MOTOROLA

Commercial Series
CM Radios

VHF2 (146-174MHz) High Power
Service Information

Issue: October 2004

Computer Software Copyrights

Table of Contents

Chapter 1 MODEL CHART AND TECHNICAL SPECIFICATIONS

Chapter 2 THEORY OF OPERATION

Chapter 3 TROUBLESHOOTING CHARTS

Chapter 4 VHF PCB/SCHEMATICS/PARTS LISTS

Chapter 1

MODEL CHART AND TECHNICAL SPECIFICATIONS

1.0 CM140/CM160 Model Chart

CM Series, VHF2, 146-174 MHz			
Model			Description
MDM50KQC9AA2			CM140 146-174 MHz, 45W, 8CH, BNC
	MDM50KQF9AA2		CM160 146-174 MHz, 45W, 64CH, BNC
		Item	Description
X		PMUD1848_	CM140 Super Tanapa VHF2, 45W, 8CH, BNC
	X	PMUD1894_	CM160 Super Tanapa VHF2, 45W, 64CH, BNC
X		PMUD1885_	CM140 Tanapa VHF2, 45W, 8CH, BNC
	X	PMUD1887_	CM160 Tanapa VHF2, 45W, 64CH, BNC
X		FCN6288_	Control Head
	X	FCN5523_	Control Head
X		PMUD1885_S	CM140 UHF2 U/C BNC Service Board
	X	PMUD1887_S	CM160 UHF2 U/C BNC Service Board
X	X	RMN5018	Mag One Microphone
X	X	6866546D02_	RTTE Leaflet
X	X	6866537D37_	Safety Leaflet
X	X	GLN7324_	Low Profile Trunnion

x = Indicates one of each is required.

2.0 Technical Specifications

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

General	
Specification	**VHF2**
Frequency Range:	146-174 MHz
Frequency Stability (-30°C to +60°C, 25°C Ref.)	±2 PPM
Channel Capacity:	CM140 - 8 CM160 - 64
Channel Spacing:	12.5/20/25 kHz
Power Output:	25-45W
Power Supply:	13.2Vdc (10.8 - 15.6 Vdc) negative vehicle ground
Dimensions (L X W X H)	118mm X 169mm X 44mm
Weight: Low power (1-25W)	1.02 Kg
Operating Temperature	-30 to 60 ^{O} C
Storage temperature	-40 to 80^{O} C
Shock and Vibration	Meets MIL-STD 810-C,D&E and TIA/EIA 603
Dust	Meets MIL-STD 810-C,D&E and TIA/EIA 603
Humidity	Meets MIL-STD 810-C,D&E and TIA/EIA 603

Transmitter	
Specification	**VHF2**
Frequency Stability:	+/- 2.5ppm
Modulation Limiting:	±2.5 kHz @ 12.5 kHz ±4.0 kHz @ 20 kHz ±5.0 kHz @ 20/25 kHz
Current Drain Transmit:	7A (25W)
FM Hum and Noise:	-40 dB@12.5 kHz -45 dB@ 20/25 kHz
Conducted/Radiated Emissions:	-36 dBm < 1 GHz -30 dBm > 1 GHz
Adjacent Channel Power	-60dB @12.5, -70dB @ 20/25kHz
Audio Response: (300 to 3000Hz)	+1, -3dB
Audio Distortion: @ 1000 Hz, 60% Rated Maximum Deviation:	3% Typical

Receiver	
Specification	**VHF2**
Sensitivity (12dBSINAD): (ETS)	0.35µV (12.5kHz) 0.30µV (25kHz) Typical
Intermodulation : (ETS)	>65dB
Adjacent Channel Selectivity: (ETS)	75 dB @ 25 kHz 65 dB @ 12.5 kHz
Spurious Rejection: (ETS)	75 dB
Rated Audio: (ETS) (Extended audio with 4 Ohm speaker)	4W Internal , 13W External
Audio Distortion @ Rated Audio:	3% Typical
Hum and Noise:	-40 dB @ 12.5 kHz -45 dB @ 20/25 kHz
Audio Response: (300 to 3000Hz)	+1, -3dB
Conducted Spurious Emission per FCC Part 15:	-57 dBm <1 GHz -47 dBm >1 GHz

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

Chapter 2

THEORY OF OPERATION

1.0 Introduction

This Chapter provides a detailed theory of operation for the VHF circuits in the radio. Details of the theory of operation and trouble shooting for the the associated Controller circuits are included in this Section of the manual.

2.0 VHF (146-174MHz) Receiver

2.1 Receiver Front-End

The received signal is applied to the radio's antenna input connector and routed through the harmonic filter and antenna switch. The insertion loss of the harmonic filter/antenna switch is less than 1 dB. The signal is routed to the first filter (4-pole), which has an insertion loss of 2 dB typically. The output of the filter is matched to the base of the LNA (Q303) that provides a 16 dB gain and a noise figure of better than 2 dB. Current source Q301 is used to maintain the collector current of Q303. Diode CR301 protects Q303 by clamping excessive input signals. Q303 output is applied to the second filter (3-pole) which has an insertion loss of 1.5 dB. In Distance mode, Q304 turns on and causes D305 to conduct, thus bypassing C322 and R337. In Local mode, the signal is routed through C322 and R337, thus inserting 7 dB attenuation. Since the attenuator is located after the RF amplifier, the receiver sensitivity is reduced only by 6 dB, while the overall third order input intercept is raised.

The first mixer is a passive, double-balanced type, consisting of T300, T301 and U302. This mixer provides all of the necessary rejection of the half-IF spurious response. High-side injection at +15 dBm is delivered to the first mixer. The mixer output is then connected to a duplex network which matches its output to the XTAL filter input (FL300) at the IF frequency of 44.85 MHz. The duplex network terminates into a 50 ohm resistor (R340) at all other frequencies.

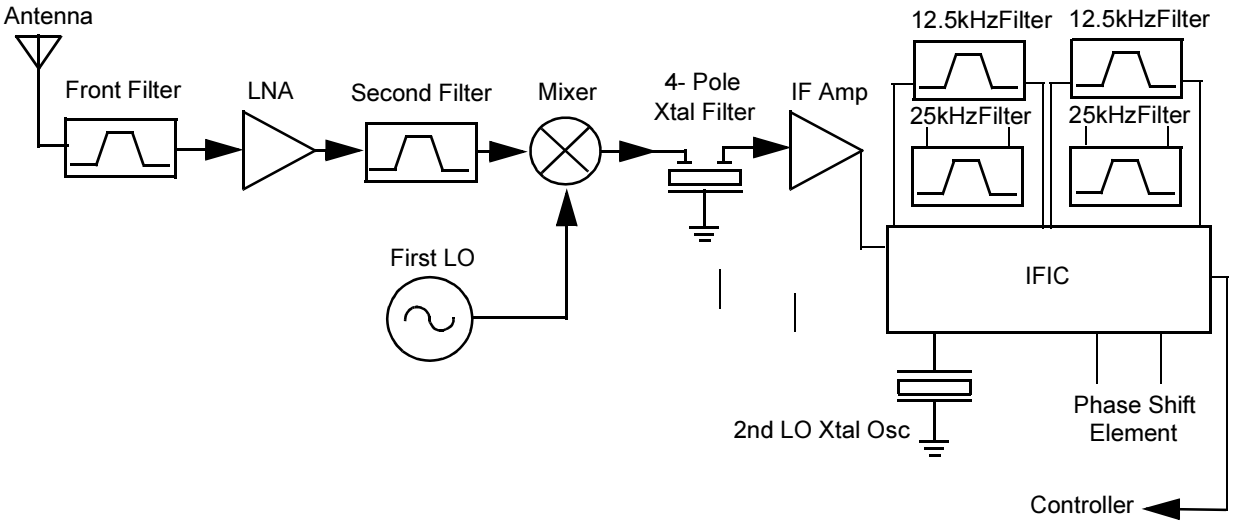


Figure 2-1 VHF Receiver Block Diagram

2.2 Receiver Back End

The IF signal from the crystal filter enters the IF amplifier which provides 20 dB of gain and feeds the IF IC at pin 1. The first IF signal at 44.85 MHz mixes with the second local oscillator (LO) at 44.395 MHz to produce the second IF at 455 kHz. The second LO uses the external crystal Y301. The second IF signal is amplified and filtered by two external ceramic filters (FL303/FL302 for 12.5KHz channel spacing and FL304/FL301 for 25KHz channel spacing). The IF IC demodulates the signal by means of a quadrature detector and feeds the detected audio (via pin 7) to the audio processing circuits. At IF IC pin 5, an RSSI signal is available with a dynamic range of 70 dB.

3.0 VHF Transmitter Power Amplifier (146-174 MHz)

The radio's 45W PA is a three-stage amplifier used to amplify the output from the TX_INJ to the antenna port. All three stages utilize LDMOS technology. The gain of the first stage (U101) is adjustable and is controlled by pin 7 of U103-2 via U103-3 and U102-1. It is followed by an LDMOS driver Q105 and final stage Q100.

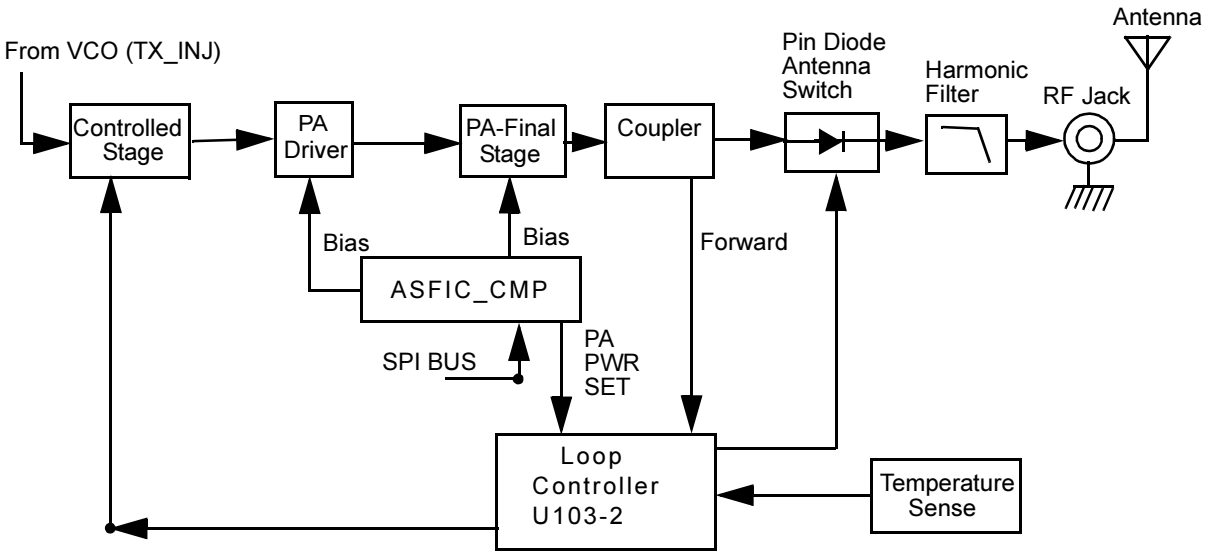


Figure 2-2 VHF Transmitter Block Diagram

Devices U101, Q105 and Q100 are surface mounted.Two screws with Belleville washers provide direct pressure ensuring good thermal contact between both the driver and final stage, and the chassis.

3.1 First Power Controller Stage

The first stage (U101) is a 20dB gain integrated circuit containing two LDMOS FET amplifier stages. It amplifies the RF signal from the VCO (TX_INJ). The output power of stage U101 is controlled by a DC voltage applied to pin 1 from the op-amp U103-3, pin 8. The control voltage simultaneously varies the bias of two FET stages within U101. This biasing point determines the overall gain of U101 and therefore its output drive level to Q105, which in turn controls the output power of the PA.

Op-amp U103-3 monitors the drain current of U101 via resistor R122 and adjusts the bias voltage of U101.

In receive mode, the DC voltage from RX_EN line turns on Q101, which in turn switches off the biasing voltage to U101.

3.2 Power Controlled Driver Stage

The next stage is an LDMOS device (Q105) which provides a gain of 12dB. This device requires a positive gate bias and a quiescent current flow for proper operation. The bias is set during transmit mode by the V_cntrl_driver which is set to provide 100-150mA of quiescent current by the factory, and fed to the gate of Q105 via the resistive network.

The V_cntrl_driver is directly controlled by the ASFIC CMP. In receive mode, the ASFIC CMP (U504) sets V_cntrl_driver to 0V (DACR pin 5).

3.3 Final Stage

The final stage is an LDMOS device (Q100) providing a gain of 12dB. This device also requires a positive gate bias and a quiescent current flow for proper operation. The voltage of the line PA_BIAS is set in transmit mode by the ASFIC and fed to the gate of Q100 via the resistive network R134, R131. This bias voltage is tuned in the factory. If the transistor is replaced, the bias voltage must be tuned using the Tuner. Care must be taken not to damage the device by exceeding the maximum allowed bias voltage. The device's drain current is drawn directly from the radio's DC supply voltage input, B+, via L117 and L115.

A matching network consisting of C1004-5, C1007-9, C1096, C1021, C1013, C1019, L116: and two striplines, transforms the impedance to 50 ohms and feeds the directional coupler.

3.4 Bi-Directional Coupler

The bi-directional Coupler is a microstrip printed circuit, which couples a small amount of the forward and reverse power of the RF power from Q100.The coupled signal is rectified to an output power which is proportional to the DC voltage rectified by diode D105; and the resulting DC voltage is routed to the power control section to ensure that the forward power out of the radio is held to a constant value.

3.5 Antenna Switch

The antenna switch utilizes the existing dc feed (B+) to the last stage device (Q100). The basic operation is to have both PIN diodes (D103, D104) turned on during key-up by forward biasing them. This is achieved by pulling down the voltage at the cathode end of D104 to around 12.4V (0.7V drop across each diode). The current through the diodes needs to be set around 100 mA to fully open the transmit path through resistor R108. Q106 is a current source controlled by Q103 which is turned on in Tx mode by TX_EN. VR102 ensures that the voltage at resistor R107 never exceeds 5.6V.

3.6 Harmonic Filter

Inductors L111, L112, L124 and L113 along with capacitors C11321, C1022, C1020, C1137, C1018 and C1017 form a low-pass filter to attenuate harmonic energy coming from the transmitter. Resistor R150 drains any electrostatic charges that might otherwise build up on the antenna. The harmonic filter also prevents high level RF signals above the receiver passband from reaching the receiver circuits to improve spurious response rejection.

3.7 Power Control

The output power is regulated by using a forward power detection control loop. A directional coupler samples a portion of the forward and reflected RF power. The forward sampled RF is rectified by diode D105, and the resulting DC voltage is routed to the operational amplifier U100. The error output current is then routed to an integrator, and converted into the control voltage. This voltage controls the bias of the pre-driver (U101) stage. The output power level is set by way of a DAC, PWR_SET, in the audio processing IC (U504), which acts at the forward power control loop reference.

The sampled reflected power is rectified by diode D107. The resulting DC voltage is amplified by an operational amplifier U100 and routed to the summing junction. This detector protects the final stage Q100 from reflected power by increasing the error current. The temperature sensor protects the final stage Q100 from overheating by increasing the error current. A thermistor RT100 measures the final stage Q100 temperature. The voltage divider output is routed to an operational amplifier U103 and then goes to the summing junction. The Zener Diode VR101 keeps the loop control voltage below 5.6V and eliminates the DC current from the 9.3 regulator U501.

A local loop for the Pre Driver (U101) is used in order to stabilize the current for each stage.

In Rx mode, the two transistors Q101 and Q102 go to saturation and shut down the transmitter by applying ground to the Pre Driver U101.

4.0 VHF (146-174MHz) Frequency Synthesis

The synthesizer consists of a reference oscillator (Y201), low voltage Fractional-N (LVFRAC-N) synthesizer (U200), and a voltage controlled oscillator (VCO) (U201).

4.1 Reference Oscillator

The reference oscillator is a crystal (Y201) controlled Colpitts oscillator and has a frequency of 16.8MHz. The oscillator transistor and start-up circuit are located in the LVFRAC-N (U200) while the oscillator feedback capacitors, crystal, and tuning varactors are external. An analog-to-digital (A/D) converter internal to the LVFRAC-N (U200) and controlled by the microprocessor via SPI sets the voltage at the warp output of U200 pin 25. This sets the frequency of the oscillator. Consequently, the output of the crystal Y201 is applied to U200 pin 23.

The method of temperature compensation is to apply an inverse Bechmann voltage curve, which matches the crystal's Bechmann curve to a varactor that constantly shifts the oscillator back on frequency. The crystal vendor characterizes the crystal over a specified temperature range and codes this information into a bar code that is printed on the crystal package. In production, this crystal code is read via a 2-dimensional bar code reader and the parameters are saved.

This oscillator is temperature compensated to an accuracy of +/-2.5 PPM from -30 to 60 degrees C. The temperature compensation scheme is implemented by an algorithm that uses five crystal parameters (four characterize the inverse Bechmann voltage curve and one for frequency accuracy of the reference oscillator at 25 degrees C). This algorithm is implemented by the LVFRAC-N (U200) at the power up of the radio.

4.2 Fractional-N Synthesizer

The LVFRAC-N U200 consists of a pre-scaler, programmable loop divider, control divider logic, phase detector, charge pump, A/D converter for low frequency digital modulation, balanced attenuator used to balance the high and low frequency analog modulation, 13V positive voltage multiplier, serial interface for control, and a super filter for the regulated 5 volts.

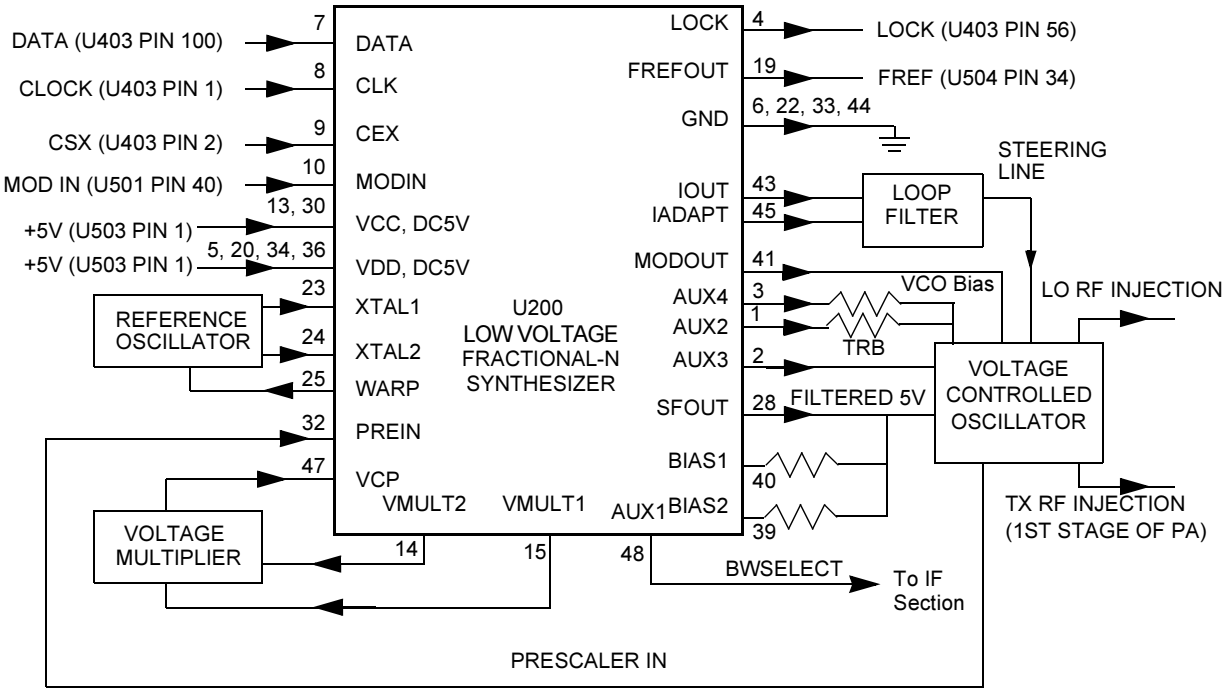


Figure 2-3 VHF Synthesizer Block Diagram

A voltage of 5V applied to the super filter input (U200, pin 30) supplies an output voltage of 4.5Vdc (VSF) at U200, pin 28. This supplies 4.5 V to the VCO Buffer IC U201.

To generate a high voltage to supply the phase detector (charge pump) output stage at pin VCP (U200, pin 47) while using a low voltage 3.3Vdc supply, a 13V positive voltage multiplier is used (D200, D201, and capacitors C2024, 2025, 2026, 2055, 2027, 2001).

Output lock (U200, pin 4) provides information about the lock status of the synthesizer loop. A high level at this output indicates a stable loop. A 16.8 MHz reference frequency is provided at U200, pin 19.

4.3 Voltage Controlled Oscillator (VCO)

The Voltage Controlled Oscillator (VCO) consists of the VCO/Buffer IC (VCOBIC, U201), the TX and RX tank circuits, the external RX amplifier, and the modulation circuitry.

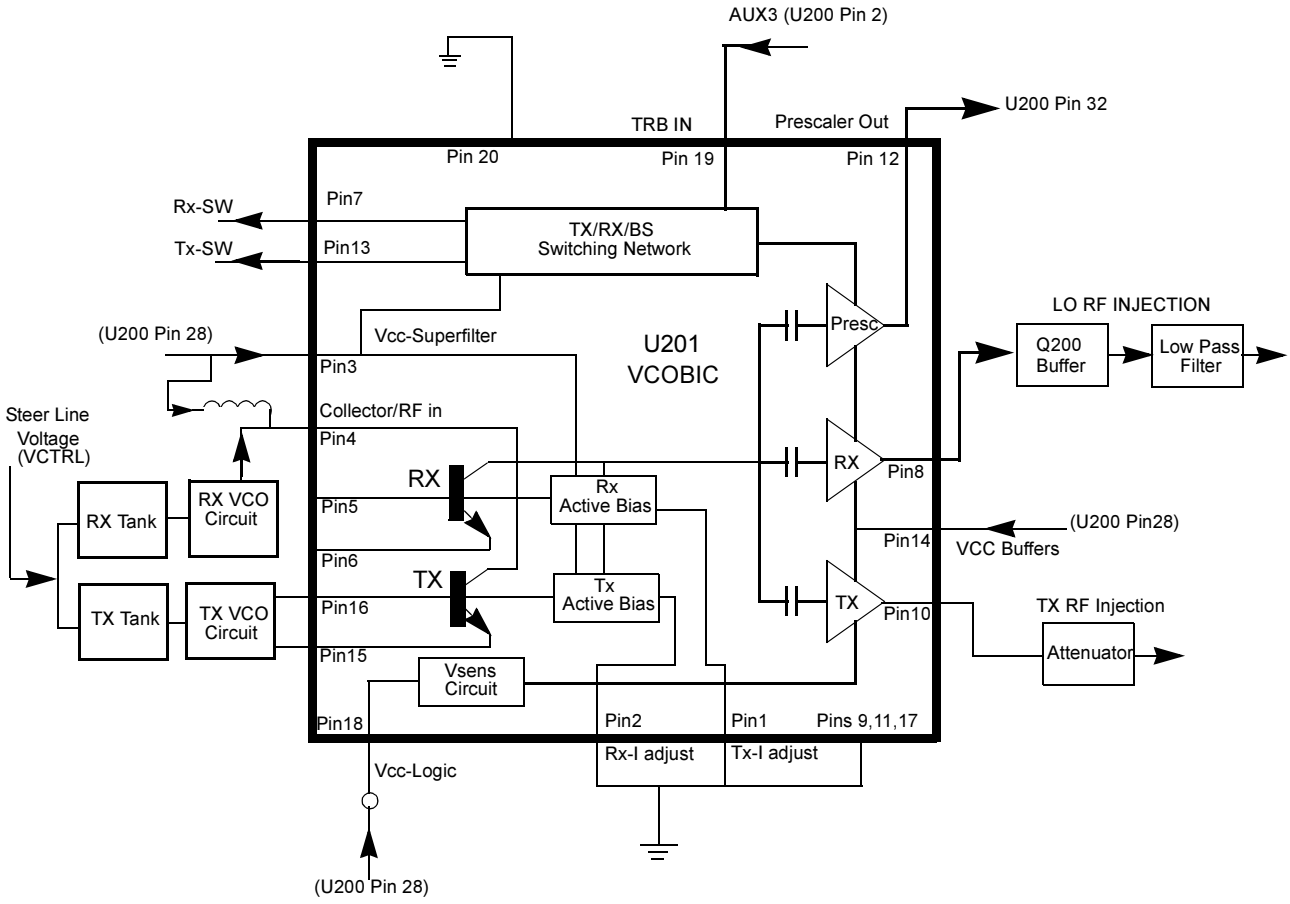


Figure 2-4 VHF VCO Block Diagram

The VCOBIC together with the LVFRAC-N (U200) generate the required frequencies in both transmit and receive modes. The TRB line (U201, pin 19) determines which VCO and buffer is enabled (high being TX output at pin 10, low being RX output at pin 8). A sample of the signal from the enabled output is routed from U201, pin 12 (PRESC_OUT), via a low pass filter to U200, pin 32 (PREIN).

A steering line voltage between 3.0V and 10.0V at varactor D204 tunes the TX VCO through the frequency range of 146-174MHz, and at D203 tunes the RX VCO through the frequency range of 190-219MHz.

The external RX amplifier is used to increase the output from U201, pin 9 from 3-4 dBm to the required 15dBm for proper mixer operation. In TX mode, the modulation signal from the LVFRAC-N (U200, pin 41) is applied to the VCO by way of the modulation circuit D205, R212, R211, C2073.

4.4 Synthesizer Operation

The synthesizer consists of a low voltage FRAC-N IC (LVFRAC-N), reference oscillator, charge pump circuits, loop filter circuit, and DC supply. The output signal (PRESC_OUT) of the VCOBIC (U201, pin 12) is fed to the PREIN, pin 32 of U200 via a low pass filter which attenuates harmonics and provides a correct input level to the LVFRAC-N in order to close the synthesizer loop.

The pre-scaler in the synthesizer (U200) is a dual modulus pre-scaler with selectable divider ratios. The divider ratio of the pre-scaler is controlled by the loop divider, which in turn receives its inputs via the SPI. The output of the pre-scaler is applied to the loop divider. The output of the loop divider is connected to the phase detector, which compares the loop divider's output signal with the reference signal. The reference signal is generated by dividing down the signal of the reference oscillator (Y201).

The output signal of the phase detector is a pulsed dc signal that is routed to the charge pump. The charge pump outputs a current from U200, pin 43 (IOUT). The loop filter (consisting of R224, R217, R234, C2074, C2075, C2077, C2078, C2079, C2080, C2028, and L205) transforms this current into a voltage that is applied the varactor diodes D203 and D204 for RX and TX respectively. The output frequency is determined by this control voltage. The current can be set to a value fixed in the LVFRAC-N or to a value determined by the currents flowing into BIAS 1 (U200, pin 40) or BIAS 2 (U200, pin 39). The currents are set by the value of R200 or R206 respectively. The selection of the three different bias sources is done by software programming.

To modulate the synthesizer loop, a two-spot modulation method is utilized via the MODIN (U200, pin 10) input of the LVFRAC-N. The audio signal is applied to both the A/D converter (low frequency path) and the balance attenuator (high frequency path). The A/D converter converts the low frequency analog modulating signal into a digital code which is applied to the loop divider, thereby causing the carrier to deviate. The balance attenuator is used to adjust the VCO's deviation sensitivity to high frequency modulating signals. The output of the balance attenuator is presented at the MODOUT port of the LVFRAC-N (U200,pin 41) and connected to the VCO modulation varactor D205.

5.0 Controller Theory of Operation

This section provides a detailed theory of operation for the radio and its components. The main radio is a single-board design, consisting of the transmitter, receiver, and controller circuits. A control head is connected by an extension cable. The control head contains LED indicators, a microphone connector, buttons, and speaker.

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

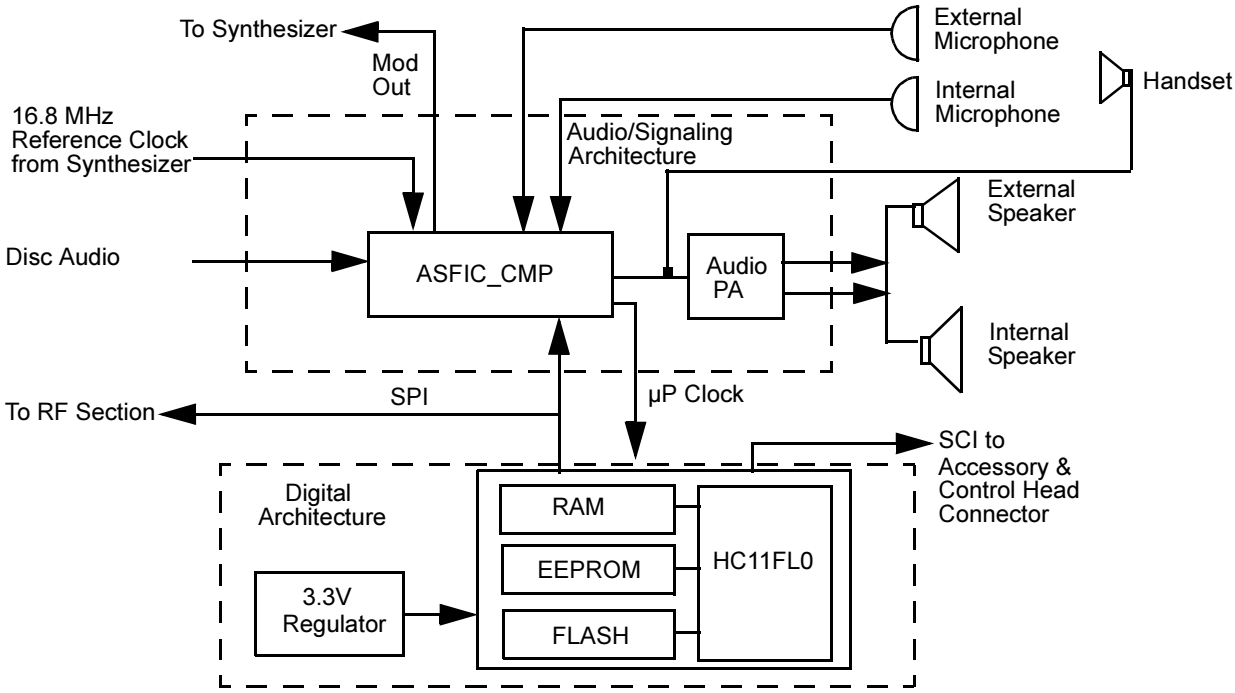


Figure 2-5 Controller Block Diagram

5.1 Radio Power Distribution

Voltage distribution is provided by five separate devices:

- U514 P-cH FET - Batt + (Ext_SWB+)
- U501 LM2941T - 9.3V
- U503 LP2951CM - 5V
- U508 MC 33269DTRK - 3.3V
- U510 LP2986ILDX - 3.3V Digital

The DC voltage applied to connector P2 supplies power directly to the following circuitry:

- Electronic on/off control
- RF power amplifier
- 12 volts P-cH FET -U514
- 9.3 volt regulator
- Audio PA

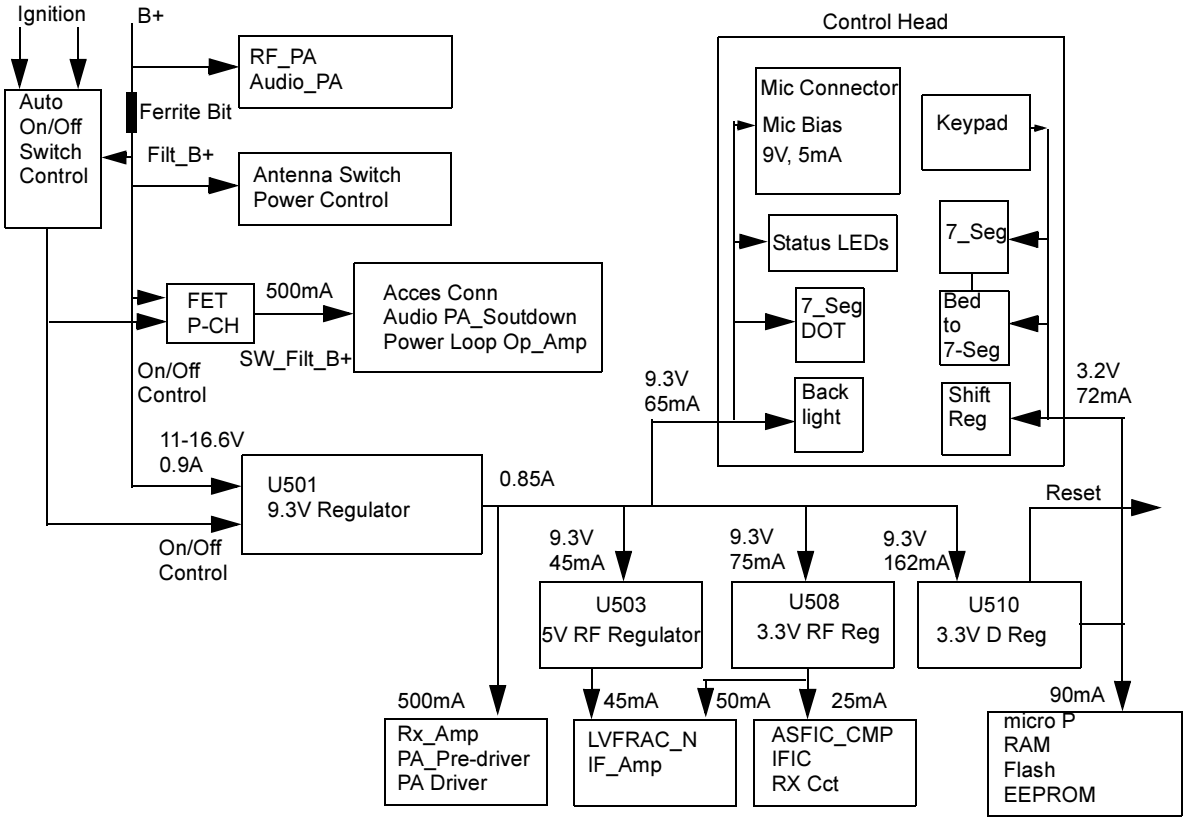


Figure 2-6 DC Power Distribution Block Diagram

Regulator U501 is used to generate the 9.3 volts required by some audio circuits, the RF circuitry and power control circuitry. Input and output capacitors are used to reduce high frequency noise. Resistors R5001 / R5081 set the output voltage of the regulator. This regulator output is electronically enabled by a 0 volt signal on pin 2. Q502, Q505 and R5038 are used to disable the regulator when the radio is turned off.

Voltage regulator U510 provides 3.3 volts for the digital circuitry. Operating voltage is from the regulated 9.3V supply. Input and output capacitors are used to reduce high frequency noise and provide proper operation during battery transients. U510 provides a reset output that goes to 0 volts if the regulator output goes below 3.1 volts. This is used to reset the controller to prevent improper operation.

Voltage regulator U508 provides 3.3V for the RF circuits and ASFIC_CMP. Input and output capacitors are used to reduce the high frequency noise and provide proper operation during battery transients.

Voltage regulator U503 provides 5V for the RF circuits. Input and output capacitors are used to reduce the high frequency noise and provide proper operation during battery transients.

VSTBY is used only for CM360 5-tone radios.

The voltage VSTBY, which is derived directly from the supply voltage by components R5103 and VR502, is used to buffer the internal RAM. Capacitor C5120 allows the battery voltage to be disconnected for a couple of seconds without losing RAM parameters. Dual diode D501 prevents radio circuitry from discharging this capacitor. When the supply voltage is applied to the radio, C5120 is charged via R5103 and D501.

5.2 Protection Devices

Diode VR500 acts as protection against ESD, wrong polarity of the supply voltage, and load dump.

VR692 - VR699 are for ESD protection.

5.3 Automatic On/Off

The radio can be switched ON in any one of the following three ways:

- On/Off switch. (No Ignition Mode)
- Ignition and On/Off switch (Ignition Mode)
- Emergency

5.3.1 No Ignition Mode

When the radio is connected to the car battery for the first time, Q500 will be in saturation, Q503 will cut-off, Filt_B+ will pass through R5073, D500, and S5010-pin 6 (On/Off switch). When S5010 is ON, Filt_B+ will pass through S5010-pin5, D511, R5069, R5037 and base of Q505 and move Q505 into saturation. This pulls U501-pin2 through R5038, D502 to 0.2V and turns On U514 and U501 9.3V regulator which supplies voltage to all other regulators and consequently turns the radio on, When U504 (ASFIC_CMP) gets 3.3V, GCB2 goes to 3.3V and holds Q505 in saturation, for soft turn off.

5.3.2 Ignition Mode

When ignition is connected for the first time, it will force high current through Q500 collector, This will move Q500 out of saturation and consequently Q503 will cut-off. S5010 pin 6 will get ignition voltage through R601 (for load dump), R610, (R610 & C678 are for ESD protection), VR501, R5074, and D500. When S5010 is ON, Filt_B+ passes through S5010-pin 5, D511, R5069, R5037 and base of Q505 and inserts Q505 into saturation. This pulls U501-pin 2 through R5038, D502 to 0.2V and turns on U514 and U501 9.3V regulator which supply voltage to all other regulators and turns the radio on, When U504 (ASFIC_CMP) get 3.3V supply, GCB2 goes to 3.3V and holds Q505 in saturation state to allow soft turn off,

When ignition is off Q500, Q503 will stay at the same state so S5010 pin 6 will get 0V from Ignition, Q504 goes from Sat to Cut, ONOFF_SENSE goes to 3.3V and it indicates to the radio to soft turn itself by changing GCB2 to ‘0’ after de registration if necessary.

5.3.3 Emergency Mode

The emergency switch (P1 pin 9), when engaged, grounds the base of Q506 via EMERGENCY _ACCES_CONN. This switches Q506 to off and consequently resistor R5020 pulls the collector of Q506 and the base of Q506 to levels above 2 volts. Transistor Q502 switches on and pulls U501 pin2 to ground level, thus turning ON the radio. When the emergency switch is released R5030 pulls the base of Q506 up to 0.6 volts. This causes the collector of transistor Q506 to go low (0.2V), thereby switching Q502 to off.

While the radio is switched on, the µP monitors the voltage at the emergency input on the accessory connector via U403-pin 62. Three different conditions are distinguished: no emergency kit is connected, emergency kit connected (unpressed), and emergency press.

If no emergency switch is connected or the connection to the emergency switch is broken, the resistive divider R5030 / R5049 will set the voltage to about 3.14 volts (indicates no emergency kit found via EMERGENCY_SENSE line). If an emergency switch is connected, a resistor to ground within the emergency switch will reduce the voltage on EMERGENCY _SENSE line, and indicate to the µP that the emergency switch is operational. An engaged emergency switch pulls line EMERGENCY _SENSE line to ground level. Diode VR503 limits the voltage to protect the µP input.

While EMERGENCY _ACCES_CONN is low, the µP starts execution, reads that the emergency input is active through the voltage level of µP pin 64, and sets the DC POWER ON output of the ASFIC CMP pin 13 to a logic high. This high will keep Q505 in saturation for soft turn off.

5.4 Microprocessor Clock Synthesiser

The clock source for the µP system is generated by the ASFIC CMP (U504). Upon power-up the synthesizer IC (FRAC-N) generates a 16.8 MHz waveform that is routed from the RF section to the ASFIC CMP pin 34. For the main board controller the ASFIC CMP uses 16.8 MHz as a reference input clock signal for its internal synthesizer. The ASFIC CMP, in addition to audio circuitry, has a programmable synthesizer which can generate a synthesized signal ranging from 1200Hz to 32.769MHz in 1200Hz steps.

When power is first applied, the ASFIC CMP will generate its default 3.6864MHz CMOS square wave UP CLK (on U504 pin 28) and this is routed to the µP (U403 pin 90). After the µP starts operation, it reprograms the ASFIC CMP clock synthesizer to a higher UP CLK frequency (usually 7.3728 or 14.7456 MHz) and continues operation.

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

The ASFIC CMP synthesizer loop uses C5025, C5024 and R5033 to set the switching time and jitter of the clock output. If the synthesizer cannot generate the required clock frequency it will switch back to its default 3.6864MHz output.

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

5.5 Serial Peripheral Interface (SPI)

The µP communicates to many of the IC's through its SPI port. This port consists of SPI TRANSMIT DATA (MOSI) (U403-pin100), SPI RECEIVE DATA (MISO) (U403-pin 99), SPI CLK (U0403-pin1) and chip select lines going to the various IC's, connected on the SPI PORT (BUS). This BUS is a synchronous bus, in that the timing clock signal CLK is sent while SPI data (SPI TRANSMIT DATA or SPI RECEIVE DATA) is sent. Therefore, whenever there is activity on either SPI TRANSMIT DATA or SPI RECEIVE DATA there should be a uniform signal on CLK. The SPI TRANSMIT DATA is used to send serial from a µP to a device, and SPI RECEIVE DATA is used to send data from a device to a µP.

In the controller section, there are two IC's on the SPI BUS, ASFIC CMP (U504 pin 22), and EEPROM (U400). In the RF sections there is one IC on the SPI BUS, the FRAC-N Synthesizer. The chip select line CSX from U403 pin 2 is shared by the ASFIC CMP and FRAC-N Synthesizer. Each of these IC's check the SPI data and when the sent address information matches the IC's address, the following data is processed.

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

5.6 SBEP Serial Interface

The SBEP serial interface allows the radio to communicate with the Customer Programming Software (CPS), or the Universal Tuner via the Radio Interface Box (RIB) or the cable with internal RIB. This interface connects to the SCI pin via control head connector (J2-pin 17) and to the accessory connector P1-6 and comprises BUS+. The line is bi-directional, meaning that either the radio or the RIB can drive the line. The µP sends serial data and it reads serial data via pin 97. Whenever the µP detects activity on the BUS+ line, it starts communication.

5.7 General Purpose Input/Output

The controller provides six general purpose lines (PROG I/O) available on the accessory connector P1 to interface to external options. Lines PROG IN 3 and 6 are inputs, PROG OUT 4 is an output and PROG IN OUT 8, 12 and 14 are bi-directional. The software and the hardware configuration of the radio model define the function of each port.

- PROG IN 3 can be used as external PTT input, or others, set by the CPS. The µP reads this port via pin 72 and Q412.
- PROG OUT 4 can be used as external alarm output, set by the CPS. Transistor Q401 is controlled by the µP (U403 pin 55)
- PROG IN 6 can be used as normal input, set by the CPS. The µP reads this port via pin 73 and Q411. This pin is also used to communicate with the RIB if resistor R421 is placed.
- DIG IN OUT 8,12,14 are bi-directional and use the same circuit configuration. Each port uses an output Q416, Q404, Q405 controlled by µP pins 52, 53, 54. The input ports are read through µP pins 74, 76, 77; using Q409, Q410, Q411

5.8 Normal Microprocessor Operation

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

During normal operation, the µP (U403) is operating in expanded mode and has access to 3 external memory devices; U400 (EEPROM), U402 (SRAM), U404 (Flash). Also, within the µP there are 3 Kilobytes of internal RAM, as well as logic to select external memory devices.

The external EEPROM (U400) space contains the information in the radio which is customer specific, referred to as the codeplug. This information consists of items such as: 1) what band the radio operates in, 2) what frequencies are assigned to what channel, and 3) tuning information.

The external SRAM (U402) as well as the µP's own internal RAM space are used for temporary calculations required by the software during execution. All of the data stored in both of these locations is lost when the radio powers off.

The µP provides an address bus of 16 address lines (ADDR 0 - ADDR 15), and a data bus of 8 data lines (DATA 0 - DATA 7). There are also 3 control lines; CSPROG (U403-38) to chip select U404-pin 30 (FLASH), CSGP2 (U403-pin 41) to chip select U404-pin 20 (SRAM) and PG7_R_W (U403-pin 4) to select whether to read or to write.

When the µP is functioning normally, the address and data lines should be toggling at CMOS logic levels. Specifically, the logic high levels should be between 3.1 and 3.3V, and the logic low levels should be between 0 and 0.2V. No other intermediate levels should be observed, and the rise and fall times should be <30ns.

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

On the µP the lines XIRQ (U403-pin 48), MODA LIR (U403-pin 58), MODB VSTPY (U403-pin 57) and RESET (U403-pin 94) should be high at all times during normal operation. Whenever a data or address line becomes open or shorted to an adjacent line, a common symptom is that the RESET line goes low periodically, with the period being in the order of 20ms. In the case of shorted lines you may also detect the line periodically at an intermediate level, i.e. around 2.5V when two shorted lines attempt to drive to opposite rails.

The MODA LIR (U403-pin 58) and MODB VSTPY (U403-pin 57) inputs to the µP must be at a logic "1" for it to start executing correctly. After the µP starts execution it will periodically pulse these lines to determine the desired operating mode. While the Central Processing Unit (CPU) is running, MODA LIR is an open-drain CMOS output which goes low whenever the µP begins a new instruction. An instruction typically requires 2-4 external bus cycles, or memory fetches.

There are eight analog-to-digital coverter ports (A/D) on U403 labelled within the device block as PEO-PE7. These lines sense the voltage level ranging from 0 to 3.3V of the input line and convert that level to a number ranging from 0 to 255 which is read by the software to take appropriate action.

5.9 Static Random Access Memory (SRAM)

The SRAM (U402) contains temporary radio calculations or parameters that can change very frequently, and which are generated and stored by the software during its normal operation. The information is lost when the radio is turned off.

The device allows an unlimited number of write cycles. SRAM accesses are indicated by the CS signal U402 (which comes from U403-CSGP2) going low. U402 is commonly referred to as the external RAM as opposed to the internal RAM which is the 3 kilobytes of RAM which is part of the 68HC11FL0. Both RAM spaces serve the purpose. However, the internal RAM is used for the calculated values which are accessed most often.

Capacitor C402 and C411 serves to filter out any AC noise which may ride on +3.3 V at U402

6.0 Control Board Audio and Signalling Circuits

6.1 Audio Signalling Filter IC and Compander (ASFIC CMP)

The ASFIC CMP (U504) used in the controller has the following four functions:

1. RX/TX audio shaping, i.e. filtering, amplification, attenuation
2. RX/TX signaling, PL/DPL/HST/MDC
3. Squelch detection
4. µP clock signal generation

The ASFIC CMP is programmable through the SPI BUS (U504 pins-20/21/22), normally receiving 19 bytes. This programming sets up various paths within the ASFIC CMP to route audio and/or signaling signals through the appropriate filtering, gain and attenuator blocks. The ASFIC CMP also has 6 General Control Bits GCB0-5 which are CMOS level outputs and used for the following:

- GCBO - BW Select
- GCBI - switches the audio PA On/Off
- GCB2 - DC Power On switches the voltage regulator (and the radio) on and off
- GCB3 - Control on MUX U509 pin 9 to select between Low Cost Mic path to STD Mic Path
- GCB4 - Control on MUX U509 pin 11 to select between Flat RX path to filtered RX path on the accessory connector.
- GCB5 - Control on MUX U509 pin 10 to select between Flat TX path mute and Flat TX path

7.0 Transmit Audio Circuits

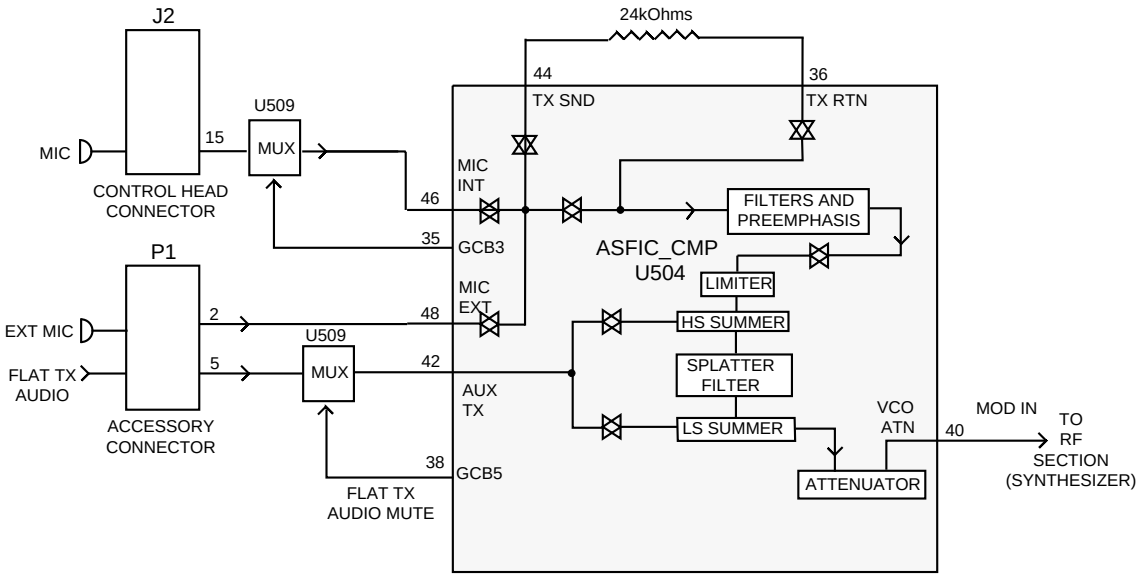


Figure 2-7 Transmit Audio Paths

7.1 Microphone Input Path

The radio supports 2 distinct microphone paths known as internal (from control head J2-15) and external mic (from accessory connector P1-2) and an auxiliary path (FLAT TX AUDIO, from accessory connector P1-5). The microphones used for the radio require a DC biasing voltage provided by a resistive network.

The two microphone audio input paths enter the ASFIC CMP at U504-pin 48 (external mic) and U504-pin 46 (internal mic). The microphone is plugged into the radio control head and connected to the audio DC via J2-pin 15. The signal is then routed via C5045 to MUX U509 that select between two paths with different gain to support Low Cost Mic (Mic with out amplifier in it) and Standard Mic.

7.1.1 Low Cost Microphone

Hook Pin is shorted to Pin 1(9.3V) inside the Low Cost Mic, This routes 9.3V to R429, and creates 2.6V on MIC_SENSE (u.P U403-67) by Voltage Divider R429/R430. U403 senses this voltage and sends command to ASFIC_CMP U504 to get GCB3 = ‘0’. The audio signal is routed from C5045 via U509-5 (Z0), R5072, U507, R5026, C5091, R5014 via C5046 to U504- 46 int. mic (C5046 100nF creates a 159Hz pole with U504- 46 int mic impedance of 16k ohm).

7.1.2 Standard Microphone

Hook Pin is shorted to the hook mic inside the standard Mic, If the mic is out off hook, 3.3V is routed to R429 via R458, D401, and it create 0.7V on MIC_SENSE (u.P U403-67) by Voltage Divider R429/R430. U403 senses this voltage and sends command to ASFIC_CMP U504 to get GCB3 =‘1’. The audio signal is routed from C5045 via U509-3 (Z1), R5072, U507, R5026, C5091, R5014 via C5046 to U504- 46 int mic (C5046 100nF create a159Hz pole with U504- 46 int mic impedance of 16Kohm). 9.3VDC is routed via R5077, R5075 to J2-15, It create 4.65V with Mic Impedance. C5010 supplies AC Ground to create AC impedance of 510 Ohms via R5075. and Filter 9.3V DC mic bias supply.

Note: The audio signal at U504-pin 46 should be approximately 12mV for 1.5kHz or 3kHz of deviation with 12.5kHz or 25kHz channel spacing.

The external microphone signal enters the radio on accessory connector P1 pin 2 and is routed via line EXT MIC to R5054. R5078 and R5076 provide the 9.3Vdc bias. Resistive divider R5054/ R5070 divide the input signal by 5.5 and provide input protection for the CMOS amplifier input. R5076 and C5009 provide a 510 ohm AC path to ground that sets the input impedance for the microphone and determines the gain based on the emitter resistor in the microphone’s amplifier circuit.

C5047 serves as a DC blocking capacitor. The audio signal at U504-pin 48 should be approximately 14mV for 1.5kHz or 3kHz of deviation with 12.5kHz or 25kHz channel spacing.

The FLAT TX AUDIO signal from accessory connector P1-pin 5 is fed to the ASFIC CMP (U504 pin 42 through U509 pin 2 to U509 pin 15 via U506 OP-AMP circuit and C5057.

The ASFIC has an internal AGC that can control the gain in the mic audio path. The AGC can be disabled / enabled by the µP. Another feature that can be enabled or disabled in the ASFIC is the VOX. This circuit, along with Capacitor C5023 at U504-pin 7, provides a DC voltage that can allow the µP to detect microphone audio. The ASFIC can also be programmed to route the microphone audio to the speaker for public address operation.

7.2 PTT Sensing and TX Audio Processing

Internal microphone PTT is sensed by µP U403 pin 71. Radio transmits when this pin is “0” and selects inside the ASFIC_ CMP U504 internal Mic path. When the internal Mic PTT is “0” then external Mic PTT is grounded via D402. External Mic PTT is sensed by U403 pin 72 via Q412 circuits. The radio transmits when this pin is “0” and selects inside the ASFIC _CMP U504 External Mic path.

Inside the ASFIC CMP, the mic audio is filtered to eliminate frequency components outside the 300-3000Hz voice band, and pre-emphasized if pre-emphasis is enabled. The signal is then limited to prevent the transmitter from over deviating. The limited mic audio is then routed through a summer, which is used to add in signaling data, and then to a splatter filter to eliminate high frequency spectral components that could be generated by the limiter. The audio is then routed to an attenuator, which is tuned in the factory or the field to set the proper amount of FM deviation. The TX audio emerges from the ASFIC CMP at U504-pin 40 MOD IN, at which point it is routed to the RF section.

8.0 Transmit Signalling Circuits

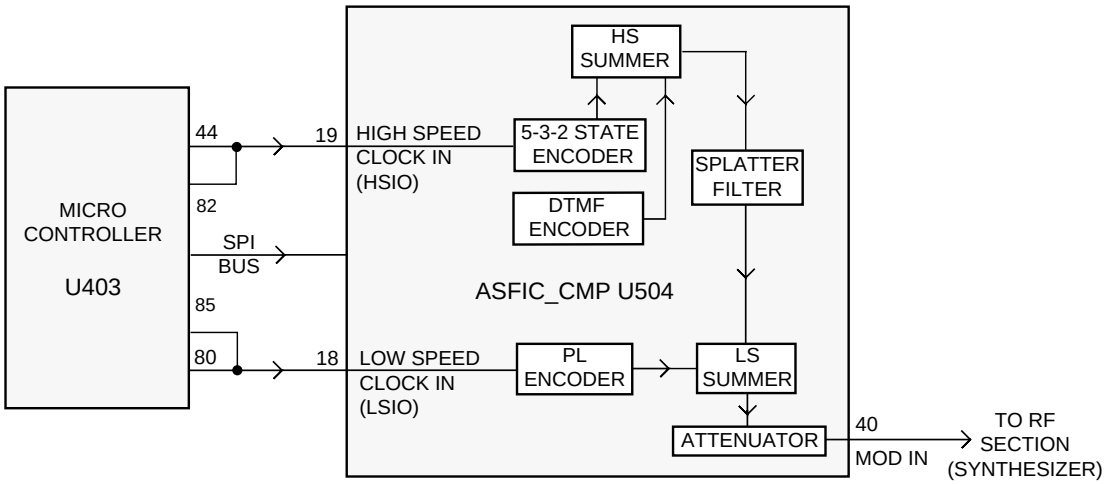


Figure 2-8 Transmit Signalling Path

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

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

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

8.1 Sub-Audio Data (PL/DPL)

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

Only one type of sub-audible data can be generated by U504 (ASFIC CMP) at any one time. The process is as follows, using the SPI BUS, the µP programs the ASFIC CMP to set up the proper low-speed data deviation and select the PL or DPL filters. The µP then generates a square wave which strobes the ASFIC PL / DPL encode input LSIO U504-pin 18 at twelve times the desired data rate. For example, for a PL frequency of 103Hz, the frequency of the square wave would be 1236Hz.

This drives a tone generator inside U504 which generates a staircase approximation to a PL sine wave or DPL data pattern. This internal waveform is then low-pass filtered and summed with voice or data. The resulting summed waveform then appears on U504-pin 40 (MOD IN), where it is sent to the RF board as previously described for transmit audio. A trunking connect tone would be generated in the same manner as a PL tone.

8.2 High Speed Data

High speed data refers to the 3600 baud data waveforms, known as Inbound Signaling Words (ISWs) used in a trunking system for high speed communication between the central controller and the radio. To generate an ISW, the µP first programs the ASFIC CMP (U504) to the proper filter and gain settings. It then begins strobing U504-pin 19 (HSIO) with a pulse when the data is supposed to change states. U504's 5-3-2 State Encoder (which is in a 2-state mode) is then fed to the post-limiter summer block and then the splatter filter. From that point it is routed through the modulation attenuator and then out of the ASFIC CMP to the RF board. MDC is generated in much the same way as trunking ISW. However, in some cases these signals may also pass through a data pre-emphasis block in the ASFIC CMP. Also these signaling schemes are based on sending a combination of 1200 Hz and 1800 Hz tones only. Microphone audio is muted during high speed data signaling.

8.3 Dual Tone Multiple Frequency (DTMF) Data

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

There are seven frequencies, with four in the low group (697, 770, 852, 941Hz) and three in the high group (1209, 1336, 1477Hz). The high-group tone is generated by the µP (U403-46) strobing U504-19 at six times the tone frequency for tones less than 1440Hz or twice the frequency for tones greater than 1440Hz. The low group tone is generated by the ASFIC CMP, controlled by the µP via SPI bus. Inside U504 the low-group and high-group tones are summed (with the amplitude of the high group tone being approximately 2 dB greater than that of the low group tone) and then pre-emphasized before being routed to the summer and splatter filter. The DTMF waveform then follows the same path as was described for high-speed data.

9.0 Receive Audio Circuits

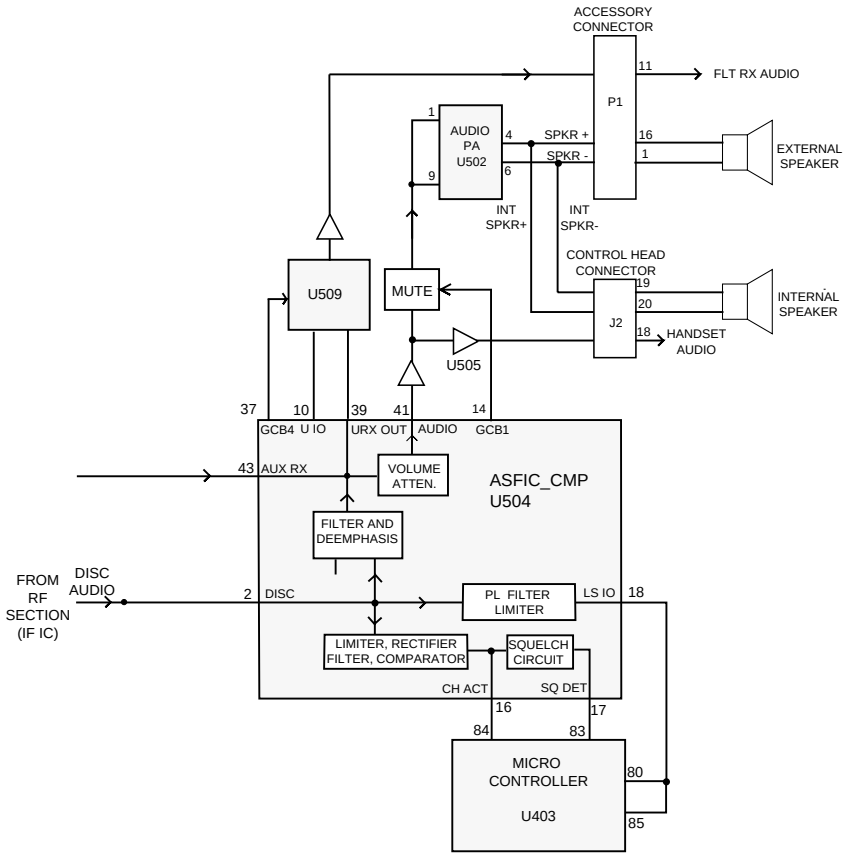


Figure 2-9 Receive Audio Paths

9.1 Squelch Detect

The radio's RF circuits are constantly producing an output at the discriminator (IF IC). This signal (DISC AUDIO) is routed to the ASFIC CMP's squelch detect circuitry input DISC (U504-pin 2). All of the squelch detect circuitry is contained within the ASFIC CMP. Therefore from a user's point of view, DISC AUDIO enters the ASFIC CMP, and the ASFIC CMP produces two CMOS logic outputs based on the result. They are CH ACT (U504-16) and SQ DET (U504-17).

The squelch signal entering the ASFIC CMP is amplified, filtered, attenuated, and rectified. It is then sent to a comparator to produce an active high signal on CH ACT. A squelch tail circuit is used to produce SQ DET (U504-17) from CH ACT. The state of CH ACT and SQ DET is high (logic "1") when carrier is detected, otherwise low (logic "0").

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

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

9.2 Audio Processing and Digital Volume Control

The receiver audio signal (DISC AUDIO) enters the controller section from the IF IC where it is.DC coupled to ASFIC CMP via the DISC input U504-pin 2. The signal is then applied to both the audio and the PL/DPL paths

The audio path has a programmable amplifier, whose setting is based on the channel bandwidth being received, an LPF filter to remove any frequency components above 3000Hz, and a HPF to strip off any sub-audible data below 300Hz. Next, the recovered audio passes through a de-emphasis filter (if it is enabled to compensate for Pre-emphasis which is used to reduce the effects of FM noise). The IC then passes the audio through the 8-bit programmable attenuator whose level is set depending on the value of the volume control. Finally the filtered audio signal passes through an output buffer within the ASFIC CMP. The audio signal exits the ASFIC CMP at AUDIO output (U504 pin 41).

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

Since sub-audible signaling is summed with voice information on transmit, it must be separated from the voice information before processing. Any sub-audible signaling enters the ASFIC CMP from the IF IC at DISC U504-2. Once inside, it goes through the PL/DPL path. The signal first passes through one of the two low-pass filters, either the PL low-pass filter or the DPL/LST low-pass filter. Either signal is then filtered and goes through a limiter and exits the ASFIC CMP at LSIO (U504-pin 18). At this point, the signal will appear as a square wave version of the sub-audible signal which the radio received. The µP U403 pin 80 will decode the signal directly to determine if it is the tone / code which is currently active on that mode.

9.3 Audio Amplification Speaker (+) Speaker (-)

The output of the ASFIC CMP's digital volume pot, U504-pin 41 is routed through DC blocking capacitor C5049 to the audio PA (U502 pin 1 and 9).

The audio power amplifier has one inverted and one non-inverted output that produces the differential audio output SPK+/SPK- (U502 pins 4 and 6)

The audio PA is enabled via the ASFIC CMP (U504-GCB1). When the base of Q501 is low, the transistor is off and U502-pin 8 is high, using pull up resistor R5041, and the audio PA is ON. The voltage at U502-pin 8 must be above 8.5Vdc to properly enable the device.

If the voltage is between 3.3 and 6.4V, the device will be active but has its input (U502-pins 1/9) off. This is a mute condition which is used to prevent an audio pop when the PA is enabled.

The SPK+ and SPK- outputs of the audio PA have a DC bias which varies proportionately with B+ (U502- pin 7). B+ of 11V yields a DC offset of 5V, and B+ of 17V yields a DC offset of 8.5V. If either of these lines is shorted to ground, it is possible that the audio PA will be damaged. SPK+ and SPK- are routed to the accessory connector (P1-pin 1 and 16) and to the control head (connector J2-pins 19 and 20).

9.4 Handset Audio

Certain handheld accessories have a speaker within them which require a different voltage level than that provided by U502. For these devices HANDSET AUDIO is available at control head connector J2 pin18.

The received audio from the output of the ASFIC CMP's digital volume attenuator is routed to U505 pin 2 where it is amplified. This signal is routed from the output of the op-amp U505 to J2-pin 18. From the control head, the signal is sent directly to the microphone jack.

9.5 Filtered Audio and Flat Audio

The ASFIC CMP output audio at U504-pin 39 is filtered and de-emphasized, but has not gone through the digital volume attenuator. From ASFIC CMP U504-pin 39 the signal is routed via R5034 through gate U509-pin 12 and AC coupled to U505-pin 6. The gate controlled by ASFIC CMP port GCB4 selects between the filtered audio signal from the ASFIC CMP pin 39 (URXOUT) or the unfiltered (flat) audio signal from the ASFIC CMP pin 10 (UIO). Resistors R5034 and R5021 determine the gain of op-amp UU505-pin 6 for the filtered audio while R5032 and R5021 determine the gain for the flat Audio. The output of U505-pin 7 is then routed to P1 pin 11 via DC blocking capacitor C5003. Note that any volume adjustment of the signal on this path must be done by the accessory.

10.0 Receive Signalling Circuits

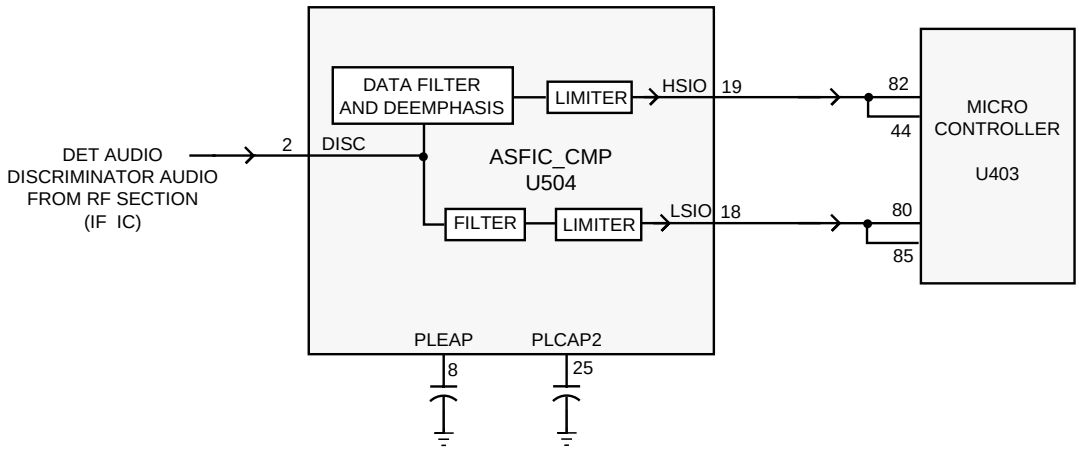


Figure 2-10 Receive Signalling Paths

10.1 Sub-Audio Data (PL/DPL) and High Speed Data Decoder

The ASFIC CMP (U504) is used to filter and limit all received data. The data enters the ASFIC CMP at input DISC (U504 pin 2). Inside U504 the data is filtered according to data type (HS or LS), then it is limited to a 0-3.3V digital level. The MDC and trunking high speed data appear at U504-pin 19, where it connects to the µP U403 pin 82.

The low speed limited data output (PL, DPL, and trunking LS) appears at U504-pin18, where it connects to the µP U403-pin 80.

The low speed data is read by the µP at twice the frequency of the sampling waveform; a latch configuration in the ASFIC CMP stores one bit every clock cycle. The external capacitors C5028, and C5026 set the low frequency pole for a zero crossings detector in the limiters for PL and HS data. The hysteresis of these limiters is programmed based on the type of received data.

10.2 Alert Tone Circuits

When the software determines that it needs to give the operator an audible feedback (for a good key press, or for a bad key press), or radio status (trunked system busy, phone call, circuit failures), it sends an alert tone to the speaker. It does so by sending SPI BUS data to U504 which sets up the audio path to the speaker for alert tones. The alert tone itself can be generated in one of two ways: internally by the ASFIC CMP, or externally using the µP and the ASFIC CMP.

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

For external alert tones, the µP can generate any tone within the 100-3000Hz audio band. This is accomplished by the µP generating a square wave which enters the ASFIC CMP at U504 pin 19. Inside the ASFIC CMP this signal is routed to the alert tone generator.

The output of the generator is summed into the audio chain just after the RX audio de-emphasis block. Inside U504, the tone is amplified and filtered, then passed through the 8-bit digital volume attenuator, which is typically loaded with a special value for alert tone audio. The tone exits at U504-pin 41 and is routed to the audio PA like receive audio.

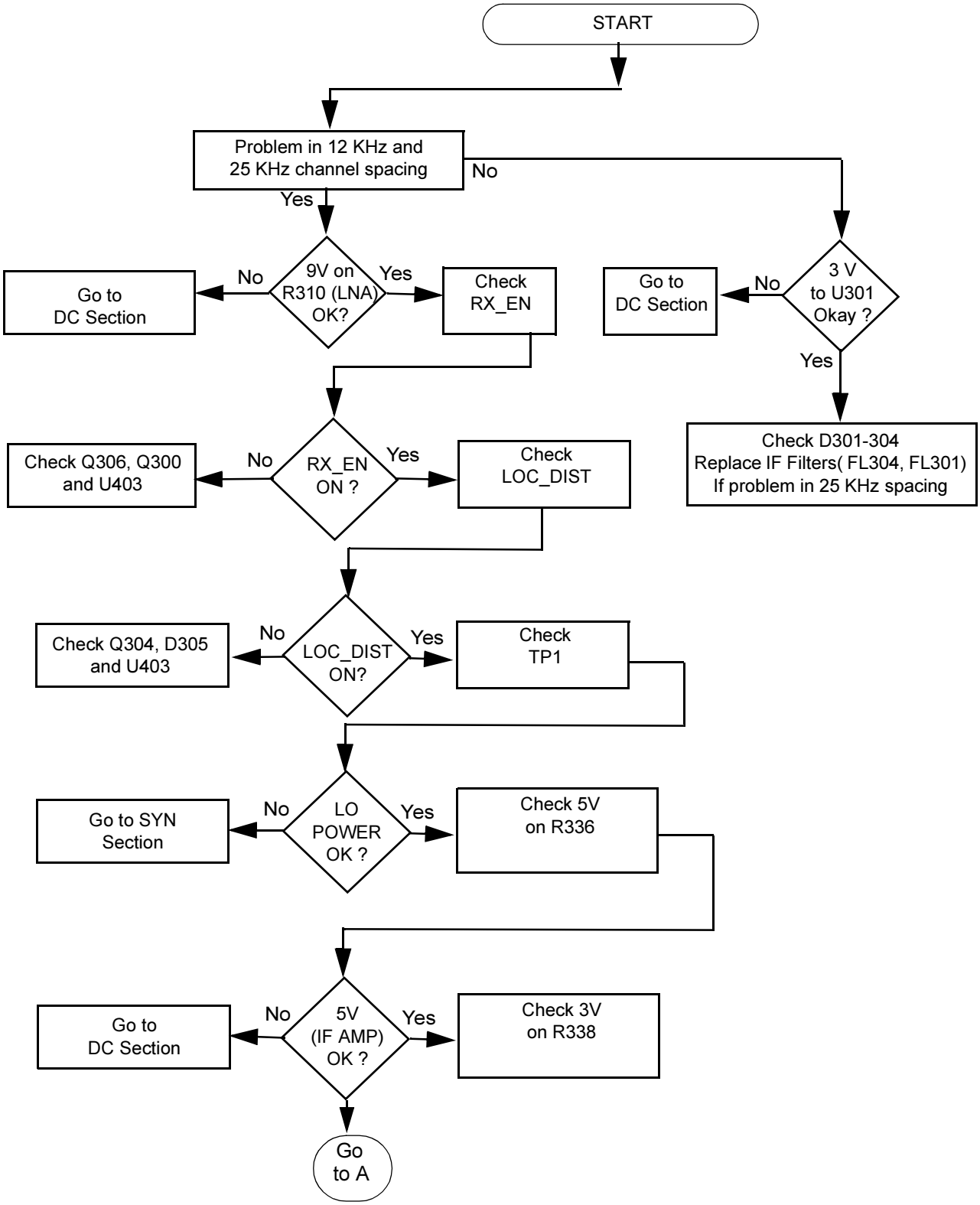
Chapter 3

TROUBLESHOOTING CHARTS

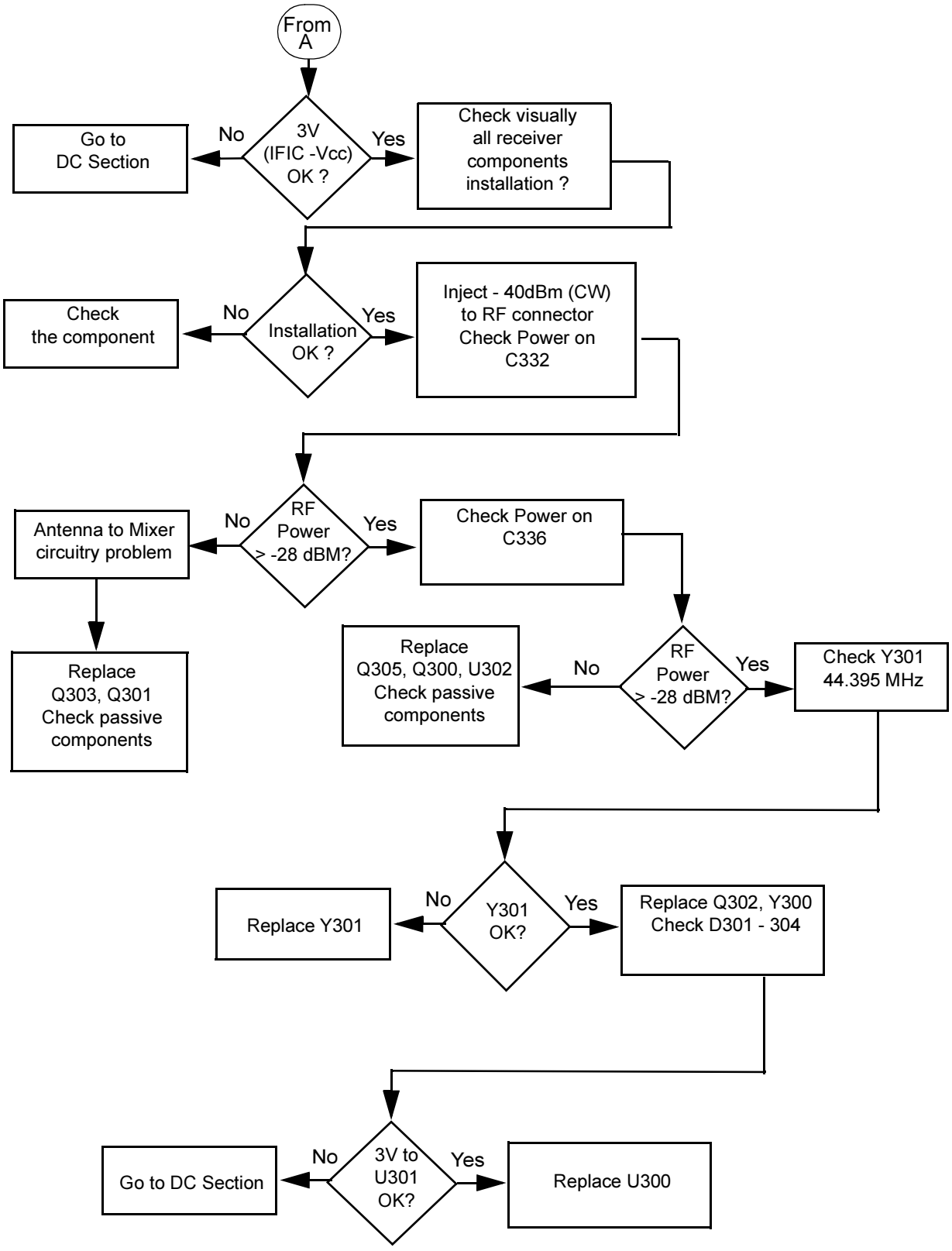
This section contains detailed troubleshooting flowcharts. These charts should be used as a guide in determining the problem areas. They are not a substitute for knowledge of circuit operation and astute troubleshooting techniques. It is advisable to refer to the related detailed circuit descriptions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

Most troubleshooting charts 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.

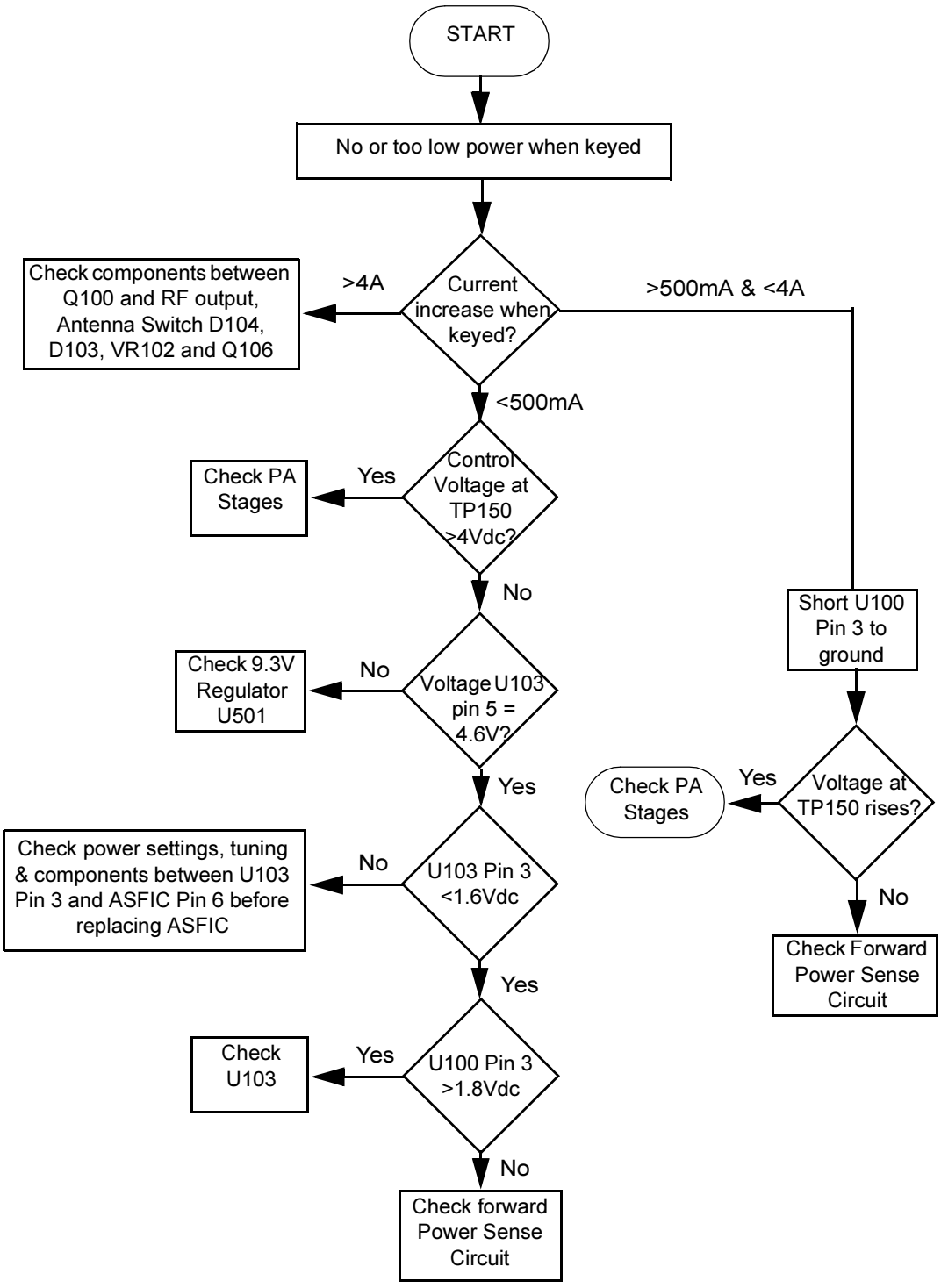
1.0 Troubleshooting Flow Chart for Receiver RF (Sheet 1 of 2)



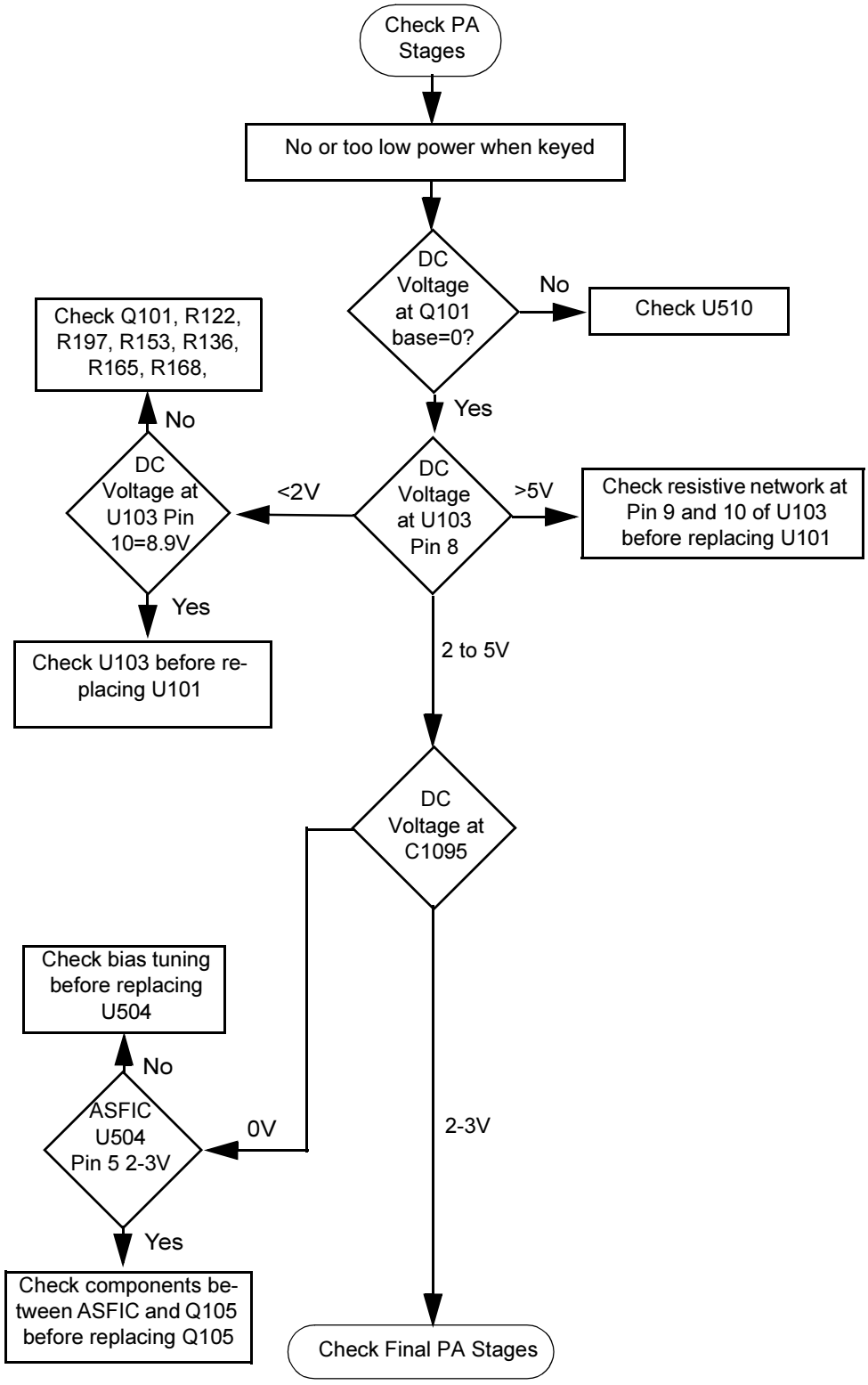
1.1 Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



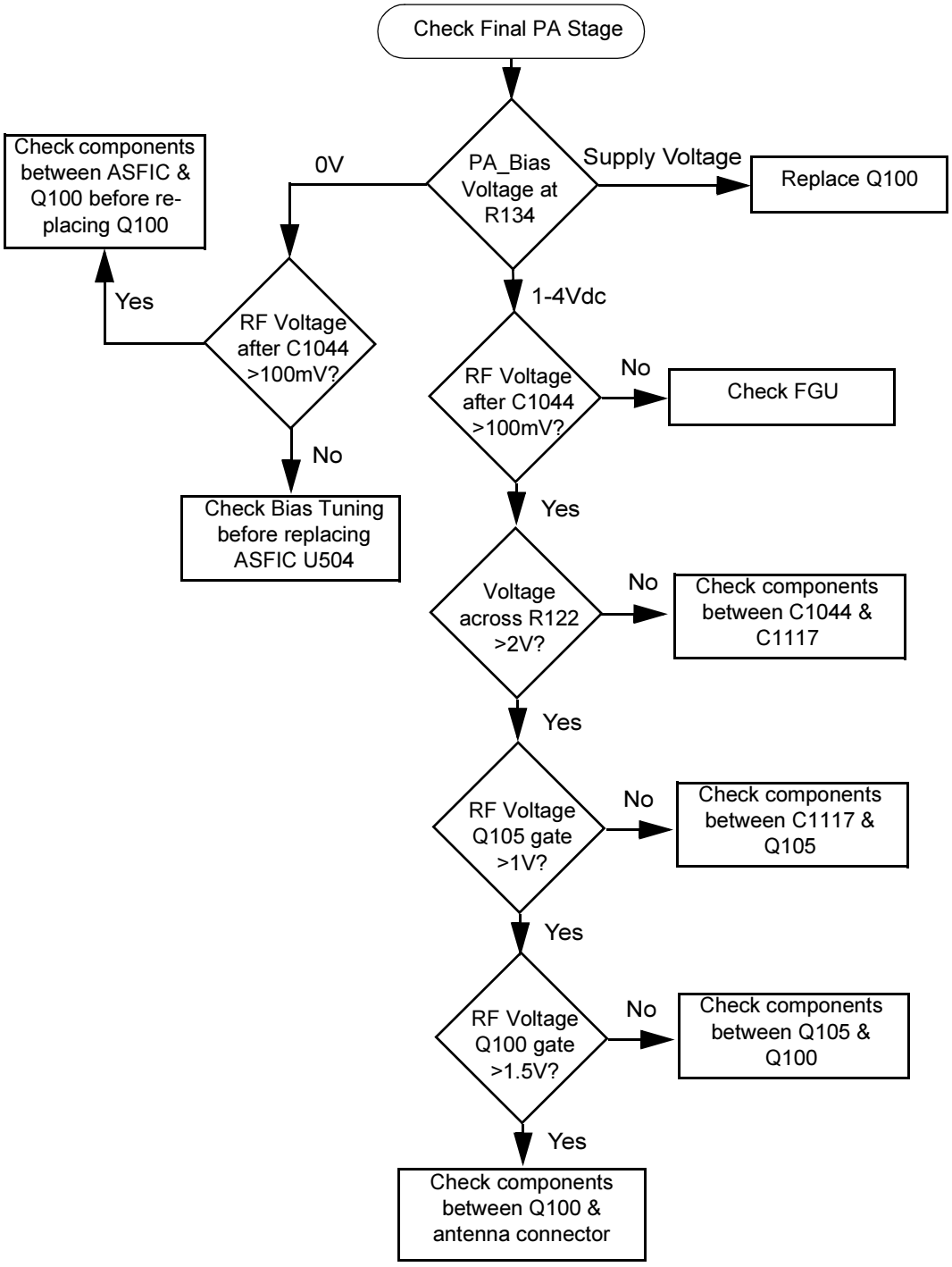
2.0 Troubleshooting Flow Chart for 45W Transmitter (Sheet 1 of 3)



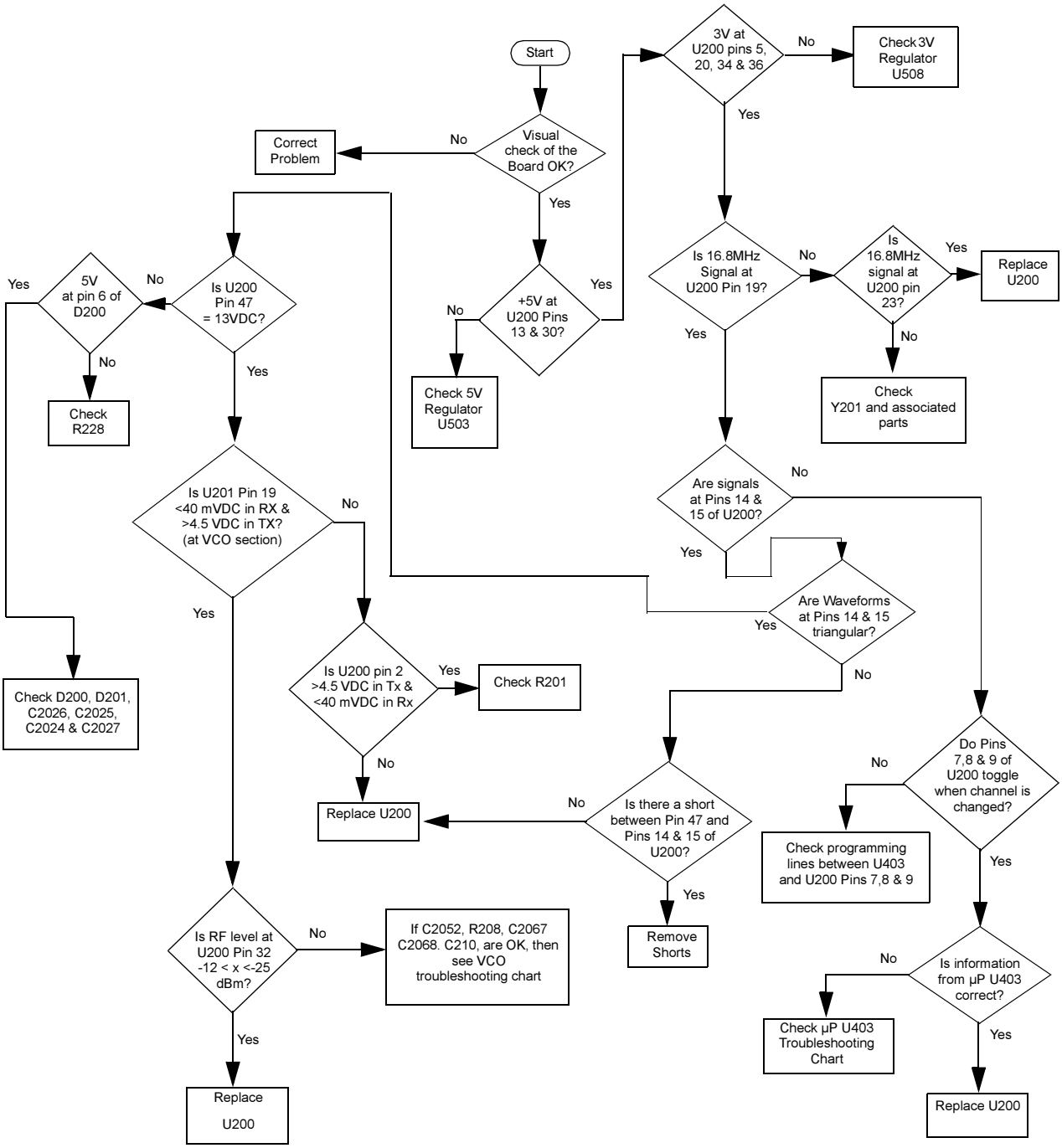
2.1 Troubleshooting Flow Chart for 45W Transmitter (Sheet 2 of 3)



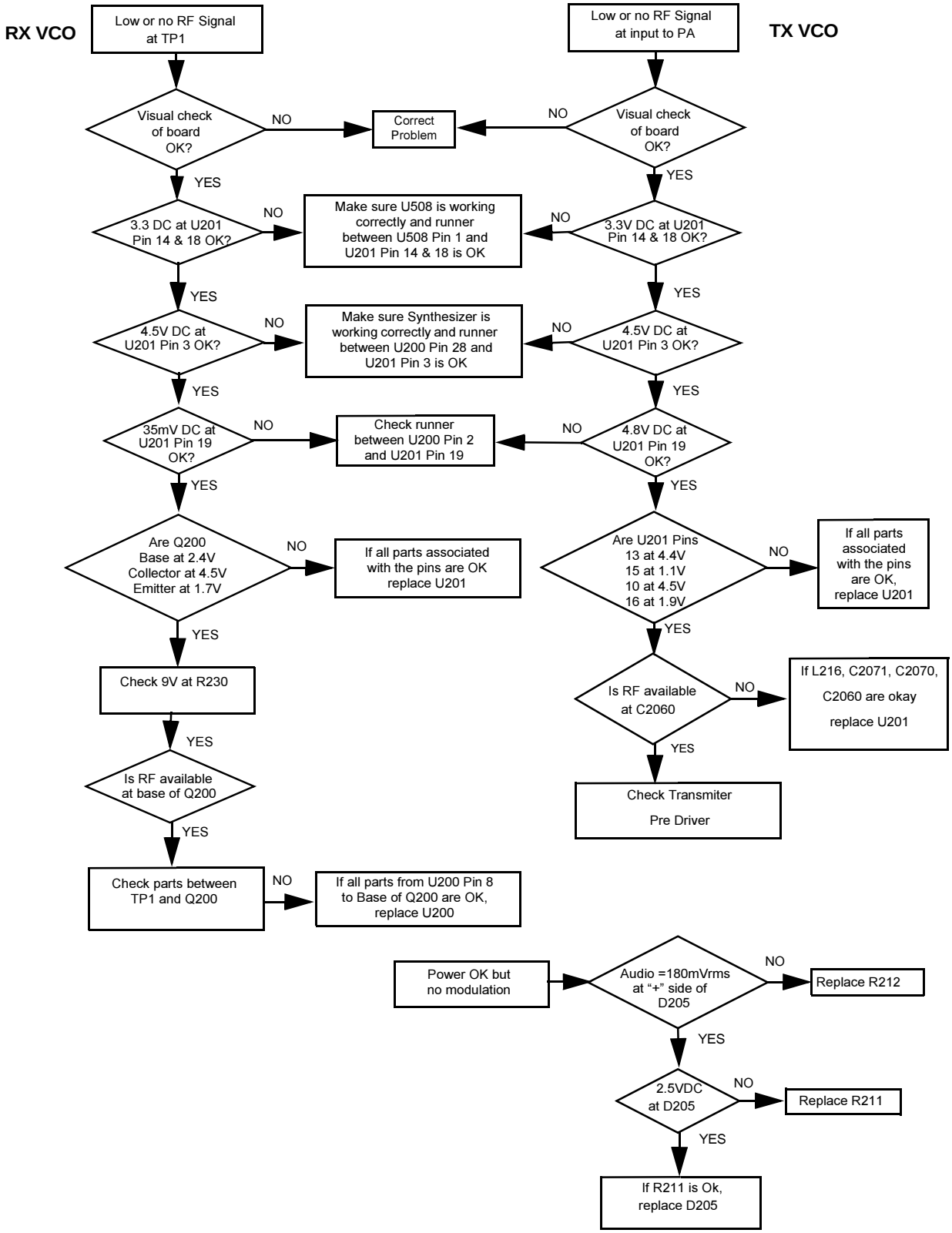
2.2 Troubleshooting Flow Chart for 45W Transmitter (Sheet 3 of 3)



3.0 Troubleshooting Flow Chart for Synthesizer

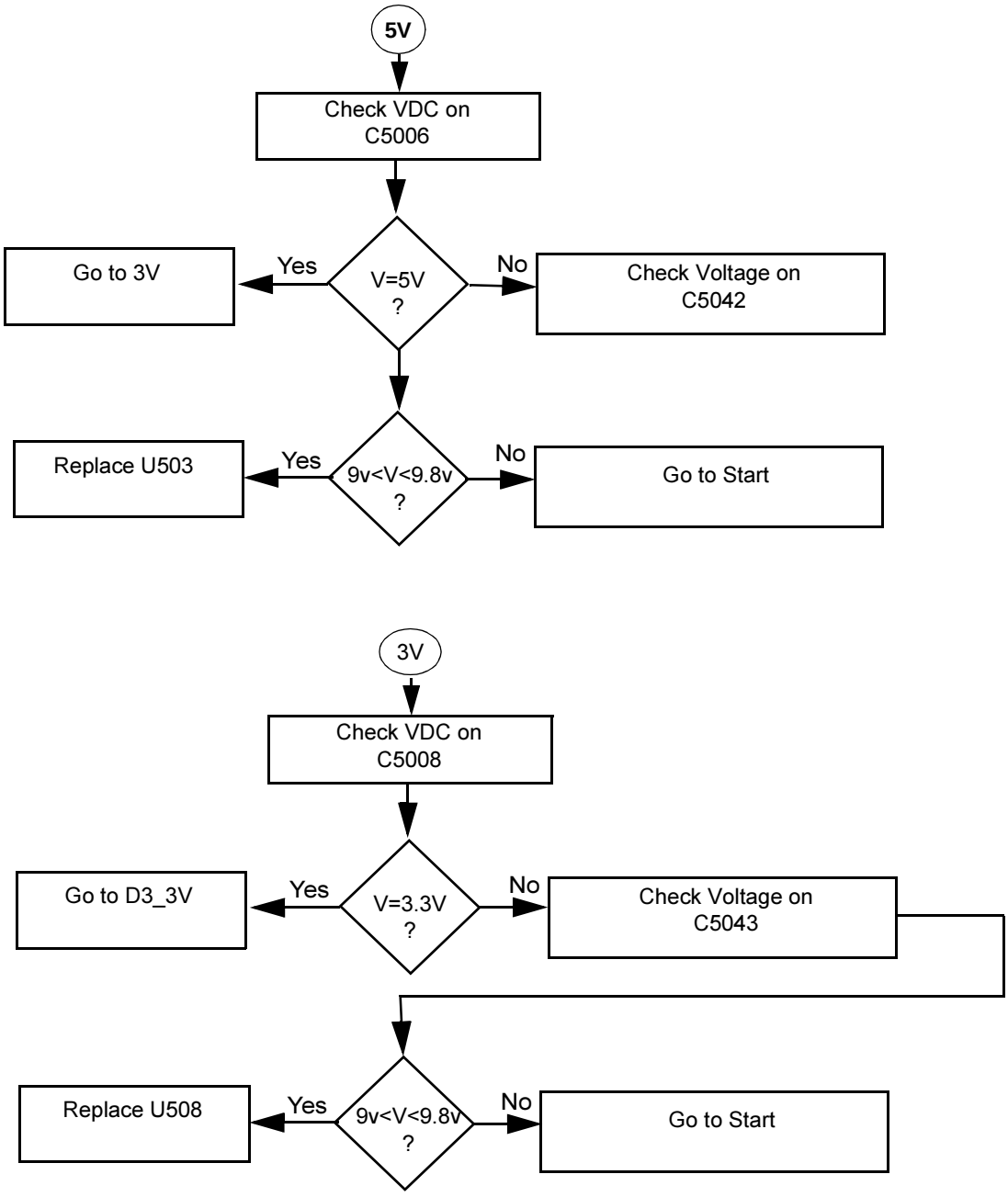


4.0 Troubleshooting Flow Chart for VCO

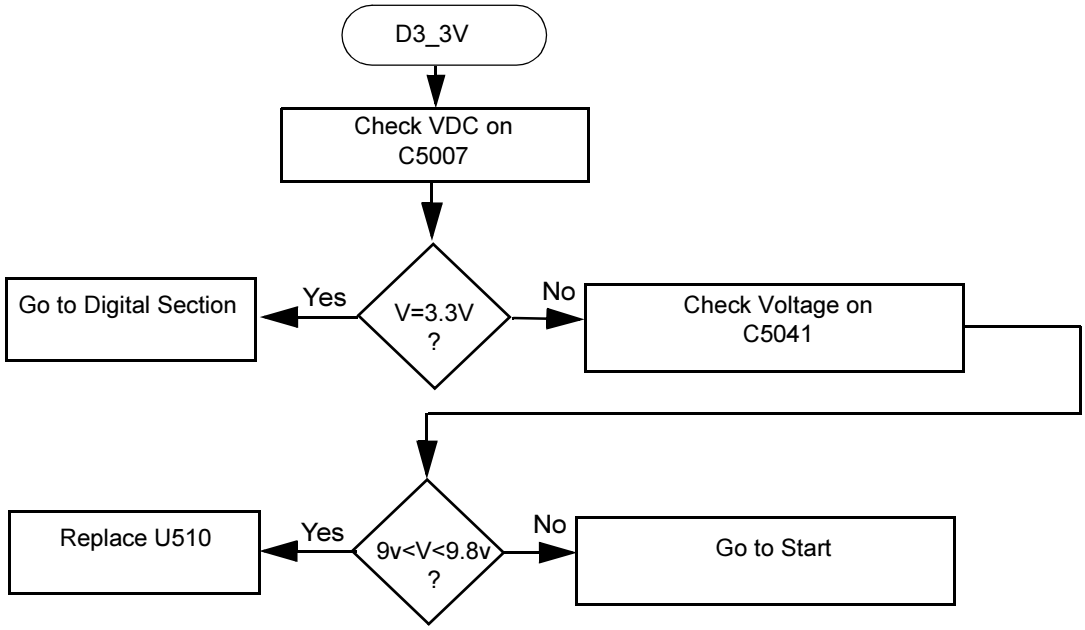


5.0 Troubleshooting Flow Chart for DC Supply (1 of 2)

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



5.1 Troubleshooting Flow Chart for DC Supply (2 of 2)



Chapter 4

VHF2 PCB/ SCHEMATICS/ PARTS LISTS

1.0 Allocation of Schematics and Circuit Boards

1.1 VHF2 and Controller Circuits

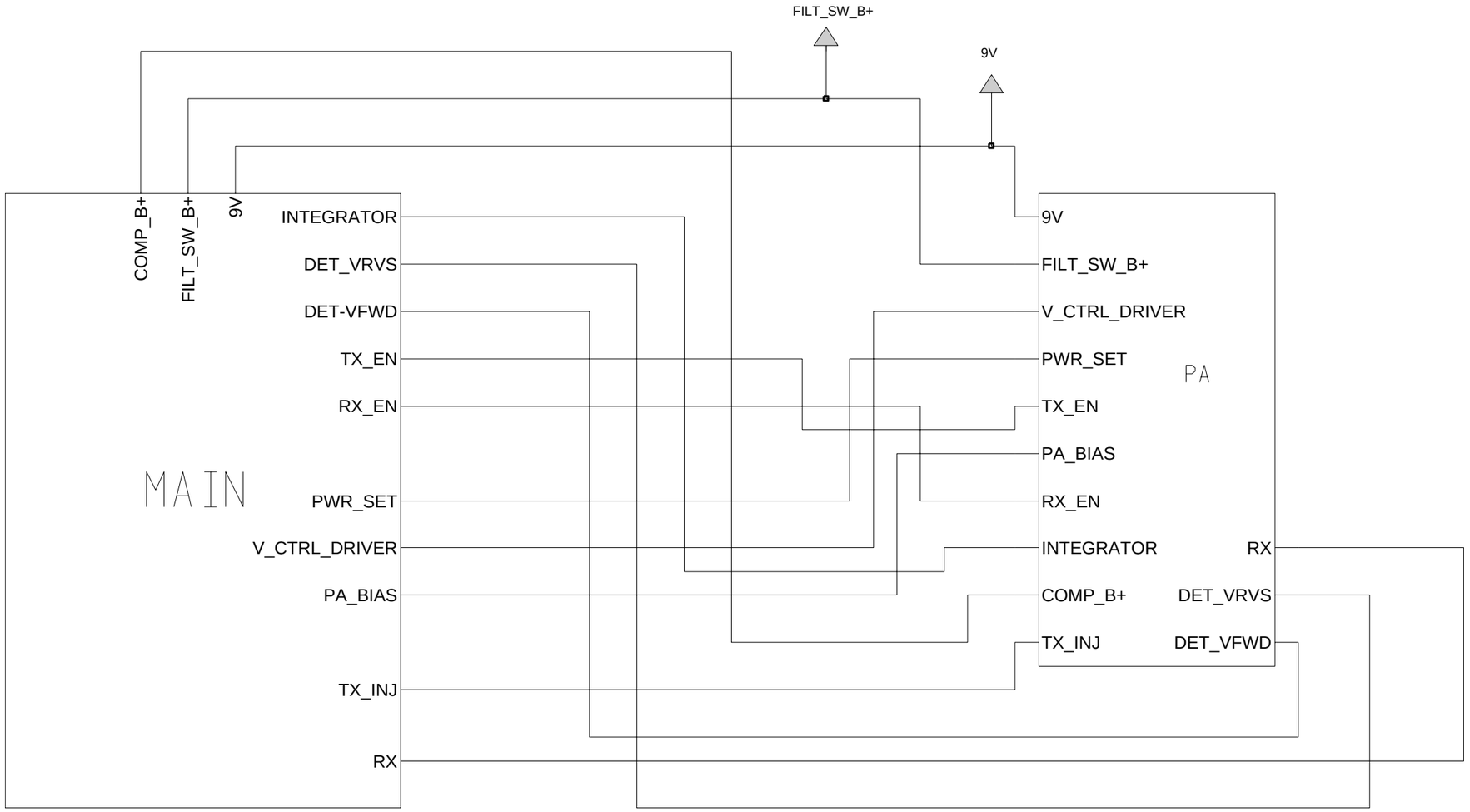
The VHF circuits are contained on the printed circuit board (PCB) which also contains the Controller circuits. This Chapter shows the schematics for both the VHF circuits and the Controller circuits. The PCB component layouts and the Parts Lists in this Chapter show both the Controller and VHF circuit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

Table 4-1 VHF2 25-45W Diagrams and Parts Lists

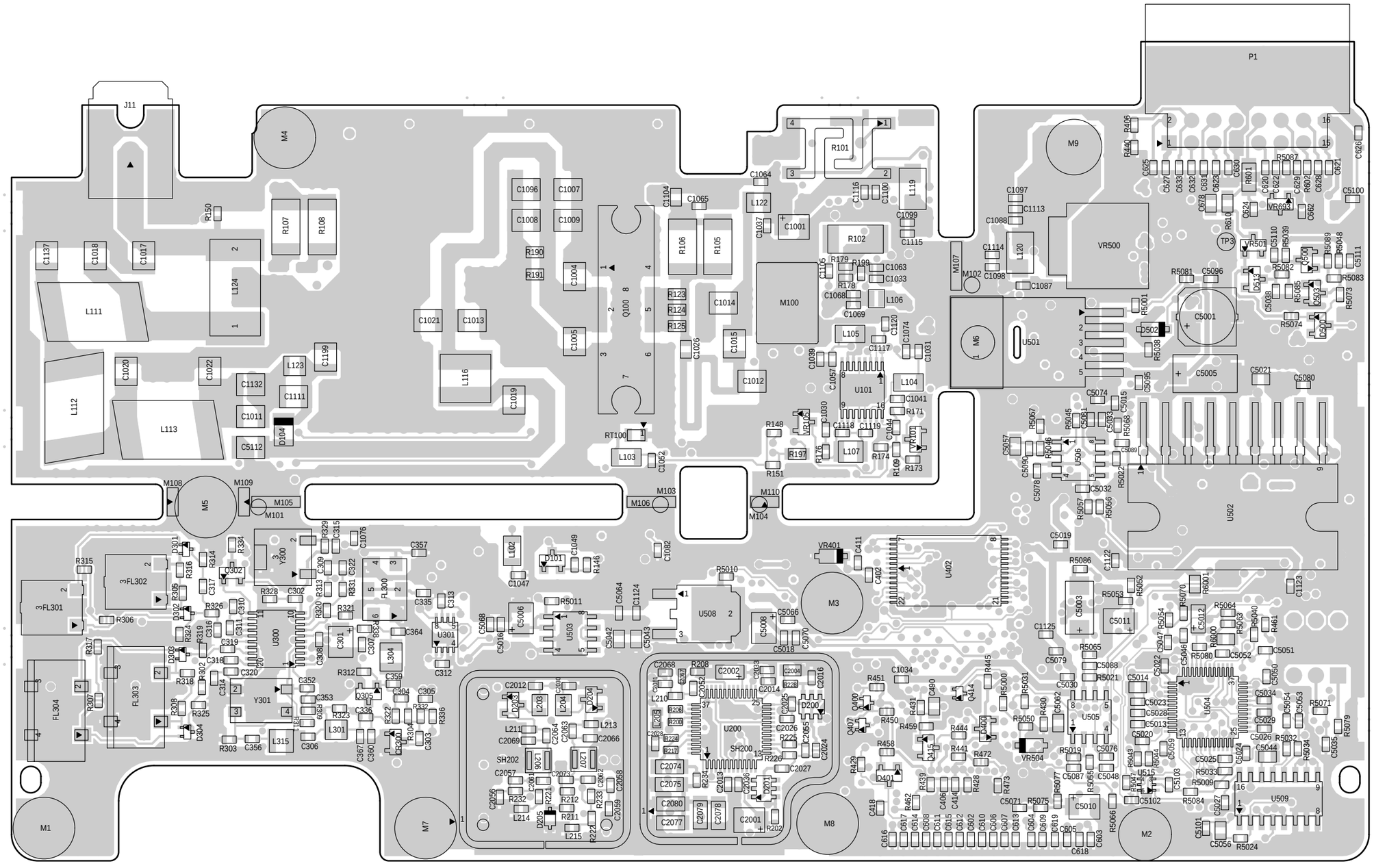
Table 4-2 VHF2 25-45W Diagrams and Parts Lists

THIS PAGE INTENTIONALLY LEFT BLANK

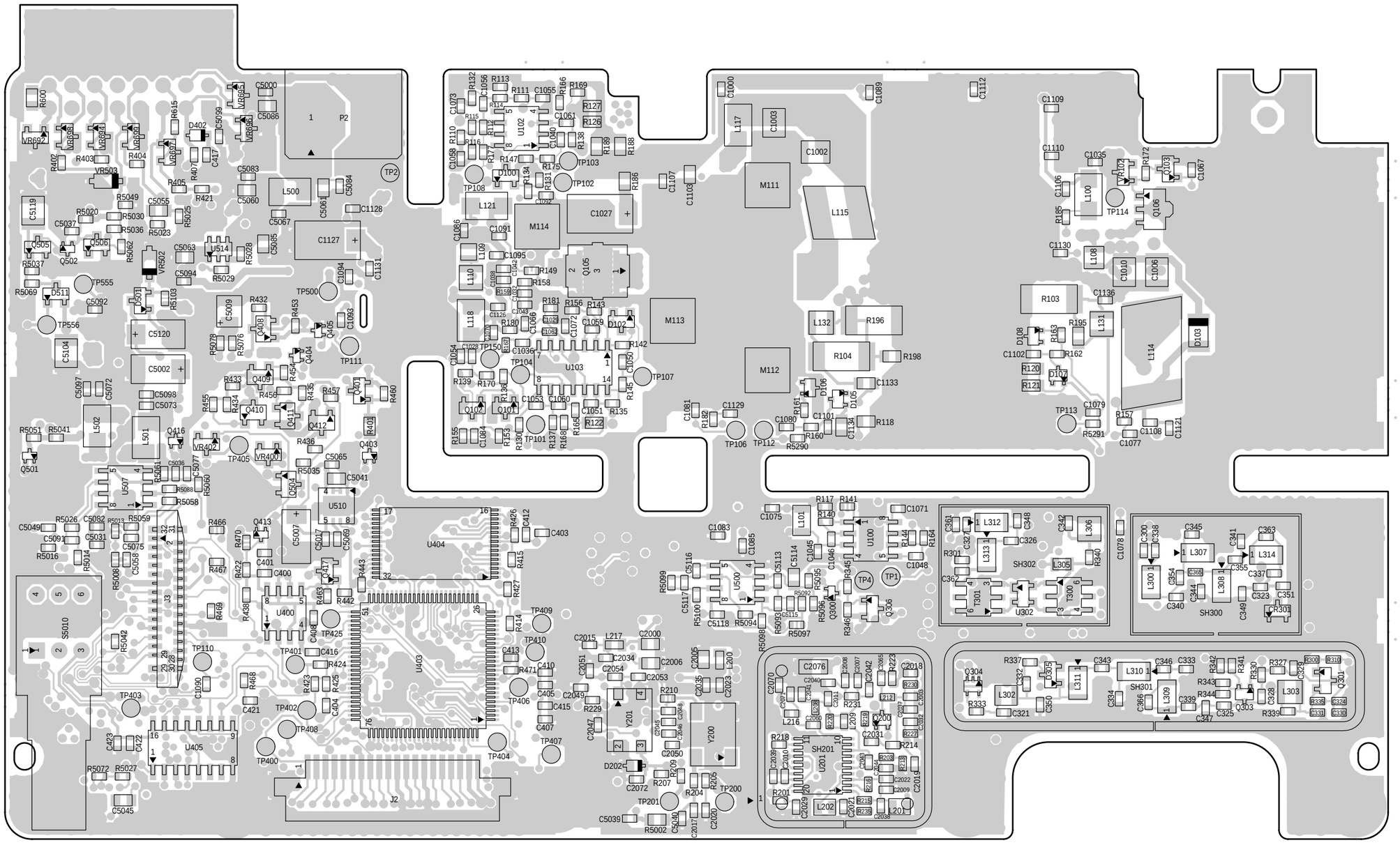
2.0 VHF 2, 25-45W PCB 8486487Z03-B / Schematics



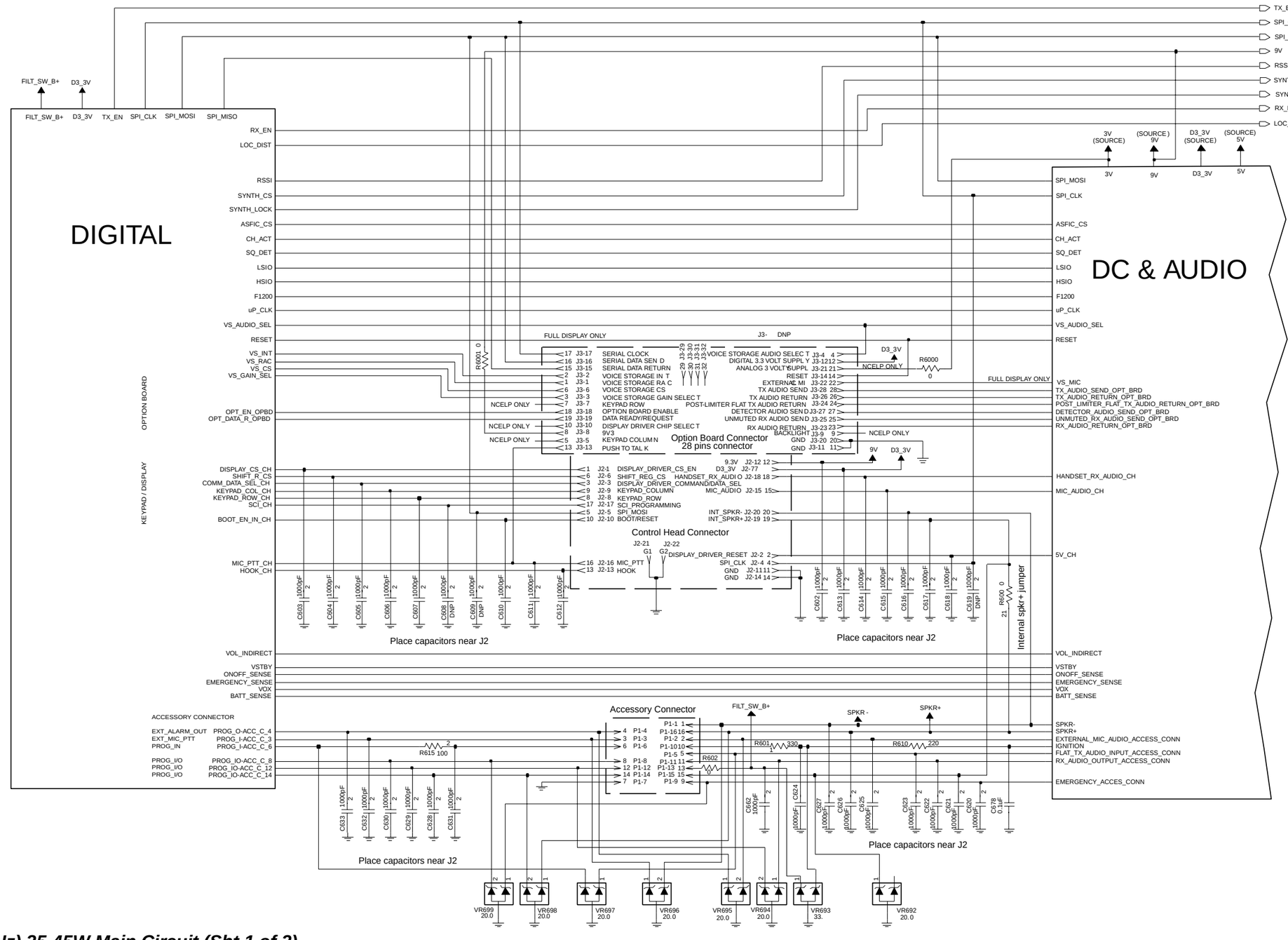
VHF2 Interconnection between Main Board and Power Amplifier Compartment



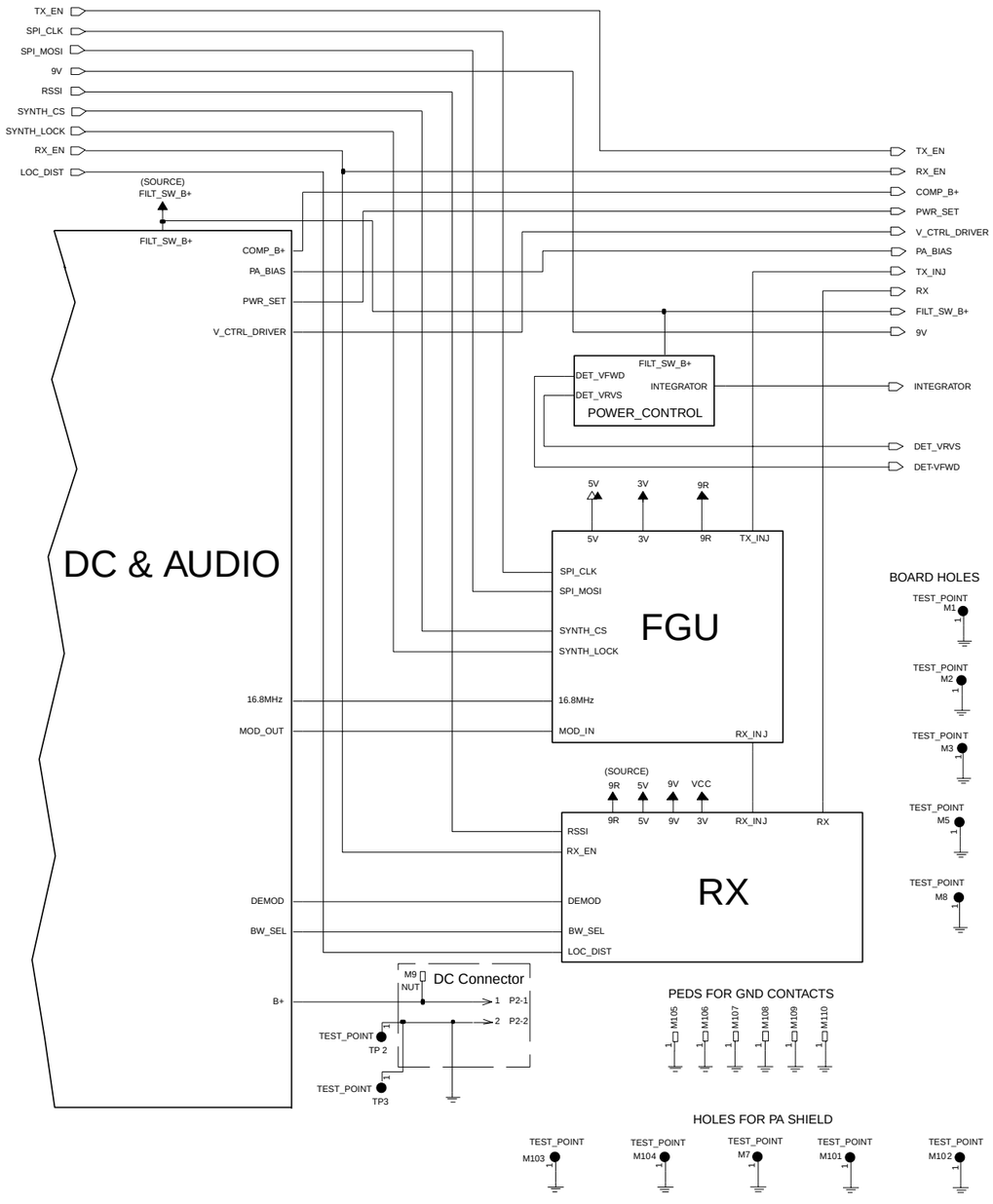
VHF2 (146-174MHz) 25-45W 8486487Z03-B Top Side



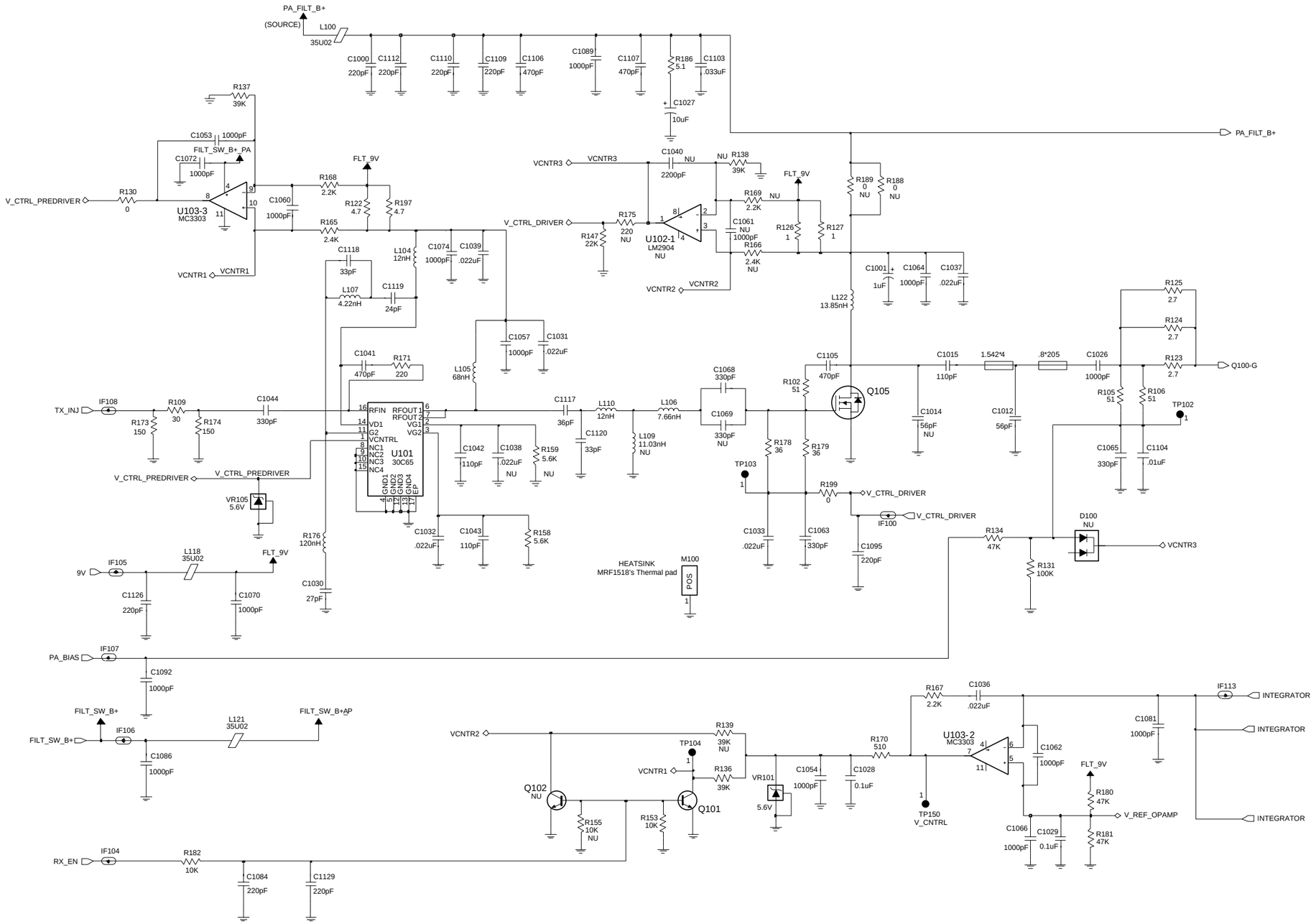
VHF2 (146-174MHz) 25-45W 8486487Z03-B Bottom Side



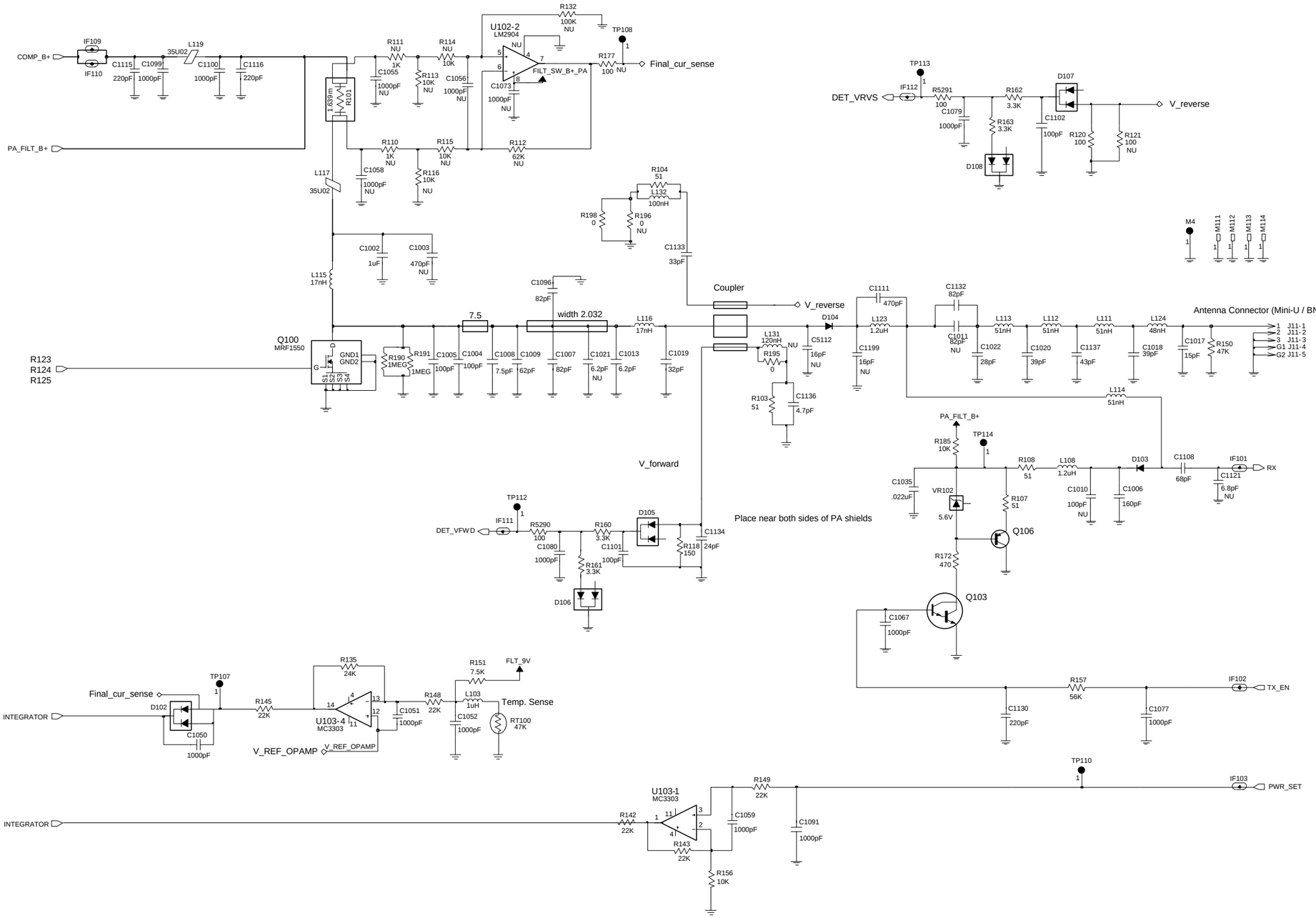
VHF2 (146-174MHz) 25-45W Main Circuit (Sht 1 of 2)



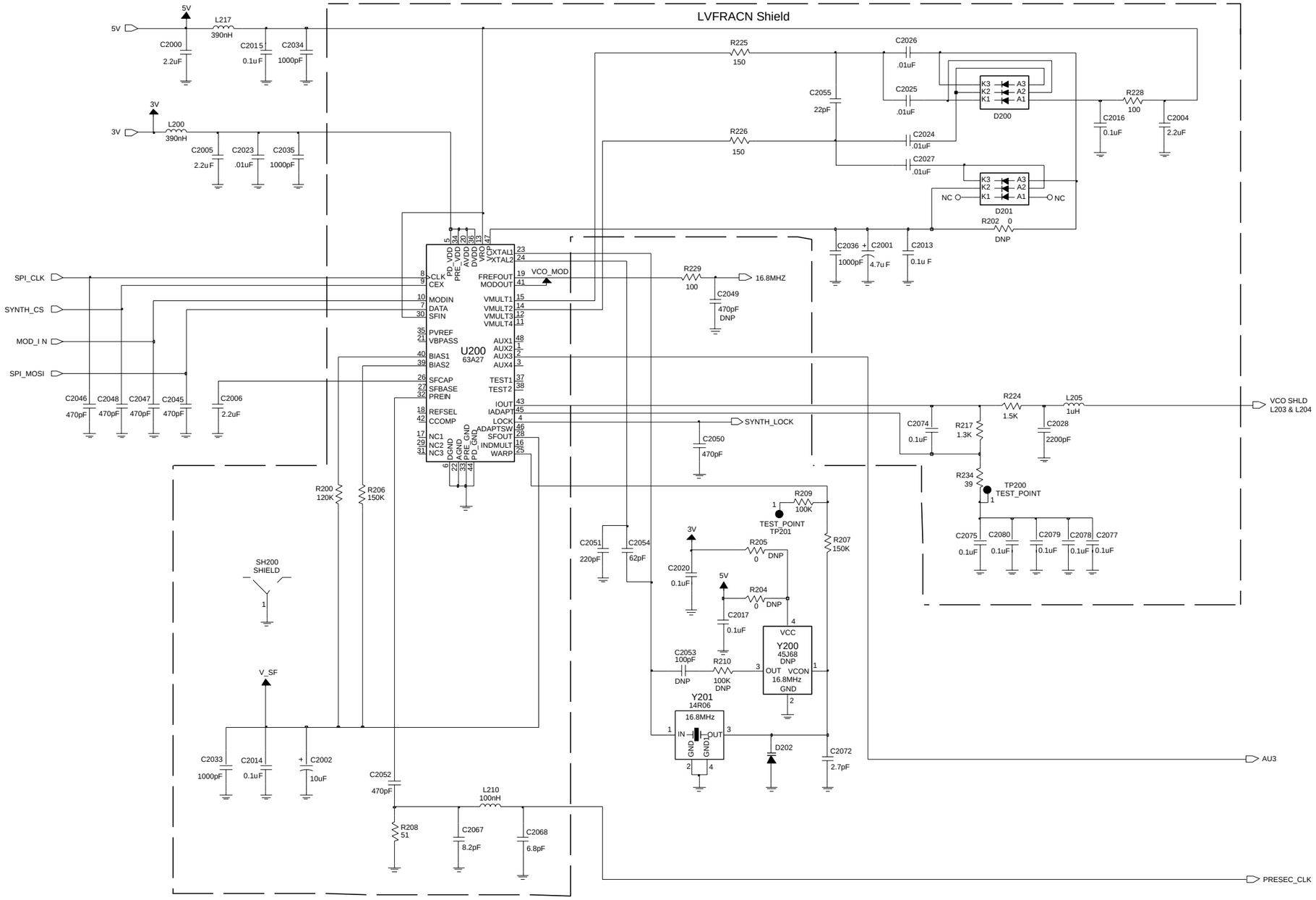
VHF2 (146-174MHz) 25-45W Main Circuit (Sht 2 of 2)



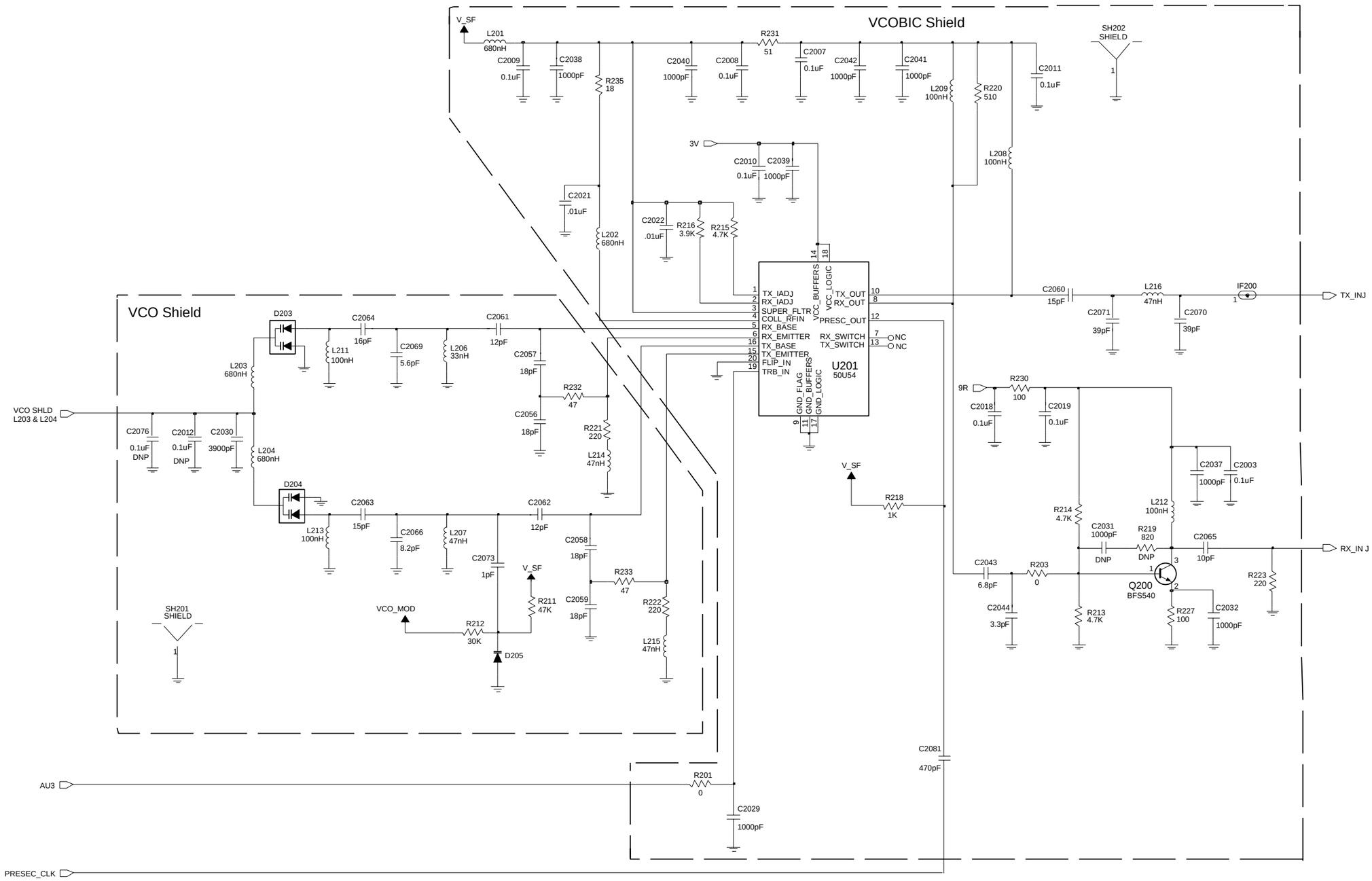
VHF2 (146-174MHz) 25-45W Transmitter (Sht 1 of 2)



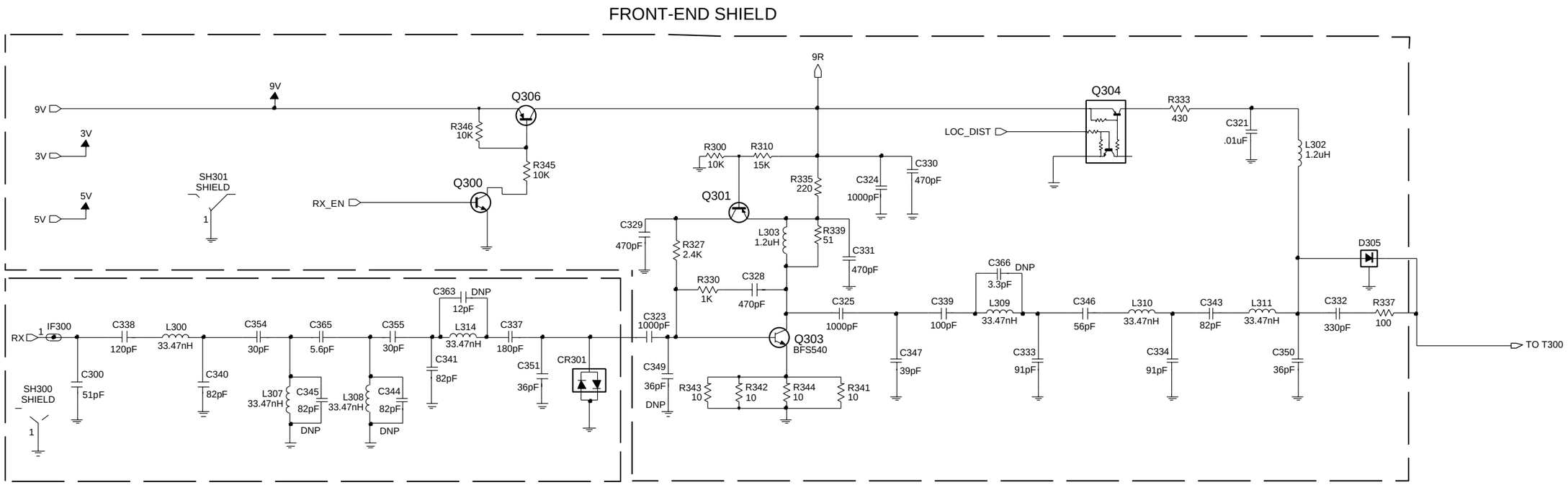
VHF2 (146-174MHz) 25-45W Transmitter (Sht 2 of 2)



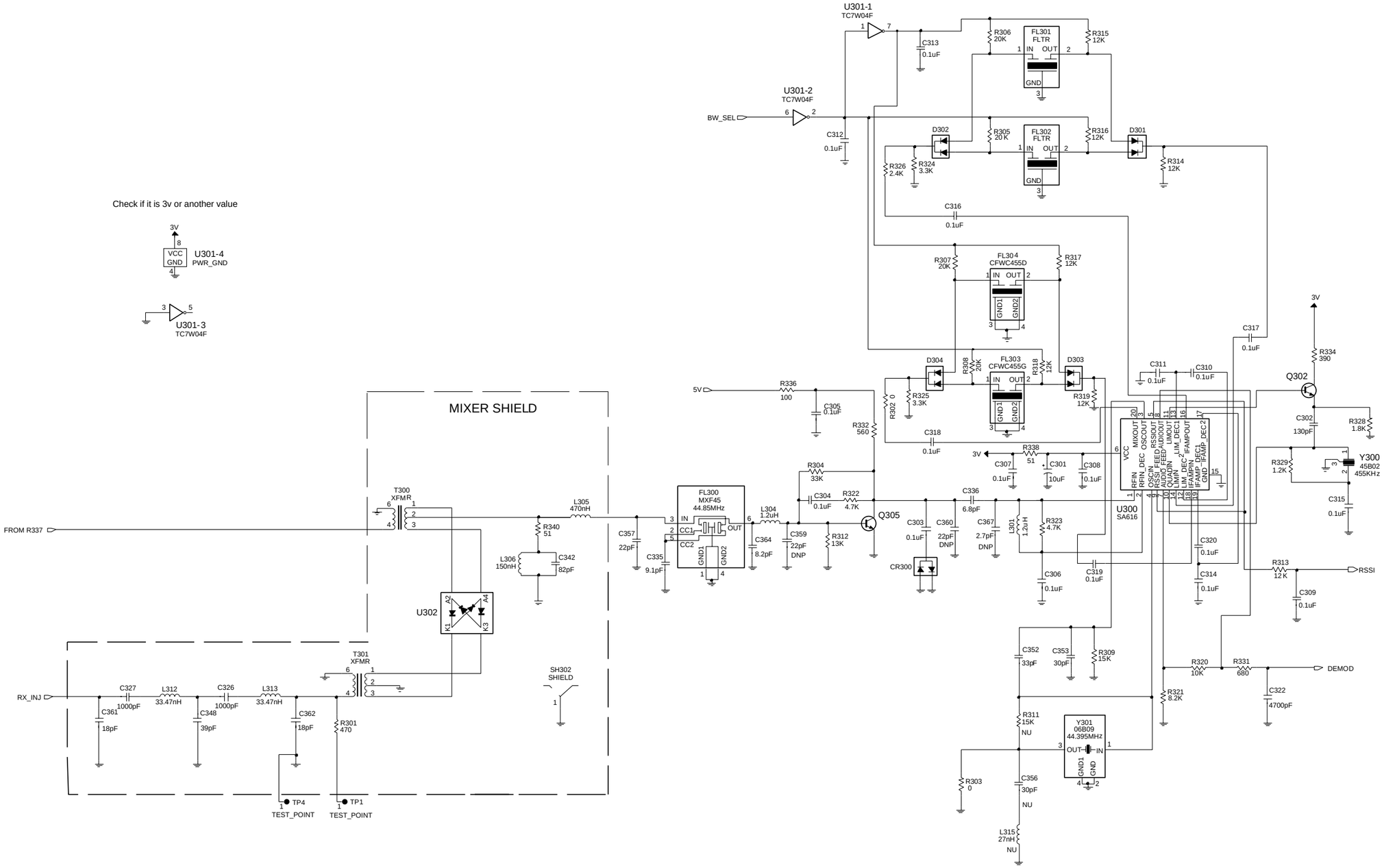
VHF2 (146-174MHz) 25-45W Synthesiser and VCO (Sht 1 of 2)



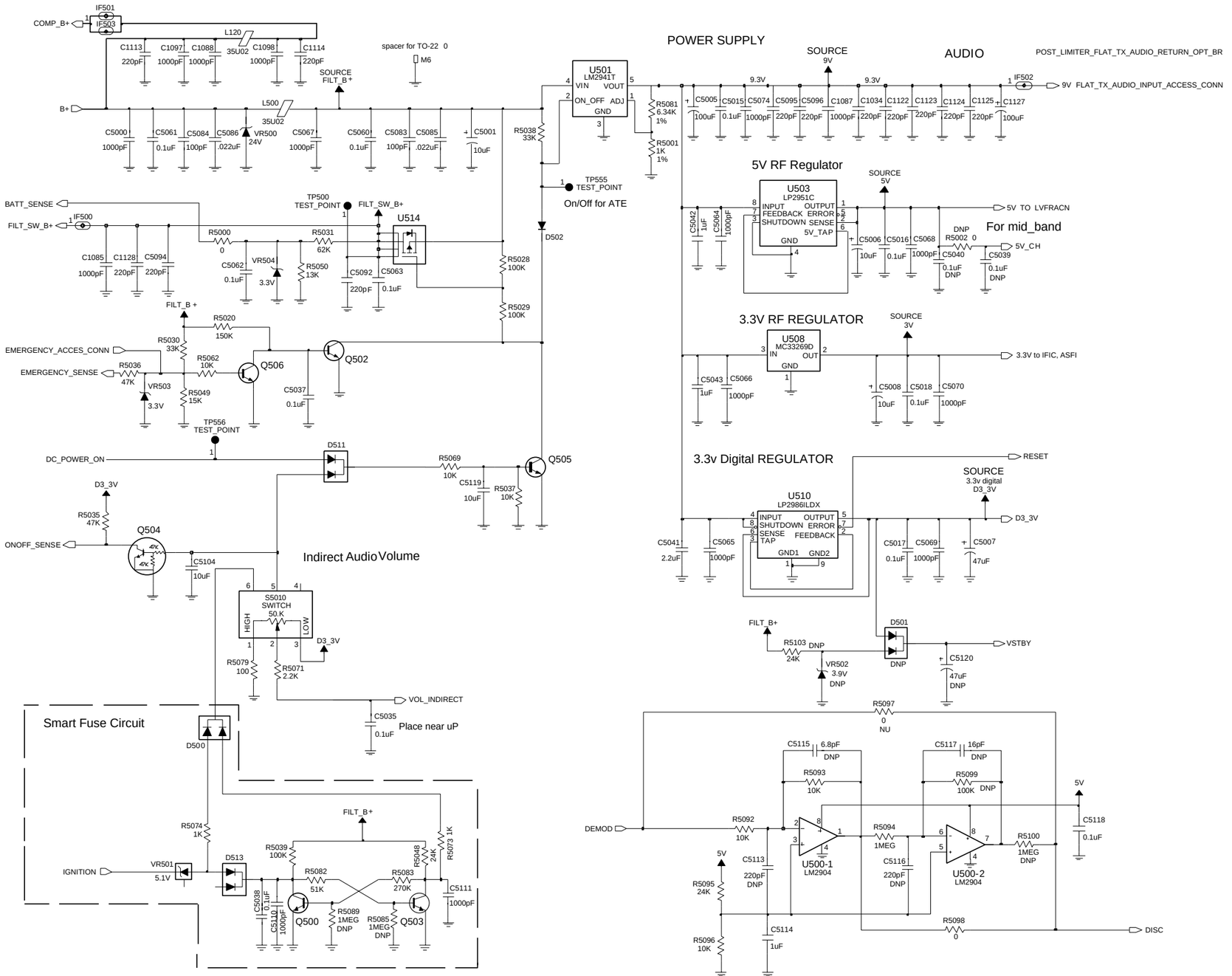
VHF2 (146-174MHz) 25-45W Synthesiser and VCO (Sht 2 of 2)



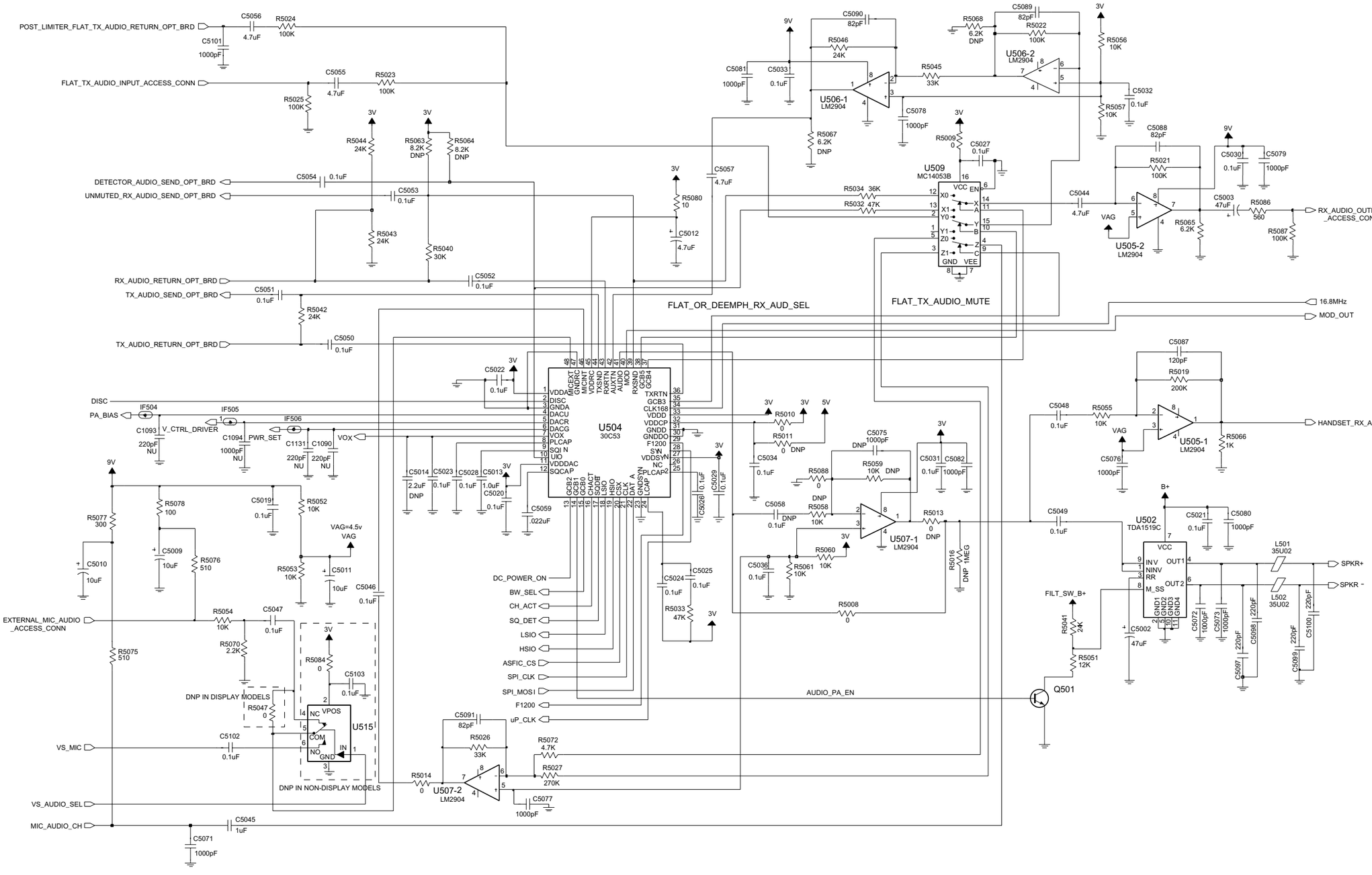
VHF2 (146-174MHz) 25-45W Receiver Front and Back End (Sht 1 of 2)



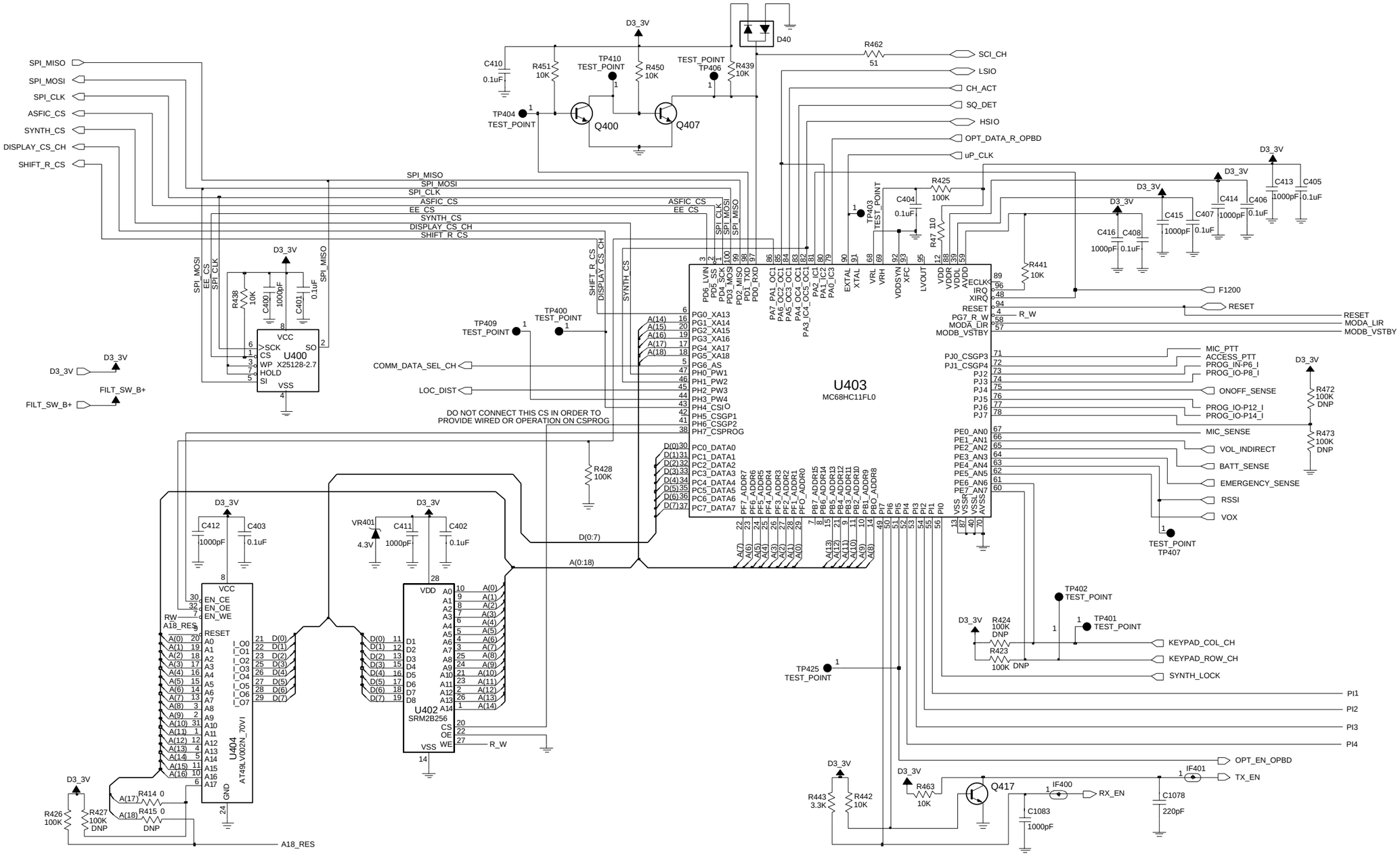
VHF2 (146-174MHz) 25-45W Receiver Front and Back End (Sht 2 of 2)



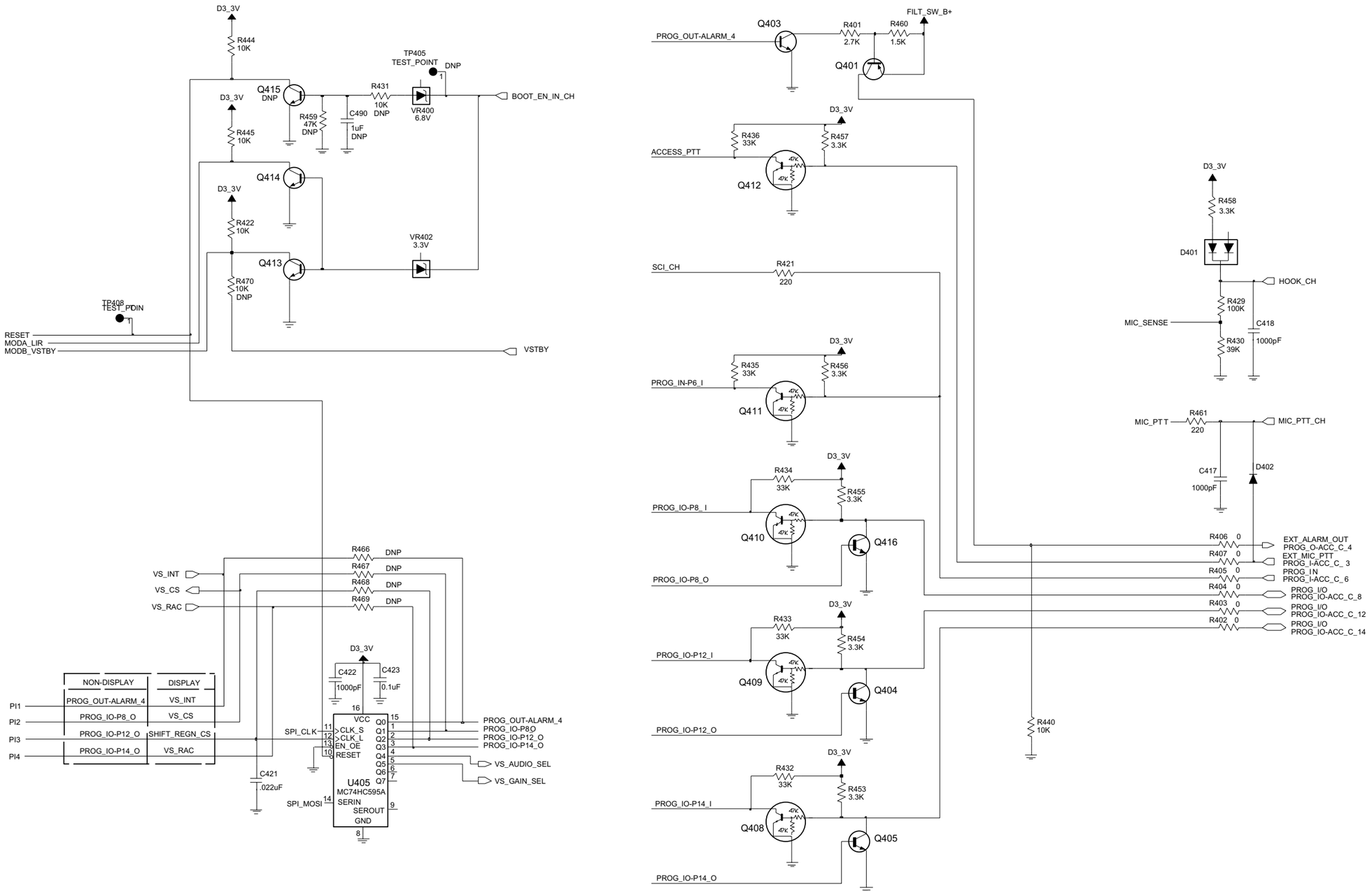
VHF2 (146-174MHz) 25-45W DC and Audio Circuits (Sht 1 of 2)



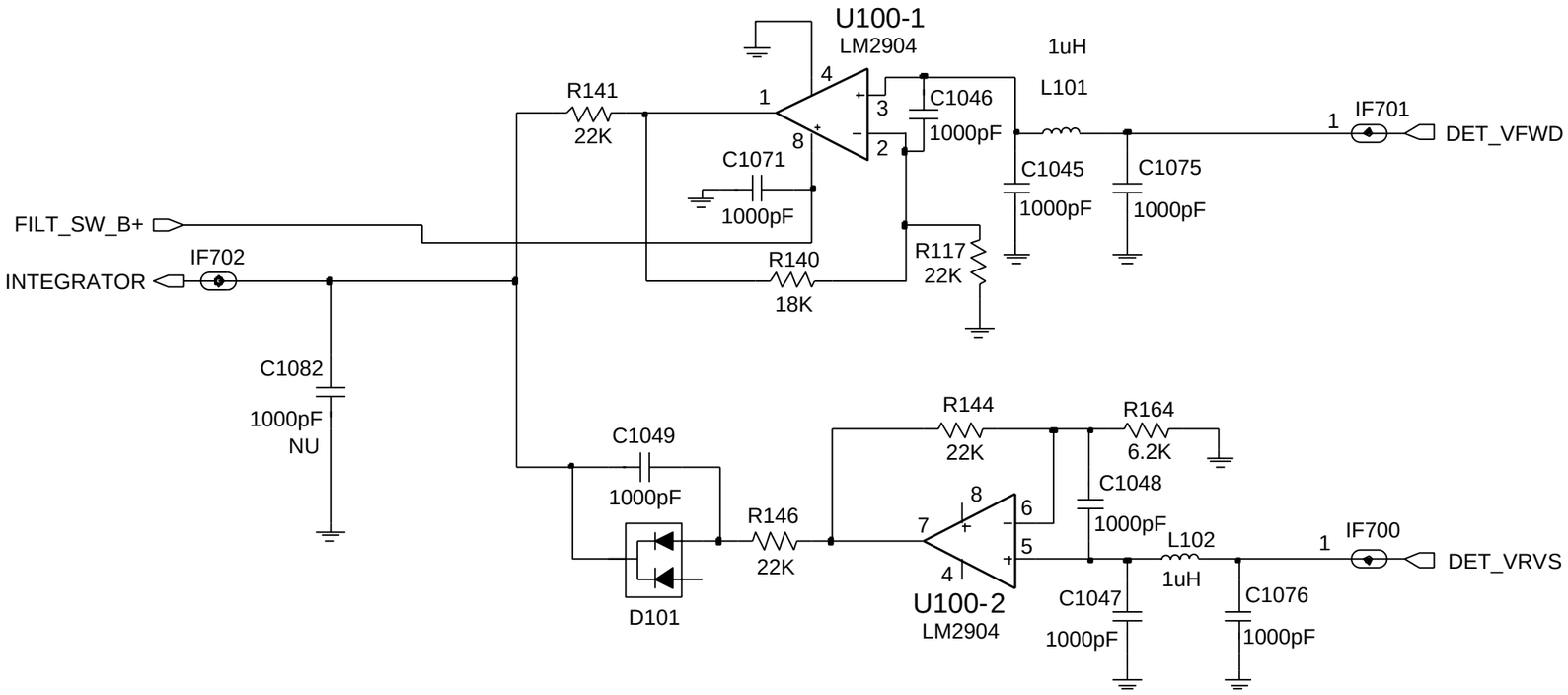
VHF2 (146-174MHz) 25-45W DC and Audio Circuits (Sht 2 of 2)



VHF2 (146-174MHz) 25-45W Microprocessor and Controller Circuits (Sht 1 of 2)



VHF2 (146-174MHz) 25-45W Microprocessor and Controller Circuits (Sht 2 of 2)



VHF2 (146-174MHz) 25-45W Power Control Circuit

2.1 VHF2 PCB 8486487Z03-B Parts List 25-45W

Circuit Ref.	Motorola Part No.	Description
C300	2113740F44	CAP, 51pF
C301	2311049A57	CAP, 10uF
C302	2113740F54	CAP, 130pF
C303	2113743K15	CAP, 0.1uF
C304	2113743E20	CAP, 0.1uF
C305	2113743E20	CAP, 0.1uF
C306	2113743E20	CAP, 0.1uF
C307	2113743E20	CAP, 0.1uF
C308	2113743E20	CAP, 0.1uF
C309	2113743E20	CAP, 0.1uF
C310	2113743E20	CAP, 0.1uF
C311	2113743E20	CAP, 0.1uF
C312	2113743E20	CAP, 0.1uF
C313	2113743E20	CAP, 0.1uF
C314	2113743E20	CAP, 0.1uF
C315	2113743E20	CAP, 0.1uF
C316	2113743E20	CAP, 0.1uF
C317	2113743E20	CAP, 0.1uF
C318	2113743E20	CAP, 0.1uF
C319	2113743E20	CAP, 0.1uF
C320	2113743E20	CAP, 0.1uF
C321	2113741F49	CAP, .01uF
C322	2113741F41	CAP, 4700pF
C323	2113741F25	CAP, 1000pF
C324	2113741F25	CAP, 1000pF
C325	2113741F25	CAP, 1000pF
C326	2113741F25	CAP, 1000pF
C327	2113741F25	CAP, 1000pF
C328	2113740F67	CAP, 470pF
C329	2113740F67	CAP, 470pF
C330	2113740F67	CAP, 470pF
C331	2113740F67	CAP, 470pF
C332	2113741F13	CAP, 330pF
C333	2113740L41	CAP, 91pF
C334	2113740L41	CAP, 91pF
C335	2113740L17	CAP, 9.1pF
C336	2113740L14	CAP, 6.8pF
C337	2113740F57	CAP, 180pF
C338	2113740F53	CAP, 120pF
C339	2113740F51	CAP, 100pF
C340	2113740F49	CAP, 82pF
C341	2113740F49	CAP, 82pF
C342	2113740F49	CAP, 82pF
C343	2113740F49	CAP, 82pF
C344	NOT PLACED	CAP, 82pF
C345	NOT PLACED	CAP, 82pF
C346	2113740F45	CAP, 56pF
C347	2113740F41	CAP, 39pF
C348	2113740F41	CAP, 39pF
C349	NOT PLACED	CAP, 36pF
C350	2113740F40	CAP, 36pF
C351	2113740F40	CAP, 36pF
C352	2113740F39	CAP, 33pF
C353	2113740F38	CAP, 30pF
C354	2113740F38	CAP, 30pF
C355	2113740F38	CAP, 30pF
C356	NOT PLACED	CAP, 30pF
C357	2113740F35	CAP, 22pF
C359	NOT PLACED	CAP, 22pF
C360	NOT PLACED	CAP, 22pF
C361	2113740F33	CAP, 18pF
C362	2113740F33	CAP, 18pF
C363	NOT PLACED	CAP, 12pF
C364	2113740F25	CAP, 8.2pF
C365	2113740F21	CAP, 5.6pF
C366	NOT PLACED	CAP, 3.3pF
C367	NOT PLACED	CAP, 2.7pF
C400	2113741F25	CAP, 1000pF
C401	2113743K15	CAP, 0.1uF
C402	2113743K15	CAP, 0.1uF
C403	2113743K15	CAP, 0.1uF
C404	2113743K15	CAP, 0.1uF
C405	2113743K15	CAP, 0.1uF
C406	2113743K15	CAP, 0.1uF
C407	2113743K15	CAP, 0.1uF
C408	2113743K15	CAP, 0.1uF
C410	2113743K15	CAP, 0.1uF
C411	2113741F25	CAP, 1000pF
C412	2113741F25	CAP, 1000pF
C413	2113741F25	CAP, 1000pF
C414	2113741F25	CAP, 1000pF
C415	2113741F25	CAP, 1000pF
C416	2113741F25	CAP, 1000pF
C417	2113741F25	CAP, 1000pF
C418	2113741F25	CAP, 1000pF
C421	NOT PLACED	CAP, .022uF
C422	NOT PLACED	CAP, 1000pF
C423	NOT PLACED	CAP, 0.1uF
C490	NOT PLACED	CAP, 1uF
C602	2113741F25	CAP, 1000pF
C603	2113741F25	CAP, 1000pF
C604	2113741F25	CAP, 1000pF
C605	2113741F25	CAP, 1000pF
C606	2113741F25	CAP, 1000pF
C607	2113741F25	CAP, 1000pF
C608	NOT PLACED	CAP, 1000pF
C609	NOT PLACED	CAP, 1000pF
C610	2113741F25	CAP, 1000pF
C611	2113741F25	CAP, 1000pF
C612	2113741F25	CAP, 1000pF
C613	2113741F25	CAP, 1000pF
C614	2113741F25	CAP, 1000pF
C615	2113741F25	CAP, 1000pF
C616	2113741F25	CAP, 1000pF
C617	2113741F25	CAP, 1000pF
C618	2113741F25	CAP, 1000pF
C619	NOT PLACED	CAP, 1000pF
C620	2113741F25	CAP, 1000pF
C621	2113741F25	CAP, 1000pF
C622	2113741F25	CAP, 1000pF
C623	2113741F25	CAP, 1000pF
C624	2113741F25	CAP, 1000pF
C625	2113741F25	CAP, 1000pF
C626	2113741F25	CAP, 1000pF
C627	2113741F25	CAP, 1000pF
C628	2113741F25	CAP, 1000pF
C629	2113741F25	CAP, 1000pF
C630	2113741F25	CAP, 1000pF
C631	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C632	2113741F25	CAP, 1000pF
C633	2113741F25	CAP, 1000pF
C662	2113741F25	CAP, 1000pF
C678	2113741M69	CAP, 0.1uF
C1000	2113740F59	CAP, 220pF
C1001	2311049A08	CAPP, 1uF
C1002	2113741W01	CAP, 1uF
C1003	NOT PLACED	CAP, 470pF
C1004	2111078B42	CAP, 100pF
C1005	2111078B42	CAP, 100pF
C1006	2111078B48	CAP, 160pF
C1007	2111078B40	CAP, 82pF
C1008	2111078B10	CAP, 7.5pF
C1009	2111078B37	CAP, 62pF
C1010	NOT PLACED	CAP, 100pF
C1011	NOT PLACED	CAP, 82pF
C1012	2111078B36	CAP, 56pF
C1013	2111078B08	CAP, 6.2pF
C1014	NOT PLACED	CAP, 56pF
C1015	2111078B43	CAP, 110pF
C1017	2111078B18	CAP, 15pF
C1018	2111078B32	CAP, 39pF
C1019	2111078B28	CAP, 32pF
C1020	2111078B32	CAP, 39pF
C1021	NOT PLACED	CAP, 6.2pF
C1022	2111078B26	CAP, 28pF
C1026	2113740A79	CAP, 1000pF
C1027	2311049A45	CAPP, 10uF
C1028	2113743K15	CAP, 0.1uF
C1029	2113743K15	CAP, 0.1uF
C1030	2113740F37	CAP, 27pF
C1031	2113743E07	CAP, .022uF
C1032	2113743E07	CAP, .022uF
C1033	2113743E07	CAP, .022uF
C1034	2113740F59	CAP, 220pF
C1035	2113743E07	CAP, .022uF
C1036	2113743E07	CAP, .022uF
C1037	2113743E07	CAP, .022uF
C1038	NOT PLACED	CAP, .022uF
C1039	2113743E07	CAP, .022uF
C1040	NOT PLACED	CAP, 2200pF
C1041	2113741F17	CAP, 470pF
C1042	2113740F52	CAP, 110pF
C1043	2113740F52	CAP, 110pF
C1044	2113741F13	CAP, 330pF
C1045	2113741F25	CAP, 1000pF
C1046	2113741F25	CAP, 1000pF
C1047	2113741F25	CAP, 1000pF
C1048	2113741F25	CAP, 1000pF
C1049	2113741F25	CAP, 1000pF
C1050	2113741F25	CAP, 1000pF
C1051	2113741F25	CAP, 1000pF
C1052	2113741F25	CAP, 1000pF
C1053	2113741F25	CAP, 1000pF
C1054	2113741F25	CAP, 1000pF
C1055	NOT PLACED	CAP, 1000pF
C1056	NOT PLACED	CAP, 1000pF
C1057	2113741F25	CAP, 1000pF
C1058	NOT PLACED	CAP, 1000pF
C1059	2113741F25	CAP, 1000pF
C1060	2113741F25	CAP, 1000pF
C1061	NOT PLACED	CAP, 1000pF
C1062	2113741F25	CAP, 1000pF
C1063	2113740F63	CAP, 330pF
C1064	2113741F25	CAP, 1000pF
C1065	2113740F63	CAP, 330pF
C1066	2113741F25	CAP, 1000pF
C1067	2113741F25	CAP, 1000pF
C1068	2113741F13	CAP, 330pF
C1069	NOT PLACED	CAP, 330pF
C1070	2113741F25	CAP, 1000pF
C1071	2113741F25	CAP, 1000pF
C1072	2113741F25	CAP, 1000pF
C1073	NOT PLACED	CAP, 1000pF
C1074	2113741F25	CAP, 1000pF
C1075	2113741F25	CAP, 1000pF
C1076	2113741F25	CAP, 1000pF
C1077	2113741F25	CAP, 1000pF
C1078	2113740F59	CAP, 220pF
C1079	2113741F25	CAP, 1000pF
C1080	2113741F25	CAP, 1000pF
C1081	2113741F25	CAP, 1000pF
C1082	NOT PLACED	CAP, 1000pF
C1083	2113741F25	CAP, 1000pF
C1084	2113740F59	CAP, 220pF
C1085	2113741F25	CAP, 1000pF
C1086	2113741F25	CAP, 1000pF
C1087	2113741F25	CAP, 1000pF
C1088	2113741F25	CAP, 1000pF
C1089	2113741F25	CAP, 1000pF
C1090	NOT PLACED	CAP, 220pF
C1091	2113741F25	CAP, 1000pF
C1092	2113741F25	CAP, 1000pF
C1093	NOT PLACED	CAP, 220pF
C1094	NOT PLACED	CAP, 1000pF
C1095	2113740F59	CAP, 220pF
C1096	2111078B40	CAP, 82pF
C1097	2113741F25	CAP, 1000pF
C1098	2113741F25	CAP, 1000pF
C1099	2113741F25	CAP, 1000pF
C1100	2113741F25	CAP, 1000pF
C1101	2113741F01	CAP, 100pF
C1102	2113741F01	CAP, 100pF
C1103	2113741A57	CAP, .033uF
C1104	2113741A45	CAP, .01uF
C1105	2113740F67	CAP, 470pF
C1106	2113740F67	CAP, 470pF
C1107	2113740F67	CAP, 470pF
C1108	2113740F47	CAP, 68pF
C1109	2113740F59	CAP, 220pF
C1110	2113740F59	CAP, 220pF
C1111	2111078B59	CAP, 470pF
C1112	2113740F59	CAP, 220pF
C1113	2113740F59	CAP, 220pF
C1114	2113740F59	CAP, 220pF
C1115	2113740F59	CAP, 220pF
C1116	2113740F59	CAP, 220pF
C1117	2113740F40	CAP, 36pF
C1118	2113740F39	CAP, 33pF
C1119	2113740F36	CAP, 24pF

Circuit Ref.	Motorola Part No.	Description
C1120	2113740F39	CAP, 33pF
C1121	NOT PLACED	CAP, 6.8pF
C1122	2113740F59	CAP, 220pF
C1123	2113740F59	CAP, 220pF
C1124	2113740F59	CAP, 220pF
C1125	2113740F59	CAP, 220pF
C1126	2113740F59	CAP, 220pF
C1127	2360567A03	CAPP, 100uF
C1128	2113740F59	CAP, 220pF
C1129	2113740F59	CAP, 220pF
C1130	2113740F59	CAP, 220pF
C1131	NOT PLACED	CAP, 220pF
C1132	2111078B40	CAP, 82pF
C1133	2113740A41	CAP, 33pF
C1134	2113740A38	CAP, 24pF
C1136	2113740F19	CAP, 4.7pF
C1137	2111078B33	CAP, 43pF
C1199	NOT PLACED	CAP, 16pF
C2000	2113743F18	CAP, 2.2uF
C2001	2311049J11	CAPP, 4.7uF
C2002	2311049A72	CAPP, 10uF
C2003	2113743K15	CAP, 0.1uF
C2004	2113743F18	CAP, 2.2uF
C2005	2113743F18	CAP, 2.2uF
C2006	2113743F18	CAP, 2.2uF
C2007	2113743E20	CAP, 0.1uF
C2008	2113743E20	CAP, 0.1uF
C2009	2113743E20	CAP, 0.1uF
C2010	2113743E20	CAP, 0.1uF
C2011	2113743E20	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C2012	NOT PLACED	CAP, 0.1uF
C2013	2113743E20	CAP, 0.1uF
C2014	2113743E20	CAP, 0.1uF
C2015	2113743E20	CAP, 0.1uF
C2016	2113743E20	CAP, 0.1uF
C2017	2113743E20	CAP, 0.1uF
C2018	2113743E20	CAP, 0.1uF
C2019	2113743E20	CAP, 0.1uF
C2020	2113743E20	CAP, 0.1uF
C2021	2113741F49	CAP, .01uF
C2022	2113741F49	CAP, .01uF
C2023	2113741F49	CAP, .01uF
C2024	2113741F49	CAP, .01uF
C2025	2113741F49	CAP, .01uF
C2026	2113741F49	CAP, .01uF
C2027	2113741F49	CAP, .01uF
C2028	2113741F33	CAP, 2200pF
C2029	2113741F25	CAP, 1000pF
C2030	2113741F39	CAP, 3900pF
C2031	NOT PLACED	CAP, 1000pF
C2032	2113741F25	CAP, 1000pF
C2033	2113741F25	CAP, 1000pF
C2034	2113741F25	CAP, 1000pF
C2035	2113741F25	CAP, 1000pF
C2036	2113741F25	CAP, 1000pF
C2037	2113741F25	CAP, 1000pF
C2038	2113741F25	CAP, 1000pF
C2039	2113741F25	CAP, 1000pF
C2040	2113741F25	CAP, 1000pF
C2041	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C2042	2113741F25	CAP, 1000pF
C2043	2113740L14	CAP, 6.8pF
C2044	2113740L06	CAP, 3.3pF
C2045	2113740F67	CAP, 470pF
C2046	2113740F67	CAP, 470pF
C2047	2113740F67	CAP, 470pF
C2048	2113740F67	CAP, 470pF
C2049	NOT PLACED	CAP, 470pF
C2050	2113740F67	CAP, 470pF
C2051	2113740F59	CAP, 220pF
C2052	2113740F67	CAP, 470pF
C2053	NOT PLACED	CAP, 100pF
C2054	2113740L37	CAP, 62pF
C2055	2113740F35	CAP, 22pF
C2056	2113740F33	CAP, 18pF
C2057	2113740F33	CAP, 18pF
C2058	2113740F33	CAP, 18pF
C2059	2113740F33	CAP, 18pF
C2060	2113740F31	CAP, 15pF
C2061	2113740F29	CAP, 12pF
C2062	2113740F29	CAP, 12pF
C2063	2113740L22	CAP, 15pF
C2064	2113740F32	CAP, 16pF
C2065	2113740F27	CAP, 10pF
C2066	2113740L16	CAP, 8.2pF
C2067	2113740F25	CAP, 8.2pF
C2068	2113740F23	CAP, 6.8pF
C2069	2113740L12	CAP, 5.6pF
C2070	2113740F41	CAP, 39pF
C2071	2113740F41	CAP, 39pF

Circuit Ref.	Motorola Part No.	Description
C2072	2113740L04	CAP, 2.7pF
C2073	2113740F03	CAP, 1pF
C2074	2109720D14	CAP, 0.1uF
C2075	2109720D14	CAP, 0.1uF
C2076	NOT PLACED	CAP, 0.1uF
C2077	2109720D14	CAP, 0.1uF
C2078	2109720D14	CAP, 0.1uF
C2079	2109720D14	CAP, 0.1uF
C2080	2109720D14	CAP, 0.1uF
C2081	2113740F67	CAP, 470pF
C5000	2113741F25	CAP, 1000pF
C5001	2389289U01	CAPP, 10uF
C5002	2311049A99	CAPP, 47uF
C5003	2311049A99	CAPP, 47uF
C5005	2360567A03	CAPP, 100uF
C5006	2311049A57	CAPP, 10uF
C5007	2311049A99	CAPP, 47uF
C5008	2311049A57	CAPP, 10uF
C5009	2311049A57	CAPP, 10uF
C5010	2311049A57	CAPP, 10uF
C5011	2311049A57	CAPP, 10uF
C5012	2311049A56	CAPP, 4.7uF
C5013	2113928P04	CAP, 1.0uF
C5014	NOT PLACED	CAP, 2.2uF
C5015	2113743K15	CAP, 0.1uF
C5016	2113743K15	CAP, 0.1uF
C5017	2113743K15	CAP, 0.1uF
C5018	2113743K15	CAP, 0.1uF
C5019	2113743K15	CAP, 0.1uF
C5020	2113743K15	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C5021	2113741M69	CAP, 0.1uF
C5022	2113743K15	CAP, 0.1uF
C5023	2113743K15	CAP, 0.1uF
C5024	2113743K15	CAP, 0.1uF
C5025	2113743K15	CAP, 0.1uF
C5026	2113743K15	CAP, 0.1uF
C5027	2113743K15	CAP, 0.1uF
C5028	2113743K15	CAP, 0.1uF
C5029	2113743K15	CAP, 0.1uF
C5030	2113743K15	CAP, 0.1uF
C5031	2113743K15	CAP, 0.1uF
C5032	2113743K15	CAP, 0.1uF
C5033	2113743K15	CAP, 0.1uF
C5034	2113743K15	CAP, 0.1uF
C5035	2113743K15	CAP, 0.1uF
C5036	2113743K15	CAP, 0.1uF
C5037	2113743K15	CAP, 0.1uF
C5038	2113743K15	CAP, 0.1uF
C5039	NOT PLACED	CAP, 0.1uF
C5040	NOT PLACED	CAP, 0.1uF
C5041	2113743F18	CAP, 2.2uF
C5042	2113743F16	CAP, 1uF
C5043	2113743F16	CAP, 1uF
C5044	2113928C04	CAP, 4.7uF
C5045	2113743F16	CAP, 1uF
C5046	2113743E20	CAP, 0.1uF
C5047	2113743E20	CAP, 0.1uF
C5048	2113743E20	CAP, 0.1uF
C5049	2113743E20	CAP, 0.1uF
C5050	2113743E20	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C5051	NOT PLACED	CAP, 0.1uF
C5052	2113743E20	CAP, 0.1uF
C5053	NOT PLACED	CAP, 0.1uF
C5054	NOT PLACED	CAP, 0.1uF
C5055	2113928C04	CAP, 4.7uF
C5056	2113928C04	CAP, 4.7uF
C5057	2113928C04	CAP, 4.7uF
C5058	NOT PLACED	CAP, 0.1uF
C5059	2113743E07	CAP, .022uF
C5060	2113741M69	CAP, 0.1uF
C5061	2113741M69	CAP, 0.1uF
C5062	2113741M69	CAP, 0.1uF
C5063	2113741M69	CAP, 0.1uF
C5064	2113741F25	CAP, 1000pF
C5065	2113741F25	CAP, 1000pF
C5066	2113741F25	CAP, 1000pF
C5067	2113741F25	CAP, 1000pF
C5068	2113741F25	CAP, 1000pF
C5069	2113741F25	CAP, 1000pF
C5070	2113741F25	CAP, 1000pF
C5071	2113741F25	CAP, 1000pF
C5072	2113741F25	CAP, 1000pF
C5073	2113741F25	CAP, 1000pF
C5074	2113741F25	CAP, 1000pF
C5075	NOT PLACED	CAP, 1000pF
C5076	2113741F25	CAP, 1000pF
C5077	2113741F25	CAP, 1000pF
C5078	2113741F25	CAP, 1000pF
C5079	2113741F25	CAP, 1000pF
C5080	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C5081	2113741F25	CAP, 1000pF
C5082	2113741F25	CAP, 1000pF
C5083	2113740F51	CAP, 100pF
C5084	2113740F51	CAP, 100pF
C5085	2113741A53	CAP, .022uF
C5086	2113741A53	CAP, .022uF
C5087	2113740F53	CAP, 120pF
C5088	2113740F49	CAP, 82pF
C5089	2113740F49	CAP, 82pF
C5090	2113740F49	CAP, 82pF
C5091	2113740F49	CAP, 82pF
C5092	2113740F59	CAP, 220pF
C5094	2113740F59	CAP, 220pF
C5095	2113740F59	CAP, 220pF
C5096	2113740F59	CAP, 220pF
C5097	2113740F59	CAP, 220pF
C5098	2113740F59	CAP, 220pF
C5099	2113740F59	CAP, 220pF
C5100	2113740F59	CAP, 220pF
C5101	NOT PLACED	CAP, 1000pF
C5102	NOT PLACED	CAP, 0.1uF
C5103	NOT PLACED	CAP, 0.1uF
C5104	NOT PLACED	CAP, 10uF
C5110	2113741F25	CAP, 1000pF
C5111	2113741F25	CAP, 1000pF
C5112	NOT PLACED	CAP, 16pF
C5113	NOT PLACED	CAP, 220pF
C5114	2113743F16	CAP, 1uF
C5115	NOT PLACED	CAP, 6.8pF
C5116	NOT PLACED	CAP, 220pF

Circuit Ref.	Motorola Part No.	Description
C5117	NOT PLACED	CAP, 16pF
C5118	2113743E20	CAP, 0.1uF
C5119	2113743H14	CAP, 10uF
C5120	NOT PLACED	CAPP, 47uF
CR300	4880154K03	MMBD353, SCHOTTKY COMM AK
CR301	4880154K03	MMBD353, SCHOTTKY COMM AK
D100	NOT PLACED	MMBD6100, DUAL COMM CATH
D101	4813833C02	MMBD6100, DUAL COMM CATH
D102	4813833C02	MMBD6100, DUAL COMM CATH
D103	4802482J02	MA4P959, PIN
D104	4802482J02	MA4P959, PIN
D105	4805218N57	RB715F, DUAL COMM CATH
D106	4805218N57	RB715F, DUAL COMM CATH
D107	4805218N57	RB715F, DUAL COMM CATH
D108	4805218N57	RB715F, DUAL COMM CATH
D200	4802233J09	IMN10, 3 DIODE ARRAY
D201	4802233J09	IMN10, 3 DIODE ARRAY
D202	4862824C03	1SV232, VARACTOR
D203	4805649Q13	1SV228, VARACTOR
D204	4805649Q13	1SV228, VARACTOR
D205	4862824C01	1SV229, VARACTOR
D301	4802245J97	DAN235ETL, DUAL COMM CATH
D302	4802245J97	DAN235ETL, DUAL COMM CATH

Circuit Ref.	Motorola Part No.	Description
D303	4802245J97	DAN235ETL, DUAL COMM CATH
D304	4802245J97	DAN235ETL, DUAL COMM CATH
D305	4880142L01	MMBV3401LT, PIN
D400	4813833C07	MMBD7000, DUAL COMM AK
D401	4813833C02	MMBD6100, DUAL COMM CATH
D402	4809948D42	RB751V40, SCHOTTKY
D500	4813833C02	MMBD6100, DUAL COMM CATH
D501	NOT PLACED	MMBD6100, DUAL COMM CATH
D502	4813825A23	MMSD301T1, SCHOTTKY
D511	4813833C02	MMBD6100, DUAL COMM CATH
D513	4813833C02	MMBD6100, DUAL COMM CATH
FL300	9180022M11	MXF45, 44.85MHz BPF
FL301	9180468V06	FLTR, 455kHZ, BW 25KHZ
FL302	9180468V04	FLTR, 455kHZ, BW 12.5KHZ
FL303	9180469V03	FLTR, 455kHZ, BW 12.5KHZ
FL304	9180469V06	FLTR, 455kHZ, BW 25KHZ
J2	0989241U02	CONNECTOR 22 PIN
J3	NOT PLACED	CONNECTOR 32 PIN
J11	2889309U01	ANTENNA CONNECTOR
L100	7686135U02	FERRITE BEAD
L101	2462587T30	IDCTR, 1uH
L102	2462587T30	IDCTR, 1uH
L103	2462587T30	IDCTR, 1uH
L104	2462587T38	IND CHIP 22NH 5% LOW PRO
L105	2462587T13	IDCTR, 68nH
L106	2460591A11	IDCTR, 7.66nH
L107	2460591A01	IDCTR, 4.22nH
L108	2462587X69	IDCTR, 1.2uH
L109	NOT PLACED	IDCTR, 11.03nH
L110	2462587N42	IDCTR, 12nH
L111	2460592B01	IDCTR, 51nH
L112	2460592B01	IDCTR, 51nH
L113	2460592B01	IDCTR, 51nH
L114	2460592B01	IDCTR, 51nH
L115	2460592A01	IDCTR, 17nH
L116	2460592A01	IDCTR, 17nH
L117	7686135U02	FERRITE BEAD
L118	7686135U02	FERRITE BEAD
L119	7686135U02	FERRITE BEAD
L120	7686135U02	FERRITE BEAD
L121	7686135U02	FERRITE BEAD
L122	2460591C23	IDCTR, 13.85nH
L123	2462587X69	IDCTR, 1.2uH
L124	2485873L05	IDCTR, 48nH
L131	NOT PLACED	IDCTR, 120nH
L132	2462587N15	IDCTR, 100nH
L200	2462587Q42	IDCTR, 390nH
L201	2462587V44	IDCTR, 680nH
L202	2462587V44	IDCTR, 680nH
L203	2462587V44	IDCTR, 680nH
L204	2462587V44	IDCTR, 680nH
L205	2462587Q47	IDCTR, 1uH
L206	2413923C05	IDCTR, 33nH
L207	2413923C07	IDCTR, 47nH
L208	2413926N24	IDCTR, 100nH
L209	2413926N24	IDCTR, 100nH
L210	2413926N24	IDCTR, 100nH
L211	2413926N24	IDCTR, 100nH
L212	2413926N24	IDCTR, 100nH
L213	2413926N24	IDCTR, 100nH
L214	2413926H20	IDCTR, 47nH
L215	2413926H20	IDCTR, 47nH
L216	2413926H20	IDCTR, 47nH
L217	2462587Q42	IDCTR, 390nH
L300	2460591G24	IDCTR, 33.47nH
L301	2462587X69	IDCTR, 1.2uH
L302	2462587X69	IDCTR, 1.2uH
L303	2462587N69	IDCTR, 1.2uH
L304	2483411T74	IDCTR, 1.2uH
L305	2413926K31	IDCTR, 470nH
L306	2462587N55	IDCTR, 150nH
L307	2460591G24	IDCTR, 33.47nH
L308	2460591G24	IDCTR, 33.47nH
L309	2460591G24	IDCTR, 33.47nH
L310	2460591G24	IDCTR, 33.47nH
L311	2460591G24	IDCTR, 33.47nH
L312	2460591G24	IDCTR, 33.47nH
L313	2460591G24	IDCTR, 33.47nH
L314	2460591G24	IDCTR, 33.47nH
L315	NOT PLACED	IDCTR, 27nH
L500	7686135U02	FERRITE BEAD
L501	7686135U02	FERRITE BEAD
L502	7686135U02	FERRITE BEAD
M6	4387454V01	SPACER
M9	0289511U01	NUT
M100	2680499Z01	HEATSINK
M105	7588823L03	CONTACT, METAL
M106	7588823L03	CONTACT, METAL
M107	7588823L03	CONTACT, METAL
M108	7588823L04	CONTACT, METAL
M109	7588823L04	CONTACT, METAL
M110	7588823L04	CONTACT, METAL
M111	NOT PLACED	CONTACT, METAL
M112	NOT PLACED	CONTACT, METAL
M113	NOT PLACED	CONTACT, METAL
M114	NOT PLACED	CONTACT, METAL
P1	2804503J01	CONNECTOR, 16 PIN
P2	NOT PLACED	CONNECTOR, 2 PIN DC
Q100	4886136B01	MRF1550, LDMOS RF
Q101	4813824A10	MMBT3904, BIPOLAR NPN
Q102	NOT PLACED	MMBT3904, BIPOLAR NPN
Q103	4813824A06	MMBTA13, DARLINGTON, NPN
Q105	4886212B01	MRF1518, LDMOS RF
Q106	4805128M27	BSR33, BIPOLAR, PNP
Q200	4802245J95	BFS540, NPN
Q300	4809940E02	DTC114YE, NPN
Q301	4813824A17	MMBT3906, BIPOLAR PNP
Q302	4813824A10	MMBT3904, BIPOLAR NPN
Q303	4802245J95	BFS540, NPN
Q304	4809939C04	UMC3

Circuit Ref.	Motorola Part No.	Description
Q305	4802197J95	PBR941, NPN
Q306	4813824A17	MMBT3906, BIPOLAR PNP
Q400	4809940E02	DTC114YE, NPN
Q401	4880141L03	BCW68G, BIPOLAR PNP
Q403	4809940E02	DTC114YE, NPN
Q404	4809940E02	DTC114YE, NPN
Q405	4809940E02	DTC114YE, NPN
Q407	4809940E02	DTC114YE, NPN
Q408	4880048M01	DTC144EKA, BIPOLAR
Q409	4880048M01	DTC144EKA, BIPOLAR
Q410	4880048M01	DTC144EKA, BIPOLAR
Q411	4880048M01	DTC144EKA, BIPOLAR
Q412	4880048M01	DTC144EKA, BIPOLAR
Q413	4809940E02	DTC114YE, NPN
Q414	4809940E02	DTC114YE, NPN
Q415	NOT PLACED	MMBT3904
Q416	4809940E02	DTC114YE, NPN
Q417	4813824A10	MMBT3904, BIPOLAR NPN
Q500	4813824A10	MMBT3904, BIPOLAR NPN
Q501	4809940E02	DTC114YE, NPN
Q502	4809940E02	DTC114YE, NPN
Q503	4813824A10	MMBT3904, BIPOLAR NPN
Q504	4880048M01	DTC144EKA, BIPOLAR
Q505	4813824A10	MMBT3904, BIPOLAR NPN
Q506	4813824A10	MMBT3904, BIPOLAR NPN
R101	1705603W01	SHUNT, 1.639m
R102	0680194M18	RES, 51
R103	0683994M18	RES, 51
R104	0680194M18	RES, 51
R105	0680194M18	RES, 51
R106	0680194M18	RES, 51
R107	0680194M18	RES, 51
R108	0680194M18	RES, 51
R109	0662057A12	RES, 30
R110	NOT PLACED	RES, 1K
R111	NOT PLACED	RES, 1K
R112	NOT PLACED	RES, 62K
R113	NOT PLACED	RES, 10K
R114	NOT PLACED	RES, 10K
R115	NOT PLACED	RES, 10K
R116	NOT PLACED	RES, 10K
R117	0662057A81	RES, 22K
R118	0662057C55	RES, 150
R120	0662057C51	RES, 100
R121	NOT PLACED	RES, 100
R122	0662057C19	RES, 4.7
R123	0662057C13	RES, 2.7
R124	0662057C13	RES, 2.7
R125	0662057C13	RES, 2.7
R126	0662057C03	RES, 1
R127	0662057C03	RES, 1
R130	0662057B47	RES, 0
R131	0662057A97	RES, 100K
R132	NOT PLACED	RES, 100K
R134	0662057A89	RES, 47K
R135	0662057A82	RES, 24K
R136	0662057A87	RES, 39K
R137	0662057A87	RES, 39K
R138	NOT PLACED	RES, 39K
R139	NOT PLACED	RES, 39K
R140	0662057A79	RES, 718K
R141	0662057A81	RES, 22K
R142	0662057A81	RES, 22K
R143	0662057A81	RES, 22K
R144	0662057A75	RES, 12K
R145	0662057A81	RES, 22K
R146	0662057A81	RES, 22K
R147	0662057A81	RES, 22K
R148	0662057A81	RES, 22K
R149	0662057A81	RES, 22K
R150	0662057A89	RES, 47K
R151	0662057A70	RES, 7.5K
R153	0662057A73	RES, 10K
R155	NOT PLACED	RES, 10K
R156	0662057A73	RES, 10K
R157	0662057A91	RES, 56K
R158	0662057A67	RES, 5.6K
R159	NOT PLACED	RES, 5.6K
R160	0662057A61	RES, 3.3K
R161	0662057A61	RES, 3.3K
R162	0662057A61	RES, 3.3K
R163	0662057A61	RES, 3.3K
R164	0662057A68	RES, 6.2K
R165	0662057A58	RES, 2.4K
R166	NOT PLACED	RES, 2.4K
R167	0662057A57	RES, 2.2K
R168	0662057A57	RES, 2.2K
R169	NOT PLACED	RES, 2.2K
R170	0662057A42	RES, 510
R171	0662057A33	RES, 220
R172	0662057A41	RES, 470
R173	0662057A29	RES, 150
R174	0662057A29	RES, 150
R175	NOT PLACED	RES, 220
R176	2413926N25	IDCTR, 120nH
R177	NOT PLACED	RES, 100
R178	0662057A14	RES, 36
R179	0662057A14	RES, 36
R180	0660082A89	RES, 47K
R181	0660082A89	RES, 47K
R182	0662057A73	RES, 10K
R185	0662057A73	RES, 10K
R186	0662057C20	RES, 5.1
R188	NOT PLACED	RES, 0
R189	NOT PLACED	RES, 0
R190	0662057G64	RES, 1MEG
R191	0662057G64	RES, 1MEG
R195	0662057C01	RES, 0
R196	NOT PLACED	RES, 0
R197	0662057C19	RES, 4.7
R198	0662057C01	RES, 0
R199	0662057B47	RES, 0
R200	0662057A99	RES, 120K
R201	0662057B47	RES, 0
R202	NOT PLACED	RES, 0
R203	0662057B47	RES, 0
R204	NOT PLACED	RES, 0

Circuit Ref.	Motorola Part No.	Description
R205	NOT PLACED	RES, 0
R206	0662057B02	RES, 150K
R207	0662057B02	RES, 150K
R208	0662057A18	RES, 51
R209	0662057A97	RES, 100K
R210	NOT PLACED	RES, 100K
R211	0662057A89	RES, 47K
R212	0662057A84	RES, 30K
R213	0662057A65	RES, 4.7K
R214	0662057A65	RES, 4.7K
R215	0662057A65	RES, 4.7K
R216	0662057A63	RES, 3.9K
R217	0662057A52	RES, 1.3K
R218	0662057A49	RES, 1K
R219	NOT PLACED	RES, 820
R220	0662057A42	RES, 510
R221	0662057A33	RES, 220
R222	0662057A33	RES, 220
R223	0662057A33	RES, 220
R224	0662057A53	RES, 1.5K
R225	0662057A29	RES, 150
R226	0662057A29	RES, 150
R227	0662057A25	RES, 100
R228	0662057A25	RES, 100
R229	0662057A25	RES, 100
R230	0662057A25	RES, 100
R231	0662057A18	RES, 51
R232	0662057A17	RES, 47
R233	0662057A17	RES, 47
R234	0662057A15	RES, 39
R235	0662057A07	RES, 18
R300	0662057A73	RES, 10K
R301	0662057A41	RES, 470
R302	0662057B47	RES, 0
R303	0662057B47	RES, 0
R304	0662057A85	RES, 33K
R305	0662057A80	RES, 20K
R306	0662057A80	RES, 20K
R307	0662057A80	RES, 20K
R308	0662057A80	RES, 20K
R309	0662057A77	RES, 15K
R310	0662057A77	RES, 15K
R311	NOT PLACED	RES, 15K
R312	0662057A76	RES, 13K
R313	0662057A75	RES, 12K
R314	0662057A75	RES, 12K
R315	0662057A75	RES, 12K
R316	0662057A75	RES, 12K
R317	0662057A75	RES, 12K
R318	0662057A75	RES, 12K
R319	0662057A75	RES, 12K
R320	0662057A73	RES, 10K
R321	0662057A71	RES, 8.2K
R322	0662057A65	RES, 4.7K
R323	0662057A65	RES, 4.7K
R324	0662057A61	RES, 3.3K
R325	0662057A61	RES, 3.3K
R326	0662057A58	RES, 2.4K
R327	0662057A58	RES, 2.4K
R328	0662057A55	RES, 1.8K
R329	0662057A51	RES, 1.2K
R330	0662057A49	RES, 1K
R331	0662057A45	RES, 680
R332	0662057A43	RES, 560
R333	0662057A40	RES, 430
R334	0662057A39	RES, 390
R335	0662057A33	RES, 220
R336	0662057A25	RES, 100
R337	0662057A25	RES, 100
R338	0662057A18	RES, 51
R339	0662057A18	RES, 51
R340	0662057A18	RES, 51
R341	0662057A01	RES, 10
R342	0662057A01	RES, 10
R343	0662057A01	RES, 10
R344	0662057A01	RES, 10
R345	0662057A73	RES, 10K
R346	0662057A73	RES, 10K
R401	0662057C85	RES, 2.7K
R402	0662057B47	RES, 0
R403	0662057B47	RES, 0
R404	0662057B47	RES, 0
R405	0662057B47	RES, 0
R406	0662057B47	RES, 0
R407	0662057B47	RES, 0
R414	0662057B47	RES, 0
R415	NOT PLACED	RES, 0
R421	0662057A33	RES, 220
R422	0662057A73	RES, 10K
R423	NOT PLACED	RES, 100K
R424	NOT PLACED	RES, 100K
R425	0662057A97	RES, 100K
R426	0662057A97	RES, 100K
R427	NOT PLACED	RES, 100K
R428	0662057A97	RES, 100K
R429	0662057A97	RES, 100K
R430	0662057A87	RES, 39K
R431	NOT PLACED	RES, 10K
R432	0662057A85	RES, 33K
R433	0662057A85	RES, 33K
R434	0662057A85	RES, 33K
R435	0662057A85	RES, 33K
R436	0662057A85	RES, 33K
R438	0662057A73	RES, 10K
R439	0662057A73	RES, 10K
R440	0662057A73	RES, 10K
R441	0662057A73	RES, 10K
R442	0662057A73	RES, 10K
R443	0662057A61	RES, 3.3K
R444	0662057A73	RES, 10K
R445	0662057A73	RES, 10K
R450	0662057A73	RES, 10K
R451	0662057A73	RES, 10K
R453	0662057A61	RES, 3.3K
R454	0662057A61	RES, 3.3K
R455	0662057A61	RES, 3.3K
R456	0662057A61	RES, 3.3K
R457	0662057A61	RES, 3.3K
R458	0662057A61	RES, 3.3K
R459	NOT PLACED	RES, 47K

Circuit Ref.	Motorola Part No.	Description
R460	0662057A53	RES, 1.5K
R461	0662057A33	RES, 220
R462	0662057A18	RES, 51
R463	0662057A73	RES, 10K
R466	0662057B47	RES, 0
R467	0662057B47	RES, 0
R468	0662057B47	RES, 0
R469	0662057B47	RES, 0
R470	NOT PLACED	RES, 10K
R471	0662057A01	RES, 10
R472	NOT PLACED	RES, 100K
R473	NOT PLACED	RES, 100K
R600	0662057C01	RES, 0
R601	0611077A62	RES, 330
R602	0662057B47	RES, 0
R610	0662057C59	RES, 220
R615	0662057A25	RES, 100
R5000	0662057B47	RES, 0
R5001	0662057T68	RES, 1K
R5002	NOT PLACED	RES, 0
R5008	0662057B47	RES, 0
R5009	0662057B47	RES, 0
R5010	0662057B47	RES, 0
R5011	NOT PLACED	RES, 0
R5013	NOT PLACED	RES, 0
R5014	0662057B47	RES, 0
R5016	NOT PLACED	RES, 1MEG
R5019	0662057B05	RES, 200K
R5020	0662057B02	RES, 150K
R5021	0662057A97	RES, 100K
R5022	0662057A97	RES, 100K
R5023	0662057A97	RES, 100K
R5024	NOT PLACED	RES, 100K
R5025	0662057A97	RES, 100K
R5026	0662057A85	RES, 33K
R5027	0662057B08	RES, 270K
R5028	0662057A97	RES, 100K
R5029	0662057A97	RES, 100K
R5030	0662057A85	RES, 33K
R5031	0662057A92	RES, 62K
R5032	0662057A89	RES, 47K
R5033	0662057A89	RES, 47K
R5034	0662057A86	RES, 36K
R5035	0662057A89	RES, 47K
R5036	0662057A89	RES, 47K
R5037	0662057A73	RES, 10K
R5038	0662057A85	RES, 33K
R5039	0662057A97	RES, 100K
R5040	0662057A84	RES, 30K
R5041	0662057A82	RES, 24K
R5042	0662057A82	RES, 24K
R5043	0662057A82	RES, 24K
R5044	0662057A82	RES, 24K
R5045	0662057A85	RES, 33K
R5046	0662057A82	RES, 24K
R5047	0662057B47	RES, 0
R5048	0662057A82	RES, 24K
R5049	0662057A77	RES, 15K
R5050	0662057A76	RES, 13K
R5051	0662057A75	RES, 12K
R5052	0662057A73	RES, 10K
R5053	0662057A73	RES, 10K
R5054	0662057A73	RES, 10K
R5055	0662057A73	RES, 10K
R5056	0662057A73	RES, 10K
R5057	0662057A73	RES, 10K
R5058	NOT PLACED	RES, 10K
R5059	NOT PLACED	RES, 10K
R5060	0662057A73	RES, 10K
R5061	0662057A73	RES, 10K
R5062	0662057A73	RES, 10K
R5063	NOT PLACED	RES, 8.2K
R5064	NOT PLACED	RES, 8.2K
R5065	0662057A68	RES, 6.2K
R5066	0662057A49	RES, 1K
R5067	NOT PLACED	RES, 6.2K
R5068	NOT PLACED	RES, 6.2K
R5069	0662057A73	RES, 10K
R5070	0662057A57	RES, 2.2K
R5071	0662057A57	RES, 2.2K
R5072	0662057A65	RES, 4.7K
R5073	0662057A49	RES, 1K
R5074	0662057A49	RES, 1K
R5075	0662057A42	RES, 510
R5076	0662057A42	RES, 510
R5077	0662057A36	RES, 300
R5078	0662057A25	RES, 100
R5079	0662057A25	RES, 100
R5080	0662057A01	RES, 10
R5081	0613952D78	RES, 6.34K
R5082	0662057A90	RES, 51K
R5083	0662057B08	RES, 270K
R5084	NOT PLACED	RES, 0
R5085	NOT PLACED	RES, 1MEG
R5086	0662057A43	RES, 560
R5087	0662057A97	RES, 100K
R5088	0662057B47	RES, 0
R5089	NOT PLACED	RES, 1MEG
R5092	0662057A73	RES, 10K
R5093	0662057A73	RES, 10K
R5094	NOT PLACED	RES, 1MEG
R5095	0662057A82	RES, 24K
R5096	0662057A73	RES, 10K
R5097	NOT PLACED	RES, 0
R5098	0662057B47	RES, 0
R5099	NOT PLACED	RES, 100K
R5100	NOT PLACED	RES, 1MEG
R5103	NOT PLACED	RES, 24K
R5290	0662057A25	RES, 100
R5291	0662057A25	RES, 100
R6000	NOT PLACED	RES, 0
R6001	NOT PLACED	RES, 0
RT100	0680361L01	THERM, 47K
S5010	1889288U01	SWITCH, 50.K
SH200	2689590U01	SHIELD
SH201	2689589U01	SHIELD
SH202	2689589U01	SHIELD
SH300	2689591U01	SHIELD
SH301	2689593U01	SHIELD
SH302	2689591U01	SHIELD

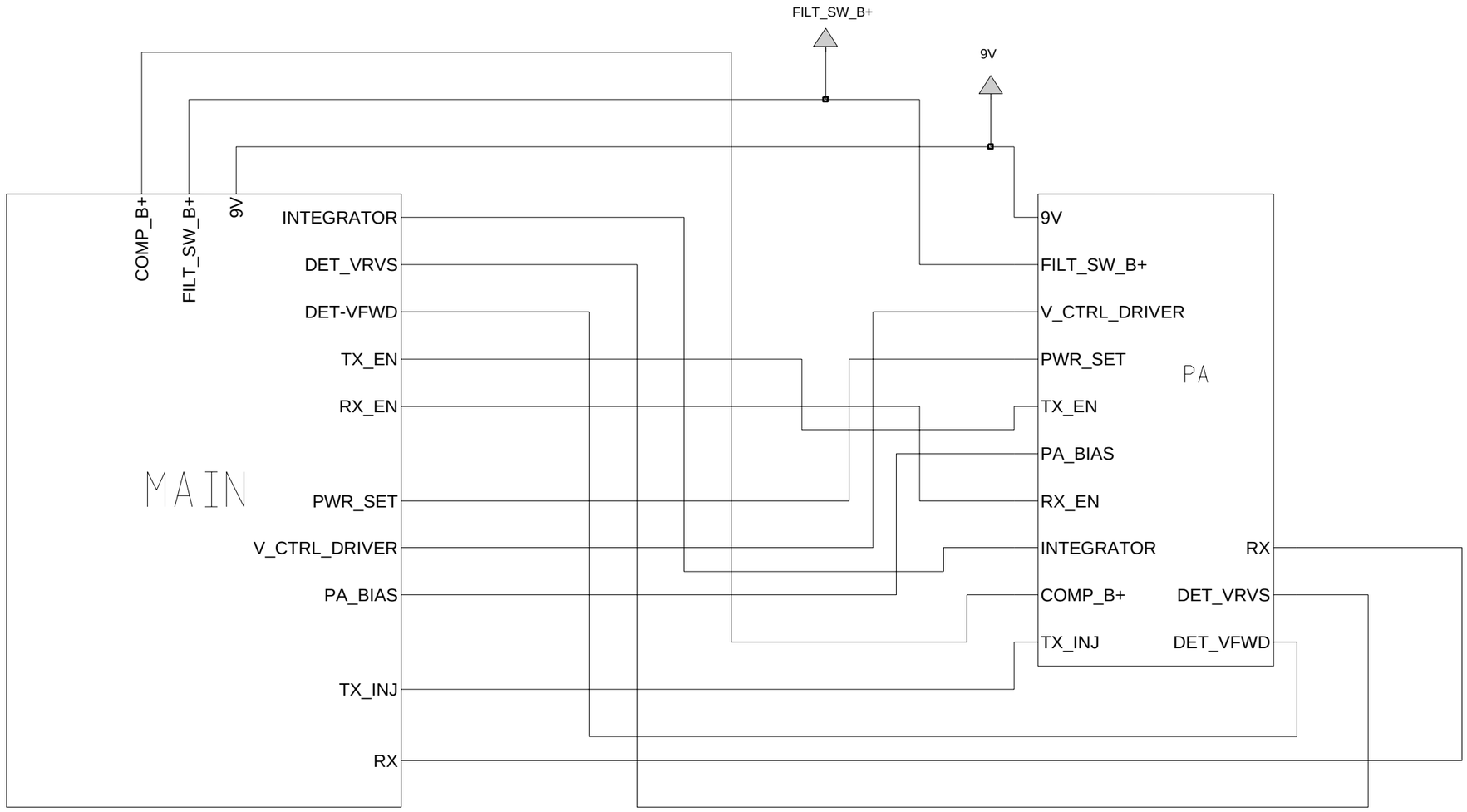
Circuit Ref.	Motorola Part No.	Description
T300	2580541Z01	XFMR
T301	2580541Z01	XFMR
U100	5180932W01	LM2904
U101	5185130C65	30C65, RF PREDRIVER
U102	NOT PLACED	LM2904, OPAMP
U103	5113819A04	MC3303
U200	5185963A27	63A27, LVFRACN
U201	5105750U54	50U54, VCOBIC
U300	5186144B01	SA616, IFIC
U301	5109522E10	TC7W04F, INVERTER
U302	4808612Y05	SMS3928_023, MIXER
U400	5102463J64	X25128-2.7, EEPROM
U402	5102463J36	SRM2B256, SRAM
U403	5102226J56	MC68HC11FL0, MICRO PROC
U404	5189233U02	AT49LV002N_70VI, FLASH
U405	NOT PLACED	MC74HC595A, SHIFT REG
U500	5180932W01	LM2904, OPAMP
U501	5102190C33	LM2941T, 9.3V REGULATOR
U502	5102463J95	TDA1519C, AUDIO PA
U503	5105469E65	LP2951C, 5V REGULATOR
U504	5185130C53	30C53, ASFIC CMP
U505	5180932W01	LM2904, OPAMP
U506	5180932W01	LM2904, OPAMP
U507	5180932W01	LM2904, OPAMP
U508	5113816A30	MC33269D, 3.3V REGULATOR
U509	5113806A20	MC14053B, MUX

Circuit Ref.	Motorola Part No.	Description
U510	5104187K94	LP2986ILDX, 3.3V REGULATOR
U514	4802393L66	SI3455ADV, 12V P-Ch FET
U515	NOT PLACED	MAX4599EXT, SWITCH
VR101	4813830A15	MMBZ5232B, 5.6V ZENER
VR102	4813830A15	MMBZ5232B, 5.6V ZENER
VR105	4813830A15	MMBZ5232B, 5.6V ZENER
VR400	NOT PLACED	MMBZ5232B, 5.6V ZENER
VR401	4813830G12	MMSZ4687T1, 4.3V ZENER
VR402	4813830A09	MMBZ5226B, 3.3V ZENER
VR500	4813832C77	MR2835S, 24V ZENER
VR501	4813830A14	MMBZ5231B, 5.1V ZENER
VR502	NOT PLACED	MMSZ4686T1, 3.9V ZENER
VR503	4813830G09	MMSZ4684, 3.3V ZENER
VR504	4813830G09	MMSZ4684, 3.3V ZENER
VR692	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR693	4813830A77	MMBZ33VAL, 33V DUAL ZENER
VR694	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR695	4813830A77	MMBZ33VAL, 33V DUAL ZENER
VR696	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR697	4813830A75	MMBZ20VAL, 20V DUAL ZENER

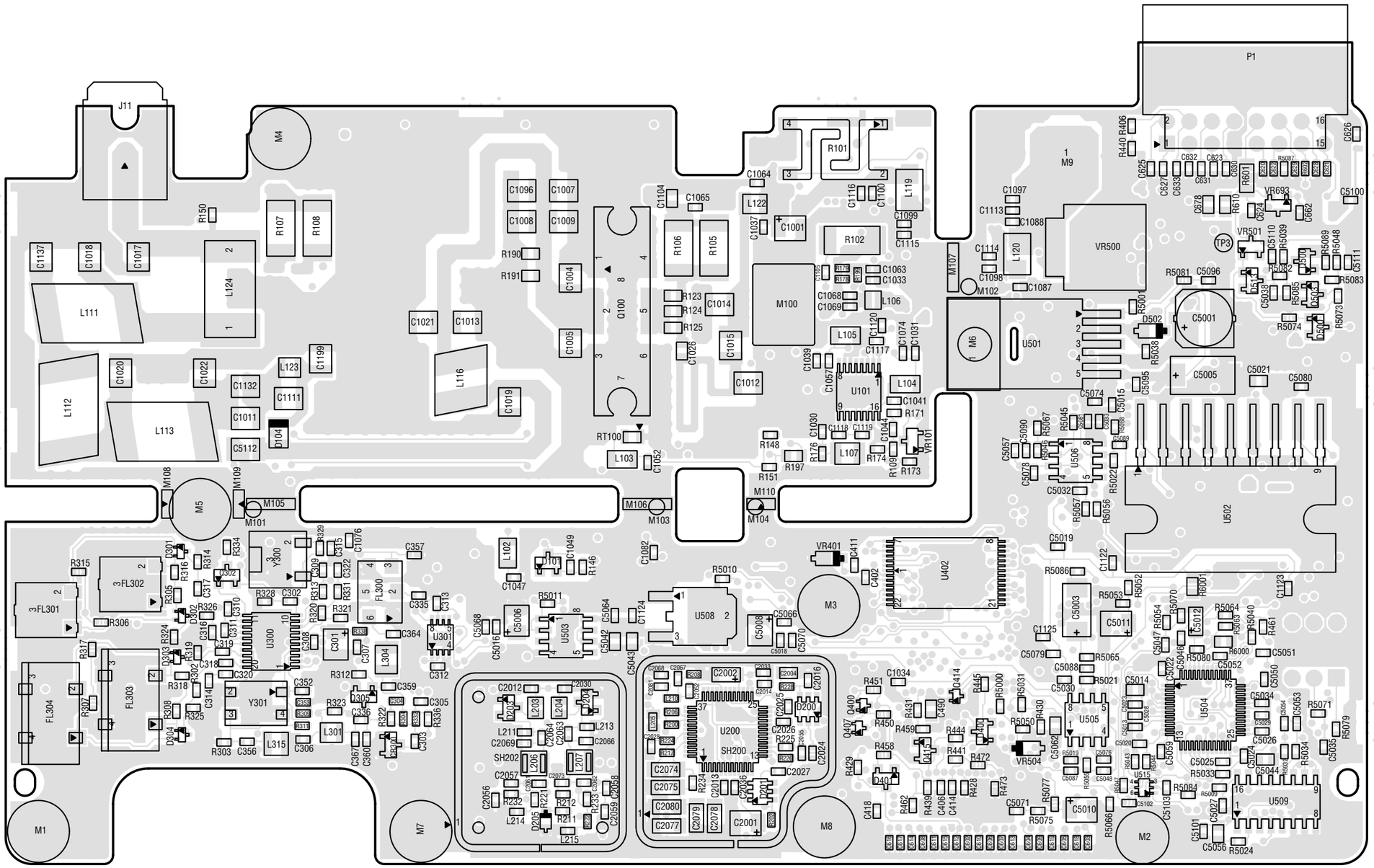
Circuit Ref.	Motorola Part No.	Description
VR698	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR699	4813830A75	MMBZ20VAL, 20V DUAL ZENER
Y200	NOT PLACED	45J68, TCXO
Y201	4880114R06	14R06, 16.8MHZ XTAL OSC
Y300	9186145B02	45B02, 455KHZ XTAL
Y301	4880606B09	06B09, 44.395MHZ XTAL OSC

THIS PAGE INTENTIONALLY LEFT BLANK

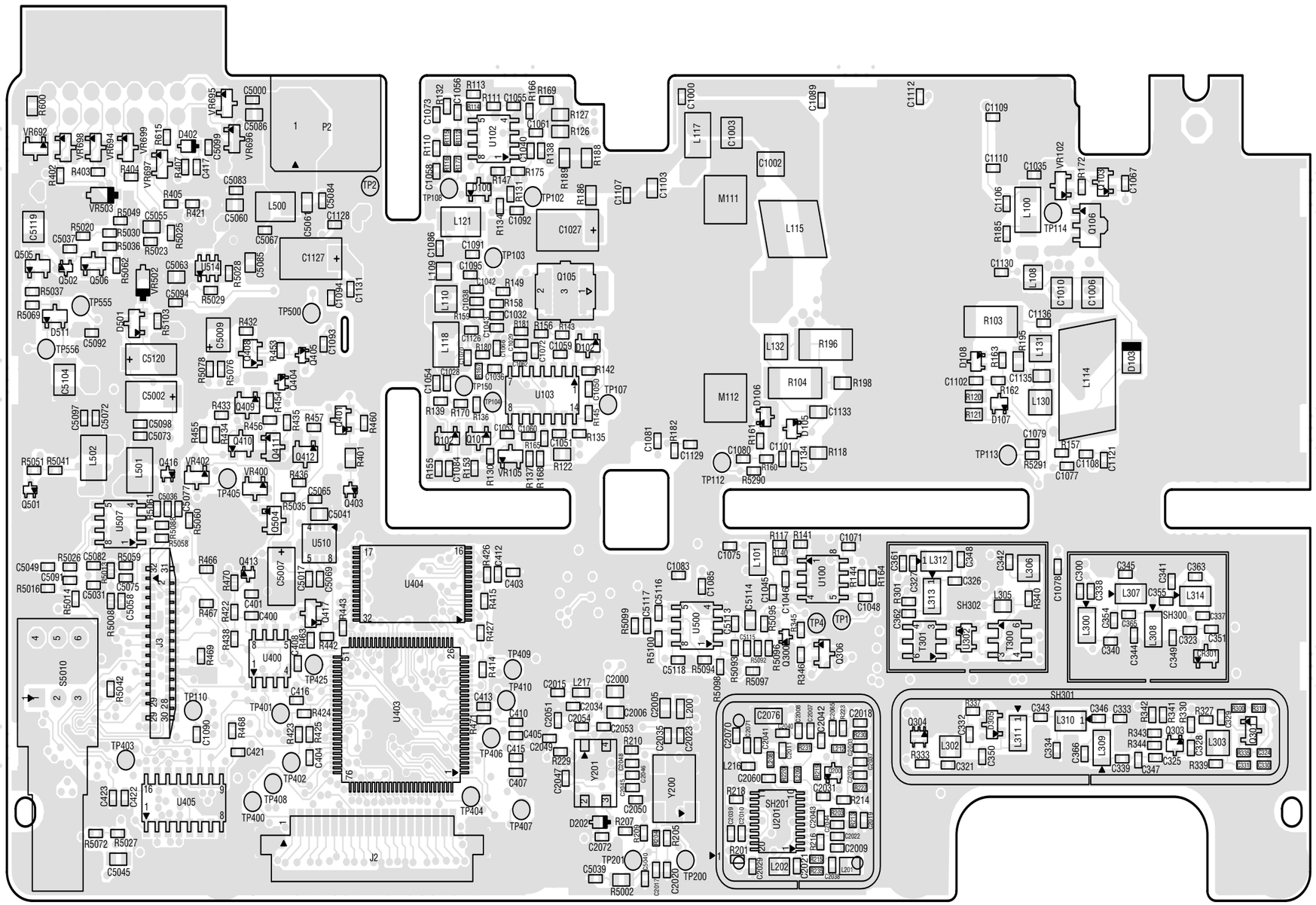
3.0 VHF 2, 25-45W PCB 8486487Z04 / Schematics



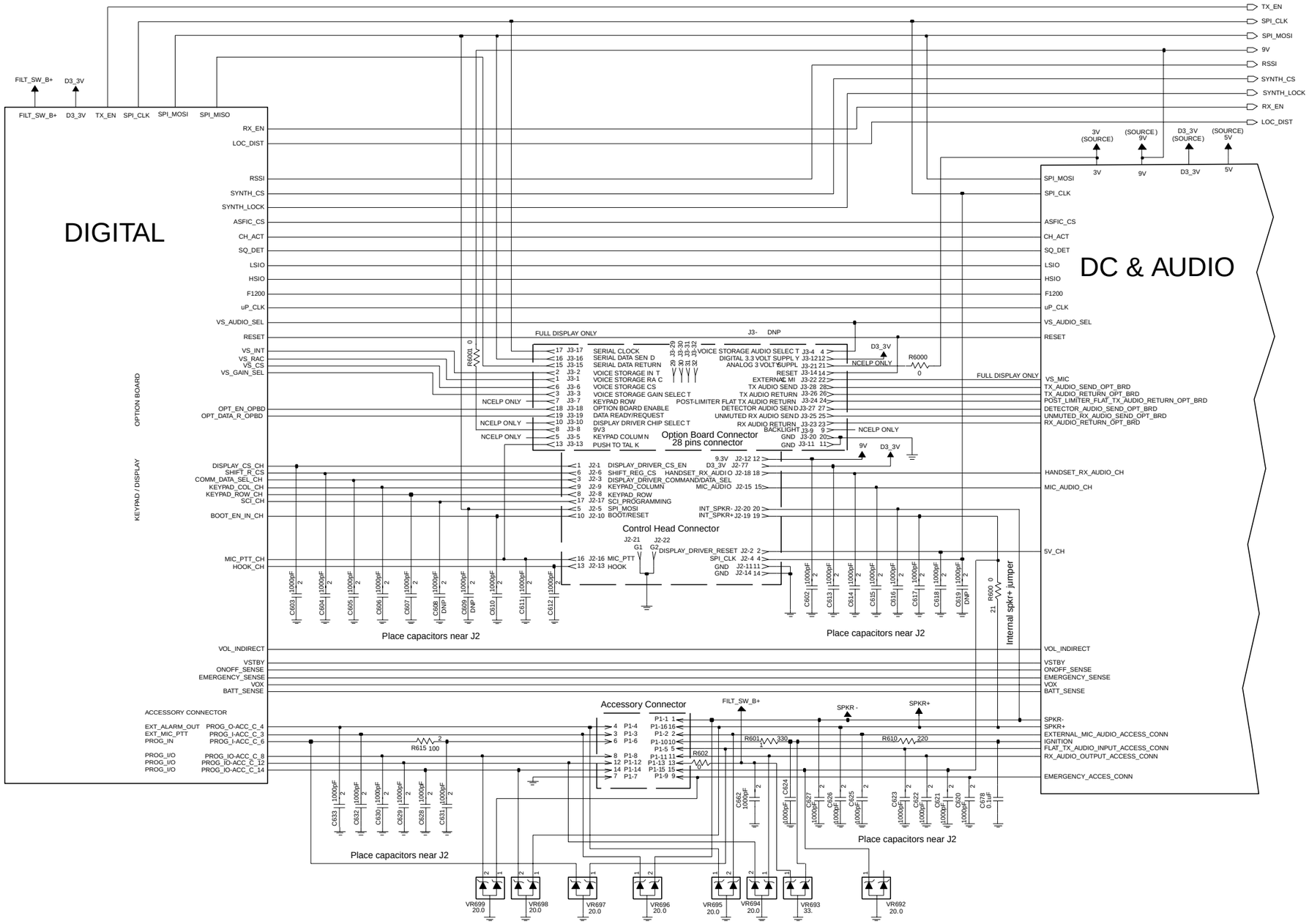
VHF 2 Interconnection between Main Board and Power Amplifier Compartment



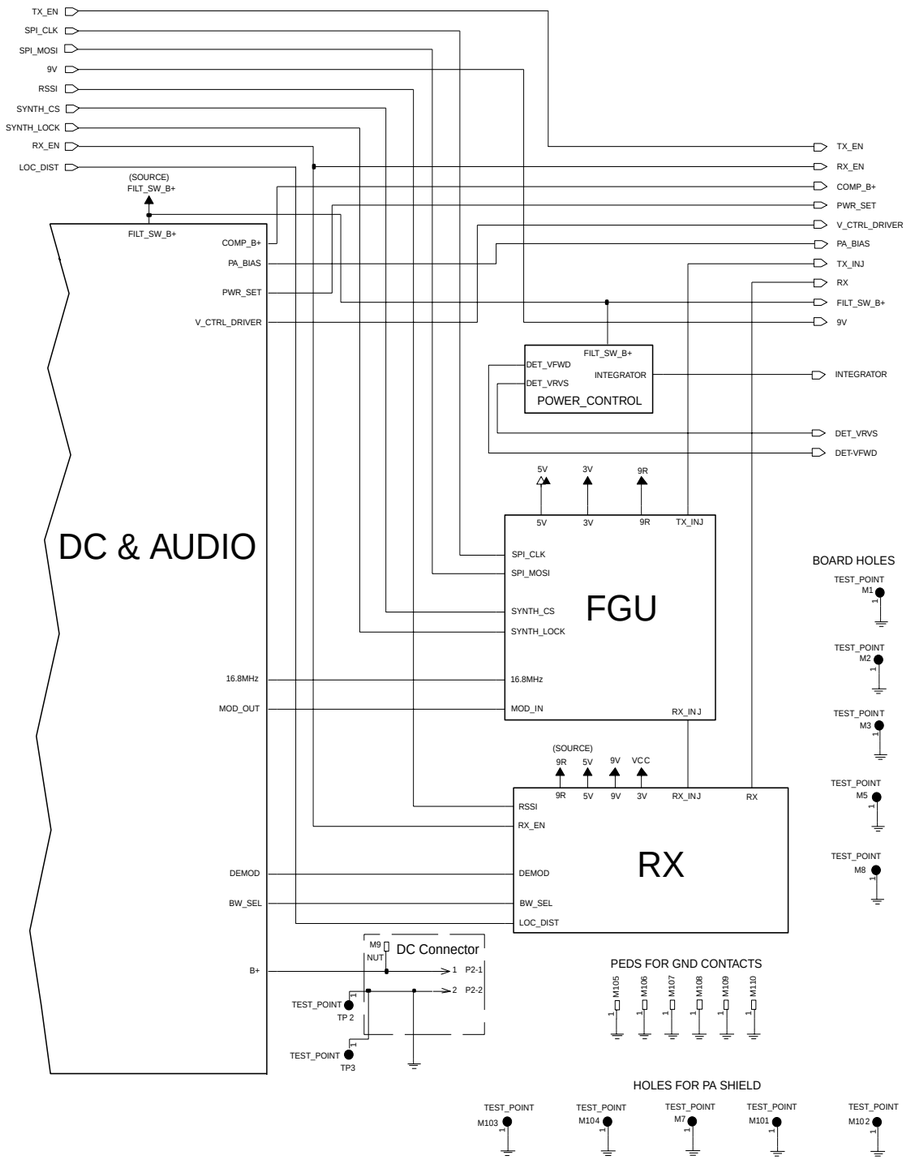
VHF 2 (146-174 MHz) 25-45 W 8486487Z04, Top Side View



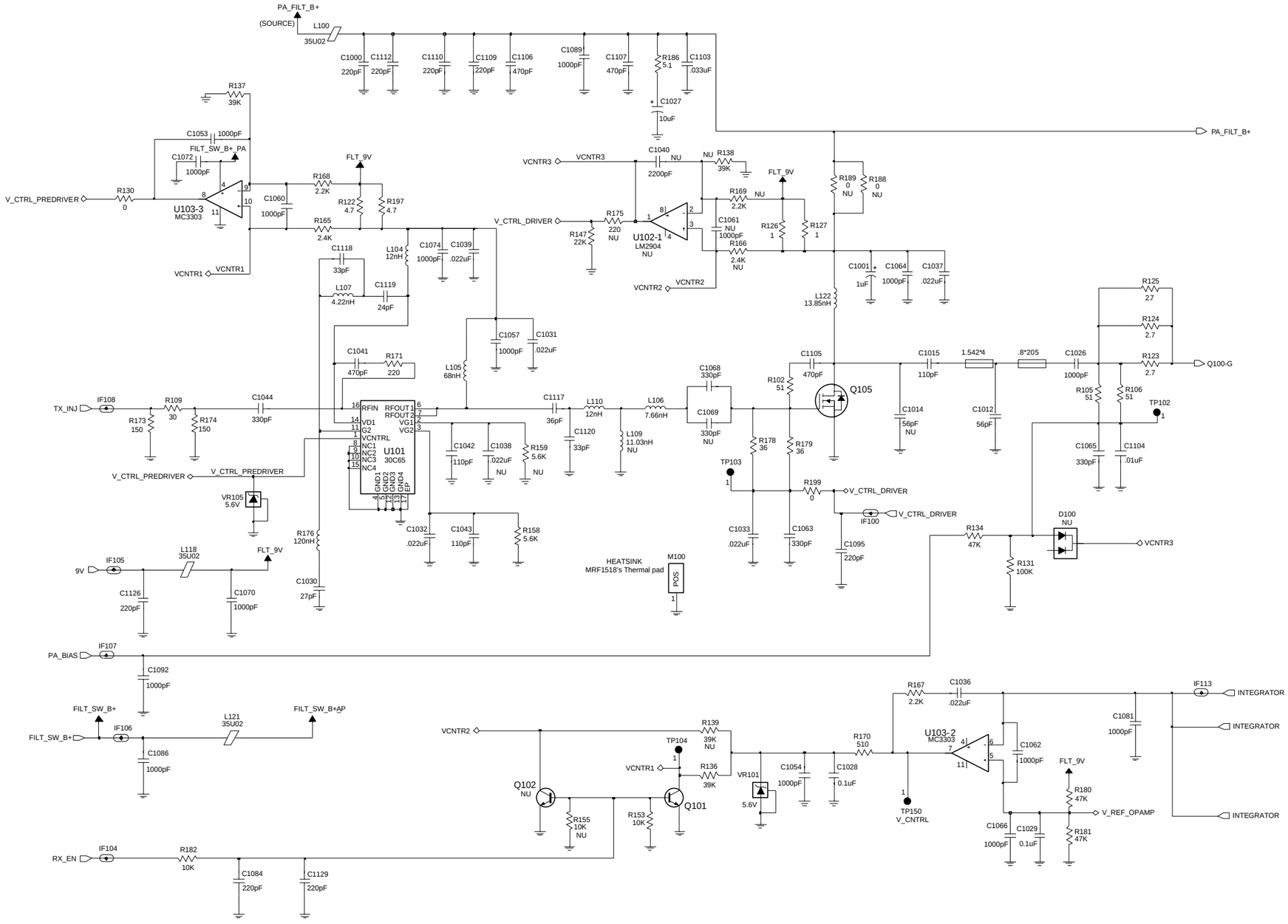
VHF 2 (146-174 MHz) 25-45 W 8486487Z04, Bottom Side View



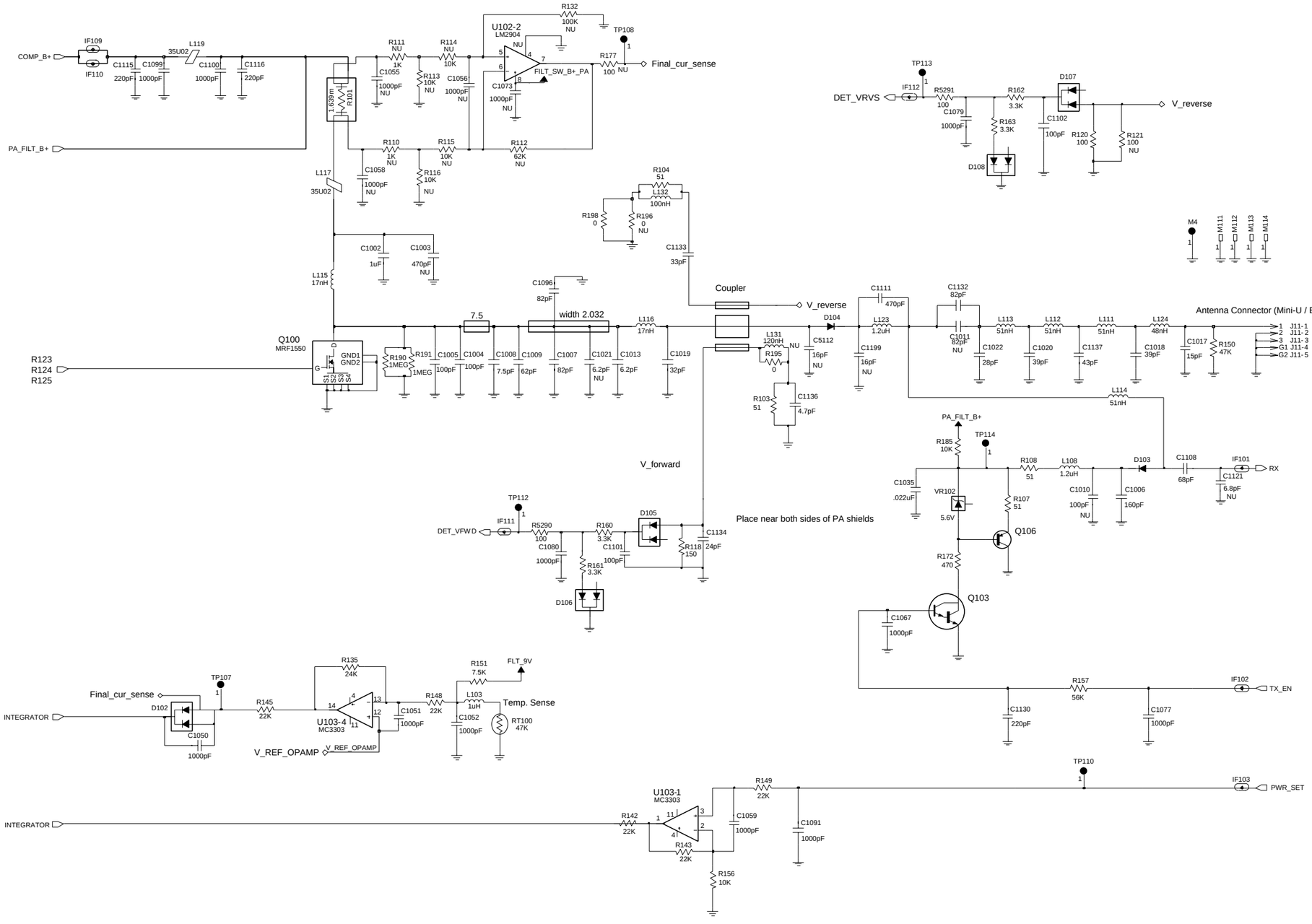
VHF 2 (146-174 MHz) 25-45W Main Circuit (Sht 1 of 2)



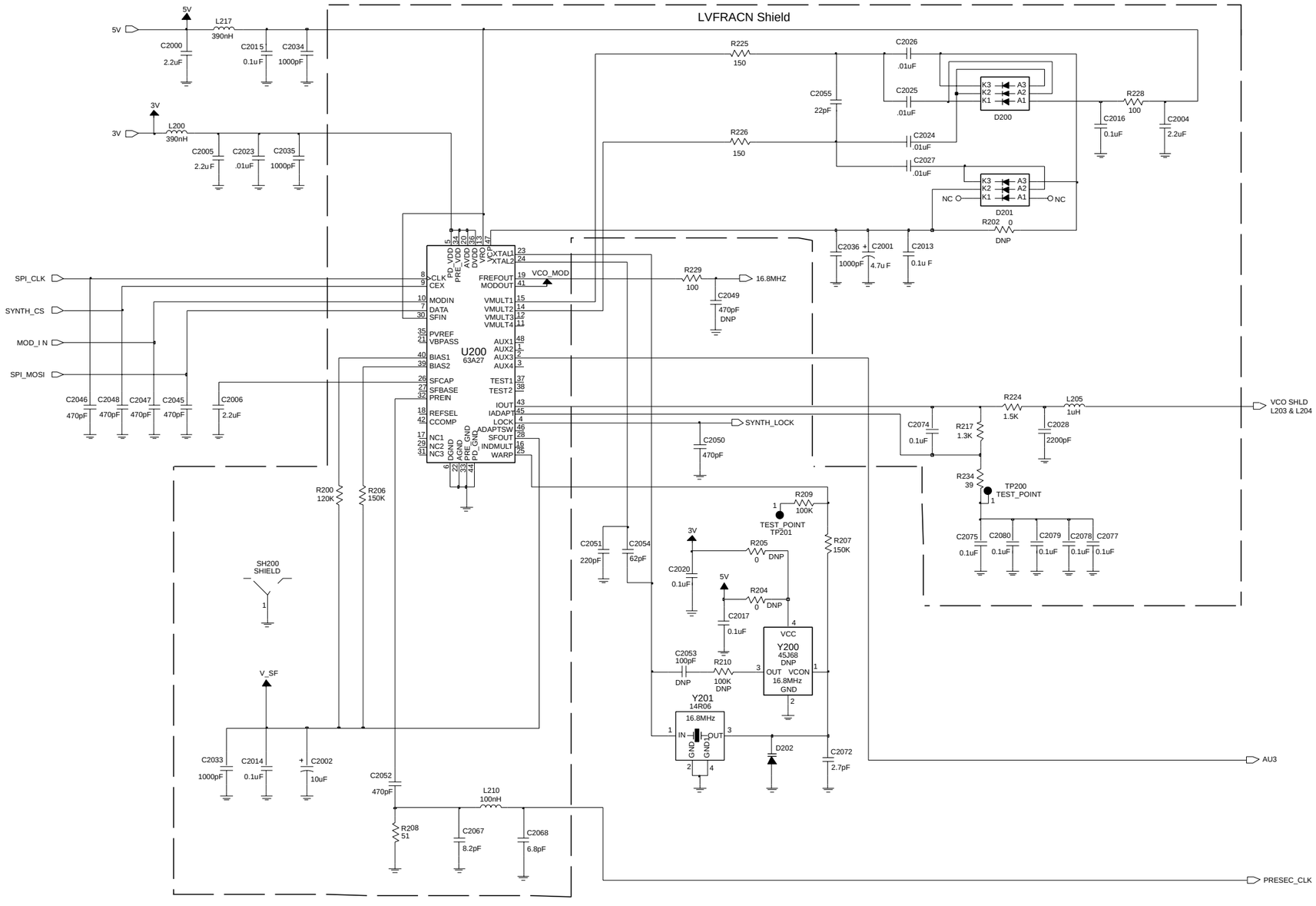
VHF 2 (146-174 MHz) 25-45W Main Circuit (Sht 2 of 2)



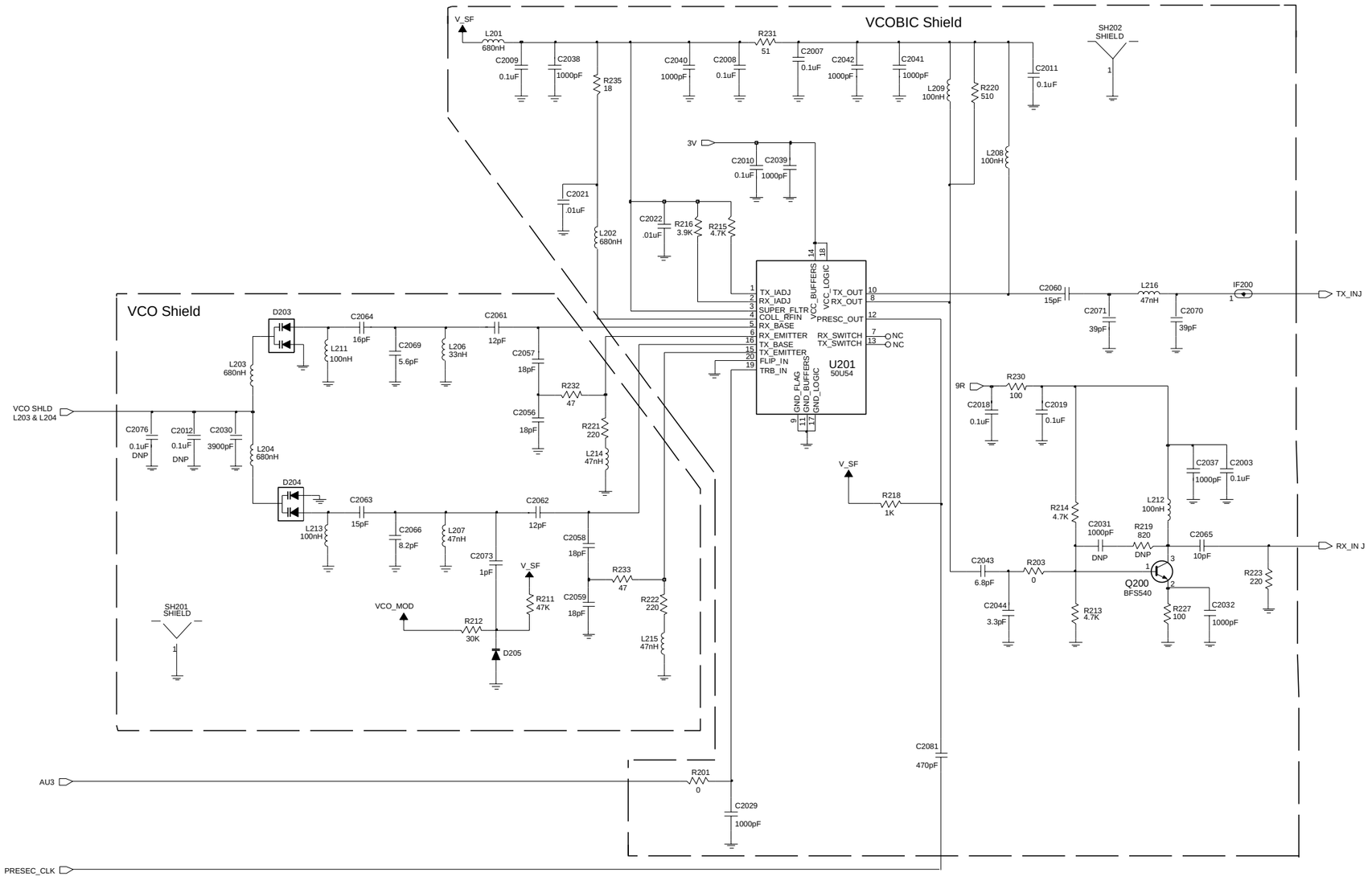
VHF 2 (146-174 MHz) 25-45W Transmitter (Sht 1 of 2)



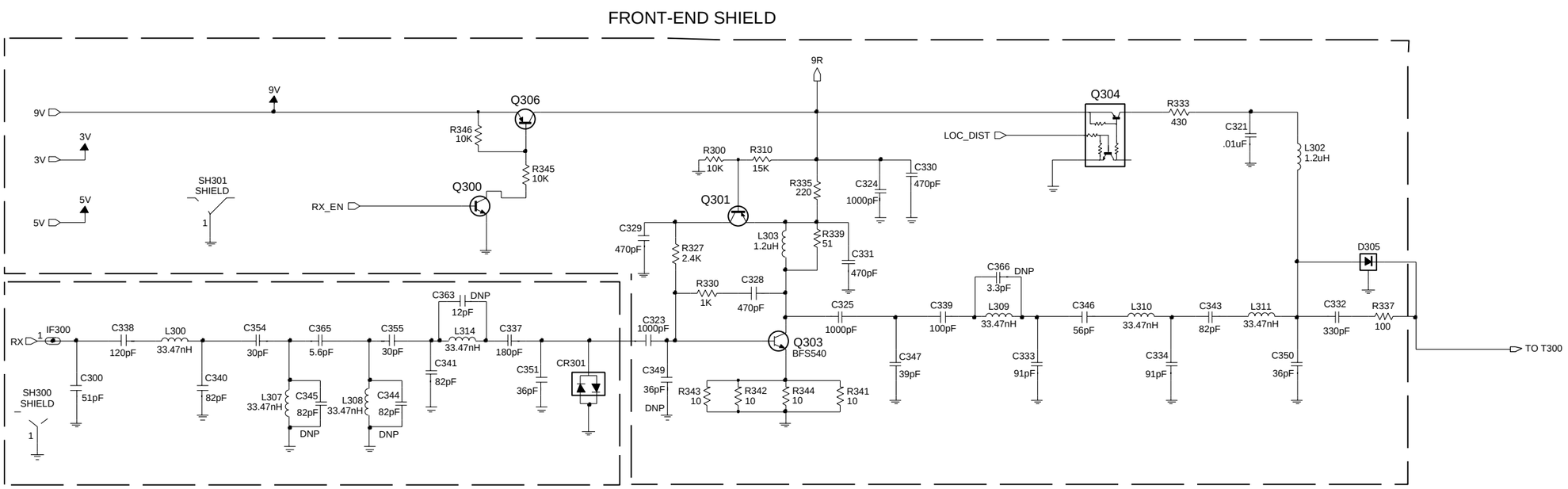
VHF 2 (146-174 MHz) 25-45W Transmitter (Sht 2 of 2)



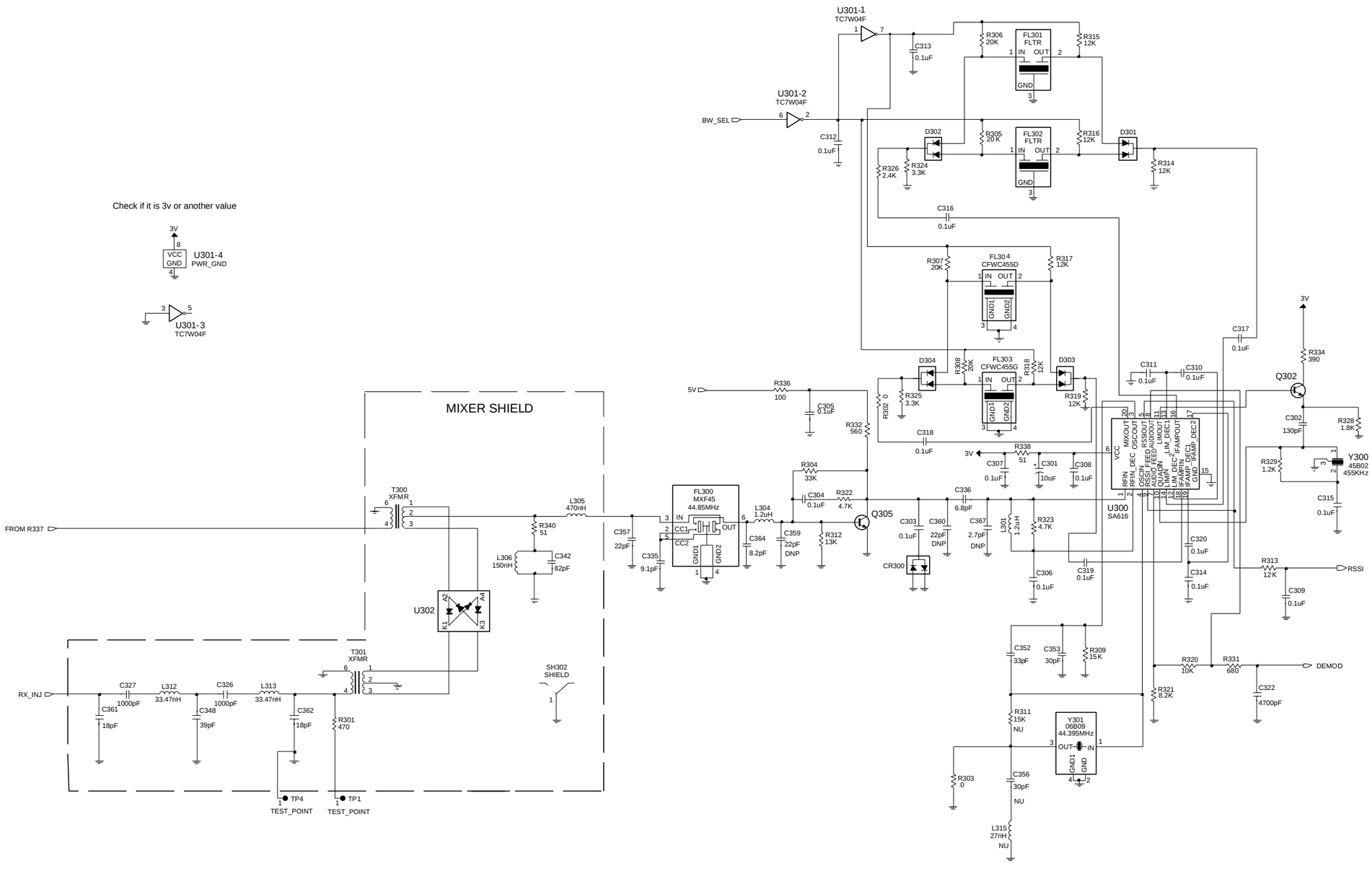
VHF 2 (146-174 MHz) 25-45W Synthesiser and VCO (Sht 1 of 2)



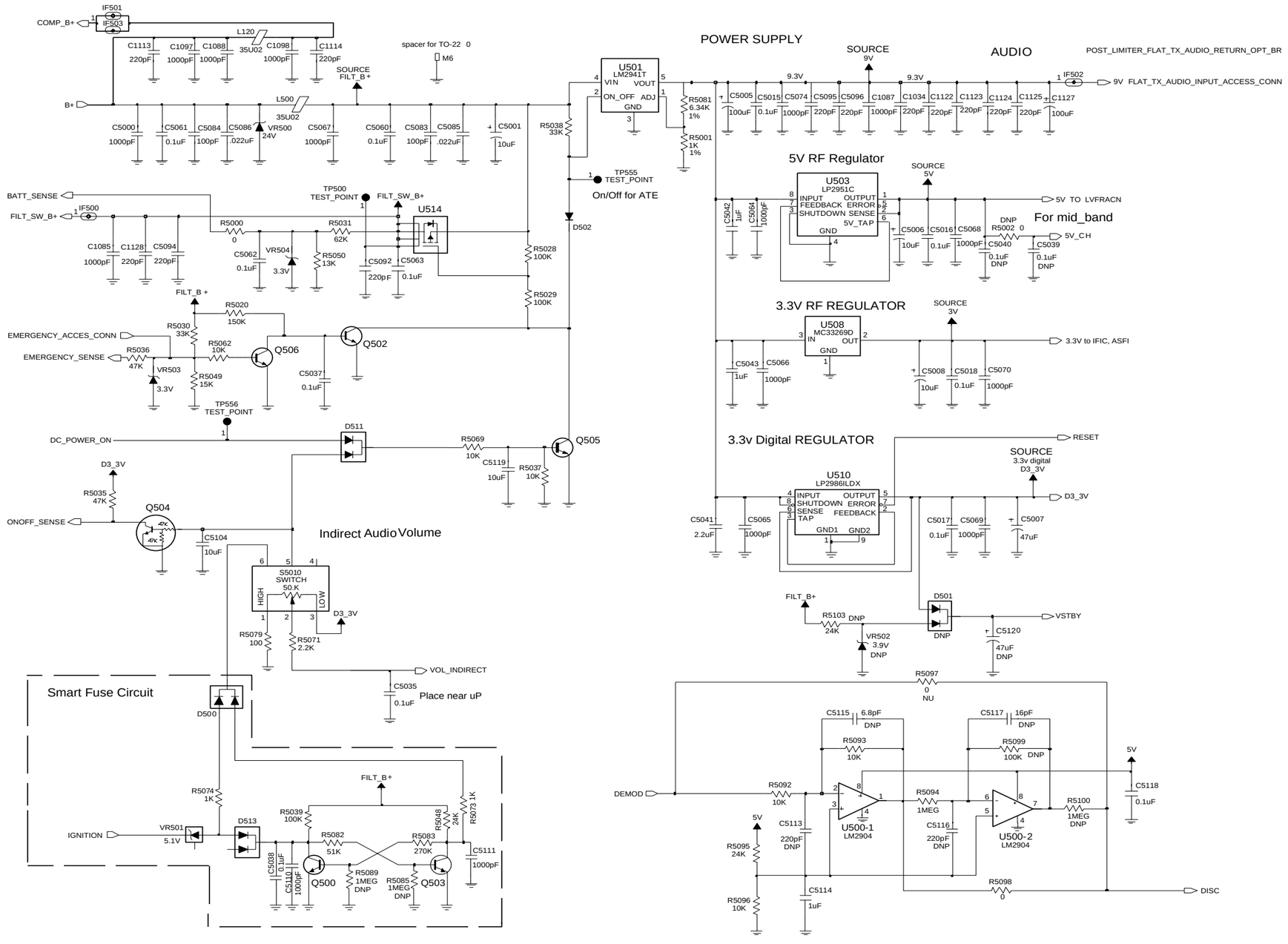
VHF 2 (146-174 MHz) 25-45W Synthesiser and VCO (Sht 2 of 2)



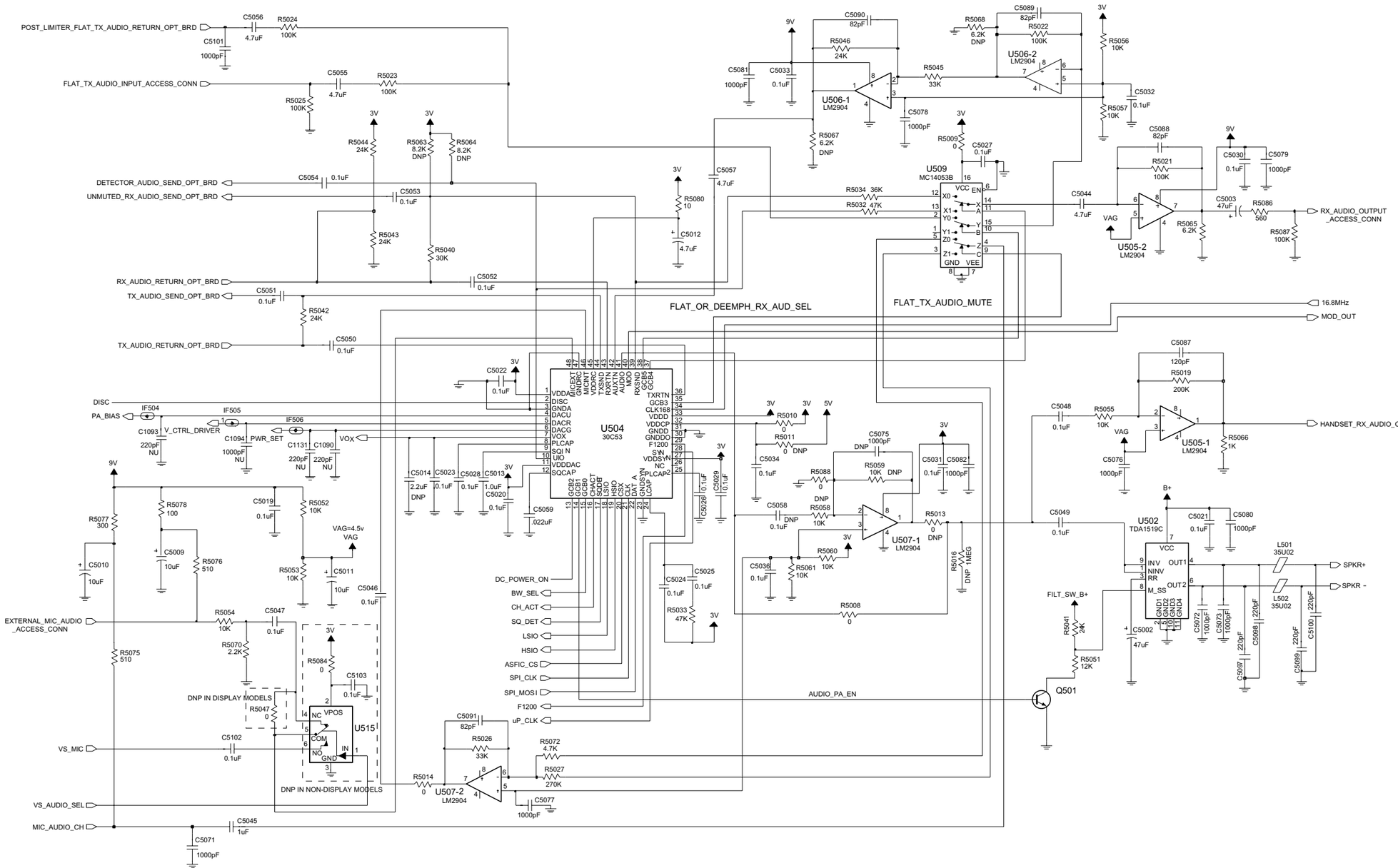
VHF 2 (146-174 MHz) 25-45W Receiver Front and Back End (Sht 1 of 2)



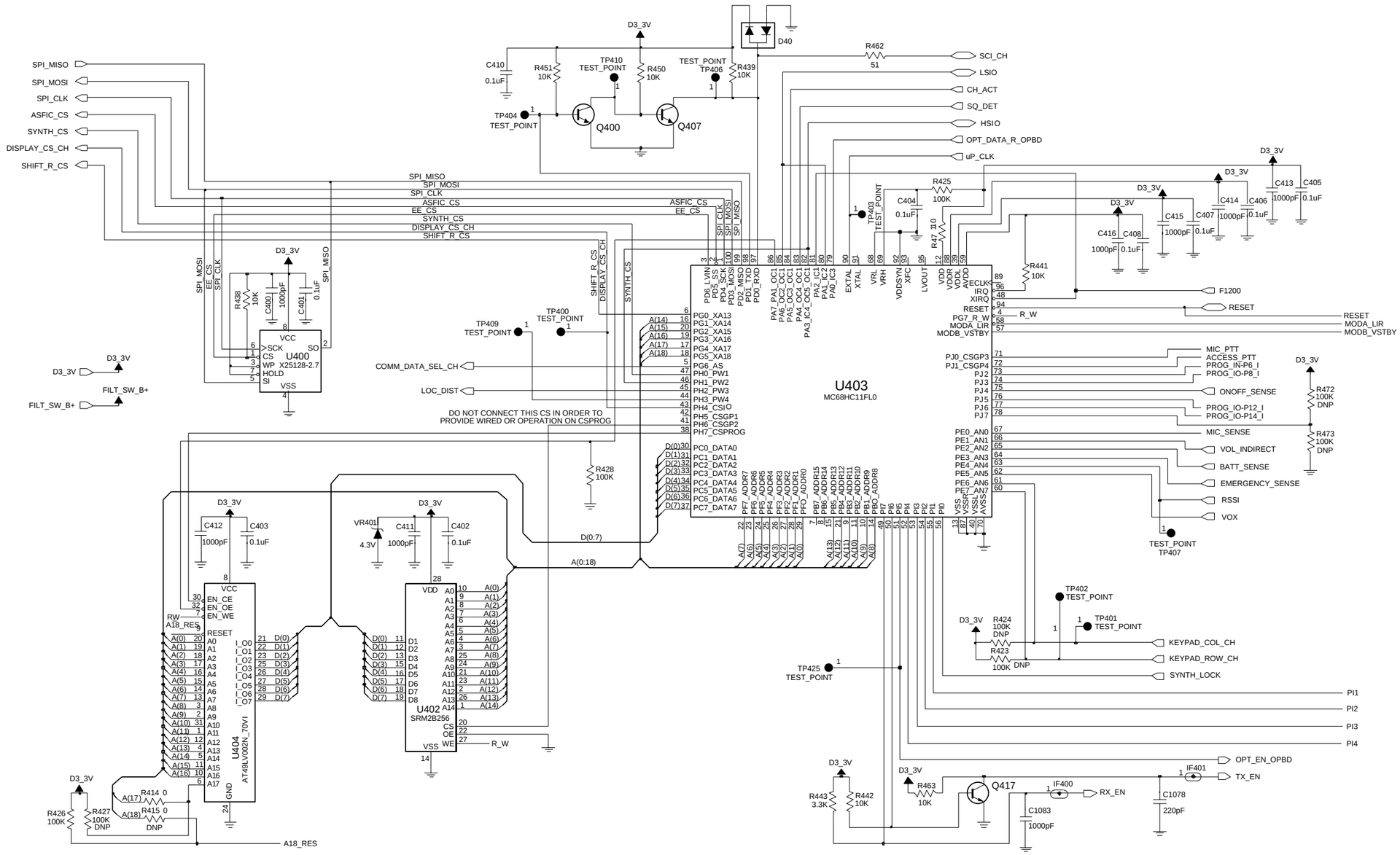
VHF 2 (146-174 MHz) 25-45W Receiver Front and Back End (Sht 2 of 2)



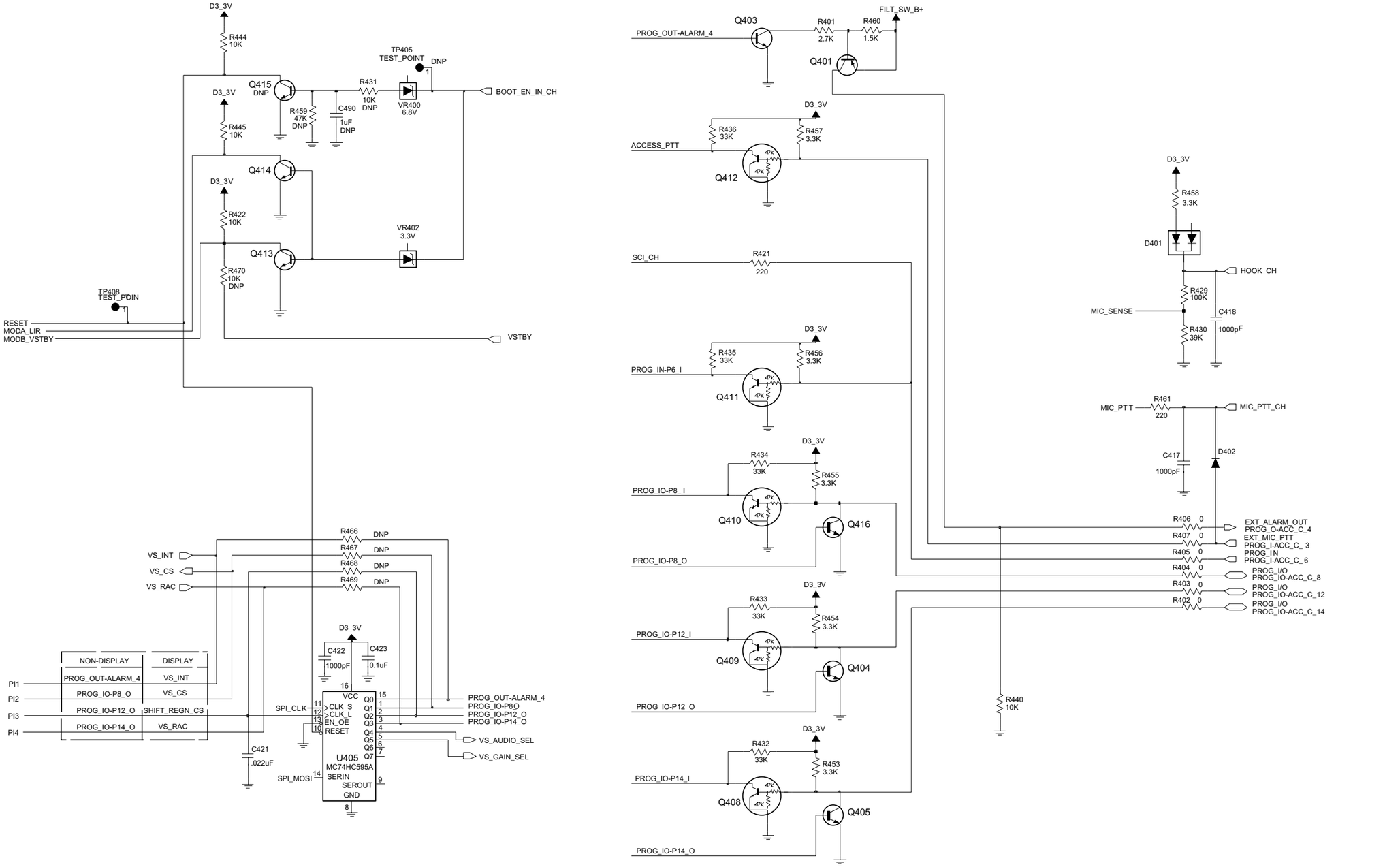
VHF 2 (146-174 MHz) 25-45W DC and Audio Circuits (Sht 1 of 2)



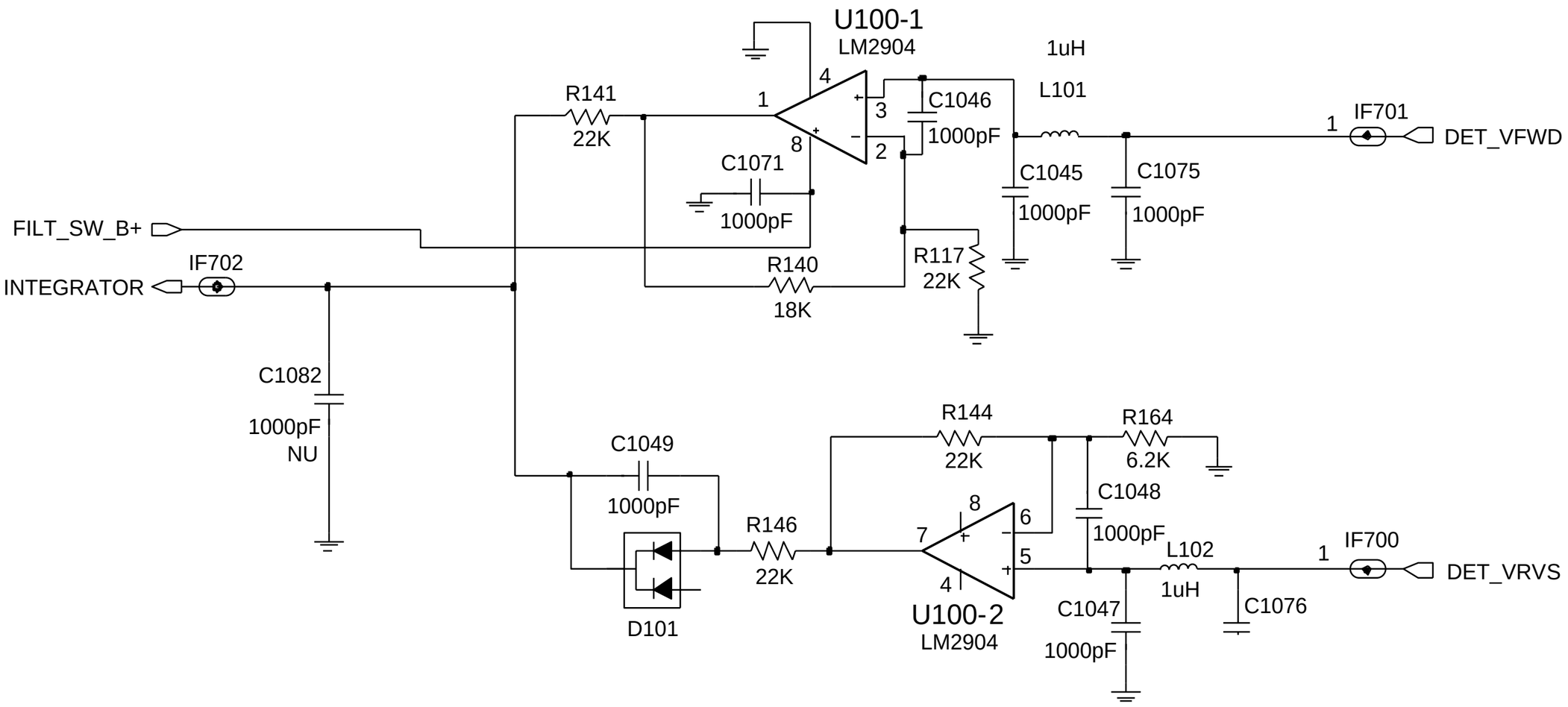
VHF 2 (146-174 MHz) 25-45W DC and Audio Circuits (Sht 2 of 2)



VHF 2 (146-174 MHz) 25-45W Microprocessor and Controller Circuits (Sht 1 of 2)



VHF 2 (146-174 MHz) 25-45W Microprocessor and Controller Circuits (Sht 2 of 2)



VHF 2 (146-174 MHz) 25-45W Power Control Circuit

3.1 VHF 2 PCB 8486487Z04 Parts List 25-45W

Circuit Ref.	Motorola Part No.	Description
C300	2113740F44	CAP, 51pF
C301	2311049A57	CAP, 10uF
C302	2113740F54	CAP, 130pF
C303	2113743K15	CAP, 0.1uF
C304	2113743E20	CAP, 0.1uF
C305	2113743E20	CAP, 0.1uF
C306	2113743E20	CAP, 0.1uF
C307	2113743E20	CAP, 0.1uF
C308	2113743E20	CAP, 0.1uF
C309	2113743E20	CAP, 0.1uF
C310	2113743E20	CAP, 0.1uF
C311	2113743E20	CAP, 0.1uF
C312	2113743E20	CAP, 0.1uF
C313	2113743E20	CAP, 0.1uF
C314	2113743E20	CAP, 0.1uF
C315	2113743E20	CAP, 0.1uF
C316	2113743E20	CAP, 0.1uF
C317	2113743E20	CAP, 0.1uF
C318	2113743E20	CAP, 0.1uF
C319	2113743E20	CAP, 0.1uF
C320	2113743E20	CAP, 0.1uF
C321	2113741F49	CAP, .01uF
C322	2113741F41	CAP, 4700pF
C323	2113741F25	CAP, 1000pF
C324	2113741F25	CAP, 1000pF
C325	2113741F25	CAP, 1000pF
C326	2113741F25	CAP, 1000pF
C327	2113741F25	CAP, 1000pF
C328	2113740F67	CAP, 470pF
C329	2113740F67	CAP, 470pF
C330	2113740F67	CAP, 470pF
C331	2113740F67	CAP, 470pF
C332	2113741F13	CAP, 330pF
C333	2113740L41	CAP, 91pF
C334	2113740L41	CAP, 91pF
C335	2113740L17	CAP, 9.1pF
C336	2113740L14	CAP, 6.8pF
C337	2113740F57	CAP, 180pF
C338	2113740F53	CAP, 120pF
C339	2113740F51	CAP, 100pF
C340	2113740F49	CAP, 82pF
C341	2113740F49	CAP, 82pF
C342	2113740F49	CAP, 82pF
C343	2113740F49	CAP, 82pF
C344	NOT PLACED	CAP, 82pF
C345	NOT PLACED	CAP, 82pF
C346	2113740F45	CAP, 56pF
C347	2113740F41	CAP, 39pF
C348	2113740F41	CAP, 39pF
C349	NOT PLACED	CAP, 36pF
C350	2113740F40	CAP, 36pF
C351	2113740F40	CAP, 36pF
C352	2113740F39	CAP, 33pF
C353	2113740F38	CAP, 30pF
C354	2113740F38	CAP, 30pF
C355	2113740F38	CAP, 30pF
C356	NOT PLACED	CAP, 30pF
C357	2113740F35	CAP, 22pF
C359	NOT PLACED	CAP, 22pF
C360	NOT PLACED	CAP, 22pF
C361	2113740F33	CAP, 18pF
C362	2113740F33	CAP, 18pF
C363	NOT PLACED	CAP, 12pF
C364	2113740F25	CAP, 8.2pF
C365	2113740F21	CAP, 5.6pF
C366	NOT PLACED	CAP, 3.3pF
C367	NOT PLACED	CAP, 2.7pF
C400	2113741F25	CAP, 1000pF
C401	2113743K15	CAP, 0.1uF
C402	2113743K15	CAP, 0.1uF
C403	2113743K15	CAP, 0.1uF
C404	2113743K15	CAP, 0.1uF
C405	2113743K15	CAP, 0.1uF
C406	2113743K15	CAP, 0.1uF
C407	2113743K15	CAP, 0.1uF
C408	2113743K15	CAP, 0.1uF
C410	2113743K15	CAP, 0.1uF
C411	2113741F25	CAP, 1000pF
C412	2113741F25	CAP, 1000pF
C413	2113741F25	CAP, 1000pF
C414	2113741F25	CAP, 1000pF
C415	2113741F25	CAP, 1000pF
C416	2113741F25	CAP, 1000pF
C417	2113741F25	CAP, 1000pF
C418	2113741F25	CAP, 1000pF
C421	NOT PLACED	CAP, .022uF
C422	2113741F25	CAP, 1000pF
C423	2113743K15	CAP, 0.1uF
C490	NOT PLACED	CAP, 1uF
C602	2113741F25	CAP, 1000pF
C603	2113741F25	CAP, 1000pF
C604	2113741F25	CAP, 1000pF
C605	2113741F25	CAP, 1000pF
C606	2113741F25	CAP, 1000pF
C607	2113741F25	CAP, 1000pF
C608	NOT PLACED	CAP, 1000pF
C609	NOT PLACED	CAP, 1000pF
C610	2113741F25	CAP, 1000pF
C611	2113741F25	CAP, 1000pF
C612	2113741F25	CAP, 1000pF
C613	2113741F25	CAP, 1000pF
C614	2113741F25	CAP, 1000pF
C615	2113741F25	CAP, 1000pF
C616	2113741F25	CAP, 1000pF
C617	2113741F25	CAP, 1000pF
C618	2113741F25	CAP, 1000pF
C619	NOT PLACED	CAP, 1000pF
C620	2113741F25	CAP, 1000pF
C621	2113741F25	CAP, 1000pF
C622	2113741F25	CAP, 1000pF
C623	2113741F25	CAP, 1000pF
C624	2113741F25	CAP, 1000pF
C625	2113741F25	CAP, 1000pF
C626	2113741F25	CAP, 1000pF
C627	2113741F25	CAP, 1000pF
C628	2113741F25	CAP, 1000pF
C629	2113741F25	CAP, 1000pF
C630	2113741F25	CAP, 1000pF
C631	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C632	2113741F25	CAP, 1000pF
C633	2113741F25	CAP, 1000pF
C662	2113741F25	CAP, 1000pF
C678	2113741M69	CAP, 0.1uF
C1000	2113740F59	CAP, 220pF
C1001	2311049A08	CAPP, 1uF
C1002	2113741W01	CAP, 1uF
C1003	NOT PLACED	CAP, 470pF
C1004	2111078B42	CAP, 100pF
C1005	2111078B42	CAP, 100pF
C1006	2111078B48	CAP, 160pF
C1007	2111078B40	CAP, 82pF
C1008	2111078B10	CAP, 7.5pF
C1009	2111078B37	CAP, 62pF
C1010	NOT PLACED	CAP, 100pF
C1011	2111078B40	CAP, 82pF
C1012	2111078B36	CAP, 56pF
C1013	2111078B08	CAP, 6.2pF
C1014	NOT PLACED	CAP, 56pF
C1015	2111078B43	CAP, 110pF
C1017	2111078B18	CAP, 15pF
C1018	2111078B32	CAP, 39pF
C1019	2111078B28	CAP, 32pF
C1020	2111078B32	CAP, 39pF
C1021	NOT PLACED	CAP, 6.2pF
C1022	2111078B26	CAP, 28pF
C1026	2113740A79	CAP, 1000pF
C1027	2311049A45	CAPP, 10uF
C1028	2113743K15	CAP, 0.1uF
C1029	2113743K15	CAP, 0.1uF
C1030	2113740F37	CAP, 27pF
C1031	2113743E07	CAP, .022uF
C1032	2113743E07	CAP, .022uF
C1033	2113743E07	CAP, .022uF
C1034	2113740F59	CAP, 220pF
C1035	2113743E07	CAP, .022uF
C1036	2113743E07	CAP, .022uF
C1037	2113743E07	CAP, .022uF
C1038	NOT PLACED	CAP, .022uF
C1039	2113743E07	CAP, .022uF
C1040	NOT PLACED	CAP, 2200pF
C1041	2113741F17	CAP, 470pF
C1042	2113740F52	CAP, 110pF
C1043	2113740F52	CAP, 110pF
C1044	2113741F13	CAP, 330pF
C1045	2113741F25	CAP, 1000pF
C1046	2113741F25	CAP, 1000pF
C1047	2113741F25	CAP, 1000pF
C1048	2113741F25	CAP, 1000pF
C1049	2113741F25	CAP, 1000pF
C1050	2113741F25	CAP, 1000pF
C1051	2113741F25	CAP, 1000pF
C1052	2113741F25	CAP, 1000pF
C1053	2113741F25	CAP, 1000pF
C1054	2113741F25	CAP, 1000pF
C1055	NOT PLACED	CAP, 1000pF
C1056	NOT PLACED	CAP, 1000pF
C1057	2113741F25	CAP, 1000pF
C1058	NOT PLACED	CAP, 1000pF
C1059	2113741F25	CAP, 1000pF
C1060	2113741F25	CAP, 1000pF
C1061	NOT PLACED	CAP, 1000pF
C1062	2113741F25	CAP, 1000pF
C1063	2113740F63	CAP, 330pF
C1064	2113741F25	CAP, 1000pF
C1065	2113740F63	CAP, 330pF
C1066	2113741F25	CAP, 1000pF
C1067	2113741F25	CAP, 1000pF
C1068	2113741F13	CAP, 330pF
C1069	NOT PLACED	CAP, 330pF
C1070	2113741F25	CAP, 1000pF
C1071	2113741F25	CAP, 1000pF
C1072	2113741F25	CAP, 1000pF
C1073	NOT PLACED	CAP, 1000pF
C1074	2113741F25	CAP, 1000pF
C1075	2113741F25	CAP, 1000pF
C1076	2113741F25	CAP, 1000pF
C1077	2113741F25	CAP, 1000pF
C1078	2113740F59	CAP, 220pF
C1079	2113741F25	CAP, 1000pF
C1080	2113741F25	CAP, 1000pF
C1081	2113741F25	CAP, 1000pF
C1082	NOT PLACED	CAP, 1000pF
C1083	2113741F25	CAP, 1000pF
C1084	2113740F59	CAP, 220pF
C1085	2113741F25	CAP, 1000pF
C1086	2113741F25	CAP, 1000pF
C1087	2113741F25	CAP, 1000pF
C1088	2113741F25	CAP, 1000pF
C1089	2113741F25	CAP, 1000pF
C1090	NOT PLACED	CAP, 220pF
C1091	2113741F25	CAP, 1000pF
C1092	2113741F25	CAP, 1000pF
C1093	NOT PLACED	CAP, 220pF
C1094	NOT PLACED	CAP, 1000pF
C1095	2113740F59	CAP, 220pF
C1096	2111078B40	CAP, 82pF
C1097	2113741F25	CAP, 1000pF
C1098	2113741F25	CAP, 1000pF
C1099	2113741F25	CAP, 1000pF
C1100	2113741F25	CAP, 1000pF
C1101	2113741F01	CAP, 100pF
C1102	2113741F01	CAP, 100pF
C1103	2113741A57	CAP, .033uF
C1104	2113741A45	CAP, .01uF
C1105	2113740F67	CAP, 470pF
C1106	2113740F67	CAP, 470pF
C1107	2113740F67	CAP, 470pF
C1108	2113740F47	CAP, 68pF
C1109	2113740F59	CAP, 220pF
C1110	2113740F59	CAP, 220pF
C1111	2111078B59	CAP, 470pF
C1112	2113740F59	CAP, 220pF
C1113	2113740F59	CAP, 220pF
C1114	2113740F59	CAP, 220pF
C1115	2113740F59	CAP, 220pF
C1116	2113740F59	CAP, 220pF
C1117	2113740F40	CAP, 36pF
C1118	2113740F39	CAP, 33pF
C1119	2113740F36	CAP, 24pF

Circuit Ref.	Motorola Part No.	Description
C1120	2113740F39	CAP, 33pF
C1121	NOT PLACED	CAP, 6.8pF
C1122	2113740F59	CAP, 220pF
C1123	2113740F59	CAP, 220pF
C1124	2113740F59	CAP, 220pF
C1125	2113740F59	CAP, 220pF
C1126	2113740F59	CAP, 220pF
C1127	2360567A03	CAPP, 100uF
C1128	2113740F59	CAP, 220pF
C1129	2113740F59	CAP, 220pF
C1130	2113740F59	CAP, 220pF
C1131	NOT PLACED	CAP, 220pF
C1132	2111078B40	CAP, 82pF
C1133	0662057C01	RES, 0
C1134	NOT PLACED	RES, 100
C1135	0662057C01	RES, 0
C1136	NOT PLACED	CAP, 4.7pF
C1137	2111078B33	CAP, 43pF
C1199	NOT PLACED	CAP, 16pF
C2000	2113743F18	CAP, 2.2uF
C2001	2311049J11	CAPP, 4.7uF
C2002	2311049A72	CAPP, 10uF
C2003	2113743K15	CAP, 0.1uF
C2004	2113743F18	CAP, 2.2uF
C2005	2113743F18	CAP, 2.2uF
C2006	2113743F18	CAP, 2.2uF
C2007	2113743E20	CAP, 0.1uF
C2008	2113743E20	CAP, 0.1uF
C2009	2113743E20	CAP, 0.1uF
C2010	2113743E20	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C2011	2113743E20	CAP, 0.1uF
C2012	NOT PLACED	CAP, 0.1uF
C2013	2113743E20	CAP, 0.1uF
C2014	2113743E20	CAP, 0.1uF
C2015	2113743E20	CAP, 0.1uF
C2016	2113743E20	CAP, 0.1uF
C2017	2113743E20	CAP, 0.1uF
C2018	2113743E20	CAP, 0.1uF
C2019	2113743E20	CAP, 0.1uF
C2020	2113743E20	CAP, 0.1uF
C2021	2113741F49	CAP, .01uF
C2022	2113741F49	CAP, .01uF
C2023	2113741F49	CAP, .01uF
C2024	2113741F49	CAP, .01uF
C2025	2113741F49	CAP, .01uF
C2026	2113741F49	CAP, .01uF
C2027	2113741F49	CAP, .01uF
C2028	2113741F33	CAP, 2200pF
C2029	2113741F25	CAP, 1000pF
C2030	2113741F39	CAP, 3900pF
C2031	NOT PLACED	CAP, 1000pF
C2032	2113741F25	CAP, 1000pF
C2033	2113741F25	CAP, 1000pF
C2034	2113741F25	CAP, 1000pF
C2035	2113741F25	CAP, 1000pF
C2036	2113741F25	CAP, 1000pF
C2037	2113741F25	CAP, 1000pF
C2038	2113741F25	CAP, 1000pF
C2039	2113741F25	CAP, 1000pF
C2040	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C2041	2113741F25	CAP, 1000pF
C2042	2113741F25	CAP, 1000pF
C2043	2113740L14	CAP, 6.8pF
C2044	2113740L06	CAP, 3.3pF
C2045	2113740F67	CAP, 470pF
C2046	2113740F67	CAP, 470pF
C2047	2113740F67	CAP, 470pF
C2048	2113740F67	CAP, 470pF
C2049	NOT PLACED	CAP, 470pF
C2050	2113740F67	CAP, 470pF
C2051	2113740F59	CAP, 220pF
C2052	2113740F67	CAP, 100pF
C2053	NOT PLACED	CAP, 100pF
C2054	2113740L37	CAP, 62pF
C2055	2113740F35	CAP, 22pF
C2056	2113740F33	CAP, 18pF
C2057	2113740F33	CAP, 18pF
C2058	2113740F33	CAP, 18pF
C2059	2113740F33	CAP, 18pF
C2060	2113740F31	CAP, 15pF
C2061	2113740F29	CAP, 12pF
C2062	2113740F29	CAP, 12pF
C2063	2113740L22	CAP, 15pF
C2064	2113740F32	CAP, 16pF
C2065	2113740F27	CAP, 10pF
C2066	2113740L16	CAP, 8.2pF
C2067	2113740F25	CAP, 8.2pF
C2068	2113740F23	CAP, 6.8pF
C2069	2113740L12	CAP, 5.6pF
C2070	2113740F41	CAP, 39pF

Circuit Ref.	Motorola Part No.	Description
C2071	2113740F41	CAP, 39pF
C2072	2113740L04	CAP, 2.7pF
C2073	2113740F03	CAP, 1pF
C2074	2109720D14	CAP, 0.1uF
C2075	2109720D14	CAP, 0.1uF
C2076	NOT PLACED	CAP, 0.1uF
C2077	2109720D14	CAP, 0.1uF
C2078	2109720D14	CAP, 0.1uF
C2079	2109720D14	CAP, 0.1uF
C2080	2109720D14	CAP, 0.1uF
C2081	2113740F67	CAP, 470pF
C5000	2113741F25	CAP, 1000pF
C5001	2389289U01	CAPP, 10uF
C5002	2311049A99	CAPP, 47uF
C5003	2311049A99	CAPP, 47uF
C5005	2360567A03	CAPP, 100uF
C5006	2311049A57	CAPP, 10uF
C5007	2311049A99	CAPP, 47uF
C5008	2311049A57	CAPP, 10uF
C5009	2311049A57	CAPP, 10uF
C5010	2311049A57	CAPP, 10uF
C5011	2311049A57	CAPP, 10uF
C5012	2311049A56	CAPP, 4.7uF
C5013	2113928P04	CAP, 1.0uF
C5014	NOT PLACED	CAP, 2.2uF
C5015	2113743K15	CAP, 0.1uF
C5016	2113743K15	CAP, 0.1uF
C5017	2113743K15	CAP, 0.1uF
C5018	2113743K15	CAP, 0.1uF
C5019	2113743K15	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C5020	2113743K15	CAP, 0.1uF
C5021	2113741M69	CAP, 0.1uF
C5022	2113743K15	CAP, 0.1uF
C5023	2113743K15	CAP, 0.1uF
C5024	2113743K15	CAP, 0.1uF
C5025	2113743K15	CAP, 0.1uF
C5026	2113743K15	CAP, 0.1uF
C5027	2113743K15	CAP, 0.1uF
C5028	2113743K15	CAP, 0.1uF
C5029	2113743K15	CAP, 0.1uF
C5030	2113743K15	CAP, 0.1uF
C5031	2113743K15	CAP, 0.1uF
C5032	2113743K15	CAP, 0.1uF
C5033	2113743K15	CAP, 0.1uF
C5034	2113743K15	CAP, 0.1uF
C5035	2113743K15	CAP, 0.1uF
C5036	2113743K15	CAP, 0.1uF
C5037	2113743K15	CAP, 0.1uF
C5038	2113743K15	CAP, 0.1uF
C5039	NOT PLACED	CAP, 0.1uF
C5040	NOT PLACED	CAP, 0.1uF
C5041	2113743F18	CAP, 2.2uF
C5042	2113743F16	CAP, 1uF
C5043	2113743F16	CAP, 1uF
C5044	2113928C04	CAP, 1uF
C5045	2113743F16	CAP, 1uF
C5046	2113743E20	CAP, 0.1uF
C5047	2113743E20	CAP, 0.1uF
C5048	2113743E20	CAP, 0.1uF
C5049	2113743E20	CAP, 0.1uF

Circuit Ref.	Motorola Part No.	Description
C5050	2113743E20	CAP, 0.1uF
C5051	NOT PLACED	CAP, 0.1uF
C5052	2113743E20	CAP, 0.1uF
C5053	NOT PLACED	CAP, 0.1uF
C5054	NOT PLACED	CAP, 0.1uF
C5055	2113928C04	CAP, 4.7uF
C5056	2113928C04	CAP, 4.7uF
C5057	2113928C04	CAP, 4.7uF
C5058	NOT PLACED	CAP, 0.1uF
C5059	2113743E07	CAP, .022uF
C5060	2113741M69	CAP, 0.1uF
C5061	2113741M69	CAP, 0.1uF
C5062	2113741M69	CAP, 0.1uF
C5063	2113741M69	CAP, 0.1uF
C5064	2113741F25	CAP, 1000pF
C5065	2113741F25	CAP, 1000pF
C5066	2113741F25	CAP, 1000pF
C5067	2113741F25	CAP, 1000pF
C5068	2113741F25	CAP, 1000pF
C5069	2113741F25	CAP, 1000pF
C5070	2113741F25	CAP, 1000pF
C5071	2113741F25	CAP, 1000pF
C5072	2113741F25	CAP, 1000pF
C5073	2113741F25	CAP, 1000pF
C5074	2113741F25	CAP, 1000pF
C5075	NOT PLACED	CAP, 1000pF
C5076	2113741F25	CAP, 1000pF
C5077	2113741F25	CAP, 1000pF
C5078	2113741F25	CAP, 1000pF
C5079	2113741F25	CAP, 1000pF

Circuit Ref.	Motorola Part No.	Description
C5080	2113741F25	CAP, 1000pF
C5081	2113741F25	CAP, 1000pF
C5082	2113741F25	CAP, 1000pF
C5083	2113740F51	CAP, 100pF
C5084	2113740F51	CAP, 100pF
C5085	2113741A53	CAP, .022uF
C5086	2113741A53	CAP, .022uF
C5087	2113740F53	CAP, 120pF
C5088	2113740F49	CAP, 82pF
C5089	2113740F49	CAP, 82pF
C5090	2113740F49	CAP, 82pF
C5091	2113740F49	CAP, 82pF
C5092	2113740F59	CAP, 220pF
C5094	2113740F59	CAP, 220pF
C5095	2113740F59	CAP, 220pF
C5096	2113740F59	CAP, 220pF
C5097	2113740F59	CAP, 220pF
C5098	2113740F59	CAP, 220pF
C5099	2113740F59	CAP, 220pF
C5100	2113740F59	CAP, 220pF
C5101	NOT PLACED	CAP, 1000pF
C5102	NOT PLACED	CAP, 0.1uF
C5103	NOT PLACED	CAP, 0.1uF
C5104	NOT PLACED	CAP, 10uF
C5110	2113741F25	CAP, 1000pF
C5111	2113741F25	CAP, 1000pF
C5112	NOT PLACED	CAP, 16pF
C5113	NOT PLACED	CAP, 220pF
C5114	2113743F16	CAP, 1uF
C5115	NOT PLACED	CAP, 6.8pF

Circuit Ref.	Motorola Part No.	Description
C5116	NOT PLACED	CAP, 220pF
C5117	NOT PLACED	CAP, 16pF
C5118	2113743E20	CAP, 0.1uF
C5119	2113743H14	CAP, 10uF
C5120	NOT PLACED	CAPP, 47uF
CR300	4880154K03	MMBD353, SCHOTTKY COMM AK
CR301	4880154K03	MMBD353, SCHOTTKY COMM AK
D100	NOT PLACED	MMBD6100, DUAL COMM CATH
D101	4813833C02	MMBD6100, DUAL COMM CATH
D102	4813833C02	MMBD6100, DUAL COMM CATH
D103	4802482J02	MA4P959, PIN
D104	4802482J02	MA4P959, PIN
D105	4805218N57	RB715F, DUAL COMM CATH
D106	4805218N57	RB715F, DUAL COMM CATH
D107	4805218N57	RB715F, DUAL COMM CATH
D108	4805218N57	RB715F, DUAL COMM CATH
D200	4802233J09	IMN10, 3 DIODE ARRAY
D201	4802233J09	IMN10, 3 DIODE ARRAY
D202	4862824C03	1SV232, VARACTOR
D203	4805649Q13	1SV228, VARACTOR
D204	4805649Q13	1SV228, VARACTOR
D205	4862824C01	1SV229, VARACTOR
D301	4802245J97	DAN235ETL, DUAL COMM CATH
D302	4802245J97	DAN235ETL, DUAL COMM CATH

Circuit Ref.	Motorola Part No.	Description
D303	4802245J97	DAN235ETL, DUAL COMM CATH
D304	4802245J97	DAN235ETL, DUAL COMM CATH
D305	4880142L01	MMBV3401LT, PIN
D400	4813833C07	MMBD7000, DUAL COMM AK
D401	4813833C02	MMBD6100, DUAL COMM CATH
D402	4809948D42	RB751V40, SCHOTTKY
D500	4813833C02	MMBD6100, DUAL COMM CATH
D501	NOT PLACED	MMBD6100, DUAL COMM CATH
D502	4813825A23	MMSD301T1, SCHOTTKY
D511	4813833C02	MMBD6100, DUAL COMM CATH
D513	4813833C02	MMBD6100, DUAL COMM CATH
FL300	9180022M11	MXF45, 44.85MHz BPF
FL301	9180468V06	FLTR, 455kHZ, BW 25KHZ
FL302	9180468V04	FLTR, 455kHZ, BW 12.5KHZ
FL303	9180469V03	FLTR, 455kHZ, BW 12.5KHZ
FL304	9180469V06	FLTR, 455kHZ, BW 25KHZ
J2	0989241U02	CONNECTOR 22 PIN
J3	NOT PLACED	CONNECTOR 32 PIN
J11	2889309U01	ANTENNA CONNECTOR
L100	7686135U02	FERRITE BEAD
L101	2462587T30	IDCTR, 1uH
L102	2462587T30	IDCTR, 1uH
L103	2462587T30	IDCTR, 1uH

Circuit Ref.	Motorola Part No.	Description
L104	2462587T38	IND CHIP 22NH 5% LOW PRO
L105	2462587T13	IDCTR, 68nH
L106	2460591A11	IDCTR, 7.66nH
L107	2460591A01	IDCTR, 4.22nH
L108	2462587X69	IDCTR, 1.2uH
L109	NOT PLACED	IDCTR, 11.03nH
L110	2462587N42	IDCTR, 12nH
L111	2460592B01	IDCTR, 51nH
L112	2460592B01	IDCTR, 51nH
L113	2460592B01	IDCTR, 51nH
L114	2460592B01	IDCTR, 51nH
L115	2460592A01	IDCTR, 17nH
L116	2460592A01	IDCTR, 17nH
L117	7686135U02	FERRITE BEAD
L118	7686135U02	FERRITE BEAD
L119	7686135U02	FERRITE BEAD
L120	7686135U02	FERRITE BEAD
L121	7686135U02	FERRITE BEAD
L122	2460591C23	IDCTR, 13.85nH
L123	2462587X69	IDCTR, 1.2uH
L124	2485873L05	IDCTR, 48nH
L130	NOT PLACED	IDCTR, 120nH
L131	NOT PLACED	IDCTR, 120nH
L132	NOT PLACED	IDCTR, 18nH
L200	2462587Q42	IDCTR, 390nH
L201	2462587V44	IDCTR, 680nH
L202	2462587V44	IDCTR, 680nH
L203	2462587V44	IDCTR, 680nH
L204	2462587V44	IDCTR, 680nH
L205	2462587Q47	IDCTR, 1uH

Circuit Ref.	Motorola Part No.	Description
L206	2413923C05	IDCTR, 33nH
L207	2413923C07	IDCTR, 47nH
L208	2413926N24	IDCTR, 100nH
L209	2413926N24	IDCTR, 100nH
L210	2413926N24	IDCTR, 100nH
L211	2413926N24	IDCTR, 100nH
L212	2413926N24	IDCTR, 100nH
L213	2413926N24	IDCTR, 100nH
L214	2413926H20	IDCTR, 47nH
L215	2413926H20	IDCTR, 47nH
L216	2413926H20	IDCTR, 47nH
L217	2462587Q42	IDCTR, 390nH
L300	2460591G24	IDCTR, 33.47nH
L301	2462587X69	IDCTR, 1.2uH
L302	2462587X69	IDCTR, 1.2uH
L303	2462587N69	IDCTR, 1.2uH
L304	2483411T74	IDCTR, 1.2uH
L305	2413926K31	IDCTR, 470nH
L306	2462587N55	IDCTR, 150nH
L307	2460591G24	IDCTR, 33.47nH
L308	2460591G24	IDCTR, 33.47nH
L309	2460591G24	IDCTR, 33.47nH
L310	2460591G24	IDCTR, 33.47nH
L311	2460591G24	IDCTR, 33.47nH
L312	2460591G24	IDCTR, 33.47nH
L313	2460591G24	IDCTR, 33.47nH
L314	2460591G24	IDCTR, 33.47nH
L315	NOT PLACED	IDCTR, 27nH
L500	7686135U02	FERRITE BEAD
L501	7686135U02	FERRITE BEAD

Circuit Ref.	Motorola Part No.	Description
L502	7686135U02	FERRITE BEAD
M6	4387454V01	SPACER
M9	0289511U01	NUT
M100	2680499Z01	HEATSINK
M105	7588823L03	CONTACT, METAL
M106	7588823L03	CONTACT, METAL
M107	7588823L03	CONTACT, METAL
M108	7588823L04	CONTACT, METAL
M109	7588823L04	CONTACT, METAL
M110	7588823L04	CONTACT, METAL
M111	NOT PLACED	CONTACT, METAL
M112	NOT PLACED	CONTACT, METAL
P1	2804503J01	CONNECTOR, 16 PIN
P2	NOT PLACED	CONNECTOR, 2 PIN DC
Q100	4886136B01	MRF1550, LDMOS RF
Q101	4813824A10	MMBT3904, BIPOLAR NPN
Q102	4813824A10	MMBT3904, BIPOLAR NPN
Q103	4813824A06	MMBTA13, DARLING-TON, NPN
Q105	4886212B01	MRF1518, LDMOS RF
Q106	4805128M27	BSR33, BIPOLAR, PNP
Q200	4802245J95	BFS540, NPN
Q300	4809940E02	DTC114YE, NPN
Q301	4813824A17	MMBT3906, BIPOLAR PNP
Q302	4813824A10	MMBT3904, BIPOLAR NPN
Q303	4802245J95	BFS540, NPN
Q304	4809939C04	UMC3
Q305	4802197J95	PBR941, NPN

Circuit Ref.	Motorola Part No.	Description
Q306	4813824A17	MMBT3906, BIPOLAR PNP
Q400	4809940E02	DTC114YE, NPN
Q401	4880141L03	BCW68G, BIPOLAR PNP
Q403	4809940E02	DTC114YE, NPN
Q404	4809940E02	DTC114YE, NPN
Q405	4809940E02	DTC114YE, NPN
Q407	4809940E02	DTC114YE, NPN
Q408	4880048M01	DTC144EKA, BIPOLAR
Q409	4880048M01	DTC144EKA, BIPOLAR
Q410	4880048M01	DTC144EKA, BIPOLAR
Q411	4880048M01	DTC144EKA, BIPOLAR
Q412	4880048M01	DTC144EKA, BIPOLAR
Q413	4809940E02	DTC114YE, NPN
Q414	4809940E02	DTC114YE, NPN
Q415	NOT PLACED	MMBT3904
Q416	4809940E02	DTC114YE, NPN
Q417	4813824A10	MMBT3904, BIPOLAR NPN
Q500	4813824A10	MMBT3904, BIPOLAR NPN
Q501	4809940E02	DTC114YE, NPN
Q502	4809940E02	DTC114YE, NPN
Q503	4813824A10	MMBT3904, BIPOLAR NPN
Q504	4880048M01	DTC144EKA, BIPOLAR
Q505	4813824A10	MMBT3904, BIPOLAR NPN
Q506	4813824A10	MMBT3904, BIPOLAR NPN
R101	1705603W01	SHUNT, 1.639m
R102	0680194M18	RES, 51
R103	0683962T51	RES, 120
R104	0680194M18	RES, 51
R105	0680194M18	RES, 51
R106	0680194M18	RES, 51
R107	0680194M18	RES, 51
R108	0680194M18	RES, 51
R109	0662057A12	RES, 30
R110	NOT PLACED	RES, 1K
R111	NOT PLACED	RES, 1K
R112	NOT PLACED	RES, 62K
R113	NOT PLACED	RES, 10K
R114	NOT PLACED	RES, 10K
R115	NOT PLACED	RES, 10K
R116	NOT PLACED	RES, 10K
R117	0662057A77	RES, 15K
R118	0662057C51	RES, 100
R120	0662057C51	RES, 100
R121	NOT PLACED	RES, 100
R122	0662057C19	RES, 4.7
R123	0662057C13	RES, 2.7
R124	0662057C13	RES, 2.7
R125	0662057C13	RES, 2.7
R126	0662057C03	RES, 1
R127	0662057C03	RES, 1
R130	0662057B47	RES, 0
R131	0662057A97	RES, 100K
R132	NOT PLACED	RES, 100K
R134	0662057A89	RES, 47K
R135	0662057A88	RES, 43K
R136	0662057A87	RES, 39K
R137	0662057A87	RES, 39K
R138	NOT PLACED	RES, 39K
R139	NOT PLACED	RES, 39K
R140	0662057A70	RES, 7.5K
R141	0662057A81	RES, 22K
R142	0662057A81	RES, 22K
R143	0662057A81	RES, 22K
R144	0662057A75	RES, 12K
R145	0662057A81	RES, 22K
R146	0662057A81	RES, 22K
R147	0662057A81	RES, 22K
R148	0662057A81	RES, 22K
R149	0662057A81	RES, 22K
R150	0662057A89	RES, 47K
R151	0662057A67	RES, 5.6K
R153	0662057A73	RES, 10K
R155	0662057A73	RES, 10K
R156	0662057A73	RES, 10K
R157	0662057A91	RES, 56K
R158	0662057A67	RES, 5.6K
R159	NOT PLACED	RES, 5.6K
R160	0662057A61	RES, 3.3K
R161	0662057A61	RES, 3.3K
R162	0662057A61	RES, 3.3K
R163	0662057A61	RES, 3.3K
R164	0662057A63	RES, 3.9K
R165	0662057A58	RES, 2.4K
R166	NOT PLACED	RES, 2.4K
R167	0662057A57	RES, 2.2K
R168	0662057A57	RES, 2.2K
R169	NOT PLACED	RES, 2.2K
R170	0662057A42	RES, 510
R171	0662057A33	RES, 220
R172	0662057A41	RES, 470
R173	0662057A29	RES, 150
R174	0662057A29	RES, 150
R175	NOT PLACED	RES, 220
R176	2413926N25	IDCTR, 120nH
R177	NOT PLACED	RES, 100
R178	0662057A14	RES, 36
R179	0662057A14	RES, 36
R180	0660082A89	RES, 47K
R181	0660082A89	RES, 47K
R182	0662057A73	RES, 10K
R185	0662057A73	RES, 10K
R186	0662057C20	RES, 5.1
R188	NOT PLACED	RES, 0
R189	NOT PLACED	RES, 0
R190	0662057G64	RES, 1MEG
R191	0662057G64	RES, 1MEG
R195	0662057C01	RES, 0
R196	NOT PLACED	RES, 0
R197	0662057C19	RES, 4.7
R198	0662057C01	RES, 0
R199	0662057B47	RES, 0
R200	0662057A99	RES, 200K
R201	0662057B47	RES, 0
R202	NOT PLACED	RES, 0
R203	0662057B47	RES, 0
R204	NOT PLACED	RES, 0
R205	NOT PLACED	RES, 0

Circuit Ref.	Motorola Part No.	Description
R206	0662057B02	RES, 150K
R207	0662057B02	RES, 150K
R208	0662057A18	RES, 390
R209	0662057A97	RES, 100K
R210	NOT PLACED	RES, 100K
R211	0662057A89	RES, 47K
R212	0662057A84	RES, 30K
R213	0662057A65	RES, 4.7K
R214	0662057A65	RES, 4.7K
R215	0662057A65	RES, 4.7K
R216	0662057A63	RES, 3.9K
R217	0662057A52	RES, 1.3K
R218	0662057A49	RES, 1K
R219	NOT PLACED	RES, 820
R220	0662057A42	RES, 510
R221	0662057A33	RES, 220
R222	0662057A33	RES, 220
R223	0662057A33	RES, 220
R224	0662057A53	RES, 1.5K
R225	0662057A29	RES, 150
R226	0662057A29	RES, 150
R227	0662057A25	RES, 100
R228	0662057A25	RES, 100
R229	0662057A25	RES, 100
R230	0662057A25	RES, 100
R231	0662057A18	RES, 51
R232	0662057A17	RES, 47
R233	0662057A17	RES, 47
R234	0662057A15	RES, 39
R235	0662057A07	RES, 18

Circuit Ref.	Motorola Part No.	Description
R300	0662057A73	RES, 10K
R301	0662057A41	RES, 470
R302	0662057B47	RES, 0
R303	0662057B47	RES, 0
R304	0662057A85	RES, 33K
R305	0662057A80	RES, 20K
R306	0662057A80	RES, 20K
R307	0662057A80	RES, 20K
R308	0662057A80	RES, 20K
R309	0662057A77	RES, 15K
R310	0662057A77	RES, 15K
R311	NOT PLACED	RES, 15K
R312	0662057A76	RES, 13K
R313	0662057A75	RES, 12K
R314	0662057A75	RES, 12K
R315	0662057A75	RES, 12K
R316	0662057A75	RES, 12K
R317	0662057A75	RES, 12K
R318	0662057A75	RES, 12K
R319	0662057A75	RES, 12K
R320	0662057A73	RES, 10K
R321	0662057A71	RES, 8.2K
R322	0662057A65	RES, 4.7K
R323	0662057A65	RES, 4.7K
R324	0662057A61	RES, 3.3K
R325	0662057A61	RES, 3.3K
R326	0662057A58	RES, 2.4K
R327	0662057A58	RES, 2.4K
R328	0662057A55	RES, 1.8K
R329	0662057A51	RES, 1.2K

Circuit Ref.	Motorola Part No.	Description
R330	0662057A49	RES, 1K
R331	0662057A45	RES, 680
R332	0662057A43	RES, 560
R333	0662057A40	RES, 430
R334	0662057A39	RES, 390
R335	0662057A33	RES, 220
R336	0662057A25	RES, 100
R337	0662057A25	RES, 100
R338	0662057A18	RES, 51
R339	0662057A18	RES, 51
R340	0662057A18	RES, 51
R341	0662057A01	RES, 10
R342	0662057A01	RES, 10
R343	0662057A01	RES, 10
R344	0662057A01	RES, 10
R345	0662057A73	RES, 10K
R346	0662057A73	RES, 10K
R401	0662057C85	RES, 2.7K
R402	0662057B47	RES, 0
R403	0662057B47	RES, 0
R404	0662057B47	RES, 0
R405	0662057B47	RES, 0
R406	0662057B47	RES, 0
R407	0662057B47	RES, 0
R414	0662057B47	RES, 0
R415	NOT PLACED	RES, 0
R421	0662057A33	RES, 220
R422	0662057A73	RES, 10K
R423	NOT PLACED	RES, 100K
R424	NOT PLACED	RES, 100K

Circuit Ref.	Motorola Part No.	Description
R425	0662057A97	RES, 100K
R426	0662057A97	RES, 100K
R427	NOT PLACED	RES, 100K
R428	0662057A97	RES, 100K
R429	0662057A97	RES, 100K
R430	0662057A87	RES, 39K
R431	NOT PLACED	RES, 10K
R432	0662057A85	RES, 33K
R433	0662057A85	RES, 33K
R434	0662057A85	RES, 33K
R435	0662057A85	RES, 33K
R436	0662057A85	RES, 33K
R438	0662057A73	RES, 10K
R439	0662057A73	RES, 10K
R440	0662057A73	RES, 10K
R441	0662057A73	RES, 10K
R442	0662057A73	RES, 10K
R443	0662057A61	RES, 3.3K
R444	0662057A73	RES, 10K
R445	0662057A73	RES, 10K
R450	0662057A73	RES, 10K
R451	0662057A73	RES, 10K
R453	0662057A61	RES, 3.3K
R454	0662057A61	RES, 3.3K
R455	0662057A61	RES, 3.3K
R456	0662057A61	RES, 3.3K
R457	0662057A61	RES, 3.3K
R458	0662057A61	RES, 3.3K
R459	NOT PLACED	RES, 47K
R460	0662057A53	RES, 1.5K

Circuit Ref.	Motorola Part No.	Description
R461	0662057A33	RES, 220
R462	0662057A18	RES, 51
R463	0662057A73	RES, 10K
R466	NOT PLACED	RES, 0
R467	NOT PLACED	RES, 0
R468	NOT PLACED	RES, 0
R469	NOT PLACED	RES, 0
R470	NOT PLACED	RES, 10K
R471	0662057A01	RES, 10
R472	NOT PLACED	RES, 100K
R473	NOT PLACED	RES, 100K
R600	0662057C01	RES, 0
R601	0611077A62	RES, 330
R602	0662057B47	RES, 0
R610	0662057C59	RES, 220
R615	0662057A25	RES, 100
R5000	0662057B47	RES, 0
R5001	0662057T68	RES, 1K
R5002	NOT PLACED	RES, 0
R5008	0662057B47	RES, 0
R5009	0662057B47	RES, 0
R5010	0662057B47	RES, 0
R5011	NOT PLACED	RES, 0
R5013	NOT PLACED	RES, 0
R5014	0662057B47	RES, 0
R5016	NOT PLACED	RES, 1MEG
R5019	0662057B05	RES, 200K
R5020	0662057B02	RES, 150K
R5021	0662057A97	RES, 100K
R5022	0662057A97	RES, 100K

Circuit Ref.	Motorola Part No.	Description
R5023	0662057A97	RES, 100K
R5024	NOT PLACED	RES, 100K
R5025	0662057A97	RES, 100K
R5026	0662057A85	RES, 33K
R5027	0662057B08	RES, 270K
R5028	0662057A97	RES, 100K
R5029	0662057A97	RES, 100K
R5030	0662057A85	RES, 33K
R5031	0662057A92	RES, 62K
R5032	0662057A89	RES, 47K
R5033	0662057A89	RES, 47K
R5034	0662057A86	RES, 36K
R5035	0662057A89	RES, 47K
R5036	0662057A89	RES, 47K
R5037	0662057A73	RES, 10K
R5038	0662057A85	RES, 33K
R5039	0662057A97	RES, 100K
R5040	0662057A84	RES, 30K
R5041	0662057A82	RES, 24K
R5042	0662057A82	RES, 24K
R5043	0662057A82	RES, 24K
R5044	0662057A82	RES, 24K
R5045	0662057A85	RES, 33K
R5046	0662057A82	RES, 24K
R5047	0662057B47	RES, 0
R5048	0662057A82	RES, 24K
R5049	0662057A77	RES, 15K
R5050	0662057A76	RES, 13K
R5051	0662057A75	RES, 12K
R5052	0662057A73	RES, 10K

Circuit Ref.	Motorola Part No.	Description
R5053	0662057A73	RES, 10K
R5054	0662057A73	RES, 10K
R5055	0662057A73	RES, 10K
R5056	0662057A73	RES, 10K
R5057	0662057A73	RES, 10K
R5058	NOT PLACED	RES, 10K
R5059	NOT PLACED	RES, 10K
R5060	0662057A73	RES, 10K
R5061	0662057A73	RES, 10K
R5062	0662057A73	RES, 10K
R5063	NOT PLACED	RES, 8.2K
R5064	NOT PLACED	RES, 8.2K
R5065	0662057A68	RES, 6.2K
R5066	0662057A49	RES, 1K
R5067	NOT PLACED	RES, 6.2K
R5068	NOT PLACED	RES, 6.2K
R5069	0662057A73	RES, 10K
R5070	0662057A57	RES, 2.2K
R5071	0662057A57	RES, 2.2K
R5072	0662057A65	RES, 4.7K
R5073	0662057A49	RES, 1K
R5074	0662057A49	RES, 1K
R5075	0662057A42	RES, 510
R5076	0662057A42	RES, 510
R5077	0662057A36	RES, 300
R5078	0662057A25	RES, 100
R5079	0662057A25	RES, 100
R5080	0662057A01	RES, 10
R5081	0613952D78	RES, 6.34K
R5082	0662057A90	RES, 51K

Circuit Ref.	Motorola Part No.	Description
R5083	0662057B08	RES, 270K
R5084	NOT PLACED	RES, 0
R5085	NOT PLACED	RES, 1MEG
R5086	0662057A43	RES, 560
R5087	0662057A97	RES, 100K
R5088	0662057B47	RES, 0
R5089	NOT PLACED	RES, 1MEG
R5092	0662057A73	RES, 10K
R5093	0662057A73	RES, 10K
R5094	NOT PLACED	RES, 1MEG
R5095	0662057A82	RES, 24K
R5096	0662057A73	RES, 10K
R5097	NOT PLACED	RES, 0
R5098	0662057B47	RES, 0
R5099	NOT PLACED	RES, 100K
R5100	NOT PLACED	RES, 1MEG
R5103	NOT PLACED	RES, 24K
R5290	0662057A25	RES, 100
R5291	0662057A25	RES, 100
R6000	NOT PLACED	RES, 0
R6001	NOT PLACED	RES, 0
RT100	0680361L01	THERM, 47K
S5010	1889288U01	SWITCH, 50.K
SH200	2689590U01	SHIELD
SH201	2689589U01	SHIELD
SH202	2689589U01	SHIELD
SH300	2689591U01	SHIELD
SH301	2689593U01	SHIELD
SH302	2689591U01	SHIELD
T300	2580541Z01	XFMR

Circuit Ref.	Motorola Part No.	Description
T301	2580541Z01	XFMR
U100	5180932W01	LM2904
U101	5185130C65	30C65, RF PREDRIVER
U102	NOT PLACED	LM2904, OPAMP
U103	5113819A04	MC3303
U200	5185963A27	63A27, LVFRACN
U201	5105750U54	50U54, VCOBIC
U300	5186144B01	SA616, IFIC
U301	5109522E10	TC7W04F, INVERTER
U302	4808612Y05	SMS3928_023, MIXER
U400	5102463J64	X25128-2.7, EEPROM
U402	5102463J36	SRM2B256, SRAM
U403	5102226J56	MC68HC11FL0, MICRO PROC
U404	5189233U02	AT49LV002N_70VI, FLASH
U405	5113805A75	MC74HC595A, SHIFT REG
U500	5180932W01	LM2904, OPAMP
U501	5102190C33	LM2941T, 9.3V REGULATOR
U502	5102463J95	TDA1519C, AUDIO PA
U503	5105469E65	LP2951C, 5V REGULATOR
U504	5185130C53	30C53, ASFIC CMP
U505	5180932W01	LM2904, OPAMP
U506	5180932W01	LM2904, OPAMP
U507	5180932W01	LM2904, OPAMP
U508	5113816A30	MC33269D, 3.3V REGULATOR
U509	5113806A20	MC14053B, MUX
U510	5104187K94	LP2986ILDX, 3.3V REGULATOR

Circuit Ref.	Motorola Part No.	Description
U514	4802393L66	SI3455ADV, 12V P-Ch FET
U515	NOT PLACED	MAX4599EXT, SWITCH
VR101	4813830A15	MMBZ5232B, 5.6V ZENER
VR102	4813830A15	MMBZ5232B, 5.6V ZENER
VR105	4813830A15	MMBZ5232B, 5.6V ZENER
VR400	NOT PLACED	MMBZ5232B, 5.6V ZENER
VR401	4813830G12	MMSZ4687T1, 4.3V ZENER
VR402	4813830A09	MMBZ5226B, 3.3V ZENER
VR500	4813832C77	MR2835S, 24V ZENER
VR501	4813830A14	MMBZ5231B, 5.1V ZENER
VR502	NOT PLACED	MMSZ4686T1, 3.9V ZENER
VR503	4813830G09	MMSZ4684, 3.3V ZENER
VR504	4813830G09	MMSZ4684, 3.3V ZENER
VR692	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR693	4813830A77	MMBZ33VAL, 33V DUAL ZENER
VR694	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR695	4813830A77	MMBZ33VAL, 33V DUAL ZENER
VR696	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR697	4813830A75	MMBZ20VAL, 20V DUAL ZENER
VR698	4813830A75	MMBZ20VAL, 20V DUAL ZENER

Circuit Ref.	Motorola Part No.	Description
VR699	4813830A75	MMBZ20VAL, 20V DUAL ZENER
Y200	NOT PLACED	45J68, TCXO
Y201	4880114R06	14R06, 16.8MHZ XTAL OSC
Y300	9186145B02	45B02, 455KHZ XTAL
Y301	4880606B09	06B09, 44.395MHZ XTAL OSC