



GP88s
Portable Radio

Service Manual

6804111J47-D

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Document History


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

Edition	Description	Date
6804111J47-D	Updated the mechanical parts list and exploded view.	Nov. 2003

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SAFETY INFORMATION

Product Safety and RF Exposure for Portable Two-Way Radios

 <p>Caution</p>	BEFORE USING THIS RADIO, READ THIS BOOKLET WHICH CONTAINS IMPORTANT OPERATING INSTRUCTIONS FOR SAFE USAGE AND RF ENERGY AWARENESS AND CONTROL INFORMATION FOR COMPLIANCE WITH RF ENERGY EXPOSURE LIMITS IN APPLICABLE NATIONAL AND INTERNATIONAL STANDARDS.
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The information provided in this document supersedes the general safety information contained in user guides published prior to February 2002.

For radios that have been approved as intrinsically safe, read the instructions and information on intrinsic safety.

Compliance with RF Energy Exposure Standards

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

Federal Communication Commission(FCC) Regulations

The FCC has established limits for safe exposure to radio frequency (RF) emissions from portable two-way radios. The FCC requires manufacturers to demonstrate compliance with RF exposure limits before portable two-way radios can be marketed in the U.S. When two-way radios are approved for occupational/controlled environment exposure limits, the FCC requires users to be fully aware of, and exercise control over, their exposure. Awareness and control of RF exposure can be accomplished by the use of labels, or by education or training through appropriate means, such as information and instructions in user manuals or safety booklets.

Your Motorola two-way radio has an RF exposure information label in the battery compartment. This user safety booklet includes useful information about RF exposure and helpful instructions on how to control your RF exposure.

Your Motorola two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. **This radio complies with the IEEE (FCC) and ICNIRP exposure limits for occupational/controlled RF exposure environments at usage factors of up to 50% talk–50% listen.** In terms of measuring RF energy for compliance with FCC exposure guidelines, **your radio radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.**

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

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

- United States Federal Communications Commission, Code of Federal Regulations; 47 CFR part 2 sub-part J
- American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95.1-1992
- Institute of Electrical and Electronic Engineers (IEEE) C95.1-1999 Edition
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) 1998

- Ministry of Health (Canada) Safety Code 6. Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz, 1999
- Australian Communications Authority Radiocommunications (Electromagnetic Radiation - Human Exposure) Standard, 2001
- ANATEL, Brasil Regulatory Authority, Resolution 256 (April 11, 2001) “additional requirements for SMR, cellular and PCS product certification.”

Compliance and Control Guidelines and Operating Instructions for Portable Two-Way Radios

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

- Transmit no more than 50% of the time. To transmit (talk), push the Push-To-Talk (PTT) button. To receive calls, release the PTT button. Transmitting 50% of the time or less is important since the radio generates measurable RF energy exposure only when transmitting (in terms of measuring standards compliance).
- **Hold the radio in a vertical position in front of the face with the microphone (and other parts of the radio including the antenna) at least one to two inches (2.5 to 5 centimeters) away from the lips. Keeping the radio at a proper distance is important since RF exposures decrease with distance from the antenna.**
- For body-worn operation, always place the radio in a Motorola-approved clip, holder, holster, case, or body harness for this product. Using non-Motorola-approved accessories may result in exposure levels which exceed the FCC’s occupational/controlled environment RF exposure limits.
- If you are not using a body-worn accessory and are not using the radio in the intended use position in front of the face, ensure the antenna and the radio are kept one inch (2.5 centimeters) from the body when transmitting. Keeping the radio at a proper distance is important since RF exposures decrease with distance from the antenna.
- **Use only Motorola-approved supplied or replacement antennas, batteries, and accessories.** Use of non-Motorola-approved antennas, batteries and accessories may exceed FCC RF exposure guidelines. **For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site which lists approved accessories: <http://ap.cgiss.motorola.com/AAD/index.html>**



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

Electromagnetic Interference/Compatibility

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

Facilities

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

Aircraft

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

Medical Devices

Pacemakers

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

Persons with pacemakers should:

- ALWAYS keep the radio more than 6 inches (15 centimeters) from their pacemaker when the radio is turned ON.
- not carry the radio in the breast pocket.
- use the ear opposite the pacemaker to minimize the potential for interference.
- turn the radio OFF immediately if you have any reason to suspect that interference is taking place.

Hearing Aids

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

Other Medical Devices

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

Driver Safety

Check the laws and regulations on the use of radios in the area where you drive. Always obey them.

When using your radio while driving, please:

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

Operational Warnings



WARNING

For Vehicles With An Air Bag

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

Potentially Explosive Atmospheres

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

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

Blasting Caps And Blasting Areas

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

Operational Cautions



Caution

Antennas

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

Batteries

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

Intrinsically Safe Radio Information

FMRC Approved Equipment

Anyone intending to use a radio in a location where hazardous concentrations of flammable materials exist (hazardous atmosphere) is advised to become familiar with the subject of intrinsic safety and with the National Electric Code NFPA 70 (National Fire Protection Association) Article 500 (hazardous [classified] locations).

An Approval Guide, issued by Factory Mutual Research Corporation (FMRC), lists manufacturers and the products approved by FMRC for use in such locations. FMRC has also issued a voluntary approval standard for repair service (“Class Number 3605”).

FMRC Approval labels are attached to the radio to identify the unit as being FMRC Approved for specified hazardous atmospheres. This label specifies the hazardous Class/Division/Group along with the part number of the battery that must be used. Depending on the design of the portable unit, this FM label can be found on the back or the bottom of the radio housing. The FM Approval Mark is shown here.



**WARNING**

- **Do not operate radio communications equipment in a hazardous atmosphere unless it is a type especially qualified (for example, FM Approved) for such use. An explosion or fire may result.**
- **Do not operate an FMRC Approved product in a hazardous atmosphere if it has been physically damaged (for example, cracked housing). An explosion or fire may result.**
- **Do not replace or charge batteries in a hazardous atmosphere. Contact sparking may occur while installing or removing batteries and cause an explosion or fire.**
- **Do not replace or change accessories in a hazardous atmosphere. Contact sparking may occur while installing or removing accessories and cause an explosion or fire.**
- **Turn the radio off before removing or installing a battery or accessory.**
- **Do not disassemble an FMRC Approved Product in any way that exposes the internal circuits of the unit.**

Radios must ship from the Motorola manufacturing facility with the hazardous atmosphere capability and FM Approval labeling. Radios will not be “upgraded” to this capability and labeled in the field. A modification changes the unit’s hardware from its original design configuration. Modifications can only be made by the original product manufacturer at one of its FMRC-audited manufacturing facilities.

**WARNING**

- **Failure to use an FMRC Approved Product with an FMRC Approved battery or FMRC Approved accessories specifically approved for that product may result in the dangerously unsafe condition of an unapproved radio combination being used in a hazardous location.**
- **Unauthorized or incorrect modification of an FMRC Approved Product will negate the Approval rating of the product.**

Repair of FMRC Approved Products

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

You should not repair or relabel any Motorola-manufactured communication equipment bearing the FMRC Approval label (“FMRC Approved Product”) unless you are familiar with the current FMRC Approval standard for repairs and service (“Class Number 3605”).

You may want to consider using a repair facility that operates under 3605 repair service approval.

**WARNING**

- **Incorrect repair or relabeling of any FMRC Approved Product could adversely affect the Approval rating of the unit.**
- **Use of a radio that is not intrinsically safe in a hazardous atmosphere could result in serious injury or death.**

The FMRC's Approval Standard Class Number 3605 is subject to change at any time without notice to you. You may want to obtain a current copy of 3605 from the FMRC. Per the December 1994 publication of 3605, some key definitions and service requirements are as follows:

Repair

A repair constitutes something done internally to the unit that would bring it back to its original condition— Approved by FMRC. A repair should be done in an FMRC Approved repair facility.

Items not considered as repairs are those in which an action is performed on a unit which does not require the outer casing of the unit to be opened in a manner that exposes the internal electrical circuits of the unit. You do not have to be an FMRC Approved repair facility to perform these actions.

Relabeling

The repair facility shall have a method by which the replacement of FMRC Approval labels are controlled to ensure that any relabeling is limited to units that were originally shipped from the manufacturer with an FM Approval label in place. FMRC Approval labels shall not be stocked by the repair facility. An FMRC Approval label shall be ordered from the original manufacturer, as needed, to repair a specific unit. Replacement labels may be obtained and applied by the repair facility, provided there is satisfactory evidence that the unit being relabeled was originally an FMRC Approved unit. Verification may include, but is not limited to a unit with a damaged Approval label, a unit with a defective housing displaying an Approval label, or a customer invoice indicating the serial number of the unit and purchase of an FMRC Approved model.

Do Not Substitute Options or Accessories

The Motorola communications equipment certified by Factory Mutual is tested as a system and consists of the FM Approved portable, FM Approved battery, and FM Approved accessories or options, or both. This FM Approved portable and battery combination must be strictly observed. There must be no substitution of items, even if the substitute has been previously Approved with a different Motorola communications equipment unit. Approved configurations are listed in the FM Product Listing Manual that was included with your radio.

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Section 1

INTRODUCTION

1.0 Scope of Manual

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

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

2.0 Warranty and Service Support

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

2.1 Warranty Period and Return Instructions

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

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

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

2.2 After Warranty Period

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

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

2.3 Piece Parts

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

All orders for parts/information should include the complete Motorola identification number. All part orders should be directed to your local AAD office. Please refer to your latest price pages.

2.4 Technical Support

Technical support is available to assist the dealer/distributor in resolving any malfunction which may be encountered. Initial contact should be by telephone wherever possible. When contacting Motorola Technical Support, be prepared to provide the product model number and the unit's serial number.

Toll-Free

Country or Territory	Number
China	800-810-0976
Indonesia	0800-1-686868
Malaysia	1800-801687
Philippines	1800-16510271
Singapore	1800-4855333
Thailand	1800-225412

Non-Toll-Free

Country or Territory	Number
China	(86-10) 6843-8231
Hong Kong SAR	(852) 2966-4188
India	(91) 80-658-7677-7678
Indonesia	(62-21) 251-3050
Korea	(822) 3466-5401
Malaysia	(603) 7803-9922
Philippines	(63-2) 810-0762
Singapore	(65) 486-7171
Taiwan	(886) 2-27058000 ext. 6308
Thailand	(66) 2254-8388
Vietnam	(84) 8-8294091
All Other Countries	IDD Code+(65)-4855333

3.0 Radio Model Information

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

Table 1-1 Radio Model Number (Example: AZH34KDC9AA3)

	Type of Unit	Model Series	Freq. Band	Power Level	Physical Packages	Channel Spacing	Protocol	Feature Level
AZ	H	34	K VHF (136-174 MHz)	D 4-5W	C GP88s	9 Programma- ble	AA Conventional	3 GP88s
			R UHF (403-470 MHz)					

H = Portable
 AZ = Country Code

Section 2

ACCESSORIES

1.0 Antennas

PMAD4012A	VHF 9cm Antenna (136-155 MHz)
PMAD4025A	VHF 9cm Antenna (150-161 MHz)
PMAD4013A	VHF 9cm Antenna (155-174 MHz)
PMAD4023A	VHF 14cm Antenna (150-161 MHz)
PMAD4014A	VHF 14cm Antenna (136-155 MHz)
PMAD4015A	VHF 14cm Antenna (155-174 MHz)
PMAE4002A	UHF 9cm Antenna (403-433 MHz) (Stubby)
PMAE4003A	UHF 9cm Helical Antenna (430-470 MHz)
NAE6483AR	UHF Whip Antenna (403-470 MHz)

2.0 Carrying Accessories

HLN9714A	Spring Belt Clip - Large (for 2" belt width)
HLN9844A	Spring Belt Clip - Medium (for 1.5" belt width)
4285631Z01	Lanyard

3.0 Chargers

PMTN4034A	Charger, Single Unit Pocket only
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4.0 Batteries

PMNN4017A	AA NiMH Battery (Black)
PMNN4020A	AFAT NiCd Battery (Black)

5.0 Adaptors

HLN9756	BNC-RF Adaptor
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6.0 Audio Accessories

HMN9030	Remote Speaker Microphone
HMN9727	Earbud w/o Volume Control
HMN9752	Earbud w/Volume Control
BDN6646	Earset/Earbud w/Mic & PTT
HMN9013	Headset with Boom Mic
BDN6648	Headset w/Noise Cancelling Boom Mic
BDN6720	Flexible Ear Receivers (Rx only)
PMMN4004	Temco Remote Speaker Microphone

7.0 Option Boards

RLN4855A	DTMF Decode Option Board
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8.0 Manuals

6804111J46	GP88s User Guide
6804111J47	GP88s Service Manual
6804111J48	GP88s Selling Guide
PMLN4357A	GP88s Product Manual

9.0 Retrofit Kit

PMLN4352A	GP88s Keypad Retrofit Kit
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10.0 Service Kits

PMKN4004	Programming/Test Cable
PMKN4003	Cloning Cable
0180305H20	Battery Eliminator
8180384J58	Housing Eliminator
PMVN4047	Customer Programmable Software (Diskette)
PMVN4048	Customer Programmable Software(CD Rom)
PMVN4029	Tuner Installation Kit (Disk)
PMVN4037	Tuner Installation Kit (CD)

Section 3

SERVICE AIDS

1.0 Recommended Test Tools

Table 3-1 lists the tools recommended for working on this family of radios. These tools are also available from Motorola.

Table 3-1 Recommended Test Tools

Motorola Part No.	Description	Application
6680387A59 6680387A64 6680387A65 0180382A31	Extractor, 2-contact Heat controller with safety stand or Safety stand only Portable desoldering unit	Removal of discrete surface-mounted devices
6680375A74 0180386A81 0180386A78	0.025 replacement tip, 5/pk Miniature digital readout soldering station (incl. 1/64" micropoint tip) Illuminated magnifying glass with lens attachment.	For 0180382A31 portable desoldering unit.
0180386A82 6684253C72 6680384A98 1010041A86 1080370B43	Anti-static grounding kit Straight prober Brush Solder (RMA type), 63/37, 0.020" diameter 1 lb. spool RMA liquid flux	Used during all radio assembly and disassembly procedures
R-1070A or R-1319A	Shields and surface-mounted component - IC removal/rework station (order all heat-focus heads separately) Shields and surface-mounted component - IC removal/rework station SMD10000 M.A.P.E.	Removal and assembly of surface-mounted integrated circuits and shields Removal and assembly of surface-mounted integrated circuits and shields
TT907A National Service Technical Guide	Repairing Leadless Component Assemblies	How to successfully remove and replace surface mount devices.

2.0 Service Aids

Table 3-2 lists service aids recommended for working on the GP88s Radios. While all of these items are available from Motorola, most are standard shop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 3-2 Service Aids

Motorola Part No.	Description	Application
RLN4460A	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
PMVN4029	Tuner - Software on 3.5" floppy diskettes	Tune hardware parameters, front end, power, deviation, etc.
PMVN4037	Tuner - Software on CD Rom	Tune hardware parameters, front end, power, deviation, etc.
PMVN4047	Customer Programming Software - Software on 3.5" floppy diskettes	Program customer option and channel data.
PMVN4048	Customer Programming Software - Software on CD Rom	Program customer option and channel data.
PMKN4004A	Programming Cable/Test Cable	Connects radio to RIB (RLN4008B).
PMKN4003A	Radio to Radio Cloning Cable	Allows a radio to be duplicated from a master radio by transferring programmed data from the master radio to the other.
RLN4008B	Radio Interface Box	Enables communications between the radio and the computer's serial communications adapter.
HLN9756B	BNC-RF Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
0180305H20 8180384J58	Shop Battery Eliminator Bench Test Housing Eliminator	Interconnects radio to power supply. Provides for troubleshooting of the radio when the housing is removed.
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)
3080369B71 or 3080369B72	Computer Interface Cable	Use B72 for the IBM PC AT. All other IBM models use B71. Connects the computer's serial communications adapter to the RIB. (RLN4008B)

3.0 Test Equipment

Table 3-3 lists test equipment required to service the GP88s Radios and other two-way radios.

Table 3-3 Recommended Test Equipment

Motorola Part No.	Description	Characteristics	Application
R2000, R2400, or R2001 with trunking option	Service Monitor	This monitor will substitute for items with an asterisk *	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
*R1049	Digital Multimeter		Two meters recommended for AC/DC voltage and current measurements
*S1100	Audio Oscillator	67 to 200Hz tones	Used with service monitor for injection of PL tones
*S1053, *SKN6009, *SKN6001	AC Voltmeter, Power Cable for meter, Test leads for meter	1 mV to 300 V, 10 Megohm input impedance	Audio voltage measurements
R1053	Dual-trace Oscilloscope	20 MHz bandwidth, 5 mV/cm - 20 V/cm	Waveform measurements
*S1350, *ST1215 (VHF) *ST1223 (UHF) *T1013	Wattmeter, Plug-in Elements (VHF & UHF), RF Dummy Load	50-Ohm, $\pm 5\%$ accuracy 10 W, max. 0-1000 MHz, 300 W	Transmitter power output measurements
S1339	RF Millivolt Meter	100 μ V to 3 VRF, 10 kHz to 1.2 GHz	RF level measurements
*R1013	SINAD Meter		Receiver sensitivity measurements
S1347 or S1348 (prog)	DC Power Supply	0-20 Vdc, 0-5 Amps	Bench supply for 7.5Vdc

4.0 Programming/Test Cable

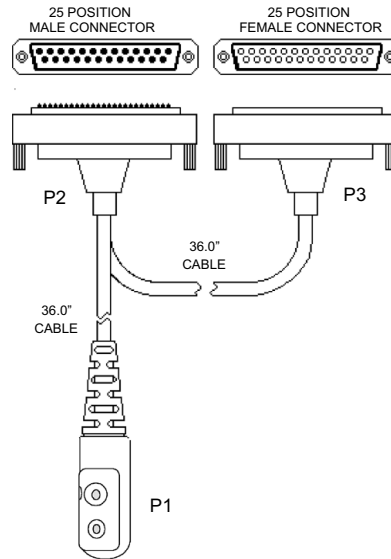


Figure 3-1 Programming/Test Cable

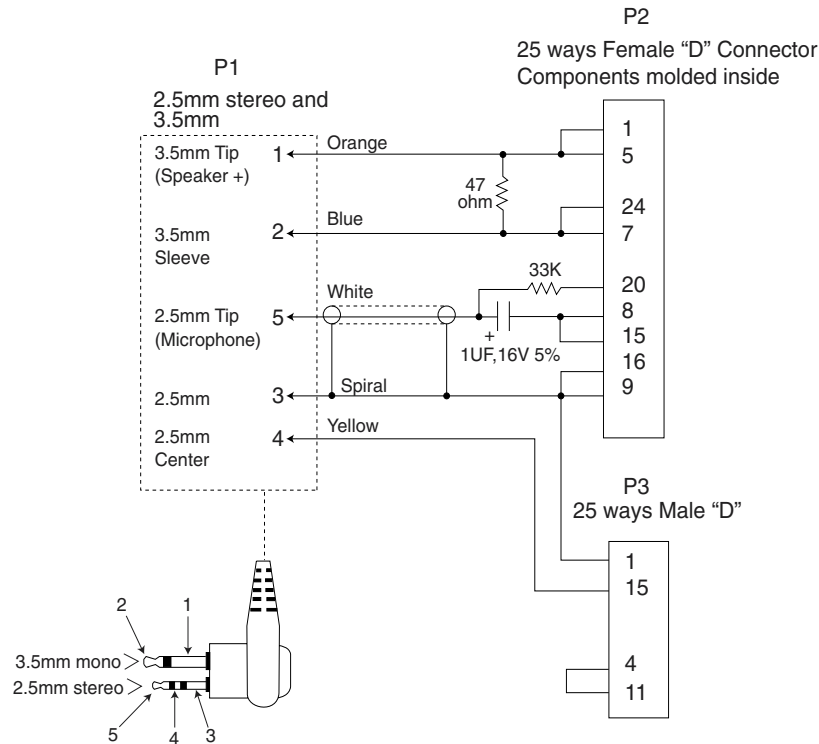


Figure 3-2 Wiring of the Connectors

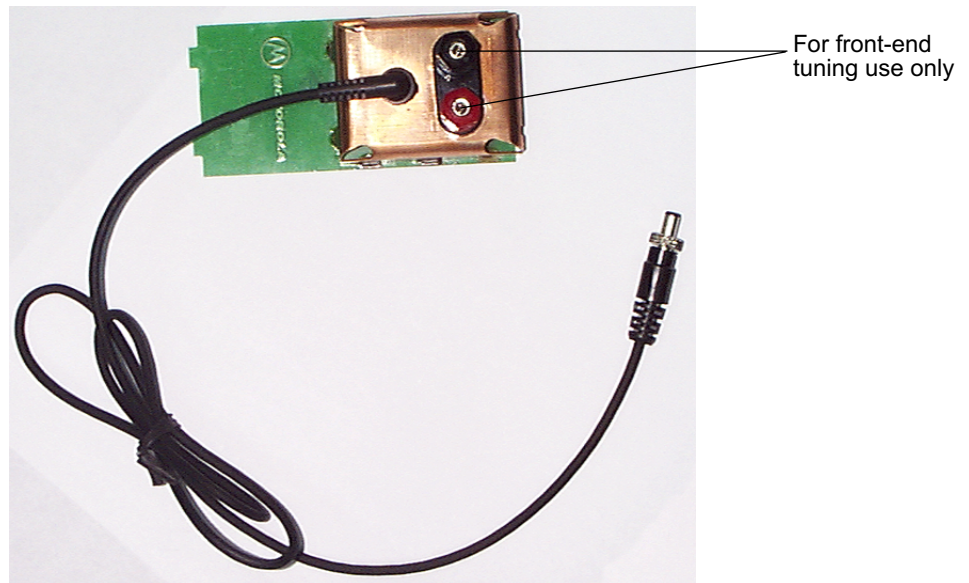


Figure 3-3 Front-end Filter Tuning Using 3rd Battery Contact

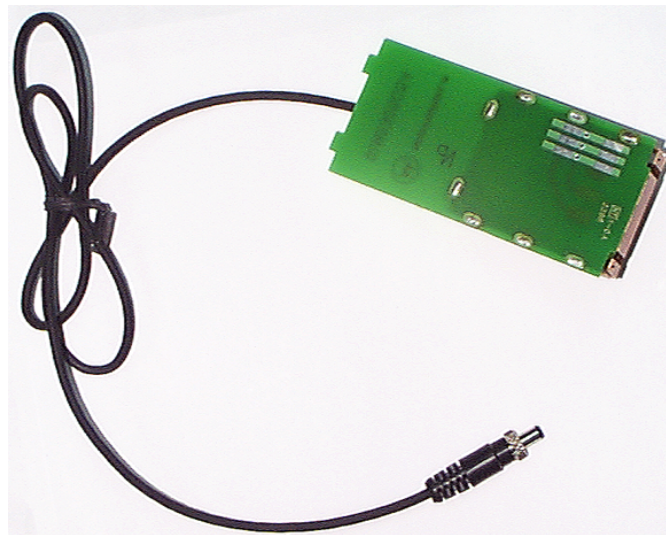


Figure 3-4 Battery Terminals

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Section 4

MAINTENANCE

1.0 Introduction

This chapter provides details about the following:

- Preventive maintenance (inspection and cleaning)
- Safe handling of CMOS and LDMOS devices
- Disassembly and reassembly of the radio
- Repair procedures and techniques
- Installation of Option Boards

2.0 Preventive Maintenance

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

2.1 Inspection

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

2.2 Cleaning Procedures

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

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

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

Pos **CAUTION:** The effects of certain chemicals and their vapors can have harmful results on certain plastics. Avoid using aerosol sprays, tuner cleaners, and other chemicals.

Cleaning External Plastic Surfaces

Apply the 0.5% detergent-water solution sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. Use a soft, absorbent, lintless cloth or tissue to remove the solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

Cleaning Internal Circuit Boards and Components

Isopropyl alcohol (70%) may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. After completing 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 Devices

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

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions. **DO NOT** attempt to disassemble the radio without first referring to the following CAUTION statement.

POE

CAUTION: This radio contains static-sensitive devices. Do not open the radio unless you are properly grounded. Take the following precautions when working on this unit:

- Store and transport all CMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS devices into conventional plastic "snow" trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service bench to protect the CMOS device. We recommend using the Motorola Static Protection Assembly (part number 0180386A82), which includes a wrist strap, two ground cords, a table mat, and a floor mat.
- Wear a conductive wrist strap in series with a 100k resistor to ground. (Replacement wrist straps that connect to the bench top covering are Motorola part number RSX-4015.)
- Do not wear nylon clothing while handling CMOS devices.
- Do not insert or remove CMOS devices with power applied. Check all power supplies used for testing CMOS devices to be certain that there are no voltage transients present.
- When straightening CMOS pins, provide ground straps for the apparatus used.
- When soldering, use a grounded soldering iron.
- If at all possible, handle CMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.

4.0 Repair Procedures and Techniques — General

Parts Replacement and Substitution

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

Rigid Circuit Boards

This 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 printed-through holes may interconnect multiple layers of the printed circuit. Therefore, exercise care to avoid pulling the plated circuit out of the hole.

When soldering near the 4-pin and 40-pin connectors:

- Avoid accidentally getting solder in the connector.
- Be careful not to form solder bridges between the connector pins.
- Examine your work closely for shorts due to solder bridges.

Flexible Circuits

The flexible circuits are made from a different material than the rigid boards, and require different soldering techniques. Excessive prolonged heat on a flexible circuit can damage the material. Therefore, avoid excessive heat and excessive bending.

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

To replace a component on a flexible circuit:

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

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

Chip Components

Use either the RLN-4062 Hot-Air Repair Station or the Motorola 0180381B45 Repair Station for chip component replacement. When using the 0180381B45 Repair Station, select the TJ-65 mini-thermojet hand piece. On either unit, adjust the temperature control to 700 degrees F. (370 degrees C), and adjust the airflow to a minimum setting. Airflow can vary due to component density.

- To remove a chip component, select a hot-air hand piece and position the nozzle of the hand piece approximately 1/8” above the component to be removed. Begin applying the hot air. Once the solder reflows, remove the component using a pair of tweezers. Using 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, select the appropriate micro-tipped soldering iron and apply fresh solder to one of the solder pads. Using a pair of tweezers, position the new chip component in place while heating the fresh solder. Once solder wicks onto the new component, remove the heat from the solder. 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, select the hot-air hand piece and reflow the solder on the solder pads to smooth it. Apply a drop of solder paste flux to each pad. Using a pair of tweezers, position the new component in place. Position the hot-air hand piece approximately 1/8" above the component and begin applying heat. Once the solder wicks to the component, remove the heat and inspect the repair. All joints should be smooth and shiny.

Shields

Removing and replacing shields will be done with the R-1070 station with the temperature control set to approximately 415°F (215°C); 445°F (230°C) max.

- To remove the shield, place the circuit board in the R-1070's holder. Select the proper heat focus head and attach it to the heater chimney. Add solder paste flux around the base of the shield. Position the shield under the heat-focus head. Lower the vacuum tip and attach it to the shield by turning on the vacuum pump. Lower the focus head until it is approximately 1/8" (0.3cm) above the shield. Turn on the heater and wait until the shield lifts off the circuit board. Once the shield is off, turn off the heat, grab the part with a pair of tweezers, and turn off the vacuum pump. Remove the circuit board from the R-1070's circuit board holder.
- To replace the shield, add solder to the shield if necessary, using a micro-tipped soldering iron. 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. Place the circuit board back in the R1070's circuit board holder. Place the shield on the circuit board using a pair of tweezers. Position the heat-focus head over the shield and lower it to approximately 1/8" above the shield. Turn on the heater and wait for the solder to reflow. Once complete, turn off the heat, raise the heat-focus head and wait approximately one minute for the part to cool. Remove the circuit board and inspect the repair. No cleaning should be necessary.

5.0 Disassembling and Reassembling the Radio — General

Since these radios may be disassembled and reassembled with the use of only four (board to casting) screws, it is important to pay particular attention to the snaps and tabs, and how parts align with each other.

The following tools are required for disassembling the radio:

- chassis opener
- keypad retainer tool
- TORX™ T6 screwdriver

If a unit requires more complete testing or service than is customarily performed at the basic level, send this unit to a Motorola Authorized Service Center.

The following disassembly procedures should be performed only if necessary:

Chassis Assembly Disassembly (Paragraph 6.2)

Keypad/Option Board Disassembly (Paragraph 6.3)

Speaker, Microphone, and Wire Disassembly (Paragraph 6.4)

PTT Disassembly (Paragraph 6.5)

Control Top Disassembly (Paragraph 6.6)

6.0 Radio Disassembly — Detailed

6.1 Front Cover from Chassis Disassembly

1. Turn off the radio.
2. Remove the battery:
 - a. Pull down on the two battery-release buttons.
 - b. With the buttons pulled down, the top of the battery will fall from the radio.
 - c. Remove the battery from the radio.

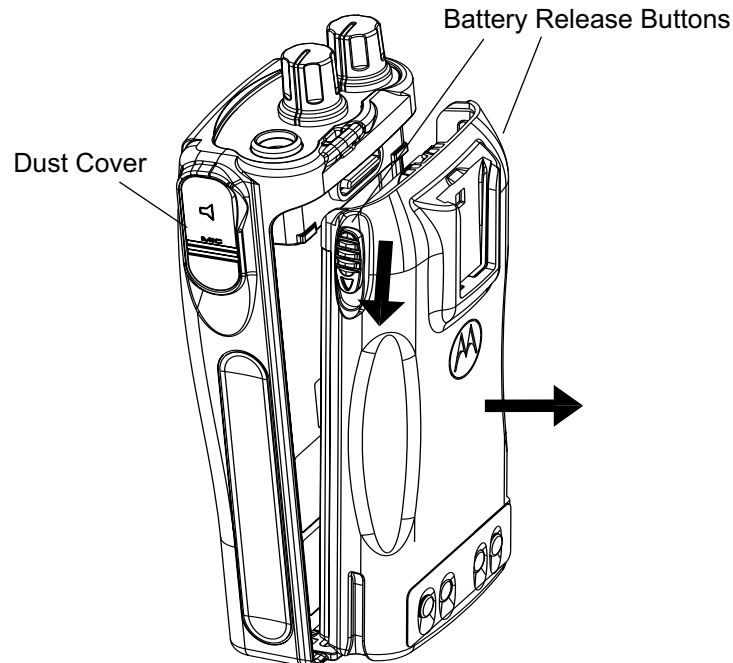


Figure 4-1 Battery Removal

3. Remove the antenna.

4. Pull the volume and channel selector knobs off of their shafts. Remove the dust cover.

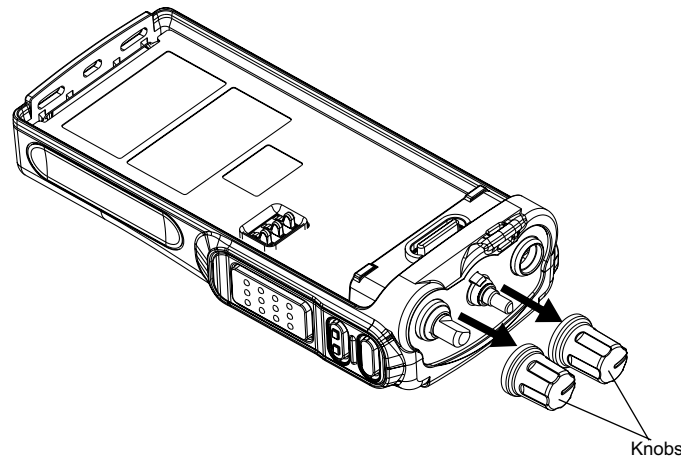


Figure 4-2 Knob Removal

NOTE Both knobs slide on and off. However, they are supposed to fit very tightly on their shafts.

5. Separate the chassis from the internal electronics front cover assembly by using the chassis opener (part number 6680702Z01). Place the broad side of the opener into the slots located at the base of the radio (see Figure 4-3). Press the handle of the opener downwards. This pressing action forces the thin inner plastic wall toward the base of the radio, releasing the two chassis base tabs.

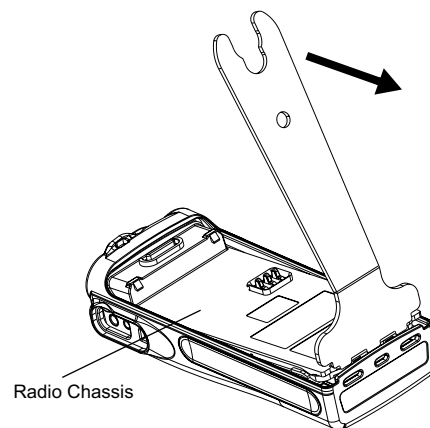


Figure 4-3 Chassis Removal

POE

CAUTION: Marring the front cover O-ring sealing area will prevent the radio from sealing properly.

NOTE The jumper flex and wire assembly connecting the front cover assembly and the chassis prevent you from completely separating the two units.

6. Lay the chassis down. Rotate the front cover backward and slightly away from the chassis.
7. Lift the latch on the main circuit board to release the jumper flex from its connector.

8. Unplug the wires from the 4-pin connector.

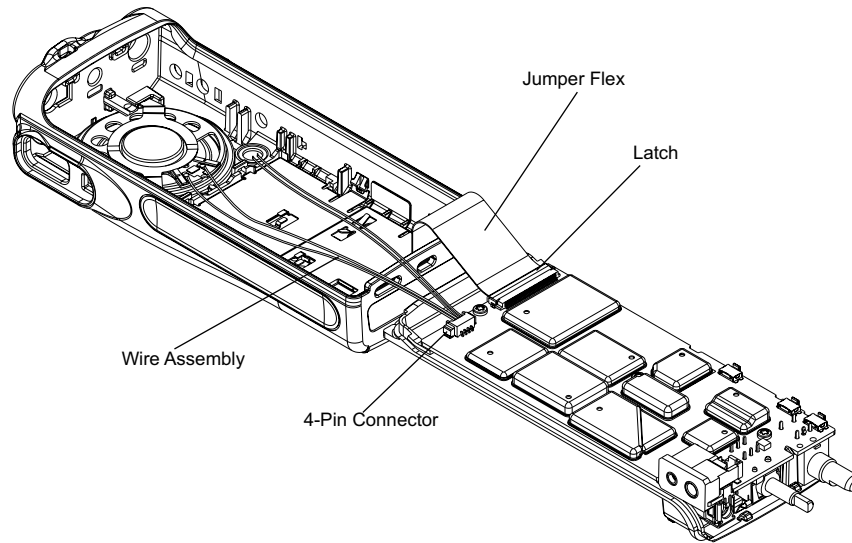


Figure 4-4 Unlatch Flex Connectors

6.2 Chassis Assembly Disassembly

Use a TORX™ screwdriver with a T6 head to remove the four screws holding the main board to the chassis.

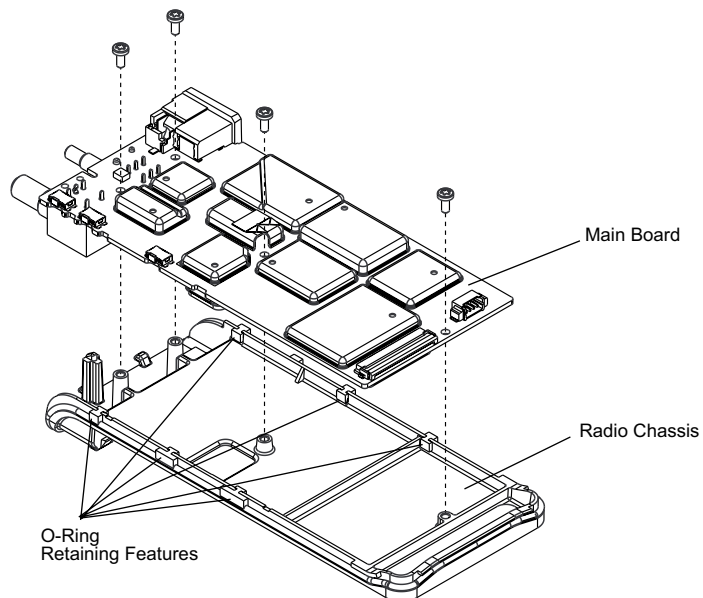


Figure 4-5 Remove Main Board from Chassis

1. Lift the main board from the chassis (See Figure 4-5).

POE

CAUTION: Refer to the CMOS CAUTION paragraph on page 2 before removing the main board. Be sure to use ESD protection when handling circuit boards.

2. Remove the six small O-ring retainers from their slots in the chassis. Note the alignment of the retainers for reassembly.
3. Remove the O-ring.

6.3 Keypad/Option Board Disassembly

1. If the disassembly of the keypad printed circuit board is required, open the catches on the keypad retainer and lift the wire assembly up. (See Figure 4-6.)
2. Lay this wire assembly to one side.
3. To remove the keypad retainer shield:
 - a. Insert the keypad retainer tool (part number 6685707Z01) in the opening at the end of the keypad retainer arm tab.
 - b. Pry the tab away from the side of the front cover until it moves past the ledges on the side wall. Duplicate this procedure for each of the four retainer arm tabs.

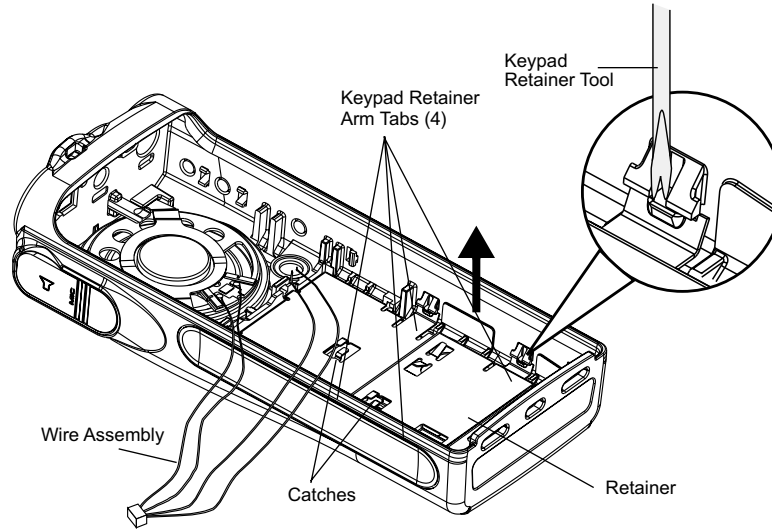


Figure 4-6 Remove Retainer

4. Note that the two “top hooks” are still held underneath the front cover—right below the speaker. Lift the keypad retainer out of the front cover; then, lift and pivot the two hooks out of the front cover.

5. The keypad/option board, and the keypad, can be removed without the use of tools.

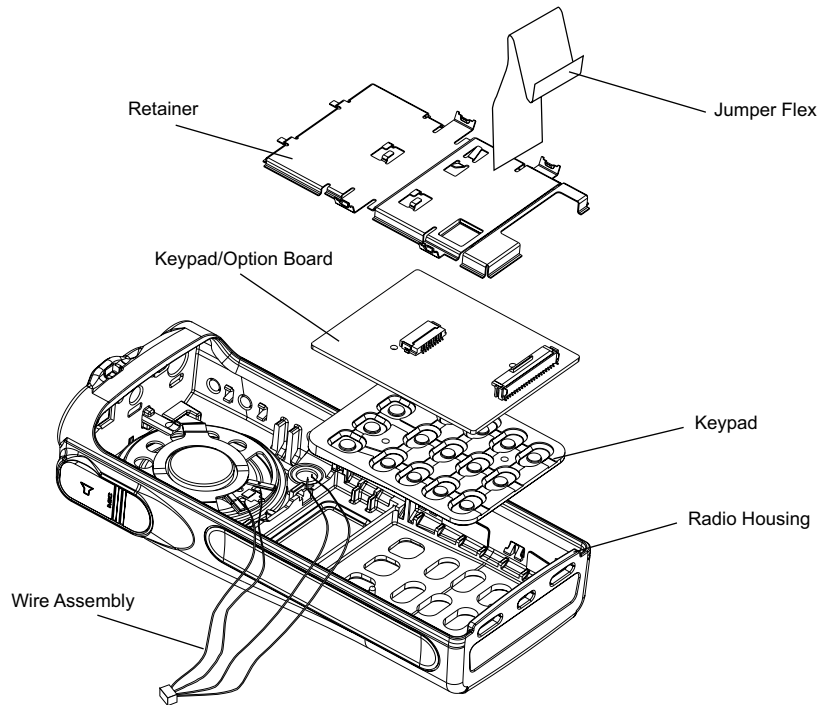


Figure 4-7 Removing the Keypad Retainer and Other Boards from the Radio Housing

NOTE At this point, the Option Board Installation Procedure should be performed, if necessary.

6.4 Speaker, Microphone, and Wire Disassembly

NOTE The speaker is held in place with a two-legged retainer bracket. The bracket legs are secured by the front cover slots. Be careful not to damage the speaker when removing the retainer bracket.

1. Using a screwdriver, push down on the portion of the speaker retainer bracket pointing toward the bottom of the radio. Then, remove the retainer by slightly pushing it toward the top of the radio until you slide it past the front cover slot.
2. Pull the rubber microphone boot from its seated position. Unless you are replacing the microphone, leave it in the boot.

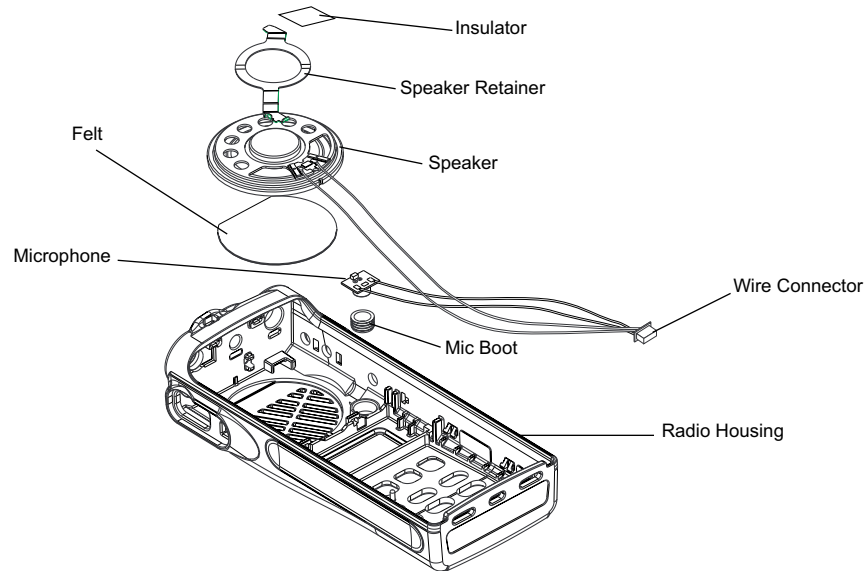


Figure 4-8 Removal Speaker-Microphone Assembly

3. When reassembling the microphone in its boot, make sure the microphone port faces the round hole in the bottom of the boot.

6.5 PTT Disassembly

1. If required, the PTT bezel, and the PTT seal assembly, can be disassembled using a small screwdriver, as follows:

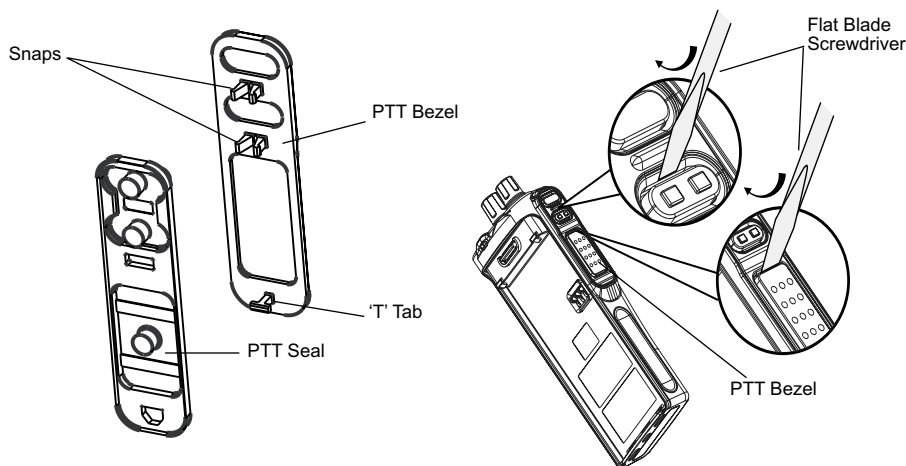


Figure 4-9 PTT Removal

- a. Insert the tip of a small screwdriver in between the bezel and side button 2 (refer to Figure 4-9).
- b. Insert the tip of a small screwdriver in between side button 2 and PTT button (refer to Figure 4-9).
- c. Pry the PTT bezel away from the radio housing.
- d. If required, the PTT seal can be easily lifted from the bezel without the use of tools.

6.6 Control Top Disassembly

1. To remove the control top assembly, place a screwdriver next to the antenna boss, and pry it against the top escutcheon. This will lift the top escutcheon away from the top of the front housing.
2. Remove the control top seal and transmit light pipe.

7.0 Radio Reassembly — Detailed

7.1 Control Top Reassembly

1. Replace transmit light pipe and control top seal.
2. Peel off the liners from a new top escutcheon, and place it in the recess in the front cover. Press the top escutcheon down uniformly.

7.2 PTT Reassembly

1. Put the PTT seal in the PTT bezel.
2. Place the bezel 'T' tab in the 'T' slot inside the front cover PTT opening. Slightly slide down the bezel so that the two snaps can be aligned and inserted into the two rectangular slots.
3. Press the PTT assembly against the front cover opening.

NOTE Look inside the front cover to make sure the T-tab and snaps are fully engaged with the front cover.

7.3 Speaker Reassembly

1. Align the notch in the speaker at the six o'clock position with the tab on the front cover.
2. Place the speaker retainer bracket into the hole on the top of the front cover, and bend the retainer down to fit underneath the boss below the speaker.

7.4 Keypad Option Board, Microphone and Wire Reassembly

1. Replace the keypad/option board.
2. Insert the “top hooks” of the keypad retainer into the slots below the speaker in the front cover. Snap all four of the retainer arm tabs in place in the front cover.

NOTE Pull the speaker-microphone wire out of harm’s way during reassembly.

3. Re-insert the microphone and boot into the pocket in the front cover.
4. Lay the speaker-microphone wire on top of the keypad/option board retainer, align them onto the catches and close the catches.

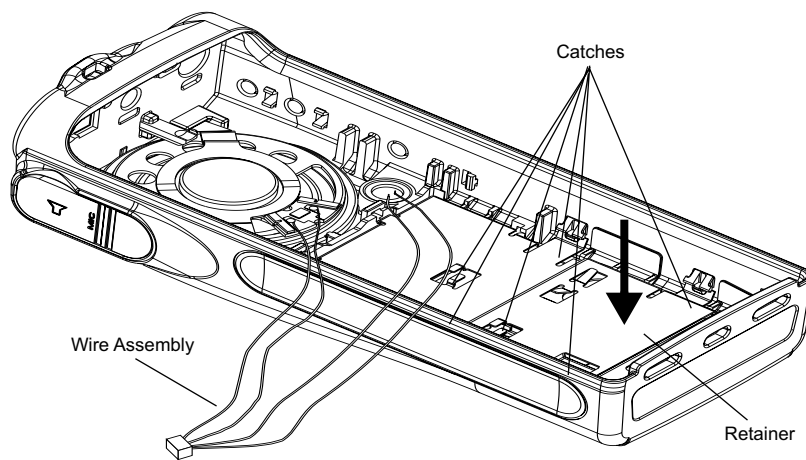


Figure 4-10 Lock retainer catches to the radio housing

7.5 Chassis Assembly Reassembly

1. Replace the O-ring. The tabs on the O-ring should reach around the chassis and point down.
2. Stretch the O-ring to place it into the retaining pocket at the bottom end of the chassis.

NOTE When properly assembled, the retainers on the O-ring should align with the slots on the chassis. If this is not the case, remove and replace the O-ring until it is aligned with the chassis and completely seated in place around the perimeter.

3. Replace the battery contact seal (if necessary) surrounding the battery contact.
4. Place the main circuit board straight down on top of the chassis.

NOTE Be sure the battery contact seal protrudes through the chassis and is not pinched under the chassis.

5. Use the T6 TORX screwdriver to fasten the screws holding the main board to the chassis.

7.6 Chassis and Front Cover Reassembly

1. Align the chassis assembly end-to-end with the front cover assembly.
2. Insert the tails of the jumper flex and wire assembly into their respective connectors at the bottom of the front cover.
3. Push down the latches on the connectors to hold the flex circuit to the main board.
4. Slide the volume potentiometer and frequency switch shafts into their respective holes in the front cover.
5. Push the chassis assembly completely into the top of the front cover until it settles in place.
6. Be sure the O-ring is properly seated.
7. Snap the bottom of the chassis into the front cover.
8. Reassemble the knobs, dust cover, antenna, and battery.

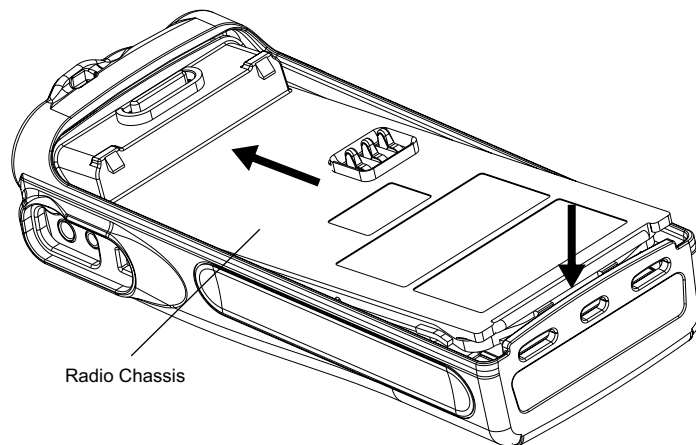


Figure 4-11 Fastening the Chassis

8.0 Option Board Installation

1. With the keypad retainer removed, the keypad board can be removed without the use of tools.
2. Remove the jumper flex from the connector on the keypad board. Notice the orientation of the flex to the connector. Arrows on the jumper flex point to the correct way of inserting the flex into the connector.
3. Remove the keypad board.

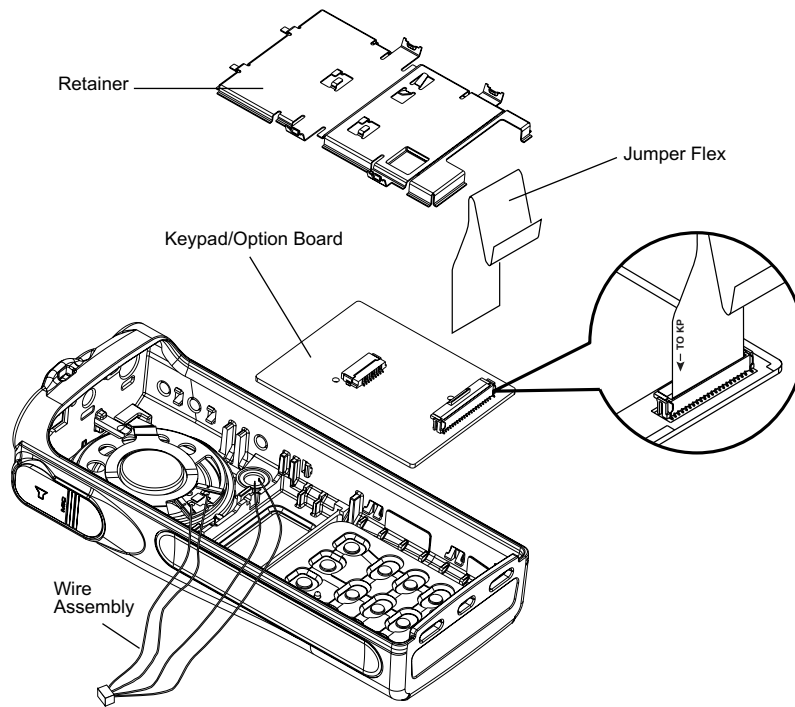


Figure 4-12 Changing the Keypad/Option Board

4. Reassemble the option board to the front cover assembly.
5. Insert the jumper flex circuit into the connector on the option board. Notice the orientation of the flex circuit. Arrows on the jumper flex point to the correct way of inserting the flex into the connector.
6. Replace the retainer by placing the two top hooks into the slots below the speaker in the front cover; then, pivot the retainer into the front cover. Ensure that all four tab arms snap correctly into the front cover.
7. With the keypad option board and retainer correctly in place, the front cover assembly can now be reassembled as described in Service Manual.

8.1 Configuring the Radio after Option Board Installation

1. Connect the radio to the computer following instructions outlined in Section 6.
2. Start up the CPS, and read the radio's codeplug.
3. Open the Radio Configuration dialog box, and proceed to the Option Board tab. From the pull-down menu, choose the option board type that you just installed (choose Simple Decoder for the DTMF option board).

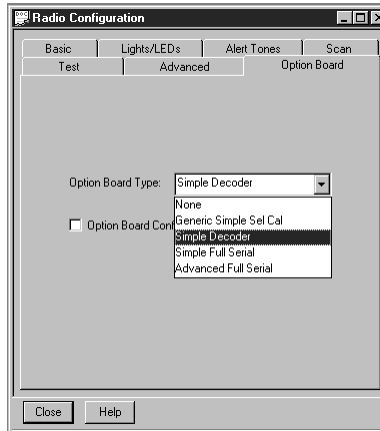


Figure 4-13 Option Board tab of the Radio Configuration dialog box.

4. Open the Personality dialog box. For every personality that you want the option board features to be activated, click on the Option Board Feature check box of the Advanced tab.

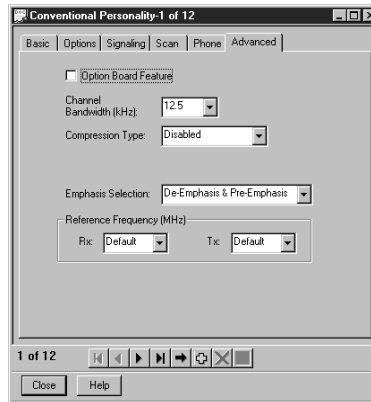


Figure 4-14 Advanced tab of the Personality dialog box.

8.2 Additional Configuration required by the DTMF Option Board

1. In the Tree View window of your CPS, expand the Signalling node. Also expand the DTMF System node. Open each of the DTMF System dialog boxes under this node, and fill in the relevant information pertinent to your DTMF system.



Figure 4-15 DTMF System dialog box

9.0 Mechanical View and Parts List

9.1 GP88s Exploded View and Parts List

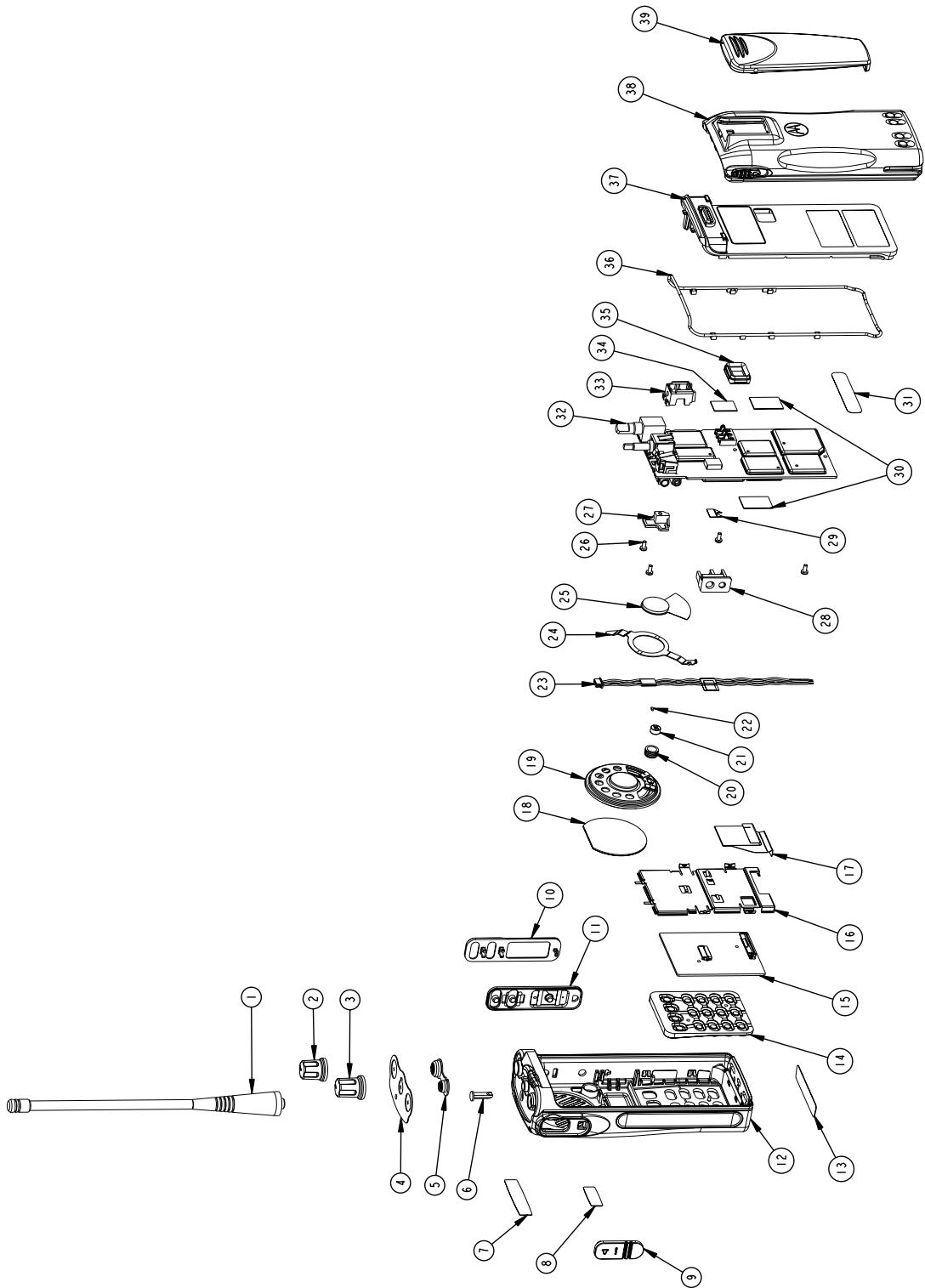


Figure 4-16 GP88s Radio Exploded View

Item	Motorola Part Number	Description
1	See Section 2	Antenna
2	3680690Z01	Knob, Volume
3	3680147S07	Knob, Frequency
4	1380691Z01	Escutcheon, Top
5	3280722Z01	Seal, Control Shaft
6	6180968Y01	Lightpipe, Tx
7	3380725Z01	Label, Logo
8	3380726Z01	Label, Name
9	3880692Z01	Cap, Dust
10	1385605Z01	Bezel, Side Control
11	7580694Z01	Keypad, Side Control
12	1580695Z01 1580695Z02	Housing, Front (Plain) Housing, Front (Keypad)
13	1380649Z03	Escutcheon, FM
14	7580720Z01 7580719Z01	Keypad, Dummy (Plain) Keypad, Front (Display)
15	0104009J11	Keypad Board Assembly
16	4285609Z04	Retainer Plate
17	8480475Z03	Flex, Keypad/Controller
18	3585606Z01	Felt, Speaker
19	5085738Z04	Speaker
20	1480577C01	Boot, Microphone
21	5013920A04	Microphone
22	2113740A55	Cap, 100pF
23	0980727Z01	Connector, Wire
24	4285601Z01	Retainer, Speaker
25	1485798Z01	Insulator, Speaker
26	0304726J05	Screw
27	1586657Z01	Retainer, Jack
28	1585815Z01	Shroud, Jack
29	3980667Z01	Contact, Finger
30	7585734Z01	Pad, VCO Shield

Item	Motorola Part Number	Description
31	3380564Z01	Label, Warning
32	See Section 9A & Section 9B	Back Cover Kit including chassis main board
33	1585705Z01	Shroud, RF Jack
34	7580556Z01	Pad, Thermal
35	3280534Z02	Seal, Contact
36	3280536Z01	Gasket, O-ring
37	2780518Z03	Chassis
38	See Section 2	Battery
39	HLN9844A	Beltclip

Section 5

TRANSCEIVER PERFORMANCE TESTING

1.0 Introduction

The radios have been prepared to meet published specifications through their manufacturing process, with the use of laboratory-quality test equipment of highest accuracy. The recommended field service equipment approaches the accuracy of the manufacturing equipment with a few exceptions.

Accuracy of the equipment must be maintained in compliance with the manufacturer's recommended calibration schedule.

2.0 Setup

Supply voltage can be connected from the battery eliminator. The equipment required for alignment procedures is connected as shown in the Radio Alignment Test Setup diagram.

Initial equipment control settings should be as indicated in the following table and should hold for all alignment procedures except as noted in Table 5-1.

Table 5-1 Initial Equipment Control Settings

Service Monitor	Test Set	Power Supply
Monitor Mode: Power Monitor	Spkr set: A	Voltage: 7.5Vdc
RF Attn: -70	Spkr/load: Speaker	DC on/standby: Standby
AM, CW, FM: FM	PTT: OFF	Volt Range: 10V
O'scope Source: Mod O'scope Horiz: 10mSec/Div O'scope Vert: 2.5kHz/Div O'scope Trig: Auto Monitor Image: Hi Monitor BW: Nar Monitor Squelch: mid CW Monitor Vol: 1/4 CW		Current: 2.5A

3.0 Test Mode

3.1 RF Test Mode

When the radio is operating in its normal environment, the radio's microcontroller controls the RF channel selection, transmitter key-up, and receiver muting. However, when the unit is on the bench for testing, alignment or repair, it is removed from its normal environment. It cannot receive commands from its system and, therefore, the internal microcontroller will not key the transmitter nor unmute the receiver. This prevents the use of normal tune-up procedures. To solve this problem a special routine, called TEST MODE or "air test," has been incorporated in the radio.

To enter test mode:

- Turn the radio on.
- Within ten seconds after the self test is complete, press the side button 2, (SB2) five times in succession.
- Upon entering test mode, the radio is on carrier squelch mode, 25 kHz channel spacing.
- Each additional press of SB2 will scroll through to the next channel spacing and a corresponding set of tones will be sounded.
- Pressing SB1 will scroll through and access test environments as shown in Table 5-2.
- Pressing SB2 for 3 seconds will switch the radio to the Control Head Test mode where button test is activated. Any button pressed will generate tone.
- Pressing SB2 for 3 seconds in the Control Head Test mode will cause the radio to return to the RF Test mode.

NOTE channel number (01 - 14)

Table 5-2 Test Environments

No. of Beeps	Description	Function
1 GKC	Carrier Squelch	RX: if carrier detected TX: mic audio
1 BKC	Tone Private-Line	RX: unsquelch if carrier and tone (192.8Hz) detected TX: mic audio + tone (192.8Hz)
2 BKC	Digital Private-Line	RX: unsquelch if carrier and digital code (131) detected TX: mic audio + digital code (131)
3 BKC	Dual-Tone mul- tiple frequency	RX: unsquelch if carrier detected TX: selected DTMF tone pair
5 BKC	Unsquelch Open	RX: constant unsquelch TX: mic audio
11 BKC	CMP	RX: if carrier detected TX: mic audio
12 BKC	LLE	RX: if carrier detected TX: mic audio

Table 5-3 Test Channel Spacing

No. of BKC	Channel Spacing
1	25 kHz
2	12.5 kHz
3	20 kHz

Table 5-4 Test Frequencies

Channel Selector Switch Position	Test Channel	VHF	UHF
1 Low Power 8 High Power	TX#1 or #8 RX#1 or #8	136.025 136.025	403.025 403.025
2 Low Power 9 High Power	TX#2 or #9 RX#2 or #9	142.325 142.325	415.025 415.025
3 Low Power 10 High Power	TX#3 or #10 RX#3 or #10	148.625 148.625	425.025 425.025
4 Low Power 11 High Power	TX#4 or #11 RX#4 or #11	154.925 154.925	436.025 436.025
5 Low Power 12 High Power	TX#5 or #12 RX#5 or #12	161.225 161.225	449.025 449.025
6 Low Power 13 High Power	TX#6 or #13 RX#6 or #13	167.525 167.525	460.025 460.025
7 Low Power 14 High Power	TX#7 or #14 RX#7 or #14	173.825 173.825	469.975 469.975

Table 5-5 Receiver Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squelch out- put at antenna	PTT to continu- ous (during the performance check)	Frequency error to be ± 200 Hz VHF ± 600 Hz UHF
Rated Audio	Mode: GEN Output level: 1.0mV RF 4th channel test frequency* Mod: 1kHz tone at 3kHz deviation Monitor: DVM: AC Volts	TEST MODE Test Channel 4 carrier squelch	PTT to OFF (center), meter selector to Audio PA	Set volume control to 3.16Vrms
Distortion	As above, except to distor- tion	As above	As above	Distortion <3.0%
Sensitivity (SINAD)	As above, except SINAD, lower the RF level for 12dB SINAD.	As above	PTT to OFF (center)	RF input to be <0.35 μ
Noise Squelch Threshold	RF level set to 1mV RF	As above	PTT to OFF (center), meter selection to Audio PA, spkr/ load to speaker	Set volume control to 3.16Vrms
	As above, except change frequency to a conventional system. Raise RF level from zero until radio unsquelches.	out of TEST MODE; select a conven- tional system	As above	Unsquelch to occur at <0.25 μ V. Preferred SINAD = 9-10dB

* See Table 5-4

Table 5-6 Transmitter Performance Checks

Test Name	Communications Analyzer	Radio	Test Set	Comments
Reference Frequency	Mode: PWR MON 4th channel test frequency* Monitor: Frequency error Input at RF In/Out	TEST MODE, Test Channel 4 carrier squench out- put at antenna	PTT to continu- ous (during the performance check)	Frequency error to be ± 200 Hz VHF ± 600 Hz UHF
Power RF	As above	As above	As above	Refer to Maintenance Specifications
Voice Modulation	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/ Out Monitor: DVM, AC Volts Set 1kHz Mod Out level for 0.025Vrms at test set, 80mVrms at AC/DC test set jack	As above	As above, meter selector to mic	Deviation: VHF, UHF ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp).
Voice Modulation (internal)	Mode: PWR MON 4th channel test frequency* atten to -70, input to RF In/ Out	TEST MODE, Test Channel 4 carrier squench out- put at antenna	Remove modu- lation input	Press PTT switch on radio. Say "four" loudly into the radio mic. Measure devia- tion: VHF, UHF ≥ 4.0 kHz but ≤ 5.0 kHz (25 kHz Ch Sp)
DTMF Modulation	As above, 4th channel test frequency*	TEST MODE, Test Channel 4 DTMF out- put at antenna	As above	Deviation: VHF, UHF ≥ 3.05 kHz but ≤ 3.45 kHz (25 kHz Ch Sp)
PL/DPL Modulation	As above 4th channel test frequency* BW to narrow	TEST MODE, Test Channel 4 TPL DPL	As above	Deviation: VHF, UHF ≥ 500 Hz but ≤ 1000 Hz (25 kHz Ch Sp).

* See Table 5-4

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Section 6

RADIO TUNING AND PROGRAMMING

1.0 Introduction

This chapter provides an overview of the Professional Radios Customer Programming Software (CPS) and Universal Tuner which have been designed for use in a Windows 95 environment. Both these software will essentially cover all the functions of the traditional Radio Service Software (RSS) package.

They are available in separate kits as shown in the table below:

Description	Kit Number
Customer Programmable Software (Diskette)	PMVN4047
Customer Programmable Software(CD Rom)	PMVN4048
Tuner Installation Kit (Disk)	PMVN4029
Tuner Installation Kit (CD)	PMVN4037

An Installation instruction manual is contained within each kit.

2.0 Radio Tuning Setup

A Windows 95 PC (personal computer) and Universal Tuner are required to tune the radio. To perform the tuning procedures, the radio must be connected to the PC, RIB (Radio Interface Box) and Universal Test Set as shown in figure below.

Refer to online help files for the tuning procedures.

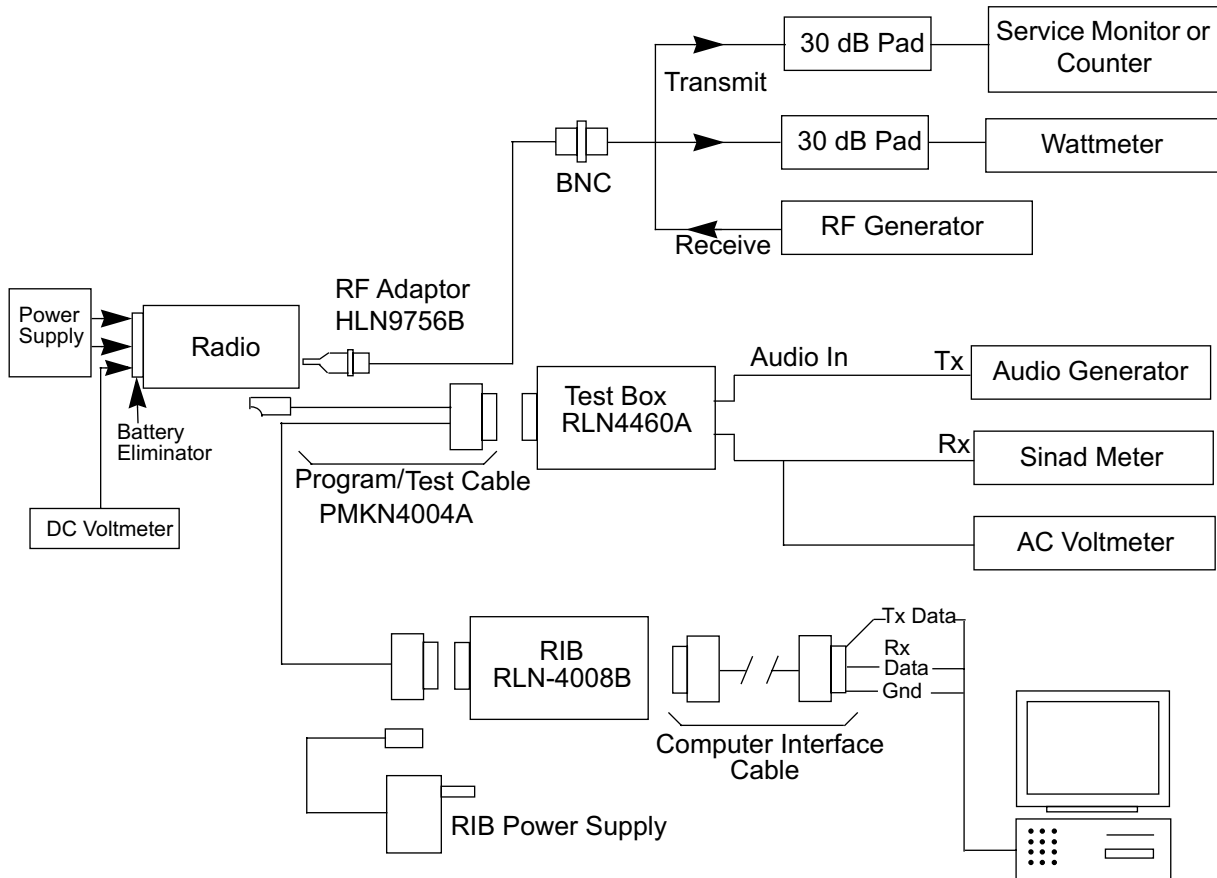


Figure 6-1 Radio Tuning Setup

3.0 CPS Programming Setup

Refer to online help files for the CPS Programming procedures.

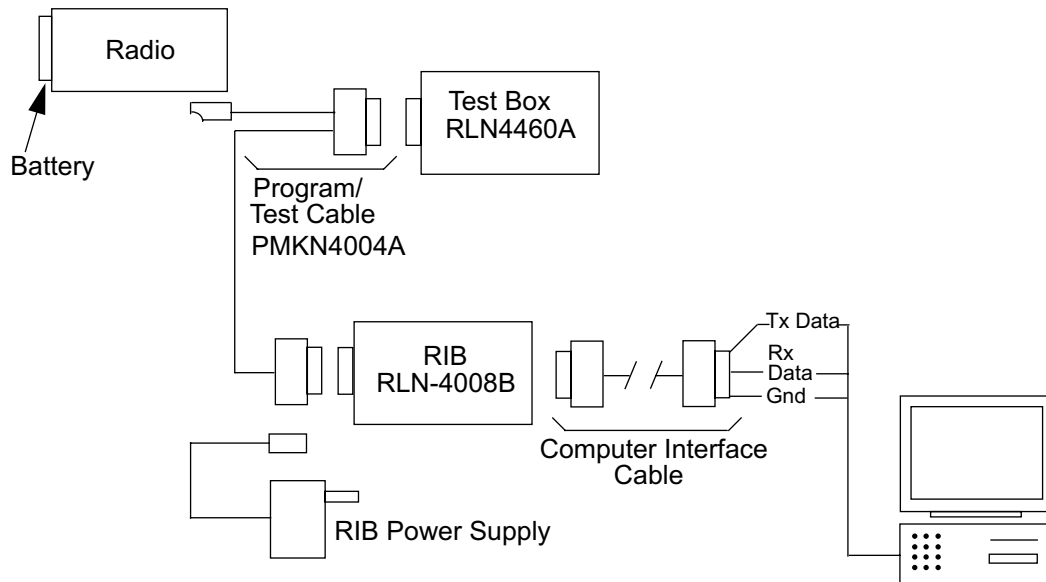


Figure 6-2 CPS Programming Setup

4.0 Cloning Information

Cloning is the process of copying the content of one radio (source radio) into another radio (target radio). Radio content refers to system-type features such as frequency, squelch type options, trunking, etc. Cloning can be performed only on radios with identical model numbers and software options.

Radio functionality inherent in one radio cannot be cloned to another radio that does not contain the same functionality. Tuning and alignment information are not transferable and are not affected by cloning.

Signaling Identification Numbers (IDs) are duplicated in the cloning process. Unique IDs may be assigned with the CPS.

Unsuccessful cloning attempts will not damage the radio.

Procedure:

1. Turn source and target radios off.
2. Connect cloning cable to side connector of both radios.
3. Turn on target radio.
4. On source radio, simultaneously press side buttons 1 and 2 then turn radio on. Both radios produce a "clone-entry" tone and turn on their green LEDs.
5. Release both side buttons. The electronic transfer process begins and will take approximately one to three minutes.
6. When cloning is completed, both radios reset themselves and turn their green LEDs off. The source radio produces a "clone-exit" tone.
7. Turn both radios off.
8. Disconnect the cloning cable from both radios and turn them on for normal operation.

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Section 7

CONTROLLER INFORMATION

1.0 Overview

This section provides a detailed theory of operation for the radio and its components.

2.0 Radio Power Distribution

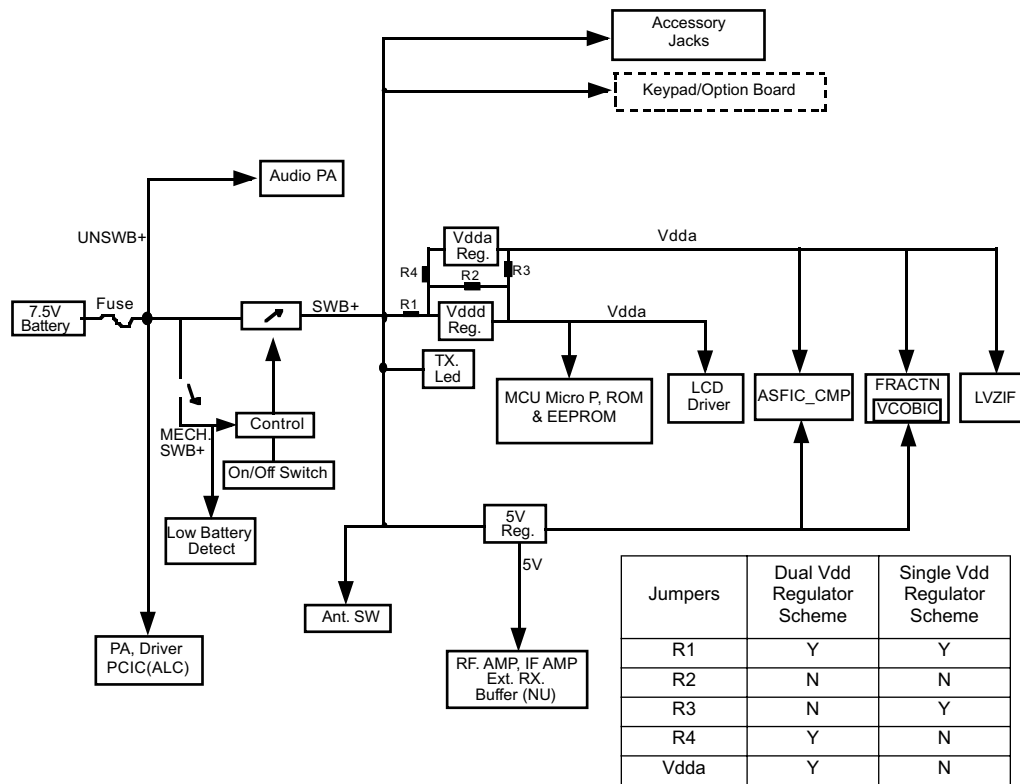


Figure 7-1 DC Power Distribution Block Diagram

Figure 7-1 illustrates the DC distribution throughout the radio board. A 7.5V battery (BATT 7.5V) supplies power directly to the electronic on/off control as UNSWB+. When the radio is turned on, MECH_SWB+ (on/off/volume control) will trigger the electronic on/off control(momentary-on path), then SWB+ is distributed as shown in Figure 7-1. Vdda from 3.3V Vdda regulator will then supply the microprocessor. Data is then sent to ASFIC_CMP to turn on GCB4(DAC). GCB4 will take over the momentary-on path within 12ms. SWB+ will continue to support the whole board until the radio is turned off.

Radio will be turned-off on two conditions;

1. MECH_SWB+ turned off
2. Low battery

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

3.0 Controller Board

3.1 General

The controller board is the central interface between the various subsystems of the radio. It is separated into digital and audio architectures. The digital portion consists of a special Motorola microcontroller (HC11FL0). The audio power amplifier (Audio PA) and audio/signalling/filter/companding IC (ASFIC_CMP) form the backbone of the audio/signalling architecture.

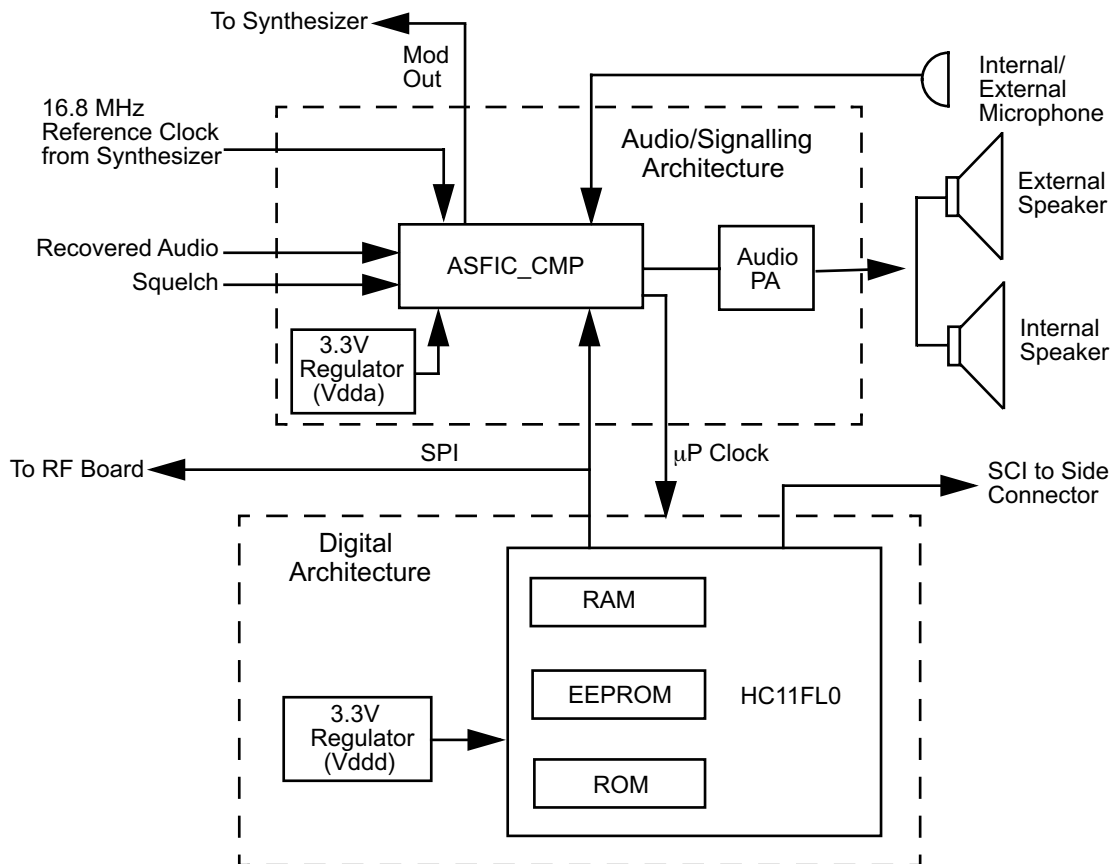


Figure 7-2 Controller Block Diagram

3.2 Digital Architecture

MCU configuration

There is one common MCU architecture for low-tier as well as for the high-tier products. It covers the Conventional and Trunking portables. An open architecture system with the new HC11FL0 as the processor is used. Combinations of different size RAM, ROM and EEPROM are available for various application software.

ModB/Vstby Supply

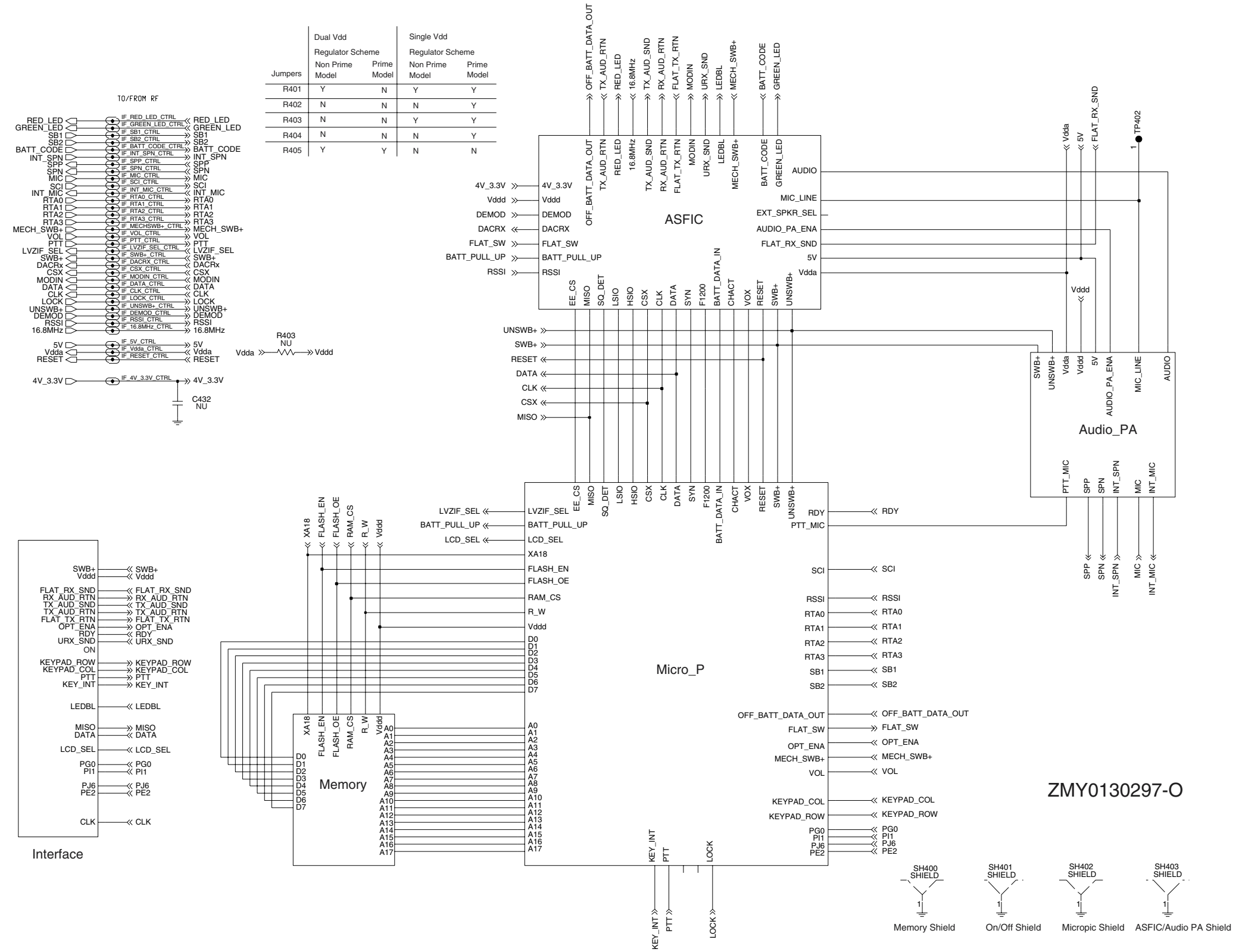
Under various conditions, the supply to the ModB/Vstby would vary. Table 7-1 shows these conditions and circuits in operation.

Table 7-1 ModB/Vstby Supply Modes

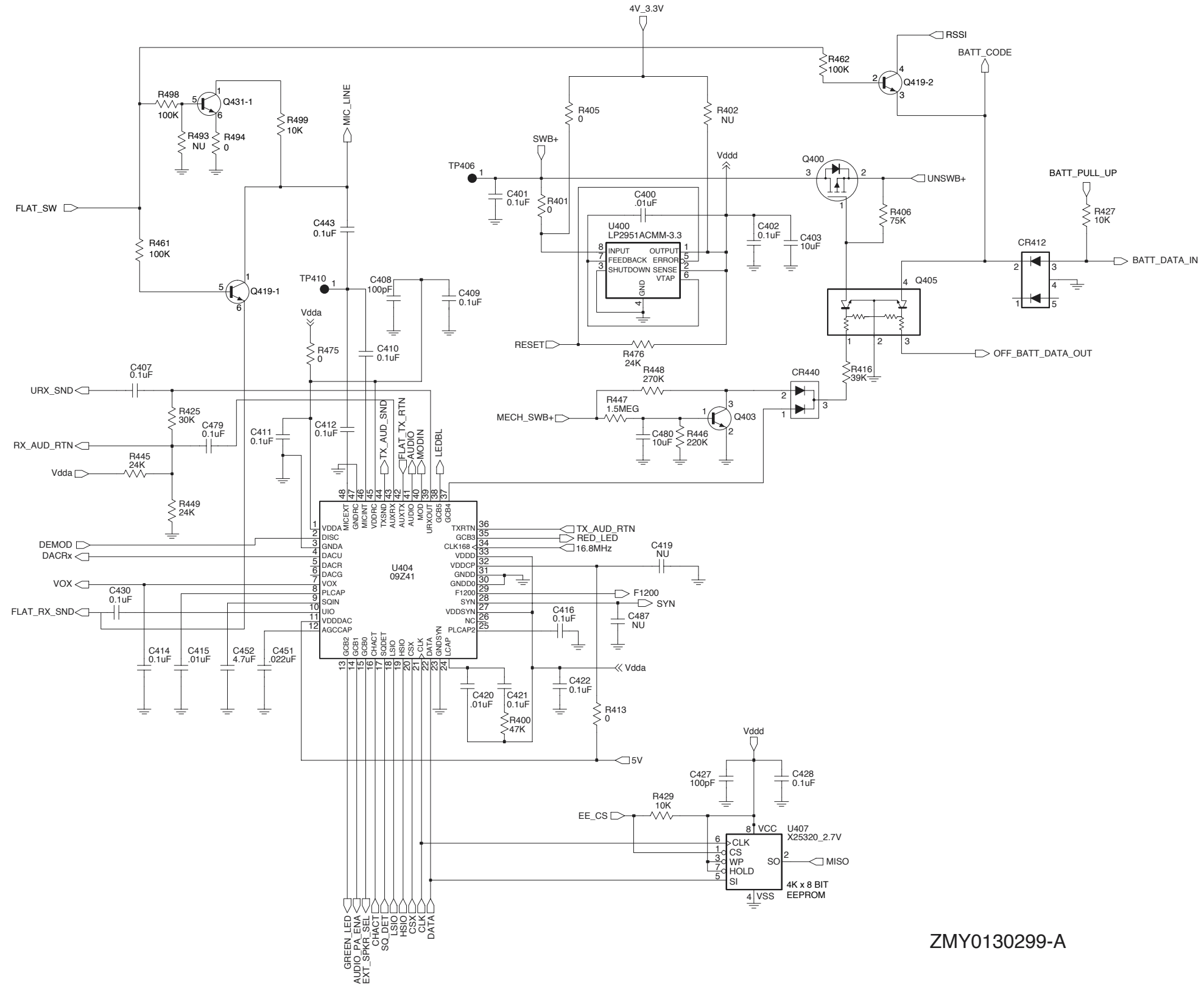
Condition	Circuit Operation
Radio On	Vdd supply voltage via CR411
Radio Off	<ul style="list-style-type: none"> • Vdd turned off • Q416 gate is pulled low by R462 • Q416 is switched on • U410 supplies 3.2V to ModB/Vstby
Primary battery removed	<ul style="list-style-type: none"> • Vdd turned off • Q416 gate is pulled low by R462 • Q416 is switched on • LiO battery provides 3.2V to ModB/Vstby

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3.3 Controller Schematics (403-470MHz for 8480672Z01 & 136-174MHz for 8480675Z01)

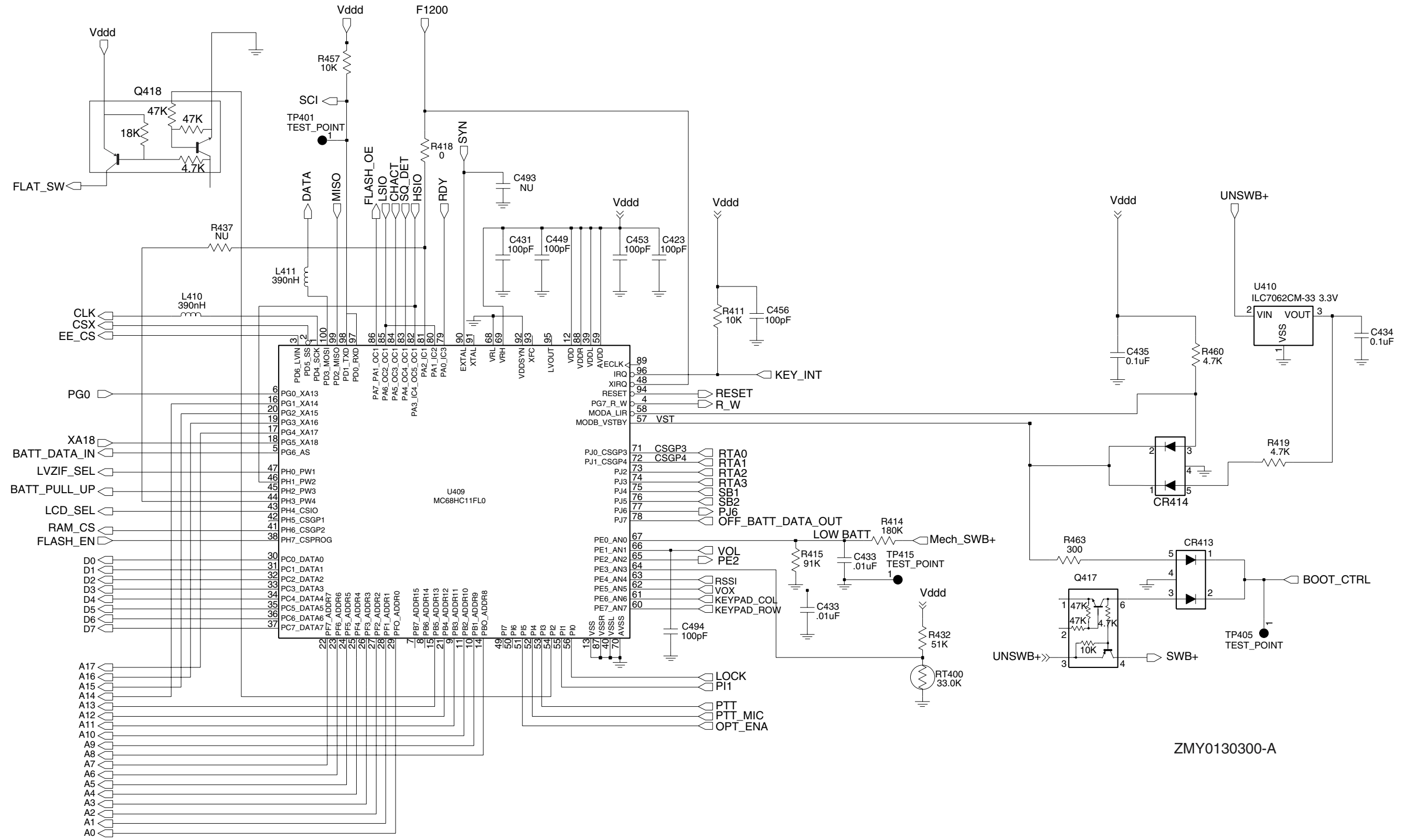


Complete Controller Schematic Diagram

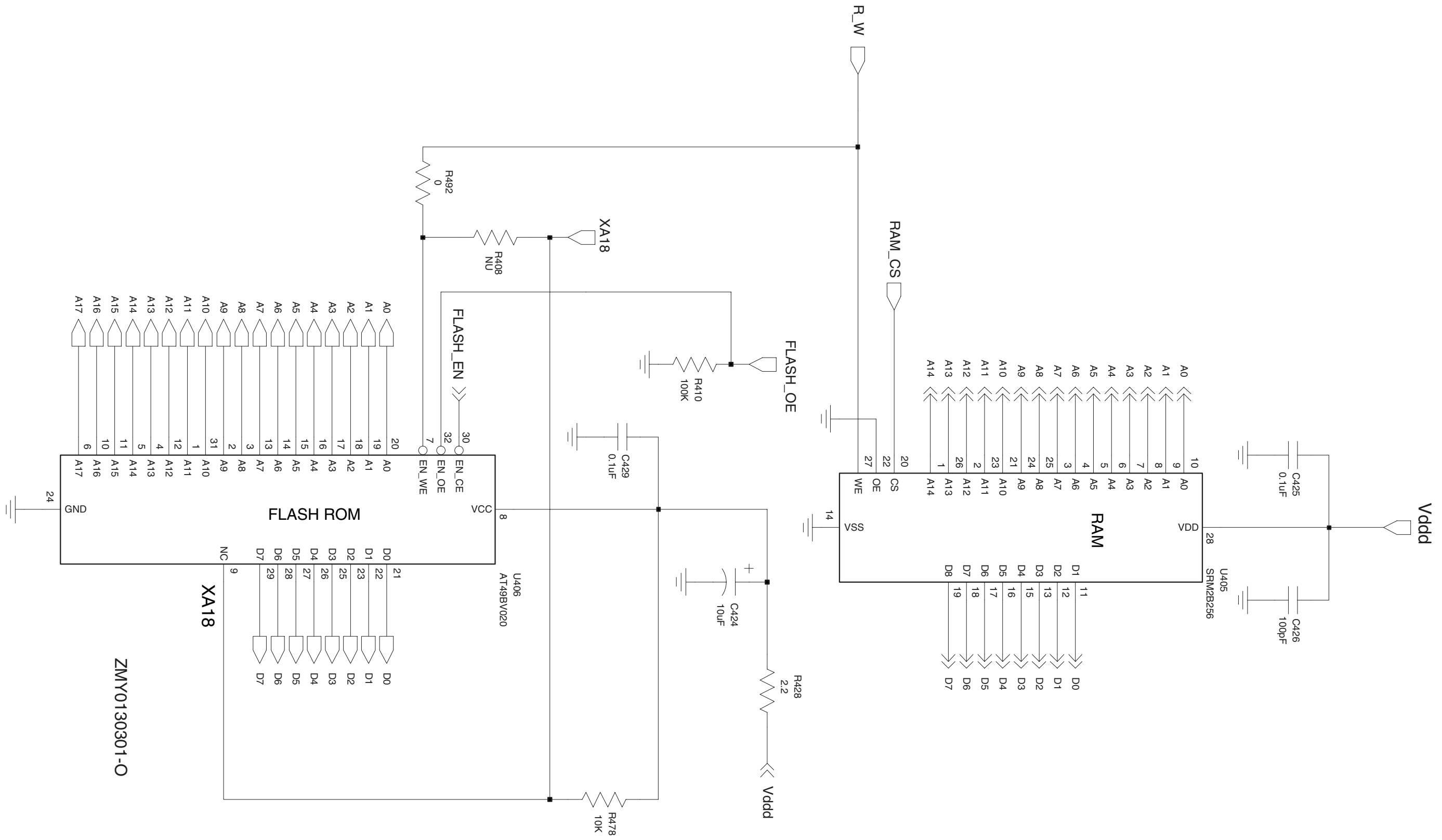


ZMY0130299-A

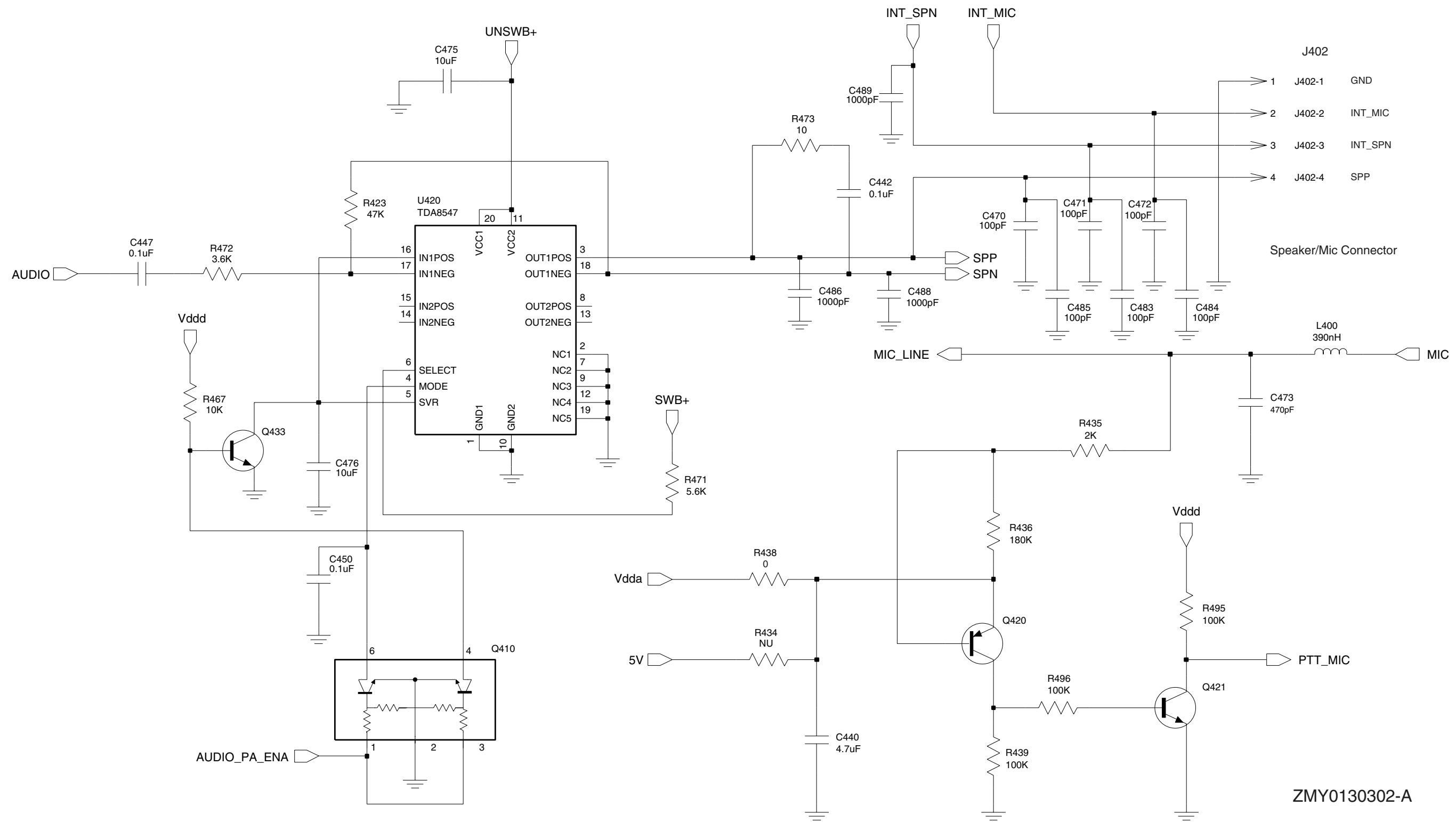
Controller ASFIC/ON_OFF Schematic Diagram



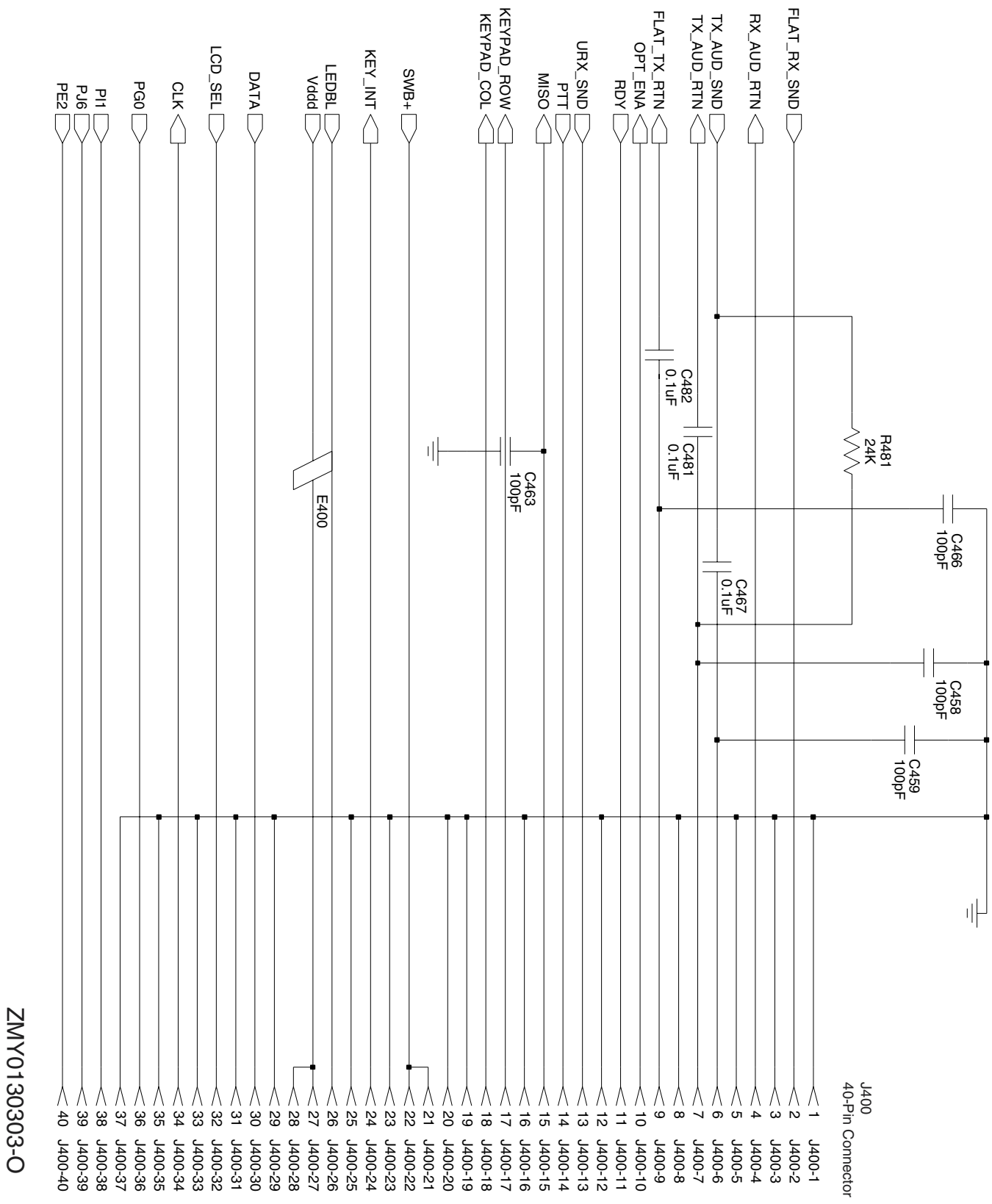
Controller Micro Processor Schematic Diagram



Controller Memory Schematic Diagram

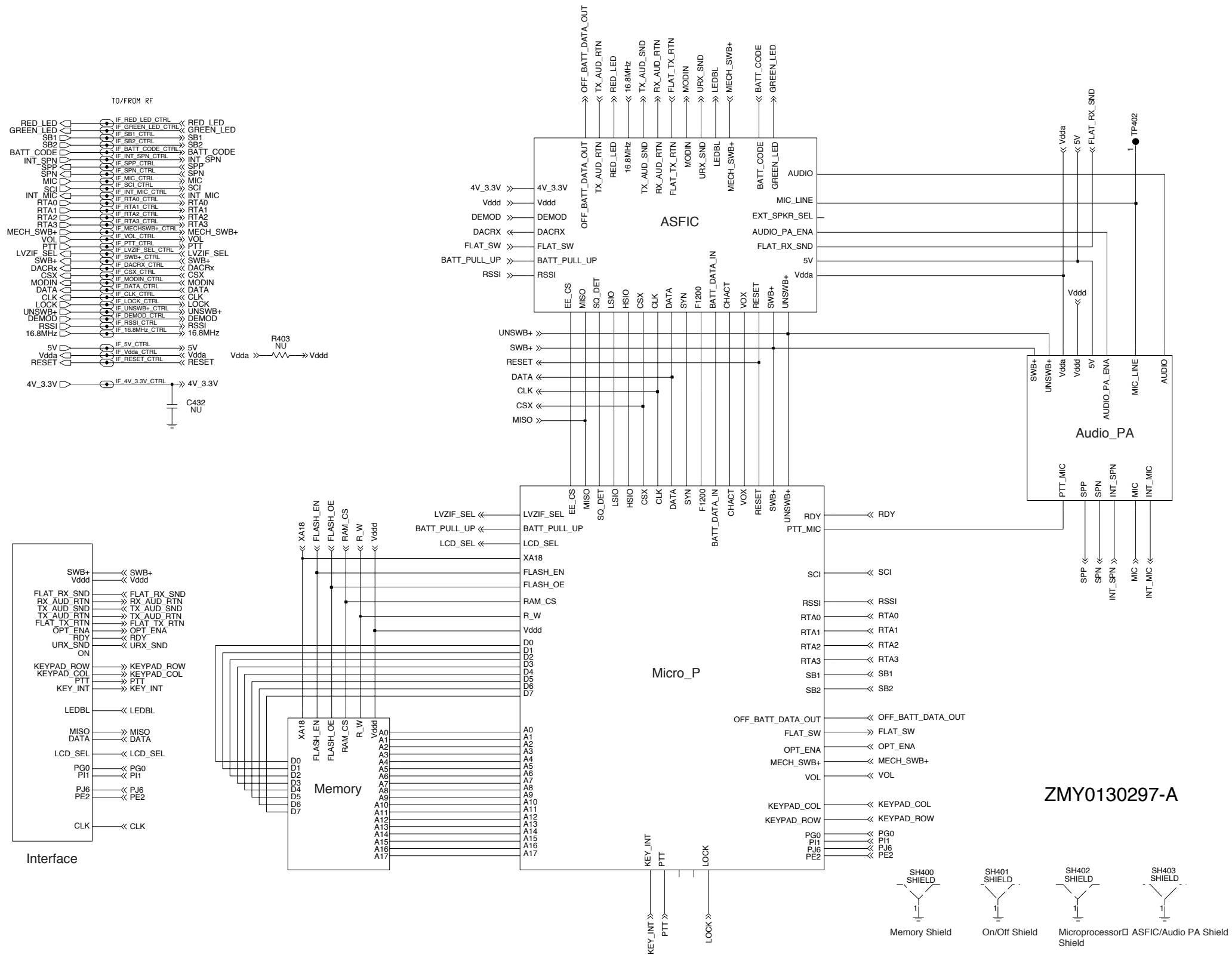


Controller Audio Power Amplifier Schematic Diagram

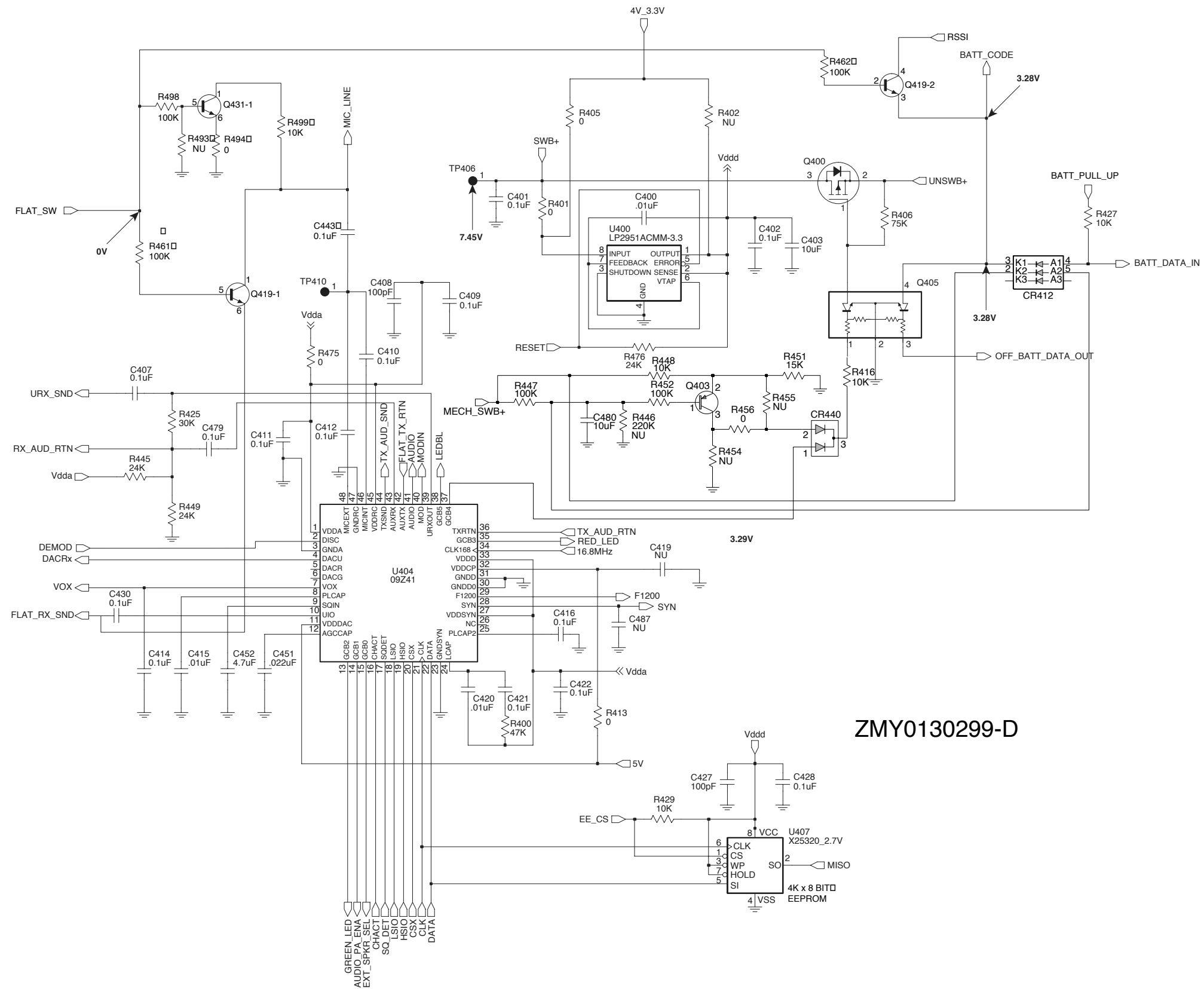


Controller Interface Schematic Diagram

3.4 Controller Schematics (403-470MHz for 8480672Z04, Z06 & 136-174MHz for 8480675Z03, Z04)

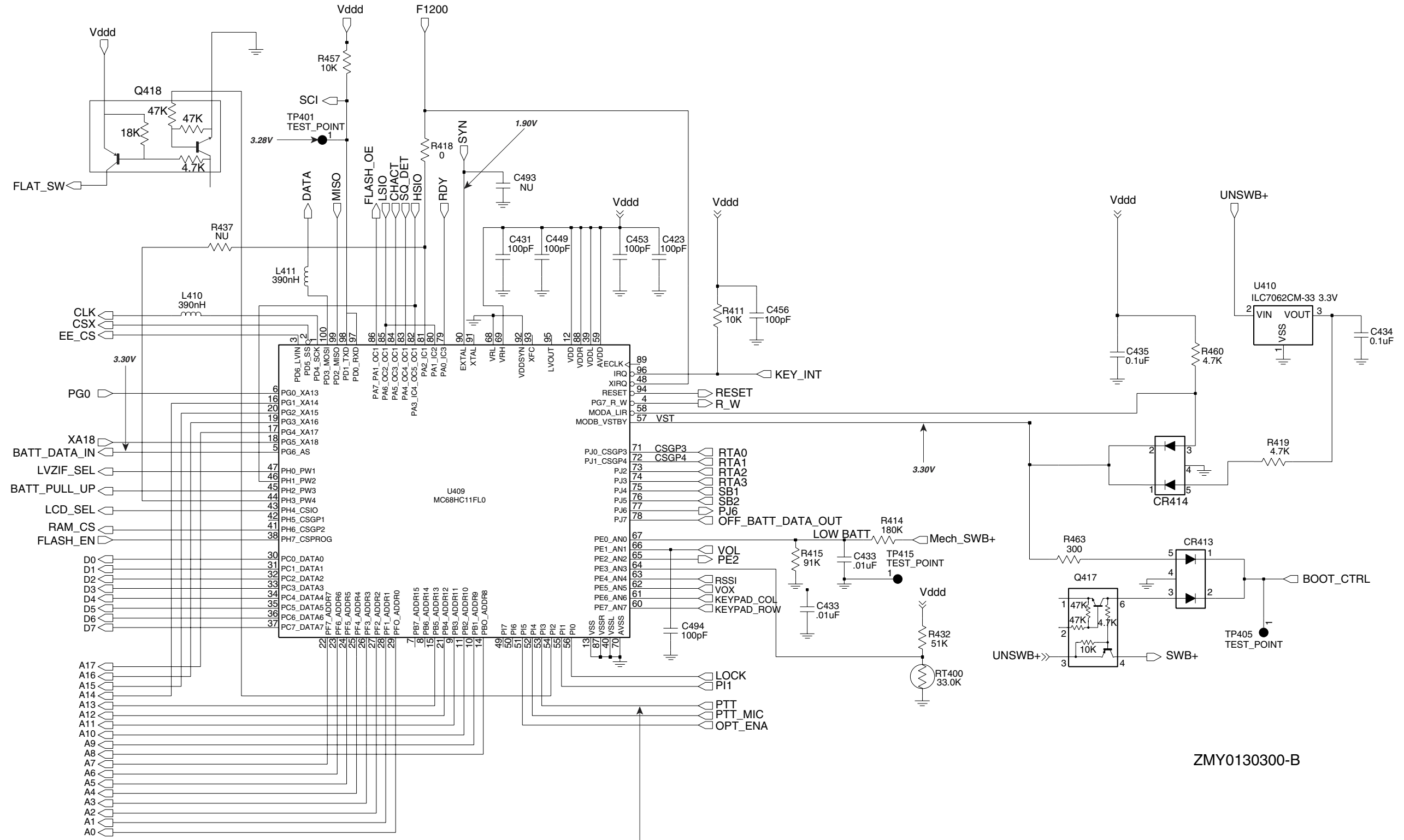


Complete Controller Schematic Diagram

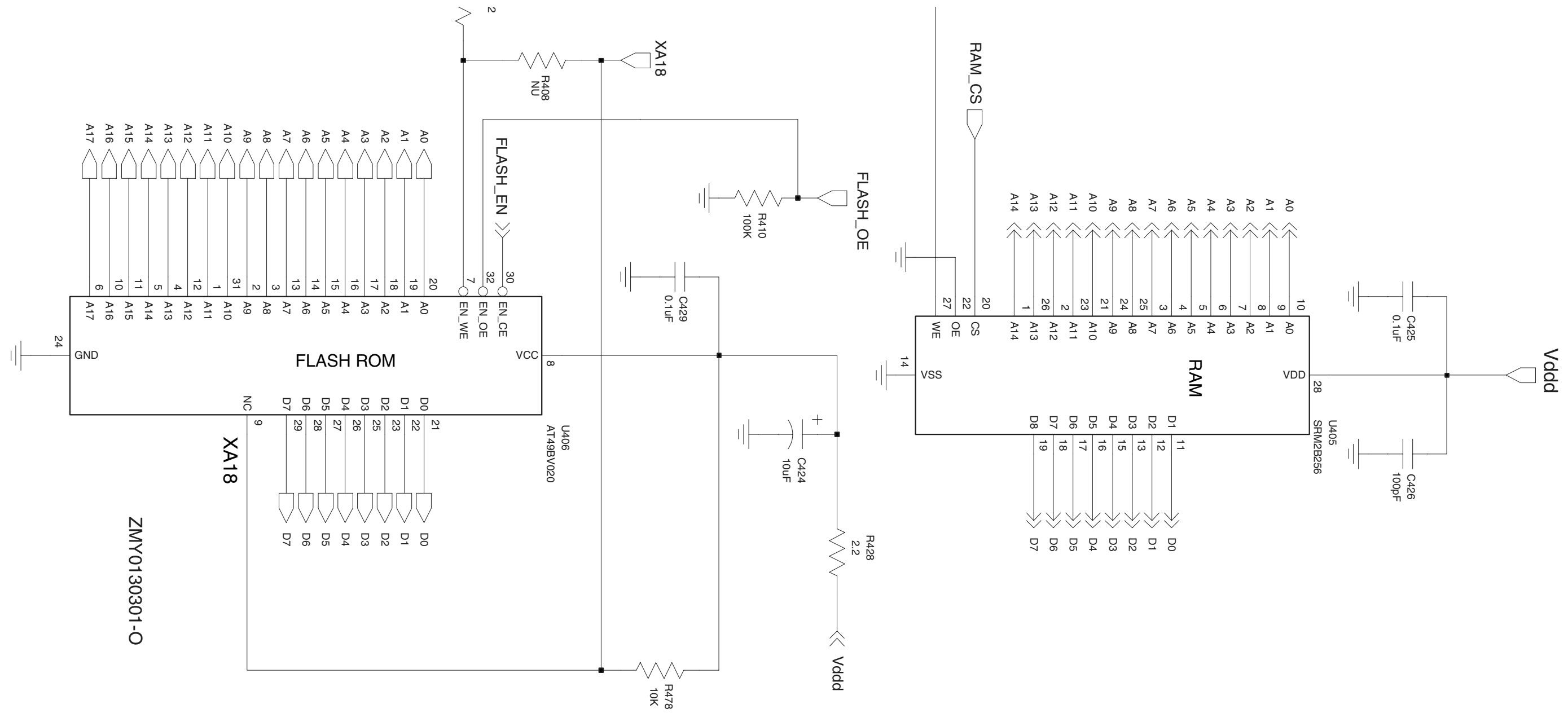


ZMY0130299-D

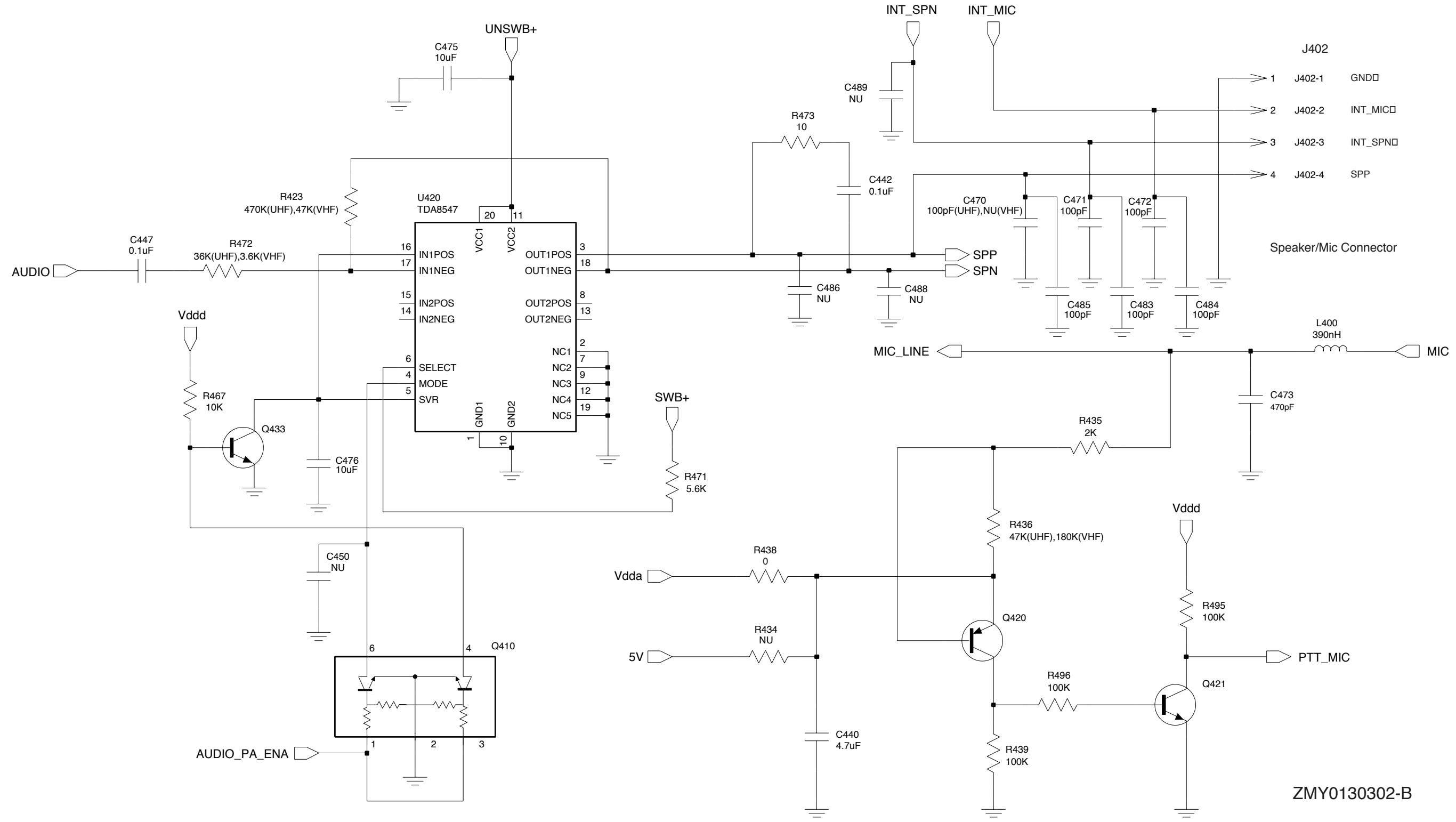
Controller ASFIC/ON_OFF Schematic Diagram



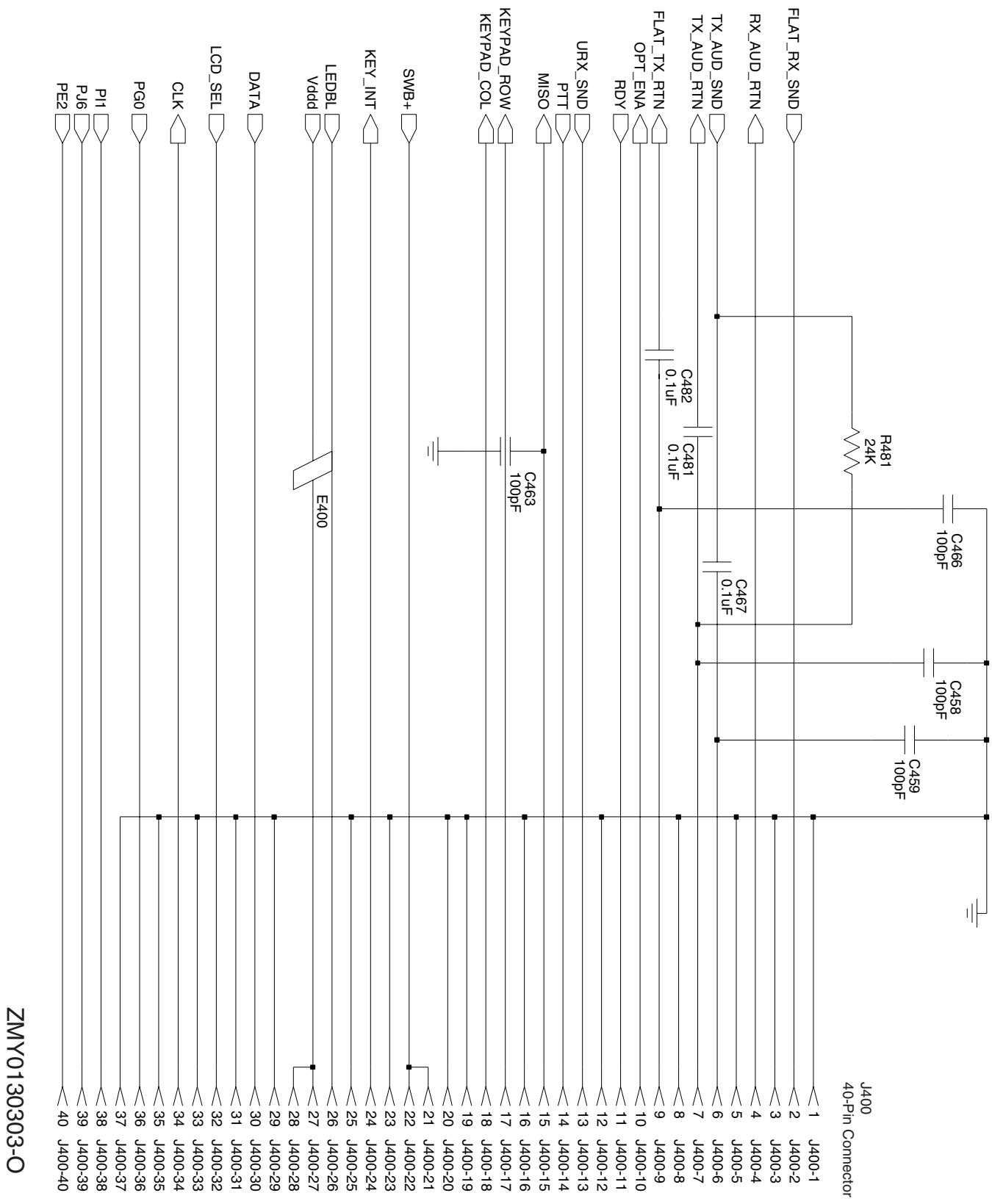
Controller Micro Processor Schematic Diagram



Controller Memory Schematic Diagram



Controller Audio Power Amplifier Schematic Diagram



ZMY0130303-O

Controller Interface Schematic Diagram

Section 8

KEYPAD BOARD INFORMATION

1.0 Theory of Operation

Keypad

U602 is a comparator that will compare the voltage when any one of the keypad row or keypad column keys is being pressed. Therefore when a key is being pressed, it will send a message to the microprocessor through the output (KEY_INT) telling it that a key has been pressed. The microprocessor will then sample the Analog to Digital voltages at the keypad row and keypad column and map it with the table so that the key being pressed can be identified.

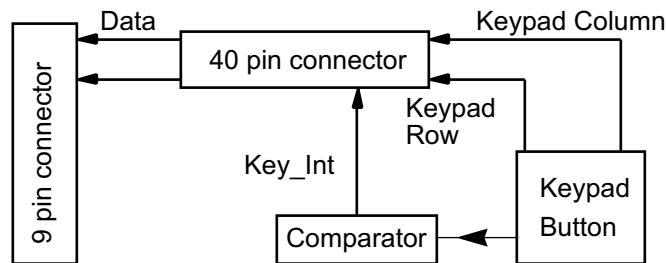


Figure 8-1 Keypad Block Diagram

2.0 Troubleshooting Chart

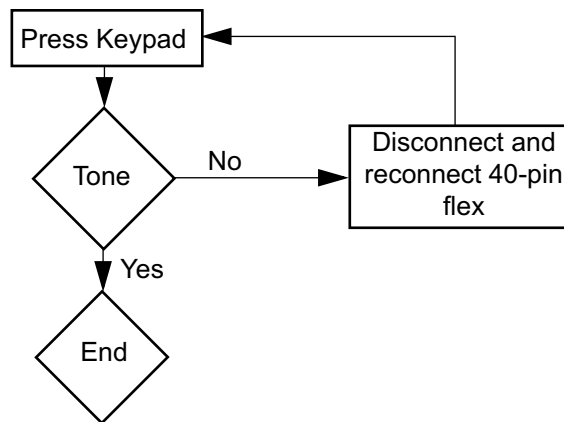
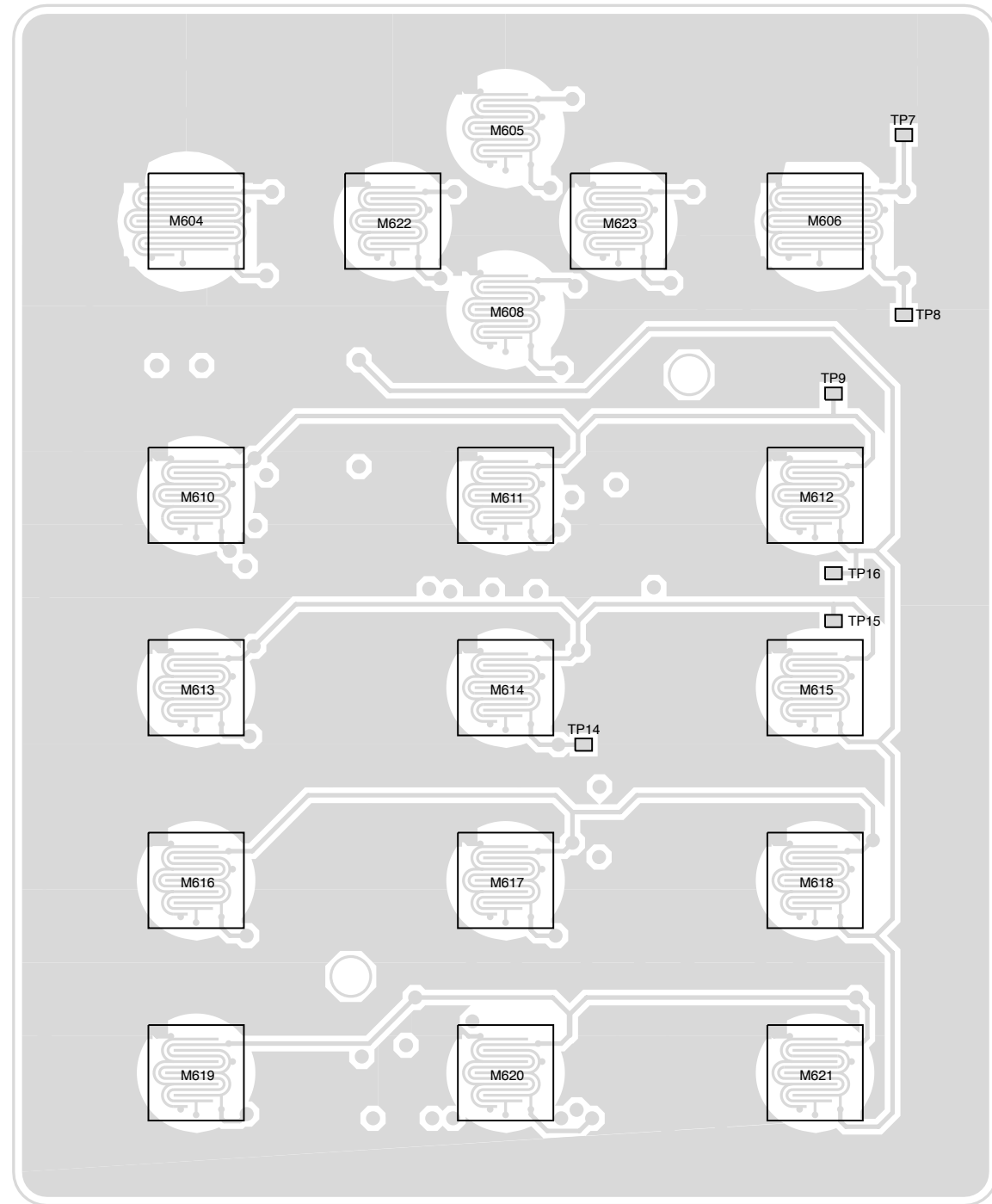


Figure 8-2 Keypad Board Troubleshooting Chart

3.0 Parts List (Keypad)

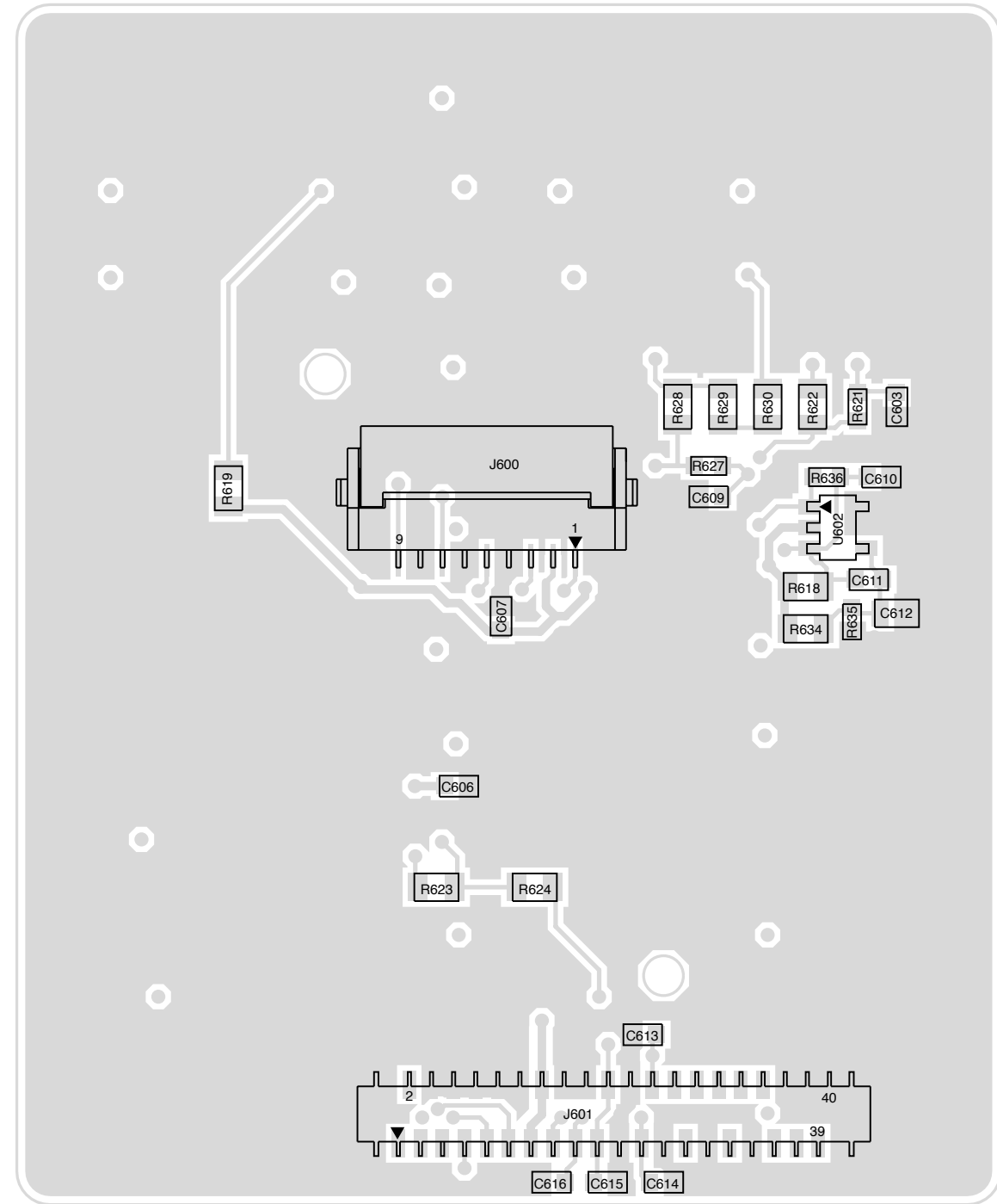
Circuit Ref	Motorola Part No.	Description
C603	2113740F51	100pF
C606	2113743E20	0.1uF
C607	2113740F51	100pF
C609	2113740F51	100pF
C610	2113740F51	100pF
C611	2113740F51	100pF
C612	2113928D08	10uF
C613	2113740F51	100pF
C614	2113740F51	100pF
C615	2113740F51	100pF
C616	2113740F51	100pF
J600	0985627Z01	11 pin connector
J601	0980521Z01	44 pin connector
R618	0660076E90	51K
R619	0660076E90	51K
R621	0662057P15	13K
R622	0660079J37	22K
R623	0660079J72	43K
R624	0662057G19	130K
R627	0662057P15	13K
R628	0660079J37	22K
R629	0660079J72	43K
R630	0662057G19	130K
R634	0660076E90	51K
R635	0662057B16	560K
R636	0662057B22	1Meg
U602	5102463J49	LMC7211 Com- parator
	8485642Z01	PC Board

4.0 Keypad Board And Schematic Diagram



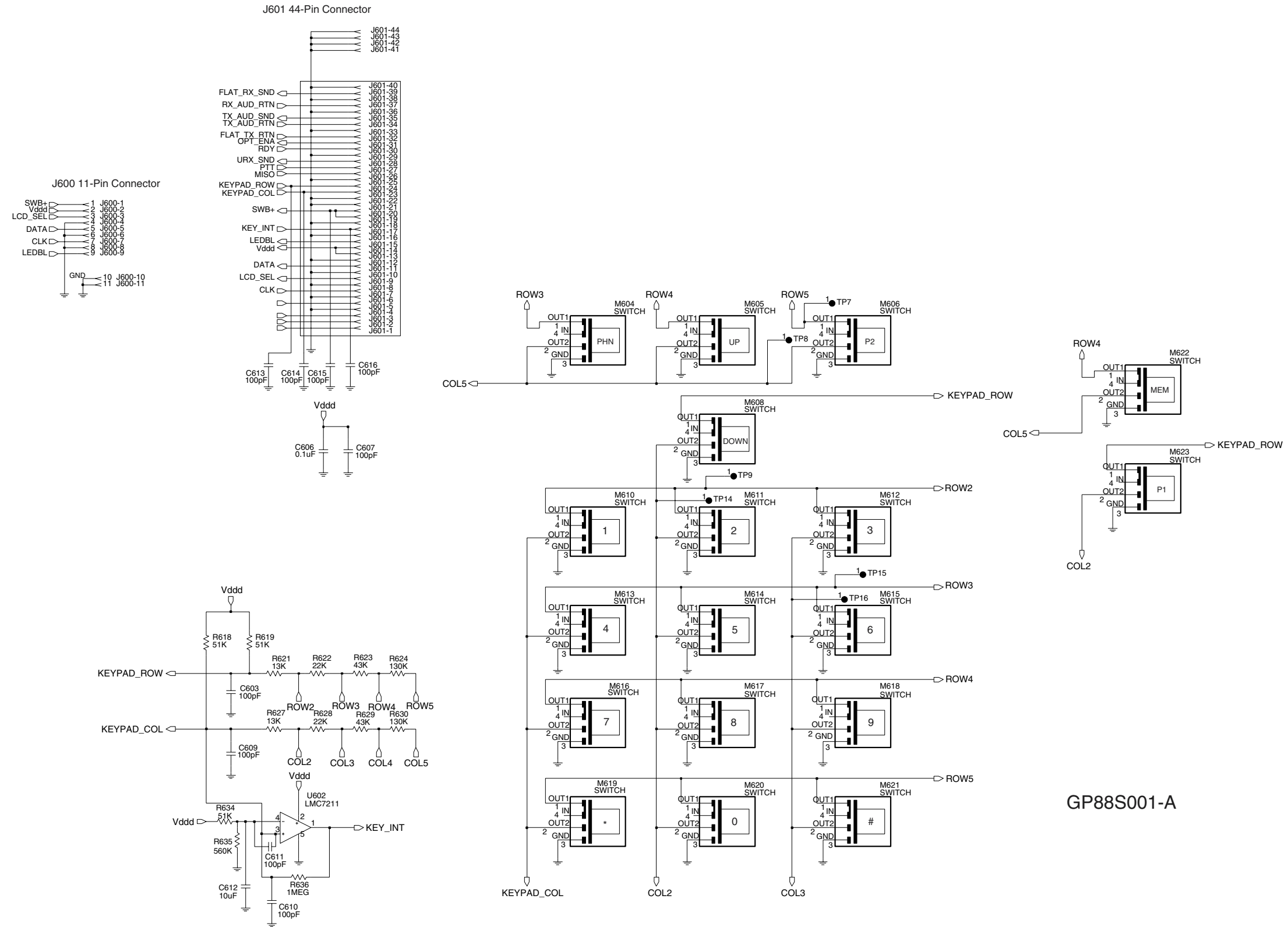
GP88S002-A

Top View



ZMY0130326-A

Bottom View



Keypad Board Schematic Diagram

Section 9A

MODEL CHART AND TEST SPECIFICATIONS (403-470 MHZ)

1.0 Model Chart

GP88s , UHF, 403-470 MHz		
Model		Description
AZH34RDC9AA3		GP88s 403-470 MHz 4W 16 CH
	Item	Description
X	PMUE1542*	GP88s Super Tanapa 403-470 MHz 4W
X	PMUE1543*	GP88s Tanapa 403-470 MHz 4W
X	PMLE4173	GP88s B/C Kit 403-470 MHz 4W
X	PMLN4343	GP88s Front Housing Kit
X	PMAE4002A	Antenna, 403-433 MHz Stubby
X	PMAE4003A	Antenna, 430-470 MHz Helical
X	NAE6483AR	Antenna, 403-470 MHz Whip
X	6804111J46	GP88s User Guide

x = Indicates one of each is required.

* Motorola Depot Servicing only

2.0 Specifications

General

	UHF	
Frequency:	403-470 MHz	
Channel Capacity:	GP88s : 16 Channels	
Power Supply:	7.5 Volts ±20%	
Dimensions with Standard High Capacity NiMH Battery:	57.5mm x 134mm x 38mm	
Weight: with Standard High Capacity NiMH Battery:	429 g	
with High Capacity NiCd Battery:	454 g	
Average Battery Life @ (5-5-90 Duty Cycle) Standard High Capacity NiMH Battery:	Low Power	High Power
	10 hrs	8 hrs
Sealing:	Passes rain testing per IP54	
Shock:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	
Vibration:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	
Dust:	Meets MIL-STD-810-C,D & E and IP54	
Humidity:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	

Transmitter

	UHF	
RF Output NiMH @ 7.5V:	Low 1W	High 4W
Frequency	403-470 MHz	
Channel Spacing	12.5/20/25 kHz	
Freq. Stability (-30°C to +60°C)	0.00025%	
Spurs/Harmonics:	-36 dBm < 1 GHz -30 dBm > 1 GHz	
Audio Response: (from 6 dB/oct. Pre-Emphasis, 300 to 3000Hz)	+1, -3 dB	
Audio Distortion: @ 1000 Hz, 60% Rated Max. Dev.	<5%	
FM Noise:	-40 dB	

Receiver

	UHF 12.5kHz	UHF 20/25kHz
Frequency:	403-470MHz	403-470MHz
Sensitivity 12dB EIA SINAD:	0.35 µV	0.35 µV
Adjacent Channel Selectivity ETS	-60 dB	-70 dB
Intermodulation ETS	-65 dB	-65 dB
Freq. Stability (-30°C to +60°C):	0.00025%	0.00025%
Spur Rejection:	-70 dB	-70 dB
Image Rejection:	-70 dB	-70 dB
Audio Output @ <5% Distortion	500 mW	500 mW

All specifications are subject to change without notice.

3.0 Transmitter

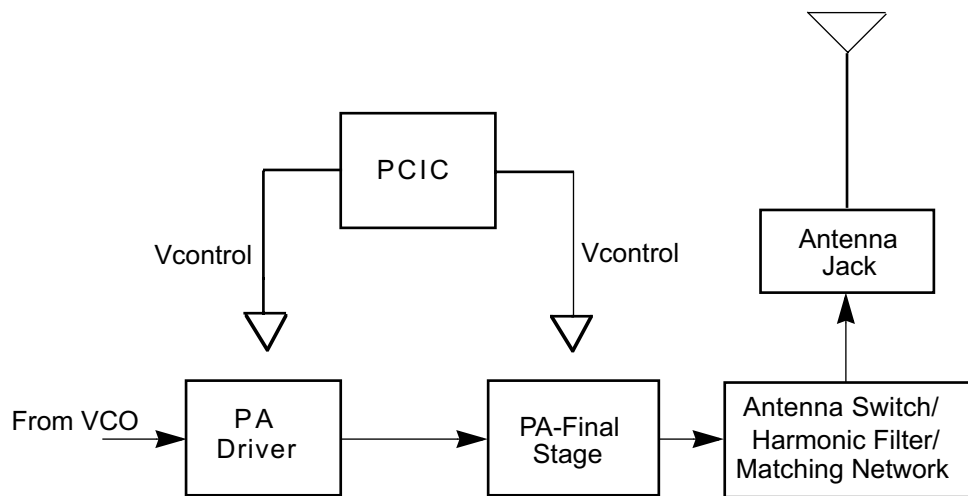


Figure 9-1 Transmitter Block Diagram

3.1 General

(Refer to Figure 9-1)

The UHF transmitter contains five basic circuits:

1. power amplifier
2. antenna switch
3. harmonic filter
4. antenna matching network
5. power control integrated circuit (PCIC).

3.1.1 Power Amplifier

The power amplifier consists of two devices:

1. 9Z67 LDMOS driver IC (U101) and
2. PRF1507 LDMOS PA (Q110).

The 9Z67 LDMOS driver IC contains a 2 stage amplification with a supply voltage of 7.3V.

This RF power amplifier is capable of supplying an output power of 0.3W (pin 6 and 7) with an input signal of 2mW (3dBm) (pin16). The current drain would typically be 160mA while operating in the frequency range of 403-470MHz.

The PRF1507 LDMOS PA is capable of supplying an output power of 7W with an input signal of 0.3W. The current drain would typically be 1300mA while operating in the frequency range of 403-470MHz. The power output can be varied by changing the biasing voltage.

3.1.2 Antenna Switch

The antenna switch circuit consists of two PIN diodes (CR101 and CR102), a pi network (C107, L104 and C106). In the transmit mode, B+ at PCIC (U102) pin 23 will go low and turn on Q111 where a B+ bias is applied to the antenna switch circuit to bias the diodes "on". The shunt diode (CR102) shorts out the receiver port, and the pi network, which operates as a quarter wave transmission line, transforms the low impedance of the shunt diode to a high impedance at the input of the harmonic filter. In the receive mode, the diodes are both off, and hence, there exists a low attenuation path between the antenna and receiver ports.

3.1.3 Harmonic Filter

The harmonic filter consists of C104, L102, C143, C103, L101, C142 and C102. The design of the harmonic filter for UHF is that of a modified Zolotarev design. It has been optimized for efficiency of the power module. This type of filter has the advantage that it can give a greater attenuation in the stop-band for a given ripple level. The harmonic filter insertion loss is typically less than 1.2dB.

3.1.4 Antenna Matching Network

A matching network which is made up of L116 and C141 is used to match the antenna's impedance to the harmonic filter. This will optimize the performance of the transmitter and receiver into an antenna.

3.1.5 Power Control Integrated Circuit (PCIC)

The transmitter uses the Power Control IC (PCIC), U102 to regulate the power output of the radio. The current to the final stage of the power module is supplied through R102 (0.075 ohm), which provides a voltage proportional to the current drain. This voltage is then fed back to the Automatic Level Control (ALC) within the PCIC to regulate the output power of the transmitter.

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

There are resistors and integrators within the PCIC, and external capacitors (C133, C134 and C135) in controlling the transmitter rising and falling time. These are necessary in reducing the power splatter into adjacent channels.

CR105 and its associated components are part of the temperature cut back circuitry. It senses the printed circuit board temperature around the transmitter circuits and output a DC voltage to the PCIC. If the DC voltage produced exceeds the set threshold in the PCIC, the transmitter output power will be reduced so as to reduce the transmitter temperature.

4.0 Receiver

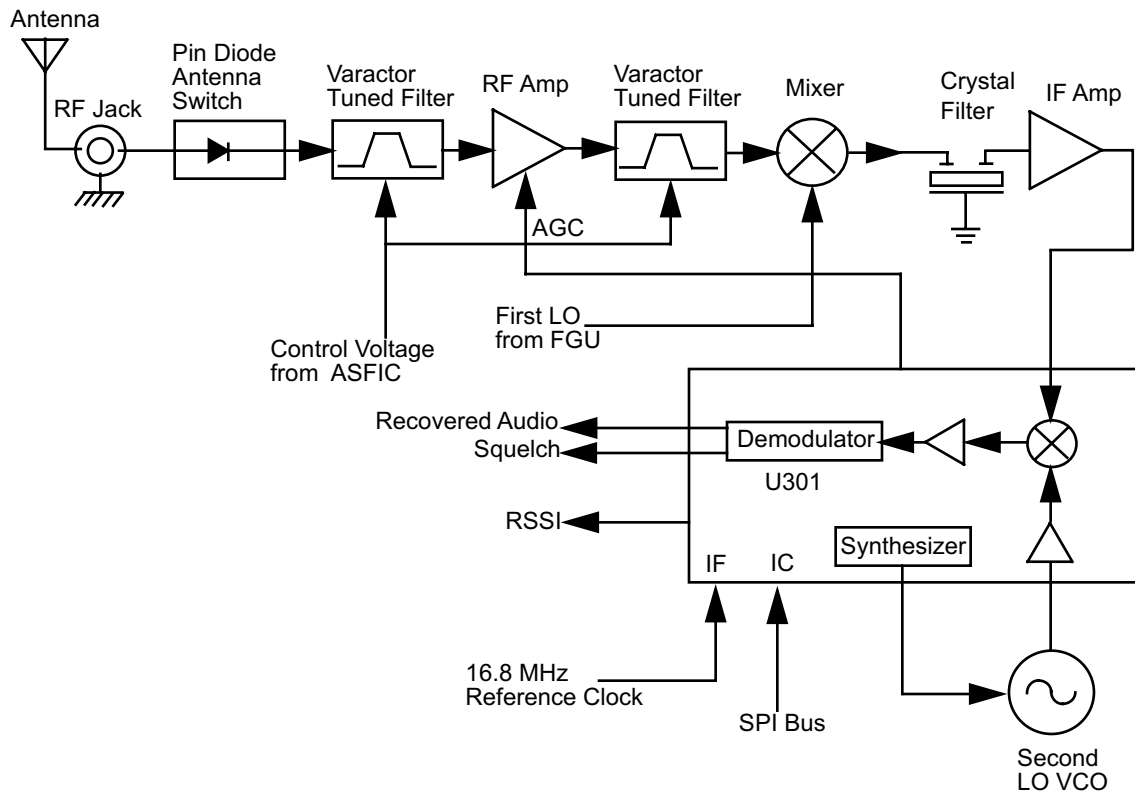


Figure 9-2 UHF Receiver Block Diagram

4.1 Receiver Front-End

(Refer to *UHF Receiver Front End Schematic Diagram* on page 9A-16 and *UHF Harmonic Filter Schematic Diagram* on page 9A-21)

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

The bandpass filter is electronically tuned by the DACRx from U404 which is controlled by the microprocessor. Depending on the carrier frequency, the DACRx will supply the tuned voltage to the varactor diodes in the filter. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

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

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

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

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

4.2 Receiver Back-End

(Refer to *UHF Receiver Back End Schematic Diagram* on page 9A-17)

The output of crystal filter FL301 is matched to the input of IF amplifier transistor Q302 by components R352 and C325. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The IF amplifier provides a gain of about 7dB. The amplified IF signal is then coupled into U301(pin 3) via C330, C338 and L330 which provides the matching for the IF amplifier and U301.

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

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

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

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

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

4.3 Automatic Gain Control Circuit

(Refer to *UHF Receiver Front End Schematic Diagram* on page 9A-16)

The front end automatic gain control circuit is to provide automatic gain reduction of the front end RF amplifier via feedback. This action is necessary to prevent overloading of backend circuits. This is achieved by drawing some of the output power from the RF amplifier's output. At high radio frequencies, capacitor C331 provides the low impedance path to ground for this purpose. CR308 is a PIN diode used for switching the path on or off. A certain amount of forward biasing current is needed to turn the PIN diode on. Transistor Q315 provides this current where upon saturation, current will flow via R347, PIN diode, collector and emitter of Q315 and R319 before going to ground. Q315 is an NPN transistor used for switching here. Maximum current flowing through the PIN is mainly limited by the resistor R319.

Radio signal strength indicator, RSSI, a voltage signal, is used to drive Q315 to saturation hence turning it on. RSSI is produced by U301 and is proportional to the gain of the RF amplifier and the input RF signal power to the radio.

Resistor network at the input to the base of Q315 is scaled to turn on Q315, hence activating the AGC, at certain RSSI levels. In order to turn on Q315, the voltage across the transistor's base to ground must be greater or equal to the voltage across R319, plus the base-emitter voltage (V_{be}) present at Q315. The resistor network with thermistor RT300 is capable of providing temperature compensation to the AGC circuit, as RSSI generated by U301 is lower at cold temperatures compared to normal operation at room temperature. Resistor R300 and capacitor C397 form an R-C network used to dampen any transient instability while the AGC is turning on.

5.0 Frequency Generation Circuitry

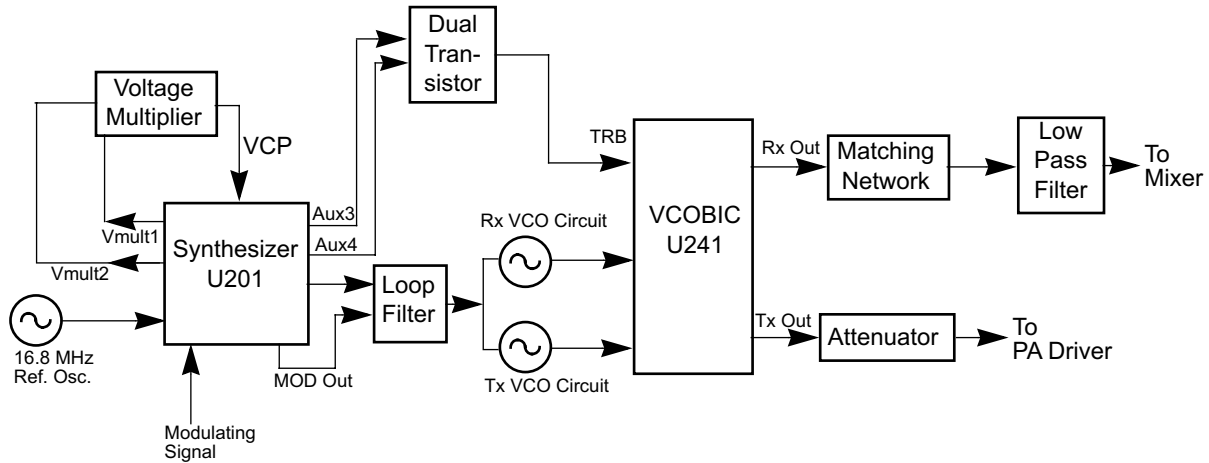


Figure 9-3 Frequency Generation Unit Block Diagram

The Frequency Generation Circuitry is composed of two main ICs, the Fractional-N synthesizer (U201), and the VCO/Buffer IC (U241). Designed in conjunction to maximize compatibility, the two ICs provide many of the functions that normally would require additional circuitry. The synthesizer block diagram illustrates the interconnect and support circuitry used in the region. Refer to the relevant schematics for the reference designators.

The synthesizer is powered by regulated 5V and 3.3V which come from U247 and U248 respectively. The synthesizer in turn generates a superfiltered 4.5V which powers U241.

In addition to the VCO, the synthesizer must interface with the logic and ASFIC circuitry.

Programming for the synthesizer is accomplished through the data, clock and chip select lines from the microprocessor. A 3.3V dc signal from synthesizer lock detect line indicates to the microprocessor that the synthesizer is locked.

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

5.1 Synthesizer

(Refer to *UHF Synthesizer Schematic Diagram* on page 9A-18)

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

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

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

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

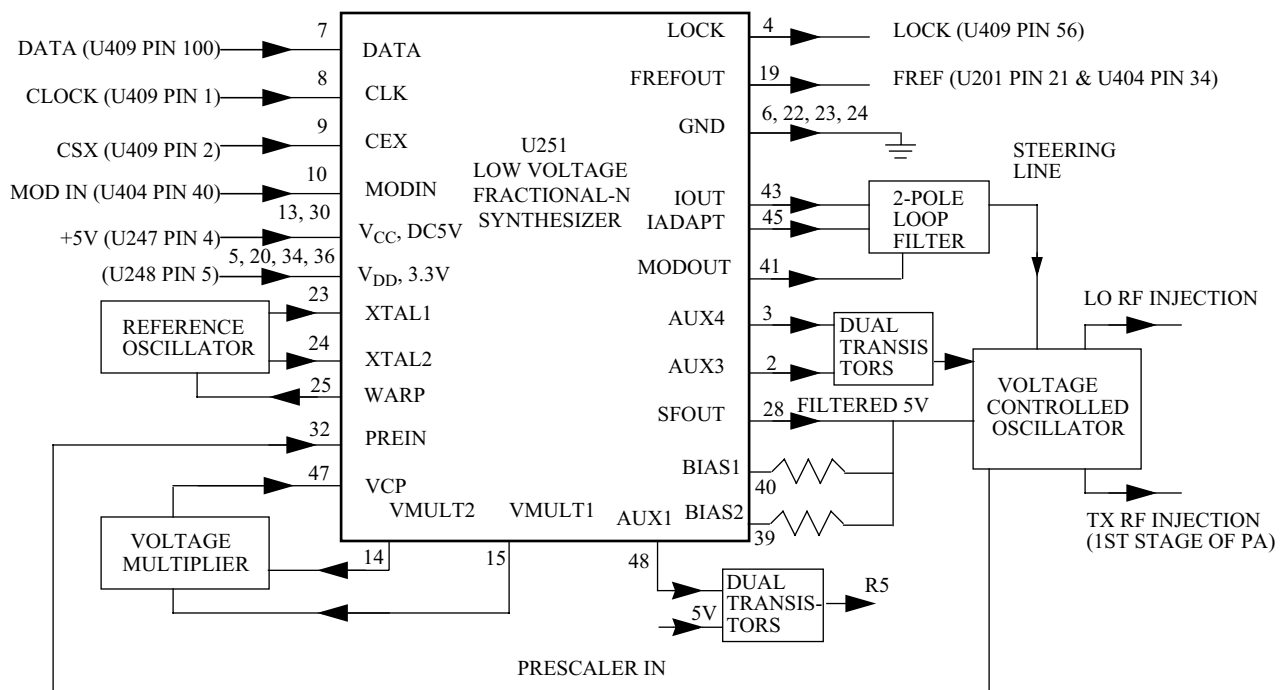


Figure 9-4 Synthesizer Block Diagram

5.2 VCO - Voltage Controlled Oscillator

(Refer to *UHF Voltage Controlled Oscillator Schematic Diagram* on page 9A-19)

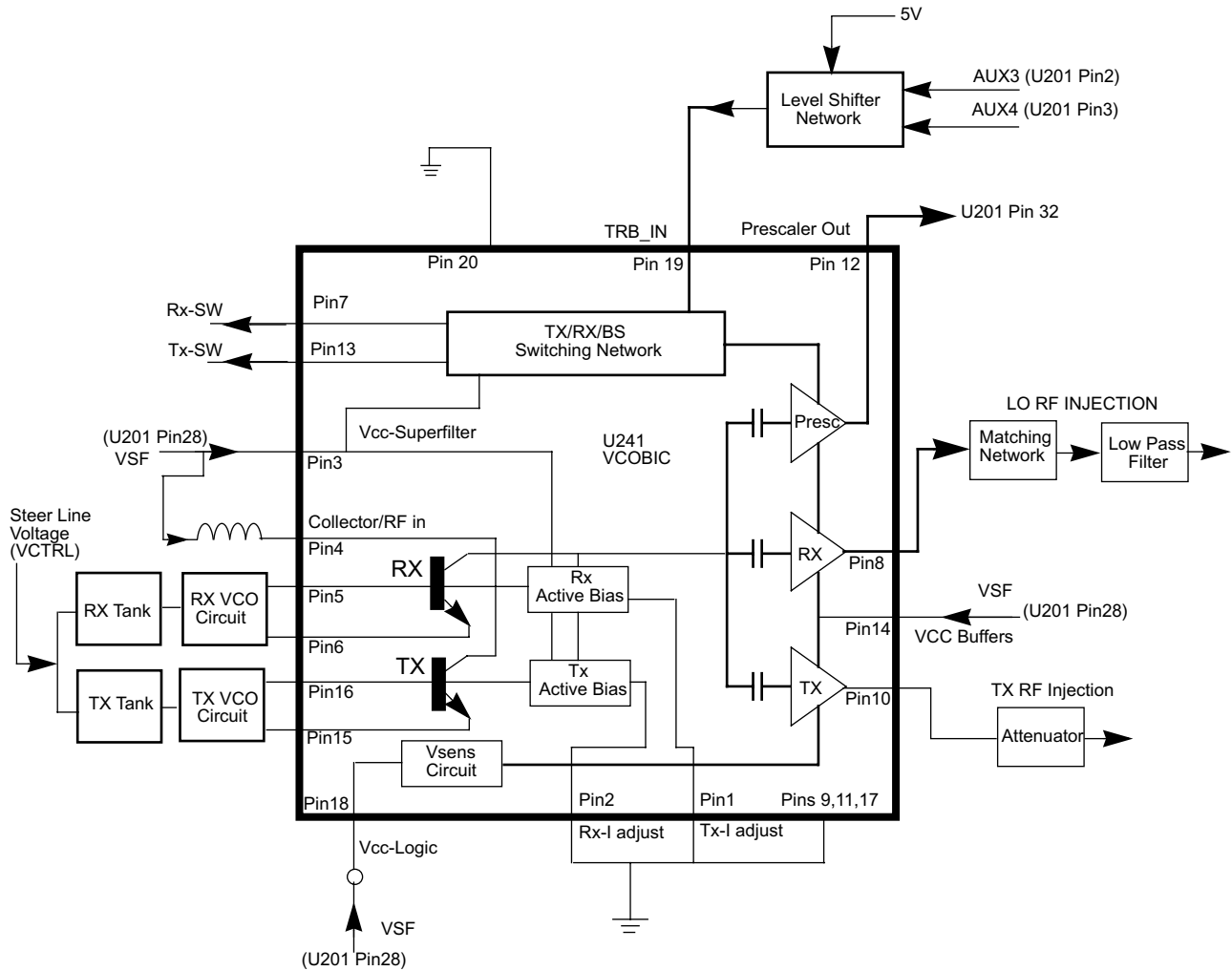


Figure 9-5 VCO Block Diagram

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

The VCOBIC(U241) is operated at 4.54 V (VSF) and Fractional-N synthesizer (U201) at 3.3V. This difference in operating voltage requires a level shifter consisting of Q260 and Q261 on the TRB line. The operation logic is shown in Table 9-1.

Table 9-1 Level Shifter Logic

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

In the receive mode, U241 pin 19 is low or grounded. This activates the receive VCO by enabling the receive oscillator and the receive buffer of U241. The RF signal at U241 pin 8 is run through a matching network. The resulting RF signal is the LO RF INJECTION and it is applied to the mixer at T302 (refer to *UHF Receiver Front End Schematic Diagram* on page 9A-16).

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

When a high impedance is applied to U241 pin 19, the VCO is operating in BATTERY SAVER mode. In this case, both the receive and transmit oscillators as well as the receive transmit and prescaler buffer are turned off.

6.0 Notes For All Schematics and Circuit Boards

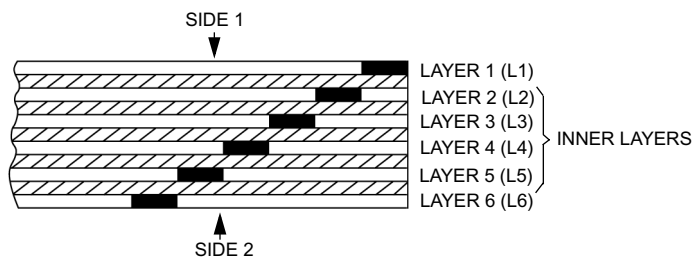
* Component is frequency sensitive. Refer to the Electrical Parts List for value and usage.

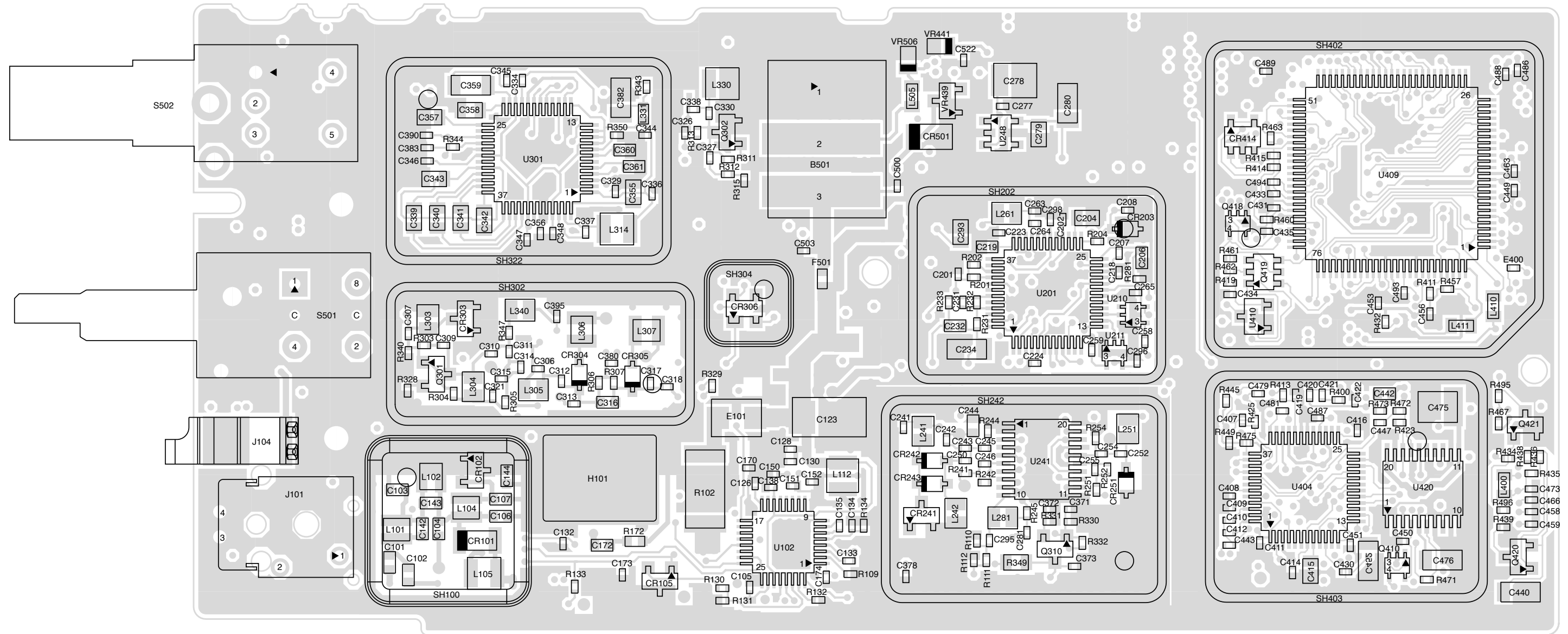
1. Unless otherwise stated, resistances are in Ohms ($k = 1000$), and capacitances are in picofarads (pF) or microfarads (μF).
2. DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. Transmitter measurements should be made with a $1.2 \mu H$ choke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

100 Series	=	Transmitter
200 Series	=	Frequency Generation
300 Series	=	Receiver
400/500 Series	=	Controller
600 Series	=	Keypad Board
4. Interconnect Tie Point Legend:

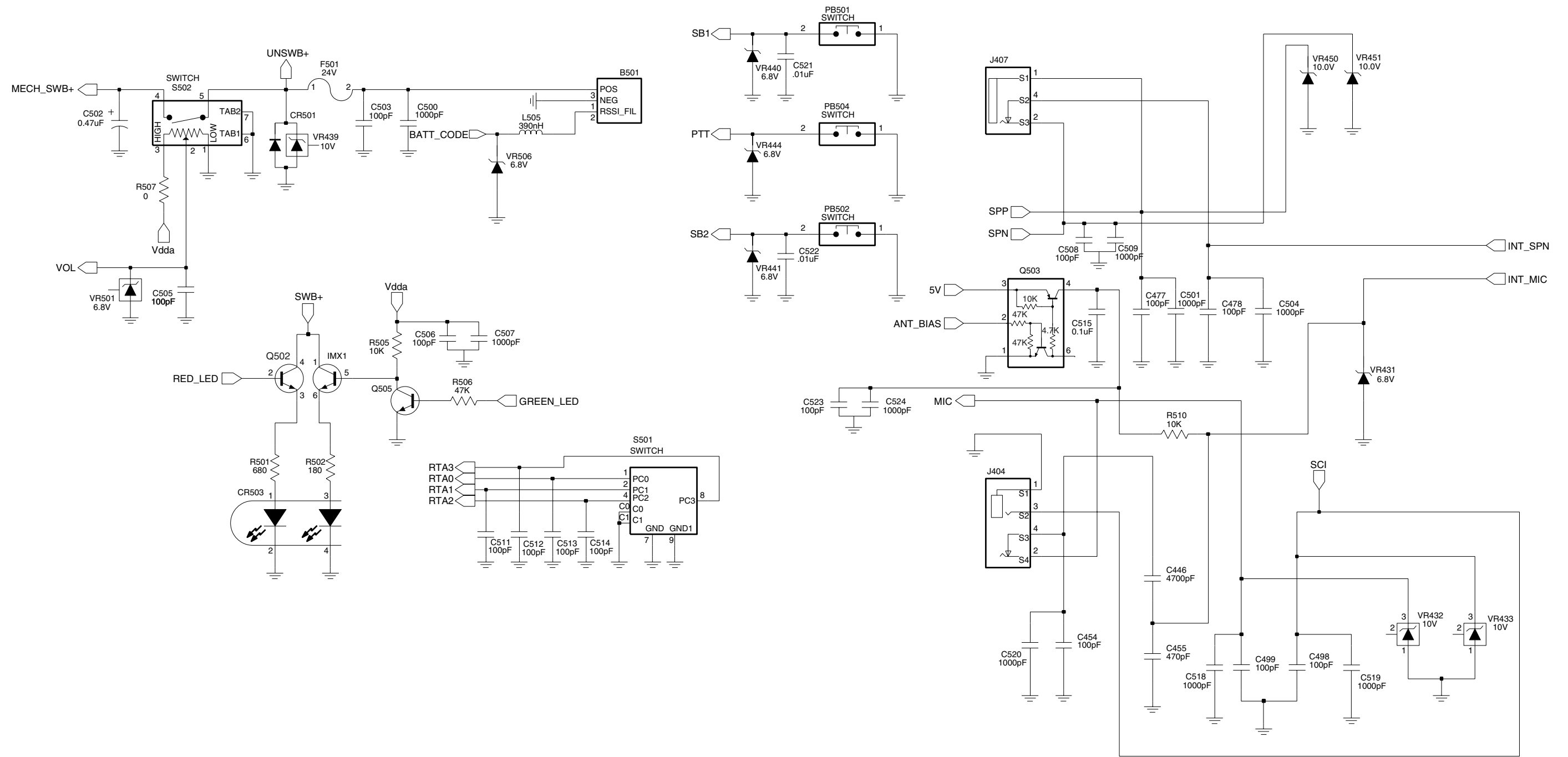
UNSWB+	=	Unswitch Battery Voltage (7.5V)
SWB+	=	Switch Battery Voltage (7.5V)
R5	=	Receiver Five Volts
CLK	=	Clock
Vdda	=	Regulated 3.3 Volts (for analog)
Vddd	=	Regulated 3.3 Volts (for digital)
CSX	=	Chip Select Line (not for LVZIF)
SYN	=	Synthesizer
DACRX	=	Digital to Analog Voltage (For Receiver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

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



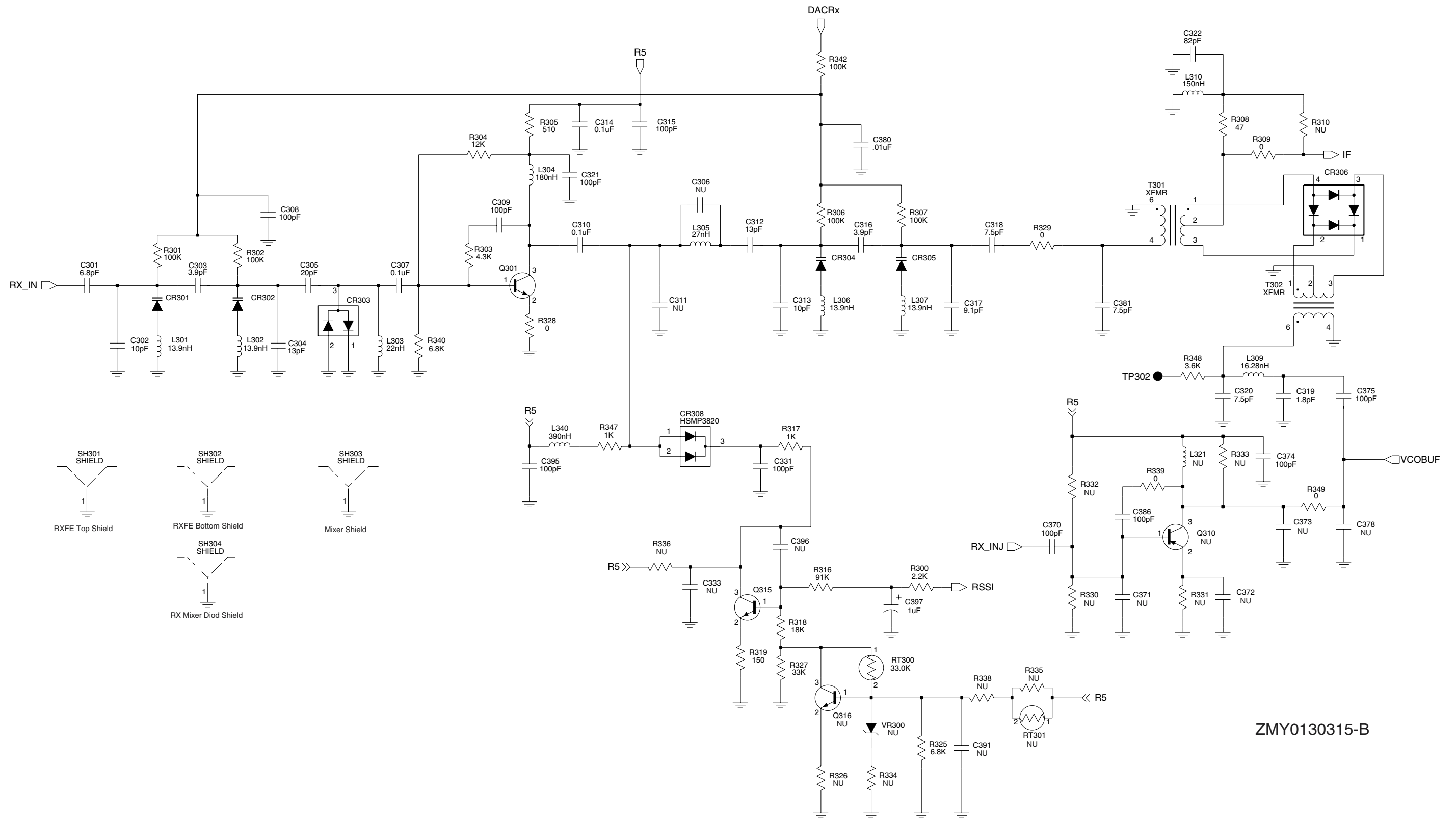


ZMY0130319-A



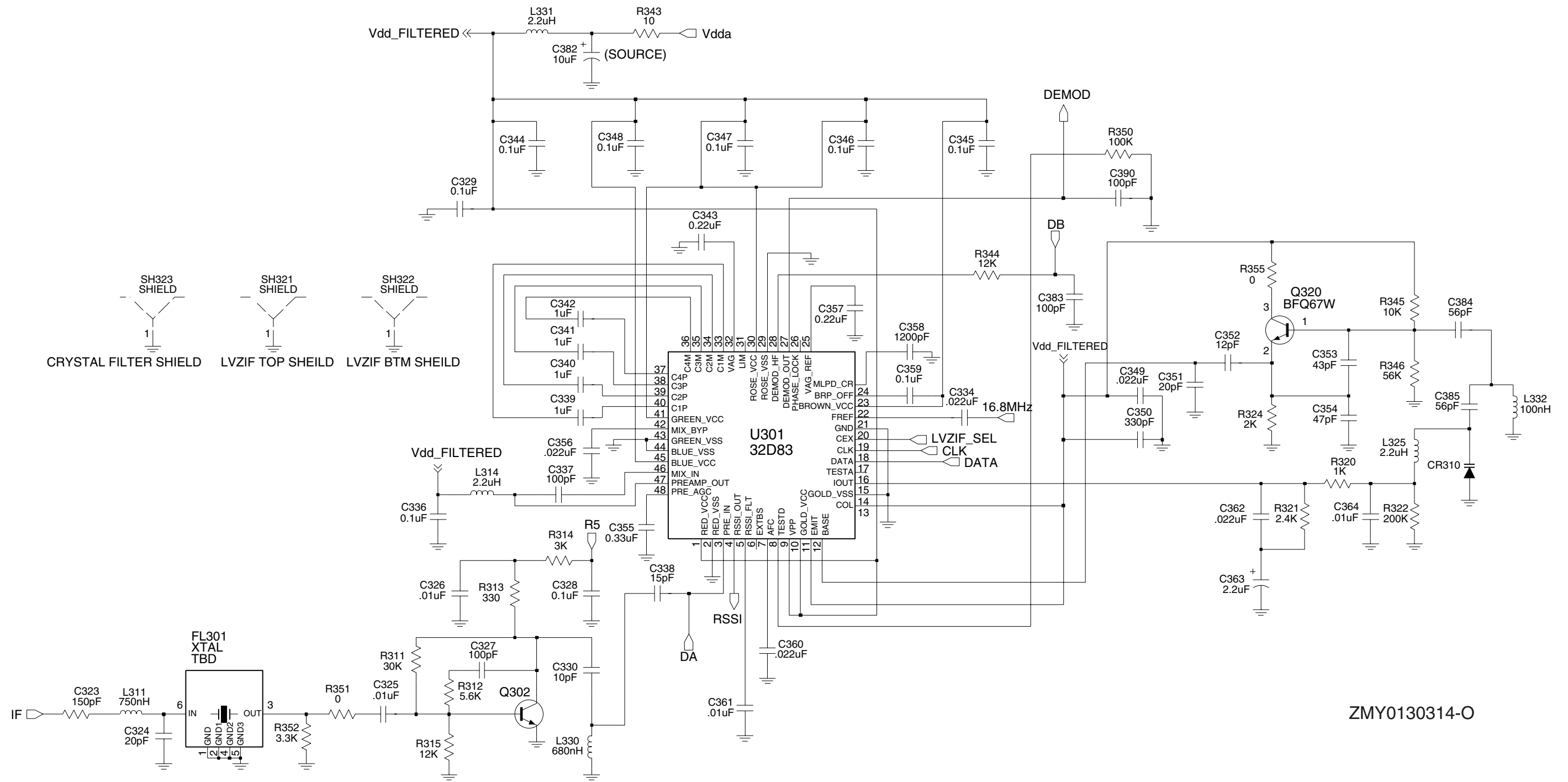
ZMY0130312-A

UHF Controls And Switches Schematic Diagram



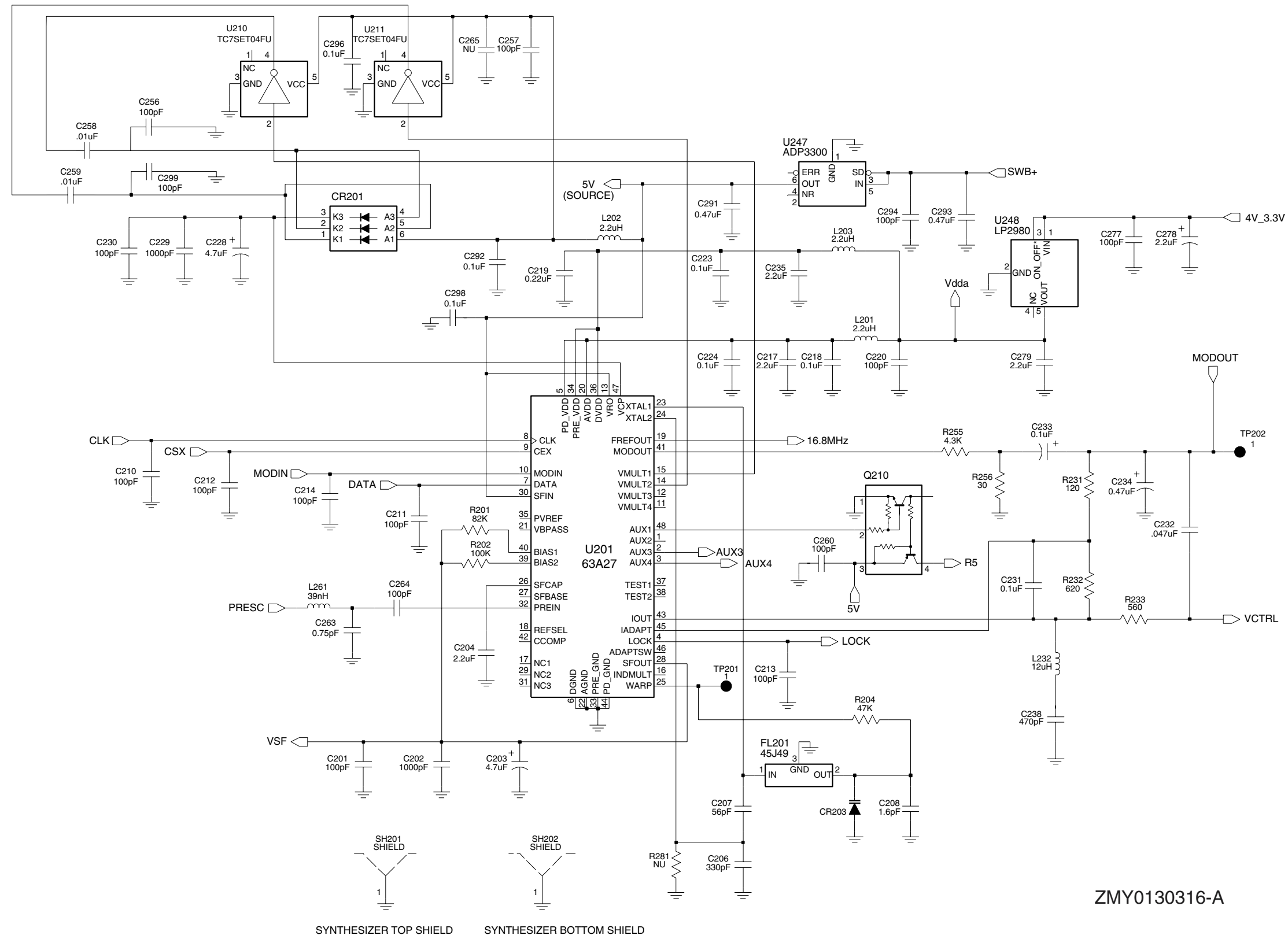
ZMY0130315-B

UHF Receiver Front End Schematic Diagram



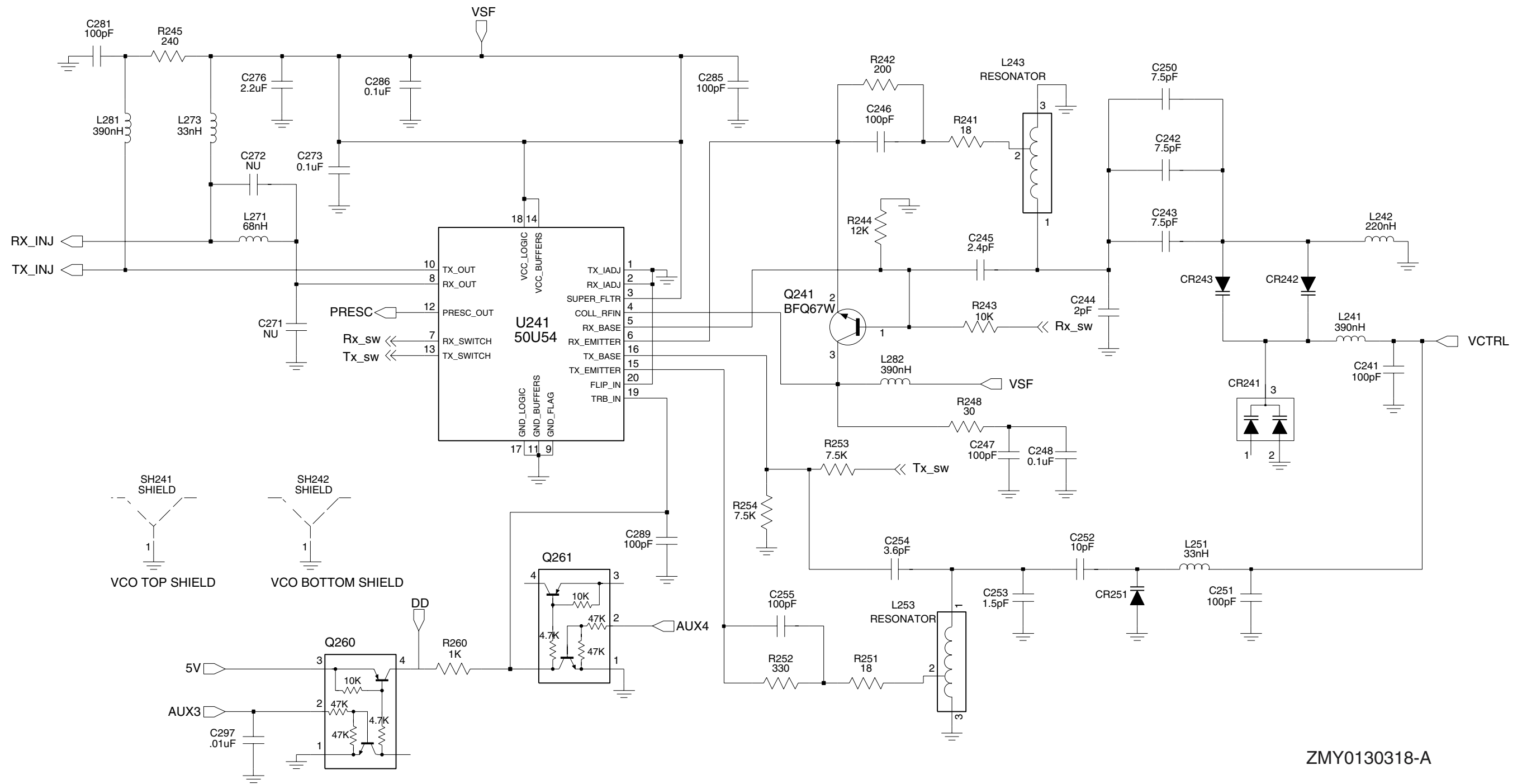
ZMY0130314-O

UHF Receiver Back End Schematic Diagram

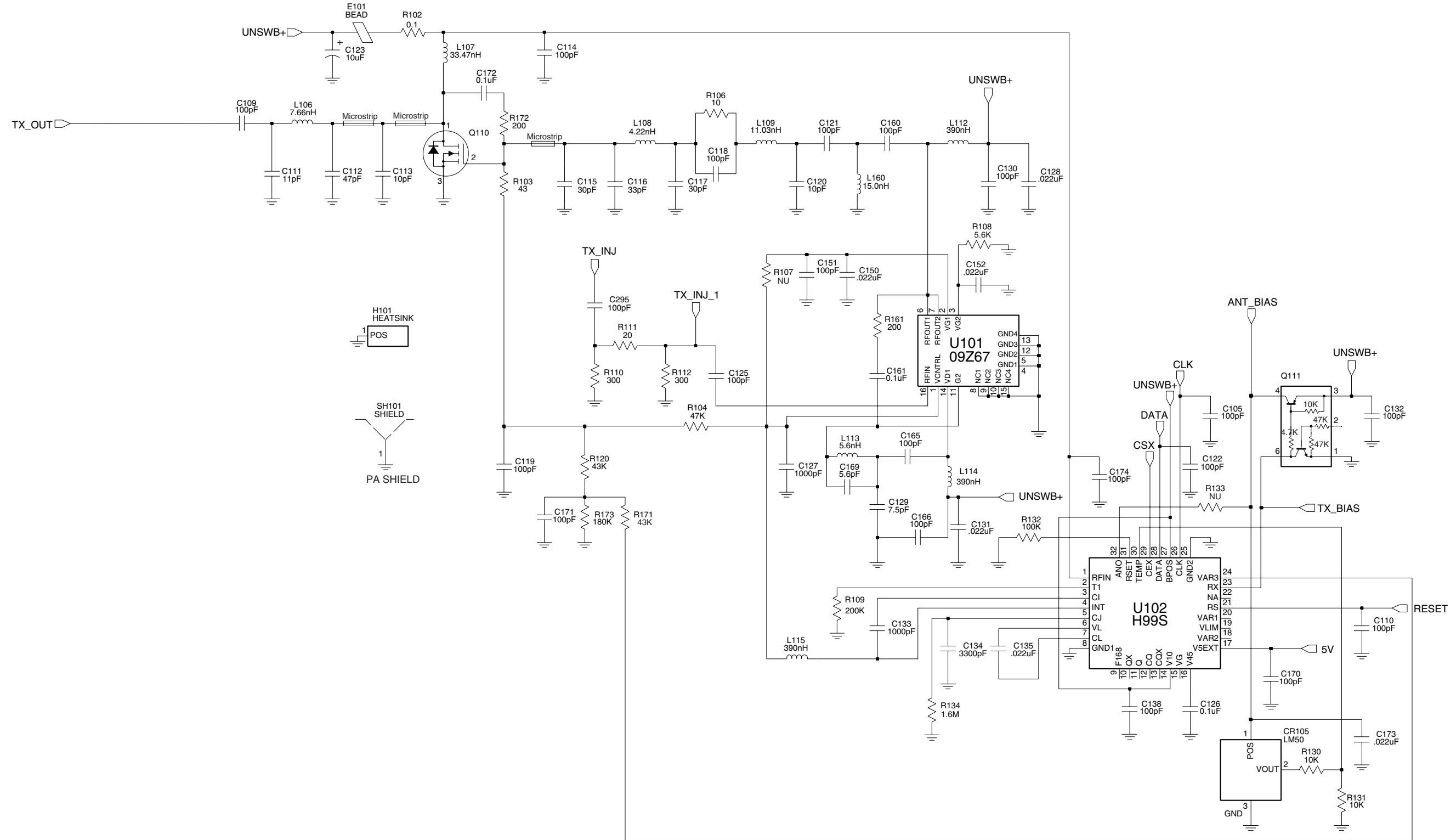


ZMY0130316-A

UHF Synthesizer Schematic Diagram

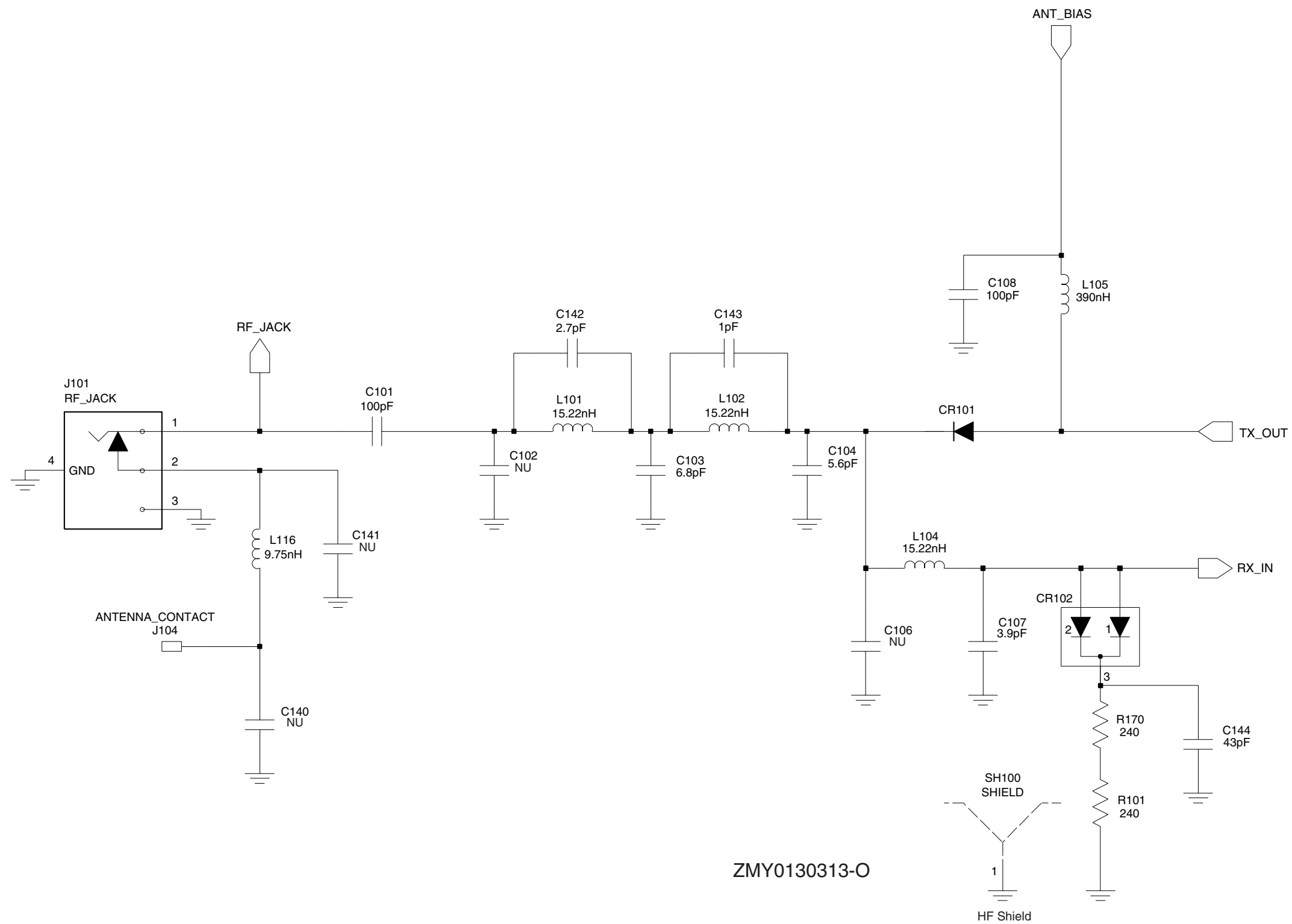


UHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130317-A

UHF Transmitter Schematic Diagram



UHF Harmonic Filter Schematic Diagram

UHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A01	Connector, Contact Battery
C101	2113740F51	100pF
C102	Not Placed	
C103	2113740F23	6.8pF
C104	2113740F21	5.6pF
C105	2113743N50	100pF
C106	Not Placed	
C107	2113740F17	3.9pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F30	13pF
C112	2180605Z32	47pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	2113743N26	10pF
C116	2113743N38	33.0pF
C117	Not Placed	
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N26	10pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	0.1uF
C127	2113743L17	1000pF
C128	2113743M08	0.022uF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	0.022uF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	0.022uF
C138	2113743N50	100pF
C142	2113740F13	2.7pF
C143	2113740F03	1pF
C144	2113740F42	43pF
C150	2113743M08	0.022uF
C151	2113743N50	100pF
C152	2113743M08	0.022uF
C160	2113743N50	100pF
C161	2113743M24	0.1uF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C172	2113740F51	100pF
C173	2113743M08	0.022uF
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7pF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N44	56.0pF
C208	2113743N08	1.6pF
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF
C219	2113743K16	0.220uF
C220	2113743N50	100pF
C223	2113743M24	0.1uF
C224	2113743M24	0.1uF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	0.1uF
C232	2113743E12	0.047uF
C233	2311049A01	0.1pF
C234	2311049A05	0.47pF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	0.01uF
C259	2113743L41	0.01uF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF
C273	2113743M24	0.1uF

Circuit Ref	Motorola Part No.	Description
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF
C289	2113743N50	100pF
C291	2380737Z10	10.0uF
C292	2113743M24	0.1uF
C293	2113743A27	0.470uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF
C297	2113743L41	0.01uF
C298	2113743M24	0.1uF
C299	2113743N50	100pF
C301	2113743N22	6.8pF
C302	2113743N26	10pF
C303	2113740L08	3.9pF
C304	2113743N29	13pF
C305	2113743N33	20.0pF
C307	2113743M24	0.1uF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF
C312	2113743N29	13pF
C313	2113743N26	10pF
C314	2113743M24	0.1uF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82.0pF
C323	2113743N54	150pF
C324	2113743N33	20.0pF
C325	2113743L41	0.01uF
C326	2113743L41	0.01uF
C327	2113743N50	100pF
C328	2113743M24	0.1uF
C329	2113743M24	0.1uF
C330	2113743N26	10pF
C331	2113743N50	100pF
C334	2113743M08	0.022uF
C336	2113743M24	0.1uF
C337	2113743N50	100pF
C338	2113743N30	15.0pF
C339	2180478Z20	1.0uF

Circuit Ref	Motorola Part No.	Description
C340	2180478Z20	1.0uF
C341	2180478Z20	1.0uF
C342	2180478Z20	1.0uF
C343	2113743A23	0.220uF
C344	2113743M24	0.1uF
C345	2113743M24	0.1uF
C346	2113743M24	0.1uF
C347	2113743M24	0.1uF
C348	2113743M24	0.1uF
C349	2113743E07	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20.0pF
C352	2113743N28	12.0pF
C353	2113743N41	43.0pF
C354	2113743N42	47.0pF
C355	2113743A24	0.330uF
C356	2113743M08	0.022uF
C357	2113743A23	0.220uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E07	0.022uF
C361	2113741F49	10NF
C362	2113743M08	0.022uF
C363	2311049A40	2.2uF
C364	2113743L41	0.01uF
C370	2113743N50	100pF
C374	2113743N50	100pF
C375	2113743N50	100pF
C380	2113743L41	0.01uF
C381	2113743N23	7.5pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56.0pF
C385	2113743N44	56.0pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C395	2113743N50	100pF
C397	2311049A05	0.47pF
C400	2113743L41	0.01uF
C401	2113743M24	0.1uF
C402	2113743M24	0.1uF
C403	2113928D08	10.0uF
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	0.1uF
C410	2113928N01	0.1uF
C411	2113743M24	0.1uF
C412	2113928N01	0.1uF
C414	2113743M24	0.1uF
C415	2109720D01	0.01uF
C416	2113928N01	0.1uF

Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description
C420	2113743L41	0.01uF	C486	2113743L17	1000pF	CR440	4813833C02	Dual Diode Common Cathode	L309	2479990C02	16.28nH
C421	2113928N01	0.1uF	C487	Not Placed		CR501	4880107R01	Rectifier	L310	2462587V36	150nH
C422	2113743M24	0.1uF	C488	2113743L17	1000pF	CR503	4805729G49	LED Red/Yel	L311	2462587N65	750nH
C423	2113743N50	100pF	C489	2113743L17	1000pF	E101	2484657R01	Ferrite Bead	L314	2462587N72	2.2uH
C424	2311049A59	10uF	C493	Not Placed		E400	2480640Z01	Ferrite Bead	L325	2480646Z20	2.20uH
C425	2113743M24	0.1uF	C494	2113743N50	100pF	F501	6580542Z01	Fuse 3A	L330	2462587N64	680nH
C426	2113743N50	100pF	C498	2113743N50	100pF	FL201	4802245J49	Crystal 16.8MHz Clip	L331	2480646Z20	2.20uH
C427	2113743N50	100pF	C499	2113743N50	100pF	FL301	4802245J43	XTAL Filter 45.1MHz	L332	2462587N53	100nH
C428	2113743M24	0.1uF	C500	2113743L17	1000pf	H101	2680499Z01	Heat Spreader	L340	2462587V41	390nH
C429	2113743M24	0.1uF	C501	2113743L17	1000pF	J101	0180117S05	RF Jack Assembly	L400	2462587Q42	390nH
C430	2113928N01	0.1uF	C502	2311049A05	0.47pF	J104	3980686Z01	Antenna Contact	L410	2462587Q42	390nH
C431	2113743N50	100pF	C503	2113743N50	100pF	J400	0905505Y04	40-Pin Connector	L411	2462587Q42	390nH
C433	2113743L41	0.01uF	C504	2113743L17	1000pF	J402	2809926G02	4-Pin Connector	L505	2462587Q42	390nH
C434	2113743M24	0.1uF	C505	2113743N50	100pF	J404	0980689Z01	Connector (Stereo Jack 2.5mm)	PB501	4080523Z01	Tactile Push Button
C435	2113743M24	0.1uF	C506	2113743N50	100pF	J407	0980688Z01	Connector (Mono Jack 3.5mm)	PB502	4080523Z01	Tactile Push Button
C436	Not Placed		C507	2113743L17	1000pF	L101	2460591B48	15.22nH, 10%	PB503	4080523Z01	Tactile Push Button
C437	Not Placed		C508	2113743N50	100pF	L102	2460591B48	15.22nH, 10%	Q110	4802245J55	RF Power FET
C440	2113743G26	4.7uF	C509	2113743L17	1000pF	L104	2460591B48	15.22nH, 10%	Q111	4802245J50	Dual NPN/PNP
C441	Not Placed		C511	2113743N50	100pF	L105	2460591B48	15.22nH, 10%	Q210	4802245J50	Dual NPN/PNP
C442	2113743E20	10uF	C512	2113743N50	100pF	L106	2462587N22	390nH	Q241	4805218N63	NPN
C443	2113928N01	0.1uF	C513	2113743N50	100pF	L107	2479990A02	7.66nH	Q260	4802245J50	Dual NPN/PNP
C444	Not Placed		C514	2113743N50	100pF	L108	2479990G01	33.47nH	Q261	4802245J50	Dual NPN/PNP
C445	Not Placed		C515	2113743M24	0.1uF	L110	2479990A01	4.22nH	Q301	4802245J44	NPN
C446	2113743R33	4700pF, 5%	C518	2113743L17	1000pF	L112	2462587N45	22nH	Q302	4802245J44	NPN
C447	2113743M08	0.022uF	C519	2113743L17	1000pF	L113	2413926H09	5.6nH	Q315	4880214G02	NPN
C448	Not Placed		C520	2113743L17	1000pF	L114	2462587N22	390nH	Q320	4805218N63	NPN
C449	2113743N50	100pF	C521	2113743L41	0.01uF	L115	2462587N22	390nH	Q400	4809579E18	MOSFET P-CHAN
C450	Not Placed		C522	2113743L41	0.01uF	L116	2479990A03	9.75nH	Q403	4880214G02	NPN
C451	2113743M08	0.022uF	C523	2113743N50	100pF	L160	Not Placed		Q405	4802245J54	Dual NPN
C452	2113743G26	4.7uF	C524	2113743L17	1000pF	L201	2462587Q20	2.2uH	Q410	4802245J54	Dual NPN
C453	2113743N50	100pF	CR101	4880973Z02	Pin Diode	L202	2462587Q20	2.2uH	Q417	4802245J50	Dual NPN/PNP
C456	2113743N50	100pF	CR102	4802245J41	Pin Diode	L203	2462587Q20	2.2uH	Q418	4802245J50	Dual NPN/PNP
C458	2113743N50	100pF	CR105	5185963A15	Temperature Sense	L232	2462587P25	12uH	Q419	5180159R01	Dual NPN
C459	2113743N50	100pF	CR201	4802233J09	Diode Triple	L241	2462587V41	390nH	Q420	4805128M67	SOT STR MMBT
C463	2113743N50	100pF	CR203	4862824C03	Varactor	L242	2462587V38	220nH	Q421	4880214G02	NPN
C466	2113743N50	100pF	CR241	4805649Q13	Dual Varactor	L243	2460593C01	Teflon Resonator	Q431	5180159R01	Dual NPN
C467	2113928N01	0.1uF	CR242	4862824C01	Varactor	L251	2462587V28	33nH	Q502	5180159R01	Dual NPN
C471	Not Placed		CR243	4862824C01	Varactor	L253	2460593C02	Teflon Resonator	Q503	4802245J50	Dual NPN/PNP
C472	Not Placed		CR251	4802245J22	Varactor	L261	2462587V29	39nH	Q505	4880214G02	NPN
C473	2113743L09	470pF	CR301	4862824C01	Varactor	L271	2462587V32	68nH	R101	0662057A34	240
C475	2113743H14	10.0uF	CR302	4862824C01	Varactor	L273	2462587V28	33nH	R102	0680735Z01	0.075
C476	2113928D08	10.0uF	CR303	4880154K03	Dual Common Anode-Cathode	L281	2462587V41	390nH	R103	0662057M41	43
C477	2113743N50	100pF	CR304	4862824C01	Varactor	L282	2462587V41	390nH	R104	0662057N15	47K
C478	2113743N50	100pF	CR305	4862824C01	Varactor	L301	2479990C01	13.9nH	R105	0662057M01	0
C479	2113928N01	0.1uF	CR306	4802245J42	Ring Quad Diode	L302	2479990C01	13.9nH	R106	0662057M26	10
C480	2113928D08	10.0uF	CR308	4802245J41	Pin Diode	L303	2462587V26	22nH	R108	0662057M92	5.6K
C481	2113928N01	0.1uF	CR310	4862824C01	Varactor	L304	2462587V37	180nH	R109	0662057N30	200K
C482	2113928N01	0.1uF	CR411	4802245J47	Diode Schottky	L305	2462587V26	22nH	R110	0662057M61	300
C483	2113743L17	1000pF	CR412	4802245J47	Diode Schottky	L306	2479990C01	13.9nH	R111	0662057M33	20
C484	2113743L17	1000pF	CR413	4802245J47	Diode Schottky	L307	2479990C01	13.9nH	R112	0662057M61	300
C485	2113743L17	1000pF							R120	0662057N14	43K

Circuit Ref	Motorola Part No.	Description
R130	0662057M98	10K
R131	0662057N14	18K
R132	0662057N33	270K
R134	0662057N52	1.6M
R161	0662057M57	200
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7.5K
R254	0662057M95	6.8K
R255	0662057M89	4.3K
R256	0662057M37	30
R260	0662057M74	1K
R281	Not Placed	
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M89	1K
R304	0662057N01	12K
R305	0662057M67	0
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M42	47
R309	0662057M01	0
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M92	5.6K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K

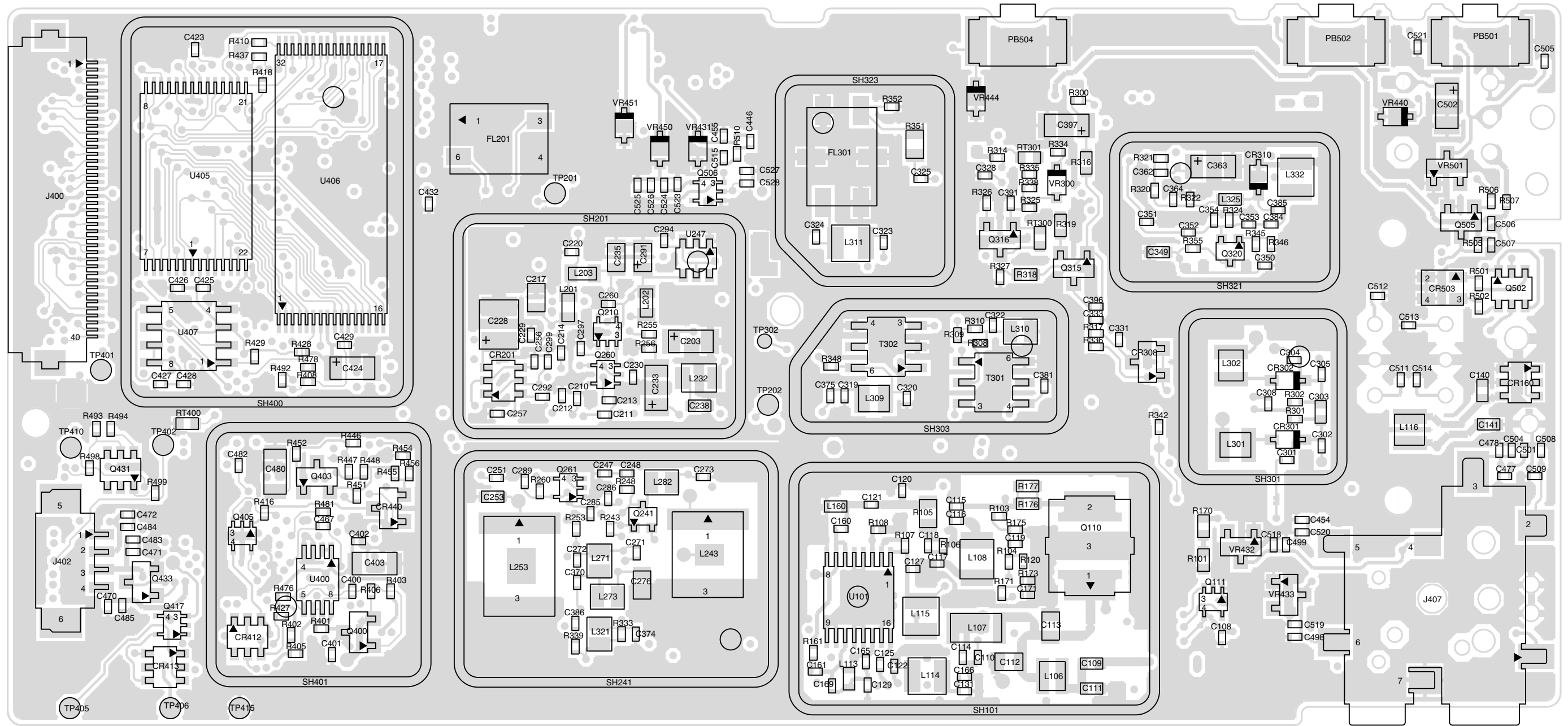
Circuit Ref	Motorola Part No.	Description
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R327	0662057N11	33K
R328	0662057M01	0
R329	0662057M01	0
R339	0662057M01	0
R340	0662057M94	6.8K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R405	0662057M01	0
R406	0662057N20	75K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057N13	39K
R418	0662057M01	0
R419	0662057M67	0
R423	0662057N39	470K
R425	0662057N10	30K
R427	0662057M98	10K
R428	0662057M10	2.2
R429	0662057M98	10K
R432	0662057N16	51K
R434	Not Placed	
R435	0662057M81	2K
R436	0662057N15	47K
R438	0662057M01	0
R445	0662057N08	24K
R446	0662057N31	220K
R447	0662057N51	1.5M
R448	0662057N33	270K
R449	0662057N08	24K
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057N23	100K
R462	0662057N23	100K

Circuit Ref	Motorola Part No.	Description
R463	0662057M61	300
R471	0662057M92	5.6K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R494	0662057M01	0
R495	0662057N23	100K
R496	0662057N23	100K
R498	0662057N23	100K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT300	0680590Z01	Thermistor_33K
RT400	0680590Z01	Thermistor_33K
S501	4080710Z01	Channel Switch
S502	1880619Z01	Volume Switch
SH100	2680687Z01	Shield, Harmonic Filter
SH101	2680510Z01	Shield, PA
SH201	2680511Z01	Synthesizer Top Shield
SH202	2680511Z01	Synthesizer Bottom Shield
SH241	2680513Z01	Shield, VCO Top
SH242	2680514Z01	Shield, VCO Bottom/LVZIF
SH301	2680554Z01	RX Pre Filter Shield
SH302	2680555Z01	RX Post Filter/RX AMP
SH303	2680509Z01	Shield, Mixer
SH304	2680624Z01	Shield, Mixer Diode
SH321	2680508Z01	Shield, LVZIF 2ND LO
SH322	2680514Z01	ZIF Shield
SH323	2680553Z01	Shield, Crystal Filter
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	On/Off Controller Shield
SH402	2680515Z01	Microprocessor Controlled Shield
SH403	2680516Z01	ASFIC CMP/Audio PA Controller Shield
T301	2580541Z01	XFMR Coil
T302	2580541Z01	XFMR Coil
U101	5105109Z67	LD MOS Driver UHF IC
U102	5185765B01	Power Control IC
U201	5185963A27	LVFRACN
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer
U247	5105739X05	Regulator Linear

Circuit Ref	Motorola Part No.	Description
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF 2.2
U400	5102463J40	3.3V Regulator
U404	5185963A53	ASFIC CMP
U405	Not Placed	
U406	*5102463J59	Flash ROM 128K x 8
U407	*5102463J64	16K x 8 EEPROM
U409	5102226J56	UP HC11FLO
U410	5102463J57	Regulator 3.3V
U420	5102463J44	Audio PA
VR432	4805656W08	5.6V Zener
VR433	4805656W08	5.6V Zener
VR434	4802245J51	Zener 6.8V
VR439	4880140L15	10V Zener
VR440	4802245J51	Zener 6.8V
VR441	4802245J51	Zener 6.8V
VR442	4802245J51	Zener 6.8V
VR443	4802245J51	Zener 6.8V
VR444	4802245J51	Zener 6.8V
VR445	4802245J53	Zener_10V
VR446	4802245J53	Zener_10V
VR447	4802245J53	Zener_10V
VR448	4802245J53	Zener_10V
VR449	4802245J53	Zener_10V
VR450	4802245J53	Zener_10V
VR501	4813830A18	6.8V Zener
VR506	4802245J51	Zener 6.8V
	7580671Z01	Pad (Flexible Circuit)
	8480672Z01	UHF B1 PC Board

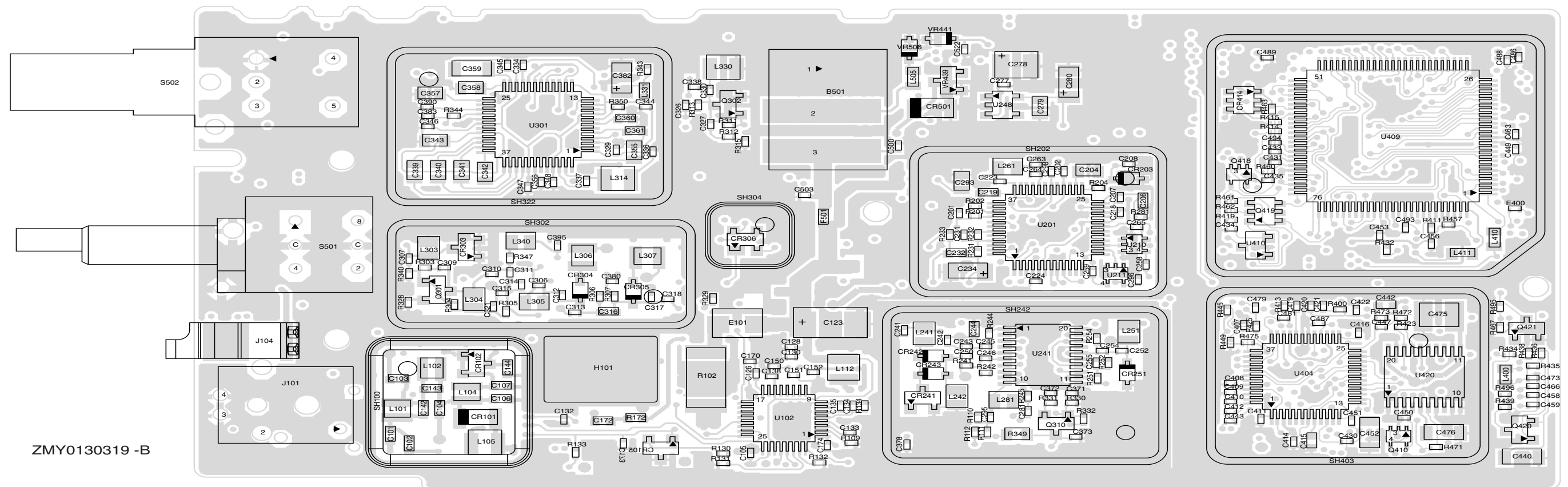
* Motorola Depot Servicing only

8.0 Circuit Board/Schematic Diagrams and Parts List



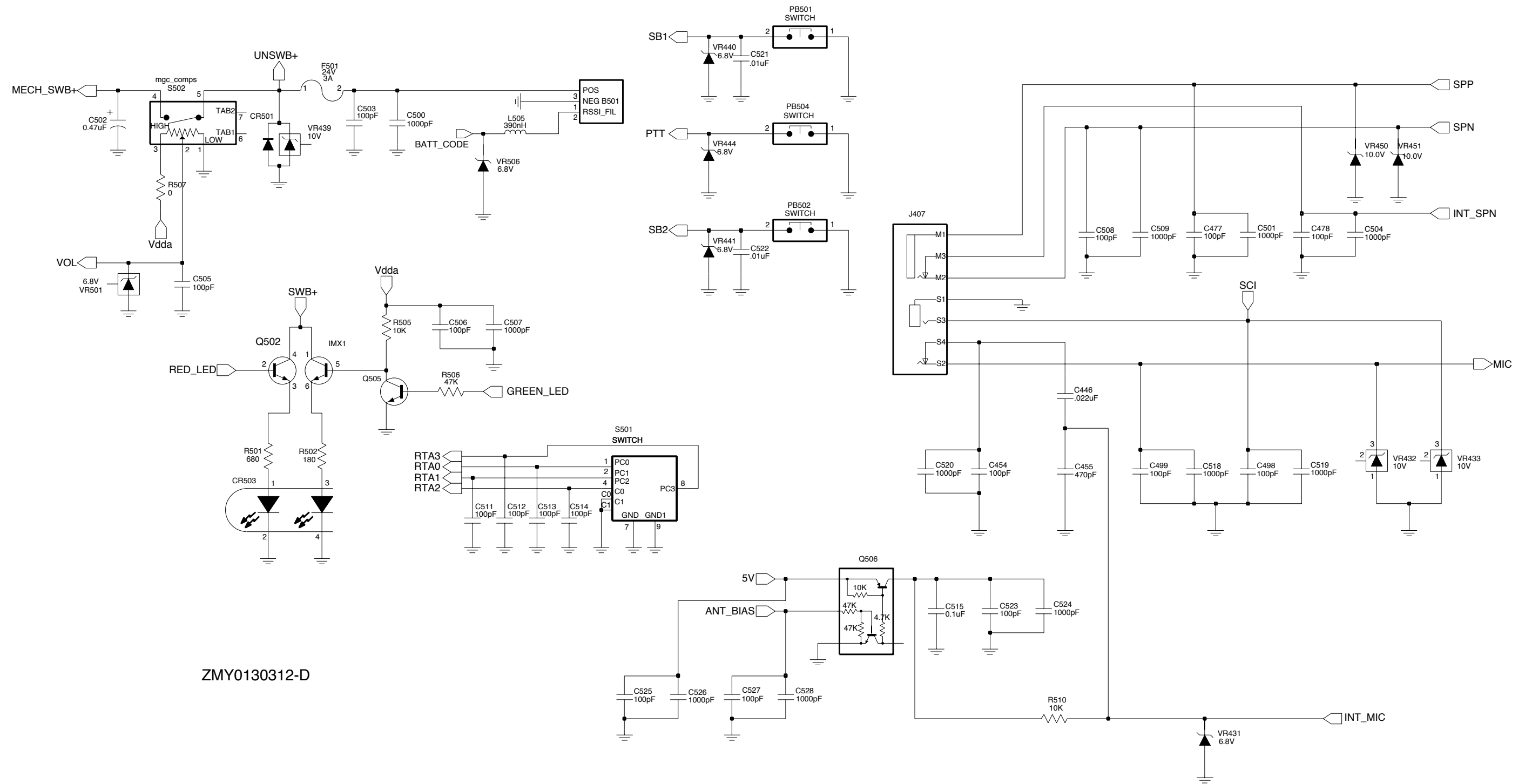
ZMY0130320 -B

UHF (403-470MHz) Main Board Top Side PCB No. 8480672Z04

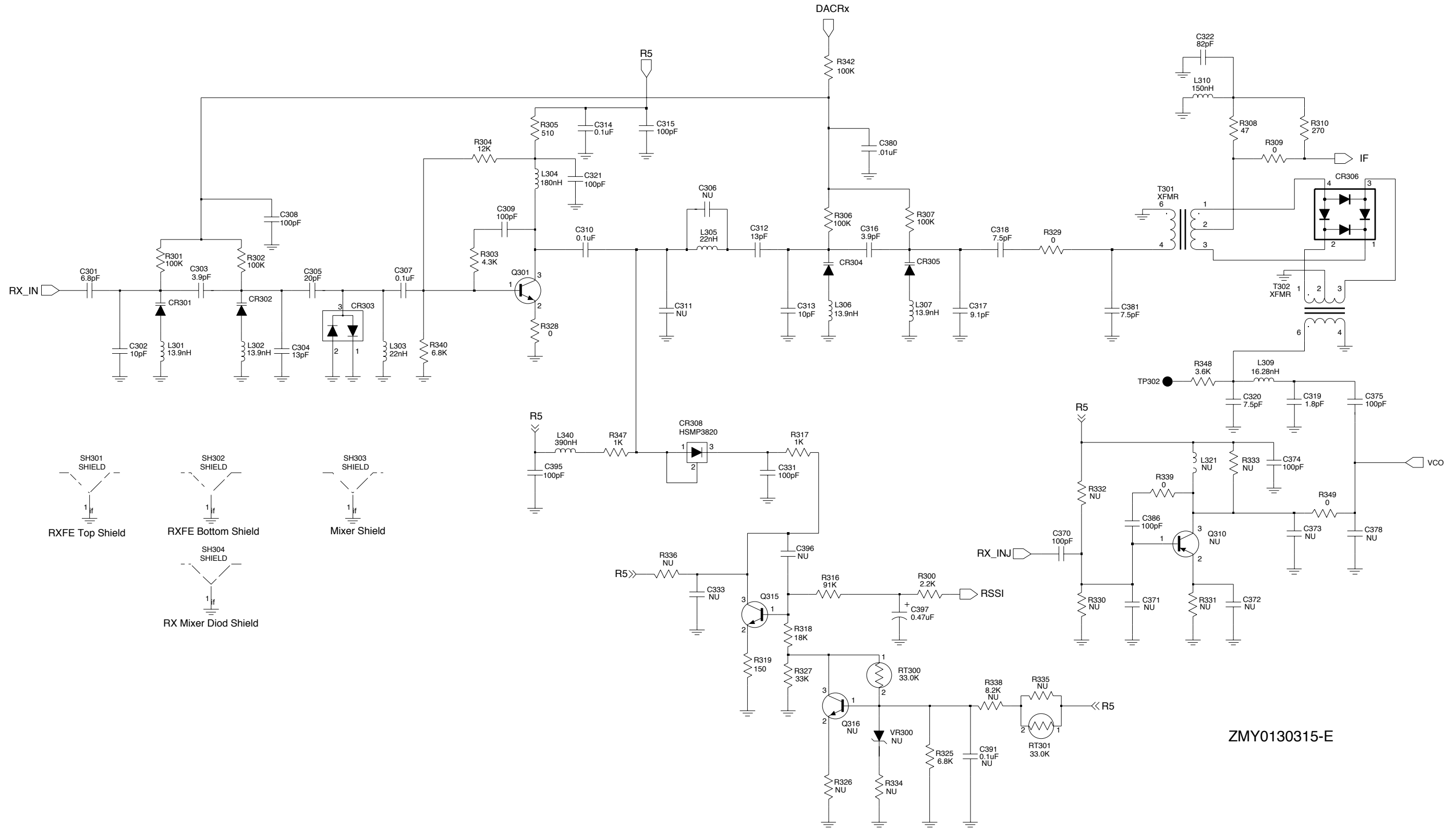


ZMY0130319 -B

UHF (403-470MHz) Main Board Bottom Side PCB No. 8480672Z04

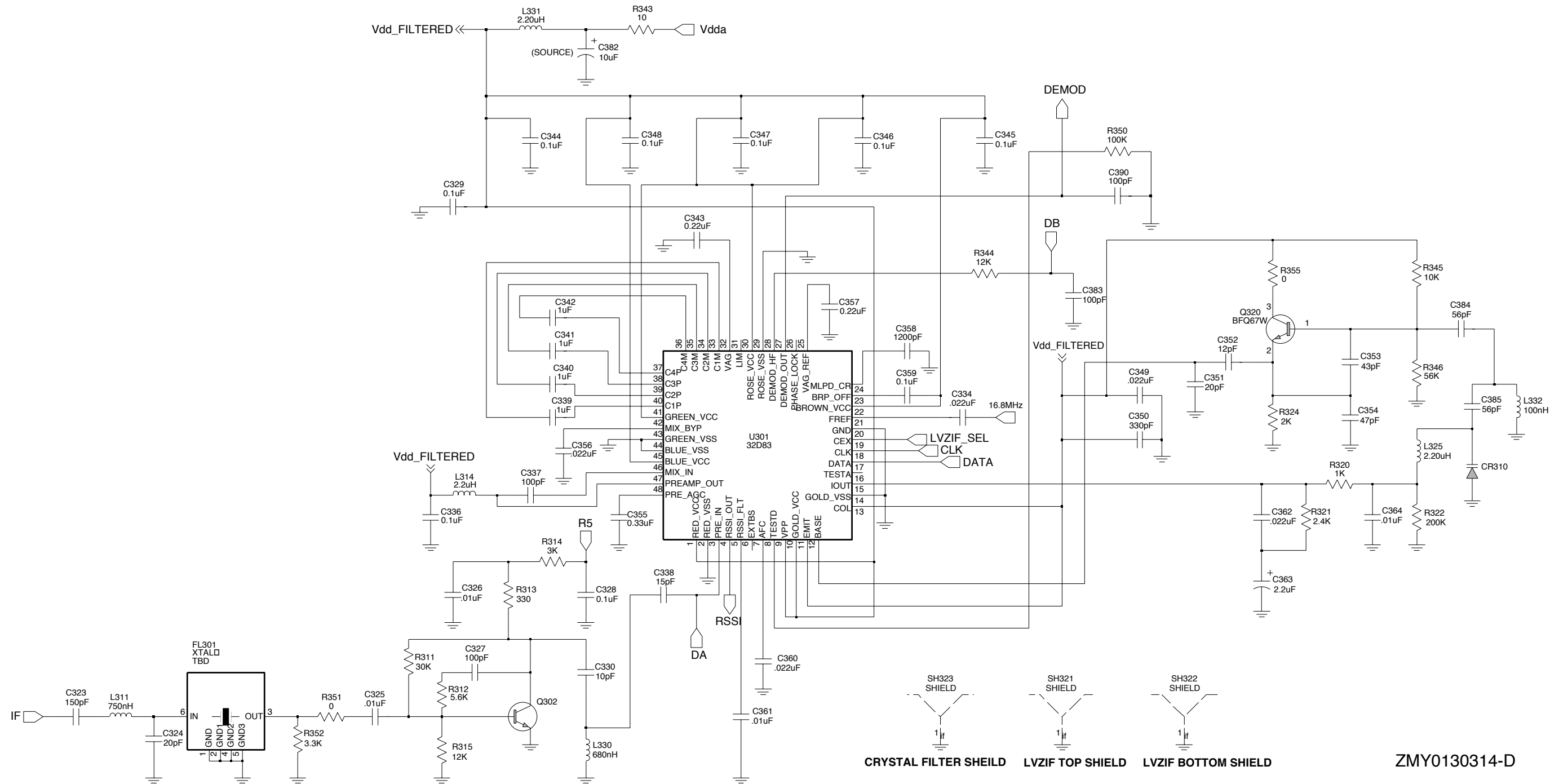


UHF Controls And Switches Schematic Diagram

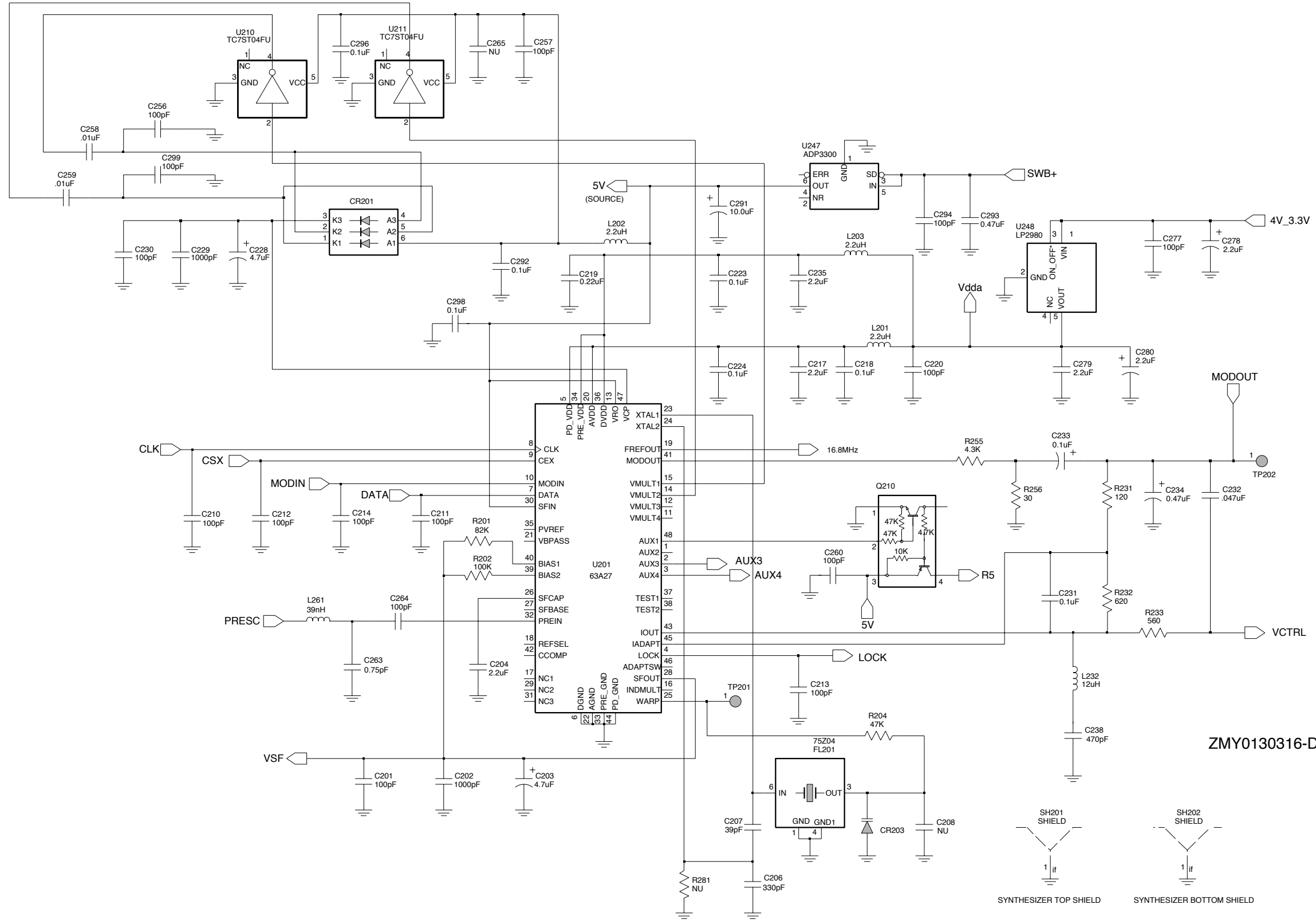


ZMY0130315-E

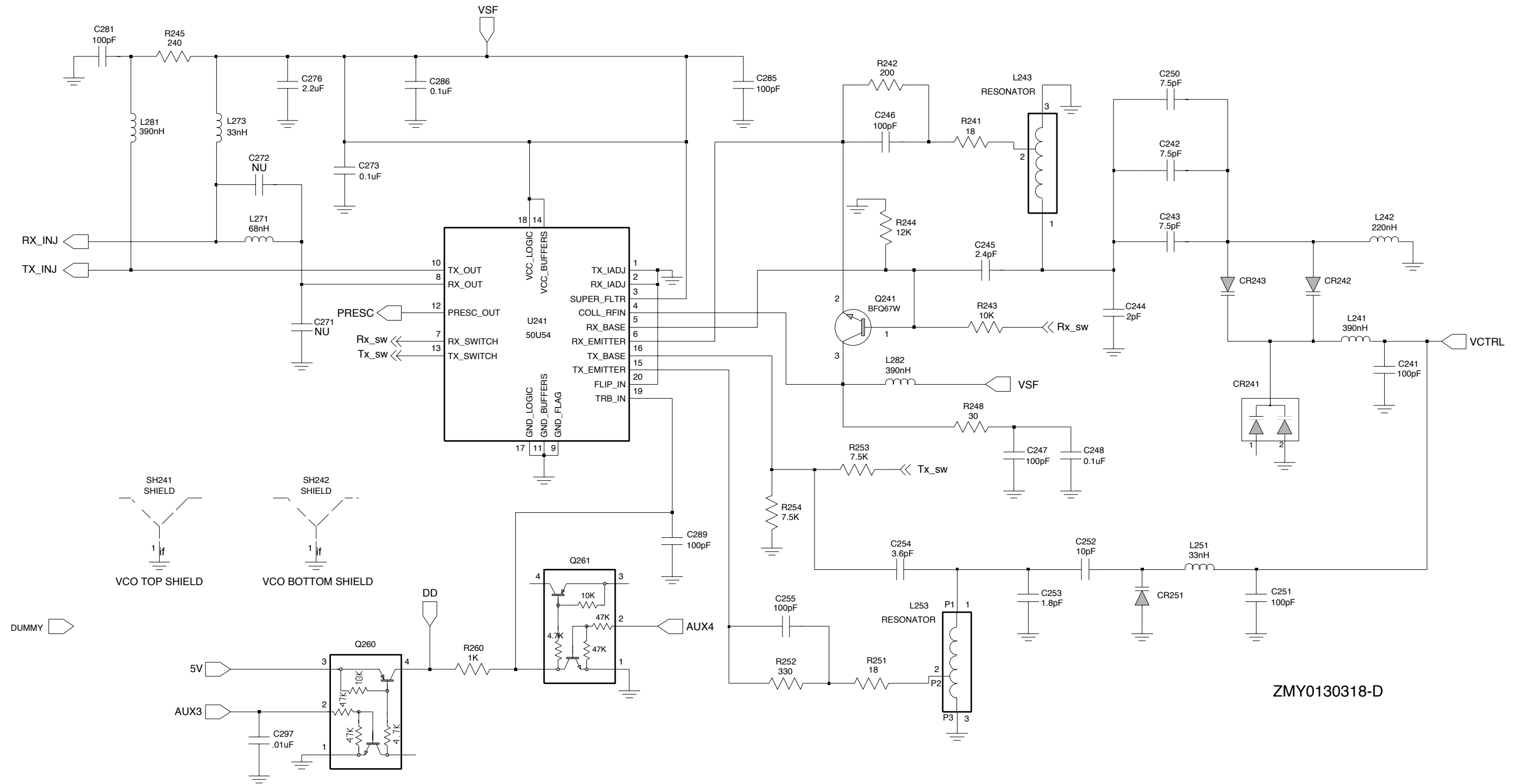
UHF Receiver Front End Schematic Diagram



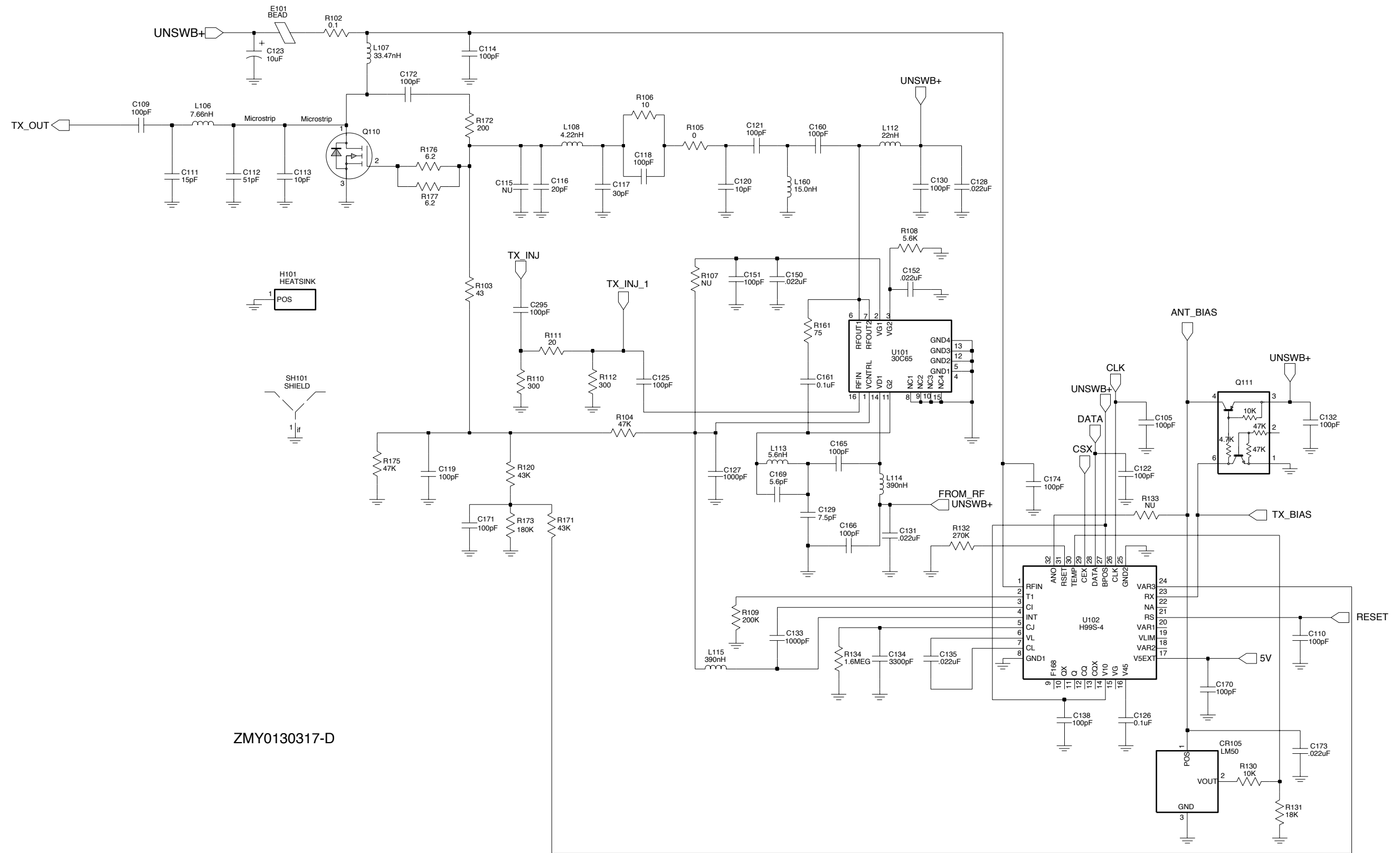
UHF Receiver Back End Schematic Diagram



UHF Synthesizer Schematic Diagram

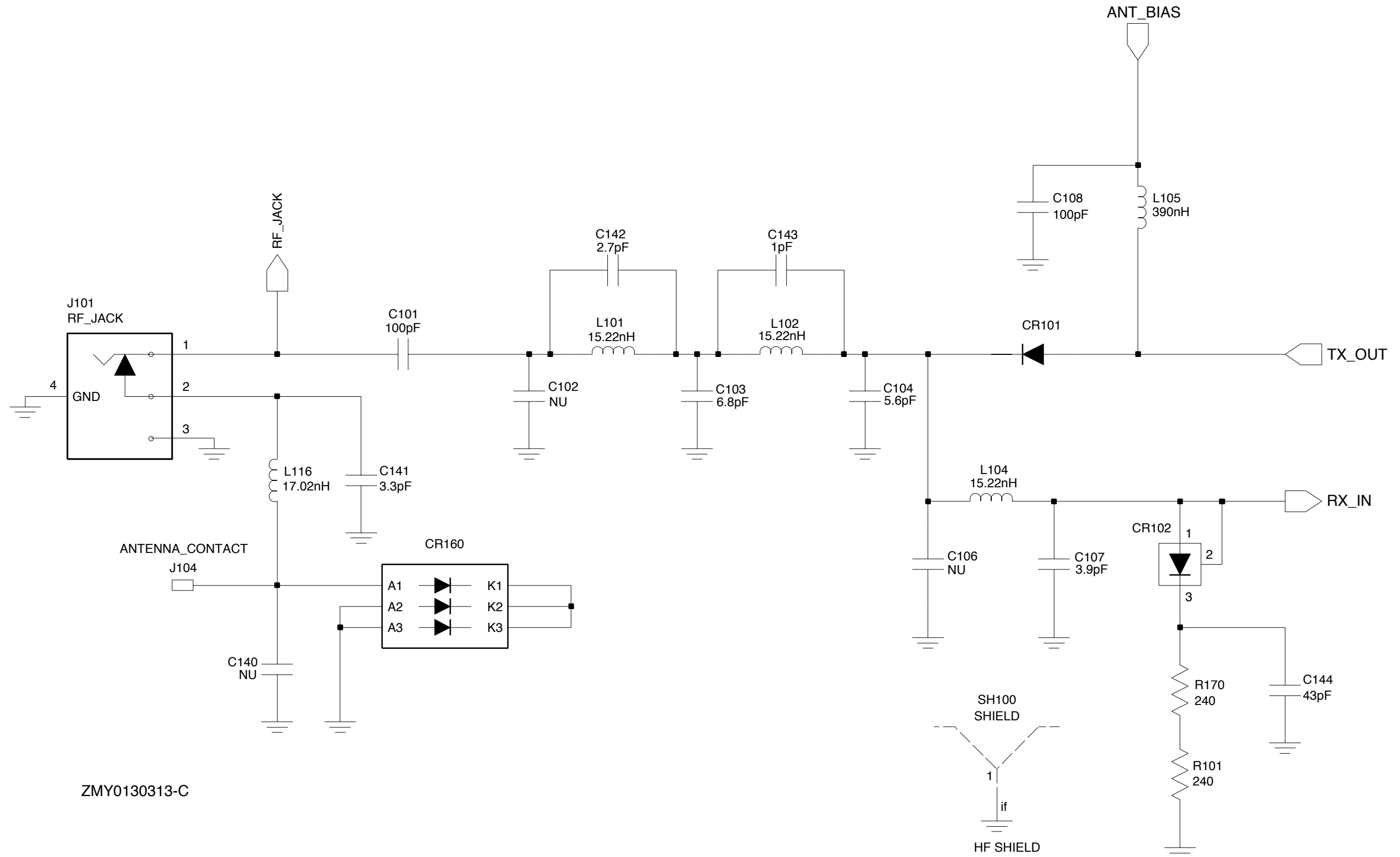


UHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130317-D

UHF Transmitter Schematic Diagram



ZMY0130313-C

UHF Harmonic Filter Schematic Diagram

UHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Connector, Battery Contact
C101	2113740F51	100pF
C102	Not Placed	GCAM Dummy Part Number
C103	2113740F23	6.8pF
C104	2113740F21	5.6pF
C105	2113743N50	100pF
C106	Not Placed	
C107	2113740F25	8.2pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F31	15pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	Not Placed	
C116	2113743N33	20pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N26	10pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	0.1uF
C127	2113743L17	1000pF
C128	2113743M08	0.022uF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	0.022uF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	0.022uF
C138	2113743N50	100pF
C140	Not Placed	
C141	2113740F15	3.3pF
C142	2113740F13	2.7pF
C143	2113740F03	1pF
C144	2113740F42	43pF
C150	2113743M08	0.022uF
C151	2113743N50	100pF
C152	2113743M08	0.022uF
C160	2113743N50	100pF
C161	2113743M24	0.1uF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C172	2113740F51	100pF
C173	2113743M08	0.022uF
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	Not Placed	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	0.1uF
C224	2113743M24	0.1uF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	0.1uF
C232	2113743E18	0.047uF
C233	2311049A01	0.1pF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C256	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	0.01uF
C259	2113743L41	0.01uF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C265	Not Placed	
C271	Not Placed	
C272	Not Placed	
C273	2113743M24	0.1uF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C280	2311049A40	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	0.1uF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF
C297	2113743L41	0.01uF
C298	2113743M24	0.1uF
C299	2113743N50	100pF
C301	2113743N22	6.8pF
C302	2113743N29	13pF
C303	2113740L08	3.9pF
C304	2113743N29	13pF
C305	2113743N33	20pF
C306	Not Placed	
C307	2113743M24	0.1uF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF
C311	Not Placed	
C312	2113743N29	13pF
C313	2113743N26	10pF
C314	2113743M24	0.1uF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	0.01uF
C326	2113743L41	0.01uF
C327	2113743N50	100pF
C328	2113743M24	0.1uF
C329	2113743M24	0.1uF

Circuit Ref	Motorola Part No.	Description
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	Not Placed	
C334	2113743M08	0.022uF
C336	2113743M24	0.1uF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1.0uF
C340	2180478Z20	1.0uF
C341	2180478Z20	1.0uF
C342	2180478Z20	1.0uF
C343	2113743A23	0.22uF
C344	2113743M24	0.1uF
C345	2113743M24	0.1uF
C346	2113743M24	0.1uF
C347	2113743M24	0.1uF
C348	2113743M24	0.1uF
C349	2113743E13	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.330uF
C356	2113743M08	0.022uF
C357	2113743A23	0.22uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E13	0.022uF
C361	2113741F49	10nF
C362	2113743M08	0.022uF
C363	2311049A40	2.2uF
C364	2113743L41	0.01uF
C370	2113743N50	100pF
C371	Not Placed	
C372	Not Placed	
C373	Not Placed	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	Not Placed	
C380	2113743L41	0.01uF
C381	2113743N23	7.5pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	Not Placed	
C395	2113743N50	100pF
C396	Not Placed	

Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description
C397	2311049A05	0.47uF	C472	2113743N50	100pF	CR203	4862824C03	Varactor	L242	2462587V38	220nH
C400	2113743L41	0.01uF	C473	2113743L09	470pF	CR241	4805649Q13	Dual Varactor	L243	2460593C01	Teflon Resonator, Rx
C401	2113743M24	0.1uF	C475	2113743H14	10uF	CR242	4862824C01	Varactor	L251	2462587V28	33nH
C402	2113743M24	0.1uF	C476	2113928D08	10uF	CR243	4862824C01	Varactor	L253	2460593C02	Teflon Resonator, Tx
C403	2113928D08	10uF	C477	2113743N50	100pF	CR251	4802245J22	Varactor	L261	2462587V29	39nH
C407	2113928N01	0.1uF	C478	2113743N50	100pF	CR301	4862824C01	Varactor	L271	2462587V32	68nH
C408	2113743N50	100pF	C479	2113928N01	0.1uF	CR302	4862824C01	Varactor	L273	2462587V28	33nH
C409	2113743M24	0.1uF	C480	2113928D08	10uF	CR303	4880154K03	Dual Common Anode-Cathode	L281	2462587V41	390nH
C410	2113928N01	0.1uF	C481	2113928N01	0.1uF	CR304	4862824C01	Varactor	L282	2462587V41	390nH
C411	2113743M24	0.1uF	C482	2113928N01	0.1uF	CR305	4862824C01	Varactor	L301	2479990C01	13.9nH
C412	2113928N01	0.1uF	C483	2113743L17	1000pF	CR306	4802245J42	Ring Quad Diode	L302	2479990C01	13.9nH
C414	2113743M24	0.1uF	C484	2113743L17	1000pF	CR308	4802245J41	Pin Diode	L303	2462587V26	22nH
C415	2185895Z01	0.01uF	C485	2113743L17	1000pF	CR310	4862824C01	Varactor	L304	2462587V37	180nH
C416	2113928N01	0.1uF	C486	Not Placed		CR412	4802245J62	Schottky Diode	L305	2462587V26	22nH
C419	Not Placed		C487	Not Placed		CR413	4802245J62	Schottky Diode	L306	2479990C01	13.9nH
C420	2113743L41	0.01uF	C488	Not Placed		CR414	4802245J62	Schottky Diode	L307	2479990C01	13.9nH
C421	2113928N01	0.1uF	C489	Not Placed		CR440	4813833C02	Dual Diode Common Cathode	L309	2479990C02	16.28nH
C422	2113743M24	0.1uF	C493	Not Placed		CR501	4880107R01	Rectifier	L310	2462587V36	150nH
C423	2113743N50	100pF	C494	2113743N50	100pF	CR503	4805729G49	LED Red/Yel	L311	2462587N65	750nH
C424	2311049A59	10uF	C498	2113743N50	100pF	E101	2484657R01	Ferrite Bead	L314	2462587N72	2.2uH
C425	2113743M24	0.1uF	C499	2113743N50	100pF	E400	2480640Z01	Ferrite Bead	L321	Not Placed	
C426	2113743N50	100pF	C500	2113743L17	1000pF	F501	6580542Z01	3A Fuse	L325	2480646Z20	2.2uH
C427	2113743N50	100pF	C501	2113743L17	1000pF	FL201	4805875Z04	16.8MHz Crystal Oscillator	L330	2462587N64	680nH
C428	2113743M24	0.1uF	C502	2311049A05	0.47uF	FL301	4802245J43	Xtal Filter 45.1Mhz	L331	2480646Z20	2.2uH
C429	2113743M24	0.1uF	C503	2113743N50	100pF	H101	2680499Z01	Heat Spreader	L332	2462587N53	100nH
C430	2113928N01	0.1uF	C504	2113743L17	1000pF	J101	0985613Z01	RF Jack	L340	2462587V41	390nH
C431	2113743N50	100pF	C505	2113743N50	100pF	J104	3980686Z01	Antenna Contact	L400	2462587Q42	390nH
C432	Not Placed		C506	2113743N50	100pF	J400	0905505Y04	40-Pin Connector	L410	2462587Q42	390nH
C433	2113743L41	0.01uF	C507	2113743L17	1000pF	J402	2809926G02	4-Pin Connector	L411	2462587Q42	390nH
C434	2113743M24	0.1uF	C508	2113743N50	100pF	J404	0980689Z01	Connector(Stereo Jack 2.5MM)	L505	2462587Q42	390nH
C435	2113743M24	0.1uF	C509	2113743L17	1000pF	J407	0980688Z01	Connector(Mono Jack 3.5MM)	PB501	4080523Z01	Tactile Push Button
C440	2113743G26	4.7uF	C511	2113743N50	100pF	L101	2460591B48	15.22nH, 10%	PB502	4080523Z01	Tactile Push Button
C442	2113743E26	0.10uF	C512	2113743N50	100pF	L102	2460591B48	15.22nH, 10%	PB504	4080523Z01	Tactile Push Button
C443	2113928N01	0.1uF	C513	2113743N50	100pF	L104	2460591B48	15.22nH, 10%	Q110	4813828A09	FET Transistor
C446	2113743M08	0.022uF	C514	2113743N50	100pF	L105	2462587N22	390nH	Q111	4802245J50	Dual NPN/PNP Transistor
C447	2113928N01	0.1uF	C515	2113743M24	0.1uF	L106	2479990A02	7.66nH	Q210	4802245J50	Dual NPN/PNP Transistor
C449	2113743N50	100pF	C518	2113743L17	1000pF	L107	2479990G01	33.47nH	Q241	4805218N63	NPN Transistor
C450	Not Placed		C519	2113743L17	1000pF	L108	2479990A01	4.22nH	Q260	4802245J50	Dual NPN/PNP Transistor
C451	2113743M08	0.022uF	C520	2113743L17	1000pF	L112	2462587N45	22nH	Q261	4802245J50	Dual NPN/PNP Transistor
C452	2113743G26	4.7uF	C521	2113743L41	0.01uF	L113	2413926H09	5.6nH	Q301	4802245J44	NPN Transistor
C453	2113743N50	100pF	C522	2113743L41	0.01uF	L114	2462587N22	390nH	Q302	4802245J44	NPN Transistor
C454	2113743N50	100pF	C523	2113743N50	100pF	L115	2462587N22	390nH	Q310	Not Placed	
C455	2113743L09	470pF	C524	2113743L17	1000pF	L116	2460591B56	17.37nH	Q315	4880214G02	NPN Transistor
C456	2113743N50	100pF	C525	2113743N50	100pF	L160	Not Placed		Q316	Not Placed	
C458	2113743N50	100pF	C526	2113743L17	1000pF	L201	2462587Q20	2.2uH	Q320	4805218N63	NPN Transistor
C459	2113743N50	100pF	C527	2113743N50	100pF	L202	2462587Q20	2.2uH	Q400	4809579E18	MOSFET P-Channel
C463	2113743N50	100pF	C528	2113743L17	1000pF	L203	2462587Q20	2.2uH	Q403	4813824A17	Bipolar Transistor
C466	2113743N50	100pF	CR101	4880973Z02	Pin Diode	L232	2462587P25	12uH	Q405	4802245J54	Dual NPN Transistor
C467	2113928N01	0.1uF	CR102	4802245J41	Pin Diode	L241	2462587V41	390nH	Q410	4802245J54	Dual NPN Transistor
C470	2113743N50	100pF	CR105	5185963A15	Temperature Sense				Q417	4802245J50	Dual NPN/PNP Transistor
C471	2113743N50	100pF	CR201	4802233J09	Triple Diode				Q418	4802245J50	Dual NPN/PNP Transistor

Circuit Ref	Motorola Part No.	Description
Q419	5180159R01	Dual NPN Transistor
Q420	4805128M67	PNP Transistor
Q421	4880214G02	NPN Transistor
Q431	5180159R01	Dual NPN Transistor
Q433	4880214G02	NPN Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
Q506	4802245J50	Dual NPN/PNP Transistor
R101	0662057A34	240
R102	0680539Z01	0.1
R103	0662057M41	43
R104	0662057N15	47K
R105	0662057C01	0
R106	0662057M26	10
R107	Not Placed	
R108	0662057M92	5.6K
R109	0662057N30	200K
R110	0662057M61	300
R111	0662057M33	20
R112	0662057M61	300
R120	0662057N14	43K
R130	0662057M98	10K
R131	0662057N05	18K
R132	0662057N33	270K
R133	Not Placed	
R134	0662057N52	1.6M
R161	0662057M47	75
R170	0662057A34	240
R171	0662057N14	43K
R172	0662057A32	200
R173	0662057N29	180K
R174	0662057N15	47K
R176	0662057B67	6.2
R177	0662057B67	6.2
R201	0662057N21	82K
R202	0662057N23	100K
R204	0662057N15	47K
R231	0662057M52	120
R232	0662057M69	620
R233	0662057M68	560
R241	0662057M32	18
R242	0662057M57	200
R243	0662057M98	10K
R244	0662057N01	12K
R245	0662057M59	240
R248	0662057M37	30
R251	0662057M32	18
R252	0662057M62	330
R253	0662057M95	7.5K
R254	0662057M95	7.5K
R255	0662057M89	4.3K

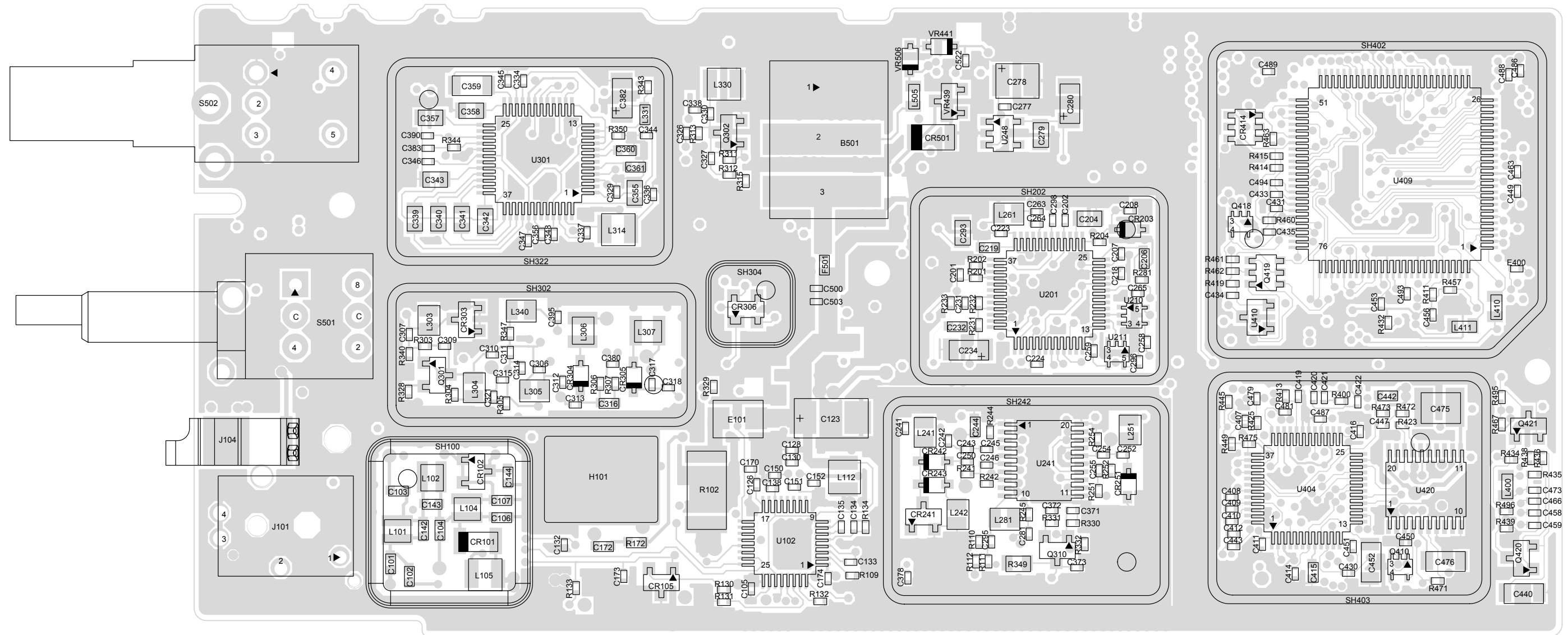
Circuit Ref	Motorola Part No.	Description
R256	0662057M37	30
R260	0662057M74	1K
R281	Not Placed	
R300	0662057M82	2.2K
R301	0662057N23	100K
R302	0662057N23	100K
R303	0662057M89	4.3K
R304	0662057N01	12K
R305	0662057M67	0
R306	0662057N23	100K
R307	0662057N23	100K
R308	0662057M42	47
R309	0662057M01	0
R310	0662057M60	270
R311	0662057N10	30K
R312	0662057M92	5.6K
R313	0662057M62	330
R314	0662057M85	3K
R315	0662057N01	12K
R316	0662057A96	91K
R317	0662057M74	1K
R318	0662057A79	18K
R319	0662057A29	150
R320	0662057M74	1K
R321	0662057M83	2.4K
R322	0662057N30	200K
R324	0662057M81	2K
R325	0662057M94	6.8K
R326	Not Placed	
R327	0662057N11	33K
R328	0662057M01	0
R329	0662057M01	0
R330	Not Placed	
R331	Not Placed	
R332	Not Placed	
R333	Not Placed	
R334	Not Placed	
R335	Not Placed	
R336	Not Placed	
R338	Not Placed	
R339	0662057M01	0
R340	0662057M94	6.8K
R342	0662057N23	100K
R343	0662057M26	10
R344	0662057N01	12K
R345	0662057M98	10K
R346	0662057N17	56K
R347	0662057M74	1K
R348	0662057M87	3.6K
R349	0662057C01	0
R350	0662057N23	100K

Circuit Ref	Motorola Part No.	Description
R351	0662057C01	0
R352	0662057M86	3.3K
R355	0662057M01	0
R400	0662057N15	47K
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R408	Not Placed	
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M90	4.7K
R423	0662057N39	470K
R425	0662057N10	30K
R427	0662057M98	10K
R428	0662057M10	2.2
R429	0662057M98	10K
R432	0662057N16	51K
R434	Not Placed	
R435	0662057M81	2K
R436	0662057N15	47K
R437	Not Placed	
R438	0662057M01	0
R439	0662057N23	100K
R445	0662057N08	24K
R446	Not Placed	
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R451	0662057N03	15K
R452	0662057N23	100K
R454	Not Placed	
R455	Not Placed	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057N23	100K
R462	0662057N23	100K
R463	0662057M61	300
R467	0662057M98	10K
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K

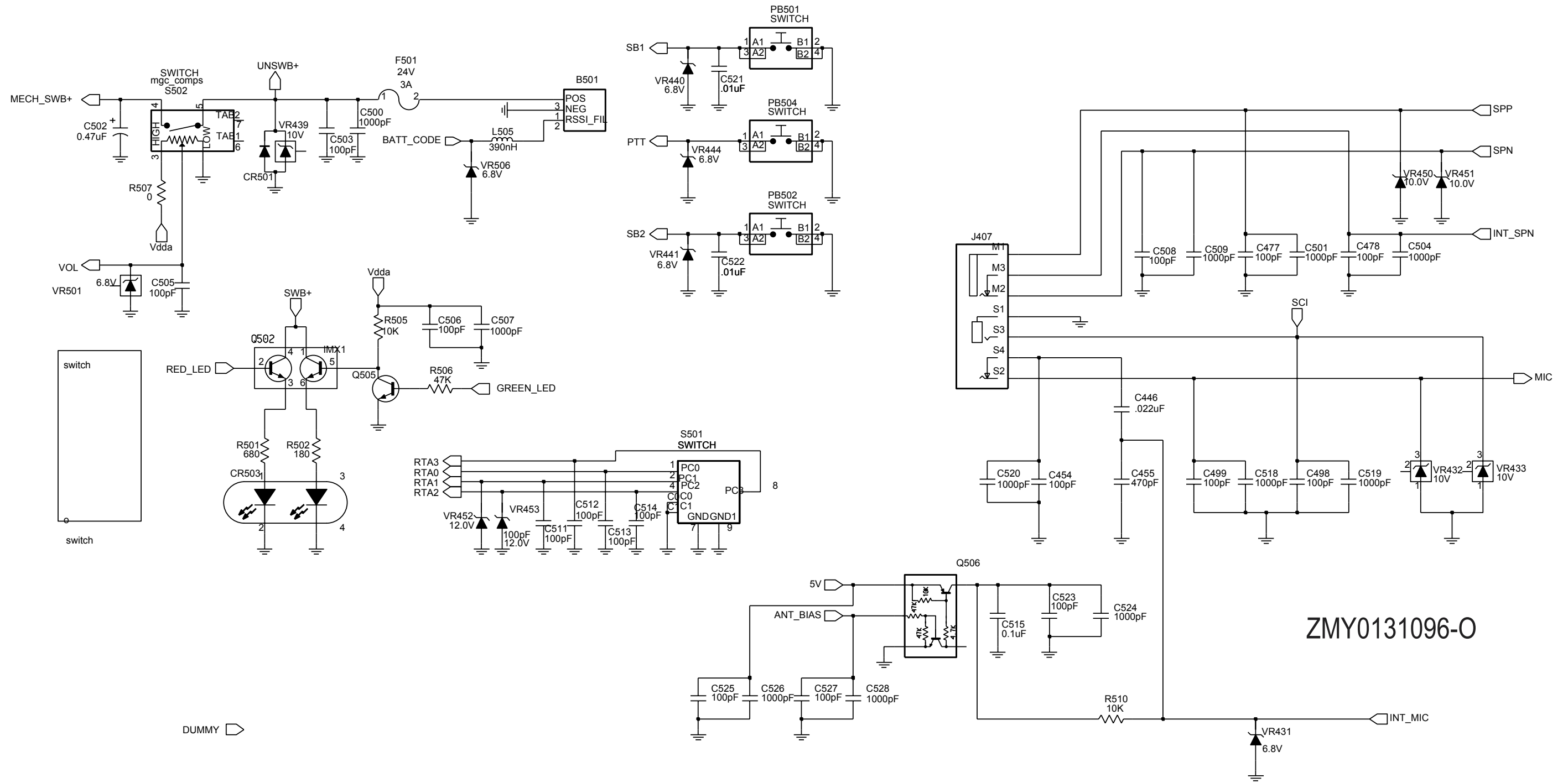
Circuit Ref	Motorola Part No.	Description
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R493	Not Placed	
R494	0662057M01	0
R495	0662057N23	100K
R496	0662057N23	100K
R498	0662057N23	100K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R510	0662057M98	10K
RT300	0680590Z01	Thermistor_33K
RT301	Not Placed	
RT400	0680590Z01	Thermistor_33K
S501	4080710Z01	Channel Switch
S502	1880619Z02	Volume Switch
SH100	2680687Z01	Shield, Harmonic Filter
SH101	2680510Z01	Shield, PA
SH201	2680511Z01	Shield, LVFRACN Synthesizer top
SH202	2680511Z01	Shield, LVFRACN Synthesizer bottom
SH241	2680513Z01	Shield, VCO Top
SH242	2680514Z01	Shield, VCO Bottom
SH301	2680554Z01	Rx Front end top shield
SH302	2680555Z01	Rx Front end bottom shield
SH303	2680509Z01	Shield, Mixer
SH304	2680624Z01	Shield, Mixer Diode
SH321	2680508Z01	Shield, LVZIF 2nd LO
SH322	2680514Z01	LVZIF Shield
SH323	2680553Z01	Shield, Crystal Filter
SH400	2680505Z01	Control Memory Shield
SH401	2680506Z01	On/Off Controller Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	ASFIC Cmp/Audio PA Controller Shield
T301	2580541Z01	ZFMR Coil
T302	2580541Z01	ZFMR Coil
U101	5185130C65	LDMOS Driver IC
U102	5185765B28	Power Control IC
U201	5185963A27	LVFRACN Synthesizer IC
U210	5102463J61	Inverter
U211	5102463J61	Inverter
U241	5105750U54	VCO Buffer IC
U247	5105739X05	5V Regulator
U248	5102463J58	3.3V Regulator
U301	5109632D83	LVZIF IC

Circuit Ref	Motorola Part No.	Description
U400	5102463J40	3.3V Regulator
U404	5105109Z41	ASFIC_CMP
U405	Not Placed	
U406	*5102463J59	Flash ROM 128K X 8
U407	*5102463J64	16K X 8 EEPROM
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Regulator
U420	5102463J44	Audio PA
VR300	Not Placed	
VR431	4802245J73	6.8V Zener
VR432	4880140L15	10V Zener
VR433	4880140L15	10V Zener
VR439	4880140L15	10V Zener
VR440	4802245J73	6.8V Zener
VR441	4802245J73	6.8V Zener
VR444	4802245J73	6.8V Zener
VR450	4802245J74	10V Zener
VR451	4802245J74	10V Zener
VR501	4813830A18	6.8V Zener
VR506	4802245J73	6.8V Zener
	1485777Z01	Insulator (Kapton)
	8480672Z04	UHF B1 PC Board

* Motorola Depot Servicing only

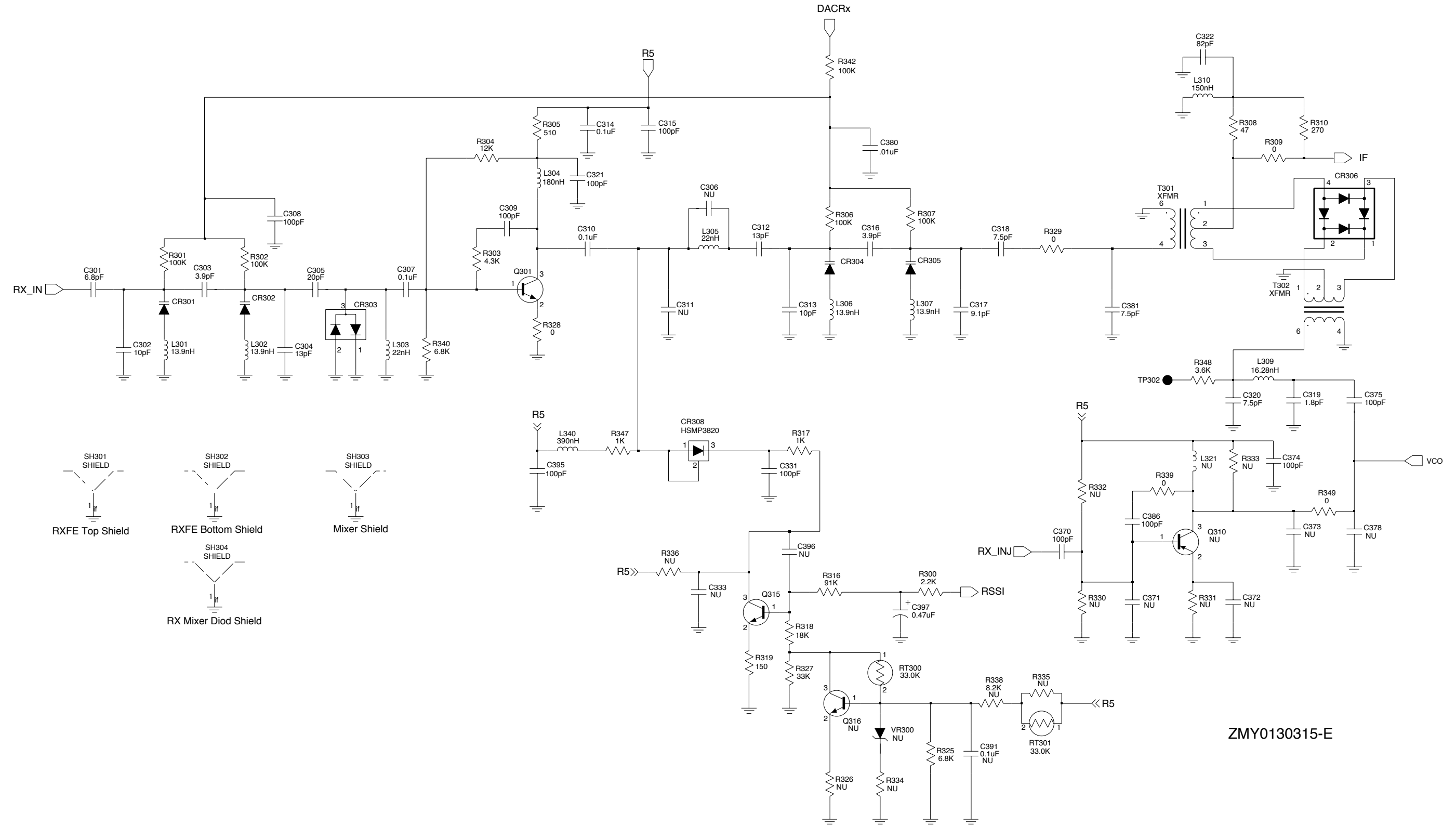


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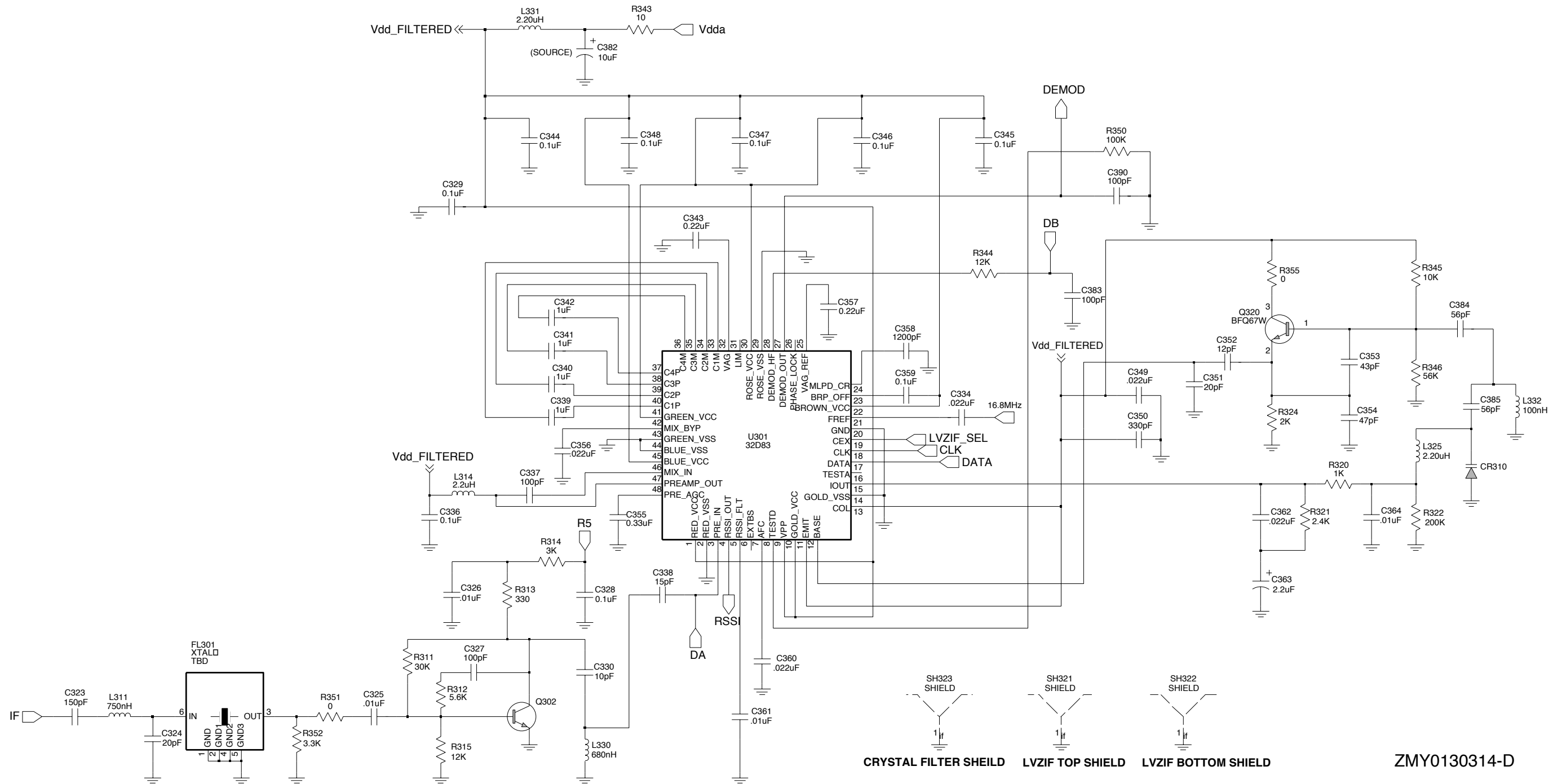


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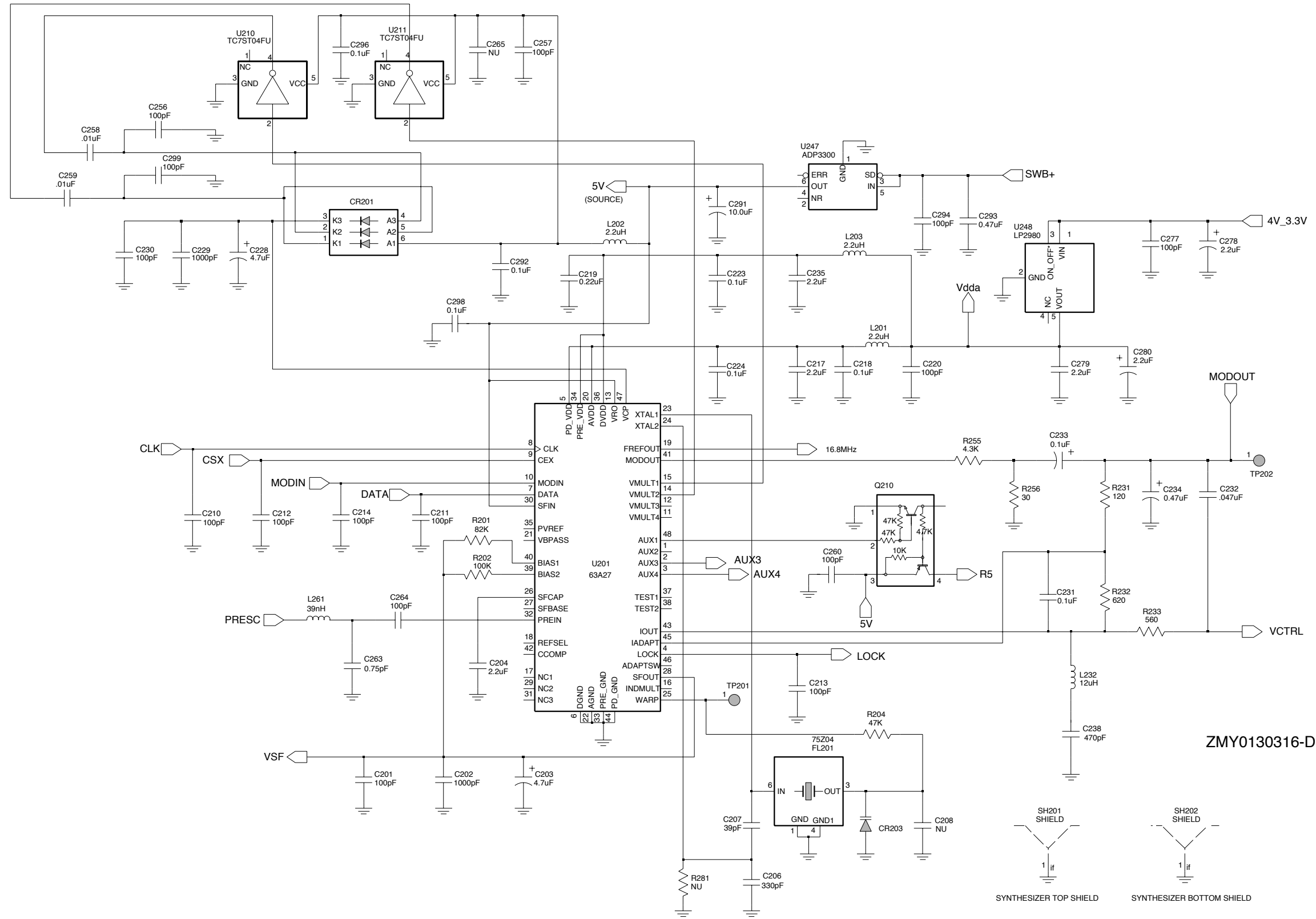
UHF Controls And Switches Schematic Diagram



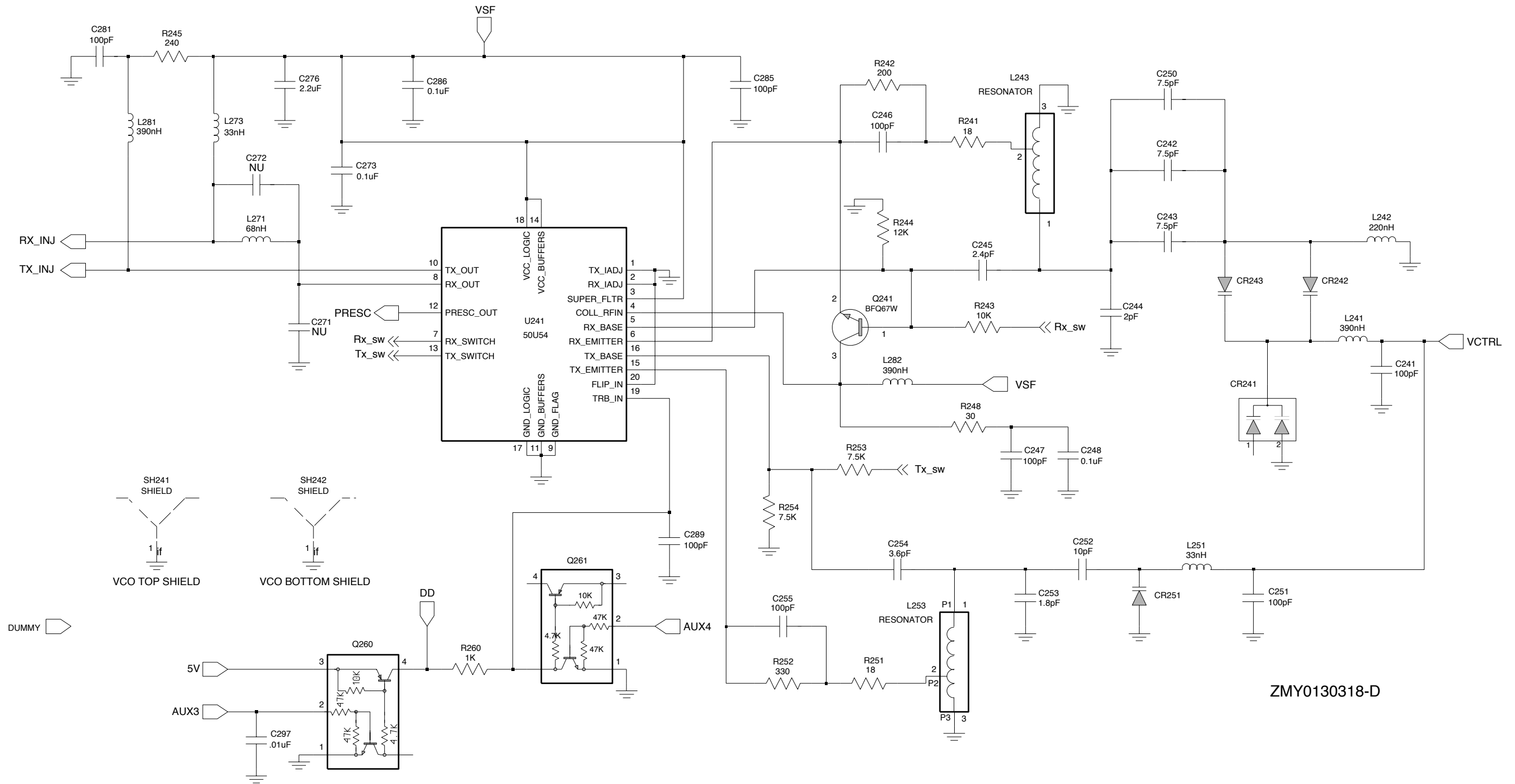
UHF Receiver Front End Schematic Diagram



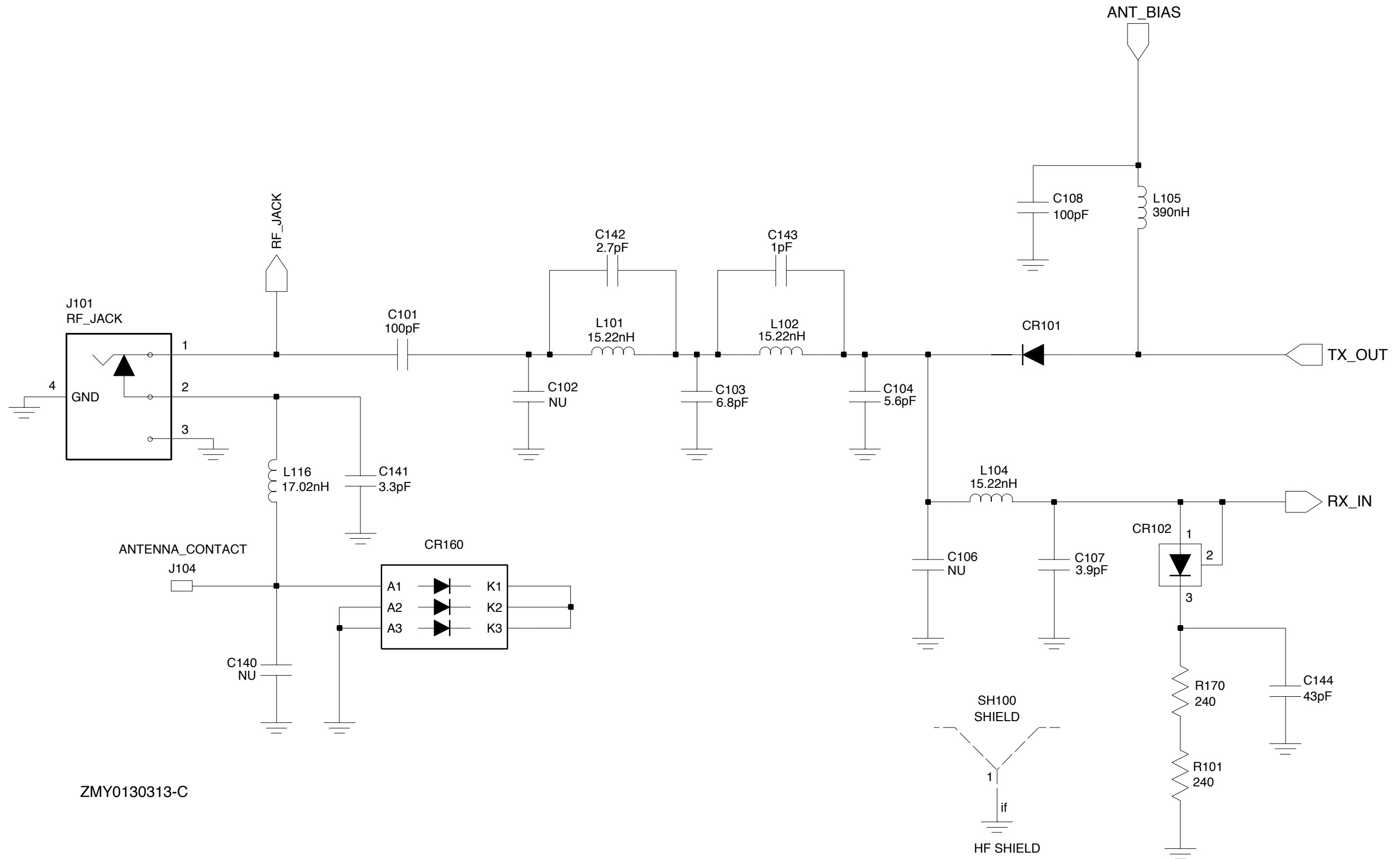
UHF Receiver Back End Schematic Diagram



UHF Synthesizer Schematic Diagram



UHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130313-C

UHF Harmonic Filter Schematic Diagram

UHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Connector, Battery Contact
C101	2113740F51	100pF
C102	Not Placed	GCAM Dummy Part Number
C103	2113740F23	6.8pF
C104	2113740F21	5.6pF
C105	2113743N50	100pF
C106	Not Placed	
C107	2113740F25	8.2pF
C108	2113743N50	100pF
C109	2113740F51	100pF
C110	2113743N50	100pF
C111	2113740F31	15pF
C113	2180605Z16	10pF
C114	2113743N50	100pF
C115	Not Placed	
C116	2113743N33	20pF
C118	2113743N50	100pF
C119	2113743N50	100pF
C120	2113743N26	10pF
C121	2113743N50	100pF
C122	2113743N50	100pF
C123	2311049A18	10uF
C125	2113743N50	100pF
C126	2113743M24	0.1uF
C127	2113743L17	1000pF
C128	2113743M08	0.022uF
C129	2113743N23	7.5pF
C130	2113743N50	100pF
C131	2113743M08	0.022uF
C132	2113743N50	100pF
C133	2113743L17	1000pF
C134	2113743L29	3300pF
C135	2113743M08	0.022uF
C138	2113743N50	100pF
C140	Not Placed	
C141	2113740F15	3.3pF
C142	2113740F13	2.7pF
C143	2113740F03	1pF
C144	2113740F42	43pF
C150	2113743M08	0.022uF
C151	2113743N50	100pF
C152	2113743M08	0.022uF
C160	2113743N50	100pF
C161	2113743M24	0.1uF
C165	2113743N50	100pF
C166	2113743N50	100pF
C169	2113743N20	5.6pF
C170	2113743N50	100pF
C171	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C172	2113740F51	100pF
C173	2113743M08	0.022uF
C174	2113743N50	100pF
C201	2113743N50	100pF
C202	2113743L17	1000pF
C203	2311049A56	4.7uF
C204	2104993J02	2.2uF
C206	2113740F63	330pF
C207	2113743N40	39pF
C208	Not Placed	
C210	2113743N50	100pF
C211	2113743N50	100pF
C212	2113743N50	100pF
C213	2113743N50	100pF
C214	2113743N50	100pF
C217	2104993J02	2.2uF
C218	2113743M24	0.1uF
C219	2113743K16	0.22uF
C220	2113743N50	100pF
C223	2113743M24	0.1uF
C224	2113743M24	0.1uF
C228	2311049J11	4.7uF
C229	2113743L17	1000pF
C230	2113743N50	100pF
C231	2113743M24	0.1uF
C232	2113743E18	0.047uF
C233	2311049A01	0.1pF
C234	2311049A05	0.47uF
C235	2104993J02	2.2uF
C238	2113741F17	470pF
C241	2113743N50	100pF
C242	2113743N23	7.5pF
C243	2113743N23	7.5pF
C244	2113740F10	2.0pF
C245	2113743N11	2.4pF
C246	2113743N50	100pF
C247	2113743N50	100pF
C248	2113743M24	0.1uF
C250	2113743N23	7.5pF
C251	2113743N50	100pF
C252	2113743N26	10pF
C253	2113740F09	1.8pF
C254	2113743N15	3.6pF
C255	2113743N50	100pF
C256	2113743N50	100pF
C257	2113743N50	100pF
C258	2113743L41	0.01uF
C259	2113743L41	0.01uF
C260	2113743N50	100pF
C263	2113743N02	0.75pF
C264	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C265	Not Placed	
C271	Not Placed	
C272	Not Placed	
C273	2113743M24	0.1uF
C276	2104993J02	2.2uF
C277	2113743N50	100pF
C278	2311049A09	2.2uF
C279	2104993J02	2.2uF
C280	2311049A40	2.2uF
C281	2113743N50	100pF
C285	2113743N50	100pF
C286	2113743M24	0.1uF
C289	2113743N50	100pF
C291	2311049A69	10uF
C292	2113743M24	0.1uF
C293	2113743A27	0.47uF
C294	2113743N50	100pF
C295	2113743N50	100pF
C296	2113743M24	0.1uF
C297	2113743L41	0.01uF
C298	2113743M24	0.1uF
C299	2113743N50	100pF
C301	2113743N22	6.8pF
C302	2113743N29	13pF
C303	2113740L08	3.9pF
C304	2113743N29	13pF
C305	2113743N33	20pF
C306	Not Placed	
C307	2113743M24	0.1uF
C308	2113743N50	100pF
C309	2113743N50	100pF
C310	2113743M24	0.1uF
C311	Not Placed	
C312	2113743N29	13pF
C313	2113743N26	10pF
C314	2113743M24	0.1uF
C315	2113743N50	100pF
C316	2113740L08	3.9pF
C317	2113743N25	9.1pF
C318	2113743N23	7.5pF
C319	2113743N69	1.8pF
C320	2113743N23	7.5pF
C321	2113743N50	100pF
C322	2113743N48	82pF
C323	2113743N54	150pF
C324	2113743N33	20pF
C325	2113743L41	0.01uF
C326	2113743L41	0.01uF
C327	2113743N50	100pF
C328	2113743M24	0.1uF
C329	2113743M24	0.1uF

Circuit Ref	Motorola Part No.	Description
C330	2113743N26	10pF
C331	2113743N50	100pF
C333	Not Placed	
C334	2113743M08	0.022uF
C336	2113743M24	0.1uF
C337	2113743N50	100pF
C338	2113743N30	15pF
C339	2180478Z20	1.0uF
C340	2180478Z20	1.0uF
C341	2180478Z20	1.0uF
C342	2180478Z20	1.0uF
C343	2113743A23	0.22uF
C344	2113743M24	0.1uF
C345	2113743M24	0.1uF
C346	2113743M24	0.1uF
C347	2113743M24	0.1uF
C348	2113743M24	0.1uF
C349	2113743E13	0.022uF
C350	2113743L05	330pF
C351	2113743N33	20pF
C352	2113743N28	12pF
C353	2113743N41	43pF
C354	2113743N42	47pF
C355	2113743A24	0.330uF
C356	2113743M08	0.022uF
C357	2113743A23	0.22uF
C358	2113741A23	1200pF
C359	2109720D14	0.1uF
C360	2113743E13	0.022uF
C361	2113741F49	10nF
C362	2113743M08	0.022uF
C363	2311049A40	2.2uF
C364	2113743L41	0.01uF
C370	2113743N50	100pF
C371	Not Placed	
C372	Not Placed	
C373	Not Placed	
C374	2113743N50	100pF
C375	2113743N50	100pF
C378	Not Placed	
C380	2113743L41	0.01uF
C381	2113743N23	7.5pF
C382	2311049A59	10uF
C383	2113743N50	100pF
C384	2113743N44	56pF
C385	2113743N44	56pF
C386	2113743N50	100pF
C390	2113743N50	100pF
C391	Not Placed	
C395	2113743N50	100pF
C396	Not Placed	

Circuit Ref	Motorola Part No.	Description
C397	2311049A05	0.47uF
C400	2113743L41	0.01uF
C401	2113743M24	0.1uF
C402	2113743M24	0.1uF
C403	2113928D08	10uF
C407	2113928N01	0.1uF
C408	2113743N50	100pF
C409	2113743M24	0.1uF
C410	2113928N01	0.1uF
C411	2113743M24	0.1uF
C412	2113928N01	0.1uF
C414	2113743M24	0.1uF
C415	2185895Z01	0.01uF
C416	2113928N01	0.1uF
C419	Not Placed	
C420	2113743L41	0.01uF
C421	2113928N01	0.1uF
C422	2113743M24	0.1uF
C423	2113743N50	100pF
C424	2311049A59	10uF
C425	2113743M24	0.1uF
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	0.1uF
C429	2113743M24	0.1uF
C430	2113928N01	0.1uF
C431	2113743N50	100pF
C432	Not Placed	
C433	2113743L41	0.01uF
C434	2113743M24	0.1uF
C435	2113743M24	0.1uF
C440	2113743G26	4.7uF
C442	2113743E26	0.10uF
C443	2113928N01	0.1uF
C446	2113743M08	0.022uF
C447	2113928N01	0.1uF
C449	2113743N50	100pF
C450	Not Placed	
C451	2113743M08	0.022uF
C452	2113743G26	4.7uF
C453	2113743N50	100pF
C454	2113743N50	100pF
C455	2113743L09	470pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF
C470	2113743N50	100pF
C471	2113743N50	100pF

Circuit Ref	Motorola Part No.	Description
C472	2113743N50	100pF
C473	2113743L09	470pF
C475	2113743H14	10uF
C476	2113928D08	10uF
C477	2113743N50	100pF
C478	2113743N50	100pF
C479	2113928N01	0.1uF
C480	2113928D08	10uF
C481	2113928N01	0.1uF
C482	2113928N01	0.1uF
C483	2113743L17	1000pF
C484	2113743L17	1000pF
C485	2113743L17	1000pF
C486	Not Placed	
C487	Not Placed	
C488	Not Placed	
C489	Not Placed	
C493	Not Placed	
C494	2113743N50	100pF
C498	2113743N50	100pF
C499	2113743N50	100pF
C500	2113743L17	1000pF
C501	2113743L17	1000pF
C502	2311049A05	0.47uF
C503	2113743N50	100pF
C504	2113743L17	1000pF
C505	2113743N50	100pF
C506	2113743N50	100pF
C507	2113743L17	1000pF
C508	2113743N50	100pF
C509	2113743L17	1000pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C515	2113743M24	0.1uF
C518	2113743L17	1000pF
C519	2113743L17	1000pF
C520	2113743L17	1000pF
C521	2113743L41	0.01uF
C522	2113743L41	0.01uF
C523	2113743N50	100pF
C524	2113743L17	1000pF
C525	2113743N50	100pF
C526	2113743L17	1000pF
C527	2113743N50	100pF
C528	2113743L17	1000pF
CR101	4880973Z02	Pin Diode
CR102	4802245J41	Pin Diode
CR105	5185963A15	Temperature Sense
CR201	4802233J09	Triple Diode

Circuit Ref	Motorola Part No.	Description
CR203	4862824C03	Varactor
CR241	4805649Q13	Dual Varactor
CR242	4862824C01	Varactor
CR243	4862824C01	Varactor
CR251	4802245J22	Varactor
CR301	4862824C01	Varactor
CR302	4862824C01	Varactor
CR303	4880154K03	Dual Common Anode-Cathode
CR304	4862824C01	Varactor
CR305	4862824C01	Varactor
CR306	4802245J42	Ring Quad Diode
CR308	4802245J41	Pin Diode
CR310	4862824C01	Varactor
CR412	4802245J62	Schottky Diode
CR413	4802245J62	Schottky Diode
CR414	4802245J62	Schottky Diode
CR440	4813833C02	Dual Diode Common Cathode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yel
E101	2484657R01	Ferrite Bead
E400	2480640Z01	Ferrite Bead
F501	6580542Z01	3A Fuse
FL201	4805875Z04	16.8MHz Crystal Oscillator
FL301	4802245J43	Xtal Filter 45.1Mhz
H101	2680499Z01	Heat Spreader
J101	0985613Z01	RF Jack
J104	3980686Z01	Antenna Contact
J400	0905505Y04	40-Pin Connector
J402	2809926G02	4-Pin Connector
J404	Not Placed	
J407	0980683Z01	Connector(Mono Jack 3.5MM)
L101	2460591B48	15.22nH, 10%
L102	2460591B48	15.22nH, 10%
L104	2460591B48	15.22nH, 10%
L105	2462587N22	390nH
L106	2479990A02	7.66nH
L107	2479990G01	33.47nH
L108	2479990A01	4.22nH
L112	2462587N45	22nH
L113	2413926H09	5.6nH
L114	2462587N22	390nH
L115	2462587N22	390nH
L116	2460591B56	17.37nH
L160	Not Placed	
L201	2462587Q20	2.2uH
L202	2462587Q20	2.2uH
L203	2462587Q20	2.2uH
L232	2462587P25	12uH
L241	2462587V41	390nH
L242	2462587V38	220nH

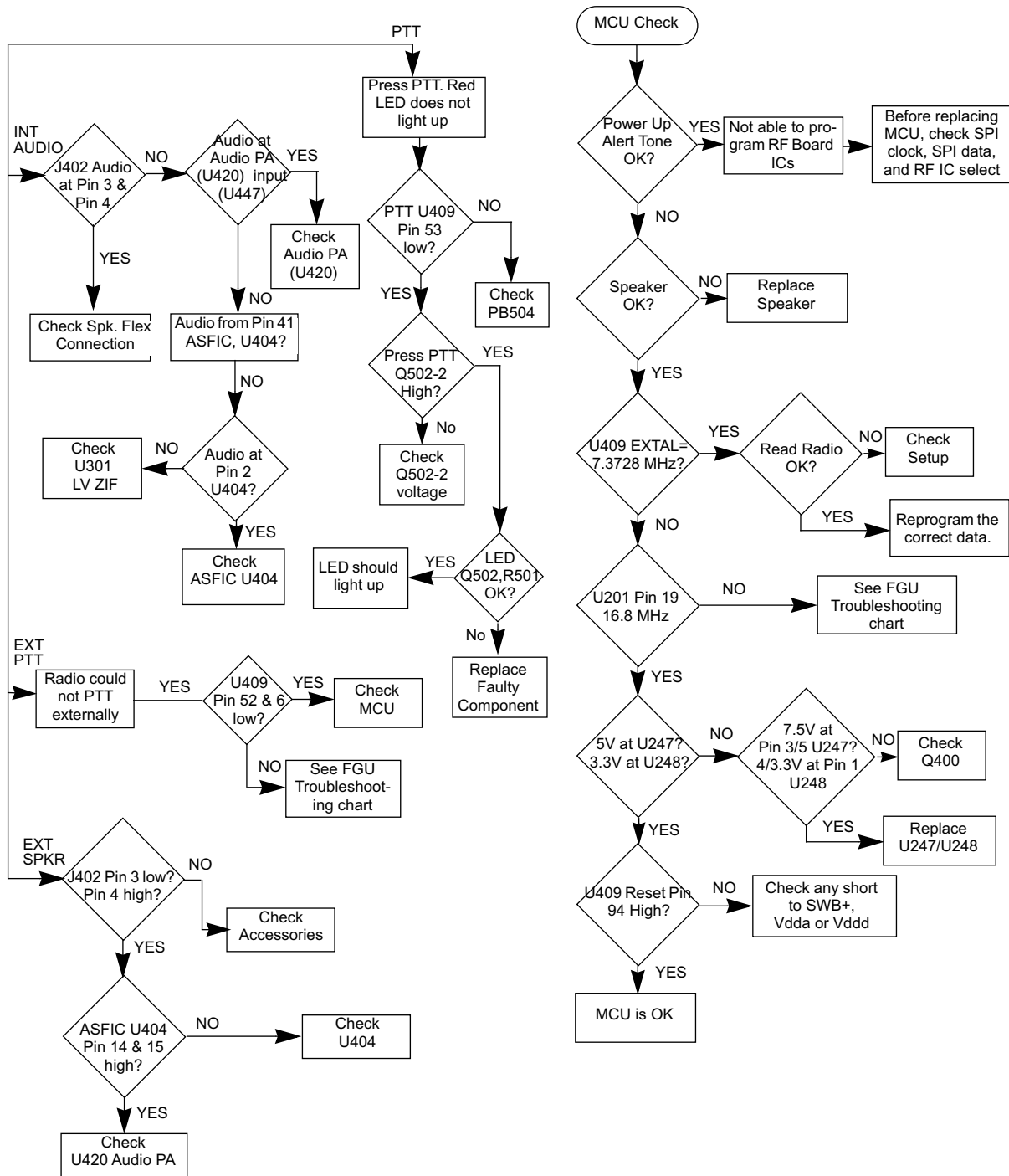
Circuit Ref	Motorola Part No.	Description
L243	2460593C01	Teflon Resonator, Rx
L251	2462587V28	33nH
L253	2460593C02	Teflon Resonator, Tx
L261	2462587V29	39nH
L271	2462587V32	68nH
L273	2462587V28	33nH
L281	2462587V41	390nH
L282	2462587V41	390nH
L301	2479990C01	13.9nH
L302	2479990C01	13.9nH
L303	2462587V26	22nH
L304	2462587V37	180nH
L305	2462587V26	22nH
L306	2479990C01	13.9nH
L307	2479990C01	13.9nH
L309	2479990C02	16.28nH
L310	2462587V36	150nH
L311	2462587N65	750nH
L314	2462587N72	2.2uH
L321	Not Placed	
L325	2480646Z20	2.2uH
L330	2462587N64	680nH
L331	2480646Z20	2.2uH
L332	2462587N53	100nH
L340	2462587V41	390nH
L400	2462587Q42	390nH
L410	2462587Q42	390nH
L411	2462587Q42	390nH
L505	2462587Q42	390nH
PB501	4070354A01	Tactile Push Button
PB502	4070354A01	Tactile Push Button
PB504	4070354A01	Tactile Push Button
Q110	4813828A09	FET Transistor
Q111	4802245J50	Dual NPN/PNP Transistor
Q210	4802245J50	Dual NPN/PNP Transistor
Q241	4805218N63	NPN Transistor
Q260	4802245J50	Dual NPN/PNP Transistor
Q261	4802245J50	Dual NPN/PNP Transistor
Q301	4802245J44	NPN Transistor
Q302	4802245J44	NPN Transistor
Q310	Not Placed	
Q315	4880214G02	NPN Transistor
Q316	Not Placed	
Q320	4805218N63	NPN Transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	Bipolar Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q417	4802245J50	Dual NPN/PNP Transistor
Q418	4802245J50	Dual NPN/PNP Transistor
Q419	5180159R01	Dual NPN Transistor

Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description
Q420	4805128M67	PNP Transistor	R260	0662057M74	1K	R352	0662057M86	3.3K	R481	0662057N08	24K
Q421	4880214G02	NPN Transistor	R281	Not Placed		R355	0662057M01	0	R492	0662057M01	0
Q431	5180159R01	Dual NPN Transistor	R300	0662057M82	2.2K	R400	0662057N15	47K	R493	Not Placed	
Q433	4880214G02	NPN Transistor	R301	0662057N23	100K	R401	0662057M01	0	R494	0662057M01	0
Q502	5180159R01	Dual NPN Transistor	R302	0662057N23	100K	R402	Not Placed		R495	0662057N23	100K
Q505	4880214G02	NPN Transistor	R303	0662057M89	4.3K	R403	Not Placed		R496	0662057N23	100K
Q506	4802245J50	Dual NPN/PNP Transistor	R304	0662057N01	12K	R405	0662057M01	0	R498	0662057N23	100K
R101	0662057A34	240	R305	0662057M67	0	R406	0662057N20	75K	R499	0662057M98	10K
R102	0680539Z01	0.1	R306	0662057N23	100K	R408	Not Placed		R501	0662057M70	680
R103	0662057M41	43	R307	0662057N23	100K	R410	0662057N23	100K	R502	0662057M56	180
R104	0662057N15	47K	R308	0662057M42	47	R411	0662057M98	10K	R505	0662057M98	10K
R105	0662057C01	0	R309	0662057M01	0	R413	0662057M01	0	R506	0662057N15	47K
R106	0662057M26	10	R310	0662057M60	270	R414	0662057V34	180K	R507	0662057M01	0
R107	Not Placed		R311	0662057N10	30K	R415	0662057V26	91K	R510	0662057M98	10K
R108	0662057M92	5.6K	R312	0662057M92	5.6K	R416	0662057M98	10K	RT300	0680590Z01	Thermistor_33K
R109	0662057N30	200K	R313	0662057M62	330	R418	0662057M01	0	RT301	Not Placed	
R110	0662057M61	300	R314	0662057M85	3K	R419	0662057M90	4.7K	RT400	0680590Z01	Thermistor_33K
R111	0662057M33	20	R315	0662057N01	12K	R423	0662057N39	470K	S501	4080710Z01	Channel Switch
R112	0662057M61	300	R316	0662057A96	91K	R425	0662057N10	30K	S502	1880619Z02	Volume Switch
R120	0662057N14	43K	R317	0662057M74	1K	R427	0662057M98	10K	SH100	2680687Z01	Shield, Harmonic Filter
R130	0662057M98	10K	R318	0662057A79	18K	R428	0662057M10	2.2	SH101	2680510Z01	Shield, PA
R131	0662057N05	18K	R319	0662057A29	150	R429	0662057M98	10K	SH201	2680511Z01	Shield, LVFRACN Synthesizer top
R132	0662057N33	270K	R320	0662057M74	1K	R432	0662057N16	51K	SH202	2680511Z01	Shield, LVFRACN Synthesizer bottom
R133	Not Placed		R321	0662057M83	2.4K	R434	Not Placed		SH241	2680513Z01	Shield, VCO Top
R134	0662057N52	1.6M	R322	0662057N30	200K	R435	0662057M81	2K	SH242	2680514Z01	Shield, VCO Bottom
R161	0662057M47	75	R324	0662057M81	2K	R436	0662057N15	47K	SH301	2680554Z01	Rx Front end top shield
R170	0662057A34	240	R325	0662057M94	6.8K	R437	Not Placed		SH302	2680555Z01	Rx Front end bottom shield
R171	0662057N14	43K	R326	Not Placed		R438	0662057M01	0	SH303	2680509Z01	Shield, Mixer
R172	0662057A32	200	R327	0662057N11	33K	R439	0662057N23	100K	SH304	2680624Z01	Shield, Mixer Diode
R173	0662057N29	180K	R328	0662057M01	0	R445	0662057N08	24K	SH321	2680508Z01	Shield, LVZIF 2nd LO
R174	0662057N15	47K	R329	0662057M01	0	R446	Not Placed		SH322	2680514Z01	LVZIF Shield
R176	0662057B67	6.2	R330	Not Placed		R447	0662057N23	100K	SH323	2680553Z01	Shield, Crystal Filter
R177	0662057B67	6.2	R331	Not Placed		R448	0662057M98	10K	SH400	2680505Z01	Control Memory Shield
R201	0662057N21	82K	R332	Not Placed		R449	0662057N08	24K	SH401	2680506Z01	On/Off Controller Shield
R202	0662057N23	100K	R333	Not Placed		R451	0662057N03	15K	SH402	2680515Z01	Microprocessor Shield
R204	0662057N15	47K	R334	Not Placed		R452	0662057N23	100K	SH403	2680516Z01	ASFIC CMP/Audio PA Controller Shield
R231	0662057M52	120	R335	Not Placed		R454	Not Placed		T301	2580541Z01	ZFMR Coil
R232	0662057M69	620	R336	Not Placed		R455	Not Placed		T302	2580541Z01	ZFMR Coil
R233	0662057M68	560	R338	Not Placed		R456	0662057M01	0	U101	5185130C65	LDMOS Driver IC
R241	0662057M32	18	R339	0662057M01	0	R457	0662057M98	10K	U102	5185765B28	Power Control IC
R242	0662057M57	200	R340	0662057M94	6.8K	R460	0662057M90	4.7K	U201	5185963A27	LVFRACN Synthesizer IC
R243	0662057M98	10K	R342	0662057N23	100K	R461	0662057N23	100K	U210	5102463J61	Inverter
R244	0662057N01	12K	R343	0662057M26	10	R462	0662057N23	100K	U211	5102463J61	Inverter
R245	0662057M59	240	R344	0662057N01	12K	R463	0662057M61	300	U241	5105750U54	VCO Buffer IC
R248	0662057M37	30	R345	0662057M98	10K	R467	0662057M98	10K	U247	5105739X05	5V Regulator
R251	0662057M32	18	R346	0662057N17	56K	R471	0662057N06	20K	U248	5102463J58	3.3V Regulator
R252	0662057M62	330	R347	0662057M74	1K	R472	0662057N12	36K	U301	5109632D83	LVZIF IC
R253	0662057M95	7.5K	R348	0662057M87	3.6K	R473	0662057M26	10	U400	5102463J40	3.3V Regulator
R254	0662057M95	7.5K	R349	0662057C01	0	R475	0662057M01	0			
R255	0662057M89	4.3K	R350	0662057N23	100K	R476	0662057N08	24K			
R256	0662057M37	30	R351	0662057C01	0	R478	0662057M98	10K			

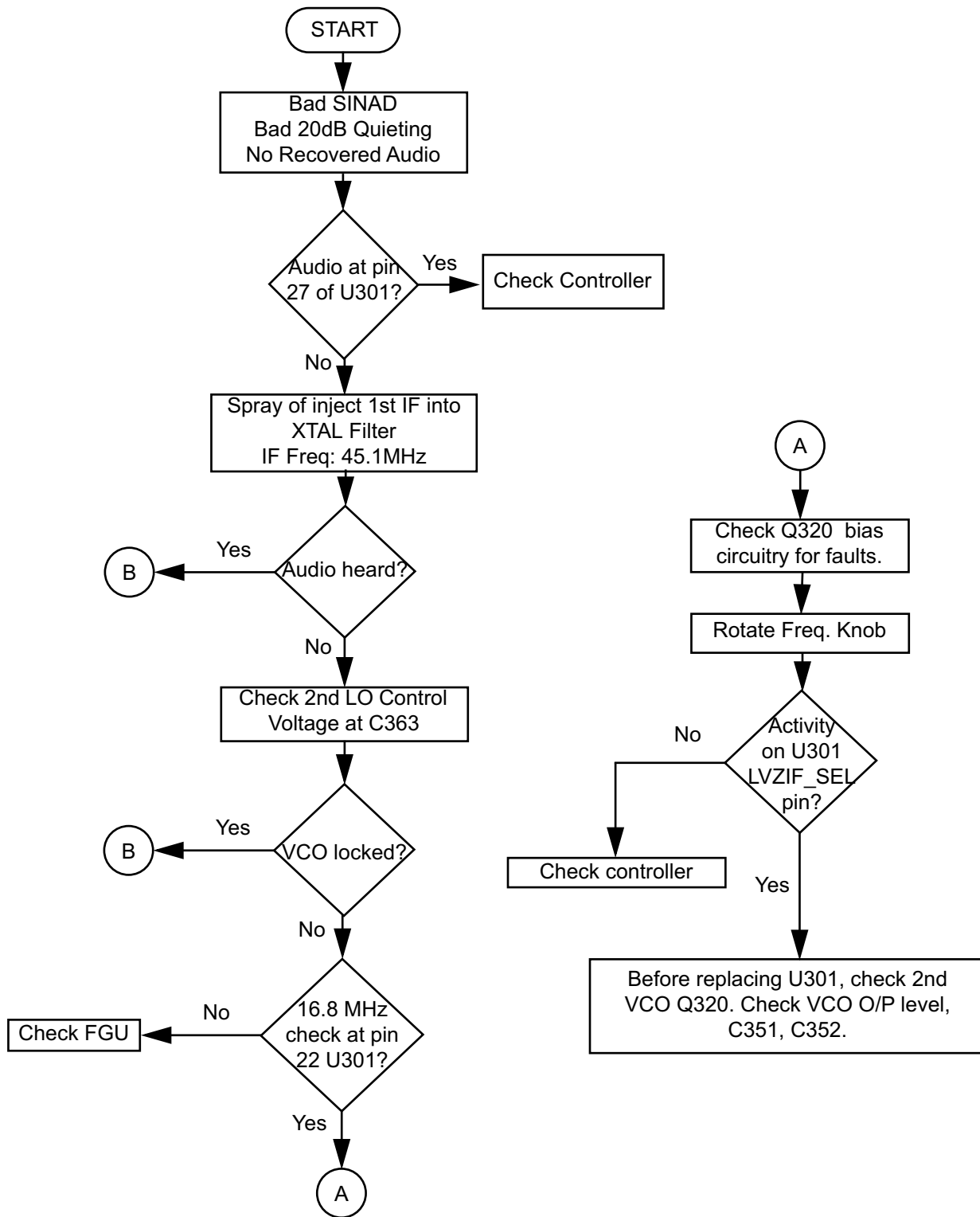
Circuit Ref	Motorola Part No.	Description
U404	5105109Z41	ASFIC_CMP
U405	Not Placed	
U406	*5102463J59	Flash ROM 128K X 8
U407	*5102463J64	16K X 8 EEPROM
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Regulator
U420	5102463J44	Audio PA
VR300	Not Placed	
VR431	4802245J73	6.8V Zener
VR432	4880140L15	10V Zener
VR433	4880140L15	10V Zener
VR439	4880140L15	10V Zener
VR440	4802245J73	6.8V Zener
VR441	4802245J73	6.8V Zener
VR444	4802245J73	6.8V Zener
VR450	4802245J74	10V Zener
VR451	4802245J74	10V Zener
VR501	4813830A18	6.8V Zener
VR506	4802245J73	6.8V Zener
	1485777Z01	Insulator (Kapton)
	8480672Z06	UHF B1 PC Board

* Motorola Depot Servicing only

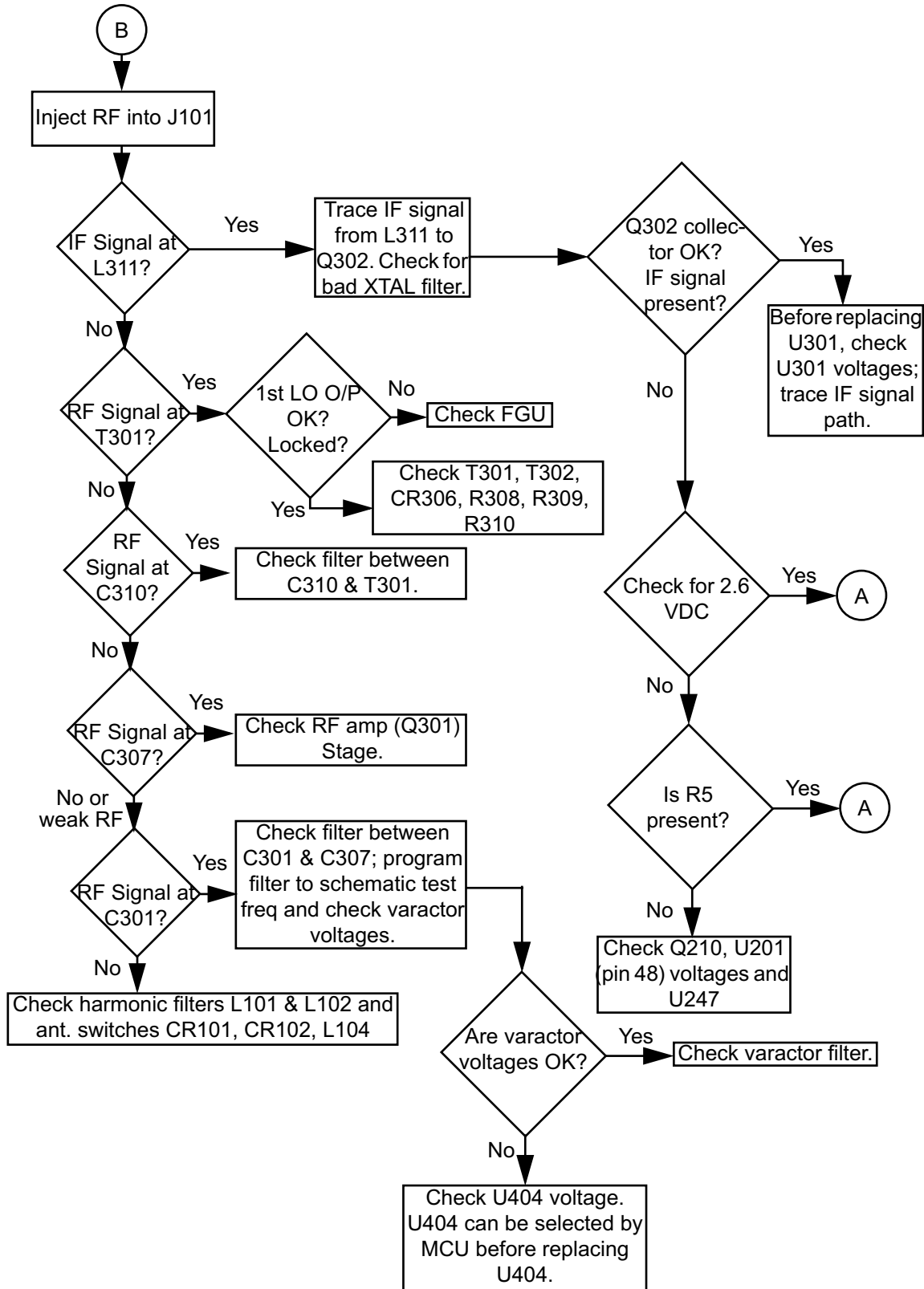
10.0 Troubleshooting charts



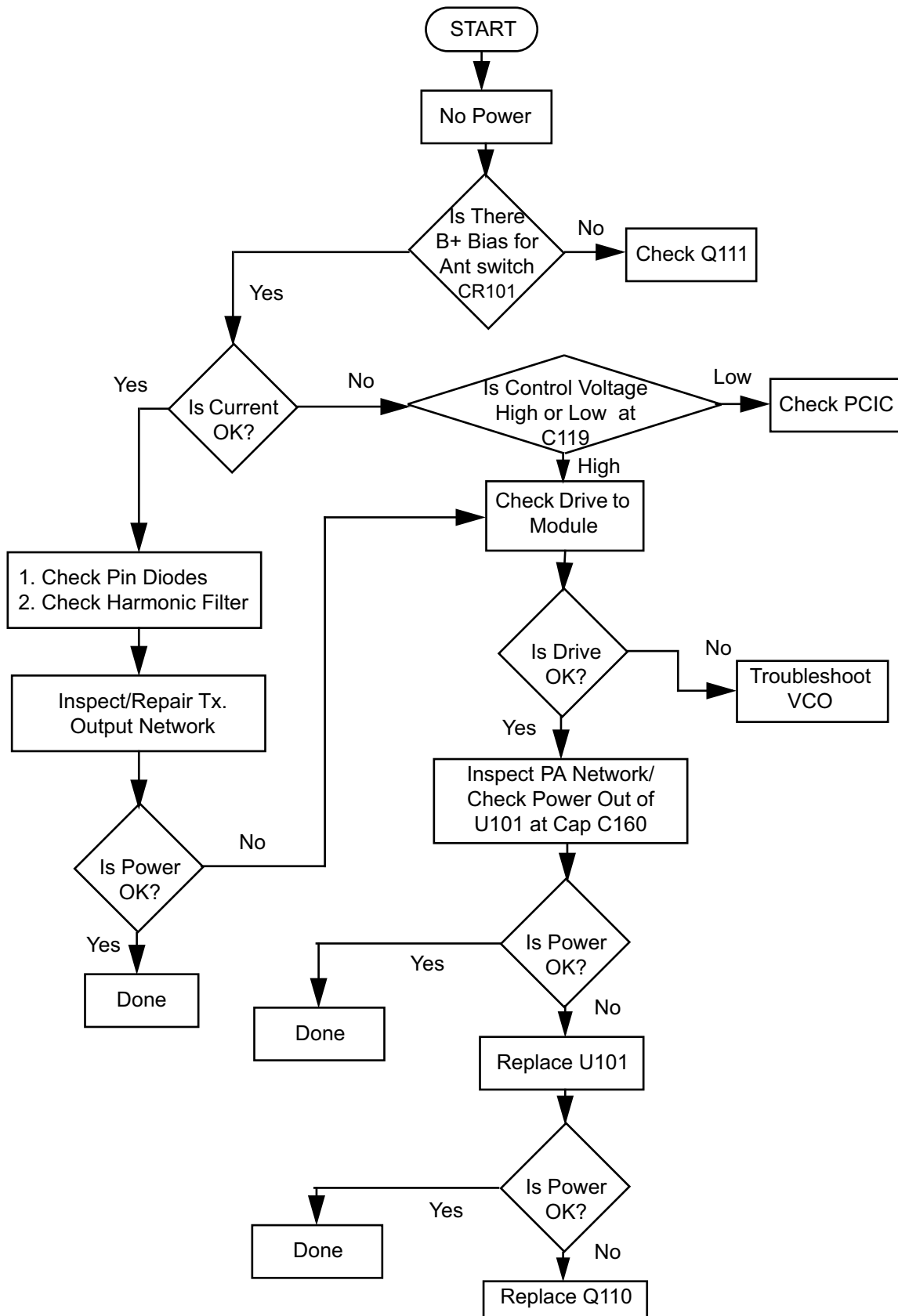
Troubleshooting Flow Chart for Controller



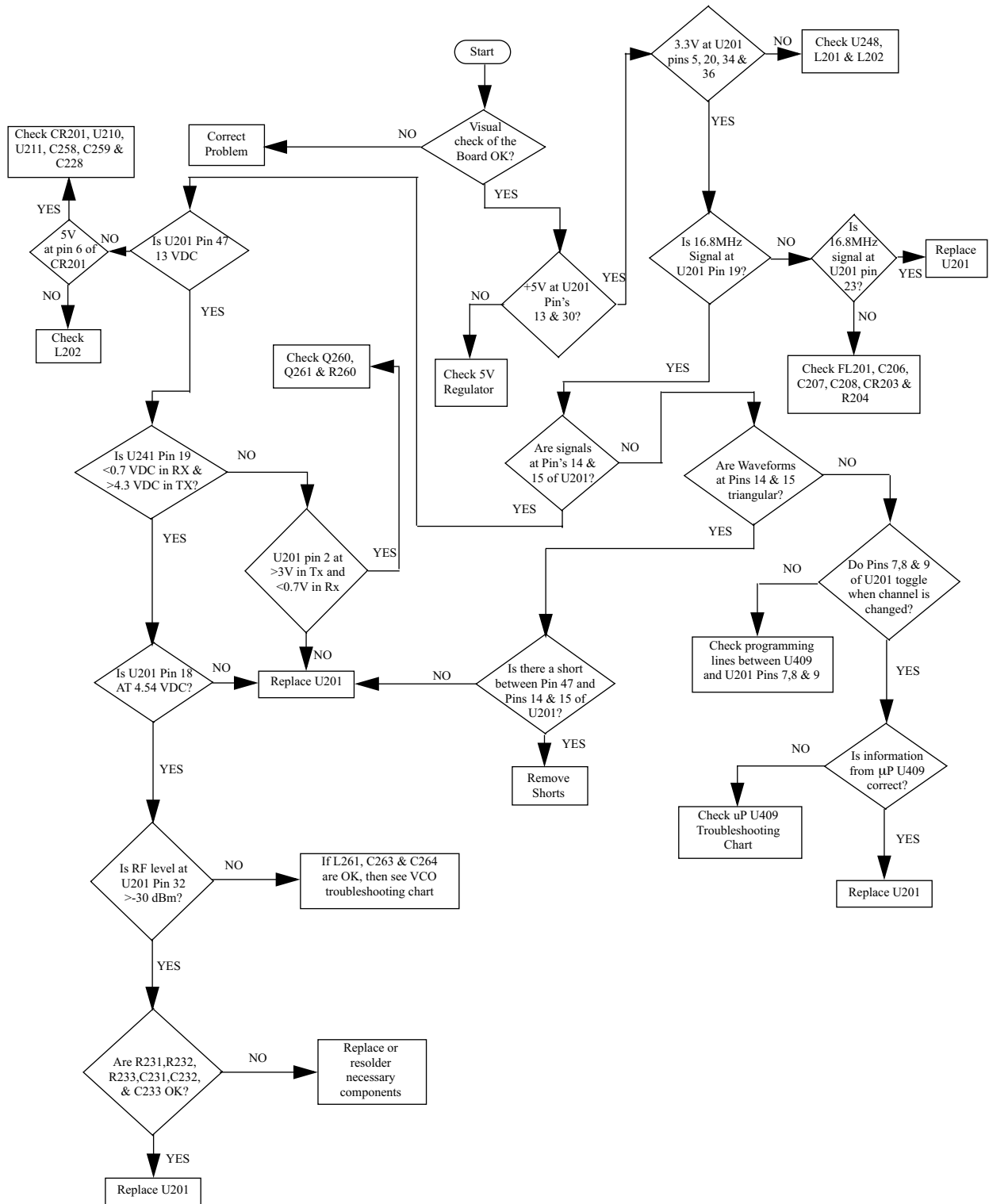
Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



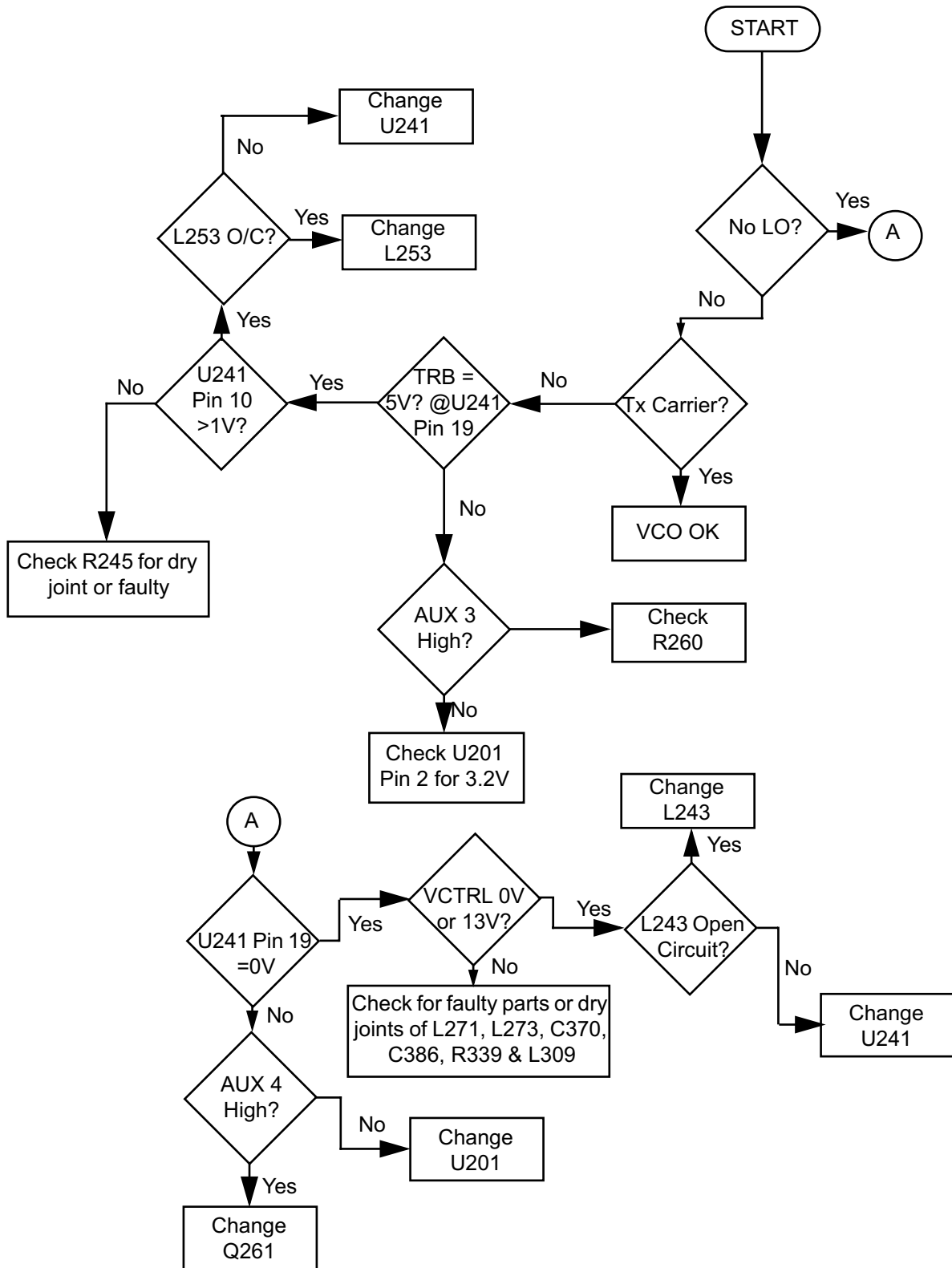
Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



Troubleshooting Flow Chart for Transmitter



Troubleshooting Flow Chart for Synthesizer



Troubleshooting Flow Chart for VCO

Section 9B

MODEL CHART AND TEST SPECIFICATIONS (136-174 MHz)

1.0 Model Chart

GP88s , VHF, 136-174 MHz																									
Model	Description																								
AZH34KDC9AA3	GP88s 136-174 MHz 5W 16 CH																								
	<table border="1"> <thead> <tr> <th>Item</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>X PMUD1590*</td> <td>GP88s Super Tanapa 136-174 MHz 5W</td> </tr> <tr> <td>X PMUD1591*</td> <td>GP88s Tanapa 136-174 MHz 5W</td> </tr> <tr> <td>X PMLD4162</td> <td>GP88s B/C Kit 136-174 MHz 5W</td> </tr> <tr> <td>X PMLN4343</td> <td>GP88s Front Housing Kit</td> </tr> <tr> <td>X PMAD4012</td> <td>Antenna, 136-155 MHz Stubby</td> </tr> <tr> <td>X PMAD4013</td> <td>Antenna, 155-174 MHz Stubby</td> </tr> <tr> <td>X PMAD4014</td> <td>Antenna, 136-155 MHz 14 cm</td> </tr> <tr> <td>X PMAD4015</td> <td>Antenna, 155-174 MHz 14 cm</td> </tr> <tr> <td>X PMAD4023</td> <td>Antenna, 150-161 MHz 14 cm</td> </tr> <tr> <td>X PMAD4025</td> <td>Antenna, 150-161 MHz Stubby</td> </tr> <tr> <td>X 6804111J46</td> <td>GP88s User Guide</td> </tr> </tbody> </table>	Item	Description	X PMUD1590*	GP88s Super Tanapa 136-174 MHz 5W	X PMUD1591*	GP88s Tanapa 136-174 MHz 5W	X PMLD4162	GP88s B/C Kit 136-174 MHz 5W	X PMLN4343	GP88s Front Housing Kit	X PMAD4012	Antenna, 136-155 MHz Stubby	X PMAD4013	Antenna, 155-174 MHz Stubby	X PMAD4014	Antenna, 136-155 MHz 14 cm	X PMAD4015	Antenna, 155-174 MHz 14 cm	X PMAD4023	Antenna, 150-161 MHz 14 cm	X PMAD4025	Antenna, 150-161 MHz Stubby	X 6804111J46	GP88s User Guide
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X PMAD4025	Antenna, 150-161 MHz Stubby																								
X 6804111J46	GP88s User Guide																								

x = Indicates one of each is required.

* Motorola Depot Servicing only

2.0 Specifications

General

	VHF	
Frequency:	136-174 MHz	
Channel Capacity:	GP88s : 16 Channels	
Power Supply:	7.5 Volts \pm 20%	
Dimensions with Standard High Capacity NiMH Battery:	57.5mm x 134mm x 38mm	
Weight: with Standard High Capacity NiMH Battery:	429 g	
with High Capacity NiCd Battery:	454 g	
Average Battery Life @ (5-5-90 Duty Cycle) Standard High Capacity NiMH Battery:	Low Power	High Power
	10 hrs	8 hrs
Sealing:	Passes rain testing per IP54	
Shock:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	
Vibration:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	
Dust:	Meets MIL-STD-810-C,D & E and IP54	
Humidity:	Meets MIL-STD-810-C,D & E and TIA/EIA 603	

Transmitter

	VHF	
RF Output NiMH @ 7.5V:	Low 1W	High 5W
Frequency	136-174 MHz	
Channel Spacing	12.5/20/25 kHz	
Freq. Stability (-30°C to +60°C)	0.00025%	
Spurs/Harmonics:	-36 dBm < 1 GHz -30 dBm > 1 GHz	
Audio Response: (from 6 dB/oct. Pre-Emphasis, 300 to 3000Hz)	+1, -3 dB	
Audio Distortion: @ 1000 Hz, 60% Rated Max. Dev.	<5%	
FM Noise:	-40 dB	

Receiver

	VHF 12.5kHz	VHF 20/25kHz
Frequency:	136-174MHz	136-174MHz
Sensitivity 12dB EIA SINAD:	0.35 μ V	0.35 μ V
Adjacent Channel Selectivity ETS	-60 dB	-70 dB
Intermodulation ETS	-65 dB	-65 dB
Freq. Stability (-30°C to +60°C):	0.00025%	0.00025%
Spur Rejection:	-70 dB	-70 dB
Image Rejection:	-70 dB	-70 dB
Audio Output @ <5% Distortion	500 mW	500 mW

All specifications are subject to change without notice.

3.0 Transmitter

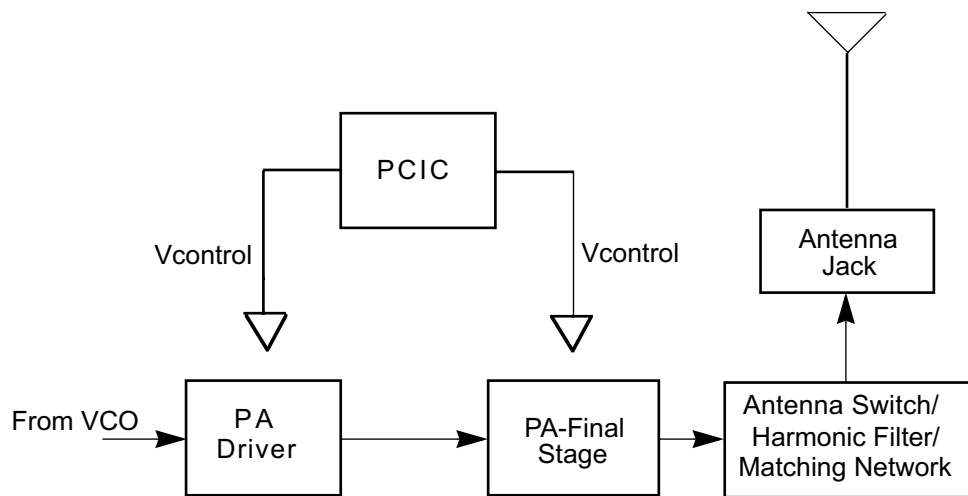


Figure 9-1 Transmitter Block Diagram

3.1 General

(Refer to Figure 9-1)

The VHF transmitter contains five basic circuits:

1. power amplifier
2. antenna switch
3. harmonic filter
4. antenna matching network
5. power control integrated circuit (PCIC).

3.1.1 Power Amplifier

The power amplifier consists of two devices:

1. 9Z67 LDMOS driver IC (U3501) and
2. PRF1507 LDMOS PA (Q3501).

The 9Z67 LDMOS driver IC contains a 2 stage amplification with a supply voltage of 7.3V.

This RF power amplifier is capable of supplying an output power of 0.3W (pin 6 and 7) with an input signal of 2mW (3dBm) (pin16). The current drain would typically be 130mA while operating in the frequency range of 136-174MHz.

The PRF1507 LDMOS PA is capable of supplying an output power of 7W with an input signal of 0.3W. The current drain would typically be 1800mA while operating in the frequency range of 136-174MHz. The power output can be varied by changing the biasing voltage.

3.1.2 Antenna Switch

The antenna switch circuit consists of two PIN diodes (D3521 and D3551), a pi network (C3531, L3551 and C3550), and two current limiting resistors (R3571, R3572, R3573). In the transmit mode, B+ at PCIC (U3502) pin 23 will go low and turn on Q3561 where a B+ bias is applied to the antenna switch circuit to bias the diodes "on". The shunt diode (D3551) shorts out the receiver port, and the pi network, which operates as a quarter wave transmission line, transforms the low impedance of the shunt diode to a high impedance at the input of the harmonic filter. In the receive mode, the diodes are both off, and hence, there exists a low attenuation path between the antenna and receiver ports.

3.1.3 Harmonic Filter

The harmonic filter consists of C3532 to C3536, L3531 and L3532. This network forms a low-pass filter to attenuate harmonic energy of the transmitter to specifications level. The harmonic filter insertion loss should be less than 1.2dB.

3.1.4 Antenna Matching Network

A matching network which is made up of L3538, C3537 and C3539 is used to match the antenna's impedance to the harmonic filter. This will optimize the performance of the transmitter and receiver into an antenna.

3.1.5 Power Control Integrated Circuit (PCIC)

The transmitter uses the Power Control IC (PCIC), U3502 to control the power output of the radio by maintaining the radio current drain. The current to the final stage of the power module is supplied through R3519 (0.1ohms), which provides a voltage proportional to the current drain. This voltage is then fed back to the Automatic Level Control (ALC) within the PCIC to keep the whole loop stable.

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

There are resistors and integrators within the PCIC, and external capacitors (C3562, C3563 and C3565) in controlling the transmitter rising and falling time. These are necessary in reducing the power splatter into adjacent channels.

U3503 and its associated circuitry acts as a temperature cut back circuitry. This circuitry provides the necessary voltage to the PCIC to cut the transmitter power when the radio temperature gets too high.

4.0 Receiver

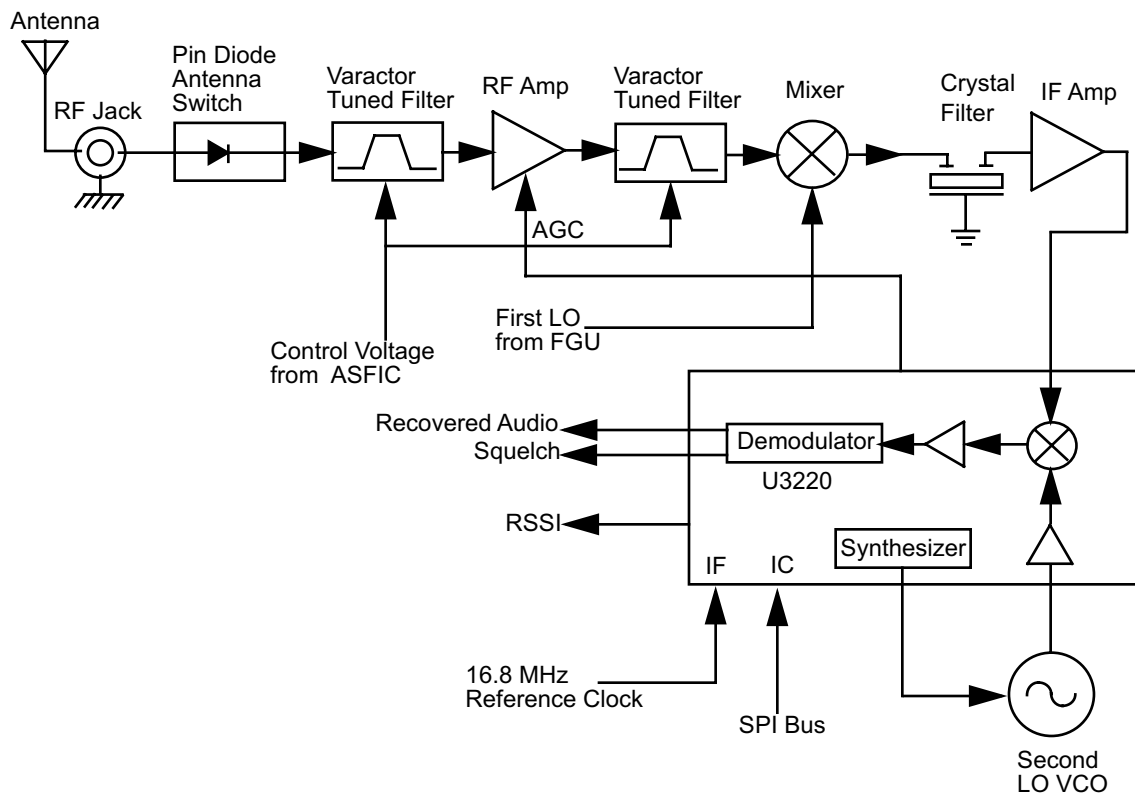


Figure 9-2 VHF Receiver Block Diagram

4.1 Receiver Front-End

(Refer to VHF Receiver Front End Schematic Diagram on page 9B-16, VHF Receiver Back End Schematic Diagram on page 9B-17, and VHF Transmitter Schematic Diagram on page 9B-20)

The RF signal is received by the antenna and applied to a low-pass filter. For VHF, the filter consists of L3531, L3532, C3532 to C3536. The filtered RF signal is passed through the antenna switch. The antenna switch circuit consists of two PIN diodes (D3521 and D3551) and a pi network (C3531, L3551 and C3550). The signal is then applied to a varactor tuned bandpass filter. The VHF bandpass filter comprises of L3301, L3303, C3301 to C3304 and D3301. The bandpass filter is tuned by applying a control voltage to the varactor diode (D3301) in the filter.

The bandpass filter is electronically tuned by the DACRx from U404 which is controlled by the microprocessor. Depending on the carrier frequency, the DACRx will supply the tuned voltage to the varactor diodes in the filter. Wideband operation of the filter is achieved by shifting the bandpass filter across the band.

The output of the bandpass filter is coupled to the RF amplifier transistor Q3302 via C3306. After being amplified by the RF amplifier, the RF signal is further filtered by a second varactor tuned bandpass filter, consisting of L3305, L3306, C3311 to C3314 and D3302.

Both the pre and post-RF amplifier varactor tuned filters have similar responses. The 3 dB bandwidth of the filter is about 12 MHz. This enables the filters to be electronically controlled by using a single control voltage which is DACRx.

The output of the post-RF amplifier filter is connected to the passive double balanced mixer which consists of T3301, T3302 and CR3301. Matching of the filter to the mixer is provided by C3317, C3318 and L3308. After mixing with the first LO signal from the voltage controlled oscillator (VCO) using high side injection, the RF signal is down-converted to the 45.1 MHz IF signal.

The IF signal coming out of the mixer is transferred to the crystal filter (Y3200) through a resistor pad (R3321 - R3323) and a diplexer (C3320 and L3309). Matching to the input of the crystal filter is provided by C3200 and L3200. The crystal filter provides the necessary selectivity and intermodulation protection.

4.2 Receiver Back-End

(Refer to VHF Receiver Back End Schematic Diagram on page 9B-17)

The output of crystal filter Y3200 is matched to the input of IF amplifier transistor Q3200 by capacitor C3203. Voltage supply to the IF amplifier is taken from the receive 5 volts (R5). The gain controlled IF amplifier provides a maximum gain of about 10dB. The amplified IF signal is then coupled into U3220(pin 3) via L3202, C3207, and C3230 which provides the matching for the IF amplifier and U3220.

The IF signal applied to pin 3 of U3220 is amplified, down-converted, filtered, and demodulated, to produce the recovered audio at pin 27 of U3220. This IF IC is electronically programmable, and the amount of filtering (which is dependent on the radio channel spacing) is controlled by the microprocessor. Additional filtering, once externally provided by the conventional ceramic filters, is replaced by internal filters in the IF module (U3220).

The IF IC uses a type of direct conversion process, whereby the externally generated second LO frequency is divided by two in U3220 so that it is very close to the first IF frequency. The IF IC (U3220) synthesizes the second LO and phase-locks the VCO to track the first IF frequency. The second LO is designed to oscillate at twice the first IF frequency because of the divide-by-two function in the IF IC.

In the absence of an IF signal, the VCO will "search" for a frequency, or its frequency will vary close to twice the IF frequency. When an IF signal is received, the VCO will lock onto the IF signal. The second LO/VCO is a Colpitts oscillator built around transistor Q3270. The VCO has a varactor diode, D3270, to adjust the VCO frequency. The control signal for the varactor is derived from a loop filter consisting of C3278 to C3280, R3274 and R3275.

The IF IC (U3220) also performs several other functions. It provides a received signal-strength indicator (RSSI) and a squelch output. The RSSI is a dc voltage monitored by the microprocessor, and used as a peak indicator during the bench tuning of the receiver front-end varactor filter. The RSSI voltage is also used to control the automatic gain control (AGC) circuit at the front-end.

The demodulated signal on pin 27 of U3220 is also used for squelch control. The signal is routed to U404 (ASFIC) where squelch signal shaping and detection takes place. The demodulated audio signal is also routed to U404 for processing before going to the audio amplifier for amplification.

4.3 Automatic Gain Control Circuit

(Refer to VHF Receiver Front End Schematic Diagram on page 9B-16 and VHF Receiver Back End Schematic Diagram on page 9B-17)

The front end automatic gain control circuit provides automatic reduction of gain, of the front end RF amplifier via feedback. This action is necessary to prevent overloading of backend circuits. This is achieved by drawing some of the output power from the RF amplifier output. At high radio frequencies, capacitor C3327 provides the low impedance path to ground for this purpose. CR3302 is a PIN diode used for switching the path on or off. A certain amount of forward biasing current is needed to turn the PIN diode on. Transistor Q3301 provides this current.

Radio signal strength indicator, RSSI, a voltage signal, is used to drive Q3301 to saturation i.e. turned on. RSSI is produced by U3220 and is proportional to the gain of the RF amplifier and the input power to the radio.

Resistors R3304 and R3305 are voltage dividers designed to turn on Q3301 at certain RSSI levels. In order to turn on Q3301 the voltage across R3305 must be greater or equal to the voltage across R3324 + V_{be} . Capacitor C3209 is used to dampen any instability while the AGC is turning on. The current flowing into the collector of Q3301, a high current gain NPN transistor, will be drawn through the PIN diode to turn it on. Maximum current flowing through the PIN is limited by the resistors R3316, R3313, R3306 and R3324. C3326 is a feedback capacitor used to provide some stability to this high gain stage.

An additional gain control circuit is formed by Q3201 and its associated circuitry. Resistors R3206 and R3207 are voltage dividers designed to turn on Q3201 at a significantly higher RSSI level than the level required to turn on PIN diode control transistor Q3301. In order to turn on Q3201 the voltage across R3207 must be greater or equal to the voltage across R3208, plus the base-emitter voltage (V_{be}) present at Q3201. As current starts flowing into the collector of Q3201, it reduces the bias voltage at the base of IF amplifier transistor Q3200 and in turn, the gain of the IF amplifier. The gain can be controlled in a range of -30dB up to +10dB.

5.0 Frequency Generation Circuitry

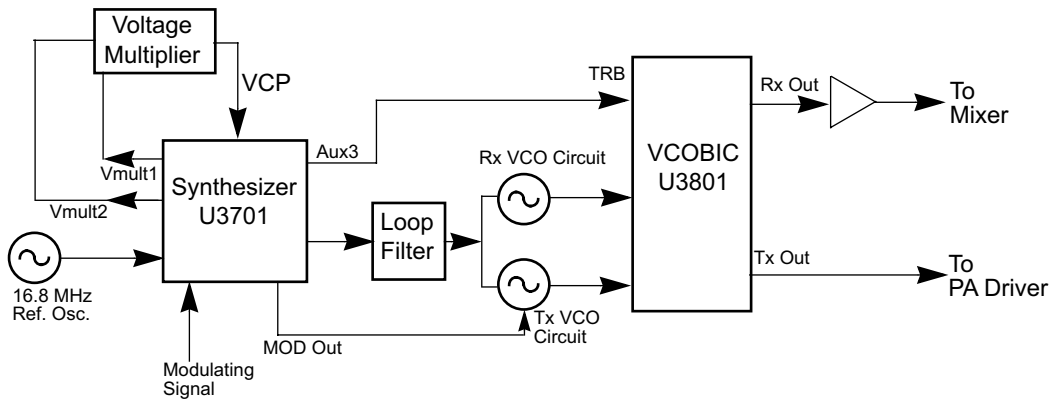


Figure 9-3 Frequency Generation Unit Block Diagram

The Frequency Generation Circuitry is composed of two main ICs, the Fractional-N synthesizer (U3701), and the VCO/Buffer IC (U3801). Designed in conjunction to maximize compatibility, the two ICs provide many of the functions that normally would require additional circuitry. The synthesizer block diagram illustrates the interconnect and support circuitry used in the region. Refer to the relevant schematics for the reference designators.

The synthesizer is powered by regulated 5V and 3.3V which come from U3711 and U3201 respectively. The synthesizer in turn generates a superfiltered 4.5V which powers U3801.

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

Transmit modulation from the ASFIC is supplied to pin10 of U3701. Internally the audio is digitized by the Fractional-N and applied to the loop divider to provide the low-port modulation. The audio runs through an internal attenuator for modulation balancing purposes before going out to the VCO.

5.1 Synthesizer

(Refer to VHF Synthesizer Schematic Diagram on page 9B-18)

The Fractional-N Synthesizer uses a 16.8MHz crystal (Y3761) to provide a reference for the system. The LVFractN IC (U3701) further divides this to 2.1MHz, 2.225MHz, and 2.4MHz as reference frequencies. Together with C3761, C3762, C3763, R3761 and D3761, they build up the reference oscillator which is capable of 2.5ppm stability over temperatures of -30 to 85°C. It also provides 16.8MHz at pin 19 of U3701 to be used by ASFIC and LVZIF.

The loop filter which consist of C3721, C3722, R3721, R3722 and R3723 provides the necessary dc steering voltage for the VCO and determines the amount of noise and spur passing through.

In achieving fast locking for the synthesizer, an internal adapt charge pump provides higher current at pin 45 of U3701 to put synthesizer within the lock range. The required frequency is then locked by normal mode charge pump at pin 43.

Both the normal and adapt charge pumps get their supply from the capacitive voltage multiplier which is made up of C3701 to C3704 and triple diodes D3701, D3702. Two 3.3V square waves (180 deg out of phase) are first multiplied by four and then shifted, along with regulated 5V, to build up 13.5V at pin 47 of U3701.

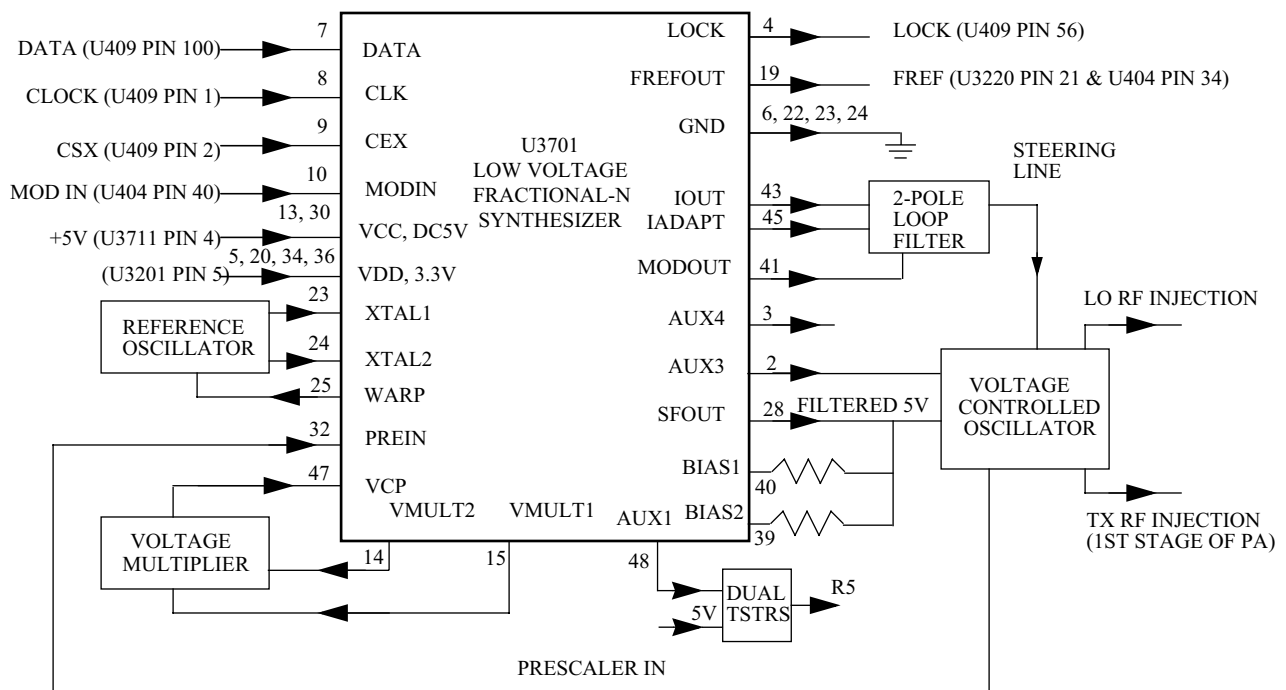


Figure 9-4 Synthesizer Block Diagram

5.2 VCO - Voltage Controlled Oscillator

(Refer to VHF Voltage Controlled Oscillator Schematic Diagram on page 9B-19)

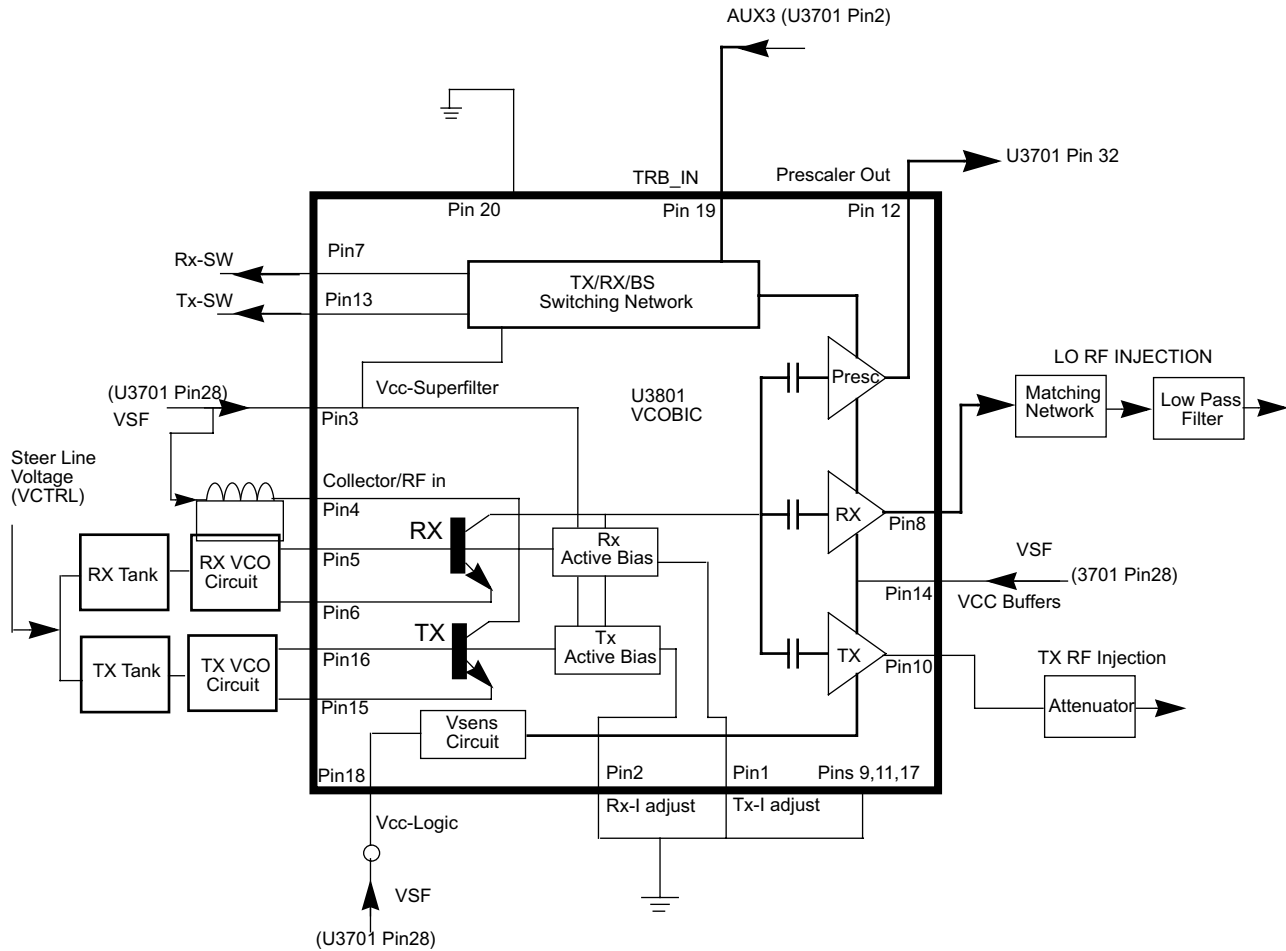


Figure 9-5 VCO Block Diagram

The VCOBIC (U3801) in conjunction with the Fractional-N synthesizer (U3701) generates RF in both the receive and the transmit modes of operation. The TRB line (U3801 pin 19) determines which oscillator and buffer will be enabled. A sample of the RF signal from the enabled oscillator is routed from U3801 pin 12, through a low pass filter, to the prescaler input (U3701 pin 32). After frequency comparison in the synthesizer, a resultant CONTROL VOLTAGE is received at the VCO. This voltage is a DC voltage typically between 3.5V and 9.5V when the PLL is locked on frequency.

The RF section of the VCOBIC(U3801) is operated at 4.54 V (VSF), while the control section of the VCOBIC and Fractional-N synthesizer (U3701) is operated at 3.3V. The operation logic is shown in Table 9-1.

Table 9-1 VCO Control Logic

Desired Mode	AUX 4	AUX 3	TRB
Tx	n.u.	High (@3.2V)	High (@3.2V)
Rx	n.u.	Low	Low
Battery Saver	n.u.	Hi-Z/Float (@1.6V)	Hi-Z/Float (@1.6V)

In the receive mode, U3801 pin 19 is low or grounded. This activates the receive VCO by enabling the receive oscillator and the receive buffer of U3801. The RF signal at U3801 pin 8 is run through a matching network. The resulting RF signal is the LO RF INJECTION and it is applied to the mixer at T3302.

During the transmit condition, when PTT is depressed, 3.2 volts is applied to U3801 pin 19. This activates the transmit VCO by enabling the transmit oscillator and the transmit buffer of U3801. The RF signal at U3801 pin 10 is injected into the input of the PA module (U3501 pin16). This RF signal is the TX RF INJECTION. Also in transmit mode, the audio signal to be frequency modulated onto the carrier is received through U3701 pin 41.

When a high impedance is applied to U3801 pin19, the VCO is operating in BATTERY SAVER mode. In this case, both the receive and transmit oscillators as well as the receive transmit and prescaler buffer are turned off.

6.0 Notes For All Schematics and Circuit Boards

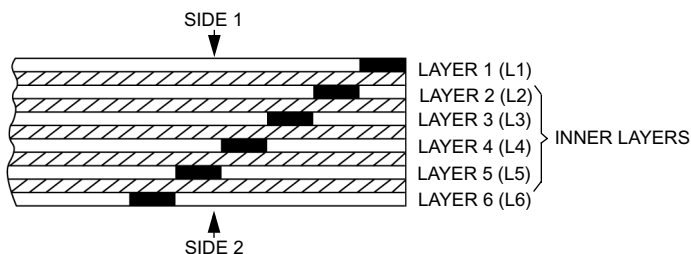
* Component is frequency sensitive. Refer to the Electrical Parts List for value and usage.

1. Unless otherwise stated, resistances are in Ohms ($k = 1000$), and capacitances are in picofarads (pF) or microfarads (μF).
2. DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. Transmitter measurements should be made with a $1.2 \mu\text{H}$ choke in series with the voltage probe to prevent circuit loading.
3. Reference Designators are assigned in the following manner:

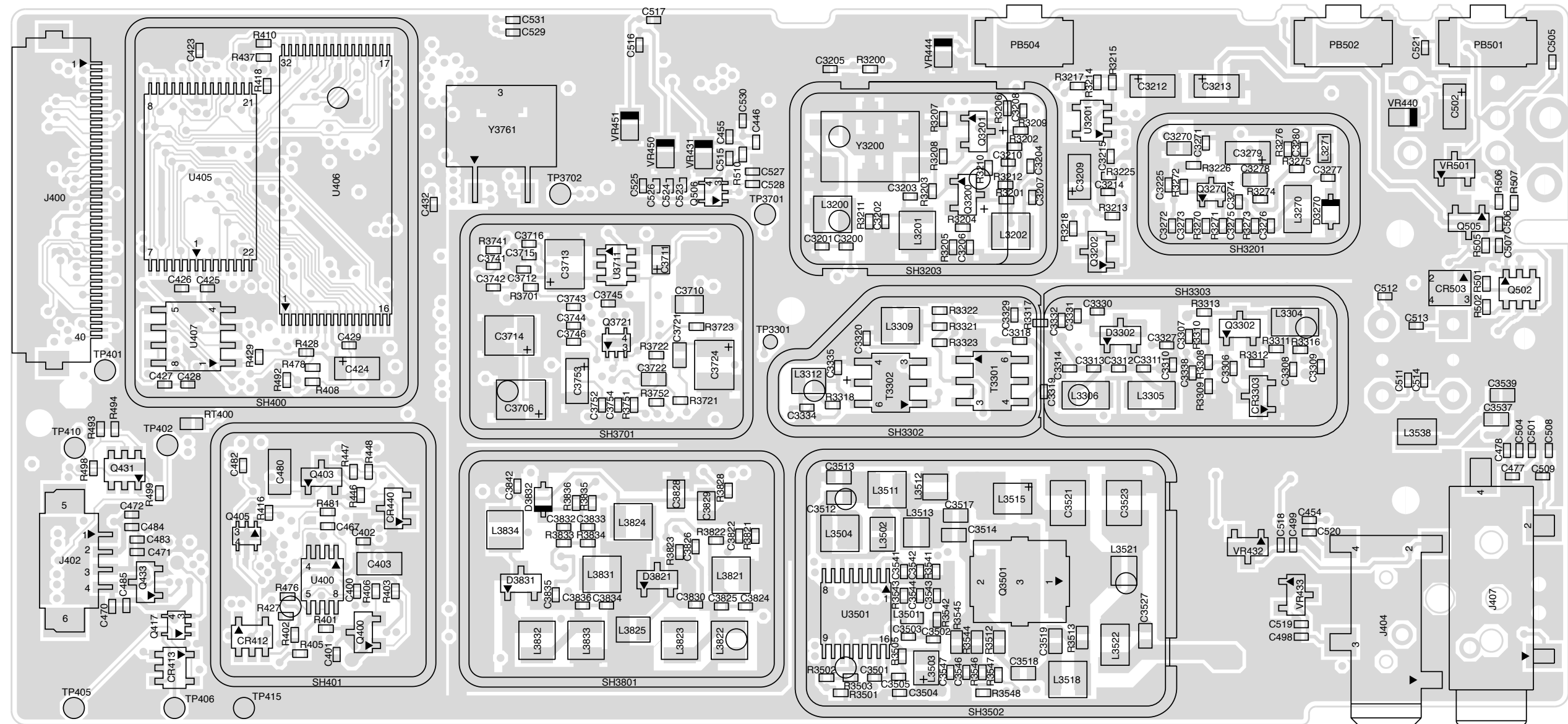
400/500 Series	=	Controller
600 Series	=	Keypad Board
3200 Series	=	IF Circuitry
3300 Series	=	Receiver
3500 Series	=	Transmitter
3700 and 3800 Series	=	Frequency Generation
4. Interconnect Tie Point Legend:

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

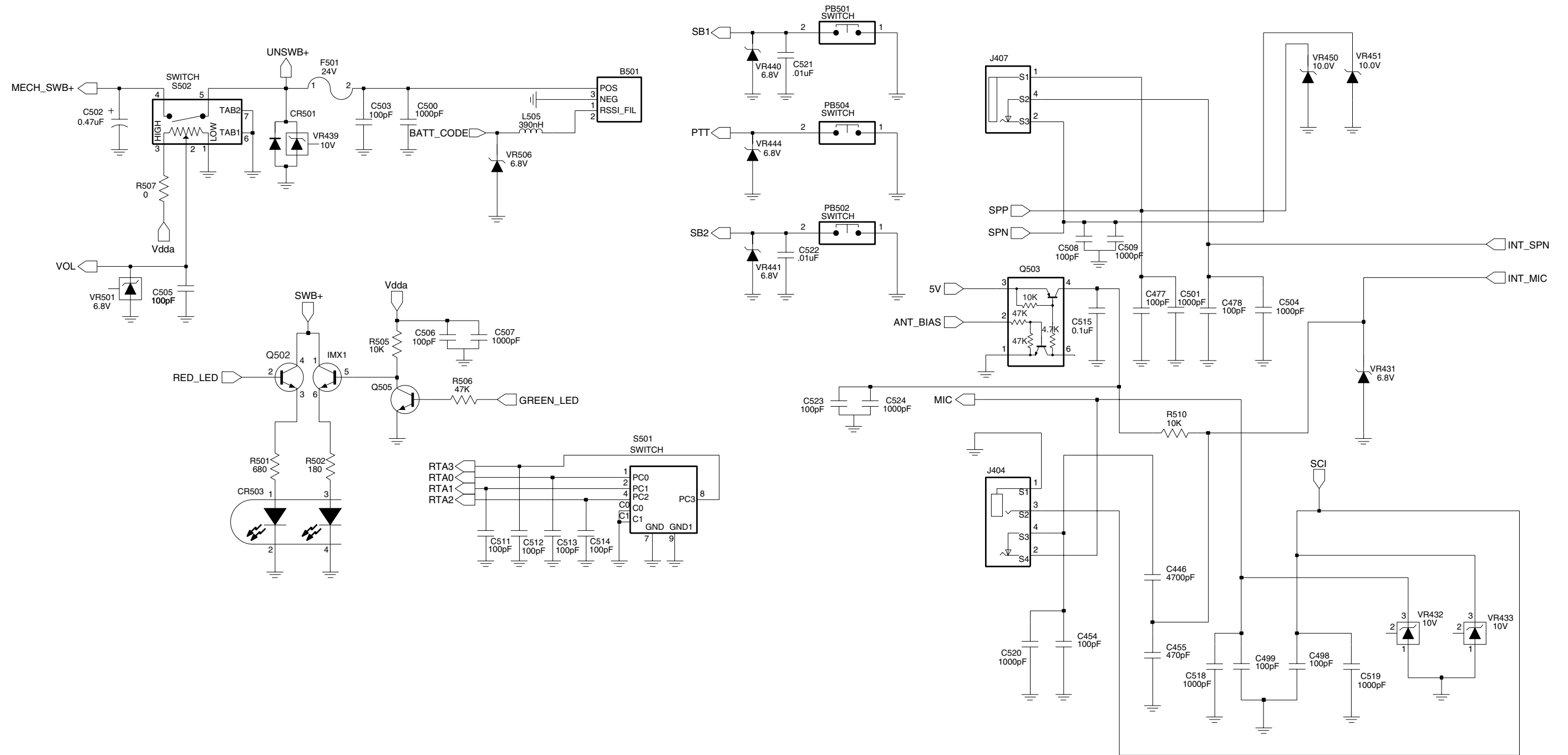
6-LAYER CIRCUIT BOARD DETAIL VIEWING COPPER STEPS IN PROPER LAYER SEQUENCE



7.0 Circuit Board/Schematic Diagrams and Parts List

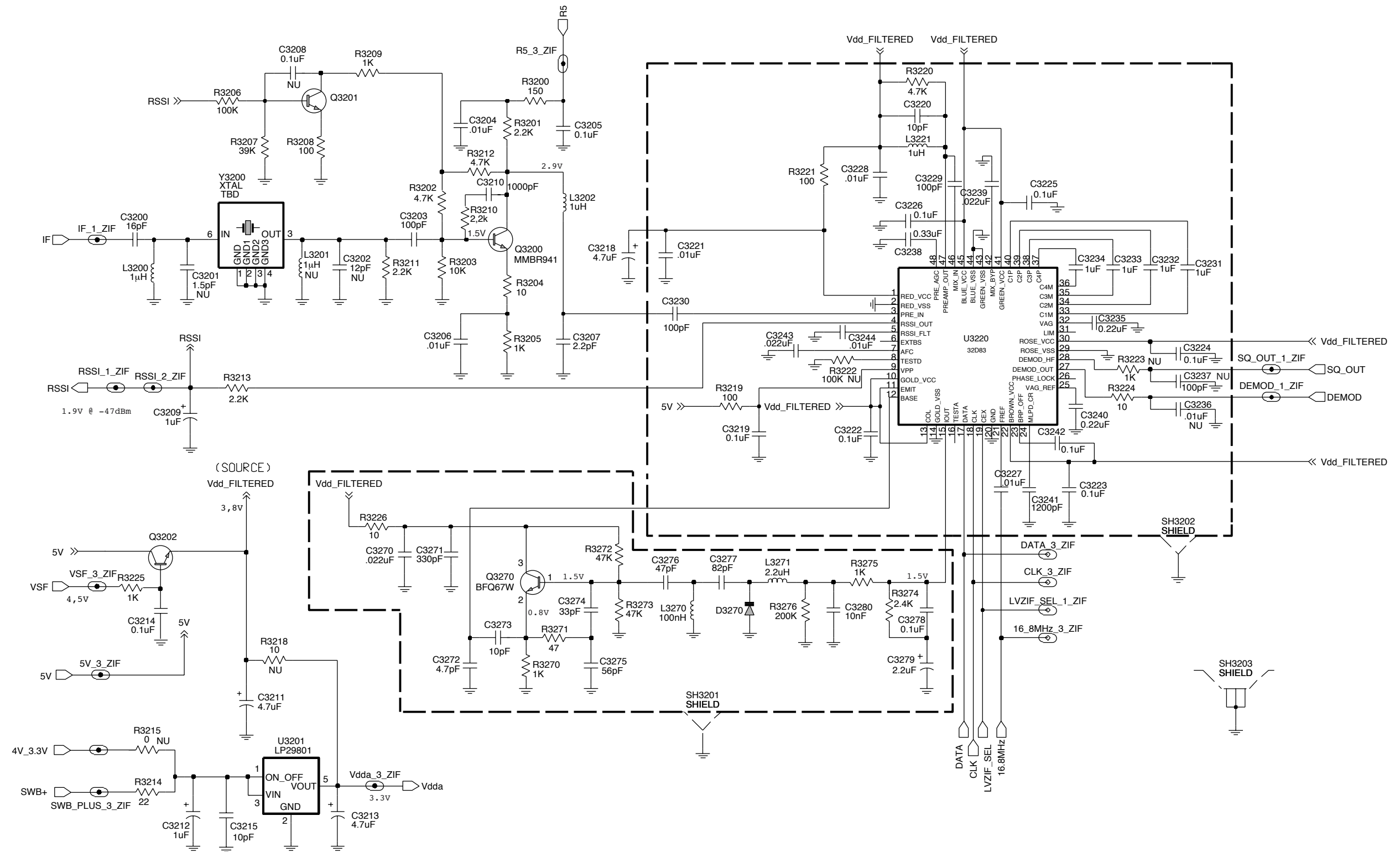


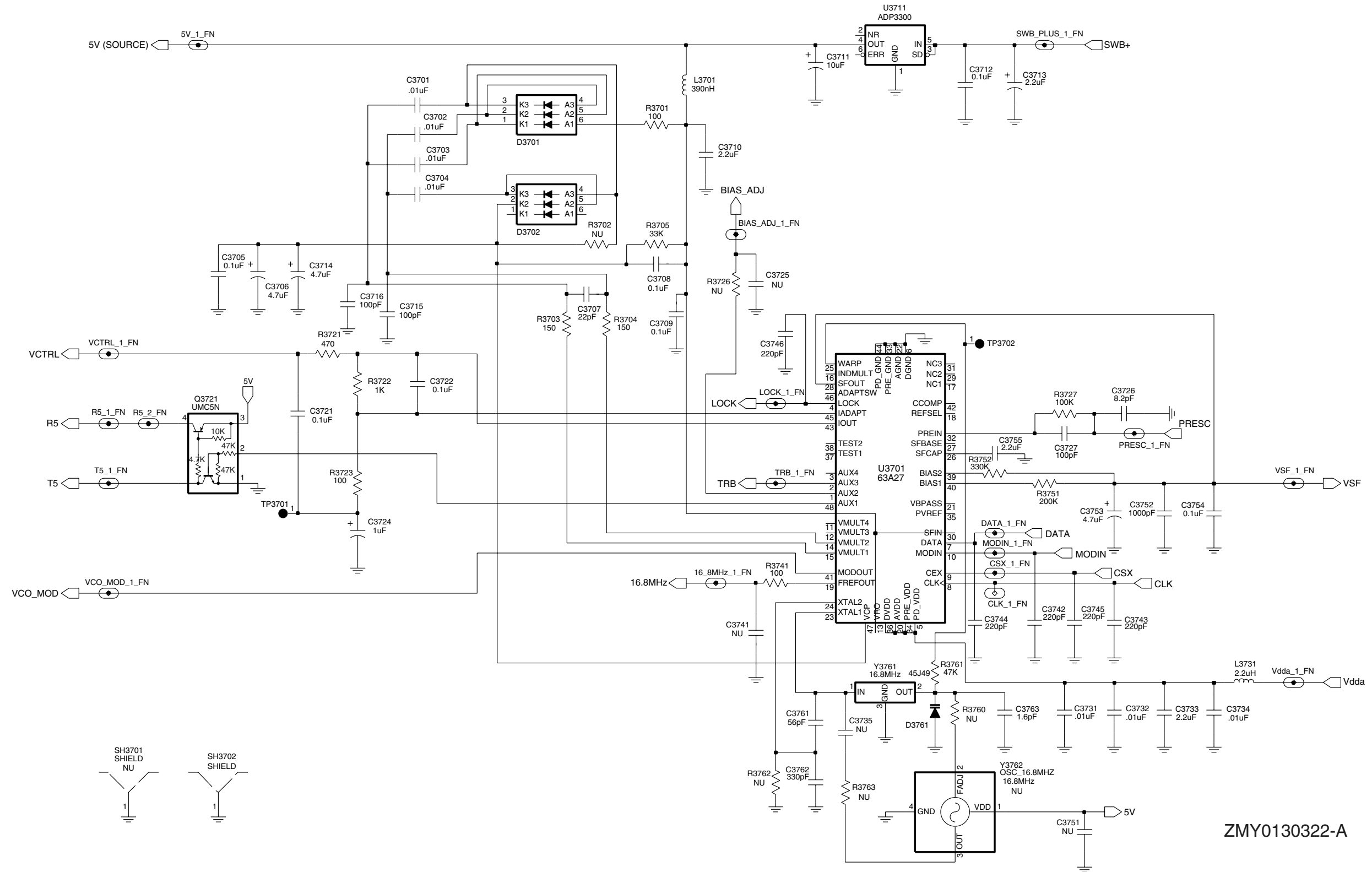
ZMY0130325-A



ZMY0130312-A

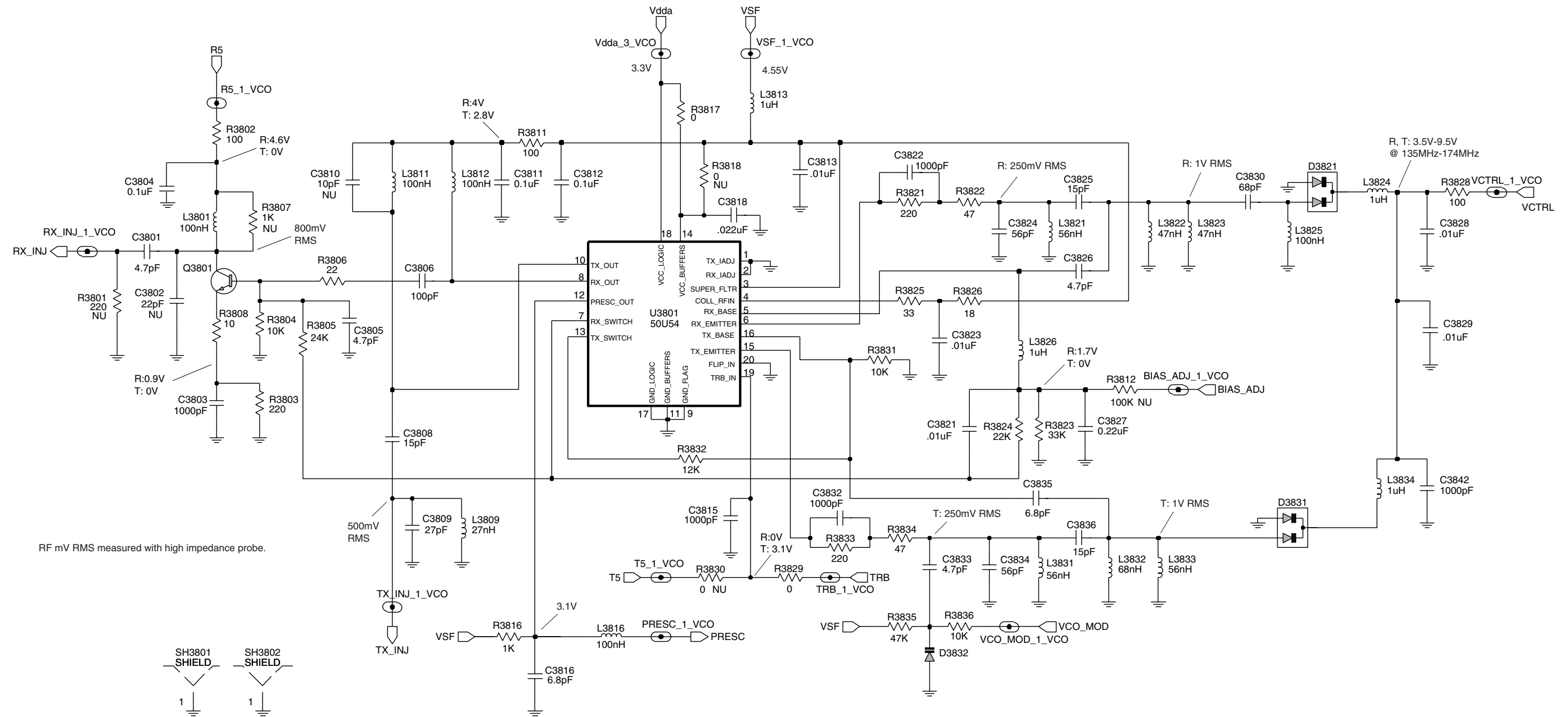
VHF Controls And Switches Schematic Diagram



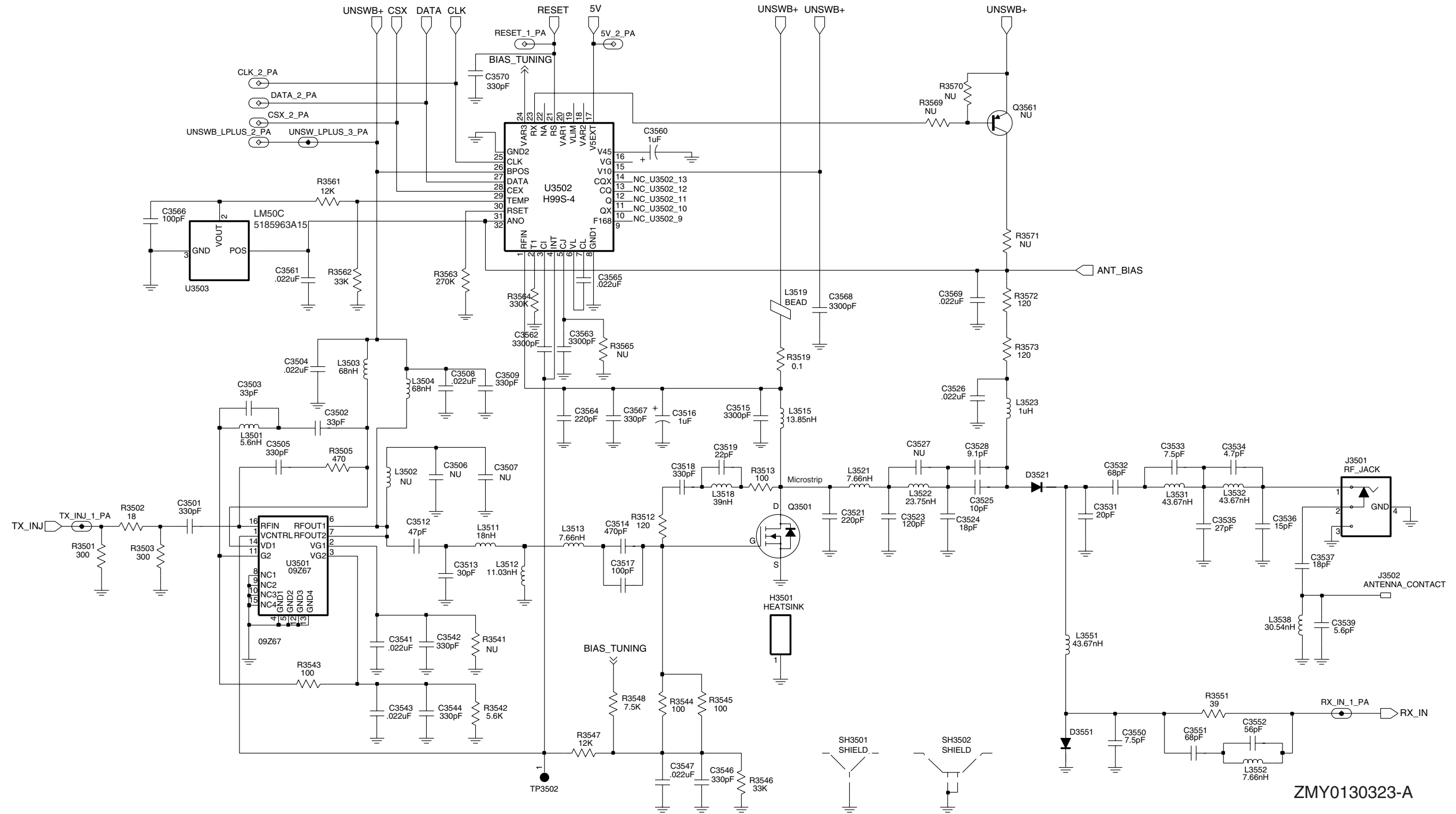


ZMY0130322-A

VHF Synthesizer Schematic Diagram



VHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130323-A

VHF Transmitter Schematic Diagram

VHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B01	0986237A01	Connector, Battery Contact
C3200	2113743N31	16pF
C3203	2113743N50	100pF
C3204	2113743L41	.01uF
C3205	2113928N01	0.1uF
C3206	2113743L41	.01uF
C3207	2113743N10	2.2pF
C3209	2311049A07	1uF
C3210	2113743L17	1000pF
C3211	2311049A56	4.7uF
C3212	2311049A07	1uF
C3213	2311049A56	4.7uF
C3214	2113928N01	0.1uF
C3215	2113743N26	10pF
C3218	2311049A56	4.7uF
C3219	2113928N01	0.1uF
C3220	2113743N26	10pF
C3221	2113743L41	.01uF
C3222	2113928N01	0.1uF
C3223	2113928N01	0.1uF
C3224	2113928N01	0.1uF
C3225	2113928N01	0.1uF
C3226	2113928N01	0.1uF
C3227	2113743L41	.01uF
C3228	2113743L41	.01uF
C3229	2113743N50	100pF
C3230	2113740F51	100pF
C3231	2180478Z20	1uF
C3232	2180478Z20	1uF
C3233	2180478Z20	1uF
C3234	2180478Z20	1uF
C3235	2113743A23	0.22uF
C3238	2113743A21	0.15uF
C3239	2113743E07	.022uF
C3240	2113743A23	0.22uF
C3241	2113743L19	1200pF
C3242	2109720D14	0.1uF
C3243	2113743E07	.022uF
C3244	2113743L41	.01uF
C3270	2113743E07	.022uF
C3271	2113743L05	330pF
C3272	2113743N18	4.7pF
C3273	2113743N26	10pF
C3274	2113743N38	33pF
C3275	2113743N44	56pF
C3276	2113743N42	47pF
C3277	2113743N48	82pF
C3278	2113743E20	0.1uF
C3279	2311049A07	1uF

Circuit Ref	Motorola Part No.	Description
C3280	2113743L39	8200pF
C3301	2113743N29	13pF
C3302	2113743N54	150pF
C3303	2113743N33	20pF
C3304	2113743N54	150pF
C3306	2113928N01	0.1uF
C3307	2113743N50	100pF
C3308	2113743L05	330pF
C3309	2113928N01	0.1uF
C3311	2113743N54	150pF
C3312	2113743N31	16pF
C3313	2113743N54	150pF
C3315	2113743N26	10pF
C3316	2113743N33	20pF
C3317	2113743N40	39pF
C3318	2113743M08	.022uF
C3320	2113743N49	91pF
C3321	2113743L05	330pF
C3322	2113743N50	100pF
C3323	2113743N50	100pF
C3324	2113743N38	33pF
C3325	2113743L17	1000pF
C3326	Not Placed	
C3327	2113743L05	330pF
C3329	2113743L05	330pF
C3330	2113743N50	100pF
C3331	2113743N50	100pF
C3332	2113743N40	39pF
C3334	2113743N33	20pF
C3335	2113743N34	22pF
C3336	2311049A18	10uF
C3337	2113743M08	.022uF
C3338	2113743L09	470pF
C3339	2113743N26	10pF
C3501	2113743L05	330pF
C3502	2113743N38	33pF
C3503	2113743N38	33pF
C3504	2113743M08	.022uF
C3505	2113743L05	330pF
C3508	2113743M08	.022uF
C3509	2113743L05	330pF
C3512	2113740F43	47pF
C3513	2113740F38	30pF
C3514	2113740F67	470pF
C3515	2113743L29	3300pF
C3516	2311049A08	1uF
C3517	2113740F51	100pF
C3518	2113740F63	330pF
C3519	2113740F35	22pF
C3521	2111078B51	220pF
C3523	2111078B45	130pF

Circuit Ref	Motorola Part No.	Description
C3524	2113740F34	22pF
C3525	2113740F35	10pF
C3526	2113743M08	.022uF
C3528	2113740F26	9.1pF
C3531	2113740F29	12pF
C3532	2113740F38	68pF
C3533	2113740F26	7.5pF
C3534	2113740F27	10pF
C3535	2113740F36	24pF
C3536	2113740F31	15pF
C3537	2113740F33	18pF
C3539	2113740F21	5.6pF
C3541	2113743M08	.022uF
C3542	2113743L05	330pF
C3543	2113743M08	.022uF
C3544	2113743L05	330pF
C3546	2113743L05	330pF
C3547	2113743M08	.022uF
C3550	2113743N33	7.5pF
C3551	2113743N49	68pF
C3552	2113743N44	56pF
C3560	2311049A07	1uF
C3561	2113743M08	.022uF
C3562	2113743L29	3300pF
C3563	2113743L29	3300pF
C3564	2113743L01	220pF
C3565	2113743M08	.022uF
C3566	2113743N50	100pF
C3568	2113743L29	3300pF
C3569	2113743M08	.022uF
C3570	2113743L05	330pF
C3701	2113743L41	.01uF
C3702	2113743L41	.01uF
C3703	2113743L41	.01uF
C3704	2113743L41	.01uF
C3705	2113743E20	0.1uF
C3706	2311049J11	4.7uF
C3707	2113743N34	22pF
C3708	2113743M24	0.1uF
C3709	2113743M24	0.1uF
C3710	2104993J02	2.2uF
C3711	2380737Z10	2.2uF
C3712	2113743M24	0.1uF
C3713	2311049A09	2.2uF
C3714	2311049J11	4.7uF
C3715	2113743N50	100pF
C3716	2113743N50	100pF
C3721	2113743E20	0.1uF
C3722	2113743E20	0.1uF
C3724	2311049A08	1uF
C3726	2113743N24	8.2pF

Circuit Ref	Motorola Part No.	Description
C3727	2113743N50	100pF
C3731	2113743L41	.01uF
C3732	2113743L41	.01uF
C3733	2104993J02	2.2uF
C3734	2113743L41	.01uF
C3742	2113743L01	220pF
C3743	2113743L01	220pF
C3744	2113743L01	220pF
C3745	2113743L01	220pF
C3746	2113743L01	220pF
C3752	2113743L17	1000pF
C3753	2311049A56	4.7uF
C3754	2113743M24	0.1uF
C3755	2104993J02	2.2uF
C3761	2113743N44	56pF
C3762	2113740F63	330pF
C3763	2113743N08	1.6pF
C3801	2113743N18	4.7pF
C3803	2113743L17	1000pF
C3804	2113743E20	0.1uF
C3805	2113743N18	4.7pF
C3806	2113743N50	100pF
C3808	2113743N30	15pF
C3809	2113743N36	27pF
C3811	2113743M24	0.1uF
C3812	2113743M24	0.1uF
C3813	2113743L41	.01uF
C3815	2113743L17	1000pF
C3816	2113743N22	6.8pF
C3818	2113743E07	.022uF
C3821	2113743L41	.01uF
C3822	2113743L17	1000pF
C3823	2113743L41	.01uF
C3824	2113743N44	56pF
C3825	2113743N30	15pF
C3826	2113743N18	4.7pF
C3827	2113743E07	.022uF
C3828	2113741A45	.01uF
C3829	2113741A45	.01uF
C3830	2113743N46	68pF
C3832	2113743L17	1000pF
C3833	2113743N18	4.7pF
C3834	2113743N44	56pF
C3835	2113743N22	6.8pF
C3836	2113743N30	15pF
C3842	2113743L17	1000pF
C400	2113743L41	.01uF, 10%
C401	2113743M24	0.1uF, +80%/-20%
C402	2113743M24	0.1uF, +80%/-20%
C403	2113928D08	10uF, +80%/-20%
C407	2113928N01	0.1uF, 10%

Circuit Ref	Motorola Part No.	Description
C408	2113743N50	100pF
C409	2113743M24	0.1uF, +80%/-20%
C410	2113928N01	0.1uF, 10%
C411	2113743M24	0.1uF, +80%/-20%
C412	2113928N01	0.1uF
C414	2113743M24	0.1uF, +80%/-20%
C415	2109720D01	.01uF, 10%
C416	2113928N01	0.1uF, 10%
C419	2113743L41	.01uF, 10%
C420	2113743L41	.01uF, 10%
C421	2113928N01	0.1uF, 10%
C422	2113743M24	0.1uF, +80%/-20%
C423	2113743N50	100pF
C424	2311049A59	10uF, 10%; 6V
C425	2113743M24	0.1uF, +80%/-20%
C426	2113743N50	100pF
C427	2113743N50	100pF
C428	2113743M24	0.1uF, +80%/-20%
C429	2113743M24	0.1uF, +80%/-20%
C430	2113928N01	0.1uF, 10%
C431	2113743N50	100pF
C432	Not Placed	
C433	2113743L41	.01uF, 10%
C434	2113743M24	0.1uF, +80%/-20%
C435	2113743M24	0.1uF, +80%/-20%
C440	2113743G26	4.7uF, +80%/-20%
C442	2113743E20	0.1uF, 10%
C443	2113928N01	0.1uF, 10%
C446	2113743R33	4700pF
C447	2113928N01	0.1uF, 10%
C448	2113928N01	0.1uF, 10%
C449	2113743N50	100pF
C451	2113743M08	.022uF, +80%/-20%
C452	2113743G26	4.7uF, +80%/-20%
C453	2113743N50	100pF
C456	2113743N50	100pF
C458	2113743N50	100pF
C459	2113743N50	100pF
C463	2113743N50	100pF
C466	2113743N50	100pF
C467	2113928N01	0.1uF, 10%
C473	2113743L09	100pF
C475	2113743H14	10uF, +80%/-20%
C476	2113928D08	10uF, +80%/-20%
C477	2113743N50	100pF
C478	2113743N50	100pF
C479	2113928N01	0.1uF, 10%
C480	2113743G24	2.2uF
C481	2113928N01	0.1uF, 10%
C482	2113928N01	0.1uF, 10%
C483	2113743L17	1000pF

Circuit Ref	Motorola Part No.	Description
C484	2113743L17	1000pF
C485	2113743L17	1000pF
C486	2113743L17	1000pF
C487	Not Placed	
C488	2113743L17	1000pF
C489	2113743L17	1000pF
C493	Not Placed	
C494	2113743N50	100pF
C498	2113743N50	100pF
C499	2113743N50	100pF
C500	2113743L17	1000pF
C501	2113743L17	1000pF
C502	2311049A05	0.47uF, 10%; 25V
C503	2113743N50	100pF
C504	2113743L17	1000pF
C505	2113743N50	100pF
C506	2113743N50	100pF
C507	2113743L17	1000pF
C508	2113743N50	100pF
C509	2113743L17	1000pF
C511	2113743N50	100pF
C512	2113743N50	100pF
C513	2113743N50	100pF
C514	2113743N50	100pF
C518	2113743L17	1000pF
C519	2113743L17	1000pF
C520	2113743L17	1000pF
C521	2113743L41	.01uF, 10%
C522	2113743L41	.01uF, 10%
C523	2113743N50	100pF
C524	2113743L17	1000pF
CR3301	4802245J42	Ring Quad Diode
CR3302	4805129M96	SMBV1032
CR3303	4880154K03	Dual Common Anode Cathode
CR414	4802245J47	Schottky Diode
CR412	4802245J47	Schottky Diode
CR413	4802245J47	Schottky Diode
CR440	4813833C02	Dual Diode Common Cathode
CR501	4880107R01	Rectifier
CR503	4805729G49	LED Red/Yel
D3270	4862824C01	Varactor
D3301	4802081B58	Diode Dual
D3302	4802081B58	Diode Dual
D3521	4880973Z02	Pin Diode
D3551	4880973Z02	Pin Diode
D3701	4802233J09	Triple Diode
D3702	4802233J09	Triple Diode
D3761	4862824C03	Varactor
D3821	4805649Q13	Dual Varactor
D3831	4805649Q13	Dual Varactor

Circuit Ref	Motorola Part No.	Description
D3832	4862824C01	Varactor
E400	2480640Z01	Ferrite Bead
F501	6580542Z01	Fuse 3A
H3501	2680499Z01	Heatsink
J104	3980686Z01	Contact (Antenna)
J3501	0180117S05	RF_Jack
J3502	3980686Z01	Antenna Contact
J400	0905505Y04	40-pin Connector
J402	2809926G02	4-pin Connector
J404	0980689Z01	Stereo Jack (2.5mm)
J407	0980688Z01	Stereo Jack (3.5mm)
L3200	2462587N68	1uH
L3202	2462587N68	1uH
L3221	2462587N68	1uH
L3270	2462587T15	100nH
L3271	2462587Q20	2.2uH
L3301	2462587T35	12nH
L3303	2462587T35	12nH
L3304	2462587T23	470nH
L3305	2462587T35	12nH
L3306	2462587T35	12nH
L3308	2462587T34	10nH
L3309	2462587N55	150nH
L3312	2462587V28	33nH
L3501	2413926H09	5.6nH
L3503	2462587V32	68nH
L3504	2462587N51	68nH
L3511	2462587N44	18nH
L3512	2460591B04	11.03nH
L3513	2460591A11	7.66nH
L3515	2460591C23	13.85nH
L3518	2462587N48	39nH
L3519	2484657R01	Bead
L3521	2460591A11	7.66nH
L3522	2460591E24	23.75nH
L3523	2462587N68	1uH
L3531	2460591N28	34.14nH
L3532	2460591N28	34.14nH
L3538	2460591M36	30.54nH
L3551	2460591N36	43.67nH
L3552	2460591A11	7.66nH
L3701	2462587Q42	390nH
L3731	2462587Q20	2.2uH
L3801	2462587V34	100nH
L3809	2462587V27	27nH
L3811	2462587V34	100nH
L3812	2462587V34	100nH
L3813	2462587Q47	1uH
L3816	2462587V34	100nH
L3821	2462587N50	56nH
L3822	2462587N49	47nH

Circuit Ref	Motorola Part No.	Description
L3823	2462587N49	47nH
L3824	2462587N68	1uH
L3825	2462587V34	100nH
L3826	2462587N68	1uH
L3831	2462587N50	56nH
L3832	2462587N51	68nH
L3833	2462587N50	56nH
L3834	2462587N68	1uH
L400	2462587Q42	390nH, 10%
L401	2462587Q42	390nH, 10%
L410	2462587Q42	390nH, 10%
L411	2462587Q42	390nH, 10%
L505	2462587Q42	390nH, 10%
PB501	4080523Z01	Tactile, Pushbutton
PB502	4080523Z01	Tactile, Pushbutton
PB504	4080523Z01	Tactile, Pushbutton
Q3200	4813827A07	MMBR941
Q3201	4880214G02	NPN
Q3202	4880214G02	NPN
Q3270	4805218N63	BFQ67W
Q3301	4880214G02	NPN
Q3302	4813827A07	NPN
Q3501	4802245J55	RF Power FET
Q3721	4802245J50	UMC5N
Q3801	4813827A07	NPN
Q400	4809579E18	MOSFET P-Chan
Q403	4880214G02	NPN
Q405	4802245J54	Dual NPN
Q410	4802245J54	Dual NPN
Q417	4802245J50	Dual NPN/PNP
Q418	4802245J50	Dual NPN/PNP
Q419	5180159R01	Dual NPN5
Q420	4805128M67	MMBT3906
Q421	4880214G02	NPN
Q502	5180159R01	Dual NPN
Q505	4880214G02	NPN
R3200	0662057M54	150
R3201	0662057M82	2.2K
R3202	0662057M90	4.7K
R3203	0662057M98	10K
R3204	0662057M34	22
R3205	0662057M74	1K
R3206	0662057N23	100K
R3207	0662057N13	39K
R3208	0662057M50	100
R3209	0662057M74	1K
R3210	0662057M82	2.2K
R3211	0662057M82	2.2K
R3212	0662057M90	4.7K
R3213	0662057M82	2.2K
R3214	0662057M50	100

Circuit Ref	Motorola Part No.	Description
R3215	0662057M50	100
R3219	0662057M50	100
R3220	0662057M90	4.7K
R3221	0662057M50	100
R3224	0662057M26	10
R3225	0662057M74	1K
R3226	0662057M26	10
R3270	0662057M74	1K
R3271	0662057M42	47
R3272	0662057N15	47K
R3273	0662057N15	47K
R3274	0662057M74	1K
R3275	0662057M88	3.9K
R3276	0662057N30	200K
R3303	0662057N23	100K
R3304	0662057N23	100K
R3305	0662057N19	33K
R3306	0662057M82	2.2K
R3307	0662057N11	33K
R3308	0662057M86	2.4K
R3309	0662057M92	5.6K
R3310	0662057M98	10K
R3311	0662057M26	10
R3312	Not Placed	
R3313	0662057M34	22
R3314	0662057M26	10
R3315	0662057M62	330
R3316	0662057M61	300
R3317	0662057N23	100K
R3318	0662057M66	470
R3321	0662057M54	150
R3322	0662057M58	220
R3323	0662057M32	18
R3324	0662057M58	220
R3501	0662057M61	300
R3502	0662057M32	18
R3503	0662057M61	300
R3505	0662057M66	470
R3512	0662057A27	120
R3513	0662057A25	100
R3519	0680539Z01	0.1
R3542	0662057M92	5.6K
R3543	0662057M50	100
R3544	0662057A25	100
R3545	0662057A25	100
R3546	0662057N11	33K
R3547	0662057N01	12K
R3548	0662057M95	7.5K
R3551	0662057M40	39
R3561	0662057N01	12K
R3562	0662057N11	33K

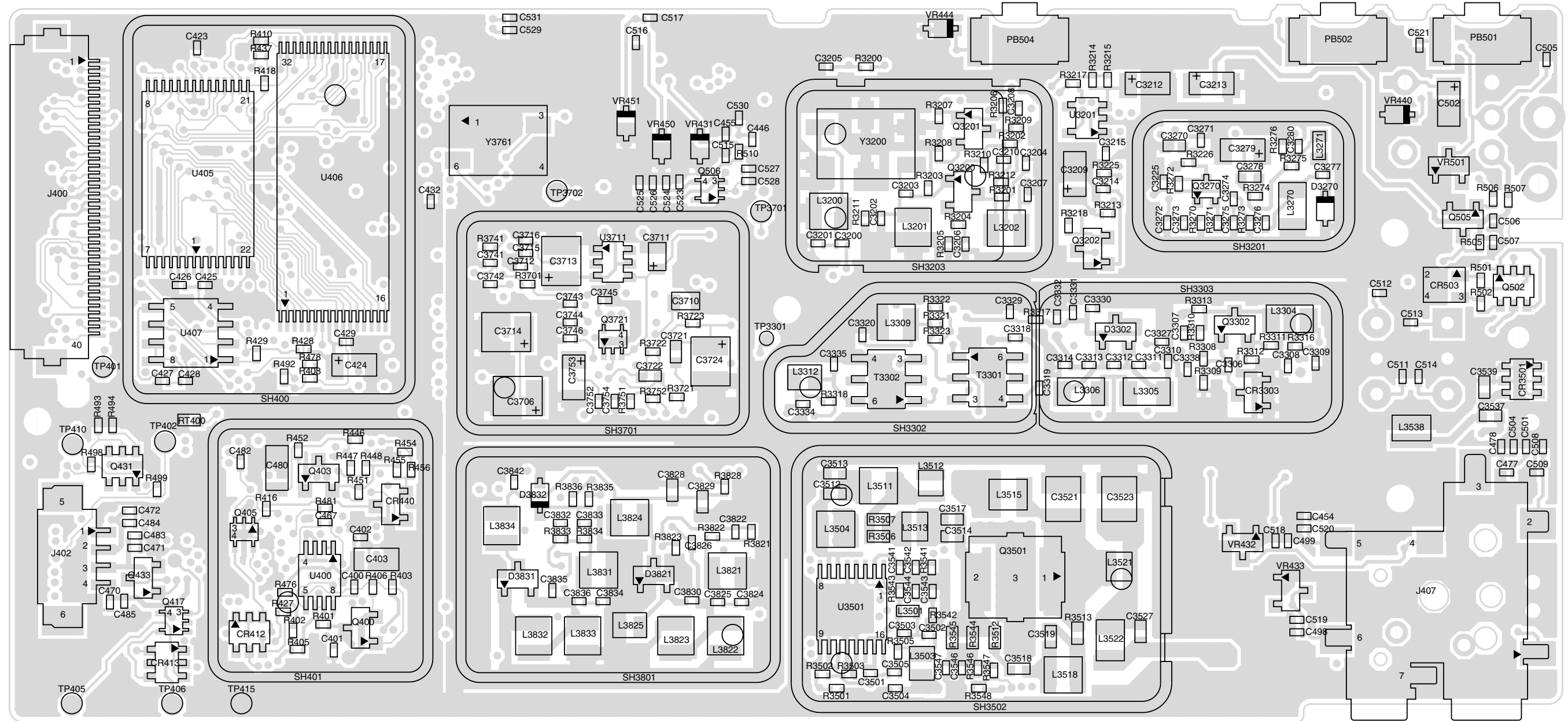
Circuit Ref	Motorola Part No.	Description
R3563	0662057N33	270K
R3564	0662057N35	330K
R3572	0662057A27	120
R3573	0662057A27	120
R3701	0662057M50	100
R3702	Not Placed	
R3703	0662057M54	150
R3704	0662057M54	150
R3705	0662057N11	33K
R3721	0662057M66	470
R3722	0662057M74	1K
R3723	0662057M50	100
R3727	0662057N23	100K
R3741	0662057M50	100
R3751	0662057N30	200K
R3752	0662057N35	330K
R3760	Not Placed	
R3761	0662057N15	47K
R3802	0662057M50	100
R3803	0662057M58	220
R3804	0662057M98	10K
R3805	0662057N08	24K
R3806	0662057M34	22
R3808	0662057M26	10
R3811	0662057M50	100
R3816	0662057M74	1K
R3817	0662057M01	0
R3821	0662057M58	220
R3822	0662057M42	47
R3823	0662057N11	33K
R3824	0662057N07	22K
R3825	0662057M38	33
R3826	0662057M32	18
R3828	0662057M50	100
R3829	0662057M01	0
R3831	0662057M98	10K
R3832	0662057N01	12K
R3833	0662057M58	220
R3834	0662057M42	47
R3835	0662057N15	47K
R3836	0662057M98	10K
R400	0662057N15	47K
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K, 1%

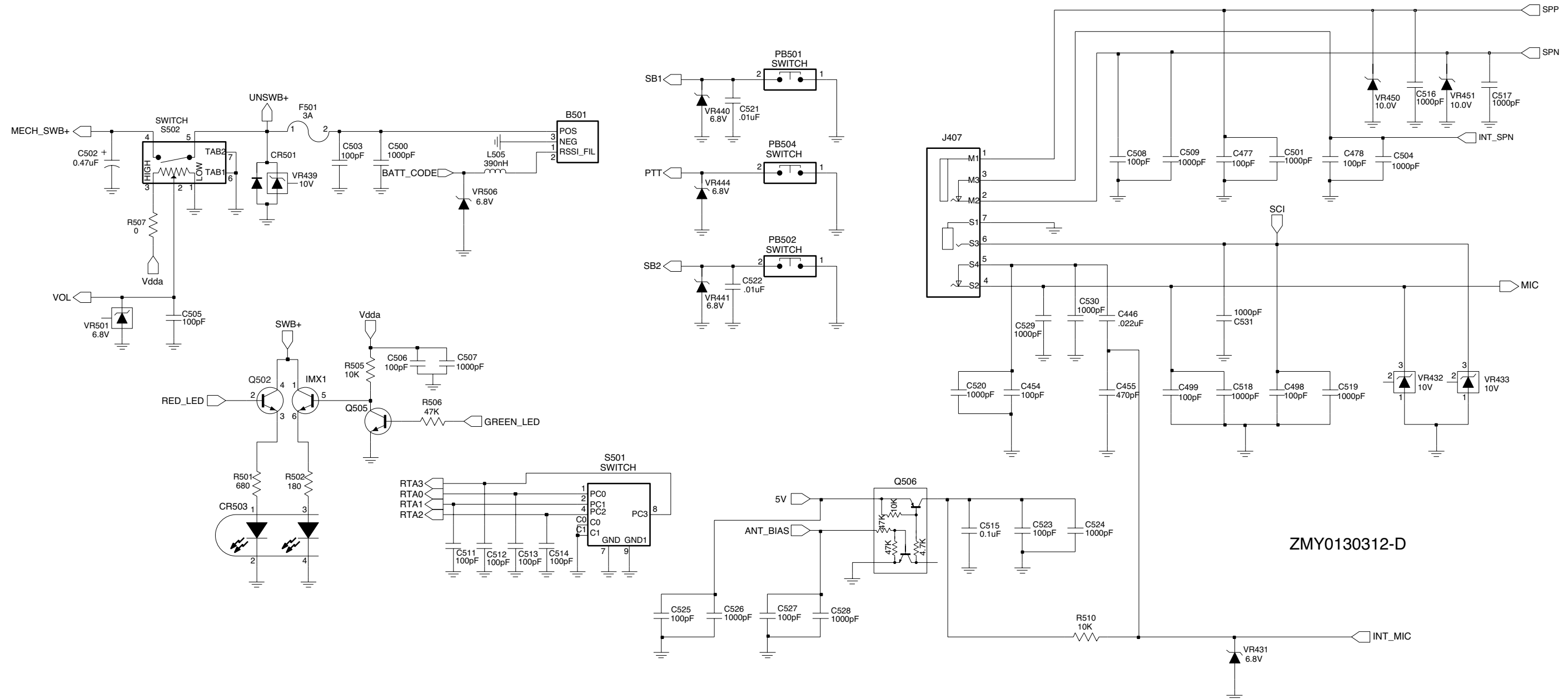
Circuit Ref	Motorola Part No.	Description
R415	0662057V26	91K, 1%
R416	0662057N13	39K
R418	0662057M01	0
R419	0662057M90	4700
R423	0662057N15	47K
R425	0662057N10	30K
R427	0662057M98	10K
R428	0662057M10	2.2K
R429	0662057M98	10K
R432	0662057N16	51K
R434	Not Placed	
R435	0662057M81	2K
R436	0662057N16	0
R437	Not Placed	
R438	0662057M01	0
R439	0662057N23	100K
R445	0662057N08	24K
R446	0662057N30	200K
R447	0662057N52	1.6M
R448	0662057N33	270K
R449	0662057N08	24K
R457	0662057M98	10K
R460	0662057M90	4.7K
R461	0662057N23	100K
R462	0662057N23	100K
R463	0662057M61	300
R471	0662057M92	5.6K
R472	0662057N12	3.6K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R478	0662057M98	10K
R481	0662057N08	24K
R492	0662057M01	0
R494	0662057M01	0
R495	0662057N23	100K
R496	0662057N23	100K
R498	0662057N23	100K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
RT400	0680590Z01	Thermistor 33K
S501	4080502B03	Channel Switch
S502	1880619Z01	Volume Switch
SH3201	2602023X08	Shield
SH3202	2686081B02	Shield
SH3203	Not Placed	
SH3301	2686081B01	Shield

Circuit Ref	Motorola Part No.	Description
SH3302	2686081B05	Shield
SH3303	2686081B06	Shield
SH3501	2686081B03	Shield
SH3502	2686081B04	Shield
SH3702	2680511Z01	Shield
SH3801	2680513Z01	Shield
SH3802	2680514Z01	Shield
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	Controller On/Off Shield
SH402	2680515Z01	Controller Microprocessor Shield
SH403	2680516Z01	Controller AsficCmp/Audio PA Shield
T3301	2580541Z01	XFMR Coil
T3302	2580541Z01	XFMR Coil
U3201	5102463J58	3.3V Voltage Regulator
U3220	5109632D83	LVZIF IC
U3501	5105109Z67	09Z67
U3502	5185765B01	H99S-4
U3503	5185963A15	Temperature Sense
U3701	5185963A27	LVFRACN Synthesizer IC
U3711	5105739X05	5V Regulator
U3801	5105750U54	VCO Buffer IC
U400	5102463J40	3.3V Voltage Regulator
U404	5185963A53	AsficCmp
U405	Not Placed	
U406	*5102463J59	Flash ROM 128K x 8
U407	*5102463J64	EEPROM 16K x 8
U409	5102226J55	up HC11FL0
U410	5102463J57	3.3V Voltage Regulator
U420	5102463J44	Audio PA
VR431	4802245J51	6.8V Zener
VR432	4880140L15	10V Zener
VR433	4880140L15	10V Zener
VR439	4880140L15	10V Zener
VR440	4802245J51	6.8V Zener
VR441	4802245J51	6.8V Zener
VR444	4802245J51	6.8V Zener
VR450	4802245J53	10V Zener
VR451	4802245J53	10V Zener
VR501	4813830A18	6.8V Zener
VR506	4802245J51	6.8V Zener
Y3200	4802245J43	XTAL Filter
Y3761	4802245J49	16.8MHz Crystal Oscillator
	7580671Z01	Pad (Flexible Circuit)
	8480675Z01	VHF main PC Board

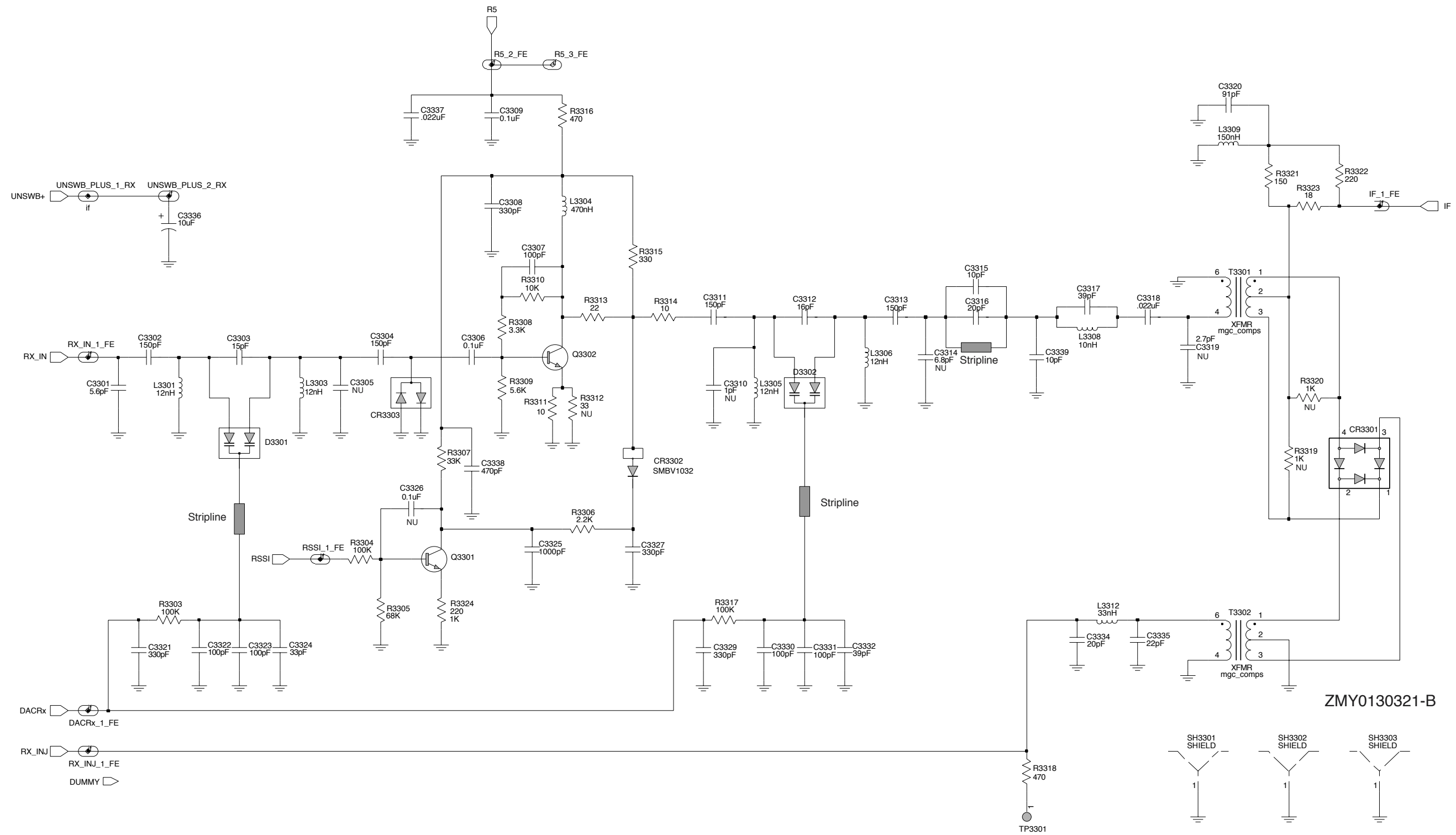
* Motorola Depot Servicing only

8.0 Circuit Board/Schematic Diagrams and Parts List

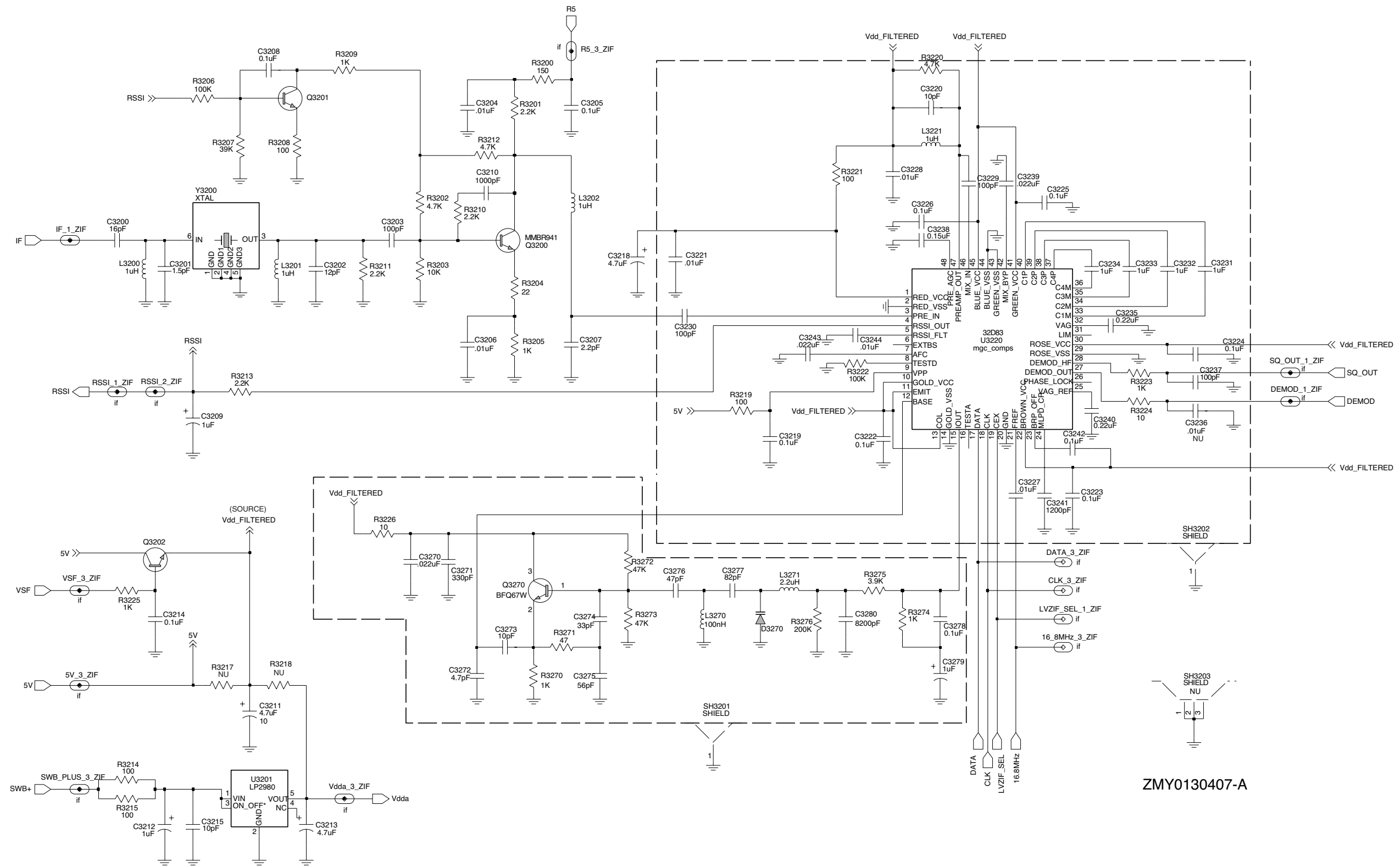




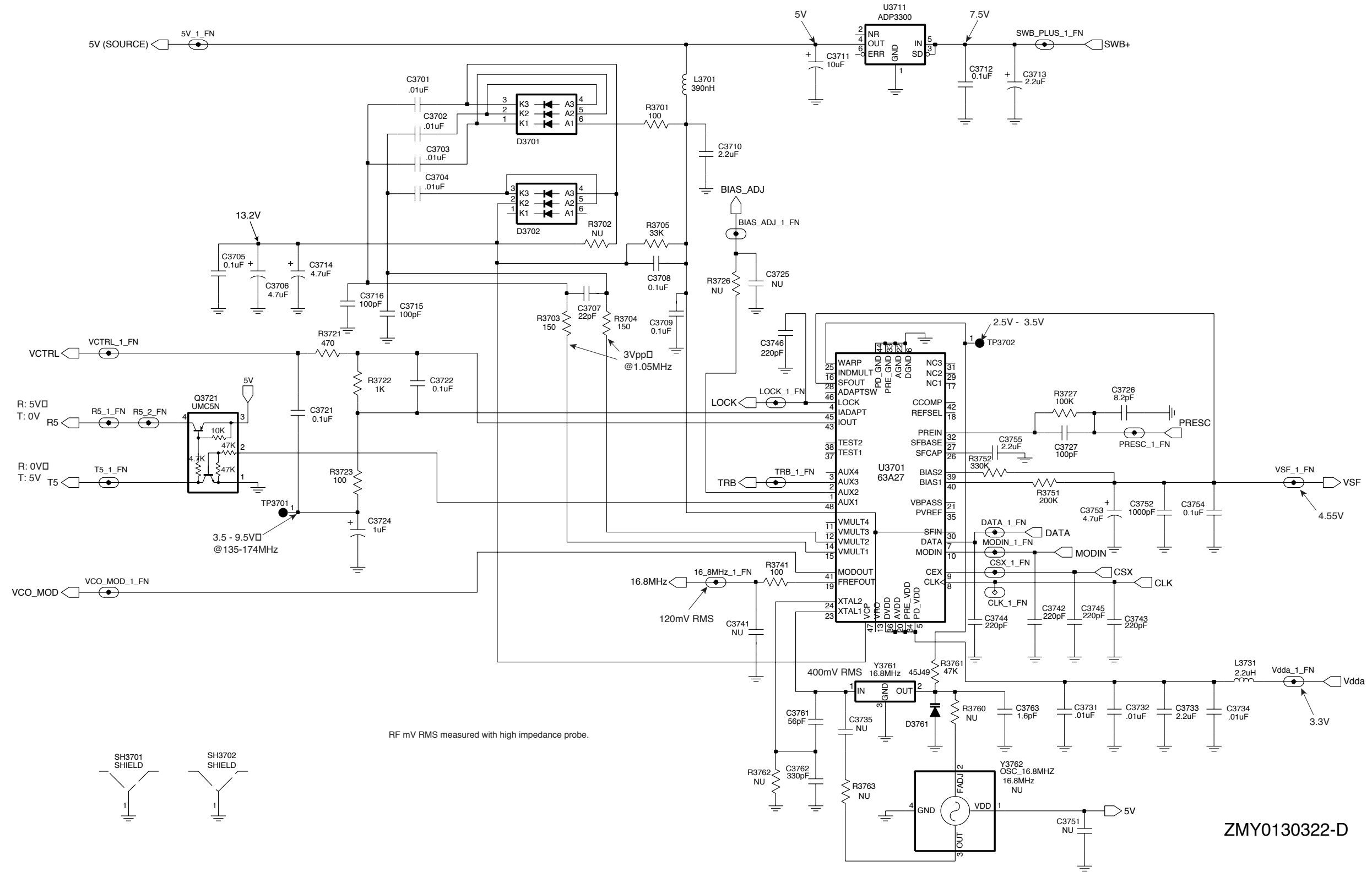
VHF Controls And Switches Schematic Diagram



VHF Receiver Front End Schematic Diagram

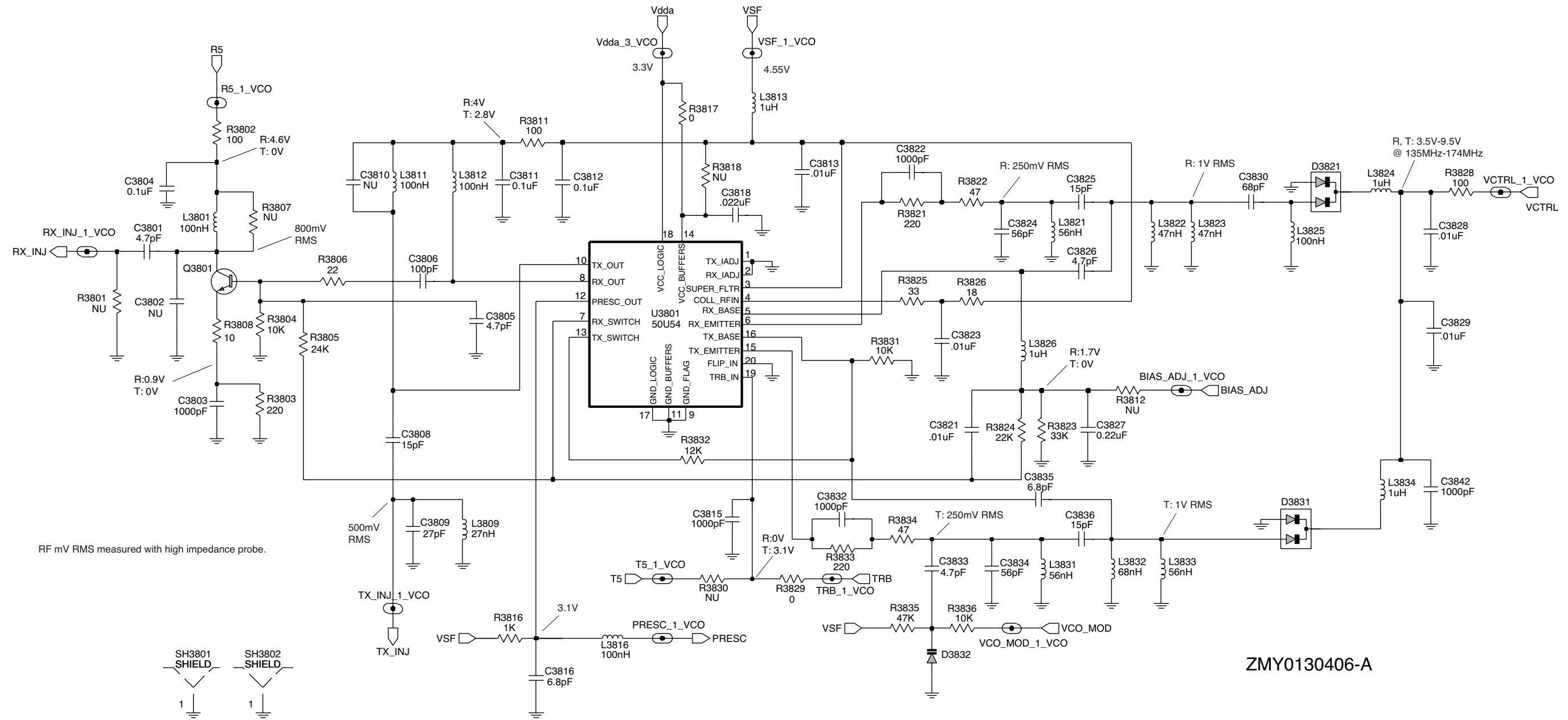


VHF Receiver Back End Schematic Diagram

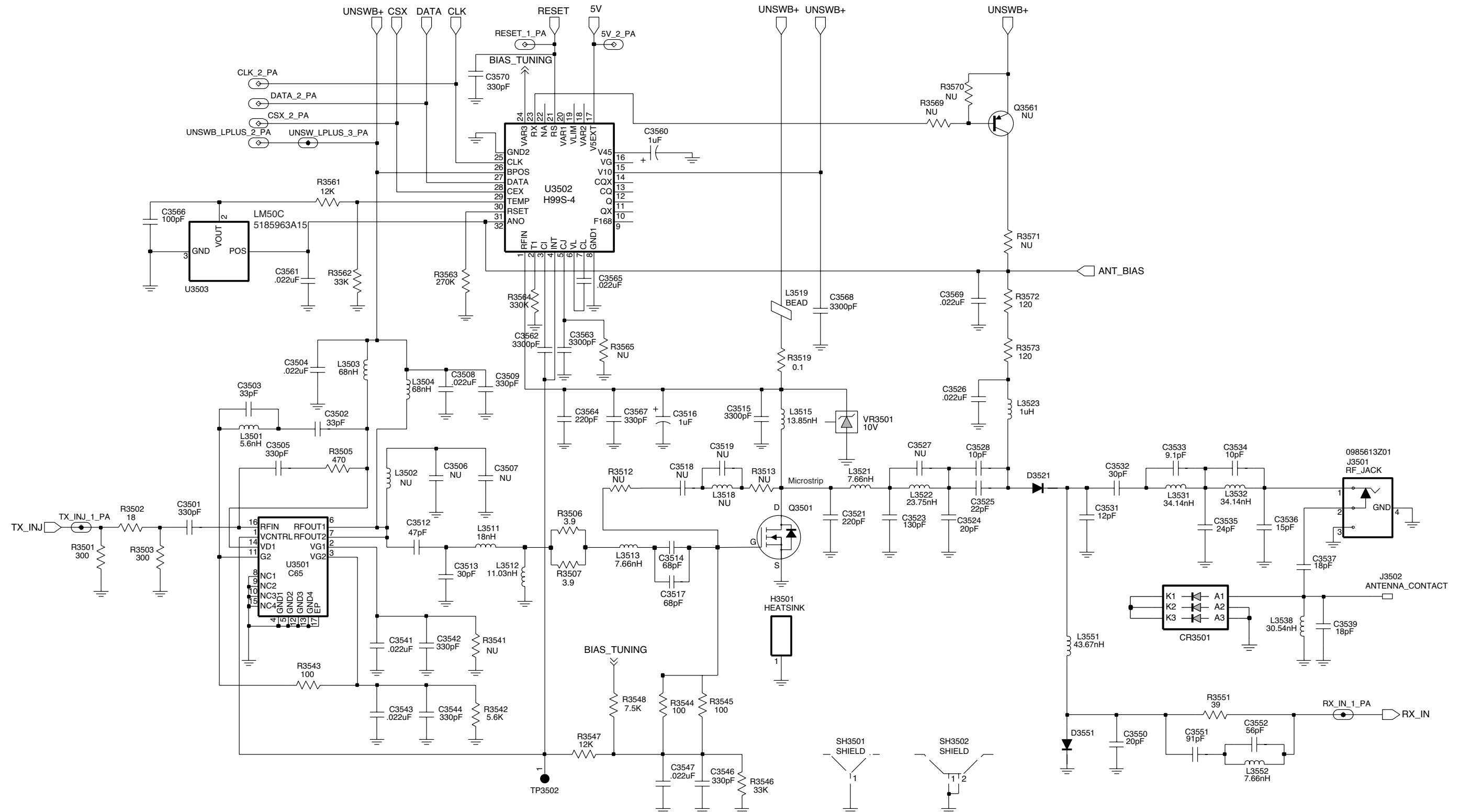


ZMY0130322-D

VHF Synthesizer Schematic Diagram



VHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130323-D

VHF Transmitter Schematic Diagram

VHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact
C3200	2113743N31	16pF
C3201	Not Placed	
C3202	Not Placed	
C3203	2113743N50	100pF
C3204	2113743L41	10000pF, 10%
C3205	2113928N01	0.1uF
C3206	2113743L41	10000pF, 10%
C3207	2113743N10	2.2pF
C3208	Not Placed	
C3209	2311049A07	1uF
C3210	2113743L17	1000pF
C3211	2311049A56	4.7uF
C3212	2311049A07	1uF
C3213	2311049A56	4.7uF
C3214	2113928N01	0.1uF
C3215	2113743N26	10pF
C3218	2311049A56	4.7uF
C3219	2113928N01	0.1uF
C3220	2113743N26	10pF
C3221	2113743L41	10000pF, 10%
C3222	2113928N01	0.1uF
C3223	2113928N01	0.1uF
C3224	2113928N01	0.1uF
C3225	2113928N01	0.1uF
C3226	2113928N01	0.1uF
C3227	2113743L41	10000pF, 10%
C3228	2113743L41	10000pF, 10%
C3229	2113743N50	100pF
C3230	2113740F51	100pF
C3231	2180478Z20	1uF
C3232	2180478Z20	1uF
C3233	2180478Z20	1uF
C3234	2180478Z20	1uF
C3235	2113743A23	0.22uF
C3236	Not Placed	
C3237	Not Placed	
C3238	2113743A24	0.33uF
C3239	2113743E07	0.022uF
C3240	2113743A23	0.22uF
C3241	2113743L19	1200pF
C3242	2109720D14	0.1uF, 1206
C3243	2113743E07	0.022uF
C3244	2113743L41	10000pF, 10%
C3270	2113743E07	0.022uF
C3271	2113743L05	330pF
C3272	2113743N18	4.7pF
C3273	2113743N26	10pF
C3274	2113743N38	33pF

Circuit Ref	Motorola Part No.	Description
C3275	2113743N44	56pF
C3276	2113743N42	47pF
C3277	2113743N48	82pF
C3278	2113743E20	0.1uF
C3279	2311049A07	1uF
C3280	2113743L39	8200pF
C3301	2113743N29	13pF
C3302	2113743N54	150pF
C3303	2113743N33	20pF
C3304	2113743N54	150pF
C3305	Not Placed	
C3306	2113928N01	0.1uF
C3307	2113743N50	100pF
C3308	2113743L05	330pF
C3309	2113928N01	0.1uF
C3310	Not Placed	
C3311	2113743N54	150pF
C3312	2113743N31	16pF
C3313	2113743N54	150pF
C3314	Not Placed	
C3315	2113743N26	10pF
C3316	2113743N33	20pF
C3317	2113743N40	39pF
C3318	2113743M08	22000pF, +80%/-20%
C3319	Not Placed	
C3320	2113743N49	91pF
C3321	2113743L05	330pF
C3322	2113743N50	100pF
C3323	2113743N50	100pF
C3324	2113743N38	33pF
C3325	2113743L17	1000pF
C3326	Not Placed	
C3327	2113743L05	330pF
C3329	2113743L05	330pF
C3330	2113743N50	100pF
C3331	2113743N50	100pF
C3332	2113743N40	39pF
C3334	2113743N33	20pF
C3335	2113743N34	22pF
C3336	2311049A18	10uF
C3337	2113743M08	22000pF, +80%/-20%
C3338	2113743L09	470pF
C3339	2113743N26	10pF
C3501	2113743L05	330pF
C3502	2113743N38	33pF
C3503	2113743N38	33pF
C3504	2113743M08	22000pF, +80%/-20%
C3505	2113743N38	33pF
C3506	Not Placed	
C3507	Not Placed	
C3508	2113743M08	22000pF, +80%/-20%

Circuit Ref	Motorola Part No.	Description
C3509	2113743L05	330pF
C3512	2113740F43	47pF
C3513	2113740F38	30pF
C3514	2113740F47	68pF
C3515	2113743L29	3300pF
C3516	2311049A08	1uF
C3518	Not Placed	
C3519	Not Placed	
C3521	2111078B51	220pF
C3523	2111078B45	130pF
C3524	2113740F34	20pF
C3525	2113740F35	22pF
C3526	2113743M08	22000pF, +80%/-20%
C3527	Not Placed	GCAM Dummy Part Number
C3528	2113740F27	10pF
C3531	2113740F29	12pF
C3532	2113740F38	30pF
C3533	2113740F26	9.1pF
C3534	2113740F27	10pF
C3535	2113740F36	24pF
C3536	2113740F31	15pF
C3537	2113740F34	20pF
C3539	2113740F33	18pF
C3541	2113743M08	22000pF, +80%/-20%
C3542	2113743L05	330pF
C3543	2113743M08	22000pF, +80%/-20%
C3544	2113743L05	330pF
C3546	2113743L05	330pF
C3547	2113743M08	22000pF, +80%/-20%
C3550	2113743N33	20pF
C3551	2113743N49	91pF
C3552	2113743N44	56pF
C3560	2311049A07	1uF
C3561	2113743M08	22000pF, +80%/-20%
C3562	2113743L29	3300pF
C3563	2113743L29	3300pF
C3564	2113743L01	220pF
C3565	2113743E07	0.022uF
C3566	2113743N50	100pF
C3567	2113743L05	330pF
C3568	2113743L29	3300pF
C3569	2113743M08	22000pF, +80%/-20%
C3570	2113743L05	330pF
C3701	2113743L41	10000pF, 10%
C3702	2113743L41	10000pF, 10%
C3703	2113743L41	10000pF, 10%
C3704	2113743L41	10000pF, 10%
C3705	2113743E20	0.1uF
C3706	2311049J11	4.7uF
C3707	2113743N34	22pF
C3708	2113743M24	100000pF, +80%/-20%

Circuit Ref	Motorola Part No.	Description
C3709	2113743M24	100000pF, +80%/-20%
C3710	2104993J02	2.2uF
C3711	2311049A69	10uF, 20%
C3712	2113743M24	100000pF, +80%/-20%
C3713	2311049A09	2.2uF
C3714	2311049J11	4.7uF
C3715	2113743N50	100pF
C3716	2113743N50	100pF
C3721	2113743E20	0.1uF
C3722	2113743E20	0.1uF
C3724	2311049A08	1uF
C3725	Not Placed	
C3726	2113743N24	8.2pF
C3727	2113743N50	100pF
C3731	2113743L41	10000pF, 10%
C3732	2113743L41	10000pF, 10%
C3733	2104993J02	2.2uF
C3734	2113743L41	10000pF, 10%
C3735	Not Placed	
C3741	Not Placed	
C3742	2113743L01	220pF
C3743	2113743L01	220pF
C3744	2113743L01	220pF
C3745	2113743L01	220pF
C3746	2113743L01	220pF
C3751	Not Placed	
C3752	2113743L17	1000pF
C3753	2311049A56	4.7uF
C3754	2113743M24	100000pF, +80%/-20%
C3755	2104993J02	2.2uF
C3761	2113743N44	56pF
C3762	2113740F63	330pF
C3763	2113743N08	1.6pF
C3801	2113743N18	4.7pF
C3802	Not Placed	
C3803	2113743L17	1000pF
C3804	2113743E20	0.1uF
C3805	2113743N18	4.7pF
C3806	2113743N50	100pF
C3808	2113743N30	15pF
C3809	2113743N36	27pF
C3810	Not Placed	
C3811	2113743M24	100000pF, +80%/-20%
C3812	2113743M24	100000pF, +80%/-20%
C3813	2113743L41	10000pF, 10%
C3815	2113743L17	1000pF
C3816	2113743N22	6.8pF
C3818	2113743E07	0.022uF
C3821	2113743L41	10000pF, 10%
C3822	2113743L17	1000pF
C3823	2113743L41	10000pF, 10%

Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description
C3824	2113743N44	56pF	C452	2113743G26	4.7uF, +80%/-20%	C520	2113743L17	1000pF	L3271	2462587Q20	2.2uH
C3825	2113743N30	15pF	C453	2113743N50	100pF	C521	2113743L41	10000pF, 10%	L3301	2462587T35	12nH
C3826	2113743N18	4.7pF	C454	2113743N50	100pF	C522	2113743L41	10000pF, 10%	L3303	2462587T35	12nH
C3827	2113743E07	0.022uF	C455	2113743L09	470pF	C523	2113743N50	100pF	L3304	2462587T23	470nH
C3828	2185895Z01	0.01uF	C456	2113743N50	100pF	C524	2113743L17	1000pF	L3305	2462587T35	12nH
C3829	2185895Z01	0.01uF	C458	2113743N50	100pF	C525	2113743N50	100pF	L3306	2462587T35	12nH
C3830	2113743N46	68pF	C459	2113743N50	100pF	C526	2113743L17	1000pF	L3308	2462587T34	10nH
C3832	2113743L17	1000pF	C463	2113743N50	100pF	C527	2113743N50	100pF	L3309	2462587N55	150nH
C3833	2113743N18	4.7pF	C466	2113743N50	100pF	C528	2113743L17	1000pF	L3312	2462587V28	33nH
C3834	2113743N44	56pF	C467	2113928N01	0.1uF	C529	2113743L17	1000pF	L3501	2413926H09	5.6nH
C3835	2113743N22	6.8pF	C471	2113743N50	100pF	C530	2113743L17	1000pF	L3502	Not Placed	
C3836	2113743N30	15pF	C472	2113743N50	100pF	C531	2113743L17	1000pF	L3503	2462587V32	68nH
C3842	2113743L17	1000pF	C473	2113743L09	470pF	CR3301	4802245J42	Ring Quad Diode	L3504	2462587N51	68nH
C400	2113743L41	10000pF, 10%	C475	2113743H14	10uF, +80%/-20%	CR3302	4805129M96	Dual Bonds Pin Diode, RH Reeled	L3511	2462587N44	18nH
C401	2113743M24	100000pF, +80%/-20%	C476	2113928D08	10uF, +80%/-20%	CR3303	4880154K03	Dual Common Anode-Cathode	L3512	2479990B01	11.03nH
C402	2113743M24	100000pF, +80%/-20%	C477	2113743N50	100pF	CR3501	Not Placed		L3513	2479990A02	7.66nH
C403	2113928D08	10uF, +80%/-20%	C478	2113743N50	100pF	CR412	4802245J62	Schottky Diode	L3515	2479990C03	13.85nH
C407	2113928N01	0.1uF	C479	2113928N01	0.1uF	CR413	4802245J62	Schottky Diode	L3518	Not Placed	
C408	2113743N50	100pF	C480	2113928D08	10uF, +80%/-20%	CR414	4802245J62	Schottky Diode	L3519	2484657R01	Bead
C409	2113743M24	100000pF, +80%/-20%	C481	2113928N01	0.1uF	CR440	4813833C02	Dual Common Cathode Diode	L3521	2479990A02	7.66nH
C410	2113928N01	0.1uF	C482	2113928N01	0.1uF	CR501	4880107R01	Rectifier	L3522	2479990E01	23.75nH
C411	2113743M24	100000pF, +80%/-20%	C483	2113743L17	1000pF	CR503	4805729G49	LED Red/Yel	L3523	2462587N68	1uH
C412	2113928N01	0.1uF	C484	2113743L17	1000pF	D3270	4862824C01	Varactor	L3531	2460591N28	34.14nH
C414	2113743M24	100000pF, +80%/-20%	C485	2113743L17	1000pF	D3301	4802081B58	Dual Diode	L3532	2460591N28	34.14nH
C415	2185895Z01	0.01uF	C486	Not Placed		D3302	4802081B58	Dual Diode	L3538	2479990M01	30.54nH
C416	2113928N01	0.1uF	C487	Not Placed		D3521	4880973Z02	Pin Diode	L3551	2479990N01	43.67nH
C419	2113743L41	10000pF, 10%	C488	Not Placed		D3551	4880973Z02	Pin Diode	L3552	2479990A02	7.66nH
C420	2113743L41	10000pF, 10%	C489	Not Placed		D3701	4802233J09	Triple Diode	L3701	2462587Q42	390nH
C421	2113928N01	0.1uF	C493	Not Placed		D3702	4802233J09	Triple Diode	L3731	2462587Q20	2.2uH
C422	2113743M24	100000pF, +80%/-20%	C494	2113743N50	100pF	D3761	4862824C03	Varactor	L3801	2462587V34	100nH
C423	2113743N50	100pF	C498	2113743N50	100pF	D3821	4805649Q13	Dual Varactor	L3809	2462587V27	27nH
C424	2311049A59	10uF, 10%	C499	2113743N50	100pF	D3831	4805649Q13	Dual Varactor	L3811	2462587V34	100nH
C425	2113743M24	100000pF, +80%/-20%	C500	2113743L17	1000pF	D3832	4862824C01	Varactor	L3812	2462587V34	100nH
C426	2113743N50	100pF	C501	2113743L17	1000pF	E400	2480640Z01	Ferrite Bead	L3813	2462587Q47	1uH
C427	2113743N50	100pF	C502	2311049A05	0.47uF, 10%, 25V	F501	6580542Z01	3A Fuse	L3816	2462587V34	100nH
C428	2113743M24	100000pF, +80%/-20%	C503	2113743N50	100pF	H3501	2680499Z01	Heat Spreader	L3821	2462587N50	56nH
C429	2113743M24	100000pF, +80%/-20%	C504	2113743L17	1000pF	J3501	0985613Z01	RF Jack	L3822	2462587N49	47nH
C430	2113928N01	0.1uF	C505	2113743N50	100pF	J3502	3980686Z01	Antenna Contact	L3823	2462587N49	47nH
C431	2113743N50	100pF	C506	2113743N50	100pF	J400	0905505Y04	40-pin Connector	L3824	2462587N68	1uH
C432	Not Placed		C507	2113743L17	1000pF	J402	2809926G02	4 pin Connector	L3825	2462587V34	100nH
C433	2113743L41	10000pF, 10%	C508	2113743N50	100pF	J404	0980689Z01	4 pin connector (Stereo Jack 2.5mm)	L3826	2462587N68	1uH
C434	2113743M24	100000pF, +80%/-20%	C509	2113743L17	1000pF	J407	0980688Z01	3 pin connector (Mono Jack 3.5mm)	L3831	2462587N50	56nH
C435	2113743M24	100000pF, +80%/-20%	C511	2113743N50	100pF	L3200	2462587N68	1uH	L3832	2462587N51	68nH
C440	2113743G26	4.7uF, +80%/-20%	C512	2113743N50	100pF	L3201	Not Placed		L3833	2462587N50	56nH
C442	2113743E20	0.1uF	C513	2113743N50	100pF	L3202	2462587N68	1uH	L3834	2462587N68	1uH
C443	2113928N01	0.1uF	C514	2113743N50	100pF	L3221	2462587N68	1uH	L400	2462587Q42	390nH
C446	2113743M08	22000pF, +80%/-20%	C515	2113743M24	100000pF, +80%/-20%	L3270	2462587T15	100nH	L410	2462587Q42	390nH
C447	2113928N01	0.1uF	C516	2113743L17	1000pF				L411	2462587Q42	390nH
C449	2113743N50	100pF	C517	2113743L17	1000pF				L505	2462587Q42	390nH
C450	Not Placed		C518	2113743L17	1000pF				PB501	4080523Z01	Tactile Push Button
C451	2113743M08	22000pF, +80%/-20%	C519	2113743L17	1000pF				PB502	4080523Z01	Tactile Push Button

Circuit Ref	Motorola Part No.	Description
PB504	4080523Z01	Tactile Push Button
Q3200	4813827A07	NPN Transistor
Q3201	4880214G02	NPN Transistor
Q3202	4880214G02	NPN Transistor
Q3270	4805218N63	RF Transistor
Q3301	4880214G02	NPN Transistor
Q3302	4813827A07	NPN Transistor
Q3501	4813828A08	RF Power FET
Q3561	Not Placed	
Q3721	4802245J50	Dual NPN/PNP Transistor
Q3801	4813827A07	NPN Transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q417	4802245J50	Dual NPN/PNP Transistor
Q418	4802245J50	Dual NPN/PNP Transistor
Q419	5180159R01	Dual NPN Transistor
Q420	4805128M67	PNP Transistor
Q421	4880214G02	NPN Transistor
Q431	5180159R01	Dual NPN Transistor
Q433	4880214G02	NPN Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
Q506	4802245J50	Dual NPN/PNP Transistor
R3200	0662057M54	150
R3201	0662057M82	2200
R3202	0662057M90	4700
R3203	0662057M98	10K
R3204	0662057M34	22
R3205	0662057M74	1000
R3206	0662057N23	100K
R3207	0662057N13	39K
R3208	0662057M50	100
R3209	0662057M74	1000
R3210	0662057M82	2200
R3211	0662057M82	2200
R3212	0662057M90	4700
R3213	0662057M82	2200
R3214	0662057M50	100
R3215	0662057M50	100
R3217	Not Placed	
R3218	Not Placed	
R3219	0662057M50	100
R3220	0662057M90	4700
R3221	0662057M50	100
R3222	Not Placed	
R3223	Not Placed	
R3224	0662057M26	10
R3225	0662057M74	1000
R3226	0662057M26	10

Circuit Ref	Motorola Part No.	Description
R3270	0662057M74	1000
R3271	0662057M42	47
R3272	0662057N15	47K
R3273	0662057N15	47K
R3274	0662057M74	1000
R3275	0662057M88	3900
R3276	0662057N30	200K
R3303	0662057N23	100K
R3304	0662057N23	100K
R3305	0662057N19	68K
R3306	0662057M82	2200
R3307	0662057N11	33K
R3308	0662057M86	3300
R3309	0662057M92	5600
R3310	0662057M98	10K
R3311	0662057M26	10
R3312	Not Placed	
R3313	0662057M34	22
R3314	0662057M26	10
R3315	0662057M62	330
R3316	0662057M61	300
R3317	0662057N23	100K
R3318	0662057M66	470
R3319	Not Placed	
R3320	Not Placed	
R3321	0662057M54	150
R3322	0662057M58	220
R3323	0662057M32	18
R3324	0662057M58	220
R3501	0662057M61	300
R3502	0662057M32	18
R3503	0662057M61	300
R3505	0662057M62	330
R3506	0662057B62	3.9
R3507	0662057B62	3.9
R3512	Not Placed	
R3513	Not Placed	
R3519	0680539Z01	0.1
R3541	0662057N13	39K
R3542	0662057M92	5600
R3543	0662057M50	100
R3544	0662057A25	100
R3545	0662057A25	100
R3546	0662057N01	12K
R3547	0662057N11	33K
R3548	0662057N07	22K
R3551	0662057M40	39
R3561	0662057N01	12K
R3562	0662057N11	33K
R3563	0662057N33	270K
R3564	0662057N35	330K

Circuit Ref	Motorola Part No.	Description
R3565	Not Placed	
R3569	Not Placed	
R3570	Not Placed	
R3571	Not Placed	
R3572	0662057A27	120
R3573	0662057A27	120
R3701	0662057M50	100
R3702	Not Placed	
R3703	0662057M54	150
R3704	0662057M54	150
R3705	0662057N11	33K
R3721	0662057M66	470
R3722	0662057M74	1000
R3723	0662057M50	100
R3726	Not Placed	
R3727	0662057N23	100K
R3741	0662057M50	100
R3751	0662057N30	200K
R3752	0662057N35	330K
R3760	Not Placed	
R3761	0662057N15	47K
R3762	Not Placed	
R3763	Not Placed	
R3801	Not Placed	
R3802	0662057M50	100
R3803	0662057M58	220
R3804	0662057M98	10K
R3805	0662057N08	24K
R3806	0662057M34	22
R3807	Not Placed	
R3808	0662057M26	10
R3811	0662057M50	100
R3812	Not Placed	
R3816	0662057M74	1000
R3817	0662057M01	0
R3818	Not Placed	
R3821	0662057M58	220
R3822	0662057M42	47
R3823	0662057N11	33K
R3824	0662057N07	22K
R3825	0662057M38	33
R3826	0662057M32	18
R3828	0662057M50	100
R3829	0662057M01	0
R3830	Not Placed	
R3831	0662057M98	10K
R3832	0662057N01	12K
R3833	0662057M58	220
R3834	0662057M42	47
R3835	0662057N15	47K
R3836	0662057M98	10K

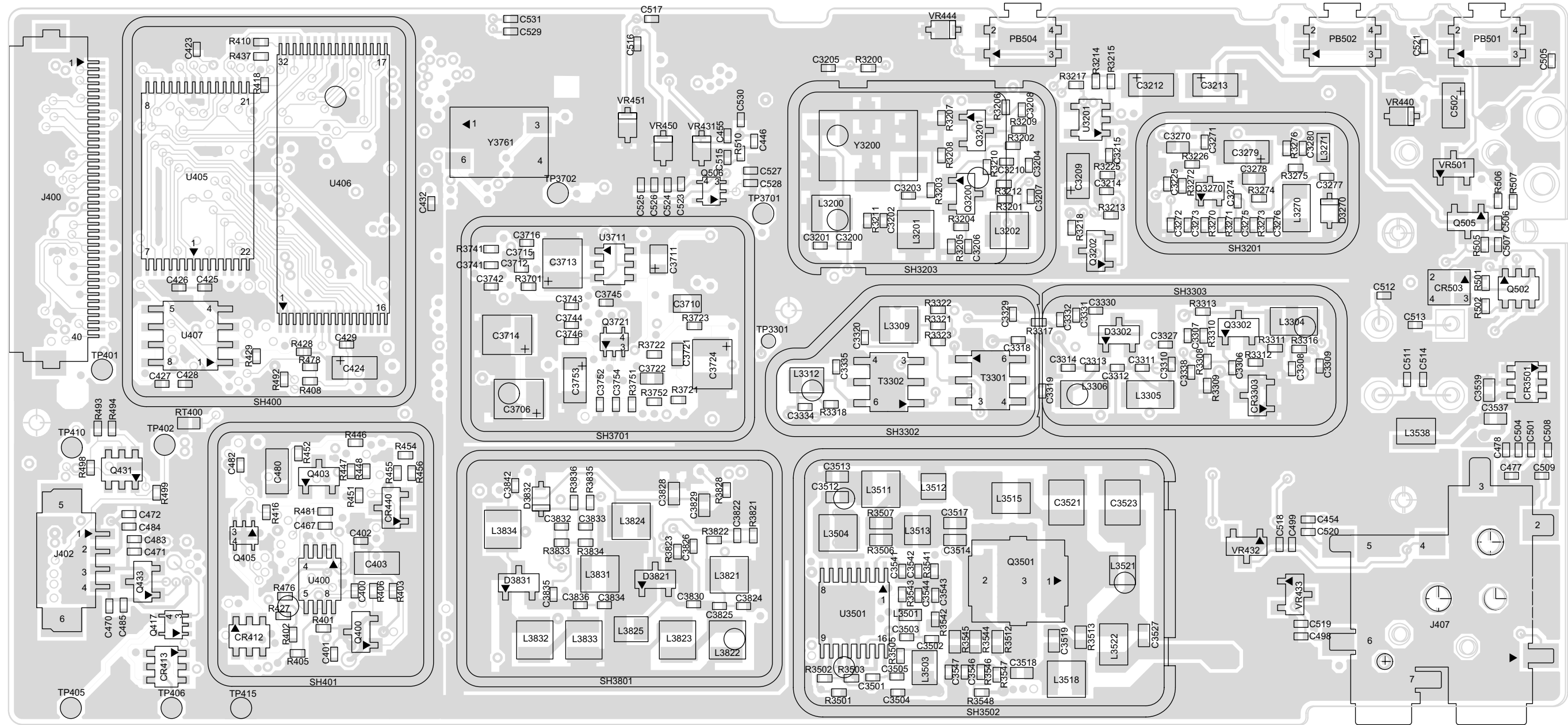
Circuit Ref	Motorola Part No.	Description
R400	0662057N15	47K
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R408	Not Placed	
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M90	4700
R423	0662057N39	470K
R425	0662057N10	30K
R427	0662057M98	10K
R428	0662057M10	2.2
R429	0662057M98	10K
R432	0662057N16	51K
R434	Not Placed	
R435	0662057M81	2000
R436	0662057N15	47K
R437	Not Placed	
R438	0662057M01	0
R439	0662057N23	100K
R445	0662057N08	24K
R446	Not Placed	
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R451	0662057N03	15K
R452	0662057N23	100K
R454	Not Placed	
R455	Not Placed	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4700
R461	0662057N23	100K
R462	0662057N23	100K
R463	0662057M61	300
R467	0662057M98	10K
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R478	0662057M98	10K
	5480678Z01	Barcode Label
R492	0662057M01	0

Circuit Ref	Motorola Part No.	Description
R493	Not Placed	
R494	0662057M01	0
R495	0662057N23	100K
R496	0662057N23	100K
R498	0662057N23	100K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R510	0662057M98	10K
RT400	0680590Z01	Thermistor 33K
S501	4080710Z01	Channel Switch
S502	1880619Z02	Volume Switch
SH3201	2602023X08	Rx Back end top shield
SH3202	2686081B02	LVZIF Shield
SH3203	2686081B03	45.1MHz Xtal Shield
SH3301	2686081B01	Rx Back end bottom shield
SH3302	2686081B05	Mixer Shield
SH3303	2686081B06	Rx Front end top shield
SH3501	2680687Z01	Shield, Harmonic Filter
SH3502	2686081B04	PA Driver Shield
SH3701	2680511Z01	Synthesizer Top Shield
SH3702	2680511Z01	Synthesizer Bottom Shield
SH3801	2680513Z01	Shield, VCO Top
SH3802	2680514Z01	Shield, VCO Bottom
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	On/off Controller Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	ASFIC CMP/Audio PA Controller Shield
T3301	2580541Z01	XFMR Coil
T3302	2580541Z01	XFMR Coil
U3201	5102463J58	3.3V Voltage Regulator
U3220	5109632D83	LVZIF IC
U3501	5185130C65	LDMOS Driver IC
U3502	5185765B28	Power Control IC
U3503	5185963A15	Temperature Sense
U3701	5185963A27	LVFRACN Synthesizer IC
U3711	5105739X05	5V Regulator
U3801	5105750U54	VCO Buffer IC
U400	5102463J40	3.3V Voltage Regulator
U404	5185130C53	ASFIC_CMP
U405	Not Placed	
U406	*5102463J59	Flash ROM 128K X 8
U407	*5102463J64	16K X 8 EEPROM
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Voltage Regulator
U420	5102463J44	Audio PA
VR3501	4880140L15	Zener diode, 10V

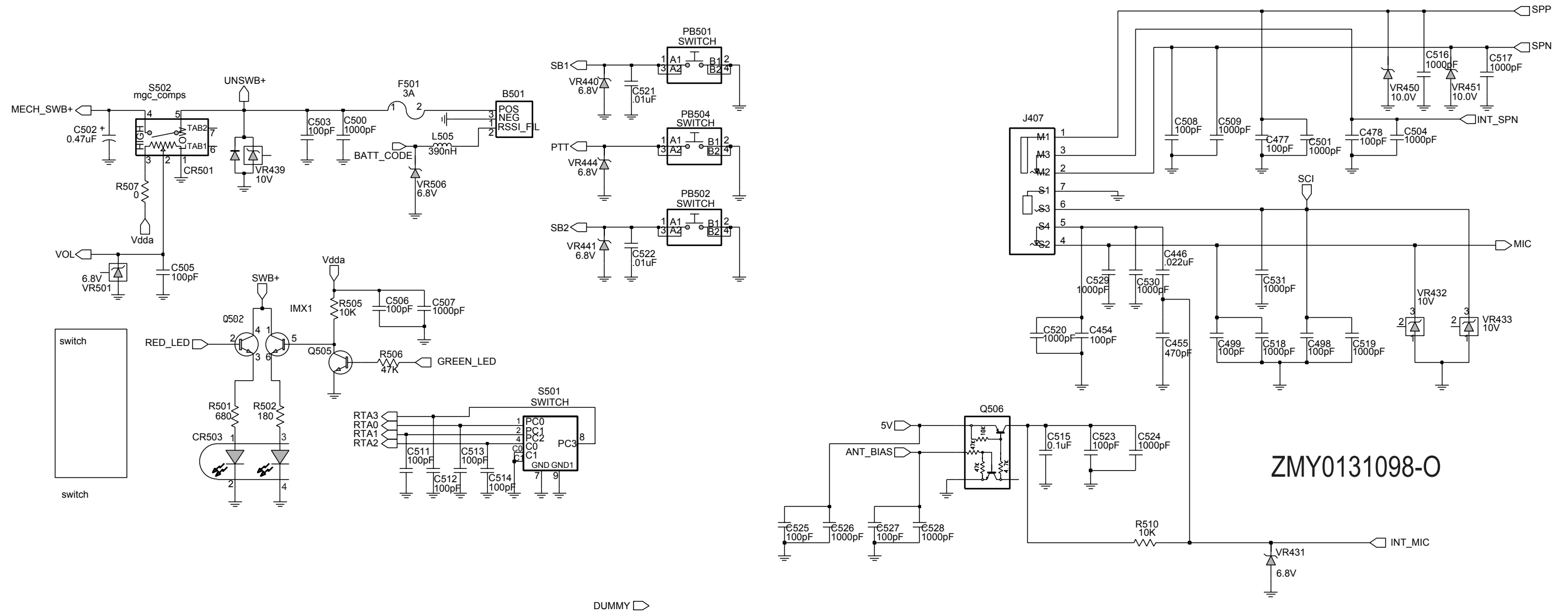
Circuit Ref	Motorola Part No.	Description
VR431	4802245J73	Zener Diode, 6.8V
VR432	4880140L15	Zener Diode, 10V
VR433	4880140L15	Zener Diode, 10V
VR439	4880140L15	Zener Diode, 10V
VR440	4802245J73	Zener Diode, 6.8V
VR441	4802245J73	Zener Diode, 6.8V
VR444	4802245J73	Zener Diode, 6.8V
VR450	4802245J75	Zener Diode, 12.0V
VR451	4802245J74	Zener Diode, 10.0V
VR501	4813830A18	Zener Diode, 6.8V
VR506	4802245J73	Zener Diode, 6.8V
Y3200	4802245J43	Xtal Filter
Y3761	4805875Z04	16.8MHz Crystal Oscillator
Y3762	Not Placed	
	5480678Z01	Barcode Label
	8480675Z03	VHF main PC board

* Motorola Depot Servicing only

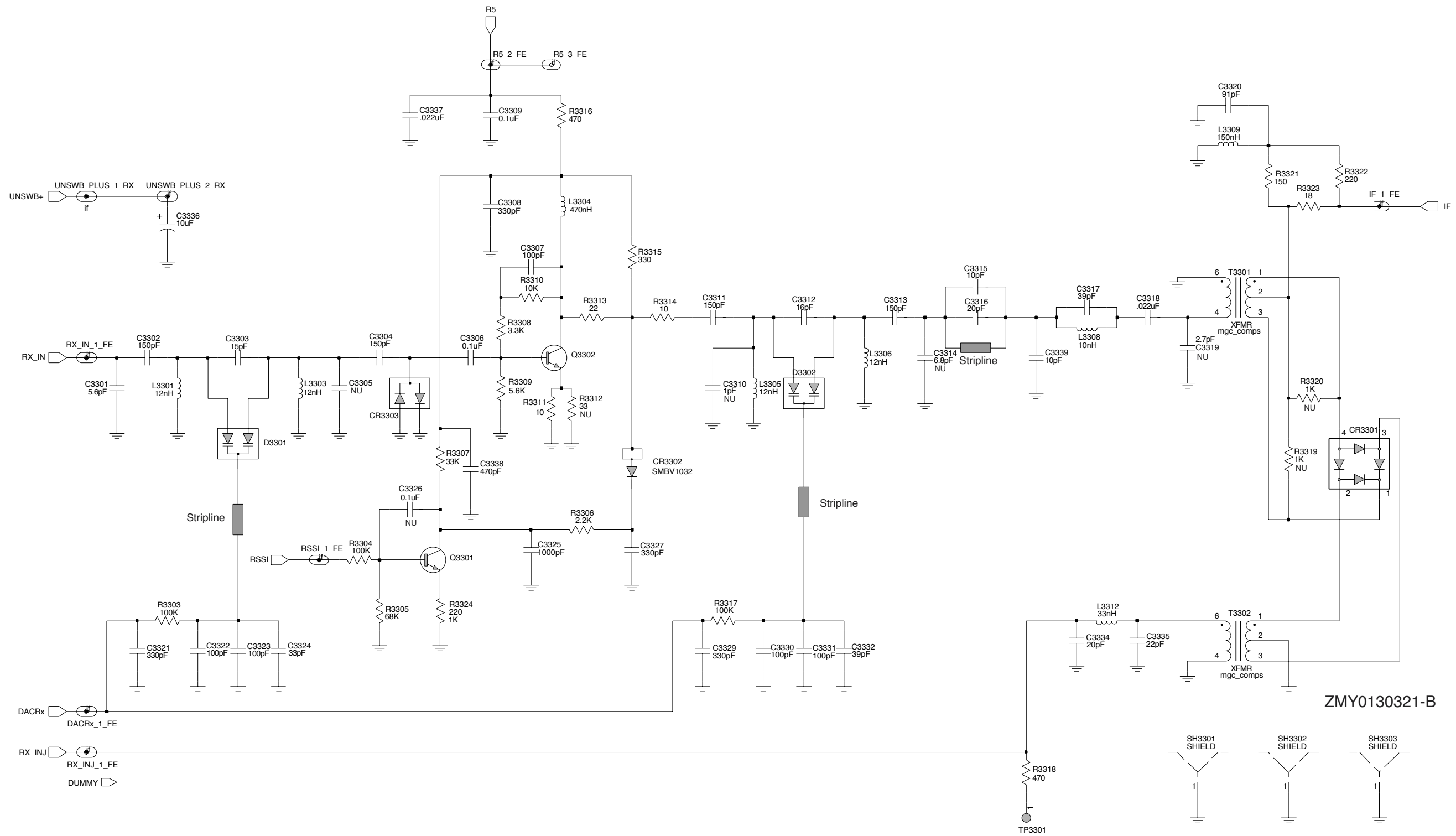
9.0 Circuit Board/Schematic Diagrams and Parts List



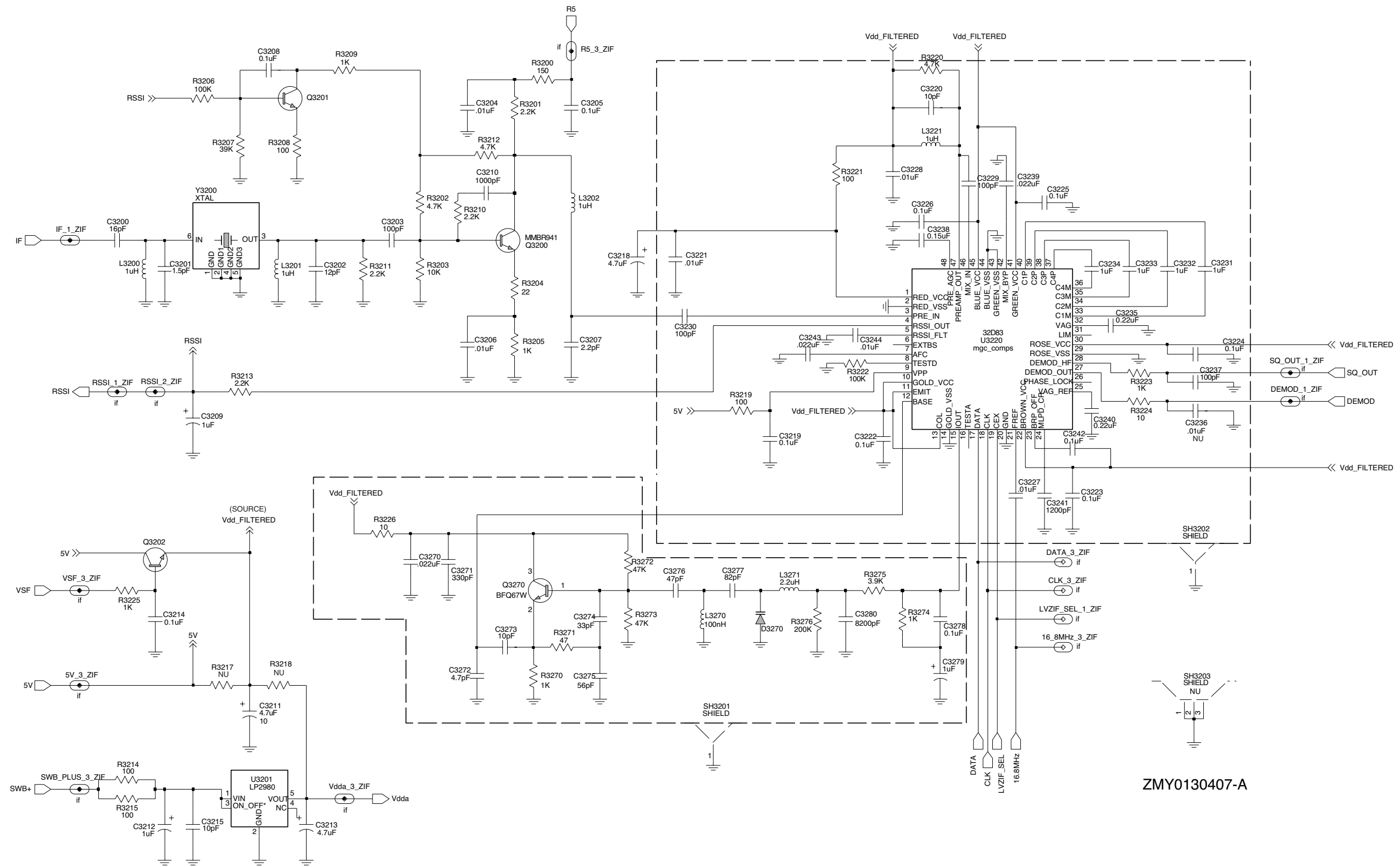
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VHF Controls And Switches Schematic Diagram

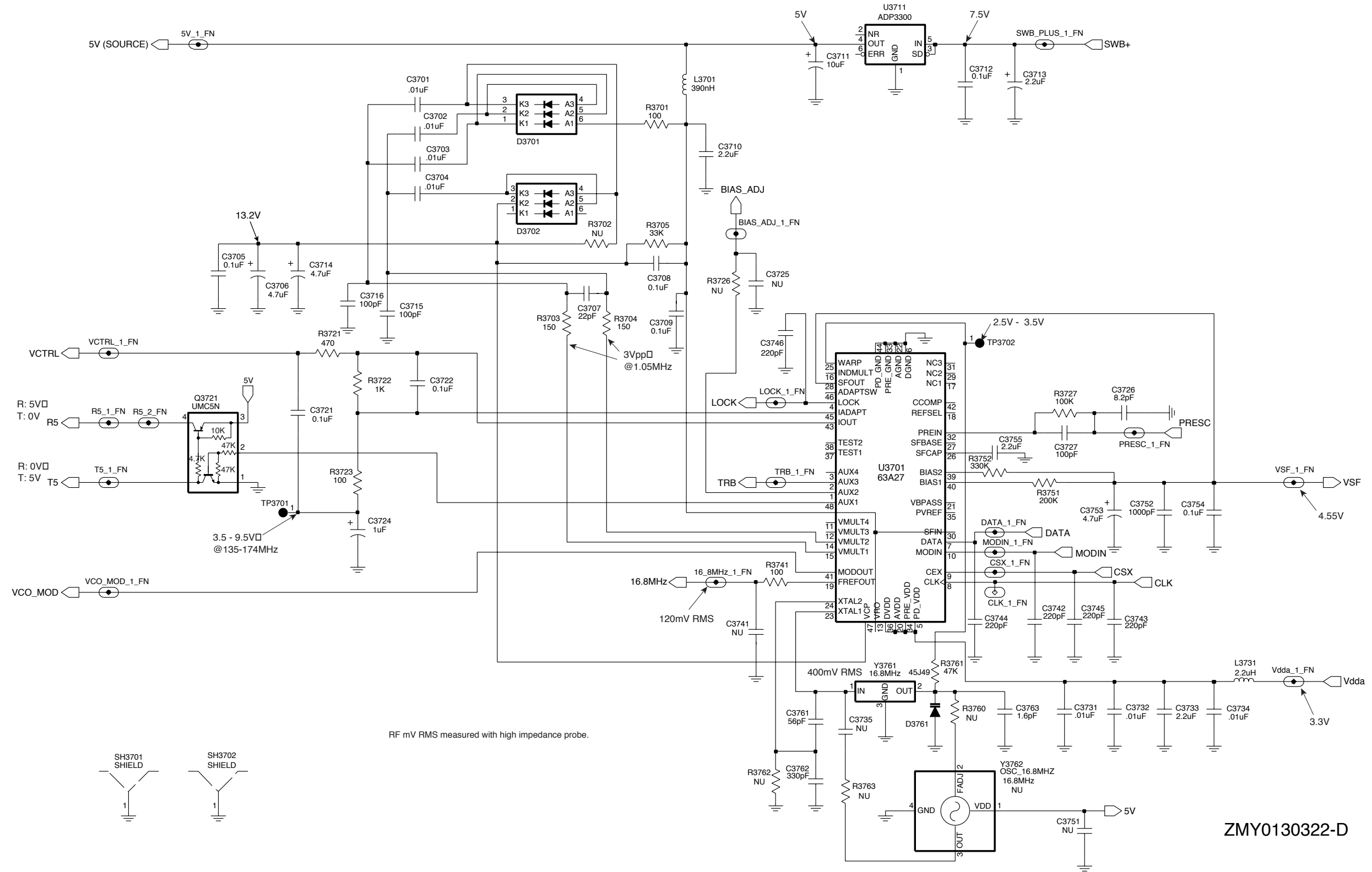


VHF Receiver Front End Schematic Diagram



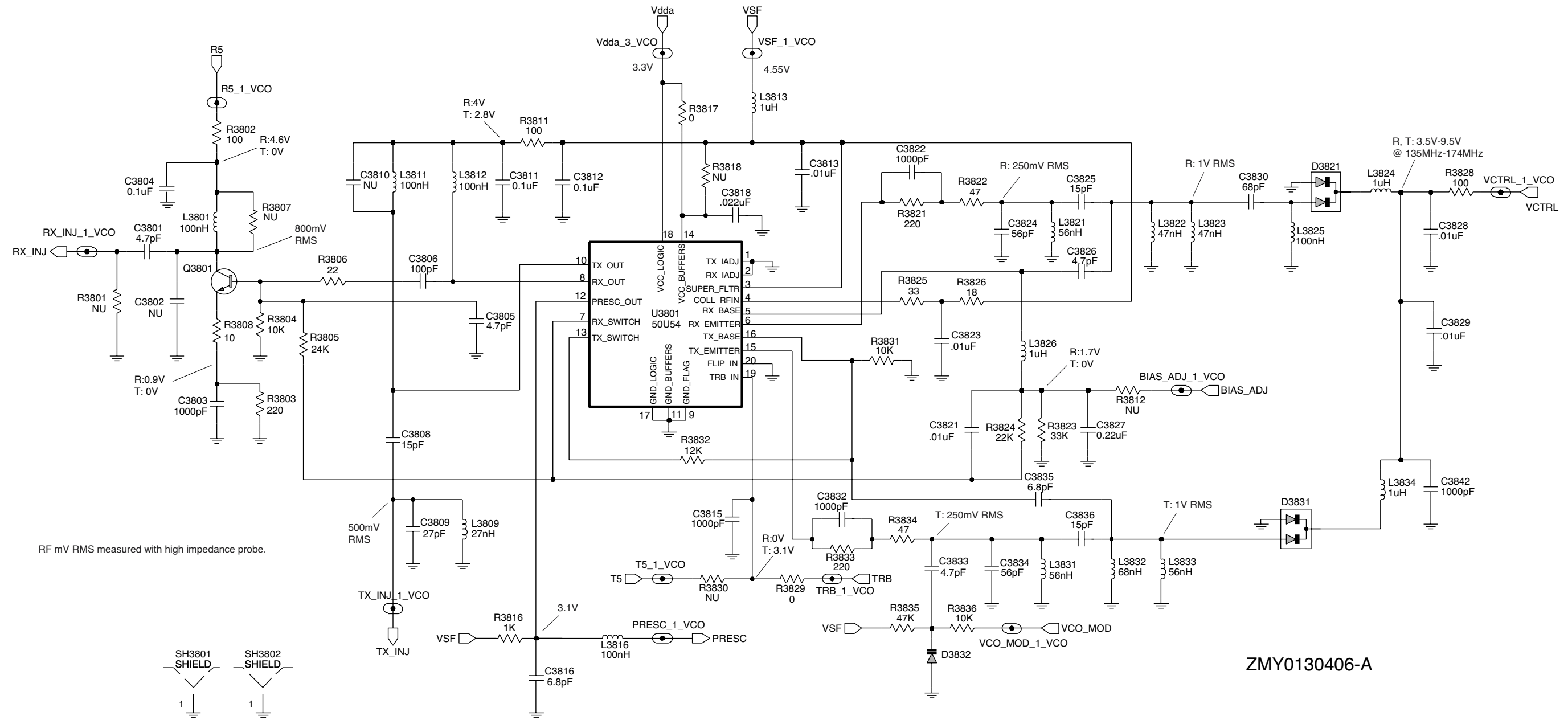
ZMY0130407-A

VHF Receiver Back End Schematic Diagram

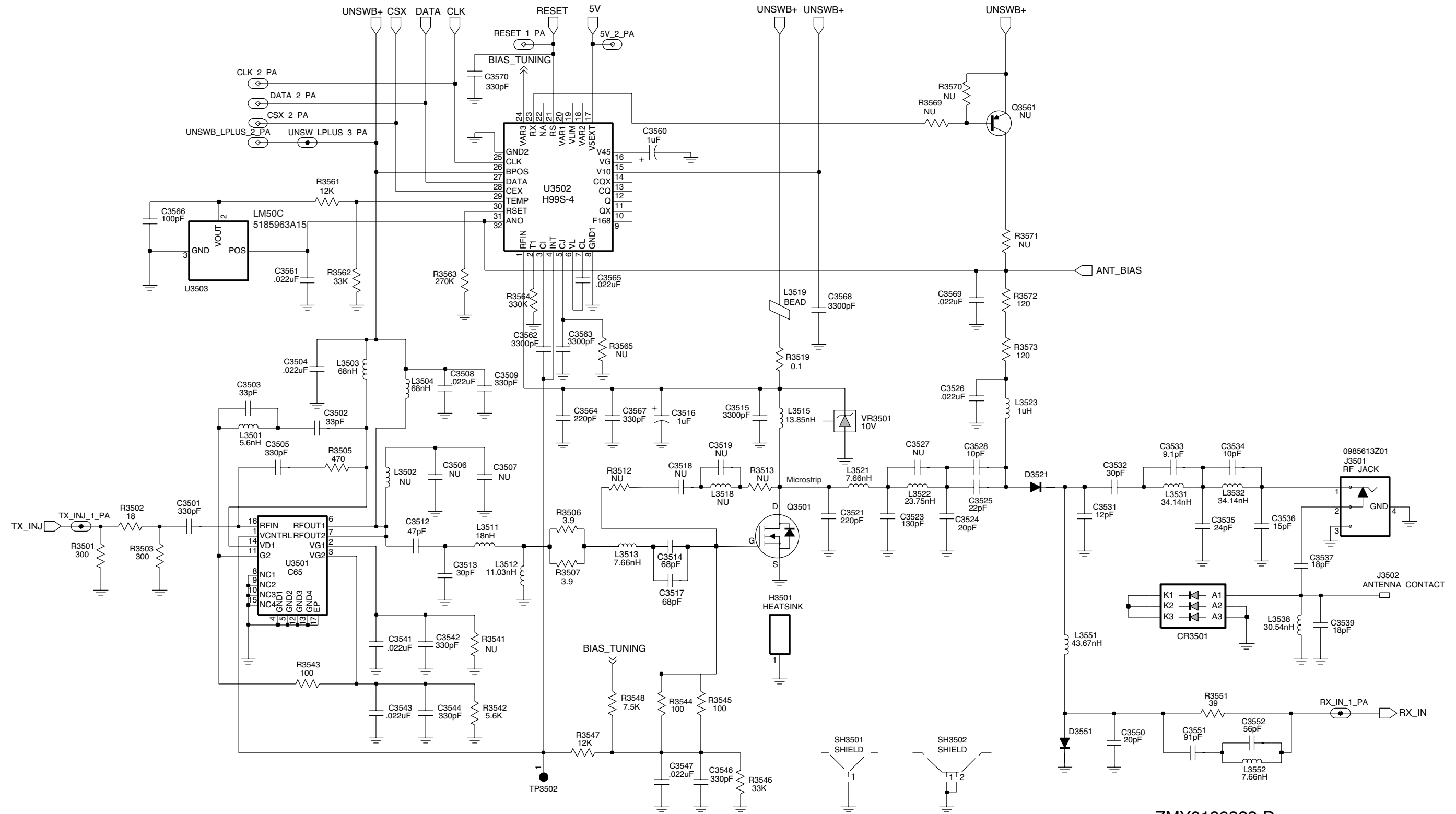


ZMY0130322-D

VHF Synthesizer Schematic Diagram



VHF Voltage Controlled Oscillator Schematic Diagram



ZMY0130323-D

VHF Transmitter Schematic Diagram

VHF Radio Parts List

Circuit Ref	Motorola Part No.	Description
B501	0986237A02	Battery Contact
C3200	2113743N31	16pF
C3201	Not Placed	
C3202	Not Placed	
C3203	2113743N50	100pF
C3204	2113743L41	10000pF, 10%
C3205	2113928N01	0.1uF
C3206	2113743L41	10000pF, 10%
C3207	2113743N10	2.2pF
C3208	Not Placed	
C3209	2311049A07	1uF
C3210	2113743L17	1000pF
C3211	2311049A56	4.7uF
C3212	2311049A07	1uF
C3213	2311049A56	4.7uF
C3214	2113928N01	0.1uF
C3215	2113743N26	10pF
C3218	2311049A56	4.7uF
C3219	2113928N01	0.1uF
C3220	2113743N26	10pF
C3221	2113743L41	10000pF, 10%
C3222	2113928N01	0.1uF
C3223	2113928N01	0.1uF
C3224	2113928N01	0.1uF
C3225	2113928N01	0.1uF
C3226	2113928N01	0.1uF
C3227	2113743L41	10000pF, 10%
C3228	2113743L41	10000pF, 10%
C3229	2113743N50	100pF
C3230	2113740F51	100pF
C3231	2180478Z20	1uF
C3232	2180478Z20	1uF
C3233	2180478Z20	1uF
C3234	2180478Z20	1uF
C3235	2113743A23	0.22uF
C3236	Not Placed	
C3237	Not Placed	
C3238	2113743A24	0.33uF
C3239	2113743E07	0.022uF
C3240	2113743A23	0.22uF
C3241	2113743L19	1200pF
C3242	2109720D14	0.1uF, 1206
C3243	2113743E07	0.022uF
C3244	2113743L41	10000pF, 10%
C3270	2113743E07	0.022uF
C3271	2113743L05	330pF
C3272	2113743N18	4.7pF
C3273	2113743N26	10pF
C3274	2113743N38	33pF

Circuit Ref	Motorola Part No.	Description
C3275	2113743N44	56pF
C3276	2113743N42	47pF
C3277	2113743N48	82pF
C3278	2113743E20	0.1uF
C3279	2311049A07	1uF
C3280	2113743L39	8200pF
C3301	2113743N29	13pF
C3302	2113743N54	150pF
C3303	2113743N33	20pF
C3304	2113743N54	150pF
C3305	Not Placed	
C3306	2113928N01	0.1uF
C3307	2113743N50	100pF
C3308	2113743L05	330pF
C3309	2113928N01	0.1uF
C3310	Not Placed	
C3311	2113743N54	150pF
C3312	2113743N31	16pF
C3313	2113743N54	150pF
C3314	Not Placed	
C3315	2113743N26	10pF
C3316	2113743N33	20pF
C3317	2113743N40	39pF
C3318	2113743M08	22000pF, +80%/-20%
C3319	Not Placed	
C3320	2113743N49	91pF
C3321	2113743L05	330pF
C3322	2113743N50	100pF
C3323	2113743N50	100pF
C3324	2113743N38	33pF
C3325	2113743L17	1000pF
C3326	Not Placed	
C3327	2113743L05	330pF
C3329	2113743L05	330pF
C3330	2113743N50	100pF
C3331	2113743N50	100pF
C3332	2113743N40	39pF
C3334	2113743N33	20pF
C3335	2113743N34	22pF
C3336	2311049A18	10uF
C3337	2113743M08	22000pF, +80%/-20%
C3338	2113743L09	470pF
C3339	2113743N26	10pF
C3501	2113743L05	330pF
C3502	2113743N38	33pF
C3503	2113743N38	33pF
C3504	2113743M08	22000pF, +80%/-20%
C3505	2113743N38	33pF
C3506	Not Placed	
C3507	Not Placed	
C3508	2113743M08	22000pF, +80%/-20%

Circuit Ref	Motorola Part No.	Description
C3509	2113743L05	330pF
C3512	2113740F43	47pF
C3513	2113740F38	30pF
C3514	2113740F47	68pF
C3515	2113743L29	3300pF
C3516	2311049A08	1uF
C3518	Not Placed	
C3519	Not Placed	
C3521	2111078B51	220pF
C3523	2111078B45	130pF
C3524	2113740F34	20pF
C3525	2113740F35	22pF
C3526	2113743M08	22000pF, +80%/-20%
C3527	Not Placed	GCAM Dummy Part Number
C3528	2113740F27	10pF
C3531	2113740F29	12pF
C3532	2113740F38	30pF
C3533	2113740F26	9.1pF
C3534	2113740F27	10pF
C3535	2113740F36	24pF
C3536	2113740F31	15pF
C3537	2113740F34	20pF
C3539	2113740F33	18pF
C3541	2113743M08	22000pF, +80%/-20%
C3542	2113743L05	330pF
C3543	2113743M08	22000pF, +80%/-20%
C3544	2113743L05	330pF
C3546	2113743L05	330pF
C3547	2113743M08	22000pF, +80%/-20%
C3550	2113743N33	20pF
C3551	2113743N49	91pF
C3552	2113743N44	56pF
C3560	2311049A07	1uF
C3561	2113743M08	22000pF, +80%/-20%
C3562	2113743L29	3300pF
C3563	2113743L29	3300pF
C3564	2113743L01	220pF
C3565	2113743E07	0.022uF
C3566	2113743N50	100pF
C3567	2113743L05	330pF
C3568	2113743L29	3300pF
C3569	2113743M08	22000pF, +80%/-20%
C3570	2113743L05	330pF
C3701	2113743L41	10000pF, 10%
C3702	2113743L41	10000pF, 10%
C3703	2113743L41	10000pF, 10%
C3704	2113743L41	10000pF, 10%
C3705	2113743E20	0.1uF
C3706	2311049J11	4.7uF
C3707	2113743N34	22pF
C3708	2113743M24	100000pF, +80%/-20%

Circuit Ref	Motorola Part No.	Description
C3709	2113743M24	100000pF, +80%/-20%
C3710	2104993J02	2.2uF
C3711	2311049A69	10uF, 20%
C3712	2113743M24	100000pF, +80%/-20%
C3713	2311049A09	2.2uF
C3714	2311049J11	4.7uF
C3715	2113743N50	100pF
C3716	2113743N50	100pF
C3721	2113743E20	0.1uF
C3722	2113743E20	0.1uF
C3724	2311049A08	1uF
C3725	Not Placed	
C3726	2113743N24	8.2pF
C3727	2113743N50	100pF
C3731	2113743L41	10000pF, 10%
C3732	2113743L41	10000pF, 10%
C3733	2104993J02	2.2uF
C3734	2113743L41	10000pF, 10%
C3735	Not Placed	
C3741	Not Placed	
C3742	2113743L01	220pF
C3743	2113743L01	220pF
C3744	2113743L01	220pF
C3745	2113743L01	220pF
C3746	2113743L01	220pF
C3751	Not Placed	
C3752	2113743L17	1000pF
C3753	2311049A56	4.7uF
C3754	2113743M24	100000pF, +80%/-20%
C3755	2104993J02	2.2uF
C3761	2113743N44	56pF
C3762	2113740F63	330pF
C3763	2113743N08	1.6pF
C3801	2113743N18	4.7pF
C3802	Not Placed	
C3803	2113743L17	1000pF
C3804	2113743E20	0.1uF
C3805	2113743N18	4.7pF
C3806	2113743N50	100pF
C3808	2113743N30	15pF
C3809	2113743N36	27pF
C3810	Not Placed	
C3811	2113743M24	100000pF, +80%/-20%
C3812	2113743M24	100000pF, +80%/-20%
C3813	2113743L41	10000pF, 10%
C3815	2113743L17	1000pF
C3816	2113743N22	6.8pF
C3818	2113743E07	0.022uF
C3821	2113743L41	10000pF, 10%
C3822	2113743L17	1000pF
C3823	2113743L41	10000pF, 10%

Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description	Circuit Ref	Motorola Part No.	Description
C3824	2113743N44	56pF	C452	2113743G26	4.7uF, +80%/-20%	C520	2113743L17	1000pF	L3301	2462587T35	12nH
C3825	2113743N30	15pF	C453	2113743N50	100pF	C521	2113743L41	10000pF, 10%	L3303	2462587T35	12nH
C3826	2113743N18	4.7pF	C454	2113743N50	100pF	C522	2113743L41	10000pF, 10%	L3304	2462587T23	470nH
C3827	2113743E07	0.022uF	C455	2113743L09	470pF	C523	2113743N50	100pF	L3305	2462587T35	12nH
C3828	2185895Z01	0.01uF	C456	2113743N50	100pF	C524	2113743L17	1000pF	L3306	2462587T35	12nH
C3829	2185895Z01	0.01uF	C458	2113743N50	100pF	C525	2113743N50	100pF	L3308	2462587T34	10nH
C3830	2113743N46	68pF	C459	2113743N50	100pF	C526	2113743L17	1000pF	L3309	2462587N55	150nH
C3832	2113743L17	1000pF	C463	2113743N50	100pF	C527	2113743N50	100pF	L3312	2462587V28	33nH
C3833	2113743N18	4.7pF	C466	2113743N50	100pF	C528	2113743L17	1000pF	L3501	2413926H09	5.6nH
C3834	2113743N44	56pF	C467	2113928N01	0.1uF	C529	2113743L17	1000pF	L3502	Not Placed	
C3835	2113743N22	6.8pF	C471	2113743N50	100pF	C530	2113743L17	1000pF	L3503	2462587V32	68nH
C3836	2113743N30	15pF	C472	2113743N50	100pF	C531	2113743L17	1000pF	L3504	2462587N51	68nH
C3842	2113743L17	1000pF	C473	2113743L09	470pF	CR3301	4802245J42	Ring Quad Diode	L3511	2462587N44	18nH
C400	2113743L41	10000pF, 10%	C475	2113743H14	10uF, +80%/-20%	CR3302	4805129M96	Dual Bonds Pin Diode, RH Reeled	L3512	2479990B01	11.03nH
C401	2113743M24	100000pF, +80%/-20%	C476	2113928D08	10uF, +80%/-20%	CR3303	4880154K03	Dual Common Anode-Cathode	L3513	2479990A02	7.66nH
C402	2113743M24	100000pF, +80%/-20%	C477	2113743N50	100pF	CR3501	Not Placed		L3515	2479990C03	13.85nH
C403	2113928D08	10uF, +80%/-20%	C478	2113743N50	100pF	CR412	4802245J62	Schottky diode	L3518	Not Placed	
C407	2113928N01	0.1uF	C479	2113928N01	0.1uF	CR413	4802245J62	Schottky diode	L3519	2484657R01	Bead
C408	2113743N50	100pF	C480	2113928D08	10uF, +80%/-20%	CR414	4802245J62	Schottky diode	L3521	2479990A02	7.66nH
C409	2113743M24	100000pF, +80%/-20%	C481	2113928N01	0.1uF	CR440	4813833C02	Dual Common Cathode Diode	L3522	2479990E01	23.75nH
C410	2113928N01	0.1uF	C482	2113928N01	0.1uF	CR501	4880107R01	Rectifier	L3523	2462587N68	1uH
C411	2113743M24	100000pF, +80%/-20%	C483	2113743L17	1000pF	CR503	4805729G49	LED Red/Yel	L3531	2460591N28	34.14nH
C412	2113928N01	0.1uF	C484	2113743L17	1000pF	D3270	4862824C01	Varactor	L3532	2460591N28	34.14nH
C414	2113743M24	100000pF, +80%/-20%	C485	2113743L17	1000pF	D3301	4802081B58	Dual Diode	L3538	2479990M01	30.54nH
C415	2185895Z01	0.01uF	C486	Not Placed		D3302	4802081B58	Dual Diode	L3551	2479990N01	43.67nH
C416	2113928N01	0.1uF	C487	Not Placed		D3521	4880973Z02	Pin Diode	L3552	2479990A02	7.66nH
C419	2113743L41	10000pF, 10%	C488	Not Placed		D3551	4880973Z02	Pin Diode	L3701	2462587Q42	390nH
C420	2113743L41	10000pF, 10%	C489	Not Placed		D3701	4802233J09	Triple Diode	L3731	2462587Q20	2.2uH
C421	2113928N01	0.1uF	C493	Not Placed		D3702	4802233J09	Triple Diode	L3801	2462587V34	100nH
C422	2113743M24	100000pF, +80%/-20%	C494	2113743N50	100pF	D3761	4862824C03	Varactor	L3809	2462587V27	27nH
C423	2113743N50	100pF	C498	2113743N50	100pF	D3821	4805649Q13	Dual Varactor	L3811	2462587V34	100nH
C424	2311049A59	10uF, 10%	C499	2113743N50	100pF	D3831	4805649Q13	Dual Varactor	L3812	2462587V34	100nH
C425	2113743M24	100000pF, +80%/-20%	C500	2113743L17	1000pF	D3832	4862824C01	Varactor	L3813	2462587Q47	1uH
C426	2113743N50	100pF	C501	2113743L17	1000pF	E400	2480640Z01	Ferrite Bead	L3816	2462587V34	100nH
C427	2113743N50	100pF	C502	2311049A05	0.47uF, 10%, 25V	F501	6580542Z01	3A Fuse	L3821	2462587N50	56nH
C428	2113743M24	100000pF, +80%/-20%	C503	2113743N50	100pF	H3501	2680499Z01	Heat Spreader	L3822	2462587N49	47nH
C429	2113743M24	100000pF, +80%/-20%	C504	2113743L17	1000pF	J3501	0985613Z01	RF Jack	L3823	2462587N49	47nH
C430	2113928N01	0.1uF	C505	2113743N50	100pF	J3502	3980686Z01	Antenna Contact	L3824	2462587N68	1uH
C431	2113743N50	100pF	C506	2113743N50	100pF	J400	0905505Y04	40-pin connector	L3825	2462587V34	100nH
C432	Not Placed		C507	2113743L17	1000pF	J402	2809926G02	4-pin Connector	L3826	2462587N68	1uH
C433	2113743L41	10000pF, 10%	C508	2113743N50	100pF	J404	Not Placed		L3831	2462587N50	56nH
C434	2113743M24	100000pF, +80%/-20%	C509	2113743L17	1000pF	J407	0980683Z01	3 pin connector (Mono Jack 3.5mm)	L3832	2462587N51	68nH
C435	2113743M24	100000pF, +80%/-20%	C511	2113743N50	100pF	L3200	2462587N68	1uH	L3833	2462587N50	56nH
C440	2113743G26	4.7uF, +80%/-20%	C512	2113743N50	100pF	L3201	Not Placed		L3834	2462587N68	1uH
C442	2113743E20	0.1uF	C513	2113743N50	100pF	L3202	2462587N68	1uH	L400	2462587Q42	390nH
C443	2113928N01	0.1uF	C514	2113743N50	100pF	L3221	2462587N68	1uH	L410	2462587Q42	390nH
C446	2113743M08	22000pF, +80%/-20%	C515	2113743M24	100000pF, +80%/-20%	L3270	2462587T15	100nH	L411	2462587Q42	390nH
C447	2113928N01	0.1uF	C516	2113743L17	1000pF	L3271	2462587Q20	2.2uH	L505	2462587Q42	390nH
C449	2113743N50	100pF	C517	2113743L17	1000pF				PB501	4070354A01	Tactile Push Button
C450	Not Placed		C518	2113743L17	1000pF				PB502	4070354A01	Tactile Push Button
C451	2113743M08	22000pF, +80%/-20%	C519	2113743L17	1000pF				PB504	4070354A01	Tactile Push Button

Circuit Ref	Motorola Part No.	Description
Q3200	4813827A07	NPN Transistor
Q3201	4880214G02	NPN Transistor
Q3202	4880214G02	NPN Transistor
Q3270	4805218N63	RF Transistor
Q3301	4880214G02	NPN Transistor
Q3302	4813827A07	NPN Transistor
Q3501	4813828A08	RF Power FET
Q3561	Not Placed	
Q3721	4802245J50	Dual NPN/PNP Transistor
Q3801	4813827A07	NPN Transistor
Q400	4809579E18	MOSFET P-Channel
Q403	4813824A17	PNP Transistor
Q405	4802245J54	Dual NPN Transistor
Q410	4802245J54	Dual NPN Transistor
Q417	4802245J50	Dual NPN/PNP Transistor
Q418	4802245J50	Dual NPN/PNP Transistor
Q419	5180159R01	Dual NPN Transistor
Q420	4805128M67	PNP Transistor
Q421	4880214G02	NPN Transistor
Q431	5180159R01	Dual NPN Transistor
Q433	4880214G02	NPN Transistor
Q502	5180159R01	Dual NPN Transistor
Q505	4880214G02	NPN Transistor
Q506	4802245J50	Dual NPN/PNP Transistor
R3200	0662057M54	150
R3201	0662057M82	2200
R3202	0662057M90	4700
R3203	0662057M98	10K
R3204	0662057M34	22
R3205	0662057M74	1000
R3206	0662057N23	100K
R3207	0662057N13	39K
R3208	0662057M50	100
R3209	0662057M74	1000
R3210	0662057M82	2200
R3211	0662057M82	2200
R3212	0662057M90	4700
R3213	0662057M82	2200
R3214	0662057M50	100
R3215	0662057M50	100
R3217	Not Placed	
R3218	Not Placed	
R3219	0662057M50	100
R3220	0662057M90	4700
R3221	0662057M50	100
R3222	Not Placed	
R3223	Not Placed	
R3224	0662057M26	10
R3225	0662057M74	1000
R3226	0662057M26	10
R3270	0662057M74	1000

Circuit Ref	Motorola Part No.	Description
R3271	0662057M42	47
R3272	0662057N15	47K
R3273	0662057N15	47K
R3274	0662057M74	1000
R3275	0662057M88	3900
R3276	0662057N30	200K
R3303	0662057N23	100K
R3304	0662057N23	100K
R3305	0662057N19	68K
R3306	0662057M82	2200
R3307	0662057N11	33K
R3308	0662057M86	3300
R3309	0662057M92	5600
R3310	0662057M98	10K
R3311	0662057M26	10
R3312	Not Placed	
R3313	0662057M34	22
R3314	0662057M26	10
R3315	0662057M62	330
R3316	0662057M61	300
R3317	0662057N23	100K
R3318	0662057M66	470
R3319	Not Placed	
R3320	Not Placed	
R3321	0662057M54	150
R3322	0662057M58	220
R3323	0662057M32	18
R3324	0662057M58	220
R3501	0662057M61	300
R3502	0662057M32	18
R3503	0662057M61	300
R3505	0662057M62	330
R3506	0662057B62	3.9
R3507	0662057B62	3.9
R3512	Not Placed	
R3513	Not Placed	
R3519	0680539Z01	0.1
R3541	0662057N13	39K
R3542	0662057M92	5600
R3543	0662057M50	100
R3544	0662057A25	100
R3545	0662057A25	100
R3546	0662057N01	12K
R3547	0662057N11	33K
R3548	0662057N07	22K
R3551	0662057M40	39
R3561	0662057N01	12K
R3562	0662057N11	33K
R3563	0662057N33	270K
R3564	0662057N35	330K
R3565	Not Placed	

Circuit Ref	Motorola Part No.	Description
R3569	Not Placed	
R3570	Not Placed	
R3571	Not Placed	
R3572	0662057A27	120
R3573	0662057A27	120
R3701	0662057M50	100
R3702	Not Placed	
R3703	0662057M54	150
R3704	0662057M54	150
R3705	0662057N11	33K
R3721	0662057M66	470
R3722	0662057M74	1000
R3723	0662057M50	100
R3726	Not Placed	
R3727	0662057N23	100K
R3741	0662057M50	100
R3751	0662057N30	200K
R3752	0662057N35	330K
R3760	Not Placed	
R3761	0662057N15	47K
R3762	Not Placed	
R3763	Not Placed	
R3801	Not Placed	
R3802	0662057M50	100
R3803	0662057M58	220
R3804	0662057M98	10K
R3805	0662057N08	24K
R3806	0662057M34	22
R3807	Not Placed	
R3808	0662057M26	10
R3811	0662057M50	100
R3812	Not Placed	
R3816	0662057M74	1000
R3817	0662057M01	0
R3818	Not Placed	
R3821	0662057M58	220
R3822	0662057M42	47
R3823	0662057N11	33K
R3824	0662057N07	22K
R3825	0662057M38	33
R3826	0662057M32	18
R3828	0662057M50	100
R3829	0662057M01	0
R3830	Not Placed	
R3831	0662057M98	10K
R3832	0662057N01	12K
R3833	0662057M58	220
R3834	0662057M42	47
R3835	0662057N15	47K
R3836	0662057M98	10K
R400	0662057N15	47K

Circuit Ref	Motorola Part No.	Description
R401	0662057M01	0
R402	Not Placed	
R403	Not Placed	
R405	0662057M01	0
R406	0662057N20	75K
R408	Not Placed	
R410	0662057N23	100K
R411	0662057M98	10K
R413	0662057M01	0
R414	0662057V34	180K
R415	0662057V26	91K
R416	0662057M98	10K
R418	0662057M01	0
R419	0662057M90	4700
R423	0662057N39	470K
R425	0662057N10	30K
R427	0662057M98	10K
R428	0662057M10	2.2
R429	0662057M98	10K
R432	0662057N16	51K
R434	Not Placed	
R435	0662057M81	2000
R436	0662057N15	47K
R437	Not Placed	
R438	0662057M01	0
R439	0662057N23	100K
R445	0662057N08	24K
R446	Not Placed	
R447	0662057N23	100K
R448	0662057M98	10K
R449	0662057N08	24K
R451	0662057N03	15K
R452	0662057N23	100K
R454	Not Placed	
R455	Not Placed	
R456	0662057M01	0
R457	0662057M98	10K
R460	0662057M90	4700
R461	0662057N23	100K
R462	0662057N23	100K
R463	0662057M61	300
R467	0662057M98	10K
R471	0662057N06	20K
R472	0662057N12	36K
R473	0662057M26	10
R475	0662057M01	0
R476	0662057N08	24K
R478	0662057M98	10K
	5480678Z01	Barcode Label
R492	0662057M01	0
R493	Not Placed	

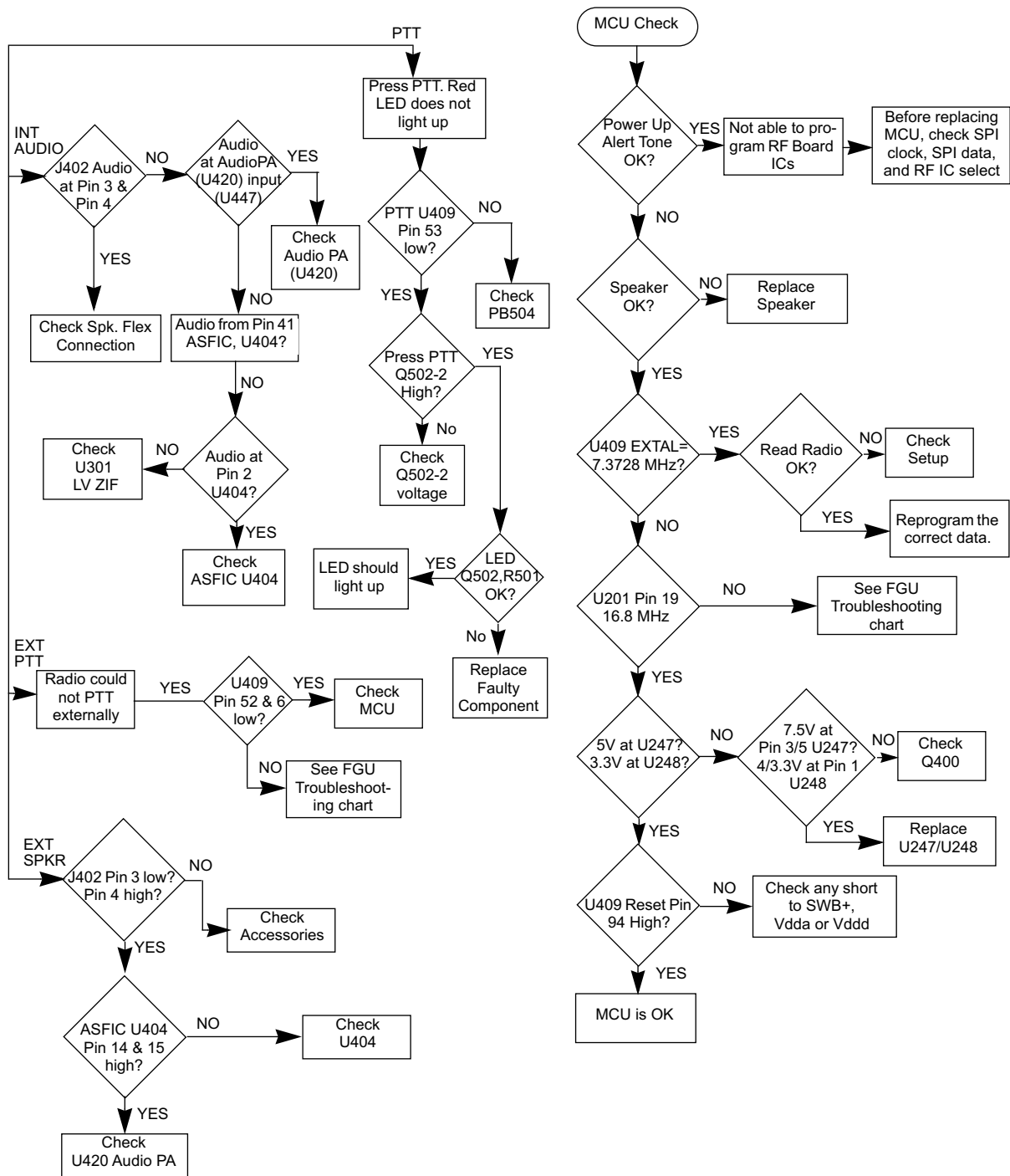
Circuit Ref	Motorola Part No.	Description
R494	0662057M01	0
R495	0662057N23	100K
R496	0662057N23	100K
R498	0662057N23	100K
R499	0662057M98	10K
R501	0662057M70	680
R502	0662057M56	180
R505	0662057M98	10K
R506	0662057N15	47K
R507	0662057M01	0
R510	0662057M98	10K
RT400	0680590Z01	Thermistor 33K
S501	4080710Z01	Channel Switch
S502	1880619Z02	Volume Switch
SH3201	2602023X08	Rx Back end top shield
SH3202	2686081B02	LVZIF Shield
SH3203	2686081B03	45.1MHz Xtal Shield
SH3301	2686081B01	Rx Back end bottom shield
SH3302	2686081B05	Mixer Shield
SH3303	2686081B06	Rx Front end top shield
SH3501	2680687Z01	Shield, Harmonic Filter
SH3502	2686081B04	PA driver Shield
SH3701	2680511Z01	Synthesizer Top Shield
SH3702	2680511Z01	Synthesizer Bottom Shield
SH3801	2680513Z01	Shield, VCO Top
SH3802	2680514Z01	Shield, VCO Bottom
SH400	2680505Z01	Controller Memory Shield
SH401	2680506Z01	On/off Controller Shield
SH402	2680515Z01	Microprocessor Shield
SH403	2680516Z01	ASFIC CMP/Audio PA Controller Shield
T3301	2580541Z01	XFMR Coil
T3302	2580541Z01	XFMR Coil
U3201	5102463J58	3.3V Voltage Regulator
U3220	5109632D83	LVZIF IC
U3501	5185130C65	LDMOS Driver IC
U3502	5185765B28	Power Control IC
U3503	5185963A15	Temperature Sense
U3701	5185963A27	LVFRACN Synthesizer IC
U3711	5105739X05	5V Regulator
U3801	5105750U54	VCO Buffer IC
U400	5102463J40	3.3V Voltage Regulator
U404	5185130C53	ASFIC_CMP
U405	Not Placed	
U406	*5102463J59	FLASH ROM 128K X 8
U407	*5102463J64	16K X 8 EEPROM
U409	5102226J56	Microprocessor
U410	5102463J57	3.3V Voltage Regulator
U420	5102463J44	Audio PA
VR3501	4880140L15	Zener Diode, 10V
VR431	4802245J73	Zener Diode, 6.8V

Circuit Ref	Motorola Part No.	Description
VR432	4880140L15	Zener Diode, 10V
VR433	4880140L15	Zener Diode, 10V
VR439	4880140L15	Zener Diode, 10V
VR440	4802245J73	Zener Diode, 6.8V
VR441	4802245J73	Zener Diode, 6.8V
VR444	4802245J73	Zener Diode, 6.8V
VR450	4802245J75	Zener Diode, 12.0V
VR451	4802245J74	Zener Diode, 10.0V
VR501	4813830A18	Zener Diode, 6.8V
VR506	4802245J73	Zener Diode, 6.8V
Y3200	4802245J43	Xtal Filter
Y3761	4805875Z04	16.8MHz Crystal Oscillator
Y3762	Not Placed	
	5480678Z01	Barcode Label
	8480675Z04	VHF main PC Board

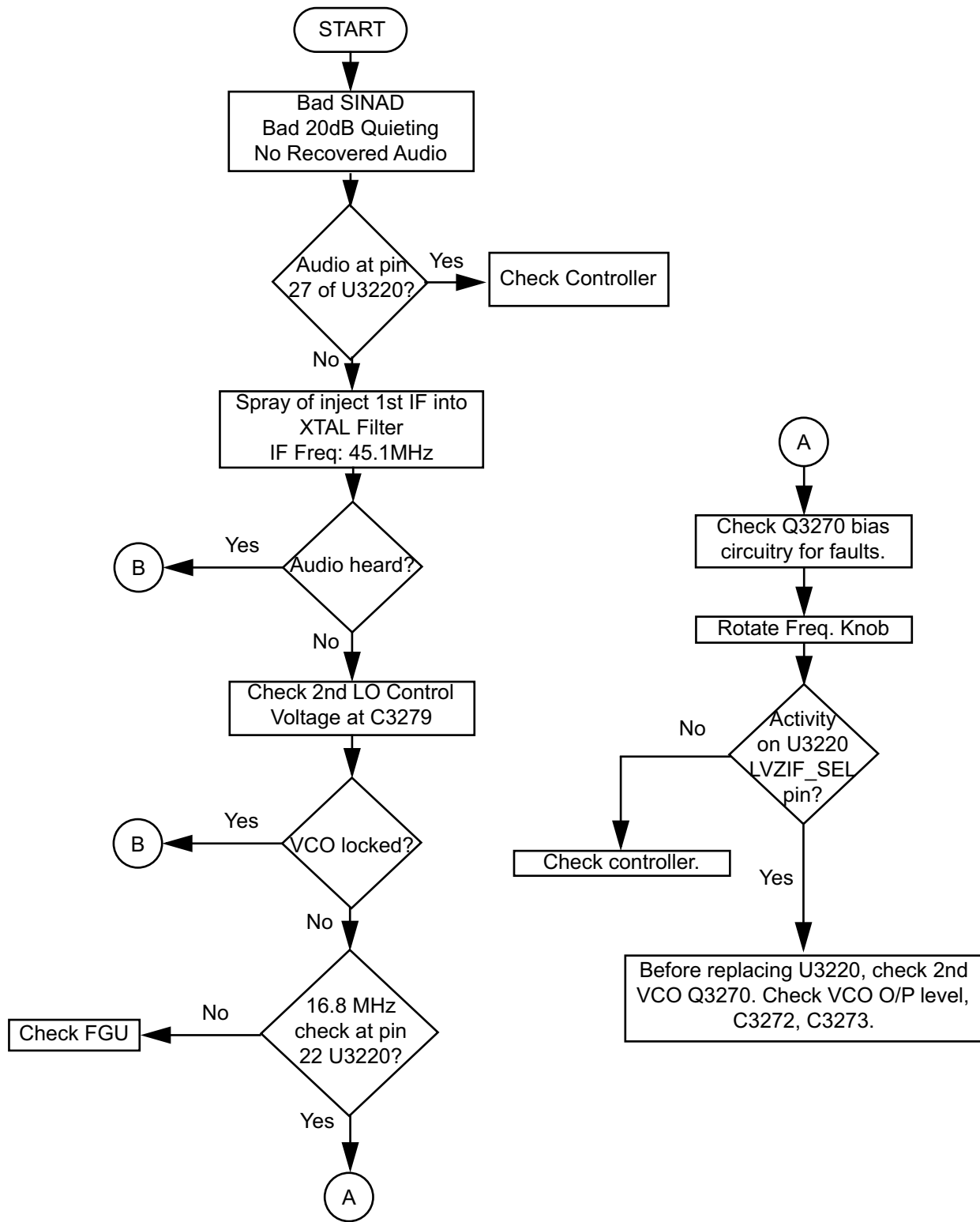
* Motorola Depot Servicing only

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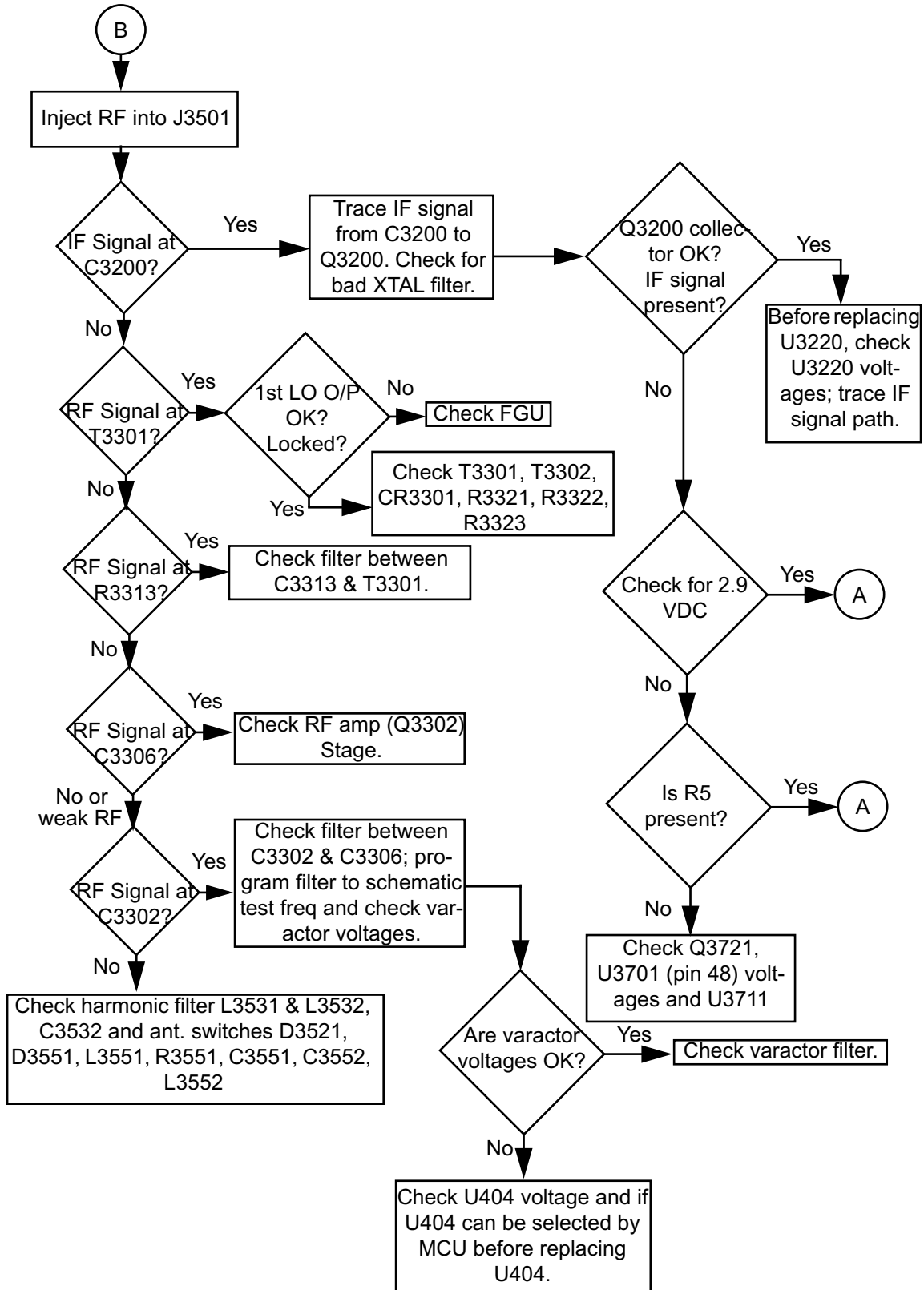
10.0 Troubleshooting Charts



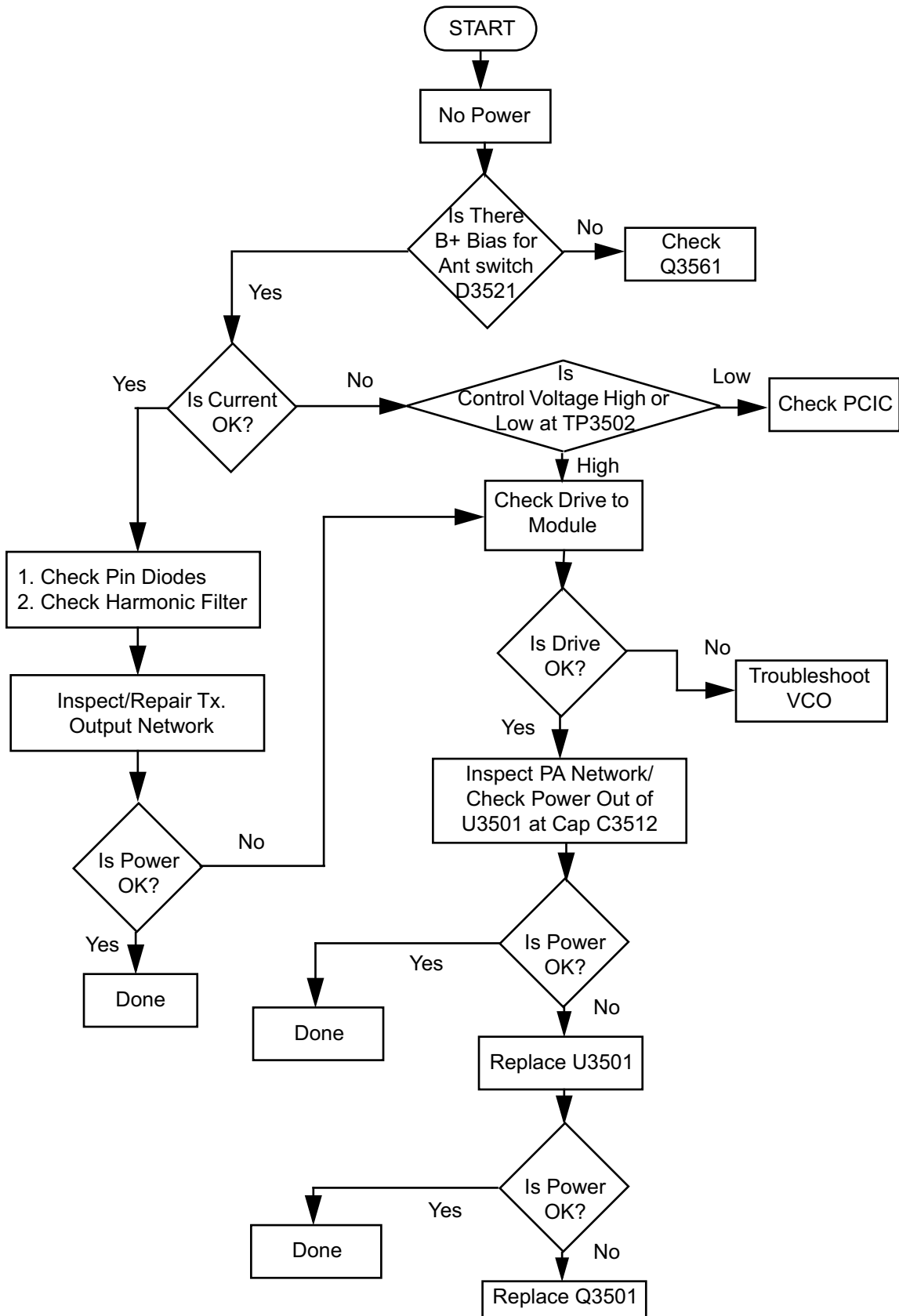
Troubleshooting Flow Chart for Controller



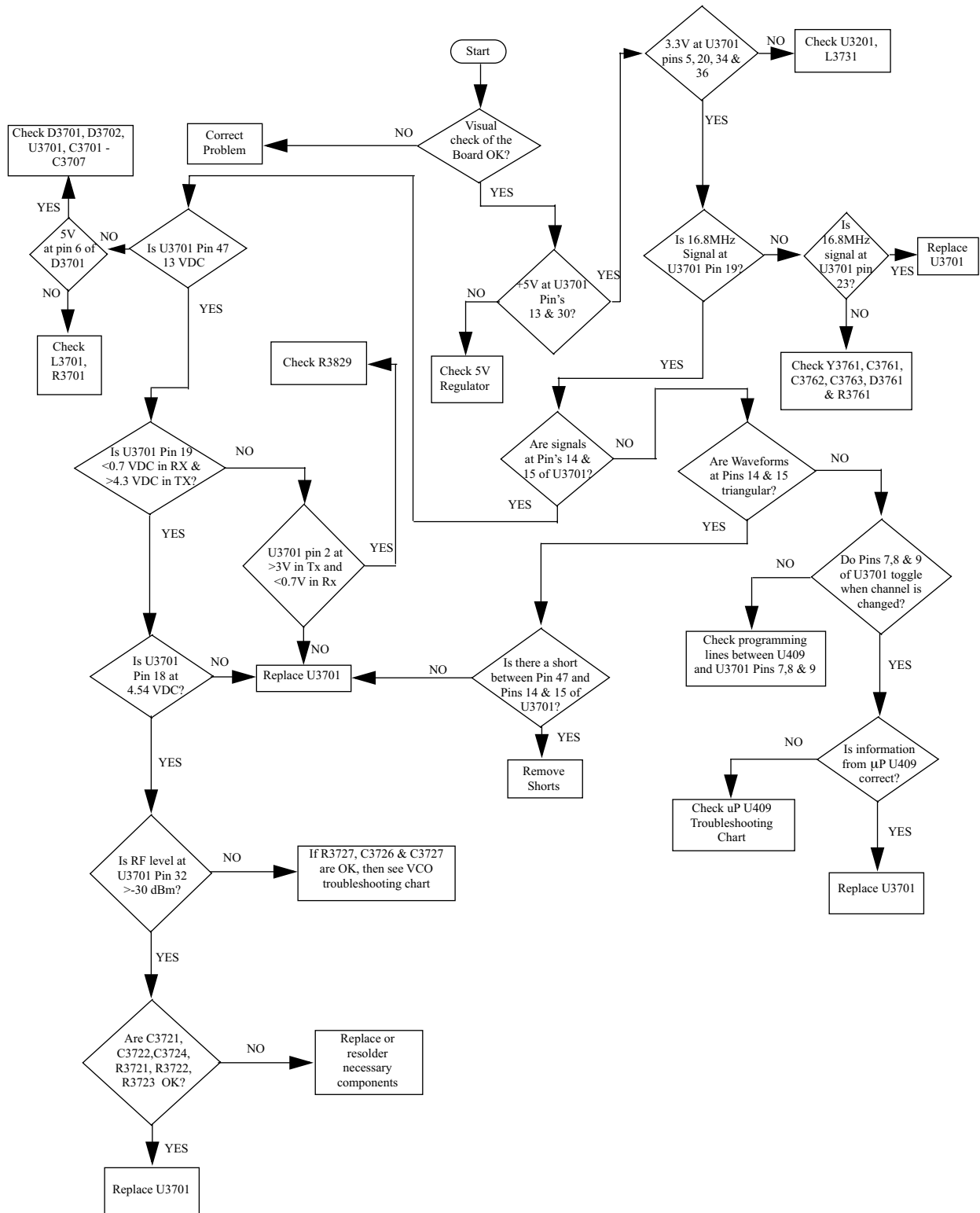
Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



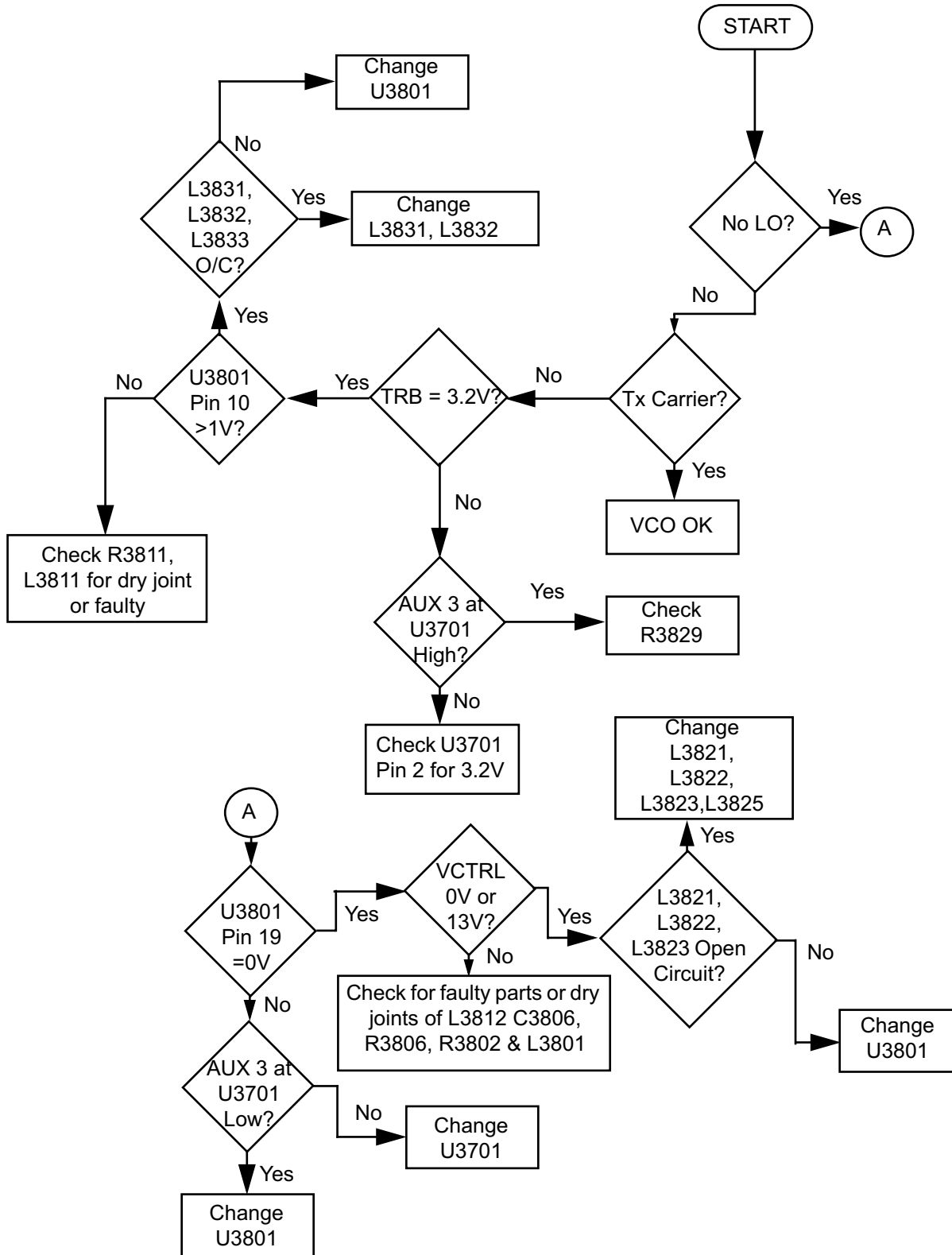
Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



Troubleshooting Flow Chart for Transmitter



Troubleshooting Flow Chart for Synthesizer

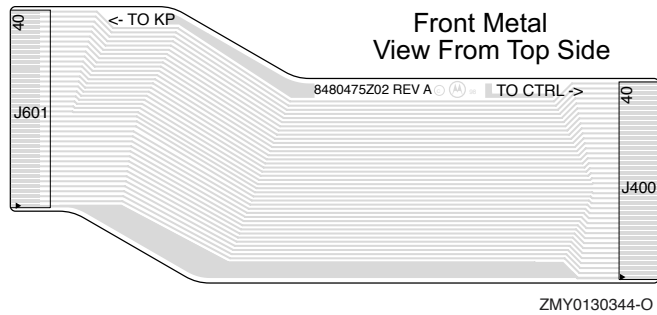


Troubleshooting Flow Chart for VCO

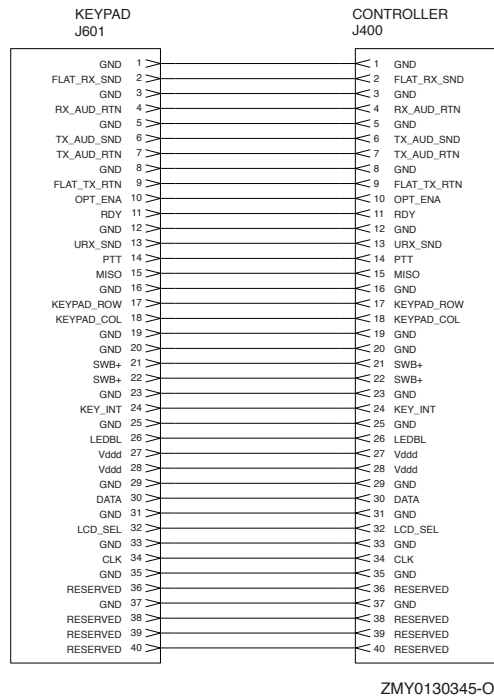
Section 10

FLEX LAYOUT/SCHEMATIC DIAGRAMS AND PARTS LISTS

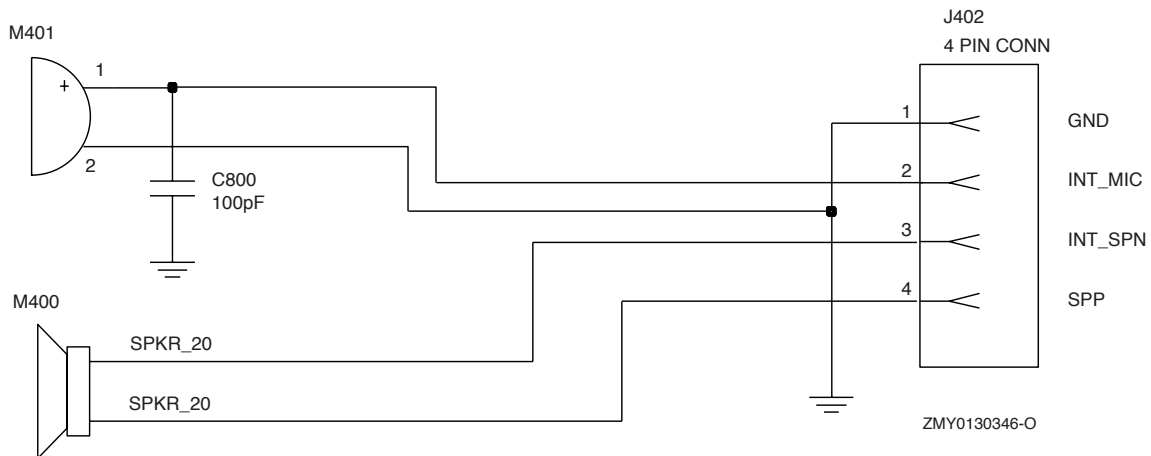
1.0 Keypad-Controller Interconnect Flex



2.0 Schematic for Keypad-Controller Interconnect Flex



3.0 Schematic For Speaker/Mic Assembly - 0104008J99



4.0 Parts List for Speaker/Mic Assembly - 0104008J99

Reference Symbol	Motorola Part No.	Description
C800	2113740A55	Cap, 100pF
M400	5085738Z02	Speaker
M401	5013920A04	Mic, Mini electrec
	8485687Z01	Flex, Mic
	0980727Z01	Connector, Wire

GLOSSARY OF TERMS

Term	Definition
ALC	Automatic Level Control: a circuit in the transmit RF path that controls RF power amplifier output, provides leveling over frequency and voltage, and protects against high VSWR (Voltage Standing Wave Ratio).
ASFIC	Audio Signalling Filter Integrated Circuit
CD	Compact Disk
CMP	Compression
CPS	Customer Programming Software
CSQ	Carrier Squelch
DTMF	Dual-Tone Multifrequency
DPL	Digital Private-Line™
EEPROM	Electronically Erasable/Programmable Read-Only Memory: used by the radio to store its personality
Firmware	Software, or a software/hardware combination of computer programs and data, with a fixed logic configuration stores in a read-only memory. Information cannot be altered or reprogrammed.
FGU	Frequency Generation Unit
GaAs	Gallium Arsenide: a type of crystalline material used in some semiconductors.
ISW	Inbound Signalling Word: data transmitted on the control channel from a subscriber unit to the central control unit.
LH DATA	Longhorn Data: a bidirectional 0-5V, RS-232 line that uses the microcontroller's integrated RS-232 asynchronous serial communications interface (SCI) peripheral.
LLE	Low Level Expander: slight amount of volume expansion; used to improve the signal to noise ratio.
LSH	Low-Speed Handshake: 150 baud digital data sent to the radio during trunked operation while receiving audio.
MCU	Micro Controller Unit
MRTI	Motorola Radio-Telephone Interconnect: a system that provides a repeater connection to the Public Switched Telephone Network (PSTN). The MRTI allows the radio to access the telephone network when the proper access code is received.
OMPAC	Over-Molded Pad-Array Carrier: a Motorola custom package, distinguished by the presence of solder balls on the bottom pads.
PC Board	Printed Circuit Board

Term	Definition
PL	Private-Line® tone squelch: a continuous sub-audible tone that is transmitted along with the carrier.
PLL	Phase-Locked Loop: a circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.
PTT	Push-To-Talk: the switch located on the left side of the radio which, when pressed, causes the radio to transmit.
RAM	Random Access Memory: the radio's RAM is loaded with a copy of the EE-PROM data.
Registers	Short-term data-storage circuits within the microcontroller.
RESET	Reset line: an input to the microcontroller that restarts execution.
RF PA	Radio Frequency Power Amplifier
RIB	Radio Interface Box
ROM	Read Only Memory
RSSI	Received Signal-Strength Indicator: a dc voltage proportional to the received RF signal strength.
RPT/TA	Repeater/Talk-Around
Softpot	Software Potentiometer: a computer-adjustable electronic attenuator
Software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
SPI (clock and data lines)	Serial Peripheral Interface: how the microcontroller communicates to modules and ICs through the CLOCK and DATA lines.
Squelch	Muting of audio circuits when received signal levels fall below a pre-determined value.
Standby Mode	An operating mode whereby the radio is muted but still continues to receive data
TOT	Time-Out Timer: a timer that limits the length of a transmission.
TPL	Tone Private-line
μC	Microcontroller
UHF	Ultra High Frequency
μP	Microprocessor
VCO	Voltage-Controlled Oscillator: an oscillator whereby the frequency of oscillation can be varied by changing a control voltage.
VCOBIC	Voltage-Controlled Oscillator Buffer Integrated Circuit
VHF	Very High Frequency
VSWR	Voltage Standing Wave Ratio

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