MOTOROLA

Commercial Series

CP140/CP160/CP180 Portable Radios

UHF3 (465-495MHz)

Service Information

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Chapter 1

MODEL CHART AND TECHNICAL SPECIFICATIONS

1.0 CP140/CP160/CP180 Model Chart

CP140/CP160/CP180 Series, UHF3, 465-495 MHz				
Model				Description
MDH65SDC9AA2AN				CP140, 465-495 MHz, 4 W, 16 Ch. Non-Display Model
	MDH65SDF9AA3AN			CP160, 465-495 MHz, 4 W, 32 Ch. Limited Keypad Model
		MDH65SDH9AA4AN		CP180, 465-495 MHz, 4W, 64 Ch. Full Keypad Model
			Item	**Description**
X			PMUE1978_	CP140, 465-495 MHz, Tanapa
	X		PMUE1979_	CP160, 465-495 MHz, Tanapa
		X	PMUE1980_	CP180, 465-495 MHz, Tanapa
X			PMLE4284_	CP140, Back Cover Kit. 465-495 MHz
	X		PMLE42??_	CP160, Back Cover Kit. 465-495 MHz
		X	PMLE42??_	CP180, Back Cover Kit. 465-495 MHz
X			PMLN4601_	CP140, Front Housing Kit, 16 Ch.
	X		PMLN4602_	CP160, Front Housing Kit, 32 Ch.
		X	PMLN4603_	CP180, Front Housing Kit, 64 Ch.
X	X	X	NNTN4497_R	Li-Ion Battery, High Capacity 1800 mAH
X	X	X	NNTN4851_	NiMh Battery, 1400 mAH
X	X	X	NNTN4852_	NiMh Battery, 1300 mAH FM
X	X	X	NNTN4970	Slim Li-Ion Battery 1600 mAH
X	X	X	WPLN4139_R	Rapid Desktop Charger w/Euro Plug
X	X	X	WPLN4140_R	Rapid Desktop Charger w/UK Plug
X	X	X	HLN8255	3” Belt Clip
X	X	X	NAE6483_	Antenna, 403-520 MHz, 14cm
X			6866550D01	CP140/CP160/CP180 User Guide
	X		6881096C29	FM Product Listing Manual
		X	6864117B25_	Safety and General Information Leaflet

X = Indicates compatibility with model(s)

2.0 Technical Specifications

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

General	UHF3		
Frequency:	465-495 MHz		
Channel Capacity:	16, 32, or 64 Channels		
Power Supply:	7.5 Volts ±20%		
Dimensions with: High Capacity Li-Ion battery NiMH FM, battery NiMH Std battery Slim Li-Ion battery:	 130.5mm H x 62mm W x 45mm D 130.5mm H x 62mm W x 45mm D 130.5mm H x 62mm W x 43mm D 130.5mm H x 62mm W x 42mm D		
Weight: for 16 Channel Model Batteries: High Capacity Li-Ion NiMH FM NiMH Std Slim Li-Ion	 376g (13.26 oz.) 449g (15.83 oz.) 446g (15.73 oz.) 337g (13.30 oz.)		
Weight: for 32 & 64 Channel Model Batteries: High Capacity Li-Ion NiMH FM NiMH Std Slim Li-Ion	 396g (13.97 oz.) 469g (16.54 oz.) 467g (16.47 oz.) 377g (14.0 oz.)		
Average Battery Life @ (5-5-90 Duty Cycle): High Capacity Li-Ion NiMH FM NiMH Std Slim Li-Ion	Capacity (mAh) 1800 1300 1400 1600	4 W 14 Hrs. 9 Hrs. 10 Hrs. 12 Hrs.	1 W 19 Hrs. 11 Hrs. 13 Hrs. 17 Hrs.

Transmitter		
Specifications	**UHF3**	
RF Output NiMH @ 7.5V:	Low 1 W	High 4W
Frequency:	465-495 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.	<3%	
FM Noise:	-40 dB (12.5 kHz) -45 dB (25 kHz)	

Receiver		
Specifications	**UHF3 12.5 kHz**	**UHF3 20/25kHz**
Frequency:	465-495 MHz	
Sensitivity 12dB EIA SINAD:	0.25 μV (typical)	
Adjacent Channel Selectivity:	-60 dB	-70 dB
Intermodulation:	-70 dB	
Freq. Stability (-30°C to +60°C):	0.00025%	
Spur Rejection:	-75 dB	
Image and 1/2 I-F Rejection:	-70 dB	
Audio Output @ <5% Distortion:	500 mW	

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

Self Quieter Frequencies
UHF3
488.326250
488.332500
488.338750
488.345000
488.351250
488.357500
488.363750 (488.345 +/- 18.75kHz)

Chapter 2

THEORY OF OPERATION

1.0 Introduction

This Chapter provides a detailed theory of operation for the UHF circuits in the radio. Schematic diagrams and board layout diagrams are included in Chapter 4 in this Section of the manual.

2.0 UHF (465-495MHz) Receiver

The UHF receiver covers the range of 465-495 MHz and provides switchable IF bandwidth for use with 20/25/30 kHz or 12.5 kHz channel spacing systems. The receiver is divided into two major blocks, as shown in Figure 2-1.

- Front End
- Back End

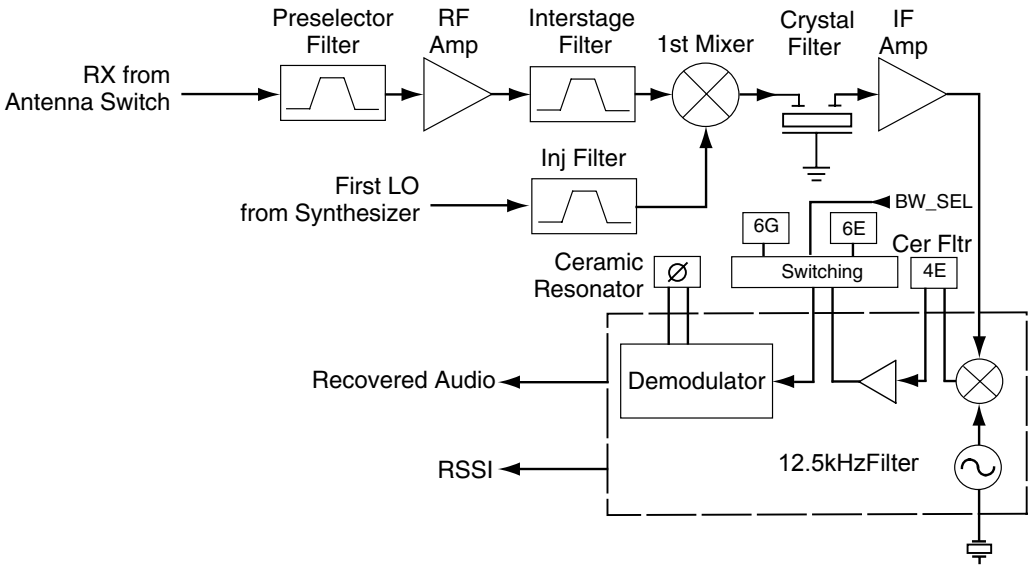


Figure 2-1 UHF Receiver Block Diagram

2.1 Receiver Front End

Incoming RF signals from the antenna are first routed through the harmonic filter and antenna switch, part of the transmitter circuitry, before being applied to the receiver front end. The receiver front end consists of a preselector filter, RF amplifier, an interstage filter, and a double-balanced first mixer.

The preselector filter is a fixed-tuned 3-pole Butterworth design using discrete elements (L1-L3, C1-C10, C12 and C523) in a shunt-resonator configuration. It has a 3 dB bandwidth of 68 MHz centered at 480 MHz, an insertion loss of 2 dB and image attenuation of 39 dB at 405.3 MHz. Diode CR1 protects the RF amplifier by limiting excessive RF levels. The filter bandwidth is considerably wider than the receive band, to achieve low insertion loss in a compact size. C523 provides a transmission-zero to improve image attenuation.

The output of the filter is matched to the base of RF amplifier Q21, which provides 18 dB of gain and a noise figure of 3.3 dB. A BFS505 device is used for high gain, low noise figure and reduced operating current. Operating voltage is obtained from the 5R source, which is turned off during transmit to reduce dissipation in Q21. Current mirror Q22 maintains the operating current of Q21 constant at 8 mA regardless of device and temperature variations, for optimum dynamic range and noise figure.

The output of the RF amplifier is applied to the interstage filter, a fixed-tuned 4-pole Butterworth shunt-coupled resonator design having a 3 dB bandwidth of 68 MHz centered at 480 MHz, and insertion loss of 3.3 dB. This filter yields an image rejection of 55 dB at 405.3 MHz, assisted by a transmission-zero at 300 MHz implemented by C524 for the reasons mentioned above.

The output of the interstage filter is connected to the passive double-balanced mixer consisting of components T41, T42, and CR41. This mixer has a conversion loss of 7.2 dB. Low-side injection from the frequency synthesizer is filtered by L40-L41 and C41-C45 to remove second harmonic energy that may degrade half-IF spurious rejection performance. The injection filter has a 3 dB bandwidth of 100 MHz centered at 408 MHz, and an insertion loss of 2.5 dB. The second-harmonic rejection is typically 40 dB or greater. The filtered injection signal is applied to T42 at a level of +6 dBm.

The mixer output is applied to a diplexer network (L51-L52, C51, R51) which matches the 44.85 MHz IF signal to crystal filter FL51, and terminates the mixer into 50Ω at all other frequencies.

2.2 Receiver Back End

The receiver back end is a dual conversion design. High IF selectivity is provided by FL51, a 4-pole fundamental mode 44.85 MHz crystal filter with a minimum 3 dB bandwidth of ±6.7 kHz, a maximum 20 dB bandwidth of + 12.5 kHz, and a maximum insertion loss of 3.5 dB. The output is matched to IF amplifier stage Q51 by L53 and C93. Q51 provides 16 dB of gain and a noise figure of 1.8 dB. The dc operating current is 1 mA. The output of Q51 is applied to the input of the receiver IFIC U51. Diode CR51 limits the maximum RF level applied to the IFIC.

The IFIC is a low-voltage monolithic FM IF system incorporating a mixer/oscillator, two limiting IF amplifiers, quadrature detector, logarithmic received signal strength indicator (RSSI), voltage regulator and audio and RSSI op amps. The second LO frequency, 44.395 MHz, is determined by Y51. The second mixer converts the 44.85 MHz high IF frequency to 455 kHz.

Additional IF selectivity is provided by two ceramic filters, FL52 (between the second mixer and IF amp) and FL53 or FL54 (between the IF amp and the limiter input). The wider filter FL53 is used for 20/25 kHz channel spacing, and the narrower filter FL54 is used for 12.5 kHz channels. When the BW_SEL line is high, the two upper diodes in packages D51 and D52 are forward biased, selecting FL53 for 20/25 kHz channels. When the BW_SEL line is low, the two lower diodes in packages D51 and D52 are forward biased, selecting FL54 for 12.5 kHz channels.

The ceramic filters have the following specifications:

	FL52	FL53	FL54
Number of Elements:	4	6	6
Insertion Loss:	4 dB	4 dB	4 dB
6 dB Bandwidth:	15 kHz	15 kHz	9 kHz
50 dB Bandwidth:	30 kHz	30 kHz	22 kHz
Stopband Rejection:	27 dB	47 dB	47 dB

Ceramic resonator Y70 provides phase vs. frequency characteristic required by the quadrature detector, with 90 degree phase shift occurring at 455 kHz. Buffer Q70 provides a lower driving impedance from the limiter to the resonator, improving the IF waveform and lowering the distortion of the recovered audio signal. The recovered audio level at the DEMOD output is 100 mV rms (25 kHz channel, 3 kHz deviation) or 50 mV rms (12.5 kHz channel, 1.5 kHz deviation). An additional RSSI output provides a DC voltage level that is proportional to RF signal level. This voltage is measured by an A/D converter contained in the microprocessor (PE4_AN4, U401 pin 63).

3.0 UHF Transmitter

The UHF transmitter covers the range of 465-495 MHz. Depending on model, the output power of the transmitter is either switchable on a per-channel basis between high power (4 watts) and low power (1 watt), or is factory preset to 2 watts. The transmitter is divided into four major blocks as shown in Figure 2-2.

- Power Amplifier
- Harmonic Filter
- Antenna Matching Network
- Power Control.

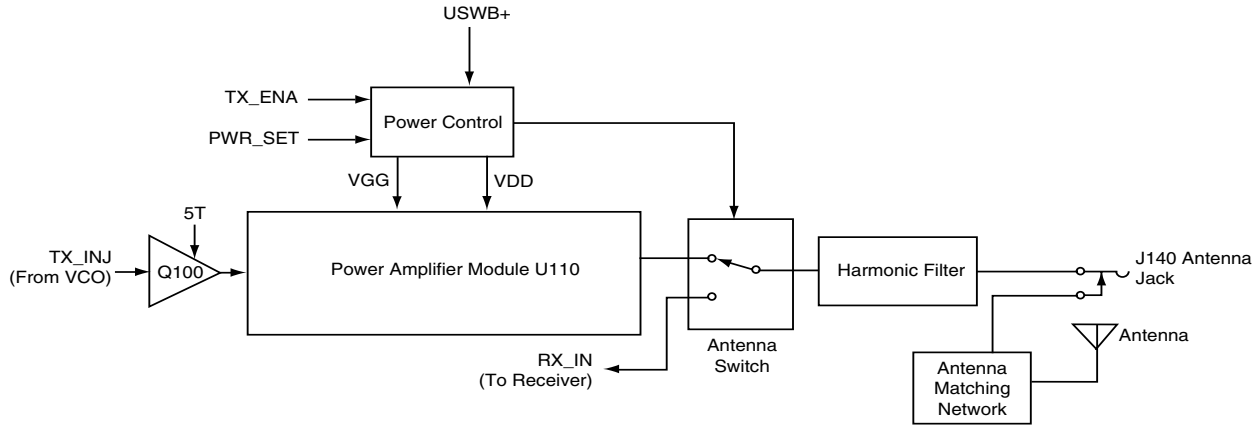


Figure 2-2 UHF Transmitter Block Diagram

3.1 Transmitter Power Amplifier

The transmitter power amplifier has three stages of amplification. The first stage, Q100, operates in Class A from the 5T source. It provides 17 dB of gain and an output of 50 mW. The current drain is typically 30mA. Components C105 and L103 match the output of Q100 to the 50Ω input of the module U110.

U110 is a two stage Silicon MOS FET power amplifier module. Drain voltage is obtained from UNSW B+ after being routed through current-sense resistor R150 in the power control circuit. The output power of the module is controlled by varying the DC gate bias on U110 pin 2 (VGG).

3.2 Antenna Switch

The antenna switch consists of two pin diodes, D120 and D121. In the receive mode, both diodes are off. Signals applied at the antenna or at jack J140 are routed, via the harmonic filter, through network C122-C124 and L121, to the receiver input. In the transmit mode, Q170 is on and TXB+ is present, forward-biasing both diodes into conduction. The diode current is 20 mA, set by R120-R121. The transmitter RF from U110 is routed through D120, and via the harmonic filter to the antenna jack. D121 conducts, shunting RF power and preventing it from reaching the receiver. L121 is selected to appear as a 1/4 wave at UHF, so that the low impedance of D121 appears as a high impedance at the junction of D120 and the harmonic filter input. This provides a high series impedance and low shunt impedance divider between the power amplifier output and receiver input.

3.3 Harmonic Filter

The harmonic filter consists of components C130-C136 and L130-L132. The harmonic filter is a seven-pole Chebychev low-pass configuration, optimized for low insertion loss, with a 3 dB frequency of approximately 655 MHz and typically less than 0.8 dB insertion loss in the passband.

3.4 Antenna Matching Network

The harmonic filter presents a 50Ω impedance to antenna jack J140. A matching network, made up of C140-C141 and L140, is used to match the antenna impedance to the harmonic filter. This optimizes the performance of the transmitter and receiver into the impedance presented by the antenna, significantly improving the antenna's efficiency.

3.5 Power Control

The power control circuit is a dc-coupled amplifier whose output is the dc gate bias voltage (VGG) applied to the two stages of the RF power amplifier U110.

The output power of the transmitter is adjusted by varying the setting of the power-set DAC contained in the ASFICcmp IC (DACG, U451 pin 6). This PWR_SET voltage is applied to U150 pin 3.

Stage U150-2 compares the voltage drop across current sense resistor R150 to the voltage drop across resistor R151 caused by current flow through Q150, and adjusts its output (pin 7) to maintain equal voltages at pins 5 and 6. Thus the current flow through Q150, and hence its emitter voltage, is proportional to the current drawn by stage U110, which is in turn proportional to the transmitter output power. The emitter voltage of Q150 is applied to U150 pin 2, where it is compared to the power set voltage PWR_SET at pin 3.

The output of U150 pin 1 is divided by R110 and R111 and applied as a gate voltage to the power amplifier U110. By varying this gate voltage as needed to keep the voltages at U150 pins 2 and 3 equal, power is maintained at the desired setting. Excessive final current, for example due to antenna mismatch, causes a lowering of the voltage at U150 pin 6, an increased voltage at pin 2, and a lowering of the voltage at pin 1 and of the gate voltage VGG. This prevents damage to the final stage due to excessive current.

4.0 UHF Frequency Generation Circuitry

The frequency generation system, shown in Figure 2-3, is composed of two circuit blocks, the Fractional-N synthesizer IC U201, the VCO/Buffer IC U251, and associated circuitry. Figure 2-4 shows the peripheral interconnect and support circuitry used in the synthesizer block, and Figure 2-5 details the internal circuitry of the VCOBIC and its interconnections to the surrounding components. Refer to the schematic to identify reference designators.

The Fractional-N synthesizer is powered by regulated 5V and 3V provided by U310 and U330 respectively. 5V is applied to U201 pins 13 and 30, and 3V is applied to pins 5, 20, 34 and 36. The synthesizer in turn generates a super-filtered 4.5V supply (VSF, from pin 28) to power U251. In addition to the VCO, the synthesizer also interfaces with the logic and ASFICcmp circuits. Programming for the synthesizer is accomplished through the microprocessor SPI_DATA_OUT, SPI_CLK, and SYNTH_CS (chip select) lines (U409 pins 100, 1 and 47 respectively). A logic high (3V) from U201 pin 4 indicates to the microprocessor that the synthesizer is locked.

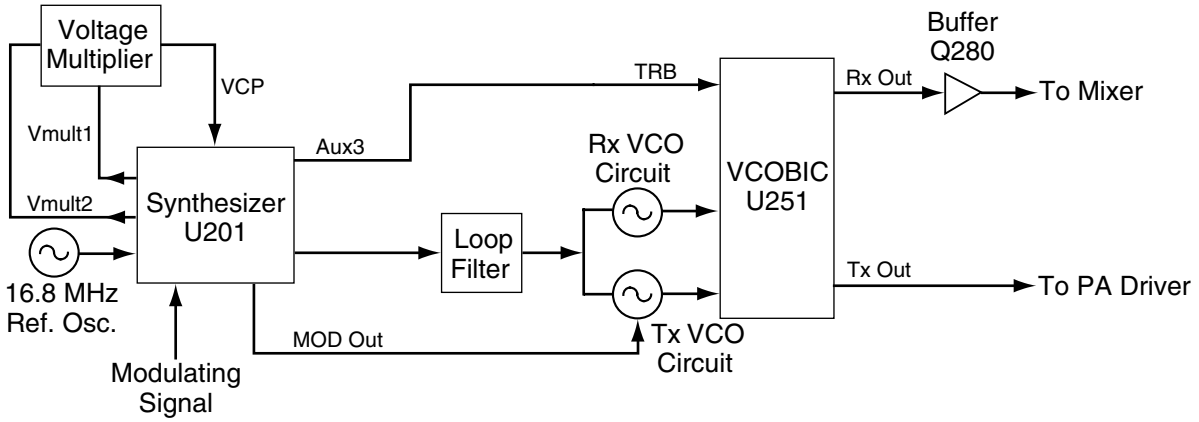


Figure 2-3 UHF Frequency Generation Unit Block Diagram

Transmit modulation from the ASFICcmp (U451 pin 40) is applied to U201 pin 10 (MOD_IN). An electronic attenuator in the ASFICcmp adjusts overall transmitter deviation by varying the audio level applied to the synthesizer IC. Internally the audio is digitized by the Fractional-N synthesizer and applied to the loop divider to provide the low-port modulation. The audio is also routed through an internal attenuator for the purpose of balancing the low port and high port modulation and reducing the deviation by 6 dB for 12.5 kHz channels, and is available at U201 pin 41 (VCO_MOD). This audio signal is routed to the VCO's modulator.

4.1 Fractional-N Synthesizer

The Fractional-N synthesizer, shown in Figure 2-4, uses a 16.8 MHz crystal (Y201) to provide the reference frequency for the system. External components C201-C203, R202 and D201 are also part of the temperature-compensated oscillator circuit. The dc voltage applied to varactor D201 from U201 pin 25 is determined by a temperature-compensation algorithm within U201, and is specific to each crystal Y201, based on a unique code assigned to the crystal that identifies its temperature characteristics. Stability is better than 2.5 ppm over temperatures of -30 to 60°C. Software-programmable electronic frequency adjustment is achieved by an internal DAC which provides a frequency adjustment voltage from U201 pin 25 to varactor D201.

The synthesizer IC U201 further divides the 16.8 MHz signal to 2.1 MHz, 2.225 MHz, or 2.4 MHz for use as reference frequencies. It also provides a buffered 16.8 MHz signal at U201 pin 19 for use by the ASFICcmp.

To achieve fast locking of the synthesizer, an internal adapt charge pump provides higher current at U201 pin 45 to quickly force the synthesizer within lock range. The required frequency is then locked by the normal mode charge pump at pin 43. A loop filter (C243-C245 and R243-R245) removes noise and spurs from the steering voltage applied to the VCO varactors, with additional filtering located in the VCO circuit.

Both the normal and adapt charge pumps get their supply from the capacitive voltage multiplier made up of C221-C224 and D220-D221. Two 3V square waves from U201 pins 14-15 provide the drive signals for the voltage multiplier, which generates 12.1V at U201 pin 47. This voltage is filtered by C225-C228.

One of the auxiliary outputs of the synthesizer IC (AUX3, U201 pin 2) provides the TRB signal which determines the operating mode of the VCO, either receive or transmit.

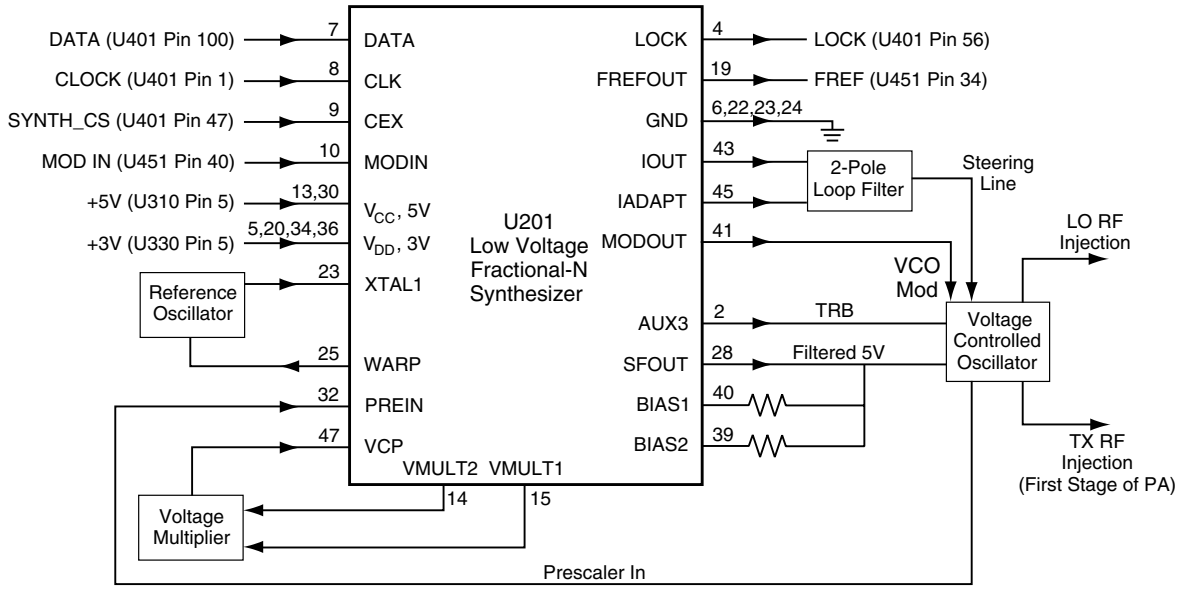


Figure 2-4 UHF Synthesizer Block Diagram

4.2 Voltage Controlled Oscillator (VCO)

The VCOBIC (U251), shown in Figure 2-5, in conjunction with the Fractional-N synthesizer (U201) generates RF in both the receive and the transmit modes of operation. The TRB line (U251 pin 19) determines which oscillator and buffer are enabled. A sample of the RF signal from the enabled oscillator is routed from U251 pin 12 through a low pass filter, to the prescaler input of the synthesizer IC (U201 pin 32). After frequency comparison in the synthesizer, a resultant DC control voltage is used to steer the VCO frequency. When the PLL is locked on frequency, this voltage can vary between 3.5V and 10V. L251 and C252 further attenuate noise and spurs on the steering line voltage.

In the receive mode, the TRB line (U251 pin 19) is low. This activates the receive VCO and the receive buffer of U251, which operate within the range of 420.15 to 450.15 MHz. The VCO frequency is determined by tank inductor L254, C253-C257, and varactor D251. The buffered RF signal at U251 pin 8 is further amplified by Q280 and applied as RX_INJ to the low-pass injection filter in the receiver front end circuit.

In the transmit mode, U251-19 is driven high by U201 pin 2, enabling the transmit VCO and buffer. The 465-495 MHz RF signal from U251 pin 10 is applied as TX_INJ to the input of the transmitter circuit via matching network C290-C291 and L291. TX VCO frequency is determined by L264, C263-C267, and varactor D261. High-port audio modulation from the synthesizer IC is applied as VCO_MOD to varactor D262 which modulates the transmit VCO.

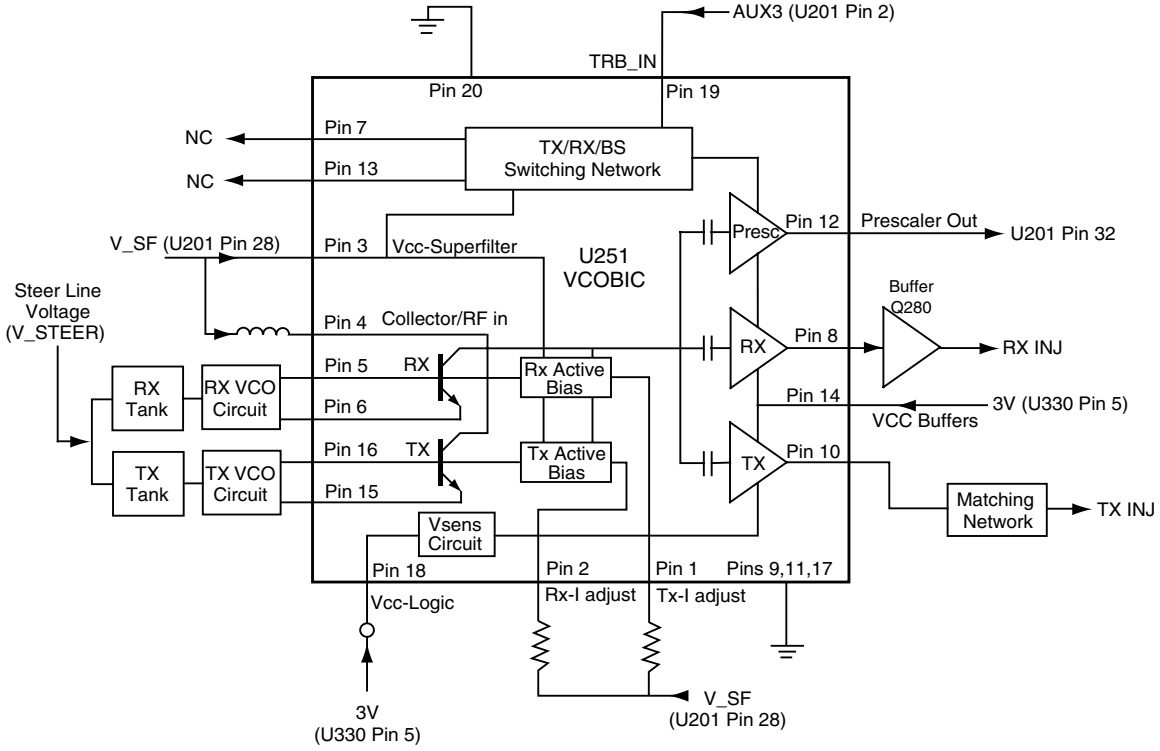


Figure 2-5 UHF VCO Block Diagram

Chapter 3

TROUBLESHOOTING TABLES

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

Most troubleshooting tables end up by pointing to an IC to replace. It is not always noted, but it is good practice to verify supplies and grounds to the affected IC and to trace continuity to the malfunctioning signal and related circuitry before replacing any IC. For instance, if a clock signal is not available at a destination, continuity from the source IC should be checked before replacing the source IC.

1.0 Troubleshooting Table for Receiver

Symptom	Possible Causes	Procedure	Corrective Action
Radio Dead (no turn-on beep, no LED indication)	1. Battery dead or defective.	Substitute known good battery or battery eliminator.	Charge or replace battery.
	2. Defective battery contacts.	Inspect battery contacts for corrosion or bent terminals.	Clean/repair/replace J301.
	3. Blown fuse	Check voltage on each side of fuse. If blown, 0 VDC after fuse.	Check for short on output, check D301, VR301, trouble-shoot/repair as needed, replace fuse.
	4. DC switching fault	Verify battery voltage present at S444 pin 5 when radio is on. Verify Q494-1 is at least 1V dc, Q494-6 is ~0.1V dc, Q493-3 is at Vbatt.	Check/replace on-off-volume control S444. Troubleshoot/replace Q493/4.
	5. Microprocessor not starting up.	Verify clock input to U401-90 (EXTAL) is 7.3975 MHz using high impedance probe. If clock is 3.8MHz, check for shorts on U401 pins. Connect RIB to verify communication via CPS. Verify U401-94 (RESET) is high.	Verify 16.8 MHz signal at U451-34. If OK, troubleshoot/replace U451. If not present, trouble-shoot U201 Synthesizer. Reprogram/reflash as needed. If RESET is Low, troubleshoot regulator U320. Check for shorts at U401 pins. Replace U401 (depot only). Reprogram/ reflash as needed.
	6. Regulator fault	Verify U310-5 is 5V dc, U320-5 is 3.3V dc, U330-5 is 3V dc.	Check for shorts on outputs, troubleshoot/repair as needed, replace faulty regulator.

Symptom	Possible Causes	Procedure	Corrective Action
No Audio	1. Synthesizer out of lock	Verify U201-4 is at 3V dc.	Troubleshoot synthesizer/VCO circuits.
	2. Defective IFIC	Verify audio is present at U51-8.	Check Q70, Y70, U51.
	3. RX audio buffer fault	Verify audio is present at U451-2.	Check U510 and associated parts.
	4. ASFIC fault	Verify audio is present at U451-41. Verify U451-14 is high.	Check squelch setting, PL/DPL programming. Troubleshoot/ replace U451.
	5. Audio PA fault	Verify U490-1 is <0.2V dc. Verify audio is present at U490-5 and 8.	Check Q490. Check/replace U490.
	6. Defective speaker	Verify audio is present at speaker terminals.	If not, check continuity of J471-2 and 3. Check J491. If yes, replace speaker.
No Receive (squelch noise present)	1. No first injection	Check that RF level at T42-6 is approx +6 dBm. Check that RF level at U251-8 is at least -8 dBm.	Check injection filter C40-44, L40-41. If yes, check Q280 and associated parts. If no, check U251 and components on pins 5 and 6.
	2. No 5R source.	Verify U401-49 is high in RX. Verify Q311 gate is 0V dc in RX Verify Q311 drain is 5V dc in RX.	Check/replace U401 Check/replace Q313. Check for shorts, check/replace Q311.
	3. Harmonic filter or antenna switch fault	Apply on-channel 100 mV RF signal at antenna port. Verify RF level at jct. C1/C2 per schematic.	Check TX harmonic filter, D120-121. Should be 0V dc on D120-121.
	4. Back end fault	Apply on-channel 100 mV RF signal at antenna port. Measure RF levels from FL51 through U51.	Check components prior to loss-of-signal point.
	5. No second injection	Measure RF level at U51-3, verify approx. 280 mV rms.	If dc voltages at U51-3 and 4 are OK, check Y51 and associated parts. If not replace U51.

2.0 Troubleshooting Table for Synthesizer

Symptom	Possible Causes	Procedure	Corrective Action
Synthesizer Out of Lock (RX mode only)	1. VCO fault	Verify oscillator is working, check RF level at U251-10 per schematic. Check dc voltages at U251 pin 2 through 6 and 10 per Board and IC troubleshooting table. Verify steering line voltage is between ~3V and 10V.	Check VCO tank components connected to U251-5 and 6. Check for shorts/opens, replace U251. Check D251 and associated components.
	2. Synthesizer fault	Verify TRB line (from U201-2 to U251-19) is low in RX mode	Check for shorts, check U201 voltages per Board and IC troubleshooting table, replace U201 if incorrect.
	3. Programming fault	Verify RX channel programming is correct.	Re-program if necessary.
Synthesizer Out of Lock (TX mode only)	1. VCO fault	Verify oscillator is working, check RF level at U251-10 per schematic. Check dc voltages at U251 pins 1,3,4,10,15,16 per Board and IC troubleshooting table. Verify steering line voltage is between ~3V and 10V.	Check VCO tank components connected to U251-15 and 16. Check for shorts/opens, replace U251. Check D261 and associated components.
	2. Synthesizer fault	Verify TRB line (U201-2 to U251-19) is high (3V) in TX mode	Check for shorts, check U201 voltages per Board and IC troubleshooting table, replace U201 if incorrect.
	3. Programming fault	Verify TX channel programming is correct.	Re-program if necessary.
Synthesizer Out of Lock (RX and TX modes)	1. VCO fault	Check that RF level at U251-12 is at least -12 to -20 dBm (UHF)	If low/missing, check L276, C276-7, R276.
	2. Synthesizer fault	Check that RF level at U201-32 is at least -12 to -20 dBm (UHF). Verify steering line voltage is between ~3V and 10V.	If correct, check/replace U201. If incorrect, check R248 and C241. Check loop filter components R243-5 and C243-5.
	3. DC voltage fault	Verify 4.5V dc at U201-28. Verify 12.1V dc at U201-47	Check C231-233, etc., for shorts. If OK check/replace U201. Check for 3V 1.05 MHz sq waves at U201-14 and 15. Check C218-228, D220-221.
	4. Programming fault	Verify channel programming is correct.	Re-program if necessary.

3.0 Troubleshooting Table for Transmitter

Symptom	Possible Causes	Procedure	Corrective Action
No Transmit (no TX LED indication)	1. PTT switch defective.	Verify U401-71 goes low when PTT is pressed.	Replace PTT switch S441.
	2. EXT MIC PTT fault	Verify U401-72 goes low when J471-4 is grounded.	Check/replace Q470, L471 etc.
No Transmit (TX LED indication OK)	1. Synthesizer out of lock	Refer to Synthesiser trouble-shooting table.	Refer to Synthesiser trouble-shooting table.
	2. No TX_ENABLE	Verify U401-50 is high when pin 71 or 72 is low.	Check/replace U401.
	3. TX DC switch fault	Verify Q171-C is 0V in TX. Verify Q170-C is at Vbatt in TX.	Replace Q171. Check for shorts, replace Q170.
	4. Power control fault	Check Q150 and U150 dc voltages per schematic and Synthesiser troubleshooting table.	Repair/replace defective components
	5. No TX injection	Check that RF level at jct. R100/R101 per schematic.	Check U251, L291-292, C290-291.
	6. No 5T source	Verify Q312 gate is 0V dc in TX Verify Q312 drain is 5V dc in TX.	Check/replace Q313. Check for shorts, check/replace Q312.
	7. TX gain stage failure	Check RF levels at Q100 and U110 per schematic.	Troubleshoot Q100/U110 and associated circuitry.
	8. Antenna switch failure	Verify dc voltage at jct. R122/L120 is approx 1.5V.	Check/replace D120-121, L120-121, R120-122, etc.
Low Power	1. Low TX injection	Check that RF level at jct. R100/R101 per schematic.	Check U251, L291-292, C290-291.
	2. Low gain in TX stage	Verify dc voltage at Q100-E is ~0.5V (UHF). Verify that RF level at U110-1 is approx. 1.6V (UHF).	Verify 5T voltage is correct. Troubleshoot Q100 circuitry. Troubleshoot Q100 circuitry. Check/replace Q100.
	3. Incorrect control voltage	Verify that the dc voltage at PWR_SET (R162) is approx 1.8V dc (at 1 watt) to 2.6V dc (at 4-5 watts). Verify that the dc voltage at U110-2 is approx 2-3V dc (at 1 watt) to 3-4V dc (at 4-5 watts). (See schematic.)	Check programming. Troubleshoot controller circuitry. Check/replace U451. Troubleshoot U150, Q150 and associated circuitry.
	4. Antenna switch defect	Verify dc voltage at jct.R121/L120 (UHF) is approx 1.7V. *Note: Do not attempt to measure RF or DC voltages at the diodes. Damage to test equipment may occur.*	Check/replace D120-121, L120-121, R120-122, etc.
	5. Harmonic filter defect	Visually inspect components C130-137, L130-132. Check dc continuity of L130-132 *in RX mode only.*	Repair/replace if necessary.

Symptom	Possible Causes	Procedure	Corrective Action
Poor TX range, conducted power OK	1. RF test jack defective	Verify continuity of J140 pins 3 and 4 *in RX mode only*.	Replace J140.
	2. Antenna matching network fault	Visually inspect components C140-141, L140 or L141. Check dc continuity of L140 or L141*in RX mode only*.	Repair/replace if necessary.
	3. Defective or wrong antenna	Verify correct antenna is installed. Try another antenna.	Replace antenna.
No internal mic audio (EXT MIC audio OK)	1. Mic bias fault	Verify U451-35 is low when side PTT is pressed. Verify Q470-6 is high when side PTT button is pressed.	Check/replace U451. Check/replace R474, R476, and Q470.
	2. Defective mic	Verify approx 1.8V dc across cartridge when side PTT button is pressed. Verify audio present (~10 mV rms) when speaking into mic.	Check mic connector and R478. Replace mic cartridge.
	3. Defective mic jack	Verify continuity between J471 pins 4 and 5.	Replace J471.
No EXT MIC audio	1. Mic bias fault	Verify approx 1.8V dc across EXT MIC cartridge in TX mode. Verify audio present (~10 mV rms) when speaking into mic.	Check Q470. R475, R477, L471. Check VR473, VR475, D470 for shorts.
	2. Audio path fault	Verify mic audio present (~10 mV rms) at U451-46. Verify amplified mic audio present (~200 mV rms) at U451-40.	Check L471, C470. Check/replace U451.
	3. Defective audio accessory	Try another accessory.	Replace defective accessory.

4.0 Troubleshooting Table for Board and IC Signals

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U51 IFIC	1	RF input 44.85 MHz	1.20	
	2	RF input decoupling	1.20	
	3	2nd LO osc output	4.02	
	4	2nd LO osc input	4.60	
	5	RSSI output	0.74	(no received signal)
	6	Vcc	4.70	
	7	Audio feedback	0.89	
	8	Audio output	1.44	DEMOD to stage U510
	9	RSSI feedback	0.74	(no received signal)
	10	Quad detector input	2.22	
	11	Limiter output	1.25	
	12	Limiter decoupling 2	1.30	
	13	Limiter decoupling 1	1.30	
	14	Limiter input	1.28	
	15	Ground	GND	
	16	IF amp output	1.22	
	17	IF amp decoupling 2	1.26	
	18	IF amp input	1.26	
	19	IF amp decoupling 1	1.26	
	20	2nd mixer output	3.09	
U52 BW Select Switch	1	Inverter 1 input	0	(25 kHz mode)
	2	Inverter 2 output	0	(25 kHz mode)
	3	Inverter 3 input (NU)	GND	
	4	Ground	GND	
	5	Inverter 3 output (NU)	4.96	
	6	Inverter 2 input	3.00	(25 kHz mode)
	7	Inverter 1 output	4.95	(25 kHz mode)
	8	Vcc	4.96	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U110 RF Power Amp	1	RF input	0	(TX mode)
	2	Vgg (gate bias)	2.65 (typ)	(TX mode)
	3	Vdd	6.59	(TX mode)
	4	RF output	--	Do not measure
	5	Ground	GND	
U150 Dual Opamp	1	Unit 1 output	4.20 (typ)	(TX mode)
	2	Unit 1 (-) input	2.39 (typ)	(TX mode)
	3	Unit 1 (+) input	2.39 (typ)	(TX mode)
	4	Ground	GND	
	5	Unit 2 (+) input	3.30 (typ)	(TX mode)
	6	Unit 2 (-) input	3.35 (typ)	(TX mode)
	7	Unit 2 output	2.23 (typ)	(TX mode)
	8	Vcc	6.79	(TX mode)
U201 Freq Synthesizer	1	AUX2 output (NU)	0	
	2	AUX3 output (TRB)	0.03	To U251-19 (RX mode)
	3	AUX4 output (NU)	0	
	4	Lock detect output	2.98	To U401-56
	5	PD Vdd	2.98	
	6	Digital ground	GND	
	7	Serial data input	3.23	
	8	Serial clock input	0	
	9	Synth chip select	3.23	From U401-47
	10	Modulation input	1.50	From U451-40
	11	VMULT4 (NU)	2.98	
	12	VMULT3 (NU)	0	
	13	VRO	4.96	
	14	VMULT2	1.49	
	15	VMULT1	1.49	
	16	INDMULT (NU)	0	
	17	NC1	0	
	18	Ref select (NU)	0	
	19	Buffered 16.8 MHz out	1.54	
	20	Analog Vdd	3.00	
	21	V bypass (NU)	1.55	
	22	Analog ground	GND	
	23	Ref osc XTAL1	2.07	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U201 Freq Synthesizer	24	Ref osc XTAL2	0	
	25	Ref osc warp output	3.00	
	26	Superfilter cap	4.48	
	27	Superfilter base (NU)	3.76	
	28	Superfilter output	4.52	
	29	NC2	0	
	30	Superfilter input	4.96	
	31	NC3	0	
	32	Prescaler input	1.97	
	33	Prescaler ground	GND	
	34	Prescaler Vdd	2.99	
	35	Prescaler Vref (NU)	1.97	
	36	Digital Vdd	2.99	
	37	TEST1 (NU)	0.01	
	38	TEST2 (NU)	0	
	39	Bias 2	3.38 (typ)	(1.34V in TX mode)
	40	Bias 1	1.50 (typ)	(3.20V in TX mode)
	41	Modulation output	3.42 (typ)	(1.62V typ in TX mode)
	42	CCOMP (NU)	0.05	
	43	Steering line IOUT	9.62 (typ)	Depends on frequency
	44	PD ground	GND	
	45	Steering line IADAPT	9.62 (typ)	Depends on frequency
	46	Adapt switch (NU)	0	
	47	Voltage from charge pump	12.8	
	48	AUX1 output (NU)	2.98	
U251 VCO / Buffer	1	TX VCO current adjust	4.50	
	2	RX VCO current adjust	4.35	
	3	Superfiltered input	4.51	
	4	Collector RF in amp	4.35	
	5	RX VCO base	1.27	
	6	RX VCO emitter	0.48	
	7	RX switch output (NU)	0	
	8	RX buffered VCO output	3.36	
	9	GND_FLAG	GND	
	10	TX buffered VCO output	3.36	
	11	GND_BUFFERS	GND	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U251 VCO / Buffer	12	Prescaler output	2.26	
	13	TX switch output (NU)	0.06	
	14	Vcc_BUFFERS	3.00	
	15	TX VCO emitter	0	(RX mode)
	16	TX VCO base	0	(RX mode)
	17	GND_LOGIC	GND	
	18	Vcc_LOGIC	3.00	
	19	TRB input	0.03	From U201-2 (RX mode)
	20	FLIP input	GND	
U310 5V Regulator	1	Vin	7.48	
	2	Ground	GND	
	3	Control input	7.48	
	4	Bypass capacitor	1.26	
	5	Vout	4.96	
U320 3.3V Regulator	1	Ground	GND	
	2	Feedback	1.23	
	3	Tap (NU)	0	
	4	Vin	7.48	
	5	Vout	3.23	
	6	Sense (NU)	0	
	7	Error (reset output)	3.20	
	8	Shutdown input	7.48	
U330 3V Regulator	1	Vin	7.48	
	2	Ground	GND	
	3	Control input	7.48	
	4	Bypass capacitor	1.26	
	5	Vout	3.00	
U401 Microprocessor	1	PD4_SCK serial clock input	0	
	2	PD5_SS	3.23	ASFIC chip select
	3	PD6_VLIN	3.23	EEPROM chip select
	4	PG7_R_W	3.21	
	5	PG6_AS	3.23	
	6	PG0_XA13	3.23	
	7	PB7_ADDR15	0.026	
	8	PB6_ADDR14	0.028	
	9	PB3_ADDR11	3.06	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U401 Microprocessor	10	PB1_ADDR9	3.05	
	11	PB2_ADDR10	0.16	
	12	VDD	3.23	
	13	VSS	GND	
	14	PBO_ADDR8	3.05	
	15	PB5_ADDR13	0.13	
	16	PG1_XA14	0.20	
	17	PG4_XA17	3.17	
	18	PG5_XA18	0	
	19	PG3_XA16	3.21	
	20	PG2_XA15	0.30	
	21	PB4_ADDR12	0.22	
	22	PF7_ADDR7	3.03	
	23	PF6_ADDR6	3.08	
	24	PF5_ADDR5	3.06	
	25	PF4_ADDR4	0.16	
	26	PF3_ADDR3	0.26	
	27	PF2_ADDR2	3.06	
	28	PF1_ADDR1	3.06	
	29	PFO_ADDR0	3.05	
	30	PC0_DATA0	0.69	
	31	PC1_DATA1	0.96	
	32	PC2_DATA2	1.10	
	33	PC3_DATA3	0.81	
	34	PC4_DATA4	0.62	
	35	PC5_DATA5	0.68	
	36	PC6_DATA6	0.67	
	37	PC7_DATA7	0.73	
	38	PH7_CSPROG	3.05	
	39	VDDL	3.23	
	40	VSSL	GND	
	41	PH6_CSGP2	3.23	
	42	PH5_CSGP1	3.23	
	43	PH4_CSIO	0	
	44	PH3_PW4	3.21	On/off control output
	45	PH2_PW3	0	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U401 Microprocessor	46	PH1_PW2	3.00	
	47	PH0_PW1	3.23	Synth chip select
	48	XIRQ	3.00	
	49	PI7	1.48	RX enable
	50	PI6	0.01	TX enable
	51	PI5	3.23	
	52	PI4	0	Green LED enable
	53	PI3	0	Red LED enable
	54	PI2	0	
	55	PI1	0	
	56	PI0	2.98	Lock detect from U201-4
	57	MODB_VSTBY	3.22	Boot mode enable
	58	MODA_LIR	3.12	
	59	AVDD	3.23	
	60	PE7_AN7	3.20	
	61	PE6_AN6	3.20	
	62	PE5_AN5	2.91	VOX threshold detect
	63	PE4_AN4	0.73	RSSI input
	64	PE3_AN3	0.14	
	65	PE2_AN2	1.62	
	66	PE1_AN1	0 - 3.3 V	Volume control wiper
	67	PE0_AN0	2.48	33% of battery voltage
	68	VRL	0	
	69	VRH	3.20	
	70	AVSS	GND	
	71	PJ0_CSGP3	3.23	Side PTT button
	72	PJ1_CSGP4	0	External MIC PTT
	73	PJ2	3.23	
	74	PJ3	3.23	
	75	PJ4	3.23	
	76	PJ5	0	
	77	PJ6	3.23	Bottom option button
	78	PJ7	3.23	Top option button
	79	PA0_IC3	0	
	80	PA1_IC2	1.57	
	81	PA2_IC1	3.00	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U401 Microprocessor	82	PA3_IC4_OC5_OC1	3.00	
	83	PA4_OC4_OC1	0	Squelch detect input
	84	PA5_OC3_OC1	0	Channel activity input
	85	PA6_OC2_OC1	0	
	86	PA7_PA1_OC1	0	
	87	VSSR	GND	
	88	VDDR	3.23	
	89	ECLK (NU)	1.60	
	90	EXTAL	1.70	Clock from U451-28
	91	XTAL	1.40	Not used
	92	VDDSYN	0	
	93	XFC (NU)	0	
	94	RESET	3.20	From U320
	95	LVOUT	0	
	96	IRQ	3.20	
	97	PD0_RXD	3.23	
	98	PD1_TXD	1.9	
	99	PD2_MISO	0	
	100	PD3_MOSI	3.23	
U402 EEPROM	1	Chip select	3.23	From U401-3
	2	Serial data out	0	
	3	Write protect	3.23	
	4	Vss	GND	
	5	Serial data in	3.23	
	6	Serial clock	0	
	7	Hold	3.23	
	8	Vcc	3.23	
U404 Flash ROM	1	A11	3.06	
	2	A9	3.08	
	3	A8	3.05	
	4	A13	0.13	
	5	A14	0.31	
	6	NC	3.17	
	7	EN_WE	3.21	From U401-4
	8	Vcc	3.23	
	9	RESET	3.20	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U404 Flash ROM	10	A16	3.17	
	11	A15	0.30	
	12	A12	0.22	
	13	A7	3.03	
	14	A6	3.08	
	15	A5	3.06	
	16	A4	0	
	17	A3	0.24	
	18	A2	3.08	
	19	A1	3.05	
	20	A0	3.05	
	21	D0	0.69	
	22	D1	0.94	
	23	D2	1.08	
	24	GND	GND	
	25	D3	0.78	
	26	D4	0.59	
	27	D5	0.66	
	28	D6	0.67	
	29	D7	0.75	
	30	EN_CE	3.01	From U401-38
	31	A10	0.16	
	32	EN_OE	0	From U401-86
U451 ASFIC_CMP	1	VDD for analog circuits	3.00	
	2	DISC audio input	1.34	From U510
	3	Ground for analog circuits	GND	
	4	DACU output	0	
	5	DACR output	0	
	6	DACG output	2.38 (typ)	Power set (TX mode)
	7	VOX peak detector output	2.91	
	8	PLCAP for DC integrator	0.40	
	9	SQIN	0.01	
	10	Universal audio input/output	0	
	11	VDD for DACs	4.95	
	12	SQCAP	0	
	13	GCB2 general purpose output	0	Audio PA_EN (unsquelched)

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U451 ASFIC_CMP	14	GCB1 general purpose output	0	
	15	GCB0 general purpose output	3.00	BW select (25 kHz mode)
	16	Squelch channel activity output	0	To U401-84
	17	Squelch detect digital output	0	To U401-83
	18	PL/low speed data I/O	1.50	
	19	High speed data I/O	3.00	
	20	Chip select	3.23	From U401-2
	21	Serial clock input	0	
	22	Serial data input	3.23	
	23	Ground for clock synthesizer	GND	
	24	Loop filter cap for clock syn	0.74	
	25	PLCAP2 for LS integrator	1.17	
	26	Not used	0	
	27	Vdd for clock synthesizer	3.00	
	28	Clock synthesizer output	1.70	
	29	1200 Hz ref for MDC decode	3.00	
	30	GNDDO	GND	
	31	Ground for digital circuits	GND	
	32	Vdd for analog switches	4.96	
	33	Vdd for digital circuits	3.00	
	34	16.8 MHz master clock input	1.54	
	35	GCB3 general purpose output	3.00	Internal MIC enable
	36	TX audio return from option	0	
	37	GCB4 general purpose output	0	
	38	GCB5 general purpose output	0	
	39	RX audio send to option	1.48	
	40	Modulation output	1.50	To U201-10
	41	RX audio out to power amp	1.51	
	42	Flat TX audio return from option	0.20	
	43	RX audio return to option	1.50	
	44	Flat TX audio send to option	1.50	
	45	Vdd for audio path I/O filters	3.00	
	46	Mic audio input	1.50	
	47	Ground for audio path I/O filters	GND	
	48	Ext mic audio input (not used)	0	

IC Designator	Pin	Pin Function	DC Voltage	Comments (Condition)
U480 Dual Opamp	1	Unit 1 output	2.48	
	2	Unit 1 (-) input	2.48	
	3	Unit 1 (+) input	2.46	
	4	Ground	GND	
	5	Unit 2 (+) input	0.28	
	6	Unit 2 (-) input	0.29	
	7	Unit 2 output	0	
	8	Vcc	4.96	
U490 Audio Power Amp	1	Enable/shutdown	0.12	(Unsquelched)
	2	Bias reference	3.26	(Unsquelched)
	3	(+) input	3.26	(Unsquelched)
	4	(-) input	3.27	(Unsquelched)
	5	(-) output	3.25	(Unsquelched)
	6	Vcc	7.48	(Unsquelched)
	7	Ground	GND	
	8	(+) output	3.29	(Unsquelched)
U510 Dual Opamp	1	Unit 1 output	1.75	
	2	Unit 1 (-) input	1.56	
	3	Unit 1 (+) input	1.55	
	4	Ground	GND	
	5	Unit 2 (+) input	1.55	
	6	Unit 2 (-) input	1.56	
	7	Unit 2 output	1.38	
	8	Vcc	4.96	

1. All voltages are measured with a high-impedance digital voltmeter and expressed in volts DC relative to ground (0V).
2. Voltages are measured with a DC input voltage of 7.50 + .02 volts DC applied to the battery connector (J301).
3. All voltages are measured in the squelched receive mode, unless otherwise indicated.

Chapter 4

UHF3 PCB/SCHEMATICS/PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 UHF2 (465-495MHz)

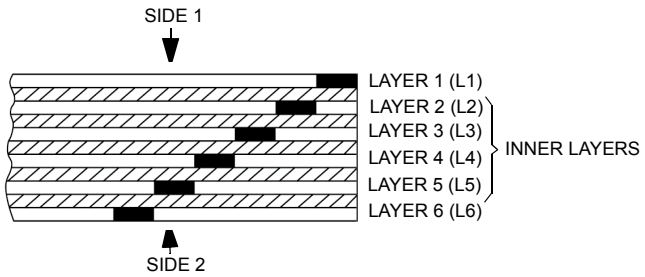
The UHF circuits are contained on the printed circuit board (PCB) which also contains the Controller circuits. This Chapter shows the schematics for the UHF circuits, the Controller circuits are contained in Section 2 of this manual. The PCB component layouts and the Parts Lists in this Chapter show both the Controller and UHF circuit components. The UHF schematics and the related PCB and parts list are shown in the table below.

Table 4-1 UHF3 Diagrams and Parts Lists

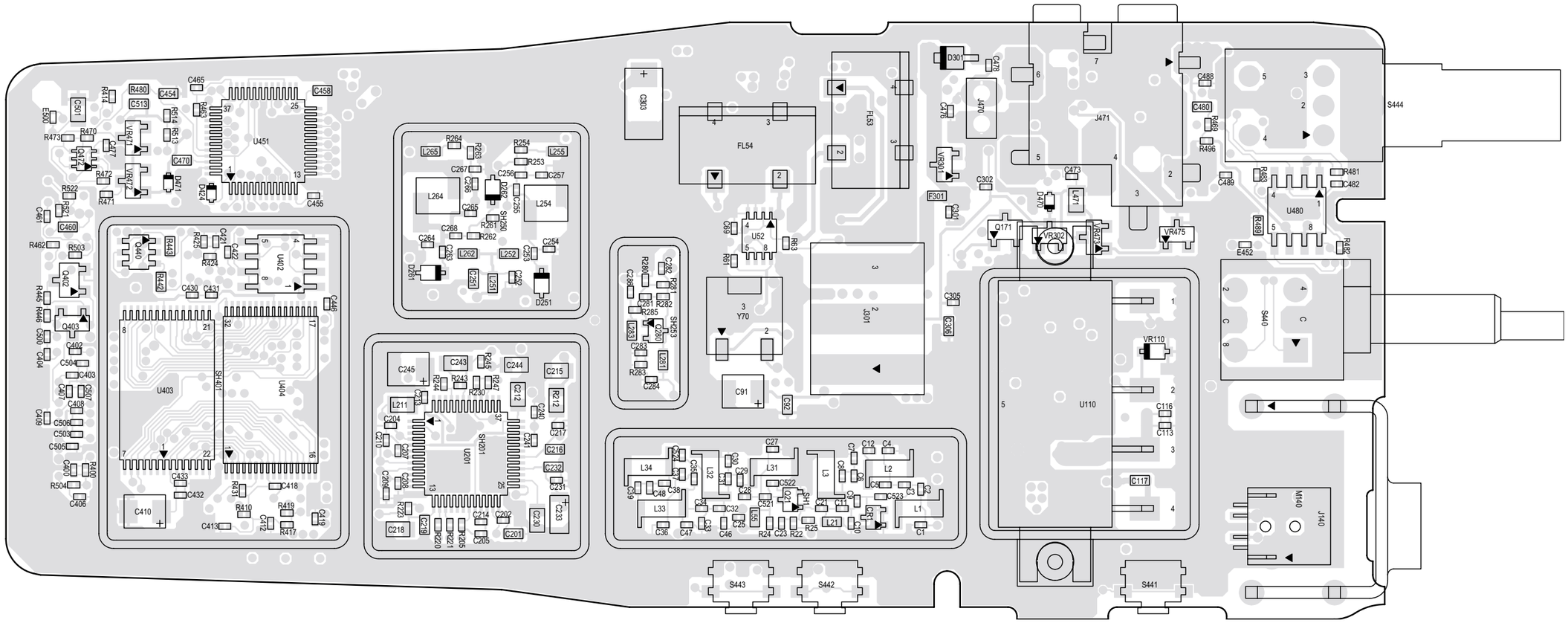
PCB :	
8486634Z02_O Main Board Top Side	Page 4-3
8486634Z02_O Main Board Bottom Side	Page 4-4
SCHEMATICS	
Radio Circuit Block Diagram	Page 4-5
Receiver Front End	Page 4-6
Receiver Back End	Page 4-7
Synthesiser	Page 4-8
VCO	Page 4-9
Transmit and Power Control Cct	Page 4-10
Parts List	
8486634Z02_O	Page 4-11

1.2 Six Layer Circuit Board

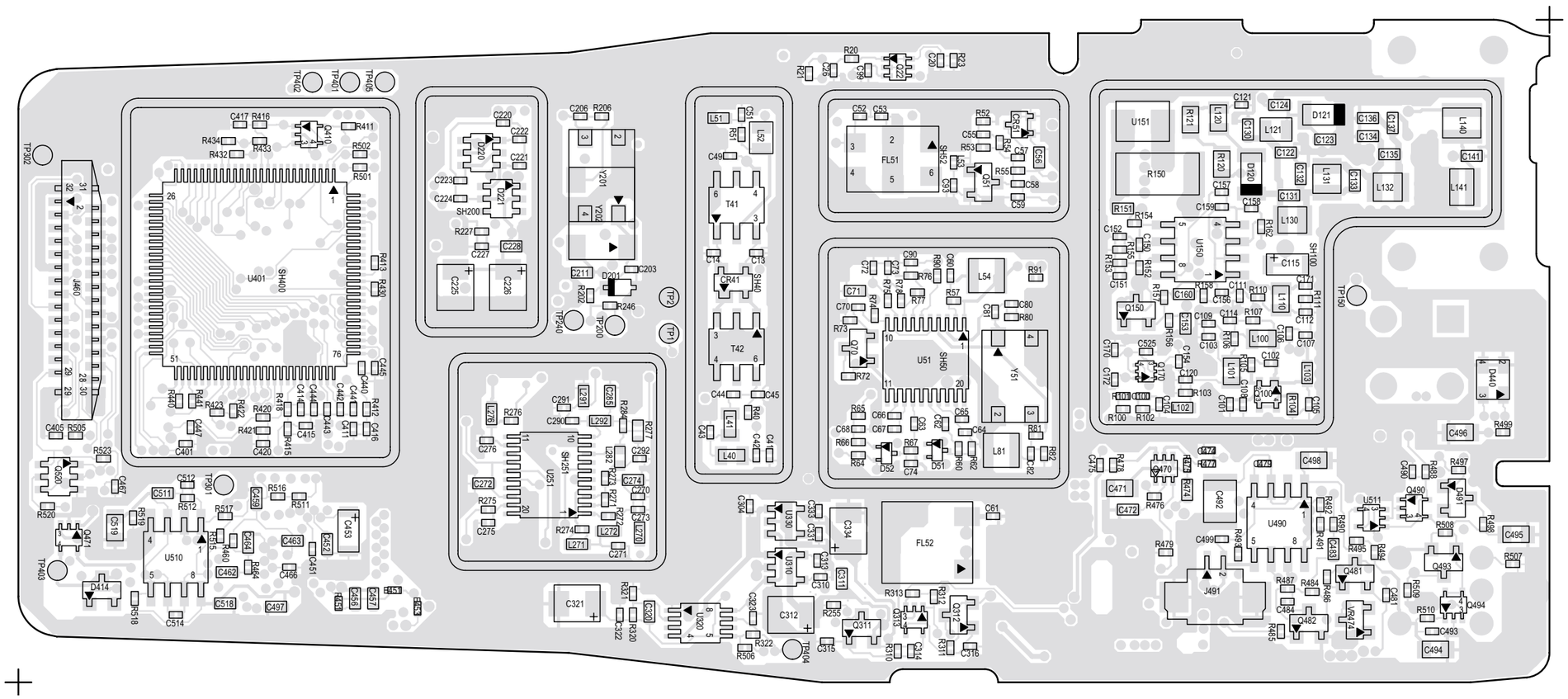
The main PCB is a 6-layer circuit board, the copper steps are in the layer sequence shown below.



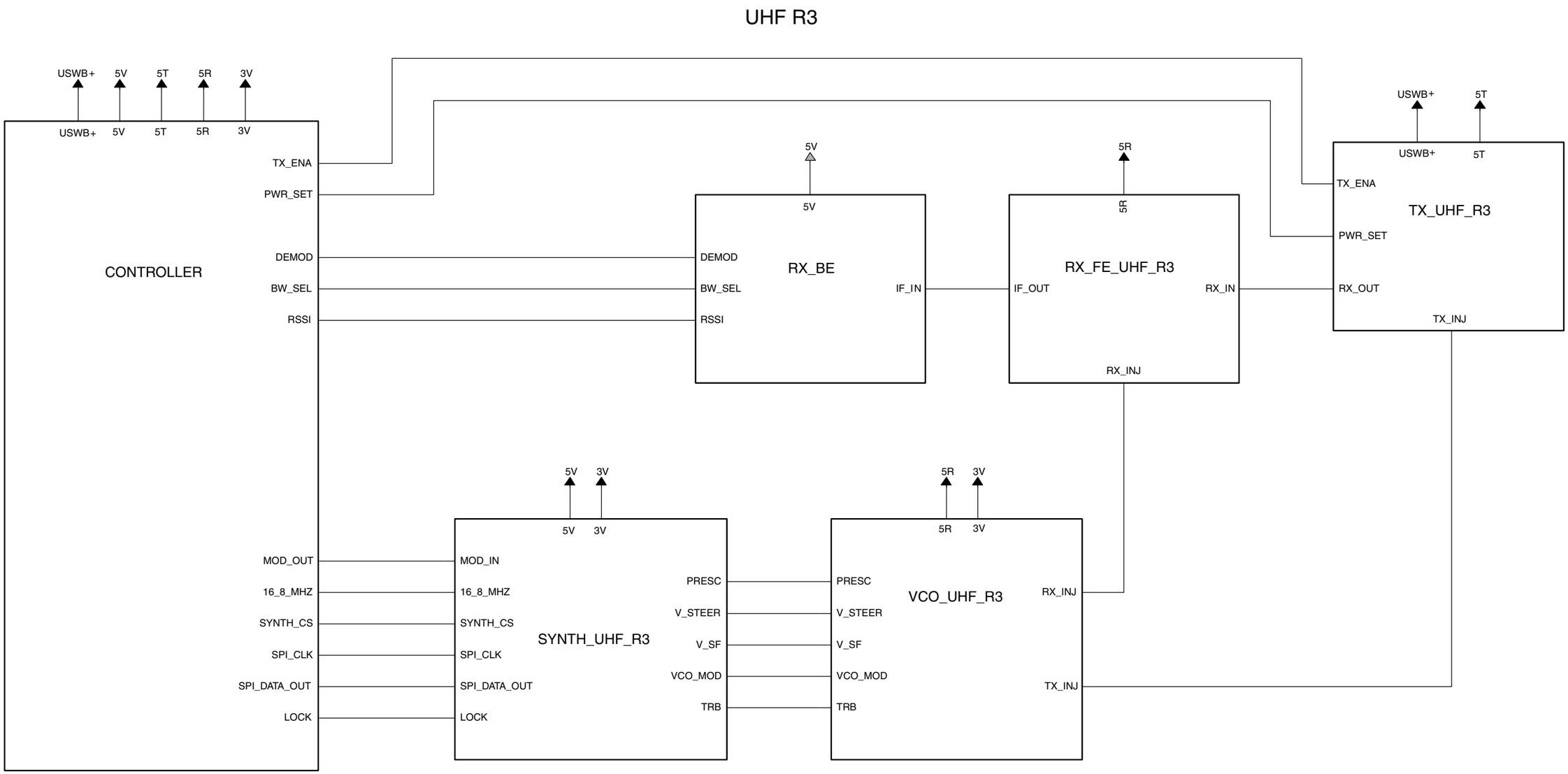
2.0 UHF3 PCB 8486634Z02-O Schematic Diagrams



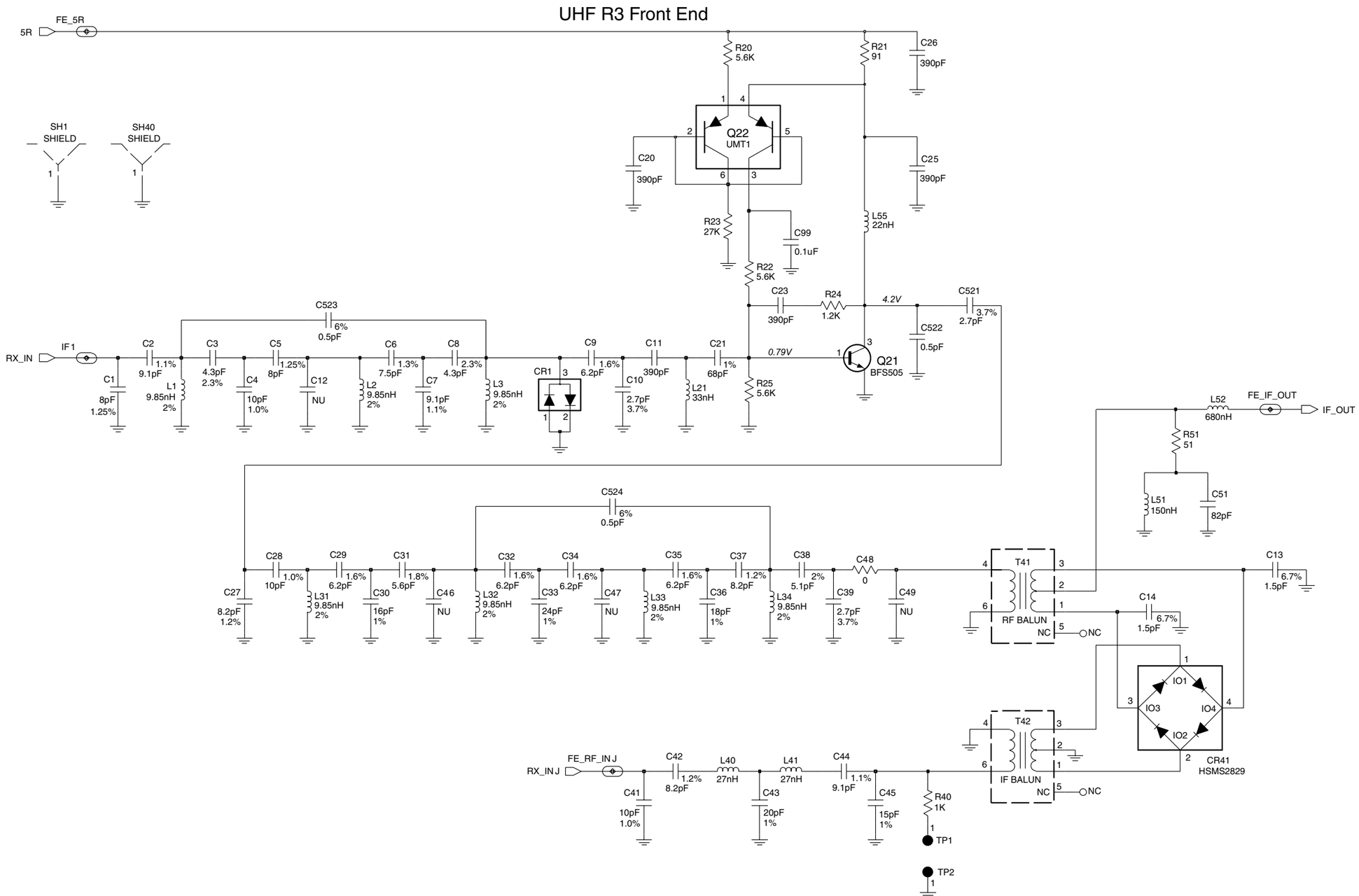
UHF3 (465-495MHz) Main Board Top Side PCB No. 8486634Z02-O



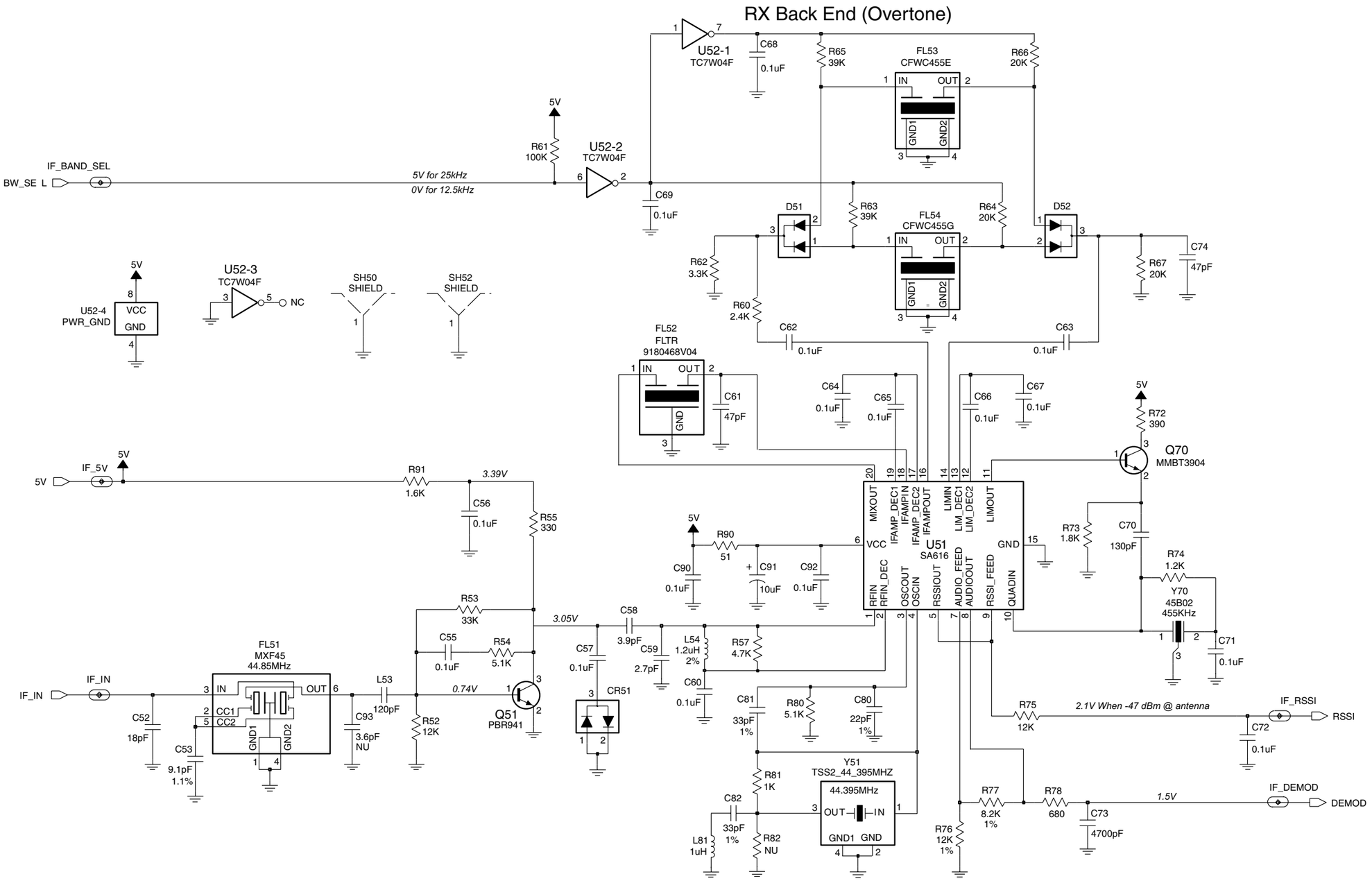
UHF3 (465-495MHz) Main Board Bottom Side PCB No. 8486634Z02-O



UHF3 Radio Circuit Block Diagram

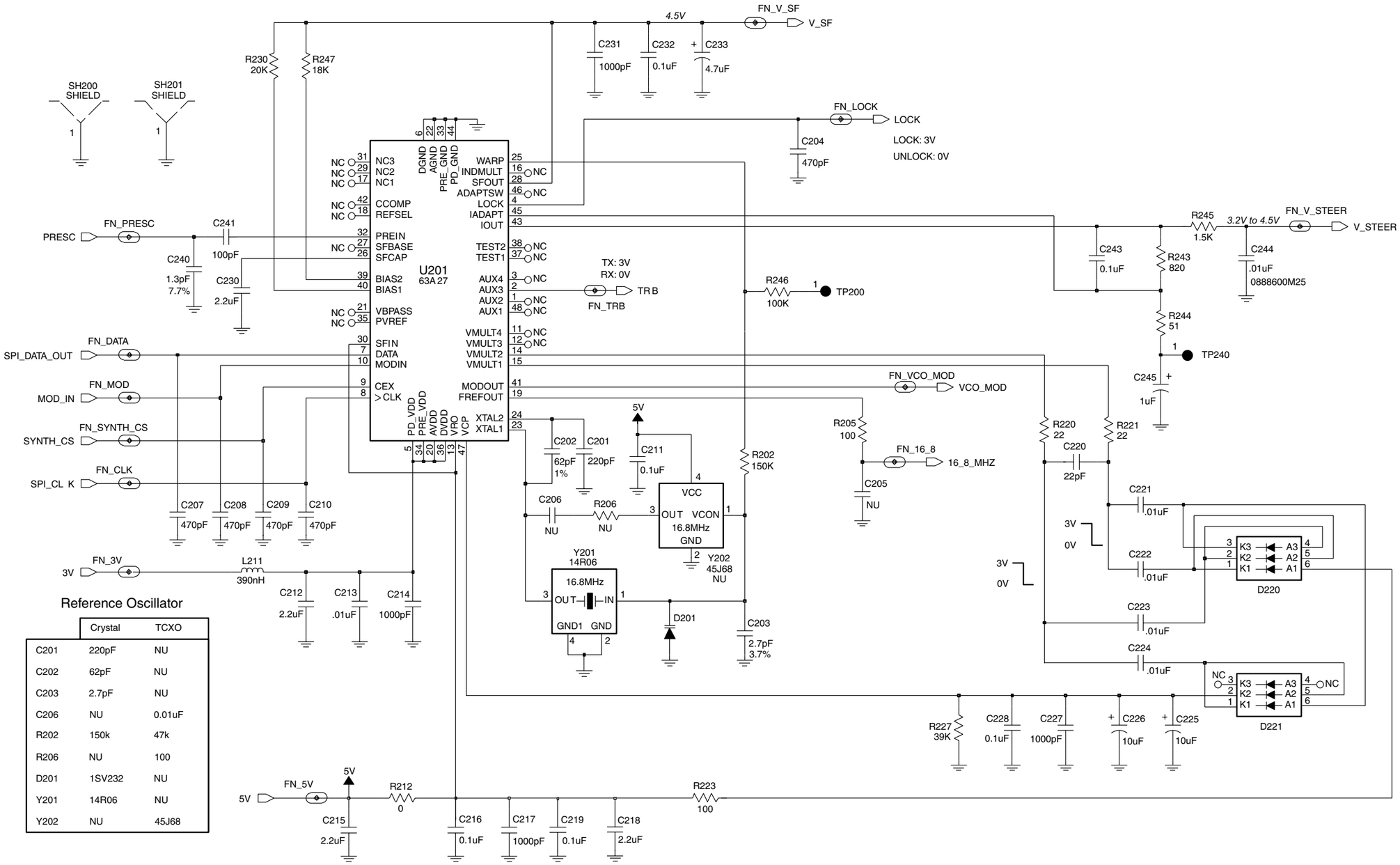


UHF3 (465-495 MHz) Receiver Front End Schematic Diagram



UHF3 (465-495 MHz) Receiver Back End Schematic Diagram

UHF R3 Synthesizer

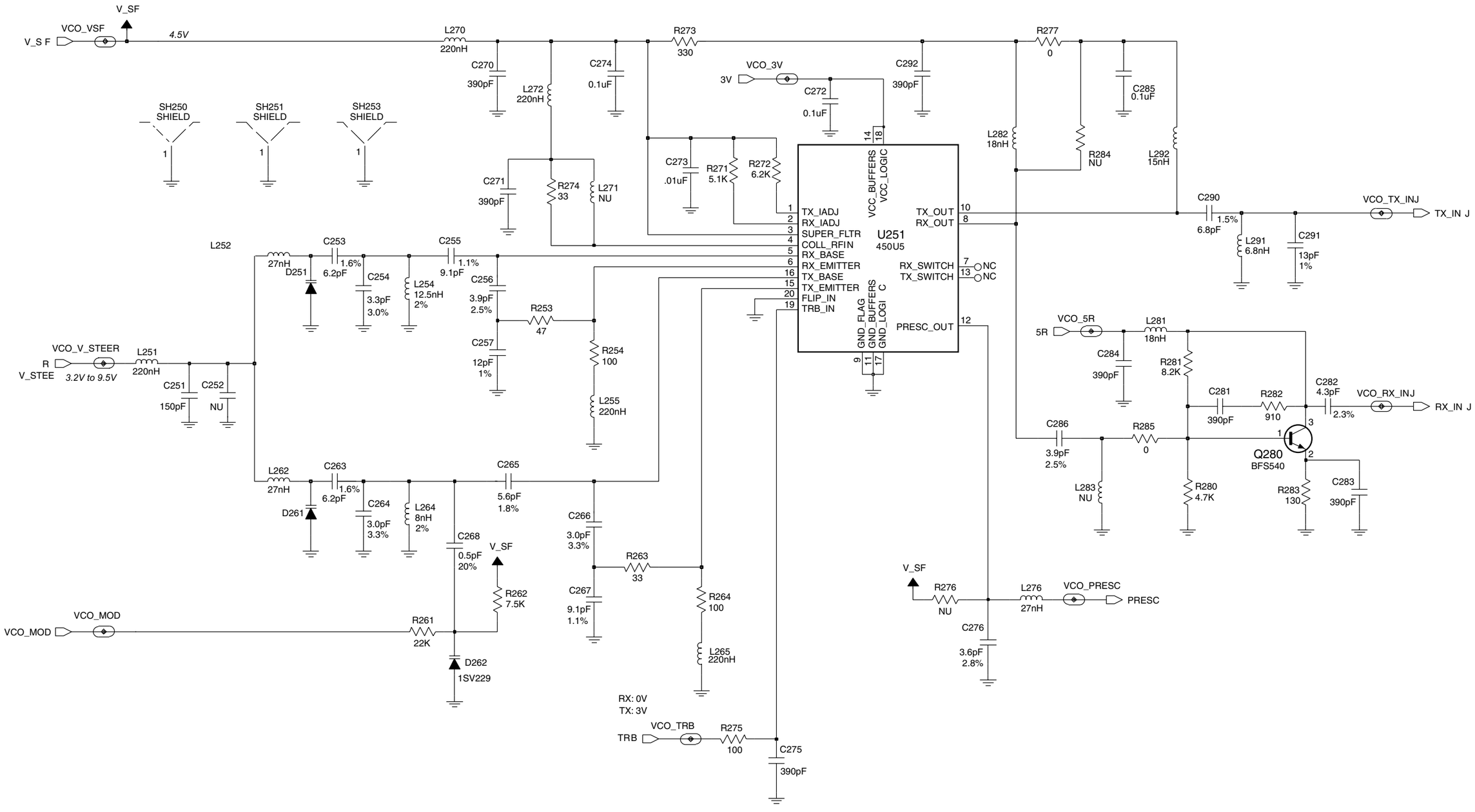


Reference Oscillator

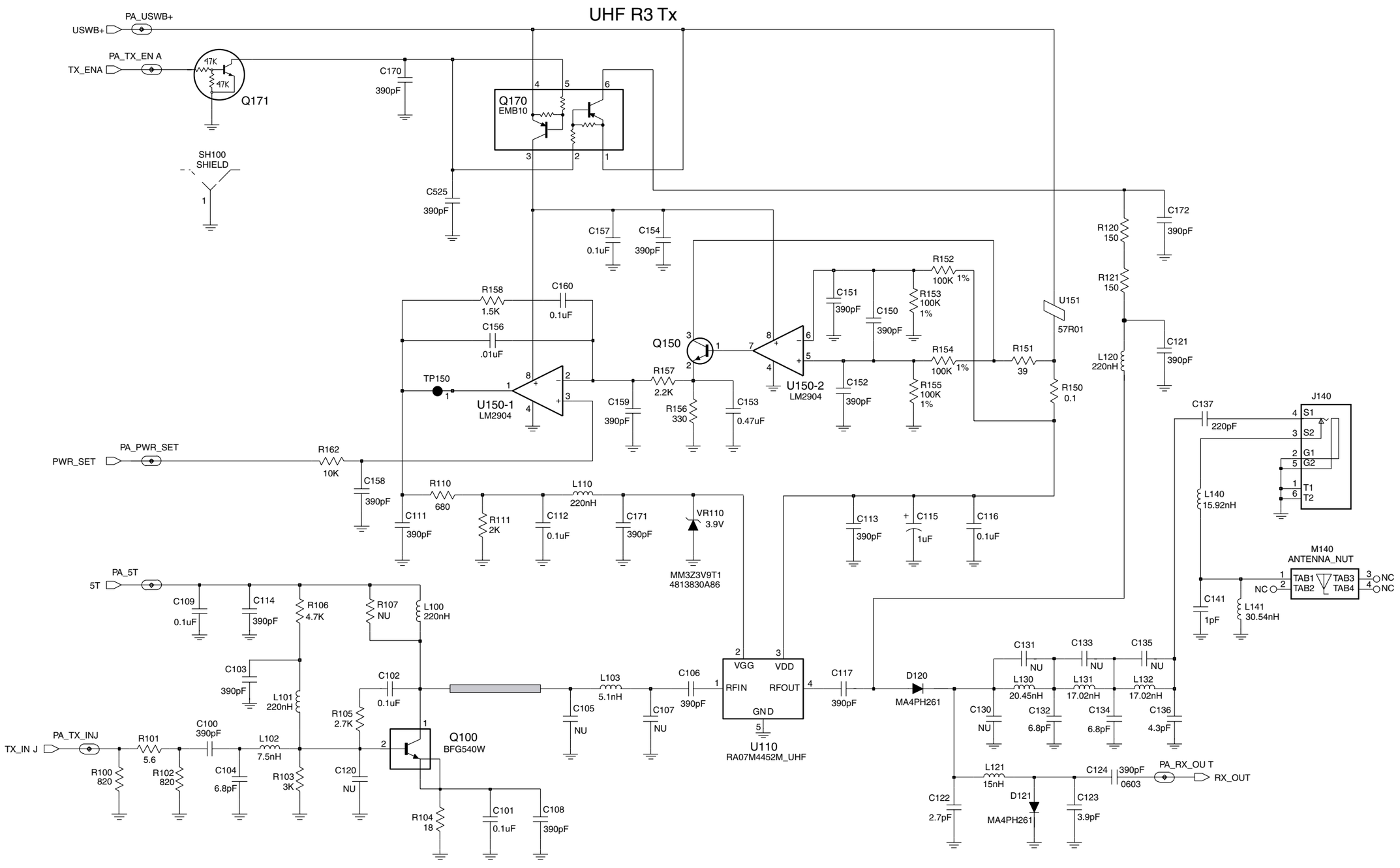
	Crystal	TCXO
C201	220pF	NU
C202	62pF	NU
C203	2.7pF	NU
C206	NU	0.01uF
R202	150k	47k
R206	NU	100
D201	1SV232	NU
Y201	14R06	NU
Y202	NU	45J68

UHF3 (465-495 MHz) Synthesizer Schematic Diagram

UHF R3 VCO



UHF3 (465-495 MHz) Voltage Controlled Oscillator Schematic



UHF3 (465-495 MHz) Transmitter and Power Control Schematic Diagram

3.0 UHF3 PCB 8486634Z02-O Parts List

Circuit Ref	Motorola Part No.	Description
C1	2109445U32	CAP, 8pF
C2	2109445U26	CAP, 9.1pF
C3	2109445U18	CAP, 4.3pF
C4	2109445U27	CAP, 10pF
C5	2109445U32	CAP, 8pF
C6	2109445U24	CAP, 7.5pF
C7	2109445U26	CAP, 9.1pF
C8	2109445U18	CAP, 4.3pF
C9	2109445U22	CAP, 6.2pF
C10	2109445U13	CAP, 2.7pF
C11	2113743L07	CAP, 390pF
C12	Not_Placed	CAP, 8.2pF
C13	2109445U07	CAP, 1.5pF
C14	2109445U07	CAP, 1.5pF
C20	2113743L07	CAP, 390pF
C21	2109445U53	CAP, 68pF
C23	2113743L07	CAP, 390pF
C25	2113743L07	CAP, 390pF
C26	2113743L07	CAP, 390pF
C27	2109445U25	CAP, 8.2pF
C28	2109445U27	CAP, 10pF
C29	2109445U22	CAP, 6.2pF
C30	2109445U38	CAP, 16pF
C31	2109445U21	CAP, 5.6pF
C32	2109445U22	CAP, 6.2pF
C33	2109445U42	CAP, 24pF
C34	2109445U22	CAP, 6.2pF
C35	2109445U22	CAP, 6.2pF
C36	2109445U39	CAP, 18pF
C37	2109445U25	CAP, 8.2pF
C38	2109445U20	CAP, 5.1pF
C39	2109445U13	CAP, 2.7pF
C41	2109445U27	CAP, 10pF
C42	2109445U25	CAP, 8.2pF
C43	2109445U40	CAP, 20pF
C44	2109445U26	CAP, 9.1pF
C45	2109445U37	CAP, 15pF
C46	Not_Placed	CAP, 10pF
C47	Not_Placed	CAP, 10pF
C48	0662057M01	RES, 0
C49	Not_Placed	CAP, 3.9pF
C51	2113743N48	CAP, 82pF
C52	2109445U39	CAP, 18pF
C53	2109445U26	CAP, 9.1pF
C55	2113743M24	CAP, 0.1uF
C56	2113743E20	CAP, 0.1uF
C57	2113743M24	CAP, 0.1uF
C58	2113743N16	CAP, 3.9pF
C59	2113743N12	CAP, 2.7pF
C60	2113743M24	CAP, 0.1uF
C61	2113743N46	CAP, 68pF
C62	2113743M24	CAP, 0.1uF
C63	2113743M24	CAP, 0.1uF
C64	2113743M24	CAP, 0.1uF
C65	2113743M24	CAP, 0.1uF
C66	2113743M24	CAP, 0.1uF
C67	2113743M24	CAP, 0.1uF
C68	2113743M24	CAP, 0.1uF
C69	2113743M24	CAP, 0.1uF
C70	2113743N53	CAP, 130pF
C71	2113743E20	CAP, 0.1uF
C72	2113743M24	CAP, 0.1uF
C73	2113743L33	CAP, 4700pF
C74	2113743N42	CAP, 47pF
C80	2109445U41	CAP, 22pF
C81	2109445U45	CAP, 33pF
C82	2109445U45	CAP, 33pF
C90	2113743M24	CAP, 0.1uF
C91	2311049A57	CAPP, 10uF
C92	2113743E20	CAP, 0.1uF
C93	Not_Placed	CAP, 3.6pF
C99	2113743M24	CAP, 0.1uF
C100	2113743L07	CAP, 390pF
C101	2113743M24	CAP, 0.1uF
C102	2113743M24	CAP, 0.1uF
C103	2113743L07	CAP, 390pF
C104	2113743N22	CAP, 6.8pF
C105	Not_Placed	CAP, 3.9pF
C106	2113743L07	CAP, 390pF
C107	Not_Placed	CAP, 27pF
C108	2113743L07	CAP, 390pF
C109	2113743M24	CAP, 0.1uF
C111	2113743L07	CAP, 390pF
C112	2113743M24	CAP, 0.1uF
C113	2113743L07	CAP, 390pF
C114	2113743L07	CAP, 390pF
C115	2311049A07	CAPP, 1uF
C116	2113743M24	CAP, 0.1uF
C117	2113740F65	CAP, 390pF
C120	Not_Placed	CAP, 8.2pF
C121	2113743L07	CAP, 390pF
C122	2113740F13	CAP, 2.7pF
C123	2113740F17	CAP, 3.9pF
C124	2113740F65	CAP, 390pF
C130	Not_Placed	CAP, 3.3pF
C131	Not_Placed	CAP, 2.2pF
C132	2113740F23	CAP, 6.8pF
C133	Not_Placed	CAP, 2.7pF
C134	2113740F23	CAP, 6.8pF
C135	Not_Placed	CAP, 0.5pF
C136	2113740F18	CAP, 4.3pF
C137	2113740F59	CAP, 220pF
C141	2113740F03	CAP, 1pF
C150	2113743L07	CAP, 390pF
C151	2113743L07	CAP, 390pF
C152	2113743L07	CAP, 390pF
C153	2113743K18	CAP, 0.47uF
C154	2113743L07	CAP, 390pF
C156	2113743L41	CAP, .01uF
C157	2113743M24	CAP, 0.1uF
C158	2113743L07	CAP, 390pF
C159	2113743L07	CAP, 390pF
C160	2113743E20	CAP, 0.1uF
C170	2113743L07	CAP, 390pF
C171	2113743L07	CAP, 390pF
C172	2113743L07	CAP, 390pF
C201	2113740F59	CAP, 220pF
C202	2109445U52	CAP, 62pF
C203	2109445U13	CAP, 2.7pF
C204	2113743L09	CAP, 470pF
C205	Not_Placed	CAP, 2.7pF
C206	Not_Placed	CAP, 1000pF
C207	2113743L09	CAP, 470pF
C208	2113743L09	CAP, 470pF
C209	2113743L09	CAP, 470pF
C210	2113743L09	CAP, 470pF
C211	2113743E20	CAP, 0.1uF
C212	2113743F18	CAP, 2.2uF
C213	2113743L41	CAP, .01uF
C214	2113743L17	CAP, 1000pF
C215	2113743F18	CAP, 2.2uF
C216	2113743E20	CAP, 0.1uF
C217	2113743L17	CAP, 1000pF
C218	2113743F18	CAP, 2.2uF
C219	2113743E20	CAP, 0.1uF
C220	2113743N34	CAP, 22pF
C221	2113743L41	CAP, .01uF
C222	2113743L41	CAP, .01uF
C223	2113743L41	CAP, .01uF
C224	2113743L41	CAP, .01uF
C225	2311049A57	CAPP, 10uF
C226	2311049A57	CAPP, 10uF
C227	2113743L17	CAP, 1000pF
C228	2113743E20	CAP, 0.1uF
C230	2113743F18	CAP, 2.2uF
C231	2113743L17	CAP, 1000pF
C232	2113743E20	CAP, 0.1uF
C233	2311049A56	CAPP, 4.7uF
C240	2109445U06	CAP, 1.3pF
C241	2113743N50	CAP, 100pF
C243	0886641Z01	CAP, 0.1uF
C244	0888600M25	CAP, .01uF
C245	2311049A08	CAPP, 1uF
C251	0888600M03	CAP, 150pF
C252	Not_Placed	CAP, 390pF
C253	2109445U22	CAP, 6.2pF
C254	2109445U15	CAP, 3.3pF
C255	2109445U26	CAP, 9.1pF
C256	2109445U17	CAP, 3.9pF
C257	2109445U35	CAP, 12pF
C263	2109445U22	CAP, 6.2pF

Circuit Ref	Motorola Part No.	Description
C264	2109445U14	CAP, 3.0pF
C265	2109445U21	CAP, 5.6pF
C266	2109445U14	CAP, 3.0pF
C267	2109445U26	CAP, 9.1pF
C268	2109445U01	CAP, 0.5pF
C270	2113743L07	CAP, 390pF
C271	2113743L07	CAP, 390pF
C272	2113743E20	CAP, 0.1uF
C273	2113743L41	CAP, .01uF
C274	2113743E20	CAP, 0.1uF
C275	2113743L07	CAP, 390pF
C276	2109445U16	CAP, 3.6pF
C281	2113743L07	CAP, 390pF
C282	2109445U18	CAP, 4.3pF
C283	2113743L07	CAP, 390pF
C284	2113743L07	CAP, 390pF
C285	2113743E20	CAP, 0.1uF
C286	2109445U17	CAP, 3.9pF
C290	2109445U23	CAP, 6.8pF
C291	2109445U36	CAP, 13pF
C292	2113743L07	CAP, 390pF
C301	2113743L07	CAP, 390pF
C302	2113743L07	CAP, 390pF
C303	2311049A97	CAPP, 33uF
C304	2113743L41	CAP, .01uF
C305	2113743N50	CAP, 100pF
C306	2113741F49	CAP, .01uF
C310	2113743L41	CAP, .01uF
C311	2113743E05	CAP, .018uF
C312	2311049A57	CAPP, 10uF
C313	2113743L41	CAP, .01uF
C314	2113743L19	CAP, 1200pF
C315	2113743L19	CAP, 1200pF
C316	2113743L19	CAP, 1200pF
C320	2113743E05	CAP, .018uF
C321	2311049A57	CAPP, 10uF
C322	2113743L41	CAP, .01uF
C323	2113743N54	CAP, 150pF
C331	2113743L41	CAP, .01uF
C333	2113743L41	CAP, .01uF
C334	2311049A57	CAPP, 10uF
C400	Not_Placed	CAP, .022uF
C401	2113743M24	CAP, 0.1uF
C402	2113743L17	CAP, 1000pF
C403	2113743N50	CAP, 150pF
C404	2113743L17	CAP, 1000pF
C405	2113743N50	CAP, 150pF
C406	2113743N50	CAP, 150pF
C407	2113743L17	CAP, 1000pF
C408	2113743L17	CAP, 1000pF
C409	2113743L17	CAP, 1000pF
C410	2311049A57	CAPP, 10uF
C411	2113743M24	CAP, 0.1uF
C412	2113743L17	CAP, 1000pF
C413	2113743M24	CAP, 0.1uF
C414	2113743M24	CAP, 0.1uF
C415	2113743L17	CAP, 1000pF
C416	2113743L17	CAP, 1000pF
C417	2113743L17	CAP, 1000pF
C418	2113743M24	CAP, 0.1uF
C419	2113743L17	CAP, 1000pF
C420	2113743L41	CAP, .01uF
C421	2113743L41	CAP, .01uF
C422	2113743L41	CAP, .01uF
C430	2113743M24	CAP, 0.1uF
C431	2113743L17	CAP, 1000pF
C432	2113743M24	CAP, 0.1uF
C433	2113743L17	CAP, 1000pF
C440	2113743L41	CAP, .01uF
C441	2113743L41	CAP, .01uF
C442	2113743L41	CAP, .01uF
C443	2113743L41	CAP, .01uF
C444	2113743L41	CAP, .01uF
C445	2113743L41	CAP, .01uF
C446	2113743L41	CAP, .01uF
C447	2113743M24	CAP, 0.1uF
C451	2113743M24	CAP, 0.1uF
C452	2113743E20	CAP, 0.1uF
C453	2311049A56	CAPP, 4.7uF
C454	2113743E20	CAP, 0.1uF
C455	2113743L48	CAP, .022uF
C456	2113743E20	CAP, 0.1uF
C457	2113743E20	CAP, 0.1uF
C458	2113743E20	CAP, 0.1uF
C459	2113743E20	CAP, 0.1uF
C460	2113743E20	CAP, 0.1uF
C461	2113743L17	CAP, 1000pF
C462	2113743E20	CAP, 0.1uF
C463	2113743E20	CAP, 0.1uF
C464	2113743E20	CAP, 0.1uF
C465	2113743L17	CAP, 1000pF
C466	Not_Placed	CAP, 470pF
C467	2113743L19	CAP, 1200pF
C470	2113743E20	CAP, 0.1uF
C471	2113743F18	CAP, 2.2uF
C472	2113743E20	CAP, 0.1uF
C473	2113743N54	CAP, 150pF
C474	2113743N54	CAP, 150pF
C475	2113743L48	CAP, .022uF
C476	2113743L48	CAP, .022uF
C477	2113743M24	CAP, 0.1uF
C478	2113743N54	CAP, 150pF
C479	2113743N54	CAP, 150pF
C480	2113743E20	CAP, 0.1uF
C481	Not_Placed	CAP, .01uF
C482	Not_Placed	CAP, .01uF
C483	2113743E20	CAP, 0.1uF
C484	Not_Placed	CAP, .033uF
C488	2113743L09	CAP, 470pF
C489	2113743L09	CAP, 470pF
C490	2113743L09	CAP, 470pF
C492	2113928J08	CAP, 10uF
C493	2113743L17	CAP, 1000pF
C494	2113743F18	CAP, 2.2uF
C495	2113743F16	CAP, 1uF
C496	2113743F16	CAP, 1uF
C497	2113743E20	CAP, 0.1uF
C498	2113743F16	CAP, 1uF
C499	2113743N48	CAP, 82pF
C500	2113743L17	CAP, 1000pF
C501	2113743F16	CAP, 1uF
C503	2113743L17	CAP, 1000pF
C504	2113743L17	CAP, 1000pF
C505	2113743L17	CAP, 1000pF
C506	2113743L17	CAP, 1000pF
C507	2113743L17	CAP, 1000pF
C511	2113740F59	CAP, 220pF
C512	2113743N22	CAP, 6.8pF
C513	2113740F59	CAP, 220pF
C514	2113743N31	CAP, 16pF
C518	2113743E20	CAP, 0.1uF
C519	2113743F16	CAP, 1uF
C521	2109445U13	CAP, 2.7pF
C522	2113743N01	CAP, 0.5pF
C523	2186463Z03	CAP, 0.5pF
C524	2186463Z03	CAP, 0.5pF
C525	2113743L07	CAP, 390pF
CR1	4813825A19	MMBD352
CR41	4802246J04	HSMS2829
CR51	4813825A19	MMBD352
D51	4802245J97	DAN235ETL
D52	4802245J97	DAN235ETL
D120	4880973Z02	MA4PH261
D121	4880973Z02	MA4PH261
D201	4862824C03	1SV232
D220	4802233J09	IMN10
D221	4802233J09	IMN10
D251	4862824C01	1SV229
D261	4862824C01	1SV229
D262	4862824C01	1SV229
D301	4813833A19	MBRM120ET3
D414	4805129M41	MMBD501
D424	4809924D18	RB520S-30
D440	4805729G49	BRPY1204W
D470	4809924D18	RB520S-30
D471	4809924D18	RB520S-30
D491	Not_Placed	MMBD501
E451	2480640Z01	BK1005HM471
E452	2480640Z01	BK1005HM471
E453	2480640Z01	BK1005HM471
E500	2480640Z01	BK1005HM471
F301	6580542Z01	FUSE
FL51	9180022M11	MXF45
FL52	9180468V04	FLTR

Circuit Ref	Motorola Part No.	Description
FL53	9180469V05	CFWC455E
FL54	9180469V03	CFWC455G
J140	0986428Z01	CONN_J
J301	0986565Z01	CONN_J
J460	Not_Placed	CONN_J
J470	0985818A01	CONN_J
J471	0980683Z03	CONN_J
J491	2809926G01	CONN_P
L1	2409348J15	IDCTR, 9.85nH
L2	2409348J15	IDCTR, 9.85nH
L3	2409348J15	IDCTR, 9.85nH
L21	2413926N18	IDCTR, 33nH
L31	2409348J15	IDCTR, 9.85nH
L32	2409348J15	IDCTR, 9.85nH
L33	2409348J15	IDCTR, 9.85nH
L34	2409348J15	IDCTR, 9.85nH
L40	2413926K16	IDCTR, 27nH
L41	2413926K16	IDCTR, 27nH
L51	2413926N26	IDCTR, 150nH
L52	2462587V44	IDCTR, 680nH
L53	2113743N52	CAP, 120pF
L54	2413923A25	IDCTR, 1.2uH
L55	2413926N16	IDCTR, 22nH
L81	2413923A19	IDCTR, 1uH
L100	2413926K27	IDCTR, 220nH
L101	2413926K27	IDCTR, 220nH
L102	2409377M25	IDCTR, 7.5nH
L103	2409377M24	IDCTR, 5.1nH
L110	2413926K27	IDCTR, 220nH
L120	2413926K27	IDCTR, 220nH
L121	2462587V24	IDCTR, 15nH
L130	2460591C36	IDCTR, 20.45nH
L131	2460591C40	IDCTR, 17.02nH
L132	2460591C40	IDCTR, 17.02nH
L140	2460591L14	IDCTR, 15.92nH
L141	2479990M01	IDCTR, 30.54nH
L211	2413926K30	IDCTR, 390nH
L251	2413926N28	IDCTR, 220nH
L252	2413926N17	IDCTR, 27nH
L254	2484562T11	IDCTR, 12.5nH
L255	2413926N28	IDCTR, 220nH
L262	2413926N17	IDCTR, 27nH
L264	2484562T13	IDCTR, 8nH
L265	2413926N28	IDCTR, 220nH
L270	2413926N28	IDCTR, 220nH
L271	Not_Placed	IDCTR, 220nH
L272	2413926N28	IDCTR, 220nH
L276	2413926N17	IDCTR, 27nH
L281	2413926N15	IDCTR, 18nH
L282	2413926N15	IDCTR, 18nH
L283	Not_Placed	IDCTR, 22nH
L291	2413926N10	IDCTR, 6.8nH
L292	2413926N14	IDCTR, 15nH
L471	2413926K30	IDCTR, 390nH
M140	0286427Z01	ANTENNA_NUT
Q21	4802247J01	BFS505
Q22	4805723X02	UMT1
Q51	4802197J95	PBR941
Q70	4880214G02	MMBT3904
Q100	4885593U03	BFG540W
Q150	4880214G02	MMBT3904
Q170	4809939C34	EMB10
Q171	4880048M01	DTC144EKA
Q280	4802245J95	BFS540
Q311	4809579E18	TP0101T
Q312	4809579E18	TP0101T
Q313	4802245J54	UMG5
Q402	4880048M01	DTC144EKA
Q403	4813824A17	MMBT3906
Q410	4802245J54	UMG5
Q440	5180159R01	IMX1
Q470	4805723X02	UMT1
Q471	4802245J54	UMG5
Q472	4805723X02	UMT1
Q481	Not_Placed	MMBT3906
Q482	Not_Placed	MMBT3904
Q490	4802245J54	UMG5
Q493	4809579E18	TP0101T
Q494	4802245J54	UMG5
Q520	5180159R01	IMX1
R20	0662057M92	RES, 5.6K
R21	0662057M49	RES, 91
R22	0662057M92	RES, 5.6K
R23	0662057N09	RES, 27K
R24	0662057M76	RES, 1.2K
R25	0662057M92	RES, 5.6K
R40	0662057M74	RES, 1K
R51	0662057M43	RES, 51
R52	0662057N01	RES, 12K
R53	0662057N11	RES, 33K
R54	0662057M91	RES, 5.1K
R55	0662057M62	RES, 330
R57	0662057M90	RES, 4.7K
R60	0662057M83	RES, 2.4K
R61	0662057N23	RES, 100K
R62	0662057M86	RES, 3.3K
R63	0662057N13	RES, 39K
R64	0662057N06	RES, 20K
R65	0662057N13	RES, 39K
R66	0662057N06	RES, 20K
R67	0662057N06	RES, 20K
R72	0662057M64	RES, 390
R73	0662057M80	RES, 1.8K
R74	0662057M76	RES, 1.2K
R75	0662057N01	RES, 12K
R76	0662057V04	RES, 12K
R77	0662057U99	RES, 8.2K
R78	0662057M70	RES, 680
R80	0662057M91	RES, 5.1K
R81	0662057M74	RES, 1K
R82	Not_Placed	RES, 0
R90	0662057M43	RES, 51
R91	0662057M79	RES, 1.6K
R100	0662057M72	RES, 820
R101	0662057M20	RES, 5.6
R102	0662057M72	RES, 820
R103	0662057M85	RES, 3K
R104	0662057A07	RES, 18
R105	0662057M84	RES, 2.7K
R106	0662057M90	RES, 4.7K
R107	Not_Placed	RES, 300
R110	0662057M70	RES, 680
R111	0662057M81	RES, 2K
R120	0662057C55	RES, 150
R121	0662057C55	RES, 150
R150	0680539Z01	RES, 0.1
R151	0662057A15	RES, 39
R152	0662057V27	RES, 100K
R153	0662057V27	RES, 100K
R154	0662057V27	RES, 100K
R155	0662057V27	RES, 100K
R156	0662057M62	RES, 330
R157	0662057M82	RES, 2.2K
R158	0662057M78	RES, 1.5K
R162	0662057M98	RES, 10K
R202	0662057N27	RES, 150K
R205	0662057M50	RES, 100
R206	Not_Placed	RES, 100
R212	0662057C01	RES, 0
R220	0662057M34	RES, 22
R221	0662057M34	RES, 22
R223	0662057M50	RES, 100
R227	0662057N13	RES, 39K
R230	0662057N06	RES, 20K
R243	0662057M72	RES, 820
R244	0662057M43	RES, 51
R245	0662057M78	RES, 1.5K
R246	0662057N23	RES, 100K
R247	0662057N05	RES, 18K
R253	0662057M42	RES, 47
R254	0662057M50	RES, 100
R255	0662057U91	RES, 3.9K
R261	0662057N07	RES, 22K
R262	0662057M95	RES, 7.5K
R263	0662057M38	RES, 33
R264	0662057M50	RES, 100
R271	0662057M91	RES, 5.1K
R272	0662057M93	RES, 6.2K
R273	0662057M62	RES, 330
R274	0662057M38	RES, 33
R275	0662057M50	RES, 100
R276	Not_Placed	RES, 1K
R277	0662057B47	RES, 0
R280	0662057M90	RES, 4.7K

Circuit Ref	Motorola Part No.	Description
R281	0662057M96	RES, 8.2K
R282	0662057M73	RES, 910
R283	0662057M53	RES, 130
R284	Not_Placed	RES, 560
R285	0662057M01	RES, 0
R310	0662057N23	RES, 100K
R311	0662057N23	RES, 100K
R312	0662057N06	RES, 20K
R313	0662057M98	RES, 10K
R320	0662057V43	RES, 330K
R321	0662057V35	RES, 200K
R322	0662057N23	RES, 100K
R400	Not_Placed	RES, 100K
R410	0662057M98	RES, 10K
R411	0662057M72	RES, 820
R412	0662057N23	RES, 100K
R413	0662057N23	RES, 100K
R414	0662057N11	RES, 33K
R415	0662057N11	RES, 33K
R416	0662057N06	RES, 20K
R417	0662057M98	RES, 10K
R418	0662057N23	RES, 100K
R419	0662057M90	RES, 4.7K
R420	0662057V35	RES, 200K
R421	0662057V27	RES, 100K
R422	0662057N23	RES, 100K
R423	0662057N23	RES, 100K
R424	0662057V35	RES, 200K
R425	0662057V27	RES, 100K
R430	0662057N23	RES, 100K
R431	Not_Placed	RES, 100K
R432	0662057M01	RES, 0
R433	0662057N23	RES, 100K
R434	Not_Placed	RES, 100K
R440	0662057M90	RES, 4.7K
R441	0662057M90	RES, 4.7K
R442	0662057A33	RES, 220
R443	0662057A27	RES, 120
R445	0662057M90	RES, 4.7K
R446	0662057M98	RES, 10K
R451	0662057N15	RES, 47K
R460	0662057N08	RES, 24K
R462	0662057N08	RES, 24K
R463	0662057N08	RES, 24K
R464	0662057N10	RES, 30K
R469	0662057M26	RES, 10
R470	0662057M82	RES, 2.2K
R471	0662057M82	RES, 2.2K
R472	0662057M70	RES, 680
R473	0662057M70	RES, 680
R474	0662057A37	RES, 330
R475	0662057N29	RES, 180K
R476	0662057N23	RES, 100K
R477	0662057M82	RES, 2.2K
R478	0662057M82	RES, 2.2K
R479	0662057N23	RES, 100K
R480	0662057B47	RES, 0
R481	Not_Placed	RES, 100K
R482	Not_Placed	RES, 330K
R483	Not_Placed	RES, 150K
R484	Not_Placed	RES, 2.2K
R485	Not_Placed	RES, 100K
R486	Not_Placed	RES, 100K
R487	0662057M01	RES, 0
R488	0662057N35	RES, 330K
R489	Not_Placed	RES, 91K
R490	Not_Placed	RES, 2.2K
R491	0662057M01	RES, 0
R492	0662057N08	RES, 24K
R493	0662057N35	RES, 330K
R494	0662057V43	RES, 330K
R495	0662057M92	RES, 5.6K
R496	Not_Placed	RES, 10K
R497	Not_Placed	RES, 1MEG
R498	Not_Placed	RES, 47K
R499	Not_Placed	RES, 270K
R501	0662057M50	RES, 100
R502	0662057M50	RES, 100
R503	0662057M50	RES, 100
R504	0662057M50	RES, 100
R505	0662057M50	RES, 100
R506	0662057M50	RES, 100
R507	0662057M50	RES, 100
R508	0662057N23	RES, 100K
R509	0662057N23	RES, 100K
R510	0662057N35	RES, 330K
R511	0662057N23	RES, 100K
R512	0662057N27	RES, 150K
R513	0662057N23	RES, 100K
R514	0662057N23	RES, 100K
R515	0662057M01	RES, 0
R516	Not_Placed	RES, 0
R517	Not_Placed	RES, 0
R518	0662057N31	RES, 220K
R519	0662057N23	RES, 100K
R520	0662057N23	RES, 100K
R521	Not_Placed	RES, 100K
R522	0662057N23	RES, 100K
R523	0662057M98	RES, 10K
S440	4080710Z06	SWITCH
S441	4070354A01	SWITCH
S442	4070354A01	SWITCH
S443	4070354A01	SWITCH
S444	1880619Z02	SWITCH
SH1	2686421Z01	SHIELD
SH40	2686419Z01	SHIELD
SH50	2686423Z01	SHIELD
SH52	2686424Z01	SHIELD
SH100	2686418Z01	SHIELD
SH200	2686424Z01	SHIELD
SH201	2686423Z01	SHIELD
SH250	2686425Z01	SHIELD
SH251	2686425Z01	SHIELD
SH253	2686422Z01	SHIELD
SH400	2686420Z01	SHIELD
SH401	2686420Z01	SHIELD
T41	2580541Z02	XFMR
T42	2580541Z02	XFMR
U51	5186144B01	SA616
U52	5109522E10	TC7W04F
U110	0186438Z02	RA07M4452M_UHF
U150	5113818A01	LM2904
U151	2484657R01	57R01
U201	5185963A27	63A27
U251	5105750U54	50U54
U310	5102478J01	TK71750S
U320	5185963A55	LP2986
U330	5102479J01	TK71730S
U401*	5102226J56	MC68HC11FL0
U402	5102463J64	X25128-2.7
U403	Not_Placed	SRM2B256
U404	5102480J01	AT49LV001N_70VI
U451	5185130C53	30C53
U480	Not_Placed	LM2904
U490	5108858K99	TDA8541
U510	5113818A01	LM2904
U511	4802245J54	UMG5
VR110	4813830A86	MM3Z3V9T1
VR301	4813830A33	MMBZ5250B
VR302	4813830A33	MMBZ5250B
VR471	4813830A18	MMBZ5235B
VR472	4813830A09	MMBZ5226B
VR473	4813830A33	MMBZ5250B
VR474	4813830A33	MMBZ5250B
VR475	4880140L20	MMBZ5245B
Y51	4802245J84	TSS2_44_395MHZ
Y70	9186145B02	45B02
Y201*	4880114R06	14R06
Y202	Not_Placed	45J68

* Motorola Depot Servicing only