



# NAV/COMM Test Set IFR 4000 Maintenance Manual

Issue-3

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# MAINTENANCE MANUAL

## NAV/COMM TEST SET

### IFR 4000

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MAINTENANCE MANUAL  
IFR 4000

# **FOR QUALIFIED SERVICE PERSONNEL ONLY**



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**Electromagnetic Compatibility:**

For continued EMC compliance, all external cables must be shielded and three meters or less in length.

**Nomenclature Statement:**

In this manual, IFR 4000, 4000, Test Set or Unit refers to the IFR 4000 NAV/COMM Test Set.



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## SAFETY FIRST: TO ALL SERVICE PERSONNEL

**REFER ALL SERVICING OF UNIT TO QUALIFIED TECHNICAL PERSONNEL.**

**WARNING: USING THIS EQUIPMENT IN A MANNER NOT SPECIFIED BY THE ACCOMPANYING DOCUMENTATION MAY IMPAIR THE SAFETY PROTECTION PROVIDED BY THE EQUIPMENT.**

### CASE, COVER OR PANEL REMOVAL

Opening the Case Assembly exposes the operator to electrical hazards that can result in electrical shock or equipment damage. Do not operate this Test Set with the Case Assembly open.

### SAFETY IDENTIFICATION IN TECHNICAL MANUAL

This manual uses the following terms to draw attention to possible safety hazards that may exist when operating this equipment.

**CAUTION:** THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN EQUIPMENT OR PROPERTY DAMAGE (E.G., FIRE).

**WARNING:** THIS TERM IDENTIFIES CONDITIONS OR ACTIVITIES THAT, IF IGNORED, CAN RESULT IN PERSONAL INJURY OR DEATH.

### SAFETY SYMBOLS IN MANUALS AND ON UNITS



**CAUTION:** Refer to accompanying documents. (This symbol refers to specific CAUTIONS represented on the unit and clarified in the text.)



**AC OR DC TERMINAL:** Terminal that may supply or be supplied with AC or DC voltage.



**DC TERMINAL:** Terminal that may supply or be supplied with DC voltage.



**AC TERMINAL:** Terminal that may supply or be supplied with AC or alternating voltage.



**DANGEROUS VOLTAGE:** Indicates electrical shock hazard due to high voltage levels.

### EQUIPMENT GROUNDING PRECAUTION

Improper grounding of equipment can result in electrical shock.

### USE OF PROBES

Check specifications for the maximum voltage, current and power ratings of any connector on the Test Set before connecting it with a probe from a terminal device. Be sure the terminal device performs within these specifications before using it for measurement, to prevent electrical shock or damage to the equipment.

### POWER CORDS

Power cords must not be frayed, broken nor expose bare wiring when operating this equipment.

### USE RECOMMENDED FUSES ONLY

Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

**WARNING: THE 4000 USES A LITHIUM ION BATTERY PACK. THE FOLLOWING WARNINGS CONCERNING LITHIUM ION BATTERIES MUST BE HEEDED:**

- DO NOT RECHARGE OUTSIDE THE IFR 4000.
- DO NOT CRUSH, INCINERATE OR DISPOSE OF IN NORMAL WASTE.
- DO NOT SHORT CIRCUIT OR FORCE DISCHARGE AS THIS MIGHT CAUSE THE BATTERY TO VENT, OVERHEAT OR EXPLODE.

**CAUTION:** INTEGRATED CIRCUITS AND SOLID STATE DEVICES SUCH AS MOS FETS, ESPECIALLY CMOS TYPES, ARE SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGES RECEIVED FROM IMPROPER HANDLING, THE USE OF UNGROUNDED TOOLS AND IMPROPER STORAGE AND PACKAGING. ANY MAINTENANCE TO THIS UNIT MUST BE PERFORMED WITH THE FOLLOWING PRECAUTIONS:

- BEFORE USE IN A CIRCUIT, KEEP ALL LEADS SHORTED TOGETHER EITHER BY THE USE OF VENDOR-SUPPLIED SHORTING SPRINGS OR BY INSERTING LEADS INTO A CONDUCTIVE MATERIAL.
- WHEN REMOVING DEVICES FROM THEIR CONTAINERS, GROUND THE HAND BEING USED WITH A CONDUCTIVE WRISTBAND.
- TIPS OF SOLDERING IRONS AND/OR ANY TOOLS USED MUST BE GROUNDED.
- DEVICES MUST NEVER BE INSERTED INTO NOR REMOVED FROM CIRCUITS WITH POWER ON.
- PC BOARDS, WHEN TAKEN OUT OF THE SET, MUST BE LAID ON A GROUNDED CONDUCTIVE MAT OR STORED IN A CONDUCTIVE STORAGE BAG. REMOVE ANY BUILT-IN POWER SOURCE, SUCH AS A BATTERY, BEFORE LAYING PC BOARDS ON A CONDUCTIVE MAT OR STORING IN A CONDUCTIVE BAG.
- PC BOARDS, IF BEING SHIPPED TO THE FACTORY FOR REPAIR, MUST BE PACKAGED IN A CONDUCTIVE BAG AND PLACED IN A WELL-CUSHIONED SHIPPING CONTAINER.



**CAUTION:** SIGNAL GENERATORS CAN BE A SOURCE OF ELECTROMAGNETIC INTERFERENCE (EMI) TO COMMUNICATION RECEIVERS. SOME TRANSMITTED SIGNALS CAN CAUSE DISRUPTION AND INTERFERENCE TO COMMUNICATION SERVICES OUT TO A DISTANCE OF SEVERAL MILES. USERS OF THIS EQUIPMENT SHOULD SCRUTINIZE ANY OPERATION THAT RESULTS IN RADIATION OF A SIGNAL (DIRECTLY OR INDIRECTLY) AND ENSURE COMPLIANCE WITH INSTRUCTIONS IN FAA CIRCULAR AC 170-6C, DATED FEBRUARY 19, 1981.



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## INTRODUCTION

This manual contains the information necessary to test and repair the IFR 4000.

It is strongly recommended that personnel be thoroughly familiar with the contents of this manual before attempting to perform maintenance on this equipment.

Only qualified personnel should perform maintenance on this equipment.

### ORGANIZATION

This manual is divided into the following Chapters and Sections:

#### CHAPTER 2 - MAINTENANCE

Section 1 - SERVICING (preventive maintenance)

Section 2 - TROUBLESHOOTING (theory of operation, troubleshooting procedures, calibration/verification, assembly drawings)

Section 3 - DISASSEMBLY/REASSEMBLY

Section 4 - PARTS LIST



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**MAINTENANCE MANUAL**  
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## SECTION 1 - SERVICING

### 1. Preventive Maintenance Procedures

Contains routine maintenance instructions for cleaning and inspecting the Test Set.

**CAUTION:** DISCONNECT POWER FROM TEST SET TO AVOID POSSIBLE DAMAGE TO ELECTRONIC CIRCUITS.

#### A. External Cleaning

STEP	PROCEDURE
1.	Clean front panel and display face with soft lint-free cloth. If dirt is difficult to remove, dampen cloth with water and mild liquid detergent.
2.	Remove grease, fungus and ground-in dirt from surfaces with soft lint-free cloth dampened (not soaked) with isopropyl alcohol.
3.	Remove dust and dirt from connectors with soft-bristled brush.
4.	Cover connectors, not in use, with suitable dust cover to prevent tarnishing of connector contacts.
5.	Clean cables with soft lint-free cloth.
6.	Paint exposed metal surface to avoid corrosion.

#### B. Internal Cleaning



**CAUTION:** DO NOT MOVE COMPONENTS ON CIRCUIT BOARDS OR DISASSEMBLE CONNECTORS NEEDLESSLY TO AVOID POSSIBLE DAMAGE.

**CAUTION:** DO NOT OPEN COMPLEX INTERNAL MODULES FOR SOLE PURPOSE OF CLEANING AND INSPECTION.

Remove dust with hand-controlled dry air jet of 15 psi (1.054 kg/cm<sup>2</sup>) and wipe internal chassis parts and frame with soft lint-free cloth moistened with isopropyl alcohol.

## C. Visual Inspection

STEP	PROCEDURE
1. Inspect Chassis for:	<ul style="list-style-type: none"><li>● Tightness of sub-assemblies and chassis mounted connectors.</li><li>● Corrosion or damage to metal surfaces.</li></ul>
2. Inspect Capacitors for:	<ul style="list-style-type: none"><li>● Loose mounting, deformities or obvious physical damage.</li><li>● Leakage or corrosion around leads.</li></ul>
3. Inspect Connectors for:	<ul style="list-style-type: none"><li>● Loose or broken parts, cracked insulation and bad contacts.</li></ul>
4. Inspect Circuit Boards for:	<ul style="list-style-type: none"><li>● Corrosion or damage to connectors.</li><li>● Damage to mounted components including crystals and ICs.</li><li>● Freedom from foreign material.</li></ul>
5. Inspect Resistors for:	<ul style="list-style-type: none"><li>● Cracked, broken, charred or blistered bodies.</li><li>● Loose or corroded soldering connections.</li></ul>
6. Inspect Semiconductors for:	<ul style="list-style-type: none"><li>● Cracked, broken, charred or discolored bodies.</li><li>● Correct placement and condition of seals around leads.</li></ul>
7. Inspect Wiring for:	<ul style="list-style-type: none"><li>● Broken or loose ends and connections.</li><li>● Proper dress relative to other chassis parts.</li></ul>
	<b>NOTE:</b> Verify wrapped wiring is tight.

## SECTION 2 - TROUBLESHOOTING

### 1. Theory of Operation

#### A. Power Supply PCB Assy

The Power Supply PCB Assy is responsible for supplying power to the internal modules for operation and for charging the internal batteries. The Power Supply PCB Assy operates from externally supplied DC power and provides simultaneous run and battery charge, or battery charge only. The battery charge time increases when in the run and charge mode. The Power Supply Assy consists of a DC-DC Converter, ON/OFF Control circuitry and the Battery Charger circuitry. The external DC input is supplied from an External DC Power Supply (supplied).

The internal batteries are removable/replaceable Li Ion battery packs with an internal "gas-gauge" feature that allows accurate determination of remaining battery life. Maximum operating and storage temperature for Li Ion batteries is -20°C to +60°C and the maximum charging temperature is 0°C to +45°C.

The Power Supply PCB Assy contains a synchronous buck converter to convert the input voltage to a fixed output voltage (+10 Vdc). The Power Supply PCB Assy also contains a low-pass filter to reduce the amount of internal emissions. The Input Converter Assembly is capable of providing enough output current to charge the battery at full current and run the Test Set at the same time, as long as the input voltage is within range.

##### (1) Battery Charger

The battery charger is a boost type converter. This battery charger monitors the battery voltage and temperature to determine if the battery is capable of being recharged, and if it is safe to attempt to recharge the battery. The battery must be at least at a 9.2 V level and the temperature must be between 0° and 45°C before a charge cycle initiates.

##### (2) Output Circuitry

The output converters are comprised of a dual-phase synchronous buck converter for developing +3.3 and +5 V outputs. The converter also has an auxiliary output that is used to generate +16 V from the +VS source (either the battery or input converter). A separate buck/boost converter is used to generate the -5 V output. The primary converter provides dual phase control, as well as gate drive for the switching mosfets and over-current protection. The main converter runs at 220 kHz, while the auxiliary converter runs at 1.2 MHz.

Both +3.3 and +5 V outputs are capable of delivering up to 3 A of current and the 16 V output can deliver up to 80 mA. If any of these three outputs experience a severe over-current, the supply turns OFF.

The -5 V converter is a stand-alone buck/boost converter that runs at approximately 220 kHz and can deliver up to 400 mA of current before starting to fold back. If the supply experiences a severe over-current condition, the supply stays in fold-back mode until the short is removed.

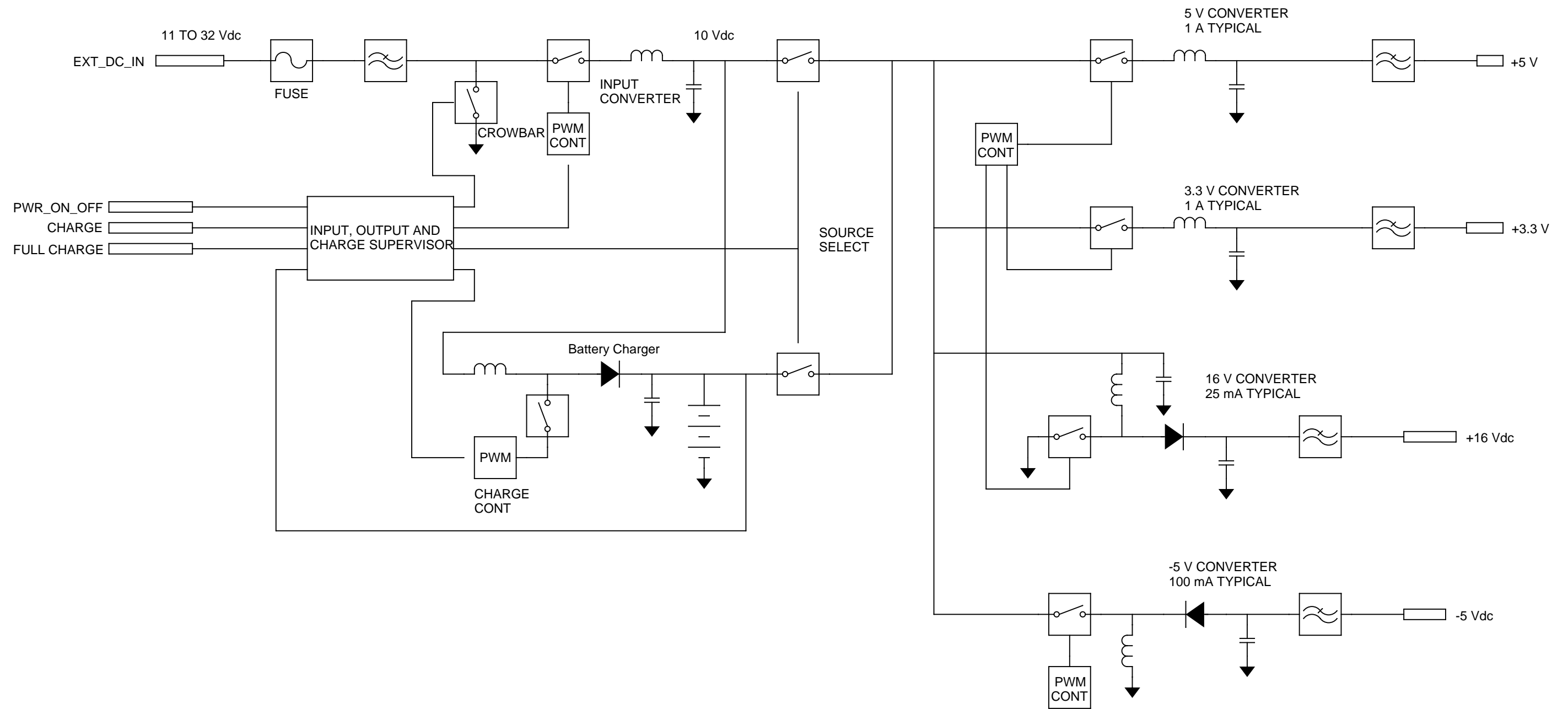
(3) Source Select Circuitry

The source select circuitry is designed to be a low-loss switch that selects the appropriate source when the output of the ON/OFF circuitry is high. The external DC (+Vdc) is selected if present. If external DC is not present, the battery (VBAT+) connects to +VS. If the Test Set is running on external DC or Line Voltage, and that power source is removed, the Test Set shuts OFF.

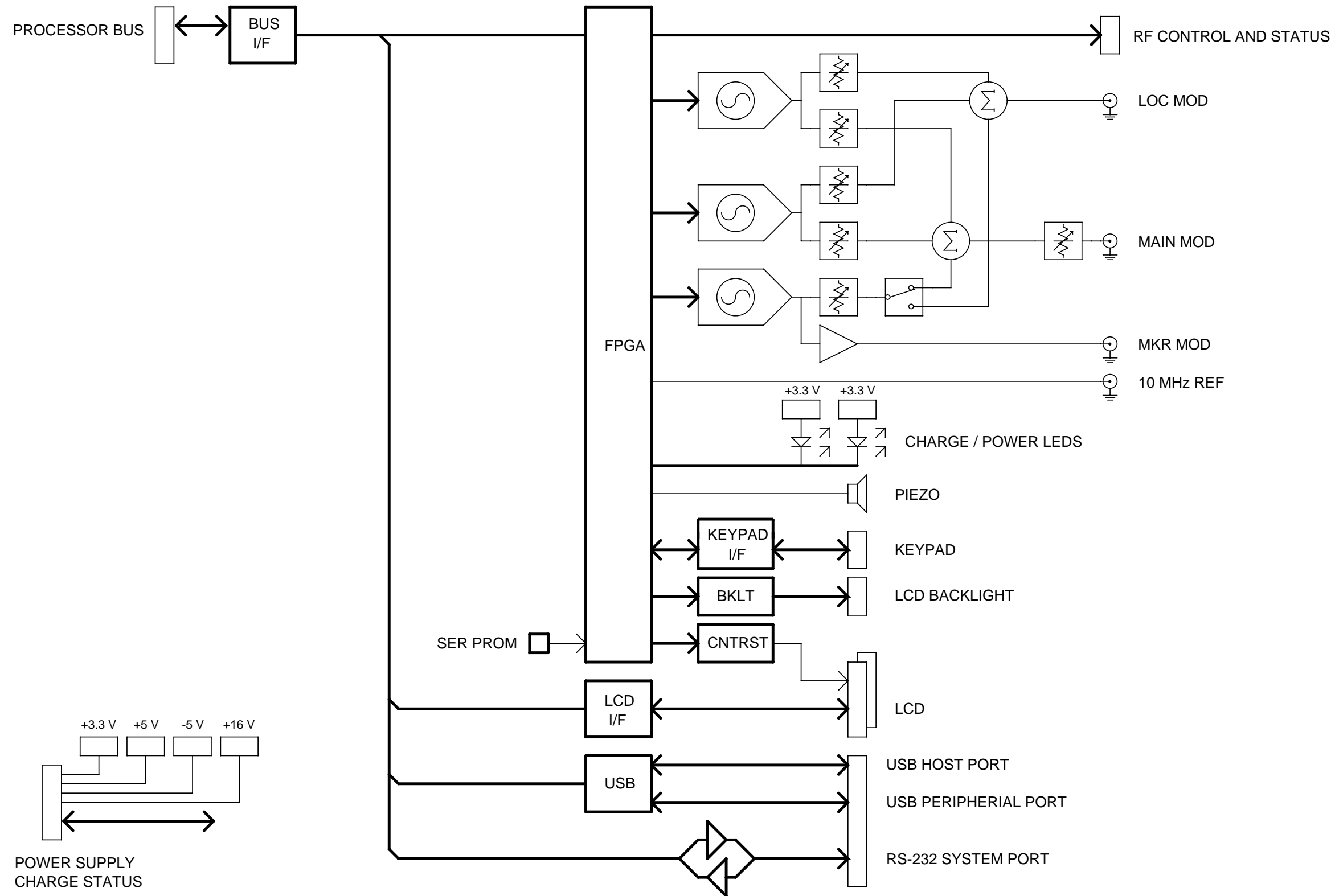
The second function of the switching circuitry is to prevent battery current from flowing into the input converter section when the Test Set is running on battery power. A low voltage cutoff is also incorporated into the ON/OFF circuitry.

(4) Protection Circuitry

The protection circuitry has four basic functions related to the DC input. The battery has internal protection circuitry. The external DC input has a fuse, an over-voltage crowbar and reverse protection diodes. The fuse is the primary disconnect to protect against any of the fault conditions. If the DC input is too high (>32 V), the over-voltage crowbar triggers and the SCR opens the fuse. If the DC input polarity is incorrect, the input clamp diodes forward bias and open the fuse. If the input converter fails and the output of the converter is above 12 V, the SCR triggers and opens the fuse. If the DC input voltage is too low, the input converter is disabled until the input voltage is within the allowable range.



056M-01  
Power Supply PCB Assy Block Diagram  
Figure 1



056M-03

Multi-Function PCB Assy Block Diagram  
Figure 2



## B. Multi-Function PCB Assy

The Multi-Function PCB Assy contains all of the application specific hardware for the Test Set. The circuitry on the Multi-Function PCB Assy provides for level and frequency control of the RF system, tone generation, keypad interface and control for the LCD and backlight. The Multi-Function PCB Assy also contains the USB controller and the level translator for the system RS-232 Connector. The REMOTE Connector provides for software upgrades and remote operation of the Test Set.

### (1) Bus Interface

The Bus Interface communicates with the Processor PCB Assy and consists of address lines A0-A23, data lines D0-D31, R/W, /Reset, CPU Clock, DMA, Timer, Interrupt, I<sup>2</sup>C bus and chip selects. The address, data, reset, clock and chip selects are buffered. Most of the DMA, timer, interrupt and I<sup>2</sup>C type signals are not. The data bus buffer enable and direction is controlled via the CPLD on the Processor PCB Assy.

### (2) FPGA

The version register is a 16-bit device that contains the version for the FPGA F/W. The status register is an 16-bit read-only device contained within the FPGA. The control register is a 16-bit write-only device contained within the FPGA.

The FPGA on the Multi-Function PCB Assy supports several types of programming methods, Slave Serial, Master Serial, Slave Parallel and Boundary Scan mode. In Master Serial, a local serial PROM provides the configuration data. In Slave Parallel mode, the Processor PCB Assy provides the configuration data

### Keypad

The keypad register provides the current status of the keypad. If a key is pressed, the corresponding row/column lines are driven high. Multiple keys can be pressed and are represented as an OR condition on the data inputs.

### Speaker

The Multi-Function PCB Assy contains a speaker that is used for audible keypad "chirps," RF input overload warnings, autopilot position updates, etc. The speaker is driven by the FPGA with a 3.3 V, 4 kHz square wave signal. The 4 kHz square wave signal is enabled by writing a 16-bit value to the Speaker Pulse Generator Register. Setting bit 15 (the MSB) high enables the speaker continuously. The register can be written to at any time. Writing a larger value to the register while the tone is in process extends the tone. Writing a smaller value to the register terminates the tone sooner.

### LCD Backlight / Contrast Control

The LCD backlight and contrast are controlled by a DAC. Output 11 is used for contrast adjustment and output 12 is used for backlight adjustment. The DAC is a serial device and is loaded with a 16-bit data word with serial bus AG1.

### (3) Frequency Counter

The Frequency counter measures the frequency of the detected 100 to 400 MHz RF carrier and is a general purpose counter via the AUX Connector. The RF carrier is run through a limiter and then a prescaler in the RF Assy. The pre-scaled output is run to the Multi-Function PCB Assy. The frequency counter consists of a 24-bit duration counter and a 32-bit frequency counter. The duration counter runs at 1 MHz and is used to gate the measurement window for the frequency counter. The duration counter requires two writes by the processor to program the duration counter. The lower 16-bits are located on data lines D31-D16 at address 40022000. The upper 8-bits are located on data lines D23-D16 at address 40022002. The value written to the counter is calculated as  $n-1$ , where  $n$  is the number of 1 MHz cycles in the duration. Zero (0) is an invalid value and is not used. For a duration of 200 ms, the value 30D3Fh is written to the 24-bit counter. D3Fh is written to the lower address and 3h is written to the upper address. Bit D18 in the control register controls the operation of the frequency counter. When Bit D18 is set to 1, the frequency counter is held in reset. When Bit D18 is set low, the frequency counter runs continuously.

When a measurement has been completed and new data is available, the FCTR\_READY signal (Bit D21) in the status register is set high. Bit D21 remains high until the data has been read. The data remains valid from when the signal goes high until the end of the next gate time, at that point, the registers are updated with the new data. This requires that the data be read prior to the next value getting written to the holding registers.

The counter data is read at address locations 40022004 and 40022006h. The lower 16-bits are contained at address location 40022004h and the upper 16-bits are contained in address location 40022006h. Since the frequency counter input signal is used to terminate the gate window, a value of one (1) must be subtracted from the value read.

At default, the frequency counter is set to count for a 200 ms window and the prescaler is set to divide the incoming signal by 100. This setup limits the incoming signal from the RF Assy to a maximum of 4 MHz.

### (4) RF Control and Status

The RF control circuitry consists of status inputs, a serial bus control register, two data registers, a start register and a latch pulse register. The four status inputs from the RF are read in the FPGA status register. A state change in any one of the four inputs (low to high or high to low) generates an interrupt. The RF serial bus control register is used to select which device gets loaded, the bit ordering for the serial transmission of data, positive or negative clocking of the data, 16 or 24-bit word length and manual control for the M-Bus SCL and SDA lines. The start register causes the serial data to begin transmitting.

Data Register #1 (address location 40023000h) contains the serial data for the 16-bit word and also the lower 16 bits of the 24-bit word. Data Register #2 (address location 40023002h) contains the serial data of the upper byte of the 24-bit word. Data Register #2 is located on data lines D23-D16. The two registers can be written in any order. The start register (address location 40023006h) is used to initiate the serial data output sequence. Data written to the start register is retransmitted.

(5) Audio Generator

The audio generation section of the Mult-Function PCB Assy consists of three tone generators.

**AF Gen #1**

AF Gen #1 synthesizer is followed by a 20 kHz LPF and a pair of attenuator DACs for setting the modulation level. AF Gen #1 is used for 30 Hz variable in VOR mode, 90 Hz in LOC and G/S mode and one of the tone pairs in SELCAL mode. The two attenuators are for LOC modulation level in dual mode and Main Path modulation level. The attenuator DACs are 16 bit multipliers, followed by one channel of the OFFSET DAC to remove the DC offset off the Audio signal. The data value written to the offset channel of the OFFSET DAC is the same value written to the modulation attenuator, except shifted right 8 places. Data is written to the offset channel every time the modulation level or DDM is changed. For the Localizer channel, a data value of 65535 = 100% modulation. For the Main Path, a data value of 40960 is equivalent to 50% modulation ( $5/4$  of the desired mod percent \* 65535) due to attenuation by the Master Mod Control.

AF Gen #1 serial control is shared with AF Gen #3, as well as all of the modulation level attenuators. AF Gen #1 also shares AF1CLK (MCLK) (983.04 kHz) with AF Gen #3 for all output tones.

**AF Gen #2**

AF Gen #2 synthesizer is identical to AF Gen #1 except AF Gen #2 has its own MCLK signal (AF2\_CLK) and serial bus. Functionally AF Gen #2 is used for 150 Hz in LOC or G/S, 9960 for VOR and the second tone in SELCAL mode. The separate clock and serial bus is for VOR mode, with the 30 Hz reference tone FM modulated on the 9960 audio tone. The lower 14 bits of the frequency word to AF Gen #2 at set at a 3 kHz rate in VOR mode to generate the 30 Hz FM signal.

**AF Gen #3**

AF Gen #3 synthesizer is followed by a fixed 20 kHz Low-Pass Filter, a 12 bit attenuator DAC for main path modulation and a fixed level output for Marker Beacon in Tri-Mode operation. The attenuated output is routed to a switch controlled by the AF3SW bit in the control register to select whether the tone is applied to the Main Path modulation or to the Localizer path modulation.

**Master Mod Control**

The Main Path modulation has an additional 12 bit attenuator in-line that changes the combined modulation percentage of the summed tones. The calibrated position for the Master Mod control is the 80% level. The Master Mod attenuator is followed by another offset channel that is programmed to be the same value as the Master Mod attenuator shifted 4 bits to the right.

**Audio Synthesizer**

The audio synthesizers have two frequency registers, two phase registers and a control register for selection of the frequency register, phase register and output options. The phase registers are set to zero to show the DAC output. The reset signal (a bit in the control register) is used in all of the NAV modes to control the phase relationship between AF Gen #1 and #2.

### **LOC and G/S Operation**

For Localizer (LOC) and Glideslope (G/S) operation, AF Gen #1 is set to 90 Hz and AF Gen #2 is set to 150 Hz. The modulation attenuator DAC's and corresponding offset DAC's are set, the bearing counter is set and both reset signals are removed simultaneously.

### **VOR Operation**

In VOR mode, AF Gen #1 uses the 983.04 kHz clock and AF Gen #2 uses the 24.576 MHz clock to reduce the quantization error due to the output DAC of the DDS. AF Gen #2 is programmed to 9960 Hz output frequency with 0 phase offset and AF Gen #1 is programmed to 30 Hz output frequency with 0 phase offset. The FM modulation, on top of the 9960 Hz, is generated by a 16 bit, 101 entry table in RAM in the FPGA. The entries in the table are output at a 3 kHz rate to modify the output frequency of the DDS to generate the 30 Hz FM reference signal for the VOR signaling format.

### **Bearing/Phase Shift Counter**

The bearing/phase shift circuitry puts both AF Gen #1 and AF Gen #2 in reset mode, programmed for a particular frequency, then releases both AF Gen #1 and AF Gen #2 from reset at a fixed interval to set the phase relationships of the two audio signals. Once AF Gen #1 and AF Gen #2 are released from reset, the relative phase remains the same. The timing relationship between the two reset signals is controlled by the bearing/phase shift counter. The bearing counter is used for VOR, ILS and GS modes. The bearing counter delays the start of AF Gen #2 to cause a phase shift between the 30 Hz Reference and the 30 Hz Variable signal that corresponds to a particular bearing setting. The counter is programmable in 0 to 3600, that corresponds to a heading from 0 to 360 degrees in 0.1 degree steps. For VOR mode, a setting of 1800 is equal to 0 degrees TO heading, and a setting of 0000 is equal to 0 degrees FROM heading. For ILS and G/S mode, the Bearing counter delays the start of the 150 Hz signal in relationship to the 90 Hz signal. In this mode, 1 degree (bearing counter setting of 10) causes a 5 degree delay in the output of the 150 Hz signal (5 degrees at 150 Hz). Adjustments are in 5 degree actual increments up to a maximum of 120 actual degrees (bearing counter setting of 240). Display indicate actual degrees of phase shift.

#### **(6) I<sup>2</sup>C Bus**

The I<sup>2</sup>C bus is a two-wire bi-directional serial bus that is used to communicate with several assemblies in the 4000. All assemblies are connected in parallel to the clock and data lines, following a master/slave type protocol.

#### **(7) USB**

The Multi-Function PCB Assy contains a Universal Serial Bus host and device controller, performing both host and peripheral functions, to communicate with an external PC for remote control or software downloads.

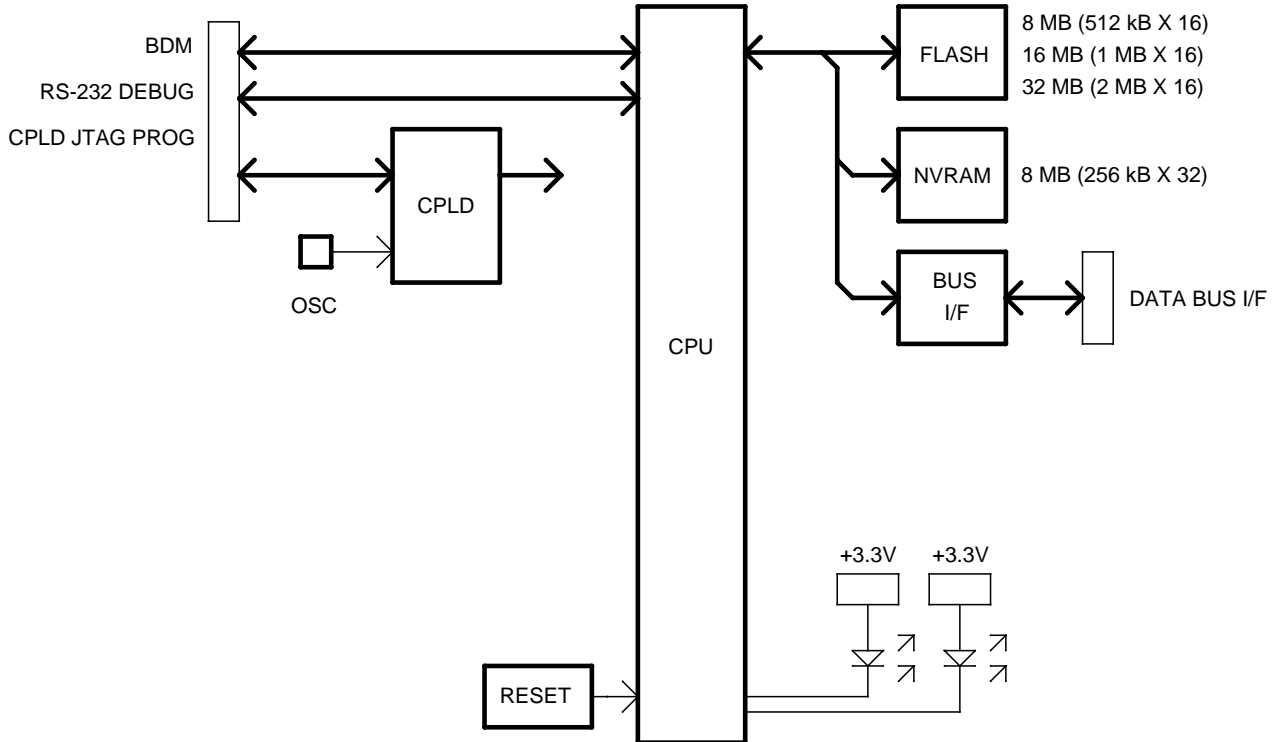
The USB controller is a 16-bit device with two address lines. The address inputs are used for selecting command or data for the HC or DC registers. The USB two interrupt outputs, one for the host and one for the device, are connected to the interrupt register in the FPGA.

#### **(8) RS-232**

The Multi-Function PCB Assy contains an RS-232 level translator. The level translator is a +3.3 V device for performing the TTL to RS-232 level translation. The level translator has driver disable and shutdown control pins for low power modes.

## C. Processor PCB Assy

The Processor PCB Assy contains the processor, FLASH, NVRAM, Serial Ports and an interface bus for controlling the Test Set.



056M-02

Processor PCB Assy Block Diagram  
Figure 3

### (1) CPU

The microprocessor used contains a DRAM controller, DMA controller, interrupt controller, timers, parallel and serial interfaces and on-chip debug support. The microprocessor contains 4 kB of cache and 8 kB of on-chip SRAM. The microprocessor runs at a maximum clock speed of 40 MHz. The Processor PCB Assy contains a 36.864 MHz oscillator, divided by two within the CPLD, and then provided to the CPU.

### (2) External Memory (FLASH)

The Processor PCB Assy memory arrangement is 256k x 16, 512k x 16, 1M x 16 or 2M x 16.

During reset, the external interrupts are sampled to define the port size and wait-state generation for chip select CS0 (FLASH). The interrupts are strapped for a 16-bit port with 15 wait states to allow the start program execution from the FLASH.

(3) External Memory (NVRAM)

There is 256k x32 of NVRAM on the CPU board. It is accessible as bytes, words and long words (32 bit). The NVRAM is battery backed up by a battery located on the Multi-Function board. The power and chip select for the NVRAM is controlled by Uxx. This device monitors the +3.3 V supply voltage and will switch over to battery power and disable the SRAM chip enable when the supply voltage drops to 2.55 to 2.70 V. Uxx also provides a battery status output. This signal will go low when the battery voltage is below 2.5 V. It is checked at power up. This input is read via the status register in the CPLD.

(4) Reset Circuit

The Processor PCB Assy contains a voltage supervisory reset circuit. The voltage supervisory device (U5) provides a reset pulse at power-up and during "brown-out" conditions. If the +3.3 V drops below 2.55 to 2.70 V, the reset goes low until the voltage returns to normal. A reset is generated while the reset input is held low.

(5) CPLD

The CPLD controls chip select generation and buffer control for devices on the Processor PCB Assy and Multi-Function PCB Assy. The CPLD also contains a status register, F/W version register, clock divider and a FPGA programming port for the FPGA on the Multi-Function PCB Assy.

The version register is an 8-bit device that contains the version for the CPLD F/W. The status register is an 8-bit device that provides the H/W configuration, user definable jumpers and the NVRAM battery status.

The FPGA on the Multi-Function PCB Assy supports Slave Serial, Master Serial, Slave Parallel and Boundary Scan mode. In Master Serial, a local (local to the Multi-Function PCB Assy) serial PROM provides the configuration data. In Slave Parallel mode, the Processor PCB Assy provides the configuration data. Configuration resistors on the Multi-Function PCB Assy provide for selecting one of the two programming methods. If the Multi-Function PCB Assy is strapped for Master Serial mode, the Processor PCB Assy is not responsible for the FPGA configuration, but can monitor the status. If the Multi-Function PCB Assy is strapped for Slave Parallel Mode, the Processor PCB Assy loads the configuration data. There is a FPGA Control Register, Status Register and Configuration Data port for configuring the FPGA. The FPGA Configuration Data port accepts data and provides configuration data to the FPGA.

(6) Serial Ports

The Processor PCB Assy has two RS-232 ports. Both ports provide RX, TX, RTS and CTS capability. COMM Port 1 is available as the system port and can be accessed via the RS-232 Connector. COMM Port 2 is accessed via the TEST Connector. Both COMM Port signals are at a 3.3 V level.

(7) Bus Interface

The Bus Interface communicates with the Multi-Function PCB Assy and consists of address lines A0-A23, data lines D0-D31, R/W, /Reset, CPU Clock, DMA, Timer, Interrupt, I<sup>2</sup>C bus, and chip selects. The address, data, reset, clock and chip selects are buffered. The data bus buffer enable and direction is controlled via the CPLD.

#### D. RF Assy (7005-5640-400) (2-2-1, Figure 4)

The RF Assy consists of the RF Controller PCB Assy and the RF Converter PCB Assy enclosed in a block. The RF Assy receives power and control via the Multi-Function PCB Assy.

The RF Converter PCB Assy contains the RF termination for the direct connect port (RF I/O Connector), the power amplifier, ANT (Antenna) Connector and the VSWR bridge to support the SWR Connector, as well as the frequency translation circuitry and step attenuator. The RF Controller PCB Assy interfaces directly with the Multi-Function PCB Assy to control the RF hardware. The RF Controller PCB Assy also contains the RF synthesizers and the modulation driver circuitry.

The RF Assy generates the modulated RF output signals that are used to test the UUT. The converter also down-converts the received signal, demodulates the FM and provides a frequency counter for the incoming signal.

A 40 MHz TCXO with 1 ppm stability provides the reference signal for the RF Assy as well as the Multi-Function PCB Assy. The 40 MHz reference provides the clock signal for the Direct Digital Synthesizer (DDS). The DDS generates a nominal 10.7 MHz signal that provides the Phase Lock Loop (PLL) reference in the IF synthesizer. Using the DDS as the PLL reference, very fine frequency steps can be achieved while keeping the division ratio (N) of the PLL low, which keeps the phase noise of the synthesizer low. The serial data bus from the Multi-Function PCB Assy controls both the DDS and the PLL.

The IF synthesizer PLL provides a 450.1 to 450.6 MHz IF for the generate function and the LO used for the final down-conversion when the system is set to receive. The IF signal is passed through an attenuator, amplifier and low-pass filter to provide isolation and to remove spurious signals and harmonics. The signal is then steered to the AM modulator circuit by the RF switch.

The AM modulator (a PI configuration PIN diode attenuator) provides the AM modulation and the fine increment output level adjustment and output leveling functions. The level control inputs as serial data to a DAC, while the baseband AM is provided by the audio circuit on the Multi-Function PCB Assy; these signals are summed with the leveling detector output to control the AM modulator.

The modulated IF signal is amplified and passed through a bandpass filter via another RF switch to a mixer. The 450 MHz IF is mixed with a 525 to 850 MHz LO to set the output frequency of 75 to 400 MHz. The LO signal is generated in the LO PLL synthesizer which is controlled via the serial bus from the Multi-Function PCB Assy. The 40 MHz TCXO is divided by 4 to provide a 10 MHz reference to the PLL, which generates a 525 to 850 MHz output in 0.5 MHz steps. The PLL output is filtered and amplified to insure sufficient level to drive the mixer and provide isolation between the mixer and the synthesizer.

The down-converted output of the mixer passes through a Low Pass Filter to reduce the level of the LO and harmonic signals. The signal is input to the amplifier via a RF switch. The amplifier provides approximately 25 dB of gain. Part of the signal is tapped off to the leveling detector with the detected signal fed back to the AM modulator to level the output of the amplifier to approximately +10 dBm. The detected signal is input to the analog to digital converter (A/D) for BIT testing and to monitor the AM modulation.

The amplified signal is input to an RF switch, where the signal is used as the source for the SWR bridge or sent to the attenuators to set the output signal power. The SWR Bridge receives an unmodulated CW signal from the RF converter. Using a 50  $\Omega$  cable, the UUT is connected to the SWR Connector and the reflected power is detected through the log amp. It is necessary to calibrate the zero return loss by connecting a short and an open at the end of the cable connected to the UUT. From these measurements the SWR of the UUT can be calculated by the software.

The attenuator circuitry is broken down into three sections: a single binary weighted 31 dB attenuator providing 1 dB steps and two attenuators with the control lines tied together so that each attenuator provides 30 dB of attenuation. The signal passes through two couplers. The first coupler is for the frequency counter in receive mode and the second coupler is used to sum the Localizer signal in dual mode.

When the Test Set is set for dual mode operation (Localizer and Glideslope), there is a separate PLL synthesizer that is powered ON to provide the Localizer signal. This Localizer signal is coupled in with the attenuator output supplying the Glideslope signal from the normal signal generation path.

The Localizer PLL circuit is similar to the LO synthesizer with a frequency range of 107 to 118 MHz in 50 kHz steps. The signal is AM modulated by a separate modulator, which is controlled by the Multi-Function PCB Assy. The Localizer signal is not leveled nor does the Localizer signal go through the attenuator. The output level is not user settable although small adjustments are made using the modulator for calibration.

The output of the second coupler can be switched to either use or bypass the power amplifier. The amplifier provides approximately 30 dB of gain and is capable of +16 dBm plus sufficient headroom to support 100% AM. When the power amplifier is bypassed, DC power is removed to conserve battery power.

Following the switchable amplifier, an one pole 4 position RF switch selects the RF I/O Connector or the ANT Connector. When the RF I/O Connector is selected, the signal is routed through a 20 dB high power attenuator to the RF I/O Connector. When the ANT Connector is selected, the signal path depends on the Test Set mode of operation. If the Test Set is in single or dual mode, the signal is routed to another RF switch and then through the straight-through path of a directional coupler to the ANT Connector.

When the Test Set is set in Tri-Mode operation, a separate oscillator generates the 75 MHz carrier for the Marker Beacon. The Marker Beacon signal is AM modulated by a separate modulator, which is controlled by the Multi-Function PCB Assy. The Marker Beacon signal is routed to the ANT Connector through the RF switch and the straight-through path of the coupler. The Glideslope and Localizer signals are input to the coupled port of the directional coupler from the 4 position RF switch.

When the Test Set is in receive mode, signals may be input to the RF I/O Connector or the ANT Connector.

Connected to the ANT Connector is the antenna protect circuit. This circuit protects the Test Set from damage if a high power signal is inadvertently input to the ANT Connector. If the signal level input to the ANT Connector is too high, PIN diodes short the input to ground. Additionally a signal is sent to the software via the Multi-Function PCB Assy to alert the operator that an overload condition exists. Under normal operating conditions, a signal input to the ANT Connector passes through the protection circuitry, through the directional coupler and RF switch to the single pole four position RF switch.

When the RF I/O Connector is selected, the signal is routed through a 20 dB high power attenuator. This attenuator allows the RF I/O Connector to accept signal levels up to 30 W directly into the Test Set. A temperature sensor mounted next to the attenuator is monitored by software. If the temperature rise is too great, the operator is alerted. Following the attenuator a resistive splitter feeds part of the received signal to the power detect circuit. The power detect circuit is a diode detector used to measure the input power for the power meter function. The other port of the resistive splitter feeds the signal to the single pole four-position switch. From this point on both the ANT Connector and RF I/O Connector share a common path.



The received signal bypasses the power amp through the RF switches, through the LOC coupler to the coupler that feeds the frequency counter. Part of the received signal is coupled off to provide the input for the frequency counter circuitry. A log amp chip acts as a limiter, providing the input to a PLL chip that is used as a prescaler for the frequency counter. The PLL chip provides a programmable prescaler, with the output sent to the FPGA on the Multi-Function PCB Assy. In addition, the video output of the log amp is fed to an analog to digital converter that is used as a software controlled threshold.

The receive signal passes through the attenuators, which can be used as part of a coarse AGC (if needed). The signal bypasses the generate amp and is input to the mixer via the low-pass filter. The signal is mixed with the LO to produce a 450 MHz IF. The bandpass filter filters out unwanted mixer products. The RF switch steers the signal to the mixer section of the IF receiver chip. The LO for the mixer is provided by the DDS/PLL synthesizer, that is tuned to approximately 450 MHz, to give a 455 kHz IF. The 455 kHz IF is filtered and input to the Log amp section of the IF receiver. The Log amp provides a limited IF signal, used for FM demodulation, and a detected video output used for thresholding.



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#### E. RF Assy (7005-5640-500) (2-2-1, Figure 5)

The RF Assy consists of the RF Controller PCB Assy and the RF Converter PCB Assy enclosed in a block. The RF Assy receives power and control via the Multi-Function PCB Assy.

The RF Converter PCB Assy contains the RF termination for the direct connect port (RF I/O Connector), the power amplifier, ANT (Antenna) Connector and the VSWR circuitry to support the SWR Connector, as well as the frequency translation circuitry and step attenuator. The RF Controller PCB Assy interfaces directly with the Multi-Function PCB Assy to control the RF hardware. The RF Controller PCB Assy also contains the RF synthesizers and the modulation driver circuitry.

The RF Assy generates the modulated RF output signals that are used to test the UUT. The converter also down-converts the received signal, demodulates the FM and provides a frequency counter for the incoming signal.

A 40 MHz TCXO with 1 ppm stability provides the reference signal for the RF Assy as well as the Multi-Function PCB Assy. The 40 MHz reference provides the clock signal for the Direct Digital Synthesizer (DDS). The DDS generates a nominal 10.7 MHz signal that provides the Phase Lock Loop (PLL) reference in the IF synthesizer. Using the DDS as the PLL reference, very fine frequency steps can be achieved while keeping the division ratio (N) of the PLL low, which keeps the phase noise of the synthesizer low. The serial data bus from the Multi-Function PCB Assy controls both the DDS and the PLL.

The IF synthesizer PLL provides a 450.1 to 450.6 MHz IF for the generate function and the LO used for the final down-conversion when the system is set to receive. The IF signal is passed through an attenuator, amplifier and low-pass filter to provide isolation and to remove spurious signals and harmonics. The signal is then steered to the AM modulator circuit by the RF switch.

The AM modulator (a PI configuration PIN diode attenuator) provides the AM modulation and the fine increment output level adjustment and output leveling functions. The level control inputs as serial data to a DAC, while the baseband AM is provided by the audio circuit on the Multi-Function PCB Assy; these signals are summed with the leveling detector output to control the AM modulator.

The modulated IF signal is amplified and passed through a bandpass filter via another RF switch to a mixer. The 450 MHz IF is mixed with a 460 to 850 MHz LO to set the output frequency of 10 to 400 MHz. The LO signal is generated in the LO PLL synthesizer which is controlled via the serial bus from the Multi-Function PCB Assy. The 40 MHz TCXO is divided by 4 to provide a 10 MHz reference to the PLL, which generates a 460 to 850 MHz output in 0.5 MHz steps. The PLL output is filtered and amplified to insure sufficient level to drive the mixer and provide isolation between the mixer and the synthesizer.

The down-converted output of the mixer passes through a Low Pass Filter to reduce the level of the LO and harmonic signals. The signal is input to the amplifier via RF switch. The amplifier provides approximately 25 dB of gain. Part of the signal is tapped off to the leveling detector with the detected signal fed back to the AM modulator to level the output of the amplifier to approximately +10 dBm. The detected signal is input to the analog to digital converter (A/D) for BIT testing and to monitor the AM modulation.

The amplified signal is input to an RF switch, where the signal is used as the source for the SWR circuitry or sent to the attenuators to set the output signal power. The SWR circuit receives an unmodulated CW signal from the RF converter. Using a 50  $\Omega$  cable, the UUT is connected to the SWR Connector and the reflected power is detected through the log amp. To calibrate the SWR circuitry, connect a short, an open and a 50  $\Omega$  load at the end of the cable connected to the UUT. From this measurement the SWR of the UUT can be calculated by the software.

The attenuator circuitry is broken down into three sections: a single binary weighted 31 dB attenuator providing 1 dB steps and two attenuators with the control lines tied together so that each attenuator provides 30 dB of attenuation. The signal passes through an RF switch and two couplers. The first coupler is for the frequency counter in receive mode and the second coupler is used to sum the Localizer signal in dual mode.

When the Test Set is set for dual mode operation (Localizer and Glideslope), there is a separate PLL synthesizer that is powered ON to provide the Localizer signal. This Localizer signal is coupled in with the attenuator output supplying the Glideslope signal from the normal signal generation path.

The Localizer PLL circuit is similar to the LO synthesizer with a frequency range of 107 to 118 MHz in 50 kHz steps. The signal is AM modulated by a separate modulator, which is control led by the Multi-Function PCB Assy. The Localizer signal is not leveled nor does the Localizer signal go through the attenuator. The output level is not user settable although small adjustments are made using the modulator for calibration.

The output of the second coupler can be switched to either use or bypass the power amplifier. The amplifier provides approximately 30 dB of gain and is capable of +16 dBm plus sufficient headroom to support 100% AM. When the power amplifier is bypassed, DC power is removed to conserve battery power.

Following the switchable amplifier, two single pole double throw switches are used to select the RF I/O Connector or the ANT Connector. When the RF I/O Connector is selected, the signal is routed through the non-attenuated path of a switch pole attenuator circuit to a 20 dB high power attenuator to the RF I/O Connector. When the ANT Connector is selected, the signal path depends on the Test Set mode of operation. If the Test Set is in single or dual mode, the signal is routed to another RF switch and then through the straight-through path of a directional coupler to the ANT Connector.

When the Test Set is set to Tri-Mode operation, a separate oscillator generates the 75 MHz carrier for the Marker Beacon. The Marker Beacon signal is AM modulated by a separate modulator, which is controlled by the Multi-Function PCB Assy. The Marker Beacon signal is routed to the ANT Connector through the RF switch and the straight through path of the coupler. The Glideslope and Localizer signals are input to the coupled port of the directional coupler.

When the Test Set is in receive mode, signals may be input to the RF I/O Connector or the ANT Connector.

Connected to the ANT Connector is the antenna protect circuit. This circuit protects the Test Set from damage if a high power signal is inadvertently input to the ANT Connector. If the signal level input to the ANT Connector is too high, PIN diodes short the input to ground. Additionally a signal is sent to the software via the Multi-Function PCB Assy to alert the operator that an overload condition exists. Under normal operating conditions, a signal input to the ANT Connector passes through the protection circuitry, through the directional coupler and RF switches to the Power amplifier bypass switch.

When the RF I/O Connector is selected, the signal is routed through a 20 dB high power attenuator. This attenuator allows the RF I/O Connector to accept signal levels up to 30 W directly into the Test Set. A temperature sensor mounted next to the attenuator is monitored by software. If the temperature rise is too great, the operator is alerted. Following the attenuator a resistive splitter feeds part of the received signal to the power detect circuit. The power detect circuit is a diode detector used to measure the input power for the power meter function. The other port of the resistive splitter feeds the signal through the 10 dB attenuated path of the switched attenuator circuits. The attenuator insures a good match from the detector for power measurement. The attenuated signal is the feed to the RF switches to the Power amplifier bypass switch. From this point on both the ANT Connector and RF I/O Connector share a common path.

The received signal bypasses the power amp through the RF switches, through the LOC coupler to the coupler that feeds the frequency counter. Part of the received signal is coupled off to provide the input for the frequency counter circuitry. A log amplifier acts as a limiter, providing the input to a PLL that is used as a prescaler for the frequency counter. The PLL provides a programmable prescaler, with the output sent to the FPGA on the Multi-Function PCB Assy. The video output of the log amplifier is fed to an analog to digital converter that is used as a software controlled threshold. In addition in AM receive mode the software uses the digitally converted log output to calculate the percent of amplitude modulation.

The receive signal is then fed to an RF switch. This switch along with the step attenuators are used as coarse AGC function controlled by the microcontroller on the RF Controller PCB Assy. When the system is in 406 Beacon mode, 121.5/243 Beacon mode, or when the audio output is enabled, the microcontroller measures the signal level from the video output of the frequency counter log amplifier. Based on this level the microcontroller sets the RF switch to bypass the attenuators or pass through the attenuators with the attenuation set to either 0 dB or 20 dB. The receive signal bypasses the generate amplifier and is input to the mixer via the low-pass filter. The signal is mixed with the LO to produce a 450 MHz IF. The bandpass filter filters out unwanted mixer products. The RF switch steers the signal to the mixer section of the IF receiver. The LO for the mixer is provided by the DDS/PLL synthesizer, that is tuned to approximately 450 MHz. In AM audio, SSB, FM or 121.5/243 Beacon mode the LO is tuned to produce a 455 kHz IF. In FM mode the 455 kHz IF is filtered and input to the log amplifier section of the IF receiver. The log amplifier provides a limited IF signal, used for FM demodulation, and a detected video output used for thresholding.

In AM Audio, SSB, and 121.5/243 Beacon modes the 455 kHz IF is fed through an active low-pass filter to the AGC amplifier, to the demodulator. The demodulated Audio signal is then passed through an audio filter to the audio amplifier, and is available on the AUX I/O Connector.

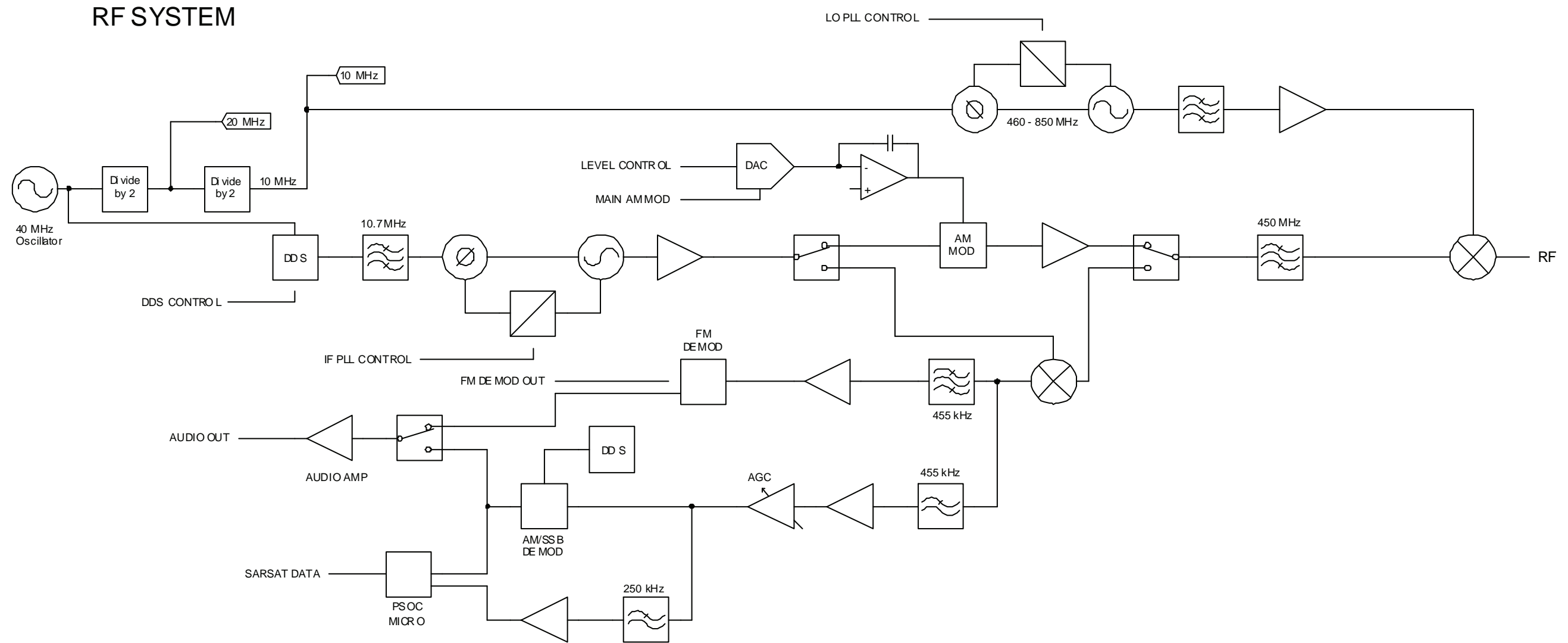
In 121.5/243 Beacon mode the demod audio signal is also sent to the microcontroller to measure the start and stop swept audio frequencies. The microcontroller then sends the data to the software for display.

In 406 Beacon mode the LO generated by the DDS/PLL synthesizer is tuned to produce an IF of approximately 200 kHz. The IF is tapped of from the mixer in the IF receiver and fed to the AGC amplifier. From there the signal passes through another active low-pass filter and is input to the microcontroller. The microcontroller demodulates the Phase Shift Keyed (PSK) signal and digitizes the data. The data is then sent to the software where the data is decoded and displayed.

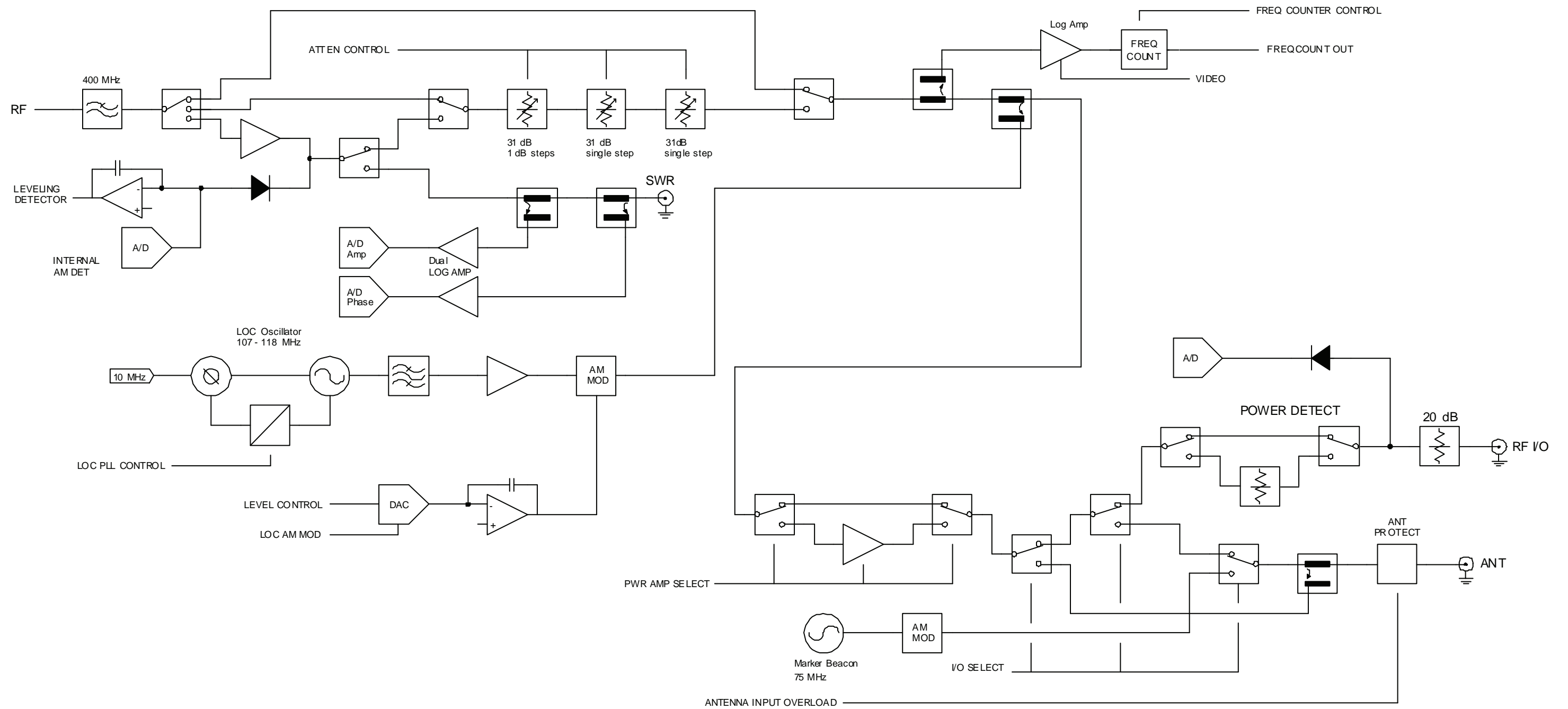


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RF Assy Block Diagram  
Figure 5



RF Assy Block Diagram (cont)  
Figure 5

## 2. Troubleshooting Procedures

### A. Guidelines

Troubleshooting is divided into a Symptom Index and a Troubleshooting Table.

The Troubleshooting Table lists common malfunctions which may occur during operation of Test Set. Perform tests/inspections and corrective actions in order listed.

**NOTE:** This manual cannot list all malfunctions that may occur, nor all tests or inspections and corrective actions.

**NOTE:** If a malfunction is not listed or is not corrected by listed corrective actions, the troubleshooting technique (the formulation of a logical approach in locating the source of trouble) is left to the technician's discretion.

Following is a list of aids to be used when troubleshooting the Test Set:

- The Test Set has a built-in Self Test to assist the technician in troubleshooting.
- Many problems on Test Sets in service are caused by corrosion. Sometimes removing and reseating an affected cable or circuit card corrects the malfunction. Cleaning connector and/or switch contacts with alcohol repairs many types of digital and analog circuit malfunctions.
- The following inspection procedures are used to locate obvious malfunctions with the Test Set:
  - Inspect all external surfaces of the Test Set for physical damage, breakage, loose or dirty contacts and missing components.
 

**CAUTION:** DO NOT DISCONNECT OR REMOVE ANY BOARD ASSEMBLIES IN THE TEST SET UNLESS THE UNIT IS REMOVED FROM ANY AC POWER SOURCES. SOME ASSEMBLIES CONTAIN DEVICES THAT CAN BE DAMAGED IF THE ASSEMBLY IS REMOVED WHEN POWER IS ON. SEVERAL COMPONENTS, INCLUDING MOS DEVICES, CAN BE DAMAGED BY ELECTROSTATIC DISCHARGE. USE CONDUCTIVE FOAM AND GROUNDING STRAPS WHEN SERVICING IS REQUIRED AROUND SENSITIVE COMPONENTS. USE CARE WHEN UNPLUGGING ICS FROM HIGH-GRIP SOCKETS.
  - Inspect printed circuit board surfaces for discoloration, cracks, breaks and warping and printed circuit board conductors for breaks, cracks, cuts, erosion or looseness.
  - Inspect all assemblies for burnt or loose components.
  - Inspect all chassis-mounted components for looseness, breakage, loose contacts or conductors.
  - Inspect Test Set for disconnected, broken, cut, loose or frayed cables or wires.

## B. Precautions

### (1) Safety

**WARNING:** REMOVE ALL JEWELRY OR OTHER COSMETIC APPAREL BEFORE PERFORMING ANY TROUBLESHOOTING INVOLVING LIVE CIRCUITS.

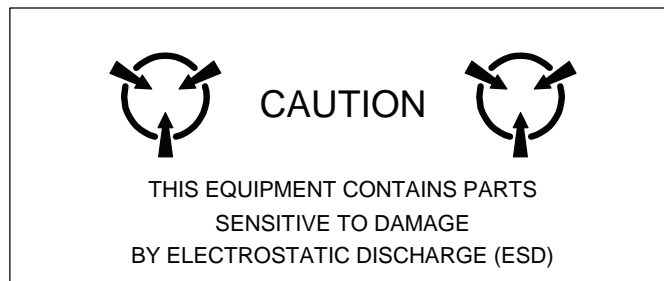
**WARNING:** WHEN WORKING WITH LIVE CIRCUITS OF HIGH POTENTIAL, KEEP ONE HAND IN POCKET OR BEHIND BACK TO AVOID SERIOUS SHOCK HAZARD.

**WARNING:** USE ONLY INSULATED TROUBLESHOOTING TOOLS WHEN WORKING WITH LIVE CIRCUITS.

**WARNING:** FOR ADDED INSULATION, PLACE RUBBER BENCH MAT UNDERNEATH ALL POWERED BENCH EQUIPMENT, AS WELL AS A RUBBER MAT UNDERNEATH TECHNICIAN'S CHAIR.

**WARNING:** HEED ALL WARNINGS AND CAUTIONS CONCERNING MAXIMUM VOLTAGES AND POWER INPUTS.

### (2) ESD



**CAUTION:** THE POWER SUPPLY ASSY, MULTI-FUNCTION PCB ASSY, RF ASSY AND PROCESSOR PCB ASSY CONTAIN PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). ALL PERSONNEL PERFORMING TROUBLESHOOTING PROCEDURES SHOULD HAVE KNOWLEDGE OF ACCEPTED ESD PRACTICES AND/OR BE ESD CERTIFIED.

### (3) EMC and Safety Compliance

All assemblies, cables, connectors, plastic fasteners, gaskets, fingerstock and miscellaneous hardware within the Test Set are configured to satisfy the safety and EMC compliance standards.

**CAUTION:** UPON COMPLETION OF ANY MAINTENANCE ACTION; ALL ASSEMBLIES, CABLES, CONNECTORS, PLASTIC FASTENERS, GASKETS, FINGERSTOCK AND MISCELLANEOUS HARDWARE MUST BE CONFIGURED AS INSTALLED AT THE FACTORY.



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27	BACKLIGHT Key Failure	7
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29	DECREMENT/SELECT Data Key Failure	7
30	Verification Failure	7

## TROUBLESHOOTING TABLE

**NOTE:** The Troubleshooting Table lists common malfunctions found during normal operation or maintenance of the Test Set or components. The tests or inspections and corrective actions should be performed in the order listed. Failure to do so may result in troubleshooting recommendations that replace working assemblies.

<i><b>MALFUNCTION</b></i>	<i><b>TEST OR INSPECTION</b></i>	<i><b>CORRECTIVE ACTION</b></i>
<b>1 External DC Power Supply failure</b>	Step 1. Connect External DC Power Supply to a verifiable AC Power Source. Step 2. Connect DMM to External DC Power Supply output. Step 3. Verify +18 Vdc ( $\pm 1$ Vdc)	◆ If incorrect, probable source of failure is the External DC Power Supply.
<b>2 POWER Indicator does not light</b>		Probable sources of failure are the circuit between Power Supply PCB Assy and the LCD Assy and a short on the Multi-Function PCB Assy or the RF Assy.
<b>3 CHARGE Indicator does not light</b>		Probable sources of failure are the Battery, Power Supply PCB Assy and the LCD Assy.
<b>4 Blows Fuse</b>		Probable source of failure is the Power Supply PCB Assy .
<b>5 Battery does not charge</b>		Probable source of failure is the Battery.
<b>6 Display is blank or abnormality exists in Display</b>		Probable sources of failure are the Power Supply PCB Assy, Multi-Function PCB Assy, LCD Assy and the interconnecting cables.
<b>7 Keys Inoperable</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.

---

**MALFUNCTION**  
**TEST OR INSPECTION**  
**CORRECTIVE ACTION**

---

**8 Self Test Failure****1. RAM Test fails**

Probable source of failure is the Processor PCB Assy.

**2. Flash fails**

Probable source of failure is the Processor PCB Assy.

**3. CPLD fails**

Probable source of failure is the Processor PCB Assy.

**4. NVRAM fails**

Probable source of failure is the Processor PCB Assy.

**5. FPGA fails**

Probable source of failure is the Multi-Function PCB Assy.

**6. USB fails**

Probable source of failure is the Multi-Function PCB Assy.

**7. Keypad fails**

Probable sources of failure are the Multi-Function PCB Assy, Keypad PCB Assy and the interconnecting cables.

**8. Battery fails**

Probable source of failure is the Battery.

**9. Micro fails**

Probable sources of failure is the RF Assy.

**10. Lock Detect fails**

Probable source of failure is the RF Assy.

**11. Level Detect fails**

Probable source of failure is the RF Assy.

**12. SWR fails**

Probable source of failure is the RF Assy.

**13. Frequency Counter fails**

Probable source of failure is the RF Assy.

**14. Localizer fails**

Probable source of failure is the RF Assy.

**15. Marker fails**

Probable source of failure is the RF Assy.

<b>MALFUNCTION</b>	<b>TEST OR INSPECTION</b>	<b>CORRECTIVE ACTION</b>
<b>8 Self Test Failure (cont)</b>		
	<b>16. Power Detector fails</b>	Probable source of failure is the RF Assy.
	<b>17. Antenna Protection fails</b>	Probable source of failure is the RF Assy.
<b>9 SWR Connector Failure</b>		Probable source of failure is the RF Assy.
<b>10 AUX I/O Connector Failure</b>		Probable source of failure is the RF Assy.
<b>11 DC POWER Connector Failure</b>		Probable sources of failure are the Power Supply PCB Assy and the interconnecting cables.
<b>12 RF I/O Connector Failure</b>		Probable source of failure is the RF Assy.
<b>13 ANTENNA Connector Failure</b>		Probable source of failure is the RF Assy.
<b>14 REMOTE Connector Failure</b>		Probable sources of failure are the Multi-Function PCB Assy and the interconnecting cables.
<b>15 MODE Select Key Failure</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>16 POWER Key Failure</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>17 Multi-Function Soft Keys Failure</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>18 RF LVL Field Select Key Failure</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>19 FREQ Field Select Key Failure</b>		Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.



<i><b>MALFUNCTION</b></i>	<i><b>TEST OR INSPECTION</b></i>	<i><b>CORRECTIVE ACTION</b></i>
<b>20</b>	<b>TONE Field Select Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>21</b>	<b>M MOD Field Select Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>22</b>	<b>SETUP Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>23</b>	<b>G/S DDM UP Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>24</b>	<b>LOC DDM LEFT Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>25</b>	<b>G/S DDM DOWN Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>26</b>	<b>LOC DDM RIGHT Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>27</b>	<b>BACKLIGHT Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>28</b>	<b>CONTRAST Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>29</b>	<b>DECREMENT/SELECT Data Key Failure</b>	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
<b>30</b>	<b>Verification Failure</b>	<p>Step 1. Perform Calibration (para 2-2-3F).</p> <p>Step 2. If Calibration does not clear failure, probable sources of failure are the Multi-Function PCB Assy and the RF Assy.</p>



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3. Calibration/Verification

A. General

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### (1) Calibration/Verification Schedule

The Calibration/Verification Procedures should be performed as a result of one or more of the following conditions:

- Failure to Meet Specifications

If, during the course of normal operation, the Test Set or any major function thereof fails to meet the performance specifications according to Appendix F, the Calibration/Verification Procedures should be performed.

If any failure occurs during performance of the Verification Procedures, the user is instructed as to the pertinent Calibration Procedure or hardware failure associated with the failure.

- Module/Assembly Replacement

If one or more of the Test Set assemblies are replaced, the Calibration Procedures should be performed.

- Annual Calibration/Verification

Aeroflex recommends an annual Calibration/Verification on the Test Set to maintain proper testing standards.

Calibration of the TCXO is required annually even if the timebase is within specification. This helps insure the cumulative effects of aging on the TCXO and ensures the Test Set stays within specification before the next calibration cycle.

### (2) Controls, Connectors and Indicators

Refer to Appendix E for location of the Test Set Controls, Connectors and Indicators.

### (3) Test Record

Verification Data Sheets are provided for recording the results obtained while performing the Verification Procedures.

**NOTE:** It is recommended the technician reproduce copies of the Verification Data Sheets, rather than use copies in this manual.

## B. Precautions

The Calibration and Verification Procedures are performed with the Test Set Covers in place. No internal adjustments or probing points are required.

## C. Requirements

### (1) Performance

It is strongly recommended that personnel thoroughly read and understand all steps of the procedures prior to performing each procedure. Knowledge of external test equipment connections and operation is also recommended.

### (2) Test Equipment

Appendix B contains a list of test equipment suitable for performing any procedure contained in this manual. Other equipment meeting specifications listed in Appendix B may be substituted in place of recommended models.

**NOTE:** For certain procedures in this manual, the equipment listed in Appendix B may exceed minimum required specifications.

### (3) Disassembly

No disassembly is required to perform the Calibration and Verification Procedures.

### (4) Environment

For best results, environmental conditions should be identical to the conditions at the normal operating location.

D. Verification

The Verification Procedures are developed for system software 2.0 and higher. If the unit being tested has system software prior to 2.0, the COMM AM Screen references in the verification steps can be performed on the VHF AM and UHF Mode Screens.

Alternate Verification Procedures (para 2-2-3F) are available for selected Test Set modes.

(1) Self Test

**TEST EQUIPMENT:** None

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
1.	Connect Test Set to an appropriate AC power source with the External DC Power Supply. Press POWER Key ON.
2.	Press the SETUP Key to display the Setup Menu.
3.	Press the H/W TOOLS Soft Key to display the Hardware Tools Screen.
4.	Press the DIAGS Soft Key to display the Diagnostics Screen.
5.	Press the SELFTEST Soft Key to display the Self Test Screen.
6.	Press the RUN Soft Key to initiate the Self Test.
	<p><b>NOTE:</b> The Self Test cannot be performed until the Test Set has finished the warm-up cycle. If the user attempts to initiate the Self Test before the Test Set is ready, the following message is displayed:</p> <p style="text-align: center;"><b>Instrument warming up Please wait xx secs</b></p> <p>The message counts down to zero (0) then the Self Test can be initiated.</p>
7.	Verify all tests pass.

(2) RF Accuracy

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE								
1.	Connect the Modulation Analyzer (RF Input) to the ANT Connector.								
2.	Configure the Modulation Analyzer as an RF Counter.								
3.	Press the SETUP Key to display the Setup Menu.								
4.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>PORT</td> <td><b>ANT</b></td> </tr> <tr> <td>GEN FREQ</td> <td><b>PRESET</b></td> </tr> </tbody> </table>	FIELD	SETTING	PORT	<b>ANT</b>	GEN FREQ	<b>PRESET</b>		
FIELD	SETTING								
PORT	<b>ANT</b>								
GEN FREQ	<b>PRESET</b>								
5.	Press the MODE Select Key until the VOR Mode Screen.								
6.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>-20.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>OFF</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.000 MHz</b>	RF LVL	<b>-20.0 dBm</b>	MOD TONE	<b>OFF</b>
FIELD	SETTING								
FREQ	<b>108.000 MHz</b>								
RF LVL	<b>-20.0 dBm</b>								
MOD TONE	<b>OFF</b>								
7.	Verify 108.0 MHz ( $\pm 108$ Hz) on the Modulation Analyzer.								
8.	Press the MODE Select Key until the LOCALIZER Mode Screen.								
9.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.100 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>-20.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>OFF</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.100 MHz</b>	RF LVL	<b>-20.0 dBm</b>	MOD TONE	<b>OFF</b>
FIELD	SETTING								
FREQ	<b>108.100 MHz</b>								
RF LVL	<b>-20.0 dBm</b>								
MOD TONE	<b>OFF</b>								
10.	Verify 108.1 MHz ( $\pm 108.1$ Hz) on the Modulation Analyzer.								
11.	Press the MODE Select Key until the GLIDESLOPE Mode Screen.								
12.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>334.700 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>-20.0 dBm</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>334.700 MHz</b>	RF LVL	<b>-20.0 dBm</b>		
FIELD	SETTING								
FREQ	<b>334.700 MHz</b>								
RF LVL	<b>-20.0 dBm</b>								
13.	Verify 334.7 MHz ( $\pm 334.7$ Hz) on the Modulation Analyzer.								
14.	Press the MODE Select Key until the MARKER BEACON Mode Screen.								
15.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>75.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>-20.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>OFF</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>75.000 MHz</b>	RF LVL	<b>-20.0 dBm</b>	MOD TONE	<b>OFF</b>
FIELD	SETTING								
FREQ	<b>75.000 MHz</b>								
RF LVL	<b>-20.0 dBm</b>								
MOD TONE	<b>OFF</b>								
16.	Verify 75.0 MHz ( $\pm 75$ Hz) on the Modulation Analyzer.								
17.	Press the MODE Select Key until the COMM AM Mode Screen is displayed.								

STEP	PROCEDURE
------	-----------

18. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>118.000 MHz</b>
RF LVL	<b>-20.0 dBm</b>
MOD TONE	<b>OFF</b>

19. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.
20. Verify 118.0 MHz ( $\pm 118$  Hz) on the Modulation Analyzer.
21. Set the FREQ Field to **137.000 MHz**.
22. Verify 137.0 MHz ( $\pm 137$  Hz) on the Modulation Analyzer.
23. Set the FREQ Field to **225.000 MHz**.
24. Verify 225.0 MHz ( $\pm 225$  Hz) on the Modulation Analyzer.
25. Set the FREQ Field to **312.000 MHz**.
26. Verify 312.0 MHz ( $\pm 312$  Hz) on the Modulation Analyzer.
27. Set the FREQ Field to **400.000 MHz**.
28. Verify 400.0 MHz ( $\pm 400$  Hz) on the Modulation Analyzer.
29. Press the SETUP Key to display the Setup Menu.
30. Set the Test Set as follows:

FIELD	SETTING
PORT	<b>ANT</b>
GEN FREQ	<b>VAR</b>

31. Press the MODE Select Key until the SELCAL Mode Screen is displayed.
32. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>118.001 MHz</b>
RF LVL	<b>-20.0 dBm</b>

33. Verify 118.001 MHz ( $\pm 118.001$  Hz) on the Modulation Analyzer.
34. Set the FREQ Field to **118.002 MHz**.
35. Verify 118.002 MHz ( $\pm 118.002$  Hz) on the Modulation Analyzer.
36. Set the FREQ Field to **118.003 MHz**.
37. Verify 118.003 MHz ( $\pm 118.003$  Hz) on the Modulation Analyzer.
38. Set the FREQ Field to **118.004 MHz**.
39. Verify 118.004 MHz ( $\pm 118.004$  Hz) on the Modulation Analyzer.
40. Set the FREQ Field to **10.000 MHz**.
41. Verify 10.000 MHz ( $\pm 10$  Hz) on the Modulation Analyzer.
42. Set the FREQ Field to **30.000 MHz**.
43. Verify 30.000 MHz ( $\pm 30$  Hz) on the Modulation Analyzer.
44. Disconnect the Modulation Analyzer from the ANT Connector.

(3) RF Level Accuracy (ANT Connector)

**TEST EQUIPMENT:** Power Meter  
Power Sensor  
Measuring Receiver

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Power Sensor to the Power Meter (POWER REF Connector) and zero Power Meter.
2. Disconnect the Power Sensor from the Power Meter (POWER REF Connector) and connect the Power Sensor to the ANT Connector.
3. Press the SETUP Key to display the Setup Menu.
4. Set the Test Set as follows:

FIELD	SETTING
PORT	<b>ANT</b>
FREQ	<b>VAR</b>

5. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>10.000 MHz</b>
RF LVL	<b>-30.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

7. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.
8. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
9. Set the FREQ Field to **30.000 MHz**.
10. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
11. Set the FREQ Field to **75.000 MHz**.
12. Set the RF LVL Field to **-16 dBm**.
13. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
14. Set the RF LVL Field to **-30 dBm**.
15. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
16. Set the FREQ Field to **108.000 MHz**.
17. Set the RF LVL Field to **-16 dBm**.
18. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
19. Set the RF LVL Field to **-30 dBm**.
20. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
21. Set the FREQ Field to **108.100 MHz**.
22. Set the RF LVL Field to **-16 dBm**.



STEP	PROCEDURE
------	-----------

---

23. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
24. Set the RF LVL Field to **-30 dBm**.
25. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
26. Set the FREQ Field to **118.000 MHz**.
27. Set the RF LVL Field to **-16 dBm**.
28. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
29. Set the RF LVL Field to **-30 dBm**.
30. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
31. Set the FREQ Field to **137.000 MHz**.
32. Set the RF LVL Field to **-16 dBm**.
33. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
34. Set the RF LVL Field to **-30 dBm**.
35. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
36. Set the FREQ Field to **175.000 MHz**.
37. Set the RF LVL Field to **-16 dBm**.
38. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
39. Set the RF LVL Field to **-30 dBm**.
40. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
41. Set the FREQ Field to **225.000 MHz**.
42. Set the RF LVL Field to **-16 dBm**.
43. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
44. Set the RF LVL Field to **-30 dBm**.
45. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
46. Set the FREQ Field to **334.700 MHz**.
47. Set the RF LVL Field to **-16 dBm**.
48. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
49. Set the RF LVL Field to **-30 dBm**.
50. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
51. Set the FREQ Field to **400.000 MHz**.
52. Set the RF LVL Field to **-16 dBm**.
53. Verify -16 dBm ( $\pm 3$  dB) on the Power Meter.
54. Set the RF LVL Field to **-30 dBm**.
55. Verify -30 dBm ( $\pm 3$  dB) on the Power Meter.
56. Set the FREQ Field to **118.000 MHz**.

STEP

PROCEDURE

---

57. Set the RF LVL Field to the following settings and verify levels on the Power Meter:

RF LVL	LEVEL
<b>-57 dBm</b>	-57 dBm ( $\pm 3$ dB)
<b>-47 dBm</b>	-47 dBm ( $\pm 3$ dB)
<b>-37 dBm</b>	-37 dBm ( $\pm 3$ dB)
<b>-27 dBm</b>	-27 dBm ( $\pm 3$ dB)
<b>-17 dBm</b>	-17 dBm ( $\pm 3$ dB)
<b>-7 dBm</b>	-7 dBm ( $\pm 3$ dB)
<b>+3 dBm</b>	+3 dBm ( $\pm 3$ dB)
<b>+13 dBm</b>	+13 dBm ( $\pm 3$ dB)

58. Set the RF LVL Field to **-67 dBm**.
59. Disconnect the Power Sensor from the ANT Connector and connect the Measuring Receiver to the ANT Connector.
60. Calibrate the Measuring Receiver for 118.000 MHz in Tuned RF Level Mode.
61. Verify -67 dBm ( $\pm 3$  dB) on the Measuring Receiver.
62. Disconnect the Measuring Receiver from the ANT Connector.

(4) RF Level Accuracy (RF I/O Connector)

**TEST EQUIPMENT:** Power Meter  
Power Sensor  
Measuring Receiver

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Power Sensor to the Power Meter (POWER REF Connector) and zero Power Meter.
2. Disconnect the Power Sensor from the Power Meter (POWER REF Connector) and connect the Power Sensor to the RF I/O Connector.
3. Press the SETUP Key to display the Setup Menu.
4. Set the Test Set as follows:

FIELD	SETTING
PORT	<b>RF I/O</b>
FREQ	<b>VAR</b>

5. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>10.000 MHz</b>
RF LVL	<b>-50.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

7. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.
8. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
9. Set the FREQ Field to **30.000 MHz**.
10. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
11. Set the FREQ Field to **75.000 MHz**.
12. Set the RF LVL Field to **-39 dBm**.
13. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
14. Set the RF LVL Field to **-50 dBm**.
15. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
16. Set the FREQ Field to **108.000 MHz**.
17. Set the RF LVL Field to **-39 dBm**.
18. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
19. Set the RF LVL Field to **-50 dBm**.
20. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
21. Set the FREQ Field to **108.100 MHz**.
22. Set the RF LVL Field to **-39 dBm**.

## STEP

## PROCEDURE

- 
23. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  24. Set the RF LVL Field to **-50 dBm**.
  25. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  26. Set the FREQ Field to **118.000 MHz**.
  27. Set the RF LVL Field to **-39 dBm**.
  28. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  29. Set the RF LVL Field to **-50 dBm**.
  30. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  31. Set the FREQ Field to **137.000 MHz**.
  32. Set the RF LVL Field to **-39 dBm**.
  33. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  34. Set the RF LVL Field to **-50 dBm**.
  35. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  36. Set the FREQ Field to **175.000 MHz**.
  37. Set the RF LVL Field to **-39 dBm**.
  38. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  39. Set the RF LVL Field to **-50 dBm**.
  40. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  41. Set the FREQ Field to **225.000 MHz**.
  42. Set the RF LVL Field to **-39 dBm**.
  43. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  44. Set the RF LVL Field to **-50 dBm**.
  45. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  46. Set the FREQ Field to **334.700 MHz**.
  47. Set the RF LVL Field to **-39 dBm**.
  48. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  49. Set the RF LVL Field to **-50 dBm**.
  50. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  51. Set the FREQ Field to **400.000 MHz**.
  52. Set the RF LVL Field to **-39 dBm**.
  53. Verify -39 dBm ( $\pm 2.5$  dB) on the Power Meter.
  54. Set the RF LVL Field to **-50 dBm**.
  55. Verify -50 dBm ( $\pm 2$  dB) on the Power Meter.
  56. Set the FREQ Field to **118.000 MHz**.
  57. Disconnect the Power Sensor from the RF I/O Connector and connect the Measuring Receiver to the RF I/O Connector.
  58. Calibrate the Measuring Receiver for 118.000 MHz in Tuned RF Level Mode with a 3.8 Special entered.

## STEP

## PROCEDURE

59. Set the RF LVL Field to the following settings and verify levels on the Measuring Receiver:

RF LVL	LEVEL
-12 dBm	-12 dBm ( $\pm 2.5$ dB)
-22 dBm	-22 dBm ( $\pm 2.5$ dB)
-32 dBm	-32 dBm ( $\pm 2.5$ dB)
-42 dBm	-42 dBm ( $\pm 2$ dB)
-52 dBm	-52 dBm ( $\pm 2$ dB)
-62 dBm	-62 dBm ( $\pm 2$ dB)
-72 dBm	-72 dBm ( $\pm 2$ dB)
-82 dBm	-82 dBm ( $\pm 2$ dB)
-92 dBm	-92 dBm ( $\pm 2$ dB)
-102 dBm	-102 dBm ( $\pm 3$ dB)
-112 dBm	-112 dBm ( $\pm 3$ dB)
-120 dBm	-120 dBm ( $\pm 3$ dB)

60. Set the FREQ Field to **334.700 MHz**.
61. Calibrate the Measuring Receiver for 334.700 MHz in Tuned RF Level Mode with a 3.8 Special entered.
62. Set the RF LVL Field to the following settings and verify levels on the Measuring Receiver:

RF LVL	LEVEL
-12 dBm	-12 dBm ( $\pm 2.5$ dB)
-22 dBm	-22 dBm ( $\pm 2.5$ dB)
-32 dBm	-32 dBm ( $\pm 2.5$ dB)
-42 dBm	-42 dBm ( $\pm 2$ dB)
-52 dBm	-52 dBm ( $\pm 2$ dB)
-62 dBm	-62 dBm ( $\pm 2$ dB)
-72 dBm	-72 dBm ( $\pm 2$ dB)
-82 dBm	-82 dBm ( $\pm 2$ dB)
-92 dBm	-92 dBm ( $\pm 2$ dB)
-102 dBm	-102 dBm ( $\pm 3$ dB)
-112 dBm	-112 dBm ( $\pm 3$ dB)
-120 dBm	-120 dBm ( $\pm 3$ dB)

63. Disconnect the Measuring Receiver from the RF I/O Connector.

(5) Harmonic and Spurious

**TEST EQUIPMENT:** Spectrum Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Spectrum Analyzer (Input) to the ANT Connector.
2. Press the SETUP Key to display the Setup Menu.
3. Set the PORT Field to **ANT**.
4. Press the MODE Select Key until the VOR Mode Screen is displayed.
5. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>108.000 MHz</b>
RF LVL	<b>0.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

6. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
7. Press the MODE Select Key until the GLIDESLOPE Mode Screen is displayed.
8. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>334.700 MHz</b>
RF LVL	<b>0.0 dBm</b>
M MOD	<b>0%</b>

9. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
10. Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.
11. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>75.000 MHz</b>
RF LVL	<b>0.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

12. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
13. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
14. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>137.000 MHz</b>
RF LVL	<b>0.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

15. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.
16. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.

## STEP

PROCEDURE

---

17. Set the FREQ Field to **400.000 MHz**.
18. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
19. Press the SETUP Key to display the Setup Menu.
20. Set the FREQ Field to **VAR**.
21. Press the SETUP Key to return to the COMM AM Mode Screen.
22. Set the FREQ Field to **10.000 MHz**.
23. Verify the spurious is <-32 dBc.
24. Set the FREQ Field to **30.000 MHz**.
25. Verify the spurious is <-32 dBc.
26. Disconnect the Spectrum Analyzer from the ANT Connector.

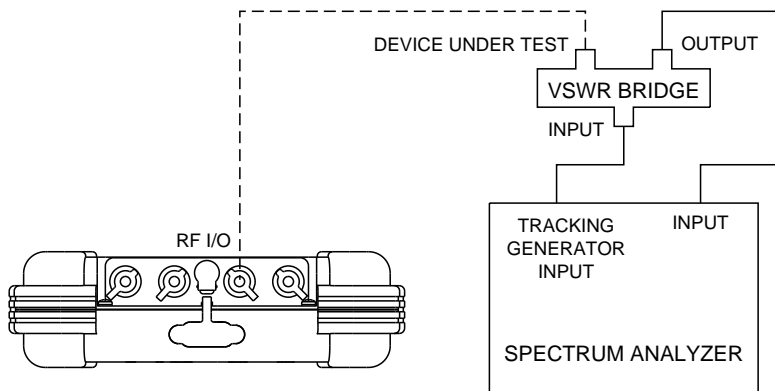
(6) VSWR (RF I/O and SWR Connectors)

**TEST EQUIPMENT:** Spectrum Analyzer  
VSWR Bridge

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect test equipment as shown:



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**RF I/O CONNECTOR**

2. Set the Spectrum Analyzer Tracking Generator Level to 0 dBm.
3. Set the Spectrum Analyzer Tracking Generator Frequency to 75, 225 and 400 MHz and record the levels as reference.
4. Connect VSWR Bridge (Device Under Test Connector) to RF I/O Connector.
5. Set the Spectrum Analyzer Tracking Generator Frequency to 75, 225 and 400 MHz and record the levels.
6. Calculate the return loss for the levels recorded in Steps 3 and 5 and record. (Return Loss = Reference - Reading).
7. Verify VSWR is <1.3 for 75 MHz, <1.3 for 225 MHz and <1.35 for 400 MHz.

$$\Gamma = 10^{(-RL / 20)}$$

$$VSWR = (1 + \Gamma) / (1 - \Gamma)$$

Where  $\Gamma$  = Reflection Coefficient

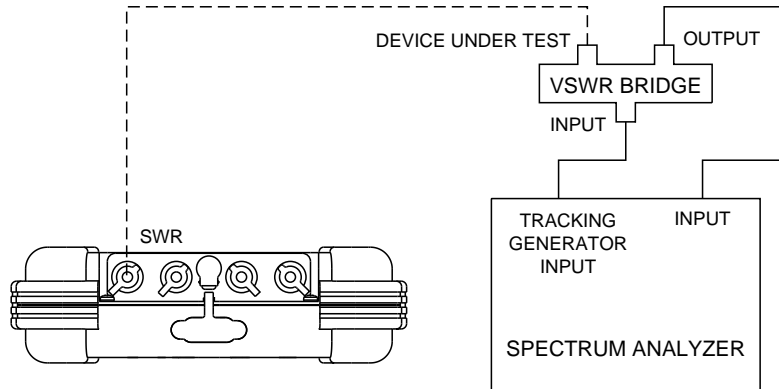
RL = Return Loss

8. Disconnect VSWR Bridge from RF I/O Connector.



## SWR CONNECTOR

9. Connect VSWR Bridge (Device Under Test Connector) to SWR Connector.



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10. Set the Spectrum Analyzer Tracking Generator Frequency to 75, 225 and 400 MHz and record the levels.
11. Calculate the return loss for the levels recorded in Steps 3 and 10 and record. (Return Loss = Reference - Reading).
12. Verify VSWR is <1.3 for 75 MHz, <1.3 for 225 MHz and <1.35 for 400 MHz.

$$\Gamma = 10^{(-RL / 20)}$$

$$VSWR = (1 + \Gamma) / (1 - \Gamma)$$

Where  $\Gamma$  = Reflection Coefficient

RL = Return Loss

13. Disconnect VSWR Bridge from SWR Connector.

(7) Marker Beacon

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE										
1.	Connect the Modulation Analyzer (RF Input) to the ANT Connector.										
2.	Set the Modulation Analyzer to AM Measurement.										
3.	Press the SETUP Key to display the Setup Menu.										
4.	Set the PORT Field to <b>ANT</b> .										
5.	Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.										
6.	Set the Test Set as follows:										
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>75.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>10.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>400 Hz</b></td> </tr> <tr> <td>M MOD</td> <td><b>CAL</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>75.000 MHz</b>	RF LVL	<b>10.0 dBm</b>	MOD TONE	<b>400 Hz</b>	M MOD	<b>CAL</b>
FIELD	SETTING										
FREQ	<b>75.000 MHz</b>										
RF LVL	<b>10.0 dBm</b>										
MOD TONE	<b>400 Hz</b>										
M MOD	<b>CAL</b>										
7.	Verify 400 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and an AM Depth of 95% AM ( $\pm 5\%$ AM) on the Modulation Analyzer.										
8.	Set the MOD TONE Field to <b>1300</b> .										
9.	Verify 1300 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and an AM Depth of 95% AM ( $\pm 5\%$ AM) on the Modulation Analyzer.										
10.	Set the MOD TONE Field to <b>3000</b> .										
11.	Verify 3000 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and an AM Depth of 95% AM ( $\pm 5\%$ AM) on the Modulation Analyzer.										
12.	Disconnect the Modulation Analyzer from the ANT Connector.										

(8) VOR

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

5. Press the MODE Select Key until the VOR Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>108.000 MHz</b>
RF LVL	<b>10.0 dBm</b>
MOD TONE	<b>1020 Hz</b>
M MOD	<b>CAL</b>
30 Hz MOD	<b>0%</b>
9960 Hz MOD	<b>0%</b>

7. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
8. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>OFF</b>
30 Hz MOD	<b>30%</b>

9. Verify 30 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and an AM Depth of 30% AM ( $\pm 1\%$  AM) on the Modulation Analyzer.
10. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	<b>0%</b>
9960 Hz MOD	<b>30%</b>
TONE DEL	<b>REF</b>

11. Verify 9960 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and an AM Depth of 30% AM ( $\pm 1\%$  AM) on the Modulation Analyzer.
12. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	<b>30%</b>
TONE DEL	<b>-</b>

13. Verify AM Depth of 60% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.

**FM DEVIATION ACCURACY**

14. Set the Modulation Analyzer to DEV 9.96K.
15. Verify 480 Hz ( $\pm 25$  Hz) on the Modulation Analyzer.

**BEARING ACCURACY**

16. Set the Modulation Analyzer to Phase Measurement.
17. Press the SETUP Key to display the Setup Menu.
18. Set the VOR BRG Field to **FIXED**.
19. Press the MODE Select Key until the VOR Mode Screen is displayed.
20. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	<b>30%</b>
9960 Hz MOD	<b>30%</b>
TO/FROM	<b>TO</b>

21. Set the BRG Field to the following settings and verify readings on the Modulation Analyzer:

BRG	READING
<b>30</b>	210° ( $\pm 0.1^\circ$ )
<b>90</b>	270° ( $\pm 0.1^\circ$ )
<b>150</b>	330° ( $\pm 0.1^\circ$ )
<b>210</b>	30° ( $\pm 0.1^\circ$ )
<b>270</b>	90° ( $\pm 0.1^\circ$ )
<b>330</b>	150° ( $\pm 0.1^\circ$ )

22. Set the TO/FROM Field to **FROM**.
23. Set the BRG Field to the following settings and verify readings on the Modulation Analyzer:

BRG	READING
<b>30</b>	30° ( $\pm 0.1^\circ$ )
<b>90</b>	90° ( $\pm 0.1^\circ$ )
<b>150</b>	150° ( $\pm 0.1^\circ$ )
<b>210</b>	210° ( $\pm 0.1^\circ$ )
<b>270</b>	270° ( $\pm 0.1^\circ$ )
<b>330</b>	330° ( $\pm 0.1^\circ$ )

24. Press the SETUP Key to display the Setup Menu.
25. Set the VOR BRG Field to **VAR**.
26. Press the MODE Select Key until the VOR Mode Screen is displayed.

## STEP

PROCEDURE

---

27. Set the BRG Field to the following settings and verify readings on the Modulation Analyzer:

<b>BRG</b>	<b>READING</b>
<b>1</b>	1° ( $\pm 0.1^\circ$ )
<b>2</b>	2° ( $\pm 0.1^\circ$ )
<b>10.1</b>	10.1° ( $\pm 0.1^\circ$ )
<b>10.2</b>	10.2° ( $\pm 0.1^\circ$ )

28. Disconnect the Modulation Analyzer from the ANT Connector.

(9) Localizer

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

5. Press the MODE Select Key until the LOCALIZER Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>108.100 MHz</b>
RF LVL	<b>10.0 dBm</b>
MOD TONE	<b>1020 Hz</b>
M MOD	<b>CAL</b>
DEV STEP	<b>FIXED</b>
LOC DDM	<b>0.000 CENTER</b>
TONE DEL	<b>90 &amp; 150</b>

7. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
8. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>OFF</b>
TONE DEL	<b>150</b>

9. Verify 90 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
10. Set the TONE DEL Field to **90**.
11. Verify 150 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.

**DDM ACCURACY**

12. Set the Modulation Analyzer to DDM.
13. Set the Test Set as follows:

FIELD	SETTING
TONE DEL	<b>OFF</b>
90/150 Hz	<b>OFF</b>

## STEP

## PROCEDURE

14. Set the LOC DDM Field to the following settings and verify readings on the Modulation Analyzer:

LOC DDM	READING
<b>0.000 CENTER</b>	0.000 ( $\pm 0.0015$ DDM)
<b>0.093 LEFT</b>	0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.093 RIGHT</b>	0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.155 LEFT</b>	0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.155 RIGHT</b>	0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.200 LEFT</b>	0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.200 RIGHT</b>	0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)

15. Set the DEV STEP Field to **VAR**.
16. Set the LOC DDM Field to the following settings and verify readings on the Modulation Analyzer:

LOC DDM	READING
<b>0.094</b>	0.094 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.095</b>	0.095 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.096</b>	0.096 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.097</b>	0.097 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)

17. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	<b>FIXED</b>
LOC DDM	<b>0.000 CENTER</b>

**PHASE ACCURACY**

18. Set the 90/150 Hz Field to the following settings and verify readings on the Modulation Analyzer:

90/150 Hz	READING
<b>0</b>	0° ( $\pm 0.5^\circ$ )
<b>5</b>	-5° ( $\pm 0.5^\circ$ )
<b>10</b>	-10° ( $\pm 0.5^\circ$ )
<b>20</b>	-20° ( $\pm 0.5^\circ$ )
<b>40</b>	-40° ( $\pm 0.5^\circ$ )
<b>80</b>	40° ( $\pm 0.5^\circ$ )
<b>120</b>	0° ( $\pm 0.5^\circ$ )

19. Set the 90/150 Hz Field to **0**.
20. Disconnect the Modulation Analyzer from the ANT Connector.

(10) Glideslope

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

5. Press the MODE Select Key until the GLIDESLOPE Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>334.700 MHz</b>
RF LVL	<b>10.0 dBm</b>
M MOD	<b>CAL</b>
DEV STEP	<b>FIXED</b>
90/150 Hz	<b>OFF</b>
TONE DEL	<b>150</b>

7. Verify 90 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 40% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
8. Set the TONE DEL Field to **90**.
9. Verify 150 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 40% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.

**DDM ACCURACY**

10. Set the Modulation Analyzer to DDM.
11. Set the TONE DEL Field to **OFF**.
12. Set the G/S DDM Field to the following settings and verify readings on the Modulation Analyzer:

LOC DDM	READING
<b>0.000 CENTER</b>	0.000 ( $\pm 0.003$ DDM)
<b>0.091 UP</b>	0.091 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)
<b>0.091 DOWN</b>	0.091 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)
<b>0.175 UP</b>	0.175 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)
<b>0.175 DOWN</b>	0.175 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)
<b>0.400 UP</b>	0.400 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)
<b>0.400 DOWN</b>	0.400 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)

13. Set the DEV STEP Field to **VAR**.



## STEP

## PROCEDURE

14. Set the G/S DDM Field to the following settings and verify readings on the Modulation Analyzer:

G/S DDM	READING
<b>0.176</b>	0.176 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)
<b>0.177</b>	0.177 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)
<b>0.178</b>	0.178 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)
<b>0.179</b>	0.179 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)

15. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	<b>FIXED</b>
G/S DDM	<b>0.000 CENTER</b>

**PHASE ACCURACY**

16. Set the 90/150 Hz Field to the following settings and verify readings on the Modulation Analyzer:

90/150 Hz	READING
<b>0</b>	0° ( $\pm 0.5^\circ$ )
<b>5</b>	-5° ( $\pm 0.5^\circ$ )
<b>10</b>	-10° ( $\pm 0.5^\circ$ )
<b>20</b>	-20° ( $\pm 0.5^\circ$ )
<b>40</b>	-40° ( $\pm 0.5^\circ$ )
<b>80</b>	40° ( $\pm 0.5^\circ$ )
<b>120</b>	0° ( $\pm 0.5^\circ$ )

17. Set the 90/150 Hz Field to **0**.
18. Disconnect the Modulation Analyzer from the ANT Connector.

(11) ILS

**TEST EQUIPMENT:** Modulation Analyzer  
Measuring Receiver  
10 dB Pad (Inline)

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) and 10 dB Pad to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.

**MARKER BEACON**

5. Press the MODE Select Key until the ILS Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>108.100 MHz</b>
RF LVL	<b>-30.0 dBm</b>
MOD TONE	<b>400 Hz (Marker ON)</b>
M MOD	<b>CAL</b>

7. Verify 75 MHz ( $\pm 75$  Hz) and tone frequency of 400 Hz ( $\pm 0.02\%$ ) with  $< 5\%$  distortion and an AM Depth of 95% AM ( $\pm 5\%$  AM) on the Modulation Analyzer.
8. Set the MOD TONE Field to **1300 Hz**.
9. Verify 1300 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and an AM Depth of 95% AM ( $\pm 3.75\%$  AM) on the Modulation Analyzer.
10. Set the MOD TONE Field to **3000 Hz**.
11. Verify 3000 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and an AM Depth of 95% AM ( $\pm 3.75\%$  AM) on the Modulation Analyzer.

**LOCALIZER**

12. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>1020 Hz</b>
TONE DEL	<b>90 &amp; 150</b>

13. Verify 108.100 MHz ( $\pm 108.100$  Hz) and tone frequency of 1020 Hz ( $\pm 0.02\%$ ) at -10 dBm ( $\pm 2.5$  dB) with  $< 2.5\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.

14. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>OFF</b>
TONE DEL	<b>150</b>

## STEP PROCEDURE

15. Verify 90 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
16. Set the TONE DEL Field to **90**.
17. Verify 150 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
18. Set the Modulation Analyzer to DDM.
19. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	<b>FIXED</b>
TONE DEL	<b>OFF</b>
90/150 Hz	<b>OFF</b>

20. Set the LOC DDM Field to the following settings and verify readings on the Modulation Analyzer:

LOC DDM	READING
<b>0.000 CENTER</b>	0.000 ( $\pm 0.0015$ DDM)
<b>0.093 LEFT</b>	0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.093 RIGHT</b>	0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.155 LEFT</b>	0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.155 RIGHT</b>	0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.200 LEFT</b>	0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)
<b>0.200 RIGHT</b>	0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)

21. Set the DEV STEP Field to **VAR**.
22. Set the LOC DDM Field to the following settings and verify readings on the Modulation Analyzer:

LOC DDM	READING
<b>0.094</b>	0.094 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.095</b>	0.095 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.096</b>	0.096 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)
<b>0.097</b>	0.097 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)

23. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	<b>FIXED</b>
LOC DDM	<b>0.000 CENTER</b>

**PHASE ACCURACY**

24. Set the 90/150 Hz Field to the following settings and verify readings on the Modulation Analyzer:

90/150 Hz	READING
0	0° ( $\pm 0.5^\circ$ )
5	-5° ( $\pm 0.5^\circ$ )
10	-10° ( $\pm 0.5^\circ$ )
20	-20° ( $\pm 0.5^\circ$ )
40	-40° ( $\pm 0.5^\circ$ )
80	40° ( $\pm 0.5^\circ$ )
120	0° ( $\pm 0.5^\circ$ )

25. Set the 90/150 Hz Field to **0**.

**GLIDESLOPE**

26. Disconnect the Modulation Analyzer and 10 dB Pad from the ANT Connector and connect the Measuring Receiver to the ANT Connector.
27. Calibrate the Measuring Receiver for 334.700 MHz in Tuned RF Level Mode.
28. Set the RF LVL Field to **-30 dBm**.
29. Verify -30 dBm ( $\pm 3$  dB) on the Measuring Receiver.
30. Set the RF LVL Field to **-10 dBm**.
31. Verify -10 dBm ( $\pm 3$  dB) on the Measuring Receiver.
32. Disconnect the Measuring Receiver from the ANT Connector.

(12) COMM AM

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.
5. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>137.000 MHz</b>
RF LVL	<b>10.0 dBm</b>
MOD TONE	<b>1020 Hz</b>
M MOD	<b>CAL</b>

7. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.
8. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
9. Set the FREQ Field to **312.000 MHz**.
10. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Modulation Analyzer.
11. Disconnect the Modulation Analyzer from the ANT Connector.

(13) COMM FM

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to FM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.
5. Press the MODE Select Key until the COMM FM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>156.000 MHz</b>
RF LVL	<b>10.0 dBm</b>
MOD TONE	<b>1000 Hz</b>
M MOD	<b>CAL</b>
M DEV	<b>CAL: 5 kHz</b>

7. If the COMM FM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM FM Mode Screen to GENERATING Mode.
8. Verify 1000 Hz ( $\pm 0.02\%$ ) with  $<5\%$  distortion and a FM Deviation of 5 kHz ( $\pm 500$  Hz) on the Modulation Analyzer.
9. Disconnect the Modulation Analyzer from the ANT Connector.

(14) SELCOM

**TEST EQUIPMENT:** Modulation Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Modulation Analyzer (RF Input) to the ANT Connector.
2. Set the Modulation Analyzer to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.
5. Press the MODE Select Key until the SELCAL Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>118.000 MHz</b>
RF LVL	<b>10.0 dBm</b>
SELCAL TONE	<b>AA-AA</b>
M MOD	<b>CAL(80%)</b>
TX MODE	<b>CONTINUOUS</b>

7. Press the START Soft Key
8. Verify 312.6 Hz ( $\pm 0.02\%$ ) Audio tone frequency and an AM Depth of 80% AM ( $\pm 4\%$  AM) on the Modulation Analyzer.
9. Set the SELCAL TONE Field to **SS-SS**.
10. Verify 1479.1 Hz ( $\pm 0.02\%$ ) Audio tone frequency and an AM Depth of 80% AM ( $\pm 4\%$  AM) on the Modulation Analyzer.
11. Disconnect the Modulation Analyzer from the ANT Connector.

(15) Frequency Counter

**TEST EQUIPMENT:** RF Signal Generator  
Function Generator

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Press the SETUP Key to display the Setup Menu.
2. Set the PORT Field to **ANT**.
3. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
4. If the COMM AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to RECEIVING Mode.
5. Connect the RF Signal Generator (Output) to the ANT Connector.
6. Set the RF Signal Generator to -35 dBm.
7. Set the RF Signal Generator to the following settings and verify readings on the Test Set:

FREQUENCY	READING
10 MHz	10 MHz ( $\pm 10$ Hz + $\pm 1$ count)
10.001 MHz	10.001 MHz ( $\pm 10.001$ Hz + $\pm 1$ count)
100.101 MHz	100.101 MHz ( $\pm 100.101$ Hz + $\pm 1$ count)
399.999 MHz	399.999 MHz ( $\pm 399.999$ Hz + $\pm 1$ count)

8. Press the SETUP Key to display the Setup Menu.
9. Set the PORT Field to **RF I/O**.
10. Press the MODE Select Key until the COMM FM Mode Screen is displayed.
11. Disconnect the RF Signal Generator from the ANT Connector and connect the RF Signal Generator (Output) to the RF I/O Connector.
12. Set the RF Signal Generator to 0 dBm.
13. Set the RF Signal Generator to the following settings and verify readings on the Test Set:

FREQUENCY	READING
10 MHz	10 MHz ( $\pm 10$ Hz + $\pm 1$ count)
10.001 MHz	10.001 MHz ( $\pm 10.001$ Hz + $\pm 1$ count)
100.101 MHz	100.101 MHz ( $\pm 100.101$ Hz + $\pm 1$ count)
399.999 MHz	399.999 MHz ( $\pm 399.999$ Hz + $\pm 1$ count)

14. Press the MODE Key until the FREQUENCY COUNTER Mode Screen is displayed.
15. Set the RESOLUTION Field to **1 Hz**.
16. Connect the Function Generator (Output) to the AUX I/O Connector.



STEP PROCEDURE

---

17. Set the Function Generator as follows:

CONTROL	SETTING
Level	1 Vp-p
Frequency	1 MHz Sinewave
Output Impedance	50 $\Omega$

18. Verify 1 MHz ( $\pm 1$  Hz +  $\pm 1$  count) on the Test Set.
19. Set Function Generator Frequency to 1.00001 MHz.
20. Verify 1.00001 MHz ( $\pm 1.00001$  Hz +  $\pm 1$  count) on the Test Set.
21. Set Function Generator Frequency to 3.00000 MHz.
22. Verify 3.00000 MHz ( $\pm 3.00000$  Hz +  $\pm 1$  count) on the Test Set.
23. Set Function Generator Frequency to 5.10001 MHz.
24. Verify 5.10001 MHz ( $\pm 5.10001$  Hz +  $\pm 1$  count) on the Test Set.
25. Set Function Generator Frequency to 9.99999 MHz.
26. Verify 9.99999 MHz ( $\pm 9.99999$  Hz +  $\pm 1$  count) on the Test Set.
27. Disconnect the Function Generator from the AUX I/O Connector.
28. Disconnect the RF Signal Generator from the RF I/O Connector.

(16) AM Meter

**TEST EQUIPMENT:** RF Signal Generator  
Measuring Receiver  
Power Sensor

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Power Sensor to the RF Signal Generator (Output).
2. Set the RF Signal Generator Frequency to 400 MHz.
3. Set the RF Signal Generator Level and AM Depth as follows and record the AM readings:

LEVEL	AM DEPTH	AM READINGS
-20 dBm	10%	Record as X1
-20 dBm	50%	Record as X2
-20 dBm	90%	Record as X3
-10 dBm	10%	Record as X4
-10 dBm	50%	Record as X5
-10 dBm	90%	Record as X6

4. Press the SETUP Key to display the Setup Menu.
5. Set the PORT Field to **ANT**.
6. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
7. If the COMM AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to RECEIVING Mode.
8. Disconnect the Power Sensor from the RF Signal Generator and connect the RF Signal Generator (Output) to the ANT Connector.
9. Set the RF Signal Generator Level and AM Depth as follows and verify the AM readings:

LEVEL	AM DEPTH	AM READINGS
-20 dBm	10%	$(X1 \div 1.1) < \text{Reading} < (X1 \div 0.9)$
-20 dBm	50%	$(X2 \div 1.1) < \text{Reading} < (X2 \div 0.9)$
-20 dBm	90%	$(X3 \div 1.1) < \text{Reading} < (X3 \div 0.9)$
-10 dBm	10%	$(X4 \div 1.1) < \text{Reading} < (X4 \div 0.9)$
-10 dBm	50%	$(X5 \div 1.1) < \text{Reading} < (X5 \div 0.9)$
-10 dBm	90%	$(X6 \div 1.1) < \text{Reading} < (X6 \div 0.9)$

10. Disconnect the RF Signal Generator from the ANT Connector.

## (17) FM Meter

**TEST EQUIPMENT:** RF Signal Generator  
 Measuring Receiver  
 Power Sensor

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Power Sensor to the RF Signal Generator (Output).
2. Set the RF Signal Generator as follows:

CONTROL	SETTING
Frequency	165 MHz
Level	-20 dBm

3. Set the RF Signal Generator Tone and FM Deviation as follows and record the FM readings:

TONE	FM DEVIATION	FM READINGS
400 Hz	15 kHz	Record as X1
400 Hz	10 kHz	Record as X2
400 Hz	1 kHz	Record as X3
1000 Hz	15 kHz	Record as X4
1000 Hz	10 kHz	Record as X5
1000 Hz	1 kHz	Record as X6

4. Press the SETUP Key to display the Setup Menu.
5. Set the PORT Field to **ANT**.
6. Press the MODE Select Key until the COMM FM Mode Screen is displayed.
7. Set the FREQ Field to **165.000 MHz**.
8. Disconnect the Power Sensor from the RF Signal Generator and connect the RF Signal Generator (Output) to the ANT Connector.
9. Set the RF Signal Generator Tone and FM Deviation as follows and verify the FM readings:

TONE	FM DEVIATION	FM READINGS
400 Hz	15 kHz	$[(X1 - 0.4) \div 1.08] < \text{Reading} < [(X1 + 0.4) \div 0.92]$
400 Hz	10 kHz	$[(X2 - 0.4) \div 1.08] < \text{Reading} < [(X2 + 0.4) \div 0.92]$
400 Hz	1 kHz	$[(X3 - 0.4) \div 1.08] < \text{Reading} < [(X3 + 0.4) \div 0.92]$
1000 Hz	15 kHz	$[(X4 - 0.4) \div 1.08] < \text{Reading} < [(X4 + 0.4) \div 0.92]$
1000 Hz	10 kHz	$[(X5 - 0.4) \div 1.08] < \text{Reading} < [(X5 + 0.4) \div 0.92]$
1000 Hz	1 kHz	$[(X6 - 0.4) \div 1.08] < \text{Reading} < [(X6 + 0.4) \div 0.92]$

10. Press the SETUP Key to display the Setup Menu.
11. Set the PORT Field to **RF I/O**.
12. Set the RF Signal Generator Level to 0 dBm.

## STEP

## PROCEDURE

13. Disconnect the RF Signal Generator from the ANT Connector and connect the RF Signal Generator (Output) to the RF I/O Connector.
14. Set the RF Signal Generator Tone and FM Deviation as follows and verify the FM readings:

TONE	FM DEVIATION	FM READINGS
1000 Hz	15 kHz	$[(X4 - 0.4) \div 1.08] < \text{Reading} < [(X4 + 0.4) \div 0.92]$
1000 Hz	10 kHz	$[(X5 - 0.4) \div 1.08] < \text{Reading} < [(X5 + 0.4) \div 0.92]$
1000 Hz	1 kHz	$[(X6 - 0.4) \div 1.08] < \text{Reading} < [(X6 + 0.4) \div 0.92]$

15. Disconnect the RF Signal Generator from the RF I/O Connector.

## (18) SWR Meter

**TEST EQUIPMENT:** 50  $\Omega$  Load  
 75  $\Omega$  Load  
 100  $\Omega$  Load  
 150  $\Omega$  Load

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Press the SETUP Key to display the Setup Menu.
2. Set the GEN FREQ Field to **VAR**.
3. Press the MODE Select Key until the SWR Mode Screen is displayed.
4. Connect the 50  $\Omega$  Load to the SWR Connector.
5. Set the FREQ Field as follows and verify readings on the Test Set:

FREQ	READINGS
75	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)
137	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)
225	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)
312	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)
400	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)

6. Disconnect the 50  $\Omega$  Load from the SWR Connector and connect the 75  $\Omega$  Load to the SWR Connector.
7. Set the FREQ Field as follows and verify readings on the Test Set:

FREQ	READINGS
75	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)
137	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)
225	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)
312	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)
400	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)

8. Disconnect the 75  $\Omega$  Load from the SWR Connector and connect the 100  $\Omega$  Load to the SWR Connector.
9. Set the FREQ Field as follows and verify readings on the Test Set:

FREQ	READINGS
75	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)
137	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)
225	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)
312	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)
400	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)

10. Disconnect the 100  $\Omega$  Load from the SWR Connector and connect the 150  $\Omega$  Load to the SWR Connector.

## STEP

PROCEDURE

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11. Set the FREQ Field as follows and verify readings on the Test Set:

<b>FREQ</b>	<b>READINGS</b>
75	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)
137	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)
225	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)
312	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)
400	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)

12. Disconnect the 150  $\Omega$  Load from the SWR Connector.

(19) Power Meter

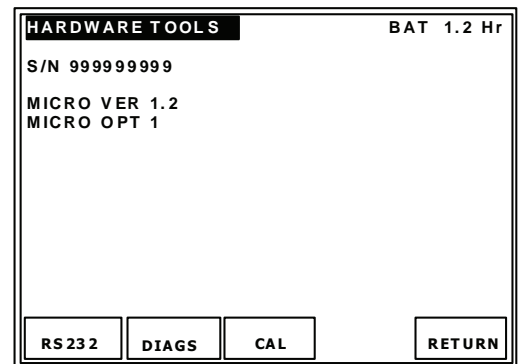
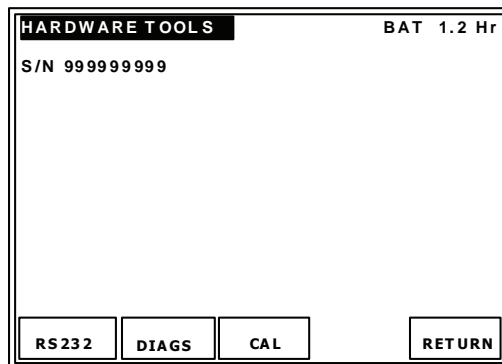
**TEST EQUIPMENT:**

- RF Signal Generator
- RF Power Amplifier
- Power Meter
- Directional Coupler
- 3 dB Attenuator
- 20 dB Attenuator
- 15 MHz Low-Pass Filter
- 45 MHz Low-Pass Filter
- 150 MHz Low-Pass Filter
- 450 MHz Low-Pass Filter

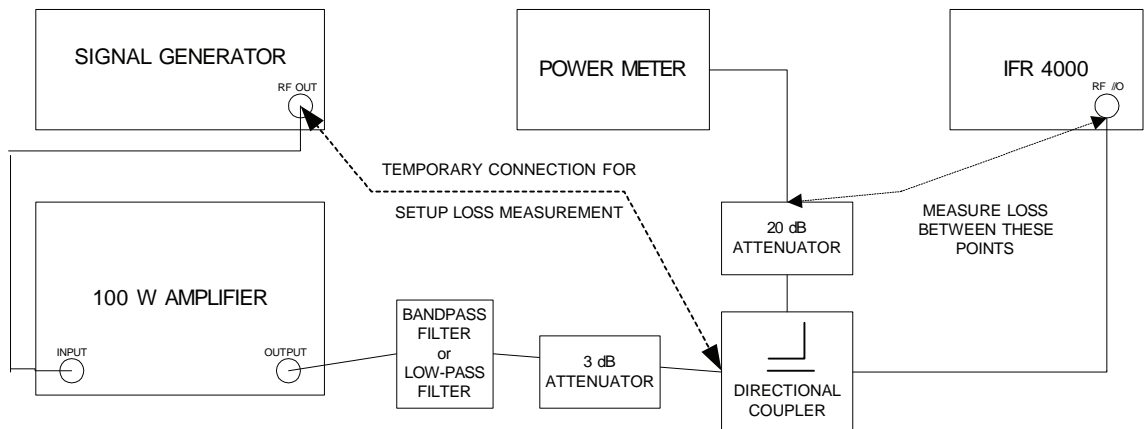
**VERIFICATION FAILURE:**

If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

1. Press the SETUP Key to display the Setup Menu.
2. Set the PORT Field to **RF I/O**.
3. Press the H/W TOOLS Soft Key to display the Hardware Tools Screen:



4. If "MICRO VER 1.2 and MICRO OPT 1" are displayed on the Hardware Tools Screen, perform Steps 26 through 47; otherwise, perform Steps 6 through 25.
5. Press the RETURN Soft Key to display the Setup Menu.
6. Connect test equipment as shown.



STEP PROCEDURE

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7. Characterize and record the offset of the Power Meter Setup:
  - Measure the loss (at 10, 30, 100 and 300 MHz) between the Signal Generator and the 20 dB attenuator on the coupled port of the directional coupler. Record as A.
  - Measure the loss (at 10, 30, 100 and 300 MHz) between the Signal Generator and the end of the coaxial cable going to the RF I/O Connector. Record as B.
  - Calculate the offset at each frequency by subtracting Loss (B) from Loss (A) and record.
8. Press the SETUP Key to display the Setup Menu.
9. Set the PORT Field to **RF I/O**.
10. Press the MODE Select Key until the COMM AM Mode Screen is displayed.
11. If the COMM AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to RECEIVING Mode.
12. Connect the 15 MHz Low-Pass filter into the test setup.
13. Set the Power Meter to measure Watts and the frequency to 10 MHz.
14. Set the Power Meter offset for 10 MHz calculated in Step 7.
15. Set the RF Signal Generator Frequency to 10 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

**CAUTION:** USE CAUTION WHEN PERFORMING THE >10 W TESTS AS THE TEST SET IS NOT RATED FOR CONTINUOUS INPUT AT THESE LEVELS. COMPLETE THESE STEPS AS QUICKLY AS POSSIBLE, AND REDUCE THE INPUT POWER AS SOON AS POSSIBLE. (INPUT POWER MAY NEED TO BE REDUCED BETWEEN HIGHER LEVEL SETTINGS TO ALLOW THE POWER TERMINATION TO COOL.)

FREQUENCY	POWER	READING
10 MHz	0.1 W	0.1 W (±12% of reading + ±1 count)
10 MHz	1.0 W	1.0 W (±12% of reading + ±1 count)
10 MHz	5.0 W	5.0 W (±12% of reading + ±1 count)
10 MHz	10.0 W	10.0 W (±12% of reading + ±1 count)
10 MHz	20.0 W	20.0 W (±12% of reading + ±1 count)
10 MHz	25.0 W	25.0 W (±12% of reading + ±1 count)

16. Remove the 15 MHz Low-Pass filter and connect the 45 MHz Low-Pass filter into the test setup.
17. Set the Power Meter frequency to 30 MHz and the offset to 30 MHz (calculated in Step 7) into the Power Meter.



## STEP

## PROCEDURE

18. Set the RF Signal Generator Frequency to 30 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
30 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)

19. Remove the 45 MHz Low-Pass filter and connect the 150 MHz Low-Pass filter into the test setup.
20. Set the Power Meter frequency to 100 MHz and the offset to 100 MHz (calculated in Step 7) into the Power Meter.
21. Set the RF Signal Generator Frequency to 100 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
100 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)

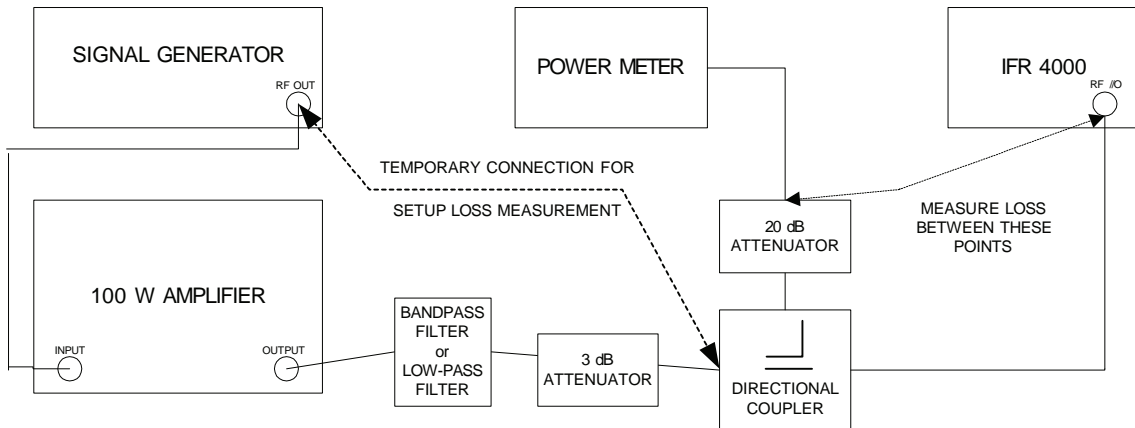
22. Remove the 150 MHz Low-Pass filter and connect the 450 MHz Low-Pass filter into the test setup.
23. Set the Power Meter frequency to 300 MHz and the offset to 300 MHz (calculated in Step 7) into the Power Meter.
24. Set the RF Signal Generator Frequency to 300 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
300 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)

25. Disconnect the RF Signal Generator and the RF Power Amplifier from the RF I/O Connector. Procedure is completed.

STEP PROCEDURE

26. Connect test equipment as shown.



27. Characterize and record the offset of the Power Meter Setup:

- Measure the loss (at 10, 30, 100, 300 and 400 MHz) between the Signal Generator and the 20 dB attenuator on the coupled port of the directional coupler. Record as A.
- Measure the loss (at 10, 30, 100, 300 and 400 MHz) between the Signal Generator and the end of the coaxial cable going to the RF I/O Connector. Record as B.
- Calculate the offset at each frequency by subtracting Loss (B) from Loss (A) and record.

28. Press the SETUP Key to display the Setup Menu.

29. Set the PORT Field to **RF I/O**.

30. Press the MODE Select Key until the COMM AM Mode Screen is displayed.

31. If the COMM AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to RECEIVING Mode.

32. Connect the 15 MHz Low-Pass filter into the test setup.

33. Set the Power Meter to measure Watts and the frequency to 10 MHz.

34. Set the Power Meter offset for 10 MHz calculated in Step 26.

STEP

PROCEDURE

35. Set the RF Signal Generator Frequency to 10 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

**CAUTION:** USE CAUTION WHEN PERFORMING THE >10 W TESTS AS THE TEST SET IS NOT RATED FOR CONTINUOUS INPUT AT THESE LEVELS. COMPLETE THESE STEPS AS QUICKLY AS POSSIBLE, AND REDUCE THE INPUT POWER AS SOON AS POSSIBLE. (INPUT POWER MAY NEED TO BE REDUCED BETWEEN HIGHER LEVEL SETTINGS TO ALLOW THE POWER TERMINATION TO COOL.)

FREQUENCY	POWER	READING
10 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)
10 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
10 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
10 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
10 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
10 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)

36. Remove the 15 MHz Low-Pass filter and connect the 45 MHz Low-Pass filter into the test setup.
37. Set the Power Meter frequency to 30 MHz and the offset to 30 MHz (calculated in Step 26) into the Power Meter.
38. Set the RF Signal Generator Frequency to 30 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
30 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)
30 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)

39. Remove the 45 MHz Low-Pass filter and connect the 150 MHz Low-Pass filter into the test setup.
40. Set the Power Meter frequency to 100 MHz and the offset to 100 MHz (calculated in Step 26) into the Power Meter.
41. Set the RF Signal Generator Frequency to 100 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
100 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
100 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)

42. Remove the 150 MHz Low-Pass filter and connect the 450 MHz Low-Pass filter into the test setup.

STEP

PROCEDURE

- 43. Set the Power Meter frequency to 300 MHz and the offset to 300 MHz (calculated in Step 26) into the Power Meter.
- 44. Set the RF Signal Generator Frequency to 300 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
300 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
300 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)

- 45. Set the Power Meter frequency to 400 MHz and the offset to 400 MHz (calculated in Step 26) into the Power Meter.
- 46. Set the RF Signal Generator Frequency to 400 MHz and the RF Power Amplifier Level to the following settings and verify the readings on the Test Set:

FREQUENCY	POWER	READING
400 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)
400 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
400 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
400 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
400 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)
400 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)

- 47. Disconnect the RF Signal Generator and the RF Power Amplifier from the RF I/O Connector.

(20) AM Audio – AUX Connector

**TEST EQUIPMENT:** RF Signal Generator  
Audio Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE												
1.	Press the SETUP Key to display the Setup Menu.												
2.	Set the Test Set as follows:												
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>PORT</td> <td><b>ANT</b></td> </tr> <tr> <td>AUDIO</td> <td><b>ON</b></td> </tr> </tbody> </table>	FIELD	SETTING	PORT	<b>ANT</b>	AUDIO	<b>ON</b>						
FIELD	SETTING												
PORT	<b>ANT</b>												
AUDIO	<b>ON</b>												
3.	Press the MODE Select Key until the COMM AM Mode Screen is displayed.												
4.	Set the FREQ Field to <b>156.000 MHz</b> .												
5.	If the COMM AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to RECEIVING Mode.												
6.	Connect the RF Signal Generator (Output) to the ANT Connector.												
7.	Set the RF Signal Generator as follows:												
	<table border="1"> <thead> <tr> <th>CONTROL</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>Frequency</td> <td>156 MHz</td> </tr> <tr> <td>Level</td> <td>0 dBm</td> </tr> <tr> <td>Modulation</td> <td>AM</td> </tr> <tr> <td>% Modulation</td> <td>80%</td> </tr> <tr> <td>Modulation Rate</td> <td>1 kHz</td> </tr> </tbody> </table>	CONTROL	SETTING	Frequency	156 MHz	Level	0 dBm	Modulation	AM	% Modulation	80%	Modulation Rate	1 kHz
CONTROL	SETTING												
Frequency	156 MHz												
Level	0 dBm												
Modulation	AM												
% Modulation	80%												
Modulation Rate	1 kHz												
8.	Connect the Audio Analyzer (High Z Input) to the AUX I/O Connector.												
9.	Verify the signal level is >0.75 Vrms.												
10.	Disconnect the Audio Analyzer from the AUX I/O Connector.												
11.	Disconnect the RF Signal Generator from the ANT Connector.												

(21) 121.5/243.0 MHz Beacon

**TEST EQUIPMENT:** RF Signal Generator  
Arbitrary Waveform Generator

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Press the SETUP Key to display the Setup Menu.
2. Set the PORT Field to **ANT**.
3. Press the MODE Select Key until the 121.5/243.0 Beacon Mode Screen is displayed.
4. Set the FREQ Field to **121.500 MHz**.
5. Set the Arbitrary Waveform Generator as follows:

CONTROL	SETTING
Output Z	Max (10 kΩ)
Function Shape	Square Wave
Hi Voltage	5 V
Low Voltage	0 V
Duty Cycle	33%
Sweep State	On
Start Frequency	1600 Hz
Stop Frequency	300 Hz
Sweep Time	33.3 ms
Sweep Type	Linear

6. Connect the ARB output to the RF Signal Generator pulse input. Enable ARB Output.
7. Connect the RF Signal Generator (Output) to the ANT Connector.
8. Set the RF Signal Generator as follows:

CONTROL	SETTING
Frequency	121.5 MHz
Level	-30 dBm
Modulation	Pulse

9. Verify the Test Set displays the following:

Frequency:	121.5 MHz (±121 Hz)
AM Depth:	>95%
Beacon Start Frequency:	1600 Hz (±128 Hz)
Beacon Stop Frequency:	300 Hz (±24 Hz)

10. Set the RF Signal Generator Frequency to 243.0 MHz.

11. Set the UUT FREQ Field to **243.000 MHz**.

12. Verify the Test Set displays the following:

Frequency:	243.0 MHz (±243 Hz)
AM Depth:	>95%
Beacon Start Frequency:	1600 Hz (±128 Hz)
Beacon Stop Frequency:	300 Hz (±24 Hz)

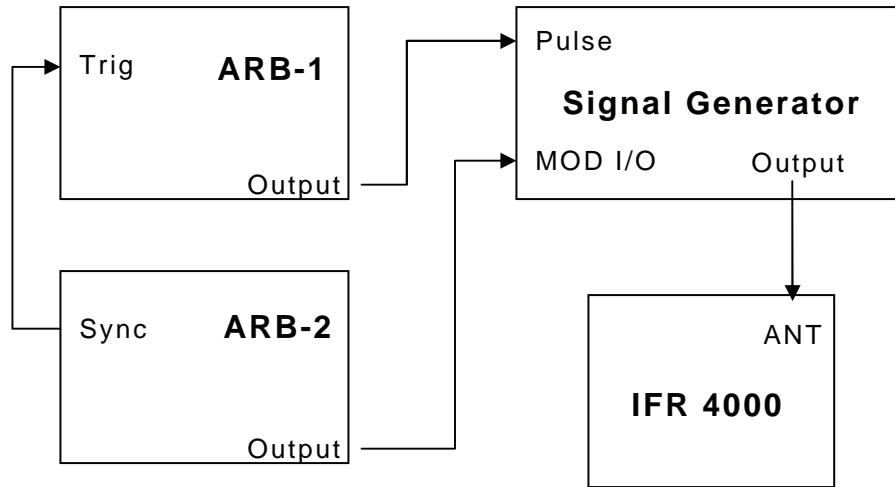
(22) 406 MHz Beacon

**TEST EQUIPMENT:** RF Signal Generator  
Arbitrary Waveform Generator (2)  
PC with Intuilink Software

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect test equipment as shown:



2. Set Arbitrary Waveform Generator 1 (ARB-1) as follows:

CONTROL	SETTING
Function	Pulse
Period	5 Sec.
Hi Level	5.0 V
LO Level	0.0 V
Width	521 ms
Output Load	High Z
Burst	ON
Burst Mode	Gated
Output	Enabled

3. Load Arbitrary Waveform Generator 2 (ARB-2) with Waveform (waveform.csv) from IFR 4000 Maintenance Manual CD using Intuilink Software.

4. Set Arbitrary Waveform Generator 2 (ARB-2) as follows:

CONTROL	SETTING
Function	Arb
Frequency	1 Hz.
Hi Level	+1.0 V
LO Level	-1.0 V
Output Load	High Z
Sync	ON
Output	Enabled



STEP

PROCEDURE

---

5. Set the RF Signal Generator as follows:

<u>CONTROL</u>	<u>SETTING</u>
Frequency	406.025 MHz.
Level	-30 dBm
Modulation Modes	Phase, Pulse
Modulation Coupling	AC
Phase Mod Deviation	2.2 Radian
Pulse Modulation	ON
Modulation	Enabled

6. Press the SETUP Key to display the Setup Menu.
7. Set the PORT Field to **ANT**.
8. Press the MODE Select Key until the 406 BCN Mode Screen is displayed
9. Verify the following decoded beacon message:

DDD6AF7252000C8C236CA570017151



(23) SSB Receive

**TEST EQUIPMENT:** RF Signal Generator

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE						
1.	Press the SETUP Key to display the Setup Menu.						
2.	Set the PORT Field to <b>ANT</b> .						
3.	Press the MODE Select Key until the COMM SSB Mode Screen is displayed.						
4.	If the COMM SSB Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM SSB Mode Screen to RECEIVING Mode.						
5.	Connect the RF Signal Generator (Output) to the ANT Connector.						
6.	Set the RF Signal Generator as follows:						
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">CONTROL</th> <th style="text-align: left;">SETTING</th> </tr> </thead> <tbody> <tr> <td>Frequency</td> <td>25.001 MHz</td> </tr> <tr> <td>Level</td> <td>-10 dBm</td> </tr> </tbody> </table>	CONTROL	SETTING	Frequency	25.001 MHz	Level	-10 dBm
CONTROL	SETTING						
Frequency	25.001 MHz						
Level	-10 dBm						
7.	Set the FREQ Field to <b>25.000 MHz</b> .						
8.	Verify the AUDIO FREQ reading is 1000 Hz ( $\pm 100$ Hz).						
9.	Set the RF Signal Generator Frequency to 24.999 MHz.						
10.	Verify the AUDIO FREQ reading is 1000 Hz ( $\pm 100$ Hz).						

(24) SSB Transmit

**TEST EQUIPMENT:** Frequency Counter

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE										
1.	Press the SETUP Key to display the Setup Menu.										
2.	Set the PORT Field to <b>ANT</b> .										
3.	Press the MODE Select Key until the COMM SSB Mode Screen is displayed.										
4.	If the COMM SSB Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM SSB Mode Screen to GENERATING Mode.										
5.	Connect the Frequency Counter (Input) to the ANT Connector.										
6.	Set the Test Set as follows:										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">FIELD</th> <th style="text-align: left;">SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>20.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>-17.0 dBm</b></td> </tr> <tr> <td>SIDE BAND</td> <td><b>UPPER</b></td> </tr> <tr> <td>M TONE</td> <td><b>1000 Hz</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>20.000 MHz</b>	RF LVL	<b>-17.0 dBm</b>	SIDE BAND	<b>UPPER</b>	M TONE	<b>1000 Hz</b>
FIELD	SETTING										
FREQ	<b>20.000 MHz</b>										
RF LVL	<b>-17.0 dBm</b>										
SIDE BAND	<b>UPPER</b>										
M TONE	<b>1000 Hz</b>										
7.	Verify 20.001 MHz ( $\pm 6.5$ Hz) on the Frequency Counter.										
8.	Set the SIDE BAND Field to <b>LOWER</b> .										
9.	Verify 19.999 MHz ( $\pm 6.5$ Hz) on the Frequency Counter.										



E. Verification Data Sheet

Test Set S/N: \_\_\_\_\_ DATE: \_\_\_\_\_

TECHNICIAN: \_\_\_\_\_

STEP	DATA	RESULT
<b>(1) Self Test</b>		
7.	Verify all tests pass	_____ (✓)
<b>(2) RF Accuracy</b>		
7.	Verify 108.0 MHz ( $\pm 108$ Hz)	_____
10.	Verify 108.1 MHz ( $\pm 108.1$ Hz)	_____
13.	Verify 334.7 MHz ( $\pm 334.7$ Hz)	_____
16.	Verify 75.0 MHz ( $\pm 75$ Hz)	_____
20.	Verify 118.0 MHz ( $\pm 118$ Hz)	_____
22.	Verify 137.0 MHz ( $\pm 137$ Hz)	_____
24.	Verify 225.0 MHz ( $\pm 225$ Hz)	_____
26.	Verify 312.0 MHz ( $\pm 312$ Hz)	_____
28.	Verify 400.0 MHz ( $\pm 400$ Hz)	_____
33.	Verify 118.001 MHz ( $\pm 118.001$ Hz)	_____
35.	Verify 118.002 MHz ( $\pm 118.002$ Hz)	_____
37.	Verify 118.003 MHz ( $\pm 118.003$ Hz)	_____
39.	Verify 118.004 MHz ( $\pm 118.004$ Hz)	_____
41.	Verify 10.000 MHz ( $\pm 10$ Hz)	_____
43.	Verify 30.000 MHz ( $\pm 30$ Hz)	_____



STEP	DATA	RESULT
<b>(3) RF Level Accuracy (ANT Connector)</b>		
8.	Verify -30 dBm ( $\pm 3$ dB) at 10.000 MHz	-----
10.	Verify -30 dBm ( $\pm 3$ dB) at 30.000 MHz	-----
13.	Verify -16 dBm ( $\pm 3$ dB) at 75.000 MHz	-----
15.	Verify -30 dBm ( $\pm 3$ dB) at 75.000 MHz	-----
18.	Verify -16 dBm ( $\pm 3$ dB) at 108.000 MHz	-----
20.	Verify -30 dBm ( $\pm 3$ dB) at 108.000 MHz	-----
23.	Verify -16 dBm ( $\pm 3$ dB) at 108.100 MHz	-----
25.	Verify -30 dBm ( $\pm 3$ dB) at 108.100 MHz	-----
28.	Verify -16 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
30.	Verify -30 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
33.	Verify -16 dBm ( $\pm 3$ dB) at 137.000 MHz	-----
35.	Verify -30 dBm ( $\pm 3$ dB) at 137.000 MHz	-----
38.	Verify -16 dBm ( $\pm 3$ dB) at 175.000 MHz	-----
40.	Verify -30 dBm ( $\pm 3$ dB) at 175.000 MHz	-----
43.	Verify -16 dBm ( $\pm 3$ dB) at 225.000 MHz	-----
45.	Verify -30 dBm ( $\pm 3$ dB) at 225.000 MHz	-----
48.	Verify -16 dBm ( $\pm 3$ dB) at 334.700 MHz	-----
50.	Verify -30 dBm ( $\pm 3$ dB) at 334.700 MHz	-----
53.	Verify -16 dBm ( $\pm 3$ dB) at 400.000 MHz	-----
55.	Verify -30 dBm ( $\pm 3$ dB) at 400.000 MHz	-----
57.	Verify levels:	
	-57 dBm      -57 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	-47 dBm      -47 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	-37 dBm      -37 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	-27 dBm      -27 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	-17 dBm      -17 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	-7 dBm        -7 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	+3 dBm        +3 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
	+13 dBm       +13 dBm ( $\pm 3$ dB) at 118.000 MHz	-----
61.	Verify -67 dBm ( $\pm 3$ dB) at 118.000 MHz	-----



STEP	DATA	RESULT
<b>(4) RF Level Accuracy (RF I/O Connector)</b>		
8.	Verify -50 dBm ( $\pm 2$ dB) at 10.000 MHz	-----
10.	Verify -50 dBm ( $\pm 2$ dB) at 30.000 MHz	-----
13.	Verify -39 dBm ( $\pm 2.5$ dB) at 75.000 MHz	-----
15.	Verify -50 dBm ( $\pm 2$ dB) at 75.000 MHz	-----
18.	Verify -39 dBm ( $\pm 2.5$ dB) at 108.000 MHz	-----
20.	Verify -50 dBm ( $\pm 2$ dB) at 108.000 MHz	-----
23.	Verify -39 dBm ( $\pm 2.5$ dB) at 108.100 MHz	-----
25.	Verify -50 dBm ( $\pm 2$ dB) at 108.100 MHz	-----
28.	Verify -39 dBm ( $\pm 2.5$ dB) at 118.000 MHz	-----
30.	Verify -50 dBm ( $\pm 2$ dB) at 118.000 MHz	-----
33.	Verify -39 dBm ( $\pm 2.5$ dB) at 137.000 MHz	-----
35.	Verify -50 dBm ( $\pm 2$ dB) at 137.000 MHz	-----
38.	Verify -39 dBm ( $\pm 2.5$ dB) at 175.000 MHz	-----
40.	Verify -50 dBm ( $\pm 2$ dB) at 175.000 MHz	-----
43.	Verify -39 dBm ( $\pm 2.5$ dB) at 225.000 MHz	-----
45.	Verify -50 dBm ( $\pm 2$ dB) at 225.000 MHz	-----
48.	Verify -39 dBm ( $\pm 2.5$ dB) at 334.700 MHz	-----
50.	Verify -50 dBm ( $\pm 2$ dB) at 334.700 MHz	-----
53.	Verify -39 dBm ( $\pm 2.5$ dB) at 400.000 MHz	-----
55.	Verify -50 dBm ( $\pm 2$ dB) at 400.000 MHz	-----
59.	Verify levels:	
	-12 dBm      -12 dBm ( $\pm 2.5$ dB)	-----
	-22 dBm      -22 dBm ( $\pm 2.5$ dB)	-----
	-32 dBm      -32 dBm ( $\pm 2.5$ dB)	-----
	-42 dBm      -42 dBm ( $\pm 2$ dB)	-----
	-52 dBm      -52 dBm ( $\pm 2$ dB)	-----
	-62 dBm      -62 dBm ( $\pm 2$ dB)	-----
	-72 dBm      -72 dBm ( $\pm 2$ dB)	-----
	-82 dBm      -82 dBm ( $\pm 2$ dB)	-----
	-92 dBm      -92 dBm ( $\pm 2$ dB)	-----
	-102 dBm     -102 dBm ( $\pm 3$ dB)	-----
	-112 dBm     -112 dBm ( $\pm 3$ dB)	-----
	-120 dBm     -120 dBm ( $\pm 3$ dB)	-----



STEP	DATA	RESULT
<b>(4) RF Level Accuracy (RF I/O Connector) (cont)</b>		
62. Verify levels:		
-12 dBm	-12 dBm ( $\pm 2.5$ dB)	_____
-22 dBm	-22 dBm ( $\pm 2.5$ dB)	_____
-32 dBm	-32 dBm ( $\pm 2.5$ dB)	_____
-42 dBm	-42 dBm ( $\pm 2$ dB)	_____
-52 dBm	-52 dBm ( $\pm 2$ dB)	_____
-62 dBm	-62 dBm ( $\pm 2$ dB)	_____
-72 dBm	-72 dBm ( $\pm 2$ dB)	_____
-82 dBm	-82 dBm ( $\pm 2$ dB)	_____
-92 dBm	-92 dBm ( $\pm 2$ dB)	_____
-102 dBm	-102 dBm ( $\pm 3$ dB)	_____
-112 dBm	-112 dBm ( $\pm 3$ dB)	_____
-120 dBm	-120 dBm ( $\pm 3$ dB)	_____



STEP	DATA	RESULT
<b>(5) Harmonic and Spurious</b>		
6. Verify:		
	Harmonic is <-20 dBc	-----
	Spurious is <-35 dBc	-----
9. Verify:		
	Harmonic is <-20 dBc	-----
	Spurious is <-35 dBc	-----
12. Verify:		
	Harmonic is <-20 dBc	-----
	Spurious is <-35 dBc	-----
16. Verify:		
	Harmonic is <-20 dBc	-----
	Spurious is <-35 dBc	-----
18. Verify:		
	Harmonic is <-20 dBc	-----
	Spurious is <-35 dBc	-----
23. Verify:		
	Spurious is <-32 dBc	-----
25. Verify:		
	Spurious is <-32 dBc	-----



STEP	DATA	RESULT
------	------	--------

**(6) VSWR (RF I/O and SWR Connectors)**

**RF I/O CONNECTOR**

3. Record levels (Reference):		
75 MHz		-----
225 MHz		-----
400 MHz		-----
5. Record levels:		
75 MHz		-----
225 MHz		-----
400 MHz		-----
6. Calculate return loss for Steps 3 and 5 and record.		-----
10 MHz		-----
30 MHz		-----
75 MHz		-----
225 MHz		-----
400 MHz		-----
7. Verify VSWR:		
75 MHz	<1.3	-----
225 MHz	<1.3	-----
400 MHz	<1.35	-----

**SWR CONNECTOR**

10. Record levels:		
75 MHz		-----
225 MHz		-----
400 MHz		-----
11. Calculate return loss for Steps 3 and 10 and record.		-----
10 MHz		-----
30 MHz		-----
75 MHz		-----
225 MHz		-----
400 MHz		-----
12. Verify VSWR:		
75 MHz	<1.3	-----
225 MHz	<1.3	-----
400 MHz	<1.35	-----





STEP	DATA	RESULT
<b>(7) Marker Beacon</b>		
7.	Verify 400 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)	-----
9.	Verify 1300 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)	-----
11.	Verify 3000 MHz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)	-----
<b>(8) VOR</b>		
<b>MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY</b>		
7.	Verify 1020 Hz ( $\pm 0.02\%$ ) with $<2.0\%$ distortion and AM Depth of 30% AM ( $\pm 2\%$ AM)	-----
9.	Verify 30 Hz ( $\pm 0.02\%$ ) with $<2.0\%$ distortion and AM Depth of 30% AM ( $\pm 1\%$ AM)	-----
11.	Verify 9960 Hz ( $\pm 0.02\%$ ) with $<2.0\%$ distortion and AM Depth of 30% AM ( $\pm 1\%$ AM)	-----
13.	Verify AM Depth of 60% AM ( $\pm 2\%$ AM)	-----
<b>FM DEVIATION ACCURACY</b>		
15.	Verify 480 Hz ( $\pm 25$ Hz)	-----
<b>BEARING ACCURACY</b>		
21.	Verify readings:	
	30                      210° ( $\pm 0.1^\circ$ )	-----
	90                      270° ( $\pm 0.1^\circ$ )	-----
	150                     330° ( $\pm 0.1^\circ$ )	-----
	210                     30° ( $\pm 0.1^\circ$ )	-----
	270                     90° ( $\pm 0.1^\circ$ )	-----
	330                     150° ( $\pm 0.1^\circ$ )	-----
23.	Verify readings:	
	30                      30° ( $\pm 0.1^\circ$ )	-----
	90                      90° ( $\pm 0.1^\circ$ )	-----
	150                     150° ( $\pm 0.1^\circ$ )	-----
	210                     210° ( $\pm 0.1^\circ$ )	-----
	270                     270° ( $\pm 0.1^\circ$ )	-----
	330                     330° ( $\pm 0.1^\circ$ )	-----
27.	Verify readings:	
	1                        1° ( $\pm 0.1^\circ$ )	-----
	2                        2° ( $\pm 0.1^\circ$ )	-----
	10.1                    10.1° ( $\pm 0.1^\circ$ )	-----
	10.2                    10.2° ( $\pm 0.1^\circ$ )	-----



STEP	DATA	RESULT
------	------	--------

**(9) Localizer**

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

- 7. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) -----
- 9. Verify 90 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) -----
- 11. Verify 150 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) -----

**DDM ACCURACY**

- 14. Verify readings:
  - 0.000 CENTER      0.000 ( $\pm 0.0015$  DDM) -----
  - 0.093 LEFT        0.093 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
  - 0.093 RIGHT      0.093 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
  - 0.155 LEFT        0.155 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
  - 0.155 RIGHT      0.155 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
  - 0.200 LEFT        0.200 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
  - 0.200 RIGHT      0.200 ( $\pm 0.0015$  DDM +  $\pm 3\%$  of setting) -----
- 16. Verify readings:
  - 0.094              0.094 ( $\pm 0.0025$  DDM +  $\pm 3\%$  of setting) -----
  - 0.095              0.095 ( $\pm 0.0025$  DDM +  $\pm 3\%$  of setting) -----
  - 0.096              0.096 ( $\pm 0.0025$  DDM +  $\pm 3\%$  of setting) -----
  - 0.097              0.097 ( $\pm 0.0025$  DDM +  $\pm 3\%$  of setting) -----

**PHASE ACCURACY**

- 18. Verify readings:
  - 0                    0° ( $\pm 0.5^\circ$ ) -----
  - 5                    -5° ( $\pm 0.5^\circ$ ) -----
  - 10                   -10° ( $\pm 0.5^\circ$ ) -----
  - 20                   -20° ( $\pm 0.5^\circ$ ) -----
  - 40                   -40° ( $\pm 0.5^\circ$ ) -----
  - 80                   40° ( $\pm 0.5^\circ$ ) -----
  - 120                  0° ( $\pm 0.5^\circ$ ) -----



STEP	DATA	RESULT
<b>(10) Glideslope</b>		
<b>MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY</b>		
7.	Verify 90 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 40% AM ( $\pm 2\%$ AM)	-----
9.	Verify 150 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 40% AM ( $\pm 2\%$ AM)	-----
<b>DDM ACCURACY</b>		
12.	Verify readings:	
	0.000 CENTER 0.000 ( $\pm 0.003$ DDM)	-----
	0.091 UP 0.091 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
	0.091 DOWN 0.091 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
	0.175 UP 0.175 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
	0.175 DOWN 0.175 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
	0.400 UP 0.400 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
	0.400 DOWN 0.400 ( $\pm 0.003$ DDM + $\pm 3\%$ of setting)	-----
14.	Verify readings:	
	0.176 0.176 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)	-----
	0.177 0.177 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)	-----
	0.178 0.178 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)	-----
	0.179 0.179 ( $\pm 0.0048$ DDM + $\pm 3\%$ of setting)	-----
<b>PHASE ACCURACY</b>		
16.	Verify readings:	
	0 0° ( $\pm 0.5^\circ$ )	-----
	5 -5° ( $\pm 0.5^\circ$ )	-----
	10 -10° ( $\pm 0.5^\circ$ )	-----
	20 -20° ( $\pm 0.5^\circ$ )	-----
	40 -40° ( $\pm 0.5^\circ$ )	-----
	80 40° ( $\pm 0.5^\circ$ )	-----
	120 0° ( $\pm 0.5^\circ$ )	-----



STEP	DATA	RESULT
<b>(11) ILS</b>		
<b>MARKER BEACON</b>		
7.	Verify 75 MHz ( $\pm 75$ Hz) and tone frequency of 400 Hz ( $\pm 0.02\%$ ) with $< 5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)	-----
9.	Verify 1300 Hz ( $\pm 0.02\%$ ) with $< 3.75\%$ distortion and AM Depth of 95% AM ( $\pm 3.75\%$ AM)	-----
11.	Verify 3000 Hz ( $\pm 0.02\%$ ) with $< 3.75\%$ distortion and AM Depth of 95% AM ( $\pm 3.75\%$ AM)	-----
<b>LOCALIZER</b>		
13.	Verify 108.100 MHz ( $\pm 108.001$ Hz) and tone frequency of 1020 Hz ( $\pm 0.02\%$ ) at -10 dBm ( $\pm 2.5$ dB) with $< 2.5\%$ distortion and AM Depth of 30% AM ( $\pm 2\%$ AM)	-----
15.	Verify 90 Hz ( $\pm 0.02\%$ ) with $< 2.5\%$ distortion and AM Depth of 20% AM ( $\pm 2\%$ AM)	-----
17.	Verify 150 Hz ( $\pm 0.02\%$ ) with $< 2.5\%$ distortion and AM Depth of 20% AM ( $\pm 2\%$ AM)	-----
20.	Verify readings:	
	0.000 CENTER      0.000 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.093 LEFT        0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.093 RIGHT      0.093 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.155 LEFT        0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.155 RIGHT      0.155 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.200 LEFT        0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
	0.200 RIGHT      0.200 ( $\pm 0.0015$ DDM + $\pm 3\%$ of setting)	-----
22.	Verify readings:	
	0.094              0.094 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)	-----
	0.095              0.095 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)	-----
	0.096              0.096 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)	-----
	0.097              0.097 ( $\pm 0.0025$ DDM + $\pm 3\%$ of setting)	-----
<b>PHASE ACCURACY</b>		
24.	Verify readings:	
	0                    0° ( $\pm 0.5^\circ$ )	-----
	5                    -5° ( $\pm 0.5^\circ$ )	-----
	10                   -10° ( $\pm 0.5^\circ$ )	-----
	20                   -20° ( $\pm 0.5^\circ$ )	-----
	40                   -40° ( $\pm 0.5^\circ$ )	-----
	80                   40° ( $\pm 0.5^\circ$ )	-----
	120                  0° ( $\pm 0.5^\circ$ )	-----



STEP	DATA	RESULT
<b>(11) ILS (cont)</b>		
<b>GLIDESLOPE</b>		
29. Verify -30 dBm ( $\pm 3$ dB)		-----
31. Verify -10 dBm ( $\pm 3$ dB)		-----
<b>(12) COMM AM</b>		
8. Verify 1020 Hz ( $\pm 0.02\%$ ) with $< 2.5\%$ distortion and AM Depth of 30% AM ( $\pm 2\%$ AM)		-----
10. Verify 1020 Hz ( $\pm 0.02\%$ ) with $< 2.5\%$ distortion and AM Depth of 30% AM ( $\pm 2\%$ AM)		-----
<b>(13) COMM FM</b>		
8. Verify 1000 Hz ( $\pm 0.02\%$ ) with $< 5\%$ distortion and FM Deviation of 5 kHz ( $\pm 500$ Hz)		-----
<b>(14) SELCOM</b>		
8. Verify 312.6 Hz ( $\pm 0.02\%$ ) Audio tone frequency and AM Depth of 80% AM ( $\pm 4\%$ AM)		-----
10. Verify 1479.1 Hz ( $\pm 0.02\%$ ) Audio tone frequency and AM Depth of 80% AM ( $\pm 4\%$ AM)		-----
<b>(15) Frequency Counter</b>		
7. Verify readings:		
10 MHz	10 MHz ( $\pm 10$ Hz + $\pm 1$ count)	-----
10.001 MHz	10.001 MHz ( $\pm 10.001$ Hz + $\pm 1$ count)	-----
100.101 MHz	100.101 MHz ( $\pm 100.101$ Hz + $\pm 1$ count)	-----
399.999 MHz	399.999 MHz ( $\pm 399.999$ Hz + $\pm 1$ count)	-----
13. Verify readings:		
10 MHz	10 MHz ( $\pm 10$ Hz + $\pm 1$ count)	-----
10.001 MHz	10.001 MHz ( $\pm 10.001$ Hz + $\pm 1$ count)	-----
100.101 MHz	100.101 MHz ( $\pm 100.101$ Hz + $\pm 1$ count)	-----
399.999 MHz	399.999 MHz ( $\pm 399.999$ Hz + $\pm 1$ count)	-----
18. Verify 1 MHz ( $\pm 1$ Hz + $\pm 1$ count)		-----
20. Verify 1.00001 MHz ( $\pm 1.00001$ Hz + $\pm 1$ count)		-----
22. Verify 3.00000 MHz ( $\pm 3.00000$ Hz + $\pm 1$ count)		-----
24. Verify 5.10001 MHz ( $\pm 5.10001$ Hz + $\pm 1$ count)		-----
26. Verify 9.99999 MHz ( $\pm 9.99999$ Hz + $\pm 1$ count)		-----



STEP	DATA	RESULT
------	------	--------

**(16) AM Meter**

3. Record AM readings:

X1	_____
X2	_____
X3	_____
X4	_____
X5	_____
X6	_____

9. Verify AM readings:

$(X1 \div 1.1) < \text{Reading} < (X1 \div 0.9)$	_____ (✓)
$(X2 \div 1.1) < \text{Reading} < (X2 \div 0.9)$	_____ (✓)
$(X3 \div 1.1) < \text{Reading} < (X3 \div 0.9)$	_____ (✓)
$(X4 \div 1.1) < \text{Reading} < (X4 \div 0.9)$	_____ (✓)
$(X5 \div 1.1) < \text{Reading} < (X5 \div 0.9)$	_____ (✓)
$(X6 \div 1.1) < \text{Reading} < (X6 \div 0.9)$	_____ (✓)

**(17) FM Meter**

3. Record FM readings:

X1	_____
X2	_____
X3	_____
X4	_____
X5	_____
X6	_____

9. Verify FM readings:

$[(X1 - 0.4) \div 1.08] < \text{Reading} < [(X1 + 0.4) \div 0.92]$	_____ (✓)
$[(X2 - 0.4) \div 1.08] < \text{Reading} < [(X2 + 0.4) \div 0.92]$	_____ (✓)
$[(X3 - 0.4) \div 1.08] < \text{Reading} < [(X3 + 0.4) \div 0.92]$	_____ (✓)
$[(X4 - 0.4) \div 1.08] < \text{Reading} < [(X4 + 0.4) \div 0.92]$	_____ (✓)
$[(X5 - 0.4) \div 1.08] < \text{Reading} < [(X5 + 0.4) \div 0.92]$	_____ (✓)
$[(X6 - 0.4) \div 1.08] < \text{Reading} < [(X6 + 0.4) \div 0.92]$	_____ (✓)

14. Verify FM readings:

$[(X4 - 0.4) \div 1.08] < \text{Reading} < [(X4 + 0.4) \div 0.92]$	_____ (✓)
$[(X5 - 0.4) \div 1.08] < \text{Reading} < [(X5 + 0.4) \div 0.92]$	_____ (✓)
$[(X6 - 0.4) \div 1.08] < \text{Reading} < [(X6 + 0.4) \div 0.92]$	_____ (✓)



STEP	DATA	RESULT
<b>(18) SWR Meter</b>		
5. Verify readings:		
75	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
137	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
225	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
312	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
400	1.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
7. Verify readings:		
75	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
137	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
225	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
312	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
400	1.500 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
9. Verify readings:		
75	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
137	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
225	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
312	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
400	2.000 ( $\pm 0.2 + \pm 20\%$ of reading)	_____
11. Verify readings:		
75	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)	_____
137	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)	_____
225	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)	_____
312	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)	_____
400	3.000 ( $\pm 0.3 + \pm 20\%$ of reading)	_____



STEP	DATA	RESULT
------	------	--------

**(19) Power Meter**

7. Characterize Test Setup:

FREQ	A	B	OFFSET
10 MHz	-----	-----	-----
30 MHz	-----	-----	-----
100 MHz	-----	-----	-----
300 MHz	-----	-----	-----

15. Verify readings:

10 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----

18. Verify readings:

30 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----

21. Verify readings:

100 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----

24. Verify readings:

300 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
300 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
300 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
300 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
300 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
300 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----



STEP	DATA	RESULT
------	------	--------

**(19) Power Meter (cont)**

27. Characterize Test Setup:

FREQ	A	B	OFFSET
10 MHz	-----	-----	-----
30 MHz	-----	-----	-----
100 MHz	-----	-----	-----
300 MHz	-----	-----	-----
400 MHz	-----	-----	-----

35. Verify readings:

10 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
10 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----

38. Verify readings:

30 MHz	0.1 W	0.1 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	1.0 W	1.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	5.0 W	5.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	10.0 W	10.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	20.0 W	20.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----
30 MHz	25.0 W	25.0 W ( $\pm 12\%$ of reading + $\pm 1$ count)	-----

41. Verify readings:

100 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----
100 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count)	-----



STEP	DATA		RESULT
<b>(19) Power Meter (cont)</b>			
44.	Verify readings:		
	300 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	300 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	300 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	300 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	300 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	300 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
46.	Verify readings:		
	400 MHz	0.1 W	0.1 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	400 MHz	1.0 W	1.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	400 MHz	5.0 W	5.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	400 MHz	10.0 W	10.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	400 MHz	20.0 W	20.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
	400 MHz	25.0 W	25.0 W ( $\pm 8\%$ of reading + $\pm 1$ count) _____
<b>(20) AM Audio - AUX Connector</b>			
9.	Verify signal level is $>0.75$ Vrms		_____
<b>(21) 121.5/243.0 MHz Beacon</b>			
9.	Verify readings:		
	Frequency:	121.5 MHz ( $\pm 121$ Hz)	_____
	AM Depth:	$>95\%$	_____
	Beacon Start Frequency:	1600 Hz ( $\pm 128$ Hz)	_____
	Beacon Stop Frequency:	300 Hz ( $\pm 24$ Hz)	_____
12.	Verify readings:		
	Frequency:	243.0 MHz ( $\pm 243$ Hz)	_____
	AM Depth:	$>95\%$	_____
	Beacon Start Frequency:	1600 Hz ( $\pm 128$ Hz)	_____
	Beacon Stop Frequency:	300 Hz ( $\pm 24$ Hz)	_____
<b>(22) 406 MHz Beacon</b>			
11.	Verify decoded message:		
	DDD6AF7252000C8C236CA570017151		_____
<b>(23) SSB Receive</b>			
8.	Verify AUDIO FREQ reading is 1000 Hz ( $\pm 100$ Hz)		_____
10.	Verify AUDIO FREQ reading is 1000 Hz ( $\pm 100$ Hz)		_____



STEP	DATA	RESULT
<b>(24) SSB Transmit</b>		
7.	Verify 20.001 MHz ( $\pm 6.5$ Hz)	-----
9.	Verify 19.999 MHz ( $\pm 6.5$ Hz)	-----



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## F. Alternate Verification Procedures

## (1) RF Accuracy

**TEST EQUIPMENT:** Measuring Receiver

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE								
1.	Connect the Measuring Receiver (RF Input) to the ANT Connector.								
2.	Set the Measuring Receiver to Auto Tune, Frequency measurement and Special Function 7.4 for 1 Hz resolution.								
3.	Press the SETUP Key to display the Setup Menu.								
4.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>PORT</td> <td><b>ANT</b></td> </tr> <tr> <td>GEN FREQ</td> <td><b>PRESET</b></td> </tr> </tbody> </table>	FIELD	SETTING	PORT	<b>ANT</b>	GEN FREQ	<b>PRESET</b>		
FIELD	SETTING								
PORT	<b>ANT</b>								
GEN FREQ	<b>PRESET</b>								
5.	Press the MODE Select Key until the VOR Mode Screen.								
6.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>0.0 dBm</b></td> </tr> <tr> <td>M MOD</td> <td><b>0%</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.000 MHz</b>	RF LVL	<b>0.0 dBm</b>	M MOD	<b>0%</b>
FIELD	SETTING								
FREQ	<b>108.000 MHz</b>								
RF LVL	<b>0.0 dBm</b>								
M MOD	<b>0%</b>								
7.	Verify 108.0 MHz ( $\pm 108$ Hz) on the Modulation Analyzer.								
8.	Press the MODE Select Key until the LOCALIZER Mode Screen.								
9.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.100 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>0.0 dBm</b></td> </tr> <tr> <td>M MOD</td> <td><b>0%</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.100 MHz</b>	RF LVL	<b>0.0 dBm</b>	M MOD	<b>0%</b>
FIELD	SETTING								
FREQ	<b>108.100 MHz</b>								
RF LVL	<b>0.0 dBm</b>								
M MOD	<b>0%</b>								
10.	Verify 108.1 MHz ( $\pm 108.1$ Hz) on the Modulation Analyzer.								
11.	Press the MODE Select Key until the GLIDESLOPE Mode Screen.								
12.	Set the Test Set as follows:								
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>334.700 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>0.0 dBm</b></td> </tr> <tr> <td>M MOD</td> <td><b>0%</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>334.700 MHz</b>	RF LVL	<b>0.0 dBm</b>	M MOD	<b>0%</b>
FIELD	SETTING								
FREQ	<b>334.700 MHz</b>								
RF LVL	<b>0.0 dBm</b>								
M MOD	<b>0%</b>								
13.	Verify 334.7 MHz ( $\pm 334.7$ Hz) on the Modulation Analyzer.								
14.	Press the MODE Select Key until the MARKER BEACON Mode Screen.								

## STEP PROCEDURE

15. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>75.000 MHz</b>
RF LVL	<b>0.0 dBm</b>
MOD TONE	<b>OFF</b>
M MOD	<b>0%</b>

16. Verify 75.0 MHz ( $\pm 75$  Hz) on the Modulation Analyzer.  
 17. Press the MODE Select Key until the COMM AM Mode Screen is displayed.  
 18. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>118.000 MHz</b>
RF LVL	<b>0.0 dBm</b>
MOD TONE	<b>OFF</b>

19. If the COMM AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM AM Mode Screen to GENERATING Mode.  
 20. Verify 118.0 MHz ( $\pm 118$  Hz) on the Modulation Analyzer.  
 21. Set the FREQ Field to **137.000 MHz**.  
 22. Verify 137.0 MHz ( $\pm 137$  Hz) on the Modulation Analyzer.  
 23. Set the FREQ Field to **225.000 MHz**.  
 24. Verify 225.0 MHz ( $\pm 225$  Hz) on the Modulation Analyzer.  
 25. Set the FREQ Field to **312.000 MHz**.  
 26. Verify 312.0 MHz ( $\pm 312$  Hz) on the Modulation Analyzer.  
 27. Set the FREQ Field to **400.000 MHz**.  
 28. Verify 400.0 MHz ( $\pm 400$  Hz) on the Modulation Analyzer.  
 29. Press the SETUP Key to display the Setup Menu.  
 30. Set the Test Set as follows:

FIELD	SETTING
PORT	<b>ANT</b>
GEN FREQ	<b>VAR</b>

31. Press the MODE Select Key until the SELCAL Mode Screen is displayed.  
 32. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>118.001 MHz</b>
RF LVL	<b>0.0 dBm</b>

33. Verify 118.001 MHz ( $\pm 118.001$  Hz) on the Modulation Analyzer.  
 34. Set the FREQ Field to **118.002 MHz**.  
 35. Verify 118.002 MHz ( $\pm 118.002$  Hz) on the Modulation Analyzer.  
 36. Set the FREQ Field to **118.003 MHz**.  
 37. Verify 118.003 MHz ( $\pm 118.003$  Hz) on the Modulation Analyzer.  
 38. Set the FREQ Field to **118.004 MHz**.



STEP

PROCEDURE

---

39. Verify 118.004 MHz ( $\pm 118.004$  Hz) on the Modulation Analyzer.
40. Set the FREQ Field to **10.000 MHz**.
41. Verify 10.000 MHz ( $\pm 10$  Hz) on the Modulation Analyzer.
42. Set the FREQ Field to **30.000 MHz**.
43. Verify 30.000 MHz ( $\pm 30$  Hz) on the Modulation Analyzer.
44. Disconnect the Modulation Analyzer from the ANT Connector.

(2) Marker Beacon

**TEST EQUIPMENT:** Measuring Receiver  
Audio Analyzer

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Measuring Receiver (RF Input) to the ANT Connector, and the Measuring Receiver Modulation Output to the Input on the Audio Analyzer.
2. Set the Measuring Receiver to AM Measurement, and the Audio Analyzer to Distortion.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.
5. Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>75.000 MHz</b>
RF LVL	<b>10.0 dBm</b>
MOD TONE	<b>400 Hz</b>
M MOD	<b>CAL</b>

7. Verify 400 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 95% AM ( $\pm 5\%$  AM) on the Measuring Receiver and Audio Analyzer.
8. Set the MOD TONE Field to **1300**.
9. Verify 1300 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 95% AM ( $\pm 5\%$  AM) on the Measuring Receiver and Audio Analyzer.
10. Set the MOD TONE Field to **3000**.
11. Verify 3000 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and an AM Depth of 95% AM ( $\pm 5\%$  AM) on the Measuring Receiver and Audio Analyzer.
12. Disconnect the Measuring Receiver from the ANT Connector.



(3) VOR

**TEST EQUIPMENT:** Measuring Receiver  
Audio Analyzer  
Frequency Counter  
Oscilloscope  
RF Detector/Amplifier  
VOR Radial Standard

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE														
1.	Connect the Measuring Receiver (RF Input) to the ANT Connector, and the Modulation output to the input on the Audio Analyzer.														
2.	Set the Measuring Receiver to AM Measurement, and the Audio Analyzer to Distortion Measurement.														
3.	Press the SETUP Key to display the Setup Menu.														
4.	Set the PORT Field to <b>ANT</b> .														
	<b>MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY</b>														
5.	Press the MODE Select Key until the VOR Mode Screen is displayed.														
6.	Set the Test Set as follows:														
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.000 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>0.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>1020 Hz</b></td> </tr> <tr> <td>M MOD</td> <td><b>CAL</b></td> </tr> <tr> <td>30 Hz MOD</td> <td><b>0%</b></td> </tr> <tr> <td>9960 Hz MOD</td> <td><b>0%</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.000 MHz</b>	RF LVL	<b>0.0 dBm</b>	MOD TONE	<b>1020 Hz</b>	M MOD	<b>CAL</b>	30 Hz MOD	<b>0%</b>	9960 Hz MOD	<b>0%</b>
FIELD	SETTING														
FREQ	<b>108.000 MHz</b>														
RF LVL	<b>0.0 dBm</b>														
MOD TONE	<b>1020 Hz</b>														
M MOD	<b>CAL</b>														
30 Hz MOD	<b>0%</b>														
9960 Hz MOD	<b>0%</b>														
7.	Verify 1020 Hz ( $\pm 0.02\%$ ) with $<2.0\%$ distortion and an AM Depth of 30% AM ( $\pm 2\%$ AM) on the Measuring Receiver and Audio Analyzer.														
8.	Set the Test Set as follows:														
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>MOD TONE</td> <td><b>OFF</b></td> </tr> <tr> <td>30 Hz MOD</td> <td><b>30%</b></td> </tr> </tbody> </table>	FIELD	SETTING	MOD TONE	<b>OFF</b>	30 Hz MOD	<b>30%</b>								
FIELD	SETTING														
MOD TONE	<b>OFF</b>														
30 Hz MOD	<b>30%</b>														
9.	Verify $<2.0\%$ distortion and an AM Depth of 30% AM ( $\pm 2\%$ AM) on the Measuring Receiver and Audio Analyzer.														
10.	Connect Measuring Receiver Modulation Output to Frequency Counter and verify 30 Hz ( $\pm 0.02\%$ ).														
11.	Reconnect Measuring Receiver Modulation Output to Audio Analyzer.														
12.	Set the Test Set as follows:														
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>30 Hz MOD</td> <td><b>0%</b></td> </tr> <tr> <td>9960 Hz MOD</td> <td><b>30%</b></td> </tr> <tr> <td>TONE DEL</td> <td><b>REF</b></td> </tr> </tbody> </table>	FIELD	SETTING	30 Hz MOD	<b>0%</b>	9960 Hz MOD	<b>30%</b>	TONE DEL	<b>REF</b>						
FIELD	SETTING														
30 Hz MOD	<b>0%</b>														
9960 Hz MOD	<b>30%</b>														
TONE DEL	<b>REF</b>														

STEP PROCEDURE

---

13. Verify 9960 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer.

14. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	<b>30%</b>
TONE DEL	<b>OFF</b>

15. Verify AM Depth of 60% AM ( $\pm 4\%$  AM) on the Measuring Receiver.

**FM DEVIATION ACCURACY**

16. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	<b>0%</b>
9960 Hz MOD	<b>30%</b>

17. Connect the Measuring Receiver Modulation output to the Oscilloscope input.

18. Set Oscilloscope to 100  $\mu\text{s}/\text{div}$  and adjust vertical scaling for full scale deflection of audio signal.

19. Set Oscilloscope trigger to positive edge trigger and adjust for a stable display with the first zero crossing occurring on the major horizontal axis.

20. Select X10 horizontal magnifier or delay time for a 5  $\mu\text{s}/\text{div}$  display.

21. Adjust delay and/or horizontal position to center the sixth positive zero crossing on the display. (Nearly a full screen of zero crossings can be seen due to the FM modulation on the 9960 audio tone.)

22. Measure the time from the first zero crossing to the last zero crossing on the current display and verify the measurement is 48.5  $\mu\text{s}$  ( $\pm 2.5 \mu\text{s}$ ).

**BEARING ACCURACY**

23. Connect the RF Detector/Amplifier (RF Input) to the ANT Connector.

24. Connect the RF Detector/Amplifier (Audio Output) to the VOR Comp Input on the VOR Radial Standard.

25. Press the SETUP Key to display the Setup Menu.

26. Set the VOR BRG Field to **FIXED**.

27. Press the MODE Select Key until the VOR Mode Screen is displayed.

28. Set the Test Set as follows:

FIELD	SETTING
RF LVL	<b>5.0 dBm</b>
30 Hz MOD	<b>30%</b>
9960 Hz MOD	<b>30%</b>
TO/FROM	<b>TO</b>

## STEP

## PROCEDURE

29. Set the BRG Field to the following settings and verify readings on the VOR Radial Standard:

BRG	READING
30	210° (±0.1°)
90	270° (±0.1°)
150	330° (±0.1°)
210	30° (±0.1°)
270	90° (±0.1°)
330	150° (±0.1°)

30. Set the TO/FROM Field to **FROM**.
31. Set the BRG Field to the following settings and verify readings on the VOR Radial Standard:

BRG	READING
30	30° (±0.1°)
90	90° (±0.1°)
150	150° (±0.1°)
210	210° (±0.1°)
270	270° (±0.1°)
330	330° (±0.1°)

32. Press the SETUP Key to display the Setup Menu.
33. Set the VOR BRG Field to **VAR**.
34. Press the MODE Select Key until the VOR Mode Screen is displayed.
35. Set the BRG Field to the following settings and verify readings on the VOR Radial Standard:

BRG	READING
1	1° (±0.1°)
2	2° (±0.1°)
10.1	10.1° (±0.1°)
10.2	10.2° (±0.1°)

36. Disconnect the RF Detector/Amplifier from the ANT Connector.

(4) Localizer

**TEST EQUIPMENT:** Measuring Receiver  
Audio Analyzer  
Frequency Counter  
Digital Multimeter

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE																
1.	Connect the Measuring Receiver (RF Input) to the ANT Connector, and the Measuring Receiver Modulation Output to the input on the Audio Analyzer.																
2.	Set the Measuring Receiver to AM Measurement and the Audio Analyzer to distortion.																
3.	Press the SETUP Key to display the Setup Menu.																
4.	Set the PORT Field to <b>ANT</b> .																
	<b>MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY</b>																
5.	Press the MODE Select Key until the LOCALIZER Mode Screen is displayed.																
6.	Set the Test Set as follows:																
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td><b>108.100 MHz</b></td> </tr> <tr> <td>RF LVL</td> <td><b>0.0 dBm</b></td> </tr> <tr> <td>MOD TONE</td> <td><b>1020 Hz</b></td> </tr> <tr> <td>M MOD</td> <td><b>CAL</b></td> </tr> <tr> <td>DEV STEP</td> <td><b>FIXED</b></td> </tr> <tr> <td>LOC DDM</td> <td><b>0.000 CENTER</b></td> </tr> <tr> <td>TONE DEL</td> <td><b>90 &amp; 150</b></td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	<b>108.100 MHz</b>	RF LVL	<b>0.0 dBm</b>	MOD TONE	<b>1020 Hz</b>	M MOD	<b>CAL</b>	DEV STEP	<b>FIXED</b>	LOC DDM	<b>0.000 CENTER</b>	TONE DEL	<b>90 &amp; 150</b>
FIELD	SETTING																
FREQ	<b>108.100 MHz</b>																
RF LVL	<b>0.0 dBm</b>																
MOD TONE	<b>1020 Hz</b>																
M MOD	<b>CAL</b>																
DEV STEP	<b>FIXED</b>																
LOC DDM	<b>0.000 CENTER</b>																
TONE DEL	<b>90 &amp; 150</b>																
7.	Verify 1020 Hz ( $\pm 0.02\%$ ) with $< 2.5\%$ distortion and an AM Depth of 30% AM ( $\pm 2\%$ AM) on the Measuring Receiver and Audio Analyzer.																
8.	Set the Test Set as follows:																
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>MOD TONE</td> <td><b>OFF</b></td> </tr> <tr> <td>TONE DEL</td> <td><b>150</b></td> </tr> </tbody> </table>	FIELD	SETTING	MOD TONE	<b>OFF</b>	TONE DEL	<b>150</b>										
FIELD	SETTING																
MOD TONE	<b>OFF</b>																
TONE DEL	<b>150</b>																
9.	Verify $< 2.5\%$ distortion and an AM Depth of 20% AM ( $\pm 2\%$ AM) on the Measuring Receiver and Audio Analyzer.																
10.	Connect Measuring Receiver Modulation Output to Frequency Counter and verify 90 Hz ( $\pm 0.02\%$ ).																
11.	Set the TONE DEL Field to <b>90</b> .																
12.	Verify 150 Hz ( $\pm 0.02\%$ ) on the Frequency Counter.																
13.	Reconnect Measuring Receiver Modulation Output to Audio Analyzer.																
14.	Verify $< 2.5\%$ distortion and an AM Depth of 20% AM ( $\pm 2\%$ AM) on the Measuring Receiver and Audio Analyzer. Record AM Depth measurement for DDM Accuracy calculations.																

**DDM ACCURACY**

15. Disconnect the Modulation Output of the Measuring Receiver from the Audio Analyzer and connect the Modulation Output of the Measuring Receiver to the Digital Multimeter.
16. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.000 CENTER
0.093 LEFT
0.093 RIGHT
0.155 LEFT
0.155 RIGHT
0.200 LEFT
0.200 RIGHT

17. Set the TONE DEL Field to **150**.
18. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.000 CENTER
0.093 LEFT
0.093 RIGHT
0.155 LEFT
0.155 RIGHT
0.200 LEFT
0.200 RIGHT

19. Set the DEV STEP Field to **VAR**.
20. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.094 RIGHT
0.095 RIGHT
0.096 RIGHT
0.097 RIGHT

21. Set the TONE DEL Field to **90**.
22. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.094 RIGHT
0.095 RIGHT
0.096 RIGHT
0.097 RIGHT

STEP PROCEDURE

---

23. Perform the calculations in the data sheet and verify all DDM readings are within tolerance.
24. Select Range Hold on Measuring Receiver.
25. Set the Test Set as follows:

FIELD	SETTING
TONE DEL	<b>OFF</b>
DEV STEP	<b>FIXED</b>
LOC DDM	<b>0.000 CENTER</b>

**PHASE ACCURACY**

26. Connect the Modulation Output of the Measuring Receiver to the Oscilloscope input and adjust for a stable display.
27. Set the 90/150 Hz Field to the following settings and monitor the displayed signal on the Oscilloscope:

**NOTE:** Change in Reading column indicates there is a change in the waveform. Using this verification procedure, this specification cannot be verified to the published specification and can only be tested for functionality.

90/150 Hz	READING
<b>0</b>	Reference waveform
<b>5</b>	Change
<b>10</b>	Change
<b>20</b>	Change
<b>40</b>	Change
<b>60</b>	Peak waveform
<b>120</b>	Matches reference waveform

28. Set the 90/150 Hz Field to **0**.
29. Disconnect the Measuring Receiver from the ANT Connector and clear Range Hold on Measuring Receiver.

(5) Glideslope

**TEST EQUIPMENT:** Measuring Receiver  
Audio Analyzer  
Frequency Counter  
Digital Multimeter

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Measuring Receiver (RF Input) to the ANT Connector, and the Measuring Receiver Modulation Output to the input on the Audio Analyzer.
  2. Set the Measuring Receiver to AM Measurement and the Audio Analyzer to distortion.
  3. Press the SETUP Key to display the Setup Menu.
  4. Set the PORT Field to **ANT**.
- MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**
5. Press the MODE Select Key until the GLIDESLOPE Mode Screen is displayed.
  6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>334.250 MHz</b>
RF LVL	<b>0.0 dBm</b>
M MOD	<b>CAL</b>
DEV STEP	<b>FIXED</b>
90/150 Hz	<b>OFF</b>
TONE DEL	<b>150</b>

7. Verify <2.5% distortion and an AM Depth of 40% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer.
8. Connect Measuring Receiver Modulation Output to Frequency Counter and verify 90 Hz ( $\pm 0.02\%$ ).
9. Set the TONE DEL Field to **90**.
10. Verify 150 Hz ( $\pm 0.02\%$ ) on the Frequency Counter.
11. Reconnect Measuring Receiver Modulation Output to Audio Analyzer.
12. Verify <2.5% distortion and an AM Depth of 40% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer and record AM Depth measurement for DDM Accuracy calculations.

**DDM ACCURACY**

13. Disconnect the Modulation Output of the Measuring Receiver from the Audio Analyzer and connect the Modulation Output of the Measuring Receiver to the Digital Multimeter.
14. Set the TONE DEL Field to **OFF** and select Range Hold on Measuring Receiver.
15. Set the TONE DEL Field to **90**.

STEP

PROCEDURE

16. Set the G/S DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

G/S DDM
0.000 CENTER
0.091 UP
0.091 DOWN
0.175 UP
0.175 DOWN
0.400 UP
0.400 DOWN

17. Set the TONE DEL Field to **150**.
18. Set the G/S DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

G/S DDM
0.000 CENTER
0.091 UP
0.091 DOWN
0.175 UP
0.175 DOWN
0.400 UP
0.400 DOWN

19. Set the DEV STEP Field to **VAR**.
20. Set the G/S DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

G/S DDM
0.176 UP
0.177 UP
0.178 UP
0.179 UP

21. Set the TONE DEL Field to **90**.
22. Set the G/S DDM Field to the following settings and record the AC Voltage reading from the voltmeter:

G/S DDM
0.176 UP
0.177 UP
0.178 UP
0.179 UP

23. Perform the calculations in the data sheet and verify all DDM readings are within tolerance.



STEP PROCEDURE

---

24. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	<b>FIXED</b>
G/S DDM	<b>0.000 CENTER</b>
TONE DEL	<b>OFF</b>

**PHASE ACCURACY**

25. Connect the Modulation Output of the Measuring receiver to the Oscilloscope input and adjust for a stable display.

26. Set the 90/150 Hz Field to the following settings and monitor the displayed signal on the Oscilloscope:

**NOTE:** Change in Reading column indicates there is a change in the waveform. Using this verification procedure, this specification cannot be verified to the published specification and can only be tested for functionality.

90/150 Hz	READING
<b>0</b>	Reference waveform
<b>5</b>	Change
<b>10</b>	Change
<b>20</b>	Change
<b>40</b>	Change
<b>60</b>	Peak waveform
<b>120</b>	Matches reference waveform

27. Set the 90/150 Hz Field to **0**.

28. Disconnect the Measuring Receiver from the ANT Connector and clear Range Hold on Measuring Receiver.

(6) ILS

**TEST EQUIPMENT:** Measuring Receiver  
Audio Analyzer  
Frequency Counter  
Digital Multimeter  
10 dB Pad (Inline)

**VERIFICATION FAILURE:** If any step in this procedure fails or is out of tolerance, this indicates a failure in the Test Set. Refer to Troubleshooting for corrective action.

STEP	PROCEDURE
------	-----------

1. Connect the Measuring Receiver (RF Input) and 10 dB Pad to the ANT Connector.
2. Set the Measuring Receiver to AM Measurement.
3. Press the SETUP Key to display the Setup Menu.
4. Set the PORT Field to **ANT**.

**MARKER BEACON**

5. Press the MODE Select Key until the ILS Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	<b>108.100 MHz</b>
RF LVL	<b>-60.0 dBm</b>
MOD TONE	<b>400 Hz (Marker ON)</b>
M MOD	<b>CAL</b>

7. Verify 75 MHz ( $\pm 75$  Hz) and tone frequency of 400 Hz ( $\pm 0.02\%$ ) with  $< 5\%$  distortion and an AM Depth of 95% AM ( $\pm 5\%$  AM) on the Measuring Receiver and Audio Analyzer.
8. Set the MOD TONE Field to **1300 Hz**.
9. Verify 1300 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and an AM Depth of 95% AM ( $\pm 3.75\%$  AM) on the Measuring Receiver and Audio Analyzer.
10. Set the MOD TONE Field to **3000 Hz**.
11. Verify 3000 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and an AM Depth of 95% AM ( $\pm 3.75\%$  AM) on the Measuring Receiver and Audio Analyzer.

**LOCALIZER**

12. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>1020 Hz</b>
TONE DEL	<b>90 &amp; 150</b>

13. Verify 108.100 MHz ( $\pm 108.100$  Hz) and tone frequency of 1020 Hz ( $\pm 0.02\%$ ) at -10 dBm ( $\pm 2.5$  dB) with  $< 2.5\%$  distortion and an AM Depth of 30% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer.

STEP PROCEDURE

---

14. Set the Test Set as follows:

FIELD	SETTING
MOD TONE	<b>OFF</b>
TONE DEL	<b>150</b>

15. Verify <2.5% distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer.

16. Connect Measuring Receiver Modulation Output to Frequency Counter and verify 90 Hz ( $\pm 0.02\%$ ).

17. Set the TONE DEL Field to **90**.

18. Verify 150 Hz ( $\pm 0.02\%$ ) on the Frequency Counter.

19. Reconnect Measuring Receiver Modulation Output to Audio Analyzer.

20. Verify <2.5% distortion and an AM Depth of 20% AM ( $\pm 2\%$  AM) on the Measuring Receiver and Audio Analyzer. Record AM Depth measurement for DDM Accuracy calculations.

**DDM ACCURACY**

21. Disconnect the Modulation Output of the Measuring Receiver from the Audio Analyzer and connect the Modulation Output of the Measuring Receiver to the Digital Multimeter.

22. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.000 CENTER
0.093 LEFT
0.093 RIGHT
0.155 LEFT
0.155 RIGHT
0.200 LEFT
0.200 RIGHT

23. Set the TONE DEL Field to **150**.

24. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.000 CENTER
0.093 LEFT
0.093 RIGHT
0.155 LEFT
0.155 RIGHT
0.200 LEFT
0.200 RIGHT

25. Set the DEV STEP Field to **VAR**.

STEP PROCEDURE

---

26. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.094 RIGHT
0.095 RIGHT
0.096 RIGHT
0.097 RIGHT

27. Set the TONE DEL Field to **90**.
28. Set the LOC DDM Field to the following settings and record the AC Voltage reading from the Digital Multimeter:

LOC DDM
0.094 RIGHT
0.095 RIGHT
0.096 RIGHT
0.097 RIGHT

29. Perform the calculations in the data sheet and verify all DDM readings are within tolerance.
30. Select Range Hold on the Measuring Receiver.
31. Set the Test Set as follows:

FIELD	SETTING
TONE DEL	<b>OFF</b>
DEV STEP	<b>FIXED</b>
LOC DDM	<b>0.000 CENTER</b>

**PHASE ACCURACY**

32. Connect the Modulation Output of the Measuring receiver to the Oscilloscope input and adjust for a stable display.
33. Set the 90/150 Hz Field to the following settings and monitor the displayed signal on the Oscilloscope:

**NOTE:** Change in Reading column indicates there is a change in the waveform. Using this verification procedure, this specification cannot be verified to the published specification and can only be tested for functionality.

90/150 Hz	READING
<b>0</b>	Reference waveform
<b>5</b>	Change
<b>10</b>	Change
<b>20</b>	Change
<b>40</b>	Change
<b>60</b>	Peak waveform
<b>120</b>	Matches reference waveform

34. Set the 90/150 Hz Field to **0**.

## STEP

PROCEDURE

---

**GLIDESLOPE**

35. Disconnect the Modulation Analyzer and 10 dB Pad from the ANT Connector and connect the Measuring Receiver to the ANT Connector.
36. Clear Range Hold on the Measuring Receiver and calibrate the Measuring Receiver for 334.700 MHz in Tuned RF Level Mode.
37. Set the RF LVL Field to **-30 dBm**.
38. Verify -30 dBm ( $\pm 3$  dB) on the Measuring Receiver.
39. Set the RF LVL Field to **-10 dBm**.
40. Verify -10 dBm ( $\pm 3$  dB) on the Measuring Receiver.
41. Disconnect the Measuring Receiver from the ANT Connector.



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G. Alternate Verification Procedures Data Sheet

Test Set S/N: \_\_\_\_\_ DATE: \_\_\_\_\_

TECHNICIAN: \_\_\_\_\_

STEP	DATA	RESULT
------	------	--------

**(1) RF Accuracy**

- |  |       |
|--|-------|
| 7. Verify 108.0 MHz ( $\pm 108$ Hz)        | _____ |
| 10. Verify 108.1 MHz ( $\pm 108.1$ Hz)     | _____ |
| 13. Verify 334.7 MHz ( $\pm 334.7$ Hz)     | _____ |
| 16. Verify 75.0 MHz ( $\pm 75$ Hz)         | _____ |
| 20. Verify 118.0 MHz ( $\pm 118$ Hz)       | _____ |
| 22. Verify 137.0 MHz ( $\pm 137$ Hz)       | _____ |
| 24. Verify 225.0 MHz ( $\pm 225$ Hz)       | _____ |
| 26. Verify 312.0 MHz ( $\pm 312$ Hz)       | _____ |
| 28. Verify 400.0 MHz ( $\pm 400$ Hz)       | _____ |
| 33. Verify 118.001 MHz ( $\pm 118.001$ Hz) | _____ |
| 35. Verify 118.002 MHz ( $\pm 118.002$ Hz) | _____ |
| 37. Verify 118.003 MHz ( $\pm 118.003$ Hz) | _____ |
| 39. Verify 118.004 MHz ( $\pm 118.004$ Hz) | _____ |
| 41. Verify 10.000 MHz ( $\pm 10$ Hz)       | _____ |
| 43. Verify 30.000 MHz ( $\pm 30$ Hz)       | _____ |

**(2) Marker Beacon**

- |  |       |
|--|-------|
| 7. Verify 400 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)    | _____ |
| 9. Verify 1300 Hz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM)   | _____ |
| 11. Verify 3000 MHz ( $\pm 0.02\%$ ) with $<2.5\%$ distortion and AM Depth of 95% AM ( $\pm 5\%$ AM) | _____ |



STEP	DATA	RESULT
------	------	--------

**(3) VOR**

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

- 7. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) -----
- 9. Verify 30 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) -----
- 10. Verify 30 Hz ( $\pm 0.02$ ). -----
- 13. Verify 9960 Hz ( $\pm 0.02\%$ ) with  $< 2.0\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) -----
- 15. Verify AM Depth of 60% AM ( $\pm 4\%$  AM) -----

**FM DEVIATION ACCURACY**

- 22. Verify 48.5  $\mu\text{s}$  ( $\pm 2.5 \mu\text{s}$ ) -----

**BEARING ACCURACY**

- 28. Verify readings:
  - 30                      210° ( $\pm 0.1^\circ$ ) -----
  - 90                      270° ( $\pm 0.1^\circ$ ) -----
  - 150                     330° ( $\pm 0.1^\circ$ ) -----
  - 210                     30° ( $\pm 0.1^\circ$ ) -----
  - 270                     90° ( $\pm 0.1^\circ$ ) -----
  - 330                     150° ( $\pm 0.1^\circ$ ) -----
- 30. Verify readings:
  - 30                      30° ( $\pm 0.1^\circ$ ) -----
  - 90                      90° ( $\pm 0.1^\circ$ ) -----
  - 150                     150° ( $\pm 0.1^\circ$ ) -----
  - 210                     210° ( $\pm 0.1^\circ$ ) -----
  - 270                     270° ( $\pm 0.1^\circ$ ) -----
  - 330                     330° ( $\pm 0.1^\circ$ ) -----
- 34. Verify readings:
  - 1                        1° ( $\pm 0.1^\circ$ ) -----
  - 2                        2° ( $\pm 0.1^\circ$ ) -----
  - 10.1                    10.1° ( $\pm 0.1^\circ$ ) -----
  - 10.2                    10.2° ( $\pm 0.1^\circ$ ) -----



STEP	DATA	RESULT
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**(4) Localizer**

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

- 7. Verify 1020 Hz ( $\pm 0.02\%$ ) with  $< 2.5\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) \_\_\_\_\_
- 9. Verify  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) \_\_\_\_\_
- 10. Verify 90 Hz ( $\pm 0.02\%$ ) \_\_\_\_\_
- 12. Verify 150 Hz ( $\pm 0.02\%$ ) \_\_\_\_\_
- 14. Verify  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) \_\_\_\_\_

Record AM Depth Measurement (% Mod) \_\_\_\_\_

**DDM ACCURACY**

- 16. Record 150 Hz Voltage readings:
  - 0.000 CENTER \_\_\_\_\_
  - 0.093 LEFT \_\_\_\_\_
  - 0.093 RIGHT \_\_\_\_\_
  - 0.155 LEFT \_\_\_\_\_
  - 0.155 RIGHT \_\_\_\_\_
  - 0.200 LEFT \_\_\_\_\_
  - 0.200 RIGHT \_\_\_\_\_
- 18. Record 90 Hz Voltage readings:
  - 0.000 CENTER \_\_\_\_\_
  - 0.093 LEFT \_\_\_\_\_
  - 0.093 RIGHT \_\_\_\_\_
  - 0.155 LEFT \_\_\_\_\_
  - 0.155 RIGHT \_\_\_\_\_
  - 0.200 LEFT \_\_\_\_\_
  - 0.200 RIGHT \_\_\_\_\_

Calculate DDM Ratio by the following equation:

$$DR = (\% \text{ mod from Step 14}) / (\text{Center voltage from Step 16} * 100) \quad \text{_____}$$

Calculate DDM by the following equation:

$$DDM = DR * (\text{value from Step 18} - \text{value from Step 16})$$

- 0.000 CENTER      0.000 ( $\pm 0.0015$  DDM) \_\_\_\_\_
- 0.093 LEFT        -0.093 ( $\pm 0.0043$  DDM) \_\_\_\_\_
- 0.093 RIGHT       0.093 ( $\pm 0.0043$  DDM) \_\_\_\_\_
- 0.155 LEFT        -0.155 ( $\pm 0.0062$  DDM) \_\_\_\_\_
- 0.155 RIGHT       0.155 ( $\pm 0.0062$  DDM) \_\_\_\_\_
- 0.200 LEFT        -0.200 ( $\pm 0.0075$  DDM) \_\_\_\_\_
- 0.200 RIGHT       0.200 ( $\pm 0.0075$  DDM) \_\_\_\_\_



STEP	DATA	RESULT
------	------	--------

**(4) Localizer (cont)**

20. Record 90 Hz Voltage readings:

0.094 Right	_____
0.095 Right	_____
0.096 Right	_____
0.097 Right	_____

22. Record 150 Hz Voltage readings:

0.094 Right	_____
0.095 Right	_____
0.096 Right	_____
0.097 Right	_____

Calculate DDM by the following equation (using DR from Step 18):

$$\text{DDM} = \text{DR} * (\text{value from Step 20} - \text{value from Step 22})$$

0.094 Right	0.094 ( $\pm 0.0053$ DDM)	_____
0.095 Right	0.095 ( $\pm 0.0054$ DDM)	_____
0.096 Right	0.096 ( $\pm 0.0054$ DDM)	_____
0.097 Right	0.097 ( $\pm 0.0054$ DDM)	_____

**PHASE ACCURACY**

27. Verify readings:

0	Reference	_____ (✓)
5	Change	_____ (✓)
10	Change	_____ (✓)
20	Change	_____ (✓)
40	Change	_____ (✓)
60	Peak waveform	_____ (✓)
120	Matches reference waveform	_____ (✓)



STEP	DATA	RESULT
------	------	--------

**(5) Glideslope**

**MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY**

- 7. Verify <2.5% distortion and AM Depth of 40% AM (±2% AM) \_\_\_\_\_
- 8. Verify 90 Hz (±0.02%) \_\_\_\_\_
- 10. Verify 150 Hz (±0.02%) \_\_\_\_\_
- 12. Verify <2.5% distortion and AM Depth of 40% AM (±2% AM) \_\_\_\_\_
- Record AM Depth Measurement (% Mod) \_\_\_\_\_

**DDM ACCURACY**

- 16. Record 150 Hz Voltage readings:
  - 0.000 CENTER \_\_\_\_\_
  - 0.091 UP \_\_\_\_\_
  - 0.091 DOWN \_\_\_\_\_
  - 0.175 UP \_\_\_\_\_
  - 0.175 DOWN \_\_\_\_\_
  - 0.400 UP \_\_\_\_\_
  - 0.400 DOWN \_\_\_\_\_
- 18. Record 90 Hz Voltage readings:
  - 0.000 CENTER \_\_\_\_\_
  - 0.091 UP \_\_\_\_\_
  - 0.091 DOWN \_\_\_\_\_
  - 0.175 UP \_\_\_\_\_
  - 0.175 DOWN \_\_\_\_\_
  - 0.400 UP \_\_\_\_\_
  - 0.400 DOWN \_\_\_\_\_

Calculate DDM Ratio by the following equation:

$$DR = (\% \text{ mod from Step 12}) / (\text{Center voltage from Step 16} * 100) \quad \text{_____}$$

Calculate DDM by the following equation:

$$DDM = DR * (\text{value from Step 16} - \text{value from Step 18})$$

- 0.000 CENTER      0.000 (±0.003 DDM)      \_\_\_\_\_
- 0.091 UP          0.091 (±0.0057 DDM)      \_\_\_\_\_
- 0.091 DOWN       -0.091 (±0.0057 DDM)      \_\_\_\_\_
- 0.175 UP          0.175 (±0.0083 DDM)      \_\_\_\_\_
- 0.175 DOWN       -0.175 (±0.0083 DDM)      \_\_\_\_\_
- 0.400 UP          0.400 (±0.0150 DDM)      \_\_\_\_\_
- 0.400 DOWN       -0.400 (±0.0150 DDM)      \_\_\_\_\_



STEP	DATA	RESULT
------	------	--------

**(5) Glideslope (cont)**

20. Record 90 Hz Voltage readings:

0.176 UP	-----
0.177 UP	-----
0.178 UP	-----
0.179 UP	-----

22. Record 150 Hz Voltage readings:

0.176 UP	-----
0.177 UP	-----
0.178 UP	-----
0.179 UP	-----

Calculate DDM by the following equation (using DR from Step 18):

$$\text{DDM} = \text{DR} * (\text{value from Step 22} - \text{value from Step 20})$$

0.176 UP	0.176 ( $\pm 0.0101$ DDM)	-----
0.177 UP	0.177 ( $\pm 0.0101$ DDM)	-----
0.178 UP	0.178 ( $\pm 0.0101$ DDM)	-----
0.179 UP	0.179 ( $\pm 0.0101$ DDM)	-----

**PHASE ACCURACY**

26. Verify readings:

0	Reference	----- (✓)
5	Change	----- (✓)
10	Change	----- (✓)
20	Change	----- (✓)
40	Change	----- (✓)
60	Peak waveform	----- (✓)
120	Matches reference waveform	----- (✓)



STEP	DATA	RESULT
------	------	--------

**(6) ILS**

**MARKER BEACON**

- 7. Verify 75 MHz ( $\pm 75$  Hz) and tone frequency of 400 Hz ( $\pm 0.02\%$ ) with  $< 5\%$  distortion and AM Depth of 95% AM ( $\pm 5\%$  AM) -----
- 9. Verify 1300 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and AM Depth of 95% AM ( $\pm 3.75\%$  AM) -----
- 11. Verify 3000 Hz ( $\pm 0.02\%$ ) with  $< 3.75\%$  distortion and AM Depth of 95% AM ( $\pm 3.75\%$  AM) -----

**LOCALIZER**

- 13. Verify 108.100 MHz ( $\pm 108.1$  Hz) and tone frequency of 1020 Hz ( $\pm 0.02\%$ ) at -10 dBm ( $\pm 2.5$  dB) with  $< 2.5\%$  distortion and AM Depth of 30% AM ( $\pm 2\%$  AM) -----
- 15. Verify  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) -----
- 16. Verify 90 Hz ( $\pm 0.02\%$ ) -----
- 18. Verify 150 Hz ( $\pm 0.02\%$ ) -----
- 20. Verify  $< 2.5\%$  distortion and AM Depth of 20% AM ( $\pm 2\%$  AM) -----

Record AM Depth Measurement (% Mod) -----

**DDM ACCURACY**

- 22. Record 150 Hz Voltage readings:
  - 0.000 CENTER -----
  - 0.093 LEFT -----
  - 0.093 RIGHT -----
  - 0.155 LEFT -----
  - 0.155 RIGHT -----
  - 0.200 LEFT -----
  - 0.200 RIGHT -----
- 24. Record 90 Hz Voltage readings:
  - 0.000 CENTER -----
  - 0.093 LEFT -----
  - 0.093 RIGHT -----
  - 0.155 LEFT -----
  - 0.155 RIGHT -----
  - 0.200 LEFT -----
  - 0.200 RIGHT -----



STEP	DATA	RESULT
------	------	--------

**(6) ILS (cont)**

Calculate DDM Ratio by the following equation:

$$DR = (\% \text{ mod from Step 20}) / (\text{Center voltage from Step 22} * 100) \quad \text{-----}$$

Calculate DDM by the following equation:

$$DDM = DR * (\text{value from Step 24} - \text{value from Step 22})$$

0.000 CENTER	0.000 ( $\pm 0.0015$ DDM)	-----
0.093 LEFT	-0.093 ( $\pm 0.0043$ DDM)	-----
0.093 RIGHT	0.093 ( $\pm 0.0043$ DDM)	-----
0.155 LEFT	-0.155 ( $\pm 0.0062$ DDM)	-----
0.155 RIGHT	0.155 ( $\pm 0.0062$ DDM)	-----
0.200 LEFT	-0.200 ( $\pm 0.0075$ DDM)	-----
0.200 RIGHT	0.200 ( $\pm 0.0075$ DDM)	-----

26. Record 90 Hz Voltage readings:

0.094 Right	-----
0.095 Right	-----
0.096 Right	-----
0.097 Right	-----

28. Record 150 Hz Voltage readings:

0.094 Right	-----
0.095 Right	-----
0.096 Right	-----
0.097 Right	-----

Calculate DDM by the following equation (using DR from Step 24 above):

$$DDM = DR * (\text{value from Step 26} - \text{value from Step 28})$$

0.094 Right	0.094 ( $\pm 0.0053$ DDM)	-----
0.095 Right	0.095 ( $\pm 0.0054$ DDM)	-----
0.096 Right	0.096 ( $\pm 0.0054$ DDM)	-----
0.097 Right	0.097 ( $\pm 0.0054$ DDM)	-----



STEP	DATA	RESULT
<b>(6) ILS (cont)</b>		
<b>PHASE ACCURACY</b>		
33. Verify readings:		
0	Reference	_____ (✓)
5	Change	_____ (✓)
10	Change	_____ (✓)
20	Change	_____ (✓)
40	Change	_____ (✓)
60	Peak waveform	_____ (✓)
120	Matches reference waveform	_____ (✓)
<b>GLIDESLOPE</b>		
38. Verify -30 dBm ( $\pm 3$ dB)		_____
40. Verify -10 dBm ( $\pm 3$ dB)		_____



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## H. Calibration

### (1) Test Setup

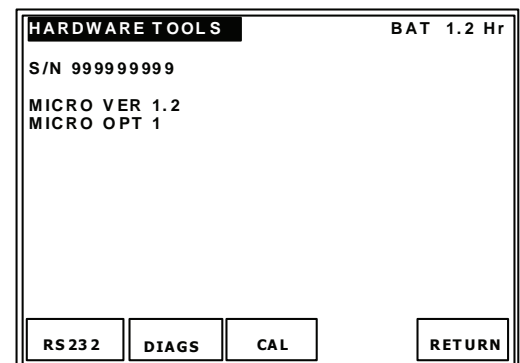
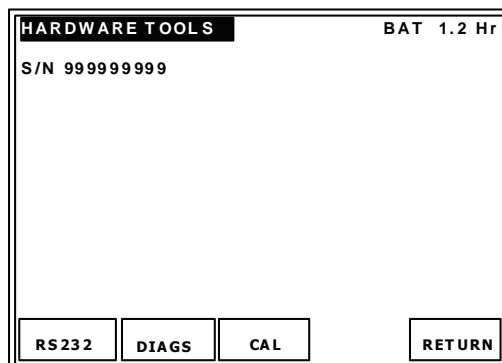
<b>PREREQUISITES:</b>	Self Test (para 2-2-3D[1])
<b>TEST EQUIPMENT:</b>	Measuring Receiver Signal Generator Audio Analyzer Power Meter TNC Precision Short (Male) RF Amplifier (100 W) 20 dB Directional Coupler (N-Type Connector) 20 dB N-Connector Attenuator 15 MHz Low-Pass Filter (N-Type Connector) 250 MHz Low-Pass Filter (N-Type Connector) 450 MHz Low-Pass Filter (N-Type Connector) 10 dB BNC Connector Attenuator 3 dB, 100 W N-Type Connector Attenuator

STEP	PROCEDURE
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1. Allow 15 minute warm-up for Test Set.
2. Connect the Measuring Receiver to the Signal Generator and calibrate the Measuring Receiver in Tuned RF Level Mode at the following frequencies (storing the calibration in the storage location indicated):

1	113.000 MHz	5	400.000 MHz
2	75.000 MHz	6	175.000 MHz
3	225.000 MHz	7	10.000 MHz
4	332.000 MHz	8	25.000 MHz

3. Connect the Measuring Receiver (Modulation Output/Audio Input) to the Audio Analyzer (High Input). Set the Audio Analyzer to Distortion (DISTN).
4. Press the SETUP Key to display the Setup Menu.
5. Press the H/W TOOLS Soft Key to display the Hardware Tools Screen.



6. If "MICRO VER 1.2 and MICRO OPT 1" are displayed on the Hardware Tools Screen, perform Steps 7, 8 and 10; otherwise, perform Steps 7, 8 and 9.
7. Press the CAL Soft Key to display the Calibration Screen.

STEP PROCEDURE

8. Enter password (3524) to display the Calibration Screen.
9. Characterize and record the loss of the Power Meter Calibration Setup (2-2-3, Figure 5):
  - Measure the loss (at 200 MHz) between the Signal Generator and the 20 dB attenuator on the coupled port of the directional coupler. Record as A.
  - Measure the loss (at 200 MHz) between the Signal Generator and the end of the coaxial cable going to the RF I/O Connector. Record as B.
  - Subtract Loss (B) from Loss (A) and record.

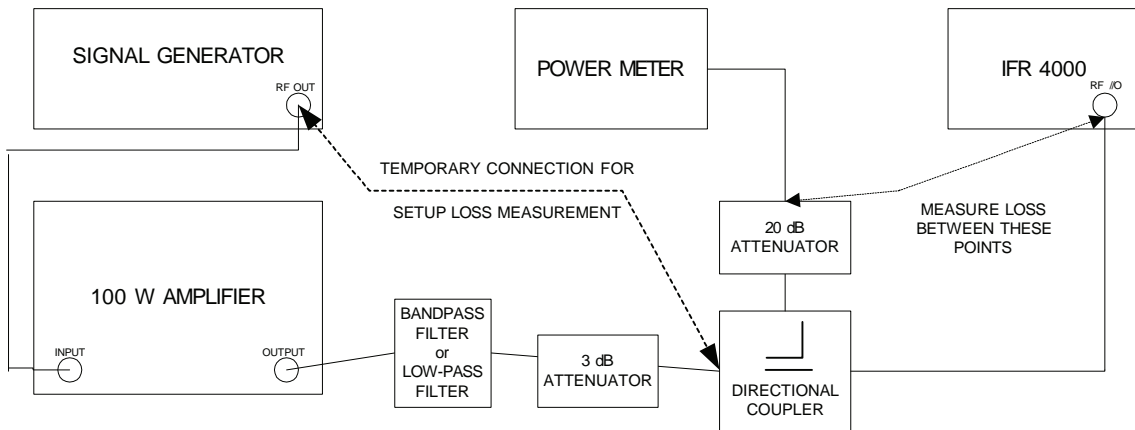
**Characterize Test Setup:**

FREQ	A	B	OFFSET
200 MHz	_____	_____	_____

10. Characterize and record the loss of the Power Meter Calibration Setup (2-2-3, Figure 5):
  - Measure the loss (at 10, 200 and 400 MHz) between the Signal Generator and the 20 dB attenuator on the coupled port of the directional coupler. Record as A.
  - Measure the loss (at 10, 200 and 400 MHz) between the Signal Generator and the end of the coaxial cable going to the RF I/O Connector. Record as B.
  - Subtract Loss (B) from Loss (A) and record.

**Characterize Test Setup:**

FREQ	A	B	OFFSET
10 MHz	_____	_____	_____
200 MHz	_____	_____	_____
400 MHz	_____	_____	_____



Power Meter Calibration Setup  
Figure 5

(2) Miscellaneous

<b>PREREQUISITES:</b>	Test Setup (para 2-2-3H[1])
<b>TEST EQUIPMENT:</b>	Measuring Receiver Signal Generator Audio Analyzer Power Meter TNC Precision Short (Male) RF Amplifier (100 W) 20 dB Directional Coupler (N-Type Connector) 20 dB N-Connector Attenuator 250 MHz Low-Pass Filter (N-Type Connector) 10 dB BNC Connector Attenuator 3 dB, 100 W N-Type Connector Attenuator

STEP	PROCEDURE
1.	From the Calibration Screen, press the MISC CALS Soft Key to enter the MISC CALS Screen.
	<b>TXCO</b>
2.	Press the TCXO Soft Key to display the TCXO CAL Sequence Screen.
3.	Connect the Signal Generator to the AUX I/O Connector. Set the Signal Generator for 10.000 MHz, +6 dBm output and no modulation. (The Signal Generator should have a frequency error of <0.1 PPM.)
4.	Press the START Soft Key to begin the TCXO CAL Sequence.
5.	When the TCXO CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MISC CALS Screen.
6.	Disconnect the Signal Generator.
	<b>SWR</b>
7.	Press the SWR Soft Key to display the SWR CAL Sequence Screen.
8.	Connect TNC Short to the SWR Connector.
9.	Press the NEXT Soft Key to begin the SWR CAL Sequence and follow the on-screen prompts.
10.	When the SWR CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MISC CALS Screen.
	<b>POWER METER</b>
11.	Press the POWER METER Soft Key to display the POWER METER CAL Sequence Screen.
12.	Connect Test Equipment to Test Set as shown in 2-2-3, Figure 5. Using the loss figure recorded in 2-2-3H(2) Step 8, input that number as an offset in the Power Meter and set the Power Meter to read Watts.

---

STEP	PROCEDURE
------	-----------

---

13. Follow the on-screen prompts, adjusting the Signal Generator output level to achieve the Power Meter readings indicated on the Test Set.

**CAUTION:** USE CAUTION WHEN PERFORMING THE >10 W CALS AS THE TEST SET IS NOT RATED FOR CONTINUOUS INPUT AT THESE LEVELS. COMPLETE THESE STEPS AS QUICKLY AS POSSIBLE, AND REDUCE THE INPUT POWER AS SOON AS POSSIBLE. DO NOT ALLOW THE TEMPERATURE INDICATED ON THE TEST SET CAL SCREEN TO EXCEED 35 °C. (INPUT POWER MAY NEED TO BE REDUCED BETWEEN HIGHER LEVEL SETTINGS TO ALLOW THE POWER TERMINATION TO COOL.)

14. When the POWER METER CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MISC CAL Screen.

**FM**

15. Press the FM CAL Soft Key to display the FM CAL Screen.
16. Press the FM DEV Soft Key to display the FM DEV CAL Sequence Screen.
17. Connect the Signal Generator to the ANT Connector. Set the Signal Generator for 156.000 MHz at -20 dBm with FM Modulation enabled.
18. Follow the on-screen prompts and set the FM deviation on the Signal Generator as indicated. When changing deviation levels, wait several seconds before pressing the NEXT Soft Key to allow the 4000 to average the modulation.
19. When the FM DEV CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MISC CAL Screen.
20. Press the FM GEN Soft Key to display the FM GEN CAL Sequence Screen.
21. Follow the on-screen prompts to calibrate FM Low.
22. When the FM GEN CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the FM CAL Screen.
23. Press the RETURN Soft Key to return to the Calibration Screen.

## (3) RF Amplitude Levels

**PREREQUISITES:** Test Setup (para 2-2-3H[1])  
 Miscellaneous (para 2-2-3H[2])

**TEST EQUIPMENT:** Measuring Receiver w/ Sensor Head

**NOTE:** Before connecting the Measuring Receiver to the 4000, the following frequencies should be calibrated and the Tuned RF levels should be saved in the Measuring Receiver: 10, 25, 75, 113, 225, 332 and 400 MHz.

STEP	PROCEDURE
1.	From the Calibration Screen, press the AMPLVL CALS Soft Key to enter the AMPL LEVEL CAL Screen.
	<b>MAIN</b>
2.	Press the MAIN Soft Key to display the MAIN AMPL LEVEL Sequence Screen.
3.	Connect Measuring Receiver Sensor Head to the ANT Connector.
4.	Switch between TUNED RF LEVEL and AM on the Measuring Receiver as necessary. (For AM measurements, use the Peak $\pm 2$ detector, and the 3 kHz Low-Pass Filter. Use no High Pass filtering.) (For distortion measurements, use the 80 kHz Low-Pass Filter on the Audio Analyzer. Use no High Pass filtering.)
5.	Follow the on-screen prompts and recall stored calibration levels on the Measuring Receiver (para 2-2-3H[1], Step 2). For the MAIN AMPL LEVEL Sequence, the AM modulation setting error must be <0.5% and the amplitude setting error must be <0.1 dB.
6.	Reference the following: <ul style="list-style-type: none"> <li>● <u>Step 1 of MAIN AMPL LEVEL Sequence</u> Turn modulation OFF to set and check RF level. Toggling the UUT Modulation field between OFF and ON and the Measuring Receiver between AM and TUNED RF LEVEL several times may be required to meet the requirements of this step.</li> <li>● <u>Step 2 of MAIN AMPL LEVEL Sequence</u> Once the VALUE: field has been set for minimum distortion, use the PREV Soft Key to return to Step 1. Steps 1 and 2 are interactive; toggling between the two is required to meet the requirements of the steps.</li> <li>● <u>Steps 3 to 8 of MAIN AMPL LEVEL Sequence</u> Follow the on-screen prompts and recall the necessary calibrations on the Measuring Receiver.</li> <li>● <u>Steps 9 to 29 of MAIN AMPL LEVEL Sequence</u> Connect the Measuring Receiver Sensor Head to the RF I/O Connector.</li> <li>● <u>Steps 30 to 37 of MAIN AMPL LEVEL Sequence</u> Follow the on-screen prompts and recall the necessary calibrations on the Measuring Receiver. If the frequency prompted on the screen is not already saved in the Measuring Receiver, press the Measuring Receiver Calibrate button and allow the cal routine to complete before setting the UUT VALUE: field.</li> </ul>
7.	When the MAIN AMPL LEVEL Sequence is complete, press the SAVE & RETURN Soft Key to return to the AMPL LEVEL CAL Screen.

STEP	PROCEDURE
------	-----------

**LOC**

8. Press the LOC Soft Key to display the LOC AMPL LEVEL Sequence Screen.
9. Connect Measuring Receiver Sensor Head to the ANT Connector.
10. Follow the on-screen prompts and recall stored calibration levels on the Measuring Receiver (para 2-2-3H[1] Step 2). For the LOC AMPL LEVEL Sequence, the AM modulation setting error must be <0.5% and the amplitude setting error must be <0.1 dB.
11. Reference the following:
  - Step 1 of LOC AMPL LEVEL Sequence  
Turn modulation OFF to set and check RF level. Toggling the UUT Modulation field between OFF and ON and the Measuring Receiver between AM and TUNED RF LEVEL several times may be required to meet the requirements of this step.
  - Step 2 of LOC AMPL LEVEL Sequence  
Once the VALUE: field has been set for minimum distortion, use the PREV Soft Key to return to Step 1. Steps 1 and 2 are interactive; toggling between the two is required to meet the requirements of the steps.
12. When the LOC AMPL LEVEL Sequence is complete, press the SAVE & RETURN Soft Key to return to the AMPL LEVEL Cal Screen.

**MKR**

13. Press the MKR Soft Key to display the MKR AMPL LEVEL Sequence Screen.
14. Connect 10 dB Attenuator between Measuring Receiver Sensor Head and ANT Connector.
15. Follow the on-screen prompts and recall stored calibration levels on the Measuring Receiver (para 2-2-3H[1] Step 2). For the LOC AMPL LEVEL Sequence, the AM modulation setting error must be <1% and the amplitude setting error must be <0.1 dB (taking into account the 10 dB Attenuator).
16. Reference the following:
  - Step 1 to 2 of MKR AMPL LEVEL Sequence  
Turn modulation OFF to set and check RF level. Toggling the UUT Modulation field between OFF and ON and the Measuring Receiver between AM and TUNED RF LEVEL several times may be required to meet the requirements of this step.
  - Step 3 of MKR AMPL LEVEL Sequence  
Select 15 kHz Low-Pass Filter on the Measuring Receiver.
17. When the MKR AMPL LEVEL Sequence is complete, press the SAVE & RETURN Soft Key to return to the AMPL LEVEL Cal Screen.
18. Press the RETURN Soft Key to return to the Calibration Screen.

## (4) Modulation

<b>PREREQUISITES:</b>	Test Setup (para 2-2-3H[1]) Miscellaneous (para 2-2-3H[2]) RF Amplitude Levels (para 2-2-3H[3])
<b>TEST EQUIPMENT:</b>	Measuring Receiver w/ Sensor Head Digital Multimeter (DMM)

STEP	PROCEDURE
1.	From the Calibration Screen, press the MOD CALS Soft Key to enter the MODULATION CAL Screen.
	<b>VOR</b>
2.	Press the VOR Soft Key to display the VOR CAL Sequence Screen.
3.	Connect Measuring Receiver Sensor Head to the ANT Connector.
4.	Select AM on the Measuring Receiver as necessary. (For AM measurements, use the Peak $\pm/2$ detector, and the 3 kHz Low-Pass Filter. Use no High Pass filtering.)
5.	Follow the on-screen prompts and recall stored calibration levels on the Measuring Receiver as needed. For the VOR CAL Sequence, the AM modulation setting error must be <0.5% and the amplitude setting error must be <0.1 dB.
6.	Reference the following: <ul style="list-style-type: none"> <li>● <u>Step 1 of VOR CAL Sequence</u> Select 3 kHz Low-Pass Filter on the Measuring Receiver.</li> <li>● <u>Step 2 of VOR CAL Sequence</u> Select 15 kHz Low-Pass Filter on the Measuring Receiver.</li> <li>● <u>Step 3 of VOR CAL Sequence</u> Select 3 kHz Low-Pass Filter on the Measuring Receiver.</li> </ul>
7.	When the VOR CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.
	<b>MAIN LOC</b>
8.	Press the MAIN LOC Soft Key to display the MAIN PATH LOC Sequence Screen.
9.	Connect Digital Multimeter to the AUX I/O Connector. Set DMM to read AC Volts.
10.	Follow the on-screen prompts.
11.	When the MAIN PATH LOC Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.
	<b>MAIN G/S</b>
12.	Press the MAIN G/S Soft Key to display the MAIN PATH G/S Sequence Screen.
13.	Connect Measuring Receiver Sensor Head to the ANT Connector.
14.	Set Measuring Receiver input frequency to 332.000 MHz. (For AM measurements, use the 3 kHz Low-Pass Filter. Use no High Pass filtering.)
15.	Follow the on-screen prompts.
16.	When the MAIN PATH G/S Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.

## STEP

PROCEDURE

---

**LOC LOC**

17. Press the LOC LOC Soft Key to display the LOC PATH LOC Sequence Screen.
18. Connect Measuring Receiver Sensor Head to the ANT Connector.
19. Set Measuring Receiver input frequency to 110.05 MHz. (For AM measurements, use the 3 kHz Low-Pass Filter. Use no High Pass filtering.)
20. Follow the on-screen prompts.
21. When the LOC PATH LOC Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.
22. Press the RETURN Soft Key until the Setup Menu is displayed.
23. Disconnect test equipment from Test Set.

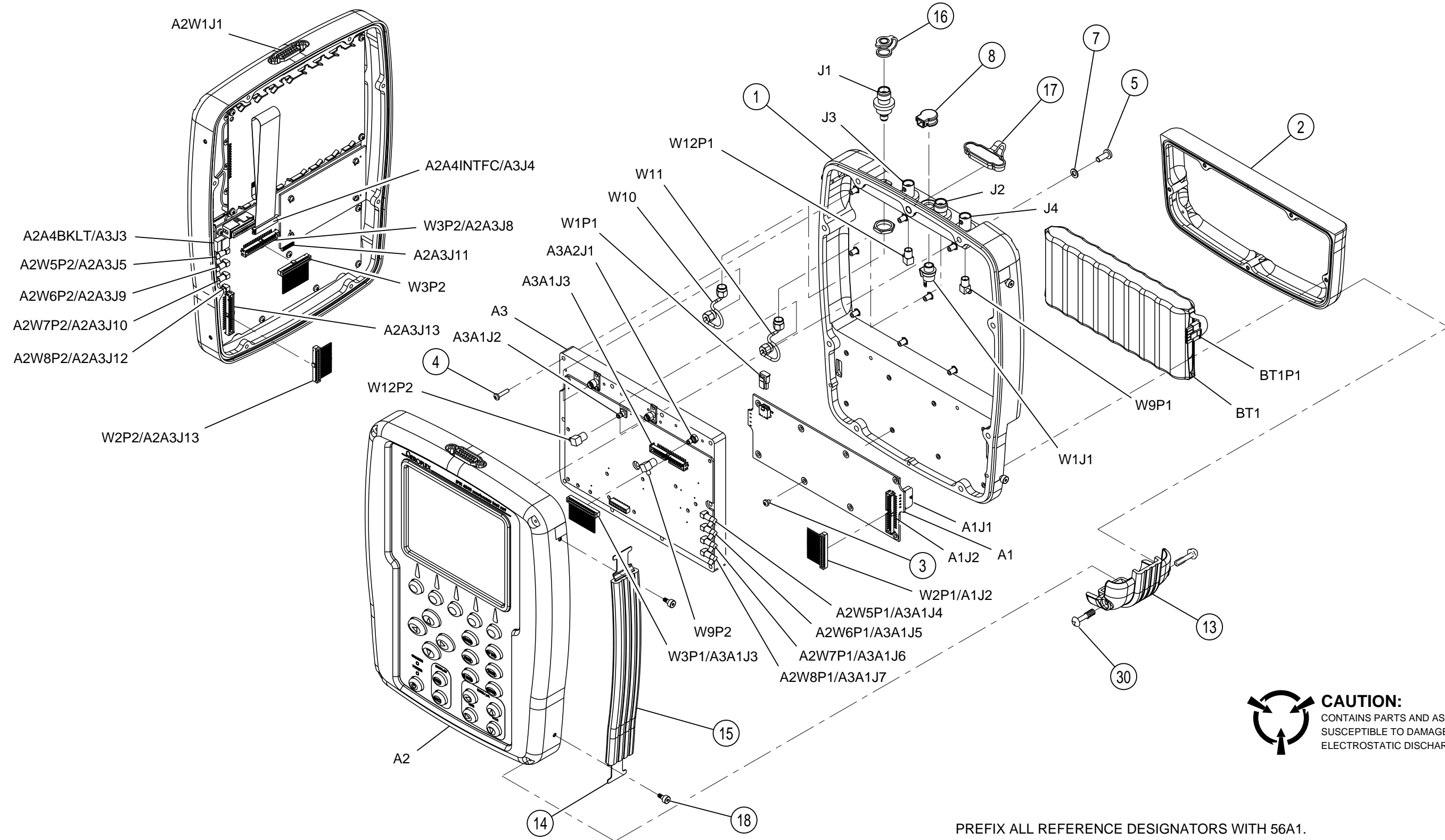


4. Assembly Drawings

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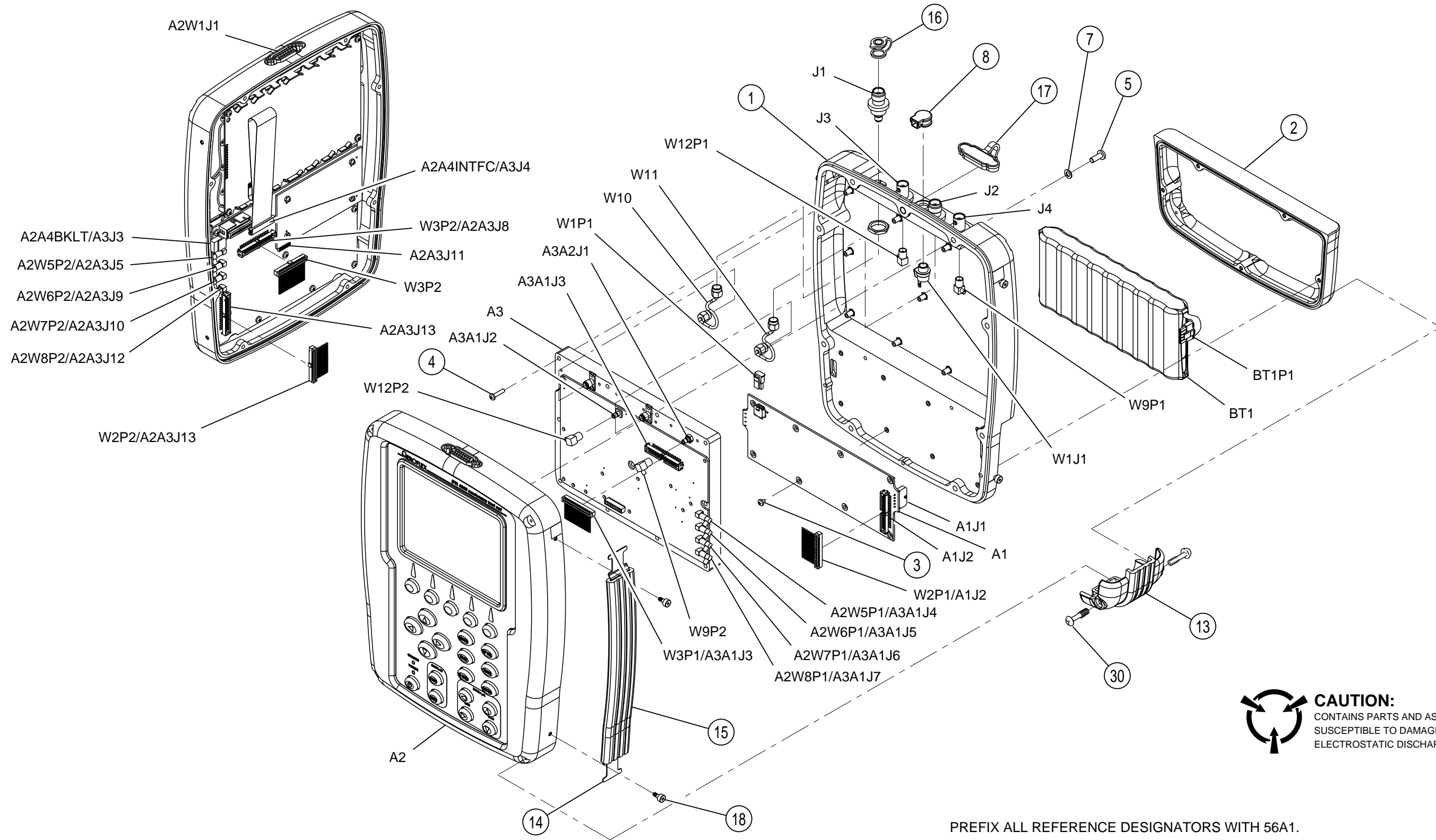
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

056M-011

(7003-5640-000-B, C, D, E, F, G, H) (64072)

Figure 6 Composite Assy (Sheet 1 of 4)  
(56A1)



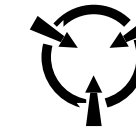
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

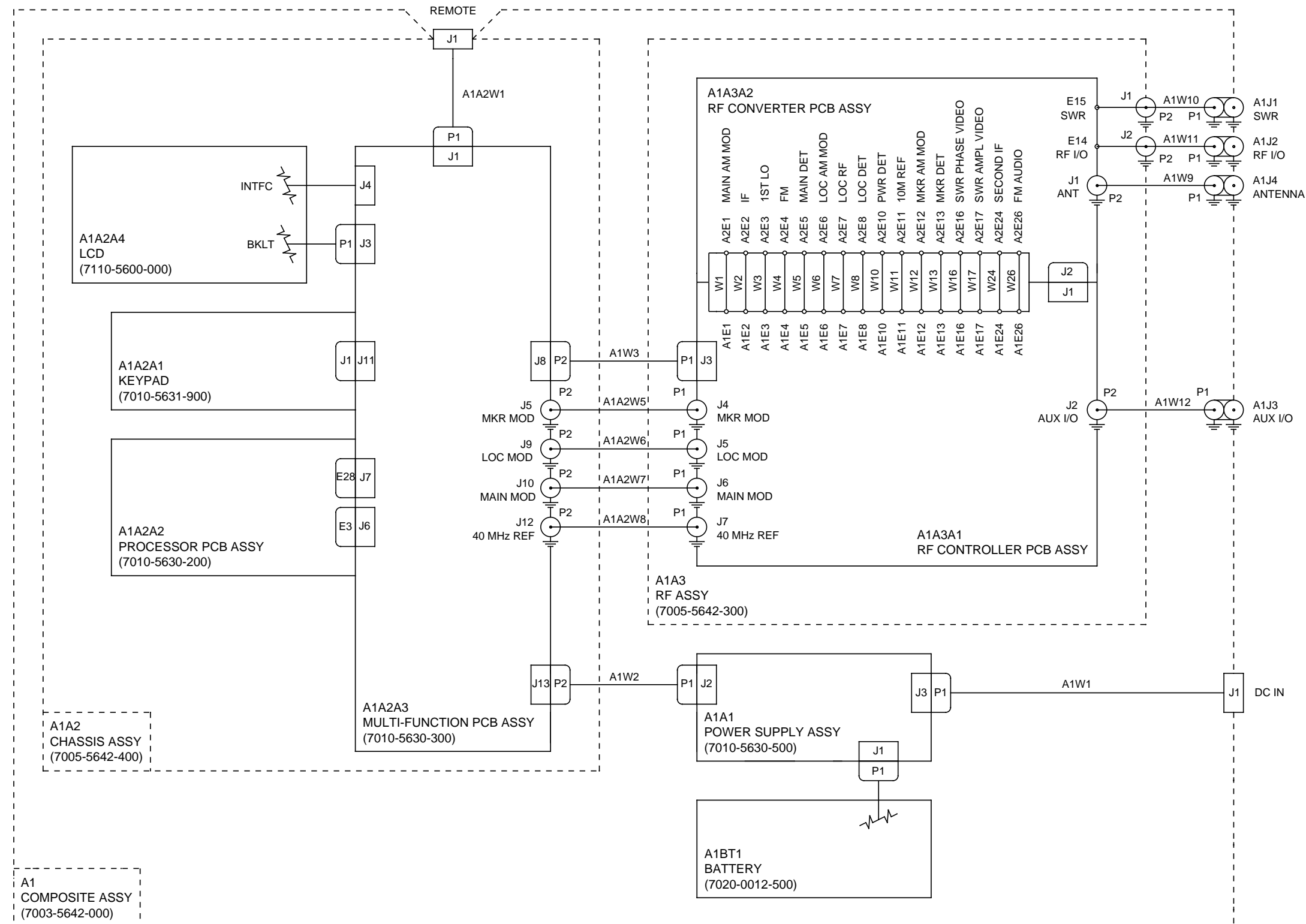
056M-011

(7003-5642-000-A, B) (64073)

Figure 6 Composite Assy (Sheet 2 of 4)  
(56A1)



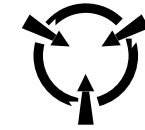
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



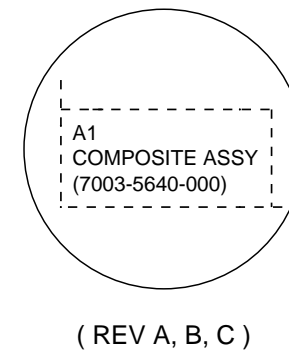
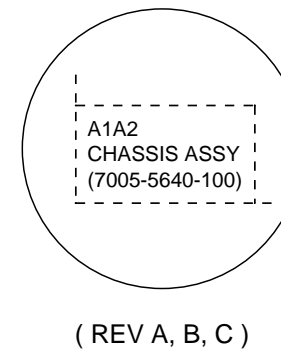
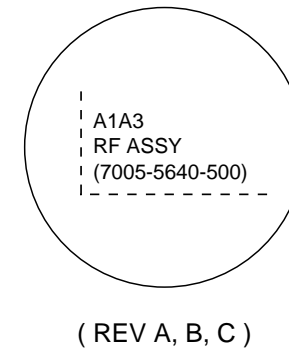
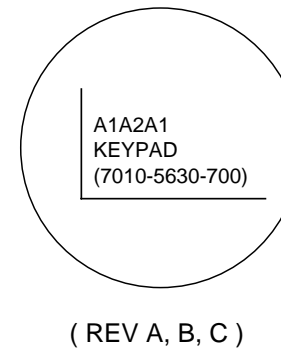
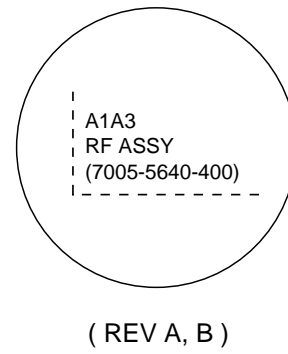
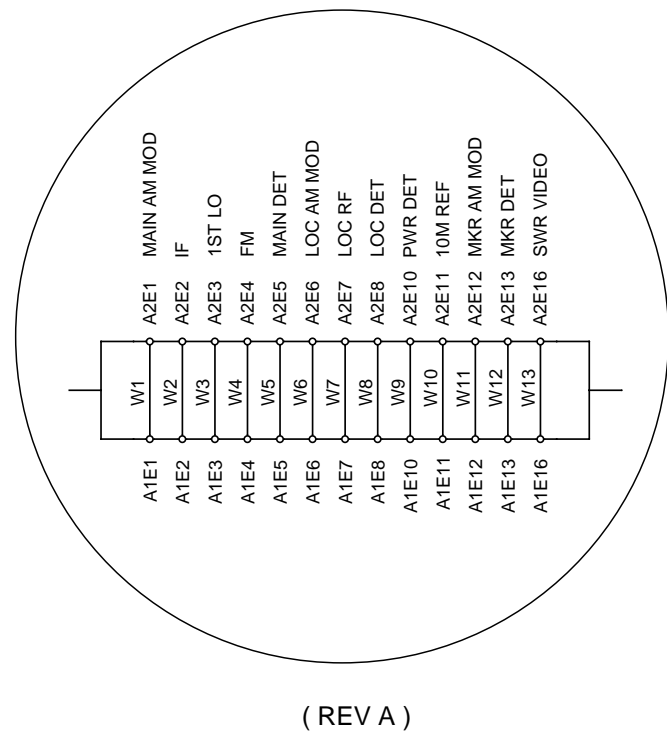
056M-10a

(0000-5640-000-D)

Figure 6 Composite Assy (Sheet 3 of 4)  
(System Interconnect Diagram) (56A1)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



(0000-5640-000-D)

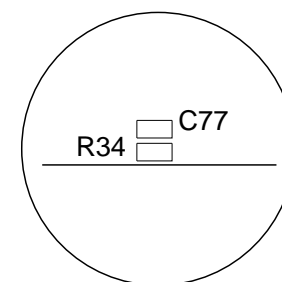
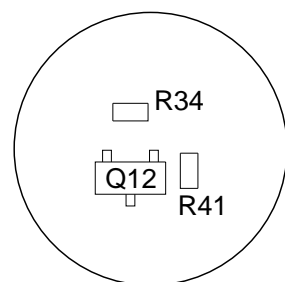
Figure 6 Composite Assy (Sheet 4 of 4)  
(System Interconnect Diagram) (56A1)

056M-10b

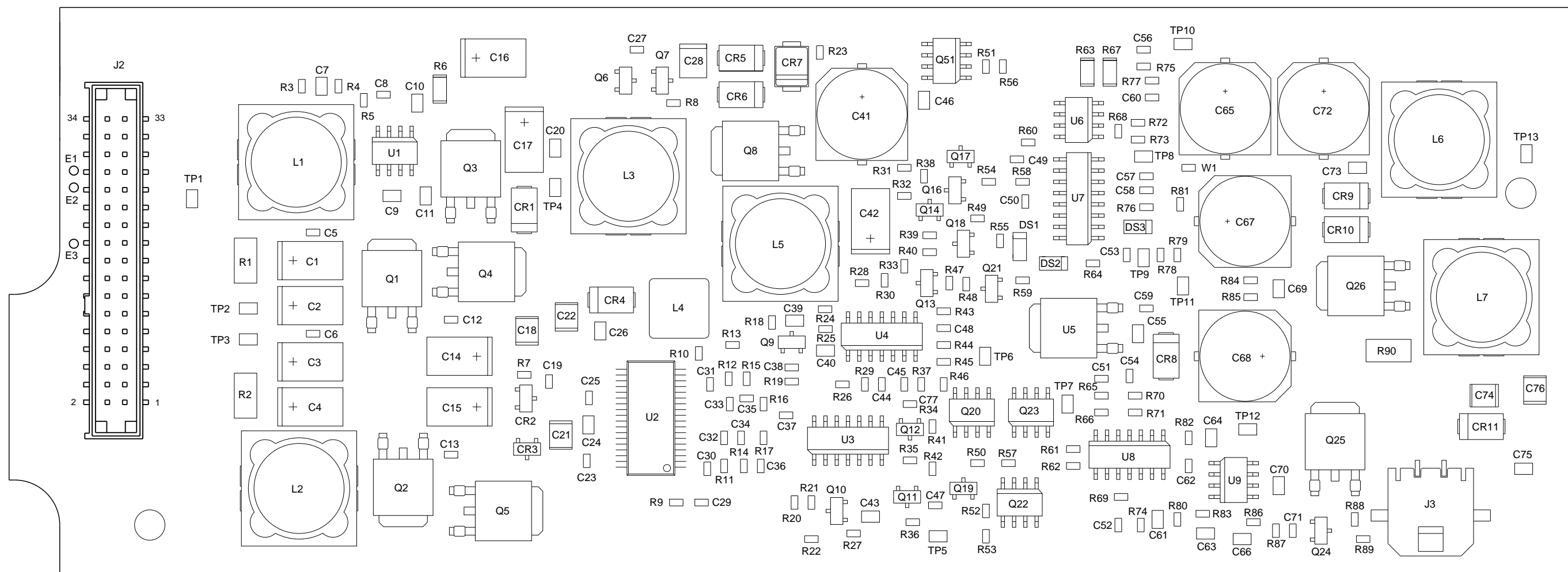


**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

(REV B1, C, D, E, F)



DETAIL  
(R34, C77)



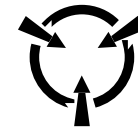
(TOP VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A1.

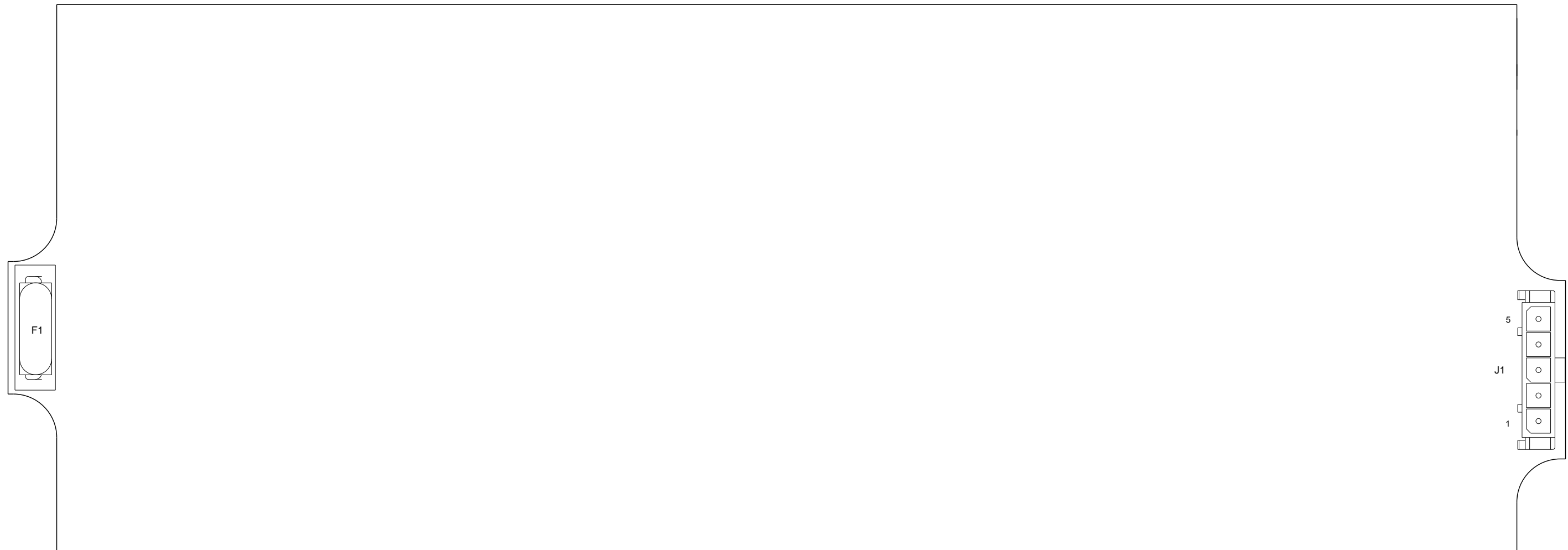
(7010-5630-500-G) (65952-A0, B0)

056M-05c

Figure 7 Power Supply PCB Assy (Sheet 1 of 12)  
(56A1A1)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



(BOTTOM VIEW)

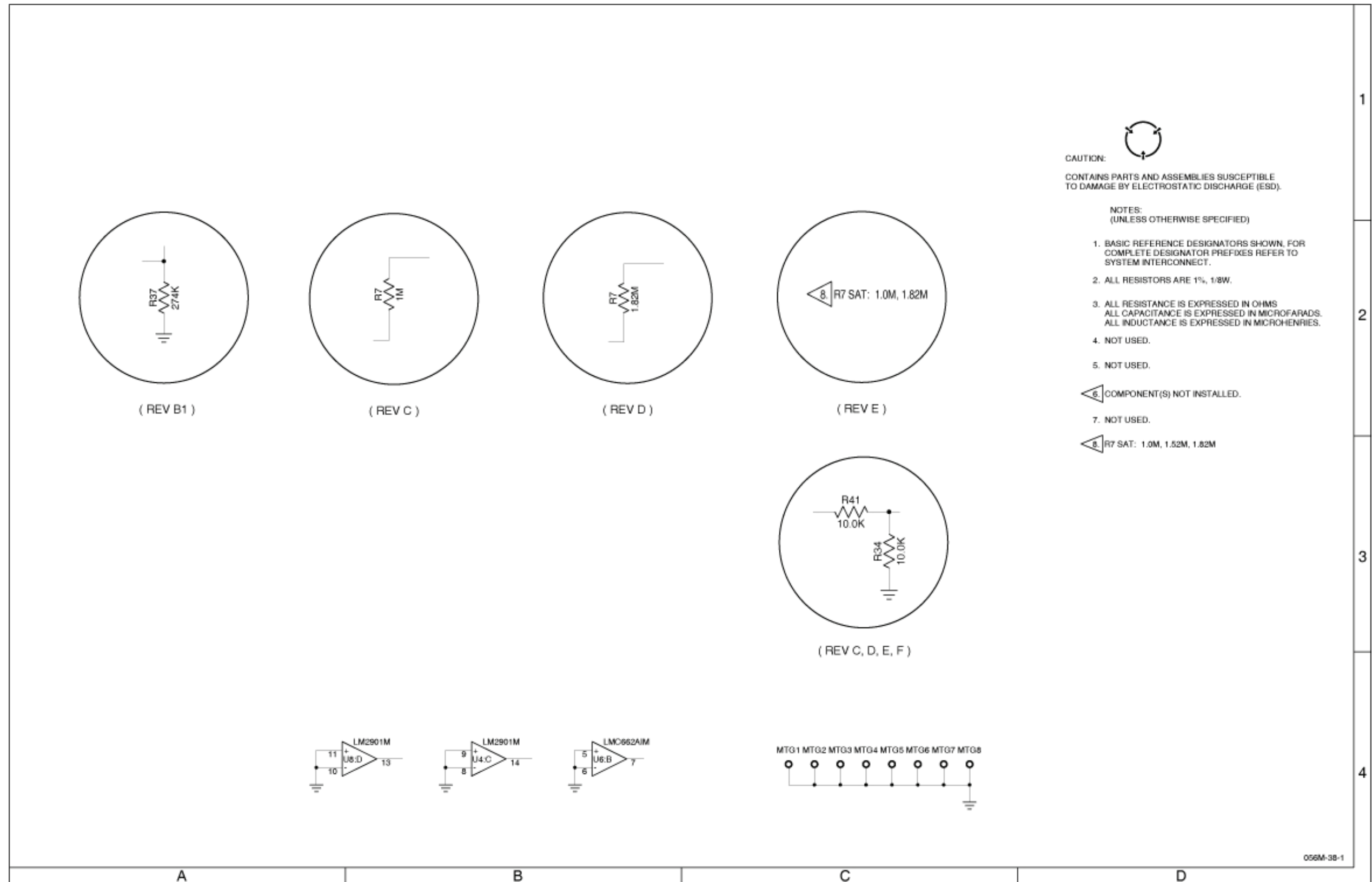
PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A1.

(7010-5630-500-B1, C, D, E, F, G) (65952-A0, B0)

056M-05b

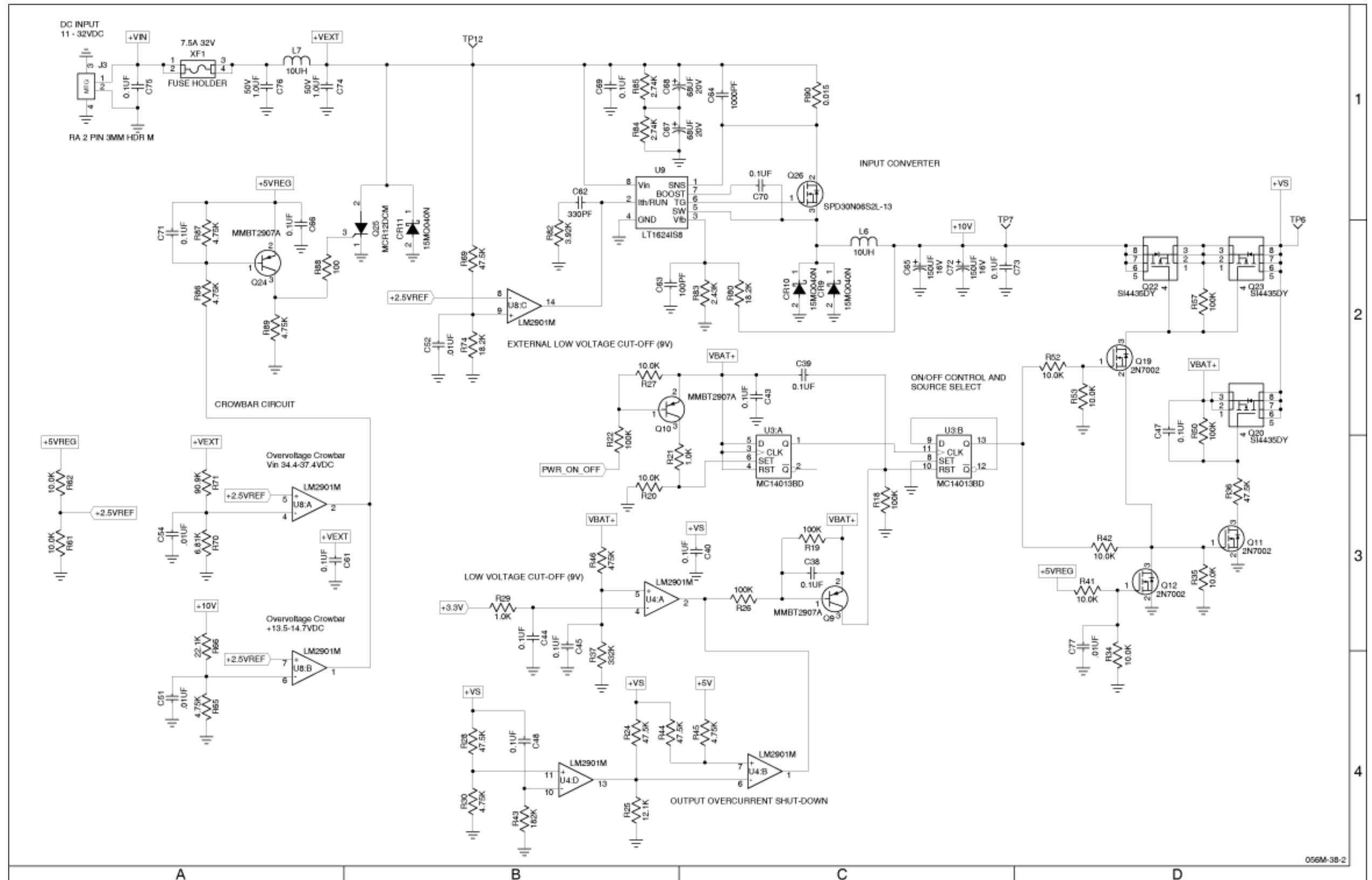
Figure 7 Power Supply PCB Assy (Sheet 2 of 12)  
(56A1A1)





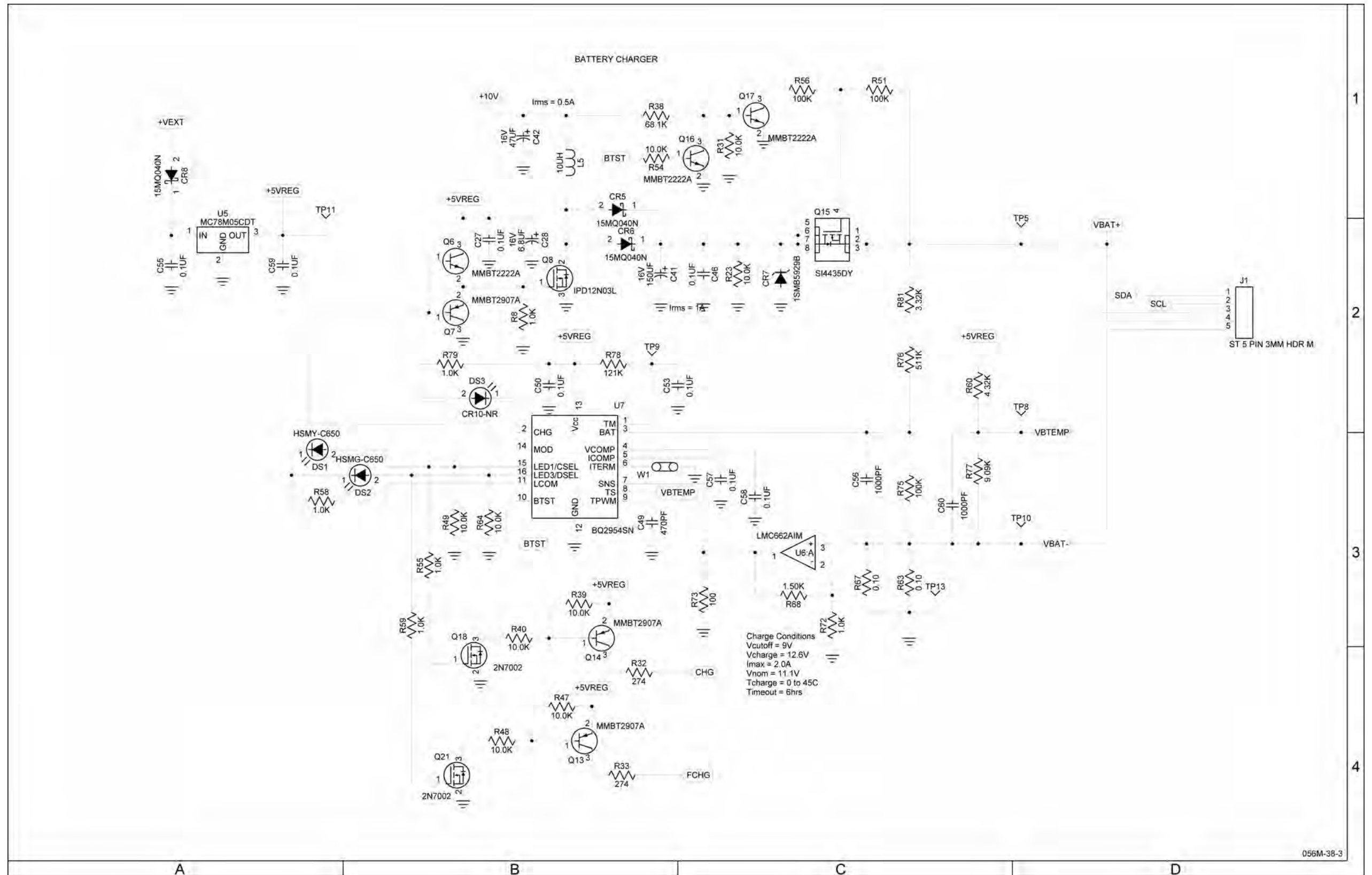
(0000-5630-500-G)

Figure 7 Power Supply PCB Assy (Sheet 3 of 12)  
(Circuit Schematic - Sheet 1 of 10) (56A1A1)



(0000-5630-500-G)

Figure 7 Power Supply PCB Assy (Sheet 4 of 12)  
(Circuit Schematic - Sheet 2 of 10) (56A1A1)



(0000-5630-500-G)

Figure 7 Power Supply PCB Assy (Sheet 5 of 12)  
(Circuit Schematic - Sheet 3 of 10) (56A1A1)

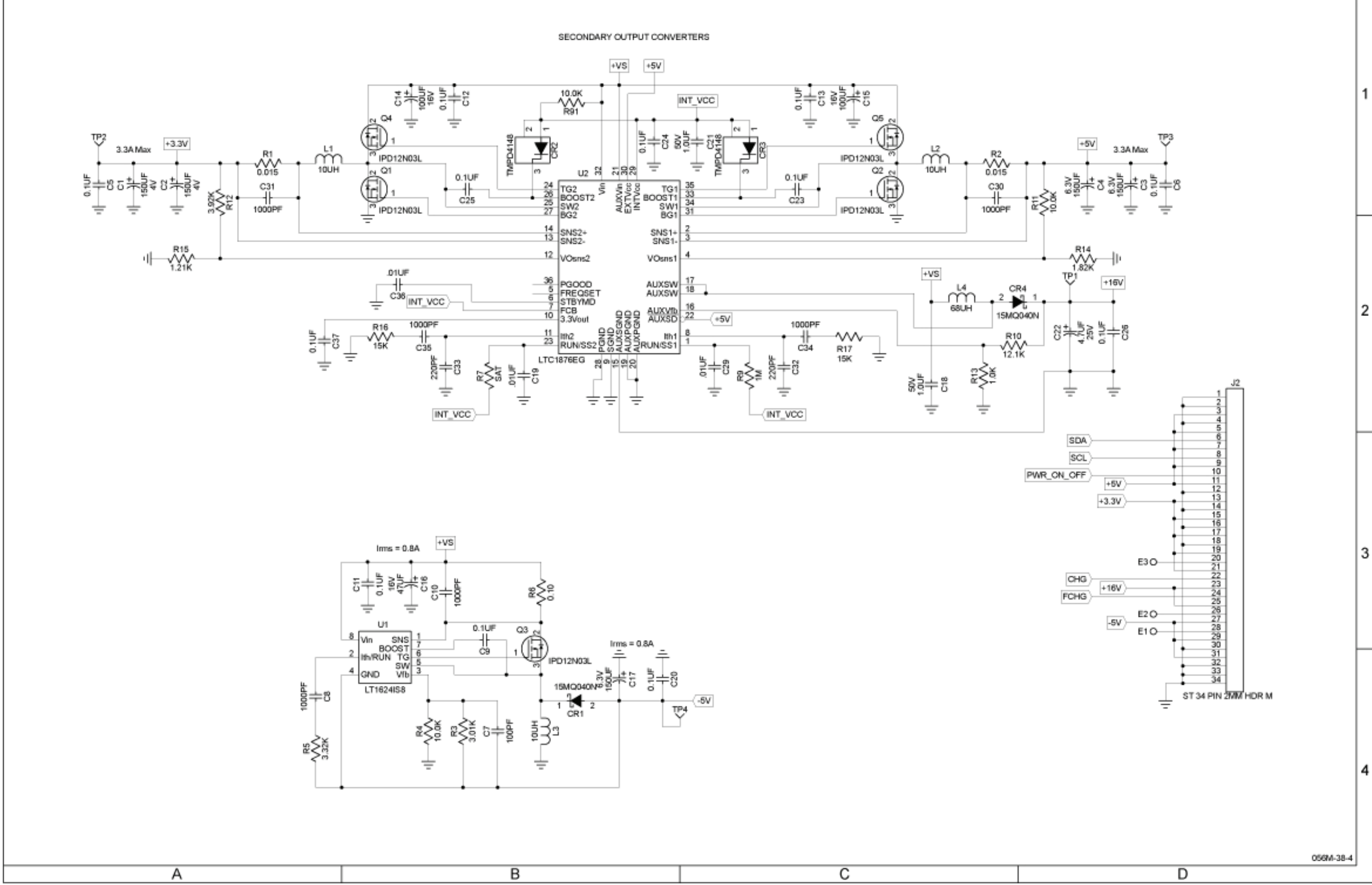
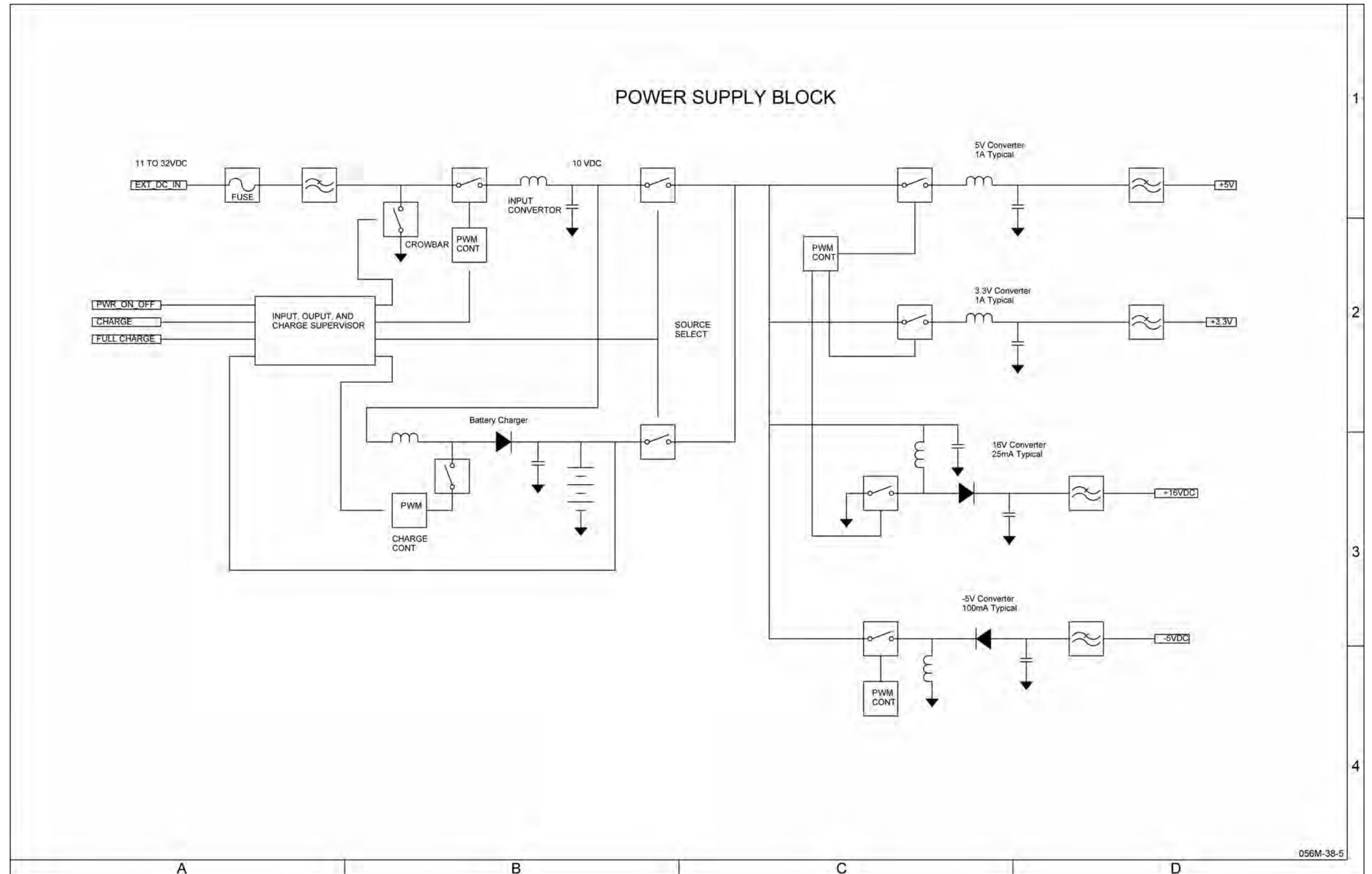


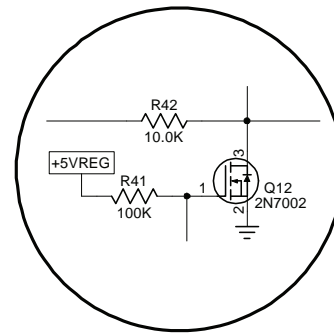
Figure 7 Power Supply PCB Assy (Sheet 6 of 12)  
(Circuit Schematic - Sheet 4 of 10) (56A1A1)

(0000-5630-500-G)



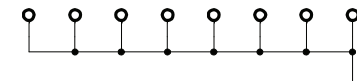
(0000-5630-500-G)

Figure 7 Power Supply PCB Assy (Sheet 7 of 12)  
(Circuit Schematic - Sheet 5 of 10) (56A1A1)



REV AA

MTG1 MTG2 MTG3 MTG4 MTG5 MTG6 MTG7 MTG8

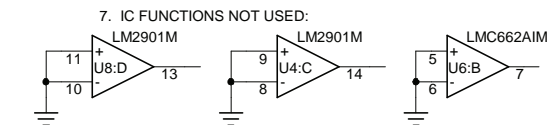


Power Table						
Ref Des	Device(Type)	Package	GND	+VEXT	+5VREG	+VS VBAT+
U3	3214-4013-200T	SO14	7			14
U4	3221-0015-000T	SO14	12		3	
U6	3221-0013-001T	SO8	4	8		
U8	3221-0015-000T	SO14	12	3		

NOTES:  
(UNLESS OTHERWISE SPECIFIED)

1. BASIC REFERENCE DESIGNATORS SHOWN, FOR COMPLETE DESIGNATOR PREFIXES REFER TO PRODUCT STRUCTURE AND SYSTEM INTERCONNECT.
2. ALL RESISTORS ARE 1%, 1/8W.
3. ALL RESISTANCE IS EXPRESSED IN OHMS  
ALL CAPACITANCE IS EXPRESSED IN MICROFARADS.  
ALL INDUCTANCE IS EXPRESSED IN MICROHENRIES.
4. HIGHEST REFERENCE DESIGNATIONS:  
SEE SPARE GATE TABLE
5. REFERENCE DESIGNATIONS NOT USED:  
SEE SPARE GATE TABLE

6. COMPONENT(S) NOT INSTALLED.



8. R7 SAT: 1.0M, 1.5M, 1.82M



CAUTION:  
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE  
TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

4

3

2

1

(10000021310-BA)

Figure 7 Power Supply PCB Assy (Sheet 8 of 12)  
(Circuit Schematic - Sheet 6 of 10) (56A1A1)

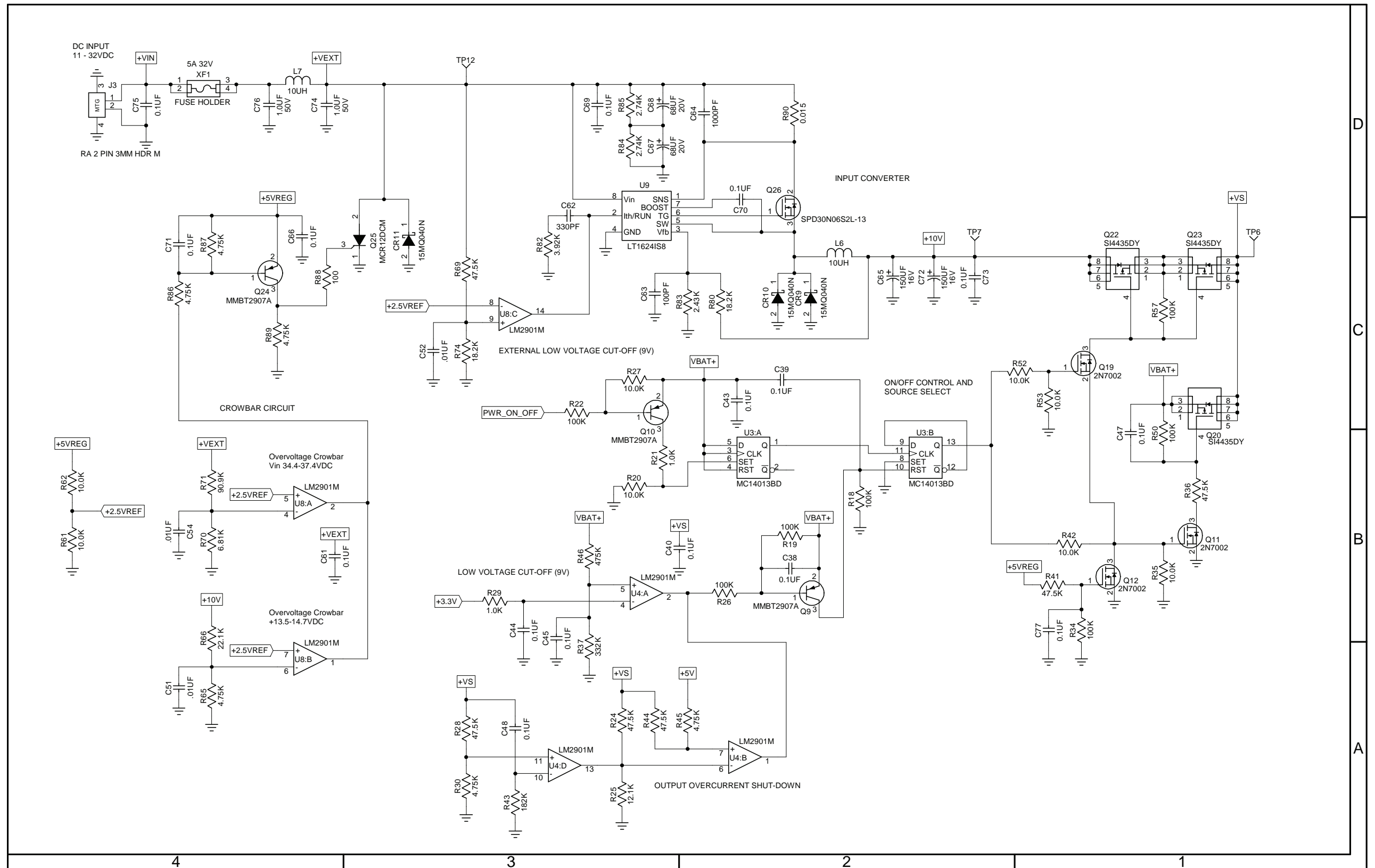
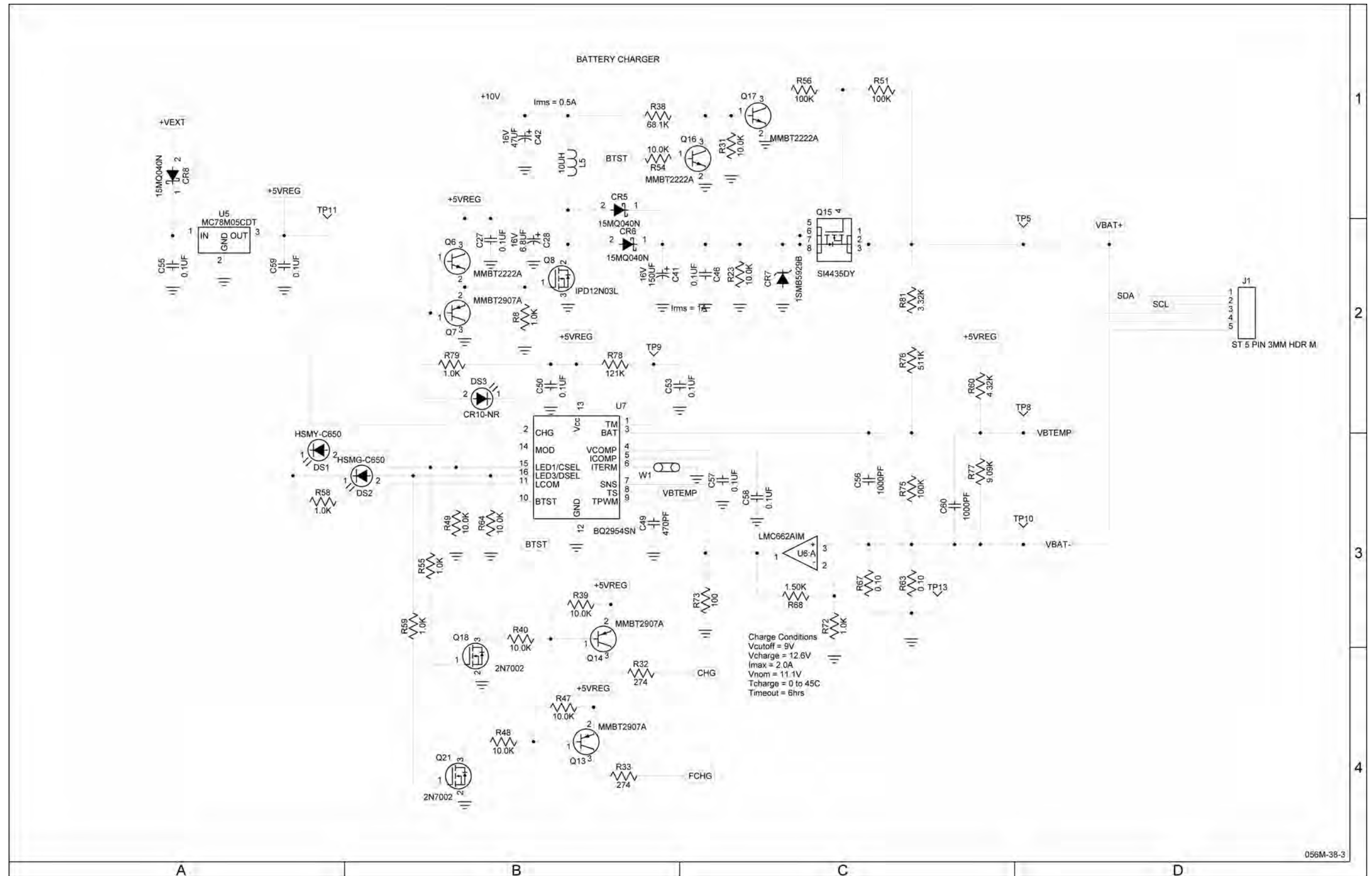


Figure 7 Power Supply PCB Assy (Sheet 9 of 12)  
(Circuit Schematic - Sheet 7 of 10) (56A1A1)

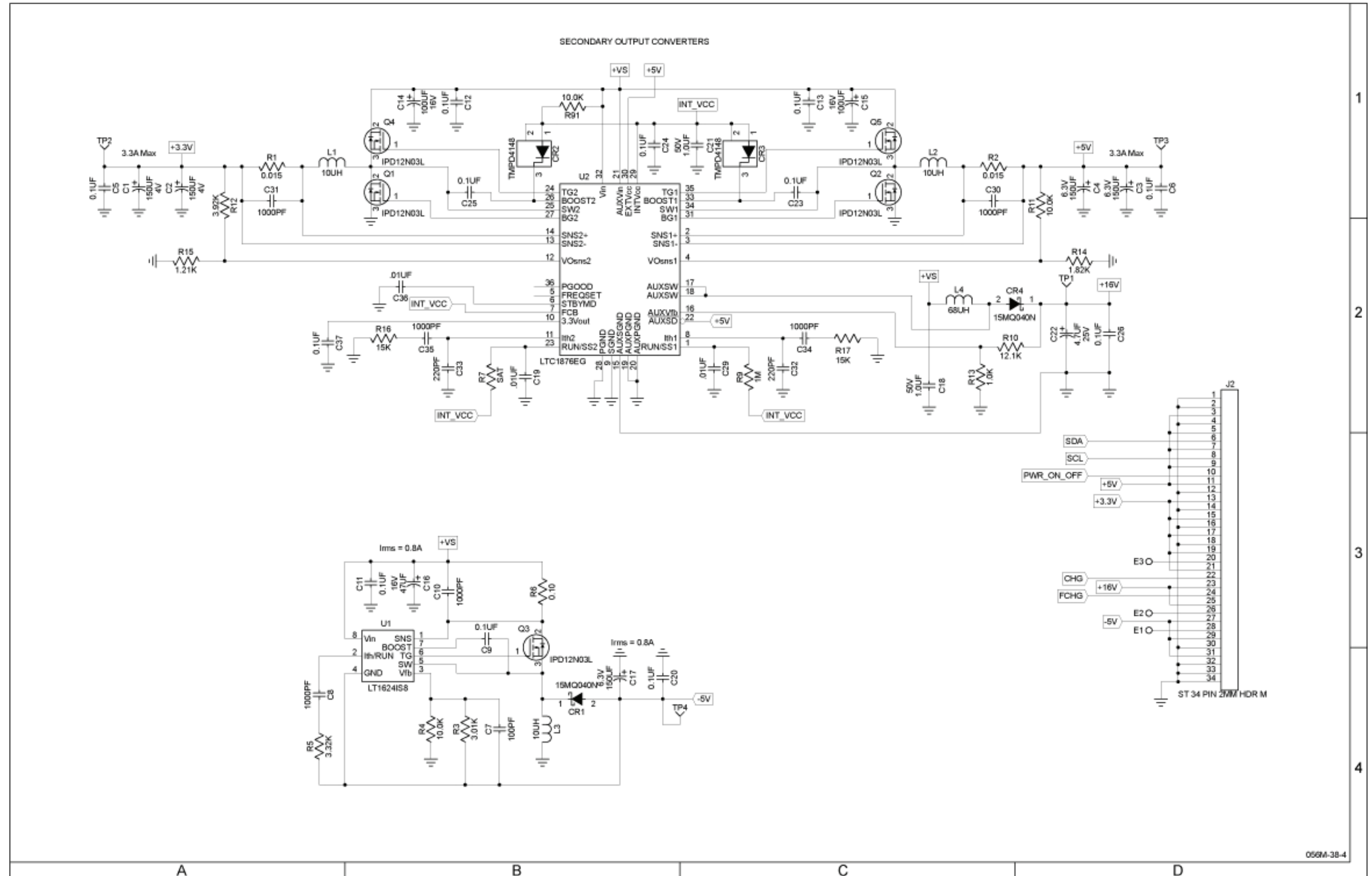
(10000021310-BA)



(1000021310-BA)

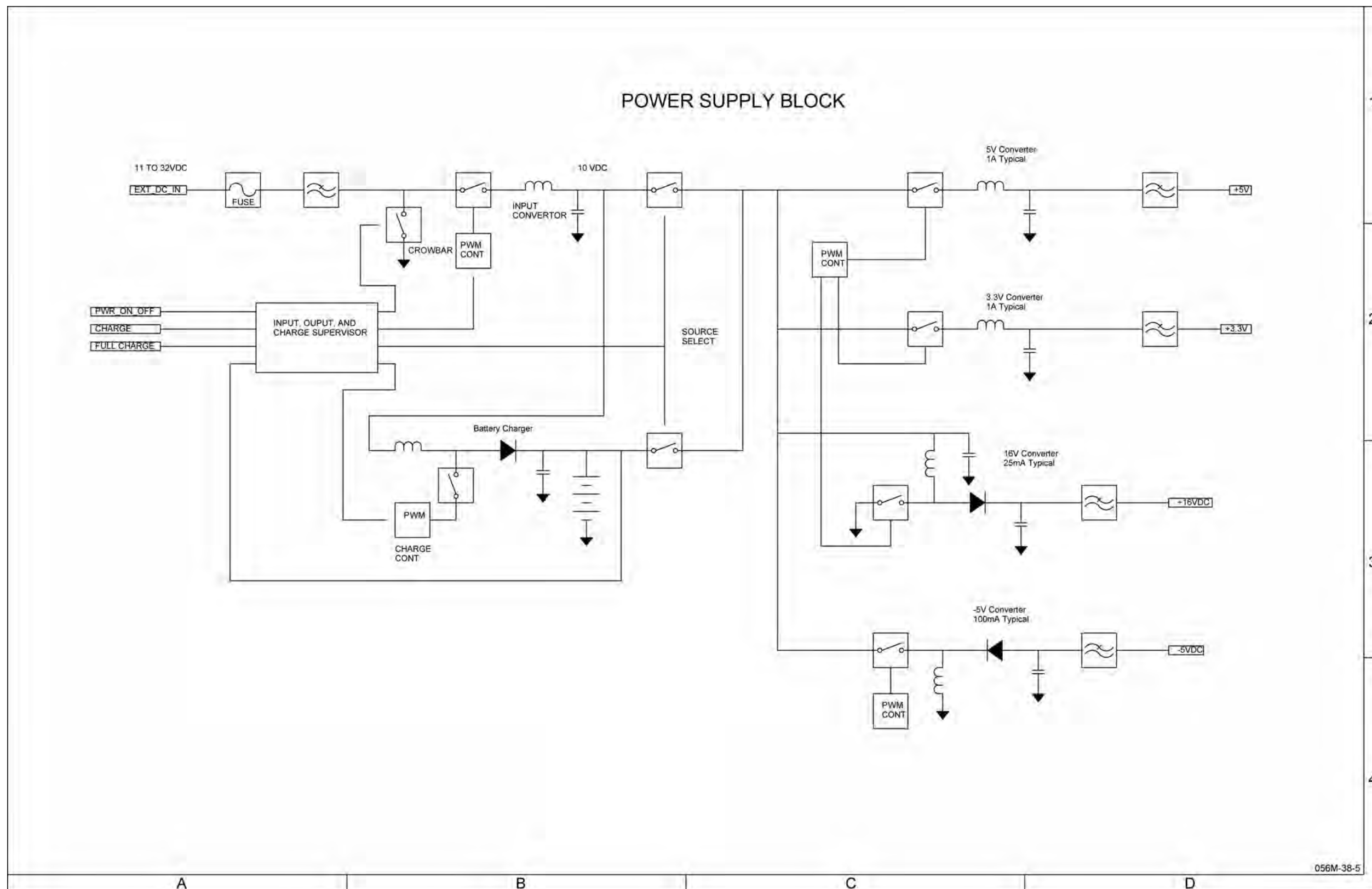
Figure 7 Power Supply PCB Assy (Sheet 10 of 12)  
(Circuit Schematic - Sheet 8 of 10) (56A1A1)





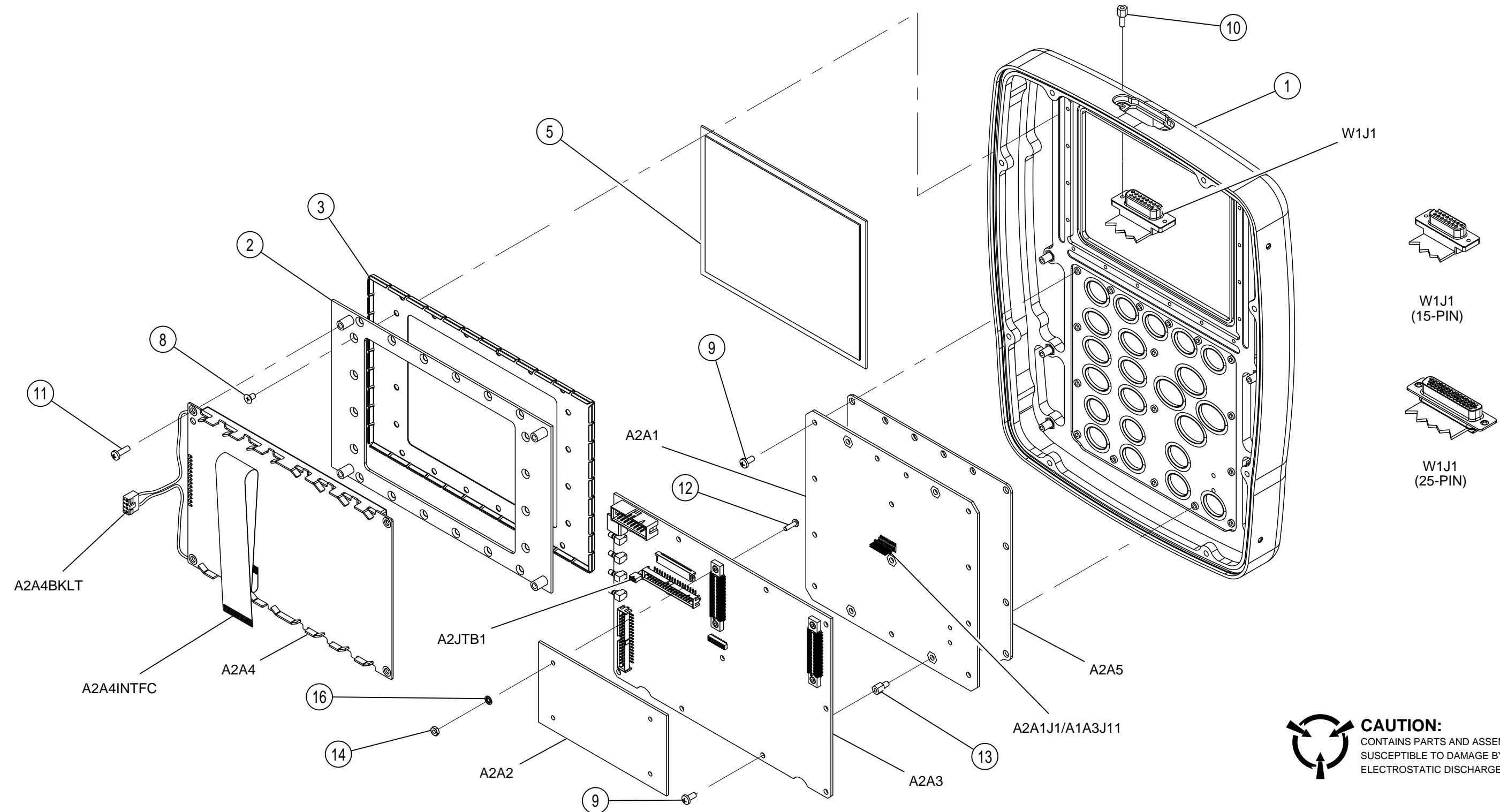
(10000021310-BA)

Figure 7 Power Supply PCB Assy (Sheet 11 of 12)  
(Circuit Schematic - Sheet 9 of 10) (56A1A1)



(10000021310-BA)

Figure 7 Power Supply PCB Assy (Sheet 12 of 12)  
(Circuit Schematic - Sheet 10 of 10) (56A1A1)



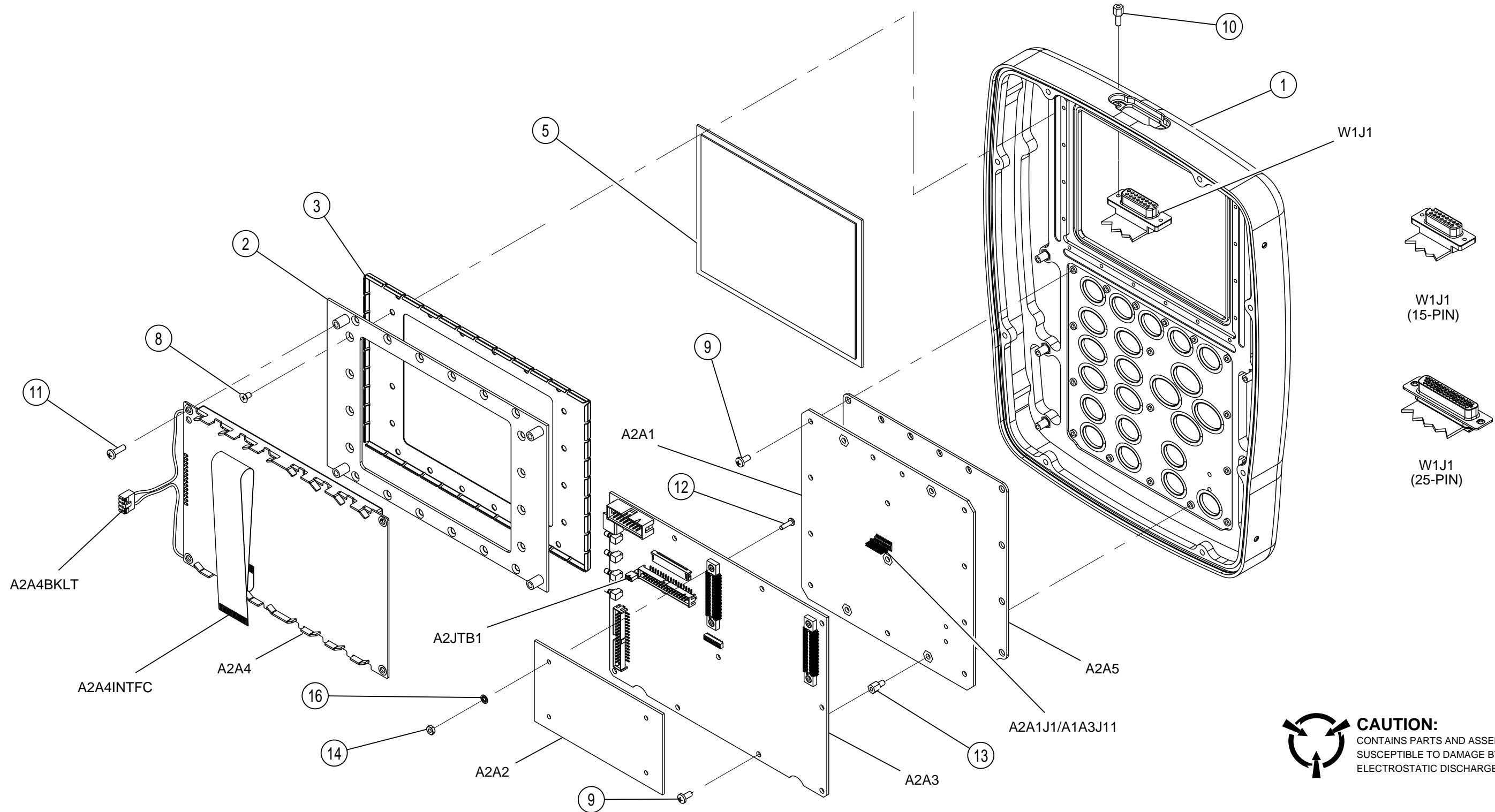
PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

(7005-5640-100-B, C) (64570)

**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

056M-12a

Figure 8 Chassis Assy (Sheet 1 of 2)  
(56A1A2)



PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

(7005-5642-400-A) (64574)

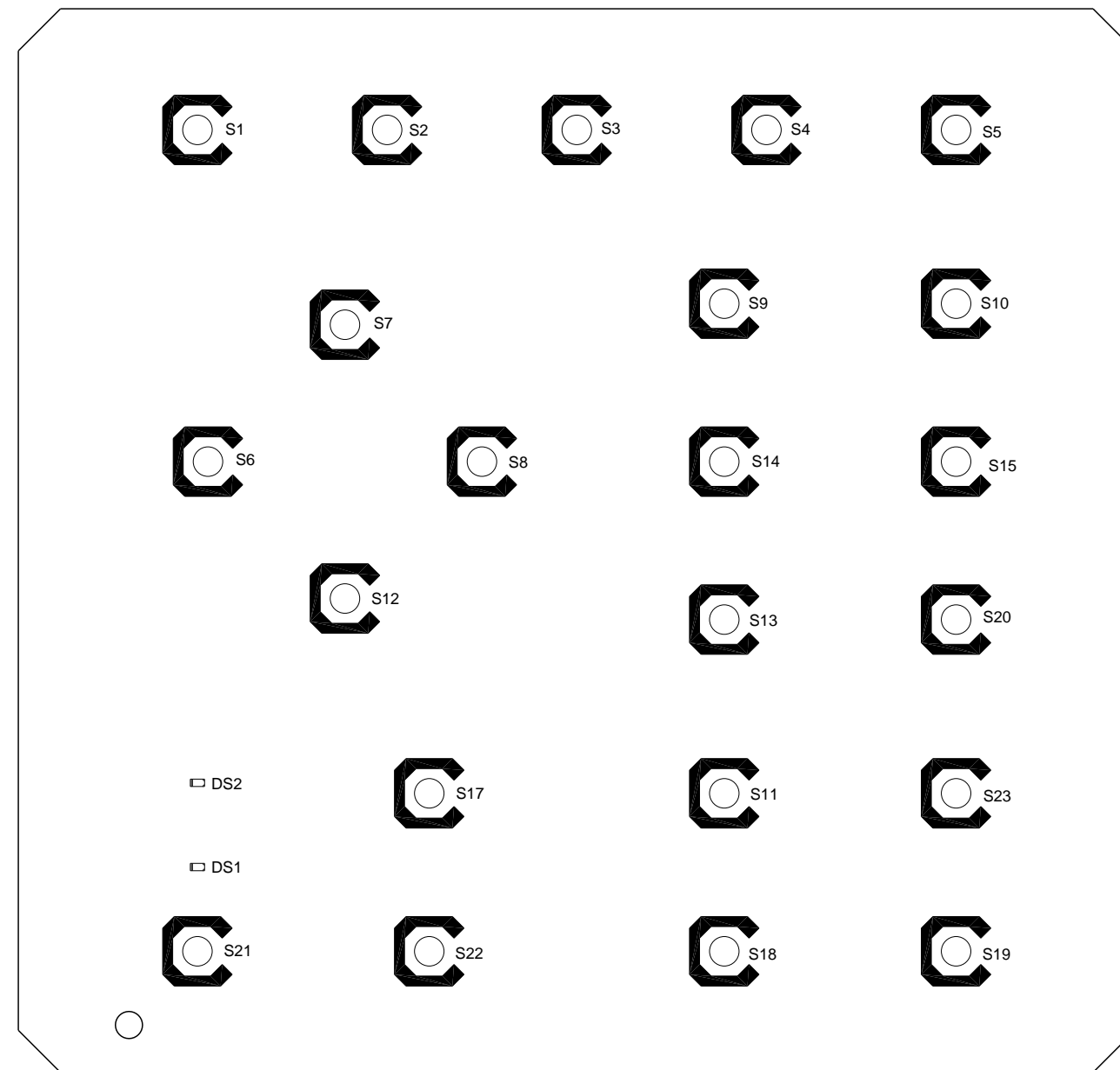
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

056M-12a

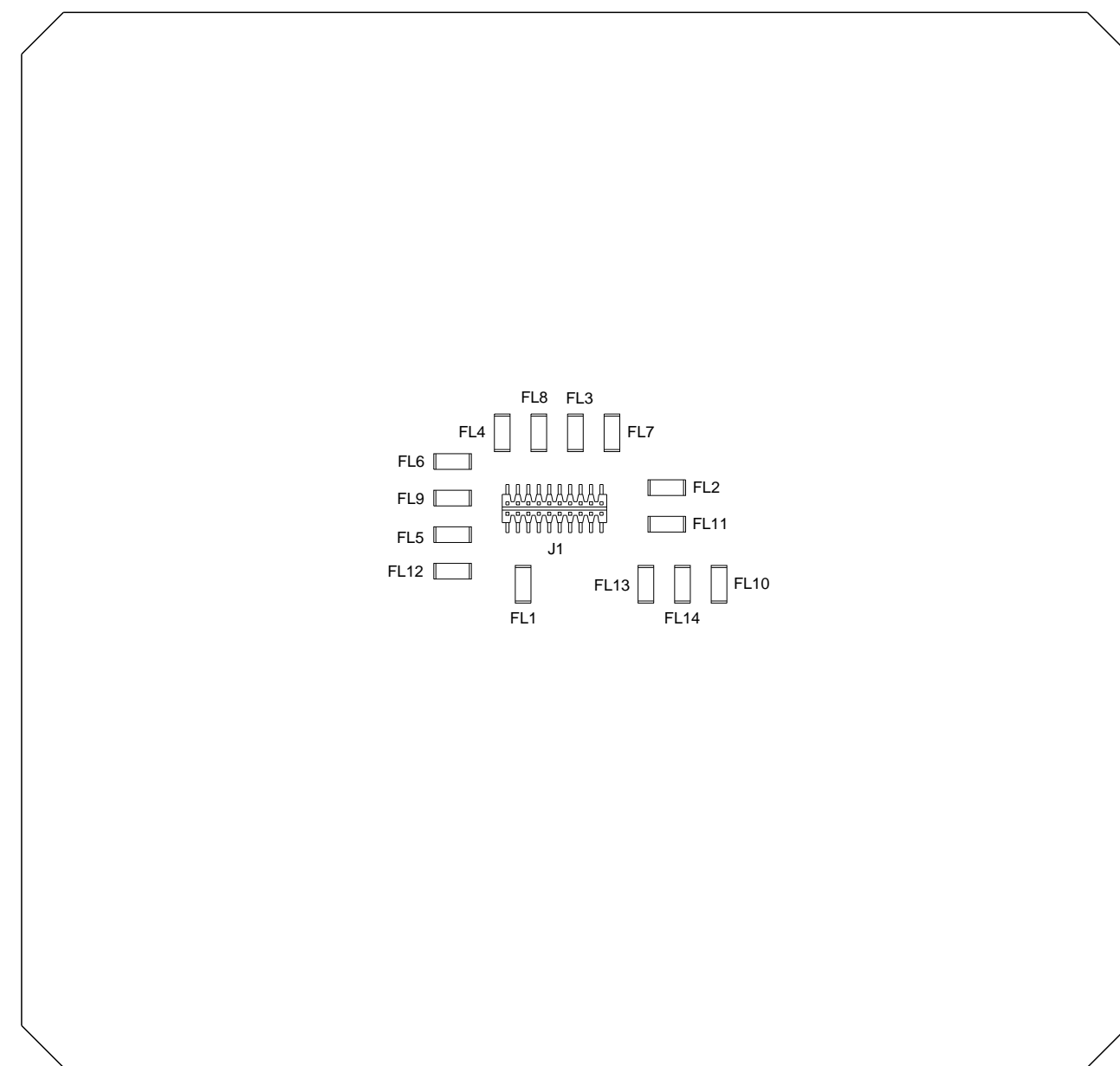
Figure 8 Chassis Assy (Sheet 2 of 2)  
(56A1A2)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



(TOP VIEW)



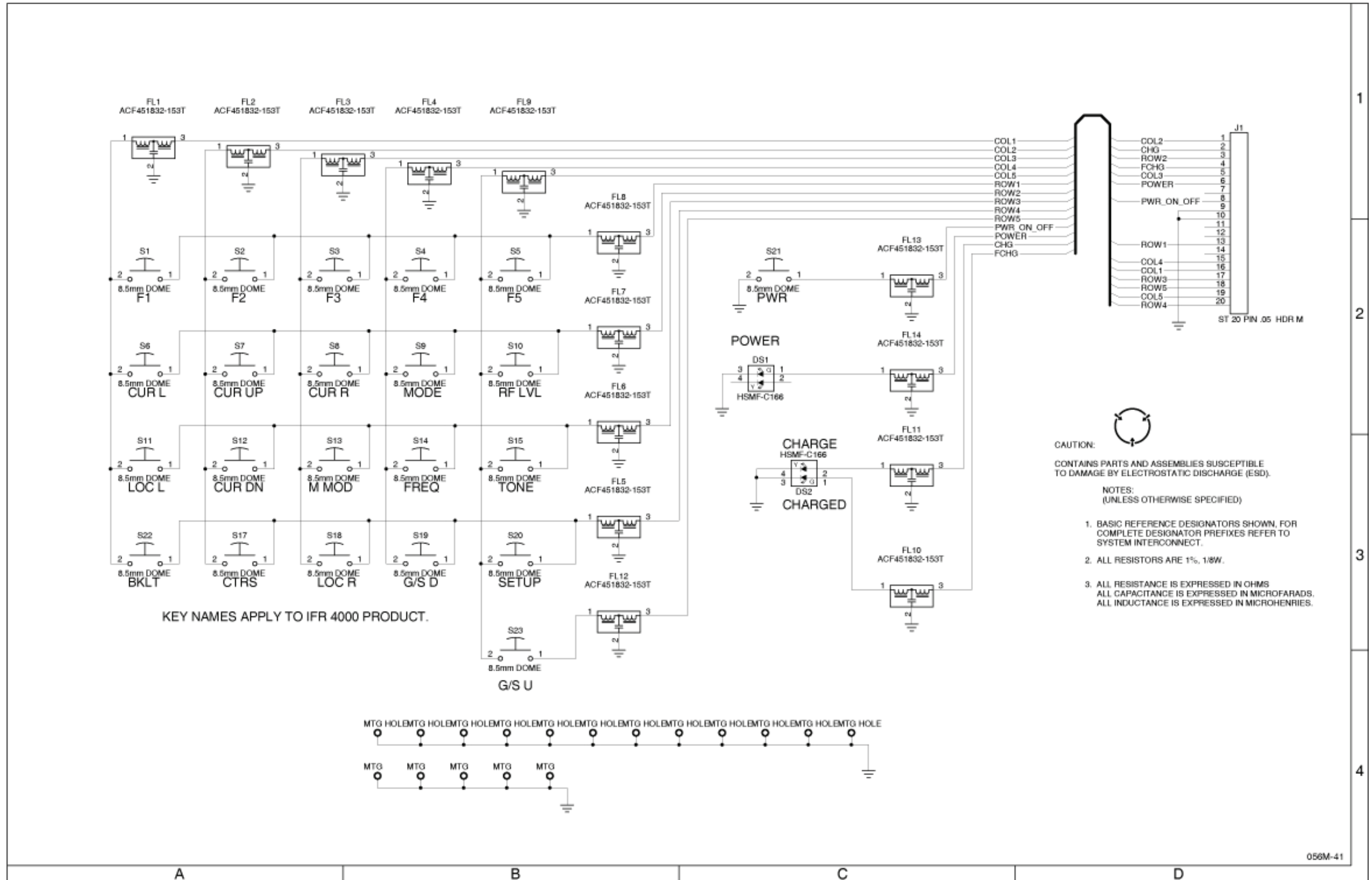
(BOTTOM VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A1.

(7010-5630-700-A, A1) (65954)

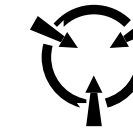
056M-32a

Figure 9 Keypad PCB Assy (Sheet 1 of 4)  
(56A1A2A1)

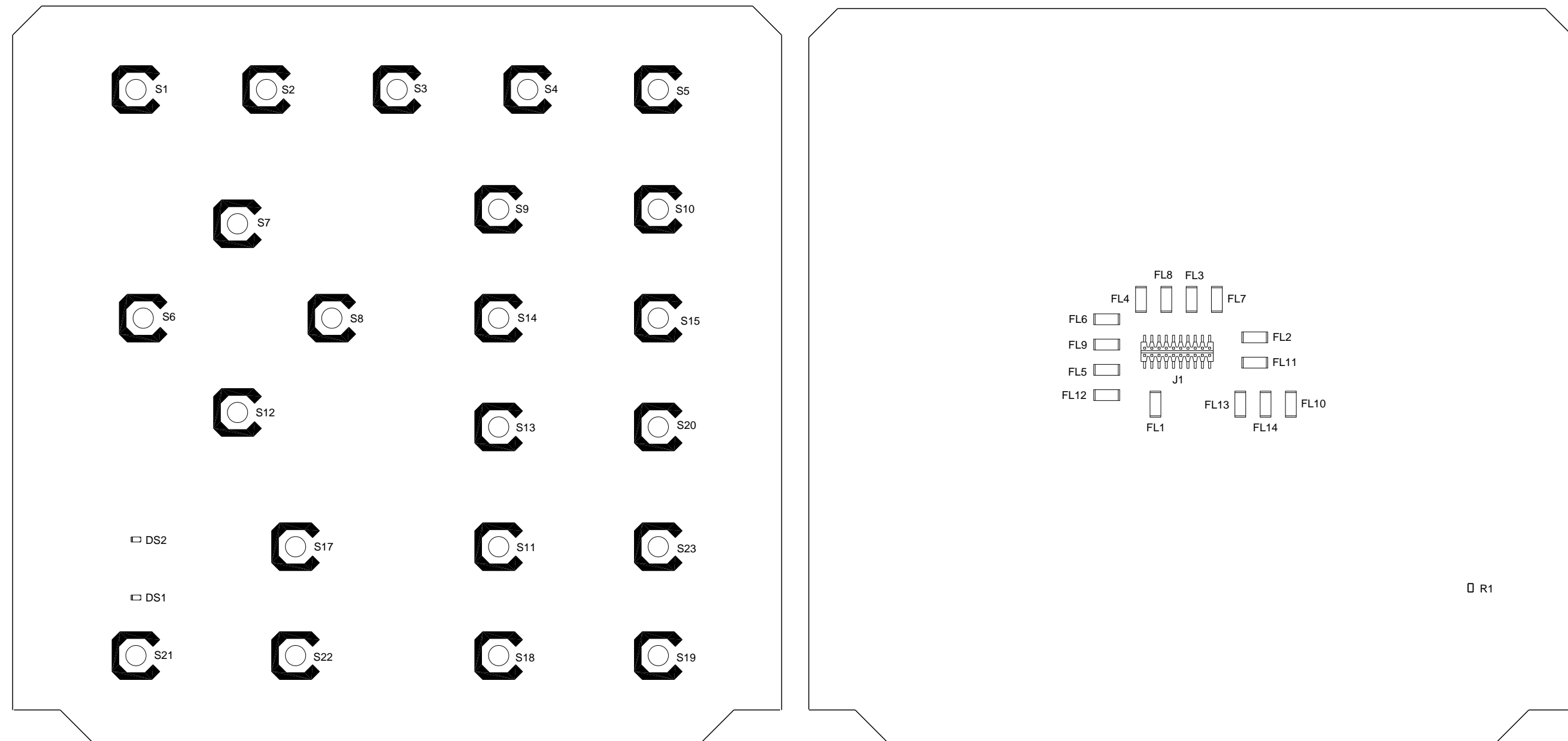


(0000-5630-700-A)

Figure 9 Keypad Assy (Sheet 2 of 4)  
(Circuit Schematic) (56A1A2A1)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



(TOP VIEW)

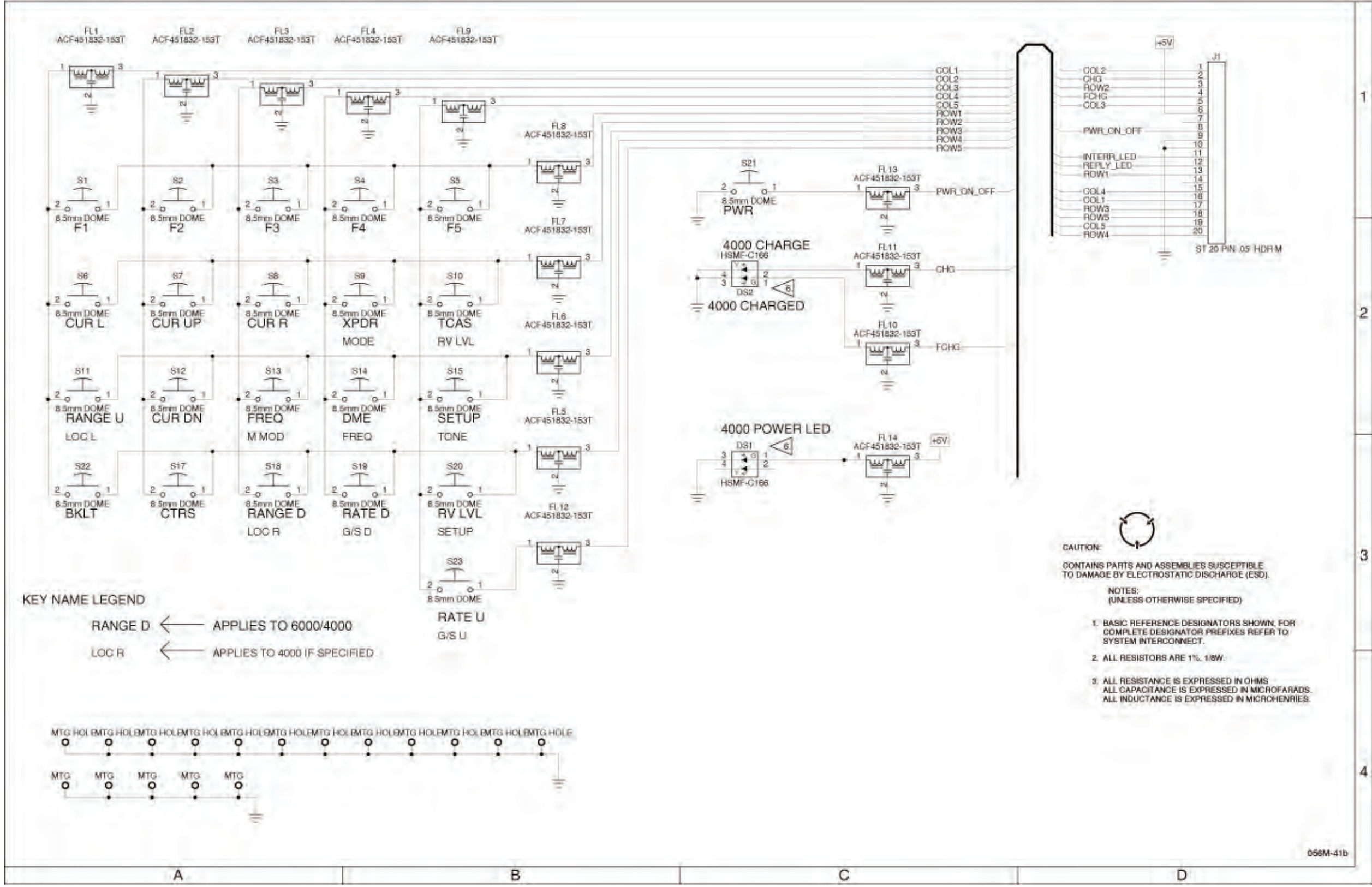
(BOTTOM VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A1.

(7010-5631-900-A) (65959)

056M-32b

Figure 9 Keypad PCB Assy (Sheet 3 of 4)  
(56A1A2A1)



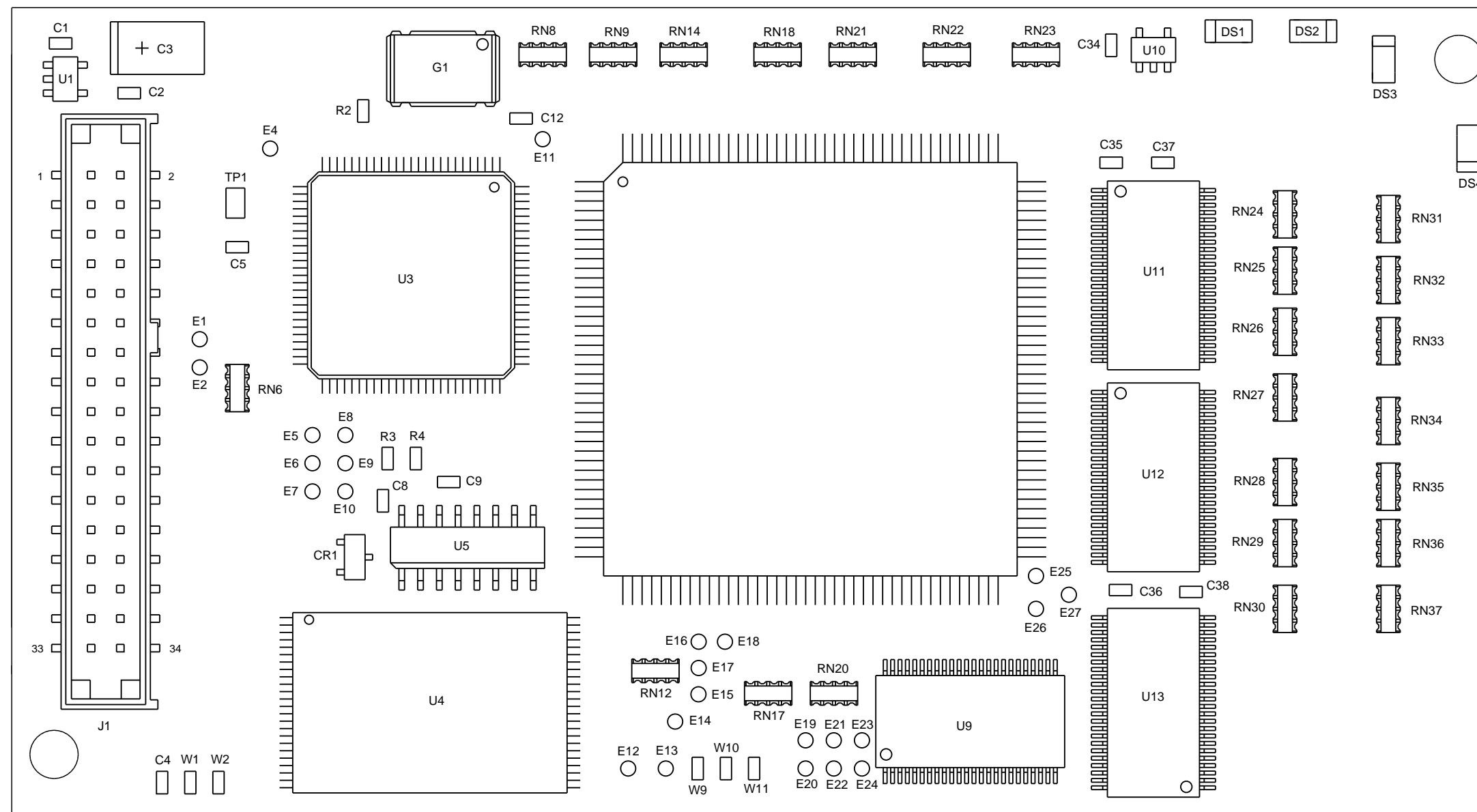
(0000-5631-900-A) (10000021313-AA)

Figure 9 Keypad Assy (Sheet 4 of 4)  
(Circuit Schematic) (56A1A2A1)





**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



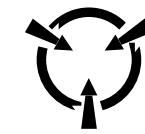
(TOP VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

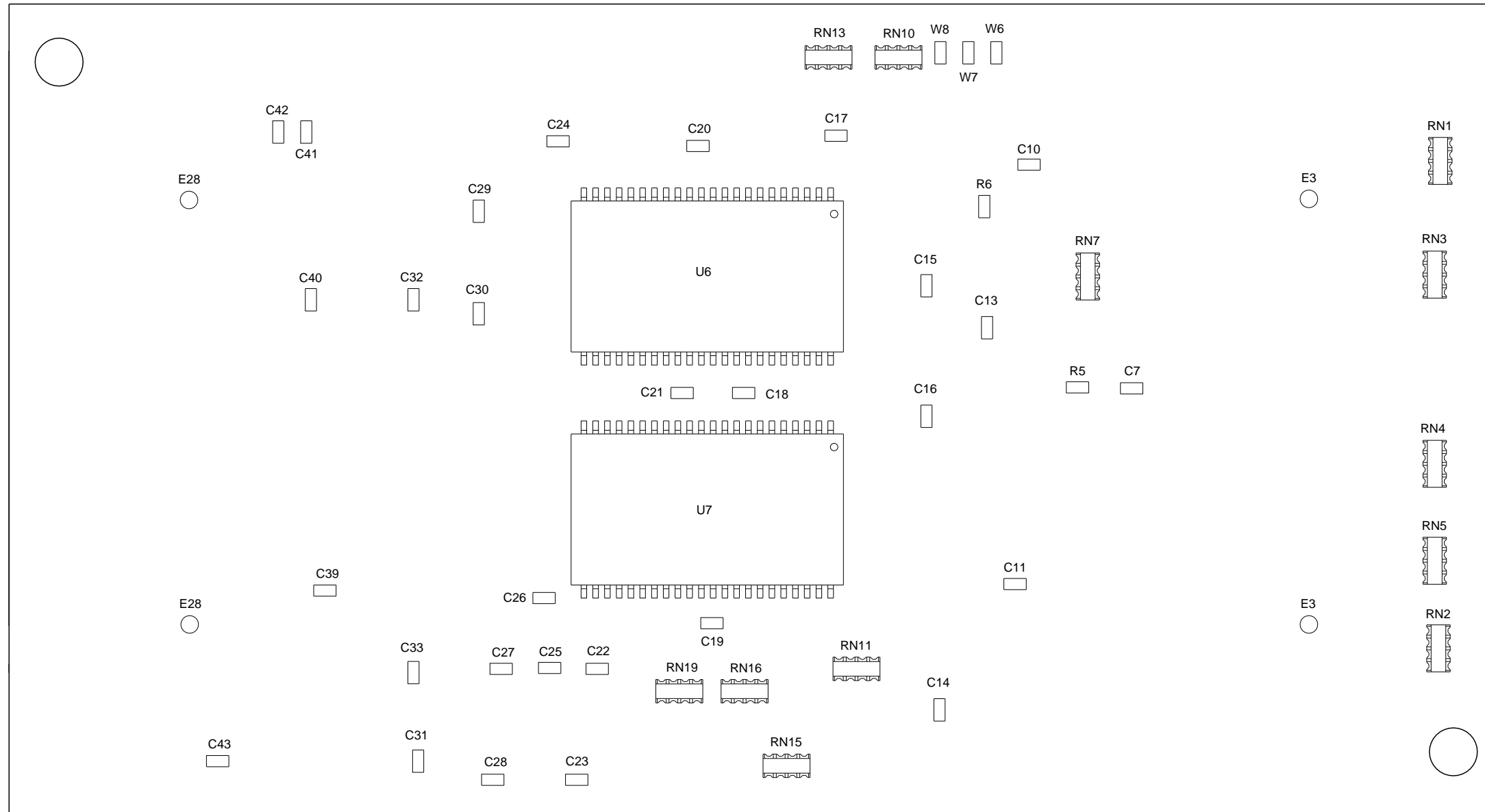
056M-30a

(7010-5630-200-A, B, C, D, E, F, G, H, J, K, L, M, N) (65949-A0)

Figure 10 Processor PCB Assy (Sheet 1 of 10)  
(56A1A2A2)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



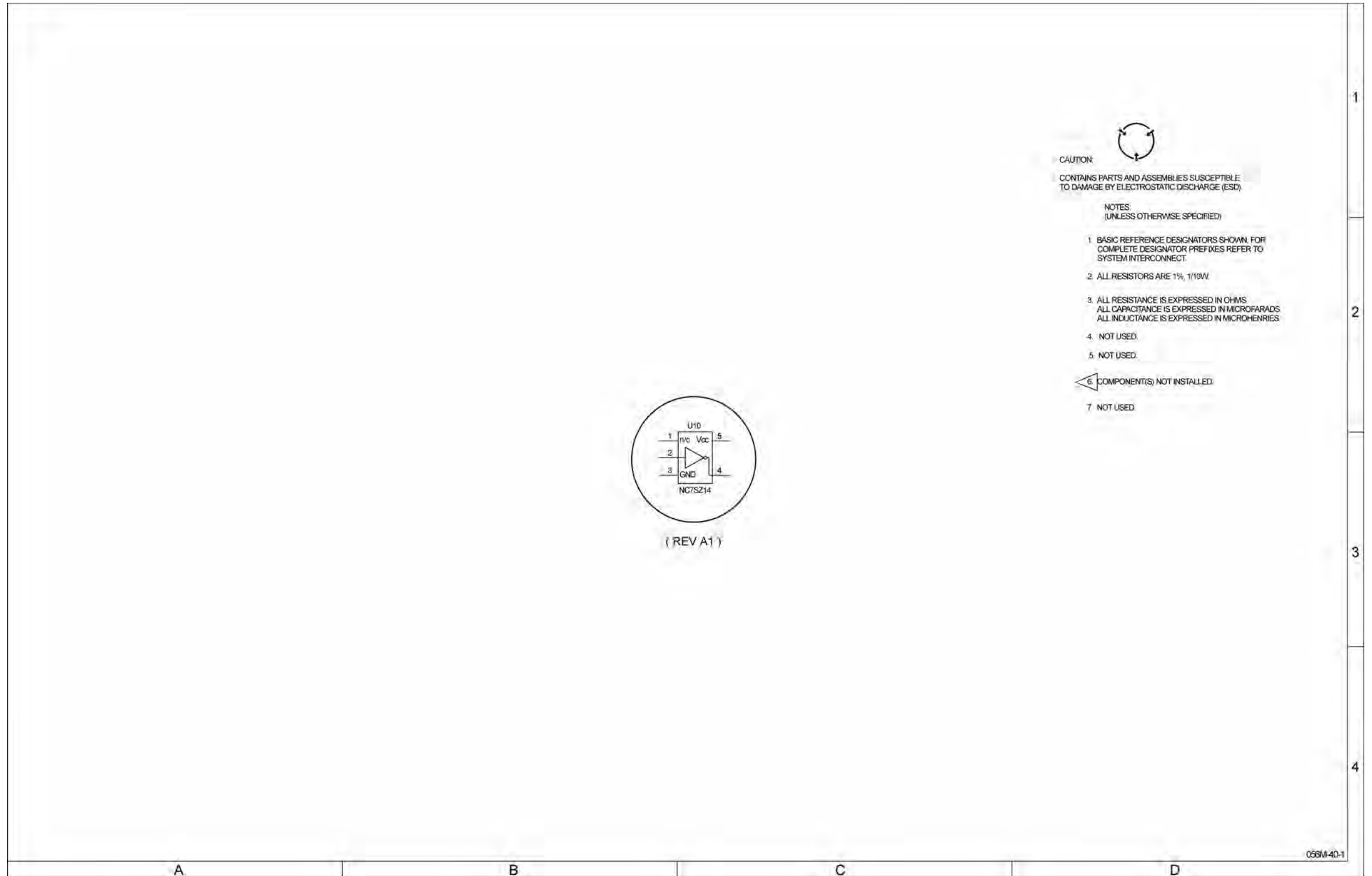
(BOTTOM VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

056M-30b

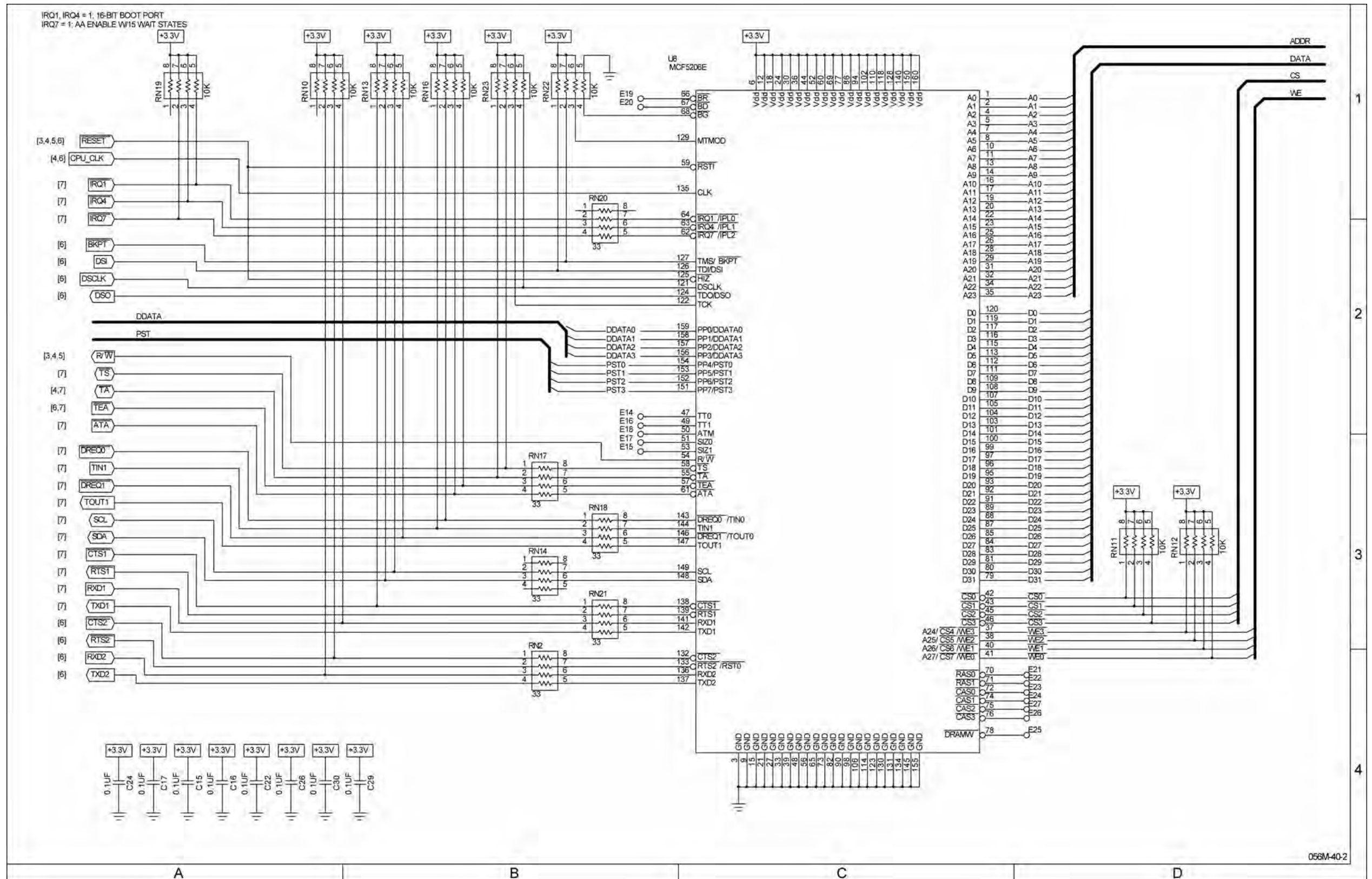
(7010-5630-200-A, B, C, D, E, F, G, H, J, K, L, M, N) (65949-A0)

Figure 10 Processor PCB Assy (Sheet 2 of 10)  
(56A1A2A2)



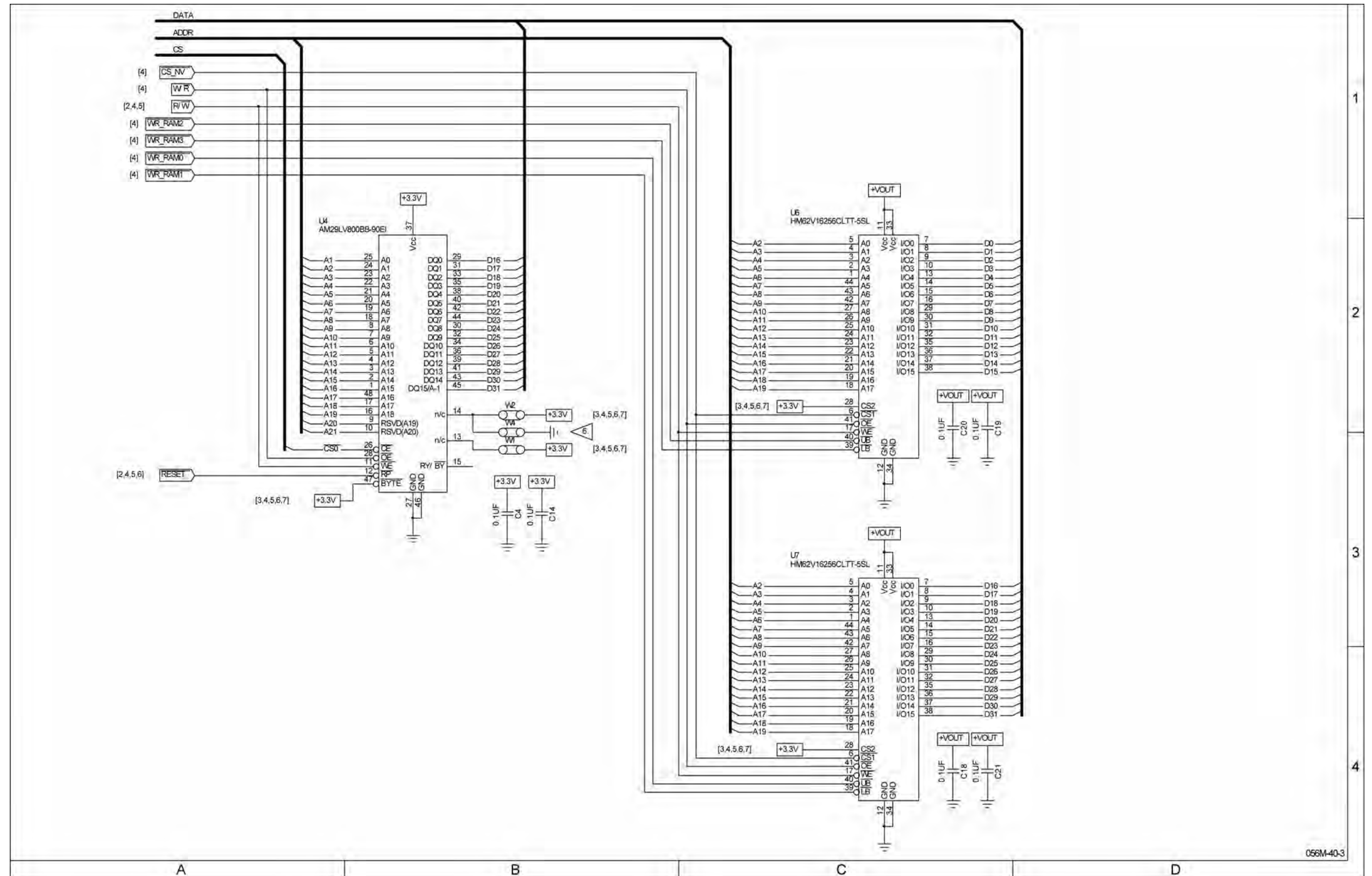
(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 3 of 10)  
(Circuit Schematic - Sheet 1 of 8) (56A1A2A2)



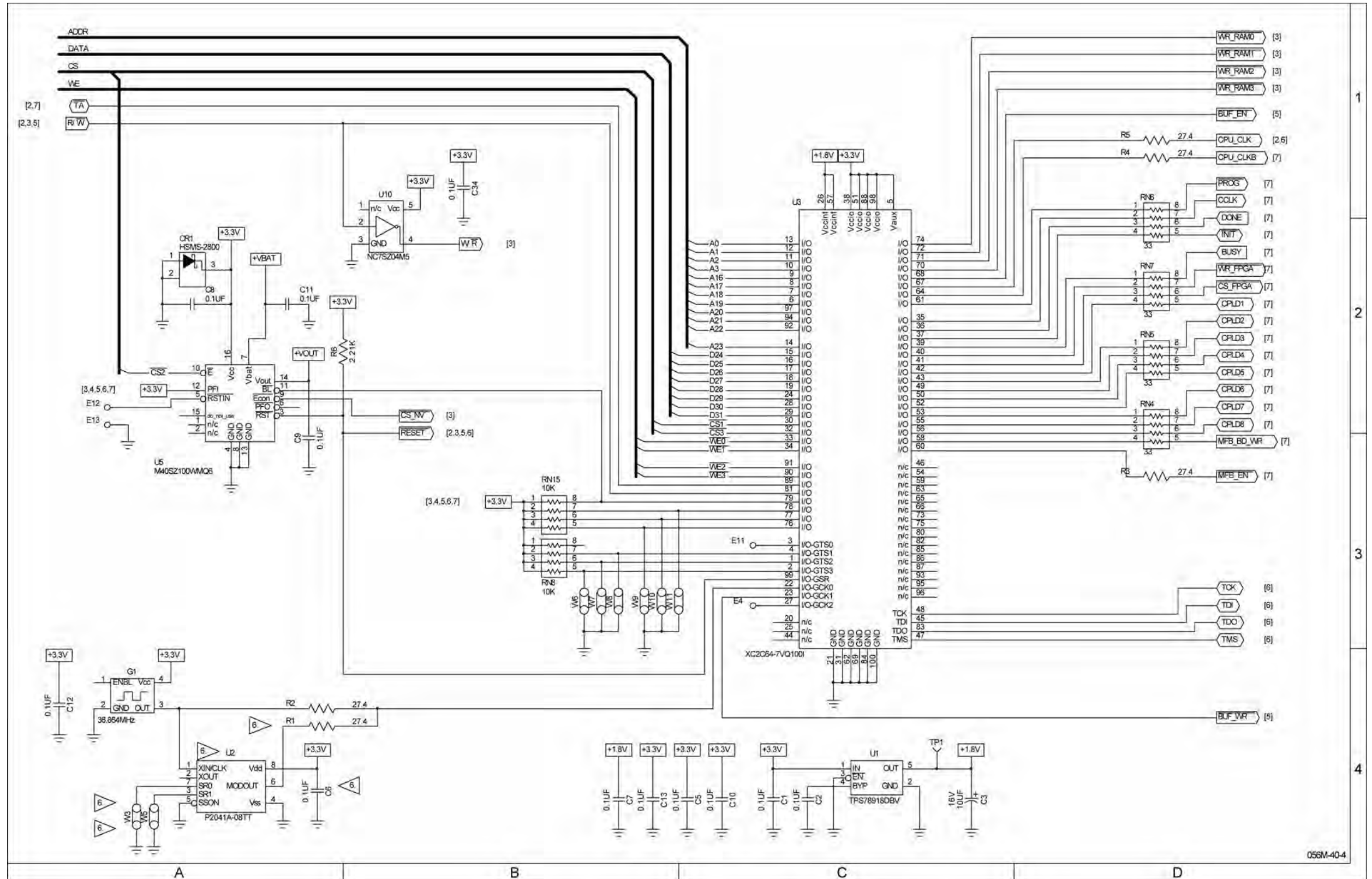
(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 4 of 10)  
(Circuit Schematic - Sheet 2 of 8) (56A1A2A2)



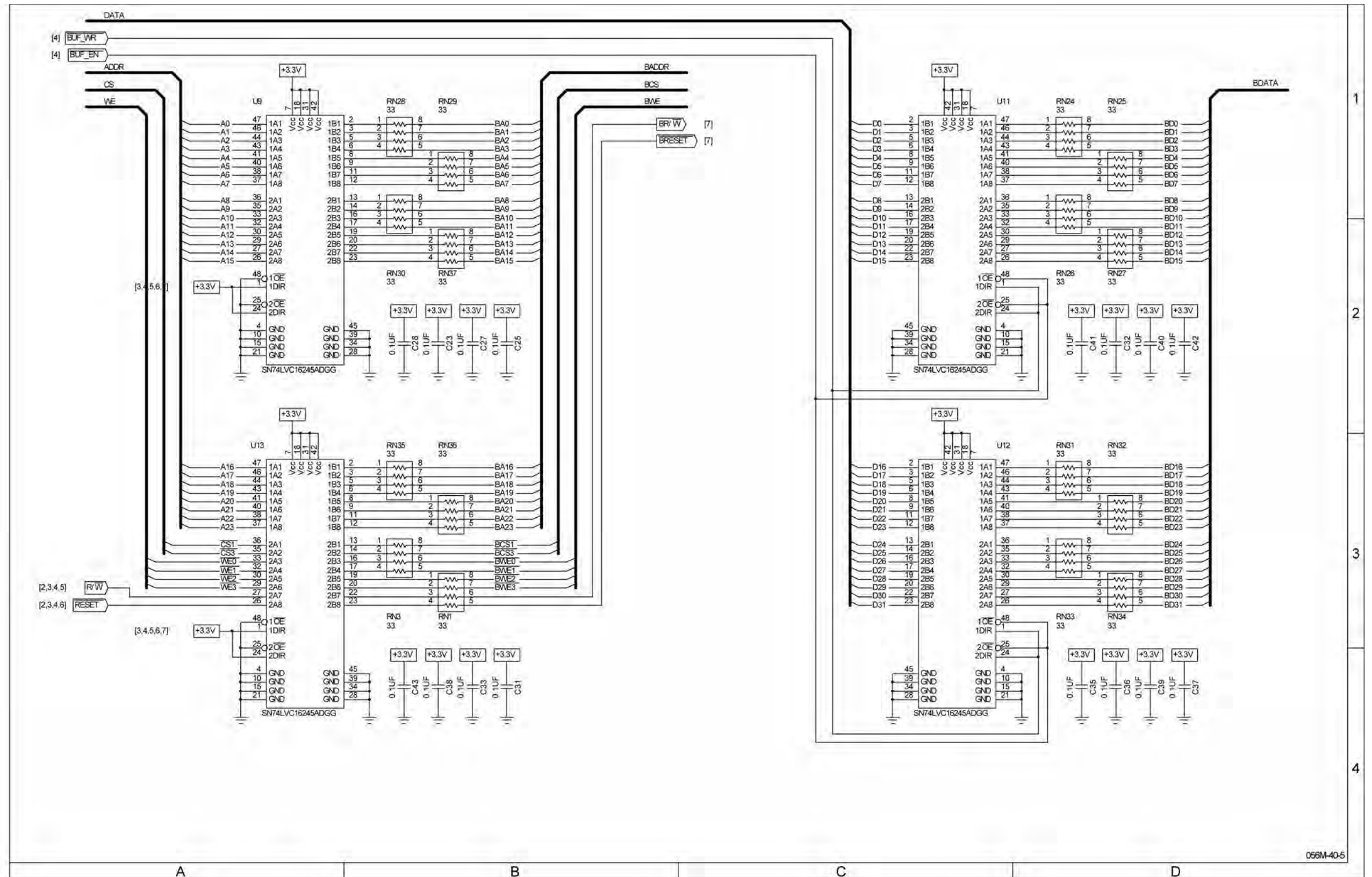
(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 5 of 10)  
(Circuit Schematic - Sheet 3 of 8) (56A1A2A2)



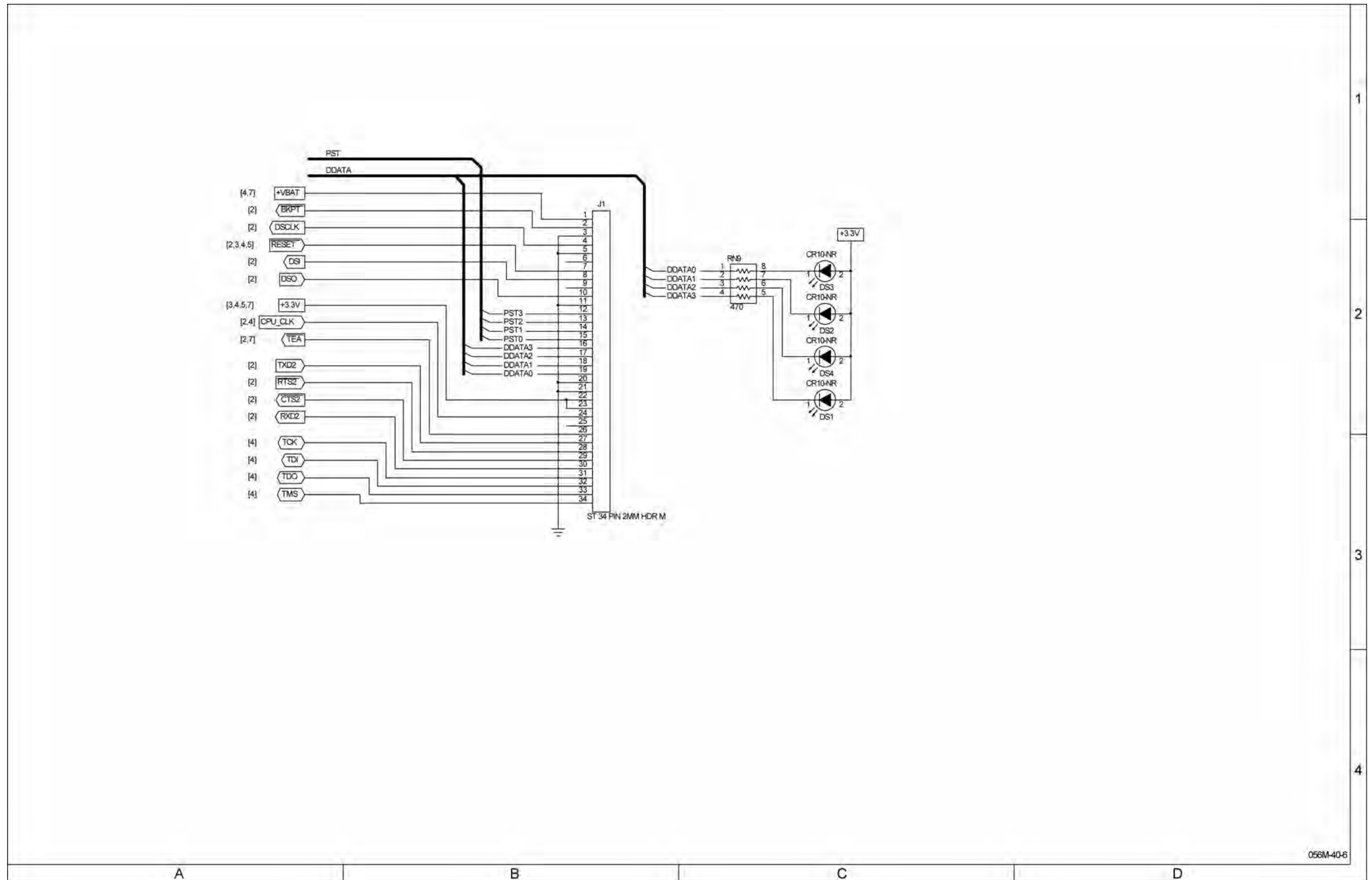
(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 6 of 10)  
(Circuit Schematic - Sheet 4 of 8) (56A1A2A2)



(0000-5630-200-B) (10000021309-AA)

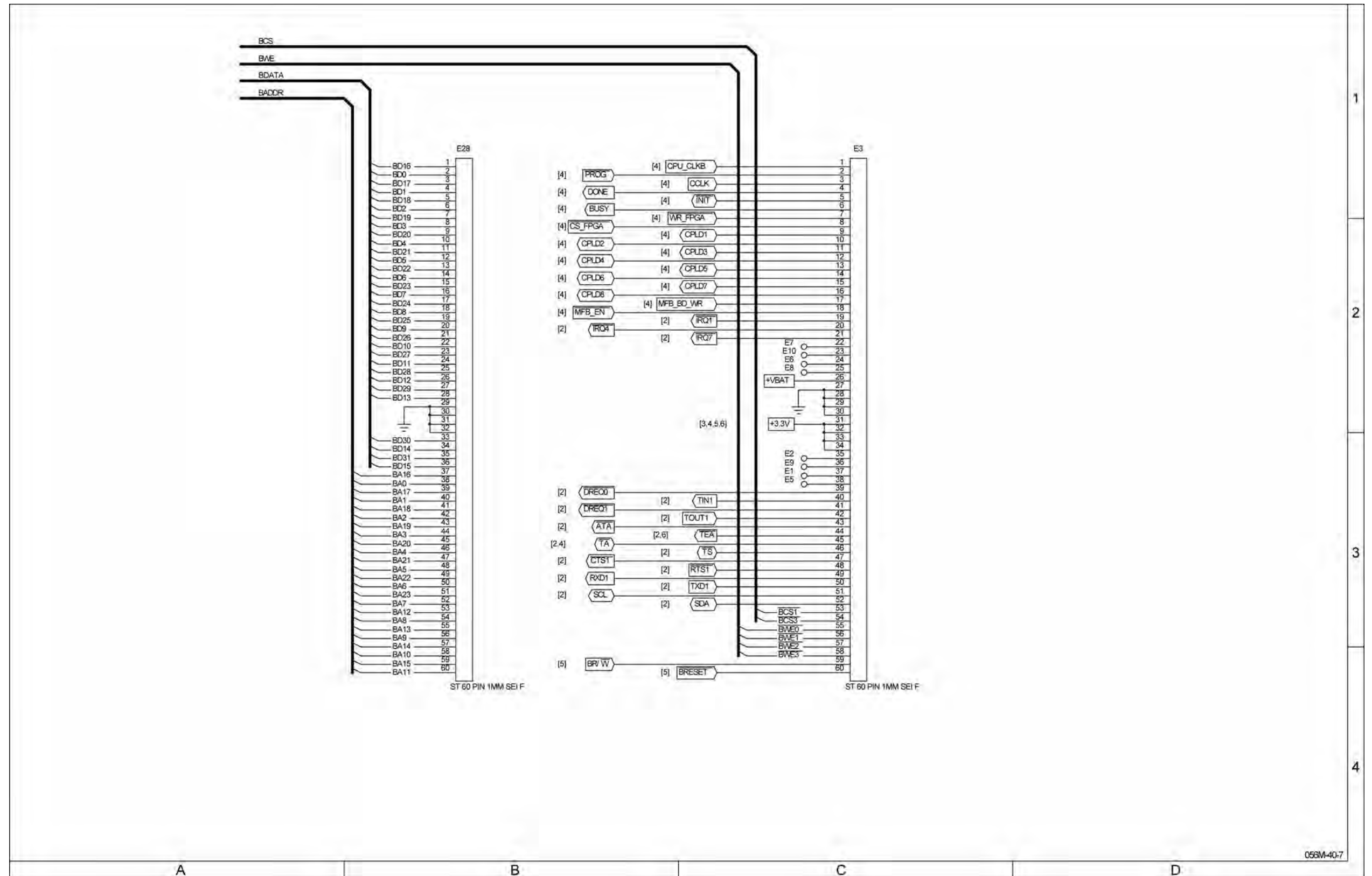
Figure 10 Processor PCB Assy (Sheet 7 of 10)  
(Circuit Schematic - Sheet 5 of 8) (56A1A2A2)



(0000-5630-200-B) (10000021309-AA)

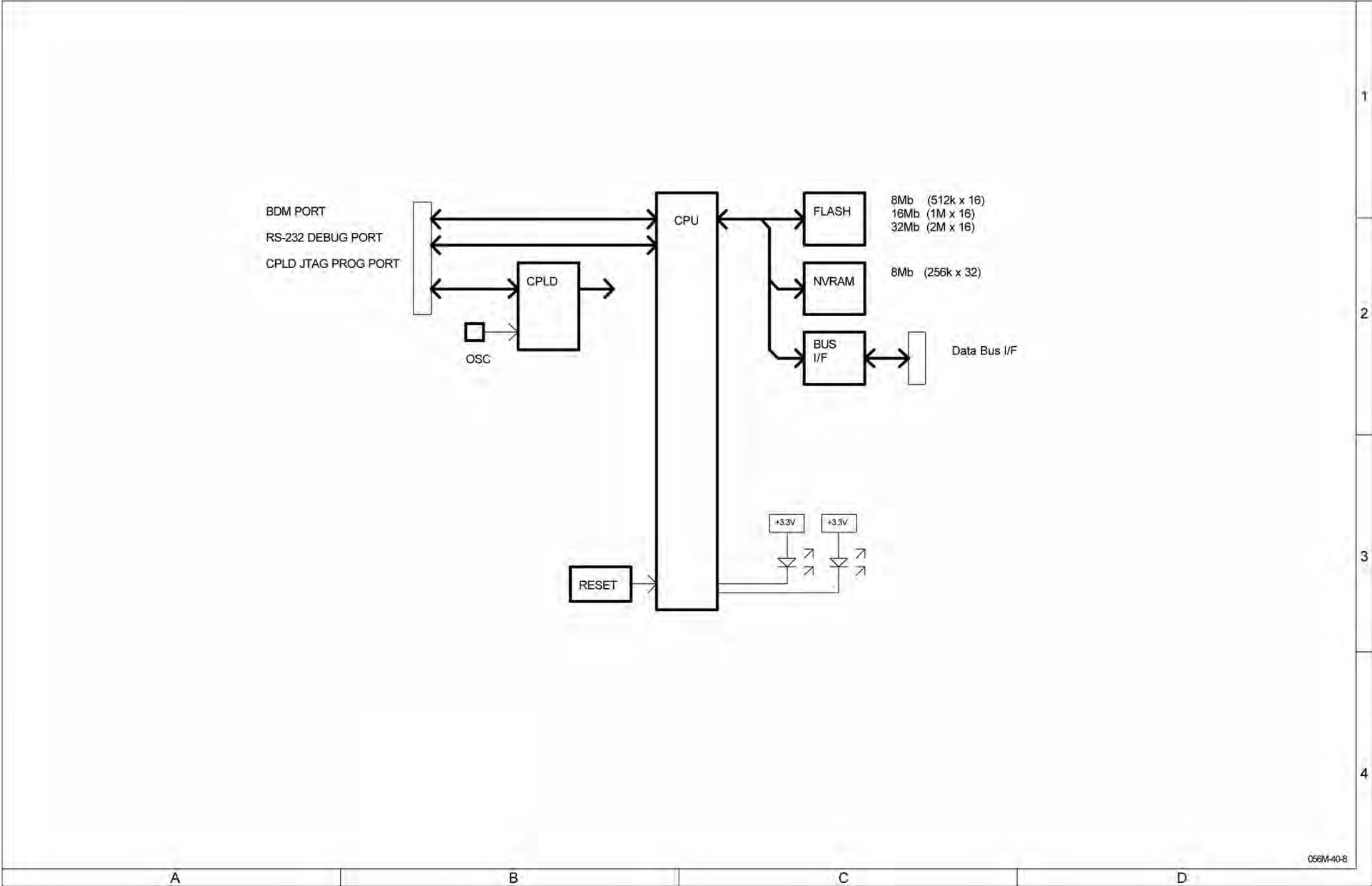
Figure 10 Processor PCB Assy (Sheet 8 of 10)  
(Circuit Schematic - Sheet 6 of 8) (56A1A2A2)





(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 9 of 10)  
(Circuit Schematic - Sheet 7 of 8) (56A1A2A2)

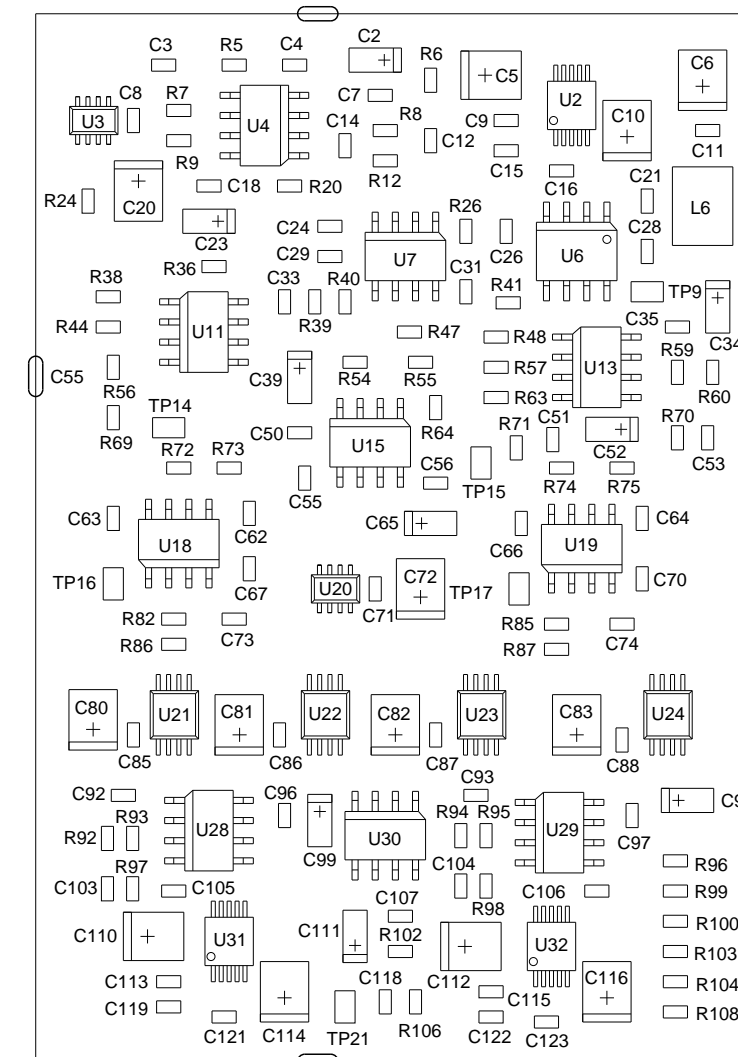
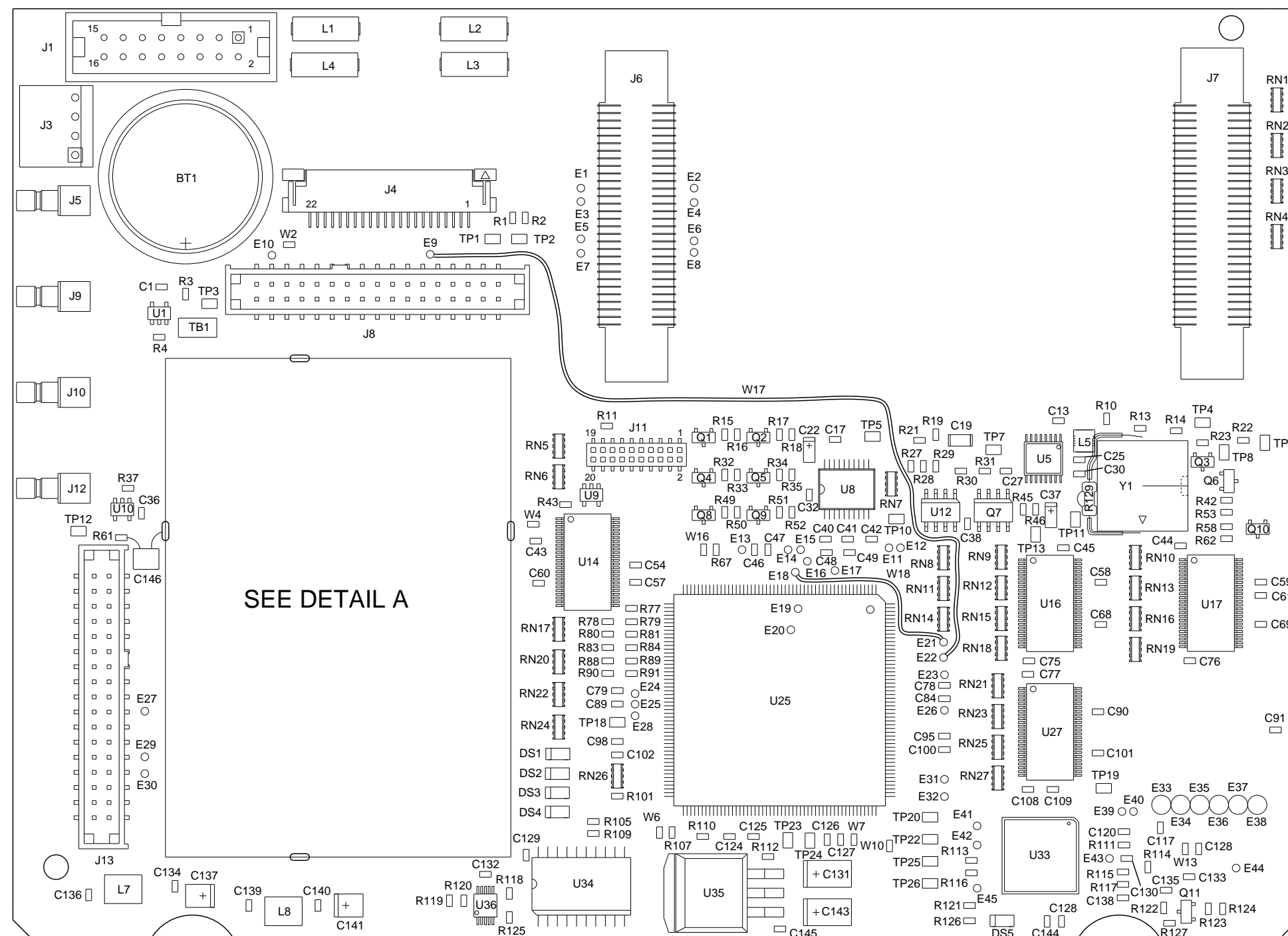


(0000-5630-200-B) (10000021309-AA)

Figure 10 Processor PCB Assy (Sheet 10 of 10)  
(Circuit Schematic - Sheet 8 of 8) (56A1A2A2)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



DETAIL A

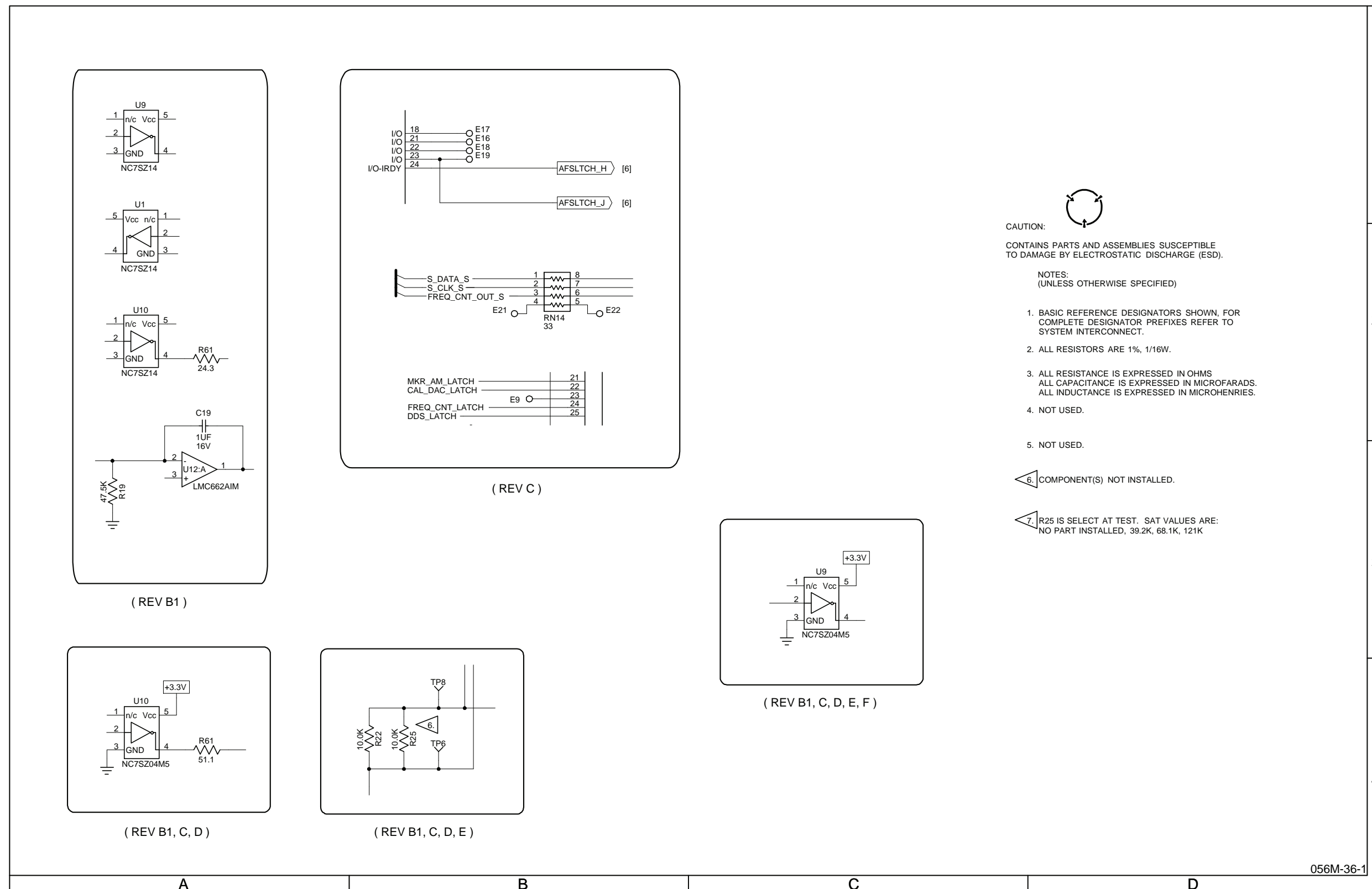
PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A3.

056M-31A

(7010-5630-300-E, F, G) (65950)

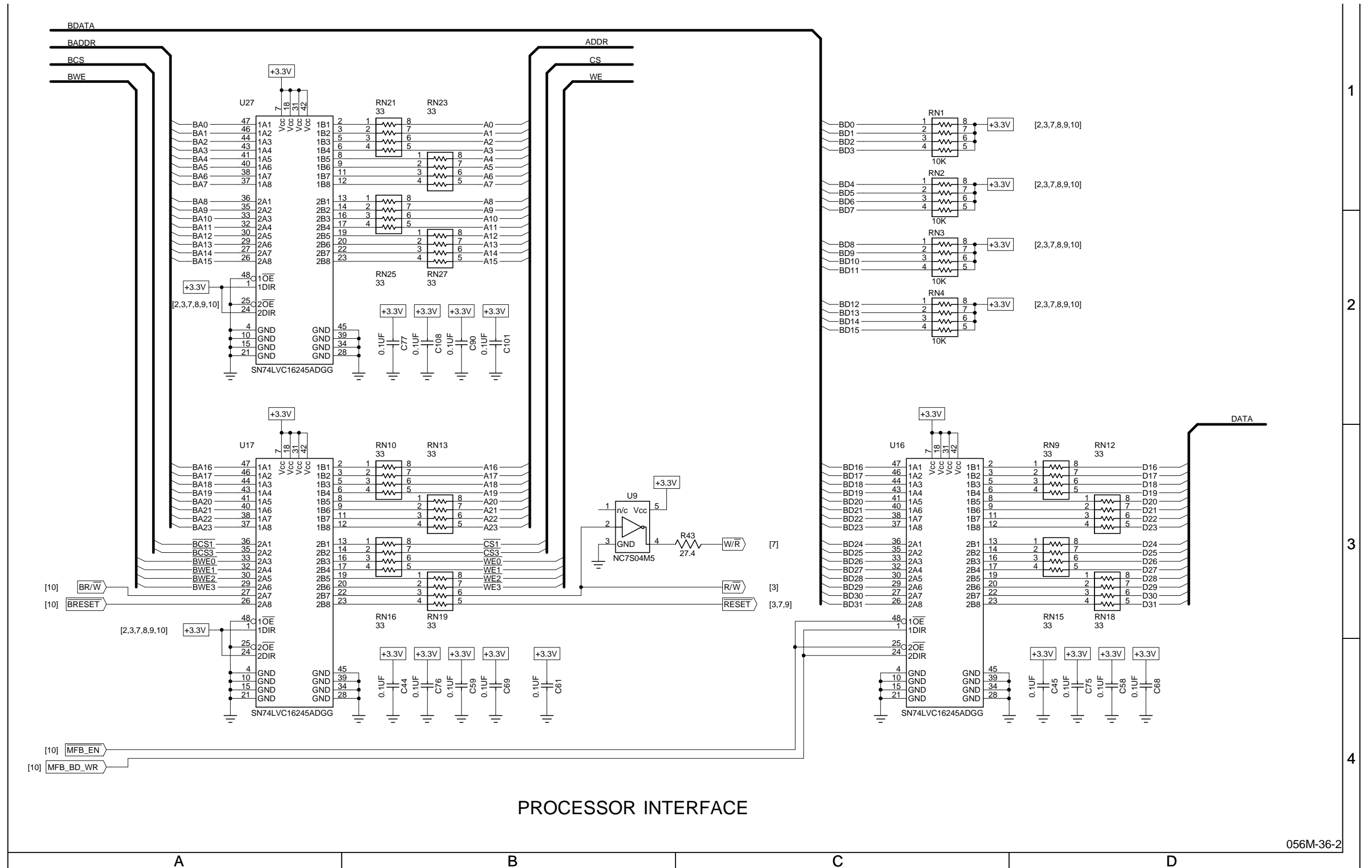
Figure 11 Multi-Function PCB Assy (Sheet 1 of 13)  
(56A1A2A3)





(0000-5630-300-F, G) (10000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 3 of 13)  
(Circuit Schematic - Sheet 1 of 11) (56A1A2A3)

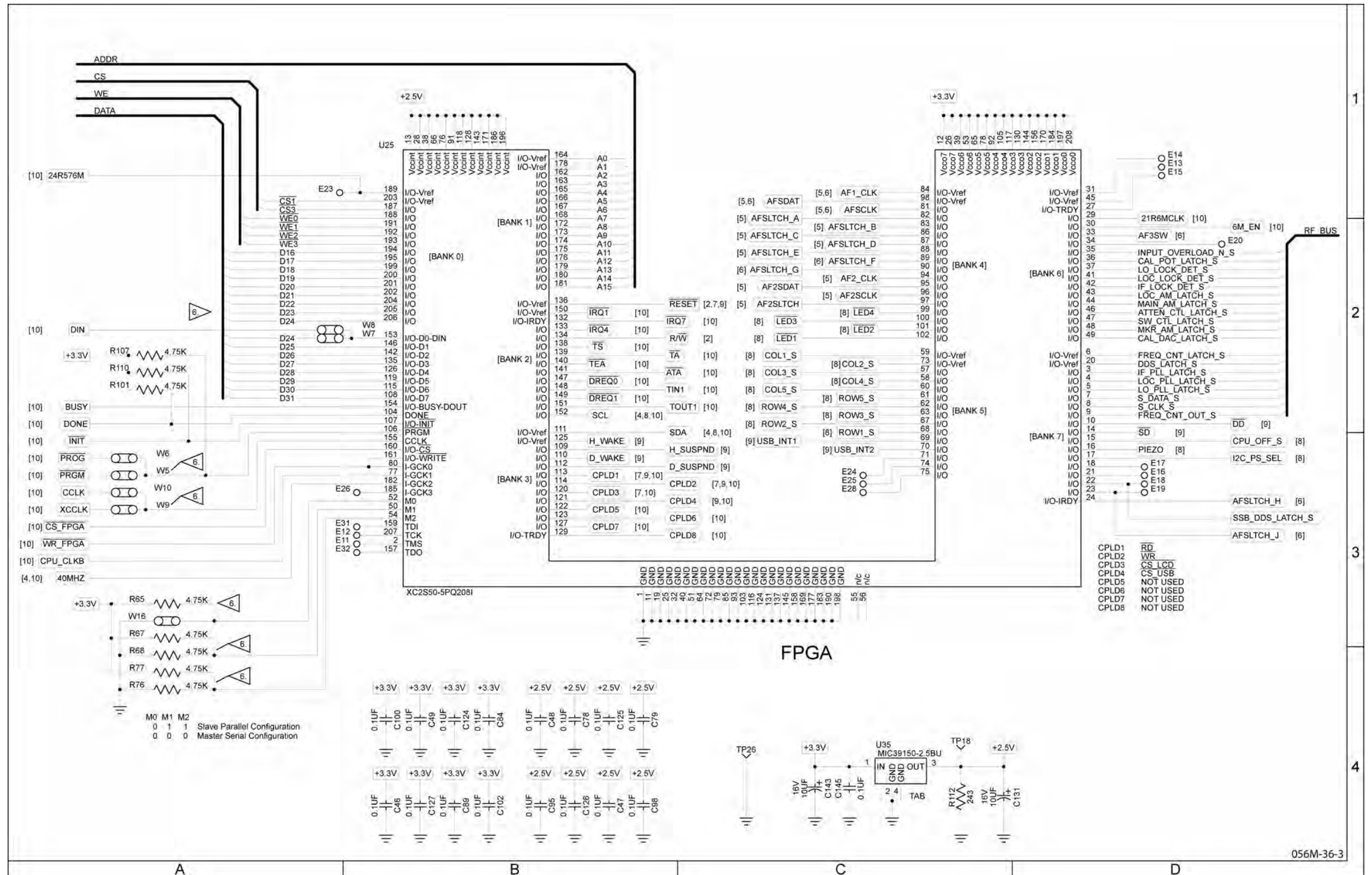


PROCESSOR INTERFACE

056M-36-2

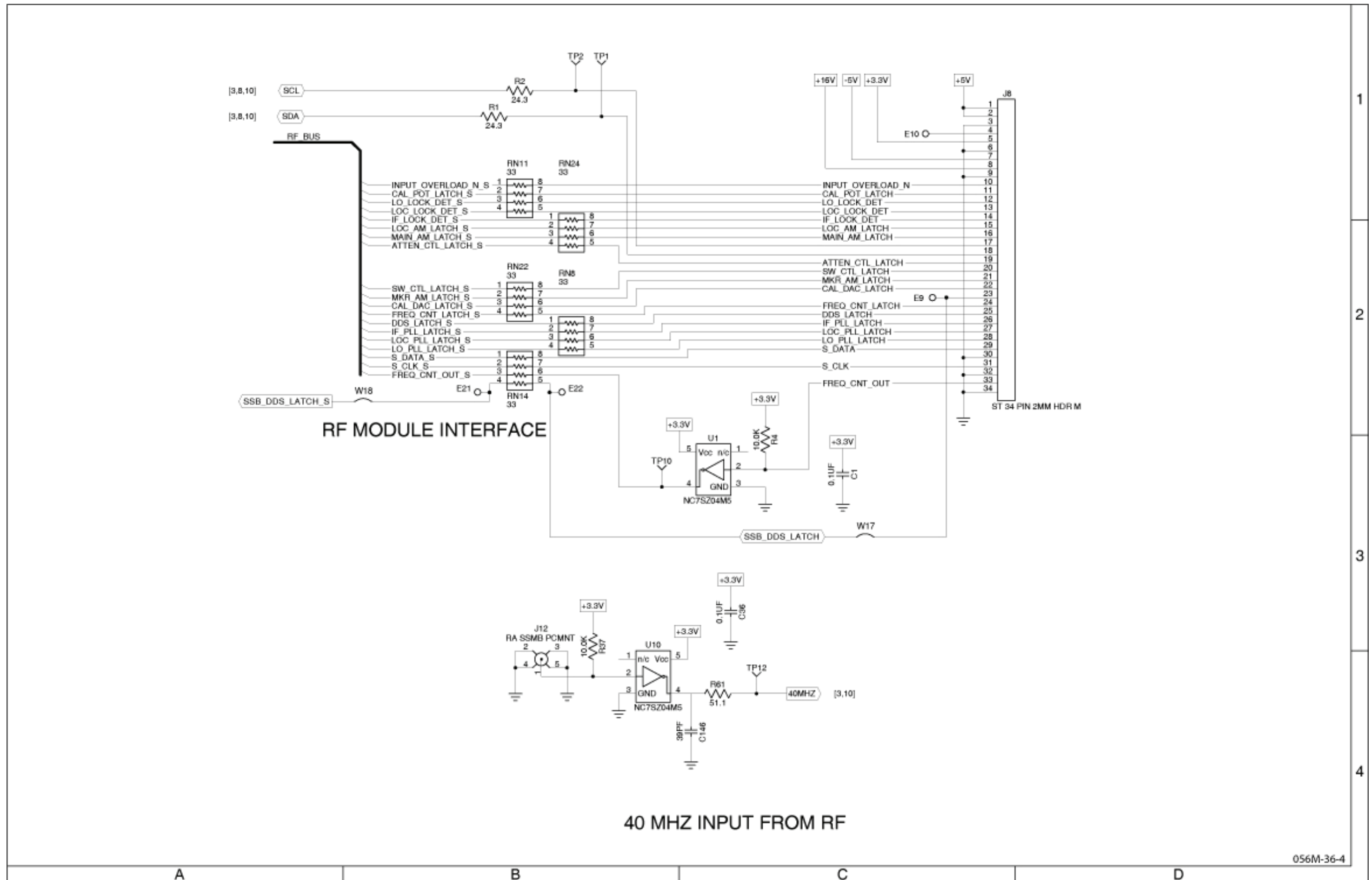
(0000-5630-300-F, G) (10000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 4 of 13)  
(Circuit Schematic - Sheet 2 of 11) (56A1A2A3)



(0000-5630-300-F, G) (1000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 5 of 13)  
(Circuit Schematic - Sheet 3 of 11) (56A1A2A3)

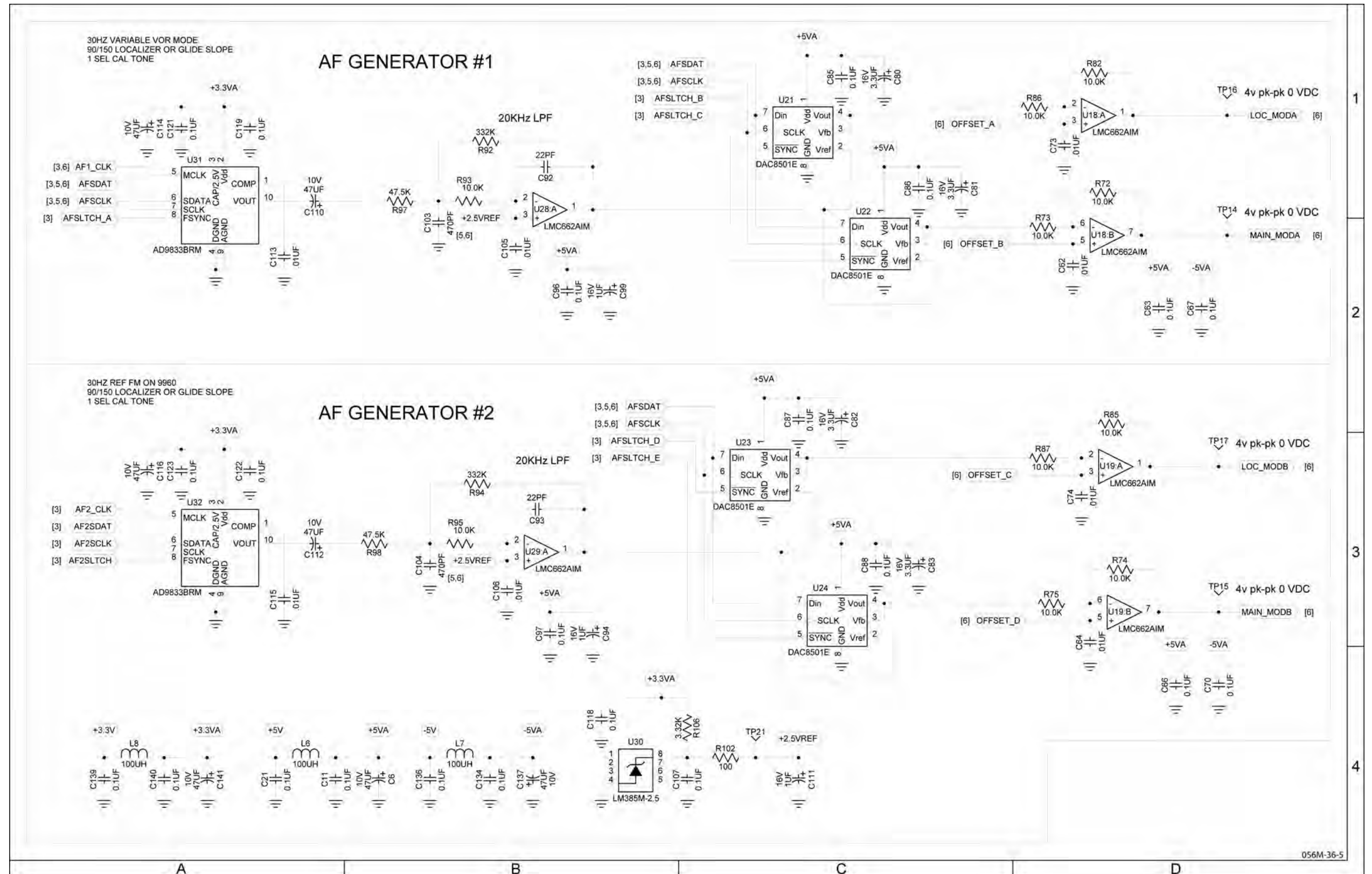


056M-36-4

(0000-5630-300-F, G) (10000021104-AA)

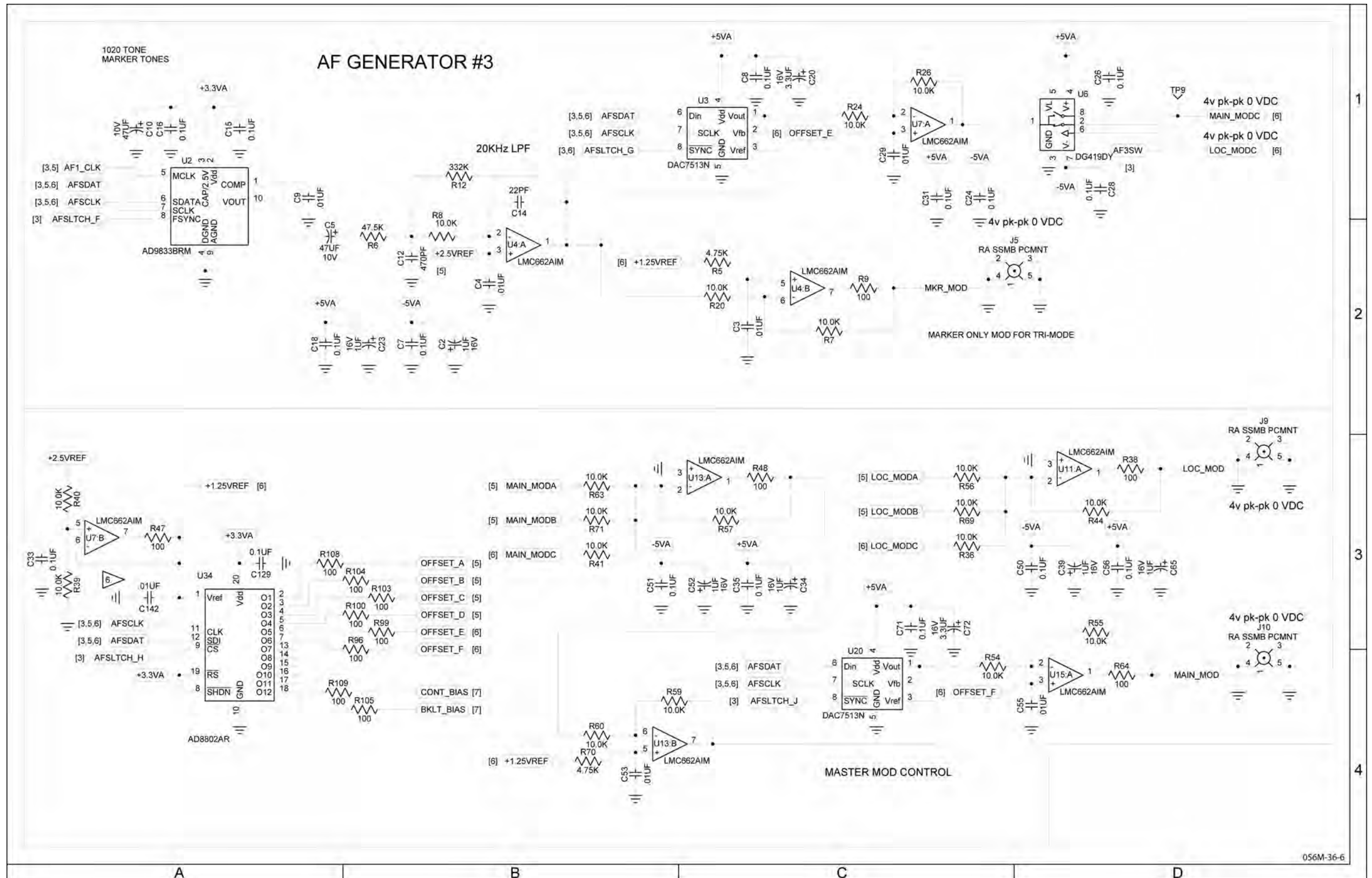
Figure 11 Multi-Function PCB Assy (Sheet 6 of 13)  
(Circuit Schematic - Sheet 4 of 11) (56A1A2A3)





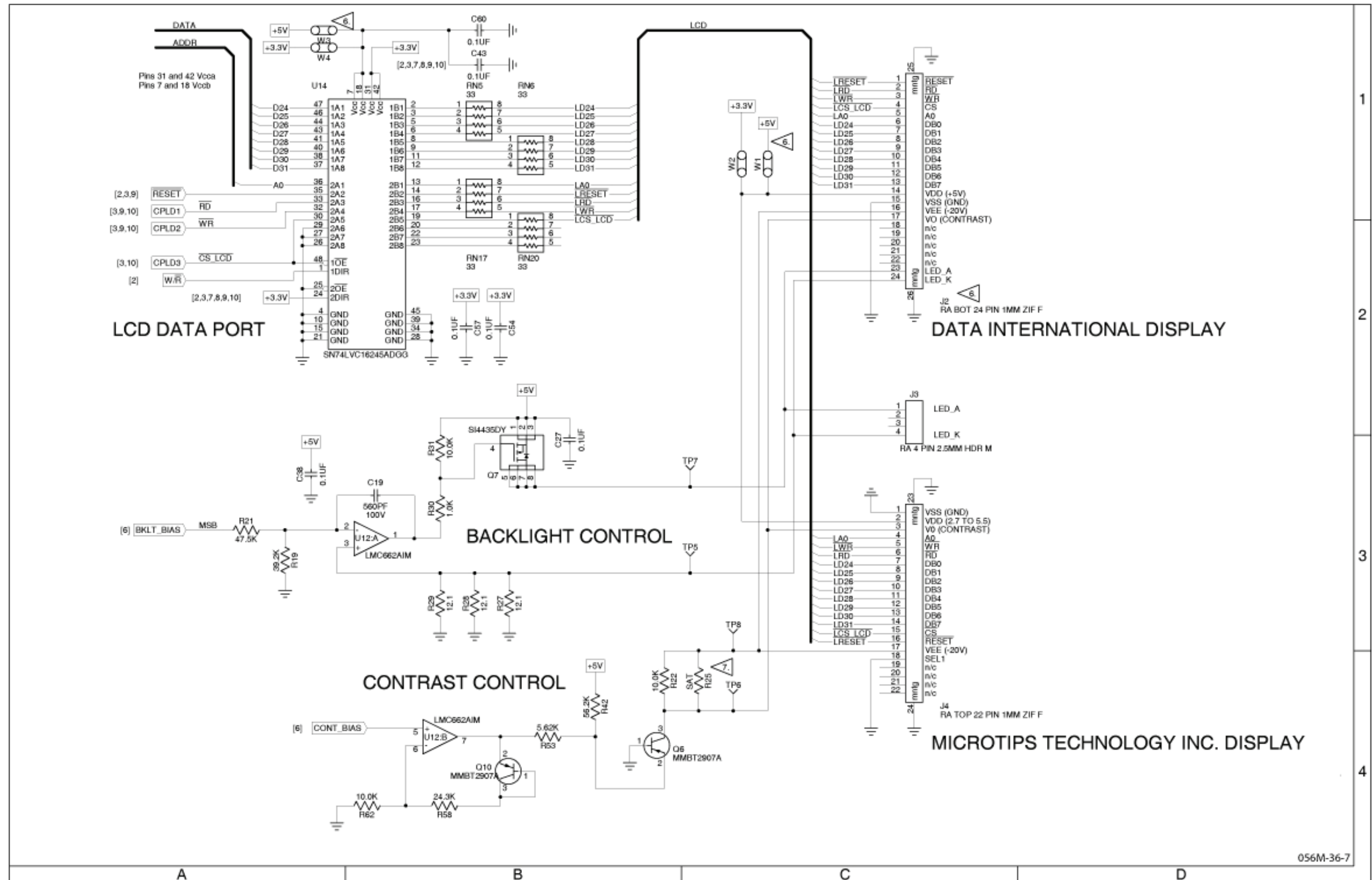
(0000-5630-300-F, G) (10000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 7 of 13)  
(Circuit Schematic - Sheet 5 of 11) (56A1A2A3)



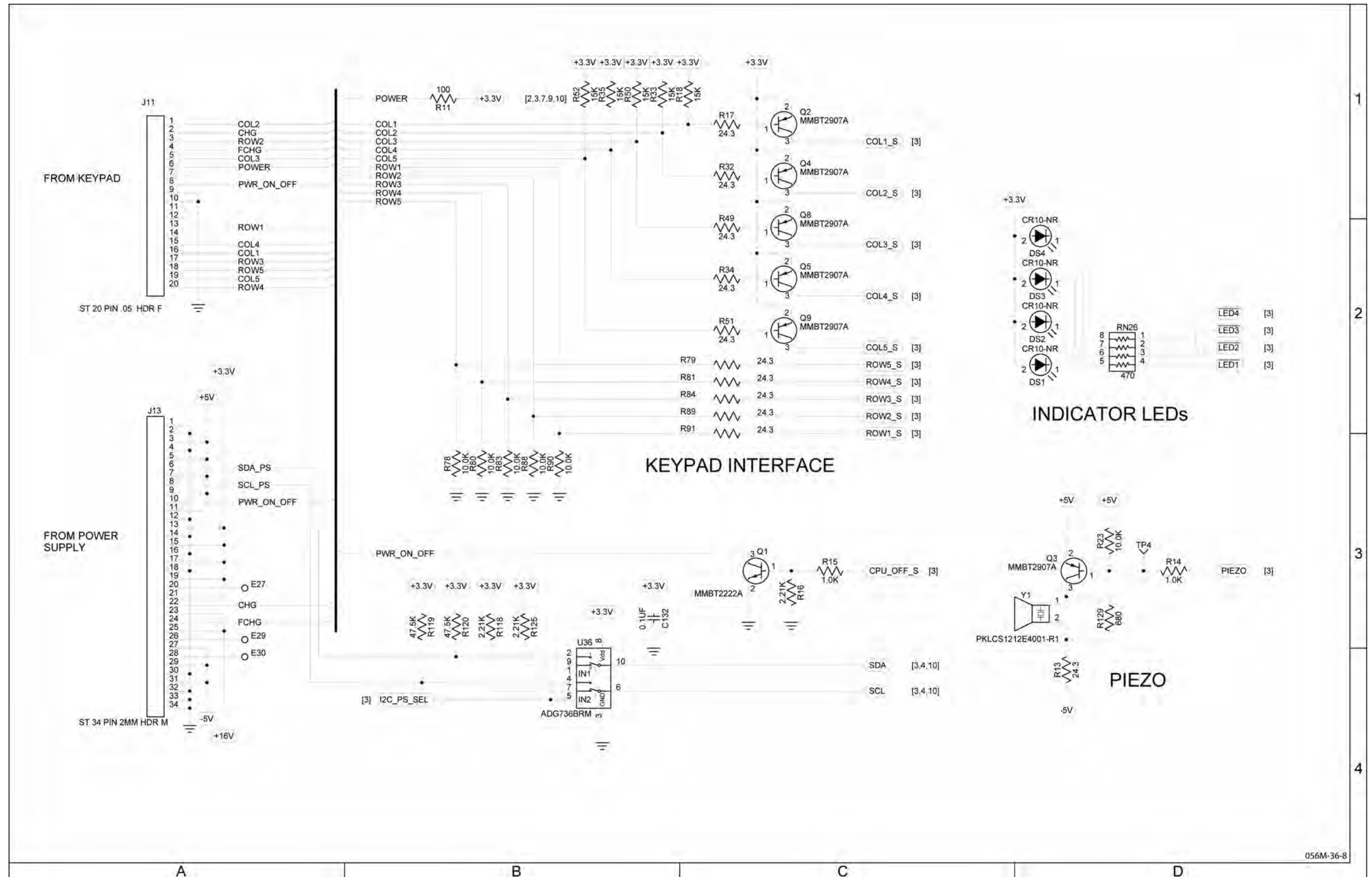
(0000-5630-300-F, G) (1000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 8 of 13)  
(Circuit Schematic - Sheet 6 of 11) (56A1A2A3)



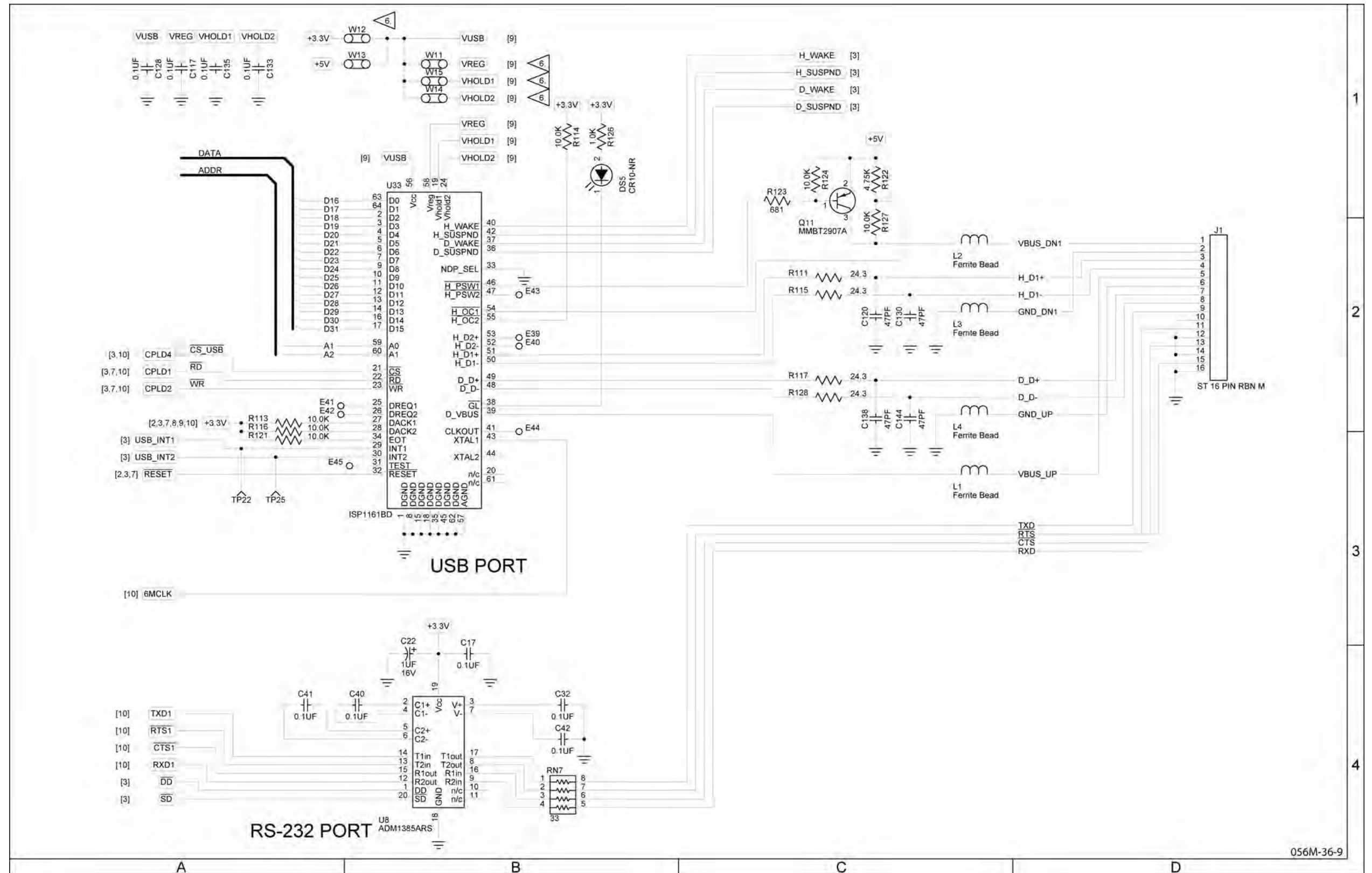
(0000-5630-300-F, G) (1000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 9 of 13)  
(Circuit Schematic - Sheet 7 of 11) (56A1A2A3)



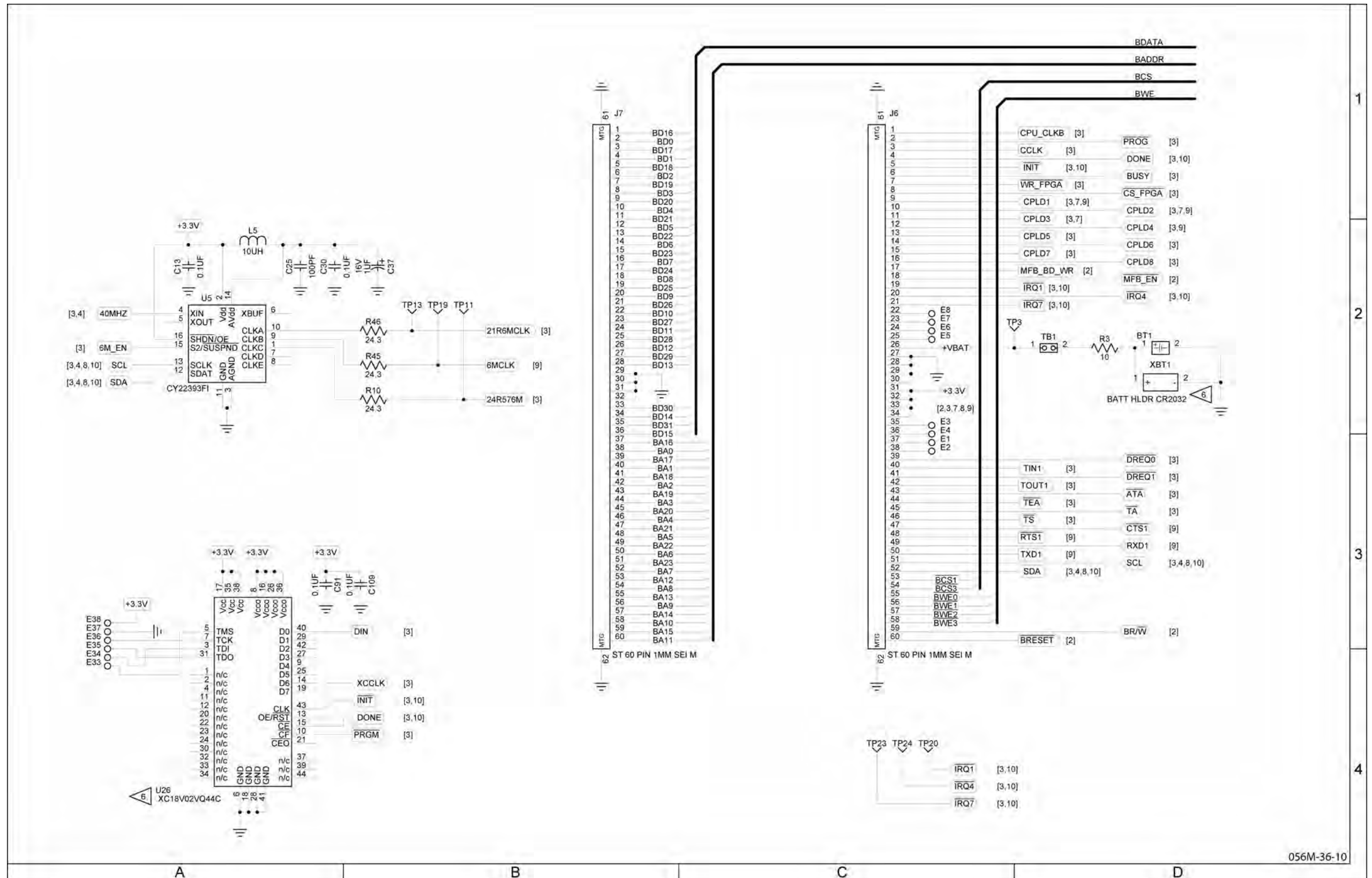
(0000-5630-300-F, G) (1000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 10 of 13)  
(Circuit Schematic - Sheet 8 of 11) (56A1A2A3)



(0000-5630-300-F, G) (10000021104-AA)

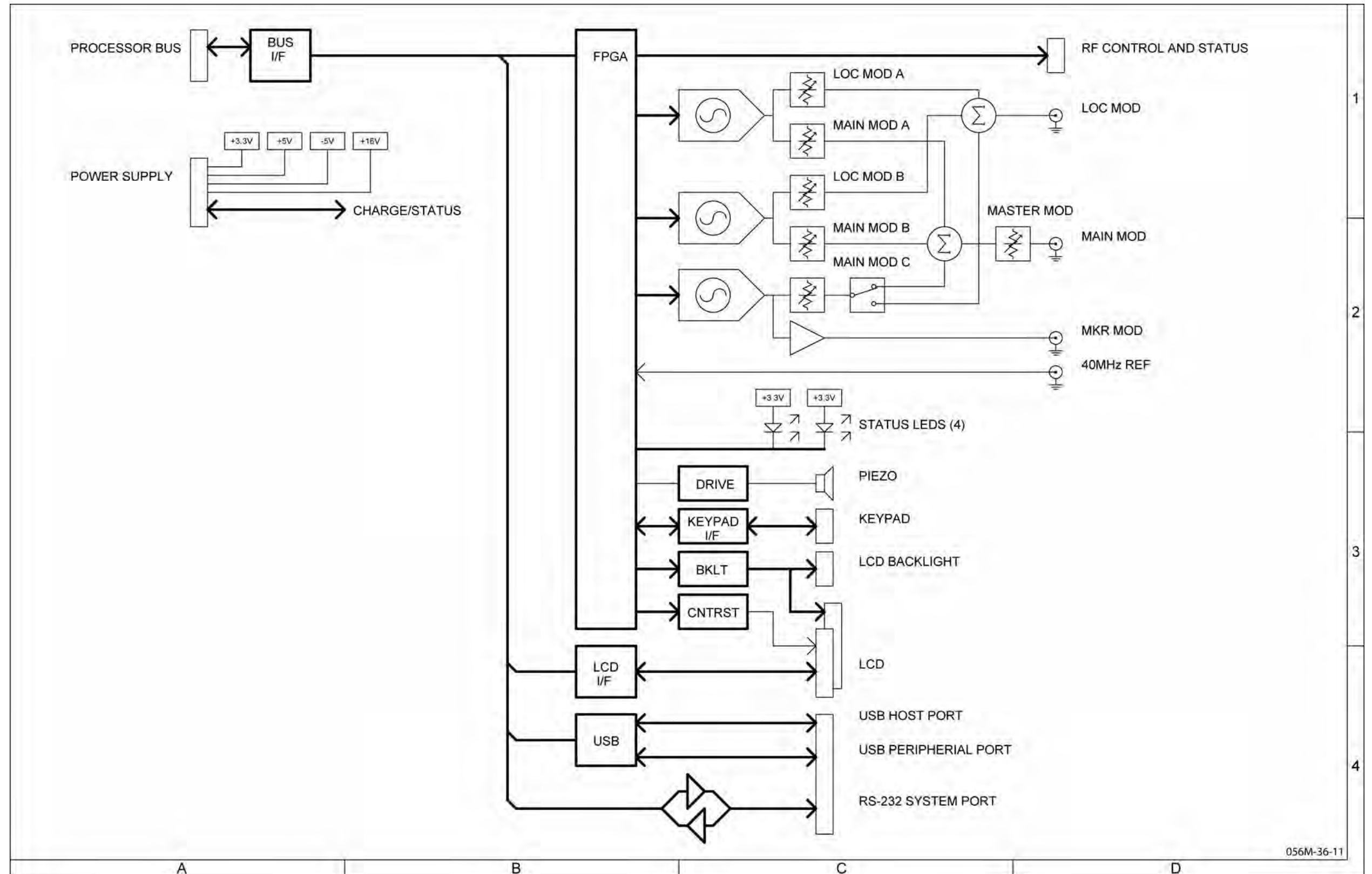
Figure 11 Multi-Function PCB Assy (Sheet 11 of 13)  
(Circuit Schematic - Sheet 9 of 11) (56A1A2A3)



056M-36-10

(0000-5630-300-F, G) (1000021104-AA)

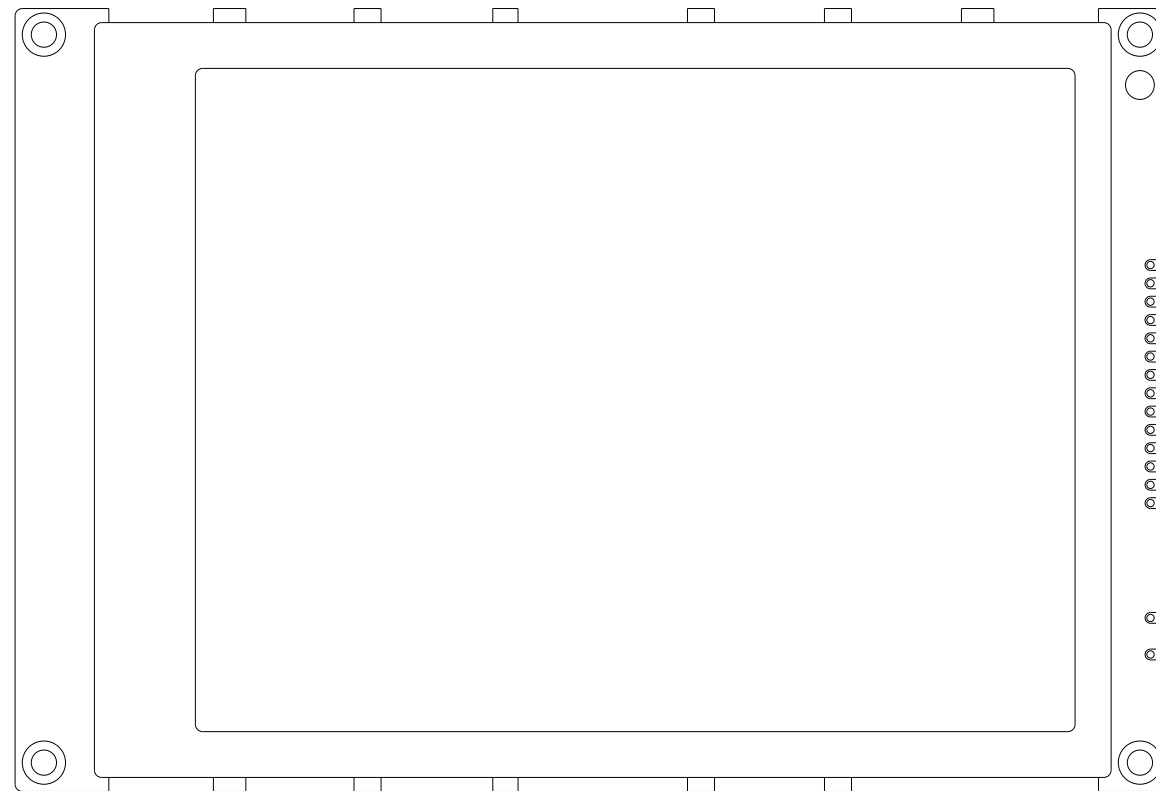
Figure 11 Multi-Function PCB Assy (Sheet 12 of 13)  
(Circuit Schematic - Sheet 10 of 11) (56A1A2A3)



056M-36-11

(0000-5630-300-F, G) (10000021104-AA)

Figure 11 Multi-Function PCB Assy (Sheet 13 of 13)  
(Circuit Schematic - Sheet 11 of 11) (56A1A2A3)

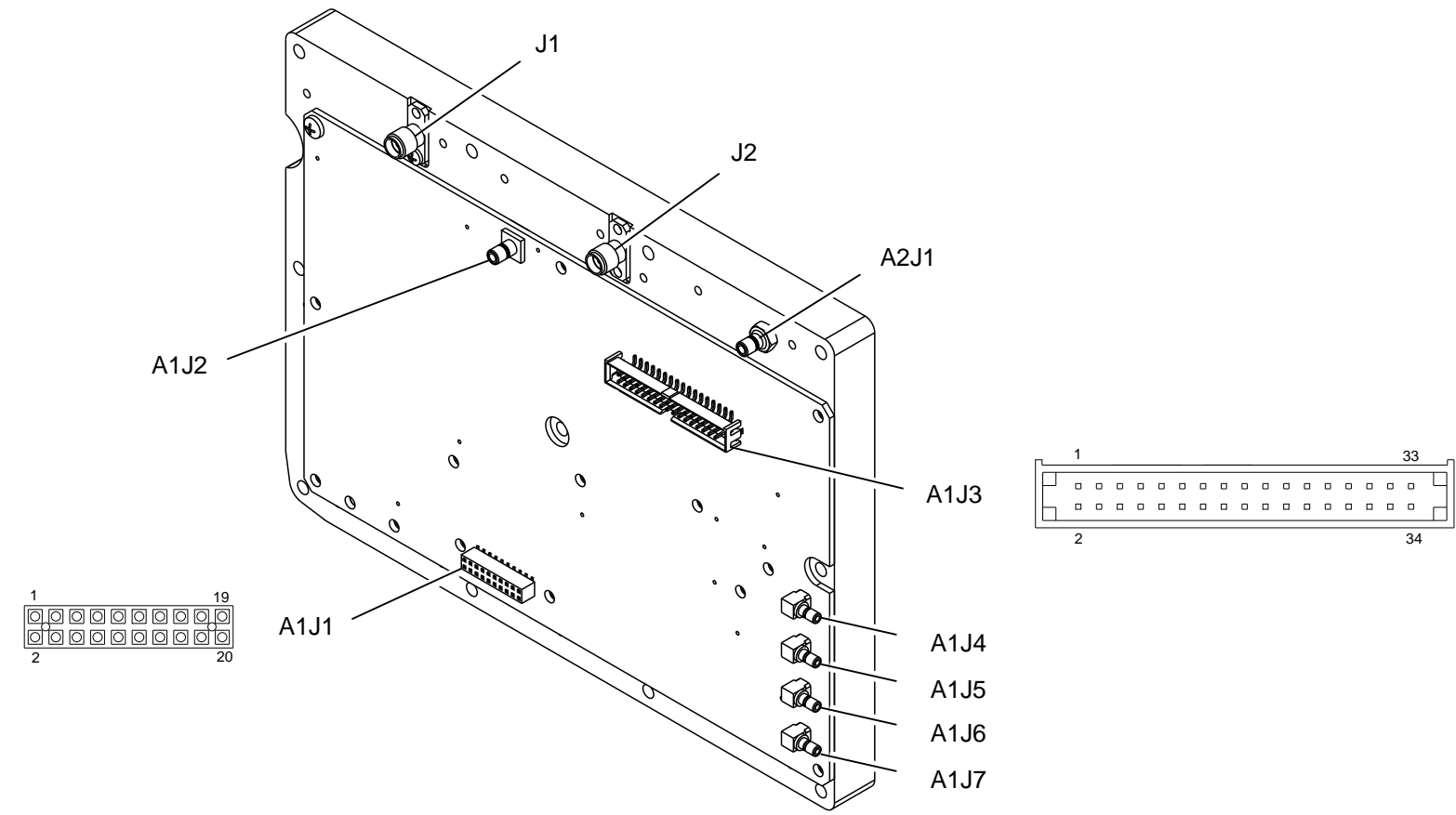


(7110-5600-000-B) (67364)

056M-09

Figure 12 LCD Assy  
(56A1A2A4)





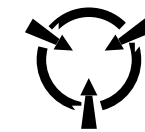
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3.

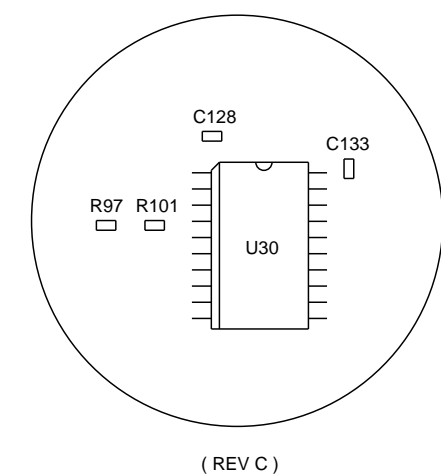
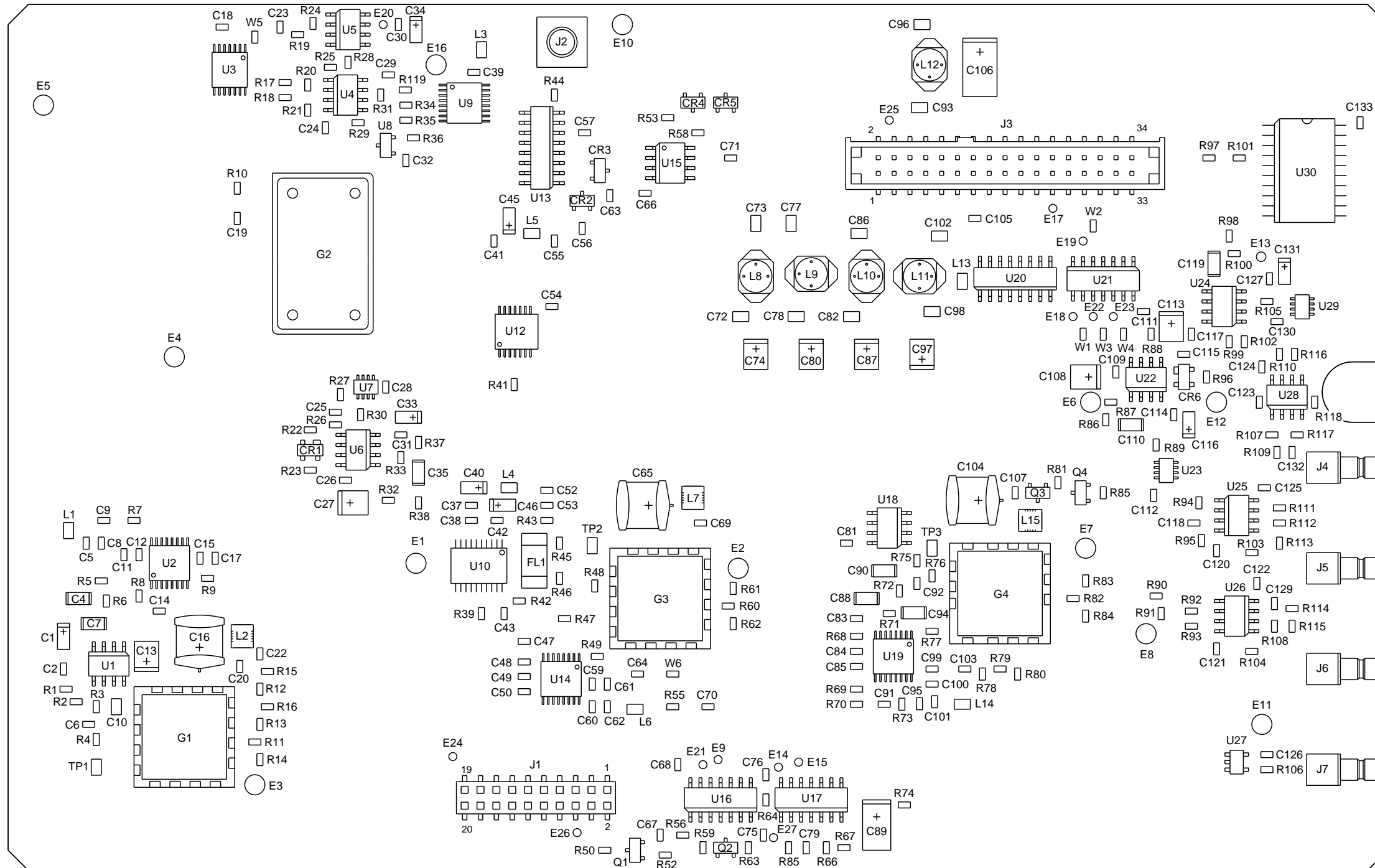
(7005-5640-400-B) (64571)

056M-014

Figure 13 RF Assy (Sheet 1 of 45)  
(56A1A3)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

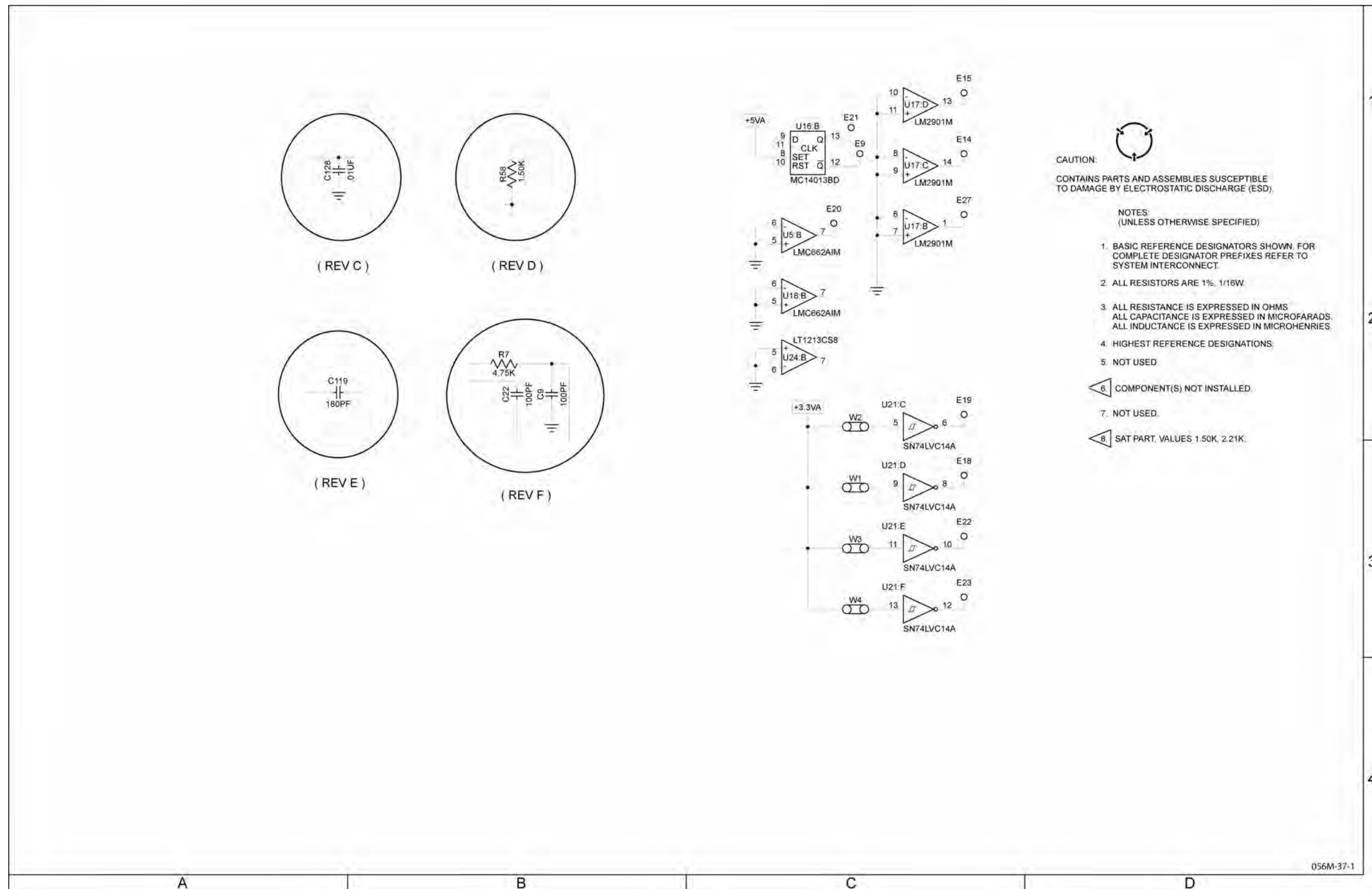


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A1.

056M-33



(7010-5630-400-D, E, F, G) (65951)

Figure 13 RF Assy (Sheet 2 of 45)  
(RF Controller PCB Assy - Sheet 1 of 6) (56A1A3A1)



CAUTION:   
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

- NOTES:  
(UNLESS OTHERWISE SPECIFIED)
1. BASIC REFERENCE DESIGNATORS SHOWN, FOR COMPLETE DESIGNATOR PREFIXES REFER TO SYSTEM INTERCONNECT.
  2. ALL RESISTORS ARE 1%, 1/16W.
  3. ALL RESISTANCE IS EXPRESSED IN OHMS. ALL CAPACITANCE IS EXPRESSED IN MICROFARADS. ALL INDUCTANCE IS EXPRESSED IN MICROHENRIES.
  4. HIGHEST REFERENCE DESIGNATIONS.
  5. NOT USED.

-  6. COMPONENT(S) NOT INSTALLED.
- 7. NOT USED.
-  8. SAT PART. VALUES 1.50K, 2.21K.

056M-37-1

Figure 13 RF Assy (Sheet 3 of 45)  
(RF Controller PCB Assy - Sheet 2 of 6) (56A1A3A1)  
(Circuit Schematic - Sheet 1 of 5)

(0000-5630-400-G)

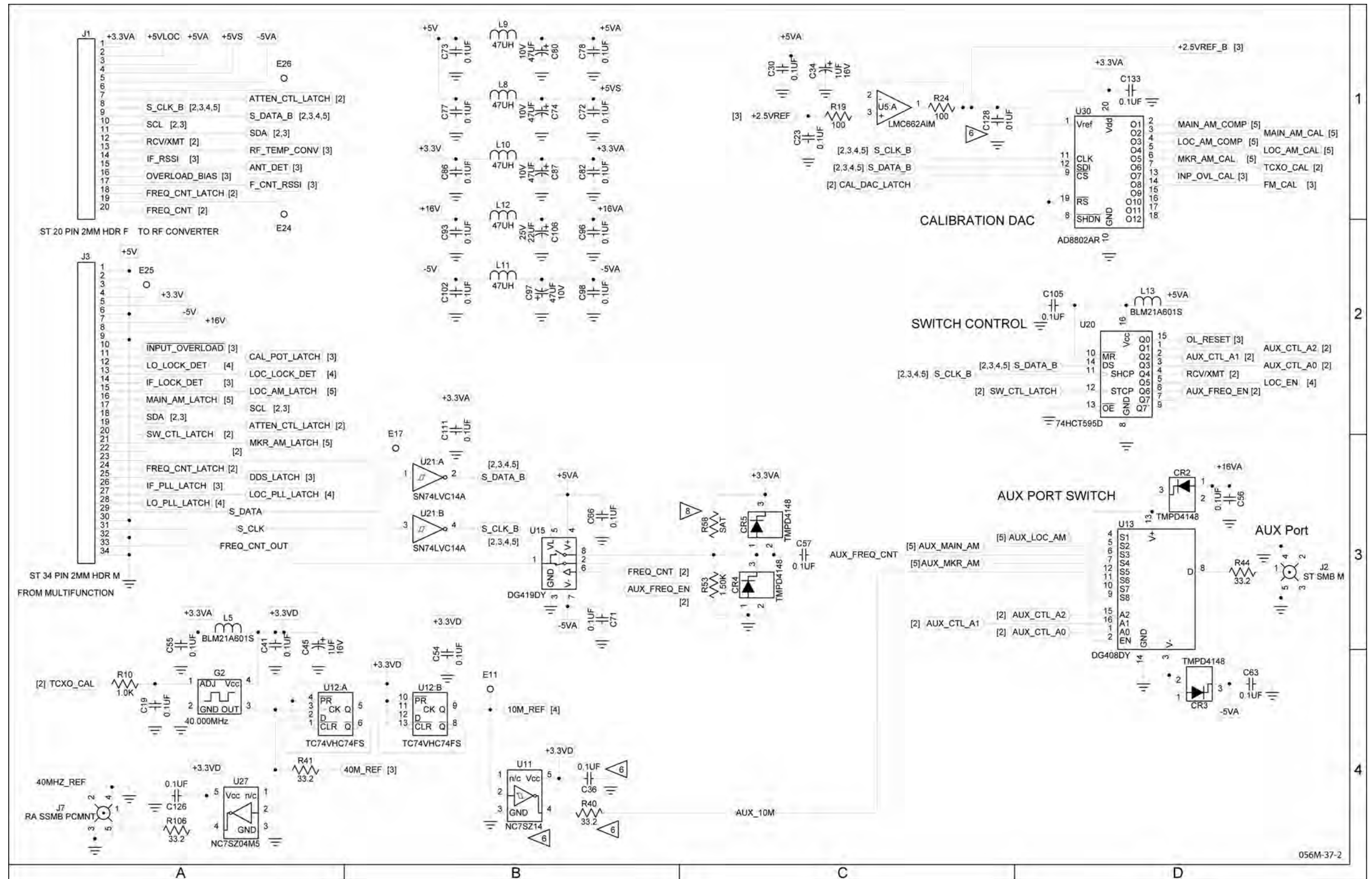


Figure 13 RF Assy (Sheet 4 of 45)  
(RF Controller PCB Assy - Sheet 3 of 6) (56A1A3A1)  
(Circuit Schematic - Sheet 2 of 5)

(0000-5630-400-G)

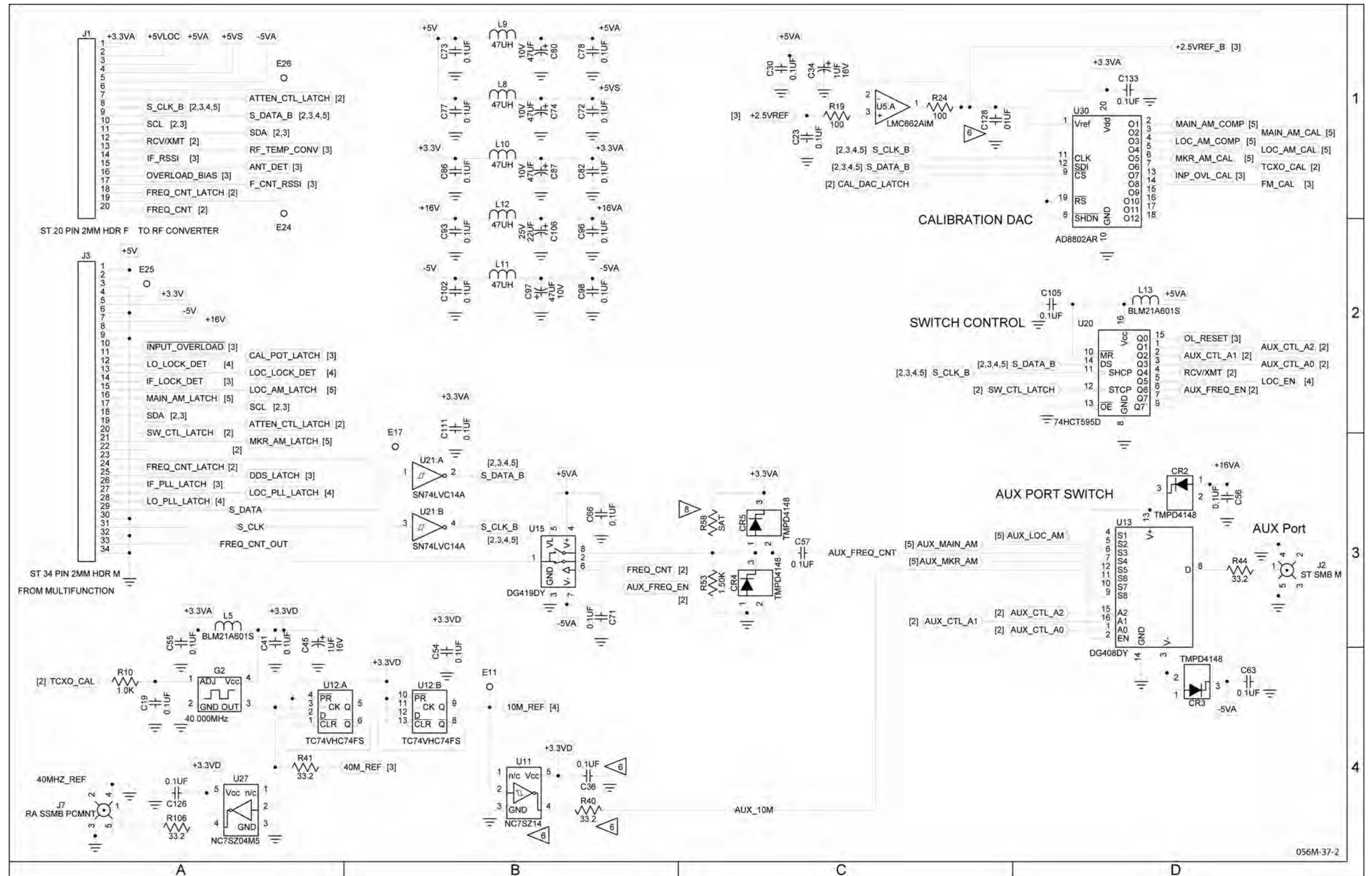


Figure 13 RF Assy (Sheet 5 of 45)  
(RF Controller PCB Assy - Sheet 4 of 6) (56A1A3A1)  
(Circuit Schematic - Sheet 3 of 5)

(0000-5630-400-G)

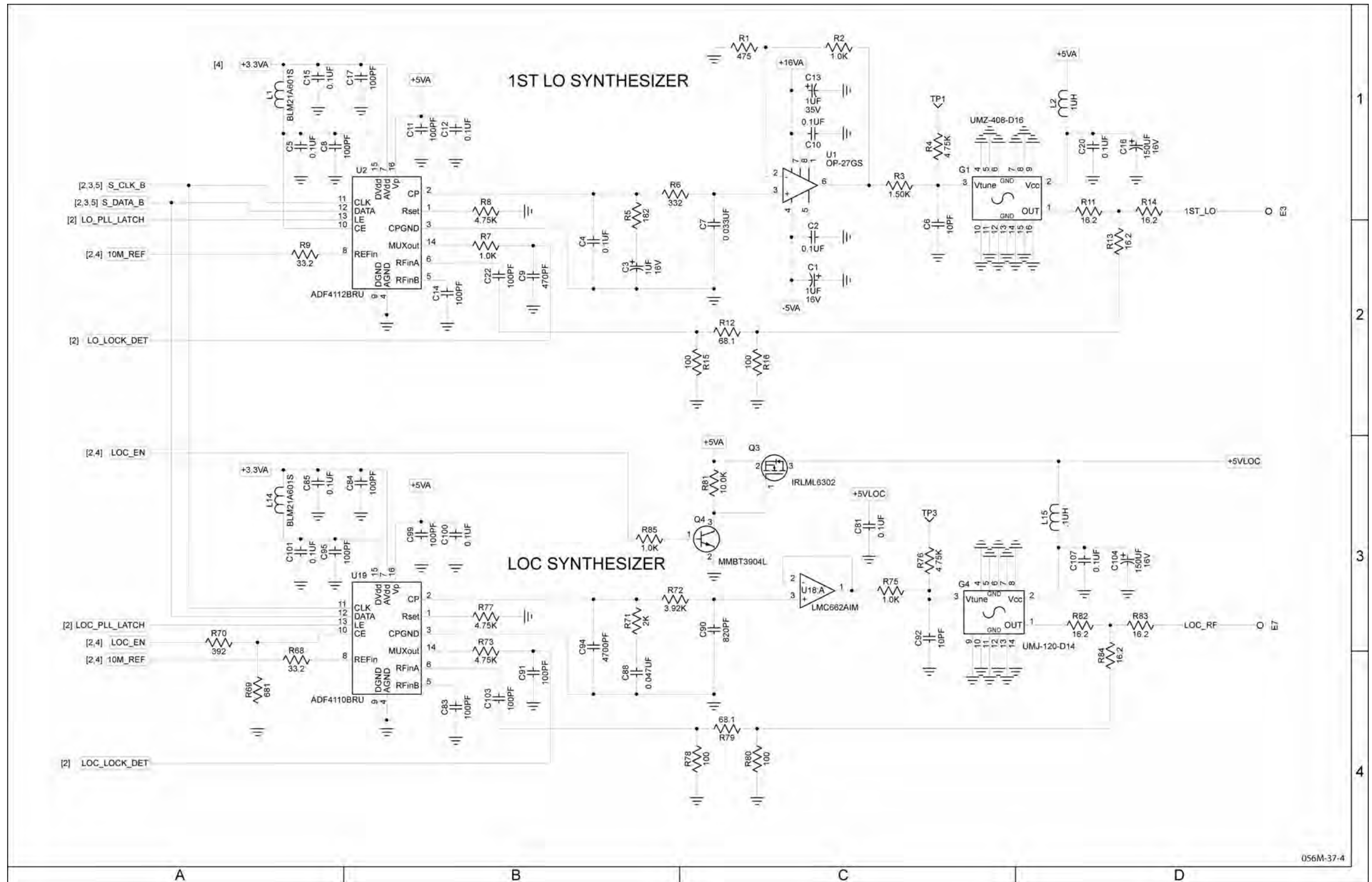


Figure 13 RF Assy (Sheet 6 of 45)  
(RF Controller PCB Assy - Sheet 5 of 6) (56A1A3A1)  
(Circuit Schematic - Sheet 4 of 5)

(0000-5630-400-G)

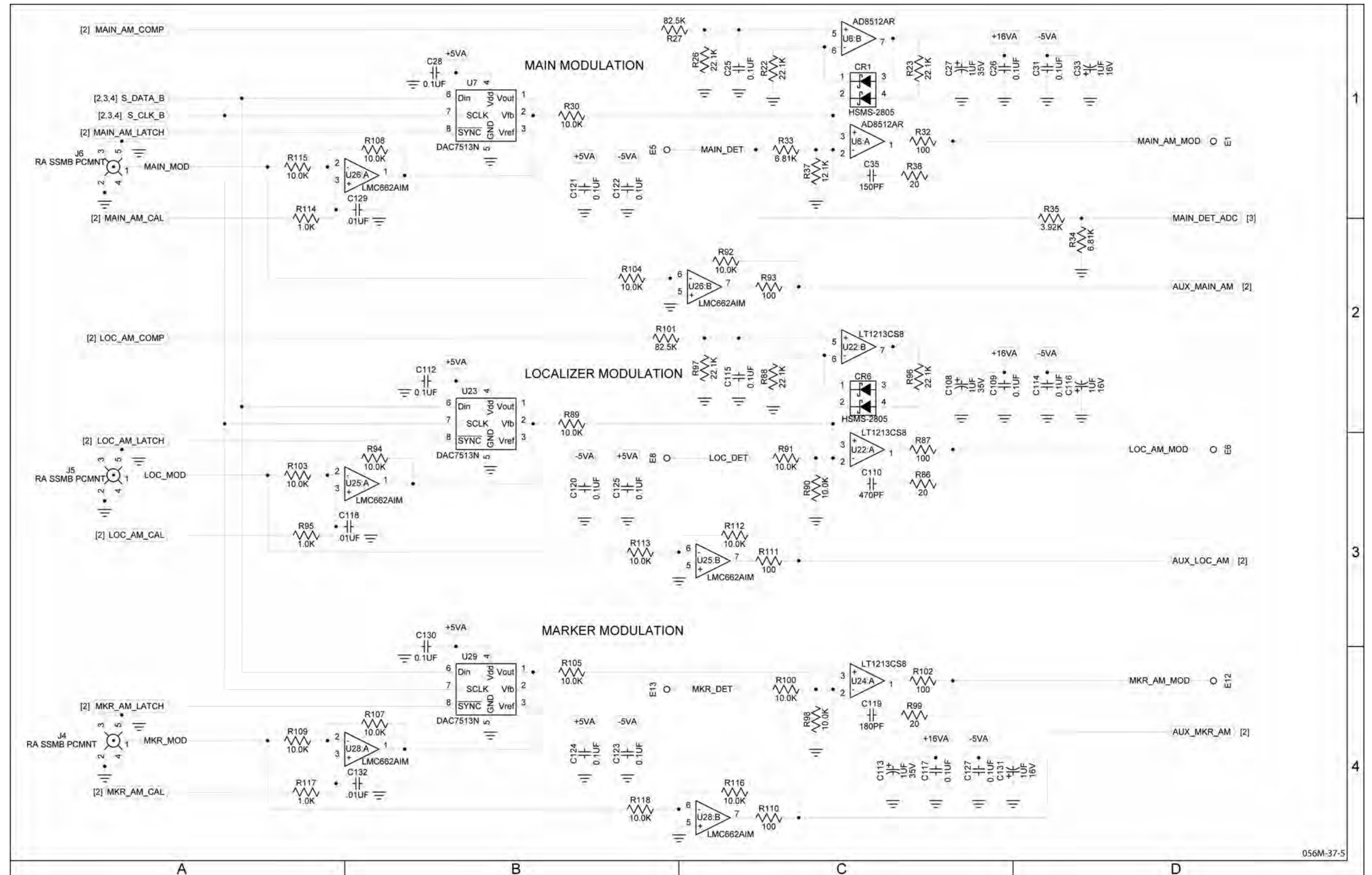
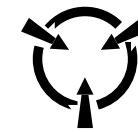


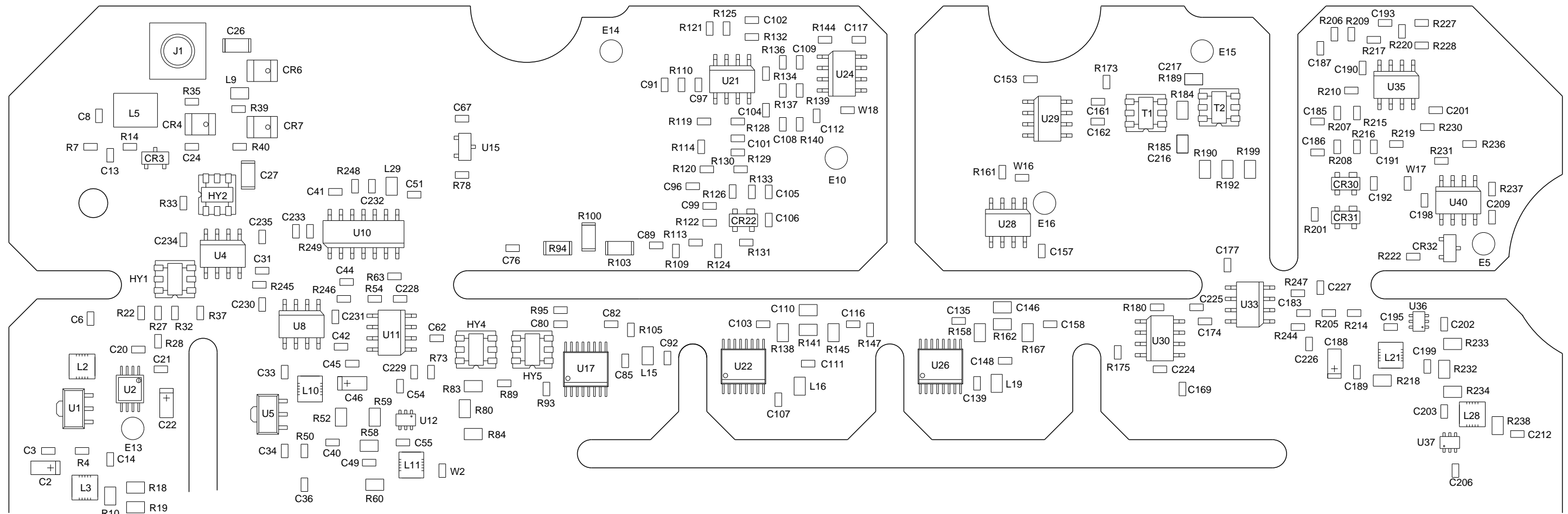
Figure 13 RF Assy (Sheet 7 of 45)  
(RF Controller PCB Assy - Sheet 6 of 6) (56A1A3A1)  
(Circuit Schematic - Sheet 5 of 5)

(0000-5630-400-G)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

DETAIL A  
DETAIL B



(DETAIL A)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A2.

056M-34a

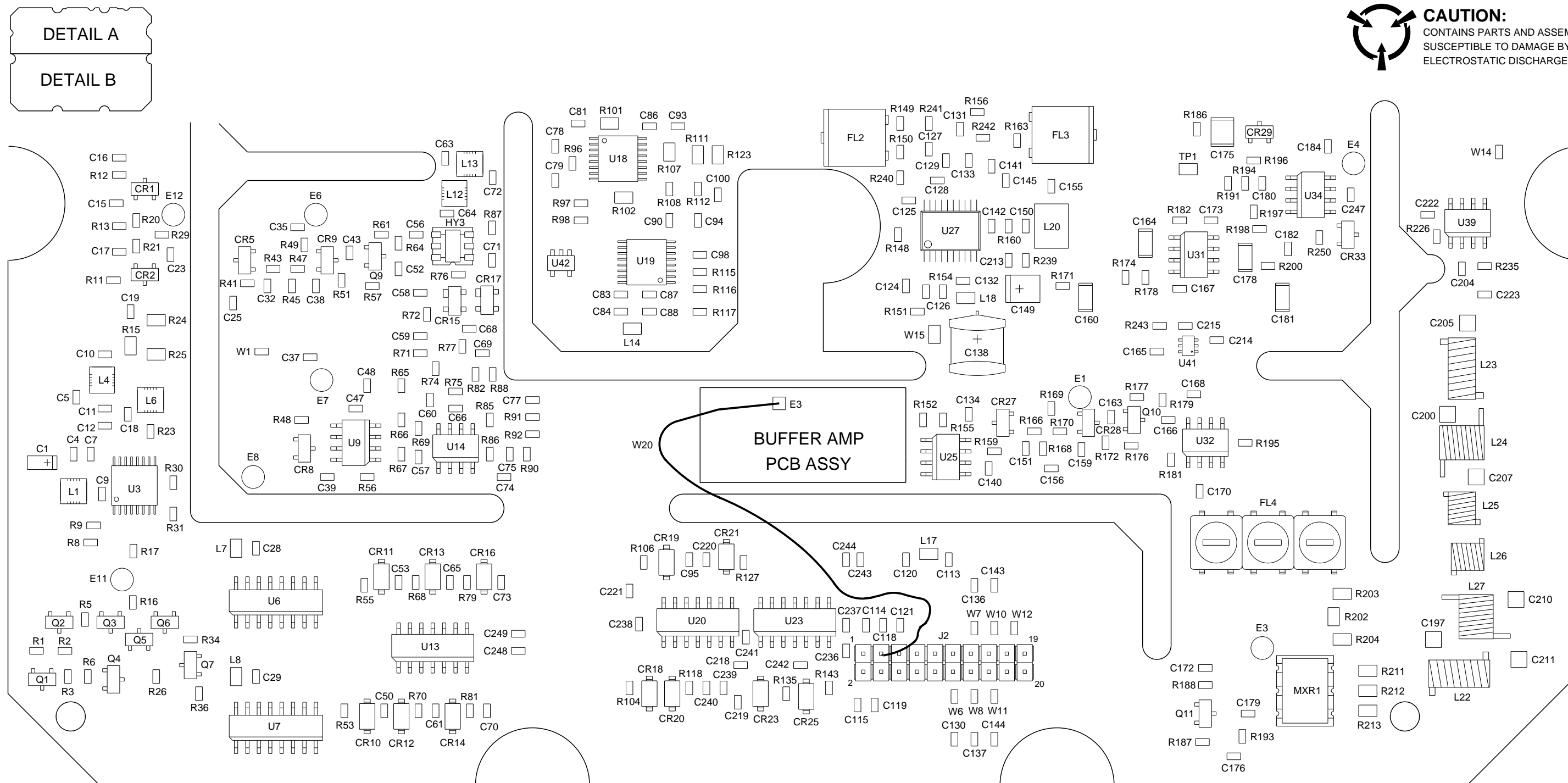
(7010-5630-600-E, F, G) (65953)

Figure 13 RF Assy (Sheet 8 of 45)  
(RF Converter PCB Assy - Sheet 1 of 10) (56A1A3A2)





**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



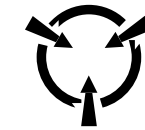
(DETAIL B)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A2.

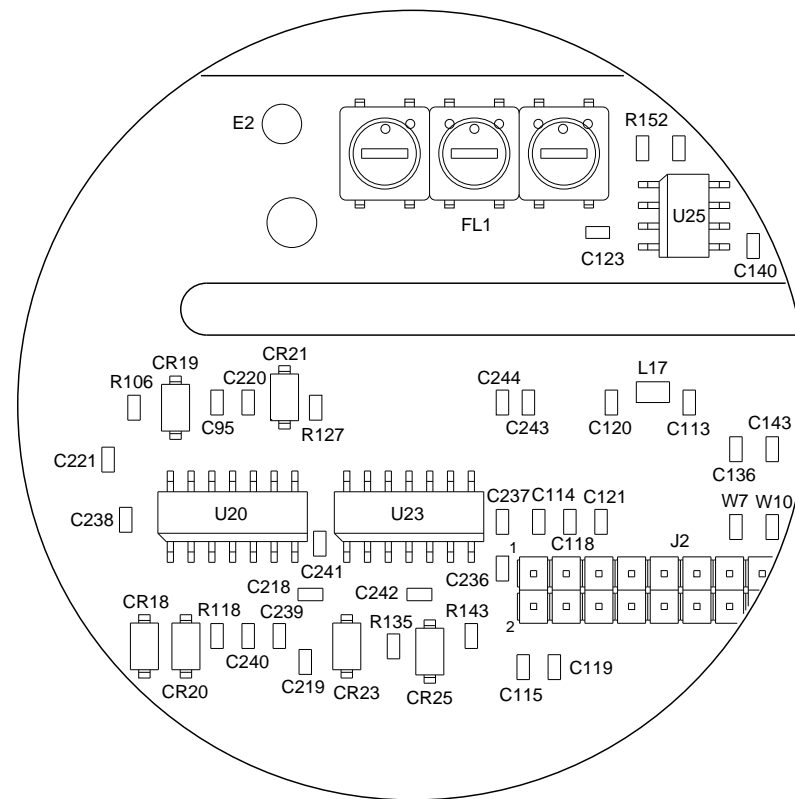
(7010-5630-600-E, F, G) (65953)

056M-34b

Figure 13 RF Assy (Sheet 9 of 45)  
(RF Converter PCB Assy - Sheet 2 of 10) (56A1A3A2)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



(REV D)

056M-34c

(7010-5630-600-E, F, G) (65953)

Figure 13 RF Assy (Sheet 10 of 45)  
(RF Converter PCB Assy - Sheet 3 of 10) (56A1A3A2)

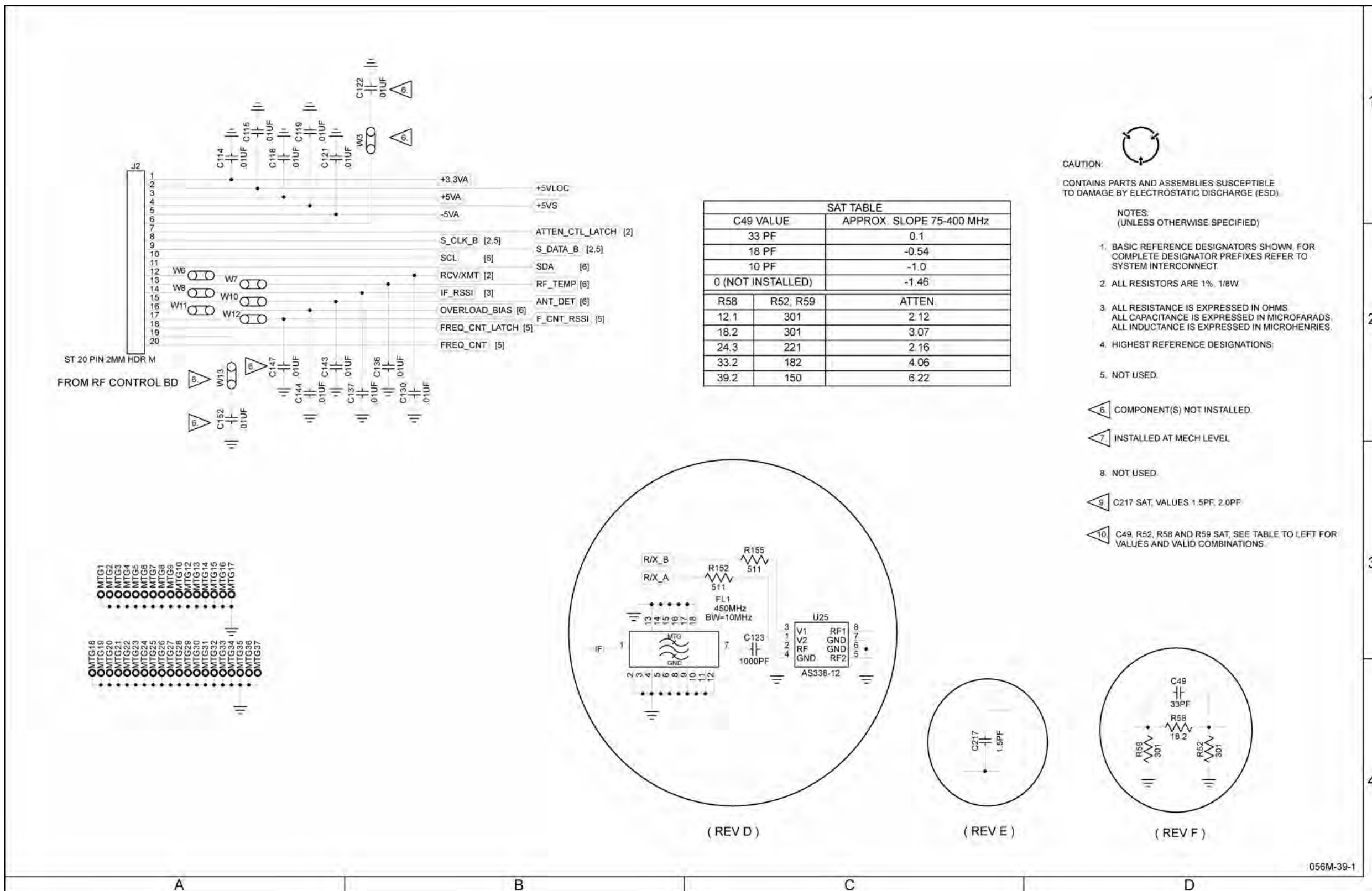


Figure 13 RF Ass'y (Sheet 11 of 45)  
(RF Converter PCB Ass'y - Sheet 4 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 1 of 6)

(0000-5630-600-G)

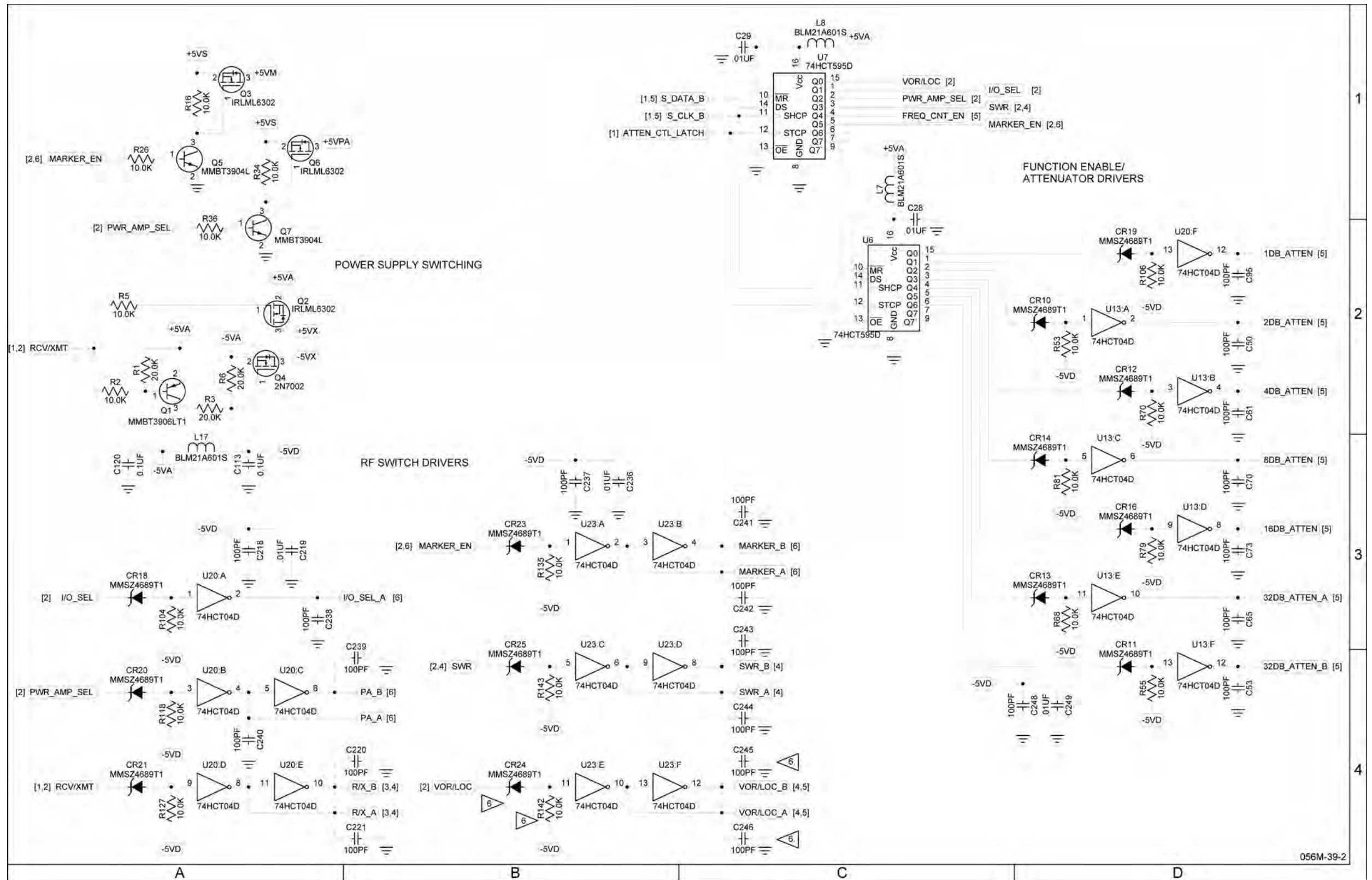
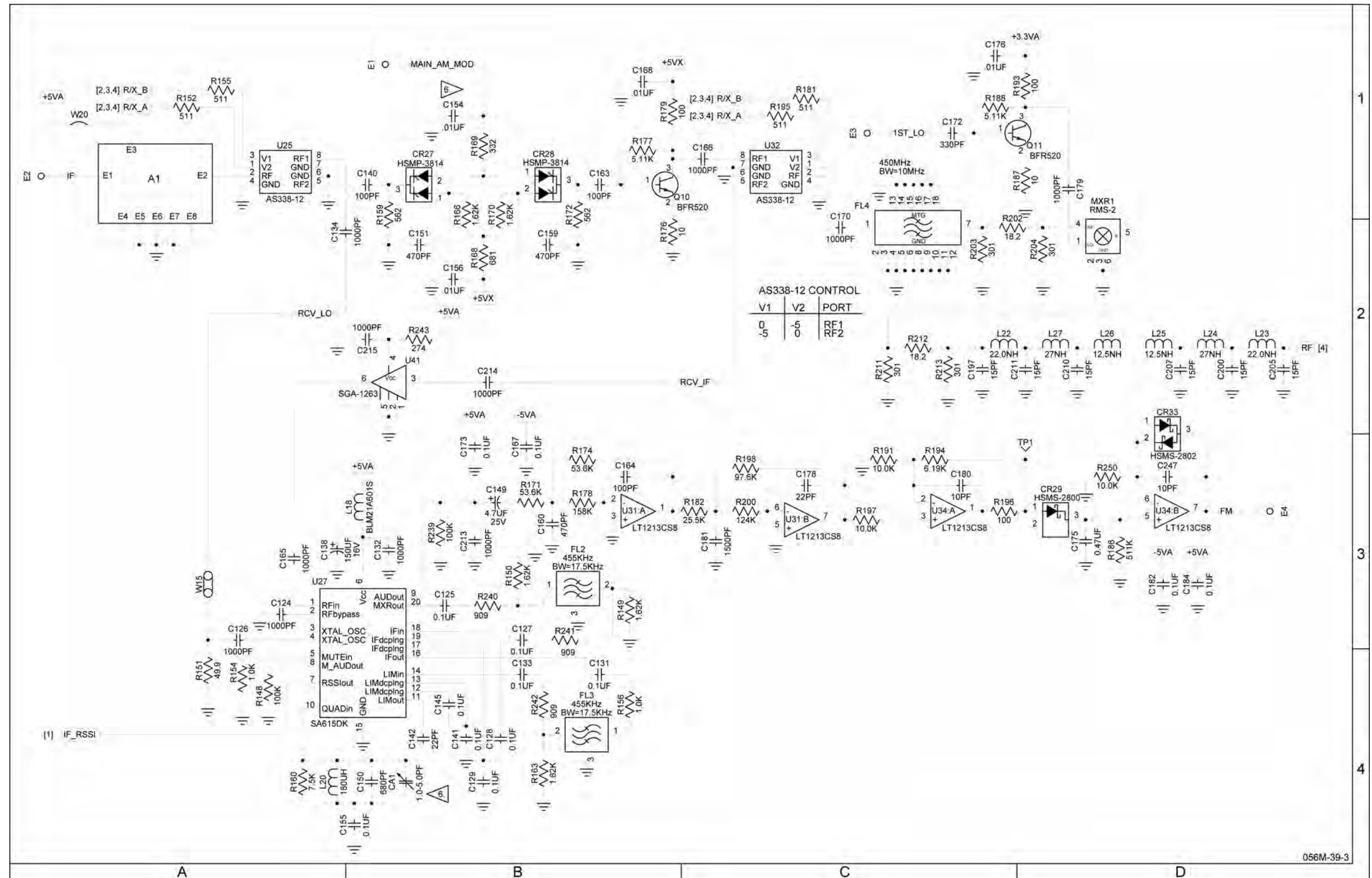


Figure 13 RF Assy (Sheet 12 of 45)  
(RF Converter PCB Assy - Sheet 5 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 2 of 6)

(0000-5630-600-G)



056M-39-3

Figure 13 RF Assy (Sheet 13 of 45)  
(RF Converter PCB Assy - Sheet 6 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 3 of 6)

(0000-5630-600-G)

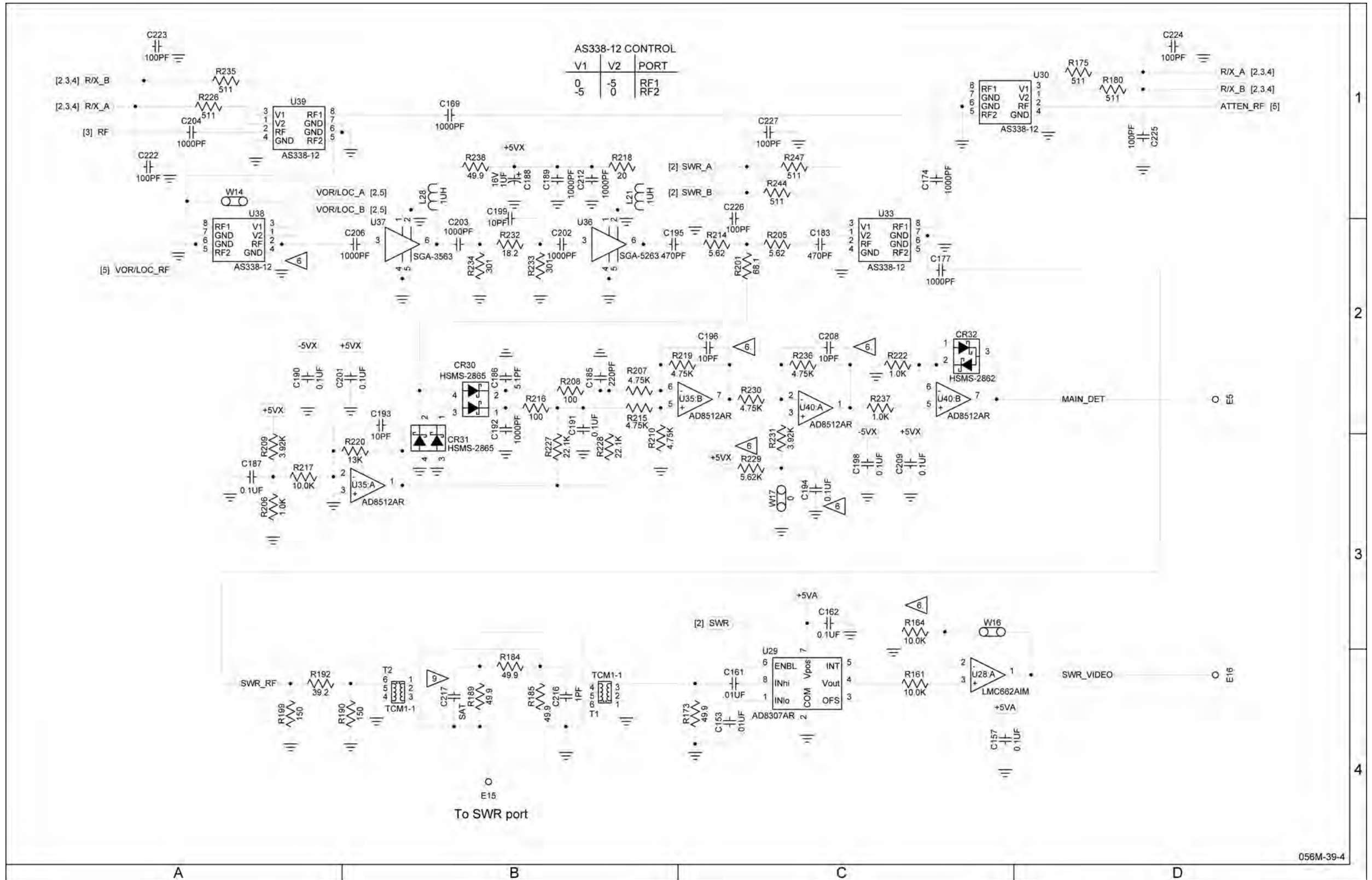


Figure 13 RF Assy (Sheet 14 of 45)  
(RF Converter PCB Assy - Sheet 7 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 4 of 6)

(0000-5630-600-G)

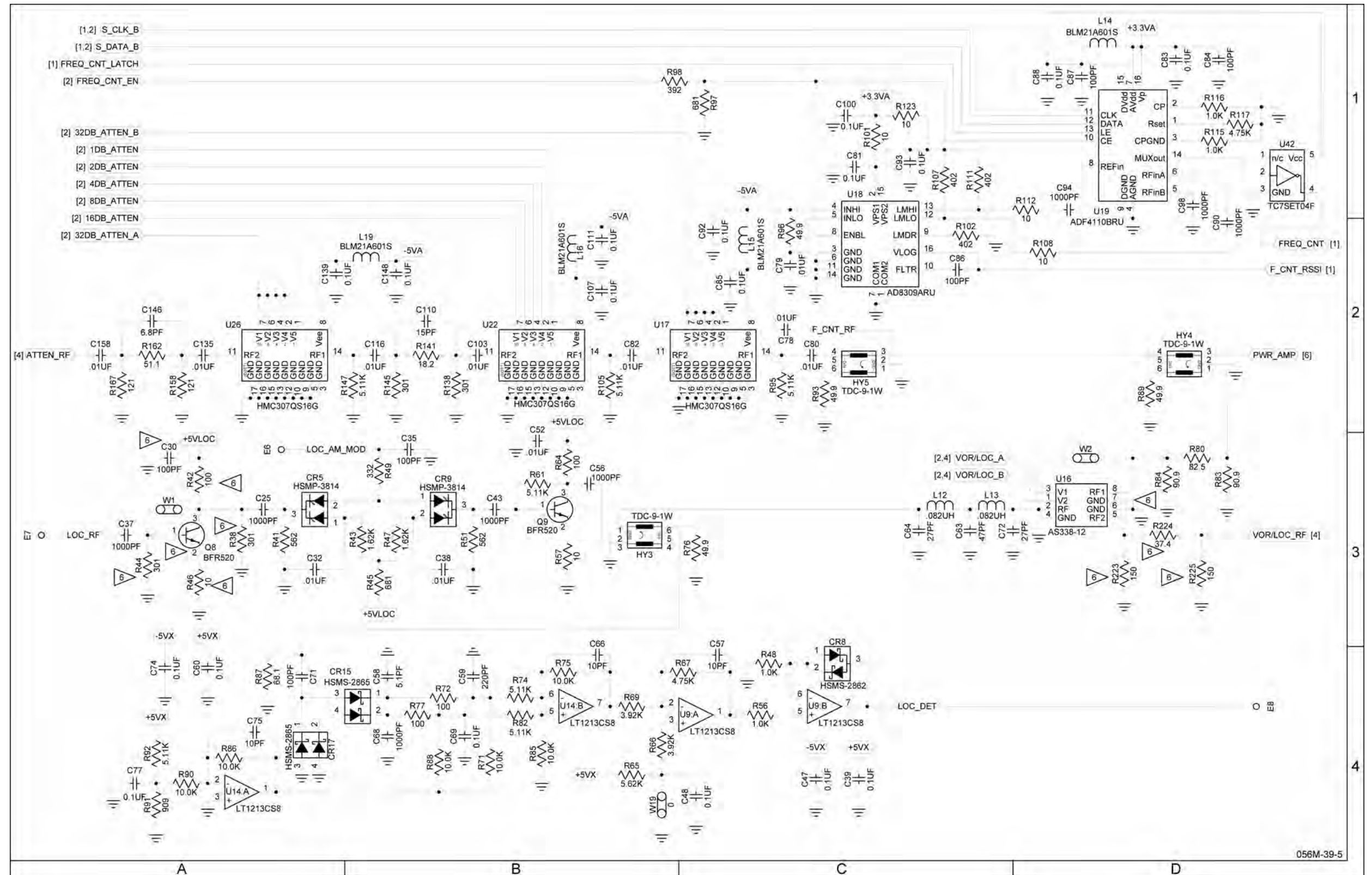


Figure 13 RF Assy (Sheet 15 of 45)  
(RF Converter PCB Assy - Sheet 8 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 5 of 6)

(0000-5630-600-G)

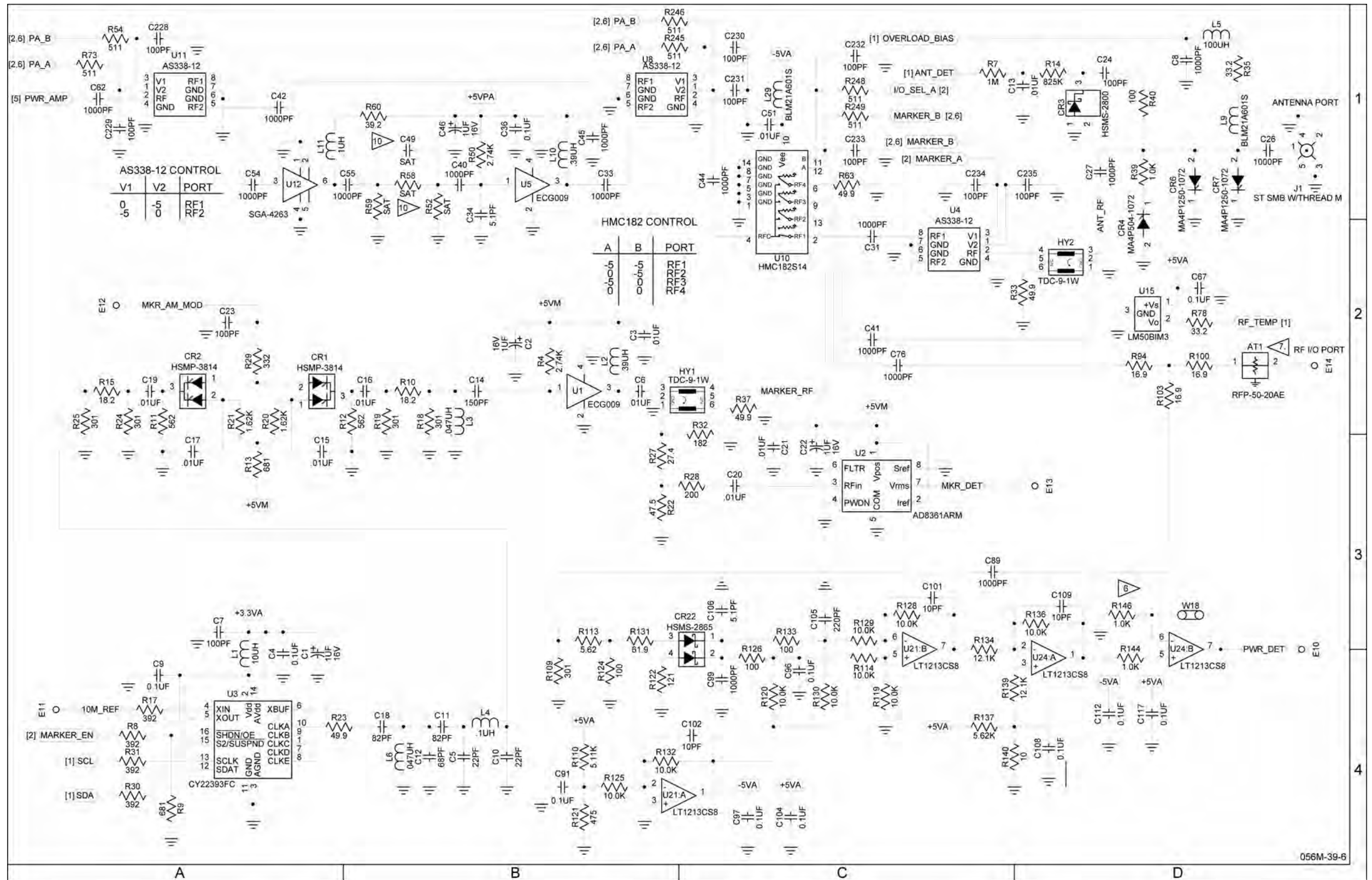
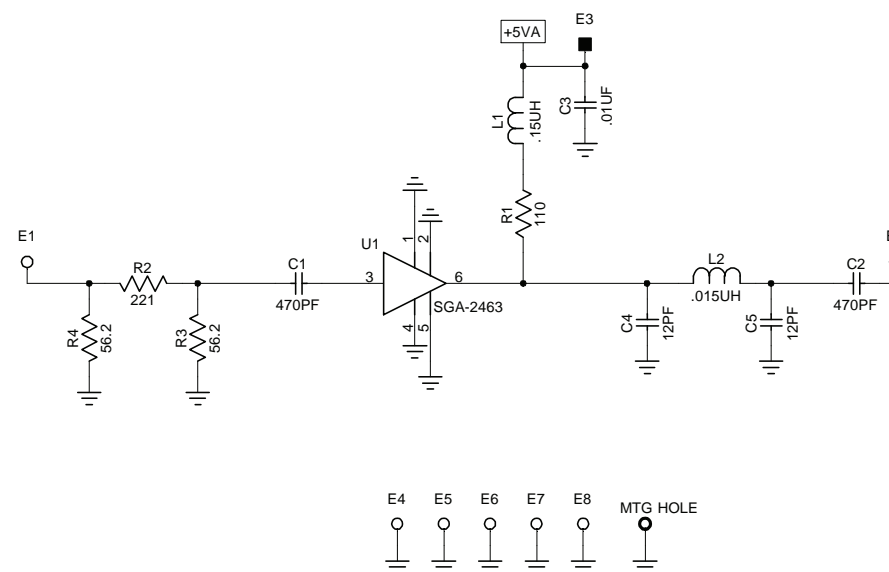




Figure 13 RF Ass'y (Sheet 16 of 45)  
(RF Converter PCB Assy - Sheet 9 of 10) (56A1A3A2)  
(Circuit Schematic - Sheet 6 of 6)

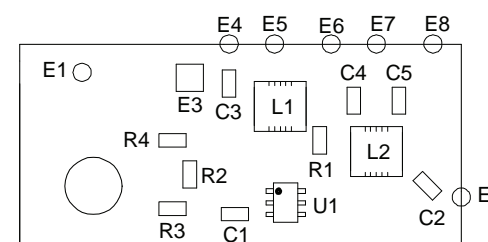
(0000-5630-600-G)





CAUTION:   
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE  
TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

- NOTES:  
(UNLESS OTHERWISE SPECIFIED)
1. BASIC REFERENCE DESIGNATORS SHOWN, FOR COMPLETE DESIGNATOR PREFIXES REFER TO SYSTEM INTERCONNECT.
  2. ALL RESISTORS ARE 1%, 1/8W.
  3. ALL RESISTANCE IS EXPRESSED IN OHMS. ALL CAPACITANCE IS EXPRESSED IN MICROFARADS. ALL INDUCTANCE IS EXPRESSED IN MICROHENRIES.
  4. NOT USED.
  5. NOT USED.
  6.  COMPONENT(S) NOT INSTALLED.
  7. NOT USED.

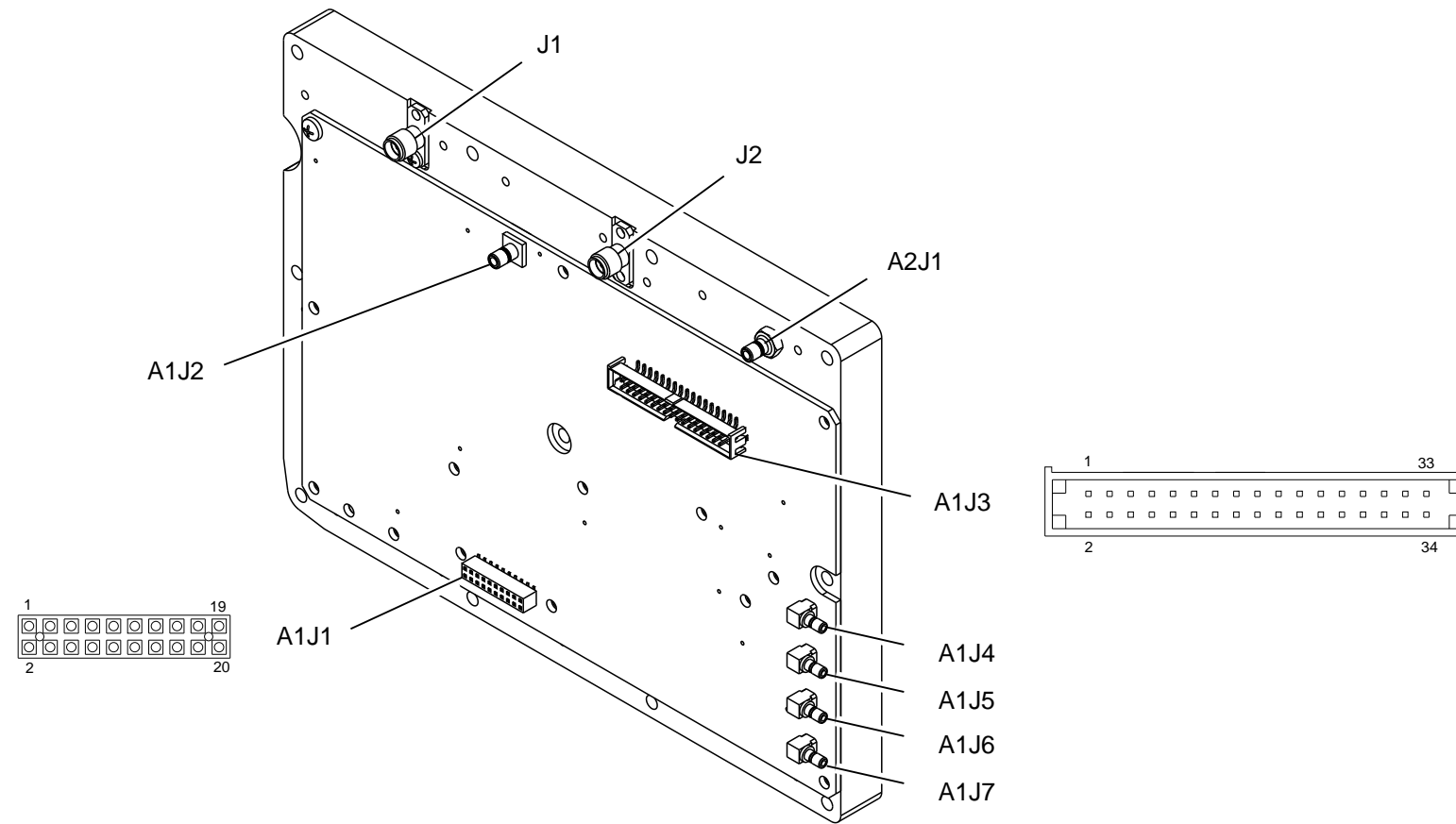


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A2A1.

056M-42

(7010-5630-900-A) (65955) (0000-5630-900-A) (10000021311-AA)

Figure 13 RF Assy (Sheet 17 of 45)  
(RF Converter PCB Assy - Sheet 10 of 10)  
(Buffer Amp PCB Assy) (56A1A3A2A1)



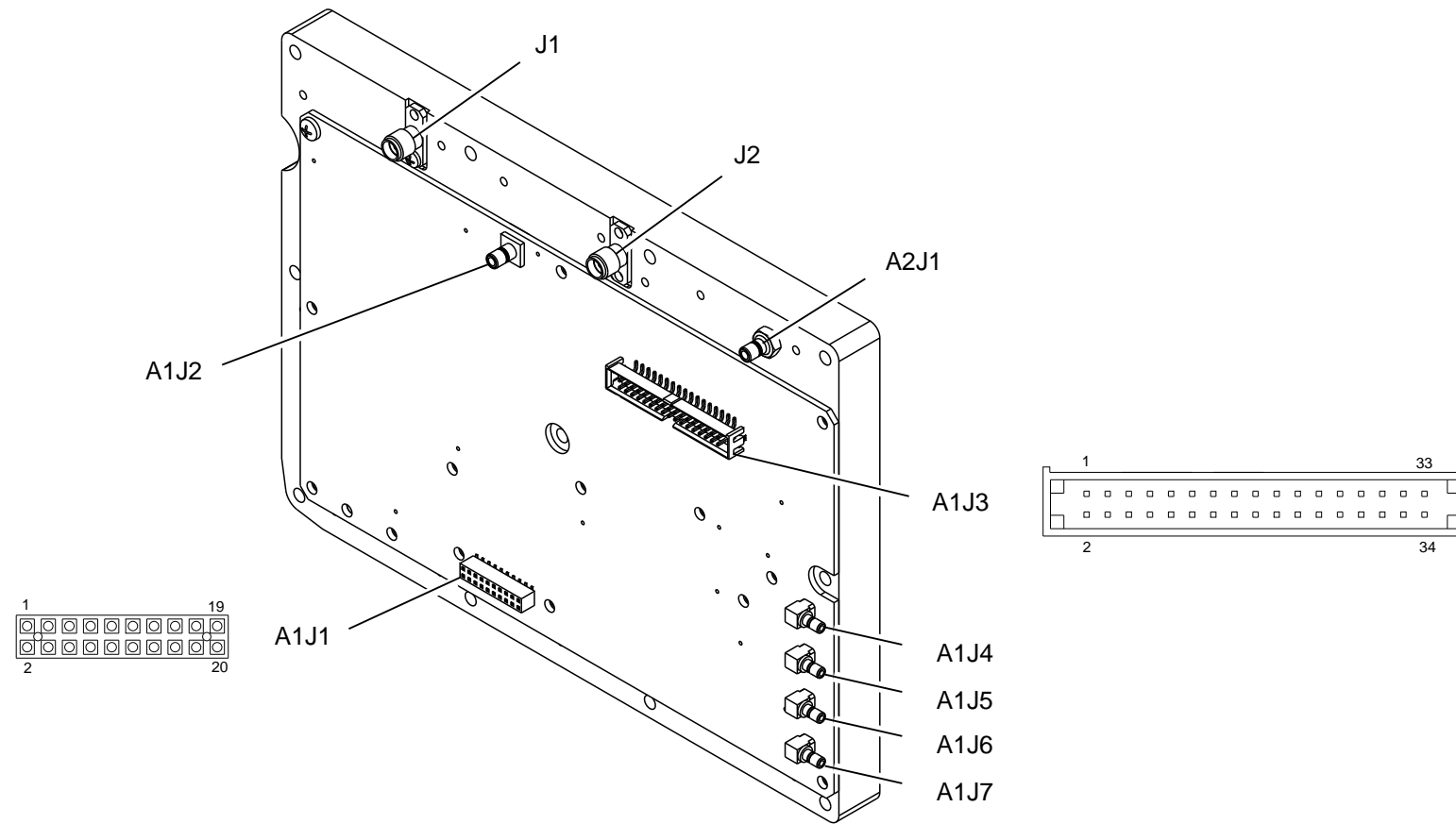
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3.

056M-014

(7005-5640-500-A, B, C, D) (64572)

Figure 13 RF Assy (Sheet 18 of 45)  
(56A1A3)



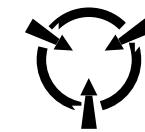
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3.

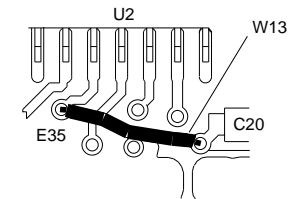
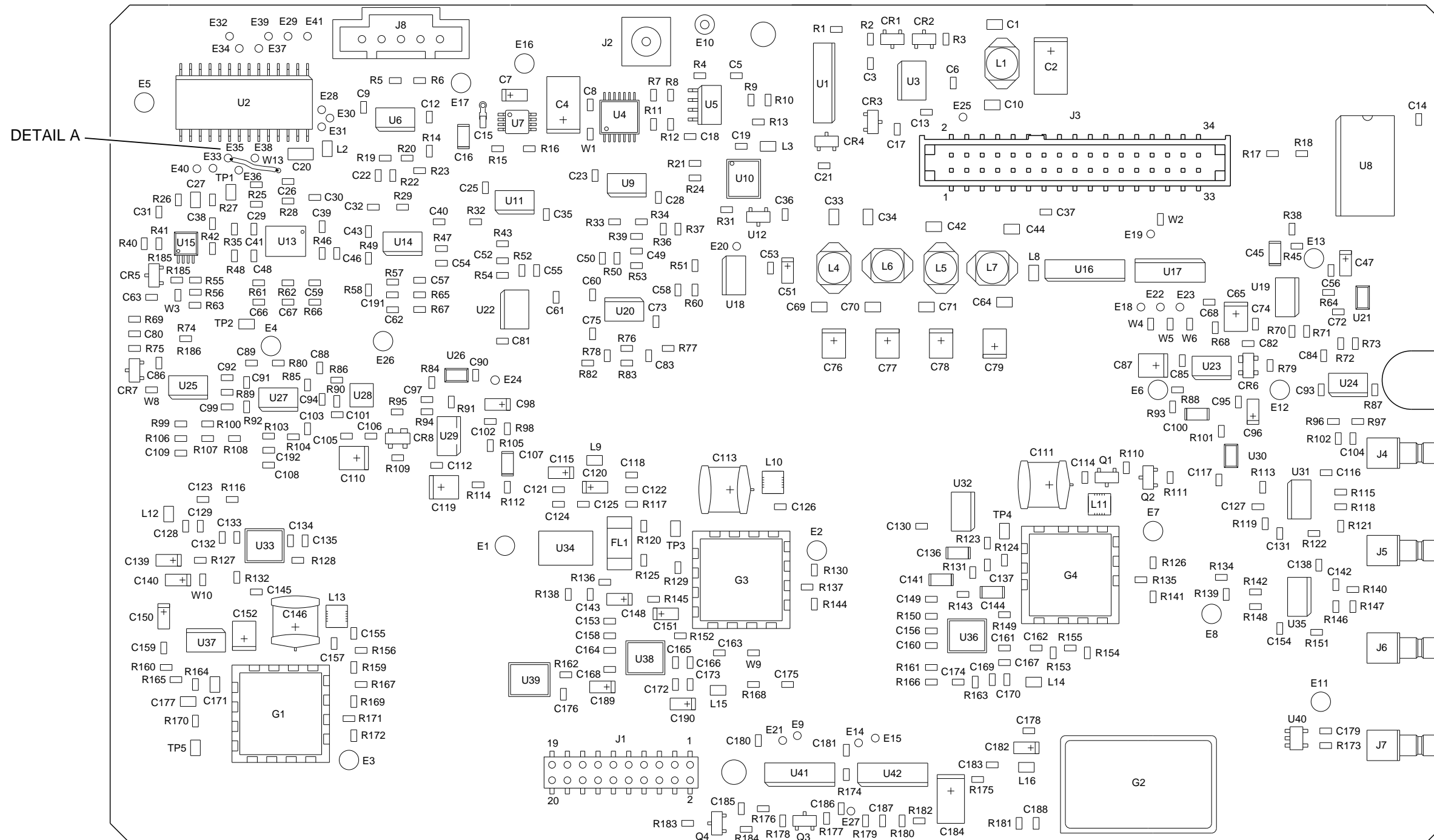
056M-014

(7005-5642-300-A, B) (64573-A0)

Figure 13 RF Assy (Sheet 19 of 45)  
(56A1A3)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



DETAIL A

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A1.

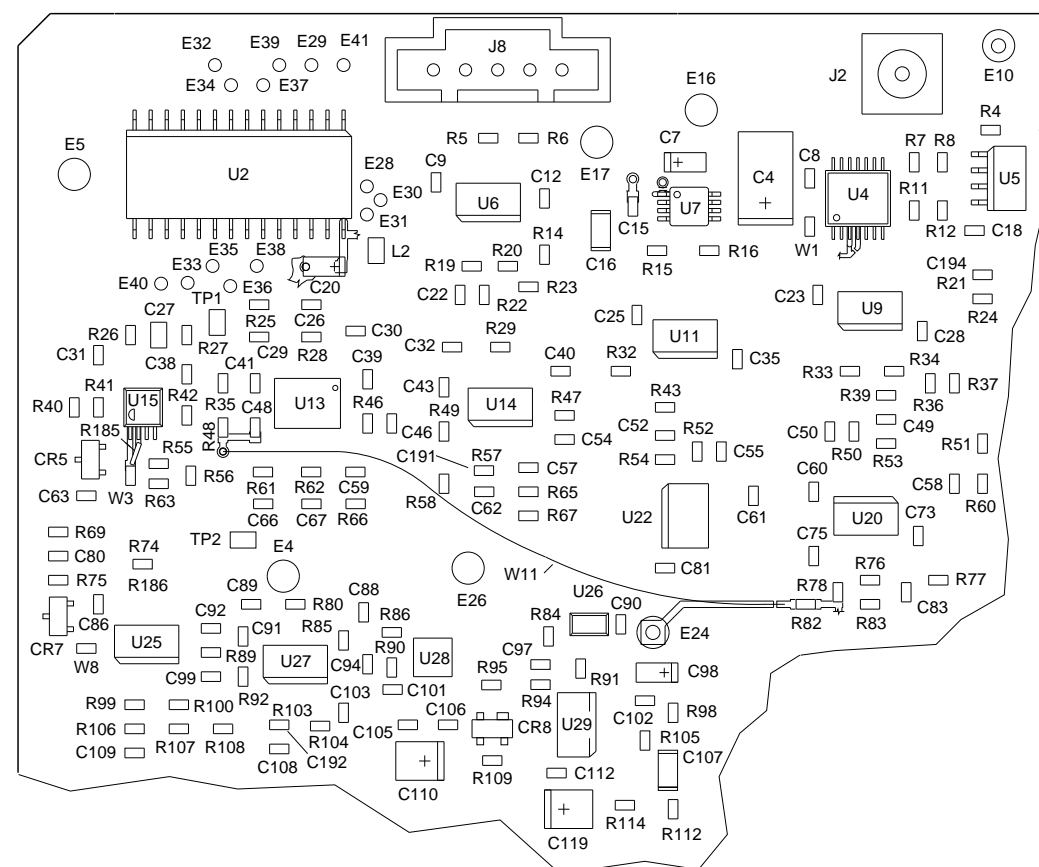
056M-33A

(7010-5631-300-B, C) (65957)

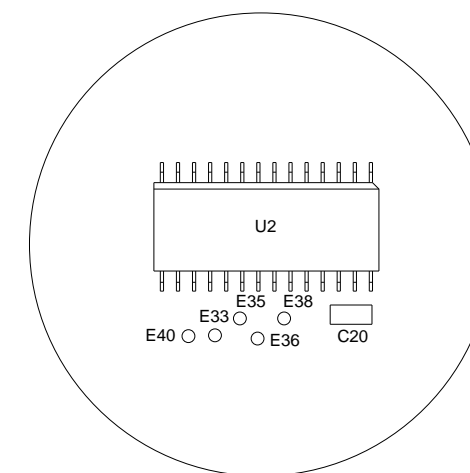
Figure 13 RF Assy (Sheet 20 of 45)  
(RF Controller PCB Assy - Sheet 1 of 9) (56A1A3A1)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



( REV A )



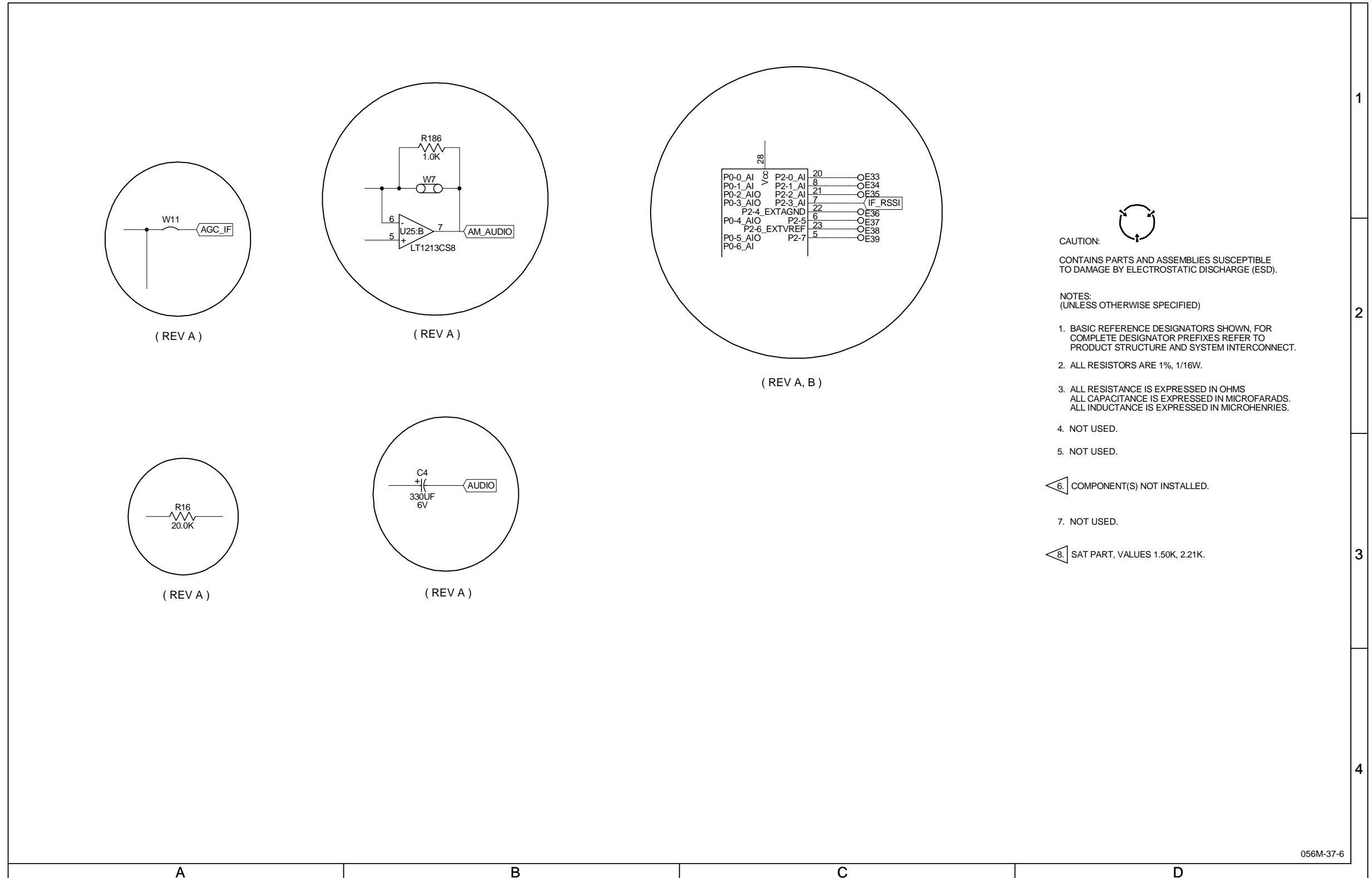
( REV A, B )

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A1.

056M-33b

(7010-5631-300-B, C) (65957)

Figure 13 RF Assy (Sheet 21 of 45)  
(RF Controller PCB Assy - Sheet 2 of 9) (56A1A3A1)



(0000-5631-300-B, C) (1000021312-AA)

Figure 13 RF Assy (Sheet 22 of 45)  
(RF Controller PCB Assy - Sheet 3 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 1 of 7)

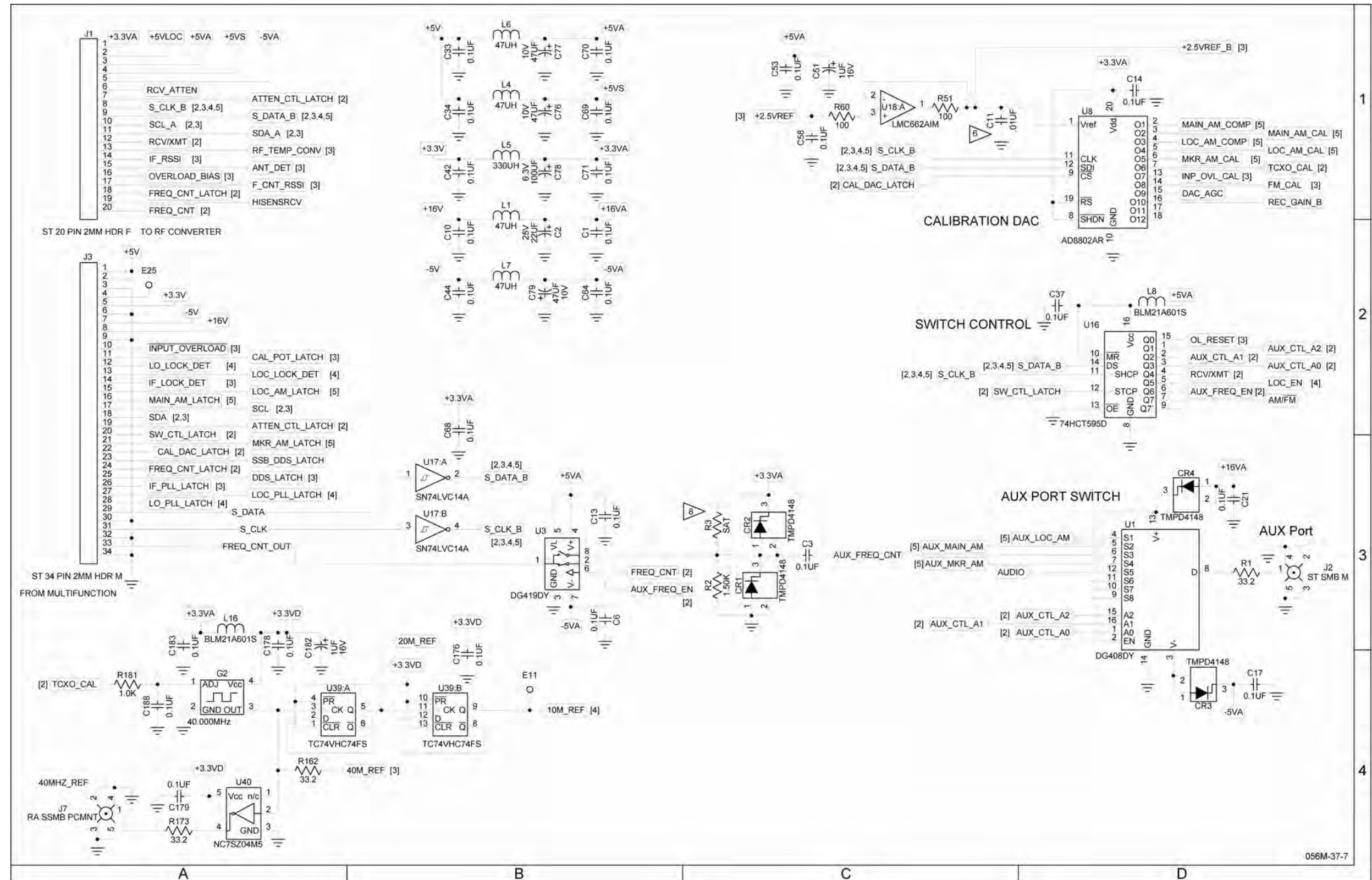
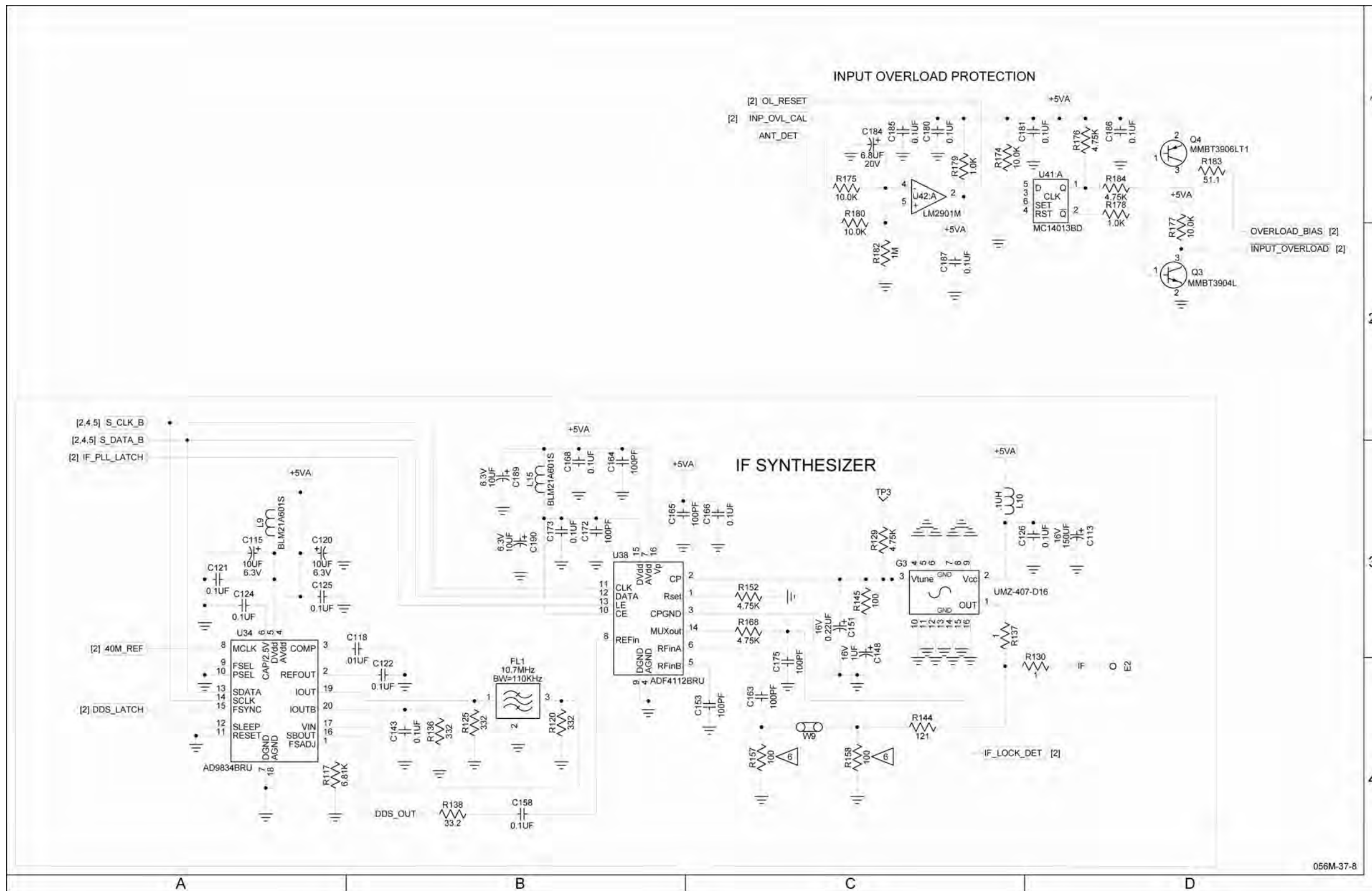
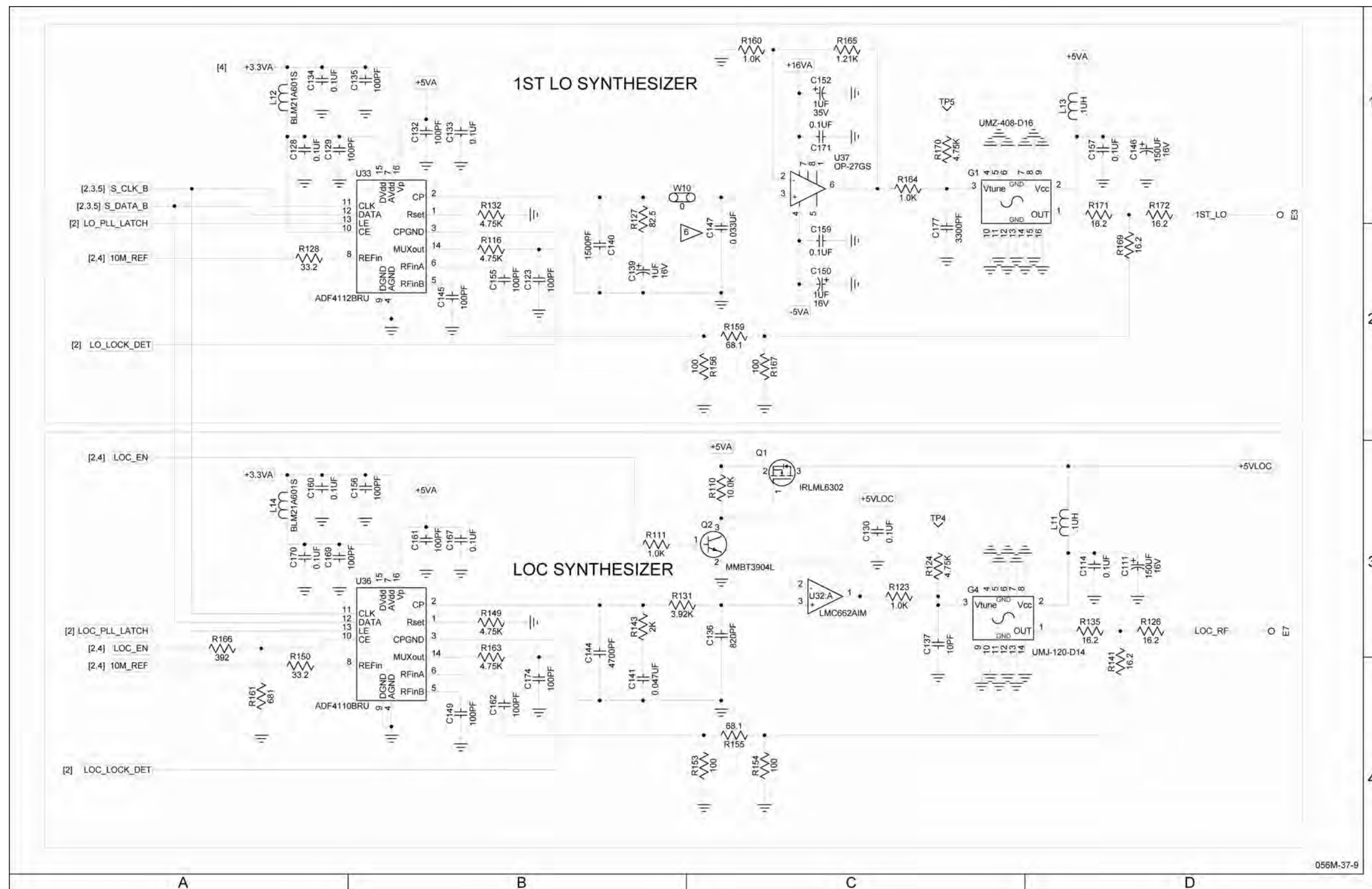


Figure 13 RF Assy (Sheet 23 of 45)  
(RF Controller PCB Assy - Sheet 4 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 2 of 7)

(0000-5631-300-B, C) (10000021312-AA)

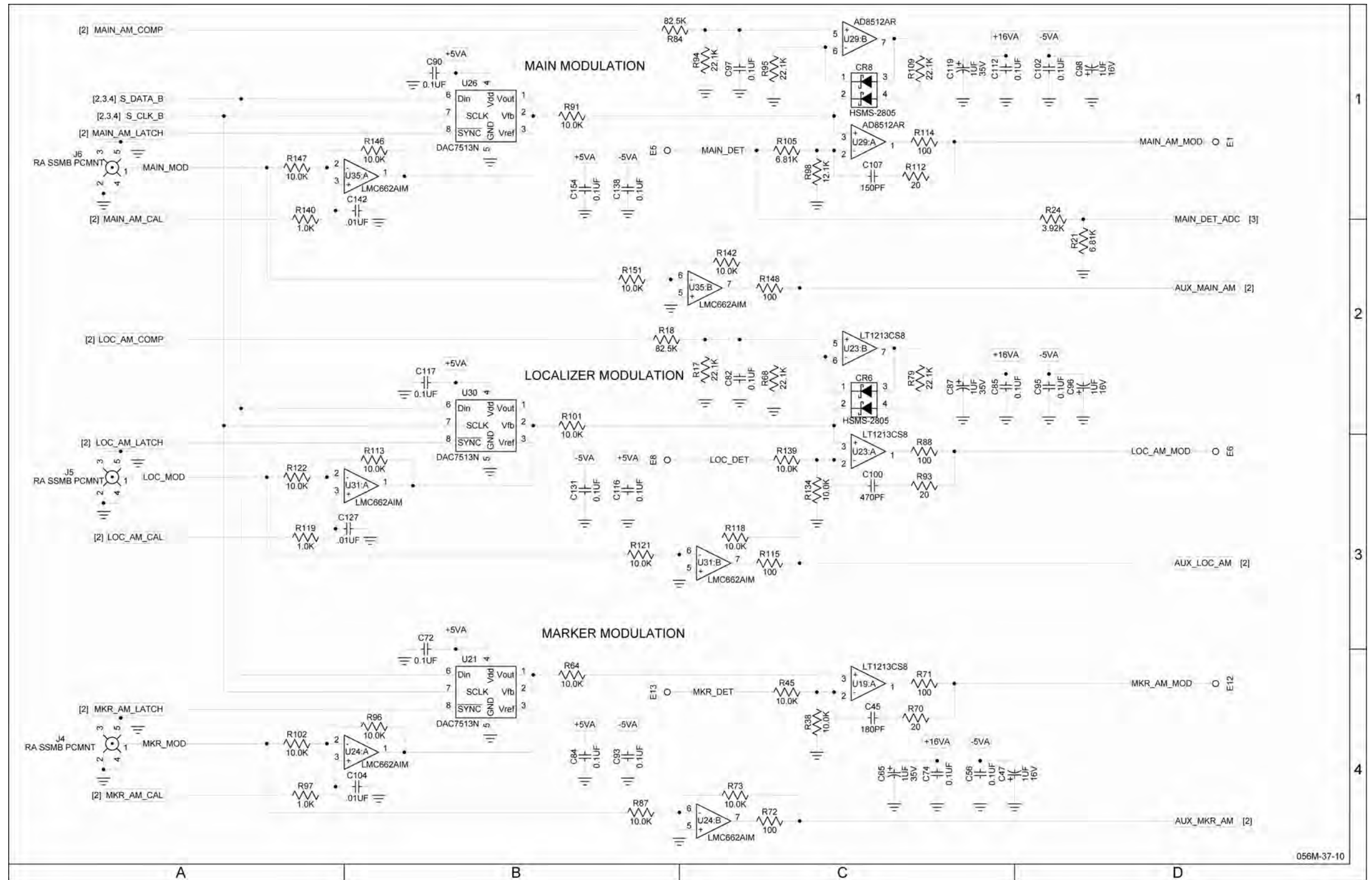






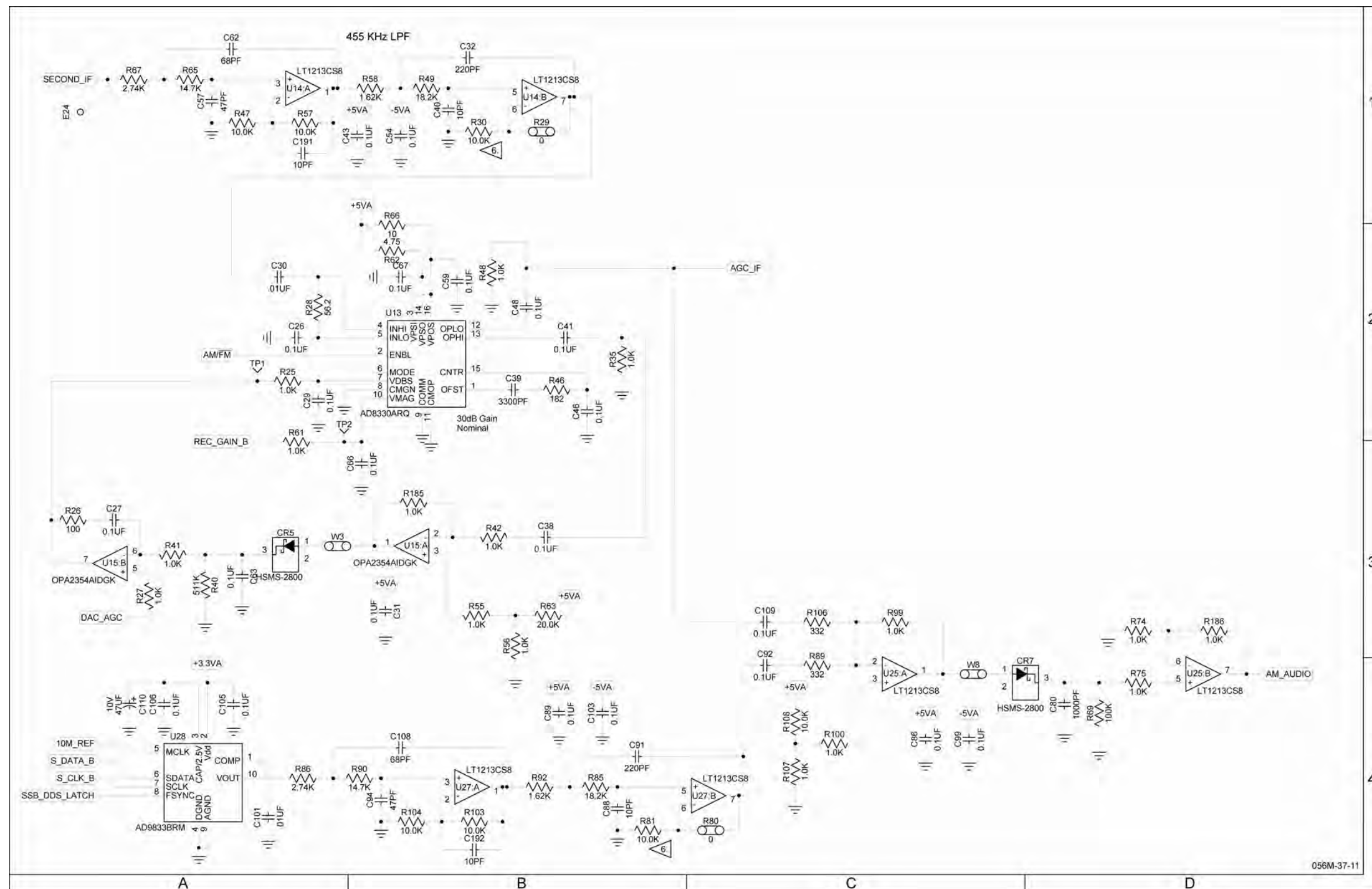
(0000-5631-300-B, C) (10000021312-AA)

Figure 13 RF Assy (Sheet 25 of 45)  
(RF Controller PCB Assy - Sheet 6 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 4 of 7)



(0000-5631-300-B, C) (10000021312-AA)

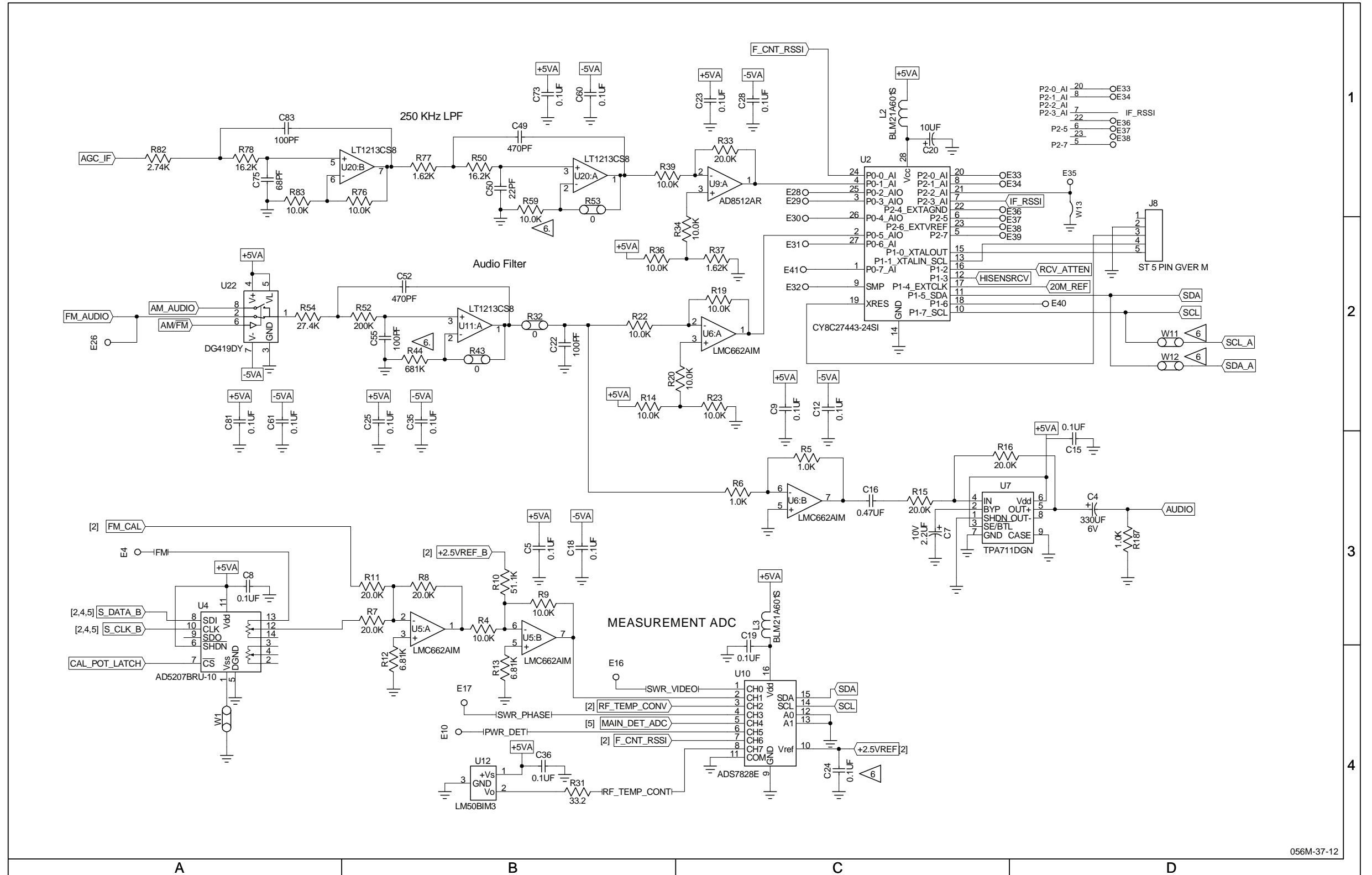
Figure 13 RF Ass'y (Sheet 26 of 45)  
(RF Controller PCB Assy - Sheet 7 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 5 of 7)



056M-37-11

Figure 13 RF Assy (Sheet 27 of 45)  
(RF Controller PCB Assy - Sheet 8 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 6 of 7)

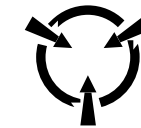
(0000-5631-300-B, C) (10000021312-AA)



056M-37-12

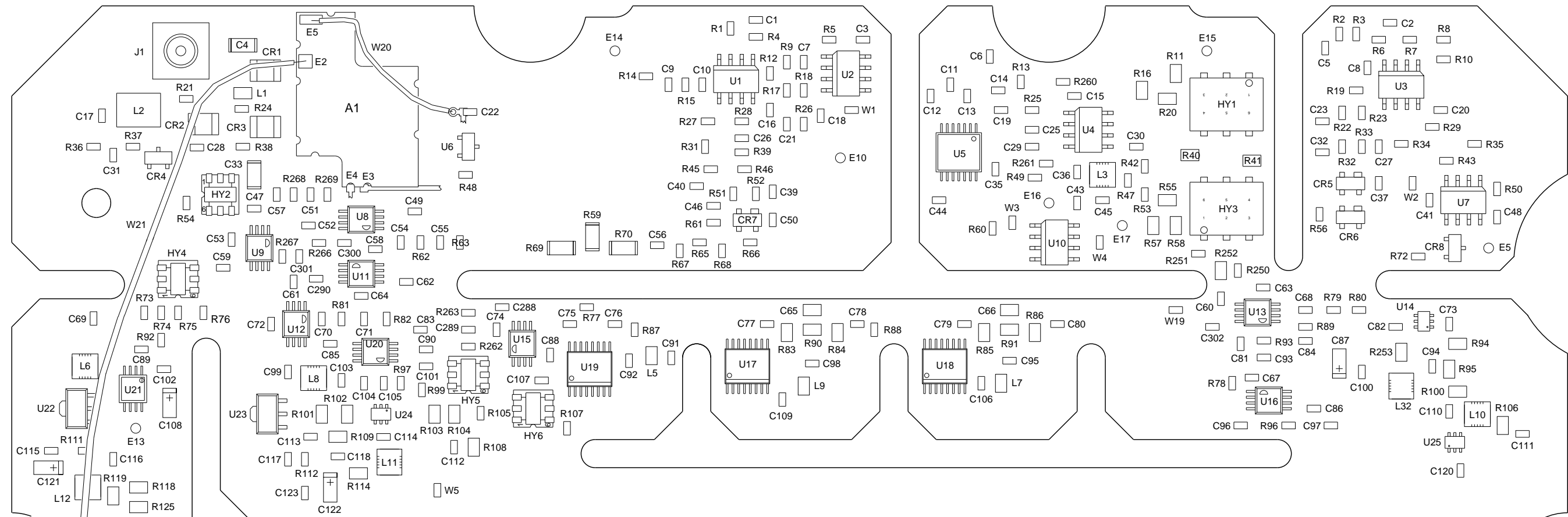
Figure 13 RF Ass'y (Sheet 28 of 45)  
(RF Controller PCB Ass'y - Sheet 9 of 9) (56A1A3A1)  
(Circuit Schematic - Sheet 7 of 7)

(0000-5631-300-B, C) (1000021312-AA)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

DETAIL A  
DETAIL B

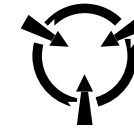


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

056M-34dZ

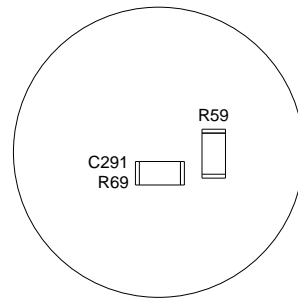
(7010-5631-200-B, C, D, E, F) (65956)

Figure 13 RF Assy (Sheet 29 of 45)  
(RF Converter PCB Assy - Sheet 1 of 17) (56A1A3A2)

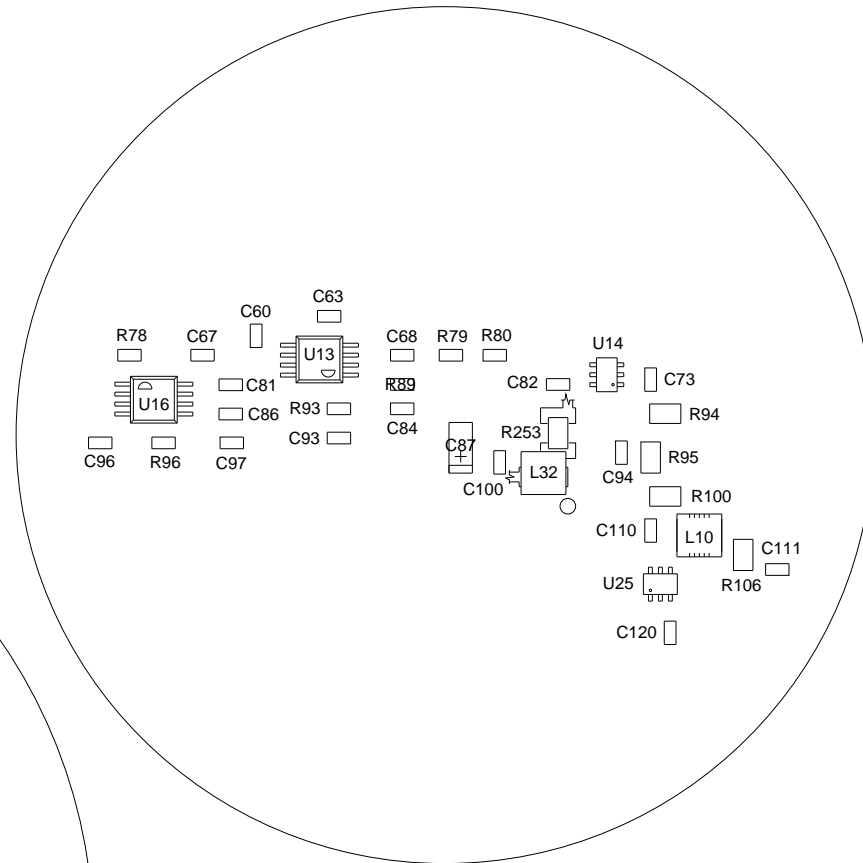


**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

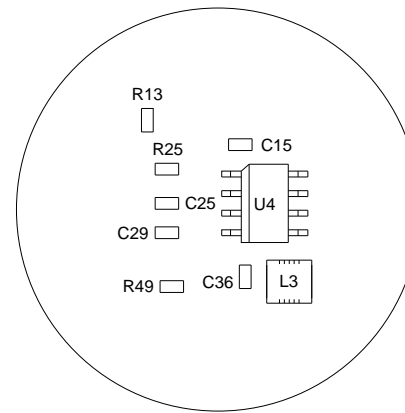
DETAIL A  
DETAIL B



(REV A)



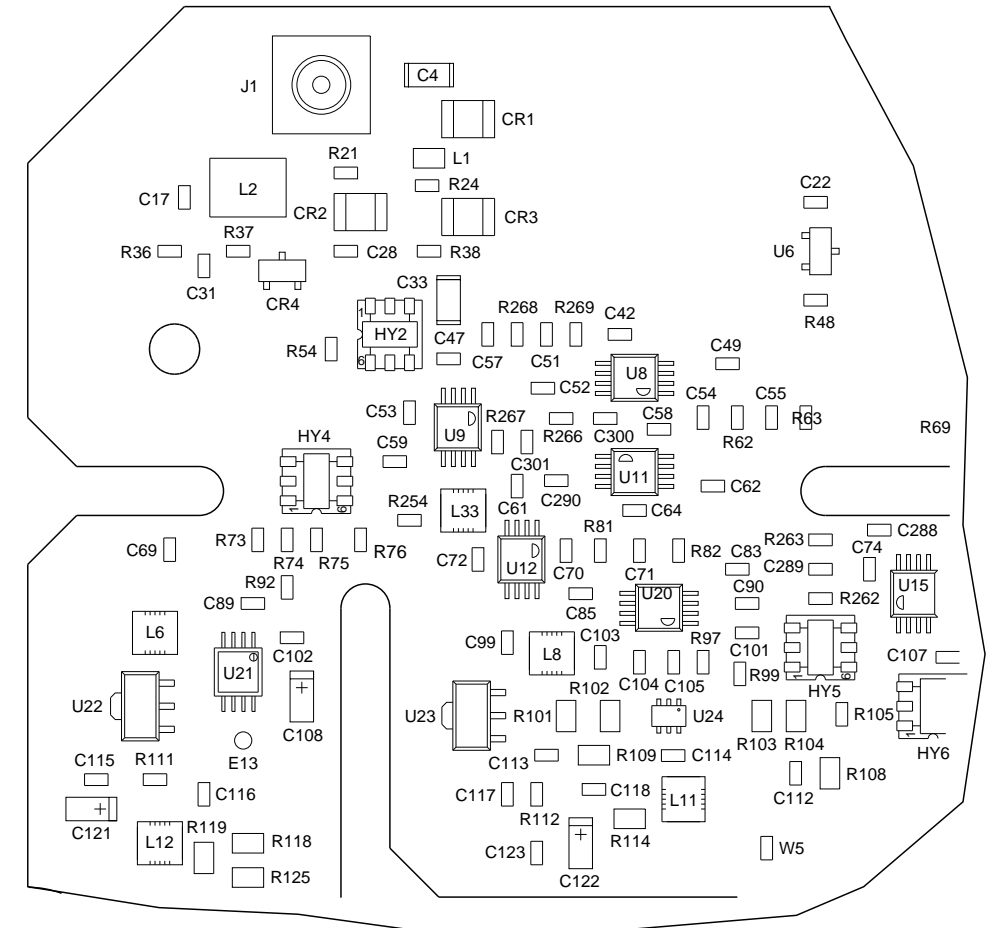
(REV A)



(REV A)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

(7010-5631-200-B, C, D, E, F) (65956)



(REV A, B, C, D, E)

(REV A)

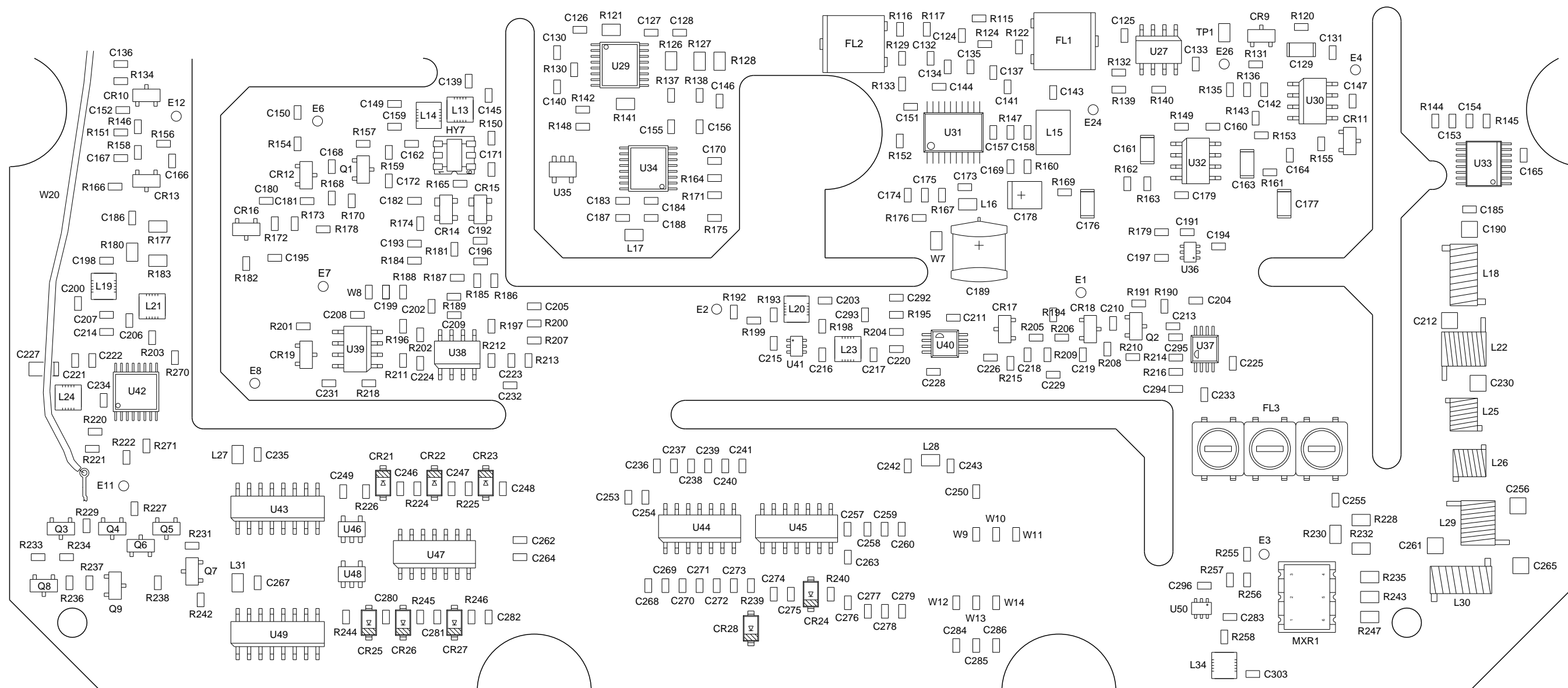
056M-34g

Figure 13 RF Assy (Sheet 30 of 45)  
(RF Converter PCB Assy - Sheet 2 of 17) (56A1A3A2)



**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

DETAIL A  
DETAIL B

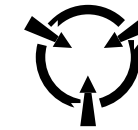


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

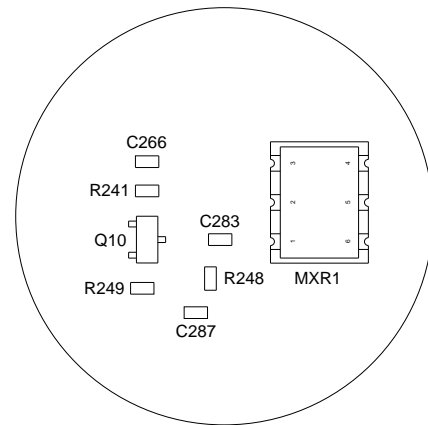
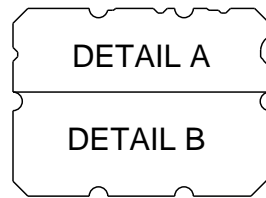
056M-34e

(7010-5631-200-B, C, D, E, F) (65956)

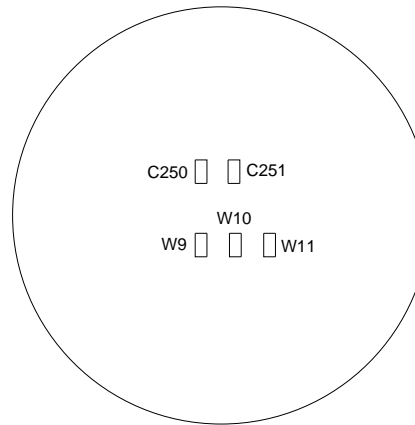
Figure 13 RF Assy (Sheet 31 of 45)  
(RF Converter PCB Assy - Sheet 3 of 17) (56A1A3A2)



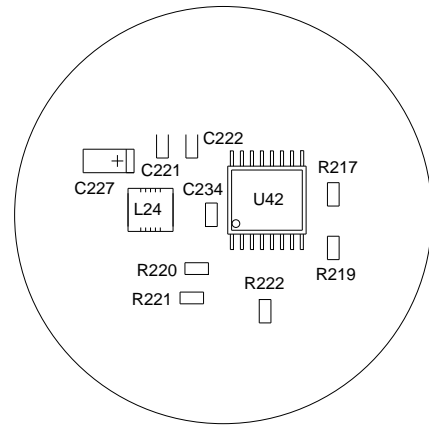
**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).



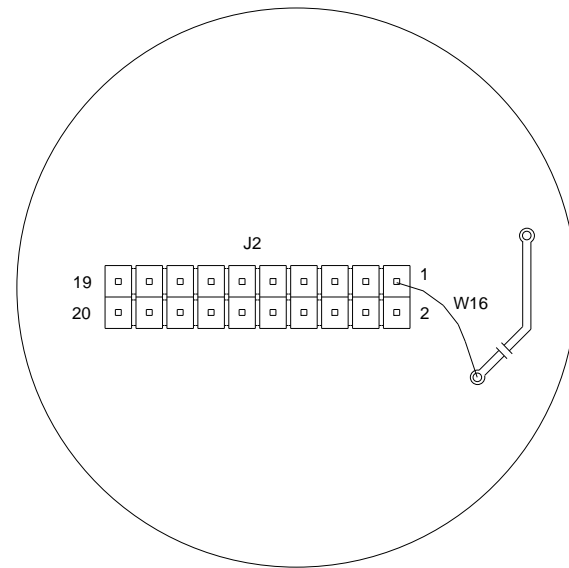
( REV A )



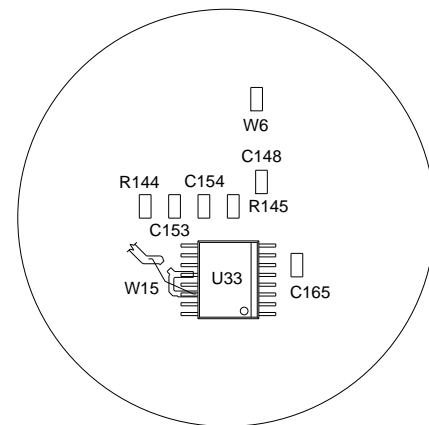
( REV A, B, C, D, E )



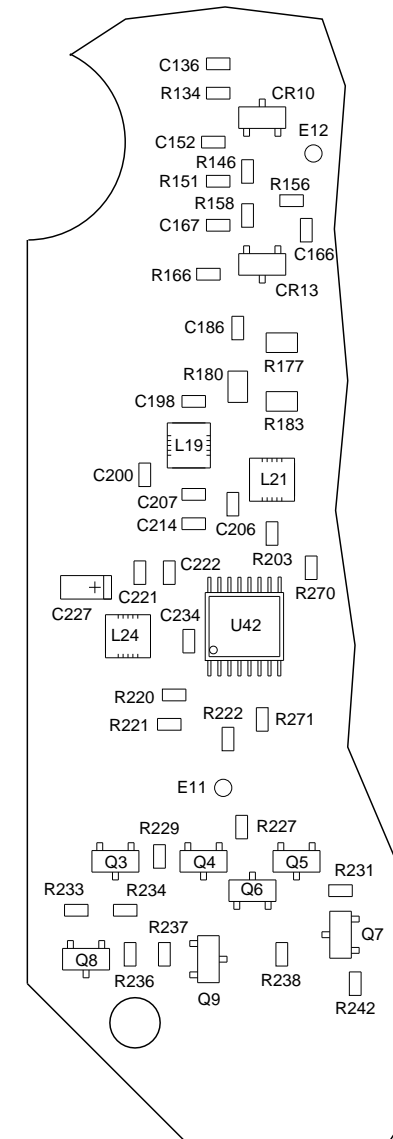
( REV A )



( REV A )  
( BOTTOM VIEW )



( REV A )



( REV A, B, C, D, E )

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

056M-34h

(7010-5631-200-B, C, D, E, F) (65956)

Figure 13 RF Assy (Sheet 32 of 45)  
(RF Converter PCB Assy - Sheet 4 of 17) (56A1A3A2)

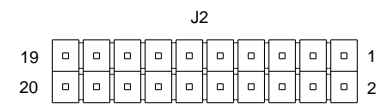
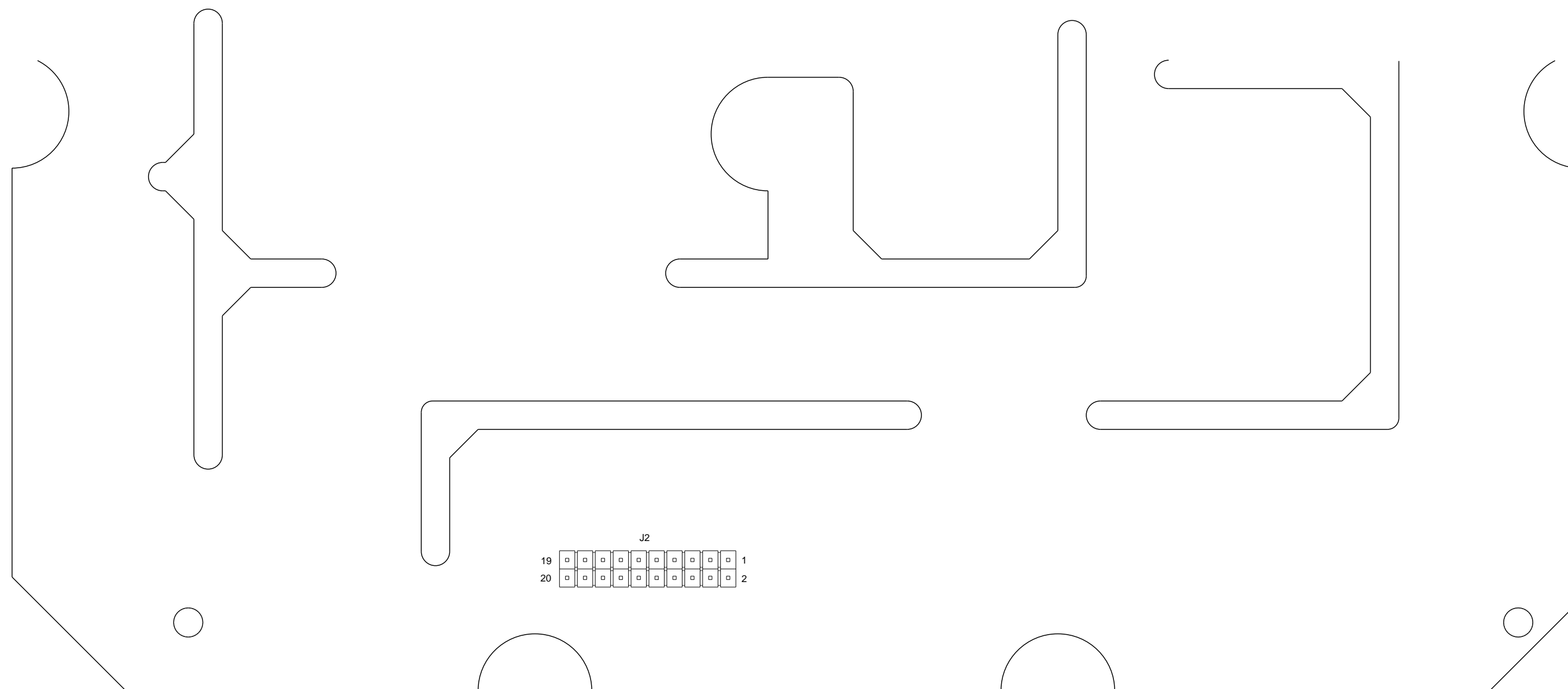




**CAUTION:**  
CONTAINS PARTS AND ASSEMBLIES  
SUSCEPTIBLE TO DAMAGE BY  
ELECTROSTATIC DISCHARGE (ESD).

DETAIL A  
DETAIL B

(BOTTOM VIEW)

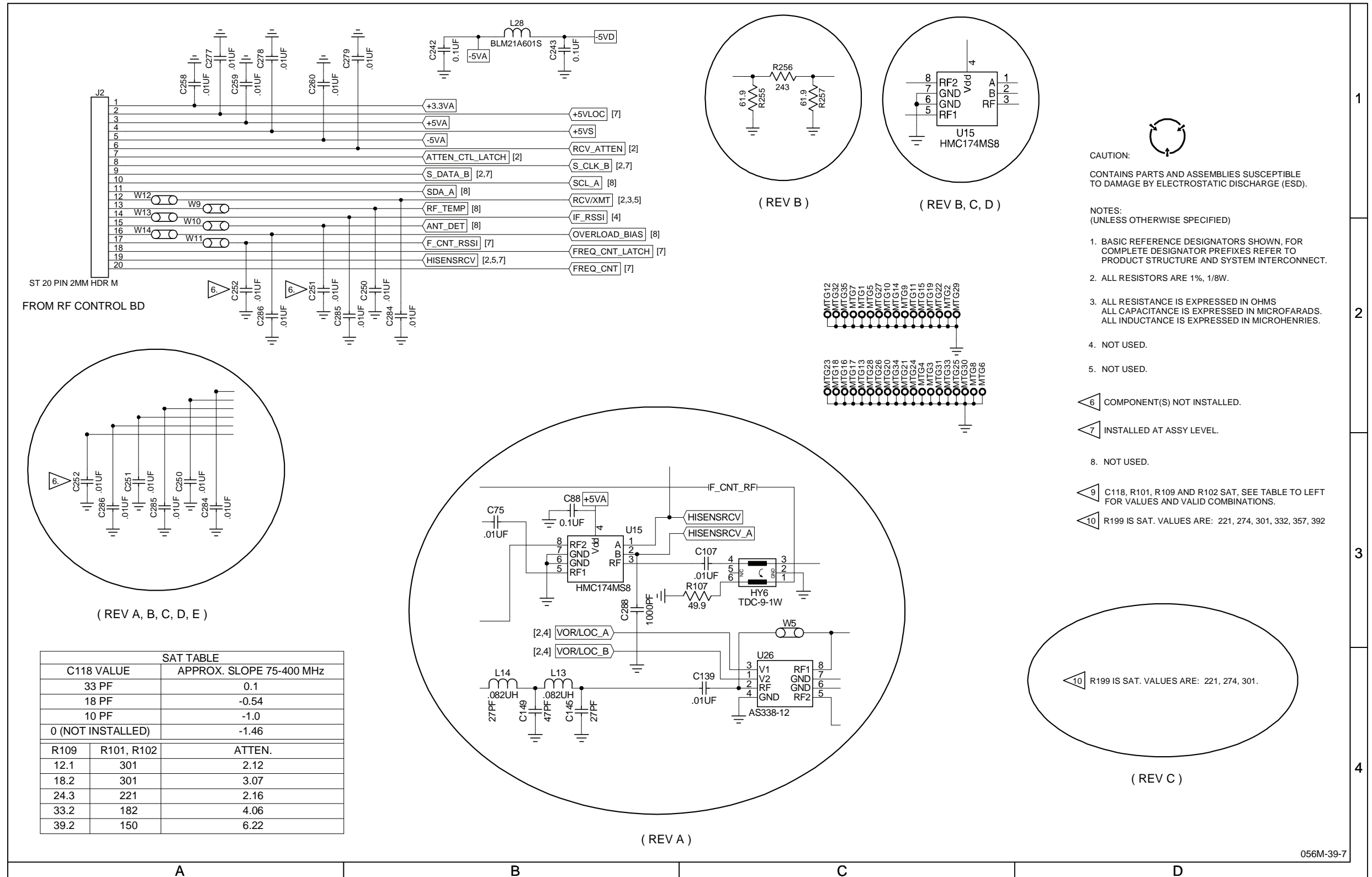


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

056M-34f

(7010-5631-200-B, C, D, E, F) (65956)

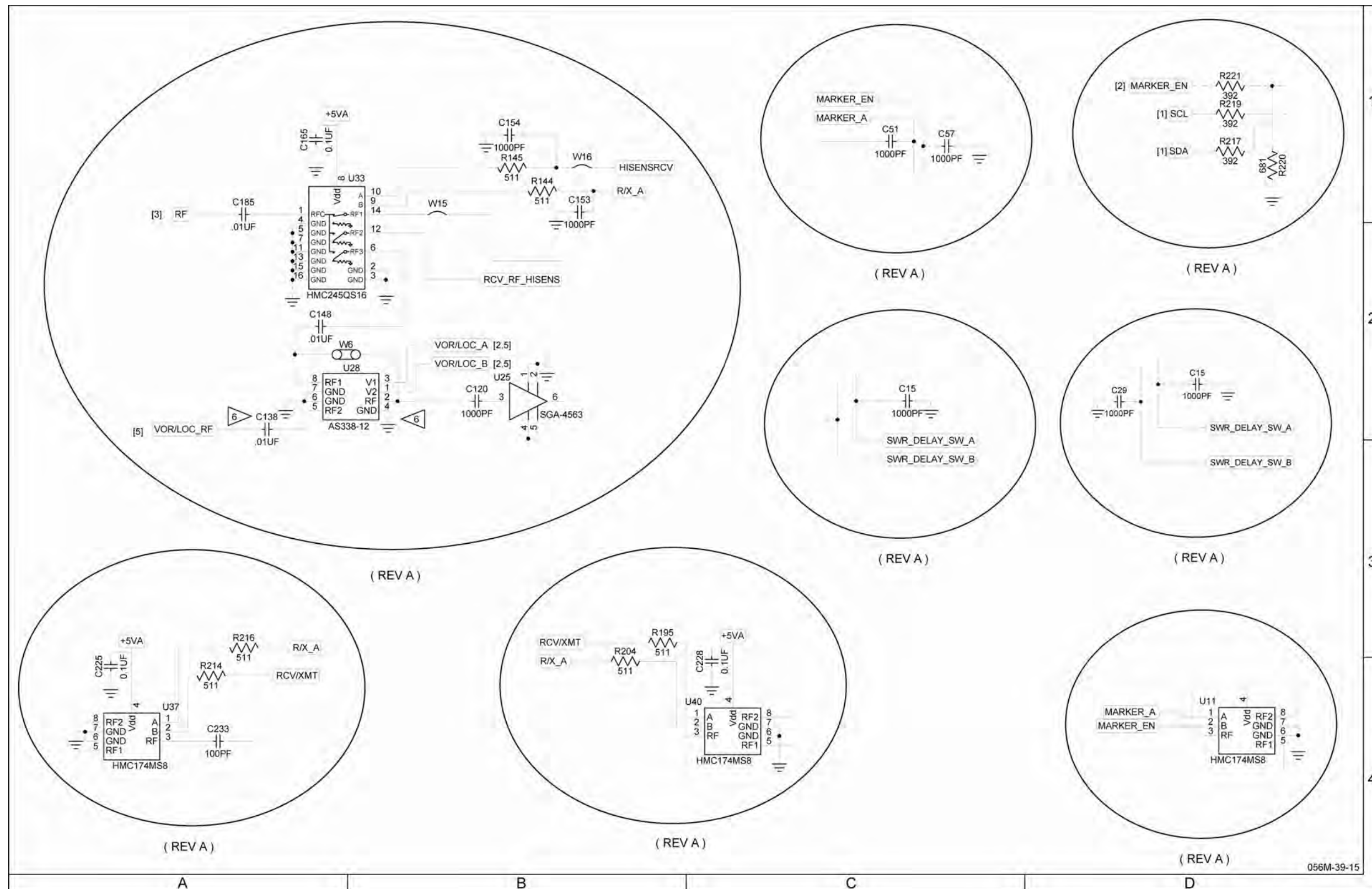
Figure 13 RF Assy (Sheet 33 of 45)  
(RF Converter PCB Assy - Sheet 5 of 17) (56A1A3A2)



- CAUTION:** CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).
- NOTES:** (UNLESS OTHERWISE SPECIFIED)
- BASIC REFERENCE DESIGNATORS SHOWN, FOR COMPLETE DESIGNATOR PREFIXES REFER TO PRODUCT STRUCTURE AND SYSTEM INTERCONNECT.
  - ALL RESISTORS ARE 1%, 1/8W.
  - ALL RESISTANCE IS EXPRESSED IN OHMS  
ALL CAPACITANCE IS EXPRESSED IN MICROFARADS.  
ALL INDUCTANCE IS EXPRESSED IN MICROHENRIES.
  - NOT USED.
  - NOT USED.
  - COMPONENT(S) NOT INSTALLED.
  - INSTALLED AT ASSY LEVEL.
  - NOT USED.
  - C118, R101, R109 AND R102 SAT, SEE TABLE TO LEFT FOR VALUES AND VALID COMBINATIONS.
  - R199 IS SAT. VALUES ARE: 221, 274, 301, 332, 357, 392

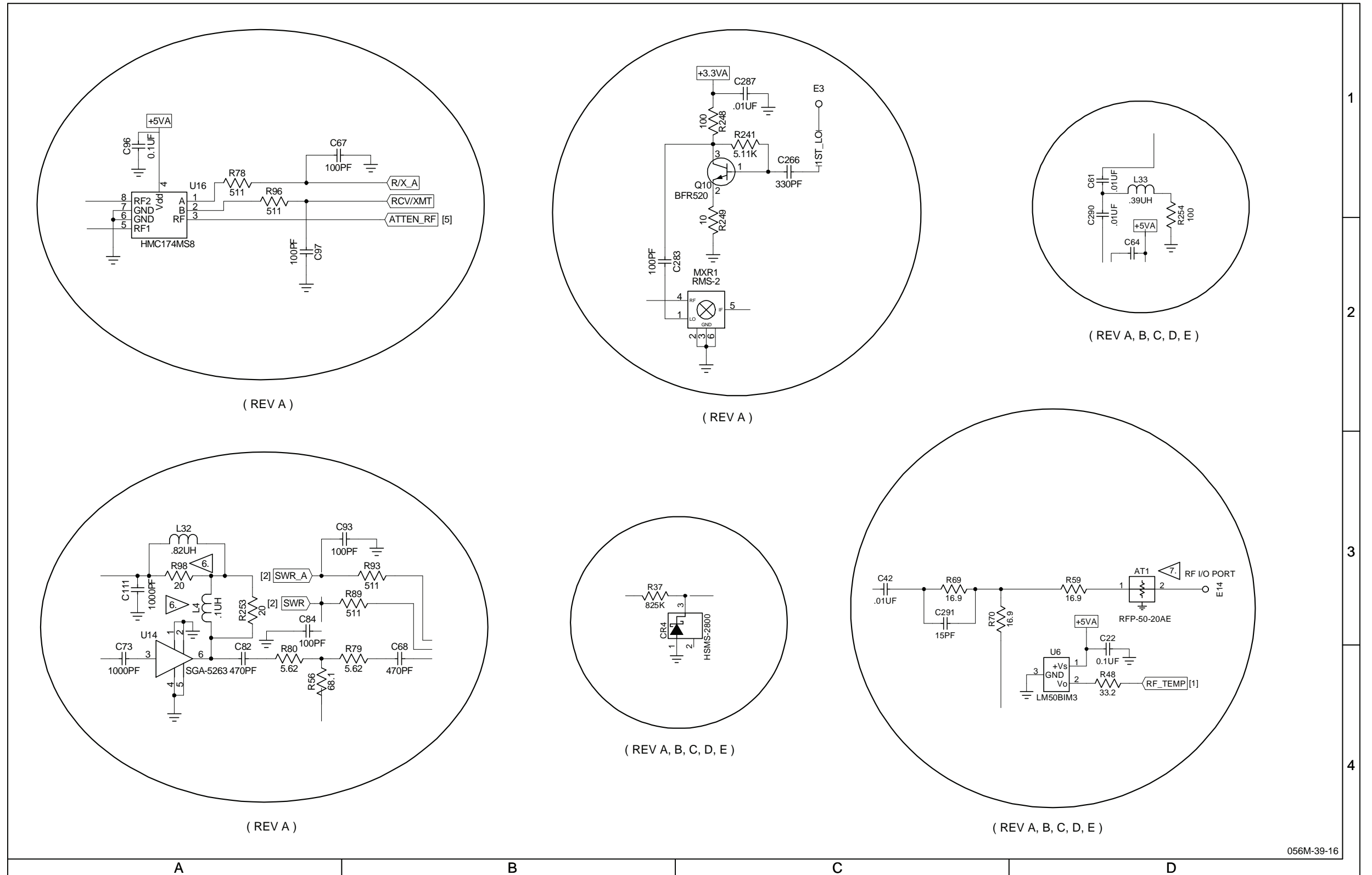
(0000-5631-200-C, D, E, F) (10000011138-AA)

Figure 13 RF Assy (Sheet 34 of 45)  
(RF Converter PCB Assy - Sheet 6 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 1 of 11)



(0000-5631-200-C, D, E, F) (10000011138-AA)

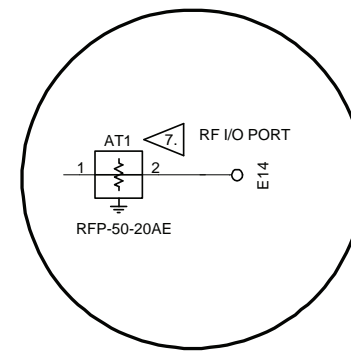
Figure 13 RF Assy (Sheet 35 of 45)  
(RF Converter PCB Assy - Sheet 7 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 2 of 11)



056M-39-16

(0000-5631-200-C, D, E, F) (10000011138-AA)

Figure 13 RF Assy (Sheet 36 of 45)  
(RF Converter PCB Assy - Sheet 8 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 3 of 11)



0000-5631-200-F ONLY

A

B

C

D

1

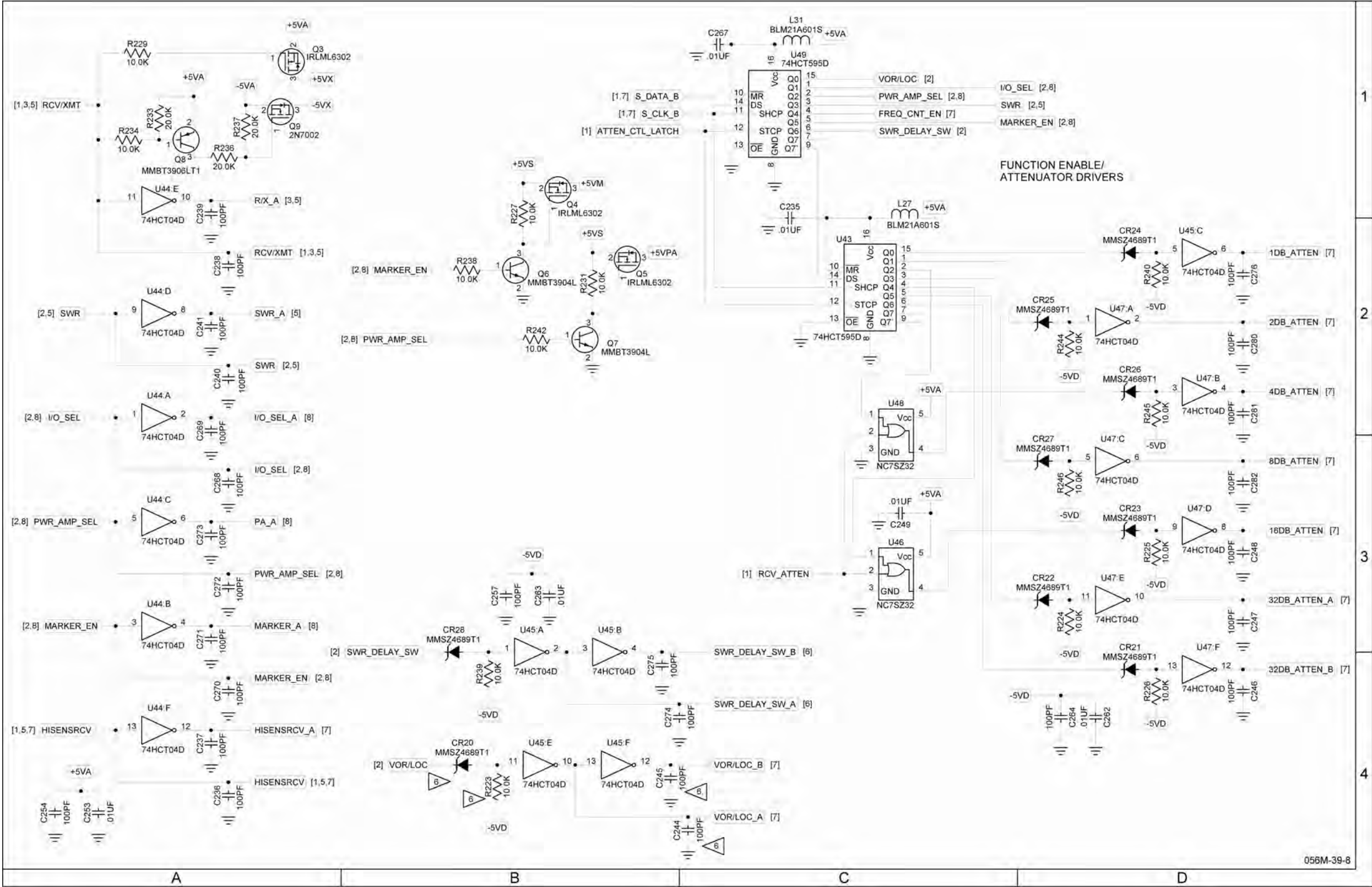
2

3

4

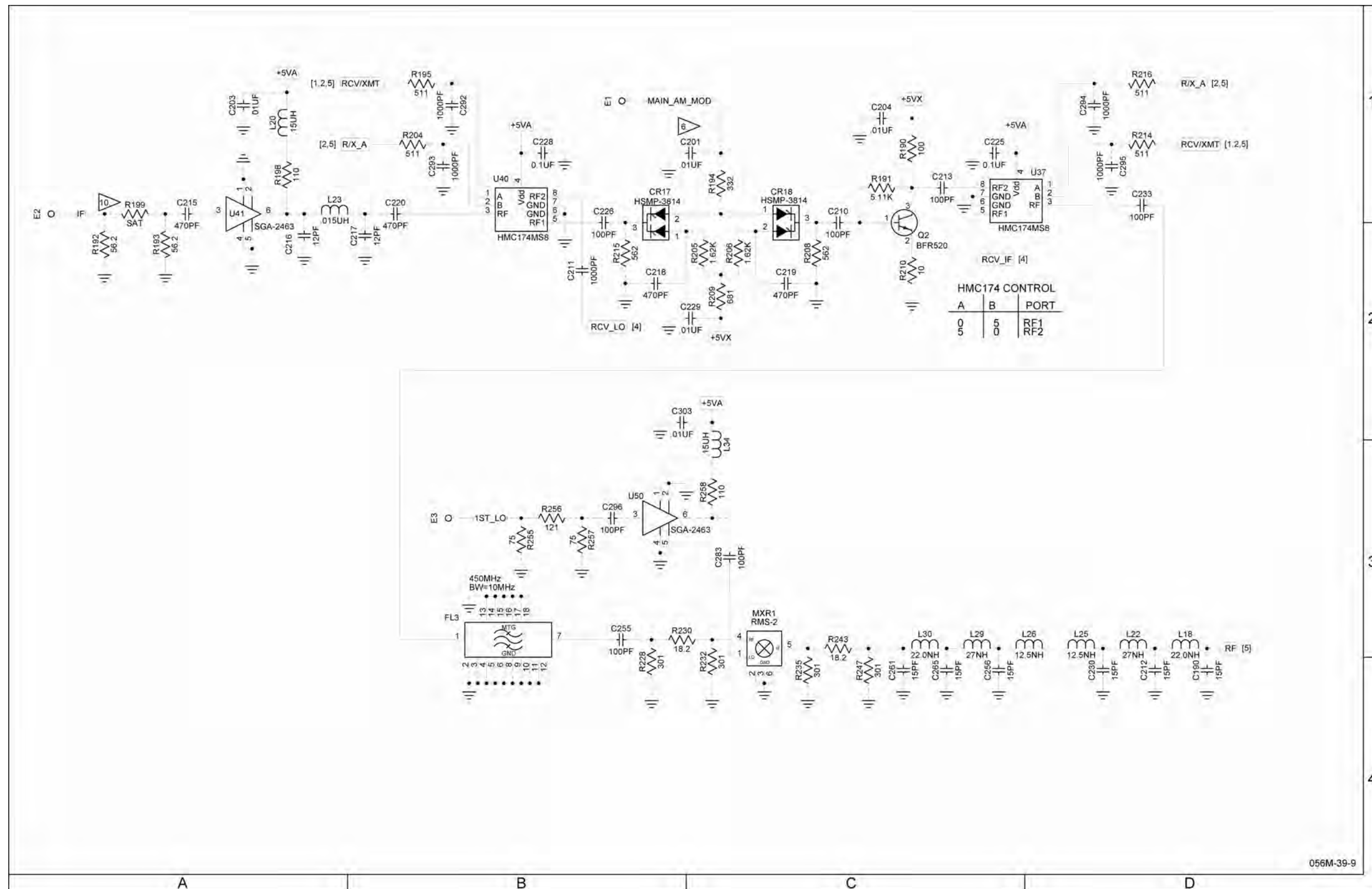
(0000-5631-200-C, D, E, F) (10000011138-AA)

Figure 13 RF Assy (Sheet 37 of 45)  
(RF Converter PCB Assy - Sheet 9 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 4 of 11)



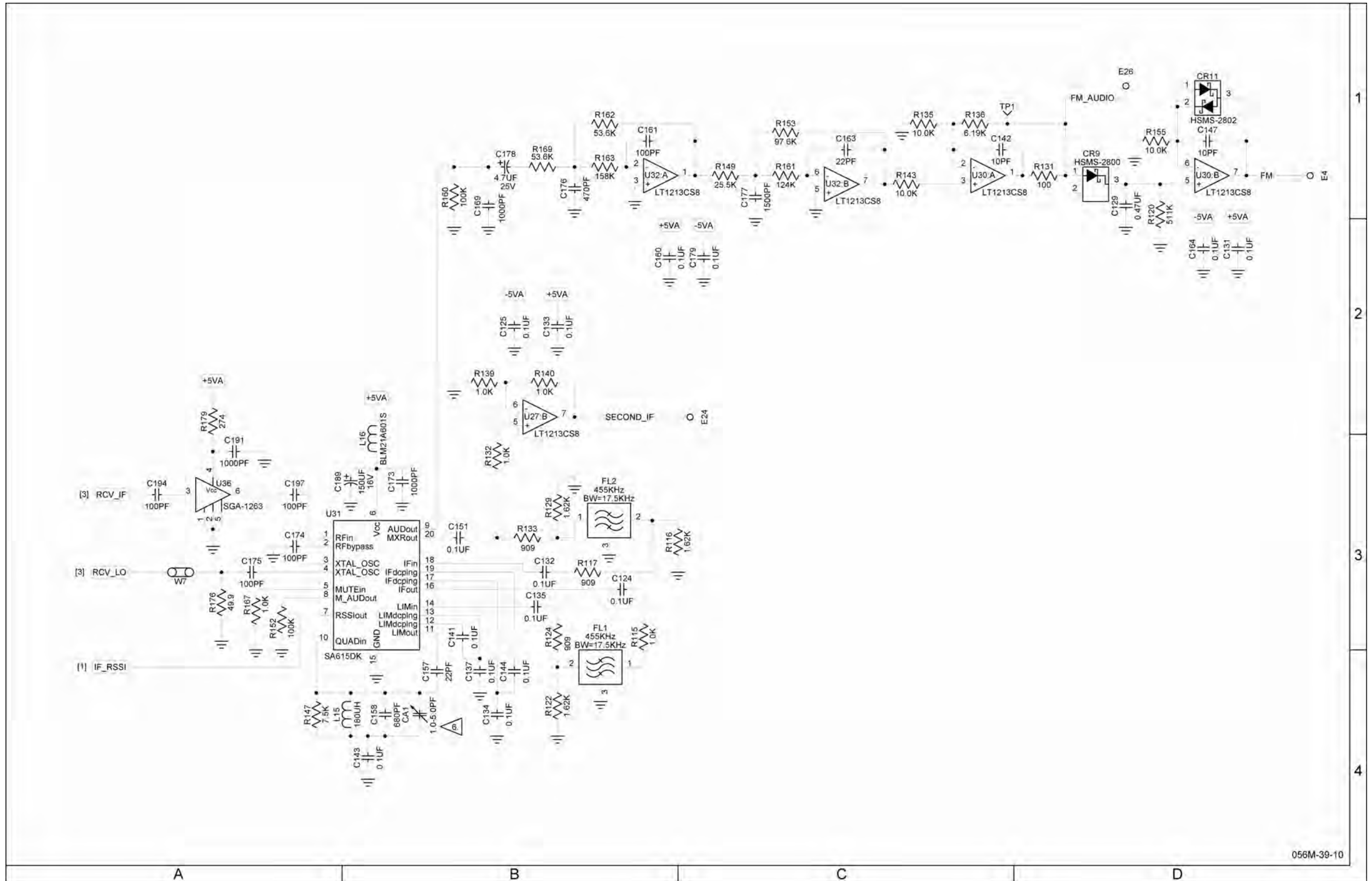
(0000-5631-200-C, D, E, F) (1000011138-AA)

Figure 13 RF Ass'y (Sheet 38 of 45)  
(RF Converter PCB Ass'y - Sheet 10 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 5 of 11)



(0000-5631-200-C, D, E, F) (1000011138-AA)

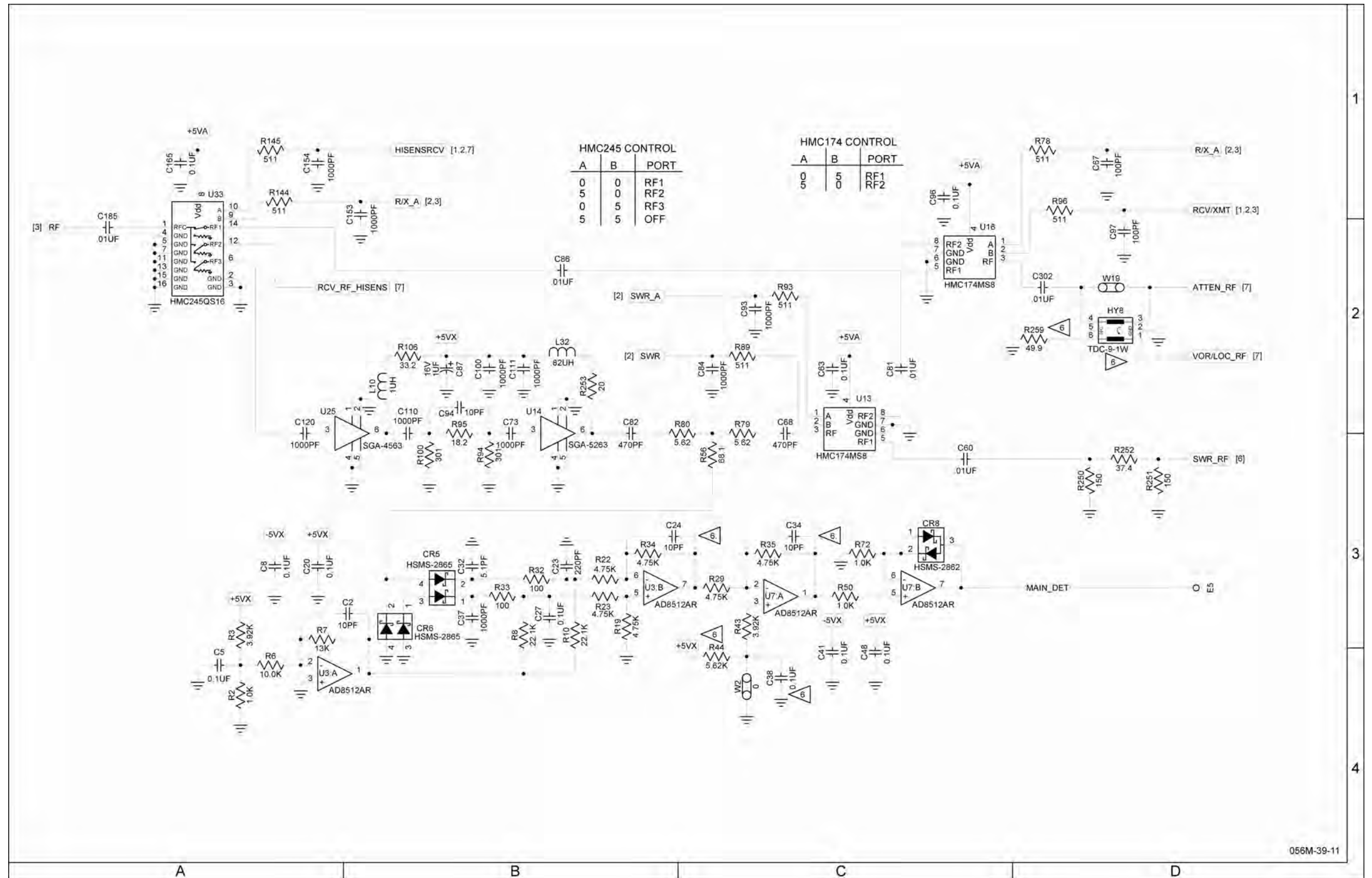
Figure 13 RF Assy (Sheet 39 of 45)  
(RF Converter PCB Assy - Sheet 11 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 6 of 11)



(0000-5631-200-C, D, E, F) (10000011138-AA)

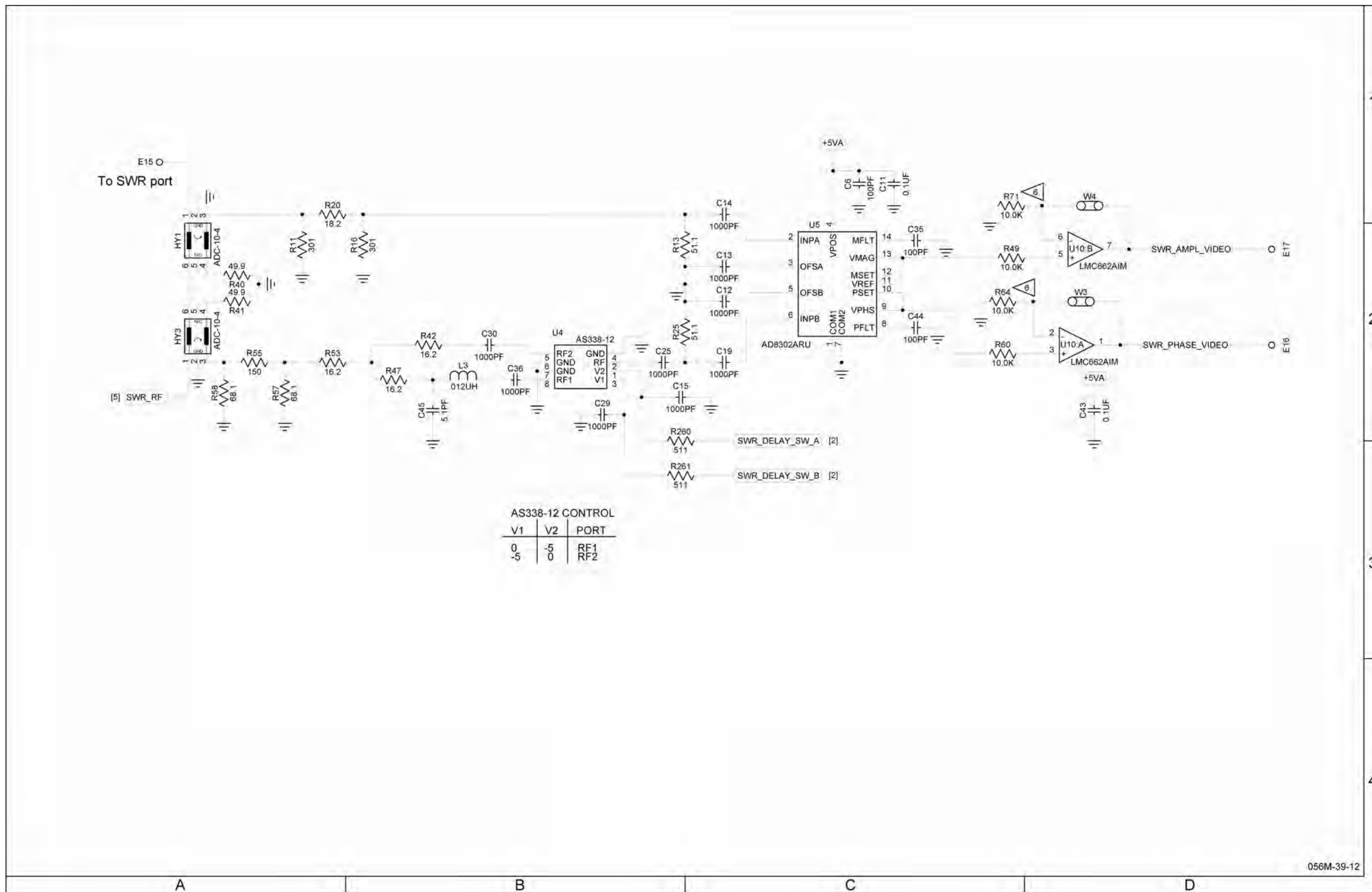
Figure 13 RF Ass'y (Sheet 40 of 45)  
(RF Converter PCB Assy - Sheet 12 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 7 of 11)





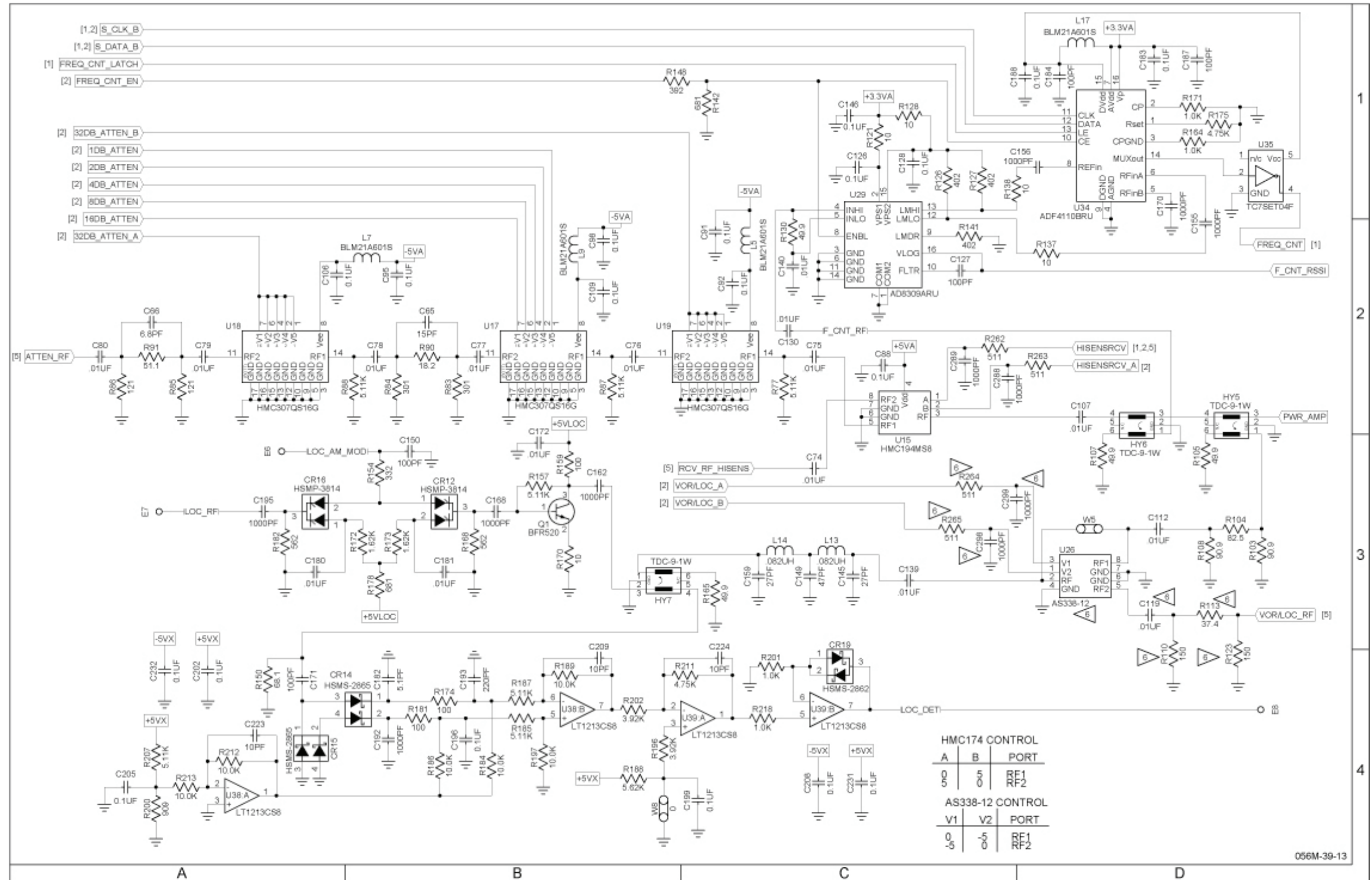
(0000-5631-200-C, D, E, F) (1000011138-AA)

Figure 13 RF Ass'y (Sheet 41 of 45)  
(RF Converter PCB Ass'y - Sheet 13 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 8 of 11)



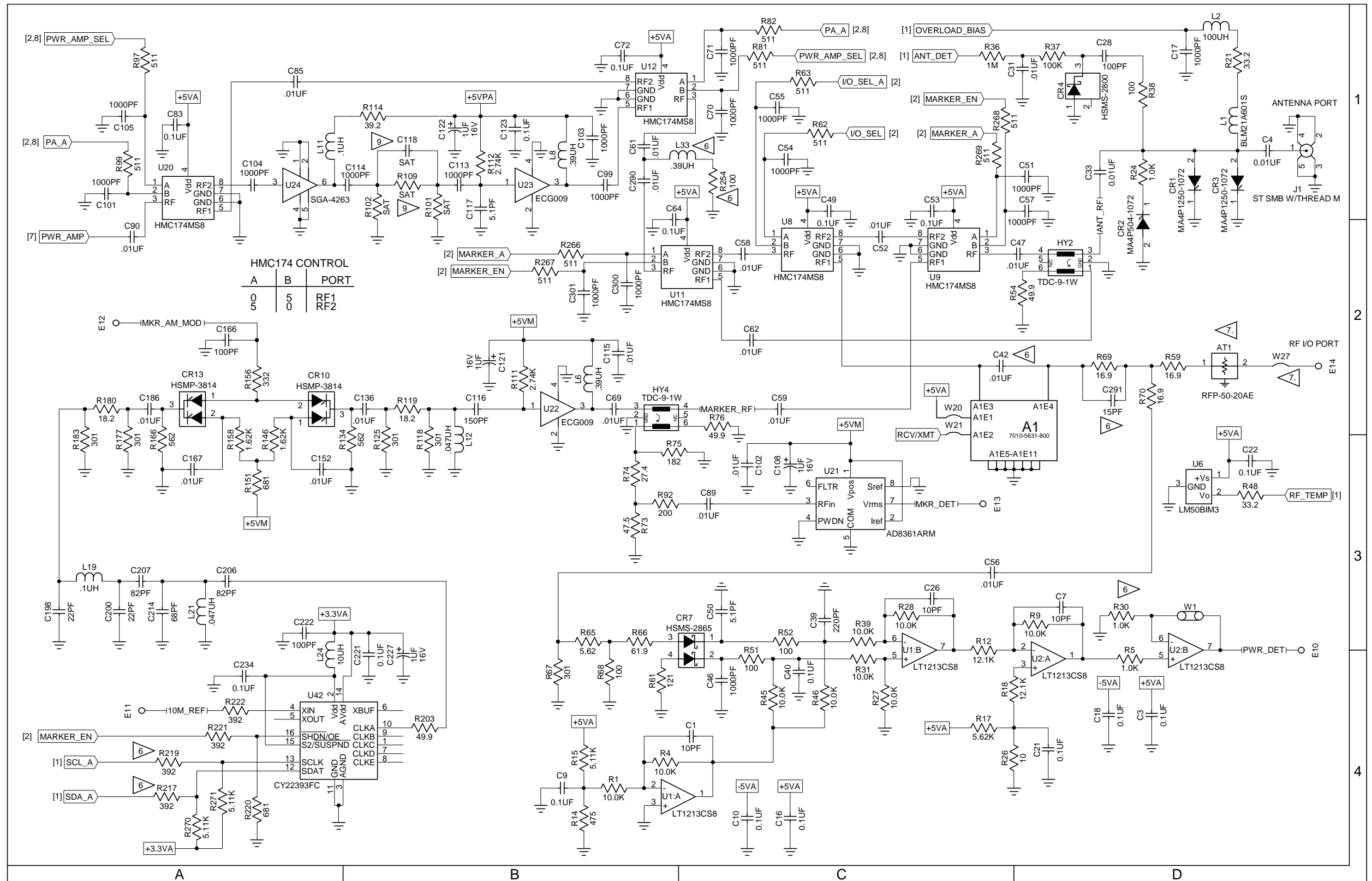
(0000-5631-200-C, D, E, F) (1000001138-AA)

Figure 13 RF Ass'y (Sheet 42 of 45)  
(RF Converter PCB Assy - Sheet 14 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 9 of 11)



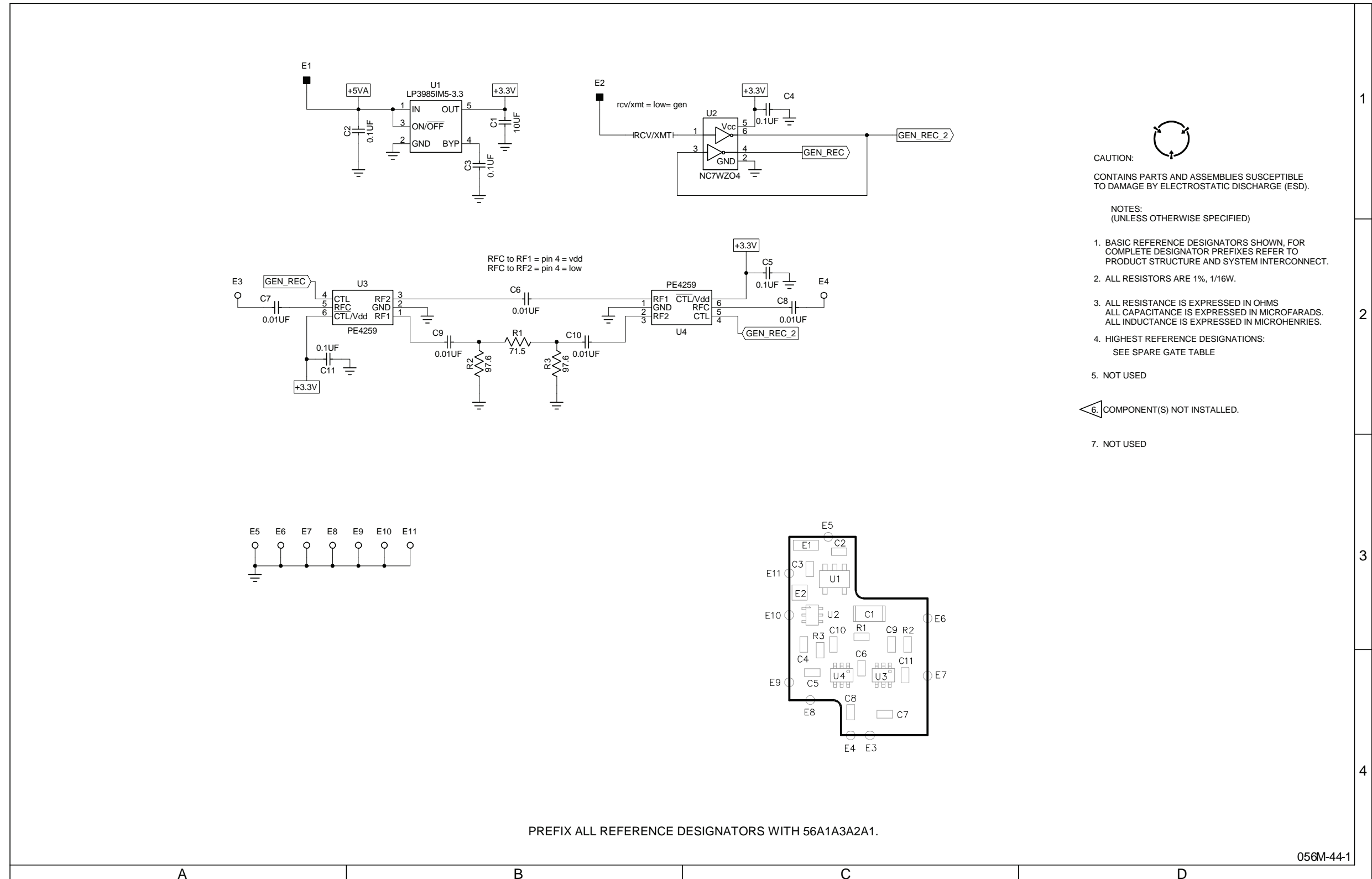
(0000-5631-200-C, D, E, F) (1000011138-AA)

Figure 13 RF Ass'y (Sheet 43 of 45)  
(RF Converter PCB Ass'y - Sheet 15 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 10 of 11)



(0000-5631-200-C, D, E, F) (10000011138-AA)

Figure 13 RF Ass'y (Sheet 44 of 45)  
(RF Converter PCB Assy - Sheet 16 of 17) (56A1A3A2)  
(Circuit Schematic - Sheet 11 of 11)



(7010-5631-800-A) (65958) (0000-5631-800-A) (10000021020-AA)

Figure 13 RF Assy (Sheet 45 of 45)  
(RF Converter PCB Assy - Sheet 17 of 17) (56A1A3A2)  
(Power Meter Switch PCB Assy) (56A1A3A2A1)

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### SECTION 3 - DISASSEMBLY/REASSEMBLY

1. Disassembly

A. General

Contains instructions necessary to remove and disassemble assemblies within the 4000.

PROCEDURE	PAGE
Battery-----	3
Fuse-----	5
Case Assy-----	7
Power Supply PCB Assy-----	9
RF Assy -----	10
Processor PCB Assy -----	12
Multi-Function PCB Assy -----	13
Keypad PCB Assy -----	15
LCD PCB Assy -----	16

B. Preliminary Considerations

(1) Tools Required

TOOL	SIZE	DESCRIPTION
SCREWDRIVER	#2	PHILLIPS
SCREWDRIVER	#1	SLOTTED
WRENCH	5/32" 3/16"	SOCKET
PLIERS		NEEDLE-NOSE

(2) Disassembly Precautions

- CAUTION:** TAG EACH WIRE AND CABLE PRIOR TO REMOVAL.
- CAUTION:** AVOID BENDING OR TWISTING SEMI-RIGID COAXIAL CABLES.
- CAUTION:** AVOID PLACING UNDUE STRAIN ON ANY WIRE OR CABLE.
- CAUTION:** AVOID DISCARDING LOOSE ITEMS (NUTS, SCREWS, WASHERS, ETC.).
- CAUTION:** AVOID EXPOSING COMPONENTS TO EXCESSIVE HEAT WHEN REMOVING SOLDER.

(3) ESD

**CAUTION:** THE POWER SUPPLY PCB ASSY, RF ASSY, KEYPAD PCB ASSY, PROCESSOR PCB ASSY, MULTI-FUNCTION PCB ASSY, LCD PCB ASSY AND KEYPAD PCB ASSY CONTAIN PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). ALL PERSONNEL PERFORMING DISASSEMBLY SHOULD HAVE KNOWLEDGE OF ACCEPTED ESD PRACTICES.



(4) EMC and Safety Compliance

All assemblies, cables, connectors, plastic fasteners, gaskets, fingerstock and miscellaneous hardware within the Test Set are configured to satisfy the safety and EMC compliance standards.

**CAUTION:** UPON COMPLETION OF ANY MAINTENANCE ACTION; ALL ASSEMBLIES, CABLES, CONNECTORS, PLASTIC FASTENERS, GASKETS, FINGERSTOCK AND MISCELLANEOUS HARDWARE MUST BE CONFIGURED AS INSTALLED AT THE FACTORY.



## C. Procedures

### (1) Battery

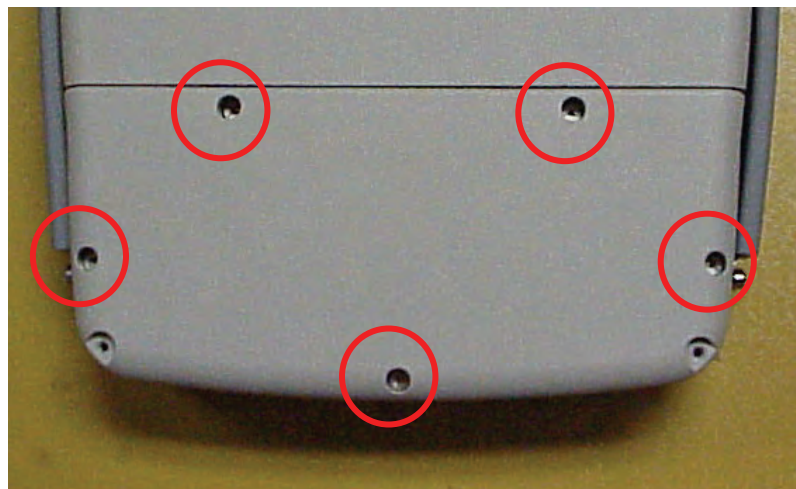
**PRELIMINARY PROCEDURES:** None

**WARNING: DANGEROUS VOLTAGES ARE PRESENT WITH CASE ASSY REMOVED IF POWER IS PRESENT.**

STEP	PROCEDURE
1.	Remove external power sources and all external cables from the 4000.
2.	Loosen the four captive screws holding bumpers (two in back and two in front). Remove bumpers.



3. Loosen five captive screws securing the Battery Cover. Remove the Battery Cover.



STEP

PROCEDURE

---

4. Disconnect the Battery wire harness.



5. Remove the Battery.

(2) Fuse

**PRELIMINARY PROCEDURES:** None

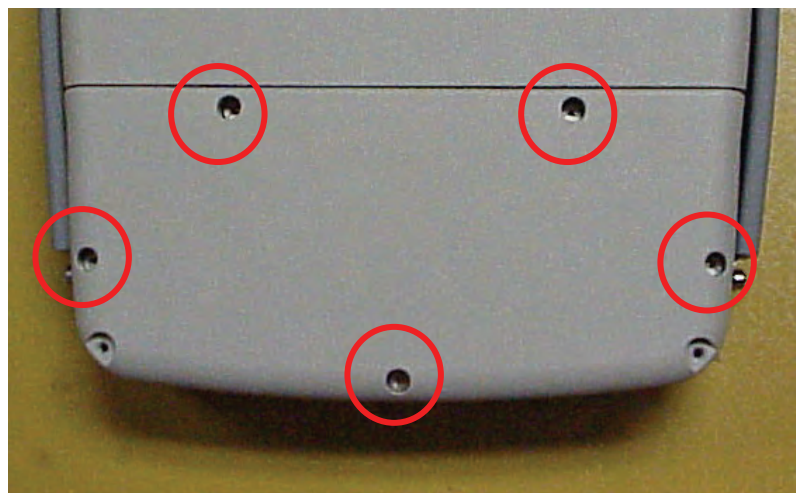
**WARNING: DANGEROUS VOLTAGES ARE PRESENT WITH CASE ASSY REMOVED IF POWER IS PRESENT.**

STEP	PROCEDURE
------	-----------

1. Remove external power sources and all external cables from the 4000.
2. Loosen the four captive screws holding bumpers (two in back and two in front). Remove bumpers.



3. Loosen five captive screws securing the Battery Cover. Remove the Battery Cover.

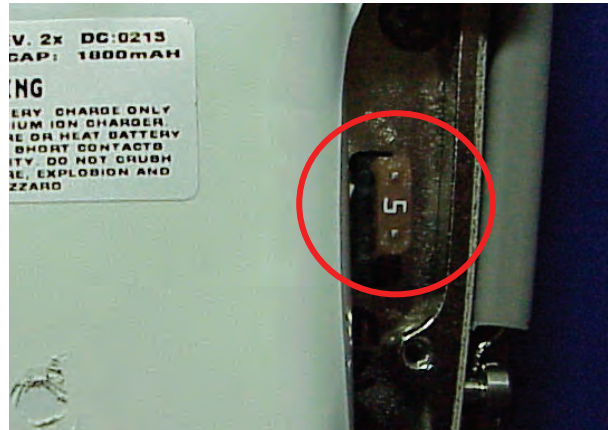


STEP

PROCEDURE

---

4. Remove the Fuse.

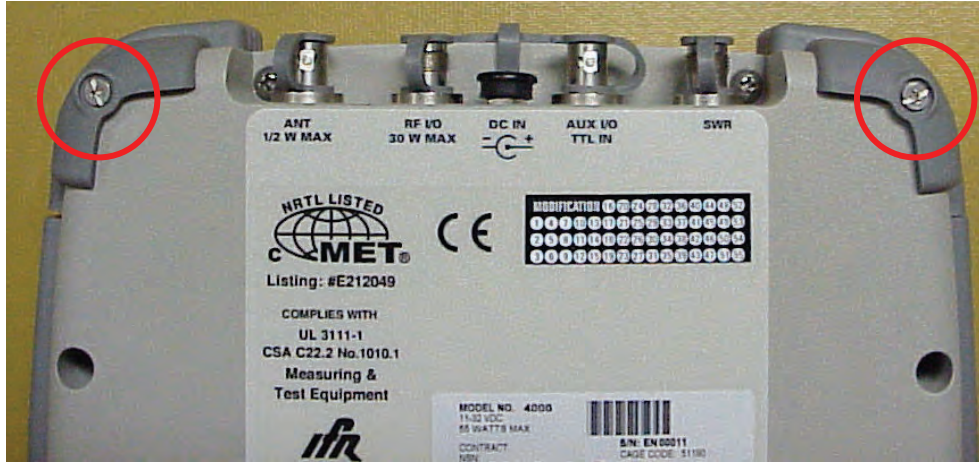


(3) Case Assy

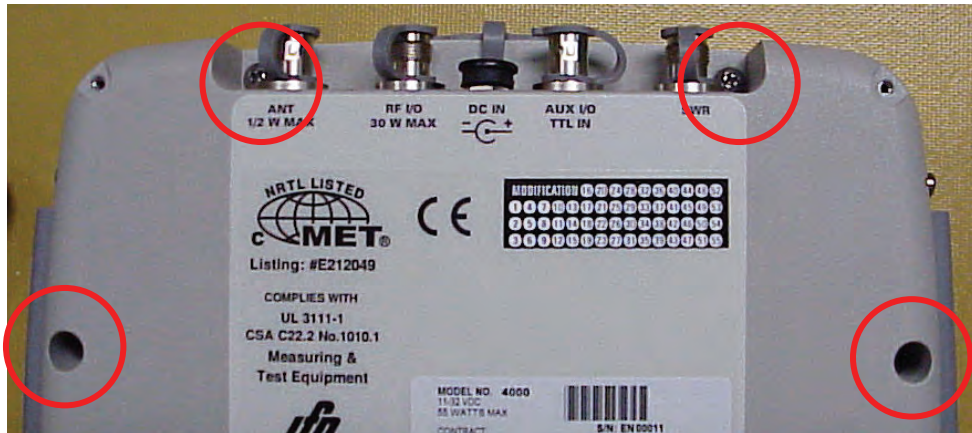
**PRELIMINARY PROCEDURES:** Battery (para 2-3-1C[1])

STEP	PROCEDURE
------	-----------

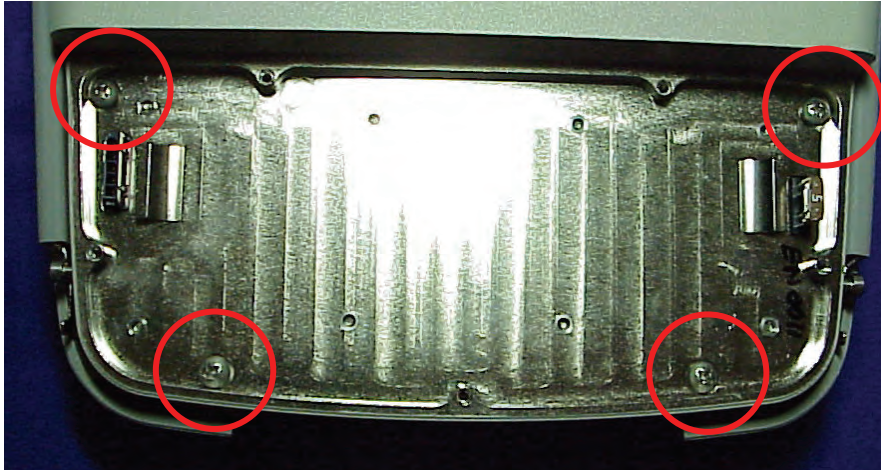
1. Loosen the four captive screws holding bumpers (two in back and two in front). Remove bumpers.



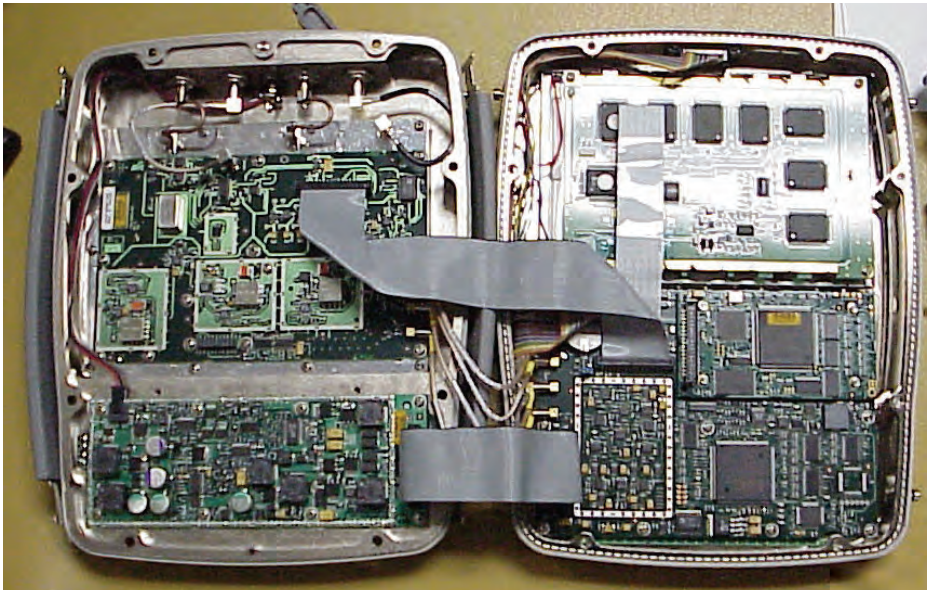
2. Remove four screws.



3. Remove four screws.



4. Open the Case Assy.

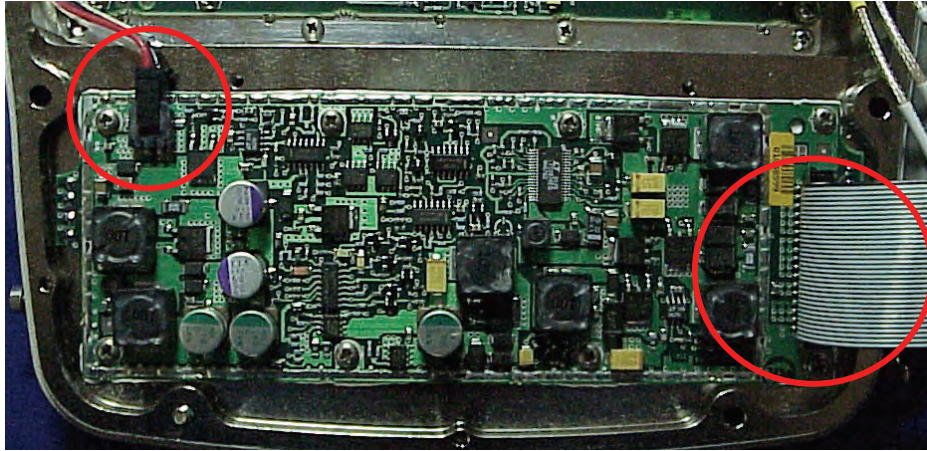


(4) Power Supply PCB Assy

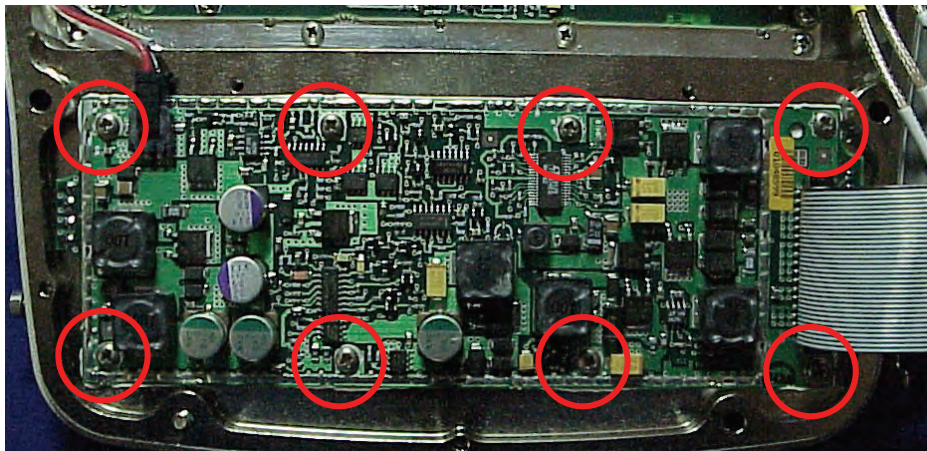
**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])

STEP	PROCEDURE
------	-----------

1. Disconnect wire cable and ribbon cable from the Power Supply PCB Assy.



2. Remove eight screws.



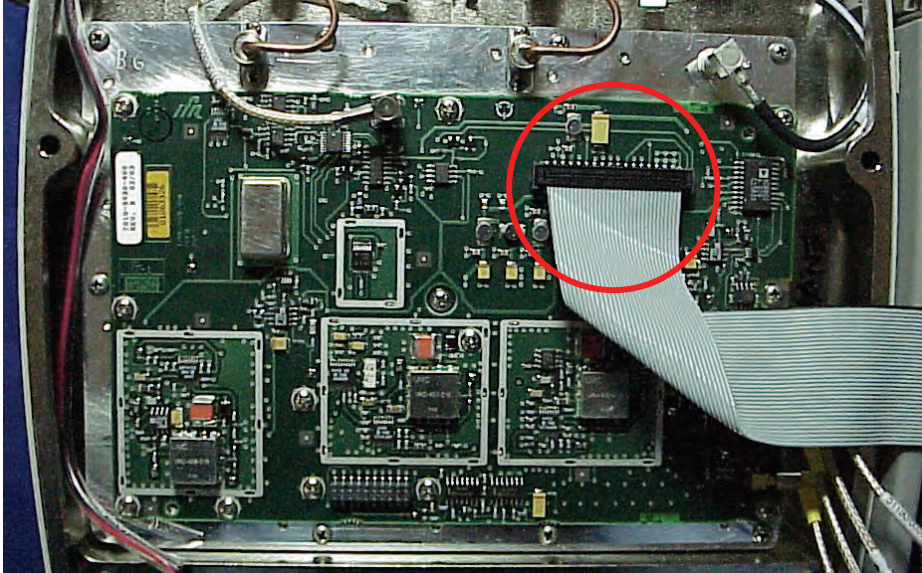
3. Remove Power Supply PCB Assy.

(5) RF Assy

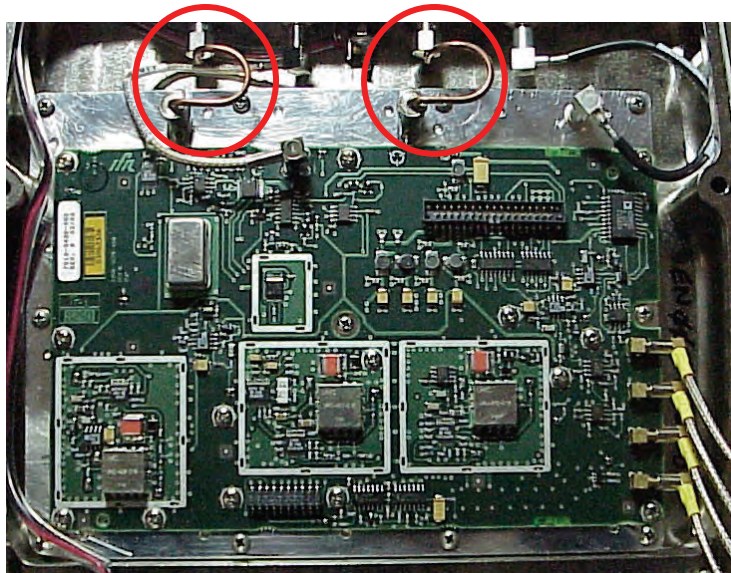
**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])

STEP	PROCEDURE
------	-----------

1. Disconnect ribbon cable from the RF Assy.



2. Remove two semi-rigid coaxial cables.

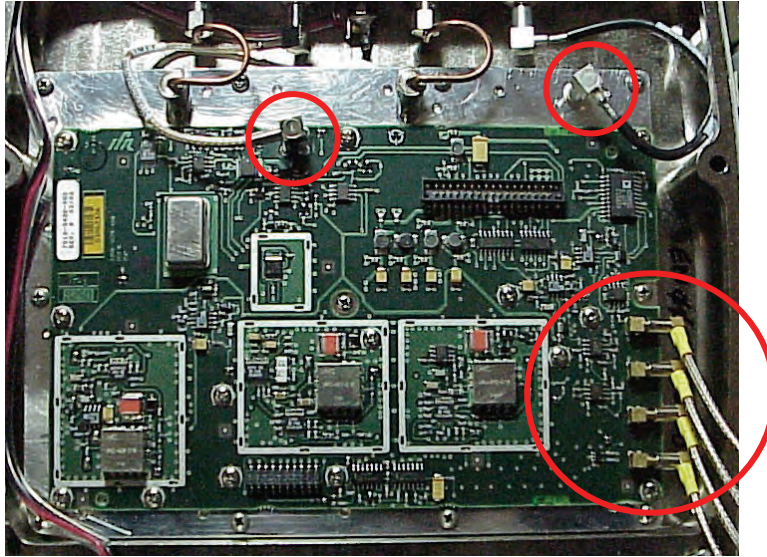




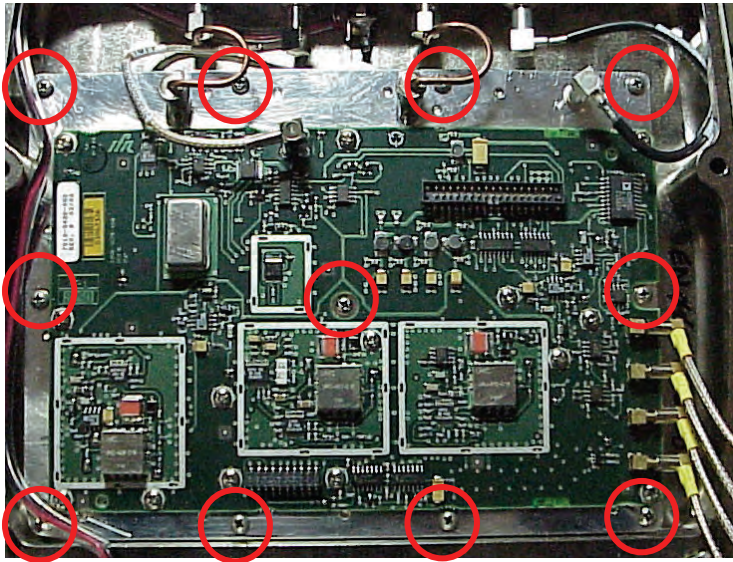
STEP

PROCEDURE

3. Disconnect six coaxial cables from the RF Assy.



4. Remove 11 screws.



5. Remove the RF Assy.

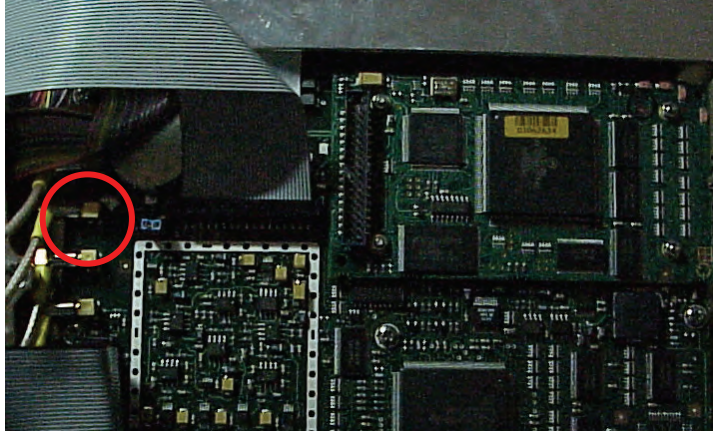
(6) Processor PCB Assy

**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])

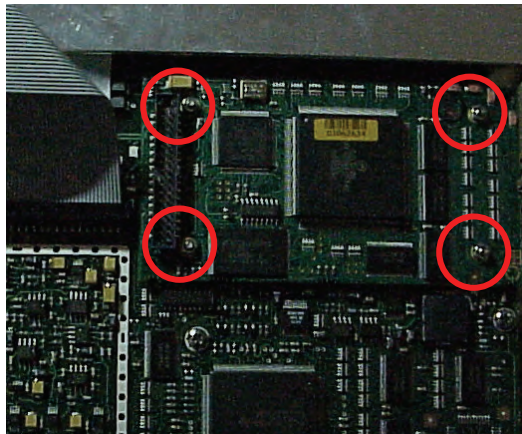
STEP	PROCEDURE
------	-----------

---

1. Remove jumper from Multi-Function PCB Assy.



2. Remove four nuts and four lock washers.



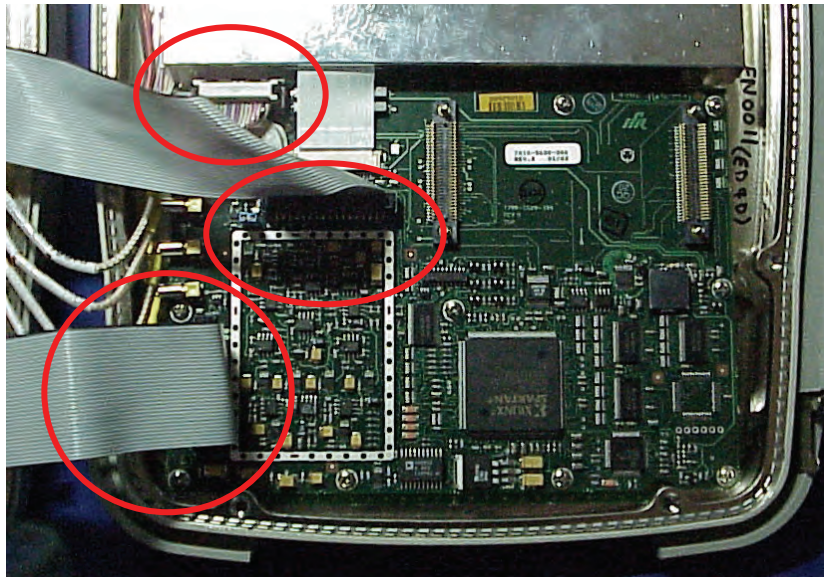
3. Remove the Processor PCB Assy.

(7) Multi-Function PCB Assy

**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])  
Processor PCB Assy (para 2-3-1C[6])

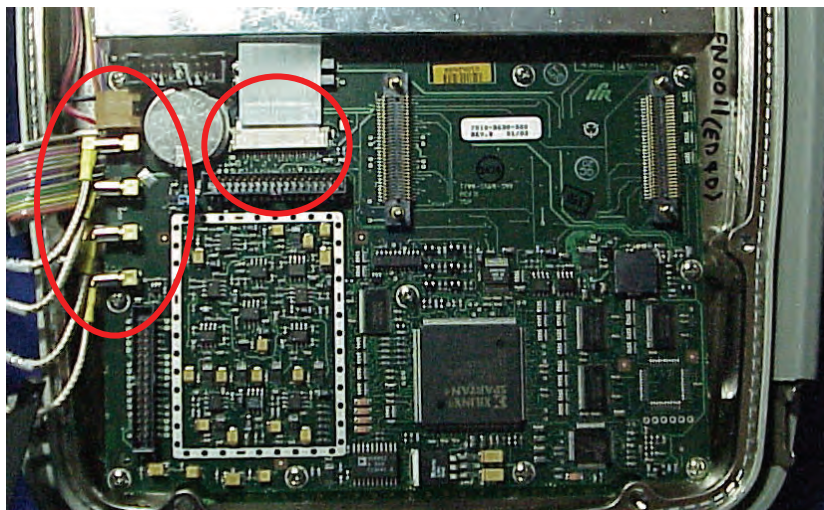
STEP	PROCEDURE
------	-----------

1. Disconnect three ribbon cables from the Multi-Function PCB Assy.

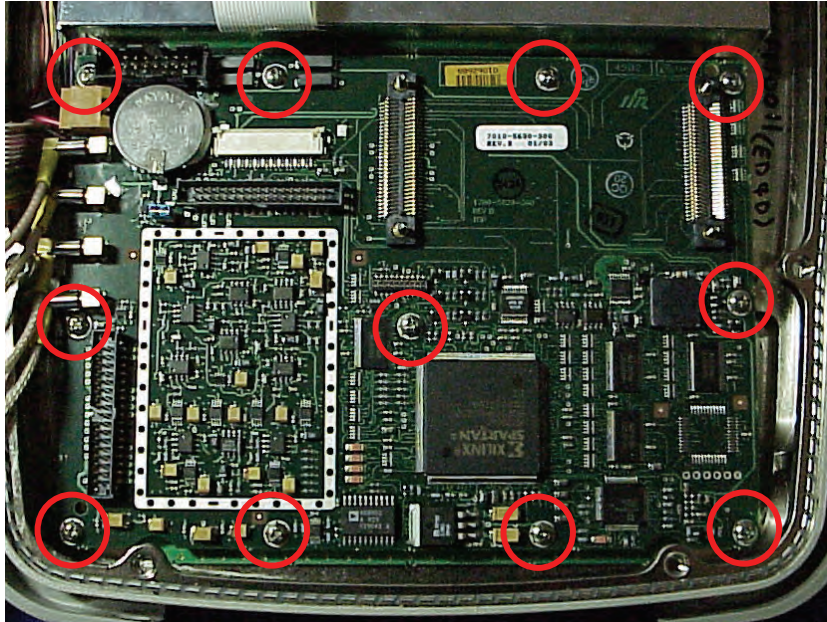


2. Disconnect ribbon cable, wire cable and four coaxial cables from the Multi-Function PCB Assy.

**CAUTION:** EXERCISE CAUTION WHEN REMOVING THE RIBBON CABLE FROM THE MULTI-FUNCTION PCB ASSY.



3. Remove 11 screws.



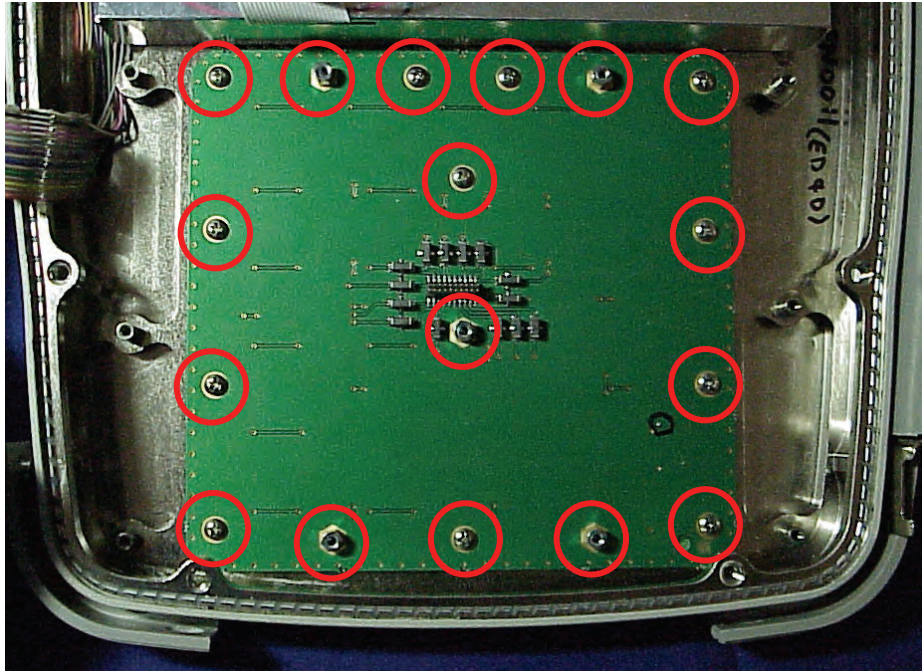
4. Remove Multi-Function PCB Assy.

(8) Keypad PCB Assy

**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])  
Processor PCB Assy (para 2-3-1C[6])  
Multi-Function PCB Assy (para 2-3-1C[7])

STEP	PROCEDURE
------	-----------

1. Remove 12 screws and five shell nuts.



2. Remove Keypad PCB Assy.

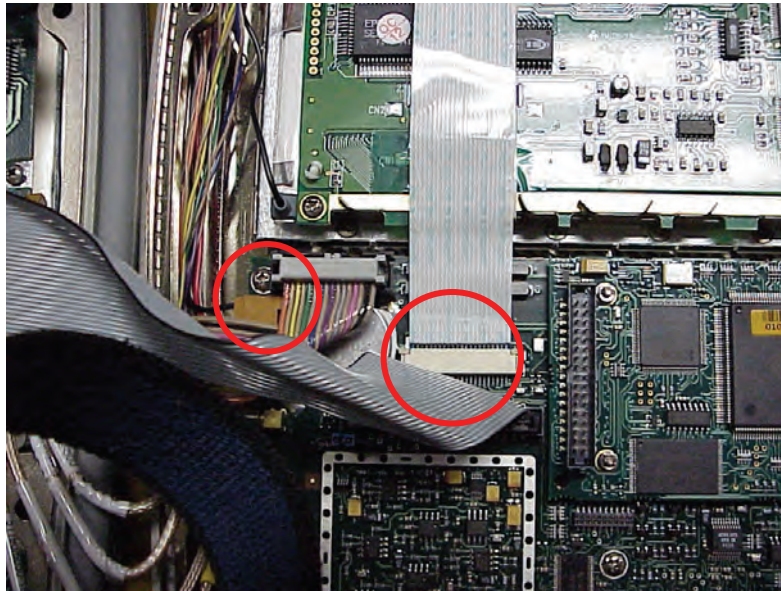
(9) LCD PCB Assy

**PRELIMINARY PROCEDURES:** Case Assy (para 2-3-1C[3])

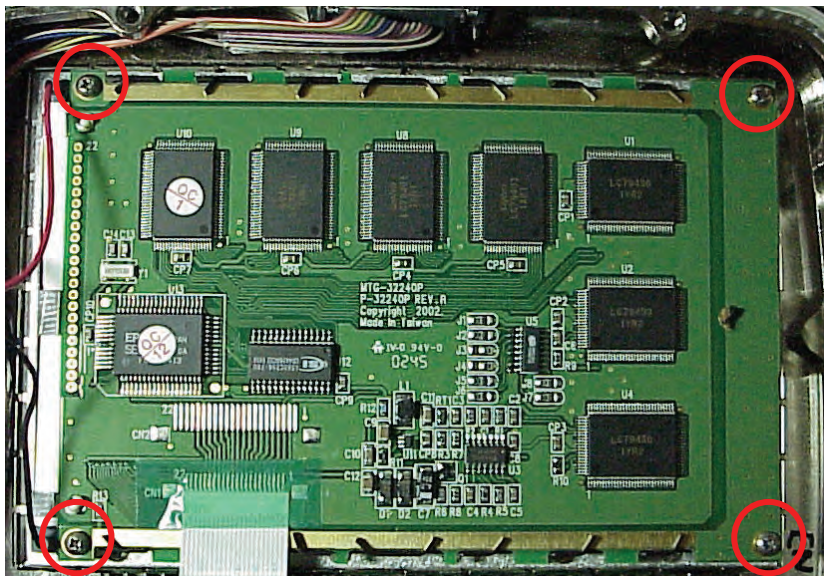
STEP	PROCEDURE
------	-----------

1. Disconnect wire cable and ribbon cable from Multi-Function PCB Assy.

**CAUTION:** EXERCISE CAUTION WHEN REMOVING THE RIBBON CABLE FROM THE MULTI-FUNCTION PCB ASSY.



2. Remove four screws.



3. Remove LCD PCB Assy.

## 2. Reassembly

### A. General

Reassembly depends upon extent of disassembly and should be performed with normal repair and/or cleaning. Perform reassembly in reverse sequence of disassembly procedures unless otherwise specified.

### B. Preliminary Considerations

#### (1) Tools Required

Reassembly requires the same tools required for disassembly unless otherwise specified.

#### (2) Reassembly Precautions

**CAUTION:** INSURE ALL COAXIAL CONNECTIONS ARE PROPERLY MATED.

**CAUTION:** AVOID BENDING OR TWISTING SEMI-RIGID COAXIAL CABLES.

**CAUTION:** PLACE ALL RIBBON CABLES TO LAY FLAT AND NEATLY FOLDED.

**CAUTION:** AVOID PLACING UNDUE STRAIN ON ANY WIRE OR CABLE.

**CAUTION:** AVOID OVERTIGHTENING SCREWS AND NUTS INCLUDING COAXIAL CONNECTORS.

**CAUTION:** REPLACE EACH REMOVED PLASTIC FASTENER IN SAME LOCATION AS MARKED AND CONFIGURED PRIOR TO REMOVAL.

**CAUTION:** AVOID EXPOSING COMPONENTS TO EXCESSIVE HEAT WHEN SOLDERING.

#### (3) ESD



**CAUTION:** THE POWER SUPPLY ASSY, MULTI-FUNCTION PCB ASSY, RF ASSY AND PROCESSOR PCB ASSY CONTAIN PARTS SENSITIVE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD). ALL PERSONNEL PERFORMING REASSEMBLY SHOULD HAVE KNOWLEDGE OF ACCEPTED ESD PRACTICES AND/OR BE ESD CERTIFIED.

#### (4) EMC and Safety Compliance

All assemblies, cables, connectors, plastic fasteners, gaskets, fingerstock and miscellaneous hardware within the Test Set are configured to satisfy the safety and EMC compliance standards.

**CAUTION:** UPON COMPLETION OF ANY MAINTENANCE ACTION, ALL ASSEMBLIES, CABLES, CONNECTORS, PLASTIC FASTENERS, GASKETS, FINGERSTOCK AND MISCELLANEOUS HARDWARE MUST BE CONFIGURED AS INSTALLED AT THE FACTORY.

### C. Reassembly Procedures

#### (1) Battery

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the five captive screws on the Battery Cover to 8 in/lbs.

#### (2) Fuse

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the five captive screws on the Battery Cover to 8 in/lbs.

#### (3) Case Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the eight screws on the Case Assy to 17 in/lbs.

#### (4) Power Supply PCB Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Install new gap pad between the Power Supply PCB Assy and the Chassis Assy.
- Torque the eight screws on the Power Supply PCB Assy to 6 in/lbs.

#### (5) RF Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Replace RF gasket if torn or damaged.
- Torque the 11 screws on the RF Assy to 8 in/lbs.
- Torque the two semi-rigid coaxial cable connectors to 10 in/lbs.

#### (6) Processor PCB Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the 4 nuts on the Processor PCB Assy to 3 in/lbs.

#### (7) Multi-Function PCB Assy

**CAUTION:** EXERCISE CAUTION WHEN INSTALLING THE RIBBON CABLE FROM THE LCD ASSY TO THE MULTI-FUNCTION PCB ASSY.

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the 11 screws on the Multi-Function PCB Assy to 6 in/lbs.

#### (8) Keypad PCB Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Torque the 12 screws on the Keypad PCB Assy to 6 in/lbs.
- Torque the five shell nuts on the Keypad PCB Assy to 6 in/lbs.

#### (9) LCD PCB Assy

- Reassembly should be performed in reverse sequence of disassembly.
- Reapply new double-stick tape.
- Torque the four screws on the LCD PCB Assy to 6 in/lbs.





### SECTION 4 - PARTS LIST

To order parts contact:

**Aeroflex**  
Customer Service Department  
10200 West York Street  
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**ACCESSORIES**

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
	6081 (1002-5600-2C0)	MANUAL, CD, OP, IFR 4000
	6083 (1002-5600-4C0)	MANUAL, CD, MN, IFR 4000
	6085 (1002-5600-8P0)	INSTRUCTIONS, ANTENNA, 4000
	6086 (1002-5600-9P0)	CARD, PP, PASSWORD, IFR 4000
	6087 (1002-5601-8P0)	MANUAL, PP, GS, IFR 4000
	9137 (1201-0909-900)	ANTENNA, TELESCOPING
	9140 (1201-5601-000)	ANTENNA, 75 MHZ, 4000
	24140 (2289-0001-009)	CAP, LOAD, 50 OHM
	24141 (2289-0001-010)	CAP, TNC, FEMALE, SHORT
	56080 (5106-0000-057)	FUSE, 5A, 32V, MINI BLADE
	62302 (6041-0001-000)	CABLE ASSY, IEC STR, COR 80-1245
	62398 (6041-5680-800)	CABLE ASSY, TNC M/TNC M, 48"
	62399 (6041-5680-900)	CABLE ASSY, RS-232 INTERFACE (15-PIN)
	62400 (6041-5681-200)	CABLE ASSY, RS-232 INTERFACE (25-PIN)
	63656 (6500-5681-000)	STAND, BENCH
	64020 (7001-9903-000)	CORDS, POWER, 220
	67366 (7110-5600-200)	POWER SUPPLY, EXTERNAL DC
	10238 (1412-5653-000)	CASE, TRANSIT



**64072 (7003-5640-000)**

**ASSY, COMPOSITE**

**B**

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	9840 (1403-5650-100)	CHASSIS,REAR
2	10602 (1414-5650-800)	COVER,BATTERY
3	35565 (2803-0125-006)	SCREW,4-40 X 1/8 PPHM
4	35611 (2803-0500-006)	SCREW,4-40 X 1/2 PPHM
5	35700 (2805-0438-006)	SCREW,8-32 X 7/16 PPHM
7	36272 (2840-0000-060)	WASHER,NYL,.312OD,.171ID,.032T
8	10259 (1414-0000-008)	COVER,MINI POWER JACK
13	11236 (1421-5651-300)	BUMPER,CORNER
14	10127 (1407-5651-400)	HANDLE,EXTRUDED
15	10128 (1407-5651-500)	HANDLE,STRAP
16	10603 (1414-5651-700)	COVER,BNC/TNC
17	10604 (1414-5651-800)	COVER,REMOTE
18	35564 (2803-0125-005)	SCREW,4-40 X 1/8 SHOULDER
30	35642 (2803-6256-500)	SCREW,CAPTIVE,4-40,.39L PH
A1	65952 (7010-5630-500)	PCB ASSY,POWER SUPPLY
A2	64570 (7005-5640-100)	ASSY,CHASSIS
A3	64571 (7005-5640-400)	ASSY,RF
BT1	67076 (7020-0012-500)	ASSY,LIION BATTERY PACK
J1	20952 (2123-0000-109)	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J2	20952 (2123-0000-109)	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J3	20953 (2123-0000-110)	CONN,F,BNC,BH,ADP,SMB,WTRPRF
J4	20953 (2123-0000-110)	CONN,F,BNC,BH,ADP,SMB,WTRPRF
W1	65007 (7007-5680-100)	WIRE HARN ASSY,DC INPUT
W2	62982 (6045-5680-400)	RBN CA ASSY,28GA,34C,6.0L,2MM
W3	62983 (6045-5680-600)	RBN CA ASSY,28GA,34C,9.75L,2MM
W9	62751 (6044-1230-500)	COAX CONF SL SMB RA-SMB RA 90
W10	62621 (6042-5680-500)	COAX ASSY,RF
W11	62621 (6042-5680-500)	COAX ASSY,RF
W12	63140 (6050-0040-500)	COAX ASSY, 316,R F SMB/R F SMB

**64072 (7003-5640-000)**

**ASSY, COMPOSITE**

**C**

Contains all parts shown in Revision B.

**64072 (7003-5640-000)**

**ASSY, COMPOSITE**

**D**

Contains all parts shown in Revision C.

**64072 (7003-5640-000)**

**ASSY, COMPOSITE**

**E**

Contains all parts shown in Revision D.

**64072 (7003-5640-000)**

**ASSY, COMPOSITE**

**F**

Contains all parts shown in Revision E with the following exception:

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
A3	64572 (7005-5640-500)	ASSY,RF



**64072 (7003-5640-000)      ASSY, COMPOSITE      G**

Contains all parts shown in Revision F.

**64072 (7003-5640-000)      ASSY, COMPOSITE      H**

Contains all parts shown in Revision G with the following exception:

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
13	11236 (1421-5651-300)	BUMPER,CORNER



**64073 (7003-5642-000) ASSY, COMPOSITE**

**A**

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	9844 (1403-5854-400)	CHASSIS,REAR,4000
2	64575 (7005-5642-500)	MECH ASSY,BATTERY COVER
3	35566 (2803-0156-006)	SCREW,4-40 X 5/32 PPHM
4	35615 (2803-0563-006)	SCREW,4-40 X 9/16 PPHM
5	35700 (2805-0438-006)	SCREW,8-32 X 7/16 PPHM
7	36272 (2840-0000-060)	WASHER,NYL,.312OD,.171ID,.032T
8	10259 (1414-0000-008)	COVER,MINI POWER JACK
13	11238 (1421-6256-900)	BUMPER,CORNER,SSHDW
14	10128 (1407-5651-500)	HANDLE,STRAP
15	10127 (1407-5651-400)	HANDLE,EXTRUDED
16	10603 (1414-5651-700)	COVER,BNC/TNC
17	10604 (1414-5851-800)	COVER, REMOTE
18	35564 (2803-0125-005)	SCREW,4-40 X 1/8 SHOULDER
30	35642 (2803-6256-500)	SCREW,CAPTIVE,4-40,.39L PH
A1	65952 (7010-5630-500)	PCB ASSY,POWER SUPPLY
A2	64574 (7005-5642-400)	MECH ASSY,FRONT CHASSIS
A3	64573 (7005-5642-300)	MECH ASSY,RF ELT
BT1	67076 (7020-0012-500)	PURCH ASSY,LIION BATTERY PACK
J1	20952 (2123-0000-109)	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J2	20952 (2123-0000-109)	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J3	20953 (2123-0000-110)	CONN,F,BNC,BH,ADP,SMB,WTRPRF
J4	20953 (2123-0000-110)	CONN,F,BNC,BH,ADP,SMB,WTRPRF
W1	65008 (7007-5680-100)	WIRE HARN ASSY,DC INPUT
W2	62982 (6045-5680-400)	RBN CA ASSY,28GA,34C,6.0L,2MM
W3	62983 (6045-5680-600)	RBN CA ASSY,28GA,34C,9.75L,2MM
W9	62751 (6044-1230-500)	COAX CONF SL SMB RA-SMB RA 90
W10	62628 (6042-6282-400)	COAX ASSY,CONF,2.125 FLSH MNT
W11	62628 (6042-6282-400)	COAX ASSY,CONF,2.125 FLSH MNT
W12	63140 (6050-0040-500)	COAX ASSY, 316,R F SMB/R F SMB

**64073 (7003-5642-000) ASSY, COMPOSITE**

**B**

Contains all parts shown in Revision A with the following exceptions:

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
W10	62622 (6042-5681-300)	COAX ASSY,CONF,2.125 FL MN,SLV
W11	62622 (6042-5681-300)	COAX ASSY,CONF,2.125 FL MN,SLV



64570 (7005-5640-100)

ASSY, CHASSIS

B

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	9839 (1403-5650-000)	CHASSIS,FRONT
2	9502 (1400-5650-200)	BRACKET,DISPLAY
3	10601 (1414-5650-300)	COVER,DISPLAY
5	46697 (3900-5650-500)	LENS,DISPLAY
8	35569 (2803-0188-003)	SCREW,4-40 X 3/16 PFHM
9	35571 (2803-0188-006)	SCREW,4-40 X 3/16 PPHM
10	37932 (2850-7866-300)	STANDOFF,HEX,MALE-FEMALE
11	35600 (2803-0375-006)	SCREW, 4-40 X 3/8 PPHM
12	35536 (2801-0375-006)	SCREW,2-56 X 3/8 PPHM
13	35844 (2818-0000-017)	STANDOFF,.188 HEX M/F,.187LG
14	37773 (2850-0000-012)	NUT,HEX,SMALL PAT,2-56
16	36239 (2840-0000-004)	WASHER,LOCK,INT TOOTH,2
A1	65954 (7010-5630-700)	PCB ASSY,KEYPAD
A2	65949 (7010-5630-200)	PCB ASSY,PROCESSOR
A3	65950 (7010-5630-300)	PCB ASSY,MULTI-FUNCTION
A4	67364 (7110-5600-000)	ASSY,LCD
A5	67365 (7110-5600-100)	ASSY,KEYPAD
JTB1	21440 (2132-0004-000)	CONN,JUMPER BLOCK,.1C,.025 PIN
W1	62981 (6045-5680-000)	RIBBON CA ASSY,RS-232/USB
W5	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W6	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W7	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W8	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB

64570 (7005-5640-100)

ASSY, CHASSIS

C

Contains all parts shown in Revision B.



64574 (7005-5642-400)

ASSY, CHASSIS

B

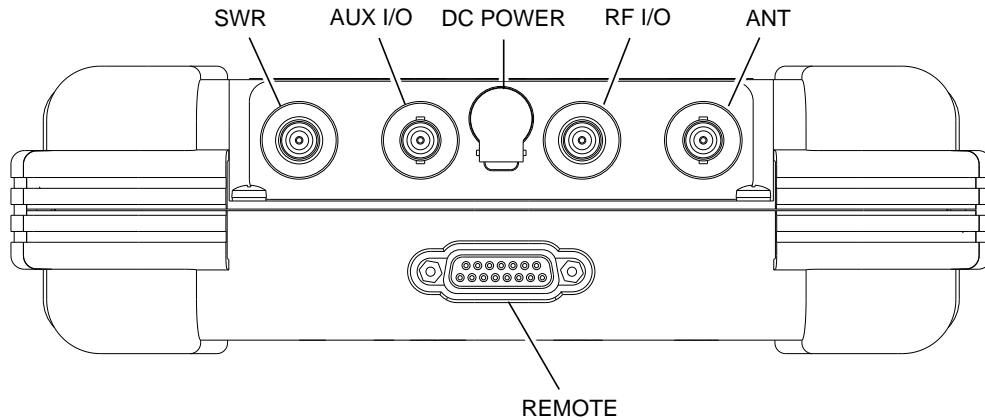
REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	9845 (1403-5854-500)	CHASSIS,FRONT,4000
2	9516 (1400-6255-300)	BRACKET,DISPLAY
3	10623 (1414-6255-200)	COVER,DISPLAY
5	46697 (3900-5650-500)	LENS,DISPLAY
8	35569 (2803-0188-003)	SCREW,4-40 X 3/16 PFHM
9	35571 (2803-0188-006)	SCREW,4-40 X 3/16 PPHM
10	37932 (2850-7866-300)	STANDOFF,HEX,MALE-FEMALE
11	35600 (2803-0375-006)	SCREW, 4-40 X 3/8 PPHM
12	35536 (2801-0375-006)	SCREW,2-56 X 3/8 PPHM
13	35844 (2818-0000-017)	STANDOFF,.188 HEX M/F,.187LG
14	37773 (2850-0000-012)	NUT,HEX,SMALL PAT,2-56
16	36239 (2840-0000-004)	WASHER,LOCK,INT TOOTH,2
A1	65959 (7010-5631-900)	PCB ASSY,4000 KEYPAD
A2	65949 (7010-5630-200)	PCB ASSY,PROCESSOR
A3	65950 (7010-5630-300)	PCB ASSY,MULTI-FUNCTION
A4	67364 (7110-5600-000)	PURCHASED ASSY,LCD
A5	67367 (7110-5600-300)	PURCH ASSY,4000 KEYPAD
JTB1	21440 (2132-0004-000)	CONN,JUMPER BLOCK,.1C,.025 PIN
W1	62984 (6045-5681-100)	RIBBON CA ASSY,RS-232/USB
W5	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W6	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W7	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB
W8	63312 (6050-1990-500)	COAX ASSY,316,RFSSMB/RFSSMB



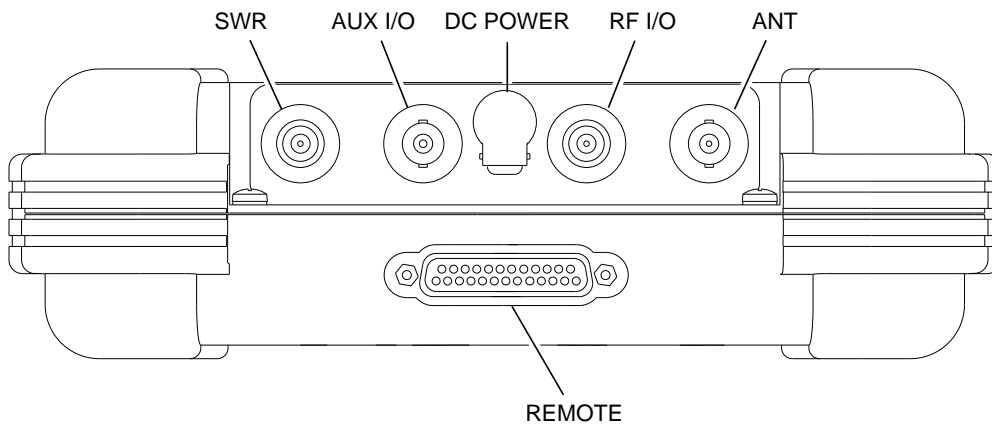
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## APPENDIX A - CONNECTOR PIN-OUT TABLES



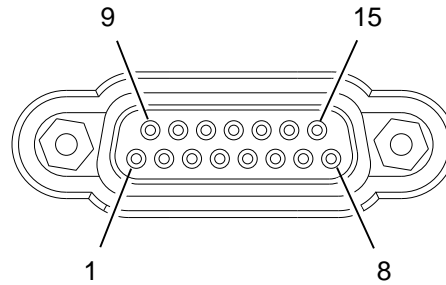
056P-02



056P-02

CONNECTOR	TYPE	SIGNAL TYPE	INPUT/OUTPUT
SWR	TNC	RF	OUTPUT
AUX I/O	BNC	N/A	INPUT/OUTPUT
DC POWER	2.5 mm CIRCULAR (2.5 mm center, 5.5 mm outer diameter, center positive)	11 to 32 Vdc	INPUT
RF I/O	TNC	RF, 30 W CW MAX	INPUT/OUTPUT
ANT	BNC	RF, 0.5 W CW MAX	INPUT/OUTPUT
REMOTE	15-Pin or 25-Pin Female	MIXED	INPUT/OUTPUT
Refer to Appendix A, Table 2 or Table 3 for REMOTE Connector description			

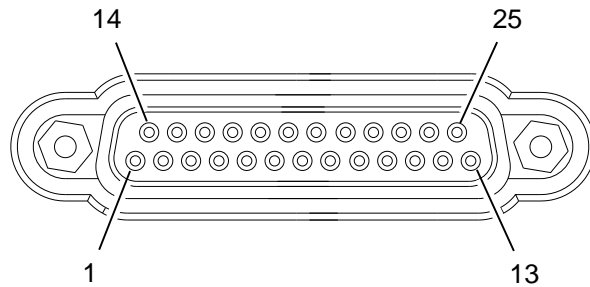
I/O Connectors  
Table 1



056P-03

PIN NO.	SIGNAL NAME	DESCRIPTION
1	VBUS_DN1	+5 Vdc Supply for Downstream USB Device
2	H_D1+	D+ Data To/From Downstream USB Device
3	VBUS_UP	+5 Vdc Input from Upstream USB Host
4	D_D+	D+ Data To/From Upstream USB Host
5	TX	RS-232 Data Output
6	RX	RS-232 Data Input
7	CTS	RS-232 Clear To Send (Input)
8	RTS	RS-232 Request To Send (Output)
9	GND_DN1	Ground for Downstream USB Device
10	H_D1-	D- Data To/From Downstream USB Device
11	GND_UP	Ground from Upstream USB Host
12	D_D-	D- Data To/From Upstream USB Host
13	GND	System Ground
14	GND	System Ground
15	GND	System Ground

REMOTE Connector Pin-Out Table (15-Pin)  
Table 2



056P-03

PIN NO.	SIGNAL NAME	DESCRIPTION
1	VBUS_DN1	+5 Vdc Supply for Downstream USB Device
2	H_D1+	D+ Data To/From Downstream USB Device
3	VBUS_UP	+5 Vdc Input from Upstream USB Host
4	D_D+	D+ Data To/From Upstream USB Host
5	TX	RS-232 Data Output
6	RX	RS-232 Data Input
7	CTS	RS-232 Clear To Send (Input)
8	RTS	RS-232 Request To Send (Output)
9	OPEN	
10	OPEN	
11	OPEN	
12	OPEN	
13	OPEN	
14	GND_DN1	Ground for Downstream USB Device
15	H_D1-	D- Data To/From Downstream USB Device
16	GND_UP	Ground from Upstream USB Host
17	D_D-	D- Data To/From Upstream USB Host
18	GND	System Ground
19	GND	System Ground
20	GND	System Ground
21	OPEN	
22	OPEN	
23	OPEN	
24	OPEN	
25	OPEN	

REMOTE Connector Pin-Out Table (25-Pin)  
Table 3



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## APPENDIX B - TEST EQUIPMENT REQUIREMENTS

This Appendix contains a list of test equipment suitable for performing all testing procedures contained in this manual. Other equipment meeting specifications listed in this Appendix may be substituted in place of recommended models. Equipment listed in this Appendix may exceed minimum required specifications for some procedures contained in this manual.

TYPE	MODEL
Adapter, TNC (M) to N-Type (F)	N/A
Arbitrary Waveform Generator	Agilent 33220A or Equivalent
Attenuator, 3 dB, 100 W (N-Type)	N/A
Attenuator, 10 dB (BNC)	N/A
Attenuator, N-Connector 20 dB	N/A
Audio Analyzer	HP-8903A or Equivalent
Digital Multimeter	Agilent 34401A or Equivalent
Directional Coupler, 20 dB (N-Type)	N/A
Frequency Counter	Agilent 53131A or Equivalent
Function Generator	Agilent 33120A or Equivalent
Load, 50 $\Omega$	N/A
Load, 75 $\Omega$	N/A
Load, 100 $\Omega$	N/A
Load, 150 $\Omega$	N/A
Low-Pass Filter, 15 MHz (N-Type)	N/A
Low-Pass Filter, 45 MHz (N-Type)	N/A
Low-Pass Filter, 150 MHz (N-Type)	N/A
Low-Pass Filter, 250 MHz (N-Type)	N/A
Low-Pass Filter, 450 MHz (N-Type)	N/A
Measuring Receiver	HP-8902A or Equivalent
Measuring Receiver Sensor Module	HP-11722A or Equivalent
Modulation Analyzer	R&S FMAV or Equivalent
Power Meter	HP-E4418B or Equivalent
Power Sensor	HP-E4412A or Equivalent
Precision Short, TNC (M)	N/A
RF Amplifier (100 W)	N/A
Signal Generator	Aeroflex 2023B or Equivalent
Spectrum Analyzer	AN-920 or Equivalent
VSWR Bridge	Wiltron 62NF50 or Equivalent



**TEST EQUIPMENT FOR ALTERNATE VERIFICATION PROCEDURES ONLY**

<b>TYPE</b>	<b>MODEL</b>
Adapter, TNC (M) to BNC (F)	N/A
RF Detector/Amplifier	Aeroflex JPN 01-0817-00 or Equivalent
Oscilloscope	Tektronix 2445A or Equivalent
VOR Radial Standard	CPN 622-3701-001 (78-3 Zifor III)
PC with Intuilink Software	Refer to Agilent website

## APPENDIX C - METRIC/BRITISH IMPERIAL CONVERSION TABLE WITH NAUTICAL DISTANCE CONVERSIONS

TO CONVERT:	INTO:	MULTIPLY BY:	TO CONVERT:	INTO:	MULTIPLY BY:
cm	feet	0.03281	meters	feet	3.281
cm	inches	0.3937	meters	inches	39.37
feet	cm	30.48	m/sec	ft/sec	3.281
feet	meters	0.3048	m/sec	km/hr	3.6
ft/sec	km/hr	1.097	m/sec	miles/hr	2.237
ft/sec	knots	0.5921	miles	feet	5280
ft/sec	miles/hr	0.6818	miles	km	1.609
ft/sec <sup>2</sup>	cm/sec <sup>2</sup>	30.48	miles	meters	1609
ft/sec <sup>2</sup>	m/sec <sup>2</sup>	0.3048	miles	nmi	0.8684
grams	ounces	0.03527	miles/hr	ft/sec	1.467
inches	cm	2.54	miles/hr	km/hr	1.609
kg	pounds	2.205	miles/hr	knots	0.8684
kg/cm <sup>2</sup>	psi	0.0703	nmi	feet	6080.27
km	feet	3281	nmi	km	1.8532
km	miles	0.6214	nmi	meters	1853.2
km	nmi	0.5396	nmi	miles	1.1516
km/hr	ft/sec	0.9113	ounces	grams	28.34953
km/hr	knots	0.5396	pounds	kg	0.4536
km/hr	miles/hr	0.6214	psi	kg/cm <sup>2</sup>	0.0703
knots	ft/sec	1.689	100 ft	km	3.048
knots	km/hr	1.8532	100 ft	miles	1.894
knots	miles/hr	1.1516	100 ft	nmi	1.645



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## APPENDIX D - SPECIFICATIONS

**NOTE:** A 15 minute warm-up period is required for all specifications.

**NOTE:** Audio distortion characteristics are measured in a 20 Hz to 15 kHz post detection bandwidth.

**NOTE:** All DDM measurements are made on an RF output signal.

**NOTE:** Specifications are subject to change without notice.

### RF SIGNAL GENERATOR

#### Output Frequency:

Marker Beacon Channel:	72.00 to 78.00 MHz in 25 kHz steps
Marker Beacon Preset:	74.50, 75.00 or 75.50 MHz
Marker Beacon Variable:	72.00 to 78.00 MHz in 1 kHz steps
VOR Channel:	108.00 to 117.95 MHz in 50 kHz steps
VOR Preset:	108.00, 108.05 or 117.95 MHz
VOR Variable:	107.00 to 118.00 MHz in 1 kHz steps
LOC Channel:	108.10 to 111.95 MHz in 50 kHz steps
LOC Preset:	108.10, 108.15 or 110.15 MHz
LOC Variable:	107.00 to 113.00 MHz in 1 kHz steps
G/S Channel:	329.15 to 335.00 MHz in 50 kHz steps
G/S Preset:	334.25, 334.55 or 334.70 MHz
G/S Variable:	327.00 to 337.00 MHz in 1 kHz steps
Comm AM Channel:	10.00 to 400.00 MHz in 25 kHz steps 118.00 to 156.00 MHz in 8.33 kHz steps
Comm AM Preset:	118.00, 137.00 or 156.00 MHz 225.00, 312.00 or 400.00 MHz
Comm AM Variable:	10.00 to 400.00 MHz in 1 kHz steps
Comm FM Channel:	10.00 to 400.00 MHz in 12.5 or 25 kHz steps
Comm FM Preset:	156.00, 165.00, 167.50 or 174.00 MHz
Comm FM Variable:	10.00 to 400.00 MHz in 1 kHz steps
Comm SSB Variable:	10.00 to 30.00 MHz in 100 Hz steps
SELCAL Channel:	118.00 to 156.00 MHz in 25 kHz steps
SELCAL Preset:	118.00, 137.00 or 156.00 MHz
SELCAL Variable:	117.00 to 157.00 MHz in 1 kHz steps

**Frequency Accuracy:** Same as Time Base

**RF SIGNAL GENERATOR (cont)**
**Output Level:**

ANT Connector (10 to 75 MHz):

Single Carrier: -17 to -67 dBm in 0.5 dB steps

 Accuracy:  $\pm 3$  dB

ANT Connector (75 to 400 MHz):

Single Carrier: +13 to -67 dBm in 0.5 dB steps

 Accuracy:  $\pm 3$  dB

Dual Mode - LOC: 0 dBm Fixed

 Accuracy:  $\pm 2.5$  dB

Dual Mode - G/S: 0 to -76 dBm in 0.5 dB steps

 Accuracy:  $\pm 3$  dB (0 to -67 dBm)

Tri-Mode - Marker: +13 dBm Fixed

 Accuracy:  $\pm 2$  dB

Tri-Mode - LOC: -7 dBm Fixed

 Accuracy:  $\pm 2$  dB

Tri-Mode - G/S: -7 to -83 dBm in 0.5 dB steps

 Accuracy:  $\pm 3$  dB (-7 to -74 dBm)

RF I/O Connector (10 to 75 MHz):

Single Carrier: -40 to -130 dBm in 0.5 dB steps

Accuracy:

 -40 to -94.5 dBm:  $\pm 2$  dB

 -95 to -120 dBm:  $\pm 3$  dB

RF I/O Connector (75 to 400 MHz):

Single Carrier: -12 to -130 dBm in 0.5 dB steps

Accuracy:

 -12 to -39.5 dBm:  $\pm 2.5$  dB

 -40 to -94.5 dBm:  $\pm 2$  dB

 -95 to -120 dBm:  $\pm 3$  dB

Dual Mode - LOC: -22 dBm Fixed

 Accuracy:  $\pm 2$  dB

Dual Mode - G/S: -22 to -101 dBm in 0.5 dB steps

 Accuracy:  $\pm 2.5$  dB

**Spectral Purity:**

 Harmonics:  $< -20$  dBc

 Non-Harmonic Spurious:  $< -32$  dBc between 10 and 400 MHz

## OPERATIONAL MODES

### VOR Mode:

#### VOR Tone Frequency Accuracy:

30 Hz Reference:	±0.02%
30 Hz Variable:	±0.02%
1020 Hz:	±0.02%
9960 Hz:	±0.02%

#### AM Modulation:

##### CAL:

30 and 9960 Hz Tones: 30% AM, Each Tone

Accuracy: ±1% Modulation

1020 Hz Tone: 30% AM

1020 Hz Morse Code: 10% AM

Accuracy: ±2% Modulation

##### Variable:

Range: 0% to 55% AM (30, 1020 and 9960 Hz Tones)

Distortion: <2.0% in CAL Position

#### FM Modulation:

30 Hz Reference at ±480 Hz Peak Deviation on 9960 Hz Sub-Carrier

Accuracy: ±25 Hz Peak Deviation

#### Bearing:

To - From Selectable

Preset Bearing: 0°, 30°, 60°, 90°, 120°, 150°, 180°, 210°, 240°, 270°, 300° and 330°

Variable Bearing: 3600 digitally derived courses in 0.1° increments.

Accuracy: ±0.1°

### LOC Mode:

#### LOC Tone Frequency Accuracy:

90 Hz:	±0.02%
150 Hz:	±0.02%
1020 Hz:	±0.02%

**OPERATIONAL MODES (cont)**

**LOC Mode (cont):**

Modulation:

CAL:

90 and 150 Hz Tones:	20% AM, Each Tone
1020 Hz Audio Tone:	30% AM
1020 Hz Morse Code:	10% AM
Accuracy:	±2% Modulation

Variable:

Range:	0% to 28% AM (90 and 150 Hz Tones) 0% to 42% AM (1020 Hz Tone)
--------	---

Distortion:	<2.5% in CAL Position
-------------	-----------------------

LOC DDM:

Fixed:

Range:	±0, 0.093, 0.155 or 0.200 DDM and Tone Delete
Accuracy:	±0.0015 DDM (±1.5 µA) (±3% of setting) (≤+10 dBm Output Level)

Variable:

Range:	±0.4 DDM in 0.001 DDM steps
Accuracy:	±0.0025 DDM (±2.5 µA) (±3% of setting) (≤+10 dBm Output Level)

Variable Sweep: (Available only in Dual and Tri-Modes)

Range:	0 to ±30 µA
Sweep Rates:	5 to 40 sec
Step Size:	5 sec
Accuracy:	±0.5 sec/sweep

Phase Shift:

Range:	0° to 120° in 5° increments (150 Hz phase relative to 90 Hz)
Accuracy:	±0.5°

**OPERATIONAL MODES (cont)**

**G/S MODE:**

G/S Tone Frequency Accuracy:

90 Hz:	±0.02%
150 Hz:	±0.02%

Modulation:

CAL:

90 and 150 Hz Tones:	40% AM, Each Tone
Accuracy:	±2% Modulation

Variable:

Range:	0% to 50% AM (90 and 150 Hz Tones)
Distortion:	<2.5% in CAL Position

G/S DDM:

Fixed:

Range:	±0, 0.091, 0.175 or 0.400 DDM and Tone Delete
Accuracy:	±0.003 DDM (±2.5 μA) (±3% of setting) (≤+10 dBm Output Level)

Variable:

Range:	±0.8 DDM in 0.001 DDM steps
Accuracy:	±0.0048 DDM (±4.0 μA) (±3% of setting) (≤+10 dBm Output Level)

Phase Shift:

Range:	0° to 120° in 5° increments (150 Hz phase relative to 90 Hz)
Accuracy:	±0.5°

**OPERATIONAL MODES (cont)****MARKER MODE:**

## MARKER Tone Frequency Accuracy:

400 Hz:	±0.02%
1300 Hz:	±0.02%
3000 Hz:	±0.02%

## Modulation:

## CAL:

Setting:	95% AM
Accuracy:	±5% Modulation

## Variable (Single Carrier Only):

Range:	0% to 95% AM
--------	--------------

## Distortion:

Single Carrier:	<2.5% in CAL Position (-67 to +10 dBm)
Tri-Mode:	<5% in CAL Position

**COMM Mode (AM):**

## COM Tone Frequency Accuracy:

1020 Hz:	±0.02%
----------	--------

## Modulation:

## CAL:

1020 Hz Tone:	30% AM
Accuracy:	±2% Modulation

## Variable:

Range:	0% to 95% AM
--------	--------------

## Distortion:

<2.5% in CAL Position

**OPERATIONAL MODES (cont)****COMM Mode (FM):**

COM Tone Frequency Accuracy:

1000 Hz:  $\pm 0.02\%$ 

Modulation:

CAL:

1000 Hz Tone: 5 kHz Deviation

Accuracy:  $\pm 5\%$ 

Variable:

Deviation Range: 1 to 80 kHz

Accuracy:  $\pm(0.3 \text{ kHz} + 4\% \text{ of setting})$ Distortion:  $<5\%$  in CAL Position**COMM Mode (SSB):**

COM Tone Frequency Accuracy:

1000 Hz:  $\pm 6.25 \text{ Hz}$  referenced to carrier

Modulation:

Variable:

Range:

Upper Sideband: 25 to 3000 Hz in 25 Hz Steps

Lower Sideband: 25 to 3000 Hz in 25 Hz Steps

**OPERATIONAL MODES (cont)**

**SELCAL Mode:** (Provides amplitude modulation with SELCAL [SElective CALLing] tones)

SELCAL Tone Frequency Accuracy:  $\pm 0.02\%$

Transmit Modes:

Single: Single Transmission

Continuous: 7.5 sec interval (typical)

Modulation:

CAL:

Per SELCAL Tone: 40% AM

Accuracy:  $\pm 2\%$  Modulation

Variable:

Range: 0% to 55% AM

Distortion:  $< 2.5\%$  in CAL Position



## METER FUNCTIONS

### External Frequency Counter:

#### Frequency Range:

##### ANT and RF I/O Connectors:

Range:	10 to 400 MHz
Resolution:	100 Hz
Accuracy:	Same as Time Base, $\pm 1$ Count

##### AUX I/O Connector:

Range:	1 to 10 MHz
Resolution:	1 Hz
Accuracy:	Same as Time Base, $\pm 1$ Count

#### Sensitivity:

ANT Connector:	$\geq -35$ dBm
RF I/O Connector:	$\geq 0$ dBm
AUX I/O Connector:	$\geq 1$ Vp-p (From a 50 $\Omega$ source)

### Power Meter (RF I/O Connector):

Frequency Range:	10.0 to 400.0 MHz
Power Range:	0.1 to <1 W 1 to <100 W 100 to 1999 W (External Attenuator required for input power >30 W.)
Resolution:	
0.1 to <1 W:	0.01 W
1 to <100 W:	0.1 W
100 to 300 W:	1 W
Accuracy:	
<100 MHz:	$\pm 12\%$ of reading, $\pm 1$ Count, CW Only (without External Attenuator)
100 to 400 MHz:	$\pm 8\%$ of reading, $\pm 1$ Count, CW Only (without External Attenuator)
Duty Cycle:	
$\leq 10$ W:	Continuous
>10 to $\leq 20$ W:	3 min ON, 2 min OFF
>20 to $\leq 30$ W:	1 min ON, 2 min OFF

**METER FUNCTIONS (cont)**

**AM METER:**

Audio Range:	50 to 3000 Hz
Percent Modulation Range:	10% to 99%
Accuracy:	±10% of reading
Sensitivity:	
ANT Connector:	≥-20 dBm
RF I/O Connector:	≥+15 dBm

**FM Meter:**

Audio Range:	50 to 3000 Hz
Deviation Range:	1 to 15 kHz
Accuracy:	± (0.4 kHz + 8% of reading)
Minimum input Level:	
ANT Connector:	≥-35 dBm
RF I/O Connector:	≥0 dBm

**SWR Meter (SWR Connector):**

Frequency Range:	10.0 to 410.0 MHz
Accuracy:	
SWR <3:1:	±0.2, ±20% of reading
SWR >3:1:	±0.3, ±20% of reading

**121.5/243 Beacon Monitor:**

Swept Audio Tone Range:	100 to 3000 Hz
Accuracy:	±10% of reading)
Sensitivity:	
ANT Connector:	≥-30 dBm
RF I/O Connector:	≥+10 dBm

**406 Beacon Monitor:**

Sensitivity:	
ANT Connector:	≥-35 dBm
RF I/O Connector:	≥0 dBm

## MISCELLANEOUS

### Inputs/Outputs:

#### RF I/O Connector:

Type:	Input/Output
Impedance:	50 $\Omega$ Typical
Maximum Input Level:	30 W, 1 min ON, 2 min OFF
VSWR:	
10 to $\leq$ 300 MHz:	<1.3:1
>300 to 400 MHz:	<1.35:1

#### ANT Connector:

Type:	Input/Output
Impedance:	50 $\Omega$ typical
Maximum Input Level:	0.5 W

#### SWR Connector:

Type:	Output
Impedance:	50 $\Omega$ Typical
Maximum Reverse Power:	+25 dBm
VSWR:	
10 to $\leq$ 300 MHz:	<1.3:1
>300 to 400 MHz:	<1.35:1

#### AUX Connector:

Type:	Input/Output
Impedance:	800 $\Omega$ Typical
Maximum Input Level:	5 Vp-p Maximum, 3 Vdc Maximum

### Time Base (TCXO):

Temperature Stability:	$\pm$ 1 ppm
Aging:	$\pm$ 1 ppm per year
Accuracy:	$\pm$ 1 ppm when Auto Cal is performed

### Battery:

Type:	Li Ion
Duration:	>8 hrs continuous operation

**MISCELLANEOUS (cont)**

**Input Power (Test Set):**

Input Range:	11 to 32 Vdc
Power Consumption:	55 W Maximum 16 W Nominal at 18 Vdc with Charged Battery
Fuse Requirements:	5 A, 32 Vdc, Type F

**Input Power (External AC to DC Converter):**

Input Range:	100 to 250 VAC, 1.5 A Maximum, 47 to 63 Hz
Main Supply Voltage Fluctuations:	≤10% of the nominal voltage
Transient Overvoltages:	According to Installation Category II

**Environmental (Test Set):**

Use:	Pollution Degree 2
Altitude:	≤4800 meters
Operating Temperature:	-20° to 55°C (Battery Charging temperature range is 5° to 40°C, controlled by internal charger)
Storage Temperature:	-30° to 70°C (Li Ion Battery must be removed when <-20°C and >60°C)
Relative Humidity:	
5°C to <10°C:	80%
10°C to <31°C:	95%
31°C to <40°C:	75%
40°C to 50°C:	45%

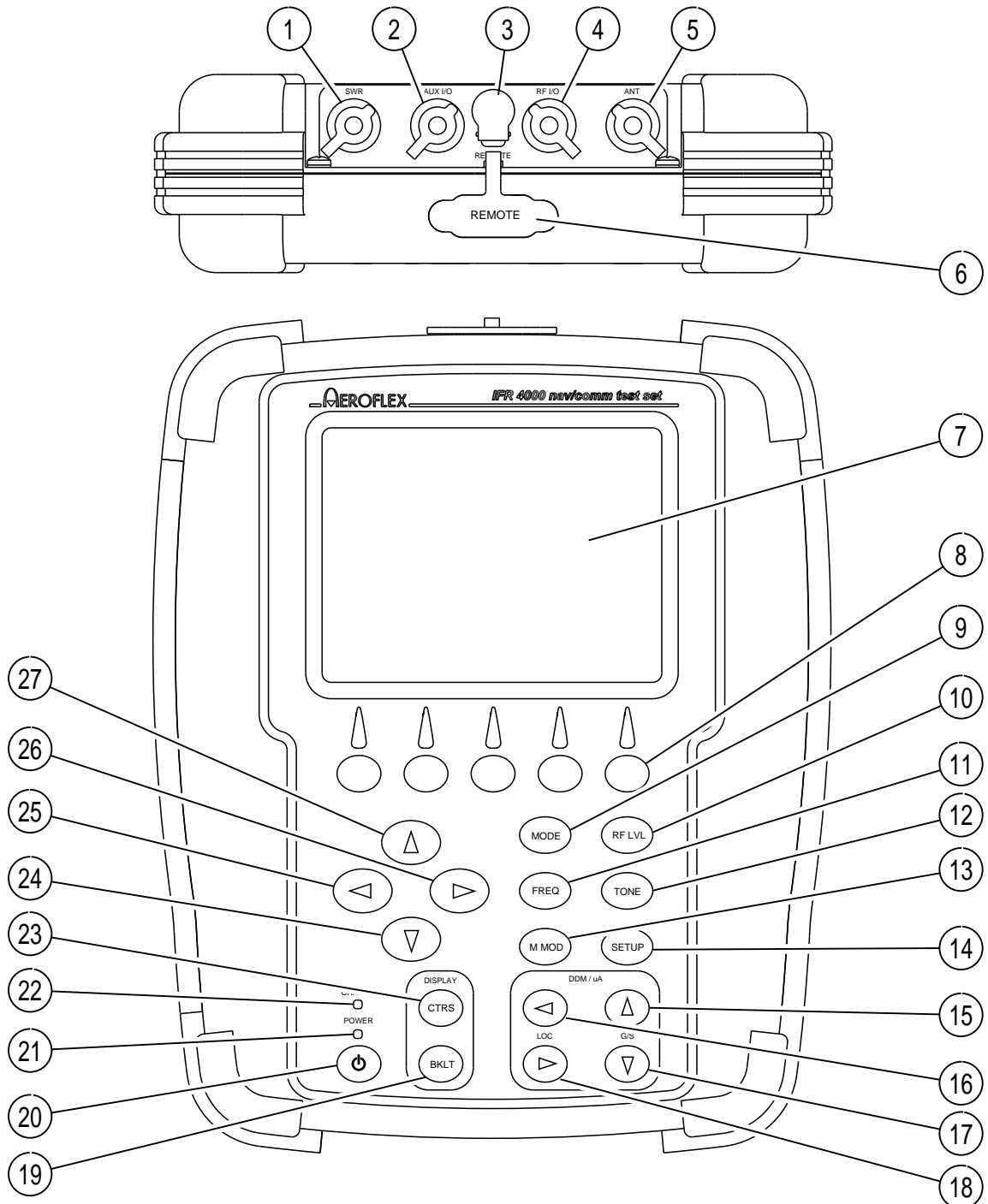
**Environmental (External AC to DC Converter):**

Use:	Indoors
Altitude:	≤3000 meters
Temperature:	5° to 40°C

**Physical Characteristics:**

Dimensions:	
Height:	11.2 in (28.5 cm)
Width:	9.1 in (23.1 cm)
Depth:	2.7 in (6.9 cm)
Weight (Test Set only):	<8 lbs. (3.6 kg)

## APPENDIX E - CONTROLS, CONNECTORS AND INDICATORS



056P-06

IFR 4000 Front Panel  
Figure 1

**NUMERICAL LOCATION LIST**

1.	SWR Connector
2.	AUX I/O Connector
3.	DC POWER Connector
4.	RF I/O Connector
5.	ANT Connector
6.	REMOTE Connector
7.	Display
8.	Multi-Function Soft Keys
9.	MODE Select Key
10.	RF LVL Field Select Key
11.	FREQ Field Select Key
12.	TONE Field Select Key
13.	M MOD Field Select Key
14.	SETUP Key
15.	G/S DDM UP Key
16.	LOC DDM LEFT Key
17.	G/S DDM DOWN Key
18.	LOC DDM RIGHT Key
19.	BACKLIGHT Key
20.	POWER Key
21.	POWER Indicator
22.	CHARGE Indicator
23.	CONTRAST Key
24.	DECREMENT/SELECT Data Key
25.	SELECT DATA UNIT MSB Key
26.	SELECT DATA UNIT LSB Key
27.	INCREMENT/SELECT Data Key

**ALPHABETICAL LOCATION LIST**

ANT Connector	5
AUX I/O Connector	2
BACKLIGHT Key	19
CHARGE Indicator	22
CONTRAST Key	23
DC POWER Connector	3
DECREMENT/SELECT Data Key	24
Display	7
FREQ Field Select Key	11
G/S DDM DOWN Key	17
G/S DDM UP Key	15
INCREMENT/SELECT Data Key	27
LOC DDM LEFT Key	16
LOC DDM RIGHT Key	18
M MOD Field Select Key	13
MODE Select Key	9
Multi-Function Soft Keys	8
POWER Indicator	21
POWER Key	20
RF I/O Connector	4
REMOTE Connector	6
RF LVL Field Select Key	10
SELECT DATA UNIT LSB Key	26
SELECT DATA UNIT MSB Key	25
SETUP Key	14
SWR Connector	1
TONE Field Select Key	11

ITEM	DESCRIPTION
1. SWR Connector	TNC Type Connector used for VSWR measurements on Antenna and Feeder Systems.
2. AUX I/O Connector	BNC Type Connector for output of baseband modulation and 10 MHz reference and for counter input.
3. DC POWER Connector	Circular Type Connector (2.5 mm center, 5.5 mm outer diameter, center positive) used for battery charging or operation of Test Set.
4. RF I/O Connector	TNC Type Connector used for direct connect to the UUT for power and frequency measurements for COMM testing, and for providing RF stimulus for VOR/ILS/GS/MB receivers.
5. ANT Connector	BNC Type Connector used for over-the-air stimulus for VOR/ILS/GS/MB receivers and for COMM testing.
6. REMOTE Connector	DB15 or DB25 Type Connector used for remote operation and software upgrades. Contains RS-232, USB Host and USB Peripheral connections.
7. Display (LCD)	38 characters by 16 lines for main screen display with Soft Key boxes at the bottom of the screen.
8. Multi-Function Soft Keys	Five Soft Keys are provided. The legends are displayed in boxes at the bottom of the Display.
9. MODE Select Key	This Key enters the MODE Field and selects the operational mode (i.e., VOR, Localizer, etc.).
10. RF LVL Field Select Key	<p>This Key moves the edit cursor to the RF LVL (RF Level) Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to slew the RF Level.</p> <p>The SELECT DATA UNITS MSB Key or the SELECT DATA UNITS LSB Key may be used to select the RF LVL units to be slewed (i.e., 0.1 dB, 1 dB, etc.).</p>
11. FREQ Field Select Key	<p>This Key moves the edit cursor to the FREQ (Frequency) Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to slew the data.</p> <p>The SELECT DATA UNITS MSB Key or the SELECT DATA UNITS LSB Key may be used to select the FREQ units to be slewed (i.e., 25 kHz, 100 kHz, etc.).</p>

ITEM	DESCRIPTION
12. TONE Field Select Key	<p>This Key moves the edit cursor to the MOD TONE Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to slew the data.</p>
13. M MOD Field Select Key	<p>This Key moves the edit cursor to the M MOD (Master Modulation) Field and turns the modulation OFF (0%) or ON (CAL).</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to slew the modulation depth.</p>
14. SETUP Key	<p>This Key displays the SETUP Menu.</p>
15. G/S DDM UP Key	<p>This Key slews the displayed Glideslope DDM Up.</p> <p>Increments are either FIXED or VAR (Variable) depending on the DDM DEV STEP Field setting.</p>
16. LOC DDM LEFT Key	<p>This Key slews the displayed Localizer DDM to the Left.</p> <p>Increments are either FIXED or VAR (Variable) depending on the DDM DEV STEP Field setting.</p>
17. G/S DDM DOWN Key	<p>This Key slews the displayed Glideslope DDM Down.</p> <p>Increments are either FIXED or VAR (Variable) depending on the DDM DEV STEP Field setting.</p>
18. LOC DDM RIGHT Key	<p>This Key slews the displayed Localizer DDM to the Right.</p> <p>Increments are either FIXED or VAR (Variable) depending on the DDM DEV STEP Field setting.</p>
19. BACKLIGHT Key	<p>This Key displays/exits the Backlight Adjust Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to adjust the Backlight Intensity.</p> <p>The IFR 4000 powers up with the Backlight set to the setting of the previous session.</p>
20. POWER Key	<p>This Key powers the IFR 4000 up and down.</p>
21. POWER Indicator	<p>This Indicator is illuminated when the IFR 4000 is powered.</p>



ITEM	DESCRIPTION
22. CHARGE Indicator	<p>This Indicator is illuminated when external DC power is applied for Bench Operation or Battery charging.</p> <p>This Indicator is yellow when the battery is charging, flashing yellow when the battery needs replacing and Green when the battery is fully charged.</p>
23. CONTRAST Key	<p>This Key displays/exits the Contrast Adjust Field.</p> <p>The INCREMENT/SELECT Data Key or the DECREMENT/SELECT Data Key may be used to adjust the Contrast.</p>
24. DECREMENT/SELECT Data Key	<p>This Key decrements data in slewable fields, such as FREQ. This Key also selects data in fields that have fixed functions, such as MOD TONE and MODE.</p>
25. SELECT DATA UNIT MSB Key	<p>This Key moves the slew cursor toward the MSB (Most Significant Bit) of the data field.</p> <p><b>Example:</b> When a variable frequency is selected, the slew cursor can be moved from the 1 kHz unit to the 10 kHz unit.</p>
26. SELECT DATA UNIT LSB Key	<p>This Key moves the slew cursor toward the LSB (Least Significant Bit) of the data field.</p> <p><b>Example:</b> When a variable frequency is selected, the slew cursor can be moved from the 10 kHz unit to the 1 kHz unit.</p>
27. INCREMENT/SELECT Data Key	<p>This Key increments data in slewable fields, such as FREQ. This Key also selects data in fields that have fixed functions, such as MOD TONE and MODE.</p>



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**APPENDIX F - ABBREVIATIONS**

<b>A</b>		<b>E</b>	
A	Amperes	EMC	Electromagnetic Compatibility
AC	Alternating Current	EXT	External
AF	Audio Frequency		
AM	Amplitude Modulation		
ANT	Antenna		
AP	Address Parity	FM	Frequency Modulation
Assy	Assembly	FPGA	Field Programmable Gate Array
ATTN	Attenuation	FREQ	Frequency
AUTO	Automatic	Ft	Foot/Feet
AUX	Auxiliary	F/W	Firmware
<b>B</b>		<b>F</b>	
BAT	Battery		
bps	Bits per Second		
BRG	Bearing		
<b>C</b>		<b>G</b>	
C	Celsius or Centigrade	GEN	Generator or Generate
CAL	Calibration	GND	Ground
ccw	Counterclockwise	G/S	Glideslope
CDI	Course Deviation Indication		
CHNL	Channel		
cm	Centimeter ( $10^{-2}$ Meters)		
COMM	Communication		
Cont	Continued		
CPLD	Complex Programmable Logic Device		
CPU	Central Processing Unit		
CTS	Clear To Send		
cw	Clockwise		
<b>D</b>		<b>H</b>	
DAC	Digital to Analog Converter	Hr	Hour
dB	Decibel	Hrs	Hours
dBc	Decibels below Carrier	H/W	Hardware
dBm	Decibels above one Milliwatt	Hz	Hertz
DC	Direct Current		
DDM	Difference in Depth of Modulation		
DDS	Direct Digital Synthesis		
deg	Degrees		
DEL	Delete		
DEV	Deviation		
DIAGS	Diagnostics		
DMA	Direct Access Memory		
DRAM	Dynamic Random Access Memory		
DWN	Down		
<b>I</b>		<b>K</b>	
		IF	Intermediate Frequency
		ILS	Instrument Landing System
		I/O	Input/Output
<b>J</b>		<b>L</b>	
		kg	Kilogram ( $10^3$ Grams)
		kHz	Kilohertz ( $10^3$ Hertz)
		km	Kilometer ( $10^3$ meters)
		kt	Knots (Velocity)
<b>K</b>		<b>L</b>	
		LCD	Liquid Crystal Display
		LED	Light Emitting Diode
		LOC	Localizer
		LPF	Low-Pass Filter
		LSB	Least Significant Bit
		LVL	Level

<b>M</b>		<b>S</b>	
m	Meters	Sec	Seconds
MAX	Maximum	SELCAL	Selective Calling
MB	Message, COMM-B	SP	Spacing
MHz	Megahertz ( $10^6$ Hertz)	SPM	Scans per Minute
MOD	Modulation	SPR	Synchronous Phase Reversal
mm	Millimeter ( $10^{-3}$ Meters)	SQTR	Squitter
M MOD	Master Modulation	Sqtr	Squitter
ms	Millisecond ( $10^{-3}$ Seconds)	SRAM	Static Random Access Memory
MSB	Most Significant Bit	SRQ	Service Request
mV	Milliwatt	SRS	Segment Request Subfield
mW	Millivolt	SSR	Secondary Surveillance Radar
		STD	Standard
		SWP	Sweep
		SWR	Standing Wave Ratio
		SYNC	Synchronous
<b>N</b>		<b>T</b>	
N/A	Not Applicable		
NAV	Navigation		
nmi	Nautical Miles		
ns	Nanosecond ( $10^{-9}$ Seconds)	TCXO	Temperature Compensated Crystal Oscillator
NVRAM	Non-Volatile Random Access Memory	TX	Transmit
		TTL	Transistor - Transistor Logic
<b>O</b>		<b>U</b>	
OUT	Output		
<b>P</b>		<b>V</b>	
para	Paragraph		
PARAM	Parameter	UHF	Ultra High Frequency
PCB	Printed Circuit Board	USB	Upper Sideband
PLL	Phase Lock Loop	USB	Universal Serial Bus
ppm	Parts per Million	UUT	Unit Under Test
PREV	Previous		
PROM	Programmable Read Only Memory		
psi	Pounds per Square Inch	V	Volt
PWR	Power	VAC	Volts, Alternating Current
		VAR	Variable
		Vdc	Volts, Direct Current
		VHF	Very High Frequency
		VOR	VHF Omni-Directional Range
		Vrms	Volts Root Mean Square
		VSWR	Voltage Standing Wave Ratio
<b>R</b>		<b>W</b>	
RAM	Random Access Memory		
RES	Resolution		
RF	Radio Frequency	W	Watt
RMS	Root Mean Square		
ROM	Read Only Memory		
RTS	Request To Send		
R/W	Read/Write	$\mu$ A	Microamps
RX	Receive	$\mu$ s	Microseconds
		$\mu$ W	Microwatts
		$\Omega$	Ohm

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As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice.

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Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven, customer-focused.