TW7000-MS

TW7000

HF Transceiver

Technical Manual

Datron World Communications Inc.
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Change Description

Date of Revision	Revision Letter	Description of Changes	Pages Affected
2/2005	E	Information regarding updated boards, schematics, part lists including the new Processor board, Ref/Control board and the High Stability option.	All
6/2007	F	Removal of references to LCD/driver board, information for the FALC option and updates as required to boards, schematics and part lists.	All
6/2009	G	ISDN nomenclature to DHSL. Clarification of COM port use. Additional specifications. 7000ALE-141B, and 7000CW1 added as options. Updated boards, schematics, part lists.	All
7/2010	H	Updated Specifications table to reflect change in duty cycle (PRN 880) and sensitivity. Updated component locations diagrams, schematics and parts lists. Added Daughter board to Front Panel Assembly. Updated Processor board to 001-01107 assembly. Updated 7000ALE option to 001-01105 assembly. Added 7000ALE-141B option with Carrier board. Updated Pre/Post Selector description. Updated Maintenance Processor troubleshooting section	1-2 4-9, 5-7, 5-8, 6-7, 8-7, 9-7, 10-5, 10-7, 12-9, 13-9, 13-11, 15-11, 19-6 19-14 to 19-23 13-22 to 13-24 Ch 14 (all) Ch 16 (all) 20-6 to 20-8 21-11 to 21-34

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c. Detailed explanation of problem.
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Safety Considerations

This product and manual must be thoroughly understood before attempting installation and operation. To do so without proper knowledge can result in equipment failure and bodily injury.

Caution: Before applying ac power, be sure that the equipment has be properly configured for the available line voltage. Attempted operation at the wrong voltage can result in damage and voids the warranty. See the manuals section on installation. DO NOT operate equipment with cover removed.

Earth Ground: All Datron products are supplied with a standard, 3-wire, grounded ac plug. DO NOT attempt to disable the ground terminal by using 2-wire adapters of any type. Any disconnection of the equipment ground causes a potential shock hazard that could result in personal injury. DO NOT operate any equipment until a suitable ground has been established. Consult the manual section on grounding.

Servicing: Trained personnel should only carry out servicing. To avoid electric shock, DO NOT open the case unless qualified to do so.

Various measurements and adjustments described in this manual are performed in ac power applied and the protective covers removed. Capacitors (particularly the large power supply electrolytics) can remain charged for a considerable time after the unit has been shut off. Use particular care when working around them, as a short circuit can release sufficient energy to cause damage to the equipment and possible injury.

To protect against fire hazard, always replace line fuses with ones of the same current rating and type (normal delay, slow-blow, etc.). DO NOT use higher value replacements in an attempt to prevent fuse failure. If fuses are failing repeatedly this indicates a probable defect in the equipment that needs attention.

Use only genuine Datron factory parts for full performance and safety of this product.

Made in the USA

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CHAPTER 1
INTRODUCTION

1.1 The TW7000

The TW7000 is an advanced HF transceiver providing a complete range of both voice and data operations over the entire high frequency (1.6 to 30 MHz) spectrum. The TW7000 includes multiple microprocessors, a direct digital synthesis (DDS) PLL as well as a variety of built-in options such as automatic link establishment (ALE), high-speed data transmission and encryption.

The TW7000 is part of the 7000-series family of radios and accessories that includes power supplies, automatic antenna tuners, RF power amplifiers and audio equipment. The TW7000 can be integrated into system configurations to fit a wide range of communication requirements.

1.2 Transceiver Configurations

The TW7000 is adaptable as a fixed station or in a rack mount installation using the Datron rack mount kit. It can also be operated remotely using a number of remote and extended control configurations. The front panel of a standard TW7000 can easily be removed for remote control up to 50 feet from the radio. Full function, modem-based remote control heads using either FSK or DHSL signaling protocols are also available for long distance, 2-wire remote operation.

1.3 Technical Specifications

Note: *Specifications are subject to change without notice or obligation.*

Characteristic	Specification
General	
Frequency Range	1.6 to 30 MHz (TX); 100 Hz to 30 MHz (RX); 10 Hz channel spacing
Preset Channels	256 standard, 1000 optional
Scanning	Multiple scan groups, operator selectable scan rates
Channel Programming	From front panel or remotely using a computer or dedicated remote control console
Frequency Stability	0.5 ppm
Modes	USB, LSB, CW, AME; simplex or half-duplex
Input Power	11 to 15.5 Vdc
Input Power Protection	Reverse polarity, transient and under/over voltage
Antenna Port	50 ohms, type N connector
Antennas	50 ohms or automatic antenna tuner (AT7000B, RAT1000C) for narrowband antennas
Interface	Control: two RS-232 COM ports; COM1 only configurable as EIA RS-422/423/485 with 7000RS option Audio: 600 ohms, balanced and isolated
Transmitter	
RF Power Output	125W PEP, 100W average; programmable - three levels
Duty Cycle	Continuous service, all modes
Harmonics	-60 dB (2 to 30 MHz) nominally
Receiver	
Sensitivity	-113 dBm at 10 dB SINAD
Attenuator	+20 dB, operator switchable
Audio	5W into 4 ohms; 0 dBm into 600 ohms
Mechanical	
Size (H x W x D)	8.9 cm x 33 cm x 43 cm (3.5 in. x 13 in. x 17 in.)
Weight	9.5 kg (21 lbs)

Characteristic	Specification
Environmental	
Cooling	On-demand fan (internal)
Temperature	-30°C to +60°C, operating
Shock, Vibration	Per MIL-STD-810

1.4 Internal Options

The following internal options are available in the TW7000. Chapters 15 to 19 provide descriptions of these options.

7000ACH — Additional channels. Increases operational channel capacity to 1000 (refer to “Additional Channels Option (7000ACH)” on page 19-2).

7000ALE — FED-STD-1045 compatible automatic link establishment system. Provides complete 1045 capability, including link quality analysis, auto-linking, sounding, and orderwire message transmission and reception. Implemented on assembly board 001-01105 (refer to “7000ALE” on page 16-1).

7000ALE-141B — MIL-STD-188-141B (Appendix A) automatic link establishment system. Provides 141B compatibility including link quality analysis, auto-linking, sounding, and orderwire messaging. Provides superior link establishment performance for networks with heavy traffic and noisier environments. Implemented on assembly board 001-01302 (refer to “7000ALE-141B” on page 16-45).

7000CW — Narrowband filter with 500 Hz bandwidth for CW operation (refer to “Narrowband CW Filter (7000CW)” on page 18-2).

7000CW1 — Combination of 500 Hz narrowband filter for CW operation and 300 to 3300 Hz wideband filter with tailored group delay characteristics for data operation. Implemented on assembly board 001-00800 (MA) (refer to “Narrow and Wideband Option (7000CW1)” on page 18-4).

7000ENCR — High-level voice encryptor uses enhanced domain transform (EDT) ciphering techniques providing long-term security (refer to “Encryption Option (7000ENCR)” on page 19-4).

7000FALC — Fast ALC loop for use with linear amplifiers like the TW1000D that use peak detection ALC (refer to “Fast ALC Option (7000FALC)” on page 15-1).

7000HS	High-stability reference oscillator allows 0.1 parts per million frequency stability (refer to “High-Stability Option (7000HS)” on page 15-9).
7000HS-FALC	High Stability reference oscillator and fast ALC loop operation (refer to “High Stability Fast ALC (7000HS-FALC)” on page 15-17).
7000NB	Impulse-type noise blanker used in high-noise environments (refer to “Noise Blanker Option (7000NB)” on page 19-5).
7000RCDR	Combines receive and transmit audio and routes them to the rear panel **ACCESSORY 2** connector (refer to “Recorder Option (7000RCDR)” on page 19-11).
7000RF	Internal modem allows remote control from the TW7201F FSK controller. Implemented on assembly board 001-01402 (refer to “FSK Remote Control Option (7000RF)” on page 17-1).
7000RI	Internal modem allows remote control from the TW7201I DHSL controller. Implemented on assembly board 001-01403 (refer to “DHSL Remote Control Option (7000RI)” on page 17-15).
7000RS	Modem interface board configures the COM1 serial port for RS-422, RS-423 or RS-485 to provide data protocol for external control of the radio through a computer. This is in addition to the standard RS-232 interface (refer to “Data Interface Option (7000RS)” on page 19-3).
7000VEM	DSP-based voice enhancement provides superior voice recognition and signal-quality improvement in noisy environments (refer to “Voice Enhancement Option (7000VEM)” on page 19-13). **Note:** *The 7000VEM option is now a standard feature for new radios, however, it is still available as an option for older radios. It is implemented on assembly board 001-10000.*
7000WB1	Wideband data filter providing 300 to 3300 Hz with tailored group delay characteristics for data operation (refer to “Wideband 1 Option (7000WB1)” on page 18-3).

TW7000AIRSELCALL

Operating with N-1304B (or equivalent) SELCALL devices and Datron power amplifiers, it adds a secondary control line to the radio and allows use of the ICAO-mandated ground-to-air SELCALL 3-tone system (refer to “N1304A Encoder (TW7000AIRSELCALL)” on page 19-27).

1.5 TW7000 Variations

This manual provides basic descriptions of variations of the TW7000. Options described here may not be available on your transceiver. For more information about these variations, contact Datron World Communications, Inc. Chapter 20 provides descriptions for these variations.

TW7000C — Designed for computer control. A blank front panel replaces the standard front panel (refer to “Computer Control (TW7000C)” on page 20-1).

TW7000E — Designed for extended control use. A line driver panel replaces the standard front panel. It is used with the TW7201E control head for remote operation up to 15m (50 ft.) (refer to “Extended Front Panel Control (TW7000E)” on page 20-1).

TW7000PP — Allows the addition of the TW5830A Pre/Postselector for co-sited operation (refer to “Pre/Postselector (TW7000PP)” on page 20-6).

Note: *The TW7000 is not field upgradeable to a TW7000PP.*

TW7000RF — Designed for long distance remote-only use beyond 2 km. A blank front panel replaces the standard front panel. An internal modem card (7000RF) is installed. For full function FSK remote control, use with the TW7201F Remote Control Head (refer to “FSK Remote Control (TW7000RF)” on page 20-9).

TW7000RI — Designed for remote-only use up to 2 km. The standard front panel is replaced with a blank front panel. An internal modem card (7000RI) is installed. For full function, real time, DHSL remote control, use with the TW7201I Remote Control Head (refer to “DHSL Remote Control (TW7000RI)” on page 20-9).

TW7000RX — Receiver only. It includes the full receiver functions of the TW7000, excluding transmit features (refer to “Receiver Only (TW7000RX)” on page 20-9).

TW7000TX Transmitter only. It includes the full transmitter functions of the TW7000, excluding receiver features (refer to “Transmitter Only (TW7000TX)” on page 20-9).

1.6 Input Power Requirements

The TW7000 is powered from a nominal +12 Vdc. Good performance is achieved when the input voltage is between the range of 11V and 15.5V.

1.7 Antenna Requirements

The TW7000 has an RF output impedance of 50 ohms and is used with either broadband or narrowband antennas, in conjunction with an automatic antenna tuner.

1.8 Accessories

The TW7000 interfaces with a variety of accessory equipment to create systems to meet the most complex of communication requirements. For more information on accessories, refer to “Accessory Connectors” on page 2-5.

1.9 Referenced Manuals

- TW7000-MS Operator Manual
- 7000ALE-MSOP Radio Control Program Operator Manual
- 7000ENCR-MSOP 7000-Series Encryption Operator Manual
- TW7201I-MS DHSL Remote Control Head Technical Manual
- TW7201F-MS FSK Remote Control Head Technical Manual

CHAPTER 2
INSTALLATION

2.1 Unpacking and Inspection

When unpacking the TW7000, carefully remove the equipment from its container and inspect it for any possible damage. If anything is damaged, notify Datron.

Check the equipment against the packing list. Save the original container and packing materials for storage or reshipping purposes.

2.2 Preinstallation Check

The TW7000 is completely aligned and tested prior to shipment. However, to insure proper functioning prior to installation, perform an operations check. For more information, refer to “Basic Performance Test” on page 21-8.

2.3 Location Considerations

The TW7000 can be successfully installed in various locations and operated remotely using a remote head or extended control. Information in this chapter pertains to the main body of the TW7000, whether it is controlled locally or from a remote site.

2.3.1 Temperature Considerations

The TW7000 should be installed in an environment where the temperature is within the specified range (-30°C to +60°C), and that there is adequate ventilation around the rear of the TW7000 to allow for air flow. The TW7000 uses an on-demand fan for cooling the internal heat sink during periods of prolonged transmit operation. The intake and exhaust vents for this fan are located on the rear panel. Provide sufficient space during installation for the cooling air to circulate properly.

To prevent unwanted noise, locate the TW7000 as far away as possible from electrostatic and magnetic field-generating equipment.

When attaching external cables to the TW7000, allow for sufficient slack in the cables. This prevents damage from sharp bends and ensures easy disconnection.

2.3.2 Fixed Station Applications

Unless otherwise specified when ordered, the TW7000 is shipped ready for operation in a fixed station desktop configuration. It can also be mounting in a rack using the appropriate rack kit. The rack mount kit can be ordered separately.

2.3.3 Vehicular or Marine Applications

For vehicle or shipboard applications, Datron offers rack, mobile and shock mount kits suitable for most installations.

2.4 Front Panel Connections

The TW7000 front panel hosts two 6-pin audio connectors. These two connectors are wired in parallel and are compatible with various audio accessories.

Figure 2-1 Front Panel Connections

The input impedance for each connector is 150 ohms (nominal). The TW7000 supports most dynamic, ceramic or magnetic headphones. Table 2-1 below lists the low-level audio accessories.

Table 2-1 Audio Accessories

Part Number	Description
PM	Heavy-duty palm microphone
DM	Dynamic desk microphone
KEY	Morse key

Table 2-1 Audio Accessories

Part Number	Description
EP	Headphones
EPL	Lightweight headphones

All Datron audio accessories have the correct mating connector. Datron offers mating adapters for other low-level audio accessories. Table 2-2 below provides pin assignments for the audio connectors.

Table 2-2 Front Panel Audio Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	RX	Receive audio (unmuted)
3	PTT	Push-to-talk
4	TX	Transmit audio
5	CW	CW key line (morse code)
6	12V	+12 Vdc

2.5 Rear Panel Connections

The rear panel of the TW7000 is attached to the rear panel bezel by six screws. The pattern of punched holes on right-side is the air intake for the internal heat sink. The left-side hole pattern is the air exhaust. Between them are the rear panel **ACCESSORY** and **REMOTE** connectors in addition to the DC input power jack, antenna connector and the fuse holder. Behind the panel is an input power protection circuit board. Internally, ribbon cables connect the rear panel to the motherboard.

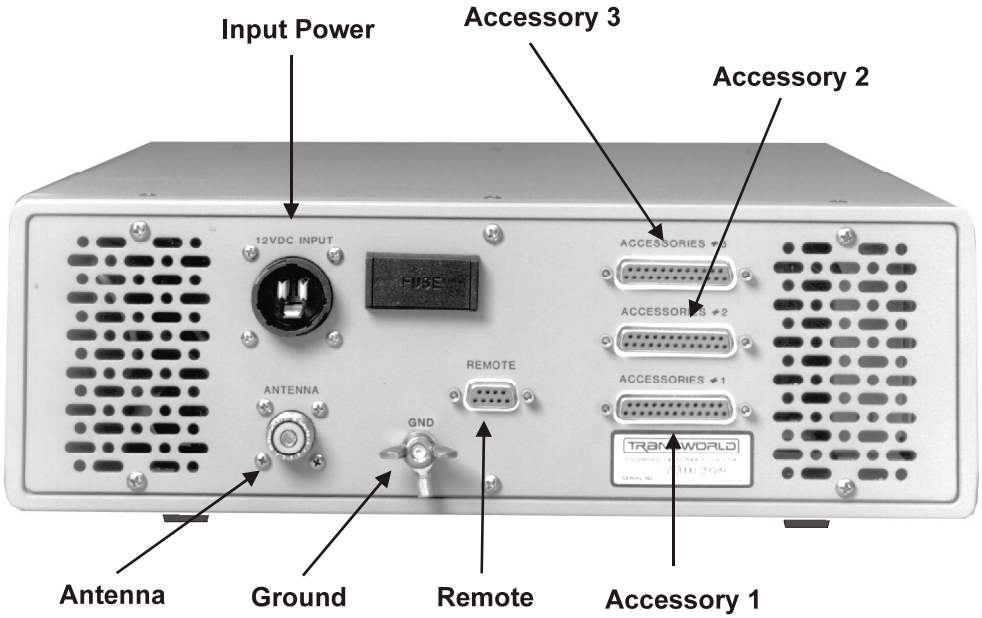


Figure 2-2 TW7000 Rear Panel

2.5.1 Power to the TW7000

Input power is nominally 13.8 Vdc, with a maximum current requirement of approximately 25A. The recommended operational voltage range of the TW7000 is 11 to 15.5 Vdc. The **12VDC INPUT** connector on the rear panel is a 3-pin 25A circular receptacle. The mating plug is attached to the input DC power cable (C991829) supplied with the TW7000. This 6.5 ft. long cable has two 12 AWG conductors and is open-ended for convenient connection to a variety of +12 Vdc sources. For specific connections, refer to Figure 2-4 on page 2-10.

The pin assignments for the input power connector are as follows:

Pin	Signal	Description
1	12V RTN	12 Vdc return (ground)
2	12V	12 Vdc supply

The DC power connection between the TW7000 and its power source should be as short as possible. If a Datron power cable is not available, use a 14 AWG cable for runs up to 3 feet, a 12 AWG cable for runs to 9 feet, or a 10 AWG cable for longer runs.

Datron offers two DC power supplies recommended for use with the TW7000 when a +12 Vdc primary power source is not available.

PF3000: A heavy duty power supply that supports continuous duty operation and runs off 110/220 VAC, 50/60 Hz, with switchable input range. This power supply requires the C991829 cable to connect to the TW7000.

PF7000: A heavy duty FSK power supply that supports continuous duty operation and runs off 110/220 VAC, 50/60 Hz, with universal input. This power supply requires a C991879 cable. to connect to the TW7000.

The fuse holder (346877) on the rear panel contains a 25A, 3-AG fuse, and a spare fuse of the same value.

2.5.2 Antenna Connector

The TW7000 is designed to transmit into a 50 ohm RF impedance. The output RF antenna connector is a type SO-239 connector. Broadband antennas and dipoles can be connected directly to this output, while high-power amplifiers and antenna tuners use specially-designed Datron cables. For specific connections, refer to Figure 2-5 on page 2-11.

2.5.3 Accessory Connectors

A variety of external accessories are available from Datron for use with the TW7000. For some of these accessories and their control cabling, refer to Figure 2-6 on page 2-12. For more information on any individual accessory, refer to the specific manual for that piece of equipment.

The TW7000 provides three DB25 rear panel **ACCESSORY** connectors for attaching various peripheral equipment. If an installation includes multiple accessories that share one or more of the **ACCESSORY** connectors, an external accessory combiner box (TW7000IOX) can be attached to any of these connectors. For the location of these connectors, refer to Figure 2-2 on page 2-4.

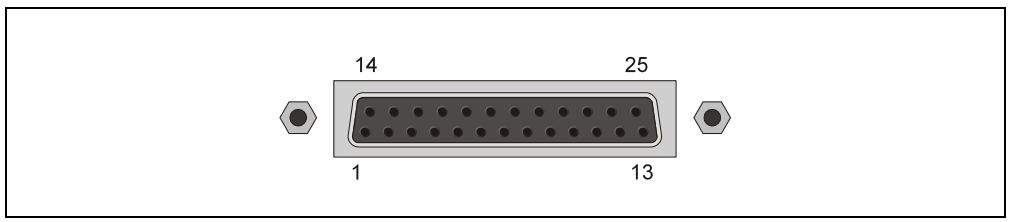


Figure 2-3 Accessory Connectors Pinout

Table 2-3 ACCESSORY1 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	COM1 RXD	RS-232, RS-422/423/485
3	COM1CTS	Standard RS-232 clear-to-send line
4	COM1TXD	Transmit audio in RS-232, RS-422/423/485 protocol

Table 2-3 ACCESSORY1 Connector Pin Assignments (continued)

Pin	Signal	Description
5	COM1RTS	Standard RS-232 ready-to-send line
6	BALRXA1	Balanced RX audio
7	BALRXA2	Balanced RX audio
8	BALTXA1	Balanced TX audio
9	BALTXA2	Balanced TX audio
10	AUXPTT\	Auxiliary PTT (active low)
11	SEL	Select line for parallel printer
12	BUSY	Busy line for parallel printer
13	12V ACC	+12V supply for accessories
14	EXTCWKEY	External CW key for parallel printer
15	STROBE	Strobe line for parallel printer
16	D0	Data 0 output line to parallel printer
17	D1	Data 1 output line to parallel printer
18	D2	Data 2 output line to parallel printer
19	D3	Data 3 output line to parallel printer
20	D4	Data 4 output line to parallel printer
21	D5	Data 5 output line to parallel printer
22	D6	Data 6 output line to parallel printer
23	D7	Data 7 output line to parallel printer
24	ACK	Acknowledge for parallel printer
25	DIO/SEL	

Table 2-4 ACCESSORY2 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	PWRON\	Power on line
4	ATUINIT	ATU tune initiate
5	ATUKEY\	ATU key line
6	BALRXA3	Balanced RX audio
7	BALRXA4	Balanced RX audio
8	BALTXA3	Balanced TX audio
9	BALTXA4	Balanced TX audio
10	AUXPTT\	Auxiliary PTT (active low)
11	COM2RXD	COM2 receive (RS-232)
12	COM2TXD	COM2 transmit (RS-232)
13	12V ACC	+12V supply for accessories
14	EXTCWKEY	External CW key
15	SPARE	Spare
16	ACHKTUNE	Antenna Tuner check tune
17	ADATA	Antenna Tuner data
18	ACLOCK	Antenna Tuner clock
19	ASTROBE	Antenna Tuner strobe
20	TC/SCALM	Selcall alarm
21	RETX\	Retransmit signal
22	EXTSPKR	External speaker audio
23	SQA	Squelch audio
24	12V ACC	+12V supply for accessories
25	12V ACC	+12V supply for accessories

Table 2-5 ACCESSORY3 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	FILTG\	Spare
4	AMPALC	External amplifier ALC line
5	AMPPTT\	External amplifier PTT line
6	FLTA	External amp low-pass filter A select line
7	FLTB	External amp low-pass filter B select line
8	FLTC	External amp low-pass filter C select line
9	FLTD	External amp low-pass filter D select line
10	FLTE	External amp low-pass filter E select line
11	FLTF	External amp low-pass filter F select line
12	FLTG	External amp low-pass filter G select line
13	5V	+5V
14	GND	Ground
15	GND	Ground
16	EXTCLK	External clock
17	EXTRXD	External receive data
18	EXTTXD	External transmit data
19	ATURX	Antenna Tuner receive data
20	ATUTX	Antenna Tuner transmit data
21	EXTEN1	
22	EXTEN2	
23	EXTIN1	
24	12V ACC	+12V ACC
25	12V ACC	+12V ACC

External Encryption

The TW7000 provides for an optional embedded encryption board (7000ENCR). External encryption can also be implemented through either **ACCESSORY 1** or **ACCESSORY 2** using balanced audio pins (BALTX3/4 and BALRX3/4) (refer to Table 2-3 on page 2-5 or Table 2-4 on page 2-7).

EIA Data Interface Standards	The TW7000 interfaces with a variety of data communications equipment (DCE) or data terminal equipment (DTE) using EIA standards RS-232, RS-422, RS-423 or RS-485. **ACCESSORY 1** is configured to provide the standard I/O port (COM1) for these interfaces. The RS-232 standard is default; all others are optional (refer to Table 2-3 on page 2-5). **Note:** *It is necessary to order the 7000RS option and to specify the required protocol so the appropriate interface chip is installed on the Processor board. If the 7000RS option is installed, the COM1TXD and COM2RXD becomes a 2-wire bidirectional RS-422/423/485 interface.* A 3-wire RS-232 (COM2) interface is also available on **ACCESSORY 2**.
Automatic Antenna Tuners	The TW7000 interfaces with the complete line of Datron automatic antenna tuners. This includes the AT/RAT7000B and RAT1000C. The AT7000B and RAT7000B use **ACCESSORY 3** ATU pins (refer to Table 2-5 on page 2-8); the RAT1000C uses **ACCESSORY 2** ATU pins (refer to Table 2-4 on page 2-7).
Data Terminal Interface	The TW7000 interfaces with its own line of data terminals or to other external units through the COM1 and COM2 serial interface ports and the balanced audio (BALRX and BALTX) lines on **ACCESSORY 1** (refer to Table 2-3 on page 2-5).
External Printers	The TW7000 supports a parallel printer through **ACCESSORY 1** pins 11 through 24 (excluding pins 13 and 14) for printing text messages stored in the TW7000 (refer to Table 2-3 on page 2-5).
External Speaker	An external speaker can be attached to the TW7000 on the EXTSPKR line (pin 22) of **ACCESSORY 2** (refer to Table 2-4 on page 2-7).
External High-Power Amplifiers	The TW7000 interfaces with all existing Datron's RF power amplifiers such as the TW500D (500W) and TW1000D (1000W) RF amplifiers using **ACCESSORY 3** pins 1 to 12 (refer to Table 2-5 on page 2-8).

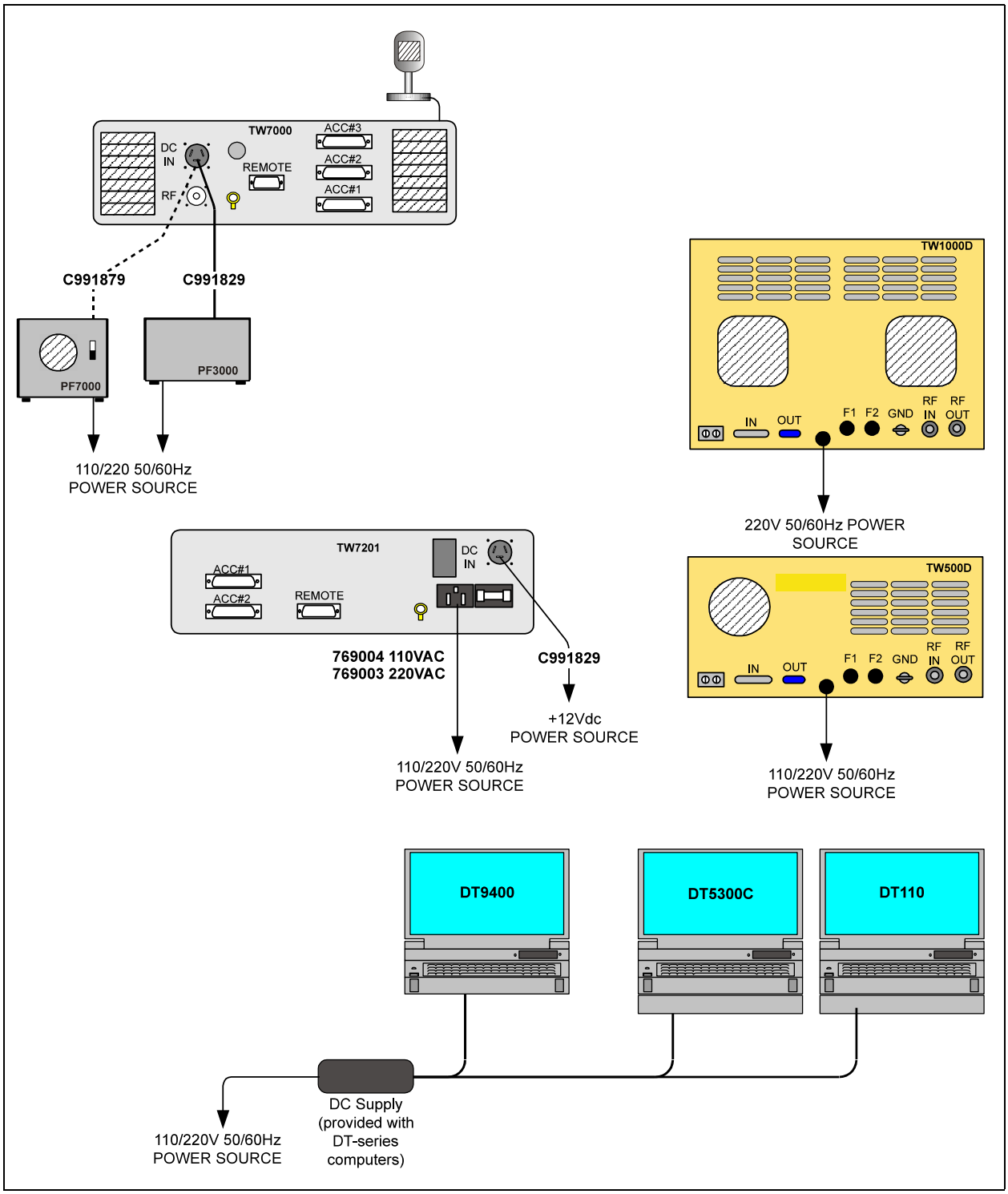


Figure 2-4 Power Cabling Accessories

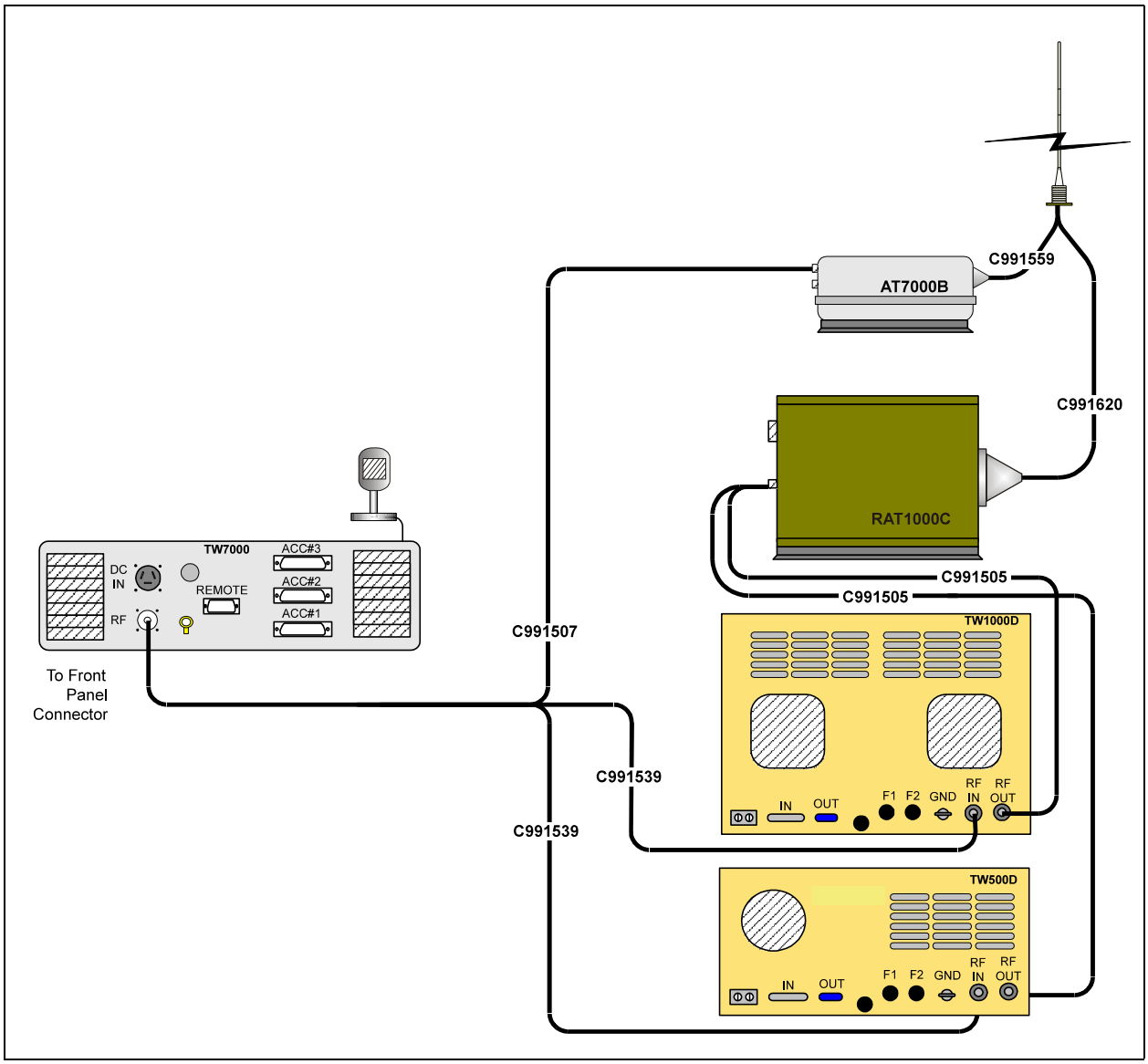


Figure 2-5 RF Cabling Accessories

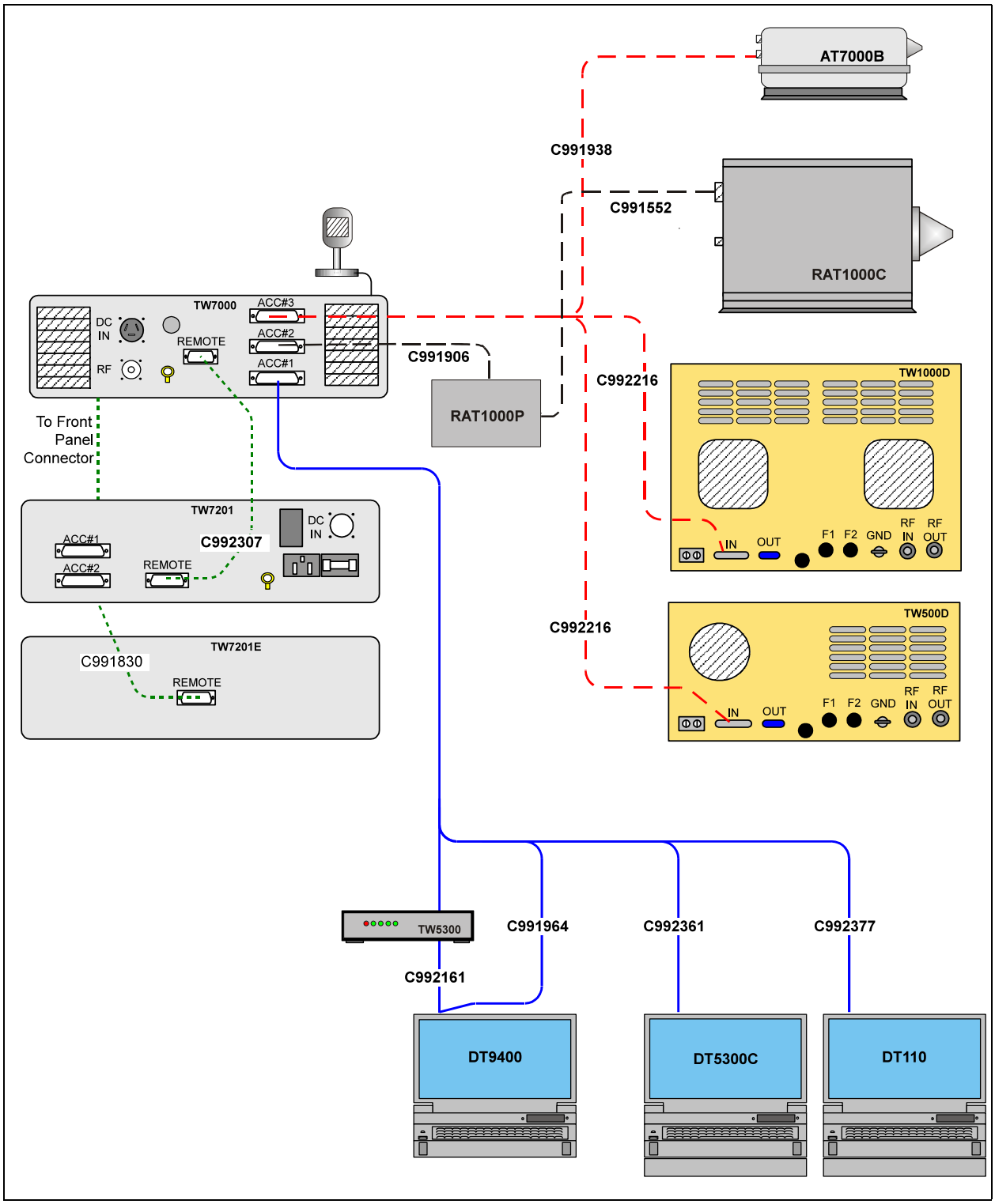


Figure 2-6 Control Cabling Accessories

2.5.4 Remote Control

The TW7000 can be controlled remotely using a computer, an extended front panel or a remote control head.

Computer Control

The TW7000 can be controlled remotely from a standard computer through rear panel **ACCESSORY 1** or **ACCESSORY 2** connectors. A custom software program is available from Datron that runs on any PC using Windows. For the connections to use, refer to “EIA Data Interface Standards” on page 2-9.

Extended Front Panel Control

The TW7000 front panel can be removed from the chassis and replaced with a line driver panel (TW7000E) to control it remotely. This special version of the radio can control operations from distances up to 50 feet.

FSK and DHSL Remote Control

The TW7000 can be controlled remotely from longer distances using either the TW7201F or TW7201I remote control heads. Both control heads require that modem interface boards (7000RF or 7000RI) be installed inside the TW7000. The TW7201F uses FSK and is for long-range remote requirements, while the TW7201I uses DHSL and is for real-time control up to 2 km.

These modem-based remote control units connect to the TW7000 through the DB 9-pin **REMOTE** connector on the rear panel.

Pin	Signal	TW7201F	TW7201I
1	GND	x	x
2	+12V UNREG	x	x
3	+12V ACC		
4	Spare (REMSP)		
5	DHSL1		x
6	DHSL2		x
7	REMRXA	x	
8	REMTXA	x	
9	PWRON\	x	x

For a complete description of these pins, refer to the TW7201F FSK Remote Control Head (TW7201F-MS) technical manual or the TW7201I DHSL Remote Control Head (TW7201I-MS) technical manual.

CHAPTER 3
THEORY OF OPERATION

This chapter describes the overall operation of the TW7000 including power distribution, frequency generation, receive and transmit paths and control signals.

3.1 Transceiver Boards

The TW7000 can accommodate a total of twenty boards either standard or option boards. Many of these are plug-in boards that can be removed and serviced easily. Figure 21-1 on page 21-3 provides the location of these boards.

Most of the wiring between individual assemblies in the TW7000 is implemented through the motherboard, eliminating wiring harnesses. Other connections between the circuit boards, front and rear panel controls, and connectors, are made using a combination of coaxial cable and ribbon cable assemblies. For more information on these boards, refer to Figure 3-1 on page 3-2.

3.2 Power Distribution

The TW7000 receives its source power through the rear panel **12VDC INPUT** connector. This power is routed to the Power Supply board through connector J26. The PWRON line from the front panel **POWER** switch (J21-7) activates a relay on the Power Supply board, turning the TW7000 on and allowing the distribution of power to the other subassemblies. Figure 4-1 on page 4-2 shows the power distribution in the TW7000.

Voltages derived from the +12 Vdc source power input include the following:

Voltage	Description
+12V PA	Unregulated, unswitched, raw input power to the RF Power Amplifier board
+12V UNREG	Unregulated, switched input power to the front panel assembly and the remote control devices via the rear panel **REMOTE** connector
+12V ACC	Regulated, switched, filtered +12 Vdc provides power to all of the rear panel connectors

Voltage	Description
+12V FAN	Unregulated, switched, filtered +12 Vdc drives the heatsink fan
+12V	Regulated, switched, filtered +12 Vdc provides power to all internal subassemblies in the TW7000 except the front panel
+5V	Regulated, switched, filtered +5 Vdc for the Processor board, ACCESSORY3 connector, and the ALE option slot

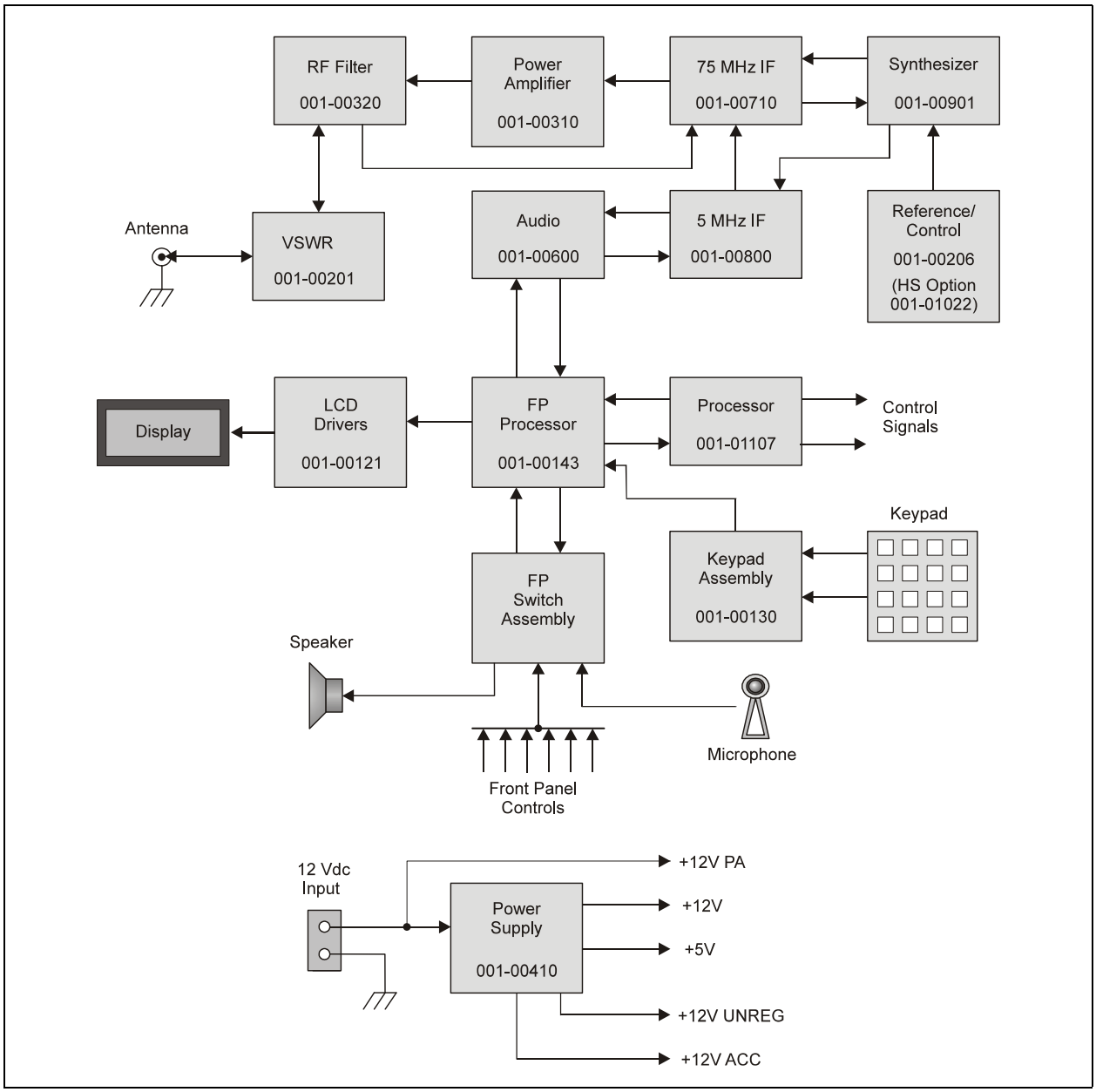


Figure 3-1 System Diagram

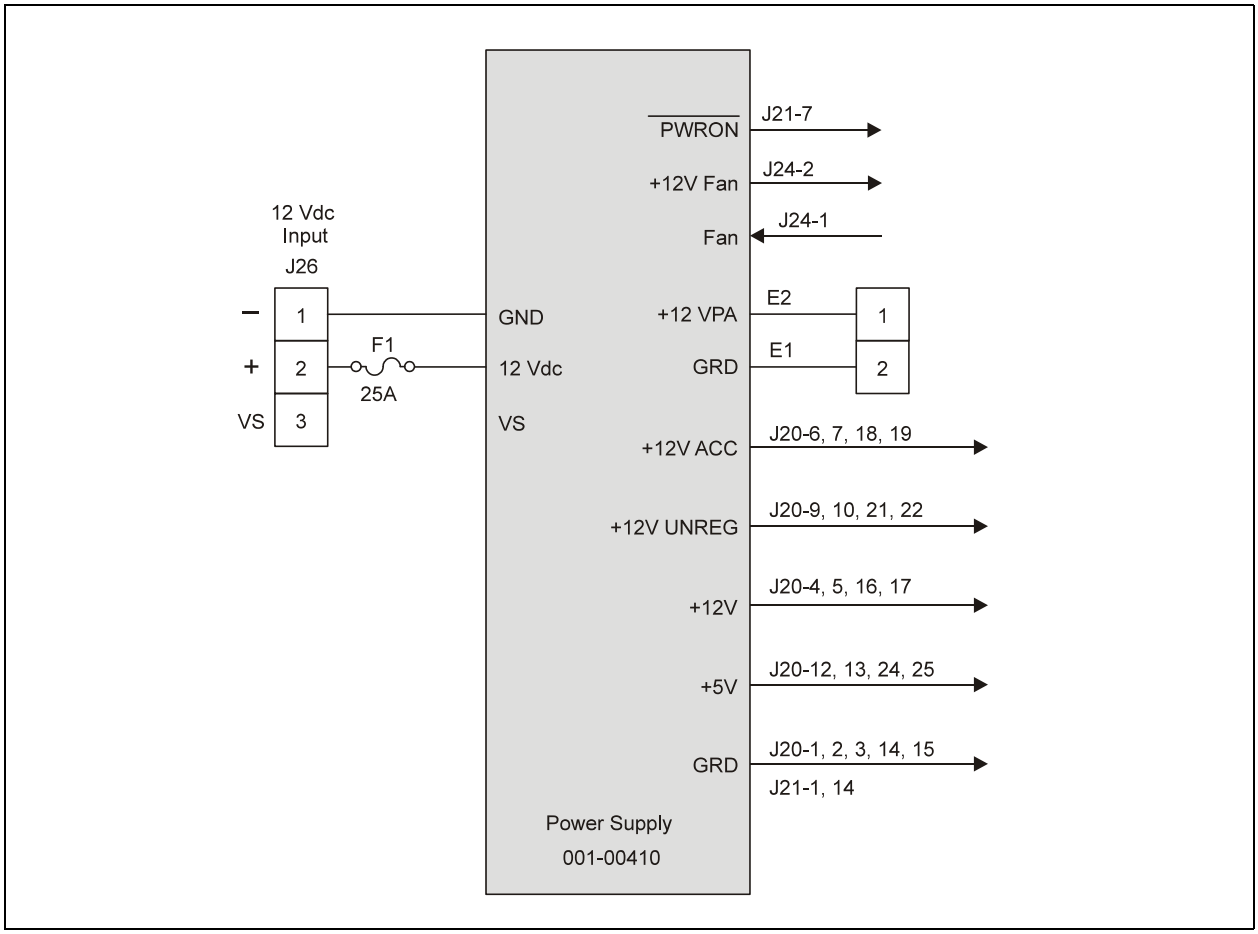


Figure 3-2 Power Distribution Diagram

Table 3-1 Transceiver Power Distribution

Voltage	Distribution	Connector
+12V PA	RF Power Amplifier board	
+12V ACC	Rear panel assembly	
	REMOTE	Pin 3
	ACCESSORY 1	Pin 13
	ACCESSORY 2	Pins 13, 24, 25
	ACCESSORY 3	Pins 24, 25
+12V UNREG	Front panel assembly	J1-3, 4
	Rear panel assembly	
	REMOTE	Pin 2
+12V	Processor board	J14-A31, B31; J15-A31, B31
	Reference/control board	J3-2
	RF Filter board	J22-3, 4

Table 3-1 Transceiver Power Distribution

Voltage	Distribution	Connector
	Synthesizer board	J4-2, 15
	75 MHz IF board	J6-2, 15
	5 MHz IF board	J5-2, 15
	Audio board	J7-2, 15
	ECU/RCU board	J11-2, 15
	ALE board	J13-2, 15
	Option slot 1	J9-2, 15
	Option slot 2	J10-2, 15
	Noise Blanker/FM board	J2-2, 15
+5V	Rear panel assembly	
	ACCESSORY 3	Pin 13
	Processor board	J15-A29, A30, B29, B30
	ALE board	J13-6, 18
PWRON	Front panel assembly	J1-26
	Rear panel assembly	
	Remote	Pin 9
	ACCESSORY 2	Pin 3

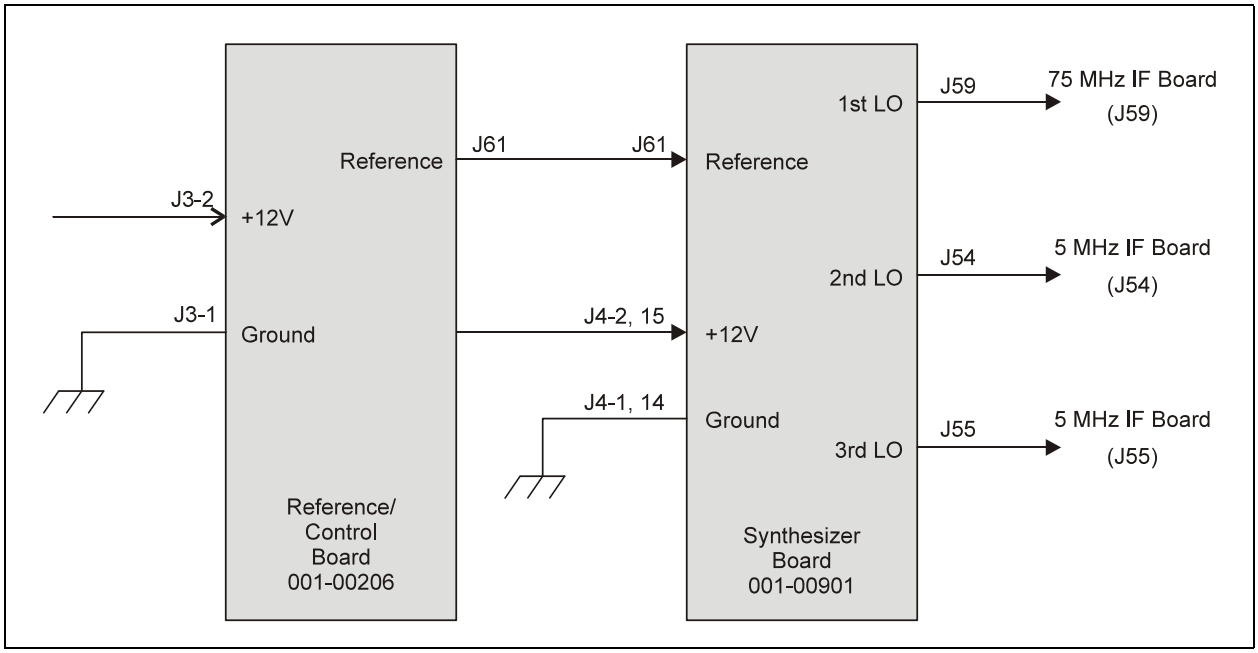


Figure 3-3 Transceiver Frequency Generation

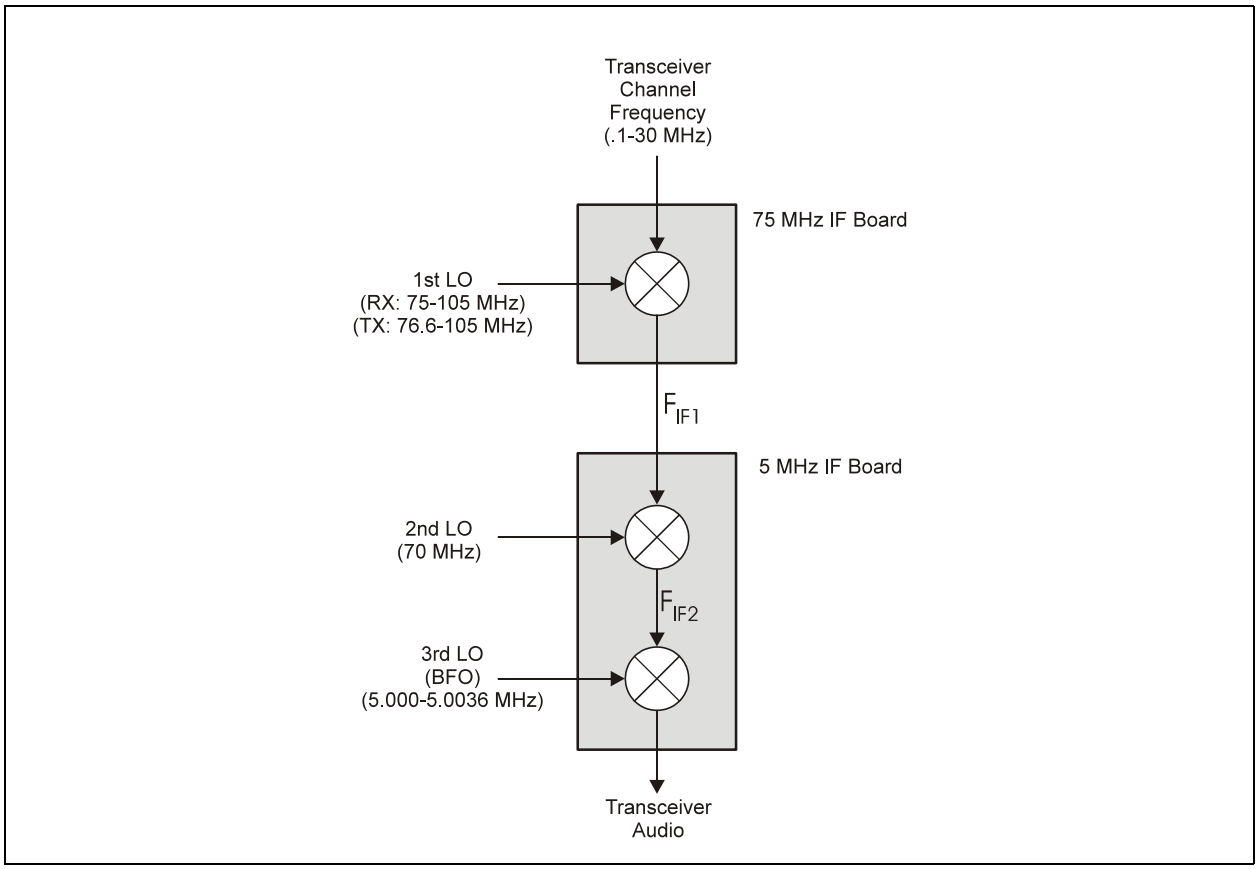


Figure 3-4 Transceiver Frequency Mixing Schematic

3.3 Frequency Generation

Figure 3-4 above provides a diagram of the boards used in frequency generation. All frequencies are tied to the reference oscillator in the Reference/Control board. This oscillator generates a frequency of 16.777216 MHz, and connects between the Reference/Control and Synthesizer boards through an internal coaxial cable (J61 on both boards). The Synthesizer compares the reference frequency input with a feedback frequency from the VCO and generates the three local oscillator (LO) output frequencies in the TW7000 mixing scheme. These are as follows:

Frequency	Value	Level
First LO	75.1 to 105 MHz (10 Hz steps)	0 ±2 dBm (50 ohm)
Second LO	≈70 MHz	0 ±2 dBm (50 ohm)
Third LO	5.000 MHz (LSB, voice) 5.003 MHz (USB, voice) 5.0036 MHz (USB, data)	0 ±2 dBm (50 ohm)

These LO frequencies result in intermediate frequencies (IF) of 75 MHz and 5 MHz. The beat frequency oscillator (BFO) uses different values depending on the modulation mode selected allowing the TW7000 to use only one sideband filter instead of the usual two (USB and LSB). This allows the TW7000 to use both USB and LSB as standard modulation modes. The third value of BFO (5.0036 MHz) is for USB operation when the optional wideband data filter is installed. The first LO is offset by 3 kHz in USB mode with the standard voice-grade filter, and by 3.6 kHz in USB mode with the optional data-grade filter. The following table provides some examples:

Channel frequency = 1.6 MHz, USB, voice, 1 kHz modulation	
First LO	= 75 MHz + channel frequency + 3 kHz
	= 75 MHz + 1.6 MHz + 3 kHz
	= 76.603 MHz
First IF	= First LO - input frequency
	= 76.603 MHz - (1.6 MHz + 1 kHz)
	= 75.002 MHz
Second IF	= First IF - second LO
	= 75.002 MHz - 70 MHz
	= 5.002 MHz
Output Audio	= BFO - second IF
	= 5.003 MHz - 5.002 MHz
	= 1 kHz
Channel frequency = 1.6 MHz, LSB, voice, 1 kHz modulation	
First LO	= 75 MHz + channel frequency
	= 76.6 MHz
First IF	= 76.6 MHz - (1.6 MHz - 1 kHz)
	= 75.001 MHz
Second IF	= 75.001 MHz - 70 MHz
	= 5.001 MHz
Output Audio	= BFO - second IF
	= 5.000 MHz - 5.001 MHz
	= -1 kHz
Channel frequency = 1.6 MHz, USB, data, 1 kHz modulation	
First LO	= 76.6036 MHz
First IF	= 75.0026 MHz
Second IF	= 5.0026 MHz

Channel frequency = 1.6 MHz, USB, data, 1 kHz modulation	
Output Audio	= BFO - second IF
	= 5.0036 - 5.0026
	= 1 kHz

3.4 Receiver Signal Flow

The TW7000 receives the receive signal (channel frequency) through the 50 ohm antenna connector on the rear panel, then passes the signal through the VSWR board (E4). The receive signal is applied to the RF Filter board at J50. In the RF Filter board, the signal is filtered before going to the 75 MHz IF board at J52. Figure 3-5 on page 3-8 provides a block diagram of the receive path in the TW7000.

The 75 MHz IF board mixes the channel frequency with the first LO to form the first IF at 75 MHz. It then filters and amplifies the signal before sending it to the 5 MHz IF board through J53. The 5 MHz IF board mixes the receive signal with the fixed 70 MHz second LO to produce the second IF at 5 MHz. It also filters and amplifies the receive signal then mixes it with the third LO (BFO) to remove the carrier frequency. This leaves just the baseband audio.

The demodulated audio (DEMODA) exits the 5 MHz IF at J5-21 and is applied to the Audio board at J8 pin 21. The Audio board processes the audio, passes it through the squelch gate, then sends it out as unbalanced squelched audio through J8 pin 7 (SQA) to drive the front panel speaker (J1-30). It can also be routed to an external speaker through **ACCESSORY 2** pin 22. The Audio board provides four channels of balanced squelched audio to the rear panel accessory connectors: two to **ACCESSORY 1** and two channels to **ACCESSORY 2**.

The front panel **SQUELCH** switch controls the syllabic squelch circuit on the Processor board. The 5 MHz IF board generates the receiver's automatic gain control (AGC) and sets the threshold.

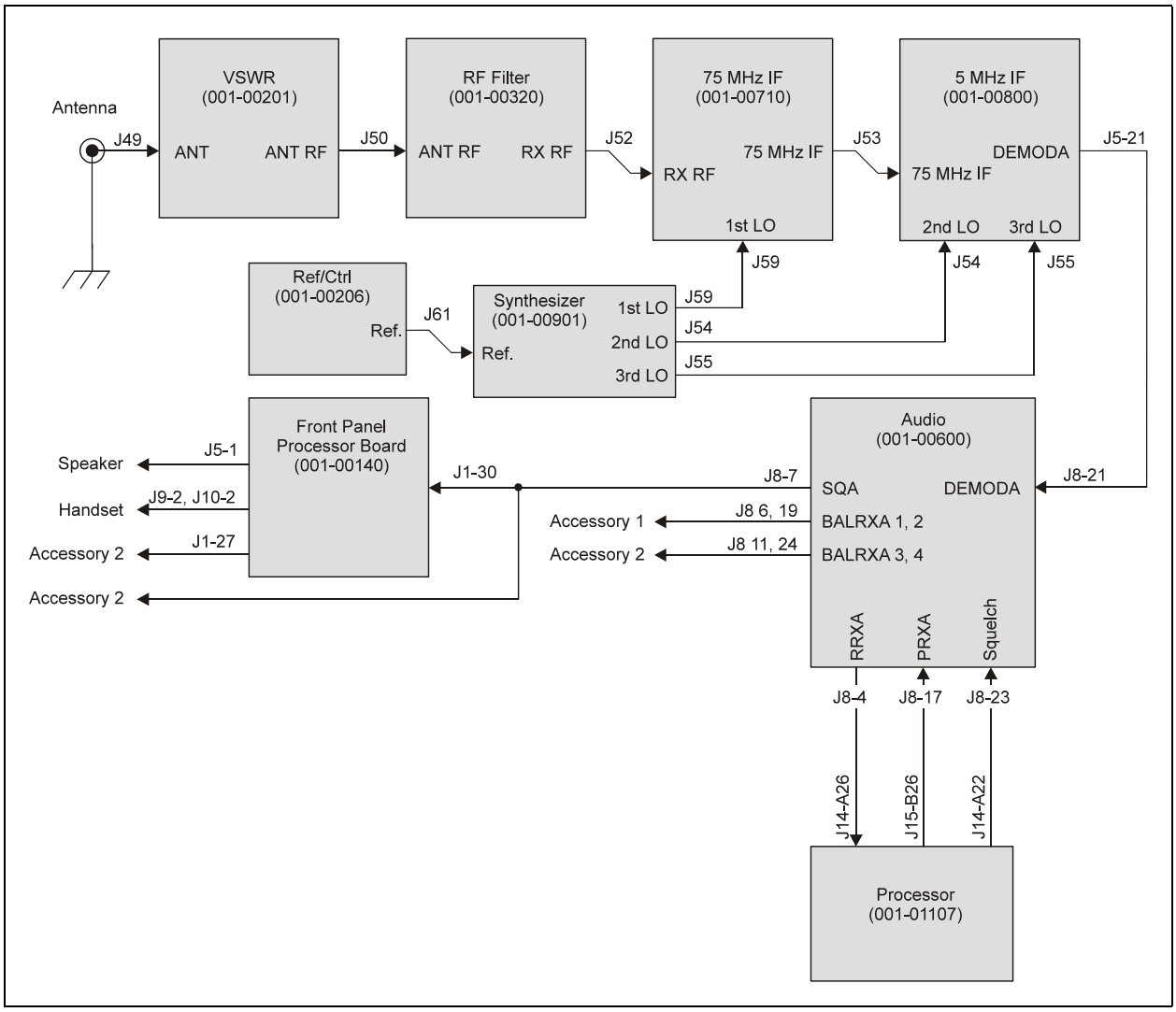


Figure 3-5 Transceiver Receive Path Diagram

3.5 Transmit Signal Flow

Figure 3-6 on page 3-10 provides a diagram of the transceiver transmit path. Primary unbalanced audio originates at microphones or headsets connected to either of the front panel audio connectors at J1 pin 25 and is applied to the Audio board at J8 pin 20. Balanced 600 ohm audio is received from either **ACCESSORY 1** or **ACCESSORY 2** (pins 15, 17), and enters the Audio board at J8 pins 5 and 18. The Audio board modulates the audio signal (MODA) and sends it to the 5 MHz IF board where it is mixed with the third LO (BFO) to form the IF at 5 MHz. The modulated audio is filtered and amplified, then mixed with the second LO to form the IF at 75 MHz before being routed to the 75 MHz IF board. On the 75 MHz IF board, the transmit signal is amplified

and filtered, and mixed with the first LO to form the low-level transmit channel frequency RF. It is amplified again in the TX exciter circuitry before being sent to the RF power amplifier.

In the RF Power Amplifier, the transmit signal is amplified to its final output power level and routed to the RF Filter board. The RF Filter board provides the necessary harmonic filtering before the signal reaches the antenna port. Just prior to this, the signal passes through the VSWR circuit where it is sampled by a forward and reflected power detector. These RF samples are fed back to the Reference/Control board where they are processed to make up the transmitter automatic level control (ALC) circuit and VSWR measurement. The raw ALC voltage is sent back to the 75 MHz IF board where it controls the gain of the low-level exciter amplifier.

3.6 Receive and Transmit Path Subassemblies

The receive/transmit path includes the following standard subassemblies:

- VSWR circuit
- RF Filter board
- RF Power Amplifier board
- 75 MHz IF board
- 5 MHz IF board
- Audio board
- Processor board

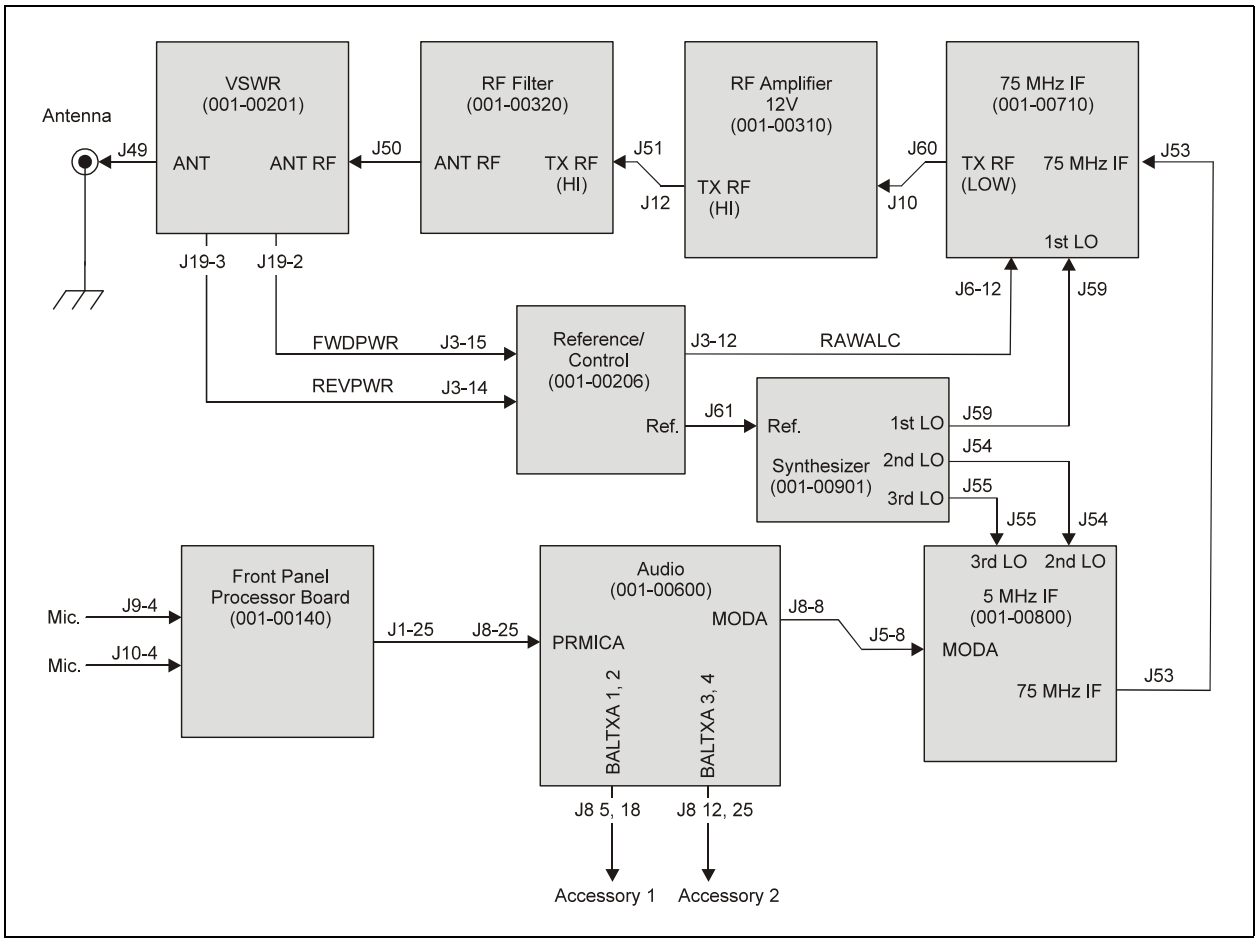


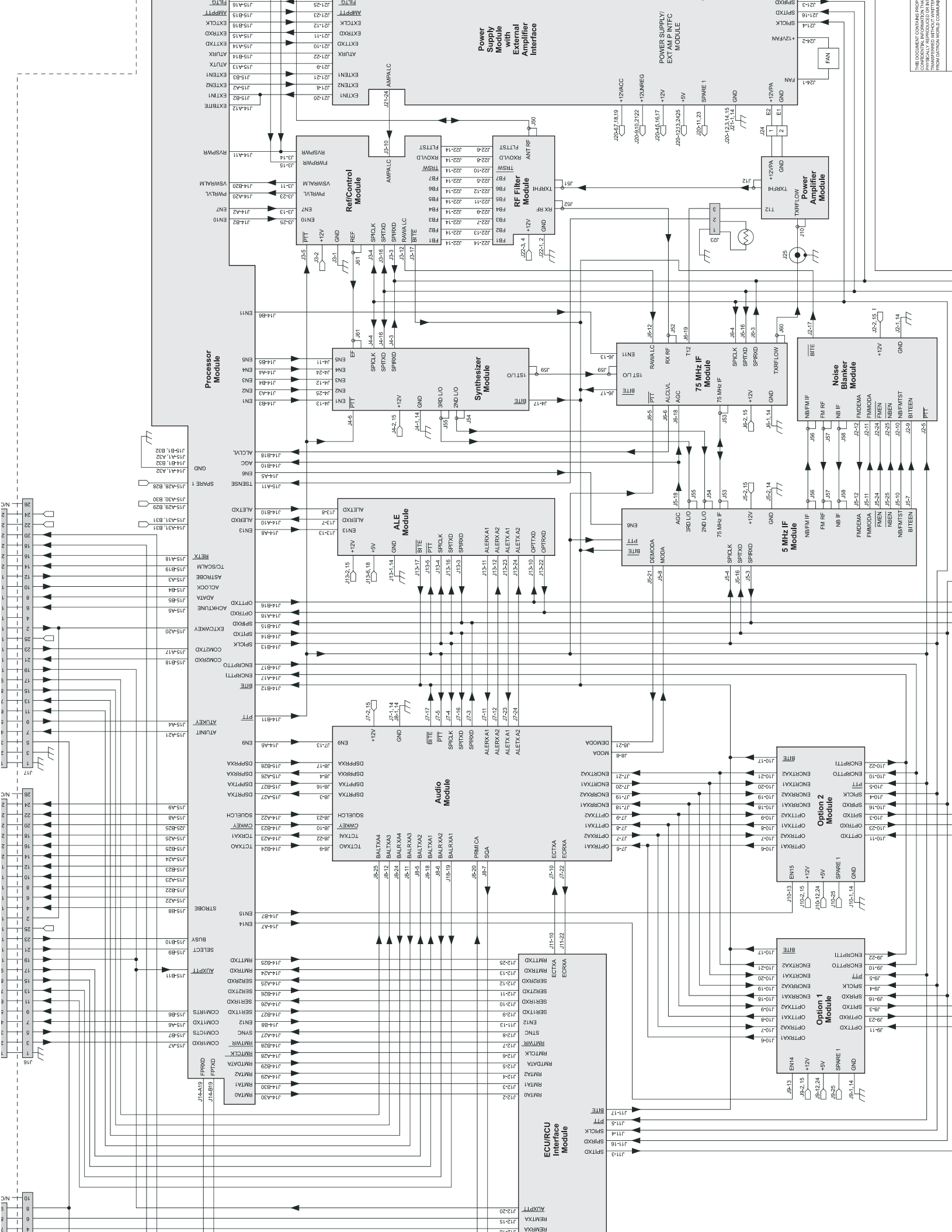
Figure 3-6 Transceiver Transmit Path

3.7 Transceiver Control Path

The TW7000 is controlled by two microprocessors: the main controller on the Processor board, and a secondary controller in the Front Panel Processor board. The secondary controller processes all of the commands from control devices on the front panel such as clarifier, volume, switches, and keys on the keypad. It relays them to the main processor to initiate the appropriate action in the radio. The main processor controls all radio operations and processes any commands received from the rear panel accessory connectors. For more information regarding the main processor, refer to “Chapter 14: Processor Board.”

3.8 Mainframe

Figure 3-7 on page 3-11 provides a mainframe schematic that shows all of the interconnect wiring between the front panel, rear panel, and motherboard. This schematic traces signals between assemblies. Most signal lines have arrows that show the direction of the signal flow.


Power Supply Module with External Amplifier Interface
POWER SUPPLY/ EXT AM P INTFC MODULE
Ref/Control Module
RF Filter Module
Power Amplifier Module
Processor Module
Synthesizer Module
75 MHz IF Module
Noise Blanker Module
ALE Module
5 MHz IF Module
Audio Module
Option 2 Module
Option 1 Module
ECU/RCU Interface Module
+12VACC
+12UNREG
+12V
+5V
SPARE 1
GND
+12VPA
FAN
+12V/FAN
PTT
REF
SPICLK
SPITXD
SPIRXD
RAWA LC
BITE
EF
3RD L/O
2ND L/O
1ST L/O
ALCLVL
AGC
75 MHz IF
RX RF
TXRFLOW
NB/FM IF
FM RF
NB IF
FMDEMA
FMMODA
FMEN
NBEN
NB/FMTST
BITEEN
DEMODA
MODA
ALERX A1
ALERX A2
ALETX A1
ALETX A2
OPTTXD
OPTRXD
ENCRTXA2
ENCRTXA1
ENCRRXA2
ENCRRXA1
ENCRPTTO
ENCRPTTI
SPARE1
BALTXA4
BALTXA3
BALRXA4
BALRXA3
BALTXA2
BALTXA1
BALRXA2
BALRXA1
PRMI CA
SQA
ECTXA
ECRXA
RMTWR
RMTCLK
RMTDATA
RMTA2
RMTA1
RMTA0
SERTXD
SERRXD
SERTRTS
SERCTS
SERRTXD
SERRRXD
SERZTXD
SERZRXD
SERZWRD
SERZRWD
AUXPTT
STBY
STROBE
SELECT
BUSY
ATUNIT
ACHKTUNE
EXTCWKEY
ADATA
ACLOCK
ASTROBE
TO/SCALM
RETX
TSENSE
SPARE 1
ALCLVL
AGC
GND
ALETXD
ALERXD
ENCRPTTI
ENCRPTTO
COM2RXD
COM2TXD
SPICLK
SPIRXD
SPITXD
OPTTXD
OPTRXD
ENCRRXA2
ENCRRXA1
ENCRTXA2
ENCRTXA1
OPTRXA2
OPTRXA1
OPTTXA2
OPTTXA1
SPARE1
SPARE2
SPARE3
SPARE4
SPARE5
SPARE6
SPARE7
SPARE8
SPARE9
SPARE10
SPARE11
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SPARE38
SPARE39
SPARE40

CHAPTER 4
POWER SUPPLY BOARD

4.1 Circuit Description

The Power Supply board consists of the power supply and a heatsink. The board is mounted to the heatsink and together they are mounted on the vertical chassis bracket located directly behind the main heatsink, facing the inside of the rear panel. The Power Supply board is connected to the rear panel through the DC power cable which plugs into the 3-pin J26 connector.

4.1.1 Power Distribution

The Power Supply board includes three voltage regulators that provide the following supply voltages:

- +12V PA (+12 Vdc unswitched, unregulated)
- +12V UNREG (+12 Vdc switched, unregulated)
- +12V (+12 Vdc switched, regulated)
- +12V ACC (+12 Vdc switch, regulated)
- +5V (+5 Vdc switched, regulated)

4.1.2 Harmonic Filter Band Switching

Decoder and line driver U1 converts the serial harmonic filter band-switching data from the Processor board into parallel data used for band filter selection on an optional external amplifier such as the TW1000D. This information goes through the J25 connector directly to the **ACCESSORY 3** connector on the connector panel along with serial data signals from the Processor board for the AT7000B antenna tuner.

4.1.3 Thermal and Voltage Protection

The Power Supply board also includes circuitry that protects against reverse polarity (diode D1), and over-voltage and under-voltage events (voltage monitor U3).

4.1.4 Temperture Control

The TW7000 includes a cooling fan controlled by a thermal sensor mounted on the RF Power Amplifier board heat sink. This sensor sends a signal (TSENSE) to the Processor board when the heat sink temperature exceeds a predetermined level. The Processor board sends a signal on the serial data line to the BITE decoder circuit which turns on the fan.

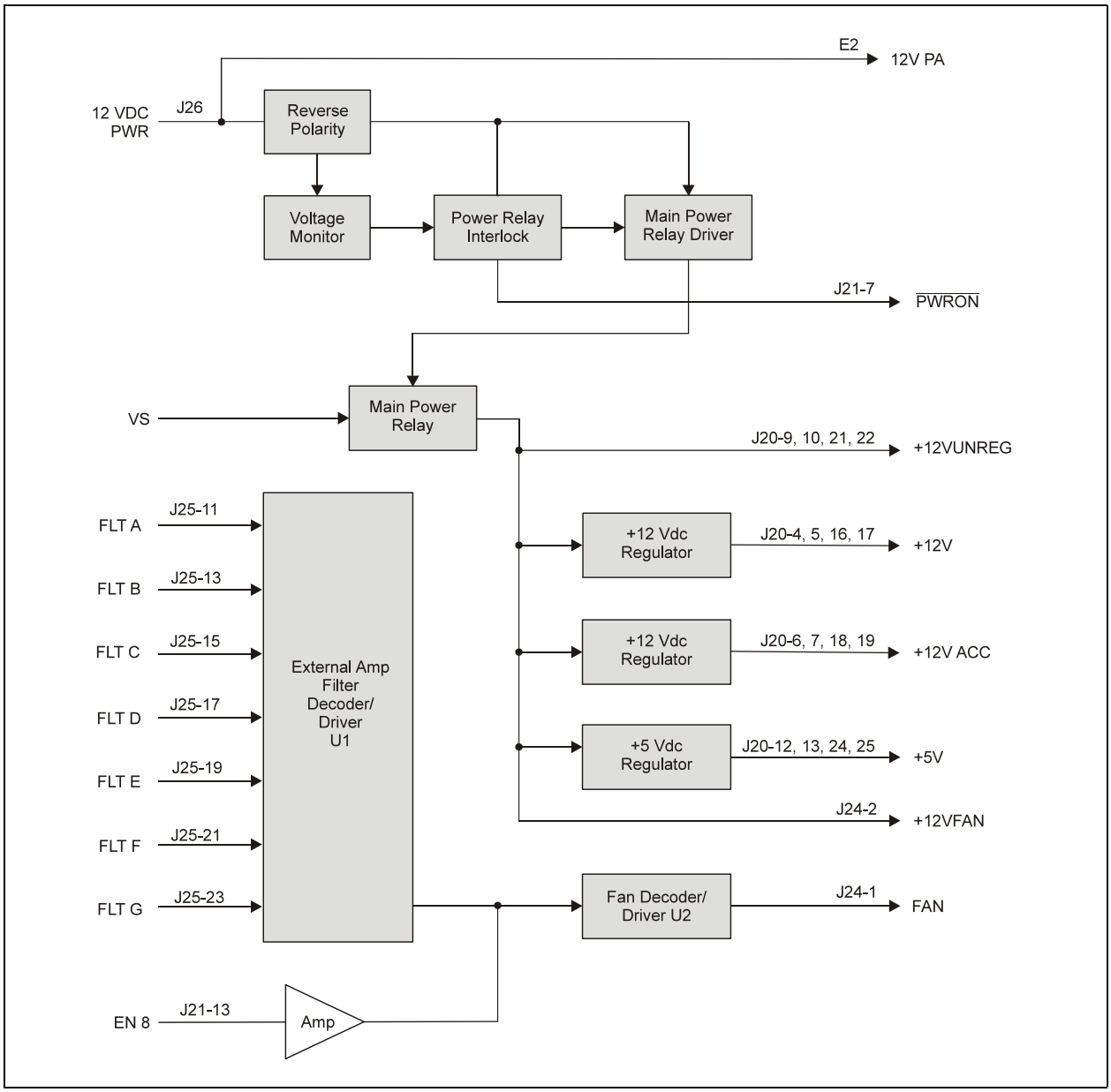


Figure 4-1 Power Supply Block Diagram

4.2 Connector Pin Assignments

The following tables provides the interconnections between the Power Supply board and the rest of the TW7000.

4.2.1 J26 Connector

J26 Connector is the rear panel DC connection to the DC power source.

Table 4-1 Rear Panel DC Connector J26

Pin	Signal	Description
1	GND	Ground
2	12V	12 Vdc input power
3	VS	12 Vdc

4.2.2 J20 Connector

J20 provides supply voltages to the various circuit boards.

Table 4-2 J20 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	GND	Ground
4	+12V	Switched, regulated +12 Vdc supply
5	+12V	Switched, regulated +12 Vdc supply
6	+12V ACC	Switched, regulated +12 Vdc supply
7	NC	No connection
8	NC	No connection
9	+12V UNREG	Switched, unregulated +12 Vdc supply
10	+12V UNREG	Switched, unregulated +12 Vdc supply
11	NC	No connection
12	+5V	Switched, regulated +5 Vdc supply
13	+5V	Switched, regulated +5 Vdc supply
14	GND	Ground
15	GND	Ground
16	+12V	Switched, regulated +12 Vdc supply
17	+12V	Switched, regulated +12 Vdc supply
18	NC	No connection
19	NC	No connection
20	NC	No connection

Table 4-2 J20 Connector Pin Assignments (continued)

Pin	Signal	Description
21	+12V UNREG	Switched, unregulated +12 Vdc supply
22	+12V UNREG	Switched, unregulated +12 Vdc supply
23	NC	No connection
24	+5V	Switched, regulated +5 Vdc supply
25	+5V	Switched, regulated +5 Vdc supply

4.2.3 J21 Connector

J21 connects to the Processor board through J14 and J15. Many of these signals pass through the Power Supply board from J25 that connects to the rear panel **ACCESSORY 3** connector.

Table 4-3 J21 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	SPI CLK	SPI clock
3	NC	No connection
4	NC	No connection
5	AMP 28V	External amp 28 Vdc supply (see J25 pin 2)
6	NC	No connection
7	PWRON\	Power on line from front panel **POWER** switch (active low)
8	ATU SP2	Antenna tuner SP line 2 (see J25 pin 18)
9	ATU TX	Antenna tuner transmit line (see J25 pin 14)
10	KB TXD	Not used
11	KB RXD	Not used
12	KB CLK	Not used
13	EN8	Harmonic filter strobe for external amplifier from Processor board
14	GND	Ground
15	NC	No connection
16	SPI TXD	SPI transmit line, provides harmonic filter selection data from Processor board
17	NC	No connection
18	NC	No connection

Table 4-3 J21 Connector Pin Assignments (continued)

Pin	Signal	Description
19	NC	No connection
20	ATU SP3	Antenna tuner SP line 3 (see J25 pin 20)
21	ATU SP1	Antenna tuner SP line 1 (see J25 pin 16)
22	ATU RX	Antenna tuner receive line (see J25 pin 12)
23	AMP PTT\	External amp PTT (active low) (see J25 pin 9)
24	AMP ALC	External amp ALC line (see J25 pin 7)
25	FILTG\	Spare (see J25 pin 5)

4.2.4 J24 Connector

J24 connects to the rear panel fan.

Table 4-4 J24 Connector Pin Assignments

Pin	Signal	Description
1	FAN	Fan return
2	+12V FAN	+12 Vdc fan supply

4.2.5 J25 Connector

J25 connects with the rear panel **ACCESSORY 3** connector. The **ACCESSORY 3** connects to either an external amplifier (TW500D or TW1000D) or an automatic antenna tuner (RAT7000B).

Note: *The connection between the J25 and **ACCESSORY 3** connectors is not pin for pin.*

Table 4-5 J25 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	AMP 28V	External amp +28 Vdc supply
3	GND	Ground
4	GND	Ground
5	FLT G\	Spare
6	EXT CLK	Not used
7	AMP ALC	RF power control
8	EXT RXD	Not used
9	AMP PTT\	External amp PTT/transmit select
10	EXT TXD	Not used

Table 4-5 J25 Connector Pin Assignments (continued)

Pin	Signal	Description
11	FLTA	External amp filter A select line (1.6 to 3 MHz)
12	ATU RX	Automatic tuner (AT7000B, RAT7000B) data receive line
13	FLTB	External amp filter B select line (3 to 5 MHz)
14	ATU TX	Automatic tuner (AT7000B, RAT7000B) data transmit line
15	FLTC	External amp filter C select line 5 to 8 MHz
16	EXTEN1	No connection
17	FLTD	External amp filter D select line (8 to 13 MHz)
18	EXTEN2	No connection
19	FLTE	External amp filter E select line (13 to 20 MHz)
20	EXTIN1	No connection
21	FLTF	External amp filter F select line (20 to 30 MHz)
22	+12V ACC	+12 Vdc supply to amplifier or tuner
23	FLTG	No connection
24	+12V ACC	+12 Vdc supply voltage to amplifier or tuner
25	+5V	+5 Vdc supply voltage

4.2.6 J25 to ACCESSORY 3 Connections

Table 4-6 provides the translation between J25 on the Power Supply board and the rear panel **ACCESSORY 3** connectors.

Table 4-6 J25 to ACCESSORY 3 Translation

J25 Pins	Signal	ACCESSORY 3
1	GND	1
2	AMP 28V	14
3	GND	2
4	GND	15
5	FLT G\	3
6	EXT CLK	16

Table 4-6 J25 to ACCESSORY 3 Translation (continued)

J25 Pins	Signal	ACCESSORY 3
7	AMP ALC	4
8	EXT RXD	17
9	AMP PTT\	5
10	EXT TXD	18
11	FLTA	6
12	ATU RX	19
13	FLTB	7
14	ATU TX	20
15	FLTC	8
16	EXTEN1	21
17	FLTD	9
18	EXTEN2	22
19	FLTE	10
20	EXTIN1	23
21	FLTF	11
22	+12V ACC	24
23	FLTG	12
24	+12V ACC	25
25	+5V	13

4.3 Component Locations, Schematic and Parts List

This section includes the components location diagram, schematic and parts list for the Power Supply board.

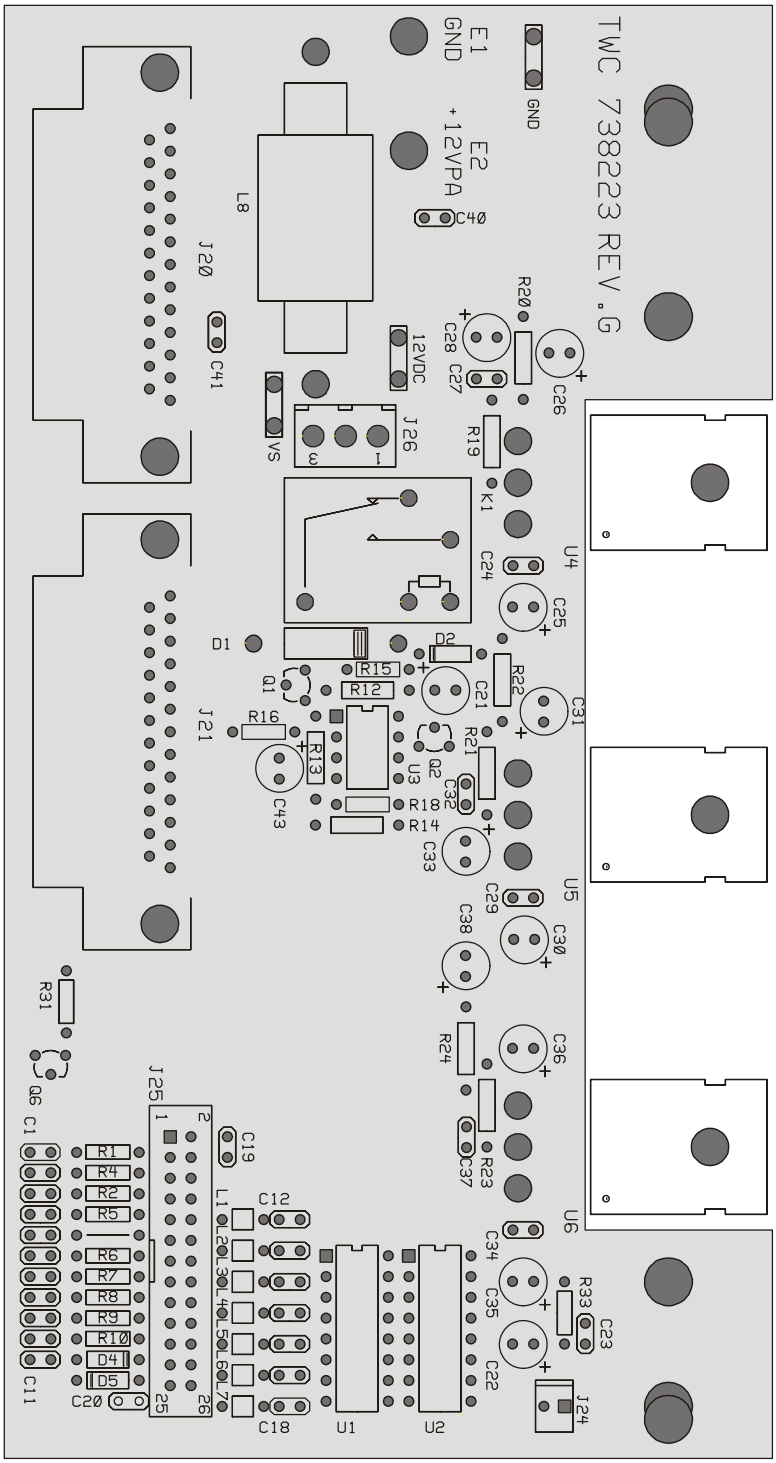


Figure 4-2 Power Supply Board Component Locations (738223 Rev. G)

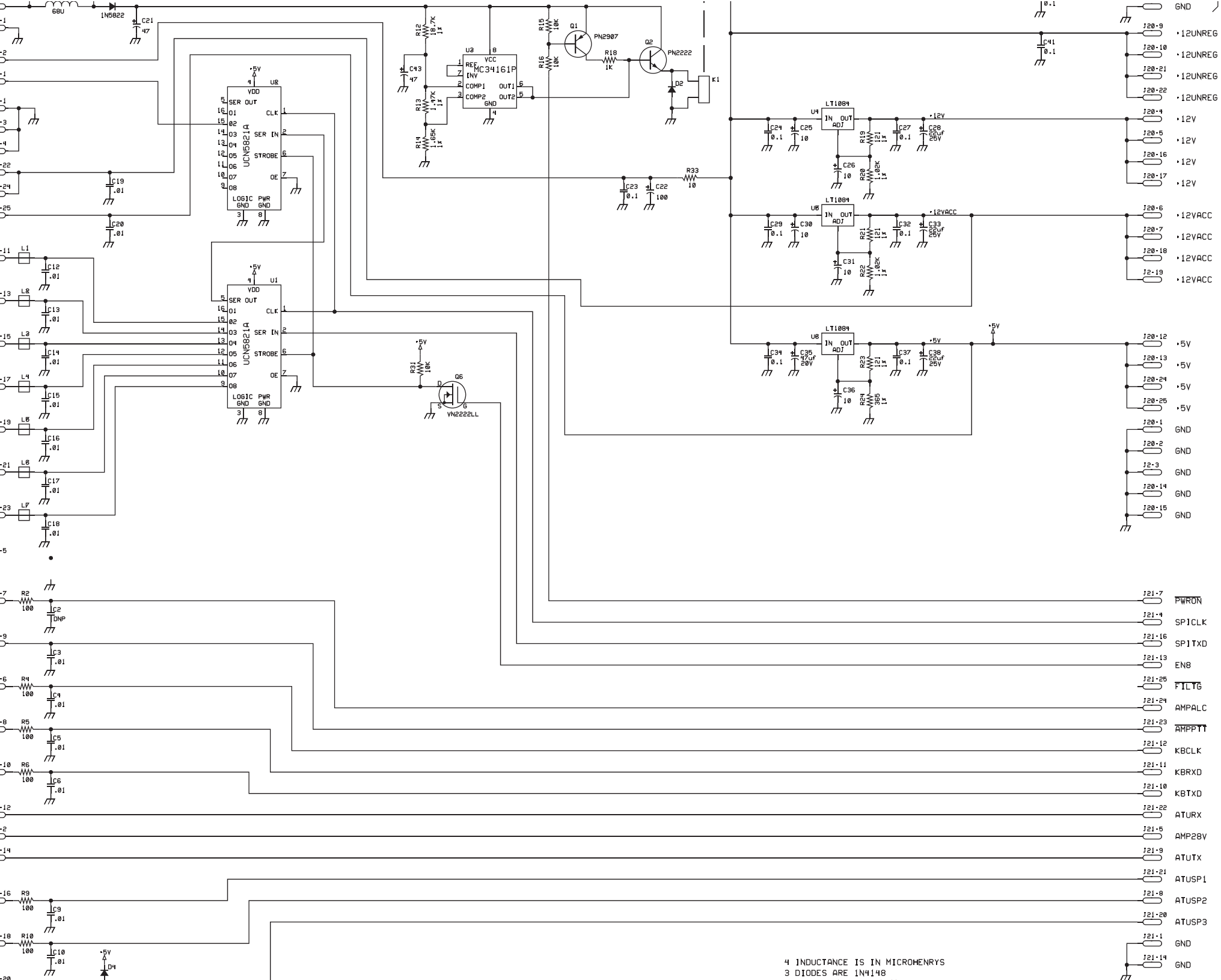

68U
1N5822
C21
47
U8
VDD
SER OUT
CLK
SER IN
STROBE
OE
LOGIC GND
PWR GND
UCN5821A
C19
.01
C20
.01
L1
L2
L3
L4
L6
L8
L7
C12
C13
C14
C15
C16
C17
C18
U1
R12
18.7K
1%
C43
47
U3
MC34161P
VCC
REF
INV
COMP1
COMP2
OUT1
OUT2
GND
R13
1.47K
1%
R14
1.65K
1%
R15
10K
R16
10K
Q1
PN2907
R18
1K
Q2
PN2222
D2
K1
R33
10
C23
0.1
C22
100
C41
0.1
U4
LT1084
IN
OUT
ADJ
C24
0.1
C25
10
R19
121
1%
C27
0.1
C28
22uf
25V
C26
10
R20
1.02K
1%
U6
C29
0.1
C30
10
R21
121
1%
C32
0.1
C33
22uf
25V
C31
10
R22
1.02K
1%
C34
0.1
C35
47uf
20V
R23
121
1%
C37
0.1
C38
22uf
25V
C36
10
R24
365
1%
R31
10K
Q6
VN2222LL
J20-9
J20-10
J20-21
J20-22
J20-4
J20-5
J20-16
J20-17
J20-6
J20-7
J20-18
J2-19
J20-12
J20-13
J20-24
J20-25
J20-1
J20-2
J2-3
J20-14
J20-15
GND
12UNREG
12V
12VACC
5V
R2
100
C2
DNP
C3
.01
R4
C4
R5
C5
R6
C6
R9
C9
R10
C10
D4
J21-7
J21-4
J21-16
J21-13
J21-25
J21-24
J21-23
J21-12
J21-11
J21-10
J21-22
J21-5
J21-9
J21-21
J21-8
J21-20
J21-1
J21-14
PWRON
SPICLK
SPITXD
EN8
FILTG
AMPALC
AMPPTT
KBCLK
KBRXD
KBTXD
ATURX
AMP28V
ATUTX
ATUSP1
ATUSP2
ATUSP3
4 INDUCTANCE IS IN MICROHENRYS
3 DIODES ARE 1N4148

Table 4-7 Power Supply Board Parts List (001-00410 Rev. AA)

Designator	Part Number	Description
C1	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C10	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C11	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C12	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C13	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C14	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C15	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C16	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C17	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C18	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C19	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C20	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C21	234470	CAP,47MF 35V ELECT VRT
C22	237101	CAP,100MF 16V ELECT VRT
C23	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C24	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C25	232100	CAP, 10UF AL 35V 20% 5X7 0.1LS
C26	232100	CAP, 10UF AL 35V 20% 5X7 0.1LS
C27	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C28	241226	CAP,T,22UF,25V,20%,RA,.1SP
C29	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C3	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C30	232100	CAP, 10UF AL 35V 20% 5X7 0.1LS
C31	232100	CAP, 10UF AL 35V 20% 5X7 0.1LS
C32	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C33	241226	CAP,T,22UF,25V,20%,RA,.1SP
C34	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C35	241476	CAP, 47UF TA 20V 20% 0.1LS
C36	232100	CAP, 10UF AL 35V 20% 5X7 0.1LS
C37	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C38	241226	CAP,T,22UF,25V,20%,RA,.1SP
C4	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C40	275104	CAP, 0.1UF X7R 50V 10% 0.1LS

Table 4-7 Power Supply Board Parts List (001-00410 Rev. AA)

Designator	Part Number	Description
C41	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C43	234470	CAP,47MF 35V ELECT VRT
C5	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C6	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C9	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
D1	320420	DIODE,IN5822 3 AMP SCHOTTKY
D2	320002	DIODE, 1N4148/1N4150 DO-35
D4	320002	DIODE, 1N4148/1N4150 DO-35
D5	320002	DIODE, 1N4148/1N4150 DO-35
E1	860008	LUG TURRET KEYSTONE 1553-2
E2	860008	LUG TURRET KEYSTONE 1553-2
J20	613163	CONN,DB-25 RT ANGLE PC PLUG
J21	613163	CONN,DB-25 RT ANGLE PC PLUG
J24	610105	HEADER, 1X2 W/LB-LOCK 0.1 TH
J25	614021	HEADER,DIN,26PIN,.100,VERTICLE
J26	610209	HEADER,MLX,3PIN,.156,POLAR
K1	540079	RELAY,SPDT 12VDC 10 AMP
L1	450132	IND ASSY,3T#28 MGT 1-490201
L2	450132	IND ASSY,3T#28 MGT 1-490201
L3	450132	IND ASSY,3T#28 MGT 1-490201
L4	450132	IND ASSY,3T#28 MGT 1-490201
L5	450132	IND ASSY,3T#28 MGT 1-490201
L6	450132	IND ASSY,3T#28 MGT 1-490201
L7	450132	IND ASSY,3T#28 MGT 1-490201
L8	430048	CHOKE,68UH HEAVY DUTY HASH
Q1	310052	XSTR, PN2907A PNP TO92
Q2	310057	XISTOR,NPN,PN2222A,TO92
Q6	310138	XISTOR,FET,VN2222LL,TO92
R1	113101	RES,100 OHM 1/8W 5% CF
R10	113101	RES,100 OHM 1/8W 5% CF
R12	1118701	RES, 18.7K, 1/8W, 1%
R13	1111471	RES, 1.47K, 1/8W, 1%, MF
R14	1111651	RES, 1.65K, 1/8W, 1%, MF

Table 4-7 Power Supply Board Parts List (001-00410 Rev. AA)

Designator	Part Number	Description
R15	113103	RES,10K 1/8W 5% CARBON FILM
R16	113103	RES,10K 1/8W 5% CARBON FILM
R18	113102	RES, 1K, 1/8W, 5%, CF
R19	1111210	RES,121 1/8W 1% METAL FILM
R2	113101	RES,100 OHM 1/8W 5% CF
R20	1111021	RES,1.02K 1/8W 1%
R21	1111210	RES,121 1/8W 1% METAL FILM
R22	1111021	RES,1.02K 1/8W 1%
R23	1111210	RES,121 1/8W 1% METAL FILM
R24	1113650	RES, 365ohm, 1/8W, 1%, MF
R3	1110000	RES,0 OHM,1/8W,1%
R31	113103	RES,10K 1/8W 5% CARBON FILM
R33	113100	RES,10 OHM 1/8W 5% FILM
R4	113101	RES,100 OHM 1/8W 5% CF
R5	113101	RES,100 OHM 1/8W 5% CF
R6	113101	RES,100 OHM 1/8W 5% CF
R7	1110000	RES,0 OHM,1/8W,1%
R8	1110000	RES,0 OHM,1/8W,1%
R9	113101	RES,100 OHM 1/8W 5% CF
U1	330384	IC,5821 8-BIT SER DRIVER DIP16
U2	330384	IC,5821 8-BIT SER DRIVER DIP16
U3	330398	IC,MC34161P VOLTAGE MONITOR

CHAPTER 5
REFERENCE/CONTROL BOARD

5.1 Circuit Description

The Reference/Control board plugs into the Motherboard at J3. It is located on the right side of the chassis, second slot from the front. The Reference/Control board includes the following circuitry:

- 16.777216 MHz reference oscillator
- ALC processing circuitry
- RF power level setting potentiometers
- Serial to parallel decoders for harmonic filter band-switching circuits on the RF Filter board.

5.1.1 Reference Oscillator

The Reference/Control board includes the 16.777216 MHz oscillator Y1 that provides the reference frequency to the Synthesizer board through coaxial connector J61.

5.1.2 Automatic Level Control

The ALC processing circuitry receives the forward (FWDPWR) and reverse (RVSPWR) power signals from the power level detectors on the VSWR board. These power level detectors only detect power levels on the transmitted power. The ALC circuitry uses the digital potentiometer U2 controlled through serial data from the Processor board to adjust the bias to the forward power amplifier U3C. The forward power amplifier bias can also be manually adjusted by R22 which controls the low RF power setting; R1 controls the high RF power setting. The ALC circuit combines the forward and reverse power signals, then amplifies the output ALC signal (RAWALC) to the ALC circuitry on the 75 MHz IF board.

The Reference/Control board also includes a decoder chip U1 that converts serial data from the Processor board to parallel data used to select the filter band on the RF Filter board. The decoder controls the filter selection process by energizing and de-energizing relays on the RF Filter board that insert or remove specific filter circuits according to the serial data based on the selected channel frequency.

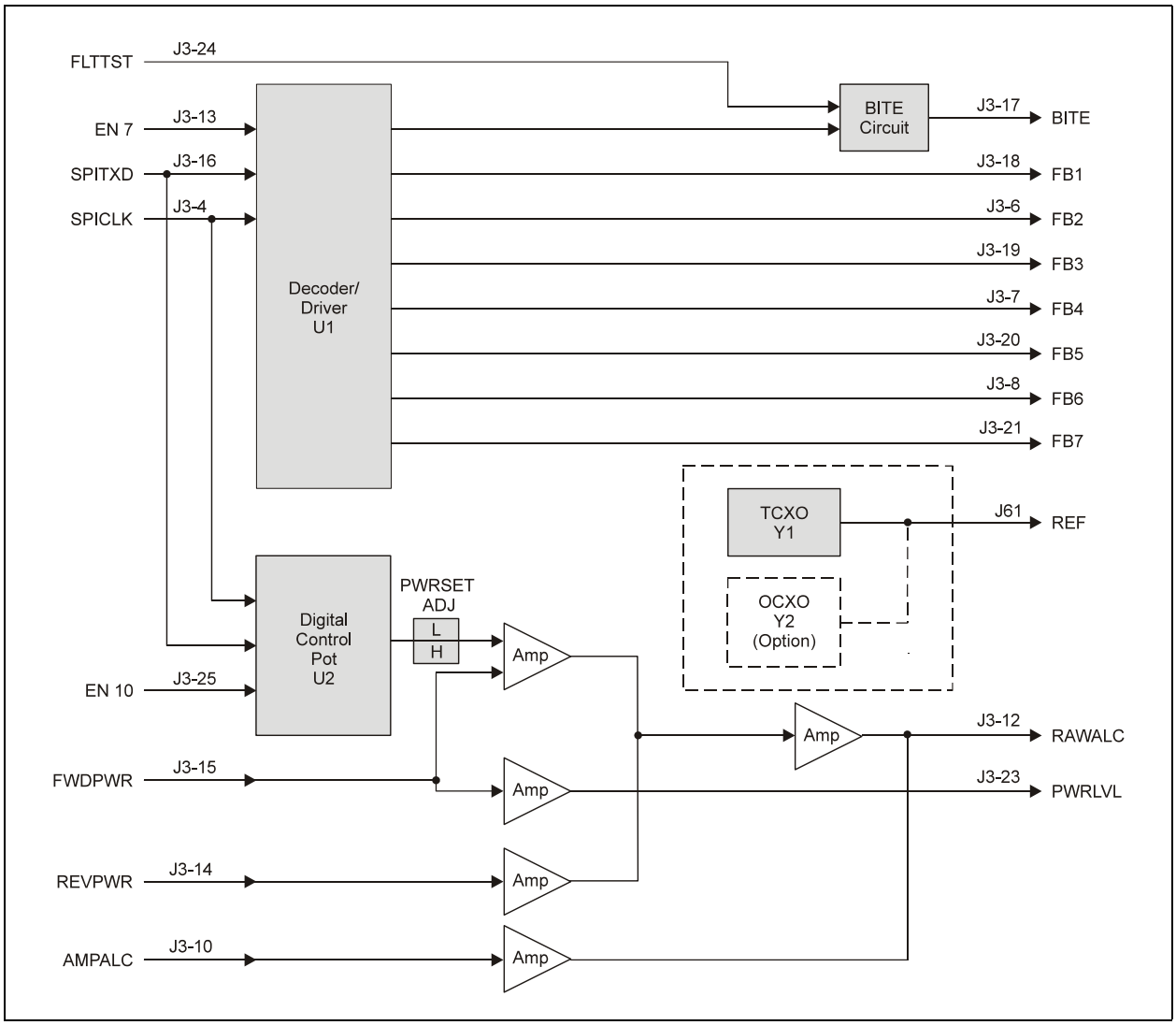


Figure 5-1 Reference/Control Board Block Diagram

5.1.3 High Stability Option

The Reference/Control board may include an optional high stability oscillator. If the high stability option is installed, the board is given a new part number.

5.2 Connector Pin Assignments

Table 5-2 provides the interconnect lines between the Reference/Control board and the rest of the radio.

Table 5-1 J3 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	12V	+12 Vdc supply
3	NC	No connection
4	SPICLK	Clock
5	PTT\	PTT (active low)
6	FB2	Filter band 2 control line
7	FB4	Filter band 4 control line
8	FB6	Filter band 6 control line
9	TRSW\	T/R relay control line (active low)
10	AMPALC	Input from external amplifier ALC
11	No connection	No connection
12	RAWALC	Transceiver ALC line
13	EN7	External amplifier filter band decoder enable line
14	RVSPWR	Reflected power indicator
15	FWDPWR	Forward power indicator
16	SPITXD	Serial TX data line
17	BITE\	BITE line (active low)
18	FB1	Filter band 1 control line
19	FB3	Filter band 3 control line
20	FB5	Filter band 5 control line
21	FB7	Filter band 7 control line
22	NC	No connection
23	PWRLVL	RF power level status line
24	FLTTST	RF Filter board status line
25	EN10	RF power level control enable

5.3 Component Locations, Schematics and Parts List

This section provides a component locations diagram, schematic and parts list for the Synthesizer board.

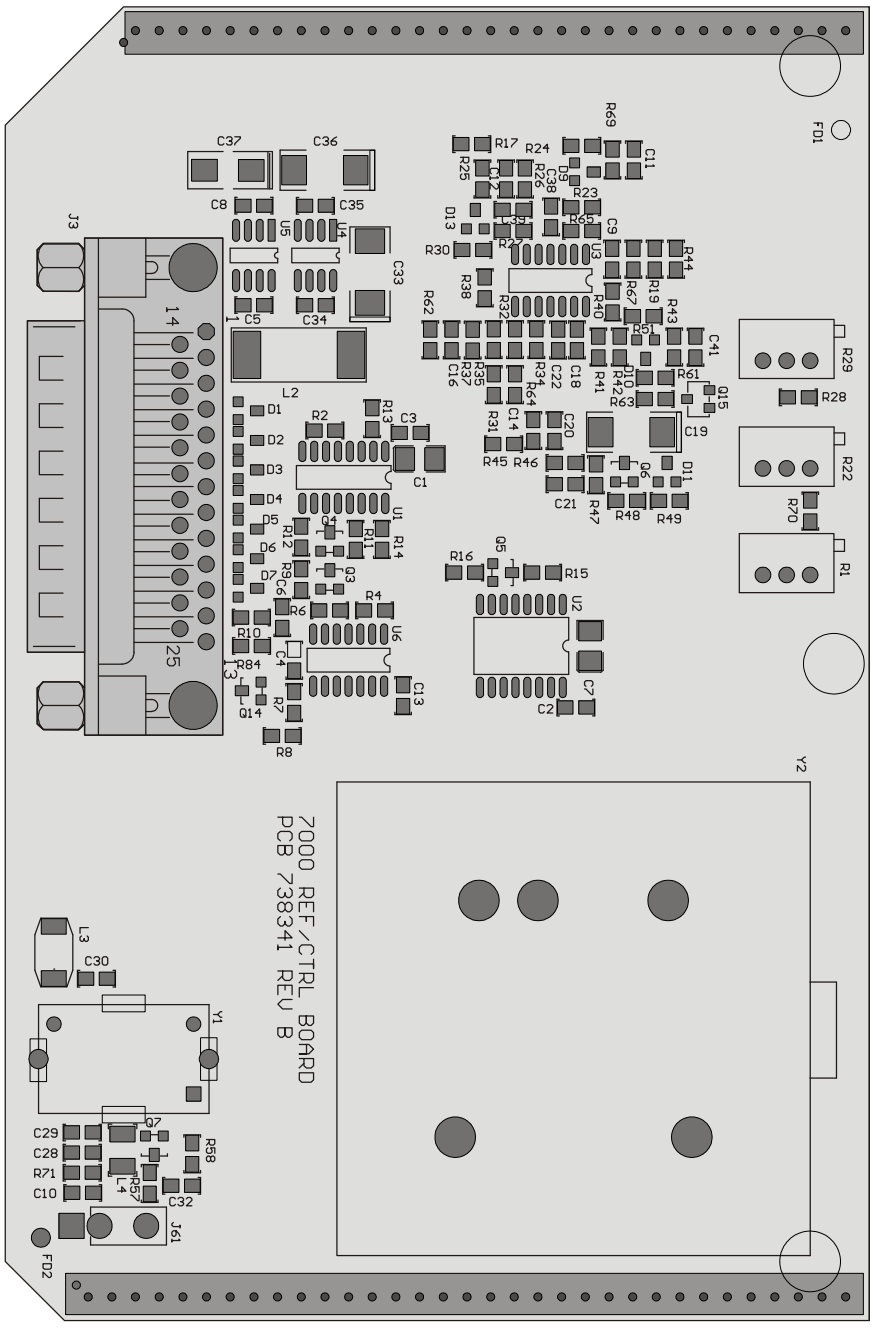


Figure 5-2 Reference/Control Board Component Locations (738341 Rev. B)

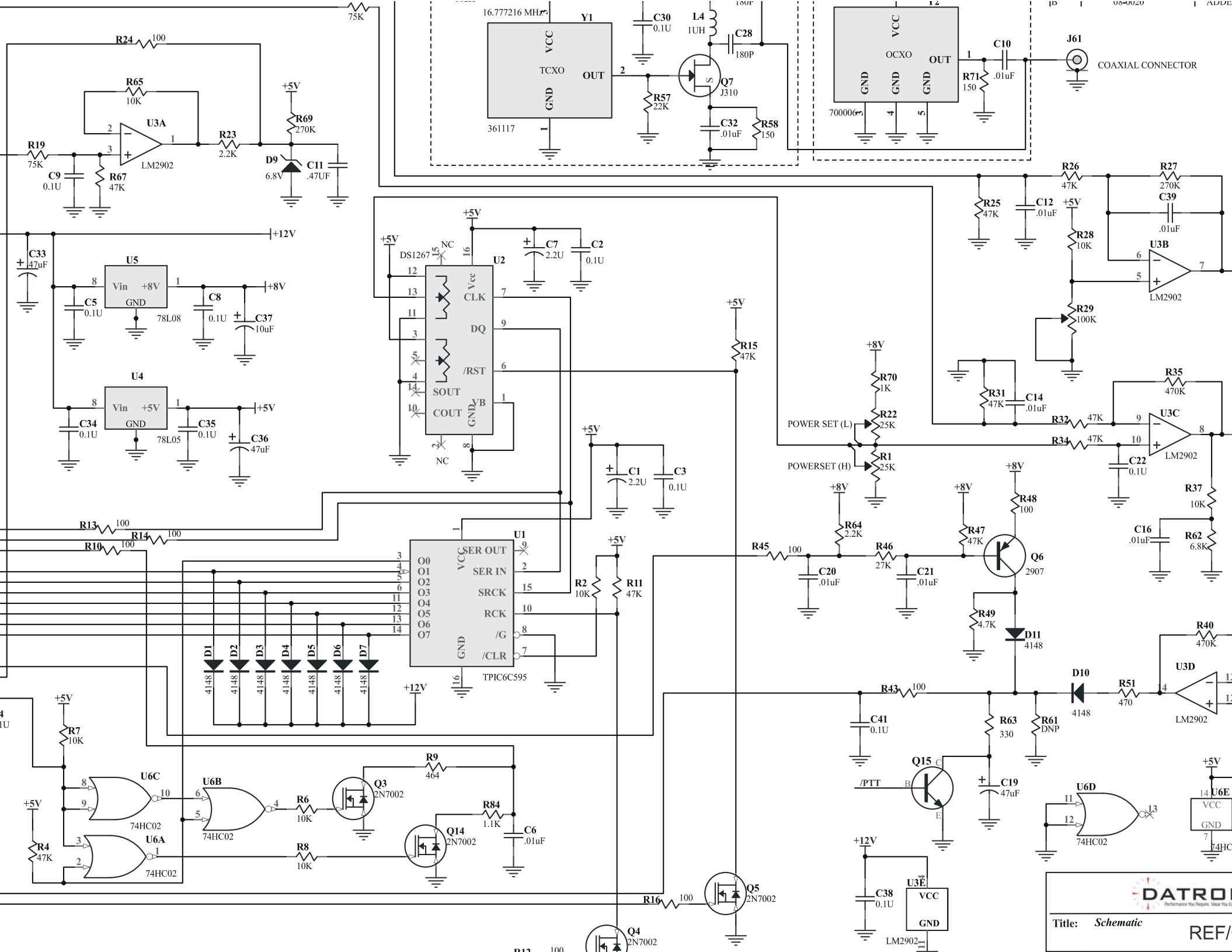

R24 100
R65 10K
U3A
R19 75K
C9 0.1U
R67 47K
LM2902
R23 2.2K
R69 270K
D9 6.8V
C11 .47UF
+5V
+12V
C33 47uF
U5
Vin +8V
GND
78L08
C5 0.1U
C8 0.1U
C37 10uF
+8V
U4
Vin +5V
78L05
C34 0.1U
C35 0.1U
C36 47uF
16.777216 MHz
Y1
TCXO
VCC
OUT
GND
361117
C30 0.1U
L4 1UH
C28 180P
Q7 J310
R57 22K
C32 .01uF
R58 150
OCXO
R71 150
C10 .01uF
J61
COAXIAL CONNECTOR
R26 47K
R27 270K
C39 .01uF
R25 47K
C12 .01uF
R28 10K
U3B
R29 100K
DS1267
U2
CLK
DQ
/RST
SOUT
COUT
VB
C7 2.2U
C2 0.1U
C1 2.2U
C3 0.1U
R15 47K
R70 1K
R22 25K
POWER SET (L)
R1 25K
POWERSET (H)
R31 47K
C14 .01uF
R35 470K
R32 47K
R34 47K
U3C
C22 0.1U
R37 10K
C16 .01uF
R62 6.8K
R64 2.2K
R45 100
R46 27K
C20 .01uF
C21 .01uF
R47 47K
R48 100
Q6 2907
R49 4.7K
D11 4148
R13 100
R14 100
R10 100
U1
SER OUT
SER IN
SRCK
RCK
/G
/CLR
TPIC6C595
O0
O1
O2
O3
O4
O5
O6
O7
R2 10K
R11 47K
D1 4148
D2 4148
D3 4148
D4 4148
D5 4148
D6 4148
D7 4148
R43 100
D10 4148
R51 470
R40 470K
U3D
C41 0.1U
R63 330
R61 DNP
Q15
/PTT
C19 47uF
U6D
U6E
R7 10K
U6C
74HC02
U6B
U6A
R4 47K
R9 464
Q3 2N7002
R6 10K
R84 1.1K
Q14 2N7002
C6 .01uF
R8 10K
R16 100
Q5 2N7002
Q4 2N7002
C38 0.1U
U3E
VCC
GND
LM2902
Title: Schematic
REF/

Table 5-2 Reference/Control Board Parts List (001-00206 Rev. G)

Designator	Part Number	Description
C1	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C10	DNP	“NULL PART, VACANT PCB LOCATION”
C11	021474001	“CAP, 0.47UF X7R 16V 10% 0805”
C12	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C14	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C16	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C18	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C19	022476000	“CAP, 47UF TA 20V 20% 7343”
C2	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C20	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C21	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C22	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C28	021181000	CAP 180PF NPO 100V 5% 0805
C29	021181000	CAP 180PF NPO 100V 5% 0805
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C30	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C32	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C33	022476000	“CAP, 47UF TA 20V 20% 7343”
C34	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	022476000	“CAP, 47UF TA 20V 20% 7343”
C37	022106001	“CAP, 10UF TA 16V 10% 6032”
C38	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C39	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C4	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C41	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C5	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C6	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C7	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C8	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
D1	037700005	“DIODE, MMBD4148 SOT-23”

Table 5-2 Reference/Control Board Parts List (001-00206 Rev. G)

Designator	Part Number	Description
D10	037700005	“DIODE, MMBD4148 SOT-23”
D11	037700005	“DIODE, MMBD4148 SOT-23”
D13	037700005	“DIODE, MMBD4148 SOT-23”
D2	037700005	“DIODE, MMBD4148 SOT-23”
D3	037700005	“DIODE, MMBD4148 SOT-23”
D4	037700005	“DIODE, MMBD4148 SOT-23”
D5	037700005	“DIODE, MMBD4148 SOT-23”
D6	037700005	“DIODE, MMBD4148 SOT-23”
D7	037700005	“DIODE, MMBD4148 SOT-23”
D9	037703002	“DIODE, ZENER 6.8V SMD SOT-23”
J3	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J61	614024	“CONN,RF PIN FEMALE JACK #45”
L2	041103002	IND SM 10UH 15% 4825
L3	041103003	“IND,SM,10uH,.7A,DTI608C-103”
L4	041102000	“INDUCTOR,CHIP,1UH,SMT,1210,10%”
Q14	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q15	031104003	“XSTR, NPN 10K/10K 50V SC-59”
Q3	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q4	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q5	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q6	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q7	032001	“JFET-N,J310, RF AMP, SOT-23”
R1	170335	“RES, 25K TRIM SIDE ADJ”
R10	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R11	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R12	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R13	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R14	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R15	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R16	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R17	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R19	013753000	“RES,SM CF 75K 0.1W 5% 0805”
R2	013103000	“RES,10K OHM 1/8W 5% TK 0805”

Table 5-2 Reference/Control Board Parts List (001-00206 Rev. G)

Designator	Part Number	Description
R22	170335	“RES, 25K TRIM SIDE ADJ”
R23	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R24	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R25	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R26	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R27	013274000	“RES,270K OHM 1/8W 5% TK 0805”
R28	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R29	170334	“RES,100K TRIM SIDE ADJ”
R30	013102000	“RES, 1K OHM 1/8W 5% TK 0805”
R31	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R32	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R34	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	“RES, 12K OHM 1/8W 5% TK 0805”
R42	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R43	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R44	013753000	“RES,SM CF 75K 0.1W 5% 0805”
R45	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R46	013273000	“RES,27K OHM 1/8W 5% TK 0805”
R47	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R48	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R49	013472000	RES SM CF 4.7K 0.1W 5% 0805
R51	013471000	“RES, 470 OHM 1/8W 5% TK 0805”
R57	013223000	“RES,22K OHM 1/8W 5% TK 0805”
R58	013151000	“RES,150 OHM 1/8W 5% TK 0805”
R6	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R61	DNP	“NULL PART, VACANT PCB LOCATION”
R62	013682000	RES SM CF 6.8K 0.1W 5% 0805
R63	013331000	“RES,330 OHM 1/8W 5% TK 0805”

Table 5-2 Reference/Control Board Parts List (001-00206 Rev. G)

Designator	Part Number	Description
R64	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R65	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R67	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R69	013274000	“RES,270K OHM 1/8W 5% TK 0805”
R7	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R70	013102000	“RES, 1K OHM 1/8W 5% TK 0805”
R71	DNP	“NULL PART, VACANT PCB LOCATION”
R8	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R84	013110100	“RES, 1.1K OHM 1/8W 1% TK 0805”
R9	013464000	“RES, 464 OHM 1/8W 1% TK 0805”
U1	033087	“IC, TPIC6C595 8-B S/REG SO-16”
U2	033305003	“IC,DS1267S 10KX2 DIG POT SOW16”
U3	033304000	“IC,SM,LM2902D,QUAD-OP,SO-14”
U4	033003	“IC,VREG 78L05 5V 5% SOIC-8”
U5	033002	“IC,VREG 78L08 8V 5% SOIC-8”
U6	033081	“IC, 74HC02 QUAD 2-I NOR SO-14”
Y1	361117	“TCXO 16.777216MHz, 0.5PPM”

CHAPTER 6
SYNTHESIZER BOARD

6.1 Circuit Description

The Synthesizer board is located in the second card slot from the right and plugs into the motherboard at J4. It takes the reference frequency (16.777216 MHz) from the Reference/Control board and generates the three local oscillator (LO) frequencies using a process known as direct digital synthesis (DDS) as part of a standard phase locked loop (PLL) circuit to generate the local oscillator frequencies.

The DDS consists of a 24-bit numerically controlled oscillator (NCO) U7 and a digital-to-analog converter (DAC) U8 that generates a frequency derived from the 16.7 MHz reference frequency and the selected channel frequency data from the Processor board.

Mixer and oscillator U2 mixes the DDS frequency with the 70 MHz second LO to generate an output frequency of 5.95 MHz to 7.00 MHz. This frequency is filtered by a series of LC networks, then mixed with the first LO at MX1. The resulting frequency is fed back to the first local oscillator PLL to generate the first LO at 75 MHz to 105 MHz incremented in 10 Hz steps.

The second LO is the fixed 70 MHz output of the voltage controlled oscillator. The 5 MHz third LO is generated by another PLL U1 tied to the reference frequency and programmed to one of three outputs, depending on the setting of the mode switch.

Data for all of the synthesizers on the board are input in serial format, with all data clocked as required to update frequency selection, then latched into the particular synthesizer device by the appropriate enable line.

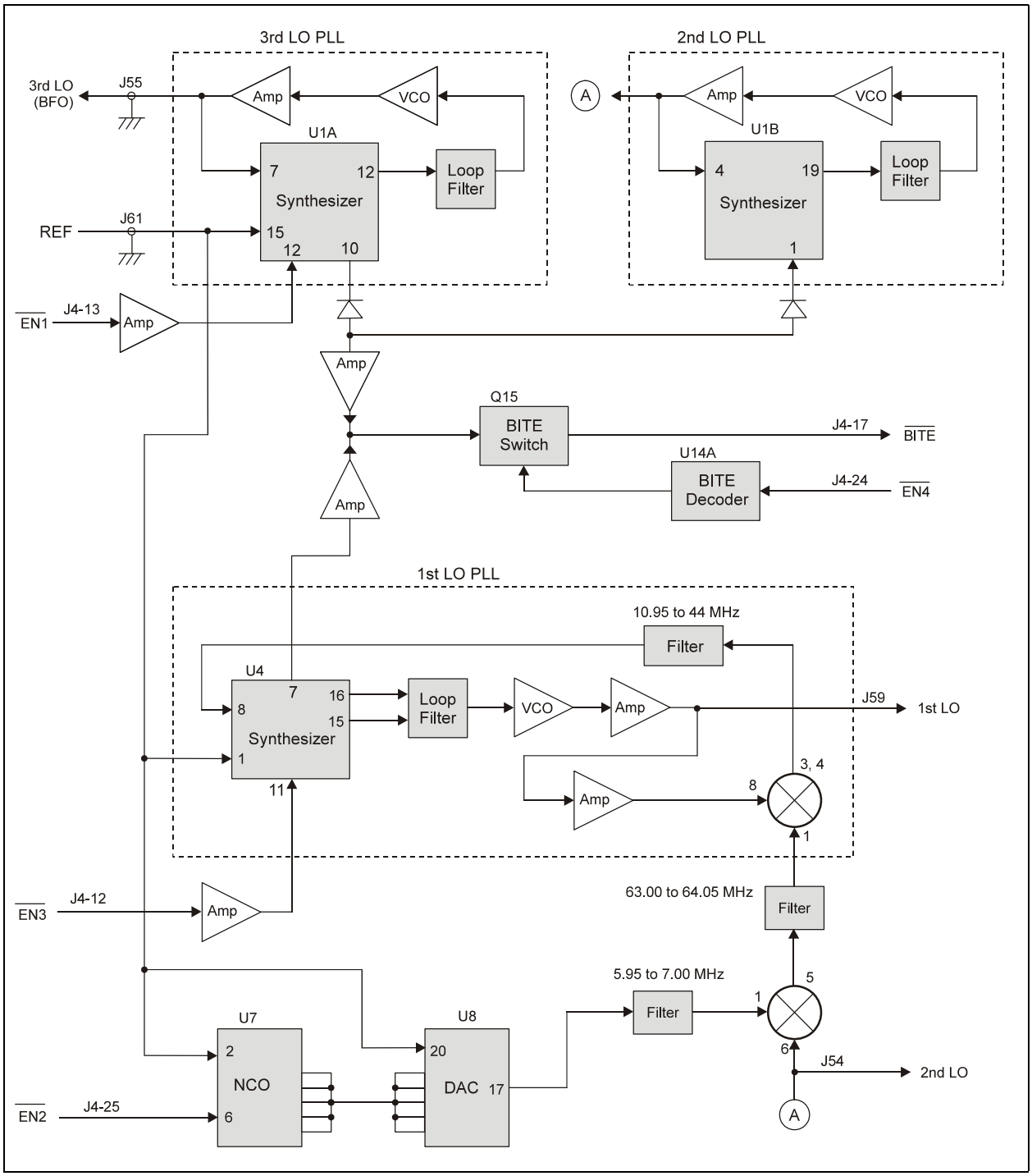


Figure 6-1 Synthesizer Board Block Diagram

6.2 Connector Pin Assignments

Table 6-1 provides the interconnect lines between the Synthesizer board and the rest of the radio.

J4 is a 25-pin connector that plugs into the TW7000TW7000 Motherboard.

Note: *The pins not listed have no connection on the Synthesizer board.*

Table 6-1 J4 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	12V	+12V supply
3	SPIRXD	Receive serial data line
4	SPICLK	Clock line
11	EN5	Not used
12	EN3	First LO synthesizer enable
13	EN1	Third LO synthesizer enable
14	GND	Ground
15	+12V input	+12V
16	SPITXD	Transmit serial data line
17	BITE	BITE signal to processor
24	EN4	BITE enable
25	EN2	DDS enable

6.3 Component Locations, Schematic and Parts List

This section provides a component locations diagram, schematic and parts list for the Synthesizer board.

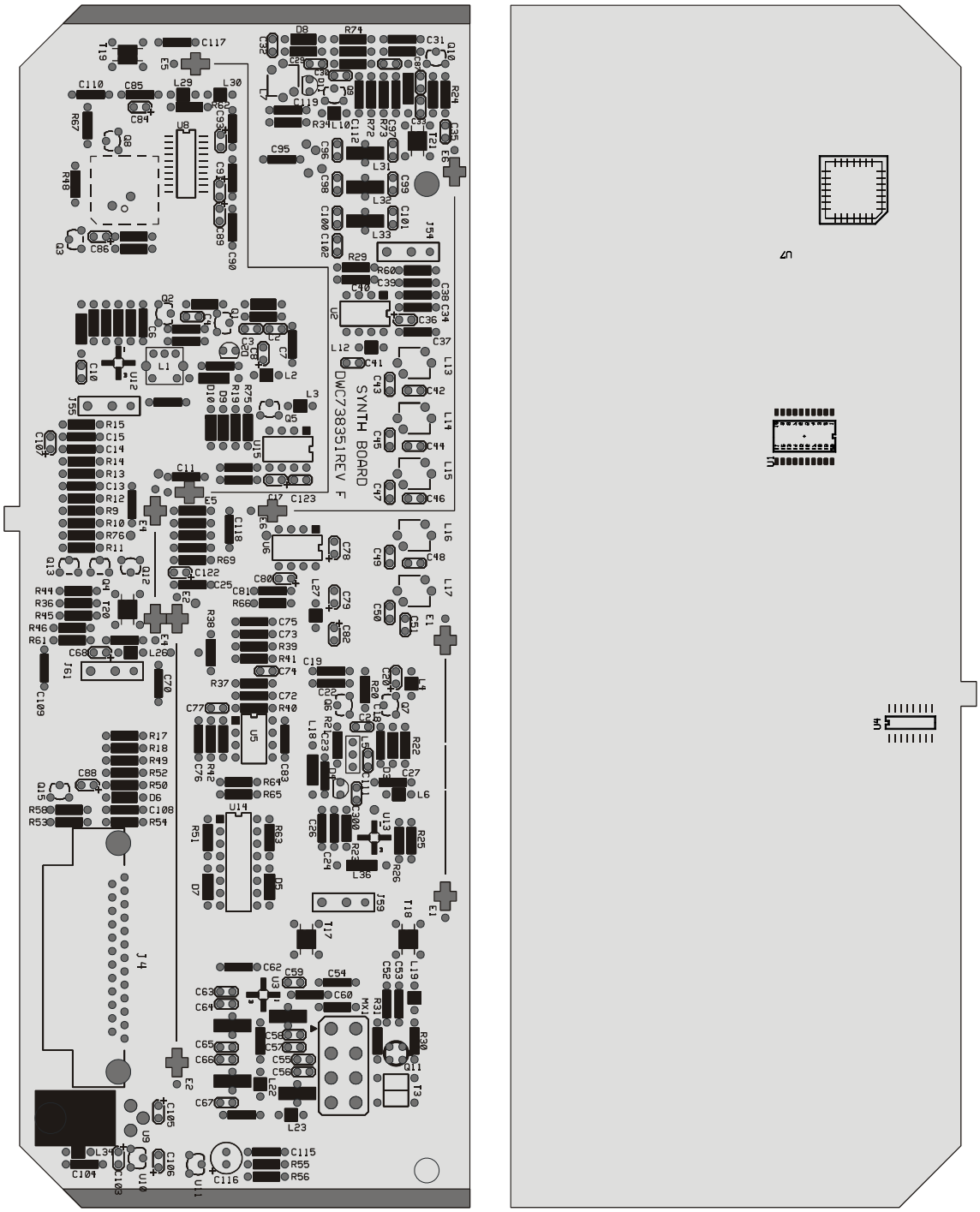
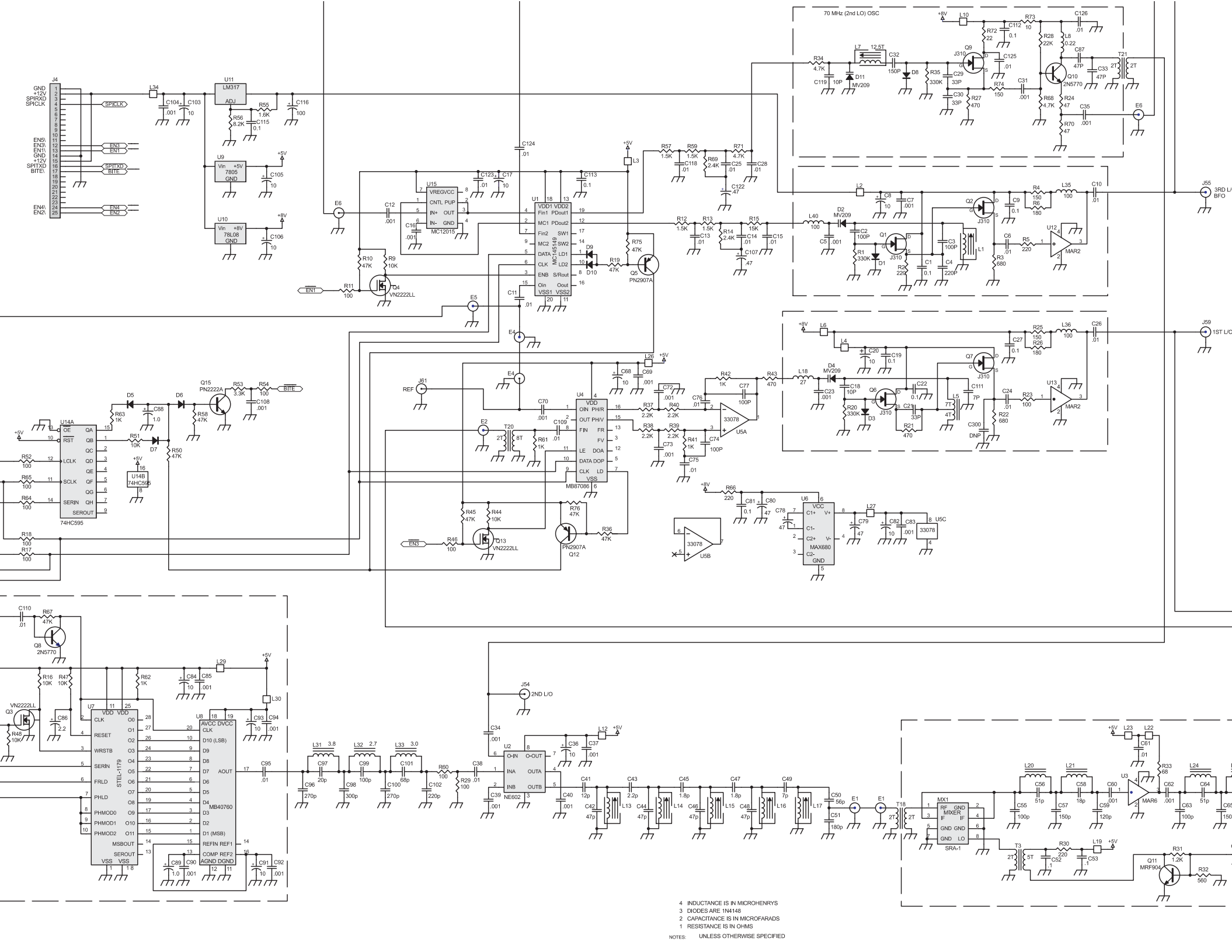


Figure 6-2 Synthesizer Board Component Locations (738351 Rev. F)



4 INDUCTANCE IS IN MICROHENRYS
3 DIODES ARE 1N4148
2 CAPACITANCE IS IN MICROFARADS
1 RESISTANCE IS IN OHMS

NOTES: UNLESS OTHERWISE SPECIFIED

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
C1	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C10	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C100	275271	“CAP,ML NPO 270PF 100V 5% 0.2S”
C101	275680	“CAP, 68 PF NPO 100V 5% 0.1LS”
C102	276221	“CAP,ML 220PF NPO 5% 100V 0.1S”
C103	241100	“CAP,10MF DIP TANTALUM”
C104	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C105	241100	“CAP,10MF DIP TANTALUM”
C106	241100	“CAP,10MF DIP TANTALUM”
C107	241047	“CAP,0.47MF 35V DIP TANT”
C108	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C109	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C11	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C110	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C111	210070	“CAP,7PF NPO 50V 0.5PF 0.1LS DSK”
C112	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C113	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C115	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C116	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C117	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C118	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C119	277100	“CAP, ML 10PF AXIAL NPO 5%”
C12	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C122	241047	“CAP,0.47MF 35V DIP TANT”
C123	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C124	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C125	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C126	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C13	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C14	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C15	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C16	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C17	241100	“CAP,10MF DIP TANTALUM”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
C18	277100	“CAP, ML 10PF AXIAL NPO 5%”
C19	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C2	221101	“CAP, 100PF MICA 300V 5% DM5”
C20	241100	“CAP,10MF DIP TANTALUM”
C21	275330	“CAP, 33PF NPO 200V 5%.15X.21X0.1L”
C22	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C23	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C24	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C25	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C26	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C27	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C28	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C29	275330	“CAP, 33PF NPO 200V 5%.15X.21X0.1L”
C3	221101	“CAP, 100PF MICA 300V 5% DM5”
C30	275330	“CAP, 33PF NPO 200V 5%.15X.21X0.1L”
C31	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C32	275151	“CAP, 150PF NPO 100V 5% 0.1LS”
C33	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C34	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C35	275102	“CAP,C,.001UF,100V,5%,N,RA,.1SP”
C36	241100	“CAP,10MF DIP TANTALUM”
C37	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C38	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C39	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C4	221221	“CAP. 220PF, MICA”
C40	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C41	210120	“CAP,12 PF DISC NPO”
C42	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C43	210022	“CAP,2.2PF NPO 50V.25P.1S DSK”
C44	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C45	210018	“CAP,1.8 PF NPO DISC”
C46	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C47	210018	“CAP,1.8 PF NPO DISC”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
C48	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C49	210022	“CAP,2.2PF NPO 50V.25P.1S DSK”
C5	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C50	221560	“CAP,56PF 5% DM5 MICA”
C51	275181	“CAP,ML 180PF NPO 5% 100V 0.1S”
C52	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C53	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C54	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C55	221101	“CAP, 100PF MICA 300V 5% DM5”
C56	210510	“CAP,51 PF 5% 50V DISC NPO”
C57	275151	“CAP, 150PF NPO 100V 5% 0.1LS”
C58	275180	“CAP,ML 18PF 5% 100V NPO 0.1 S”
C59	275121	“CAP,ML 120PF NPO 5% 100V 0.1S”
C6	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C60	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C61	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C62	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C63	221101	“CAP, 100PF MICA 300V 5% DM5”
C64	210510	“CAP,51 PF 5% 50V DISC NPO”
C65	275151	“CAP, 150PF NPO 100V 5% 0.1LS”
C66	275180	“CAP,ML 18PF 5% 100V NPO 0.1 S”
C67	275121	“CAP,ML 120PF NPO 5% 100V 0.1S”
C68	241100	“CAP,10MF DIP TANTALUM”
C69	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C7	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C70	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C72	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C73	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C74	221101	“CAP, 100PF MICA 300V 5% DM5”
C75	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C76	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C77	221101	“CAP, 100PF MICA 300V 5% DM5”
C78	241476	“CAP, 47UF TA 20V 20% 0.1LS”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
C79	241476	“CAP, 47UF TA 20V 20% 0.1LS”
C8	241100	“CAP,10MF DIP TANTALUM”
C80	241476	“CAP, 47UF TA 20V 20% 0.1LS”
C81	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C82	241100	“CAP,10MF DIP TANTALUM”
C83	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C84	241100	“CAP,10MF DIP TANTALUM”
C85	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C86	241020	“CAP,2.2MF DIP TANTALUM”
C87	275470	“CAP,ML 47PF NPO 5% 100V 0.1SP”
C88	241010	“CAP,1.0 MF DIP TANTALUM”
C89	241010	“CAP,1.0 MF DIP TANTALUM”
C9	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C90	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C91	241100	“CAP,10MF DIP TANTALUM”
C92	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C93	241100	“CAP,10MF DIP TANTALUM”
C94	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C95	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C96	275271	“CAP,ML NPO 270PF 100V 5% 0.2S”
C97	210200	“CAP,20 PF DISC NPO”
C98	221301	“CAP, 300 PF DM5 MICA”
C99	221101	“CAP, 100PF MICA 300V 5% DM5”
D1	320002	“DIODE, 1N4148/1N4150 DO-35”
D10	320002	“DIODE, 1N4148/1N4150 DO-35”
D11	320305A	“VARACTOR MV209,1099/TW2000”
D2	320305A	“VARACTOR MV209,1099/TW2000”
D3	320002	“DIODE, 1N4148/1N4150 DO-35”
D4	320305A	“VARACTOR MV209,1099/TW2000”
D5	320002	“DIODE, 1N4148/1N4150 DO-35”
D6	320002	“DIODE, 1N4148/1N4150 DO-35”
D7	320002	“DIODE, 1N4148/1N4150 DO-35”
D8	320002	“DIODE, 1N4148/1N4150 DO-35”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
D9	320002	“DIODE, 1N4148/1N4150 DO-35”
E1	769330-1	“SEMI-RIGID CA,SYNTH,E1,TW7000”
E2	769330-2	“SEMI-RIGID CA,SYNTH,E2,TW7000”
E4	769330-4	“SEMI-RIGID CA,SYNTH,E4,TW7000”
E5	769330-3	“SEMI-RIGID CA,SYNTH,E5,TW7000”
E6	769330-5	“SEMI-RIGID CA,SYNTH,E5,TW7000”
J4	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J54	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J55	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J59	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J61	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
L1	490146	“INDUCTOR,12 UH VARIABLE”
L10	459032	“IND ASY,3T#30 MAGNET 1-490201”
L12	459032	“IND ASY,3T#30 MAGNET 1-490201”
L13	490114	CORE 6.5T (MD) SQ LG PI CORE
L14	490114	CORE 6.5T (MD) SQ LG PI CORE
L15	490114	CORE 6.5T (MD) SQ LG PI CORE
L16	490114	CORE 6.5T (MD) SQ LG PI CORE
L17	490114	CORE 6.5T (MD) SQ LG PI CORE
L18	430013	“IND,27UH FR 10% 135MA.26X0.105 AX”
L19	459032	“IND ASY,3T#30 MAGNET 1-490201”
L2	459032	“IND ASY,3T#30 MAGNET 1-490201”
L20	459260	“IND ASSY,8T#24 MAG 1-490032”
L21	459261	“IND ASSY,9T#24 MAG 1-490032”
L22	459032	“IND ASY,3T#30 MAGNET 1-490201”
L23	459032	“IND ASY,3T#30 MAGNET 1-490201”
L24	459260	“IND ASSY,8T#24 MAG 1-490032”
L25	459261	“IND ASSY,9T#24 MAG 1-490032”
L26	459032	“IND ASY,3T#30 MAGNET 1-490201”
L27	459032	“IND ASY,3T#30 MAGNET 1-490201”
L29	459032	“IND ASY,3T#30 MAGNET 1-490201”
L3	459032	“IND ASY,3T#30 MAGNET 1-490201”
L30	459032	“IND ASY,3T#30 MAGNET 1-490201”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
L31	459232	IND ASSY 21T #26MAG 1-490060
L32	459230	IND ASSY 17T#26 MAG 1-490060
L33	459231	IND ASSY 18T#26 MAG 1-490060
L34	459032	“IND ASY,3T#30 MAGNET 1-490201”
L35	430014	INDUCTOR MOLDED MIN 100UH
L36	430014	INDUCTOR MOLDED MIN 100UH
L4	459032	“IND ASY,3T#30 MAGNET 1-490201”
L40	430014	INDUCTOR MOLDED MIN 100UH
L5	459259	“IND,7T-TAP-4T#30 MAG 1-490068”
L6	459032	“IND ASY,3T#30 MAGNET 1-490201”
L7	490109	COIL 12.5T (MD) SQ LG PI CORE
L8	430047	“INDUCTOR,0.22 UH MOLDED”
MX1	830052	NYLON TO-5 XSISTOR MOUNT PAD
MX1	380006	MIXER MINI DOUBLE-BALANCED
Q1	310033	“XSTR, J310 N-JFET TO92”
Q10	310032	“XISTOR,NPN,2N5770,TO92”
Q11	310165	“XSTR, BFY90 NPN RF TO-72”
Q12	310052	“XSTR, PN2907A PNP TO92”
Q13	310138	“XISTOR,FET,VN2222LL,TO92”
Q15	310057	“XISTOR,NPN,PN2222A,TO92”
Q2	310033	“XSTR, J310 N-JFET TO92”
Q3	310138	“XISTOR,FET,VN2222LL,TO92”
Q4	310138	“XISTOR,FET,VN2222LL,TO92”
Q5	310052	“XSTR, PN2907A PNP TO92”
Q6	310033	“XSTR, J310 N-JFET TO92”
Q7	310033	“XSTR, J310 N-JFET TO92”
Q8	310032	“XISTOR,NPN,2N5770,TO92”
Q9	310033	“XSTR, J310 N-JFET TO92”
R1	113334	“RES,330K 1/8W 5% CARBON FILM”
R10	113473	“RES, 47K OHM 1/8W CF 5%”
R11	113101	“RES,100 OHM 1/8W CF 5%”
R12	113152	“RES,1.5K OHM 1/8W CF 5%”
R13	113152	“RES,1.5K OHM 1/8W CF 5%”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
R14	113242	“RES, 2.4K OHM 1/8W 5% CF”
R15	113153	“RES,15K OHM 1/8W CF 5%”
R16	113103	“RES, 10K OHM 1/8W CF 5%”
R17	113101	“RES,100 OHM 1/8W CF 5%”
R18	113101	“RES,100 OHM 1/8W CF 5%”
R19	113473	“RES, 47K OHM 1/8W CF 5%”
R2	113221	“RES,220 OHM 1/8W 5% CF”
R20	113334	“RES,330K 1/8W 5% CARBON FILM”
R21	113471	“RES,470 OHM 1/8W CF 5%”
R22	113681	“RES,680 OHM 1/8W CF 5%”
R23	113101	“RES,100 OHM 1/8W CF 5%”
R24	113470	“RES,47 OHM 1/8W 5% CARBON FILM”
R25	113151	“RES,150 OHM 1/8W 5% CF”
R26	113181	“RES,180 OHM 1/8W 5% CF”
R27	113471	“RES,470 OHM 1/8W CF 5%”
R28	113223	“RES,22K OHM 1/8W CF 5%”
R29	113101	“RES,100 OHM 1/8W CF 5%”
R3	113681	“RES,680 OHM 1/8W CF 5%”
R30	113221	“RES,220 OHM 1/8W 5% CF”
R31	113122	“RES,1.2K OHM 1/8W CF 5%”
R32	113561	“RES,560 OHM 1/8W 5% CF”
R33	113680	“RES,68 OHM 1/8W 5% CF”
R34	113472	“RES, 4.7K OHM 1/8W CF 5%”
R35	113334	“RES,330K 1/8W 5% CARBON FILM”
R36	113473	“RES, 47K OHM 1/8W CF 5%”
R37	113222	“RES,2.2K OHM 1/8W CF 5%”
R38	113222	“RES,2.2K OHM 1/8W CF 5%”
R39	113222	“RES,2.2K OHM 1/8W CF 5%”
R4	113151	“RES,150 OHM 1/8W 5% CF”
R40	113222	“RES,2.2K OHM 1/8W CF 5%”
R41	113102	“RES, 1K OHM 1/8W CF 5%”
R42	113102	“RES, 1K OHM 1/8W CF 5%”
R43	113471	“RES,470 OHM 1/8W CF 5%”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
R44	113103	“RES, 10K OHM 1/8W CF 5%”
R45	113473	“RES, 47K OHM 1/8W CF 5%”
R46	113101	“RES,100 OHM 1/8W CF 5%”
R47	113103	“RES, 10K OHM 1/8W CF 5%”
R48	113103	“RES, 10K OHM 1/8W CF 5%”
R49	113101	“RES,100 OHM 1/8W CF 5%”
R5	113221	“RES,220 OHM 1/8W 5% CF”
R50	113473	“RES, 47K OHM 1/8W CF 5%”
R51	113103	“RES, 10K OHM 1/8W CF 5%”
R52	113101	“RES,100 OHM 1/8W CF 5%”
R53	113332	“RES,3.3K OHM 1/8W CF 5%”
R54	113101	“RES,100 OHM 1/8W CF 5%”
R55	113162	“RES, 1.6K OHM 1/8W 5% CF”
R56	113822	“RES,8.2K OHM 1/8W CF 5%”
R57	113152	“RES,1.5K OHM 1/8W CF 5%”
R58	113473	“RES, 47K OHM 1/8W CF 5%”
R59	113152	“RES,1.5K OHM 1/8W CF 5%”
R6	113181	“RES,180 OHM 1/8W 5% CF”
R60	113101	“RES,100 OHM 1/8W CF 5%”
R61	113102	“RES, 1K OHM 1/8W CF 5%”
R62	113102	“RES, 1K OHM 1/8W CF 5%”
R63	113102	“RES, 1K OHM 1/8W CF 5%”
R64	113101	“RES,100 OHM 1/8W CF 5%”
R65	113101	“RES,100 OHM 1/8W CF 5%”
R66	113221	“RES,220 OHM 1/8W 5% CF”
R67	113473	“RES, 47K OHM 1/8W CF 5%”
R68	113472	“RES, 4.7K OHM 1/8W CF 5%”
R69	113242	“RES, 2.4K OHM 1/8W 5% CF”
R70	113470	“RES,47 OHM 1/8W 5% CARBON FILM”
R71	113472	“RES, 4.7K OHM 1/8W CF 5%”
R72	113220	“RES,22 OHM 1/8W 5% CARBON FILM”
R73	113100	“RES,10 OHM 1/8W 5% FILM”
R74	113151	“RES,150 OHM 1/8W 5% CF”

Table 6-2 Synthesizer Board Parts List (001-00901 Rev. V)

Designator	Part Number	Description
R75	113473	“RES, 47K OHM 1/8W CF 5%”
R76	113473	“RES, 47K OHM 1/8W CF 5%”
R9	113103	“RES, 10K OHM 1/8W CF 5%”
T17	459258	“XFMR,1T-2T#30 MAG 1-490352”
T18	459237	XFMR 2T-2T#32 MAG 1-490352
T19	459265	“XFMR,2T2T 32 AWG MAG 1-490351”
T20	459238	XFMR 2T-8T #32 MAG 2-490201
T21	459237	XFMR 2T-2T#32 MAG 1-490352
T3	459239	XFMR 5T-2T#30 MAG 1-491301
U1	033304017	“IC,PLL, DUAL,MC145149, SOG-20”
U10	330018	“IC,VREG,78L08,TO94,8V”
U11	330343	“IC, LM317LZ ADJ VREG 100 MA TO-92”
U12	380013	“IC,MAR-2 MONOLITHIC AMPLIFIER”
U13	380013	“IC,MAR-2 MONOLITHIC AMPLIFIER”
U14	330273	IC 74HC595
U15	330648	“IC, MC12015 PRESCLR 2-MOD HYBRID-8”
U2	330417	“IC, SA602AN RF DB MIXER/OSC DIP-8”
U3	380011	“IC, MAR-6+ RF AMP MICRO-X”
U4	330639	“IC, MB87086APF PLL SYN SOIC16”
U5	330368	“IC,MC33078”
U6	330471	“IC,MAX680”
U7	330418	“IC,STEL-1179,M-NCO,PLCC28”
U8	330646	“IC, MB40760 10-BIT DAC SOP-20”
U9	330015	“IC, 7805 VREG 5V 1A 4% TO-220”
XL13	490067	INDUCTOR CAN
XL14	490067	INDUCTOR CAN
XL15	490067	INDUCTOR CAN
XL16	490067	INDUCTOR CAN
XL17	490067	INDUCTOR CAN
XL7	490067	INDUCTOR CAN

CHAPTER 7
VSWR DETECTOR BOARD

7.1 Circuit Description

The VSWR Detector board is located on the rear panel. It is mounted to the antenna connector and has a pendant 3-wire cable that plugs into the Motherboard at J19.

The VSWR Detector board includes reflected and forward power detectors that sample the transmit RF signal and send DC voltage indications of both forward and reverse powers to the Reference/Control board to drive the ALC circuitry. Although both transmit and receive RF signals pass through this board, it only samples transmit signals.

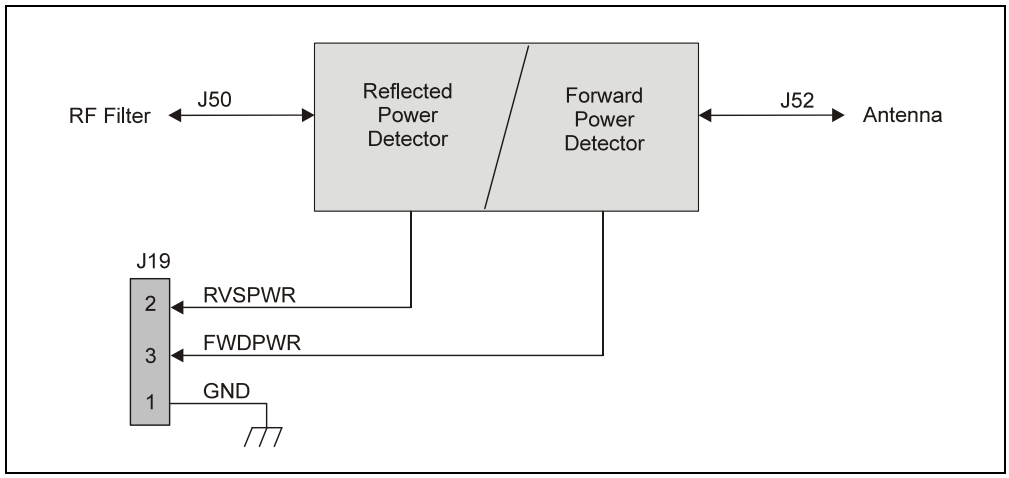


Figure 7-1 VSWR Detector Board Block Diagram

7.2 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the VSWR Detector board.

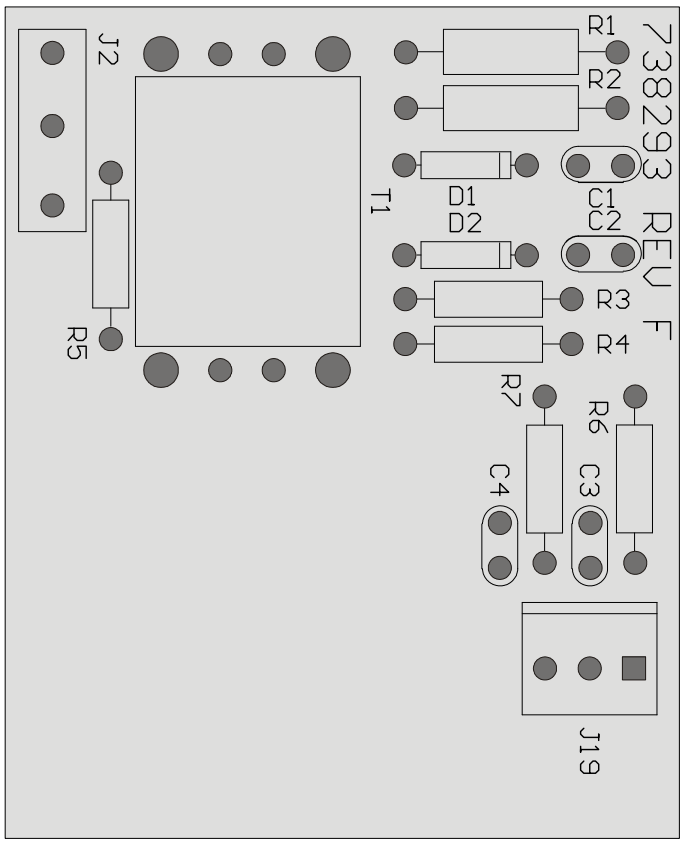


Figure 7-2 VSWR Detector Board Component Locations (738293 Rev. F)

HENRYS

FARADS

1/8W.

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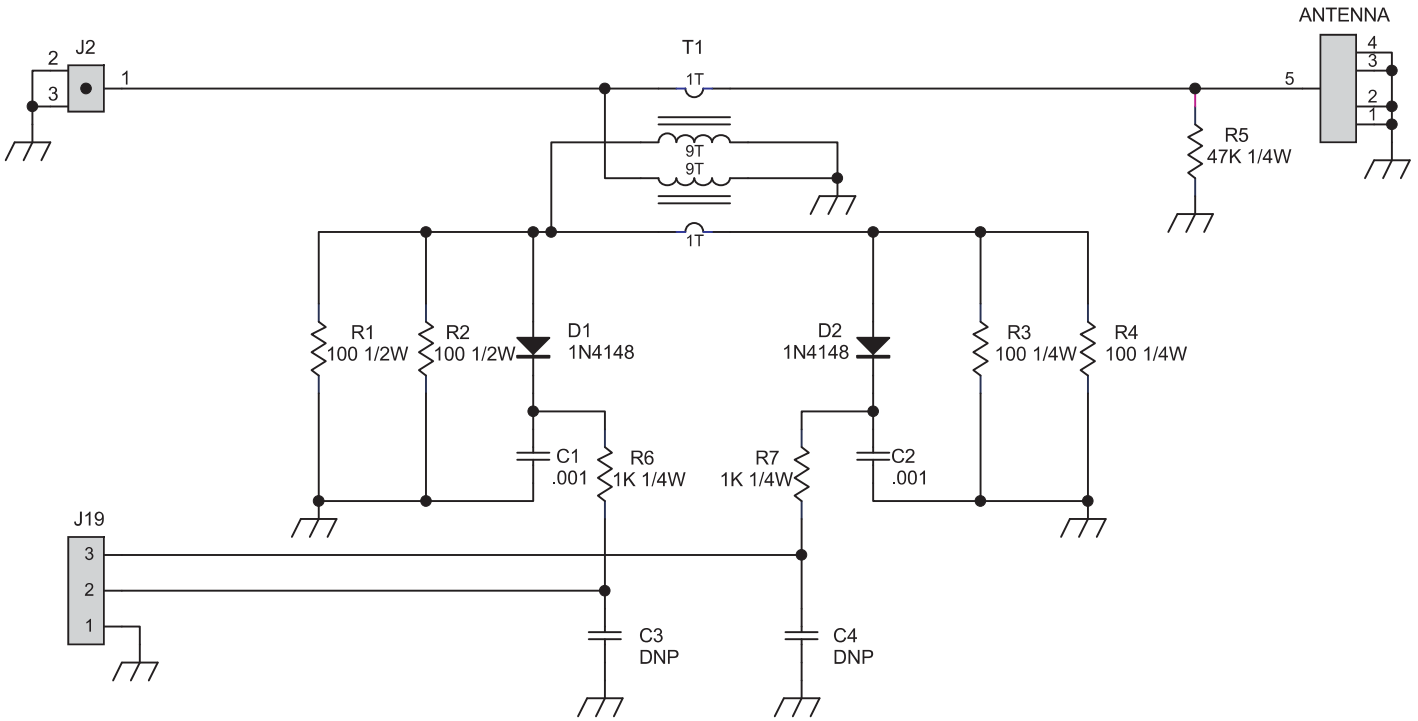

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Title: Schematic

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Table 7-1 VSWR Detector Board Parts List (001-00201 Rev. J)

Designator	Part Number	Description
C1	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C2	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
D1	320002	DIODE, 1N4148/1N4150 DO-35
D2	320002	DIODE, 1N4148/1N4150 DO-35
J19	610285	HEADER,PIN 1X3 MLX 0.1 W/LOCK
R1	134101	RES,100 OHM 1/2W 5% FILM
R2	134101	RES,100 OHM 1/2W 5% FILM
R3	124101	RES,100 OHM 1/4W 5% CF
R4	124101	RES,100 OHM 1/4W 5% CF
R5	124473	RES,47K 1/4W 5% CARBON FILM
R6	113102	RES, 1K, 1/8W, 5%, CF
R7	113102	RES, 1K, 1/8W, 5%, CF
T1	459316	XFMR ASSY, 9T/9T#30 1-490061

CHAPTER 8
RF FILTER BOARD

8.1 Circuit Description

The RF Filter board is mounted on the heat sink assembly and connects to the VSWR circuit (J50), the RF Power Amplifier board (J51), and the 75 MHz IF board (J52) through coaxial cables. It receives filter select signals from the Reference/Control board through connector J22. The RF Filter board includes the seven harmonic filters, the receive/transmit relay, and the receive overload protection circuit. Figure 8-1 on page 8-2 provides a block diagram of the RF Filter board.

8.1.1 Harmonic Filter Bands

The RF Filter board filters the transmit and receive RF signal for harmonic and spurious tones over the 1.6 MHz to 30 MHz operating frequency range. The RF Filter board divides the frequency range into the following seven frequency bands:

Band	Frequency Range
FB 1	1.6 MHz to 2.74 MHz
FB 2	2.75 MHz to 3.99 MHz
FB 3	4.0 MHz to 6.24 MHz
FB 4	6.25 MHz to 8.99 MHz
FB 5	9.0 MHz to 13.49 MHz
FB 6	13.5 MHz to 20.99 MHz
FB 7	21.0 MHz to 30 MHz (0 MHz to 1.6 MHz)

The decoder U1 on the Reference/Control board selects the filter band (FB) based on the selected channel frequency information received as serial data from the Processor board. The FB signals from the Reference/Control board energize relays on the RF Filter board to insert the appropriate filter in the RF transmit or receive path.

8.1.2 T/R Relay

The transmit/receive switch (TRSW) signal (active low) from the Reference/Control board (which is actually the PTT signal from the Processor board) energizes the transmit/receive relay K15 by turning on Q1 which connects the relay to ground. This connects the filter circuit with the transmit connector J52.

8.1.3 Receive Overload Switch

The receive relay K16 is energized by the receive signal when the transmit relay K15 is de-energized. The receive line to K16 includes the operational amplifier U1A that functions as part of an overload protection circuit. This circuit protects downstream circuitry (75 MHz IF board) against excessively strong receive signals.

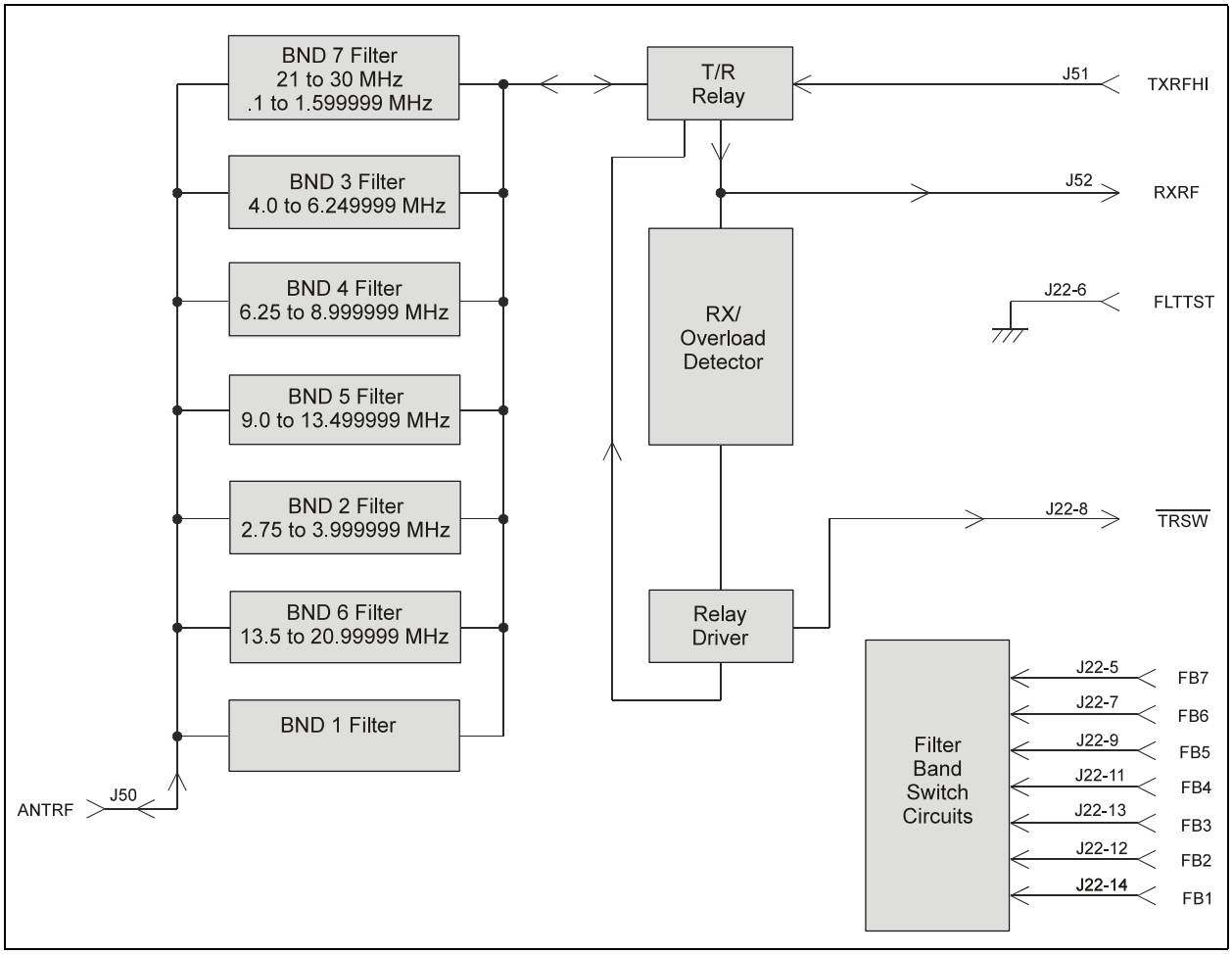


Figure 8-1 RF Filter Board Block Diagram

8.2 Connector Pin Assignments

J22 connects to the Reference/Control board (J3) through the Motherboard.

Table 8-1 J22 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	GND	Ground
3	+12V	+12 Vdc supply
4	+12V	+12 Vdc supply
5	FB7	Filter band 7 select line
6	FLTTST	RF filter BITE line
7	FB3	Filter band 3 select line
9	FB4	Filter band 4 select line
10	TRSW	T/R relay control line
11	FB5	Filter band 5 select line
12	FB6	Filter band 6 select line
13	FB2	Filter band 2 select line
14	FB1	Filter band 1 select line

8.3 Component Locations, Schematic and Parts List

This section includes the component locations diagram, schematic and parts list for the RF Filter board.

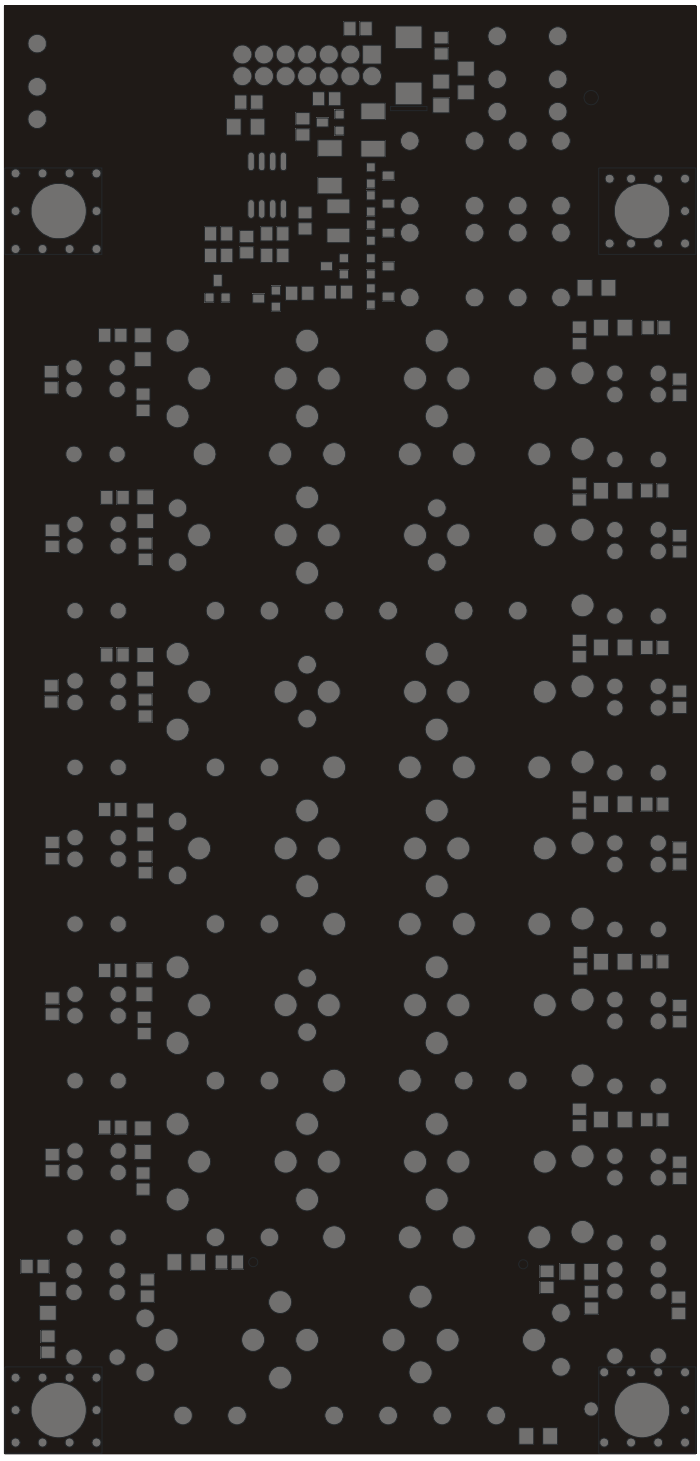


Figure 8-2 RF Filter Board Component Locations (738228 Rev. L)

E WAS REPLACED WITH A ZERO OHM RESISTOR.

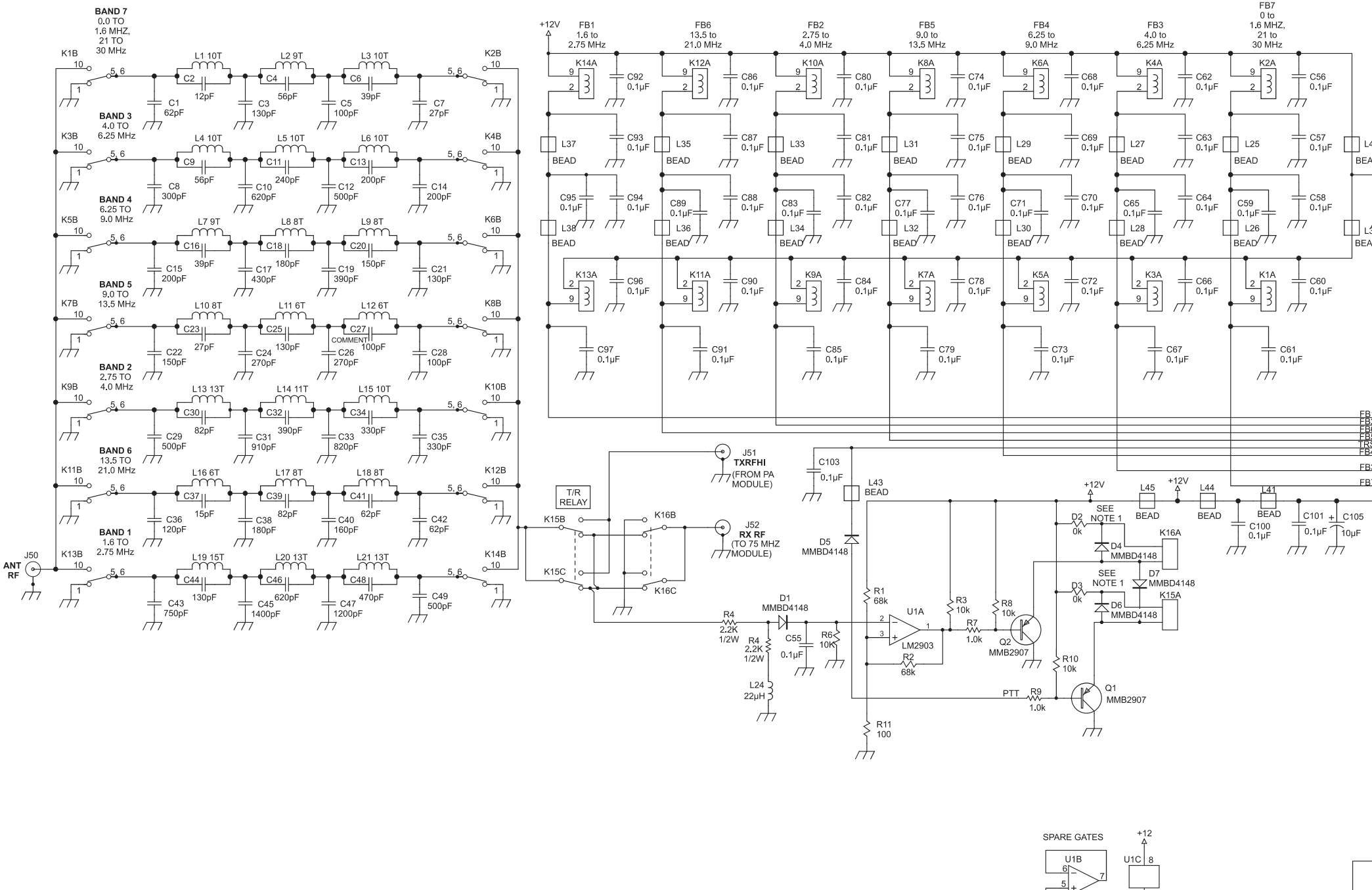


Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
C1	220620	“CAP,62PF DM15 MICA”
C10	224621	“CAP,620PF MICA DM19”
C100	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C101	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C103	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C105	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C11	224241	“CAP,240PF DM19 MICA”
C12	224501	“CAP,500PF DM19 MICA”
C13	224201	“CAP,200PF DM19 MICA”
C14	224201	“CAP,200PF DM19 MICA”
C15	224201	“CAP,200PF DM19 MICA”
C16	220390	“CAP,39PF DM15 MICA”
C17	220431	“CAP,430PF DM15 MICA”
C18	224181	“CAP,180PF 5% DM19 MICA”
C19	224391	“CAP,390PF DM19 MICA”
C2	220120	“CAP,12PF DM15 MICA”
C20	220151	“CAP,150PF DM15 MICA”
C21	224131	“CAP,130PF DM19 MICA”
C22	220151	“CAP,150PF DM15 MICA”
C23	220270	“CAP,27PF 5% DM15 MICA”
C24	224301	“CAP,300PF DM19 MICA”
C25	224131	“CAP,130PF DM19 MICA”
C26	224271	“CAP,270PF 5% DM19 MICA”
C27	220101	“CAP,100PF DM15 MICA”
C28	220101	“CAP,100PF DM15 MICA”
C29	224501	“CAP,500PF DM19 MICA”
C3	224131	“CAP,130PF DM19 MICA”
C30	220820	“CAP,82PF DM15 MICA”
C31	220911	“CAP,910PF DM15 MICA”
C32	224391	“CAP,390PF DM19 MICA”
C33	224821	“CAP,820PF DM19 MICA”
C34	224331	“CAP,330PF DM19 MICA”
C35	224331	“CAP,330PF DM19 MICA”

Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
C36	220121	“CAP,120PF 5% MICA DIPPED”
C37	220150	“CAP,15PF DM15 5% 500V MICA”
C38	224181	“CAP,180PF 5% DM19 MICA”
C39	220820	“CAP,82PF DM15 MICA”
C4	220560	“CAP,56PF DM15 MICA”
C40	220161	“CAP,160PF DM15 MICA”
C41	220620	“CAP,62PF DM15 MICA”
C42	220620	“CAP,62PF DM15 MICA”
C43	224751	“CAP, 750PF DM19 MICA”
C44	224131	“CAP,130PF DM19 MICA”
C45	224142	“CAP,1400PF DM19 MICA”
C46	224621	“CAP,620PF MICA DM19”
C47	224122	CAP.1200PF MICA DM19
C48	224471	“CAP,470PF DM19 MICA”
C49	224501	“CAP,500PF DM19 MICA”
C5	220101	“CAP,100PF DM15 MICA”
C55	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C56	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C57	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C58	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C59	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C6	220390	“CAP,39PF DM15 MICA”
C60	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C61	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C62	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C63	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C64	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C65	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C66	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C67	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C68	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C69	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C7	220270	“CAP,27PF 5% DM15 MICA”

Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
C70	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C71	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C72	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C73	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C74	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C75	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C76	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C77	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C78	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C79	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C8	224301	“CAP,300PF DM19 MICA”
C80	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C81	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C82	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C83	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C84	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C85	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C86	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C87	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C88	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C89	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	220560	“CAP,56PF DM15 MICA”
C90	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C91	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C92	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C93	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C94	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C95	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C96	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C97	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C98	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
D1	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D2	013000000	“RES, ZERO OHM 2A TK 0805”

Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
D3	013000000	“RES, ZERO OHM 2A TK 0805”
D4	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D5	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D6	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D7	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
J22	620017	“HEADER, 2X7 MLX 0.1 BOX PLAIN”
J50	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J51	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J52	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
K1	540077	“RELAY,SP PCB MOUNT”
K10	540077	“RELAY,SP PCB MOUNT”
K11	540077	“RELAY,SP PCB MOUNT”
K12	540077	“RELAY,SP PCB MOUNT”
K13	540077	“RELAY,SP PCB MOUNT”
K14	540077	“RELAY,SP PCB MOUNT”
K15	540080	“RELAY,DPDT 2 AMP SEALED”
K16	540080	“RELAY,DPDT 2 AMP SEALED”
K2	540077	“RELAY,SP PCB MOUNT”
K3	540077	“RELAY,SP PCB MOUNT”
K4	540077	“RELAY,SP PCB MOUNT”
K5	540077	“RELAY,SP PCB MOUNT”
K6	540077	“RELAY,SP PCB MOUNT”
K7	540077	“RELAY,SP PCB MOUNT”
K8	540077	“RELAY,SP PCB MOUNT”
K9	540077	“RELAY,SP PCB MOUNT”
L1	459325	“IND ASSY,10T,#20,1-490006”
L10	451122	“IND ASSY,8T#20 1-490008”
L11	459424	“IND ASSY,6T#20 1-490008 COMPRS”
L12	459424	“IND ASSY,6T#20 1-490008 COMPRS”
L13	459119	“IND ASSY, 13T#22 1-490009”
L14	459103	“IND ASSY,11T#22,AWG,1-490009”
L15	459174	“IND ASSY,10T#22 AWG 1-490009”
L16	459131	“IND ASSY, 6T#20 AWG 1-490008”

Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
L17	451127	“IND ASSY, 8T#20 1-490010”
L18	459425	“IND ASSY,8T#20 1-490010 COMPRS”
L19	451115	“IND ASSY,15T#22 1-490009”
L2	459326	“IND ASSY,9T,#20,2-490104”
L20	459119	“IND ASSY, 13T#22 1-490009”
L21	459119	“IND ASSY, 13T#22 1-490009”
L24	041223000	IND SM 22UH 1210 10%
L25	045000001	“BEAD, FERRITE Z=120 1206”
L26	045000001	“BEAD, FERRITE Z=120 1206”
L27	045000001	“BEAD, FERRITE Z=120 1206”
L28	045000001	“BEAD, FERRITE Z=120 1206”
L29	045000001	“BEAD, FERRITE Z=120 1206”
L3	459325	“IND ASSY,10T,#20,1-490006”
L30	045000001	“BEAD, FERRITE Z=120 1206”
L31	045000001	“BEAD, FERRITE Z=120 1206”
L32	045000001	“BEAD, FERRITE Z=120 1206”
L33	045000001	“BEAD, FERRITE Z=120 1206”
L34	045000001	“BEAD, FERRITE Z=120 1206”
L35	045000001	“BEAD, FERRITE Z=120 1206”
L36	045000001	“BEAD, FERRITE Z=120 1206”
L37	045000001	“BEAD, FERRITE Z=120 1206”
L38	045000001	“BEAD, FERRITE Z=120 1206”
L39	045000001	“BEAD, FERRITE Z=120 1206”
L4	459134	“IND ASSY, 10T#22 AWG 1-490008”
L40	045000001	“BEAD, FERRITE Z=120 1206”
L41	045000001	“BEAD, FERRITE Z=120 1206”
L43	045000001	“BEAD, FERRITE Z=120 1206”
L44	045000001	“BEAD, FERRITE Z=120 1206”
L45	045000001	“BEAD, FERRITE Z=120 1206”
L5	459134	“IND ASSY, 10T#22 AWG 1-490008”
L6	459134	“IND ASSY, 10T#22 AWG 1-490008”
L7	459120	“IND ASSY,9T#22 1-490008”
L8	459105	“IND ASSY, 8T#22 AWG 1-490008”

Table 8-2 RF Filter Board Parts List (001-00320 Rev. AA)

Designator	Part Number	Description
L9	459105	“IND ASSY, 8T#22 AWG 1-490008”
Q1	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q2	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
R1	013683000	“RES,SM,CF,68K 0.1W 5% 0805”
R10	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R11	013101002	“RES, 100 OHM 1/8W 1% TK 0805”
R2	013683000	“RES,SM,CF,68K 0.1W 5% 0805”
R3	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R4	019222002	“RES, 2.2K 1/2W 5% TK 2010”
R5	019222002	“RES, 2.2K 1/2W 5% TK 2010”
R6	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R7	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R8	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R9	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
U1	033304061	“IC,SM,LIN,COMPAR,DUAL,LM2903MX”

CHAPTER 9
RF POWER AMPLIFIER BOARD

9.1 Circuit Description

The RF Power Amplifier board is a two-stage broadband 1.6 to 30 MHz power amplifier capable of putting out 150W of RF power. It is located on the heat sink assembly and is driven by the exciter circuitry on the 75 MHz IF board through coaxial connector J10 (TXRFLOW). The high power output is applied to the RF Filter board through connector J12 (TXRFHI). Power (12 Vdc) for the board comes directly from primary DC input power source, unregulated, unswitched, through a pendant cable terminated in connector J24 (refer to Figure 9-1 below).

The RF amplifier board contains class-AB driver amplifiers and class-AB final amplifiers, both of which operate in a push-pull mode. Special broadband transformers are used in the combiner circuits shown in Figure 9-1. Each stage has its own separate bias network, turned on by the T12 line (+12 Vdc only in transmit mode) from the 75 MHz IF board.

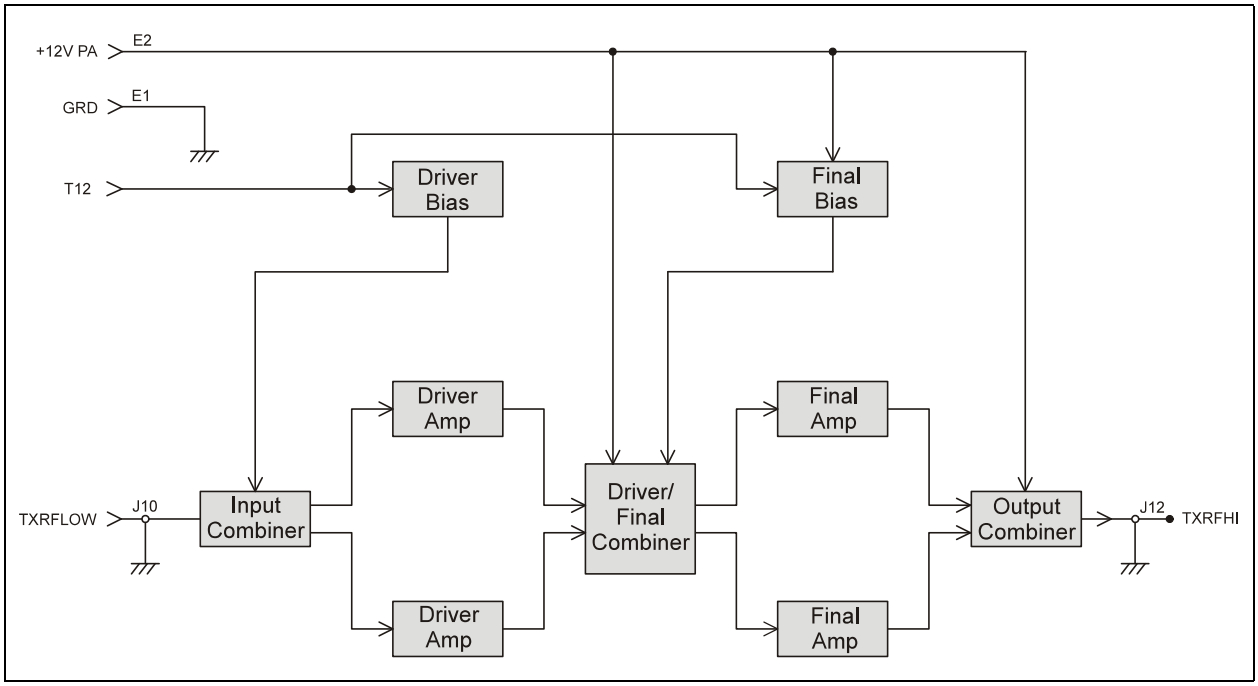


Figure 9-1 RF Power Amplifier Board Block Diagram

9.2 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the RF Power Amplifier board.

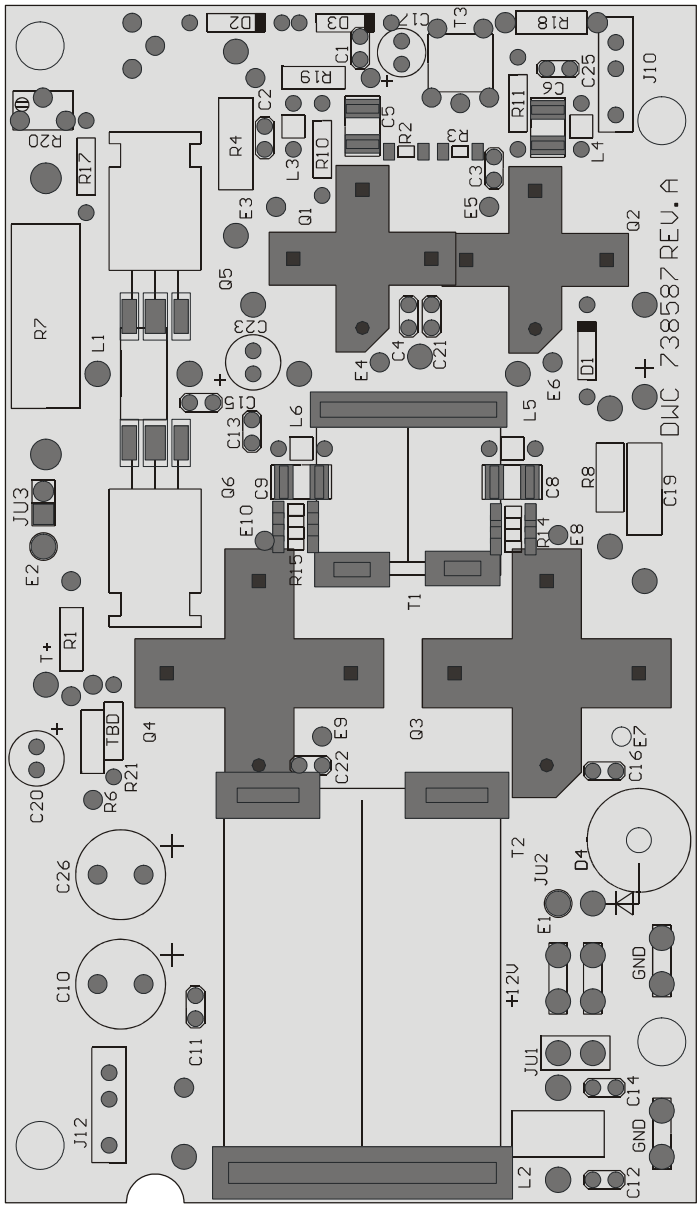
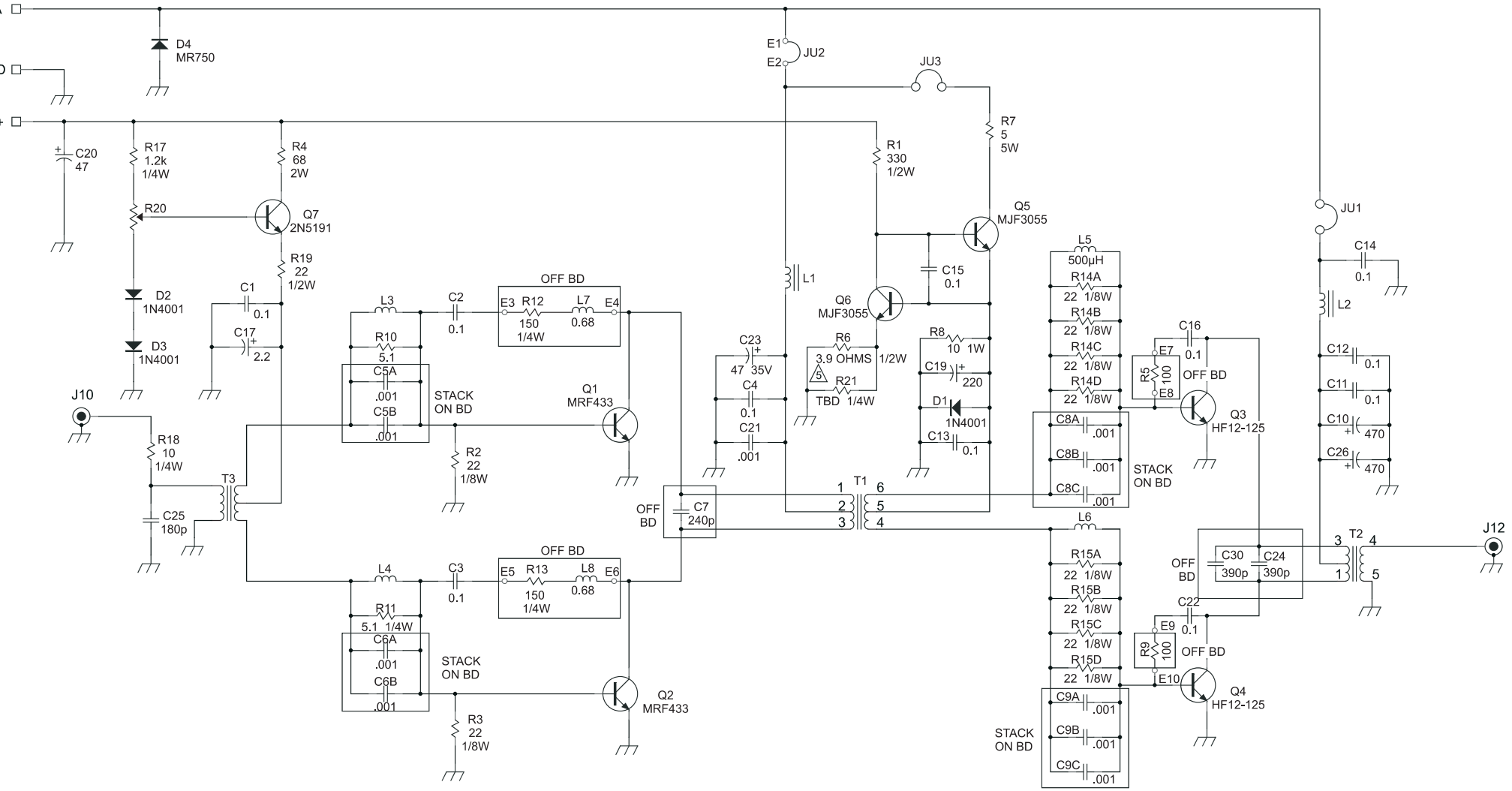


Figure 9-2 RF Power Amplifier Board Component Locations (738587 Rev. A)

D	05-0290
E	06-0036
F	08-0396



5 REFER TO SELECTION PROCEDURE IN TECHNICAL MANUAL.
4 INDUCTANCE IS IN MICROHENRYS
3 DIODESARE 1N4148
2 CAPACITANCE IS IN MICROFARADS

Table 9-1 RF Power Amplifier Board Parts List (004-00311 Rev. C)

Designator	Part Number	Description
C1	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C10	233471	“CAP,470MF,35V,ELECT,VERT”
C11	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C12	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C13	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C14	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C15	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C16	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C17	231020	“CAP, 2.2UF AL 50V 20% 2MM LS”
C19	230201	“CAP,220uF,16V,ELECT”
C2	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C20	231500	“CAP, 47UF AL 16V 20% 5X11X0.1”
C21	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C22	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C23	234470	“CAP,47MF 35V ELECT VRT”
C25	210181	“CAP, 180PF NPO DISC .1SP”
C26	233471	“CAP,470MF,35V,ELECT,VERT”
C3	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C4	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C5A	216102-1	“CAP,1000PF 10% CHIP CER”
C5B	216102-1	“CAP,1000PF 10% CHIP CER”
C6A	216102-1	“CAP,1000PF 10% CHIP CER”
C6B	216102-1	“CAP,1000PF 10% CHIP CER”
C7	224241	“CAP,240PF DM19 MICA”
C8A	216102-1	“CAP,1000PF 10% CHIP CER”
C8B	216102-1	“CAP,1000PF 10% CHIP CER”
C8C	216102-1	“CAP,1000PF 10% CHIP CER”
C9A	216102-1	“CAP,1000PF 10% CHIP CER”
C9B	216102-1	“CAP,1000PF 10% CHIP CER”
C9C	216102-1	“CAP,1000PF 10% CHIP CER”
D1	320102	“DIODE, 1N4001 1A 50V DO-41”

Table 9-1 RF Power Amplifier Board Parts List (004-00311 Rev. C)

Designator	Part Number	Description
D2	320102	“DIODE, 1N4001 1A 50V DO-41”
D3	320102	“DIODE, 1N4001 1A 50V DO-41”
D4	320421	“DIODE, MR750 6A 50V AXIAL”
J10	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J12	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
JU3	650048	“HEADER, PIN 1X2 MLX 0.1 TH”
L1	459113	“IND ASSY,3T,#18,1-490302”
L2	459113	“IND ASSY,3T,#18,1-490302”
L3	459114	“IND ASSY,6T#30GA RED 1-490201”
L4	459114	“IND ASSY,6T#30GA RED 1-490201”
L5	459114	“IND ASSY,6T#30GA RED 1-490201”
L6	459114	“IND ASSY,6T#30GA RED 1-490201”
R1	134331	“RES,330 OHM 1/2W 5% CF”
R10	124050	“RES,5.1 OHM 1/4W 5% CF”
R11	124050	“RES,5.1 OHM 1/4W 5% CF”
R14A	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R14B	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R14C	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R14D	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R15A	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R15B	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R15C	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R15D	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R17	124122	“RES,1.2K 1/4W 5% CARBON FILM”
R18	124100	“RES,10 OHM 1/4W 5% CARBON FILM”
R19	134220	“RES, 22 OHM 1/2W 1% MF”
R2	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R20	170003	POT CRM 500 OHMS 0.25 12T TH
R21	124XXX	“RESISTOR 1/4W, TBD”
R3	014220900	“RES, 22 OHM 1/4W 1% TK 1206”
R4	154680	“RES, 68 OHM MOX 2W 5%”

Table 9-1 RF Power Amplifier Board Parts List (004-00311 Rev. C)

Designator	Part Number	Description
R6	134039	“RES,3.9 OHM 1/2W 5% FILM”
R7	161050	“RES,5 OHM 5W 10% WW”
R8	144100	“RES,10 OHM 1W 5% CF”
T1	459211	“XFMR,1T1T #20AWG 6-490302”
T2	459212	“XFMR ASSY,4T#20 AWG 4-490502”
T3	451136-1	“XFMR ASSY,4T2T#32 GA 1-490303”

Table 9-2 PA Heatsink Assembly Parts List (001-00300 Rev. M)

Designator	Part Number	Description
J10	001-00014	“CABLE ASSY,TW7000 COAX 27”
J50	001-00011	“CABLE ASSY,TW7000 COAX 9”
J51	001-00011	“CABLE ASSY,TW7000 COAX 9”

Table 9-3 RF Amplifier Assembly Parts List (001-00310 Rev. R)

Designator	Part Number	Description
J23	001-00350	HEATSINK CABLE ASSEMBLY
L7	430005	INDUCTOR FIXED 0.68UH
L8	430005	INDUCTOR FIXED 0.68UH
Q1	310140	“XISTOR,RF,NPN,12.5V”
Q2	310140	“XISTOR,RF,NPN,12.5V”
Q3	310015	“XSTR,NPN HF12-125,GRADED”
Q4	310015	“XSTR,NPN HF12-125,GRADED”
Q5	310133	“XSTR, MJF3055 NPN TO-220 INS”
Q6	310133	“XSTR, MJF3055 NPN TO-220 INS”
Q7	310055	“XSTR,2N5191 NPN 4A 60V TO225”
R12	124151	“RES,150 OHM 1/4W 5% CF”
R13	124151	“RES,150 OHM 1/4W 5% CF”
R5	154101	“RES,100 OHM 2W 5% MOX STD”
R9	154101	“RES,100 OHM 2W 5% MOX STD”

CHAPTER 10

75 MHZ IF BOARD

10.1 Circuit Description

The 75 MHz IF board plugs into the motherboard at J6 and is located in the fourth card slot from the right side of the radio. It is used in both the transmit and receive paths.

10.1.1 Voltage Regulation

The 75 MHz IF board is powered by the +12 Vdc supply from the Power Supply board which it regulates to 8 Vdc, receive-only 8 Vdc (R8), transmit-only 8 Vdc (T8), and transmit-only 12 Vdc (T12). T12 provides bias control line for the RF Power Amplifier board. T8 and R8 power the transmit/receive switches and the onboard circuits that operate in either transmit-only or receive-only mode.

The decoder/driver translates the serial data inputs (SPITXD, SPICLK) from the processor into signals to drive the switch matrix. This switch circuit controls the high pass filter (relay K2), the 20 dB attenuator (relay K1), and the BITE status line.

10.1.2 Receive Mode

The receive RF from the RF Filter board is connected through a coaxial cable to connector J52. From there it is applied to a high-pass filter (HPF) that is automatically switched into the circuit for all channel frequencies above 2 MHz. It is then applied to a 20 dB attenuator controlled by the front panel **RX Attenuator** switch. Frequency mixer HX1 mixes the receive signal with the first LO to form the first IF at 75 MHz. Then it is amplified (U1), filtered (XF3), and amplified again (U2) before going out to the 5 MHz IF board at coaxial connector J53. The AGC voltage for the receiver is applied at J6-18 and controls the gain of the last 75 MHz amplifier.

10.1.3 Transmit Mode

The modulated 75 MHz audio signal from the 5 MHz IF board is received at J53 and is applied to transmit amplifier U3 . The gain of this amplifier is controlled by the radio ALC system, in particular the RAWALC J6-12 line. The RAWALC line is the ALC voltage from the Reference/Control board. The ALC voltage is a combination of forward and reflected power samples; when the antenna is a perfect 50 ohm match, there is no reflected voltage, and the

ALC allows the radio to put out the full rated power. As the VSWR increases, the reflected voltage goes up, and the larger value on the RAWALC line causes the output power to decrease proportionally.

From the transmit amplifier, the TX signal is applied to the 75 MHz filter, and is amplified again (U4) prior to mixing with the first LO (MX1). The transmit signal, now at the channel frequency, is applied to the transmitter exciter, a two-stage amplifier whose output is a push-pull amplifier with a nominal output of +20 dBm. The output signal is connected via a coaxial cable at J60 (TXRFLOW) to the RF Power Amplifier board.

10.2 Connector Pin Assignments

Table 10-1 provides the J6 pin assignments.

Table 10-1 J6 Connector Pin Assignments

Pins	Signal	Description
1	GND	Ground
2	+12V	+12 Vdc supply
4	SPICLK	SPI clock from the Processor board
5	PTT	Push-to-talk from the Processor board
6	ALC LVL	ALC output to the Processor board
12	RAW ALC	ALC voltage from the Ref/Control board
13	EN11	Decoder/driver enable from the Processor board
14	GND	Ground
15	+12V	+12 Vdc supply voltage
16	SPITXD	Serial TX data line from the Processor board
17	BITE	BITE status line
19	T12	+12 Vdc (transmit-only) to the Power Amplifier board

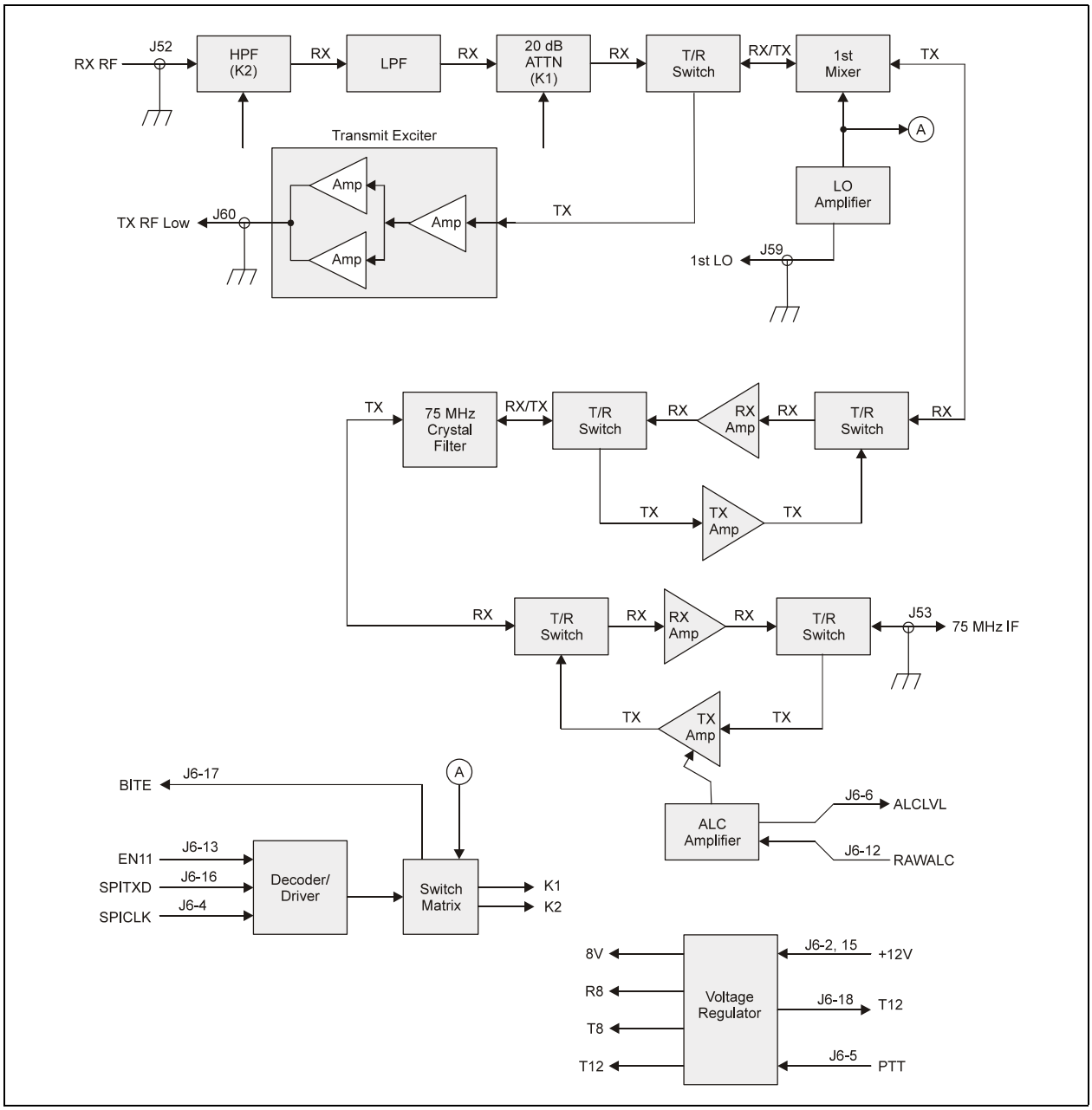


Figure 10-1 75 MHz IF Block Diagram

10.3 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the 75 MHz IF board.

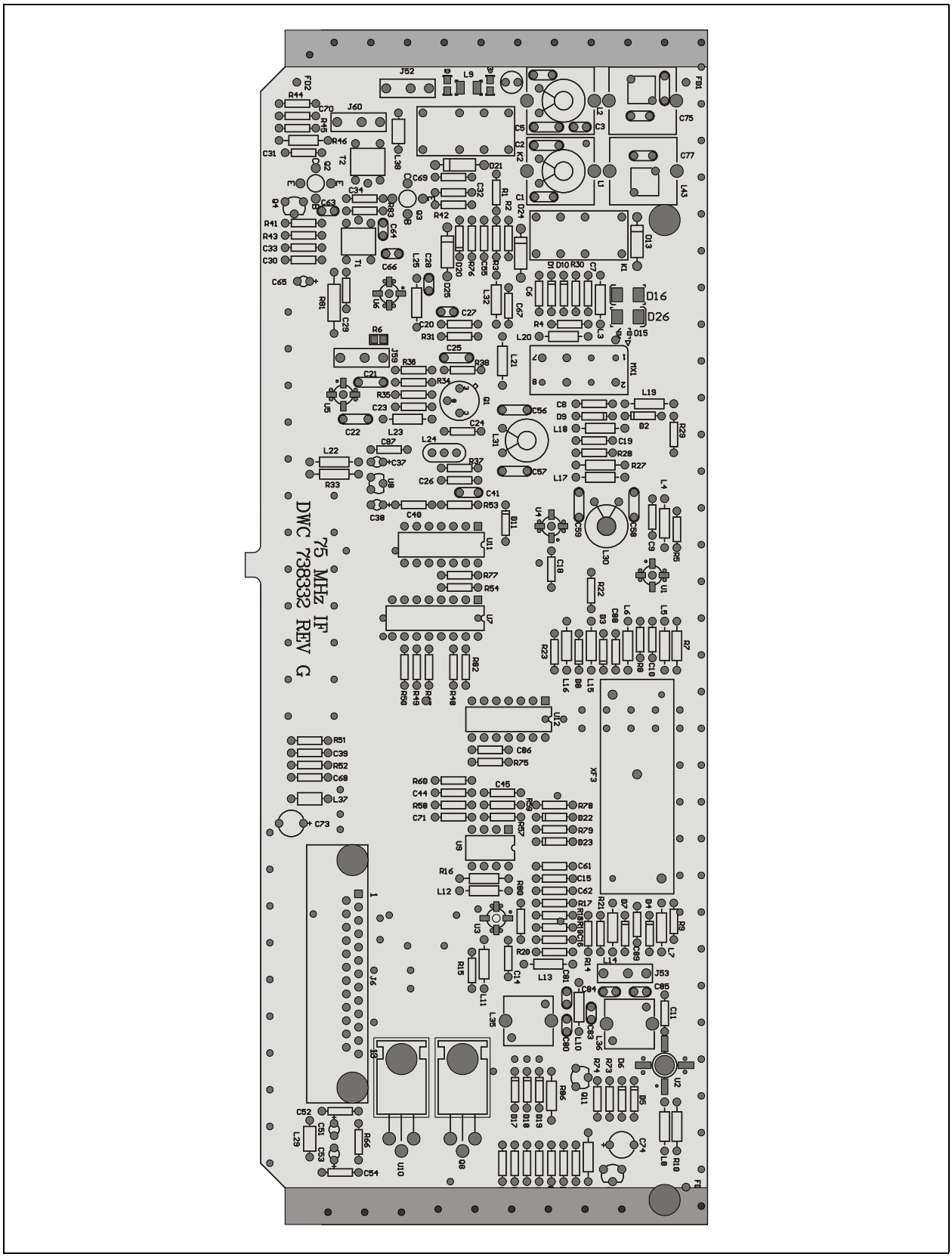
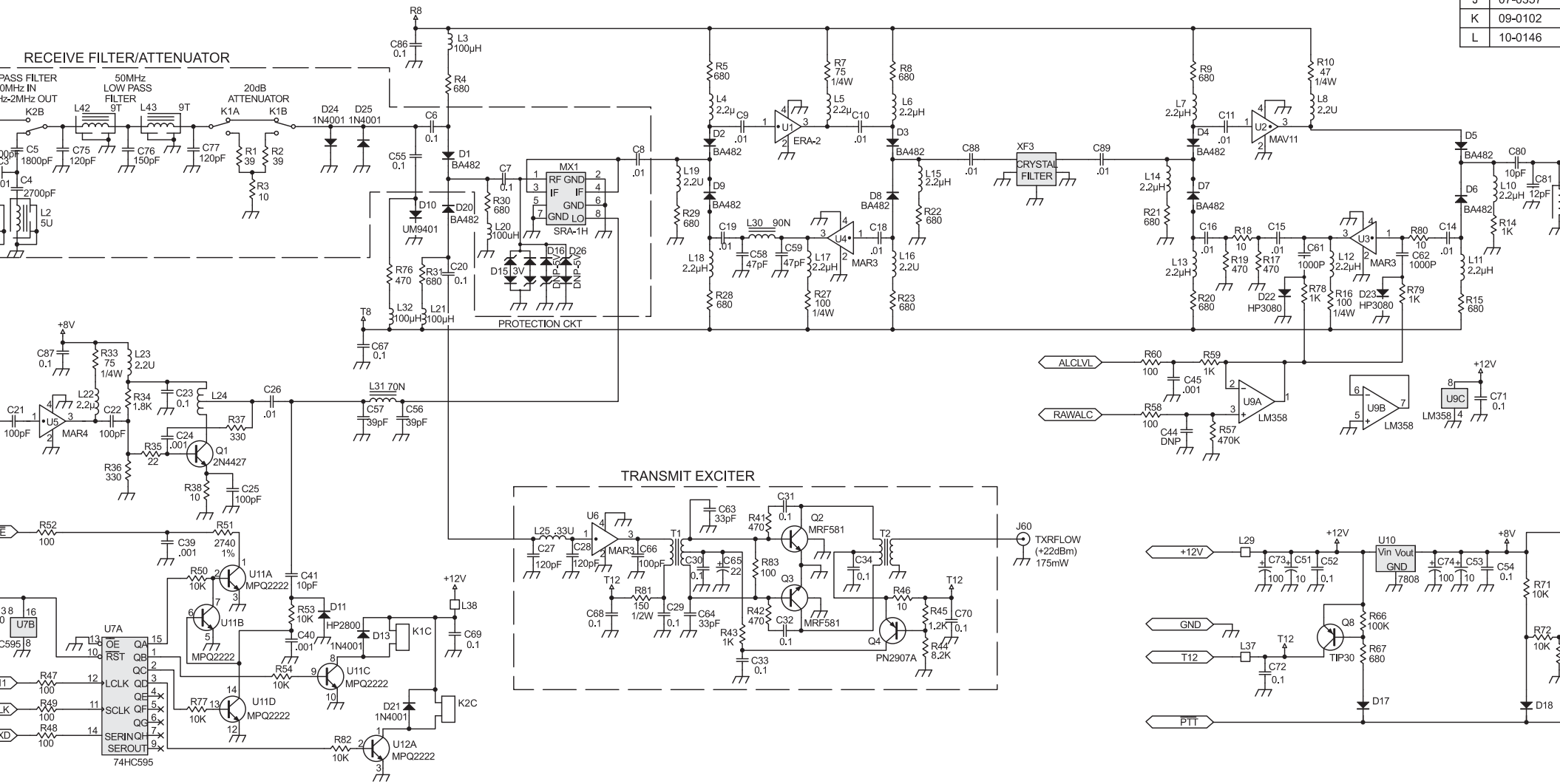


Figure 10-2 75 MHz IF Board Component Locations (738332 Rev. G)

D	01-0629
E	02-0123
F	03-0427
G	04-0330
H	05-0457
J	07-0357
K	09-0102
L	10-0146



4 INDUCTANCE IS IN MICROHENRYS.
3 DIODES ARE 1N4148.
2 CAPACITANCE IS IN MICROFARADS.
1 RESISTANCE IS IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED

U12D MPQ2222 SPARE

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
C1	254152	“CAP,0.0015MF MYLAR”
C10	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C11	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C12	021680001	“CAP, 68PF NPO 100V 2% 0805”
C13	021680001	“CAP, 68PF NPO 100V 2% 0805”
C14	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C15	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C16	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C18	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C19	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C2	254822-1	“CAP,Y,8200PF,50V,5%,RA,.15”
C20	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C21	210101	“CAP,100PF NPO 50V 5%.2LS DISK”
C22	210101	“CAP,100PF NPO 50V 5%.2LS DISK”
C23	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C24	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C25	210101	“CAP,100PF NPO 50V 5%.2LS DISK”
C26	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C27	210121	“CAP,120 PF DISC NPO”
C28	210121	“CAP,120 PF DISC NPO”
C29	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C3	254102	“CAP,0.001MF 5% MYLAR”
C30	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C31	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C32	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C33	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C34	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C37	241100	“CAP,10MF DIP TANTALUM”
C38	241100	“CAP,10MF DIP TANTALUM”
C39	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C4	254272	“CAP,0.0027UF MYLAR 100V 10%”
C40	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C41	210100	“CAP,10 PF NPO 50V 5% 0.1LS DSK”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
C45	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C5	254182	“CAP,Y,1800PF,50V,5%,RA,.15”
C51	241100	“CAP,10MF DIP TANTALUM”
C52	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C53	241100	“CAP,10MF DIP TANTALUM”
C54	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C55	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C56	210391	“CAP, 39PF NPO 5% 50V 0.2LS”
C57	210391	“CAP, 39PF NPO 5% 50V 0.2LS”
C58	210470	“CAP,47PF DISK NPO 50V 5% 0.2LS”
C59	210470	“CAP,47PF DISK NPO 50V 5% 0.2LS”
C6	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C61	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C62	277102	“CAP,C,1000P,100,10%,X,AX,.25SP”
C63	210330	“CAP,33 PF DISC NPO”
C64	210330	“CAP,33 PF DISC NPO”
C65	241226	“CAP,T,22UF,25V,20%,RA,.1SP”
C66	221101	“CAP, 100PF MICA 300V 5% DM5”
C67	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C68	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C69	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C7	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C70	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C71	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C72	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C73	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C74	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C75	210121	“CAP,120 PF DISC NPO”
C76	210151	“CAP, 150PF Y5V 50V 10% DISC.1LS”
C77	210121	“CAP,120 PF DISC NPO”
C8	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C80	210100	“CAP,10 PF NPO 50V 5% 0.1LS DSK”
C81	210120	“CAP,12 PF DISC NPO”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
C83	210020	“CAP,2PF NPO 50V.25P 0.1LS DSK”
C84	210120	“CAP,12 PF DISC NPO”
C85	210100	“CAP,10 PF NPO 50V 5% 0.1LS DSK”
C86	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C87	277104	“CAP,C,0.1U,50,10%,X,AX,.25SP”
C88	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C89	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
C9	277103	“CAP,C,0.01U,100,10%,X,AX,.25SP”
D1	320005	“DIODE, BA482 PIN SWITCH DO-34”
D10	320005	“DIODE, BA482 PIN SWITCH DO-34”
D11	320015	“DIODE,HP2800”
D13	320102	“DIODE, 1N4001 1A 50V DO-41”
D15	037700008	“DIODE,SM,TVS,SOD323,3VBRKDN”
D16	DNP	“NULL PART, VACANT PCB LOCATION”
D17	320002	“DIODE, 1N4148/1N4150 DO-35”
D18	320002	“DIODE, 1N4148/1N4150 DO-35”
D19	320002	“DIODE, 1N4148/1N4150 DO-35”
D2	320005	“DIODE, BA482 PIN SWITCH DO-34”
D20	320432	“DIODE,PIN,ANT SW,5.5W,UM9401B”
D21	320102	“DIODE, 1N4001 1A 50V DO-41”
D22	320503	“DIODE,PIN 5082-3080”
D23	320503	“DIODE,PIN 5082-3080”
D24	320102	“DIODE, 1N4001 1A 50V DO-41”
D25	320102	“DIODE, 1N4001 1A 50V DO-41”
D26	DNP	“NULL PART, VACANT PCB LOCATION”
D3	320005	“DIODE, BA482 PIN SWITCH DO-34”
D4	320005	“DIODE, BA482 PIN SWITCH DO-34”
D5	320005	“DIODE, BA482 PIN SWITCH DO-34”
D6	320005	“DIODE, BA482 PIN SWITCH DO-34”
D7	320005	“DIODE, BA482 PIN SWITCH DO-34”
D8	320005	“DIODE, BA482 PIN SWITCH DO-34”
D9	320005	“DIODE, BA482 PIN SWITCH DO-34”
DS1	390009	“LAMP, NEON NE-2 STD. 6X18”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
J52	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J53	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J59	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J6	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J60	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
K1	540073	“RELAY,2PDT MDX-12-01”
K2	540073	“RELAY,2PDT MDX-12-01”
L1	459228	“IND HORZ,32T AWG32 1-490033”
L10	430031	INDUCTOR FIXED MOLDED 2.2UH
L11	430031	INDUCTOR FIXED MOLDED 2.2UH
L12	430031	INDUCTOR FIXED MOLDED 2.2UH
L13	430031	INDUCTOR FIXED MOLDED 2.2UH
L14	430031	INDUCTOR FIXED MOLDED 2.2UH
L15	430031	INDUCTOR FIXED MOLDED 2.2UH
L16	430031	INDUCTOR FIXED MOLDED 2.2UH
L17	430031	INDUCTOR FIXED MOLDED 2.2UH
L18	430031	INDUCTOR FIXED MOLDED 2.2UH
L19	430031	INDUCTOR FIXED MOLDED 2.2UH
L2	459229	“IND HORZ,39T 32AWG 1-490033”
L20	430014	INDUCTOR MOLDED MIN 100UH
L21	430014	INDUCTOR MOLDED MIN 100UH
L22	430031	INDUCTOR FIXED MOLDED 2.2UH
L23	430031	INDUCTOR FIXED MOLDED 2.2UH
L24	459227	“IND ASSY,1T/1T 32AWG 1-491301”
L25	430045	“IND,0.33UH 10% AXIAL MOLD TH”
L29	450132	“IND ASSY,3T#28 MGT 1-490201”
L3	430014	INDUCTOR MOLDED MIN 100UH
L30	459243	“IND ASSY,7T#22AWG 1-490032”
L31	459244	“IND ASSY,4T#22AWG 1-490032”
L32	430014	INDUCTOR MOLDED MIN 100UH
L35	490144	“IND,VAR 0.22-0.25UH BLUE 10MM”
L36	490144	“IND,VAR 0.22-0.25UH BLUE 10MM”
L37	490204	BEAD FERRITE SHIELD 43 MAT

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
L38	490204	BEAD FERRITE SHIELD 43 MAT
L4	430031	INDUCTOR FIXED MOLDED 2.2UH
L42	490127	COIL 9.5T (MD) SQ
L43	490127	COIL 9.5T (MD) SQ
L5	430031	INDUCTOR FIXED MOLDED 2.2UH
L6	430031	INDUCTOR FIXED MOLDED 2.2UH
L7	430031	INDUCTOR FIXED MOLDED 2.2UH
L8	430031	INDUCTOR FIXED MOLDED 2.2UH
L9	041221000	“IND, 220NH FR 0.45A 20% 1210”
MX1	380021	“MIXER, T17DBM 50KHZ”
Q1	310011	“XSTR, 2N4427 NPN RF TO-39”
Q11	310052	“XSTR, PN2907A PNP TO92”
Q2	310130	“XSTR, MRF581A NPN RF SOT-103”
Q3	310130	“XSTR, MRF581A NPN RF SOT-103”
Q4	310052	“XSTR, PN2907A PNP TO92”
Q8	310083	“XSTR, TIP30C PNP 100V TO-220”
Q9	310052	“XSTR, PN2907A PNP TO92”
R1	113390	“RES,39 OHM 1/8W 5% CARBON FILM”
R10	124470	“RES,47 OHM 1/4W 5% CARBON FILM”
R14	113102	“RES, 1K OHM 1/8W CF 5%”
R15	113681	“RES,680 OHM 1/8W CF 5%”
R16	124101	“RES,100 OHM 1/4W 5% CF”
R17	113471	“RES,470 OHM 1/8W CF 5%”
R18	113100	“RES,10 OHM 1/8W 5% FILM”
R19	113471	“RES,470 OHM 1/8W CF 5%”
R2	113390	“RES,39 OHM 1/8W 5% CARBON FILM”
R20	113681	“RES,680 OHM 1/8W CF 5%”
R21	113681	“RES,680 OHM 1/8W CF 5%”
R22	113681	“RES,680 OHM 1/8W CF 5%”
R23	113681	“RES,680 OHM 1/8W CF 5%”
R27	124101	“RES,100 OHM 1/4W 5% CF”
R28	113681	“RES,680 OHM 1/8W CF 5%”
R29	113681	“RES,680 OHM 1/8W CF 5%”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
R3	113100	“RES,10 OHM 1/8W 5% FILM”
R30	113681	“RES,680 OHM 1/8W CF 5%”
R31	113681	“RES,680 OHM 1/8W CF 5%”
R33	124750	“RES,75 OHM 1/4W 5% CARBON FILM”
R34	113182	“RES,1.8K OHM 1/8W 5% CF”
R35	113220	“RES,22 OHM 1/8W 5% CARBON FILM”
R36	113331	“RES,330 OHM 1/8W CF 5%”
R37	113331	“RES,330 OHM 1/8W CF 5%”
R38	113100	“RES,10 OHM 1/8W 5% FILM”
R4	113681	“RES,680 OHM 1/8W CF 5%”
R41	113471	“RES,470 OHM 1/8W CF 5%”
R42	113471	“RES,470 OHM 1/8W CF 5%”
R43	113102	“RES, 1K OHM 1/8W CF 5%”
R44	113822	“RES,8.2K OHM 1/8W CF 5%”
R45	113122	“RES,1.2K OHM 1/8W CF 5%”
R46	124100	“RES,10 OHM 1/4W 5% CARBON FILM”
R47	113101	“RES,100 OHM 1/8W CF 5%”
R48	113101	“RES,100 OHM 1/8W CF 5%”
R49	113101	“RES,100 OHM 1/8W CF 5%”
R5	113681	“RES,680 OHM 1/8W CF 5%”
R50	113103	“RES, 10K OHM 1/8W CF 5%”
R51	1112741	“RES,2740 OHMS 1/8W 1% RN50 MF”
R52	113101	“RES,100 OHM 1/8W CF 5%”
R53	113103	“RES, 10K OHM 1/8W CF 5%”
R54	113103	“RES, 10K OHM 1/8W CF 5%”
R57	113474	“RES,470K OHM 1/8W CF 5%”
R58	113101	“RES,100 OHM 1/8W CF 5%”
R59	113102	“RES, 1K OHM 1/8W CF 5%”
R6	013510000	“RES,51 OHM 1/8W 5% TK 0805”
R60	113101	“RES,100 OHM 1/8W CF 5%”
R66	113104	“RES,100K OHM 1/8W CF 5%”
R67	113681	“RES,680 OHM 1/8W CF 5%”
R68	113104	“RES,100K OHM 1/8W CF 5%”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
R69	113102	“RES, 1K OHM 1/8W CF 5%”
R7	124750	“RES,75 OHM 1/4W 5% CARBON FILM”
R70	113103	“RES, 10K OHM 1/8W CF 5%”
R71	113103	“RES, 10K OHM 1/8W CF 5%”
R72	113103	“RES, 10K OHM 1/8W CF 5%”
R73	113104	“RES,100K OHM 1/8W CF 5%”
R74	113681	“RES,680 OHM 1/8W CF 5%”
R75	113103	“RES, 10K OHM 1/8W CF 5%”
R76	113471	“RES,470 OHM 1/8W CF 5%”
R77	113103	“RES, 10K OHM 1/8W CF 5%”
R78	113102	“RES, 1K OHM 1/8W CF 5%”
R79	113102	“RES, 1K OHM 1/8W CF 5%”
R8	113681	“RES,680 OHM 1/8W CF 5%”
R80	113100	“RES,10 OHM 1/8W 5% FILM”
R81	134151	“RES,150 OHM 1/2W 5% CF”
R82	113103	“RES, 10K OHM 1/8W CF 5%”
R83	113101	“RES,100 OHM 1/8W CF 5%”
R85	124020	“RES,2.2 OHM 1/4W 5% CF”
R86	124020	“RES,2.2 OHM 1/4W 5% CF”
R9	113681	“RES,680 OHM 1/8W CF 5%”
T1	459226	“IND ASSY,2T2T/4T#32 1-490303”
T2	459169	“XFMR,3T3T/2T#32 AWG 1-490303”
U1	033306030	“IC, ERA-2SM+ 6 GHZ AMP WW107”
U10	330100	“IC,7808 VREG 8V 1A 4% TO-220”
U11	310101	“XSTR, NPN QUAD MPQ2222A DIP14”
U12	310101	“XSTR, NPN QUAD MPQ2222A DIP14”
U2	033306031	“IC, MAV-11SM RF AMP SMT”
U3	033306010	“IC,RF AMP,+12dB,+10dBm,MAR3-SM”
U4	033306010	“IC,RF AMP,+12dB,+10dBm,MAR3-SM”
U5	033306029	“IC,SM,MAR-4SM,MONO AMPLIFIER”
U6	033306010	“IC,RF AMP,+12dB,+10dBm,MAR3-SM”
U7	330273	IC 74HC595
U8	330025	“IC,VREG,78L05,TO92,5V”

Table 10-2 75 MHz IF Board Parts List (001-00710 Rev. AA)

Designator	Part Number	Description
U9	330081	“IC,LIN,LM358N,DIP8,OP-AMP”
XF3	361111	“XTAL FILTER,75MHZ,4 POLE”

CHAPTER 11
5 MHZ BOARD

11.1 Circuit Description

The 5 MHz IF board plugs directly into the motherboard in the third card slot from the right side of the radio. It is connected to the motherboard through the J5 connector and is used in both transmit and receive paths.

The 5 MHz IF board is powered from +12 Vdc and contains voltage regulation and switching circuitry to generate +8 Vdc, +8 Vdc RX only, and +8 Vdc TX only for internal use on the board. The board contains decoder/driver and switching circuits that process the incoming serial data from the processor, using different enable lines to turn on appropriate circuits as requested. For example, BITE EN (J5-7) is the BITE enable line that allows the processor to read the status of the BITE line (J5-17). EN1 (J5-13) tells the decoders to latch in the appropriate input data. NBEN (J5-25) is enabled when the Noise Blanker option (7000NB) is installed. It activates relay K3 which routes 5 MHz IF, in receive only, to and from the Noise Blanker option. NB (J5-10) is the status line for the noise blanker.

11.1.1 Receive Mode

The 75 MHz IF signal is received through coaxial connector J53 and is mixed with the 70 MHz second LO at MX1 to form the second IF at 5 MHz. In standard operation, the RX IF signal is then amplified and applied to the crystal filter where the main receiver selectivity is achieved. If the Noise Blanker option is installed, switch K3 is activated and the 5 MHz signal is routed through J56 to the Noise Blanker board before going through the standard receive path. If the Noise Blanker option is present and selected, the signal is processed and returned through J58 where it then goes through the standard IF process.

The standard crystal filter XF1 is a voice-grade 300 to 2700 Hz, 6-pole filter with a 60 dB bandwidth of 5 kHz. An optional Wideband option XF2 (7000WB1) is available with tailored group delay characteristics, a pass band of 300 to 3300 Hz, and a 60 dB bandwidth of 5.6 kHz. Both filters can be installed simultaneously in the TW7000, with filter selection determined by the front panel mode buttons. An optional CW narrowband (7000CW) is also available with a 500 Hz bandwidth center at 1 kHz.

After filtering, the RX signal is again amplified (U8) and heterodyned with the third LO (BFO) at MX2 to produce baseband audio. The audio is then amplified (U17) and applied to the Audio board through J5-21 (DEMODA).

The demodulated audio is also used as input to the AGC circuit. In this circuit, the AGC threshold is set and the AGC output controls the gain of the IF amplifiers.

11.1.2 Transmit Mode

The modulated audio (MODA) is received on the 5 MHz IF board at J5-8 and is applied to the third mixer MX2 (which now functions like a balanced modulator) where it is heterodyned with the BFO. It is then amplified and applied to the crystal filter.

After filtering, the TX signal is amplified (U8) and routed to the second mixer (U1) where it is mixed with the fixed 70 MHz LO and sent to the 75 MHz IF board at J53. If the radio is operating in AME or PCS modes, the carrier is injected on the TX signal immediately before the last amplifier stage.

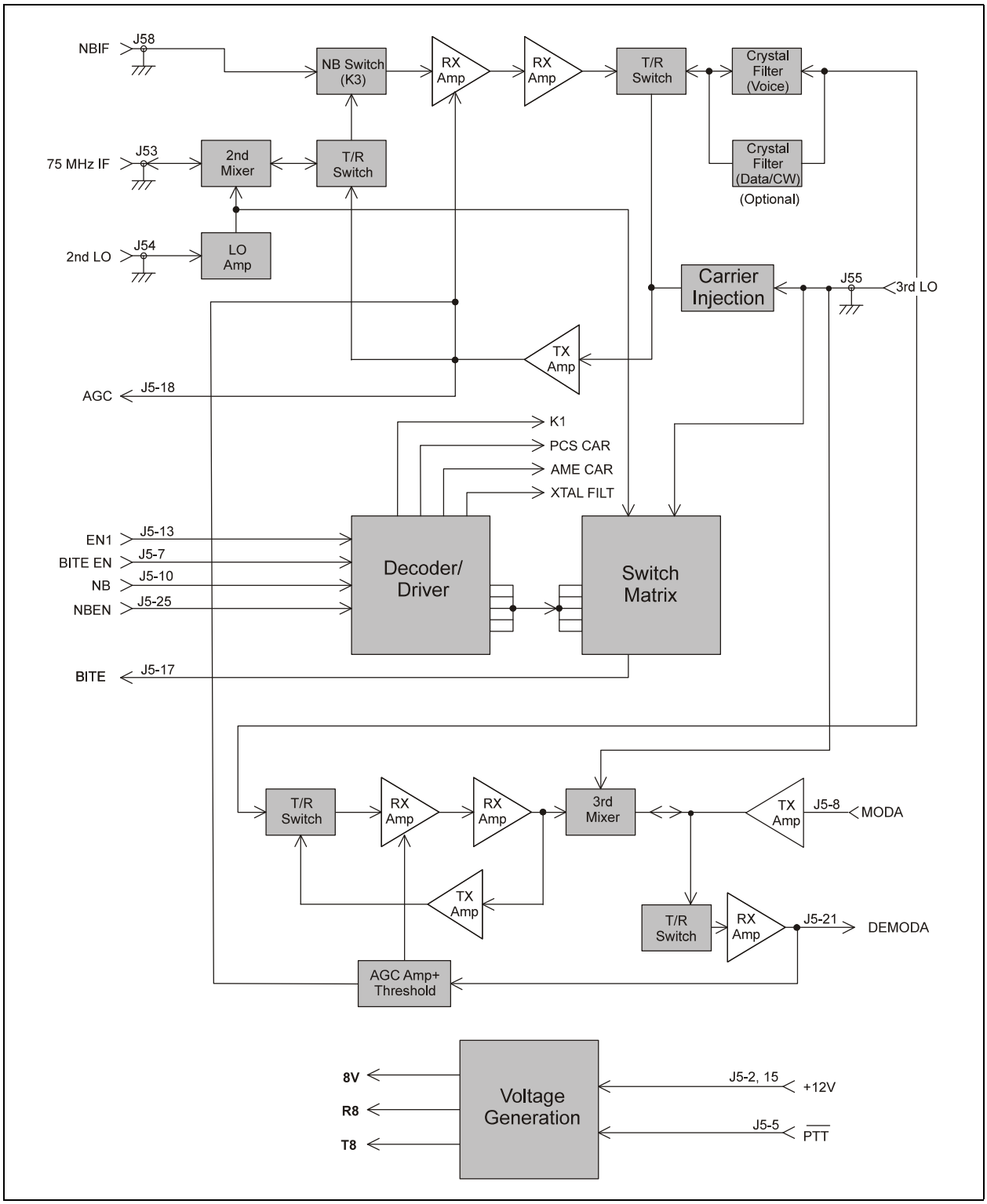


Figure 11-1 5 MHz IF Board Block Diagram

11.2 Connector Pin Assignments

For the interconnect lines between the 5 MHz board and the rest of the radio, refer to the table below.

Table 11-1 J5 Connector Pin Assignments

Pin	Signal	Description
1, 14	GND	Ground
2, 15	+12V	12 Vdc supply voltage
3	SPIRXD	Serial RX data line
4	SPICLK	SPI serial bus clock
5	PTT	Push-to-talk from the Processor board
6	NC	Not connected
7	BITE ENA	BITE enable input
8	MODA	Modulated audio input
9	NC	Not connected
10	NB/FMTST	Noise blanker status line
13	EN6	Strobe
16	SPITXD	Serial TX data line input
17	BITE	BITE status line output
18	AGC	RX AGC voltage output
19	NC	Not connected
20	NC	Not connected
21	DEMODA	Demodulated audio output
22	NC	Not connected
23	NC	Not connected
24	FM ENA	Not used
25	NB ENA	Enable line to Noise Blanker board

11.3 Component Locations, Schematic and Parts List

This section includes a component location diagram, schematic and parts list for the Audio board.

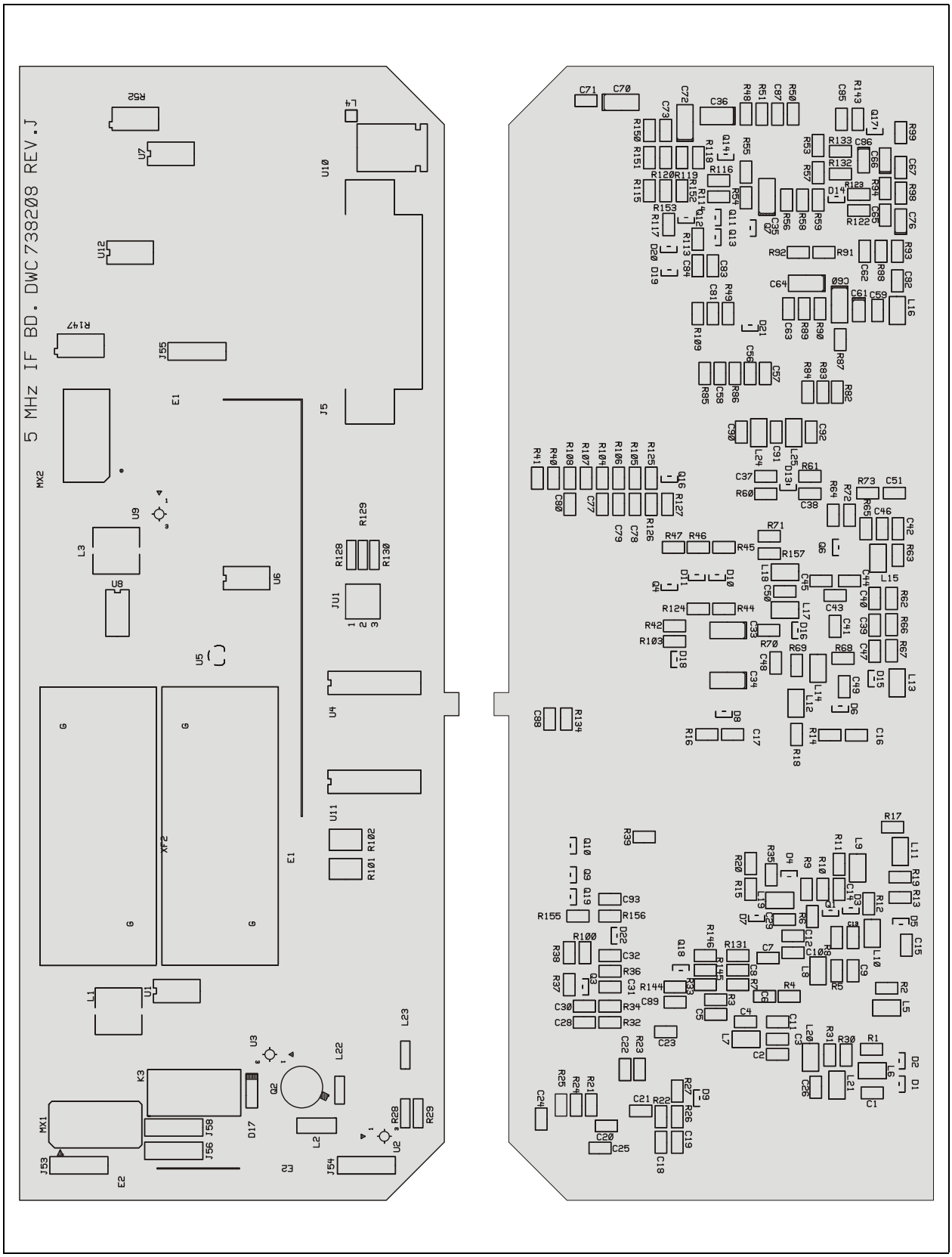


Figure 11-2 5 MHz IF Board Component Locations (738208 Rev. J)

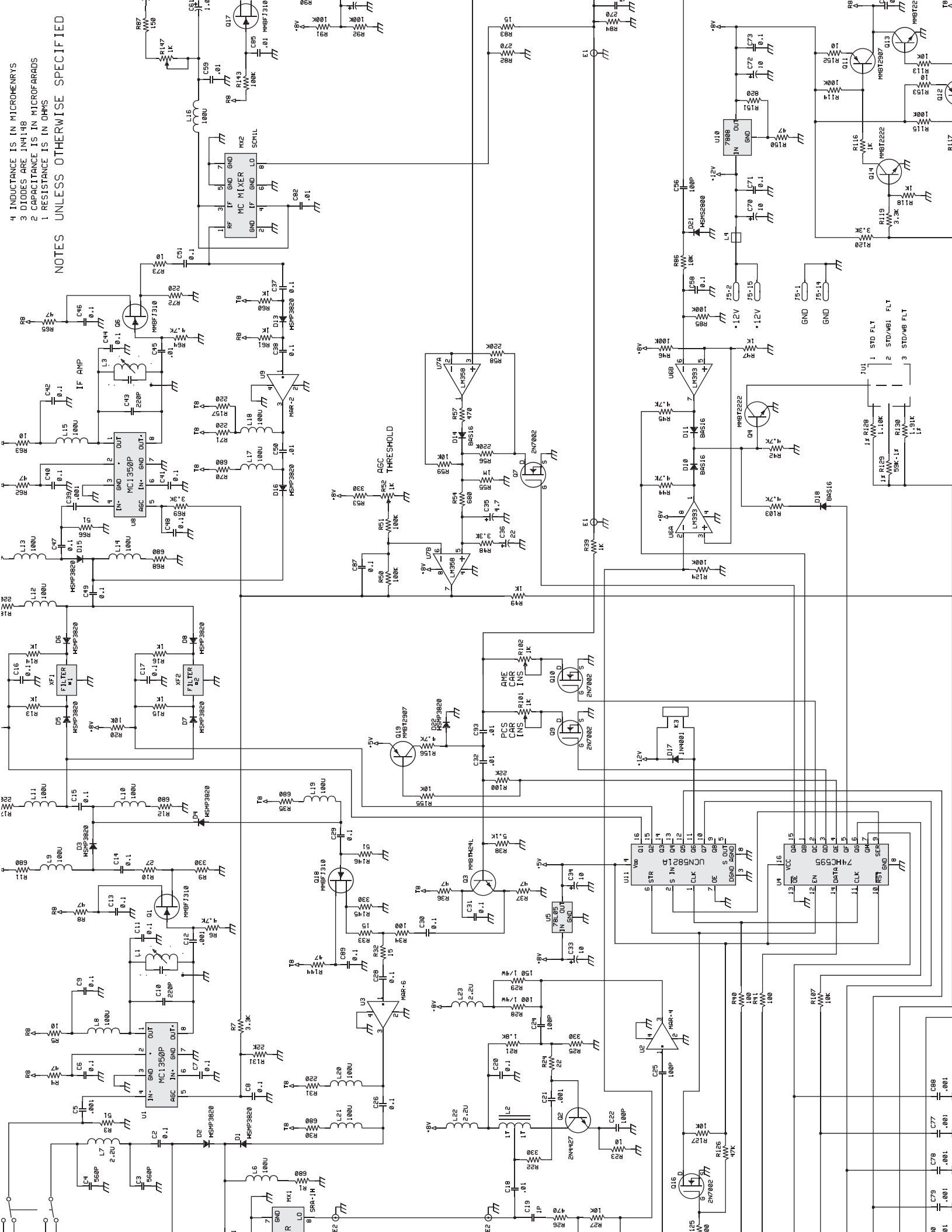

NOTES UNLESS OTHERWISE SPECIFIED
1 RESISTANCE IS IN OHMS
2 CAPACITANCE IS IN MICROFARADS
3 DIODES ARE 1N4148
4 INDUCTANCE IS IN MICROHENRYS
IF AMP
AGC THRESHOLD
AME CAR INS
PCS CAR INS
STD FLT
STD/WB1 FLT
STD/WB FLT
MC MIXER
MC1350P
MAR-2
MAR-4
MAR-6
LM358
LM393
7805 OUT
7808 OUT
UCN5821A
74HC595
MMBT2907
MMBT2222
MMBF310
2N7002
2N4427
MSMP3820
MSMS2800
BAS16
1N4001
SRA-1H
FILTER #1
FILTER #2
J5-1
J5-2
J5-14
J5-15
GND
+12V
+8V
+5V

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
C1	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C10	020221	“CAP, 220PF NPO 50V 10% 1206”
C11	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C12	021102	“CAP,.001MF 50V 10% SMT 1206”
C13	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C14	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C15	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C16	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C17	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C18	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C19	020010	“CAP,1 PF 50V NPO SMT 1206”
C2	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C20	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C21	021102	“CAP,.001MF 50V 10% SMT 1206”
C22	020101	“CAP,100PF 100V 5% NPO 1206”
C23	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C24	020101	“CAP,100PF 100V 5% NPO 1206”
C25	020101	“CAP,100PF 100V 5% NPO 1206”
C26	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C28	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C29	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C3	020561	“CAP,560PF 50V 5% NPO SMT 1206”
C30	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C31	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C32	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C33	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C34	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C35	023047	“CAP,4.7UF,16V,SMT,TANT,6032”
C36	022220	“CAP,22UF TA 16V 20% 5646-31”
C37	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C38	021104	“CAP,.1MF 50V 10% X7R SMT 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
C39	021102	“CAP,.001MF 50V 10% SMT 1206”
C4	020561	“CAP,560PF 50V 5% NPO SMT 1206”
C40	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C41	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C42	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C43	020221	“CAP, 220PF NPO 50V 10% 1206”
C44	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C45	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C46	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C47	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C48	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C49	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C5	021102	“CAP,.001MF 50V 10% SMT 1206”
C50	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C51	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C56	020101	“CAP,100PF 100V 5% NPO 1206”
C57	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C58	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C59	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C6	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C60	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C61	022010	“CAP, 1UF TA 16V 10% 1206”
C62	020221	“CAP, 220PF NPO 50V 10% 1206”
C63	020680	“CAP,68PF 50V 5% NPO SMT 1206”
C64	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C65	021102	“CAP,.001MF 50V 10% SMT 1206”
C66	022010	“CAP, 1UF TA 16V 10% 1206”
C67	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C7	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C70	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C71	021104	“CAP,.1MF 50V 10% X7R SMT 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
C72	022100	“CAP,SMT,TANT,10MF,10%,16V,2213”
C73	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C76	022010	“CAP, 1UF TA 16V 10% 1206”
C77	021102	“CAP,.001MF 50V 10% SMT 1206”
C78	021102	“CAP,.001MF 50V 10% SMT 1206”
C79	021102	“CAP,.001MF 50V 10% SMT 1206”
C8	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C80	021102	“CAP,.001MF 50V 10% SMT 1206”
C81	021102	“CAP,.001MF 50V 10% SMT 1206”
C82	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C83	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C84	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C85	021103	“CAP,.01MF 50V 10% X7R SMT1206”
C86	022010	“CAP, 1UF TA 16V 10% 1206”
C87	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C88	021102	“CAP,.001MF 50V 10% SMT 1206”
C89	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C9	021104	“CAP,.1MF 50V 10% X7R SMT 1206”
C90	020561	“CAP,560PF 50V 5% NPO SMT 1206”
C91	021102	“CAP,.001MF 50V 10% SMT 1206”
C92	020561	“CAP,560PF 50V 5% NPO SMT 1206”
C93	021103	“CAP,.01MF 50V 10% X7R SMT1206”
D1	031005	“DIODE,HSMP-3820 PIN SOT-23”
D10	031002	“DIODE, BAS16 75V 0.2A SOT-23”
D11	031002	“DIODE, BAS16 75V 0.2A SOT-23”
D13	031005	“DIODE,HSMP-3820 PIN SOT-23”
D14	031002	“DIODE, BAS16 75V 0.2A SOT-23”
D15	031005	“DIODE,HSMP-3820 PIN SOT-23”
D16	031005	“DIODE,HSMP-3820 PIN SOT-23”
D17	320102	“DIODE, 1N4001 1A 50V DO-41”
D18	031002	“DIODE, BAS16 75V 0.2A SOT-23”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
D19	031002	“DIODE, BAS16 75V 0.2A SOT-23”
D2	031005	“DIODE,HSMP-3820 PIN SOT-23”
D20	031002	“DIODE, BAS16 75V 0.2A SOT-23”
D21	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D22	031005	“DIODE,HSMP-3820 PIN SOT-23”
D3	031005	“DIODE,HSMP-3820 PIN SOT-23”
D4	031005	“DIODE,HSMP-3820 PIN SOT-23”
D5	031005	“DIODE,HSMP-3820 PIN SOT-23”
D6	031005	“DIODE,HSMP-3820 PIN SOT-23”
D7	031005	“DIODE,HSMP-3820 PIN SOT-23”
D8	031005	“DIODE,HSMP-3820 PIN SOT-23”
D9	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
E1	769331-1	“SEMI-RIGID CA,5MHZ IF,TW7000”
E2	769331-2	“SEMI-RIGID CA,5MHZ IF,TW7000”
J5	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J53	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J54	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J55	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J56	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
J58	614026	“CONN,RF FEMALE LOW-TYPE RECEPT”
JU1	614057	“HEADER,9 PIN MALE 3 X 3”
JU1	860097	“MICRO SHUNT, .100 CENTERS”
K3	540073	“RELAY,2PDT MDX-12-01”
L1	420017	INDUCTOR IF 10.7MHZ
L10	045104	“IND,100 UH FR 150MA 10% 1210”
L11	045104	“IND,100 UH FR 150MA 10% 1210”
L12	045104	“IND,100 UH FR 150MA 10% 1210”
L13	045104	“IND,100 UH FR 150MA 10% 1210”
L14	045104	“IND,100 UH FR 150MA 10% 1210”
L15	045104	“IND,100 UH FR 150MA 10% 1210”
L16	045104	“IND,100 UH FR 150MA 10% 1210”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
L17	045104	“IND,100 UH FR 150MA 10% 1210”
L18	045104	“IND,100 UH FR 150MA 10% 1210”
L19	045104	“IND,100 UH FR 150MA 10% 1210”
L2	459242	“XFMR,2T#28 AWG 1-491301”
L20	045104	“IND,100 UH FR 150MA 10% 1210”
L21	045104	“IND,100 UH FR 150MA 10% 1210”
L22	430031	INDUCTOR FIXED MOLDED 2.2UH
L23	430031	INDUCTOR FIXED MOLDED 2.2UH
L24	045222	“INDUCTOR,2.2 UH 20% SMT 1210”
L25	045222	“INDUCTOR,2.2 UH 20% SMT 1210”
L3	420017	INDUCTOR IF 10.7MHZ
L4	459032	“IND ASY,3T#30 MAGNET 1-490201”
L5	045104	“IND,100 UH FR 150MA 10% 1210”
L6	045104	“IND,100 UH FR 150MA 10% 1210”
L7	045222	“INDUCTOR,2.2 UH 20% SMT 1210”
L8	045104	“IND,100 UH FR 150MA 10% 1210”
L9	045104	“IND,100 UH FR 150MA 10% 1210”
MX1	380008	“MIXER,SRA-1H +17 DBM”
MX2	380007	MIXER
Q1	032001	“JFET-N,J310, RF AMP, SOT-23”
Q10	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q11	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q12	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q13	032004	“XSTR,MMBT2222A NPN SOT23”
Q14	032004	“XSTR,MMBT2222A NPN SOT23”
Q16	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q17	032001	“JFET-N,J310, RF AMP, SOT-23”
Q18	032001	“JFET-N,J310, RF AMP, SOT-23”
Q19	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q2	310011	“XSTR, 2N4427 NPN RF TO-39”
Q3	032003	“XSTR, MMBTH10LT1 NPN VHF SOT23”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
Q4	032004	“XSTR,MMBT2222A NPN SOT23”
Q6	032001	“JFET-N,J310, RF AMP, SOT-23”
Q7	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q9	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
R1	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R10	013270	“RES,27 OHM 1/8W 5% SMT 1206”
R100	013223	“RES,22K OHM 1/4W 5% TK 1206”
R101	170224	POT 1K 12T 1/4W V-ADJ TH
R102	170224	POT 1K 12T 1/4W V-ADJ TH
R103	013472	“RES,4.7K 1/8W 5% SMT 1206”
R104	013101	“RES,100 OHM 1/4W 5% TK 1206”
R105	013101	“RES,100 OHM 1/4W 5% TK 1206”
R106	013101	“RES,100 OHM 1/4W 5% TK 1206”
R107	013103	“RES,10K OHM 1/4W 5% TK 1206”
R108	013101	“RES,100 OHM 1/4W 5% TK 1206”
R109	013101	“RES,100 OHM 1/4W 5% TK 1206”
R11	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R113	013103	“RES,10K OHM 1/4W 5% TK 1206”
R114	013104	“RES,100K OHM 1/4W 5% TK 1206”
R115	013104	“RES,100K OHM 1/4W 5% TK 1206”
R116	013102	“RES,1K OHM 1/4W 5% TK 1206”
R117	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R118	013102	“RES,1K OHM 1/4W 5% TK 1206”
R119	013332	“RES,3,3K 1/8W 5% SMT 1206”
R12	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R120	013332	“RES,3,3K 1/8W 5% SMT 1206”
R122	013103	“RES,10K OHM 1/4W 5% TK 1206”
R123	013103	“RES,10K OHM 1/4W 5% TK 1206”
R124	013104	“RES,100K OHM 1/4W 5% TK 1206”
R125	013101	“RES,100 OHM 1/4W 5% TK 1206”
R126	013473	“RES, 47K 1/8W 5% SMT 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
R127	013103	“RES,10K OHM 1/4W 5% TK 1206”
R128	1111101	“RES, 1.10K MF 1/8W 1%”
R129	1115902	RES 59K 1/8 WATT 1% METAL FILM
R13	013102	“RES,1K OHM 1/4W 5% TK 1206”
R130	1111911	“RES, 1.91K 1/8W 1%”
R131	013223	“RES,22K OHM 1/4W 5% TK 1206”
R132	013104	“RES,100K OHM 1/4W 5% TK 1206”
R133	013104	“RES,100K OHM 1/4W 5% TK 1206”
R134	013101	“RES,100 OHM 1/4W 5% TK 1206”
R14	013102	“RES,1K OHM 1/4W 5% TK 1206”
R143	013104	“RES,100K OHM 1/4W 5% TK 1206”
R144	013470	“RES,47 OHM 1/4W 5% TK 1206”
R145	013331	“RES,330 OHM 1/8W 5% SMT 1206”
R146	013510	“RES,51 OHM 1/8W 5% SMT 1206”
R147	170336	“RES, 1K TRIM SIDE ADJ”
R15	013102	“RES,1K OHM 1/4W 5% TK 1206”
R150	013470	“RES,47 OHM 1/4W 5% TK 1206”
R151	013821	“RES,820 OHMS 1/8W 5% SMT 1206”
R152	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R153	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R155	013103	“RES,10K OHM 1/4W 5% TK 1206”
R156	013472	“RES,4.7K 1/8W 5% SMT 1206”
R157	013221	“RES,220 OHM 1/4W 5% TK 1206”
R16	013102	“RES,1K OHM 1/4W 5% TK 1206”
R17	013221	“RES,220 OHM 1/4W 5% TK 1206”
R18	013221	“RES,220 OHM 1/4W 5% TK 1206”
R19	013103	“RES,10K OHM 1/4W 5% TK 1206”
R2	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R20	013103	“RES,10K OHM 1/4W 5% TK 1206”
R21	013182	“RES,1.8K OHM 1/4W 5% TK 1206”
R22	013331	“RES,330 OHM 1/8W 5% SMT 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
R23	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R24	013220	“RES,22 OHM 1/8W 5% SMT 1206”
R25	013331	“RES,330 OHM 1/8W 5% SMT 1206”
R26	013471	“RES,470 OHMS 1/8W 5% SMT 1206”
R27	013103	“RES,10K OHM 1/4W 5% TK 1206”
R28	124101	“RES,100 OHM 1/4W 5% CF”
R29	124151	“RES,150 OHM 1/4W 5% CF”
R3	013510	“RES,51 OHM 1/8W 5% SMT 1206”
R30	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R31	013221	“RES,220 OHM 1/4W 5% TK 1206”
R32	013150	“RES,15 OHM 1/4W 5% TK 1206”
R33	013150	“RES,15 OHM 1/4W 5% TK 1206”
R34	013101	“RES,100 OHM 1/4W 5% TK 1206”
R35	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R36	013470	“RES,47 OHM 1/4W 5% TK 1206”
R37	013470	“RES,47 OHM 1/4W 5% TK 1206”
R38	013512	“RES, 5.1K OHM 1/4W 5% TK 1206”
R39	013102	“RES,1K OHM 1/4W 5% TK 1206”
R4	013470	“RES,47 OHM 1/4W 5% TK 1206”
R40	013101	“RES,100 OHM 1/4W 5% TK 1206”
R41	013101	“RES,100 OHM 1/4W 5% TK 1206”
R42	013472	“RES,4.7K 1/8W 5% SMT 1206”
R44	013472	“RES,4.7K 1/8W 5% SMT 1206”
R45	013472	“RES,4.7K 1/8W 5% SMT 1206”
R46	013104	“RES,100K OHM 1/4W 5% TK 1206”
R47	013102	“RES,1K OHM 1/4W 5% TK 1206”
R48	013332	“RES,3,3K 1/8W 5% SMT 1206”
R49	013102	“RES,1K OHM 1/4W 5% TK 1206”
R5	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R50	013104	“RES,100K OHM 1/4W 5% TK 1206”
R51	013104	“RES,100K OHM 1/4W 5% TK 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
R52	170336	“RES, 1K TRIM SIDE ADJ”
R53	013331	“RES,330 OHM 1/8W 5% SMT 1206”
R54	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R55	013105	“RES,1M OHM 1/4W 5% TK 1206”
R56	013224	“RES,220K OHM 1/4W 5% TK 1206”
R57	013471	“RES,470 OHMS 1/8W 5% SMT 1206”
R58	013224	“RES,220K OHM 1/4W 5% TK 1206”
R59	013103	“RES,10K OHM 1/4W 5% TK 1206”
R6	013472	“RES,4.7K 1/8W 5% SMT 1206”
R60	013102	“RES,1K OHM 1/4W 5% TK 1206”
R61	013102	“RES,1K OHM 1/4W 5% TK 1206”
R62	013470	“RES,47 OHM 1/4W 5% TK 1206”
R63	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R64	013472	“RES,4.7K 1/8W 5% SMT 1206”
R65	013470	“RES,47 OHM 1/4W 5% TK 1206”
R66	013510	“RES,51 OHM 1/8W 5% SMT 1206”
R67	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R68	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R69	013332	“RES,3,3K 1/8W 5% SMT 1206”
R7	013332	“RES,3,3K 1/8W 5% SMT 1206”
R70	013681	“RES,680 OHM 1/8W 5% SMT 1206”
R71	013221	“RES,220 OHM 1/4W 5% TK 1206”
R72	013221	“RES,220 OHM 1/4W 5% TK 1206”
R73	013100	“RES, 10 OHM 1/4W 5% TK 1206”
R8	013470	“RES,47 OHM 1/4W 5% TK 1206”
R82	013271	“RES,270 OHM 1/8W 5% SMT 1206”
R83	013150	“RES,15 OHM 1/4W 5% TK 1206”
R84	013271	“RES,270 OHM 1/8W 5% SMT 1206”
R85	013104	“RES,100K OHM 1/4W 5% TK 1206”
R86	013103	“RES,10K OHM 1/4W 5% TK 1206”
R87	013151	“RES,150 OHM 1/4W 5% TK 1206”

Table 11-2 5 MHz IF Board Parts List (001-00800 Rev. AB)

Designator	Part Number	Description
R88	013223	“RES,22K OHM 1/4W 5% TK 1206”
R89	013474	“RES,470K 1/8W 5% SMT 1206”
R9	013331	“RES,330 OHM 1/8W 5% SMT 1206”
R90	013222	“RES,2.2K OHM 1/4W 5% TK 1206”
R91	013104	“RES,100K OHM 1/4W 5% TK 1206”
R92	013104	“RES,100K OHM 1/4W 5% TK 1206”
R93	013472	“RES,4.7K 1/8W 5% SMT 1206”
R94	013472	“RES,4.7K 1/8W 5% SMT 1206”
R98	013101	“RES,100 OHM 1/4W 5% TK 1206”
R99	013101	“RES,100 OHM 1/4W 5% TK 1206”
U1	330009	“IC,LIN,MC1350P,DIP8,IF AMP”
U10	330100	“IC,7808 VREG 8V 1A 4% TO-220”
U11	330384	“IC,5821 8-BIT SER DRIVER DIP16”
U12	330368	“IC,MC33078”
U2	380012	“IC, MAR-4+ 1GHZ RF AMP MICRO-X”
U3	380011	“IC, MAR-6+ RF AMP MICRO-X”
U4	330273	IC 74HC595
U5	330025	“IC,VREG,78L05,TO92,5V”
U6	330185	IC LM393N
U7	330081	“IC,LIN,LM358N,DIP8,OP-AMP”
U8	330009	“IC,LIN,MC1350P,DIP8,IF AMP”
U9	380013	“IC,MAR-2 MONOLITHIC AMPLIFIER”
XF1	830017	WASHER SEAL
XF1	361088	“CRYSTAL FILTER 5MHZ, STANDARD”

CHAPTER 12
AUDIO BOARD

12.1 Circuit Description

The Audio board is located in the fifth card slot from the right side of the radio. It connects to the motherboard through connectors J7 and J8, and is used in both receive and transmit paths.

The Audio board operates on a +12 Vdc input and includes onboard regulators to generate +10 Vdc and +5 Vdc for internal use. Decoder/driver circuits take the serial data control inputs and translate them into binary commands for the TX and RX gates in the board. These gates direct RX and TX audio to the various optional devices installed in the TW7000.

12.1.1 Receive Mode

Demodulated audio from the 5 MHz IF board is applied to the Audio board at (DEMODA) J8-21, it is applied to an op amp (U8D), and passes through the RX CMOS gates. Depending on what options are installed, these gates route the RX audio to the appropriate options or accessory connectors and the commands from the decoder/driver circuits. Primary receiver audio is then applied to another op amp (U14C), then to the squelch circuit on the Processor board at J8-4 (DSPRRXA).

The squelch circuit on the Processor board samples the audio. If the front panel **SQUELCH** is off, squelch is disabled and the squelch gate (U13D on the Audio board) is always open; if it is on, the squelch gate is controlled by the level and the syllabic nature of the RX audio sampled on the squelch circuit on the Processor board. After processing, squelched audio returns to the Audio board at J8-17 (DSPPRX2). The squelch signal (J8-23) from the processor controls the squelch gate in the Audio board. The squelched audio (SQA) leaves the Audio board at J8-7 and is applied to the internal speaker through the Front Panel Assembly.

Balanced RX audio is sent to accessory 1 at J8-6, 19. Balanced RX audio is sent to accessory 2 at J8-11, 24.

12.1.2 Transmit Mode

Primary microphone audio (PRIMICA) is received from the front panel at J8-20. Balanced audio from the **ACCESSORY 1** or **ACCESSORY 2** connector is received at J8-5,18 and is transformed to unbalanced before being processed like microphone audio. These inputs pass through the TX gating circuits having

the same function on the transmit side that the RX gating circuits have on the RX side. The modulated audio output (MODA) is applied to the 5 MHz IF board at J8-8.

The Audio board also includes the CW oscillator keyed by the CWKEY line (J8-10). CW tone output is routed through the transmit processing path and goes out as MODA, while a sample of the same tone is connected into the receive path and used for CW sidetone. R99 adjusts the frequency of the CW oscillator.

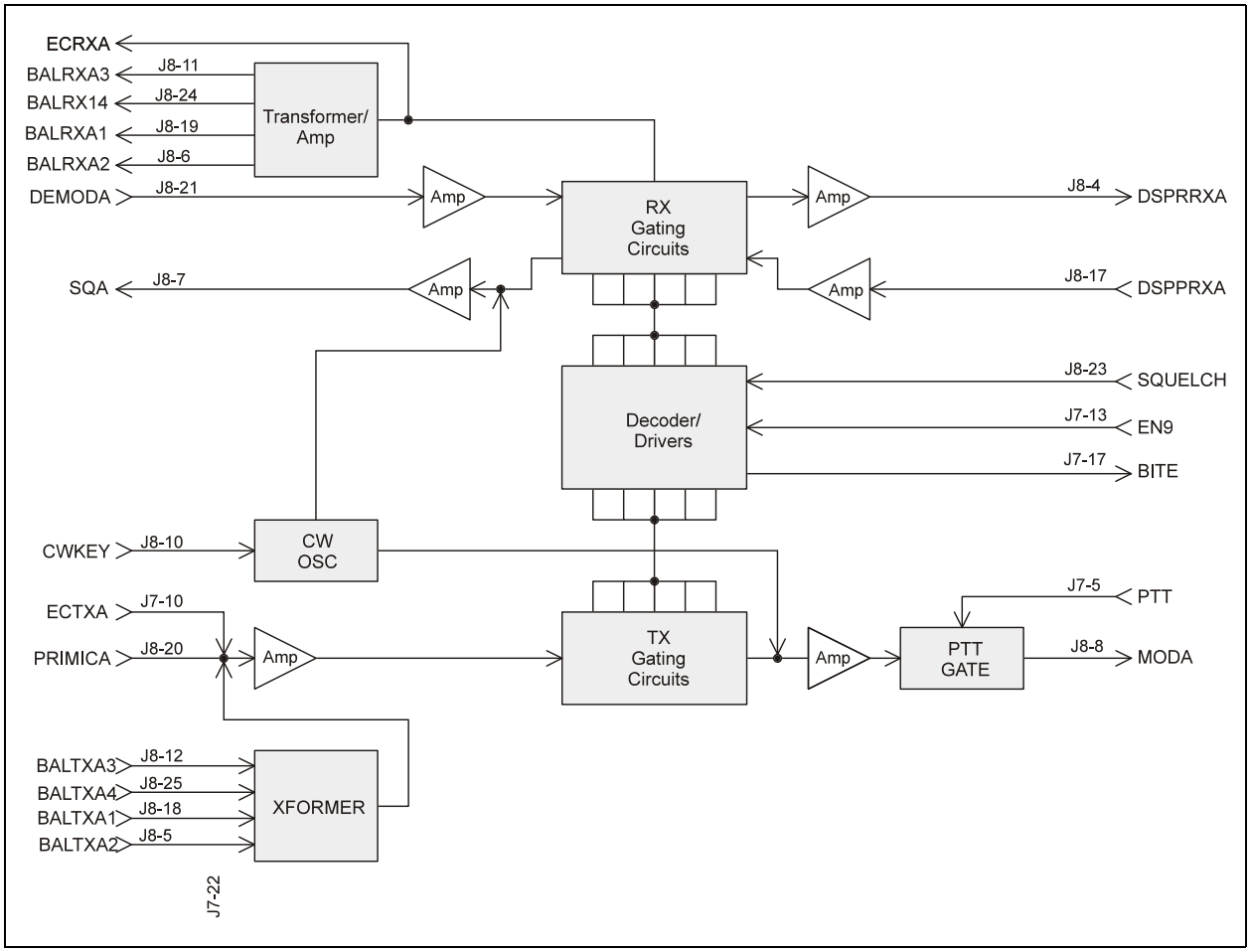


Figure 12-1 Audio Board Block Diagram

12.2 Connector Pin Assignments

12.2.1 J7 Connector

For the interconnect lines between the Audio board and the rest of the radio, refer to the table below.

Table 12-1 J7 Connector Pin Assignments

Pin	Signal	Description
1, 14	GND	Ground
2, 15	+12V	+12 Vdc supply voltage
3	SPIRXD	Serial RX data line
4	SPICLK	Clock
5	PTT\	Push-to-talk
6	OPTRXA1	RX audio to option slots
7	OPTRXA2	RX audio to option slots
8	OPTTXA1	TX audio to option slots
9	OPTTXA2	TX audio to option slots
10	ECTXA	TX audio from RCU interface slot
11	ALERXA1	RX audio to ALE option slot
12	ALERXA2	RX audio to ALE option slot
13	EN9	Data enable
16	SPITXD	Serial TX data line
17	BITE\	BITE status line
18	ENCRRXA1	RX audio to encryption slots
19	ENCRRXA2	RX audio to encryption slots
20	ENCRTXA1	TX audio to encryption slots
21	ENCRTXA2	TX audio to encryption slots
22	ECRXA	RX audio to RCU interface slot
23	ALETXA1	TX audio from ALE option slot
24	ALETXA2	TX audio from ALE option slot

12.2.2 J8 Connector

J8 connects to the Motherboard.

Table 12-2 J8 Connector Pin Assignments

Pin	Signal	Description
1, 14	Ground	
3	DSPRTXA	TX audio out to processor
4	DSPRRXA	RX audio out to processor
5	BALTXA2	Balanced TX audio from accessory 1
18	BALTXA1	Balanced TX audio from accessory 1
6	BALRXA2	Balanced RX audio to accessory 1
19	BALRXA1	Balanced RX audio to accessory 1
7	SQA	Squelched RX audio output
8	MODA	Modulated TX audio output
9	TCTXAO	Transcall TX audio input
10	CWKEY\	CW key line
11	BALRXA3	Balanced RX audio to accessory 2
12	BALTXA3	Balanced TX audio from accessory 2
16	DSPPTXA	TX audio in from processor
17	DSPPRXA	RX audio in from processor
20	PRIMICA	Microphone audio input
21	DEMODA	Demodulated RX audio input
22	TCRXAI	Transcall RX audio output
23	Squelch	Squelch signal from processor
24	BALRXA4	Balanced RX audio to accessory 2
25	BALTXA4	Balanced TX audio from accessory 2

12.3 Component Locations, Schematic and Parts List

This section includes a components location diagram, schematic and parts list for the Audio board.

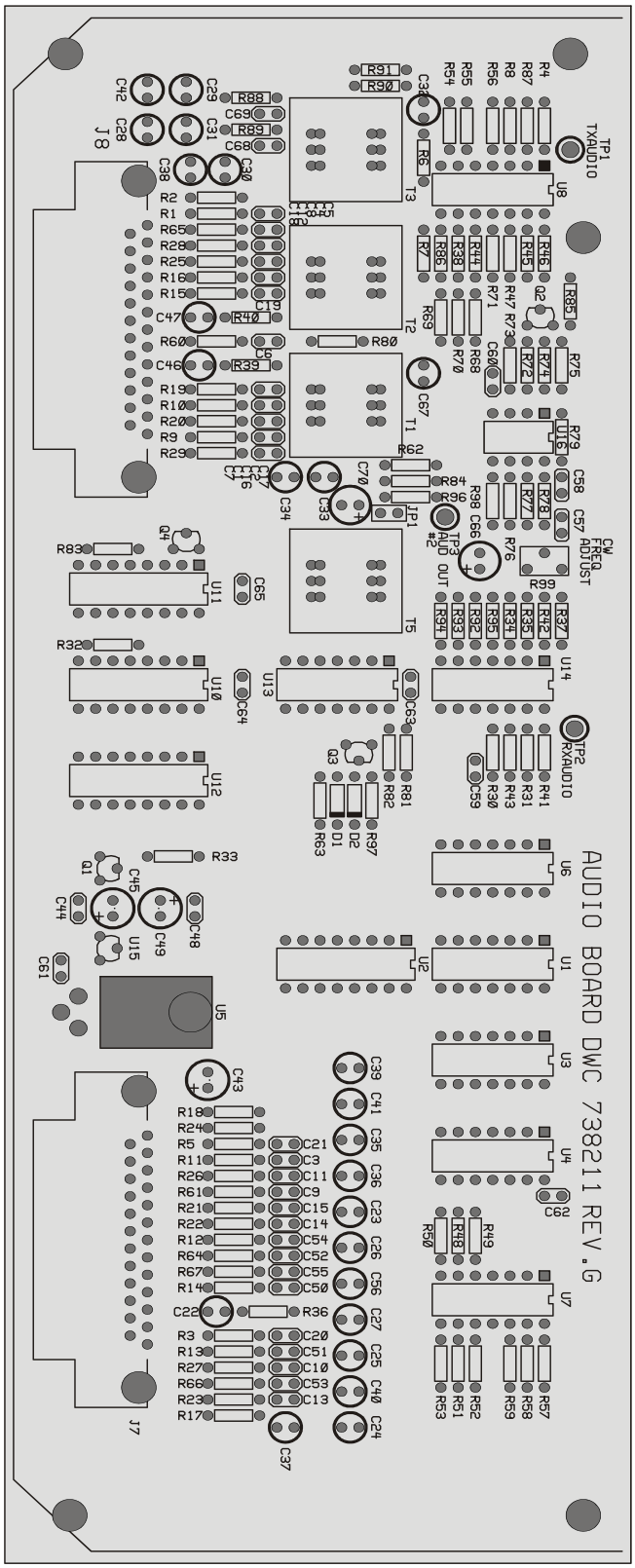


Figure 12-2 Audio Board Component Locations (738211 Rev. G)

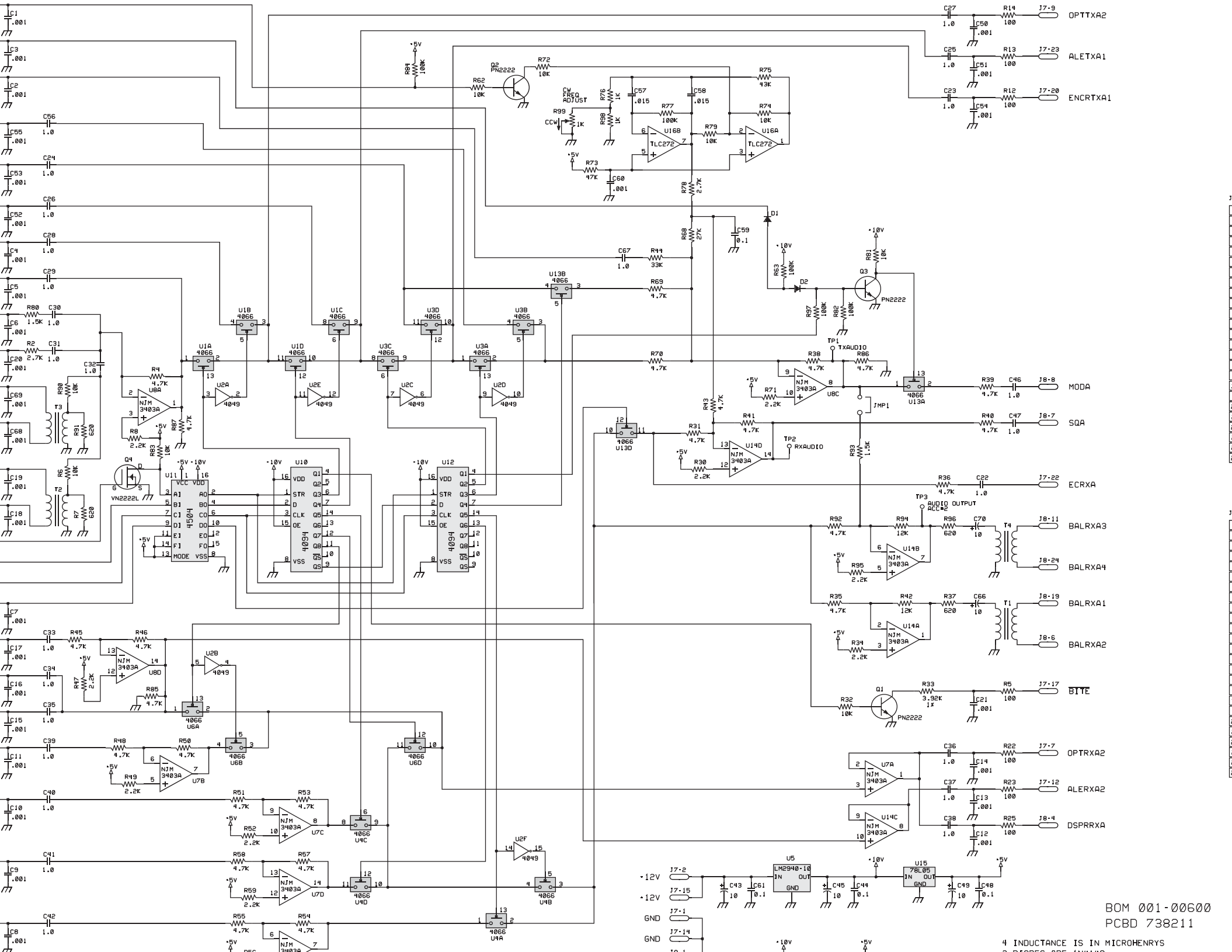

OPTTXA2
ALETXA1
ENCRTXA1
MODA
SQA
ECRXA
BALRXA3
BALRXA4
BALRXA1
BALRXA2
BITE
OPTRXA2
ALERXA2
DSPRRXA
TXAUDIO
RXAUDIO
AUDIO OUTPUT
CW FREQ ADJUST
BOM 001-00600
PCBD 738211
4 INDUCTANCE IS IN MICROHENRYS

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
C1	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C10	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C11	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C12	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C13	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C14	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C15	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C16	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C17	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C18	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C19	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C2	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C20	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C21	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C22	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C23	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C24	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C25	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C26	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C27	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C28	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C29	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C3	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C30	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C31	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C32	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C33	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C34	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C35	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C36	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C37	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C38	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C39	230010	“CAP, 1UF AL 50V 20% NON-POLAR”

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
C4	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C40	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C41	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C42	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C43	232100	“CAP, 10UF AL 35V 20% 5X7 0.1LS”
C44	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C45	232100	“CAP, 10UF AL 35V 20% 5X7 0.1LS”
C46	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C47	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C48	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C49	232100	“CAP, 10UF AL 35V 20% 5X7 0.1LS”
C5	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C50	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C51	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C52	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C53	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C54	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C55	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C56	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C57	254153	“CAP, 0.015UF MYLAR 10% 100V 3.5LS”
C58	254153	“CAP, 0.015UF MYLAR 10% 100V 3.5LS”
C59	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C6	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C60	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C61	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C62	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C63	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C64	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C65	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C66	232100	“CAP, 10UF AL 35V 20% 5X7 0.1LS”
C67	230010	“CAP, 1UF AL 50V 20% NON-POLAR”
C68	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C69	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
C7	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C70	232100	“CAP, 10UF AL 35V 20% 5X7 0.1LS”
C8	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C9	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
D1	320002	“DIODE, 1N4148/1N4150 DO-35”
D2	320002	“DIODE, 1N4148/1N4150 DO-35”
J7	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J8	613163	“CONN,DB-25 RT ANGLE PC PLUG”
JP1	650048	“HEADER, PIN 1X2 MLX 0.1 TH”
Q1	310057	“XISTOR,NPN,PN2222A,TO92”
Q2	310057	“XISTOR,NPN,PN2222A,TO92”
Q3	310057	“XISTOR,NPN,PN2222A,TO92”
Q4	310138	“XISTOR,FET,VN2222LL,TO92”
R1	113101	“RES,100 OHM 1/8W CF 5%”
R10	113101	“RES,100 OHM 1/8W CF 5%”
R11	113101	“RES,100 OHM 1/8W CF 5%”
R12	113101	“RES,100 OHM 1/8W CF 5%”
R13	113101	“RES,100 OHM 1/8W CF 5%”
R14	113101	“RES,100 OHM 1/8W CF 5%”
R15	113101	“RES,100 OHM 1/8W CF 5%”
R16	113101	“RES,100 OHM 1/8W CF 5%”
R17	113101	“RES,100 OHM 1/8W CF 5%”
R18	113101	“RES,100 OHM 1/8W CF 5%”
R19	113101	“RES,100 OHM 1/8W CF 5%”
R2	113272	“RES,2.7K OHM 1/8W CF 5%”
R20	113101	“RES,100 OHM 1/8W CF 5%”
R21	113101	“RES,100 OHM 1/8W CF 5%”
R22	113101	“RES,100 OHM 1/8W CF 5%”
R23	113101	“RES,100 OHM 1/8W CF 5%”
R24	113101	“RES,100 OHM 1/8W CF 5%”
R25	113101	“RES,100 OHM 1/8W CF 5%”
R26	113101	“RES,100 OHM 1/8W CF 5%”
R27	113101	“RES,100 OHM 1/8W CF 5%”

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
R28	113101	“RES,100 OHM 1/8W CF 5%”
R29	113101	“RES,100 OHM 1/8W CF 5%”
R3	113101	“RES,100 OHM 1/8W CF 5%”
R30	113222	“RES,2.2K OHM 1/8W CF 5%”
R31	113472	“RES, 4.7K OHM 1/8W CF 5%”
R32	113103	“RES, 10K OHM 1/8W CF 5%”
R33	1113921	“RES, 3.92K OHMS 1/8W 1% MF”
R34	113222	“RES,2.2K OHM 1/8W CF 5%”
R35	113472	“RES, 4.7K OHM 1/8W CF 5%”
R36	113472	“RES, 4.7K OHM 1/8W CF 5%”
R37	113621	“RES,620 OHM 1/8W CF 5%”
R38	113472	“RES, 4.7K OHM 1/8W CF 5%”
R39	113472	“RES, 4.7K OHM 1/8W CF 5%”
R4	113472	“RES, 4.7K OHM 1/8W CF 5%”
R40	113472	“RES, 4.7K OHM 1/8W CF 5%”
R41	113472	“RES, 4.7K OHM 1/8W CF 5%”
R42	113123	“RES,12K OHM 1/8W CF 5%”
R43	113472	“RES, 4.7K OHM 1/8W CF 5%”
R44	113333	“RES,33K OHM 1/8W CF 5%”
R45	113472	“RES, 4.7K OHM 1/8W CF 5%”
R46	113472	“RES, 4.7K OHM 1/8W CF 5%”
R47	113222	“RES,2.2K OHM 1/8W CF 5%”
R48	113472	“RES, 4.7K OHM 1/8W CF 5%”
R49	113222	“RES,2.2K OHM 1/8W CF 5%”
R5	113101	“RES,100 OHM 1/8W CF 5%”
R50	113472	“RES, 4.7K OHM 1/8W CF 5%”
R51	113472	“RES, 4.7K OHM 1/8W CF 5%”
R52	113222	“RES,2.2K OHM 1/8W CF 5%”
R53	113472	“RES, 4.7K OHM 1/8W CF 5%”
R54	113472	“RES, 4.7K OHM 1/8W CF 5%”
R55	113472	“RES, 4.7K OHM 1/8W CF 5%”
R56	113222	“RES,2.2K OHM 1/8W CF 5%”
R57	113472	“RES, 4.7K OHM 1/8W CF 5%”

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
R58	113472	“RES, 4.7K OHM 1/8W CF 5%”
R59	113222	“RES,2.2K OHM 1/8W CF 5%”
R6	113103	“RES, 10K OHM 1/8W CF 5%”
R60	113101	“RES,100 OHM 1/8W CF 5%”
R61	113101	“RES,100 OHM 1/8W CF 5%”
R62	113103	“RES, 10K OHM 1/8W CF 5%”
R63	113104	“RES,100K OHM 1/8W CF 5%”
R64	113101	“RES,100 OHM 1/8W CF 5%”
R65	113101	“RES,100 OHM 1/8W CF 5%”
R66	113101	“RES,100 OHM 1/8W CF 5%”
R67	113101	“RES,100 OHM 1/8W CF 5%”
R68	113273	“RES,27K OHM 1/8W CF 5%”
R69	113472	“RES, 4.7K OHM 1/8W CF 5%”
R7	113621	“RES,620 OHM 1/8W CF 5%”
R70	113472	“RES, 4.7K OHM 1/8W CF 5%”
R71	113222	“RES,2.2K OHM 1/8W CF 5%”
R72	113103	“RES, 10K OHM 1/8W CF 5%”
R73	113473	“RES, 47K OHM 1/8W CF 5%”
R74	113103	“RES, 10K OHM 1/8W CF 5%”
R75	113433	“RES,43K 1/8W 5% CARBON FILM”
R76	113102	“RES, 1K OHM 1/8W CF 5%”
R77	113104	“RES,100K OHM 1/8W CF 5%”
R78	113272	“RES,2.7K OHM 1/8W CF 5%”
R79	113103	“RES, 10K OHM 1/8W CF 5%”
R8	113222	“RES,2.2K OHM 1/8W CF 5%”
R80	113152	“RES,1.5K OHM 1/8W CF 5%”
R81	113103	“RES, 10K OHM 1/8W CF 5%”
R82	113104	“RES,100K OHM 1/8W CF 5%”
R83	113103	“RES, 10K OHM 1/8W CF 5%”
R84	113104	“RES,100K OHM 1/8W CF 5%”
R85	113472	“RES, 4.7K OHM 1/8W CF 5%”
R86	113472	“RES, 4.7K OHM 1/8W CF 5%”
R87	113472	“RES, 4.7K OHM 1/8W CF 5%”

Table 12-3 Audio Board Parts List (001-00600 Rev. W)

Designator	Part Number	Description
R88	113101	“RES,100 OHM 1/8W CF 5%”
R89	113101	“RES,100 OHM 1/8W CF 5%”
R9	113101	“RES,100 OHM 1/8W CF 5%”
R90	113103	“RES, 10K OHM 1/8W CF 5%”
R91	113621	“RES,620 OHM 1/8W CF 5%”
R92	113472	“RES, 4.7K OHM 1/8W CF 5%”
R93	113152	“RES,1.5K OHM 1/8W CF 5%”
R94	113123	“RES,12K OHM 1/8W CF 5%”
R95	113222	“RES,2.2K OHM 1/8W CF 5%”
R96	113621	“RES,620 OHM 1/8W CF 5%”
R97	113104	“RES,100K OHM 1/8W CF 5%”
R98	113102	“RES, 1K OHM 1/8W CF 5%”
R99	170345	“RES,1K TRIM SIDE ADJ”
T1	410019	“XFMR, AUDIO MINI 600CT - 600CT”
T2	410019	“XFMR, AUDIO MINI 600CT - 600CT”
T3	410019	“XFMR, AUDIO MINI 600CT - 600CT”
T5	410019	“XFMR, AUDIO MINI 600CT - 600CT”
TP1	860083	TERMINAL TURRET
TP2	860083	TERMINAL TURRET
TP3	860083	TERMINAL TURRET
U1	330074	“IC,DIG,CD4066BE,DIP14,ANALOGSW”
U10	330126	“IC,4094B 8-STG SHIFT REG DIP16”
U11-	330395	“IC,MC14504B LEVEL SHIFTER”
U12	330126	“IC,4094B 8-STG SHIFT REG DIP16”
U13	330074	“IC,DIG,CD4066BE,DIP14,ANALOGSW”
U15	330025	“IC,VREG,78L05,TO92,5V”
U16	330163	IC TLC272CP
U2	330080	“IC, 4049B HEX INV BUFFER DIP16”
U3	330074	“IC,DIG,CD4066BE,DIP14,ANALOGSW”
U4	330074	“IC,DIG,CD4066BE,DIP14,ANALOGSW”
U5	330396	“IC, REGULATOR”
U6	330074	“IC,DIG,CD4066BE,DIP14,ANALOGSW”

CHAPTER 13
FRONT PANEL ASSEMBLY

13.1 Circuit Description

The Front Panel Assembly consists of the front panel and four boards: Front Panel Processor, Keypad, LCD/Driver, and Switch. It connects to the main body of the radio by a single ribbon cable attached to connector J1. Figure 13-1 on page 13-3 provides a block diagram of the interconnections between the Front Panel Processor board and the Motherboard.

13.1.1 Front Panel Processor Board

The Front Panel Processor board provides direct electrical connections to the speaker (J5), microphone connectors (J9, J10), mode (J19), status (J14), function (J15), clarifier (J8), volume control (J7), lite (J16), source power (J12), and the Motherboard (J1). The board's main function is to process front panel commands, and interact with the processor on the Processor board. It also includes the TX and RX paths for the front panel audio. Transmit audio is received on pin 4 of either of the two microphone connectors and is applied to a VOGAD (U17) (providing speech compression), then output to the Audio board as PRIMICA (J1-25). The RX audio is received on the Front Panel Processor board on J-30 as SQA and is routed to the top of the volume control (J7 pin 3). It is then attenuated using the front panel **VOL CTRL** knob and output on the wiper of the control (J7 pin 4) to the audio amplifier U14 before going to front panel audio connectors J9 and J10, pin 2 (handset audio). It also is routed to the speaker disable circuit before going to both the speaker (J5 pin 2) and to the motherboard connector (J1 pin 27).

Parity tree U5 monitors the PTT, CW, clarifier, and keypad. Any change of status in one of these inputs causes the output at pin 9 to change its state. Monostable vibrator U4 is configured as a one shot; it outputs a 20 ms pulse when there is an input change. The output goes to Q1 which is connected to the interrupt line of processor U13 (pin-2 IRQ). U16 provides power on/off conditioning for the processor. Y1 (2.3576 MHz) is the crystal for the internal clock of the processor (OSC1 and OSC2). PD0 through PD7 are SPI serial data ports. The processor updates the LCD and sends commands to the radio as required.

When a key on the front panel keypad is pressed, a row column gets crossed and a connection is made. This causes a pulse to come out of U12 pin 3. The pulse then stops the keypad scanning oscillator U19C. The oscillator drives counter U9 which is scanning the rows and columns. When keypad scanning

stops, U10 records the count which corresponds to a unique key. After reading the key, the processor restarts the scanning loop by toggling U3 pin 7. U2 is a parallel to serial chip, and jumpers J11 configure the front panel. This configuration is read by the processor on power up. The function of J11 jumpers are as follows:

Table 13-1 J11 Jumper Settings

Jumper	JU11 Functions	Normal Position
1.	All function lockout	Off
2.	Frequency change lockout	Off
3.	Frequency display lockout	Off
4.	Mode change lockout	Off
5.	Power change lockout	Off
6.	PTT lockout	Off
7.	CW lockout	Off
8.	TW7000 lockout	Off
9.	No function assigned	N/A
10.	No function assigned	N/A

13.1.2 Keypad Board

The keypad mounts to a small board on the Front Panel Processor board. The Keypad board connects electrically via J11 to the front panel Switch board. Contact closures on the keypad are as follows:

Key	J11 Connections	Key	J11 Connections
0, sp	1-9	4, jkl	5-9
8, vwx	1-10	C	5-10
1, abc	2-9	5, mno	6-9
9, yz-	2-10	, -	6-10
2, def	3-9	6, pqr	7-9
, .	3-10	E	7-10
3, ghi	4-9	7, stu	8-9
, -	4-10	F	8-10

13.1.3 LCD/Driver Board

The LCD/Driver board contains a custom LCD that mounts to a board and connects to the Front Panel Processor board through J3 and J4. It includes display driver circuits that provide the input for the different LCD segments. It also includes an LCD serial driver circuit that takes in serial TX data and provides parallel input for the display bar graph and a few other indicators.

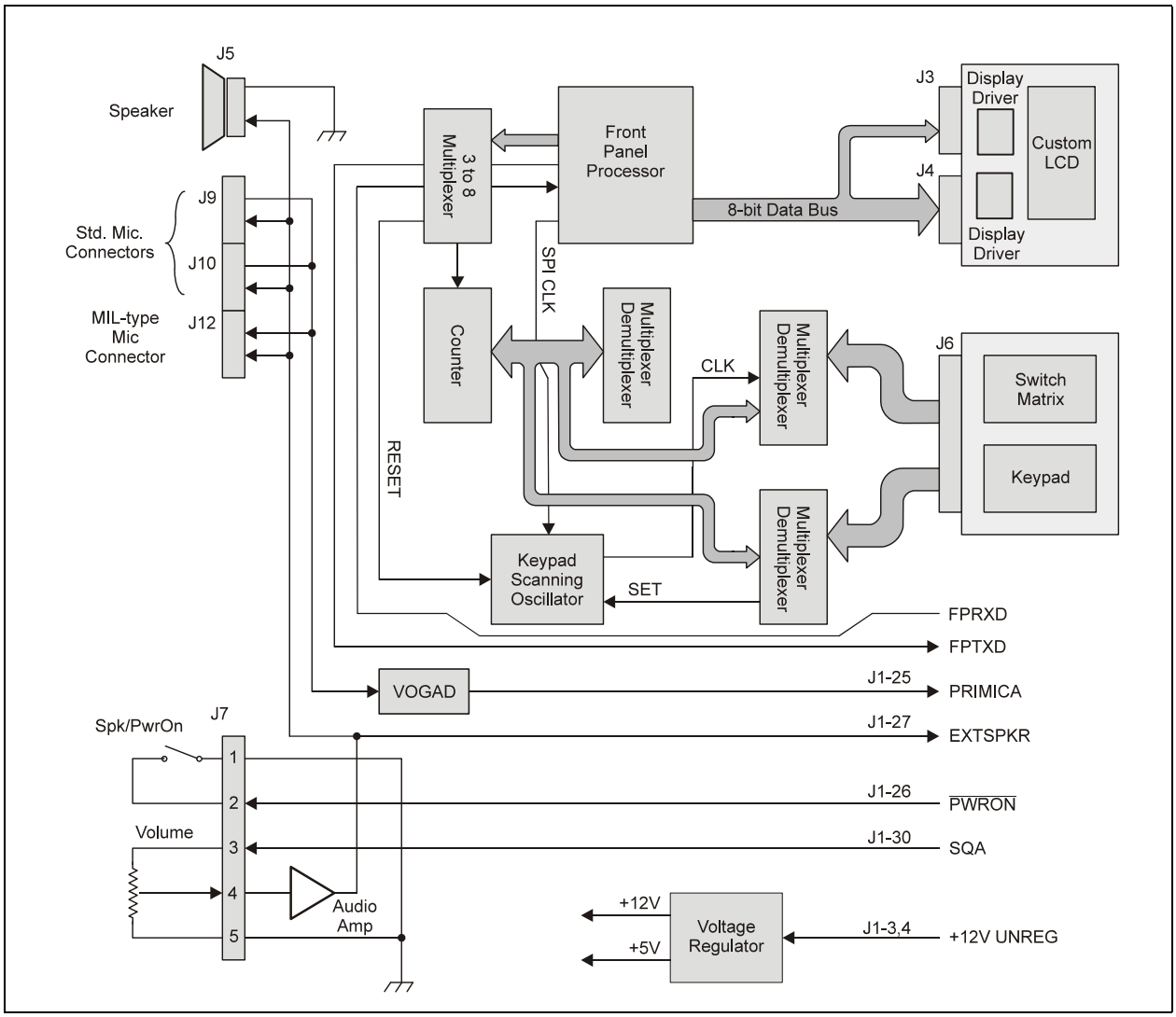


Figure 13-1 Front Panel Assembly Block Diagram

13.2 Connector Pin Assignments

13.2.1 J1 Connector

J1 connects to the Motherboard.

Table 13-2 J1 Connector Pin Assignments

Pin	Signal	Description
1, 2	GND	Ground
3, 4	+12V UNREG	+12 Vdc unregulated supply voltage
5	PB7	Data bus line for display drivers
6	PB6	Data bus line for display drivers
7	PB5	Data bus line for display drivers
8	PB4	Data bus line for display drivers
9	PB3	Data bus line for display drivers
10	PB2	Data bus line for display drivers
11	PB1	Data bus line for display drivers
12	PB0	Data bus line for display drivers
13	FPCWKEY	CW key line
14	FPCWA	CW audio
15	FPWSP1	Front panel spare
16	FPPTT	Front panel PTT
17	FPSPITXD	Front panel serial TX data
18	FPSPIRXD	Front panel serial RX data
19	FPSPICLK	Front panel serial clock
20	FPBITE	Front panel BITE
21	ENA	Enable
22	FPWSP2	Front panel spare
23	DHSLMSEL	DHSL
24	FPTCALM	Transcall alarm tone
25	PRIMICA	Microphone audio output
26	PWRON	Power on/off switch status
27	EXTSPKR	Speaker RX audio
28	CWKEY	CW key line
29	MODEM EN	Modem enable
30	SQA	Squelched RX audio output
31	FPRXD	Front panel RX data
32	FPTXD	Front panel TX data

Table 13-2 J1 Connector Pin Assignments (continued)

Pin	Signal	Description
33	FPSP1	Front panel spare
34	EXAUDPTT	External audio PTT

13.2.2 J3 Connector

J3 connects to the Display board.

Table 13-3 Front Panel Interconnections to Display

Pin	Signal	Description
1	PB0	Display driver data bus
2	PB1	Display driver data bus
3	PB2	Display driver data bus
4	PB3	Display driver data bus
5	PB4	Display driver data bus
6	PB5	Display driver data bus
7	PB6	Display driver data bus
8	PB7	Display driver data bus
9	5V	+5 Vdc supply voltage
10	GND	Ground
11	BKLT1	Backlight 1 signal
12	BKLT2	Backlight 2 signal

13.2.3 J4 Connector

J4 connects to the Display board.

Table 13-4 J4 Connector Pin Assignments

Pin	Signal	Description
1	SYNC	Not used
2	WE	Write enable
3	RE	Read enable
4	READY	Not used
5	+12V	Heater
6	CS2	Chip select 2
7	CS1	Chip select 1
8	SPITXD	Serial peripheral interface
9	CLKDIS	Not used
10	HEATER SW	Not used

Table 13-4 J4 Connector Pin Assignments (continued)

Pin	Signal	Description
11	SENSE 1	Not used
12	CONTRAST	Not used

13.2.4 J6 Connector

J6 connects to the front panel keypad.

Table 13-5 J6 Connector Pin Assignments

Pin	Signal	Description
1	C0	Column 0 switch matrix data
2	C1	Column 1 switch matrix data
3	C2	Column 2 switch matrix data
4	C3	Column 3 switch matrix data
5	C4	Column 4 switch matrix data
6	C5	Column 5 switch matrix data
7	C6	Column 6 switch matrix data
8	C7	Column 7 switch matrix data
9	R0	Row 0 switch matrix data
10	R1	Row 1 switch matrix data
11	R2	Row 2 switch matrix data
12	R3	Row 3 switch matrix data
13	R4	Row 4 switch matrix data
14	R5	Row 5 switch matrix data
15	R6	Row 6 switch matrix data

13.2.5 J7 Connector

J7 connects to the front panel

Table 13-6 J7 Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	PWRON	Power switch status (ground when on)
3	SQA	Squelched RX audio, top of volume pot
4	VOL CTRL	Volume-controlled RX audio (wiper of volume pot)
5	GND	Ground

13.2.6 J8 Connector

J8 connects to the front panel Clarifier select switch.

Table 13-7 J8 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	CLAR CTRL A	Clarifier control A
3	CLAR CTRL B	Clarifier control B
4	CLAR SW A	Clarifier switch A
5	CLAR SW B	Clarifier switch B

13.2.7 J9, J12 Connector

J9 and J12 connect to the front panel audio connectors.

Table 13-8 J9, J12 Connector Pin Assignments

Pin	Signal	Description
1	GND	Ground
2	HNDST AUDIO	Handset audio
3	PTT	PTT
4	MIC AUDIO	Microphone audio
5	CW	CW key
6	12V	+12V

13.3 Component Locations, Schematics and Parts List

This section includes a component locations diagram, schematic and parts list for the Front Panel Assembly.

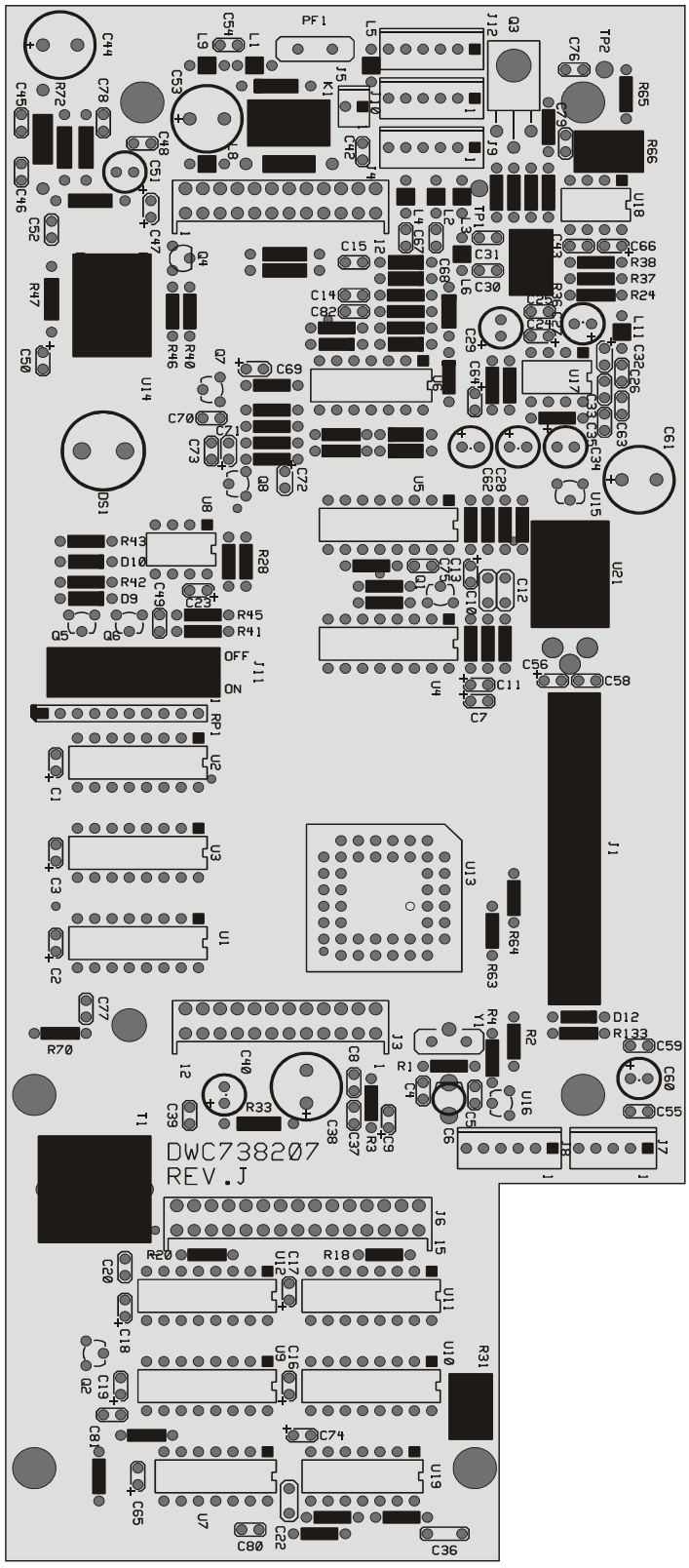
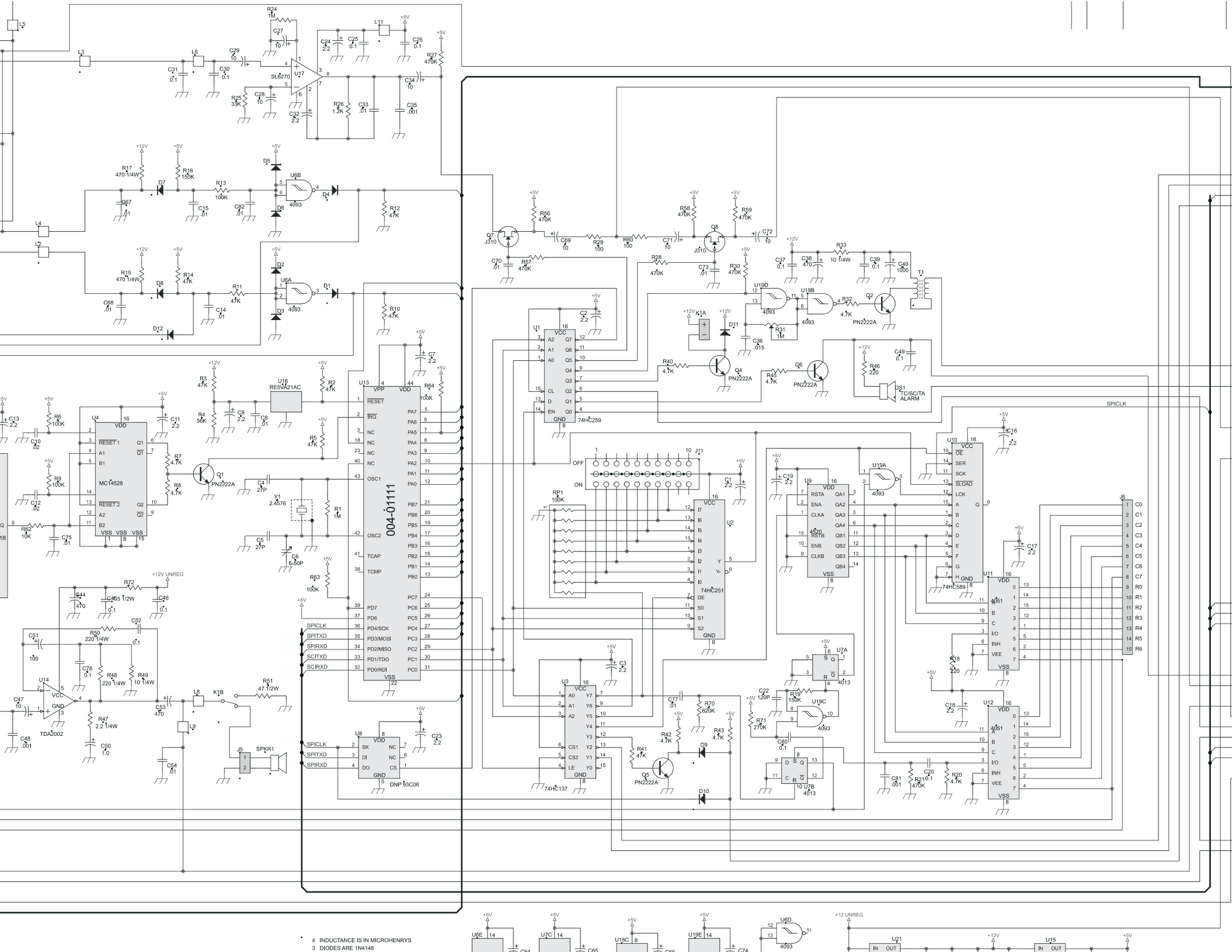


Figure 13-2 Front Panel Assembly Component Locations (738207 Rev. J)



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3 DIODES ARE 1N4148

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
C1	241020	“CAP,2.2MF DIP TANTALUM”
C10	254203	“CAP,0.02MF 10% MYLAR”
C11	241020	“CAP,2.2MF DIP TANTALUM”
C12	254203	“CAP,0.02MF 10% MYLAR”
C13	241020	“CAP,2.2MF DIP TANTALUM”
C14	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C15	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C16	241020	“CAP,2.2MF DIP TANTALUM”
C17	241020	“CAP,2.2MF DIP TANTALUM”
C18	241020	“CAP,2.2MF DIP TANTALUM”
C19	241020	“CAP,2.2MF DIP TANTALUM”
C2	241020	“CAP,2.2MF DIP TANTALUM”
C20	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C22	210121	“CAP,120 PF DISC NPO”
C23	241020	“CAP,2.2MF DIP TANTALUM”
C24	241020	“CAP,2.2MF DIP TANTALUM”
C25	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C26	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C27	241100	“CAP,10MF DIP TANTALUM”
C28	241100	“CAP,10MF DIP TANTALUM”
C29	241100	“CAP,10MF DIP TANTALUM”
C3	241020	“CAP,2.2MF DIP TANTALUM”
C30	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C31	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C32	241020	“CAP,2.2MF DIP TANTALUM”
C33	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C34	241100	“CAP,10MF DIP TANTALUM”
C35	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C36	254153	“CAP, 0.015UF MYLAR 10% 100V 3.5LS”
C37	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C38	231471	“CAP,A,470UF,16V,20%,RA,.20SP”
C39	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C4	210270	“CAP,27PF NPO 50V 5% 0.1LS DISC”

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
C40	231103	“CAPACITOR,16V,1000 UF 10X16”
C44	231471	“CAP,A,470UF,16V,20%,RA,.20SP”
C45	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C46	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C47	241100	“CAP,10MF DIP TANTALUM”
C48	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C49	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C5	210270	“CAP,27PF NPO 50V 5% 0.1LS DISC”
C50	241010	“CAP,1.0 MF DIP TANTALUM”
C51	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C52	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C53	231471	“CAP,A,470UF,16V,20%,RA,.20SP”
C54	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C55	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C56	241100	“CAP,10MF DIP TANTALUM”
C58	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C59	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C6	261600	“TRIMMER, 6-50PF N1300 TOP 5MM”
C60	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C61	231471	“CAP,A,470UF,16V,20%,RA,.20SP”
C62	231101	“CAP,100U,16V,20%,RADIAL,.1SP”
C63	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C64	241020	“CAP,2.2MF DIP TANTALUM”
C65	241020	“CAP,2.2MF DIP TANTALUM”
C66	241020	“CAP,2.2MF DIP TANTALUM”
C67	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C68	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C69	241100	“CAP,10MF DIP TANTALUM”
C7	241020	“CAP,2.2MF DIP TANTALUM”
C70	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C71	241100	“CAP,10MF DIP TANTALUM”
C72	241100	“CAP,10MF DIP TANTALUM”
C73	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
C74	241020	“CAP,2.2MF DIP TANTALUM”
C75	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C77	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C78	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C8	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C80	275104	“CAP, 0.1UF X7R 50V 10% 0.1LS”
C81	210102	“CAP,.001UF Y5P 50V 20% 0.1LS”
C82	214103	“CAP, 0.01UF X7R 50V 10% 0.1LS”
C9	241020	“CAP,2.2MF DIP TANTALUM”
D1	320002	“DIODE, 1N4148/1N4150 DO-35”
D10	320002	“DIODE, 1N4148/1N4150 DO-35”
D11	320002	“DIODE, 1N4148/1N4150 DO-35”
D12	320002	“DIODE, 1N4148/1N4150 DO-35”
D2	320002	“DIODE, 1N4148/1N4150 DO-35”
D3	320002	“DIODE, 1N4148/1N4150 DO-35”
D4	320002	“DIODE, 1N4148/1N4150 DO-35”
D5	320002	“DIODE, 1N4148/1N4150 DO-35”
D6	320002	“DIODE, 1N4148/1N4150 DO-35”
D7	320002	“DIODE, 1N4148/1N4150 DO-35”
D8	320002	“DIODE, 1N4148/1N4150 DO-35”
D9	320002	“DIODE, 1N4148/1N4150 DO-35”
DS1	710104	“BUZZER,MICRO”
J1	620050	HEADER 34PIN RT ANGLE
J10	610103	“HEADER,MLX,6PIN,.100”
J11	614017	“HEADER,30 PIN MALE 3 X 10”
J12	610103	“HEADER,MLX,6PIN,.100”
J3	613155	“CONN,BOTTOM ENTRY,12 PIN,GOLD”
J4	613155	“CONN,BOTTOM ENTRY,12 PIN,GOLD”
J5	610105	“HEADER, 1X2 W/LB-LOCK 0.1 TH”
J6	613156	“CONNECTOR,15 PIN BOTTOM ENTRY”
J7	610215	“HEADER,PIN 1X5 MLX 0.1 W/LOCK”
J8	610103	“HEADER,MLX,6PIN,.100”
J9	610103	“HEADER,MLX,6PIN,.100”

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
K1	540077	“RELAY,SP PCB MOUNT”
L1	459032	“IND ASY,3T#30 MAGNET 1-490201”
L11	459032	“IND ASY,3T#30 MAGNET 1-490201”
L2	459032	“IND ASY,3T#30 MAGNET 1-490201”
L3	459032	“IND ASY,3T#30 MAGNET 1-490201”
L4	459032	“IND ASY,3T#30 MAGNET 1-490201”
L5	459032	“IND ASY,3T#30 MAGNET 1-490201”
L6	459032	“IND ASY,3T#30 MAGNET 1-490201”
L8	459032	“IND ASY,3T#30 MAGNET 1-490201”
L9	459032	“IND ASY,3T#30 MAGNET 1-490201”
PF1	550042	“FUSE,POLY RESISTOR 1.4 AMPS”
Q1	310057	“XISTOR,NPN,PN2222A,TO92”
Q2	310057	“XISTOR,NPN,PN2222A,TO92”
Q4	310057	“XISTOR,NPN,PN2222A,TO92”
Q5	310057	“XISTOR,NPN,PN2222A,TO92”
Q6	310057	“XISTOR,NPN,PN2222A,TO92”
Q7	310033	“XSTR, J310 N-JFET TO92”
Q8	310033	“XSTR, J310 N-JFET TO92”
R1	113105	“RES,1M OHM 1/8W CF 5%”
R10	113473	“RES, 47K OHM 1/8W CF 5%”
R11	113473	“RES, 47K OHM 1/8W CF 5%”
R12	113473	“RES, 47K OHM 1/8W CF 5%”
R13	113473	“RES, 47K OHM 1/8W CF 5%”
R133	113103	“RES, 10K OHM 1/8W CF 5%”
R14	113473	“RES, 47K OHM 1/8W CF 5%”
R15	124471	“RES,470 OHM 1/4W 5% CF”
R16	113473	“RES, 47K OHM 1/8W CF 5%”
R17	124471	“RES,470 OHM 1/4W 5% CF”
R18	113221	“RES,220 OHM 1/8W 5% CF”
R19	113154	“RES,150K OHM 1/8W CF 5%”
R2	113473	“RES, 47K OHM 1/8W CF 5%”
R20	113472	“RES, 4.7K OHM 1/8W CF 5%”
R21	113474	“RES,470K OHM 1/8W CF 5%”

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
R24	113105	“RES,1M OHM 1/8W CF 5%”
R25	113333	“RES,33K OHM 1/8W CF 5%”
R26	113122	“RES,1.2K OHM 1/8W CF 5%”
R27	113474	“RES,470K OHM 1/8W CF 5%”
R28	113474	“RES,470K OHM 1/8W CF 5%”
R29	113101	“RES,100 OHM 1/8W CF 5%”
R3	113473	“RES, 47K OHM 1/8W CF 5%”
R30	113474	“RES,470K OHM 1/8W CF 5%”
R31	170213	“RES,1M 20Y TRIMMER VRT”
R32	113472	“RES, 4.7K OHM 1/8W CF 5%”
R33	124100	“RES,10 OHM 1/4W 5% CARBON FILM”
R4	113563	“RES,56K 1/8W 5% CARBON FILM”
R40	113472	“RES, 4.7K OHM 1/8W CF 5%”
R41	113473	“RES, 47K OHM 1/8W CF 5%”
R42	113472	“RES, 4.7K OHM 1/8W CF 5%”
R43	113472	“RES, 4.7K OHM 1/8W CF 5%”
R45	113472	“RES, 4.7K OHM 1/8W CF 5%”
R46	113221	“RES,220 OHM 1/8W 5% CF”
R47	124020	“RES,2.2 OHM 1/4W 5% CF”
R48	124221	“RES,220 OHM 1/4W 5% CF”
R49	124100	“RES,10 OHM 1/4W 5% CARBON FILM”
R5	113473	“RES, 47K OHM 1/8W CF 5%”
R50	124101	“RES,100 OHM 1/4W 5% CF”
R51	134470	“RES,47 OHM 1/2W 5% CARBON FILM”
R52	113104	“RES,100K OHM 1/8W CF 5%”
R53	113472	“RES, 4.7K OHM 1/8W CF 5%”
R54	113104	“RES,100K OHM 1/8W CF 5%”
R55	113472	“RES, 4.7K OHM 1/8W CF 5%”
R56	113474	“RES,470K OHM 1/8W CF 5%”
R57	113474	“RES,470K OHM 1/8W CF 5%”
R58	113474	“RES,470K OHM 1/8W CF 5%”
R59	113474	“RES,470K OHM 1/8W CF 5%”
R6	113104	“RES,100K OHM 1/8W CF 5%”

Table 13-9 Front Panel Assembly Parts List (001-00143 Rev. R)

Designator	Part Number	Description
R60	113101	“RES,100 OHM 1/8W CF 5%”
R62	113103	“RES, 10K OHM 1/8W CF 5%”
R63	113104	“RES,100K OHM 1/8W CF 5%”
R64	113104	“RES,100K OHM 1/8W CF 5%”
R7	113472	“RES, 4.7K OHM 1/8W CF 5%”
R70	113624	“RES,620K OHM 1/8W 5%”
R71	113274	“RES,270K 1/8W 5% CARBON FILM”
R72	134015	“RES,1.5 OHM 1/2W 5% CF”
R8	113472	“RES, 4.7K OHM 1/8W CF 5%”
R9	113104	“RES,100K OHM 1/8W CF 5%”
RP1	182002	“R-NET, 100K X 9 BUSS 2% TK SIP10”
T1	410071	“TRANSFORMER,50K/1K,CT,AUDIO”
U1	330348	“IC,74HC259N”
U10	330381	“IC,74HC589”
U11	330194	IC CD4051BE
U12	330194	IC CD4051BE
U13	004-01111	“DAUGHTER PCA,7000 FRONT PANEL”
U14	330043	“IC,TDA2002-H 8W AUD AMP TO220”
U15	330025	“IC,VREG,78L05,TO92,5V”
U16	330341	“IC,RE5LV21 V-DET 2.1V 3% TO92”
U17	330029	“IC, SL6270C VOGAD PREAMP DIP-8”
U19	330342	“IC,4093B,QD 2-I SCH-NAND,DIP14”
U2	330349	“IC, 74HC251N”
U21	330002	“IC, LM2940-12 VREG 12V 1A TO220”
U3	330380	“IC,74HC137”
U4	330115	IC MC14528BCP
U5	330130	“IC,MC14531 PARITY TREE DIP16”
U6	330342	“IC,4093B,QD 2-I SCH-NAND,DIP14”
U7	330040	“IC,DIG,CD4013,DIP14,FLIP-FLOP”
U9	330057	IC CD4520BE
XU13	621019	“SOCKET, IC PLCC-44”
XY1	364001	INSULATOR CRYSTAL HC25/U
Y1	361085	“XTAL, 2.4576 MHZ XT HC-49/U”

13.4 Switch Board

The Switch board mounts to a small board attached to the Front Panel Processor board. It electrically connects to this board via connector J6. The switch matrix uses the same column lines from the keypad (J11), but includes three unique row lines. Contact closures for each front panel key are as follows:

Table 13-10 Switch Board J6 Connections

Switch	J6 Connections	Switch	J6 Connections
Option	1-11	(Select 2)	4-13
Attenuator	1-12	Scan Group	5-11
Send	1-13	SQ	5-12
Status	2-11	(Select 3)	5-13
Tune	2-12	Scan	6-11
Alpha	2-13	(Spare 1)	6-12
D	3-11	RF Power	7 -11
Ext Amp	3-12	Speaker	7 -12
(Select 1)	3-13	Call	8-11
Ñ	4-11	(Spare 2)	8-12
Priority	4-12		

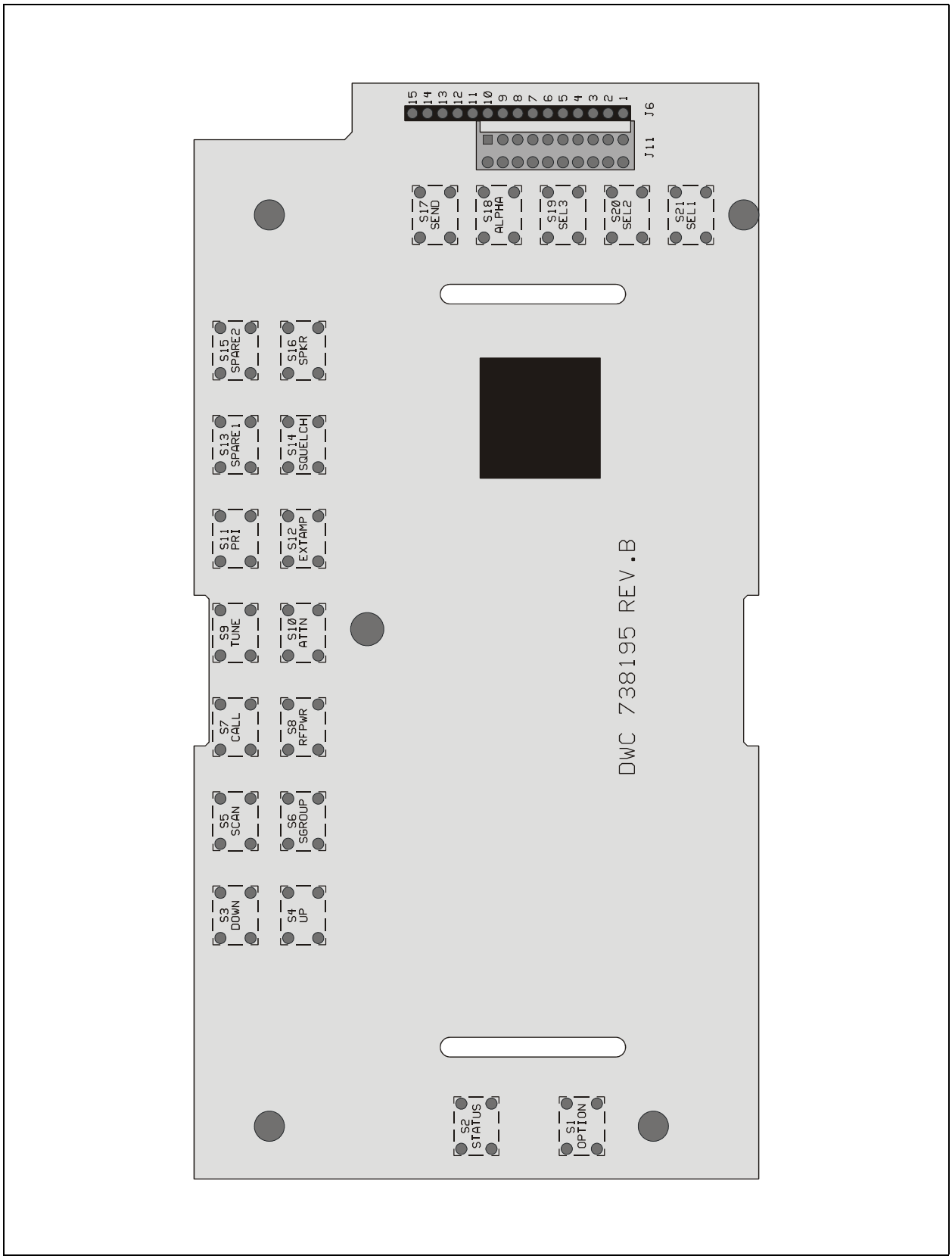


Figure 13-4 Switch Board Component Locations (738195 Rev. B)

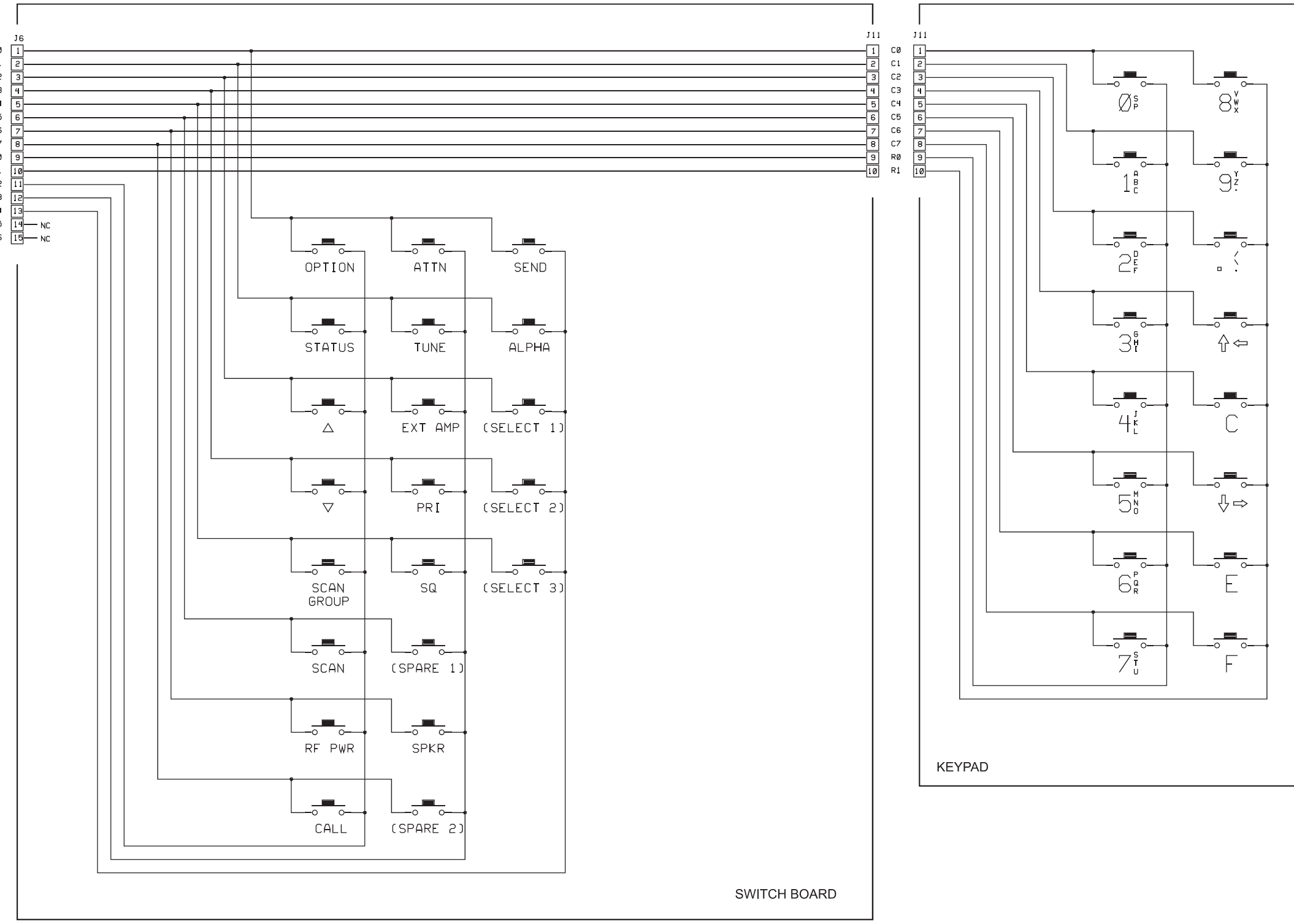

J6
1
2
3
4
5
6
7
8
9
10
11
12
13
14 NC
15 NC
J11
1 C0
2 C1
3 C2
4 C3
5 C4
6 C5
7 C6
8 C7
9 R0
10 R1
OPTION
ATTN
SEND
STATUS
TUNE
ALPHA
△
EXT AMP
(SELECT 1)
▽
PRI
(SELECT 2)
SCAN GROUP
SQ
(SELECT 3)
SCAN
(SPARE 1)
RF PWR
SPKR
CALL
(SPARE 2)
SWITCH BOARD
J11
Ø SP
8 V W X
1 A B C
9 Y Z
2 D E F
3 G H I
4 J K L
C
5 M N O
6 P Q R
E
7 S T U
F
KEYPAD

Table 13-11 Switch Board Parts List (001-00110 Rev. A1)

Designator	Part Number	Description
J11	614027	CONN,10 POS BOTTOM ENTRY MOLX
J6	610286	HEADER,SIL,15PIN,.100,
S1	530105	SWITCH,TW7000 F.P.
S10	530105	SWITCH,TW7000 F.P.
S11	530105	SWITCH,TW7000 F.P.
S12	530105	SWITCH,TW7000 F.P.
S13	530105	SWITCH,TW7000 F.P.
S14	530105	SWITCH,TW7000 F.P.
S15	530105	SWITCH,TW7000 F.P.
S16	530105	SWITCH,TW7000 F.P.
S17	530105	SWITCH,TW7000 F.P.
S18	530105	SWITCH,TW7000 F.P.
S19	530105	SWITCH,TW7000 F.P.
S2	530105	SWITCH,TW7000 F.P.
S20	530105	SWITCH,TW7000 F.P.
S21	530105	SWITCH,TW7000 F.P.
S3	530105	SWITCH,TW7000 F.P.
S4	530105	SWITCH,TW7000 F.P.
S5	530105	SWITCH,TW7000 F.P.
S6	530105	SWITCH,TW7000 F.P.
S7	530105	SWITCH,TW7000 F.P.
S8	530105	SWITCH,TW7000 F.P.
S9	530105	SWITCH,TW7000 F.P.

13.5 Front Panel Assembly Daughter Board

The Front Panel Processor board includes a small daughter board that contains the programmable display processor U1. The display processor resides on a plug-in daughter board installed during production. The daughter board plugs into the existing PLCC32 socket.

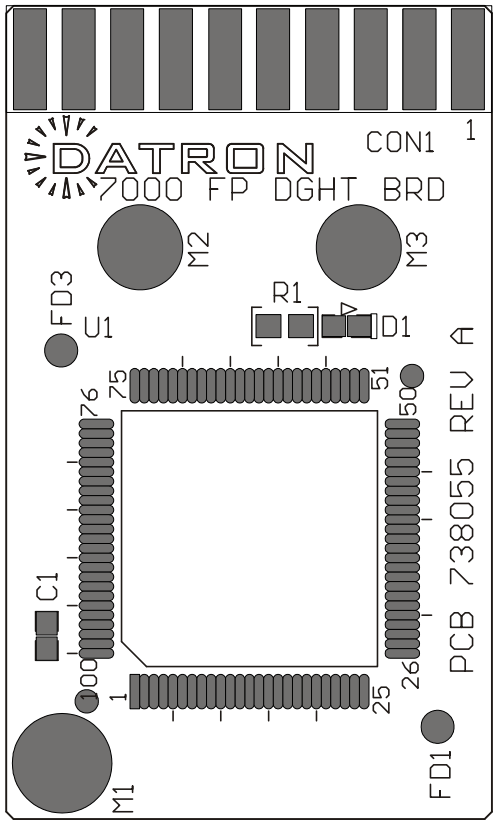
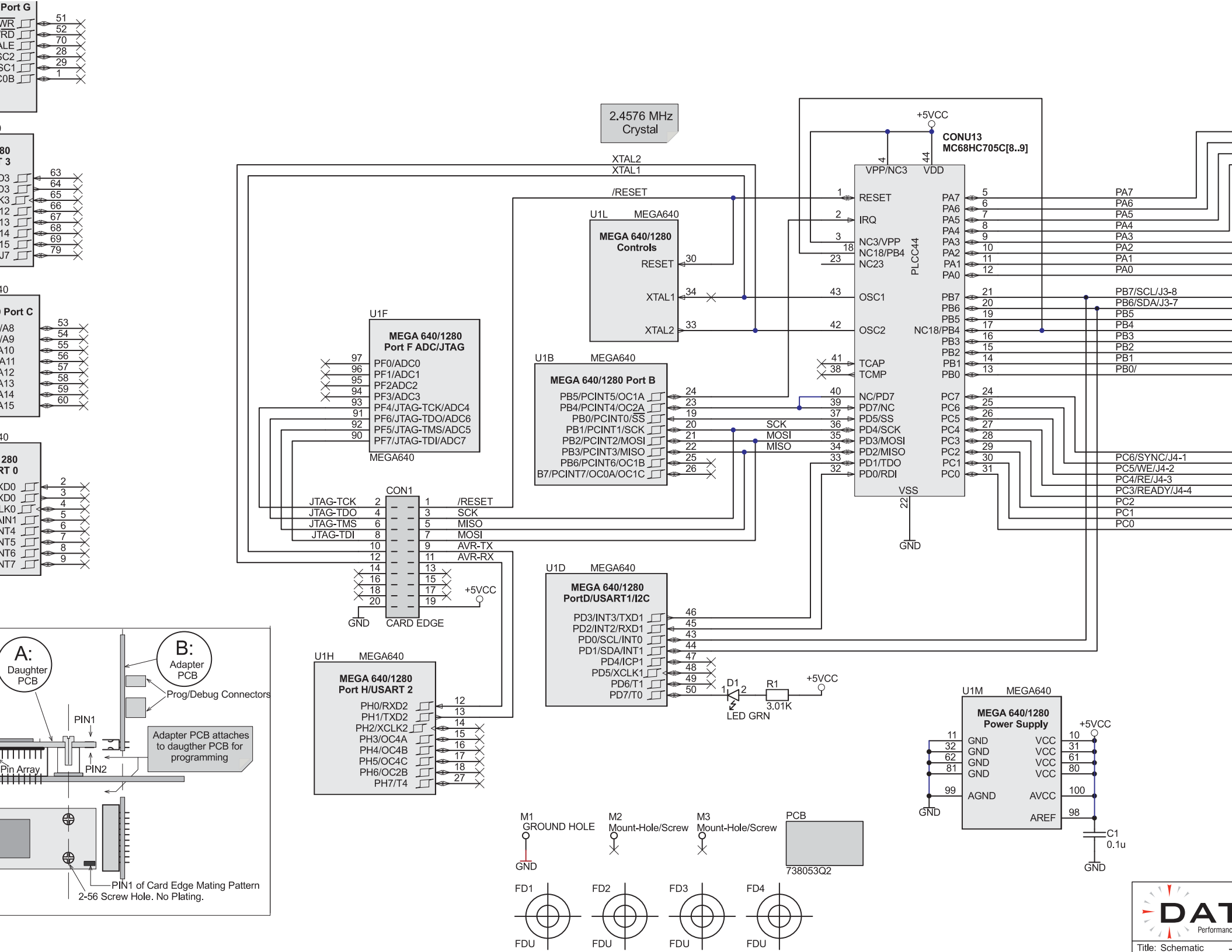


Figure 13-6 Front Panel Daughter Board Component Locations (738055 Rev. A)

Table 13-12 Front Panel Daughter Board Parts List (004-01111 Rev. A)

Designator	Part Number	Description
C1	021104006	CAP, 0.1UF 25V X7R 10% 0603
CONU13	089044001	CON,ADAPTER,PLCA44
D1	035500006	LED,SMT 0603,GREEN,HIGH EFF
M2	815202	SCREW FILST PHIL 2-56X5/16 SS
M3	815202	SCREW FILST PHIL 2-56X5/16 SS
R1	012301101	RES,3.01K OHM 1/10W 1% TK 0603
U1	033301015	IC,MCU AVR 64K FLASH 100-TQFP


2.4576 MHz Crystal
XTAL2
XTAL1
/RESET
+5VCC
CONU13
MC68HC705C[8..9]
VPP/NC3
VDD
PLCC44
U1L MEGA640
MEGA 640/1280 Controls
RESET
XTAL1
XTAL2
U1F
MEGA 640/1280 Port F ADC/JTAG
PF0/ADC0
PF1/ADC1
PF2ADC2
PF3/ADC3
PF4/JTAG-TCK/ADC4
PF6/JTAG-TDO/ADC6
PF5/JTAG-TMS/ADC5
PF7/JTAG-TDI/ADC7
MEGA640
U1B MEGA640
MEGA 640/1280 Port B
PB5/PCINT5/OC1A
PB4/PCINT4/OC2A
PB0/PCINT0/SS
PB1/PCINT1/SCK
PB2/PCINT2/MOSI
PB3/PCINT3/MISO
PB6/PCINT6/OC1B
B7/PCINT7/OC0A/OC1C
SCK
MOSI
MISO
TCAP
TCMP
NC/PD7
PD7/NC
PD5/SS
PD4/SCK
PD3/MOSI
PD2/MISO
PD1/TDO
PD0/RDI
NC18/PB4
NC23
OSC1
OSC2
VSS
GND
CON1
JTAG-TCK
JTAG-TDO
JTAG-TMS
JTAG-TDI
/RESET
SCK
MISO
MOSI
AVR-TX
AVR-RX
+5VCC
GND
CARD EDGE
U1D MEGA640
MEGA 640/1280 PortD/USART1/I2C
PD3/INT3/TXD1
PD2/INT2/RXD1
PD0/SCL/INT0
PD1/SDA/INT1
PD4/ICP1
PD5/XCLK1
PD6/T1
PD7/T0
D1
LED GRN
R1
3.01K
+5VCC
U1H MEGA640
MEGA 640/1280 Port H/USART 2
PH0/RXD2
PH1/TXD2
PH2/XCLK2
PH3/OC4A
PH4/OC4B
PH5/OC4C
PH6/OC2B
PH7/T4
U1M MEGA640
MEGA 640/1280 Power Supply
GND
VCC
AGND
AVCC
AREF
C1
0.1u
GND
M1
GROUND HOLE
GND
M2
Mount-Hole/Screw
M3
Mount-Hole/Screw
PCB
738053Q2
FD1
FD2
FD3
FD4
FDU
A:
Daughter PCB
B:
Adapter PCB
Prog/Debug Connectors
PIN1
Adapter PCB attaches to daugther PCB for programming
Pin Array
PIN2
PIN1 of Card Edge Mating Pattern
2-56 Screw Hole. No Plating.
PA7
PA6
PA5
PA4
PA3
PA2
PA1
PA0
PB7/SCL/J3-8
PB6/SDA/J3-7
PB5
PB4
PB3
PB2
PB1
PB0/
PC6/SYNC/J4-1
PC5/WE/J4-2
PC4/RE/J4-3
PC3/READY/J4-4
PC2
PC1
PC0
Title: Schematic

CHAPTER 14
PROCESSOR BOARD

14.1 Circuit Description

The Processor board includes the Motorola 68HC000 processor that executes front panel control commands and controls the functions of the other boards. It also communicates with remote control heads to control radio functions remotely. Figure 14-3 on page 14-8 provides a block diagram of the Processor board.

The following circuit description discusses the main processor and associated circuitry. The ALE processor and circuitry options are covered in Chapter 16.

14.1.1 Processor

The Motorola MC68HC000 processor (U4), combined with the input/output circuits, forms a special purpose microcomputer that uses the 68000 CMOS microprocessor core to address up to 1 MB of PROM memory and 64 KB of static RAM. The processor controls the TW7000 operation in response to control inputs.

The processor operates at a clock frequency of 7.3728 MHz derived from the external oscillator U9. Address lines A1 to A23 and data lines D0 to D15 provide communications with the external EPROM, RAM, and analog converter system.

14.1.2 EPROM Program Storage

EPROMs U2 and U3 store the firmware for the TW7000. Each EPROM provides 1 MB of programmable read-only memory installed in a PLCC32 socket. The chip enable (CE) and output enable (OE) signals control access of the firmware code from the EPROM.

14.1.3 RAM Program Storage

RAM chips U5 and U6 provide volatile storage for all the channel and scan group data. Each RAM chip provides 256 kB of static RAM memory organized as 32k words x 8 bits.The chip select 1 (CS1) and output enable (OE) signals control access to the RAM. The write enable (WE) signal controls read/write operations to the RAM.

14.1.4 Clock Oscillator Circuit

External oscillator U9 provides a 29.4912 MHz clock to the FPGA(U8). The FPGA divides the 29.4912 MHz clock to provide the other clocks required by the Processor board. The clocks for the ALE processor are derived from buffered oscillator U76, while the very precise clocks required for the audio CODEC and DSP are derived from buffered oscillator U92.

14.1.5 Reset Control and Power Monitor

Reset controller and power monitor U1 includes a voltage detector that monitors the +5V supply. It generates a reset output to hold the microprocessor's reset line low whenever the +5V supply voltage is below 4.65 Vdc. When a power failure occurs, U1 issues a non-maskable interrupt (NMI) to the processor allowing the processor to power down to standby state while retaining data.

U1 also provides power to the RAM chips when source power is lost, preserving the data stored in RAM. This data includes channel frequencies and settings and must be preserved at all times. When a power failure is detected, U1 automatically switches to the 3.3V lithium backup battery BT1 to provide power to the RAM chips to preserve their contents.

U1 also includes a watchdog function that monitors the processor and resets it if the WDI line is not toggled for longer than 1.2 seconds. This function also drives the onboard fault LED (D1). If the fault LED is flashing intermittently, it is a good indication that one of the peripheral chips is not functioning. If the processor internal bus is completely stopped, the fault LED stays lit continuously.

14.1.6 Analog Converter System

Analog-to-digital converter (ADC) chip U7 converts analog signals from circuits such as the AGC, ACL and temperature sensor to digital signals to allow precise monitoring of the following functions:

- BITE
- AGC
- ALC
- Output power level
- RF power amplifier temperature sense
- 12 Vdc voltage sense, reverse power
- External BITE

BITE System

The BITE system checks the status of each board. From the BITE line the processor can determine which boards are installed in the radio and if they are functioning.

AGC, ALC and Power Level	The AGC line provides an analog voltage that represents an automatic gain control value which the processor presents as bar graph readings displayed on the front panel LCD in receive mode. The ALC and PWR LVL lines determine bar graph readings displayed on the LCD in transmit mode.
Temperature Protection	The TSENSE line provides an analog voltage that represents the power amplifier heat sink temperature. The processor monitors the TSENSE line, If the temperature exceeds a preset value, the processor begins scaling back the transmit power so the heat sink can cool to a safe temperature.
Overvoltage and Reverse Power Protection	The 12VSENSE line monitors the 12 Vdc line for under or over-voltage conditions. The RVS PWR line provides an analog voltage that represents the amount of reverse power from the VSWR bridge.
External BITE	The EXTBITE line detects the presence and function of the C1021 and RT5830 Pre/post selector.

14.1.7 FPGA Control Logic

The field programmable gate array (FPGA) (U8A) provides control logic for multiple functions for the main processor such as address decoding, interrupt control and serial communications. It also provides control logic for the ALE circuitry.

Address Decoding	The main address control logic is implemented within the FPGA which decodes the addresses for memory devices U2, U3, U5, and U6. The peripheral address decoding for the analog-to-digital converter (ADC) U7 is also handled within the FPGA.
Interrupt Control	The FPGA also implements the interrupt control logic. Priority levels are represented on the IPL0 to IPL2 lines. This allows a higher priority device to override a lower priority interrupt to get servicing immediately. The processor decodes the interrupt request to see where it came from. Once the source is determined, the processor presents an address to the interrupt acknowledge logic in the FPGA. The processor puts a valid code out on the function code (FC0 to FC2) lines back to the FPGA, which signals the interrupting device that the interrupt is serviced and can be cleared.
UARTs	The FPGA includes four internal dual universal asynchronous receiver/transmitters (MC68681) (DUART1 through DUART4). DUART1 (U8D) communicates with the Front Panel Processor board and the COM1 transceiver (U34). The serial link to the Front Panel Processor board is a 9600 baud TTL/CMOS level data link. The serial link to COM1 varies between 50 and 19200 baud. A computer terminal can controls all radio functions through the COM1 port. DUART1 also provides other output functions such as watchdog timer input (WDI), PTT for an external amplifier (AMPPTT), and encryption PTT. (ENCPTT).

DUART2 (U8D) communicates with the COM2 transceiver (U34), the GPS option module (if present), and the AT7000 antenna tuner through RS-422/485 transceiver (U40). When the GPS module is not present, the serial link to COM2 is variable between 50 and 19200 baud. A computer terminal can control all radio functions through COM2. The serial link to the AT7000 is a 9600 baud TTL/CMOS level data link. DUART2 also provides output functions for the AT7000 such as ADATA, ATUINIT, and ACHKTUNE and senses the input states of ATUKEY, ASTROBE, ACLOCK.

DUART3 (U8E) communicates with the DHSL and FSK remote heads. The serial link to the DHSL is a 9600 baud TTL/CMOS level data link. The serial link to the FSK remote is a 1200 baud TTL/CMOS level data link. DUART3 also provides output functions to the remote heads such as RMTA0, RMTA1, RMTA2, RMTWR, RMTCLK, and RMTDATA. It also senses the input states of SYNC.

DUART4 (U8E) communicates with the ALE circuitry (U53). The serial link to the 7000ALE-141B card is a 9600 baud TTL/CMOS level data link. DUART4 also provides antenna tuner output functions such as ATUSP1 (EXT_EN1) and ATUSP2 (EXT_EN2). It also senses the input states of EXTIN1 and JU1.

Multi-Function Peripheral Device

The FPGA includes an internal multi-function peripheral device (MC68901) that provides all the main interrupt sources and outputs for the TW7000. Interrupt sources include:

- Squelch INTR (IRQ2)
- EXTCWKEY (IRQ3)
- ENCRPTTI (IRQ4)
- AUXPTT IN (IRQ7)

The outputs include:

- PTT (IRQ0)
- CWKEY (IRQ5)
- AUXPTT OUT (IRQ6)

The Schmitt trigger chip (U20) squares the incoming interrupt signals to eliminate false interrupts. This device also contains the UART for communications with the 7000ENCR option board.

Parallel Interface/Timer Chip

The parallel interface/timer in the FPGA provides parallel input/output for a parallel printer. The parallel printer interface is implemented through port B (PB0 to PB7) in conjunction with U26 and U30.

SPI Controller

The FPGA includes a synchronous serial peripheral interface (SPI) controller that communicates with various devices on the Processor board as well as other boards. SPI is implemented through port A (PA6, PA7) using U31 and U32.

14.1.8 RS-232/422/ 485 Interface

The RS-232 serial bus transceiver (U34) provides RS-232 communications through COM1 and COM2 serial ports. This chip includes an onboard capacitor charge pump for generating the -10 Vdc and +10 Vdc necessary for RS-232 communications. Chip U38 provides RS-422 single point differential communications or RS-485 multipoint differential communications. Configuration resistors R51 (TX), R56 (RX) route serial communications between DUART1 in the FPGA, the RS-232 transceiver and the COM1 port. Configuration resistors R50 (TX), and R57 (RX) route serial communications between DUART1 in the FPGA, the RS-422/485 transceiver and the COM2 port. For the correct jumper placements, refer to Table 21-6 on page 21-23.

14.1.9 Miscellaneous Controls

DUART1 OP6 in the FPGA controls transistor Q5 to activate an internal encrypted PTT output signal (ENCRYPTTO). DUART1 OP5 controls transistor Q4 to activate the amplifier PTT signal (AMPTT) that controls an external amplifier.

14.1.10 Antenna Tuner Interface

The ATU interface provides communication with the R/AT7000B antenna tuners using U40 as a 9600 baud RS-422/485 transceiver for the communications protocol between the radio and the antenna tuner.

Line driver chips U39 provide the interface to the RAT1000C antenna tuners with signals for the ATUINIT, ATUKEY, ADATA, ACHKTUNE, ACLOCK, and ASTROBE lines.

The ATUINIT line initiates the antenna tuner tune cycle with low pulse.

The antenna tuner switches the ATUKEY line low to tell the radio to supply CW at a low power level for the antenna tuner to tune. The ATUKEY line goes high when the tune cycle is complete. The other lines are for the AT/RAT1000 memory and provide channel change information to the antenna tuner.

The ACHKTUNE line provides the interrupt to the antenna tuner to alert it to receive the serial channel data.

The ASTROBE line goes high, briefly indicating the antenna tuner is ready to receive data. The radio sends the BCD channel information to the antenna tuner with the ADATA and ACLOCK lines. The ACHKTUNE goes high when data receive is complete.

14.1.11 Remote Interface

The remote interface provides communication with the DHSL and FSK remote control systems.

DHSL Interface

The DHSL protocol handles two 9600 baud communication channels. One is for a standard 9600 baud front panel display communication channel and is routed on SER2. The second DHSL is for control functions routed on SER1.

FSK Interface

The FSK remote is a 1200 baud communications channel to accommodate noisy environments such as telephone lines. The FSK remote interface provides address (RMTA0, RMTA1, RMTA2), write/read (RMTWR), clock (RMTCLK) and data (RMTDATA) signals that program the FSK modem on the FSK remote board.

14.1.12 Serial Peripheral Interface (SPI)

The SPI is the heart of transceiver programming. This synchronous serial data link communicates to all the boards in the TW7000 providing full processor control of the radio. This data link consists of FPGA port A (PA6, PA7) and line driver U19A that provides the SPI enable pulses to each of the boards (refer to Table 14-1 on page 14-9). The enable lines are normally high and pulse low for about 1 ms when programming of the appropriate board is finished. As the boards are programmed, data is sent out on the SPITXD line.

14.1.13 Parallel Printer

The parallel printer interface consists of FPGA port B, U26, and U30. Bus driver chips U26 and U230 provide bidirectional data transfer on all of the interface lines (refer to Table 14-2 on page 14-9).

14.1.14 Squelch Circuit

The Processor board routes demodulated receive audio (DSPRRXA) from the Audio board to the squelch circuit. The squelch circuit on the Processor board operates by detecting the syllabic rate of change present in the human voice. The squelch is immune to impulse noise, static, carriers and general background noise. The squelch is preset internally and is activated by pressing the control panel **SQUELCH** button.

The demodulated receive audio output feeds into the operational amplifiers, U55A and U55B. These stages are high gain amplifiers that limit (clip) the amplitude of signal or noise. This provides a square wave output to trigger the one-shot multivibrators U60A and U60B. The output from the one-shot is a series of pulses that go through the high-pass filter C148, R102, C149, R103, then the low-pass filter R104, C150, R105, and C151. At this point the one-shot presents a DC level signal proportional to the input frequency.

The DC level changes as the frequency shifts, representing the change in frequency of the human voice at a syllabic rate between 0.5 and 2.5 Hz. This signal is AC coupled through C152 to the low frequency differentiation amplifier U56A. The output of U56A is fed into U56B, which pulls down D15 if any signal appears at D13/D14 with a positive or negative amplitude of 0.9V or greater. This unipolar converter enables the squelch to detect the first syllabic rate change at the output of the Audio board.

D15 is connected to U60C and U60D which form a timer with C156 and R116 to hold the audio on for approximately four seconds after the last syllabic change is detected. The squelch is turned off when the timer output is grounded through R118.

The squelch circuit sends the output SQIN to the FPGA parallel interface/timer where it is used to generate the squelch signal to the Audio board to control the squelch gate.

Figure 14-1 on page 14-7 shows the receive audio distribution for the TW7000. DSPRRXA is the unsquelched receive audio from the Audio board.

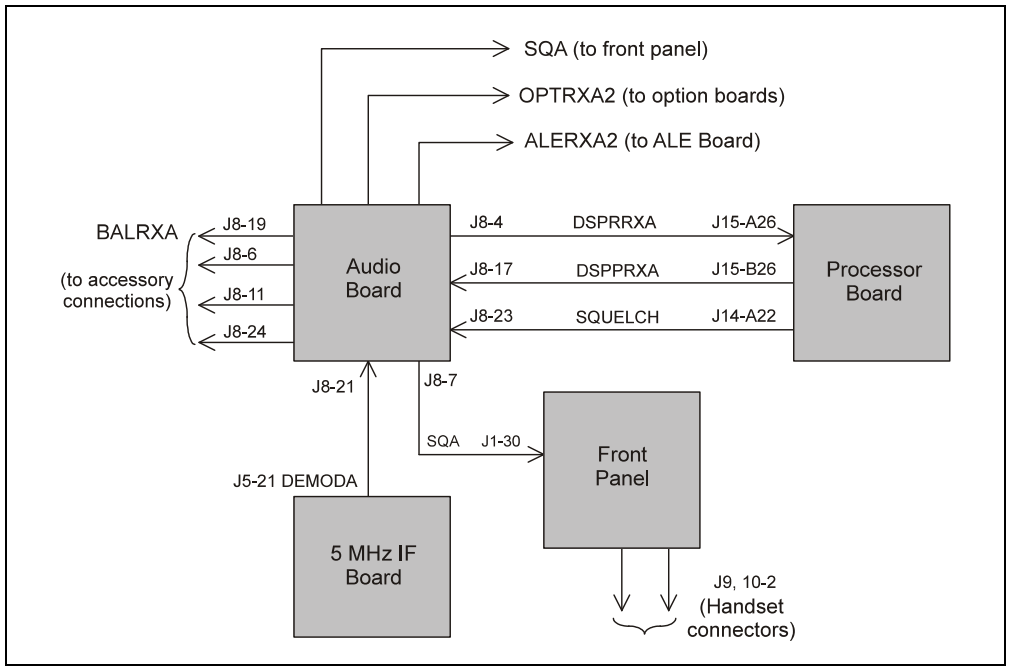


Figure 14-1 RX Audio Distribution Block Diagram

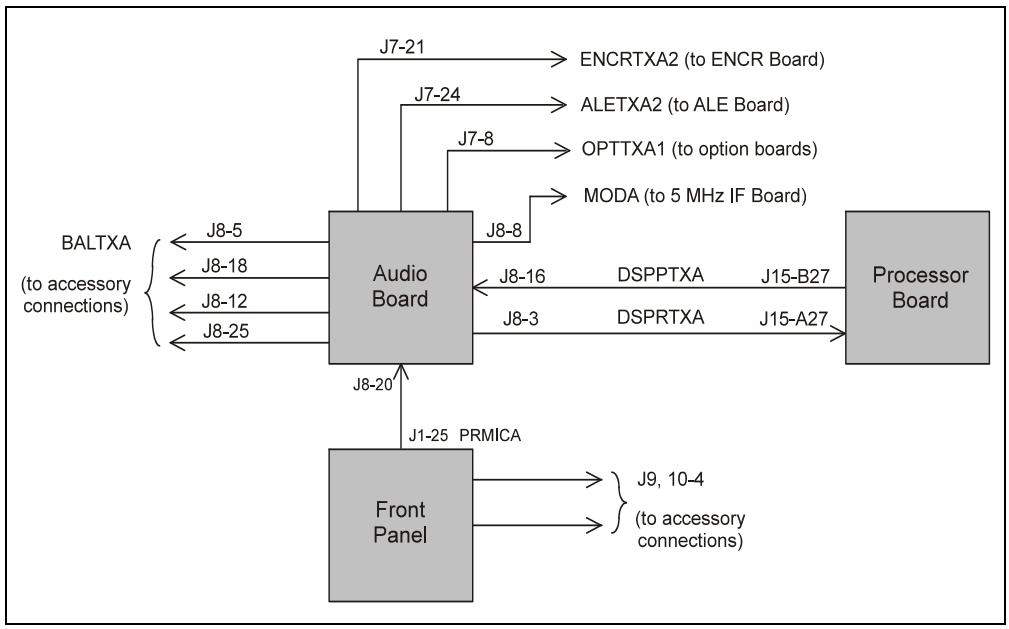


Figure 14-2 TX Audio Distribution Block Diagram

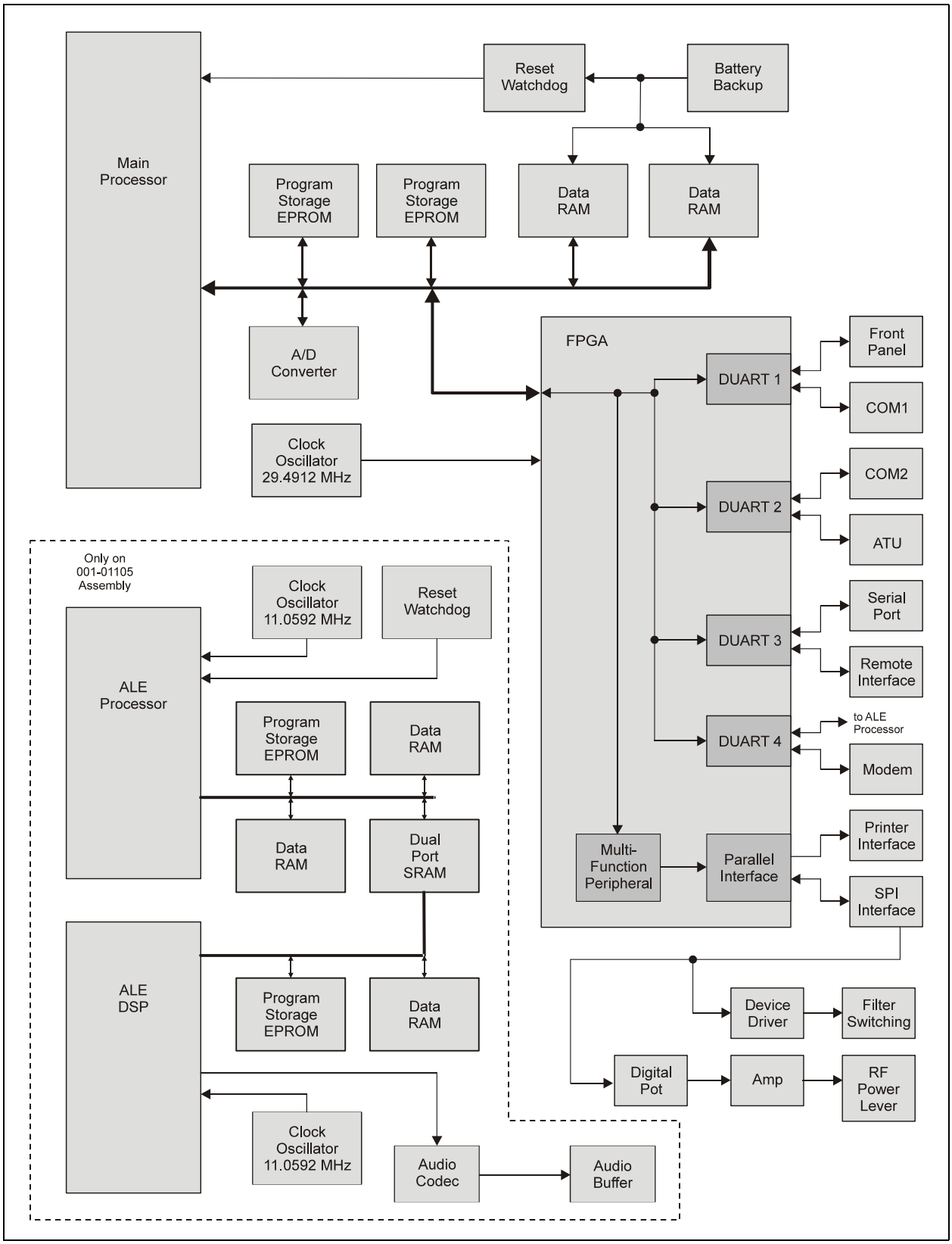


Figure 14-3 Main Processor Block Diagram

14.1.15 SPI Enable Lines

Table 14-1 below lists the SPI enable lines controlled by the FPGA and routed through J14.

Table 14-1 SPI Enable Line Descriptions

Enable	Description
EN1	Main synthesizer - BFO synthesizer
EN2	Main synthesizer - direct digital synthesizer (DDS)
EN3	Main synthesizer - main loop synthesizer
EN4	Main synthesizer - BITE line
EN5	Not used
EN6	5 MHz IF board programming
EN7	Reference/control board programming - filter bands
EN8	Power supply/external amplifier board programming
EN9	Audio board programming
EN10	Reference/control board programming - RF power level
EN11	75 MHz IF board programming
EN12	ECU/RCU interface board programming
EN13	ALE board programming
EN14	Option 1 board programming
EN15	Option 2 board programming
EN16	Serial EEPROM chip programming

14.1.16 Parallel Printer Interface

The TW7000 provides a parallel printer interface through J15.

Table 14-2 Parallel Printer Interface

Line	Printer
DATA0	D0 line (LSB)
DATA1	D1 line
DATA2	D2 line
DATA3	D3 line
DATA4	D4 line
DATA5	D5 line
DATA6	D6 line
DATA7	D7 line (MSB)
STROBE	Strobe line
ACK	Acknowledge

Table 14-2 Parallel Printer Interface (continued)

Line	Printer
SELECT	Select line
BUSY	Busy line
DI/OSEL	Data in/out select line

14.2 Connector Pin Assignments

14.2.1 J14 Connector

J14 connects to the Motherboard.

Table 14-3 Processor Board J14 Pin Assignments

A-Pins	Signal	Description
A1	GND	Ground
A2	EN7	Reference/control board programming
A3	EN2	Main synthesizer DDS programming
A4	EN4	Main synthesizer BITE line
A5	EN6	5 MHz IF board programming
A6	EN9	Audio board programming
A7	EN14	Option 1 slot programming
A8	EN13	ALE board programming (7000ALE option only)
A9	N/C	No connection
A10	ALE RXD	Not used on 001-01107 assembly
A11	RVSPWR	Reverse power line
A12	EXTBITE	C1021 detect
A13	N/C	No connection
A14	N/C	No connection
A15	N/C	No connection
A16	SERRXD	Option slots receive data line
A17	ENCRPTTI	Encryption PTT input line
A18	AGC	Automatic gain control line
A19	FPRXD	Front panel receive data line
A20	PWRLVL	Power level line
A21	N/C	No connection
A22	SQUELCH	Audio board squelch line

Table 14-3 Processor Board J14 Pin Assignments (continued)

A-Pins	Signal	Description
A23	TCRXAI	TA/TC/SC receive audio line
A24	RMTRXD	FSK remote receive data line
A25	SER2RXD	DHSL front panel receive data line
A26	SER1RXD	DHSL second serial channel receive data line
A27	SYNC	DHSL synchronization line
A28	RMTCLK	FSK remote modem clock line
A29	RMTA2	FSK remote modem address 2 line
A30	RMTA0	FSK remote modem address 0 line
A31	+12V	+12 Vdc supply voltage
A32	GND	Ground
B-Pins	**Signal**	**Description**
B1	GND	Ground
B2	EN10	Reference/control board programming
B3	EN1	Main synthesizer BFO programming
B4	EN3	Main synthesizer main loop programming
B5	EN5	Not used
B6	EN11	75 MHz IF board programming
B7	EN15	Option 2 slot programming
B8	EN12	ECU/RCU interface board programming
B9	EN8	Power supply/external amplifier board programming
B10	ALE TXD	Not used on 001-01107 assembly
B11	PTT	Internal radio PTT line
B12	BITE	BITE line
B13	SPICLK	Serial peripheral interface (SPI) clock line
B14	SPITXD	SPI transmit data line
B15	SPIRXD	SPI receive data line
B16	OPTTXD	Option slots transmit data line
B17	ENCRPTTO	Encryption PTT output line
B18	ALCLVL	ALC transmit level line
B19	FPTXD	Front panel transmit data line
B20	VSWRALM	VSWR alarm line
B21	N/C	No connection

Table 14-3 Processor Board J14 Pin Assignments (continued)

B-Pins	Signal	Description
B22	N/C	No connection
B23	CWKEY	Audio board CW key line
B24	TCTXA0	TA/TC/SC transmit audio line
B25	RMTTXD	FSK remote transmit data line
B26	SER2TXD	DHSL front panel transmit data line
B27	SER1TXD	DHSL second serial channel transmit data line
B28	RMTWR	FSK remote modem write line
B29	RMTDATA	FSK remote modem data line
B30	RMTA1	FSK remote modem address 1 line
B31	+12V	+12V supply voltage
B32	GND	Ground

14.2.2 J15 Connector

J15 connects to the Motherboard.

Table 14-4 Processor Board J15 Pin Assignments

A-Pins	Signal	Description
A1	GND	Ground
A2	EXT_EN2	External SPI enable
A3	ASTROBE	AT/RAT100 memory strobe line
A4	ATUKEY	AT/RAT100 tune cycle key line
A5	ACHKTUNE	AT/RAT100 memory check tune line
A6	COM1TXD	COM1 transmit data line
A7	COM1RXD	COM1 receive data line
A8	ACK	Printer acknowledge line
A9	DI/OSEL	Data input/output select line
A10	ALE RXD	No connection
A11	TSENSE	Heat sink temperature sense line
A12	EXTBITE	Used on TW7000PP only
A13	ATUTX	AT7000 transmit data line
A14	EXTTXD	Keyboard transmit data line
A15	EXTRXD	Keyboard receive data line
A16	FILTG	Filter G select line
A17	COM2TXD	COM2 transmit data line

Table 14-4 Processor Board J15 Pin Assignments (continued)

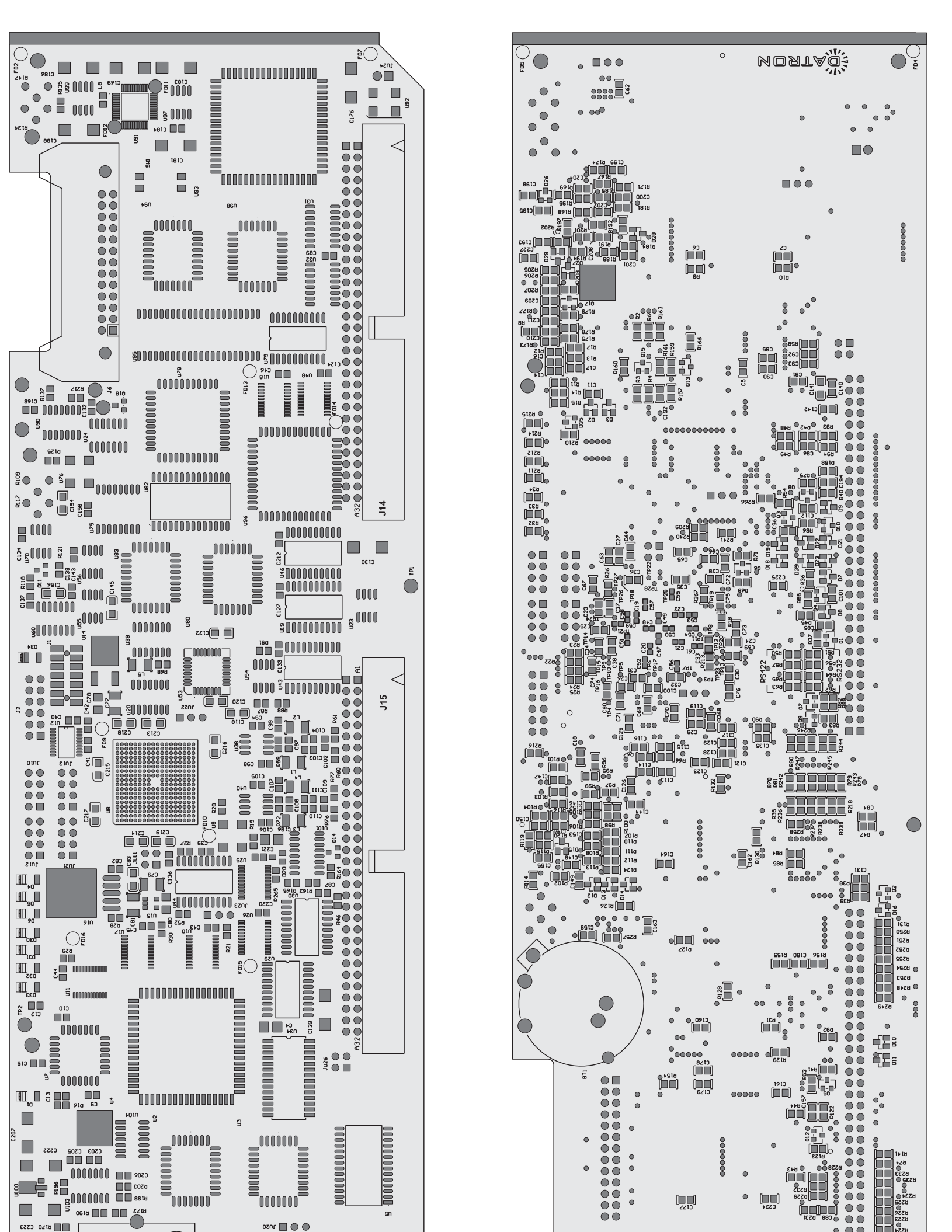
A-Pins	Signal	Description
A18	RETX	Re-transmit signal line
A19	N/C	No connection
A20	EXTCWKEY	External CW key line
A21	ATUINIT	AT/RAT100 tune cycle initiate line
A22	DATA0	Parallel printer data 0 line
A23	DATA2	Parallel printer data 2 line
A24	DATA4	Parallel printer data 4 line
A25	DATA6	Parallel printer data 6 line
A26	DSPRRXA	Squelch receive audio line
A27	DSPRTXA	Audio loop
A28	N/C	No connection
A29	+5V	+5V supply voltage
A30	+5V	+5V supply voltage
A31	+12V	+12V supply voltage
A32	GND	Ground
B-Pins	**Signal**	**Description**
B1	GND	Ground
B2	EXTIN1	Currently unused
B3	EXTEN1	Ext SPI enable 1
B4	ACLOCK	RAT1000 clock line
B5	ADATA	RAT1000 data line
B6	COM1RTS	COM1 RTS line
B7	COM1CTS	COM1 CTS line
B8	STROBE	Printer strobe line
B9	SELECT	Printer select line
B10	BUSY	Printer busy line
B11	AUXPTT	Auxiliary PTT line
B12	N/C	No connection
B13	N/C	No connection
B14	ATURX	AT7000 receive data line
B15	AMPPTT	External amplifier PTT line
B16	EXTCLK	Ext SPI clock line
B17	N/C	No connection

Table 14-4 Processor Board J15 Pin Assignments (continued)

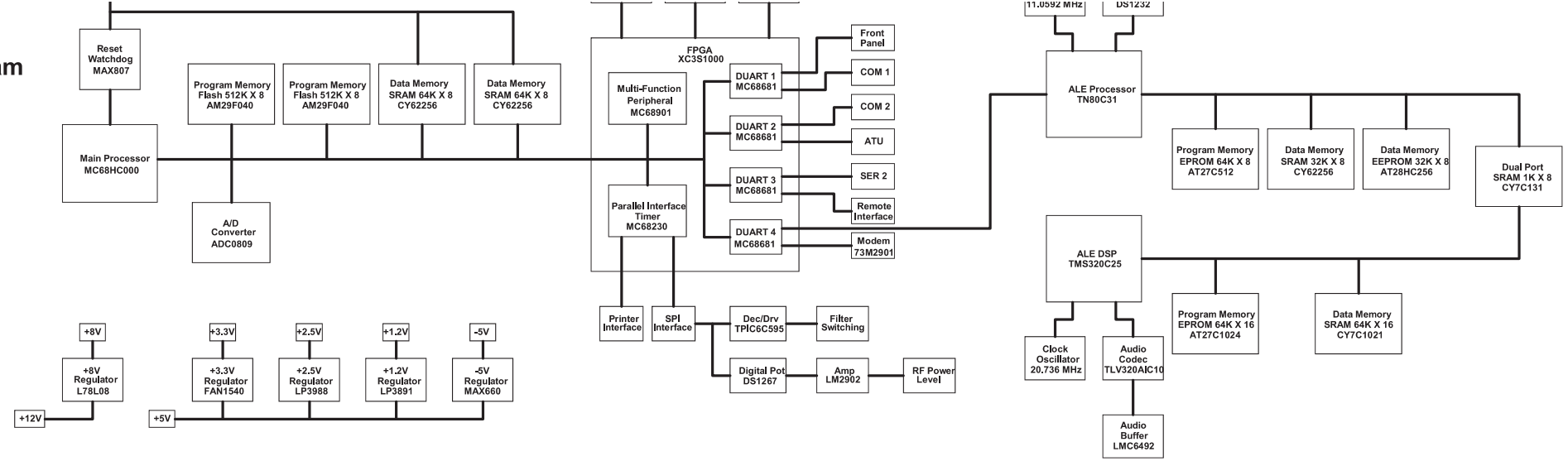
B-Pins	Signal	Description
B18	COM2RXD	COM2 receive data line
B19	TC/SCALM	TA/TC/SC alarm line
B20	N/C	No connection
B21	N/C	No connection
B22	DATA1	Parallel printer data 1 line
B23	DATA3	Parallel printer data 3 line
B24	DATA5	Parallel printer data 5 line
B25	DATA7	Parallel printer data 7 line
B26	DSPPRXA	Receive audio line
B27	DSPPTXA	Audio loop
B28	N/C	No connection
B29	+5V	+5V supply voltage
B30	+5V	+5V supply voltage
B31	+12V	+12V supply voltage
B32	GND	Ground

14.3 Component Locations, Schematics and Parts List

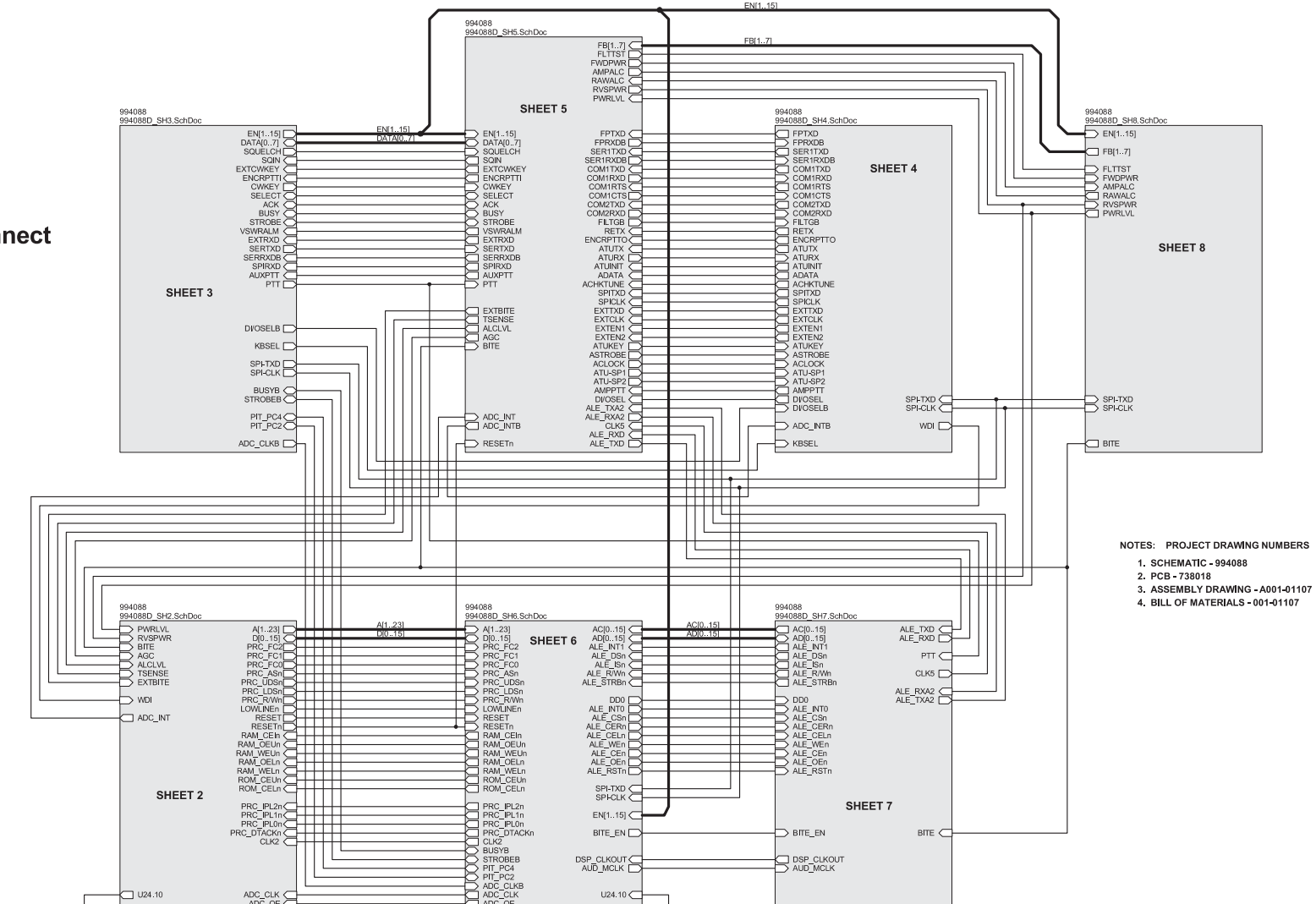
This section includes a components location diagram, schematics and a parts list for the Processor board.


DATRON
J14
J15
A32
A1
RS232
RS422
BT1
TP1
TP2
SW1

ck Diagram



Interconnect



Schematic Sheet Description	
Sheet	Description
1	Cover Sheet
2	Main Processor
3	Parallel Timer/Multi Peripheral
4	DUART 1 and 2
5	DUART 3 and 4
6	FPGA and Power Supplies
7	ALE
8	Reference Control

NOTES: PROJECT DRAWING NUMBERS

1. SCHEMATIC - 994088
2. PCB - 738018
3. ASSEMBLY DRAWING - A001-01107
4. BILL OF MATERIALS - 001-01107

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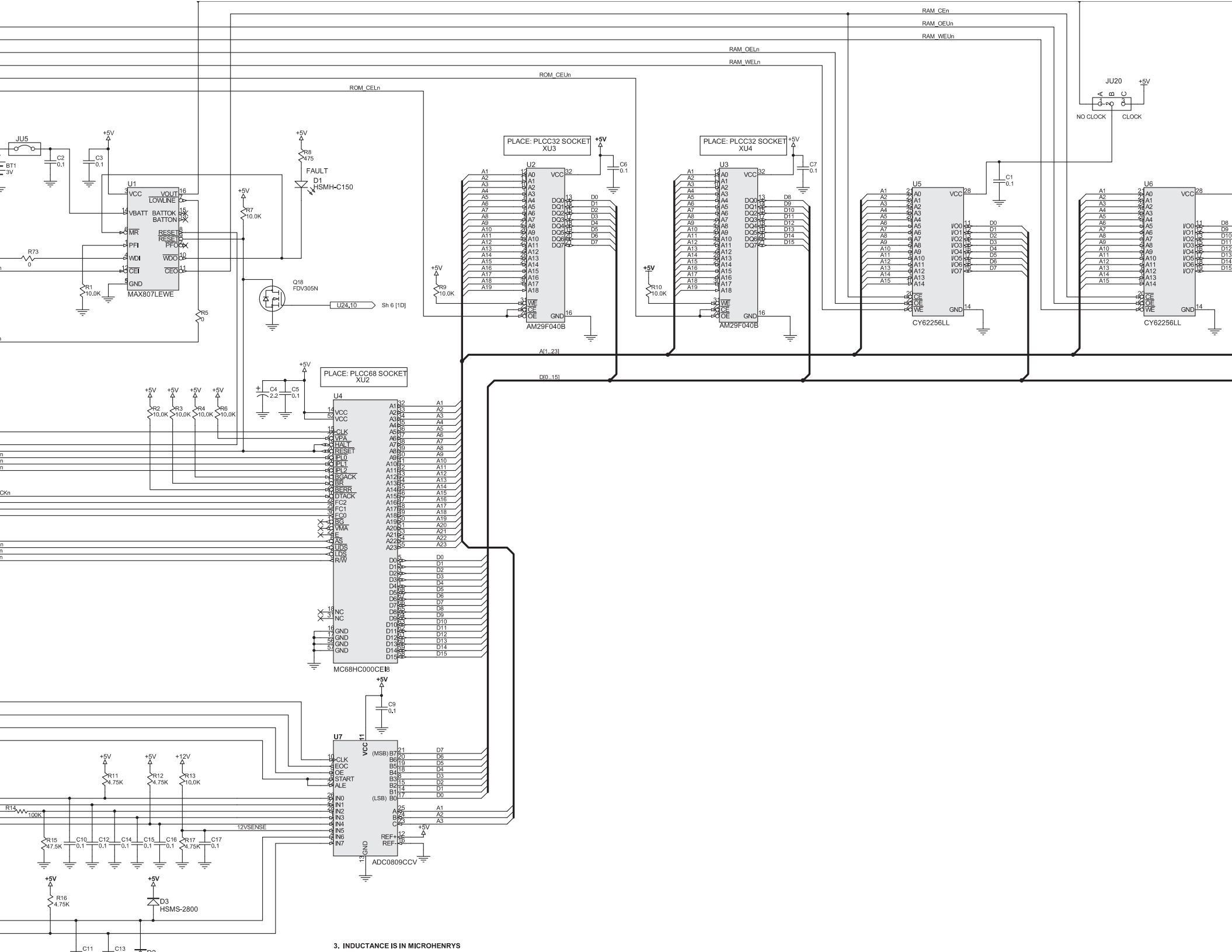
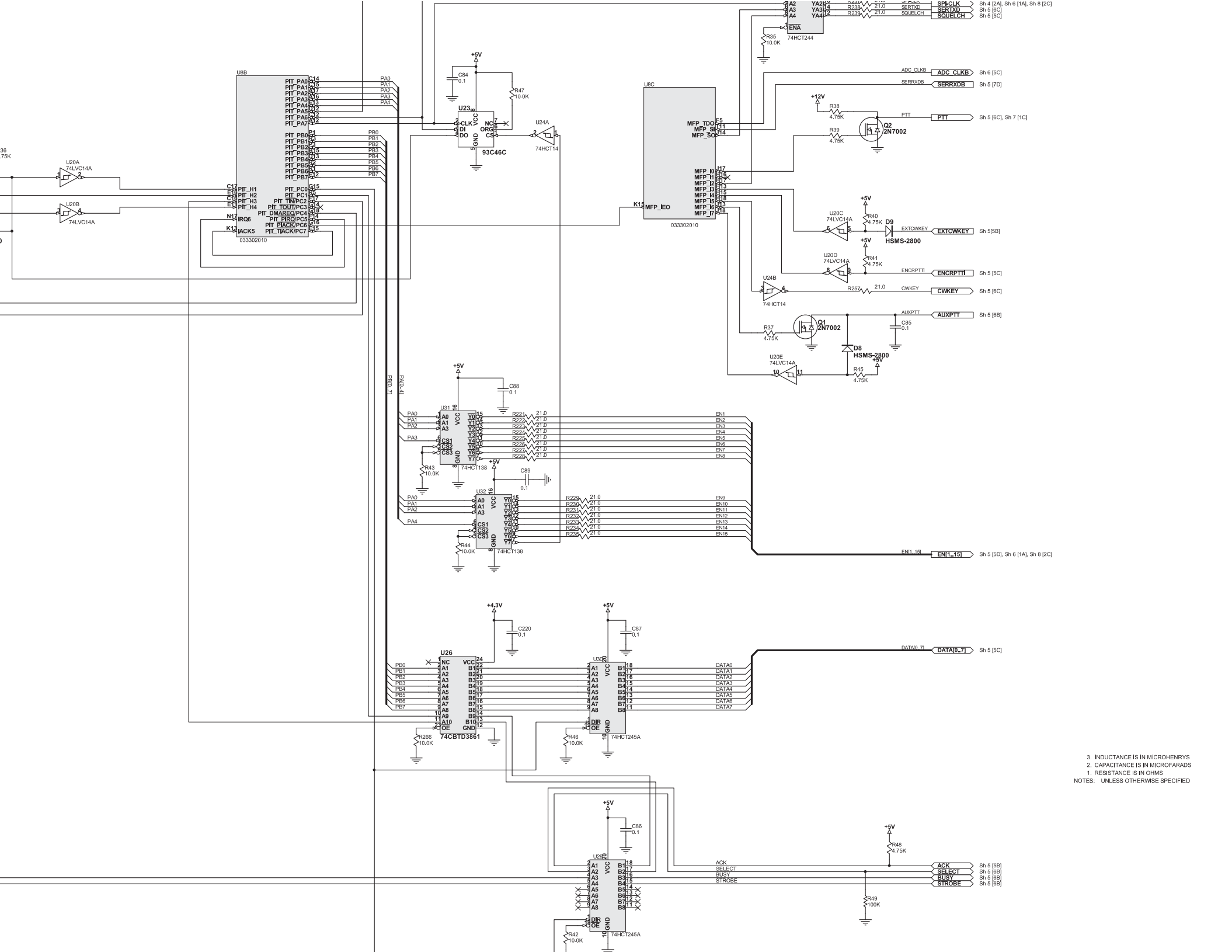
APPROVALS	DATE
DRAFTER	

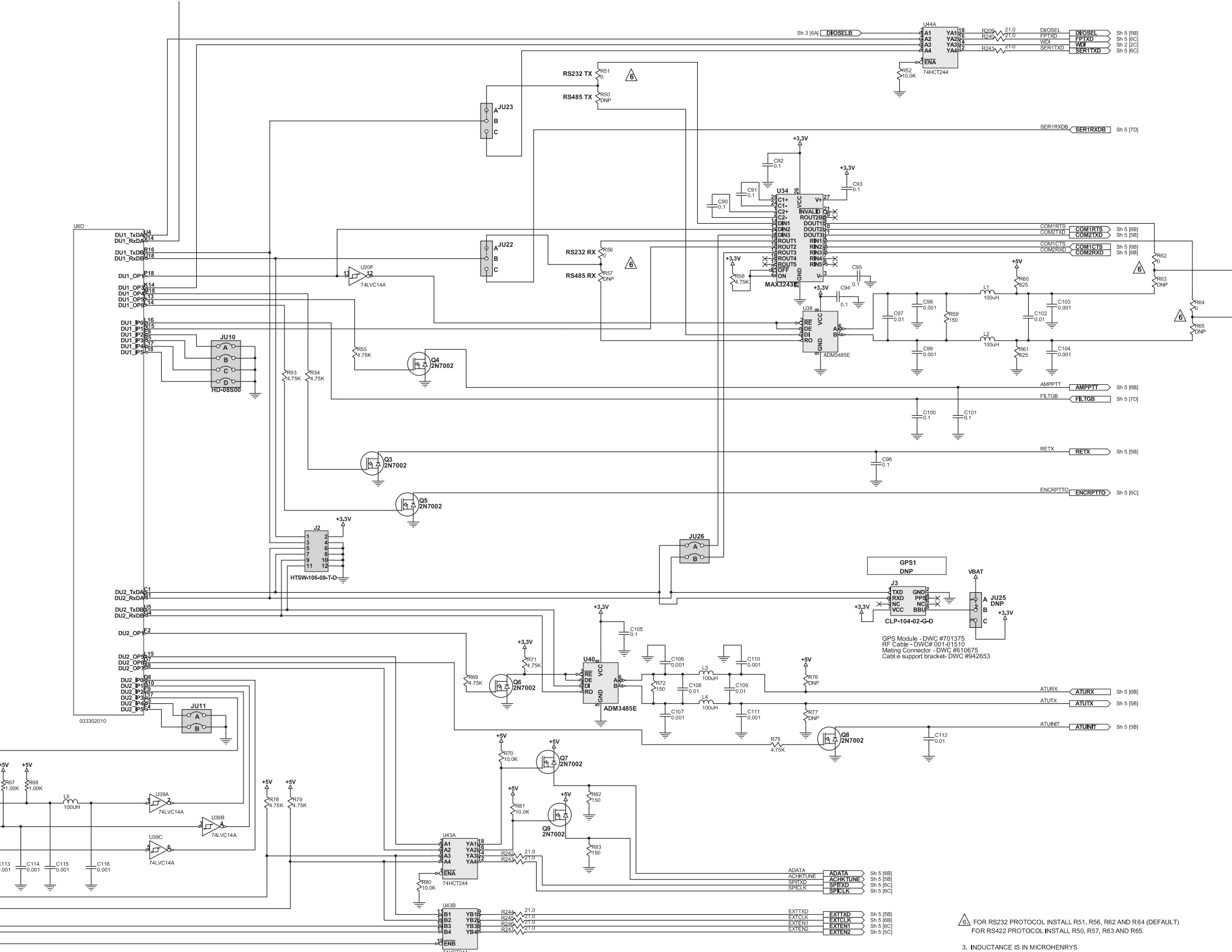
TITLE SCH
7000



3. INDUCTANCE IS IN MICROHENRYS

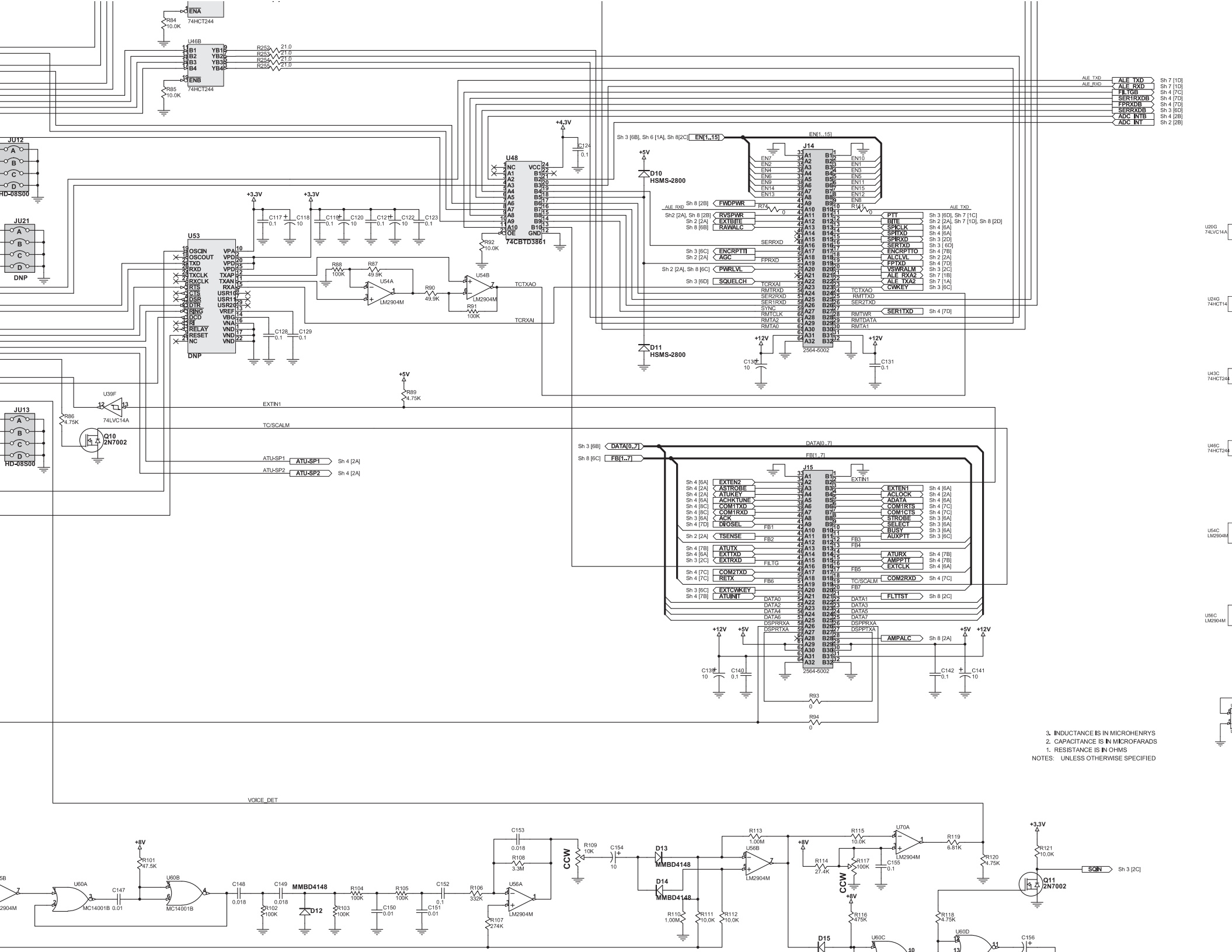


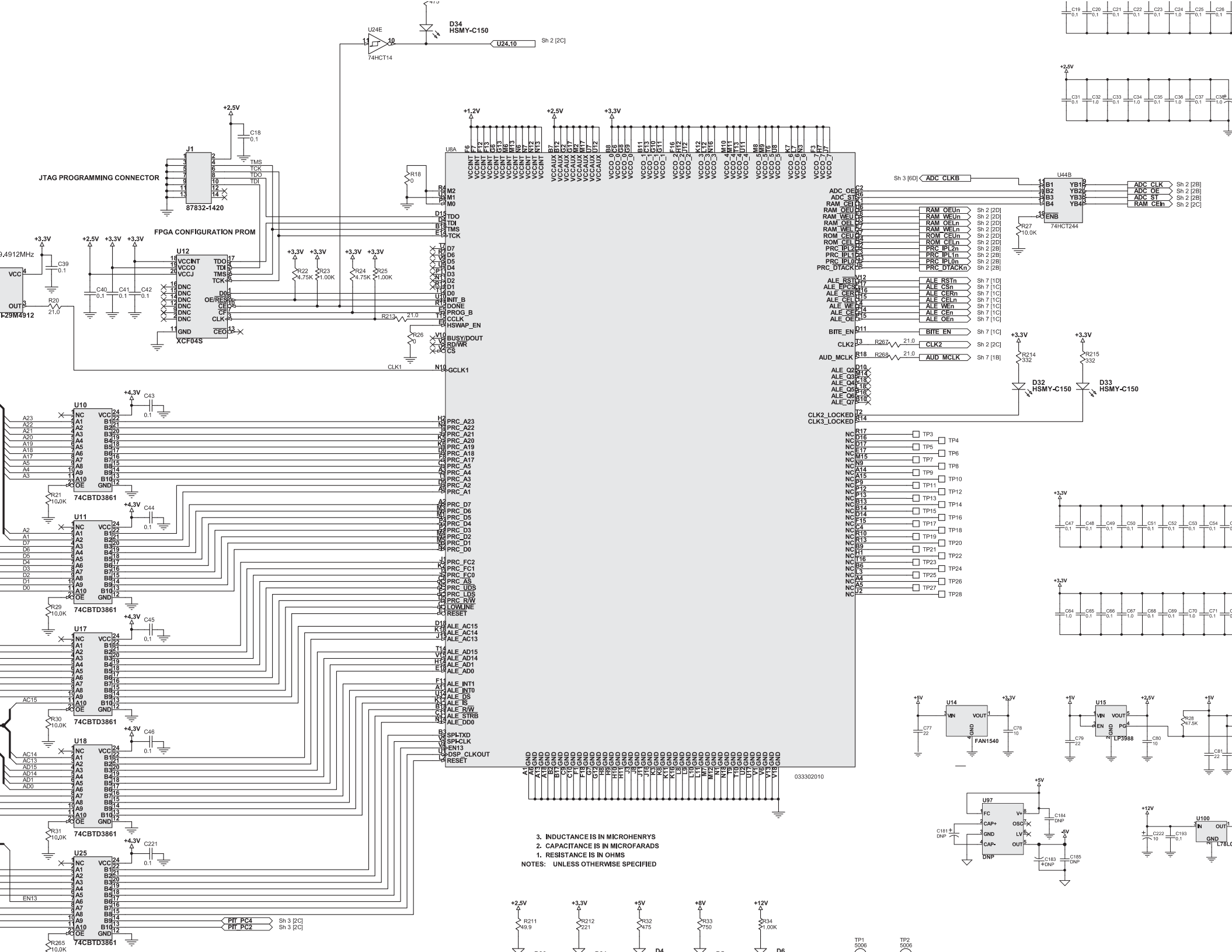
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IS IN OHMS
2. CAPACITANCE IS IN MICROFARADS
3. INDUCTANCE IS IN MICROHENRYS

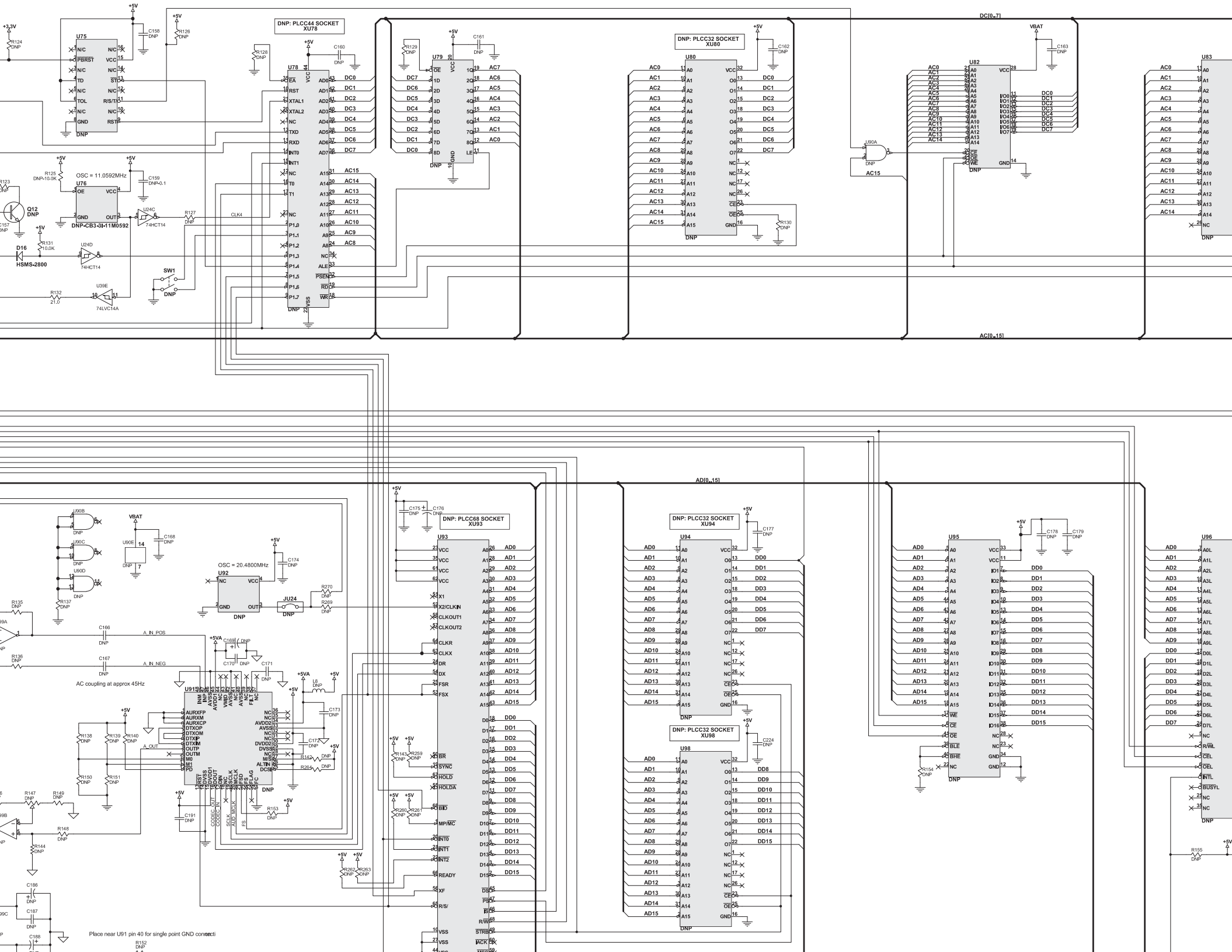


6 FOR RS232 PROTOCOL INSTALL R51, R56, R62 AND R64 (DEFAULT)
FOR RS422 PROTOCOL INSTALL R50, R57, R63 AND R65.

3. INDUCTANCE IS IN MICROHENRYS


U46B
ENA
ENB
74HCT244
R84 10.0K
R85 10.0K
R252 21.0
R253 21.0
R254 21.0
R255 21.0
ALE_TXD
ALE_RXD
FILTGB
SER1RXDB
FPRXDB
SERRXDB
ADC_INTB
ADC_INT
Sh 7 [1D]
Sh 4 [7C]
Sh 4 [7D]
Sh 3 [6D]
Sh 4 [2B]
Sh 2 [2B]
JU12
JU21
JU13
HD-08S00
DNP
U48
74CBTD3861
C124 0.1
+4.3V
U53
OSCIN
OSCOUT
TXD
RXD
TXCLK
RXCLK
RTS
CTS
DSR
DTR
RING
DCD
RI
RELAY
RESET
NC
VPA
VPD
TXAP
TXAN
RXA
USR1
USR2
VREF
VBG
VNA
VND
+3.3V
C117 0.1
C118 10
C119 0.1
C120 10
C121 0.1
C122 10
C123 0.1
C128 0.1
C129 0.1
R92 10.0K
R88 100K
R87 49.9K
R90 49.9K
R91 100K
U54A
U54B
LM2904M
TCTXAO
TCRXAI
+5V
R89 4.75K
U39F
74LVC14A
R86 4.75K
Q10 2N7002
EXTIN1
TC/SCALM
ATU-SP1
ATU-SP2
Sh 4 [2A]
D10 HSMS-2800
D11 HSMS-2800
J14
EN[1..15]
Sh 3 [6B], Sh 6 [1A], Sh 8[2C]
EN7
EN2
EN4
EN6
EN9
EN14
EN13
EN10
EN1
EN3
EN5
EN11
EN15
EN12
EN8
FWDPWR
RVSPWR
EXTBITE
RAWALC
ENCRPTII
AGC
PWRLVL
SQUELCH
SERRXD
FPRXD
TCRXAI
RMTRXD
SER2RXD
SER1RXD
SYNC
RMTCLK
RMTA2
RMTA0
PTT
BITE
SPICLK
SPITXD
SPIRXD
SERTXD
ENCRPTTO
ALCLVL
FPTXD
VSWRALM
ALE_RXA2
ALE_TXA2
CWKEY
SER1TXD
TCTXAO
RMTTXD
SER2TXD
RMTWR
RMTDATA
RMTA1
Sh 3 [6D], Sh 7 [1C]
Sh 2 [2A], Sh 7 [1D], Sh 8 [2D]
Sh 4 [6A]
Sh 3 [2D]
Sh 3 [6D]
Sh 4 [7B]
Sh 2 [2A]
Sh 4 [7D]
Sh 3 [2A]
Sh 7 [1B]
Sh 7 [1A]
Sh 3 [6C]
Sh 4 [7D]
+12V
C130 10
C131 0.1
2564-5002
DATA[0..7]
FB[1..7]
DATA[0..7]
FB[1..7]
J15
EXTEN2
ASTROBE
ATUKEY
ACHKTUNE
COM1TXD
COM1RXD
ACK
DIOSEL
TSENSE
ATUTX
EXTTXD
EXTRXD
COM2TXD
RETX
EXTCWKEY
ATUINT
EXTEN1
ACLOCK
ADATA
COM1RTS
COM1CTS
STROBE
SELECT
BUSY
AUXPTT
ATURX
AMPPTT
EXTCLK
COM2RXD
FLTTST
AMPALC
FB1
FB2
FB3
FB4
FB5
FB6
FB7
FILTG
TC/SCALM
DATA0
DATA1
DATA2
DATA3
DATA4
DATA5
DATA6
DATA7
DSPRRXA
DSPRTXA
DSPPRXA
DSPPTXA
Sh 4 [6A]
Sh 4 [2A]
Sh 4 [6A]
Sh 4 [8C]
Sh 4 [8C]
Sh 3 [6A]
Sh 4 [7D]
Sh 2 [2A]
Sh 4 [7B]
Sh 4 [6A]
Sh 3 [2C]
Sh 4 [7C]
Sh 4 [7C]
Sh 3 [6C]
Sh 4 [7B]
Sh 4 [7B]
Sh 4 [6A]
Sh 4 [7C]
Sh 4 [7C]
Sh 3 [6A]
Sh 3 [6A]
Sh 3 [6A]
Sh 3 [6C]
Sh 8 [2C]
Sh 8 [2A]
C139 10
C140 0.1
C142 0.1
C141 10
R93 0
R94 0
3. INDUCTANCE IS IN MICROHENRYS
2. CAPACITANCE IS IN MICROFARADS
1. RESISTANCE IS IN OHMS
NOTES: UNLESS OTHERWISE SPECIFIED
VOICE_DET
+8V
R101 47.5K
U60A
U60B
MC14001B
C147 0.01
C148 0.018
C149 0.018
R102 100K
MMBD4148
D12
R103 100K
R104 100K
R105 100K
C150 0.01
C151 0.01
C152 0.1
R106 332K
R107 274K
U56A
LM2904M
C153 0.018
R108 3.3M
CCW
R109 10K
C154 10
D13 MMBD4148
D14 MMBD4148
R110 1.00M
R111 10.0K
R112 10.0K
R113 1.00M
U56B
R114 27.4K
R115 10.0K
R117 100K
C155 0.1
U70A
R116 475K
D15
U60C
U60D
R118 4.75K
R119 6.81K
R120 4.75K
C156
R121 10.0K
Q11 2N7002
SQIN
Sh 3 [2C]
U20G 74LVC14A
U24G 74HCT14
U43C 74HCT244
U46C 74HCT244
U54C LM2904M
U56C LM2904M


JTAG PROGRAMMING CONNECTOR
87832-1420
FPGA CONFIGURATION PROM
XCF04S
74HCT14
74HCT244
74CBTD3861
FAN1540
LP3988
D34 HSMY-C150
D32 HSMY-C150
D33 HSMY-C150
U24.10
Sh 2 [2C]
ADC_CLKB
ADC_CLK
ADC_OE
ADC_ST
RAM_CEn
CLK2
AUD_MCLK
CLK2_LOCKED
CLK3_LOCKED
PIT_PC4
PIT_PC2
3. INDUCTANCE IS IN MICROHENRYS
2. CAPACITANCE IS IN MICROFARADS
1. RESISTANCE IS IN OHMS
NOTES: UNLESS OTHERWISE SPECIFIED
033302010


DNP: PLCC44 SOCKET XU78
DNP: PLCC32 SOCKET XU80
DNP: PLCC68 SOCKET XU93
DNP: PLCC32 SOCKET XU94
DNP: PLCC32 SOCKET XU98
DC[0..7]
AC[0..15]
AD[0..15]
OSC = 11.0592MHz
OSC = 20.4800MHz
DNP-CB3-3I-11M0592
HSMS-2800
A_IN_POS
A_IN_NEG
A_OUT
AC coupling at approx 45Hz
Place near U91 pin 40 for single point GND connecti

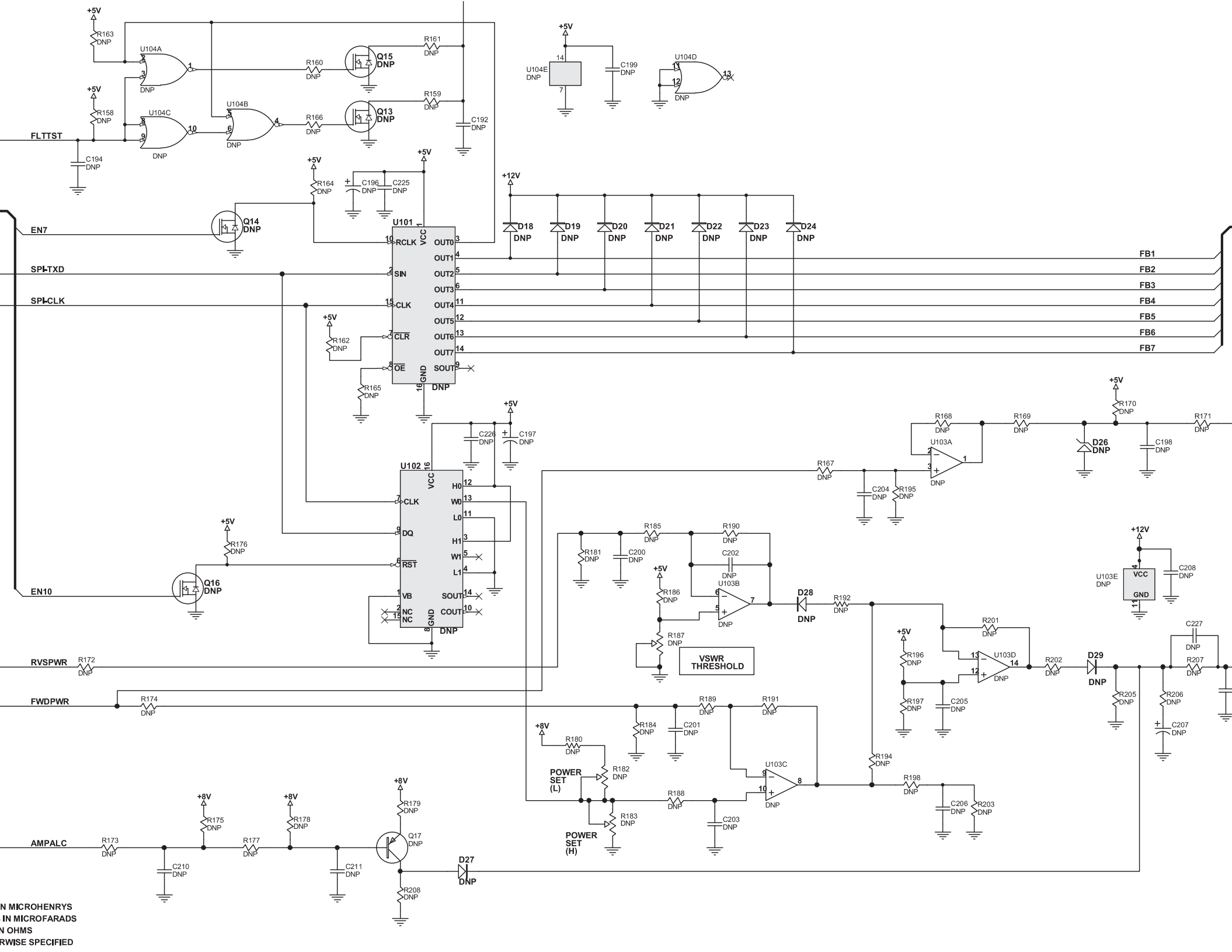

+5V
R163 DNP
U104A
R160 DNP
Q15 DNP
R161 DNP
U104E DNP
C199 DNP
U104D
FLTTST
R158 DNP
U104C
U104B
R166 DNP
Q13 DNP
R159 DNP
C192 DNP
C194 DNP
R164 DNP
C196 DNP
C225 DNP
+12V
D18 DNP
D19 DNP
D20 DNP
D21 DNP
D22 DNP
D23 DNP
D24 DNP
EN7
Q14 DNP
U101
RCLK
SIN
CLK
CLR
OE
VCC
GND
OUT0
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7
SOUT
FB1
FB2
FB3
FB4
FB5
FB6
FB7
SPI-TXD
SPI-CLK
R162 DNP
R165 DNP
U102
C226 DNP
C197 DNP
CLK
DQ
RST
VB
NC
H0
W0
L0
H1
W1
L1
COUT
EN10
Q16 DNP
R176 DNP
R167 DNP
U103A
R168 DNP
R169 DNP
R170 DNP
R171 DNP
D26 DNP
C198 DNP
C204 DNP
R195 DNP
R185 DNP
R190 DNP
R181 DNP
C200 DNP
C202 DNP
U103B
R186 DNP
R187 DNP
D28 DNP
R192 DNP
VSWR THRESHOLD
U103E DNP
C208 DNP
R201 DNP
U103D
R196 DNP
R197 DNP
C205 DNP
R202 DNP
D29 DNP
C227 DNP
R207 DNP
R205 DNP
R206 DNP
C207 DNP
RVSPWR
R172 DNP
FWDPWR
R174 DNP
R189 DNP
R191 DNP
R184 DNP
C201 DNP
+8V
R180 DNP
POWER SET (L)
R182 DNP
U103C
R194 DNP
R198 DNP
R188 DNP
C203 DNP
C206 DNP
R203 DNP
R183 DNP
POWER SET (H)
AMPALC
R173 DNP
R175 DNP
R177 DNP
R178 DNP
R179 DNP
Q17 DNP
C210 DNP
C211 DNP
R208 DNP
D27 DNP
N MICROHENRYS
IN MICROFARADS
N OHMS
RWISE SPECIFIED

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
BT1	750057	“BATT, 3V LITH”
C1	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C10	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C100	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C101	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C102	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C103	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C104	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C105	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C106	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C107	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C108	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C109	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C11	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C110	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C111	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C112	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C113	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C114	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C115	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C116	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C117	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C118	022106003	“CAP, TA 10UF 16V 20% 3216”
C119	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C12	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C120	022106003	“CAP, TA 10UF 16V 20% 3216”
C121	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C122	022106003	“CAP, TA 10UF 16V 20% 3216”
C123	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C124	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C125	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C126	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C127	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C128	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C129	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C130	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C131	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C132	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C133	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C134	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C135	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C136	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C137	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C138	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C139	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C14	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C140	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C141	022106003	“CAP, TA 10UF 16V 20% 3216”
C142	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C143	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C144	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C145	022106003	“CAP, TA 10UF 16V 20% 3216”
C146	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C147	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C148	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C149	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C15	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C150	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C151	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C152	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C153	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C154	022106003	“CAP, TA 10UF 16V 20% 3216”
C155	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C156	022106003	“CAP, TA 10UF 16V 20% 3216”
C157	DNP	“NULL PART, VACANT PCB LOCATION”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C158	DNP	“NULL PART, VACANT PCB LOCATION”
C159	DNP	“NULL PART, VACANT PCB LOCATION”
C16	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C160	DNP	“NULL PART, VACANT PCB LOCATION”
C161	DNP	“NULL PART, VACANT PCB LOCATION”
C162	DNP	“NULL PART, VACANT PCB LOCATION”
C163	DNP	“NULL PART, VACANT PCB LOCATION”
C164	DNP	“NULL PART, VACANT PCB LOCATION”
C165	DNP	“NULL PART, VACANT PCB LOCATION”
C166	DNP	“NULL PART, VACANT PCB LOCATION”
C167	DNP	“NULL PART, VACANT PCB LOCATION”
C168	DNP	“NULL PART, VACANT PCB LOCATION”
C169	DNP	“NULL PART, VACANT PCB LOCATION”
C17	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C170	DNP	“NULL PART, VACANT PCB LOCATION”
C171	DNP	“NULL PART, VACANT PCB LOCATION”
C172	DNP	“NULL PART, VACANT PCB LOCATION”
C173	DNP	“NULL PART, VACANT PCB LOCATION”
C174	DNP	“NULL PART, VACANT PCB LOCATION”
C175	DNP	“NULL PART, VACANT PCB LOCATION”
C176	DNP	“NULL PART, VACANT PCB LOCATION”
C177	DNP	“NULL PART, VACANT PCB LOCATION”
C178	DNP	“NULL PART, VACANT PCB LOCATION”
C179	DNP	“NULL PART, VACANT PCB LOCATION”
C18	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C180	DNP	“NULL PART, VACANT PCB LOCATION”
C181	DNP	“NULL PART, VACANT PCB LOCATION”
C182	DNP	“NULL PART, VACANT PCB LOCATION”
C183	DNP	“NULL PART, VACANT PCB LOCATION”
C184	DNP	“NULL PART, VACANT PCB LOCATION”
C185	DNP	“NULL PART, VACANT PCB LOCATION”
C186	DNP	“NULL PART, VACANT PCB LOCATION”
C187	DNP	“NULL PART, VACANT PCB LOCATION”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C188	DNP	“NULL PART, VACANT PCB LOCATION”
C189	DNP	“NULL PART, VACANT PCB LOCATION”
C19	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C191	DNP	“NULL PART, VACANT PCB LOCATION”
C192	DNP	“NULL PART, VACANT PCB LOCATION”
C193	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C194	DNP	“NULL PART, VACANT PCB LOCATION”
C195	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C196	DNP	“NULL PART, VACANT PCB LOCATION”
C197	DNP	“NULL PART, VACANT PCB LOCATION”
C198	DNP	“NULL PART, VACANT PCB LOCATION”
C199	DNP	“NULL PART, VACANT PCB LOCATION”
C2	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C20	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C200	DNP	“NULL PART, VACANT PCB LOCATION”
C201	DNP	“NULL PART, VACANT PCB LOCATION”
C202	DNP	“NULL PART, VACANT PCB LOCATION”
C203	DNP	“NULL PART, VACANT PCB LOCATION”
C204	DNP	“NULL PART, VACANT PCB LOCATION”
C205	DNP	“NULL PART, VACANT PCB LOCATION”
C206	DNP	“NULL PART, VACANT PCB LOCATION”
C207	DNP	“NULL PART, VACANT PCB LOCATION”
C208	DNP	“NULL PART, VACANT PCB LOCATION”
C209	DNP	“NULL PART, VACANT PCB LOCATION”
C21	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C210	DNP	“NULL PART, VACANT PCB LOCATION”
C211	DNP	“NULL PART, VACANT PCB LOCATION”
C212	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C213	022106003	“CAP, TA 10UF 16V 20% 3216”
C214	022106003	“CAP, TA 10UF 16V 20% 3216”
C215	022106003	“CAP, TA 10UF 16V 20% 3216”
C216	022106003	“CAP, TA 10UF 16V 20% 3216”
C217	022106003	“CAP, TA 10UF 16V 20% 3216”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C218	022106003	“CAP, TA 10UF 16V 20% 3216”
C219	022106003	“CAP, TA 10UF 16V 20% 3216”
C22	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C220	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C221	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C222	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C223	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C224	DNP	“NULL PART, VACANT PCB LOCATION”
C225	DNP	“NULL PART, VACANT PCB LOCATION”
C226	DNP	“NULL PART, VACANT PCB LOCATION”
C227	DNP	“NULL PART, VACANT PCB LOCATION”
C23	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C24	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C25	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C26	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C27	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C28	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C29	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C30	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C31	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C32	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C33	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C34	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C37	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C38	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C39	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C4	022020	“CAP, 2.2UF TA 20V 10% 3528”
C40	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C41	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C42	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C43	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C44	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C45	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C46	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C47	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C48	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C49	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C5	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C50	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C51	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C52	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C53	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C54	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C55	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C56	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C57	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C58	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C59	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C6	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C60	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C61	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C62	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C63	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C64	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C65	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C66	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C67	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C68	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C69	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C7	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C70	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C71	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C72	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
C73	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C74	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C75	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C76	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C77	021226000	“CAP, 22UF 10V X5R 20% 1210”
C78	021106001	“CAP,SM,CER,10UF,16V,X5R,1206”
C79	021226000	“CAP, 22UF 10V X5R 20% 1210”
C8	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C80	021106001	“CAP,SM,CER,10UF,16V,X5R,1206”
C81	021226000	“CAP, 22UF 10V X5R 20% 1210”
C82	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C83	022106003	“CAP, TA 10UF 16V 20% 3216”
C84	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C85	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C86	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C87	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C88	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C89	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C90	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C91	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C92	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C93	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C94	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C95	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C96	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C97	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C98	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C99	021102000	“CAP, 1000PF NPO 100V 5% 0805”
D1	035500003	“LED, RED TOP-V 1206”
D10	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D11	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D12	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
D13	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D14	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D15	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D16	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D18	DNP	“NULL PART, VACANT PCB LOCATION”
D19	DNP	“NULL PART, VACANT PCB LOCATION”
D2	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D20	DNP	“NULL PART, VACANT PCB LOCATION”
D21	DNP	“NULL PART, VACANT PCB LOCATION”
D22	DNP	“NULL PART, VACANT PCB LOCATION”
D23	DNP	“NULL PART, VACANT PCB LOCATION”
D24	DNP	“NULL PART, VACANT PCB LOCATION”
D26	DNP	“NULL PART, VACANT PCB LOCATION”
D27	DNP	“NULL PART, VACANT PCB LOCATION”
D28	DNP	“NULL PART, VACANT PCB LOCATION”
D29	DNP	“NULL PART, VACANT PCB LOCATION”
D3	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D30	035500002	“LED, GREEN TOP-V 1206”
D31	035500002	“LED, GREEN TOP-V 1206”
D32	035500001	“LED, YELLOW TOP-V 1206”
D33	035500001	“LED, YELLOW TOP-V 1206”
D34	035500001	“LED, YELLOW TOP-V 1206”
D35	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D4	035500002	“LED, GREEN TOP-V 1206”
D5	035500002	“LED, GREEN TOP-V 1206”
D6	035500002	“LED, GREEN TOP-V 1206”
D7	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D8	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D9	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
GPS1	DNP	“NULL PART, VACANT PCB LOCATION”
J1	081014000	“HEADER, 2X7 BOX 2MM SMT”
J14	613166	“HEADER,64 PIN RT ANGLE PC MNT”
J15	613166	“HEADER,64 PIN RT ANGLE PC MNT”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
J2	620172	“HEADER, 2X6 MLX 0.1”
J3	610675	“HEADER,RECEPT 2X4 0.05 LP SMT”
J6	DNP	“NULL PART, VACANT PCB LOCATION”
JU10	620026	“HEADER,8 PIN DUAL MALE”
JU11	620025	“HEADER,4 PIN DUAL MALE”
JU12	620026	“HEADER,8 PIN DUAL MALE”
JU13	620026	“HEADER,8 PIN DUAL MALE”
JU20	620030	“HEADER,3 PIN.025 SQ POST”
JU21	DNP	“NULL PART, VACANT PCB LOCATION”
JU22	620030	“HEADER,3 PIN.025 SQ POST”
JU23	620030	“HEADER,3 PIN.025 SQ POST”
JU24	DNP	“NULL PART, VACANT PCB LOCATION”
JU25	DNP	“NULL PART, VACANT PCB LOCATION”
JU26	620025	“HEADER,4 PIN DUAL MALE”
JU5	650048	“HEADER, PIN 1X2 MLX 0.1 TH”
L1	045104	“IND,100 UH FR 150MA 10% 1210”
L2	045104	“IND,100 UH FR 150MA 10% 1210”
L3	045104	“IND,100 UH FR 150MA 10% 1210”
L4	045104	“IND,100 UH FR 150MA 10% 1210”
L5	045104	“IND,100 UH FR 150MA 10% 1210”
L6	DNP	“NULL PART, VACANT PCB LOCATION”
L7	DNP	“NULL PART, VACANT PCB LOCATION”
L8	DNP	“NULL PART, VACANT PCB LOCATION”
Q1	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q10	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q11	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q12	DNP	“NULL PART, VACANT PCB LOCATION”
Q13	DNP	“NULL PART, VACANT PCB LOCATION”
Q14	DNP	“NULL PART, VACANT PCB LOCATION”
Q15	DNP	“NULL PART, VACANT PCB LOCATION”
Q16	DNP	“NULL PART, VACANT PCB LOCATION”
Q17	DNP	“NULL PART, VACANT PCB LOCATION”
Q18	031102038	“MOSFET-N, FDV305N 20V SOT-23”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
Q2	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q3	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q4	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q5	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q6	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q7	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q8	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q9	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
R1	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R10	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R100	013332300	“RES, 332K OHM 1/8W 1% TK 0805”
R101	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R102	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R103	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R104	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R105	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R106	013332300	“RES, 332K OHM 1/8W 1% TK 0805”
R107	013274001	“RES, 274K OHM 1/8W 1% TK 0805”
R108	013335000	“RES, 3.3M OHM 1/8W 5% TK 0805”
R109	170229	“RES, 10K TRM CER S-ADJ MT TH”
R11	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R110	013105001	“RES, 1M OHM 1/8W 1% TK 0805”
R111	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R112	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R113	013105001	“RES, 1M OHM 1/8W 1% TK 0805”
R114	013274200	“RES, 27.4K OHM 1/8W 1% TK 0805”
R115	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R116	013475300	“RES, 475K OHM 1/8W, 1% TK 0805”
R117	170333	“RES, 100K TRM CER S-ADJ MT TH”
R118	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R119	013681100	“RES, 6.81K OHM 1/8W 1% TK 0805”
R12	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R120	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R121	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R122	DNP	“NULL PART, VACANT PCB LOCATION”
R123	DNP	“NULL PART, VACANT PCB LOCATION”
R124	DNP	“NULL PART, VACANT PCB LOCATION”
R125	DNP	“NULL PART, VACANT PCB LOCATION”
R126	DNP	“NULL PART, VACANT PCB LOCATION”
R127	DNP	“NULL PART, VACANT PCB LOCATION”
R128	DNP	“NULL PART, VACANT PCB LOCATION”
R129	DNP	“NULL PART, VACANT PCB LOCATION”
R13	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R130	DNP	“NULL PART, VACANT PCB LOCATION”
R131	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R132	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R133	DNP	“NULL PART, VACANT PCB LOCATION”
R134	DNP	“NULL PART, VACANT PCB LOCATION”
R135	DNP	“NULL PART, VACANT PCB LOCATION”
R136	DNP	“NULL PART, VACANT PCB LOCATION”
R137	DNP	“NULL PART, VACANT PCB LOCATION”
R138	DNP	“NULL PART, VACANT PCB LOCATION”
R139	DNP	“NULL PART, VACANT PCB LOCATION”
R14	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R140	DNP	“NULL PART, VACANT PCB LOCATION”
R141	013000000	“RES, ZERO OHM 2A TK 0805”
R142	DNP	“NULL PART, VACANT PCB LOCATION”
R143	DNP	“NULL PART, VACANT PCB LOCATION”
R144	DNP	“NULL PART, VACANT PCB LOCATION”
R145	DNP	“NULL PART, VACANT PCB LOCATION”
R146	DNP	“NULL PART, VACANT PCB LOCATION”
R147	DNP	“NULL PART, VACANT PCB LOCATION”
R148	DNP	“NULL PART, VACANT PCB LOCATION”
R149	DNP	“NULL PART, VACANT PCB LOCATION”
R15	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R150	DNP	“NULL PART, VACANT PCB LOCATION”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R151	DNP	“NULL PART, VACANT PCB LOCATION”
R152	DNP	“NULL PART, VACANT PCB LOCATION”
R153	DNP	“NULL PART, VACANT PCB LOCATION”
R154	DNP	“NULL PART, VACANT PCB LOCATION”
R155	DNP	“NULL PART, VACANT PCB LOCATION”
R156	DNP	“NULL PART, VACANT PCB LOCATION”
R157	DNP	“NULL PART, VACANT PCB LOCATION”
R158	DNP	“NULL PART, VACANT PCB LOCATION”
R159	DNP	“NULL PART, VACANT PCB LOCATION”
R16	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R160	DNP	“NULL PART, VACANT PCB LOCATION”
R161	DNP	“NULL PART, VACANT PCB LOCATION”
R162	DNP	“NULL PART, VACANT PCB LOCATION”
R163	DNP	“NULL PART, VACANT PCB LOCATION”
R164	DNP	“NULL PART, VACANT PCB LOCATION”
R165	DNP	“NULL PART, VACANT PCB LOCATION”
R166	DNP	“NULL PART, VACANT PCB LOCATION”
R167	DNP	“NULL PART, VACANT PCB LOCATION”
R168	DNP	“NULL PART, VACANT PCB LOCATION”
R169	DNP	“NULL PART, VACANT PCB LOCATION”
R17	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R170	DNP	“NULL PART, VACANT PCB LOCATION”
R171	DNP	“NULL PART, VACANT PCB LOCATION”
R172	DNP	“NULL PART, VACANT PCB LOCATION”
R173	DNP	“NULL PART, VACANT PCB LOCATION”
R174	DNP	“NULL PART, VACANT PCB LOCATION”
R175	DNP	“NULL PART, VACANT PCB LOCATION”
R176	DNP	“NULL PART, VACANT PCB LOCATION”
R177	DNP	“NULL PART, VACANT PCB LOCATION”
R178	DNP	“NULL PART, VACANT PCB LOCATION”
R179	DNP	“NULL PART, VACANT PCB LOCATION”
R18	013000000	“RES, ZERO OHM 2A TK 0805”
R180	DNP	“NULL PART, VACANT PCB LOCATION”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R181	DNP	“NULL PART, VACANT PCB LOCATION”
R182	DNP	“NULL PART, VACANT PCB LOCATION”
R183	DNP	“NULL PART, VACANT PCB LOCATION”
R184	DNP	“NULL PART, VACANT PCB LOCATION”
R185	DNP	“NULL PART, VACANT PCB LOCATION”
R186	DNP	“NULL PART, VACANT PCB LOCATION”
R187	DNP	“NULL PART, VACANT PCB LOCATION”
R188	DNP	“NULL PART, VACANT PCB LOCATION”
R189	DNP	“NULL PART, VACANT PCB LOCATION”
R19	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R190	DNP	“NULL PART, VACANT PCB LOCATION”
R191	DNP	“NULL PART, VACANT PCB LOCATION”
R192	DNP	“NULL PART, VACANT PCB LOCATION”
R194	DNP	“NULL PART, VACANT PCB LOCATION”
R195	DNP	“NULL PART, VACANT PCB LOCATION”
R196	DNP	“NULL PART, VACANT PCB LOCATION”
R197	DNP	“NULL PART, VACANT PCB LOCATION”
R198	DNP	“NULL PART, VACANT PCB LOCATION”
R2	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R20	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R201	DNP	“NULL PART, VACANT PCB LOCATION”
R202	DNP	“NULL PART, VACANT PCB LOCATION”
R203	DNP	“NULL PART, VACANT PCB LOCATION”
R205	DNP	“NULL PART, VACANT PCB LOCATION”
R206	DNP	“NULL PART, VACANT PCB LOCATION”
R207	DNP	“NULL PART, VACANT PCB LOCATION”
R208	DNP	“NULL PART, VACANT PCB LOCATION”
R209	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R21	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R210	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R211	013499900	“RES, 49.9 OHM 1/8W 1% TK 0805”
R212	013221001	“RES, 221 OHM 1/8W 1% TK 0805”
R213	013210900	“RES, 21 OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R214	013332001	“RES, 332 OHM 1/8W 1% TK 0805”
R215	013332001	“RES, 332 OHM 1/8W 1% TK 0805”
R216	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R217	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R218	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R219	DNP	“NULL PART, VACANT PCB LOCATION”
R22	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R220	DNP	“NULL PART, VACANT PCB LOCATION”
R221	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R222	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R223	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R224	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R225	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R226	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R227	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R228	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R229	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R23	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R230	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R231	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R232	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R233	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R234	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R235	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R236	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R237	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R238	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R239	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R24	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R240	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R241	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R242	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R243	013210900	“RES, 21 OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R244	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R245	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R246	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R247	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R248	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R249	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R25	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R250	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R251	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R252	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R253	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R254	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R255	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R257	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R258	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R259	DNP	“NULL PART, VACANT PCB LOCATION”
R26	013000000	“RES, ZERO OHM 2A TK 0805”
R260	DNP	“NULL PART, VACANT PCB LOCATION”
R261	DNP	“NULL PART, VACANT PCB LOCATION”
R262	DNP	“NULL PART, VACANT PCB LOCATION”
R263	DNP	“NULL PART, VACANT PCB LOCATION”
R264	DNP	“NULL PART, VACANT PCB LOCATION”
R265	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R266	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R267	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R268	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R269	DNP	“NULL PART, VACANT PCB LOCATION”
R27	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R270	DNP	“NULL PART, VACANT PCB LOCATION”
R28	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R29	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R3	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R30	013103001	“RES, 10K OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R31	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R32	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R33	013750001	“RES, 750 OHM 1/8W 1% TK 0805”
R34	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R35	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R36	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R37	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R38	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R39	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R4	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R40	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R41	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R42	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R43	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R44	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R45	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R46	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R47	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R48	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R49	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R5	013000000	“RES, ZERO OHM 2A TK 0805”
R50	DNP	“NULL PART, VACANT PCB LOCATION”
R51	013000000	“RES, ZERO OHM 2A TK 0805”
R52	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R53	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R54	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R55	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R56	013000000	“RES, ZERO OHM 2A TK 0805”
R57	DNP	“NULL PART, VACANT PCB LOCATION”
R58	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R59	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R6	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R60	013825000	“RES, 825 OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R61	013825000	“RES, 825 OHM 1/8W 1% TK 0805”
R62	013000000	“RES, ZERO OHM 2A TK 0805”
R63	DNP	“NULL PART, VACANT PCB LOCATION”
R64	013000000	“RES, ZERO OHM 2A TK 0805”
R65	DNP	“NULL PART, VACANT PCB LOCATION”
R66	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R67	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R68	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R69	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R7	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R70	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R71	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R72	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R73	013000000	“RES, ZERO OHM 2A TK 0805”
R74	013000000	“RES, ZERO OHM 2A TK 0805”
R75	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R76	DNP	“NULL PART, VACANT PCB LOCATION”
R77	DNP	“NULL PART, VACANT PCB LOCATION”
R78	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R79	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R8	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R80	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R81	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R82	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R83	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R84	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R85	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R86	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R87	013499200	“RES, 49.9K OHM 1/8W 1% TK 0805”
R88	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R89	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R9	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R90	013499200	“RES, 49.9K OHM 1/8W 1% TK 0805”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
R91	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R92	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R93	013000000	“RES, ZERO OHM 2A TK 0805”
R94	013000000	“RES, ZERO OHM 2A TK 0805”
R95	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R96	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R97	013332100	“RES, 3.32K OHM 1/8W 1% TK 0805”
R98	013332100	“RES, 3.32K OHM 1/8W 1% TK 0805”
R99	013335000	“RES, 3.3M OHM 1/8W 5% TK 0805”
SW1	DNP	“NULL PART, VACANT PCB LOCATION”
TP1	650000	“TEST PNT, BLK 0.125 DIA TH”
TP2	650000	“TEST PNT, BLK 0.125 DIA TH”
U1	033301003	“IC,SM,UP,MAX807LEWE”
U10	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U100	034304000	“IC,78L08 VREG 8V 100MA SOT-89”
U101	DNP	“NULL PART, VACANT PCB LOCATION”
U102	DNP	“NULL PART, VACANT PCB LOCATION”
U103	DNP	“NULL PART, VACANT PCB LOCATION”
U104	DNP	“NULL PART, VACANT PCB LOCATION”
U11	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U12	033300015	“IC, PROM XCF04S 4MB TSSOP-20”
U14	034400006	“IC, FAN1540DX VREG 3.3V TO252”
U15	034400008	“IC,LP3988 VR ULDO 2.5V SOT23-5”
U16	034400007	“IC,VREG ULDO 1.2V 0.8A TO263-5”
U17	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U18	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U19	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U20	033303107	“IC,74LVC14A HEX SCH TRIG SO14”
U23	033300016	“IC, EEPROM 93C46C 64X16 SO8”
U24	033035	“IC,74HCT14 HEX SCH TRIG SO-14”
U25	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U26	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U29	033045	“IC,74HCT245 OCT BUS XCVR,SOW20”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
U30	033045	“IC,74HCT245 OCT BUS XCVR,SOW20”
U31	033043	“IC, 74HCT138 3-8 DEMUX SOIC-16”
U32	033043	“IC, 74HCT138 3-8 DEMUX SOIC-16”
U34	033305028	“IC, RS232 XCVR MAX3243 SOIC-28”
U38	033305027	“IC, BUS XCVR RS-485 SOIC-8”
U39	033303107	“IC,74LVC14A HEX SCH TRIG SO14”
U4	033301011	“IC,MC68HC000E18 UPROC PLCC-68”
U40	033305027	“IC, BUS XCVR RS-485 SOIC-8”
U43	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U44	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U46	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U48	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U5	033300032	“IC,SRAM 32KX8 CY62256LL SOIC28”
U53	DNP	“NULL PART, VACANT PCB LOCATION”
U54	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U55	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U56	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U6	033300032	“IC,SRAM 32KX8 CY62256LL SOIC28”
U60	033303056	“IC,MC14001B QUAD 2-IN NOR SO14”
U7	033082	“IC,ADC0809 8-BIT ADC PLCC28”
U70	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U75	DNP	“NULL PART, VACANT PCB LOCATION”
U76	DNP	“NULL PART, VACANT PCB LOCATION”
U78	DNP	“NULL PART, VACANT PCB LOCATION”
U79	DNP	“NULL PART, VACANT PCB LOCATION”
U8	033302010	“IC, FPGA XC3S1000 FBGA-320”
U80	DNP	“NULL PART, VACANT PCB LOCATION”
U82	DNP	“NULL PART, VACANT PCB LOCATION”
U83	DNP	“NULL PART, VACANT PCB LOCATION”
U9	065296000	“OSC,29.4912 MHZ 3.3V”
U90	DNP	“NULL PART, VACANT PCB LOCATION”
U91	DNP	“NULL PART, VACANT PCB LOCATION”
U92	DNP	“NULL PART, VACANT PCB LOCATION”

Table 14-5 Processor Board Parts List (001-01107 Rev. F)

Designator	Part Number	Description
U93	DNP	“NULL PART, VACANT PCB LOCATION”
U94	DNP	“NULL PART, VACANT PCB LOCATION”
U95	DNP	“NULL PART, VACANT PCB LOCATION”
U96	DNP	“NULL PART, VACANT PCB LOCATION”
U97	DNP	“NULL PART, VACANT PCB LOCATION”
U98	DNP	“NULL PART, VACANT PCB LOCATION”
U99	DNP	“NULL PART, VACANT PCB LOCATION”
XU2	089032000	“SOCKET, PLCC32 SMT”
XU3	089032000	“SOCKET, PLCC32 SMT”

CHAPTER 15

FAST ALC AND HIGH STABILITY OPTIONS

15.1 Fast ALC Option (7000FALC)

The Fast ALC 7000FALC option reduces the reaction time of the automatic level control (ALC) and is designed for linear amplifiers that utilize peak detecting ALC like Datron's 1000W D-series linear amplifiers (TW1000D and RA1000D). The ALC attack time is increased to less than 200 µs allowing the suppression of RF transients and providing a peak-detecting ALC loop capable of operation with multiple modulation modes.

The 7000FALC replaces the standard Reference/Control Board and provides the same I/O functionality available in the standard board. For further information, refer to "Chapter 5: Reference/Control Board."

To install the 7000FALC option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Locate the standard Reference/Control board and remove it with the board puller. Remove the J61 reference coax connection.
4. Install the new high stability Reference/Control board (001-00207). Reconnect the J61 coax connection and slide the new board into the Ref /Control slot.
5. Turn the TW7000 on and test the transmit operation of the TW7000.
6. Check the power output. If an accurate counter/standard is available, check the output frequency.
7. If adjustments are required for power or frequency, adjust as shown in the "Reference/ Control Board Test" on page 21-29. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the sticker on the TCXO and set the frequency using the internal adjustment.
8. Reinstall the board retaining bar and top cover.

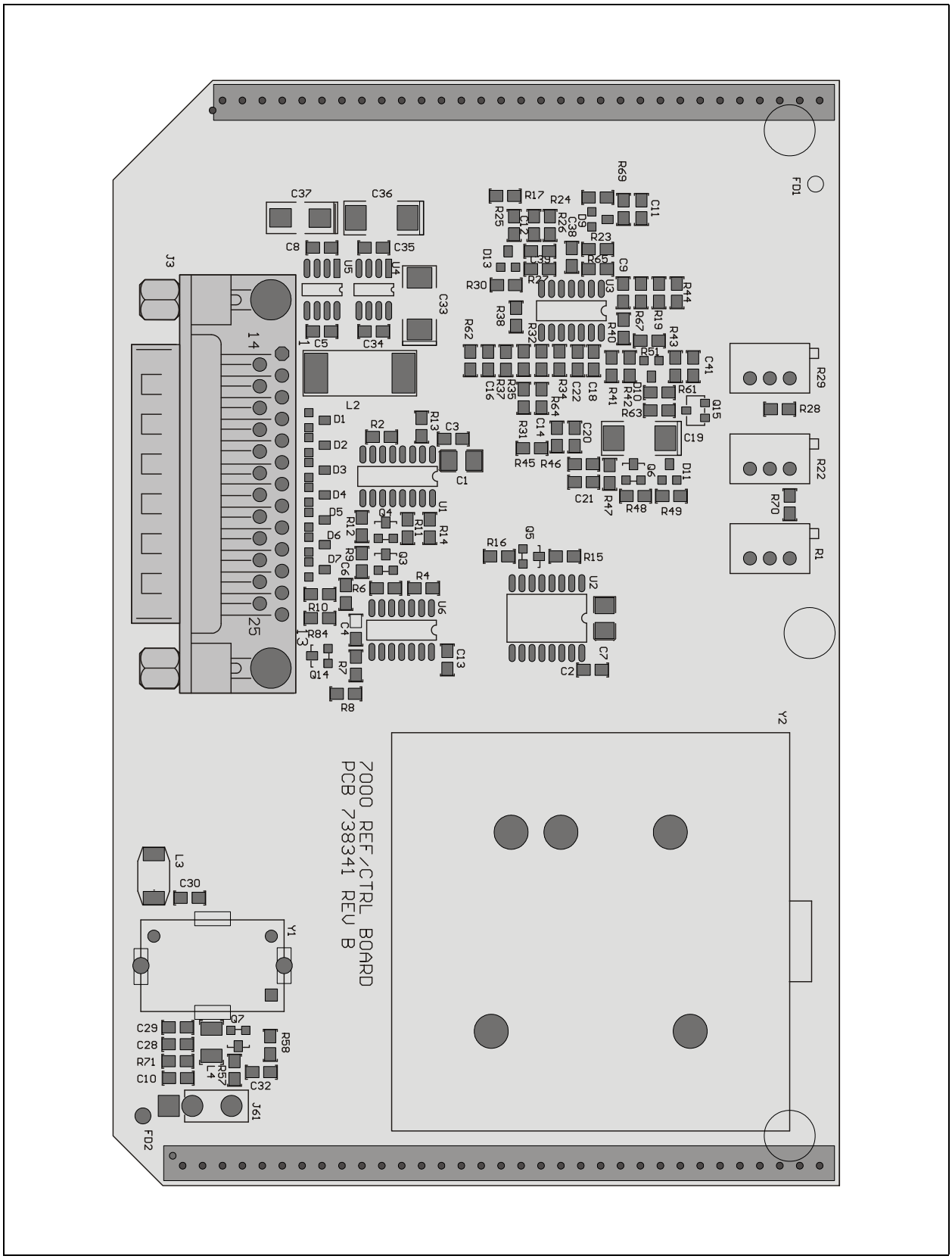


Figure 15-1 Fast ALC Option Component Locations (738341 Rev. B)

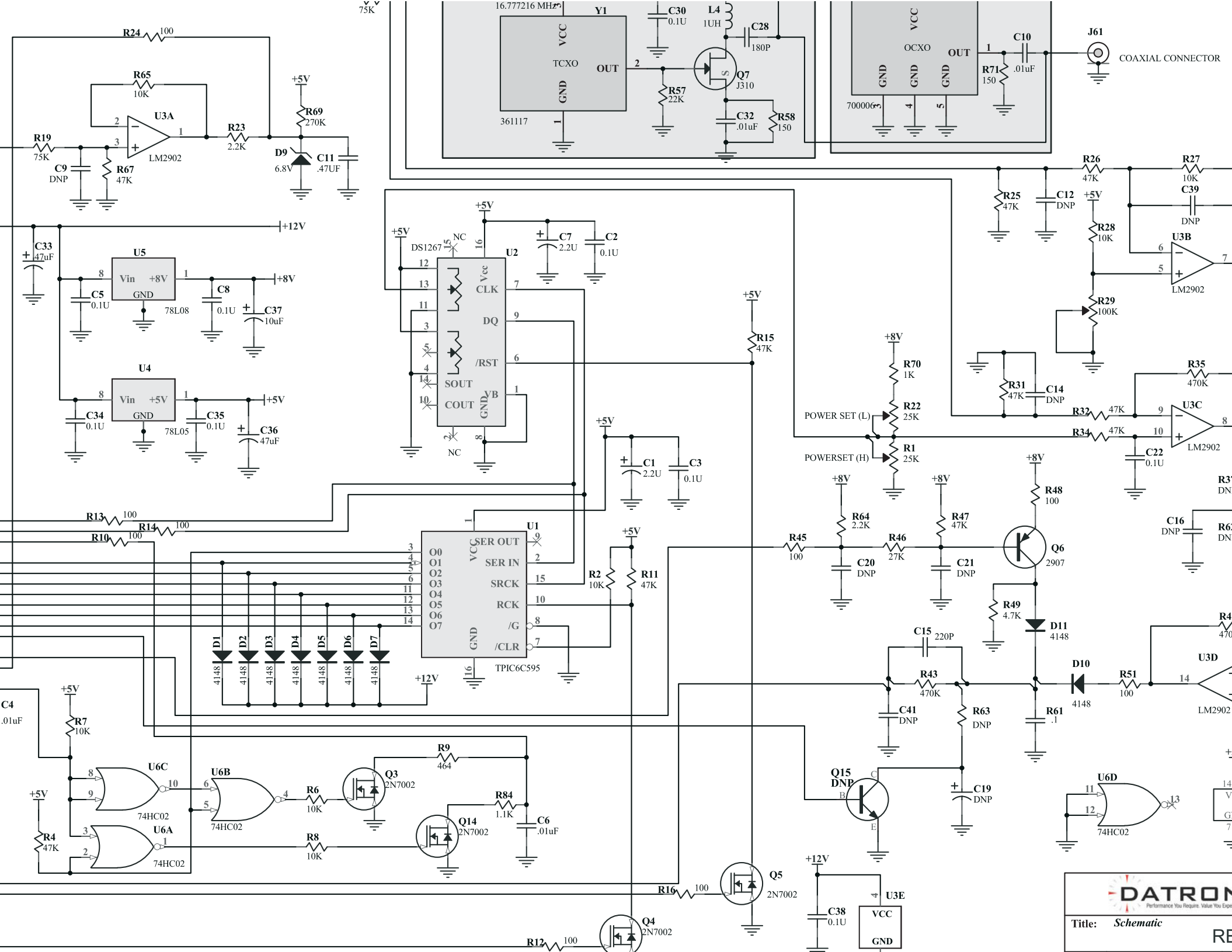

R24 100
R65 10K
U3A
LM2902
R19 75K
C9 DNP
R67 47K
R23 2.2K
R69 270K
+5V
D9 6.8V
C11 .47UF
+12V
C33 47uF
U5
Vin +8V GND
78L08
C5 0.1U
C8 0.1U
C37 10uF
+8V
U4
Vin +5V GND
78L05
C34 0.1U
C35 0.1U
C36 47uF
+5V
75K
16.777216 MHz
Y1
TCXO
VCC
OUT
GND
361117
C30 0.1U
L4 1UH
C28 180P
R57 22K
Q7 J310
C32 .01uF
R58 150
OCXO
700006
R71 150
C10 .01uF
J61
COAXIAL CONNECTOR
R26 47K
R27 10K
C39 DNP
R25 47K
C12 DNP
R28 10K
U3B
LM2902
R29 100K
R31 47K
C14 DNP
R35 470K
R32 47K
R34 47K
U3C
LM2902
C22 0.1U
DS1267
NC
U2
Vcc
CLK
DQ
/RST
SOUT
COUT
VB
GND
C7 2.2U
C2 0.1U
R15 47K
C1 2.2U
C3 0.1U
R70 1K
R22 25K
POWER SET (L)
R1 25K
POWERSET (H)
R64 2.2K
R47 47K
R48 100
R45 100
R46 27K
C20 DNP
C21 DNP
Q6 2907
R49 4.7K
D11 4148
C16 DNP
R13 100
R14 100
R10 100
U1
SER OUT
SER IN
SRCK
RCK
/G
/CLR
O0
O1
O2
O3
O4
O5
O6
O7
TPIC6C595
R2 10K
R11 47K
D1
D2
D3
D4
D5
D6
D7
4148
C15 220P
R43 470K
C41 DNP
R63 DNP
D10 4148
R51 100
R61 .1
U3D
LM2902
C4 .01uF
R7 10K
U6C
U6B
U6A
74HC02
R4 47K
R9 464
Q3 2N7002
R6 10K
R84 1.1K
Q14 2N7002
C6 .01uF
R8 10K
Q15 DNP
C19 DNP
U6D
R16 100
Q5 2N7002
Q4 2N7002
R12 100
U3E
C38 0.1U
VCC
GND
DATRON
Title: Schematic
RE

Table 15-1 Fast ALC Parts List (001-00207 Rev. B)

Designator	Part Number	Description
C1	022225000	CAP SM T 2.2U 16V 10% 3528
C11	021471003	CAP,0.47UF Y5V 16V 80/20% 0805
C13	021104000	CAP, 0.1UF X7R 25V 5% 0805
C15	021221000	CAP, 220PF NPO 100V 5% 0805
C18	021104000	CAP, 0.1UF X7R 25V 5% 0805
C2	021104000	CAP, 0.1UF X7R 25V 5% 0805
C22	021104000	CAP, 0.1UF X7R 25V 5% 0805
C28	021181000	CAP 180PF NPO 100V 5% 0805
C29	021181000	CAP 180PF NPO 100V 5% 0805
C3	021104000	CAP, 0.1UF X7R 25V 5% 0805
C30	021104000	CAP, 0.1UF X7R 25V 5% 0805
C32	021103000	CAP, 0.01UF X7R 50V 5% 0805
C33	022476000	CAP, 47UF TA 20V 20% 7343
C34	021104000	CAP, 0.1UF X7R 25V 5% 0805
C35	021104000	CAP, 0.1UF X7R 25V 5% 0805
C36	022476000	CAP, 47UF TA 20V 20% 7343
C37	022106001	CAP, 10UF TA 16V 10% 6032
C38	021104000	CAP, 0.1UF X7R 25V 5% 0805
C4	021103000	CAP, 0.01UF X7R 50V 5% 0805
C5	021104000	CAP, 0.1UF X7R 25V 5% 0805
C6	021103000	CAP, 0.01UF X7R 50V 5% 0805
C7	022225000	CAP SM T 2.2U 16V 10% 3528
C8	021104000	CAP, 0.1UF X7R 25V 5% 0805
D1	037700005	DIODE, MMBD4148 SOT-23
D10	037700005	DIODE, MMBD4148 SOT-23
D11	037700005	DIODE, MMBD4148 SOT-23
D13	037700005	DIODE, MMBD4148 SOT-23
D2	037700005	DIODE, MMBD4148 SOT-23
D3	037700005	DIODE, MMBD4148 SOT-23
D4	037700005	DIODE, MMBD4148 SOT-23
D5	037700005	DIODE, MMBD4148 SOT-23
D6	037700005	DIODE, MMBD4148 SOT-23
D7	037700005	DIODE, MMBD4148 SOT-23
D9	037703002	DIODE, ZENER 6.8V SMD SOT-23

Table 15-1 Fast ALC Parts List (001-00207 Rev. B)

Designator	Part Number	Description
J3	613163	CONN,DB-25 RT ANGLE PC PLUG
J61	614024	CONN,RF PIN FEMALE JACK #45
L2	041103002	IND SM 10UH 15% 4825
L3	041103003	IND,SM,10uH,.7A,DTI608C-103
L4	041102000	INDUCTOR,CHIP,1UH,SMT,1210,10%
Q14	032005	XSTR, 2N7002 N-MOSFET SOT-23
Q3	032005	XSTR, 2N7002 N-MOSFET SOT-23
Q4	032005	XSTR, 2N7002 N-MOSFET SOT-23
Q5	032005	XSTR, 2N7002 N-MOSFET SOT-23
Q6	032006	XSTR,MMBT2907A PNP SOT-23EBC
Q7	032001	XSTR,J310,NFET,SOT-23
R1	170335	RES, 25K TRIM SIDE ADJ
R10	013101000	RES SM CF 100R 0.1W 5% 0805
R11	013473000	RES SM CF 47K 0.1W 5% 0805
R12	013101000	RES SM CF 100R 0.1W 5% 0805
R13	013101000	RES SM CF 100R 0.1W 5% 0805
R14	013101000	RES SM CF 100R 0.1W 5% 0805
R15	013473000	RES SM CF 47K 0.1W 5% 0805
R16	013101000	RES SM CF 100R 0.1W 5% 0805
R17	013101000	RES SM CF 100R 0.1W 5% 0805
R19	013753000	RES,SM CF 75K 0.1W 5% 0805
R2	013103000	RES SM CF 10K 0.1W 5% 0805
R22	170335	RES, 25K TRIM SIDE ADJ
R23	013222000	RES SM CF 2.2K 0.1W 5% 0805
R24	013101000	RES SM CF 100R 0.1W 5% 0805
R25	013473000	RES SM CF 47K 0.1W 5% 0805
R26	013473000	RES SM CF 47K 0.1W 5% 0805
R27	013103000	RES SM CF 10K 0.1W 5% 0805
R28	013103000	RES SM CF 10K 0.1W 5% 0805
R29	170334	RES,100K TRIM SIDE ADJ
R30	013473000	RES SM CF 47K 0.1W 5% 0805
R31	013473000	RES SM CF 47K 0.1W 5% 0805
R32	013473000	RES SM CF 47K 0.1W 5% 0805
R34	013473000	RES SM CF 47K 0.1W 5% 0805

Table 15-1 Fast ALC Parts List (001-00207 Rev. B)

Designator	Part Number	Description
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	RES SM CF 47K 0.1W 5% 0805
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	RES, 12K OHM 1/8W 5% TK 0805
R42	013473000	RES SM CF 47K 0.1W 5% 0805
R43	013474000	RES SM CF 470K 0.1W 5% 0805
R44	013753000	RES,SM CF 75K 0.1W 5% 0805
R45	013101000	RES SM CF 100R 0.1W 5% 0805
R46	013273000	RES SM CF 27K 0.1W 5% 0805
R47	013473000	RES SM CF 47K 0.1W 5% 0805
R48	013101000	RES SM CF 100R 0.1W 5% 0805
R49	013472000	RES SM CF 4.7K 0.1W 5% 0805
R51	013101000	RES SM CF 100R 0.1W 5% 0805
R57	013223000	RES SM CF 22K 0.1W 5% 0805
R58	013151000	RES SM CF 150R 0.1W 5% 0805
R6	013103000	RES SM CF 10K 0.1W 5% 0805
R61	021104000	CAP, 0.1UF X7R 25V 5% 0805
R64	013222000	RES SM CF 2.2K 0.1W 5% 0805
R65	013103000	RES SM CF 10K 0.1W 5% 0805
R67	013473000	RES SM CF 47K 0.1W 5% 0805
R69	013274000	RES SM CF 270K 0.1W 5% 0805
R7	013103000	RES SM CF 10K 0.1W 5% 0805
R70	013102000	RES, 1K OHM 1/8W 5% TK 0805
R8	013103000	RES SM CF 10K 0.1W 5% 0805
R84	013110100	RES,SM TK 1.1KOHM 0.1W 1% 0805
R9	013464000	RES, 464 OHM 1/8W 1% TK 0805
U1	033087	IC,8BIT SHIFT,TPIC6C595,SO-16
U2	033305003	IC,DS1267S 10KX2 DIG POT SOW16
U3	033304000	IC,SM,LM2902D,QUAD-OP,SO-14
U4	033003	IC,VREG 78L05 5V 5% SOIC-8
U5	033002	IC,VREG 78L08 8V 5% SOIC-8
U6	033081	IC,MC74HC02AD, SO-14 751A-02
Y1	361117	TCXO 16.777216MHz, 0.5PPM

15.2 High-Stability Option (7000HS)

The High-Stability 7000HS option provides 0.1 ppm frequency stability to the 7000-series of HF transceivers (3 Hz at 30 MHz). It replaces the standard Reference/Control board with one that has a precision OCXO in place of the standard crystal oscillator.

To install this option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Locate the standard Reference/Control board and remove it with the board puller. Remove the J61 reference coax connection.
4. Reinsert the new 7000HS option. Reconnect J61 coax connection and slide the new board into the Ref Control slot.
5. Turn the TW7000 on and test the transmit operation of the TW7000.
6. Check the power output. Check output frequency only if an accurate counter/standard is available.
7. If adjustments are required for power or frequency, adjust as shown in the "Reference/ Control Board Test" on page 21-29. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the screw on the OCXO and set the frequency using the internal potentiometer. Replace the screw.

CAUTION: When adjusting the frequency of the high-stability oscillator, make sure the standard used for the counter is higher than 0.1 ppm.

8. Reinstall the board retaining bar and top cover.

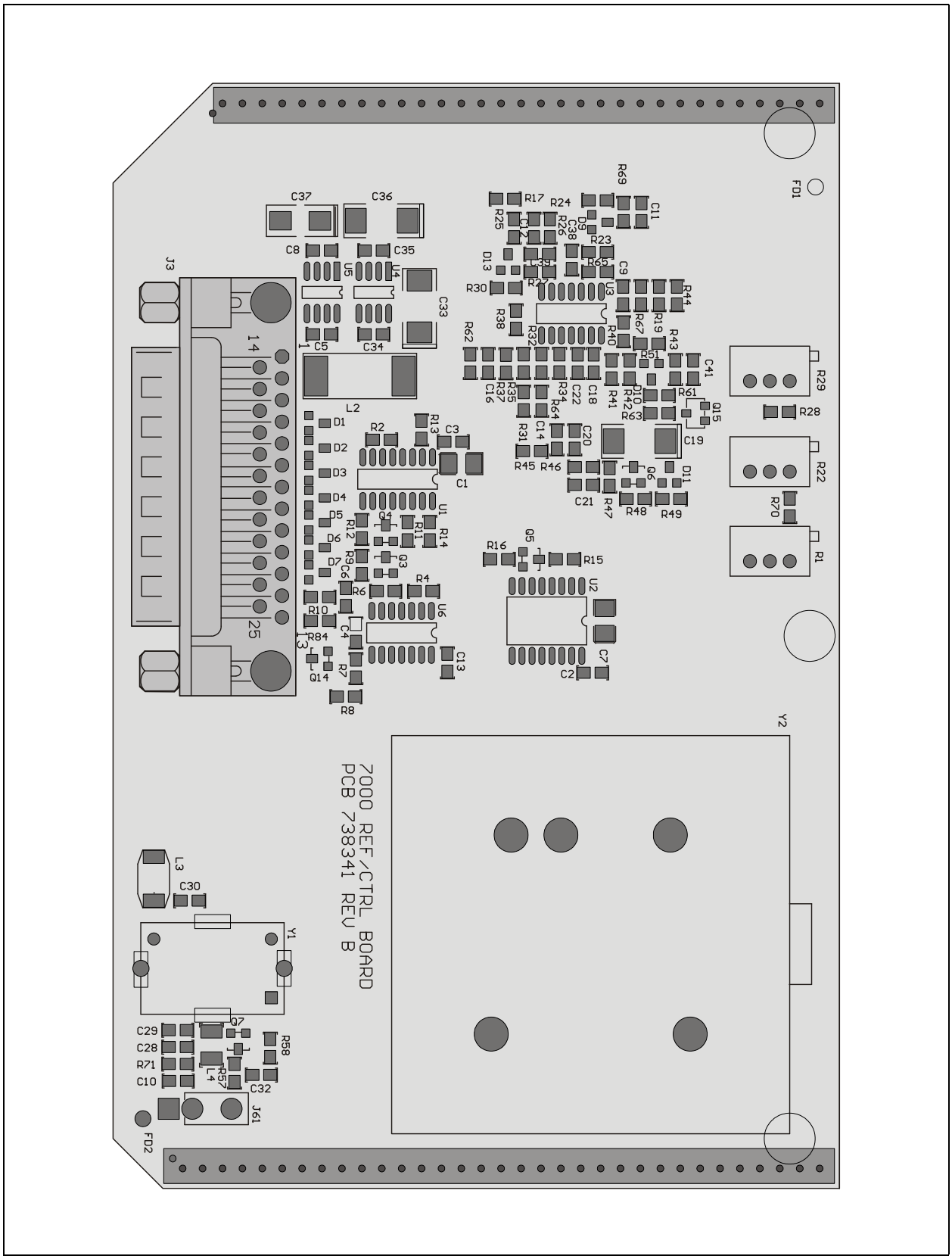


Figure 15-3 High Stability Option Component Locations (738341 Rev. B)

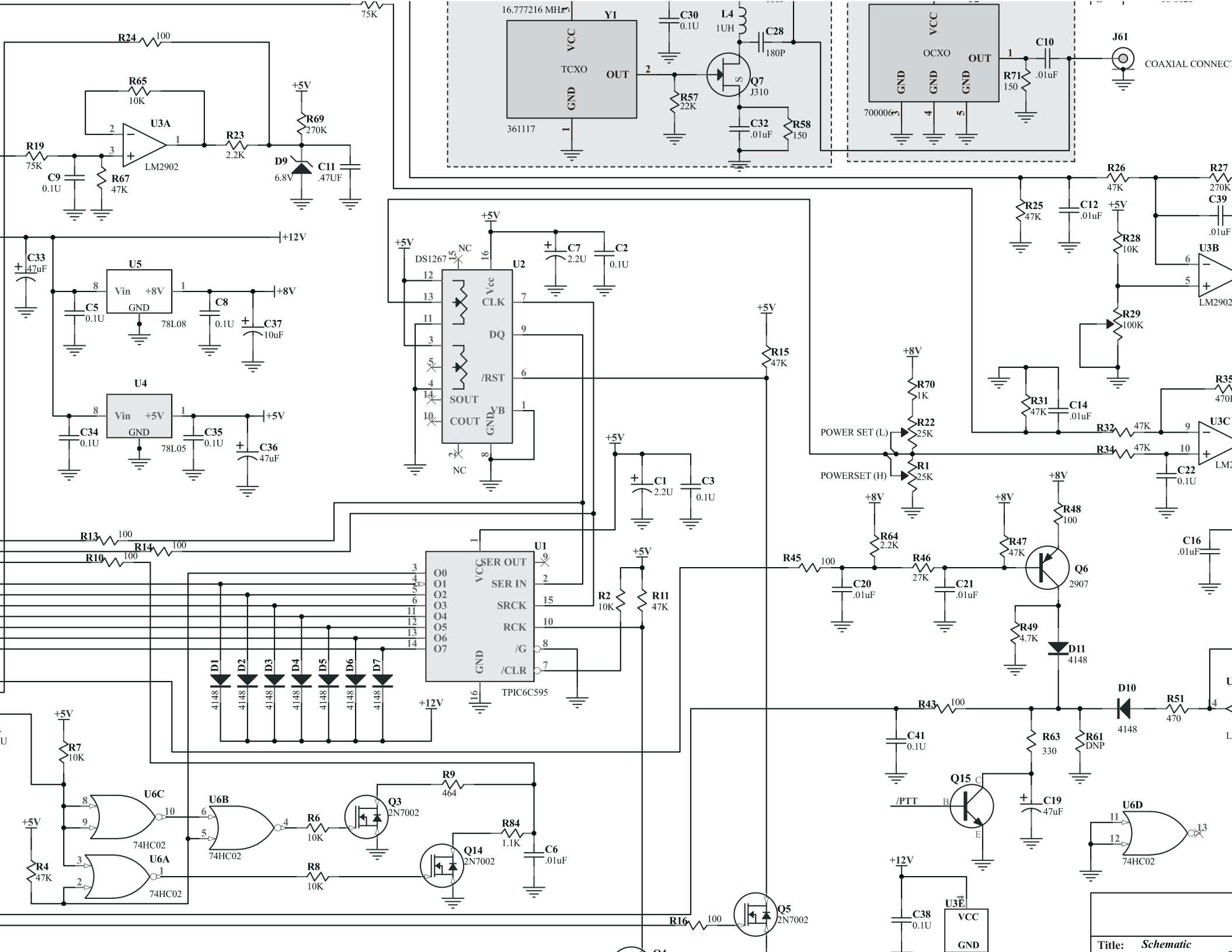

R24 100
R65 10K
U3A
LM2902
R19 75K
C9 0.1U
R67 47K
R23 2.2K
+5V
R69 270K
D9 6.8V
C11 .47UF
75K
16.777216 MHz
Y1
TCXO
VCC
OUT
GND
361117
C30 0.1U
L4 1UH
C28 180P
Q7 J310
R57 22K
C32 .01uF
R58 150
OCXO
700006
R71 150
C10 .01uF
J61
COAXIAL CONNECT
+12V
C33 47uF
U5
Vin +8V
GND
78L08
C5 0.1U
C8 0.1U
C37 10uF
+8V
U4
Vin +5V
78L05
C34 0.1U
C35 0.1U
C36 47uF
DS1267
NC
U2
CLK
DQ
/RST
SOUT
COUT
VB
C7 2.2U
C2 0.1U
R15 47K
C1 2.2U
C3 0.1U
R13 100
R14 100
R10 100
U1
SER OUT
SER IN
SRCK
RCK
/G
/CLR
O0
O1
O2
O3
O4
O5
O6
O7
TPIC6C595
R2 10K
R11 47K
D1
D2
D3
D4
D5
D6
D7
4148
R7 10K
U6C
U6B
U6A
74HC02
R4 47K
R9 464
R6 10K
R8 10K
R84 1.1K
C6 .01uF
Q3 2N7002
Q14 2N7002
R16 100
Q5 2N7002
R26 47K
R27 270K
C39 .01uF
R25 47K
C12 .01uF
R28 10K
R29 100K
U3B
LM2902
R31 47K
C14 .01uF
R32 47K
R34 47K
U3C
C22 0.1U
POWER SET (L)
POWERSET (H)
R70 1K
R22 25K
R1 25K
R64 2.2K
R45 100
R46 27K
C20 .01uF
C21 .01uF
R47 47K
R48 100
Q6 2907
R49 4.7K
D11 4148
C16 .01uF
R43 100
D10 4148
R51 470
C41 0.1U
R63 330
R61 DNP
Q15
/PTT
C19 47uF
U6D
74HC02
U3E
C38 0.1U
Title: Schematic

Table 15-2 High Stability Parts List (001-01022 Rev. E)

Designator	Part Number	Description
C1	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C10	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C11	021471003	“CAP,0.47UF Y5V 16V 80/20% 0805”
C12	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C14	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C16	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C18	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C19	022476000	“CAP, 47UF TA 20V 20% 7343”
C2	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C20	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C21	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C22	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C28	DNP	“NULL PART, VACANT PCB LOCATION”
C29	DNP	“NULL PART, VACANT PCB LOCATION”
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C30	DNP	“NULL PART, VACANT PCB LOCATION”
C32	DNP	“NULL PART, VACANT PCB LOCATION”
C33	022476000	“CAP, 47UF TA 20V 20% 7343”
C34	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	022476000	“CAP, 47UF TA 20V 20% 7343”
C37	022106001	“CAP, 10UF TA 16V 10% 6032”
C38	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C39	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C4	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C41	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C5	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C6	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C7	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C8	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
D1	037700005	“DIODE, MMBD4148 SOT-23”

Table 15-2 High Stability Parts List (001-01022 Rev. E)

Designator	Part Number	Description
D10	037700005	“DIODE, MMBD4148 SOT-23”
D11	037700005	“DIODE, MMBD4148 SOT-23”
D13	037700005	“DIODE, MMBD4148 SOT-23”
D2	037700005	“DIODE, MMBD4148 SOT-23”
D3	037700005	“DIODE, MMBD4148 SOT-23”
D4	037700005	“DIODE, MMBD4148 SOT-23”
D5	037700005	“DIODE, MMBD4148 SOT-23”
D6	037700005	“DIODE, MMBD4148 SOT-23”
D7	037700005	“DIODE, MMBD4148 SOT-23”
D9	037703002	“DIODE, ZENER 6.8V SMD SOT-23”
J3	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J61	614024	“CONN,RF PIN FEMALE JACK #45”
L2	041103002	IND SM 10UH 15% 4825
L3	DNP	“NULL PART, VACANT PCB LOCATION”
L4	DNP	“NULL PART, VACANT PCB LOCATION”
Q14	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q15	031104003	“XSTR, NPN 10K/10K 50V SC-59”
Q3	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q4	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q5	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q6	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q7	DNP	“NULL PART, VACANT PCB LOCATION”
R1	170335	“RES, 25K TRIM SIDE ADJ”
R10	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R11	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R12	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R13	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R14	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R15	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R16	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R17	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R19	013753000	“RES,SM CF 75K 0.1W 5% 0805”
R2	013103000	“RES,10K OHM 1/8W 5% TK 0805”

Table 15-2 High Stability Parts List (001-01022 Rev. E)

Designator	Part Number	Description
R22	170335	“RES, 25K TRIM SIDE ADJ”
R23	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R24	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R25	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R26	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R27	013274000	“RES,270K OHM 1/8W 5% TK 0805”
R28	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R29	170334	“RES,100K TRIM SIDE ADJ”
R30	013102000	“RES, 1K OHM 1/8W 5% TK 0805”
R31	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R32	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R34	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	“RES, 12K OHM 1/8W 5% TK 0805”
R42	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R43	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R44	013753000	“RES,SM CF 75K 0.1W 5% 0805”
R45	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R46	013273000	“RES,27K OHM 1/8W 5% TK 0805”
R47	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R48	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R49	013472000	RES SM CF 4.7K 0.1W 5% 0805
R51	013471000	“RES, 470 OHM 1/8W 5% TK 0805”
R57	DNP	“NULL PART, VACANT PCB LOCATION”
R58	DNP	“NULL PART, VACANT PCB LOCATION”
R6	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R61	DNP	“NULL PART, VACANT PCB LOCATION”
R62	013682000	RES SM CF 6.8K 0.1W 5% 0805
R63	013331000	“RES,330 OHM 1/8W 5% TK 0805”

Table 15-2 High Stability Parts List (001-01022 Rev. E)

Designator	Part Number	Description
R64	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R65	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R67	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R69	013274000	“RES,270K OHM 1/8W 5% TK 0805”
R7	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R70	013102000	“RES, 1K OHM 1/8W 5% TK 0805”
R71	013151000	“RES,150 OHM 1/8W 5% TK 0805”
R8	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R84	013110100	“RES, 1.1K OHM 1/8W 1% TK 0805”
R9	013464000	“RES, 464 OHM 1/8W 1% TK 0805”
U1	033087	“IC, TPIC6C595 8-B S/REG SO-16”
U2	033305003	“IC,DS1267S 10KX2 DIG POT SOW16”
U3	033304000	“IC,SM,LM2902D,QUAD-OP,SO-14”
U4	033003	“IC,VREG 78L05 5V 5% SOIC-8”
U5	033002	“IC,VREG 78L08 8V 5% SOIC-8”
U6	033081	“IC, 74HC02 QUAD 2-I NOR SO-14”
Y2	700006	“OCXO,16.777216 MHZ 0.1 PPM”

15.3 High Stability Fast ALC (7000HS-FALC)

The High-Stability Fast ALC 7000HS-FALC option is the high stability version of the 7000FALC. The 7000HS-FALC provides 0.1ppm frequency stability to the 7000-series of HF transceivers (3 Hz at 30 MHz). It replaces the standard oscillator (Y1) with a precision oscillator OCXO (Y2). The 7000HS-FALC also reduces the reaction time of the ALC and is designed to be used with linear amplifiers that utilize peak detecting ALC like the DATRON 1000W D-series linear amplifiers (TW1000D and RA1000D). The ALC attack time is increased to less than 200 µs, allowing the suppression of RF transients and providing a peak-detecting ALC loop capable of operation with multiple modulation modes.

The 7000HS-FALC replaces the standard Reference/Control Board and provides the same I/O functionality available in the standard board. For more information, refer to “Chapter 5: Reference/Control Board.”

To install this option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bars.
3. Locate the standard Reference/Control board and remove it with the board puller. Remove the J61 reference coax connection.
4. Install the new high stability Reference/Control board (001-01023). Reconnect J61 coax connection and slide the new board into the Ref/Control slot.
5. Turn the TW7000 on and test the transmit operation of the TW7000.
6. Check the power output. If an accurate counter/standard is available, check the output frequency.
7. If adjustments are required for power or frequency, adjust as shown in the “Reference/ Control Board Test” on page 21-29. For the frequency setting, allow for a 15 minute warm up period before measuring the frequency. If it needs to be adjusted, remove the screw on the OCXO and set the frequency using the internal potentiometer. Replace the screw.

CAUTION: When adjusting the frequency of the high-stability oscillator, make sure the standard used for the counter is better than 0.1 ppm.

8. Reinstall the board retaining bar and top cover.

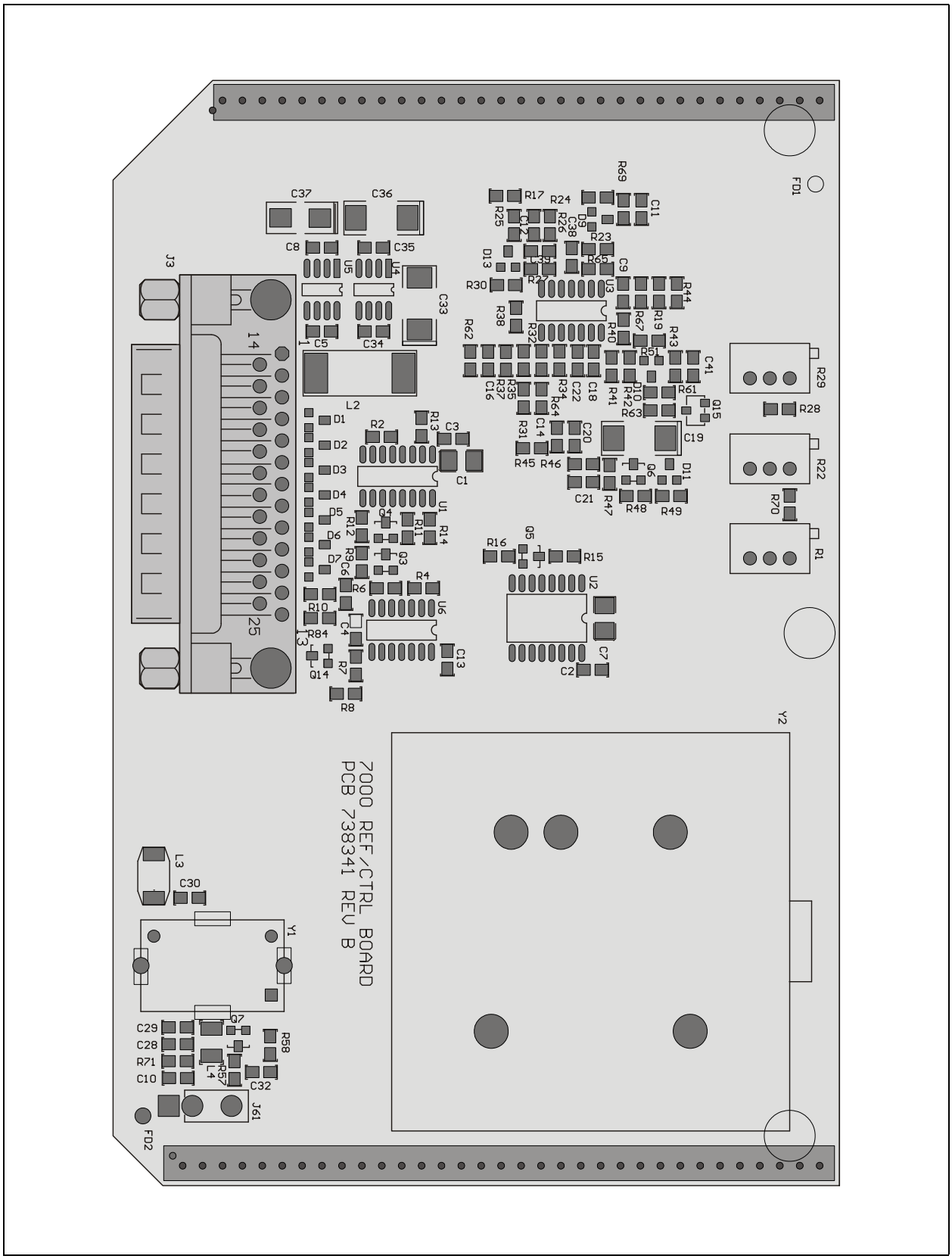


Figure 15-5 High Stability Fast ALC Component Locations (738341 Rev. B)

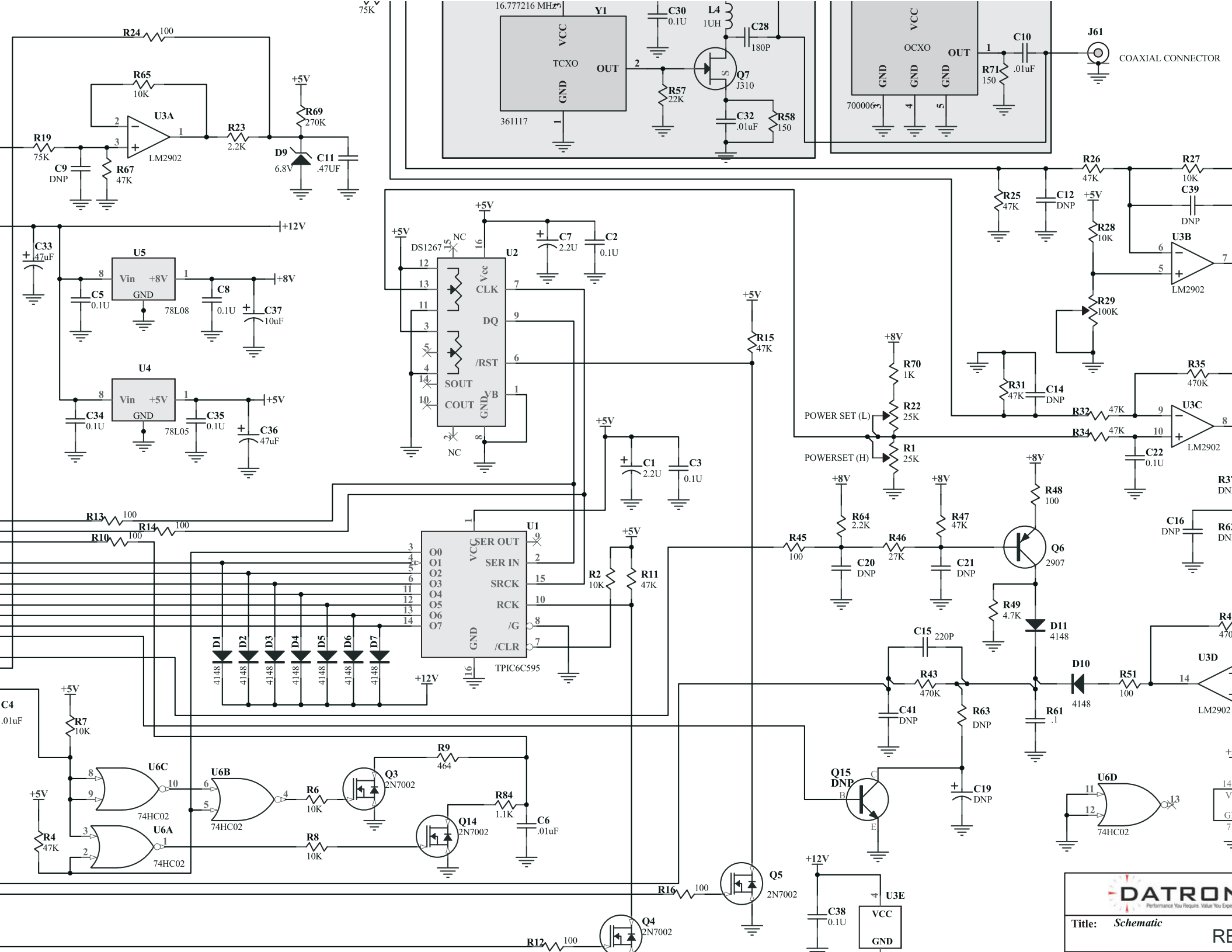

R24 100
R65 10K
U3A
LM2902
R19 75K
C9 DNP
R67 47K
R23 2.2K
R69 270K
+5V
D9 6.8V
C11 .47UF
+12V
C33 47uF
U5
Vin +8V GND
78L08
C5 0.1U
C8 0.1U
C37 10uF
+8V
U4
Vin +5V GND
78L05
C34 0.1U
C35 0.1U
C36 47uF
+5V
75K
16.777216 MHz
Y1
TCXO
VCC
OUT
GND
361117
C30 0.1U
L4 1UH
C28 180P
R57 22K
Q7 J310
C32 .01uF
R58 150
OCXO
700006
R71 150
C10 .01uF
J61
COAXIAL CONNECTOR
R26 47K
R27 10K
C39 DNP
R25 47K
C12 DNP
R28 10K
U3B
LM2902
R29 100K
R31 47K
C14 DNP
R35 470K
R32 47K
R34 47K
U3C
LM2902
C22 0.1U
DS1267
NC
U2
Vcc
CLK
DQ
/RST
SOUT
COUT
VB
GND
C7 2.2U
C2 0.1U
R15 47K
C1 2.2U
C3 0.1U
R70 1K
R22 25K
POWER SET (L)
R1 25K
POWERSET (H)
R64 2.2K
R47 47K
R48 100
R45 100
R46 27K
C20 DNP
C21 DNP
Q6 2907
R49 4.7K
D11 4148
C16 DNP
R13 100
R14 100
R10 100
U1
SER OUT
SER IN
SRCK
RCK
/G
/CLR
O0
O1
O2
O3
O4
O5
O6
O7
TPIC6C595
R2 10K
R11 47K
D1
D2
D3
D4
D5
D6
D7
4148
C15 220P
R43 470K
C41 DNP
R63 DNP
D10 4148
R51 100
R61 .1
U3D
LM2902
C4 .01uF
R7 10K
U6C
U6B
U6A
74HC02
R4 47K
R9 464
Q3 2N7002
R6 10K
R84 1.1K
Q14 2N7002
C6 .01uF
R8 10K
Q15 DNP
C19 DNP
U6D
R16 100
Q5 2N7002
Q4 2N7002
R12 100
U3E
C38 0.1U
VCC
GND
DATRON
Title: Schematic
RE

Table 15-3 High Stability Fast ALC Parts List (001-01023 Rev. B)

Designator	Part Number	Description
C1	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C10	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C11	021471003	“CAP,0.47UF Y5V 16V 80/20% 0805”
C12	DNP	“NULL PART, VACANT PCB LOCATION”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C14	DNP	“NULL PART, VACANT PCB LOCATION”
C15	021221000	“CAP, 220PF NPO 100V 5% 0805”
C16	DNP	“NULL PART, VACANT PCB LOCATION”
C18	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C19	DNP	“NULL PART, VACANT PCB LOCATION”
C2	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C20	DNP	“NULL PART, VACANT PCB LOCATION”
C21	DNP	“NULL PART, VACANT PCB LOCATION”
C22	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C28	DNP	“NULL PART, VACANT PCB LOCATION”
C29	DNP	“NULL PART, VACANT PCB LOCATION”
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C30	DNP	“NULL PART, VACANT PCB LOCATION”
C32	DNP	“NULL PART, VACANT PCB LOCATION”
C33	022476000	“CAP, 47UF TA 20V 20% 7343”
C34	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	022476000	“CAP, 47UF TA 20V 20% 7343”
C37	022106001	“CAP, 10UF TA 16V 10% 6032”
C38	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C39	DNP	“NULL PART, VACANT PCB LOCATION”
C4	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C41	DNP	“NULL PART, VACANT PCB LOCATION”
C5	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C6	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C7	022225000	“CAP, 2.2UF TA 16V 10% 3528-21”
C8	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	DNP	“NULL PART, VACANT PCB LOCATION”

Table 15-3 High Stability Fast ALC Parts List (001-01023 Rev. B)

Designator	Part Number	Description
D1	037700005	“DIODE, MMBD4148 SOT-23”
D10	037700005	“DIODE, MMBD4148 SOT-23”
D11	037700005	“DIODE, MMBD4148 SOT-23”
D13	037700005	“DIODE, MMBD4148 SOT-23”
D2	037700005	“DIODE, MMBD4148 SOT-23”
D3	037700005	“DIODE, MMBD4148 SOT-23”
D4	037700005	“DIODE, MMBD4148 SOT-23”
D5	037700005	“DIODE, MMBD4148 SOT-23”
D6	037700005	“DIODE, MMBD4148 SOT-23”
D7	037700005	“DIODE, MMBD4148 SOT-23”
D9	037703002	“DIODE, ZENER 6.8V SMD SOT-23”
J3	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J61	614024	“CONN,RF PIN FEMALE JACK #45”
L2	041103002	IND SM 10UH 15% 4825
L3	DNP	“NULL PART, VACANT PCB LOCATION”
L4	DNP	“NULL PART, VACANT PCB LOCATION”
Q14	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q15	DNP	“NULL PART, VACANT PCB LOCATION”
Q3	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q4	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q5	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q6	032006	“XSTR,MMBT2907A PNP SOT-23EBC”
Q7	DNP	“NULL PART, VACANT PCB LOCATION”
R1	170335	“RES, 25K TRIM SIDE ADJ”
R10	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R11	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R12	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R13	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R14	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R15	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R16	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R17	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R19	013753000	“RES,SM CF 75K 0.1W 5% 0805”

Table 15-3 High Stability Fast ALC Parts List (001-01023 Rev. B)

Designator	Part Number	Description
R2	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R22	170335	“RES, 25K TRIM SIDE ADJ”
R23	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R24	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R25	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R26	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R27	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R28	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R29	170334	“RES,100K TRIM SIDE ADJ”
R30	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R31	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R32	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R34	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R35	013474000	RES SM CF 470K 0.1W 5% 0805
R37	DNP	“NULL PART, VACANT PCB LOCATION”
R38	013474000	RES SM CF 470K 0.1W 5% 0805
R4	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R40	013474000	RES SM CF 470K 0.1W 5% 0805
R41	013123000	“RES, 12K OHM 1/8W 5% TK 0805”
R42	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R43	013474000	RES SM CF 470K 0.1W 5% 0805
R44	013753000	“RES,SM CF 75K 0.1W 5% 0805”
R45	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R46	013273000	“RES,27K OHM 1/8W 5% TK 0805”
R47	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R48	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R49	013472000	RES SM CF 4.7K 0.1W 5% 0805
R51	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R57	DNP	“NULL PART, VACANT PCB LOCATION”
R58	DNP	“NULL PART, VACANT PCB LOCATION”
R6	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R61	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
R62	DNP	“NULL PART, VACANT PCB LOCATION”

Table 15-3 High Stability Fast ALC Parts List (001-01023 Rev. B)

Designator	Part Number	Description
R63	DNP	“NULL PART, VACANT PCB LOCATION”
R64	013222000	“RES,2.2K OHM 1/8W 5% TK 0805”
R65	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R67	013473000	“RES,47K OHM 1/8W 5% TK 0805”
R69	013274000	“RES,270K OHM 1/8W 5% TK 0805”
R7	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R70	013102000	“RES, 1K OHM 1/8W 5% TK 0805”
R71	013151000	“RES,150 OHM 1/8W 5% TK 0805”
R8	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R84	013110100	“RES, 1.1K OHM 1/8W 1% TK 0805”
R9	013464000	“RES, 464 OHM 1/8W 1% TK 0805”
U1	033087	“IC, TPIC6C595 8-B S/REG SO-16”
U2	033305003	“IC,DS1267S 10KX2 DIG POT SOW16”
U3	033304000	“IC,SM,LM2902D,QUAD-OP,SO-14”
U4	033003	“IC,VREG 78L05 5V 5% SOIC-8”
U5	033002	“IC,VREG 78L08 8V 5% SOIC-8”
U6	033081	“IC, 74HC02 QUAD 2-I NOR SO-14”
Y1	DNP	“NULL PART, VACANT PCB LOCATION”
Y2	700006	“OCXO,16.777216 MHZ 0.1 PPM”

CHAPTER 16
ALE OPTIONS

16.1 7000ALE

The FED-STD-1045 compatible adaptive ALE system provides complete 1045-specification capability including link quality analysis, auto-linking, and order wire message transmissions. The following circuit description only covers the ALE circuitry. The main processor and associated circuitry is described in “Chapter 14: Processor Board.”

16.1.1 Circuit Description

The ALE option includes the main ALE processor and DSP. Figure 16-1 on page 16-4 provides a block diagram of the ALE/Processor board.

ALE Processor

ALE processor U78, combined with the input/output circuits, forms a special purpose microcomputer. The ALE processor controls ALE data as it comes from the DSP. It also prepares the ALE data before it is sent to the DSP for transmission.

The ALE processor addresses up to 64 kilobytes of static RAM (SRAM). It includes 1 UART, 2 timers, 32 bidirectional input/output lines, and 6 external interrupt sources. The ALE processor operates at a clock frequency of 11.0592 MHz provided by external oscillator U76. The UART communicates with the main radio processor through the serial buffers.

Port 1 is used for the following miscellaneous control functions:

Port	Function
P1.0	Selects the communications mode for the external serial-control interface which is strictly for processor control or control through an external dumb terminal.
P1.1	Sets the serial control interface baud rate of 9600 or 19200 baud.
P1.2	Keyline output drive for keying the PTT line of an external device.
P1.3	Input that reads the current status of the PTT line.
P1.4	Provides the microprocessor watchdog output to reset controller chip U1.
P1.5	Provides a control input into the DSP.

Port	Function
P1.6	Interrupt line 1 to the DSP and dual port SRAM chip.
P1.7	Provides the DSP reset pulse for a controlled power-up of the DSP.

Port 3 is for interrupt functions that have high priority:

Port	Function
P3.0	No connection.
P3.1	Transmit driver pin for the serial-control interface.
P3.2	Receive pin for the serial-control interface.
P3.3	Interrupt from the dual port RAM that indicates the DSP has left data that must be retrieved for processing.
P3.4	External timing input from the DSP.
P3.5	External timing input from the DSP.
P3.6	No connection.

The ALE, PSEN, RD, WR, address/data lines AD0-AD7 and address lines A8-A15 are for communications with the program memory EPROM (U80), data RAM (U82), data memory EEPROM (U83) and DSP (U93) that support the ALE processor.

Reset Controller

The controller (U75) provides three functions. The first function is a reset pulse generator that monitors the +5V line. It generates a reset output to hold the microprocessor's reset line low whenever the +5V line is below 4.65 Vdc. On power-up, an internal monostable multivibrator holds the reset line low for 250 ms, which allows the power supply to stabilize before generating the reset pulse. This also prevents repeated toggling of the reset line.

The second function is as a debounced reset input line used as an external push button to reset the microprocessor. It is available on the JTAG connector J1 pin 7.

The third function of U75 is as a microprocessor watchdog that requires the microprocessor to toggle STB input at least once every 500 ms. If the microprocessor fails to do so, the reset controller assumes the processor is locked up and provides a reset pulse to start it again. This is a rare occurrence and the ALE circuitry is able to recover from it without external help.

Clock Oscillator

Clock oscillator U76 provides the internal clock for the ALE processor. Clock oscillator U92 is a high-stability oscillator that provides the internal clock and timing for the DSP.

Buffers	The inverter/buffer chip (U24) provides protection for the main processor from the outside world. U22D buffers the PTT input line. U24C and U39E buffer the output of the 11.0592 MHz oscillator.
EPROM Program Storage	The EPROM chip (U80) stores the main software operating program for the ALE board. The DSP EPROM chips (U94 and U98) store the high-speed DSP.
RAM Program Storage	The RAM chip (U82) stores all the current operating data. DSP RAM chip U95 executes the high-speed DSP.
Memory Backup	If the TW7000's DC power source (+12 Vdc) fails, the voltage detector device U1 switches to the onboard 3V Lithium backup battery to maintain power to the RAM chips (main and ALE). It is only designed to provide backup power to the memory chips for a few days.
EEPROM Data Storage	EEPROM chip U83 provides long term operating data and parameters storage.
Dual Port SRAM	The dual port SRAM (DPSRAM) chip (U96) provides an easy interface between the ALE processor and the DSP. Each time the DSP receives ALE data, it stores it in the DPSRAM, then sends an interrupt to the main processor to indicate data is waiting. The main processor retrieves and processes the data. Conversely, when the microprocessor wants to transmit, it stores the data in DPSRAM. The DPSRAM sends an interrupt to the DSP. The DSP then retrieves the data and transmits it.
Control Logic	The FPGA (U8) field-programmable gate-array chip contains all the interface logic between the ALE processor and its memories, and the DSP and its memories. It also provides the control interface between the ALE and DSPs. The bus multiplex chip (U79) multiplexes the address and data lines coming from the main processor. The address is first presented to the lower address bus and then is latched with the ALE signal from the main microprocessor. The bus is then able to read or write data on AD0-AD8.
Digital Signal Processor	The digital signal processor (DSP) U93 is a special purpose processor optimized for fast math functions. Digital processing enables the DSP to distinguish ALE tones from normal background noise in noisy environments. It also generates transmit tones with superb quality enhancing the likelihood of detection at the receiving end. The DSP operates at a clock frequency of 20.736 MHz provided by high-stability oscillator U92. This high-stability clock is necessary for providing precise ALE tone generation and decoding.

The DS, PS, IS, STAB, and RW lines (all active-low) provide the switching logic for the external EPROM (U94 and U98), SRAM (U95), and Dual Port SRAM (U96) chips. Address lines A0-A15 and D0-D15 are address and data lines that communicate with the EPROM, SRAM, and DPRAM chips.

The DSP interfaces with the audio CODEC chip U91 which processes all the incoming receive audio and digitizes it for the DSP. It also generates the ALE transmit tones from the digital data that the DSP sends.

Audio Interface

The audio interface chip (U91) is responsible for the decoding and generation of ALE tones. The chip is divided into two parts, the receive circuitry and the transmit circuitry. The receive circuits consist of a 14-bit analog-to-digital converter (ADC) that breaks down the incoming signal into a digital sequence which is applied to the DSP. The transmitting circuits use a 14-bit digital-to-analog converter (DAC) to convert the incoming digital sequence from the DSP into a precise transmit audio (analog) tone.

The audio buffer chips buffer the receive audio input (U99A) and transmit audio output (U99B). They allow adjustment of the input (R134)and output (R147) levels. For location of adjustment points, refer to Figure 16-2 on page 16-5.

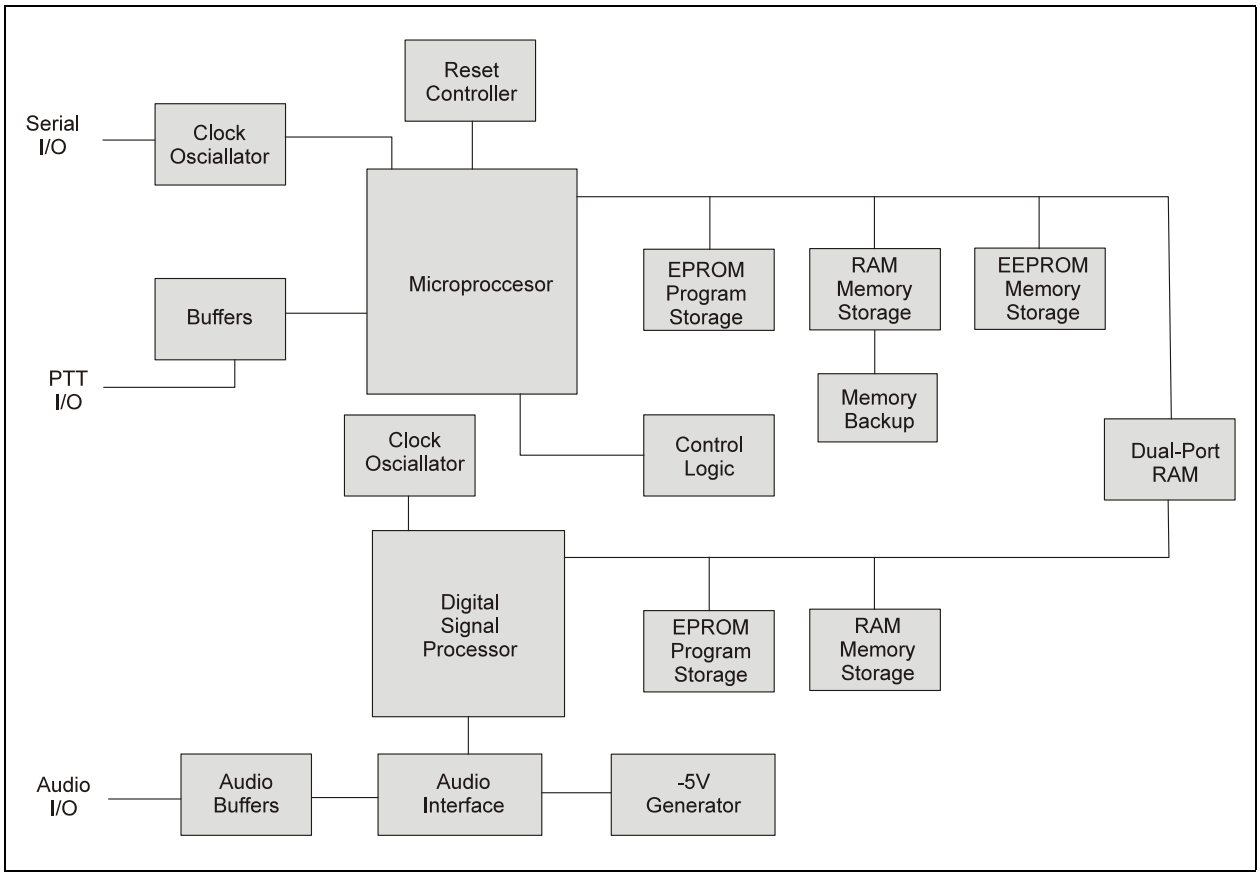


Figure 16-1 7000ALE Option Block Diagram

16.1.2 Installation

The 7000ALE option consists of the Processor board with 1045 ALE circuitry populated on the board (001-01105). It is installed in the Processor board slot and uses a DB25 ribbon cable connected to the Motherboard to communicate ALE information with the TW7000.

To install the 7000ALE option:

1. Turn the radio off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107) and remove it using the board puller using correct anti-static procedures.
3. Verify the jumpers on JU13A and JU24 on the new 7000ALE option board (001-01105) are installed as shown in Figure 16-2 below.
4. Reinsert the 7000ALE option board and plug the ribbon cable in the ALE option slot (J13) next to the 7000ALE option board.
5. Replace the retaining bar and the cover of the radio.
6. When powered up, the ALE icon displays.

For operational information on ALE, refer to the ALE operator manual (7000ALE-MSOP).

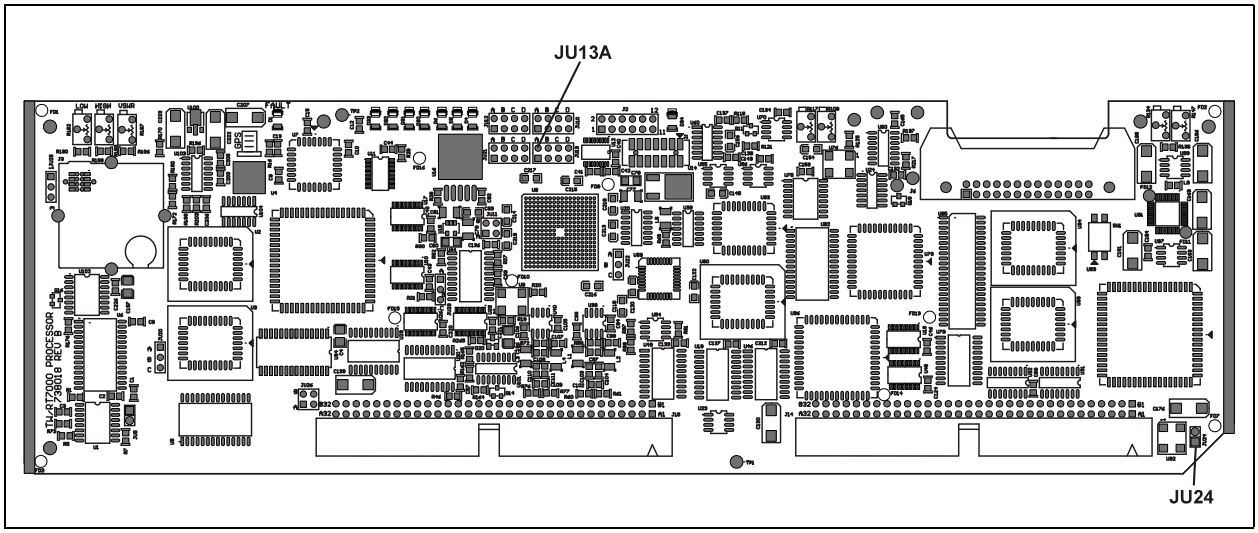


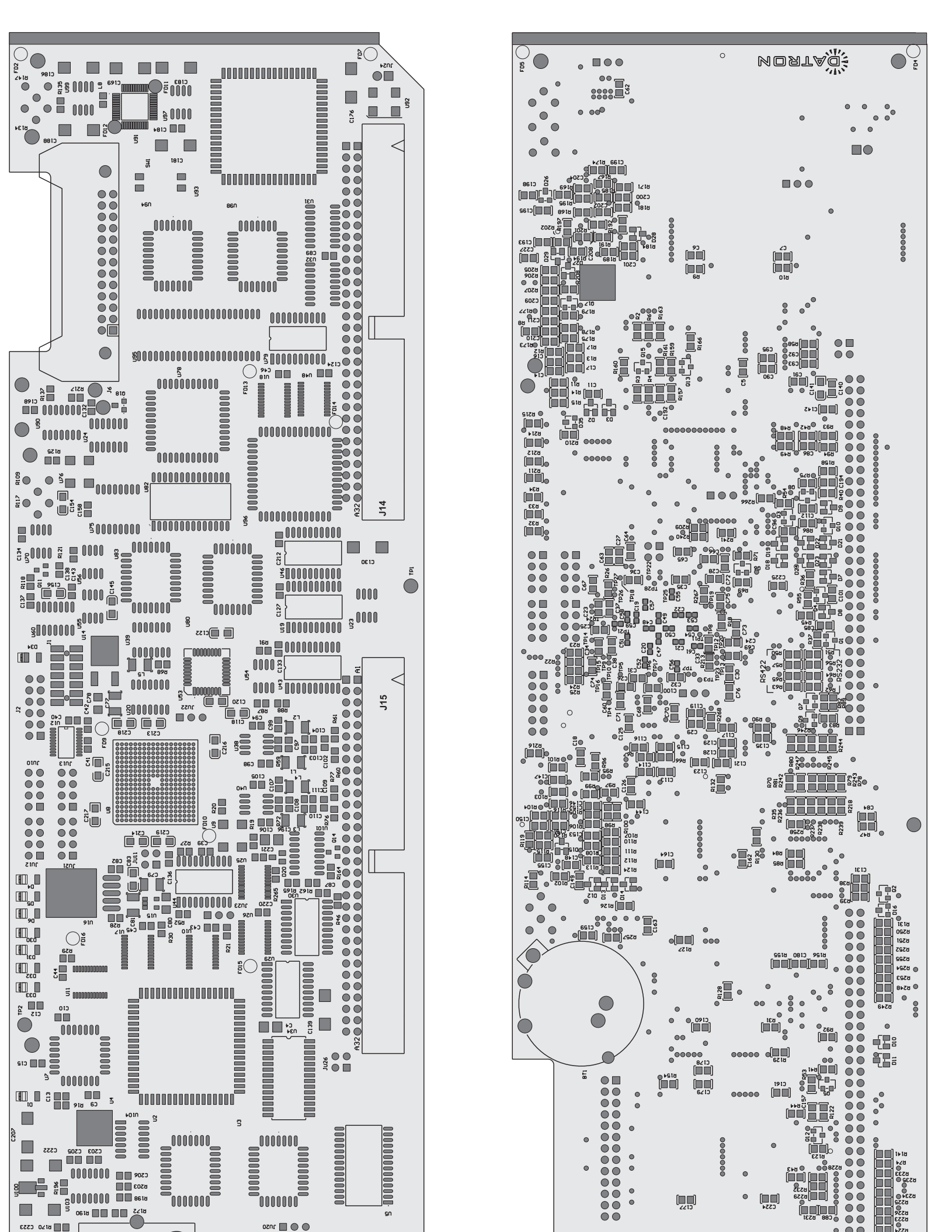
Figure 16-2 7000ALE Option Jumper Placement

16.1.3 Connector Pin Assignments

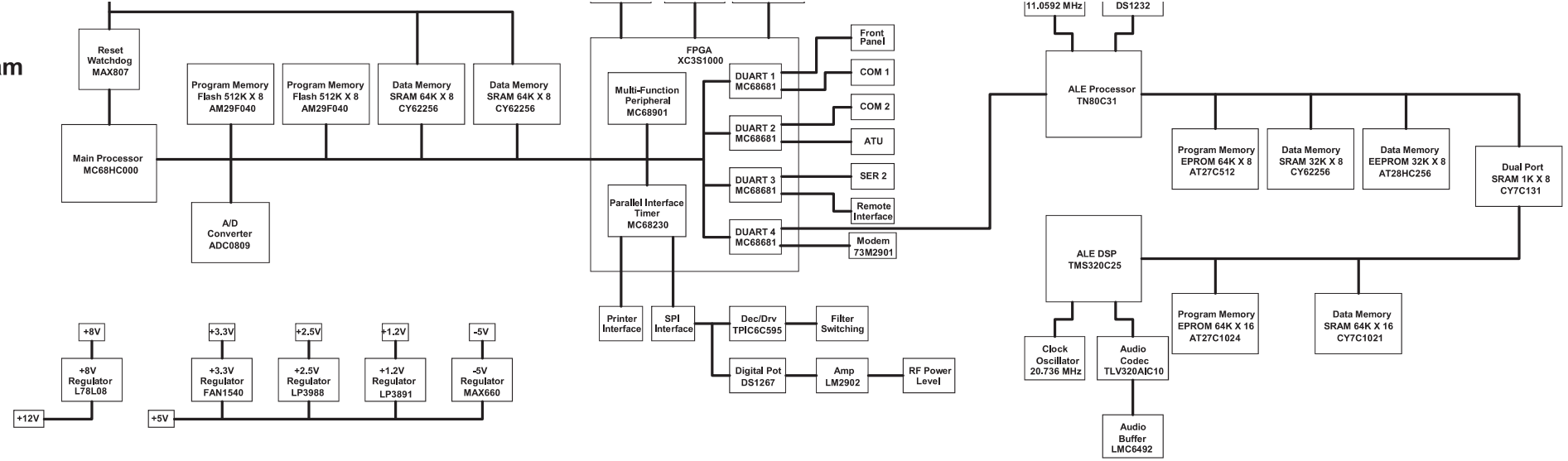
For 7000ALE option connector pin assignments, refer to “Connector Pin Assignments” on page 14-10.

16.1.4 Component Locations, Schematic and Parts List

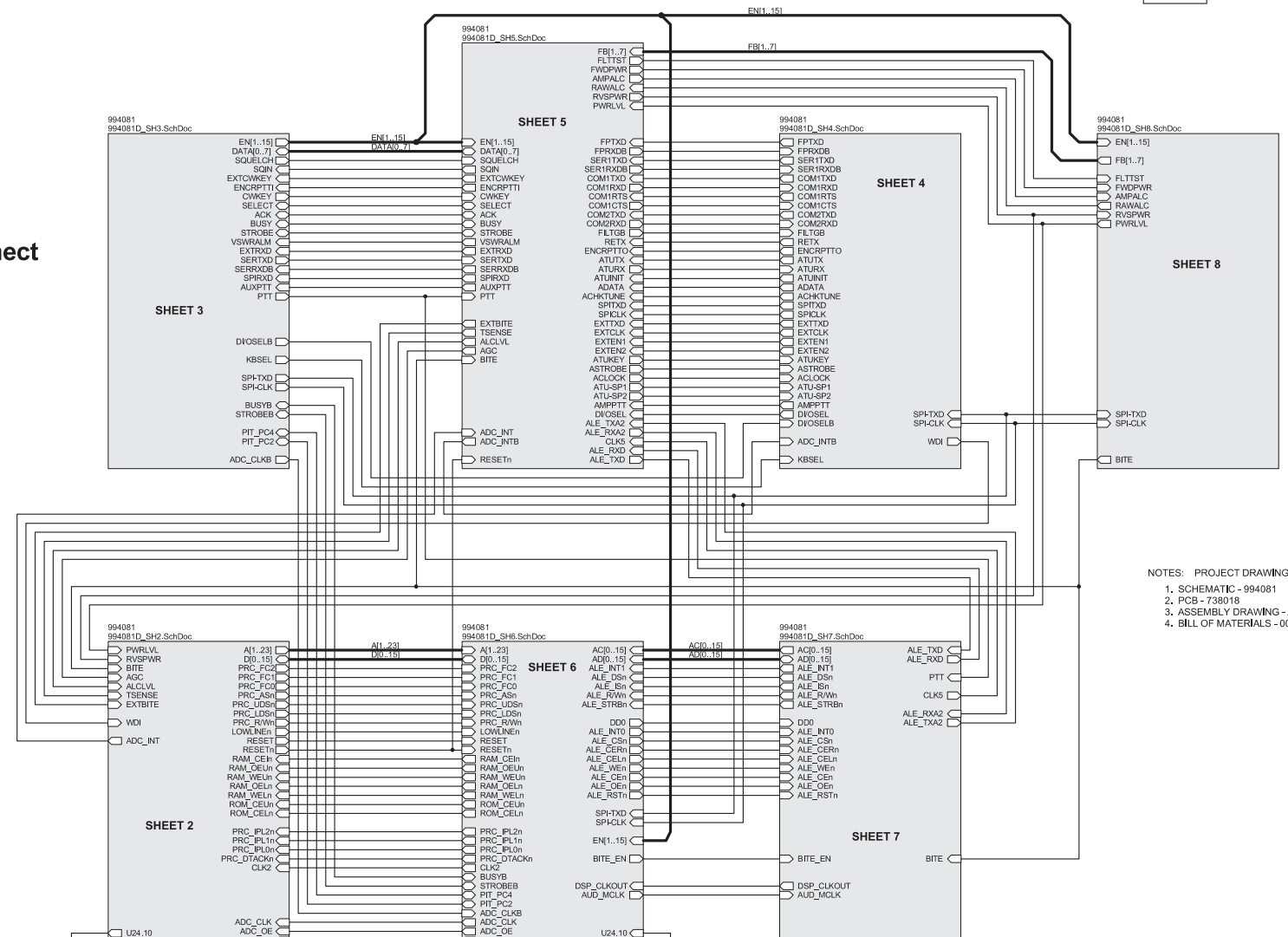
This section includes a component locations diagram, schematics and parts list for the 7000ALE option.


DATRON
J14
J15
A32
A1
RS232
RS422
BT1
TP1
TP2
SW1

ck Diagram



Interconnect



Schematic Sheet Description	
Sheet	Description
1	Cover Sheet
2	Main Processor
3	Parallel Timer/Multi Peripheral
4	DUART 1 and 2
5	DUART 3 and 4
6	FPGA and Power Supplies
7	ALE
8	Reference Control

NOTES: PROJECT DRAWING NUMBERS

1. SCHEMATIC - 994081
2. PCB - 738018
3. ASSEMBLY DRAWING - A001-01105
4. BILL OF MATERIALS - 001-01105

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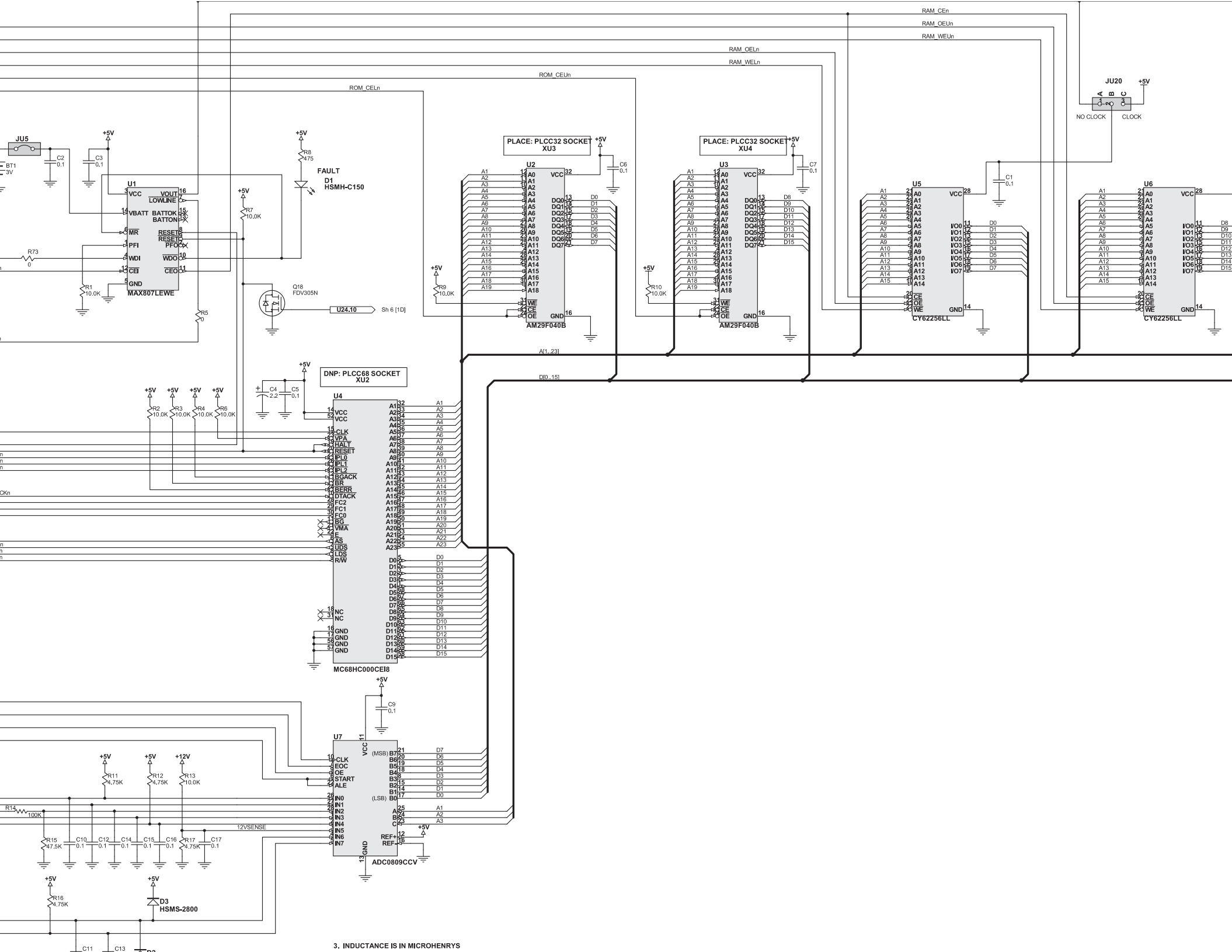
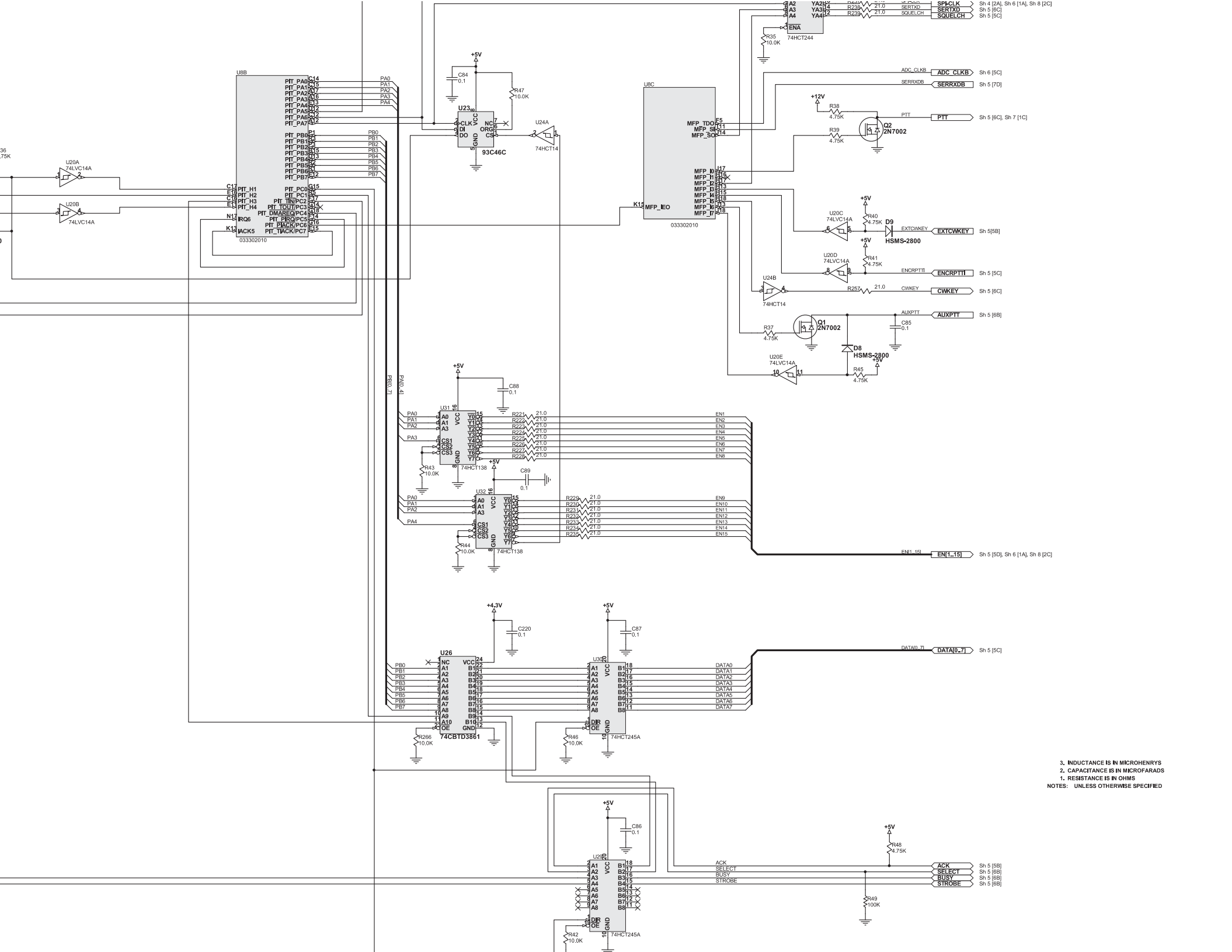
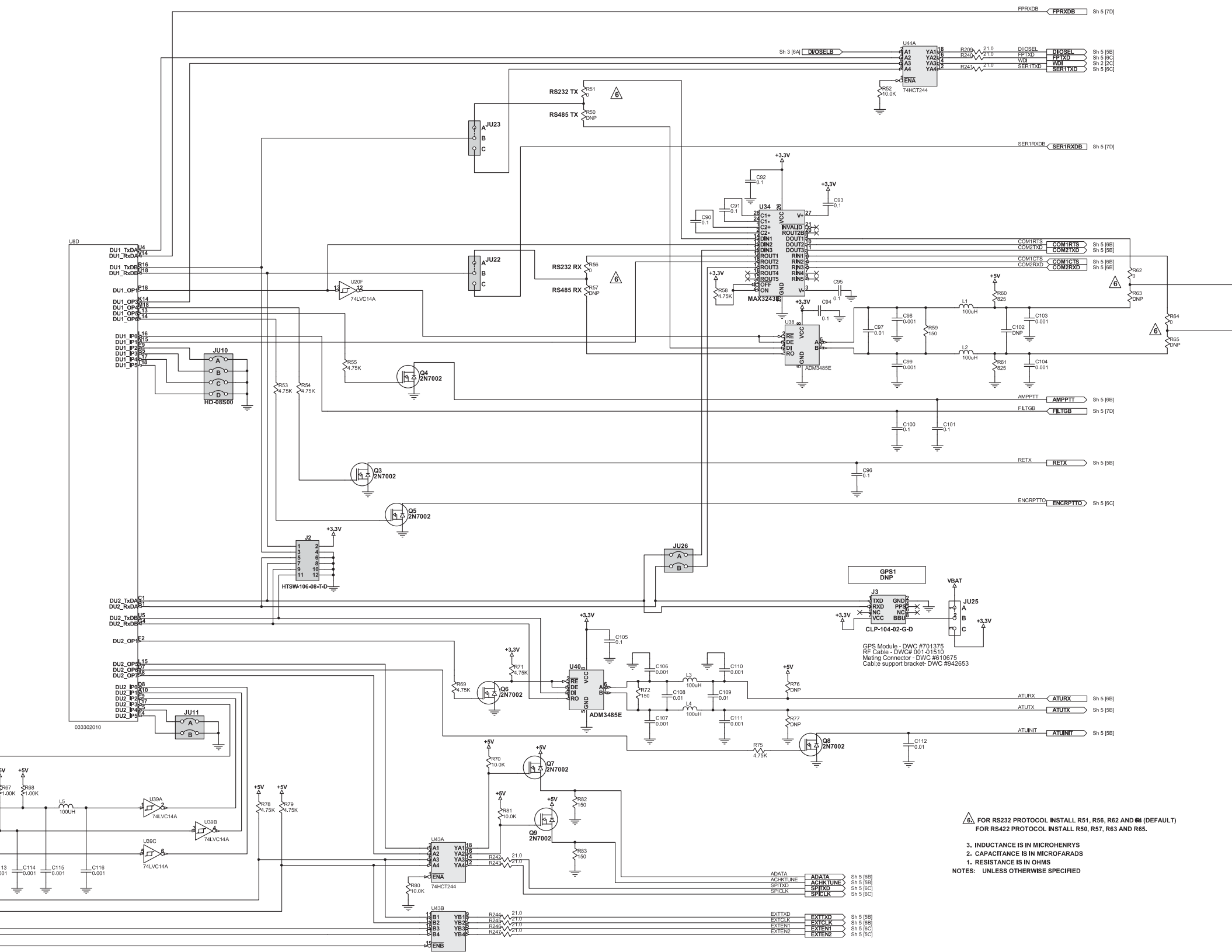
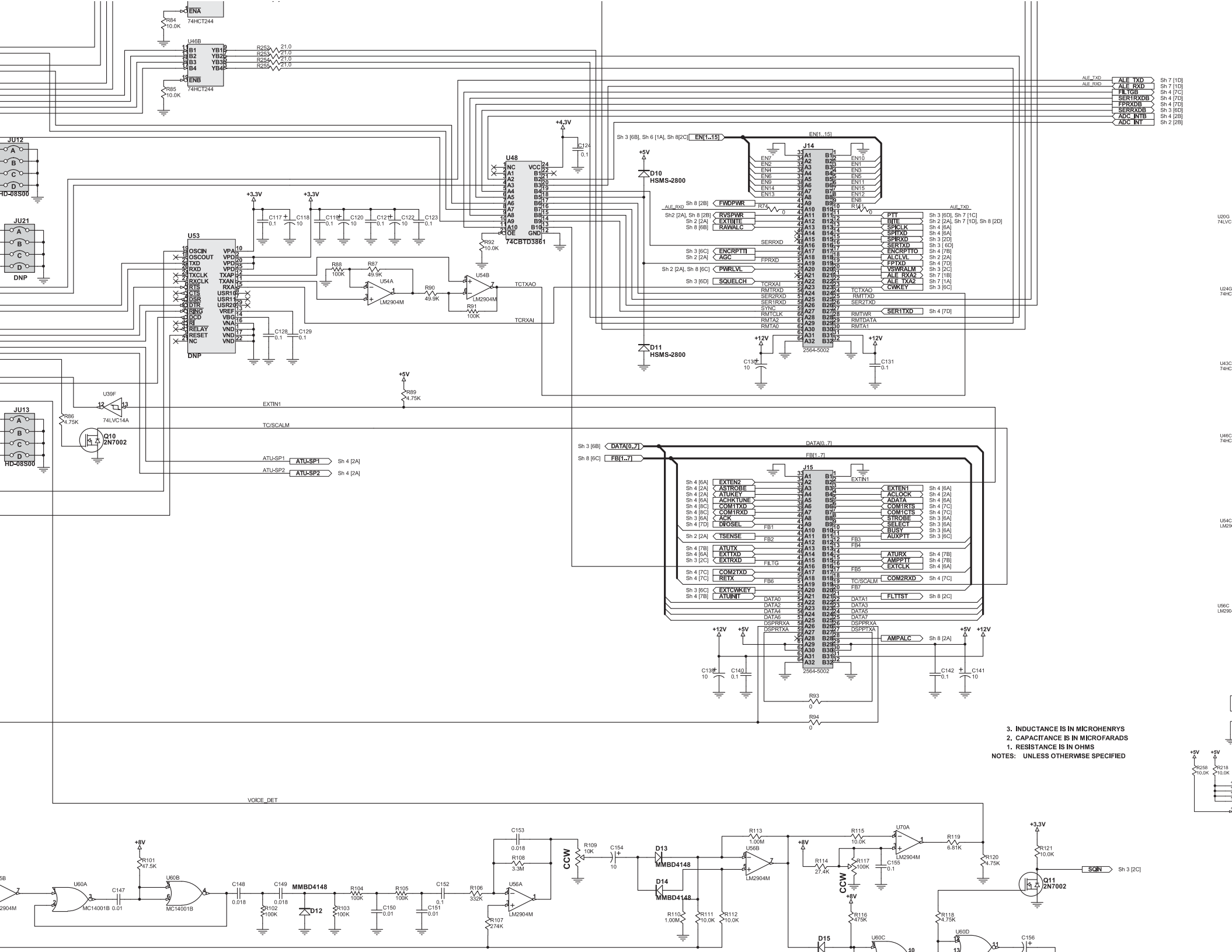
APPROVALS	DATE
DRAFTER	

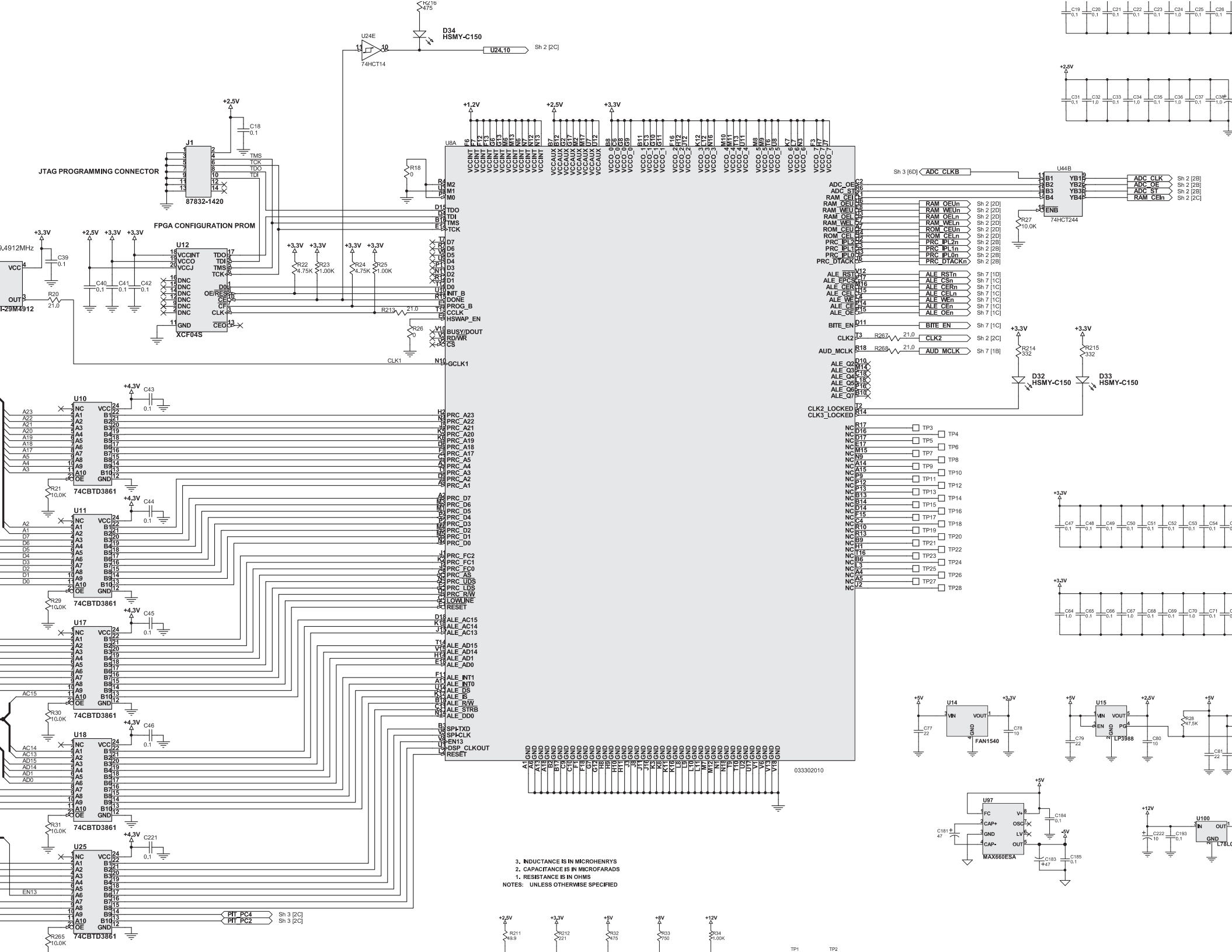
TITLE SCH
7000


RAM_CEn
RAM_OEUn
RAM_WEUn
RAM_OELn
RAM_WELn
ROM_CEUn
ROM_CELn
JU20
NO CLOCK
CLOCK
JU5
BT1
3V
U1
MAX807LEWE
FAULT
D1
HSMH-C150
Q18
FDV305N
U24.10
Sh 6 [1D]
PLACE: PLCC32 SOCKET
XU3
U2
AM29F040B
PLACE: PLCC32 SOCKET
XU4
U3
AM29F040B
U5
CY62256LL
U6
CY62256LL
A[1..23]
D[0..15]
DNP: PLCC68 SOCKET
XU2
U4
MC68HC000CEI8
U7
ADC0809CCV
12VSENSE
D3
HSMS-2800
3. INDUCTANCE IS IN MICROHENRYS


U8B
033302010
U8C
033302010
U23
93C46C
U24A
74HCT14
U20A
74LVC14A
U20B
74LVC14A
U20C
74LVC14A
U20D
74LVC14A
U20E
74LVC14A
U24B
74HCT14
U31
74HCT138
U32
74HCT138
U26
74CBTD3861
U30
74HCT245A
U29
74HCT245A
Q1
2N7002
Q2
2N7002
D8
HSMS-2800
D9
HSMS-2800
R35 10.0K
R37 4.75K
R38 4.75K
R39 4.75K
R40 4.75K
R41 4.75K
R43 10.0K
R44 10.0K
R45 4.75K
R46 10.0K
R47 10.0K
R48 4.75K
R49 100K
R266 10.0K
C84 0.1
C85 0.1
C86 0.1
C87 0.1
C88 0.1
C89 0.1
C220 0.1
+5V
+12V
+4.3V
SPI_CLK
SERTXD
SQUELCH
ADC_CLKB
SERRXDB
PTT
EXTCWKEY
ENCRPTTI
CWKEY
AUXPTT
EN[1..15]
DATA[0..7]
ACK
SELECT
BUSY
STROBE
Sh 4 [2A], Sh 6 [1A], Sh 8 [2C]
Sh 5 [6C]
Sh 5 [5C]
Sh 6 [1A]
Sh 5 [7D]
Sh 5 [6C], Sh 7 [1C]
Sh 5 [5B]
Sh 5 [5C]
Sh 6 [6C]
Sh 5 [6B]
Sh 5 [5D], Sh 6 [1A], Sh 8 [2C]
Sh 5 [5C]
Sh 5 [5B]
Sh 5 [6B]
Sh 5 [6B]
Sh 5 [6B]
3. INDUCTANCE IS IN MICROHENRYS
2. CAPACITANCE IS IN MICROFARADS
1. RESISTANCE IS IN OHMS
NOTES: UNLESS OTHERWISE SPECIFIED


FPRXDB
Sh 5 [7D]
DI/OSELB
Sh 3 [6A]
U44A
74HCT244
DI/OSEL
FPTXD
WDI
SER1TXD
Sh 5 [5B]
Sh 5 [6C]
Sh 2 [2C]
RS232 TX
RS485 TX
JU23
SER1RXDB
U34
MAX3243E
COM1RTS
COM2TXD
COM1CTS
COM2RXD
U38
ADM3485E
L1
L2
100uH
AMPPTT
FILTGB
RETX
ENCRPTTO
U8D
DU1_TxDA
DU1_RxDA
DU1_TxDB
DU1_RxDB
DU1_OP1
DU1_OP3
DU1_OP4
DU1_OP5
DU1_OP6
DU1_IP0
DU1_IP1
DU1_IP2
DU1_IP3
DU1_IP4
DU1_IP5
JU10
HD-08S00
RS232 RX
RS485 RX
JU22
U20F
74LVC14A
Q4
2N7002
Q3
2N7002
Q5
2N7002
J2
HTSW-106-08-T-D
JU26
GPS1
DNP
J3
CLP-104-02-G-D
VBAT
JU25
GPS Module - DWC #701375
RF Cable - DWC# 001-01510
Mating Connector - DWC #610675
Cable support bracket- DWC #942653
DU2_TxDA
DU2_RxDA
DU2_TxDB
DU2_RxDB
DU2_OP1
DU2_OP5
DU2_OP6
DU2_OP7
DU2_IP0
DU2_IP1
DU2_IP2
DU2_IP3
DU2_IP4
DU2_IP5
JU11
033302010
U40
ADM3485E
Q6
2N7002
Q7
2N7002
Q8
2N7002
Q9
2N7002
ATURX
ATUTX
ATUINIT
U39A
U39B
U39C
74LVC14A
U43A
U43B
74HCT244
ADATA
ACHKTUNE
SPITXD
SPICLK
EXTTXD
EXTCLK
EXTEN1
EXTEN2
6. FOR RS232 PROTOCOL INSTALL R51, R56, R62 AND R64 (DEFAULT)
FOR RS422 PROTOCOL INSTALL R50, R57, R63 AND R65.
3. INDUCTANCE IS IN MICROHENRYS
2. CAPACITANCE IS IN MICROFARADS
1. RESISTANCE IS IN OHMS
NOTES: UNLESS OTHERWISE SPECIFIED


ALE_TXD
ALE_RXD
FILTGB
SER1RXDB
FPRXDB
SERRXDB
ADC_INTB
ADC_INT
U46B
74HCT244
R84 10.0K
R85 10.0K
R252 21.0
R253 21.0
R254 21.0
R255 21.0
JU12
JU21
JU13
HD-08S00
DNP
U53
U48
74CBTD3861
U54A
U54B
LM2904M
U39F
74LVC14A
Q10
2N7002
D10
HSMS-2800
D11
HSMS-2800
J14
J15
2564-5002
EN[1..15]
DATA[0..7]
FB[1..7]
TCTXAO
TCRXAI
EXTIN1
TC/SCALM
ATU-SP1
ATU-SP2
AMPALC
VOICE_DET
MMBD4148
D12
D13
D14
D15
MC14001B
U60A
U60B
U60C
U60D
U56A
U56B
U70A
Q11
2N7002
SCIN
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IS IN OHMS
2. CAPACITANCE IS IN MICROFARADS
3. INDUCTANCE IS IN MICROHENRYS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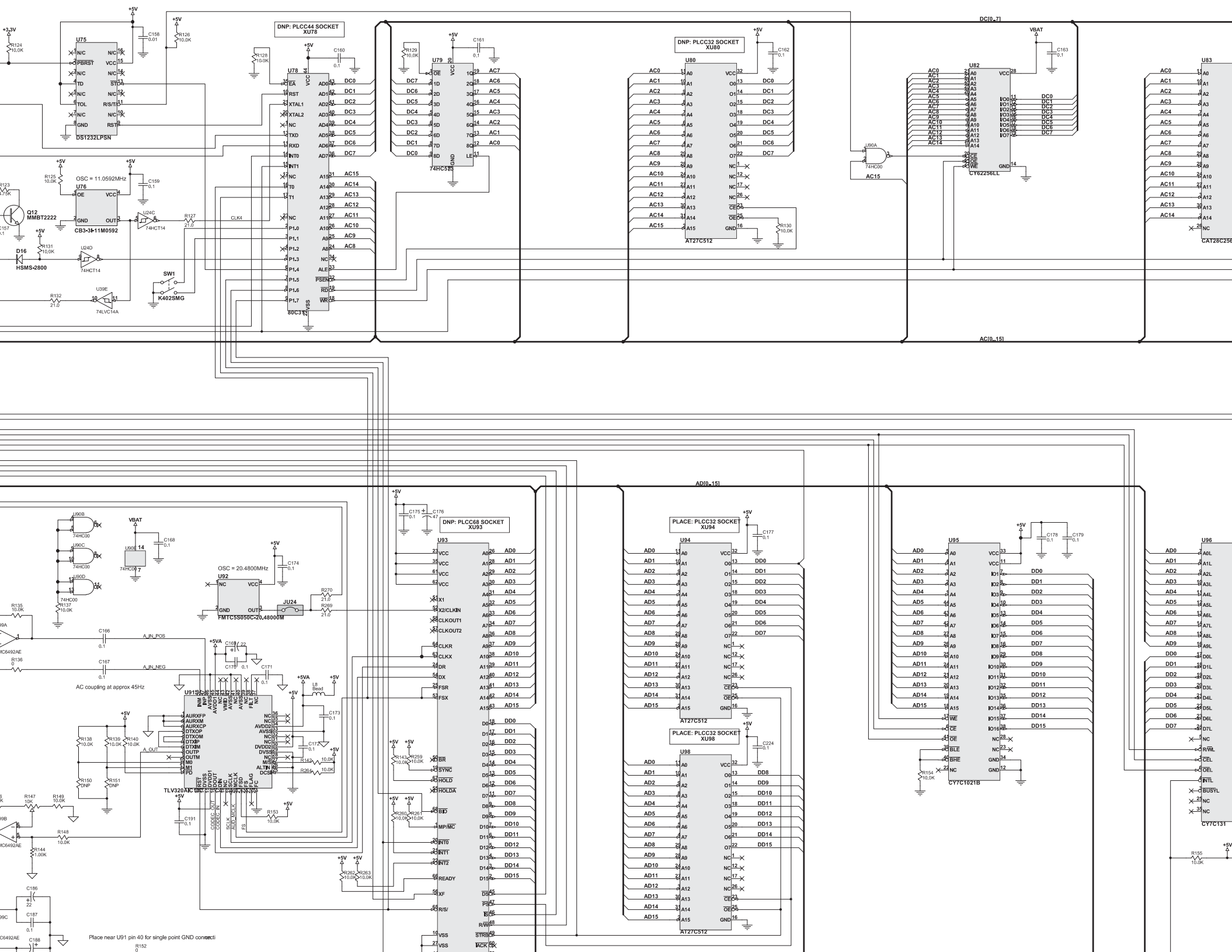
87832-1420
FPGA CONFIGURATION PROM
XCF04S
74HCT14
74HCT244
74CBTD3861
FAN1540
LP3988
MAX660ESA
D34 HSMY-C150
D32 HSMY-C150
D33 HSMY-C150
U24,10
ADC_CLKB
ADC_CLK
ADC_OE
ADC_ST
RAM_CEn
RAM_OEUn
RAM_WEUn
RAM_OELn
RAM_WELn
ROM_CEUn
ROM_CELn
PRC_IPL2n
PRC_IPL1n
PRC_IPL0n
PRC_DTACKn
ALE_RSTn
ALE_CSn
ALE_CERn
ALE_CELn
ALE_WEn
ALE_CEn
ALE_OEn
BITE_EN
CLK2
AUD_MCLK
CLK2_LOCKED
CLK3_LOCKED
PRC_A23
PRC_A22
PRC_A21
PRC_A20
PRC_A19
PRC_A18
PRC_A17
PRC_A5
PRC_A4
PRC_A3
PRC_A2
PRC_A1
PRC_D7
PRC_D6
PRC_D5
PRC_D4
PRC_D3
PRC_D2
PRC_D1
PRC_D0
PRC_FC2
PRC_FC1
PRC_FC0
PRC_AS
PRC_UDS
PRC_LDS
PRC_R/W
LOWLINE
RESET
ALE_AC15
ALE_AC14
ALE_AC13
ALE_AD15
ALE_AD14
ALE_AD1
ALE_AD0
ALE_INT1
ALE_INT0
ALE_DS
ALE_IS
ALE_R/W
ALE_STRB
ALE_DD0
SPI-TXD
SPI-CLK
EN13
DSP_CLKOUT
RESET
PIT_PC4
PIT_PC2
033302010
NOTES: UNLESS OTHERWISE SPECIFIED
1. RESISTANCE IS IN OHMS
2. CAPACITANCE IS IN MICROFARADS
3. INDUCTANCE IS IN MICROHENRYS


DNP: PLCC44 SOCKET XU78
DNP: PLCC32 SOCKET XU80
DNP: PLCC68 SOCKET XU93
PLACE: PLCC32 SOCKET XU94
PLACE: PLCC32 SOCKET XU98
DC[0..7]
AC[0..15]
AD[0..15]
VBAT
U75
DS1232LPSN
U76
CB3-3I-11M0592
OSC = 11.0592MHz
U78
80C31
U79
74HC573
U80
AT27C512
U82
CY62256LL
U83
CAT28C256
U90A
74HC00
AC15
U92
FMTC5S050C-20.48000M
OSC = 20.4800MHz
U93
U94
U95
CY7C1021B
U96
CY7C131
U98
U91
TLV320AIC10IPW
Q12
MMBT2222
D16
HSMS-2800
SW1
K402SMG
A_IN_POS
A_IN_NEG
A_OUT
AC coupling at approx 45Hz
Place near U91 pin 40 for single point GND connecti

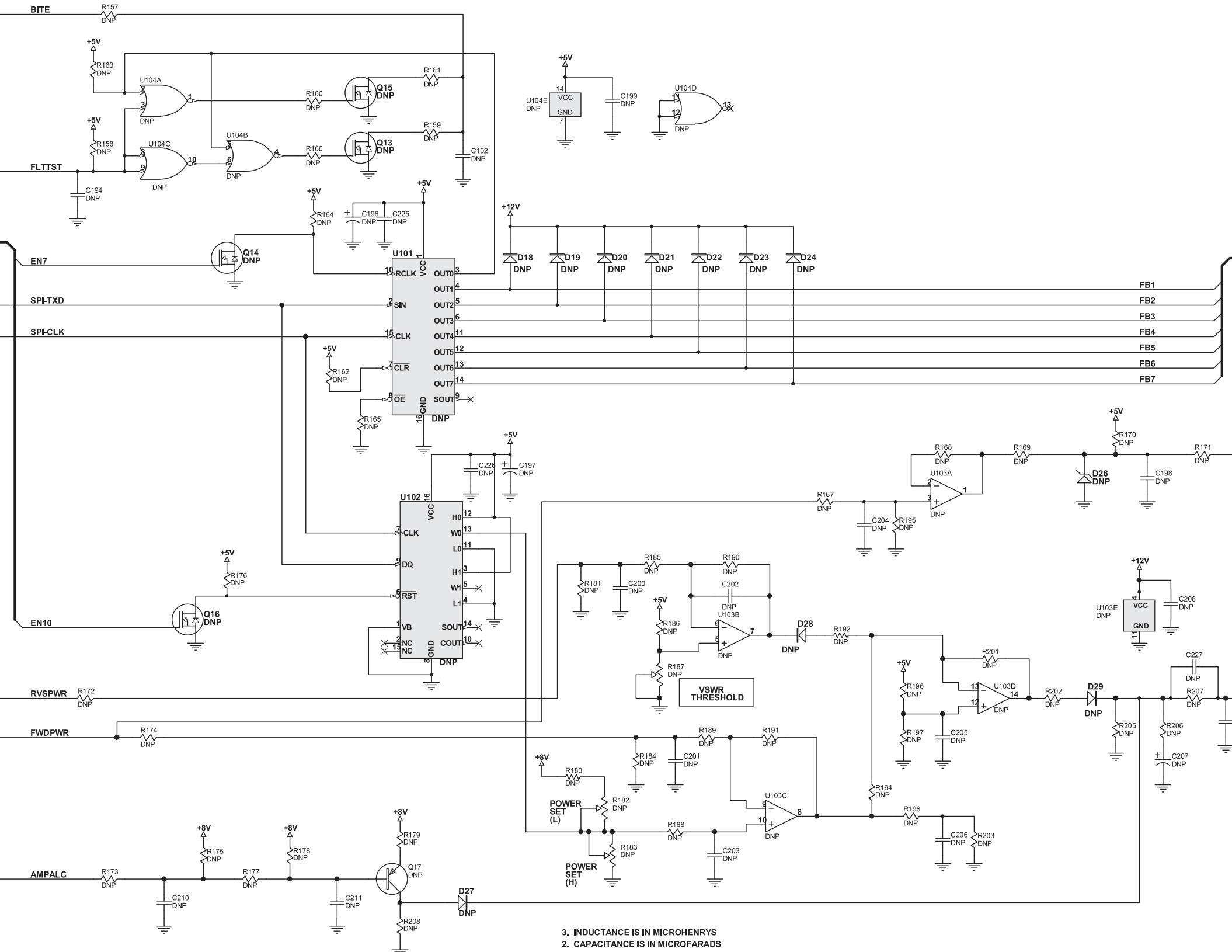

BITE
R157 DNP
+5V
R163 DNP
U104A
R160 DNP
Q15 DNP
R161 DNP
R159 DNP
Q13 DNP
U104B
U104C
R166 DNP
C192 DNP
FLTTST
R158 DNP
C194 DNP
U104E DNP
VCC
GND
C199 DNP
U104D
+12V
R164 DNP
C196 DNP
C225 DNP
EN7
Q14 DNP
U101
RCLK
SIN
CLK
CLR
OE
VCC
GND
OUT0
OUT1
OUT2
OUT3
OUT4
OUT5
OUT6
OUT7
SOUT
DNP
D18 DNP
D19 DNP
D20 DNP
D21 DNP
D22 DNP
D23 DNP
D24 DNP
FB1
FB2
FB3
FB4
FB5
FB6
FB7
SPI-TXD
SPI-CLK
R162 DNP
R165 DNP
C226 DNP
C197 DNP
U102
CLK
DQ
RST
VB
NC
NC
H0
W0
L0
H1
W1
L1
SOUT
COUT
EN10
Q16 DNP
R176 DNP
R168 DNP
R169 DNP
R170 DNP
R171 DNP
U103A
D26 DNP
C198 DNP
R167 DNP
C204 DNP
R195 DNP
R185 DNP
R190 DNP
R181 DNP
C200 DNP
C202 DNP
R186 DNP
U103B
D28 DNP
R192 DNP
R187 DNP
VSWR THRESHOLD
U103E DNP
C208 DNP
R201 DNP
R196 DNP
U103D
R202 DNP
D29 DNP
C227 DNP
R207 DNP
R205 DNP
R206 DNP
C207 DNP
R197 DNP
C205 DNP
RVSPWR
R172 DNP
FWDPWR
R174 DNP
R189 DNP
R191 DNP
R184 DNP
C201 DNP
+8V
R180 DNP
POWER SET (L)
R182 DNP
R183 DNP
POWER SET (H)
U103C
R194 DNP
R188 DNP
C203 DNP
R198 DNP
C206 DNP
R203 DNP
AMPALC
R173 DNP
R175 DNP
R177 DNP
R178 DNP
R179 DNP
Q17 DNP
C210 DNP
C211 DNP
R208 DNP
D27 DNP
3. INDUCTANCE IS IN MICROHENRYS
2. CAPACITANCE IS IN MICROFARADS

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
BT1	750057	“BATT, 3V LITH”
C1	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C10	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C100	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C101	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C102	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C103	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C104	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C105	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C106	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C107	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C108	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C109	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C11	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C110	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C111	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C112	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C113	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C114	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C115	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C116	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C117	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C118	022106003	“CAP, TA 10UF 16V 20% 3216”
C119	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C12	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C120	022106003	“CAP, TA 10UF 16V 20% 3216”
C121	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C122	022106003	“CAP, TA 10UF 16V 20% 3216”
C123	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C124	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C125	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C126	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C127	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C128	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C129	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C130	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C131	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C132	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C133	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C134	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C135	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C136	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C137	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C138	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C139	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C14	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C140	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C141	022106003	“CAP, TA 10UF 16V 20% 3216”
C142	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C143	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C144	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C145	022106003	“CAP, TA 10UF 16V 20% 3216”
C146	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C147	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C148	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C149	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C15	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C150	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C151	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C152	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C153	021183002	“CAP, 0.018UF X7R 50V 10% 0805”
C154	022106003	“CAP, TA 10UF 16V 20% 3216”
C155	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C156	022106003	“CAP, TA 10UF 16V 20% 3216”
C157	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C158	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C159	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C16	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C160	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C161	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C162	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C163	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C164	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C165	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C166	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C167	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C168	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C169	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C17	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C170	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C171	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C172	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C173	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C174	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C175	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C176	022476000	“CAP, 47UF TA 20V 20% 7343”
C177	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C178	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C179	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C18	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C180	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C181	022476000	“CAP, 47UF TA 20V 20% 7343”
C182	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C183	022476000	“CAP, 47UF TA 20V 20% 7343”
C184	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C185	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C186	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C187	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C188	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C189	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C19	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C191	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C192	DNP	“NULL PART, VACANT PCB LOCATION”
C193	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C194	DNP	“NULL PART, VACANT PCB LOCATION”
C195	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C196	DNP	“NULL PART, VACANT PCB LOCATION”
C197	DNP	“NULL PART, VACANT PCB LOCATION”
C198	DNP	“NULL PART, VACANT PCB LOCATION”
C199	DNP	“NULL PART, VACANT PCB LOCATION”
C2	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C20	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C200	DNP	“NULL PART, VACANT PCB LOCATION”
C201	DNP	“NULL PART, VACANT PCB LOCATION”
C202	DNP	“NULL PART, VACANT PCB LOCATION”
C203	DNP	“NULL PART, VACANT PCB LOCATION”
C204	DNP	“NULL PART, VACANT PCB LOCATION”
C205	DNP	“NULL PART, VACANT PCB LOCATION”
C206	DNP	“NULL PART, VACANT PCB LOCATION”
C207	DNP	“NULL PART, VACANT PCB LOCATION”
C208	DNP	“NULL PART, VACANT PCB LOCATION”
C209	DNP	“NULL PART, VACANT PCB LOCATION”
C21	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C210	DNP	“NULL PART, VACANT PCB LOCATION”
C211	DNP	“NULL PART, VACANT PCB LOCATION”
C212	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C213	022106003	“CAP, TA 10UF 16V 20% 3216”
C214	022106003	“CAP, TA 10UF 16V 20% 3216”
C215	022106003	“CAP, TA 10UF 16V 20% 3216”
C216	022106003	“CAP, TA 10UF 16V 20% 3216”
C217	022106003	“CAP, TA 10UF 16V 20% 3216”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C218	022106003	“CAP, TA 10UF 16V 20% 3216”
C219	022106003	“CAP, TA 10UF 16V 20% 3216”
C22	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C220	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C221	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C222	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C223	022106000	“CAP, 10UF TA 35V 10% 7343-31”
C224	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C225	DNP	“NULL PART, VACANT PCB LOCATION”
C226	DNP	“NULL PART, VACANT PCB LOCATION”
C227	DNP	“NULL PART, VACANT PCB LOCATION”
C23	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C24	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C25	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C26	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C27	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C28	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C29	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C30	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C31	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C32	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C33	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C34	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C37	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C38	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C39	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C4	022020	“CAP, 2.2UF TA 20V 10% 3528”
C40	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C41	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C42	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C43	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C44	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C45	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C46	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C47	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C48	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C49	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C5	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C50	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C51	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C52	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C53	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C54	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C55	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C56	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C57	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C58	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C59	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C6	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C60	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C61	021104006	“CAP, 0.1UF 25V X7R 10% 0603”
C62	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C63	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C64	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C65	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C66	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C67	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C68	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C69	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C7	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C70	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C71	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C72	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
C73	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C74	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C75	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C76	021105007	“CAP, 1.0UF 16V X7R 10% 0805”
C77	021226000	“CAP, 22UF 10V X5R 20% 1210”
C78	021106001	“CAP,SM,CER,10UF,16V,X5R,1206”
C79	021226000	“CAP, 22UF 10V X5R 20% 1210”
C8	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C80	021106001	“CAP,SM,CER,10UF,16V,X5R,1206”
C81	021226000	“CAP, 22UF 10V X5R 20% 1210”
C82	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C83	022106003	“CAP, TA 10UF 16V 20% 3216”
C84	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C85	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C86	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C87	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C88	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C89	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C9	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C90	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C91	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C92	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C93	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C94	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C95	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C96	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C97	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C98	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C99	021102000	“CAP, 1000PF NPO 100V 5% 0805”
D1	035500003	“LED, RED TOP-V 1206”
D10	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D11	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D12	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
D13	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D14	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D15	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D16	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D18	DNP	“NULL PART, VACANT PCB LOCATION”
D19	DNP	“NULL PART, VACANT PCB LOCATION”
D2	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D20	DNP	“NULL PART, VACANT PCB LOCATION”
D21	DNP	“NULL PART, VACANT PCB LOCATION”
D22	DNP	“NULL PART, VACANT PCB LOCATION”
D23	DNP	“NULL PART, VACANT PCB LOCATION”
D24	DNP	“NULL PART, VACANT PCB LOCATION”
D26	DNP	“NULL PART, VACANT PCB LOCATION”
D27	DNP	“NULL PART, VACANT PCB LOCATION”
D28	DNP	“NULL PART, VACANT PCB LOCATION”
D29	DNP	“NULL PART, VACANT PCB LOCATION”
D3	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D30	035500002	“LED, GREEN TOP-V 1206”
D31	035500002	“LED, GREEN TOP-V 1206”
D32	035500001	“LED, YELLOW TOP-V 1206”
D33	035500001	“LED, YELLOW TOP-V 1206”
D34	035500001	“LED, YELLOW TOP-V 1206”
D35	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
D4	035500002	“LED, GREEN TOP-V 1206”
D5	035500002	“LED, GREEN TOP-V 1206”
D6	035500002	“LED, GREEN TOP-V 1206”
D7	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D8	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
D9	031006	“DIODE,HSMS-2800 SCHOT SOT-23AK”
GPS1	DNP	“NULL PART, VACANT PCB LOCATION”
J1	081014000	“HEADER, 2X7 BOX 2MM SMT”
J14	613166	“HEADER,64 PIN RT ANGLE PC MNT”
J15	613166	“HEADER,64 PIN RT ANGLE PC MNT”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
J2	620172	“HEADER, 2X6 MLX 0.1”
J3	610675	“HEADER,RECEPT 2X4 0.05 LP SMT”
J6	620013	“HEADER, 2X13 4-WALL RT EJC 0.1”
JU10	620026	“HEADER,8 PIN DUAL MALE”
JU11	620025	“HEADER,4 PIN DUAL MALE”
JU12	620026	“HEADER,8 PIN DUAL MALE”
JU13	620026	“HEADER,8 PIN DUAL MALE”
JU20	620030	“HEADER,3 PIN.025 SQ POST”
JU21	DNP	“NULL PART, VACANT PCB LOCATION”
JU22	620030	“HEADER,3 PIN.025 SQ POST”
JU23	620030	“HEADER,3 PIN.025 SQ POST”
JU24	650048	“HEADER, PIN 1X2 MLX 0.1 TH”
JU25	620030	“HEADER,3 PIN.025 SQ POST”
JU26	620025	“HEADER,4 PIN DUAL MALE”
JU5	650048	“HEADER, PIN 1X2 MLX 0.1 TH”
L1	045104	“IND,100 UH FR 150MA 10% 1210”
L2	045104	“IND,100 UH FR 150MA 10% 1210”
L3	045104	“IND,100 UH FR 150MA 10% 1210”
L4	045104	“IND,100 UH FR 150MA 10% 1210”
L5	045104	“IND,100 UH FR 150MA 10% 1210”
L6	045000000	BEAD FERRITE Z=600 0.2A 0805
L7	045000000	BEAD FERRITE Z=600 0.2A 0805
L8	045000000	BEAD FERRITE Z=600 0.2A 0805
Q1	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q10	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q11	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q12	032004	“XSTR,MMBT2222A NPN SOT23”
Q13	DNP	“NULL PART, VACANT PCB LOCATION”
Q14	DNP	“NULL PART, VACANT PCB LOCATION”
Q15	DNP	“NULL PART, VACANT PCB LOCATION”
Q16	DNP	“NULL PART, VACANT PCB LOCATION”
Q17	DNP	“NULL PART, VACANT PCB LOCATION”
Q18	031102038	“MOSFET-N, FDV305N 20V SOT-23”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
Q2	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q3	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q4	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q5	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q6	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q7	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q8	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
Q9	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
R1	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R10	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R100	013332300	“RES, 332K OHM 1/8W 1% TK 0805”
R101	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R102	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R103	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R104	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R105	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R106	013332300	“RES, 332K OHM 1/8W 1% TK 0805”
R107	013274001	“RES, 274K OHM 1/8W 1% TK 0805”
R108	013335000	“RES, 3.3M OHM 1/8W 5% TK 0805”
R109	170229	“RES, 10K TRM CER S-ADJ MT TH”
R11	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R110	013105001	“RES, 1M OHM 1/8W 1% TK 0805”
R111	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R112	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R113	013105001	“RES, 1M OHM 1/8W 1% TK 0805”
R114	013274200	“RES, 27.4K OHM 1/8W 1% TK 0805”
R115	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R116	013475300	“RES, 475K OHM 1/8W, 1% TK 0805”
R117	170333	“RES, 100K TRM CER S-ADJ MT TH”
R118	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R119	013681100	“RES, 6.81K OHM 1/8W 1% TK 0805”
R12	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R120	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R121	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R122	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R123	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R124	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R125	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R126	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R127	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R128	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R129	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R13	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R130	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R131	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R132	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R133	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R134	170229	“RES, 10K TRM CER S-ADJ MT TH”
R135	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R136	013000000	“RES, ZERO OHM 2A TK 0805”
R137	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R138	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R139	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R14	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R140	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R141	013000000	“RES, ZERO OHM 2A TK 0805”
R142	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R143	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R144	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R145	013101002	“RES, 100 OHM 1/8W 1% TK 0805”
R146	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R147	170229	“RES, 10K TRM CER S-ADJ MT TH”
R148	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R149	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R15	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R150	DNP	“NULL PART, VACANT PCB LOCATION”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R151	DNP	“NULL PART, VACANT PCB LOCATION”
R152	013000000	“RES, ZERO OHM 2A TK 0805”
R153	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R154	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R155	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R156	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R157	DNP	“NULL PART, VACANT PCB LOCATION”
R158	DNP	“NULL PART, VACANT PCB LOCATION”
R159	DNP	“NULL PART, VACANT PCB LOCATION”
R16	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R160	DNP	“NULL PART, VACANT PCB LOCATION”
R161	DNP	“NULL PART, VACANT PCB LOCATION”
R162	DNP	“NULL PART, VACANT PCB LOCATION”
R163	DNP	“NULL PART, VACANT PCB LOCATION”
R164	DNP	“NULL PART, VACANT PCB LOCATION”
R165	DNP	“NULL PART, VACANT PCB LOCATION”
R166	DNP	“NULL PART, VACANT PCB LOCATION”
R167	DNP	“NULL PART, VACANT PCB LOCATION”
R168	DNP	“NULL PART, VACANT PCB LOCATION”
R169	DNP	“NULL PART, VACANT PCB LOCATION”
R17	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R170	DNP	“NULL PART, VACANT PCB LOCATION”
R171	DNP	“NULL PART, VACANT PCB LOCATION”
R172	DNP	“NULL PART, VACANT PCB LOCATION”
R173	DNP	“NULL PART, VACANT PCB LOCATION”
R174	DNP	“NULL PART, VACANT PCB LOCATION”
R175	DNP	“NULL PART, VACANT PCB LOCATION”
R176	DNP	“NULL PART, VACANT PCB LOCATION”
R177	DNP	“NULL PART, VACANT PCB LOCATION”
R178	DNP	“NULL PART, VACANT PCB LOCATION”
R179	DNP	“NULL PART, VACANT PCB LOCATION”
R18	013000000	“RES, ZERO OHM 2A TK 0805”
R180	DNP	“NULL PART, VACANT PCB LOCATION”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R181	DNP	“NULL PART, VACANT PCB LOCATION”
R182	DNP	“NULL PART, VACANT PCB LOCATION”
R183	DNP	“NULL PART, VACANT PCB LOCATION”
R184	DNP	“NULL PART, VACANT PCB LOCATION”
R185	DNP	“NULL PART, VACANT PCB LOCATION”
R186	DNP	“NULL PART, VACANT PCB LOCATION”
R187	DNP	“NULL PART, VACANT PCB LOCATION”
R188	DNP	“NULL PART, VACANT PCB LOCATION”
R189	DNP	“NULL PART, VACANT PCB LOCATION”
R19	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R190	DNP	“NULL PART, VACANT PCB LOCATION”
R191	DNP	“NULL PART, VACANT PCB LOCATION”
R192	DNP	“NULL PART, VACANT PCB LOCATION”
R194	DNP	“NULL PART, VACANT PCB LOCATION”
R195	DNP	“NULL PART, VACANT PCB LOCATION”
R196	DNP	“NULL PART, VACANT PCB LOCATION”
R197	DNP	“NULL PART, VACANT PCB LOCATION”
R198	DNP	“NULL PART, VACANT PCB LOCATION”
R2	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R20	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R201	DNP	“NULL PART, VACANT PCB LOCATION”
R202	DNP	“NULL PART, VACANT PCB LOCATION”
R203	DNP	“NULL PART, VACANT PCB LOCATION”
R205	DNP	“NULL PART, VACANT PCB LOCATION”
R206	DNP	“NULL PART, VACANT PCB LOCATION”
R207	DNP	“NULL PART, VACANT PCB LOCATION”
R208	DNP	“NULL PART, VACANT PCB LOCATION”
R209	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R21	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R210	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R211	013499900	“RES, 49.9 OHM 1/8W 1% TK 0805”
R212	013221001	“RES, 221 OHM 1/8W 1% TK 0805”
R213	013210900	“RES, 21 OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R214	013332001	“RES, 332 OHM 1/8W 1% TK 0805”
R215	013332001	“RES, 332 OHM 1/8W 1% TK 0805”
R216	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R217	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R218	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R219	013604000	“RES, 604 OHM 1/8W 1% TK 0805”
R22	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R220	013000000	“RES, ZERO OHM 2A TK 0805”
R221	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R222	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R223	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R224	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R225	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R226	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R227	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R228	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R229	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R23	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R230	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R231	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R232	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R233	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R234	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R235	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R236	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R237	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R238	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R239	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R24	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R240	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R241	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R242	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R243	013210900	“RES, 21 OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R244	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R245	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R246	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R247	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R248	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R249	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R25	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R250	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R251	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R252	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R253	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R254	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R255	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R257	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R258	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R259	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R26	013000000	“RES, ZERO OHM 2A TK 0805”
R260	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R261	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R262	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R263	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R264	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R265	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R266	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R267	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R268	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R269	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R27	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R270	013210900	“RES, 21 OHM 1/8W 1% TK 0805”
R28	013473001	“RES, 47.5K OHM 1/8W 1% TK 0805”
R29	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R3	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R30	013103001	“RES, 10K OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R31	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R32	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R33	013750001	“RES, 750 OHM 1/8W 1% TK 0805”
R34	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R35	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R36	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R37	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R38	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R39	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R4	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R40	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R41	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R42	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R43	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R44	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R45	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R46	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R47	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R48	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R49	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R5	013000000	“RES, ZERO OHM 2A TK 0805”
R50	DNP	“NULL PART, VACANT PCB LOCATION”
R51	013000000	“RES, ZERO OHM 2A TK 0805”
R52	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R53	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R54	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R55	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R56	013000000	“RES, ZERO OHM 2A TK 0805”
R57	DNP	“NULL PART, VACANT PCB LOCATION”
R58	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R59	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R6	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R60	013825000	“RES, 825 OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R61	013825000	“RES, 825 OHM 1/8W 1% TK 0805”
R62	013000000	“RES, ZERO OHM 2A TK 0805”
R63	DNP	“NULL PART, VACANT PCB LOCATION”
R64	013000000	“RES, ZERO OHM 2A TK 0805”
R65	DNP	“NULL PART, VACANT PCB LOCATION”
R66	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R67	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R68	013102002	“RES, 1K OHM 1/8W 1% TK 0805”
R69	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R7	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R70	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R71	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R72	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R73	013000000	“RES, ZERO OHM 2A TK 0805”
R74	013000000	“RES, ZERO OHM 2A TK 0805”
R75	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R76	DNP	“NULL PART, VACANT PCB LOCATION”
R77	DNP	“NULL PART, VACANT PCB LOCATION”
R78	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R79	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R8	013475001	“RES, 475 OHM 1/8W 1% TK 0805”
R80	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R81	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R82	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R83	013150000	“RES, 150 OHM 1/8W 1% TK 0805”
R84	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R85	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R86	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R87	013499200	“RES, 49.9K OHM 1/8W 1% TK 0805”
R88	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R89	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R9	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R90	013499200	“RES, 49.9K OHM 1/8W 1% TK 0805”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
R91	013104001	“RES, 100K OHM 1/8W 1% TK 0805”
R92	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R93	013000000	“RES, ZERO OHM 2A TK 0805”
R94	013000000	“RES, ZERO OHM 2A TK 0805”
R95	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R96	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R97	013332100	“RES, 3.32K OHM 1/8W 1% TK 0805”
R98	013332100	“RES, 3.32K OHM 1/8W 1% TK 0805”
R99	013335000	“RES, 3.3M OHM 1/8W 5% TK 0805”
SW1	053001	“SWITCH,2-SPST DIP 0.1LS SMT”
TP1	650000	“TEST PNT, BLK 0.125 DIA TH”
TP2	650000	“TEST PNT, BLK 0.125 DIA TH”
U1	033301003	“IC,SM,UP,MAX807LEWE”
U10	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U100	034304000	“IC,78L08 VREG 8V 100MA SOT-89”
U101	DNP	“NULL PART, VACANT PCB LOCATION”
U102	DNP	“NULL PART, VACANT PCB LOCATION”
U103	DNP	“NULL PART, VACANT PCB LOCATION”
U104	DNP	“NULL PART, VACANT PCB LOCATION”
U11	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U12	033300015	“IC, PROM XCF04S 4MB TSSOP-20”
U14	034400006	“IC, FAN1540DX VREG 3.3V TO252”
U15	034400008	“IC,LP3988 VR ULDO 2.5V SOT23-5”
U16	034400007	“IC,VREG ULDO 1.2V 0.8A TO263-5”
U17	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U18	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U19	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U20	033303107	“IC,74LVC14A HEX SCH TRIG SO14”
U23	033300016	“IC, EEPROM 93C46C 64X16 SO8”
U24	033035	“IC,74HCT14 HEX SCH TRIG SO-14”
U25	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U26	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U29	033045	“IC,74HCT245 OCT BUS XCVR,SOW20”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
U30	033045	“IC,74HCT245 OCT BUS XCVR,SOW20”
U31	033043	“IC, 74HCT138 3-8 DEMUX SOIC-16”
U32	033043	“IC, 74HCT138 3-8 DEMUX SOIC-16”
U34	033305028	“IC, RS232 XCVR MAX3243 SOIC-28”
U38	033305027	“IC, BUS XCVR RS-485 SOIC-8”
U39	033303107	“IC,74LVC14A HEX SCH TRIG SO14”
U4	033301011	“IC,MC68HC000E18 UPROC PLCC-68”
U40	033305027	“IC, BUS XCVR RS-485 SOIC-8”
U43	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U44	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U46	033047	“IC,74HCT244 OCT BUS XCVR SOW20”
U48	033305029	“IC,74CBT3861 BUS SWT TSSOP24”
U5	033300032	“IC,SRAM 32KX8 CY62256LL SOIC28”
U53	DNP	“NULL PART, VACANT PCB LOCATION”
U54	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U55	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U56	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U6	033300032	“IC,SRAM 32KX8 CY62256LL SOIC28”
U60	033303056	“IC,MC14001B QUAD 2-IN NOR SO14”
U7	033082	“IC,ADC0809 8-BIT ADC PLCC28”
U70	033304020	“IC, LM2904M DUAL OP-AMP SOIC-8”
U75	033305030	“IC,DS1232LPSN UP-MONITOR SOW16”
U76	065116000	“OSC, 11.0592MHZ 5V 7X5MM”
U78	033301021	“IC,P80C31SFAA UCTL PLCC44”
U79	033058	“IC,74HC573A OCTAL LATCH SOW-20”
U8	033302010	“IC, FPGA XC3S1000 FBGA-320”
U82	033300032	“IC,SRAM 32KX8 CY62256LL SOIC28”
U83	033300017	“IC,28C256N 32KX8 EEPROM PLCC32”
U9	065296000	“OSC,29.4912 MHZ 3.3V”
U90	033057	“IC, 74HC00 NAND GATE SOP-14”
U91	033303100	“IC, TLV320AIC CODEC PQFP-48”
U92	065206000	“TCXO, 20.480 MHZ 5V 7X5MM”
U93	033301009	“IC,TMS320C25FNA DSP CTL PLCC68”

Table 16-1 7000ALE Option Parts List (001-01105 Rev. F)

Designator	Part Number	Description
U95	033300027	“IC,CY7C1021B 64KX16 SRAM SOJ44”
U96	033300031	“IC,SRAM 1K-8 DUAL PORT PLCC-52”
U97	034402010	“IC, DC-DC CNVTR MAX660 SO-8”
U99	033304057	“IC,MC6492A DUAL OP-AMP SOIC-8”
XU2	089032000	“SOCKET, PLCC32 SMT”
XU3	089032000	“SOCKET, PLCC32 SMT”
XU80	089032000	“SOCKET, PLCC32 SMT”
XU94	089032000	“SOCKET, PLCC32 SMT”
XU98	089032000	“SOCKET, PLCC32 SMT”

16.2 7000ALE-141B

The 7000ALE-141B board supports the MIL-STD 188-141B ALE specification. It is mounted on a Carrier board which is installed in the second slot next to the Processor board.

The 7000ALE-141B option is implemented on the Carrier board (001-01302). Connector J13 connects to the radio and J1 connects to the 7000ALE-141B board.

To install the 7000ALE-141B option:

1. Turn the radio off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107) and remove it using a board puller following correct anti-static procedures.
3. Install jumpers on JU13A and JU24 on the Processor board (refer to Figure 16-2 on page 16-5).
4. Reinsert the Processor board.
5. Install the 7000ALE-141B board on the Carrier board, then install the Carrier board in the ALE option slot (J13) next to the Processor board.
6. Replace the retaining bar and the cover of the radio.
7. When powered up, the ALE icon displays.

For operational information on ALE, refer to the ALE operator manual (7000ALE-MSOP).

16.2.1 Component Locations, Schematic and Parts List

This section includes a component locations diagram, schematic and parts list for the 7000ALE-141B option.

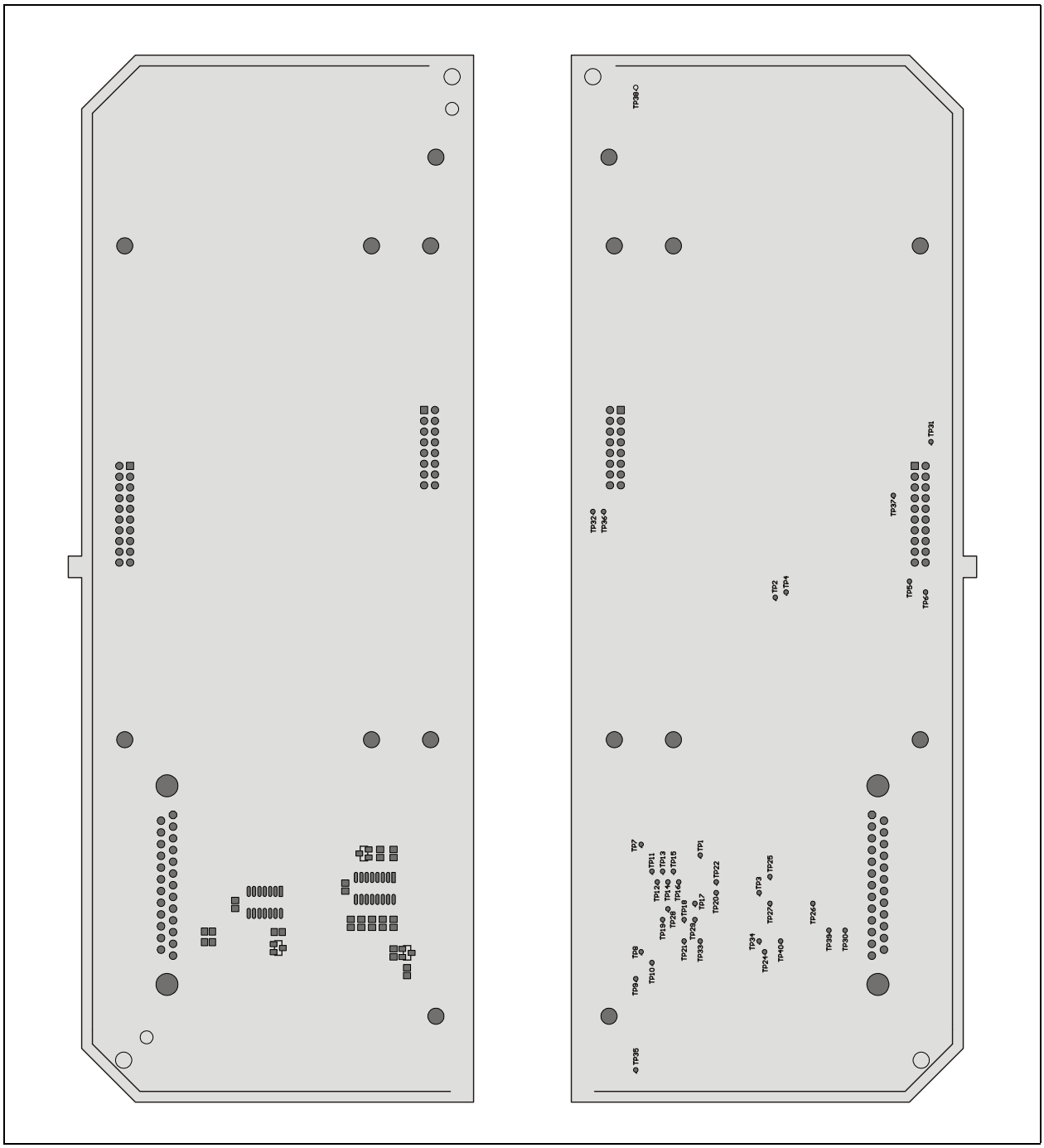
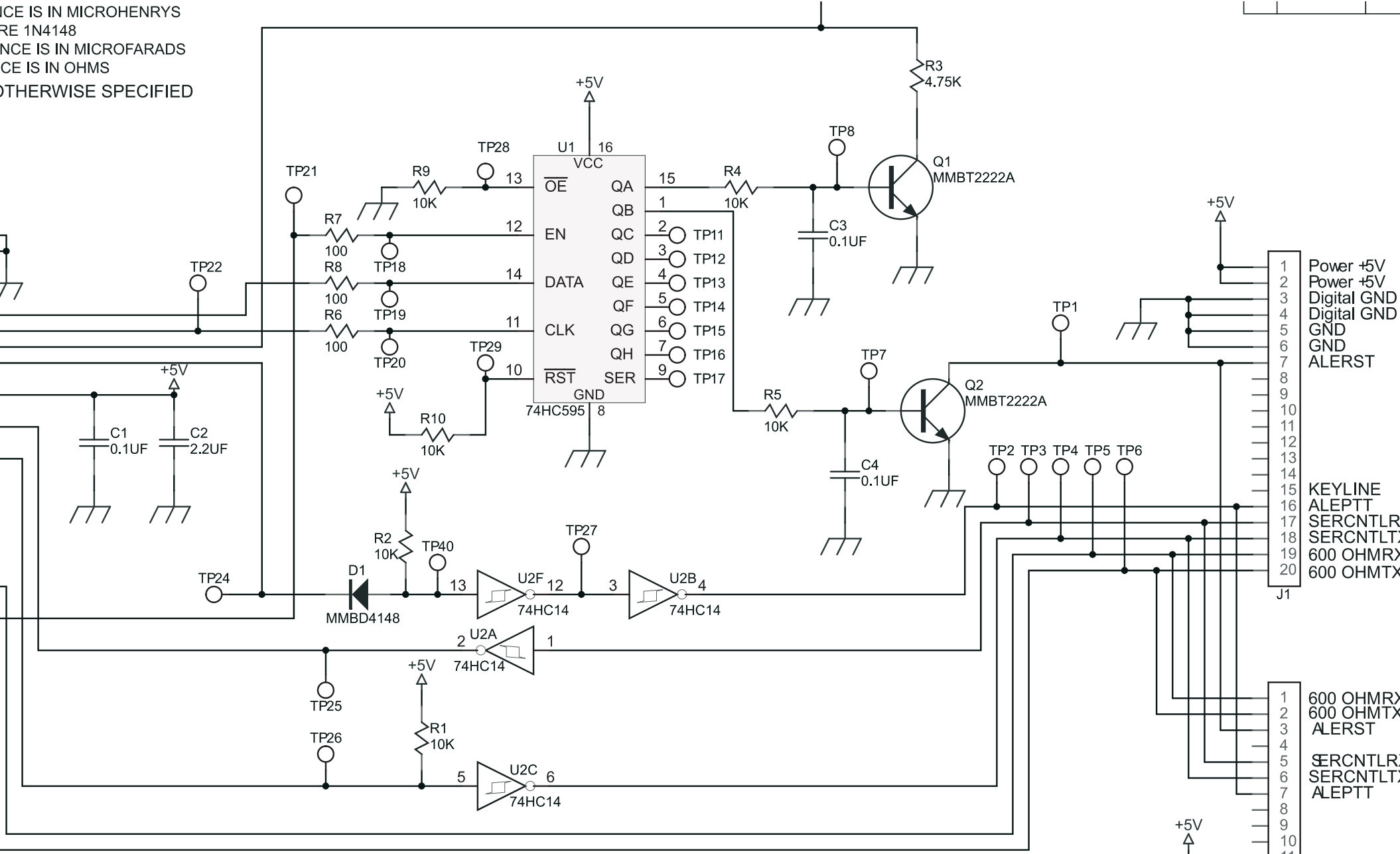
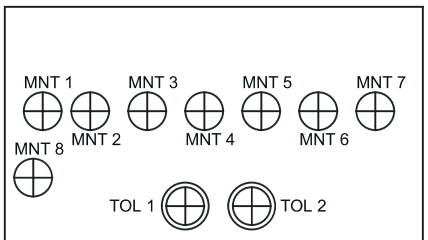


Figure 16-12 ALE Carrier Board Component Locations (738045 Rev. C)

NCE IS IN MICROHENRYS
RE 1N4148
NCE IS IN MICROFARADS
CE IS IN OHMS
OTHERWISE SPECIFIED



MOUNTING, TOOLING AND FIDUCIAL



PCA: 001-01302

Title: Schematic

Table 16-2 Carrier Board Parts List (001-01302 Rev. C)

Designator	Part Number	Description
C1	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C2	021225003	“CAP, 2.2UF X7R 25V 10% 0805”
C3	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C4	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
D1	037700005	“DIODE, MMBD4148 SOT-23”
J1	610292	“CONN,2X10 LOW PROFILE SOCKET”
J13	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J3	610206	“CONN,2X8 LOW PROFILE SOCKET”
Q1	031100018	“XSTR, MMBT2222A NPN SOT-23”
Q2	031100018	“XSTR, MMBT2222A NPN SOT-23”
R1	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R10	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R2	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R3	013475100	“RES, 4.75K OHM 1/8W 1% TK 0805”
R4	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R5	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
R6	013101002	“RES, 100 OHM 1/8W 1% TK 0805”
R7	013101002	“RES, 100 OHM 1/8W 1% TK 0805”
R8	013101002	“RES, 100 OHM 1/8W 1% TK 0805”
R9	013103001	“RES, 10K OHM 1/8W 1% TK 0805”
U1	033007	“IC,74HC595 8-BIT SIPO SOIC-16”
U2	033303001	“IC,SM,DIG,74HC14,SOIC-14”

CHAPTER 17
REMOTE CONTROL OPTIONS

17.1 FSK Remote Control Option (7000RF)

The FSK Remote Control 7000RF option provides complete remote voice and data operation of the TW7000 over a 2-wire or 4-wire audio pair. It is implemented on assembly board 001-01402. This option requires use of the TW7201F Remote Control Head and the 7000RF internal FSK modem for the TW7000. The following configuration is standard:

Remote/Local Control
Transceiver: TW7000
Internal FSK modem: 7000RF
Remote control head: TW7201F
Interface cable: C992307

The TW7201F is microprocessor-controlled and shares the interface line between audio and data control. The 7000RF modem allows remote operation in conjunction with local radio operation with the radio as master in the system. A custom LCD provides channel, frequency data, feedback and other front-panel control functions, BITE information, and orderwire text messages. For a more detailed technical description, refer to the TW7201F operator/technical manual (TW7201F-MS).

To install the 7000RF option:

1. Turn the TW7000 off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107 or 001-01105) and remove it using the board puller.
3. Using proper antistatic procedures, install a jumper in JU12-B (refer to Figure 17-1 on page 17-2).
4. Reinsert the Processor board.
5. Install the FSK Remote board in the FSK/DHSL slot (refer to Figure 21-1 on page 21-3). Verify that the board configuration is correct for the line configuration (2-wire or 4-wire).
6. Reinstall the board retaining bar and the top cover.

For more information on the RT7201F FSK Remote Control Head, refer to the TW7201F operator/technical manual (TW7201F-MS).

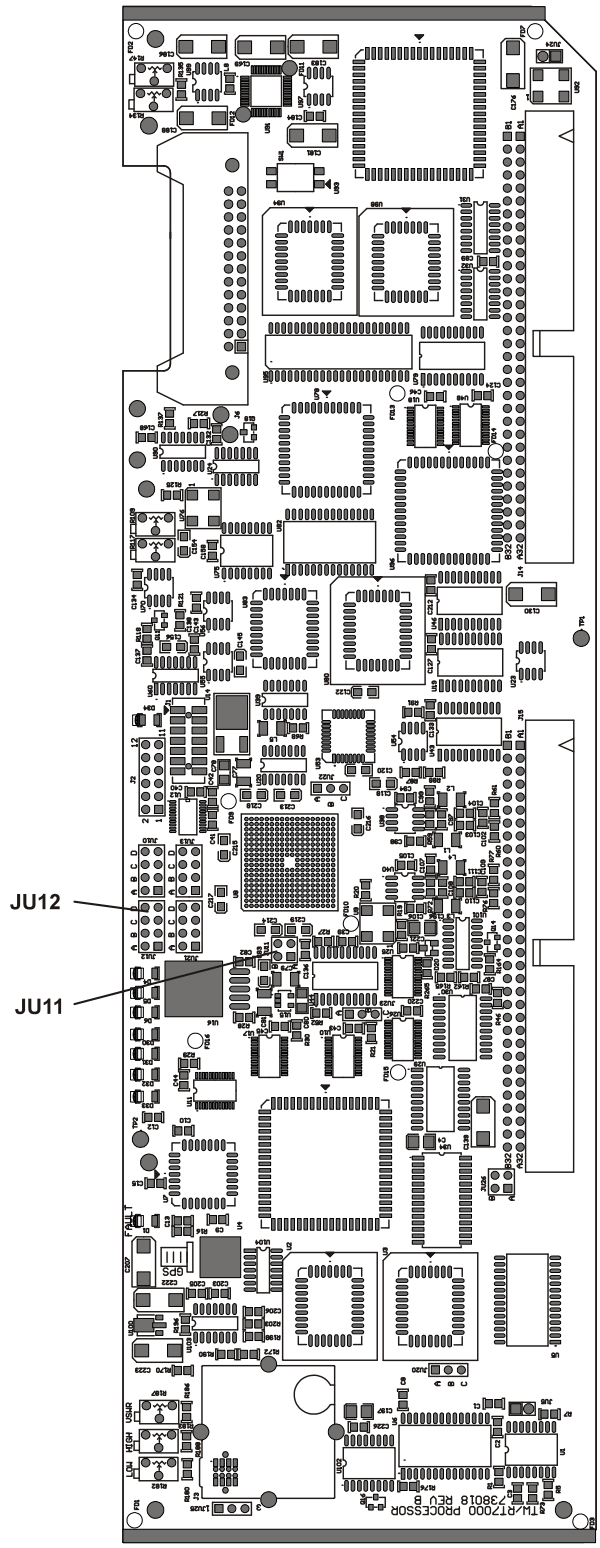


Figure 17-1 FSK Remote Control Jumper Placement

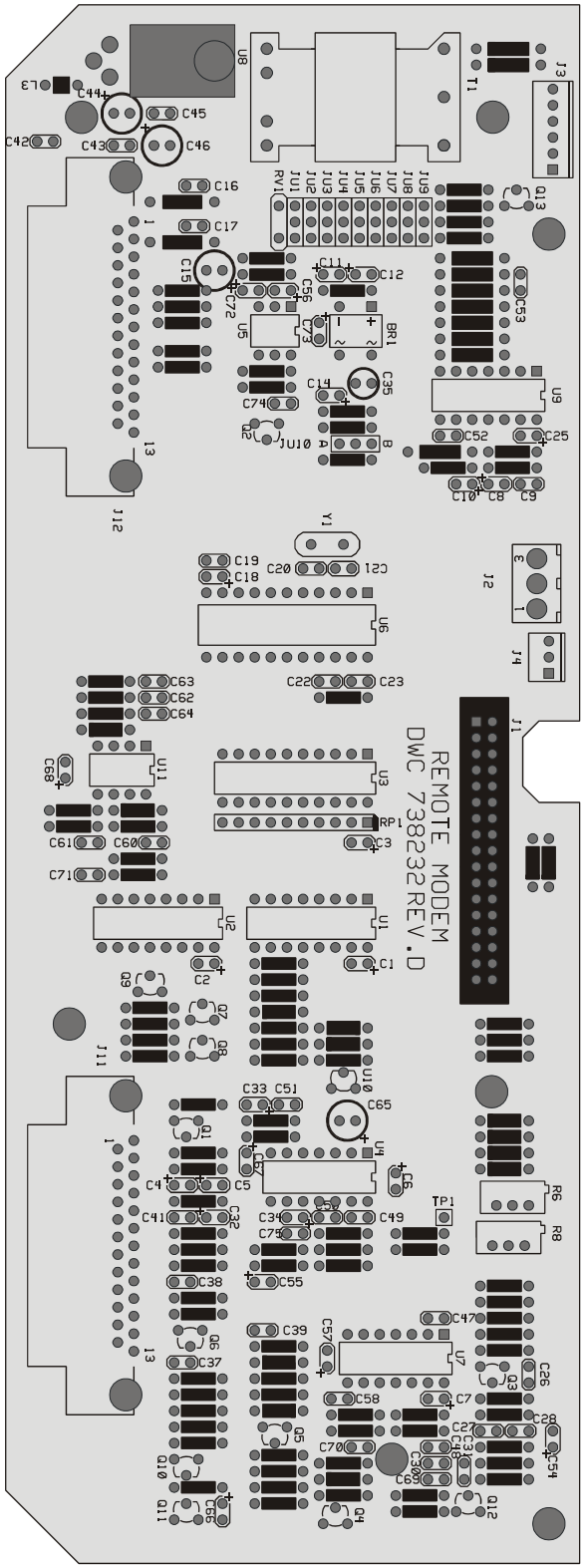


Figure 17-2 FSK Remote Control Component Locations (738232 Rev. D)

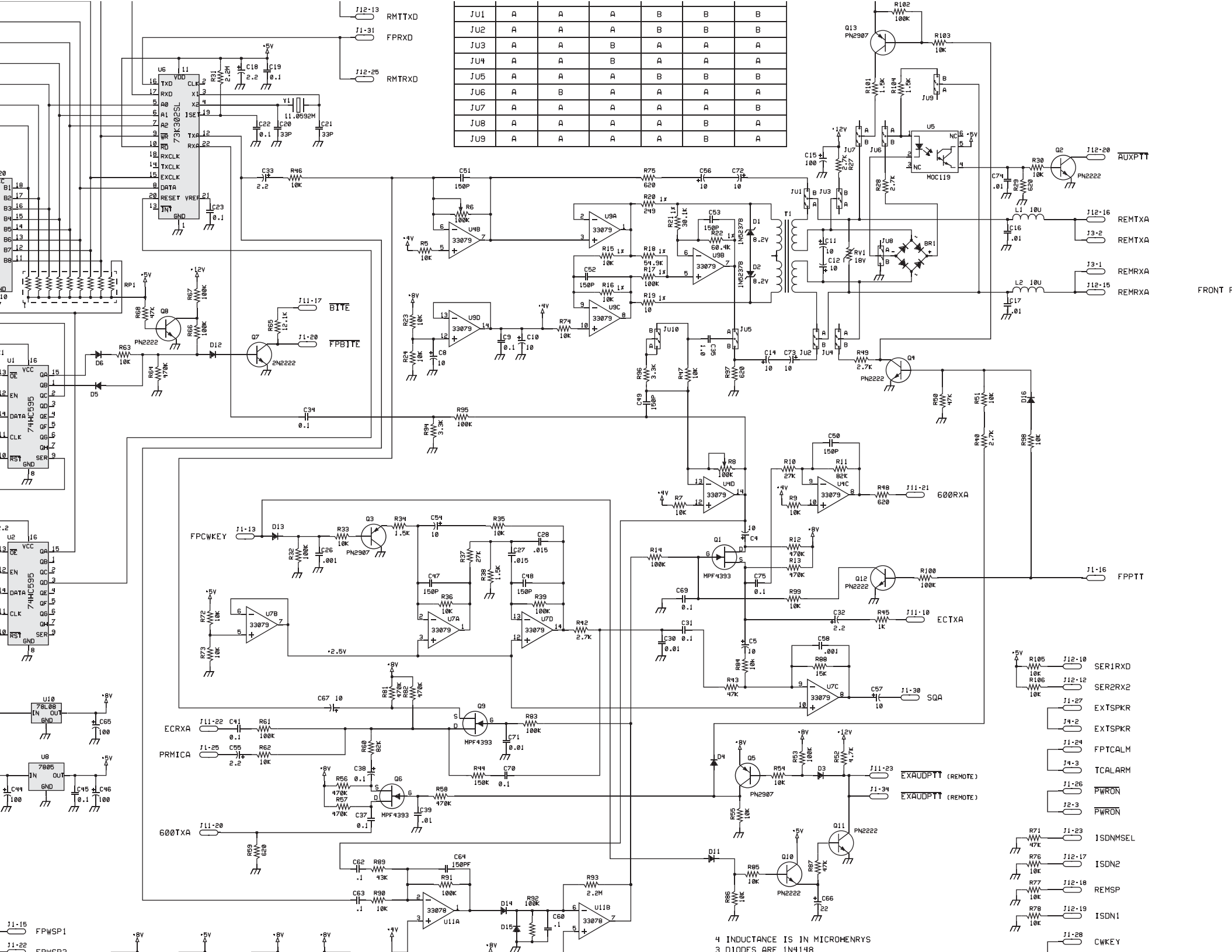

JU1 A A A B B B
JU2 A A A B B B
JU3 A A B A A A
JU4 A A B A A A
JU5 A A A B B B
JU6 A B A A A A
JU7 A A A A A B
JU8 A A A A B A
JU9 A A A A B A
RMTTXD
FPRXD
RMTRXD
73K302SL
11.0592M
BITE
FPBITE
74HC595
78L08
7805
FPCWKEY
PRMICA
600TXA
ECRXA
MPF4393
PN2907
PN2222
2N2222
MOC119
1N6237B
8.2V
AUXPTT
REMTXA
REMRXA
600RXA
FPPTT
ECTXA
SQA
EXAUDPTT (REMOTE)
SER1RXD
SER2RX2
EXTSPKR
FPTCALM
TCALARM
PWRON
ISDNMSEL
ISDN2
REMSP
ISDN1
CWKEY
FPWSP1
4 INDUCTANCE IS IN MICROHENRYS
3 DIODES ARE 1N4148

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
(U8)_	831403	WASHER INTERNAL LOCK #4 SS
BR1	320424	DIODE BRIDGE, DB102
C1	241020	CAP,2.2MF DIP TANTALUM
C10	241100	CAP,10MF DIP TANTALUM
C11	241100	CAP,10MF DIP TANTALUM
C12	241100	CAP,10MF DIP TANTALUM
C14	241100	CAP,10MF DIP TANTALUM
C15	231101	CAP,100U,16V,20%,RADIAL, .1SP
C16	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C17	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C18	241020	CAP,2.2MF DIP TANTALUM
C19	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C2	241020	CAP,2.2MF DIP TANTALUM
C20	210330	CAP,33 PF DISC NPO
C21	210330	CAP,33 PF DISC NPO
C22	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C23	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C25	241020	CAP,2.2MF DIP TANTALUM
C26	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C27	254153	CAP,0.015MF 100V MYLAR
C28	254153	CAP,0.015MF 100V MYLAR
C3	241020	CAP,2.2MF DIP TANTALUM
C30	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C31	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C32	241020	CAP,2.2MF DIP TANTALUM
C33	241020	CAP,2.2MF DIP TANTALUM
C34	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C35	230010	CAP, 1UF AL 50V 20% NON-POLAR
C37	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C38	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C39	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C4	241100	CAP,10MF DIP TANTALUM
C41	275104	CAP, 0.1UF X7R 50V 10% 0.1LS

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
C42	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C43	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C44	231101	CAP,100U,16V,20%,RADIAL, .1SP
C45	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C46	231101	CAP,100U,16V,20%,RADIAL, .1SP
C47	210151	CAP,150 PF 10% DISC
C48	210151	CAP,150 PF 10% DISC
C49	210151	CAP,150 PF 10% DISC
C5	241100	CAP,10MF DIP TANTALUM
C50	210151	CAP,150 PF 10% DISC
C51	210151	CAP,150 PF 10% DISC
C52	210151	CAP,150 PF 10% DISC
C53	210151	CAP,150 PF 10% DISC
C54	241100	CAP,10MF DIP TANTALUM
C55	241020	CAP,2.2MF DIP TANTALUM
C56	241100	CAP,10MF DIP TANTALUM
C57	241100	CAP,10MF DIP TANTALUM
C58	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C6	241020	CAP,2.2MF DIP TANTALUM
C60	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C61	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C62	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C63	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C64	210151	CAP,150 PF 10% DISC
C65	231101	CAP,100U,16V,20%,RADIAL, .1SP
C66	241226	CAP,T,22UF,25V,20%,RA,.1SP
C67	241100	CAP,10MF DIP TANTALUM
C68	241020	CAP,2.2MF DIP TANTALUM
C69	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C7	241020	CAP,2.2MF DIP TANTALUM
C70	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C71	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C72	241100	CAP,10MF DIP TANTALUM

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
C73	241100	CAP,10MF DIP TANTALUM
C74	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C75	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C8	241100	CAP,10MF DIP TANTALUM
C9	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
D1	320202	DIODE, ZENER 8.2V 1N5237B
D10	320002	DIODE, 1N4148/1N4150 DO-35
D11	320002	DIODE, 1N4148/1N4150 DO-35
D12	320002	DIODE, 1N4148/1N4150 DO-35
D13	320002	DIODE, 1N4148/1N4150 DO-35
D14	320002	DIODE, 1N4148/1N4150 DO-35
D15	320002	DIODE, 1N4148/1N4150 DO-35
D16	320002	DIODE, 1N4148/1N4150 DO-35
D2	320202	DIODE, ZENER 8.2V 1N5237B
D3	320002	DIODE, 1N4148/1N4150 DO-35
D4	320002	DIODE, 1N4148/1N4150 DO-35
D5	320002	DIODE, 1N4148/1N4150 DO-35
D6	320002	DIODE, 1N4148/1N4150 DO-35
D7	320002	DIODE, 1N4148/1N4150 DO-35
D8	320002	DIODE, 1N4148/1N4150 DO-35
D9	320002	DIODE, 1N4148/1N4150 DO-35
J1	620038	CONN HDR 2X17 SHROUDED PC MNT
J11	613163	CONN,DB-25 RT ANGLE PC PLUG
J12	613163	CONN,DB-25 RT ANGLE PC PLUG
J2	610209	HEADER,MLX,3PIN,.156,POLAR
J3	610103	HEADER,MLX,6PIN,.100
J4	610285	HEADER,PIN 1X3 MLX 0.1 W/LOCK
JU1	620040	MALE HEADER 15 PIN 3X5
JU10	620030	HEADER,3 PIN .025 SQ POST
JU2	620040	MALE HEADER 15 PIN 3X5
JU3	620040	MALE HEADER 15 PIN 3X5
JU4	620040	MALE HEADER 15 PIN 3X5
JU5	620040	MALE HEADER 15 PIN 3X5

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
JU6	614004	HEADER 3X4 .1 LEAD SPACING
JU7	614004	HEADER 3X4 .1 LEAD SPACING
JU8	614004	HEADER 3X4 .1 LEAD SPACING
JU9	614004	HEADER 3X4 .1 LEAD SPACING
L1	430029	INDUCTOR,10 UH 10% FIXED MOLD
L2	430029	INDUCTOR,10 UH 10% FIXED MOLD
L3	459032	IND ASY,3T#30 MAGNET 1-490201
Q1	310046	XISTOR,JFET,NCH,MPF4393,TO92
Q10	310057	XISTOR,NPN,PN2222A,TO92
Q11	310057	XISTOR,NPN,PN2222A,TO92
Q12	310057	XISTOR,NPN,PN2222A,TO92
Q13	310052	XSTR, PN2907A PNP TO92
Q2	310057	XISTOR,NPN,PN2222A,TO92
Q3	310052	XSTR, PN2907A PNP TO92
Q4	310057	XISTOR,NPN,PN2222A,TO92
Q5	310052	XSTR, PN2907A PNP TO92
Q6	310046	XISTOR,JFET,NCH,MPF4393,TO92
Q7	310057	XISTOR,NPN,PN2222A,TO92
Q8	310057	XISTOR,NPN,PN2222A,TO92
Q9	310046	XISTOR,JFET,NCH,MPF4393,TO92
R1	113101	RES,100 OHM 1/8W 5% CF
R10	113273	RES,27K 1/8W 5% CARBON FILM
R100	113104	RES,100K 1/8W 5% CARBON FILM
R101	113152	RES,1.5K 1/8W 5% CARBON FILM
R102	113104	RES,100K 1/8W 5% CARBON FILM
R103	113103	RES,10K 1/8W 5% CARBON FILM
R104	113152	RES,1.5K 1/8W 5% CARBON FILM
R105	113103	RES,10K 1/8W 5% CARBON FILM
R106	113103	RES,10K 1/8W 5% CARBON FILM
R11	113823	RES,82K 1/8W 5% CARBON FILM
R12	113474	RES,470K 1/8W 5% CARBON FILM
R13	113474	RES,470K 1/8W 5% CARBON FILM
R14	113104	RES,100K 1/8W 5% CARBON FILM

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
R15	1111002	RES,10K 1/8W 1% FILM
R16	1111002	RES,10K 1/8W 1% FILM
R17	1111003	RES,100K 1/8W 1% FILM
R18	1115492	RES,54.9K 1/8W METAL FILM
R19	113100	RES,10 OHM 1/8W 5% FILM
R2	113101	RES,100 OHM 1/8W 5% CF
R20	1112490	RES,249 OHM 1/8W 1% FILM
R21	1113012	RES,30.1K 1/4W 1% FILM
R22	1116042	RES,60.4K 1/8W 1%
R23	113103	RES,10K 1/8W 5% CARBON FILM
R24	113103	RES,10K 1/8W 5% CARBON FILM
R27	113272	RES,2.7K 1/8W 5% CARBON FILM
R28	113272	RES,2.7K 1/8W 5% CARBON FILM
R29	113621	RES,620 OHM 1/8W 5% CF
R3	113101	RES,100 OHM 1/8W 5% CF
R30	113103	RES,10K 1/8W 5% CARBON FILM
R31	113225	RES, 2.2M 1/8W 5% CF
R32	113104	RES,100K 1/8W 5% CARBON FILM
R33	113103	RES,10K 1/8W 5% CARBON FILM
R34	113152	RES,1.5K 1/8W 5% CARBON FILM
R35	113103	RES,10K 1/8W 5% CARBON FILM
R36	113103	RES,10K 1/8W 5% CARBON FILM
R37	113273	RES,27K 1/8W 5% CARBON FILM
R38	113152	RES,1.5K 1/8W 5% CARBON FILM
R39	113104	RES,100K 1/8W 5% CARBON FILM
R40	113272	RES,2.7K 1/8W 5% CARBON FILM
R42	113272	RES,2.7K 1/8W 5% CARBON FILM
R43	113473	RES,47K 1/8W 5% CARBON FILM
R44	113154	RES,150K 1/8W 5% CARBON FILM
R45	113102	RES, 1K, 1/8W, 5%, CF
R46	113103	RES,10K 1/8W 5% CARBON FILM
R47	113103	RES,10K 1/8W 5% CARBON FILM
R48	113621	RES,620 OHM 1/8W 5% CF

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
R49	113272	RES,2.7K 1/8W 5% CARBON FILM
R5	113103	RES,10K 1/8W 5% CARBON FILM
R50	113473	RES,47K 1/8W 5% CARBON FILM
R51	113103	RES,10K 1/8W 5% CARBON FILM
R52	113472	RES,4.7K 1/8W 5% CARBON FILM
R53	113104	RES,100K 1/8W 5% CARBON FILM
R54	113103	RES,10K 1/8W 5% CARBON FILM
R55	113103	RES,10K 1/8W 5% CARBON FILM
R56	113474	RES,470K 1/8W 5% CARBON FILM
R57	113474	RES,470K 1/8W 5% CARBON FILM
R58	113474	RES,470K 1/8W 5% CARBON FILM
R59	113621	RES,620 OHM 1/8W 5% CF
R6	170334	RES,100K TRIM SIDE ADJ
R60	113823	RES,82K 1/8W 5% CARBON FILM
R61	113104	RES,100K 1/8W 5% CARBON FILM
R62	113103	RES,10K 1/8W 5% CARBON FILM
R63	113103	RES,10K 1/8W 5% CARBON FILM
R64	113474	RES,470K 1/8W 5% CARBON FILM
R65	1111212	RES, 12.1Kohm 1% 1/8W MF
R66	113104	RES,100K 1/8W 5% CARBON FILM
R67	113104	RES,100K 1/8W 5% CARBON FILM
R68	113473	RES,47K 1/8W 5% CARBON FILM
R69	113101	RES,100 OHM 1/8W 5% CF
R7	113103	RES,10K 1/8W 5% CARBON FILM
R70	113101	RES,100 OHM 1/8W 5% CF
R71	113473	RES,47K 1/8W 5% CARBON FILM
R72	113103	RES,10K 1/8W 5% CARBON FILM
R73	113103	RES,10K 1/8W 5% CARBON FILM
R74	113103	RES,10K 1/8W 5% CARBON FILM
R75	113621	RES,620 OHM 1/8W 5% CF
R76	113103	RES,10K 1/8W 5% CARBON FILM
R77	113103	RES,10K 1/8W 5% CARBON FILM
R78	113103	RES,10K 1/8W 5% CARBON FILM

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
R79	113104	RES,100K 1/8W 5% CARBON FILM
R8	170334	RES,100K TRIM SIDE ADJ
R80	113154	RES,150K 1/8W 5% CARBON FILM
R81	113474	RES,470K 1/8W 5% CARBON FILM
R82	113474	RES,470K 1/8W 5% CARBON FILM
R83	113104	RES,100K 1/8W 5% CARBON FILM
R84	113103	RES,10K 1/8W 5% CARBON FILM
R85	113103	RES,10K 1/8W 5% CARBON FILM
R86	113103	RES,10K 1/8W 5% CARBON FILM
R87	113473	RES,47K 1/8W 5% CARBON FILM
R88	113153	RES,15K 1/8W 5% CARBON FILM
R89	113433	RES,43K 1/8W 5% CARBON FILM
R9	113103	RES,10K 1/8W 5% CARBON FILM
R90	113103	RES,10K 1/8W 5% CARBON FILM
R91	113104	RES,100K 1/8W 5% CARBON FILM
R92	113104	RES,100K 1/8W 5% CARBON FILM
R93	113225	RES, 2.2M 1/8W 5% CF
R94	113332	RES,3.3K 1/8W 5% CARBON FILM
R95	113104	RES,100K 1/8W 5% CARBON FILM
R96	113332	RES,3.3K 1/8W 5% CARBON FILM
R97	113621	RES,620 OHM 1/8W 5% CF
R98	113103	RES,10K 1/8W 5% CARBON FILM
R99	113103	RES,10K 1/8W 5% CARBON FILM
RP1	182015	RES PACK,10K X 9
RV1	350003	VARISTOR 18 VOLT
T1	410060	XFMR,DATA MODEM COUPLING
U1	330273	IC 74HC595
U10	330018	IC,VREG,78L08,TO94,8V
U11	330368	IC,MC33078
U2	330273	IC 74HC595
U3	330504	IC, BUFFER
U4	330322	IC, MC33079P
U5	320701	COUPLER OPTO DIP

Table 17-1 FSK Remote Control Parts List (001-01402 Rev. M)

Designator	Part Number	Description
U6	330394	IC,73K302SL-1P MODEM
U7	330322	IC, MC33079P
U8	330015	IC,VREG,7805,TO220,5V
U9	330322	IC, MC33079P
Y1	361086	XTAL,11.0592 MHZ

17.2 DHSL Remote Control Option (7000RI)

The 7000RI provides complete voice and data service operation of the TW7000 over a 2-wire DHSL pair. This option is implemented on assembly board 001-01403. It requires the TW7201I remote control head and the 7000RI internal DHSL modem for the TW7000. The following configuration is standard:

Remote/Local Control
Transceiver: TW7000
Internal DHSL modem: 7000RI
Remote control head: TW7201I
Interface cable: C992307

The TW7201I is microprocessor controlled and features two full-duplex data channels as well as a full-duplex digitized voice channel. The 7000RI modem allows high-speed remote operation in conjunction with local radio operation.

To install the 7000RI option:

1. Turn the TW7000 off and remove the top cover. Remove the board retaining bar.
2. Locate the Processor board (001-01107 or 001-01105) and remove it using the board puller.
3. Using proper anti-static procedures, install jumpers JU12-A (refer to Figure 17-4 on page 17-16).
4. Reinsert the Processor board into the guide.
5. Install the DHSL Remote board in the FSK/DHSL slot (refer to Figure 21-1 on page 21-3).
6. Replace the retaining bar and the cover of the TW7000.
7. If COM1 is used at the 7201I **ACCESSORY 1** connector, move JU22 and JU23 to position B-C.

For a more information about the RT7201I DHSL Remote Control Head, refer to the TW7201I operator/technical manual (TW7201I-MS).

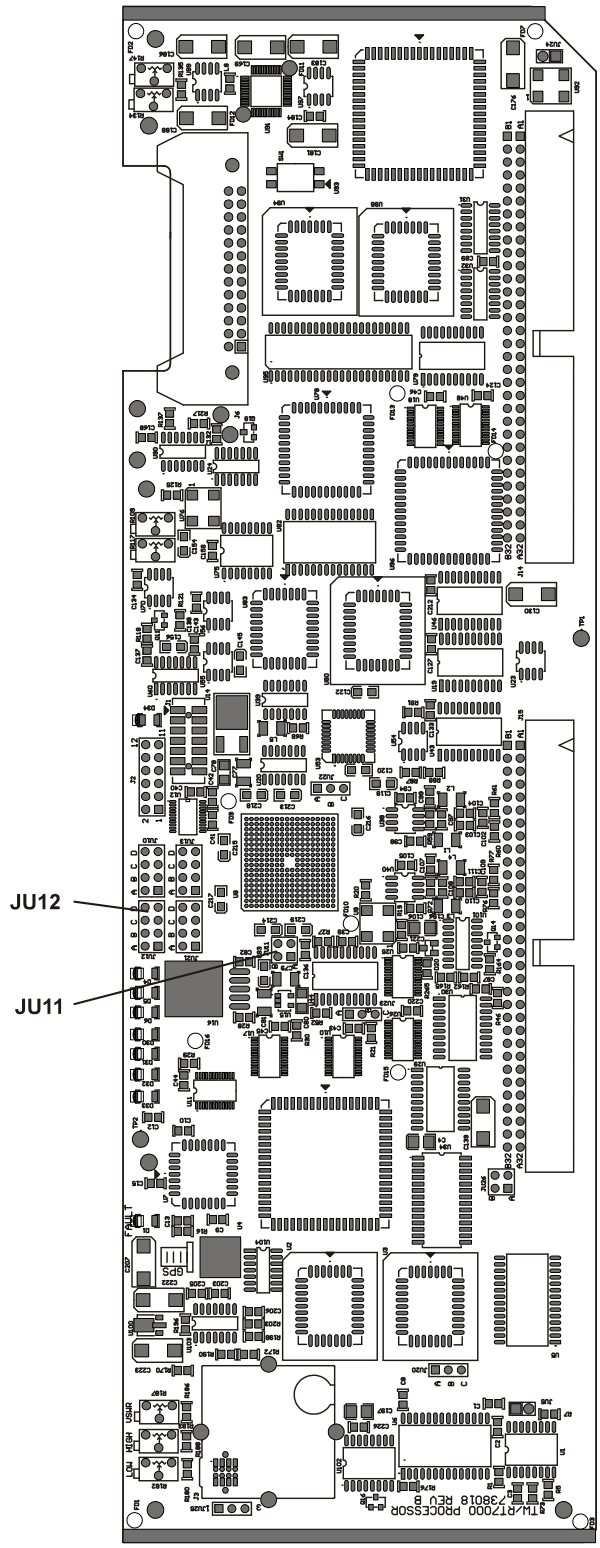


Figure 17-4 DHSL Remote Control Component Placement

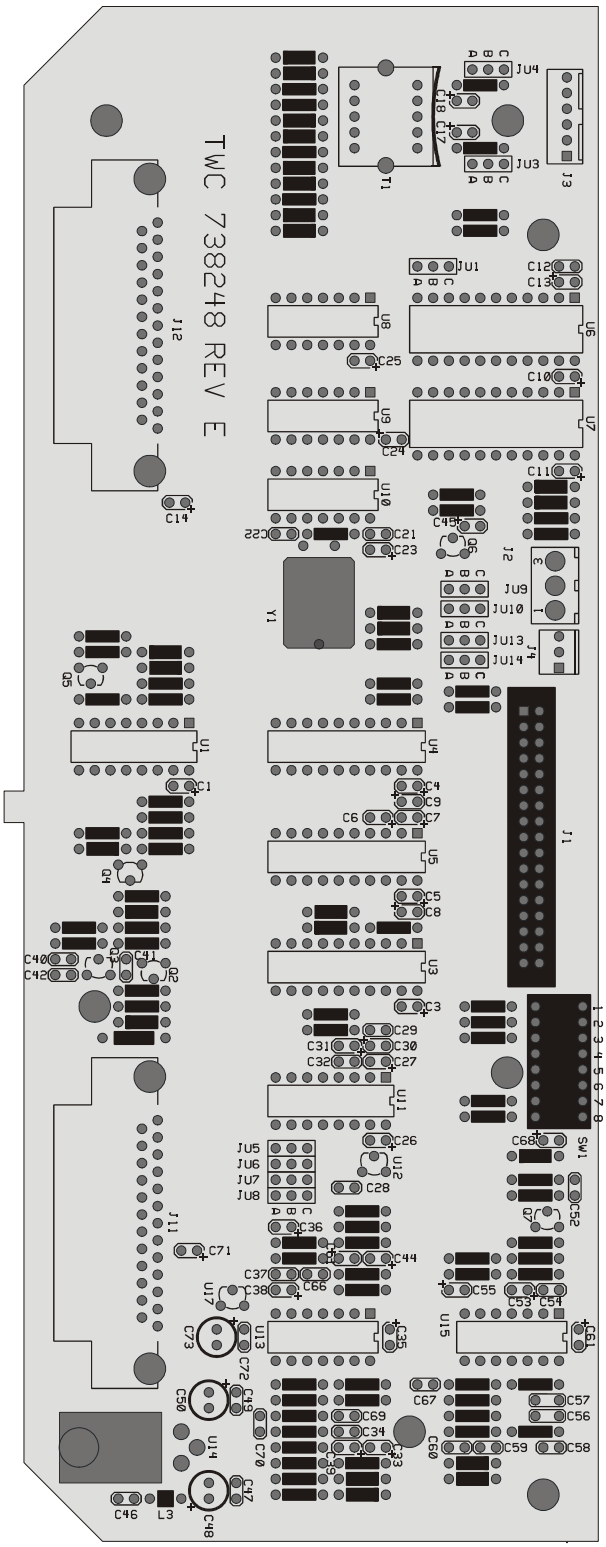


Figure 17-5 DHSL Remote Control Component Locations (738248 Rev. E)

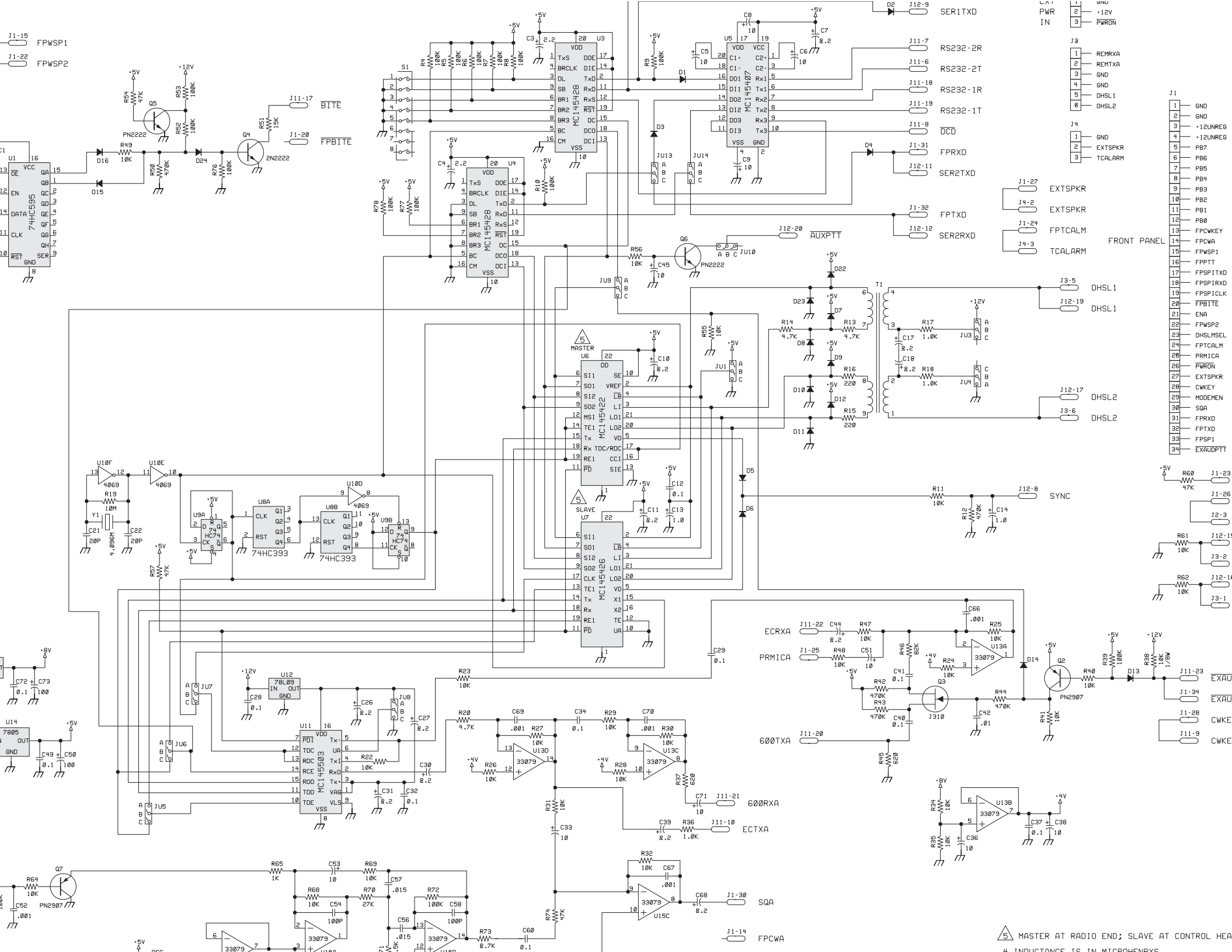

J1-15 FPWSP1
J1-22 FPWSP2
BITE
FPBITE
SER1TXD
RS232-2R
RS232-2T
RS232-1R
RS232-1T
DCD
FPRXD
SER2TXD
FPTXD
SER2RXD
AUXPTT
EXTSPKR
EXTSPKR
FPTCALM
TCALARM
FRONT PANEL
DHSL1
DHSL1
DHSL2
DHSL2
SYNC
ECRXA
PRMICA
600TXA
600RXA
ECTXA
SQA
FPCWA
MASTER
SLAVE
74HC595
MC145428
MC145407
MC145422
MC145426
MC145503
74HC393
4069
33079
PN2222
2N2222
PN2907
78L09
7805
J310
5 MASTER AT RADIO END; SLAVE AT CONTROL HEA
INDUCTANCE IS IN MICROHENRYS

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
C1	241020	CAP,2.2MF DIP TANTALUM
C10	241020	CAP,2.2MF DIP TANTALUM
C11	241020	CAP,2.2MF DIP TANTALUM
C12	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C13	241010	CAP,1.0 MF DIP TANTALUM
C14	241010	CAP,1.0 MF DIP TANTALUM
C17	241020	CAP,2.2MF DIP TANTALUM
C18	241020	CAP,2.2MF DIP TANTALUM
C21	210220	CAP,22PF NPO
C22	210220	CAP,22PF NPO
C23	241020	CAP,2.2MF DIP TANTALUM
C24	241020	CAP,2.2MF DIP TANTALUM
C25	241020	CAP,2.2MF DIP TANTALUM
C26	241020	CAP,2.2MF DIP TANTALUM
C27	241020	CAP,2.2MF DIP TANTALUM
C28	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C29	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C3	241020	CAP,2.2MF DIP TANTALUM
C30	241020	CAP,2.2MF DIP TANTALUM
C31	241020	CAP,2.2MF DIP TANTALUM
C32	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C33	241100	CAP,10MF DIP TANTALUM
C34	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C35	241020	CAP,2.2MF DIP TANTALUM
C36	241100	CAP,10MF DIP TANTALUM
C37	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C38	241100	CAP,10MF DIP TANTALUM
C39	241020	CAP,2.2MF DIP TANTALUM
C4	241020	CAP,2.2MF DIP TANTALUM
C40	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C41	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C42	214103	CAP,C,0.01U,50,10%,X,RA,.1SP
C44	241020	CAP,2.2MF DIP TANTALUM

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
C45	241100	CAP,10MF DIP TANTALUM
C46	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C47	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C48	231101	CAP,100U,16V,20%,RADIAL, .1SP
C49	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C5	241100	CAP,10MF DIP TANTALUM
C50	231101	CAP,100U,16V,20%,RADIAL, .1SP
C51	241100	CAP,10MF DIP TANTALUM
C52	210102	CAP,.001UF Y5P 50V 20% 0.1LS
C53	241100	CAP,10MF DIP TANTALUM
C54	275101	CAP,ML NPO 100PF 100V 5% 0.2S
C55	241100	CAP,10MF DIP TANTALUM
C56	254153	CAP,0.015MF 100V MYLAR
C57	254153	CAP,0.015MF 100V MYLAR
C58	275101	CAP,ML NPO 100PF 100V 5% 0.2S
C6	241100	CAP,10MF DIP TANTALUM
C60	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C61	241020	CAP,2.2MF DIP TANTALUM
C66	210102	CAP,.001UF Y5P 50V 20% 0.1LS
C67	210102	CAP,.001UF Y5P 50V 20% 0.1LS
C68	241020	CAP,2.2MF DIP TANTALUM
C69	210102	CAP,.001UF Y5P 50V 20% 0.1LS
C7	241020	CAP,2.2MF DIP TANTALUM
C70	210102	CAP,.001UF Y5P 50V 20% 0.1LS
C71	241100	CAP,10MF DIP TANTALUM
C72	275104	CAP, 0.1UF X7R 50V 10% 0.1LS
C73	231101	CAP,100U,16V,20%,RADIAL, .1SP
C8	241100	CAP,10MF DIP TANTALUM
C9	241100	CAP,10MF DIP TANTALUM
D1	320002	DIODE, 1N4148/1N4150 DO-35
D10	320002	DIODE, 1N4148/1N4150 DO-35
D11	320002	DIODE, 1N4148/1N4150 DO-35
D12	320002	DIODE, 1N4148/1N4150 DO-35

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
D13	320002	DIODE, 1N4148/1N4150 DO-35
D14	320002	DIODE, 1N4148/1N4150 DO-35
D15	320002	DIODE, 1N4148/1N4150 DO-35
D16	320002	DIODE, 1N4148/1N4150 DO-35
D17	320002	DIODE, 1N4148/1N4150 DO-35
D18	320002	DIODE, 1N4148/1N4150 DO-35
D19	320002	DIODE, 1N4148/1N4150 DO-35
D2	320002	DIODE, 1N4148/1N4150 DO-35
D20	320002	DIODE, 1N4148/1N4150 DO-35
D21	320002	DIODE, 1N4148/1N4150 DO-35
D22	320002	DIODE, 1N4148/1N4150 DO-35
D23	320002	DIODE, 1N4148/1N4150 DO-35
D24	320002	DIODE, 1N4148/1N4150 DO-35
D3	320002	DIODE, 1N4148/1N4150 DO-35
D4	320002	DIODE, 1N4148/1N4150 DO-35
D5	320002	DIODE, 1N4148/1N4150 DO-35
D6	320002	DIODE, 1N4148/1N4150 DO-35
D7	320002	DIODE, 1N4148/1N4150 DO-35
D8	320002	DIODE, 1N4148/1N4150 DO-35
D9	320002	DIODE, 1N4148/1N4150 DO-35
J1	620038	CONN HDR 2X17 SHROUDED PC MNT
J11	613163	CONN,DB-25 RT ANGLE PC PLUG
J12	613163	CONN,DB-25 RT ANGLE PC PLUG
J2	610209	HEADER,MLX,3PIN,.156,POLAR
J3	610197	HEADER,MLX,6PIN,.100
J4	610285	HEADER,PIN 1X3 MLX 0.1 W/LOCK
JU1	620030	HEADER,3 PIN .025 SQ POST
JU10	620030	HEADER,3 PIN .025 SQ POST
JU13	620030	HEADER,3 PIN .025 SQ POST
JU14	620030	HEADER,3 PIN .025 SQ POST
JU3	620030	HEADER,3 PIN .025 SQ POST
JU4	620030	HEADER,3 PIN .025 SQ POST
JU5	614004	HEADER 3X4 .1 LEAD SPACING

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
JU6	614004	HEADER 3X4 .1 LEAD SPACING
JU7	614004	HEADER 3X4 .1 LEAD SPACING
JU8	614004	HEADER 3X4 .1 LEAD SPACING
JU9	620030	HEADER,3 PIN .025 SQ POST
L3	459032	IND ASY,3T#30 MAGNET 1-490201
Q2	310052	XSTR, PN2907A PNP TO92
Q3	310033	XSTR, J310 N-JFET TO92
Q4	310057	XISTOR,NPN,PN2222A,TO92
Q5	310057	XISTOR,NPN,PN2222A,TO92
Q6	310057	XISTOR,NPN,PN2222A,TO92
Q7	310052	XSTR, PN2907A PNP TO92
R1	113101	RES,100 OHM 1/8W 5% CF
R10	113104	RES,100K 1/8W 5% CARBON FILM
R11	113103	RES,10K 1/8W 5% CARBON FILM
R12	113474	RES,470K 1/8W 5% CARBON FILM
R13	113472	RES,4.7K 1/8W 5% CARBON FILM
R14	113472	RES,4.7K 1/8W 5% CARBON FILM
R15	113221	RES,220 OHM 1/8W 5% CF
R16	113221	RES,220 OHM 1/8W 5% CF
R17	113102	RES, 1K, 1/8W, 5%, CF
R18	113102	RES, 1K, 1/8W, 5%, CF
R19	113106	RES,10M 1/8W 5% CARBON FILM
R2	113101	RES,100 OHM 1/8W 5% CF
R20	113472	RES,4.7K 1/8W 5% CARBON FILM
R22	113103	RES,10K 1/8W 5% CARBON FILM
R23	113103	RES,10K 1/8W 5% CARBON FILM
R24	113103	RES,10K 1/8W 5% CARBON FILM
R25	113103	RES,10K 1/8W 5% CARBON FILM
R26	113103	RES,10K 1/8W 5% CARBON FILM
R27	113103	RES,10K 1/8W 5% CARBON FILM
R28	113103	RES,10K 1/8W 5% CARBON FILM
R29	113103	RES,10K 1/8W 5% CARBON FILM
R3	113101	RES,100 OHM 1/8W 5% CF

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
R30	113103	RES,10K 1/8W 5% CARBON FILM
R31	113103	RES,10K 1/8W 5% CARBON FILM
R32	113103	RES,10K 1/8W 5% CARBON FILM
R34	113103	RES,10K 1/8W 5% CARBON FILM
R35	113103	RES,10K 1/8W 5% CARBON FILM
R36	113102	RES, 1K, 1/8W, 5%, CF
R37	113621	RES,620 OHM 1/8W 5% CF
R38	113103	RES,10K 1/8W 5% CARBON FILM
R39	113104	RES,100K 1/8W 5% CARBON FILM
R4	113104	RES,100K 1/8W 5% CARBON FILM
R40	113103	RES,10K 1/8W 5% CARBON FILM
R41	113103	RES,10K 1/8W 5% CARBON FILM
R42	113474	RES,470K 1/8W 5% CARBON FILM
R43	113474	RES,470K 1/8W 5% CARBON FILM
R44	113474	RES,470K 1/8W 5% CARBON FILM
R45	113621	RES,620 OHM 1/8W 5% CF
R46	113823	RES,82K 1/8W 5% CARBON FILM
R47	113103	RES,10K 1/8W 5% CARBON FILM
R48	113103	RES,10K 1/8W 5% CARBON FILM
R49	113103	RES,10K 1/8W 5% CARBON FILM
R5	113104	RES,100K 1/8W 5% CARBON FILM
R50	113474	RES,470K 1/8W 5% CARBON FILM
R51	1111502	RESISTOR 15K 1/8W 1%
R52	113104	RES,100K 1/8W 5% CARBON FILM
R53	113104	RES,100K 1/8W 5% CARBON FILM
R54	113473	RES,47K 1/8W 5% CARBON FILM
R55	113103	RES,10K 1/8W 5% CARBON FILM
R56	113103	RES,10K 1/8W 5% CARBON FILM
R57	113473	RES,47K 1/8W 5% CARBON FILM
R58	113101	RES,100 OHM 1/8W 5% CF
R59	113101	RES,100 OHM 1/8W 5% CF
R6	113104	RES,100K 1/8W 5% CARBON FILM
R60	113473	RES,47K 1/8W 5% CARBON FILM

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
R61	113103	RES,10K 1/8W 5% CARBON FILM
R62	113103	RES,10K 1/8W 5% CARBON FILM
R63	113104	RES,100K 1/8W 5% CARBON FILM
R64	113103	RES,10K 1/8W 5% CARBON FILM
R65	113102	RES, 1K, 1/8W, 5%, CF
R66	113103	RES,10K 1/8W 5% CARBON FILM
R67	113103	RES,10K 1/8W 5% CARBON FILM
R68	113103	RES,10K 1/8W 5% CARBON FILM
R69	113103	RES,10K 1/8W 5% CARBON FILM
R7	113104	RES,100K 1/8W 5% CARBON FILM
R70	113273	RES,27K 1/8W 5% CARBON FILM
R71	113152	RES,1.5K 1/8W 5% CARBON FILM
R72	113104	RES,100K 1/8W 5% CARBON FILM
R73	113272	RES,2.7K 1/8W 5% CARBON FILM
R74	113473	RES,47K 1/8W 5% CARBON FILM
R76	113104	RES,100K 1/8W 5% CARBON FILM
R77	113104	RES,100K 1/8W 5% CARBON FILM
R78	113104	RES,100K 1/8W 5% CARBON FILM
R8	113104	RES,100K 1/8W 5% CARBON FILM
R9	113104	RES,100K 1/8W 5% CARBON FILM
S1	530010	SWITCH DIP 8 SECT SPST
T1	410062	TRANSFORMER,ISDN
U1	330273	IC 74HC595
U10	330482	IC,4069 HEX INVERTER
U11	330485	IC, MC145503P
U12	330484	IC,78LO9 9VOLT REGULATOR TO92
U13	330322	IC, MC33079P
U14	330015	IC,VREG,7805,TO220,5V
U15	330322	IC, MC33079P
U17	330018	IC,VREG,78L08,TO94,8V
U3	330489	IC,MC145428P
U4	330489	IC,MC145428P
U5	330488	IC, MC145407P

Table 17-2 DHSL Remote Control Parts List (001-01403 Rev. L)

Designator	Part Number	Description
U6	330486	IC,MC145422 80KBPS UDLT MASTER
U6	621007	SOCKET, 22 PIN IC DIP
U7	621007	SOCKET, 22 PIN IC DIP
U8	330305	IC, 74HC393
U9	330483	IC,74HC74 DUAL D FLIP FLOP
Y1	360037	CRYSTAL HC18/U HOLDER 4.096MH

CHAPTER 18
RF FILTER OPTIONS

This chapter covers the RF filter options consisting of different configurations of the 5 MHz IF board. The RF filter options include:

- 7000CW
- 7000WB1
- 7000CW1

These filter options are variations of the 5 MHz IF board. The 5 MHz IF board includes a standard voice crystal installed in XF1. The 7000CW option has a 500 Hz (1 kHz center frequency) narrowband crystal filter installed in XF2. The 7000WB1 option has a 300 Hz to 3300 Hz wideband crystal filter installed in XF2. The CW1 option is a combination of the 7000CW option and the 7000WB1option with the narrowband crystal installed in XF1 and the wide band crystal installed in XF2.

Converting the 5 MHz IF board to one of these options involves installing the crystal filter and changing the jumper positions on jumper block JU1 (refer to the respective component locations diagram). It may also involve replacing a resistor.

18.1 Narrowband CW Filter (7000CW)

The 7000CW RF filter option provides a narrowband filter with 500 Hz bandwidth for CW operation. Figure 18-1 on page 18-2 shows where the CW narrowband filter is placed.

Note: *If it is necessary to perform a field installation, a soldering iron and wire cutters are required.*

To install the 7000CW crystal filter:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Remove the 5 MHz board (refer to Figure 21-1 on page 21-3).
4. Remove the coaxial cables connected to the board. With the insulation washers under the filter, mount the filter to the board in position XF2. Solder the filter leads, trimming any excess.
5. If XF1 is a standard voice crystal, change resistor R130 to 1% 1/8W 3.92k ohm (1113921)
6. Change the JU1 jumper on position 3 as shown in Figure 18-1 below.
7. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
8. Reinstall the retaining bar and the top cover.

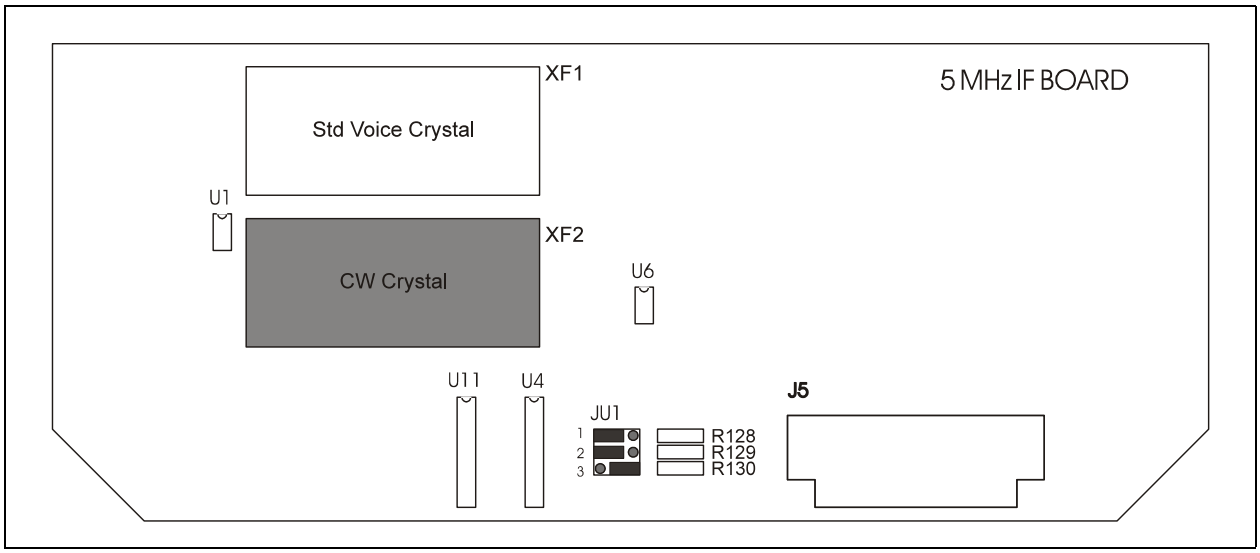


Figure 18-1 Narrowband CW Option Component Placement

18.2 Wideband 1 Option (7000WB1)

The 7000WB1 RF filter option provides a 300 Hz to 3300 Hz wideband filter with tailored group delay characteristics for data operation (USB/LSB).

Note: *7000WB1 requires the 5 MHz IF board is revision U or higher.*

Note: *If it is necessary to perform a field installation, a soldering iron and wire cutters are required.*

To install the 7000WB1 option:

1. Turn the TW7000 off and remove the cover. Remove the board retaining bar.
2. Locate and remove the 5 MHz IF board using a board puller (refer to Figure 21-1 on page 21-3).
3. Remove the coaxial cables connected to the board. With the insulation washers under the crystal, mount the filter to the board in position XF2. Solder the crystal leads, trimming any excess.
4. If the 5 MHz IF board has a standard voice crystal installed in XF1, change jumper JU1 as shown in Figure 18-2 below.
5. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
6. Reinstall the retaining bar and the top cover.

Note: *When powered up, the filter band modes **USB DATA** and **LSB DATA** (wideband) are displayed on the front panel LCD. For information on selecting a mode, refer to the TW7000-MSOP operator manual.*

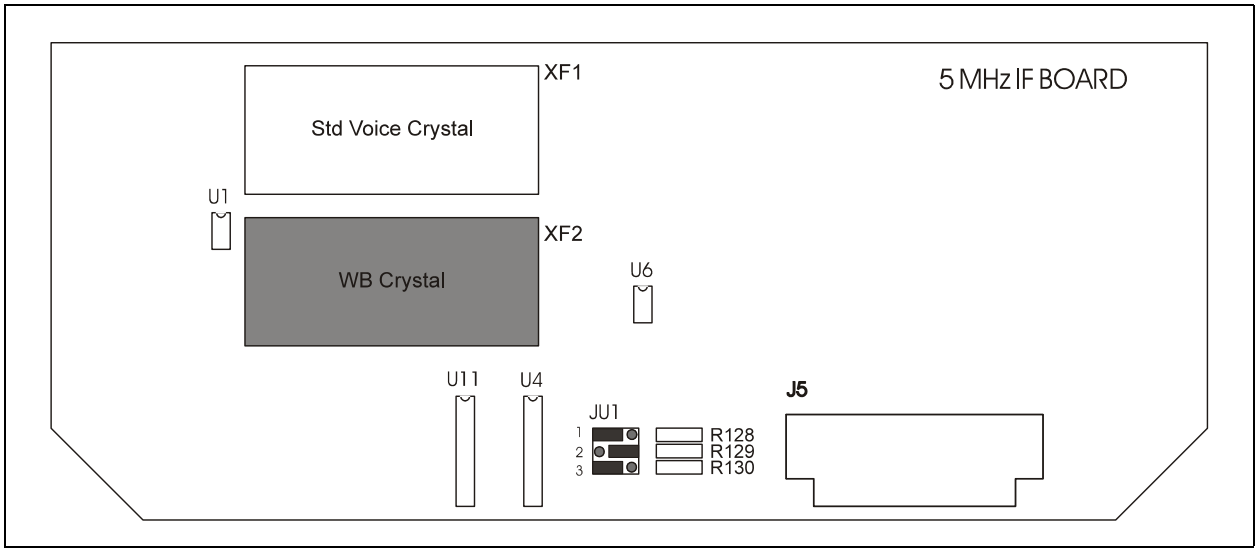


Figure 18-2 Wideband WB1 Option Component Placement

18.3 Narrow and Wideband Option (7000CW1)

The 7000CW1 RF filter option combines the narrowband filter of the 7000CW option for CW operation and the wideband filter of the 7000WB1 option for data operation. The standard voice filter is eliminated.

If necessary to perform a field installation, a soldering iron and cutters are required. Follow the steps below. For component placement, refer to the figure below.

1. Turn the TW7000 off and remove the cover. Remove the board retaining bar.
2. Locate and remove the 5 MHz IF board using a board puller (refer to Figure 21-1 on page 21-3).
3. Remove the coaxial cables connected to the board.
4. With the insulation washers under the filter, remove the standard voice crystal in XF1 and install the CW filter in its place (the wideband filter is installed in XF2). Solder the crystal leads, trimming any excess.
5. Replace R129 with a 1% 1/8W 10k ohm resistor (1111002).
6. JU1 jumpers should be configured as shown in Figure 18-3 below.
7. Reinstall the coaxial cables and reinsert the 5 MHz IF board.
8. Reinstall the retaining bar and the cover.

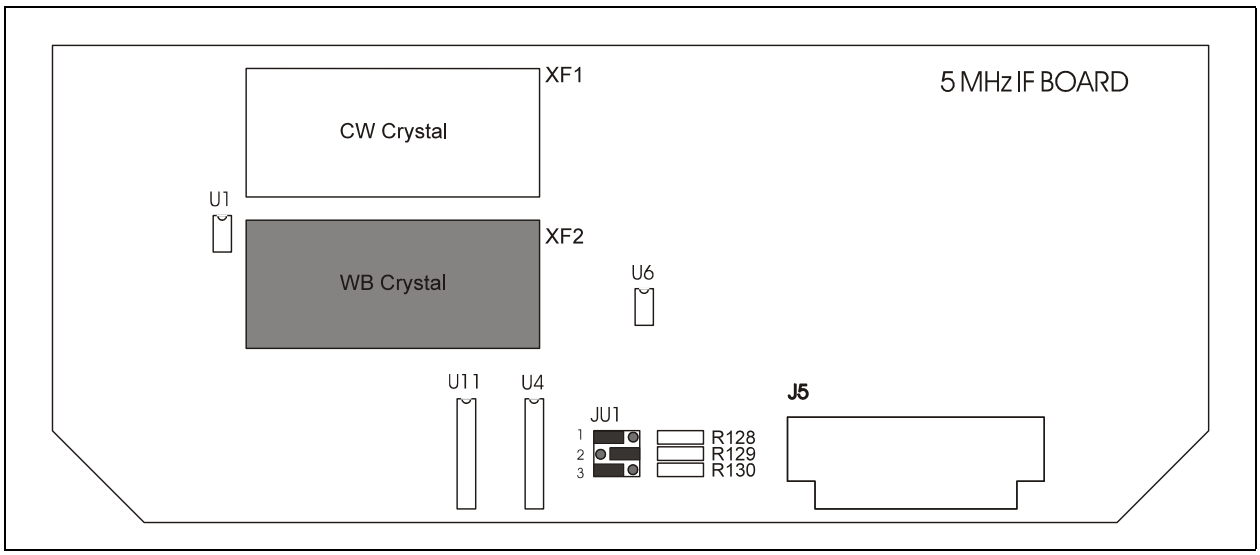


Figure 18-3 Combination Narrow and Wideband CW1 Option Component Placement

CHAPTER 19
OTHER OPTIONS

This chapter covers internal options that can be added to the TW7000. They are generally factory installed. If added in the field, installation requires a #2 Phillips-head screwdriver and a board puller included in the following maintenance kits.

- 7000EXT extender kit
- TW7000TK tool kit

Internal Option	Part Number	Page
Additional Channel	7000ACH	19-2
Data Interface RS422/423/485	7000RS	19-3
Encryption	7000ENCR	19-4
Noise Blanker	7000NB	19-5
Recorder	7000RCDR	19-11
Voice Enhancement Module	7000VEM	19-13
SELCALL Enable	RT7000AIRSELCALL	19-27

For information on changing the on or off status of these options, refer to the TW7000-MSOP operator manual.

19.1 Additional Channels Option (7000ACH)

The Additional Channels 7000ACH option increases the number of programmable channels of the 7000-series transceiver to 1000 channels. It is compatible with revision D and later processor boards.

CAUTION: This option involves RAM; any programmed information is over-written.

To install the 7000ACH option:

1. Turn the TW7000 off and remove the cover. Remove the board retaining bar.
2. Using the correct antistatic procedures and board puller, locate and remove the Processor board (001-01107 or 001-01105).
3. Install a jumper at JU10-A (refer to Figure 19-1 on page 19-2).
4. Reinsert the Processor board into its slot. Turn on the TW7000, and verify the channels range from 000-999 for a total of 1000 channels. Turn the TW7000 off and remove jumper JU10-D.
5. Reinstall the board retaining bar and the top cover on the radio.

When powered up, the TW7000 operates with up to 1000 channels.

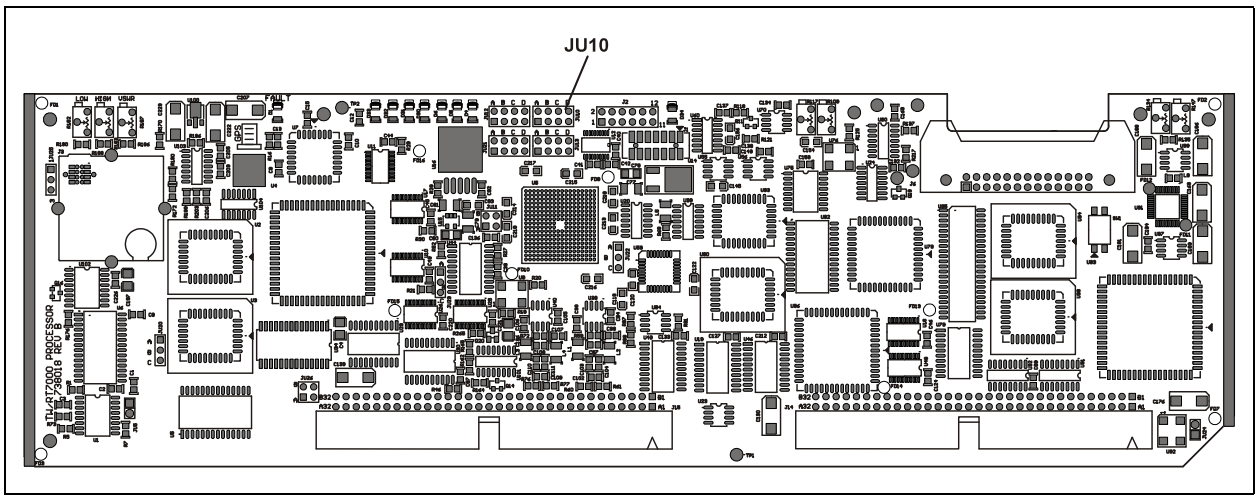


Figure 19-1 Additional Channel Jumper Placement

19.2 Data Interface Option (7000RS)

Serial communications through COM1 uses standard RS-232. With the Data Interface 7000RS option, COM1 can also be configured for RS422/423/485. Only COM1 is changed; COM2 remains RS-232.

To install the 7000RS option:

1. Turn the radio off and remove the cover. Remove the board retaining bar.
2. Using proper antistatic procedures, locate and remove the Processor board (001-01107 or 001-01105) using a board puller.
3. Set jumpers JU22 and JU23 to the A-B position (refer to Table 21-6 on page 21-23).
4. Reinsert the Processor board and reinstall the board retaining bar and cover.

The selected interface standard is now available as COM1 at the rear panel **ACCESSORY 1** connector.

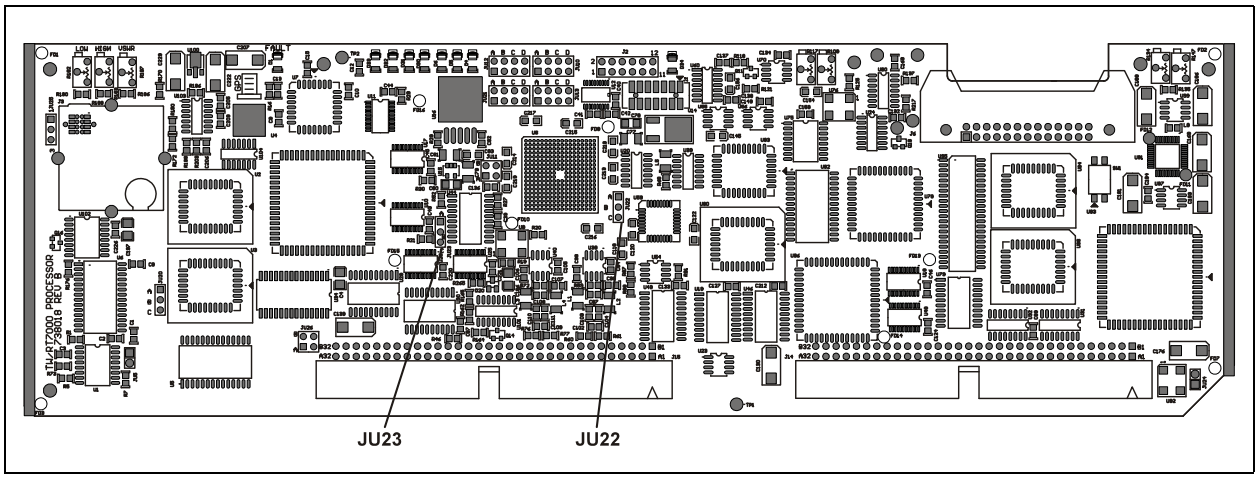


Figure 19-2 Data Interface Component and Jumper Placement

19.3 Encryption Option (7000ENCR)

The Encryption 7000ENCR option provides an extremely secure voice encryption capability. It is compatible with revision F and later Processor boards, and with software revision N or later. For installation into radios with Processor boards of an earlier revision, contact Datron's Customer Service.

Note: *If the system has a narrowband antenna with a tuner, encryption must be turned off before attempting to tune the radio.*

To install the 7000ENCR option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Carefully insert the 7000ENCR board into the OPT2 slot (refer to Figure 21-1 on page 21-3).
4. Reinstall the board retaining bar and the top cover.

Operational procedures for the TW7000 remain the same with this option installed. The only noticeable difference is the ability to turn encryption on and off. For complete operating instructions, refer to the 7000ENCR operator manual (7000ENCR-MSOP).

Component locations diagram, schematic and parts list for the 7000ENCR option are not available.

19.4 Noise Blanker Option (7000NB)

The Noise Blanker 7000NB option reduces background noise on the 7000-series radios. It minimizes interference caused by certain types of impulse noise, such as ignition noise in a vehicle.

To install this option:

1. Turn the TW7000 off and remove the top and bottom covers. Remove the board retaining bar.
2. Run the cables from the 5 MHz IF board J56 and J58, to the appropriate connectors on the Noise Blanker board.
3. Install the 7000NB in the NB slot (refer to Figure 21-1 on page 21-3).
4. Reinstall the board retaining bar and the top and bottom covers.
5. When powered up, the **NB** icon displays on the front panel LCD.
6. To activate this option, refer to the TW7000-MSOP operator manual.

When activated, the 5 MHz IF is sampled through connector J56. The IF signal is applied to U2 pin 2 where the rising edge of noise pulses are detected and used to trigger the gates of U4 and U6. This causes attenuation of the IF signal for a duration of time specified by R16. The timing is factory-set for a blanking pulse of approximately 80 ms. The IF signal is routed out of the noise blanker through control J58.

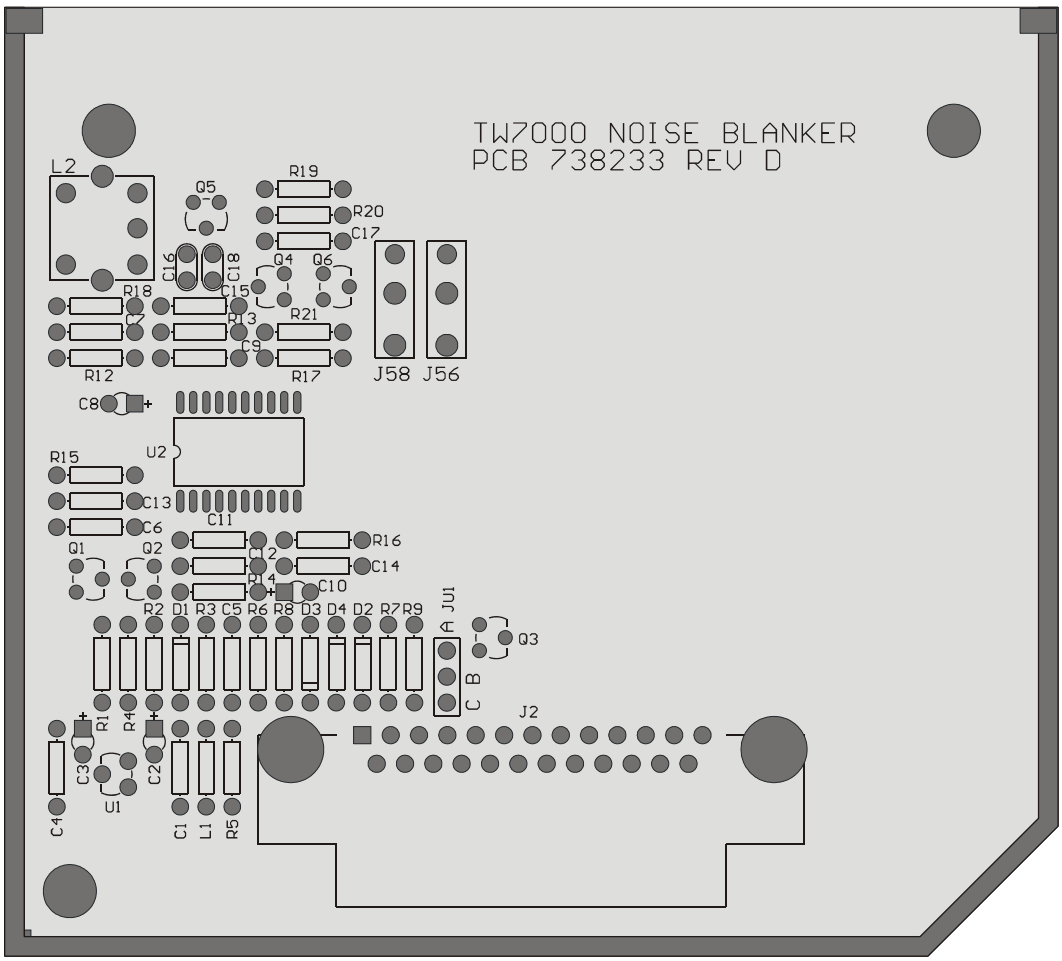


Figure 19-3 Noise Blanker Component Locations (738233 Rev. D)

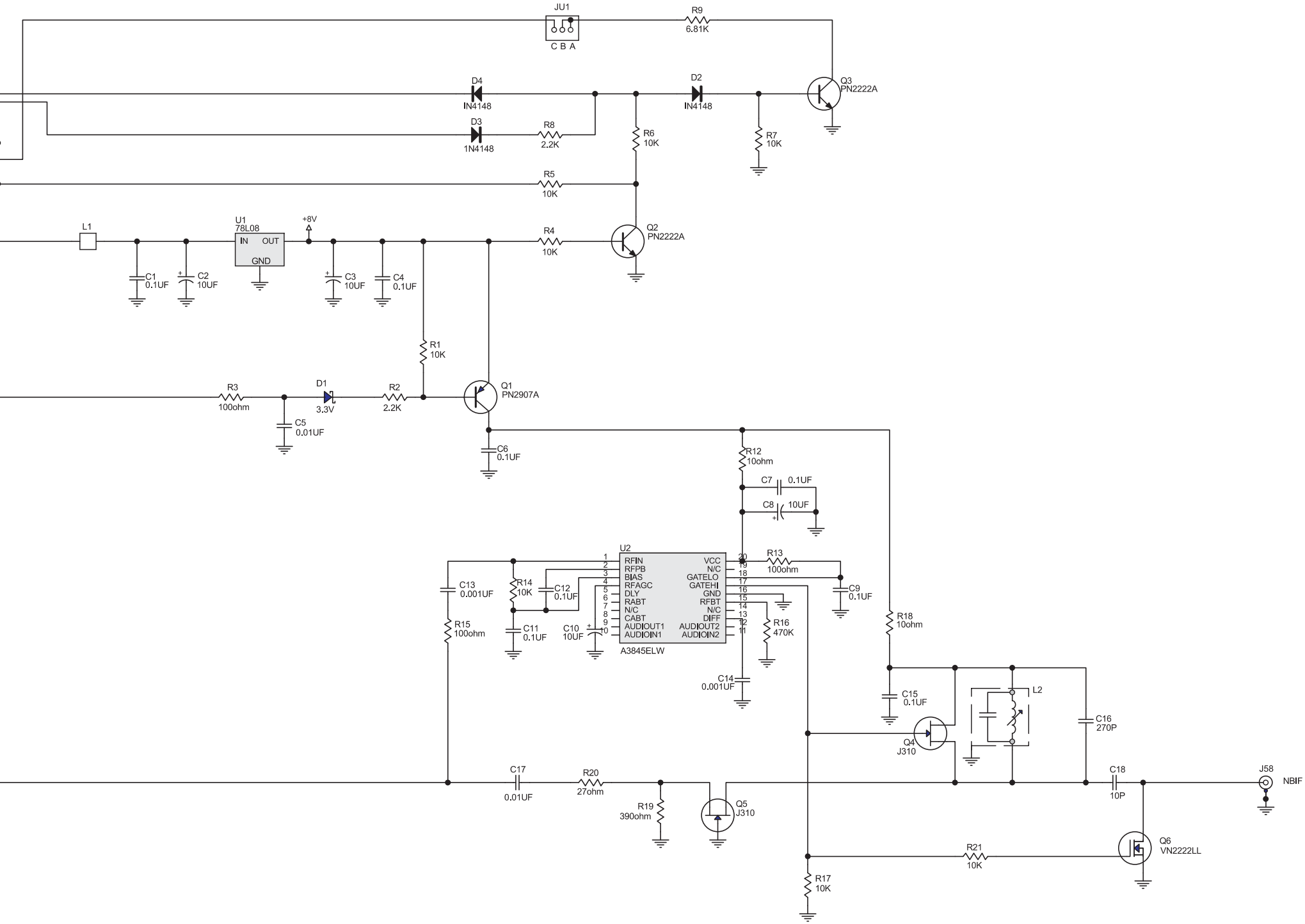

JU1
C B A
R9
6.81K
D4
IN4148
D2
IN4148
Q3
PN2222A
D3
1N4148
R8
2.2K
R6
10K
R7
10K
R5
10K
L1
U1
78L08
IN
OUT
GND
+8V
R4
10K
Q2
PN2222A
C1
0.1UF
C2
10UF
C3
10UF
C4
0.1UF
R1
10K
R3
100ohm
D1
3.3V
R2
2.2K
Q1
PN2907A
C5
0.01UF
C6
0.1UF
R12
10ohm
C7
0.1UF
C8
10UF
U2
RFIN
RFPB
BIAS
RFAGC
DLY
RABT
N/C
CABT
AUDIOUT1
AUDIOIN1
VCC
N/C
GATELO
GATEHI
GND
RFBT
N/C
DIFF
AUDIOUT2
AUDIOIN2
A3845ELW
R13
100ohm
C9
0.1UF
C13
0.001UF
R14
10K
C12
0.1UF
R15
100ohm
C11
0.1UF
C10
10UF
R16
470K
C14
0.001UF
R18
10ohm
C15
0.1UF
L2
Q4
J310
C16
270P
C17
0.01UF
R20
27ohm
R19
390ohm
Q5
J310
C18
10P
J58
NBIF
Q6
VN2222LL
R21
10K
R17
10K

Table 19-1 Noise Blanker Parts List (001-01202 Rev. E)

Designator	Part Number	Description
C1	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C10	241100	CAP,10MF DIP TANTALUM
C11	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C12	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C13	277102	CAP,C,1000P,100,10%,X,AX,.25SP
C14	277102	CAP,C,1000P,100,10%,X,AX,.25SP
C15	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C16	275271	CAP,ML NPO 270PF 100V 5% 0.2S
C17	277103	CAP,C,0.01U,100,10%,X,AX,.25SP
C18	210100	CAP, 10PF DISC NPO 50V 5% 0.1
C2	241100	CAP,10MF DIP TANTALUM
C3	241100	CAP,10MF DIP TANTALUM
C4	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C5	277103	CAP,C,0.01U,100,10%,X,AX,.25SP
C6	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C7	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
C8	241100	CAP,10MF DIP TANTALUM
C9	277104	CAP,C,0.1U,50,10%,X,AX,.25SP
D1	320210	DIODE,ZENER 3.3V 1N746A
D2	320002	DIODE, 1N4148/1N4150 DO-35
D3	320002	DIODE, 1N4148/1N4150 DO-35
D4	320002	DIODE, 1N4148/1N4150 DO-35
J2	613163	CONN,DB-25 RT ANGLE PC PLUG
J56	614026	CONN,RF FEMALE LOW-TYPE RECEPT
J58	614026	CONN,RF FEMALE LOW-TYPE RECEPT
JU1	620030	HEADER,3 PIN .025 SQ POST
JU1	860097	MICRO SHUNT, .100 CENTERS
L1	459032	IND ASY,3T#30 MAGNET 1-490201
L2	420017	INDUCTOR IF 10.7MHZ
Q1	310052	XSTR, PN2907A PNP TO92
Q2	310057	XISTOR,NPN,PN2222A,TO92
Q3	310057	XISTOR,NPN,PN2222A,TO92
Q4	310033	XSTR, J310 N-JFET TO92

Table 19-1 Noise Blanker Parts List (001-01202 Rev. E)

Designator	Part Number	Description
Q5	310033	XSTR, J310 N-JFET TO92
Q6	310138	XISTOR,FET,VN2222LL,TO92
R1	113103	RES,10K 1/8W 5% CARBON FILM
R12	113100	RES,10 OHM 1/8W 5% FILM
R13	113101	RES,100 OHM 1/8W 5% CF
R14	113103	RES,10K 1/8W 5% CARBON FILM
R15	113101	RES,100 OHM 1/8W 5% CF
R16	113474	RES,470K 1/8W 5% CARBON FILM
R17	113103	RES,10K 1/8W 5% CARBON FILM
R18	113100	RES,10 OHM 1/8W 5% FILM
R19	113331	RES,330 OHM 1/8W 5% CF
R2	113222	RES,2.2K 1/8W 5% CARBON FILM
R20	113270	RES,27 OHM 1/8W 5% CARBON FILM
R21	113103	RES,10K 1/8W 5% CARBON FILM
R3	113101	RES,100 OHM 1/8W 5% CF
R4	113103	RES,10K 1/8W 5% CARBON FILM
R5	113103	RES,10K 1/8W 5% CARBON FILM
R6	113103	RES,10K 1/8W 5% CARBON FILM
R7	113103	RES,10K 1/8W 5% CARBON FILM
R8	113222	RES,2.2K 1/8W 5% CARBON FILM
R9	1116811	RES, 6.8K 1/8W 1% FILM
U1	330018	IC,VREG,78L08,TO94,8V
U2	033304028	IC,SM,LIN,A3845ELW, SOW-20

19.5 Recorder Option (7000RCDR)

The Recorder 7000RCDR option makes transmit and receive audio available for recording or split site purposes at **ACCESSORY 2**.

To install the 7000RCDR option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Using the proper antistatic procedures and a board puller, locate and remove the Audio board (refer to Figure 21-1 on page 21-3).
4. Install a jumper on JP1 as shown in Figure 19-5 below.
5. Reinsert the Audio board.
6. Reinstall the board retaining bar and top cover.
7. Turn on the TW7000 and operate normally.

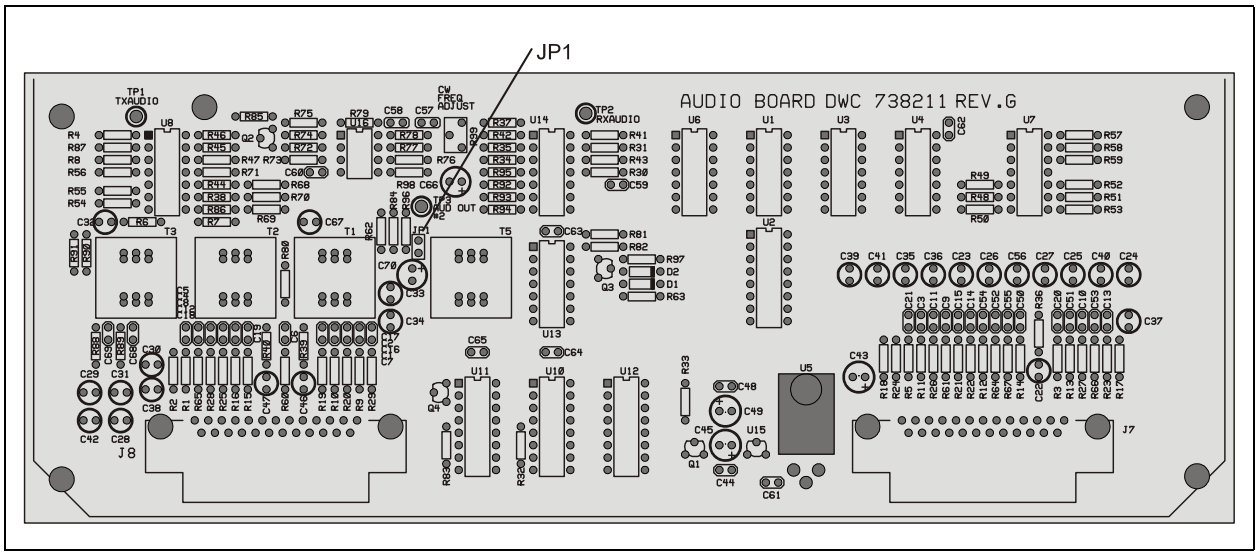


Figure 19-5 Recorder Option Jumper Placement

19.6 Voice Enhancement Option (7000VEM)

The Voice Enhancement 7000VEM option provides superior voice recognition and signal-quality improvement in noisy environments. This option is implemented on assembly board 001-10000.

To install this option:

1. Turn the TW7000 off and remove the top cover.
2. Remove the board retaining bar.
3. Install the VEM board into the OPT1 slot (refer to Figure 21-1 on page 21-3).
4. Reinstall the board retaining bar and top cover.

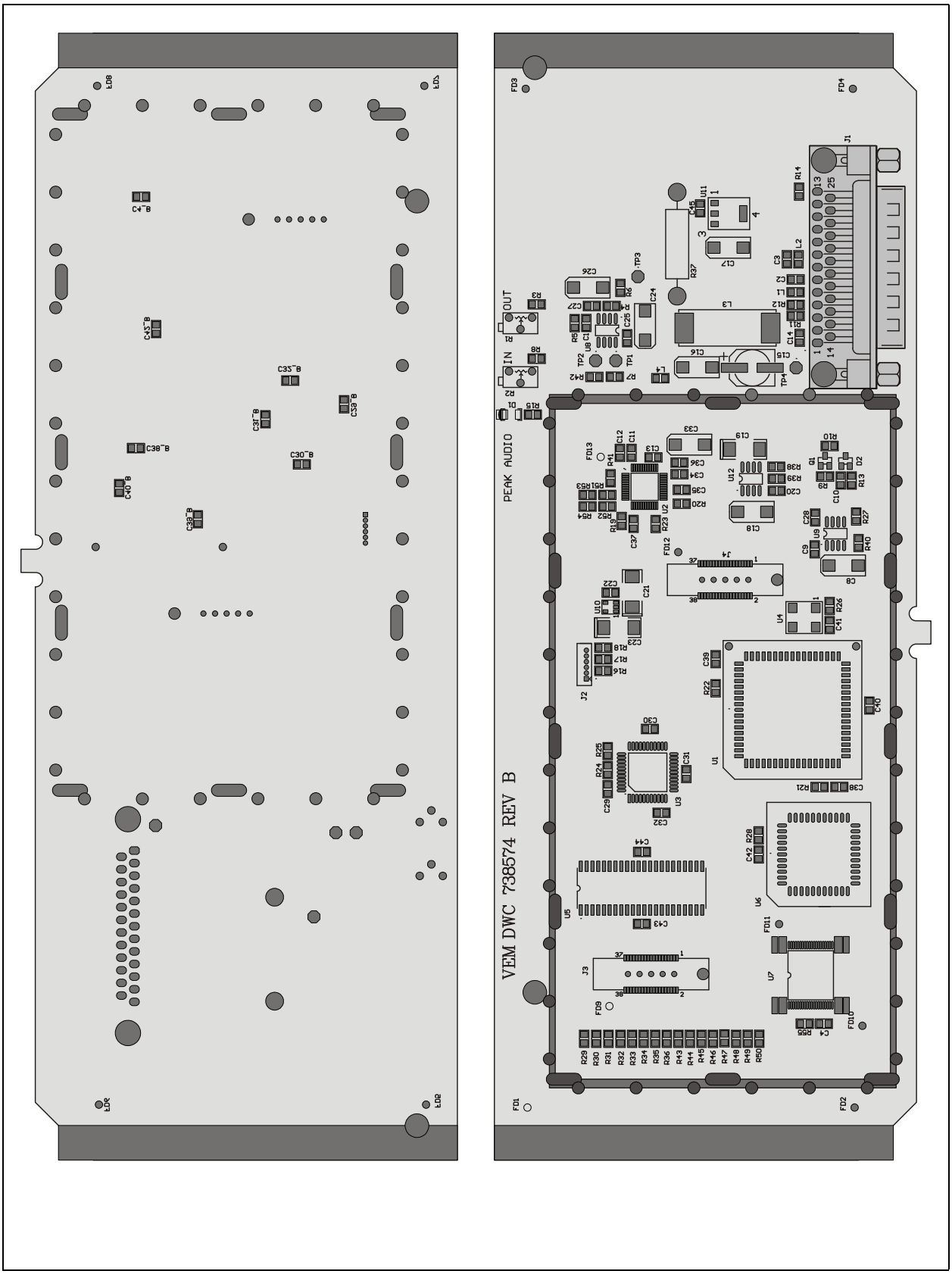
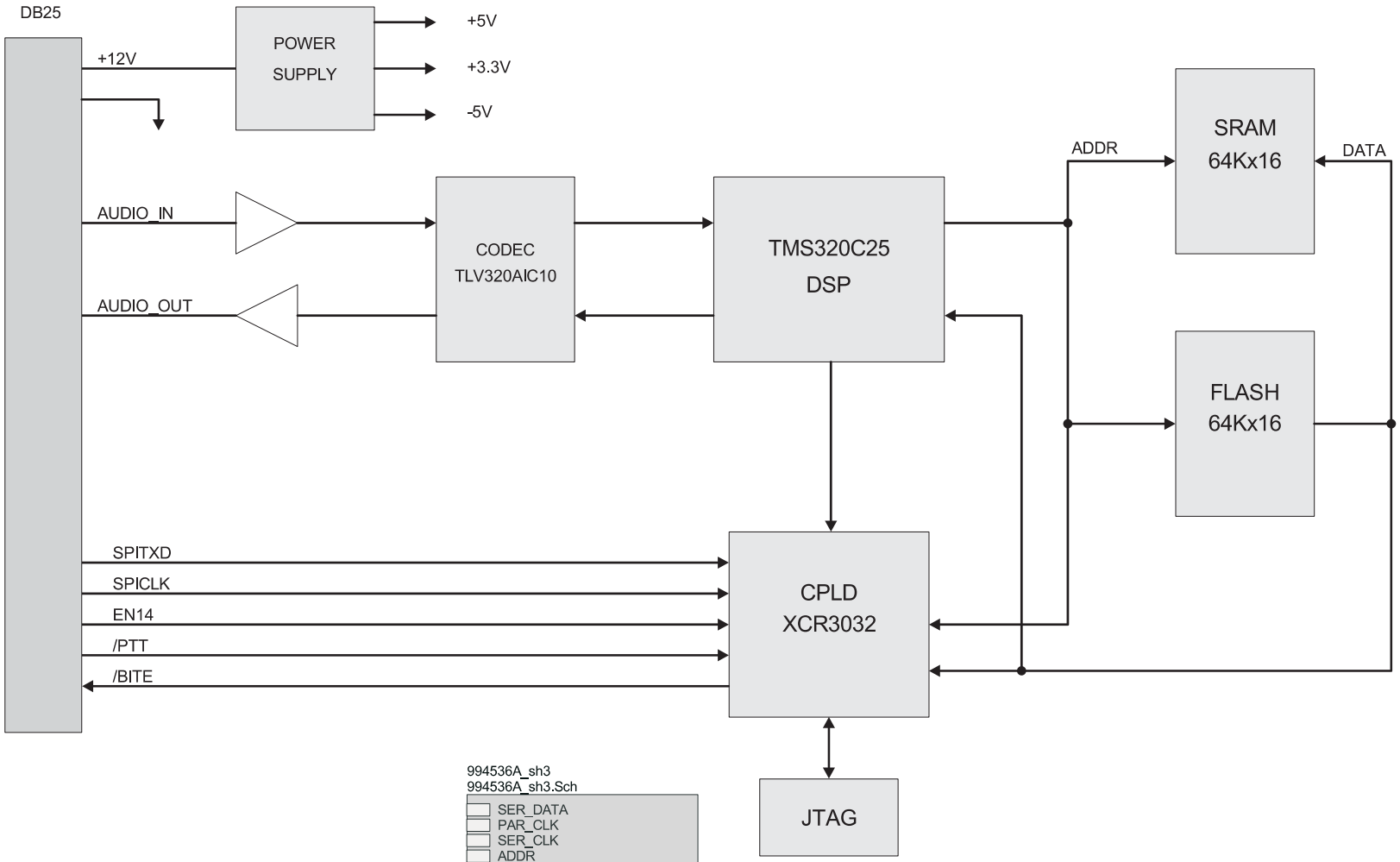


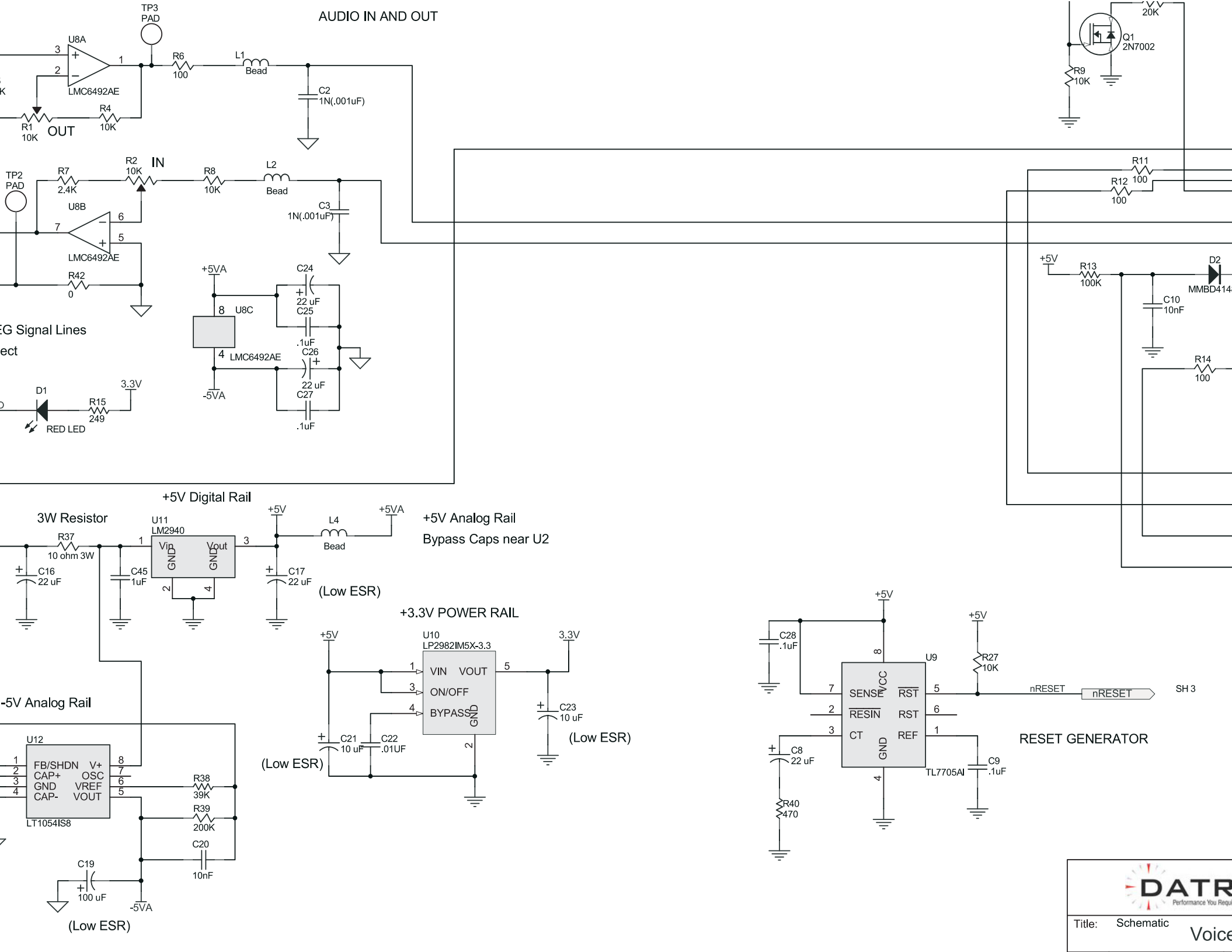
Figure 19-6 Voice Enhancement Option Component Locations (738574 Rev. B)

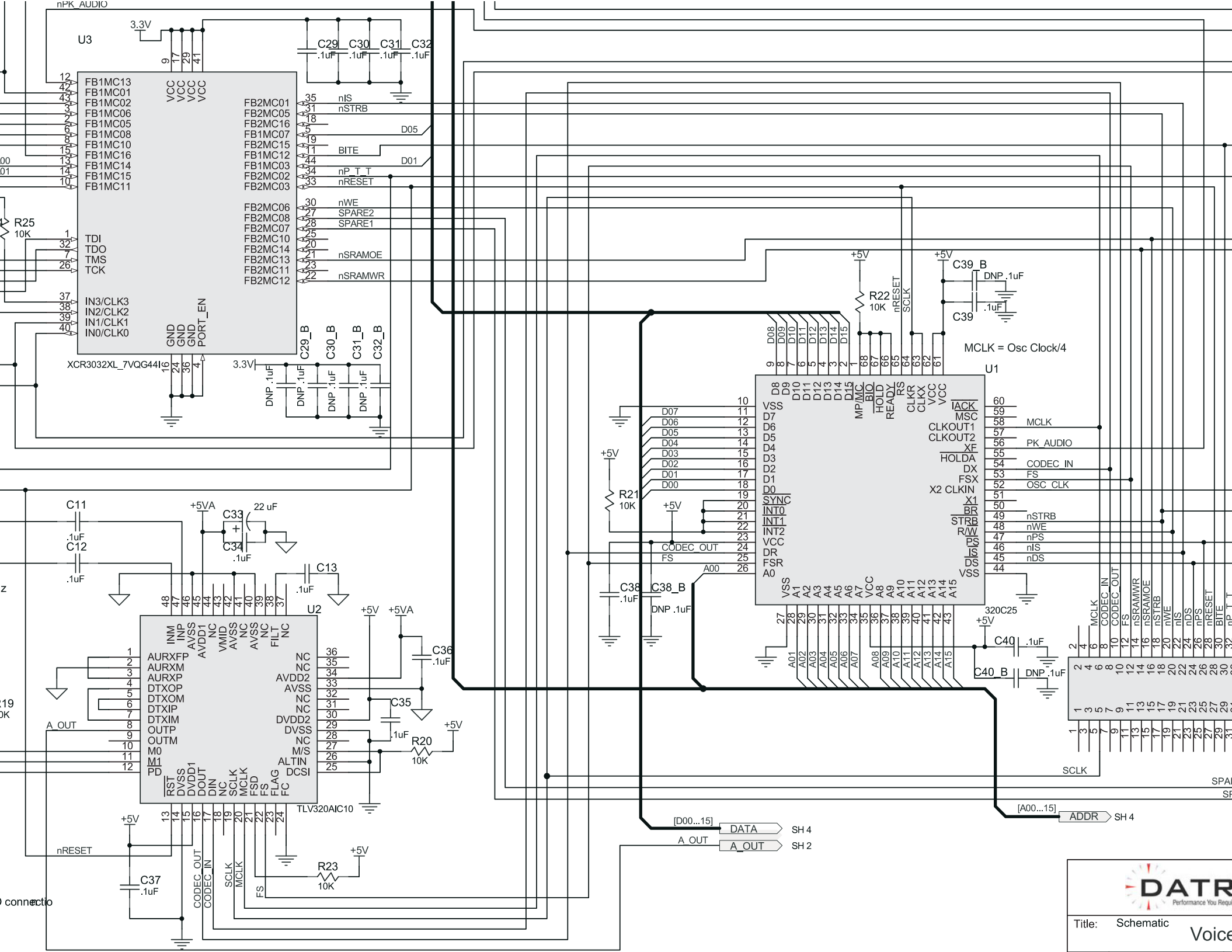


DATR
Performance You Requi

Title: Schematic

Voice


AUDIO IN AND OUT
TP3
PAD
U8A
LMC6492AE
R6
100
L1
Bead
C2
1N(.001uF)
R1
10K
OUT
R4
10K
TP2
PAD
R7
2.4K
R2
10K
IN
R8
10K
L2
Bead
C3
1N(.001uF)
U8B
LMC6492AE
R42
0
EG Signal Lines
ect
+5VA
C24
22 uF
C25
.1uF
U8C
LMC6492AE
C26
22 uF
C27
.1uF
-5VA
D1
RED LED
R15
249
3.3V
Q1
2N7002
20K
R9
10K
R11
100
R12
100
+5V
R13
100K
D2
MMBD414
C10
10nF
R14
100
+5V Digital Rail
3W Resistor
R37
10 ohm 3W
U11
LM2940
Vin
GND
GND
Vout
C16
22 uF
C45
1uF
C17
22 uF
+5V
+5VA
L4
Bead
+5V Analog Rail
Bypass Caps near U2
(Low ESR)
+3.3V POWER RAIL
U10
LP2982IM5X-3.3
VIN
VOUT
ON/OFF
BYPASS
GND
C21
10 uF
C22
.01UF
C23
10 uF
3.3V
(Low ESR)
(Low ESR)
-5V Analog Rail
U12
FB/SHDN
V+
CAP+
OSC
GND
VREF
CAP-
VOUT
LT1054IS8
R38
39K
R39
200K
C20
10nF
C19
100 uF
-5VA
(Low ESR)
C28
.1uF
U9
SENSE
VCC
RST
RESIN
RST
CT
REF
GND
TL7705AI
R27
10K
nRESET
nRESET
SH 3
C8
22 uF
R40
470
C9
.1uF
RESET GENERATOR
DATR
Performance You Requi
Title: Schematic
Voice


nPK_AUDIO
U3
3.3V
C29 .1uF
C30 .1uF
C31 .1uF
C32 .1uF
FB1MC13
FB1MC01
FB1MC02
FB1MC06
FB1MC05
FB1MC08
FB1MC10
FB1MC16
FB1MC14
FB1MC15
FB1MC11
FB2MC01
FB2MC05
FB2MC16
FB1MC07
FB2MC15
FB1MC12
FB1MC03
FB2MC02
FB2MC03
FB2MC06
FB2MC08
FB2MC07
FB2MC10
FB2MC14
FB2MC13
FB2MC11
FB2MC12
nIS
nSTRB
D05
BITE
D01
nP_T_T
nRESET
nWE
SPARE2
SPARE1
nSRAMOE
nSRAMWR
TDI
TDO
TMS
TCK
IN3/CLK3
IN2/CLK2
IN1/CLK1
IN0/CLK0
GND
PORT_EN
XCR3032XL_7VQG44I
R25 10K
C29_B
C30_B
C31_B
C32_B
DNP .1uF
MCLK = Osc Clock/4
U1
R22 10K
C39_B
C39
DNP .1uF
.1uF
+5V
nRESET
SCLK
D08
D09
D10
D11
D12
D13
D14
D15
MP/MC
BIO
HOLD
READY
RS
CLKR
CLKX
VCC
VSS
D07
D06
D05
D04
D03
D02
D01
D00
SYNC
INT0
INT1
INT2
CODEC_OUT
FS
A00
IACK
MSC
CLKOUT1
CLKOUT2
XF
HOLDA
DX
FSX
X2 CLKIN
X1
BR
STRB
R/W
PS
IS
DS
MCLK
PK_AUDIO
CODEC_IN
FS
OSC_CLK
nSTRB
nWE
nPS
nIS
nDS
320C25
R21 10K
C38
C38_B
DNP .1uF
C40
C40_B
C11 .1uF
C12 .1uF
+5VA
C33 22 uF
C34 .1uF
C13 .1uF
U2
INM
INP
AVSS
AVDD1
NC
VMID
FILT
AURXFP
AURXM
AURXP
DTXOP
DTXOM
DTXIP
DTXIM
OUTP
OUTM
M0
M1
PD
AVDD2
DVDD2
DVSS
M/S
ALTIN
DCSI
RST
DVDD1
DOUT
DIN
SCLK
MCLK
FSD
FS
FLAG
FC
TLV320AIC10
C36 .1uF
C35 .1uF
R20 10K
A_OUT
nRESET
C37 .1uF
R23 10K
CODEC_OUT
CODEC_IN
[D00...15]
DATA
SH 4
A_OUT
A_OUT
SH 2
[A00...15]
ADDR
SH 4
SCLK
Title:
Schematic
Voice

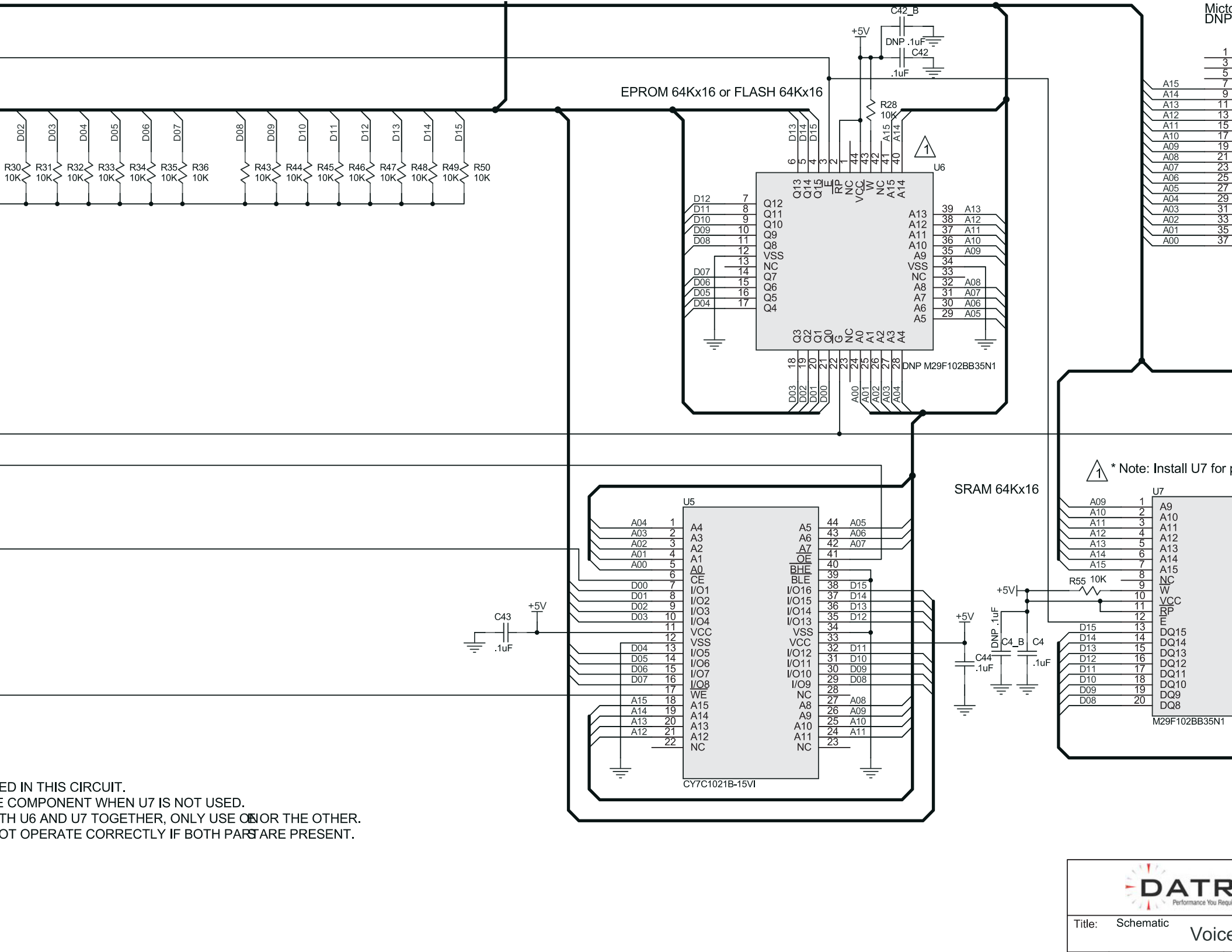

EPROM 64Kx16 or FLASH 64Kx16
SRAM 64Kx16
U6
U5
U7
DNP M29F102BB35N1
CY7C1021B-15VI
M29F102BB35N1
* Note: Install U7 for p
C42_B
DNP .1uF
C42
.1uF
+5V
R28
10K
R30 10K
R31 10K
R32 10K
R33 10K
R34 10K
R35 10K
R36 10K
R43 10K
R44 10K
R45 10K
R46 10K
R47 10K
R48 10K
R49 10K
R50 10K
R55 10K
C43
.1uF
C44
.1uF
C4_B
C4
DNP .1uF
.1uF
ED IN THIS CIRCUIT.
E COMPONENT WHEN U7 IS NOT USED.
TH U6 AND U7 TOGETHER, ONLY USE ONE OR THE OTHER.
OT OPERATE CORRECTLY IF BOTH PARTS ARE PRESENT.
Title: Schematic
Voice

Table 19-2 Voice Enhancement Option Parts List (001-10000 Rev. E)

Designator	Part Number	Description
C1	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C10	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C11	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C12	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C13	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C14	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C15	023471002	“CAP, 470UF AL 16V 20% 8X10MM”
C16	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C17	022226002	“CAP,SM,T,22U 25V 20% 7343”
C18	022226002	“CAP,SM,T,22U 25V 20% 7343”
C19	022107000	“CAP,100UF TA LESR 10V 10% 7343”
C2	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C20	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C21	022106002	“CAP,10UF TA L-ESR 35V 10% 7343”
C22	021103000	“CAP, 0.01UF X7R 50V 5% 0805”
C23	022106002	“CAP,10UF TA L-ESR 35V 10% 7343”
C24	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C25	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C26	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C27	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C28	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C29	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C3	021102000	“CAP, 1000PF NPO 100V 5% 0805”
C30	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C31	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C32	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C33	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C34	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C35	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C36	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C37	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C38	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C39	021104000	“CAP, 0.1UF X7R 25V 5% 0805”

Table 19-2 Voice Enhancement Option Parts List (001-10000 Rev. E)

Designator	Part Number	Description
C4	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C40	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C41	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C42	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C43	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C44	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
C45	021105000	“CAP, 1UF Y5V 16V -20/+80% 0805”
C8	022226000	“CAP, 22UF TA 16V 10% 7343-31”
C9	021104000	“CAP, 0.1UF X7R 25V 5% 0805”
D1	035500003	“LED, RED TOP-V 1206”
D2	037700005	“DIODE,BAS16,75V,0.2A,SOT-23”
J1	613163	“CONN,DB-25 RT ANGLE PC PLUG”
J2	080004001	“CONN,1.25MM,HEADER,6PIN”
L1	045000000	BEAD FERRITE Z=600 0.2A 0805
L2	045000000	BEAD FERRITE Z=600 0.2A 0805
L3	041104001	IND SM 100UH 15% 7832
L4	045000000	BEAD FERRITE Z=600 0.2A 0805
Q1	032005	“XSTR, 2N7002 N-MOSFET SOT-23”
R1	170229	“RES, 10K TRM CER S-ADJ MT TH”
R10	013203500	“RES,20K OHM 1/8W 5% TK 0805”
R11	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R12	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R13	013104000	“RES,100K OHM 1/8W 5% TK 0805”
R14	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R15	013249000	“RES, 249 OHM 1/8W 1% TK 0805”
R16	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R17	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R18	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R19	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R2	170229	“RES, 10K TRM CER S-ADJ MT TH”
R20	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R21	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R22	013103000	“RES,10K OHM 1/8W 5% TK 0805”

Table 19-2 Voice Enhancement Option Parts List (001-10000 Rev. E)

Designator	Part Number	Description
R23	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R24	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R25	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R26	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R27	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R28	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R29	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R3	013242000	“RES,2.4K OHM 1/8W 5% TK 0805”
R30	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R31	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R32	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R33	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R34	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R35	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R36	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R37	155100	“RES,10 OHM 3W 5% FP MOX”
R38	013393000	“RES,39K OHM 1/8W 5% TK 0805”
R39	013204000	“RES, 200K OHM 1/8W 1% TK 0805”
R4	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R40	013471000	“RES, 470 OHM 1/8W 5% TK 0805”
R41	013000000	“RES, ZERO OHM 2A TK 0805”
R42	013000000	“RES, ZERO OHM 2A TK 0805”
R43	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R44	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R45	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R46	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R47	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R48	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R49	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R5	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R50	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R51	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R52	013103000	“RES,10K OHM 1/8W 5% TK 0805”

Table 19-2 Voice Enhancement Option Parts List (001-10000 Rev. E)

Designator	Part Number	Description
R55	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R6	013101000	“RES,100 OHM 1/8W 5% TK 0805”
R7	013242000	“RES,2.4K OHM 1/8W 5% TK 0805”
R8	013103000	“RES,10K OHM 1/8W 5% TK 0805”
R9	013103000	“RES,10K OHM 1/8W 5% TK 0805”
U1	330407	“IC,TMS320C25FN DSP CTL PLCC68”
U10	033304070	“IC,LP2982 3.3V VR ULDO SOT23-5”
U11	034400003	“IC,SM,VR,1A,LOW DROPOUT SOT223”
U12	034402008	“IC, LT1054 SWTCH V CNVTR SO-8”
U2	033303100	“IC, TLV320AIC CODEC PQFP-48”
U3	033302011	“IC, XCR3032XL-7 CPLD VQFP-44”
U4	361122	“OSCILLATOR,40.000 MHZ SMT”
U5	033300027	“IC,CY7C1021B 64KX16 SRAM SOJ44”
U7	001-11001	VEM PGM IC FLASH MEMORY
U8	033304057	“IC,MC6492A DUAL OP-AMP SOIC-8”
U9	033303101	“IC, TL7705 VOLT SUPVR SO-8”

19.7 N1304A Encoder (TW7000AIRSELCALL)

The N1304A AIRSELCALL option provides an interface with Motorola® N1304 SELCALL or compatible devices. This option adds a secondary control line (AME EN) from the 5 MHz IF board to the rear panel **ACCESSORY 2** connector that enables TW7000 to use the ICAO-mandated ground-to-air SELCALL 3-tone system.

To call an aircraft, the operator enters the 4-digit calling code, then presses the send button. The TW7000 automatically switches to AME mode and sends the SELCALL. After the TW7000 transmits the calling tone sequence, it returns to normal SSB mode.

The TW7000AIRSELCALL option involves adding a bipolar transistor on the component side of the 5 MHz IF board, and adding an extra line from the Motherboard J5 solder pattern to the **ACCESSORY 2** ribbon cable.

Note: *The TW7000AIRSELCALL option cannot be installed in the field nor is it field-servicable. It is installed in the radio as a special order.*

CHAPTER 20
ALTERNATE CONFIGURATIONS

7.1 Computer Control (TW7000C)

The TW7000C is a computer-controlled version of the TW7000. The front panel consists of an on/off switch and a LED power indicator.

7.2 Extended Front Panel Control (TW7000E)

The TW7000E is an extended control version of the TW7000. It includes a front panel containing a single connector. The front panel contains an interface board and connector transition. The interface board converts the serial communications to a differential RS-485 format. At the radio end, jumpers JU1 C and D are installed.

The TW7000E is used with the TW7201E control console which attaches to the connector using control cable C991830. The console can be up to 50 feet away.

The TW7201E consists of the standard TW7000 front panel and an extended control interface board. Operation from the TW7201E is identical to that of the standard TW7000.

The TW7201E uses the same interface board as the TW7000E front panel and is installed with jumpers JU1 A and B (refer to Figure 20-1 on page 20-2). The TW7201E chassis consists of a housing and base mount plate.

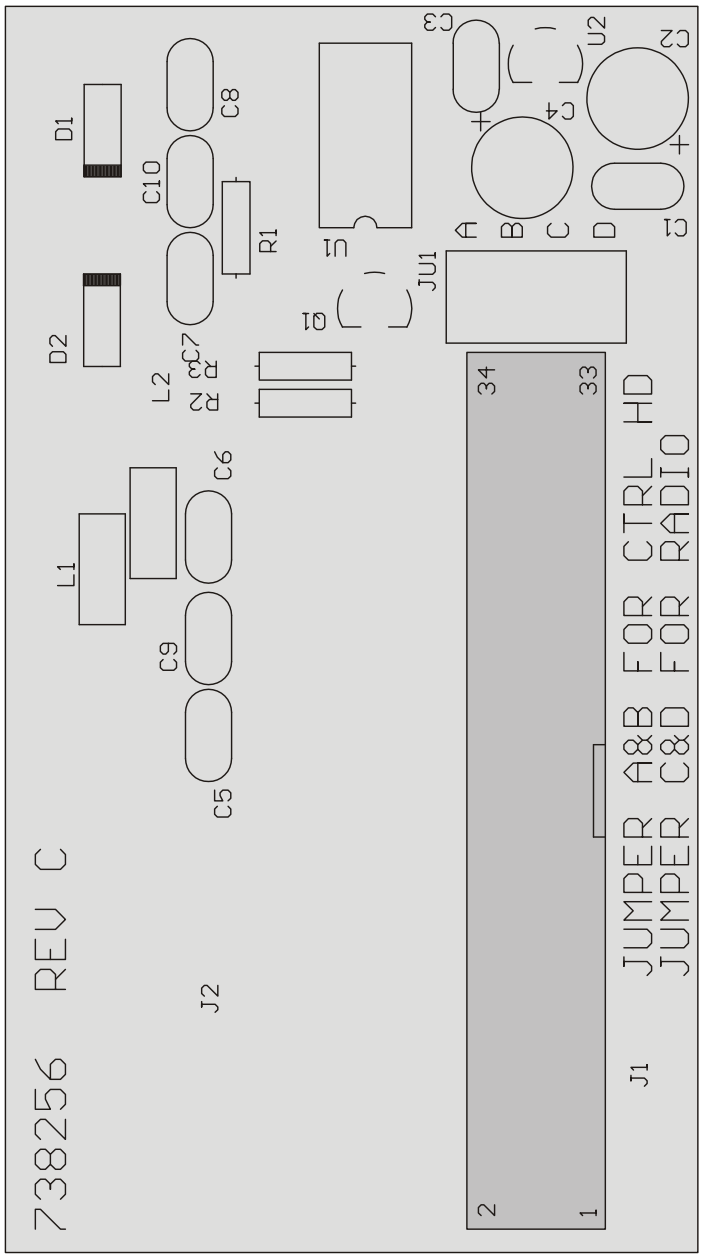
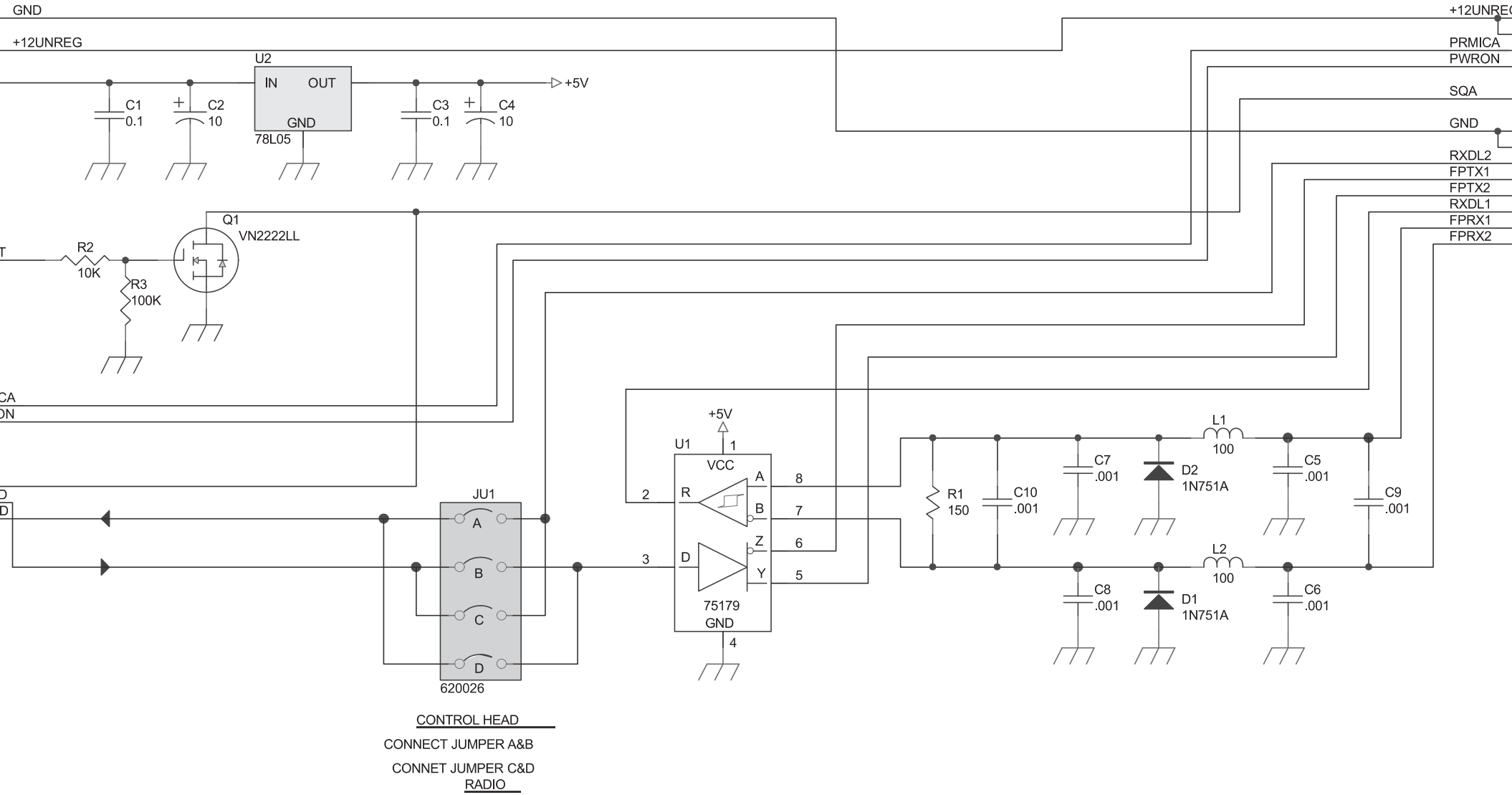


Figure 20-1 TW7000E Connector Transition Component Locations (738256 Rev. C)

SPECIFIED

FARADS.

ENRYS.



CONTROL HEAD

CONNECT JUMPER A&B

CONNET JUMPER C&D

RADIO

BOM 002-01003 PCBD 738256

DATR

Performance You Re

Title: Schematic TW7

CONI

Table 20-1 TW7000E Connector Transition Parts List (002-01003 Rev. F)

Designator	Part Number	Description
C1	275104	CAP,C,0.1U,50,10%,X,RA,.10SP
C10	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C2	231100	CAP,10MF 16V ELECT VRT
C3	275104	CAP,C,0.1U,50,10%,X,RA,.10SP
C4	231100	CAP,10MF 16V ELECT VRT
C5	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C6	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C7	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C8	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
C9	275102	CAP,C,.001UF,100V,5%,N,RA,.1SP
D1	320204	DIODE, ZENER 5.1V
D2	320204	DIODE, ZENER 5.1V
J1	620036	HEADER,34 PIN DUAL ROW MALE
J2	610449	CONN,D-SUB 15 PIN MALE PC MNT
JU1	620026	HEADER,8 PIN DUAL MALE
L1	430014	INDUCTOR MOLDED MIN 100UH
L2	430014	INDUCTOR MOLDED MIN 100UH
Q1	310138	XISTOR,FET,VN2222LL,TO92
R1	113151	RES,150 OHM 1/8W 5% CF
R2	113103	RES,10K 1/8W 5% CARBON FILM
R3	113104	RES,100K 1/8W 5% CARBON FILM
U1	330495	IC, RS-485 TRANSCEIVER
U2	330025	IC,VREG,78L05,TO92,5V

7.3 Pre/Postselector (TW7000PP)

This section describes the interface requirements between the 7000-series radios and the 5830-series pre/postselectors.

The TW5830 provides sharp band-pass filtering of both transmit and receive RF signals. It is most frequently used in co-site installations. The radio communicates frequency information to the TW5830, which then inserts the proper filters and conditioning circuits.

To use the TW5830 pre/postselector, the TW7000PP version is used in conjunction with the C1021 interface device. The following modifications are factory installed:

- Rear panel assembly replaced by new PP version
- Internal RF wiring changed
- Jumper JU11-B inserted on Processor board

The transmit RF path is broken between the 75 MHz IF board and the RF Power Amplifier board as shown in Figure 20-3 on page 20-7. The RF lines are routed to the new BNC connectors located on the rear panel of the radio while the control and BITE lines are routed to **ACCESSORY 3**. Transmit RF flows from the 75 MHz IF board through the postselector portion of the TW5830, and back to the RF Power Amplifier board.

The receive signal is automatically filtered by the TW5830. This section is placed in bypass mode when the system is in transmit mode.

The TW5830 requires frequency information from the radio. The serial-to-parallel converter C1021 interface converts serial data from **ACCESSORY 3** to parallel data. It also provides BITE information back to the radio.

The only selectable feature in the C1021 is the device address. By placing the jumper in position 1 or 2, the radio can selectively address the TW5830s. Normally, it comes preconfigured as device 1.

The C1021 provides an interface between the TW7000PP and the TW5830. It performs this for both the control signals and BITE diagnostics. On power-up and during a forced BITE (refer to TW7000-MSOP), the radio's processor reads the BITE resistor located in the C1021 (R1). The valid voltage range is between 0.5 Vdc (low range) and 5.0 Vdc (high range).

If the proper levels fail, the radio displays **BAD OR NONE PRESELECTOR 1 or BAD OR NONE PRESELECTOR 2**, depending on the device addressed.

In addition to detecting the presence of C1021, the TW7000 responds to an internal TW5830 failure. This same BITE line indicates a fault and the radio does not send any data to the TW5830 until it is cleared. There is also a visual indication by the fault LED on the TW5830.

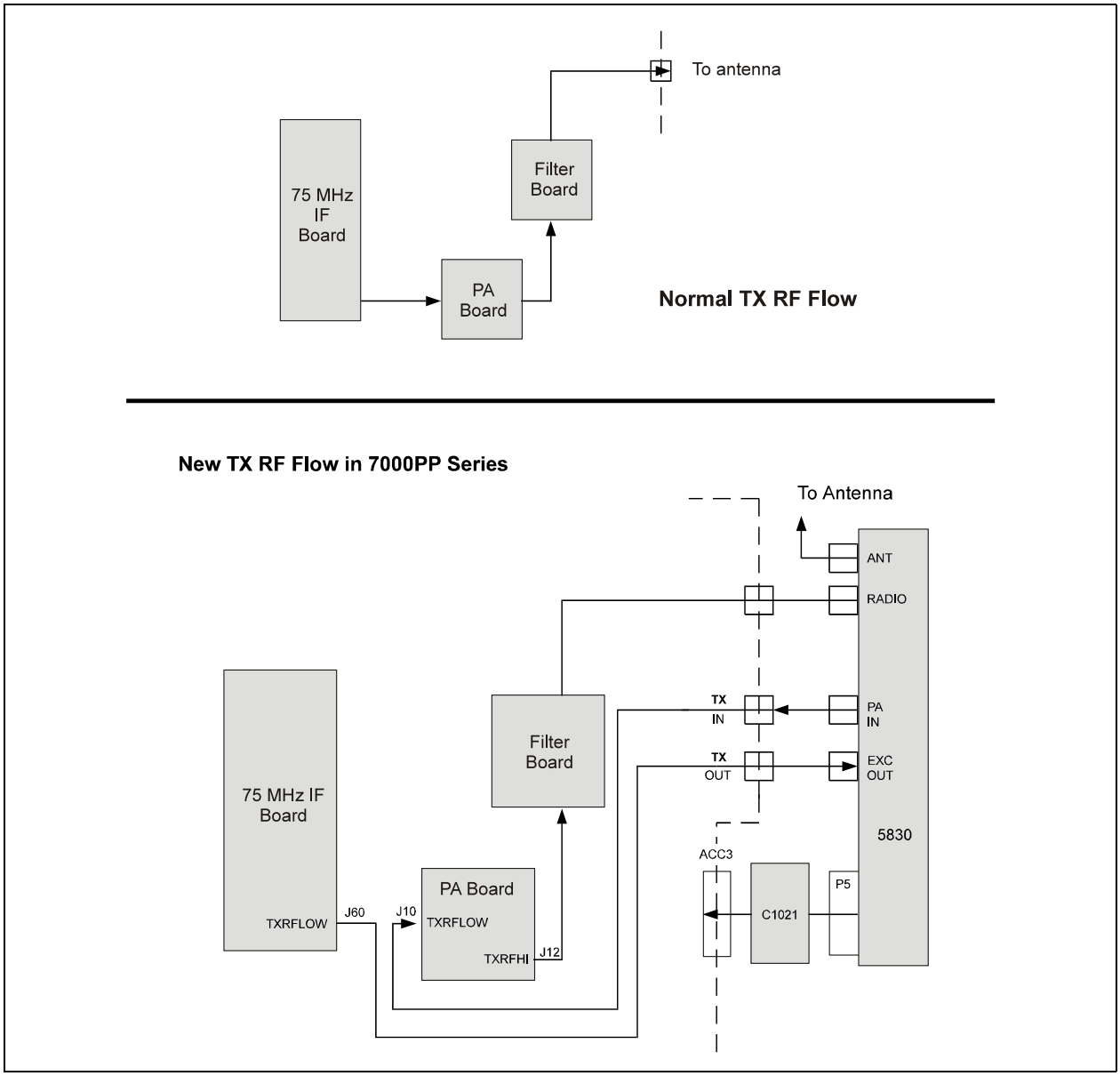


Figure 20-3 TW7000PP Internal Wiring Diagram

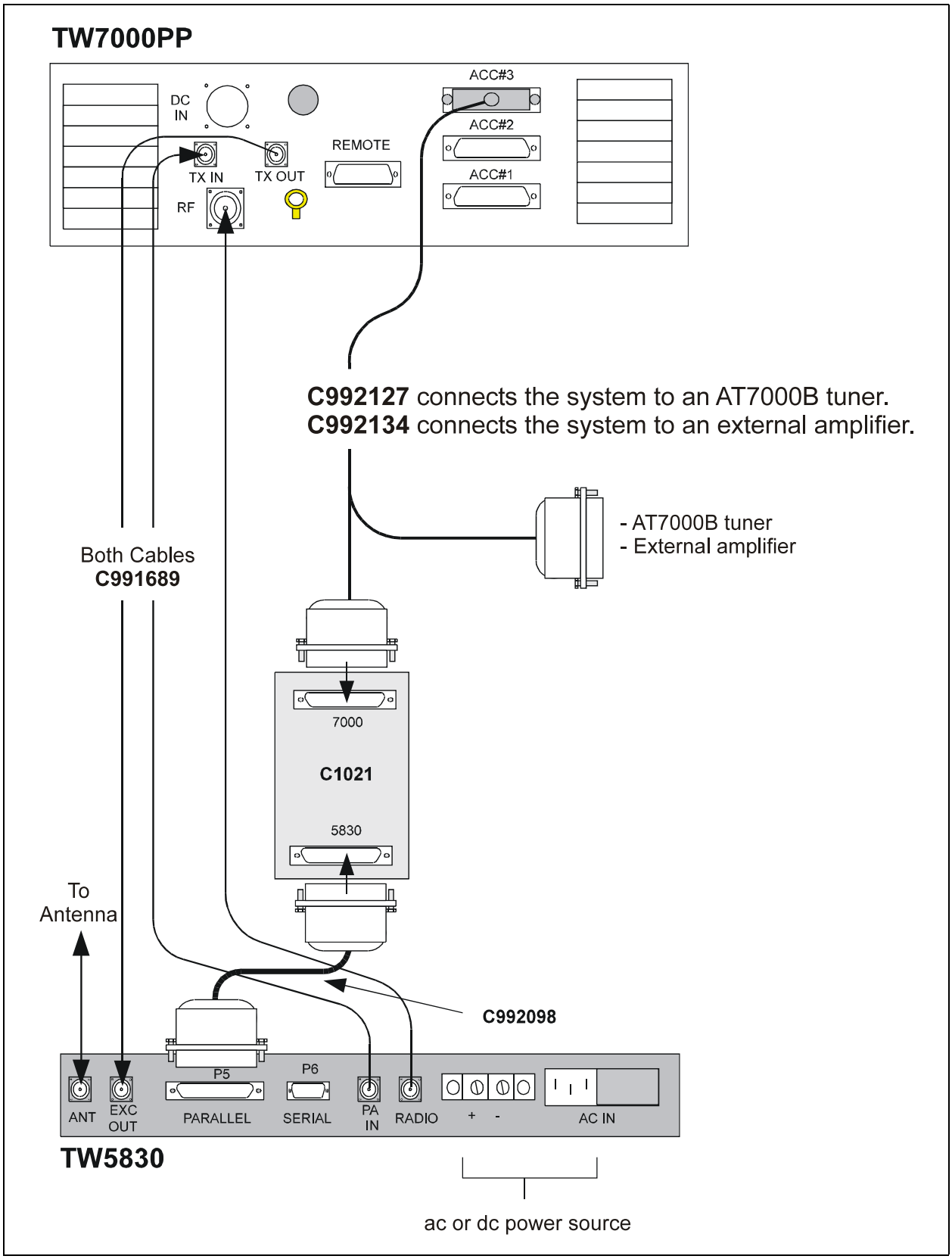


Figure 20-4 TW7000PP Cabling Connections

7.4 FSK Remote Control (TW7000RF)

The TW7000RF is the standard TW7000 transceiver with a blank front panel designed for long-range remote control from a TW7201F control console. It includes the internal 7000RF modem.

7.5 DHSL Remote Control (TW7000RI)

The TW7000RI is the standard TW7000 transceiver with a blank front panel designed for up to 2 km remote control from a TW7201I control console. It includes the internal 7000RI modem.

7.6 Receiver Only (TW7000RX)

The TW7000RX is a receiver-only variation of the TW7000 with full features of the TW7000, without the capability to transmit.

7.7 Transmitter Only (TW7000TX)

The TW7000TX is a transmitter-only variation with full features of the TW7000, without the capability to receive transmissions.

CHAPTER 21
MAINTENANCE

This chapter provides information and procedures for testing and troubleshooting the TW7000. These procedures provide a quick and accurate way of evaluating the essential operating characteristics of the TW7000. If a fault is indicated, these procedures aid in determining intermediate maintenance solutions.

21.1 Subassembly Breakdown

The TW7000 consists of a final assembly and an accessory kit. The accessory kit consists of one cable (C991829) and two slow blow fuses (25A). The main functional subassemblies of the standard TW7000 and their respective boards and cables, are listed in Table 21-1 on page 21-7. Figure 21-2 on page 21-4 shows the TW7000 final assembly.

21.2 Internal Layout

The TW7000 is a modular design concept. It features plug-in boards that permit simple field repair as well as field upgrades. Major internal options, such as ALE and remote control, are field-installable by inserting the new circuit board in the appropriate slot.

For the location of each board, refer to Figure 21-1 on page 21-3.

Most boards in the TW7000 have dedicated slots that plug into the Motherboard. These include the following:

- Reference/Control board
- Synthesizer board
- 5 MHz IF board
- 75 MHz IF board
- Audio board
- Processor board
- Noise blanker (option)
- ALE (option)
- Remote Control Unit (RCU) interface (option)

21.3 Board Access

To access these boards, remove the top cover of the TW7000. The top cover (and bottom) is held in place by six screws, three in the front and three in the rear. To remove a board, carefully pull it out of its card slot. To service a board in the radio, remove it from the card slot, mount it on the appropriate extender card and make the appropriate adjustment or repair, then reinstall it in the radio. Use the following kits to assist in servicing and adjusting these boards.

- 7000EXT extender kit
- TW7000TK tool kit

Remove the front panel from the main body of the radio by removing the 2 large screws securing it to the side panels (after first removing the top and bottom covers). The entire panel connects electrically to the main body by a single ribbon cable.

21.3.1 Power Supply

The Power Supply board includes the power supply circuitry and a heat sink. It mounts onto the vertical chassis bracket located immediately behind the main heat sink facing the inside of the rear panel.

To access this board,

1. Remove the top and bottom of the radio.
2. Remove the two large screws holding the side rails to the rear panel.
3. Pull the rear panel away from the main body of the radio, exposing the Power Supply board. The rear panel connects to the main body of the radio by the individual cables routed to the rear panel connectors. Sufficient service loops exist in these cables so the power supply and rear panel circuitry can be checked without disconnecting them. The Power Supply board connects to the rear panel through DC power cable (001-00411), which plugs into the 3-pin connector J26.
4. To remove the Power Supply board and its heat sink from the chassis bracket, remove the two outermost screws on top of the board. Disconnect the various cables running to the board.

21.3.2 VSWR

The VSWR board is the small board mounted directly on the inside of the antenna connector on the rear panel. You can access it by going through the same steps described for the Power Supply board.

21.3.3 Heat Sink

The heat sink assembly includes the RF Power Amplifier and RF Filter boards. To remove the heat sink assembly from the radio:

1. Unscrew the long hex nut accessible inside the vertical cutout on the left front of the heat sink next to the chassis card-cage.
2. Pull the boards out of the radio. Disconnect the cables running to the boards.
3. Access the RF Power Amplifier and RF Filter boards by removing the six screws holding its shield to the heat sink.

Figure 21-3 on page 21-5 provides a breakdown of the Front Panel Assembly. Figure 21-4 on page 21-6 provides a breakdown of the rear panel assembly.

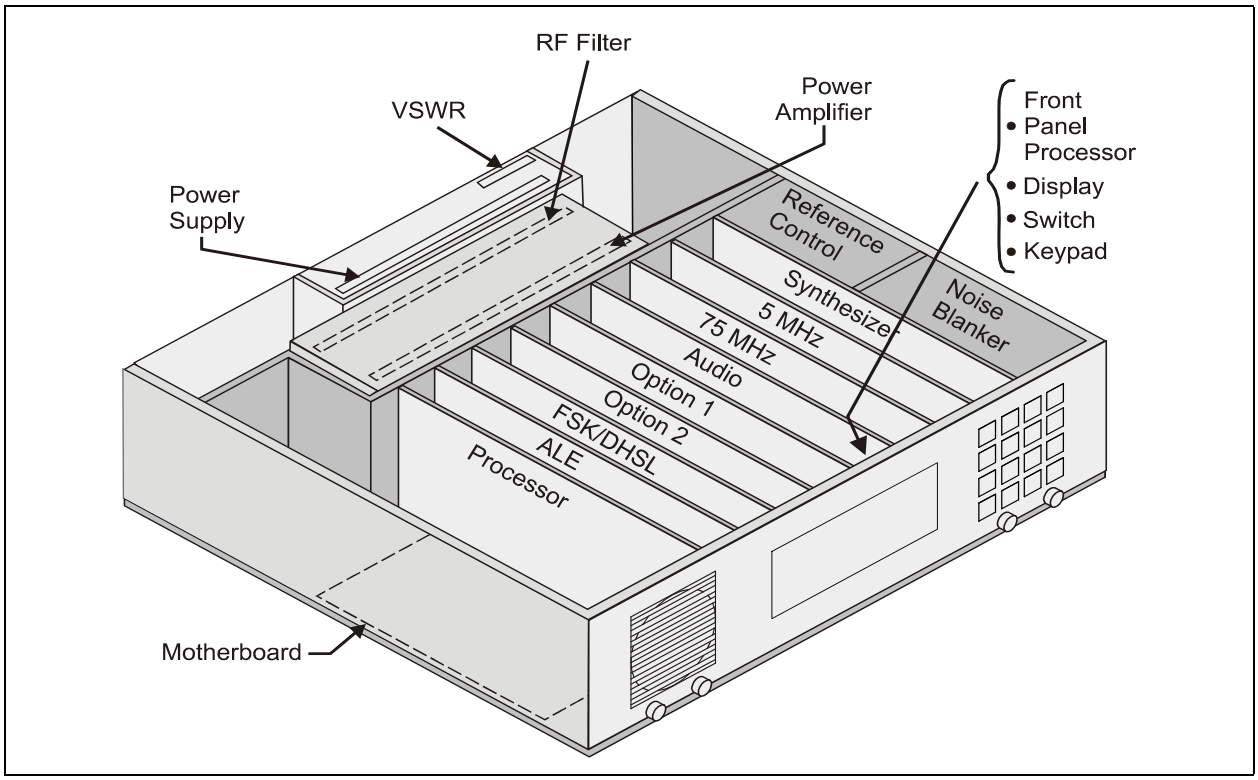


Figure 21-1 Board Locations

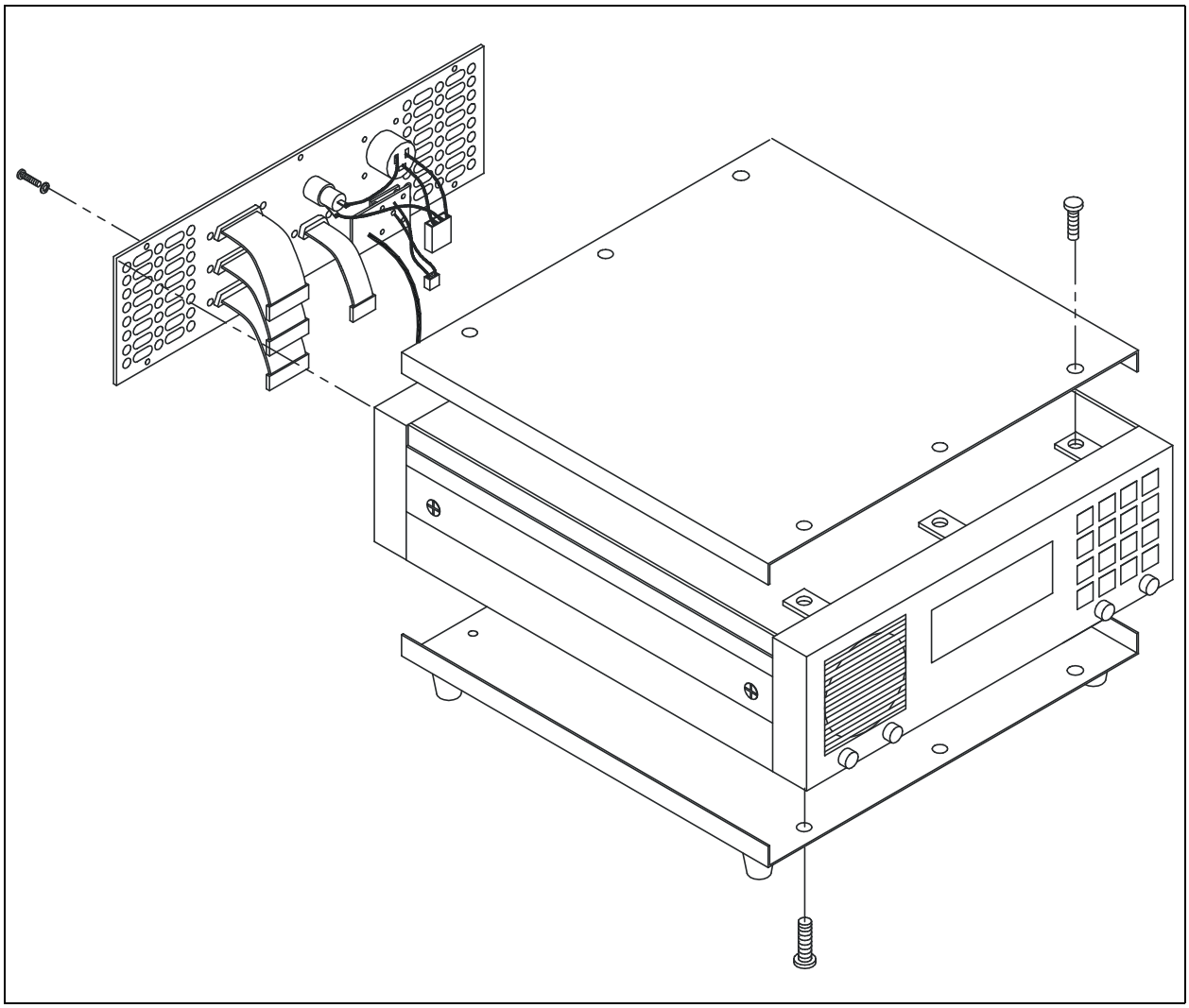


Figure 21-2 Final Assembly

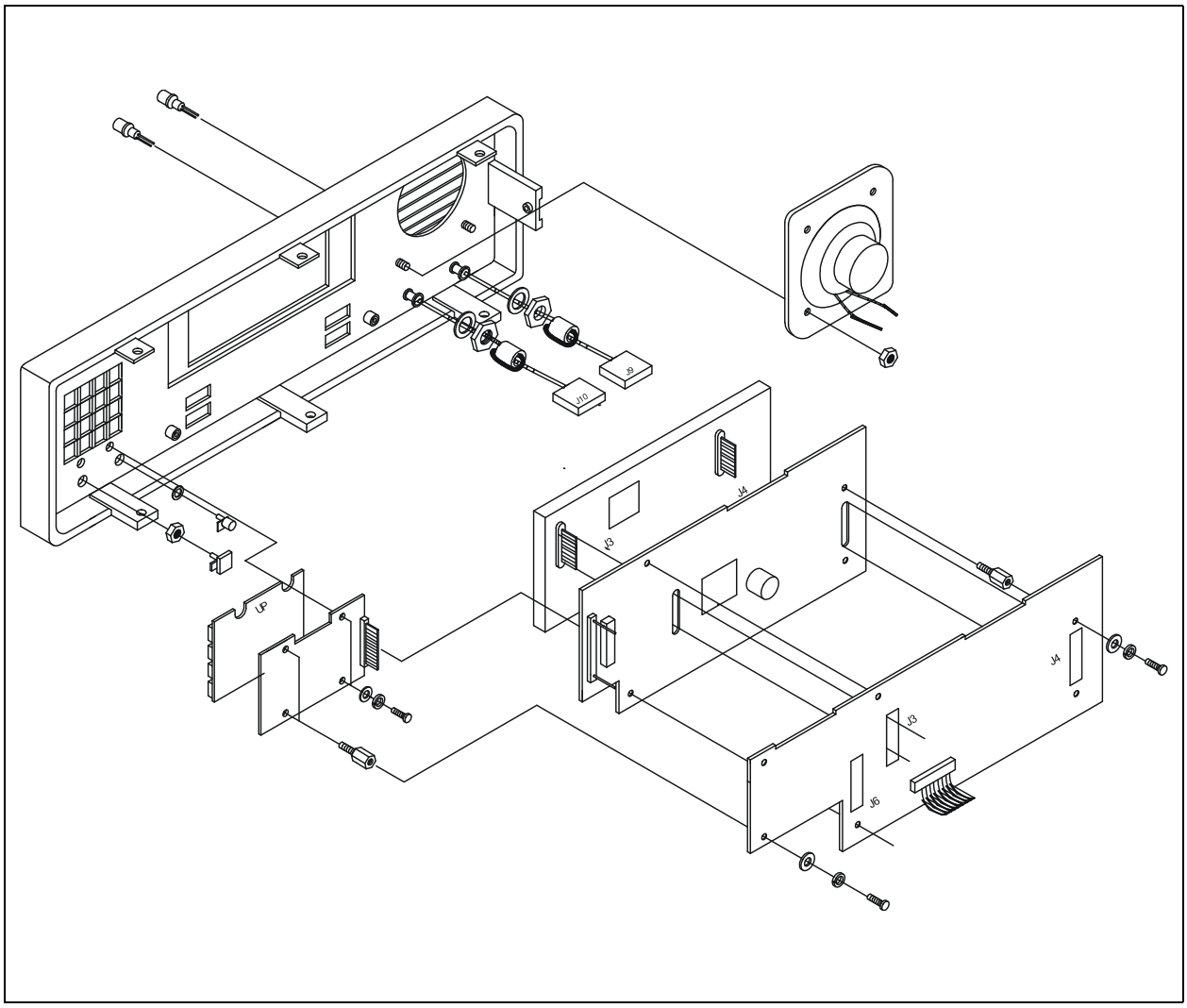


Figure 21-3 Front Panel Assembly

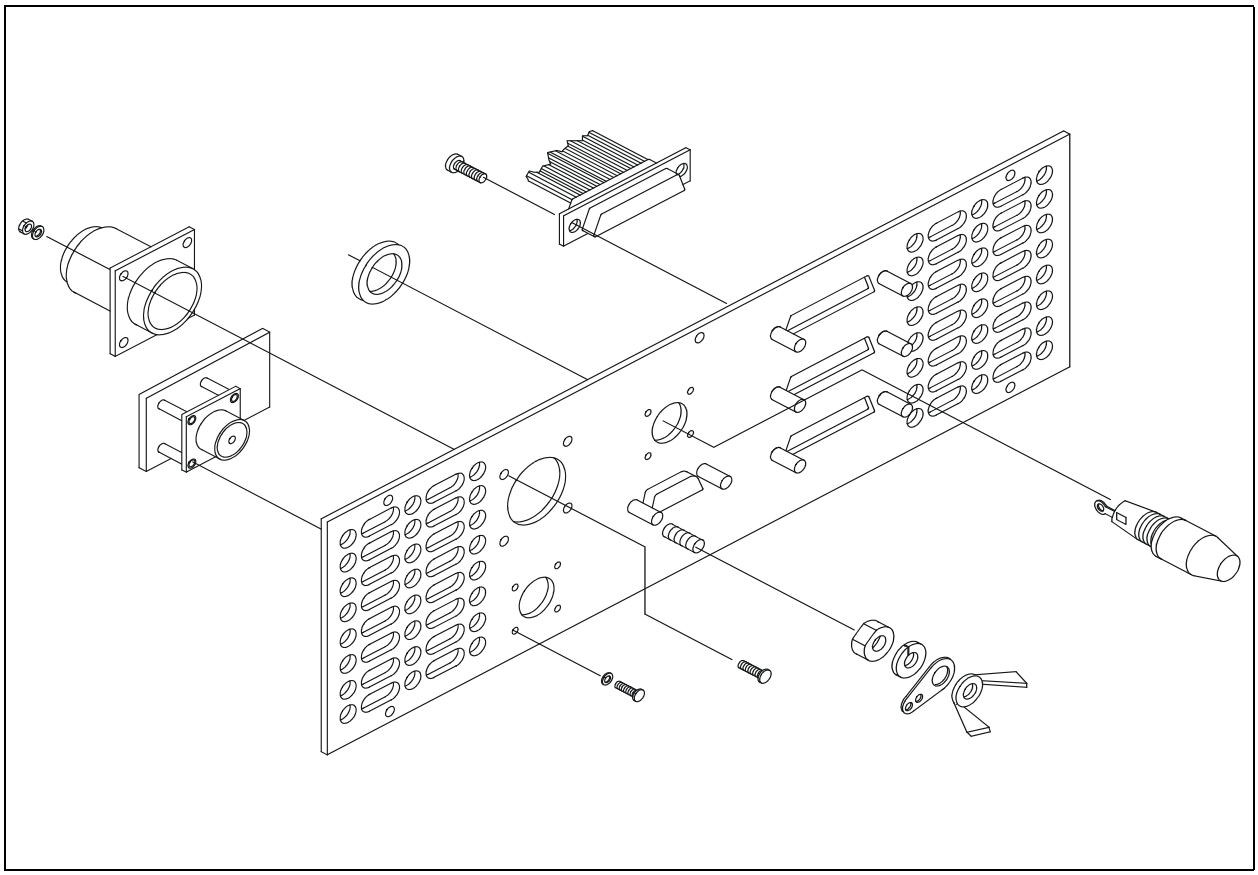


Figure 21-4 Rear Panel Assembly

Table 21-1 Subassemblies

Subassembly	Description	Contains
001-00100	Front panel assembly	(001-00110): Switch board (004-00120): LCD assembly (001-00130): Keypad board (001-00143): Front panel Processor board (001-00141): Ribbon cable assembly (001-00142): Front panel software (001-00150): Volume cable assembly (001-00161): Clarifier cable assembly (001-00170): Speaker assembly (001-00180): Mic connector cable assembly
001-00200	Rear panel assembly	(001-00210): VSWR Detector board (001-00211): Coax cable assembly (001-00220): DB25 cable assembly (001-00230): DB9 cable assembly (001-00241): DC cable assembly
001-00300	Heat sink assembly	(001-00310): RF Power Amplifier board (001-00320): RF Filter board (001-00330): Fan assembly (001-00340): Ribbon cable assembly (001-00350): Heat sink cable assembly (001-00360): RF power amplifier cable assembly
001-00400	Power supply assembly	(001-00410): Power supply board (001-00411): DC power cable assembly
001-00500	Chassis assembly	(001-00510): Motherboard
001-00600	Audio board	
001-00710	75 MHz IF board	
001-00800	5 MHz IF board	
001-00901	Synthesizer board	
001-00206	Reference/Control board	TCXO
001-01022	Optional Reference/Control board	High Stability option
001-01105	7000ALE option	(001-01114): Programmed chip, TW7000 processor (001-01321): Programmed chip set, 001-01105
001-01107	Processor board	(001-01114): Programmed chip, TW7000 processor

21.4 Test Equipment

The following equipment is required to test and troubleshoot the TW7000. If the specified test equipment is not available, equivalent items can be substituted.

Item	Model Recommended	Specification
Attenuator	Bird 8323	30 dB, 100W, 50 ohms
Wattmeter	Bird 43	50W and 250W elements
Signal generator	Marconi 2022D	10k to 500 MHz
Counter	Leader LDC-824S	
SINAD meter	Helper Sinadder 3	
Oscilloscope	Kikusui	100 MHz/analog/dual trace
12V Power supply	Astron 35M	15 Vdc 25A
Multimeter	Fluke 85	
Test set	Hewlett Packard 8920	
Microphone	MHS/MDR/MRR	
CW key	KYR	
DC power cable (C991829)		
Broadband 50 ohm antenna		
Two-tone test box	Datron	

21.5 Basic Performance Test

A brief test checks the overall operation of the TW7000. Perform the test on initial inspection of the equipment, after the equipment is repaired, or any time you suspect degradation. This test requires the following equipment:

- Power supply: 0 to 15 Vdc, 25A
- TW7000 DC power cable (C991829)
- Microphone
- Broadband 50 ohm antenna

To perform the basic performance test:

1. Attach the power supply to the TW7000 using the C991829 power cable. Connect the antenna and the microphone to the TW7000.
2. Turn the power switch on. The TW7000 internal BITE circuit activates automatically on power-up. If there is a BITE fault in the TW7000, the

faulty subassembly displays on the front panel. If there is no BITE fault, the channel number and frequency of the last channel used is displayed.

3. Turn the speaker switch on and the volume control up. You should hear noise in the speaker.
4. Select a WWV frequency and listen to the tone. The tone should be recognizable and approximately 1 kHz.
5. Select an appropriate TX frequency. Press the PTT on the microphone and speak into it. Receive audio clears, and the bar graph on the display indicates an RF output power proportional to the transmit audio input from the microphone.

21.6 Detailed Performance Test

When detailed performance data is needed, or if performance degradation is suspected in certain areas, refer to the Detailed Performance Test Parameters table below. The tests are arranged in 3 groups.

General Operational Tests: Check all power-supply voltages and verify all display and front panel switch functions. Required test equipment is a DC power supply and a multimeter.

Receiver Tests: Check all standard receiver parameters. Required test equipment are a DC power supply, an RF signal generator (connected to the antenna terminal), a SINAD meter and an audio voltmeter.

Transmitter Tests: Check all standard transmitter parameters. Required test equipment include a power supply, 50 ohm load (connected to the antenna terminal), an in-line wattmeter between the 50 ohm load and the TW7000, and an oscilloscope.

Table 21-2 Detailed Performance Test Parameters

General Operational Tests	
Regulated Power Supply Voltages (on Power Supply board)	Main +12.0 ±0.6V ACC +12.0 ±0.6V 5V +5.0 ±0.25V
Keypad Functions	Verify channel, frequency, alpha, and arrow keypad entry
LCD Display	Verify all display functions and icons are visible and operational.
Button/Icon Operations	Verify that ALPHA, SPKR, SQ, EXT AMP, ATTN, RF PWR, SCAN GROUP, MODE, and OPTION buttons/icons operate
Receiver Tests	
Receiver Current	2A maximum (volume at minimum)
Audio Output/Distortion	2.8 ±0.25 Vrms at microphone jack with -100 dBm input
SINAD	10 dB at -113 dBm input
AGC Operation	3 dB change over input range of -103 dBm to +13 dBm
Squelch Operation	Operational at -110 dBm
Pass Band Response	300 to 2700 Hz ±3 dB with standard 5 MHz filter
Clarifier Operation	±600 Hz in 10 Hz steps
Attenuator Operation	Verify attenuator is functioning
Bar Graph Operation	Verify bar graph is functioning
Transmitter Tests	
Transmit Current	3A maximum at idle, 23A maximum at 100W
Power Output	All tests use -10 dBm 1 kHz audio into the microphone audio pin of the microphone jack. Low: 10 ±2W with Alpha 5* set to 10 Medium: 25 ±5W with Alpha 5* set to 30 High: 100 ±20W with Alpha 5* set to 200
CW Mode Operation	Low: 10 ±2W with Alpha 5* set to 10 Medium: 25 ±5W with Alpha 5* set to 30 High: 100 ±20W with Alpha 5* set to 200
AME Mode Operation	Verify carrier is 10W to 80W in LSB at 14.75 MHz
PCS Mode Operation	Verify carrier is 2.5 ±1W in USB at 14.75 MHz
Carrier Suppression	Verify that a PTT key with no audio input is less than 200 mVpp at the RF output
Two-Tone Distortion	Verify waveform linearity and freedom from distortion (flat-topping). Use 1 kHz and 1.8 kHz tones at 50 mV each into microphone jack

Table 21-2 Detailed Performance Test Parameters

Transmitter Tests (continued)	
Microphone Operation	Verify operation of both front panel microphone jacks
Bar Graph Operation	Verify bar graph is functioning
VSWR (Power Reduction)	Verify power reduction at 3:1 VSWR
Frequency Calibration	±15 Hz at 30 MHz
* Refer to the TW7000-MSOP for information on using the Alpha menu.	

21.7 Subassembly Troubleshooting

This section contains TW7000 troubleshooting information down to the subassembly level. The objective is to identify the faulty board by utilizing logical diagnostic procedures along with the internal BITE system. After replacing the suspect board, proper performance is verified as below.

21.7.1 Internal BITE System

The BITE system aids in troubleshooting the equipment down to the board level. The BITE routine performs the following:

1. Checks that each board is in its proper location inside the standard TW7000.
2. Checks for the presence of options.
3. Check the coax cable connections
4. Checks the performance of certain key parameters on the following boards.
   - **75 MHz IF:** Verifies that the injection level of the 1st LO into the first mixer is correct.
   - **5 MHz IF:** Verifies that injection levels of the 2nd and 3rd LOs into the second and third mixers are correct.
   - **Synthesizer:** Verifies that all PLLs are locked and operating properly.

     Note: *Failure of the Synthesizer PLL may be caused by no reference frequency from the Reference/Control board. Check Reference/Control board and coax cables.*

   - **Reference/Control:** Verifies connection to filter assembly.

The BITE system activates automatically at power up, or manually using the keypad (refer to the TW7000-MSOP). If a fault is diagnosed, a coded fault message is displayed. If faults in several boards are identified, the fault codes for each board are displayed.

All of the boards have special circuitry to control the BITE line. The line is controlled by the SPI bus. The BITE line descriptions are explained in the following table. The values are approximate with a ±0.1 Vdc of the stated voltage.

Table 21-3 BITE Line Descriptions

Board	Type of BITE	BITE Voltage
Reference/Control	Receiver overload, filter board and reference oscillator	0.53* Vdc
Reference/Control VSWR	Receiver overload, filter board and reference oscillator	1.08* Vdc
Synthesizer	First local oscillator, BFO	0.84 Vdc
Synthesizer 2	Second local oscillator, BFO	2.06 Vdc
5 MHz IF (STD)	Second local oscillator, BFO and standard filter	1.08 Vdc
5 MHz IF (STD + WB)	Second local oscillator, BFO, standard and wideband filter	1.53 Vdc
5 MHz IF (STD + WB1)	Second local oscillator, BFO, standard and wideband 1 filter	4.63 Vdc
5 MHz IF (STD + CW)	Second local oscillator, BFO, standard and CW filter	2.29 Vdc
5 MHz IF (CW and WB1)	Second local oscillator, BFO, CW and wideband 1 filter	3.41 Vdc
75 MHz IF	First local oscillator	1.88 Vdc
Audio	Audio board installed	2.29 Vdc
ALE	ALE board installed	2.50 Vdc
ALE GPS	ALE board installed	2.73 Vdc
Encryption	Encryption board installed	2.71 Vdc
Noise Blanker	Noise blanker installed	2.95 Vdc
FSK Remote	FSK remote board installed	3.59 Vdc
DHSL Remote	DHSL remote board installed	3.80 Vdc
Option 1	Option 1 board installed	4.04 Vdc
Option 2	Option 2 board installed	4.26 Vdc
Option 3	Option 3 board installed	4.42 Vdc
Option 4	Option 4 board Installed	4.61 Vdc
* Result is 0.53 Vdc when filter board bad or missing, 5 Vdc when good		

21.7.2 Other Diagnostics

While the BITE system is extremely useful in troubleshooting down to the board level, there are other diagnostics that can be performed on the TW7000. Identifying faulty boards in a malfunctioning transceiver is one of logical deduction and analysis. For example, if the BITE system indicates a fault in a particular board, replace the board and run BITE again. If there is no BITE fault indication and the TW7000 is still not functioning properly, other diagnostics can pinpoint the problem.

The most frequent transceiver symptoms are listed below and offer logical troubleshooting techniques to identify a faulty board.

TW7000 Doesn't Turn On

1. Check the external power source. Its voltage under load should be between 11 and 16 Vdc; otherwise, the radio does not turn on because the high/low voltage protection circuit inhibits it.
2. Check the DC power cable. Measure the DC voltage at the **+12VDC INPUT** terminal on the rear panel.
3. Check the rear panel fuse. Replace a blown fuse only if you have resolved the reason for its occurrence.
4. Check the front panel **POWER/VOL** switch. Ground the PWRON line to verify proper switch operation.
5. Check the Power Supply board voltages:

   +12V: J29, A1, A2, A3, B1, B2, B3

   +12 UNREG: J29, A4, A5, B4, B5

   +12V ACC: J16-25, J17-26, J25-26, J18-10

   +5V: J29, A9, A18, B9, B10

   +12 VPA: E2

Chapter 4 describes where each of these generated DC voltages are used in the TW7000.

No Front Panel Control

If the TW7000 is not responding to input from the keypad or any front panel controls, it is an indication that the main Processor board has a problem and must be reset.

1. Remove the radio's top cover and observe the LEDs mounted on the Processor board (refer to Figure 21-5 on page 21-24). If it is flashing, the Processor board is out of lock.
2. Turn the TW7000 off.
3. Verify the connectors on the Front Panel Assembly are secure.

4. On the Processor board, place the jumper provided at JU10 across the two pins at JU10-D. If a jumper is unavailable, substitute a metal object such as a screw driver.

CAUTION: Placing a jumper across JU10-D resets all data stored in RAM including channel and scan group settings to the default settings.

5. Turn the TW7000 on and allow it to go through its power-up sequence.
6. Turn the radio off and remove the jumper at JU10D.

   If these steps don't solve the problem, change the Front Panel Processor board to see if the problem is solved.

No Front Panel Display

If the LEDs on the Processor board are flashing or continuously lit, perform the following steps:

1. Reset the processor by placing the jumper provided at JU10 across the two pins at JU10-D. If a jumper is unavailable, substitute a metal object such as a screw driver.
2. Check the +12 UNREG to the front panel on J1 pins 3 and 4. The Front Panel Assembly is powered by the unregulated +12V and has its own onboard +5 and +12V regulators.
3. Check the main processor data lines (J1-31, 32). Toggling between 0 and +5V indicates data passing between the Front Panel Processor board and the main Processor board.

No Receive Audio Output

You can easily check the receiver path with a DC multimeter, a signal generator, and an RF voltmeter.

1. Connect the frequency generator to the antenna port with an input level of -50 dBm and a frequency set to generate a 1 kHz tone.
2. On the 75 MHz IF board, verify the onboard regulated voltages (+12V, +8V, +R8). The input RF signal level at J52 should be -51 dBm nominal at the channel frequency. The RF output level at J53 should be -41 dBm, nominal, at 75 MHz.
3. On the 5 MHz IF board, verify the onboard regulated voltages (+12, +8, +R8). The input RF signal level at J53 should be -41 dBm nominal, at 75 MHz. The output audio level at J5-21 should be 2.6 Vpp nominal.
4. On the Audio board, verify the onboard regulated voltages are +10 Vdc and +5 Vdc The input audio at
   J8-21 should be 2.6 Vpp nominal, and the output audio level at J8-7 should be 1.2 Vpp.

5. On the Front Panel Processor board, verify the audio input at J1 pin 30 (SQA). It should be 1.2 Vpp nominal. Turn the volume to maximum with the speaker on and check for speaker noise; you may have to replace the speaker or it may have a bad connection to the Front Panel Processor board. If input to the front panel and the speaker is correct, the problem is probably in the audio amplifier U14 on the Front Panel Processor board.

No Transmit Audio Output

The transmit path is checked in a similar manner as the receiver but in the opposite direction.

1. Apply a 1 kHz tone to the microphone input (J9, J10 pin 4).
2. On the Front Panel Processor board, verify the microphone input (J9, J10 pin 4). Check the audio output (PRIMICA) at J1 pin 25; it should be about 0.2 Vpp nominal. If the microphone input is correct but the audio output is bad, the problem is probably with the compressor amplifier U17.
3. On the Audio board, verify the audio input level at J8 pin 20; it should be 0.2 Vpp nominal, and the output (MODA) at J8 pin 8 should be 0.2 Vpp nominal.
4. On the 5 MHz board, verify the output of the +T8 onboard regulator. The audio input at J5 pin 8 should be 0.25 Vpp nominal, and the 75 MHz output at J53 should be -15 dBm, nominal.
5. On the 75 MHz board, verify the outputs of the +T12 and +T8V onboard regulators. The 75 MHz input at J53 should be -14 dBm nominal, and the channel frequency output at J60 should be +20 dBm nominal.
6. On the RF Power Amplifier board, verify the T12 and +12V PA input lines. The RF input at J10 should be +23 dBm nominal, and the output at J12 should be 200 Vpp nominal.

Other areas to check in the transmit path (if above tests are normal) include the input (J51) and output (J50) of the RF Filter board, and the antenna connector on the rear panel.

Note: *If the TW7000 doesn't go into transmit mode when you activate PTT, the problem could be the main transmit/receive relay on the RF Filter board, the PTT connection (pin 3) on the microphone jack, or Alpha 8 (Receive set RX only) is activated for that channel.*

Frequency Generation Problems

The BITE system checks the injection levels of all the LO's and the reference oscillator, so if it indicates a fault in the Synthesizer or either of the IF boards, it is possible the faulty board is the Synthesizer or the Reference/Control board. For example, if replacing the IF board did not clear the fault indication, then the Synthesizer board is probably the problem.

To verify the Synthesizer board is faulty, replace the synthesizer, or take the following measurements:

1. On the Synthesizer board, verify the output of the onboard +5 Vdc and +8 Vdc supply voltages. All LO levels: LO1 at J59 (75 to 105 MHz), LO2 at J54 (70 MHz) and LO3 at J55 (5.003 MHz with the radio set to USB) should be 0 dBm nominal, and the reference input level (J61) should be 1 Vpp, nominal at 16.777216 MHz.

   Note: *The LO frequencies should be stable, not changing. If any of the LO frequencies are drifting, the PLL on the Synthesizer board is not locked.*

2. On the Ref/Control board, verify the output of the onboard regulated +5, +8 Vdc, and +12 Vdc. The reference output signal level at J61 should be 1 Vpp nominal with J61 disconnected.

It is also possible the master oscillator is out of adjustment causing speech to sound garbled and the clarifier to offset needlessly. If this is the case, recalibrate the oscillator (refer to “Alignment Procedures” on page 21-22).

21.8 Main Processor Troubleshooting

The Processor board is not intended for repaired on site. The board is complicated and constructed with surface mount technology (SMT), requiring specialized soldering/desoldering equipment. Any troubleshooting should be performed by personnel experienced with these types of circuits. This section does not attempt to explain 68000 microprocessor operation. For processor troubleshooting suggestions, refer to the tables below.

21.8.1 Onboard LEDs

The onboard LEDs provide the following indications (refer to Figure 21-5 on page 21-24):

Table 21-4 Processor Board LED Indications

Diode	Indication
D1 (red)	Indicates the processor is locked up and not responding to commands or interrupts. This may also indicate a low supply voltage to the Processor board forcing the processor into reset. This LED should only be lit during power up. If lit, verify D4 LED is lit.
D4 (green)	Indicates the +5 Vdc supply is present. This LED should be lit during normal operation; if not, check J15 pins A29 (61), B29 (29), A30 (62) and B30 (30) for +5V. If +5 Vdc is present at any of the J15 connector pins mentioned above, but the D4 LED is not lit, replace the Processor board.
D5 (green)	Indicates the +8 Vdc supply is present. This LED should be lit during normal operation; if not, verify D6 LED is lit.
D6 (green)	Indicates the +12 Vdc supply is present. This LED should be lit during normal operation; if not, check J14 pins A31 (63), B31 (31); also check J15 pins A31 (63) and B31 (31) for +12V. If +12 Vdc is present at any of the J14 or J15 connector pins mentioned above, but the D6 LED is not lit, replace the Processor board.

Table 21-4 Processor Board LED Indications

Diode	Indication
D30 (green)	Indicates the +2.5 Vdc supply is present. This LED should be lit during normal operation; if not, verify D5 LED is lit.
D31 (green)	Indicates the +3.3 Vdc supply is present. This LED should be lit during normal operation; if not, verify D5 LED is lit.
D32 (yellow)	Indicates the FPGA (U8) CLK2 output is present and locked. This clock supplies the processor chip. This LED should be lit during normal operation; if not, replace the Processor board.
D33 (yellow)	FPGA (U8) CLK3 output is locked. CLK3 is not used.
D34 (yellow)	Indicates the FPGA is programmed. This LED should be lit during normal operation; if not, replace the Processor board.

Table 21-5 Troubleshooting the Processor Board

Indication	Action
Before troubleshooting the Processor board: • Verify the LEDs described in Table 21-4 above are correct (D1 should not be lit; the other LEDs should be lit). • Verify the jumpers described on Table 21-6 on page 21-23 are correctly installed.	
FAULT LED (D1)	Is D4 lit? Is D32 lit? Is D34 lit? These LEDs should be lit during normal operation; if not, replace the Processor board.
No front panel display	Same action as **FAULT** LED above. Verify the Front Panel Assembly board connectors (J1, J3 and J4) are secure.

Table 21-5 Troubleshooting the Processor Board

Indication	Action
No transmit or receive on COM1 (RS-232 and RS-485)	Verify jumpers JU22 and JU23 are installed on pins A and B. **For RS-232:** verify configuration resistors R51, R56, R62 and R64 are installed and R50, R57, R63 and R65 are not installed. **For RS-485:** verify configuration resistors, R50, R57, R63 and R65 are installed and R51, R56, R62 and R64 are not installed. **Note:** *R50, R51, R56, R57, R62, R63, R64 and R65 are located next to the solder pads for J15 on the PCB. This is the side opposite from the side with most of the IC chips.* Verify transmit signal (COM1TXD) on J15 pin 38 (A16). If there is no transmit signal, replace the Processor board.
No transmit or receive on COM2	Verify jumper A and B on JU26 are installed. Verify transmit signal (COM2TXD) on J15 pin 49 (A17). If there is no transmit signal, replace the Processor board.
AT7000B or AT/RAT1000B not tuning TW7000 to the antenna	Verify DC (12 Vdc) and RF power (125W) connections to the AT7000B. Press the **TUNE** button on the TW7000 front panel and verify a signal is present on the ATUTX line (pin 20) at the rear panel **ACCESSORY 3** connector; at pin 45 (A13)on Processor connector J15. Does front panel LCD display **BAD TUNE**? If there is no signal present on J15 pin 45 (A13) when the front panel **TUNE** button is pressed, replace the Processor board.

Table 21-5 Troubleshooting the Processor Board

Indication	Action
RAT1000C not tuning TW7000 to the antenna	Verify the DC (28 Vdc) and RF power (1000W) connections to the RAT1000C. Press the **TUNE** button on the TW7000 front panel and verify a signal is present on the ATUINIT line (pin 4) at the rear panel **ACCESSORY 2** connector; at pin 53 (A21) on Processor connector J15. Does front panel LCD display **BAD TUNE**? If there is no signal present on J15 pin 53 (A21) when the front panel **TUNE** button is pressed, replace the Processor board.
No external amplifier PTT operation	Verify a low on the AMPTT line at J15 pin 15 (B15). If the AMPTT line does not go low when PTT is pressed, replace the Processor board.
No AUXPTT operation	Verify a low on the AUXPTT line at J11 pin 15 (B11). If the AMPTT line does not go low when PTT is pressed, replace the Processor board.
No internal PTT operation	Verify the PTT (low) on J14 pin B11 (11). If the PTT signal at J14 is not low when PTT is pressed, replace the Processor board.
No external CW operation	Verify the EXTCWKEY signal at J15 pin A20(52). If the EXTCWKEY signal at J15 is not xxxx, replace the Processor board.
No radio board programming (SPI bus)	Verify the SPICLK (pin B13), SPITXD (pin B14) and SPIRXD (pin B15) on J14.
No receiver bar graph display on LCD	Verify the AGC input signal at J14 pin A18 (50). If the AGC signal is present but there is no bar graph display on the LCD, replace the Processor board.
No transmit bar graph display on LCD	Verify the PWRLVL input signal at J14 pin A20 (52). If the PWRLVL signal is present but there is no bar graph display on the LCD, replace the Processor board.

Table 21-5 Troubleshooting the Processor Board

Indication	Action
BITE does not run	Verify the BITE signal at J14 pin B12 (12).
Optional Parts	
Remote DHSL head TW7201I is not controlling TW7000.	Verify the AC or DC power and remote cable connections to the RT7201I Remote Head. Verify jumpers JU11A and JU12A are installed. Verify the DHSL receive signal (SER2RXD) at J14 pin B25 (57) and transmit signal (SER2TXD) at J14 B26 (26). If the remote head is functioning properly and the jumpers are properly installed, and if there is a receive signal J14 pin B25 but no output (FPTXD) to the Front Panel Assembly at J14 B19, replace the Processor board.
Remote FSK head TW7201F is not controlling TW7000	Verify the AC or DC power and remote cable connections to the RT7201F Remote Head. Verify jumpers JU11A and JU12B are installed. If the remote head is functioning properly and the jumpers are properly installed, and if there is a receive signal J14 pin B25 but no output (FPTXD) to the Front Panel Assembly at J14 B19, replace the Processor board.
7000ALE is not functioning	Replace the Processor/7000ALE board.
7000ALE-141B option is not working	Make sure the 7000ALE-141B is securely mounted on the Carrier board and the Carrier board is securely installed in the ALE option slot (next to the Processor board. Make sure jumpers JU11B and JU13A are installed. If the jumpers are installed correctly but there is no ALE functionality, replace the Processor board.

21.9 Alignment Procedures

Alignment procedures (after the replacement of a board) include the transmitter ALC adjustment and master oscillator calibration on the Reference/Control board, and the option jumper settings on the Processor board.

21.9.1 Transmit ALC Adjustment

The transmit ALC adjustments are located on the Reference/Control board.

1. Measure the regulator voltage, U2 pin 16, +5.0 ±0.25V, U5 output 8.0 ±0.4V.
2. Make the following adjustments to R1 and R22 (located close to the non-beveled edge of the board) until no further adjustment is required:
   - Adjust R1 (high power set) for a transmit output power of 100W average, single tone at 14.75 MHz.
   - Adjust R22 (low power set) for 10W average, single tone at 14.75 MHz.
3. Remove the load from the wattmeter. Key the radio in high power and adjust R29 (reverse power set) for 12W of reflected power using a 3:1 load (three 50 ohm loads connected in parallel).

21.9.2 Master Oscillator Calibration

The master oscillator is also located on the Reference/Control board.

1. Terminate the radio into a 50 ohm load and monitor the RF output with a frequency counter.
2. Set the radio to 30.0 MHz.
3. Set the radio to AME mode and key PTT.
4. Adjust the reference oscillator TCXO until the output frequency reads the same as the selected channel frequency (as displayed on the front panel).
5. Verify the transmit frequency at 2.0 MHz and at 15.0 MHz. The frequency error should not exceed the specification for the installed oscillator option.

21.10 Jumper Settings

The Processor board includes multiple configuration jumpers to accommodate a wide variety of system functions and options. Table 21-6 below provides an overview of the jumper settings and their functions. Figure 21-5 on page 21-24 shows the location of the various jumpers as well as adjustment potentiometers and indicator diodes.

Table 21-6 TW7000 Option Enable Assignments

Jumper	Function	A to B/ Installed	B to C/ Not Installed	Default Position
JU5	RAM BATT	BATT	NO BATT	Installed
JU10A	ACH OPT	ACH OPT	No connect	Not installed
JU10B	None	None	No connect	Not installed
JU10C	S/W UPGRD	S/W UPGRD	No connect	
JU10D	RAM CLR	RAM CLR	No connect	
JU11A	DUART3 SEL (REM)	DUART3 SEL	No connect	Not installed
JU11B	DUART4 SEL (ALE)	DUART4 SEL	No connect	Installed
JU12A	DHSL SEL	DHSL SEL	No connect	Not installed
JU12B	FSK SEL	FSK SEL	No connect	Not installed
JU12C	None	None	No connect	Not installed
JU12D	None	None	No connect	Not installed
JU13A	ALE OPT	ALE OPT	No connect	Installed
JU13B	None	None	No connect	Not installed
JU13C	None	None	No connect	
JU13D	ALE LOAD	ALE LOAD	No connect	
JU20	None	Installed	No connect	
JU22	COM1 SEL	COM1/COM2 ACC1 RX	REM RX	A to B
JU23	COM1 SEL	COM1/COM2 ACC1 TX	REM TX	A to B
JU24	ALE DSP CLK	DSP OSC	NO DSP OSC	Installed
JU25	GPS BATT	GPS BATT	NO GPS BATT	Not installed
JU26A	COM2	COM2 TXD	GPS TXD	Installed
JU26B	COM2	COM2 RXD	GPS RXD	Installed

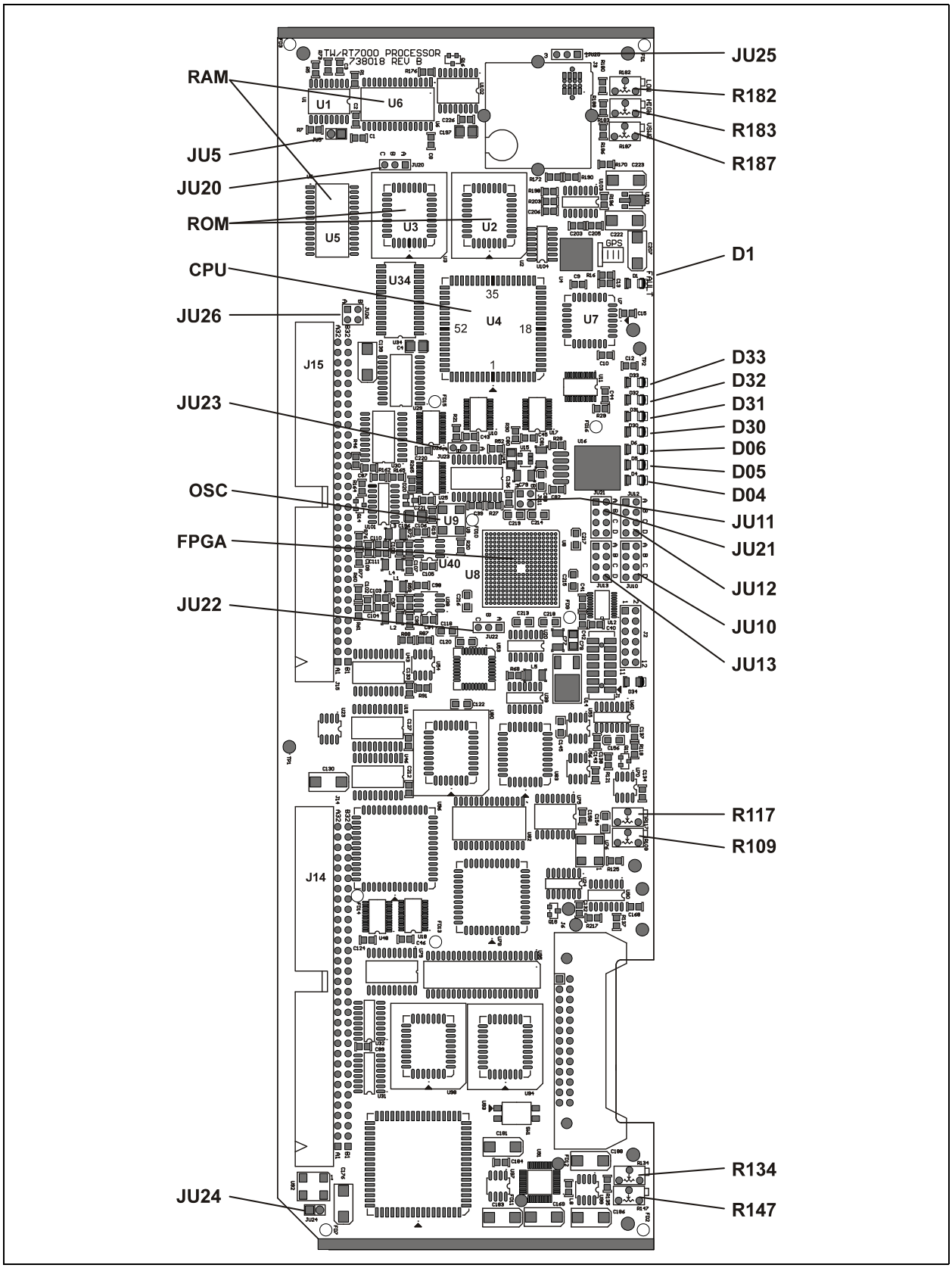


Figure 21-5 TW7000 Jumpers and Adjustments Locations

JU5 RAM Battery Jumper	The JU5 jumper enables the RAM backup battery. The default setting is the A-B position. This jumper is for voltage and current checking on the RAM backup battery.
COM2 Source Select Jumpers	The JU26 jumpers route the COM2 serial communications through the RS-232 driver U34 connected to the rear panel **ACCESSORY 2** connector.
JU10 - DUART1 Configuration Jumpers	The JU10 jumper bank configures the TW7000 for upgrading firmware and clearing RAM. **JU10A** activates the ACH option that gives the radio 1000 channels. This is only used with the 32K x 8 RAM (62256 or 62257) for U5 and U6. **JU10B** is not currently used. **JU10C** clears only the necessary RAM variables to enable a software upgrade. This does not disturb any of the channel or scan group programming. **JU10D** clears the entire RAM space and loads all default channel information and scan groups.
JU11 - DUART2 Configuration Jumpers	The JU11 jumper bank selects optional DUART3 and DUART4 installations. **JU11A** enables DUART2. For DUART2 configuration information, refer to the JU12-DUARTE3 Configuration Jumper section below. **JU11B** enables DUART4. It lets the processor know the chip is installed and ready for programming. For DUART4 configuration information, refer to the JU13-DUART4 Configuration Jumpers section below.
JU12 - DUART3 Configuration Jumper	The JU12 jumper bank enables the selected UART for the DHSL or FSK remote options. **JU12A** enables DUART3 DHSL remote UART. Enable this jumper with JU11A to establish communications with the ECU/RCU board. **JU12B** enables DUART3 FSK remote UART. Enable this jumper along with JU11A to establish communications with the ECU/RCU board. **JU12C** is not currently used. **JU12D** is not currently used.

JU13 - DUART4 Configuration Jumpers

The JU13 jumper bank enables the selected UART for the ALE options.

JU13A enables the DUART4 ALE UART. Enable this jumper with JU11B to establish communications with the ALE board.

JU13B is not currently used.

JU13C is not currently used.

JU13D loads the ALE card with default configurations.

To perform a default load:

1. Make sure the ALE option is installed and turned on.
2. Turn the radio off and install a jumper on JU13D, then turn on the radio. **LOADING ALE** displays. It may take up to 90 seconds to load ALE.
3. When loading is finished, the front panel LCD displays **LOAD DONE** and the radio starts scanning.
4. Remove jumper JU13D and put it in a safe place.

JU20

JU20 jumper is not currently used.

JU22 and JU23 COM1 Source Select Jumpers

The JU22 and JU23 jumpers enables the TW7000 to be controlled by a remote computer terminal using the serial RS-232 or RS-422/423/485 protocol through the rear panel **ACCESSORY 1** connector.

This collection of jumpers and configuration resistors route the COM1 serial communications through the RS-232 driver to the rear panel **ACCESSORY 1** connector, or through the RS-422/485 driver also connected to **ACCESSORY 1**.

Note: *Configuring the Processor board for RS-422/423/485 protocol involves removing configuration resistors R51, R56, R62 and R64 and installing resistors R50, R57, R63 and R65. Contact Datron Customer Service for details and resistors for converting from RS-232 protocol to RS-422/423/485 protocol.*

Note: *The Processor board cannot be configured for use of both RS-232 and RS-422/423/485 protocols.*

21.11 Board Functional Tests

21.11.1 Power Supply Board Test

This test procedure requires the following equipment:

- Multimeter
- Power supply 0 to 20 Vdc minimum
- 3 Jumper cables

Ohmmeter Test

1. Check the following points for shorts to ground: J26 pin 2, J20 pin 9, J20 pin 4, J20 pin 6, J20 pin 12, and J20 pin 11(if shorted, repair before applying power).
2. Check the following points for resistance; all readings should be 100 ±5 ohms:

J25 pin 5 to J21 pin 25	J25 pin 12 to J21 pin 22
J25 pin 6 to J21 pin 12	J25 pin 14 to J21 pin 9
J25 pin 7 to J21 pin 24	J25 pin 16 to J21 pin 21
J25 pin 8 to J21 pin 11	J25 pin 18 to J21 pin 8
J25 pin 9 to J21 pin 23	J25 pin 20 to J21 pin 20
J25 pin 10 to J21 pin 10	

Voltage Measurements

1. Apply 13.8 Vdc to the radio. Turn the radio on and check the following points for correct voltages:

J26 pin 2	13.8 ±0.2 Vdc
J26 pin 1	13.8 ±0.2 Vdc
J20 pin 9	13.8 ±0.2 Vdc
J20 pin 10	13.8 ±0.2 Vdc
J22 pin 21	13.8 ±0.2 Vdc
J20 pin 4	12.0 ±0.6 Vdc
J20 pin 5	12.0 ±0.6 Vdc
J20 pin 16	12.0 ±0.6 Vdc
J20 pin 17	12.0 ±0.6 Vdc
J24 pin 2	13.8 ±0.5 Vdc

J20 pin 6	12.0 ±0.6 Vdc
J20 pin 7	12.0 ±0.6 Vdc
J20 pin 18	12.0 ±0.6 Vdc
J20 pin 19	12.0 ±0.6 Vdc
J20 pin 22	13.8 ±0.2 Vdc
J20 pin 12	5.0 ±0.25 Vdc
J20 pin 13	5.0 ±0.25 Vdc
J20 pin 24	5.0 ±0.25 Vdc
J20 pin 25	5.0 ±0.25 Vdc

2. Check the voltage protect circuit. Connect the voltmeter to J20 pin 4. 12.0 ±0.6 Vdc should be present. Vary the power supply from 10.5 Vdc to 16 Vdc. The voltage at test point should drop to zero when the power supply is at or below 10.0 Vdc and at or above 15.8 Vdc.

21.11.2 Audio Board Test

These test procedures require the following equipment:

- SINAD meter/AC voltmeter
- RF signal generator
- Oscilloscope
- Two-tone test box
- Multimeter
- 12V power supply
- Wattmeter
- TW7000 test radio
- Extender card set

RX Test

1. Install the Audio board on the extender card. Turn the radio on. Measure the input of U15 10.0 ±0.5 Vdc, output 5.0 ±0.25 Vdc.
2. Set the USB mode to 15.59 MHz. Set the signal generator to 15.591 MHz, -113 dBm. RX tone should be present. SINAD should measure 10 dB or better.
3. Turn the speaker off and the volume to maximum. Set the signal generator to -95 dBm. Press the SINAD meter AC volts button. It should measure approximately 3 Vdc or better. Turn the volume to its middle level and turn the speaker on.
4. Turn squelch on. The RX tone should mute. Vary the signal generator up, then back, by 1000 Hz. Squelch should open, then close. Turn off the squelch.

TX Test

1. Set the TW7000 to 14.75 MHz. Key the radio with the two-tone test box set to single tone. Check for 100 ±20W output. Unkey the radio.
2. Turn off the single tone and key the radio with CW. Check for 100 ±20W.

21.11.3 Reference/ Control Board Test

These test procedures require the following equipment:

- Frequency counter
- 100W Dummy load
- Wattmeter with 250W slug
- Two-tone test box
- Extender card set

Input/Output Signals

1. Reference the signal output at J61; frequency = 16.777216 MHz Level = 1 Vpp.
2. Forward power input (FWDPWR) at J3-15.
3. Reverse power input (RVSPWR) at J3-14.
4. External amplifier ALC input (AMPALC) at J3-10.
5. ALC output (RAWALC) at J3-12.
6. Power level output (PWRLVL) at J3-23.

Adjustments and Measurements

1. With a DMM, measure the 5V regulator voltage at U2 pin 16, It should read +5.0 ±0.25 Vdc. Measure the 8V regulator at U5; it should be 8.0 ±0.4 Vdc.
2. Verify that the oscillator is stabilized.
3. Set the radio transmit frequency to 30.0 MHz and the radio mode to USB AME.
4. Key the PTT.
5. Measure the RF output of the radio and adjust the oscillator for 30.0 MHz.
6. Verify the transmit frequency at 15.0 MHz and 2.0 MHz. The frequency error should not exceed the specification for the installed oscillator option.
7. Repeat the following adjustments to R1 and R22 until no further adjustment is required:
   - Adjust R1 (high power set) for a transmit output power of 100W average, single tone at 14.75 MHz.
   - Adjust R22 (low power set) for 10W average, single tone at 14.75 MHz.

8. Remove the load from the wattmeter. Key the radio in high power and adjust R29 (reverse power set) for 12W of reflected power using a 3:1 load (three 50 ohm loads connected in parallel).

Miscellaneous Test

1. Verify the radio's low pass filter select by setting it to the following frequencies. The pin for the filter should be logic low with all other Filter board pins logic high.

Pin	Filter	Frequency
18	FB1	1.6 MHz
18	FB1	2.74 MHz
6	FB2	2.75 MHz
6	FB2	3.99 MHz
19	FB3	4.0 MHz
19	FB3	6.24 MHz
7	FB4	6.25 MHz
7	FB4	8.99 MHz
20	FB5	9.0 MHz
20	FB5	13.49 MHz
8	FB6	13.5 MHz
8	FB6	20.99 MHz
21	FB7	21.0 MHz
21	FB7	30.0 MHz

2. Key the radio at 30 MHz and ground J3-10. The power out should reduce.

Digital TX Power Adjustment

1. Key the radio in high power at 14.75 MHz.
2. Check for low power at approximately 10W, medium power at approximately 25W, and high-power at approximately 100W with Alpha 5 set to the default settings for each power level (refer to the TW7000-MSOP operator manual for information on the Alpha menu and function 5).

21.11.4 Synthesizer Board Test

These test procedures require the following equipment:

- Oscilloscope
- SINAD meter
- Frequency counter
- Spectrum Analyzer

- Multimeter
- Power supply 0 to 20 Vdc
- Wattmeter
- -30 dBm Attenuator dummy load
- Two-tone test box
- Signal generator
- Extender card set

Alignment

1. Set the power supply for 13.8 Vdc.
2. Connect DMM to junction C28 and R71. Adjust L7 for a nominal tuning voltage of 2.5 ±0.25 Vdc.
3. Connect the oscilloscope probe to J54 and verify the output voltage is 1.3 ±0.2 Vpp. The output should be clean and stable.
4. Place the oscilloscope probe on the bottom of R15 above J55 and adjust L1 for exactly 3 Vdc (ensure the oscilloscope is set for DC).
5. Place the oscilloscope probe on U3, pin 3 (set the oscilloscope to a 10 mV scale, 20 ms time). Adjust L13-L17 for a maximum signal (approximately130 mVpp minimum).
6. Set the radio frequency to 30.0 MHz. Carefully adjust L5 for 10.0 ±0.25 Vdc at U5, pin 1.

Miscellaneous Test

1. Measure the voltage at U5, pin 8 for 9.0 ±0.5 Vdc.
2. Verify that the RX tone is present with the signal generator set at -113 dBm and 8.001 MHz, and the radio at 8 MHz USB. SINAD should be approximately 10 dB or better. At -75 dBm level, the audio should be approximately 3 Vdc or better with maximum volume and the radio's speaker off.
3. At -113 dBm input, check SINAD at various frequencies from 1.6 to 30 MHz (this verifies that the synthesizer is locking).
4. With the signal generator set to 8.001 MHz +6 dBm level, turn the carrier off, then on. The RX tone should sound normal.

TX Test

1. Connect the dummy load to the oscilloscope (2V scale, 0.5ms time). At 8 MHz, key the radio with the test box (set to +10 dBm). The TX wave should be approximately 100W with no distortion.

2. Key the radio again at 2 MHz and 29.999 MHz. TX wave should be approximately 100W with no distortion.

Input/Output Signals

1. The reference input signal at J61 should read 16,777,216 Hz. The level should be 1 Vpp.
2. The first LO output signal at J59 should read 75 to 105 MHz. The level should be 0 ±2 dBm.
3. The third LO (BFO) output signal at J55 should read 5.000 MHz (LSB) and 5.003 MHz (USB). The level should be 0 ±2 dBm.
4. The second LO output signal at J54 should read approximately 70.000 MHz. The level should be 0 ±2 dBm.

21.11.5 75 MHz IF Board Test

These test procedures require the following equipment:

- Oscilloscope
- SINAD meter
- Multimeter
- 0 to 20 Vdc power supply
- Wattmeter
- 50 ohm, -30 dBm attenuator dummy load
- Two-tone test box
- Signal generator
- Extender card set

RX Test

1. Turn on the radio and check the input and output of U8. The input should be 8.0 ±0.4 Vdc, and output 5.0 ±0.25 Vdc.
2. Set the radio to 8 MHz and the signal generator to 8.001 MHz, -113 dBm. Turn the volume control to the maximum clockwise position with the speaker off, and peak both variable inductors (L35, L36) for maximum audio as indicated on the two-tone test box. The level should be approximately 3 Vdc or better. Set the volume to the 12:00 position.
3. Set the radio to 15.59 MHz USB and set the RF signal generator for 15.591 MHz with -113 dBm output. Test the radio at 1.65 MHz. The SINAD reading should be 10 dB or higher.
4. Change the signal generator output to -93 dBm. Select **ATTN** on the TW7000 front panel to turn the attenuator on. The SINAD reading should be 10 dB or higher. Select **ATTN** to turn the attenuator off.

TX Test

Note: *While keying the radio, the two-tone test box should be +10 dBm, 1 tone, and the reference potentiometer in the 2:00 position.*

1. Key the radio at 14.75 MHz. The output on the wattmeter should be approximately 100 ±20W.
2. Verify that the low and medium TX power is functioning.

21.11.6 5 MHz IF Board Test

These test procedures require the following equipment:

- TW7000
- Oscilloscope
- Voltmeter
- SINAD meter
- RF signal generator
- Two-tone test box
- Wattmeter with a 250W element
- 12V power supply
- Extender card set

RX Test

1. Turn the radio on and check the voltage at U5. Input should be 8.0 ±0.4 Vdc and output 5.0 ±0.25 Vdc.
2. Set the radio to 15.59 MHz (USB). Turn the speaker off. Turn the volume control to its maximum clockwise position.
3. Set the signal generator to 15.591 MHz. Set the signal generator to a level just below clipping of the wave form on the scope.
4. Adjust L1 and L3 for maximum output, lowering the level of the signal generator to maintain no clipping.
5. Set the volume to its middle position.
6. Set the signal generator to -113 dBm and check the SINAD on both USB and LSB. They should be 10 dBm or higher.
7. Check the AGC.
8. Put the oscilloscope probe on J5-21. Set the signal generator to -20 dBm.
9. Observing the oscilloscope, set R52 for maximum audio just before clipping occurs. Change the signal generator to +6 dBm. If there is clipping, slightly readjust R52.
10. Vary the signal generator from +6 dBm to -70 dBm. There should be no more than 3 dB of change on the AC voltmeter.

TX Test

1. Set the radio to 14.75 MHz USB.
2. Key the radio on single tone. Power out should be 100 ±20W.
3. With the two-tone box off (no tone), and the radio set to USB AME, key the radio.
4. Adjust R102 for 25W.
5. Unkey and set the radio to LSB AME.
6. Key the radio. Power out should be 40 ±10W. Unkey the radio.

   Note: *The power out value can be adjusted to maintain 10 to 80W at 2 to 30 MHz*

7. Set the reference potentiometer to the maximum counterclockwise position and the selector switch to off.
8. Set the TW7000 to USB PCS mode.
9. Key the PTT and adjust R101 for 2.5W.
10. Set the TW7000 to USB.
11. Key the transceiver without modulation input and read the residual carrier output. The reading should be -50 dBm or lower (more negative).

21.11.7 Squelch Test Procedure

This test requires the following equipment:

- RT7000
- RF signal generator
- 12 Vdc power supply

1. Connect the generator and dummy load to the test radio.
2. Turn the TW7000 on.
3. On the Processor board, measure the regulator output at U60 pin 11. The voltage should be 8.0 ±0.4 Vdc.
4. Set the squelch potentiometer R117 so the radio stays squelched without receive audio input.
5. Set the TW7000 to 15.59 MHz (USB mode) with the squelch and speaker on. Set the signal generator to 15.590 MHz at –95 dBm.
6. Vary the generator up by 1 kHz.
7. Vary the generator frequency down by 1 kHz. Squelch should open, then close.
8. Turn off squelch and verify that it is disabled.

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