HPD™ 1000 MODEM

MOTOROLA

Detailed Service Manual

Foreword

The manual covers all models of the HPD™ 1000 700–800 MHz Modem unless otherwise specified. It includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures. This level of service goes down to the board replacement level and is typical of some local service centers, self-maintained customers, and distributors.

For details on modem operation or basic troubleshooting, refer to the applicable manuals available separately. A list of related publications is provided in the section, "Related Publications," on page xiii.

Product Safety and RF Exposure Compliance

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

ATTENTION!

This modem is restricted to occupational use only to satisfy FCC RF energy exposure requirements. Before using this product, read the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet enclosed with your modem (Motorola Publication part number 6881095C99) to ensure compliance with RF energy exposure limits.

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

Manual Revisions

Changes which occur after this manual is printed are described in PMRs (Publication Manual Revisions). These PMRs provide complete replacement pages for all added, changed, and deleted items, including pertinent parts list data, schematics, and component layout diagrams. To obtain PMRs, go to http://www.motorola.com/businessonline

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Document History

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

Edition	Description	Date
6816255H01-A	Initial release.	Sept. 2007

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Related Publications

HPD 1000 Modem 700-800 MHz Basic Service Manual 6816254H01
HPD 1000 Modem 700-800 MHz Installation Manual 6871220L01
HPD 1000 Modem 700-800 MHz User Guide 6871218L01

Notes

Commercial Warranty

Limited Warranty

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Product Accessories	One (1) Year

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VII. Governing Law

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

Notes

Chapter 1 Introduction

1.1 Notations Used in This Manual

Throughout the text in this publication, you will notice the use of **WARNING**, **CAUTION**, and **Notes** notations throughout this manual. These notations are used to emphasize that safety hazards exist, and care must be taken and observed.

NOTE: The Note notation indicates an operational procedure, practice, or condition that is essential to emphasize.

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

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

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

1.2 General

This manual includes all the information necessary to maintain peak product performance and maximum working time. This detailed level of service (component-level) is typical of some service centers, self-maintained customers, and distributors.

Use this manual in conjunction with the *HPD 1000 Modem Basic Service Manual (6816254H01)*, which helps in troubleshooting a problem to a particular board.

Conduct the basic performance checks first to verify the need to analyze the modem and help pinpoint the functional problem area. In addition, you will become familiar with the modem test mode of operation which is a helpful tool. If any basic receiver or transmitter parameters fail to be met, the modem should be aligned using the modem alignment procedure described in the *HPD 1000 Modem Basic Service Manual (6816254H01)*.

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

The Theory of Operation section of this manual contains detailed descriptions of operations of many circuits. Once you locate the problem area, review the Troubleshooting Charts for that circuit to fix the problem.

Chapter 2 Product Overview

2.1 Introduction

The HPD 1000 modem contains 3 boards. The Transceiver and Transmitter boards are contained within the modem, while the UIP (User Interface Panel) board is contained within the front cover. The Transceiver Board includes one voltage-controlled oscillator (VCO) module containing two VCOs used for APCO transmitter frequencies and APCO and HPD receiver frequencies.

It is important to correctly identify the malfunctioning region before replacing expensive modules. To assist with modem repair, descriptions of the sections contained on the HPD 1000 boards are listed below.

2.2 Functional Blocks

The HPD 1000 modems contain the following functional blocks:

- Modem Power Distribution–contains voltage-regulation circuitry for power distribution throughout the modem.
- Receiver Front-End section–contains the preselector, low-noise amplifier (LNA), and mixer.
- Receiver Back-End section–contains the receiver intermediate-frequency (IF) amplifier/filter and the digital receiver back-end integrated circuit (IC).
- Transmitter section–contains the antenna switch, directional coupler/ detector, Isolator, Booster, and power amplifier circuitry.
- Frequency Generation section–contains the synthesizer, voltage-controlled oscillators (VCOs), reference oscillator, and receive and transmit buffers.

2.3 Receiver Section

2.3.1 700–800 MHz Band modems

The 700–800 MHz receiver consists of a front-end section, intermediate frequency section and a back-end section.

2.3.1.1 Front-End Section

The primary function of the receiver front-end is to optimize image rejection and selectivity while providing the first conversion. The front-end uses discreet filters and LNAs. The first filter reduces the IF spur, image frequency response and limits some of the out-of-band interference. The second filter following the second low-noise amplifier (LNA) provides additional image rejection and half IF spur.

The receiver front-end signal is fed to the monolithic mixer IC where it is down converted to an IF of 73.35 MHz. The mixer is driven by the receiver injection buffer that provides 15 dBm to the mixer. The VCO performs high side injection for the 700 band and low side injection for the 800 band. The design maintains temperature stability, low insertion loss, and high out-of-band rejection.

2.3.1.2 IF Section

The mixer of the Receiver Front End leads into the Intermediate Frequency (IF) section of the Receiver. The IF section consists of two paths. The narrowband path is for APCO and HPD25 signals and the wideband path is for HPD50, HPD100, and HPD150 signals. A logic circuit selects the correct path. The narrowband path contains a crystal filter and the wideband path contains a SAW filter. After the dual path circuit, there is an amplifier, and a second SAW filter. This provides selectivity at the IF while attenuating out-of-band signals and protecting the back-end (BE) IC.

2.3.1.3 Back-End Section

The output of the IF circuit is fed directly to the Abacus III digital back-end IC. The ABACUS III is an IC with a variable-bandwidth bandpass Sigma-Delta architecture. It is capable of down-converting analog, as well as digital, RF protocols into a baseband signal transmitted on the Synchronous Serial Interface (SSI) bus. The ABACUS III IC converts the 73.35 MHz signal from the IF section down to 2.43 MHz using a second LO frequency of 70.92 MHz or 75.78 MHz. The second LO VCO is tuned to 70.92 MHz (low side), but can be modified to 75.78 MHz (high side injection) depends on known spurious interference related to the programmed received frequency.

2.4 Transmitter Section

In APCO Mode, the modulated carrier output of the Fractional-N Synthesizer VCO/PLL is applied to the input of the RF PA stage.

In HPD Mode, the Tomahawk supplies the Javelin IC with both analog baseband I & Q waveforms and an unmodulated VCO/PLL input. The Javelin modulates the RF carrier and in turn supplies the RF PA input stage with the modulated carrier. Through Cartesian feedback, the Javelin also serves to provide power control and linearization compensation of the forward gain path.

2.4.1 700–800 MHz modems

The RF PA is a three-stage power amplifier consisting of discrete LDMOS transistors:

- Controlled stage
- Driver stage
- Final stage

The RF PA is followed by the ON section, consisting of discrete circuitry with the following functions:

- Antenna switch
- Harmonic filter
- Power detector

2.4.2 Gain Stages

The controlled stage consists of a two-stage, integrated amplifier with external matching, which amplifies the input signal from the VCO buffer for APCO operation or from the I&Q modulation IC for HPD operation. This controlled stage provides drive to the driver stage. Power is controlled via gate bias to both internal stages, and drain bias is supplied via SW_A_PLUS. The driver stage has a fixed gate bias. Drain bias is supplied by DRIVER_28V. The driver stage drives the final stage consisting of two transistors operating in parallel. Both devices have separate, fixed gate biases, and their drain biases are supplied by FINAL_28V. The output of the final stage feeds an RF isolator which in turn feeds the antenna switch, which routes the RF PA to the harmonic filter/power detector/antenna and isolates the RX front-end in transmit mode. Antenna switch routes antenna/power detector/harmonic filter to RX and isolates TX in RX mode. Mode is determined via SWITCH_BIAS. The harmonic filter is a low-pass filter that attenuates harmonics generated by the RF PA in transmit mode and provides additional receive selectivity in receive mode.

2.4.3 Power Control

Power control is achieved by two different schemes depending under which mode of operation the HPD modem is currently functioning.

In APCO mode, power is regulated by an automatic-level control (ALC) circuit. The transmitter ALC consists of a distributed power detector with a detection diode, buffer/amplifier, digital-to-analog converter (DAC), and loop integrator. During transmission, the RF PA gain and output power is adjusted by a control voltage. The power detector senses incident power transferred to the antenna via a directional coupler whose signal is converted to a DC voltage by the detection diode. This DC voltage is buffered/amplified and then added to the DAC voltage which is then compared to a fixed voltage reference. The carrier power level is set by adjusting the DAC voltage while monitoring the output power, which is saved in modem memory.

In HPD mode, the I&Q modulation IC monitors the FWD transmit power via a coupler that is integrated into the circuit board on the input of the isolator. The I&Q modulation IC the adjusts the input drive to the PA to maintain power output and linearity.

2.4.4 Circuit Protection

RF PA final-stage drain current, RF PA final-stage temperature, RF PA control voltage, and battery voltage are sensed by the power-control circuitry. If a fault condition is detected, the control voltage is reduced, which cuts back the output power to a level that is safe for the particular conditions. In addition several power cut back mechanisms have been implemented to protect the PA and Power supply during Low line, High line and extreme temperature conditions.

2.4.5 Booster

The boost converter is designed to up-convert the alternator voltage from the nominal value of 13.8 V to either 28 V or 23 V. During normal operation, transistor Q3100 is repeatedly switched on and off by the control circuit via controller U3101 and FET driver U3100. When the diodes D3100 and D3101 conduct, an effective LC output filter is formed. This LC network filters out the train of pulses to produce a dc output voltage, Vo. Switching between 28 V and 23 V is accomplished by toggling BST_SWITCH which changes the dividing ratio for the feedback loop of controller U3101 via Q3103. BST_SWITCH Lo corresponds to 28 V and BST_SWITCH Hi corresponds to 23 V.

The boost converter is designed to turn on only in Transmit mode. When the boost converter is off, the alternator voltage minus a minor loss is still present at the output (E3101) due to the nature of the switching converter design. Turning the booster on/off is accomplished by turning TX_BSTEN high or low.

The booster is designed to operate in 2 frequencies. The default frequency is 262.5 kHz. However, on low battery voltage, the output of the comparator U3109 turns high and switches the frequency to 525 kHz via switch U3108.

2.5 Frequency Generation Unit

2.5.1 Main Fractional-N Synthesizer

The Main frequency generation unit consists of the following:

- Fractional-N synthesizer IC.
- 16.8 MHz reference oscillator IC.
- One voltage-controlled oscillator (VCO) module (containing two VCOs used for APCO transmitter frequencies and APCO and HPD receiver frequencies).
- VCO buffer/amplifier circuits for transmitter and receiver injection.
- And associated circuitry.

Figure 2-1 depicts the basic structure of this synthesizer.

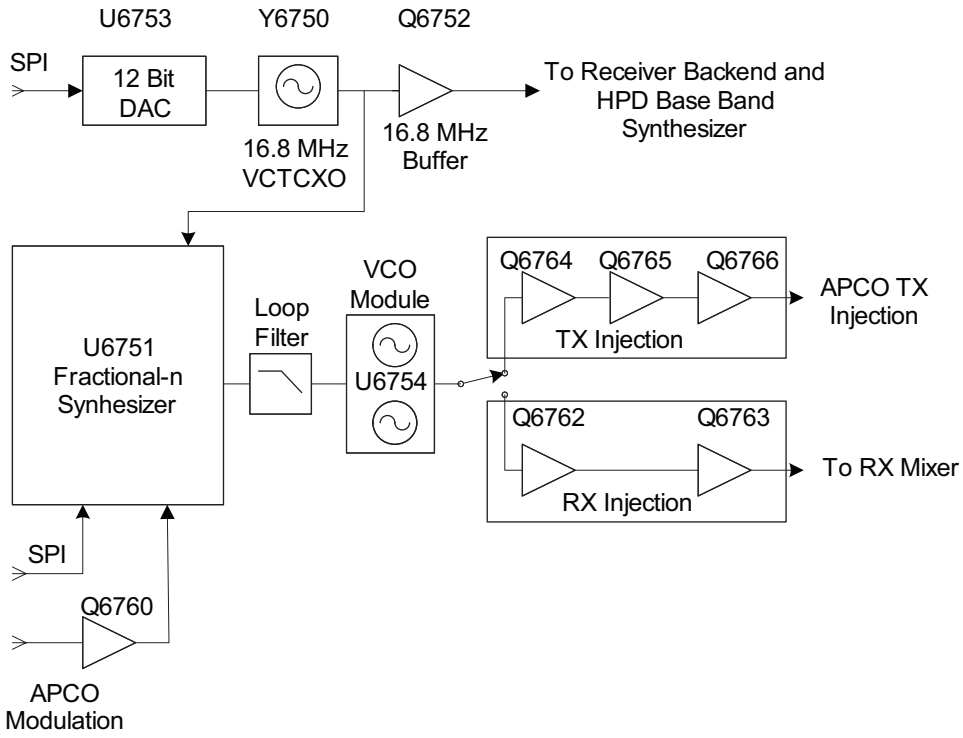


Figure 2-1. Main Frequency Generation Unit Simplified Block Diagram

The reference oscillator IC Y6750 provides a frequency standard to the Main fractional-N synthesizer IC (U6751), the receiver digital back-end IC (U6000), and the HPD fractional-N synthesizer (U400). U6753, a digital to analog converter (DAC), is utilized to warp the reference oscillator on frequency in tune mode and during Automatic Frequency Control (AFC). The synthesizer U6751 turns on one of the two VCOs (determined by mode and band of operation) and tunes it to the receiver (RX) local oscillator (LO) or the APCO transmitter (TX) carrier frequency.

In TX mode, the VCO module output is coupled to a three-stage amplifier/buffer circuit before being injected into the power amplifier. In RX mode, the VCO output is buffered and amplified with a two-stage amplifier circuit. The output of the amplifier provides the proper signal level for the LO port of the RX front-end mixer (U6208).

APCO C4FM modulation is provided by the baseband section of the HPD fractional-N synthesizer (U400) and is coupled to Q6760 and processed by U6751.

U6753 (12 Bit DAC) and U6751 are programmed via the SPI (Serial Programming Interface) lines. The SPI has three input lines, clock, chip select and data.

2.5.2 Tomahawk/Escort Synthesizer

The Tomahawk/Escort Synthesizer consist of the following:

- 2 Tomahawk/Reference VCOs
- 1 Escort (Translational Loop) VCO
- 1 Escort (Translational Loop) Buffer
- 1 Tomahawk/Escort IC

The reference oscillator IC Y6750 provides a frequency standard to the Tomahawk IC (U400). The controller section turns on one of the two reference VCOs (determined by the band of operation) and the synthesizer U400 tunes it to the reference frequency required by the Escort loop. The controller also turns on the Escort VCO and the Escort synthesizer tunes it to the required HPD TX frequency used by the Javelin IC. An Escort buffer provides the required isolation and drive level for the TX injection and the Escort prescaler.

2.6 Controller Section

2.6.1 Introduction

The controller section will be discussed here in basic terms, to assist in the overall understanding of what is contained in the controller section, and a simplified description of its elemental parts. Some limited warnings and recommendations are offered for prevention of common repair-induced damage.

2.6.2 Location

The controller section is located in the designated section of the board, with critical parts arranged on the top and bottom sides of the uniboard (see Figure 2-2 below).

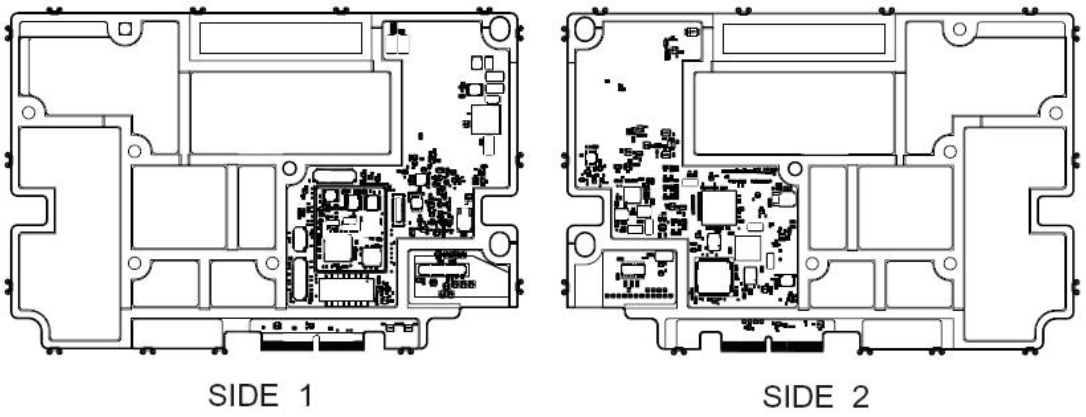


Figure 2-2. Controller Section Location

NOTE: Troubleshooting of the controller section usually requires the removal of the transceiver from the chassis. Whenever this board is removed, any transmitting of the RF section, whether intentional or accidental (trunking affiliation), can cause permanent destruction or degradation of various RF components. Such damage may not be visually noticeable, but can impact the modem's performance and reliability.

2.6.3 Power Distribution

The power distribution in the HPD controller section will be handled by a switching regulator, two linear regulators, and a power management IC. The controller section will be supplied with A+ which will be used as an input to the 5.0 V switching regulator. The 5.0 V switching regulator sources a maximum 650 mA of current and is used as an input to the linear regulators, the power management IC, on/off logic and the GPS regulators on the UIP.

The two linear regulators supply 2.775 V and 3.0 V and are used primarily as supplies for I/O. The two regulators source minimal current.

The power management IC supplies the controller circuitry with four voltages. Two of these voltages, 3.3 V and 1.6 V, are supplied via on board switching regulators. The 3.3 V switching regulator sources approximately 400 mA and is used to supply I/O voltages, the Ethernet IC and the Flash. A pass transistor will be used as a delay which will allow the core voltages (1.6 V and 1.26 V) to start up before the 3.3 V is supplied. This is done to satisfy the microprocessor and turbo product code startup sequence requirements. The 1.6 V switching regulator sources approximately 350 mA and is only used to supply the microprocessor core. The turbo product code core is 1.26 V and is supplied by the power management ICs internal linear regulator. This regulator sources approximately 160 mA. The power management ICs final linear regulator is used to supply 1.8 V to the SDRAM IC. This regulator sources approximately 20 mA of current.

2.6.4 Microprocessor & Memory

The main microprocessor consists of an ARM-based controller and a DSP core that communicates with the two memory ICs via separate 16-bit data busses. It also communicates to peripheral ICs on the main board via an SSI and SPI bus. This microprocessor contains a fixed amount of one-time programmable ROM and a small section of RAM. However, the microprocessor does not contain the modem software setting as programmed in the Customer Programming Software (CPS) or the firmware as installed at the factory. The only purpose of this IC is for interpretation and processing of the content inside the FLASH IC. Therefore, this part may be replaced, as is, without the need to reflash the modem.

Several clocks are provided to the main microprocessor: a 12 MHz master clock, a 32 kHz real-time clock, and a 16.8 MHz reference clock.

The FLASH IC is the firmware storage IC. The part on the HPD 1000 is a 8 MByte NOR-Flash device. This density provides 23 address lines and 16 data lines to the main microprocessor's external memory interface which is also shared with the Ethernet controller IC and the TPC DSP. Programming this Flash memory IC is accomplished using the USB cable.

NOTE: If you choose to reflash the modem (reflash the IC), DO NOT interrupt the process; otherwise, you might corrupt the FLASH IC and need advanced technical support to revive your modem.

NOTE: It is recommended that FLASH IC replacement is not supported as a field-repair option. If this part is removed, the modem must be reflashed and retuned. This is because the FLASH IC must be hard-boot loaded at the factory to allow the programming of a unique file.

The SDRAM IC is a 16 MB synchronous dynamic RAM device. This density provides 12 address lines and 16 data lines to the main microprocessor's fast external memory interface.

2.6.5 Ethernet

The Ethernet controller on the HPD 1000 design supports 10 Mbps, and it provides 16 data lines to the external memory interface which is sufficient for this architecture.

2.6.6 Turbo Product Code

The TPC solution used on HPD is a standalone DSP separate from the main microprocessor. This DSP is connected to the main processor through the main processor's memory interface shared with the Ethernet controller and the flash memory IC. This DSP contains 32k X 16-bit on chip RAM, 16 kb of instruction cache, up to 3 Multichannel Buffered Serial Ports (McBSP), an I2C interface, a 32-bit external memory interface, and up to eight GPIOs.

2.6.7 External Signal Connections

2.6.7.1 Ethernet connector

The Ethernet connector is in the form of a standard eight pin RJ-45. The connector consists of transmit and receive positive and negative data lines. The remaining four unused pins on the connector are terminated as recommended by the Ethernet standard.

2.6.7.2 Mobile 26-Pin Connector

- The 26-Pin Connector contains the USB, RS232, GPIOs, 1-Wire and ignition.
- The USB interface contains the USB positive and negative data lines and USB Vbus.
- The RS232 interface contains the standard receive and transmit lines along with the request to send (RTS) and clear to send (CTS) lines.
- The two GPIO pins are 3.0 V logic and will be used to support future accessories, if needed.
- The 1-Wire line is used to support 1-Wire devices contained within SMART accessories.

Chapter 3 Theory of Operation

3.1 Main Board

This section provides a detailed circuit description of the HPD 1000 Transceiver and Transmitter boards for 700–800 MHz models. The Transceiver board contains the following major sections:

- Receiver Front-End
- Receiver Back-End
- Linear Baseband Transmitter
- Frequency Generation Unit
- Controller

The Transmitter board contains the following major sections:

- RF Power Amplifier
- Harmonic Filter
- Isolator
- Booster

When reading the theory of operation, refer to your appropriate schematic and component location diagrams located in “Chapter 7. Schematics, Component Location Diagrams, and Parts Lists”. This detailed Theory of Operation will help isolate the problem. However, first use the *HPD 1000 Modem Basic Service Manual (6816254H01)* to troubleshoot the problem to a particular board.

3.2 Main Board Major Sections

This section contains the main board layouts for the 700–800 MHz modem frequency band.

3.2.1 700–800 MHz Band

The illustrations (Figure 3-1 on page 3-2 and Figure 3-2 on page 3-3) and their accompanying tables (Table 3-1 on page 3-2 and Table 3-2 on page 3-3) identify the location of the major sections of the main board.

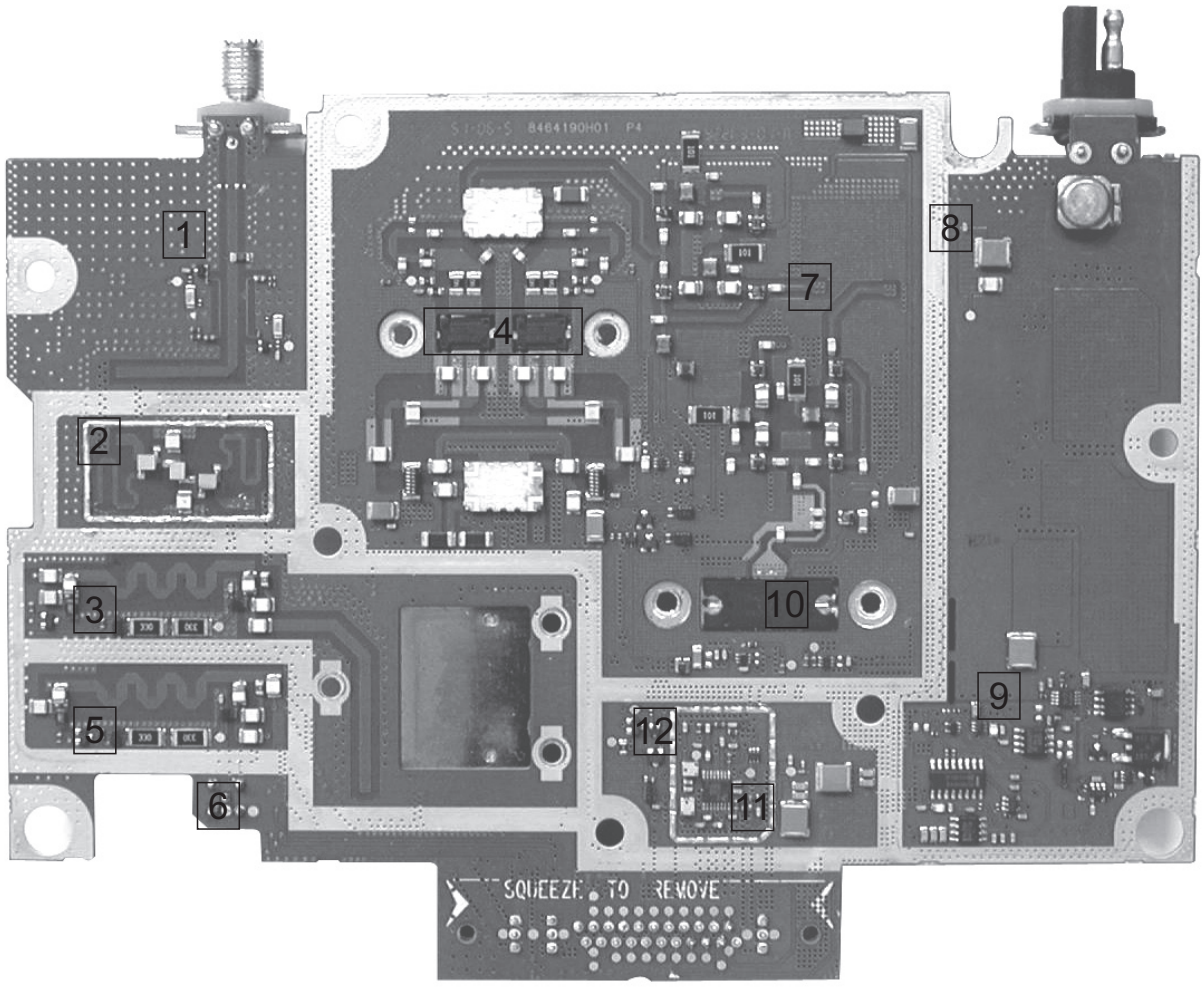


Figure 3-1. HPD 1000 Transmitter Board Sections (700–800 MHz)–Side 1

Table 3-1. HPD 1000 Transmitter Board Sections (700–800 MHz)–Side 1

1	Power Detector	7	Filter Switch Network
2	Harmonic Filter	8	Booster Output to RFPA
3	Tx Antenna Switch	9	Booster Controller & Regulators
4	Final Stage Devices with Bias Switches	10	Driver Stage Device with Bias Switches
5	Rx Antenna Switch	11	Pre-driver Stage Device with Bias Switch
6	RX Duplex Antenna Connection	12	Bias Enable Activation Circuit

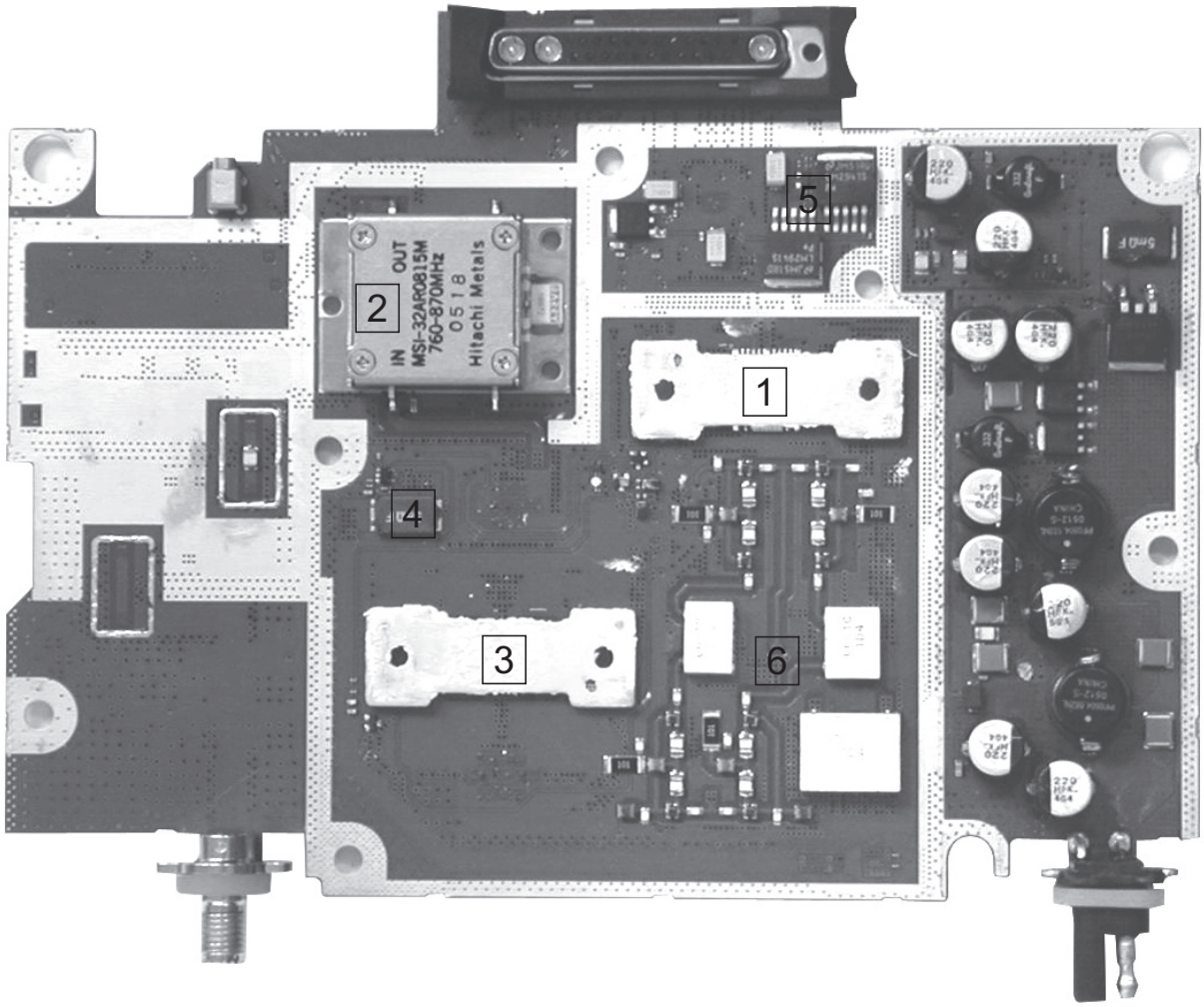


Figure 3-2. HPD 1000 Transmitter Board Sections (700–800 MHz)–Side 2

Table 3-2. HPD 1000 Transmitter Board Sections (700–800 MHz)–Side 2

1	Driver Device Heatsink
2	Isolator
3	Final Stage Device Heatsink (Dogbone)
4	Current Sense Resistor
5	9.1 V and 5.0 V RFPA regulators
6	Filter Switch Network

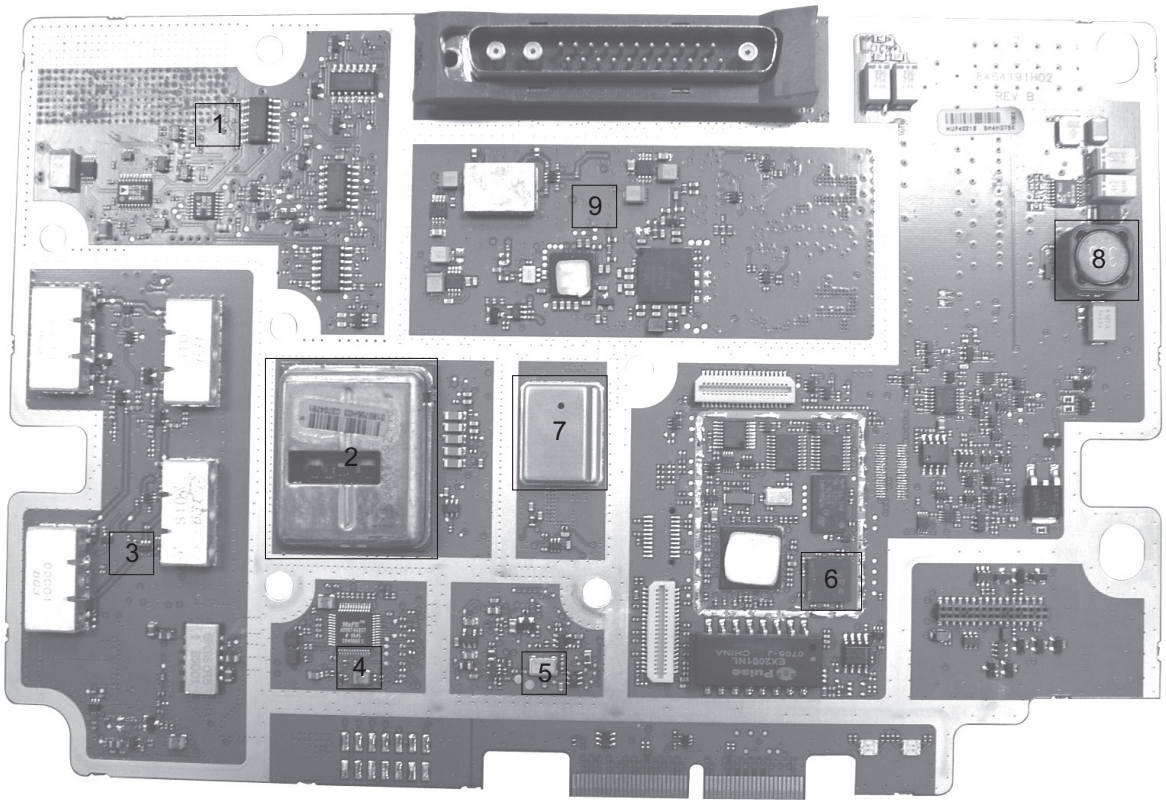


Figure 3-3. HPD 1000 Transceiver Board Sections (700–800 MHz)–Side 1

Table 3-3. HPD 1000 Transceiver Board Sections (700–800 MHz)–Side 1

1	Power Control Circuits
2	VCO Module
3	Receiver Front-end
4	Receiver Back-end
5	FGU Reference Oscillator
6	Controller
7	Translational VCO Loop
8	Power Inductor
9	Tomahawk/Javelin VCO

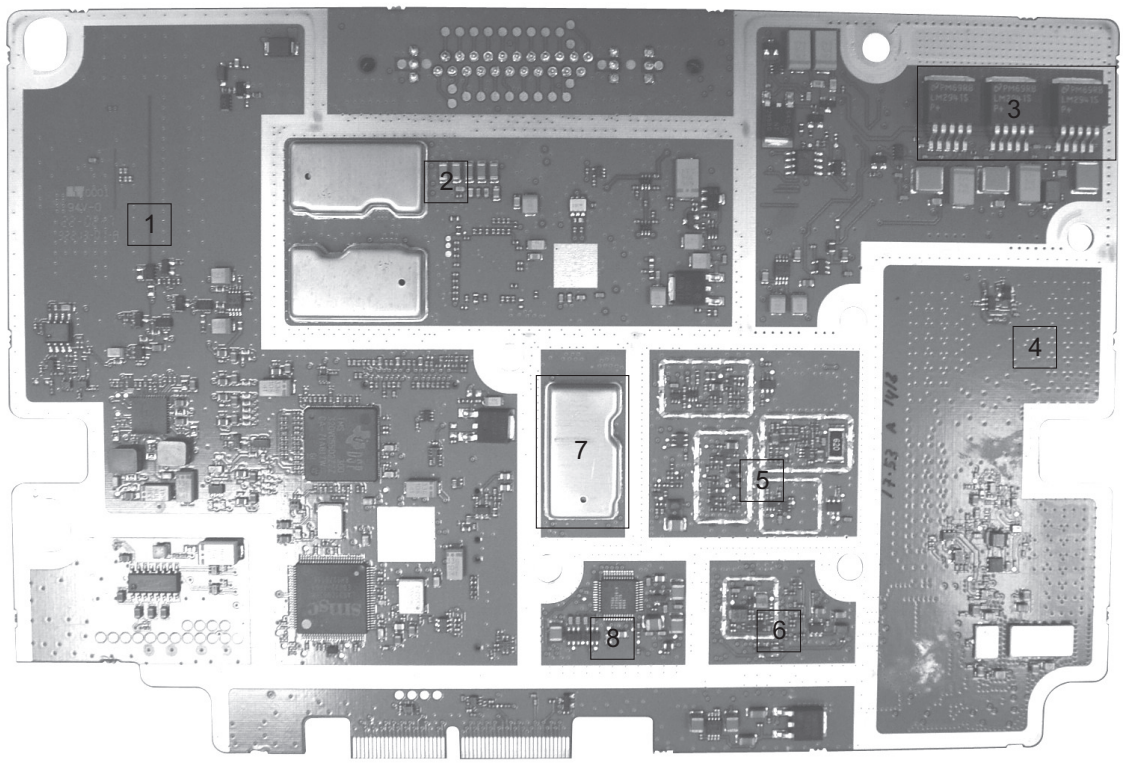


Figure 3-4. HPD 1000 Transceiver Board Sections (700–800 MHz)–Side 2

Table 3-4. HPD 1000 Transceiver Board Sections (700–800 MHz)–Side 2

1	Controller
2	Javelin/Tomahawk VCO
3	DC Regulators
4	Receiver Front-end
5	FGU Circuitry
6	Receiver Back-end
7	Translational Loop VCO Buffer
8	Frac-N Synthesizer

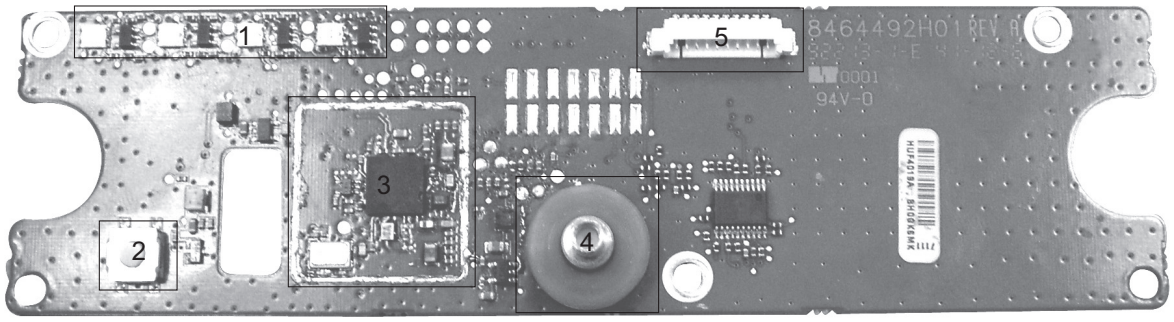


Figure 3-5. HPD 1000 UIP Board Sections (700–800 MHz)–Side 2

Table 3-5. HPD 1000 UIP Board Sections (700–800 MHz)–Side 2

1	LED Indicators
2	Power Button
3	GPS Circuit
4	GPS Antenna
5	Ethernet Connector

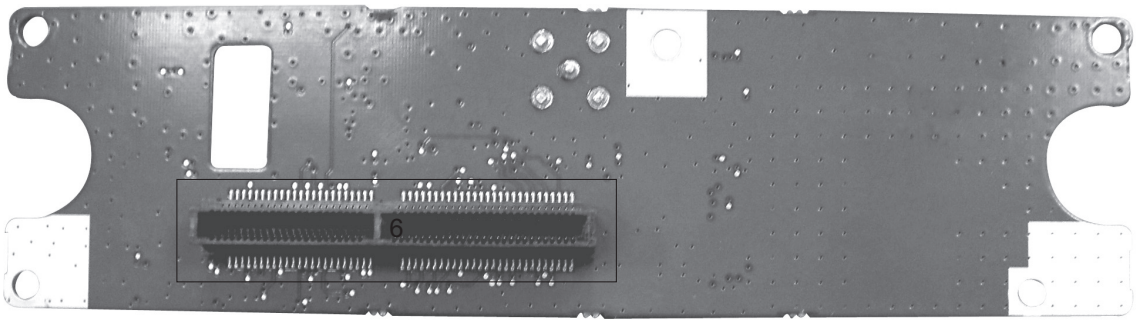


Figure 3-6. HPD 1000 UIP Board Sections (700–800 MHz)–Side 2

Table 3-6. HPD 1000 UIP Board Sections (700–800 MHz)–Side 2

6	Connector to Brick

3.3 700–800 MHz Band Receiver

The receiver circuits primary duties are to detect, filter, amplify, and demodulate RF signals in the presence of strong interfering noise and unintended signals. The receiver is broken down into four or five different blocks: Preselector, LNA & Mixer, IF, and Back-end.

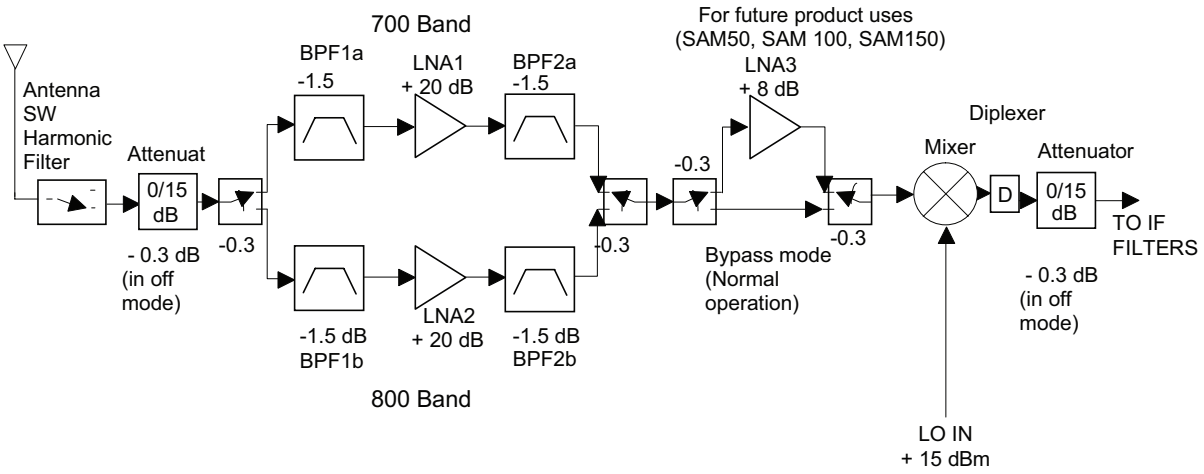


Figure 3-7. Receiver Block Diagram

3.3.1 Preselector Filters

The HPD 1000 front-end operates in two bands, 700 MHz and 800 MHz. Both bands have two preselector filters and one Low Noise Amplifier (LNA). The front end's primary function is to optimize image rejection and selectivity while providing the first conversion. The front end uses fixed ceramic filter technology. There are two sets of filters: (B6250 and B6252) for the 800 MHz band and (B6251 and B6253) for the 700 MHz band. These filters are switched between bands by switches (U6202 and U6205). The first filter is a filter that reduces the image frequency response and limits some of the out of band interferers. The second filter following the monolithic Low Noise Amplifier (LNA) provides additional image rejection.

3.3.2 Low Noise Amplifiers (LNA, U6250, U6301)

A diode (D6258 – 800 MHz band, D6259 – 700 MHz band) located after the first preselector and before the LNA (in both bands), protects the receiver from strong RF signals by limiting the signal amplitude going into the amplifier. The LNAs are low noise monolithic ICs providing ~ 20 dB of gain to the receiver. It is biased with 3.0 V at pin 4 (through RF choke). The input matching consists of an LC (C6263, L6215 – 800 MHz LNA) (L6213, C6279 – 700 MHz LNA) network for optimal gain and noise performance. There is also a discrete LNA that the RF path can be switched (U6206, U6207) to (it is normally bypassed), however this is only for future products that will use SAM 50, 100, and 150.

3.3.3 Mixer (U6208)

The monolithic passive Mixer IC down converts the received signal to an Intermediate Frequency (IF) of 73.35 MHz. The mixer is designed to provide low conversion loss (~ 7.0) and high intermodulation performance. To improve the performance of the mixer a balun (T6209), or RF 1:1 transformer (~1.0 dB loss), is added at the IF port (pins 1 and 6) of the mixer. The LO (local oscillator – also called the Voltage Controlled Oscillator) injection provides 15 dBm to the mixer. The VCO does high side injection for the 700 MHz band and low side injection for the 800 MHz band. For improved intermodulation performance a diplexer (C6300, C6312, C6313, L6234, L6238, R6236, and R6237) was added after the balun and before the IF section.

3.3.4 ABACUS III IC (U6000)

The receiver back-end is designed around the ABACUS III (AD9874 IF digitizing subsystem) IC and its associated circuitry. The AD9874 (Figure 3-8) is a general-purpose, IF subsystem that digitizes a low-level, 10–300 MHz IF input with a bandwidth up to 270 kHz. The signal chain of the AD9874 consists of a variable gain, low-noise amplifier, a mixer; a bandpass, sigma-delta, A/D converter; and a decimation filter with programmable decimation factor. An automatic gain control (AGC) circuit provides the AD9874 with 12 dB of continuous gain adjustment. The high dynamic range and inherent anti-aliasing provided by the bandpass, sigma-delta converter allow the AD9874 to cope with blocking signals 80 dB stronger than the desired signal. Auxiliary blocks include clock and LO synthesizers, as well as an SPI port. Input signal RXIF is the 73.35 MHz IF from the IF filter in the receiver front-end.

Components C6000, C6001, and L6000 match the input impedance from 50 ohms (IF Filter terminating impedance) to the ABACUS III IC input IFIN. Formatted SSI (synchronous serial interface) data is output to the microcontroller IC for DSP processing on ports FS, DOUTA, and CLKOUT. Control logic is sent to the ABACUS III IC from the Patriot microcontroller via the SPI lines (PC, PD, PE).

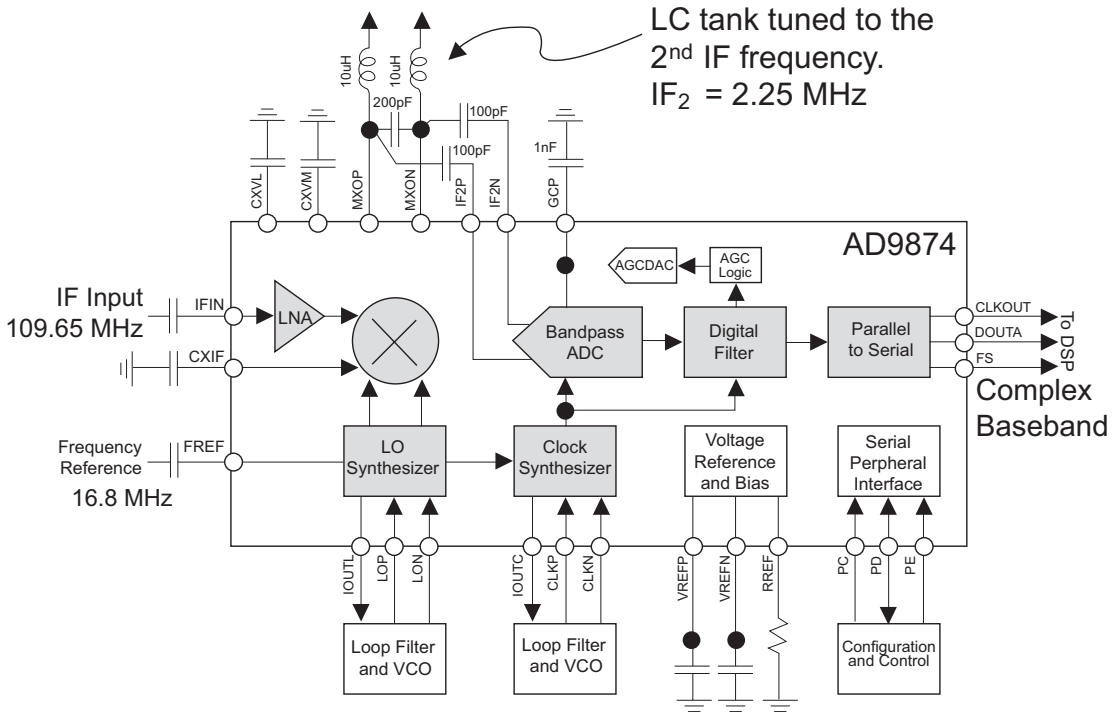


Figure 3-8. ABACUS III (AD9874) IC Functional Block Diagram from Data Sheet (700–800 MHz)

3.3.4.1 Second Local Oscillator (LO)

The ABACUS III IC local oscillator (LO) synthesizer controls the second LO. Signal FREF is the 16.8 MHz reference from the frequency generation unit (FGU). The second LO frequency is 70.92 MHz (71.1MHz in APCO) by default, or 75.78 MHz (75.6 MHZ in APCO) in special cases as necessary to avoid modem self-quieters. The second LO signal mixes with IFIN to produce a 2.43 MHz (2.25 MHz in APCO) final IF. The external VCO consists of transistor Q6000, together with its bias and instability network and tank elements. Darlington transistor Q6001 along with C6084 and R6001 form an active DC filter. The second order loop filter is comprised of C6056, C6057, and R6019.

3.3.4.2 Sampling Clock Oscillator

The ABACUS III IC sampling clock synthesizer, at Fclk=19.44 MHz (18 MHz in Apco) (IF2=Fclk/8, where Fclk is the clockrate), utilizes a negative-resistance core that is internal to the ABACUS III IC which, when used in conjunction with an external LC tank (made up of L6003 and C6031) and a varactor (D6030), serves as the VCO.

3.4 Main Frequency Generation Unit (FGU)

This section of the theory of operation provides a detailed circuit description of the Main frequency generation unit (FGU). This Main FGU is utilized for receiver first local oscillator injection for both APCO and HPD modes of operation and for APCO transmitter RF Injection. See “Schematics, Component Location Diagrams, and Parts Lists” on page 7-1

3.4.1 Frequency Generation Unit Section

The FGU (Figure 3-9) provides the HPD 1000 modem with a 16.8 MHz reference frequency, receiver first local oscillator, and a C4FM transmitter RF carrier, used for APCO Modulation, that is further amplified by the power amplifier section of the modem.

The FGU consists of the following:

- Reference oscillator section consisting of U6750, Y6750 and U6752
- Fractional-N synthesizer (U6751) and associated circuits
- Two voltage-controlled oscillators (VCOs) contained in U6754
- Two receiver LO amplifiers (Q6762 and Q6763)
- Three transmitter injection amplifiers (Q6764, Q6765 and Q6766)

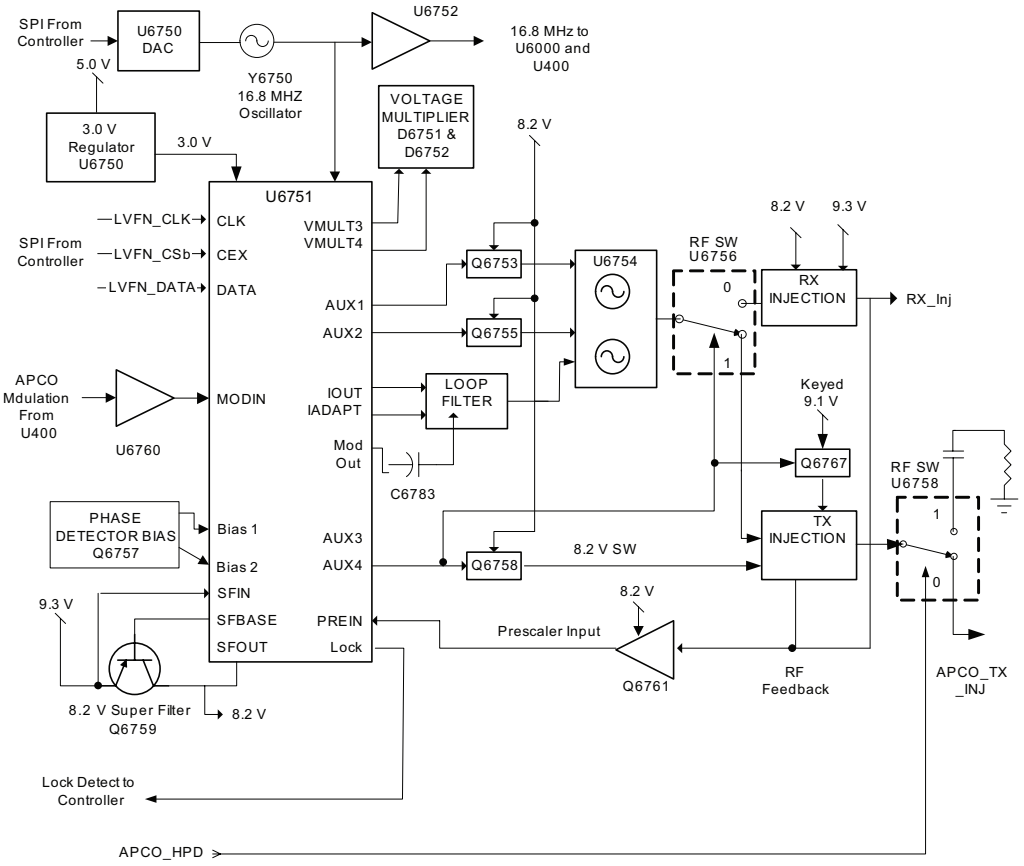


Figure 3-9. Main Frequency Generation Unit Block Diagram

3.4.2 Reference Oscillator

The modem's frequency stability and accuracy is derived from the 16.8 MHz reference oscillator (Y6750). The reference oscillator circuitry consists of the reference oscillator (Y6750), a Digital to Analog Converter (U6753) and inverter/buffer circuitry containing the active device U6752.The 16.8 MHz reference oscillator circuitry provides a 16.8 MHz reference to the Main Synthesizer (U6751), receiver back-end IC (U6000), and the HPD Transmitter fractional-N synthesizer (U400) section of the HPD 1000 modem. Y6750 is a voltage-controlled, temperature-compensated crystal oscillator (VCTCXO) and circuitry internal to Y6750 compensates for frequency error over temperature. Warping of the oscillator on frequency is accomplished via the separate programmable digital to analog converter (DAC) U6753. This DAC along with the microprocessor allow warping of the oscillator on frequency in tune mode and also performs Automatic Frequency Control (AFC) during APCO and HPD receiver operation and also during HPD transmitter operation.

The analog warp voltage for Y6750 is present at pin 1 (VOUT) of U6753 and is applied to pin 1 (VCONT) of Y6750. The 16.8 MHz output frequency of Y6750 is capacitor-coupled to pin 23 (XTAL1) of the Main Synthesizer (U6751) and also to the inverter/buffer stage U6752. L6756 and C6755 at the output of U6752 filter the 16.8 MHz signal, and R6757 along with C6759 set the appropriate amplitude of the signal for the receiver backend IC U6000 and HPD 1000 transmitter synthesizer U400. DC supply voltage for Y6750, U6752 and U6753 is provided by F3.0V from the 3.0 VDC regulator IC U6750.

3.4.3 Main Fractional-N Synthesizer IC U6751

The Main synthesizer IC (U6751) functions include frequency synthesis, a 8.2 V low noise (superfilter) DC supply, APCO modulation control, voltage multiplication and filtering, auxiliary logic outputs for VCO selection, selection of receiver or transmitter injection paths and activation of the transmitter injection string.

U6751 is a mixed-mode IC containing digital and analog circuits. Separate power supply inputs are used for the various functional blocks on the IC. Inductors L6752 and L6753 provide isolation between supply pin 20 (AVDD - analog supply input) and pin 36 (DVDD - digital supply input) connected to F3.0v. This 3.0 V DC supply is provided by U6750, a 3.0 V regulator IC which receives an input voltage of 5.0 VDC from the 5 V U6001 regulator

All programmable variables on the synthesizer IC, such as the synthesizer frequency, adapt-timer duration, modulation-attenuator setting, transmit functions, receive functions and auxiliary-control outputs, which select one of the two voltage-controlled oscillators, are programmed through a serial peripheral interface (SPI). The SPI is connected to the controller microcomputer via three programming lines, namely the data (pin 7-DATA), clock (pin 8-CLK), and the chip enable (pin 9-CEX) of U6751.

3.4.4 Voltage Multiplier

Pin 12 (VMULT3) and pin 11 (VMULT4) of U6751, together with diode arrays D6751 and D6752 and their associated capacitors C6763, C6766, C6769 C6771 and C6768, form the voltage multiplier. The voltage multiplier generates 12.0 VDC from the 3.0 V supply to supply the phase detector and charge-pump output stage at pin 47 (VCP) of U6751. This voltage multiplier is basically a stacked, multiple-diode capacitor network driven by two 1.05 MHz, 180 degrees out-of-phase signals from pins 12 and 11 of U6751.

3.4.5 Superfilter 8.2 VDC Supply

The superfilter is an active filter, contained in U6751, that provides a low-noise supply for the VCOs, prescaler, receiver and transmitter injection amplifiers. Regulator U5002, located in the transceiver board power control section, supplies 9.3 VDC to the FGU section through the filtering network consisting of L6755, C6806, C6807, and C6818. This voltage is applied to pin 30 (SFIN) of U6751 and the emitter of Q6759. The output is a superfiltered 8.2 VDC at the junction of pin 28 (SFOUT) of U6751 and the collector of Q6759. Filtering is accomplished with capacitors C6808, C6790, and C6791 at the output of this circuit and C6775 at pin 26 (SFCAP) of U6751.

3.4.6 APCO C4FM Modulation

To support APCO data, and signaling protocols, HPD 1000 modems must modulate the transmitter carrier frequency over a wide frequency range, from less than 10 Hz up to more than 6 kHz. The Main synthesizer supports frequencies down to 0 Hz by using dual-port modulation. Modulation is passed from the base band section of Fractional-N synthesizer (U400) pin K8 (HP_MOD_Out) located in the HPD synthesizer section. The signal is then coupled to the inverting amplifier U6760 where the gain of the signal is attenuated to the required input level of the Main synthesizer U6751 at pin10 (MODIN). The signal at pin 10 (MODIN) is internally divided into high- and low-frequency components, which modulate both the synthesizer dividers and the external VCOs through signal pin 41(MODOUT) of U6751.The IC is adjusted to achieve flat modulation frequency response during transmitter modulation balance calibration using a built-in modulation attenuator.

3.4.7 Charge Pump Bias

R6760, connected to the superfilter 8.2 VDC supply, along with resistors R6768 and R6769 set the steady state current supplied to pin 39 (BIAS 2) of U6751. Transistor Q6758 and resistors R6770, R6768, and capacitor C6794 form a circuit that momentarily increases the current to pin 39 (BIAS 2) during channel programming of U6751. This circuit is activated by pin 46 (ADAPTSW) of U6751 during the transition of programming U6751 to frequency and effectively decreases the length of time for the synthesizer to lock on frequency. During channel programming of the synthesizer U6751, an Adapt Timer internal to U6751 is activated for a short duration (typically 1.9 milliseconds). This adapt timer switches the configuration of the loop filter as explained in the next section and also provides a momentary 3.0 VDC output at pin 46 (ADAPTSW) of U6751. This 3.0 VDC is applied to R6770 which activates Q6758 allowing more current to flow through R6768 and into pin 39 (BIAS2) of U6751.

3.4.8 Loop Filter

The loop filter operates in synchronization with the phase detector of U6751 in two modes, normal and adapt. In normal mode, the loop filter forms a third-order loop filter consisting of components R6764, R6765, R6761, C6776 to C6779, and C6785 to C6789.

Pin 43 (IOUT) of U6751 provides the charge-pump current for steering of the control voltage line to the VCOs. During normal mode, pin 45 (IADAPT) is set to a high impedance and has no effect on the loop filter. When U6751 is programmed to a new frequency, the IC is initially operated in adapt mode. In this mode the loop filter is reconfigured for a wider bandwidth allowing the synthesizer to lock faster. The charge-pump output is supplied through pin 45 (IADAPT) in this mode, and this reconfigures the loop filter to behave like a second-order filter.

3.4.9 Lock Detect

Lock status of the synthesizer loop is provided to the microprocessor by pin 4 (LOCK) of U6751. A high level (3.0 VDC) indicates that the loop is stable. A low voltage indicates that the loop is not locked and will result in a failure to transmit or receive depending on the mode of failure.

3.4.10 Transmitter Injection

When pin 3 (AUX4) of U6751 is active high (3.0 VDC), RF switch U6756 is activated to divert the RF output of the VCO (U6754) to provide transmitter injection during APCO transmission. The transmit (TX) injection string consists of three amplifier stages (Q6764, Q6765, and Q6766) whose main purpose is to maintain a constant output to drive the RF power amplifier and supply the TX feedback signal to the synthesizer prescaler input. The first two stages Q6764 and Q6765 are powered by the superfilter 8.2 VDC supply, which is decreased by 0.7 VDC via the dual diode D6750, resulting in a 7.5 VDC supply. This 7.5 VDC is present when U6751 is programmed for transmitter operation. During this mode Pin 3 (AUX4) of U6751 is high (3.0 VDC) which turns on transistor switch Q6768. This switch connects the superfilter 8.2 VDC supply to D6750 which in turn active the RF transistors Q6764 and Q6765. Also, when Pin 3 (AUX4) of U6751 is high (3.0 VDC) voltage from K9.1 VDC supply is switched to Q6766 by switching transistor Q6767.

The K9.1 VDC is supplied by regulator U5005 and switching transistors Q5002 and Q5003 in the power control section of the transceiver board. The VCO RF output is attenuated 3 dB via resistors R6829 through R6831. This output is coupled to the first-stage amplifier Q6764, further attenuated 3 dB via resistors R6809 through R6811, and then coupled to the second-stage amplifier Q6765. This output is tapped to supply the TX feedback signal to the synthesizer prescaler, and the balance is further attenuated 3 dB via resistors R6816 through R6818. This output is coupled to the third stage amplifier Q6766, further attenuated 3 dB via resistors R6825 through R6827, and coupled to the input of the RF Switch U6758. U6758 requires two logic levels for operation and these are provided by inverter U6757 and the microprocessor GPIO labeled APCO_HPD_SW_VA. When U6758 pin 6 (VA) is 0 VDC and pin 4 (VB) is 3.0 VDC the RF switch connects to C6846 and R6835. In this mode the transmitter injection string is isolated from the RF power amplifier circuits. During APCO transmission U6758 pin 6 (VA) is 3 VDC and pin 4 (VB) is 0 VDC and the RF switch connects to a second RF Switch U3881 located in the HPD synthesizer section of the transceiver board. RF switch U3881 selects either the APCO RF from the main synthesizer or the RF from the HPD synthesizer depending on the mode of operation.

3.4.11 Receiver Injection

When pin 3 (AUX4) of U6751 is active low (0 VDC), RF switch U6756 is activated to divert the RF output of the VCO (U6754) to provide receiver injection during APCO or HPD receive mode. The receiver (RX) injection string is a two-stage amplifier that supplies the RX feedback signal to the U6751 synthesizer prescaler input and supplies the first local oscillator (LO) signal to the RX front-end mixer U6208. The RX VCO output is attenuated 6 dB via resistors R6793 through R6795 to increase isolation. This buffered signal is amplified by the first-stage amplifier Q6762, which is supplied by the 8.2 V superfilter for a gain of approximately 10 dB. Resistors R6789, R6790, and R6796 through R6798 bias Q6762 to approximately 5 V and 35 mA. L6757 serves as a choke inductor; C6819 and C6821 are added for filtering. The output of Q6762 is split into two paths. The first path feeds back to the synthesizer prescaler through blocking capacitor C6822. The second path, which supplies the LO signal to the RX front-end mixer, is attenuated 3 dB via resistors R6799, R6800, and R6824 to increase isolation. This buffered signal is amplified by the second-stage amplifier Q6763, which is supplied by the 9.3 V regulator for a gain of approximately 15 dB. Resistor R6801 biases Q6763 to approximately 4.5 VDC. L6758 serves as a choke inductor; C6823, C6824, and C6826 are added for filtering. The output of Q6763 is passed through blocking capacitor C6825 and attenuated 3 dB via resistors R6802 through R6804 to increase isolation and supply approximately 15.5 dBm to the LO port of the mixer U6208.

3.4.12 Voltage Controlled Oscillators (VCOs)

APCO transmitter RF frequencies are generated from two VCOs contained in U6754. U6754 is not serviceable and should be replaced if it is determined to be non-functional. APCO transmitter frequencies in the range of 764 to 776 MHz (repeater talkaround) and 794 to 806 MHz (trunking or repeater mode) can be generated when Aux1 (pin 48) of U6751 is active high (3.0 VDC). This 3.0 volts is applied to transistor switch Q6753 allowing the superfiltered 8.2 VDC supply to be connected to pin 2 (SWBPOSC1), bias for the first VCO of U6754. Likewise, transmitter frequencies in the range of 806 to 825 MHz (trunking or repeater mode) and 851 to 870 MHz (repeater talkaround) can be generated when Aux2 (pin 1) of U6751 is active high (3.0 VDC). This 3.0 V is applied to transistor switch Q6755 allowing the superfiltered 8.2 VDC supply to be connected to pin 17 (SWBPOSC2), bias for the second VCO of U6754.

APCO and HPD receiver first local-oscillator frequencies are also generated from the two VCOs in U6754. For receiver frequencies in the range of 764 to 776 MHz, high-side, first local-oscillator injection of 837.35 to 849.35 MHz (Fc + 73.35 MHz) is generated when Aux2 (pin 1) of U6751 is active high (3.0 Vdc). This 3.0 volts is applied to transistor switch Q6755 allowing the superfiltered 8.2 Vdc supply to be connected to pin 17 (SWBPOSC2), bias for the second VCO of U6754. For receiver frequencies in the range of 851 to 870 MHz, low-side, first LO injection of 777.65 to 796.65 MHz (Fc - 73.35 MHz) is generated when Aux1 (pin 48) of U6751 is active high (3.0 VDC). This 3.0 volts is applied to transistor switch Q6753 allowing the superfiltered 8.2 VDC supply to be connected to pin 2 (SWBPOSC1), bias for the first VCO of U6754.

Pin 20 (RFOUT) of U6754 is common to both oscillators and couples the oscillator's output signal to the RF switch U6756 which diverts the RF to either the transmitter injection path or receiver injection path depending on the mode of operation. Aux 4 from U6751 along with inverter U6755 place the switch U6756 into the proper mode of operation. Modulation and frequency steering is accomplished through pin 8 (Cont_V) of U6754.

3.4.13 Prescaler Feedback

RF feedback for the synthesizer loop is provided by prescaler amplifier Q6761.Feedback from both the transmitter and receiver injection strings are coupled to this amplifier through resistor networks (R6791, R6792, R6780, R6777, and R6779) that both balance and attenuate the levels prior to amplification by Q6761. The output of Q6761 is coupled to U6751 at pin 32 (PREIN), which is the prescaler input for the synthesizer. Supply voltage for Q6761 is provided by the Superfiltered 8.2 VDC supply through choke L6754 and R6774. Q6761 is biased by resistors R6774, R6775 and R6778.

3.5 Tomahawk/Escort Synthesizer

3.5.1 Tomahawk Synthesizer

Two low-control voltage VCOs and the Multi-Accumulator synthesizer in the Tomahawk IC will be employed to generate the reference frequency for the ESCORT loop. A Colpitts configuration has been selected for the VCOs. The Reference VCOs will operate from 809 MHz to 868 MHz (REF1) and 868 to 929 MHz (REF2) with a Side Band Noise equal or less than -115 dBc/Hz. The Buffer circuitry design utilizes discrete transistor stages to achieve the required signal level to the prescaler input of the multi-accumulator synthesizer in the Tomahawk IC (-10 dBm +/- 5 dBm) and isolation required by the VCO. The Escort translational loop will generate an injection carrier for the transmit modulator that is free of frequency pulling effects that would be present in a conventional direct launch transmitter wherein the VCO is operated at the transmitter output frequency. This is accomplished by fractionally dividing a "reference" signal from the main synthesizer which is not integer harmonically related to the output frequency and thus relatively immune to self-interference effects. This reference is relatively close to the transmitter operating frequency but far away enough to ensure easy filtering of reference spurs. The divider is referred to as a "near unity divider" or NUD. The NUD has 2 ranges, ÷1 to ÷ 1.5 in 1/64 steps, and ÷2 to ÷3 in 1/32 steps. The transmit frequency NUD output is applied to a low noise UHF phase detector where it is compared with the output of the TX VCO. The phase detector output is interfaced to the TX VCO via a charge pump and loop filter. The loop is operated at a sufficiently high bandwidth such that it is able to eliminate any parasitic FM or PM that is inflicted on the transmit VCO due to self-interference or other sources.

"High side" operation will be selected for the HSD mobile. For low side operation, the reference signal is applied to the phase detector directly and the TX VCO signal is passed through the NUD. Conventional phase-frequency detector circuits cannot operate at UHF frequencies so the ESCORT detector is composed of a low noise UHF phase detector for steady state operation and a noisier phase-frequency steering circuit for initial frequency acquisition. The ESCORT charge pump is incorporated on chip and operates from the 5v supply. A frequency steering circuit is provided in ESCORT to rapidly steer the VCO close to the desired frequency. Programmable dividers are provided at the inputs to the steering circuitry to accommodate different frequency bands.

3.5.2 ESCORT Translational Loop: TX VCO and Buffer Circuitry

A Colpitts configuration has been selected for this VCO. The ESCORT loop TX VCO will operate from 762 to 825 MHz with a side band noise equal or less than –110 dBc/Hz. The Buffer circuitry design utilizes discrete transistor stages to achieve the required signal level specified by the ESCORT block in the Tomahawk IC (0.1 to 0.3 Vrms), the input requirements of the Javelin IC (+10 dBm) and isolation required by the VCO.

3.6 Transmitter

This section of the theory of operation provides a detailed circuit description of the transmitter, which includes the RF power amplifier (RFPA), output network (ON), and power control.

When reading the theory of operation, refer to the appropriate schematic and component location diagrams located in "Chapter 7. Schematics, Component Location Diagrams, and Parts Lists". This detailed theory of operation will help isolate the problem to a particular component. However, first use the *HPD 1000 Modem Basic Service Manual (6816254H01)* to troubleshoot the problem to a particular section.

3.6.1 Transmitter

The following text discusses the transmitter.

3.6.1.1 RF Power Amplifier (RFPA)

The RFPA consists of three gain stages, which are shown in Figure 3-10.

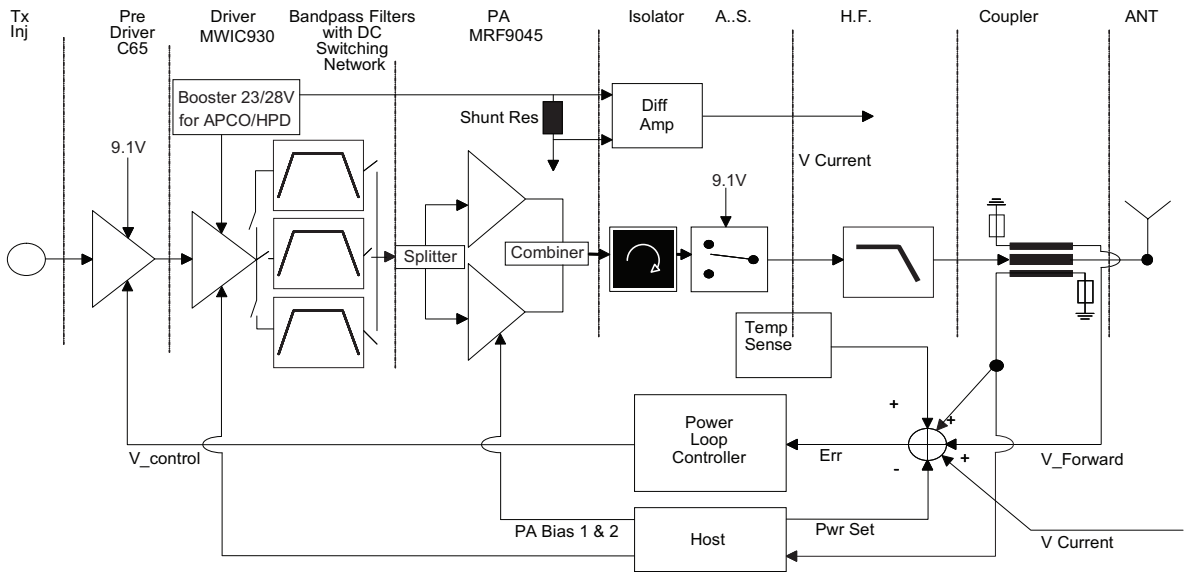


Figure 3-10. RF Power Amplifier (RFPA) Gain Stages (HPD)

3.6.1.2 First Stage

The RFPA first stage provides gain that is determined by the control voltage, RFPA_CNTRL. This control voltage is generated in the power control section and is a function of the final-stage output power, temperature, and current, as well as the control and A+ voltage levels. See “Power Control” on page 3-18 for a detailed explanation of the power control section. The 2 mW TX_INJ signal is routed to the U3550 first-stage device (Pin 16, RFIN) via C3500 to an integrated, wide-band input match. U3550 is a two-stage LDMOS device with a band pass interstage match consisting of C3503, L3502, C3504, R3501 and C3505 routed between VD1 (pin 14) and G2 (pin 11). L3501 and L3503 provide the K9.1V drain bias voltage for the first and second stages to VD1 (pin 14) and RFOUT1/2 (pins 6 and 7), respectively. The RFPA_CNTRL gate bias is provided to both stages internally via VCNTRL (pin 1). Both U3550 stages are operated Class A.

3.6.1.3 Driver Stage

C3521, L3520, C3520, and a transmission line form a low-pass, interstage match that transfers power to the Q3530 LDMOS transistor. R3520-3 provide device stability, and R3524 and C3522 supply the VGBIAS2 gate bias. L3530-1, R3530-1, C3530, C3531, C3536 and C3537 form the A+ drain bias circuit. Q3530 is operated Class AB.

3.6.1.4 Interstage Filter Network

The power from the driver stage enters the interstage switch network via capacitor C4740. This network provides filtering of far-out noise for the three transmit bands. There are three ceramic filters through which the RF can be routed. U4963 passes the 762–776Mhz band, U4964 passes the 851–870Mhz band and U4965 passes the 792–825Mhz band. The following table shows the control logic to activate the network and utilize one of the three filters.

Table 3-7. Control Logic

TX_DUP_SIMP_FILT_SWITCH	TX_SIMP_7_8_FILT_SWITCH	Filter
0 V	0 V	U4964
0 V	3.0 V	U4963
3.0 V	0 V	U4965
3.0 V	3.0 V	N/A

The TX_DUP_SIMP_FILT_SWITCH and TX_SIMP_7_8_FILT_SWITCH are control lines from the transceiver board that are used to activate the switches. Each switch consists of an input leg and an output leg. Each leg of a switch contains two diodes connected anode to cathode, e.g. D4901 and D4902, biasing and matching inductors L4917,L4918, bias choke L4933, bias resistor R4977 along with bypass capacitors C4957 and C4970. To activate this leg, control logic sends 9.3 V to L4917 and L4918, this activates D4901 and D4902 sending current through L4933 and R 4977 of approximately 80mA. The bias coils and bypass capacitors are carefully selected for matching to the respective filters. Each path has approximately 3 dB of insertion loss in the passband while providing a given attenuation to particular out of band frequencies.

3.6.1.5 Final Stage

The final stage of the HPD transmitter is a balanced LDMOS power amplifier consisting of two SRF7078DNR1(s) Q4700 and Q4701. RF drive from the **Driver Stage** is split in two by U4704. U4704 is a 90 degree 3 dB hybrid coupler. In essence, half of the RF power from the **Driver Stage** is delivered to each of the SRF7078DNR1(s) 90 degrees out of phase.

The input RF drive then passes through identical impedance matching networks consisting of transmission line, C4767 (3.3 pF), and C4768 (6.8 pF) for stage B (Q4701); and transmission line, C4738 (3.3 pF), and C4739 (6.8 pF) for stage A (Q4700).

R4711 (10 Ohm), R4709 (1.2 Ohm), R4712 (1.2 Ohm), R4713 (15 Ohm), and C4741 (0.01µF) provide stability for Stage A (Q4700). R4723 (10 Ohm), R4724 (1.2 Ohm), R4722 (1.2 Ohm), R4725 (15 Ohm), and C4769 (0.01µF) provide stability for Stage B (Q4700).

Gate bias circuitry for Stage A (Q4700) consists of R4708 (1k Ohm), R4726 (1M Ohm), and Q4705 a transistor switch. Gate bias circuitry for Stage B (Q4701) consists of R4721 (1k Ohm), R4727 (1M Ohm), and Q4702 a transistor switch. The switching transistors Q4705 and Q4702 control the output state of Q4700 and Q4701. When the *SIMPLEX* line (pin 2 of the transmitter board interconnect) is high (3 volts) the final devices Q4700 and Q4701 are on in APCO mode of operation. In HPD mode of operation, the *SIMPLEX* line (pin 2 of the transmitter board interconnect) is low (0 volts) and the *ASW* line (pin 1 of the transmitter board interconnect) toggles between high and low in sync with the transmit slot provided by the Javelin IC. When *ASW* is high the final devices are on and when ASW is low the final devices are off.

L4701 (22.57 nH), C4714 (39 pF), C4776 (4.7 µF), and C4713 (0.01µF) form the drain bias for Q4700. L4706 (22.57 nH), C4744 (39 pF), C4743 (4.7 µF), and C4777 (0.01µF) form the drain bias for Q4701.

The output networks of both final devices are low pass impedance matching networks. Transmission line, C4721 (13 pF), C4728 (13 pF), C4722 (4.7 pF), C4730 (3.3 pF) form the output match for Q4700. Transmission line, C4762 (13 pF), C4756 (13 pF), C4763 (4.7 pF), C4764 (3.3 pF) form the output match for Q4701. The outputs of the output matching networks of Q4700 and Q4700 are then recombined in U4704, another 90 degree hybrid coupler. The output power is then passes through the **Output Network**.

R4700 (15m Ohm), R4702 (100k Ohm), C4709 (39 pF), and U3561 comprise the final-stage, current-sense circuit that generates the *VCURRENT* voltage proportional to the final stage current. R4702 sets the circuit gain.

U4700 generates the *VTEMP* voltage, which is proportional to the final-stage temperature.

3.6.2 Output Network (ON)

The ON consist of the antenna switch, harmonic filter, and power detector.

3.6.2.1 Antenna Switch

The antenna switch functions in three modes, which are determined by the presence of SW_BIAS and RX_DUPLEX. Those modes are, SIMPLEX RX, SIMPLEX TX and DUPLEX. SW_BIAS is applied via Q6701. When SW_BIAS is present, the switch is in TX mode (simplex or duplex). When RX_DUPLEX is present, the switch is in Duplex mode. During Transmit, D6701 is forward biased forming a low-loss path from the RFPA final stage to the harmonic filter. During Receive Duplex, D6705 is forward bias to let the RF from the duplex antenna into the receiver front-end.

Isolation is achieved via two quarter-wave transmission lines between D6701 and D6705. When SW_BIAS is absent, the switch is in RX SIMPLEX mode. D6701 and D3703 are reverse biased forming a low-loss path from the harmonic filter to the RX front-end and a 60 dB isolation path from the harmonic filter to the RFPA final stage. Isolation is achieved via the D6701 off resistance.

3.6.2.2 Harmonic Filter

L6702,L6703, L6704, C6704, C6704 and C6705 form the low-pass harmonic filter. The filter attenuates harmonics generated by the RFPA when the antenna switch is in TX mode and provides extra selectivity when the antenna switch is in RX SIMPLEX mode.

3.6.2.3 Power Detector

The power detector consists of two asymmetric, coupled transmission lines and detection circuitry that detects forward and reverse power. C6708, D6702 L6706, R6710, and R6711 form the forward-power detector (VFORWARD), which is used for power leveling. C6701, D6700, L6700, R6704, and R6705 form the reverse-power detector (VREVERSE).

3.6.3 Power Control

The power control section is comprised of a control loop to level forward power and protection mechanisms to reduce power to a safe level for the given environmental conditions. The power control section operates in two (2) modes, APCO and HPD. In APCO mode, an analog control loop is used to control the input to C65 IC. In HPD mode, the analog control is by passed and the bias to the C65 is achieved via PWR_SET line coming from the AD.

3.6.3.1 Power Control Loop

VFORWARD from the ON is buffered via the non-inverting, variable-gain stage U0956-2 whose gain is set by EPOT U0964. The proper gain is determined during power-detection calibration tuning.

Buffered VFORWARD (U0956-2, Pin 7) is added to PWR_SET via R0971, R0972, and then compared to a reference determined by R0974 and R0975. PWR_SET is supplied by the digital-to-analog converter (DAC) U0959, Pin 4. Comparator stage U0956-3 increases or decreases RFPA_CNTRL so that the voltage at U0956-3, Pin 9 is the same at the reference voltage at U0956-3, Pin 10. When the PWR_SET voltage is decreased, U0956-3 increases RFPA_CNTRL to increase VFORWARD which is proportional to forward power thus increasing the power level. When the PWR_SET voltage is increased, U0956-3 decreases RFPA_CNTRL to decrease VFORWARD, thus decreasing the power level. The microprocessor initiates the loop through U0958-1 and Q0954. Loop timing is set via software together with R0977, and C0973.

3.6.3.2 Protection Mechanisms

Final-stage temperature is sensed in the RFPA resulting in VTEMP, which is proportional to temperature. VTEMP is compared against a reference voltage TEMP_1 (U0959, pin 12) via U0957-1. When VTEMP exceeds TEMP_1, the U0957-1, pin 1, voltage increases and forward biases one of the D0951 diodes, which cuts back power. Power continues to cut back with rising temperature until the voltage level at the junction of R0978 and R0983 is high enough to forward bias D0952, thus clamping the cut back so that the modem meets its duty cycle specification while providing protection against high-temperature conditions. The clamping level is set via TEMP_2 (U0959, pin 13) and U0957-2. U0957-3 is used to sense if a high A+ battery voltage condition exists and, if it does, the Q0955 gate is biased on, which increases the clamp voltage allowing for additional power cutback for a high A+, high temperature condition.

Final-stage current is also monitored via VCURRENT, which is proportional to current. VCURRENT is compared against a reference CURR_LIM_SET (U0959, pin 5) which is tuned after power characterization. If VCURRENT exceeds CURR_LIM_SET, then U0957-4, pin 14, voltage rises and forward biases one of the D0951 diodes, which limits power.

Finally, control voltage is limited by U0956-4 and D0950. RFPA_CNTRL can rise to the control voltage limit set by R0942-4.

3.6.4 Boost Converter Section

The boost converter is designed to up-convert the alternator voltage form the nominal value of 13.8 V DC to either 28V DC or 23 V DC depending on the mode of operation (28 V for HPD and 23 V for APCO). Switching between 28 V/23 V is accomplished by toggling BST_SWITCH. BST_SWITCH high corresponds to 28V and BST_SWITCH low corresponds to 23 V. The up conversion is accomplished by switching the main transistor Q3100 on and off. When the Q3100 is on, inductor L3102 charges, on the off-mode, the inductor releases its energy to the load and the load-capacitors (C3125, C3114, C3113, C3130). On the next transistor on-state, the inductor charges itself again while the load-capacitors discharged their energy to the load and the process repeats itself.

The boost converter is designed to be on only in Transmit mode. In the off mode, the alternator voltage minus a minor loss is still present at the output (E3101) due to the nature of the switching converter design. Turning the booster on/off is accomplished by turning TX_BSTEN high or low.

The reference clock TX_BOOST_CLK for the controller (U3101) is turned into a square wave via U3107 before going into the frequency divider IC U3106. U3106 allows the booster to operate in 2 frequencies. The default frequency is 262.5 kHz. However, on low battery voltage, the output of the comparator U3109 turns high and switches the frequency to 525 kHz via switch U3108.

3.6.5 Linear Transmitter

3.6.5.1 HPD Mode

The HPD mode modulations, namely 4QAM, 16QAM and 64QAM, are phase and amplitude sensitive and thus require a linear transmitter. This modem transmits 10W average slot power and has a peak-to-average power ratio of approximately 6dB. Therefore, the modem must transmit linear power up to at least 40W. Linearity requirements are met via PA (power amplifier) design and the utilization of a Cartesian feedback system.

An additional feature of the transmitter design is the far-out noise (FON) filtering employed to mitigate interference of the HPD receiver in duplex mode and interference of Public Safety radios operating simultaneously in adjacent bands.

The HPD linear transmitter can most easily be broken down into a front end section located on the transceiver board and a back end section located on the transmitter PA board. See Figure 3-11. HPD Linear Transmitter Block Diagram on page 20 for the discussion of this section of the manual.

3.6.5.2 Linear Transmitter Front End

The front end of the linear transmitter is mainly comprised of the Tomahawk and Javelin ICs (integrated circuits) which basically convert digital data from the controller's processor to a linearly modulated RF signal. The RF signal passes through an APCO/HPD TX switch and a transceiver switched FON filter network before leaving the transceiver board and being amplified and filtered by the transmitter PA board. The APCO/HPD TX switch selects the respective modulated RF source to be applied to the PA lineup.

3.6.5.3 Tomahawk IC

The Tomahawk IC provides two main functions for the linear transmitter – it serves as a DAC (digital to analog converter) and also synthesizes the RF carrier frequency.

The frequency synthesis of the direct launch RF carrier is achieved through the Main Synthesizer section of the Tomahawk with an external reference VCO and the ESCORT section of the Tomahawk in conjunction with an external VCO that completes the PLL (phase locked loop). The result is a single-ended RF carrier that is amplified and passed through a balun to feed the differential LO (local oscillator) input of the Javelin. A detailed description of HPD frequency synthesis can be found in the Frequency Generation section of this manual.

The processor configures the Tomahawk (as well as the Javelin) via SPI communication. Baseband digital I/Q data, however, is sent to the Tomahawk via SSI communication. The data is digitally filtered, converted to analog I/Q signals and passed through a smoothing filter all within the Tomahawk. There is a course and fine attenuator in line with both the I and Q paths for purposes of tuning output power and as part of the power cutback scheme. The differential analog I/Q waveforms exit the Tomahawk IC, pass through a single-pole low-pass baseband RC filter and then feed the differential analog I/Q inputs of the Javelin.

3.6.5.4 Javelin IC

The Javelin serves several important purposes. It functions as an I/Q quadrature modulator accepting analog baseband I/Q inputs and an LO input from the Tomahawk section. The Javelin provides power control, DC training, amplitude training and phase training. In addition, it is the heart of the Cartesian feedback system responsible for improving transmit linearity on the order of 30dB. In the closed loop configuration, a portion of the PA final RF output is fed back to the Javelin RF input. The fed back RF is then demodulated, compared to the input baseband and an error signal is added to the forward path providing the entire Cartesian feedback system.

DC training is done autonomously by the Javelin at the end of each transmit burst. Phase and amplitude training are performed periodically (every 200 transmit slots) to ensure stable linear transmission of the Cartesian feedback system. This accounts for drifts in temperature and supply voltage that could affect loop stability and linearity. Phase and amplitude training are also performed upon any transmit frequency change and for certain power level changes. Except for the training waveform provided on the I channel by the processor, phase and amplitude training are also autonomous to the Javelin.

3.6.5.5 Linear Transmitter Back End

The linear transmitter back end basically consists of cascaded pre-driver and driver PA stages followed by FON filtering and a split and combined PA final. Before being transmitted out of the antenna, the RF signal passes through a coupler, an isolator, a transmit/receive antenna switch and a harmonic filter. The coupler feeds back a sample of the RF signal, approximately -20dB, that is further attenuated before applied to the Javelin RF input to complete the Cartesian feedback loop. The isolator protects the closed loop Cartesian feedback system from reflected power that may occur at the antenna port, thus further ensuring linear transmission. Detailed descriptions of the PA and ON (output network) circuits can be found in their respective sections of this manual.

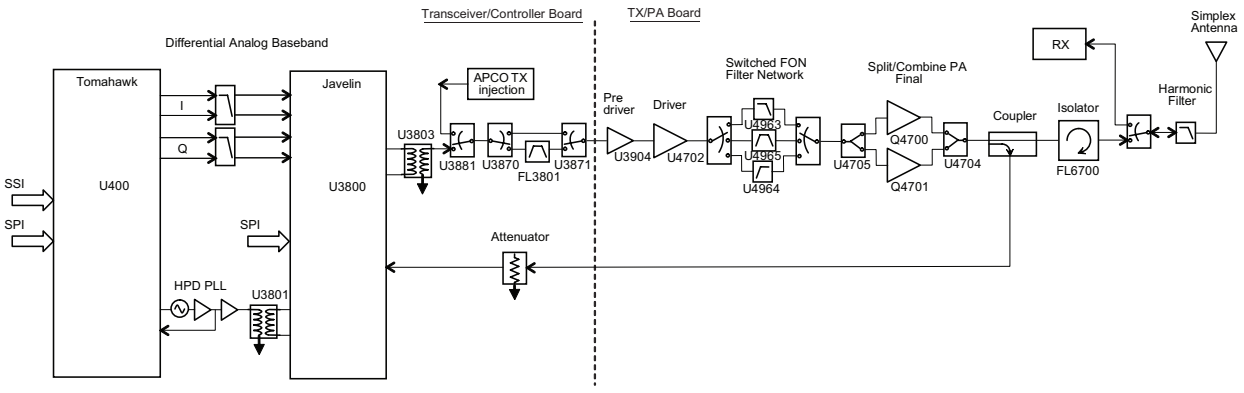


Figure 3-11. HPD Linear Transmitter Block Diagram

3.7 Controller Section

The controller section of the HPD 1000 is contained on the transceiver board. It acts as the interface between the mobile computer and the radio frequency section of the modem. Its tasks include receiving and transmitting data to and from the mobile computer, configuring all of the integrated circuits, performing digital signal processing on the transmit and receive data to and from the transceiver circuitry, controlling the on/off status of the modem, and controlling the status LEDs.

The following diagram (Figure 3-12) shows the three functional sections of the controller section.

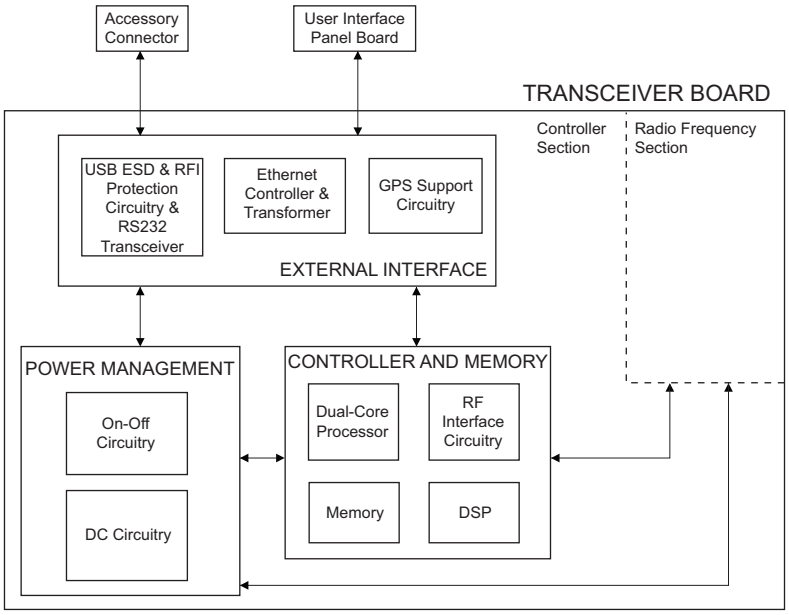


Figure 3-12. Controller Design Functional Sections

The functional sections of the controller include the following:

- **External Interface:** electrostatic discharge (ESD) protection circuitry and radio frequency interference (RFI) reduction circuitry for USB and RS232 busses, an RS232 transceiver, an Ethernet controller IC, an Ethernet transformer and GPS support circuitry
- **Power Management:** On-Off control logic circuitry, a power management integrated circuit (IC), several discrete voltage regulators, and a low-battery voltage monitoring circuit
- **Controller and Memory:** a dual-core processor with its memory devices, a discrete digital signal processor (DSP), and RF interface support circuitry

3.7.1 Accessory Interface

The HPD 1000 has a 26-Pin D-shield External Connector that provides essential connectivity functions. A complete pin out and pin functions are described in Figure 3-13 and Table 3-8.

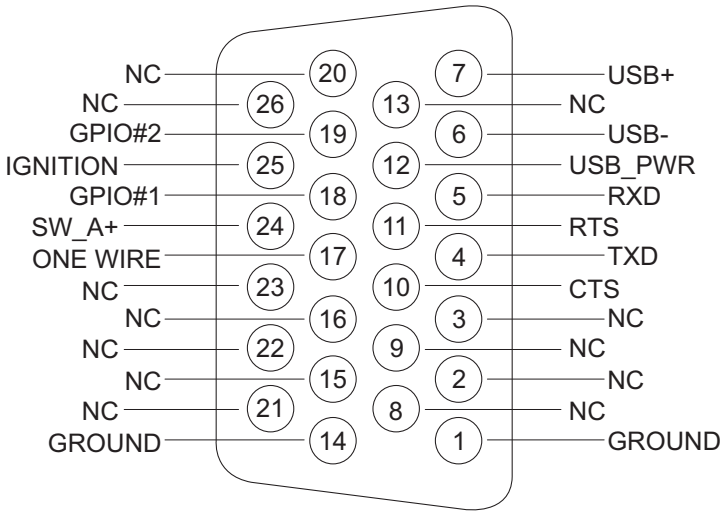


Figure 3-13. 26 Pin Accessory Connector

Table 3-8. Pin Assignment Functions for the 26 Pin Accessory Connector

Pin	Function		Description
1	GROUND	-	-
2	No Connection	-	-
3	No Connection	-	-
4	DCE_TXD	RS232 Transmit Data	This is part of the 4-Wire RS232 interface to external data accessories, programming cables, etc.
5	DCE_RXD	RS232 Receive Data	This is part of the 4-Wire RS232 interface to external data accessories, programming cables, etc.
6	USB-	USB- (Data)	This is part of the 2-Wire USB differential data bus used for programming and data communication.
7	USB+	USB+ (Data)	This is part of the 2-Wire USB differential data bus used for programming and data communication.
8	No Connection	-	-
9	No Connection	-	-
10	DCE_RTS	RS232 Request-To-Send	This is part of the 4-Wire RS232 interface to external data accessories, programming cables, etc.

Table 3-8. Pin Assignment Functions for the 26 Pin Accessory Connector

Pin	Function		Description
11	DCE_CTS	RS232 Clear-To-Send	This is part of the 4-Wire RS232 interface to external data accessories, programming cables, etc.
12	USB PWR	USB Power	This is the supply (5.0 V) for the USB data bus, and is an input into the HPD 1000.
13	No Connection	-	-
14	GROUND	-	-
15	No Connection	-	-
16	No Connection	-	-
17	ONE WIRE	1-Wire data	0-2.8V bidirectional data used for identification of smart accessories/cables. Caution, an external source of voltage could damage the microprocessor.
18	GPIO #1	Accessory Interface Control Line	3.0 V control line output used for control of future accessories.
19	GPIO #2	Accessory Interface Control Line	3.0 V control line output used for control of future accessories.
20	No Connection	-	-
21	No Connection	-	-
22	No Connection	-	-
23	No Connection	-	-
24	SW A+	Switched Battery Voltage	This voltage is available when the modem is switched on, at A+ levels.
25	Ignition	Ignition Sense	Connecting this line to the ignition line of the vehicle must be done so that the HPD 1000 can be powered on via button press, USB or Ethernet connections.
26	No Connection	-	-

The 26-Pin Accessory Connector connects through a flex-cable to the 32-Pin Connector (J7801), on the controller section of the Transceiver board. Appropriate Electrostatic Discharge (ESD) and Radio Frequency Interference (RFI) protection components are placed on the periphery of this connector on all signal lines. The following section describes the individual interfaces and signals that are incorporated in the 26-Pin Accessory Connector.

3.7.1.1 Universal Serial Bus (USB)

The USB interface is certified as a full speed function under the USB 2.0 specification. The HPD 1000 plugs into a type-A downstream connector on a USB hub or computer terminal using the Motorola USB accessory cables (HKN6177A, HKN6178A or HKN6179A).

The USB interface is composed of the following four lines:

- USB D+
- USB D-
- VBUS (USB_PWR)
- Ground

D+ and D- are bidirectional data lines that operate at a speed of 12MHz, with 3.0 V logic levels. The two lines operate in both differential and single ended signaling modes. Therefore all electrical characteristics of the two lines are very closely matched. The VBUS line conveys bus power from the USB host (i.e. computer terminal or USB hub). The voltage on this line is nominally 5.0 V. The steady state current draw from VBUS (by HPD 1000) is typically below 0.5mA. The VBUS line is used to sense the presence of a USB host connected to the HPD 1000 and is monitored by the ON/OFF block to initiate the power up of the HPD 1000. In addition, the dual-core processor senses this line to initiate USB communications with the USB host. The Ground Pin serves as the signal return path for D+ and D- lines. It is also connected to the shields of the cable and connector to ensure the recommended electrical characteristics across the transmission path and as protection against any source of interference.

3.7.1.2 RS232 Interface

RS232 provides an interface for data accessories and debugging. RS232 is composed of five lines:

- TXD
- RXD
- RTS
- CTS
- Ground

TXD the Transmit Data (output) from the HPD 1000 and RXD is Receive Data (input). RTS (Request To Send) and CTS (Clear To Send) are hardware flow control pins.

The Ground Pin functions as the signal return path and cable shielding.

The serial communication protocol is configured as: 9600 Bd, 8 data bits, no parity, 1 stop bit, software flow control. The RS232 interface uses a bipolar signaling scheme. The nominal voltage swing is -5.0 V and +5.0 V.

3.7.1.3 1-Wire

The 1-Wire interface is used to communicate with the 1-Wire ROM, embedded in the Motorola accessory cables. This is a bidirectional serial digital bus using +5.0 V, 0 V signaling levels.

3.7.1.4 SW_A+

This pin is a gated output of the battery supply input (A+). The gating operation is controlled by Q7204. SW_A+ turns on when the HPD 1000 is powered on.

3.7.1.5 Ignition

This is an input signal to the HPD 1000, used for sensing the vehicle's ignition status. If the voltage on this pin drops below 6.0 V, the HPD 1000 turns off. During the cranking of the vehicle this makes the modem turn off, when necessary.

3.7.1.6 GPIOs

The accessory connector provides two GPIOs from the DUAL-CORE PROCESSOR processor. These pins operate at 3.0 V, 0 V signaling levels.

3.7.2 Ethernet Controller / Transformer & Link Detect Circuitry

This section describes the operation of the Ethernet interface of the High Performance Data Modem (HPD 1000). This interface has a dual purpose for the modem. The first is to allow the modem to communicate via Ethernet protocol (IEEE 802.3) to a computer terminal at 10Mbps. In this case, the Ethernet Controller is the main component. The second purpose is to detect the presence of a powered ON computer terminal attached to HPD 1000's Ethernet Interface using Motorola's Cable (Kit # HKN6175_ or HKN6176_). In this case, the Link Detect Circuitry is the main component. The following diagram depicts the interaction of these main components to the HPD 1000 modem. See "Link Detect Circuitry" on page 3-32. for more information on the Link Detect Circuitry.

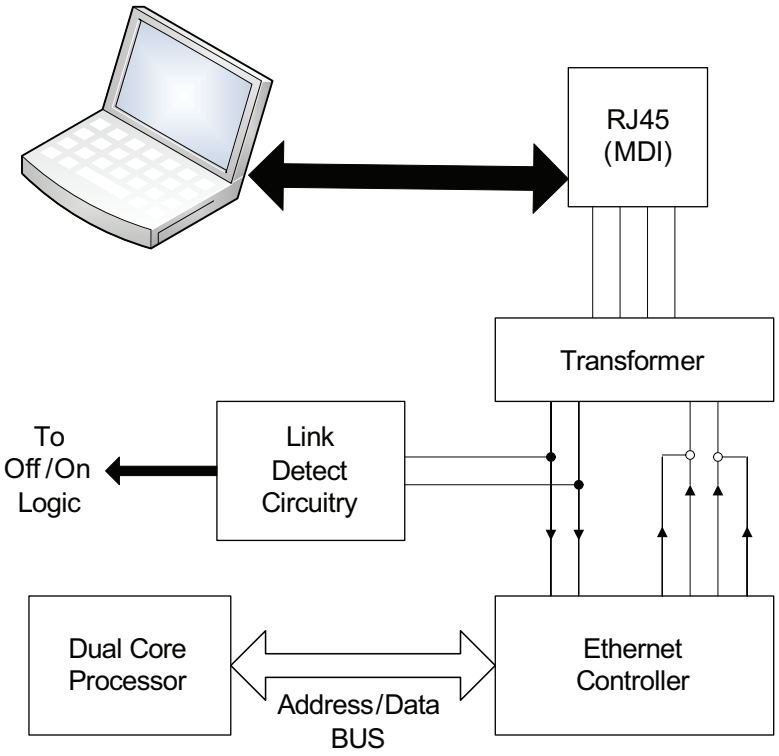


Figure 3-14. Ethernet Interface Block Diagram

3.7.2.1 MDI Connector and Transformer

The Ethernet cable connects to the Medium Dependent Interface (MDI) or RJ45 connector on the User Interface Panel (UIP) board . This connector provides shielding as well as connectivity for all four signals for communication with the computer terminal. Its pin diagram is given below.

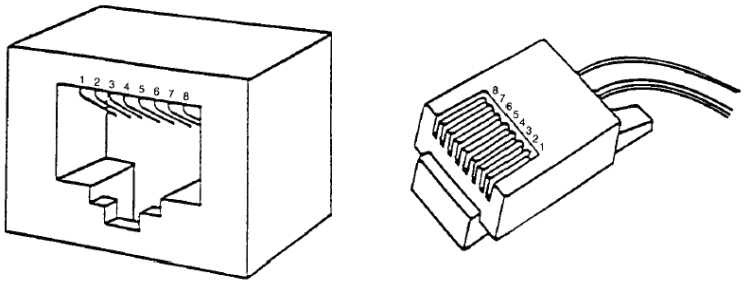


Figure 3-15. MDI and Twisted Pair Link Segment Connector

The signals connecting the MDI connector with the transformer are crossed over to allow a computer terminal to connect to the HPD 1000 modem without the need of a crossover cable. The transformer (T7300) isolates the Ethernet Controller from the connector and the external cable, providing protection against DC voltage differences that might be present at the interface. It also provides a constant reference for the AC signals being transmitted over the interface.

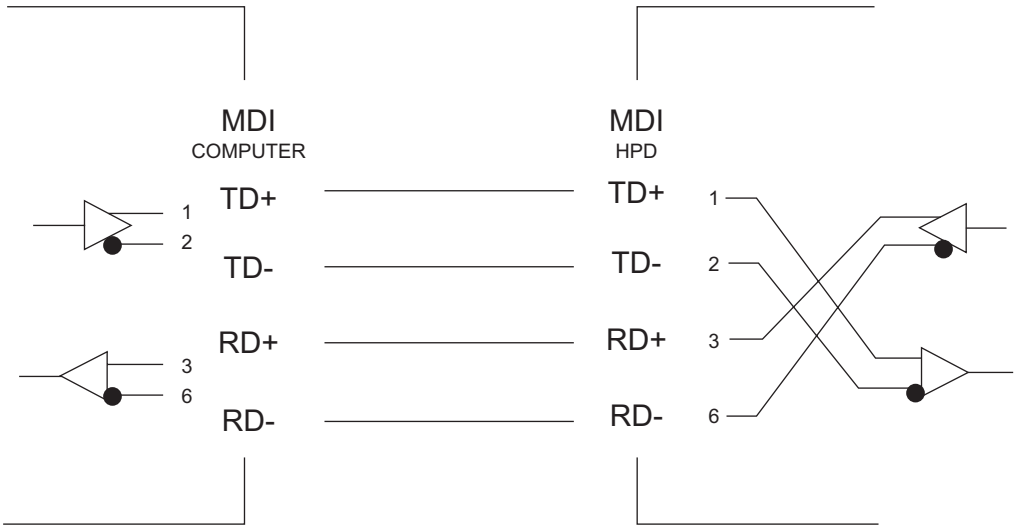


Figure 3-16. Medium Attachment Unit (MAU) Embedded Crossover Function

3.7.2.2 Ethernet Controller

The Ethernet Controller (U7300) is an IC that controls full duplex 10BASE-T communication for the HPD 1000 modem. Its main function is to control the data flow from the dual-core processor residing within HPD 1000's Controller and Memory Block, and to Manchester-encode the data for transmission over the interface. The Ethernet Controller acts as a client device connected to the dual-core processor through the main address and data bus of the modem, with its data flow being controlled using interrupts. This IC gets it power from VCC_3_3, and uses a 20 MHz oscillator as its clock source. In order to guarantee that the oscillator starts after the IC's power source reaches 1.6 V, a 10ms delay was implemented with external support circuitry to the IC.

3.7.3 Global Positioning System (GPS)

The HPD 1000 incorporates GPS functionality. This section describes the data interface between the GPS receiver IC and the dual-core processor.

The GPS receiver IC (U8000) is located on the User Interface Panel (UIP) board. Communications between the GPS IC and the dual-core processor is achieved using the Universal Asynchronous Receiver Transmitter (UART) integrated into the two components. The serial data signals (GPS_TXD_IN and GPS_RXD_IN) from the GPS IC are routed through the UIP connector. The signals go through a level translator before they are connected to the dual-core processor's UART2 interface. Table 3-9 describes the signals between the GPS IC and DUAL-CORE PROCESSOR. In addition to the data communication lines, a 32 kHz, 3.0 V logic level clock signal is supplied to the GPS IC from the controller section.

Table 3-9. GPS Interface Signals

Signal name at GPS IC	Signal name at Controller section	UIP connector pin number	Pin function
GPS_TXD_IN	GPS_TXD	A7, B7	Serial data from dual-core processor to GPS IC
GPS_RXD_IN	GPS_RXD	A9, B9	Serial data from GPS IC to dual-core processor
32KHZ_CLK_GPS	GPS_32K_RTC	A29, B29	32kHz Real Time Clock

3.7.4 ON/OFF Circuitry

The ON/OFF block is closely integrated with the DC distribution circuit on the controller section of the transceiver board. The major function of the ON/OFF block is to provide a method to control power by external signals such as Ethernet, USB, IGNITION_SENSE etc. and software controlled signals, LATCH_CLR and STO.

The SW_5V_ENABLE is essentially the logic output of the ON/OFF control block, responsible for enabling and disabling power to the system. The ON/OFF block is powered by the UNSW_5V and UNSW_3V supply rails. These rails power up shortly after A_PLUS is applied to the HPD 1000.

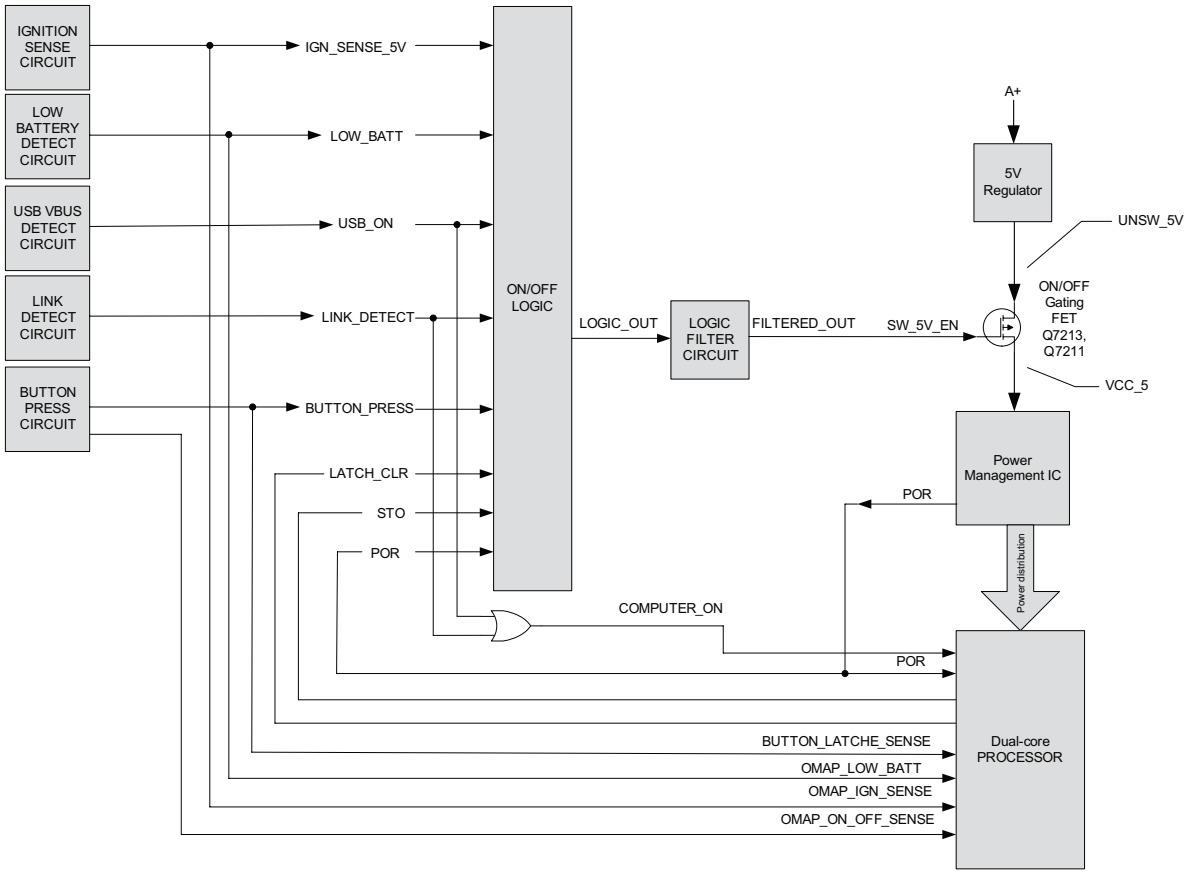


Figure 3-17. Top Level View of the ON/OFF Circuitry and its relation to the Controller Section and the DC Distribution

Figure 3-17 shows the interconnection of the ON/OFF block and other circuits on the controller board. A detail list of the signals is provided in Table 3-10.

Table 3-10. Description of Important Signals in the ON/OFF Block

#	Signal Name	Source of Signal	Functional Description
1	IGN_SENSE_5V	From the DC Block	Active high 5.0 V signal that indicates if the vehicle's ignition switch has been activated (a voltage greater than 6.0 V has been applied to the IGNITION input of the accessory connector). It is an input to the ON/OFF logic block of the modem.
2	OMAP_IGN_SENSE	This is the same signal as IGN_SENSE_5V but with 3.0 V logic.	Active high 3.0 V signal used by the processor to determine if the vehicle's ignition has been turned OFF and hence triggering the start of the OFF sequence. This input is de-bounced in software.
3	LOW_BATT	From the low battery detector in the DC Block section.	Active high 5.0 V signal indicating that the vehicle's battery voltage has dropped below 10 V.
4	OMAP_LOW_BATT	This is the same signal as LOW_BATT but with 3.0 V logic.	Active high 3.0 V signal used by the processor to monitor the status of the battery voltage. If high, the software will de-bounce and initiate the OFF sequence.
5	ON_OFF_SENSE	From the ON/OFF button detect circuit in the User Interface Panel (UIP) Board.	Active high 3.0 V strobe signal used by the ON/OFF logic to power ON the modem. The logic will record a strobe on this signal.
6	OMAP_ON_OFF_SENSE	This is the buffered version of the ON_OFF_SENSE signal.	Active high 3.0 V strobe signal used by the processor to de-bounce and initiate the OFF sequence or to cause an IP revert.
7	BUTTON_PRESS	This signal is the recorded (latched) version of ON_OFF_SENSE	Active high 5.0 V signal used by the ON/OFF logic to turn the modem ON.
8	BUTTON_LATCH_SENSE	This is the same signal as BUTTON_PRESS but with 3.0 V logic.	Active high 3.0 V signal used by the processor to acknowledge that the modem turned ON via a button press.
9	LINK_DETECT	From the Link Detect Circuitry on the ON/OFF Block.	Active high 5.0 V signal used by the ON/OFF logic to turn ON the modem. This signal, when asserted, indicates the presence of an Ethernet connection between a PC and the modem.
10	USB_ON	From the Connectivity Block and Accessory Connector.	Active high 5.0 V signal used by the ON/OFF logic to turn ON the modem. This signal, when asserted, indicates the presence of a host device attached to the modem via its USB cable.

Table 3-10. Description of Important Signals in the ON/OFF Block

#	Signal Name	Source of Signal	Functional Description
11	COMPUTER_ON	This is the logical OR of USB_ON and LINK_DETECT	Active high 3.0 V signal used by the processor to acknowledge that the modem turned ON via a PC, and to initiate the OFF sequence when a USB or Ethernet connection is no longer present.
12	POR	Power On Reset from the Power Management IC on the DC Block.	Active low 3.0 V signal used by the ON/OFF logic to mask possible glitches on LATCH_CLR from the processor. For more explanation see section below.
13	STO	From the dual-core processor	Soft Turn OFF. Active low 3.0 V signal used by the processor to turn modem OFF.
14	LATCH_CLR	From the dual-core processor	Active high 3.0 V signal used to clear the logic before STO gets asserted.
15	LATCH_CLR_5V	This is the same signal as LATCH_CLR but with 5.0 V logic.	Active low 5.0 V signal used by the processor to clear the recorded latched (BUTTON_PRESS) signal.
16	LATCH_INIT	From the Voltage Supervisor of UNSW_5V.	Active low 5.0 V signal used by the ON/OFF logic to initialize the content of the latch used to record the button press event. Also used by the Filter and Link Detect to initialize their state. This signal gets asserted for ~10ms after the modem is connected to the vehicle's battery supply (A_PLUS).

3.7.4.1 ON/OFF Logic Sub-circuit

Figure 3-18 shows a simplified diagram indicating the logic relation of all the signals generating the LOGIC_OUT signal in the ON/OFF block.

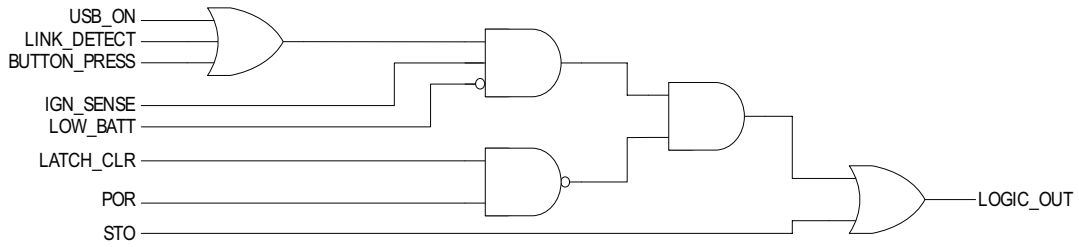


Figure 3-18. Simplified ON/OFF Logic

To turn the modem on, the ON/OFF circuit needs to be stimulated by signals that originate from the computer terminal or the ON/OFF button. A logic low on either IGN_SENSE or LOW_BATT causes the ON/OFF logic to ignore any of these input signals. Therefore the presence of IGN_SENSE and LOW_BATT are required conditions for proper modem operation. The POR and LATCH_CLR signals block any unwanted transients during start up that may cause the ON/OFF logic circuit to behave unevenly. See section below for more details.

Assuming that the asserted IGN_SENSE and LOW_BATT conditions are met, the modem will turn ON for at least 6 seconds with the aid of the logic filter which is described in a subsequent section. This time is required for the processor to become fully operational, and for the STO signal to be asserted by software to a logic high, causing the LOGIC_OUT signal to maintain a logic high output, and hence the ON state of the modem. At this time, any changes to IGN_SENSE, LOW_BATT, the ON/OFF Button, USB_ON or LINK_DETECT, will not cause the hardware to turn OFF the modem. This way, the dual-core processor, with the assertion of STO, is in full control of the OFF sequence. Once the modem is ON and operational, the dual-core processor monitors the state of IGN_SENSE, COMPUTER_ON, BUTTON_LATCH_SENSE and LOW_BATT to determine the cause for the ON state.

During the ON period, the dual-core processor continues to sense the status on the OMAP_ON_OFF_SENSE, COMPUTER_ON, OMAP_LOW_BATT and OMAP_IGN_SENSE lines. An assertion on either one of these signals initiates the software routine to power down the modem. During this process, the LATCH_CLR signal is pulled high to erase all recorded states for the button press (clearing BUTTON_LATCH_SENSE), and then the STO line is pulled down to logic low, causing the SW_5V_ENABLE signal to go low and turning off the power to the Power Management IC.

3.7.4.2 LATCH_CLR, POR and STO signals

The signal LATCH_CLR is an input to the ON/OFF circuitry from the dual-core processor. It is software controllable, and its purpose is to clear all recorded events during the ON sequence, such that the dual-core processor is able to successfully turn OFF HPD 1000 independent of any of the previous events (button presses, LINK_DETECT or USB_ON). During normal operation, LATH_CLR is asserted at the last stage of the OFF sequence, before Soft Turn OFF (STO) gets asserted. STO is the signal used by the software to control, when asserted, when the HPD 1000 modem will turn off the main 5.0 V regulator though SW_5V_ENABLE. When de-asserted, STO inhibits any of the input signals in hardware to take any effect in an eventual OFF sequence without software's control.

From the Power Management IC (U7204), Power On Reset (POR), provides additional notification to the ON/OFF circuitry that all regulators are running and that all voltages are stable. In relevance to the ON/OFF circuitry, POR provides a way to filter out any glitches caused by the dual-core processor's GPIO's during the first second of the power ON sequence. A glitch or an unexpected transition of the signal LATCH_CLR, which is an input from the dual-core processor, can cause the HPD 1000 modem to quickly turn OFF by erasing the recorded event of a button press before the ON sequence has completed.

3.7.4.3 ON/OFF Button

A momentary press on the ON/OFF button causes the D-type latch (U7434) to be latched high. The output of this device, called BUTTON_PRESS, is presented as an input to the ON/OFF block. A buffered version of the signal, called BUTTON_LATCH_SENSE, is also routed to the dual-core processor GPIO. The D-type latch (U7434) is reset (output set to logic low) if LATCH_CLR, LATCH_INIT or IGN_SENSE is at logic low.

3.7.4.4 Link Detect Circuitry

The Link Detect Circuitry is powered directly from the UNSW_5V regulator, which enables this circuit to operate while HPD 1000 is in its OFF state and connected to its main power source (A_PLUS). The main purpose of this circuit is to detect the presence of a differential signal coming into HPD 1000 from the twisted pair medium or Ethernet cable. The differential signal is called a link pulse, and it's sent periodically by a powered computer terminal. When the computer's MDI is connected to the Modem's MDI via a twisted pair medium, the link pulse gets detected as long as its differential voltage exceeds 200mV. This detection causes a strobe to be sent to the ON/OFF Logic within HPD 1000's Power Management Block. When the twisted pair medium is removed, the Link Detect Circuit will de-assert its signal to the ON/OFF Logic to alert the dual-core processor that the computer terminal was disconnected from the modem. This will typically result in the modem to start a self power off sequence (See 3.7.4.1 ON/OFF Logic Sub-circuit on page 30 for more details). The circuit relies on the modem to successfully turn ON, such that the link pulse period from the computer automatically switches to about 16ms, fast enough to enable the Link Detect Circuit to keep asserting its COMPUTER_ON signal to the dual-core processor.

The following diagram depicts the main components of this circuitry, which are the LVDS Receiver (U7459) and the Timer Circuitry (U7441). The LVDS receiver provides the main detection mechanism with a hysterisis value of 200mV between its terminals. Once the correct differential signal gets detected, the strobe signal gets recorded onto a set of registers (D-type latch). The Timer Circuitry will then sample the register and assert the LINK_DETECT signal if a successful link pulse had been detected and recorded earlier. After the sampling, the Timer Circuitry will reset the contents of the register to allow a subsequent absence of a link pulse to be detected and hence it will be able to de-assert the LINK_DETECT signal.

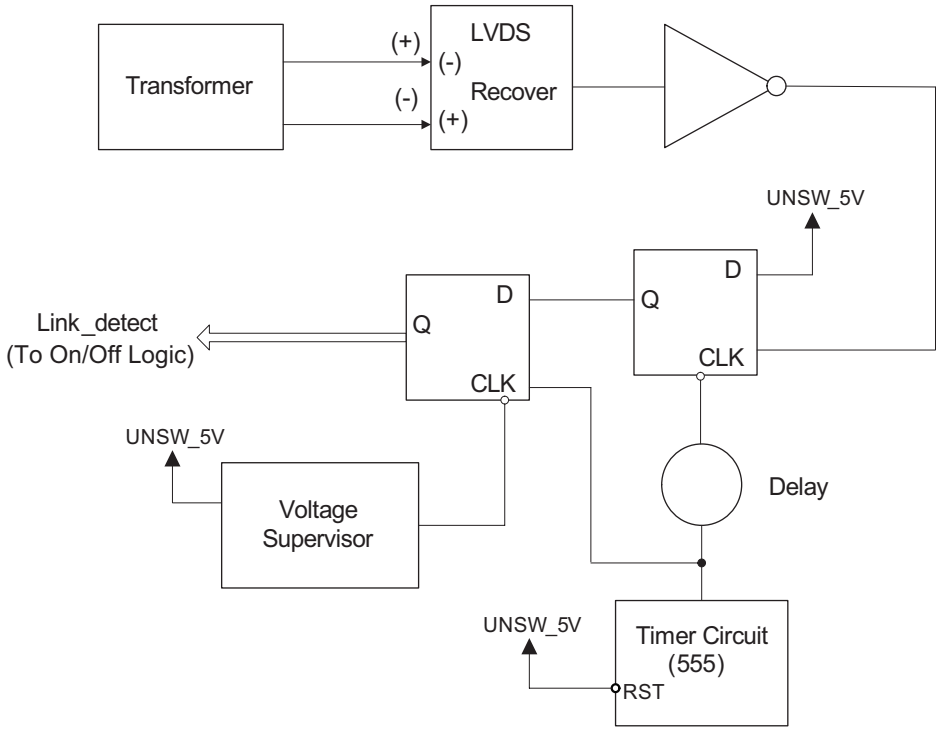


Figure 3-19. Link Detect Circuitry

3.7.4.5 Logic Filter Circuit

During the time between the first stimulus to turn the HPD 1000 ON, to when STO gets de-asserted, the ON/OFF logic state can vary substantially due to cranking, Electro Static Discharge (ESD), Radio Frequency Interference (RFI), and improper USB/Ethernet Cable attachments. During this time, which can be anywhere from 4 to 6 seconds, the regulators can toggle ON and OFF in response to these effects, creating undesirable and undermined voltage states through out the electronics of the modem. To avoid this, the output of the ON/OFF logic gets filtered for transients using a timer circuit that will filter only for the first 6+ seconds.

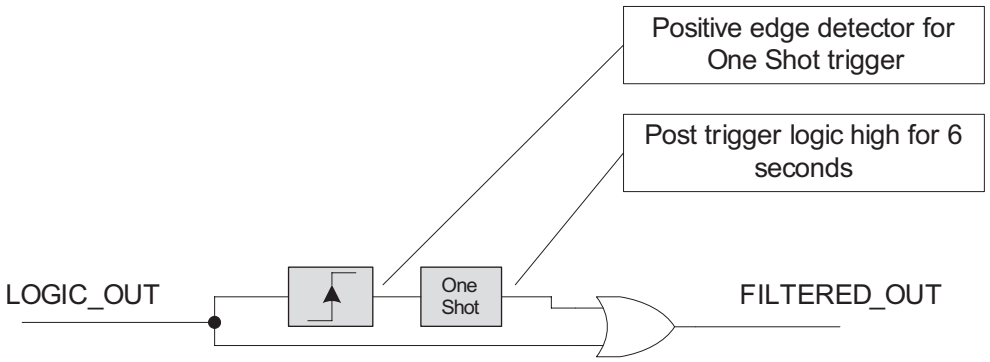


Figure 3-20. Logic Filter Circuit

3.7.5 Controller DC Power Distribution

Figure 3-21 below illustrates the controller DC power distribution circuitry.

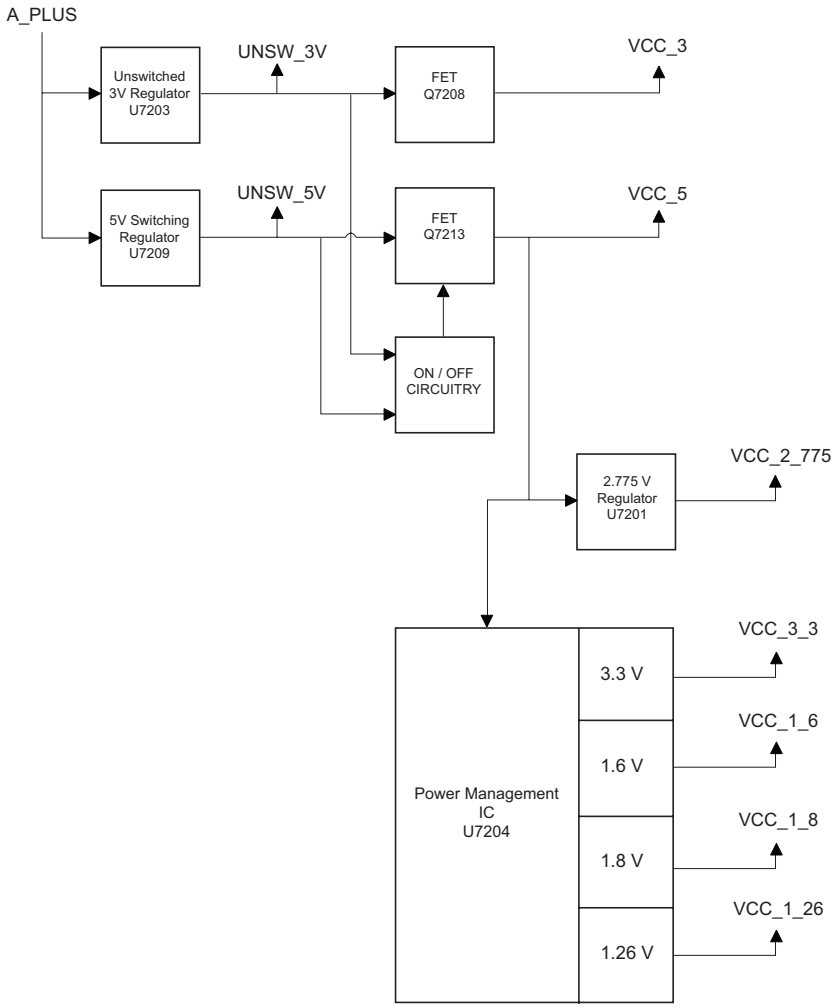


Figure 3-21. Controller DC Power Distribution Block Diagram

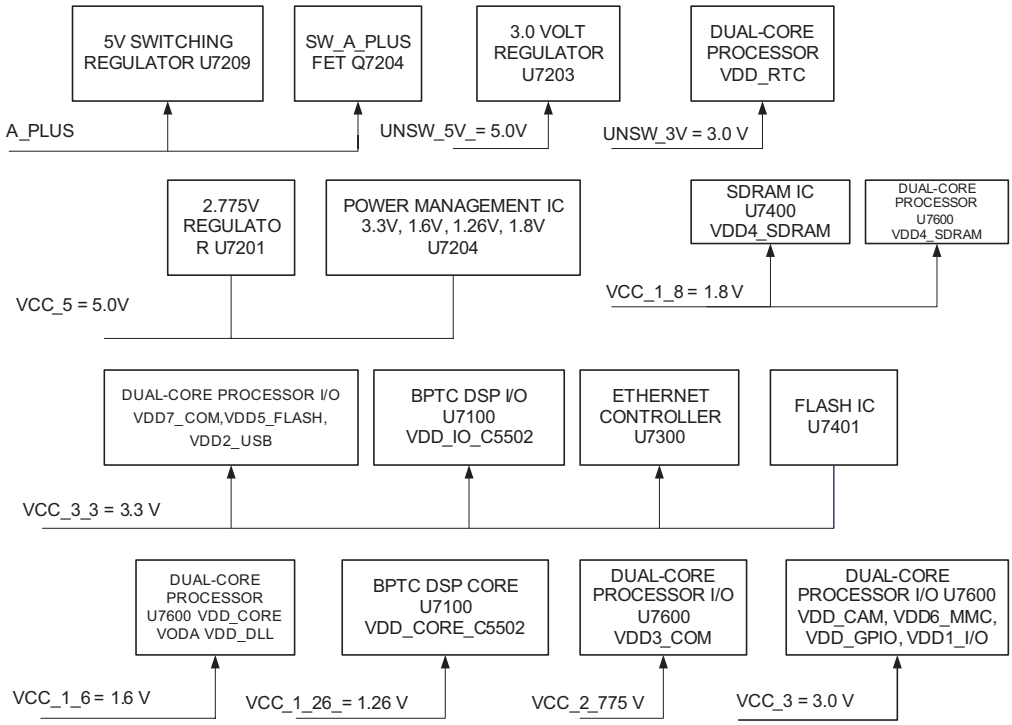


Figure 3-22. Voltage Routing for Controller Section

The A_PLUS power for the modem is derived from a 12 V battery, which is applied to the transmitter board through connector P3102. This A_PLUS voltage is routed to the transceiver board through connector P1001, pin 21 and is then routed to the controller section.

SW_A_PLUS is supplied through a FET switch (Q7204). This voltage is enabled when the switched 5.0 V (VCC_5) is present. SW_A_PLUS is routed externally to pin 24 on the 26-Pin Accessory Connector.

When A_PLUS is initially applied the 5.0 V regulator (U7209) powers up. The output of this regulator is fed into a power FET switch (Q7215) which does not pass the voltage until the output of the 5.0 V regulator has stabilized. Once the output has stabilized the power FET switch is enabled and UNSW_5V is applied to the controller circuitry.

The UNSW_5V voltage is used as an input to the 3.0 V regulator (U7203) which generates UNSW_3V. Both of these voltages are used to power the on/off circuitry and the dual-core processor real time clock.

The power FET switch (Q7213) applies a switched version of 5.0 V (VCC_5V) based on the status of the on/off circuit. The VCC_5V supplies the following regulators:

- U7204 (power management IC, 3.3 V, 1.6 V, 1.26 V and 1.8 V) which generates voltages for the BPTC DSP and dual-core processor core and I/O, the SDRAM and Ethernet controller.
- U7201 (2.775 V) which generates voltages for the dual-core processor I/O used to interface the receiver backend IC (U6000) and baseband modulation IC (U400).

The VCC_5V is also routed to the user interface panel on pins A19 and B19, where it is used as the main voltage for the user interface panel's voltage regulators.

Two other FET switches (Q7201 and Q7208) pass VCC_3 (switched 3 V) and VCC_3_3 (switched 3.3 V). These FETs are enabled by 1.8 V and pass the above voltages once the 1.8 V supply is active and are used to ensure that the supply sequencing specifications for both the dual-core processor and the BPTC DSP are satisfied.

The various voltages used by the ICs in the controller section are shown in the table below:

Integrated Circuit	VCC_1_26	VCC_1_6	VCC_1_8	VCC_2_775	UNSW_3V	VCC_3	UNSW_3_3	VCC_3_3	UNSW_5V	VCC_5	A+
Dual-Core Processor (U7600)		✓	✓	✓	✓	✓		✓			
Flash (U7401)								✓			
SDRAM (U7400)			✓								
Ethernet Controller (U7300)								✓			
Power Management IC (U7204)										✓	
BPTC DSP (U7100)	✓							✓			
RS232 Transceiver (U7501)										✓	
20 MHz Oscillator (Y7100,Y7300)								✓			
32 kHz Oscillator (U7601)					✓						
I/O expansion (U7602-04)						✓		✓			
Low Battery Detect Circuit (U7208)									✓		✓
5V Regulator (U7209)											✓

Figure 3-23. Controller Section Voltages

3.7.6 Dual-Core Processor

The main integrated circuit of the controller section is the dual-core processor (U7600). This integrated circuit has a microcontroller unit (MCU) ARM-based core and a digital signal processor (DSP) core in a single package. Each core is capable of running at 192 MHz internal clock. The dual-core processor has many peripherals that are either shared by each core or are programmed to be controlled by one of the cores.

3.7.6.1 Supply Voltages and Reset

The dual-core processor is supplied with several voltages: VCC_1_6 supply voltage for the core voltage supply and VCC_1_8, VCC_2_775, VCC_3, and VCC_3_3 for the various input/output (I/O) peripheral voltage supplies of the dual-core processor. The dual-core processor has two active-low logic reset pins, and these pins are connected and controlled by the power management IC (U7204).

3.7.6.2 Clocks

There are three clocks that are supplied to the dual-core processor. The circuit block that is made up of crystal Y7600, an un-buffered logic inverter U7601, a Schmitt inverter U7610, and several other discrete capacitors and resistors generates a square wave 32.768 kHz clock. The output of this circuit block is connected to the dual-core processor and is also routed to the User Interface Panel board as a reference clock for the GPS circuitry. Crystal Y7602 is connected to the dual-core processor's internal oscillator to produce a 12 MHz internal clock reference. The third clock supplied to the dual-core processor is a 16.8 MHz square wave clock signal.

3.7.6.3 Memory Interfaces

The dual-core processor has two separate memory interfaces – one for the SDRAM IC (U7400) and another for the flash memory (U7401) and other memory mapped devices. The SDRAM interface contains 14 address lines, 16 data lines, and several control lines including the SDRAM clock line, row and column address strobe lines among others. This peripheral is supplied with VCC_1_8.

The other memory interface is made up of 25 address lines, 16 data lines, 5 chip select lines, and several control lines including the read and write lines. This memory interface is supplied by VCC_3_3. The flash memory IC, the Ethernet controller (U7300), the BPTC DSP (U7100), and the GPIO expansion circuits are the four memory mapped circuits that are connected to the dual-core processor through this memory interface (refer to Figure 3-24 for a block diagram of this memory interface).

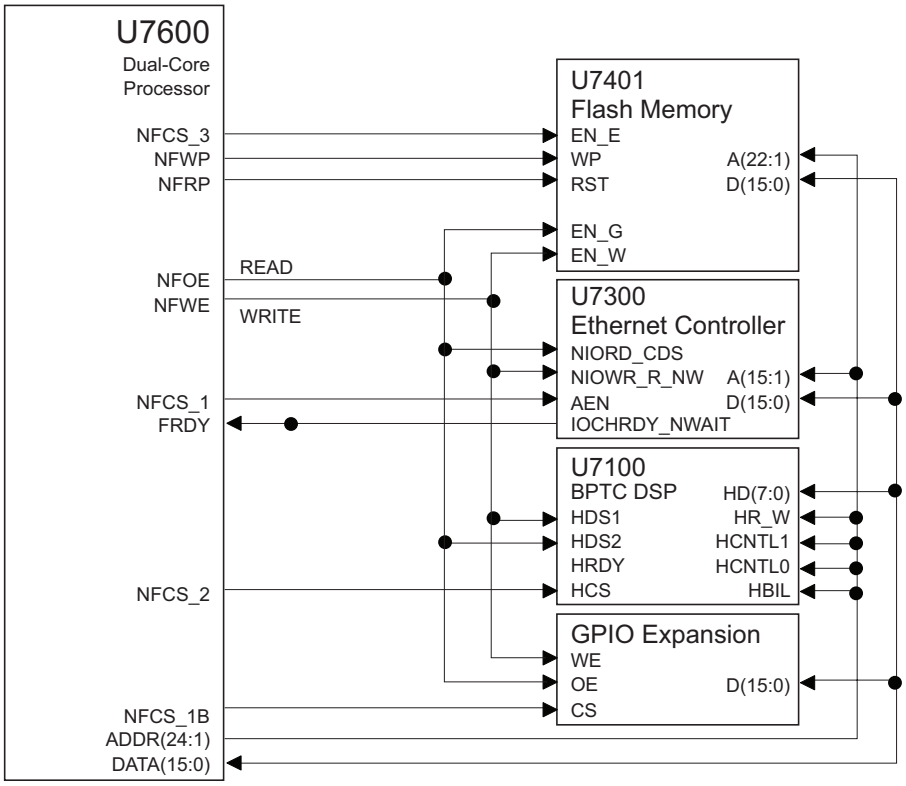


Figure 3-24. Dual-core Processor Shared Memory Interface

3.7.6.4 GPIO Expansion

The GPIO expansion circuitry is made up of octal latches U7603 and U7604, a logic OR-gate U7606, a logic-NOR gate U7605, a logic inverter gate U7608, and a D-type latch (U7609). This circuitry uses some of the memory interface control lines to configure the memory data lines to act as 8 general purpose inputs and 8 general purpose outputs. Figure 3-25 shows the block diagram for this circuitry. The reset for this circuit block is controlled by the Power On Reset (POR) I/O, which is an active-low reset that comes from the power management IC (U7204).

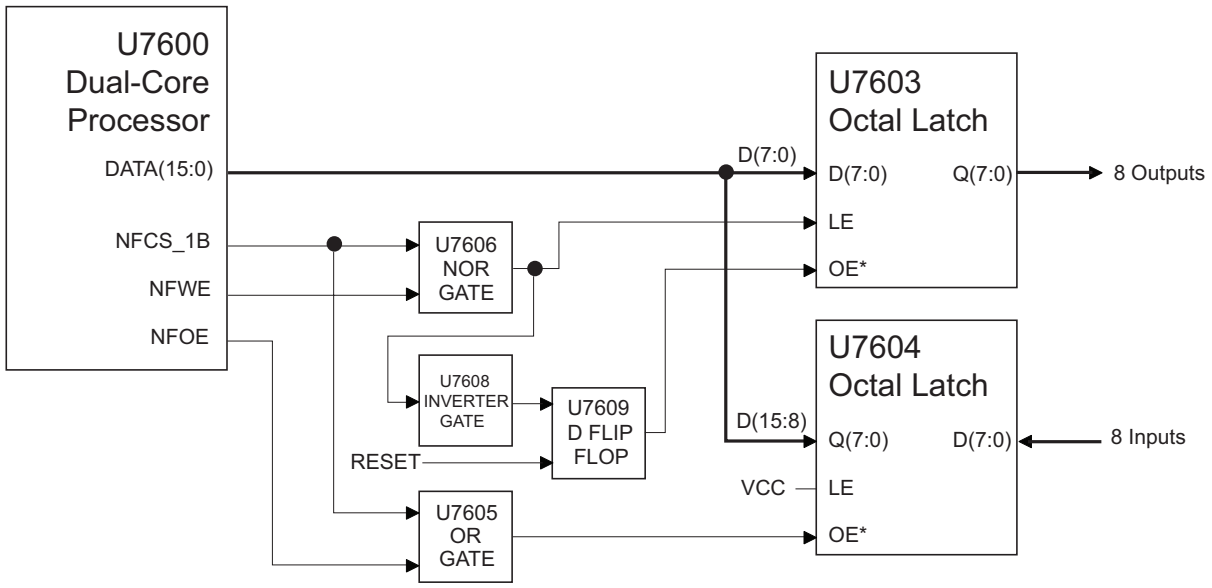


Figure 3-25. GPIO Expansion Circuitry

3.7.6.5 Dual-core Processor Peripherals – SPI and SSI

Several of the peripherals on the dual-core processor are controlled by the ARM core, including 2 universal asynchronous receiver/transmitters (UART), a USB transceiver, a 1-Wire peripheral, and the ARM-only general purpose input/output (ARMIO) peripheral. The DSP core controls the baseband serial synchronous interface (SSI) peripheral and the serial peripheral interface (SPI) pins. Both cores share the memory interface traffic controller and the general purpose input/output (GPIO) peripheral.

The SPI bus is the peripheral used by the dual-core processor to program several ICs in the transceiver section of the board. This bus consists of a clock line (SPI_CLK), a data line out from the dual-core processor (SPI_DATA_TX) also known as the MOSI (master-out slave-in) line, a data line into the dual-core processor (SPI_DATA_RX) also known as the MISO (master-in slave-out) line, and a chip select line for each device. A 3:8 decoder (U7602) is used to generate the SPI chip selects for the various ICs, and the inputs to the 3:8 decoder (U7602) are GPIO lines from the dual-core processor. Figure 3-26 shows a block diagram for the SPI bus connections.

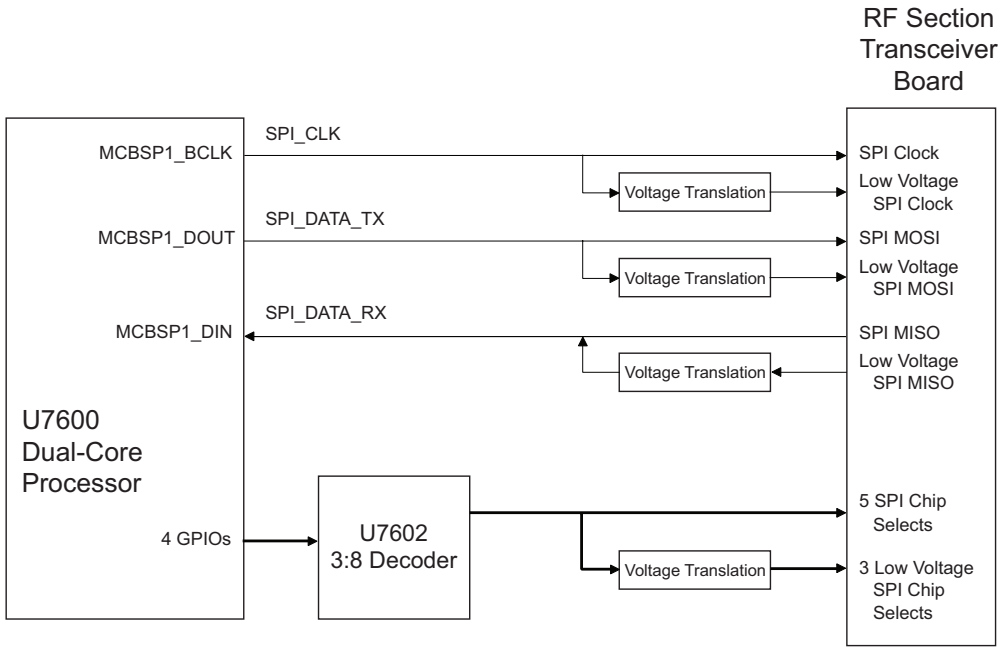


Figure 3-26. SPI Bus Connections

The SSI bus is the peripheral used by the dual-core processor to transfer data to the transmitter front-end section and transfer data from the receiver back-end section. This bus consist of a clock signal, a frame synchronization signal, and a data line for both the transmit and receive paths for a total of six lines. The transmit SSI clock and frame synchronization (sync) signals are provided to the dual-core processor from the baseband modulation IC (U400) of the transmitter front end section. Similarly, the receive SSI clock and frame sync signals are provided to the dual-core processor from the receiver backend IC (U6000). This bus operates from the VCC_2_775 supply. In order to meet timing specifications, a dual buffer (U7705) was used on the receive SSI clock and frame sync lines. Figure 3-27 shows a block diagram for the SSI connections.

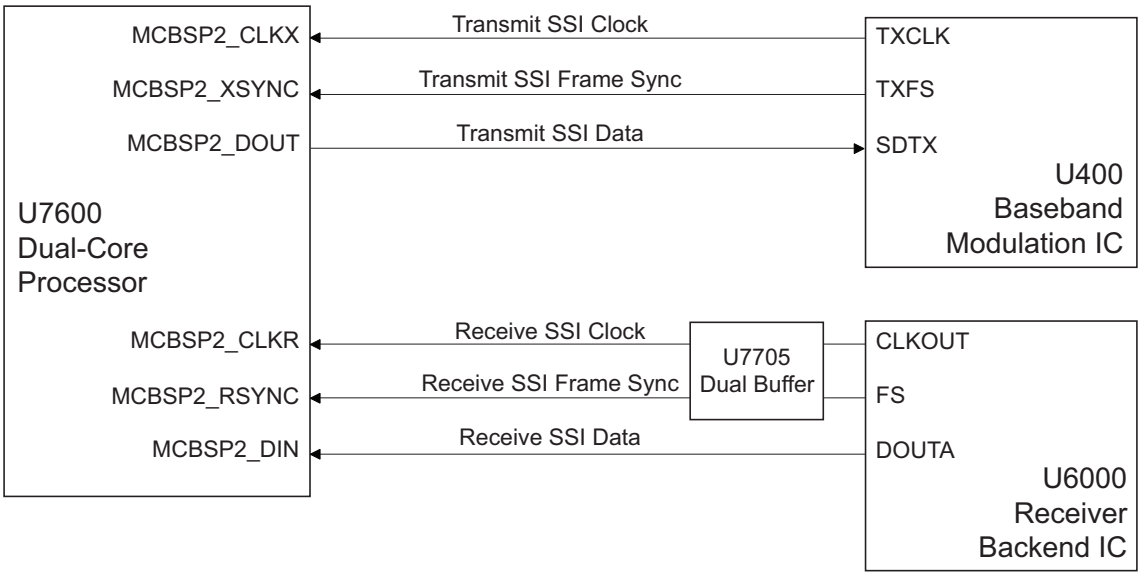


Figure 3-27. SSI Bus Connections

3.7.7 Memory Devices –SDRAM IC and Flash Memory IC

The dual-core processor has 2 separate memory interfaces with one being dedicated to the SDRAM and another that is connected to the flash and other memory mapped devices.

3.7.7.1 SDRAM IC

The SDRAM (synchronous dynamic random access memory) IC (U7400) is a volatile, synchronous 16 Mbyte memory device that is used as the dual-core processors main external working memory device during operation of the HPD 1000 modem. It is supplied from VCC_1_8. This part uses 12 address lines, 16 data lines, and 9 control lines including a clock line, row address and column address strobes and 2 bank select lines. During operation, the clock provided to the SDRAM from the dual-core processor could be as fast as 96 MHz. Series resistor R7600 is used on the clock line to limit reflections, overshoot and ringing on this high-speed line.

3.7.7.2 Flash Memory IC

The Flash memory IC (U7401) is an asynchronous 8 Mbyte NOR-flash memory device that is used as the non-volatile storage for the modem firmware, tuning data and codeplug information. It is operates from the VCC_3_3 supply. This part uses 22 address lines, 16 data lines, and 5 control lines including chip select, read enable, write enable, write protection, and reset. This memory device is on the shared memory interface of the dual-core processor unlike the SDRAM IC which has a dedicated interface to the dual-core processor. Upon power up and after the dual-core processor is released from reset, the dual-core processor releases the flash memory reset line and begins to read the code from the flash memory and copies pertinent parts of the code from the flash memory into the SDRAM IC.

3.7.8 Block Product Turbo Coding Digital Signal Processor (DSP)

The stand-alone DSP (U7100) is a high performance DSP capable of running at a 300 MHz internal clock rate. The DSP is used to run the Block Product Turbo Coding (BPTC) algorithm. This algorithm is used to encode forward error correction (FEC) code to the data in transmit mode and to decode the FEC code of the data in receive mode. Since the FEC decoding of the receive data involves intensive processing, this algorithm is processed on this DSP instead of the DSP-core of the dual-core processor (U7600).

3.7.8.1 Supply Voltages, Reset, & Clock

Voltage supply VDD_CORE_C5502 (VCC_1_26) is provided to the DSP for its core voltage while its I/O voltage operates from the VDD_IO_C5502 (VCC_3_3) supply. The active-low reset into this DSP is controlled by a GPIO from the dual-core processor (U7600). The DSP uses a square wave 20 MHz clock as its base clock, and this clock is provided by an off-chip 20 MHz oscillator (Y7100).

3.7.8.2 Interface to Dual-Core Processor

The BPTC DSP is connected to the dual-core processor as a memory mapped device. The DSP uses four address lines as control lines, 8 data lines as multiplexed address and data signals, and four control lines including a chip select line, read and write lines, and the bus ready line. There is also an interrupt line from the DSP to the dual-core processor, and there is another interrupt line from the dual-core processor to the BPTC DSP. Refer to Figure 3-28 for a connection block diagram.

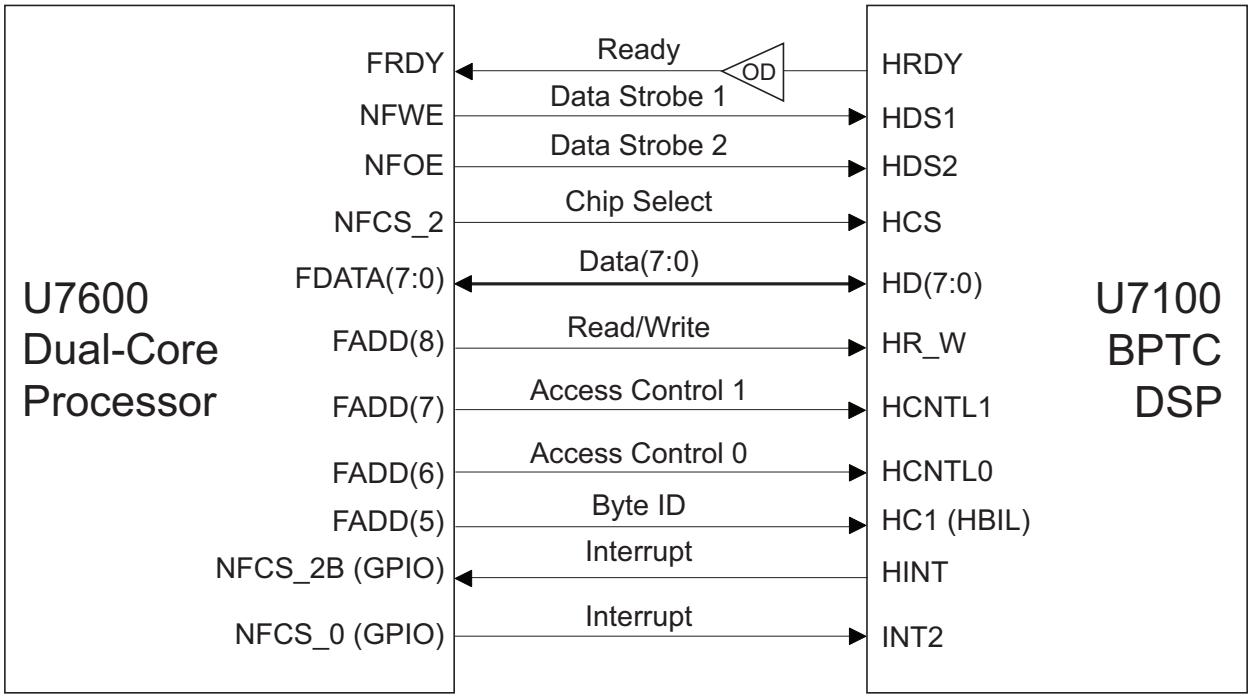


Figure 3-28. Dual-core Processor – BPTC DSP Interface

3.7.9 RF Interface

3.7.9.1 16.8 MHz amplifier

The main reference clock of the RF circuitry is a 16.8 MHz reference sine wave clock. For synchronization purposes, this 16.8 MHz reference is needed by the dual-core processor (U7600) but the dual-core processor requires a square wave reference. A clock amplifier circuit was implemented using an operation amplifier (U7703) and several discrete resistors, capacitors and inductors, and the output of this circuit yields a square wave 16.8 MHz reference between 0 V and the VCC_3 supply.

3.7.9.2 Receive SSI Clock and Frame Sync Buffer

The Receiver Back-end IC (U6000) provides the clock and frame sync signals for the receive SSI bus of the dual-core processor. In order to meet the timing specifications of the dual-core processor, a dual buffer U7705 was used on these lines. At the output of the buffers, series resistors R7753 (for the clock line) and R7754 (for the frame sync line) are used to minimize overshoot and ringing on these lines going to the dual-core processor.

3.7.9.3 SPI Clock and Data Line Voltage Translators

The dual-core processor is supplied with VCC_3 for this peripheral; however, some of the peripherals on the SPI bus operate from the VCC_2_775 supply, so there are voltage translation buffers on the SPI lines for those devices. For the SPI clock line, buffer U7704 is used to translate and provide a lower voltage clock to the lower voltage SPI devices. Buffer U7701 is used in the same manner for the SPI transmit data or MOSI line. On the SPI receive data line or MISO line, resistors R7706 and R7707 form a voltage divider network to prevent the higher voltages from reaching the lower voltage SPI devices.

Notes

Chapter 4 Troubleshooting Procedures

4.1 Introduction

This section will aid you in troubleshooting a malfunctioning HPD 1000 modem. It is intended to be detailed enough to localize the malfunctioning circuit and isolate the defective component.

Caution

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

4.2 Handling Precautions

Complementary metal-oxide semiconductor (CMOS) devices and other high-technology devices, are used in the HPD 1000 modem. While the attributes of these devices are many, their characteristics make them susceptible to damage by electrostatic discharge (ESD) or high-voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair. Handling precautions are mandatory for this modem, and are especially important in low-humidity conditions. DO NOT attempt to disassemble the modem without observing the following handling precautions.

1. Eliminate static generators (plastics, polystyrene, etc.) in the work area.
2. Remove nylon or double-knit polyester jackets, roll up long sleeves, and remove or tie back loose hanging neckties.
3. Store and transport all static-sensitive devices in ESD-protective containers.
4. Disconnect all power from the unit before ESD-sensitive components are removed or inserted unless otherwise noted.
5. Use a static-safeguarded workstation, which can be accomplished through the use of an anti-static kit (Motorola part number 01-80386A82). This kit includes a wrist strap, two ground cords, a static-control table mat and a static-control floor mat.
6. Always wear a conductive wrist strap when servicing this equipment. The Motorola part number for a replacement wrist strap that connects to the table mat is 42-80385A59.

4.2.1 Parts Replacement and Substitution

Special care should be taken to ensure that a suspected component is actually the one at fault. This special care will eliminate unnecessary unsoldering and removal of parts, which could damage or weaken other components or the printed circuit board (PCB) itself.

When damaged parts are replaced, identical parts should be used. If the identical replacement component is not locally available, check the parts list for the proper Motorola part number and order the component from the nearest Motorola Communications Parts facility.

4.2.2 Rigid Circuit Boards

The HPD 1000 modem uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, special considerations are required when soldering and unsoldering components. The printed-through holes might interconnect multiple layers of the printed circuit. Therefore, care should be exercised to avoid pulling the plated circuit out of the hole.

When soldering near module socket pins, be careful to avoid accidentally getting solder in the socket. Also, be careful not to form solder bridges between module socket pins. Closely examine your work for shorts caused by solder bridges. When removing modules with metal enclosures, be sure to unsolder the enclosure ground tabs as well as the module parts.

4.2.3 Heat-Related Precautions

During all repair procedures, heating neighboring components can be minimized by:

- Using upper heat only
- Using the correct size of heat-focus head, which should be approximately the same size as the carrier being replaced
- Keeping the heat-focus head approximately 1/8 inch (3-6 mm) above the printed circuit board when removing or replacing the device

Caution

Moisture-sensitive devices (MSD) are subject to die-bond (or other interface) delamination if heated above 185°C. To ensure that delamination does not occur, the PCB should be baked for eight hours at 125°C prior to repair if an adjacent MSD could potentially be exposed to 185°C or greater temperature during repair. Use 0.250 in. as the determining distance between the component being repaired and the MSD.

4.3 Voltage Measurement and Signal Tracing

In most situations, the problem circuit may be identified using a DC voltmeter, RF millivoltmeter, and oscilloscope (preferably with 100 MHz bandwidth or more). The “Recommended Test Equipment, Service Aids, and Tools” section in the *HPD 1000 Modem Basic Service Manual (6816254H01)* outlines the recommended tools and service aids which would be useful. Of special note are:

- RLN1561 Chassis Eliminator which allows access to probing the boards
- IFR3900 enables Receiver and Transmitter Electrical Lineup Testing

In some cases DC voltages at probe points are shown in red on the schematics. In other areas diagrams are included to show time-varying signals, which should be present under the indicated circumstances. It is recommended that a thorough check be made prior to replacement of any IC or part. If the probe point does not have a signal reasonably close to the indicated one, a check of the surrounding components should be made prior to replacing any parts.

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

4.4 Operational Error Codes

During modem operation, the modem performs dynamic tests to determine if the modem is working properly. Problems detected during these tests are presented as error codes on the modem’s display. The presence of an error code should prompt a user that a problem exists and that a service technician should be contacted. Table 4-1 will aid in understanding particular operational error codes.

Table 4-1. Operational Error Codes

Error Code	Description	Error Type	Corrective Action
LED 1-4 Red	Self-test Failure	FATAL	
LED 1 red	Insufficient Voltage	FATAL	Ensure input voltage is higher than 10 V
LED 4 Red	GPS Error/Failure	NON-FATAL	
LED 2-3 Red	Out of Range	NON-FATAL	Check antenna connections and system settings using CPS

4.5 HPD 1000 Transceiver Board Troubleshooting

This information will help you troubleshoot the RF section of the 700-800 MHz band. Use this information, along with the theory and operation and troubleshooting charts, to diagnose and isolate the causes of the failures.

Prior to troubleshooting, it is important to review the theory of operation, including specific precautions and troubleshooting methods. Because much of the modem’s circuitry operates at high frequencies, measurements must be taken carefully. **Notes** and **CAUTION** are added to the text to alert you to this need in areas of greatest sensitivity. However, the need for extreme care does exist in all measurements and test.

4.5.1 Main FGU Synthesizer (U6751) Unlocked

The following information will help to trouble shoot the frequency generation unit, containing U6751, to the component level. Perform the following checks to determine the mode of the failure:

1. Determine if the "out-of-lock" condition occurs in either receive mode, transmit mode, or both. Also, check other frequencies programmed in the unit if available.
2. To determine if the "out-of-lock" is frequency or VCO dependant, place the unit into RF Tune Mode, as described in the *HPD 1000 Modem Basic Service Manual (6816254H01)* and step through each transmitter test channel for Transmitter Deviation Tune. To check the receiver VCO functionality use the receiver BER test and determine if operational when frequencies listed in Table 4-3 are tested.
   In addition, Table 4-2 indicates the frequency and Aux logic level of U6751 for each APCO transmitter test mode channel. Table 4-3 provides suggested frequencies and associated Aux logic level of U6751 for receiver test mode channels. Table 4-4 provides information about the frequency of operation for each VCO.

3. Continue troubleshooting by using the FGU troubleshooting charts in Chapter 5.

Table 4-2. APCO Transmitter Tune Mode Channels (700-800 MHz)

Tune Mode	LV Frac-N TX Logic	TX Oscillator	Aux 4 Tx Enable VDC	TX Freq. (MHz)
CHAN 1	AUX 2	U6754 osc1	3.0	762.0125
CHAN 2	AUX 2	U6754 osc1	3.0	770.0125
CHAN 3	AUX 2	U6754 osc1	3.0	775.9875
CHAN 4	AUX 2	U6754 osc1	3.0	794.0125
CHAN 5	AUX 2	U6754 osc1	3.0	805.9875
CHAN 6	AUX 1	U6754 osc2	3.0	806.0125
CHAN 7	AUX 1	U6754 osc2	3.0	815.0125
CHAN 8	AUX 1	U6754 osc2	3.0	824.9875
CHAN 9	AUX 1	U6754 osc2	3.0	851.0125
CHAN 10	AUX 1	U6754 osc2	3.0	860.0125
CHAN 11	AUX 1	U6754 osc2	3.0	869.9875

Table 4-3. APCO Receiver Tune Mode Channels (700-800 MHz)

Tune Mode	LV Frac-N RX Logic	RX Oscillator	RX Freq. (MHz)	LO Freq. (MHz)
CHAN	AUX 1	U6754 osc1	762.0625	835.4125
CHAN	AUX 1	U6754 osc1	775.9375	849.2875
CHAN	AUX 2	U6754 osc2	851.0625	777.7125
CHAN	AUX 2	U6754 osc2	869.9375	796.5875

Table 4-4. APCO Receiver Tune Mode Channels (700-800 MHz)

Mode	Radio Freq. (MHZ)	VCO Freq. Formula	VCO Freq. (MHz)	AUX1	AUX2	AUX3	AUX4
RX	762-776	F(U6754 osc2) = Fc + 73.35 MHz	835.35-849.35	HIgh	Low	NA	Low
RX	851-870	F(U6754 osc1) = Fc + 73.35 MHz	777.65-796.65	Low	HIgh	NA	Low
TX(TA) APCO	762-776	F(U6754 osc1) = Fc	762-776	Low	HIgh	NA	HIgh
TX(RPTR) APCO	792-806	F(U6754 osc1) = Fc	794-806	Low	HIgh	NA	HIgh
TX(RPTR) APCO	806-825	F(U6754 osc2) = Fc	806-825	HIgh	Low	NA	HIgh
TX(TA) APCO	851-870	F(U6754 osc2) = Fc	851-870	HIgh	Low	NA	HIgh

4.5.2 FGU Troubleshooting Aids

The following illustrations are additional service aids for troubleshooting the frequency generation unit.

- Figure 4-1 on page 4-6 is a block diagram of the DC distribution for the frequency generation unit.
- Figure 4-2 on page 4-7 is a location diagram of the frequency generation unit.
- Table 4-5 on page 4-7 describes the function of pins on the LV Frac-N IC U6751.
- Figure 4-3 on page 4-9 is a waveform representation during programming of the LV Frac-N IC U6751.

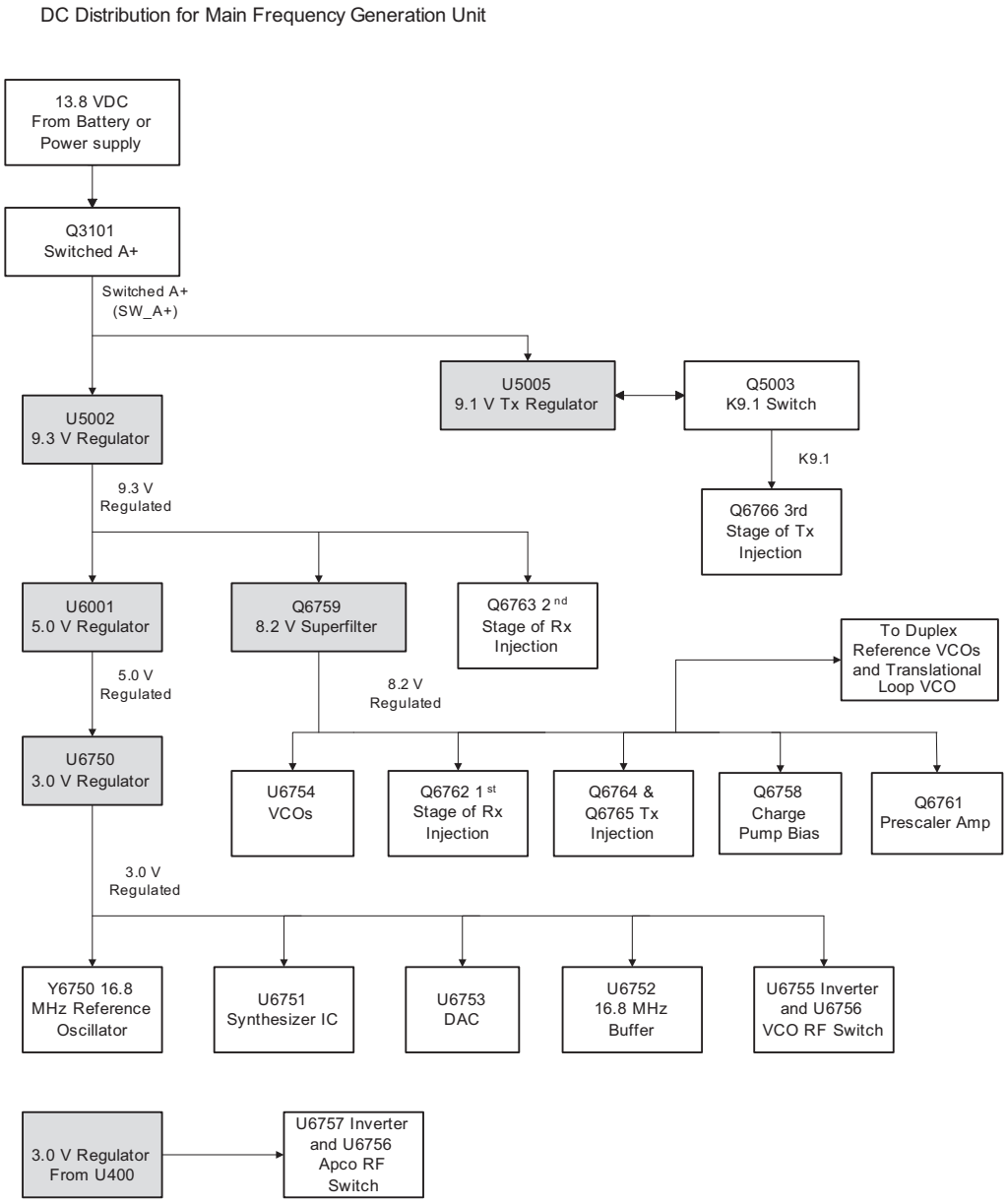


Figure 4-1. Frequency Generation Unit DC Power Supply Distribution (700–800 MHz)

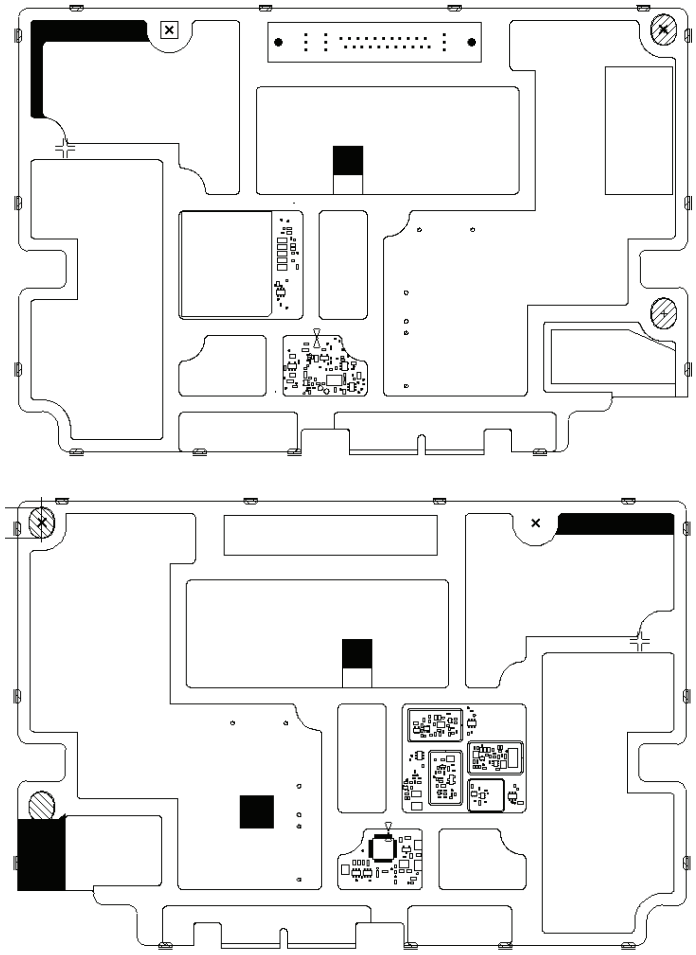


Figure 4-2. Frequency Generation Unit Location Diagram (700–800 MHz)

Table 4-5. LV Frac-N U6751 Pin Descriptions (700–800 MHz)

Pin No.	Pin Name	Description
1	AUX2	Auxiliary logic output, high selects U6754 OSC1
2	AUX3	Not used
3	AUX4	Auxiliary logic output, activates last stage of TX injection string
4	LOCK	Lock detect–logic high indicates in-lock condition
5	PD_VDD	3.0 V supply (phase detector)
6	GROUND	Ground (digital)
7	DATA	SPI data I/O
8	CLK	SPI clock
9	CEX	SPI enable line—active low
10	MODIN	Modulation Mod Amp
11	VMULT4	Multiplier clock output

Table 4-5. LV Frac-N U6751 Pin Descriptions (700–800 MHz) (Continued)

Pin No.	Pin Name	Description
12	VMULT3	Multiplier clock output
13	VRO	3.0 V supply for reference oscillator warp circuitry
14	VMULT2	Not used
15	VMULT1	Not used
16	INDMULT	Not used
17	—	No connection
18	REFSEL	Not used
19	FREFOUT	Not used
20	AVDD	3.0 V supply (analog)
21	VBPASS	Not used
22	GND	Ground (analog)
23	XTAL1	16.8 MHz reference oscillator input
24	XTAL2	Not used
25	WARP	Not used
26	SFCAP	Superfilter bypass node
27	SFBASE	Superfilter control node for Q6759
28	SFOUT	Superfilter output
29	—	No connection
30	SFIN	Superfilter supply input
31	—	No connection
32	PREIN	Prescalar input
33	GROUND	Ground (prescalar)
34	PRE_VDD	3.0 V supply
35	PVREF	Not used
36	DVDD	3.0 V supply (digital)
37	TEST1	Not used
38	TEST2	Not used
39	CPB2	Phase detector bias input
40	CPB1	Phase detector bias input
41	MODOUT	Modulation output
42	CCOMP	Not used
43	IOUT	Phase detector normal mode output
44	GND	Ground (phase detector)
45	IADAPT	Phase detector adapt mode output
46	ADAPTSW	Phase detector adapt switch
47	VCP	High-voltage supply for phase detector
48	AUX1	Auxiliary logic output, high selects U6754 OSC2

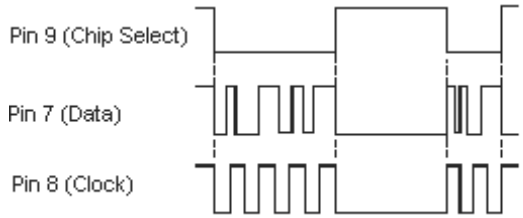


Figure 4-3. Waveform Representation During Programming of the LV Frac-N IC (U6751)

NOTE: The above waveforms are representations only.

4.5.3 No or Low Output Power (TX or RX Injection)

In addition to the schematic and theory of operation, refer to the transmitter injection troubleshooting flowchart and the receiver injection troubleshooting flowchart in "Chapter 5. Troubleshooting Charts". The charts will guide you through a sequence of tests and checks designed to isolate problems in the Transmitter or receiver injection strings.

4.5.4 No or Low APCO Modulation

In addition to the schematic and theory of operation, refer to the transmitter TX troubleshooting flowchart in "Chapter 5. Troubleshooting Charts". The chart will guide you through a sequence of tests and checks designed to isolate problems in the Transmitter section of the FGU.

4.5.5 700–800 MHz Band

Use this information, along with the theory of operation, to diagnose and isolate the cause of failures. The principle tools needed to troubleshoot a circuit to the component level are the schematic and the theory of operation.

In addition to the schematic and theory, you can use the troubleshooting flowchart in "Chapter 5. Troubleshooting Charts" that guides you through a sequence of tests and checks designed to isolate problems.

Prior to troubleshooting, it is important to review the theory of operation including specific precautions and troubleshooting methods. Measurements must be taken carefully as much of the modem's circuitry operates at 800 MHz.

4.6 Power Amplifier Procedures

This section provides band-specific troubleshooting procedures for the RF power amplifier (RFPA).

4.6.1 700–800 MHz Band

In addition to the schematic ("Chapter 7. Schematics, Component Location Diagrams, and Parts Lists") and theory of operation ("Chapter 3. Theory of Operation"), refer to the RFPA troubleshooting flowcharts in "Chapter 5. Troubleshooting Charts". These flowcharts will guide you through a sequence of tests and checks designed to isolate problems in the RFPA stages.

Use the following information as a guide for troubleshooting the RF power amplifier circuitry:

- Read the theory of operation before troubleshooting.
- To avoid damage to the RFPA, only key the transmitter with the main board installed in the chassis and the internal screws completely installed and secured with the proper torque setting.

- The chassis eliminator, which allows access to both sides of the main board is useful for transmitter troubleshooting. Keying the transmitter for an extended period of time while using the chassis eliminator can cause damage to the modem. Therefore, be sure to cool the modem by forcing air through the chassis eliminator cooling fins.
- To avoid personal injury from high RF voltages and currents, exercise extreme care while troubleshooting the transmitter power amplifier.
- Set the A+ supply to 13.6 V with the current limit set to 15 A.
- Calibrate the power meter regularly using the manufacturer's suggested calibration method.
- If a component is removed for troubleshooting, replace the removed part, regardless of its condition, with a new part.
- To reinstall the main board into the chassis, follow the reassembly instruction in the *HPD 1000 Modem Basic Service Manual (6816254H01)*.
- Apply new thermal pads if the current thermal pad are damaged. Follow the instructions in the *HPD 1000 Modem Basic Service Manual (6816254H01)*.
- Use Motorola-specified parts when component replacement is required.
- When instructed to inspect parts, look for any package damage and/or solder defects.

Chapter 5 Troubleshooting Charts

5.1 Introduction

This chapter contains detailed troubleshooting flowcharts and tables. These 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 chapter prior to troubleshooting a modem.

5.2 List of Troubleshooting Charts

Most troubleshooting flowcharts (see Table 5-1) end by pointing to an IC to replace. Before replacing any IC, it is good practice to verify power supplies and grounds to the affected IC and trace continuity to the malfunctioning signal and related circuitry. For example, if a clock signal is not available at a destination IC, continuity from the source IC should be checked before replacing the source IC.

Table 5-1. List of Troubleshooting Charts

NOTE: The term μC might be used in some of the following troubleshooting charts; μC = MCU or microprocessor.

5.3 Main FGU Troubleshooting Test Points

The following figures show the location of the main transceiver board test points for measuring voltages and viewing waveforms of the Main FGU section.

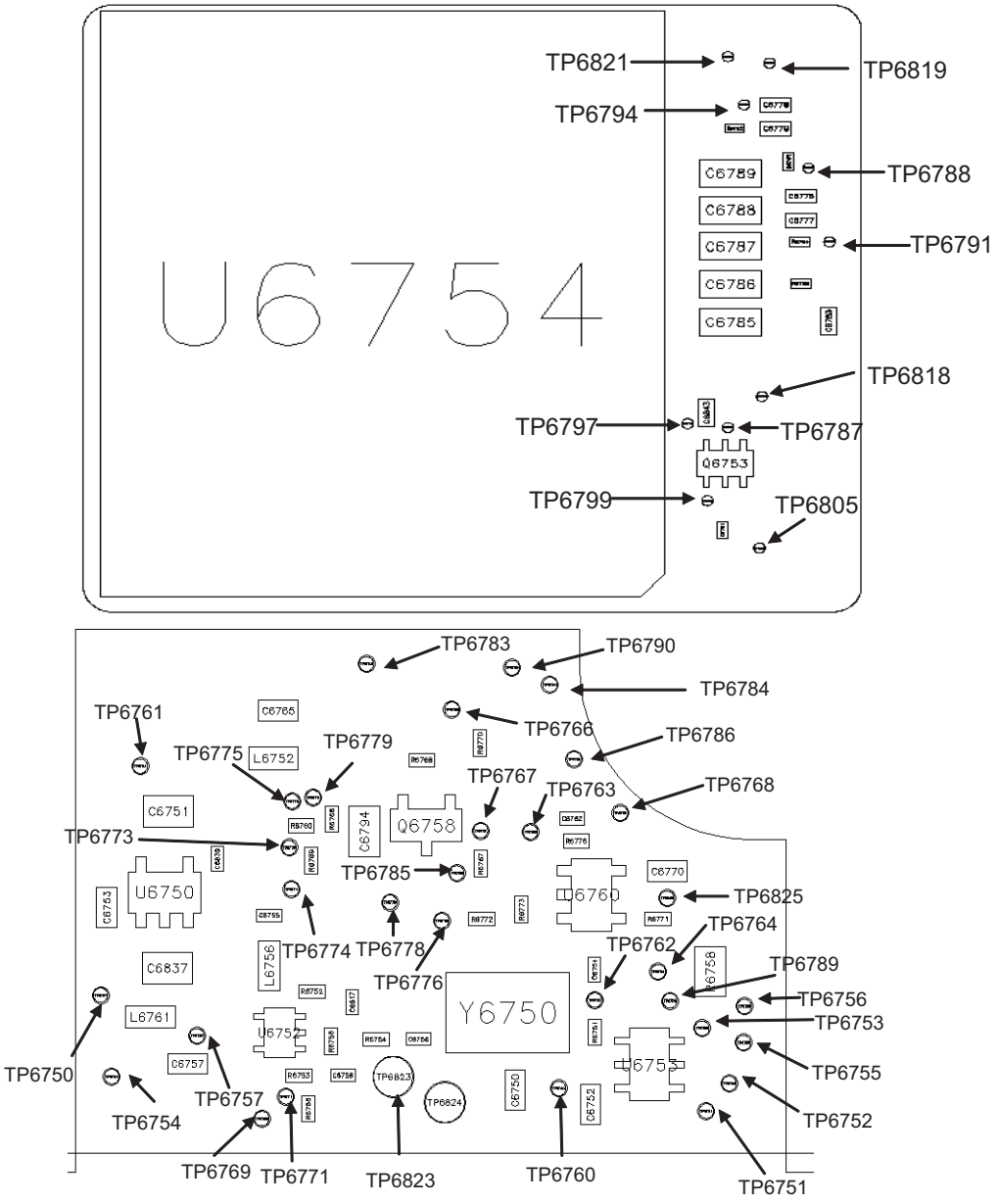


Figure 5-1. Test Points—Top Side

Table 5-2. Typical DC Voltage Measurements

Reference	Description	Measurement VDC Receive Mode	Measurement VDC APCO Transmit Mode
TP6750	5V_Reg	5	5
TP6751	SPI DATA to U6753 (DAC_DAT)	See Note 1	See Note 1
TP6752	SPI Clock to U6753 (DAC_CLK)	See Note 1	See Note 1
TP6753	SPI Chip Select U6753 (DAC_Csb)	See Note 1	See Note 1
TP6754	9.3 V supply	9.01	9.01
TP6755	SPI Clock to U6751(LVFN_CLK) Pin 8	See Note 1	See Note 1
TP6756	SPI Chip Select for U6751(LVFN_Csb)	See Note 1	See Note 1
TP6757	5 VDC Input to U6750	5	5
TP6760	3 VDC Regulator to U6753 and Y6750	2.99	2.99
TP6761	3 VDC U6750 Regulator Output	2.98	2.98
TP6762	Vcont for Y6750	1.37	1.38
TP6763	Modulation Output from U6768 to Pin 10 MODIN of U6751	1.5	1.5
TP6764	Chip enable to U6751 CEX Pin 9	See Note 1	See Note 1
TP6766	Adapt Switch Pin 46 of U6751	See Note 4	See Note 4
TP6767	Charge Pump Bias2 Pin 39 Of U6751	1.55	1.55
TP6768	SPI DATA to U6751 (LVFN_DATA)	See Note 1	See Note 1
TP6769	16.8 MHz to U6000 and U400	0	
TP6771	3 V Supply to U6752	2.99	2.99
TP6773	Superfilter Base of Q6759	8.17	8.17
TP6774	Filtered 16.8 MHz From U6752	1.31	1.31
TP6775	Superfiltered 8.2 V Supply	8.4	8.38

Table 5-2. Typical DC Voltage Measurements

Reference	Description	Measurement VDC Receive Mode	Measurement VDC APCO Transmit Mode
TP6776	3 v supply to U6752 and U6751	2.99	2.99
TP6778	Filtered 3 V Digital supply to U6751, pins 5, 34 and 20	2.99	2.99
TP6779	Prescaler Input to U6751 Pin 32	1.9	1.9
TP6783	Modout Pin 41 Of U6751	0	1.6
TP6784	AUX 4 Pin 3 Of U6751	0	2.93
TP6785	Charge Pump Circuit Q6758	3.14	3.14
TP6786	Lock Pin 4 of U6751	2.98	2.98
TP6787	AUX 1 Pin 48 Of U6751	See Note 2	See Note 2
TP6788	Iout Pin 43 of U6751	Vcontrol	
TP6789	Charge Pump Voltage to Pin 47 of U6751	12.16	12.16
TP6790	AUX 2 Pin 1 Of U6751	See Note 2	See Note 2
TP6791	Adapt Pin 45 of U6751	See Note 3	See Note 3
TP6794	Loop Filter Test point	See Note 3	See Note 3
TP6797	Switched 8.2 V to VCO U6754 Osc1 Pin 2	See Note 2	See Note 2
TP6799	SuperFiltered 8.2 V for Q6753	8.24	8.15
TP6805	SuperFiltered 8.2 V for Q6761	8.4	8.38
TP6818	RF from RX Injection for Prescaler	0	0
TP6819	3.0 Volt Supply for U6757	3	3
TP6821	APCO TX Injection	2.55	2.17
TP6823	Y6750 16.8 MHz output	0	0
TP6824	Ground	0	0
TP6825	Modulation input to Preamp U6760	1.4	1.4

Note 1: Chip Select for U6751 or U6753 is low (0.0 VDC) when either IC is being programmed. See Figure 4-3, on page 4-9 for a representation of waveforms that appear on the Chip Select, Data and Clock Lines.

Note 2: These voltage levels are frequency dependant. See Table 4-2 on page 4-4, Table 4-3 on page 4-4 and Table 4-4 on page 4-5 to determine AUX voltage or logic levels for a particular frequency in APCO transmit or receive mode.

Note 3: The Steering Voltage (Vcontrol) is present on these test points and will vary depending on the frequency being generated from the Voltage Controlled Oscillator module U6754. Typically the lowest frequency of the VCO's (764 or 806 MHz) will have a steering voltage in the range of 1 to 5 VDC whereas the higher frequencies (805 or 870 MHz will have a voltage in the range of 10.0 to 11.0 VDC.

Note 4: After the IC U6751 is programmed the internal adapt timer is activated for a period of 1.9 milliseconds. During this time an adapt voltage of 3.0 VDC is generated.

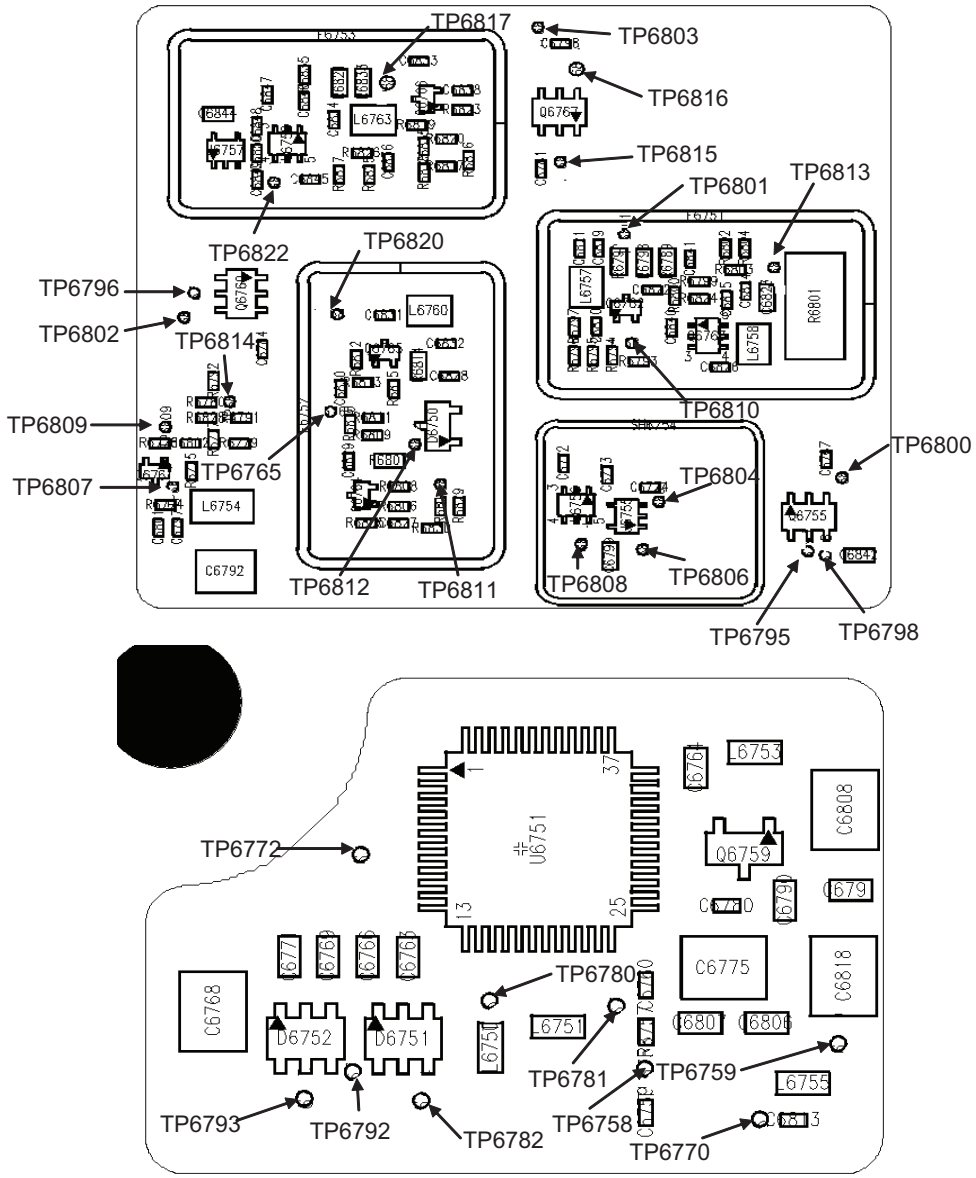


Figure 5-2. Test Points—Bottom Side

Table 5-3. Typical DC Voltage Measurements

Reference	Description	Measurement VDC Receive Mode	Measurement VDC APCO Transmit Mode
TP6758	Same as TP6769, 16.9 MHz to U6000 and U400	0	0
TP6759	Filtered 9.3 V Supply	8.98	8.95
TP6765	TX Injection to Q6765	0	0
TP6770	9.3 V supply to U6751 SFIN Pin 30	8.98	8.95
TP6772	SPI Clock to U6751(LVFN_CLK) Pin 8	*See Note 1	*See Note 1
TP6780	3.0 V supply to pin 13 of U6751	2.98	2.98
TP6781	16.8 Mhz input to U6751 xtal1 Pin 23	2.15	2.15
TP6782	3.0 V supply to pin 5 of D6751	2.98	2.98
TP6792	Charge Pump Supply D6751	3.9	3.9
TP6793	Charge Pump Supply D6752	8.77	8.77
TP6795	AUX 1 to Q6755	*See Note 2	*See Note 2
TP6796	Same as TP6784, AUX 4 Pin 3 of U6751	0	2.92
TP6798	Switched 8.2 V to VCO U6754 Osc2 Pin 17	*See Note 2	*See Note 2
TP6800	SuperFiltered 8.2 V for Q6755	8.24	8.15
TP6801	SuperFiltered 8.2 V for Q6760	8.24	8.15
TP6802	Switched 8.2 VDC to TX Injection String	0	8.04
TP6803	Control Voltage to U6754 CONT_V Pin 8	*See Note 3	*See Note 3
TP6804	AUX 4 Pin 3 Of U6751	0	2.92
TP6806	3 V Supply for U6755	2.99	2.99
TP6807	Collector of Preamp Q6761	6.15	6.1
TP6808	VCO U6754 RF Output to Switch U6756	2.65	2.6

Table 5-3. Typical DC Voltage Measurements

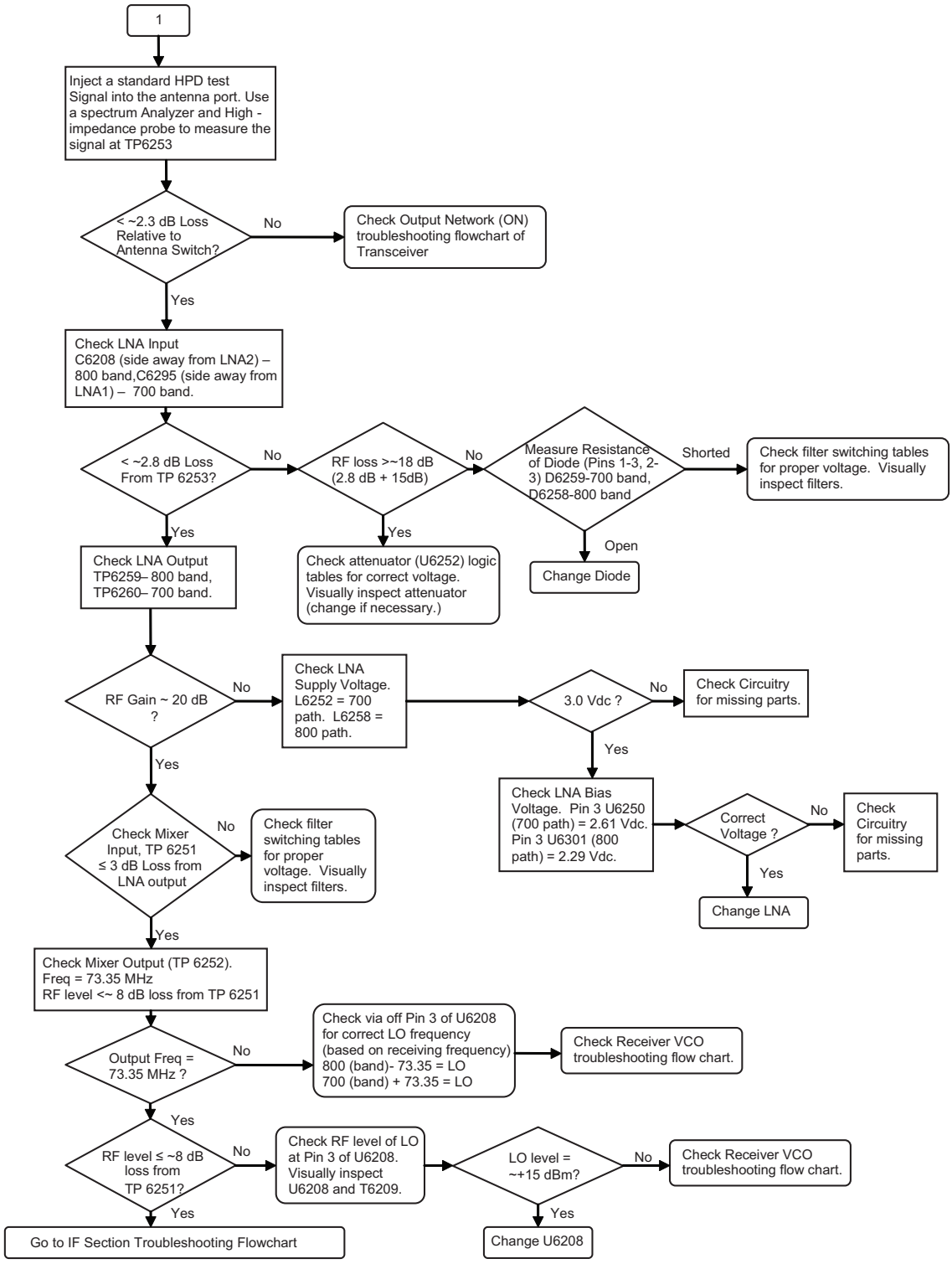
Reference	Description	Measurement VDC Receive Mode	Measurement VDC APCO Transmit Mode
TP6809	Q6761 prescaler amp input	0.75	0.74
TP6810	RF to RX Injection from U6756 and VCO	0	0
TP6811	RF to TX Injection from U6756 and VCO	0	0
TP6812	Switched 8.2 V to TX injection after D6750	0	7.3
TP6813	9.3 V Supply to RX Injection Q6763	8.97	8.95
TP6814	Prescaler Combining Network	0	0
TP6815	Switched K9.1 For TX Injection	0	9.1
TP6816	AUX 1 Pin 48 Of U6751	*See Note 2	*See Note 2
TP6817	Switched 9.1 V for TX Injection Q6757	0	9.04
TP6820	RF from Tx Injection for Prescaler	0	0
TP6822	Logic For Injection Switch U6757 and UU6758	0	0

* Please refer to **Notes** below Table 5-2 on page 5-3.

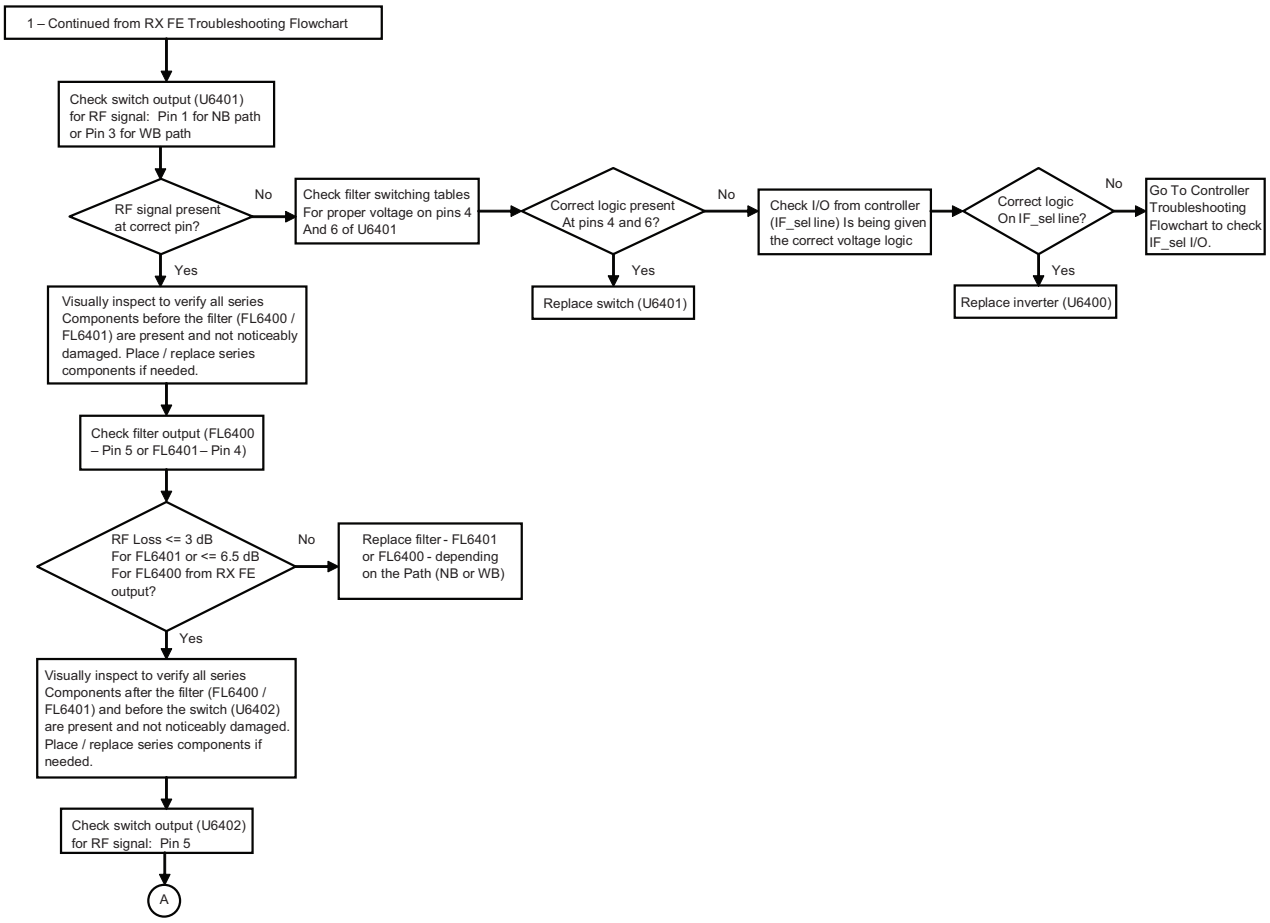
5.4 Flowcharts

This section contains the troubleshooting flowcharts that can help you isolate a problem in your modem.

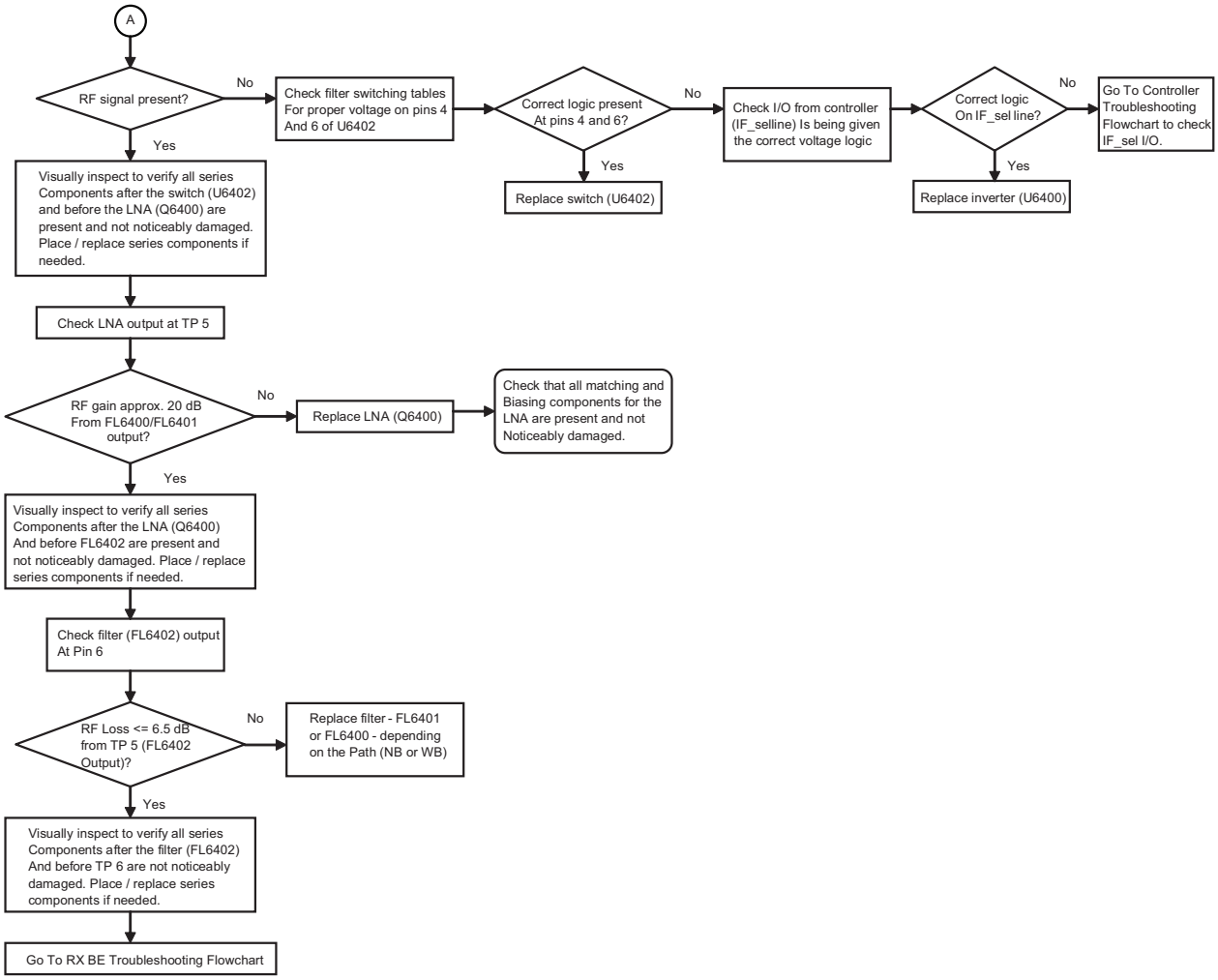
5.4.1 Rx Front-end Degraded BER



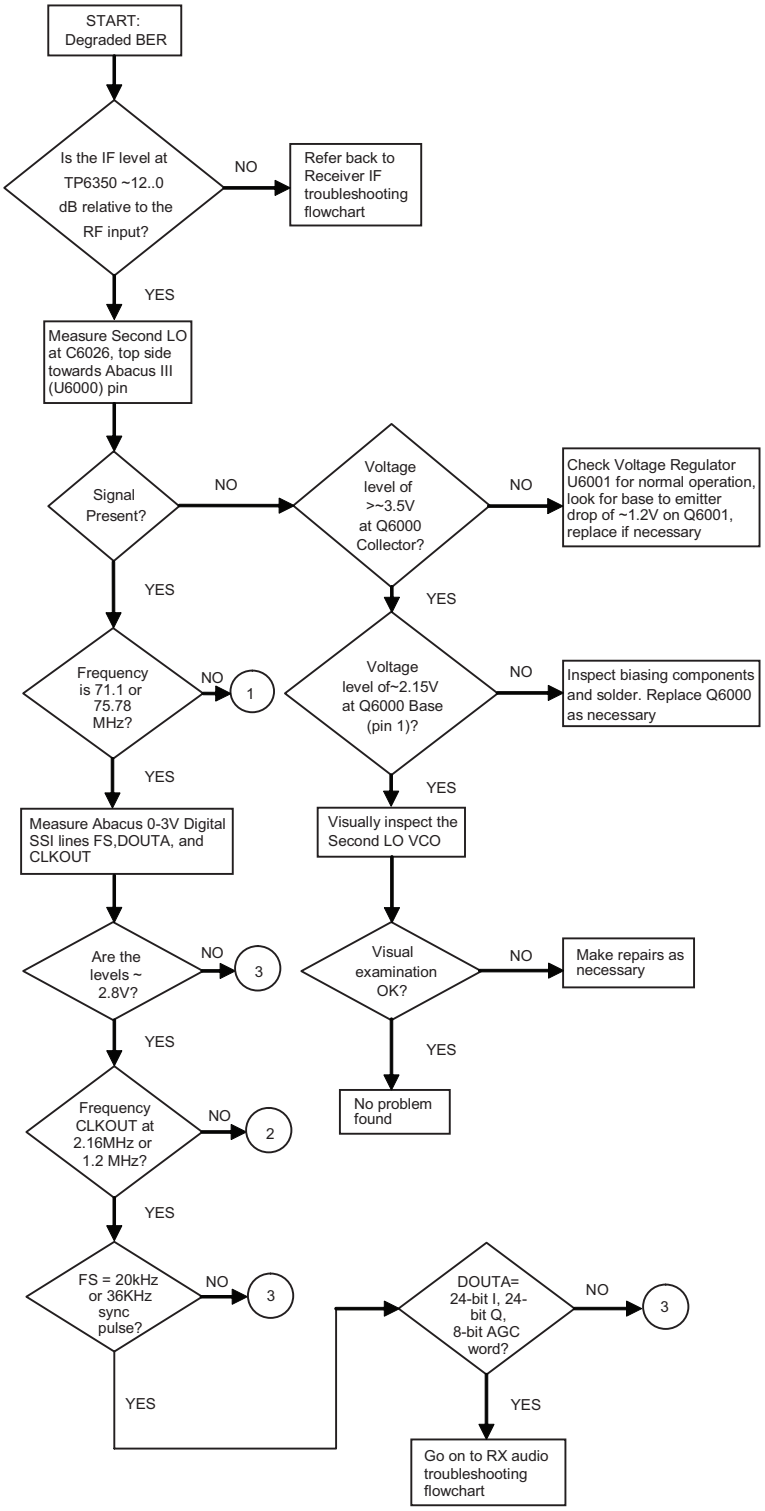
5.4.2 Rx IF Degraded BER -Sheet 1 of 2



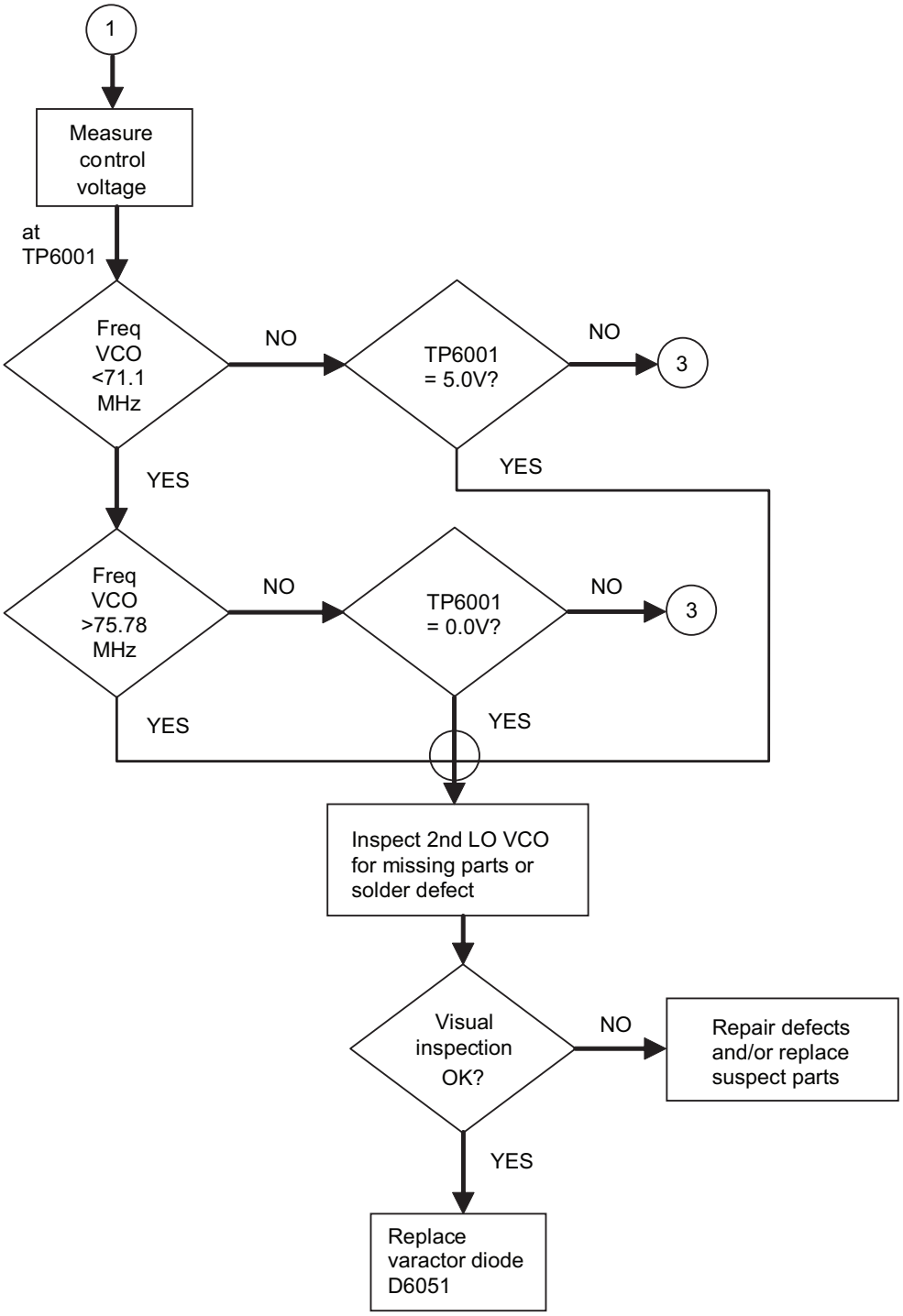
5.4.3 Rx IF Degraded BER -Sheet 2 of 2



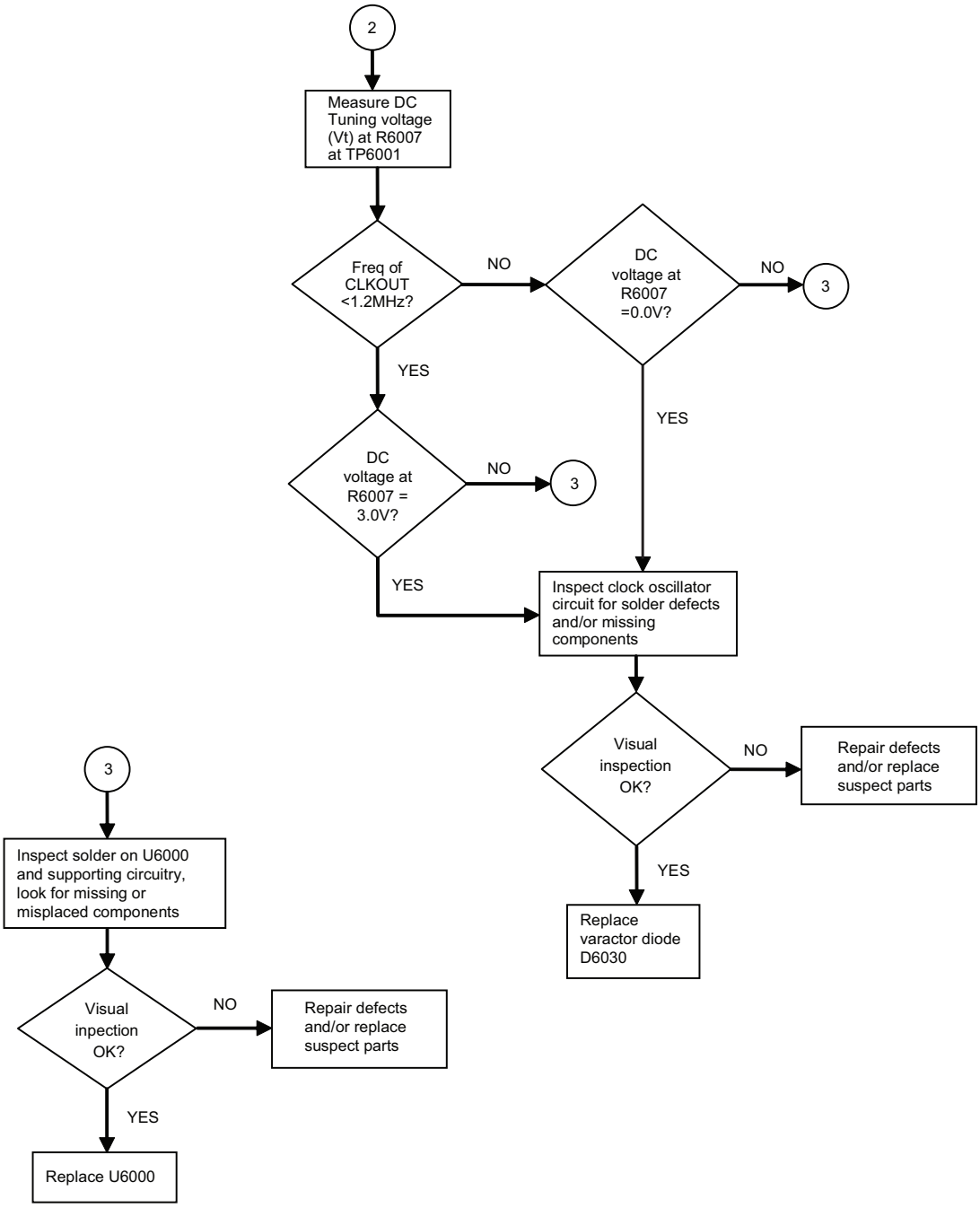
5.4.4 Rx Back-end Degraded BER -Sheet 1 of 3



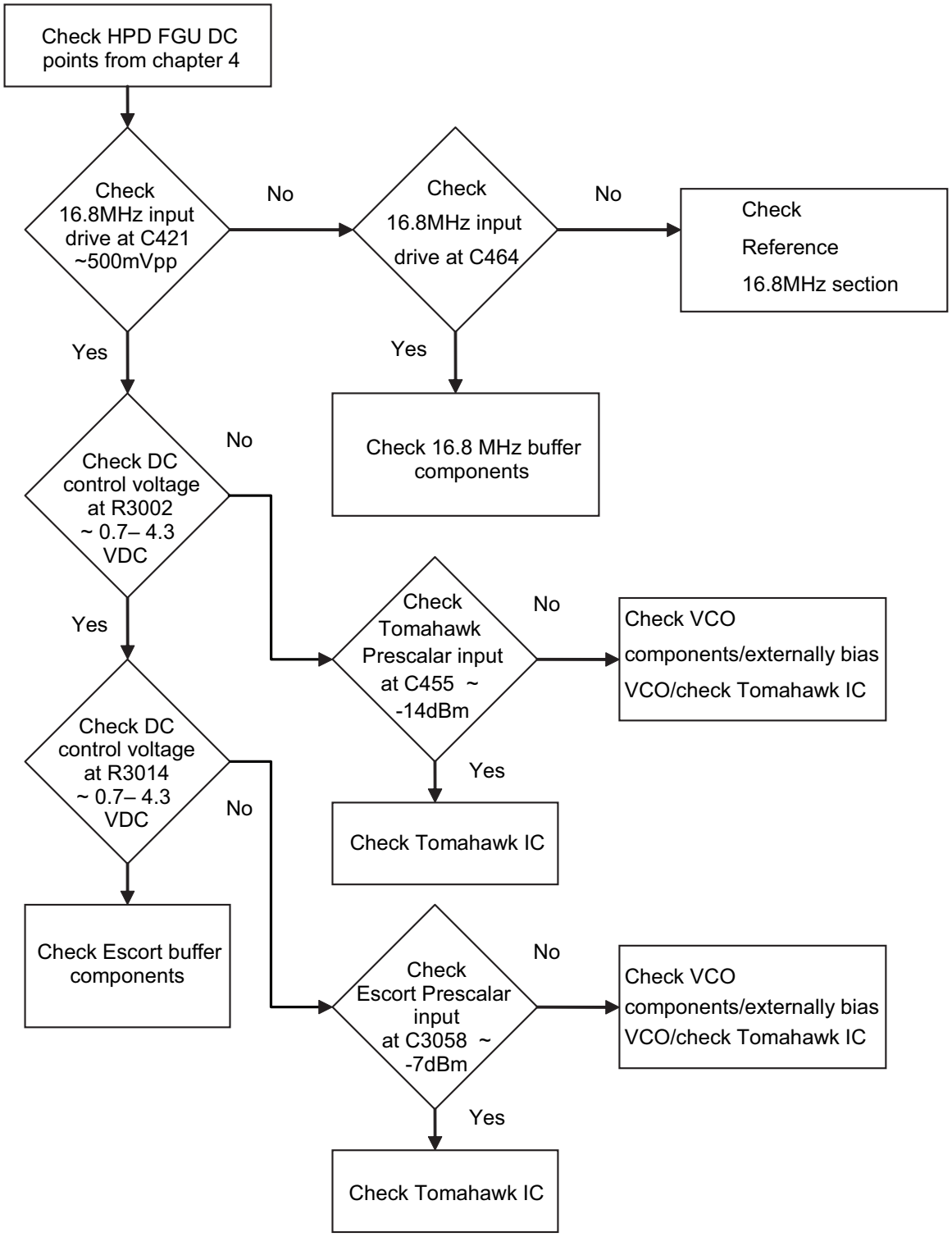
5.4.5 Rx Back-end Degraded BER -Sheet 2 of 3



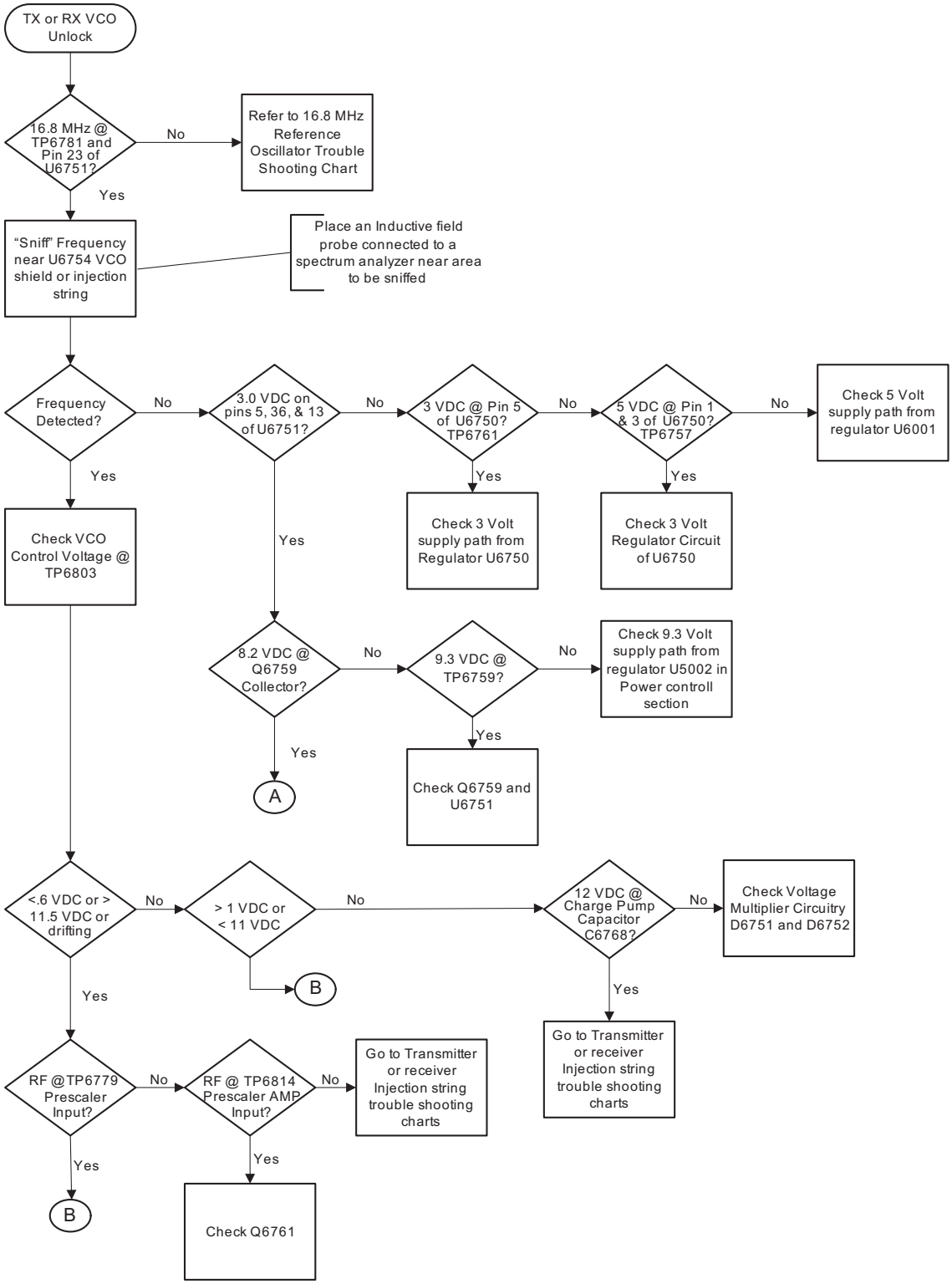
5.4.6 Rx Back-end Degraded BER -Sheet 3 of 3



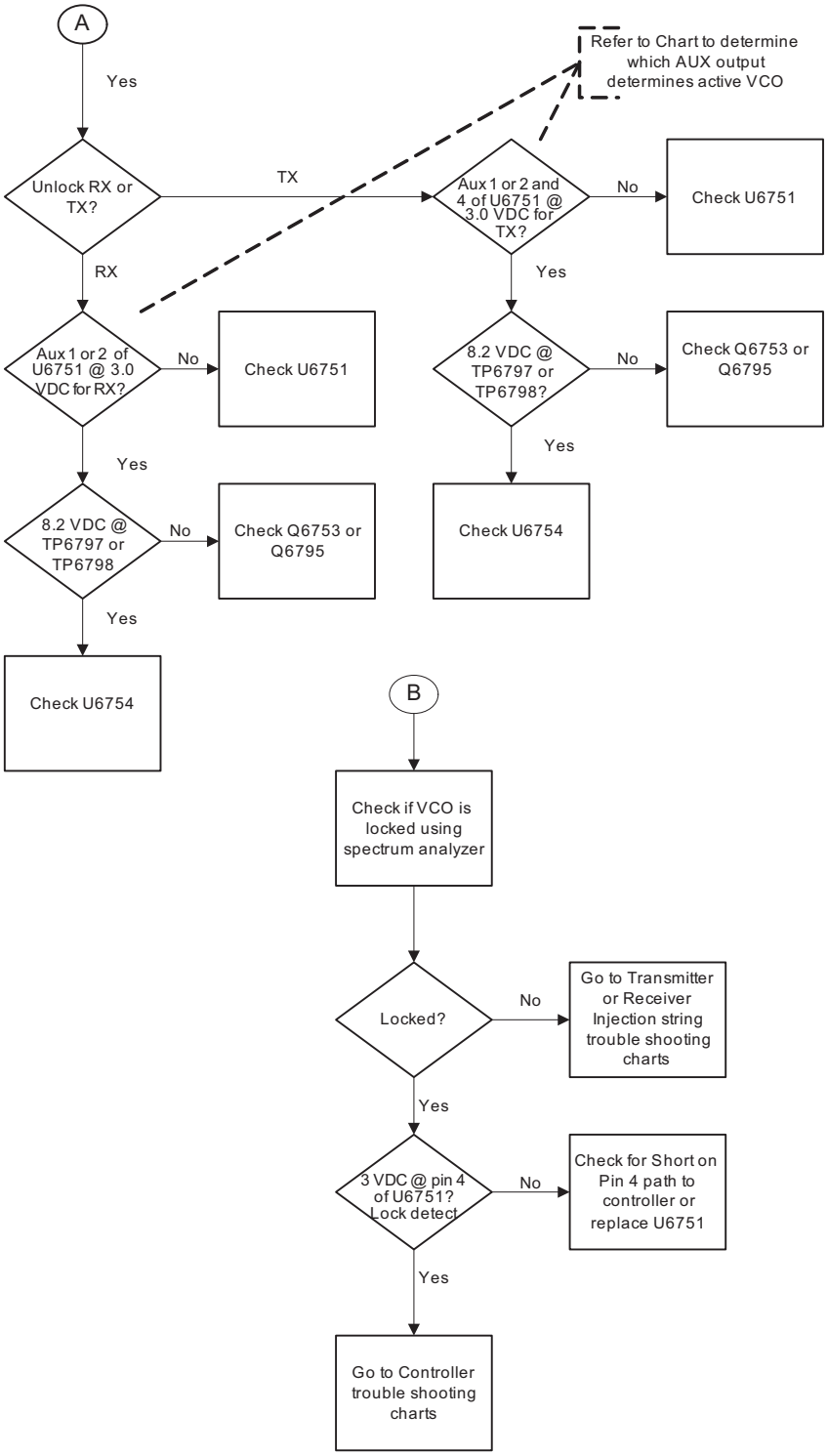
5.4.7 Tomahawk FGU Unlocked



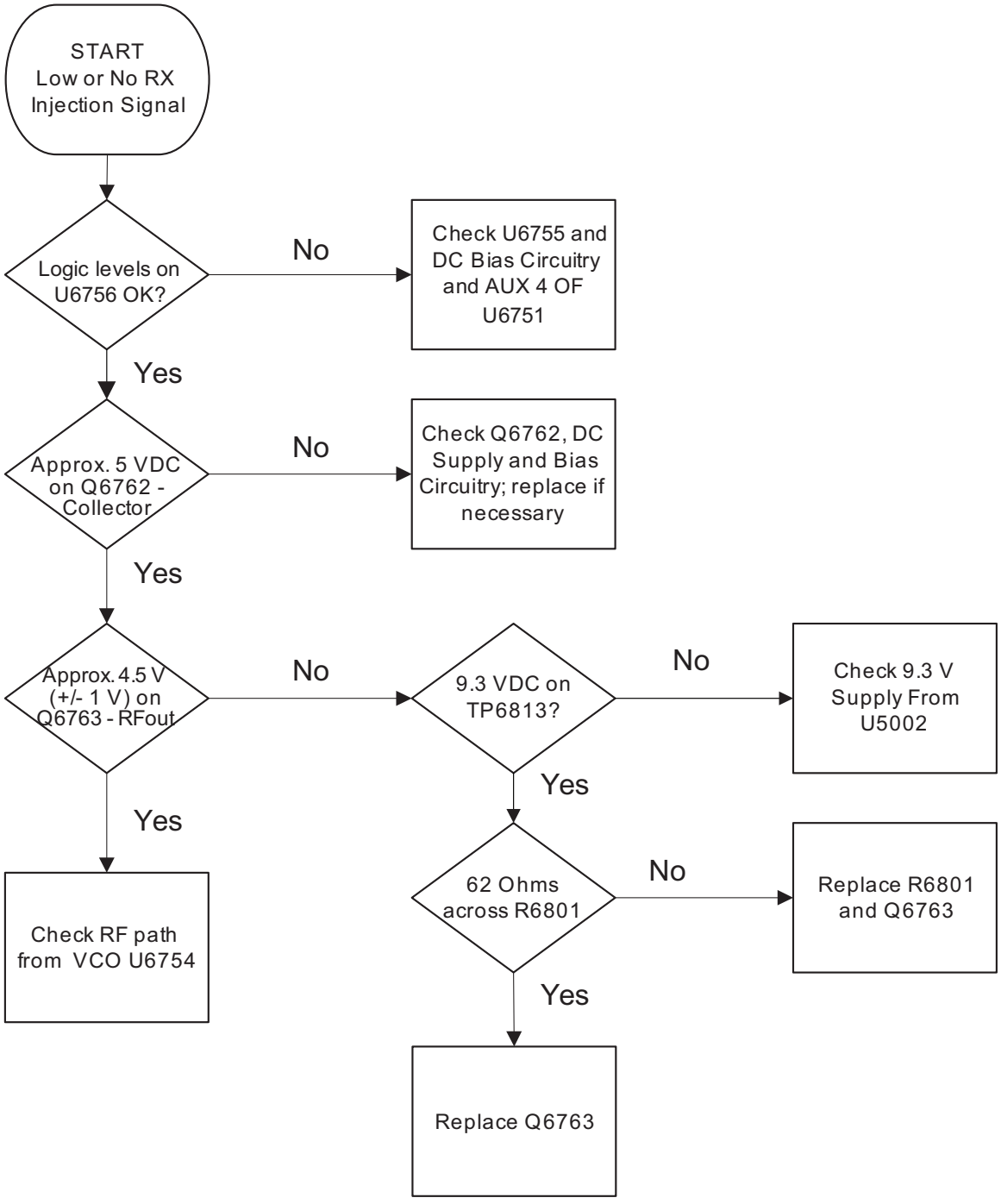
5.4.8 Rx APCO Tx Unlocked -Sheet 1 of 2



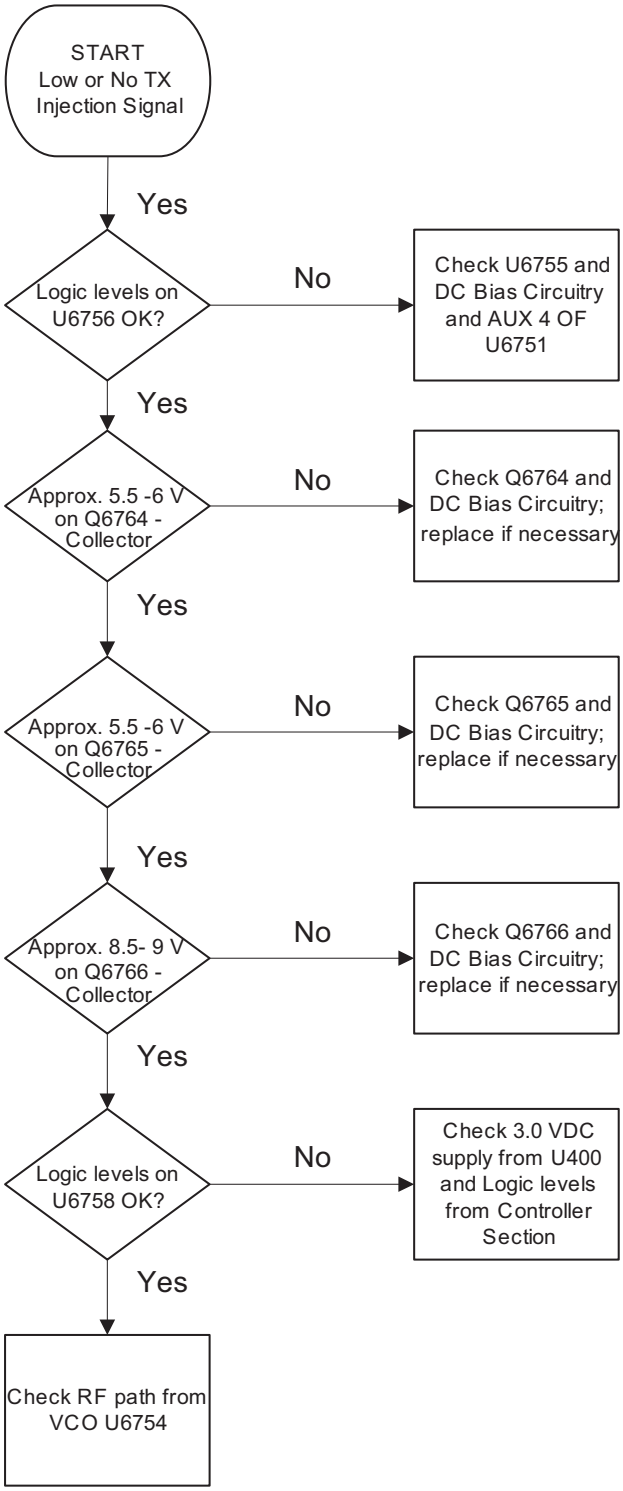
5.4.9 Rx APCO Tx Unlocked -Sheet 2 of 2



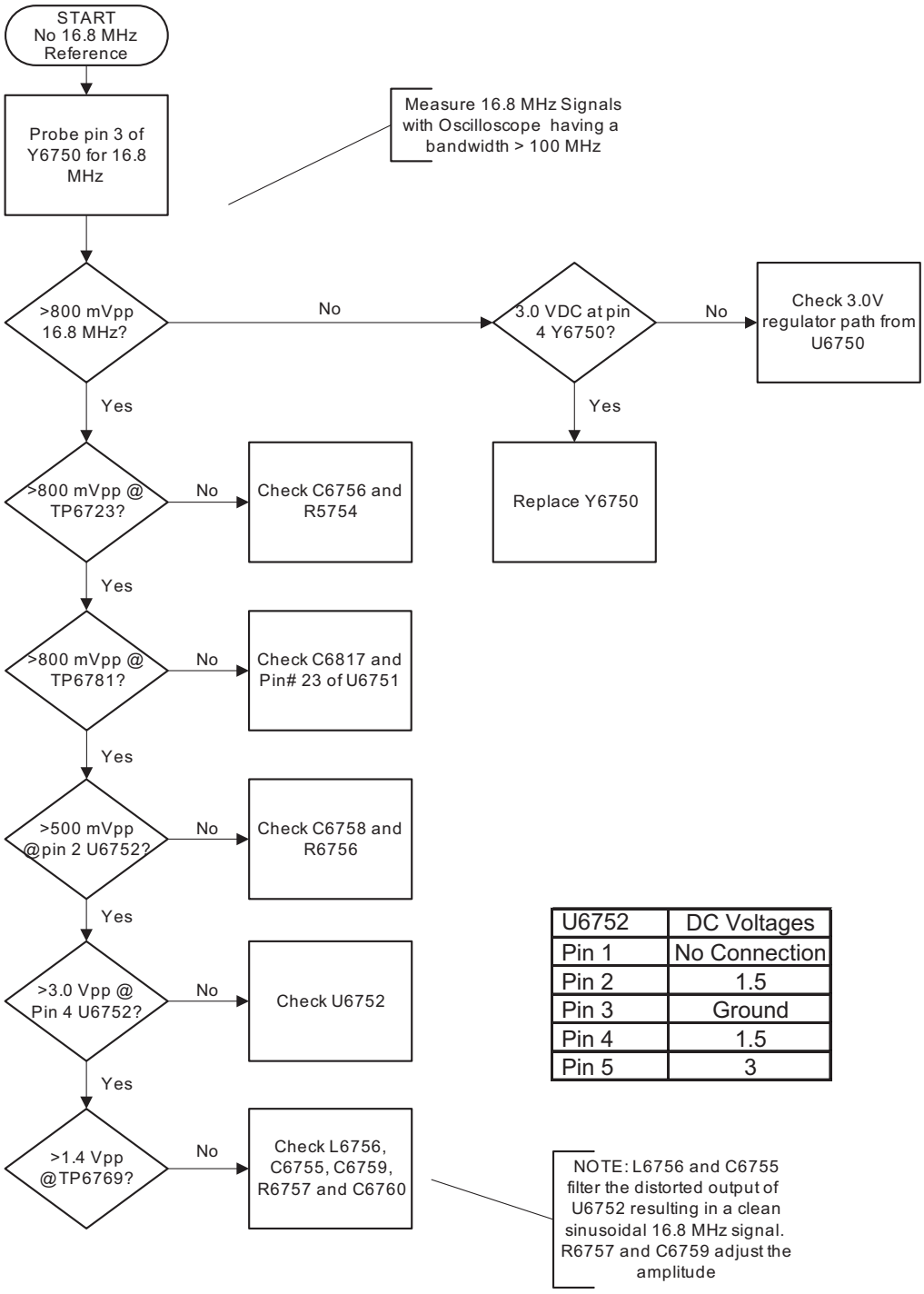
5.4.10 Low Rx Injection



5.4.11 APCO Transmitter Injection Low

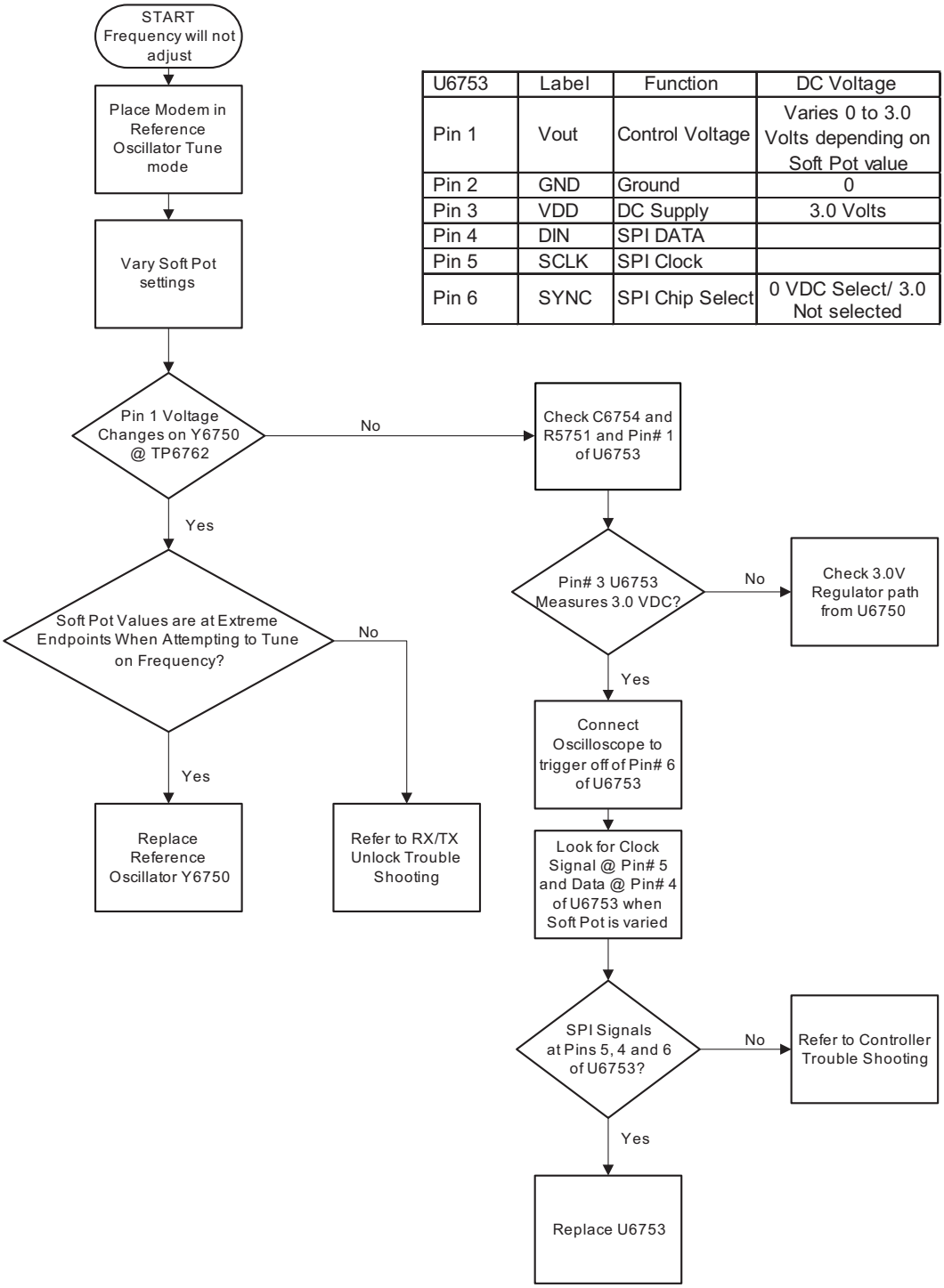


5.4.12 No 16.8 MHz Reference Oscillator Injection



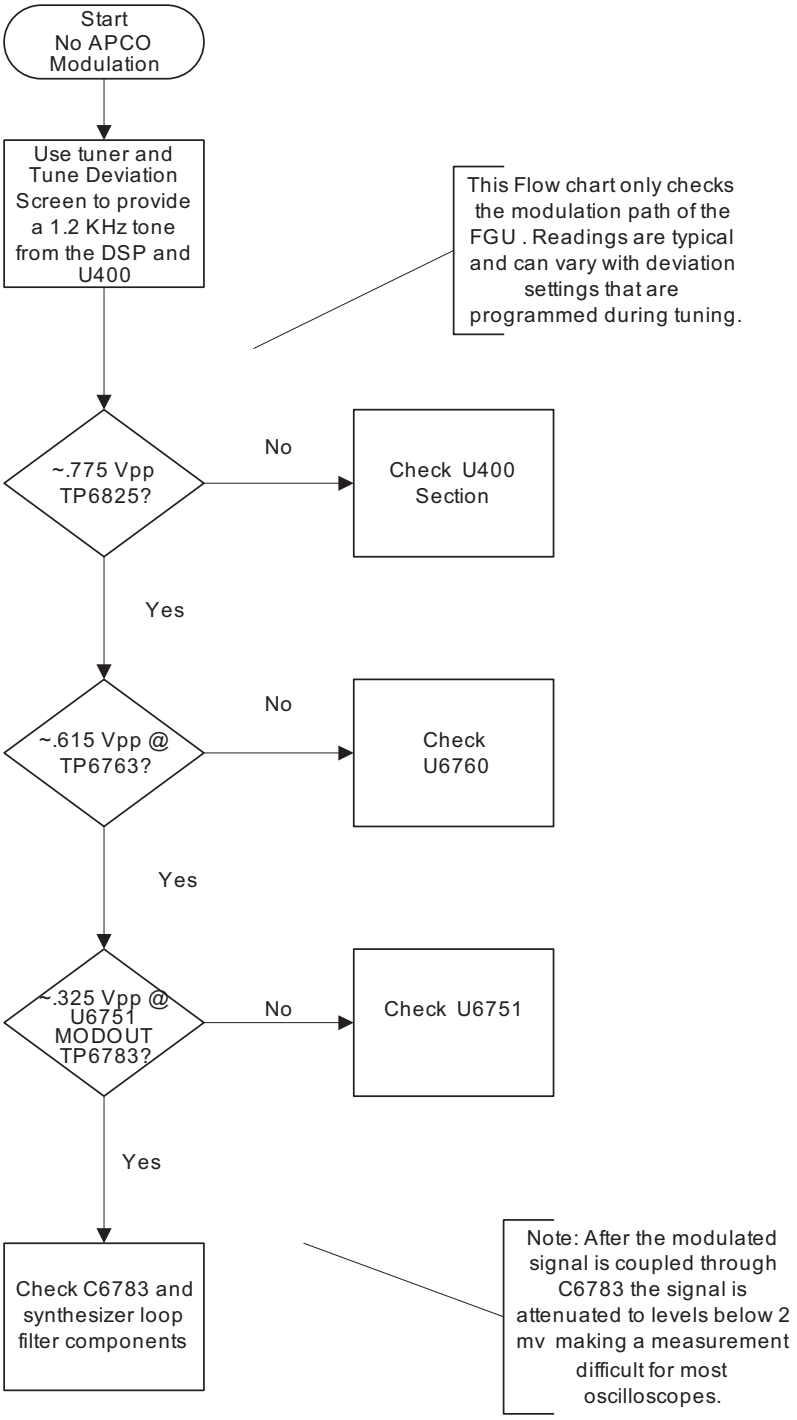
U6752	DC Voltages
Pin 1	No Connection
Pin 2	1.5
Pin 3	Ground
Pin 4	1.5
Pin 5	3

5.4.13 16.8 MHz Reference Oscillator Off Frequency

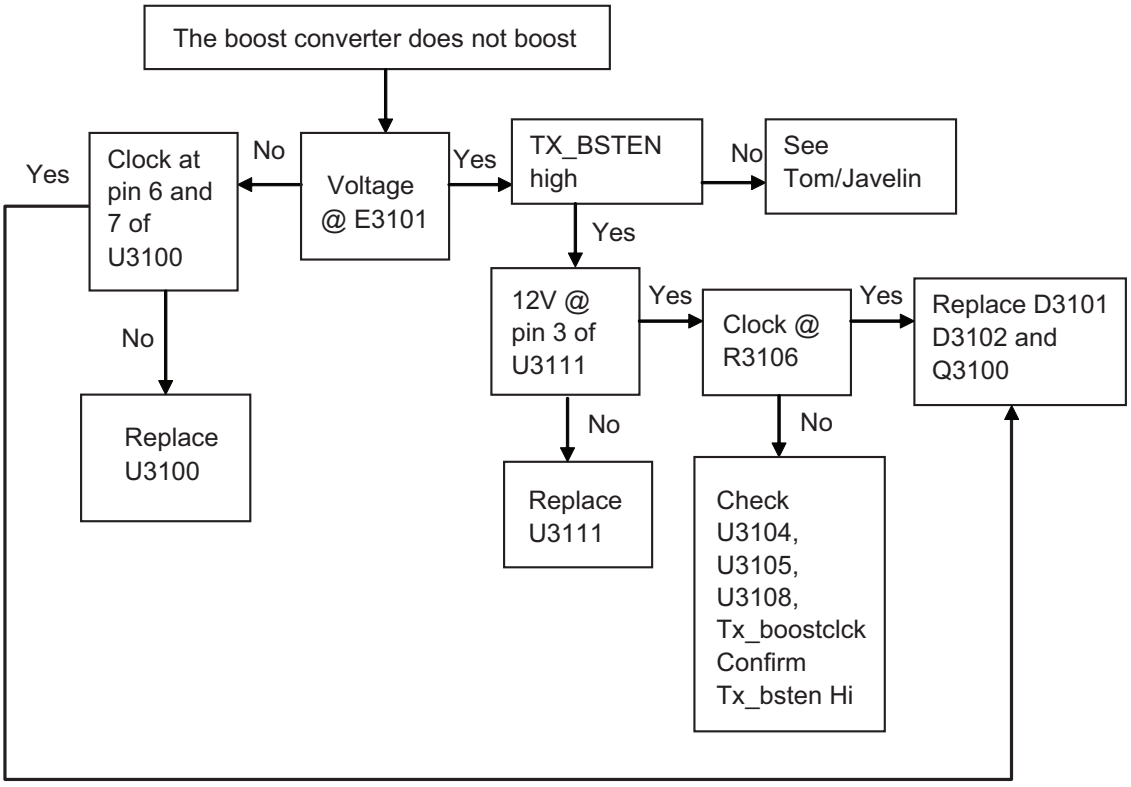


U6753	Label	Function	DC Voltage
Pin 1	Vout	Control Voltage	Varies 0 to 3.0 Volts depending on Soft Pot value
Pin 2	GND	Ground	0
Pin 3	VDD	DC Supply	3.0 Volts
Pin 4	DIN	SPI DATA	
Pin 5	SCLK	SPI Clock	
Pin 6	SYNC	SPI Chip Select	0 VDC Select/ 3.0 Not selected

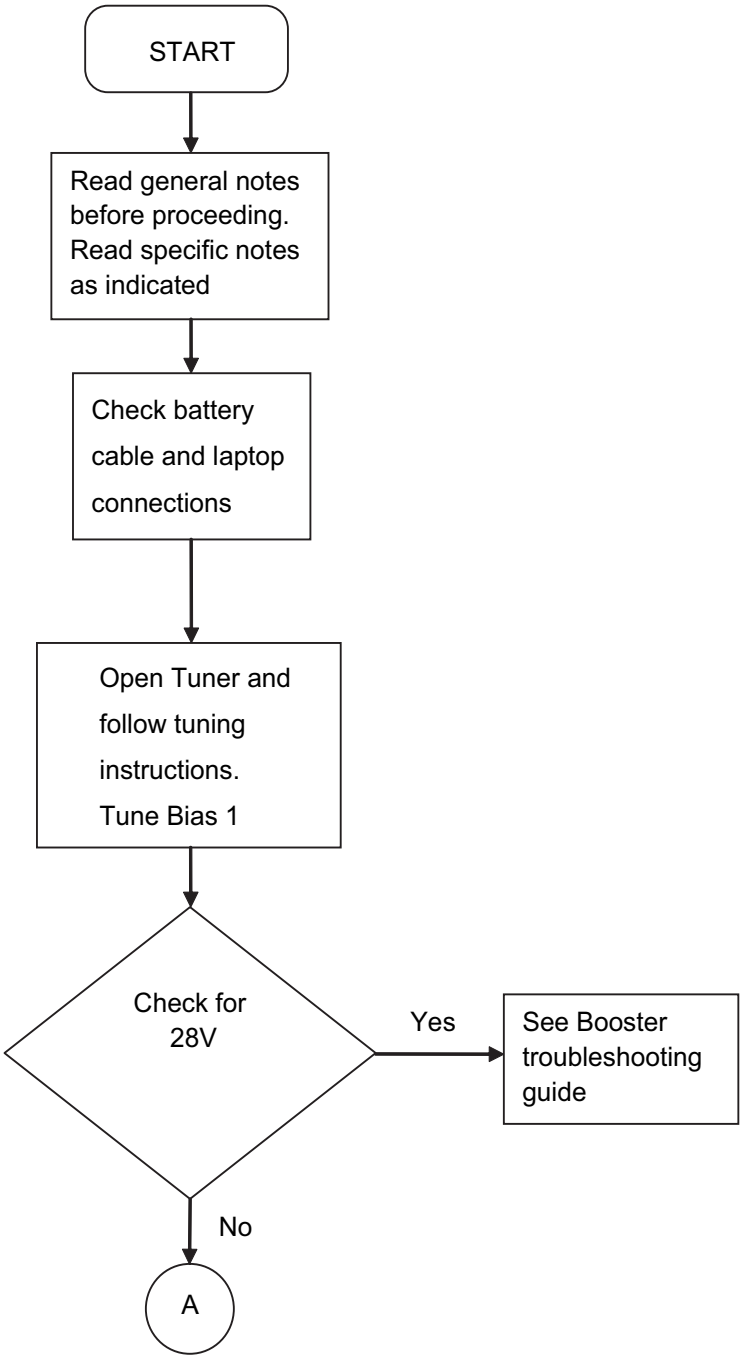
5.4.14 APCO Transmitter Modulation



5.4.15 Booster Low Voltage

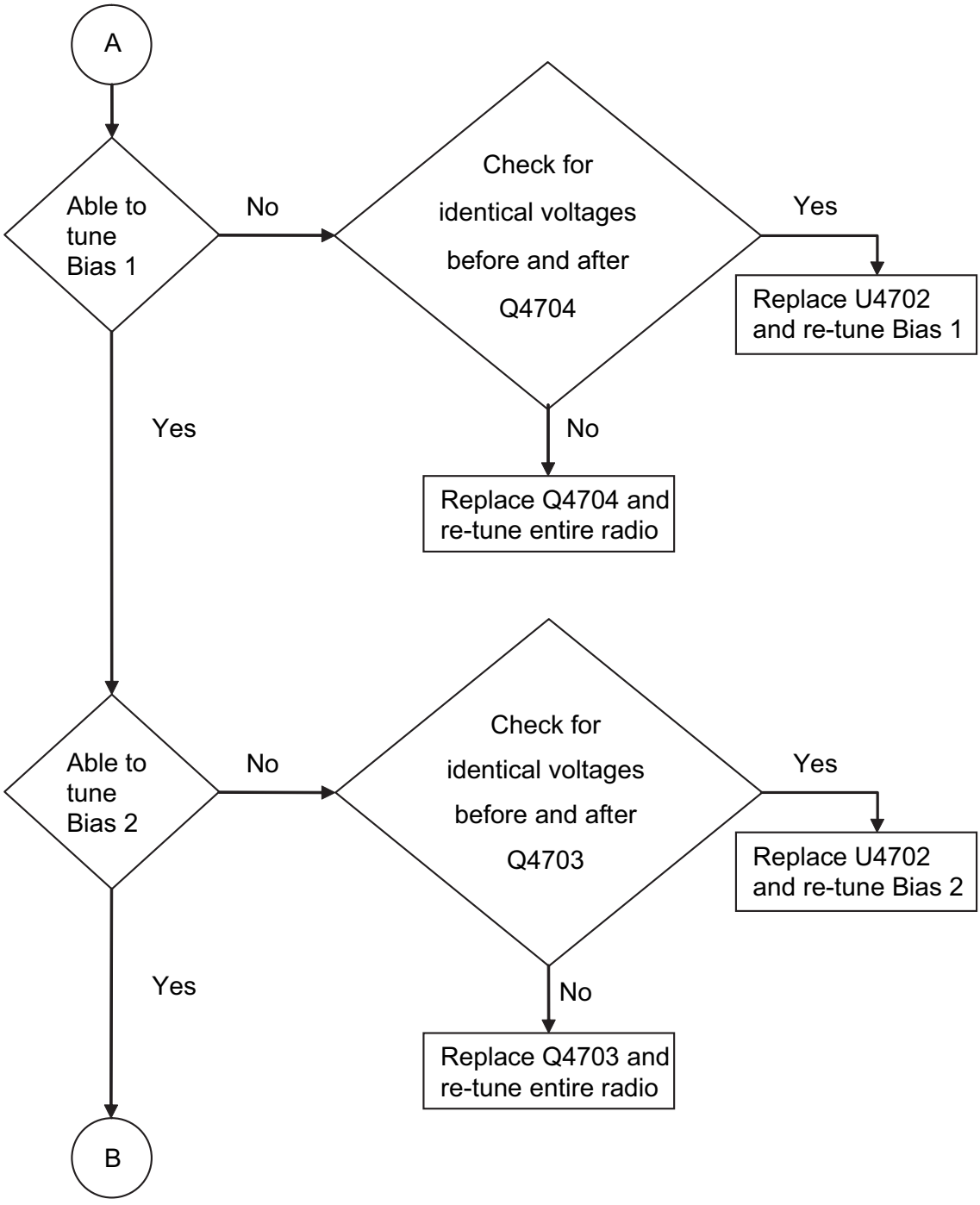


5.4.16 Power Amplifier and Driver (No or Low Tx Power) -Sheet 1 of 8

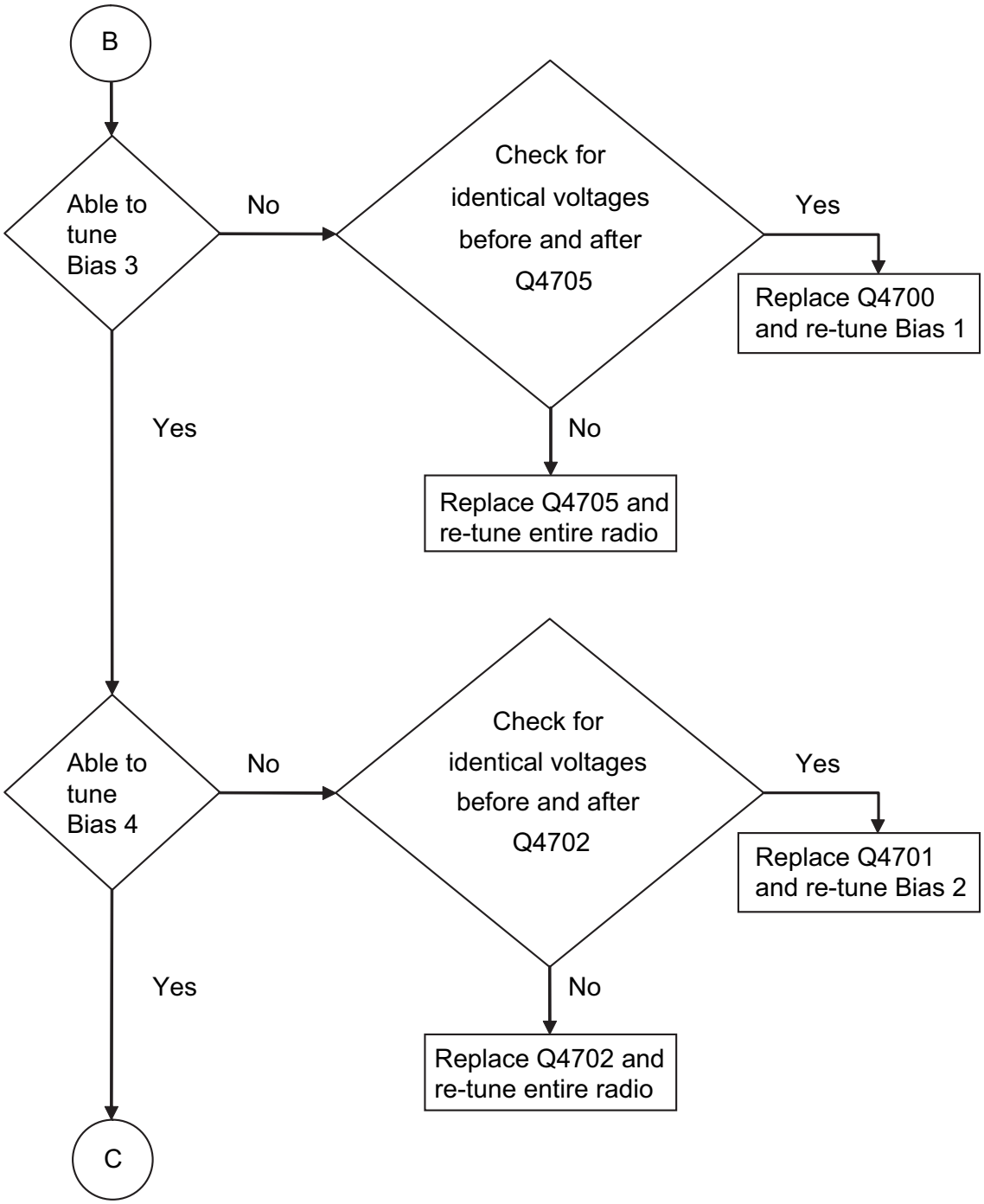


5.4.17 Power Amplifier and Driver (No or Low Tx Power) -Sheet 2 of 8

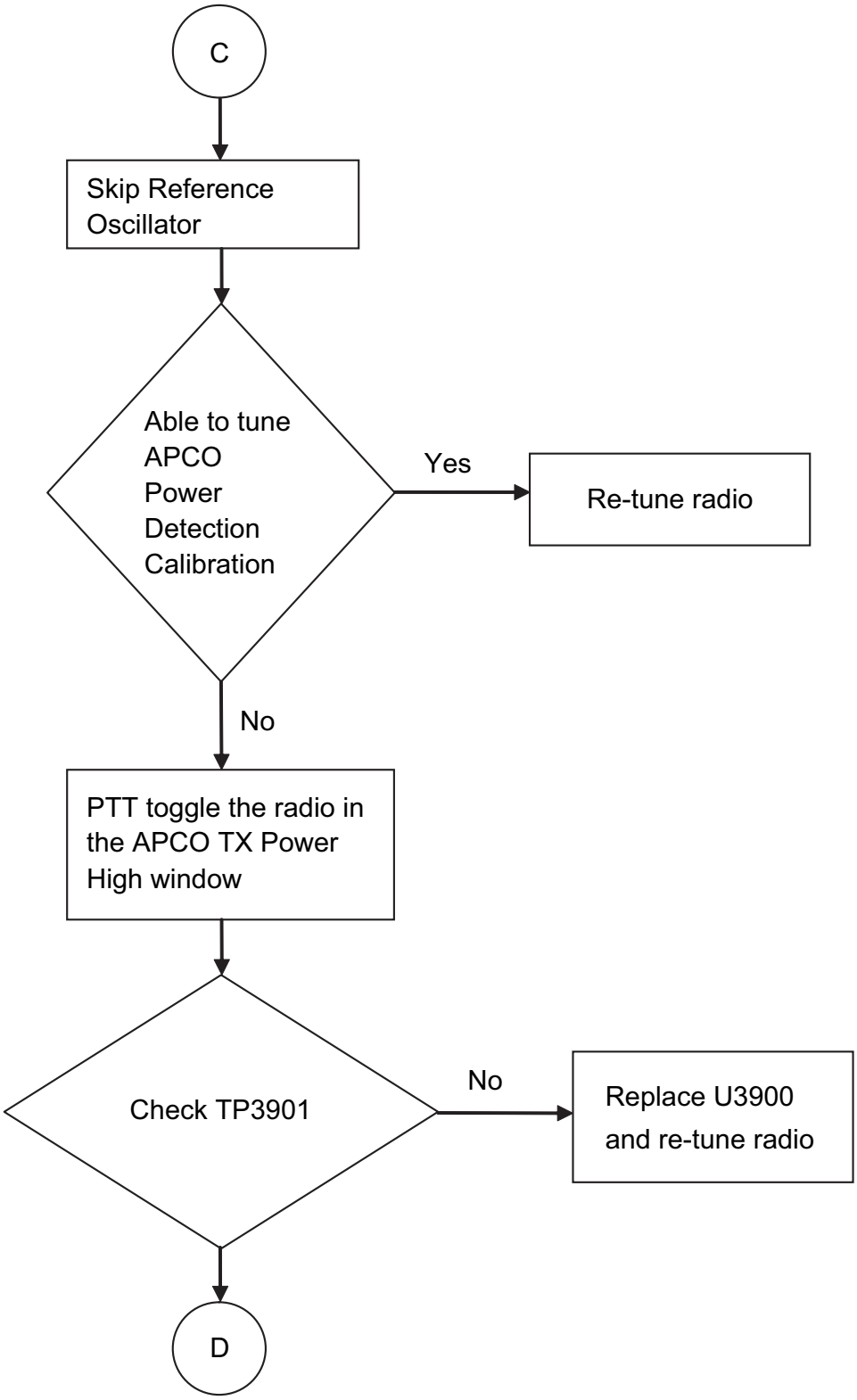
.



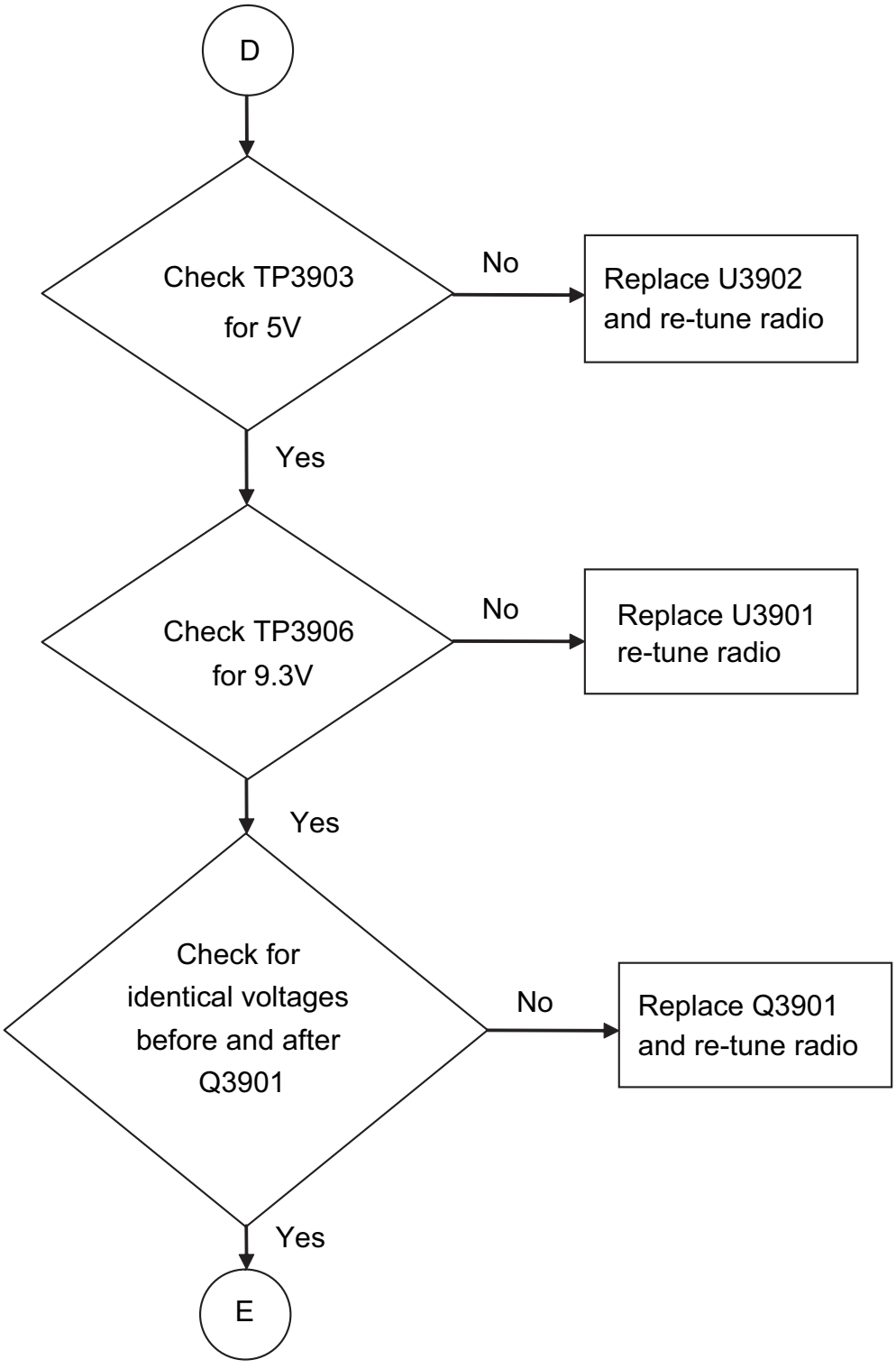
5.4.18 Power Amplifier and Driver (No or Low Tx Power) -Sheet 3 of 8



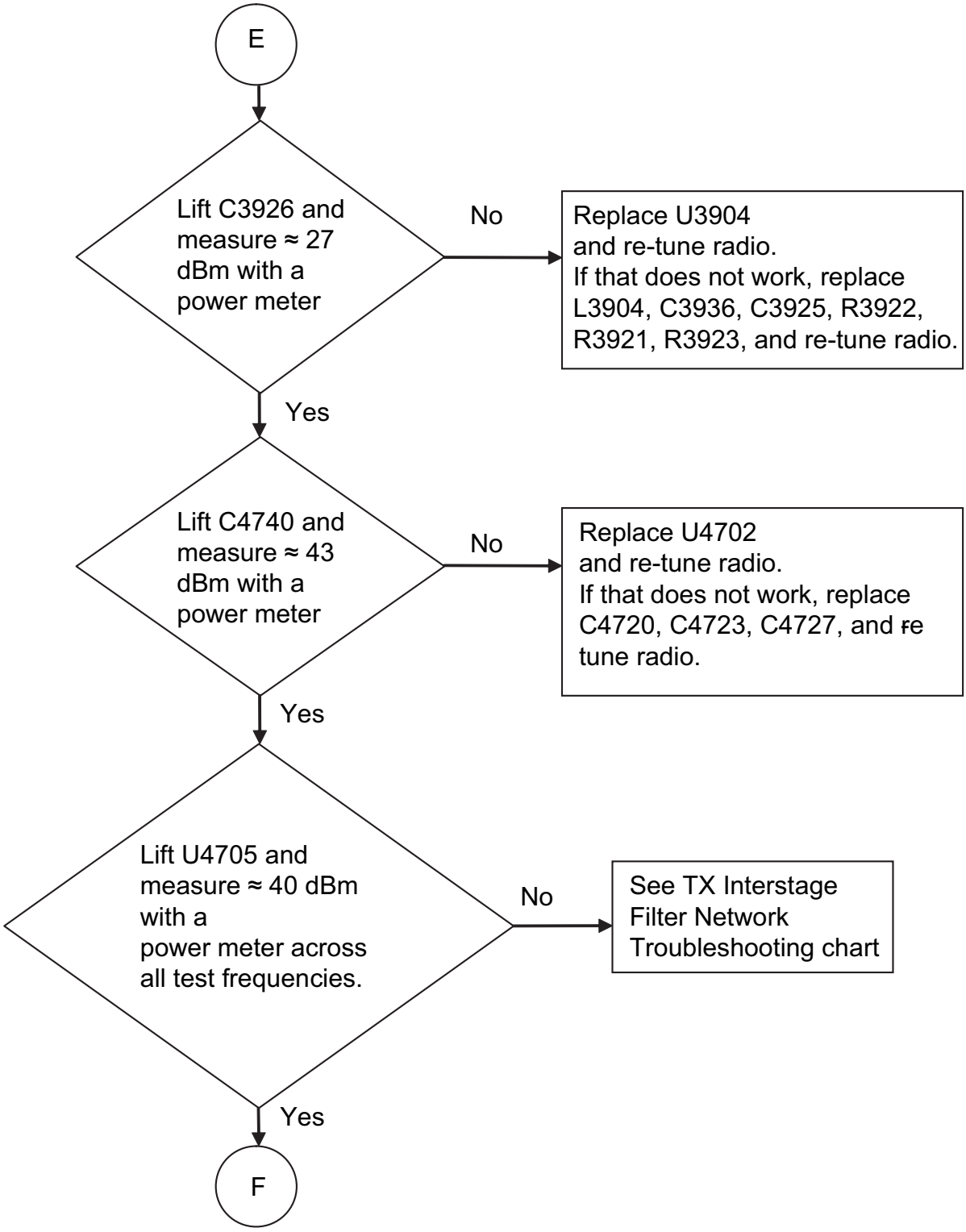
5.4.19 Power Amplifier and Driver (No or Low Tx Power) -Sheet 4 of 8



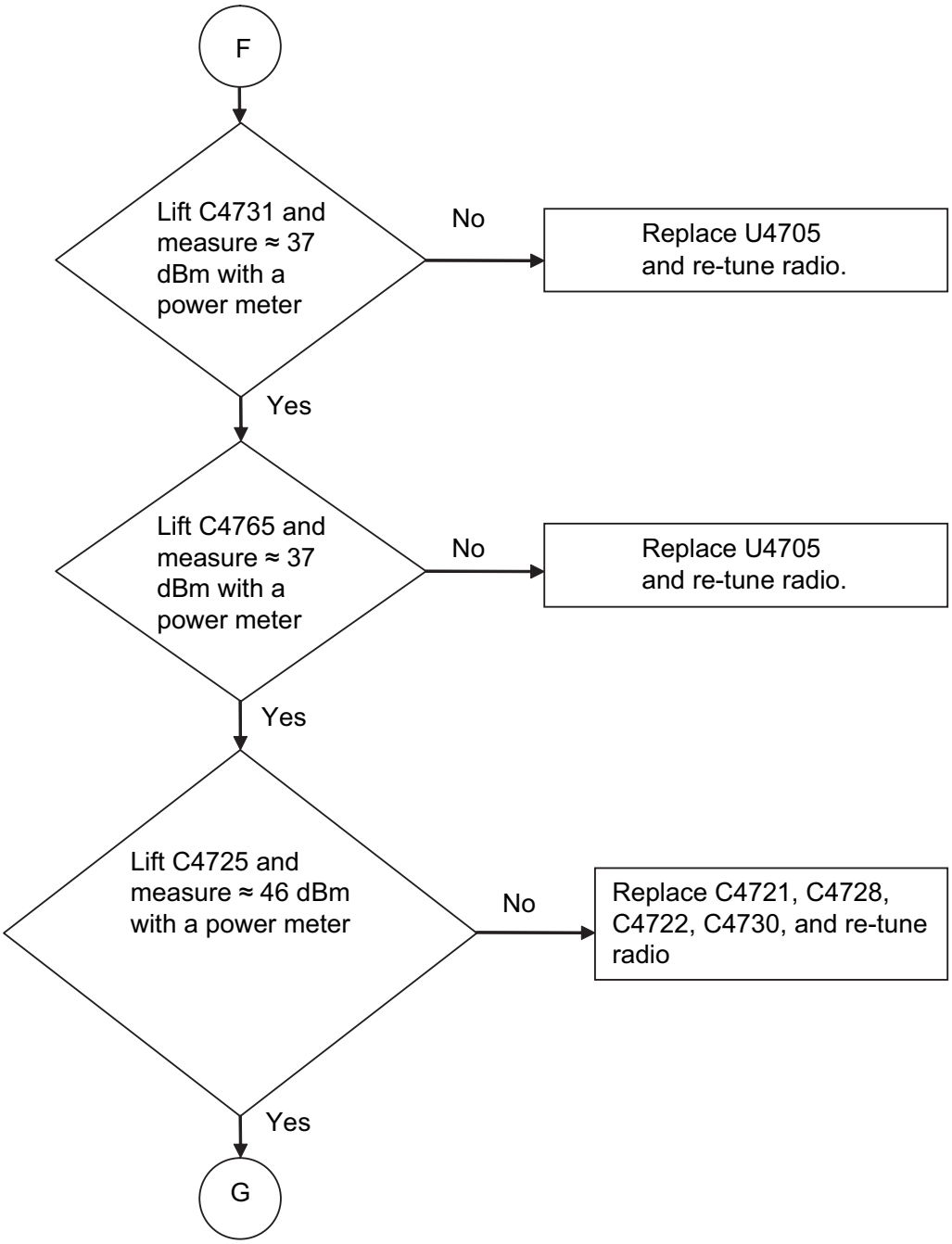
5.4.20 Power Amplifier and Driver (No or Low Tx Power) -Sheet 5 of 8



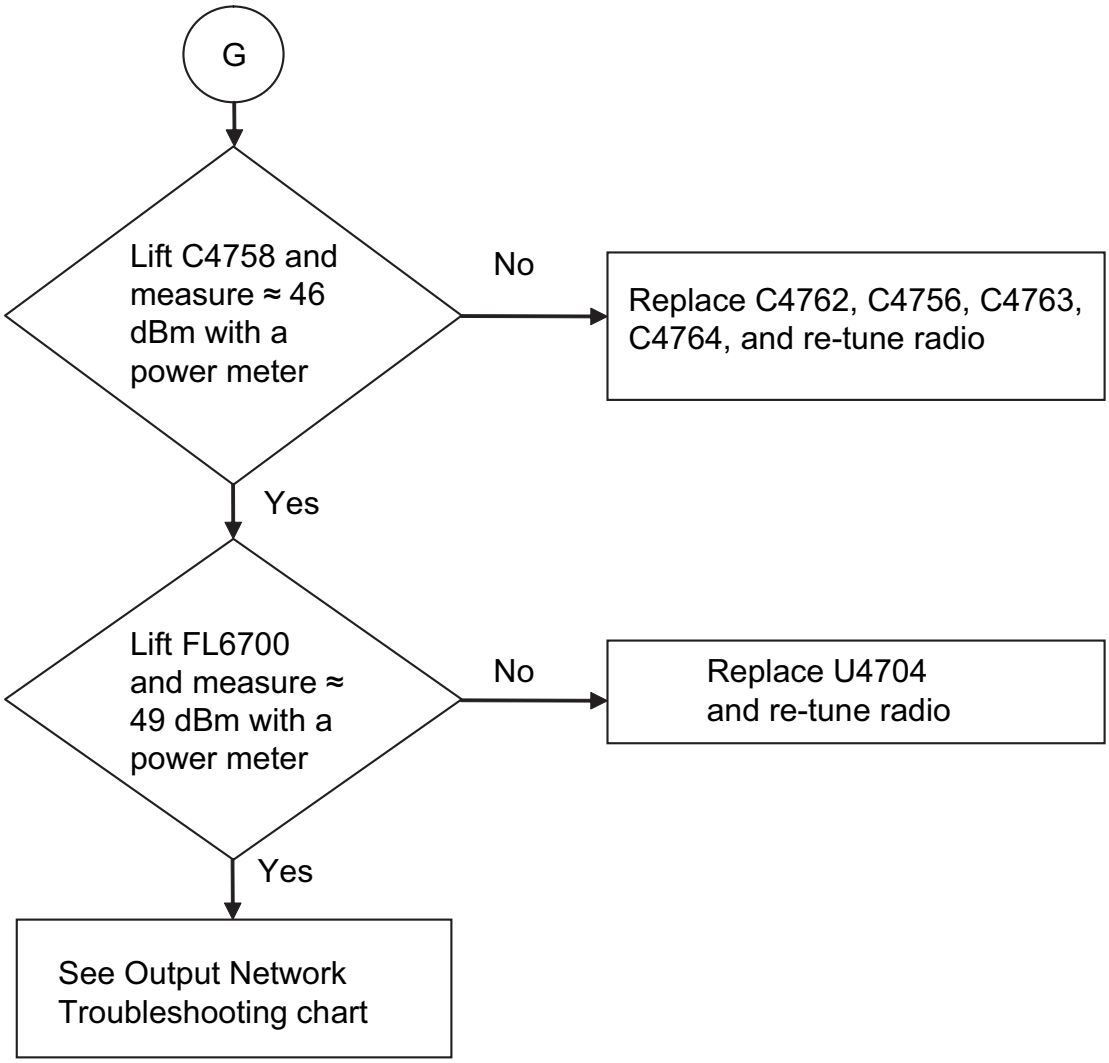
5.4.21 Power Amplifier and Driver (No or Low Tx Power) -Sheet 6 of 8



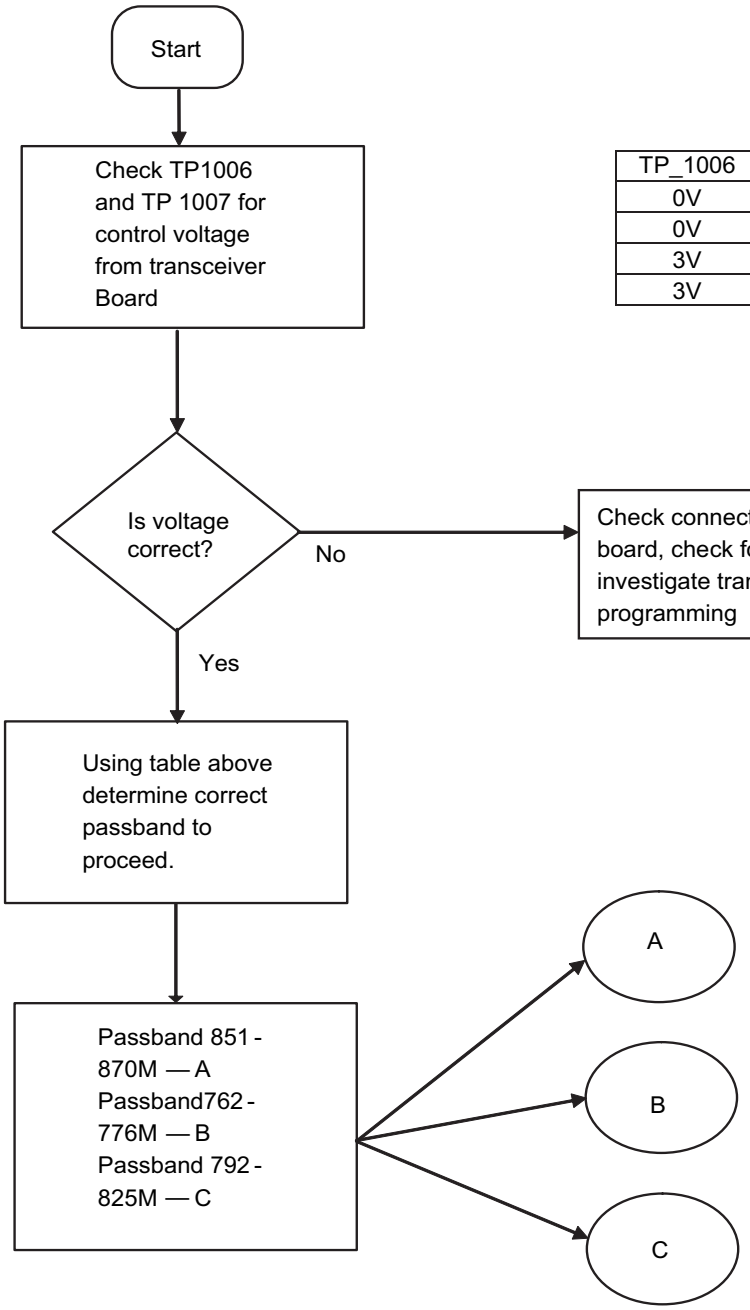
5.4.22 Power Amplifier and Driver (No or Low Tx Power) -Sheet 7 of 8



5.4.23 Power Amplifier and Driver (No or Low Tx Power) -Sheet 8 of 8

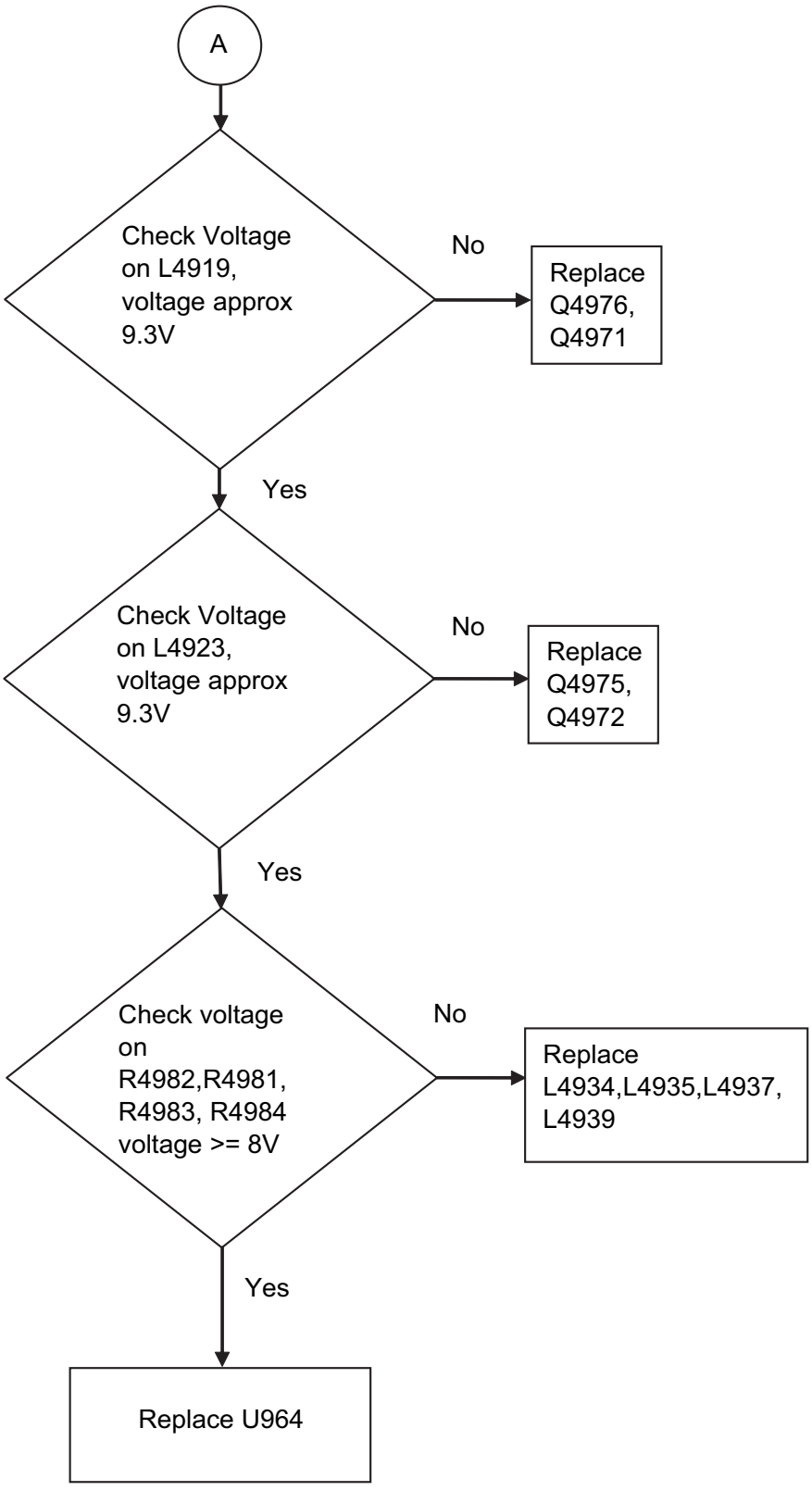


5.4.24 Tx Inter-stage Network (No or Low Power) -Sheet 1 of 4

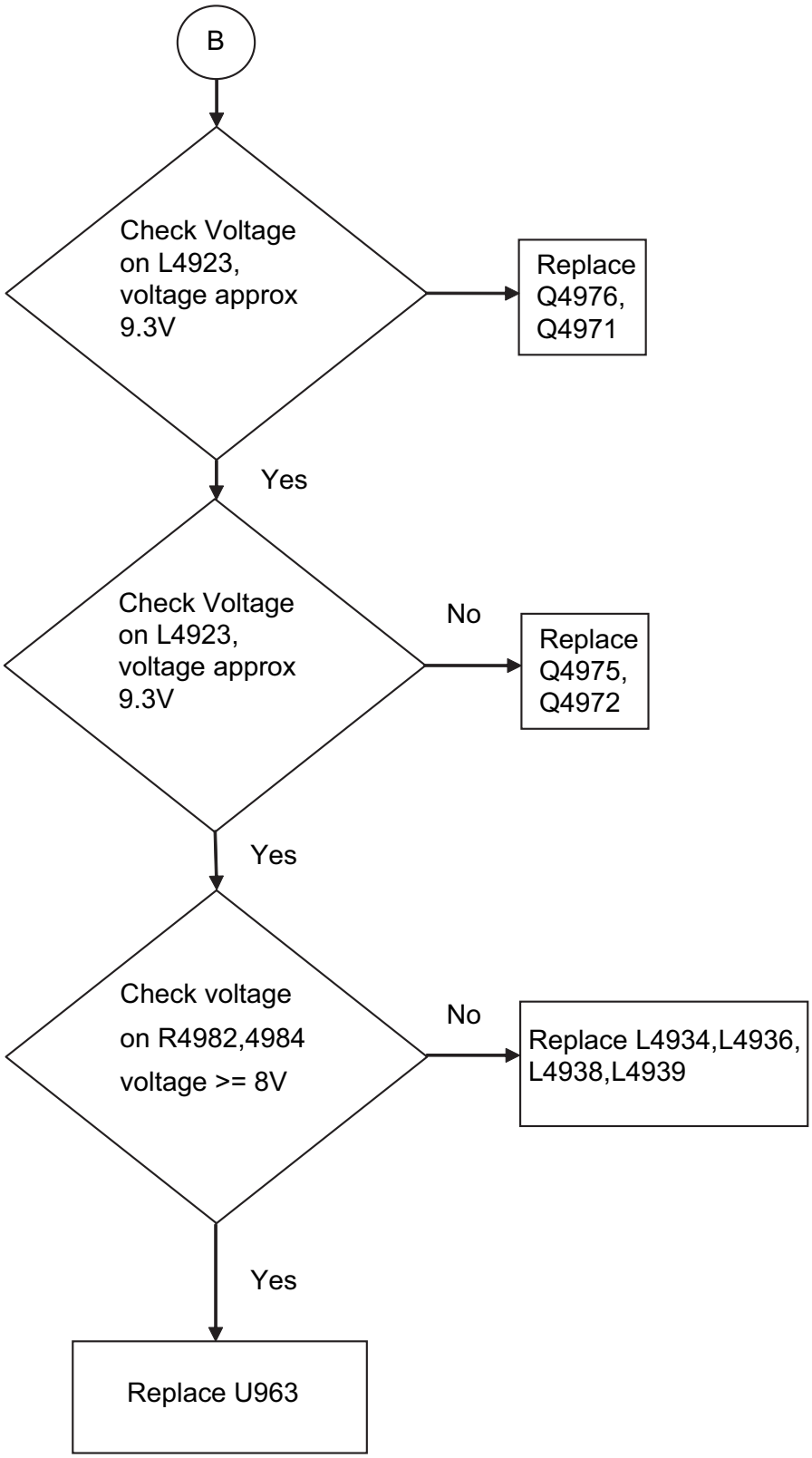


TP_1006	TP_1007	Pass Band
0V	0V	851-870M
0V	3V	762-776M
3V	0V	792-825M
3V	3V	N/A

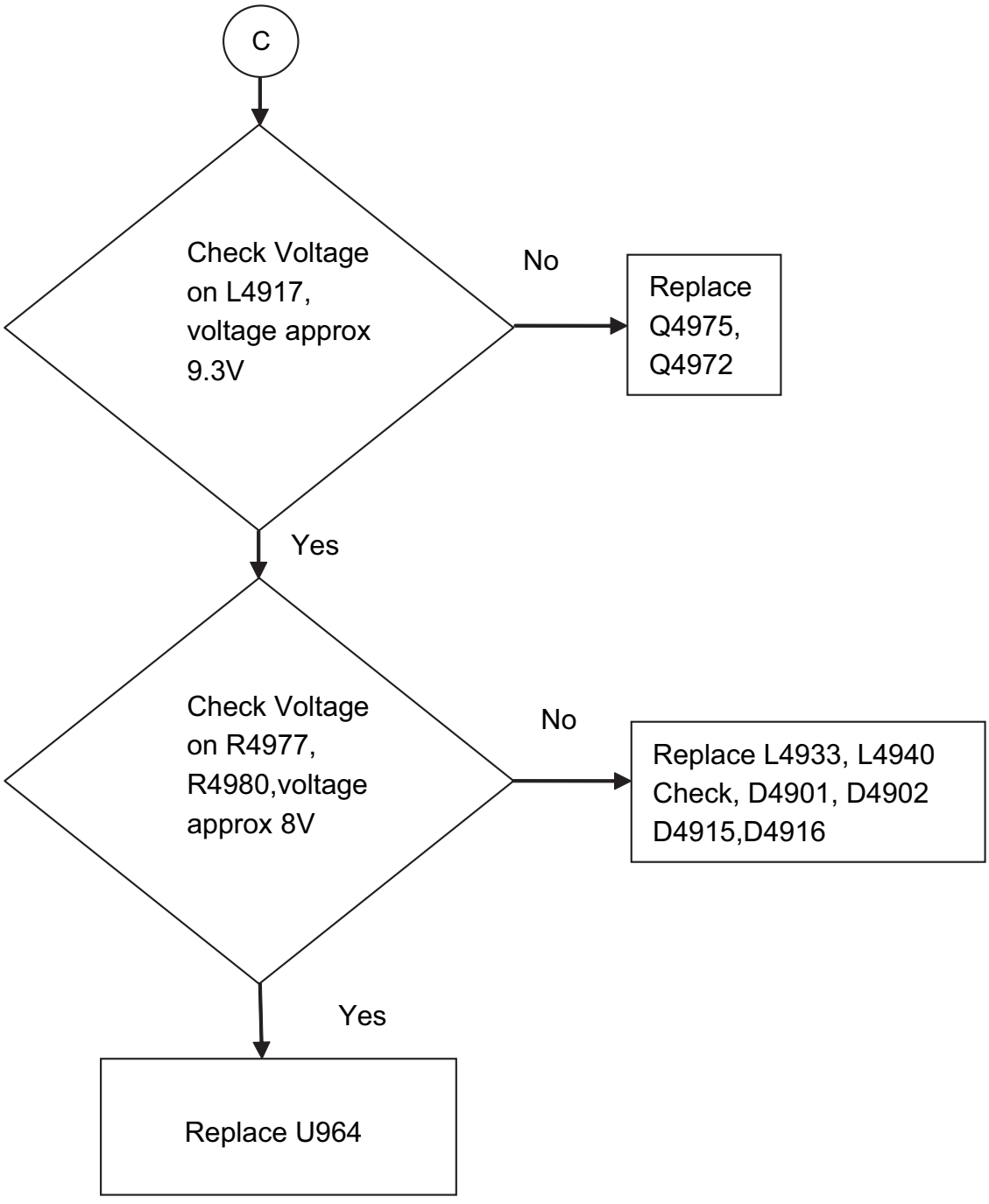
5.4.25 Tx Inter-stage Network (No or Low Power) -Sheet 2 of 4



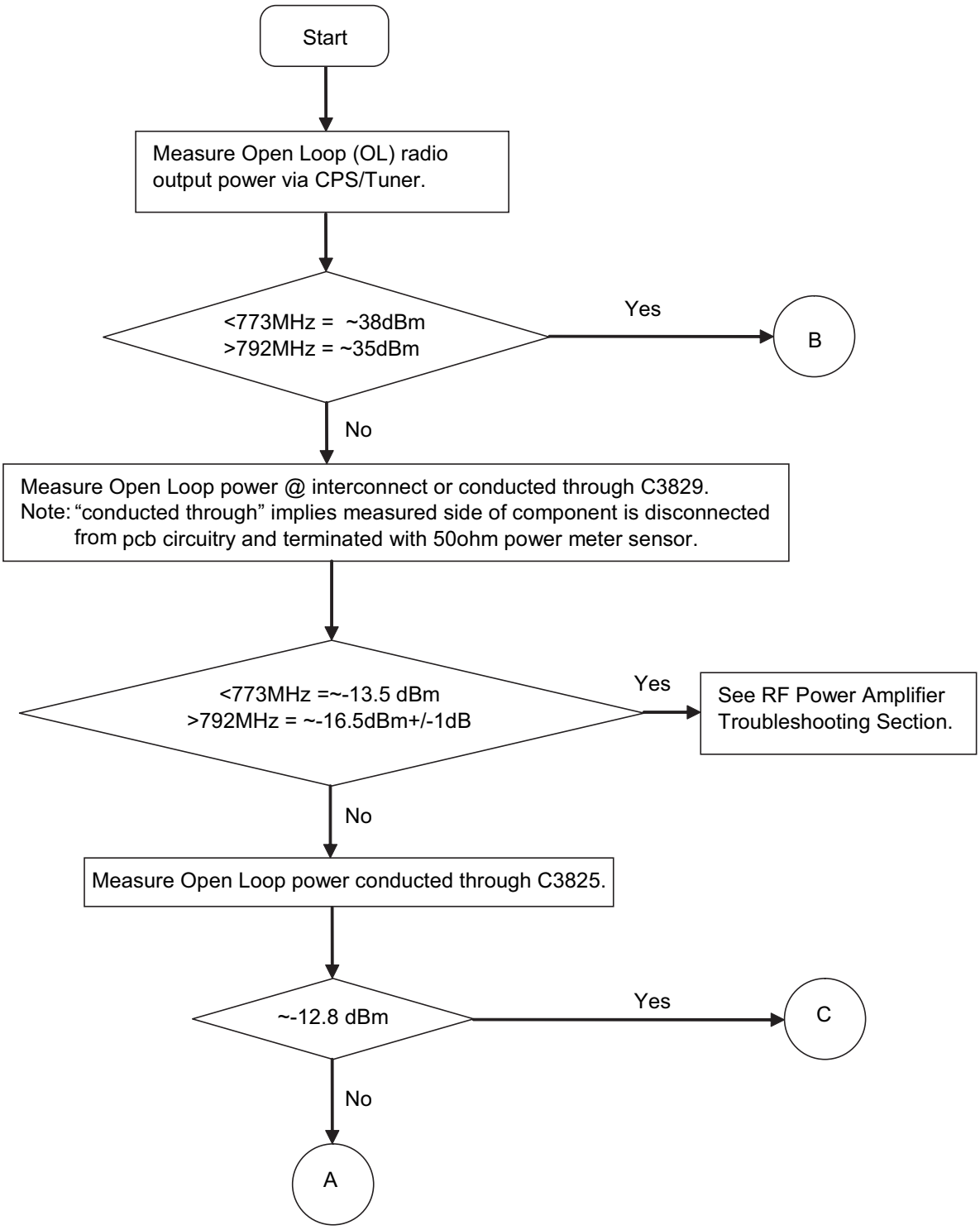
5.4.26 Tx Inter-stage Network (No or Low Power) -Sheet 3 of 4



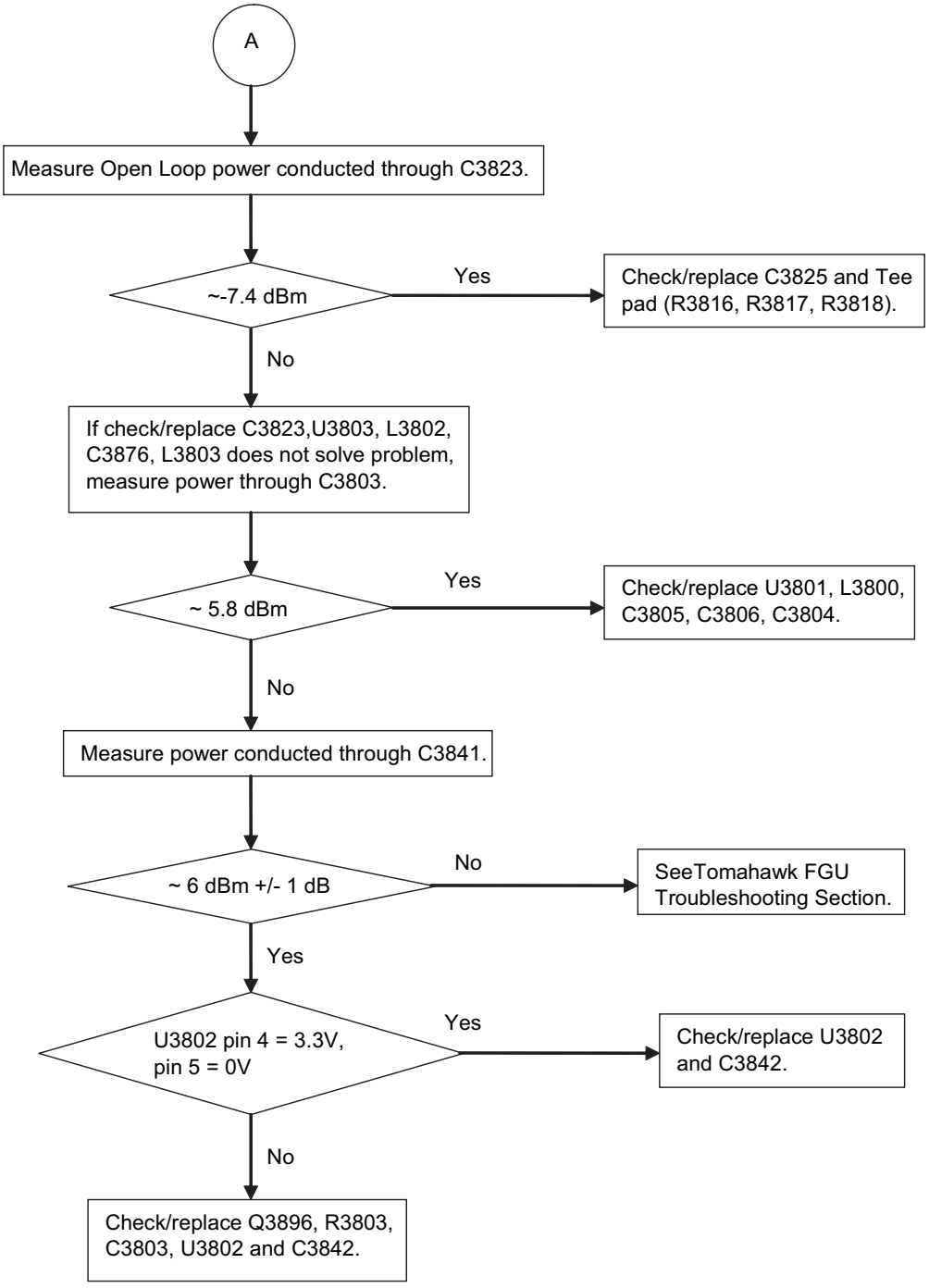
5.4.27 Tx Inter-stage Network (No or Low Power) -Sheet 4 of 4



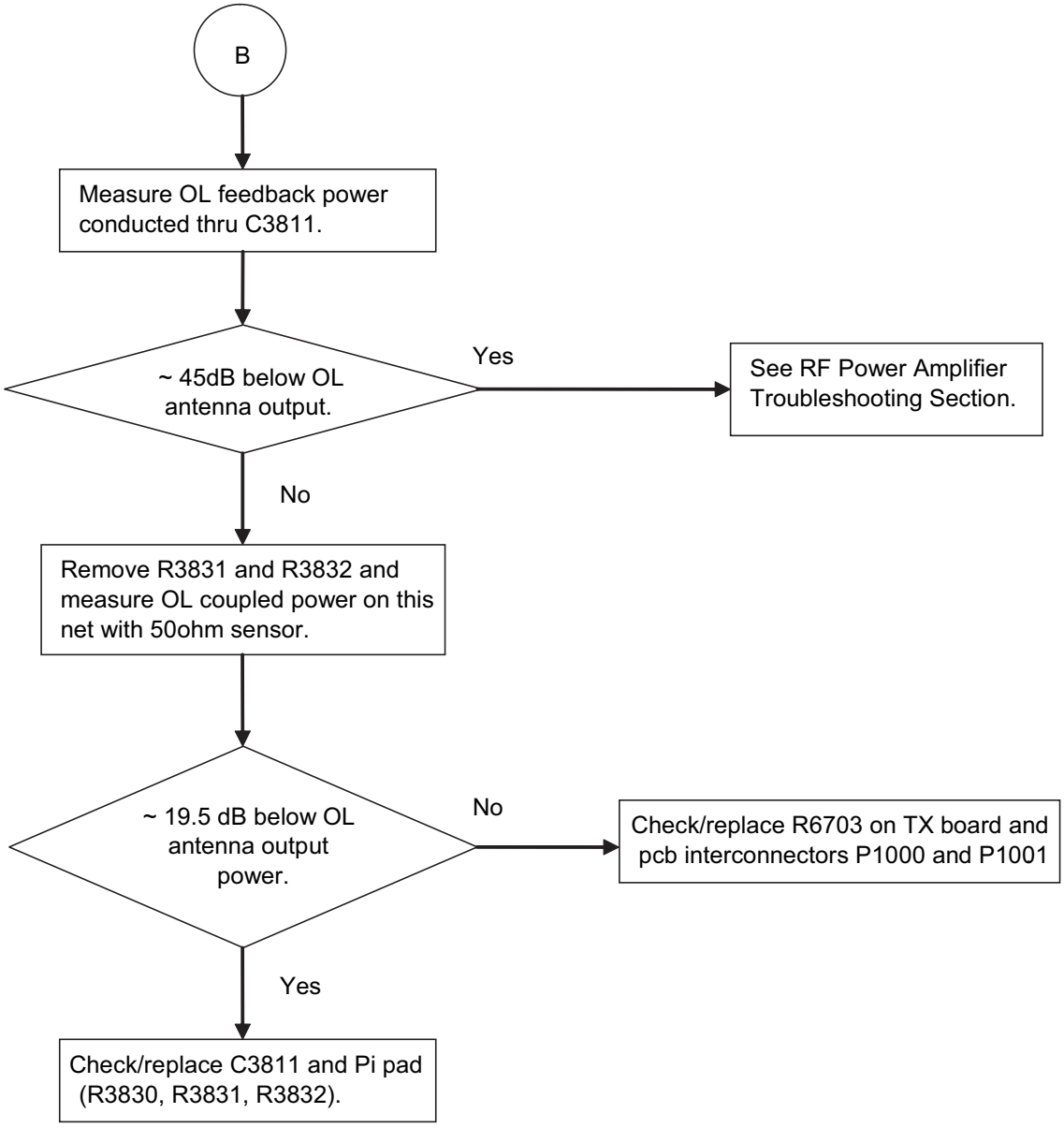
5.4.28 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 1 of 6



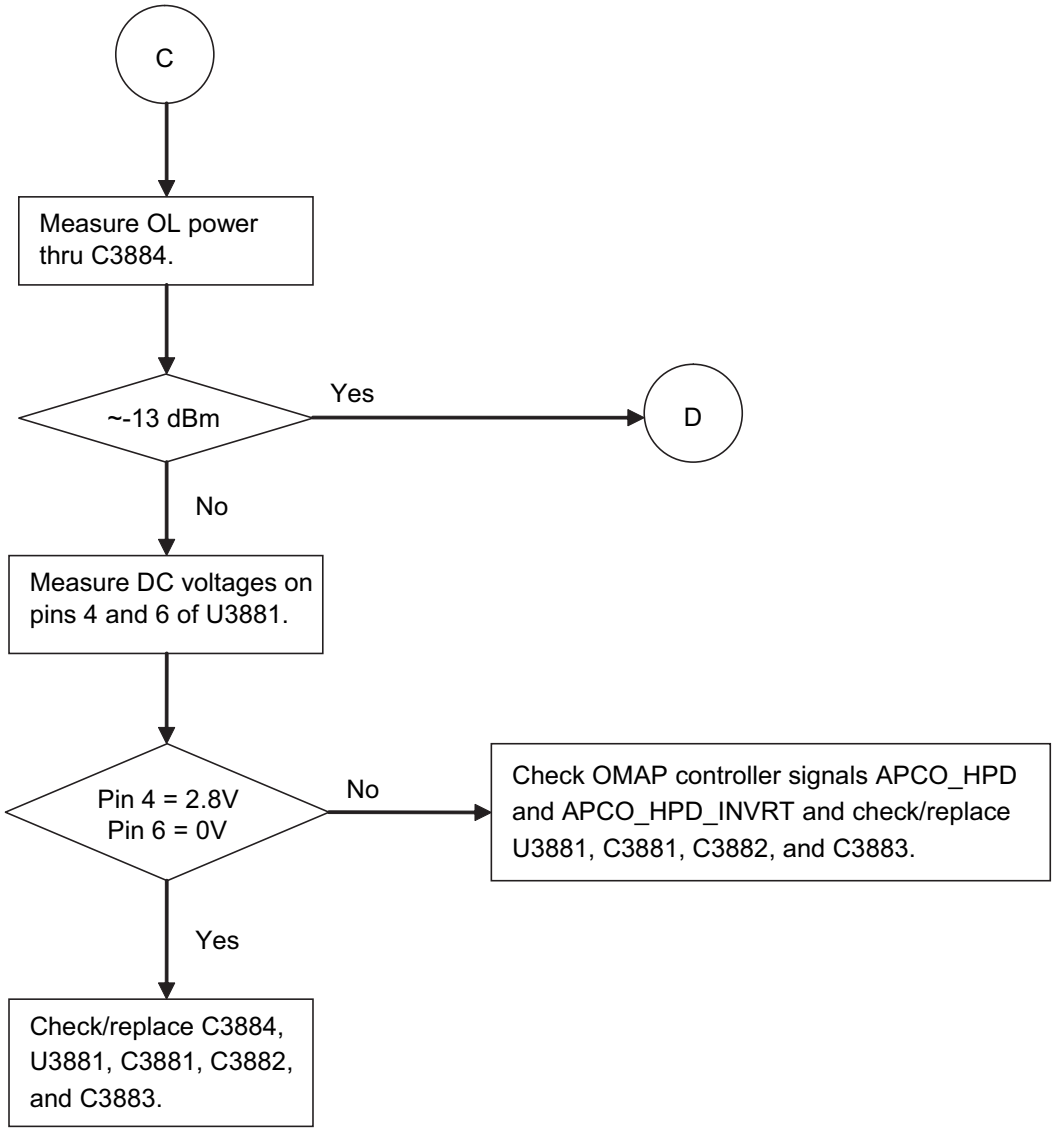
5.4.29 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 2 of 6



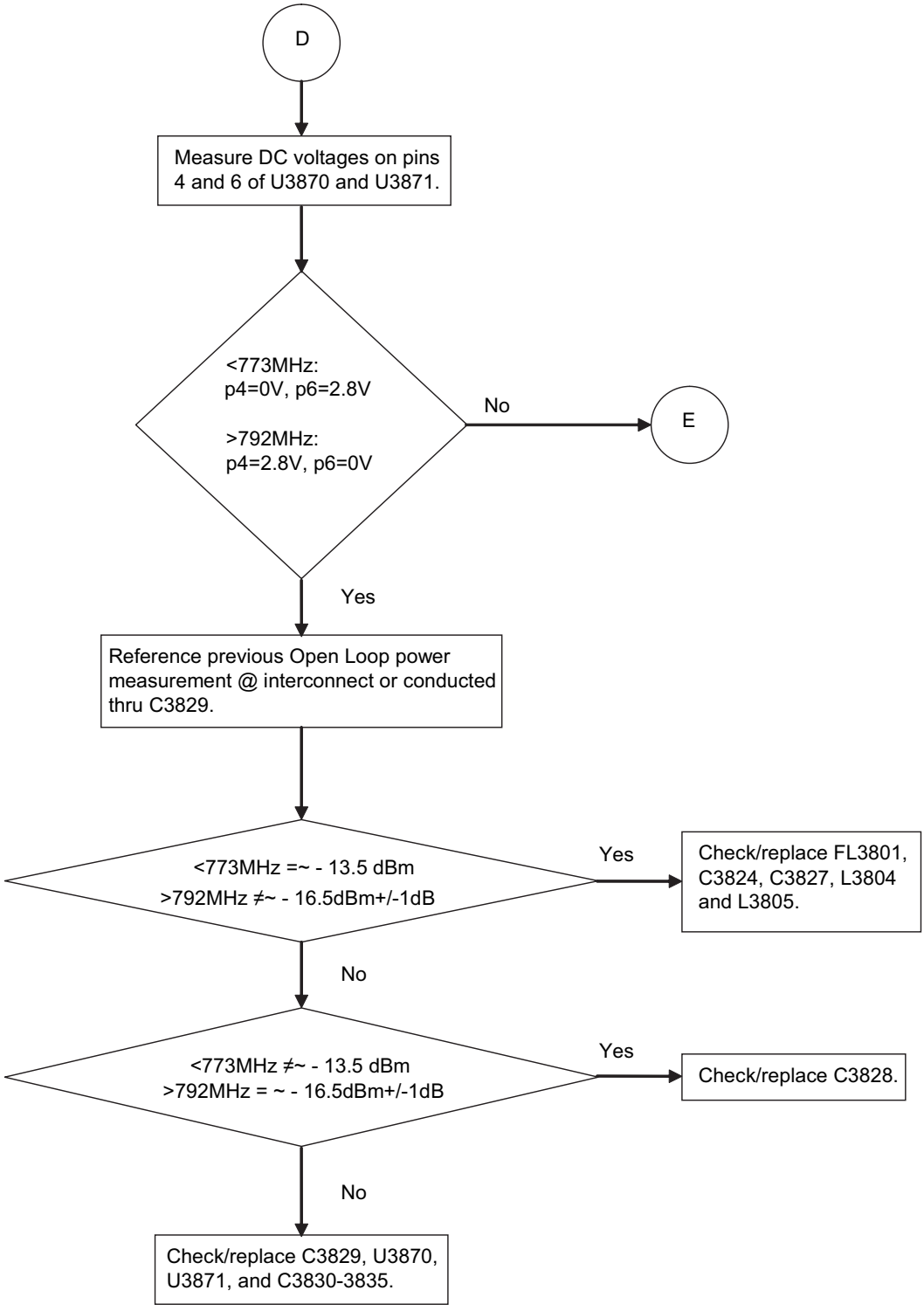
5.4.30 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 3 of 6



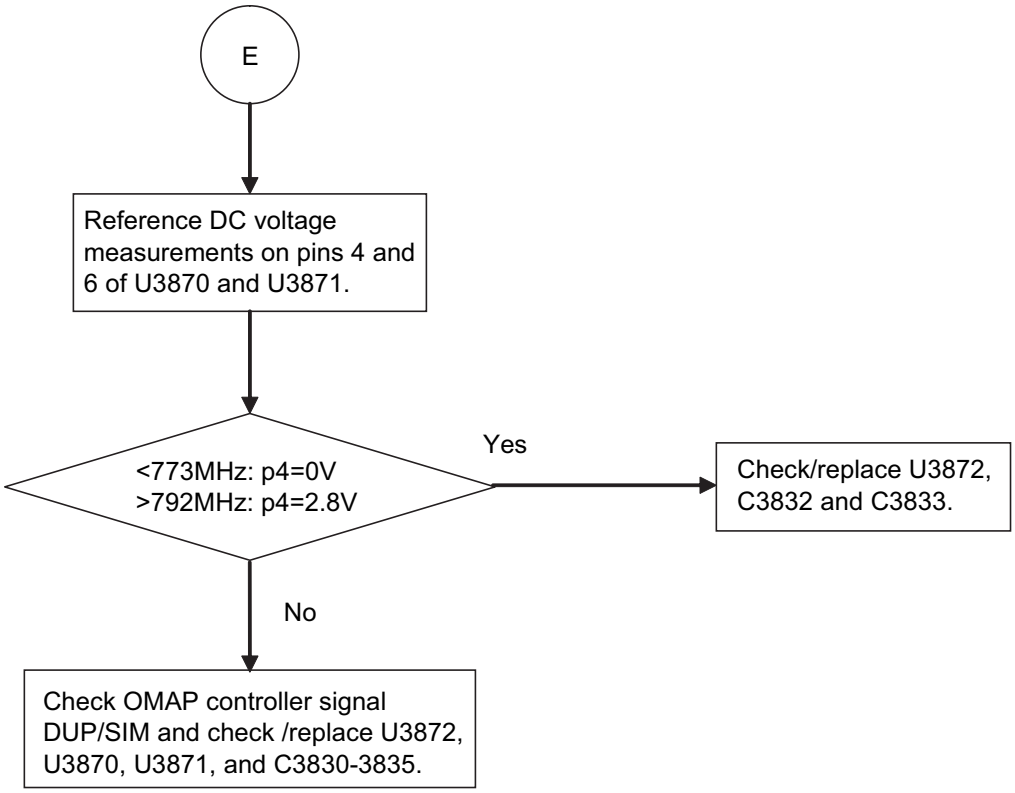
5.4.31 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 4 of 6



5.4.32 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 5 of 6



5.4.33 HPD Linear Tx Issue (Power, Spectrum, or ACP) -Sheet 6 of 6



Chapter 6 Troubleshooting Waveforms

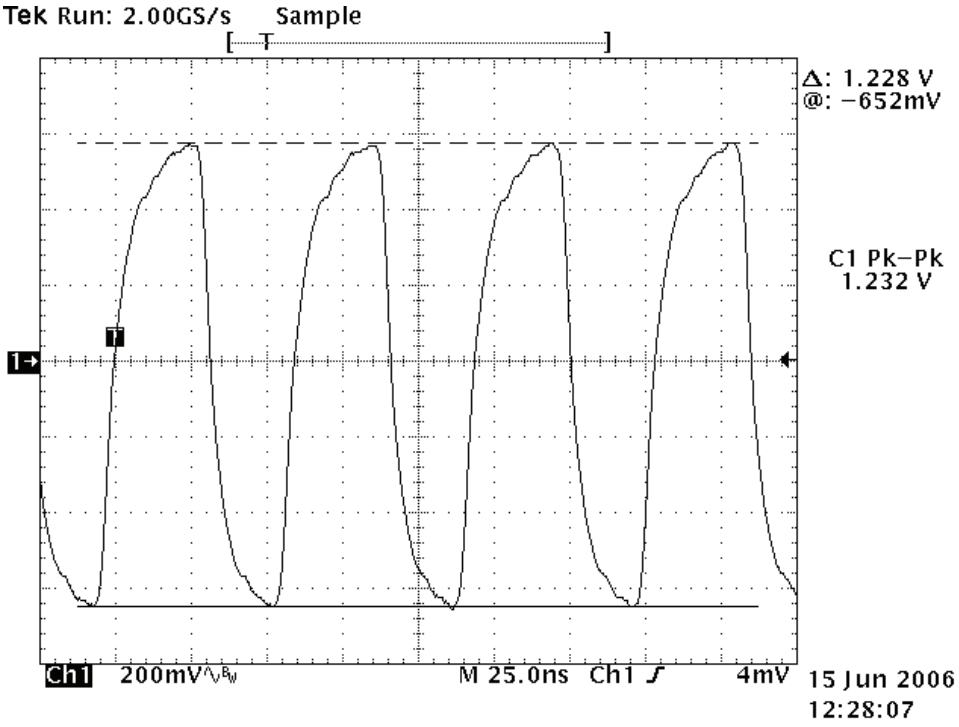
6.1 Introduction

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

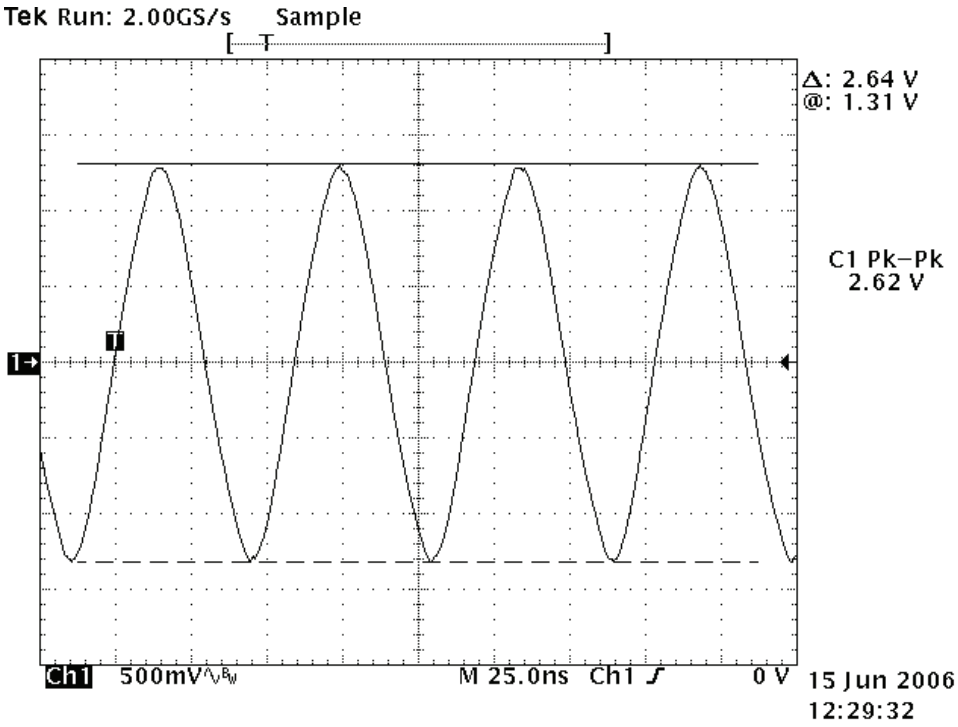
Table 6-1. List of Troubleshooting Waveforms

6.2 16.8 MHz Reference Oscillator Y6750 Typical Waveforms

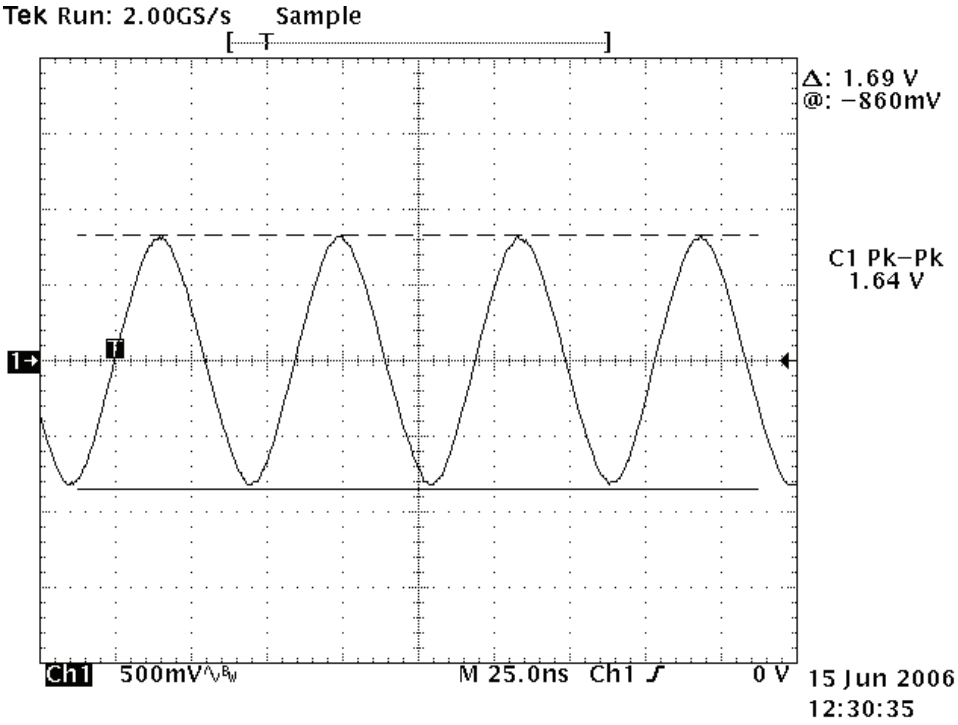
6.2.1 Oscillator Output Measured at TP6823



6.2.2 Oscillator Output Measured at TP6774

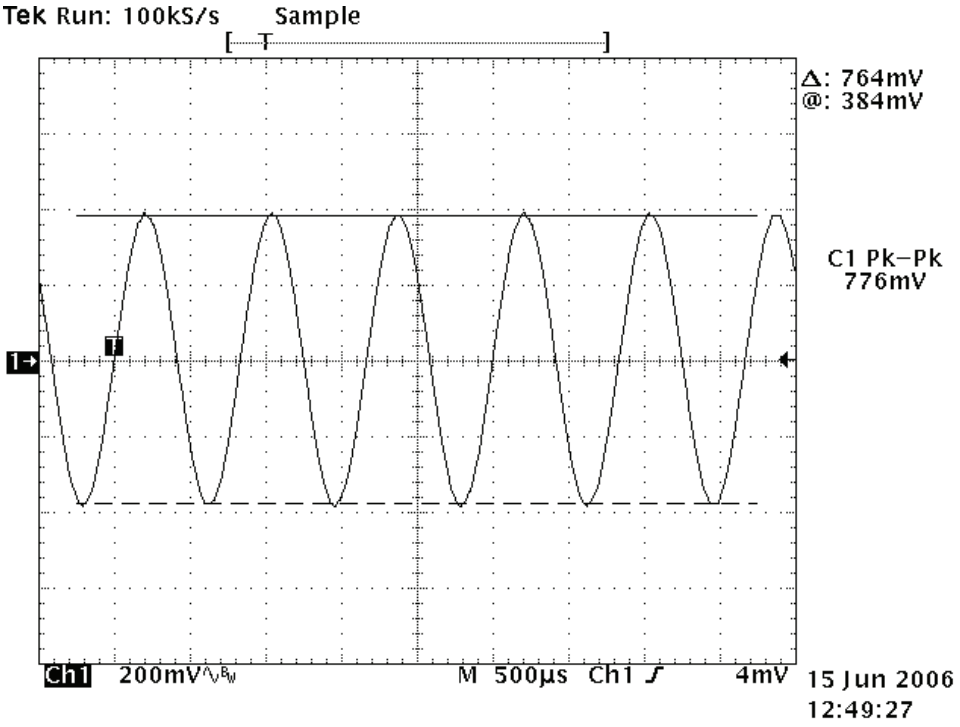


6.2.3 Oscillator Output Measured at TP6769

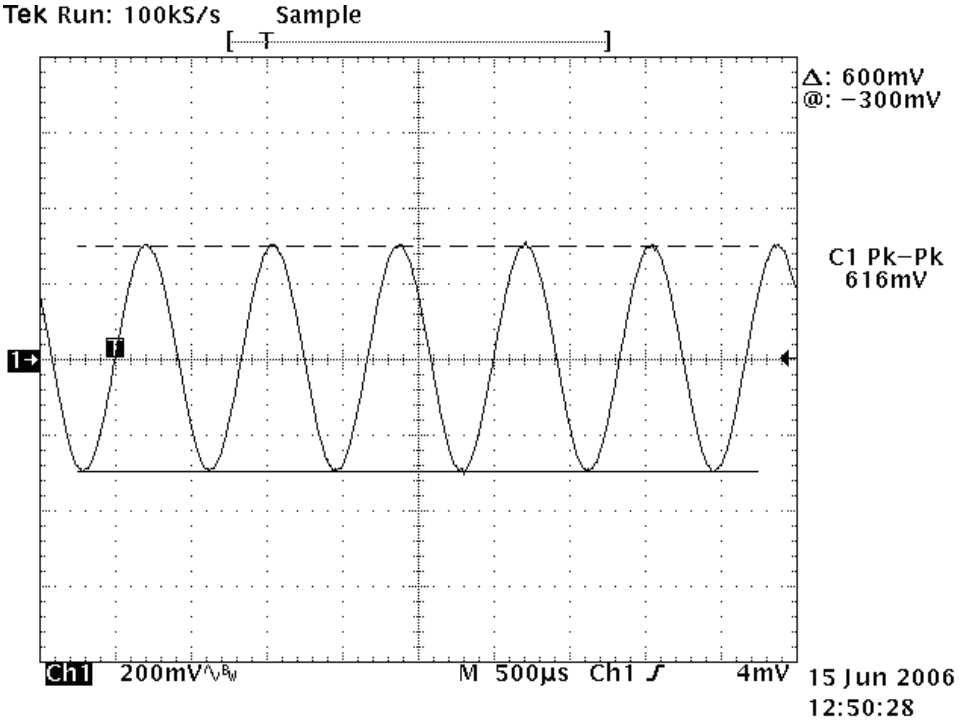


6.3 APCO Modulation Typical Waveforms 1200 Hz Tone

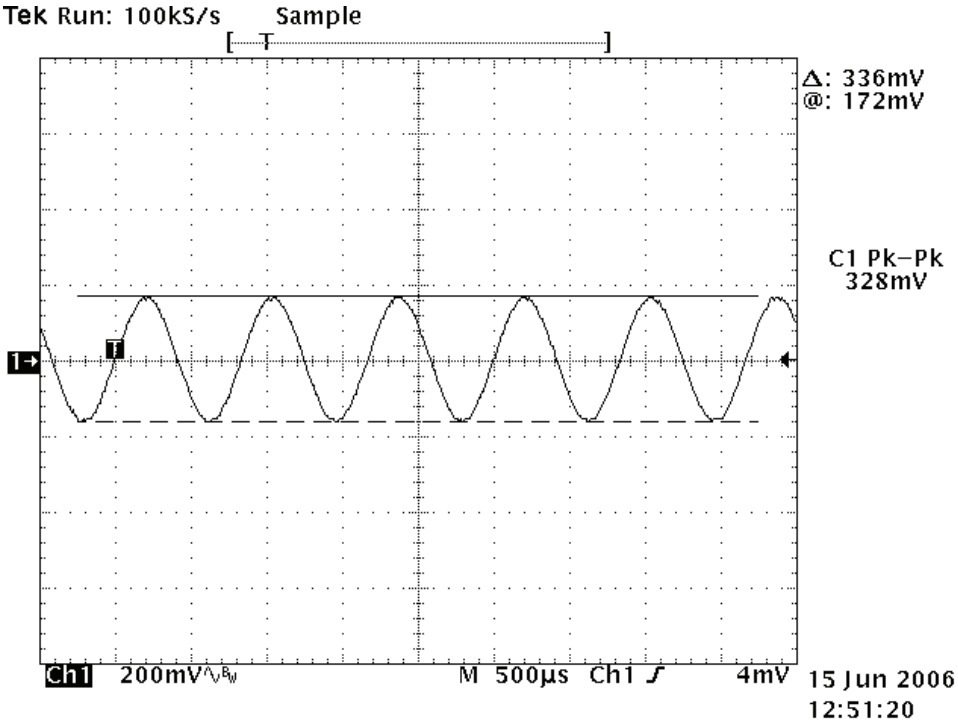
6.3.1 APCO Modulation measured at TP6825



6.3.2 APCO Modulation measured at TP6763



6.3.3 APCO Modulation measured at TP6783



Notes

Chapter 7 Schematics, Component Location Diagrams, and Parts Lists

7.1 List of Schematics, Component Location Diagrams, and Parts Lists

The following table lists the schematics, component location diagrams, and parts lists contained in this chapter.

Table 7-1. List of Schematics, Component Location Diagrams, and Parts Lists

Table 7-1. List of Schematics, Component Location Diagrams, and Parts Lists (Continued)

7.2 HUF4021 Transceiver/Controller Main Board

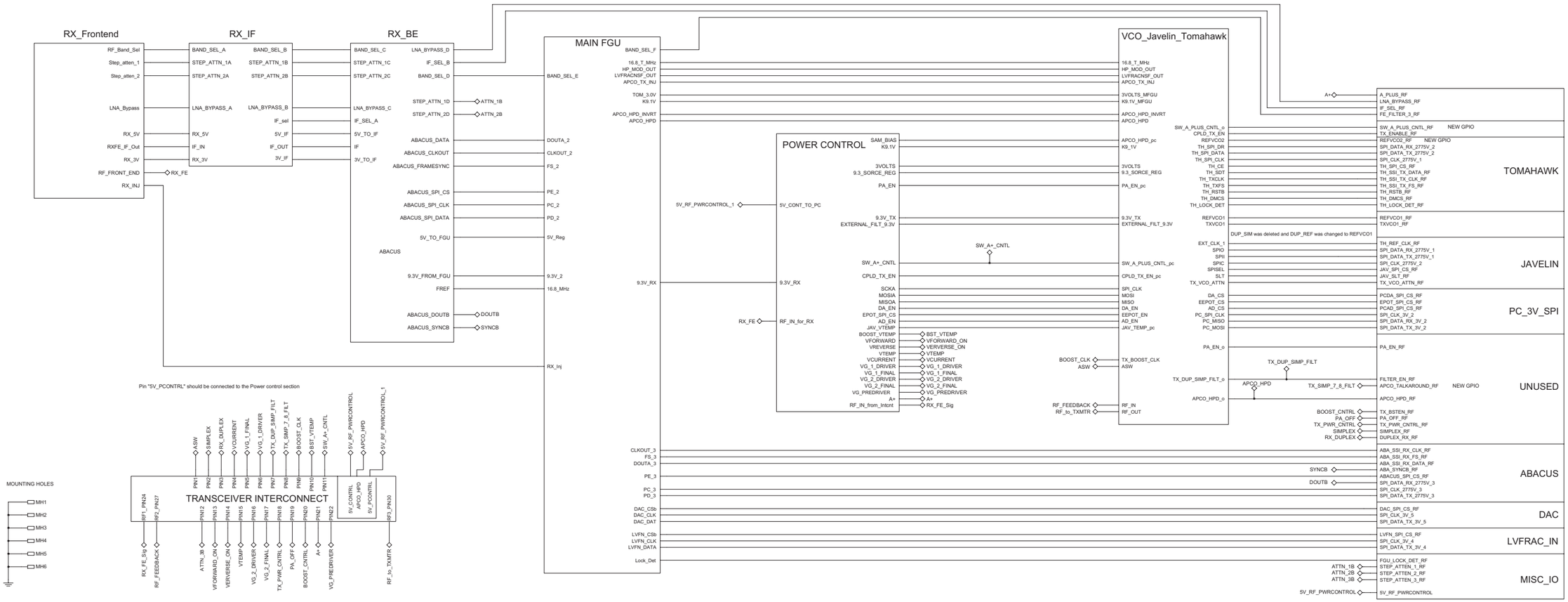


Figure 7-1. HSD Transceiver

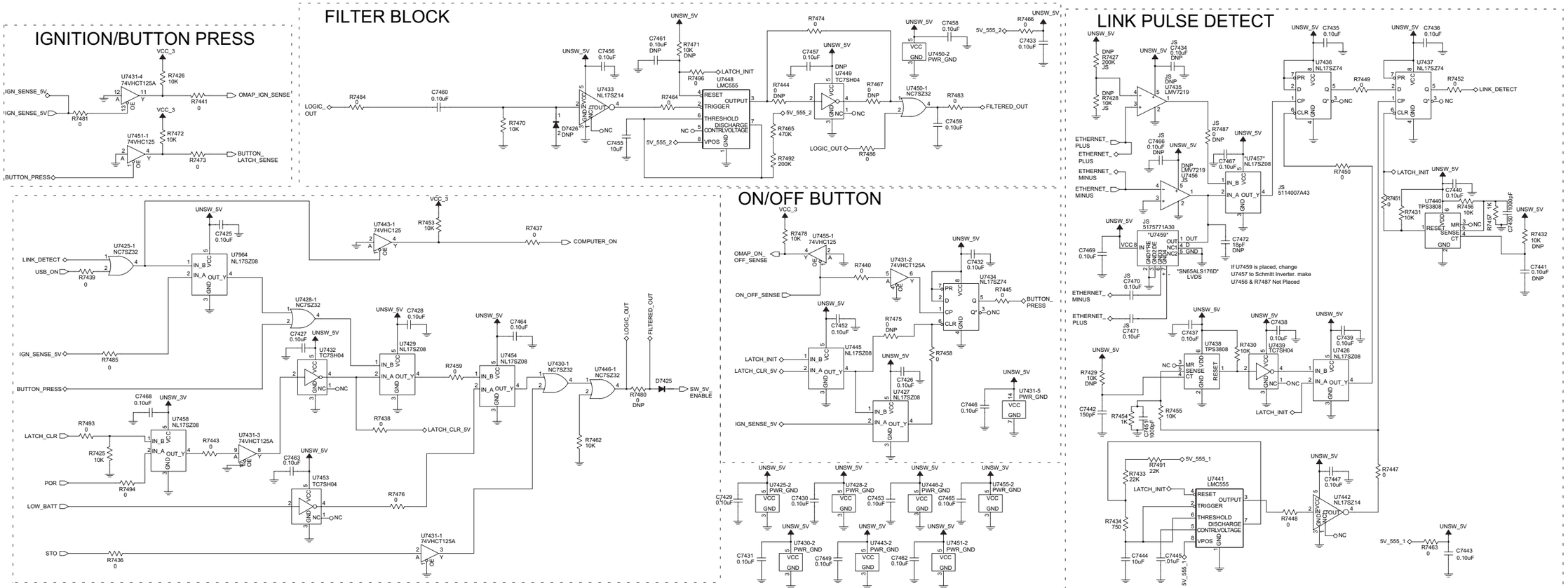


Figure 7-2. ON OFF

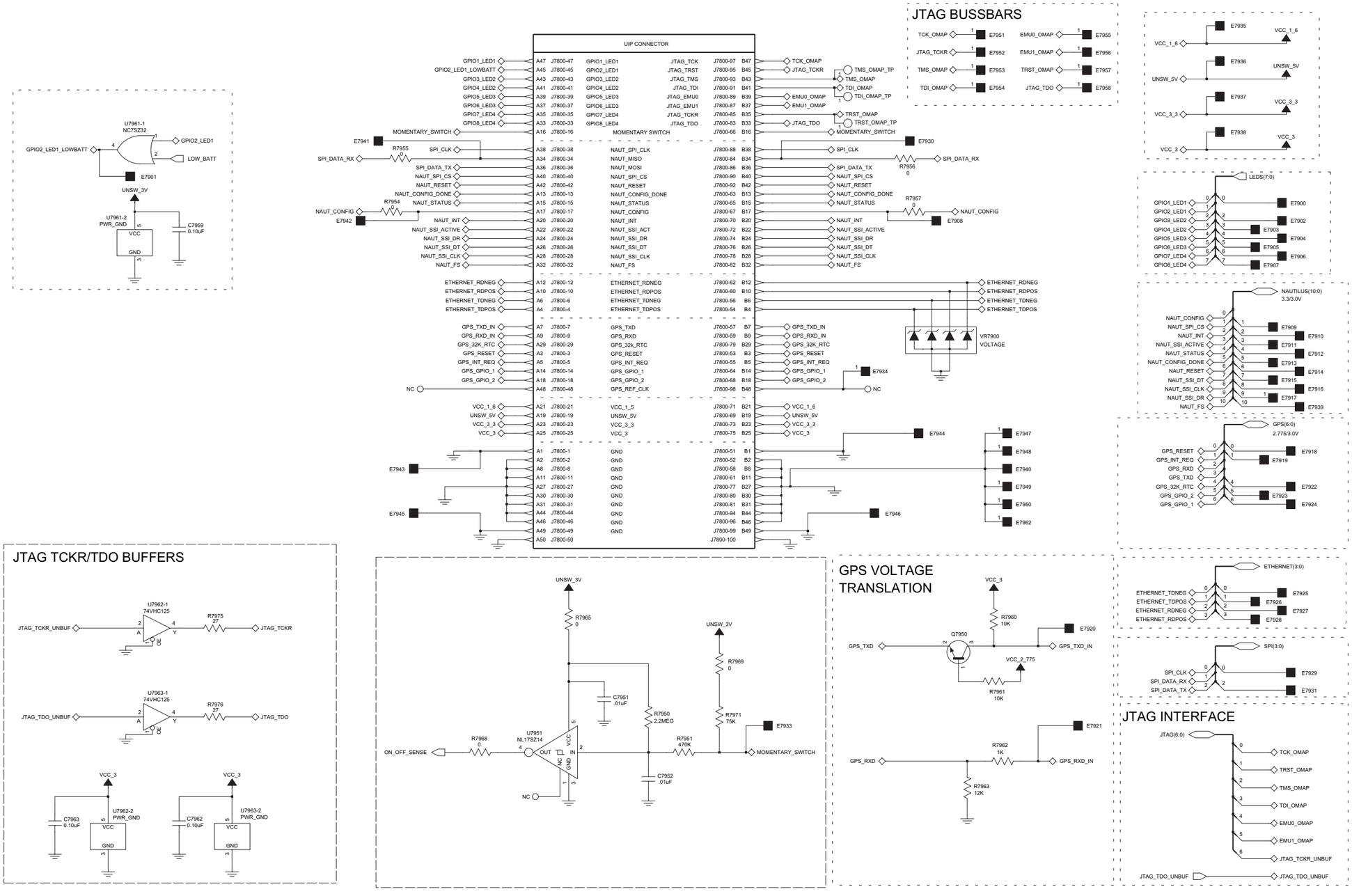
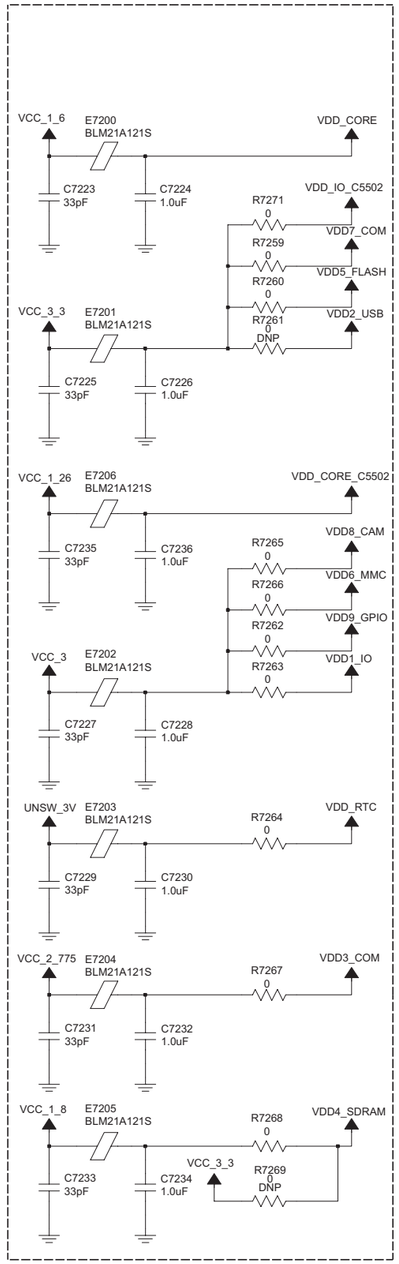
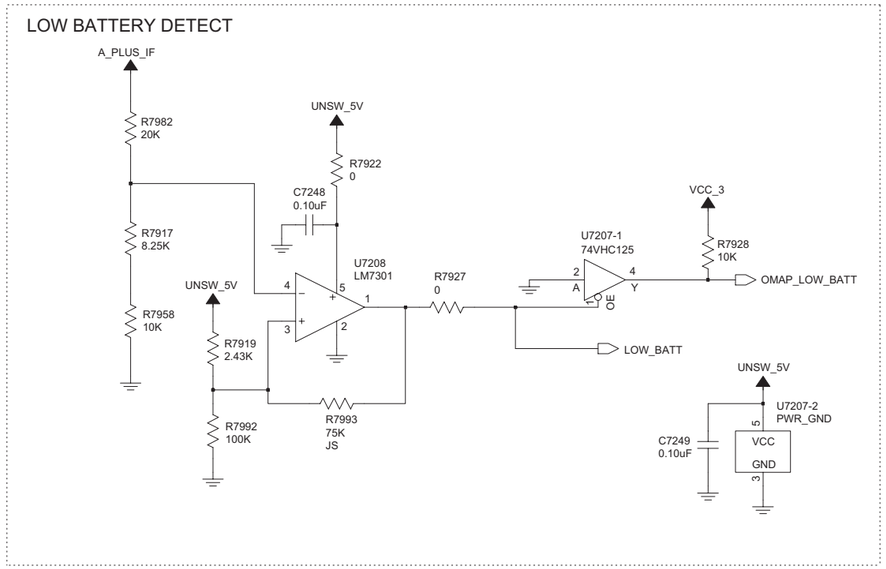


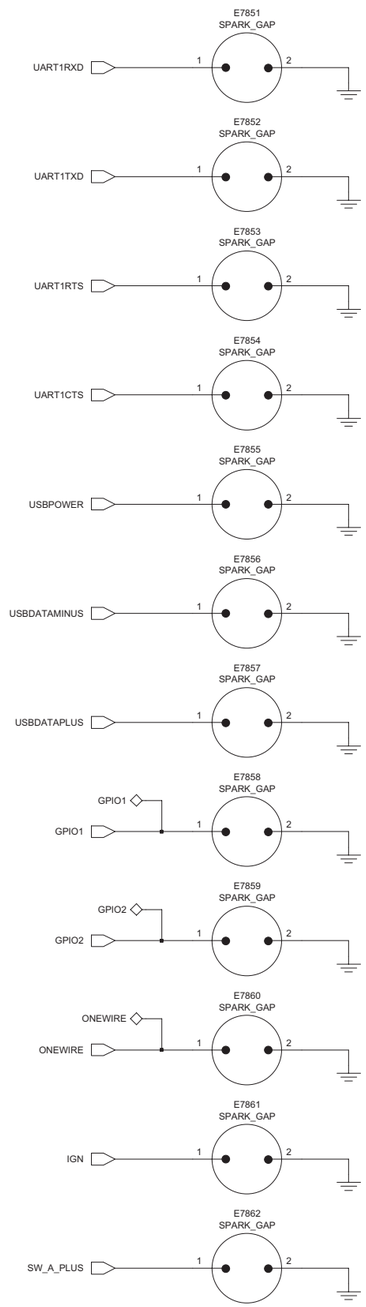
Figure 7-3. UIP 100 Pin Connector

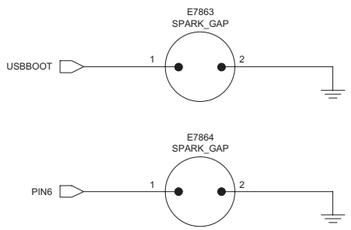




DC Voltage Table				
Supply Type				
Name	Value	Range	Part No.	Current
VCC_1_26	1.26V	1.21 - 1.32V	TPS65010	
VCC_1_5	1.5V	1.46 - 1.55V	TPS65010	
VCC_1_8	1.8V	1.75 - 1.86 V	TPS65010	
VCC_2_775	2.8V	2.72 - 2.88V	LP2988	
VCC_3_3	3.3V	3.2 - 3.4V	TPS65010	
VCC_5	5.0V	4.75 - 5.25 V	LM2596	
UNSW_3V	3.0V	2.9 - 3.1V	LP3985	
UNSW_5V	5.0V	4.75 - 5.25 V	LM2925	
A+	13.8V	11 - 16.5 V		

Figure 7-4. DC





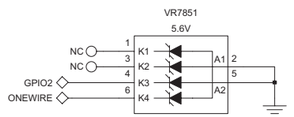


Figure 7-5. ESD Protection

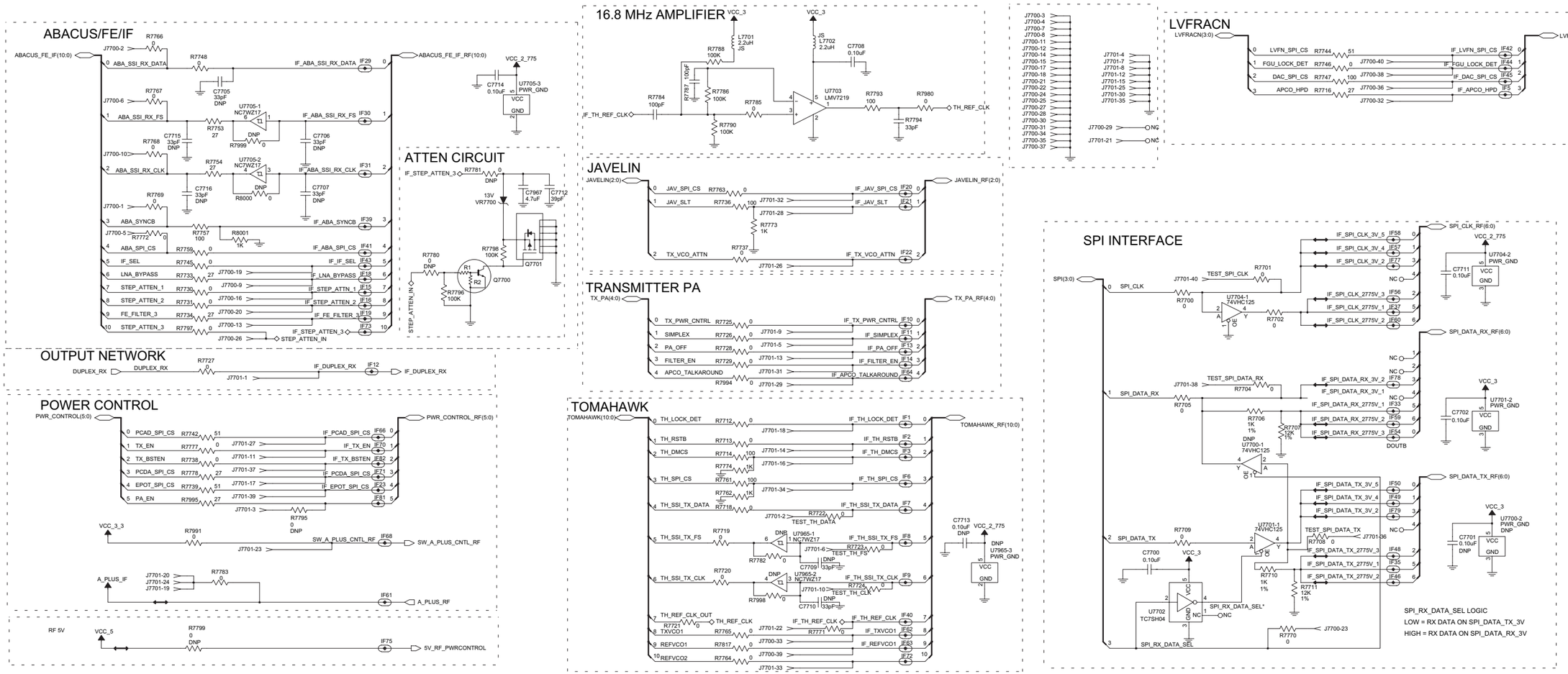


Figure 7-6. RF Interface

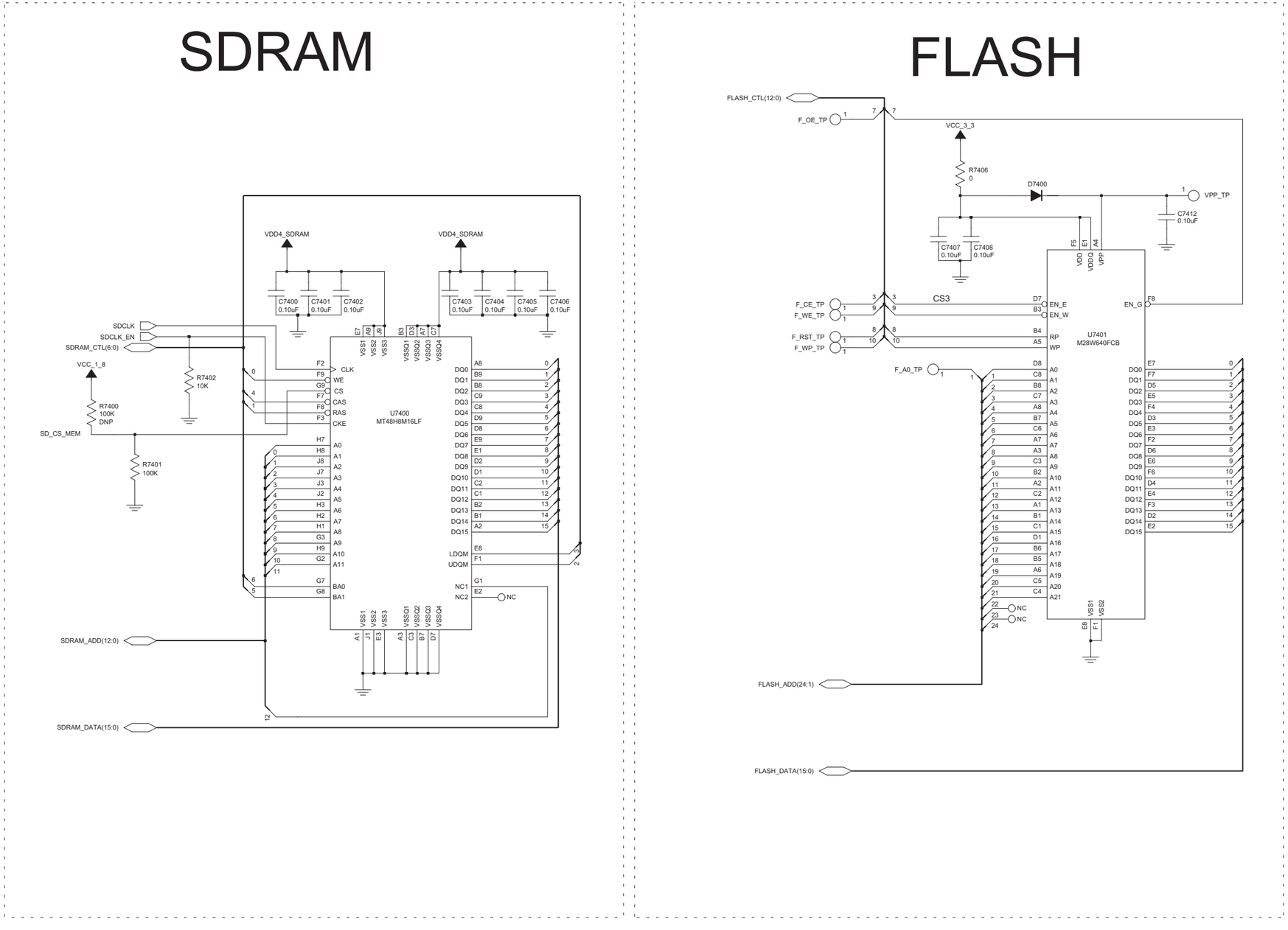


Figure 7-7. Memory

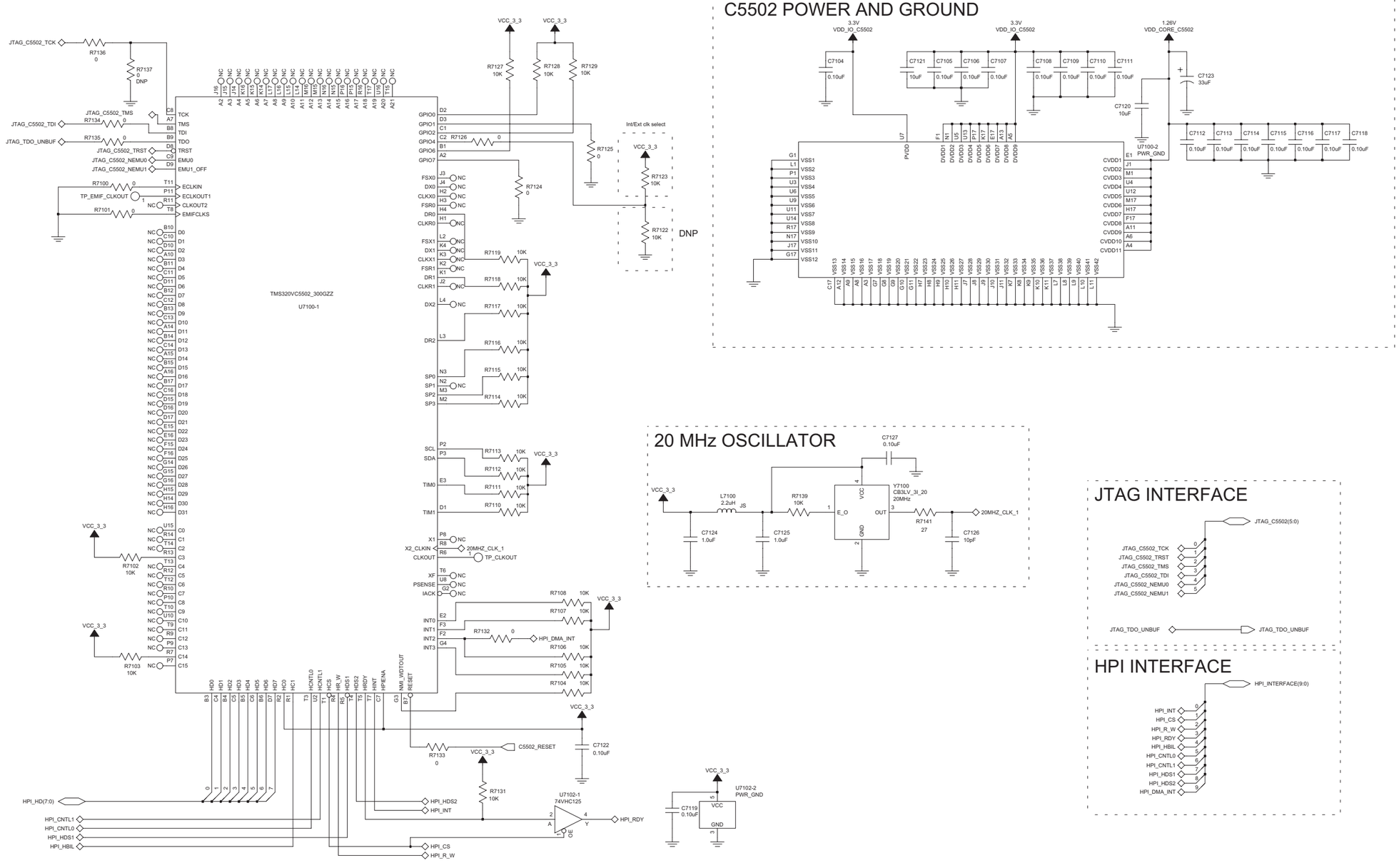


Figure 7-8. C5502

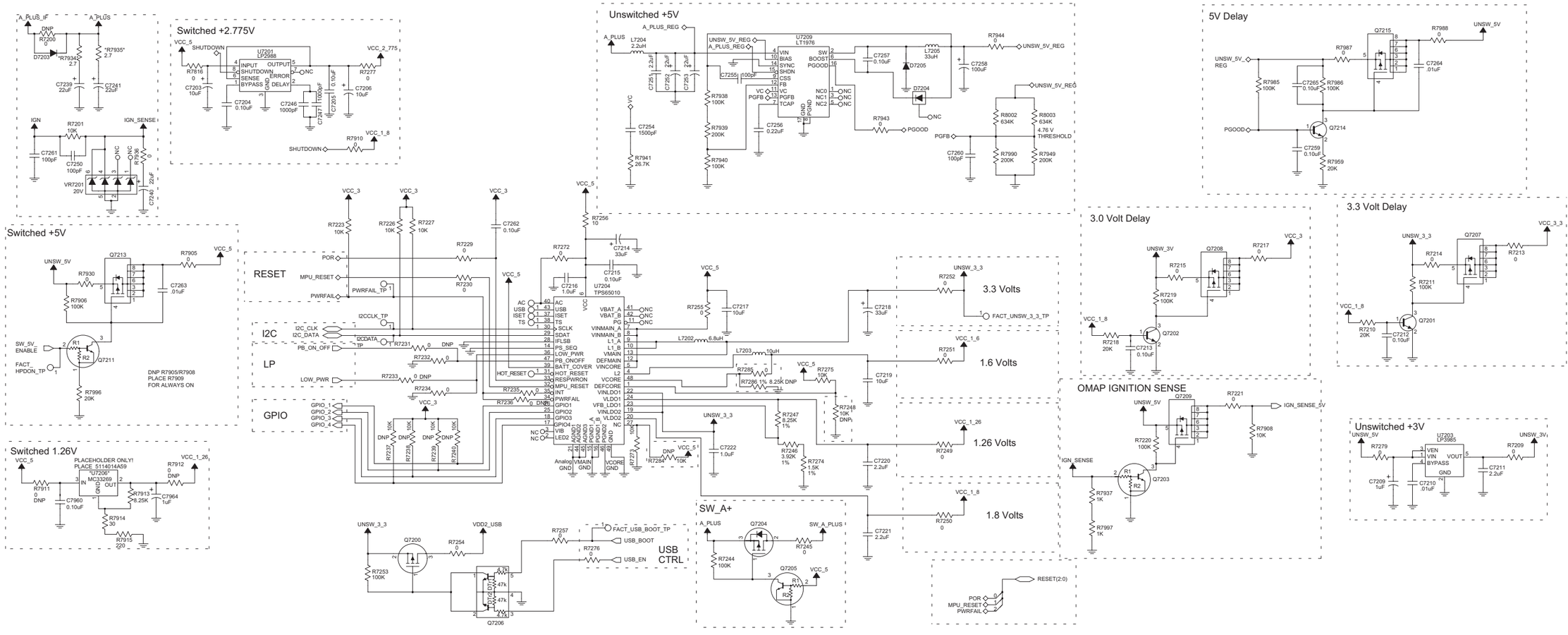
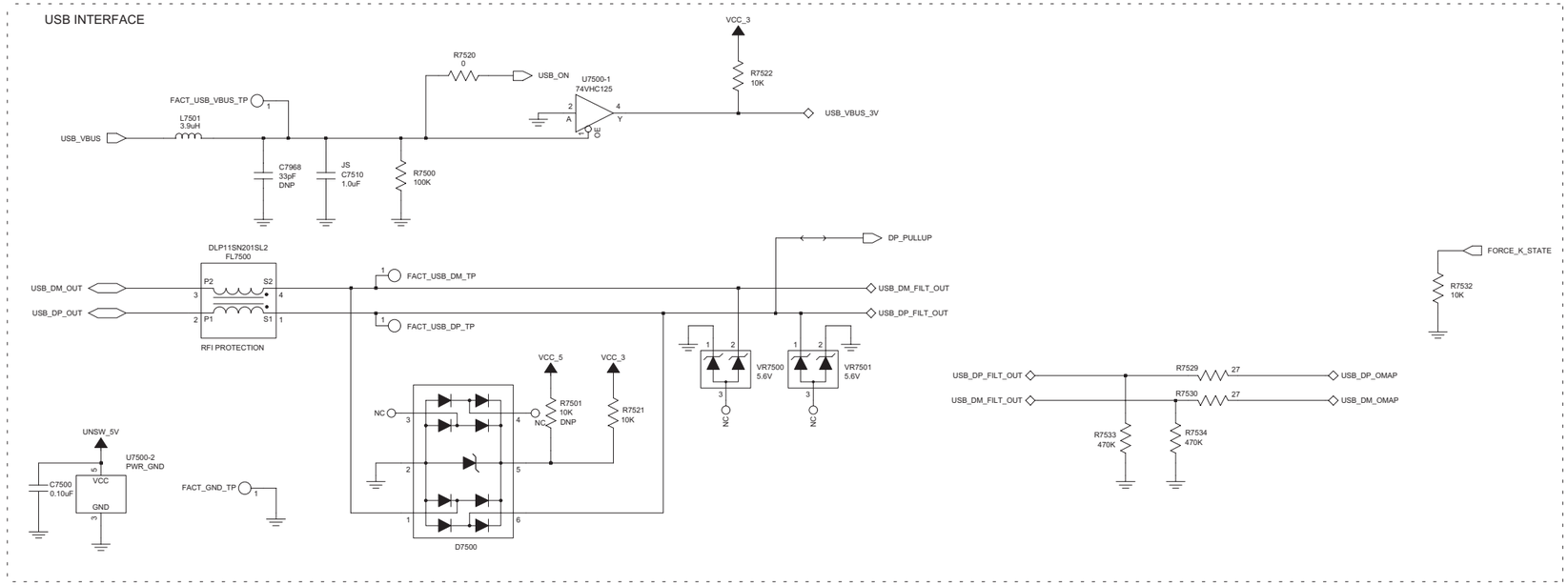

Switched +2.775V
Unswitched +5V
5V Delay
Switched +5V
RESET
I2C
LP
GPIO
3.3 Volts
1.6 Volts
1.26 Volts
1.8 Volts
3.0 Volt Delay
3.3 Volt Delay
OMAP IGNITION SENSE
Unswitched +3V
Switched 1.26V
SW_A+
USB CTRL
DNP R7905/R7908
PLACE R7909
FOR ALWAYS ON
PLACEHOLDER ONLY!
PLACE_5114014A59

Figure 7-9. DC



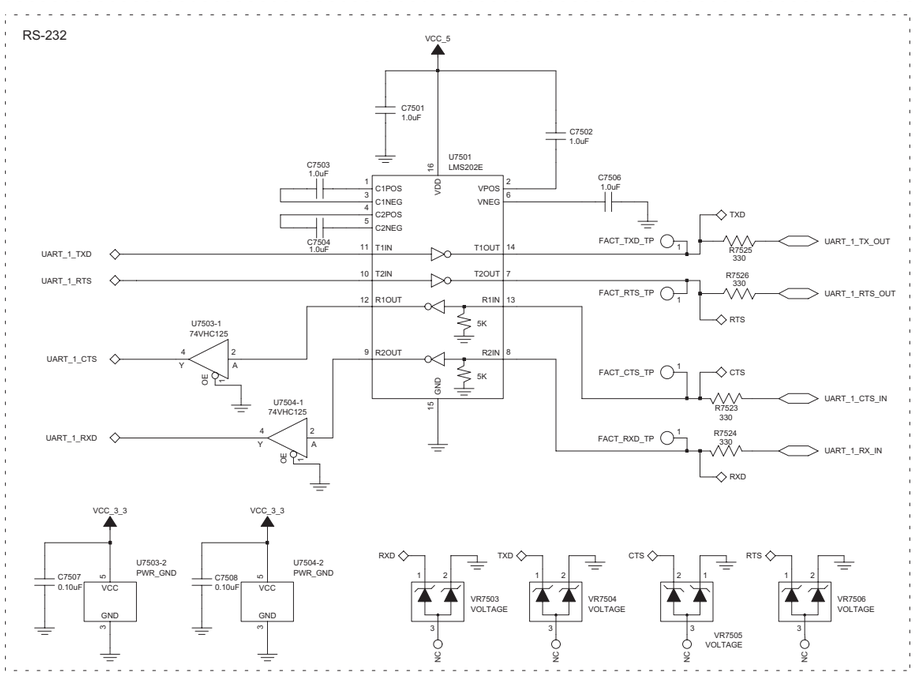
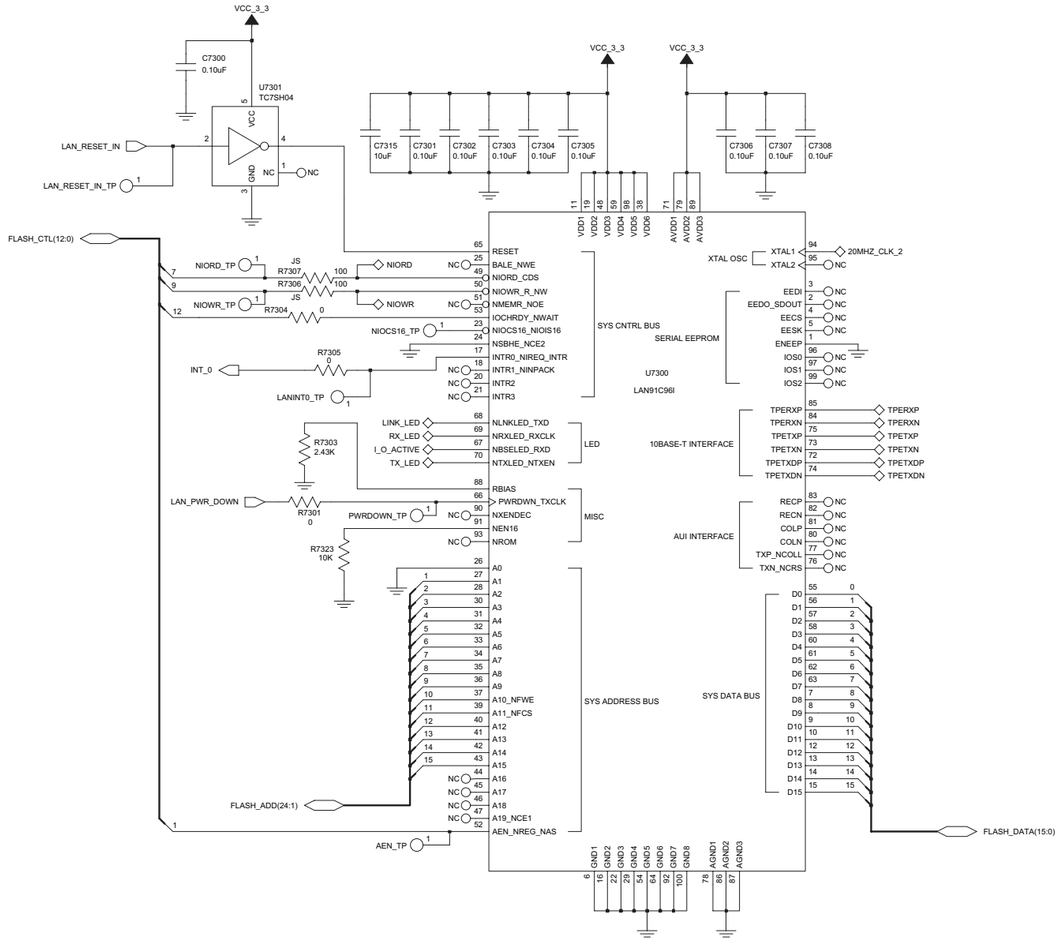
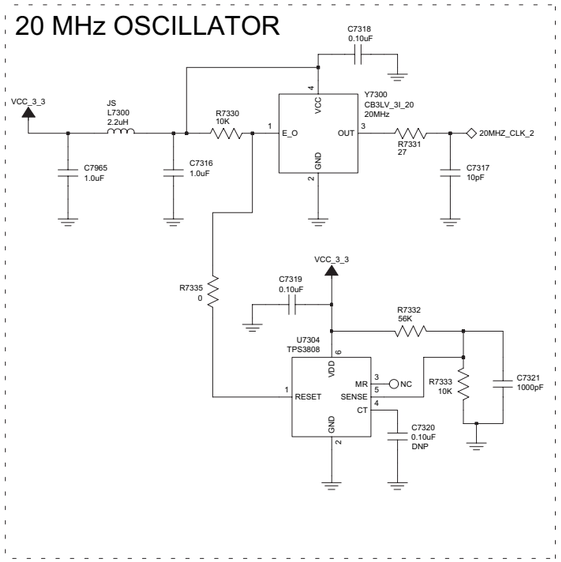
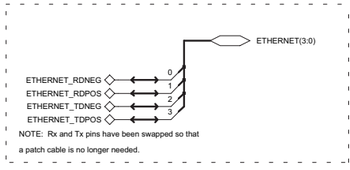
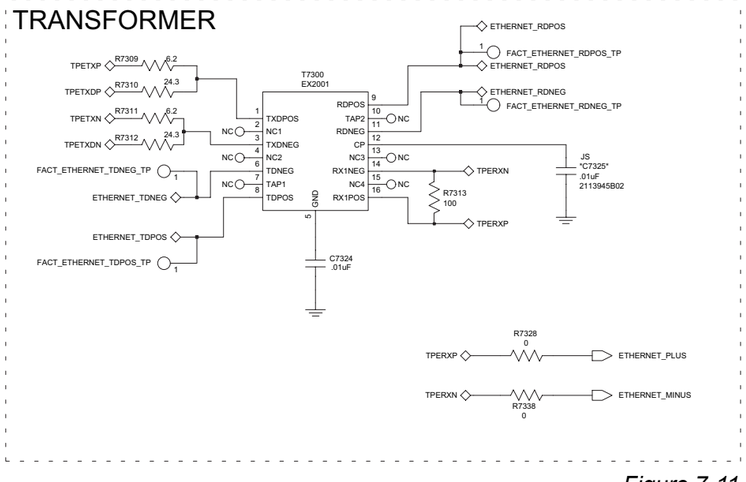


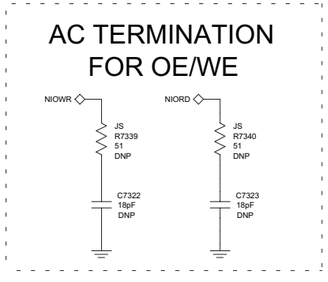
Figure 7-10. Connectivity











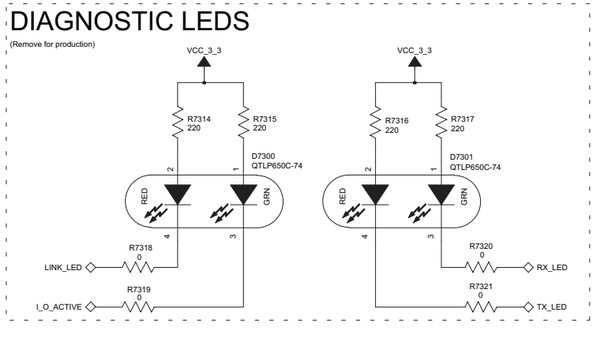


Figure 7-11. Ethernet

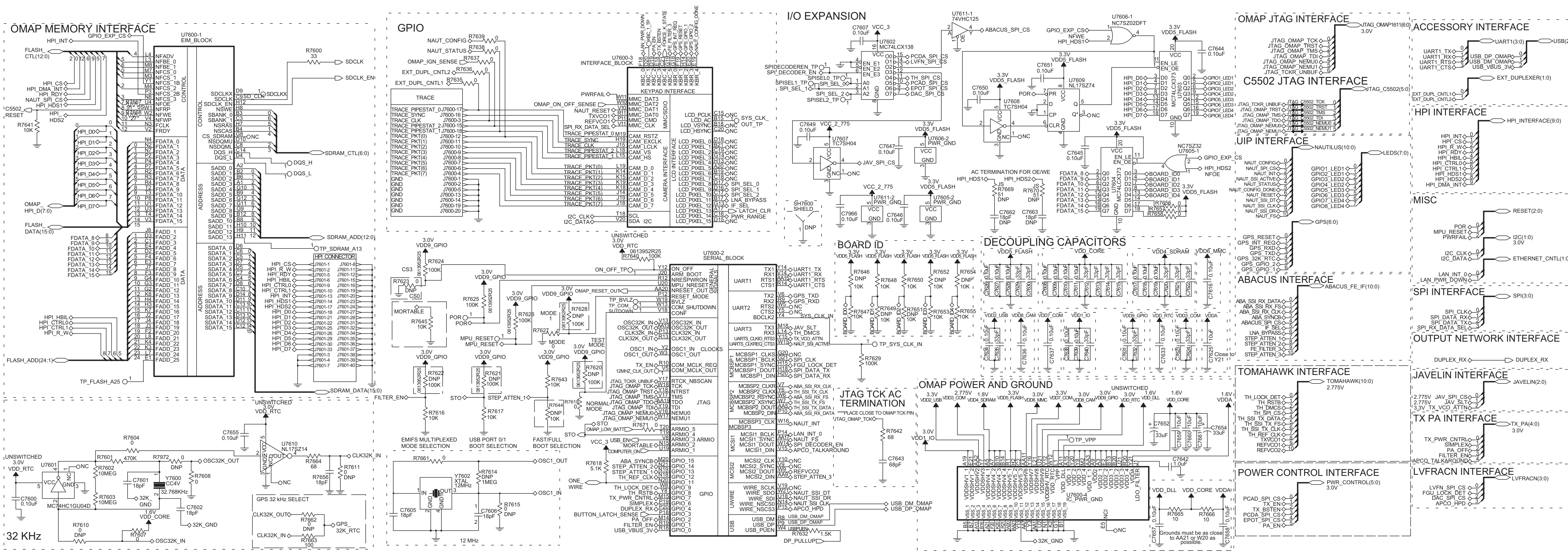


Figure 7-12. OMAP 1611

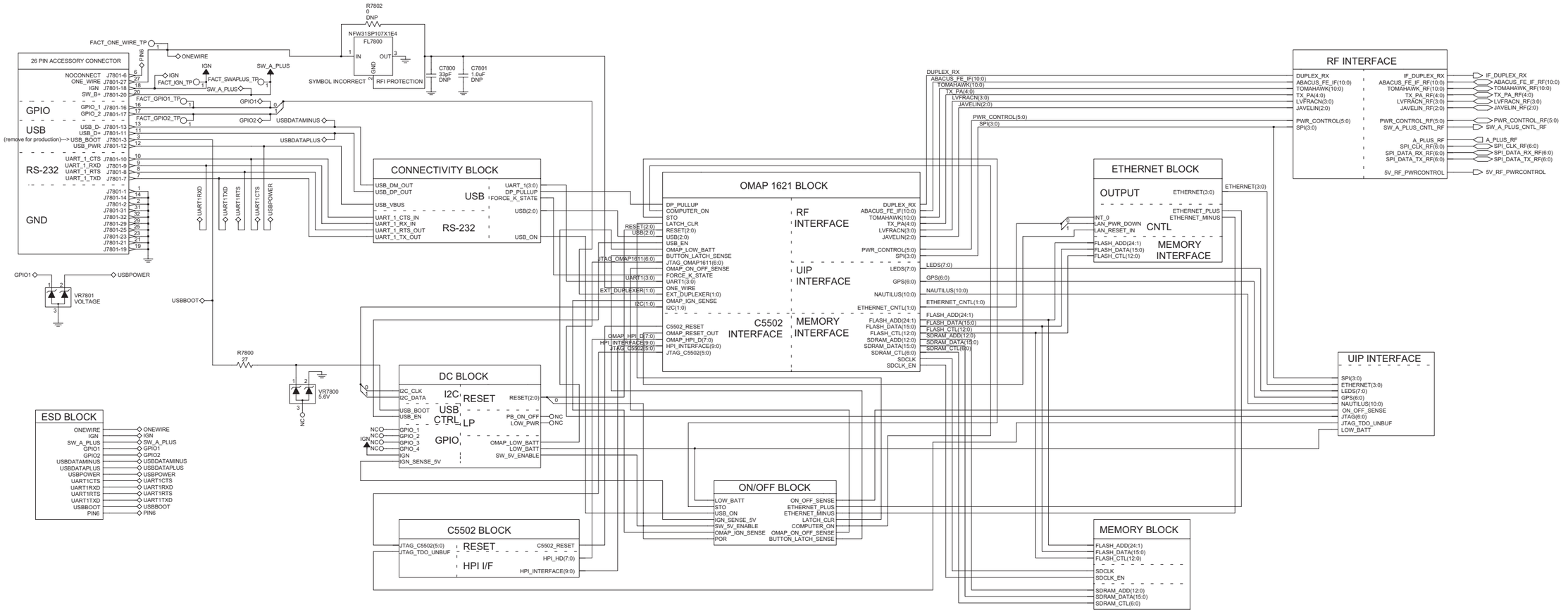


Figure 7-13. Controller

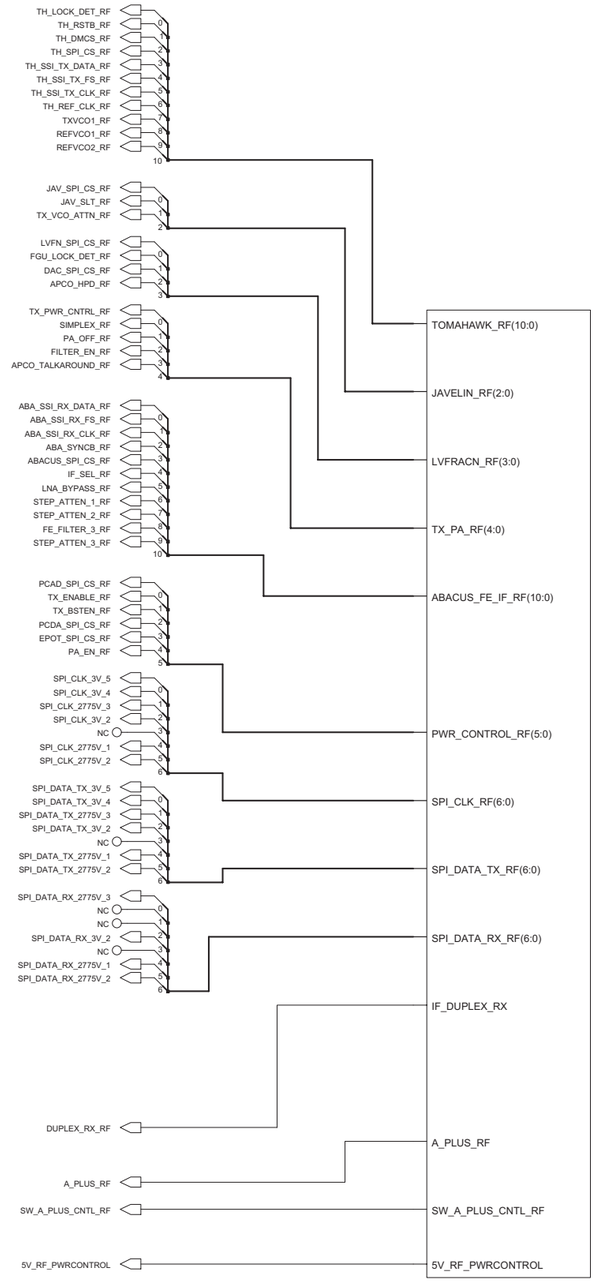


Figure 7-14. CNTL Synbol Merge

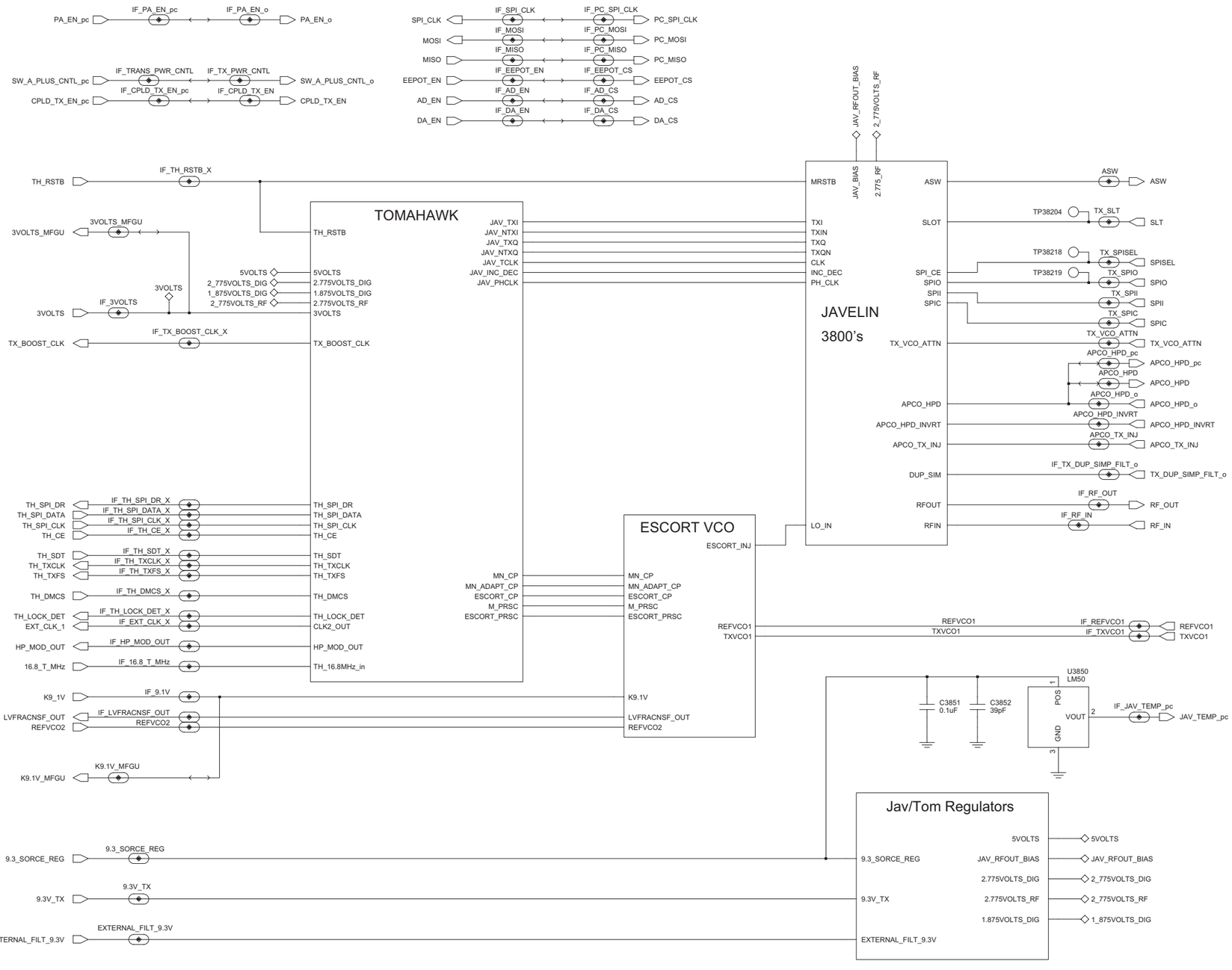


Figure 7-15. VCO Javelin Tomahawk (Block Diagram)

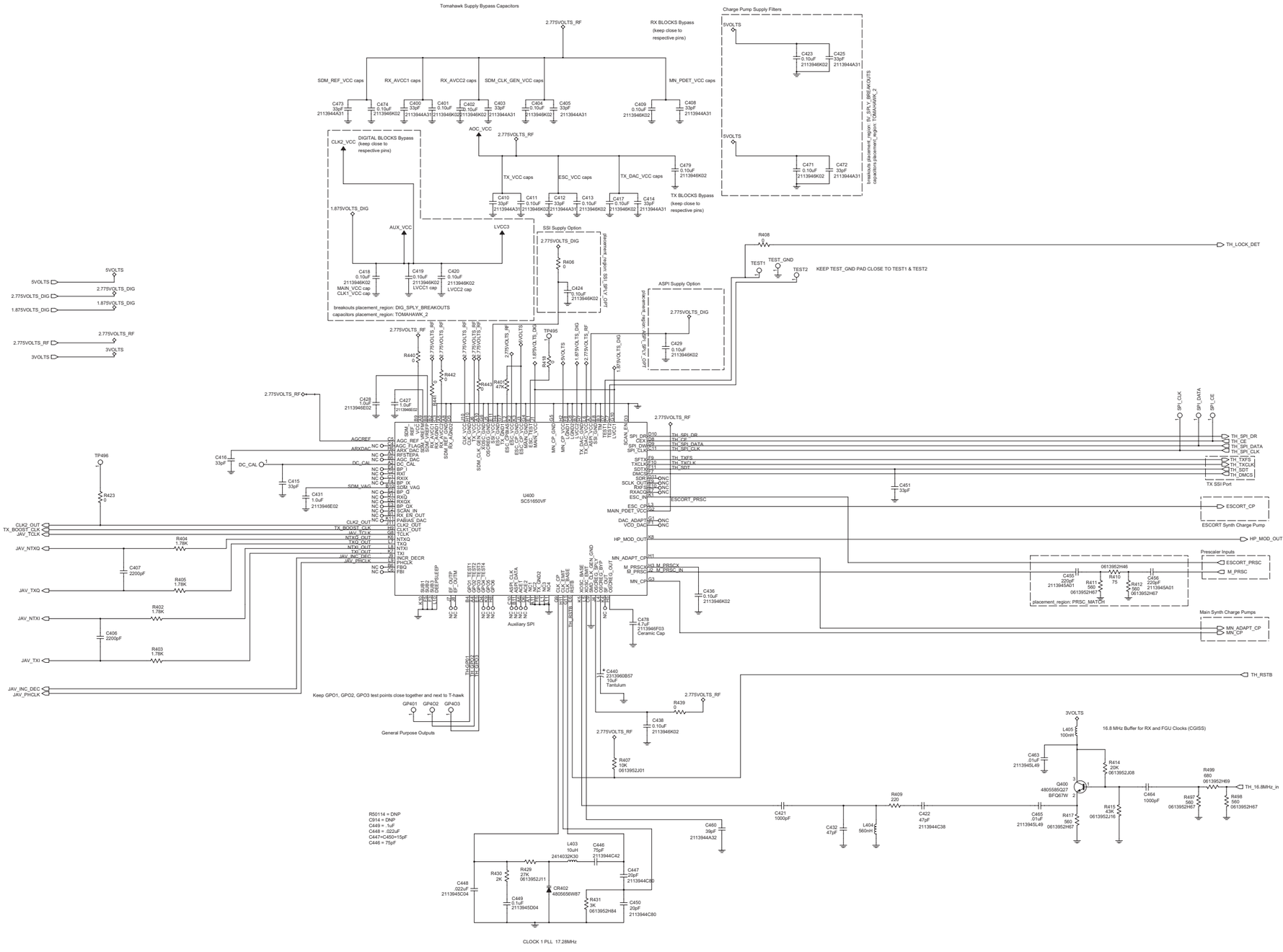


Figure 7-16. Tomahawk

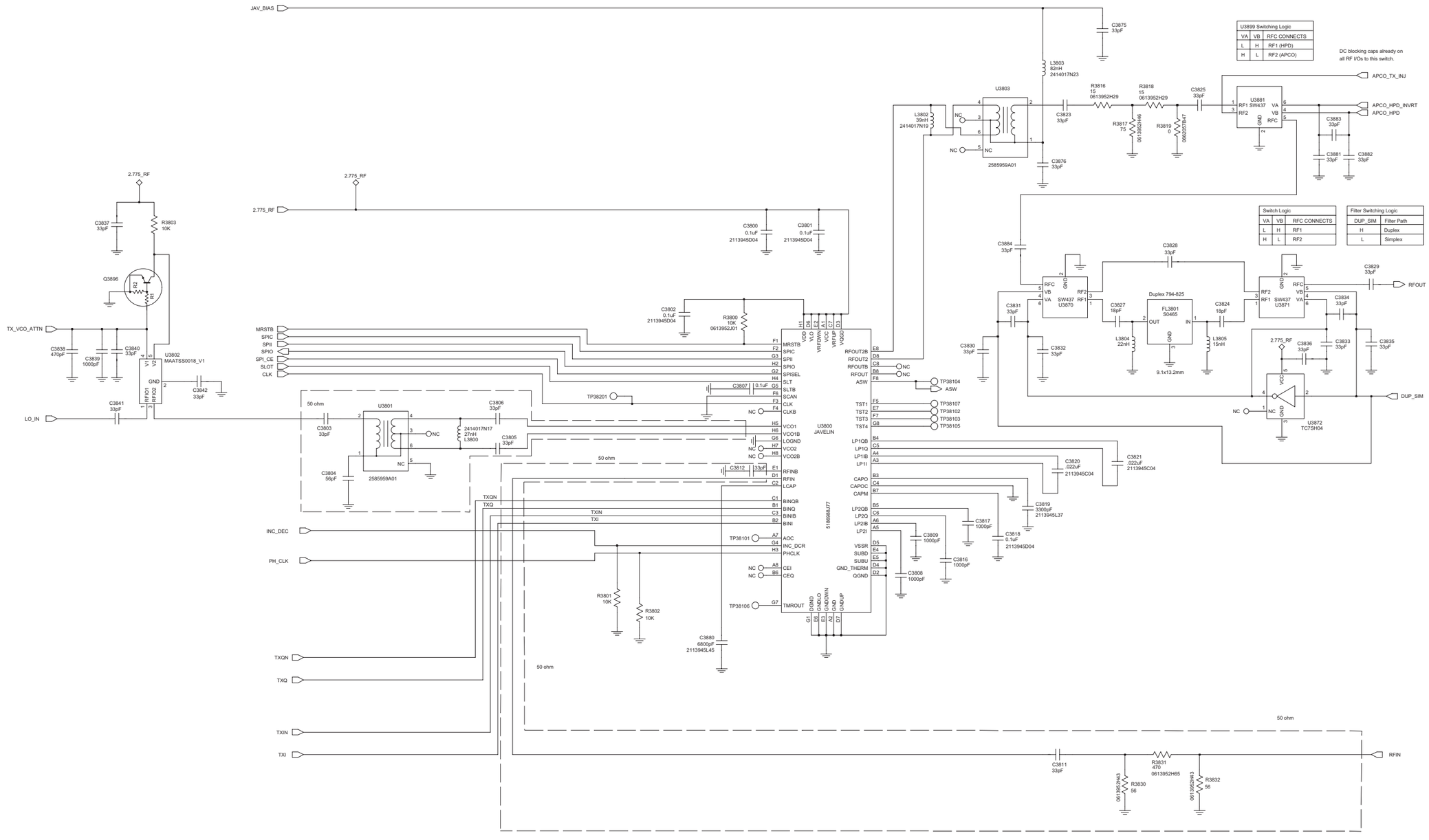


Figure 7-17. Javelin

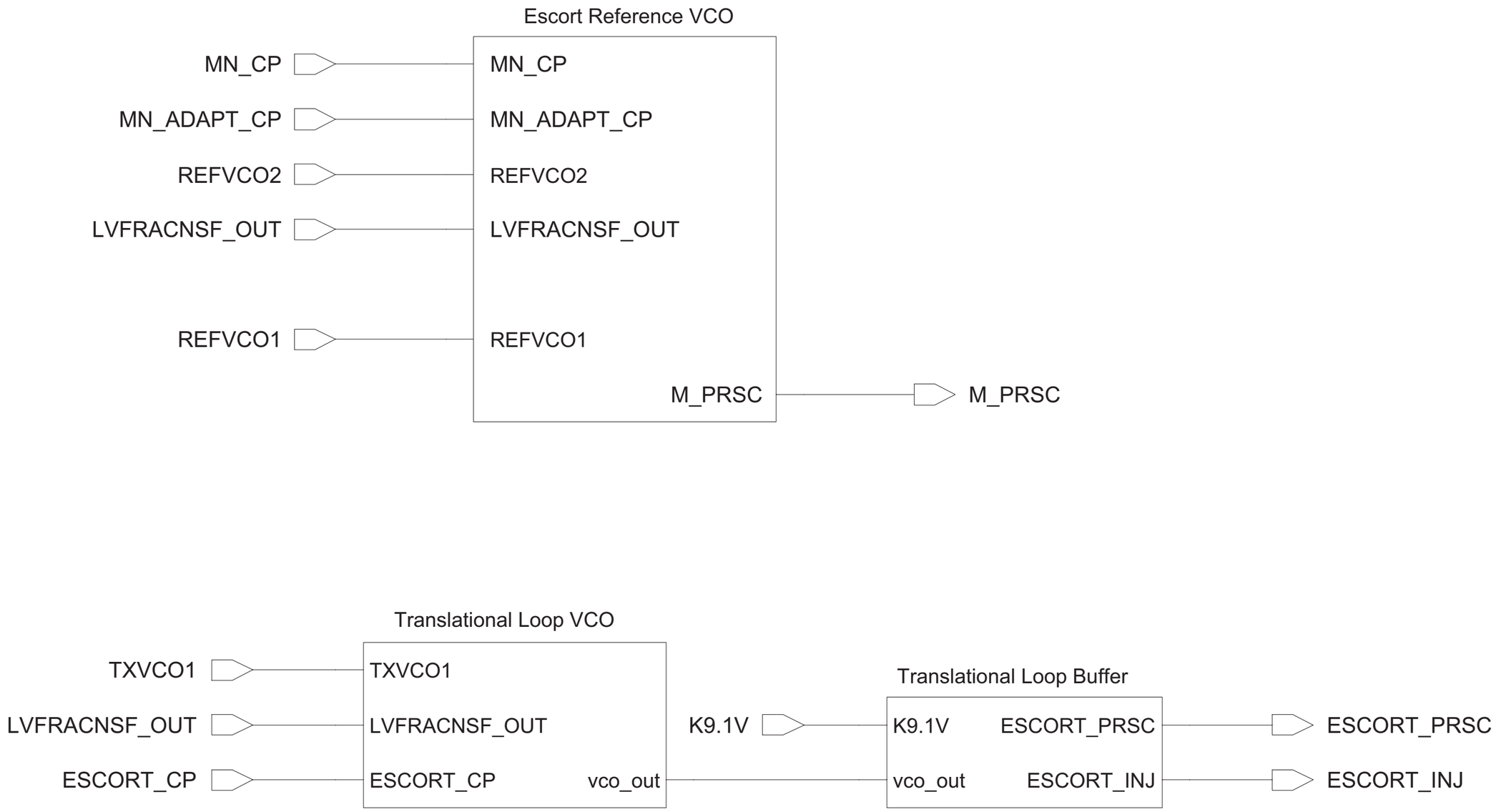


Figure 7-18. Escort VCO (Block Diagram)

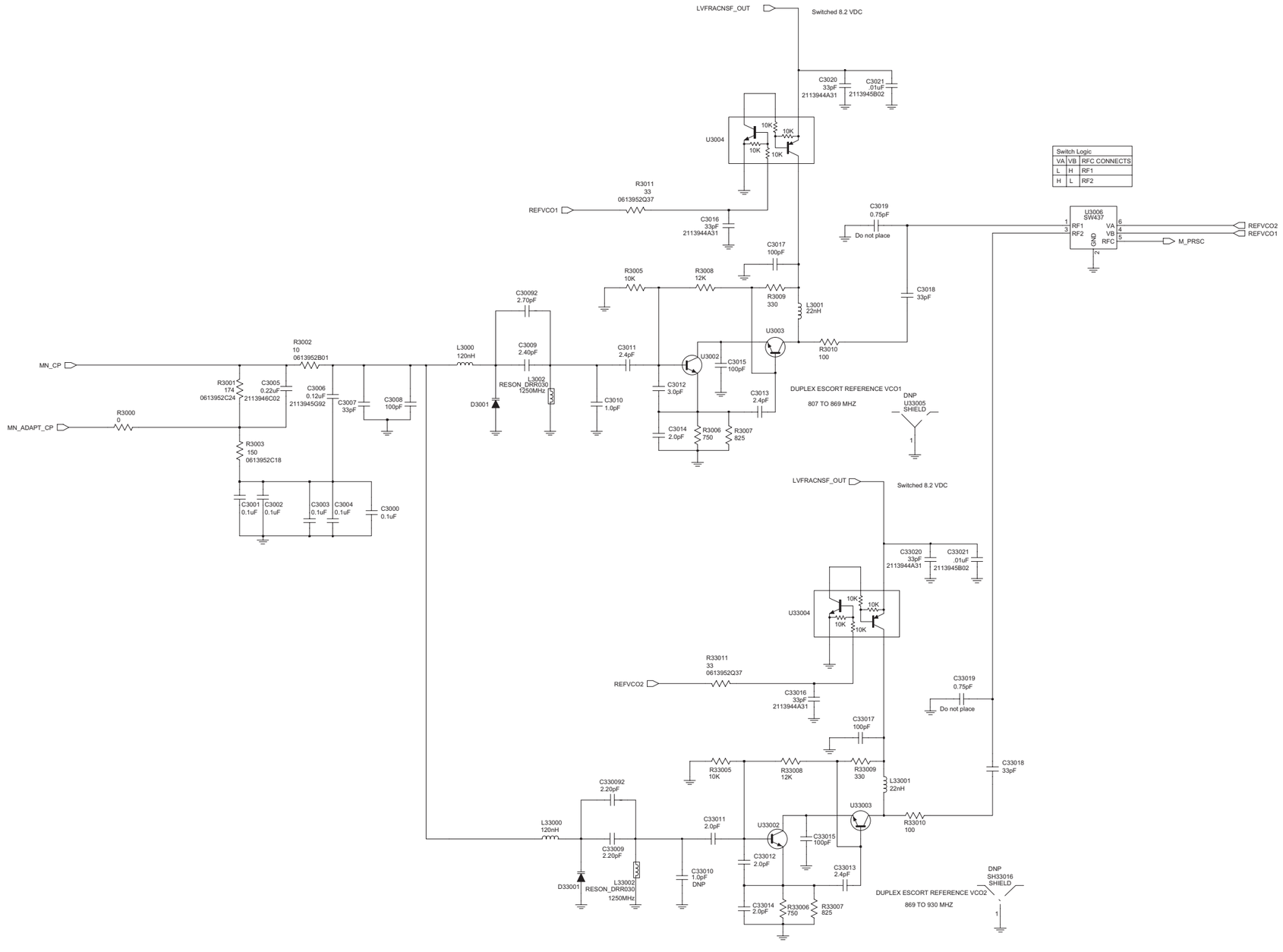


Figure 7-19. Tomahawk Reference VCO

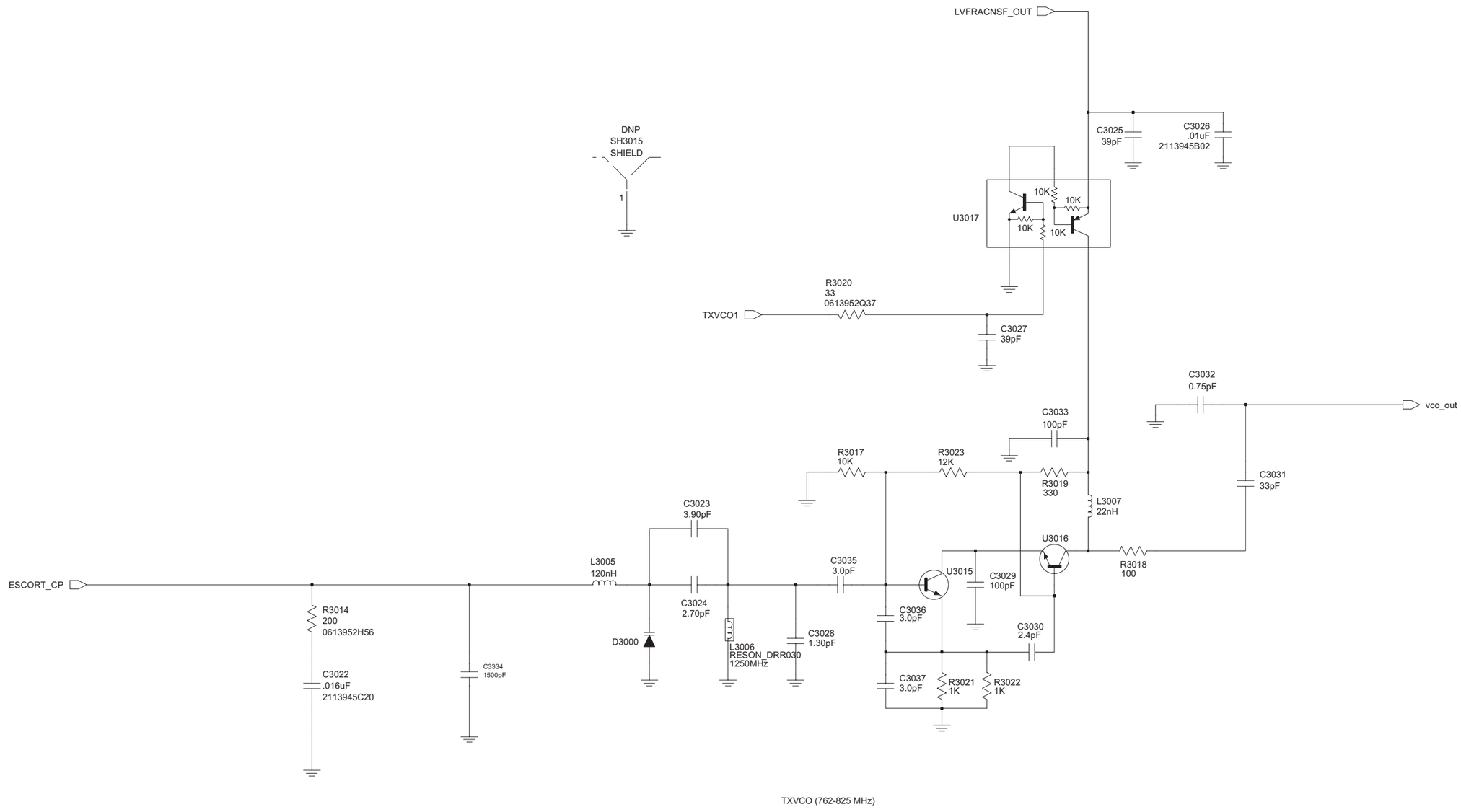


Figure 7-20. Translational Loop VCO

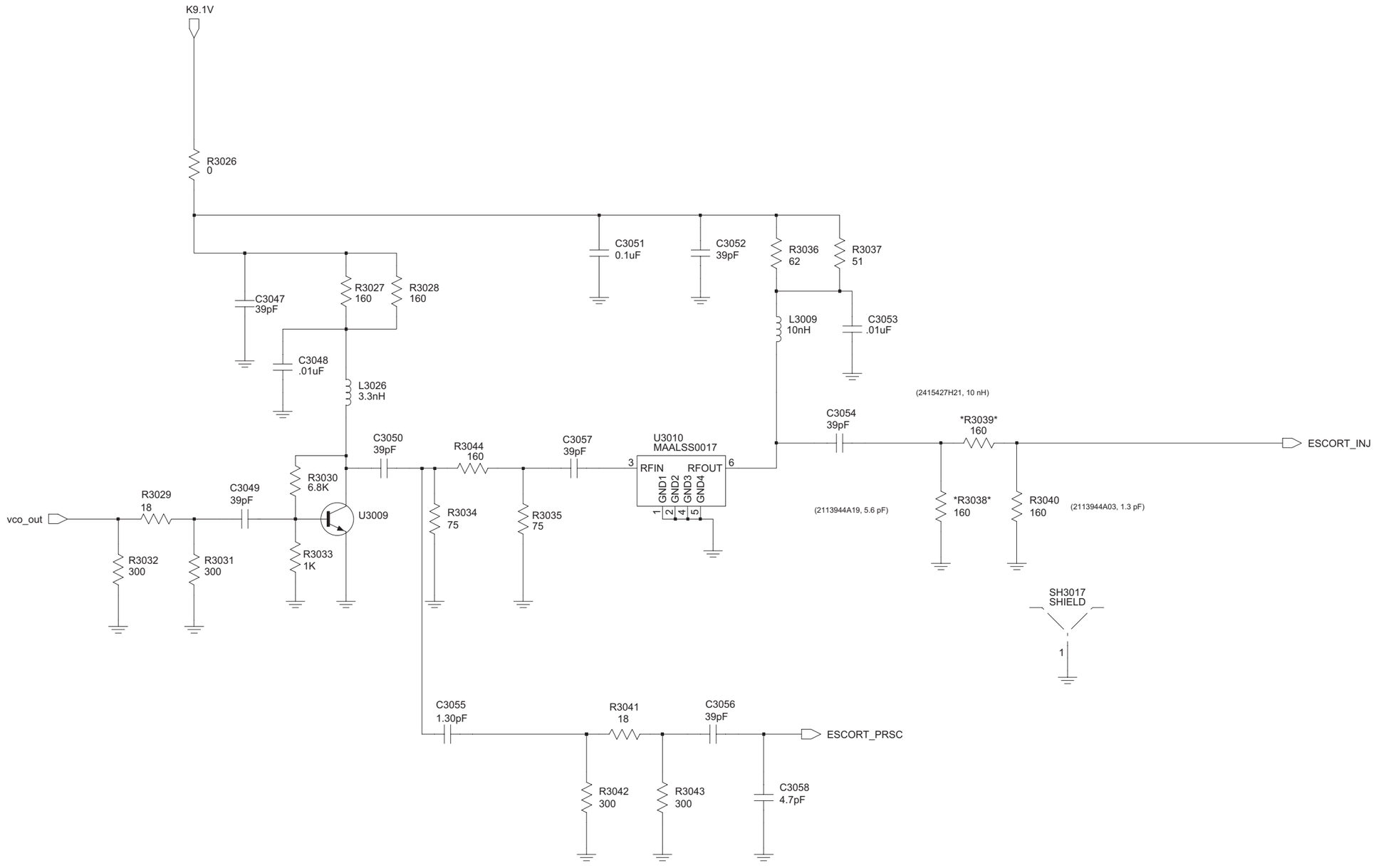


Figure 7-21. Translational Loop Buffer

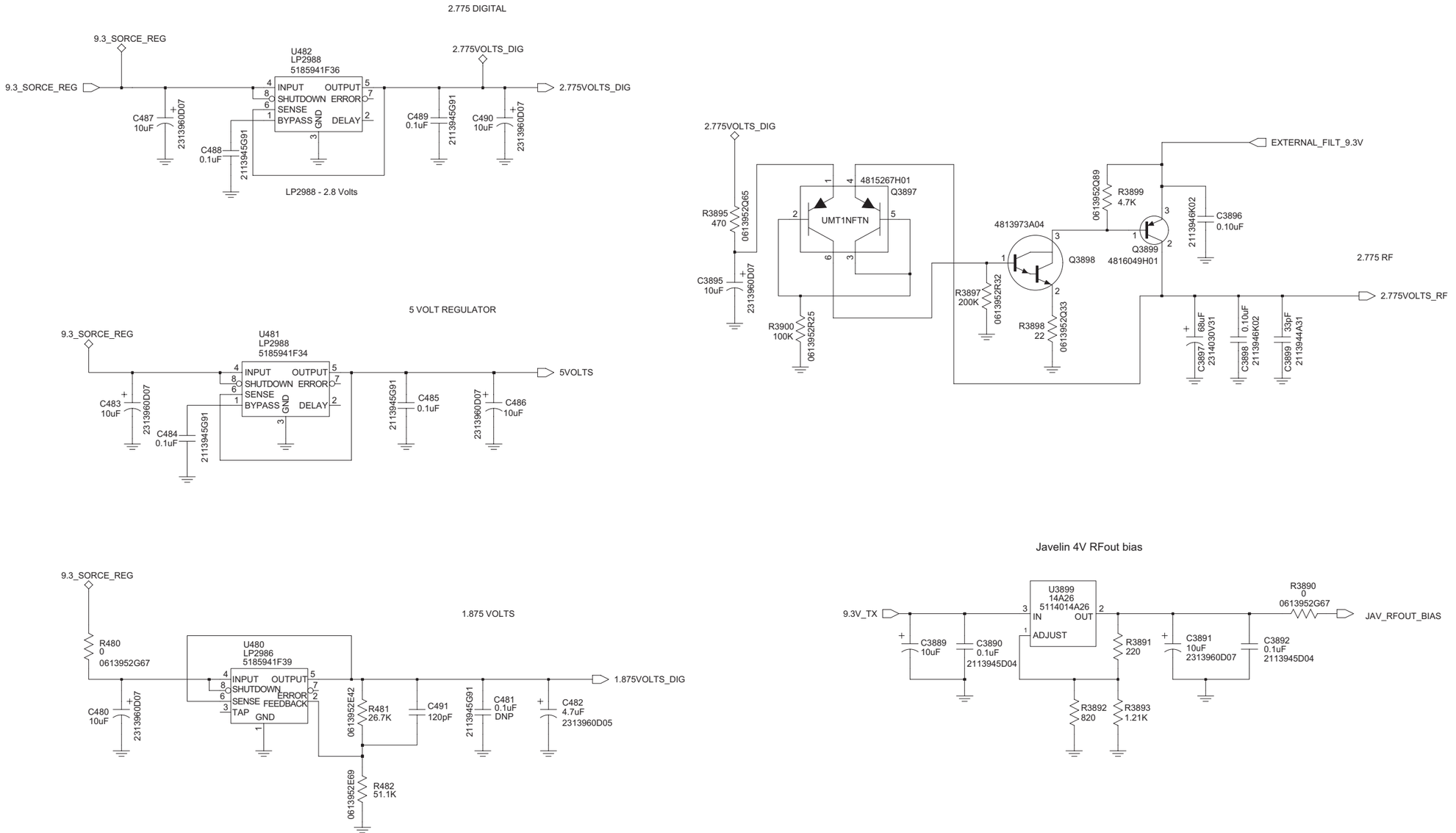


Figure 7-22. Javelin/Tomahawk Regulators

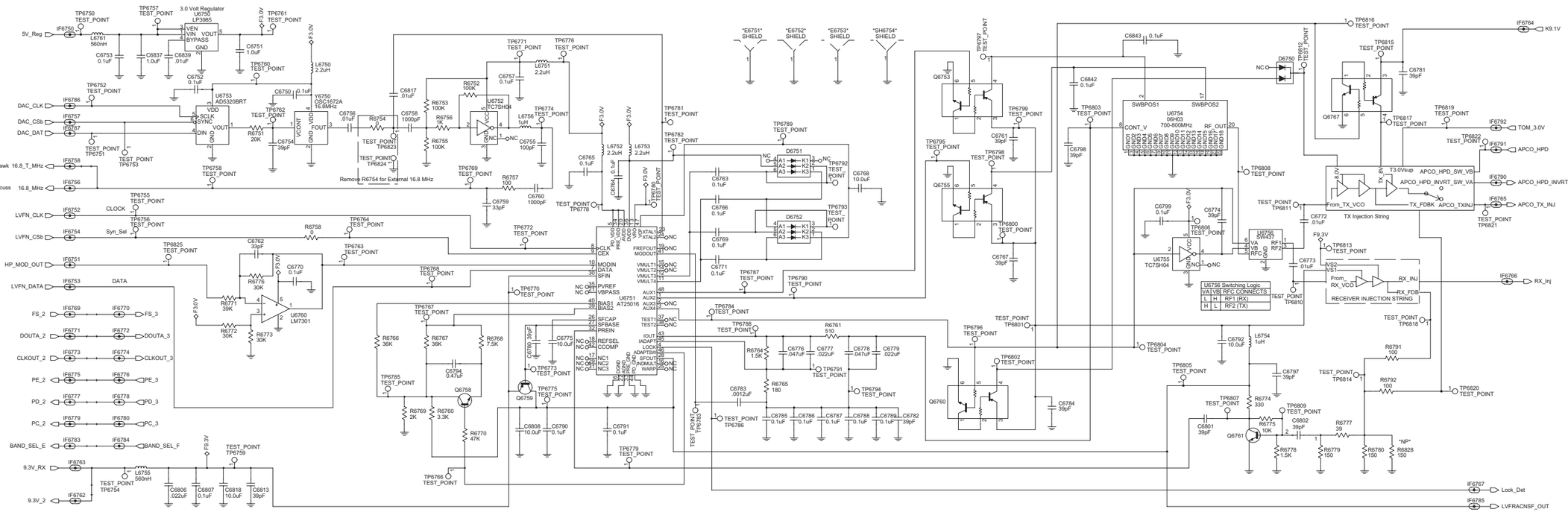


Figure 7-23. Frequency Generation Unit (FGU)

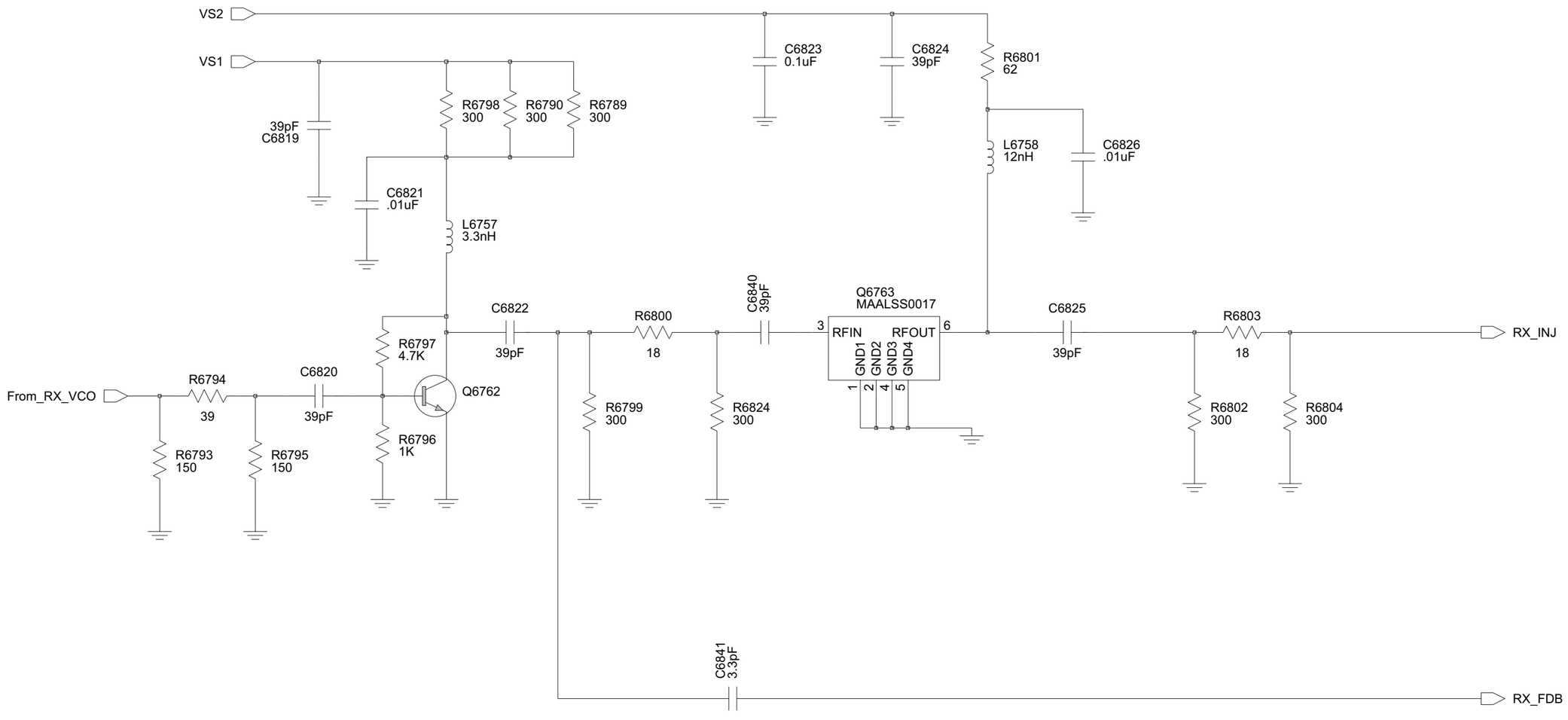


Figure 7-24. 700-800 RX Injection

U6758 Switching Logic		
VA	VB	RFC CONNECTS
L	H	RF1 (HPD)
H	L	RF2 (APCO)

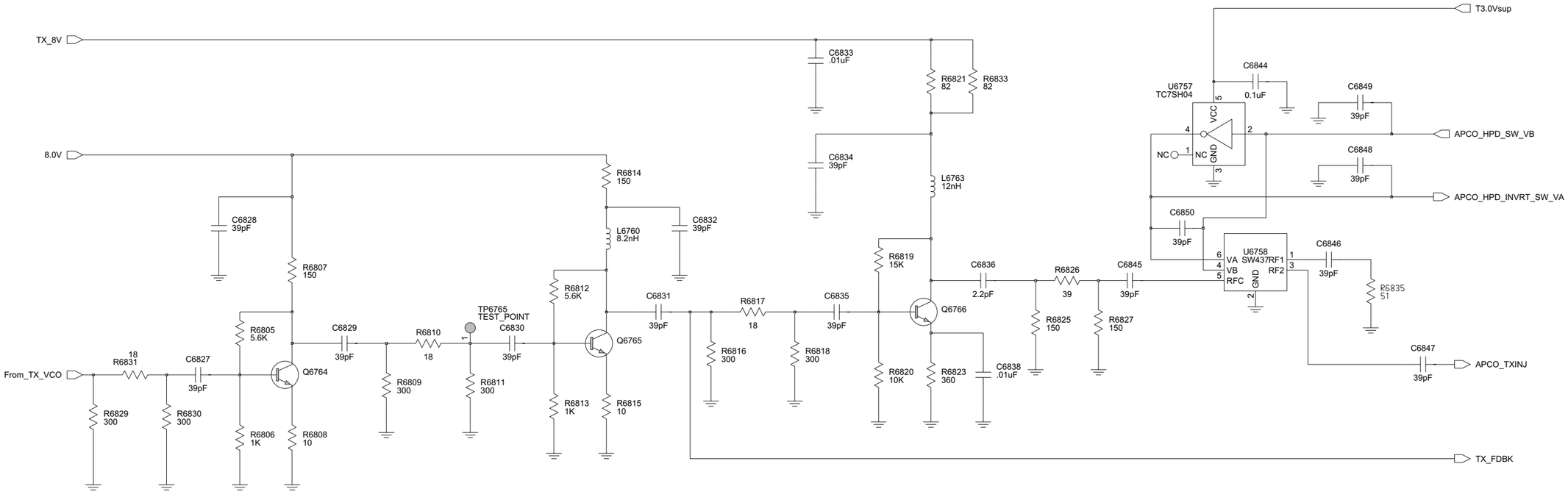


Figure 7-25. 700-800 TX Injection

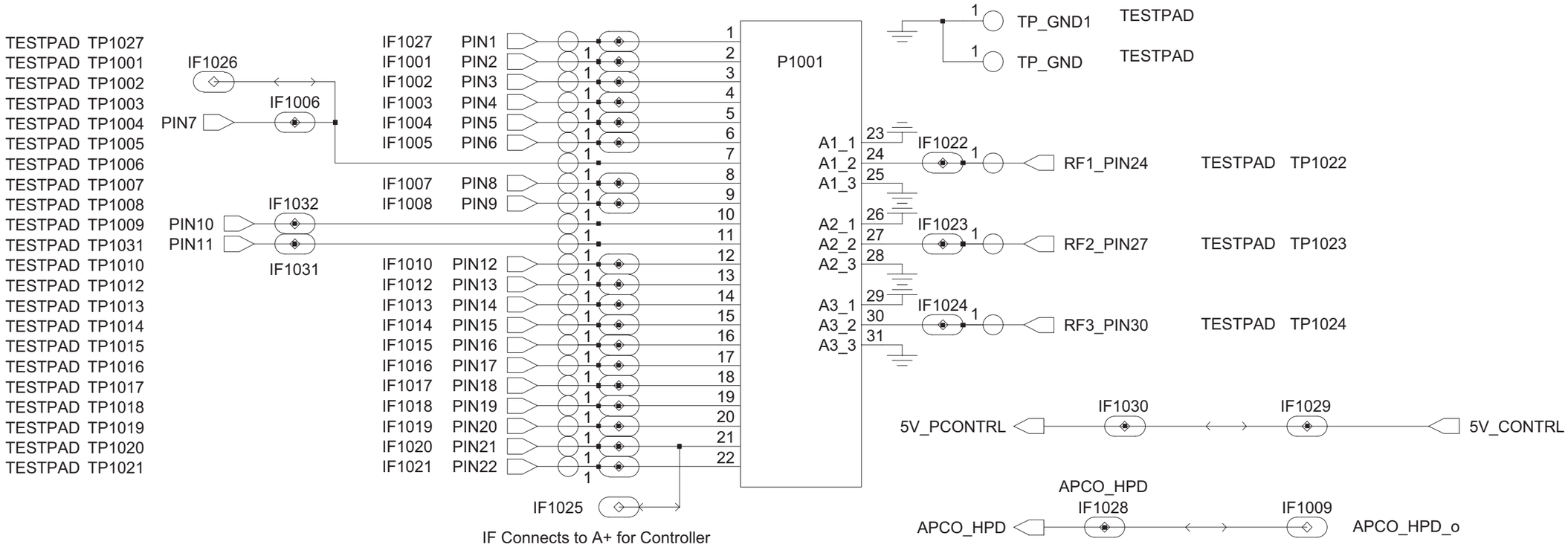
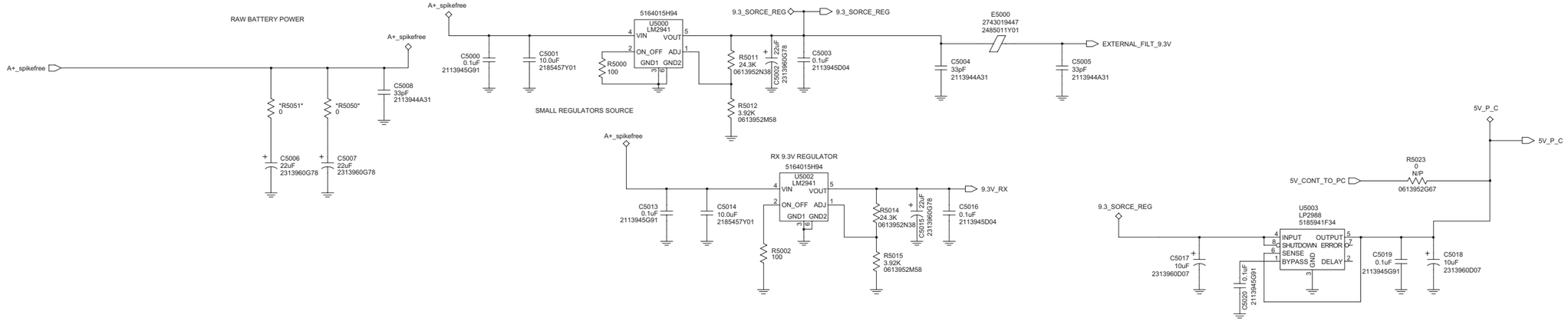


Figure 7-26. Transceiver Interconnect



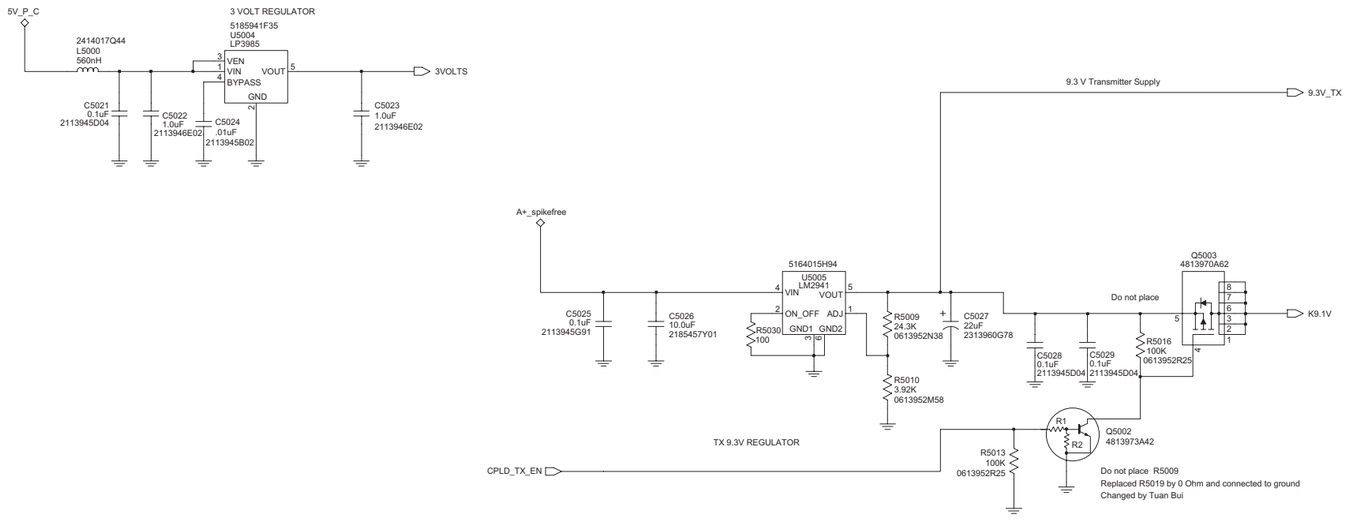


Figure 7-27. DC Regulators

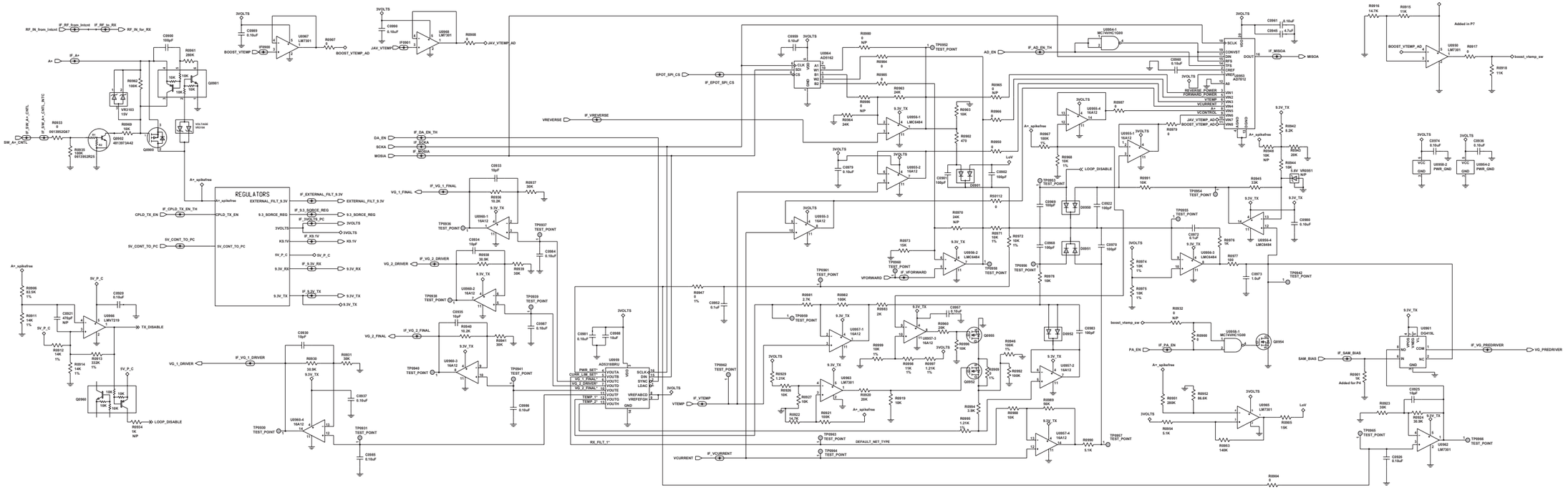


Figure 7-28. Power Control

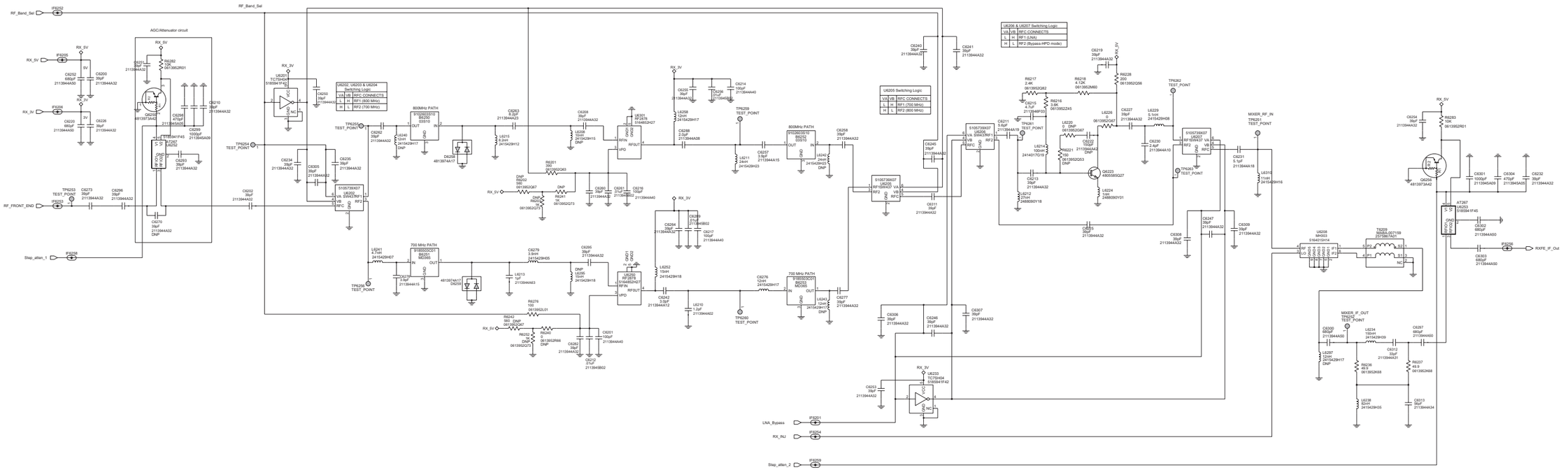


Figure 7-29. High Performance Data Front End

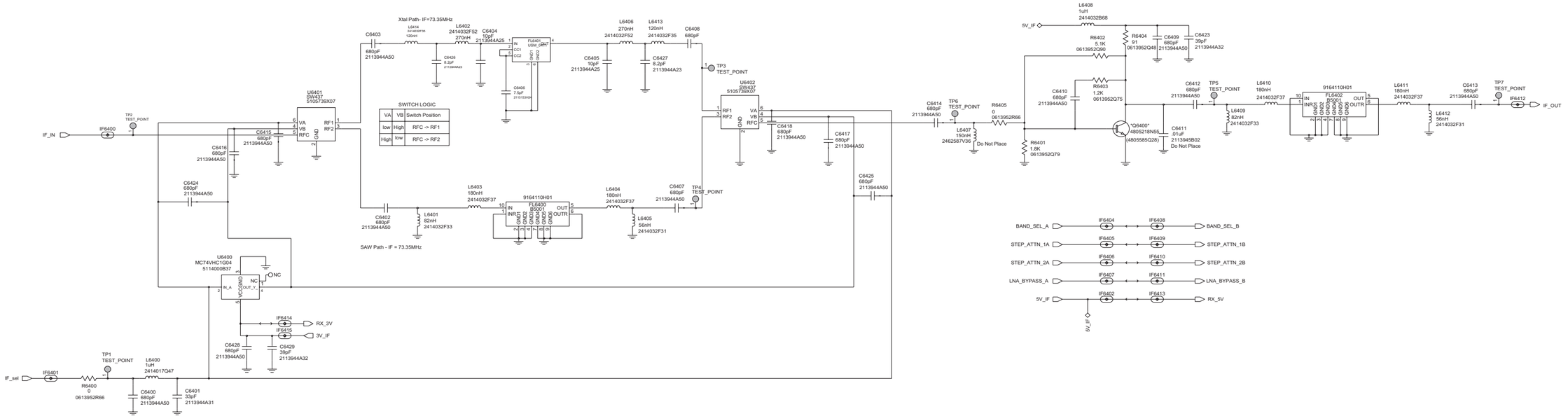


Figure 7-30. RX IF

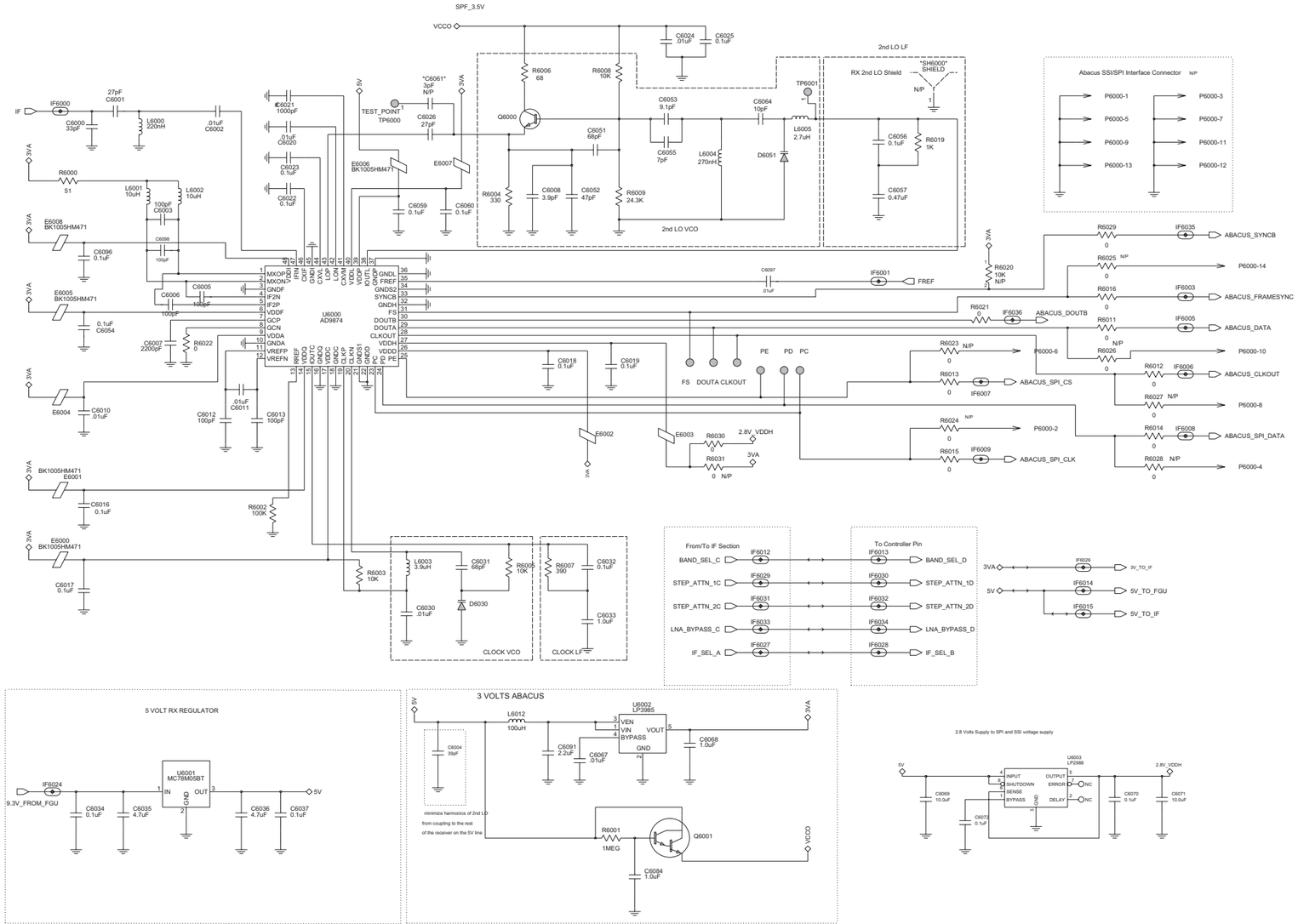


Figure 7-31. ABACUS Back-end

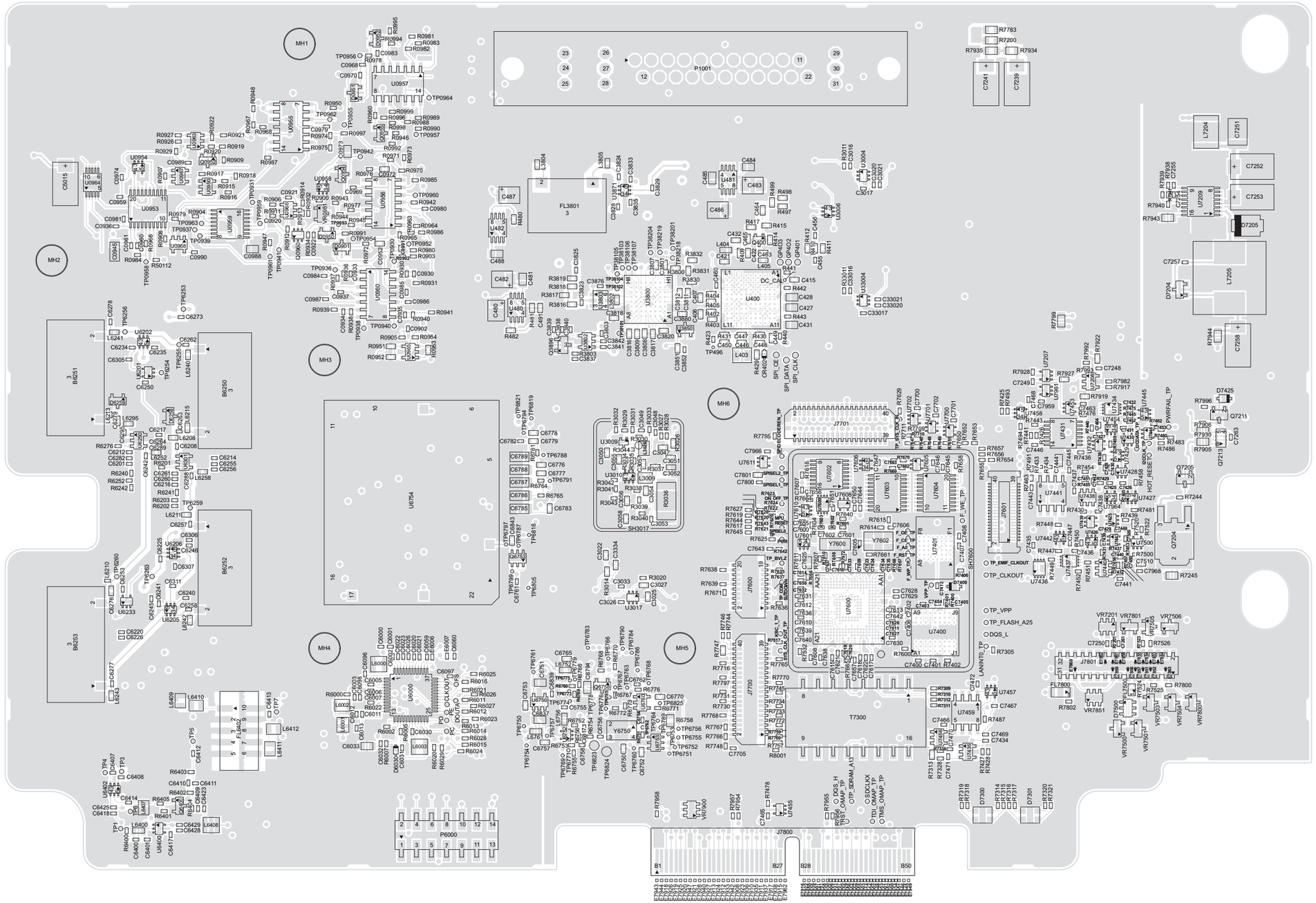


Figure 7-32. 8464191H02 PCB Top Side

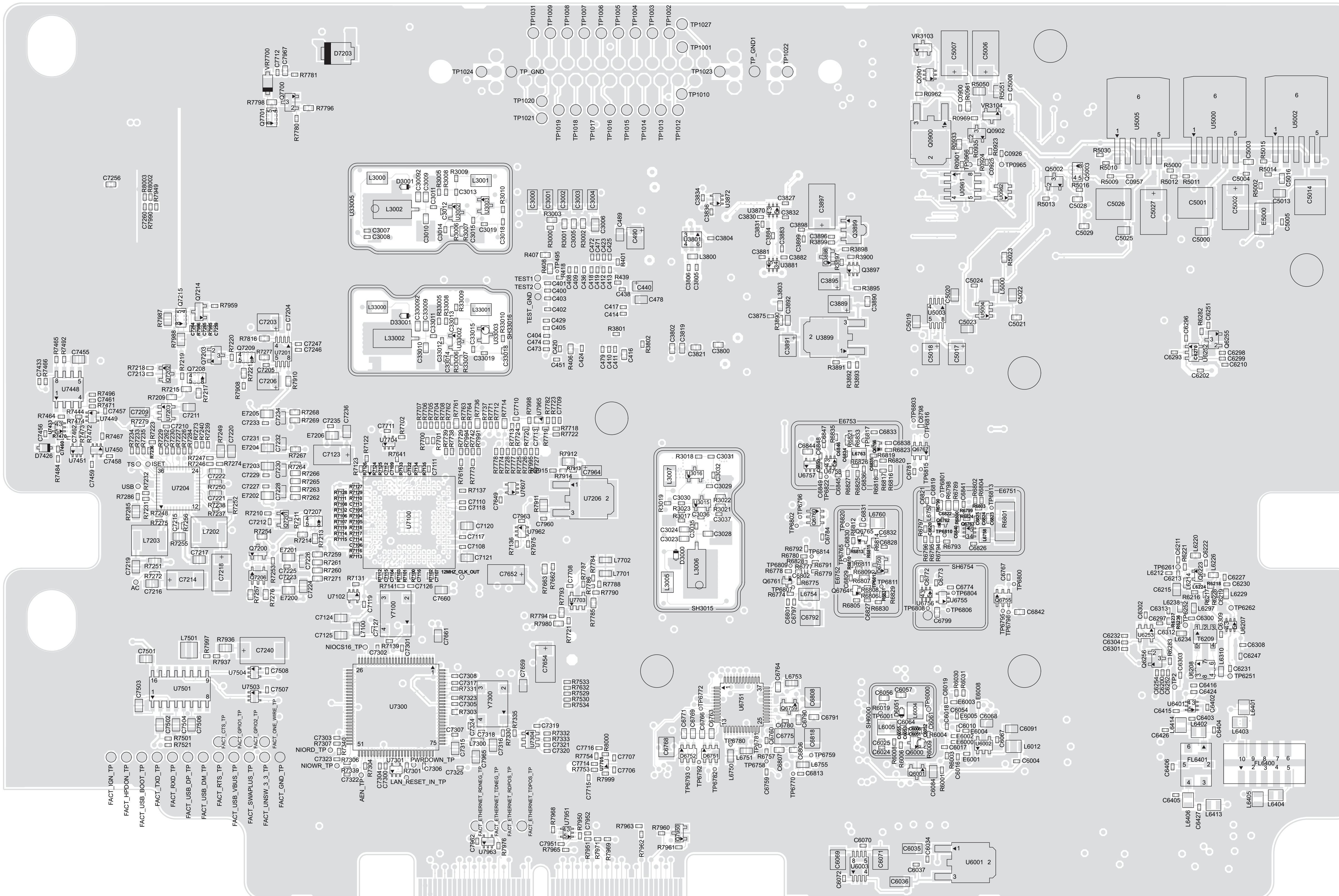


Figure 7-33. 8464191H02 PCB Bottom Side

HUF4021 Transceiver/Controller Main Board Parts List

Reference Designator	Motorola Part Number	Description
B6250	9102603S10	FILTER 860.5 MHZ
B6251	9185503C01	FILTER CERAMIC 770 MHZ
B6252	9102603S10	FILTER 860.5 MHZ
B6253	9185503C01	FILTER CERAMIC 770 MHZ
C400	2113944A31	CAP CER CHP 33.0PF 50V 5%
C401	2113946K02	CAP CER CHP 0.10UF 16V
C402	2113946K02	CAP CER CHP 0.10UF 16V
C403	2113944A31	CAP CER CHP 33.0PF 50V 5%
C404	2113946K02	CAP CER CHP 0.10UF 16V
C405	2113944A31	CAP CER CHP 33.0PF 50V 5%
C406	2113944C55	CAP CER CHP 1200.OPF 50V 5%
C407	2113944C55	CAP CER CHP 1200.OPF 50V 5%
C408	2113944A31	CAP CER CHP 33.0PF 50V 5%
C409	2113946K02	CAP CER CHP 0.10UF 16V
C410	2113944A31	CAP CER CHP 33.0PF 50V 5%
C411	2113946K02	CAP CER CHP 0.10UF 16V
C412	2113944A31	CAP CER CHP 33.0PF 50V 5%
C413	2113946K02	CAP CER CHP 0.10UF 16V
C414	2113944A31	CAP CER CHP 33.0PF 50V 5%
C415	NOTPLACED	-
C416	NOTPLACED	-
C417	2113946K02	CAP CER CHP 0.10UF 16V
C418	2113946K02	CAP CER CHP 0.10UF 16V
C419	2113946K02	CAP CER CHP 0.10UF 16V
C420	2113946K02	CAP CER CHP 0.10UF 16V
C421	2113944C51	CAP CER CHP 1000.OPF 50V 5
C422	2113944C38	CAP CER CHP 56.0PF 50V 5%CAP CER CHP 47.0PF 50V 5%
C423	2113946K02	CAP CER CHP 0.10UF 16V
C424	2113946K02	CAP CER CHP 0.10UF 16V
C425	2113944A31	CAP CER CHP 33.0PF 50V 5%
C427	NOTPLACED	-
C428	NOTPLACED	-
C429	2113946K02	CAP CER CHP 0.10UF 16V
C431	NOTPLACED	-
C432	NOTPLACED	-
C436	2113946K02	CAP CER CHP 0.10UF 16V
C438	2113946K02	CAP CER CHP 0.10UF 16V
C440	2313960B57	CAP,FXD,10UF,+10%,-10%,6.3V-DC,SM,-55DEG CMIN,125DEG CMAX,137MA
C446	2113944C42	CAP CER CHP 75.0PF 50V 5%
C447	2113944C80	CAP,FXD,20PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C448	2113945C04	CAP CER CHP 22,000PF 50V 10%
C449	2113945D04	CAP CER CHP 100,000PF 25V 10%
C450	2113944C80	CAP,FXD,20PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C451	NOTPLACED	-
C455	2113945A01	CAP CER CHP 220PF 50V 10,
C456	2113945A01	CAP CER CHP 220PF 50V 10,
C460	2113944A32	CAP CER CHP 39.0PF 50V 5%
C463	2113945L49	CAP,FXD,.01UF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C464	2113944C51	CAP CER CHP 1000.OPF 50V 5
C465	2113945L49	CAP,FXD,.01UF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C471	2113946K02	CAP CER CHP 0.10UF 16V
C472	2113944A31	CAP CER CHP 33.0PF 50V 5%
C473	2113944A31	CAP CER CHP 33.0PF 50V 5%
C474	2113946K02	CAP CER CHP 0.10UF 16V
C478	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C479	2113946K02	CAP CER CHP 0.10UF 16V
C480	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C481	NOTPLACED	-
C482	2313960D05	CAP,FXD,4.7UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,156MA
C483	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C484	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C485	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C486	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C487	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C488	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C489	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C490	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C491	2113944C46	CAP CER CHP 120.0PF 50V 5%
C0900	NOTPLACED	-
C0901	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0902	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0920	2113946K02	CAP CER CHP 0.10UF 16V
C0921	NOTPLACED	-
C0922	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0925	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C0926	NOTPLACED	-
C0930	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C0933	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C0934	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C0935	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C0936	2113946K02	CAP CER CHP 0.10UF 16V
C0937	2113946K02	CAP CER CHP 0.10UF 16V
C0945	2113946H01	CAP CER CHP 4.7UF 10V 10%
C0952	NOTPLACED	-
C0957	2113946K02	CAP CER CHP 0.10UF 16V
C0959	2113946K02	CAP CER CHP 0.10UF 16V
C0960	2113946K02	CAP CER CHP 0.10UF 16V
C0961	2113946K02	CAP CER CHP 0.10UF 16V
C0968	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0969	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0970	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0972	2113945D04	CAP CER CHP 100,000PF 25V 10%
C0973	2113946E02	CAP CER CHP 1.0UF 16V 10%
C0974	2113946K02	CAP CER CHP 0.10UF 16V
C0979	2113946K02	CAP CER CHP 0.10UF 16V
C0980	2113946K02	CAP CER CHP 0.10UF 16V
C0981	2113946K02	CAP CER CHP 0.10UF 16V

Reference Designator	Motorola Part Number	Description
C0983	2113944A40	CAP CER CHP 100.0PF 50V 5%
C0984	NOTPLACED	-
C0985	NOTPLACED	-
C0986	NOTPLACED	-
C0987	NOTPLACED	-
C0988	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C0989	2113946K02	CAP CER CHP 0.10UF 16V
C0990	2113946K02	CAP CER CHP 0.10UF 16V
C3000	2185419D06	CAP CER SUPER L/D 0.1UF
C3001	2185419D06	CAP CER SUPER L/D 0.1UF
C3002	2185419D06	CAP CER SUPER L/D 0.1UF
C3003	2185419D06	CAP CER SUPER L/D 0.1UF
C3004	2185419D06	CAP CER SUPER L/D 0.1UF
C3005	2113946C02	CAP CER CHP 0.22UF 10V 10%
C3006	2113945G92	CAP,FXD,.12UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C3007	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3008	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3009	2113951A19	CAP NPO 2.40PF +/-.1PF 250V HI FREQ
C3010	2113951A10	CAP NPO 1.00PF +/-.1PF 250V HI FREQ
C3011	2113944A10	CAP CER CHP 2.4PF 50V +/- 0.25PF
C3012	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C3013	2113944A10	CAP CER CHP 2.4PF 50V +/- 0.25PF
C3014	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C3015	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3016	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3017	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3018	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3019	2113944A62	CAP,FXD,.75PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C3020	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3021	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3022	2113945C20	CAP,FXD,.016UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C3023	2113951A24	CAP NPO 3.90PF +/-.1PF 250V HI FREQ
C3024	2113951A20	CAP NPO 2.70PF +/-.1PF 250V HI FREQ
C3025	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3026	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3027	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3028	2113951A13	CAP NPO 1.30PF +/-.1PF 250V HI FREQ
C3029	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3030	2113944A10	CAP CER CHP 2.4PF 50V +/- 0.25PF
C3031	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3032	2113944A62	CAP,FXD,.75PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C3033	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3035	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C3036	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C3037	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C3047	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3048	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3049	2113944A32	CAP CER CHP 39.0PF 50V 5%
C3050	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3051	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3052	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3053	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3054	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3055	2113951A13	CAP NPO 1.30PF +/-.1PF 250V HI FREQ
C3056	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3057	2113944C37	CAP CER CHP 39.0PF 50V 5%
C3058	2113944C22	CAP CER CHP 4.7PF 50V +/- 0.25PF
C3334	2113945C14	CAP CER CHP 1500PF 50V 10%
C3800	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3801	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3802	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3803	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3804	2113944A34	CAP CER CHP 56.0PF 50V 5%
C3805	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3806	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3807	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3808	2113945L25	CAP,FXD,1000PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3809	2113945L25	CAP,FXD,1000PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3811	2113944C36	CAP CER CHP 33.0PF 50V 5%
C3812	2113944C36	CAP CER CHP 33.0PF 50V 5%
C3816	2113945L25	CAP,FXD,1000PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3817	2113945L25	CAP,FXD,1000PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3818	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3819	2113945L37	CAP,FXD,3300PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3820	2113945C04	CAP CER CHP 22,000PF 50V 10%
C3821	2113945C04	CAP CER CHP 22,000PF 50V 10%
C3823	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3824	2113944A28	CAP CER CHP 18.0PF 50V 5%
C3825	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3827	2113944A28	CAP CER CHP 18.0PF 50V 5%
C3828	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3829	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3830	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3831	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3832	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3833	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3834	2113944A31	CAP CER CHP 33.0PF 50V 5%

Reference Designator	Motorola Part Number	Description
C3835	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3836	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3837	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3838	2113945A05	CAP CER CHP 470PF 50V 10%
C3839	2113945A09	CAP CER CHP 1000PF 50V 10%
C3840	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3841	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3842	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3851	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3852	2113944A32	CAP CER CHP 39.0PF 50V 5%
C3875	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3876	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3880	2113945L45	CAP,FXD,6800PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C3881	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3882	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3883	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3884	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3889	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C3890	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3891	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C3892	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3895	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C3896	2113946K02	CAP CER CHP 0.10UF 16V
C3897	2314030V31	CAP,FXD,68UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,791MA
C3898	2113946K02	CAP CER CHP 0.10UF 16V
C3899	2113944A31	CAP CER CHP 33.0PF 50V 5%
C5000	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C5001	2185457Y01	CAP CHIP CER 10UF 35V W18
C5002	2313960G78	CAP,FXD,22UF,+10%,-10%,20V-DC,SM,-55DEG CMIN,125DEG CMAX,433MA
C5003	2113945D04	CAP CER CHP 100,000PF 25V 10%
C5004	2113944A31	CAP CER CHP 33.0PF 50V 5%
C5005	2113944A31	CAP CER CHP 33.0PF 50V 5%
C5006	2313960G78	CAP,FXD,22UF,+10%,-10%,20V-DC,SM,-55DEG CMIN,125DEG CMAX,433MA
C5007	2313960G78	CAP,FXD,22UF,+10%,-10%,20V-DC,SM,-55DEG CMIN,125DEG CMAX,433MA
C5008	2113944A31	CAP CER CHP 33.0PF 50V 5%
C5013	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C5014	2185457Y01	CAP CHIP CER 10UF 35V W18
C5015	2313960G78	CAP,FXD,22UF,+10%,-10%,20V-DC,SM,-55DEG CMIN,125DEG CMAX,433MA
C5016	2113945D04	CAP CER CHP 100,000PF 25V 10%
C5017	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C5018	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C5019	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C5020	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C5021	2113945D04	CAP CER CHP 100,000PF 25V 10%
C5022	2113946E02	CAP CER CHP 1.0UF 16V 10%
C5023	2113946E02	CAP CER CHP 1.0UF 16V 10%
C5024	2113945B02	CAP CER CHP 10,000PF 25V 10%
C5025	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C5026	2185457Y01	CAP CHIP CER 10UF 35V W18
C5027	2313960G78	CAP,FXD,22UF,+10%,-10%,20V-DC,SM,-55DEG CMIN,125DEG CMAX,433MA
C5028	2113945D04	CAP CER CHP 100,000PF 25V 10%
C5029	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6000	2113944A31	CAP CER CHP 33.0PF 50V 5%
C6001	2113944A30	CAP CER CHP 27.0PF 50V 5%
C6002	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6003	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6004	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6005	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6006	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6007	2113945A11	CAP CER CHP 2200PF 50V 10%
C6008	2113944A15	CAP CER CHP 3.9PF 50V +/- 0.25PF
C6010	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6011	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6012	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6013	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6016	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6017	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6018	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6019	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6020	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6021	2113945A09	CAP CER CHP 1000PF 50V 10%
C6022	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6023	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6024	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6025	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6026	2113944A30	CAP CER CHP 27.0PF 50V 5%
C6030	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6031	2113944A36	CAP CER CHP 68.0PF 50V 5%
C6032	2113946B04	CAP CER CHP 0.10UF 10V 10%

Reference Designator	Motorola Part Number	Description
C6033	2113946E02	CAP CER CHP 1.0UF 16V 10%
C6034	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6035	2113946H01	CAP CER CHP 4.7UF 10V 10%
C6036	2113946H01	CAP CER CHP 4.7UF 10V 10%
C6037	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6051	2113944A36	CAP CER CHP 68.0PF 50V 5%
C6052	2113944A33	CAP CER CHP 47.0PF 50V 5%
C6053	2113944A24	CAP CER CHP 9.1PF 50V +/- 0.5PF
C6054	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6055	2115153H31	CAP, CERAMIC, COG
C6056	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6057	2113946D01	CAP CER CHP 0.47UF 6.3V 10%
C6059	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6060	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6061	NOTPLACED	-
C6064	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C6067	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6068	2113946E02	CAP CER CHP 1.0UF 16V 10%
C6069	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6070	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6071	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6072	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6084	2113946E02	CAP CER CHP 1.0UF 16V 10%
C6091	2113946F01	CAP CER CHP 2.2UF 6.3V 10%

Reference Designator	Motorola Part Number	Description
C6096	2113946B04	CAP CER CHP 0.10UF 10V 10%
C6097	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6098	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6200	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6201	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6202	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6208	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6210	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6211	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C6212	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6213	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6214	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6215	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C6216	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6217	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6219	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6220	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6222	NOTPLACED	-
C6225	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6226	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6227	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6230	2113944A10	CAP CER CHP 2.4PF 50V +/- 0.25PF
C6231	2113944A18	CAP CER CHP 5.1PF 50V +/- 0.5PF
C6232	2113944A32	CAP CER CHP 39.0PF 50V 5%

Reference Designator	Motorola Part Number	Description
C6234	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6235	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6240	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6241	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6242	2113944A12	CAP CER CHP 3.0PF 50V +/- 0.25PF
C6245	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6246	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6247	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6250	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6251	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6252	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6253	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6254	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6255	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6256	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6257	2113944A15	CAP CER CHP 3.9PF 50V +/- 0.25PF
C6258	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6260	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6261	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6262	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6263	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C6264	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6270	NOTPLACED	-
C6273	2113944A32	CAP CER CHP 39.0PF 50V 5%

Reference Designator	Motorola Part Number	Description
C6276	2415429H17	CHIP INDUCTOR
C6277	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6278	2113944A15	CAP CER CHP 3.9PF 50V +/- 0.25PF
C6279	2415429H05	CHIP INDUCTOR
C6282	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6288	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C6289	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6293	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6295	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6296	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6297	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6298	2113945A05	CAP CER CHP 470PF 50V 10%
C6299	2113945A09	CAP CER CHP 1000PF 50V 10%
C6300	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6301	2113945A09	CAP CER CHP 1000PF 50V 10%
C6302	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6303	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6304	2113945A05	CAP CER CHP 470PF 50V 10%
C6305	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6306	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6307	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6308	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6309	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6311	2113944A32	CAP CER CHP 39.0PF 50V 5%

Reference Designator	Motorola Part Number	Description
C6312	2113944A31	CAP CER CHP 33.0PF 50V 5%
C6313	2113944A34	CAP CER CHP 56.0PF 50V 5%
C6400	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6401	2113944A31	CAP CER CHP 33.0PF 50V 5%
C6402	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6403	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6404	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C6405	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C6406	2115153H24	CAP, CERAMIC, COG
C6407	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6408	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6409	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6410	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6411	NOTPLACED	-
C6412	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6413	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6414	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6415	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6416	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6417	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6418	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6423	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6424	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6425	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6426	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C6427	2113944A23	CAP CER CHP 8.2PF 50V +/- 0.5PF
C6428	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C6429	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6750	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6751	2113946E02	CAP CER CHP 1.0UF 16V 10%
C6752	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6753	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6754	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6755	2113944A40	CAP CER CHP 100.0PF 50V 5%
C6756	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6757	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6758	2113945A09	CAP CER CHP 1000PF 50V 10%
C6759	2113944A31	CAP CER CHP 33.0PF 50V 5%
C6760	2113945A09	CAP CER CHP 1000PF 50V 10%
C6761	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6762	2113944A31	CAP CER CHP 33.0PF 50V 5%
C6763	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6764	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6765	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6766	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6767	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6768	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6769	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6770	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6771	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6772	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6773	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6774	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6775	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6776	2113945D02	CAP CER CHP 47,000PF 25V 10%
C6777	2113945C04	CAP CER CHP 22,000PF 50V 10%
C6778	2113945D02	CAP CER CHP 47,000PF 25V 10%
C6779	2113945C04	CAP CER CHP 22,000PF 50V 10%
C6780	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6781	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6782	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6783	2185419D08	CAP CER SUPER L/D 0.0012UF
C6784	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6785	2185419D06	CAP CER SUPER L/D 0.1UF
C6786	2185419D06	CAP CER SUPER L/D 0.1UF
C6787	2185419D06	CAP CER SUPER L/D 0.1UF
C6788	2185419D06	CAP CER SUPER L/D 0.1UF
C6789	2185419D06	CAP CER SUPER L/D 0.1UF
C6790	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6791	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6792	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6794	2113945G98	CAP,FXD,.47UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C6797	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6798	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6799	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6801	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6802	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6806	2113945C04	CAP CER CHP 22,000PF 50V 10%
C6807	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6808	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6813	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6817	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6818	2113946J03	CAP CER CHP 10.0UF 16V 10%
C6819	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6820	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6821	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6822	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6823	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6824	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6825	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6826	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6827	2113944A32	CAP CER CHP 39.0PF 50V 5%

Reference Designator	Motorola Part Number	Description
C6828	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6829	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6830	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6831	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6832	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6833	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6834	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6835	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6836	2113944A09	CAP CER CHP 2.2PF 50V +/- 0.25PF
C6837	2113946E02	CAP CER CHP 1.0UF 16V 10%
C6838	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6839	2113945B02	CAP CER CHP 10,000PF 25V 10%
C6840	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6841	2113944A13	CAP CER CHP 3.3PF 50V +/- 0.25PF
C6842	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6843	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6844	2113945D04	CAP CER CHP 100,000PF 25V 10%
C6845	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6846	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6847	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6848	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6849	2113944A32	CAP CER CHP 39.0PF 50V 5%
C6850	2113944A32	CAP CER CHP 39.0PF 50V 5%
C7104	2113946K02	CAP CER CHP 0.10UF 16V

Reference Designator	Motorola Part Number	Description
C7105	2113946K02	CAP CER CHP 0.10UF 16V
C7106	2113946K02	CAP CER CHP 0.10UF 16V
C7107	2113946K02	CAP CER CHP 0.10UF 16V
C7108	2113946K02	CAP CER CHP 0.10UF 16V
C7109	2113946K02	CAP CER CHP 0.10UF 16V
C7110	2113946K02	CAP CER CHP 0.10UF 16V
C7111	2113946K02	CAP CER CHP 0.10UF 16V
C7112	2113946K02	CAP CER CHP 0.10UF 16V
C7113	2113946K02	CAP CER CHP 0.10UF 16V
C7114	2113946K02	CAP CER CHP 0.10UF 16V
C7115	2113946K02	CAP CER CHP 0.10UF 16V
C7116	2113946K02	CAP CER CHP 0.10UF 16V
C7117	2113946K02	CAP CER CHP 0.10UF 16V
C7118	2113946K02	CAP CER CHP 0.10UF 16V
C7119	2113946K02	CAP CER CHP 0.10UF 16V
C7120	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7121	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7122	2113946K02	CAP CER CHP 0.10UF 16V
C7123	2314030F29	CAP,FXD,33UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,542MA
C7124	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7125	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7126	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C7127	2113946K02	CAP CER CHP 0.10UF 16V
C7203	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA
C7204	2113946K02	CAP CER CHP 0.10UF 16V
C7205	2113946K02	CAP CER CHP 0.10UF 16V
C7206	2313960D07	CAP,FXD,10UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,174MA

Reference Designator	Motorola Part Number	Description
C7209	2313960B01	CAP,FXD,1UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,87MA,E
C7210	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7211	2113946N03	CAP CER CHP 2.2UF 16V
C7212	2113946K02	CAP CER CHP 0.10UF 16V
C7213	2113946K02	CAP CER CHP 0.10UF 16V
C7214	2314030F29	CAP,FXD,33UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,542MA
C7215	2113946K02	CAP CER CHP 0.10UF 16V
C7216	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7217	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7218	2314030F29	CAP,FXD,33UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,542MA
C7219	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7220	2113946N03	CAP CER CHP 2.2UF 16V
C7221	2113946N03	CAP CER CHP 2.2UF 16V
C7222	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7223	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7224	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7225	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7226	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7227	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7228	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7229	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7230	2113946E02	CAP CER CHP 1.0UF 16V 10%

Reference Designator	Motorola Part Number	Description
C7231	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7232	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7233	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7234	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7235	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7236	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7239	2314030J28	CAP,FXD,22UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,742MA
C7240	2314030J28	CAP,FXD,22UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,742MA
C7241	2314030J28	CAP,FXD,22UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,742MA
C7246	2113945A09	CAP CER CHP 1000PF 50V 10%
C7247	2113945A09	CAP CER CHP 1000PF 50V 10%
C7248	2113946K02	CAP CER CHP 0.10UF 16V
C7249	2113946K02	CAP CER CHP 0.10UF 16V
C7250	2113944A40	CAP CER CHP 100.0PF 50V 5%
C7251	2184988Y06	CAP,CER,2.2UF,10%,100V,1812
C7252	2314030J28	CAP,FXD,22UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,742MA
C7253	2314030J28	CAP,FXD,22UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,742MA
C7254	2113945A10	CAP CER CHP 1500PF 50V 10%
C7255	2113944A40	CAP CER CHP 100.0PF 50V 5%
C7256	2113946C02	CAP CER CHP 0.22UF 10V 10%

Reference Designator	Motorola Part Number	Description
C7257	2113946K02	CAP CER CHP 0.10UF 16V
C7258	2314030H32	CAP,FXD,100UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,1.224
C7259	2113946K02	CAP CER CHP 0.10UF 16V
C7260	2113944A40	CAP CER CHP 100.0PF 50V 5%
C7261	2113944A40	CAP CER CHP 100.0PF 50V 5%
C7262	2113946K02	CAP CER CHP 0.10UF 16V
C7263	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7264	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7265	2113946K02	CAP CER CHP 0.10UF 16V
C7300	2113946K02	CAP CER CHP 0.10UF 16V
C7301	2113946K02	CAP CER CHP 0.10UF 16V
C7302	2113946K02	CAP CER CHP 0.10UF 16V
C7303	2113946K02	CAP CER CHP 0.10UF 16V
C7304	2113946K02	CAP CER CHP 0.10UF 16V
C7305	2113946K02	CAP CER CHP 0.10UF 16V
C7306	2113946K02	CAP CER CHP 0.10UF 16V
C7307	2113946K02	CAP CER CHP 0.10UF 16V
C7308	2113946K02	CAP CER CHP 0.10UF 16V
C7315	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7316	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7317	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C7318	2113946K02	CAP CER CHP 0.10UF 16V
C7319	2113946K02	CAP CER CHP 0.10UF 16V
C7320	NOTPLACED	-
C7321	2113945A09	CAP CER CHP 1000PF 50V 10%
C7322	NOTPLACED	-
C7323	NOTPLACED	-
C7324	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7325	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7400	2113946K02	CAP CER CHP 0.10UF 16V
C7401	2113946K02	CAP CER CHP 0.10UF 16V
C7402	2113946K02	CAP CER CHP 0.10UF 16V
C7403	2113946K02	CAP CER CHP 0.10UF 16V
C7404	2113946K02	CAP CER CHP 0.10UF 16V
C7405	2113946K02	CAP CER CHP 0.10UF 16V
C7406	2113946K02	CAP CER CHP 0.10UF 16V
C7407	2113946K02	CAP CER CHP 0.10UF 16V
C7408	2113946K02	CAP CER CHP 0.10UF 16V
C7412	2113946K02	CAP CER CHP 0.10UF 16V
C7425	2113946K02	CAP CER CHP 0.10UF 16V
C7426	2113946K02	CAP CER CHP 0.10UF 16V
C7427	2113946K02	CAP CER CHP 0.10UF 16V
C7428	2113946K02	CAP CER CHP 0.10UF 16V
C7429	2113946K02	CAP CER CHP 0.10UF 16V
C7430	2113946K02	CAP CER CHP 0.10UF 16V
C7431	2113946K02	CAP CER CHP 0.10UF 16V
C7432	2113946K02	CAP CER CHP 0.10UF 16V
C7433	2113946K02	CAP CER CHP 0.10UF 16V
C7434	NOTPLACED	-
C7435	2113946K02	CAP CER CHP 0.10UF 16V
C7436	2113946K02	CAP CER CHP 0.10UF 16V
C7437	2113946K02	CAP CER CHP 0.10UF 16V
C7438	2113946K02	CAP CER CHP 0.10UF 16V
C7439	2113946K02	CAP CER CHP 0.10UF 16V
C7440	2113946K02	CAP CER CHP 0.10UF 16V
C7441	NOTPLACED	-
C7442	2113944A42	CAP CER CHP 150.0PF 50V 5%
C7443	2113946K02	CAP CER CHP 0.10UF 16V
C7444	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7445	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7446	2113946K02	CAP CER CHP 0.10UF 16V
C7447	2113946K02	CAP CER CHP 0.10UF 16V
C7449	2113946K02	CAP CER CHP 0.10UF 16V
C7450	2113945A09	CAP CER CHP 1000PF 50V 10%
C7451	2113945A09	CAP CER CHP 1000PF 50V 10%
C7452	2113946K02	CAP CER CHP 0.10UF 16V
C7453	2113946K02	CAP CER CHP 0.10UF 16V
C7455	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7456	2113946K02	CAP CER CHP 0.10UF 16V
C7457	2113946K02	CAP CER CHP 0.10UF 16V
C7458	2113946K02	CAP CER CHP 0.10UF 16V
C7459	2113946K02	CAP CER CHP 0.10UF 16V
C7460	2113946K02	CAP CER CHP 0.10UF 16V
C7461	NOTPLACED	-
C7462	2113946K02	CAP CER CHP 0.10UF 16V
C7463	2113946K02	CAP CER CHP 0.10UF 16V
C7464	2113946K02	CAP CER CHP 0.10UF 16V
C7465	2113946K02	CAP CER CHP 0.10UF 16V
C7466	NOTPLACED	-
C7467	2113946K02	CAP CER CHP 0.10UF 16V
C7468	2113946K02	CAP CER CHP 0.10UF 16V
C7469	2113946K02	CAP CER CHP 0.10UF 16V
C7470	2113946K02	CAP CER CHP 0.10UF 16V
C7471	2113946K02	CAP CER CHP 0.10UF 16V
C7472	NOTPLACED	-
C7500	2113946K02	CAP CER CHP 0.10UF 16V
C7501	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7502	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7503	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7504	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7506	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7507	2113946K02	CAP CER CHP 0.10UF 16V
C7508	2113946K02	CAP CER CHP 0.10UF 16V
C7510	2113946S35	CAP CER CHP 1.0UF 16V 10%
C7600	2113946K02	CAP CER CHP 0.10UF 16V
C7601	2113944A28	CAP CER CHP 18.0PF 50V 5%
C7602	2113944A28	CAP CER CHP 18.0PF 50V 5%
C7605	2113944A28	CAP CER CHP 18.0PF 50V 5%
C7606	2113944A28	CAP CER CHP 18.0PF 50V 5%
C7607	2113946K02	CAP CER CHP 0.10UF 16V
C7608	2113946K02	CAP CER CHP 0.10UF 16V
C7609	2113946K02	CAP CER CHP 0.10UF 16V
C7610	2113946K02	CAP CER CHP 0.10UF 16V
C7611	2113946K02	CAP CER CHP 0.10UF 16V
C7612	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7613	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7614	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7615	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7616	2113946K02	CAP CER CHP 0.10UF 16V
C7617	2113946K02	CAP CER CHP 0.10UF 16V
C7618	2113946K02	CAP CER CHP 0.10UF 16V
C7619	2113946K02	CAP CER CHP 0.10UF 16V
C7620	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7621	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7622	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7623	2113946K02	CAP CER CHP 0.10UF 16V
C7624	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7625	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7626	2113946K02	CAP CER CHP 0.10UF 16V
C7627	2113946K02	CAP CER CHP 0.10UF 16V
C7628	2113946K02	CAP CER CHP 0.10UF 16V
C7629	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7630	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7631	2113946K02	CAP CER CHP 0.10UF 16V
C7632	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7633	2113946K02	CAP CER CHP 0.10UF 16V
C7634	2113946K02	CAP CER CHP 0.10UF 16V

Reference Designator	Motorola Part Number	Description
C7635	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7636	2113946K02	CAP CER CHP 0.10UF 16V
C7637	2113946K02	CAP CER CHP 0.10UF 16V
C7638	2113946K02	CAP CER CHP 0.10UF 16V
C7639	2113946K02	CAP CER CHP 0.10UF 16V
C7640	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7642	2113946S35	CAP CER CHP 1.0UF 16V 10%
C7643	2113944A36	CAP CER CHP 68.0PF 50V 5%
C7644	2113946K02	CAP CER CHP 0.10UF 16V
C7645	2113946K02	CAP CER CHP 0.10UF 16V
C7646	2113946K02	CAP CER CHP 0.10UF 16V
C7647	2113946K02	CAP CER CHP 0.10UF 16V
C7649	2113946K02	CAP CER CHP 0.10UF 16V
C7650	2113946K02	CAP CER CHP 0.10UF 16V
C7651	2113946K02	CAP CER CHP 0.10UF 16V
C7652	2314030F29	CAP,FXD,33UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,542MA
C7654	2314030F29	CAP,FXD,33UF,+10%,-10%,10V-DC,SM,-55DEG CMIN,125DEG CMAX,542MA
C7655	2113946K02	CAP CER CHP 0.10UF 16V
C7656	2113944A28	CAP CER CHP 18.0PF 50V 5%
C7657	2113946K02	CAP CER CHP 0.10UF 16V
C7658	2113946K02	CAP CER CHP 0.10UF 16V
C7659	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7660	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7661	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C7662	NOTPLACED	-
C7663	NOTPLACED	-

Reference Designator	Motorola Part Number	Description
C7700	2113946K02	CAP CER CHP 0.10UF 16V
C7701	NOTPLACED	-
C7702	2113946K02	CAP CER CHP 0.10UF 16V
C7705	NOTPLACED	-
C7706	NOTPLACED	-
C7707	NOTPLACED	-
C7708	2113946K02	CAP CER CHP 0.10UF 16V
C7709	NOTPLACED	-
C7710	NOTPLACED	-
C7711	2113946K02	CAP CER CHP 0.10UF 16V
C7712	2113944A32	CAP CER CHP 39.0PF 50V 5%
C7713	NOTPLACED	-
C7714	2113946K02	CAP CER CHP 0.10UF 16V
C7715	NOTPLACED	-
C7716	NOTPLACED	-
C7800	NOTPLACED	-
C7801	NOTPLACED	-
C7951	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7952	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7959	2113946K02	CAP CER CHP 0.10UF 16V
C7960	2113946K02	CAP CER CHP 0.10UF 16V
C7962	2113946K02	CAP CER CHP 0.10UF 16V
C7963	2113946K02	CAP CER CHP 0.10UF 16V
C7964	2313960B01	CAP,FXD,1UF,+10%,-10%,16V-DC,SM,-55DEG CMIN,125DEG CMAX,87MA,E
C7965	2113946E02	CAP CER CHP 1.0UF 16V 10%
C7966	2113946K02	CAP CER CHP 0.10UF 16V
C7967	2113946D07	CAP,CHIP,4.7UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C7968	NOTPLACED	-
C30092	2113951A20	CAP NPO 2.70PF +/-.1PF 250V HI FREQ
C33009	2113951A18	CAP NPO 2.20PF +/-.1PF 250V HI FREQ
C33010	NOTPLACED	-
C33011	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF

Reference Designator	Motorola Part Number	Description
C33012	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C33013	2113944A10	CAP CER CHP 2.4PF 50V +/- 0.25PF
C33014	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C33015	2113944A40	CAP CER CHP 100.0PF 50V 5%
C33016	2113944A31	CAP CER CHP 33.0PF 50V 5%
C33017	2113944A40	CAP CER CHP 100.0PF 50V 5%
C33018	2113944A31	CAP CER CHP 33.0PF 50V 5%
C33019	2113944A62	CAP,FXD,.75PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C33020	2113944A31	CAP CER CHP 33.0PF 50V 5%
C33021	2113945B02	CAP CER CHP 10,000PF 25V 10%
C330092	2113951A18	CAP NPO 2.20PF +/-.1PF 250V HI FREQ
CR402	4805656W87	DIODE,VCTR, @ 15V,1SV279,SOD-523/SC-79
D0901	4813978C02	PB FREE, NOT COMPLETELY ENRICHED
D0950	4813978C02	PB FREE, NOT COMPLETELY ENRICHED
D0951	4813978C02	PB FREE, NOT COMPLETELY ENRICHED
D0952	4813978C02	PB FREE, NOT COMPLETELY ENRICHED
D3000	4815098H01	VARACTOR DIODE BBY5802W
D3001	4815098H01	VARACTOR DIODE BBY5802W
D6030	4815098H01	VARACTOR DIODE BBY5802W
D6051	4805656W86	DIODE,VCTR, @ 10V,1SV305,SOD-523/SC-79
D6258	4813974A17	DIODE ARRAY,MXR,SM,SOT-23,7V,.225W,SHTK,2,HOT CARRIER, PB-FREE

Reference Designator	Motorola Part Number	Description
D6259	4813974A17	DIODE ARRAY,MXR,SM,SOT-23,7V,.225W,SHTK,2,HOT CARRIER, PB-FREE
D6750	4813978C02	PB FREE, NOT COMPLETELY ENRICHED
D6751	4815011H01	DIODE TRIPLE
D6752	4815011H01	DIODE TRIPLE
D7203	4885489Y01	DIODE SCHOTTKY 2A 40V SMB PB-FREE
D7204	4813978C09	DIODE,SWG,MMBD914,SM,SOT-23,200MA,100V,.225W,PB-FREE
D7205	4885489Y01	DIODE SCHOTTKY 2A 40V SMB PB-FREE
D7300	4885102C22	LED, COMPLIANT, RED/GREEN SMT
D7301	4885102C22	LED, COMPLIANT, RED/GREEN SMT
D7400	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D7425	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D7426	NOTPLACED	-
D7500	4813979A45	DIODE ARRAY,SUPR,TSOP,5V,500W,9,PB-FREE
D33001	4815098H01	VARACTOR DIODE BBY5802W
E5000	2485011Y01	INDUCTOR BEAD CHP PB-FREE
E6000	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6001	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6002	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6003	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6004	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6005	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6006	2480640Z01	SURFACE MOUNT FERRITE BEAD

Reference Designator	Motorola Part Number	Description
E6007	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6008	2480640Z01	SURFACE MOUNT FERRITE BEAD
E6751	NOTPLACED	-
E6752	NOTPLACED	-
E6753	NOTPLACED	-
E7200	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7201	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7202	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7203	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7204	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7205	2480067M02	CHK RF CHIP BEAD INDUCTOR
E7206	2480067M02	CHK RF CHIP BEAD INDUCTOR
FL7500	2587511Y01	CHOKE FILTER, GSM, RAZOR (D54)
FL3801	9164710H01	FLTR,CER,FLTR 700/800 MHZ BANDPASS
FL6400	9164110H01	FILTER, 73.35 MHZ SAW
FL6401	9164962H01	FILTER 4 POLE XTAL
FL6402	9164110H01	FILTER, 73.35 MHZ SAW
FL7800	9108445S12	EMI FILTER,EMI,25V-DCV-DC,200MA
J7600	NOTPLACED	-
J7601	NOTPLACED	-
J7700	0980423L11	CONNECTOR, 40 PIN, RECEPTACLE
J7701	0980423L11	CONNECTOR, 40 PIN, RECEPTACLE
J7800	NOTPLACED	-
J7801	0985631E01	CONNECTOR FEMALE 32 PIN ACCY
L403	2414032K30	IDCTR,WW,10UH,5%,150 MA,2.1OHM,FERR,30 Q,36MHZ SRF,SM,PB-FRE
L404	NOTPLACED	-
L405	2415429H36	CHIP INDUCTOR

Reference Designator	Motorola Part Number	Description
L3000	2414032D16	IDCTR,WW,120NH,5%,800 MA,.26OHM,CER,42 Q,1GHZ SRF,SM,PB-FREE
L3001	2414032D38	IDCTR,WW,22NH,5%,1A,.1 OHM,CER,33 Q,1.9GHZ SRF,SM,LEAD-FREE
L3002	4805911Z21	RESONATOR, COAX CER 1250 MHZ SMD
L3005	2414032D16	IDCTR,WW,120NH,5%,800 MA,.26OHM,CER,42 Q,1GHZ SRF,SM,PB-FREE
L3006	4805911Z21	RESONATOR, COAX CER 1250 MHZ SMD
L3007	2414032D38	IDCTR,WW,22NH,5%,1A,.1 OHM,CER,33 Q,1.9GHZ SRF,SM,LEAD-FREE
L3009	2414032F66	IDCTR,WW,10NH,5%,600 MA,.1OHM,CER,60 Q,4.2GHZ SRF,SM,PB-FREE
L3026	2414032F20	IDCTR,WW,3.3NH,5%,600 MA,.08OHM,CER,50 Q,3GHZ SRF,SM,PB-FREE
L3800	2414017N17	IDCTR,CHIP,27NH,5%,600 MA,.62OHM,CER,13 Q,1.2GHZ SRF,SM,0603
L3802	2414017N19	IDCTR,CHIP,39NH,5%,500 MA,.74OHM,CER,15 Q,1GHZ SRF,SM,0603,PB
L3803	2414017N23	IDCTR,CHIP,82NH,5%,300 MA,1.8OHM,CER,15 Q,750MHZ SRF,SM,0603
L3804	2414017N16	IDCTR,CHIP,22NH,5%,600 MA,.54OHM,CER,13 Q,1.3GHZ SRF,SM,0603
L3805	2414017N14	IDCTR,CHIP,15NH,5%,600 MA,.4OHM,CER,13 Q,1.8GHZ SRF,SM,0603,P
L5000	2414017Q44	IDCTR,FXD,560NH,10%,150MA,.75OHM,FERR,25 Q,115MHZ SRF,SM,080
L6000	2414015A08	IDCTR,FXD,220NH,2%,720MA,.84OHM,CER,28 Q,600MHZ SRF,SM,1008
L6001	2414032L24	IDCTR,WW,10UH,5%,155 MA,3.5OHM,FERR,25 Q,27MHZ SRF,SM,PB-FRE

Reference Designator	Motorola Part Number	Description
L6002	2414032L24	IDCTR,WW,10UH,5%,155 MA,3.5OHM,FERR,25 Q,27MHZ SRF,SM,PB-FRE
L6003	2414032B75	IDCTR,WW,3.9UH,5%,340 MA,3.6OHM,CER,20 Q,70MHZ SRF,SM,PB-FRE
L6004	2414015A09	IDCTR,FXD,270NH,2%,690MA,.91OHM,CER,28 Q,550MHZ SRF,SM,1008
L6005	2414032K23	IDCTR,WW,2.7UH,5%,290 MA,1.1OHM,FERR,30 Q,70MHZ SRF,SM,PB-FR
L6012	2414032L36	IDCTR,WW,100UH,5%,60 MA,21OHM,FERR,15 Q,9MHZ SRF,SM,PB-FREE
L6208	NOTPLACED	-
L6210	2113944A02	CAP CER CHP 1.2PF 50V +/- 0.25PF
L6211	2415429H23	CHIP INDUCTOR
L6212	2488090Y18	INDUCTOR,MULTI-LAYER,27NH,1005,SMD,PB FREE
L6213	2113944A63	CAP,FXD,1PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,P
L6214	2414017G19	IDCTR,CHIP,100NH,5%,300MA,2.5OHM,CER,8 Q,SM,0603,PB-FREE
L6215	2415429H12	CHIP INDUCTOR
L6220	NOTPLACED	-
L6224	2488090Y01	INDUCTOR,MULTI-LAYER,1.0NH,1005,SMD,PB FREE
L6226	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
L6229	2415429H08	CHIP INDUCTOR
L6234	2415429H39	CHIP INDUCTOR
L6238	2415429H35	CHIP INDUCTOR
L6240	NOTPLACED	-
L6241	2415429H07	CHIP INDUCTOR
L6242	NOTPLACED	-
L6243	NOTPLACED	-
L6252	2415429H18	CHIP INDUCTOR
L6258	2415429H17	CHIP INDUCTOR
L6295	NOTPLACED	-

Reference Designator	Motorola Part Number	Description
L6297	NOTPLACED	-
L6310	2415429H16	CHIP INDUCTOR
L6400	2414017Q47	IDCTR,FXD,1UH,10%,50MA,.45OHM,FERR,45 Q,75MHZ SRF,SM,0805,PB
L6401	2414032F33	IDCTR,WW,82NH,5%,400 MA,.42OHM,CER,40 Q,1.02GHZ SRF,SM,PB-FR
L6402	2414032F52	IDCTR,WW,270NH,5%,280 MA,1OHM,CER,40 Q,800MHZ SRF,SM,PB-FREE
L6403	2414032F37	IDCTR,WW,180NH,5%,400 MA,.64OHM,CER,35 Q,710MHZ SRF,SM,PB-FR
L6404	2414032F37	IDCTR,WW,180NH,5%,400 MA,.64OHM,CER,35 Q,710MHZ SRF,SM,PB-FR
L6405	2414032F31	IDCTR,WW,56NH,5%,500 MA,.34OHM,CER,40 Q,1.3GHZ SRF,SM,PB-FRE
L6406	2414032F52	IDCTR,WW,270NH,5%,280 MA,1OHM,CER,40 Q,800MHZ SRF,SM,PB-FREE
L6407	NOTPLACED	-
L6408	2414032B68	IDCTR,WW,1UH,5%,460MA,1.75OHM,CER,33 Q,290MHZ SRF,SM,PB-FRE
L6409	2414032F33	IDCTR,WW,82NH,5%,400 MA,.42OHM,CER,40 Q,1.02GHZ SRF,SM,PB-FR
L6410	2414032F37	IDCTR,WW,180NH,5%,400 MA,.64OHM,CER,35 Q,710MHZ SRF,SM,PB-FR
L6411	2414032F37	IDCTR,WW,180NH,5%,400 MA,.64OHM,CER,35 Q,710MHZ SRF,SM,PB-FR
L6412	2414032F31	IDCTR,WW,56NH,5%,500 MA,.34OHM,CER,40 Q,1.3GHZ SRF,SM,PB-FRE
L6413	2414032F35	IDCTR,WW,120NH,5%,400 MA,.51OHM,CER,35 Q,860MHZ SRF,SM,PB-FR

Reference Designator	Motorola Part Number	Description
L6414	2414032F35	IDCTR,WW,120NH,5%,400 MA,.51OHM,CER,35 Q,860MHZ SRF,SM,PB-FR
L6750	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L6751	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L6752	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L6753	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L6754	2414032D30	IDCTR,WW,1UH,5%,320M A,2.8OHM,CER,28 Q,340MHZ SRF,SM,LEAD-FR
L6755	2414017Q44	IDCTR,FXD,560NH,10%,1 50MA,.75OHM,FERR,25 Q,115MHZ SRF,SM,080
L6756	2414017Q47	IDCTR,FXD,1UH,10%,50M A,.45OHM,FERR,45 Q,75MHZ SRF,SM,0805,PB
L6757	2414032F20	IDCTR,WW,3.3NH,5%,600 MA,.08OHM,CER,50 Q,3GHZ SRF,SM,PB-FREE
L6758	2414032F23	IDCTR,WW,12NH,5%,600 MA,.15OHM,CER,45 Q,2.75GHZ SRF,SM,PB-FR
L6760	2414032F22	IDCTR,WW,8.2NH,5%,600 MA,.12OHM,CER,50 Q,3GHZ SRF,SM,PB-FREE
L6761	2414017Q44	IDCTR,FXD,560NH,10%,1 50MA,.75OHM,FERR,25 Q,115MHZ SRF,SM,080
L6763	2414032F23	IDCTR,WW,12NH,5%,600 MA,.15OHM,CER,45 Q,2.75GHZ SRF,SM,PB-FR
L7100	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L7202	2475302B01	INDUC-TOR,POWER,6.8UH,10%, 1.9A,.13OH
L7203	2464820H01	INDUCTOR,SHIELDED
L7204	2464650H02	INDUCTOR, 2.2UH
L7205	2464650H01	IDCTR,PWR,33UH,SHIEL DED
L7300	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L7501	2414032B75	IDCTR,WW,3.9UH,5%,340 MA,3.6OHM,CER,20 Q,70MHZ SRF,SM,PB-FRE
L7701	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L7702	2414017Q20	IDCTR,FXD,2.2UH,20%,30 MA,.65OHM,FERR,45 Q,50MHZ SRF,SM,0805
L33000	2414032D16	IDCTR,WW,120NH,5%,800 MA,.26OHM,CER,42 Q,1GHZ SRF,SM,PB-FREE
L33001	2414032D38	IDCTR,WW,22NH,5%,1A,.1 OHM,CER,33 Q,1.9GHZ SRF,SM,LEAD-FREE
L33002	4805911Z21	RESONATOR, COAX CER 1250 MHZ SMD
P1001	2864706H02	CONNECTOR, MALE,3RF 22I/O
P6000	NOTPLACED	-
PWB	8464191H02	PCB, MAIN BOARD
Q400	4805585Q27	TRANSISTOR RF NPN, BFQ67W NOPB
Q0900	4813970A66	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,DPAK,60V,55W, PB-FREE
Q0901	4813973A81	XSTR,BIP GP SS,DIG,NPN AND PNP,SOT-363,50V,.25W,100MA,BIAS
Q0902	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q0952	NOTPLACED	-
Q0954	4813972A17	PB-FREE,NOT COM-PLETELY ENRICHED
Q0955	4813972A17	PB-FREE,NOT COM-PLETELY ENRICHED
Q0960	4813973A81	XSTR,BIP GP SS,DIG,NPN AND PNP,SOT-363,50V,.25W,100MA,BIAS
Q3896	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q3897	4815267H01	DBRT UMT1NFTN
Q3898	4813973A04	XSTR,BIP GP SS,NPN,TA13,SM,SOT-23,SMT,30V,.225W,300MA, 125MHZ,P
Q3899	4816049H01	MEDIUM PWR TRANSIS-TOR
Q5002	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q5003	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q6000	4805585Q27	TRANSISTOR RF NPN, BFQ67W NOPB
Q6001	4813973A04	XSTR,BIP GP SS,NPN,TA13,SM,SOT-23,SMT,30V,.225W,300MA, 125MHZ,P
Q6223	4805585Q27	TRANSISTOR RF NPN, BFQ67W NOPB
Q6255	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q6256	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q6400	4805585Q28	TRANSISTOR RF NPN 8GHZ NOPB
Q6753	4885316E10	XSTR,DUAL DIGI-TAL,IMD6AT108
Q6755	4885316E10	XSTR,DUAL DIGI-TAL,IMD6AT108
Q6758	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA, 300MHZ
Q6759	4813973A13	XSTR,BIP GP SS,PNP,T3906,SM,SOT-23,SMT,-40V,.225W,-200MA,250MH
Q6760	4885316E10	XSTR,DUAL DIGI-TAL,IMD6AT108
Q6761	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
Q6762	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
Q6763	5185941F43	IC,RF AMPLI-FIER,MAALSS0012,SOT-363,14.2DB,70MHZMIN,3G HZMA
Q6764	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
Q6765	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
Q6766	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
Q6767	4885316E10	XSTR,DUAL DIGI-TAL,IMD6AT108
Q7200	4813970A59	P-CH FET 1.0A 20V SOT-23 T&R
Q7201	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA, 300MHZ
Q7202	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA, 300MHZ
Q7203	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q7204	4813970A66	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,DPAK,60V,55W, PB-FREE
Q7205	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,P B-FREE
Q7206	4805921T28	XSTR, DUAL NOPB
Q7207	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q7208	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE

Reference Designator	Motorola Part Number	Description
Q7209	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q7211	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,PB-FREE
Q7213	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q7214	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
Q7215	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q7700	4813973A42	XSTR,BIP GP SS,NPN,SM,SC-59,SMT,50V,.23W,100MA,PB-FREE
Q7701	4813970A62	XSTR,FET GP PWR,MOS-FET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q7950	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
R401	0613952R17	CER CHIP RES 47K OHM 5% 0402
R402	0613952D25	CER CHIP RES 1780 OHM 1 0603
R403	0613952D25	CER CHIP RES 1780 OHM 1 0603
R404	0613952D25	CER CHIP RES 1780 OHM 1 0603
R405	0613952D25	CER CHIP RES 1780 OHM 1 0603
R406	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R407	0613952J01	CER CHIP RES 10K OHM 5% 0603
R408	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R409	0613952H57	CER CHIP RES 220 OHM 5% 0603
R410	0613952H46	CER CHIP RES 75.0 OHM 5 0603
R411	0613952H67	CER CHIP RES 560 OHM 5 0603
R412	0613952H67	CER CHIP RES 560 OHM 5 0603
R414	0613952J08	CER CHIP RES 20K OHM 5 0603
R415	0613952J16	CER CHIP RES 43K OHM 5 0603
R417	0613952H67	CER CHIP RES 560 OHM 5 0603
R418	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R423	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R429	0613952J11	CER CHIP RES 27K OHM 5% 0603
R430	0613952H80	CER CHIP RES 2000 OHM 5 0603
R431	0613952H84	CER CHIP RES 3000 OHM 5 0603
R439	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R440	NOTPLACED	-
R441	NOTPLACED	-
R442	NOTPLACED	-
R443	NOTPLACED	-
R480	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R481	0613952E42	CER CHIP RES 26.7K OHM 1 0603
R482	0613952E69	CER CHIP RES 51.1K OHM 1 0603
R497	0613952H67	CER CHIP RES 560 OHM 5 0603
R498	0613952H67	CER CHIP RES 560 OHM 5 0603
R499	0613952H69	CER CHIP RES 680 OHM 5 0603
R0900	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0901	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R0902	0613952Q65	CER CHIP RES 470 OHM 5 0402
R0903	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0904	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0905	0613952R05	CER CHIP RES 15K OHM 5% 0402
R0906	0613952N89	CER CHIP RES 82.5K OHM 1 0402
R0907	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0908	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0909	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0911	0613952N15	CER CHIP RES 14.0K OHM 1 0402
R0912	0613952N15	CER CHIP RES 14.0K OHM 1 0402
R0913	0613952P51	CER CHIP RES 332K OHM 1 0402
R0914	0613952N15	CER CHIP RES 14.0K OHM 1 0402
R0915	0613952N05	CER CHIP RES 11.0K OHM 1 0402
R0916	0613952N17	CER CHIP RES 14.7K OHM 1 0402
R0917	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0918	0613952N05	CER CHIP RES 11.0K OHM 1 0402
R0919	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0920	0613952R08	CER CHIP RES 20K OHM 5 0402
R0921	0613952P01	CER CHIP RES 100K OHM 1 0402
R0922	0613952N17	CER CHIP RES 14.7K OHM 1 0402
R0923	0613952R12	CER CHIP RES 30K OHM 5 0402
R0924	0613952N48	CER CHIP RES 30.9K OHM 1 0402
R0926	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0927	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0929	0613952M09	CER CHIP RES 1210 OHM 1% 0402
R0930	0613952N48	CER CHIP RES 30.9K OHM 1 0402
R0931	0613952R12	CER CHIP RES 30K OHM 5 0402
R0932	NOTPLACED	-
R0933	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R0934	NOTPLACED	-
R0935	0613952R25	CER CHIP RES 100K OHM 5% 0402
R0936	0613952N17	CER CHIP RES 14.7K OHM 1 0402
R0937	0613952R12	CER CHIP RES 30K OHM 5 0402
R0938	0613952N48	CER CHIP RES 30.9K OHM 1 0402
R0939	0613952R12	CER CHIP RES 30K OHM 5 0402
R0940	0613952N17	CER CHIP RES 14.7K OHM 1 0402
R0941	0613952R12	CER CHIP RES 30K OHM 5 0402
R0942	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R0943	0613952R08	CER CHIP RES 20K OHM 5 0402
R0944	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0945	0613952R13	CER CHIP RES 33K OHM 5% 0402
R0946	0613952P01	CER CHIP RES 100K OHM 1 0402
R0947	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0948	NOTPLACED	-
R0950	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0951	0613952F44	CER CHIP RES 280K OHM 1 0603
R0952	0613952E91	CER CHIP RES 86.6K OHM 1 0603
R0953	0613952F15	CER CHIP RES 140K OHM 1 0603
R0954	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R0960	0613952R08	CER CHIP RES 20K OHM 5 0402

Reference Designator	Motorola Part Number	Description
R0961	0613952F44	CER CHIP RES 280K OHM 1 0603
R0962	0613952P01	CER CHIP RES 100K OHM 1 0402
R0963	0613952R10	CER CHIP RES 24K OHM 5 0402
R0964	0613952R10	CER CHIP RES 24K OHM 5 0402
R0965	NOTPLACED	-
R0966	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0967	0613952P01	CER CHIP RES 100K OHM 1 0402
R0968	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0969	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0970	NOTPLACED	-
R0971	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0972	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0973	0613952R05	CER CHIP RES 15K OHM 5% 0402
R0974	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0975	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R0976	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R0977	0613952Q49	CER CHIP RES 100 OHM 5 0402
R0978	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0979	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0980	NOTPLACED	-
R0981	0613952Q83	CER CHIP RES 2700 OHM 5 0402
R0982	0613952R25	CER CHIP RES 100K OHM 5% 0402
R0983	0613952Q80	CER CHIP RES 2000 OHM 5 0402
R0984	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0985	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0986	NOTPLACED	-
R0987	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R0988	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0989	0613952R19	CER CHIP RES 56K OHM 5% 0402
R0990	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R0991	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0992	0613952P01	CER CHIP RES 100K OHM 1 0402
R0994	0613952Q87	CER CHIP RES 3900 OHM 5 0402
R0995	0613952M09	CER CHIP RES 1210 OHM 1% 0402
R0996	0613952R01	CER CHIP RES 10K OHM 5% 0402
R0997	0613952M09	CER CHIP RES 1210 OHM 1% 0402
R0998	0613952N05	CER CHIP RES 11.0K OHM 1 0402
R0999	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3000	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R3001	0613952C24	CER CHIP RES 174 OHM 1% 0603
R3002	0613952B01	CER CHIP RES 10.0 OHM 1% 0603
R3003	0613952C18	CER CHIP RES 150 OHM 1% 0603
R3005	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3006	0613952C85	CER CHIP RES 750 OHM 1 0603
R3007	0613952C89	CER CHIP RES 825 OHM 1% 0603
R3008	0613952R03	CER CHIP RES 12K OHM 5% 0402
R3009	0613952Q61	CER CHIP RES 330 OHM 5 0402
R3010	0613952Q49	CER CHIP RES 100 OHM 5 0402
R3011	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R3014	0613952H56	CER CHIP RES 200 OHM 5 0603
R3017	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3018	0613952L01	CER CHIP RES 100 OHM 1% 0402
R3019	0613952Q61	CER CHIP RES 330 OHM 5 0402
R3020	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R3021	0613952D01	CER CHIP RES 1000 OHM 1% 0603
R3022	0613952D01	CER CHIP RES 1000 OHM 1% 0603
R3023	0613952R03	CER CHIP RES 12K OHM 5% 0402
R3026	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R3027	0613952Q54	CER CHIP RES 160 OHM 5 0402
R3028	0613952Q54	CER CHIP RES 160 OHM 5 0402
R3029	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R3030	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R3031	0613952Q60	CER CHIP RES 300 OHM 5 0402
R3032	0613952Q60	CER CHIP RES 300 OHM 5 0402
R3033	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R3034	0613952Q46	CER CHIP RES 75.0 OHM 5 0402
R3035	0613952Q46	CER CHIP RES 75.0 OHM 5 0402
R3036	0613959Y44	CER CHIP RES OHM 5% 2512
R3037	0613952H42	CER CHIP RES 51.0 OHM 5% 0603
R3038	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
R3039	2415427H21	CHIP INDUCTOR
R3040	2113944A03	CAP CER CHP 1.3PF 50V +/- 0.25PF
R3041	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R3042	0613952Q60	CER CHIP RES 300 OHM 5 0402
R3043	0613952Q60	CER CHIP RES 300 OHM 5 0402
R3044	0613952Q54	CER CHIP RES 160 OHM 5 0402
R3800	0613952J01	CER CHIP RES 10K OHM 5% 0603
R3801	0613952R01	CER CHIP RES 10K OHM 5% 0402
R3802	0613952R01	CER CHIP RES 10K OHM 5% 0402
R3803	0613952R01	CER CHIP RES 10K OHM 5% 0402
R3816	0613952H29	CER CHIP RES 15.0 OHM 5 0603
R3817	0613952H46	CER CHIP RES 75.0 OHM 5 0603
R3818	0613952H29	CER CHIP RES 15.0 OHM 5 0603
R3819	NOTPLACED	-
R3830	0613952H43	CER CHIP RES 56.0 OHM 5 0603
R3831	0613952H65	CER CHIP RES 470 OHM 5% 0603
R3832	0613952H43	CER CHIP RES 56.0 OHM 5 0603
R3890	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R3891	0613952Q57	CER CHIP RES 220 OHM 5 0402
R3892	0613952Q71	CER CHIP RES 820 OHM 5 0402
R3893	0613952M09	CER CHIP RES 1210 OHM 1% 0402
R3895	0613952Q65	CER CHIP RES 470 OHM 5 0402
R3897	0613952R32	CER CHIP RES 200K OHM 5 0402
R3898	0613952Q33	CER CHIP RES 22.0 OHM 5 0402
R3899	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R3900	0613952R25	CER CHIP RES 100K OHM 5% 0402
R5000	0613952Q49	CER CHIP RES 100 OHM 5 0402

Reference Designator	Motorola Part Number	Description
R5002	0613952Q49	CER CHIP RES 100 OHM 5 0402
R5009	0613952N38	CER CHIP RES 24.3K OHM 1 0402
R5010	0613952M58	CER CHIP RES 3920 OHM 1% 0402
R5011	0613952N38	CER CHIP RES 24.3K OHM 1 0402
R5012	0613952M58	CER CHIP RES 3920 OHM 1% 0402
R5013	0613952R25	CER CHIP RES 100K OHM 5% 0402
R5014	0613952N38	CER CHIP RES 24.3K OHM 1 0402
R5015	0613952M58	CER CHIP RES 3920 OHM 1% 0402
R5016	0613952R25	CER CHIP RES 100K OHM 5% 0402
R5023	NOTPLACED	-
R5030	0613952Q49	CER CHIP RES 100 OHM 5 0402
R5050	0613958A43	CER CHIP RES 2.74 OHM 1% 0805
R5051	0613958A43	CER CHIP RES 2.74 OHM 1% 0805
R6000	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R6001	0613952R49	CER CHIP RES 1.0M OHM 5% 0402
R6002	0613952R25	CER CHIP RES 100K OHM 5% 0402
R6003	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6004	0613952Q61	CER CHIP RES 330 OHM 5 0402
R6005	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6006	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R6007	0613952Q63	CER CHIP RES 390 OHM 5 0402
R6008	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6009	0613952N38	CER CHIP RES 24.3K OHM 1 0402
R6011	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM

Reference Designator	Motorola Part Number	Description
R6012	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6013	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6014	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6015	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6016	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6019	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R6020	NOTPLACED	-
R6021	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6022	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6023	NOTPLACED	-
R6024	NOTPLACED	-
R6025	NOTPLACED	-
R6026	NOTPLACED	-
R6027	NOTPLACED	-
R6028	NOTPLACED	-
R6029	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6030	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6031	NOTPLACED	-
R6201	0613952Q63	CER CHIP RES 390 OHM 5 0402
R6202	NOTPLACED	-
R6203	NOTPLACED	-
R6216	0613952Z45	RES,MF,3.6KOHM,1%,.062 5W,SM,0402,200PPM/ CEL,PB-FREE
R6217	0613952Q82	CER CHIP RES 2400 OHM 5 0402
R6218	0613952M60	CER CHIP RES 4120 OHM 1 0402
R6221	NOTPLACED	-
R6228	0613952Q56	CER CHIP RES 200 OHM 5 0402
R6236	0613952K68	CER CHIP RES 49.9 OHM 1% 0402
R6237	0613952K68	CER CHIP RES 49.9 OHM 1% 0402

Reference Designator	Motorola Part Number	Description
R6240	NOTPLACED	-
R6241	NOTPLACED	-
R6242	NOTPLACED	-
R6252	NOTPLACED	-
R6276	0613952L01	CER CHIP RES 100 OHM 1% 0402
R6282	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6283	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6400	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6401	0613952Q79	CER CHIP RES 1800 OHM 5 0402
R6402	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R6403	0613952Q75	CER CHIP RES 1200 OHM 5 0402
R6404	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R6405	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6751	0613952R08	CER CHIP RES 20K OHM 5 0402
R6752	0613952R25	CER CHIP RES 100K OHM 5% 0402
R6753	0613952R25	CER CHIP RES 100K OHM 5% 0402
R6754	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R6755	0613952R25	CER CHIP RES 100K OHM 5% 0402
R6756	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R6757	0613952Q49	CER CHIP RES 100 OHM 5 0402
R6758	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R6760	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R6761	0613952Q66	CER CHIP RES 510 OHM 5 0402
R6764	0613952Q77	CER CHIP RES 1500 OHM 5 0402
R6765	0613952Q55	CER CHIP RES 180 OHM 5 0402

Reference Designator	Motorola Part Number	Description
R6766	0613952R14	CER CHIP RES 36K OHM 5 0402
R6767	0613952R14	CER CHIP RES 36K OHM 5 0402
R6768	0613952Q94	CER CHIP RES 7500 OHM 5 0402
R6769	0613952Q80	CER CHIP RES 2000 OHM 5 0402
R6770	0613952R17	CER CHIP RES 47K OHM 5% 0402
R6771	0613952R15	CER CHIP RES 39K OHM 5% 0402
R6772	0613952R12	CER CHIP RES 30K OHM 5 0402
R6773	0613952R12	CER CHIP RES 30K OHM 5 0402
R6774	0613952Q61	CER CHIP RES 330 OHM 5 0402
R6775	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6776	0613952R12	CER CHIP RES 30K OHM 5 0402
R6777	0613952Q39	CER CHIP RES 39.0 OHM 5 0402
R6778	0613952Q77	CER CHIP RES 1500 OHM 5 0402
R6779	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6780	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6789	0613952H60	CER CHIP RES 300 OHM 5 0603
R6790	0613952H60	CER CHIP RES 300 OHM 5 0603
R6791	0613952Q49	CER CHIP RES 100 OHM 5 0402
R6792	0613952Q49	CER CHIP RES 100 OHM 5 0402
R6793	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6794	0613952Q39	CER CHIP RES 39.0 OHM 5 0402
R6795	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6796	0613952Q73	CER CHIP RES 1000 OHM 5 0402

Reference Designator	Motorola Part Number	Description
R6797	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R6798	0613952H60	CER CHIP RES 300 OHM 5 0603
R6799	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6800	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R6801	0613959Y44	CER CHIP RES OHM 5% 2512
R6802	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6803	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R6804	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6805	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R6806	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R6807	0613952H53	CER CHIP RES 150 OHM 5% 0603
R6808	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R6809	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6810	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R6811	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6812	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R6813	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R6814	0613952H53	CER CHIP RES 150 OHM 5% 0603
R6815	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R6816	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6817	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R6818	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6819	0613952R05	CER CHIP RES 15K OHM 5% 0402
R6820	0613952R01	CER CHIP RES 10K OHM 5% 0402
R6821	0613952H47	CER CHIP RES 82.0 OHM 5 0603
R6823	0613952Q62	CER CHIP RES 360 OHM 5 0402
R6824	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6825	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6826	0613952Q39	CER CHIP RES 39.0 OHM 5 0402
R6827	0613952Q53	CER CHIP RES 150 OHM 5 0402
R6828	NOTPLACED	-
R6829	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6830	0613952Q60	CER CHIP RES 300 OHM 5 0402
R6831	0613952Q31	CER CHIP RES 18.0 OHM 5 0402
R6833	0613952H47	CER CHIP RES 82.0 OHM 5 0603
R6835	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7100	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7101	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7102	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7103	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7104	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7105	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7106	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7107	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7108	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7110	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7111	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7112	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7113	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7114	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7115	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7116	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7117	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7118	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7119	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7122	NOTPLACED	-
R7123	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7124	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7125	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7126	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7127	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7128	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7129	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7131	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7132	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7133	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7134	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7135	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7136	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7137	NOTPLACED	-
R7139	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7141	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7200	NOTPLACED	-
R7201	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7209	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7210	0613952R08	CER CHIP RES 20K OHM 5 0402
R7211	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7213	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7214	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7215	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7217	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7218	0613952R08	CER CHIP RES 20K OHM 5 0402
R7219	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7220	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7221	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7223	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7226	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7227	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7229	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7230	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7231	NOTPLACED	-
R7232	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7233	NOTPLACED	-
R7234	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7235	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7236	NOTPLACED	-

Reference Designator	Motorola Part Number	Description
R7237	NOTPLACED	-
R7238	NOTPLACED	-
R7239	NOTPLACED	-
R7240	NOTPLACED	-
R7244	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7245	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7246	0613952M58	CER CHIP RES 3920 OHM 1% 0402
R7247	0613952M89	CER CHIP RES 8250 OHM 1% 0402
R7248	NOTPLACED	-
R7249	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7250	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7251	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7252	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7253	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7254	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7255	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7256	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R7257	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7259	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7260	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7261	NOTPLACED	-
R7262	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7263	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7264	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7265	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7266	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7267	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7268	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7269	NOTPLACED	-
R7271	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7272	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7273	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7274	0613952M18	CER CHIP RES 1500 OHM 1% 0402
R7275	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7276	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7277	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7279	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7284	NOTPLACED	-
R7285	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7286	NOTPLACED	-
R7301	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7303	0613952D38	CER CHIP RES 2430 OHM 1% 0603
R7304	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7305	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7306	0613952Q49	CER CHIP RES 100 OHM 5 0402
R7307	0613952Q49	CER CHIP RES 100 OHM 5 0402
R7309	0613952Q20	CER CHIP RES 6.2 OHM 5 0402
R7310	0613952K38	CER CHIP RES 24.3 OHM 1 0402
R7311	0613952Q20	CER CHIP RES 6.2 OHM 5 0402
R7312	0613952K38	CER CHIP RES 24.3 OHM 1 0402
R7313	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7314	0613952Q57	CER CHIP RES 220 OHM 5 0402
R7315	0613952Q57	CER CHIP RES 220 OHM 5 0402
R7316	0613952Q57	CER CHIP RES 220 OHM 5 0402
R7317	0613952Q57	CER CHIP RES 220 OHM 5 0402
R7318	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7319	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7320	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7321	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7323	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7328	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7330	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7331	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7332	0613952R19	CER CHIP RES 56K OHM 5% 0402
R7333	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7335	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7338	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7339	NOTPLACED	-
R7340	NOTPLACED	-
R7400	NOTPLACED	-
R7401	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7402	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7406	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7425	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7426	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7427	NOTPLACED	-
R7428	NOTPLACED	-
R7429	NOTPLACED	-
R7430	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7431	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7432	NOTPLACED	-
R7433	0613952R09	CER CHIP RES 22K OHM 5% 0402
R7434	0613952L85	CER CHIP RES 750 OHM 1 0402
R7436	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7437	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7438	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7439	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7440	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7441	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7443	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7444	NOTPLACED	-
R7445	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7447	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7448	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7449	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7450	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7451	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7452	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7453	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7454	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7455	0613952R01	CER CHIP RES 10K OHM 5% 0402

Reference Designator	Motorola Part Number	Description
R7456	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7457	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7458	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7459	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7462	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7463	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7464	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7465	0613952R41	CER CHIP RES 470K OHM 5% 0402
R7466	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7467	NOTPLACED	-
R7470	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7471	NOTPLACED	-
R7472	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7473	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7474	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7475	NOTPLACED	-
R7476	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7478	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7480	NOTPLACED	-
R7481	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7483	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7484	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7485	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7486	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7487	NOTPLACED	-

Reference Designator	Motorola Part Number	Description
R7491	0613952R09	CER CHIP RES 22K OHM 5% 0402
R7492	0613952P30	CER CHIP RES 200K OHM 1 0402
R7493	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7494	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7496	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7500	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7501	NOTPLACED	-
R7520	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7521	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7522	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7523	0613952Q61	CER CHIP RES 330 OHM 5 0402
R7524	0613952Q61	CER CHIP RES 330 OHM 5 0402
R7525	0613952Q61	CER CHIP RES 330 OHM 5 0402
R7526	0613952Q61	CER CHIP RES 330 OHM 5 0402
R7529	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7530	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7532	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7533	0613952R41	CER CHIP RES 470K OHM 5% 0402
R7534	0613952R41	CER CHIP RES 470K OHM 5% 0402
R7600	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7601	0613952R41	CER CHIP RES 470K OHM 5% 0402
R7602	0613952R74	RES,MF,10MOHM,5%,.0625W,SM,0402,400PPM/CEL,PB-FREE
R7603	0613952R74	RES,MF,10MOHM,5%,.0625W,SM,0402,400PPM/CEL,PB-FREE

Reference Designator	Motorola Part Number	Description
R7604	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7607	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7608	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7610	NOTPLACED	-
R7611	NOTPLACED	-
R7614	NOTPLACED	-
R7615	NOTPLACED	-
R7616	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7617	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7618	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R7619	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7620	NOTPLACED	-
R7621	NOTPLACED	-
R7622	NOTPLACED	-
R7623	NOTPLACED	-
R7624	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7625	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7626	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7627	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7628	NOTPLACED	-
R7629	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7632	0613952Q77	CER CHIP RES 1500 OHM 5 0402
R7635	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7636	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7637	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7638	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7639	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM

Reference Designator	Motorola Part Number	Description
R7640	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7641	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7642	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R7643	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7644	NOTPLACED	-
R7645	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7646	NOTPLACED	-
R7647	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7648	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7649	NOTPLACED	-
R7650	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7651	NOTPLACED	-
R7652	NOTPLACED	-
R7653	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7654	NOTPLACED	-
R7655	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7656	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7657	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7658	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7661	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7662	NOTPLACED	-
R7663	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7664	0613952Q45	CER CHIP RES 68.0 OHM 5 0402
R7665	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R7666	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R7667	0613952Q42	CER CHIP RES 51.0 OHM 5 0402

Reference Designator	Motorola Part Number	Description
R7668	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7669	NOTPLACED	-
R7670	NOTPLACED	-
R7671	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7700	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7701	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7702	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7704	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7705	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7706	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7707	0613952Z55	RES,MF,12KOHM,1%,.062 5W,SM,0402,200PPM/ CEL,PB-FREE
R7708	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7709	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7710	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7711	0613952Z55	RES,MF,12KOHM,1%,.062 5W,SM,0402,200PPM/ CEL,PB-FREE
R7712	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7713	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7714	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7716	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7718	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7719	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7720	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7721	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7722	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7723	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7724	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7725	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7726	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7727	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7728	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7729	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7730	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7731	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7733	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7734	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7736	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7737	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7738	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7739	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7742	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7744	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7745	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7746	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7747	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7748	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7753	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7754	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7757	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7759	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7761	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7762	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7763	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7764	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7765	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7766	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7767	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7768	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7769	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7770	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7771	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7772	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7773	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7774	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7777	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7778	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7780	NOTPLACED	-
R7781	NOTPLACED	-
R7782	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7783	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7784	2113944A40	CAP CER CHP 100.0PF 50V 5%
R7785	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7786	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7787	2113944A40	CAP CER CHP 100.0PF 50V 5%
R7788	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7790	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7793	0613952C01	CER CHIP RES 100 OHM 1% 0603
R7794	NOTPLACED	-
R7795	NOTPLACED	-
R7796	0613952J25	CER CHIP RES 100K OHM 5% 0603
R7797	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7798	0613952J25	CER CHIP RES 100K OHM 5% 0603
R7799	NOTPLACED	-
R7800	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7802	NOTPLACED	-
R7816	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7817	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7905	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7906	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7908	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7910	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7911	NOTPLACED	-
R7912	NOTPLACED	-
R7913	0613952M89	CER CHIP RES 8250 OHM 1% 0402
R7914	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
R7915	0613952Q57	CER CHIP RES 220 OHM 5 0402
R7917	0613952M89	CER CHIP RES 8250 OHM 1% 0402

Reference Designator	Motorola Part Number	Description
R7919	0613952D38	CER CHIP RES 2430 OHM 1% 0603
R7922	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7927	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7928	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7930	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7934	0613958A43	CER CHIP RES 2.74 OHM 1% 0805
R7935	0613958A43	CER CHIP RES 2.74 OHM 1% 0805
R7936	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7937	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7938	0613952P01	CER CHIP RES 100K OHM 1 0402
R7939	0613952P30	CER CHIP RES 200K OHM 1 0402
R7940	0613952P01	CER CHIP RES 100K OHM 1 0402
R7941	0613952N42	CER CHIP RES 26.7K OHM 1 0402
R7943	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7944	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7949	0613952P30	CER CHIP RES 200K OHM 1 0402
R7950	0613952R57	CER CHIP RES 2.2M OHM 5% 0402
R7951	0613952R41	CER CHIP RES 470K OHM 5% 0402
R7954	NOTPLACED	-
R7955	NOTPLACED	-
R7956	NOTPLACED	-
R7957	NOTPLACED	-
R7958	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7959	0613952R08	CER CHIP RES 20K OHM 5 0402
R7960	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7961	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7962	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7963	0613952Z55	RES,MF,12KOHM,1%,.0625W,SM,0402,200PPM/CEL,PB-FREE
R7965	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7968	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7969	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7971	0613952R22	CER CHIP RES 75K OHM 5 0402
R7972	NOTPLACED	-
R7975	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7976	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7980	0613952G67	CER CHIP RES 0.0 +/- 0.050 OHM
R7982	0613952R08	CER CHIP RES 20K OHM 5 0402
R7985	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7986	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7987	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7988	0613958J74	CER CHIP RES 0.0 OHM JMP 0805
R7990	0613952P30	CER CHIP RES 200K OHM 1 0402
R7991	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7992	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7993	0613952R22	CER CHIP RES 75K OHM 5 0402
R7994	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7995	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
R7996	0613952R08	CER CHIP RES 20K OHM 5 0402
R7997	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R7998	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
R7999	NOTPLACED	-
R8000	NOTPLACED	-
R8001	0613952M01	CER CHIP RES 1000 OHM 1% 0402
R8002	0613952P78	CER CHIP RES 634K OHM 1 0402
R8003	0613952P78	CER CHIP RES 634K OHM 1 0402
R33005	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R33006	0613952C85	CER CHIP RES 750 OHM 1 0603
R33007	0613952C89	CER CHIP RES 825 OHM 1% 0603
R33008	0613952R03	CER CHIP RES 12K OHM 5% 0402
R33009	0613952Q61	CER CHIP RES 330 OHM 5 0402
R33010	0613952Q49	CER CHIP RES 100 OHM 5 0402
R33011	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R50112	0613952R66	CER CHIP RES 0.0 +/- 0.050 OHM
SH3015	2685965D01	SHIELD MIXER
SH3017	2685786D01	SHEILD ABACUS 2ND LO
SH6000	NOTPLACED	-
SH6754	NOTPLACED	-
SH7600	NOTPLACED	-
SH33016	2685965D01	SHIELD MIXER
T6209	2575867A01	XFMR,RF,1:1,2.87UH,SM,1:1 4.5-3G
T7300	2564217H01	XFMR,10BASE,INTFC MOD PB-FREE
U400	5104932K08	IC,CUST,1PER PKG,BGA,ABL TRAMS-CEOVER OC
U480	5185941F39	IC, VREG,NOPB
U481	5185941F34	IC, LNR VREG, NOPB
U482	5185941F36	IC,VREG,200MA UL DROPOUT LN,NOPB
U0950	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U0953	5185941F41	IC,4-/8-CHANNEL SAMPLING ADCS
U0954	5114000B34	IC,NAND,1PER PKG,SM,SOT-353,PB-FREE
U0955	5114016A12	IC,OP AMP,4PER PKG,LVOLT,SM,SO-14,PB-FREE
U0956	5185941F37	IC, OP AMP, NOPB
U0957	5114016A12	IC,OP AMP,4PER PKG,LVOLT,SM,SO-14,PB-FREE
U0958	5114000B34	IC,NAND,1PER PKG,SM,SOT-353,PB-FREE
U0959	5187399T01	ANALOG TO DIGITAL CONVERTER
U0960	5114016A12	IC,OP AMP,4PER PKG,LVOLT,SM,SO-14,PB-FREE
U0961	5185941F46	IC, LOW VOLT CMOS ANALOG SWITCHES
U0962	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U0963	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U0964	5185956E99	IC,POT,DUAL 256 TAP DIGITAL 50K SPI
U0965	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U0966	5185941F26	IC,COMPTR,LMV7219,NOPB
U0967	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U0968	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U3002	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U3003	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U3004	4813973A81	XSTR,BIP GP SS,DIG,NPN AND PNP,SOT-363,50V,.25W,100MA,BIAS
U3006	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH

Reference Designator	Motorola Part Number	Description
U3009	4805585Q29	TRANSISTOR RF, IRF949T PB FREE
U3010	5185941F43	IC,RF AMPLI-FIER,MAALSS0012,SOT-363,14.2DB,70MHZMIN,3G HZMA
U3015	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U3016	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U3017	4813973A81	XSTR,BIP GP SS,DIG,NPN AND PNP,SOT-363,50V,.25W,100MA,BIAS
U3800	5186988J77	IC,XMTR,SM,BGA,JAVE-LIN EPP COMPLIENT
U3801	2585959A01	TRANSFORMER BALUN CERAMIC
U3802	5189046V01	ATTEN,VAR,10DBMAX,SM ,SOT-25,DIG,GAAS,ATTENUA-TOR,1 BIT,PB-F
U3803	2585959A01	TRANSFORMER BALUN CERAMIC
U3850	5185070Y01	IC TEMPERATURE SEN-SOR PB-FREE
U3870	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U3871	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U3872	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U3881	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U3899	5114014A26	IC,LNR V REGLTR,ADJUST-ABLE,1.2V TO,37V,500MA,SM,DPAK, PB-FREE
U5000	5164015H94	IC, LM2941, TO DROPOUT REG
U5002	5164015H94	IC, LM2941, TO DROPOUT REG
U5003	5185941F34	IC, LNR VREG, NOPB
U5004	5185941F35	IC, VREG, NOPB
U5005	5164015H94	IC, LM2941, TO DROPOUT REG
U6000	5185963A85	IC-ABACUS III-LP
U6001	5114014A07	IC,LNR V REGLTR,FXD,5V,500MA,SM,DPAK,PB-FREE
U6002	5185941F35	IC, VREG, NOPB
U6003	5185941F36	IC,VREG,200MA UL DROPOUT LN,NOPB
U6201	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U6202	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6205	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6206	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6207	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6208	5164015H14	IC,MXR, 700/ 800,720MHZMIN,900MHZ MAX,20MHZMIN,100MHZ MAX,S
U6233	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U6250	5164852H27	IC, HIGH-LINEARITY LNA
U6252	5185941F45	ATTEN,VAR,14.4DBMIN,15 .6DBMAX,0-2000 MHZ-FREQ,50OHM,PCMT,SOT
U6253	5185941F45	ATTEN,VAR,14.4DBMIN,15 .6DBMAX,0-2000 MHZ-FREQ,50OHM,PCMT,SOT
U6301	5164852H27	IC, HIGH-LINEARITY LNA
U6400	5114000B37	IC,INVTR,1PER PKG,SM,SOT-353,PB-FREE
U6401	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6402	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6750	5185941F35	IC, VREG, NOPB
U6751	5185177Y01	IC TESTED AT25016 48 PIN W18
U6752	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U6753	5185941F40	IC, 12 BIT DAC
U6754	0180706H03	PB FREE MOBILE TRANS-MIT VCO 700/800
U6755	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U6756	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6757	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U6758	5105739X07	SINGLE POLE, DOUBLE THROW RF SWITCH
U6760	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U7100	5108340Y14	IC,DSP,BGA,300MHZ,16BITS,65536BY
U7102	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7201	5185941F36	IC,VREG,200MA UL DROPOUT LN,NOPB
U7203	5185941F35	IC, VREG, NOPB
U7204	5185956E90	IC,POWER MANAGE-MENT,SUPERVISORY/ REG
U7206	5114014A26	IC,LNR V REGLTR,ADJUST-ABLE,1.2V TO,37V,500MA,SM,DPAK, PB-FREE
U7207	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7208	5185941F22	IC,OPAMP,SGL,OPA237,SOT23,NOPB
U7209	5184688Y01	200KHZ STEPDOWN SWITCHING REG
U7300	5175771A40	SINGLE CHIP FULL DUPLEX ETHERNET CO
U7301	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U7304	5187904J03	IC,SOT-23,SOT-23,0PER PKG,LOW QUIESCENT CURRENT, PROGRAMMA-BLE
U7400	5185941F17	IC,SDRAM,128MB,8MX16, PB-FREE
U7401	5164852H43	IC, 64 MBIT (4MB X 16, BOOT BLOCK)
U7425	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7426	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7427	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7428	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7429	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7430	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7431	5114000C08	IC,BFR,4PER PKG,125,N-I,TSSOP,PB-FREE
U7432	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U7433	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
U7434	5114007M28	IC,F-F/D,1PER PKG,17SZ74,N-I,SM,SOIC8,PB-FREE
U7435	NOTPLACED	-
U7436	5114007M28	IC,F-F/D,1PER PKG,17SZ74,N-I,SM,SOIC8,PB-FREE
U7437	5114007M28	IC,F-F/D,1PER PKG,17SZ74,N-I,SM,SOIC8,PB-FREE
U7438	5187904J03	IC,SOT-23,SOT-23,0PER PKG,LOW QUIESCENT CURRENT, PROGRAMMA-BLE
U7439	5185941F42	IC,INVTR,TC7SH04F/ FU,SOT-353
U7440	5187904J03	IC,SOT-23,SOT-23,0PER PKG,LOW QUIESCENT CURRENT, PROGRAMMA-BLE
U7441	5185941F23	IC,CMOS,TIMER,LMC555 CM,NOPB
U7442	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
U7443	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7445	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE

Reference Designator	Motorola Part Number	Description
U7446	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7448	5185941F23	IC,CMOS,TIMER,LMC555 CM,NOPB
U7449	NOTPLACED	-
U7450	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7451	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7453	5185941F42	IC,INVTR,TC7SH04F/FU,SOT-353
U7454	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7455	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7456	NOTPLACED	-
U7457	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
U7458	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7459	5175771A30	IC, LVDS TRANSCEIVER
U7500	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7501	5185941F54	IC, RS232 TRANSCEIVER
U7503	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7504	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7600	5164852H45	IC OMAP 1621 GP DUAL CORE PROCESSOR
U7601	5114000A48	IC,INVTR,1GU04,1PER PKG,SOT-353,PB-FREE
U7602	5114007A10	IC,DECODER/DEMUX,1PER PKG,74LCX138,SM,TSSOP16,PB-FREE
U7603	5114007A09	IC,LCH,8PER PKG,74LCX373,N-I,SM,TSSOP20,PB-FREE
U7604	5114007A09	IC,LCH,8PER PKG,74LCX373,N-I,SM,TSSOP20,PB-FREE
U7605	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7606	5114007M45	IC,NOR,1PER PKG,SOT-353,PB-FREE
U7607	5185941F42	IC,INVTR,TC7SH04F/FU,SOT-353
U7608	5185941F42	IC,INVTR,TC7SH04F/FU,SOT-353
U7609	5114007M28	IC,F-F/D,1PER PKG,17SZ74,N-I,SM,SOIC8,PB-FREE
U7610	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
U7611	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7700	NOTPLACED	-
U7701	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7702	5185941F42	IC,INVTR,TC7SH04F/FU,SOT-353
U7703	5185941F26	IC,COMPTR,LMV7219,NOPB
U7704	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7705	5109522E84	IC DUAL SCHMITT TRIG MICRO PAK
U7951	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
U7961	5114007A47	IC,OR,17SZ32,1PER PKG,SOT-353,PB FREE
U7962	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7963	5114000B39	IC,BFR,1PER PKG,SM,SOT-353,PB-FREE
U7964	5114007M38	IC,AND,1PER PKG,SM,SOT-353,PB-FREE
U7965	NOTPLACED	-
U33002	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U33003	4885060Y01	XSTR,BIP RF SMALL SGNL PB-FREE
U33004	4813973A81	XSTR,BIP GP SS,DIG,NPN AND PNP,SOT-363,50V,.25W,100MA,BIAS
U33005	2685965D01	SHIELD MIXER
VR0951	NOTPLACED	-
VR3103	4813977A44	DIODE ARRAY,TRNSNT PROT,MMBZ15V,SM,SOT-23,15V,.225W,ZEN,2,PB-FR
VR3104	4813977A48	DIODE ARRAY,SUPR,SM,SOT-23,17V,.225W,ZEN,2,PB-FREE
VR7201	4813979C11	DIODE,SUPR,SOT-26/SC-74,15V,.225W,ZEN,PB-FREE
VR7500	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7501	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7503	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7504	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7505	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7506	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7700	4813977C23	DIODE,ZEN,MMSZ5243,SM,SOD-123,13V,10MA,.5W,ZEN,PB-FREE
VR7800	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7801	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
VR7851	4813979P10	DIODE ARRAY,TRANSIENT PROTECTION,SM,SOT-457,5.6V,.225W,ZEN,4,P
VR7900	4813979C11	DIODE,SUPR,SOT-26/SC-74,15V,.225W,ZEN,PB-FREE
Y6750	5185143E07	IC 16.8 MHZ REF OSC.8 PPM
Y7100	4886753H07	CRYSTAL OSCILLATOR 20MHZ
Y7300	4886753H07	CRYSTAL OSCILLATOR 20MHZ
Y7600	4809995L05	XTAL QUARTZ 32.768KHZ CC4V-T1
Y7602	4802582S85	RESON,QRTZ,12MHZ,TOLERANCE10PPM,STABILITY15PPM,SM,FUND,LO

7.3 HUF4020 Mobile Transmitter Board

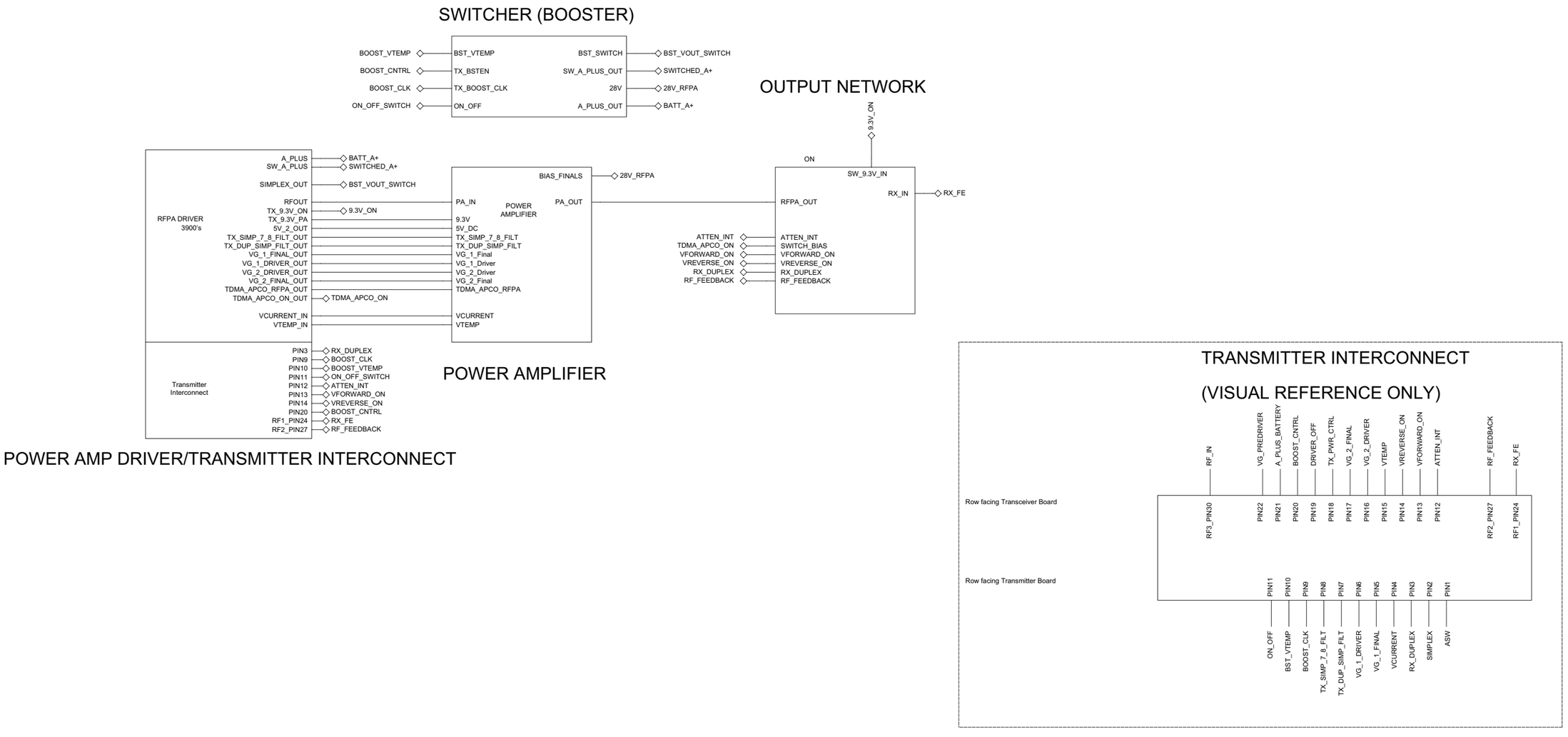


Figure 7-34. Mobile Transmitter Main Schematic

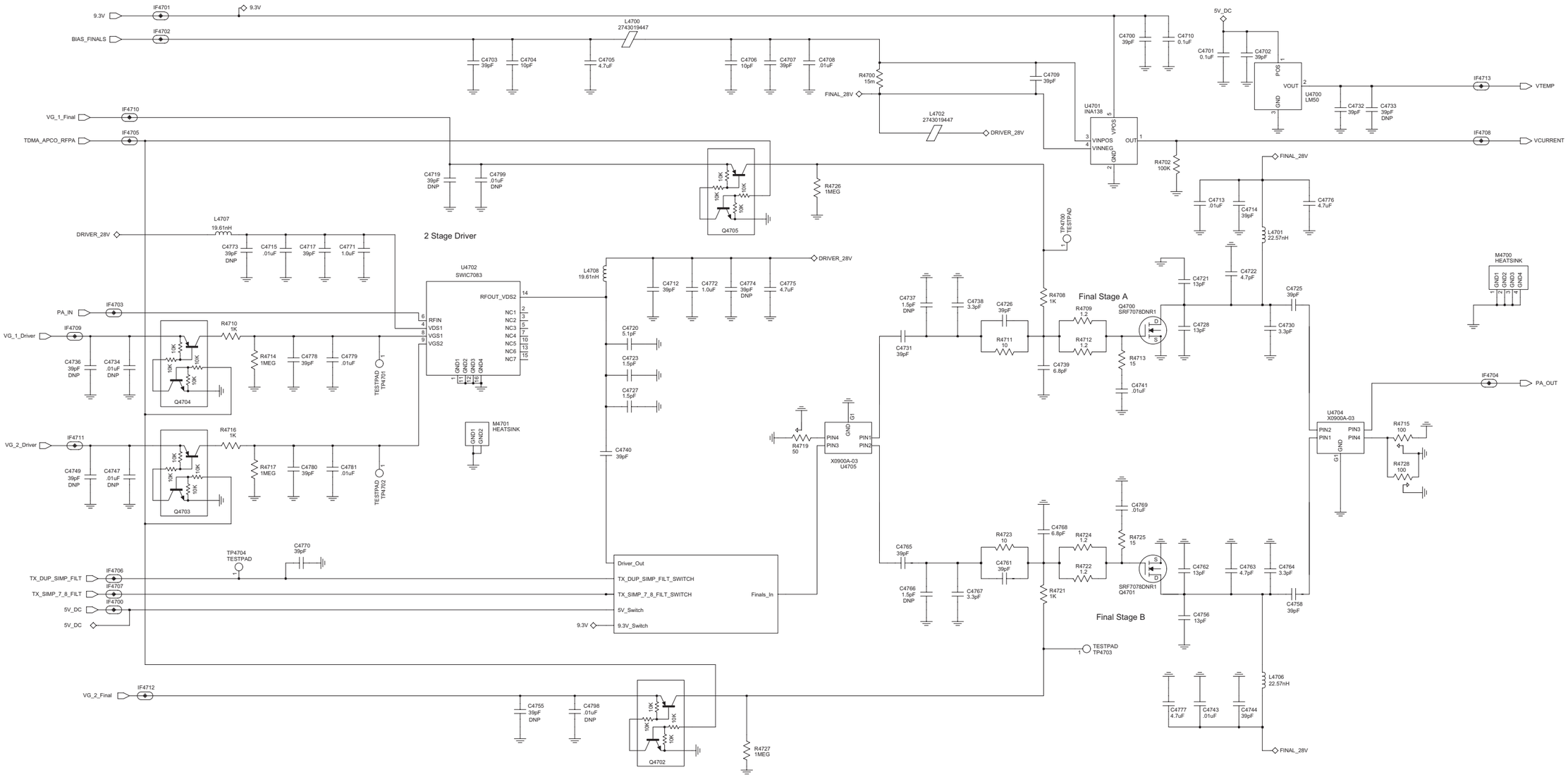


Figure 7-35. RFPA Driver and Finals

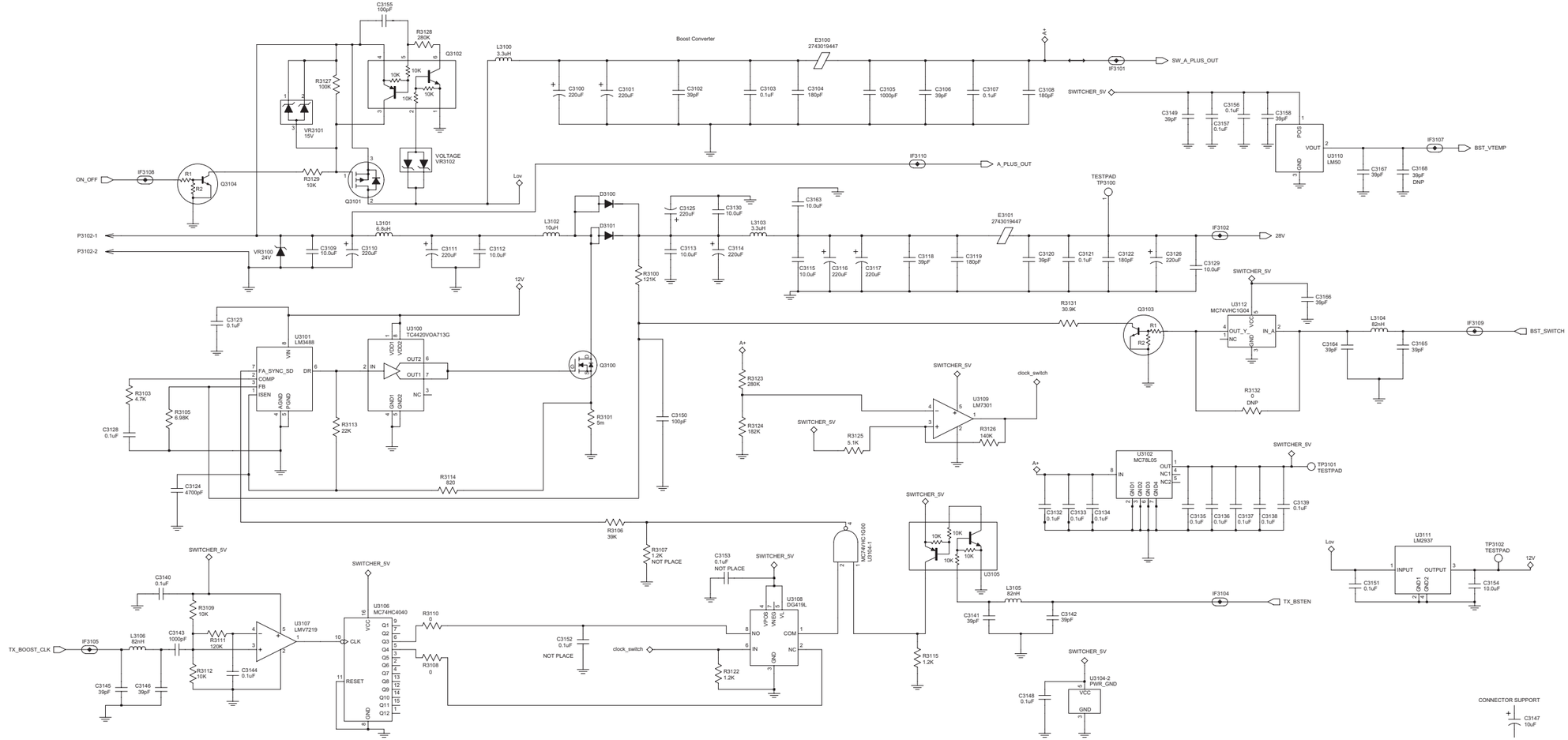


Figure 7-36. Boost Converter

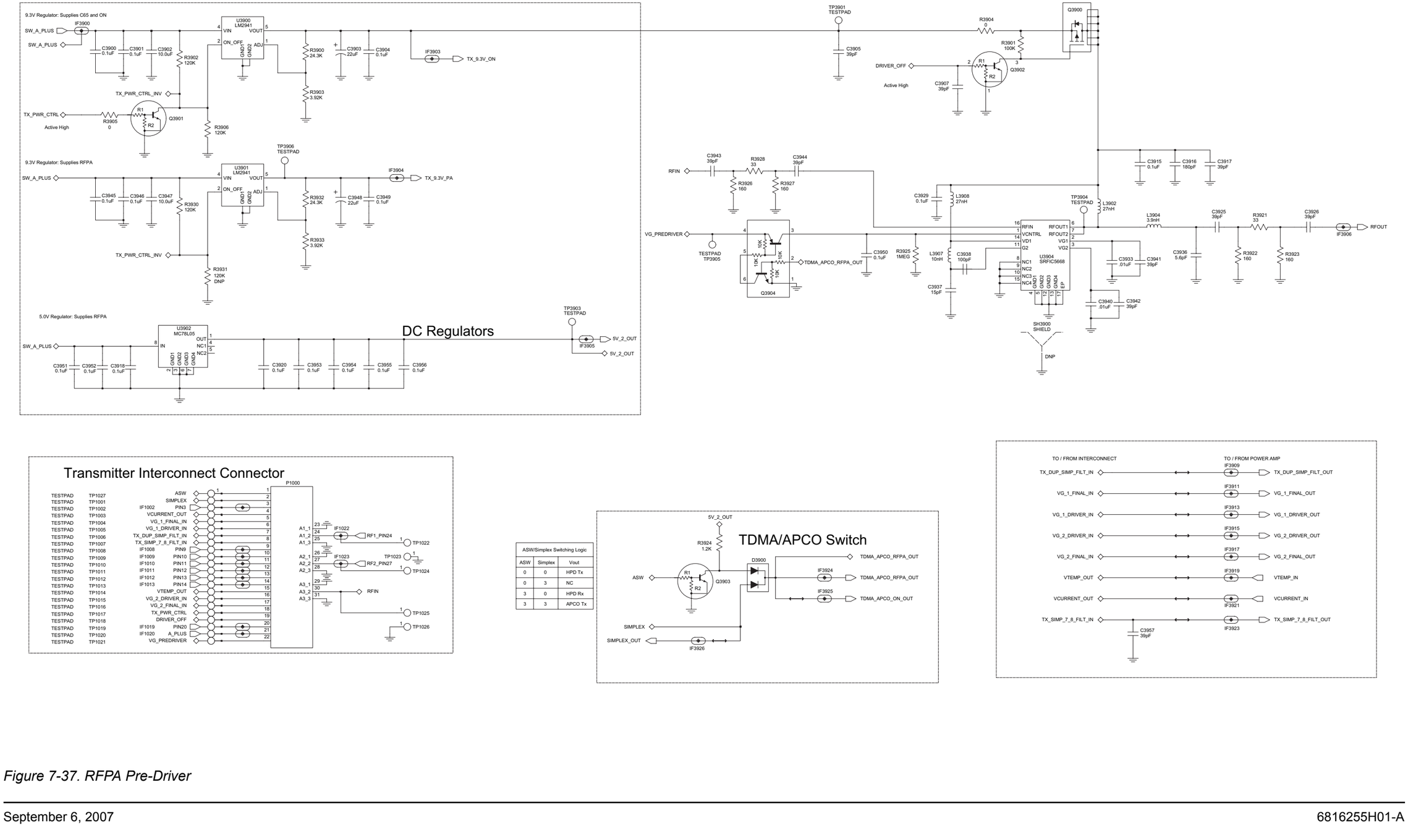


Figure 7-37. RFPA Pre-Driver

Filters Switching Logic		
TX_DUP_SIMP_FILT_SWITCH	TX_SIMP_7_8_FILT_SWITCH	Passband (MHz)
0	0	851 - 870
0	3	762 - 776
3	0	792 - 825
3	3	NC

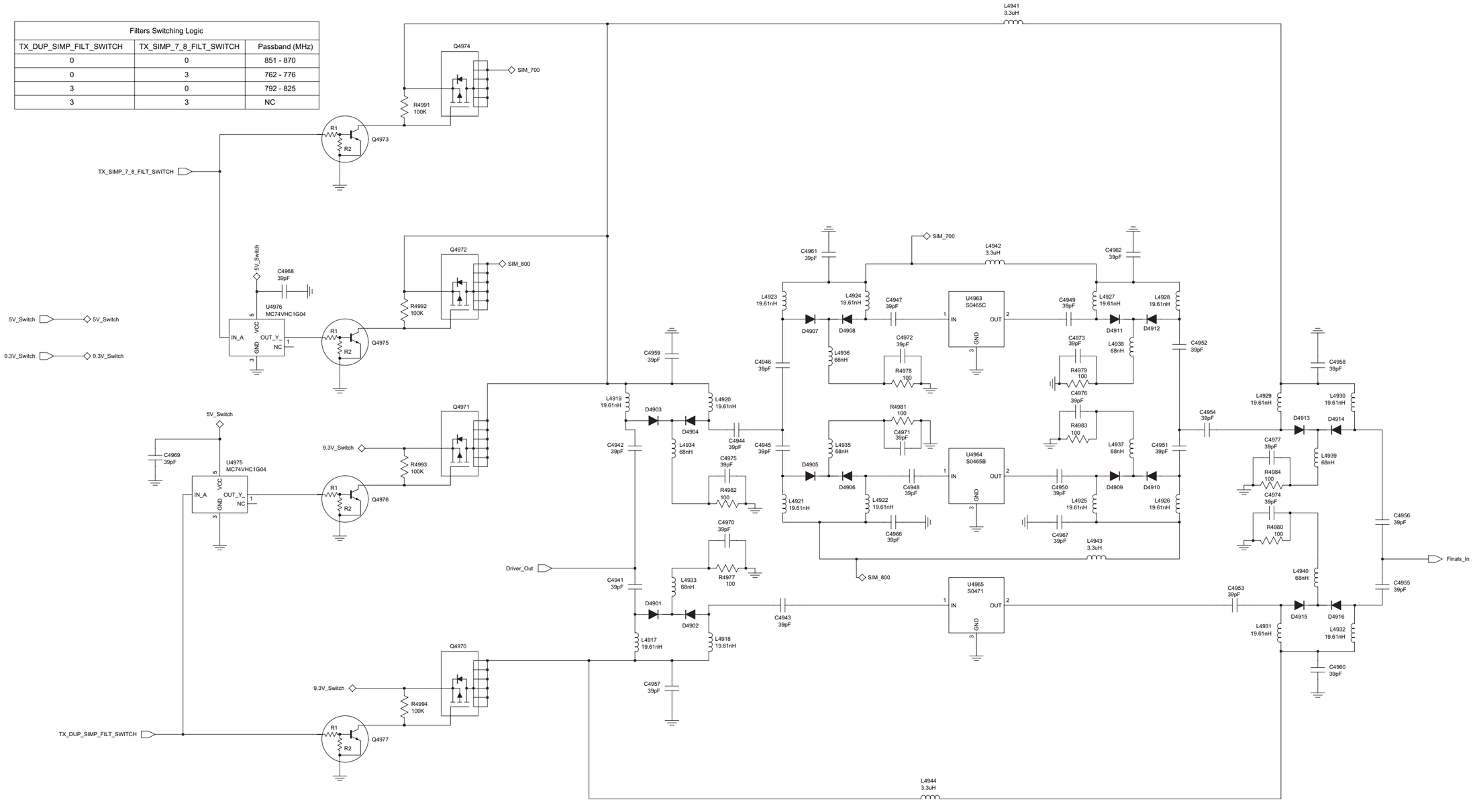


Figure 7-38. Interstage Filter Network

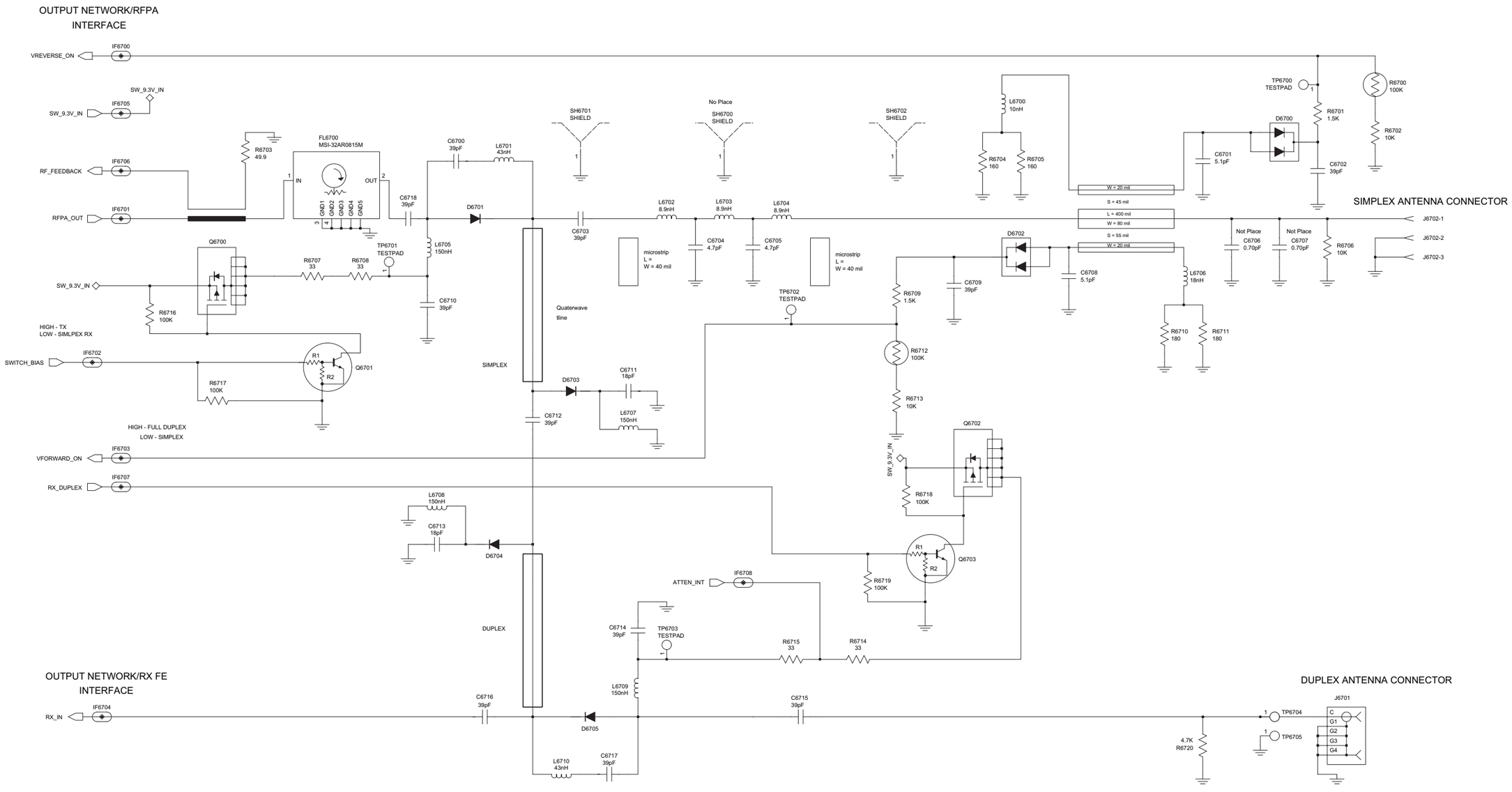


Figure 7-39. 700-800 Output Network

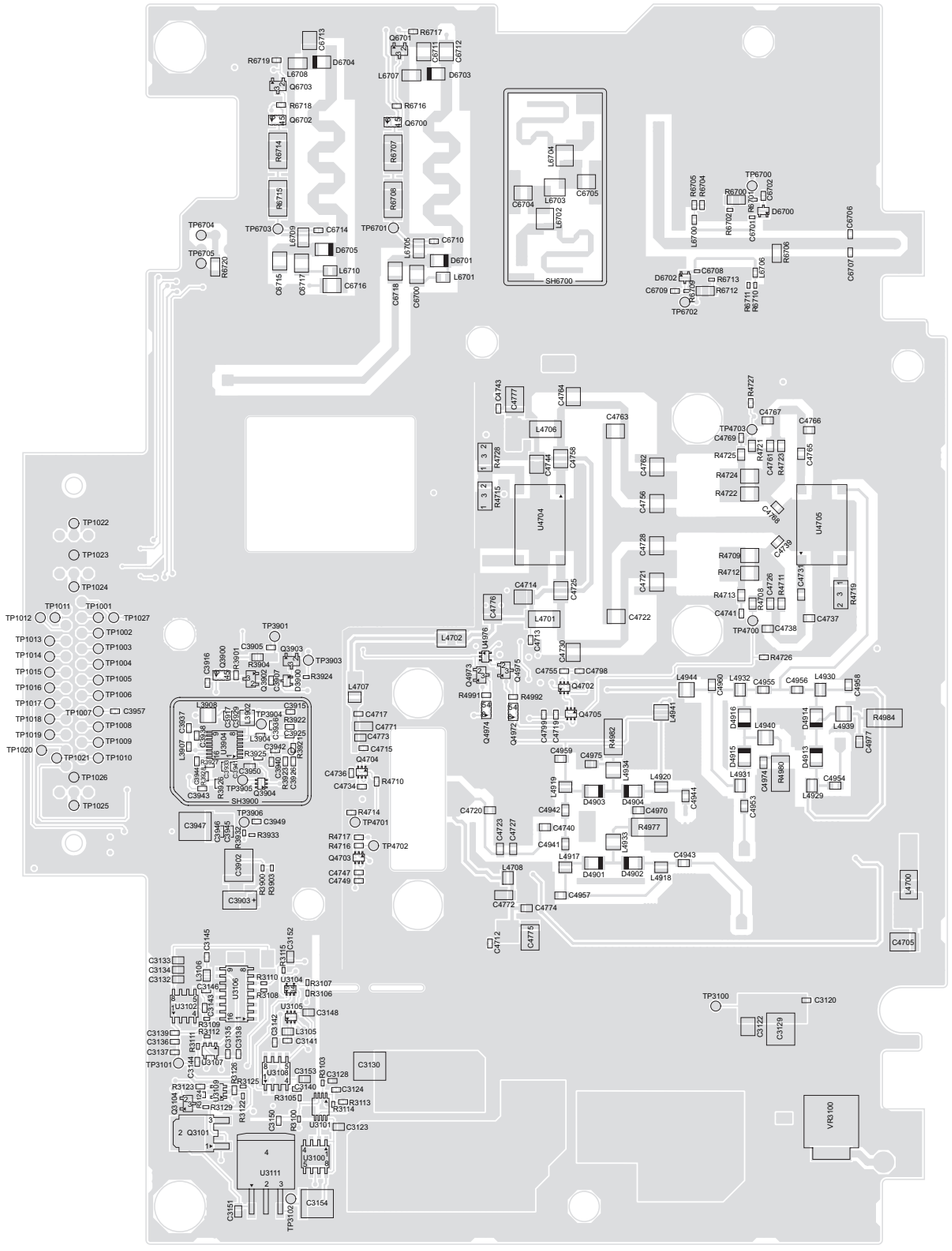


Figure 7-40. 8464190H02 PCB Top Side

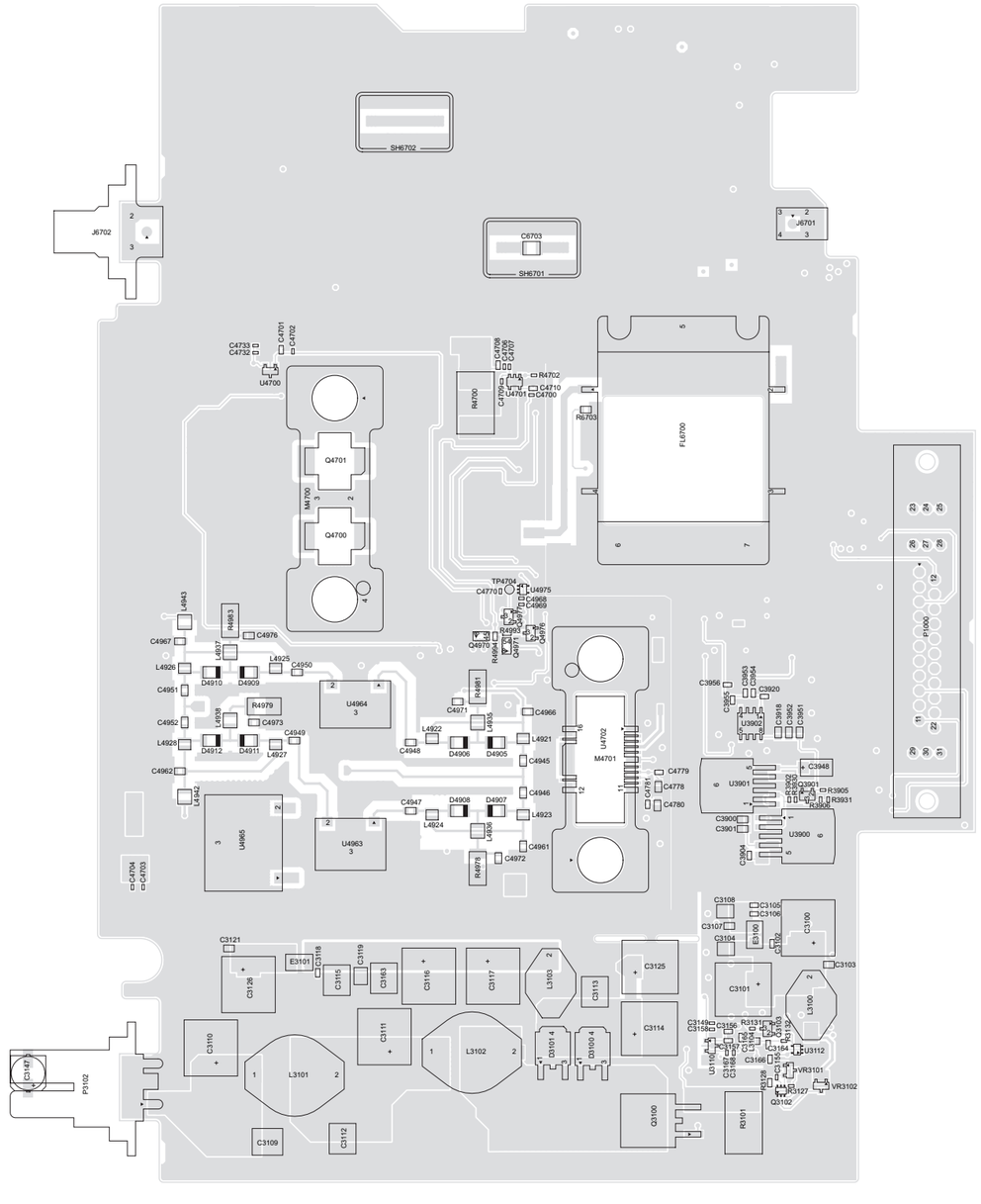


Figure 7-41. 8464190H02 PCB Bottom Side

HUF4020 Mobile Transmitter Board Parts List

Reference Designator	Motorola Part Number	Description
C3100	2375347B01	CAPACITOR 330 UF,35 V
C3101	2375347B01	CAPACITOR 330 UF,35 V
C3102	2113944C37	CAP CER CHP 39.0PF 50V
C3103	2113945G91	CAP,FXD,.1UF,+10%,-
C3104	2113901C65	CAP CHIP HI Q 180 PF +/- 5%
C3105	2113944C51	CAP CER CHP 1000.OPF 50V
C3106	2113944C37	CAP CER CHP 39.0PF 50V
C3107	2113945G91	CAP,FXD,.1UF,+10%,-
C3108	2113901C65	CAP CHIP HI Q 180 PF +/- 5%
C3109	2185457Y01	CAP CHIP CER 10UF 35V
C3110	2375347B01	CAPACITOR 330 UF,35 V
C3111	2375347B01	CAPACITOR 330 UF,35 V
C3112	2185457Y01	CAP CHIP CER 10UF 35V
C3113	2185457Y01	CAP CHIP CER 10UF 35V
C3114	2375347B01	CAPACITOR 330 UF,35 V
C3115	2185457Y01	CAP CHIP CER 10UF 35V
C3116	2375347B01	CAPACITOR 330 UF,35 V
C3117	2375347B01	CAPACITOR 330 UF,35 V
C3118	2113944C37	CAP CER CHP 39.0PF 50V
C3119	2113901C65	CAP CHIP HI Q 180 PF +/- 5%
C3120	2113944C37	CAP CER CHP 39.0PF 50V
C3121	2113945G91	CAP,FXD,.1UF,+10%,-
C3122	2113901C65	CAP CHIP HI Q 180 PF +/- 5%
C3123	2113945G91	CAP,FXD,.1UF,+10%,-
C3124	2113945C02	CAP CER CHP 10,000PF 50V
C3125	2375347B01	CAPACITOR 330 UF,35 V
C3126	2375347B01	CAPACITOR 330 UF,35 V
C3128	2113945D04	CAP CER CHP 100,000PF
C3129	2185457Y01	CAP CHIP CER 10UF 35V
C3130	2185457Y01	CAP CHIP CER 10UF 35V
C3132	2113945G91	CAP,FXD,.1UF,+10%,-
C3133	2113945G91	CAP,FXD,.1UF,+10%,-
C3134	2113945G91	CAP,FXD,.1UF,+10%,-
C3135	2113945D04	CAP CER CHP 100,000PF
C3136	2113945D04	CAP CER CHP 100,000PF
C3137	2113945D04	CAP CER CHP 100,000PF
C3138	2113945D04	CAP CER CHP 100,000PF
C3139	2113945D04	CAP CER CHP 100,000PF
C3140	2113945D04	CAP CER CHP 100,000PF
C3141	2113944C37	CAP CER CHP 39.0PF 50V
C3142	2113944C37	CAP CER CHP 39.0PF 50V
C3143	2113944C51	CAP CER CHP 1000.OPF 50V
C3144	2113945D04	CAP CER CHP 100,000PF
C3145	2113944C37	CAP CER CHP 39.0PF 50V
C3146	2113944C37	CAP CER CHP 39.0PF 50V
C3147	2380090M24	CAP ALU 10 20 50V SURF MT
C3148	2113945G91	CAP,FXD,.1UF,+10%,-
C3149	2113944A32	CAP CER CHP 39.0PF 50V
C3150	2113944C45	CAP CER CHP 100.0PF 50V
C3151	2113945G91	CAP,FXD,.1UF,+10%,-
C3152	NOTPLACED	-
C3153	NOTPLACED	-
C3154	2185457Y03	CAP,CHIP,CER,10UF,20%,16V
C3155	NOTPLACED	-
C3156	2113945D04	CAP CER CHP 100,000PF
C3157	2113945D04	CAP CER CHP 100,000PF
C3158	2113944A32	CAP CER CHP 39.0PF 50V
C3163	2185457Y01	CAP CHIP CER 10UF 35V
C3164	2113944C37	CAP CER CHP 39.0PF 50V
C3165	2113944C37	CAP CER CHP 39.0PF 50V
C3166	2113944C37	CAP CER CHP 39.0PF 50V
C3167	2113944A32	CAP CER CHP 39.0PF 50V
C3168	NOTPLACED	-
C3900	2113945G91	CAP,FXD,.1UF,+10%,-
C3901	2113945G91	CAP,FXD,.1UF,+10%,-
C3902	2185457Y01	CAP CHIP CER 10UF 35V
C3903	2313960F03	CAP,FXD,22UF,+10%,-
C3904	2113945D04	CAP CER CHP 100,000PF
C3905	2113944C37	CAP CER CHP 39.0PF 50V
C3907	2113944C37	CAP CER CHP 39.0PF 50V
C3915	2113945D04	CAP CER CHP 100,000PF
C3916	2113944C01	CAP CER CHP 180.0PF 50V
C3917	2113944C37	CAP CER CHP 39.0PF 50V
C3918	2113945G91	CAP,FXD,.1UF,+10%,-
C3920	2113945D04	CAP CER CHP 100,000PF
C3925	2113944C37	CAP CER CHP 39.0PF 50V
C3926	2113944C37	CAP CER CHP 39.0PF 50V
C3929	2113945D04	CAP CER CHP 100,000PF
C3933	2113945C02	CAP CER CHP 10,000PF 50V
C3936	2113944C24	CAP CER CHP 5.6PF 50V +/-
C3937	2113944C32	CAP CER CHP 15.0PF 50V
C3938	2113944C45	CAP CER CHP 100.0PF 50V
C3940	2113945C02	CAP CER CHP 10,000PF 50V
C3941	2113944C37	CAP CER CHP 39.0PF 50V
C3942	2113944C37	CAP CER CHP 39.0PF 50V
C3943	2113944C37	CAP CER CHP 39.0PF 50V
C3944	2113944C37	CAP CER CHP 39.0PF 50V
C3945	2113945G91	CAP,FXD,.1UF,+10%,-
C3946	2113945G91	CAP,FXD,.1UF,+10%,-
C3947	2185457Y01	CAP CHIP CER 10UF 35V
C3948	2313960F03	CAP,FXD,22UF,+10%,-
C3949	2113945D04	CAP CER CHP 100,000PF
C3950	2113945G91	CAP,FXD,.1UF,+10%,-
C3951	2113945G91	CAP,FXD,.1UF,+10%,-
C3952	2113945G91	CAP,FXD,.1UF,+10%,-
C3953	2113945D04	CAP CER CHP 100,000PF
C3954	2113945D04	CAP CER CHP 100,000PF
C3955	2113945D04	CAP CER CHP 100,000PF
C3956	2113945D04	CAP CER CHP 100,000PF
C3957	2113944C37	CAP CER CHP 39.0PF 50V
C4700	2113944A32	CAP CER CHP 39.0PF 50V
C4701	2113945D04	CAP CER CHP 100,000PF
C4702	2113944A32	CAP CER CHP 39.0PF 50V
C4703	2113944A32	CAP CER CHP 39.0PF 50V
C4704	2113944A25	CAP CER CHP 10.0PF 50V +/-
C4705	2185457Y07	CAP,CHIP,CER,4.7UF,20%,35
C4706	2113944A25	CAP CER CHP 10.0PF 50V +/-
C4707	2113944A32	CAP CER CHP 39.0PF 50V
C4708	2113945C02	CAP CER CHP 10,000PF 50V
C4709	2113944A32	CAP CER CHP 39.0PF 50V
C4710	2113945D04	CAP CER CHP 100,000PF
C4712	2113944C37	CAP CER CHP 39.0PF 50V
C4713	2113945C02	CAP CER CHP 10,000PF 50V
C4714	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C4715	2113945C02	CAP CER CHP 10,000PF 50V
C4717	2113944C37	CAP CER CHP 39.0PF 50V
C4719	NOTPLACED	-
C4720	2113901A22	CAP CHIP HI Q 5.1 PF +/-
C4721	2113901C32	CAP CHIP HI Q 13 PF +/- 5%
C4722	2113901C21	CAP CHIP HI Q 4.7 PF +/-
C4723	2113901A06	CAP CHIP HI Q 1.5 PF +/-
C4725	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C4726	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4727	2113901A06	CAP CHIP HI Q 1.5 PF +/-
C4728	2113901C32	CAP CHIP HI Q 13 PF +/- 5%
C4730	2113901C17	CAP CHIP HI Q 3.3 PF +/-
C4731	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4732	2113944A32	CAP CER CHP 39.0PF 50V
C4733	NOTPLACED	-
C4734	NOTPLACED	-
C4736	NOTPLACED	-
C4737	NOTPLACED	-
C4738	2113901A17	CAP CHIP HI Q 3.3 PF +/-
C4739	2113901A25	CAP CHIP HI Q 6.8 PF +/-
C4740	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4741	2113945C02	CAP CER CHP 10,000PF 50V
C4743	2113945C02	CAP CER CHP 10,000PF 50V
C4744	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C4747	NOTPLACED	-
C4749	NOTPLACED	-
C4755	NOTPLACED	-
C4756	2113901C32	CAP CHIP HI Q 13 PF +/- 5%
C4758	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C4761	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4762	2113901C32	CAP CHIP HI Q 13 PF +/- 5%
C4763	2113901C21	CAP CHIP HI Q 4.7 PF +/-
C4764	2113901C17	CAP CHIP HI Q 3.3 PF +/-
C4765	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4766	NOTPLACED	-
C4767	2113901A17	CAP CHIP HI Q 3.3 PF +/-
C4768	2113901A25	CAP CHIP HI Q 6.8 PF +/-
C4769	2113945C02	CAP CER CHP 10,000PF 50V
C4770	2113944A32	CAP CER CHP 39.0PF 50V
C4771	2185457Y02	CAP CHIP CER 1.0UF 35V
C4772	2185457Y02	CAP CHIP CER 1.0UF 35V
C4773	NOTPLACED	-
C4774	NOTPLACED	-
C4775	2185457Y07	CAP,CHIP,CER,4.7UF,20%,35
C4776	2185457Y07	CAP,CHIP,CER,4.7UF,20%,35
C4777	2185457Y07	CAP,CHIP,CER,4.7UF,20%,35
C4778	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4779	2113945C02	CAP CER CHP 10,000PF 50V
C4780	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4781	2113945C02	CAP CER CHP 10,000PF 50V
C4798	NOTPLACED	-
C4799	NOTPLACED	-
C4941	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4942	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4943	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4944	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4945	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4946	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4947	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4948	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4949	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4950	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4951	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4952	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4953	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4954	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4955	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4956	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4957	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4958	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4959	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4960	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4961	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4962	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4966	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4967	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4968	2113944A32	CAP CER CHP 39.0PF 50V
C4969	2113944A32	CAP CER CHP 39.0PF 50V
C4970	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4971	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4972	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4973	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4974	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4975	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4976	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C4977	2113901A48	CAP CHIP HI Q 39 PF +/- 5%
C6700	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6701	2113944A18	CAP CER CHP 5.1PF 50V +/-
C6702	2113944C37	CAP CER CHP 39.0PF 50V
C6703	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6704	2113901C21	CAP CHIP HI Q 4.7 PF +/-
C6705	2113901C21	CAP CHIP HI Q 4.7 PF +/-
C6706	NOTPLACED	-
C6707	NOTPLACED	-
C6708	2113944A18	CAP CER CHP 5.1PF 50V +/-
C6709	2113944C37	CAP CER CHP 39.0PF 50V
C6710	2113944C37	CAP CER CHP 39.0PF 50V
C6711	2113901C36	CAP CHIP HI Q 18 PF +/- 5%
C6712	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6713	2113901C36	CAP CHIP HI Q 18 PF +/- 5%

Reference Designator	Motorola Part Number	Description
C6714	2113944C37	CAP CER CHP 39.0PF 50V
C6715	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6716	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6717	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
C6718	2113901C48	CAP CHIP HI Q 39 PF +/- 5%
D3100	4813978A11	DIODE,RECT,MBRD835,SM,D
D3101	4813978A11	DIODE,RECT,MBRD835,SM,D
D3900	4888722V03	DIODE,SWG,SM,SOT-323/SC-
D4901	4802482J02	PIN DIODE SMD
D4902	4802482J02	PIN DIODE SMD
D4903	4802482J02	PIN DIODE SMD
D4904	4802482J02	PIN DIODE SMD
D4905	4802482J02	PIN DIODE SMD
D4906	4802482J02	PIN DIODE SMD
D4907	4802482J02	PIN DIODE SMD
D4908	4802482J02	PIN DIODE SMD
D4909	4802482J02	PIN DIODE SMD
D4910	4802482J02	PIN DIODE SMD
D4911	4802482J02	PIN DIODE SMD
D4912	4802482J02	PIN DIODE SMD
D4913	4802482J02	PIN DIODE SMD
D4914	4802482J02	PIN DIODE SMD
D4915	4802482J02	PIN DIODE SMD
D4916	4802482J02	PIN DIODE SMD
D6700	4888722V03	DIODE,SWG,SM,SOT-323/SC-
D6701	4802482J02	PIN DIODE SMD
D6702	4888722V03	DIODE,SWG,SM,SOT-323/SC-
D6703	4802482J02	PIN DIODE SMD
D6704	4802482J02	PIN DIODE SMD
D6705	4802482J02	PIN DIODE SMD
E3100	2485011Y01	INDUCTOR BEAD CHP PB-
E3101	2485011Y01	INDUCTOR BEAD CHP PB-
FL6700	5864713H01	ISOLATOR, 760-870 MHZ
J6701	0964708H02	CONN, 50 OHM MCX(J) R/A
J6702	0905901V11	RF CONNECTOR,RF,F,CONN
L3100	2475053B01	INDUCTOR, PWR SMD 3.3UH
L3101	2475638B01	INDUCTOR 6.8 UH, (+/- 20%)
L3102	2475638B02	POWER INDUCTOR 10 UH,
L3103	2475053B01	INDUCTOR, PWR SMD 3.3UH
L3104	2414017D22	IDCTR,CHIP,82NH,10%,300M
L3105	2414017D22	IDCTR,CHIP,82NH,10%,300M
L3106	2414017D22	IDCTR,CHIP,82NH,10%,300M
L3902	2414015A21	IDCTR,FXD,27NH,2%,1A,.13
L3904	2414017H07	IDCTR,CHIP,3.9NH,300MA,.1
L3907	2414017H12	IDCTR,CHIP,10NH,5%,600MA
L3908	2414015A21	IDCTR,FXD,27NH,2%,1A,.13
L4700	2485011Y01	INDUCTOR BEAD CHP PB-
L4701	2460591E65	COIL AIR WOUND INDUC
L4702	2485011Y01	INDUCTOR BEAD CHP PB-
L4706	2460591E65	COIL AIR WOUND INDUC
L4707	2460591B80	COIL AIR WOUND INDUC
L4708	2460591B80	COIL AIR WOUND INDUC
L4917	2460591B80	COIL AIR WOUND INDUC
L4918	2460591B80	COIL AIR WOUND INDUC
L4919	2460591B80	COIL AIR WOUND INDUC
L4920	2460591B80	COIL AIR WOUND INDUC
L4921	2460591B80	COIL AIR WOUND INDUC
L4922	2460591B80	COIL AIR WOUND INDUC
L4923	2460591B80	COIL AIR WOUND INDUC
L4924	2460591B80	COIL AIR WOUND INDUC
L4925	2460591B80	COIL AIR WOUND INDUC
L4926	2460591B80	COIL AIR WOUND INDUC
L4927	2460591B80	COIL AIR WOUND INDUC
L4928	2460591B80	COIL AIR WOUND INDUC
L4929	2460591B80	COIL AIR WOUND INDUC
L4930	2460591B80	COIL AIR WOUND INDUC
L4931	2460591B80	COIL AIR WOUND INDUC
L4932	2460591B80	COIL AIR WOUND INDUC
L4933	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4934	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4935	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4936	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4937	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4938	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4939	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4940	2414032B13	IDCTR,WW,68NH,10%,1A,.2O
L4941	2414032B36	IDCTR,WW,3.3UH,10%,350M
L4942	2414032B36	IDCTR,WW,3.3UH,10%,350M
L4943	2414032B36	IDCTR,WW,3.3UH,10%,350M
L4944	2414032B36	IDCTR,WW,3.3UH,10%,350M
L6700	2475304A06	IND CHIP WW 10NH 5% 2.0A
L6701	2414032F60	IDCTR,WW,43NH,5%,500MA,.
L6702	2464946H01	INDUCTOR 8NH,SURFACE
L6703	2464946H01	INDUCTOR 8NH,SURFACE
L6704	2464946H01	INDUCTOR 8NH,SURFACE
L6705	2414032D17	IDCTR,WW,150NH,5%,750MA
L6706	2475304A09	IND CHIP WW 18NH 5% 1.9A
L6707	2414032D17	IDCTR,WW,150NH,5%,750MA
L6708	2414032D17	IDCTR,WW,150NH,5%,750MA
L6709	2414032D17	IDCTR,WW,150NH,5%,750MA
L6710	2414032F60	IDCTR,WW,43NH,5%,500MA,.
M4700	2685837C09	HEATSINK, LDMOS CARRIER
M4701	2685837C10	HEATSINK, DRIVER
P1000	0964703H02	CONNECTOR, FEMALE, RF
P3102	0905902V08	CONNECTOR DC, CUSTOM
PWB	8464190H02	BOARD, PC, HPD
Q3100	4813970A68	XSTR,FET GP
Q3101	4813970A66	XSTR,FET GP
Q3102	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q3103	4813973A42	XSTR,BIP GP
Q3104	4813973A42	XSTR,BIP GP
Q3900	4813970A62	XSTR,FET GP
Q3901	4813973A42	XSTR,BIP GP
Q3902	4813973A42	XSTR,BIP GP
Q3903	4813973A42	XSTR,BIP GP
Q3904	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q4700	4813976A16	XSTR,FET RF POWER,N-
Q4701	4813976A16	XSTR,FET RF POWER,N-
Q4702	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q4703	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q4704	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q4705	4813973A81	XSTR,BIP GP SS,DIG,NPN
Q4970	4813970A62	XSTR,FET GP
Q4971	4813970A62	XSTR,FET GP
Q4972	4813970A62	XSTR,FET GP
Q4973	4813973A42	XSTR,BIP GP
Q4974	4813970A62	XSTR,FET GP
Q4975	4813973A42	XSTR,BIP GP
Q4976	4813973A42	XSTR,BIP GP
Q4977	4813973A42	XSTR,BIP GP
Q6700	4813970A62	XSTR,FET GP
Q6701	4813973A42	XSTR,BIP GP
Q6702	4813970A62	XSTR,FET GP
Q6703	4813973A42	XSTR,BIP GP
R3100	0613952P09	CER CHIP RES 121K OHM 1
R3101	0664916H02	RESISTOR, 5MOHM 3W
R3103	0613952Q73	CER CHIP RES 1000 OHM 5
R3105	0613952M82	CER CHIP RES 6980 OHM 1
R3106	0613952R15	CER CHIP RES 39K OHM 5%
R3107	NOTPLACED	-
R3108	0613952R66	CER CHIP RES 0.0 +/-0.050
R3109	0613952R01	CER CHIP RES 10K OHM 5%
R3110	0613952R66	CER CHIP RES 0.0 +/-0.050
R3111	0613952R27	CER CHIP RES 120K OHM
R3112	0613952R01	CER CHIP RES 10K OHM 5%
R3113	0613952J09	CER CHIP RES 22K OHM 5%
R3114	0613952Q71	CER CHIP RES 820 OHM 5
R3115	0613952Q75	CER CHIP RES 1200 OHM 5
R3122	0613952Q75	CER CHIP RES 1200 OHM 5
R3123	0613952F44	CER CHIP RES 280K OHM 1
R3124	0613952P26	CER CHIP RES 182K OHM 1
R3125	0613952Q90	CER CHIP RES 5100 OHM 5
R3126	0613952F15	CER CHIP RES 140K OHM 1
R3127	0613952P01	CER CHIP RES 100K OHM 1
R3128	0613952F44	CER CHIP RES 280K OHM 1
R3129	0613952R01	CER CHIP RES 10K OHM 5%
R3131	0613952N48	CER CHIP RES 30.9K OHM 1
R3132	NOTPLACED	-
R3900	0613952N38	CER CHIP RES 24.3K OHM 1
R3901	0613952J25	CER CHIP RES 100K OHM
R3902	0613952R27	CER CHIP RES 120K OHM
R3903	0613952M58	CER CHIP RES 3920 OHM 1%
R3904	0613958J74	CER CHIP RES 0.0 OHM JMP
R3905	0613952R66	CER CHIP RES 0.0 +/-0.050
R3906	0613952R27	CER CHIP RES 120K OHM
R3921	0613952H37	CER CHIP RES 33.0 OHM 5%
R3922	0613952H54	CER CHIP RES 160 OHM 5%
R3923	0613952H54	CER CHIP RES 160 OHM 5%
R3924	0613952Q75	CER CHIP RES 1200 OHM 5
R3925	0613952J49	CER CHIP RES 1.0M OHM 5%
R3926	0613952H54	CER CHIP RES 160 OHM 5%
R3927	0613952H54	CER CHIP RES 160 OHM 5%
R3928	0613952H37	CER CHIP RES 33.0 OHM 5%
R3930	0613952R27	CER CHIP RES 120K OHM
R3931	NOTPLACED	-
R3932	0613952N38	CER CHIP RES 24.3K OHM 1
R3933	0613952M58	CER CHIP RES 3920 OHM 1%
R4700	0664916H03	RESISTOR, 15MOHM 3W
R4702	0613952P01	CER CHIP RES 100K OHM 1
R4708	0613958H73	CER CHIP RES 1000 OHM 5%
R4709	0613959G03	CER CHIP RES 1.2 OHM 5%
R4710	0613952H73	CER CHIP RES 1000 OHM 5%
R4711	0613958H25	CER CHIP RES 10.0 OHM 5%
R4712	0613959G03	CER CHIP RES 1.2 OHM 5%
R4713	0613958H29	CER CHIP RES 15.0 OHM 5%
R4714	0613952J49	CER CHIP RES 1.0M OHM 5%
R4715	0685609Y02	RES CHIP 100 OHM 10W 5%
R4716	0613952H73	CER CHIP RES 1000 OHM 5%
R4717	0613952J49	CER CHIP RES 1.0M OHM 5%
R4719	0685609Y01	RES CHIP 50 OHM 10W 5%
R4721	0613958H73	CER CHIP RES 1000 OHM 5%
R4722	0613959G03	CER CHIP RES 1.2 OHM 5%
R4723	0613958H25	CER CHIP RES 10.0 OHM 5%
R4724	0613959G03	CER CHIP RES 1.2 OHM 5%
R4725	0613958H29	CER CHIP RES 15.0 OHM 5%
R4726	0613952J49	CER CHIP RES 1.0M OHM 5%
R4727	0613952J49	CER CHIP RES 1.0M OHM 5%
R4728	0685609Y02	RES CHIP 100 OHM 10W 5%
R4977	0613959Y49	CER CHIP RES OHM 5% 2512
R4978	0613959Y49	CER CHIP RES OHM 5% 2512
R4979	0613959Y49	CER CHIP RES OHM 5% 2512
R4980	0613959Y49	CER CHIP RES OHM 5% 2512
R4981	0613959Y49	CER CHIP RES OHM 5% 2512
R4982	0613959Y49	CER CHIP RES OHM 5% 2512
R4983	0613959Y49	CER CHIP RES OHM 5% 2512
R4984	0613959Y49	CER CHIP RES OHM 5% 2512
R4991	0613952J25	CER CHIP RES 100K OHM
R4992	0613952J25	CER CHIP RES 100K OHM
R4993	0613952J25	CER CHIP RES 100K OHM
R4994	0613952J25	CER CHIP RES 100K OHM
R6700	0685191Y01	THERMISTOR CHIP 100
R6701	0613952Q77	CER CHIP RES 1500 OHM 5
R6702	0613952R01	CER CHIP RES 10K OHM 5%
R6703	0613958B68	CER CHIP RES 49.9 OHM 1%
R6704	0613952H54	CER CHIP RES 160 OHM 5%
R6705	0613952H54	CER CHIP RES 160 OHM 5%
R6706	0613958T01	CER CHIP RES 10.0K OHM 5
R6707	0613959Y37	CER CHIP RES OHM 5% 2512
R6708	0613959Y37	CER CHIP RES OHM 5% 2512
R6709	0613952Q77	CER CHIP RES 1500 OHM 5
R6710	0613952Q55	CER CHIP RES 180 OHM 5
R6711	0613952Q55	CER CHIP RES 180 OHM 5
R6712	0685191Y01	THERMISTOR CHIP 100
R6713	0613952R01	CER CHIP RES 10K OHM 5%
R6714	0613959Y37	CER CHIP RES OHM 5% 2512
R6715	0613959Y37	CER CHIP RES OHM 5% 2512

Reference Designator	Motorola Part Number	Description
R6716	0613952J25	CER CHIP RES 100K OHM
R6717	0613952J25	CER CHIP RES 100K OHM
R6718	0613952J25	CER CHIP RES 100K OHM
R6719	0613952J25	CER CHIP RES 100K OHM
R6720	0613958S89	CER CHIP RES 4700 OHM 5
SH3900	NOTPLACED	-
SH6700	NOTPLACED	-
SH6701	2602660J02	SHLD 18.13 X 11.14
SH6702	2602660J02	SHLD 18.13 X 11.14
U3100	5164852H81	IC, 6A HIGH-SPEED MOSFET
U3101	5185941F31	IC, SWITCHING REG
U3102	5114014A03	IC,LNR V
U3104	5114000B34	IC,NAND,1PER PKG,SM,SOT-
U3105	4813973A81	XSTR,BIP GP SS,DIG,NPN
U3106	5114000B19	IC CNTR 12 STAGE BINARY
U3107	5185941F26	IC,COMPTR,LMV7219,NOPB
U3108	5185941F46	IC, LOW VOLT CMOS
U3109	5185941F22	IC,OPAMP,SGL,OPA237,SOT
U3110	5185070Y01	IC TEMPERATURE SENSOR
U3111	5185941F92	IC,LM2937 12V-500MA LDO
U3112	5114000B37	IC,INVTR,1PER PKG,SM,SOT-
U3900	5164015H94	IC, LM2941, TO DROPOUT
U3901	5164015H94	IC, LM2941, TO DROPOUT
U3902	5114014A03	IC,LNR V
U3904	5115678H01	VHF/UHF/800/900 MHZ
U4700	5185070Y01	IC TEMPERATURE SENSOR
U4701	5188032U43	IC,SENSING
U4702	5114037A06	IC,RF PWR
U4704	5888156T01	SPLTR CMBR,2-WAY,811MHZ
U4705	5888156T01	SPLTR CMBR,2-WAY,811MHZ
U4963	9175306A01	FILTER, 762-794 MHZ
U4964	9175306A03	FILTER, 851-870 MHZ
U4965	9175306A08	CER FILT MB4 SMASK
U4975	5114000B37	IC,INVTR,1PER PKG,SM,SOT-
U4976	5114000B37	IC,INVTR,1PER PKG,SM,SOT-
VR3100	4813979C17	DIODE,SUPR,SM,32V,AVALA
VR3101	4813977A44	DIODE ARRAY,TRNSNT
VR3102	4813977A48	DIODE

7.4 HUF4019 UIP/Main Board

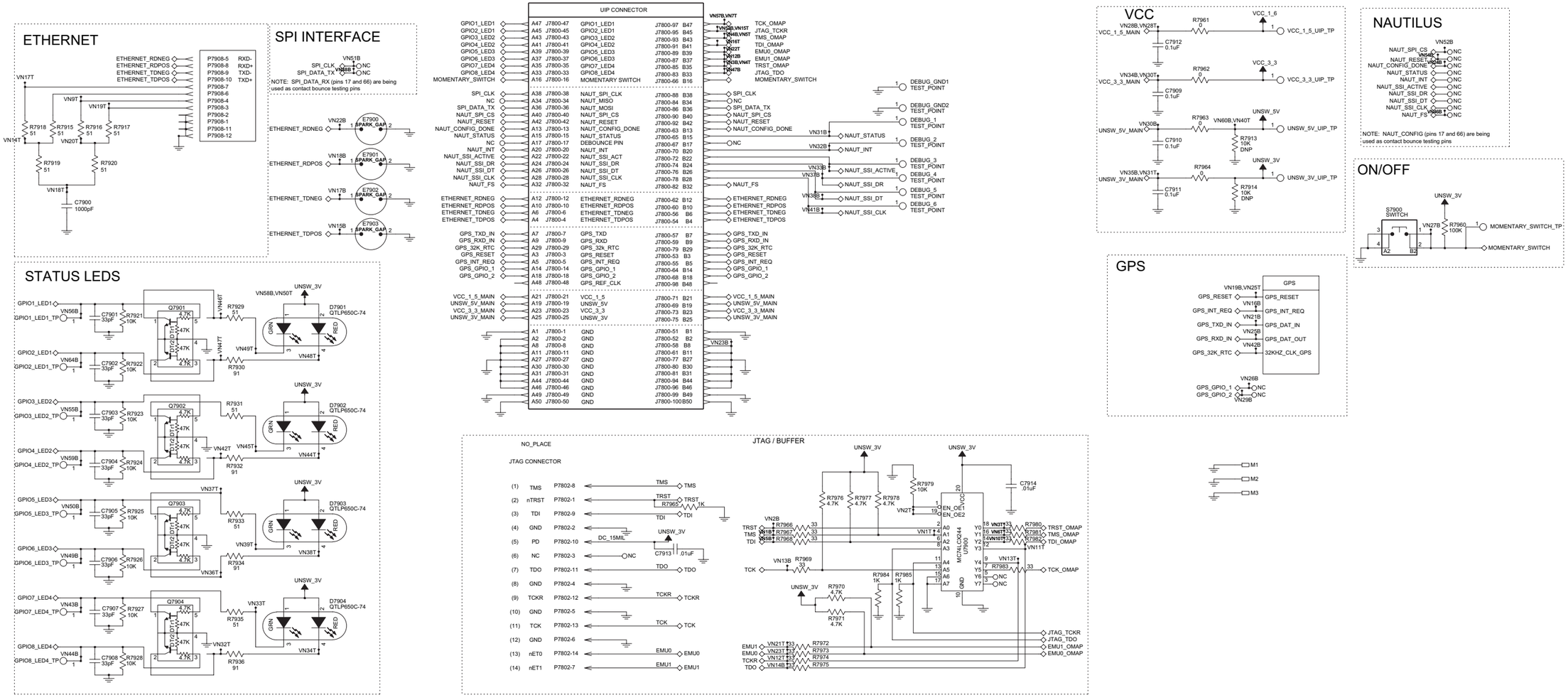


Figure 7-42. UIP/Main Board

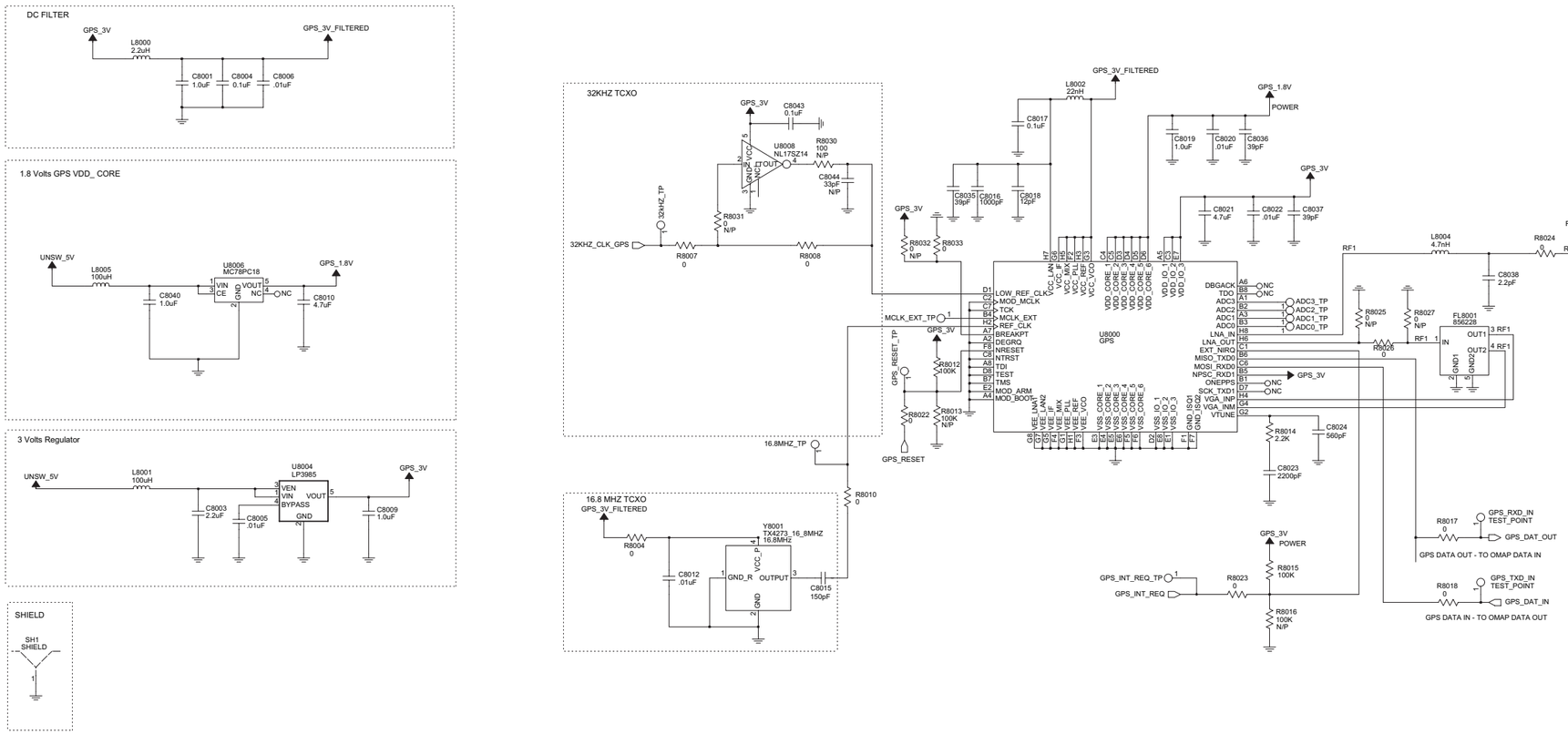


Figure 7-43. Global Positioning System

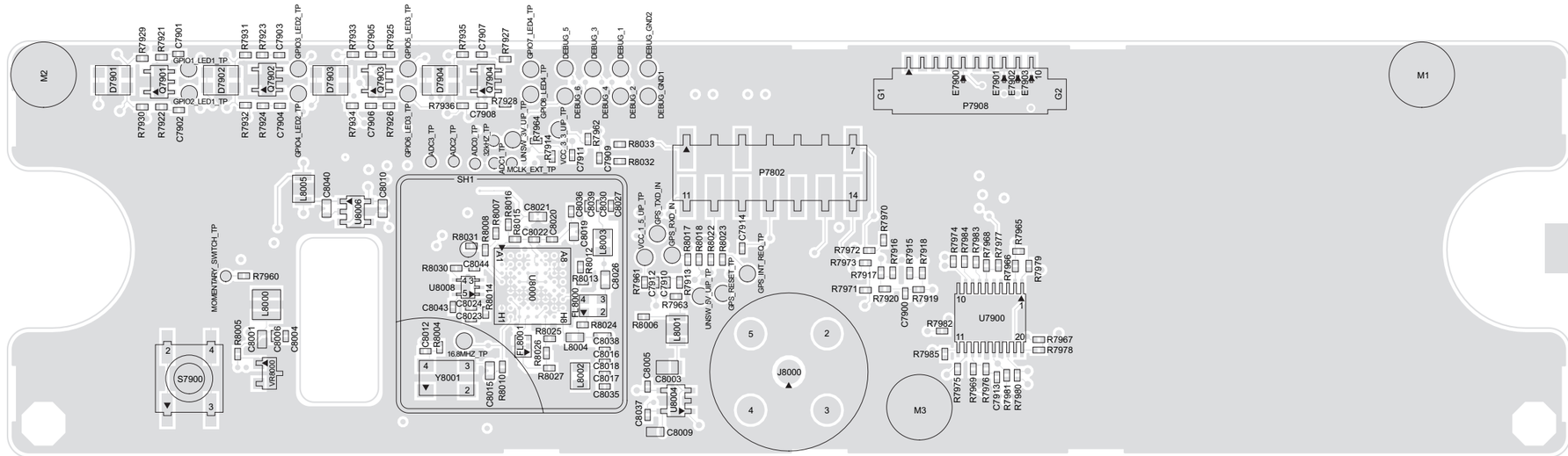


Figure 7-44. 8464492H01 PCB Top Side

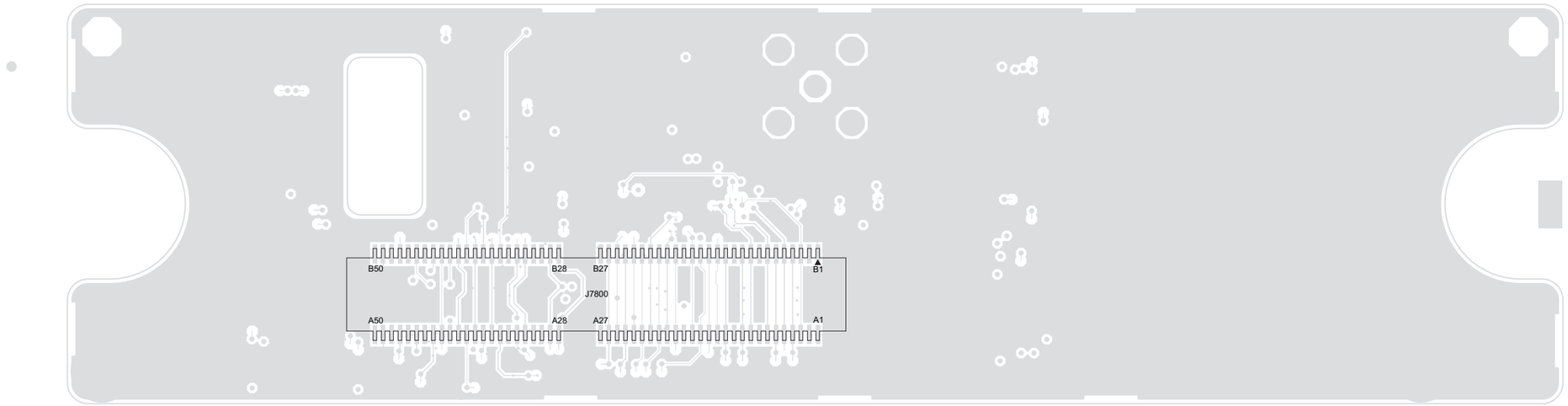


Figure 7-45. 8464492H01 PCB Bottom Side

HUF4019 UIP/Main Board Parts List

Reference Designator	Motorola Part Number	Description
C0100	2113743N32	CAP CHIP 18.0 PF 5% COG
C7900	2113945A09	CAP CER CHP 1000PF 50V 10%
C7901	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7902	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7903	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7904	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7905	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7906	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7907	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7908	2113944A31	CAP CER CHP 33.0PF 50V 5%
C7909	2113946B04	CAP CER CHP 0.10UF 10V 10%
C7910	2113946B04	CAP CER CHP 0.10UF 10V 10%
C7911	2113946B04	CAP CER CHP 0.10UF 10V 10%
C7912	2113946B04	CAP CER CHP 0.10UF 10V 10%
C7913	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7914	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8001	2113946S35	CAP CER CHP 1.0UF 16V 10%
C8003	2113946F01	CAP CER CHP 2.2UF 6.3V 10%
C8004	2113946B04	CAP CER CHP 0.10UF 10V 10%
C8005	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8006	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8009	2113946S35	CAP CER CHP 1.0UF 16V 10%
C8010	2113946D07	CAP,CHIP,4.7UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C8012	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8015	2113944C47	CAP CER CHP 150.0PF 50V 5%
C8016	2113945A09	CAP CER CHP 1000PF 50V 10%
C8017	2113946B04	CAP CER CHP 0.10UF 10V 10%
C8018	2113944A26	CAP CER CHP 12.0PF 50V 5%
C8019	2113946S35	CAP CER CHP 1.0UF 16V 10%
C8020	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8021	2113946D07	CAP,CHIP,4.7UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C8022	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8023	2113945A11	CAP CER CHP 2200PF 50V 10%
C8024	2113945A06	CAP CER CHP 560PF 50V 10%
C8026	2113951A42	CAP NPO 27.0PF +/-5% 250V HI FREQ
C8027	2113944A26	CAP CER CHP 12.0PF 50V 5%
C8030	2113945A09	CAP CER CHP 1000PF 50V 10%
C8035	2113944A32	CAP CER CHP 39.0PF 50V 5%
C8036	2113944A32	CAP CER CHP 39.0PF 50V 5%
C8037	2113944A32	CAP CER CHP 39.0PF 50V 5%
C8038	2113944M02	CAP,FXD,2.2PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C8039	2113944A32	CAP CER CHP 39.0PF 50V 5%
C8040	2113946S35	CAP CER CHP 1.0UF 16V 10%
C8043	2113946B04	CAP CER CHP 0.10UF 10V 10%
C8044	NOTPLACED	-
D7901	4885102C22	LED, COMPLIANT, RED/ GREEN SMT
D7902	4885102C22	LED, COMPLIANT, RED/ GREEN SMT
D7903	4885102C22	LED, COMPLIANT, RED/ GREEN SMT
D7904	4885102C22	LED, COMPLIANT, RED/ GREEN SMT
FL8000	9185521F01	FLTR,SAW,1.57542GHZNOM, SAW FL
FL8001	9102190J14	FLTR,SAW,1.575GHZ NOM,2.0X1.5X0.8,SMD
J7800	0915032C01	CONNECTOR, 100-PIN EDGE CARD
L8000	2414032B34	IDCTR,WW,2.2UH,10%,380MA,2.8OHM,CER,20 Q,140MHZ SRF,SM,PB-F
L8001	2414032L36	IDCTR,WW,100UH,5%,60MA,21OHM,FERR,15 Q,9MHZ SRF,SM,PB-FREE
L8002	2414032F26	IDCTR,WW,22NH,5%,500MA,.22OHM,CER,45 Q,2.2GHZ SRF,SM,PB-FRE
L8003	2414032F26	IDCTR,WW,22NH,5%,500MA,.22OHM,CER,45 Q,2.2GHZ SRF,SM,PB-FRE
L8004	2414017G03	IDCTR,CHIP,4.7NH,300MA,.28OHM,CER,8 Q,SM,0603,PB-FREE
L8005	2414032L36	IDCTR,WW,100UH,5%,60MA,21OHM,FERR,15 Q,9MHZ SRF,SM,PB-FREE
P7802	NOTPLACED	-
P7908	0975815A01	Conn., Wire to Board
PWB	8464492H01	PWB,CTRL HD,8 LAYER,INTFC
Q7901	4805921T28	XSTR, DUAL NOPB
Q7902	4805921T28	XSTR, DUAL NOPB
Q7903	4805921T28	XSTR, DUAL NOPB
Q7904	4805921T28	XSTR, DUAL NOPB
R7913	NOTPLACED	-
R7914	NOTPLACED	-
R7915	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7916	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7917	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7918	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7919	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7920	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7921	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7922	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7923	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7924	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7925	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7926	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7927	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7928	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7929	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7930	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R7931	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7932	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R7933	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7934	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R7935	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R7936	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R7960	0613952R25	CER CHIP RES 100K OHM 5% 0402
R7961	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM

Reference Designator	Motorola Part Number	Description
R7962	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R7963	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R7964	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R7965	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R7966	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7967	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7968	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7969	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7970	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R7971	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R7972	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7973	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7974	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7975	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7976	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R7977	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R7978	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R7979	0613952R01	CER CHIP RES 10K OHM 5% 0402
R7980	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7981	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7982	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7983	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R7984	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R7985	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R8004	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8005	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8006	NOTPLACED	-
R8007	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8008	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8010	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8012	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8013	NOTPLACED	-
R8014	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R8015	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8016	NOTPLACED	-
R8017	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8018	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8022	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8023	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8024	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8025	NOTPLACED	-
R8026	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8027	NOTPLACED	-
R8030	NOTPLACED	-
R8031	NOTPLACED	-
R8032	NOTPLACED	-
R8033	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
S7900	4015040C01	SWITCH, TACTILE
SH1	2685089D01	SHLD ABACUS
U7900	5114007A07	IC,BFR,8PER PKG,74LCX244,N-I,3ST,SM,TSSOP20,PB-FREE
U8000	5109841C71	IC PHOENIX GAM
U8004	5185941F35	IC, VREG, NOPB
U8006	5114014A69	PB-FREE,NOTCOMPLETELYENRICHED
U8008	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5 V, PB-FREE
VR8000	4813977A43	PB-FREE, NOTCOMPLETELYENRICHED
Y8001	5108675Y38	OSC,TCXO,16.8MHZ,SM,PB-FREE
*	0964702H02	CONNECTOR, SMA, GPS

Notes

Appendix A Replacement Parts Ordering

A.1 Basic Ordering Information

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

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

A.2 Motorola Online

Motorola Online users can access our online catalog at

http://www.motorola.com/businessonline

To register for online access, please call 800-814-0601 (for U.S. and Canada Service Centers only). International customers can obtain assistance at http://www.motorola.com/businessonline

A.3 Mail Orders

Send written orders to the following addresses:

Replacement Parts/ Test Equipment/Manuals/ Crystal Service Items:

Motorola Inc.
Radio Products Services Division*
Attention: Order Processing
1307 E. Algonquin Road
Schaumburg, IL 60196
U.S.A.

Federal Government Orders:

Motorola Inc.
U.S. Federal Government
Markets Division
Attention: Order Processing
7230 Parkway Drive
Landover, MD 21076
U.S.A.

International Orders:

Motorola Inc.
Radio Products Services Division*
Attention: Order Processing
1307 E. Algonquin Road
Schaumburg, IL 60196
U.S.A.

* The Radio Products Services Division (RPSD) was formerly known as the Customer Care and Services Division (CCSD) and/or the Accessories and Aftermarket Division (AAD).

A.4 Telephone Orders

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

U.S. Federal Government Markets Division (USFGMD)
1-800-826-1913 Federal Government Parts - Credit Cards Only
8:30 AM to 5:00 PM (Eastern Standard Time)

A.5 Fax Orders

Radio Products Services Division*
(United States and Canada)
1-800-622-6210
847-576-3023 (International)

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

A.6 Parts Identification

Radio Products Services Division*
(United States and Canada)
1-800-422-4210, menu 3

A.7 Product Customer Service

Customer Response Center
(Non-technical Issues)
1-800-247-2346
FAX:1-800-247-2347

* The Radio Products Services Division (RPSD) was formerly known as the Customer Care and Services Division (CCSD) and/or the Accessories and Aftermarket Division (AAD).

Appendix B Environmental Information

The ASTRO Digital HPD 1000 modem was designed using Design for Environment (DfE) principles. The electronic portions of the product achieved a 59% percent reduction in the lead content and a 73% reduction in halogen content. Using Motorola-proprietary software (GDA), Motorola determined this product is 98% recoverable and 73% recyclable. An estimate of the material content is provided in the following table.

Material	% by Weight
Aluminum	77.3
Plastic	6.2
PWB	11.8
Steel	2.3

There are no embedded batteries in this product.

Do not dispose of this product in a landfill. Motorola, Inc. encourages reuse or recycling of the material used to manufacture this product. Please contact the Motorola, Inc. Commercial, Government, and Industrial Solutions Sector (CGISS) at 1-888-567-7347 or your local sales representative for rebate programs and for the latest disassembly and recycling strategies.

Notes

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to ASTRO portable and mobile subscriber modem products.

Term	Definition
A/D	*See analog-to-digital conversion.*
ABACUS IC	A custom integrated circuit providing a digital receiver intermediate frequency (IF) backend.
ADC	*See analog-to-digital converter.*
ALC	*See automatic level control.*
analog	Refers to a continuously variable signal or a circuit or device designed to handle such signals. *See also digital.*
Analog-to-Digital, Digital-to-Analog and Glue	An integrated circuit designed to be an interface between the modem's DSP, which is digital, and the analog transmitter and receiver ICs.
analog-to-digital conversion	Conversion of an instantaneous dc voltage level to a corresponding digital value. *See also D/A.*
analog-to-digital converter	A device that converts analog signals into digital data. *See also DAC.*
automatic level control	A circuit in the transmit RF path that controls RF power amplifier output, provides leveling over frequency and voltage, and protects against high VSWR.
band	Frequencies allowed for a specific purpose.
BBP	*See baseband interface port.*
baseband interface port	Synchronous serial interface to the transceiver board used to transfer transmit and receive data.
BGA	*See ball grid array.*
ball grid array	A type of IC package characterized by solder balls arranged in a grid that are located on the underside of the package.
CODEC	*See coder/decoder.*
codeplug	A memory chip inside a device that contains various programmable parameters, including frequencies, time-out timer, and so on.
coder/decoder	A device that encodes or decodes a signal.

Term	Definition
CPS	*See Customer Programming Software.*
Customer Programming Software	Software with a graphical user interface containing the feature set of an ASTRO modem. *See also RSS.*
D/A	*See digital-to-analog conversion.*
DAC	*See digital-to-analog converter.*
default	A pre-defined set of parameters.
digital	Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals. *See also analog.*
digital-to-analog conversion	Conversion of a digital signal to a voltage that is proportional to the input value. *See also A/D.*
digital-to-analog converter	A device that converts digital data into analog signals. *See also ADC.*
Digital Private Line	A type of digital communications that utilizes privacy call, as well as memory channel and busy channel lock out to enhance communication efficiency.
digital signal processor	A microcontroller specifically designed for performing the mathematics involved in manipulating analog information, such as sound, that has been converted into a digital form. DSP also implies the use of a data compression technique.
digital signal processor code	Object code executed by the Digital Signal Processor in an ASTRO subscriber modem. The DSP is responsible for computation-intensive tasks, such as decoding ASTRO signaling.
DPL	*See Digital Private Line. See also PL.*
DSP	*See digital signal processor.*
DSP code	*See digital signal processor code.*
DTMF	*See dual tone multi-frequency.*
dual tone multi-frequency	The system used by touch-tone telephones. DTMF assigns a specific frequency, or tone, to each key so that it can easily be identified by a microprocessor.
EPOT	Electrically Programmable Digital Potentiometer.
EEPROM	*See Electrically Erasable Programmable Read-Only Memory.*

Term	Definition
Electrically Erasable Programmable Read-Only Memory	A special type of PROM that can be erased by exposing it to an electrical charge. An EEPROM retains its contents even when the power is turned off.
EME	Electromagnetic Emissions.
ESD	Electrostatic Discharge.
FCC	Federal Communications Commission.
FET	Field-Effect Transistor.
firmware	Code executed by an embedded processor such as the Host or DSP in a subscriber modem. This type of code is typically resident in non-volatile memory and as such is more difficult to change than code executed from RAM.
FGU	*See frequency generation unit.*
flash	A non-volatile memory device similar to an EEPROM. Flash memory can be erased and reprogrammed in blocks instead of one byte at a time.
FLASHcode	A 13-digit code which uniquely identifies the System Software Package and Software Revenue Options that are enabled in a particular subscriber modem. FLASHcodes are only applicable for modems which are upgradeable through the FLASHport process.
FLASHport®	A Motorola term that describes the ability of a modem to change memory. Every FLASHport modem contains a FLASHport EEPROM memory chip that can be software written and rewritten to, again and again.
FMR	*See Florida Manual Revision.*
Florida Manual Revision	A publication that provides supplemental information for its parent publication before it is revised and reissued.
frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
frequency generation unit	This unit generates ultra-stable, low-phase noise master clock and other derived synchronization clocks that are distributed throughout the communication network.
General-Purpose Input/Output	Pins whose function is programmable.
GPIO	*See General-Purpose Input/Output.*
host code	Object code executed by the host processor in an ASTRO subscriber modem. The host is responsible for control-oriented tasks such as decoding and responding to user inputs.

Term	Definition
IC	*See integrated circuit.*
IF	Intermediate Frequency.
IMBE	A sub-band, voice-encoding algorithm used in ASTRO digital voice.
inbound signaling word	Data transmitted on the control channel from a subscriber unit to the central control unit.
integrated circuit	An assembly of interconnected components on a small semiconductor chip, usually made of silicon. One chip can contain millions of microscopic components and perform many functions.
ISW	*See inbound signaling word.*
key-variable loader	A device used to load encryption keys into a modem.
kHz	*See kilohertz.*
kilohertz	One thousand cycles per second. Used especially as a modem-frequency unit.
LCD	*See liquid-crystal display.*
LED	*See light emitting diode.*
light emitting diode	An electronic device that lights up when electricity is passed through it.
liquid-crystal display	An LCD uses two sheets of polarizing material with a liquid-crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.
LO	Local oscillator.
low-speed handshake	150-baud digital data sent to the modem during trunked operation while receiving.
LSH	*See low-speed handshake.*
Master In Slave Out	SPI data line from a peripheral to the MCU.
Master Out Slave In	SPI data line from the MCU to a peripheral.
MCU	*See microcontroller unit.*
MDC	Motorola Digital Communications.
MDI	MCU/DSP Interface internal to the Patriot IC.
MHz	*See Megahertz.*
Megahertz	One million cycles per second. Used especially as a modem-frequency unit.

Term	Definition
microcontroller unit	Also written as µC. A microprocessor that contains RAM and ROM components, as well as communications and programming components and peripherals.
microprocessor core	The central processing unit of the microprocessor and DSP IC and powered by a lower voltage supply than the logic I/O section.
MISO	*See Master In Slave Out.*
Modem frequency	The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
Modem frequency power amplifier	Amplifier having one or more active devices to amplify modem signals.
Modem Interface Box	A service aid used to enable communications between a modem and the programming software.
modem Service Software	DOS-based software containing the feature set of an ASTRO modem. *See also CPS.*
MOSI	*See Master Out Slave In.*
multiplexer	An electronic device that combines several signals for transmission on some shared medium (e.g., a telephone wire).
MUX	*See multiplexer.*
NiCd	Nickel-cadmium.
NiMH	Nickel-metal-hydride.
OMPAC	*See over-molded pad-array carrier.*
open architecture	A controller configuration that utilizes a microprocessor with extended ROM, RAM, and EEPROM.
oscillator	An electronic device that produces alternating electric current and commonly employs tuned circuits and amplifying components.
OSW	*See outbound signaling word.*
OTAR	*See over-the-air rekeying.*
outbound signaling word	Data transmitted on the control channel from the central controller to the subscriber unit.
over-molded pad-array carrier	A Motorola custom IC package, distinguished by the presence of solder balls on the bottom pads.
over-the-air rekeying	Allows the dispatcher to remotely reprogram the encryption keys in the modem.
PA	Power amplifier.

Term	Definition
paging	One-way communication that alerts the receiver to retrieve a message.
Patriot IC	A dual-core processor that contains an MCU and a DSP in one IC package.
PC Board	Printed Circuit Board. Also referred to as a PCB.
phase-locked loop	A circuit in which an oscillator is kept in phase with a reference, usually after passing through a frequency divider.
PL	*See private-line tone squelch.*
PLL	*See phase-locked loop.*
private-line tone squelch	A continuous sub-audible tone that is transmitted along with the carrier. *See also DPL.*
Programmable Read-Only Memory	A memory chip on which data can be written only once. Once data has been written onto a PROM, it remains there forever.
PROM	*See Programmable Read-Only Memory.*
PTT	*See Push-to-Talk.*
Push-to-Talk	The switch or button usually located on the left side of the modem which, when pressed, causes the modem to transmit. When the PTT is released, the unit returns to receive operation.
random access memory	A type of computer memory that can be accessed randomly; that is, any byte of memory can be accessed without touching the preceding bytes.
RAM	*See random access memory.*
read-only memory	A type of computer memory on which data has been prerecorded. Once data has been written onto a ROM chip, it cannot be removed and can only be read.
real-time clock	A module that keeps track of elapsed time even when a computer is turned off.
receiver	Electronic device that amplifies RF signals. A receiver separates the signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
registers	Short-term data-storage circuits within the microcontroller unit or programmable logic IC.
repeater	Remote transmit/receive facility that re-transmits received signals in order to improve communications range and coverage (conventional operation).
repeater/talkaround	A conventional modem feature that permits communication through a receive/transmit facility, which re-transmits received signals in order to improve communication range and coverage.

Term	Definition
RESET	Reset line: an input to the microcontroller that restarts execution.
RF	*See Modem frequency.*
RF PA	*See Modem frequency power amplifier.*
RIB	*See Modem Interface Box.*
ROM	*See read-only memory.*
RPCIC	Regulator/power control IC.
RPT/TA	*See repeater/talkaround.*
RSS	*See modem Service Software.*
RTC	*See real-time clock.*
RX	Receive.
RX DATA	Recovered digital data line.
Serial Communication Interface Input Line	A full-duplex (receiver/transmitter) asynchronous serial interface.
SCI IN	*See Serial Communication Interface Input Line.*
Serial Peripheral Interface	How the microcontroller communicates to modules and ICs through the CLOCK and DATA lines.
signal	An electrically transmitted electromagnetic wave.
Signal Qualifier mode	An operating mode in which the modem is muted, but still continues to analyze receive data to determine RX signal type.
softpot	*See software potentiometer.*
software	Computer programs, procedures, rules, documentation, and data pertaining to the operation of a system.
software potentiometer	A computer-adjustable electronic attenuator.
spectrum	Frequency range within which radiation has specific characteristics.
SPI	*See Serial Peripheral Interface.*
squelch	Muting of audio circuits when received signal levels fall below a pre-determined value. With carrier squelch, all channel activity that exceeds the modem's preset squelch level can be heard.
SRAM	*See static RAM.*
SRIB	Smart modem Interface Box. *See RIB.*

Term	Definition
SSI	*See Synchronous Serial Interface.*
Standby mode	An operating mode in which the modem is muted but still continues to monitor data.
static RAM	A type of memory used for volatile, program/data memory that does not need to be refreshed.
Synchronous Serial Interface	DSP interface to peripherals that consists of a clock signal line, a frame synchronization signal line, and a data line.
system central controllers	Main control unit of the trunked dispatch system; handles ISW and OSW messages to and from subscriber units *(See ISW and OSW)*.
system select	The act of selecting the desired operating system with the system-select switch (also, the name given to this switch).
thin small-outline package	A type of dynamic random-access memory (DRAM) package that is commonly used in memory applications.
time-out timer	A timer that limits the length of a transmission.
TOT	*See time-out timer.*
transceiver	Transmitter-receiver. A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.
transmitter	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
TSOP	*See thin small-outline package.*
TX	Transmit.
UART	*See also Universal Asynchronous Receiver Transmitter.*
UCM	Universal Crypto Module.
UHF	Ultra-High Frequency.
Universal Asynchronous Receiver Transmitter	A microchip with programming that controls a computer's interface to its attached serial devices.
Universal Serial Bus	An external bus standard that supports data transfer rates of 12 Mbps.
Urchin IC	A programmable logic device configured to supply a 2.8 V, 48 kHz square wave at 2% duty cycle and a 2.8 V, 2.4 MHz square wave at 50% duty cycle to the TX modulation DAC using a 16.8 MHz reference input.These clock signals are used by the DAC to convert the digital SSI into an analog modulation waveform.
USB	*See Universal Serial Bus.*
VCO	*See voltage-controlled oscillator.*

Term	Definition
vector sum excited linear predictive coding	A voice-encoding technique used in ASTRO digital voice.
VHF	Very-High Frequency.
VIP	Vehicle Interface Port.
VOCON	*See vocoder/controller.*
vocoder	An electronic device for synthesizing speech by implementing a compression algorithm particular to voice. *See also voice encoder.*
vocoder/controller	A PC board that contains an ASTRO modem's microcontroller, DSP, memory, and power functions, and interface support circuitry.
voice encoder	The DSP-based system for digitally processing analog signals, and includes the capabilities of performing voice compression algorithms or voice encoding. *See also vocoder.*
voltage-controlled oscillator	An oscillator in which the frequency of oscillation can be varied by changing a control voltage.

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