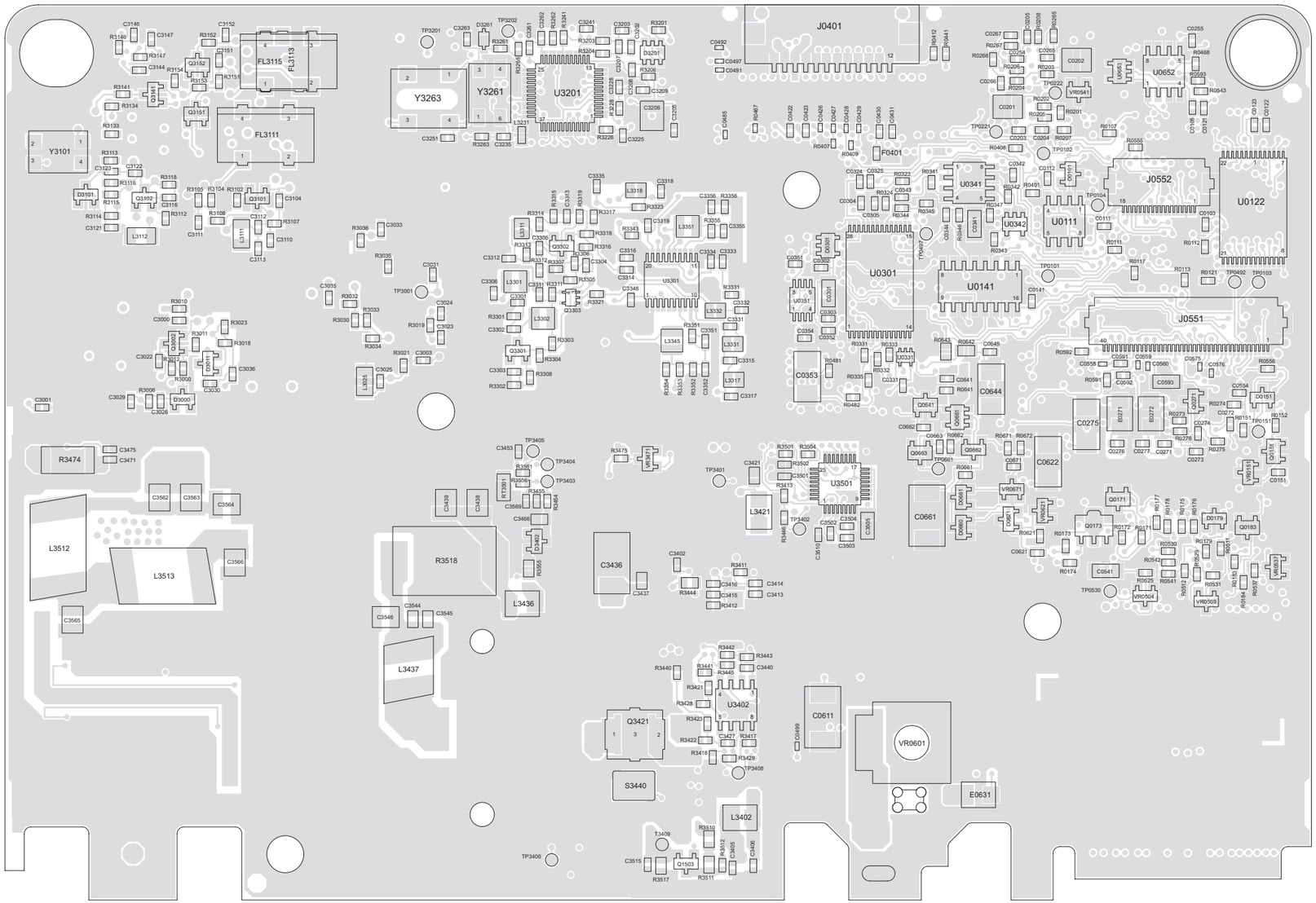
2.0 VHF (136-174 MHz) 25-45W LDMOS PCB 8486140B15, Schematics, and Parts Lists



ZWG0131057-O

VHF (136-174 MHz) 25-45W LDMOS PCB 8486140B15 Top Side

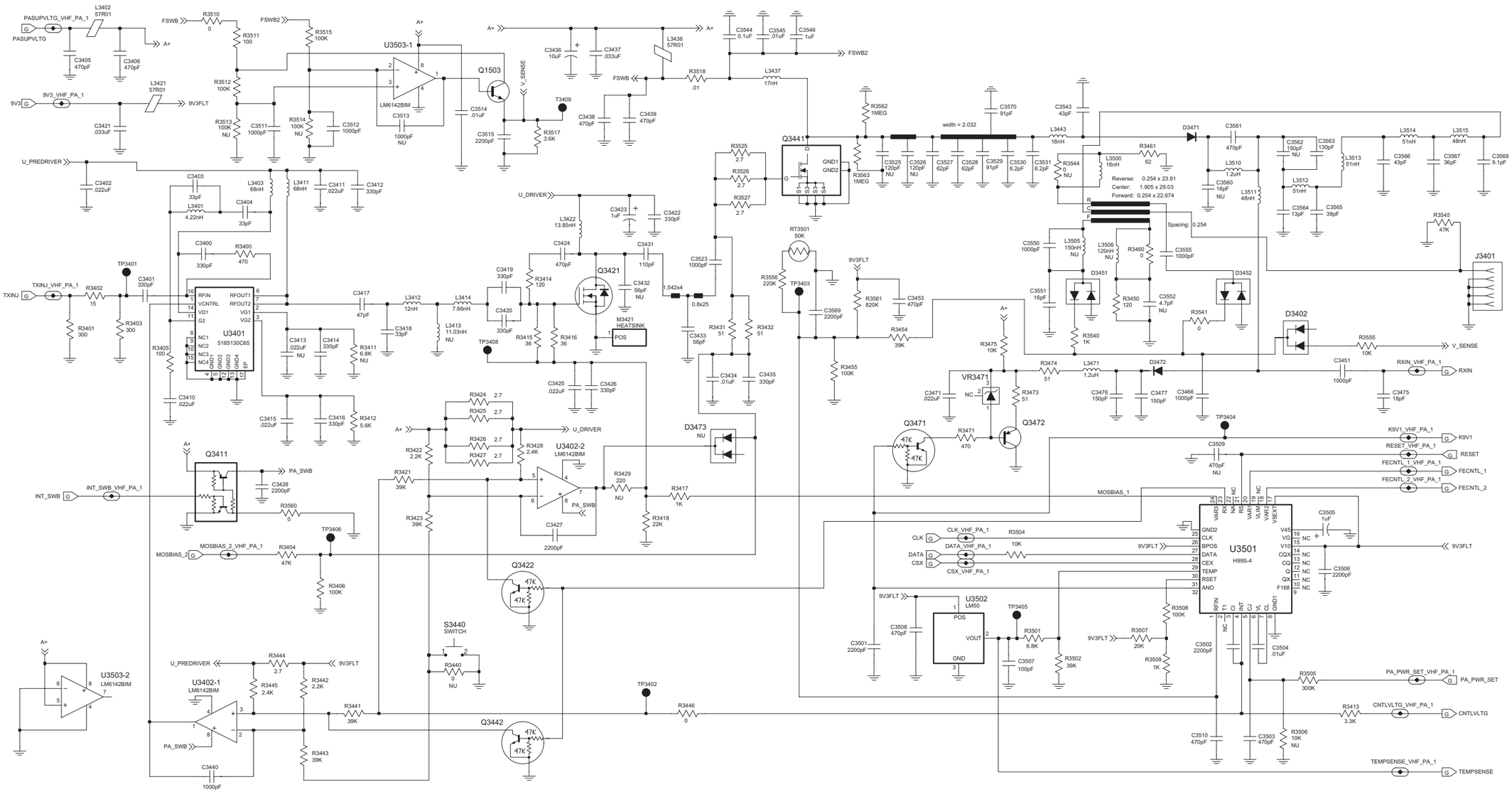
6881091C63-C

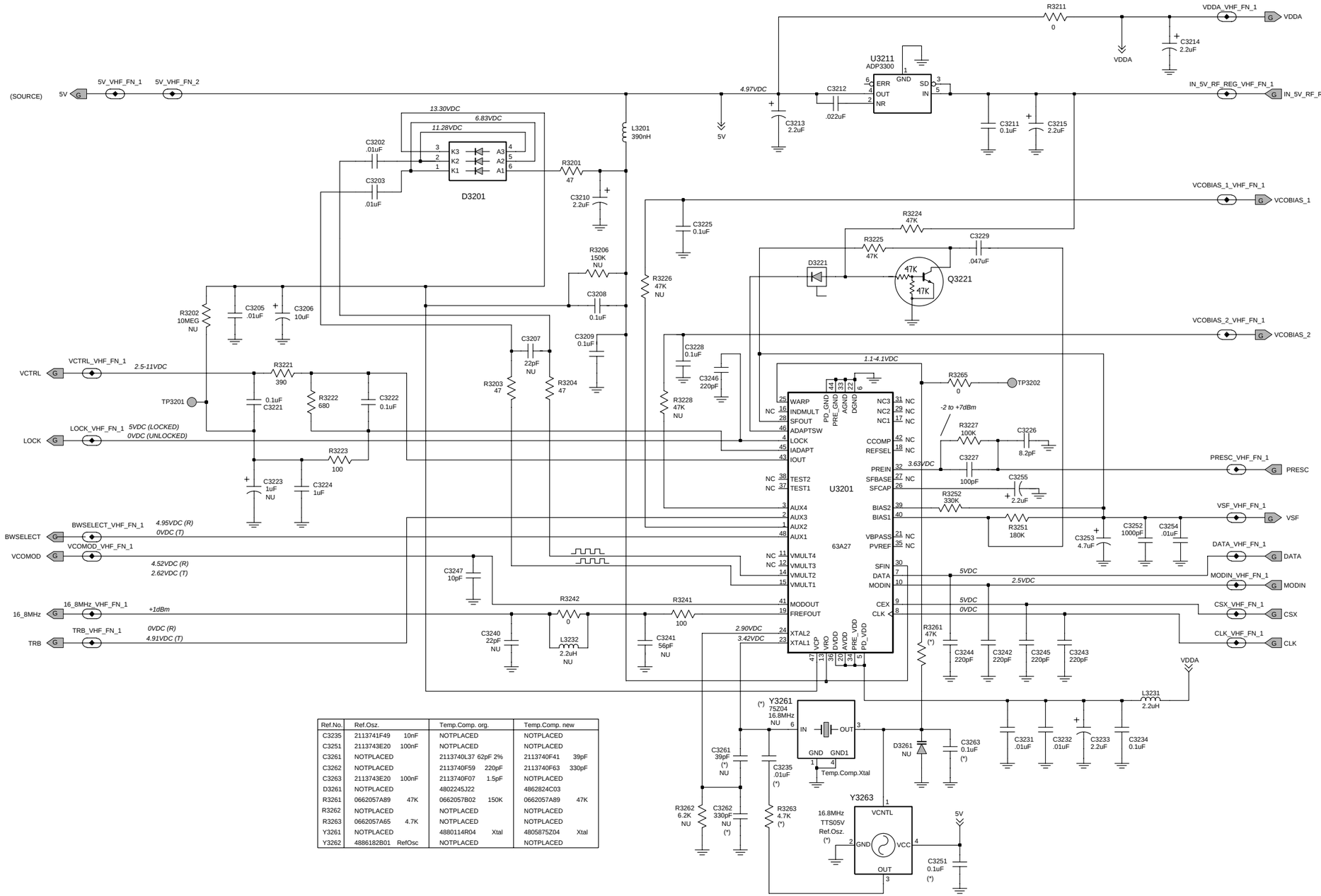


ZWG0131058-O

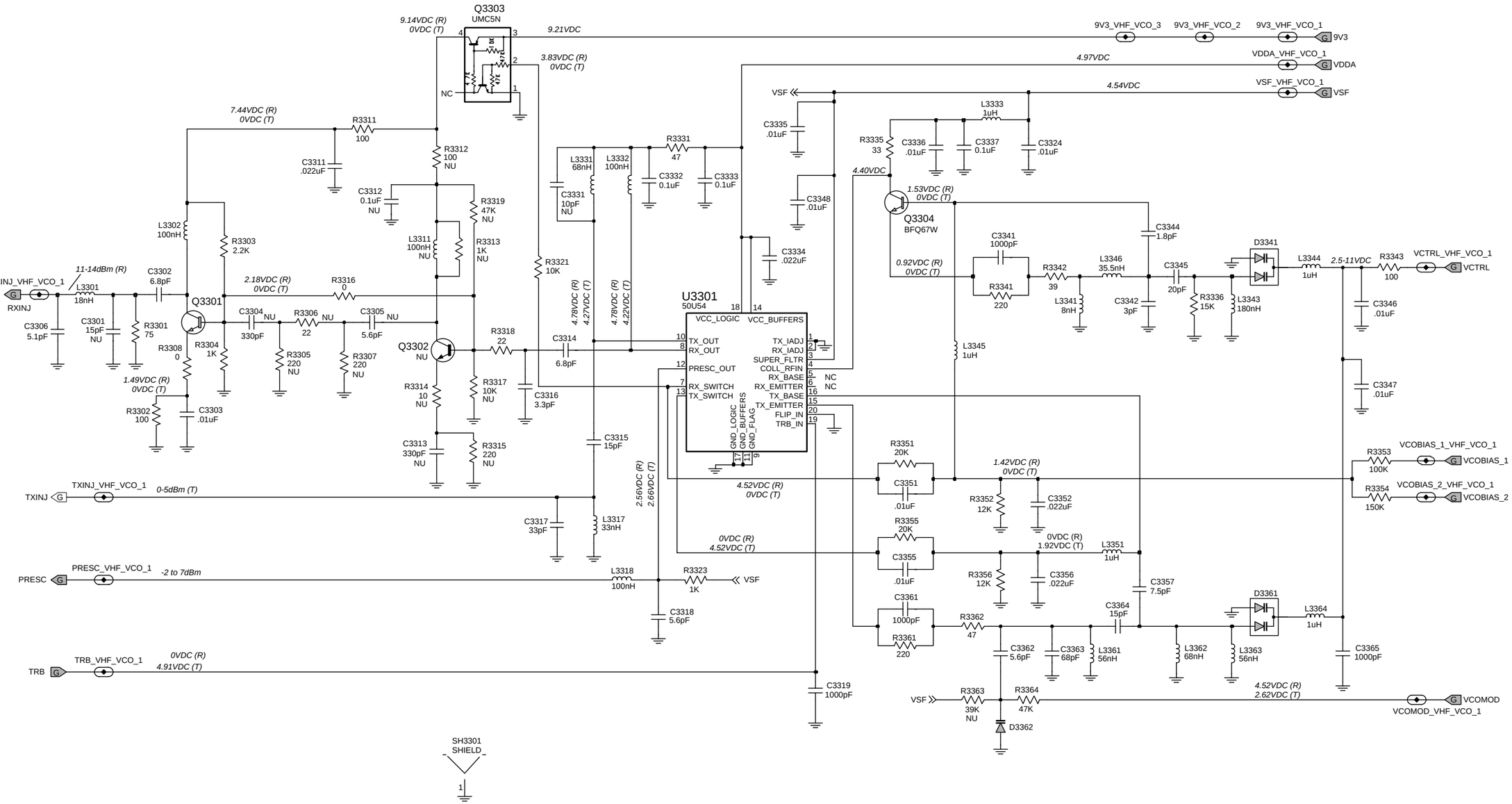
VHF (136-174 MHz) 25-45W LDMOS PCB 8486140B15 Bottom Side

6881091C63-C


PASUPVLTG_VHF_PA_1
PASUPVLTG
L3402 57R01
C3405 470pF
C3406 470pF
A+
FSWB
R3510 0
R3511 100
FSWB2
R3515 100K
9V3_VHF_PA_1
9V3
L3421 57R01
9V3FLT
C3421 .033uF
R3512 100K
R3513 100K NU
R3514 100K NU
C3511 1000pF
C3512 1000pF
U3503-1
LM6142BIM
C3513 1000pF NU
C3514 .01uF
Q1503
V_SENSE
T3409
C3515 2200pF
R3517 3.6K
C3436 10uF
C3437 .033uF
L3436 57R01
C3438 470pF
C3439 470pF
R3518 .01
L3437 17nH
C3544 0.1uF
C3545 .01uF
C3546 1uF
U_PREDRIVER
C3402 .022uF
C3403 33pF
L3401 4.22nH
C3404 33pF
L3403 68nH
L3411 68nH
C3411 .022uF
C3412 330pF
C3400 330pF
R3400 470
TP3401
C3401 330pF
TXINJ_VHF_PA_1
TXINJ
R3402 15
R3401 300
R3403 300
U3401
5185130C65
RFIN
VCNTRL
VD1
G2
RFOUT1
RFOUT2
VG1
VG2
NC1
NC2
NC3
NC4
GND1
GND2
GND3
GND4
R3405 100
C3410 .022uF
C3413 .022uF NU
C3414 330pF
R3411 6.8K NU
C3417 47pF
L3412 12nH
C3418 33pF
L3413 11.03nH NU
L3414 7.66nH
C3415 .022uF
C3416 330pF
R3412 5.6K
U_DRIVER
L3422 13.85nH
C3423 1uF
C3422 330pF
C3424 470pF
C3431 110pF
Q3421
C3419 330pF
R3414 120
C3420 330pF
R3415 36
R3416 36
C3432 56pF NU
M3421 HEATSINK
POS
TP3408
1.542x4
0.8x25
C3523 1000pF
C3433 56pF
C3434 .01uF
C3435 330pF
R3431 51
R3432 51
C3425 .022uF
C3426 330pF
R3424 2.7
R3425 2.7
R3426 2.7
R3427 2.7
U3402-2
LM6142BIM
R3428 2.4K
D3473 NU
A+
Q3411
PA_SWB
C3428 2200pF
INT_SWB
INT_SWB_VHF_PA_1
R3560 0
TP3406
R3422 2.2K
R3421 39K
R3423 39K
R3429 220 NU
R3417 1K
R3418 22K
C3427 2200pF
MOSBIAS_2
MOSBIAS_2_VHF_PA_1
R3404 47K
R3406 100K
Q3422
47K
S3440
SWITCH
R3440 0 NU
U3503-2
LM6142BIM
U3402-1
LM6142BIM
R3444 2.7
R3445 2.4K
R3442 2.2K
R3441 39K
R3443 39K
C3440 1000pF
TP3402
R3446 0
Q3442
Q3441
GND1
GND2
R3562 1MEG
R3563 1MEG
C3525 120pF NU
C3526 120pF NU
C3527 62pF
C3528 62pF
C3529 91pF
C3530 6.2pF
C3531 6.2pF
C3570 91pF
width = 2.032
C3543 43pF
L3443 18nH
R3544 0 NU
R3525 2.7
R3526 2.7
R3527 2.7
RT3501 50K
R3556 220K
TP3403
C3569 2200pF
R3561 820K
C3453 470pF
R3454 39K
R3455 100K
9V3FLT
A+
R3475 10K
R3474 51
L3471 1.2uH
D3472
VR3471
R3473 51
C3471 .022uF
C3476 150pF
C3477 150pF
C3466 1000pF
Q3471
47K
R3471 470
Q3472
TP3404
C3509 470pF NU
L3500 18nH
R3461 62
Reverse: 0.254 x 23.91
Center: 1.905 x 29.03
Forward: 0.254 x 22.674
Spacing: 0.254
D3471
C3561 470pF
L3510 1.2uH
C3560 16pF NU
L3511 48nH
C3562 150pF NU
C3563 130pF
L3512 51nH
C3564 13pF
C3565 39pF
L3513 51nH
L3514 51nH
L3515 48nH
C3566 43pF
C3567 36pF
C3568 9.1pF
R3545 47K
J3401
C3550 1000pF
L3505 150nH NU
L3506 120nH NU
R3460 0
C3555 1000pF
D3451
D3452
C3551 16pF
R3450 120
C3552 4.7pF NU
R3540 1K
R3541 0
D3402
R3555 10K
V_SENSE
C3451 1000pF
RXIN_VHF_PA_1
RXIN
C3475 18pF
K9V1_VHF_PA_1
K9V1
RESET_VHF_PA_1
RESET
FECNTL_1_VHF_PA_1
FECNTL_1
FECNTL_2_VHF_PA_1
FECNTL_2
MOSBIAS_1
U3501
H99S-4
C3505 1uF
C3506 2200pF
9V3FLT
CLK_VHF_PA_1
CLK
R3504 10K
DATA_VHF_PA_1
DATA
CSX
CSX_VHF_PA_1
U3502
LM50
TP3405
R3501 6.8K
C3507 100pF
R3502 39K
C3501 2200pF
C3508 470pF
R3508 100K
R3507 20K
R3509 1K
C3502 2200pF
C3504 .01uF
R3505 300K
PA_PWR_SET_VHF_PA_1
PA_PWR_SET
R3413 3.3K
CNTLVLTG_VHF_PA_1
CNTLVLTG
C3510 470pF
C3503 470pF
R3506 10K NU
TEMPSENSE_VHF_PA_1
TEMPSENSE



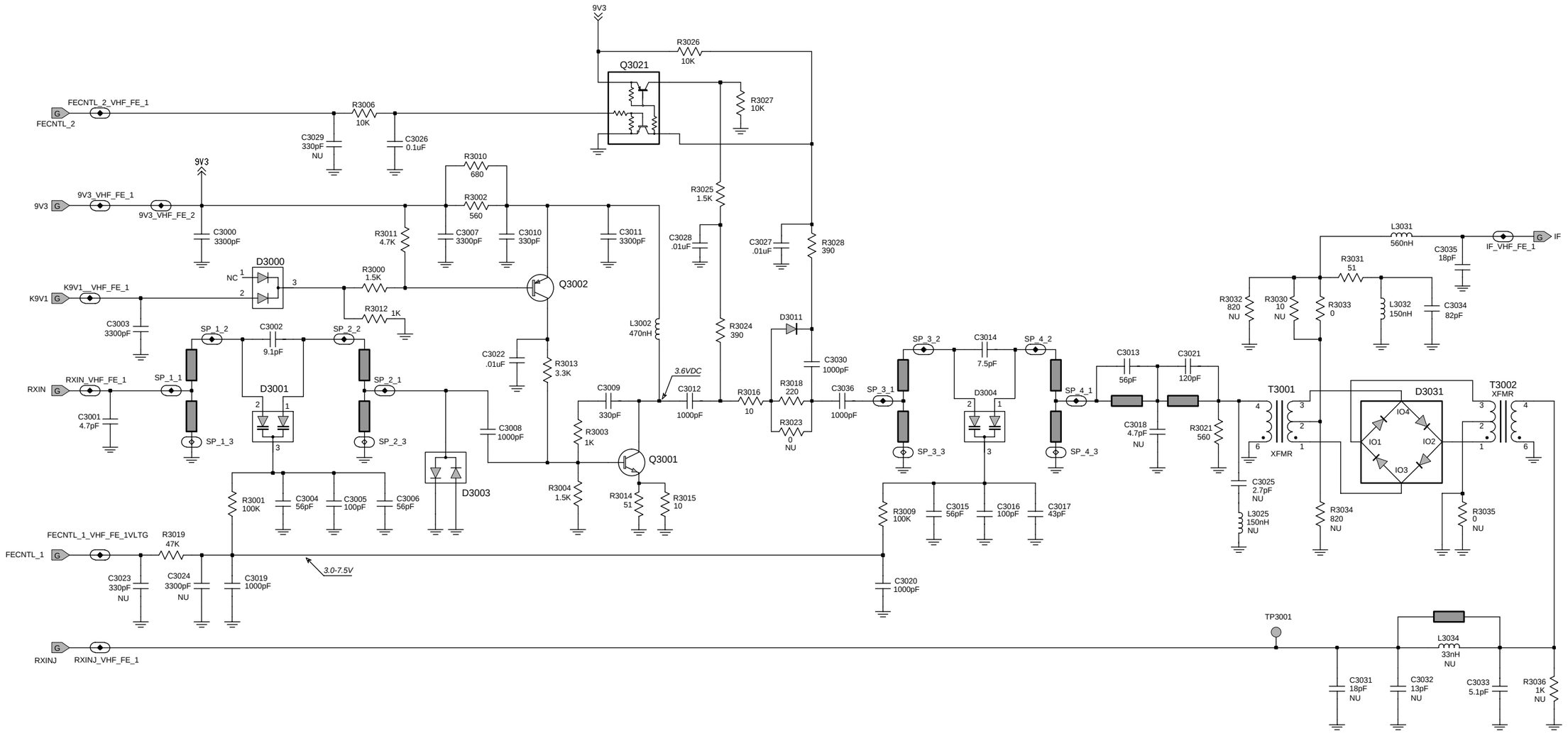
Ref.No.	Ref.Osz.	Temp.Comp. org.	Temp.Comp. new
C3235	2113741F49 10nF	NOTPLACED	NOTPLACED
C3251	2113743E20 100nF	NOTPLACED	NOTPLACED
C3261	NOTPLACED	2113740L37 62pF 2%	2113740F41 39pF
C3262	NOTPLACED	2113740F59 220pF	2113740F63 330pF
C3263	2113743E20 100nF	2113740F07 1.5pF	NOTPLACED
D3261	NOTPLACED	4802245J22	4862824C03
R3261	0662057A89 47K	0662057B02 150K	0662057A89 47K
R3262	NOTPLACED	NOTPLACED	NOTPLACED
R3263	0662057A65 4.7K	NOTPLACED	NOTPLACED
Y3261	NOTPLACED	4880114R04 Xtal	4805875Z04 Xtal
Y3262	4886182B01 RefOsc	NOTPLACED	NOTPLACED



ZWG0131059-O

VHF (136-174 MHz) 25-45W LDMOS Voltage Controlled Oscillator

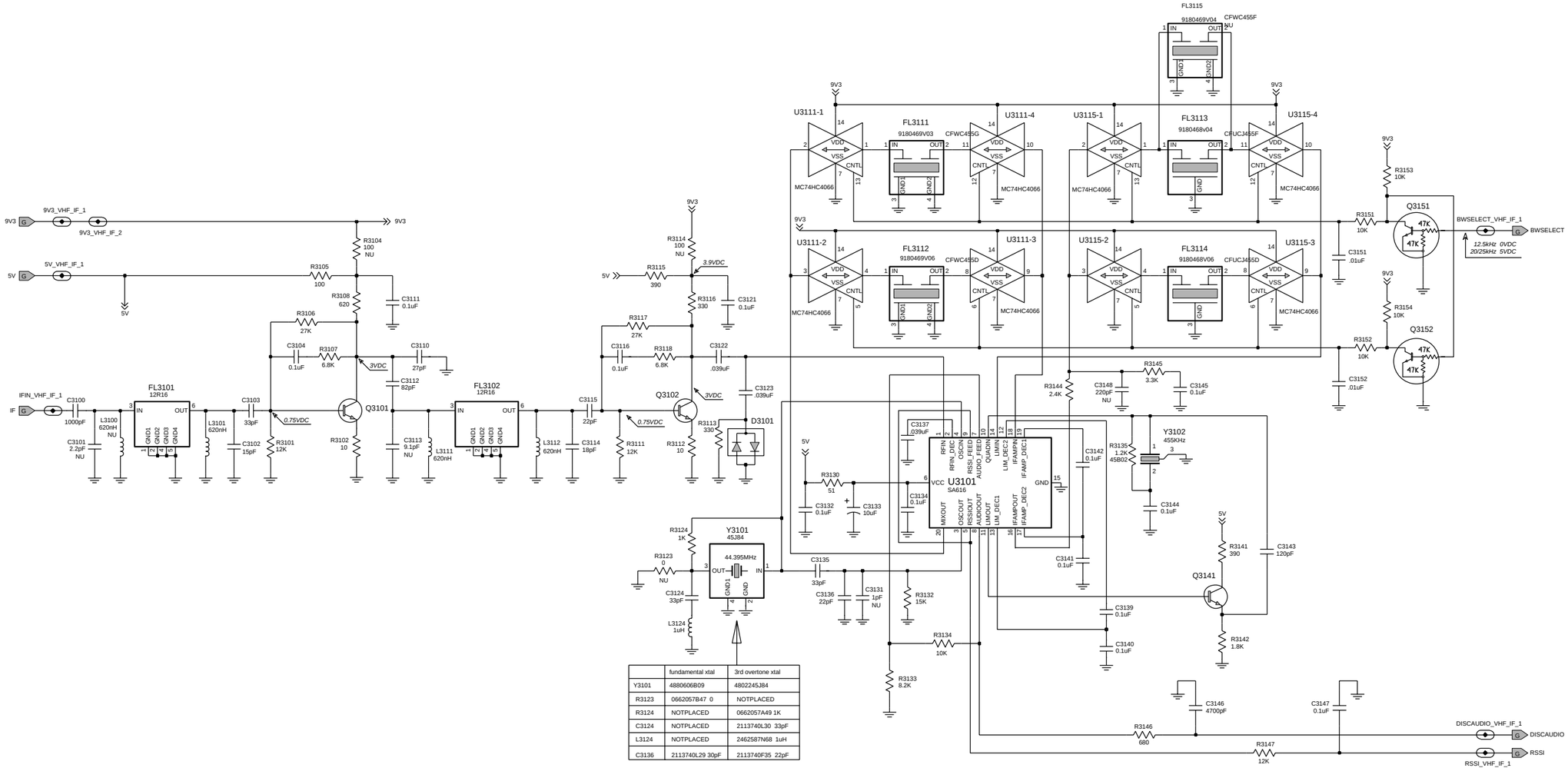
6881091C63-C



VHF (136-174 MHz) 25-45W LDMOS Receiver Front-End

6881091C63-C

ZWG0131062-O



	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

ZWG0131060-O

VHF 25-45W PCB 8486140B15 Parts List†

Circuit Ref	Motorola Part No.	Description
C3000	2113741F37	3300
C3001	2113740F19	4.7PF
C3002	2113740F26	9.1
C3003	2113741F37	3300
C3004	2113740F45	30 56
C3005	2113740F51	100
C3006	2113740F45	56
C3007	2113741F37	3300
C3008	2113741F25	1000
C3009	2113741F13	330
C3010	2113741F13	330
C3011	2113741F37	3300
C3012	2113741F25	1000
C3013	2113740F45	56
C3014	2113740F24	7.5
C3015	2113740F45	56
C3016	2113740F51	100
C3017	2113740F42	43
C3019	2113741F25	1000
C3020	2113741F25	1000
C3021	2113740F53	120
C3022	2113741F49	10000
C3026	2113743E20	.10 UF 10%
C3027	2113741F49	10000
C3028	2113741F49	10000
C3030	2113741F25	1000
C3033	2113740F20	5.1
C3034	2113740F49	82
C3035	2113740F33	18
C3036	2113741F25	1000
C3100	2113741F25	1000
C3102	2113740F31	15
C3103	2113740F39	33
C3104	2113743E20	.10 UF 10%
C3110	2113740F37	27
C3111	2113743E20	.10 UF 10%
C3112	2113740F49	82
C3114	2113740F33	18
C3115	2113740F35	22
C3116	2113743E20	.10 UF 10%
C3121	2113743E20	.10 UF 10%
C3122	2113743E11	.039 UF 10% X 7R
C3123	2113743E11	.039 UF 10% X 7R
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	.10 UF 10%
C3133	2311049A57	A/P 10UF 10% 16V
C3134	2113743E20	.10 UF 10%
C3135	2113740L30	CAP 33.0 PF 50V 2.0 %
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	.039 UF 10% X 7R
C3139	2113743E20	.10 UF 10%
C3140	2113743E20	.10 UF 10%
C3141	2113743E20	.10 UF 10%
C3142	2113743E20	.10 UF 10%
C3143	2113740F53	120
C3144	2113743E20	.10 UF 10%
C3145	2113743E20	.10 UF 10%
C3146	2113741F41	4700
C3147	2113743E20	.10 UF 10%
C3151	2113741F49	10000
C3152	2113741F49	10000
C3202	2113741F49	10000
C3203	2113741F49	10000
C3205	2113741F49	10000
C3206	2311049A57	A/P 10UF 10% 16V
C3208	2113743E20	.10 UF 10%
C3209	2113743E20	.10 UF 10%
C3210	2311049A40	2.2 UF 10%
C3211	2113743E20	.10 UF 10%
C3212	2113743E07	.022UF
C3213	2311049A40	GLOBAL TANT 10% 2.2 UF
C3214	2311049A09	2.2 UF 10%
C3215	2311049A09	2.2 UF 10%
C3221	2113743E20	.10 UF 10%
C3222	2113743E20	.10 UF 10%
C3224	0882422W23	FILM SM 1.0 UF 15V 5%
C3225	2113743E20	.10 UF 10%
C3226	2113740F25	8.2
C3227	2113740F51	100
C3228	2113743E20	.10 UF 10%
C3229	2113743E12	.047UF 10% X7R
C3231	2113741F49	10000
C3232	2113741F49	10000
C3233	2311049A40	GLOBAL CAP TANT 10% 2.2 UF
C3234	2113743E20	.10 UF 10%
C3235	2113741F49	10000
C3242	2113740F59	220
C3243	2113740F59	220
C3244	2113740F59	220
C3245	2113740F59	220
C3246	2113740F59	220
C3247	2113740F27	10
C3251	2113743E20	.10 UF 10%
C3252	2113741F25	1000
C3253	2311049A56	CAP TAN CHIP A/P 4.7 20 10
C3254	2113741F49	10000
C3255	2311049A40	GLOBAL TANT 10% 2.2 UF
C3263	2113743E20	.10 UF 10%
C3302	2113740F23	6.8
C3303	2113741F49	10000
C3306	2113740F20	5.1
C3311	2113743E07	CER .022UF
C3314	2113740F23	6.8
C3315	2113740F31	15
C3316	2113740F15	3.3
C3317	2113740F39	33
C3318	2113740F21	5.6
C3319	2113741F25	1000
C3324	2113741F49	10000
C3332	2113743E20	.10 UF 10%
C3333	2113743E20	.10 UF 10%
C3334	2113743E07	.022UF
C3335	2113741F49	10000
C3336	2113741F49	10000
C3337	2113743E20	.10 UF 10%
C3341	2113741F25	1000
C3342	2113740L05	3.0 PF0.1PF
C3344	2113740F09	30 1.8
C3345	2113740L25	20.0 PF .25PF
C3346	2113741F49	10000
C3347	2113741F49	10000
C3348	2113741F49	10000
C3351	2113741F49	10000
C3352	2113743E07	.022UF
C3355	2113741F49	10000
C3356	2113743E07	.022UF
C3357	2113740F24	7.5
C3361	2113741F25	1000
C3362	2113740F21	5.6
C3363	2113740F47	68
C3364	2113740F31	15
C3365	2113741F25	1000
C3400	2113740F63	330 5%
C3401	2113740F63	330 5%
C3402	2113743E07	.022UF
C3403	2113740F39	33
C3404	2113740F39	33
C3405	2113740F67	470 5%
C3406	2113740F67	470 5%
C3410	2113743E07	.022UF
C3411	2113743E07	.022UF
C3412	2113740F63	330 5%
C3414	2113740F63	330 5%
C3415	2113743E07	.022UF
C3416	2113740F63	330 5%
C3417	2113740F43	47
C3418	2113740F39	33
C3419	2113740F63	330 5%
C3420	2113740F63	330 5%
C3421	2113741A57	33K +5% (2160521A31)
C3422	2113740A67	330PF +5%
C3423	2311049A08	KEMET CAPS
C3424	2113740F67	470 5%
C3425	2113743E07	.022UF
C3426	2113740F63	330 5%
C3427	2113741F33	2200
C3428	2113741F33	2200
C3431	2111078B43	CAP
C3433	2111078B36	RF 56 5 NPO 100V
C3434	2113741A45	10000PF +5%
C3435	2113740A67	330PF +5%
C3436	2311049A45	10 10 35
C3437	2113741A57	33K +5% (2160521A31)
C3438	2111078B59	RF 470 5 NPO 100V
C3439	2111078B59	RF 470 5 NPO 100V
C3440	2113741F25	1000
C3451	2113740A79	1000PF +5%
C3453	2113740F67	470 5%
C3466	2113740A79	1000PF +5%
C3471	2113743E07	.022UF
C3475	2113740F33	18
C3476	2111078B47	RF 150 5 NP O 100V
C3477	2111078B47	RF 150 5 NP O 100V
C3501	2113741F33	2200
C3502	2113741F33	2200
C3503	2113740F67	470 5%
C3504	2113741F49	10000
C3505	2311049A07	10% 1.0UF
C3506	2113741F33	2200
C3507	2113740F51	100
C3508	2113740F67	470 5%
C3510	2113740F67	470 5%
C3511	2113741F25	1000
C3512	2113741F25	1000
C3514	2113741A45	10000PF +5%
C3515	2113741F33	2200
C3523	2113740A79	1000PF +5%
C3527	2111078B37	RF 62 5 NPO 100V
C3528	2111078B37	RF 62 5 NPO 100V
C3529	2111078B41	RF 91 5 NPO 100V
C3530	2111078B08	RF 6.2 .25NPO 100V
C3531	2111078B08	RF 6.2 .25NPO 100V
C3543	2111078B33	RF 43 5 NPO 100V
C3544	2113741M69	CLS2 100000 PF 20V 10%
C3545	2113741A45	10000PF +5%
C3546	2113741W01	P CER 1MF 25V 10%
C3550	2113740A79	1000PF +5%
C3551	2113740F32	16
C3555	2113740A79	1000PF +5%
C3561	2111078B59	RF 470 5 NPO 100V
C3563	2111078B45	RF 130PF 5 NPO 100V
C3564	2111078B16	RF 13 5 NPO 100V
C3565	2111078B32	ALT E12
C3566	2111078B33	RF 43 5 NPO 100V
C3567	2111078B31	36PF + 5%
C3568	2111078B12	RF 9.1 .5 NPO 100V
C3569	2113741F33	2200
C3570	2111078B41	RF 91 5 NPO 100V
D3000	4813833C02	DUAL 70V '5B' COMM CATH
D3001	4805649Q13	VCTR ISV 228
D3003	4880154K03	SOT MMBD353 RH DUAL SCHT
D3004	4805649Q13	VCTR ISV 228
D3011	4880142L01	SOT MMBV109 RH
D3031	4886143B01	WM MIXER QUAD RING
D3101	4880154K03	SOT MMBD353 RH DUAL SCHT
D3201	4802233J09	TRIPLE SOT25-RH
D3221	4813825A05	30V HOT CARRIER MMBD301L
D3341	4805649Q13	VCTR ISV 228
D3361	4805649Q13	VCTR ISV 228
D3362	4862824C01	VARACTOR

Circuit Ref	Motorola Part No.	Description
D3402	4813833C02	DUAL 70V '5B' COMM CATH
D3451	4882290T02	SI HOT CARRIER *HSM2802*
D3452	4882290T02	SI HOT CARRIER *HSM2802*
D3471	4802482J02	SMD PIN
D3472	4802482J02	SMD PIN
FL3101	9180112R16	44.85 MHZ CRYSTAL FLTR
FL3102	9180112R16	44.85 MHZ CRYSTAL FLTR
FL3111	9180469V03	SMD455KHZ 6 ELEMENT CER FLTR
FL3112	9180469V06	SMD455KHZ 6 ELEMENT CER FLTR
FL3113	9180468V04	SMD455KHZ 4 ELEMENT CER FLTR
FL3114	9180468V06	SMD455KHZ 4 ELEMENT CER FLTR
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J3401	0986166B02	RF CONNECTOR (MINI UHF)
L3002	2462587T23	470NH 5% LOW PRO
L3031	2462587T24	INDUCTOR CHIP 560NH 5% LOW PRO
L3032	2462587T17	150NH 5% LOW PRO
L3101	2462587T25	620NH 5% LOW PRO
L3111	2462587T25	620NH 5% LOW PRO
L3112	2462587T25	620NH 5% LOW PRO
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L3201	2462587Q42	390NH 10%
L3231	2462587Q20	2,200NH 20%
L3301	2462587N44	18 NH 5%
L3302	2462587N53	100 NH 5%
L3317	2462587V28	33 NH 5%
L3318	2462587V34	100NH 5%
L3331	2462587V32	68NH 5%
L3332	2462587V15	100 NH 10%
L3333	2462587Q47	1000 NH 10%
L3341	2484562T13	COIL SURFACE MNT AIR WOUND
L3343	2462587N56	180NH 5%
L3344	2462587N68	1000 NH 5%
L3345	2462587N68	1000 NH 5%
L3346	2484562T18	COIL SURFACE MNT AIR WOUND
L3351	2462587N68	1000 NH 5%
L3361	2462587N50	56 NH 5%
L3362	2462587N51	68 NH 5%
L3363	2462587N50	56 NH 5%
L3364	2462587N68	1000 NH 5%
L3401	2460591A01	COIL AIR WOUND INDUC 4.22
L3402	2484657R01	INDUCTOR BEAD CHIP
L3403	2462587T13	68NH 5% LOW PRO
L3411	2462587T13	68NH 5% LOW PRO

Circuit Ref	Motorola Part No.	Description
L3412	2462587N42	12 NH 5%
L3414	2460591A11	COIL AIR WOUND INDUC 7.66
L3421	2484657R01	INDUCTOR BEAD CHIP
L3422	2460591C23	COIL AIR WOUND INDUC 13.85
L3436	2484657R01	INDUCTOR BEAD CHIP
L3437	2460592A01	COIL AW 2 TURN 17 NH
L3443	2485873L01	ENCAPSULATED AIR WOUND COIL
L3471	2462587N69	1200 NH 5%
L3500	2462587N42	12 NH 5%
L3510	2462587N69	1200 NH 5%
L3511	2485873L05	ENCAPSULATED AIR WOUND 48NH
L3512	2460592B01	COIL AW 4 TURN 51 NH
L3513	2460592B01	COIL AW 4 TURN 51 NH
L3514	2460592B01	COIL AW 4 TURN 51 NH
L3515	2485873L05	ENCAPSULATED AIR WOUND 48NH
M3421	2686201B01	HEAT SPREADER WM
Q3001	4813827A07	NPN SML SIG MMBR941LT1 7Y
Q3002	4813824A17	XSTR PNP40V .2A GENPB=100-300
Q3021	4805921T02	XISTOR FMC2 RH
Q3101	4813827A07	NPN SML SIG MMBR941LT1 7Y
Q3102	4813827A07	NPN SML SIG MMBR941LT1 7Y
Q3141	4880214G02	MMBT3904
Q3151	4880048M01	NPN DIG 47K/47K
Q3152	4880048M01	NPN DIG 47K/47K
Q3221	4880048M01	NPN DIG 47K/47K
Q3301	4813827A07	NPN SML SIG MMBR941LT1 7Y
Q3303	4809939C05	DUAL NPN/PNP UMH 5
Q3304	4805218N63	RF TRANS SOT 323 BFQ67W
Q3411	4805921T02	XISTOR FMC2 RH
Q3421*	4886212B01	LDMOS PWR MRF1518
Q3422	4880048M01	NPN DIG 47K/47K
Q3441*	4886136B01	LDMOS SMT 55W 520MHZ 12V
Q3442	4880048M01	NPN DIG 47K/47K
Q3471	4880048M01	NPN DIG 47K/47K
Q3472	4805128M27	SOT TRANS
R3000	0662057A53	1500 OHMS 5%
R3001	0662057A97	100K OHM 5%
R3002	0662057A43	560 OHMS 5%
R3003	0662057A49	1000 OHMS 5%
R3004	0662057A53	1500 OHMS 5%
R3006	0662057A73	10K OHMS 5%
R3009	0662057A97	100K OHM 5%
R3010	0662057A45	680 OHMS 5%
R3011	0662057A65	4700 OHMS 5%
R3012	0662057A49	1000 OHMS 5%
R3013	0662057A61	3300 OHMS 5%
R3014	0662057A18	51 OHMS 5%
R3015	0662057A01	10 OHMS 5%
R3016	0662057A01	10 OHMS 5%
R3018	0662057A33	220 OHMS 5%
R3019	0662057A89	47K OHMS 5%
R3021	0662057A43	560 OHMS 5%

Circuit Ref	Motorola Part No.	Description
R3024	0662057A39	390 OHMS 5%
R3025	0662057A53	1500 OHMS 5%
R3026	0662057A73	10K OHMS 5%
R3027	0662057A73	10K OHMS 5%
R3028	0662057A39	390 OHMS 5%
R3031	0662057A18	51 OHMS 5%
R3033	0662057B47	0 OHMS +.050 OHMS
R3101	0662057A75	12K OHMS 5%
R3102	0662057A01	10 OHMS 5%
R3105	0662057A25	100 OHMS 5%
R3106	0662057A83	27K OHMS 5%
R3107	0662057A69	6800 OHM 5 1/8W
R3108	0662057A44	620 OHMS 5%
R3111	0662057A75	12K OHMS 5%
R3112	0662057A01	10 OHMS 5%
R3113	0662057A37	330 OHMS 5%
R3115	0662057A39	390 OHMS 5%
R3116	0662057A37	330 OHMS 5%
R3117	0662057A83	27K OHMS 5%
R3118	0662057A69	6800 OHM 5 1/8W
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51 OHMS 5%
R3132	0662057A77	15K OHMS 5%
R3133	0662057A71	8200 OHMS 5%
R3134	0662057A73	10K OHMS 5%
R3135	0662057A51	1200 OHMS 5%
R3141	0662057A39	390 OHMS 5%
R3142	0662057A55	1800 OHM 5%
R3144	0662057A58	2400 OHMS 5%
R3145	0662057A61	3300 OHMS 5%
R3146	0662057A45	680 OHMS 5%
R3147	0662057A75	12K OHMS 5%
R3151	0662057A73	10K OHMS 5%
R3152	0662057A73	10K OHMS 5%
R3153	0662057A73	10K OHMS 5%
R3154	0662057A73	10K OHMS 5%
R3201	0662057A17	47 OHMS 5%
R3203	0662057A17	47 OHMS 5%
R3204	0662057A17	47 OHMS 5%
R3211	0662057B47	0 OHMS +.050 OHMS
R3221	0662057A39	390 OHMS 5%
R3222	0662057A45	680 OHMS 5%
R3223	0662057A25	100 OHMS 5%
R3224	0662057A89	47K OHMS 5%
R3225	0662057A89	47K OHMS 5%
R3227	0662057A97	100K OHM 5%
R3241	0662057A25	100 OHMS 5%
R3242	0662057B47	0 OHMS +.050 OHMS
R3251	0662057B04	180K OHMS 5%
R3252	0662057B10	330K OHMS 5%
R3261	0662057A89	47K OHMS 5%
R3263	0662057A65	4700 OHMS 5%
R3265	0662057B47	0 OHMS +.050 OHMS

Circuit Ref	Motorola Part No.	Description
R3301	0662057A22	75 OHMS 5%
R3302	0662057A25	100 OHMS 5%
R3303	0662057A57	2200 OHMS 5%
R3304	0662057A49	1000 OHMS 5%
R3308	0662057B47	0 OHMS +.050 OHMS
R3311	0662057A25	100 OHMS 5%
R3316	0662057B47	0 OHMS +.050 OHMS
R3318	0662057A09	22 OHMS 5%
R3321	0662057A73	10K OHMS 5%
R3323	0662057A49	1000 OHMS 5%
R3331	0662057A17	47 OHMS 5%
R3335	0662057A13	33 OHMS 5%
R3336	0662057A77	15K OHMS 5%
R3341	0662057A33	220 OHMS 5%
R3342	0662057A15	39 OHMS 5%
R3343	0662057A25	100 OHMS 5%
R3351	0662057A80	20K OHMS 5%
R3352	0662057A75	12K OHMS 5%
R3353	0662057A97	100K OHM 5%
R3354	0662057B02	150K OHMS 5%
R3355	0662057A80	20K OHMS 5%
R3356	0662057A75	12K OHMS 5%
R3361	0662057A33	220 OHMS 5%
R3362	0662057A17	47 OHMS 5%
R3364	0662057A89	47K OHMS 5%
R3400	0662057A41	470 OHMS 5%
R3401	0662057A36	300 OHMS 5%
R3402	0662057A05	15 OHMS 5%
R3403	0662057A36	300 OHMS 5%
R3404	0662057A89	47K OHMS 5%
R3405	0662057A25	100 OHMS 5%
R3406	0662057A97	100K OHM 5%
R3412	0662057A67	5600 OHMS 5%
R3413	0662057A61	3300 OHMS 5%
R3414	0683962T51	120 5-1
R3415	0662057A14	36 OHM 5 1/8W
R3416	0662057A14	36 OHM 5 1/8W
R3417	0662057A49	1000 OHMS 5%
R3418	0662057A81	22K OHMS 5%
R3421	0662057A87	39K OHMS 5%
R3422	0662057A57	2200 OHMS 5%
R3423	0662057A87	39K OHMS 5%
R3424	0662057C13	2.7 OHMS 5%
R3425	0662057C13	2.7 OHMS 5%
R3426	0662057C13	2.7 OHMS 5%
R3427	0662057C13	2.7 OHMS 5%
R3428	0662057A58	2400 OHMS 5%
R3431	0680194M18	51 OHMS 5% 1W
R3432	0680194M18	51 OHMS 5% 1W
R3441	0662057A87	39K OHMS 5%
R3442	0662057A57	2200 OHMS 5%
R3443	0662057A87	39K OHMS 5%
R3444	0662057C13	2.7 OHMS 5%
R3445	0662057A58	2400 OHMS 5%
R3446	0662057B47	0 OHMS +.050 OHMS
R3450	0683962T51	120 5-1

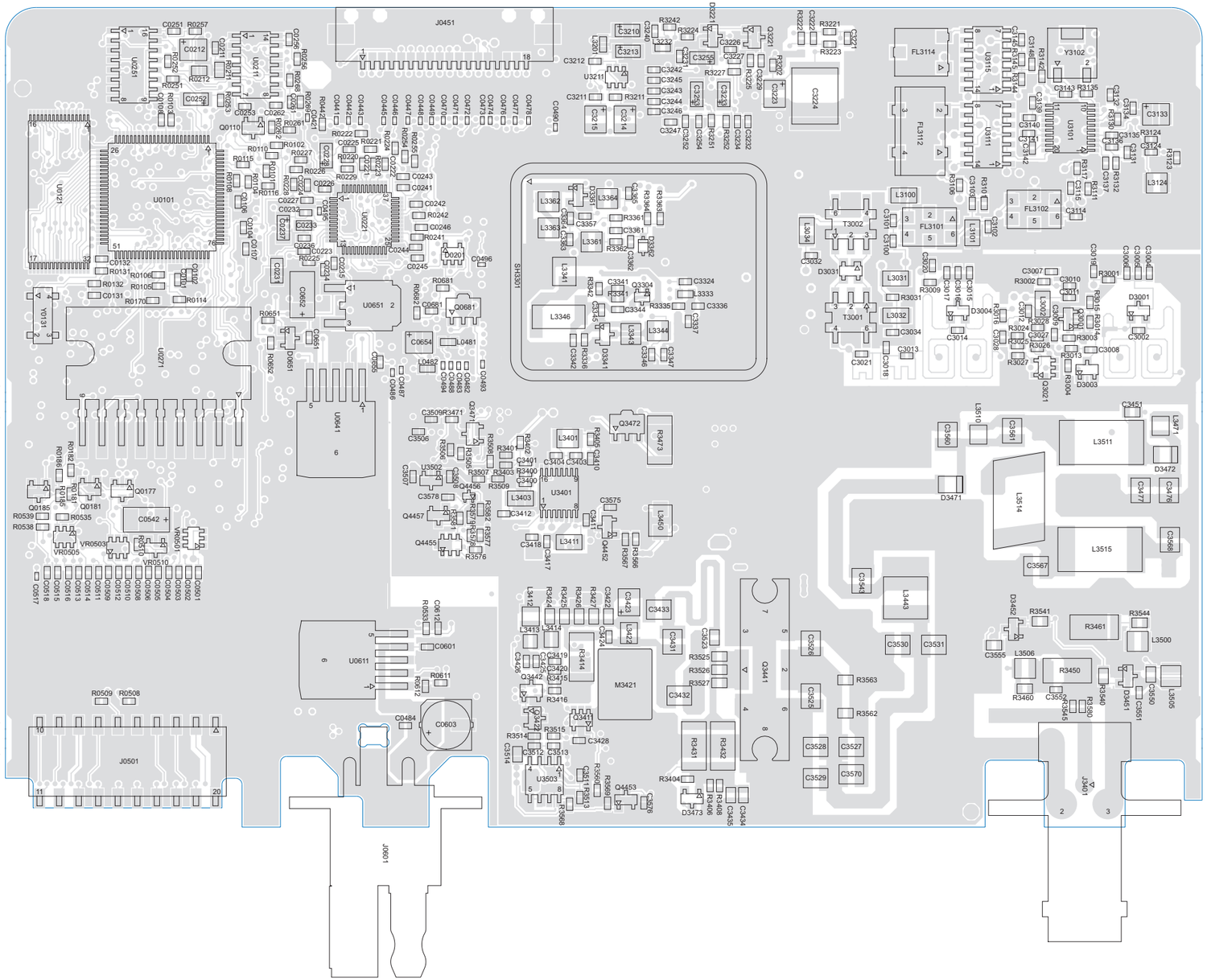
Circuit Ref	Motorola Part No.	Description
R3454	0662057A87	39K OHMS 5%
R3455	0662057A97	100K OHM 5%
R3460	0662057C01	0 OHMS .050 OHMS
R3461	0680194M20	62 OHMS 5% 1W
R3471	0662057A41	470 OHMS 5%
R3473	0680194M18	51 OHMS 5% 1W
R3474	0680194M18	51 OHMS 5% 1W
R3475	0662057A73	10K OHMS 5%
R3501	0662057A69	6800 OHM 5 1/8W
R3502	0662057A87	39K OHMS 5%
R3504	0662057A73	10K OHMS 5%
R3505	0662057B09	300K OHMS
R3507	0662057A80	20K OHMS 5%
R3508	0662057A97	100K OHM 5%
R3509	0662057A49	1000 OHMS 5%
R3510	0662057C01	0 OHMS .050 OHMS
R3511	0662057R19	100 OHMS 1%
R3512	0662057P95	100.0K 1%
R3515	0662057P95	100.0K 1%
R3517	0662057C88	3600 OHMS 5%
R3518	0682089V01	SMT .01 2W
R3525	0662057C13	2.7 OHMS 5%
R3526	0662057C13	2.7 OHMS 5%
R3527	0662057C13	2.7 OHMS 5%
R3540	0662057C75	1000 OHMS 5%
R3541	0662057C01	0 OHMS .050 OHMS
R3545	0662057A89	47K OHMS 5%
R3555	0662057C99	10K OHMS 5%
R3556	0662057B06	220K OHMS 5%
R3560	0662057B47	0 OHMS +.050 OHMS
R3561	0662057B20	820K OHMS 5%
R3562	0662057D48	1.0 MEG OHMS 5%
R3563	0662057D48	1.0 MEG OHMS 5%
RT3501	0605621T02	TMTR CHIP SURFACE MT
SH3301	2602641Y02	SHIELD, ARIANE VCO
T3001	2508396X02	TRANSFORMER
T3002	2508397X02	TRANSFORMER
U3101	5186144B01	FM IF IC SA616
U3111	5102463J52	MC74HC4066D QUAD ANALOG SWITCH
U3115	5102463J52	MC74HC4066D QUAD ANALOG SWITCH
U3201	5185963A27	IC TESTED AT25016 48 PIN GFP
U3211	5105739X05	IC SOT 5V HI-PRECISION REGULAT
U3301	5105750U54	IC PKG DIE VCO BUFFER
U3401	5185130C65	IC VHF/UHF/800 MHZ LDMOS DRIVER
U3402	5109731C21	C OP AMP LM6142BIM 8SO
U3501	5185765B26	IC PWR CTRL IN MOS20
U3502	5185963A15	IC TEMP SENSOR 1M50C
U3503	5109731C21	C OP AMP LM6142BIM 8SO
Y3101	4802245J84 4880606B09	2ND OSC XTAL 44.395 MHZ 3rd overtone crystal fundamental crystal
Y3102	9186145B02	CER.DISCR. CDBCA455CX36-TC
Y3263	4886182B01	VCTCXO 16.8MHZ 2PPM TTS05V

* Motorola Depot Servicing only

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

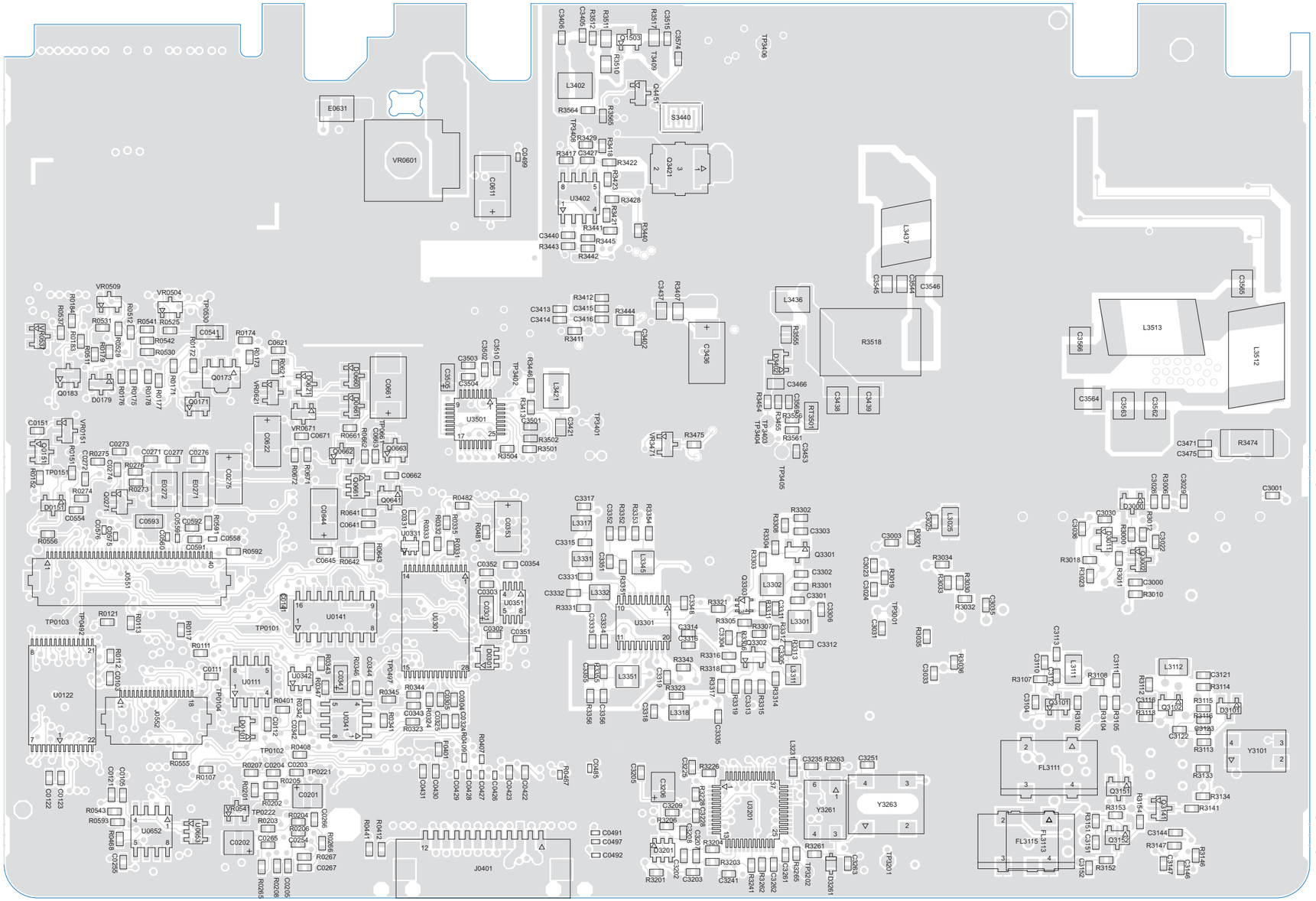
† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

4.0 VHF (136-174 MHz) 25-45W LDMOS PCB 8471234L02, Schematics, and Parts Lists



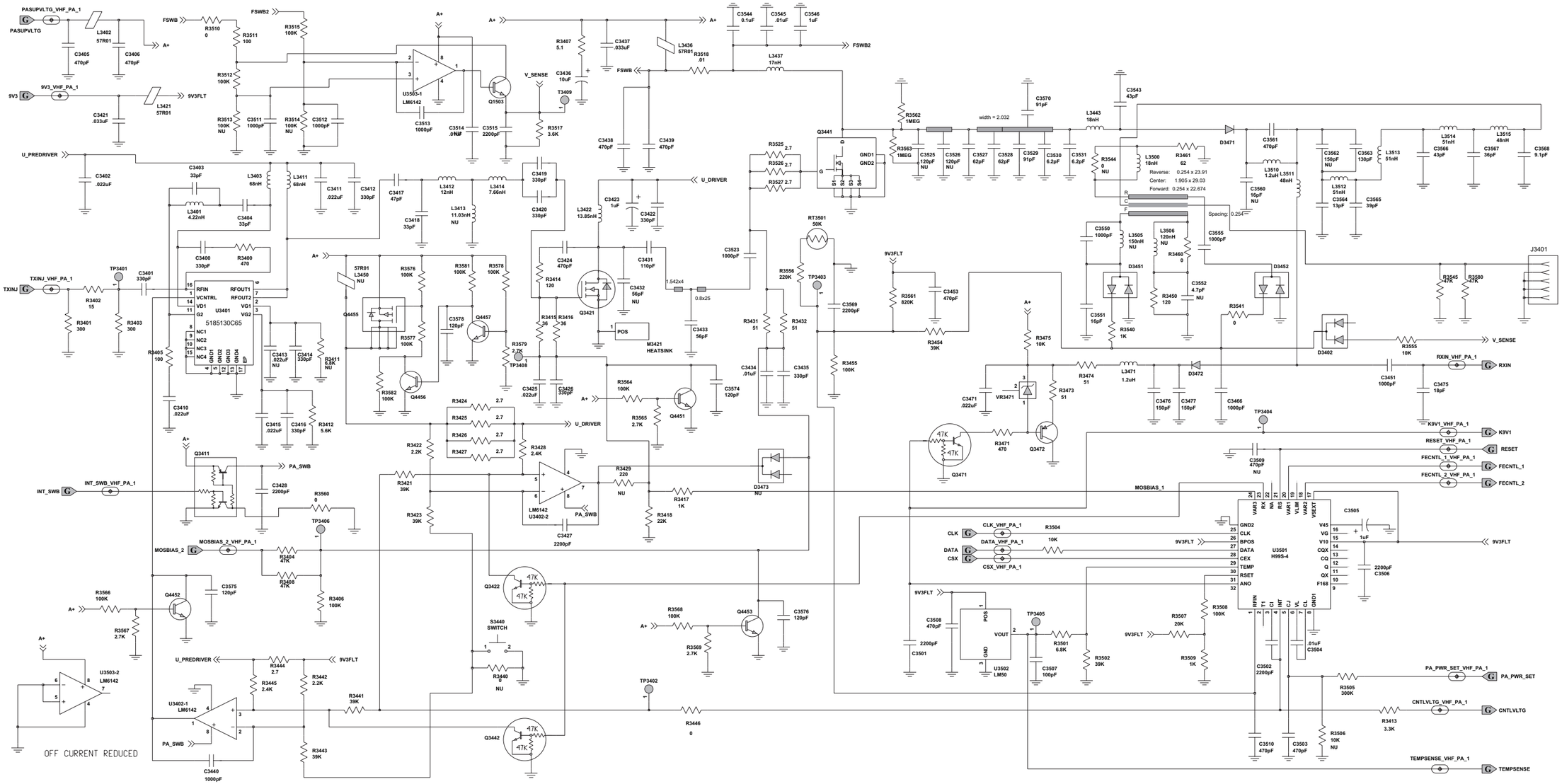
VHF (136-174 MHz) 25-45W 8471234L02 Top Side

6881091C63-C



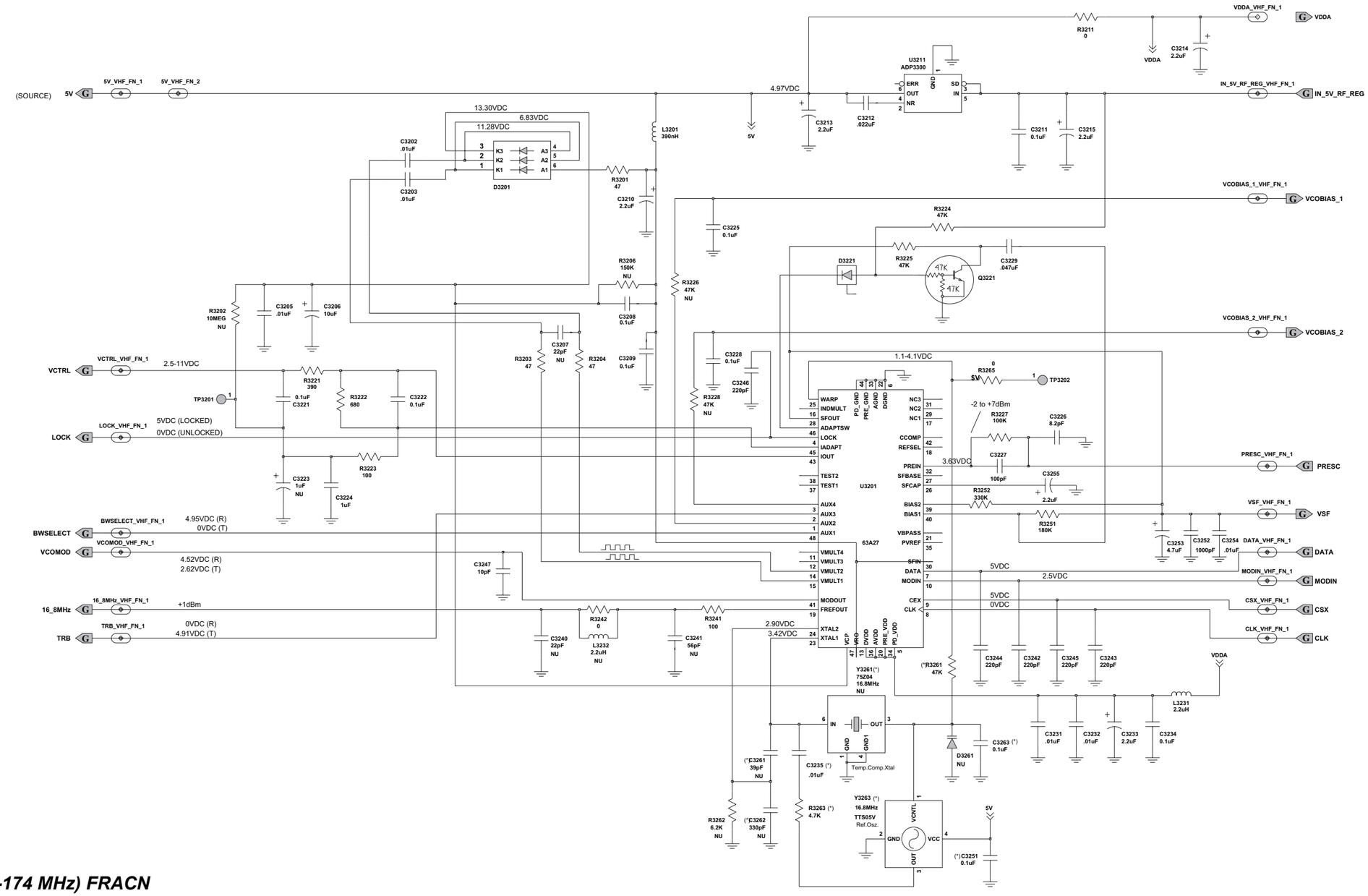
VHF (136-174 MHz) 25-45W 8471234L02 Bottom Side

6881091C63-C

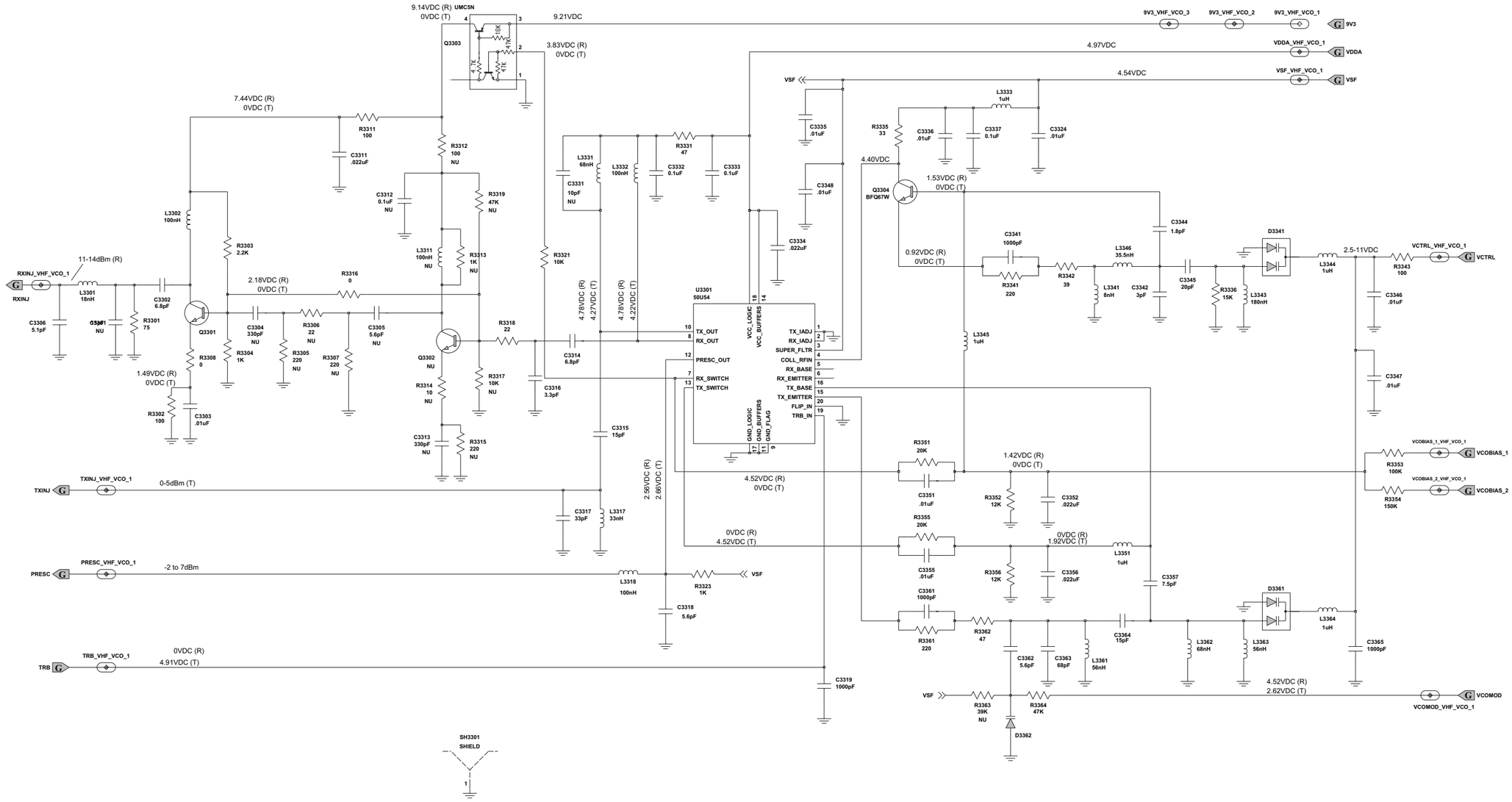


VHF (136-174 MHz) Power Amplifier 25-45W

6881091C63-C

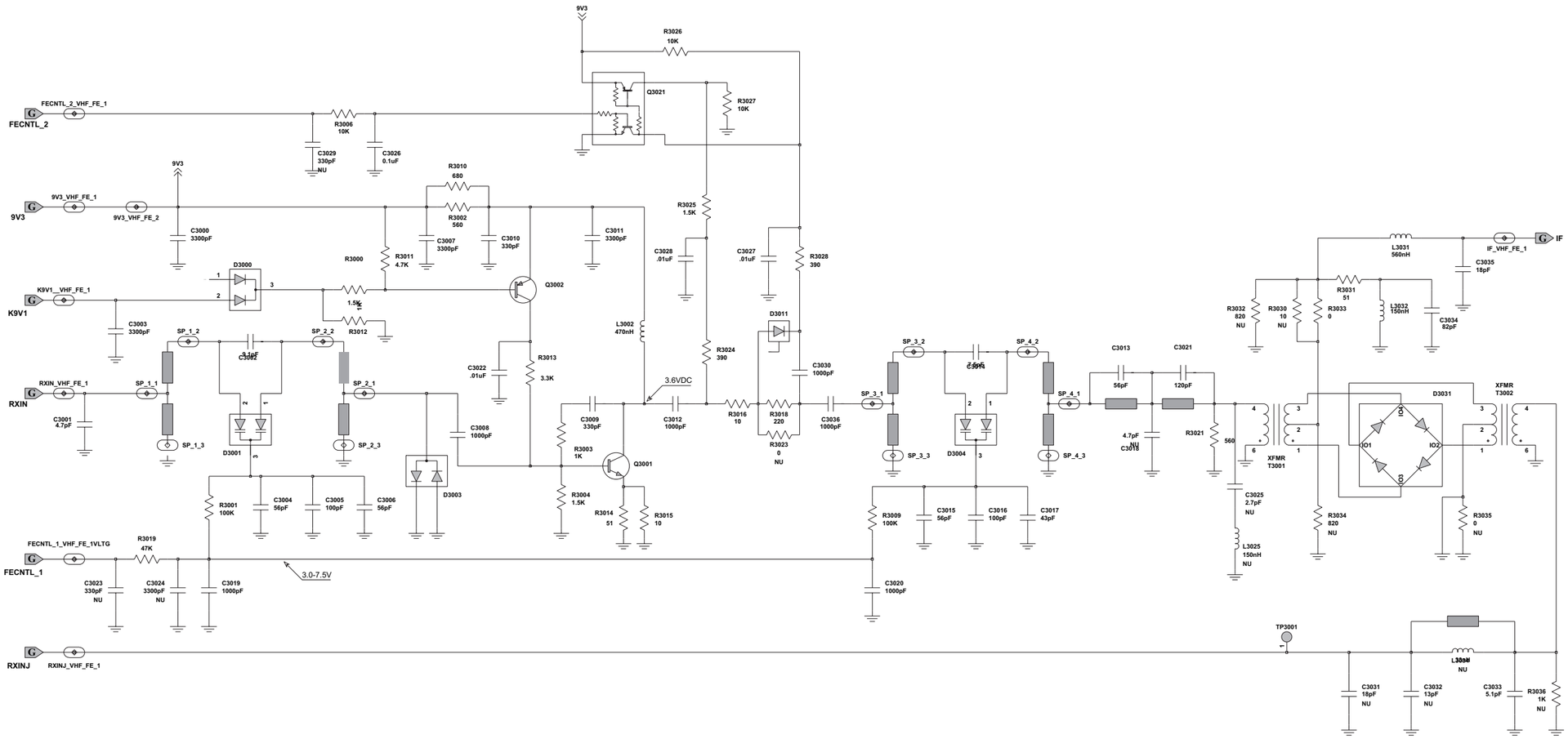


VHF (136-174 MHz) FRACN



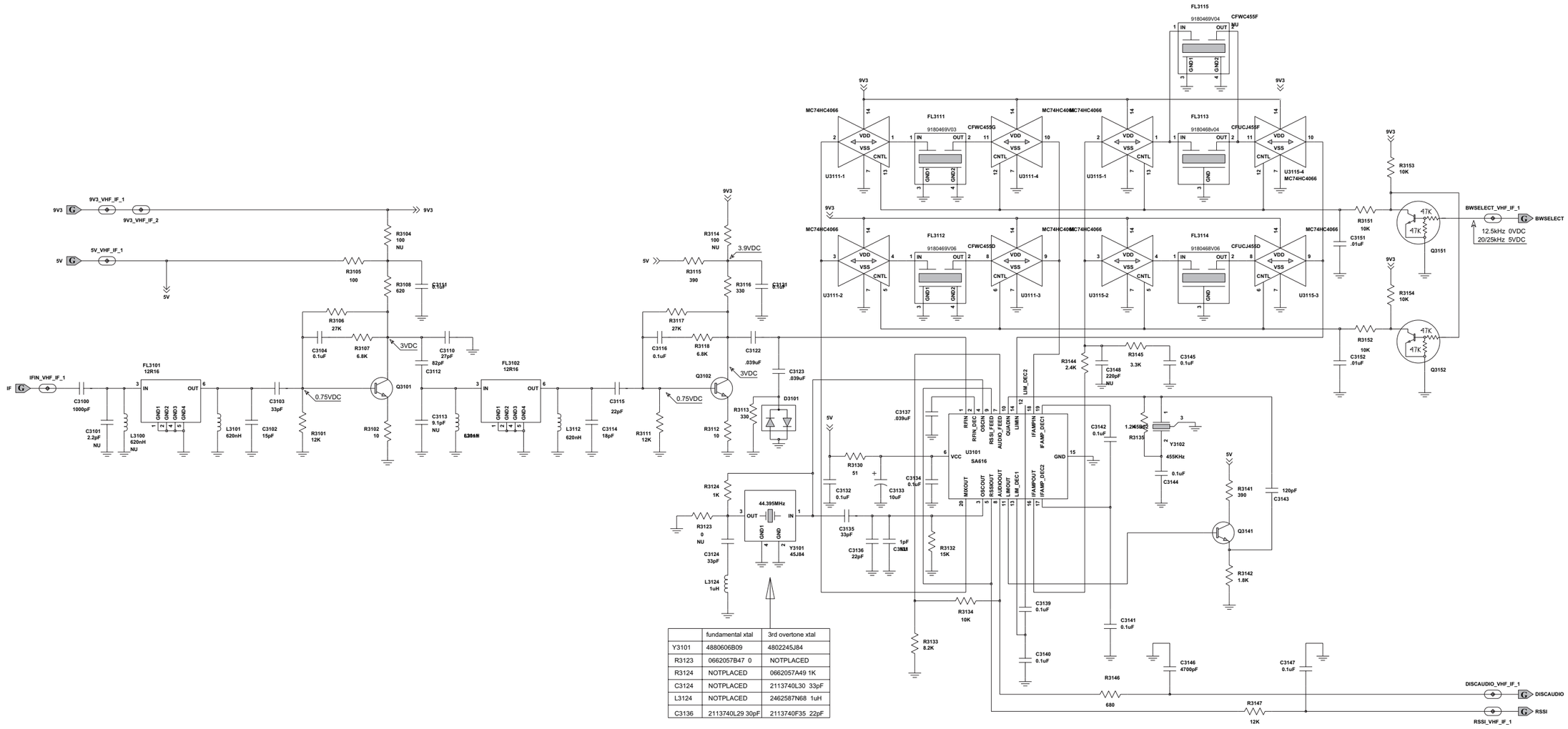
VHF (136-174 MHz) Voltage Controlled Oscillator

6881091C63-C



VHF (136-174 MHz) Receiver Front End

3



	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

VHF (136-174 MHz) IF

VHF PCB 8471234L02 Parts List

Circuit Ref	Motorola Part No.	Description
C3000	2113945L37	CAP 3300 PF
C3001	2113944C73	CAP 6.8 PF
C3002	2113944C76	CAP 9.1 PF
C3003	2113945L37	CAP 3300 PF
C3004	2113944C39	CAP 56 PF
C3005	2113944C45	CAP 100 PF
C3006	2113944C39	CAP 56 PF
C3007	2113945L37	CAP 3300 PF
C3008	2113945L25	CAP 1000 PF
C3009	2113945L13	CAP 330 PF
C3010	2113945L13	CAP 330 PF
C3011	2113945L37	CAP 3300 PF
C3012	2113945L25	CAP 1000 PF
C3013	2113944C39	CAP 56 PF
C3014	2113944C74	CAP 7.5 PF
C3015	2113944C39	CAP 56 PF
C3016	2113944C45	CAP 100 PF
C3017	2113944C84	CAP 43 PF
C3019	2113945L25	CAP 1000 PF
C3020	2113945L25	CAP 1000 PF
C3021	2113944C46	CAP 120 PF
C3022	2113945L49	CAP 1 UF
C3025	2113944C19	CAP 3.6 PF
C3026	2113945C31	CAP 0.1 UF
C3027	2113945L49	CAP 1 UF
C3028	2113945L49	CAP 1 UF
C3030	2113945L25	CAP 1000 PF
C3033	2113944C70	CAP 5.1 PF
C3034	2113944C43	CAP 82 PF
C3035	2113944C33	CAP 18 PF
C3036	2113945L25	CAP 1000 PF
C3100	2113945L25	CAP 1000 PF
C3102	2113944C32	CAP 15 PF
C3103	2113944C36	CAP 33 PF
C3104	2113945C31	CAP 0.1 UF
C3110	2113944C61	CAP 0.5 PF
C3111	2113945C31	CAP 0.1 UF
C3112	2113944C36	CAP 33 PF
C3113	2113944C75	CAP 8.2 PF
C3114	2113944C71	CAP 5.6 PF
C3115	2113944C32	CAP 15 PF
C3116	2113945C31	CAP 0.1 UF
C3121	2113945C31	CAP 0.1 UF
C3122	2113945C26	CAP 39 UF
C3123	2113945C26	CAP 39 UF
C3124	2113944M30	CAP 33 PF
C3132	2113945C31	CAP 0.1 UF
C3133	2313960D07	CAP 10 UF
C3134	2113945C31	CAP 0.1 UF
C3135	2113944M30	CAP 33 PF
C3136	2113944C34	CAP 22 PF
C3137	2113945C26	CAP 39 UF
C3139	2113945C31	CAP 0.1 UF
C3140	2113945C31	CAP 0.1 UF
C3141	2113945C31	CAP 0.1 UF
C3142	2113945C31	CAP 0.1 UF
C3143	2113944C46	CAP 120 PF
C3144	2113945C31	CAP 0.1 UF
C3145	2113945C31	CAP 0.1 UF
C3146	2113945L41	CAP 4700 PF
C3147	2113945C31	CAP 0.1 UF
C3151	2113945L49	CAP 1 UF
C3152	2113945L49	CAP 1 UF
C3202	2113945L49	CAP 1 UF
C3203	2113945L49	CAP 1 UF
C3205	2113945L49	CAP 1 UF
C3206	2313960D07	CAP 10 UF
C3208	2113945C31	CAP 0.1 UF
C3209	2113945C31	CAP 0.1 UF
C3210	2313960B28	CAP 2.2 UF
C3211	2113945C31	CAP 0.1 UF
C3212	2113945C04	CAP 22000 PF
C3213	2313960B28	CAP 2.2 UF
C3214	2313960C78	CAP 2.2 UF
C3215	2313960C78	CAP 2.2 UF
C3221	2113945C31	CAP 0.1 UF
C3222	2113945C31	CAP 0.1 UF
C3223	2115358H25	CAP 1 UF
C3225	2113945C31	CAP 0.1 UF
C3226	2113944C75	CAP 8.2 PF
C3227	2113944C45	CAP 100 PF
C3228	2113945C31	CAP 0.1 UF
C3229	2113945C27	CAP 47 UF
C3231	2113945L49	CAP 1 UF
C3232	2113945L49	CAP 1 UF
C3233	2313960B28	CAP 2.2 UF
C3234	2113945C31	CAP 0.1 UF
C3235	2113945L49	CAP 1 UF
C3242	2113944C02	CAP 220 PF
C3243	2113944C02	CAP 220 PF
C3244	2113944C02	CAP 220 PF
C3245	2113944C02	CAP 220 PF
C3246	2113944C02	CAP 220 PF
C3247	2113944C30	CAP 10 PF
C3251	2113945C31	CAP 0.1 UF
C3252	2113945L25	CAP 1000 PF
C3253	2313960B30	CAP 4.7 UF
C3254	2113945C31	CAP 0.1 UF
C3255	2313960B28	CAP 2.2 UF
C3263	2113945C31	CAP 0.1 UF
C3302	2113944C73	CAP 6.8 PF
C3303	2113945L49	CAP 1 UF
C3306	2113944C70	CAP 5.1 PF
C3311	2113945C04	CAP 22000 PF
C3314	2113944C73	CAP 6.8 PF
C3315	2113944C32	CAP 15 PF
C3316	2113944C18	CAP 3.3 PF
C3317	2113944C36	CAP 33 PF
C3318	2113944C71	CAP 5.6 PF
C3319	2113945L25	CAP 1000 PF
C3324	2113945L49	CAP 1 UF
C3332	2113945C31	CAP 0.1 UF
C3333	2113945C31	CAP 0.1 UF
C3334	2113945C04	CAP 22000 PF
C3335	2113945L49	CAP 1 UF
C3336	2113945L49	CAP 1 UF
C3337	2113945C31	CAP 0.1 UF
C3341	2113945L25	CAP 1000 PF
C3342	2113944M05	CAP 3 PF
C3344	2113944C65	CAP 1.2 PF
C3345	2113944M25	CAP 20 PF
C3346	2113945L49	CAP 1 UF
C3347	2113945L49	CAP 1 UF
C3348	2113945L49	CAP 1 UF
C3351	2113945L49	CAP 1 UF
C3352	2113945C04	CAP 22000 PF
C3355	2113945L49	CAP 1 UF
C3356	2113945C04	CAP 22000 PF
C3357	2113944C74	CAP 7.5 PF
C3361	2113945L25	CAP 1000 PF
C3362	2113944C72	CAP 6.2 PF
C3363	2113944C41	CAP 68 PF
C3364	2113944C31	CAP 12 PF
C3365	2113945L25	CAP 1000 PF
C3400	2113944C04	CAP 330 PF
C3401	2113944C04	CAP 330 PF
C3402	2113945C04	CAP 22UF
C3403	2113944C36	CAP 33 PF
C3404	2113944C36	CAP 33 PF
C3405	2113944C06	CAP 470 PF
C3406	2113944C06	CAP 470 PF
C3410	2113945C04	CAP 22UF
C3411	2113945C04	CAP 22UF
C3412	2113944C04	CAP 330 PF
C3413	2113945C31	CAP .10 UF
C3414	2113944C04	CAP 330 PF
C3415	2113945C31	CAP .10 UF
C3416	2113944C04	CAP 330 PF
C3417	2113944C38	CAP 47 PF
C3418	2113944C36	CAP 33 PF
C3419	2113944C04	CAP 330 PF
C3420	2113944C04	CAP 330 PF
C3421	2113945G57	CAP 33000 PF
C3422	2113944F04	CAP 330 PF
C3423	2313960C26	CAP 1 UF
C3424	2113944C02	CAP 220 PF
C3425	2113945C25	CAP 33 UF
C3426	2113944C04	CAP 330 PF
C3427	2113945L33	CAP 2200 PF
C3428	2113945L33	CAP 2200 PF
C3431	2111078B43	CAP 110 PF
C3433	2111078B36	CAP 56 PF
C3434	2113945G45	CAP 10000 PF
C3435	2113944F04	CAP 330 PF
C3436	2313960G32	CAP 10 UF
C3437	2113945G57	CAP 33000 PF
C3438	2111078B59	CAP 470 PF
C3439	2111078B59	CAP 470 PF
C3440	2113945L25	CAP 1000 PF
C3451	2113944F07	CAP 1000 PF
C3453	2113944C06	CAP 470 PF
C3466	2113944F07	CAP 1000 PF
C3471	2113945C04	CAP 22UF
C3475	2113944C33	CAP 18 PF
C3476	2111078B47	CAP 150 PF
C3477	2111078B47	CAP 150 PF
C3501	2113945L33	CAP 2200 PF
C3502	2113945L33	CAP 2200 PF
C3503	2113944C06	CAP 470 PF
C3504	2113945L49	CAP 1 UF
C3505	2313960B01	CAP 1 UF
C3506	2113945L33	CAP 2200 PF
C3507	2113944C45	CAP 100 PF
C3508	2113944C06	CAP 470 PF
C3510	2113944C06	CAP 470 PF
C3511	2113945L25	CAP 1000 PF

Circuit Ref	Motorola Part No.	Description
C3512	2113945L25	CAP 1000 PF
C3514	2113945G45	CAP 10000 PF
C3515	2113945L33	CAP 2200 PF
C3523	2113944F07	CAP 1000 PF
C3527	2111078B37	CAP 62 PF
C3528	2111078B37	CAP 62 PF
C3529	2111078B41	CAP 91 PF
C3530	2111078B08	CAP 6.2 PF
C3531	2111078B08	CAP 6.2 PF
C3543	2111078B33	CAP 43 PF
C3544	2113945G91	CAP 100000 PF
C3545	2113945G45	CAP 10000 PF
C3546	2113955E01	CAP 1 UF
C3550	2113944F07	CAP 1000 PF
C3551	2113944C79	CAP 16 PF
C3555	2113944F07	CAP 1000 PF
C3561	2111078B59	CAP 470 PF
C3563	2111078B45	CAP 130 PF
C3564	2111078B12	CAP 9.1 PF
C3565	2111078B32	CAP 39 PF
C3566	2111078B33	CAP 43 PF
C3567	2111078B31	CAP 36 PF
C3568	2111078B14	CAP 11 PF
C3569	2113945L33	CAP 2200 PF
C3570	2111078B41	CAP 91 PF
C3574	2113944C46	CAP 120 PF
C3575	2113944C46	CAP 120 PF
C3576	2113944C46	CAP 120 PF
C3578	2113944C46	CAP 120 PF
D3000	4813978C02	DIODE DUAL 70V 5B
D3001	4885094Y01	DIODE VARACTOR ISV228
D3003	4815048H01	DIODE MMBD353 DUAL
D3004	4885094Y01	DIODE VARACTOR ISV228
D3011	4813974A06	DIODE PIN SOT-23
D3031	4886143B01	WM MIXER QUAD RING DIODE
D3101	4815048H01	DIODE MMBD353 DUAL
D3201	4815011H01	DIODE TRIPLE
D3221	4813974A05	DIODE MMBD301L
D3341	4885094Y01	DIODE VARACTOR ISV228
D3361	4885094Y01	DIODE VARACTOR ISV228
D3362	4885055Y01	DIODE VARACTOR 15V
D3402	4813978C02	DIODE DUAL 70V 5B
D3451	4813974A21	DIODE BAS70-04
D3452	4813974A21	DIODE BAS70-04
D3471	4802482J02	DIODE PIN SMD
D3472	4802482J02	DIODE PIN SMD

Circuit Ref	Motorola Part No.	Description
FL3101	9180112R16	44.85 MHZ XTAL FILTER
FL3102	9180112R16	44.85 MHZ XTAL FILTER
FL3111	9115811H01	6 ELEMENT XTAL FILTER
FL3112	9115811H04	6 ELEMENT XTAL FILTER
FL3114	9180468V06	4 ELEMENT XTAL FILTER
FL3115	9115811H02	6 ELEMENT XTAL FILTER
J3401	0986166B01	BNC RF CONNECTOR
L3002	2414032D23	IDCTR 470 NH
L3025	2414032D17	IDCTR 150 NH
L3031	2414032D24	IDCTR 560 NH
L3032	2414032D17	IDCTR 150 NH
L3101	2414032D25	IDCTR 620 NH
L3111	2414032D25	IDCTR 620 NH
L3112	2414032D25	IDCTR 620 NH
L3124	2414032B68	IDCTR 1 UH
L3201	2414017Q42	IDCTR 390 NH
L3231	2414017Q20	IDCTR 2.2 UH
L3301	2414032B44	IDCTR 18 NH
L3302	2414032B53	IDCTR 100 NH
L3317	2414032F28	IDCTR 33 NH
L3318	2414032F34	IDCTR 100 NH
L3331	2414032F32	IDCTR 68 NH
L3332	2414032F15	IDCTR 100 NH
L3333	2414017Q47	IDCTR 1 UH
L3341	2415385H01	IDCTR 8 NH
L3343	2414032B56	IDCTR 180 NH
L3344	2414032B68	IDCTR 1 UH
L3345	2414032B68	IDCTR 1 UH
L3346	2415385H07	IDCTR 35.5 NH
L3351	2414032B68	IDCTR 1 UH
L3361	2414032B50	IDCTR 56 NH
L3362	2414032B51	IDCTR 68 NH
L3363	2414032B50	IDCTR 56 NH
L3364	2414032B68	IDCTR 1 UH
L3401	2460591A01	IDCTR 4.22 NH
L3402	2415954H02	IDCTR BEAD CHIP
L3403	2414032D13	IDCTR 68 NH
L3411	2414032D13	IDCTR 68 NH
L3412	2414032B42	IDCTR 12 NH
L3414	2460591A11	IDCTR 7.66 NH
L3421	2415954H02	IDCTR BEAD CHIP
L3422	2460591C23	IDCTR 13.85 NH
L3436	2415954H02	IDCTR BEAD CHIP
L3437	2460592A01	IDCTR 17 NH
L3443	2485873L01	IDCTR 18 NH
L3471	2414032B69	IDCTR 1200 NH
L3500	2414032B42	IDCTR 12 NH

Circuit Ref	Motorola Part No.	Description
L3510	2414032B69	IDCTR 1200 NH
L3511	2485873L05	IDCTR 48 NH
L3512	2460592B01	IDCTR 51 NH
L3513	2460592B01	IDCTR 51 NH
L3514	2460592B01	IDCTR 51 NH
L3515	2485873L05	IDCTR 48 NH
M3421	2686201B02	HEATSPREADER
Q1503	4813973M07	TSTR MMBT3904
Q3001	4802197J95	TSTR PBR941
Q3002	4813973A13	TSTR PNP TO-236
Q3021	4816097H01	TSTR FMC2 RH
Q3101	4802197J95	TSTR PBR941
Q3102	4802197J95	TSTR PBR941
Q3141	4813973M07	TSTR MMBT3904
Q3151	4813973A42	TSTR NPN SC-59
Q3152	4813973A42	TSTR NPN SC-59
Q3221	4813973A42	TSTR NPN SC-59
Q3301	4802197J95	TSTR PBR941
Q3303	4815055H01	TSTR UMC5NT2G DUAL
Q3304	4805218N63	TSTR BFQ67W
Q3411	4816097H01	TSTR FMC2 RH
Q3421	4813976A04	TSTR MRF1518 LDMOS
Q3422	4813973A42	TSTR NPN 47K
Q3441	4816121H01	LD MOS SMT 55W 520MHZ 12V
Q3442	4813973A42	TSTR NPN 47K
Q3471	4813973A42	TSTR NPN 47K
Q3472	4816049H01	SOT TRANS
Q4451	4813973M07	TSTR MMBT3904
Q4452	4813973M07	TSTR MMBT3904
Q4455	4871309S01	XSTR SI3455D
Q4456	4816000H01	TSTR DTC114YETL
Q4457	4813973M07	TSTR MMBT3904
R3000	0613952H77	RES 1500 OHM
R3001	0613952J25	RES 100K OHM
R3002	0613952H67	RES 560 OHM
R3003	0613952H73	RES 1000 OHM
R3004	0613952H77	RES 1500 OHM
R3006	0613952J01	RES 10K OHM
R3009	0613952J25	RES 100K OHM
R3010	0613952H69	RES 680 OHM
R3011	0613952H89	RES 4700 OHM
R3012	0613952H73	RES 1000 OHM
R3013	0613952H85	RES 3300 OHM
R3014	0613952H42	RES 51 OHM
R3015	0613952H25	RES 10 OHM
R3016	0613952H25	RES 10 OHM

Circuit Ref	Motorola Part No.	Description
R3018	0613952H57	RES 220 OHM
R3019	0613952J17	RES 47K OHM
R3021	0613952H67	RES 560 OHM
R3024	0613952H63	RES 390 OHM
R3025	0613952H77	RES 1500 OHM
R3026	0613952J01	RES 10K OHM
R3027	0613952J01	RES 10K OHM
R3028	0613952H63	RES 390 OHM
R3031	0613952H42	RES 51 OHM
R3033	0613952G67	RES 0 OHM
R3101	0613952J03	RES 12K OHM
R3102	0613952H25	RES 10 OHM
R3105	0613952H49	RES 100 OHM
R3106	0613952J11	RES 27K OHM
R3107	0613952H82	RES 2400 OHM
R3108	0613952H75	RES 1200 OHM
R3111	0613952J03	RES 12K OHM
R3112	0613952H25	RES 10 OHM
R3113	0613952H61	RES 330 OHM
R3115	0613952H63	RES 390 OHM
R3116	0613952H81	RES 2200 OHM
R3117	0613952J11	RES 27K OHM
R3118	0613952H82	RES 2400 OHM
R3124	0613952H73	RES 1000 OHM
R3130	0613952H42	RES 51 OHM
R3132	0613952J05	RES 15K OHM
R3133	0613952H89	RES 4700 OHM
R3134	0613952H95	RES 8200 OHM
R3135	0613952H75	RES 1200 OHM
R3141	0613952H63	RES 390 OHM
R3142	0613952H79	RES 1800 OHM
R3144	0613952H82	RES 2400 OHM
R3145	0613952H85	RES 3300 OHM
R3146	0613952H69	RES 680 OHM
R3147	0613952J03	RES 12K OHM
R3151	0613952J01	RES 10K OHM
R3152	0613952J01	RES 10K OHM
R3153	0613952J01	RES 10K OHM
R3154	0613952J01	RES 10K OHM
R3201	0613952H41	RES 47 OHM
R3203	0613952H41	RES 47 OHM
R3204	0613952H41	RES 47 OHM
R3211	0613952G67	RES 0 OHM
R3221	0613952H63	RES 390 OHM
R3222	0613952H69	RES 680 OHM
R3223	0613952H49	RES 100 OHM
R3224	0613952J17	RES 47K OHM

Circuit Ref	Motorola Part No.	Description
R3225	0613952J17	RES 47K OHM
R3227	0613952J25	RES 100K OHM
R3241	0613952H49	RES 100 OHM
R3242	0613952G67	RES 0 OHM
R3251	0613952J31	RES 180K OHM
R3252	0613952J37	RES 330K OHM
R3261	0613952J17	RES 47K OHM
R3263	0613952H89	RES 4700 OHM
R3265	0613952G67	RES 0 OHM
R3301	0613952H46	RES 75 OHM
R3302	0613952H49	RES 100 OHM
R3303	0613952H81	RES 2200 OHM
R3304	0613952H73	RES 1000 OHM
R3308	0613952G67	RES 0 OHM
R3311	0613952H49	RES 100 OHM
R3316	0613952G67	RES 0 OHM
R3318	0613952H33	RES 22 OHM
R3321	0613952J01	RES 10K OHM
R3323	0613952H73	RES 1000 OHM
R3331	0613952H41	RES 47 OHM
R3335	0613952H37	RES 33 OHM
R3336	0613952J05	RES 15K OHM
R3341	0613952H57	RES 220 OHM
R3342	0613952H39	RES 39 OHM
R3343	0613952H49	RES 100 OHM
R3351	0613952J08	RES 20K OHM
R3352	0613952J03	RES 12K OHM
R3353	0613952J25	RES 100K OHM
R3354	0613952J29	RES 150K OHM
R3355	0613952J08	RES 20K OHM
R3356	0613952J03	RES 12K OHM
R3361	0613952H57	RES 220 OHM
R3362	0613952H41	RES 47 OHM
R3364	0613952J17	RES 47K OHM
R3400	0613952H65	RES 470 OHM
R3401	0613952H60	RES 300 OHM
R3402	0613952H29	RES 15 OHM
R3403	0613952H60	RES 300 OHM
R3405	0613952H49	RES 100 OHM
R3406	0613952J25	RES 100K OHM
R3407	0613958H18	RES 5.1 OHM
R3408	0613952J17	RES 47K OHM
R3411	0613952H70	RES 750 OHM
R3412	0613952H73	RES 1000 OHM
R3413	0613952H85	RES 3300 OHM
R3414	0613959Y51	RES 120 OHM
R3415	0613952H38	RES 36 OHM
R3416	0613952H38	RES 36 OHM
R3417	0613952J11	RES 27K OHM
R3418	0613952J09	RES 22K OHM
R3421	0613952J15	RES 39K OHM
R3422	0613952H81	RES 2200 OHM
R3423	0613952J15	RES 39K OHM
R3424	0613958H11	RES 2.7 OHM
R3425	0613958H11	RES 2.7 OHM
R3426	0613958H11	RES 2.7 OHM
R3427	0613958H11	RES 2.7 OHM
R3428	0613952H82	RES 2400 OHM
R3431	0613959Y42	RES 51 OHM
R3432	0613959Y42	RES 51 OHM
R3441	0613952J15	RES 39K OHM
R3442	0613952H81	RES 2200 OHM
R3443	0613952J15	RES 39K OHM
R3444	0613958H11	RES 2.7 OHM
R3445	0613952H82	RES 2400 OHM
R3446	0613952G67	RES 0 OHM
R3450	0613959Y51	RES 120 OHM
R3454	0613952J15	RES 39K OHM
R3455	0613952J25	RES 100K OHM
R3460	0613958J74	RES 0 OHM
R3461	0613959Y44	RES 62 OHM
R3471	0613952H65	RES 470 OHM
R3473	0613959Y42	RES 51 OHM
R3474	0613959Y42	RES 51 OHM
R3475	0613952J01	RES 10K OHM
R3501	0613952H93	RES 6800 OHM
R3502	0613952J15	RES 39K OHM
R3504	0613952J01	RES 10K OHM
R3505	0613952J36	RES 300K OHM
R3507	0613952J08	RES 20K OHM
R3508	0613952J25	RES 100K OHM
R3509	0613952H73	RES 1000 OHM
R3510	0613958J74	RES 0 OHM
R3511	0613958C01	RES 100 OHM
R3512	0613952F01	RES 100K OHM
R3515	0613952F01	RES 100K OHM
R3517	0613958H86	RES 3600 OHM
R3518	0671463L01	RES 0.01 OHM
R3525	0613958H11	RES 2.7 OHM
R3526	0613958H11	RES 2.7 OHM
R3527	0613958H11	RES 2.7 OHM
R3540	0613958H73	RES 1000 OHM
R3541	0613958J74	RES 0 OHM
R3545	0613952J17	RES 47K OHM
R3555	0613958J01	RES 10K OHM
R3556	0613952J33	RES 220K OHM
R3560	0613952G67	RES 0 OHM
R3561	0613952J47	RES 820K OHM
R3562	0613958J49	RES 1M OHM
R3563	0613958J49	RES 1M OHM
R3564	0613952J25	RES 100K OHM
R3565	0613952H82	RES 2400 OHM
R3566	0613952J25	RES 100K OHM
R3567	0613952H82	RES 2400 OHM
R3568	0613952J25	RES 100K OHM
R3569	0613952H83	RES 2700 OHM
R3576	0613952J25	RES 100K OHM
R3577	0613952J25	RES 100K OHM
R3578	0613952J25	RES 100K OHM
R3579	0613952H82	RES 2400 OHM
R3580	2415347H01	IDCTR 1 UH
R3581	0613952J25	RES 100K OHM
RT3501	0671668L01	TERMISTOR 50K OHM
SH3301	2602641Y03	SHIELD VCO
T3001	2566506A01	BALUN TRANSFORMER
T3002	2566506A02	BALUN TRANSFORMER
U3101	5115281H01	IC FM IF SA616
U3111	5185291Y01	IC SOIC14
U3115	5185291Y01	IC SOIC14
U3201	5185177Y01	IC FRACTN AT25016
U3211	5115026H01	IC LINEAR VOLTAGE REG
U3301	5171121L01	IC PKG DIE VCO BUFFER
U3401	5115678H01	IC RF AMP TSSOP16EP
U3402	5115344H01	IC OP AMP LM6142BIM 8SO
U3501	5185765B26	IC PWR CTRL TQFP32
U3502	5115022H01	IC TEMPERATURE SENSOR 1M50C
U3503	5115344H01	IC OP AMP LM6142BIM 8SO
VR3471	4813977M11	DIODE MBZ5253B
Y3101	4802245J84	XTAL 44.395 MHZ
Y3102	9186145B02	CER DISC CDBCA455CX36-TC
Y3263	4816142H01	XTAL OSC 16.8 MHZ

* Motorola Depot Servicing only

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

Chapter 12: UHF Band 1 (403-470 MHz) 25-40W LDMOS Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF (403-470 MHz) 25-40W LDMOS (Conventional, LTR/PassPort)

Model	Description
AAM25RKC9AA1AN	CDM750, 403-470 MHz, 25-40W, Conv Pref (LDMOS)
AAM25RKD9AA2AN	CDM1250, 403-470 MHz, 25-40W, Conv Pref (LDMOS)
AAM25RKF9AA5AN	CDM1550, 403-470 MHz, 25-40W, Conv Pref (LDMOS)
AAM25RKF9DU5AN	CDM1550•LS, 403-470 MHz, 25-40W, Conv Pref (LDMOS)
AAM25RKF9DP5AN	CDM1550•LS+, 403-470 MHz, 25-40W, Conv Pref (LDMOS)

					Item	Description
X					GCN6112	Control Head, CDM750
	X				GCN6113	Control Head, CDM1250
		X	X	X	GCN6114	Control Head, CDM1550
X	X	X	X		IMUE6024	Tanapa, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	X		IMUE6024_S	Replacement Board, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
				X	PMUE1756	Tanapa, CDM1550•LS+, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
				X	PMUE1756_S	Replacement Board, CDM1550•LS+, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X					6881091C54	User Guide, CDM750
	X				6881091C55	User Guide, CDM1250
		X			6881091C56	User Guide, CDM1550
			X		6881093C32	User Guide, CDM1550•LS
				X	6881094C79	User Guide, CDM1550•LS+

1.2 PRO Series Model Chart

PRO Series, UHF (403-470 MHz) 25-40W LDMOS				
Model				Description
LAM25RKC9AA1AN				PRO3100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
	LAM25RKD9AA2AN			PRO5100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
		LAM25RKF9AA5AN		PRO7100, 403-470 MHz, 25-40W, 12.5/20/25 kHz Ch Sp, Conv Pref (LDMOS)
			Item	Description
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6024	Tanapa, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	IMUE6024_S	Replacement Board, UHF 403-470 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	HAE4002	Antenna, 403-430 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4010	Antenna, 406-420 MHz, 3.5dB Gain Roof Mount (Mini U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**25 - 40W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±2.0 ppm
Power	25-40W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 403-470 MHz
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3W Internal 7.5W External 13W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000Hz @ 20/25 kHz) (300 - 2550Hz @12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of this manual.

2.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS Receiver Front-End

2.1 Receiver Front-End

The receiver is able to cover the UHF range from 403 to 470 MHz. It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. Low-side first injection is used.

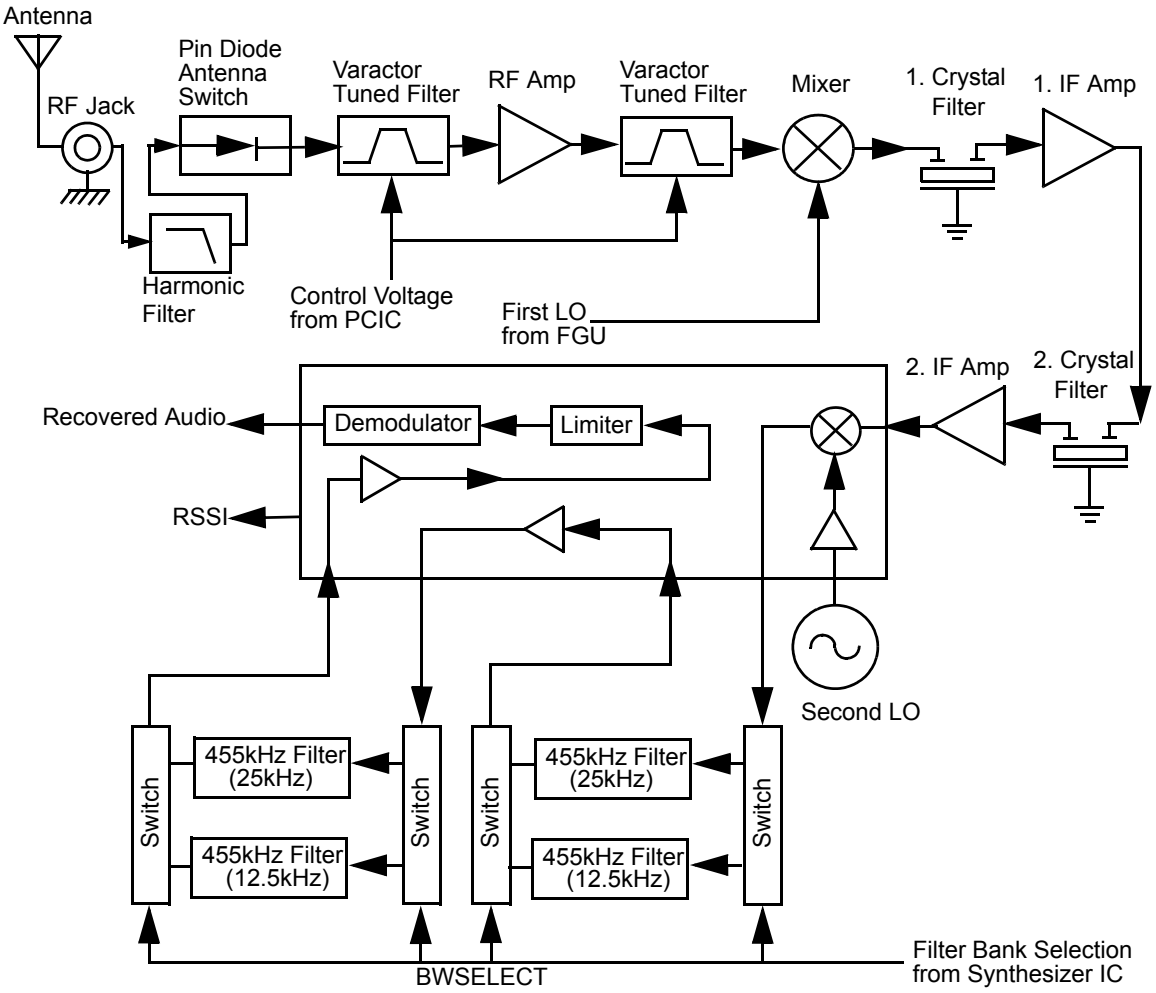


Figure 12-1 UHF Receiver Block Diagram

There are two 2-pole 44.85 MHz crystal filters in the high-IF section and 2 pairs of 455 kHz ceramic filters in the low-IF section to provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuitry, before being applied to the receiver pre-selector filter (C4001, C4002, D4001 and associated components). The 2-pole pre-selector filter tuned by the varactor diodes D4001 and D4002 pre-selects the incoming signal (RXIN) from the antenna switch to reduce spurious effects to following stages. The tuning voltage (FECTRL_1) ranging from 2 volts to 8 volts is controlled by pin 20 of PCIC (U4501) in the Transmitter section. A dual hot carrier diode (D4003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q4003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3V supply via L4003 and R4002. A switchable 3dB pad (R4066, R4007, R4063, R4064 and R4070), controlled via line FECTRL_2 and Q4004 stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. The varactor diodes D4004 and D4005 are controlled by the same signal FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R4013 - R4015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal coming from the front-end is converted to the first IF (44.85 MHz) using a passive double-balanced mixer (D4051). Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T4051 and T4052. The injection signal (RXINJ) coming from the RX VCO buffer (Q4332) is filtered by the low-pass filter consisting of (L4053, L4054, C4053 - C4055) followed by a matching transformer T4052 and has a level of approximately 15dBm.

The mixer IF output signal (IF) from transformer T4501pin 2 is fed to the first two pole crystal filter FL3101. The filter output in turn is matched to the following IF amplifier.

The IF amplifier Q3101 is actively biased by a collector base feedback (R3101, R3106) to a current drain of approximately 5 mA drawn from the voltage 5V. Its output impedance is matched to the second two pole crystal filter FL3102. The signal is further amplified by a pre-amplifier (Q3102) before going into pin 1 of IFIC (U3101).

A dual hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 high IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator (2nd LO) to produce the low IF signal at 455 kHz. The 2nd LO frequency is determined by crystal Y3101. The low IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters FL3112, FL3114 for 20/25 kHz channel spacing or FL3111,FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103 pin 8 (DISCAUDIO) which is fed to the ASFIC_CMP (U0221) pin 2 (part of the controller circuitry).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101 pin 5, having a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101 pin 63) and in addition is available at accessory connector J0501-15.

3.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS Transmitter Power Amplifier (PA) 40W

The radio's 40W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U4401) is adjustable, controlled by pin 4 of PCIC (U4501). It is followed by an LDMOS stage (Q4421) and LDMOS final stage (Q4441).

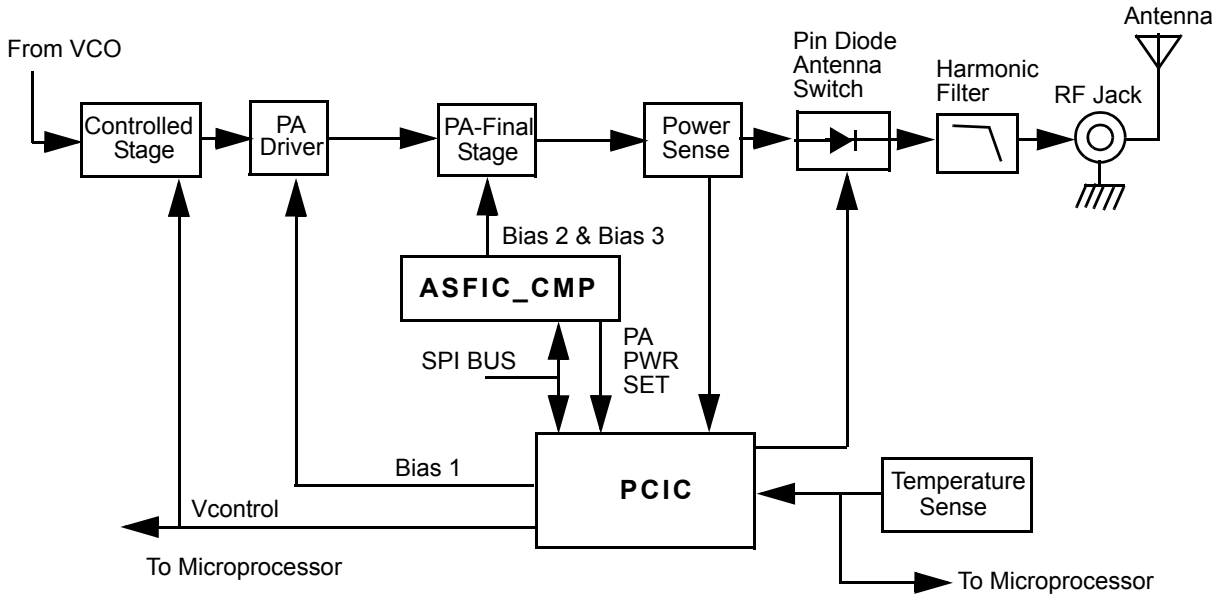


Figure 12-2 UHF Transmitter Block Diagram

Devices U4401, Q4421 and Q4441 are surface mounted. A pressure pad between the board and the radio's cover provides good thermal contact between the devices and the chassis.

3.1 First Power Controlled Stage

The first stage (U4401) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U4401 is controlled by a DC voltage applied to pin 1 from Q4473. The control voltage simultaneously varies the bias of two FET stages within U4401. This biasing point determines the overall gain of U4401 and therefore its output drive level to Q4421, which in turn controls the output power of the PA.

Switch S4440 is a pressure pad with a conductive strip which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S4440 opens and cuts the supply voltage to Q4473 thus disabling control voltage to U4401. This prevents transmitter key up while the devices do not have proper thermal contact to the chassis.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q4421) providing a gain of 12dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by U4501-24 and fed to the gate of Q4421 via the resistive network R4480, R4408, R4415 and R4416.

3.3 Final Stage

The final stage is an LDMOS MRF 1570 device Q4441. It provides a gain of 11dB. It integrates two MRF1535 die inside. These two die are being run in parallel. The output of each of the device (die) inside are combined to constitute the total output power. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 and MOSBIAS_3 are set in transmit mode by the ASFIC and fed to the gate of Q4441 via two resistive network R4631, R4634, R4485, R4486 and R4632, R4635, R4481, R4489. These bias voltages are tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Global Tuner. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device’s drain current is drawn directly from the radio’s DC supply voltage input, PASUPVLTG, via L4421, L4437 and L4436, L4438.

A matching network consisting of C4440-45, C4466-67, C4476-77, C4487, C4491, C4489, C4490, C4455-56, C4449-50 and striplines transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward power delivered by Q4441. The coupled signal is rectified by D4451. The DC voltage is proportional to the RF output power and feeds the RFIN port of the PCIC (U4501 pin 1). The PCIC controls the gain of stage U4401 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

3.5 Antenna Switch

The antenna switch consists of two PIN diodes, D4471 and D4472. In the receive mode, both diodes are off. Signals applied at the antenna jack J4401 are routed, via the harmonic filter, through network L4472, C4474 and C4475, to the receiver input. In the transmit mode, K9V1 turns on Q4471 which enables current sink Q4472, set to 96 mA by R4512 and VR4471. This completes a

DC path from PASUPVLTG, through L4437, D4471, L4472, D4472, L4473, R4496 and the current sink, to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D4471 to the harmonic filter and antenna jack. D4472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L4472 is selected to appear as a broadband lambda/4 wave transmission line, making the short circuit presented by D4472 appear as an open circuit at the junction of D4472 and the receiver path.

3.6 Harmonic Filter

Components L4491-L4493 and L4472, C4448, C4494, C4496 and C4498 form a Butterworth low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R4491 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.7 Power Control

The transmitter uses the Power Control IC (PCIC, U4501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the directional coupler and rectified, to provide a DC voltage to the RFIN port of the PCIC (pin 1) which is proportional to the sampled RF power.

The ASFIC (U0221) has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop to the PCIC via R4483. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which sets the drain current of the first (U4401). This adjusts the transmitter power output to the intended value. Variations in forward transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C4502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power-rise (key-up) and power-decay (de-key) characteristic to minimize splatter into adjacent channels.

U4502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

4.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS Frequency Synthesis

The synthesizer subsystem consists of the reference oscillator (Y4261 or Y4262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U4201), and the Voltage Controlled Oscillator VCO.

4.1 Reference Oscillator

The reference oscillator (Y4262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U4201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U4201 pin 25 to set the frequency of the oscillator. The output of the oscillator (pin 3 of Y4262) is applied to pin 23 (XTAL1) of U4201 via a RC series combination.

In applications where less frequency stability is required the oscillator inside U4201 is used along with an external crystal Y4261, varactor diode D4261, C4261, C4262 and R4262. In this case, Y4262, R4263, C4235 and C4251 are not used. When Y4262 is used, Y4261, D4261, C4261, C4262 and R4262 are not used, and C4263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U4201) consists of a pre-scaler, a programmable loop divider, control divider logic, a phase detector, a charge pump, an A/D converter for low frequency digital modulation, a balance attenuator to balance high frequency analog modulation and low frequency digital modulation, a 13V positive voltage multiplier, a serial interface for control, and finally a super filter for the regulated 5 volts.

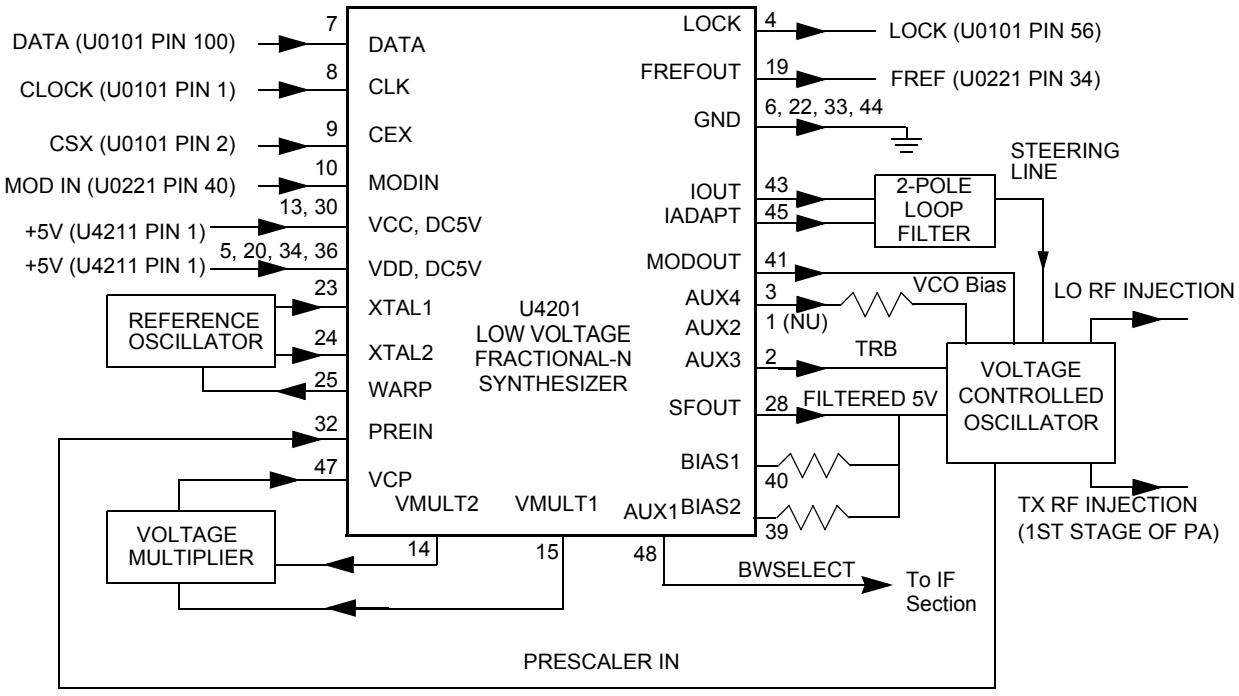


Figure 12-3 UHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U4201 pin 30) supplies an output voltage of 4.5 VDC(VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R4322) and the synthesizer charge pump resistor network (R4251, R4252). The synthesizer supply voltage is provided by the 5V regulator U4211.

In order to generate a high voltage to supply the phase detector (charge pump) output stage at pin 47 VCP (U4201-47), a voltage of 13 VDC is being generated by the positive voltage multiplier circuitry (D4201, C4202, C4203). This voltage multiplier is basically a diode capacitor network driven by two (1.05MHz) 180 degrees out of phase signals (U4201-14 and -15).

Output LOCK (U4201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U4201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via the data line DATA (U4201-7), clock line CLK (U4201-8), and chip enable line CSX (U4201-9).

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U4301), the TX and RX tank circuits, the external RX buffer stages, and the modulation circuitry.

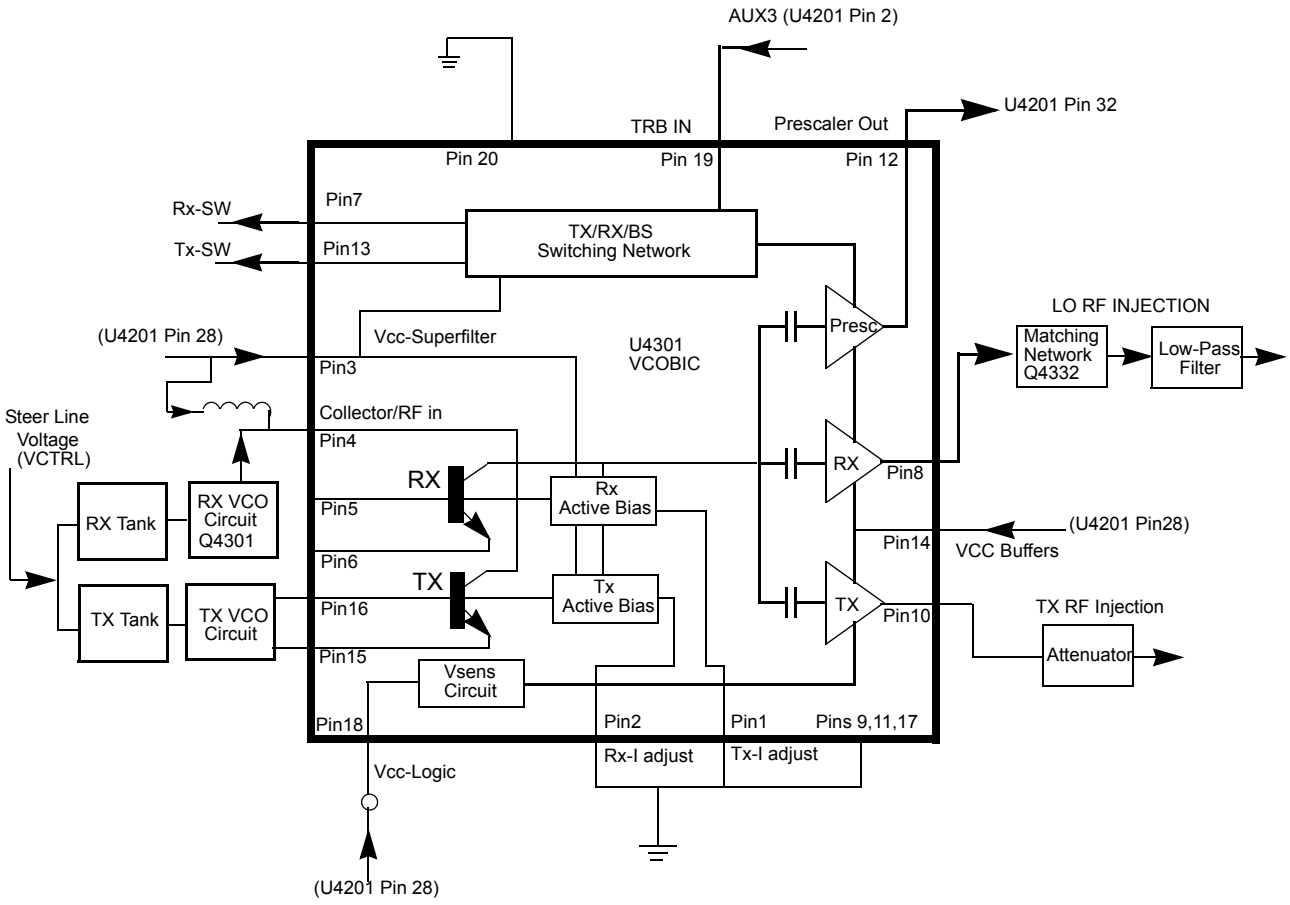


Figure 12-4 UHF VCO Block Diagram

The VCOBIC together with Fractional-N synthesizer (U4201) generates the required frequencies in both transmit and receive modes. The TRB line (U4301 pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and

a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U4301 pin 12 (PRESC_OUT), via a low-pass filter, to pin 32 of U4201 (PREIN).

A steering line voltage (VCTRL) between 3.0V and 10.0V at varactor diode CR4311 will tune the full TX frequency range (TXINJ) from 403 MHz to 470 MHz, and at varactor diodes CR4301, CR4302 and CR4303 will tune the full RX frequency range (RXINJ) from 358 MHz to 425 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, an external transistor Q4301 is used in conjunction with the internal transistor for better side-band noise.

The external RX buffers (Q4332) are enabled by a high at U4201 pin 3 (AUX4) via transistor switch Q4333. In TX mode the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U4201 pin41) is applied modulation circuitry CR4321, R4321, R4322 and C4324, which modulates the TX VCO frequency via coupling capacitor C4321. Varactor CR4321 is biased for linearity from VSF.

4.4 Synthesizer Operation

The complete synthesizer subsystem comprises mainly of low voltage FRAC-N (LVFRACN) IC, Reference Oscillator (crystal oscillator with temperature compensation), charge pump circuitry, loop filter circuitry and DC supply. The output signal PRESC_OUT of the VCOBIC (U4301 pin 12) is fed to pin 32 of U4201 (PREIN) via a low-pass filter (C4229, L4225) which attenuates harmonics and provides the correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U4201) is basically a dual modulus pre-scaler with selectable divider ratios. This divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y4261 or Y4262).

The output signal of the phase detector is a pulsed DC signal which is routed to the charge pump. The charge pump outputs a current at pin 43 of U4201 (IOUT). The loop filter (which consists of R4221-R4223, C4221-C4225,L4221) transforms this current into a voltage that is applied to the varactor diodes CR4311 for transmit, CR4301, CR4302 & CR4303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U4201-40) or BIAS 2 (U4201-39). The currents are set by the value of R4251 or R4252 respectively. The selection of the three different bias sources is done by software programming.

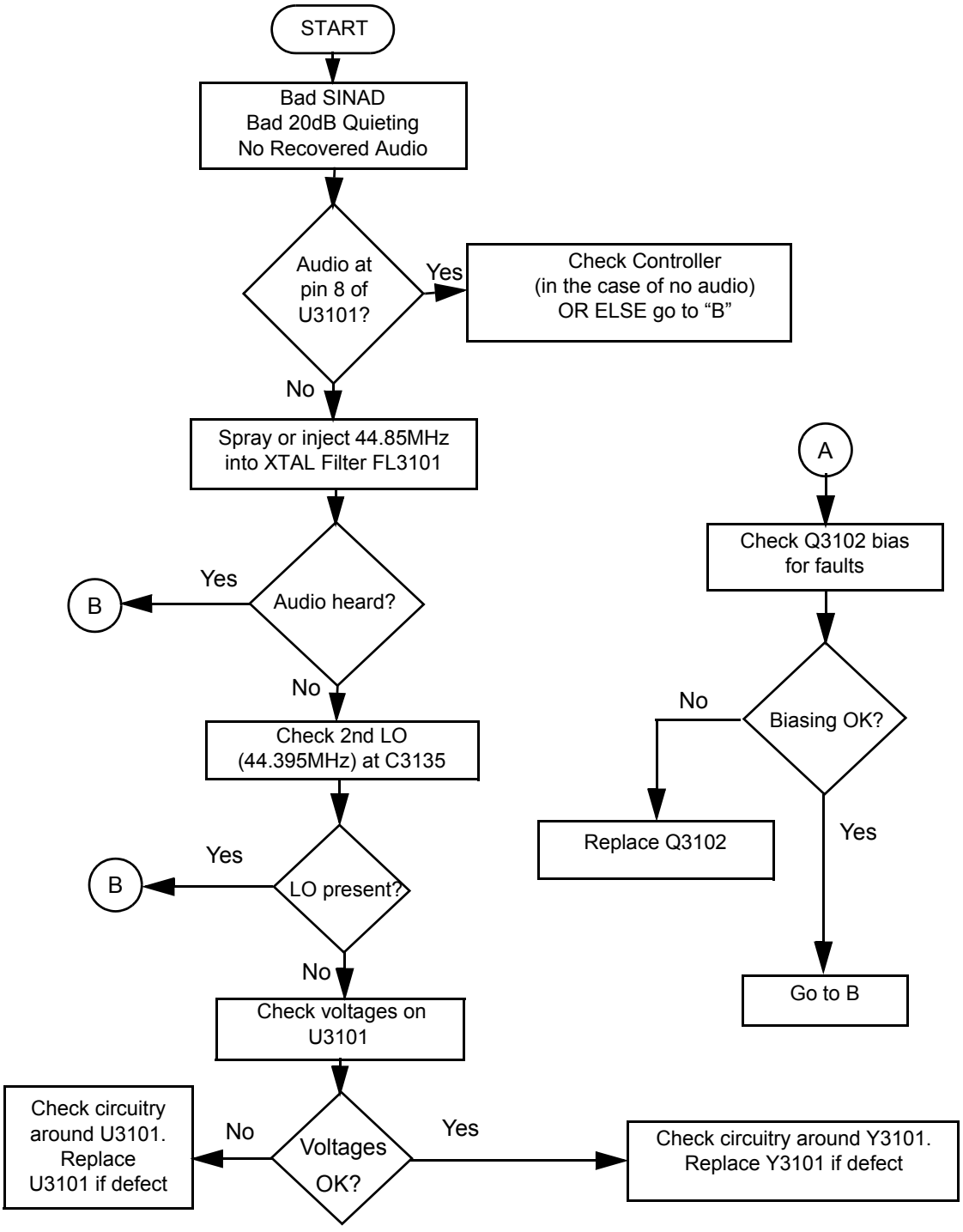
To reduce synthesizer lock time when new frequency data has been loaded into the synthesizer the magnitude of the loop current is increased by enabling the IADAPT (U4201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U4201-4).

The LOCK (U4201-4) signal is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active. In order to modulate the PLL the two spot modulation method is utilized. Via pin 10 (MODIN) on U4201 the audio signal is applied to both the A/D converter (low freq path) as well as the balance attenuator (high freq path). The A/D converter converts the low frequency analog modulating signal into a digital code that is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U4201-41) and connected to the VCO modulation diode CR4321 via R4321, C4325.

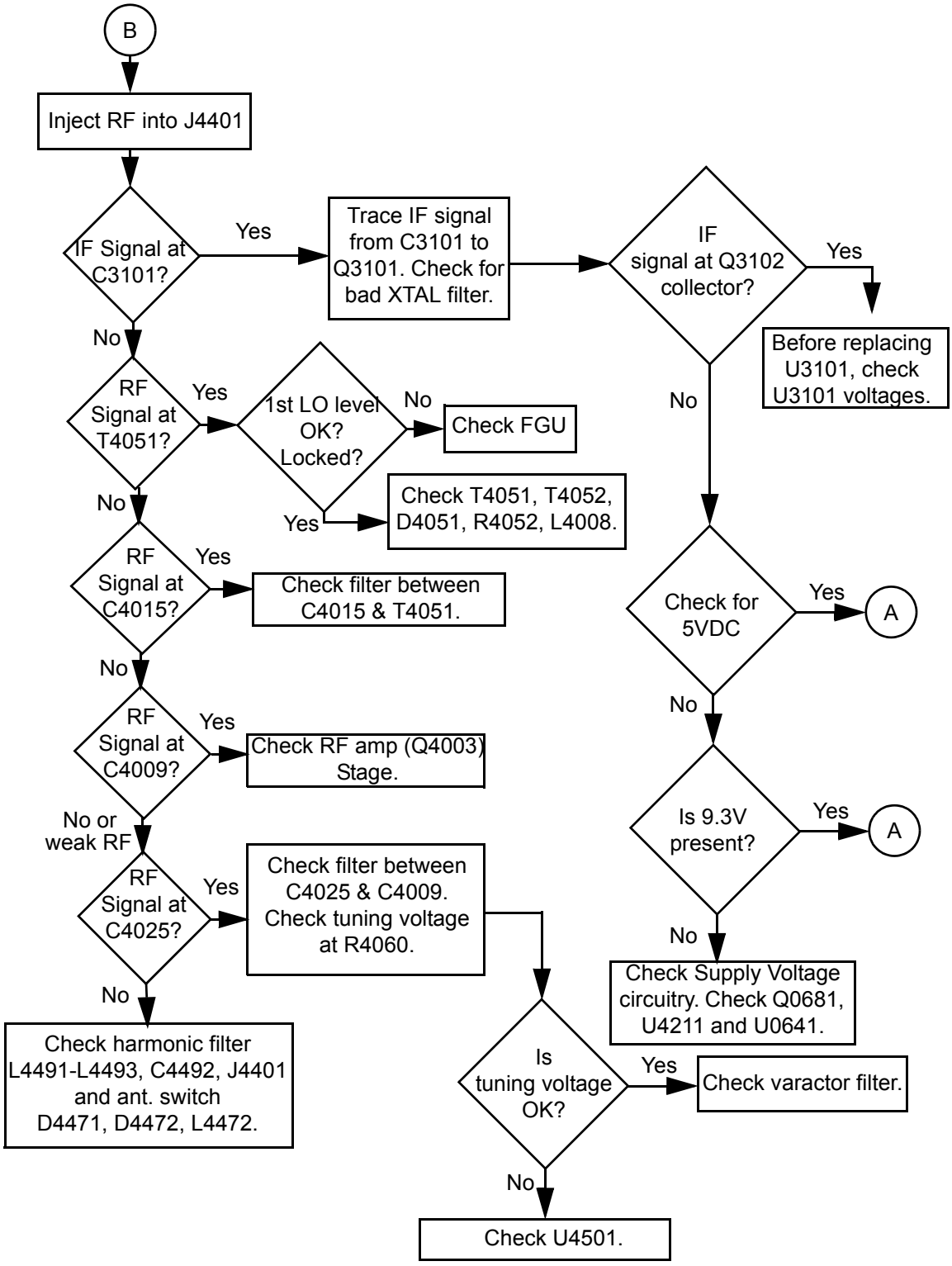
Section 3

TROUBLESHOOTING CHARTS

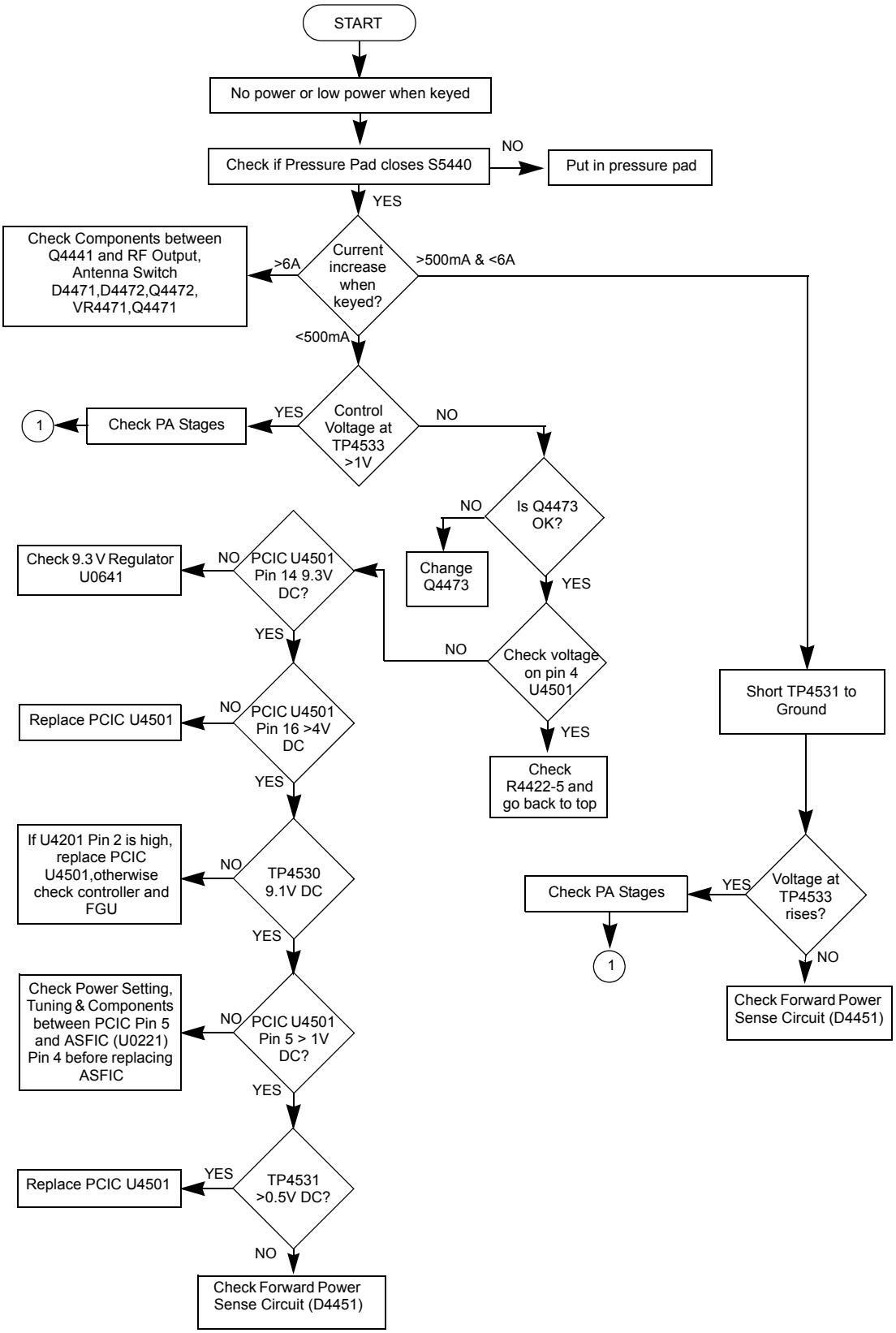
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



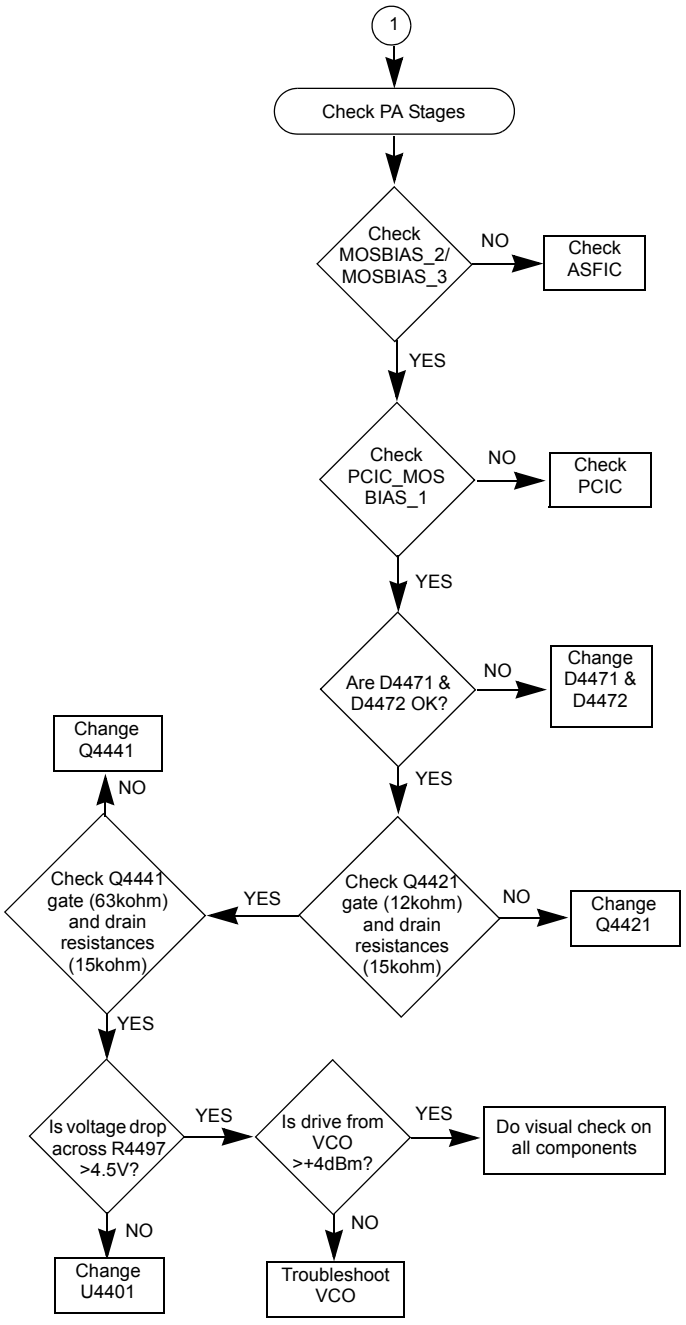
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



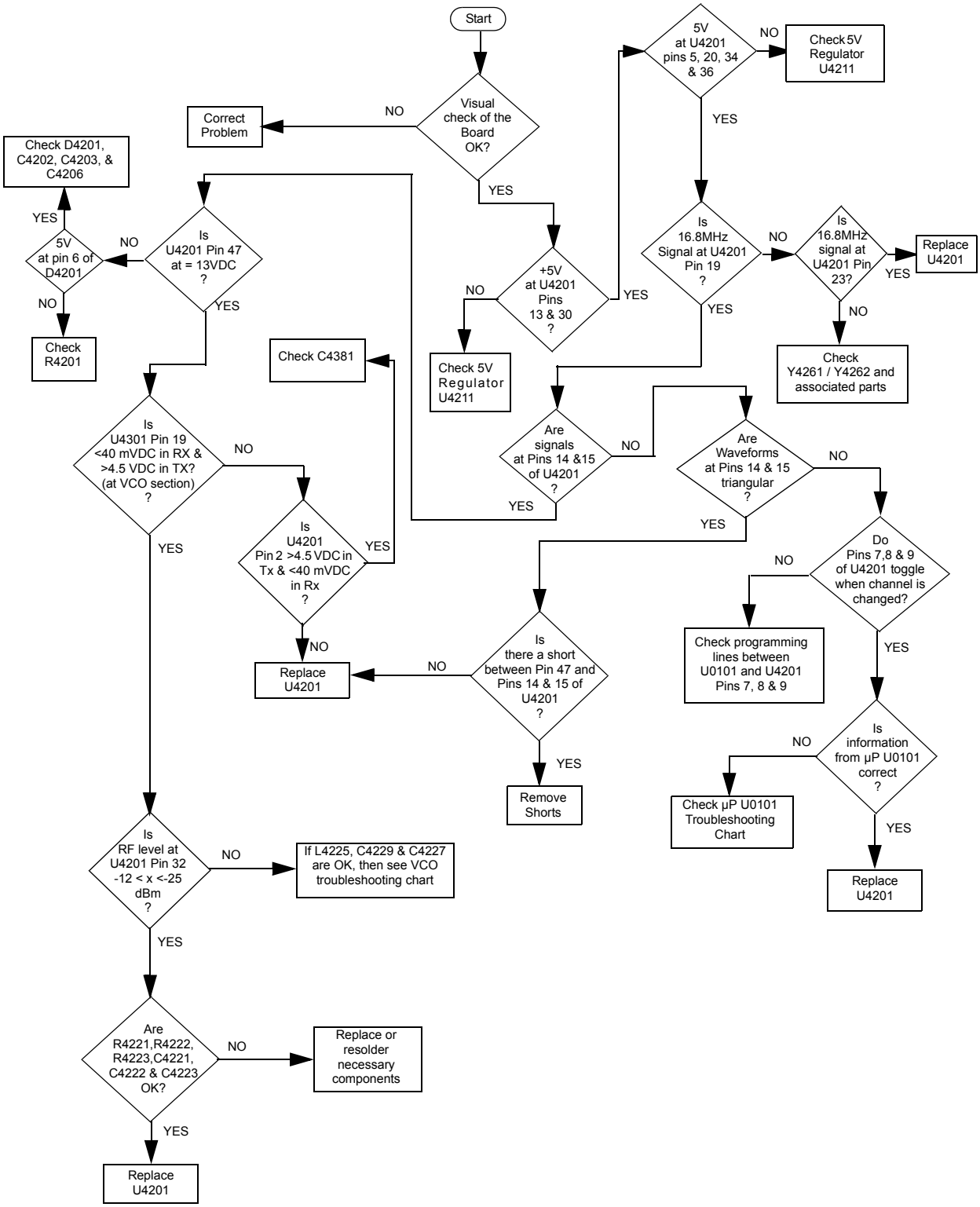
2.0 Troubleshooting Flow Chart for 40W Transmitter (Sheet 1 of 2)



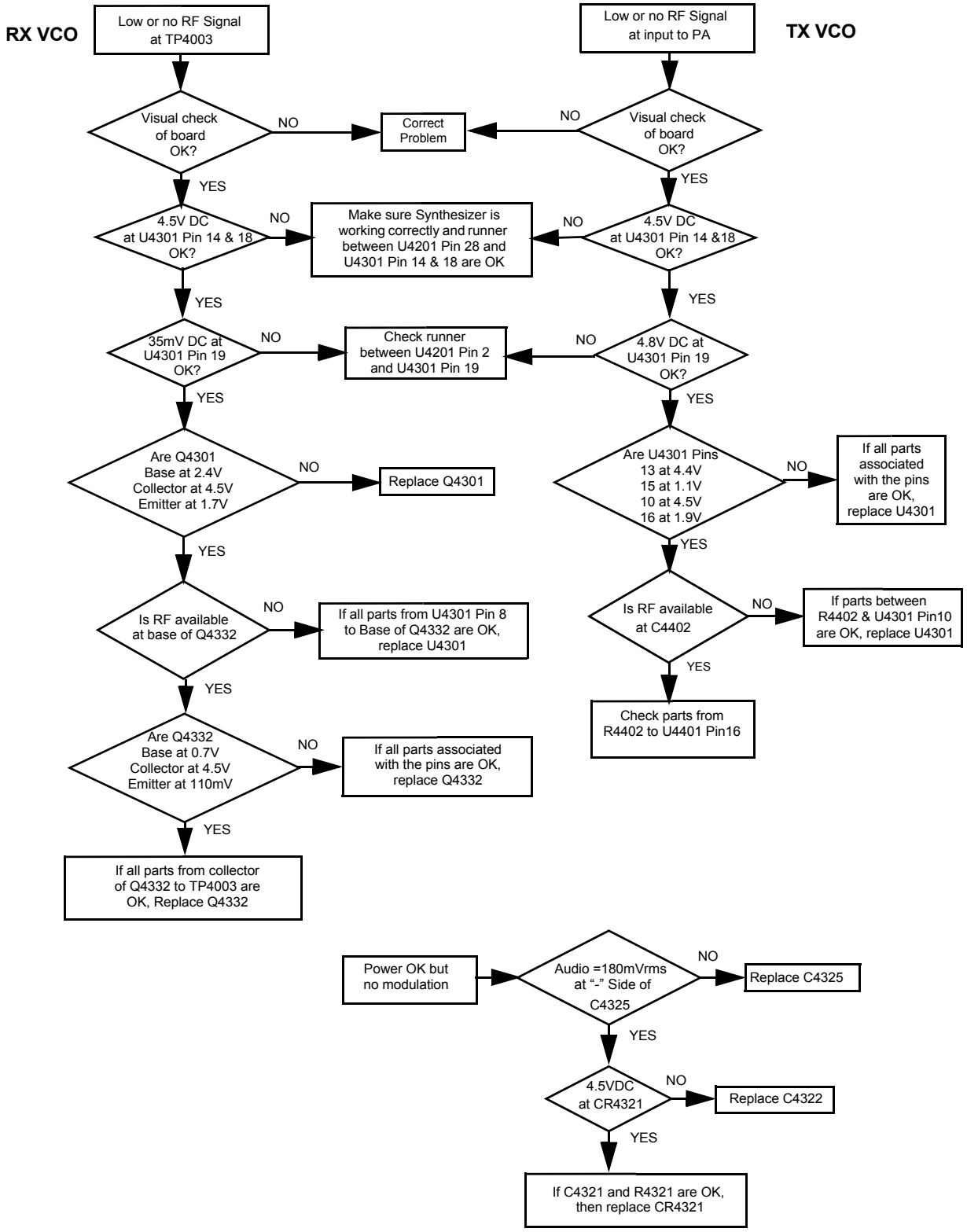
2.1 Troubleshooting Flow Chart for 40W Transmitter (Sheet 2 of 2)



3.0 Troubleshooting Flow Chart for Synthesizer

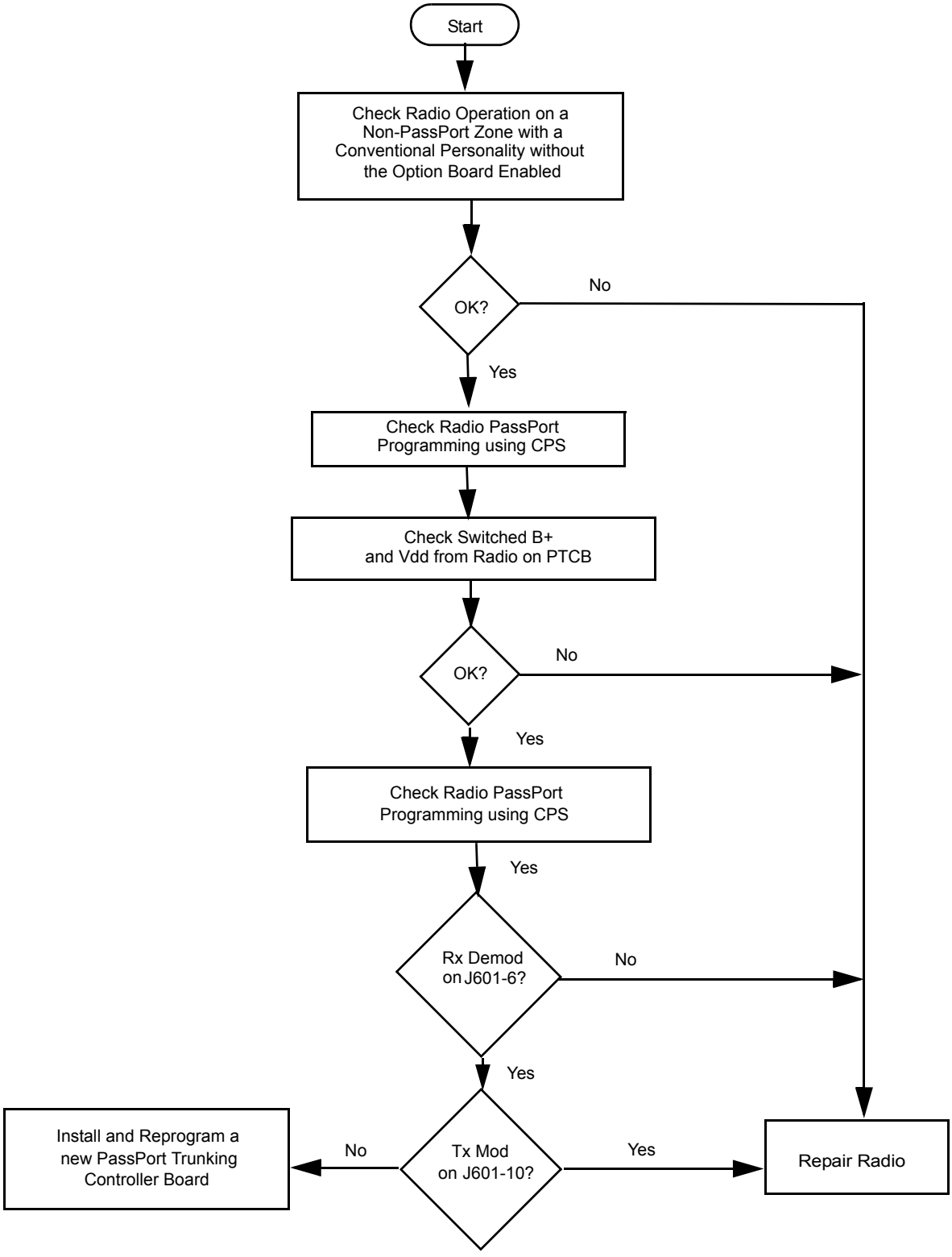


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Notes

Section 4

UHF BAND 1 (403-470 MHZ) 25-40W LDMOS PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

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

Table 12-1 UHF Band 1 25-40W LDMOS PCB 8486127Z01 Diagrams and Parts Lists

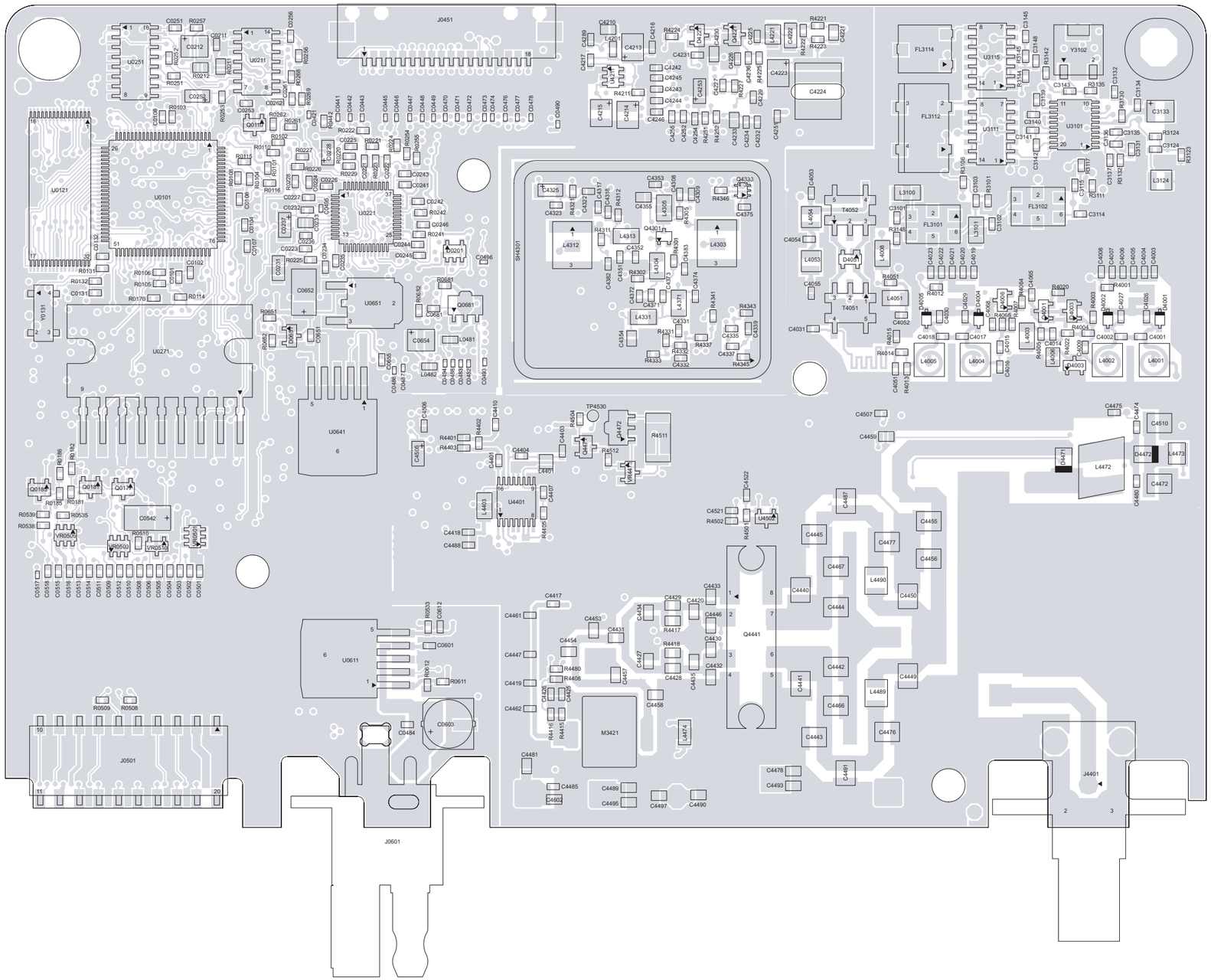
PCB 8486127Z01:	**Page:**
Main Board Top Side	**12: 4-3**
Main Board Bottom Side	**12: 4-4**
SCHEMATICS	
Power Amplifier 25 - 40W	**12: 4-5**
FRACN Synthesizer	**12: 4-6**
Voltage Controlled Oscillator	**12: 4-7**
Receiver Front-End	**12: 4-8**
IF	**12: 4-9**
Parts List	**12: 4-10**
Controller version is **T12**	

Table 12-2 UHF Band 1 25-40W LDMOS PCB 8471223L02 Diagrams and Parts Lists

PCB 8471223L02:	**Page:**
Main Board Top Side	**12: 4-14**
Main Board Bottom Side	**12: 4-15**
SCHEMATICS	
Power Amplifier 25 - 40W	**12: 4-16**
FRACN Synthesizer	**12: 4-17**
Voltage Controlled Oscillator	**12: 4-18**
Receiver Front-End	**12: 4-19**
IF	**12: 4-20**
Parts List	**12: 4-21**
Controller version is **T12**	

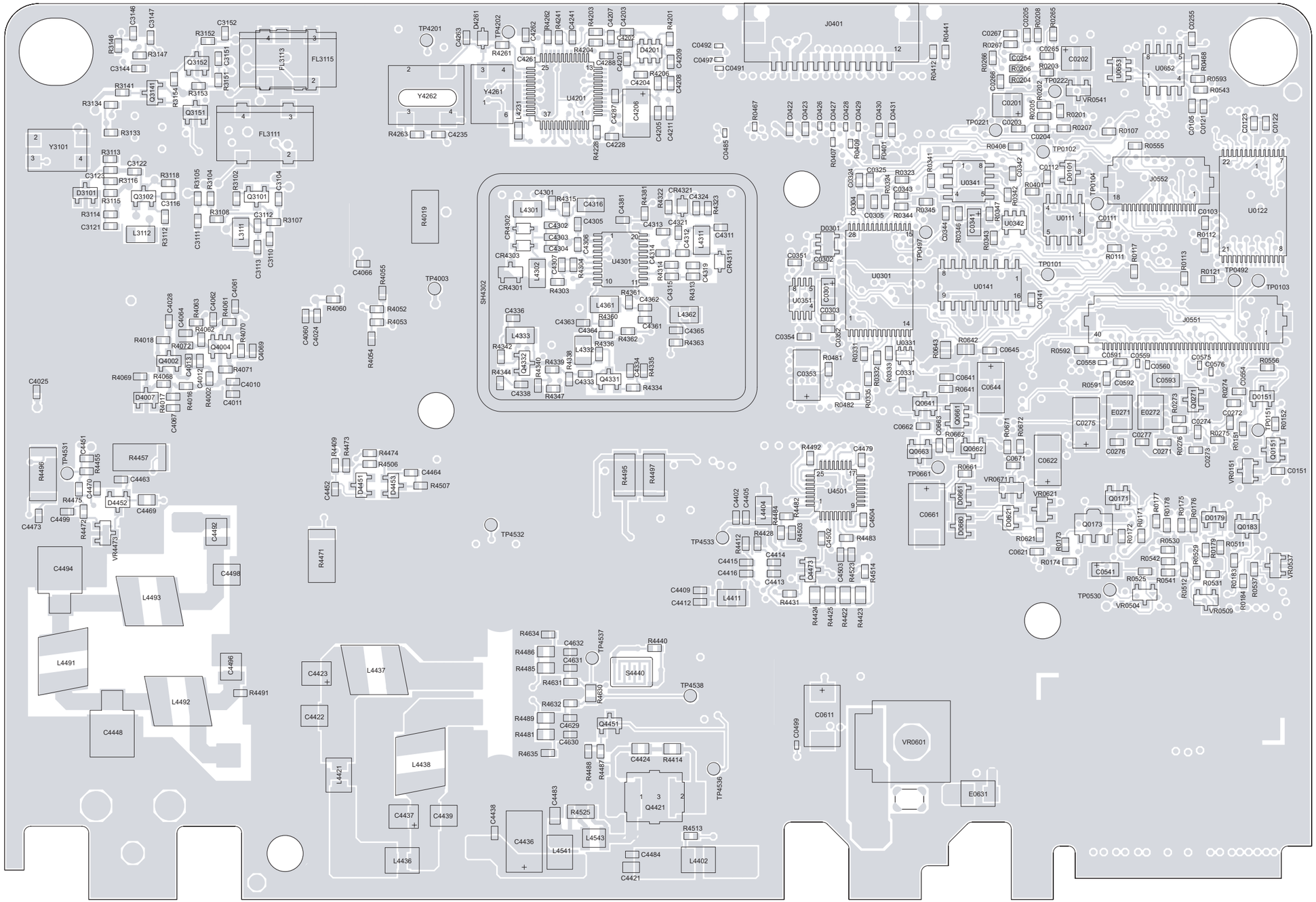
Notes

2.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8486127Z01, Schematics, and Parts Lists



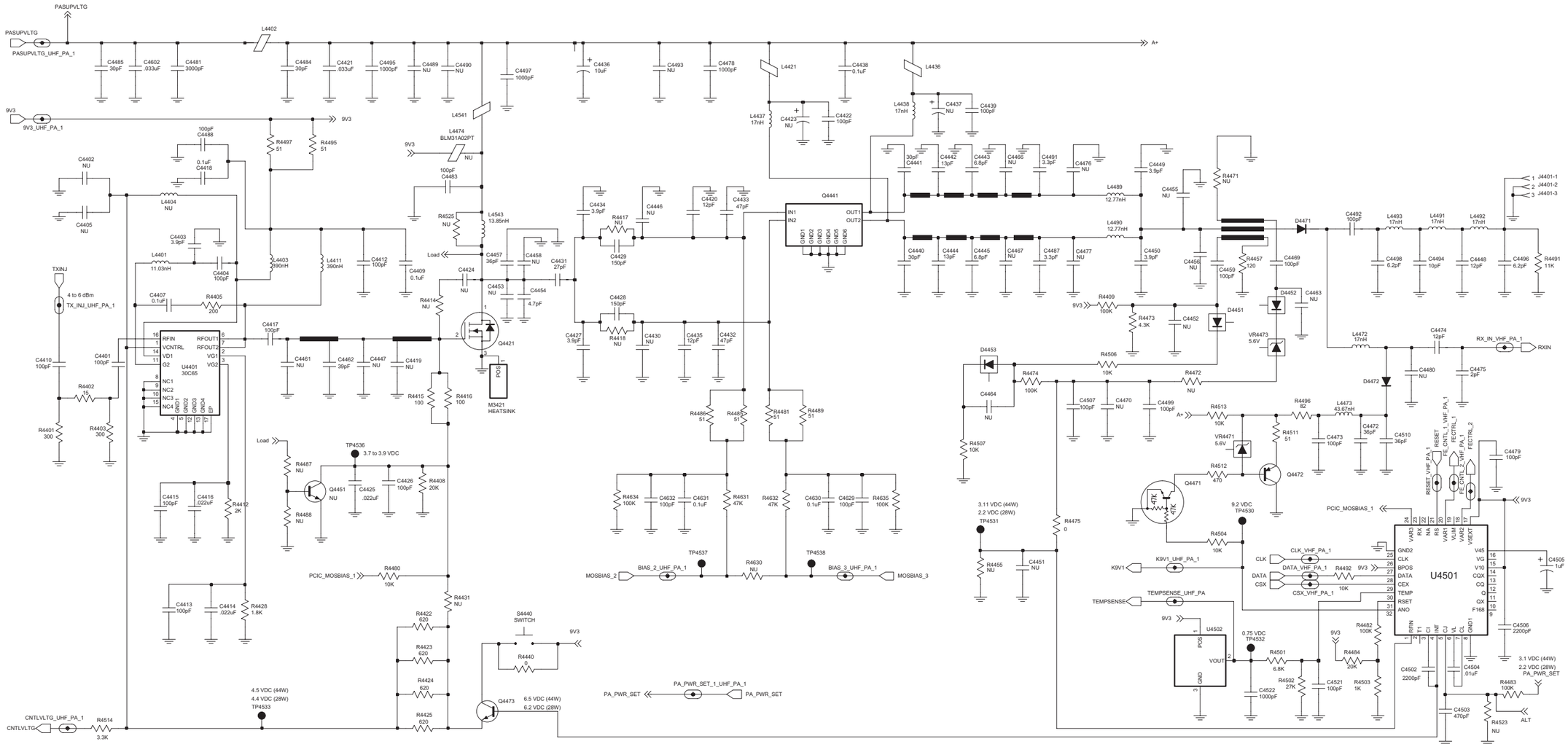
UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8486127Z01 Top Side

6881091C63-C



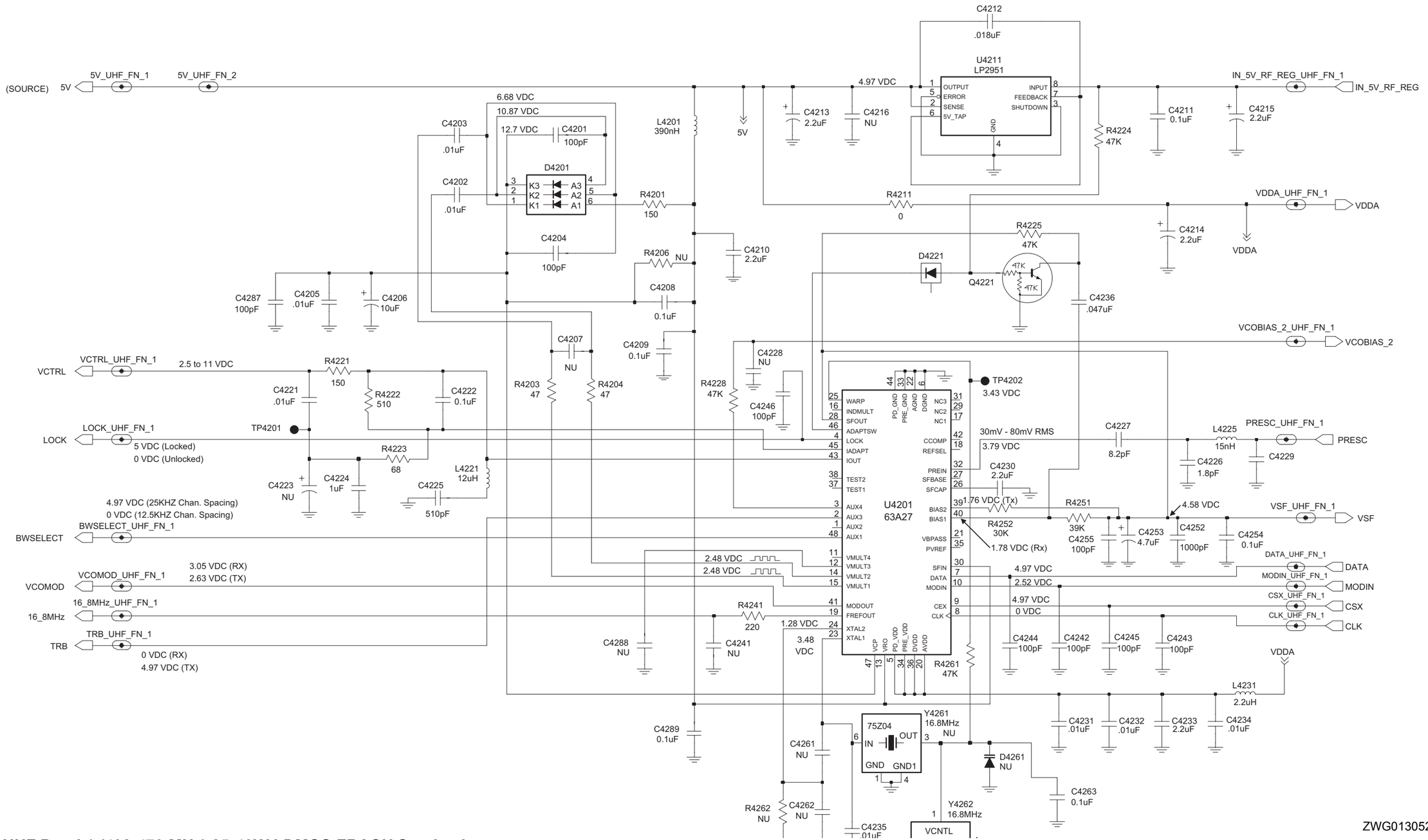
UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8486127Z01 Bottom Side

6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W LDMOS Power Amplifier

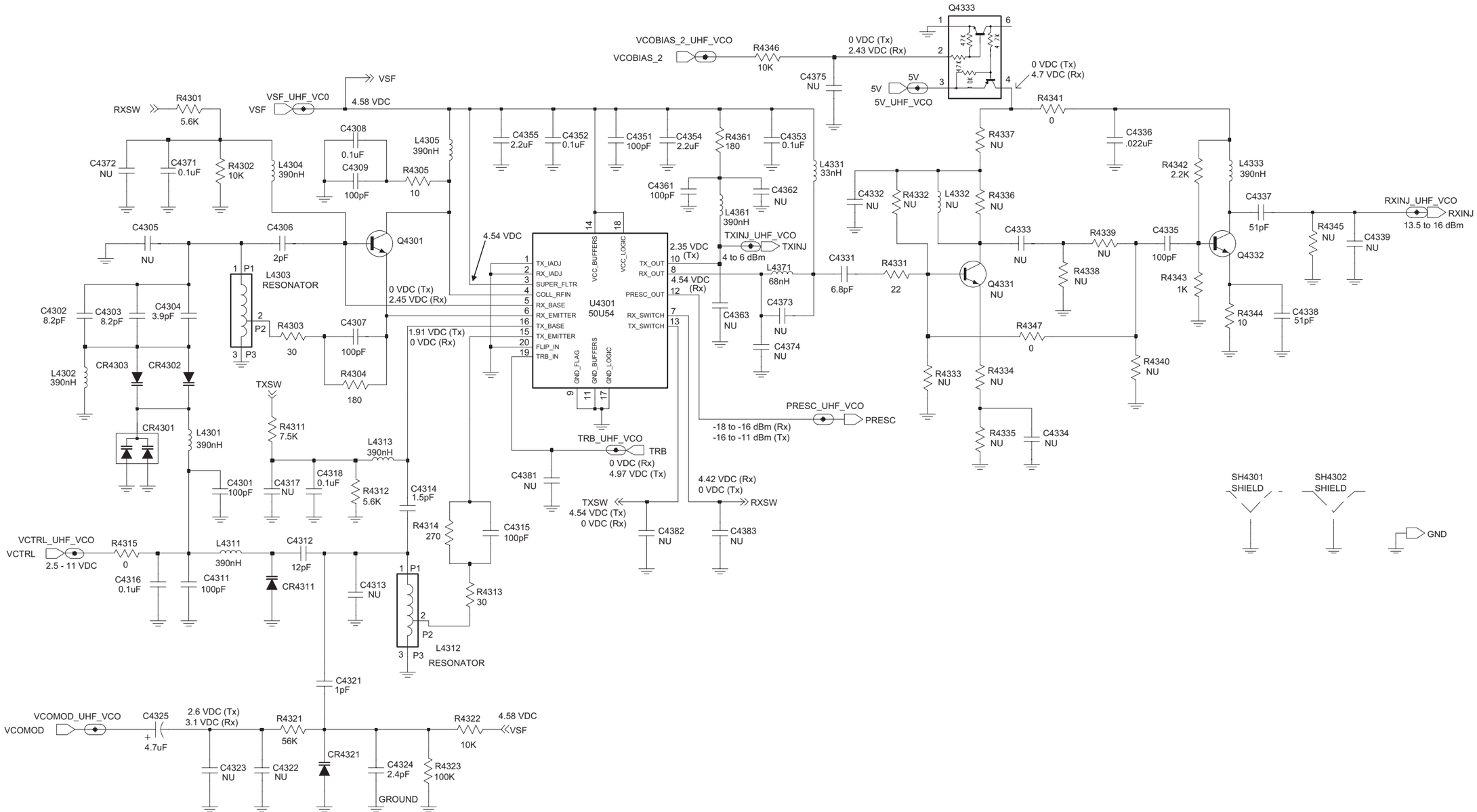
6881091C63-C



ZWG0130521-B

UHF Band 1 (403-470 MHz) 25-40W LDMOS FRACN Synthesizer

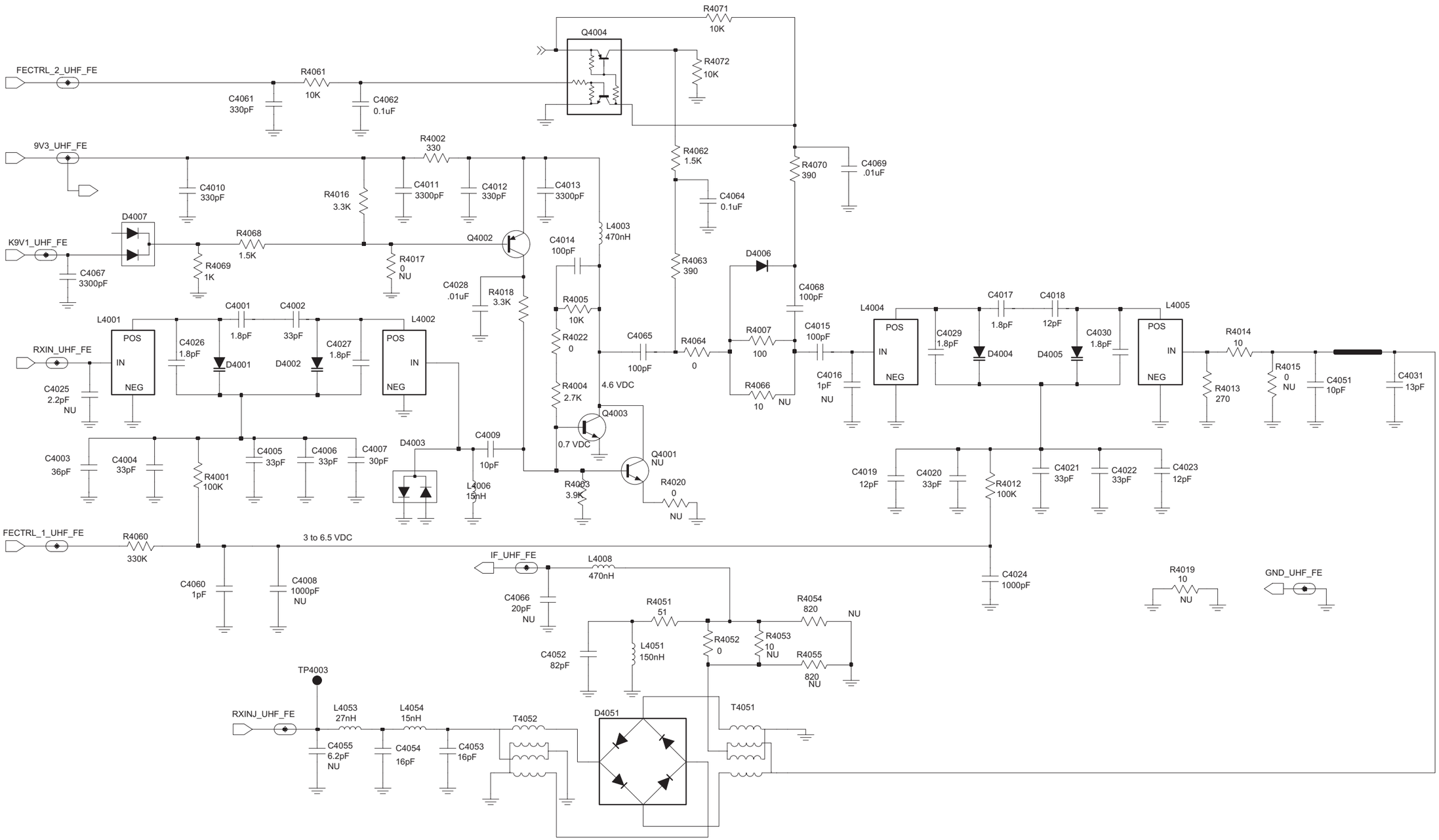
6881091C63-C



ZWG0130523-A

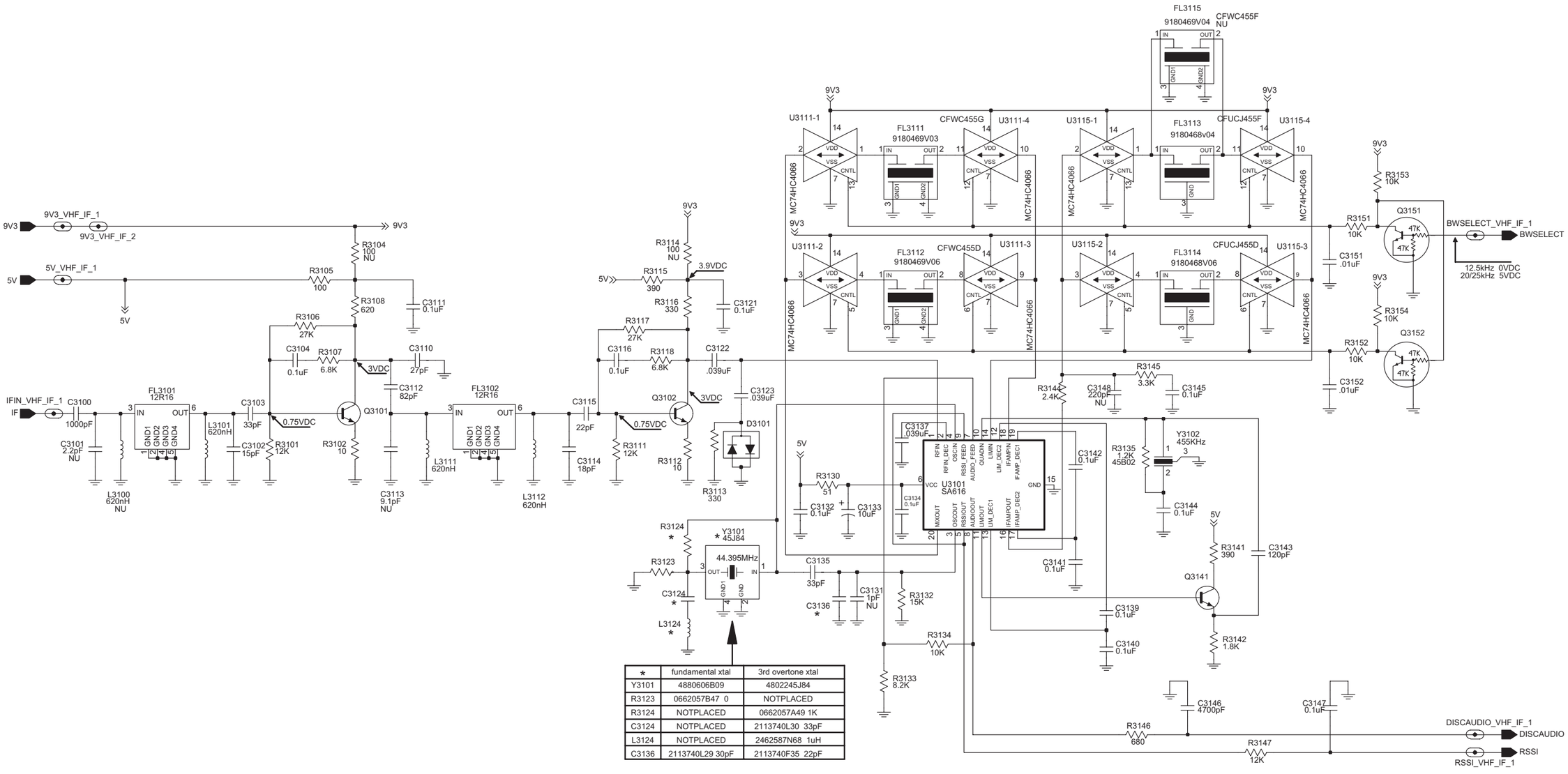
UHF Band 1 (403-470 MHz) 25-40W LDMOS Voltage Controlled Oscillator

6881091C63-C



UHF Band 1 (403-470 MHz) 25-40W LDMOS Receiver Front-End ZWG0130524-B

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

ZWG0130522-B

UHF Band 1 (403-470 MHz) 25-40W LDMOS IF

6881091C63-C

UHF B1 25-40W PCB 8486127Z01 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	10nF
C0201	2311049A57	10uF
C0202	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0228	2311049A56	4.7uF
C0231	2113743B29	1uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	0.022uF
C0236	2113743E10	0.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	10nF
C0251	2113743E20	0.1uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0256	2113740F51	100pF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	10nF
C0271	2113741F49	10nF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0301	2311049A07	1uF
C0302	2113743E20	0.1uF
C0303	2113740F51	100pF
C0304	2113743E20	0.1uF
C0305	2113743E20	0.1uF
C0324	2113743E20	0.1uF
C0331	2113743E20	0.1uF
C0341	2311049A07	1uF
C0342	2113743E20	0.1uF
C0343	2113743E20	0.1uF
C0344	2113743E20	0.1uF
C0351	2113743E20	0.1uF
C0352	2113743E07	0.022uF
C0353	2311049A97	33uF
C0354	2113743E20	0.1uF
C0421	2113743N48	82PF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0441	2113743L09	470pF
C0442	2113743L09	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743N48	82pF
C0472	2113743N48	82pF
C0473	2113743N48	82pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	10nF
C0502	2113741F17	470pF
C0503	2113741F17	470pF
C0504	2113741F17	470pF
C0505	2113741F17	470pF
C0506	2113741F17	470pF
C0508	2113741F17	470pF
C0509	2113741F17	470pF
C0510	2113741F17	470pF
C0511	2113741F17	470pF
C0512	2113741F17	470pF
C0513	2113741F17	470pF
C0514	2113741F17	470pF
C0515	2113741F17	470pF
C0516	2113741F49	10nF
C0517	2113743N48	82pF
C0518	2113741F17	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0560	2113743L17	1000pF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	10nF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	0.1uF
C3110	2113740F37	27pF
C3111	2113743E20	0.1uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	0.1uF
C3121	2113743E20	0.1uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	0.1uF
C3133	2311049A57	10uF
C3134	2113743E20	0.1uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	0.1uF
C3140	2113743E20	0.1uF
C3141	2113743E20	0.1uF
C3142	2113743E20	0.1uF
C3143	2113740F53	120pF
C3144	2113743E20	0.1uF
C3145	2113743E20	0.1uF
C3146	2113741F41	4700pF
C3147	2113743E20	0.1uF
C3151	2113741F49	10nF
C3152	2113741F49	10nF
C4001	2113740F09	1.8pF
C4002	2113740F39	33pF
C4003	2113740F40	36pF
C4004	2113740F39	33pF
C4005	2113740F39	33pF
C4006	2113740F39	33pF
C4007	2113740F38	30pF
C4008	2113741F25	1000pF
C4009	2113740F27	10pF
C4010	2113741F13	330pF
C4011	2113741F37	3300pF
C4012	2113741F13	330pF
C4013	2113741F37	3300pF
C4014	2113740F51	100pF
C4015	2113740F51	100pF
C4017	2113740F09	1.8pF
C4018	2113740F29	12pF
C4019	2113740F29	12pF
C4020	2113740F39	33pF
C4021	2113740F39	33pF
C4022	2113740F39	33pF
C4023	2113740F29	12pF
C4024	2113741F25	1000pF
C4026	2113740F09	1.8pF
C4027	2113740F09	1.8pF
C4028	2113741F49	10nF
C4029	2113740F09	1.8pF
C4030	2113740F09	1.8pF

Circuit Ref	Motorola Part No.	Description
C4031	2113740F30	13pF
C4051	2113740F27	10pF
C4052	2113740F49	82pF
C4053	2113740F32	16pF
C4054	2113740F32	16pF
C4061	2113740F63	330pF
C4062	2113743E20	0.1uF
C4064	2113743E20	0.1uF
C4065	2113740F51	100pF
C4067	2113741F37	3300pF
C4068	2113740F51	100pF
C4069	2113741F49	10nF
C4201	2113740F51	100pF
C4202	2113741F49	10nF
C4203	2113741F49	10nF
C4204	2113740F51	100pF
C4205	2113741F49	10nF
C4206	2311049J25	10uF
C4208	2113743E20	0.1uF
C4209	2113743E20	0.1uF
C4210	2104993J02	2.2uF
C4211	2113743E20	0.1uF
C4213	2311049A09	2.2uF
C4214	2311049A09	2.2uF
C4215	2311049A09	2.2uF
C4217	2113741F49	10nF
C4221	2109720D01	0.01uF
C4222	2109720D14	0.1uF
C4224	0882422W23	1.0 uF
C4225	2113741F18	510pF
C4226	2113740L03	2.4pF
C4227	2113740F27	10pF
C4230	2104993J02	2.2uF
C4231	2113741F49	10nF
C4232	2113741F49	10nF
C4233	2104993J02	2.2uF
C4234	2113741F49	10nF
C4235	2113741F49	10nF
C4236	2113743E12	0.047uF
C4242	2113740F51	100pF
C4243	2113740F51	100pF
C4244	2113740F51	100pF
C4245	2113740F51	100pF
C4246	2113740F51	100pF
C4251	2113743E20	0.1uF
C4252	2113741F25	1000pF
C4253	2311049A56	4.7uF
C4254	2113743E20	0.1uF
C4255	2113740F51	100pF
C4263	2113743E20	0.1uF
C4287	2113740F51	100pF

Circuit Ref	Motorola Part No.	Description
C4289	2113743E20	0.1uF
C4301	2113740F51	100pF
C4302	2113740L16	8.2pF
C4303	2113740L16	8.2pF
C4304	2113740L08	3.9pF
C4306	2113740L01	2pF
C4307	2113740F51	100pF
C4308	2113743E20	0.1uF
C4309	2113740F51	100pF
C4311	2113740F51	100pF
C4312	2113740F29	12pF
C4314	2113740F07	1.5pF
C4315	2113740F51	100pF
C4316	2109720D14	0.1uF
C4318	2113743E20	0.1uF
C4321	2113740F03	1pF
C4324	2113740L03	2.4pF
C4325	2311049A56	4.7uF
C4331	2113740L14	6.8pF
C4335	2113740F51	100pF
C4336	2113743E07	0.022uF
C4337	2113740F44	51pF
C4338	2113740F44	51pF
C4351	2113740F51	100pF
C4352	2113743E20	0.1uF
C4353	2113743E20	0.1uF
C4354	2104993J02	2.2uF
C4355	2104993J02	2.2uF
C4361	2113741F25	1000pF
C4364	2113740F21	5.6pF
C4365	2113740F07	1.5pF
C4371	2113743E20	0.1uF
C4401	2113740F51	100pF
C4403	2113740F17	3.9pF
C4404	2113740F51	100pF
C4407	2113743E20	0.1uF
C4409	2113743E20	0.1uF
C4410	2113740F51	100pF
C4412	2113740F51	100pF
C4413	2113740F51	100pF
C4414	2113743E07	0.022uF
C4415	2113740F51	100pF
C4416	2113743E07	0.022uF
C4417	2113740F44	51pF
C4418	2113743E20	0.1uF
C4420	2113740A31	12pF
C4421	2113741A57	0.033uF
C4422	2111078B42	100pF
C4425	2113743E07	0.022uF
C4426	2113740F51	100pF
C4427	2113740A18	4.3pF

Circuit Ref	Motorola Part No.	Description
C4428	2113740A61	180pF
C4429	2113740A61	180pF
C4431	2113740A39	27pF
C4432	2113740A46	47pF
C4433	2113740A46	47pF
C4434	2113740A18	4.3pF
C4435	2113740A31	12pF
C4436	2311049A45	10uF
C4438	2113743E20	0.1uF
C4439	2111078B42	100pF
C4440	2111078B29	33pF
C4441	2111078B29	33pF
C4442	2111078B16	13pF
C4443	2111078B09	6.8pF
C4444	2111078B16	13pF
C4445	2111078B09	6.8pF
C4448	2180464E65	12pF
C4449	2111078B03	3.9pF
C4450	2111078B03	3.9pF
C4454	2113740A18	4.3pF
C4457	2113740A42	36pF
C4459	2113740A55	100pF
C4462	2113740F41	39pF
C4469	2113740A55	100pF
C4472	2111078B31	36pF
C4473	2113740F51	100pF
C4474	2113740F29	12pF
C4475	2113740F10	2pF
C4478	2113741A21	1000pF
C4479	2113740F51	100pF
C4481	2113741A32	3000pF
C4483	2113740A55	100pF
C4484	2113740F38	30pF
C4485	2113740F38	30pF
C4487	2111078B01	3.3pF
C4488	2113740F51	100pF
C4491	2111078B01	3.3pF
C4492	2111078B42	100pF
C4494	2180464E63	10pF
C4495	2113741A21	1000pF
C4496	2111078B08	6.2pF
C4497	2113741A21	1000pF
C4498	2111078B08	6.2pF
C4499	2113740F51	100pF
C4502	2113743E01	0.012uF
C4503	2113741F17	470pF
C4504	2113741F49	10nF
C4505	2311049A07	1uF
C4506	2113741F33	2200pF
C4507	2113740F51	100pF
C4510	2111078B31	36pF

Circuit Ref	Motorola Part No.	Description
C4521	2113740F51	100pF
C4522	2113741F25	1000pF
C4602	2113741A57	0.033uF
C4629	2113740F51	100pF
C4630	2113743E20	0.1uF
C4631	2113743E20	0.1uF
C4632	2113740F51	100pF
CR4301	4805649Q13	DIODE VCTR ISV 228
CR4302	4862824C01	DIODE VARACTOR
CR4303	4862824C01	DIODE VARACTOR
CR4311	4802245J22	DIODE, VARACTOR
CR4321	4862824C01	DIODE VARACTOR
D0101	4813825A05	DIODE
D0151	4813833C02	DIODE, DUAL 70V
D0179	4813833C02	DIODE, DUAL 70V
D0301	4802245J47	DIODE, SCHOTTKY
D0621	4813833C02	DIODE, DUAL 70V
D0651	4813833C02	DIODE, DUAL 70V
D0660	4813833C02	DIODE, DUAL 70V
D0661	4813833C02	DIODE, DUAL 70V
D3101	4880154K03	DIODE DUAL SCHOTTKY
D4001	4862824C01	DIODE VARACTOR
D4002	4862824C01	DIODE VARACTOR
D4003	4880154K03	DIODE DUAL SCHOTTKY
D4004	4862824C01	DIODE VARACTOR
D4005	4862824C01	DIODE VARACTOR
D4006	4880142L01	DIODE
D4007	4813833C02	DIODE, DUAL 70V
D4051	4886143B01	DIODE, MIXER
D4201	4802233J09	DIODE, TRIPLE
D4221	4813825A05	DIODE
D4451	4813825A05	DIODE
D4452	4813825A05	DIODE
D4453	4813825A05	DIODE
D4471	4802482J02	DIODE, SMD PIN
D4472	4802482J02	DIODE, SMD PIN
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
F0401	6580542Z01	FUSE 3A
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	CERAMIC FILTER, 455KHz
FL3112	9180469V06	CERAMIC FILTER, 455KHz
FL3114	9180468V06	CERAMIC FILTER, 455KHz
FL3115	9180469V04	CERAMIC FILTER, 455KHz
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR

Circuit Ref	Motorola Part No.	Description
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J4401	0986166B02	RF CONNECTOR (MINI UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L4003	2462587T23	470nH
L4006	2462587V24	15nH
L4008	2462587T23	470nH
L4051	2462587T17	150nH
L4053	2462587N46	27nH
L4054	2462587N43	15nH
L4201	2462587Q42	390nH
L4221	2462587P25	12uH
L4231	2462587Q20	2.2uH
L4301	2462587T22	390nH
L4302	2462587T22	390nH
L4303	2460593C01	RESONATOR
L4304	2462587T22	390nH
L4305	2462587T22	390nH
L4311	2462587T22	390nH
L4312	2460593C01	RESONATOR
L4313	2462587T22	390nH
L4331	2462587T09	33nH
L4333	2462587T22	390nH
L4361	2462587T09	33nH
L4362	2462587T09	33nH
L4371	2462587T13	68nH
L4401	2460591B04	11.03nH
L4402	2484657R01	FERRITE BEAD
L4403	2462587T22	390nH
L4411	2462587T22	390nH
L4421	2484657R01	FERRITE BEAD
L4436	2484657R01	FERRITE BEAD
L4437	2460592A01	17nH
L4438	2460592A01	17nH
L4472	2460592A01	17nH
L4473	2460591N36	43.67nH
L4489	2460591B77	13.9nH
L4490	2460591B77	13.9nH
L4491	2460592A01	17nH
L4492	2460592A01	17nH
L4493	2460592A01	17nH
L4541	2484657R01	FERRITE BEAD
L4543	2460591C23	13.85nH
M3421	2686201B01	HEAT SPREADER
Q0110	4880048M01	NPN
Q0151	4880048M01	NPN
Q0171	4880048M01	NPN
Q0173	4880052M01	NPN DARLINGTON
Q0177	4880048M01	NPN
Q0181	4880048M01	NPN
Q0183	4880048M01	NPN
Q0185	4880048M01	NPN
Q0271	4880214G02	NPN
Q0641	4880048M01	NPN
Q0661	4805921T02	DUAL NPN/PNP
Q0662	4880214G02	NPN
Q0663	4880048M01	NPN
Q0681	4880052M01	NPN DARLINGTON
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q4002	4813824A17	PNP
Q4003	4813827A07	NPN
Q4004	4805921T02	DUAL NPN/PNP
Q4221	4880048M01	NPN
Q4301	4805218N63	DIODE DUAL SCHOTTKY
Q4332	4813827A07	NPN
Q4333	4809939C05	DUAL NPN/PNP
Q4421	4886212B01	POWER TRANSISTOR - MRF1518
Q4441	4813828C32	POWER TRANSISTOR - MRF1570
Q4471	4880048M01	NPN
Q4472	4805128M27	PNP
Q4473	4880214G02	NPN
R0101	0662057A73	10K
R0102	0662057A65	4.7K
R0103	0662057A01	10
R0104	0662057A73	10K
R0106	0662057B47	0
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	100K
R0131	0662057B46	10M
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K
R0201	0662057A25	100
R0202	0662057A43	560
R0203	0662057A25	100
R0204	0662057A43	560
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0228	0662057B47	0
R0229	0662057A01	10
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	100K
R0254	0662057A73	10K
R0255	0662057A73	10K
R0256	0662057A97	100K
R0257	0662057A57	2.2K
R0261	0662057A73	10K
R0262	0662057B08	270K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0323	0662057A79	18K
R0324	0662057A79	18K
R0331	0662057A73	10K
R0332	0662057A73	10K
R0333	0662057A73	10K
R0335	0662057B02	150K
R0341	0662057A73	10K
R0342	0662057A55	1.8K
R0343	0662057B47	0
R0344	0662057A91	56K
R0345	0662057A66	5.1K
R0346	0662057A89	47K
R0347	0662057A89	47K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10
R0412	0662057B47	0
R0441	0662057B47	0
R0442	0662057A49	1K
R0467	0662057M26	10
R0468	0662057A97	100K
R0481	0662057B47	0
R0482	0662057B47	0
R0508	0662057A41	470
R0509	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	100K
R0512	0662057A77	15K
R0525	0662057A97	100K
R0529	0662057A89	47K
R0530	0662057A81	22K
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0543	0662057A97	100K
R0555	0662057A25	100
R0556	0662057A25	100
R0591	0662057A82	24K
R0592	0662057A01	10
R0593	0662057A97	100K
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
R3101	0662057A75	12K

Circuit Ref	Motorola Part No.	Description
R3102	0662057A01	10
R3105	0662057A25	100
R3106	0662057A83	27K
R3107	0662057A69	6.8K
R3108	0662057A44	620
R3111	0662057A75	12K
R3112	0662057A01	10
R3113	0662057A37	330
R3115	0662057A39	390
R3116	0662057A37	330
R3117	0662057A83	27K
R3118	0662057A69	6.8K
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51
R3132	0662057A77	15K
R3133	0662057A71	8.2K
R3134	0662057A73	10K
R3135	0662057A51	1.2K
R3141	0662057A39	390
R3142	0662057A55	1.8K
R3144	0662057A58	2.4K
R3145	0662057A61	3.3K
R3146	0662057A45	680
R3147	0662057A75	12K
R3148	0662057B47	0
R3151	0662057A73	10K
R3152	0662057A73	10K
R3153	0662057A73	10K
R3154	0662057A73	10K
R4001	0662057A97	100K
R4002	0662057A37	330
R4003	0662057A63	3.9K
R4004	0662057A59	2.7K
R4005	0662057A73	10K
R4007	0662057A25	100
R4012	0662057A97	100K
R4013	0662057A35	270
R4014	0662057A01	10
R4016	0662057A61	3.3K
R4018	0662057A61	3.3K
R4022	0662057B47	0
R4051	0662057A18	51
R4052	0662057B47	0
R4060	0662057B10	330K
R4061	0662057A73	10K
R4062	0662057A53	1.5K
R4063	0662057A39	390
R4064	0662057B47	0
R4068	0662057A53	1.5K
R4069	0662057A49	1K
R4070	0662057A39	390
R4071	0662057A73	10K
R4072	0662057A73	10K
R4201	0662057A29	150
R4203	0662057A17	47
R4204	0662057A17	47
R4211	0662057B47	0
R4221	0662057A29	150
R4222	0662057A42	510
R4223	0662057A21	68
R4224	0662057A89	47K
R4225	0662057A89	47K
R4228	0662057A73	10K
R4241	0662057A33	220
R4251	0662057A87	39K
R4252	0662057A84	30K
R4261	0662057A89	47K
R4263	0662057A25	100
R4301	0662057A67	5.6K
R4302	0662057A73	10K
R4303	0662057A12	30
R4304	0662057A31	180
R4305	0662057A01	10
R4311	0662057A70	7.5K
R4312	0662057A67	5.6K
R4313	0662057A12	30
R4314	0662057A35	270
R4315	0662057B47	0
R4321	0662057A91	56K
R4322	0662057A73	10K
R4323	0662057A97	100K
R4331	0662057A09	22
R4341	0662057B47	0
R4342	0662057A57	2.2K
R4343	0662057A49	1K
R4344	0662057A01	10
R4346	0662057A73	10K
R4347	0662057B47	0
R4360	0662057A35	270
R4361	0662057A31	180
R4362	0662057A01	10
R4363	0662057A49	1K
R4381	0662057A41	470
R4401	0662057A36	300
R4402	0662057A05	15
R4403	0662057A36	300
R4405	0662057A32	200
R4408	0662057A80	20K
R4409	0662057A97	100K
R4412	0662057A56	2K
R4415	0662057A15	39
R4416	0662057A15	39
R4422	0611079A69	620
R4423	0611079A69	620
R4424	0611079A69	620
R4425	0611079A69	620
R4428	0662057A55	1.8K
R4457	0683962T51	120
R4473	0662057A64	4.3K
R4474	0662057A97	100K
R4475	0662057B47	0
R4480	0662057A73	10K
R4481	0662057C44	51
R4482	0662057B09	300K
R4483	0662057A97	100K
R4484	0662057A93	68K
R4485	0662057C44	51
R4486	0662057C44	51
R4489	0662057C44	51
R4491	0662057A74	11K
R4492	0662057A73	10K
R4495	0680195M18	51
R4496	0680194M23	82
R4497	0680195M18	51
R4501	0662057A67	5.6K
R4502	0662057A93	68K
R4503	0662057A63	3.9K
R4504	0662057A73	10K
R4506	0662057A73	10K
R4507	0662057A73	10K
R4511	0680194M18	51
R4512	0662057A41	470
R4513	0662057A73	10K
R4514	0662057A61	3.3K
R4631	0662057A89	47K
R4632	0662057A89	47K
R4634	0662057A97	100K
R4635	0662057A97	100K
SH4301	2602641Y02	SHIELD
SH4302	2602641Y02	SHIELD
T4051	2505515V03	TRANSFORMER 4:1
T4052	2505515V04	TRANSFORMER 5:1
U0101	5102226J56	MICROPROCESSOR
U0111	5102463J64	EEPROM
U0121	5186137B01	IC, FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	IC, QUAD OPAMP
U0221	5185130C53	IC, ASFIC
U0251	5184704M60	IC-CMOS ANALOG
U0271	5109699X01	AUDIO PA
U0301	5109152M01	EEPROM ANALOG
U0331	5186204B01	BUFFER / DRIVER
U0341	5113818A01	LINEAR IC OP-AMP
U0342	5105750U28	IC CMOS SWITCH
U0351	5102463J40	REGULATOR, 3.3V
U0611	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0641	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0651	5113816A07	REGULATOR, 5V
U0652	5113815A02	UNDERVOLT SENSOR
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U4201	5185963A27	IC FRACTN
U4211	5105739X05	IC, VOLTAGE REGULATOR
U4301	5105750U54	IC, VCO
U4401	5185130C65	IC LDMOS DRIVER
U4501	5185765B26	IC POWER CONTROL
U4502	5185963A15	IC TEMPERATURE SENSOR
VR0151	4813830A15	DIODE, 5.6V
VR0501	4805656W09	DIODE, ZENER
VR0503	4805656W09	DIODE, ZENER
VR0504	4813830A40	SOC23 AUTO SDN
VR0505	4805656W09	DIODE, ZENER
VR0509	4813830A40	DIODE, ZENER
VR0510	4813830A40	DIODE, ZENER
VR0537	4813830A15	DIODE, 5.6V
VR0541	4813830A27	DIODE, 14V
VR0601	4813832C77	DIODE
VR0621	4813830A15	DIODE, 5.6V
VR4471	4813830A15	DIODE, 5.6V
VR4473	4813830A15	DIODE, 5.6V
Y0131	4880113R19	CRYSTAL 38.4KHZ
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455KHz DISCRIMINATOR
Y4262	4886182B01	TCXO 16.8MHZ

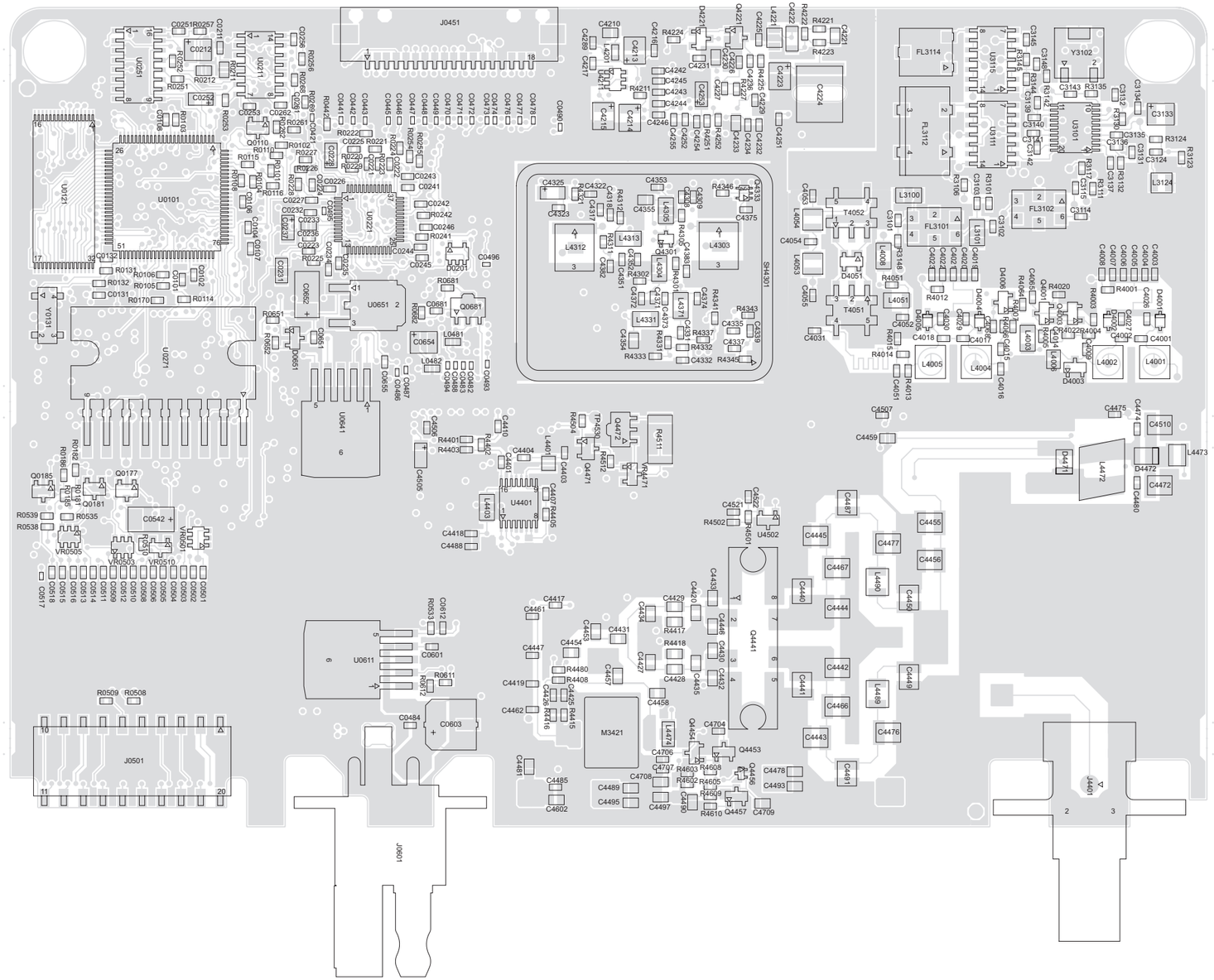
* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

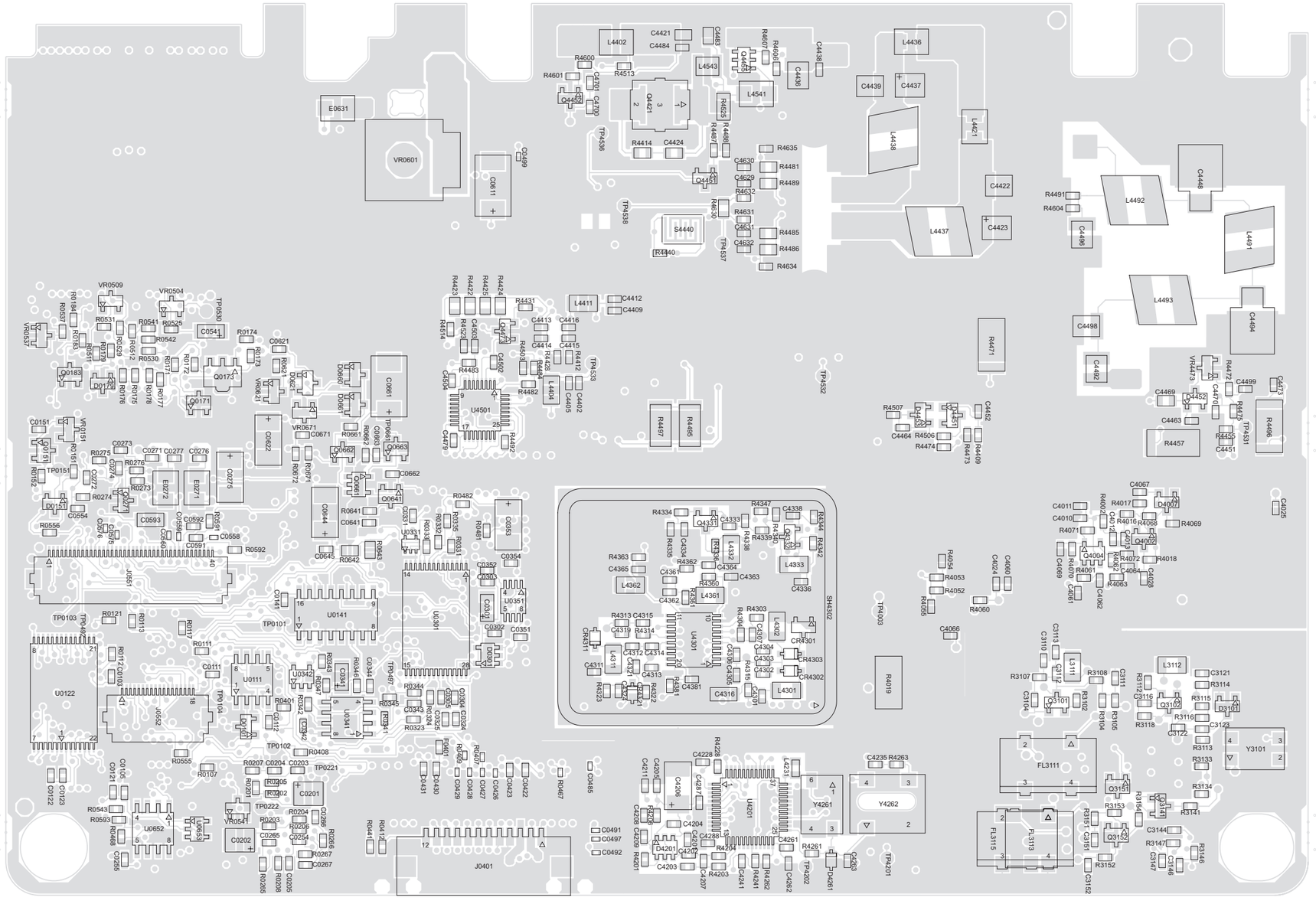
6881091C63-C

3.0 UHF Band 1 (403-470 MHz) 25-40W LDMOS PCB 8471223L02, Schematics, and Parts Lists

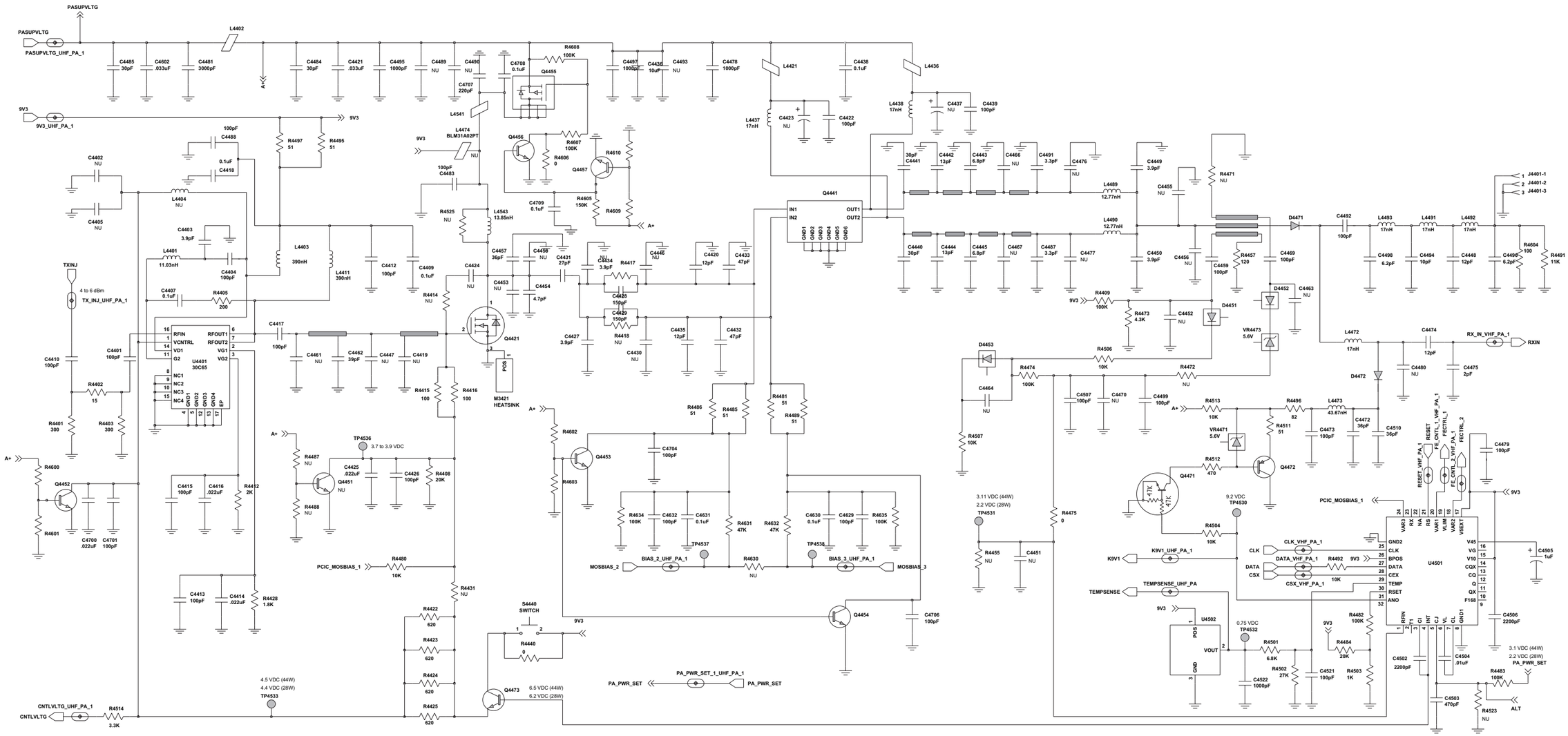


UHF (403-470 MHz) 25-40W 8471223L02 Top Side

6881091C63-C

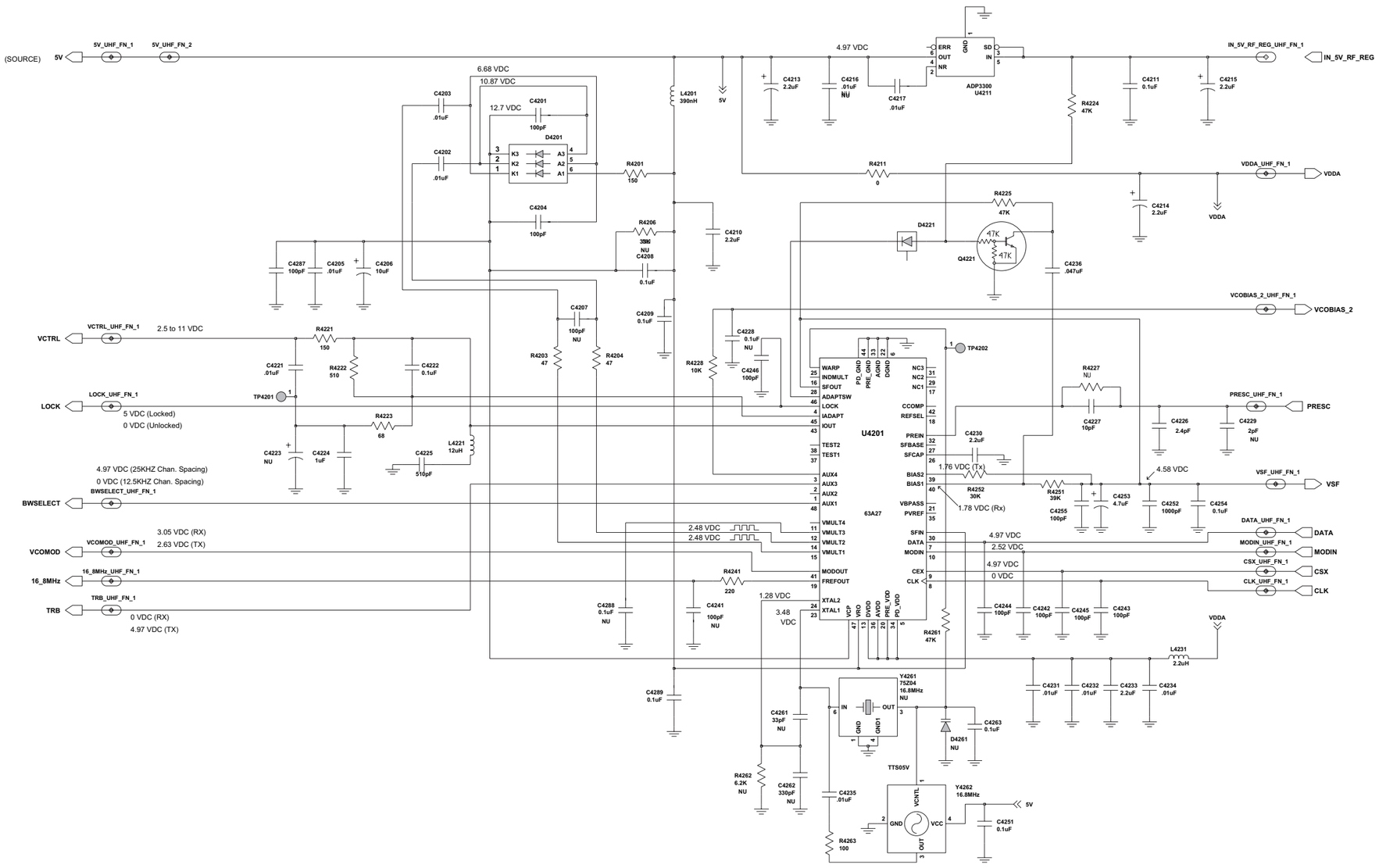


UHF (403-470 MHz) 25-40W 8471223L02 Bottom Side



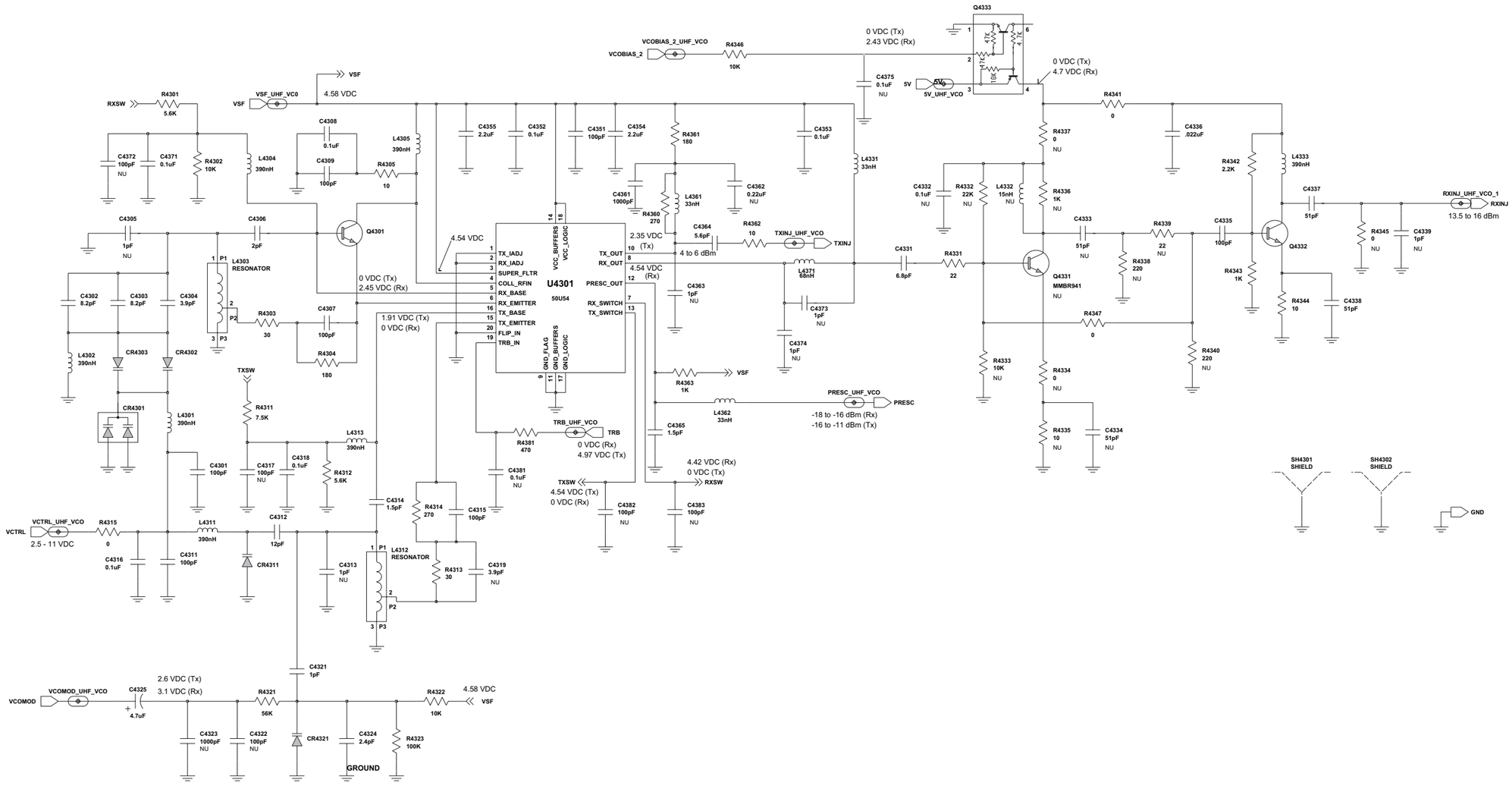
UHF (403-470 MHz) Power Amplifier 25-40W

6881091C63-C

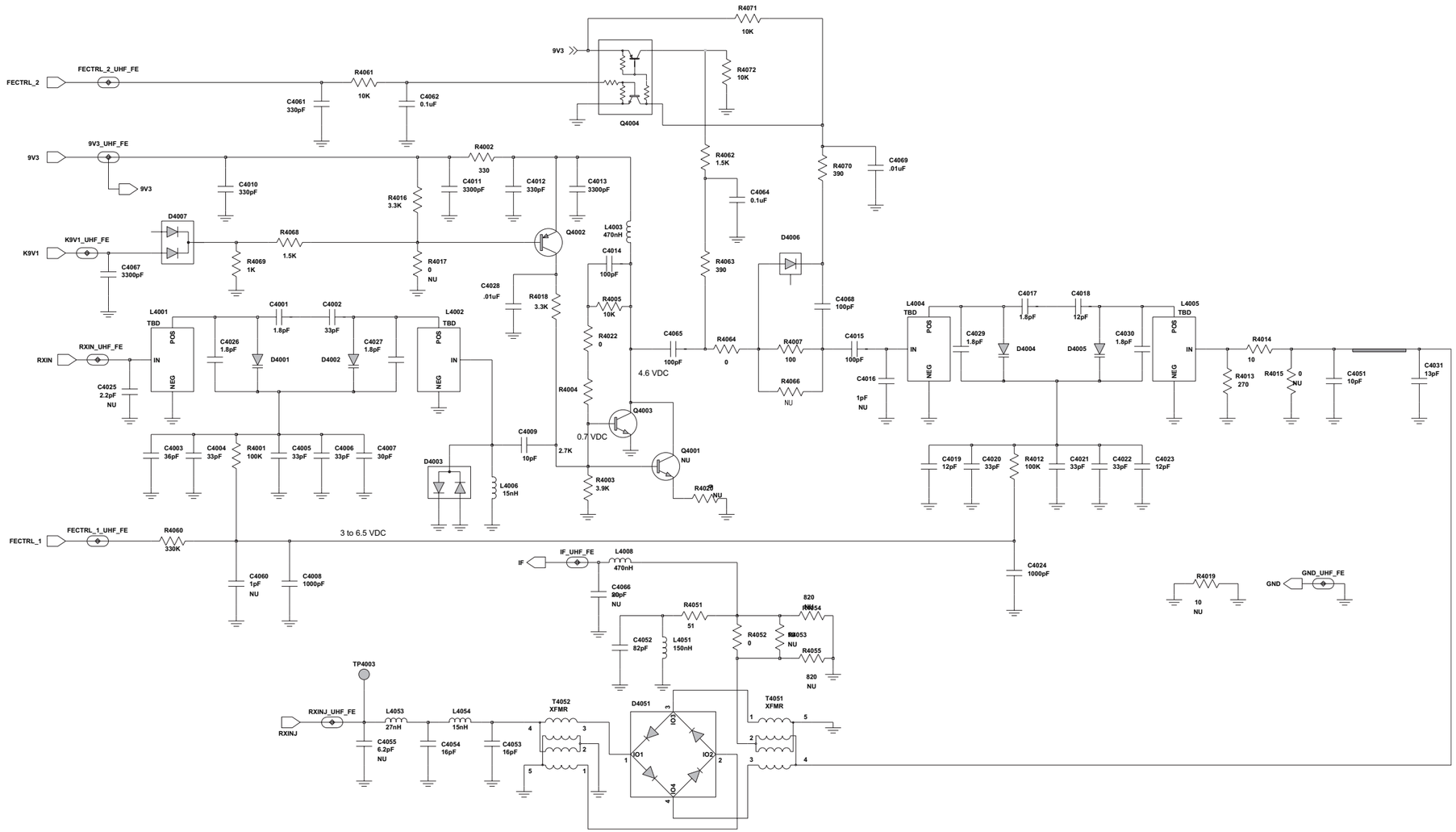


UHF (403-470 MHz) FRACN

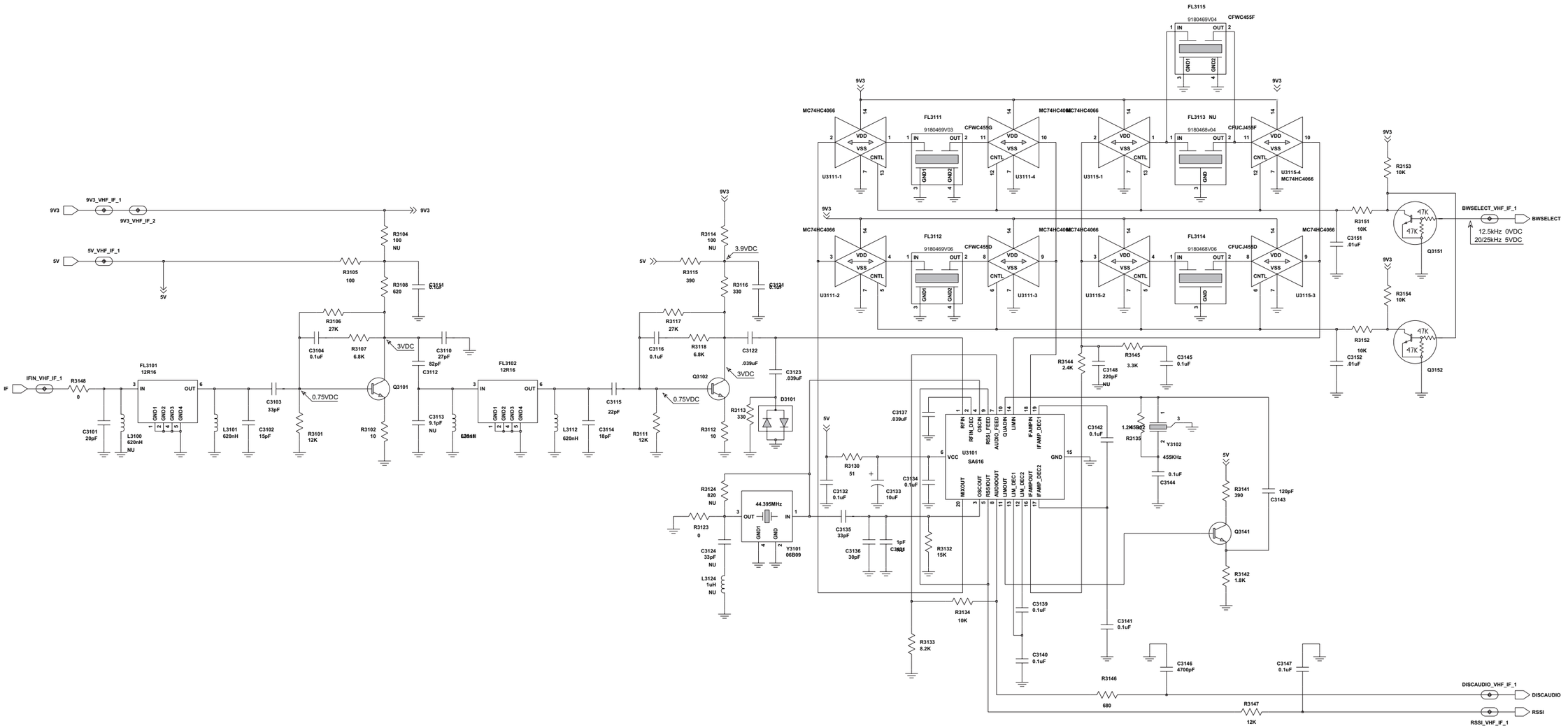
6881091C63-C



UHF (403-470 MHz) Voltage Controlled Oscillator



UHF (403-470 MHz) Receiver Front End



UHF (403-470 MHz) IF

6881091C63-C

UHF B1 25-40W PCB 8471223L02 Parts List

Circuit Ref	Motorola Part No.	Description
C3101	2113944C80	CAP 20 PF
C3102	2113944C32	CAP 15 PF
C3103	2113944C36	CAP 33 PF
C3104	2113945C31	CAP 0.1 UF
C3110	2113944C61	CAP 0.5 PF
C3111	2113945C31	CAP 0.1 UF
C3112	2113944C36	CAP 33 PF
C3113	2113944C75	CAP 8.2 PF
C3114	2113944C30	CAP 10 PF
C3115	2113944C32	CAP 15 PF
C3116	2113945C31	CAP 0.1 UF
C3121	2113945C31	CAP 0.1 UF
C3122	2113945C26	CAP 39 UF
C3123	2113945C26	CAP 39 UF
C3124	2113944M30	CAP 33 PF
C3132	2113945C31	CAP 0.1 UF
C3133	2313960D07	CAP 10 UF
C3134	2113945C31	CAP 0.1 UF
C3135	2113944M30	CAP 33 PF
C3136	2113944C34	CAP 22 PF
C3137	2113945C26	CAP 39 UF
C3139	2113945C31	CAP 0.1 UF
C3140	2113945C31	CAP 0.1 UF
C3141	2113945C31	CAP 0.1 UF
C3142	2113945C31	CAP 0.1 UF
C3143	2113944C46	CAP 120 PF
C3144	2113945C31	CAP 0.1 UF
C3145	2113945C31	CAP 0.1 UF
C3146	2113945L41	CAP 4700 PF
C3147	2113945C31	CAP 0.1 UF
C3151	2113945L49	CAP 1 UF
C3152	2113945L49	CAP 1 UF
C4001	2113944C69	CAP 1.8 PF
C4002	2113944C43	CAP 82 PF
C4003	2113944C35	CAP 27 PF
C4004	2113944C36	CAP 33 PF
C4005	2113944C36	CAP 33 PF
C4006	2113944C36	CAP 33 PF
C4007	2113944C82	CAP 30 PF
C4008	2113945L25	CAP 1000 PF
C4009	2113944C30	CAP 10 PF
C4010	2113945L13	CAP 330 PF
C4011	2113945L37	CAP 3300 PF
C4012	2113945L13	CAP 330 PF
C4013	2113945L37	CAP 3300 PF
C4014	2113944C45	CAP 100 PF
C4015	2113944C45	CAP 100 PF
C4017	2113944C69	CAP 1.8 PF
C4018	2113944C80	CAP 20 PF
C4019	2113944C31	CAP 12 PF
C4020	2113944C36	CAP 33 PF
C4021	2113944C36	CAP 33 PF
C4022	2113944C36	CAP 33 PF
C4023	2113944C31	CAP 12 PF
C4024	2113945L25	CAP 1000 PF
C4026	2113944C69	CAP 1.8 PF
C4027	2113944C69	CAP 1.8 PF
C4028	2113945L49	CAP 1 UF
C4029	2113944C69	CAP 1.8 PF
C4030	2113944C69	CAP 1.8 PF
C4031	2113944C78	CAP 13 PF
C4051	2113944C30	CAP 10 PF
C4052	2113944C43	CAP 82 PF
C4053	2113944C79	CAP 16 PF
C4054	2113944C79	CAP 16 PF
C4055	2113944C73	CAP 6.8 PF
C4061	2113944C04	CAP 330 PF
C4062	2113945C31	CAP 0.1 UF
C4064	2113945C31	CAP 0.1 UF
C4065	2113944C45	CAP 100 PF
C4067	2113945L37	CAP 3300 PF
C4068	2113944C45	CAP 100 PF
C4069	2113945L49	CAP 1 UF
C4201	2113944C45	CAP 100 PF
C4202	2113945L49	CAP 1 UF
C4203	2113945L49	CAP 1 UF
C4204	2113944C45	CAP 100 PF
C4205	2113945L49	CAP 1 UF
C4206	2313960F01	CAP 10 UF
C4208	2113945C31	CAP 0.1 UF
C4209	2113945C31	CAP 0.1 UF
C4210	2113946N03	CAP 2.2 UF
C4211	2113945C31	CAP 0.1 UF
C4213	2313960C78	CAP 2.2 UF
C4214	2313960C78	CAP 2.2 UF
C4215	2313960C78	CAP 2.2 UF
C4217	2113945L49	CAP 1 UF
C4221	2113944F13	CAP 1 UF
C4222	2189705V01	CAP 0.1 UF
C4223	2115358H25	CAP 1 UF
C4225	2113945L18	CAP 510 PF
C4226	2113944M03	CAP 2.4 PF
C4227	2113944C30	CAP 10 PF
C4230	2113946N03	CAP 2.2 UF
C4231	2113945L49	CAP 1 UF
C4232	2113945L49	CAP 1 UF
C4233	2113946N03	CAP 2.2 UF
C4234	2113945L49	CAP 1 UF
C4235	2113945L49	CAP 1 UF
C4236	2113945C27	CAP 47 UF
C4242	2113944C45	CAP 100 PF
C4243	2113944C45	CAP 100 PF
C4244	2113944C45	CAP 100 PF
C4245	2113944C45	CAP 100 PF
C4246	2113944C45	CAP 100 PF
C4251	2113945C31	CAP 0.1 UF
C4252	2113945L25	CAP 1000 PF
C4253	2313960B30	CAP 4.7 UF
C4254	2113945C31	CAP 0.1 UF
C4255	2113944C45	CAP 100 PF
C4263	2113945C31	CAP 0.1 UF
C4287	2113944C45	CAP 100 PF
C4289	2113945C31	CAP 0.1 UF
C4301	2113944C45	CAP 100 PF
C4302	2113944M16	CAP 8.2 PF
C4303	2113944M16	CAP 8.2 PF
C4304	2113944M08	CAP 3.9 PF
C4306	2113944M01	CAP 2 PF
C4307	2113944C45	CAP 100 PF
C4308	2113945C31	CAP 0.1 UF
C4309	2113944C45	CAP 100 PF
C4311	2113944C45	CAP 100 PF
C4312	2113944C31	CAP 12 PF
C4314	2113944C67	CAP 1.5 PF
C4315	2113944C45	CAP 100 PF
C4316	2189705V01	CAP 0.1 UF
C4318	2113945C31	CAP 0.1 UF
C4321	2113944C63	CAP 1 PF
C4324	2113944M03	CAP 2.4 PF
C4325	2313960B30	CAP 4.7 UF
C4331	2113944M14	CAP 6.8 PF
C4335	2113944C45	CAP 100 PF
C4336	2113945C04	CAP 22000 PF
C4337	2113944C85	CAP 51 PF
C4338	2113944C85	CAP 51 PF
C4351	2113944C45	CAP 100 PF
C4352	2113945C31	CAP 0.1 UF
C4353	2113945C31	CAP 0.1 UF
C4354	2113946N03	CAP 2.2 UF
C4355	2113946N03	CAP 2.2 UF
C4361	2113945L25	CAP 1000 PF
C4364	2113944C71	CAP 5.6 PF
C4365	2113944C67	CAP 1.5 PF
C4371	2113945C31	CAP 0.1 UF
C4401	2113944C45	CAP 100 PF
C4403	2113944C20	CAP 3.9 PF
C4404	2113944C45	CAP 100 PF
C4407	2113945C31	CAP 0.1 UF
C4409	2113945C31	CAP 0.1 UF
C4410	2113944C45	CAP 100 PF
C4412	2113944C45	CAP 100 PF
C4413	2113944C45	CAP 100 PF
C4414	2113945C04	CAP 22000 PF
C4415	2113944C45	CAP 100 PF
C4416	2113945C04	CAP 22000 PF
C4417	2113944C85	CAP 51 PF
C4418	2113945C31	CAP 0.1 UF
C4420	2113944F44	CAP 12 PF
C4421	2113945G57	CAP 33000 PF
C4422	2111078B42	CAP 100 PF
C4424	2113944C38	CAP 56 PF
C4425	2113945C04	CAP 22000 PF
C4426	2113944C45	CAP 100 PF
C4427	2113944F33	CAP 4.3 PF
C4428	2113944F70	CAP 180 PF
C4429	2113944F70	CAP 180 PF
C4431	2113944F52	CAP 27 PF
C4432	2113944F58	CAP 47 PF
C4433	2113944F58	CAP 47 PF
C4434	2113944F33	CAP 4.3 PF
C4435	2113944F44	CAP 12 PF
C4436	2113955E37	CAP 10 UF
C4438	2113945C31	CAP 0.1 UF
C4439	2111078B42	CAP 100 PF
C4440	2111078B25	CAP 27 PF
C4441	2111078B25	CAP 27 PF
C4443	2111078B16	CAP 13 PF
C4445	2111078B16	CAP 13 PF
C4448	2171388L01	CAP 12 PF
C4449	2111078B03	CAP 3.9 PF
C4450	2111078B03	CAP 3.9 PF
C4454	2113944F33	CAP 4.3 PF
C4457	2113944F55	CAP 36 PF

Circuit Ref	Motorola Part No.	Description
C4459	2113944F01	CAP 100 PF
C4462	2113944C37	CAP 39 PF
C4469	2113944F01	CAP 100 PF
C4472	2111078B31	CAP 36 PF
C4473	2113944C45	CAP 100 PF
C4474	2113944C31	CAP 12 PF
C4475	2113944C13	CAP 2 PF
C4478	2113945G21	CAP 1000 PF
C4479	2113944C45	CAP 100 PF
C4481	2113945G32	CAP 3000 PF
C4483	2113944F01	CAP 100 PF
C4484	2113944C82	CAP 30 PF
C4485	2113944C82	CAP 30 PF
C4487	2111078B01	CAP 3.3 PF
C4488	2113944C45	CAP 100 PF
C4491	2111078B01	CAP 3.3 PF
C4492	2111078B42	CAP 100 PF
C4494	2180464E63	CAP 10 PF
C4495	2113945G21	CAP 1000 PF
C4496	2111078B08	CAP 6.2 PF
C4497	2113945G21	CAP 1000 PF
C4498	2111078B08	CAP 6.2 PF
C4499	2113944C45	CAP 100 PF
C4502	2113945C18	CAP 12 UF
C4503	2113945L17	CAP 470 PF
C4504	2113945L49	CAP 1 UF
C4505	2313960B01	CAP 1 UF
C4506	2113945L33	CAP 2200 PF
C4507	2113944C45	CAP 100 PF
C4510	2111078B31	CAP 36 PF
C4602	2113945G57	CAP 33000 PF
C4629	2113944C45	CAP 100 PF
C4630	2113945C31	CAP 0.1 UF
C4631	2113945C31	CAP 0.1 UF
C4632	2113944C45	CAP 100 PF
C4701	2113944C45	CAP 100 PF
C4704	2113944C45	CAP 100 PF
C4706	2113944C45	CAP 100 PF
C4707	2113944C02	CAP 220 PF
C4708	2113945G91	CAP 100000 PF
C4709	2113945G91	CAP 100000 PF
CR4301	4885094Y01	DIODE VARACTOR ISV228
CR4302	4885055Y01	DIODE VARACTOR 15V
CR4303	4885055Y01	DIODE VARACTOR 15V
CR4311	4815322H01	DIODE VARACTOR BB153
CR4321	4885055Y01	DIODE VARACTOR 15V
D3101	4815048H01	DIODE MMBD353 DUAL
D4001	4885055Y01	DIODE VARACTOR 15V
D4002	4885055Y01	DIODE VARACTOR 15V
D4003	4815048H01	DIODE MMBD353 DUAL
D4004	4885055Y01	DIODE VARACTOR 15V
D4005	4885055Y01	DIODE VARACTOR 15V
D4006	4813974A06	DIODE PIN SOT-23
D4007	4813978C02	DIODE DUAL 70V 5B
D4051	4886143B01	WM MIXER QUAD RING DIODE
D4201	4815011H01	DIODE TRIPLE
D4221	4813974A05	DIODE MMBD301L
D4451	4813974A05	DIODE MMBD301L
D4452	4813974A05	DIODE MMBD301L
D4453	4813974A05	DIODE MMBD301L
D4471	4802482J02	DIODE PIN SMD
D4472	4802482J02	DIODE PIN SMD
FL3101	9180112R16	44.85 MHZ XTAL FILTER
FL3102	9180112R16	44.85 MHZ XTAL FILTER
FL3111	9115811H01	6 ELEMENT XTAL FILTER
FL3112	9115811H04	6 ELEMENT XTAL FILTER
FL3114	9180468V06	4 ELEMENT XTAL FILTER
FL3115	9115811H02	6 ELEMENT XTAL FILTER
J4401	0986166B01	BNC RF CONNECTOR
L3101	2414032D25	IDCTR 620 NH
L3111	2414032D25	IDCTR 620 NH
L3112	2414032D25	IDCTR 620 NH
L3124	2414032B68	IDCTR 1 UH
L4003	2414032D23	IDCTR 470 NH
L4006	2414032F24	IDCTR 15 NH
L4008	2414032D23	IDCTR 470 NH
L4051	2414032D17	IDCTR 150 NH
L4053	2414032B46	IDCTR 27 NH
L4054	2414032B43	IDCTR 15 NH
L4201	2414017Q42	IDCTR 390 NH
L4221	2414032L25	IDCTR 12 UH
L4231	2414017Q20	IDCTR 2.2 UH
L4301	2414032D22	IDCTR 390 NH
L4302	2414032D22	IDCTR 390 NH
L4303	2460593C01	IDCTR 12.21 NH
L4304	2414032D22	IDCTR 390 NH
L4305	2414032D22	IDCTR 390 NH
L4311	2414032D22	IDCTR 390 NH
L4312	2460593C01	IDCTR 12.21 NH
L4313	2414032D22	IDCTR 390 NH
L4331	2414032D09	IDCTR 33 NH
L4333	2414032D22	IDCTR 390 NH
L4361	2414032D09	IDCTR 33 NH
L4362	2414032D09	IDCTR 33 NH
L4371	2414032D13	IDCTR 68 NH
L4401	2460591B04	IDCTR 11.03 NH
L4402	2415954H02	IDCTR BEAD CHIP
L4403	2414032D22	IDCTR 390 NH
L4411	2414032D22	IDCTR 390 NH
L4421	2415954H02	IDCTR BEAD CHIP
L4436	2415954H02	IDCTR BEAD CHIP
L4437	2460592A01	IDCTR 17 NH
L4438	2460592A01	IDCTR 17 NH
L4472	2460592A01	IDCTR 17 NH
L4473	2460591N36	IDCTR 43.67 NH
L4489	2460591B77	IDCTR 13.90 NH
L4490	2460591B77	IDCTR 13.90 NH
L4491	2460592A01	IDCTR 17 NH
L4492	2460592A01	IDCTR 17 NH
L4493	2460592A01	IDCTR 17 NH
L4541	2415954H02	IDCTR BEAD CHIP
L4543	2460591C23	IDCTR 13.85 NH
M3421	2686201B02	HEATSPREADER
Q3101	4802197J95	TSTR PBR941
Q3102	4802197J95	TSTR PBR941
Q3141	4813973M07	TSTR MMBT3904
Q3151	4813973A42	TSTR NPN SC-59
Q3152	4813973A42	TSTR NPN SC-59
Q4002	4813973A13	TSTR PNP TO-236
Q4003	4802197J95	TSTR PBR941
Q4004	4816097H01	TSTR FMC2 RH
Q4221	4813973A42	TSTR NPN SC-59
Q4301	4805218N63	TSTR BFQ67W
Q4332	4802197J95	TSTR PBR941
Q4333	4815055H01	TSTR UMC5NT2G DUAL
Q4421	4813976A04	TSTR MRF1518 LDMOS
Q4441	4816022H01	TSTR MRF1570 LDMOS
Q4451	4813973M07	TSTR MMBT3904
Q4452	4813973M07	TSTR MMBT3904
Q4453	4813973M07	TSTR MMBT3904
Q4454	4813973M07	TSTR MMBT3904
Q4455	4871309S01	XSTR SI3455D
Q4456	4816000H01	TSTR DTC114YETL
Q4457	4813973M07	TSTR MMBT3904
Q4471	4813973A42	TSTR NPN SC-59
Q4472	4816049H01	TSTR 2SB1132 BIPOLAR
Q4473	4813973M07	TSTR MMBT3904
R3101	0613952J03	RES 12K OHM
R3102	0613952H25	RES 10 OHM
R3105	0613952H49	RES 100 OHM
R3106	0613952J11	RES 27K OHM
R3107	0613952H82	RES 2400 OHM
R3108	0613952H75	RES 1200 OHM
R3111	0613952J03	RES 12K OHM
R3112	0613952H25	RES 10 OHM
R3113	0613952H61	RES 330 OHM
R3115	0613952H63	RES 390 OHM
R3116	0613952H81	RES 2200 OHM
R3117	0613952J11	RES 27K OHM
R3118	0613952H82	RES 2400 OHM
R3124	0613952H73	RES 1000 OHM
R3130	0613952H42	RES 51 OHM
R3132	0613952J05	RES 15K OHM
R3133	0613952H89	RES 4700 OHM
R3134	0613952H95	RES 8200 OHM
R3135	0613952H75	RES 1200 OHM
R3141	0613952H63	RES 390 OHM
R3142	0613952H79	RES 1800 OHM
R3144	0613952H82	RES 2400 OHM
R3145	0613952H85	RES 3300 OHM
R3146	0613952H69	RES 680 OHM
R3147	0613952J03	RES 12K OHM
R3148	2113944C45	CAP 100 PF
R3151	0613952J01	RES 10K OHM
R3152	0613952J01	RES 10K OHM
R3153	0613952J01	RES 10K OHM
R3154	0613952J01	RES 10K OHM
R4001	0613952J25	RES 100K OHM
R4002	0613952H61	RES 330 OHM
R4003	0613952H87	RES 3900 OHM
R4004	0613952H83	RES 2700 OHM
R4005	0613952J01	RES 10K OHM
R4007	0613952H49	RES 100 OHM
R4012	0613952J25	RES 100K OHM
R4013	0613952H59	RES 270 OHM
R4014	0613952H25	RES 10 OHM
R4016	0613952H85	RES 3300 OHM
R4018	0613952H85	RES 3300 OHM
R4022	0613952G67	RES 0 OHM
R4051	0613952H42	RES 51 OHM
R4052	0613952G67	RES 0 OHM
R4060	0613952J37	RES 330K OHM
R4061	0613952J01	RES 10K OHM

Circuit Ref	Motorola Part No.	Description
R4062	0613952H77	RES 1500 OHM
R4063	0613952H63	RES 390 OHM
R4064	0613952G67	RES 0 OHM
R4068	0613952H77	RES 1500 OHM
R4069	0613952H73	RES 1000 OHM
R4070	0613952H63	RES 390 OHM
R4071	0613952J01	RES 10K OHM
R4072	0613952J01	RES 10K OHM
R4201	0613952H53	RES 150 OHM
R4203	0613952H41	RES 47 OHM
R4204	0613952H41	RES 47 OHM
R4211	0613952G67	RES 0 OHM
R4221	0613952H53	RES 150 OHM
R4222	0613952H66	RES 510 OHM
R4223	0613952H45	RES 68 OHM
R4224	0613952J17	RES 47K OHM
R4225	0613952J17	RES 47K OHM
R4228	0613952J01	RES 10K OHM
R4241	0613952H57	RES 220 OHM
R4251	0613952J15	RES 39K OHM
R4252	0613952J12	RES 30K OHM
R4261	0613952J17	RES 47K OHM
R4263	0613952H49	RES 100 OHM
R4301	0613952H91	RES 5600 OHM
R4302	0613952J01	RES 10K OHM
R4303	0613952H36	RES 30 OHM
R4304	0613952H55	RES 180 OHM
R4305	0613952H25	RES 10 OHM
R4311	0613952H94	RES 7500 OHM
R4312	0613952H91	RES 5600 OHM
R4313	0613952H36	RES 30 OHM
R4314	0613952H59	RES 270 OHM
R4315	0613952G67	RES 0 OHM
R4321	0613952J19	RES 56K OHM
R4322	0613952J01	RES 10K OHM
R4323	0613952J25	RES 100K OHM
R4331	0613952H33	RES 22 OHM
R4341	0613952G67	RES 0 OHM
R4342	0613952H81	RES 2200 OHM
R4343	0613952H73	RES 1000 OHM
R4344	0613952H25	RES 10 OHM
R4346	0613952J01	RES 10K OHM
R4347	0613952G67	RES 0 OHM
R4360	0613952H59	RES 270 OHM
R4361	0613952H55	RES 180 OHM
R4362	0613952H25	RES 10 OHM

Circuit Ref	Motorola Part No.	Description
R4363	0613952H73	RES 1000 OHM
R4381	0613952H65	RES 470 OHM
R4401	0613952H60	RES 300 OHM
R4402	0613952H29	RES 15 OHM
R4403	0613952H60	RES 300 OHM
R4405	0613952H56	RES 200 OHM
R4408	0613952J08	RES 20K OHM
R4409	0613952J25	RES 100K OHM
R4412	0613952H80	RES 2000 OHM
R4414	0613952H60	RES 300 OHM
R4415	0613952H39	RES 39 OHM
R4416	0613952H39	RES 39 OHM
R4422	0613958H68	RES 620 OHM
R4423	0613958H68	RES 620 OHM
R4424	0613958H68	RES 620 OHM
R4425	0613958H68	RES 620 OHM
R4428	0613952H79	RES 1800 OHM
R4457	0613959Y51	RES 120 OHM
R4473	0613952H88	RES 4300 OHM
R4474	0613952J25	RES 100K OHM
R4475	0613952G67	RES 0 OHM
R4480	0613952J01	RES 10K OHM
R4481	0613958H42	RES 51 OHM
R4482	0613952J36	RES 300K OHM
R4483	0613952J25	RES 100K OHM
R4484	0613952J20	RES 62K OHM
R4485	0613958H42	RES 51 OHM
R4486	0613958H42	RES 51 OHM
R4487	0613952J25	RES 100K OHM
R4488	0613952H83	RES 2700 OHM
R4489	0613958H42	RES 51 OHM
R4491	0613952J02	RES 11K OHM
R4492	0613952J01	RES 10K OHM
R4495	0613959Q42	RES 51 OHM
R4496	0613959Y47	RES 82 OHM
R4497	0613959Q42	RES 51 OHM
R4501	0613952H75	RES 1200 OHM
R4502	0613952J32	RES 200K OHM
R4503	0613952H87	RES 3900 OHM
R4504	0613952J01	RES 10K OHM
R4506	0613952J01	RES 10K OHM
R4507	0613952J01	RES 10K OHM
R4511	0613959Y42	RES 51 OHM
R4512	0613952H65	RES 470 OHM
R4513	0613952J01	RES 10K OHM
R4514	0613952H85	RES 3300 OHM

Circuit Ref	Motorola Part No.	Description
R4600	0613952J25	RES 100K OHM
R4601	0613952H83	RES 2700 OHM
R4602	0613952J25	RES 100K OHM
R4603	0613952H83	RES 2700 OHM
R4604	2415429H47	IDCTR 390 NH
R4605	0613952J29	RES 150K OHM
R4607	0613952J25	RES 100K OHM
R4608	0613952J25	RES 100K OHM
R4609	0613952J25	RES 100K OHM
R4610	0613952H83	RES 2700 OHM
R4631	0613952J17	RES 47K OHM
R4632	0613952J17	RES 47K OHM
R4634	0613952J25	RES 100K OHM
R4635	0613952J25	RES 100K OHM
SH4301	2602641Y03	SHIELD VCO
SH4302	2602641Y03	SHIELD VCO
T4051	2516149H01	XFMR MIXER 4-1
T4052	2516148H01	XMFR MIXER 5-1
U3101	5115281H01	IC FM IF SA616
U3111	5185291Y01	IC SOIC14
U3115	5185291Y01	IC SOIC14
U4201	5185177Y01	IC FRACTN AT25016
U4211	5115026H01	IC LINEAR VOLTAGE REG
U4301	5171121L01	IC PKG DIE VCO BUFFER
U4401	5115678H01	IC RF AMP TSSOP16EP
U4501	5185765B26	IC PWR CTRL TQFP32
U4502	5115022H01	IC TEMPERATURE SENSOR
VR4471	4813977M11	DIODE MBZ5232
VR4473	4813977M11	DIODE MBZ5232
Y3101	4802245J84	XTAL 44.395 MHZ
Y3102	9186145B02	CER DISC CDBCA455CX36-TC
Y4262	4816142H01	XTAL OSC 16.8 MHZ

* Motorola Depot Servicing only

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

Notes

Chapter 13: UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Service Information

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Section 1

MODEL CHARTS AND TECHNICAL SPECIFICATIONS

1.0 UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Model Charts

1.1 CDM Series Model Chart

CDM Series, UHF (450-512 MHz) 25-40W LDMOS (Conventional, LTR/PassPort)

Model	Description
AAM25SKC9AA1AN	CDM750, 450-512 MHz, 25-40W, Conv Pref (LDMOS)
AAM25SKD9AA2AN	CDM1250, 450-512 MHz, 25-40W, Conv Pref (LDMOS)
AAM25SKF9AA5AN	CDM1550, 450-512 MHz, 25-40W, Conv Pref (LDMOS)
AAM25SKF9DU5AN	CDM1550•LS, 450-512 MHz, 25-40W, Conv Pref (LDMOS)
AAM25SKF9DP5AN	CDM1550•LS^{+}, 450-512 MHz, 25-40W, Conv Pref (LDMOS)
AAM25SKC9PW1AN	CDM750 450-512 MHz 25-40W Conv Pref (LDMOS)
AAM25SKD9PW2AN	CDM1250 450-512 MHz 25-40W Conv Pref (LDMOS)
AAM25SKF9PW5AN	CDM1550 450-512 MHz 25-40W Conv Pref (LDMOS)

								Item	Description
X					X			GCN6112_	Control Head, CDM750
	X					X		GCN6113_	Control Head, CDM1250
		X	X	X			X	GCN6114_	Control Head, CDM1550
X	X	X	X					IMUE6025	Tanapa, UHF 450-512 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	X					IMUE6025_S	Replacement Board, UHF 450-512 MHz, 25-40W, 12.5/20/25 kHz
				X				PMUE1757	Tanapa, CDM1550•LS^{+}, 450-512 MHz, 25-40W
				X				PMUE1757_S	Replacement Board, CDM1550•LS^{+}, 450-512 MHz, 25-40W
					X	X	X	PMUE1874_	Tanapa, UHF 450-512 MHz 25-40 W 12.5/20/25 kHz
					X	X	X	PMUE1874_S	Replacement Board, UHF 450-512 MHz 25-40 W 12.5/20/25 kHz
X	X	X	X	X	X	X	X	HAE4003_	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini-U)
X	X	X	X	X	X	X	X	HAE4004_	Antenna, 470-512 MHz, 1/4 Wave Roof Mount (Mini-U)
X	X	X	X	X	X	X	X	HAE4011_	Antenna, 450-470 MHz, 3.5 dB Gain Roof Mount (Mini-U)
X	X	X	X	X	X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5 dB Gain Roof Mount (Mini-U)
X	X	X	X	X	X	X	X	HAE4013_	Antenna, 494-512 MHz, 5 dB Gain Roof Mount (Mini-U)
X					X			6881091C54	User Guide, CDM750
	X					X		6881091C55	User Guide, CDM1250
		X					X	6881091C56	User Guide, CDM1550
			X					6881093C32	User Guide, CDM1550•LS
				X				6881094C79	User Guide, CDM1550•LS+

1.2 PRO Series Model Chart

PRO Series, UHF (450-520 MHz) 25-40W LDMOS				
Model				**Description**
LAM25SKC9AA1AN				PRO3100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp Conv Pref (LDMOS)
	LAM25SKD9AA2AN			PRO5100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp Conv Pref (LDMOS)
		LAM25SKF9AA5AN		PRO7100, 450-520 MHz, 25-40W, 12.5/20/25 kHz Ch Sp Conv Pref (LDMOS)
			Item	**Description**
X			GCN6112	Control Head, PRO3100
	X		GCN6113	Control Head, PRO5100
		X	GCN6114	Control Head, PRO7100
X	X	X	IMUE6025	Tanapa, UHF 450-520 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	IMUE6025_S	Replacement Board, UHF 450-520 MHz, 25-40W, 12.5/20/25 kHz
X	X	X	HAE4003_R	Antenna, 450-470 MHz, 1/4 Wave Roof Mount (Mini U)
X	X	X	HAE4011_R	Antenna, 450-470 MHz, 3.5dB Gain Roof Mount (Mini U)
X	X	X	HAE4012_	Antenna, 470-494 MHz, 3.5 dB Gain Roof Mount (Mini-U)
X			6881091C57	User Guide, PRO3100
	X		6881091C58	User Guide, PRO5100
		X	6881091C59	User Guide, PRO7100

2.0 Technical Specifications

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

General Specifications	
Channel Capacity **CDM750/PRO3100** **CDM1250/PRO5100** **CDM1550 Series/PRO7100**	 4 64 128
Power Supply	13.2Vdc (10.8 - 15.6Vdc)
Dimensions: H x W x D (in./mm) **CDM750/PRO3100** **CDM1250/PRO5100 and CDM1550 Series/PRO7100** Depth excludes knobs	**25 - 40W:** 2.2 in. x 6.93 in. x 7.44 in. (56 mm x 176 mm x 189 mm) 2.34 in. x 7.05 in. x 7.8 in. (59 mm x 179 mm x 198 mm) Add 0.35 in. (9mm) for Volume Knob
Weight (All CDM and PRO models)	3.5 lb. (1590 g)
Sealing:	Withstands rain testing per MIL STD 810 C/D/E and IP54
Shock and Vibration:	Protection provided via impact resistant housing exceeding MIL STD 810-C/D/E
Dust, Salt & Fog	Protection provided via environment resistant housing exceeding MIL STD 810 C/D/E

Transmitter	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-520 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Frequency Stability (-30°C to +60°C, +25° Ref.)	±1.5 ppm ±2.0 ppm
Power	25-40 W
Modulation Limiting	±2.5 @ 12.5 kHz ±4.0 @ 20 kHz ±5.0 @ 25 kHz
FM Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Conducted/Radiated Emission	-36 dBm <1 GHz -30 dBm >1 GHz
Adjacent Channel Power	-60 dB @ 12.5 kHz -70 dB @ 25 kHz
Audio Response (300 - 3000 Hz @ 20/25 kHz) (300-2550 Hz @ 12.5 kHz)	+1 to -3 dB TIA/EIA box
Audio Distortion @1000 Hz, 60% Rated Maximum Deviation	<3% typical

Receiver	UHF
*Frequencies - Full Bandsplit	UHF 450-512 MHz (CDM) UHF 450-520 MHz (PRO)
Channel Spacing	12.5/20/25 kHz
Sensitivity (12 dB SINAD)	0.30 µV (0.22 µV typical)
Intermodulation	>65 dB (ETS) 75 dB (TIA)
Adjacent Channel Selectivity	65 dB @ 12.5 kHz 70 dB @ 20 kHz 75 dB @ 25 kHz
Spurious Rejection	70 dB @ 12.5 kHz 75 dB @ 20/25 kHz
Rated Audio	3 W Internal 7.5 W External 13 W External
Audio Distortion @ Rated Audio	<3% typical
Hum & Noise	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response (300 - 3000 Hz @ 20/25 kHz) (300-2550 Hz @ 12.5 kHz)	+1 to -3 dB TIA/EIA box
Conducted Spurious Emission	-57 dBm <1 GHz -47 dBm >1 GHz

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

Notes

Section 2

THEORY OF OPERATION

1.0 Introduction

This chapter provides a detailed theory of operation for the UHF circuits in the radio. For details of the theory of operation and troubleshooting for the associated controller circuits refer to the controller section of the manual.

2.0 UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Receiver Front-End

2.1 Receiver Front-End

The UHF receiver, shown in Figure 13-1, is able to cover the UHF range from 450 to 512 MHz (for CDM models) and from 450 to 520 MHz (for PRO models). It consists of four major blocks: front-end bandpass filters and pre-amplifier, first mixer, high-IF, low-IF and receiver back-end. Two varactor-tuned bandpass filters perform antenna signal pre-selection. A passive double-balanced mixer converts the signal to the first IF of 44.85 MHz. Low-side first injection is used.

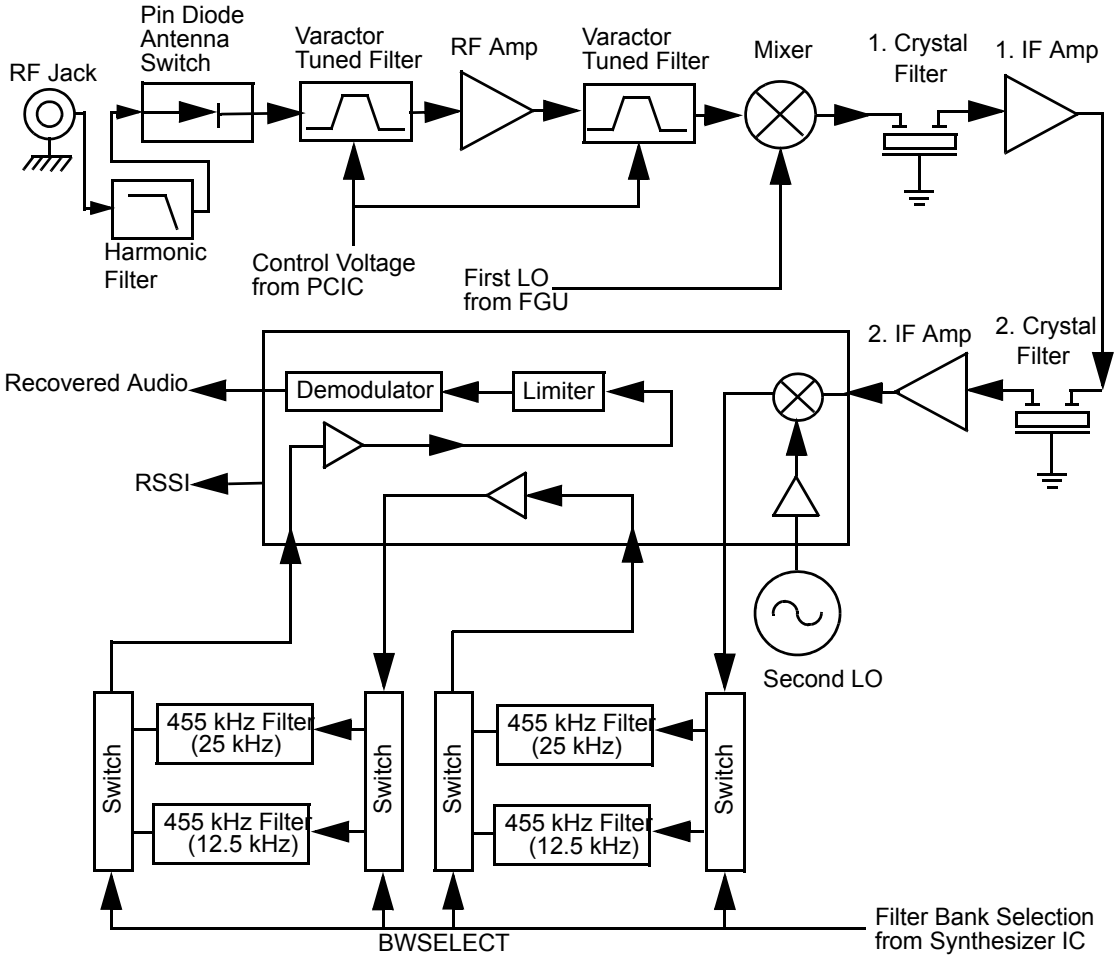


Figure 13-1 UHF Receiver Block Diagram

The two 2-pole 44.85 MHz crystal filters in the high-IF section and two pairs of 455 kHz ceramic filters in the low-IF section provide the required adjacent channel selectivity. The correct pair of ceramic filters for 12.5 or 25 kHz channel spacing is selected via control line BWSELECT. The second IF at 455 kHz is mixed, amplified, and demodulated in the IF IC. The processing of the demodulated audio signal is performed by an audio processing IC located in the controller section.

2.2 Front-End Bandpass Filters and Pre-Amplifier

The received signal from the radio's antenna connector is first routed through the harmonic filter and antenna switch, which are part of the RF power amplifier circuits, before being applied to the receiver pre-selector filter (C5001, C5002, D5001, and related components). The 2-pole pre-selector filter, tuned by the varactor diodes D5001 and D5002, pre-select the incoming signal (RXIN) from the antenna switch to reduce spurious effects to the stages that follow. The tuning voltage (FECTRL_1), ranging from 2 volts to 8 volts, is controlled by pin 20 of PCIC (U5501) in the transmitter section. A dual hot carrier diode (D5003) limits any inband signal to 0 dBm to prevent damage to the pre-amplifier.

The RF pre-amplifier is an SMD device (Q5003) with collector base feedback to stabilize gain, impedance, and intermodulation. The collector current of approximately 11-16 mA is drawn from the 9.3 volt supply via L5003 and R5002. A 3 dB pad (R5006, R5007, R5011, and R5008 - R5010) stabilizes the output impedance and intermodulation performance.

A second 2-pole varactor tuned bandpass filter provides additional filtering of the amplified signal. Varactor diodes D5004 and D5005 are controlled by the same signal, FECTRL_1, which controls the pre-selector filter. A following 1 dB pad (R5013 - R5015) stabilizes the output impedance and intermodulation performance.

2.3 First Mixer and High Intermediate Frequency (IF)

The signal from the front-end is converted to the first IF (44.85 MHz) using passive double-balanced mixer D5051. Its ports are matched for incoming RF signal conversion to the 44.85 MHz IF using low side injection via matching transformers T5051 and T5052. The injection signal (RXINJ) coming from the RX VCO buffer (Q5332) is filtered by the low-pass filter consisting of L5053, L5054, and C5053 - C5055 followed by matching transformer T5052 which has a level of approximately 15 dBm.

The mixer IF output signal from transformer T5501, pin 2 is fed to the first two-pole crystal filter (FL3101). The filter output in turn is matched to IF amplifier Q3101 which is actively biased using collector-base feedback resistors R3101and R3106 to provide a current drain of approximately 5 mA drawn from the 5 volt supply. The output impedance of this device is matched to the second two-pole crystal filter FL3102. The signal is further amplified by a pre-amplifier Q3102 before going to pin 1 of IFIC (U3101).

A dual, hot carrier diode (D3101) limits the filter output voltage swing to reduce overdrive effects at RF input levels above -27 dBm.

2.4 Low Intermediate Frequency (IF) and Receiver Back-End

The 44.85 MHz first IF signal from the second IF amplifier feeds the IF IC (U3101) at pin1. Within the IF IC the 44.85 MHz high IF signal mixes with the 44.395 MHz second local oscillator to produce a low IF signal of 455 kHz. The second LO frequency is determined by crystal Y3101. The second IF signal is amplified and filtered by an external pair of 455 kHz ceramic filters (FL3112 and FL3114) for

20/25 kHz channel spacing, or FL3111 and FL3113/F3115 for 12.5 kHz channel spacing. These pairs are selectable via BWSELECT. The filtered output from the ceramic filters is applied to the limiter input pin of the IF IC (pin 14).

The IF IC contains a quadrature detector using a ceramic phase-shift element (Y3102) to provide audio detection. Internal amplification provides an audio output level of 120 mV rms (at 60% deviation) from U3103, pin 8 (DISCAUDIO) which is fed to ASFIC_CMP U0221, pin 2 (part of the controller circuits).

A Receive Signal Strength Indicator (RSSI) signal is available at U3101, pin 5, which has a dynamic range of 70 dB. The RSSI signal is interpreted by the µP (U0101, pin 63) and is available at accessory connector J0501-15.

3.0 UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Transmitter Power Amplifier (PA) 40W

The radio's 40W PA is a three-stage amplifier used to amplify the output from the VCOBIC to the radio transmit level. All three stages utilize LDMOS technology. The gain of the first stage (U5401) is adjustable, controlled by pin 4 of PCIC (U5501). It is followed by an LDMOS stage (Q5421) and LDMOS final stage (Q5441).

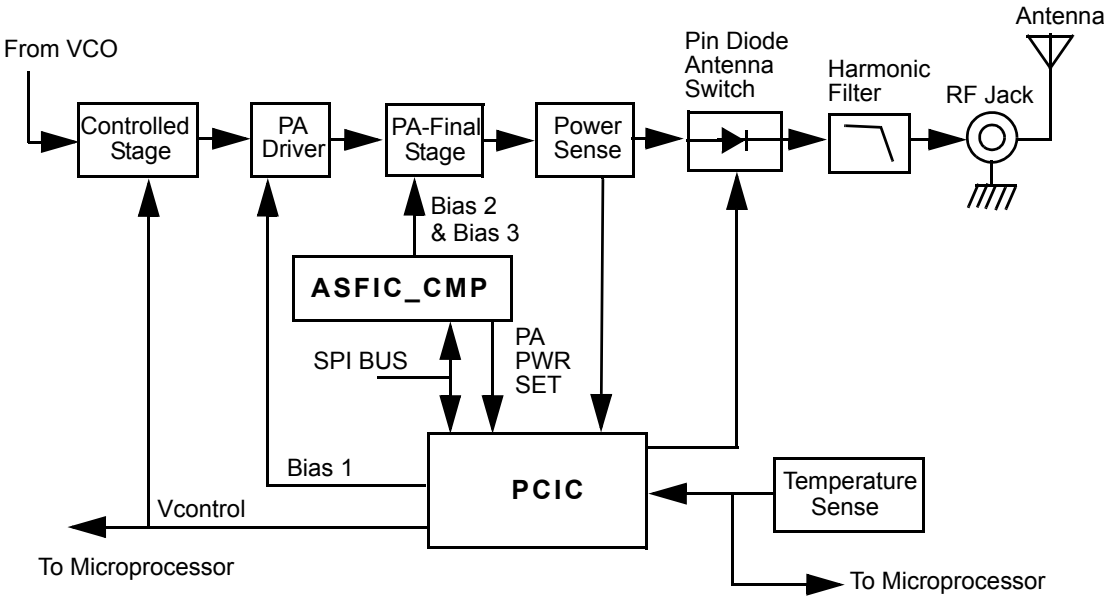


Figure 13-2 UHF Transmitter Block Diagram

Devices U5401, Q5421 and Q5441 are surface mounted. A pressure pad between the board and the radio's cover provides good thermal contact between the devices and the chassis.

3.1 First Power Controlled Stage

The first stage (U5401) is a 20 dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TXINJ). The output power of stage U5401 is

controlled by a DC voltage applied to pin 1 from Q5473. The control voltage simultaneously varies the bias of two FET stages within U5401. This biasing point determines the overall gain of U5401 and therefore its output drive level to Q5421, which in turn controls the output power of the PA.

Switch S5440 is a pressure pad with a conductive strip which connects two conductive areas on the board when the radio's cover is properly screwed to the chassis. When the cover is removed, S5440 opens and cuts the supply voltage to Q5473 thus disabling control voltage to U5401. This prevents transmitter key up while the devices do not have proper thermal contact to the chassis.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q5421) providing a gain of 12 dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by U5501-24 and fed to the gate of Q5421 via the resistive network R5480, R5408, R5415 and R5416.

3.3 Final Stage

The final stage is an LDMOS MRF1570 device Q5441. It provides a gain of 11 dB. It integrates two MRF1535 die inside. These two die are being run in parallel. The output of each of the device (die) inside are combined to constitute the total output power. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line MOSBIAS_2 and MOSBIAS_3 are set in transmit mode by the ASFIC and fed to the gate of Q5441 via two resistive networks R5631, R5634, R5485, R5486 and R5632, R5635, R5481, R5489. These bias voltages are tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Global Tuner. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device’s drain current is drawn directly from the radio’s DC supply voltage input, PASUPVLTG, via L5421, L5437 and L5436, L5438. A matching network consisting of C5440-45, C5466-67, C5476-77, C5487, C5491, C5455-56, C5449-50, C5465, C5468 and striplines transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Directional Coupler

The directional coupler is a microstrip printed circuit, which couples a small amount of the forward power delivered by Q5441. The coupled signal is rectified by D5451. The DC voltage is proportional to the RF output power and feeds the RFIN port of the PCIC (U5501 pin 1). The PCIC controls the gain of stage U5401 as necessary to hold this voltage constant, thus ensuring the forward power out of the radio to be held to a constant value.

3.5 Antenna Switch

The antenna switch consists of two PIN diodes, D5471 and D5472. In the receive mode, both diodes are off. Signals applied at the antenna jack J5401 are routed, via the harmonic filter, through network L5472, C5474 and C5475, to the receiver input. In the transmit mode, K9V1 turns on Q5471 which enables current sink Q5472, set to 96 mA by R5512 and VR5471. This completes a DC path from PASUPVLTG, through L5437, D5471, L5472, D5472, L5473, R5496 and the current sink to ground. Both diodes are forward biased into conduction. The transmitter RF from the directional coupler is routed via D5471 to the harmonic filter and antenna jack. D5472 also conducts, shunting RF power and preventing it from reaching the receiver port (RXIN). L5472 is selected to appear as a broadband lambda/4 wave transmission line, making the short circuit presented by D5472 appear as an open circuit at the junction of D5472 and the receiver path.

3.6 Harmonic Filter

Components L5491-L5493 and L5472, C5448, C5494, C5496 and C5498 form a Butterworth low-pass filter to attenuate harmonic energy of the transmitter to specifications level. R5491 is used to drain electrostatic charge that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits, improving spurious response rejection.

3.7 Power Control

The transmitter uses the power control IC (PCIC, U5501) to control the power output of the radio. A portion of the forward RF power from the transmitter is sampled by the bi-directional coupler and rectified to provide a DC voltage to the RFIN port of the PCIC (pin 1) that is proportional to the sampled RF power.

The ASFIC (U0221) has internal digital-to-analog converters (DACs) which provide a reference voltage of the control loop to the PCIC via R5483. The reference voltage level is programmable through the SPI line of the PCIC. This reference voltage is proportional to the desired power setting of the transmitter, and is factory programmed at several points across the frequency range of the transmitter to offset frequency response variations of the transmitter's power detector circuit.

The PCIC provides a DC output voltage at pin 4 (INT) which sets the drain current of the first (U5401). This adjusts the transmitter power output to the intended value. Variations in forward transmitter power cause the DC voltage at pin 1 to change, and the PCIC adjusts the control voltage above or below its nominal value to raise or lower output power.

Capacitors C5502-4, in conjunction with resistors and integrators within the PCIC, control the transmitter power rise (key-up) and power decay (de-key) characteristic to minimize splatter into adjacent channels.

U5502 is a temperature-sensing device, which monitors the circuit board temperature in the vicinity of the transmitter driver and final devices, and provides a DC voltage to the PCIC (TEMP, pin 30) proportional to temperature. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to decrease the transmitter temperature.

4.0 UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Frequency Synthesis

The synthesizer subsystem shown in Figure 13-3, consists of the reference oscillator (Y5261 or Y5262), the Low Voltage Fractional-N synthesizer (LVFRAC-N, U5201), and the Voltage Controlled Oscillator (VCO).

4.1 Reference Oscillator

The reference oscillator (Y5262) contains a temperature compensated crystal oscillator with a frequency of 16.8 MHz. An analog-to-digital (A/D) converter internal to U5201 (LVFRAC-N) and controlled by the µP via serial interface (SRL) sets the voltage at the warp output of U5201, pin 25 to set the frequency of the oscillator. The output of the oscillator (Y5262, pin 3) is applied to pin 23 (XTAL1) of U5201 via an RC series combination.

In applications where less frequency stability is required, the oscillator inside U5201 is used along with external crystal Y5261, varactor diode D5261, C5261, C5262, and R5262. In this case, Y5262, R5263, C5235 and C5251 are not used. When Y5262 is used, Y5261, D5261, C5261, C5262 and R5262 are not used, and C5263 is increased to 0.1 uF.

4.2 Fractional-N Synthesizer

The LVFRAC-N synthesizer IC (U5201) consists of a pre-scaler, programmable loop divider, control divider logic, phase detector, charge pump, A/D converter for low frequency digital modulation, balanced attenuator used to balance high frequency analog modulation and low frequency digital modulation, 13 V positive voltage multiplier, serial interface for control, and a super filter for the regulated 5 volts.

A voltage of 5 V applied to the super filter input (U5201, pin 30) supplies an output voltage of 4.5 Vdc (VSF) at pin 28. It supplies the VCO, VCO modulation bias circuit (via R5322), and synthesizer charge pump resistor network (R5251, R5252). The synthesizer supply voltage is provided by 5 V regulator, U5211.

To generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U5701-32), a voltage of 13 Vdc is generated by the positive voltage multiplier circuit (D5201, C5202, and C5203). This voltage multiplier is basically a diode capacitor network driven by two signals (1.05 MHz) 180 degrees out of phase (U5201, pins 14 and 15).

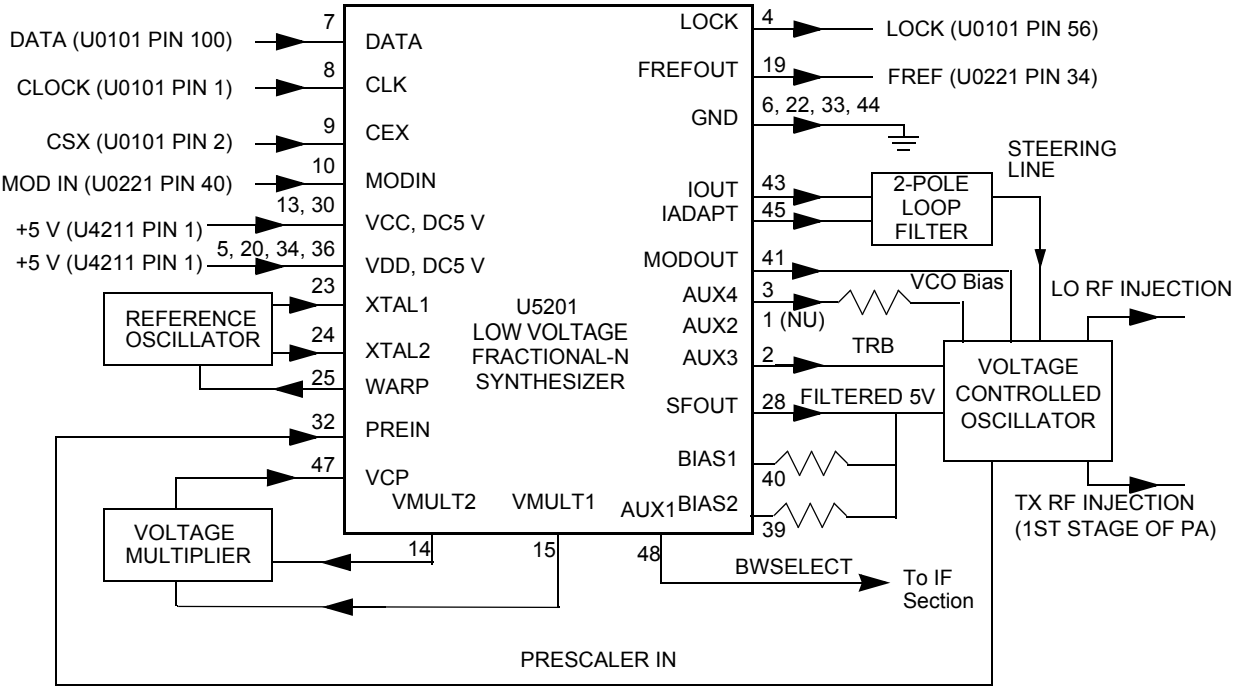


Figure 13-3 UHF Synthesizer Block Diagram

Output LOCK (U5201-4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. IC U5201 provides the 16.8 MHz reference frequency at pin 19.

The serial interface (SRL) is connected to the µP via data line DATA (U5201-7), clock line CLK (U5201-8), and chip enable line CSX (U5201-9).

4.3 Voltage Controlled Oscillator (VCO)

The voltage controlled oscillator (VCO), shown in Figure 13-4, consists of a VCO buffer IC (VCOBIC, U5301), TX and RX tank circuits, external RX buffer stages, and modulation circuits.

The VCOBIC together with Fractional-N synthesizer (U5201) generates the required frequencies in both transmit and receive modes. The TRB line (U5301, pin 19) determines which tank circuits and internal buffers are to be enabled. A high level on TRB enables TX tank and TX output (pin 10), and a low enables RX tank and RX output (pin 8). A sample of the signal from the enabled output is routed from U5301, pin 12 (PRESC_OUT), via a low-pass filter of U5201, pin 32 (PREIN).

A steering line voltage (VCTRL) between 3.0 V and 10.0 V at varactor diode CR5311 tunes the full TX frequency range (TXINJ) from 450 MHz to 512 (or 520) MHz, and at varactor diodes CR5301, CR5302, and CR5303 tunes the full RX frequency range (RXINJ) from 405 MHz to 467 MHz. The tank circuits uses the Hartley configuration for wider bandwidth. For the RX tank circuit, external transistor Q5301 is used in conjunction with the internal transistor for better side-band noise.

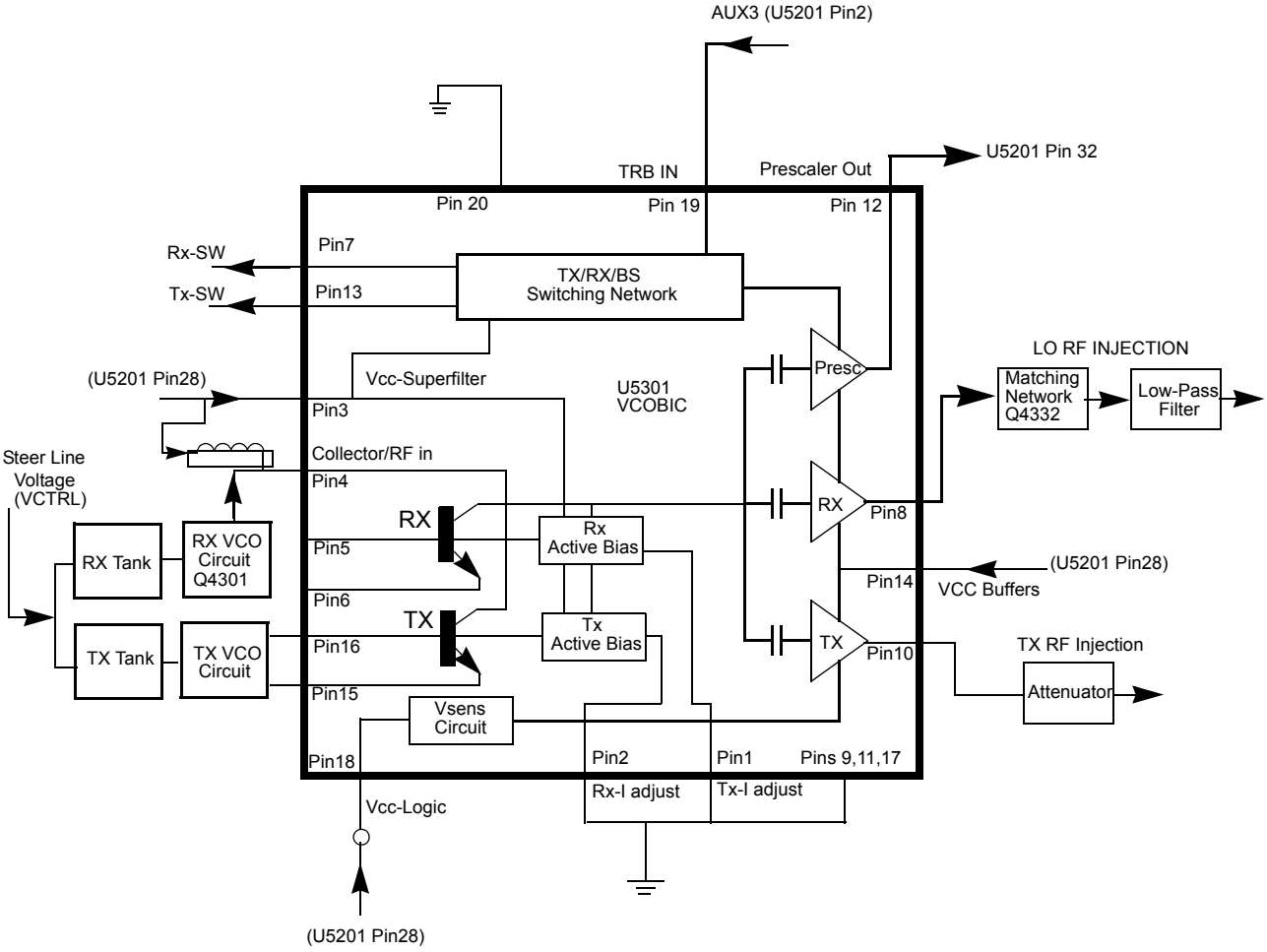


Figure 13-4 UHF VCO Block Diagram

The external RX buffers (Q5332) are enabled by a high at U5201, pin 3 (AUX4) via transistor switch Q5333. In TX mode, the modulation signal (VCOMOD) from the LVFRAC-N synthesizer IC (U5201, pin 41) is applied to the modulation circuits CR5321, R5321, R5322, and C5324. These modulate the TX VCO frequency via coupling capacitor C5321. Varactor CR5321 is biased for linearity from the VSF.

4.4 Synthesizer Operation

The synthesizer consists of a low voltage FRAC-N (LVFRACN) IC, reference oscillator (crystal oscillator with temperature compensation), charge pump circuits, loop filter circuits, and DC supply. The output signal (PRESC_OUT) of the VCOBIC (U5301, pin12) is fed to U5201, pin 32 (PREIN) via a low-pass filter (C5229,L5225,and C5226) which attenuates harmonics and provides correct level to close the synthesizer loop.

The pre-scaler in the synthesizer (U5201) is a dual modulus pre-scaler with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SRL. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y5261 or Y5262).

The output signal of the phase detector is a pulsed DC signal routed to the charge pump. The charge pump outputs a current at U5201, pin 43 (IOUT). The loop filter (consisting of R5221-R5223, C5221-C5225, and L5221) transforms this current into a voltage that is applied to varactor diodes CR5311 for transmit, CR5301, CR5302 and CR5303 for receive and alters the output frequency of the VCO. The current can be set to a value fixed in the LVFRAC-N IC or to a value determined by the currents flowing into BIAS 1 (U5201-40) or BIAS 2 (U5201-39). The currents are set by the value of R5251 or R5252 respectively. The selection of the three different bias sources is done by software programming.

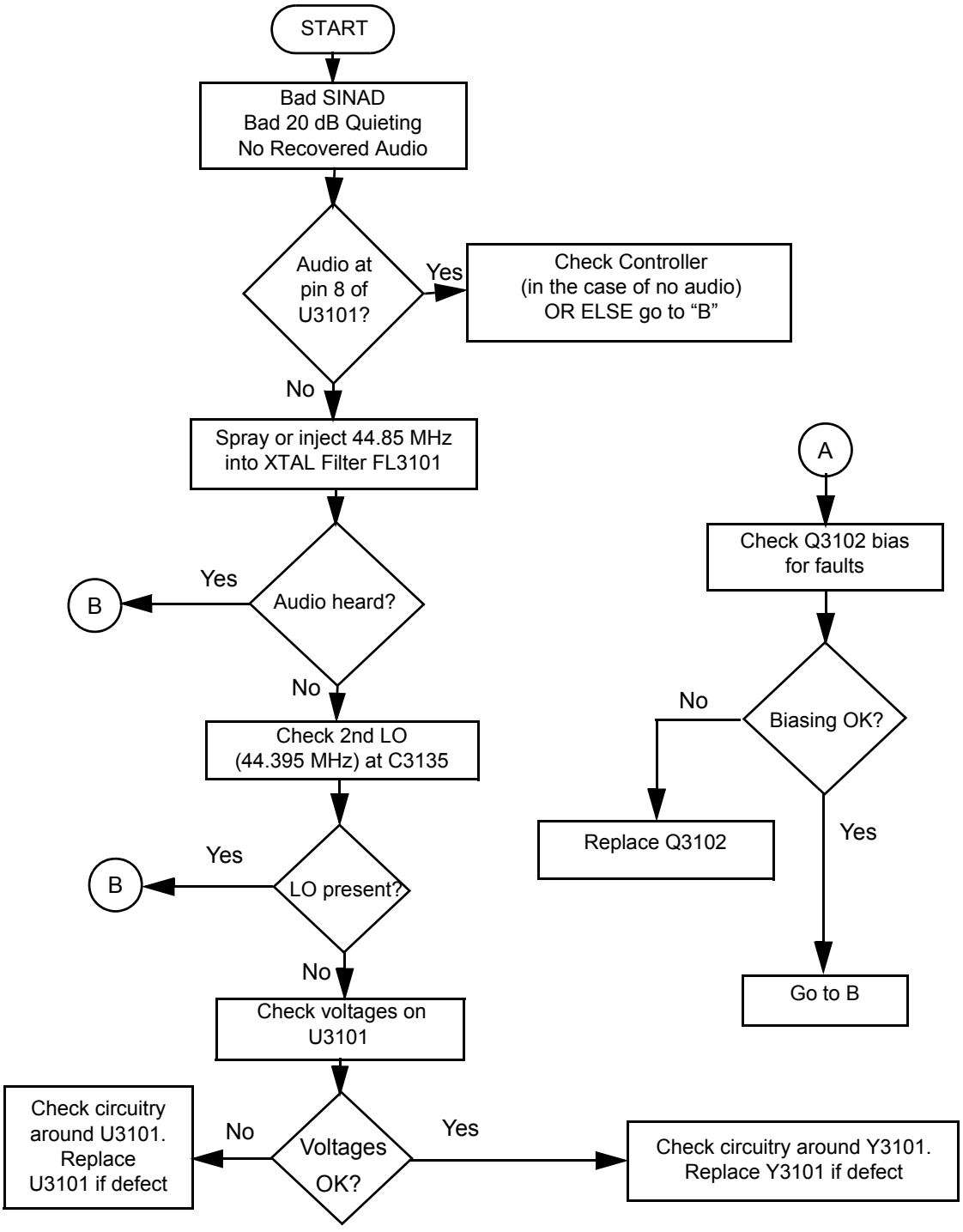
To reduce synthesizer lock time, when new frequency data has been loaded into the synthesizer, the magnitude of the loop current is increased by enabling the IADAPT (U5201-45) for a certain software programmable time (Adapt Mode). The adapt mode timer is started by a low to high transition of the CSX line. When the synthesizer is within the lock range, the current is determined only by the resistors connected to BIAS 1, BIAS 2, or the internal current source. A settled synthesizer loop is indicated by a high level of signal LOCK (U5201-4) which is routed to one of the µP's ADCs input U101-56. From the voltage the µP determines whether LOCK is active.

To modulate the PLL, the two-spot modulation method is utilized via pin 10 (MODIN) on U5201. The audio signal is applied to both the A/D converter (low frequency path) and the balanced attenuator (high frequency path). The A/D converter converts the low frequency analog modulating signal into a digital code which is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is present at the MODOUT port (U5201-41) and connected to the VCO modulation diode CR5321 via R5321 and C5325.

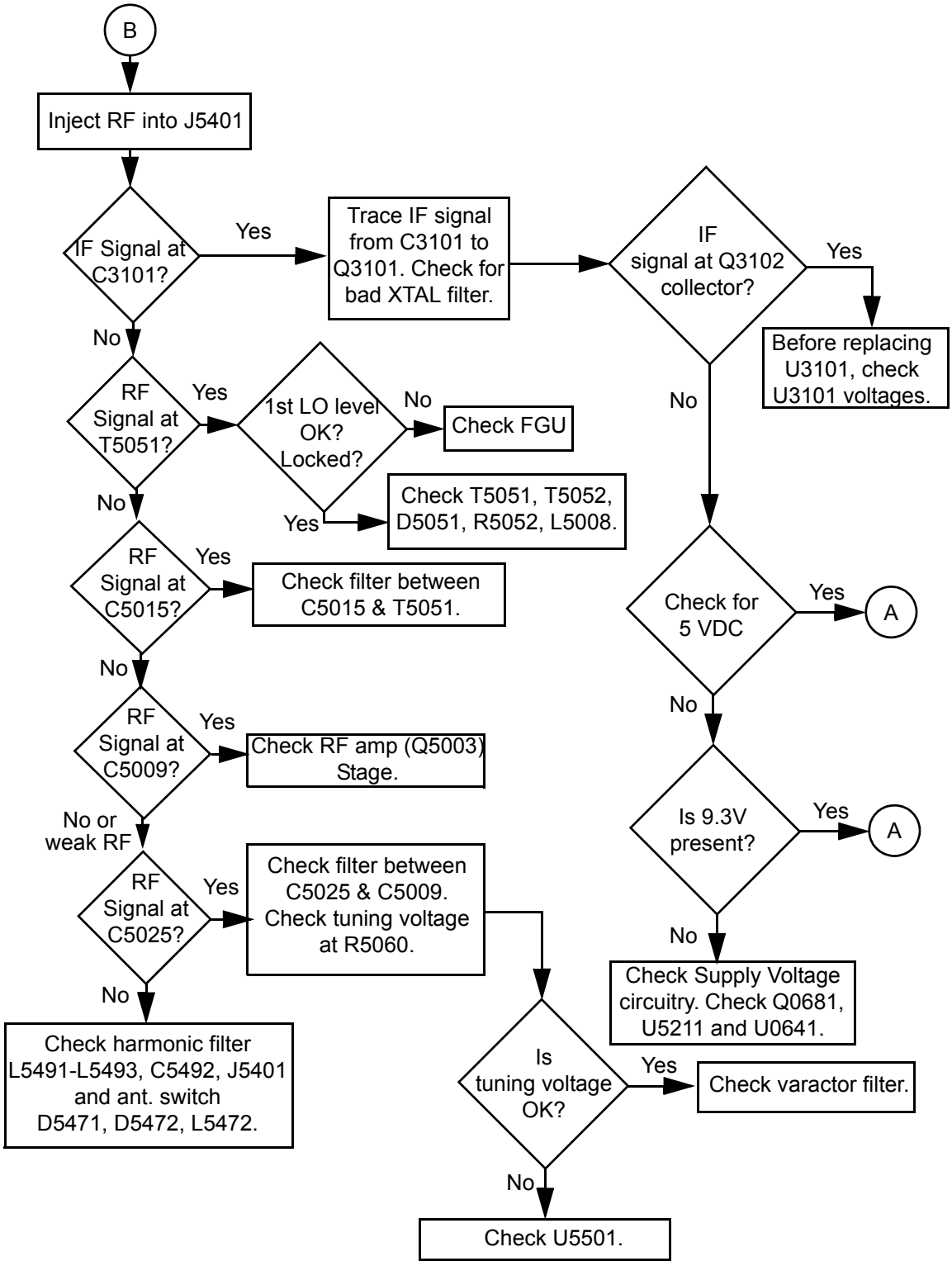
Section 3

TROUBLESHOOTING CHARTS

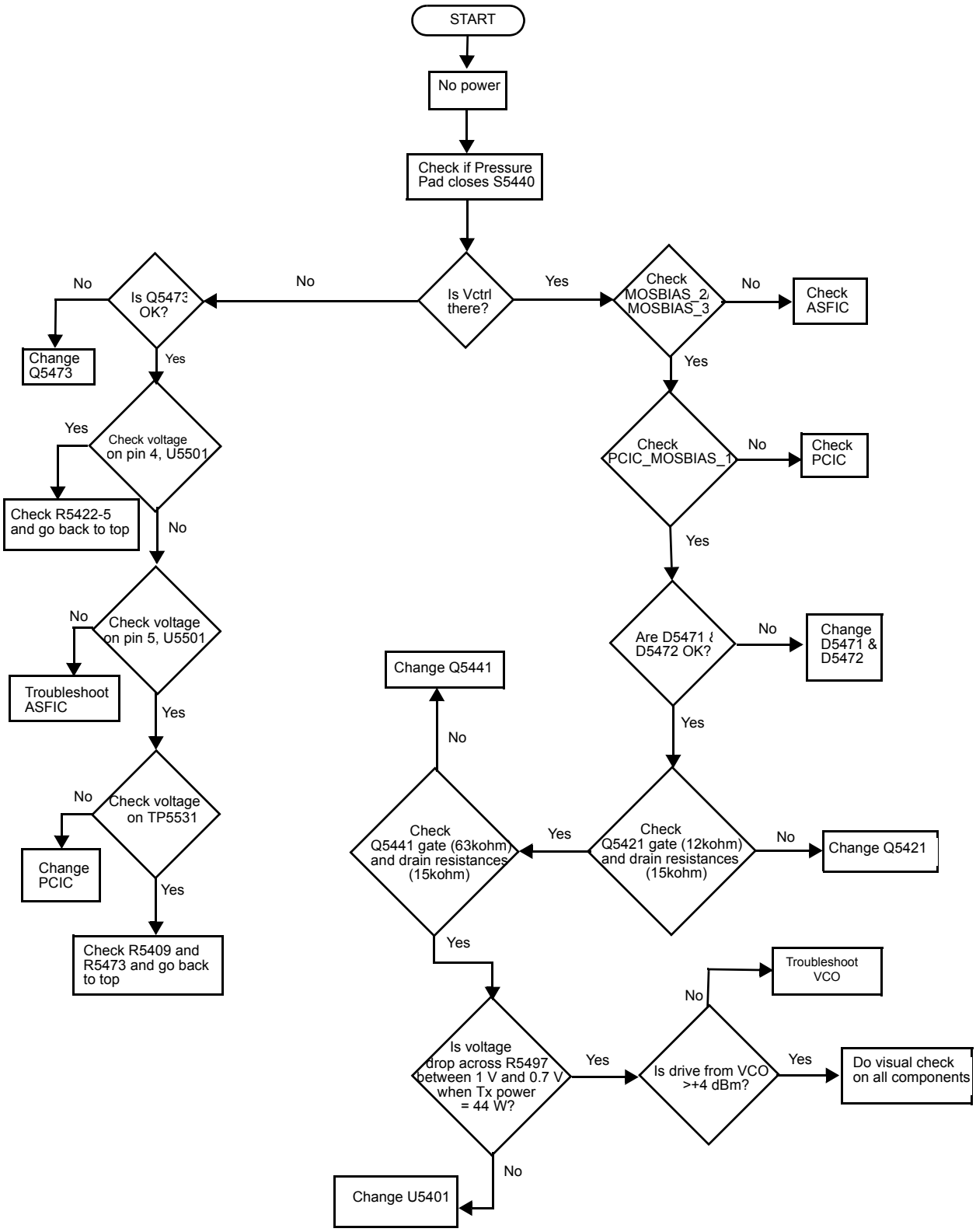
1.0 Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



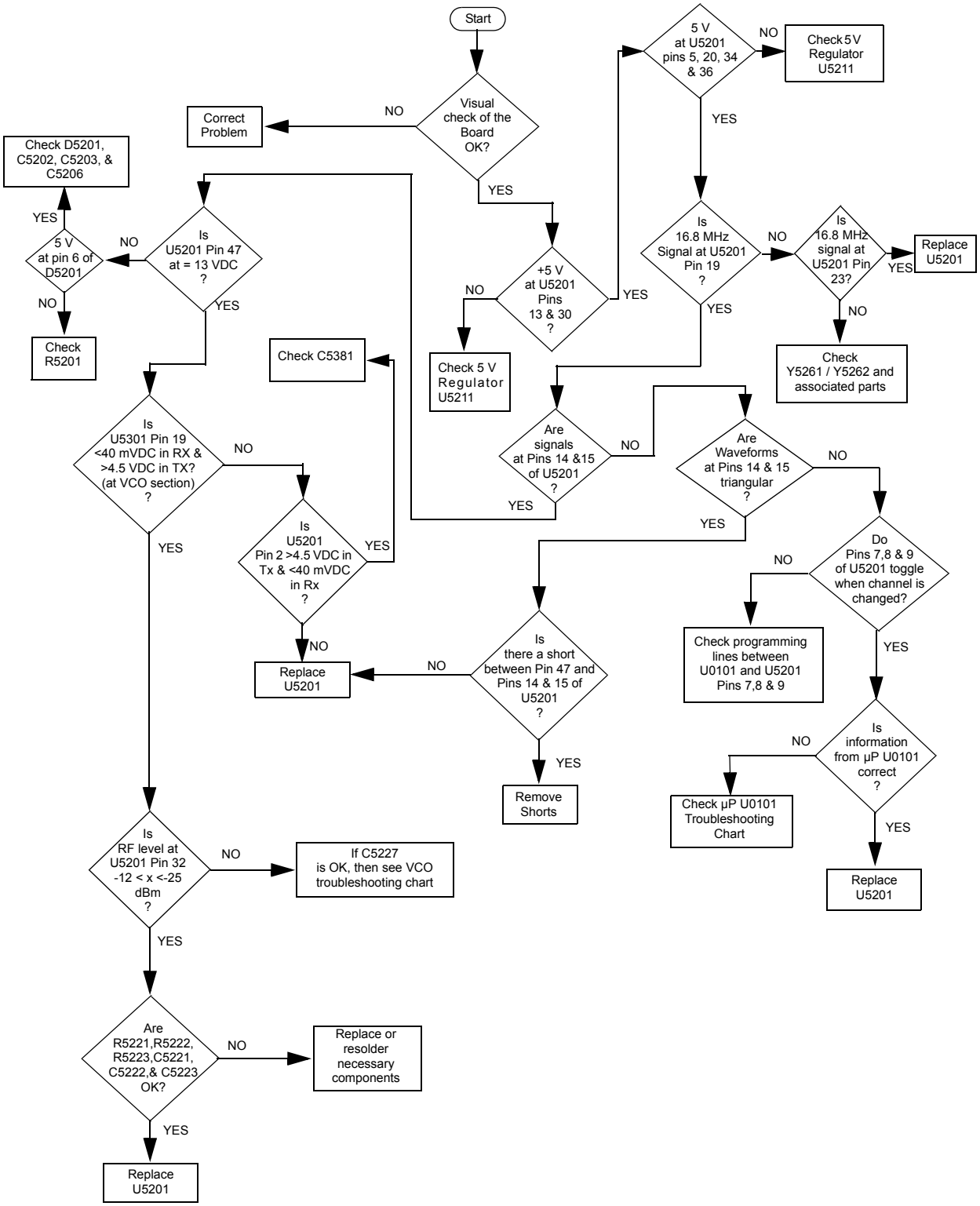
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



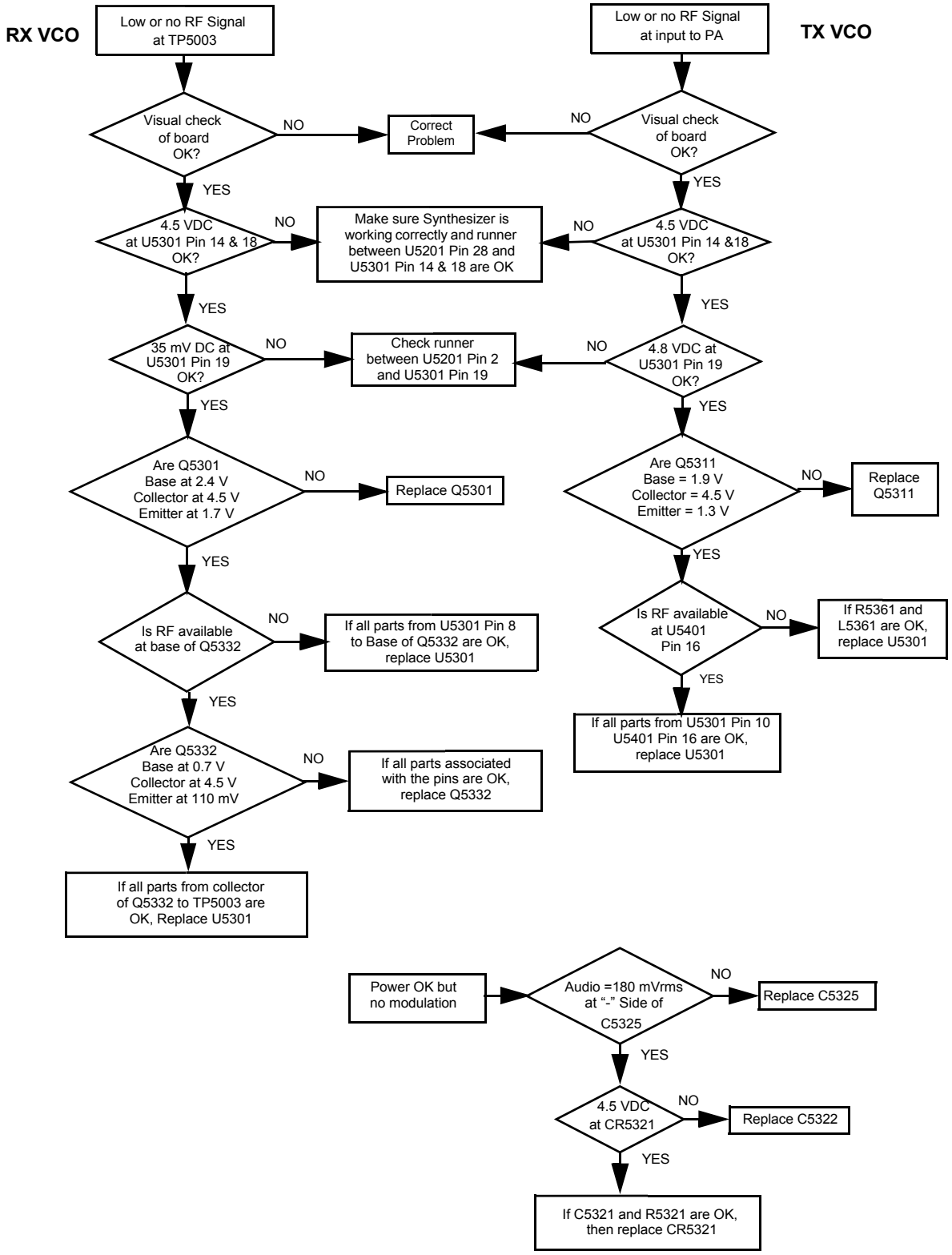
2.0 Troubleshooting Flow Chart for 40W Transmitter



3.0 Troubleshooting Flow Chart for Synthesizer

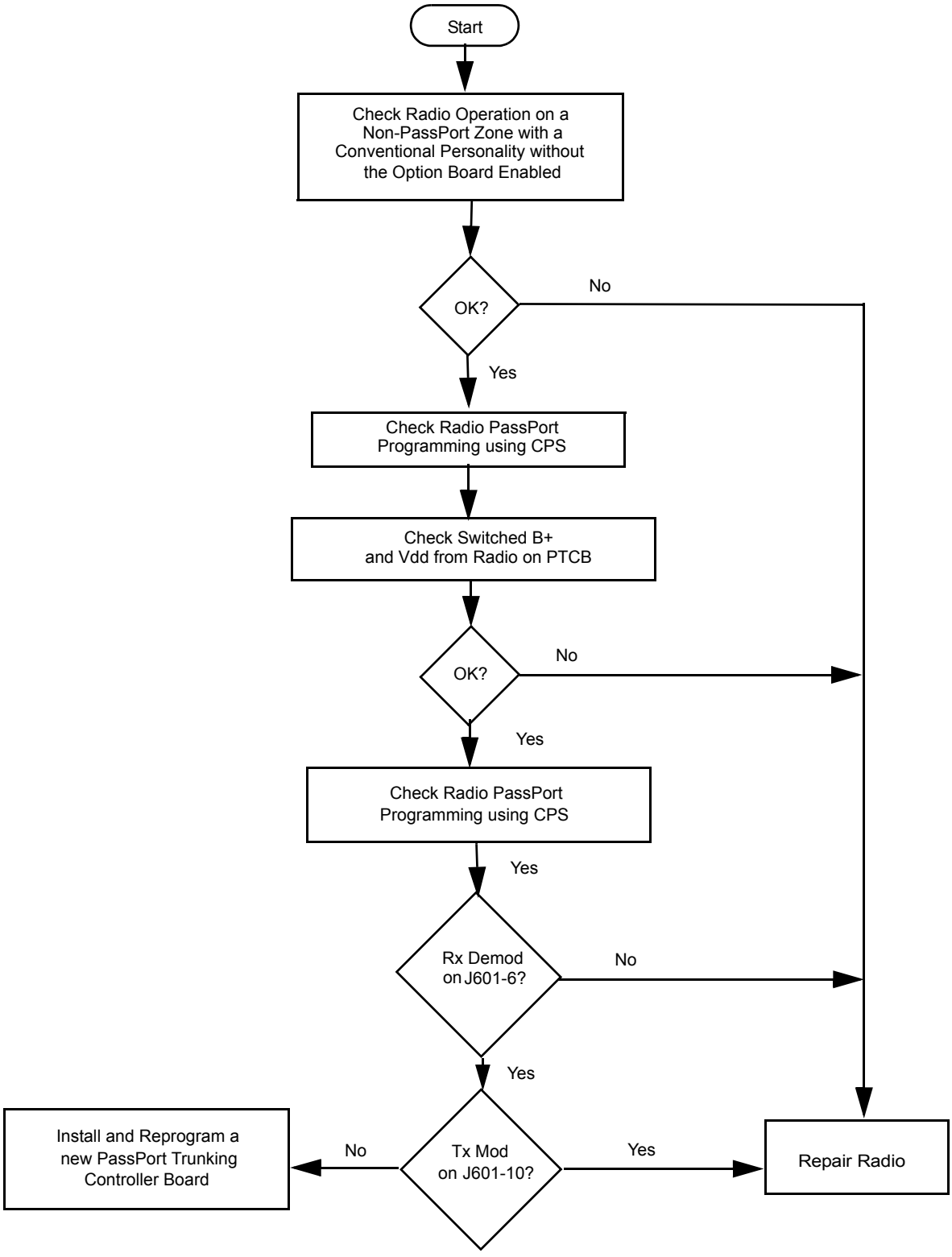


4.0 Troubleshooting Flow Chart for VCO



5.0 Troubleshooting Flow Chart for PassPort

Troubleshooting in PassPort mode must be completed in conventional mode. If any issues related to the option board are discovered, the PassPort board should be replaced.



Section 4

UHF BAND 2 (450-512/520 MHZ) 25-40W LDMOS PCBS, SCHEMATICS, AND PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 Controller Circuits

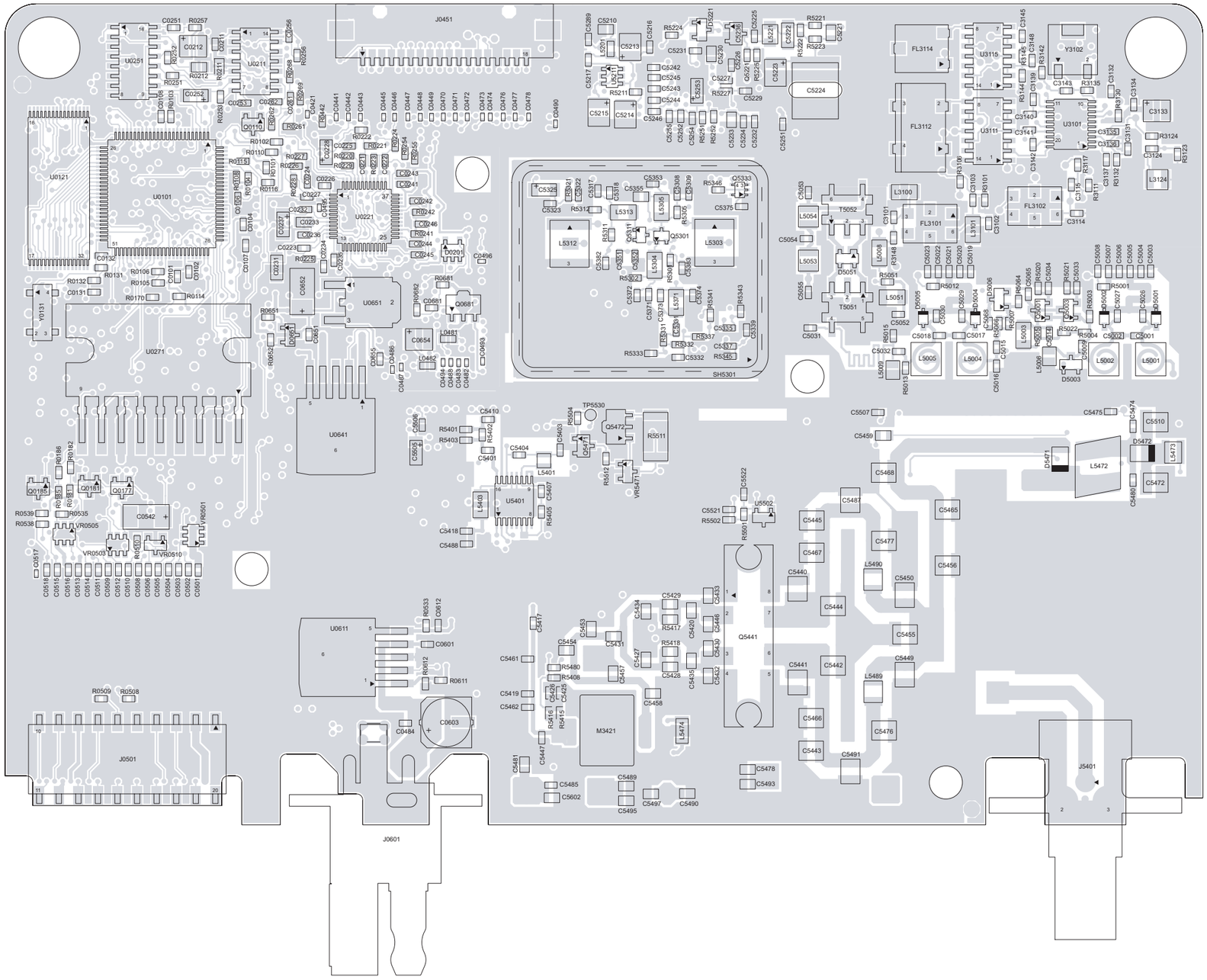
The UHF circuits are contained on the printed circuit board (PCB) which also contains the controller circuits. This chapter shows the schematics for the UHF circuits only. Refer to the controller section for details of the related controller circuits. The PCB component layouts and the parts lists in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

Table 13-1 UHF Band 2 25-40W LDMOS PCB 8486250Z02 Diagrams and Parts Lists

PCB 8486250Z02:	**Page:**
Main Board Top Side	**13: 4-3**
Main Board Bottom Side	**13: 4-4**
SCHEMATICS	
Power Amplifier 40 W	**13: 4-5**
FRACN Synthesizer	**13: 4-6**
Voltage Controlled Oscillator	**13: 4-7**
Receiver Front-End	**13: 4-8**
IF	**13: 4-9**
Parts List	**13: 4-10**
Controller version is **T12**	

Notes

2.0 UHF Band 2 (450-512/520 MHz) 25-40W LDMOS PCB 8486250Z02, Schematics, and Parts Lists

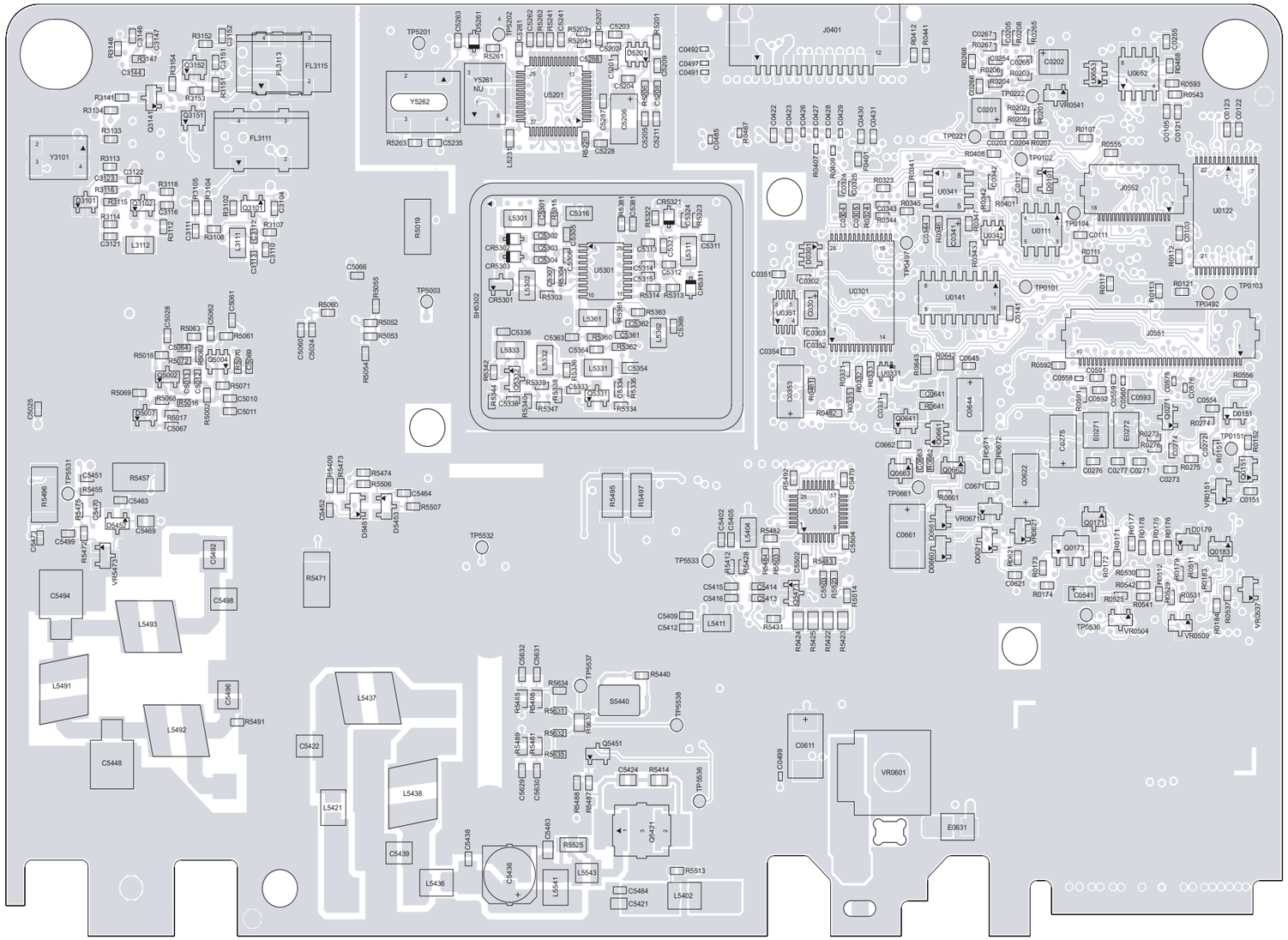


ZMY0131036-O

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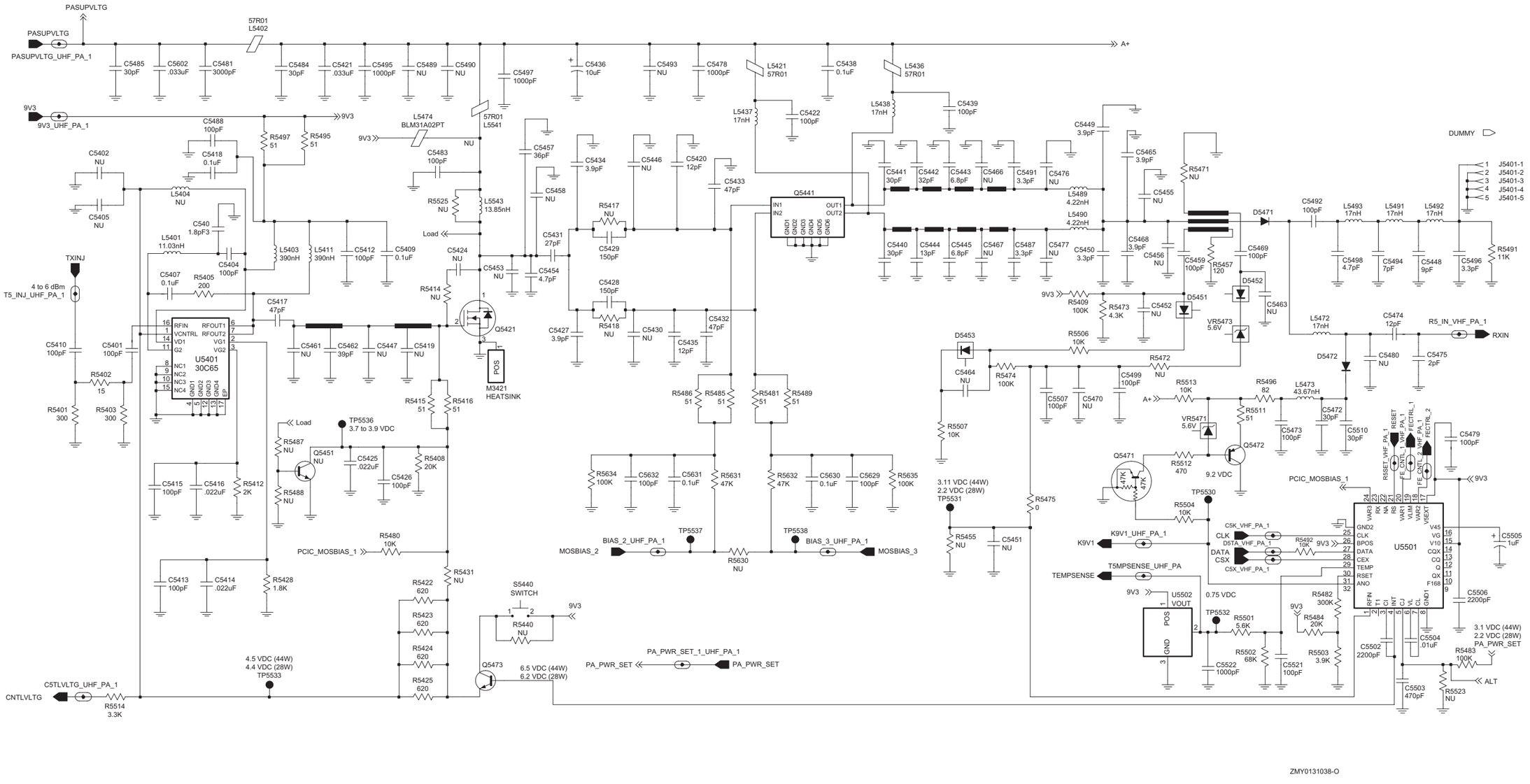
UHF Band 2 (450-512/520 MHz) 25-40W LDMOS PCB 8486250Z02 Top Side

6881091C63-C

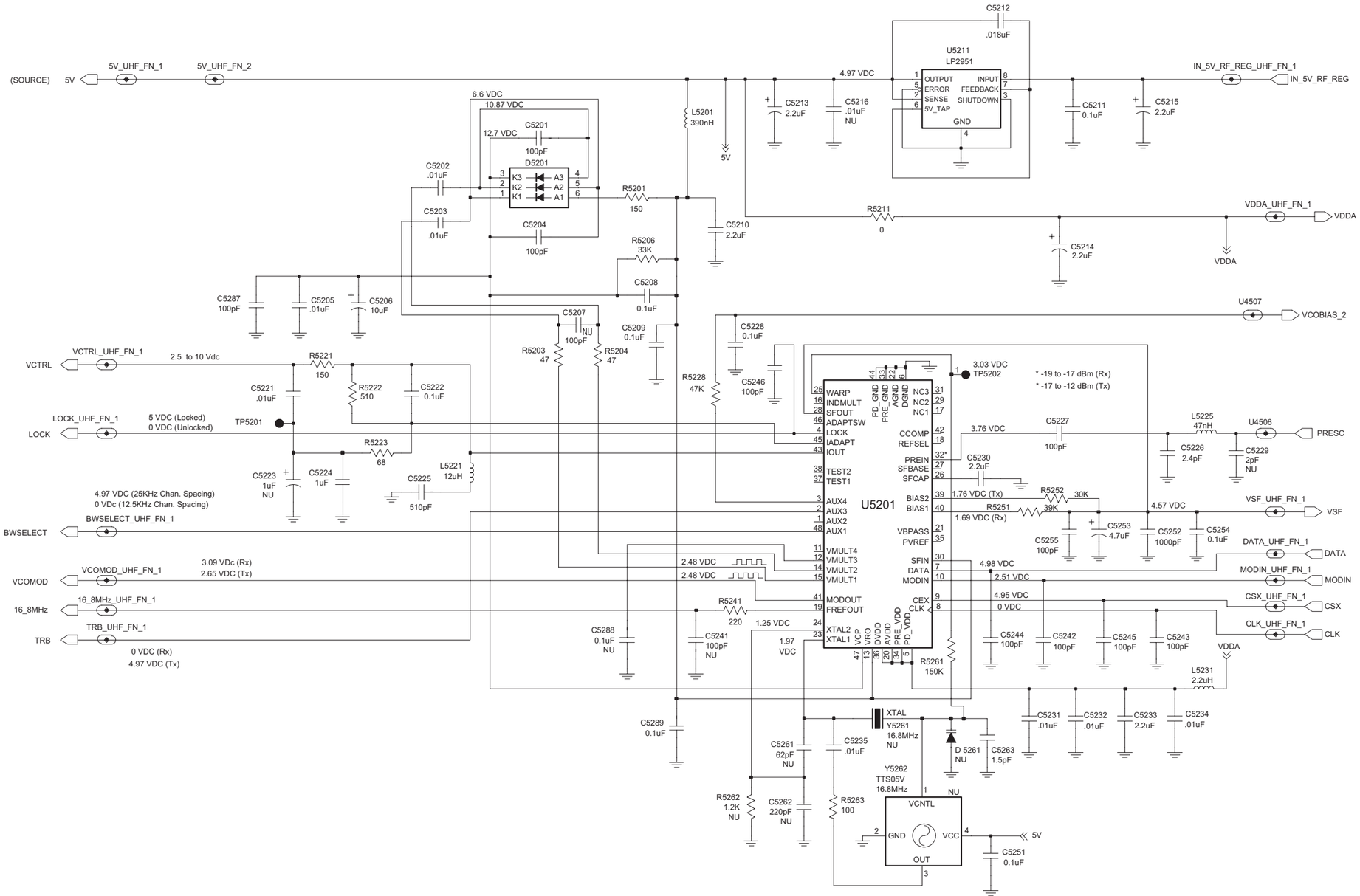


UHF Band 2 (450-512/520 MHz) 25-40W LDMOS PCB 8486250Z02 Bottom Side

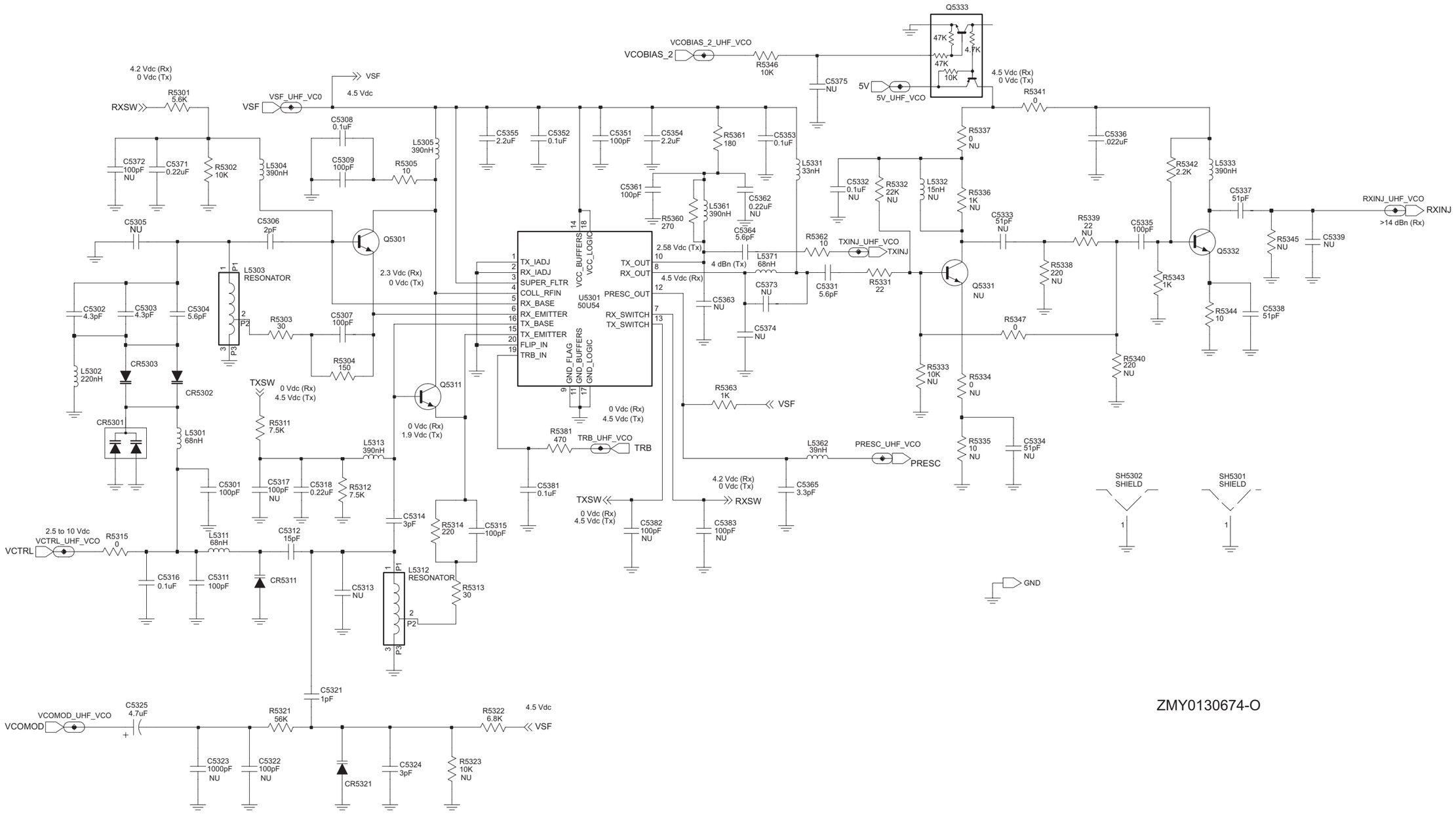
ZMY0131037-O



UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Power Amplifier



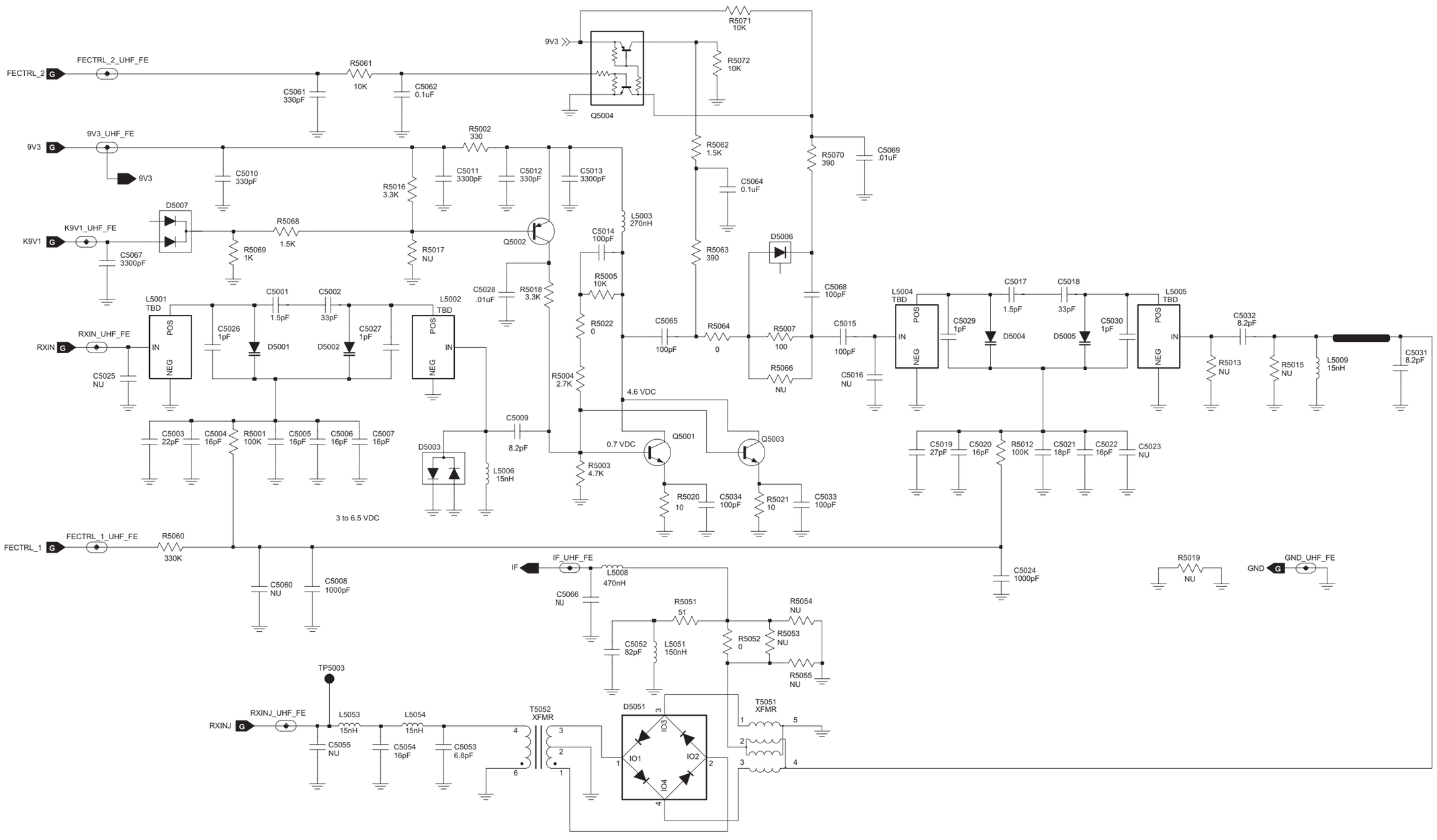
UHF Band 2 (450-512/520 MHz) 25-40W LDMOS FRACN Synthesizer



ZMY0130674-O

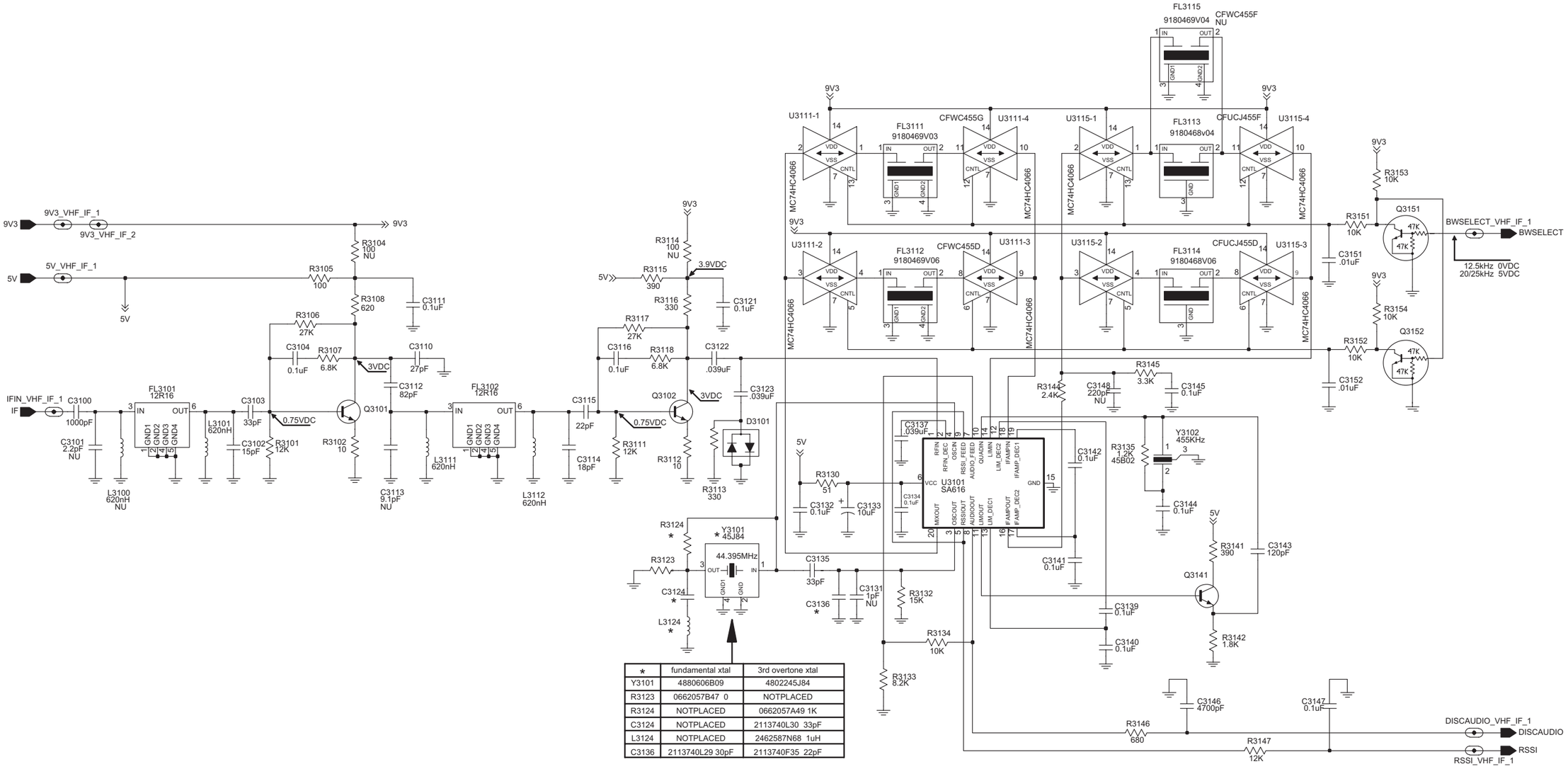
UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Voltage Controlled Oscillator

6881091C63-C



UHF Band 2 (450-512/520 MHz) 25-40W LDMOS Receiver Front-End

6881091C63-C



*	fundamental xtal	3rd overtone xtal
Y3101	4880606B09	4802245J84
R3123	0662057B47 0	NOTPLACED
R3124	NOTPLACED	0662057A49 1K
C3124	NOTPLACED	2113740L30 33pF
L3124	NOTPLACED	2462587N68 1uH
C3136	2113740L29 30pF	2113740F35 22pF

UHF Band 2 (450-512/520 MHz) 25-40W LDMOS IF

ZWG0130565-B

6881091C63-C

UHF B2 25-40W PCB 8486250Z02 Parts List†

Circuit Ref	Motorola Part No.	Description
C0101	2113740F51	100pF
C0107	2113741F25	1000pF
C0112	2113743E20	0.1uF
C0121	2113743E20	0.1uF
C0122	2113743E20	0.1uF
C0131	2113740F35	22pF
C0132	2113740F35	22pF
C0141	2113743E20	0.1uF
C0151	2113741F49	10nF
C0201	2311049A57	10uF
C0202	2311049A57	10uF
C0204	2113743E20	0.1uF
C0212	2311049A57	10uF
C0221	2113743E20	0.1uF
C0222	2113743E20	0.1uF
C0223	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0224	2113740F51	100pF
C0225	2113743E20	0.1uF
C0226	2113743E20	0.1uF
C0228	2311049A56	4.7uF
C0231	2113743B29	1uF
C0232	2113743E20	0.1uF
C0234	2113743E20	0.1uF
C0235	2113743E07	0.022uF
C0236	2113743E10	0.033uF
C0241	2113743E20	0.1uF
C0243	2113740F51	100pF
C0244	2113743E20	0.1uF
C0245	2113743E20	0.1uF
C0246	2113741F49	10nF
C0251	2113743E20	0.1uF
C0252	2311049A07	1uF
C0254	2113743E20	0.1uF
C0255	2113743E20	0.1uF
C0256	2113740F51	100pF
C0261	2113743E20	0.1uF
C0262	2113740F49	82pF
C0265	2113743E20	0.1uF
C0267	2113741F49	10nF
C0271	2113741F49	10nF
C0272	2113743E20	0.1uF
C0273	2113741F37	3300pF
C0275	2311049A99	47uF
C0276	2113741F25	1000pF
C0277	2113741F25	1000pF
C0301	2311049A07	1uF
C0302	2113743E20	0.1uF
C0303	2113740F51	100pF
C0304	2113743E20	0.1uF
C0305	2113743E20	0.1uF
C0324	2113743E20	0.1uF
C0331	2113743E20	0.1uF
C0341	2311049A07	1uF
C0342	2113743E20	0.1uF
C0343	2113743E20	0.1uF
C0344	2113743E20	0.1uF
C0351	2113743E20	0.1uF
C0352	2113743E07	0.022uF
C0353	2311049A97	33uF
C0354	2113743E20	0.1uF
C0421	2113743N48	82pF
C0422	2113741F17	470pF
C0423	2113741F17	470pF
C0426	2113743L09	470pF
C0427	2113743L09	470pF
C0428	2113743N48	82pF
C0429	2113743L09	470pF
C0430	2113741F17	470pF
C0431	2113741F17	470pF
C0441	2113743L09	470pF
C0442	2113743L09	470pF
C0445	2113743L09	470pF
C0446	2113743L09	470pF
C0447	2113743L09	470pF
C0448	2113743L09	470pF
C0449	2113743L09	470pF
C0470	2113743L09	470pF
C0471	2113743N48	82pF
C0472	2113743N48	82pF
C0473	2113743N48	82pF
C0474	2113743L09	470pF
C0476	2113743L09	470pF
C0477	2113743L09	470pF
C0478	2113743L09	470pF
C0482	2113743L09	470pF
C0483	2113743L09	470pF
C0484	2113741F17	470pF
C0485	2113743L09	470pF
C0486	2113743L09	470pF
C0487	2113743L09	470pF
C0488	2113743L09	470pF
C0490	2113743L09	470pF
C0491	2113743L09	470pF
C0492	2113743L09	470pF
C0493	2113743L09	470pF
C0494	2113743L09	470pF
C0495	2113743L09	470pF
C0496	2113743L09	470pF
C0497	2113743L09	470pF
C0499	2113743L09	470pF
C0501	2113741F49	10nF
C0502	2113741F17	470pF
C0503	2113741F17	470pF
C0504	2113741F17	470pF
C0505	2113741F17	470pF
C0506	2113741F17	470pF
C0508	2113741F17	470pF
C0509	2113741F17	470pF
C0510	2113741F17	470pF
C0511	2113741F17	470pF
C0512	2113741F17	470pF
C0513	2113741F17	470pF
C0514	2113741F17	470pF
C0515	2113741F17	470pF
C0516	2113741F49	10nF
C0517	2113743N48	82pF
C0518	2113741F17	470pF
C0541	2311049A05	0.47uF
C0542	2311049A99	47uF
C0560	2113743L17	1000pF
C0591	2113743E20	0.1uF
C0592	2113743E20	0.1uF
C0593	2113743E20	0.1uF, 0662057B47, 0 Kohm resistor for LS+ models
C0601	2113741F17	470pF
C0603	2380090M24	10uF
C0611	2311049C06	22uF
C0612	2113743E20	0.1uF
C0622	2311049A99	47uF
C0641	2113741F17	470pF
C0644	2311049A97	33uF
C0645	2113743E20	0.1uF
C0652	2311049A97	33uF
C0654	2311049A57	10uF
C0655	2113743E20	0.1uF
C0661	2311049C05	47uF
C0662	2113741F49	10nF
C0663	2113743E20	0.1uF
C0671	2113743E20	0.1uF
C0681	2113743E20	0.1uF
C3101	2113740F34	20pF
C3102	2113740F31	15pF
C3103	2113740F39	33pF
C3104	2113743E20	0.1uF
C3110	2113740F37	27pF
C3111	2113743E20	0.1uF
C3112	2113740F49	82pF
C3114	2113740F33	18pF
C3115	2113740F35	22pF
C3116	2113743E20	0.1uF
C3121	2113743E20	0.1uF
C3122	2113743E11	0.039uF
C3123	2113743E11	0.039uF
C3124	2113740L30 NU	33pF 2% 3rd overtone crystal fundamental crystal
C3132	2113743E20	0.1uF
C3133	2311049A57	10uF
C3134	2113743E20	0.1uF
C3135	2113740L30	33pF
C3136	2113740F35	22pF 3rd overtone crystal
	2113740L29	30pF 2% fundamental crystal
C3137	2113743E11	0.039uF
C3139	2113743E20	0.1uF
C3140	2113743E20	0.1uF
C3141	2113743E20	0.1uF
C3142	2113743E20	0.1uF
C3143	2113740F53	120pF
C3144	2113743E20	0.1uF
C3145	2113743E20	0.1uF
C3146	2113741F41	4700pF
C3147	2113743E20	0.1uF
C3151	2113741F49	10nF
C3152	2113741F49	10nF
C5001	2113740F07	1.5pF
C5002	2113740F39	33pF
C5003	2113740F35	22pF
C5004	2113740F32	16pF
C5005	2113740F32	16pF
C5006	2113740F32	16pF
C5007	2113740F32	16pF
C5008	2113741F25	1000pF
C5009	2113740F25	8.2pF
C5010	2113741F13	330pF
C5011	2113741F37	3300pF
C5012	2113741F13	330pF
C5013	2113741F37	3300pF
C5014	2113740F51	100pF
C5015	2113740F51	100pF
C5017	2113740F07	1.5pF
C5018	2113740F39	33pF
C5019	2113740F37	27pF
C5020	2113740F32	16pF
C5021	2113740F33	18pF
C5022	2113740F32	16pF
C5024	2113741F25	1000pF
C5026	2113740F03	1pF
C5027	2113740F03	1pF
C5028	2113741F49	10nF
C5029	2113740F03	1pF
C5030	2113740F03	1pF
C5031	2113740F25	8.2pF
C5032	2113740F25	8.2pF
C5033	2113740F51	100pF
C5034	2113740F51	100pF
C5052	2113740F49	82pF

Circuit Ref	Motorola Part No.	Description
C5053	2113740F23	6.8pF
C5054	2113740F32	16pF
C5061	2113740F63	330pF
C5062	2113743E20	0.1uF
C5064	2113743E20	0.1uF
C5065	2113740F51	100pF
C5067	2113741F37	3300pF
C5068	2113740F51	100pF
C5069	2113741F49	10nF
C5201	2113740F51	100pF
C5202	2113741F49	10nF
C5203	2113741F49	10nF
C5204	2113740F51	100pF
C5205	2113741F49	10nF
C5206	2311049J25	10uF
C5208	2113743E20	0.1uF
C5209	2113743E20	0.1uF
C5210	2104993J02	2.2uF
C5211	2113743E20	0.1uF
C5213	2311049A09	2.2uF
C5214	2311049A09	2.2uF
C5215	2311049A09	2.2uF
C5217	2113741F49	10nF
C5221	2109720D01	0.01uF
C5222	2109720D14	0.1uF
C5224	0882422W23	1uF
C5225	2113741F18	510pF
C5227	2113740F27	10pF
C5230	2104993J02	2.2uF
C5231	2113741F49	10nF
C5232	2113741F49	10nF
C5233	2104993J02	2.2uF
C5234	2113741F49	10nF
C5235	2113741F49	10nF
C5236	2113743E12	0.047uF
C5242	2113740F51	100pF
C5243	2113740F51	100pF
C5244	2113740F51	100pF
C5245	2113740F51	100pF
C5246	2113740F51	100pF
C5251	2113743E20	0.1uF
C5252	2113741F25	1000pF
C5253	2311049A56	4.7uF
C5254	2113743E20	0.1uF
C5255	2113740F51	100pF
C5263	2113743E20	0.1uF
C5287	2113740F51	100pF
C5289	2113743E20	0.1uF
C5301	2113740F51	100pF
C5302	2113740L09	4.3pF
C5303	2113740L09	4.3pF
C5304	2113740L12	5.6pF
C5306	2113740L01	2pF
C5307	2113740F51	100pF
C5308	2113743E20	0.1uF
C5309	2113740F51	100pF
C5311	2113740F51	100pF
C5312	2113740F33	18pF
C5314	2113740L01	2pF
C5315	2113740F51	100pF
C5316	2109720D14	0.1uF
C5318	2113743E20	100nF
C5321	2113740F03	1pF
C5324	2113740F07	1.5pF
C5325	2311049A56	4.7uF
C5331	2113740L12	5.6pF
C5335	2113740F51	100pF
C5336	2113743E07	0.022uF
C5337	2113740F44	51pF
C5338	2113740F44	51pF
C5351	2113740F51	100pF
C5352	2113743E20	0.1uF
C5353	2113743E20	0.1uF
C5354	2104993J02	2.2uF
C5355	2104993J02	2.2uF
C5361	2113740F51	100pF
C5364	0662057B47	0
C5371	2113743E20	100nF
C5381	2113743E20	0.1uF
C5401	2113740F51	100pF
C5404	2113740F51	100pF
C5407	2113743E20	0.1uF
C5409	2113743E20	0.1uF
C5410	2113740F51	100pF
C5412	2113740F51	100pF
C5413	2113740F51	100pF
C5414	2113743E07	0.022uF
C5415	2113740F51	100pF
C5416	2113743E07	0.022uF
C5417	2113740F43	47pF
C5418	2113743E20	0.1uF
C5420	2113740A36	20pF
C5421	2113741A57	0.033uF
C5422	2111078B42	100pF
C5425	2113743E07	0.022uF
C5426	2113740F51	100pF
C5427	2113740A23	6.2pF
C5428	2113740A55	100pF
C5429	2113740A55	100pF
C5431	2113740A39	27pF
C5432	2113740A41	33pF
C5433	2113740A41	33pF
C5434	2113740A23	6.2pF
C5435	2113740A36	20pF
C5436	2380090M24	10uF
C5438	2113743E20	0.1uF
C5439	2111078B42	100pF
C5440	2111078B29	33pF
C5441	2111078B29	33pF
C5447	2113740F42	43pF
C5448	2180464E62	9pF
C5449	2111078B03	3.9pF
C5450	2111078B01	3.3pF
C5457	2113740A42	36pF
C5458	2113740A18	4.3pF
C5459	2113740A55	100pF
C5466	2111078B09	6.8pF
C5467	2111078B09	6.8pF
C5469	2113740A55	100pF
C5472	2111078B27	30pF
C5473	2113740F51	100pF
C5474	2113740F18	4.3pF
C5475	2113740F10	2pF
C5478	2113741A21	1000pF
C5479	2113740F51	100pF
C5481	2113741A32	3000pF
C5483	2113740A55	100pF
C5484	2113740F38	30pF
C5485	2113740F38	30pF
C5488	2113740F51	100pF
C5492	2111078B42	100pF
C5494	2180464E60	7pF
C5495	2113741A21	1000pF
C5496	2111078B01	3.3pF
C5497	2113741A21	1000pF
C5498	2111078B01	3.3pF
C5499	2113740F51	100pF
C5502	2113741F41	4.7nF
C5503	2113741F17	470pF
C5504	2113741F43	5.6nF
C5505	2311049A07	1uF
C5506	2113741F33	2200pF
C5507	2113740F51	100pF
C5510	2111078B27	30pF
C5522	2113741F25	1000pF
C5602	2113741A57	0.033uF
C5629	2113740F51	100pF
C5630	2113743E20	0.1uF
C5631	2113743E20	0.1uF
C5632	2113740F51	100pF
CR5301	4805649Q13	DIODE VCTR ISV 228
CR5302	4862824C01	DIODE VARACTOR
CR5303	4862824C01	DIODE VARACTOR
CR5311	4862824C01	DIODE VARACTOR
CR5321	4802245J22	DIODE, VARACTOR
D0101	4813825A05	DIODE
D0151	4813833C02	DIODE, DUAL 70 V
D0179	4813833C02	DIODE, DUAL 70 V
D0301	4802245J47	DIODE, SCHOTTKY
D0621	4813833C02	DIODE, DUAL 70 V
D0651	4813833C02	DIODE, DUAL 70 V
D0660	4813833C02	DIODE, DUAL 70 V
D0661	4813833C02	DIODE, DUAL 70 V
D3101	4880154K03	DIODE DUAL SCHOTTKY
D5001	4862824C01	DIODE VARACTOR
D5002	4862824C01	DIODE VARACTOR
D5003	4880154K03	DIODE DUAL SCHOTTKY
D5004	4862824C01	DIODE VARACTOR
D5005	4862824C01	DIODE VARACTOR
D5006	4880142L01	DIODE
D5007	4813833C02	DIODE, DUAL 70 V
D5051	4886143B01	DIODE, MIXER
D5201	4802233J09	DIODE, TRIPLE
D5221	4813825A05	DIODE
D5451	4813825A05	DIODE
D5452	4813825A05	DIODE
D5453	4813825A05	DIODE
D5471	4802482J02	DIODE, SMD PIN
D5472	4802482J02	DIODE, SMD PIN
E0271	2484657R01	FERRITE BEAD
E0272	2484657R01	FERRITE BEAD
E0631	2484657R01	FERRITE BEAD
F0401	6580542Z01	FUSE 3A
FL3101	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3102	9180112R16	2 POLE 44.85 MHZ CRYSTAL FILTER
FL3111	9180469V03	CERAMIC FILTER, 455 KHZ
FL3112	9180469V06	CERAMIC FILTER, 455 KHZ
FL3114	9180468V06	CERAMIC FILTER, 455 KHZ
FL3115	9180469V04	CERAMIC FILTER, 455 KHZ
J0401	0902636Y02	FLEX CONNECTOR
J0451	0902636Y01	FLEX CONNECTOR
J0501	0986105B01	ACCESSORY CONNECTOR
J0551	0905505Y04	FLEX CONNECTOR
J0552	0905505Y03	FLEX CONNECTOR
J0601	0986165B01	DC POWER CONNECTOR
J5401	0986166B02	RF CONNECTOR (MINI UHF)
L3101	2462587T25	620nH
L3111	2462587T25	620nH
L3112	2462587T25	620nH
L3124	2462587N68 NU	1uH 3rd overtone crystal fundamental crystal
L5003	2462587T20	270nH
L5006	2462587V24	15nH
L5008	2462587T23	470nH
L5009	2462587V24	15nH
L5051	2462587T17	150nH

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Circuit Ref	Motorola Part No.	Description
L5053	2462587N43	15nH
L5054	2462587N43	15nH
L5201	2462587Q42	390nH
L5221	2462587P25	12uH
L5231	2462587Q20	2.2uH
L5301	2462587T13	68nH
L5302	2462587T19	220nH
L5303	2460593C03	RESONATOR
L5304	2462587T22	390nH
L5305	2462587T22	390nH
L5311	2462587T22	390nH
L5312	2460593C03	RESONATOR
L5313	2462587T22	390nH
L5331	2462587T09	33nH
L5333	2462587T22	390nH
L5361	2462587T22	390nH
L5362	2462587T38	22nH
L5371	2462587T13	68nH
L5401	2460591B04	11.03nH
L5402	2484657R01	FERRITE BEAD
L5403	2462587T22	390nH
L5411	2462587T22	390nH
L5421	2484657R01	FERRITE BEAD
L5436	2484657R01	FERRITE BEAD
L5437	2460592A01	17nH
L5438	2460592A01	17nH
L5472	2460592A01	17nH
L5473	2460591N36	43.67nH
L5489	2460591A01	4.22nH
L5490	2460591A01	4.22nH
L5491	2460592A01	17nH
L5492	2460592A01	17nH
L5493	2460592A01	17nH
L5541	2484657R01	FERRITE BEAD
L5543	2460591A01	4.22nH
M3421	2686201B01	HEAT SPREADER
Q0110	4880048M01	NPN
Q0151	4880048M01	NPN
Q0171	4880048M01	NPN
Q0173	4880052M01	NPN DARLINGTON
Q0177	4880048M01	NPN
Q0181	4880048M01	NPN
Q0183	4880048M01	NPN
Q0185	4880048M01	NPN
Q0271	4880214G02	NPN
Q0641	4880048M01	NPN
Q0661	4805921T02	DUAL NPN/PNP
Q0662	4880214G02	NPN
Q0663	4880048M01	NPN
Q0681	4880052M01	NPN DARLINGTON
Q3101	4813827A07	NPN
Q3102	4813827A07	NPN
Q3141	4880214G02	NPN
Q3151	4880048M01	NPN
Q3152	4880048M01	NPN
Q5001	4813827A07	NPN
Q5002	4813824A17	PNP
Q5003	4813827A07	NPN
Q5004	4805921T02	DUAL NPN/PNP
Q5221	4880048M01	NPN
Q5301	4805218N63	DIODE DUAL SCHOTTKY
Q5311	4805218N63	DIODE DUAL SCHOTTKY
Q5332	4813827A07	NPN
Q5333	4809939C05	DUAL NPN/PNP
Q5421	4886212B01	POWER TRANSISTOR - MRF1518
Q5441	4813828C32	POWER TRANSISTOR - MRF1570
Q5471	4880048M01	NPN
Q5472	4805128M27	PNP
Q5473	4880214G02	NPN
R0101	0662057A73	10K
R0102	0662057A65	4.7K
R0103	0662057A01	10
R0104	0662057A73	10K
R0105	0662057A97	100K
R0108	0662057A57	2.2K
R0111	0662057B47	0
R0113	0662057A73	10K
R0114	0662057A73	10K
R0115	0662057A73	10K
R0117	0662057A63	3.9K
R0121	0662057A97	100K
R0131	0662057B46	10M
R0132	0662057B10	330K
R0151	0662057A82	24K
R0152	0662057A82	24K
R0170	0662057A73	10K
R0171	0662057A65	4.7K
R0172	0662057A73	10K
R0173	0662057A65	4.7K
R0174	0662057A73	10K
R0175	0662057A73	10K
R0176	0662057A84	30K
R0177	0662057A65	4.7K
R0178	0662057A89	47K
R0179	0662057A89	47K
R0181	0662057A65	4.7K
R0182	0662057A89	47K
R0183	0662057A65	4.7K
R0184	0662057A89	47K
R0185	0662057A65	4.7K
R0186	0662057A89	47K
R0201	0662057A25	100
R0202	0662057A43	560
R0203	0662057A25	100
R0204	0662057A43	560
R0205	0662057A73	10K
R0206	0662057A73	10K
R0207	0662057A57	2.2K
R0208	0662057A57	2.2K
R0211	0660076E70	7.5K
R0212	0660076E70	7.5K
R0221	0662057A82	24K
R0222	0662057A82	24K
R0223	0662057A84	30K
R0224	0662057A71	8.2K
R0228	0662057B47	0
R0229	0662057A01	10
R0241	0662057A89	47K
R0242	0662057B47	0
R0251	0662057A89	47K
R0252	0662057A91	56K
R0253	0662057A97	100K
R0254	0662057A73	10K
R0255	0662057A73	10K
R0256	0662057A97	100K
R0257	0662057A57	2.2K
R0261	0662057A73	10K
R0262	0662057B08	270K
R0265	0662057A82	24K
R0267	0662057A89	47K
R0268	0662057A73	10K
R0269	0662057A41	470
R0273	0662057A82	24K
R0275	0662057A73	10K
R0276	0662057A77	15K
R0323	0662057A79	18K
R0324	0662057A79	18K
R0331	0662057A73	10K
R0332	0662057A73	10K
R0333	0662057A73	10K
R0335	0662057B02	150K
R0341	0662057A73	10K
R0342	0662057A55	1.8K
R0343	0662057B47	0
R0344	0662057A91	56K
R0345	0662057A66	5.1K
R0346	0662057A89	47K
R0347	0662057A89	47K
R0401	0662057A33	220
R0407	0662057M26	10
R0408	0662057A25	100
R0409	0662057M26	10
R0412	0662057B47	0
R0441	0662057B47	0
R0442	0662057A49	1K
R0467	0662057M26	10
R0468	0662057A97	100K
R0481	0662057B47	0
R0482	0662057B47	0
R0508	0662057A41	470
R0509	0662057B47	0
R0510	0662057A65	4.7K
R0511	0662057A97	100K
R0512	0662057A77	15K
R0525	0662057A97	100K
R0529	0662057A89	47K
R0530	0662057A81	22K
R0531	0662057A43	560
R0533	0662057B47	0
R0535	0662057A49	1K
R0537	0662057A33	220
R0538	0662057A33	220
R0539	0662057A65	4.7K
R0541	0662057A83	27K
R0543	0662057A97	100K
R0555	0662057A25	100
R0556	0662057A25	100
R0591	0662057A82	24K
R0592	0662057A01	10
R0593	0662057A97	100K
R0611	0662057A91	56K
R0612	0662057A65	4.7K
R0621	0662057A82	24K
R0641	0662057A73	10K
R0642	0660076E70	7.5K
R0643	0660076E51	1.2K
R0651	0662057A01	10
R0652	0662057A01	10
R0661	0662057A49	1K
R0662	0662057B02	150K
R0671	0662057A84	30K
R0672	0662057A73	10K
R0681	0662057A79	18K
R0682	0662057A93	68K
R3101	0662057A75	12K
R3102	0662057A01	10
R3105	0662057A25	100
R3106	0662057A83	27K
R3107	0662057A69	6.8K
R3108	0662057A44	620
R3111	0662057A75	12K
R3112	0662057A01	10

Circuit Ref	Motorola Part No.	Description
R3113	0662057A37	330
R3115	0662057A39	390
R3116	0662057A37	330
R3117	0662057A83	27K
R3118	0662057A69	6.8K
R3123	NU	3rd overtone crystal
	0662057B47	0 fundamental crystal
R3124	0662057A49	1K 3rd overtone crystal
	NU	fundamental crystal
R3130	0662057A18	51
R3132	0662057A77	15K
R3133	0662057A71	8.2K
R3134	0662057A73	10K
R3135	0662057A51	1.2K
R3141	0662057A39	390
R3142	0662057A55	1.8K
R3144	0662057A58	2.4K
R3145	0662057A61	3.3K
R3146	0662057A45	680
R3147	0662057A75	12K
R3148	0662057B47	0
R3151	0662057A73	10K
R3152	0662057A73	10K
R3153	0662057A73	10K
R3154	0662057A73	10K
R5001	0662057A97	100K
R5002	0662057A37	330
R5003	0662057A65	4.7K
R5004	0662057A59	2.7K
R5005	0662057A73	10K
R5007	0662057A25	100
R5012	0662057A97	100K
R5016	0662057A61	3.3K
R5018	0662057A61	3.3K
R5020	0662057A01	10
R5021	0662057A01	10
R5022	0662057B47	0
R5051	0662057A18	51
R5052	0662057B47	0
R5060	0662057B10	330K
R5061	0662057A73	10K
R5062	0662057A53	1.5K
R5063	0662057A39	390
R5064	0662057B47	0
R5068	0662057A53	1.5K
R5069	0662057A49	1K
R5070	0662057A39	390
R5071	0662057A73	10K
R5072	0662057A73	10K
R5201	0662057A29	150
R5203	0662057A17	47

Circuit Ref	Motorola Part No.	Description
R5204	0662057A17	47
R5211	0662057B47	0
R5221	0662057A29	150
R5222	0662057A42	510
R5223	0662057A21	68
R5224	0662057A89	47K
R5225	0662057A89	47K
R5228	0662057A89	47K
R5241	0662057A33	220
R5251	0662057A87	39K
R5252	0662057A84	30K
R5261	0662057A89	47K
R5263	0662057A25	100
R5301	0662057A67	5.6K
R5302	0662057A73	10K
R5303	0662057A12	30
R5304	0662057A29	150
R5305	0662057A01	10
R5311	0662057A70	7.5K
R5312	0662057A70	7.5K
R5313	0662057A12	30
R5314	0662057A33	220
R5315	0662057B47	0
R5321	0662057A91	56K
R5322	0662057A69	6.8K
R5323	0662057A97	100K
R5331	0662057A09	22
R5341	0662057B47	0
R5342	0662057A57	2.2K
R5343	0662057A49	1K
R5344	0662057A01	10
R5346	0662057A73	10K
R5347	0662057B47	0
R5361	0662057A31	180
R5362	0662057A01	10
R5363	0662057A49	1K
R5381	0662057A41	470
R5401	0662057A36	300
R5402	0662057A05	15
R5403	0662057A36	300
R5405	0662057A32	200
R5408	0662057A80	20K
R5409	0662057A97	100K
R5412	0662057A56	2K
R5415	0662057A18	51
R5416	0662057A18	51
R5422	0611079A69	620
R5423	0611079A69	620
R5424	0611079A69	620
R5425	0611079A69	620
R5428	0662057A55	1.8K

Circuit Ref	Motorola Part No.	Description
R5457	0683962T51	120
R5473	0662057A64	4.3K
R5474	0662057A97	100K
R5475	0662057B47	0
R5480	0662057A73	10K
R5481	0662057C44	51
R5482	0662057B09	300K
R5483	0662057A97	100K
R5484	0662057A90	51K
R5485	0662057C44	51
R5486	0662057C44	51
R5489	0662057C44	51
R5491	0662057A97	100K
R5492	0662057A73	10K
R5495	0680195M18	51
R5496	0680194M23	82
R5497	0680195M18	51
R5501	0662057A51	1.2K
R5502	0662057B05	200K
R5503	0662057A63	3.9K
R5504	0662057A73	10K
R5506	0662057A73	10K
R5507	0662057A73	10K
R5511	0680194M18	51
R5512	0662057A41	470
R5513	0662057A73	10K
R5514	0662057A61	3.3K
R5631	0662057A89	47K
R5632	0662057A89	47K
R5634	0662057A97	100K
R5635	0662057A97	100K
SH5301	2602641Y02	SHIELD
SH5302	2602641Y02	SHIELD
T5051	2505515V03	TRANSFORMER 4:1
T5052	2508397X02	TRANSFORMER 1:1
U0101	5102226J56	MICROPROCESSOR
U0111	5102463J64	EEPROM
U0121	5186137B01	IC, FLASH ROM
U0122	5185748L01	SRAM
U0141	5113805A30	REMUX
U0211	5183222M49	IC, QUAD OPAMP
U0221	5185130C53	IC, ASFIC
U0251	5184704M60	IC-CMOS ANALOG
U0271	5102463J95	AUDIO PA
U0301	5109152M01	EEPROM ANALOG
U0331	5186204B01	BUFFER / DRIVER
U0341	5113818A01	LINEAR IC OP AMP
U0342	5105750U28	IC CMOS SWITCH
U0351	5102463J40	REGULATOR, 3.3 V
U0611	5183308X01	ADJUSTABLE VOLTAGE REGULATOR

Circuit Ref	Motorola Part No.	Description
U0641	5183308X01	ADJUSTABLE VOLTAGE REGULATOR
U0651	5113816A07	REGULATOR, 5 V
U0652	5113815A02	UNDERVOLT SENSOR
U3101	5186144B01	IC, IF
U3111	5102463J52	QUAD ANALOG SWITCH
U3115	5102463J52	QUAD ANALOG SWITCH
U5201	5185963A27	IC FRACTN
U5211	5105739X05	IC, VOLTAGE REGULATOR
U5301	5105750U54	IC, VCO
U5401	5185130C65	IC LDMOS DRIVER
U5501	5185765B26	IC POWER CONTROL
U5502	5185963A15	IC TEMPERATURE SENSOR
VR0151	4813830A15	DIODE, 5.6 V
VR0501	4805656W09	DIODE, ZENER
VR0503	4805656W09	DIODE, ZENER
VR0504	4813830A40	SOC23 AUTO SDN
VR0505	4805656W09	DIODE, ZENER
VR0509	4813830A40	DIODE, ZENER
VR0510	4813830A40	DIODE, ZENER
VR0537	4813830A15	DIODE, 5.6 V
VR0541	4813830A27	DIODE, 14 V
VR0601	4813832C77	DIODE
VR0621	4813830A15	DIODE, 5.6 V
VR5471	4813830A15	DIODE, 5.6 V
VR5473	4813830A15	DIODE, 5.6 V
Y0131	4880113R19	CRYSTAL 38.4 KHZ
Y3101		2ND OSC XTAL 44.395 MHZ
	4802245J84	3rd overtone crystal
	4880606B09	fundamental crystal
Y3102	9186145B02	455 KHZ DISCRIMINATOR
Y5262	4886182B01	TCXO 16.8 MHZ
	4886182B02	TCXO 16.8 MHZ (for PMUE1874_ only)

* Motorola Depot Servicing only

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

† Replacement boards must be ordered from RPSO (formerly CCSD and/or AAD) using the number shown in the model charts in Section 1. Boards are not orderable using the 84-prefixed number.

Notes

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 Replacement Board Ordering Information

When ordering a replacement board, refer to the applicable model chart in the front of each chapter and include the proper information with your order.

A.3 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.4 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.5 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.6 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.7 Parts Identification

Radio Products and Solutions Organization*
(United States and Canada)
1-800-422-4210

A.8 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).

A.9 Product Customer Service

Customer Response Center
(Non-technical Issues)
1-800-247-2346
FAX:1-800-247-2347



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