Service Manual

SYSTEM 5000™

ELECTROSURGICAL UNIT

ConMed® CORPORATION

LIMITED WARRANTY

For a period of two years following the date of delivery, CONMED Corporation warrants the CONMED System 5000™ Electrosurgical Generator against any defects in material or workmanship and will repair or replace (at CONMED's option) the same without charge, provided that routine maintenance as specified in this manual has been performed using replacement parts approved by CONMED. This warranty is void if the product is used in a manner or for purposes other than intended.

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U.S. Patent Nos. 4,961,739 - 5,152,762 - 5,626,575- 6,830,569 - 6,835,082 - 6,875,210 - 6,939,347 - D477,082 - D477,408.

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The revision level of this manual is specified by the highest revision letter found on either the inside front cover or enclosed errata pages (if any).

Manual Number 60-8017-ENG Rev. R 01/08

Unit Serial Number_______________________________

Table of Contents
& List of Illustrations

Theory of Operation
Section 3.0

System 5000™ functions and essential circuit information are provided in this section. This section begins with a description of the key parameters for each mode. This is followed by an overview of how the system functions and some key operational information for the modules within the system.

3.1 Mode Descriptions

The key functional parameters for each mode are presented here. Nominal mode specifications are provided in section 1.2.11.

3.1.1 Cut Major Modes

Major mode	Minor Mode	RF frequency	Modulation: Number of Pulses, Time on/off	Modulation: Frequency & period
CUT	PURE	391 KHz	None	None
	BLEND 1	391 KHz	16 pulses 40μs/10μs	20 KHz 50μs
	BLEND 2	391 KHz	11 pulses 28μs/23μs	20 KHz 50μs
	BLEND 3	391 KHz	10 pulses 26μs/24μs	20 KHz 50μs

Activation of Pulse Cut will make the selected cut mode, Pure Cut, Blend 1, Blend 2, or Blend 3 active for 70 milliseconds every 600 milliseconds.

NOTE: The low duty cycle of Pulsed Cut mode makes the average power very low – about 12%– when compared with the power displayed on the front panel. The period is also long causing most ESU analyzers to provide erratic or erroneous readings. Correct power can be verified by measuring the peak to peak current and comparing the value with the current measured in the non-pulsed mode.

3.1.2 COAG Major Modes

Major mode	Minor Mode	RF frequency	Modulation: Number of Pulses, Time on/off	Modulation: Frequency & period
COAG	PINPOINT	391 KHz	4 pulses 10μs/40μs	20 KHz 50μs
	STANDARD	562 KHz	Single pulse	39 KHz
	SPRAY	562 KHz	Single pulse	19 KHz

Activation of Pulse Coag will make the selected coag mode, either Standard or Spray, active for 2.5 milliseconds every 5 milliseconds. Displayed power setting will represent the average power being delivered which is approximately half the power delivered during the pulses.

Standard and Spray Coag modes are fundamentally different from the Cut modes in that the resonant circuit of the RF Amplifier and Transformer combination is excited by the energy of a single pulse, causing the resonant circuit to ring until the energy is dissipated. Circuitry in the amplifier provides further damping to dissipate the energy more quickly to minimize RF leakage effects. Spray Coag provides the maximum open circuit voltage for which the system is rated.

3.1.3 Bipolar Major Modes

Major mode	Minor Mode	RF frequency	Modulation: Number of Pulses, Time on/off	Modulation: Frequency & period
BIPOLAR	MACRO	391 KHz	None	None
	MICRO	391 KHz	None	None

3.1.4 Advanced Specialty Modes

Specialty Mode	Effect
General	Normal open surgery mode – Parameters noted above.
Fluids	Temporarily increases power upon activation for faster initiation. Duration and power increase vary with mode and power setting
Lap	Limits maximum peak voltage for safer laparoscopic surgery. This action does affect the load curves when in high impedance tissue, or using normally high voltage modes.

3.2 System Overview

Mains power is converted to electrosurgical output power through the High Voltage Power Supply (HVPS), the RF Amplifier, and the Transformer and Output sections of the system.

Mains power is converted to high voltage direct current power in the HVPS to supply the RF Amplifier. This universal input power factor corrected, single output, switch mode power supply is adjustable under software control with 10-bit resolution. The HVPS output and power factor correction sections of the HVPS can be enabled or disabled under software control. The HVPS uses a current mode two-switch forward converter topology with short circuit protection and over voltage limiting.

Pulses generated in the RF Controller are amplified to electrosurgical power and voltage levels in the RF Amplifier and Transformer portions of the power train. The RF Amplifier and Transformer form a resonant switched mode amplifier with multiple outputs that are selected on a mode-by-mode basis using relays on the primary and secondary side of the transformers. One transformer is used for monopolar outputs, while the other transformer is for the bipolar output.

Electrosurgical power flows from the RF Amplifier and Transformer sections to the Output section where the power is switched to the specific electrosurgical outputs. The Output section also has circuitry to detect activations from accessories and the circuitry to perform the Automatic Return Monitor (A.R.M.™) function to ensure the integrity of the dispersive electrode connection.

The power section also includes a number of output voltage and current sensors that are used by the RF Controller for control of power delivery and by the Monitor to detect errant output conditions.

The RF Controller is a Digital Signal Processor (DSP) that generates an RF Amplifier drive signal based upon measured parameters compared with settings-based parameters. The pulse train sequence is a settings-based parameter that is dependent on the selected mode. Target power, current limit, voltage limit, and impedance thresholds are all settings-based parameters derived from a load curve that is specific to the front panel power setting. The RF Controller samples electrosurgical output voltage and output current from sensors over 450,000 times per second and uses these sampled values to calculate output power and sensed impedance. The output power, output current, output voltage, and sensed impedance are compared with corresponding settings-based parameters of target power, current limit, voltage limit, and impedance threshold; respectively; and the RF Controller adjusts the width of individual pulses within each mode-based pulse train sequence in a closed-loop fashion to control corresponding output power. The RF Controller also adjusts the HVPS output more slowly, allowing adjustment of the RF Amplifier drive pulses

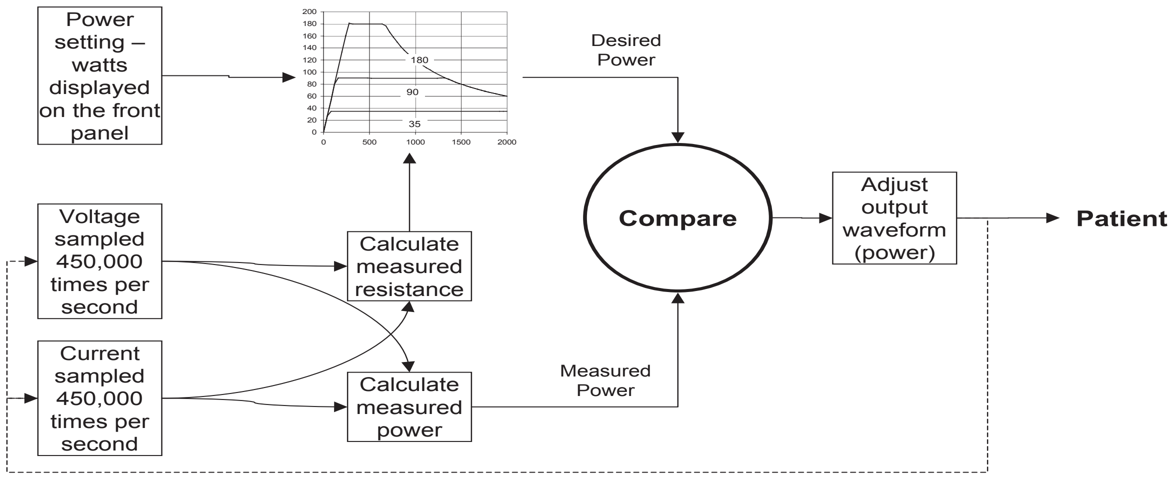

Figure 3.1 RF Controller Block Diagram

to optimize the electrosurgical output waveform. Finally, the RF Controller minimizes RF leakage currents using the CONMED Leakage Abatement System (CLAS™), which imposes a duty cycle on the electrosurgical output when sensed impedance and output voltage exceed settings-based impedance thresholds and voltage limits in the Coag modes.

The RF Monitor is also a DSP, but it is used to monitor the system for a variety of conditions that could lead to safety problems, including:

- The Monitor has independent sensors for output voltage and current, which it uses to calculate power for comparison with the power that the RF Controller senses and for comparison with the generator power setting.
- To ensure that the correct outputs are activated, the Monitor also independently senses current at each of the outputs, looking for current flow that would indicate electrosurgical power at outputs other than the selected output.
- The Monitor senses the voltage at the output of the HVPS to ensure that it is reasonable for the power setting.
- The Monitor senses the audio output to ensure that a tone occurs whenever electrosurgical outputs are active.
- The RF Amplifier drive signal is sensed by the Monitor to detect improper frequencies or improper pulse sequences for the selected mode.
- The Monitor independently compares the activation signal with that seen by the System Controller to ensure that the activation signal is consistent.

The Monitor has the capability to independently disable the electrosurgical output if a problem is detected.

The System Controller provides the primary control interface to the user and other outside systems, including the serial interface, the activation relay, tone generation, and displays.

Finally, the Display accepts all user input and provides all user feedback. The Display is controlled by the System Controller through a serial interface and illuminates the LED display elements in a time division multiplexed fashion; the illuminated LED display elements are actually on less than half the time. The Display also provides for user input through the buttons on the control panel, including switch de-bouncing and conditioning.

Figure 3.2 illustrates the key elements of the system in block diagram form.

3.2.1 High Voltage Power Supply (HVPS)

The HVPS is comprised of a Power Factor Control (PFC) section and a Forward Converter (FC) section. The PFC converts Mains power to approximately 400 volts using techniques that ensure the mains current into the supply is sinusoidal and in phase with the mains voltage. By doing so, RMS current and harmonic distortion are reduced. The Forward Converter then

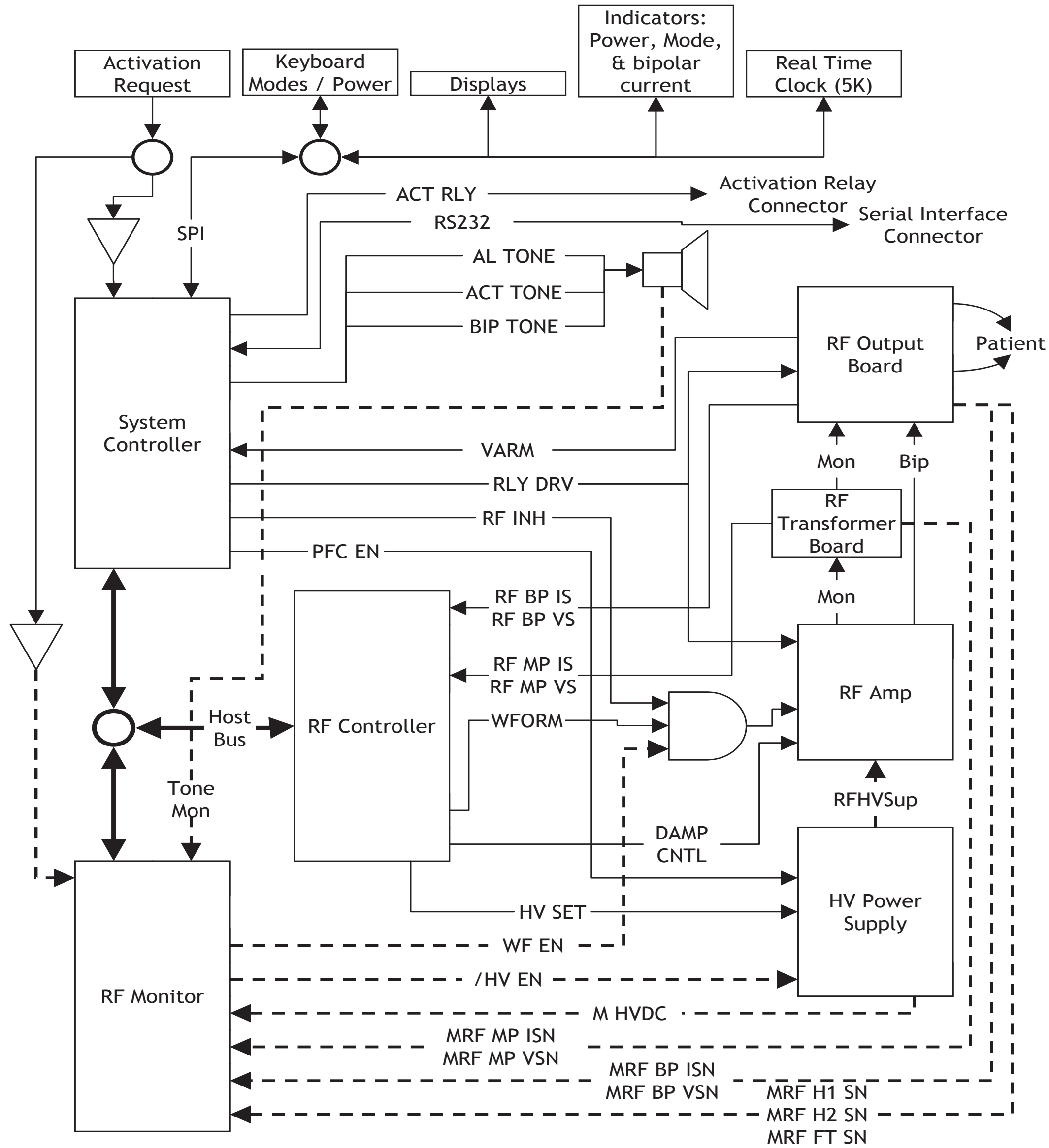

Figure 3.2 System Block Diagram

converts the PFC output to an adjustable DC voltage for use by the RF amplifier.

The System Controller can enable or disable the PFC section of the HVPS. The PFC is normally enabled during operation to ensure a resistive load is presented to the Mains.

The Forward Converter is a switch-mode power converter that adjusts its operating frequency between 25KHz and 100KHz to ensure proper resolution for the commanded output voltage. Isolation between Mains power and the HVPS output occurs in the Forward Converter. Forward Converter output voltage is set from the RF Controller by the /HVSET signal. The RF Monitor enables the output of the HVPS. The forward converter includes current limiting on the output and has provisions to shutdown when the output of the Low Voltage Supply exceeds limits.

3.2.2 RF Amplifier and Transformer

The RF Amplifier and Transformer portions use a switch-mode resonant amplifier to convert the power from the HVPS to the RF energy necessary for electrosurgery. One may think of the amplifier as a high-speed switch that pulses current through a resonant circuit, which is formed by the monopolar or bipolar transformer together with capacitors and inductors connected to the transformer primary and secondary windings. Two Metal-Oxide-Semiconductor Field Effect Transistors (MOSFETs) are connected in a parallel fashion provide the switching. The pulses to drive the gates on the MOSFETs in this arrangement come from the RF Controller. Adjusting the width of the drive pulses regulates the output power in this arrangement; as the pulses become longer, the output power increases. As noted in the RF Controller discussion, the RF Controller compares the output power with the desired power and adjusts the pulse width to minimize the difference.

A drive of several pulses at a frequency that closely matches the resonant frequency of the amplifier characterize Cut, Blend, and Pinpoint modes, and the output pulses substantially correspond to the drive. Spray and Standard Coag modes, however, are characterized by pulses that occur less frequently where the amplifier is allowed to "ring" at its resonant frequency. A damping capability is provided to enhance the surgical effect by damping the ringing effect for each drive pulse.

Because the transformer windings and the resonant frequencies between the cut and coag modes are different, a method of selecting resonating components is implemented using relays. These relays switch in the relevant components for the selected mode based upon commands from the System Controller.

A Balun transformer is provided for the monopolar modes to reduce differences between the source and return currents, thus reducing RF leakage.

Finally, the RF Amplifier and Transformer provide capabilities for sensing RF output current and voltage. These are transformer-isolated representations of the current flowing in the leads and the voltage across the output, which are supplied to the RF Controller and the Monitor processors.

3.2.3 Electrosurgical Outputs

Relays are provided to isolate electrosurgical outputs and select which outputs are active. The System Controller selects the appropriate output relays based upon activation command inputs.

The Monitor utilizes sensors implemented on each electrosurgical output to determine whether current is flowing only to the correct outputs. In the event that current flows in an output that is not selected, the Monitor can independently disable RF.

The System 5000™ output panel connectors are illuminated to aid visibility in low lighting situations. This illumination is provided by a single LED on the display board that is distributed to the receptacles through a fiber-optic bundle.

3.2.4 Activation Command Sensing

Each of the Hand Controlled Accessory receptacles incorporate inputs that are used to sense an activation command from the user. Each monopolar hand controlled accessory receptacle has an input for cut and an input for coag. The bipolar receptacle incorporates a single activation input. Each of these five inputs is isolated from the other electrosurgical outputs and from other low-level circuitry in the system. All are powered by a multiple output isolated power supply. The footswitch activation inputs on the back panel are configured in a similar way and share one of the isolated power supply outputs.

3.2.5 Automatic Return Monitor (A.R.M.™)

The patient return connector interfaces to single and dual dispersive electrodes using a two-pin connector. A.R.M.™ circuitry uses an actively driven impedance measurement circuit, which allows the System Controller to detect the type of dispersive electrode connected and verify its integrity.

3.2.6 Low Voltage Power Sources

The low voltage power supply is a medical-grade universal input offline triple output switching power supply. The power supply is active anytime Mains power is connected to the unit with the Mains power switch turned on.

3.2.7 System Controllers and Monitor

Three processors are used for system interface & control, RF control, and system monitor functions. The ESU control section consists of dual channel architecture with two independent channels where one is used exclusively for RF output control and the other is used for safety monitoring. All three of these processors are located on the Control board, along with circuitry to isolate them from RF noise.

- System Controller (System Microcontroller): A dedicated microcontroller that handles the entire user interface, Serial Interface, real time clock functions, and enables/disables the power factor control section of the HVPS using the PFC_EN signal. The System Controller can also disable the signal used to drive the RF Amplifier and can terminate RF drive at any time without interaction from either the RF Controller or the Monitor. The System Controller is comprised of an standard architecture microprocessor together with Field Programmable Gate Array (FPGA), which provides interface logic to a variety of signals, a 3.68MHz oscillator, independent voltage regulators, a processor supervisory reset circuit, and other interface logic.
- RF Controller: A DSP that is dedicated to the output and control of RF power using the DAMPCNTRL and RF_DRV outputs. To reduce the effects on the microprocessor circuits on the Controller board from RF noise at the output, DAMPCNTRL and RF_DRV are both differential mode signals running between the RF Controller and the RF Amplifier. The RF Controller is capable of disabling RF output power and putting the system into a safe state without any interaction from the Monitor or the System Controller. The RF Controller independently monitors the RF output voltage and current for control purposes through several scaled inputs. It sets the output voltage of the HVPS using the HV_SET signal dependent on the output Mode and power selected. The RF Controller controls the fan based upon temperature measurements supplied from the RF Amplifier through the System Controller. The RF Controller is comprised of a DSP, together with circuitry necessary for converting the signals used for control purposes between analog and digital form, independent voltage regulators, and other interface logic.
- RF Monitor: A DSP that is dedicated to safety monitoring activities. The Monitor is capable of disabling RF output power and putting the system into a safe state without any interaction from the RF Controller or the System Controller. To ensure that the Monitor can correctly perform its function, the Monitor is resistively isolated from the other two processors and has independent voltage regulation. The RF Monitor independently monitors a variety of inputs to detect safety problems and has control of disable signals for both the HVPS and RF Amplifier drive. The Monitor is comprised of the same DSP as the RF Controller, together with circuitry necessary for converting the signals monitored between analog and digital form, an FPGA to provide interface logic, independent voltage regulators, isolation resistors and other interface logic.

3.2.8 Low Voltage Power Monitoring

The low voltage power supply is monitored in hardware and resets the processors if it is out of range. The microprocessor supervisory device on the Controller board monitors +5V and +3.3V and will reset the system should the levels drop approximately 0.3V. The Controller assembly has the circuit that will reset the system should the 3.3V supply exceed 3.6V. The High Voltage power supply has a circuit that will inhibit HVDC should the +5V supply exceed 5.7V.

3.2.9 Operator Control Panel

Keyboard: The main operator input device for choosing operating modes and settings is the membrane keyboard panel. Tactile-feedback mechanical switches allow the operator to set modes and adjust power settings.

Display Panel: Consists of 7-segment displays, discrete dual colored LED's, and light bars that will display all controls and settings. LED display elements are illuminated in a time division multiplexed fashion; the illuminated LED display elements are actually on less than half the time.

Bipolar Current Meter: The System 5000™ has a bargraph display that provides an indication of measured bipolar impedance. A special tone works in conjunction with this bargraph to indicate when the measured bipolar impedance exceeds a particular limit.

3.2.10 Activation Tones

Tone is generated for all activation requests, fault detection and changes made on the Control Panel. The System Controller generates the tone signal (ACT_TONE, AL_TONE, & BP_TONE), which is amplified by a driver on the Backpanel PCB Assembly. The activation tone and bipolar tone are individually adjustable, but alarm tones are not adjustable and are set to generate tone greater than 65 dB.

Circuitry on the Backpanel PCB permits the Monitor to verify the oscillation from voltage measured across the speaker, which provides confirmation that the speaker is indeed generating audible tones during activation. RF output is inhibited should the speaker drive current be absent or too low.

3.2.11 Activation Relay Connector

There is an Accessory Relay Connector, which provides a relay closure (SPST switch) that may be used for activating external accessories such as smoke evacuation units.

3.3 Optional System Configurations

An eight-position configuration dipswitch (S2), located on the Controller PCB Assembly (A4) allows a qualified service technician to change some of the factory default settings. With the exception of the DACview switch, the configuration dipswitch settings are only detected when power is initialized, so any changes to the switch positions must be made with the main power off. Each switch is OFF in the Down position and ON in the UP position. The system detects changes in the DACview switch while power is on, so it is treated differently. Relevant information for the configuration dipswitches appears in Section 4.9.

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Maintenance
Section 4.0

This section contains information useful in the maintenance and repair of the System 5000™.

WARNING: High voltages are present at the connections and within the System 5000™. Maintenance personnel should take precautions to protect themselves. Read the safety summary in Section 1.1.4 before working on the ESU.

4.1 General Maintenance Information

Although the System 5000™ has been designed and manufactured to high industry standards, it is recommended that periodic inspection and performance testing be performed to ensure continual safe and effective operation.

Ease of maintenance was a primary consideration in the design of the System 5000™. Maintenance features of this unit include microprocessor aided troubleshooting aids and push button calibration, built in fault detection, circuit protection, and easy access to circuitry while the unit is operational. These features, coupled with the warranty, local support, loaner equipment, factory support, toll free phone service to the factory and available factory training ensure the user of a minimal maintenance effort with extensive support available.

4.2 Maintenance Personnel

Only qualified biomedical engineers should perform service on the System 5000™. Refer all servicing to a qualified biomedical engineer. If necessary, your CONMED sales representative will be happy to assist you in getting your equipment serviced.

4.3 Assembly Breakdown/Parts Access

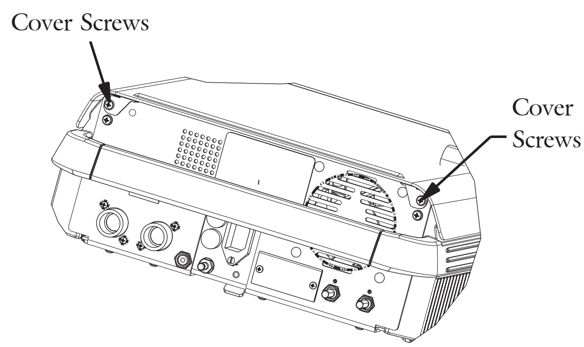
CAUTION: This device contains components that can be damaged by static electricity. Proper handling by grounding of personnel during servicing is mandatory.

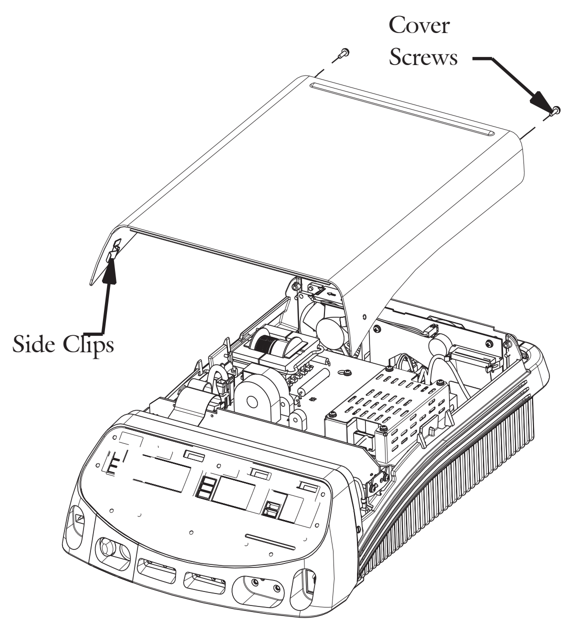
Following are instructions for unit disassembly and reassembly instructions.

4.3.1 Top Cover Removal and Replacement

<u>Top Removal</u>:

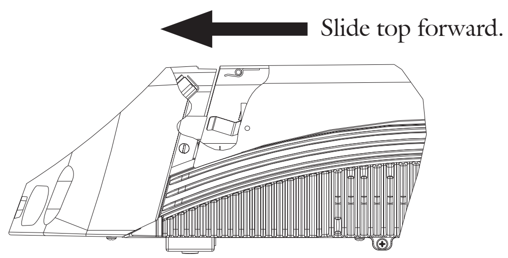
1) Remove the two screws located on rear of unit as shown.
2) Pull back and up to remove top.





Top Replacement:

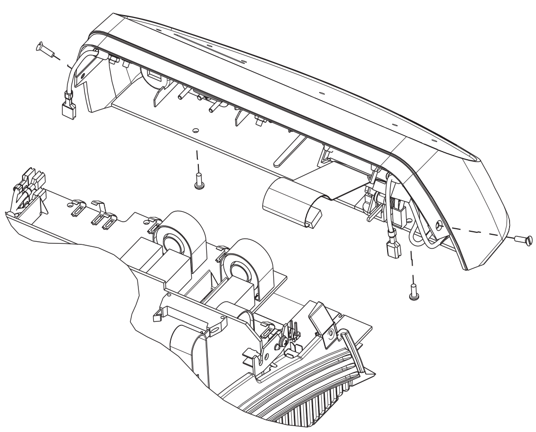
1) Place top approximately ¾” from front bezel on top of unit.
2) Press forward, aligning lip of front bezel with groove in top and side clips with tabs on casting.
3) Re-install screws.

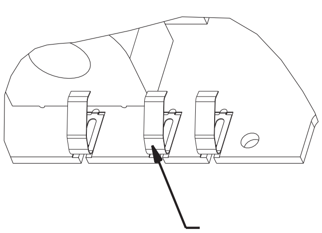


4.3.2 Bezel Removal and Replacement

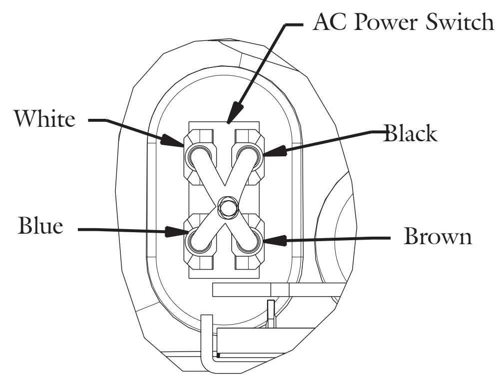
Bezel Removal:

1) Remove Top.
2) Remove two flat-head screws on side of bezel and two pan-head screws on bottom of bezel.



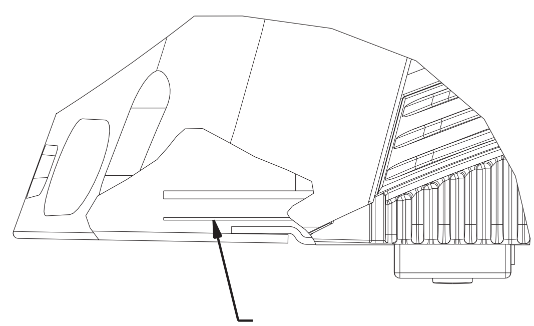


3) Unlatch display ribbon cable, dispersive electrode connector, ReadiPlug™ cable connector and two ground connectors.
4) In most situations, it is not necessary to remove the four power switch connectors. The bezel can be rotated off to the right side for output board removal. To fully remove the bezel, these connectors must be disconnected.



Bezel Replacement:

1) Connect power switch connectors as shown, if required.
2) Connect dispersive electrode connector and ReadiPlug™ cable connector prior to sliding bezel into place.
3) Slide bezel into unit. As shown in figure, the output board insulator is positioned between the sheet metal base and the Output Board.

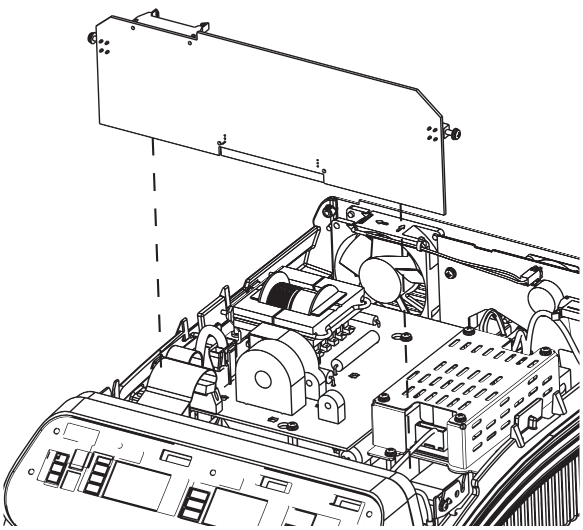


4) Reconnect cables and replace and tighten screws.

4.3.3 Processor Board Removal and Replacement

Processor Board Removal:

1) Remove Top.
2) Loosen the two screws holding the board to slots in the brackets.
3) Unlatch the ribbon cable going to the display.
4) Pull board up and out of unit.



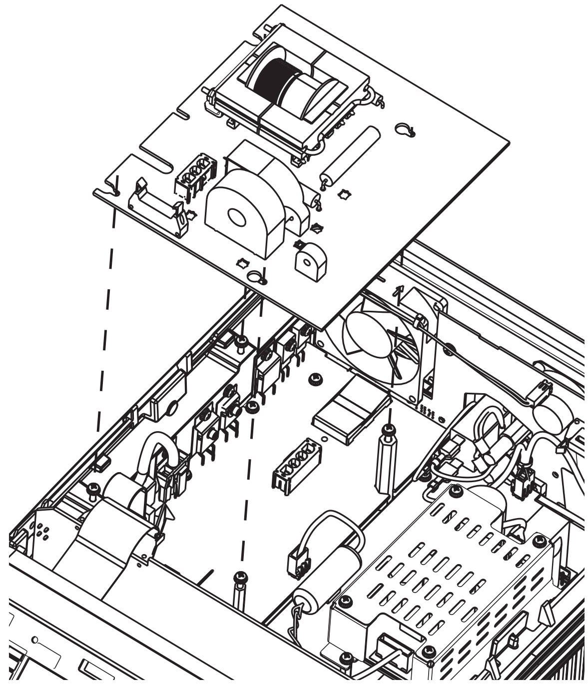
Processor Board Replacement:

1) Align board into the two slots of the brackets attached to the heatsinks. Align with connector on Output Board and press firmly to engage it fully. Tighten the two screws.

4.3.4 Transformer Board Removal and Replacement

Transformer Board Removal:

1) Remove Top.
2) Loosen the two screws mounting the board to the keyhole slots on standoffs and two screws mounting the board to the heatsink.

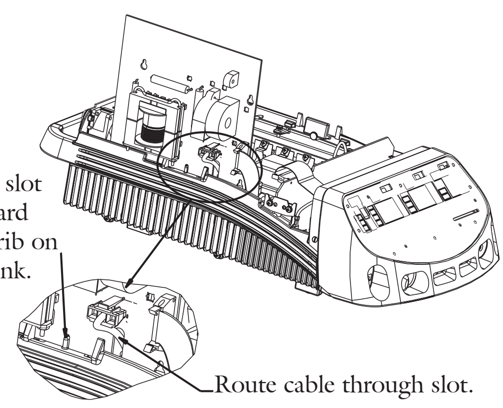


3) Unlatch the ribbon cable and power cable on the top of the board.
4) Pull board towards inside of unit so screws line up with keyholes, then up and out of unit. The power cable to RF Amp must be unplugged to completely remove transformer board.

Transformer Board Replacement:

1) Reverse board removal operation.

NOTE: When servicing unit, board can be supported in heatsink as shown. This will provide access to the lower boards while the unit is functional.



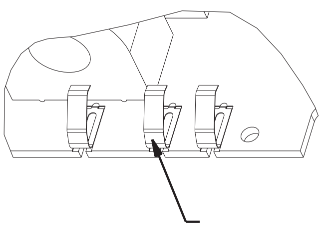
4.3.5 Output Board Removal and Replacement

Output Board Removal:

1) Remove Top, Bezel and Processor Board.

Note: It is not necessary to remove power switch connections from the bezel.

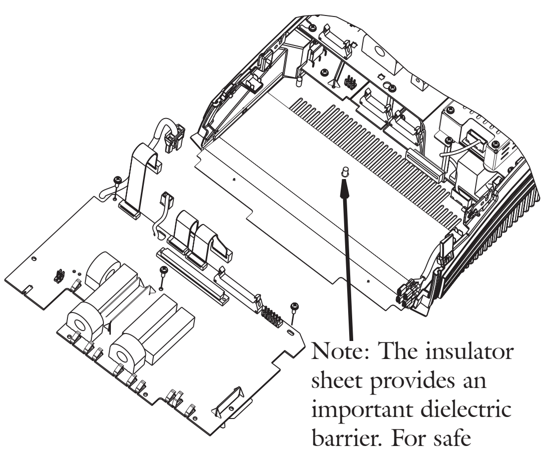
2) Remove the seven cables along the rear side of the board and the three screws shown.



Spring contacts are exposed and can be deformed, causing erratic operation. Handle with care.

Output Board Replacement:

1) Prior to replacing board, assure that the insulator sheet is positioned properly as shown.



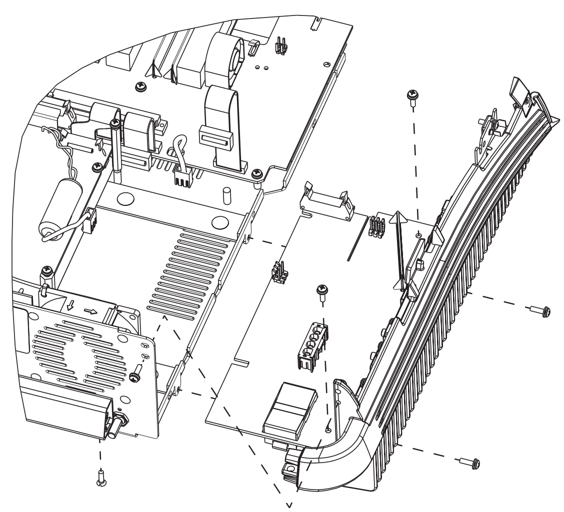
Note: The insulator sheet provides an important dielectric barrier. For safe operation, position over center standoff as shown.

2) Replace board on standoffs.
3) Route cables as they were prior to removal and connect them back to their proper connectors.
4) Replace and tighten the three screws.

4.3.6 RF Amp Board Removal and Replacement

RF Amp Board Removal:

1) Remove Top, Bezel and Transformer Board.
2) Remove the four screws that attach the heatsink to the sheet metal chassis. One for the handle, one on the back panel, and two below the heatsink. Remove the two screws that attach the board to the sheet metal chassis as shown. Note: These screws are in holes, not slots.
3) Unlatch three cables – two cables from the RF Output Board and a cable from the RF Power Supply Board.
4) Loosen the smaller hex standoff.
5) Slide RF Amp Board with heatsink off the base as shown.



RF Amp Board Replacement:

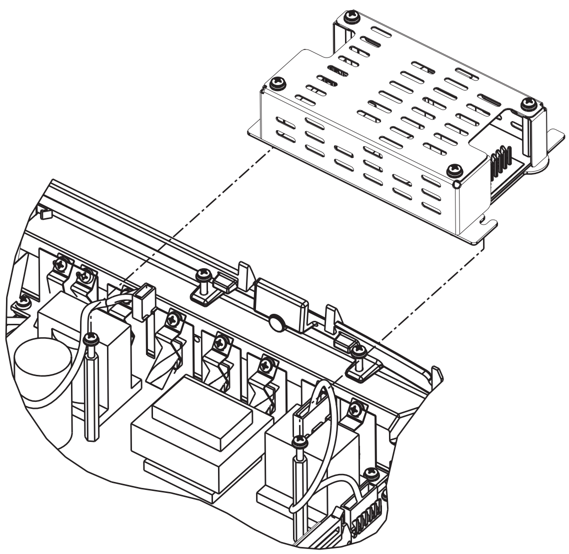
1) Slide board with heatsink back into its previous position on the sheet metal chassis. The heatsink has two pins that align into holes on the sheet metal chassis.
2) Tighten hex standoff onto board. It provides an electrical ground to Transformer Board.
3) Reinstall and tighten the six screws and latch the three cables.

4.3.7 Low Voltage Power Supply Module Removal and Replacement

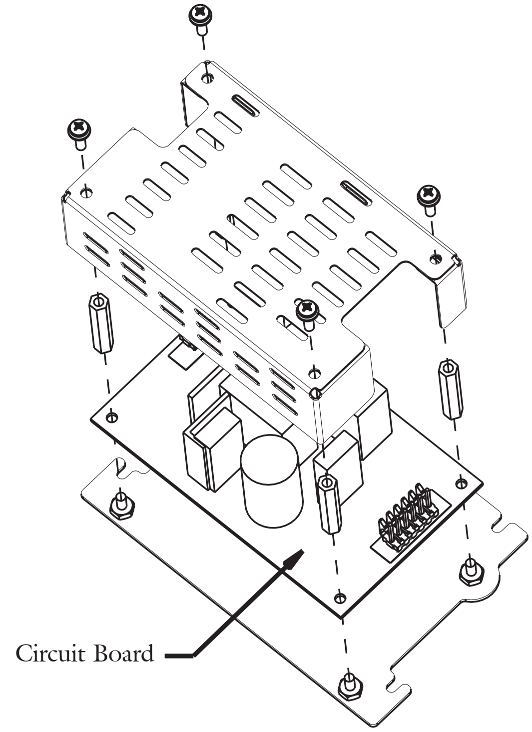
NOTE: This module is not user serviceable at the component level. If faulty, the entire circuit board must be replaced. Replacements are available from CONMED Customer Service. Do not discard the module cover, mounting plate and hardware; the replacement part includes only the circuit board.

Low Voltage Power Supply Module Removal:

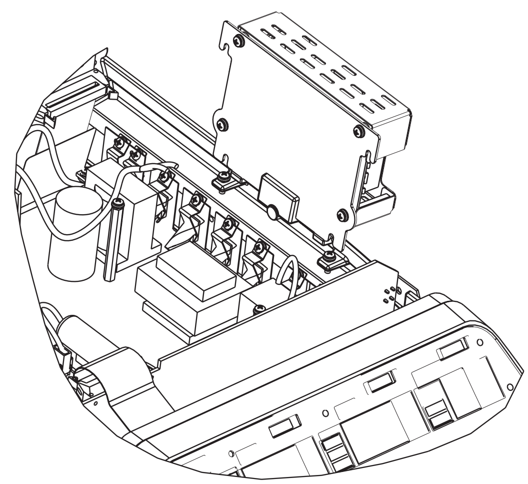
1) Remove Top Cover.
2) Loosen four screws located in slots and unlatch the two cables.
3) Slide Low Voltage Power Supply Module inward off the slots, then upward to remove.



4) Remove the cover by removing four screws. Then remove the four standoffs to separate the Low Voltage Power Supply from its mounting plate.



NOTE: When servicing unit, board can be held in heatsink as shown. This will provide access to the lower boards while the unit is functioning.



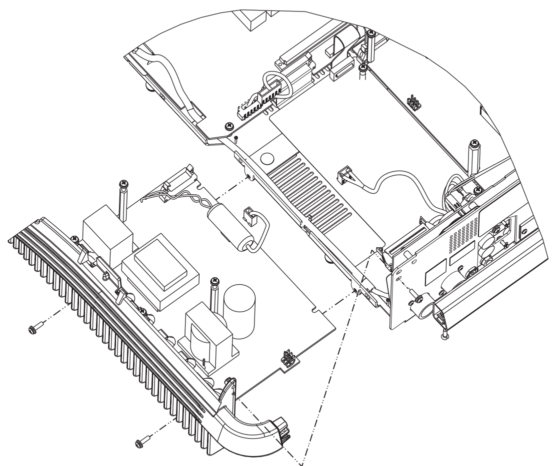
Low Voltage Power Supply Module Replacement:

1) Replace Low Voltage Power Supply on mounting plate, fasten standoffs, replace cover and tighten screws.
2) Place Low Voltage Power Supply Module into unit on standoffs. Tighten the loose screws and latch the two connectors.

4.3.8 High Voltage Power Supply Removal and Replacement

High Voltage Power Supply Board Removal:

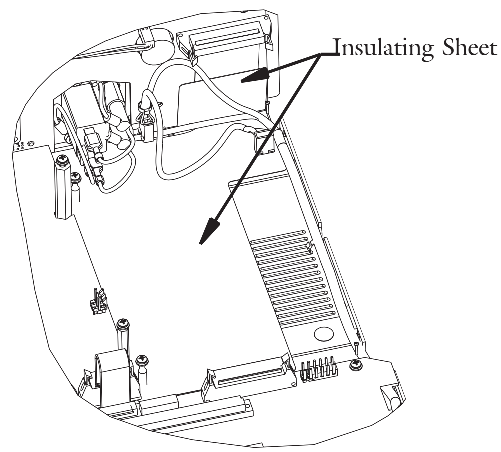
1) Remove Top Cover. Position Transformer Board in its servicing position to gain access to screws. If desired, remove the Low Voltage Power Supply.
2) Unlatch the Mains Power Cable, RF Amp Cable, and Output Board Ribbon Cable.
3) Loosen the two screws holding the edge of the board to the chassis.
4) Remove the screw to the handle, the screw to the back panel, the two screws on the bottom of the heatsink and slide out the heatsink with the board attached.



High Voltage Power Supply Board Replacement:

1) Slide board with heatsink back into its previous position on the sheet metal chassis. The heatsink has two pins that align into holes on the sheet metal chassis.
2) Reinstall and tighten the six screws and latch the three cables.

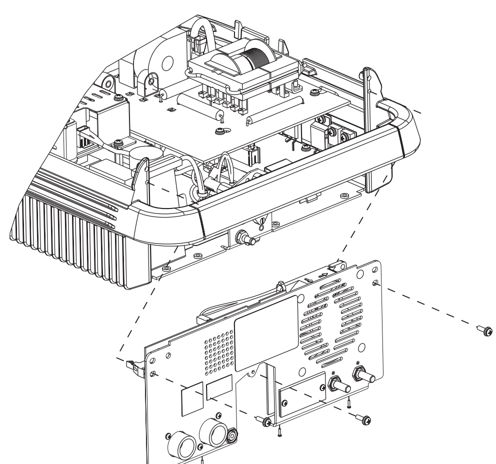
Note: Observe the position of the insulating sheet under the High Voltage Power Supply. If the insulating sheet is removed, replace it as shown. It is important to maintain its function as a dielectric barrier and to protect the ribbon cable from the leads of the High Voltage Power Supply Board.



4.3.9 Rear Panel with Board Removal and Replacement

Rear Panel with Back Panel Board Removal:

1) Remove Top Cover.
2) Unlatch the Ribbon Cable.
3) Remove the four screws on the bottom of the Rear Panel, and the three screws shown on the Rear Panel.



4) Slide the Rear Panel with Back Panel Board back toward the handle and then down to remove.

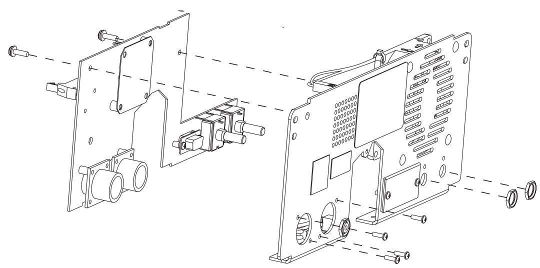
Rear Panel with Back Panel Board Replacement:

1) Slide Rear Panel with Back Panel Board back into place on the unit.
2) Reinstall and tighten the seven screws and latch the ribbon cable.

4.3.10 Back Panel Board Removal and Replacement

Back Panel Board Removal:

1) Remove Top Cover and Rear Panel.
2) Unlatch the Activation Relay and Fan connectors.
3) Remove the four screws for the foot switch connectors, the two nuts on the volume potentiometers and the two screws to the rear panel sheet metal standoffs. This will free the Back Panel Board from the Rear Panel.



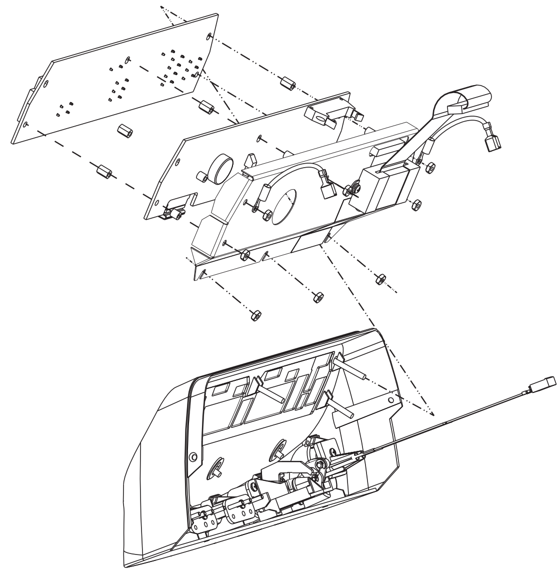
Back Panel Board Replacement:

1) Install Back Panel Board to Rear Panel
2) Reinstall and tighten the six screws, two nuts. Latch the RSA and fan cables.

4.3.11 Display Boards Removal and Replacement

Display Boards Removal:

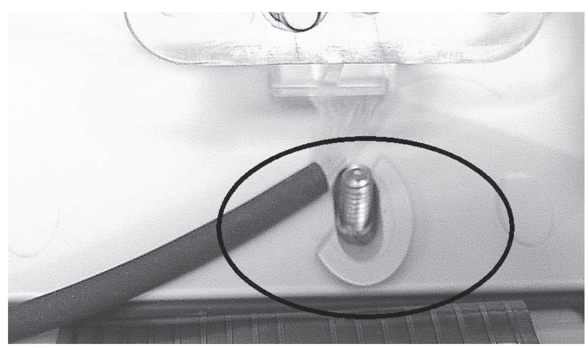
1) Remove the Top Cover and Bezel.
2) Remove 8 nuts and two ground cables on the back of the display shield.
3) Disconnect the ribbon cable and remove the sheet metal display shield.
4) Slide the round spacers off their studs.
5) Disconnect the flex circuit connector. Caution: The flex circuit has a short service loop and is fragile; handle with care.
6) Pull to disconnect the fiber optic cable from LED. Caution: The fiber optic cable is fragile; handle with care.



7) Remove the Display Controller Board by separating it from the display board and pulling it off the studs. There are two 40-pin connectors between these boards that may require separation by prying with a blunt object.
8) Remove the five hex standoffs and pull the Display board off the studs.

Display Boards Replacement:

Caution: When reinstalling Boards and display shield, take care to route fiber optic cable as shown to avoid crimping it between the bezel and display shield.



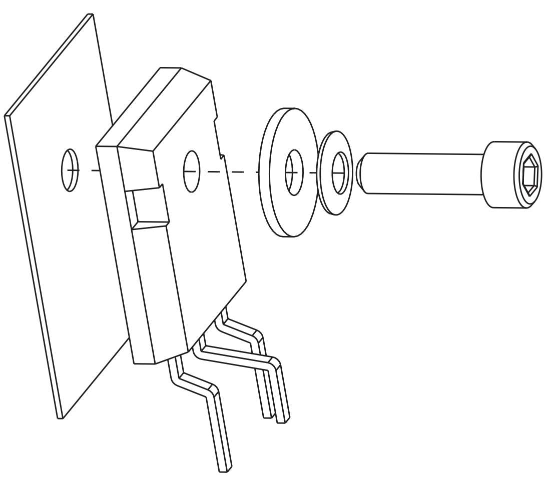
1) Reinstall boards in the reverse order described above. Latch the flex circuit connector, press fiber optic cable onto the LED and press the Display Controller Board firmly into place on the two 40 pin connectors.

4.3.12 Power Transistor Replacement

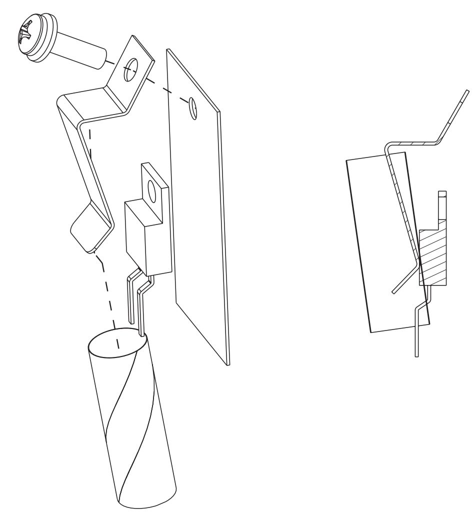
Caution: This device contains components that can be damaged by static electricity. Proper handling by grounding of personnel during servicing is mandatory.

All RF Power Supply and RF Amp components mounted to the heatsink may be replaced. **Use only components supplied by CONMED.** Follow these instructions for replacement:

1) No thermal compound is necessary, but the mating surfaces of the transistor, insulator pad and surface of casting should be clean. Always replace the insulator pad associated with the transistor. Always fasten or clamp the part to the heat sink surface prior to soldering it to the board. This will assure good thermal contact is maintained.
2) In order to maintain alignment with the heat sink surface, the leads of these parts have been bent to the proper shape. They should be purchased from CONMED with bent leads.
3) When installing the RF Amp transistors or diodes, be sure to orient the Bellville washer as shown with the convex surface next to the head of the screw. Tighten screws to 5-7 inch pounds.



4) When installing the RF Power Supply transistors or diodes, replace components as shown and ensure the insulating tube is installed over the clip. Locate the part on the clip so that the bend of the clip is approximately centered on the body of the part as shown. Tighten screw to 8-10 in-lbs. When tightening screw, hold the clip to prevent it from rotating. Clamp the part to the heatsink surface prior to soldering to the board.



4.4 Cleaning

The interior of the unit may be vacuumed or blown out as required. The exterior of the unit may be cleaned by wiping it with a cloth that has been dampened (not dripping) with a mild detergent such as Windex® or Formula 409®. Windex® is a registered trademark of the S.C. Johnson Company. Formula 409® is a registered trademark of the Clorox Company.

4.5 Periodic Inspection

The System 5000™ should be visually inspected at least every six months. This inspection should include checks for the following:

1) Damage to the power cord and plug.
2) The proper mating and absence of damage to the accessory connectors.
3) Any obvious external or internal damage to the unit.
4) An accumulation of lint or debris within the unit or heatsink.
5) Control Panel cuts, punctures, or dents.

4.6 Periodic Performance Testing

The System 5000™ should be tested for correct performance at least once every year. Every unit is supplied with a serialized Production Test Data Sheet that tabulates the results of the factory tests that were performed on the unit. This data is supplied so that it may be used as a reference for subsequent tests. Recommended periodic performance tests are listed in the following sections.

4.6.1 Chassis Ground Integrity

Connect a standard ohmmeter between the earth ground prong on the power plug and the Equipotential Ground Connection. Compensate for lead resistance. Confirm less than 0.2 ohms resistance is measured.

4.6.2 Displays, Alarms and Commands

Perform the Preliminary Functional Test procedure described in section 2.3.1 of this manual to verify proper operation of displays, alarms and commands.

4.6.3 Output Power

1) Equipment Requirements:
   a) Monopolar Footswitch
   b) Bipolar Footswitch
   c) Commercial ESU Tester (e.g. Dynatech 454A or equivalent) with 50 and 300 ohm loads for bipolar modes and a 500 ohm load for monopolar modes.

Note: Micro Bipolar is particularly sensitive to the load resistance. A 50 ohm load should be used for checking power to obtain the best results.

2) Use test leads to connect the ESU tester to the unit's return electrode output and the footswitch controlled active output. Set the Load resistance per mode as indicated in Tables 4.1 and 4.2.
3) Perform the monopolar power tests indicated in Tables 4.1 and 4.2. The acceptance range is given in both Watts and Amps to accommodate available test equipment. It is not necessary to test for both power and current.

Table 4.1 Monopolar Cut Mode RF Output Power Accuracy

Mode	Load (ohms)	Power Setting	Watts (min)	Watts (max)	Amps (min)	Amps (max)
Pure	500	10	7	13.0	0.118	0.161
Standard	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	200	180	220	0.600	0.663
	500	300	270	330	0.735	0.812
Blend 1	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	200	180	220	0.600	0.663
Blend 2	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	200	180	220	0.600	0.663
Blend 3	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	200	180	220	0.600	0.663

Table 4.2 Monopolar Coag Mode RF Output Power Accuracy

Mode	Load (ohms)	Power Setting	Watts (min)	Watts (max)	Amps (min)	Amps (max)
Spray	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	80	72	88	0.379	0.420
Standard	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	120	108	132	0.465	0.514
Mode	Load (ohms)	Power Setting	Watts (min)	Watts (max)	Amps (min)	Amps (max)
Pinpoint	500	10	7	13.0	0.118	0.161
	500	20	17	23.0	0.184	0.214
	500	50	45	55	0.300	0.332
	500	100	90	110	0.424	0.469
	500	120	108	132	0.465	0.514
Standard pulse	500	10	7	13.0	0.118	0.161
	500	20	17	23	0.184	0.214
	500	60	54	66	0.329	0.363
Spray pulse	500	10	7	13.0	0.118	0.161
	500	20	17	23	0.184	0.214
	500	40	36	44	0.268	0.297

4) Disconnect the ESU tester from the unit.
5) Use test leads to connect the ESU tester to the Bipolar Accessory outputs.
6) Perform the bipolar power tests indicated in Table 4.3. This table only provides the minimum number of points to be tested.

Table 4.3 Bipolar Mode RF Output Power Accuracy

Mode	Load (ohms)	Power Setting	Watts (min)	Watts (max)	Amps (min)	Amps (max)
Macro Bipolar	300	10	7	13.0	0.153	0.208
	300	20	17	23.0	0.238	0.277
	300	50	45	55	0.387	0.428
	300	90	81	99	0.520	0.574
Micro Bipolar	50	10	7	13.0	0.374	0.510
	50	25	22	28.0	0.663	0.748
	50	50	45	55	0.949	1.049

4.6.4 RF Leakage Measurement

RF Leakage can present a hazard in the operating room because electrosurgical currents can flow to the patient and operating room staff through unintended paths, which can cause injury. RF leakage occurs because the total energy in the output voltage waveform is provided with a conductive path through stray parasitic capacitance distributed within the generator and along the length of the leads. Table 4.4 presents the allowed RF leakage currents to ground.

Table 4.4 Allowable RF Leakage Current to Ground

MEASURED TERMINAL	ACTIVATED ACCESSORY	MODE	RF LEAKAGE (Ma)
Dispersive Electrode	Coag Footswitch	Standard Coag	< 100
Dispersive Electrode	Cut Footswitch	Pure Cut	< 100
Dispersive Electrode	Left Hand Controlled	Standard Coag	< 100
Dispersive Electrode	Right Hand Controlled	Standard Coag	< 100
Footswitched Active	Coag Footswitch	Standard Coag	< 100
Left Hand Controlled Active	Left Hand Controlled	Standard Coag	< 100
Right Hand Controlled Active	Right Hand Controlled	Standard Coag	< 100
Bipolar Right	Bipolar Footswitch	Bipolar Macro	< 67
Bipolar Left	Bipolar Footswitch	Bipolar Macro	< 67

Equipment:

- ESU Tester with RF Leakage function -OR-
- 0-250 mA RF Ammeter with a 200 ohm 10 W Non-inductive Resistor
- Patient Plate Adapter Plug
- 2 - Test leads, 1 m max. length
- 3 - Test leads, 10 cm max. length
- Wooden table approximately 1 m from floor.

NOTE: The CONMED Leakage Abatement System (CLAS™) controls RF leakage by pulsing the output to reduce the RMS voltage during open circuit conditions, thus keeping the hazardous energy below IEC safe limits. Use a measuring device that meets IEC specification for RMS measured over one second.

Procedure:

1) Ensure that the unit is fully assembled and all fasteners are tight.
2) Place the ESU tester or meter with resistor on the table so that they are at least 0.5m away from the unit under test and any other conductive surface.
3) Set the unit for full power for the modes noted in the table. Connect the ESU tester in accordance with the manufacturer's instructions -OR- connect the 200-ohm non-inductive resistor in series with the 250 mA RF ammeter to the Equipotential Ground Connection on the Rear Panel. Also make sure there are no connections to any output other than the one you are measuring.

WARNING: HAND CONTROL ACTIVATIONS SHOULD BE KEYED USING 3" OR LESS WELL-INSULATED JUMPER. USE OF AN INSULATING ROD TO INSERT THE JUMPER IS ADVISED TO PREVENT RF BURNS.

3) One at a time, connect test setup to each RF output terminal indicated in Table 4.4 and activate the unit using the corresponding command. Confirm no meter readings exceed the specified maximum. Hand control coag activations are accomplished by connecting a jumper between the left jack and center jack of the desired hand switched accessory jack.

RF leakage should also be measured between inactive outputs and the Dispersive Electrode connection. The procedure is as follows:

1) Set the unit for full power for the modes noted in Table 4.5. Connect the ESU tester according to manufacturer's instructions -OR- the 200-ohm non-inductive resistor in series with the 250 mA RF ammeter to the Dispersive Electrode connection on the front panel. Also make sure there are no connections to any output other than the one you are measuring.
2) One at a time, connect this series combination to each RF output terminal indicated in Table 4.5 and activate the unit using the corresponding command. Confirm that no meter readings exceed the specified maximum.

Table 4.5 Allowable RF Leakage Current - Inactive Monopolar Outputs

MEASURED TERMINAL	ACTIVATED ACCESSORY	MODE	RF LEAKAGE (Ma)
Footswitched Active	Left Hand Controlled	Standard Coag	<50
Footswitched Active	Right Hand Controlled	Standard Coag	<50
Footswitched Active	Bipolar Footswitch	Bipolar Macro	<20
Left Hand Controlled Active	Right Hand Controlled	Standard Coag	<50
Left Hand Controlled Active	Bipolar Footswitch	Bipolar Macro	<20
Right Hand Controlled Active	Bipolar Footswitch	Bipolar Macro	<40
Bipolar Left	Right Hand Controlled	Standard Coag	<48

Finally, RF leakage should be measured between the inactive bipolar outputs while a monopolar accessory is activated. Do the following:

1) Set the unit for full power for the bipolar mode noted in Table 4.6. Connect ESU tester according to manufacturer's instructions -OR- the 200-ohm non-inductive resistor in series with the 250 mA RF ammeter between the two bipolar output connections.
2) Activate and verify the limit in Table 4.6.

Table 4.6 Allowable RF Leakage Current - Inactive Bipolar Outputs

MEASURED TERMINAL	ACTIVATED ACCESSORY	MODE	RF LEAKAGE (Ma)
Bipolar Right to Left	Right Hand Controlled	Standard Coag	<48

4.6.5 Line Frequency Leakage

CAUTION: To prevent RF current from destroying the test equipment and/or affecting leakage readings, set all power settings to zero.

Circuit ground and the Neutral (Low MAINS) must be connected together for UUT MAINS leakage testing.

WARNING: Electrocution Hazard. DO NOT DISCONNECT circuit ground from Earth Ground unless an isolated MAINS power supply is used.

Equipment:

These tests are performed most conveniently using any good quality biomedical electrical safety tester.

Procedure:

1) Connect the electrical safety analyzer to make the measurements indicated in Table 4.7.
2) Mode: Measure leakage for Bipolar to Neutral and Chassis to Neutral.

Table 4.7 Line Frequency Allowable Leakage - Inactive

RF output to Neutral	LINE	GND	LIMIT max
Equipotential Ground	Normal	Closed	30 μA
Equipotential Ground	Reversed	Closed	30 μA
Equipotential Ground	Normal	Open	270 μA
Equipotential Ground	Reversed	Open	270 μA
Dispersive Electrode	Normal	Closed	15 μA
Dispersive Electrode	Reversed	Closed	15 μA
Dispersive Electrode	Normal	Open	15 μA
Dispersive Electrode	Reversed	Open	15 μA
Bipolar Output*	Normal	Closed	15 μA
Bipolar Output*	Reversed	Closed	15 μA
Bipolar Output*	Normal	Open	15 μA
Bipolar Output*	Reversed	Open	15 μA

*Measure the Bipolar Output with Bipolar connections shorted together.

5) Since the System 5000™ monopolar active outputs are disconnected by relays when the unit is not activated, active-to-neutral leakage tests must be performed with the unit activated in order to be valid.

6) With all power controls set to zero, measure the leakage current as in step 1 from each of the three active output terminals to neutral; see Table 4.8; while that output is activated in Cut by the appropriate footswitch or hand control jumper. Hand control cut activations are accomplished by connecting a jumper between the two outer jacks of where the handcontrol accessory is plugged into the unit.

Table 4.8 Line Frequency Allowable Leakage - Active

RF output to Neutral	LINE	GND	ACTIVATION	LIMIT max
Footswitched Active	Normal	Closed	Monopolar Footswitched Cut	15 µA
Footswitched Active	Reversed	Closed	Monopolar Footswitched Cut	15 µA
Footswitched Active	Normal	Open	Monopolar Footswitched Cut	15 µA
Footswitched Active	Reversed	Open	Monopolar Footswitched Cut	15 µA
Left Hand Controlled Active	Normal	Closed	Left Hand Controlled Cut	15 µA
Left Hand Controlled Active	Reversed	Closed	Left Hand Controlled Cut	15 µA
Left Hand Controlled Active	Normal	Open	Left Hand Controlled Cut	15 µA
Left Hand Controlled Active	Reversed	Open	Left Hand Controlled Cut	15 µA
Right Hand Controlled Active	Normal	Closed	Right Hand Controlled Cut	15 µA
Right Hand Controlled Active	Reversed	Closed	Right Hand Controlled Cut	15 µA
Right Hand Controlled Active	Normal	Open	Right Hand Controlled Cut	15 µA
Right Hand Controlled Active	Reversed	Open	Right Hand Controlled Cut	15 µA

4.6.6 Automatic Return Monitor (A.R.M.™) Check

A.R.M.™ has two specific ranges that will be tested initially and then the circuit will be tested to verify that the circuit measures dissipative electrode resistance correctly. For this testing, only a Decade Resistance Box (DRB) and a dispersive electrode cable adapter are required. Connect the DRB to the Dispersive Electrode Receptacle using the dispersive electrode cable adapter.

A.R.M.™ may be reset by disconnecting the dispersive electrode connector or adjusting the DRB above 10K Ohms until the Single and Dual Dispersive Electrode Status/Alarm Indicators flash red in alternating fashion. Allow approximately two seconds after the DRB is changed before proceeding to the next step in the procedure. A.R.M.™ indicators not mentioned in the procedure must be off for each test.

1) Dual Electrode Alarm Limit: Set the DRB to 158 Ohms, then connect it to the Dispersive Electrode Receptacle and verify that the Single and Dual Dispersive Electrode Status/Alarm Indicators flash red in alternating fashion.
2) Dual Electrode Upper Limit: Set DRB to 140 Ohms and verify that the Dual Dispersive Electrode Status/Alarm Indicator is flashing Green and a single bar in the Bargraph is illuminated.
3) Dual Electrode Lower Limit: Set the DRB to 15 Ohms and verify the Dual Dispersive Electrode Status/Alarm Indicator is flashing Green and eight bars in the Bargraph are illuminated.
4) Single Electrode Upper Limit: Set the DRB to 7 Ohms, then reset A.R.M.™ and verify the Single Dispersive Electrode Status/Alarm Indicator is Green and not flashing.

4.6.7 Output Coupling Capacitor Check

WARNING: ENSURE ALL POWER SETTINGS ARE AT 0 WATTS BEFORE CONDUCTING THIS TEST TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO TEST EQUIPMENT.

NOTE: Not all capacitance meters will read properly for this test. The test frequency should be at or below 1 kHz for best accuracy. The following meters have been tried successfully: Fluke 189, Extech 285, Sencor LC75 and HP4284A (1 kHz setting or below).

1. Connect shorting plug to banana adapter to the two pin Dispersive Electrode Receptacle. Use 6” or less test leads to connect a capacitance meter between the shorting plug adapter and the footswitched ReadiPlug™ Universal Accessory Receptacle.
2. Measure capacitance and confirm it is less than 0.5 nF.
3. Confirm cut power is set to 0, then activate and confirm capacitance is between 4.3 and 6.3 nF.
4. Do not activate for this bipolar test. Move test leads to Bipolar Output Accessory Receptacles. Confirm capacitance is between 9.6 and 14 nF.

4.7 System Calibration

The System 5000™ is calibrated during manufacture using equipment traceable to National Institute of Standards & Technology (NIST) standards and should retain its accuracy for a long period of time. Recalibrate the generator after repair or if it performs out of specification. Check the calibration in normal operating mode and only perform calibration if errors are identified.

The System 5000™ stores its calibration in non-volatile semiconductor memory, so the calibration will be retained without any action on the part of the user or maintenance staff. Calibration should be checked in normal operating mode during annual preventative maintenance to ensure there is no change. Calibration is required when:

- “Err 140” occurs: An error is detected with the stored calibration values.
- “Err 143” occurs: One or more modes require calibration.
- The Controller board assembly (P/N 61-6431), the Transformer board assembly (P/N 61-6445), or the Output board assembly (P/N 61-6461) is replaced.
- Calibration differences are found during preventative maintenance.

4.7.1 Calibration Preliminaries

Calibration on the System 5000™ occurs in Calibration Operating Mode, which is entered by setting the system configuration DIP switches on the Controller board. Set the Calibration system configuration DIP switch (A4SW2.2) to the ON (UP) position and the Test system configuration DIP switch (A4SW2.1) to the OFF (DOWN) position. Other configuration DIP switch settings positions will not affect this. See Section 4.9 for system configuration DIP switch details.

With this configuration set, turn on power while pressing and holding the Remote Power Control Key. Release the Key when you hear the 4-tone sequence. When the Remote Power Control Key is released, CAL will appear in the Monopolar Cut Power Digital Display and the software revision will appear in the Monopolar Coag Power Digital Display for a few seconds. The display will then provide an indication of the calibration status:

- “ALL” will appear in the Monopolar Cut Power Digital Display if the calibration memory is empty.
- “nEr” will appear in the Monopolar Cut Power Digital Display, where “n” indicates how many major modes require calibration, will be displayed if only particular modes require calibration. All of the minor mode indicators will be illuminated and the minor modes needing calibration will flash.
- “Cu”, “COA”, “bP”, or “PAd” will appear in the Monopolar Cut Power Digital Display to indicate the major mode when only minor modes under that major mode require calibration. All of the minor mode indicators will be illuminated and the minor modes needing calibration will flash.
- “Cu” will appear in the Monopolar Cut Power Digital Display with the Pure Cut Mode Indicator illuminated if all modes are calibrated.

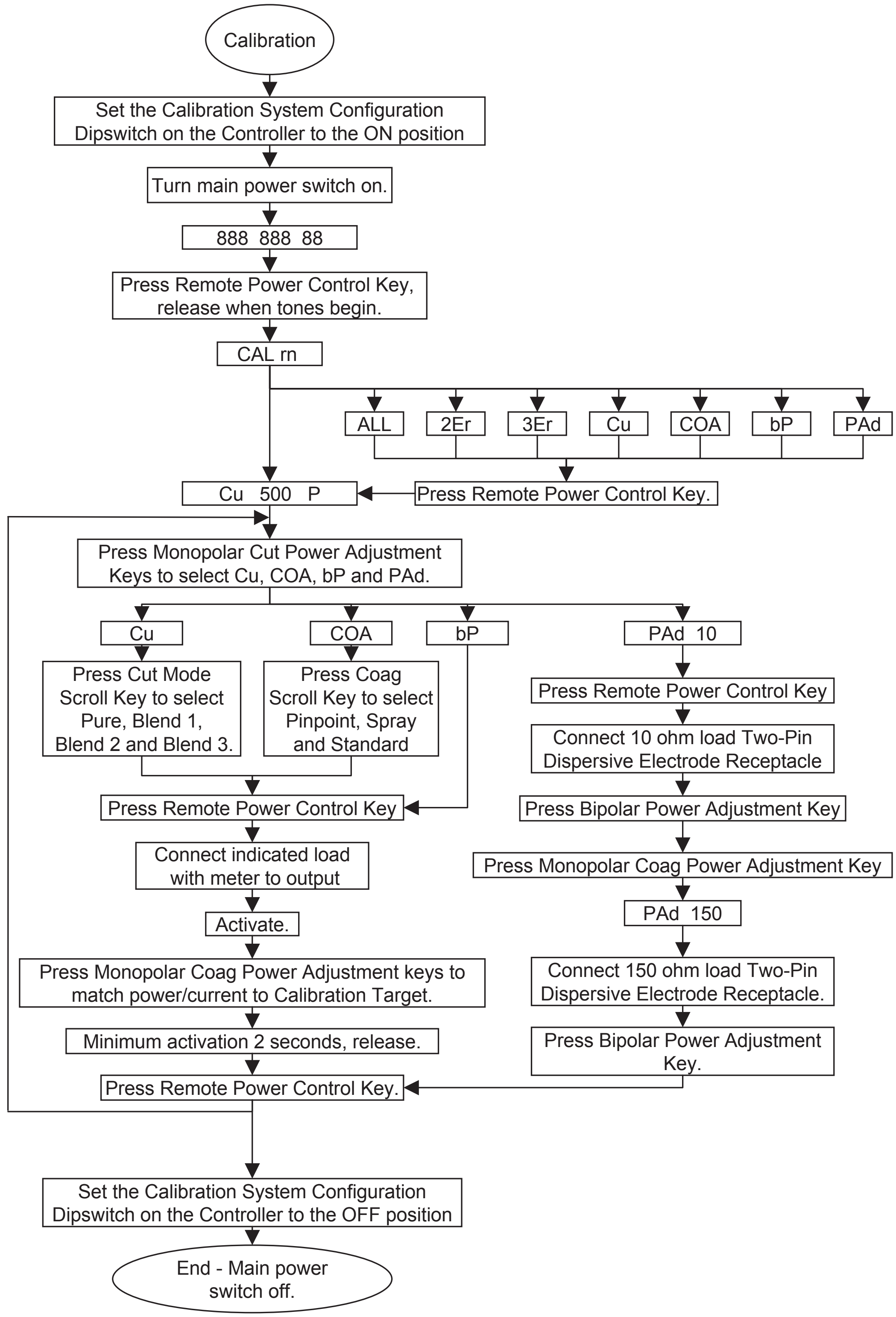


Figure 4.1 Calibration Procedure Flow Chart

For all except the last of these, a single Press and release of the Remote Power Control Key is required to proceed past this point on the menu. After pressing this key, "Cu" will appear in the Monopolar Cut Power Digital Display with the Pure Cut Mode Indicator illuminated.

4.7.2 Selecting the Mode to Calibrate

Press the Monopolar Cut Power Adjustment Keys to select the major mode to calibrate as displayed in the Monopolar Cut Power Digital Display. The selections are "Cu" for Cut, "COA" for Coag, "bP" for Bipolar, or "PAd" for the Dispersive Electrode A.R.M.™ connection. If any of the minor modes under these major modes are not calibrated, the displayed major mode will flash.

Scroll between the monopolar minor modes using the Cut Mode Scroll Key or the Coag Scroll Key, as appropriate. Macro Bipolar is used to calibrate both of the Bipolar modes, so no scrolling is necessary.

4.7.3 Calibrating a Monopolar Mode

This section applies to the Pure Cut, Blend 1, Blend 2, Blend 3, Pinpoint Coag, Standard Coag, and Spray Coag modes.

Calibration may be performed by measuring current or by measuring power. To select between calibration using measured current and measured power, press the Bipolar Power Adjustment Keys to set the calibration units to either "A" for current or "P" for power.

The resistance to be used for calibration will appear in the Monopolar Coag Power Digital Display. Connect a resistor of this value between the output connection that is being used for calibration and both pins on the Two-Pin Dispersive Electrode Receptacle.

Press and release the Remote Power Control Key to begin calibration. After this key is pressed, the target level appears in the Monopolar Coag Power Digital Display.

Activate using the appropriate Handswitch or Footswitch. Power will now flow to the resistor. While monitoring either the current or the power, adjust the power up or down using the Monopolar Coag Power Adjustment Keys until the measured value is as close to the target level as possible. The activation must be maintained for a minimum of 2 seconds to ensure the calibration is valid. After the power is properly adjusted, release the activation. Press and release the Remote Power Control Key to complete the calibration sequence for the selected minor mode.

After a minor mode has been calibrated, the associated minor mode indicator will quit flashing. When all of the minor modes within a major mode have been calibrated, the major mode indicated in the Monopolar Cut Power Digital Display will quit flashing.

4.7.4 Calibrating Bipolar Modes

The Bipolar modes are calibrated using a method that is very similar to the Monopolar modes. Both Bipolar modes are calibrated with a single calibration of the Bipolar Macro mode.

Calibration may be performed by measuring current or by measuring power. To select between calibration using measured current and measured power, press the Bipolar Power Adjustment Keys to set the calibration units to either "A" for current or "P" for power.

The resistance to be used for calibration will appear in the Monopolar Coag Power Digital Display. Connect a resistor of this value between the two active connections in the Bipolar Accessory Receptacle.

Press and release the Remote Power Control Key to begin calibration. After this key is pressed, the target level appears in the Monopolar Coag Power Digital Display.

Activate using the Bipolar Footswitch. Power will now flow to the resistor. While monitoring either the current or the power, adjust the power up or down using the Monopolar Coag Power Adjustment Keys until the measured value is as close to the target level as possible. The activation must be maintained for a minimum of 2 seconds to ensure the calibration is valid. After the power is properly adjusted, release the activation. Press and release the Remote Power Control Key to complete the calibration sequence for the Bipolar mode.

After the Bipolar mode has been calibrated, the Macro Bipolar Indicator and the major mode indicated in the Monopolar Cut Power Digital Display will both quit flashing.

4.7.5 Calibrating A.R.M.™

A.R.M.™ is calibrated against a pair of known resistances.

Press and release the Remote Power Control Key to begin calibration. The resistance to be used for calibration will appear in the Monopolar Coag Power Digital Display. Connect a resistor of this value ±1% between the two active connections in the Two-Pin Dispersive Electrode Receptacle.

Calibrate the particular value connected by pressing one of the Bipolar Power Adjustment Keys. When the value is accepted, a two-tone sequence will sound and the resistance in the Monopolar Coag Power Digital Display will quit flashing.

Now scroll to the other of the pair of known resistances using the Monopolar Coag Power Adjustment Keys. The resistance to be used for calibration will appear in the Monopolar Coag Power Digital Display. Connect a resistor of this value ±1% between the two active connections in the Two-Pin Dispersive Electrode Receptacle.

Calibrate the particular value connected by again pressing one of the Bipolar Power Adjustment Keys. When the value is accepted, a two-tone sequence will sound and the resistance in the Monopolar Coag Power Digital Display will quit flashing.

Press and release the Remote Power Control Key to complete A.R.M.™ calibration.

After A.R.M.™ has been calibrated, the major mode "PAd" indicated in the Monopolar Cut Power Digital Display will quit flashing.

4.7.6 Completing Calibration

Turn power off and set the Calibration system configuration DIP switch (A4SW2.2) to the OFF (DOWN) position. See Section 4.9 for system configuration DIP switch details. The ESU will be ready for normal operation the next time the power is turned on.

4.8 Last Fault Code Retrieval and Clear

Up to 20 error codes can be stored in memory for retrieval. Each error code stored is "date stamped" where the "time" and "date" the error occurred is also stored for retrieval. When retrieving the error codes, it is also possible to retrieve the system settings when the error occurred.

4.8.1 Last Fault Code Retrieval

1) Turn the Main power on. While the unit is powering up, press the PC key until a tone occurs. This action will place the system in the Last Fault Code Mode (LFC). Electrosurgical outputs cannot be activated while the system is in LFC.
2) For 3 seconds: "LFC" will be displayed in the Cut Window, which is for Last Fault Codes. The Coag window will display "rX", (where X is a numeric value for the software revision).
3) If any errors are stored in memory, the Cut Window will next display "Err"; the Coag window will display the error code (a numeric value); and the Bipolar Window will display the storage location of that error code.

Last Fault display

Pure Blend 1 Blend 2 Blend 3	Err	381	1

4) Scroll through the stored error codes using the Bipolar Power Adjustment Keys. The error codes are stored Last in, First out. A "1" in the Bipolar Display shows the last error that occurred. Press the Bipolar Up key and a "2" will be displayed if more than one error occurred.
5) To retrieve the date and time of the error, it is necessary to have a Handcontrol accessory connected. Press the Cut activation switch and the "time" that the error occurred is displayed. Press the Coag activation switch and the "date" that the error occurred is displayed. Press both Cut and Coag activation switches and the Display Panel will show the system settings when the error occurred.

Time Display: Press Handcontrol Cut Switch

Hours can be set for A.M. or P.M. The time is displayed as Hours - Minutes - Seconds.

Pure Blend 1 Blend 2 Blend 3	2P	23	12

Date Display: Press Handcontrol Coag Switch

The date is displayed as Month - Day - Year.

Pure Blend 1 Blend 2 Blend 3	09	28	04

6) If the date defaults to 01 01 01 or the time defaults to 12P 0 1, then the Real Time Clock battery is low or the clock was not set on the last service. The battery voltage must be 2V or greater for the Real Time Clock to run.
   a) The battery is being charged when the main power is turned on. It takes about 12 hours to charge the battery if the battery is fully discharged.
   b) To test the battery, connect a DVM to the battery lead that is visible through the hole on the display shield (backside of the Display PCB assembly). Connect the other lead of the DVM to the GND test point on the Controller Assembly (TP6). Test the battery voltage with the main power turned off. The battery voltage should be 3V or greater.
   c) Another way to test if the battery is charged it to set the clock and date. Turn off the main power and then turn the main power back on. Press the PC key while the unit is powering up to enter the Last Fault Codes. If the clock displays 12P 0 1, then the battery is not charged or taking a charge.

4.8.2 Clearing Last Fault Codes

As errors occur, fault codes from earlier errors are erased in a last-in-first-out fashion. While it is not absolutely necessary to clear the older codes, clearing the codes may be desirable in some situations.

- Pressing the Monopolar Cut Power Adjustment Down Key followed by the Remote Power Control Key will clear the entire fault code memory. The cut window will display "CLr" when codes are cleared.
- Pressing the PC key again will display the optional system configuration settings.

4.9 Displaying Optional System Configuration

The optional system configuration DIP switch settings can be checked without removing the top cover.

- Turn on the main power. While the system is powering up, press and hold the PC Key on the Display panel until the Test Tone starts.
- Last Fault Codes are displayed initially. The Cut window will display "LFC" and the Coag window will display the software revision number for approximately 3 seconds, then the Last Fault Code will be displayed. (See the section on Last Fault Codes.)
- Press the PC Key again and the configuration DIP switch settings will be displayed. "0" is for OFF and a "1" is for ON.

The eight-position configuration DIP switch (S2), located on the Controller PCB Assembly (A4) allows a qualified service technician to change some of the factory default settings. The default switch is only read during Power On Self Test (POST) or when the system is powered on, so any changes to the switch positions should be made with the main power off. Each switch is OFF in the down position and ON in the up position. Relevant information for each switch is described in Table 4.9 and the positions are illustrated in Figure 4.2.

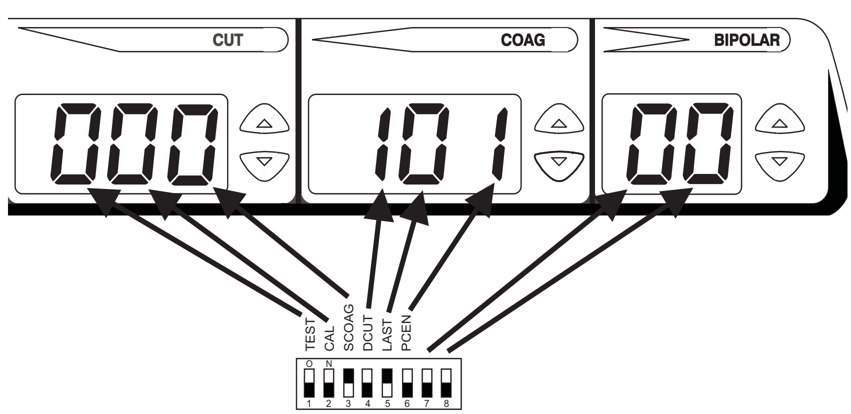


Figure 4.2 DIP Switch Positions

Table 4.9 DIP Switch Settings

Config. Switch Position	Title / Display Element	Default	Description for Off	Description for On
1	TEST / Cut 100's	Off	Run Mode. Required position for surgery.	Activates Test Mode, which inhibits most of the system level monitoring for trouble-shooting purposes. When this switch is ON, the Remote PC Switch on the Display Panel must be pressed until the Test Tone begins. If the Remote PC key is not pressed, and Err 100 is displayed and the power must be cycled.
2	CAL/ Cut 10's	Off	Run Mode. Required position for surgery.	Required for calibration of output power and A.R.M.™ When this switch is ON, the Remote PC Switch on the Display Panel must be pressed until the Test Tone begins. If the Remote PC key is not pressed, and Err 100 is displayed and the power must be cycled.
3	SCOAG / Cut 1's	On	Allows simultaneous activation of two accessories for Pinpoint Coagulation.	Allows activation of only one accessory for Pinpoint Coagulation. Spray and Standard Coagulation modes always allow simulta-neous activation of two accessories.
4	DCUT / Coag 100's	Off	Allows activation of only one active accessory in cut modes.	Allows activation of two active accessories in cut modes.
5	LAST / Coag 10's	On	Defaults to Pure Cut, Pinpoint Coag, and Macro Bipolar and sets all power levels to zero (0W) each time the system is initialized.	Defaults all modes and power levels to the settings the last time the system was pow-ered down.
6	PCEN / Coag 1's	Off	Allows the Remote Power Control feature to be enabled by pressing the PCEN switch on the Display Panel.	Inhibits the Remote Power Control fea-ture.
7	Not used / Bipolar 10's	Off	Not used.	Not used.
8	DACview / Bipolar 1's	NA	DACview - See below.	DACview - See below.

4.10 DACview

DACview is a troubleshooting aid that allows access to internal readings. The feature allows output voltage, current and power that the system reads to be output to a DVM or oscilloscope.
To use DACview, the system must be in the Test Mode.

1) Set the system for operation in Test Mode as described in the preceding section.
2) Connect a DVM to the Control Board test points labeled TP7 – DAC_VIEW and TP6 – AGND.
3) Turn the power on and press the PC key until the Test Tones begin.
4) Move the DACview switch (S2 position 8 – the change is recognized, not whether the switch is on or off).
5) The Monopolar Cut Power Digital Display is used to display the selected DACview channel. Since power was just initialized, the Monopolar Cut Power Digital Display will display “0” at this point. Select the desired channel using the Monopolar Cut Power Adjustment Keys.
6) Move the DACview switch (again, the change is recognized, not whether the switch is on or off). The cut power setting will be displayed.
7) To select a different location to monitor with a DVM, simply move the DACview switch and the memory locations will be displayed instead of the cut power. Select the desired selection and then move the DACview switch again.

Table 4.10 DACview Channels

Channel	Source	Function	Scaling
0		No channel selected	
1	Monitor	RF RMS Power (300mS running average)	0.01 V / 1 W
2	Monitor	RF RMS Power	0.01 V / 1 W
3	Monitor	RF RMS Current	1 V / 1 A
4	Monitor	RF RMS Voltage	0.001 V / 1 V
5	Monitor	RF RMS Current (300mS running average)	1 V / 1 A
6	Monitor	RF RMS Voltage (300mS running average)	0.001 V / 1 V
7	Monitor	Max RMS RF Voltage during single activation	0.001 V / 1 V
8	Monitor	Reserved- Future Use	
9	Monitor	H1 accessory, RMS current output	1 V / 1 A
10	Monitor	H2 accessory, RMS current output	1 V / 1 A
11	Monitor	FT accessory, RMS current output	1 V / 1 A
12	Monitor	BP accessory, RMS current output	1 V / 1 A
13	Monitor	+HV, High Voltage power supply output	0.01 V / 1 V
14	Monitor	Max Power during single activation	0.01 V / 1 W
15	Monitor	Max RMS Current during single activation	1 V / 1 A
16	Monitor	Calculated output resistance	0.001 V / 1 OHM
17	Monitor	A/D Input DC voltage offset	1 V / 1 V
18	Monitor	Reserved- Future Use	
19	System Controller	A.R.M.TM resistance	0.01 V / 1 OHM
20	Controller	Gate pulse width	Variable
21	Controller	Output RMS Voltage	Variable
22	Controller	Output RMS Current	Variable
23	Controller	Output impedance	0.2V/100 OHM
24	Controller	Reserved- Future Use	
25	Controller	Reserved- Future Use	
26	Monitor	Calibrated POST RF cut mode voltage	0.001 V / 1 V
27	Monitor	Calibrated POST RF coag mode voltage	0.001 V / 1 V

4.11 Setting the Clock

The clock is only visible while in the Last Fault Display and the purpose of the clock is only to "Date/Time Stamp" system faults.

1) To set the clock, turn the Main power on. While the unit is powering up, press the PC key until a tone occurs. This action will place the system in the Last Fault Code Mode (LFC).
2) For 3 seconds: "LF[" will be displayed in the Cut Window, which is for Last Fault Codes. The Coag window will display "rX", (where X is a numeric value for the software revision).
3) If any errors are stored in memory, the Cut Window will next display "Err"; the Coag window will display the error code (a numeric value); and the Bipolar Window will display the storage location of that error code.
4) Press PC key: the display will show the DIP switch settings on the Controller Assembly.
5) Press PC key: the "Date" will be displayed as MO – DAY – YEAR. Press the Power Adjustment Keys associated with each window to set the date. Once the date is set, Press the STORE" key that is below the Program Window scroll key to lock the date in memory.
6) Press PC key: the "Time" will be displayed as HOUR – MINUTE – SECONDS. Press the Power Adjustment Keys associated with each window to set the time. The Cut Window has either a "P" for PM. or "A" for AM. Once the time is set, Press the STORE" key that is below the Program Window scroll key to lock the time in memory.
7) Press PC key to return to the error code display. To exit the Last Fault Code Mode, it is necessary to turn off the main power.

4.12 Troubleshooting

Listed in Table 4.11 are potential errors that may occur and problem solving ideas for each. All error codes (Err xxx) can only be cleared by cycling power. When an error code is displayed, reset the system to determine if the error can be cleared with a System Reset or if further service is required. Error codes are stored as Last Fault Codes (See Last Fault Codes).

Table 4.11 Troubleshooting

Problem	Possible Cause
Display Panel Blank when System is Powered on	Verify the power cord is fully seated in the power receptacle on the back of the System.
	With the power cord disconnected, verify fuses are good and are installed properly in the receptacles on the back panel of the generator.
	Remove the top cover and verify that the controller board and all harnesses are properly seated.
	Check the Low Voltage Power Supply for +5V and +15V.
Display: ACC xxx	Accessory error – Faulty accessory is connected, a hand controlled accessory is erroneously actuated, or a footswitch is erroneously actuated. Ensure that footswitches are not stacked on top one another. ACC rh and ACC Lh, indicate problems with the accessories connected to the right-hand and left-hand Hand Controlled Monopolar Accessory Receptacles, respectively. ACC FS indicates a problem with the footswitch connected to either of the Monopolar or Bipolar Footswitch Connectors.
Display: ACC CP xx	Control Panel error – Check for a faulty push button on the front control panel, a control panel push button that has been pushed while the unit is being turned on, or a faulty cable connection between the front panel and the display board.
Display: LFC xxx	Last Fault Codes – the Remote Power Control Key was pressed while power was initialized. The generator must be reset to clear this condition. See section 4.8.

Problem	Possible Cause
Display: CAL	The system is in the Calibration Mode. Calibration Mode is selected when the configuration DIP switch in the second position on the Controller assembly is in the ON (Up) position and the Remote Power Control Key is pressed and held while power is turned on. See section 4.9.
Display: Err xxx	Refer to Table 4.12 for list of Err codes and possible causes. If an Err code appears, try cycling power. If it reappears, the unit should be taken out of service until a qualified biomedical engineer can diagnose the problem.
Single and Dual Dispersive Electrode Status / Alarm Indicators flash alternating red.	A Dispersive Electrode is not connected to the system
	A Dual Dispersive Electrode is connected but is not properly applied to patient.
	A Dispersive Electrode is connected to the System, but is not properly seated – ensure the connector is fully seated in the Two-Pin Dispersive Electrode Receptacle.
Flashing Decimal Points on the Display	The system is in the Test Mode. Test Mode is selected when the configuration DIP switch in the first position on the Controller assembly is in the ON (Up) position and the Remote Power Control Key is pressed and held while power is turned on. Note: When the Test Mode is active, most of the internal safety monitoring is inhibited. See section 4.9.
No output power	One or more connections inside the system are bad. Check: • A6J1, controller • A6J2, monopolar transformer board • A6J3, high voltage power supply • A6J4, bipolar output • A7J1, controller • A7J2, monopolar output • Faulty accessory – blade not seated fully • Output board jacks not making contact
	Low voltage power supplied to A6 is bad. Check: • +15V • -15V • -5V
	Shorted RF Amplifier power MOSFET. Note: A better indication of the problem will be provided by cycling power, which will allow the generator to find a fault during POST. • Remove A6 JMP1 and A6 JMP2. • Using an ohmmeter measure between drain and ground on Q3 and Q4 for low resistance. • Using an ohmmeter measure between gate and ground on Q3 and Q4 for low resistance. • If either exhibit low resistance, either replace the faulty MOSFET or replace the RF Amplifier.
	HVPS output too low. • Configure system for test mode operation. • Unplug the connector A6J3 on the RF Amplifier. • Set the system for Pure cut at 35 watts. • Activate and ensure A9LED2 is brightly illuminated.
	Improper gate drive. • Configure system for test mode operation. • Verify that the input to A6U1 is switching between –5V and 0 volts when the system is activated, and that this signal is synchronous with crossing transitions of RF_DRV and /RF_DRV. • Verify that A6 GATE_A and A6 GATE_B are at –5V when not activated.

Problem	Possible Cause
Incorrect monopolar output	Bad calibration – Recalibrate Ensure the load resistor is correct when checking output power.
	Bad voltage or current feedback. Check: • A7 RF_MP_VSN, monopolar voltage sense • A7 RF_MP_ISN, monopolar current sense • These signals should match the Monitor voltage and current sense, MRF_MP_VSN and MRF_MP_ISN, respectively.
Incorrect bipolar output	Bad calibration – Recalibrate Ensure the load resistor is correct when checking output power.
	Bad voltage or current feedback. Check: • A5 RF_BP_VSN, bipolar voltage sense • A5 RF_BP_ISN, bipolar current sense • These signals should match the Monitor voltage and current sense, MRF_BP_VSN and MRF_BP_ISN, respectively.

4.12.1 HVPS Troubleshooting Hints

• Danger: Use an isolation transformer when working on Mains side! A line on the printed circuit board and on the schematic identifies the Mains side of the HVPS.

WARNING: LOSS OF POWER SUPPLY ISOLATION CAN CAUSE ELECTRICAL SHOCK. WHEN SERVICING THE HIGH VOLTAGE POWER SUPPLY, ASSUME INTERNAL ISOLATION IS COMPROMISED UNTIL VERIFIED OTHERWISE.

- For best access for HVPS measurements, place both the Low Voltage Power Supply and the Transformer Boards in their service positions; that is, mounted vertically in the appropriate heatsink mounting slots. See mechanical access section for details.
- Make sure the LED for the circuit you're working on is OFF when making connections or touching circuitry.
- Observe both LEDs during POST. The PFC LED should always be on when power is on. It will become momentarily brighter during POST. The Forward Converter LED will normally be off unless it has been recently activated. After activation it will slowly fade to off. During POST, it should turn on dimly, then brightly, then fade. The brightness of both LEDs corresponds to the output voltage of the corresponding circuit.
- Check Line Voltage input, HVSET, M-HVEN, PFC_EN, and +15, +5, GND connections for proper operation before replacing parts.
- If LED2 does not light during POST, unplug the RF Amplifier and cycle power – there might be a short on the RF Amplifier.
- If fuses are blown, Q3 is probably shorted. Also check surrounding components for failure if Q3 is found to be bad.
- If the Forward Converter output will not exceed about 70Vdc, the PFC output voltage is probably too low. (This limit will vary with input line voltage.)
- The Forward Converter gate pulse width should be close to 50% with no input voltage while HVSET is low.
- If the PFC output voltage is changing with heavy load, try increasing mains voltage with a variable transformer. If this stabilizes the PFC output voltage, PFC current sense circuitry is probably at fault. This is not generally a problem with 220V inputs.
- The PFC can be disabled for safer low voltage Forward Converter troubleshooting – by shorting TP11(PFC_EN) to TP4(-HV). Use a variable transformer to set the desired input voltage to the Forward Converter.
- Check the clock frequency and reference voltage on both the PFC controller and Forward Converter controller integrated circuits. The PFC clock must have PFC enabled to function correctly.
- If the output voltage for either PFC or Forward Converter is too high, check the feedback resistors.

- The Forward Converter will oscillate with brief output bursts when the output current limit is active. This is generally caused by shorted MOSFETS on the RF Amplifier.
- At low output current, the PFC will cycle on and off. This is normal.
- When replacing a MOSFET, check all the gate drive components.
- Resistance measured between TP7 and TP4 (-HV) when power is off should be greater than 100K ohms. Resistance measured between U2P15 (VCC) and TP4 when power is off should be greater than 100K ohms.
- If either of above is low, Q3 or the associated protection diodes are suspect. If these are removed and the measured resistance continues to be low, U2 is probably failed.
- The forward converter can be disconnected from the Power Factor Controller for troubleshooting the PFC. Do this by removing the E1-E2 wire. Be sure to note the routing of the wire through T1 so it can be reconnected correctly. Incorrect polarity can damage the Forward Converter.

4.13 Parts Ordering Information

To obtain replacement parts or additional information regarding your unit, write or telephone according to the contact information as listed on the inside front cover of this manual, or contact your CONMED distributor. To ensure prompt service, please provide the following information:

Model Number

Serial Number

Reference Designator and Description of Part

Conmed Part Number (if known)

Quantity Desired

Mailing or Shipping Address

Preferred Shipping Means (if any)

Purchase Order Number (if applicable)

Your Name

If you are returning a unit, obtain a Return Authorization (R.A.) Number from CONMED Technical Services. Please mark the R.A. number on the outside of the carton for prompt service.

4.14 Fault Codes

This section of the manual contains a table of fault codes. Each numeric fault code is listed along with a description of the fault, possible causes and things to check, and corrective actions.

Table 4.12 Fault Codes

Err Code	Description	Possible Cause	Things to check	Correction
100	Test or CAL mode dip switch with no remote power control key press	The Remote Power Control Key must be depressed when power initialized until the test tones sound. Release this key before the last tone sounds.	Cycle system power while pressing the Remote Power Control Key and determine if this error is repeated.	Replace the Controller assembly.
101	Controller/Monitor DIP switch mismatch	The System Controller and the Monitor do not detect the same settings for the Configuration Dipswitches.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
102	Corrupted communications between the System Controller and Monitor	The data transmitted from the System Controller to the Monitor through the HPI port is faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
103	Corrupted communications between the System Controller and RF Controller	The data transmitted from the System Controller to the RF Controller through the HPI port is faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
104	Monitor TOKEN not incremented, monitor program scrambled	The data transmitted from the System Controller to the Monitor through the HPI port is faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
105	Controller failed ram test	The System Controller memory errors have been detected during POST.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
106	RF controller boot-load program does not match controller ROM table	The program transmitted from the System Controller to the RF Controller through the HPI port at startup is faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
107	Monitor bootload program does not match controller ROM table	The program transmitted from the System Controller to the Monitor through the HPI port at startup is faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
108	RF TOKEN not incremented, RF controller program scrambled	The program transmitted from the System Controller to the RF Controller through the HPI port at startup is faulty or has been corrupted after initialization. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
109	Communications lost during POST tests	Communications through the HPI port are faulty. This could be caused by damage to components associated with the HPI bus on the Controller, permitting electromagnetic interference to upset one of the processors.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
112	Pre-activation handshake, monitor does not read an activation signal	The activation signals detected by the System Controller and the Monitor do not match.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
113	Pre-activation handshake, monitor does not read a tone signal	Prior to enabling electrosurgical output power, the Monitor ensures that an activation tone is present. This error occurs if the activation tone is not present when the Monitor checks prior to enabling electrosurgical output power.	Increase the tone volume by adjusting the Volume Control on the back panel of the generator. Cycle system power and determine if this error is repeated. Configure system for test mode operation. Check the tone drive signal from the Controller assembly while the unit is activated. Lack of a signal indicates a problem with the Controller assembly. Check for a proper TONE_MON signal to the controller. Lack of a signal indicates a problem with the Back Panel assembly.	Replace the Controller assembly. Replace the Back Panel assembly.
114	Display or keyboard SPI communication failure	Communication between the Control assembly and the Display assembly over the SPI bus is faulty.	Cycle system power and determine if this error is repeated. Check SPI_SCK, SPI_MOSI, and SPI_MISO to see signals toggle.	Replace the cable between the Display and the Controller. Replace the Controller assembly. Replace the Display assembly.
117	5.0 volt too low	5-volt power in the system is too low.	Check the output of the low voltage power supply. Verify that the ADC reference voltages on the Controller are 2.5 volts.	If the power supply voltage is out of limits, replace the power supply. If the power supply is within limits, replace the Controller assembly.
118	5.0 volt too high	5-volt power in the system is too high.	Check the output of the low voltage power supply. Verify that the ADC reference voltages on the Controller are 2.5 volts.	If the power supply voltage is out of limits, replace the power supply. If the power supply is within limits, replace the Controller assembly.
122	System Controller flash program CRC does not match the calculated CRC	The self-check CRC for the System Controller is not internally consistent, indicating an error in the stored software.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
135	A.R.M.™ calibration (10/150 Ohm) EEprom CRC failed	The CRC for the calibration coefficient memory is not self consistent, indicating an error in the stored calibration coefficients.	Recalibrate the A.R.M.™ system. See section 4.7.	Replace the Controller assembly if the system will not calibrate.

Err Code	Description	Possible Cause	Things to Check	Correction
136	A.R.M.™ circuit dropped below .4V (circuit failed)	The A.R.M.™ circuit on the Output assembly or the A.R.M.™ sensing circuit on the Controller assembly has failed.	Verify proper voltage on the VARM signal entering the Controller assembly.	Replace the Output assembly if VARM entering the Controller is faulty. Replace the Controller assembly if VARM appears correct.
137	RF controller calibration EEPROM CRC failed	The CRC for the calibration coefficient memory is not self consistent, indicating an error in the stored calibration coefficients.	Recalibrate the entire system.	Replace the Controller assembly if the system will not calibrate.
138	Monitor calibration EEPROM CRC failed	The CRC for the calibration coefficient memory is not self consistent, indicating an error in the stored calibration coefficients.	Recalibrate the entire system.	Replace the Controller assembly if the system will not calibrate.
139	During calibration, not all points were entered for the mode	The calibration was not completed in the correct manner.	Recalibrate any uncalibrated modes. See Section 4.7.	Replace the Controller assembly if the system will not calibrate.
140	A calibration EEPROM CRC failed (POST ERROR)	The CRC for the calibration coefficient memory is not self consistent, indicating an error in the stored calibration coefficients.	Recalibrate any uncalibrated modes. See Section 4.7.	Replace the Controller assembly if the system will not calibrate.
141	Test and cal dip switches are both turned on	The Calibration and Test Configuration Dipswitches are both in the ON position. At least one of these must be in the OFF position.	Change the Calibration and Test Configuration Dipswitches to the desired state, cycle system power, and determine if this error is repeated.	Replace the Controller assembly.
142	RF PWM (RF_PROT) gate protection circuit shutdown	The pulse width commanded by the RF Controller exceeds the maximum allowed for the selected mode.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
143	The unit or a mode was never calibrated	The system or a mode was never calibrated. The Controller was replaced but not calibrated.	Calibrate any modes that need calibration.	Replace the Controller assembly if the system will not calibrate.

Err Code	Description	Possible Cause	Things to Check	Correction
144	RF controller and Monitor power levels do not match	The Monitor and RF Controller and constantly checking to ensure they see the same electrosurgical output power during activation. This error occurs if the power they sense does not match. This typically results from differences between the independent Monitor and RF Controller sensing circuits.	Use DACView to troubleshoot the Monitor. Verify that the output power is consistent with displayed power setting. Check voltage and current sensing channels for both the RF Controller and the Monitor.	Replace the Controller assembly. Troubleshoot the RF voltage (Vsense) and current (Isense) feedback circuits for the activated mode.
170	Controller waveform inhibit failed (will not disable RF) (POST ERROR)	The Monitor has detected that the System Controller cannot disable the RF Drive signal during POST.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
200	Modality function timed out while waiting for ADC DMAs to finish	Component failure on Controller assembly SPI circuitry.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
201	RF Controller emulation restart.	Programming function only	NA	Return to ConMed.
202	Inter-processor communications error	Controller Assembly - Host Port	NA	Replace the Controller assembly.
204	Processor system clock change failed	The clock frequencies that run the microprocessors normally change after they are initialized. This error occurs when they do not change to the correct frequency.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
205	Halt mode active beyond limit		Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
206	RF Controller discovered run time bad CRC.	Errors found in software downloaded from the System Controller to the RF Controller during initialization.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
207	Unexpected mode change while active	The selected output mode changed while the system is activated.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
236	Bad CRC on modality coefficients	Calibration problem.	Recalibrate the system.	Replace the Controller assembly if calibration is not accepted.

Err Code	Description	Possible Cause	Things to Check	Correction
237	POST memory failure.	Errors found in microprocessor memories during power initialization.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
239	RF Controller rejected a calibration value	Calibration failed for one or more modes.	Confirm proper load resistor and power measurement. Configure system for test mode operation. Check for proper HVPS output voltage while activated in test mode. Check for proper RF output power while activated in test mode. Cycle system power and determine if this error is repeated.	Repair or Replace the HVPS. Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.
311	POST Monitor memory failure.	Errors found in Monitor microprocessor memory during power initialization.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
314	POST Monitor or RF controller clock failure	RF Controller or Monitor clock oscillator failure detected during POST.	Check for 10 MHz clock frequency input to RF Controller and Monitor processors. Verify that the ribbon cable connector, J1, is properly connected to the Transformer Assembly, A7.	Replace the controller assembly.
315	POST Monitor activation circuitry failure	The states of the activation request signals detected by the Monitor do not match the states detected by the System Controller.	Check for active high activation request on lines running to the Monitor.	Replace the controller assembly.
320	Monitor failed program CRC test	Errors found in software downloaded from the System Controller to the Monitor during initialization.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
321	Monitor failed calibration data CRC test	Monitor calibration data is corrupted.	Recalibrate all system modes.	Replace the Controller assembly.
322	Monitor or RF controller did not return to IDLE state	Activation continues after activation command ceases.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
330	POST RF AC voltage cut feedback too low (A/D channel 0)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	Configure the system for Calibration mode operation and initialize power. Configure the system for test mode operation and cycle power. Measure HVPS output, RF Amplifier drive, RF Amplifier output, and voltage sensing channel.	Replace the controller assembly, the HVPS, the RF Amplifier, the Transformer board depending on the specific cause of the failure.
331	POST RF AC voltage cut feedback too high (A/D channel 0)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	See above.	See above.
332	POST RF AC voltage coag feedback too low (A/D channel 2)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	See above.	See above.
333	POST RF AC voltage coag feedback too high (A/D channel 2)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	See above.	See above.

Err Code	Description	Possible Cause	Things to Check	Correction
334	POST RF AC voltage coag feedback too low (A/D channel 1)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	See above.	See above.
335	POST RF AC voltage coag feedback too high (A/D channel 1)	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel. The limits for this comparison are set when the system enters calibration mode.	See above.	See above.
336	Calibration RF AC voltage cut feedback too high	Monitor senses electrosurgical voltage output too high during POST test, indicating excessive voltage from HVPS, excessive drive from the RF Controller, or a failed voltage sensing channel.	Check for proper performance of the RF Amplifier, the HVPS, and the voltage and current sense channels. Verify that all cables are properly connected.	See above.
337	Calibration RF AC voltage cut feedback too low	Monitor senses electrosurgical voltage output too low during POST test, indicating insufficient voltage from HVPS, insufficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel.	See above.	See above.
338	Calibration RF AC voltage coag feedback too high	Monitor senses electrosurgical voltage output too high during POST test, indicating excessive voltage from HVPS, excessive drive from the RF Controller, or a failed voltage sensing channel.	See above.	See above.

Err Code	Description	Possible Cause	Things to Check	Correction
339	Calibration RF AC voltage coag feed-back too low	Monitor senses electrosurgical voltage out-put too low during POST test, indicating insufficient voltage from HVPS, insuf-ficient drive from the RF Controller, failed RF Amplifier, or a failed voltage sensing channel.	See above.	See above.
340	Monitor Timer0 interrupt failed	One of the timers internal to the Monitor is failed.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
341	Monitor Timer0 interrupt failed POST	Failure of one of the tim-ers internal to the Monitor detected during POST.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
342	Monitor Timer1 interrupt failed POST	Failure of one of the tim-ers internal to the Monitor detected during POST.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
343	Monitor has lost communica-tions - controller TOKENS not incremented	Reset machine and if error repeats, then replace Controller Assembly or replace U9.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
344	Monitor Isense DMA or SPI hung	The Monitor DMA or SPI interface to one of the ADCs has failed.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
345	Monitor Power DMA or SPI hung	The Monitor DMA or SPI interface to one of the ADCs has failed.	Cycle system power and deter-mine if this error is repeated.	Replace the Controller assembly.
350	Monitor output channel current sensor failure	Current detected by the monitor through the output channel current sensor that is used to detect a stuck out-put relay does not match the current sensed by the power monitoring sensor. This typically indicates that there is a problem with the output channel current sens-ing circuit.	Configure the system for test mode operation and cycle power. Use DACview to compare the output channel current with the output current while activating at constant power into a fixed load.	Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.
351	Monitor sensed over power condi-tion for 300mS running average	Over power at the electrosurgical output has persisted for more than 300 ms.	Configure the system for test mode operation and cycle power. Measure the actual power into a fixed load. If power is correct, verify proper operation of the Monitor voltage and current sensing circuits. If power is correct, verify proper operation of the RF Controller voltage and current sensing cir-cuits, the HVPS, and the RF Amplifier.	Repair or Replace the HVPS. Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
352	Monitor sensed 4x over power condition for short period	Excessive power at the electrosurgical output was detected for a short period of time.	Recalibrate the system. Configure the system for test mode operation and cycle power. Measure the actual power into a fixed load. If power is correct, verify proper operation of the Monitor voltage and current sensing circuits. If power is correct, verify proper operation of the RF Controller voltage and current sensing circuits, the HVPS, and the RF Amplifier.	Repair or Replace the HVPS. Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.
357	Monitor sensed power @ 0W dial power setting	The Monitor has sensed electrosurgical output power during activation while the power is set to zero.	Recalibrate the system. Configure the system for test mode operation and cycle power. Measure the actual power into a fixed load. If power is correct, verify proper operation of the Monitor voltage and current sensing circuits. If power is correct, verify proper operation of the RF Controller voltage and current sensing circuits, the HVPS, and the RF Amplifier.	Repair or Replace the HVPS. Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.
358	Monitor sensed gate drive in idle @ 0W dial power setting	The Monitor has detected a drive signal while the system is not activated.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
359	Monitor sensed peak voltages above the LAP Limit	The Monitor has detected voltage peaks in excess of the limits while the system is activated in Lap Advanced Specialty mode.	Recalibrate the system. Configure the system for test mode operation and cycle power. Measure the actual power into a fixed load. If power is correct, verify proper operation of the Monitor voltage and current sensing circuits. If power is correct, verify proper operation of the RF Controller voltage and current sensing circuits, the HVPS, and the RF Amplifier.	Repair or Replace the HVPS. Repair or Replace the RF Amplifier. Repair or Replace the RF Transformer board. Repair or Replace the RF output board. Replace the Controller assembly.
360	Monitor program counter landed on an unused interrupt vector	Monitor processor anomaly.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
371	Monitor will not disable RF waveform on the Controller assembly during POST	POST has determined that the Monitor cannot disable the RF waveform.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
372	Monitor will not disable high voltage during POST	POST has determined that the Monitor cannot disable the HVPS. The ribbon cable providing control to the HVPS is not properly connected.	Verify that all cables are properly connected. Configure the system for test mode operation and verify proper voltages on HV_MON. Cycle system power and determine if this error is repeated.	Repair or replace the HVPS. Replace the Controller assembly.
373	Damping circuit failed POST – damping not detected.	The Monitor detected a failure in the RF Amplifier damping drive signal during POST.	Configure system for test mode operation. Verify that the RFDAMP_DR signal switches high immediately preceding each RF Drive pulse and switches low following each RF Drive pulse while activating in Spray or Standard Coag modes. Verify correct operation of the damping circuitry on the RF Amplifier.	Repair or replace the RF Amplifier assembly. Replace the Controller assembly.
374	Damping circuit failed POST – damping stuck on,	The Monitor detected a failure in the RF Amplifier damping drive signal during POST. No RF output.	Verify that all internal cables are properly connected. Configure system for test mode operation. Verify that the RFDAMP_DR signal switches high immediately preceding each RF Drive pulse and switches low following each RF Drive pulse while activating in Spray or Standard Coag modes.	Repair or replace the RF Amplifier assembly. Q1 may have failed. Replace the Controller assembly.
379	RF calibration failed POST	System calibration required on one or more modes.	Recalibrate the system. Configure the system for test mode operation and cycle power. Measure the actual power into a fixed load. If power is correct, verify proper operation of the Monitor voltage and current sensing circuits. If power is correct, verify proper operation of the RF Controller voltage and current sensing circuits, the HVPS, and the RF Amplifier.	Replace the Controller assembly if the system will not calibrate.

Err Code	Description	Possible Cause	Things to Check	Correction
381	No tone feedback during POST	The Monitor did not detect tones during POST. This typically occurs because of a problem in the tone generation circuitry.	Listen for tones during POST. Verify that all internal cables are properly connected. Increase the tone volume by adjusting the Volume Control on the back panel of the generator. Cycle system power and determine if this error is repeated. Configure system for test mode operation. Check the tone drive signal from the Controller assembly while the unit is activated. Lack of a signal indicates a problem with the Controller assembly. Check for a proper TONE_MON signal to the controller. Lack of a signal indicates a problem with the Back Panel assembly.	Replace the Controller assembly. Repair or replace the Back Panel assembly.
382	Activation without a tone	The Monitor did not detect a tone during activation. This typically occurs because of a problem in the tone generation circuitry.	Listen for a tone during activation. Verify that all internal cables are properly connected. Increase the tone volume by adjusting the Volume Control on the back panel of the generator. Cycle system power and determine if this error is repeated. Configure system for test mode operation. Check the tone drive signal from the Controller assembly while the unit is activated. Lack of a signal indicates a problem with the Controller assembly. Check for a proper TONE_MON signal to the controller. Lack of a signal indicates a problem with the Back Panel assembly.	Replace the Controller assembly. Repair or replace the Back Panel assembly.
383	RF Current sensed at an unselected output.	The Monitor has sensed current flowing at an output that has not been selected. This may indicate a faulty or stuck output relay.	Arrange the system with fixed loads connected to all outputs. Activate each output in turn while monitoring all outputs for current.	Replace or repair the Output assembly. Replace the Controller assembly.

Err Code	Description	Possible Cause	Things to Check	Correction
384	POST HVDC to 30V failed- supply too low	The HVPS output is too low during POST.	Cycle system power and determine if this error is repeated. Watch LED2 on the HVPS during POST and confirm that it illuminates. If not, disconnect the cable between the HVPS and the RF Amplifier and cycle while again watching LED2. If it is now illuminated, a problem with the RF Amplifier is likely. Configure system for test mode operation. Verify HVPS control signals from the controller are correct while activated. Verify the HVPS is functioning correctly – see HVPS Troubleshooting Guidelines	Verify that all cables are properly connected. Replace the Controller assembly. Replace or repair the HVPS. Replace or repair the RF Amplifier.
385	POST HVDC to 30V failed- supply too high	The HVPS output is too high during POST.	Cycle system power and determine if this error is repeated. Configure system for test mode operation. Verify HVPS control signals from the controller are correct while activated. Verify the HVPS is functioning correctly – see HVPS Troubleshooting Guidelines	Replace the Controller assembly. Replace or repair the HVPS.
386	POST HVDC to 140V failed- supply too low	The HVPS output is too low during POST.	Cycle system power and determine if this error is repeated. Watch LED2 on the HVPS during POST and confirm that it illuminates. If not, disconnect the cable between the HVPS and the RF Amplifier and cycle while again watching LED2. If it is now illuminated, a problem with the RF Amplifier is likely. Configure system for test mode operation. Verify HVPS control signals from the controller are correct while activated. Verify the HVPS is functioning correctly – see HVPS Troubleshooting Guidelines	Verify that all cables are properly connected. Replace the Controller assembly. Replace or repair the HVPS. Replace or repair the RF Amplifier.
387	POST HVDC to 140V failed- supply too high	The HVPS output is too high during POST.	Cycle system power and determine if this error is repeated. Configure system for test mode operation. Verify HVPS control signals from the controller are correct while activated. Verify the HVPS is functioning correctly – see HVPS Troubleshooting Guidelines	Replace the Controller assembly. Replace or repair the HVPS.

Err Code	Description	Possible Cause	Things to Check	Correction
388	POST monitor timed out- did not respond to a POST command	Reset machine and if error repeats, then replace Controller Assembly	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
389	Dial setting over maximum limit	The front panel power setting exceeds the limit for the selected mode.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
391	Monitor detected the wrong RF waveform	The Monitor has detected an improper RF Amplifier drive waveform or frequency for the selected mode.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
392	Monitor detected a pulse mode on-time that was too long	The active pulse mode pulses are longer than the nominal duration limits.	Cycle system power and determine if this error is repeated.	Replace the Controller assembly.
393	Vbias signal too high	The reference voltages on one or more of the ADCs on the Controller are too high.	Verify 2.5VDC on the voltage sense pins of the ADC when the system is not activated. Verify that all cables are properly connected.	Replace the Controller assembly.
394	Vbias signal too low	The reference voltages on one or more of the ADCs on the Controller are too low.	Verify 2.5VDC on the voltage sense pins of the ADC when the system is not activated. Verify that all cables are properly connected.	Replace the Controller assembly.

This appendix contains printed circuit board layouts, parts lists and schematic diagrams for the System 5000™.

To assist in the location of components on the printed circuit boards, a “grid” system is used. The parts lists contain the component grid locations, shown in parentheses after the reference designator. The letter and number; i.e. “(A/1)”; correspond to a grid shown on the printed circuit board layout. Boards that are double-sided, with components installed on both sides, have the location prefixed with a “T” for top of the board, and “B” for the bottom of the board. Therefore, a component’s location within an approximate one-inch grid can be determined similar to locating cities on a roadmap.

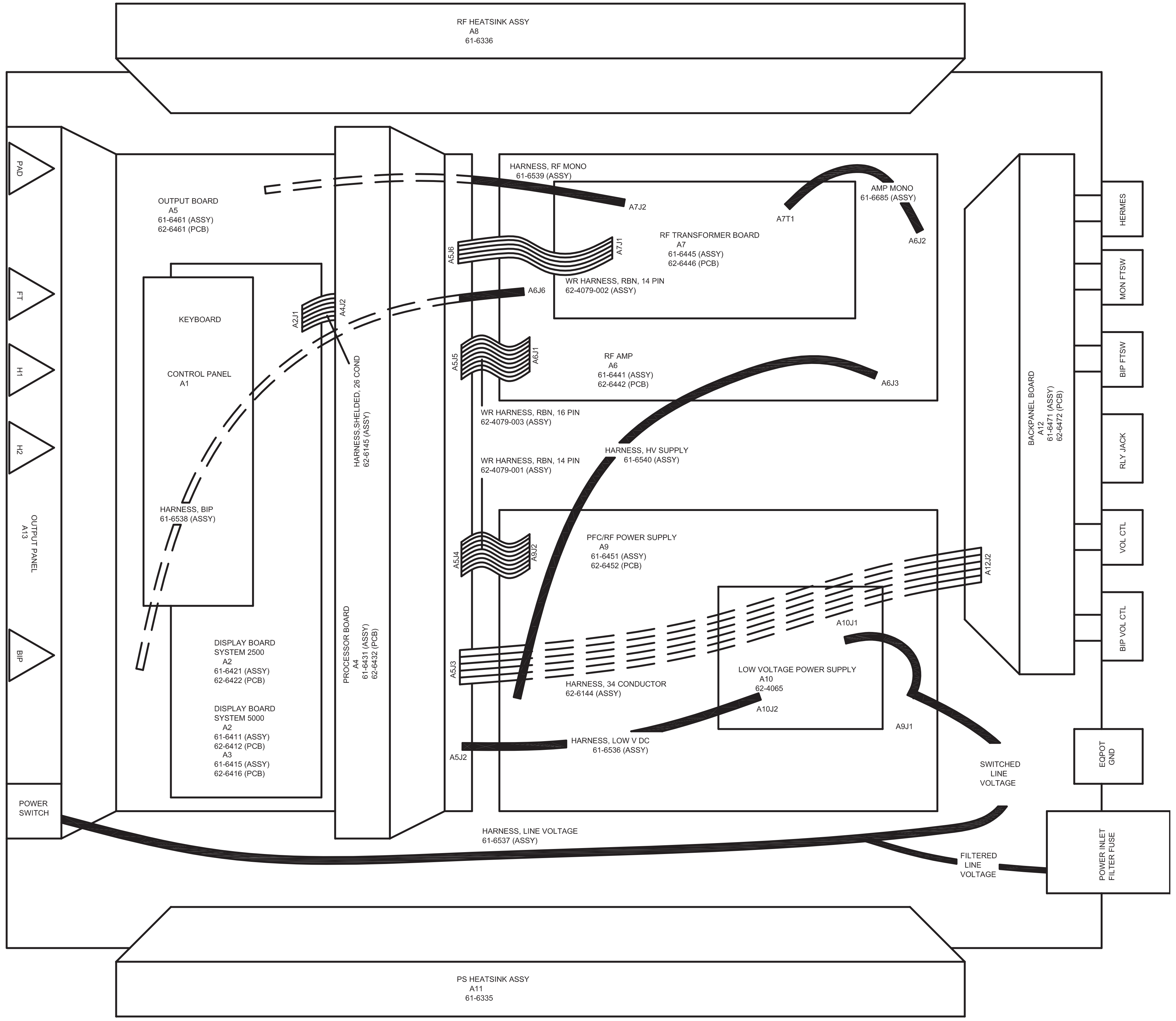
Listed are the replaceable parts available from CONMED. Many of the more common parts may be available from local electronic suppliers.

Bill of Material: Chassis & Top Assembly

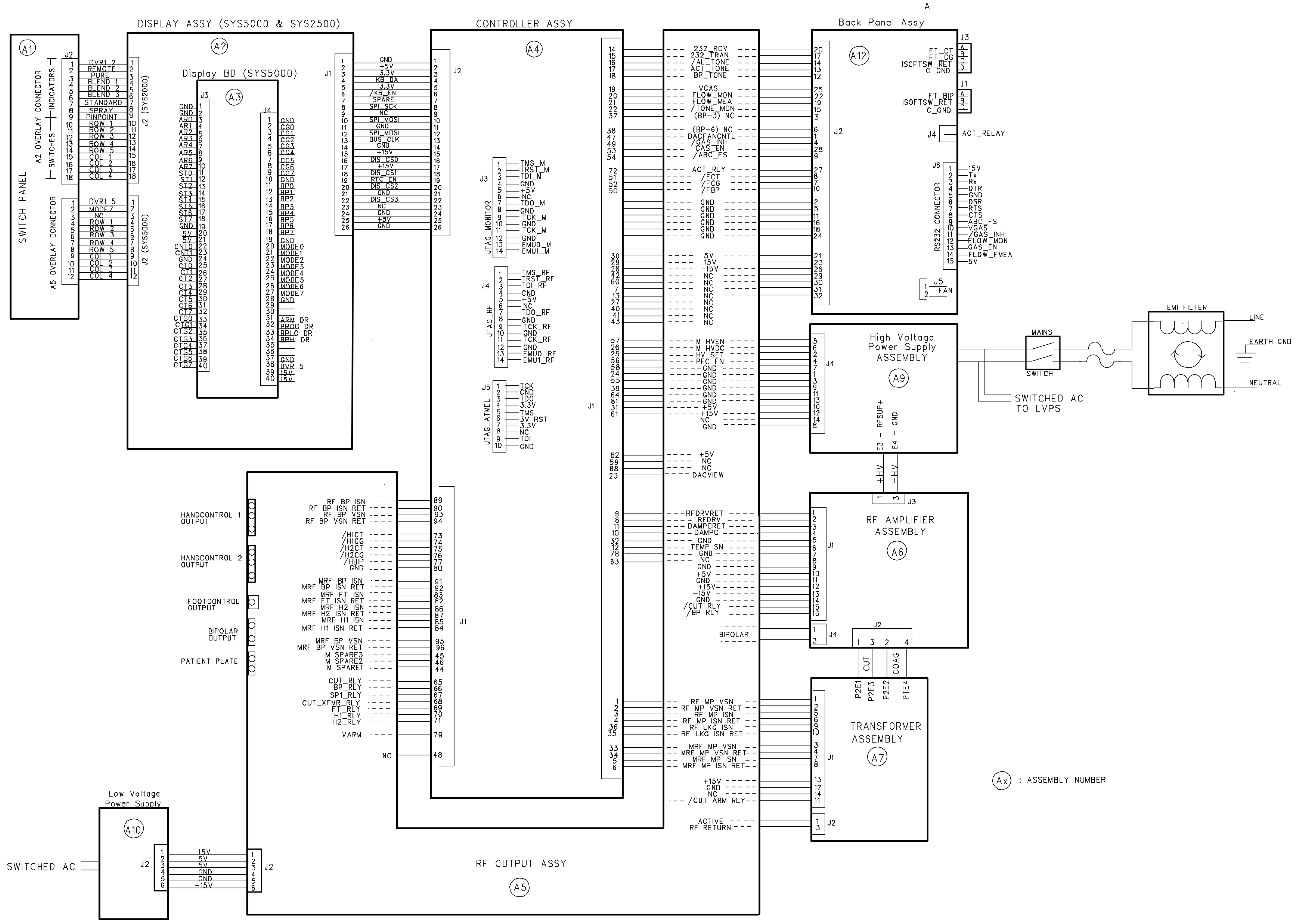
REF. DES.	CONMED P/N	DESCRIPTION
MISC. CHASSIS/TOP ASSEMBLY COMPONENTS		
N/A	030257005	SCREW BDR HD/PH,4-40X3/8
N/A	030257103	SCREW,BDR HD,PH,6-32X1/4L
N/A	030257104	SCREW, 6-32 X .312
N/A	030257105	SCREW,BDR HD,PH,6-32 X3/8
N/A	030257109	SCREW,BDR HD,PH16-32X3/4
N/A	030257111	SCREW,6-32X1”,PH,PHILLIPS
N/A	030446007	SCREW FH PH BLK 4-40X1/2
N/A	030446107	SCREW FH PH BLK 6-32X1/2
N/A	10044020	STANDOFF,NYLON,6-32,1 1/4
N/A	61-6350004-00	BEZEL ASSEMBLY SYS,5000
A3	61-6411001-00	ASSY,PWB,DSPL CNTLR A2, SYS 5K
A2	61-6415001-00	ASSY,PWB,DSPL PANEL A3,SYS 5K
A4	61-6431002-00	ASSY,A3 MICROCTL,SYS,2/5 FPGA
A6	61-6441001-00	ASSY, RF AMP, SYS A2/A5
A7	61-6445001-00	ASSY, RF XFMR PWB, SYS A2/A5
A9	61-6451001-00	ASSY,RF PWRSPLY+PFC A9,SYS2/5K
A5	61-6461001-00	ASSY A5,OUTPUT BD,SYS 2/5ESU
A12	61-6471001-00	ASSY,A12,BACKPANEL,SYS 5K
N/A	61-6536001-00	HARNESS,LOW V DC,SYS2/5K
N/A	61-6537001-00	HARNESS,LINE VOLTAGE,SYS 2/5K
N/A	61-6598001-00	SUB-ASSY, FAN WIRES, A2/A5
N/A	61-6599001-00	TOP GROUND, A2/A5
N/A	61-6599002-00	BASE GROUND, A2/A5
N/A	61-6603001-00	SUB-ASSY,FUSE HOLDER,A2/A5,BL
N/A	61-6603002-00	SUB-ASSY,FUSE HOLDER,A2/A5,BRN
N/A	61-6604001-00	SUB-ASSY, 3.5 mm JACK, A2/A5
N/A	61-6606001-00	SUB-ASSY, CONNECTOR, A2/A5
N/A	62-0260001-00	CABLE TIE
N/A	62-0335005-00	STANDOFF, HEX 6-32 X 1 7/8
N/A	62-0343002-00	NUT KEPS 6-32
N/A	62-0418003-00	WASHER LOCK IT #6
N/A	62-0620004-00	TUBE HS RNF100 TYPE1 3/16
N/A	62-0797003-00	RETAINING RING 1/8”
N/A	62-0797004-00	RETAINING RING 3/16”
N/A	62-1206003-00	STUD,GND EQUIV M6 THREAD
N/A	62-4065001-00	POWER SUPPLY, TRIPLE, 40W
N/A	62-4236315-00	FUSE5X20mm TD HGH BRK CAP 3.15A (230V ONLY)
N/A	62-4236630-00	FUSE5X20mm TD HGH BRK CAP 6.3A (120V ONLY)
N/A	62-4236800-00	FUSE5X20mm TD HGH BRK CAP 8.0A (100V ONLY)
N/A	62-4511001-00	FILTER, IEC INLET
N/A	62-4884002-00	TAPE, INSULATING
N/A	62-5314001-00	LABEL,GROUND

REF. DES.	CONMED P/N	DESCRIPTION
N/A	62-6144001-00	HARNESS ASSY, 34 CONDUCTOR
N/A	62-6145002-00	HARNESS ASSY,SHIELD26COND 8.5”
N/A	62-6207001-00	ELECTRODE
N/A	61-7041001-00	READIPLUG CABLE
N/A	62-6209001-00	PUSH BUTTON, MOLDED, A2/A5
N/A	62-6210001-00	FRONT,BEZEL
N/A	62-6211001-00	4MM BANANA JACK
N/A	62-6212001-00	BANANA JACK , HC
N/A	62-6213001-00	JACK RETAINER
N/A	62-6214001-00	PIN RETAINER
N/A	62-6215001-00	RETURN PAD PIN
N/A	62-6216001-00	BASE, F.C. RECEP. MECH A2/A5
N/A	62-6217001-00	JACK ARM, F.C. RECP MECH A2/A5
N/A	62-6218001-00	JACK INSRT F.C. RECP MECH A2/A
N/A	62-6219001-00	PIVOT PIN F.C. RECP MECH A2/A5
N/A	62-6220001-00	LINK, F.C. RECEP MECH A2/A5
N/A	62-6232001-00	INSULATOR, OUTPUT BOARD A2/A5
N/A	62-6249001-00	SHIELD, DISPLAY
N/A	62-6269001-00	DISPLAY LIGHT CHANNEL
N/A	62-6275001-00	BEZEL FIBER OPTIC CABLE
N/A	62-6289001-00	STANDOFF BRASS HEX 6-32 .25 L
N/A	62-6331001-00	CONTROL PANEL,SYSTEM 5000
N/A	62-6341001-00	SWITCH RKR PWR DP 125V 16A
N/A	62-6477001-00	SPRING COMP .468 OD 1.0 L
N/A	62-6477002-00	SPRING COMP .312 OD .38L
N/A	62-6478001-00	SPACER AL .25 OD .14 ID .25 L
N/A	62-6479001-00	RIVET PUSH NYLON .115 X .395 L
N/A	62-6480001-00	PUSHNUT .062” SHAFT
N/A	62-6484001-00	BASE,CHASSIS,SYS 2500/5000
N/A	62-6485001-00	HANDLE
N/A	62-6490001-00	FASTENER,TUFLOK, .155 DIA
N/A	62-6493001-00	PLATE BTM, DC POWER SUPPLY
N/A	62-6494001-00	COVER, DC POWER SUPPLY,A2/A5
N/A	62-6504001-00	TOP COVER A2/A5
N/A	62-6508001-00	SCREW, TYPE AB, #8x1/2
N/A	62-6511001-00	SILICONE TUBE, 3/16x1/8
N/A	62-6514001-00	CUSTOM HEX STANDOFF
N/A	62-6525001-00	MOUNTING CLIP, TOP COVER
N/A	62-6534001-00	SCREW & WASHER ASSY, SQ. CONE
N/A	62-6534002-00	SCREW & WASHER ASSY,SQ. CONE
N/A	62-6534003-00	SCREW & WASHER ASSY, BLK
N/A	62-6543001-00	COVER, RS232, A2/A5
N/A	62-6569001-00	NUT, PANEL, HEX 3/8-32
N/A	62-6580001-00	PROTECTOR, RIBBON CABLE
N/A	62-6631002-00	KEEPER
N/A	62-6684001-00	CORE, RIBBON CABLE

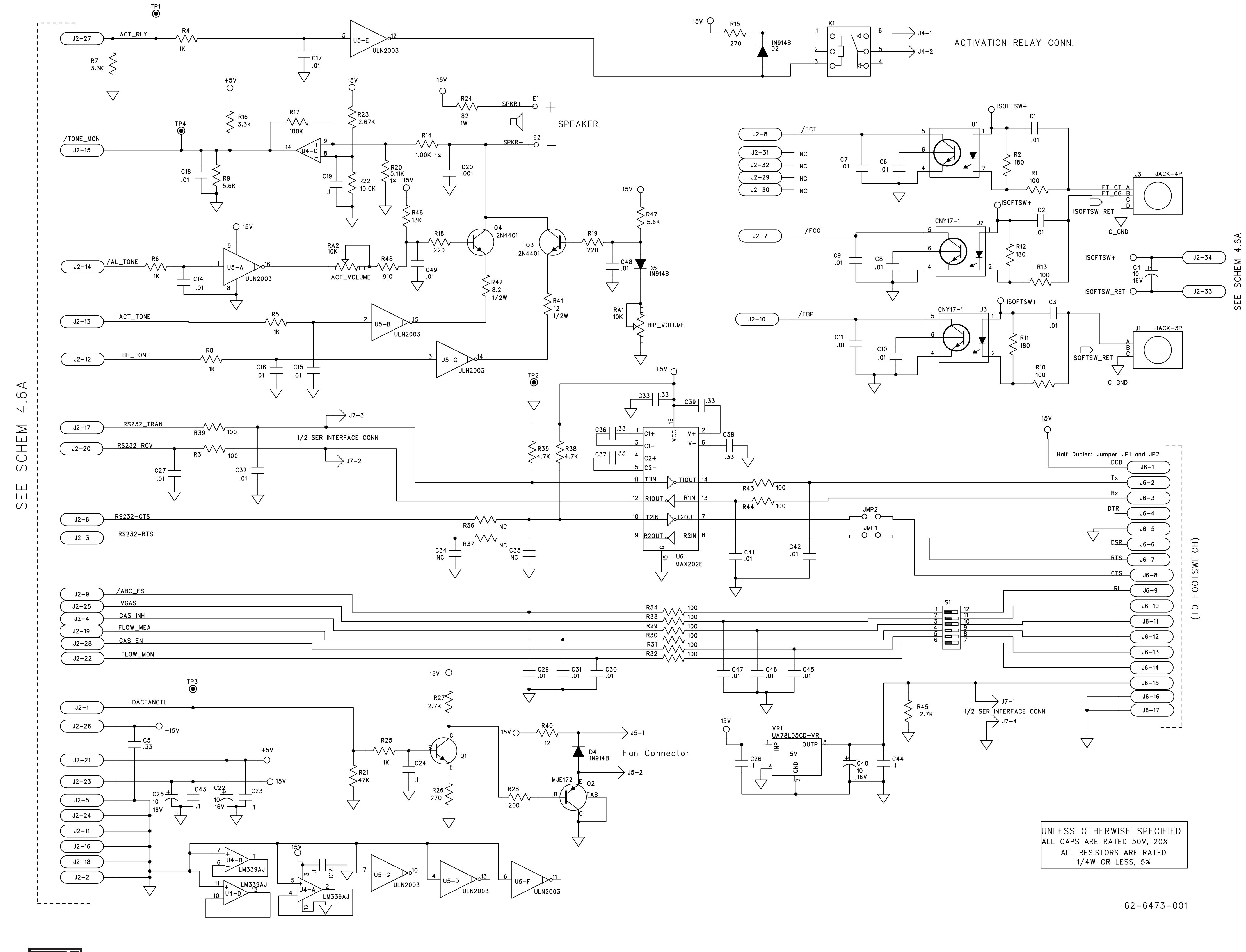
Figure 4.3 Module Diagram



Schematic 4.1 Interconnect Diagram



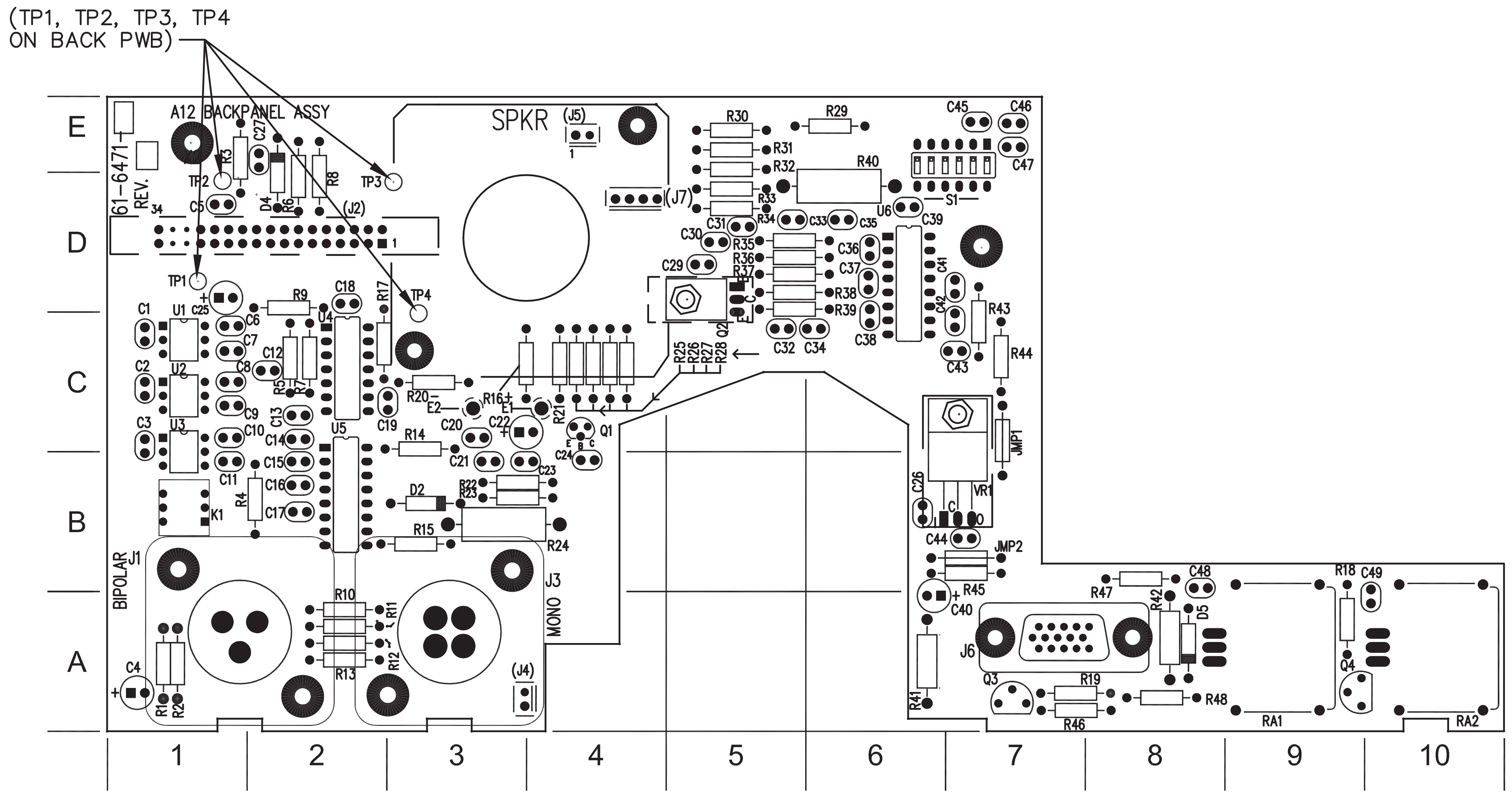
Schematic 4.2 A12 Back Panel PCB



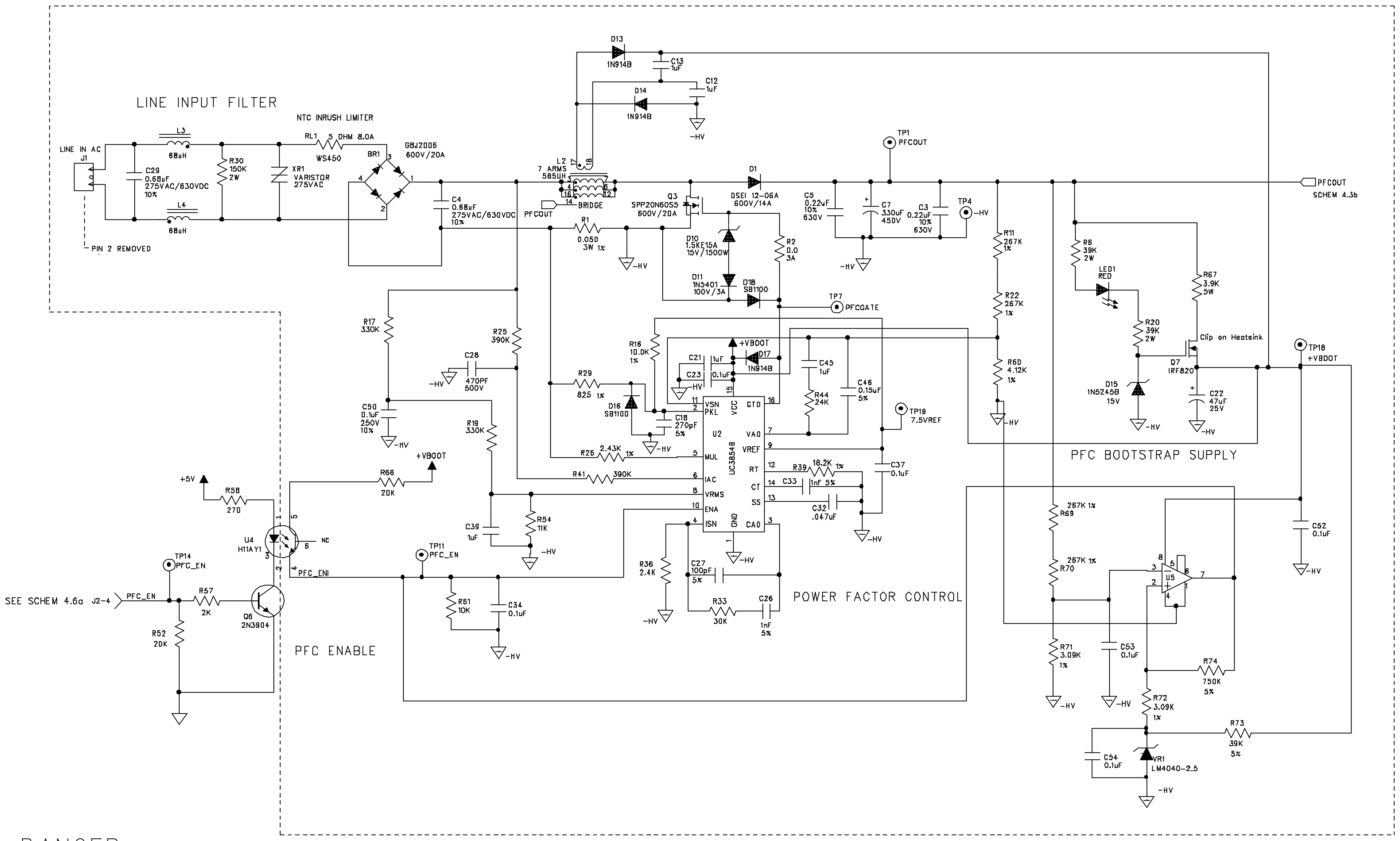
Bill of Material: Back Panel PCB Assembly

REF. DES.	CONMED P/N	DESCRIPTION
61-6471-001 A12 BACK PANEL PCB ASSEMBLY		
C1,C2,C3,C6,C7, C8,C9,C10(C/1); C11(B/1);C14(C/2); C15,C16,C17(B/2); C18(D/2);C27(E/2); C29,C30,C31(D/5); C32(C/5);C41(D/7); C42(C/7);C45,C46, C47(E/7);C48(B/8); C49(A/10)	010262103	CAP,CER,Z5U,50V,20%,.01MF
C4(A/1);C22(C/4); C25(D/1);C40(A/6)	62-6153106-00	CAP,ELEC,LO-PROFILE,10UF
C5(D/1);C33(D/5); C36,C37,C39(D/6); C38(C/6)	62-0267003-00	CAP,CER,Z5U,.33UF,50V,20%
C12(C/2);C19(C/3); C23,C24(B/4); C26(B/6);C43(C/7); C44(B/7)	010262104	CAP,CER,Z5U,50V,20%,0.1MF
C20(C/3)	010262102	CAP,CER,Z5U,50V,20%,.001M
D2(B/3);D4(D/2); D5(A/8)	010029000	DIODE, IN914B
J1(A/1)	62-0279002-00	CONNECTOR
J2(D/2)	62-4857005-00	HEADER, DIN W/LATCH 34 PIN
J3(A/3)	62-0279001-00	CONNECTOR RECEPTACLE
J4(A/3)	62-1390001-00	HEADER, RA, .100 SOL, 2 CKT
J5(E/4)	62-2845001-00	HEADER,STRAIGHT,.100, 2 PIN
J6(A/7)	62-6308002-00	CONN, 15 PIN, PCB, D-SUB, FEM
J7(D/4)	62-1390003-00	HEADER,RT ANGLE,4P .100
K1(B/1)	62-6237001-00	RELAY, LOW PROFILE, 12V
Q1(C/4)	62-4239001-00	TRANSISTOR, 2N3904
Q2(D/5)	62-6522001-00	TRANSISTOR, PNP, POWER
Q3(A/7);Q4(A/9)	62-4239002-00	TRANSISTOR NPN 2N4401
R1(A/1);R3(E/1); R10,R13(A/2); R29(E/6); R30,R31,R32(E/5); R33,R34,R39(D/5); R43,R44(C/7)	010166101	RES, 100 OHM 1/4W 5% CARBON
R2(A/1); R11,R12(A/2)	010166181	RES,FX,1/4W,5%,180
R4(B/2);R5(C/2);R6, R8(D/2);R25(C/4)	010166102	RES, 1K OHM 1/4W 5% CARBON
R7(C/2);R16(C/4)	010166332	RES,FX,1/4W,5%,3.3K
R9(D/2);R47(B/8)	010166562	RES,FX,1/4W,5%,5.6K
R14(C/3)	010316201	RES,FX,1/8W,1%,1.00K
R15(B/3);R26(C/4)	010166271	RES,FX,1/4W,5%,270 OHM
R17(C/2)	010166104	RES,FX,1/4W,5%,100K OHM
R18(A/9);R19(A/7)	010166221	RES,FX,1/4W,5%,220 OHM
R20(C/3)	010316269	RES,FX,1/8W,1%,5.11K
R21(C/4)	010166473	RES, 47K OHM 1/4W 5% CARBON
R22(B/3)	010316301	RES, FX1/8W,1%,10.0K
R23(B/3)	010316242	RES,FX,1/8W,1%,2.67K
R24(B/3)	010168820	RES,FX,1W,5%,82 OHM
R27(C/4);R45(B/7)	010166272	RES, 2.7K OHM 1/4W 5% CARBON
R28(C/4)	010166201	RES FX,1/4W,5%, 200 OHM
R35, R38(D/5)	010166472	RES, 4.7K OHM 1/4W 5% CARBON
R40(D/6)	62-1693009-00	RES FLAMPRF, 12 OHM, 3W, 5%
R41(A/6)	010167120	RES,FX,1/2W,5%,12 OHM
R42(A/8)	010167082	RES,FX,1/2W,5%, 8.2ohm
R46(A/7)	010166133	RES, CARBON, 1/4W, 5%, 13K OHM
R48(A/8)	010166911	RES,FX,1/4W,5%,910
RA1(A/9);RA2(A/10)	010595103	POTENTIOMETER, 10K OHM
S1(E/7)	62-3651003-00	SWITCH, DIP, 6 POS
N/A	62-6238001-00	SPEAKER, 8 OHM
TP1(D/1),TP3(D/3), TP4(C/3)	020361101	TEST POINTS
TP2(D/1)	62-6325001	TEST POINT, BLACK, 0.200 LONG
U1,U2,U3(C/1)	010647001	I.C., OPTO COUPLER
U4(C/2)	010281000	IC,QUAD VOLT COMP., LM339
U5(C/2)	62-1374001-00	IC XSTR ARRAY ULN2003
U6(D/6)	62-6236001-00	IC, RS232 TRANSCEIVER
VR1(B/7)	62-0417001-00	REGULATOR VOLTAGE 5V
N/A	62-6476001-00	STANDOFF,.312Lx4-40,SELF CLIN
N/A	62-6476002-00	STANDOFF, PCB #4-40 X 1/4”
N/A	030446107	SCREW FH PH BLK 6-32X1/2
N/A	080334000	WIRE, SOLID, 22AWG,WHT
N/A	62-0343001-00	NUT KEPS 4-40
N/A	62-0649002-00	SEALANT,LOCTITE #222-31 50ML
N/A	62-3608004-00	SCREW 4-40X5/16 PN HD PHL
N/A	62-3608005-00	SCREW,4-403/8 PN HD PHL
N/A	62-6476003-00	STANDOFF, .312L x 6-32
N/A	62-6763001-00	GASKET, SPEAKER, SYS 2500/5000

Figure 4.4 A12 Back Panel PCB Assembly



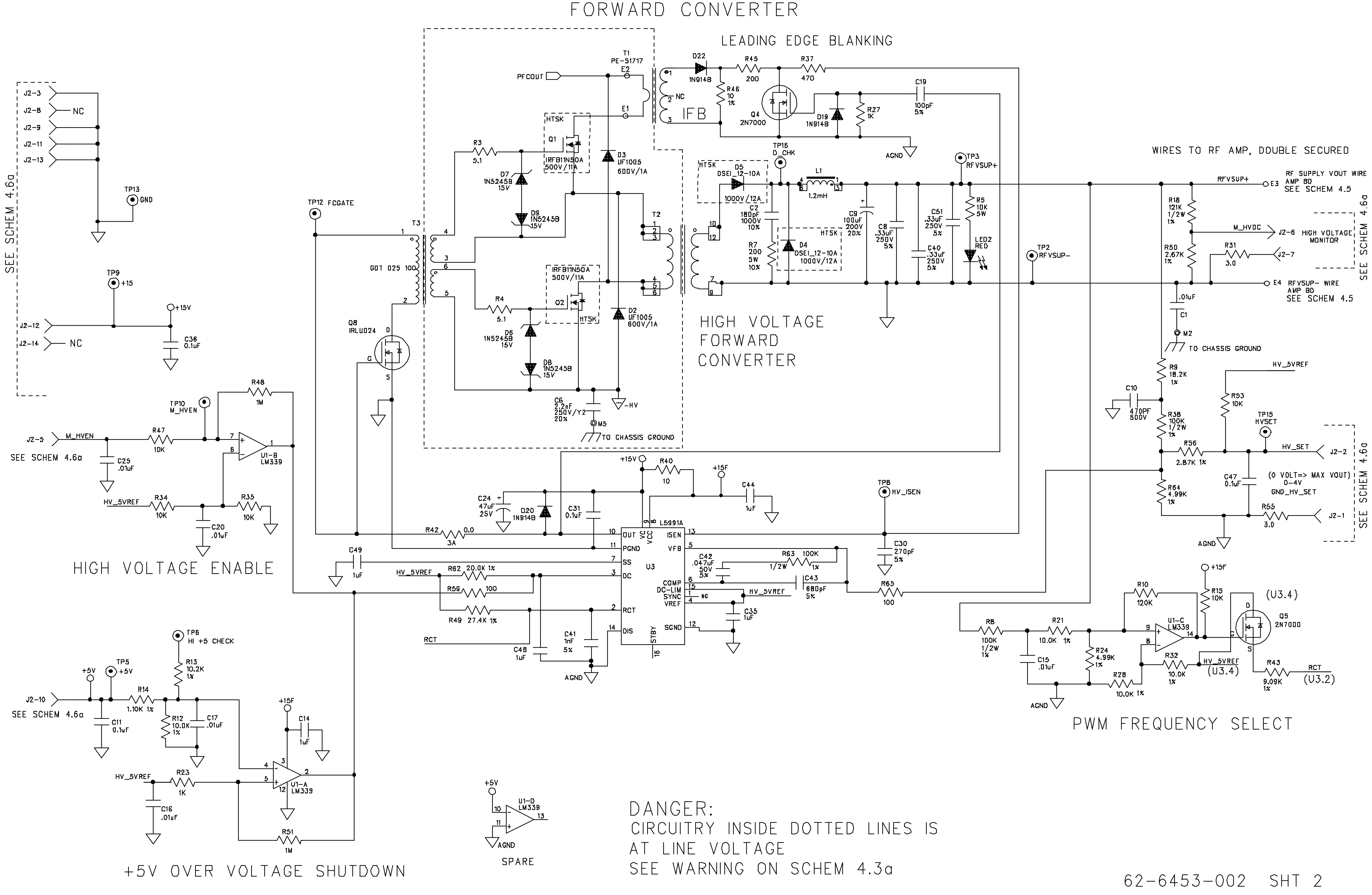
Schematic 4.3a A9 RF Power Supply PCB - Power Factor Controller



DANGER:
CIRCUITRY INSIDE THE DOTTED LINES IS AT LINE VOLTAGE.
DO NOT CONNECT GROUND LEADS TO THOSE CIRCUITS
UNLESS AN ISOLATION TRANSFORMER IS USED CORRECTLY.
SEE THEORY OF OPERATION FOR DETAILS.

62-6453-002 SHT 1

Schematic 4.3b A9 RF Power Supply PCB - Forward Converter

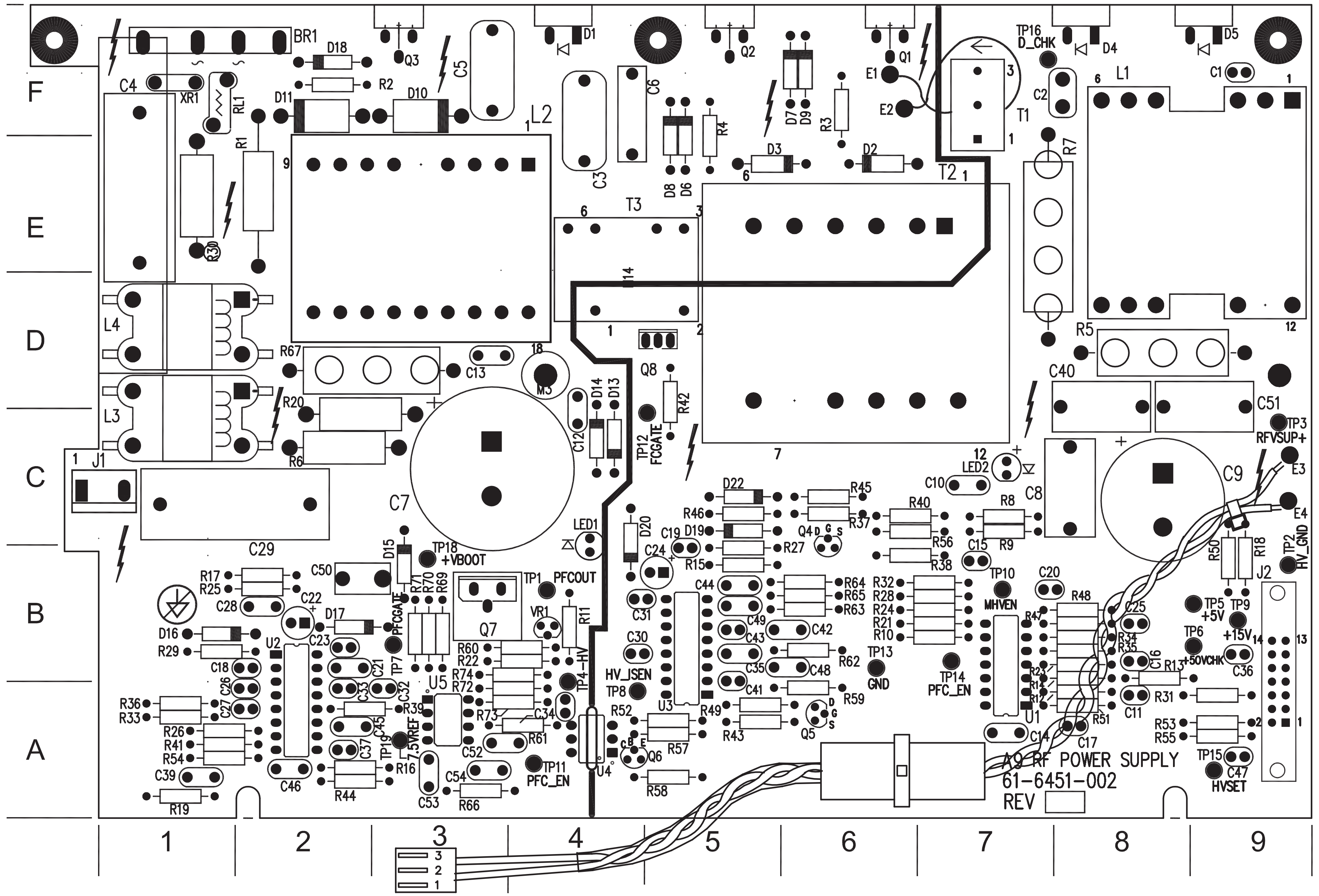


Bill of Material: RF Power Supply PCB Assembly

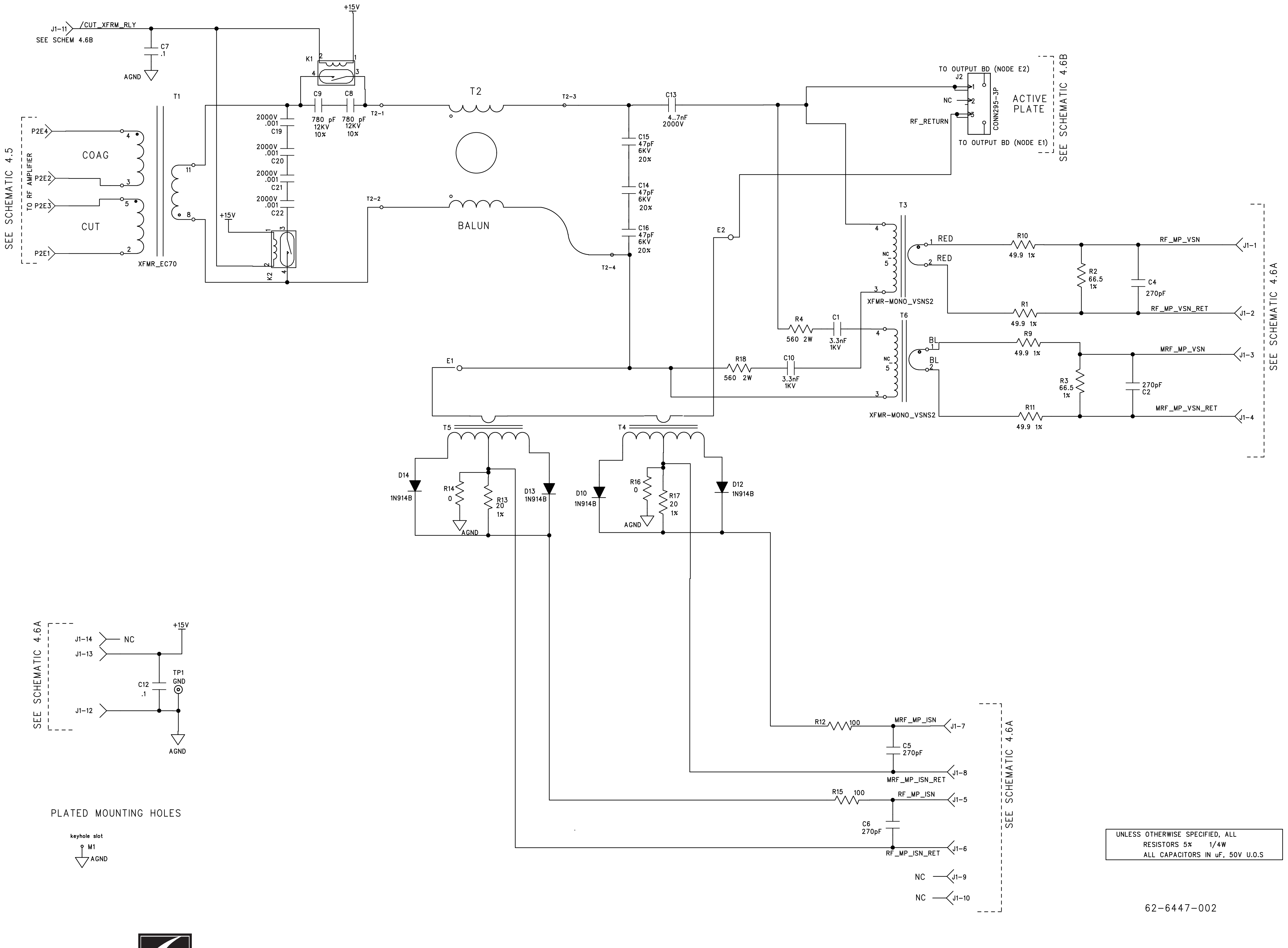
61-6451-002 A9 RF POWER SUPPLY PCB ASSEMBLY

REF. DES.	CONMED P/N	DESCRIPTION
BR1(F/1)	62-6310001-00	BRIDGE RECTIFIER, PC MOUNT
C1(F/9);C15, C20(B/7);C16, C25(B/8);C17(A/8)	62-0267001-00	CAP,CER,Z5U,.01UF,50V,20%
C2(F/8)	62-6482003-00	CAP CER DISC 180PF 1000V 10%
C3(F/4);C5(F/3)	62-6531004-00	CAP,POLYE,.22uF,630VDC, 10%
C4(E/1);C29(C/2)	62-6140001-00	CAP,FILM,X2,0.68uF,275VAC,10%
C6(F/4)	62-6140002-00	CAP,FILM,Y2,2200pF,250VAC,20%
C7(C/3)	62-6530001-00	CAP, ALUM,ELECTROLYTIC
C8(C/8);C40(D/8); C51(D/9)	62-6419334-00	CAP,MET,PP,250V,5%,0.33UF
C9(C/8)	62-6138001-00	CAP,ELECT,100UF,200V,20%
C10(C/7);C28(B/2)	62-6533001-00	CAPACITOR, CER. DISC, 550V
C11(A/8);C23(B/2); C31(B/4);C34(A/4); C36(B/9);C37(A/2); C47(A/9); C52,C53,C54(A/3)	62-0267002-00	CAP,CER,Z5U,.1UF,50V,20%
C12(C/4);C13(D/3); C14(A/7);C21(B/2); C35,C44,C49(B/5); C39(A/1);C45(A/2); C48(B/6)	62-0267006-00	CAP,CER,Z5U,1.0UF,50V,20%
C18(B/2);C30(B/4)	62-0267009-00	CAP,CER,C0G,270PF,50V,5%
C19(B/5);C27(A/2)	62-0267004-00	CAP,CER,C0G,100PF,50V,5%
C22,C23(B/2); C24(B/5)	62-4083001-00	CAP, ELEC., MIN., 47uF, 25V
C26,C33(A/2); C41(B/5)	62-0267016-00	CAP,CER,COG,0.001UF,50V,5%
C32(A/3)	62-0267017-00	CAP,CER,Z5U,0.047UFD,50V,20%
C42(B/6)	62-3575004-00	CAP, MET, .047MFD, 50V 5%
C43(B/5)	62-0267010-00	CAP,CER,C0G,680PF,50V,5%
C46(A/2)	62-3575009-00	CAP, MET, .15MFD, 50V, 5%
C50(B/2)	62-6531006-00	CAP,POLYE,.1uF,250VDC, 10%
D1(F/4)	62-4068002-00	DIODE,HIGH VOLTAGE/SPEED
D2,D3(E/6)	62-6117002-00	DIODE, UF1005 600V 75nS
D4(F/8);D5(F/9)	62-4068001-00	DIODE, HIGH VOLTAGE/SPEED
D6,D8(F/5);D7, D9(F/6);D15(B/3)	62-0292002-00	DIODE, ZENER, 1N5245B
D10(F/3)	010318013	SUPPRESSOR, VOLTAGE, 1.5KE15
D11(F/2)	62-4865001-00	DIODE, 1N5401
D13,D14,D20(C/4); D17(B/2); D19,D22(C/5)	62-0290002-00	DIODE, 1N914B
D16(B/1);D18(F/2)	62-3313002-00	DIODE, SCHOTTKY, SB1100
J1(C/1)	62-6300006-00	CONN,HEADER,0.156,3 POS
J2(A/9)	62-4857003-00	HEADER, DIN W/LATCH 14 PIN
L1(F/9)	62-6159001-00	INDUCTOR,OUTPUT,1.2mH,5A
L2(E/4)	62-6391001-00	INDUCTOR,PFC BOOST,585uH,7ARMS
L3(C/1);L4(D/1)	62-6139001-00	IND,LINE FLTR,68UH,8ADC
LED1(C/4); LED2(C/7)	62-4056001-00	LED, RED
Q1(F/6);Q2(F/5)	62-5590001-00	MOSFET N-CHAN 500V 0.52 TO-220
Q3(F/3)	62-6311002-00	MOSFET,N-CHAN,600V,.19,TO-220
Q4(C/6);Q5(A/6)	010630001	XISTOR,FET, 2N7000
Q6(A/4)	62-4239001-00	TRANSISTOR, 2N3904
Q7(B/3)	62-1694003-00	TRANSISTOR, POWER, IRF820
Q8(D/5)	62-7107001-00	POWER MOSFET, IRLU024
R1(F/2)	62-6334001-00	RES,CURRENT SENSE,.05ohm,1%,3W
R2(F/2);R42(D/5)	62-3062001-00	RES,ZERO OHM
R3(F/6);R4(F/5)	62-0364008-00	RES, 5.1, 1/4W, 5%
R5(D/8)	62-3859001-00	RES, 10K 5W 5%
R6,R20(C/2)	010628393	RES,MET OX,FX,2W,5%,39K OHM
R7(E/7)	010654201	RES WW 200 OHMS 5W 10%
R8(C/7);R38, R63(B/6)	62-6408385-00	RES,MF,100K 1/2W 1%
R9(C/7);R39(A/2)	62-0961314-00	RES, 18.2K, 1/4W, 1%
R10(B/7)	62-0364113-00	RES 120K, 1/4W, 5%
R11,R22(B/4); R69,R70(B/3)	62-0961426-00	RES,MF,267K,1/4W,1%
R12(A/8);R16(A/2); R21,R28,R32(B/7)	62-0961289-00	RES, MF, 10.0K, 1/4W, 1%
R13(B/8)	62-0961290-00	RES,MF,10.2K,1/4W,1%
R14(B/8)	62-0961197-00	RES, MF, 1.10K 1/4W 1%
R15(B/5);R34,R35, R47(B/8);R53(A/9); R61(A/4)	62-0364087-00	RES, 10K, 1/4W, 5% CF
R17(B/2);R19(A/1)	62-0364123-00	RES 330K, 1/4W, 5%
R18(B/9)	62-6408393-00	RES,MF,121K,1/2W,1%
R23(B/8);R27(B/5)	62-0364063-00	RES, 1K 1/4W 5% CF
R24(B/7);R64(B/6)	62-0961260-00	RES, 4.99K, 1/4W, 1%
R25(B/2);R41(A/1)	62-0364125-00	RES, 390K, 1/4W, 5%
R26(A/1)	62-0961230-00	RES, MF, 2.43K, 1/4W, 1%
R29(B/1)	62-0961185-00	RES,825 1/4W 1% MF
R30(E/1)	62-4609005-00	RES MF 2W 5% 150K
R31,R55(A/9)	62-0364002-00	RES, CF, 3.0 OHM, 1/4W, 5%
R33(A/1)	62-0364098-00	RES,30K,1/4W, 5%
R36(A/1)	62-0364072-00	RES, 2.4K, 1/4W, 5% CF
R37(C/6)	62-0364055-00	RES, 470 1/4W 5% CF
R40(C/6)	62-0364015-00	RES, 10, 1/4W, 5%
R43(A/5)	62-0961285-00	RES 9.09K 1/4W 1%
R44(A/2)	62-0364096-00	RES, 24K, 1/4W, 5%
R45(C/6)	62-0364046-00	RES, 200, 1/4W, 5% CF
R46(C/5)	62-0961001-00	RES, MF, 10 OHM, 1/4W, 1%
R48(B/8);R51(A/8)	62-0364135-00	RES, 1.0M, 1/4W, 5% CF
R49(A/5)	62-0961331-00	RES, MF, 27.4K, 1/4W, 1%
R50(B/9)	62-0961234-00	RES, MF, 2.67K, 1/4W, 1%
R52(A/5);R66(A/3)	62-0364094-00	RES, 20K, 1/4W, 5%
R54(A/1)	62-0364088-00	RES, 11K, 1/4W, 5%
R56(C/6)	62-0961237-00	RES,2.87K,1/4W, 1%
R57(A/5)	62-0364070-00	RES, 2K, 1/4W, 5% CF
R58(A/5)	62-0364049-00	RES, 270, 1/4W, 5%
R59(A/6);R65(B/6)	62-0364039-00	RES, 100 1/4W 5% CF
R60(B/4)	62-0961252-00	RES,4.12K, 1/4W, 1%
R62(B/6)	62-0961318-00	RES, MF, 20.0K, 1/4W, 1%
R67(D/2)	010618392	RES,FX,MO,NI,5W,5%,3.9K
R71(B/3);R72(A/4)	62-0961240-00	RES, MF, 3.09K, 1%, 1/4W
R73(A/4)	62-0364101-00	RES, 39K, 1/4W, 5%
R74(B/4)	62-0364132-00	RES, 750K, 1/4W, 5%
RL1(F/1)	62-5589002-00	RES,INRUSH LIMITER,5.0ohm,8A
T1(E/7)	62-3948001-00	INDUCTOR,CURR SNS,50T CEN.TAP
T2(E/7)	62-6160002-00	TRANSFORMER, HV SUP SWITCHING
T3(D/5)	62-6323002-00	TRANSFORMER, GATE DRIVE
TP1(B/4);TP3(C/9); TP5,TP6,TP9(B/9); TP7,TP18(B/3); TP8,TP11(A/4); TP10,TP14(B/7); TP12(C/5); TP15(A/9); TP16(F/7); TP19(A/3)	020361101	TEST POINTS
TP2(B/9);TP4(B/4); TP13(B/6)	62-6325001-00	TEST POINT,BLACK, 0.200 LONG
U1(A/7)	62-4257001-00	IC QUAD COMPARATOR LM339
U2(B/2)	62-5388001-00	I.C.,POWER FACTOR CONTROL
U3(A/5)	62-6116001-00	IC CURRENT MODE CONTROL PWM
U4(A/4)	010480001	IC,OPTOCOUPLER,CNY17-3
U5(A/3)	62-6656001-00	IC COMPARATOR SINGLE LOW PWR
VR1(B/4)	62-3957001-00	IC,VOLT REF. 2.5V 1%,TO-92
XQ7(B/3)	62-2726005-00	HEATSINK, TO220 PC 20C/W
XR1(F/1)	62-4594002-00	VARISTOR, METAL OXIDE 275VAC
N/A	10044036	STANDOFF, NYLON, 6-32, 2 1/4
N/A	61-6540001-00	HARNESS,HV SUPPLY,SYS 2/5K
N/A	62-0431001-00	WIRE BARE BUS 22AWG
N/A	62-0260001-00	CABLE TIE .085 WIDE
N/A	62-0622002-00	WIRE HI VOLTAGE #22 10KV
N/A	62-4768001-00	BRACKET,MOUNTING
N/A	62-4926001-00	BUMPER, RUBBER, SELF-ADHESIVE
N/A	62-6132001-00	BRACKET, STRAP, GND SHIELD
N/A	62-6400003-00	THERMAL PAD, RFPS TO-220
N/A	62-6400004-00	THERMAL PAD, RFPS BR
N/A	62-6486001-00	NUT TINNERMAN 6-32
N/A	62-6525002-00	MOUNTING CLIP, TRANSISTOR
N/A	62-6525003-00	MOUNTING CLIP, TRANSISTOR
N/A	62-6534002-00	SCREW & WASHER ASSY,SQ. CONE
N/A	62-6544001-00	GROUND CLIP, PWB MOUNT
N/A	62-6556002-00	DIE CAST RIGHT SIDE, A2/A5
N/A	62-6670001-00	TUBE, SPIRAL WRAP, KAPTON

Figure 4.5 A9 RF Power Supply PCB Assembly



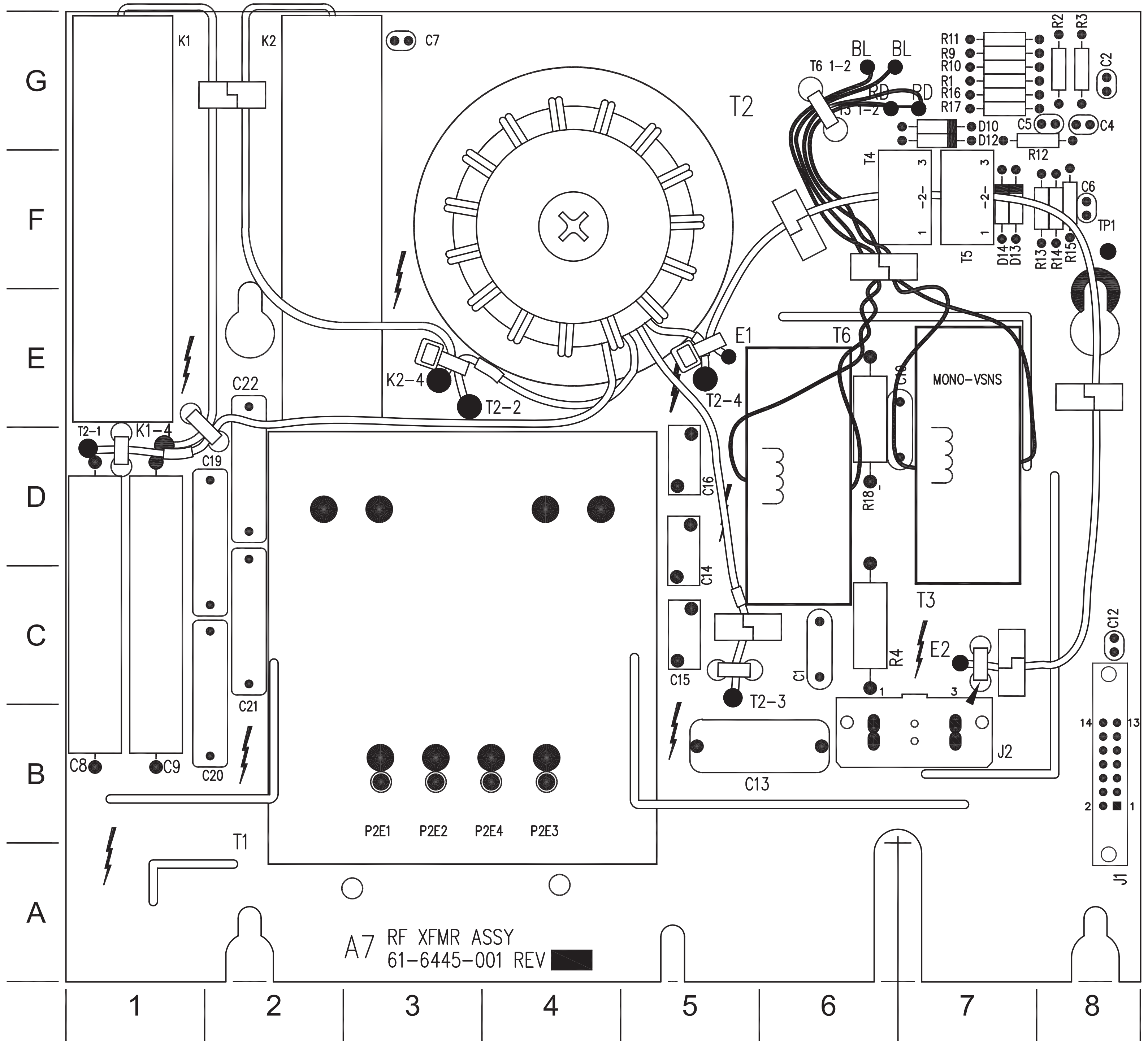
Schematic 4.4 A7 RF Transformer PCB



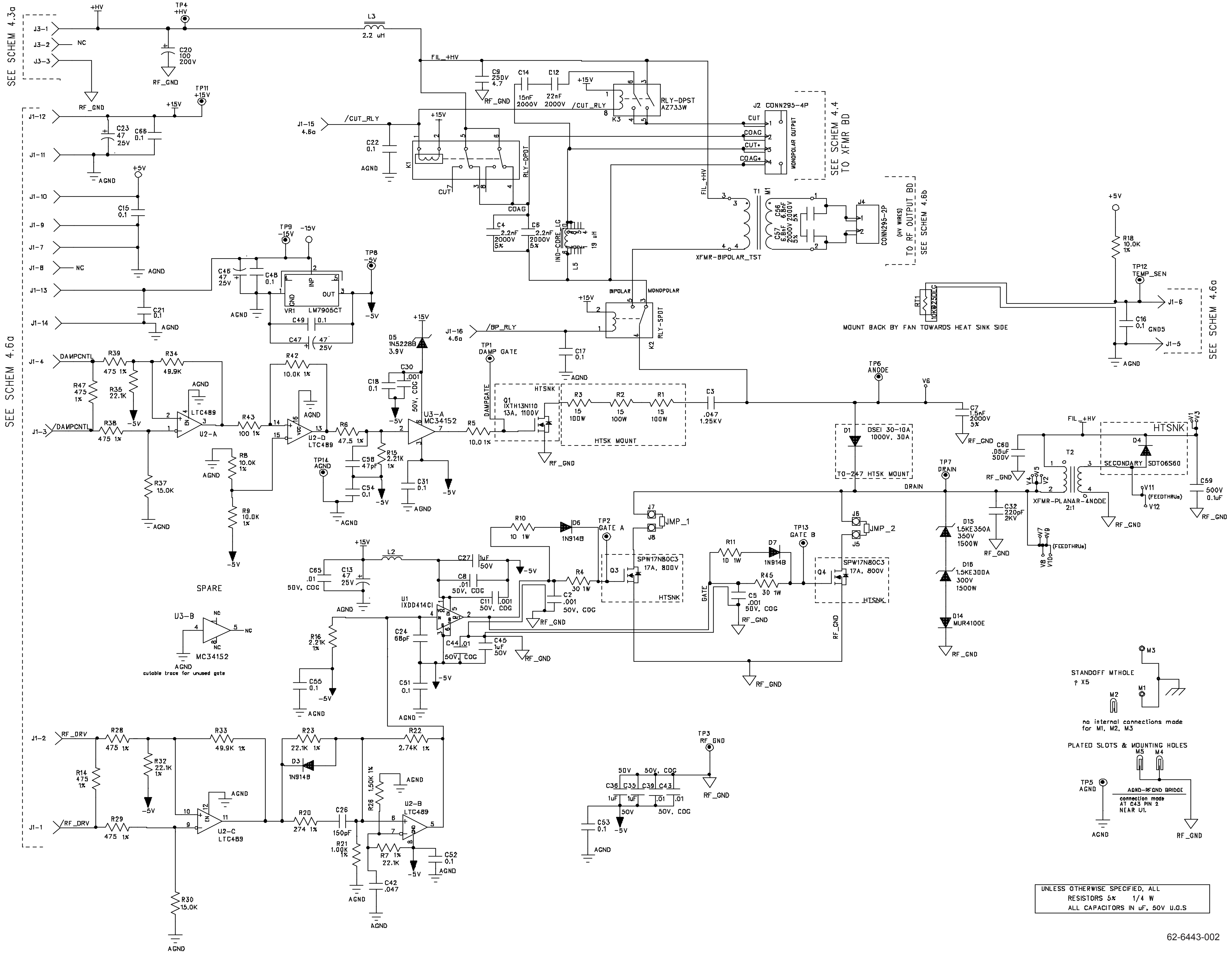
Bill of Material: RF Transformer PCB Assembly

REF. DES.	CONMED P/N	DESCRIPTION
61-6445-001 A7 RF TRANSFORMER PCB ASSEMBLY		
C1(C/6);C10(D/7)	62-5404003-00	CAP.,CER., 1KV, 3300pF +/- 20%
C2,C4,C5(G/8); C6(F/8)	62-0267009-00	CAP,CER,C0G,270PF,50V,5%
C7(G/3);C12(C/8)	62-0267002-00	CAP,CER,Z5U,.1UF,50V,20%
C8,C9(C/1)	62-6623002-00	CAP, MET, PP, 780 PF, 1250V
C13(B/6)	010261472	CAP,POLYPROP,2KV,4700 PF
C14,C16(D/5); C15(C/5)	62-0265007-00	CAP CER DISC 47PF 6KV 20%
C19,C22(D/2); C20,C21(C/2)	010261102	CAP,POLYPROP,2KV,1000 PF
D10,D12(G/7); D13,D14(F/7)	62-0290002-00	DIODE, 1N914B
J1(B/8)	62-4857003-00	HEADER, DIN W/LATCH 14 PIN
J2(B/7)	62-6230303-00	CONN, 3 CKT .093" PWB VERTICAL
K1(F/1);K2(F/2)	62-3473004-00	RELAY, REED, HV, 14V
R1,R9,R10,R11(G/7)	62-0961068-00	RESISTOR MF 1/4W 1% 49.9
R2,R3(G/8)	62-0961080-00	RES, MF 66.5 OHM, 1/4W, 1%
R4(C/6);R18(E/6)	010628561	RES,MET OX,FX,2W,5%,560 OHM
R12(G/8);R15(F/8)	62-0364039-00	RES, 100 1/4W 5% CF
R13(F/8);R17(G/7)	62-0961030-00	RES, 20 OHM, 1/4 W, 1%
R14(F/8);R16(G/7)	62-3062001-00	RES,ZERO OHM
T1(C/3)	61-6652001-00	XFMR, MONOPOLAR OUTPUT A2/A5
T2(F/4)	61-6653002-00	XFMR, BALUN, SYS 2500/5000
T3(D/7);T6(D/6)	61-4069001-00	XFRMR, V-SENSE, MONO
T4,T5(F/7)	62-3948001-00	INDUCTOR,CURR SNS,50T CEN.TAP
TP1(F/8)	62-6325001-00	TEST POINT,BLACK, 0.200 LONG
N/A	62-6534002-00	SCREW & WASHER ASSY,SQ. CONE
N/A	030080000	WASHER,FLAT,1/4X9/16X1/16
N/A	030463405	BOLT,HEX WASHER HD,1/4-20
N/A	62-0418006-00	WASHER LOCK INT TOOTH 1/4
N/A	62-5339001-00	SCREW,1/4-20 X 1/2 FH PHIL
N/A	62-6512001-00	CAP, TOROID
N/A	62-6555002-00	HEX STANDOFF, 1/4-20, 1.44 L
N/A	61-6685001-00	HARNESS,XFMR BD,SYS 2500/5000
N/A	62-0260001-00	CABLE TIE .085 WIDE
N/A	62-0622002-00	WIRE HI VOLTAGE #22 10KV
N/A	62-1621002-00	KAPTON TAPE, 3/4"
N/A	62-5586001-00	WIRE, TRIPLE INS. TEFZEL 24AWG,RED
N/A	62-5586002-00	WIRE,TRP INS. TEFZEL24AWG,BLUE
N/A	62-6320001-00	STANDOFF, WIRE, 1", THK PWB

Figure 4.6 A7 RF Transformer PCB Assembly



Schematic 4.5 A6 RF Amplifier PCB

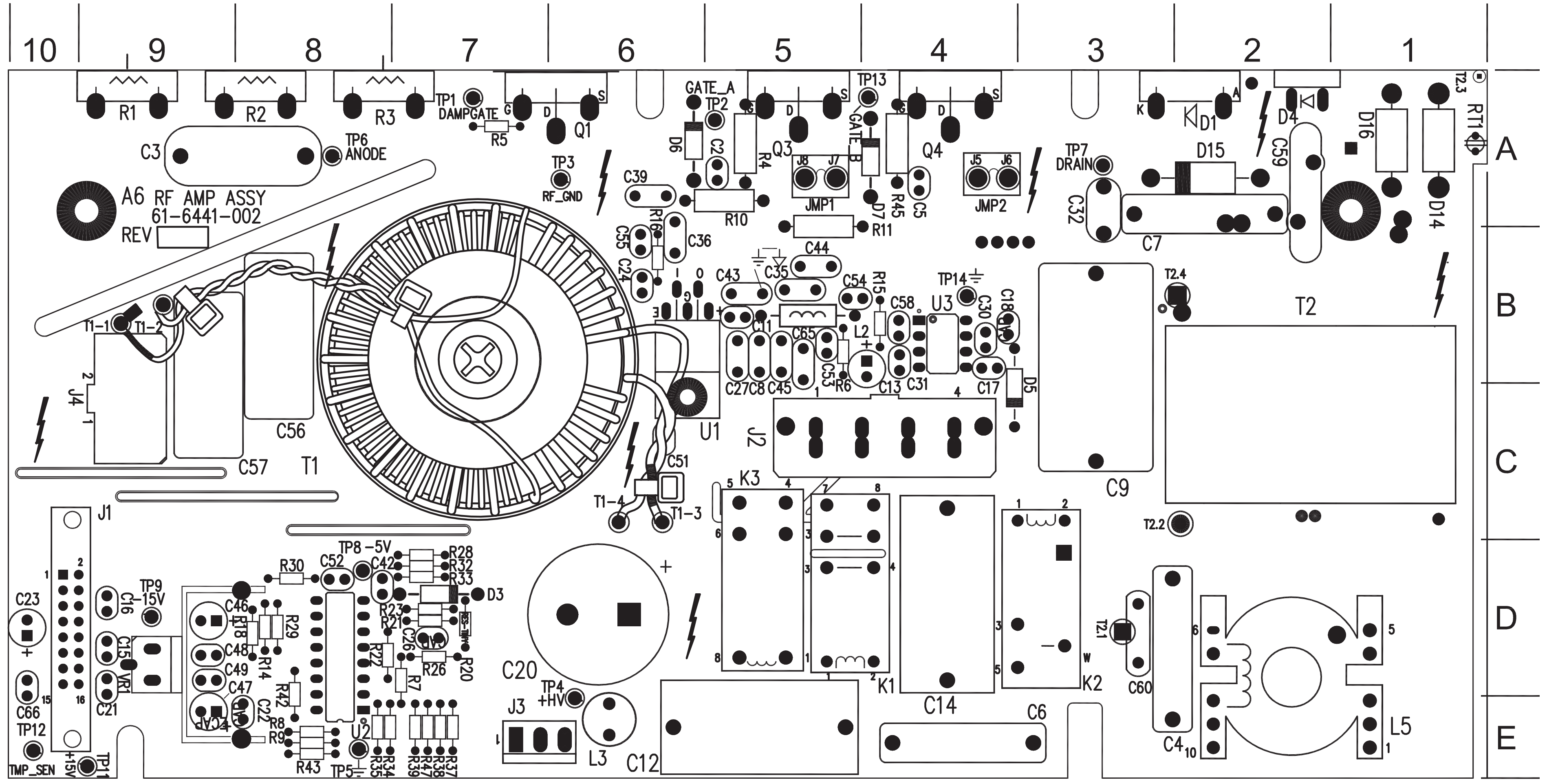


Bill of Material: RF Amplifier PCB Assembly

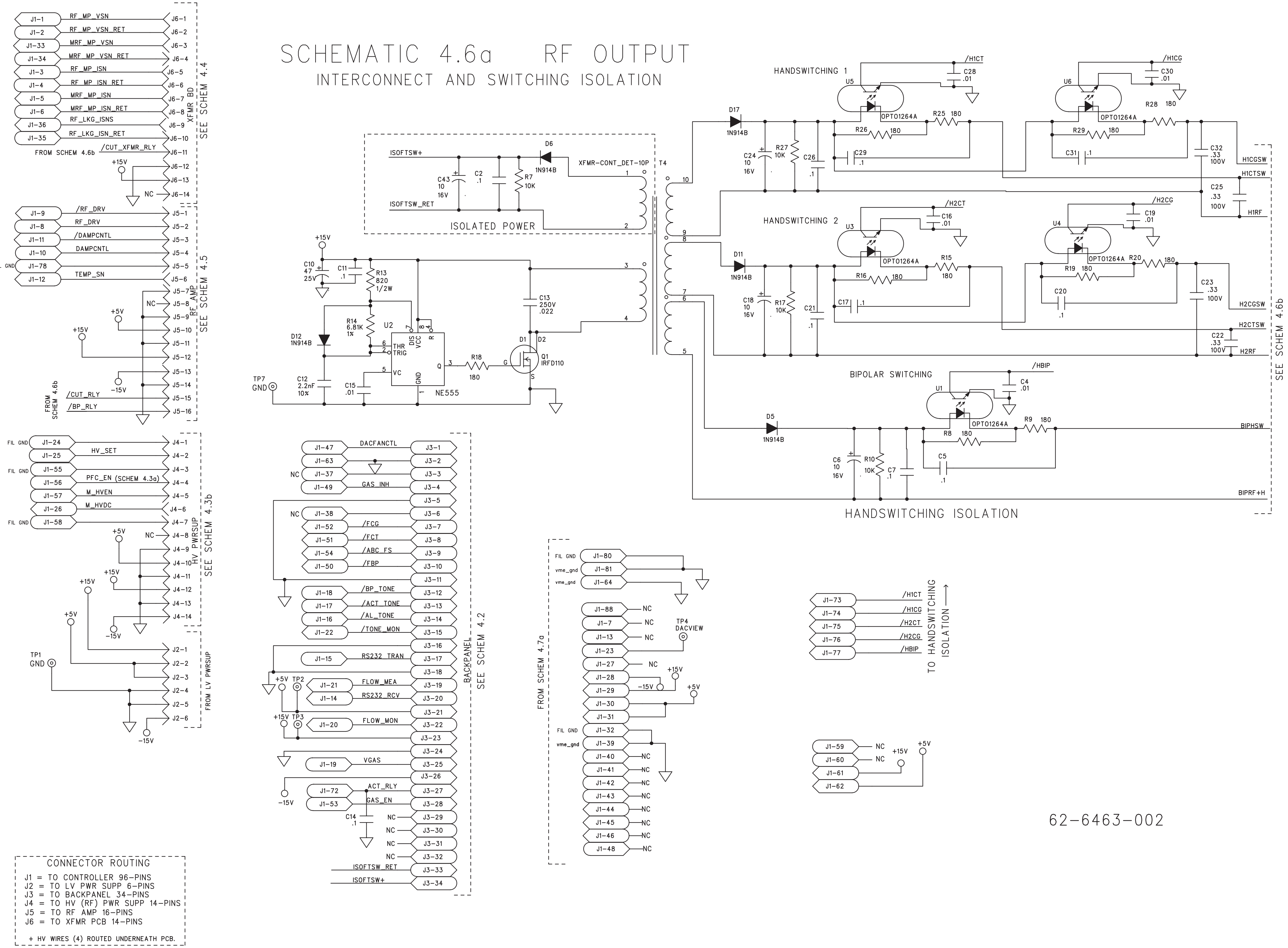
61-6441-002 A6 RF AMPLIFIER PCB ASSEMBLY

REF. DES.	CONMED P/N	DESCRIPTION
C2(A/5);C5(A/4); C11(B/5);C30(B/4)	62-0267016-00	CAP,CER,COG,0.001UF,50V,5%
C3(A/8)	62-4082001-00	CAP,MET,PP .047uF 1.25K VDC 5%
C4(D/2);C6(E/4)	010261222	CAP,POLYPROP,2KV,2200 PF
C7(A/2)	010261152	CAP,POLYPROP,2KV,1500 pF
C8,C43,C44, C65(B/5);C39(A/6)	62-0267019-00	CAP, CER COG 0.01UF 50V 5-10%
C9(B/3)	62-6419475-00	CAP,MET,PP,250V,5%,4.7UF
C12(E/5)	010261223	CAP,POLYPROP,22000pF 2KV
C13(B/4);C23(D/10); C46(D/9);C47(E/9)	62-4083001-00	CAP, ELEC., MIN., 47uF, 25V
C14(D/4)	010261153	CAP,POLYPROP,15000pF 2KV
C15,C16,C21,C48, C49(D/9);C17,C31, C54(B/4);C18(B/3); C22(E/8);C51(C/6); C52(D/8);C53(B/5); C55(B/6);C66(D/10)	62-0267002-00	CAP,CER,Z5U,.1UF,50V,20%
C20(D/6)	62-6138001-00	CAP,ELECT,100UF,200V,20%
C24(B/6)	62-0267008-00	CAP,CER,C0G,68PF,50V,5%
C26(D/7)	010614151	CAP,CER,COG,(NPO),150 PF
C27,C35,C45(B/5); C36(B/6)	62-0267018-00	CAP, CER X7R 1UF 50V 10%
C32(A/3)	62-6638221-00	CAP, CER DISK 220PF 2KV 5&10%
C42(D/7)	62-0267017-00	CAP,CER,Z5U,0.047UFD,50V,20%
C56(B/8);C57(B/9)	010261682	CAP,POLYPROP,2KV,6800PF
C58(B/4)	010614470	CAP,CER,COG,50V,5%,47PF
C59(A/2)	62-0265004-00	CAP CER DISC .1UF 500V
C60(D/3)	62-0265008-00	CAP,CER,DISC,.05uF,500V,20%
D1(A/2)	62-6130001-00	DIODE, HI VOLTAGE, HI SPEED
D3(D/7);D6(A/5); D7(A/4)	62-0290002-00	DIODE, 1N914B
D4(A/2)	62-6637001-00	DIODE SCHOTTKY SIL-CAR 6A 600V
D5(C/3)	62-0292003-00	DIODE, ZENER 1N5228B
D14(A/1)	62-1683001-00	DIODE, HV, MUR4100E
D15(A/2)	010318103	SUPPRESSOR, VOLT, KE350A
D16(A/1)	010318102	SUPPRESOR,VOLTAGE,1.5KE300A
J1(D/9)	62-4857004-00	HEADER, DIN W/LATCH 16 PIN
J2(C/4)	62-6230304-00	CONN,4 CKT .093" PWB VERTICAL
J3(E/6)	62-3598004-00	HEADER, STR. PIN, 3 CKT, TIN
J4(C/9)	62-6230302-00	CONN,2 CKT, .093" PWB VERTICAL
J5(A/4);J6(A/3); J7,J8(A/5)	62-6619001-00	CONN,SHRT LK,INS,RED,.04x.2
J5(A/4);J6(A/3); J7,J8(A/5)	62-6624001-00	CONN CAGE JACK PRESS .04 AU/NI
K1(D/4)	62-6195002-00	RELAY,POWER PCB,DPDT,12VDC
K2(D/3)	62-6195001-00	RELAY,POWER PCB, SPDT, 12 VDC
K3(D/5)	62-6673001-00	RELAY,PCB,DPST,12VDC,5KV,10A
L2(B/5)	050119001	FERRITE SHIELD BEAD
L3(E/6)	62-6636022-00	INDUCTOR, FIXED RADIAL
L5(D/2)	61-7104001-00	INDUCTOR, CUT, CURRENT LIMIT
Q1(A/6)	62-6321001-00	MOSFET, IXTH13N110, 1100V, 13A
Q3(A/5);Q4(A/4)	62-6635001-00	MOSFET, 17A, 800V, 0.29 OHM
R1(A/9);R2(A/8); R3(A/7)	62-6309001-00	RESISTOR, PWR, 100W, 15OHMS 1%
R4(A/5);R45(A/4)	62-6660001-00	RES SMALL MF 1W 5% 30
R5(A/7)	62-6674001-00	RES SMALL MF 1/4W 1% 10.0
R6(B/5)	62-6674066-00	RES SMALL MF 1/4W 1% 47.5
R7,R23,R32(D/7); R35(E/8)	62-6674322-00	RES SMALL MF 1/4W 1% 22.1K
R8,R9(E/8); R18,R42(D/8)	62-6674289-00	RES SMALL MF 1/4W 1% 10.0K
R10(A/5);R11(B/5)	62-5748002-00	RES,10 OHM 5% SM. 1W FUSIBLE
R14,R29(D/8); R28(D/7);R38,R39, R47(E/7)	62-6674162-00	RES SMALL MF 1/4W 1% 475
R15(B/4);R16(B/6)	62-6674226-00	RES SMALL MF 1/4W 1% 2.21K
R20(D/7)	62-6674139-00	RES SMALL MF 1/4W 1% 274
R21(D/7)	62-6674193-00	RES SMALL MF 1/4W 1% 1.00K
R22(D/7)	62-6674235-00	RES SMALL MF 1/4W 1% 2.74K
R26(D/7)	62-6674210-00	RES SMALL MF 1/4W 1% 1.50K
R30(D/8);R37(E/7)	62-6674306-00	RES SMALL MF 1/4W 1% 15.0K
R33(D/7);R34(E/7)	62-6674356-00	RES SMALL MF 1/4W 1% 49.9K
R43(E/8)	62-6674097-00	RES SMALL MF 1/4W 1% 100
RT1(A/1)	62-6420103-00	THERMISTOR 10K OHM 10%
T1(B/7)	61-4067001-00	TRANSFORMER, BIPOLAR
T2(C/3)	62-6655001-00	CORE, FERRITE, PLANAR E
T2(C/3)	62-6655002-00	CORE, FERRITE, PLANAR PLATE
TP1(A/7);TP2(A/5); TP3(A/6);TP4(E/6); TP5(E/8);TP6(A/8); TP7(A/3);TP8(D/8); TP9(D/9); TP11(E/9); TP12(E/10); TP13(A/4); TP14(B/4)	62-6325001-00	TEST POINT,BLACK, 0.200 LONG
U1(B/6)	62-6634002-00	DRIVER, MOSFET, 14A, TO-220
U2(D/8)	62-6136001-00	IC QUAD RS485 LINE RCVR 16 DIP
U3(B/4)	62-4081001-00	MOSFET DRIVER
VR1(D/9)	010367001	VOLTAGE REGULATOR -5V 7905CT
N/A	030257103	SCREW,SLT,PH,SEMS EW,6-32X1/4L
N/A	62-4842001-00	TAPE, FOAM
N/A	62-6678001-00	CLAMP, PLANAR E-CORE, A2/A5
N/A	62-6679001-00	BOTTOM BRACKET, PLANAR E-CORE
N/A	030241003	NUT,SELF-CLINCH,PCB, 4-40
N/A	62-5740001-00	HEATSINK TO-220 PC 1.18x.95x.5
N/A	030080000	WASHER,FLAT,1/4X9/16X1/16
N/A	030257005	SCREW BDR HD/PH,4-40X3/8
N/A	030463405	BOLT,HEX WASHER HD,1/4-20
N/A	62-0260001-00	CABLE TIE .085 WIDE
N/A	62-0343001-00	NUT KEPS 4-40
N/A	62-0418006-00	WASHER LOCK INT TOOTH 1/4
N/A	62-1621002-00	KAPTON TAPE, 3/4"
N/A	62-4286001-00	INSULATOR CLAMP T0220 0.69X0.2
N/A	62-4768001-00	BRACKET,MOUNTING
N/A	62-4842002-00	TAPE, FOAM 5/8" x 5/8"
N/A	62-4926001-00	BUMPER, RUBBER, SELF-ADHESIVE
N/A	62-5339001-00	SCREW,1/4-20 X 1/2 FH PHIL
N/A	62-6132001-00	BRACKET, STRAP, GND SHIELD
N/A	62-6312001-00	CLAMP, TRANSISTOR
N/A	62-6400001-00	THERMAL PAD, TO-220
N/A	62-6400005-00	THERMAL PAD, TO-247
N/A	62-6486001-00	NUT TINNERMAN 6-32
N/A	62-6512001-00	CAP, TOROID
N/A	62-6534002-00	SCREW & WASHER ASSY,SQ. CONE
N/A	62-6544001-00	GROUND CLIP, PWB MOUNT
N/A	62-6555001-00	HEX STANDOFF, 1/4-20, .500 L
N/A	62-6556001-00	DIE CAST LEFT SIDE, A2/A5
N/A	62-6671001-00	DAMPENING PAD
N/A	62-6681001-00	FENCE, HV AMP, SYS. 2500/5000
N/A	62-0419003-00	WASHER FLAT #6
N/A	62-6760001-00	WASHER BELLEVILLE #6-32
N/A	62-6761001-00	SCREW, SCH, HEX, BLK, #6-32
N/A	62-6745001-00	ADHESIVE, LOCTITE 324
N/A	62-6745002-00	ADHESIVE, LOCTITE 7649

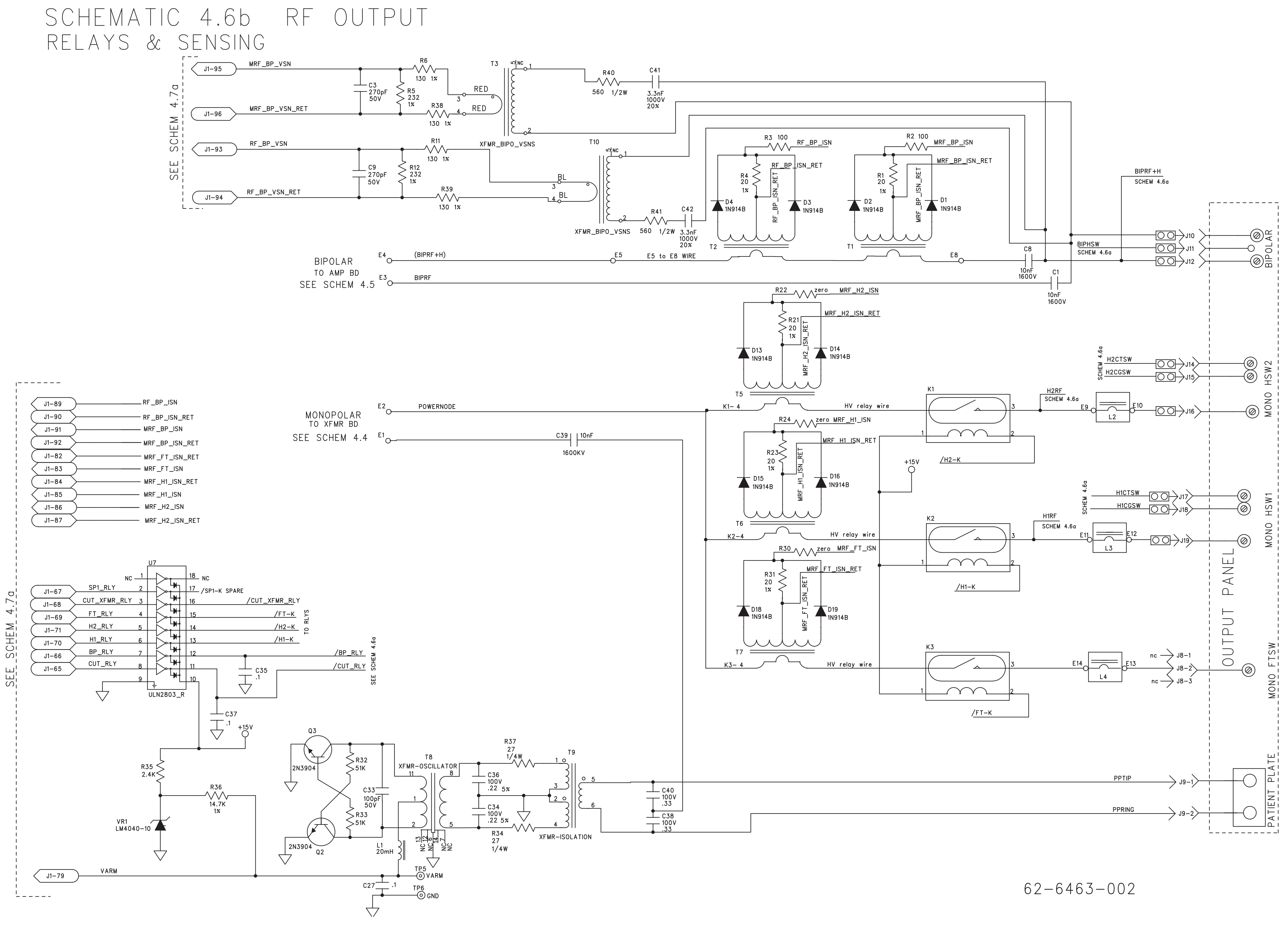
Figure 4.7 A6 RF Amplifier PCB Assembly



Schematic 4.6a A5 RF Output PCB - Interconnect & Switching Isolation



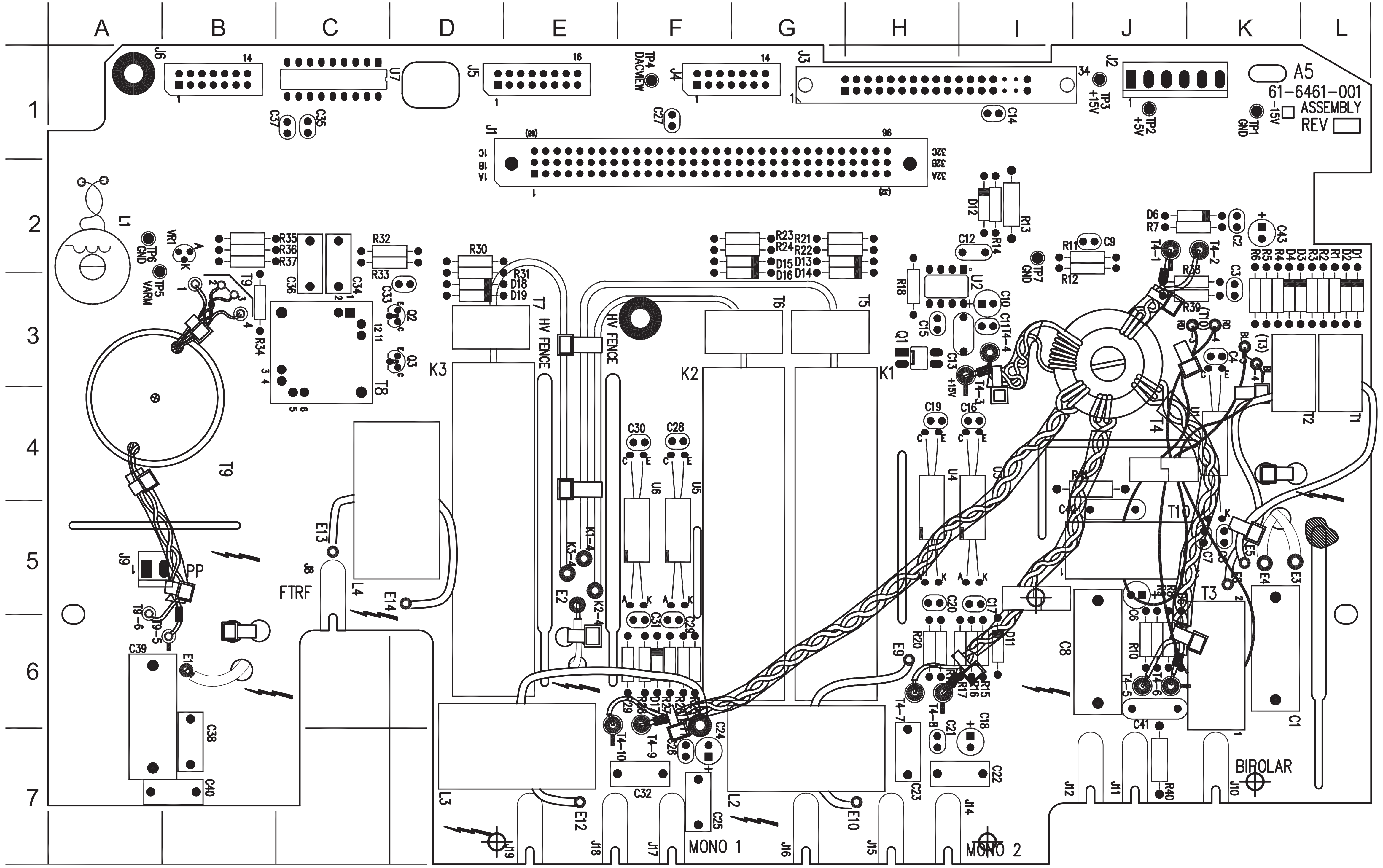
Schematic 4.6b A5 RF Output PCB - Relays & Sensing



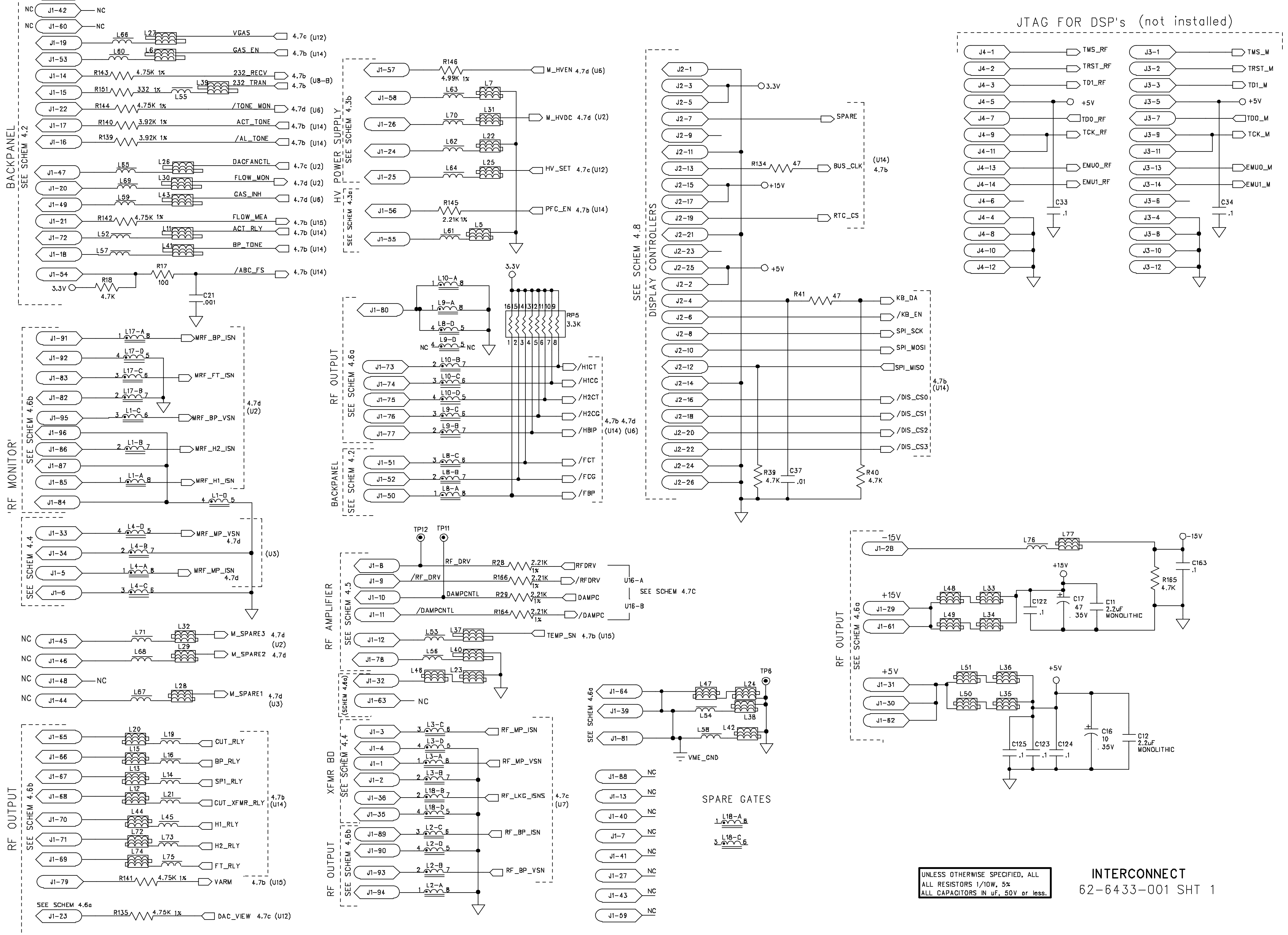
Bill of Material: RF Output PCB Assembly

REF. DES.	CONMED P/N	DESCRIPTION
61-6461-003 A5 RF OUTPUT PCB ASSEMBLY		
C1(K/6);C8(J/6); C39(A/6)	62-6137001-00	CAP MET PP .01UF 1600V 10%
C2(K/2);C5,C7(K/5); C11(I/3);C14(I/1); C17(I/5);C20(H/5); C21(H/7);C26(F/7); C27(F/1); C29,C31(F/6); C35,C37(C/1)	62-0267002-00	CAP. DIP CER 0.1UF
C3(K/3);C9(J/2)	62-0267009-00	CAP,CER 270PF 50V
C4(K/3);C15(H/3); C16(I/4);C19(H/4); C28,C30(F/4)	62-0267001-00	CAP. DIP CER 0.01UF
C6(J/5);C18(I/7); C24(F/7);C43(K/2)	62-0268001-00	CAP. ELEC 10UF 16V
C10(I/3)	62-4083001-00	CAP, MIN ELECTRO. 47uF, 25V
C12(I/2)	62-1677009-00	CAP,0.0022UF 50V 10%
C13(I/3)	62-6764223-00	CAP,PP FILM .022uF,250V
C22(I/7);C23(H/7); C25,C32(F/7); C38,C40(B/7)	62-1677004-00	CAP,METPE 0.33UF 100V 5%
C33(D/3)	62-0267004-00	CAP. DIP CER 100PF
C34,C36(C/2)	62-1677005-00	CAP,METPE 0.22UF 100V 5%
C41(J/6);C42(J/5)	62-5404003-00	CAP.,CER.,HV, 3300pF +/- 20%
D1,D2,D3(L/3); D4(K/3);D5(J/6); D6(K/2);D11(I/6); D12(I/2);D13(H/2); D14(H/3);D15(G/2); D16(G/3);D17(F/6); D18,D19(D/3)	62-0290002-00	DIODE,1N914B
J1(F/1)	62-3986003-00	CONN,SOCKET,FEMALE,STRAIGHT
J2(J/1)	62-3598001-00	HEADER FRICT LOK 24CKT ST
J3(H/1)	62-4857005-00	HEADER, DIN W/LATCH 34 PIN
J4(G/1)	62-4079001-00	WR HARNESS,RBN,14PIN, 3.9"
J5(E/1)	62-4079003-00	WR HARNESS,RBN,16 PIN, 3.9"
J6(B/1)	62-4079002-00	WR HARNESS, RBN, 14 PIN, 6.3"
J8(C/6)	62-3598004-00	HEADER, STR. PIN, 3 CKT, TIN
J9(A/5)	62-3598003-00	HEADER FRICT LOCK GOLD
J10(K/7);J12(J/7); J14,J15(H/8); J16(G/8);J17(F/8); J18,J19(E/8)	62-6205001-00	CONTACT, SHORT OUTPUT
J11(J/7)	62-6206001-00	CONTACT, LONG OUTPUT
K1,K2(G/5);K3(D/5)	62-3473004-00	RELAY REED, HV, 14V
L1(A/2)	62-4178001-00	INDUCTOR 20MH
L2(G/7);L3(E/7); L4(D/5)	61-6597001-00	EMI SUPPRESSOR ASSY, TOMBSTONE
Q1(H/3)	010476001	TRANS.MOSFET,DIP,100V,1A
Q2,Q3(D/3)	62-4239001-00	TRANSISTOR NPN 2N3904
R1(L/3);R4(K/3); R21(H/2);R23(G/2); R31(D/3)	62-0961030-00	RES, 20 OHM, 1/4 W, 1%
R2,R3(L/3)	62-0961097-00	RES, 100 1/4W 1%
R5(K/3);R12(J/2)	62-0961132-00	RES, MF, 232, 1% .25W
R6,R38,R39(K/3); R11(J/2)	62-0961108-00	RES, MF, 130 OHM, 1/4W, 1%
R7(K/2);R10(J/6); R17(I/6);R27(F/6)	62-0364087-00	RES, 10K, 1/4W, 5%
R8,R9(J/6);R15, R16(I/6);R18(H/3); R19,R20(H/6); R25,R26,R28, R29(F/6)	62-0364045-00	RES, 180, 1/4W,5%
R13(I/2)	62-0365061-00	RES, 820, 1/2W, 5%
R22(H/2);R24(G/2); R30(D/2)	62-3062001-00	RES,ZERO OHM
R32,R33(D/2)	62-0364104-00	RES, 51K, 1/4W, 5%
R34(B/3);R37(B/2)	62-0364025-00	RES, 27, 1/4W, 5%
R35(B/2)	62-0364072-00	RES, 2400, 1/4W, 5%
R14(I/2)	62-0961273-00	RES, 6810, 1/4W, 1%
R36(B/2)	62-0961305-00	RES, MF, 14.7K, 1/4W, 1%
R40(J/7);R41(J/4)	62-0365057-00	RES, 560, 1/2W, 5%
T1(L/3);T2(K/3)	62-0622002-00	WIRE HI VOLTAGE #22 10KV
T1(L/3);T2(K/3); T5,T6(G/3);T7(D/3)	62-3948001-00	50T CEN.TAP(IND.CURR.SENSE)
T3(K/6);T10(J/5)	61-3069002-00	XFMR,V-SNS,BIPOLAR,TMBSTN MNT
T4(J/3)	61-6224002-00	ASSY, XFMR,CONTINUITY DETECTOR
T8(C/3)	62-4177001-00	XFMR ARM OSC EX
T9(A/4)	61-4176007-00	XFMR ARM ISOLATION A SERIES
TP1(K/1);TP2, TP3(J/1);TP4(F/1); TP5,TP6(A/2); TP7(I/2)	020361101	TEST POINT, BLK.
U1(K/4);U3(I/5); U4(H/5);U5,U6(F/5)	62-4238001-00	OPTOISOLATOR, OPI1264A
U2(H/3)	62-0301001-00	IC TIMER NE555N
U7(C/1)	62-1374003-00	IC TRANSISTOR ARRAY 18 PIN
VR1(B/2)	62-3957002-00	IC, VOLT REF.10.0V 1%, TO -92
N/A	62-0753003-00	NUT HEX NYLON 6-32
N/A	62-4278001-00	SCREW6-32X1/2 BDGH SL NY
N/A	62-4278005-00	SCREW. NYLON, #6-32x3/4
N/A	62-5234001-00	BUSHING ARM XFMR
N/A	030263029	WASHER,SHLD,NYL,.750X.152
N/A	030285205	SCREW,PAN HD,NYL,8-32X2/3
N/A	030421210	SPACER,HEX,NYL.,8-32X.750
N/A	61-6538002-00	HARNESS, BIP, SYS 2500/5000
N/A	61-6539001-00	HARNESS,RF MONO, SYS 2/5K
N/A	61-6662001-00	WIRE HARNESS, SYS 2500/5000
N/A	62-0260001-00	CABLE TIE
N/A	62-0620009-00	TUBE HS RNF 100 TYPE 2 3/8 CLR
N/A	62-5586001-00	WIRE, TRIPLE INS. TEFZEL 24AWG
N/A	62-5586002-00	WIRE,TRP INS. TEFZEL24AWG,BLUE
N/A	62-6296001-00	FENCE, BIPOLAR
N/A	62-6320001-00	STANDOFF, WIRE, 1", THK PWB
N/A	62-6513001-00	FENCE, HV, 2.1x.125 SLOT

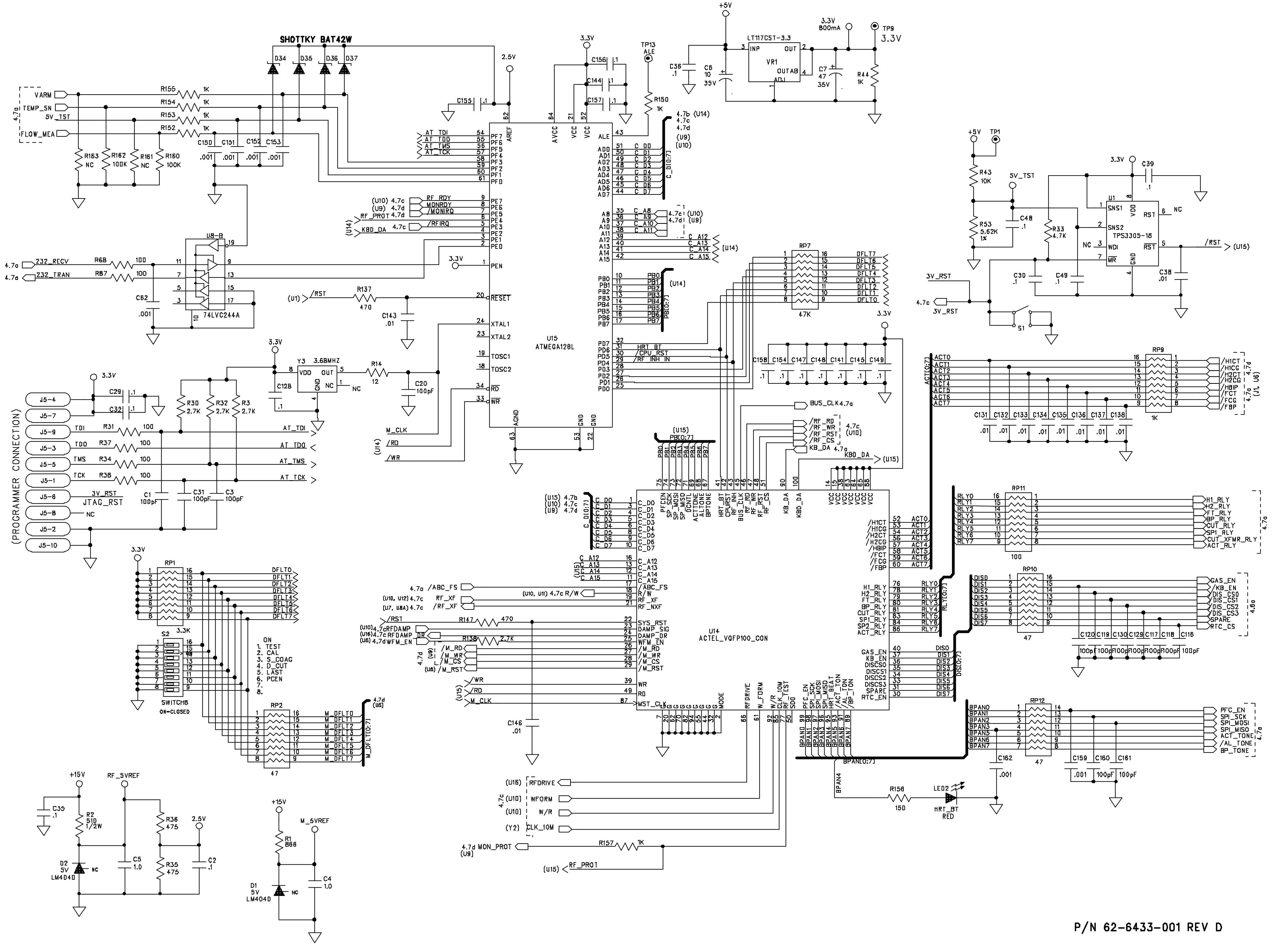
Figure 4.8 A5 RF Output PCB Assembly



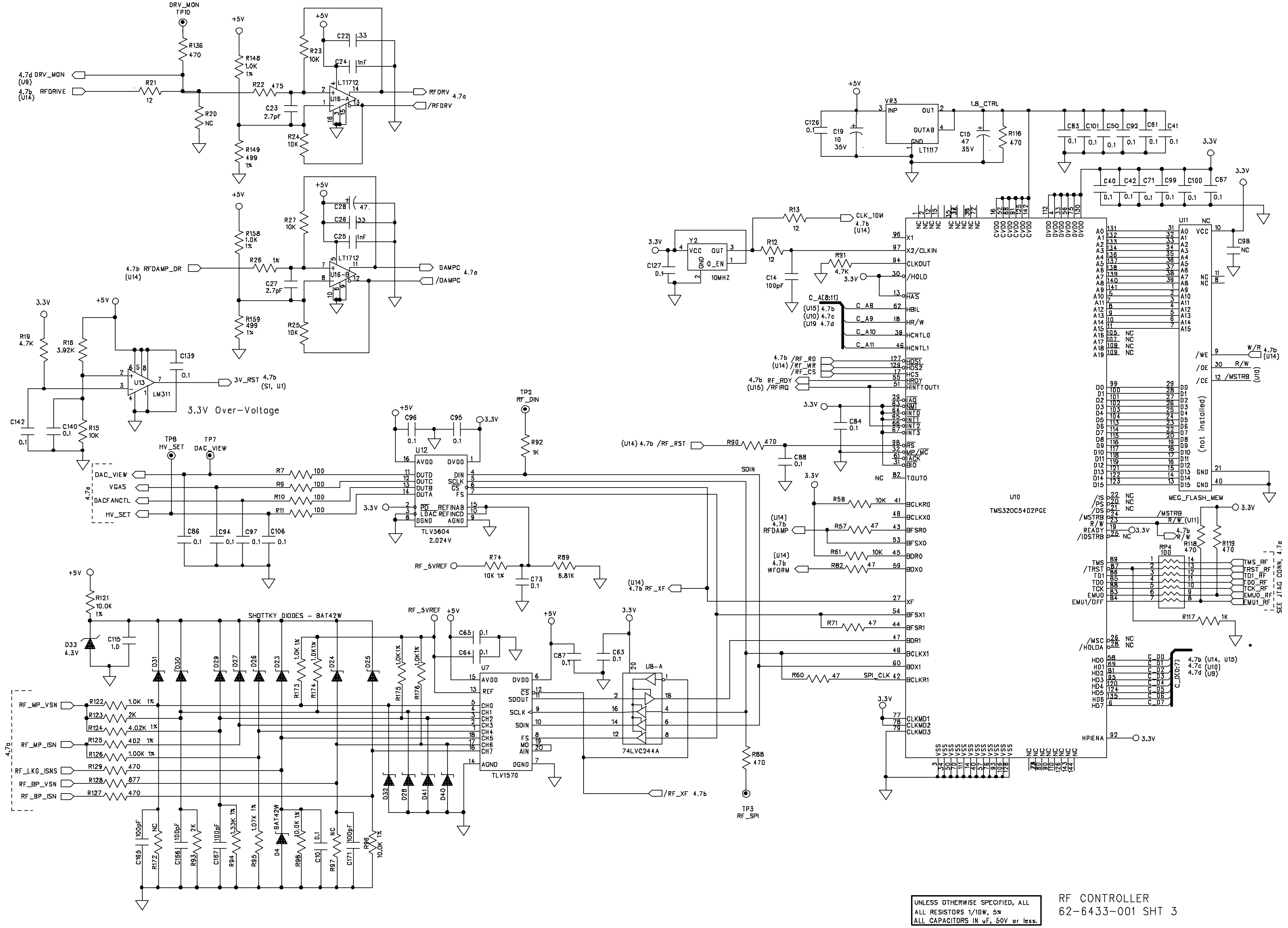
Schematic 4.7a A4 Microcontroller PCB - Controller Interconnect



Schematic 4.7b A4 Microcontroller PCB - Microcontroller



Schematic 4.7c A4 Microcontroller PCB - RF Controller



UNLESS OTHERWISE SPECIFIED, ALL
ALL RESISTORS 1/10W, 5%
ALL CAPACITORS IN µF, 50V or less.

RF CONTROLLER
62-6433-001 SHT 3

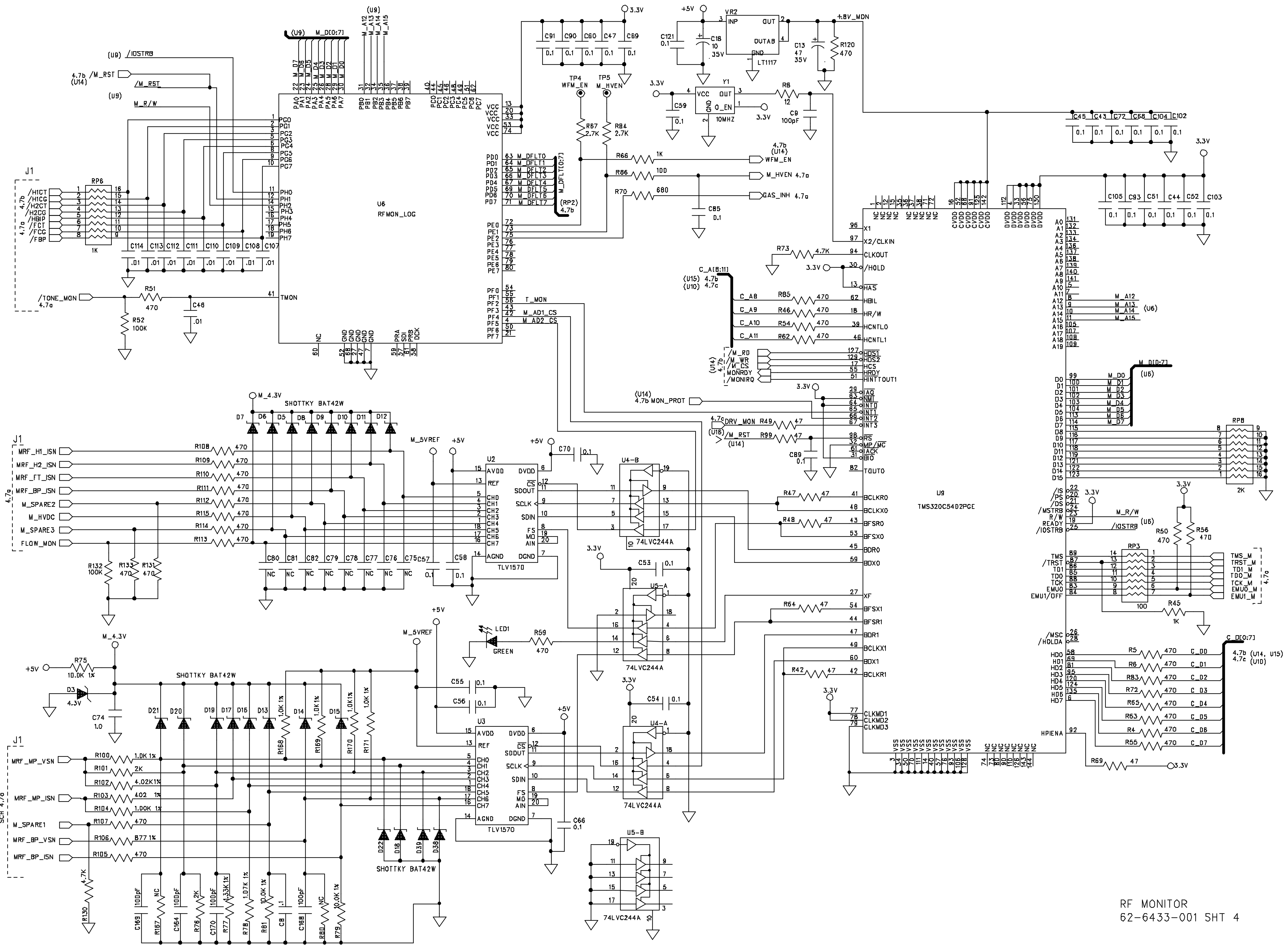
Bill of Material: Microcontroller PCB Assembly

61-6431-002 A4 MICROCONTROLLER PCB ASSEMBLY

REF. DES.	CONMED P/N	DESCRIPTION
C1,C3(TD/8); C9(TC/8); C14,C20(TB/11); C31(BD/7); C116,C117,C118, C119,C120,C129, C130(BB/10); C160,C161(BA/10); C164,C169(TB/3); C165(BC/5); C166,C167, C171(BC/4); C168,C170(BC/3)	62-3998101-00	CAP.CER.CHIP,50V,5%,SMT,100
C2(TD/4);C8(TC/2); C10(TC/4); C29,C33(BD/7); C30,C39(BD/4); C32(BD/8); C34(BD/6); C35(BD/3); C36(BD/11); C40,C50,C67, C83,C88(BC/11); C41,C42,C61,C71, C84,C92,C99,C100, C101(BC/10); C43,C44,C51,C72, C93,C102,C103, C104(BC/9); C45,C52,C59,C60, C68,C89,C105(BC/8); C47,C69,C85,C90, C91(BC/7); C48,C49,C54,C64, C65,C87,C115(BC/4); C53,C86,C94,C97, C106(BC/5); C55,C56, C66,C74(BC/3); C57,C58,C70(BC/2); C63,C73,C95, C96(BC/6); C121(BB/8); C122(BB/2);C123, C124,C125(BB/1); C126,C127,C140, C142,C144(BB/11); C128,C141, C145(BB/10); C139(BB/12); C147,C148(BB/9); C149,C157, C158(BA/10); C154(BA/9); C155,C156(BA/11); C163(BA/3)	62-3995104-00	CAP.CER.Y5V,25V,SMT,.1uF
C4(TD/3);C5(TD/4);	62-6392001-00	CAP,CER,25V,20%,1.0uF,SMT
C6(TC/11); C16(TB/1); C18(TB/8); C19(TB/11)	62-6192106-00	CAP.ELEC.25V,10uF,SMT
C7(TD/12); C13(TC/8); C15(TC/12); C17(TB/1); C28(TA/11)	62-6192476-00	CAP.ELEC.25V,47uF,SMT
C11,C12(TC/1)	62-6328225-00	CAP CER Z5U 50V 20% SMT 2.2UF
C21(TB/9); C62(BC/6); C150,C151,C152, C153(BA/11); C162(BA/10)	62-6248102-00	CAP.,CER.CHIP,X7R,10%,25V,SMT
C22,C26(TA/11)	62-6741334-00	CAP,CER,0805,X74,16V,SMT
C23,C27(TA/12)	62-3999027-00	CAP CER C0G 50V 10% SMT 2.7PF
C24,C25(TA/11)	62-6123102-00	CAP CER C0G 50V 10% SMT 1000PF
C37(BD/9); C38(BD/4); C46(BC/8); C107,C108,C109, C110,C111,C112, C113,C114(BC/7); C131,C132,C133, C134,C135,C136, C137,C138(BB/9); C143(BB/11); C146(BB/10); C159(BA/10)	62-3995103-00	CAP.CER.Y5V,25V,SMT,10.000,01
D1,D2(TD/3)	62-3957004-00	IC, VOLT REF.5.0V,1%,SMT,TO-92
D3(TC/3);D33(TC/5)	62-6197001-00	DIODE, ZENER, 1/2W, SMT, 4.3V
D4,D23,D24,D25, D26,D27,D28, D29,D30,D31, D32,D40(TC/4); D5,D6,D7,D8, D9,D10,D11, D12,D13(TC/2); D14,D15,D16, D17,D18,D19, D20,D21,D22, D38,D39(TC/3); D41(TC/5)	62-3990001-00	SCHOTTKY DIODE,SER.BAT42W,SMT
J1(TA/6)	62-3986001-00	CONN,PLUG,MALE,RIGHT ANGLE
J2(TD/10)	62-4857002-00	HEADER, DIN, W/LATCH, 26 PIN
J3(TD/6);J4(TD/7)	62-6196014-00	HEADER,UNSHRD'D,.025STR.14PIN
J5(TD/8)	62-6196010-00	HEADER,UNSHRD'D,.025STR,10PIN
L1(TB/2);L2(TB/3); L3,L4(TB/4); L8(TB/6); L9,L10(TB/7); L17(TA/1);L18(TA/2)	62-6340001-00	CHOKE,COMMON MODE,4 GATE,SMT
L5,L6,L7(TB/5); L11,L12(TB/8); L13(TB/9); L15,L20(TA/9); L22,L23,L24(BB/5); L25,L26,L27(BB/4); L28,L29,L30, L31(BB/3); L32,L33,L34, L48,L49(BB/2); L35,L36,L50, L51(BB/1); L37(BB/8); L38,L39,L40, L41(BB/7); L42,L43(BB/6); L44(BB/9); L46,L47(BA/5); L72,L74(BA/9); L77(BA/3)	62-6338001-00	FERRITE BEAD, SMT
L14(TB/9); L16,L19(TA/9); L21(BB/8); L45(BB/9); L52(BA/8); L53,L54,L55, L56,L57(BA/7); L58,L59,L60, L61,L62(BA/6); L63(BA/5); L64,L65,L66(BA/4); L67,L68,L69, L70,L76(BA/3); L71(BA/2); L73,L75(BA/9)	62-6339001-00	CHIP INDUCTOR, 1206, SMT
LED1(TC/5)	62-3941001-00	LED, SMT, GREEN
LED2(TA/10)	62-3941002-00	LED, SMT, RED
R1(TD/3)	62-3947191-00	RES.1/10W,1%,SMT,866 OHM
R2(TD/3)	62-3946511-00	RES. 1/2W, 5%, SMT, 510 OHM
R45(BD/8); R44(BD/12); R66(BC/7); R92(BC/6); R117(BC/9); R150(BA/10); R152,R153, R154,R155(BA/11); R157(BA/9)	62-3945102-00	RESISTOR,1/10W,5%,SMT,1K OHM

{continued on next page}

Schematic 4.7d A4 Microcontroller PCB - RF Monitor



REF. DES.	CONMED P/N	DESCRIPTION
61-6431-002 A4 MICROCONTROLLER PCB ASSEMBLY {continued from previous page}		
R4,R5,R6(TC/9); R46,R55,R63, R65,R72,R118, R119(BC/9); R50,R56, R120(BC/8); R51(BC/7); R54,R62,R83, R85(BC/10); R59(BC/5); R88(BC/6); R90(BC/11); R105(BC/3); R107,R108,R109, R110,R111,R112, R113,R114, R115(BC/2); R116(BC/12); R127,R129(BC/4); R131,R133(BB/2); R136(BB/12); R137(BB/11); R147(BB/10)	62-3945471-00	RESISTOR,1/10W,5%,SMT,470 OHM
R7,R9,R10, R11(TC/5); R17(TB/8); R31,R34, R37(BD/8); R38(BD/7); R68,R87(BC/6); R86(BC/7)	62-3945101-00	RESISTOR,1/10W,5%,SMT, 100 OHM
R8(TC/8);R12, R13,R14(TB/11); R21(TB/12)	62-3945120-00	RESISTOR,1/10W,5%,SMT,12 OHM
R15(TB/11); R23(TB/12); R24,R25, R27(TA/12); R43(BD/4); R58,R61(BC/10)	62-3945103-00	RESISTOR,1/10W,5%,SMT,10K OHM
R16(TB/11);R139, R140(BB/8)	62-3947258-00	RES.1/10W,1%,SMT,3.92K OHM
R18(TB/8); R19(TB/11); R33(BD/4); R39,R40(BD/10); R73(BC/9); R91(BC/10); R130(BB/2); R165(BA/3)	62-3945472-00	RESISTOR,1/10W,5%,SMT,4.7K OHM
R22(TB/11); R26(TA/11); R35,R36(BD/4)	62-3947166-00	RES. 1/10W,1%,SMT,475 OHM
R28,R29(TA/9); R145(BB/6);R164, R166(BA/9)	62-3947234-00	RES.1/10W,1%,SMT,2.21K OHM
R41,R42(BD/9); R47,R48,R49, R64,R69(BC/9); R57,R60,R71, R82(BC/10); R99(BC/8); R134(BD/10)	62-3945470-00	RES,1/10W,5%,SMT,47-OHM
R52(BC/7); R132(BB/2); R160,R162(BA/11)	62-3945104-00	RESISTOR,1/10W,5%,SMT,100K OHM
R53(BC/4)	62-3947273-00	RES.1/10W,1%,SMT,5.62 K OHM
R3(TD/7); R30,R32(BD/8); R67,R84(BC/7); R138(BB/10)	62-3945272-00	RESISTOR,1/10W, 5%, SMT, 2.7KOHM
R70(BC/7)	62-3945681-00	RES.,1/10W,5%,SMT, 680 OHM
R74(BC/6); R79(BC/3); R81(BC/2); R96,R98(BC/4); R75(BC/3); R121(BC/5)	62-3947301-00	RES.1/10W,1%,SMT,10.0 K OHM
R76,R101(BC/3); R93,R123(BC/4)	62-3947230-00	RES. 1/10W,1%,SMT,2K OHM
R77(BC/3); R94(BC/4)	62-3947213-00	RES. 1/10W,1%,SMT,1.33K OHM
R78(BC/3); R95(BC/4)	62-3947204-00	RES.,1/10W,1%, SMT, 1.07K OHM
R89(BC/6)	62-3947281-00	RES.1/10W,1%,SMT,6.81 K OHM
R100,R104(BC/3); R122,R126(BC/4); R148,R158(BA/12); R168,R169(TB/3); R170,R171(TC/3); R173,R174,R175, R176(TC/4)	62-3947201-00	RES.1/10W,1%,SMT,1.0K OHM
R102(BC/3); R124(BC/4)	62-3947259-00	RES. 1/10W,1%,SMT,4.02K OHM
R103(BC/3); R125(BC/4)	62-3947159-00	RES., 1/10W, 1%, SMT, 402 OHM
R106(BC/3); R128(BC/4)	62-3947497-00	RES. 1/10W, 1%, SMT, 877 OHM
R135(BB/4); R141,R142(BB/8); R143,R144(BB/6)	62-3947266-00	RES.1/10W,1%,SMT,4.75 K OHM
R146(BB/6)	62-3947268-00	RES.1/10W,1%,SMT,4.99K OHM
R149,R159(BA/12)	62-3947168-00	RES.1/10W,1%,SMT,499 OHM
R151(BA/7)	62-3947151-00	RES.1/10W,1%,SMT,332 OHM
R156(BA/10)	62-3945151-00	RES.,1/10W,5%,SMT, 150 OHMS
RP1(TD/6); RP5(TB/6)	62-3997332-00	RESIST.NET.8,SMT,2%,3.3KOHM
RP2(TD/6); RP10(TB/10)	62-3997470-00	RESIST.NET.8,SMT,2%,47 OHM
RP3(TC/8); RP4(TC/10)	62-3996101-00	RESIST.NET 7,SMT,2%,100 OHM
RP6(TB/7); RP9(TB/9)	62-3997102-00	RESIST.NET.8,SMT,2%,1.0KOHM
RP7(TB/7)	62-3997473-00	RES,NET.8,SMT,2%,47K OHMS
RP8(TB/9)	62-3997202-00	RESIST.NET.8,SMT,2%,2.0KOHM
RP11(TA/9)	62-3997101-00	RESIST.NET.8,SMT,2%,100OHM
RP12(TA/10)	62-3996470-00	RESIST.NET.7,SMT,2%,47 OHM
S1(TD/4)	62-3988002-00	SWITCH, PSH BTN, 230/260g, SMT
S2(TD/5)	62-3987001-00	SWITCH, DIP, 8 POLE, SMT
TP1(TD/4); TP2,TP3(TC/6); TP4,TP5(TC/7); TP7,TP8(TC/5); TP9(TB/6); TP10(TB/12); TP11,TP12(TA/8); TP13(TA/10)	020361101	TEST POINT, BLK.
TP6(TC/5)	62-6325001-00	TEST POINT, BLACK, 0.200 LONG
U1(TD/4)	62-3982001-00	DUAL PROCESSOR SUPERVISOR, SMT
U2(TC/2); U3(TC/3); U7(TC/4)	62-3992001-00	SERIAL ANA-TO-DIG CONV., SMT
U4,U5(TC/5); U8(TC/6)	62-3932001-00	OCTAL BUFFER/DRIVER
U6(TC/7)	61-6627001-00	PRGRMD DEVICE, ACTEL, MONITOR
U9(TC/9); U10(TC/10)	62-3991001-00	FX'D-PNT DIG. SIG. PROC., SMT
U12(TC/6)	62-3993001-00	QUAD. DIG-TO-ANA CONV., SMT
U13(TB/12)	62-3981001-00	VOLTAGE COMPARATOR, SMT
U14(TB/10)	61-6625001-00	PRGRMD DEVICE,ACTEL,CONTROLLER
U15(TB/11)	62-6393001-00	MICROCONTROLLER,ATmega128L-8AC
U16(TA/12)	62-6397001-00	IC DUAL ULTRA-FAST COMPAR SMT
VR1(TD/11)	62-3936001-00	800mA,LDO ADJ. REG.,3.3 V
VR2(TB/8); VR3(TB/12)	62-6396001-00	VOLTAGE REG., FX, 1.8V, SMT
X1(TC/1);X2(TC/12)	62-6524001-00	TERMINAL, SCREW, PWB MOUNTED
Y1(TC/8);Y2(TB/11)	62-5885002-00	CLOCK OSCILLATOR, 10.000 MGz
Y3(TB/10)	62-5885001-00	CLOCK OSCILLATOR, 3.6864 MHz

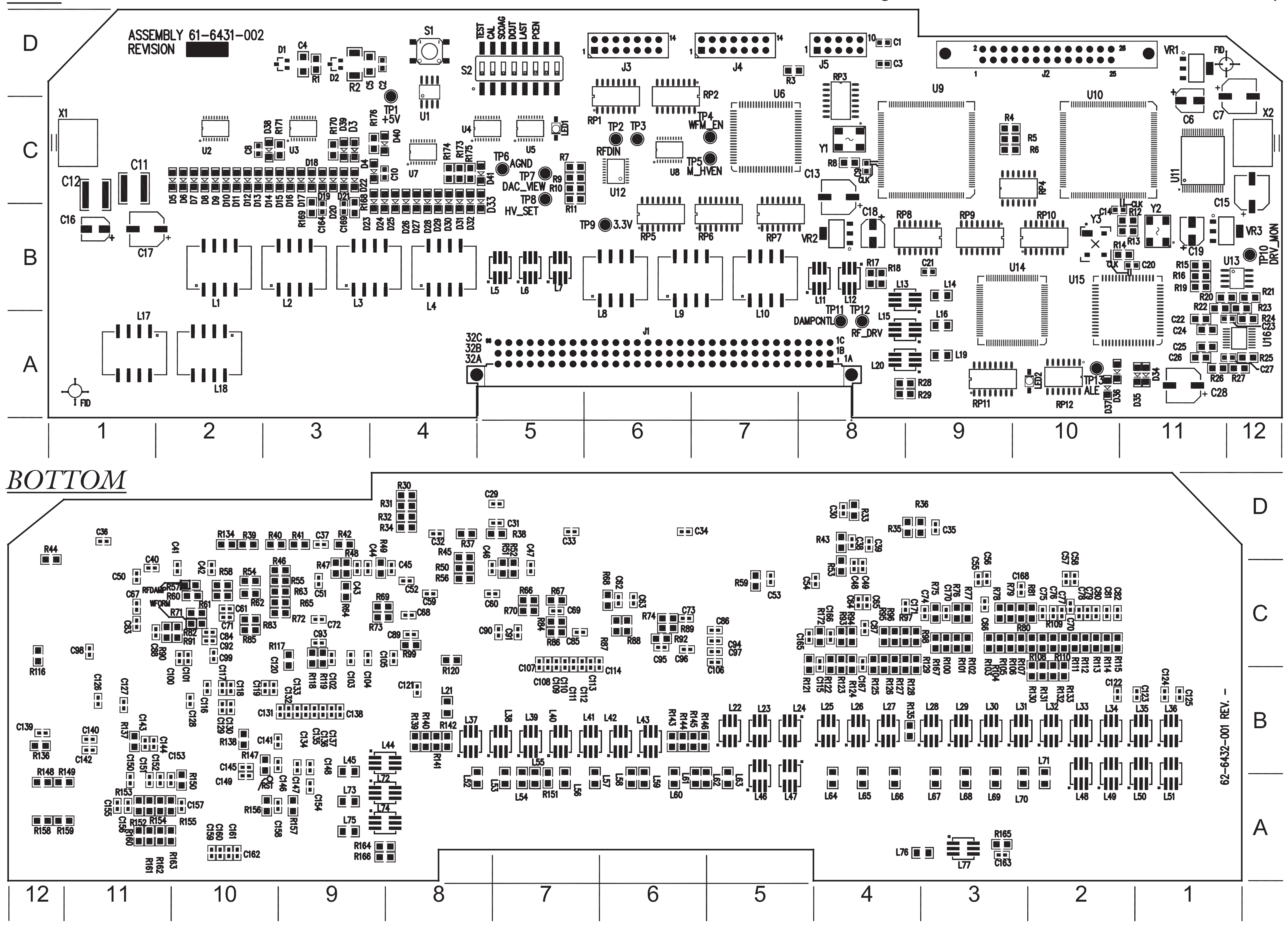
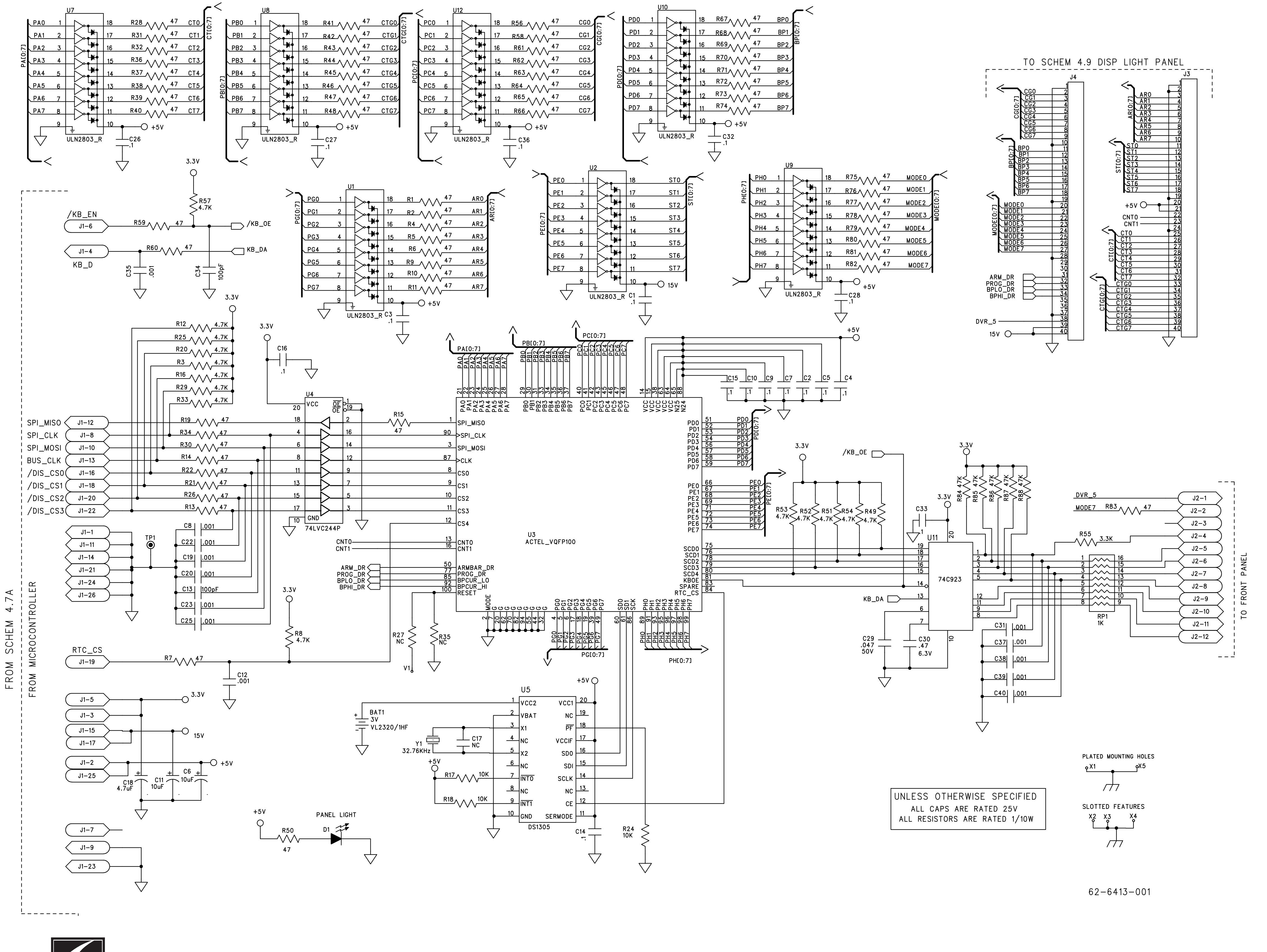


Figure 4.9 A4 Microcontroller PCB Assembly

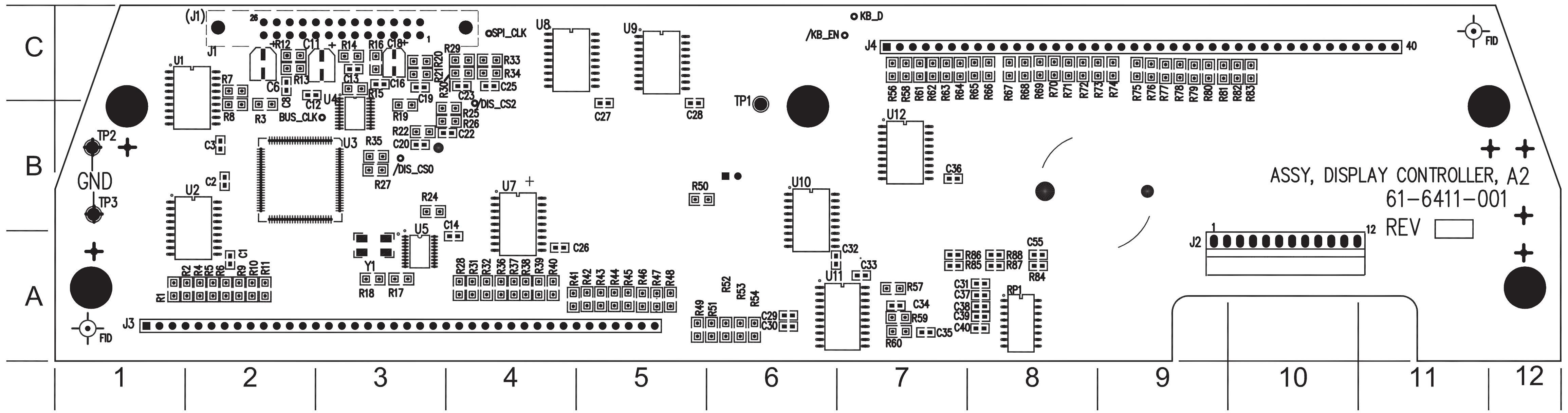
Schematic 4.8 A2 Display Controller PCB



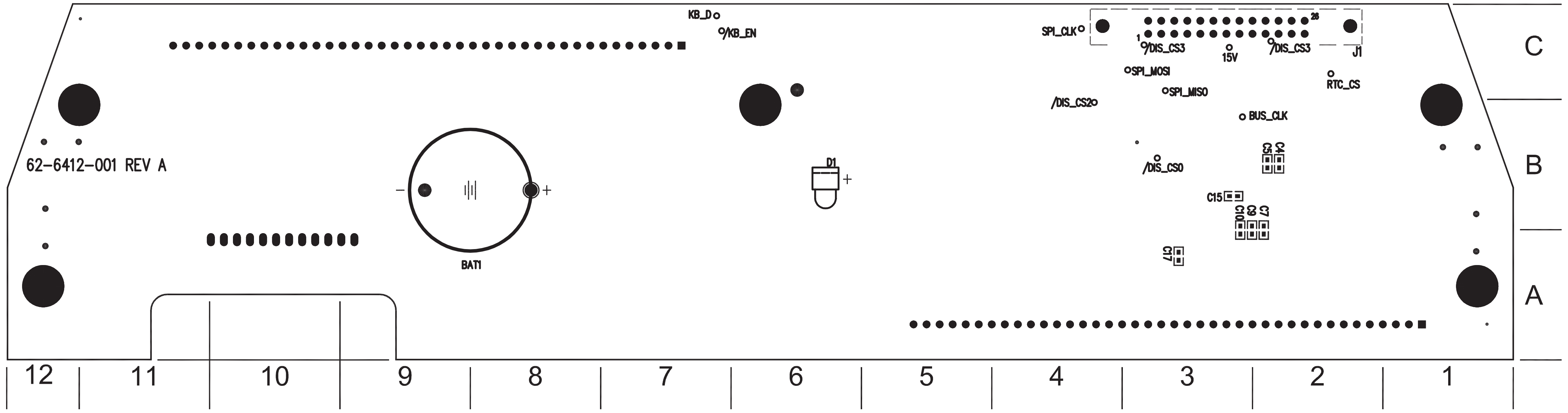
Bill of Material: Display Controller PCB Assembly

REF. DES.	CONMED P/N	DESCRIPTION
61-6411-001 A2 DISPLAY CONTROLLER PCB ASSEMBLY		
BAT1(BB/9)	62-6305001-00	BATTERY, LITH, COIN, 3V
C1(TA/2); C2,C3(TB/2); C4,C5,C7,C9(BB/2); C10,C15(BB/3); C14(TA/3); C16(TC/3); C26(TA/4); C27,C28(TC/5); C32(TA/6); C33(TA/7); C36(TB/7)	62-3995104-00	CAP.CER.Y5V,25V,SMT,100.000.1
C6(TC/2);C11(TC/3)	62-6192106-00	CAP.ELEC.25V,10uF,SMT
C8(TC/2);C19(TC/3); C20(TB/3); C22(TB/4); C23,C25(TC/4); C31,C37,C38, C39,C40(TA/8)	62-6248102-00	CAP.,CER.CHIP,X7R,10%,25V,SMT
C12(TC/2);C35(TA/7)	62-3995103-00	CAP.CER.Y5V,25V,SMT,10.000,01
C13(TC/3);C34(TA/7)	62-3998101-00	CAP.CER.CHIP,50V,5%,SMT,100
C18(TC/3)	62-6192475-00	CAP.ELEC,25V,4.7uF,SMT
C29(TA/6)	62-3999473-00	CAP.CER.CHIP,25V,10%,SMT,47000
C30(TA/6)	62-6748474-00	CAP.CER.6.3V 10% SMT 470000pF
D1(BB/6)	62-6229001-00	LED, T-1 3/4, WHITE
J1(TC/3)	62-4857002-00	HEADER, DIN, W/LATCH, 26 PIN
J2(TA/9)	62-6306112-00	HEADER,UNSHR,12PIN,90DEG,TIN
J3(TA/1);J4(TC/7)	62-6333040-00	HEADER,FEM,40P,.25"SQ,LO-PROF
R1(TA/1);R2, R4,R5,R6,R9, R10,R11(TA/2); R7,R13(TC/2); R14,R15, R21(TC/3); R19,R22(TB/3); R26(TB/4); R28,R31,R32,R36, R37,R38,R39,R40, R41(TA/4); R30,R34(TC/4); R42,R43,R44,R45, R46,R47,R48(TA/5); R50(TB/5); R56,R58,R61,R62, R63,R64(TC/7); R59,R60(TA/7); R65,R66,R67,R68, R69,R70,R71,R72, R73(TC/8); R74,R75,R76, R77,R78,R79, R80,R81(TC/9); R82,R83(TC/10)	62-3945470-00	RES,1/10W,5%,SMT,47-OHM
R3,R8(TB/2); R12(TC/2); R16,R20(TC/3); R25(TB/4); R29,R33(TC/4); R49(TA/5);R51,R52, R53,R54(TA/6); R57(TA/7)	62-3945472-00	RESISTOR,1/10W,5%,SMT,4.7K OHM
R17,R18(TA/3); R24(TB/3)	62-3945103-00	RESISTOR,1/10W,5%,SMT,10K OHM
R55(TA/8)	62-3945332-00	RESISTOR,1/10W,5%,SMT 3.3K OHM
R84,R87,R88(TA/8); R85,R86(TA/7)	62-3945473-00	RESISTOR,1/10W,5%,SMT,47K OHM
RP1(TA/8)	62-3997102-00	RESIST.NET.8,SMT,2%,1.0KOHM
TP1(TC/6); TP2,TP3(TB/1)	020361101	TEST POINT, BLK.
U1(TC/2);U2(TB/2); U7(TB/4);U8(TC/4); U9(TC/5); U10(TB/6); U12(TB/7)	62-6186002-00	8 CHAN.TRANS.AR.SMT,ULN2803
U3(TB/2)	61-6629001-00	PROGRAMMED DISP. DVR, A5
U4(TB/3)	62-3932001-00	OCTAL BUFFER/DRIVER
U5(TA/3)	62-6303001-00	REAL TIME CLOCK, SERIAL, SMD
U11(TA/7)	62-3935001-00	20-KEY ENCODER,SM.OUTLINE I.C.
XD1#N/A	62-6131001-00	LED HOLDER, T-1, 90 DEGREE
Y1(TA/3)	62-4085001-00	CRYSTAL OSCILL, 32.768KHz, SMT

Figure 4.10 A2 Display Controller PCB Assembly

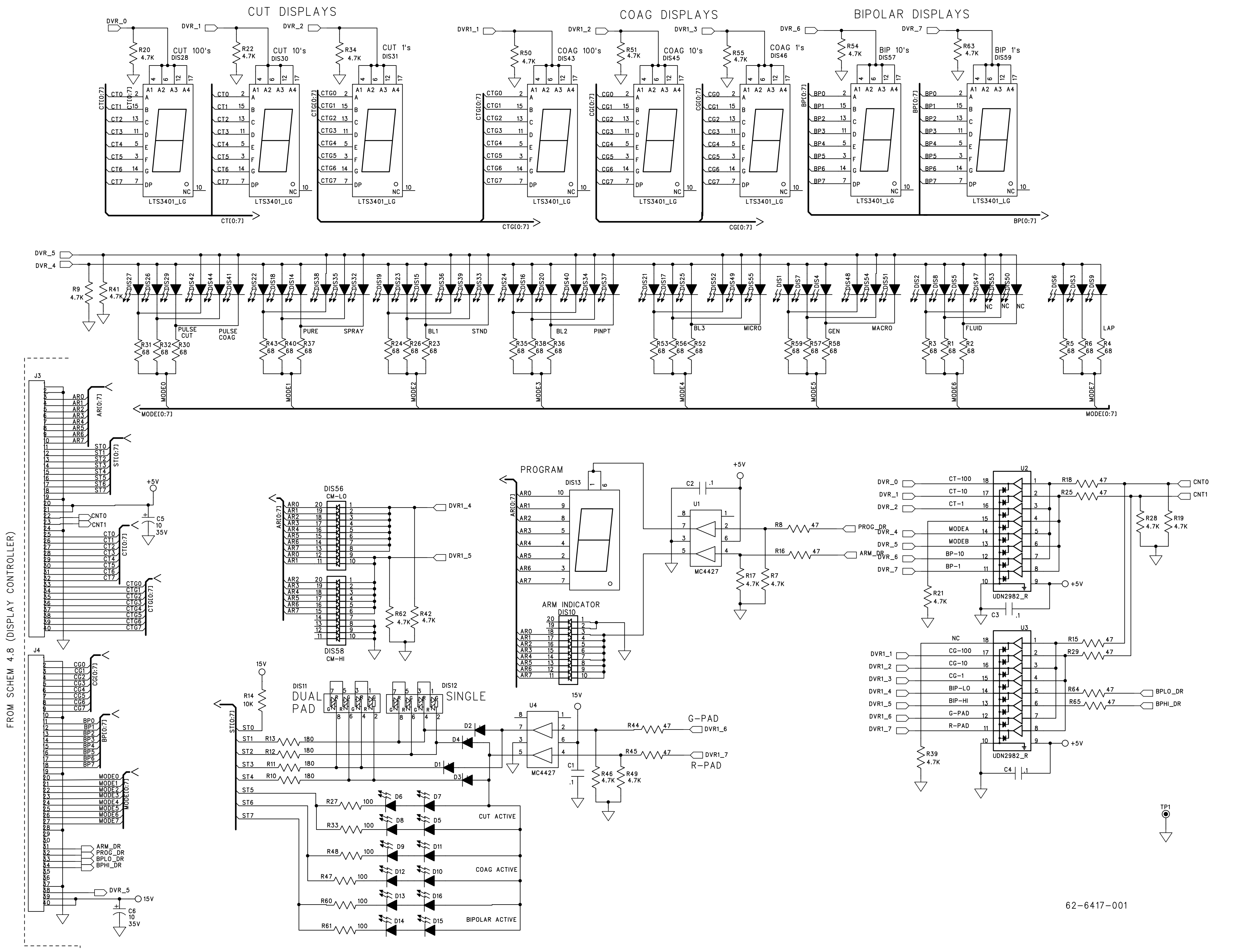


TOP



BOTTOM

Schematic 4.9 A3 Display Light Panel PCB



Bill of Material: Display Light Panel PCB Assembly

REF. DES.	CONMED P/N	DESCRIPTION
61-6415-001 A3 DISPLAY LIGHT PANEL PCB ASSEMBLY		
C1(TA/7);C2(TB/2); C3(TC/4);C4(TC/6)	62-3995104-00	CAP.CER.Y5V,25V,SMT,100.000.1
C5(TC/3);C6(TC/10)	62-6191106-00	CAP.ELEC.35V,LOW ESR,10uF,SMT
D1,D2(TB/2); D3,D4(TC/3)	62-6304001-00	DIODE, SIGNAL, SMD
D5,D6,D7, D8(TC/5); D9,D10, D12(TC/8); D11(TC/9); D13(TC/10); D14,D15, D16(TC/11)	62-6239001-00	LED, SMT, WHITE
DIS1,DIS4(TB/1); DIS2,DIS3,DIS5, DIS6(TA/1); DIS7(TB/2); DIS8,DIS9(TA/2); DIS14,DIS15, DIS16,DIS18, DIS19,DIS22, DIS23,DIS26(TB/3); DIS17,DIS20, DIS21,DIS24, DIS25(TA/3); DIS27,DIS29(TB/4); DIS32,DIS35, DIS38(TB/6); DIS33,DIS34, DIS36,DIS37, DIS39,DIS40(TA/6); DIS41,DIS42, DIS44(TB/7); DIS48,DIS49, DIS51,DIS52(TA/9); DIS54,DIS55(TA/10)	62-6124002-00	LED, SMT, BRIGHT ORANGE
DIS10(TC/2)	62-3462001-00	LED BAR GRAPH 10 SEG GRN
DIS11,DIS12(TB/2)	62-6301001-00	LED-SQUARE, BI-COLOR
DIS13(TA/2)	62-6228001-00	7-SEGMENT LED, .39”
DIS28,DIS30(TB/4); DIS31(TB/5); DIS43(TB/7); DIS45(TB/8); DIS46(TB/9); DIS57(TB/10); DIS59(TB/11)	62-5795002-00	LED,7 SEG, .8” GRN
DIS56(TB/10); DIS58(TB/11)	62-3462002-00	LED BAR GRAPH 10 SEG. YELLOW
J3(BA/1);J4(BC/7)	62-6332040-00	HEADER,MALE,40P,.25”SQ,LO-PROF
R1,R2,R3,R4(TB/1); R5,R6(TA/1); R23(TB/4);R24,R26, R30,R31,R32(TB/5); R35,R36,R38(TA/6); R37,R40,R43(TB/6); R52,R53,R56, R58,R59(TA/9); R57(TA/10)	62-3945680-00	RESISTOR,1/10W,5%,SMT,68 OHMS
R7(TB/1);R9(TA/1); R17,R19(TC/3); R20,R22(TB/4); R21(TC/4); R28(TC/5); R34(TB/6); R39,R42(TC/6); R41,R46(TA/6); R49(TA/7); R50(TB/7); R51(TB/8); R54,R55(TB/9); R62(TB/11); R63(TB/12)	62-3945472-00	RESISTOR,1/10W,5%,SMT,4.7K OHM
R8(TB/1);R15, R16,R18(TC/3); R25(TC/4); R29(TC/5); R44,R45(TA/6); R64,R65(TC/7)	62-3945470-00	RES,1/10W,5%,SMT,47-OHM
R10,R11(TB/2); R12,R13(TA/2)	62-3945181-00	RES.,1/10W,5%,SMT 180 OHMS
R14(TA/2)	62-3945103-00	RESISTOR,1/10W,5%,SMT,10K OHM
R27,R33(TC/5); R47,R48(TC/7); R60(TC/10); R61(TC/11)	62-3945101-00	RESISTOR,1/10W,5%,SMT, 100 OHM
TP1,TP2(TB/1)	020361101	TEST POINT, BLK.
U1(TB/2);U4(TA/7)	62-6247001-00	I.C., FET DRIVER, 4427
U2(TC/4);U3(TC/6)	62-6187002-00	8 CHAN.SRC.DRV.SMT,UDN2982

Figure 4.11 A3 Display Light Panel PCB Assembly