



NAV/COMM Test Set IFR 4000

Maintenance Manual

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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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Cable Statements:

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

For continued EMC compliance, all external cables must be double shielded.



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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

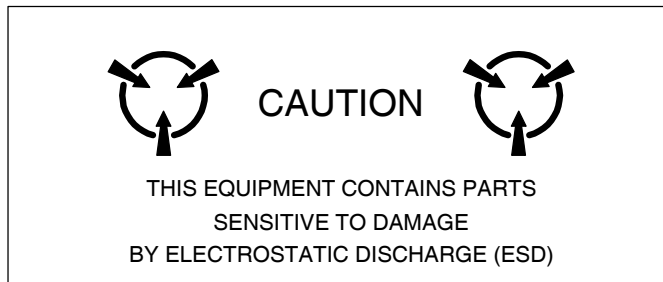
Use only fuses specifically recommended for the equipment at the specified current and voltage ratings.

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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SECTION 1 - SERVICING

1. Preventive Maintenance Procedures

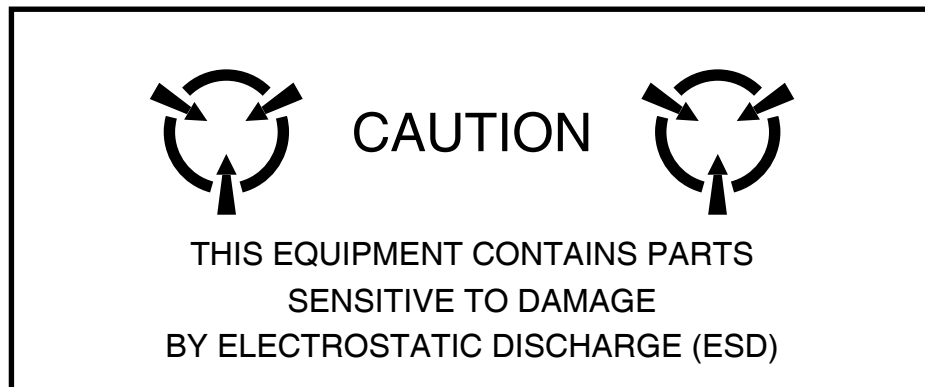
Contains routine maintenance instructions for cleaning and inspecting the Test Set.

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/cm²) 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">● Tightness of sub-assemblies and chassis mounted connectors.● Corrosion or damage to metal surfaces.
2.	Inspect Capacitors for: <ul style="list-style-type: none">● Loose mounting, deformities or obvious physical damage.● Leakage or corrosion around leads.
3.	Inspect Connectors for: <ul style="list-style-type: none">● Loose or broken parts, cracked insulation and bad contacts.
4.	Inspect Circuit Boards for: <ul style="list-style-type: none">● Corrosion or damage to connectors.● Damage to mounted components including crystals and ICs.● Freedom from foreign material.
5.	Inspect Resistors for: <ul style="list-style-type: none">● Cracked, broken, charred or blistered bodies.● Loose or corroded soldering connections.
6.	Inspect Semiconductors for: <ul style="list-style-type: none">● Cracked, broken, charred or discolored bodies.● Correct placement and condition of seals around leads.
7.	Inspect Wiring for: <ul style="list-style-type: none">● Broken or loose ends and connections.● Proper dress relative to other chassis parts. <p>NOTE: Verify wrapped wiring is tight.</p>

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 $+60^{\circ}\text{C}$ and the maximum charging temperature is 0°C to $+45^{\circ}\text{C}$.

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.

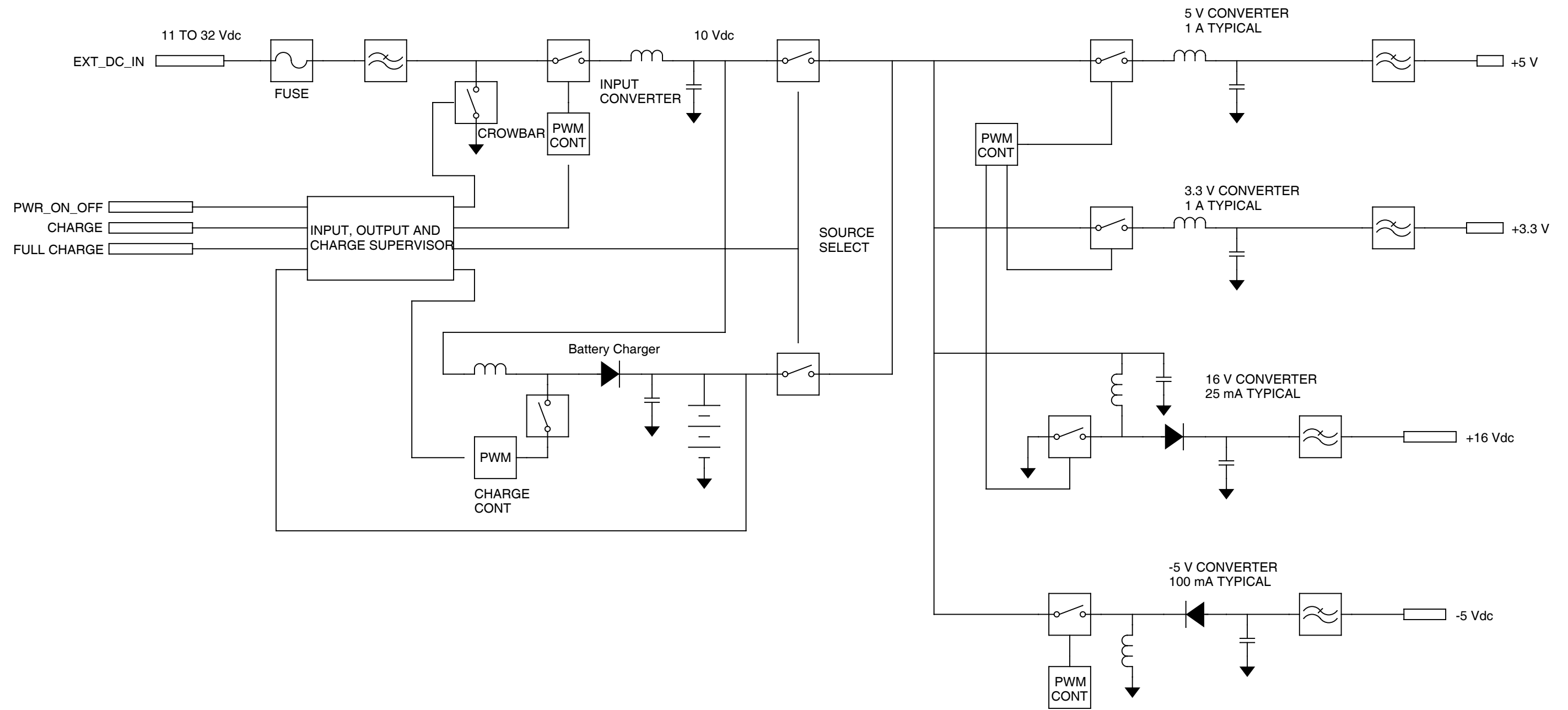
(3) Source Select Circuitry

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.

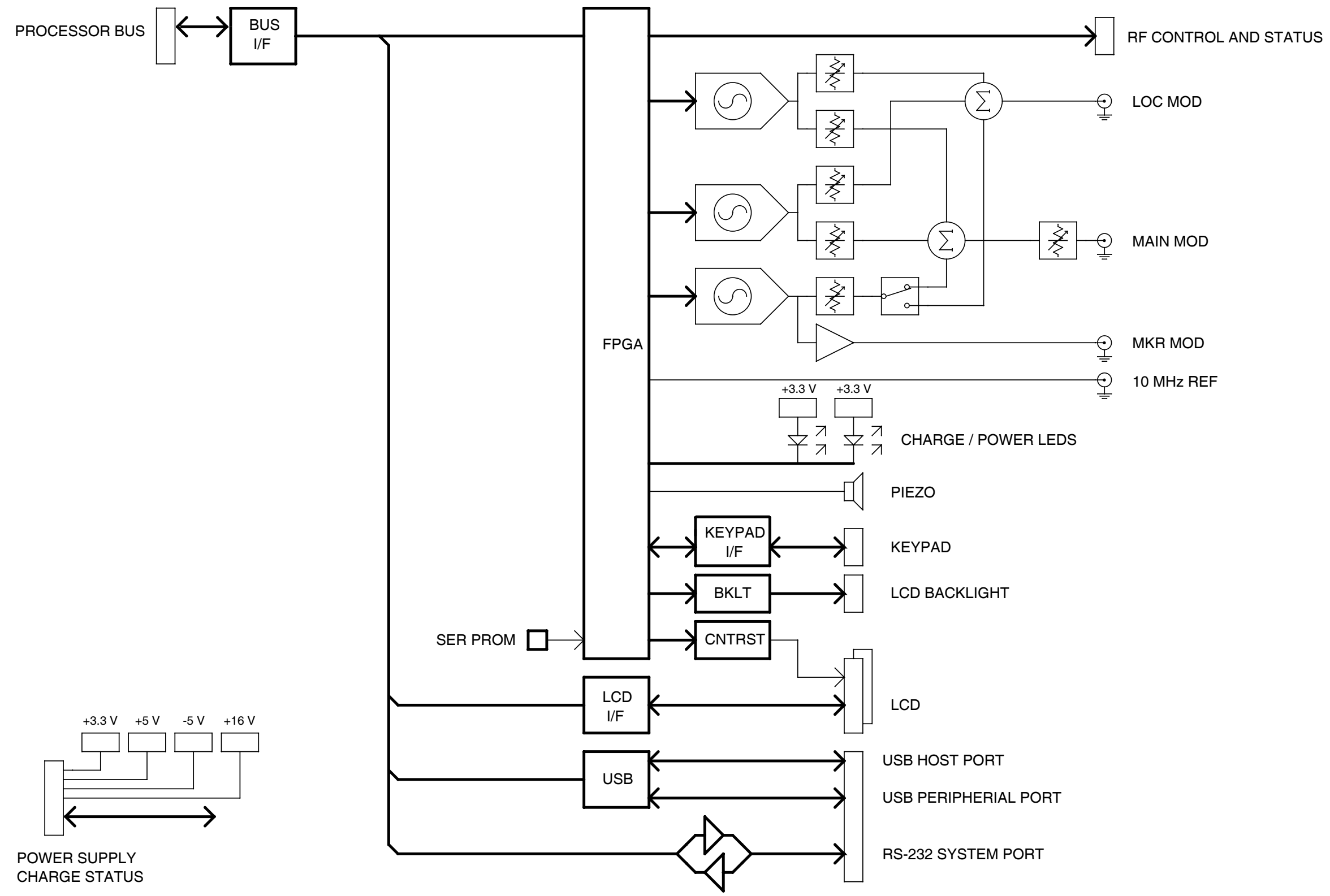
The second function of the switching circuitry is to prevent battery current from flowing into the input converter section when the Test Set is running on battery power. A low voltage cutoff is also incorporated into the ON/OFF circuitry.

(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, I²C bus and chip selects. The address, data, reset, clock and chip selects are buffered. Most of the DMA, timer, interrupt and I²C 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) I²C Bus

The I²C 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.

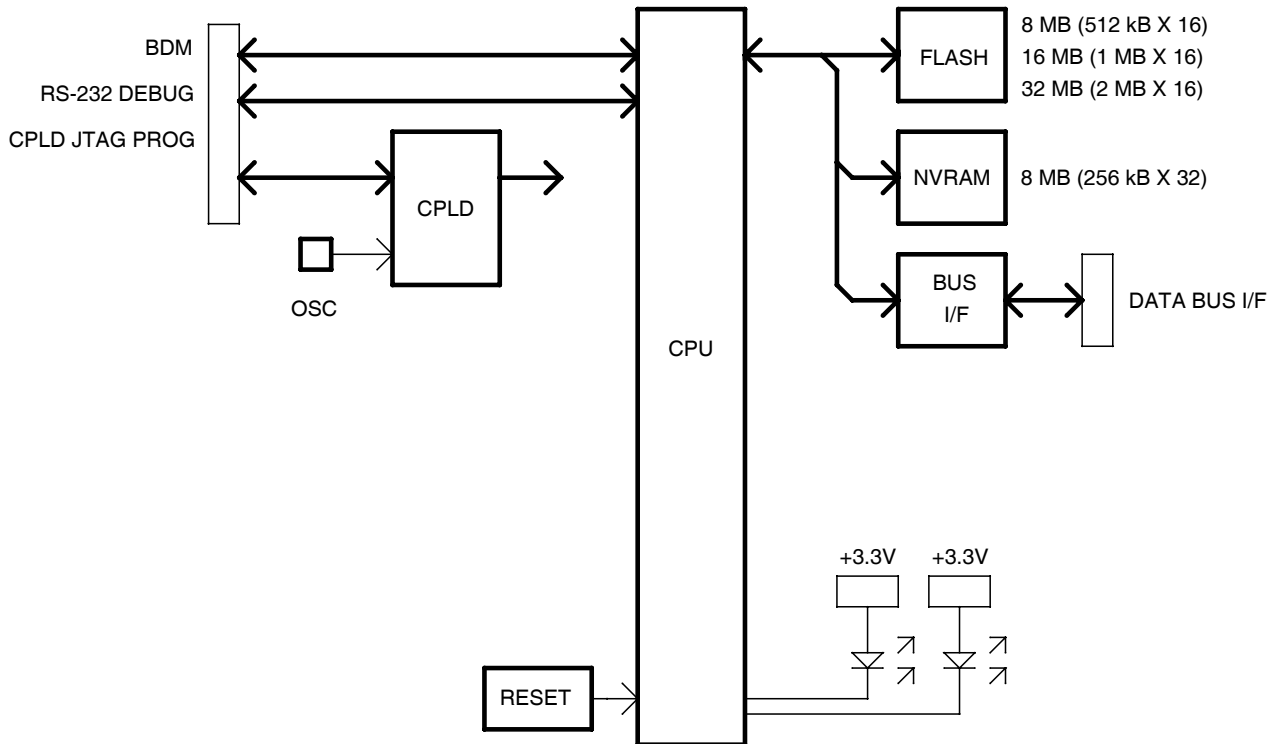
The USB controller is a 16-bit device with two address lines. The address inputs are used for selecting command or data for the HC or DC registers. The USB two interrupt outputs, one for the host and one for the device, are connected to the interrupt register in the FPGA.

(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, I²C 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

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 Ω cable, the UUT is connected to the SWR Connector and the reflected power is detected thorough 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 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 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.

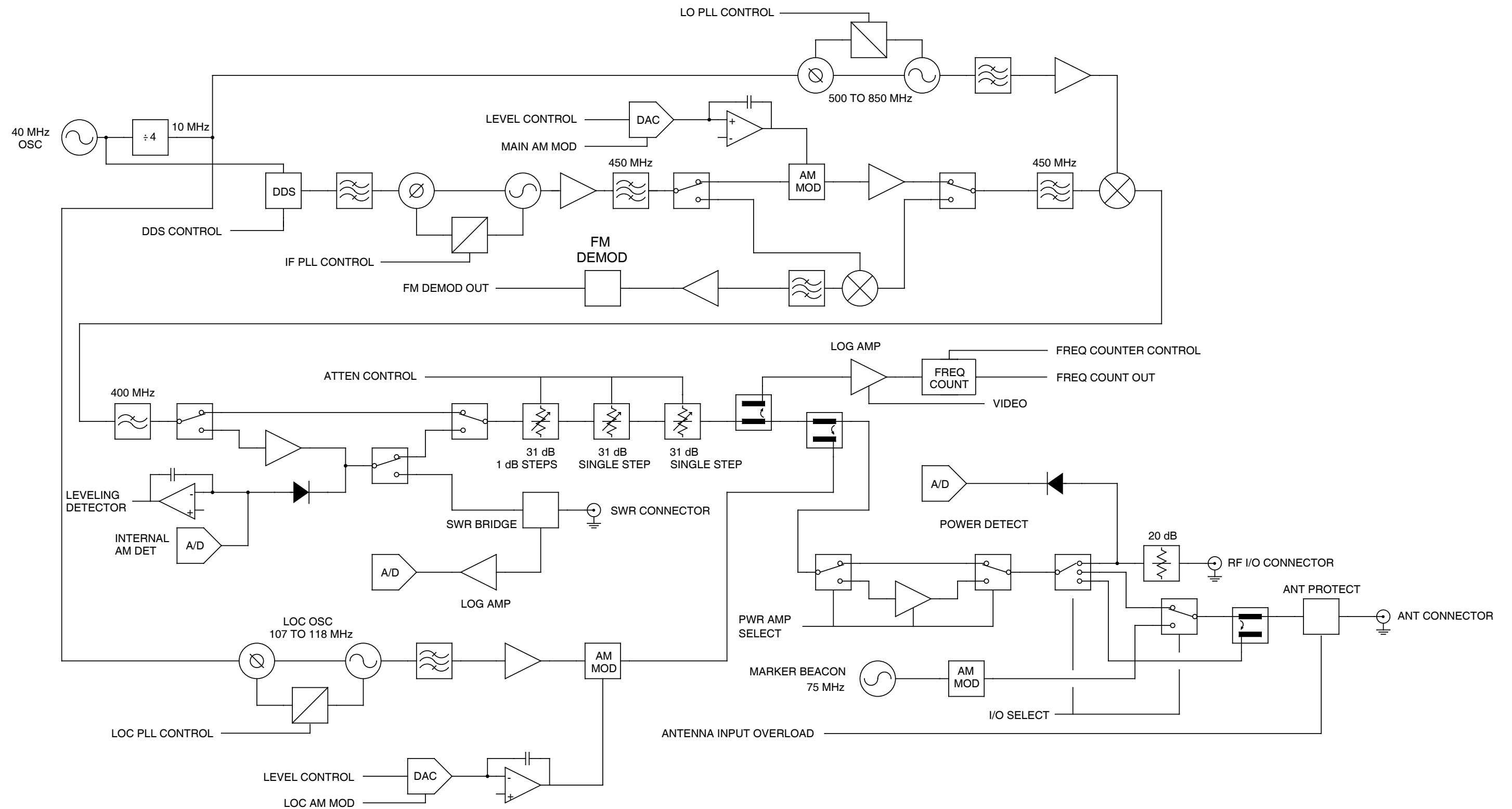
When the RF I/O Connector is selected, the signal is routed through a 20 dB high power attenuator. This attenuator allows the RF I/O Connector to accept signal levels up to 30 W directly into the Test Set. A temperature sensor mounted next to the attenuator is monitored by software. If the temperature 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 feed 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 chip. The Log amp provides a limited IF signal, used for FM demodulation, and a detected video output used for thresholding.



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RF Assy Block Diagram
Figure 4

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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.

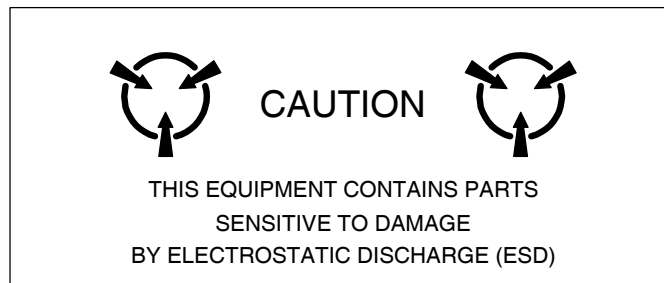
WARNING: WHEN WORKING WITH LIVE CIRCUITS OF HIGH POTENTIAL, KEEP ONE HAND IN POCKET OR BEHIND BACK TO AVOID SERIOUS SHOCK HAZARD.

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.



SYMPTOM INDEX

SYMPTOM	DESCRIPTION	PAGE
1	External DC Power Supply failure	4
2	POWER Indicator does not light	4
3	CHARGE Indicator does not light	4
4	Blows Fuses	4
5	Battery does not charge	4
6	Display is blank or abnormality exists in Display	4
7	Keys Inoperable	4
8	Self Test Failure	5
9	SWR Connector Failure	6
10	AUX I/O Connector Failure	6
11	DC POWER Connector Failure	6
12	RF I/O Connector Failure	6
13	ANTENNA Connector Failure	6
14	REMOTE Connector Failure	6
15	MODE Select Key Failure	6
16	POWER Key Failure	6
17	Multi-Function Soft Keys Failure	6
18	RF LVL Field Select Key Failure	6
19	FREQ Field Select Key Failure	6
20	TONE Field Select Key Failure	7
21	M MOD Field Select Key Failure	7
22	SETUP Key Failure	7
23	G/S DDM UP Key Failure	7
24	LOC DDM LEFT Key Failure	7
25	G/S DDM DOWN Key Failure	7
26	LOC DDM RIGHT Key Failure	7
27	BACKLIGHT Key Failure	7
28	CONTRAST Key Failure	7
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>MALFUNCTION</i>	<i>TEST OR INSPECTION</i>	<i>CORRECTIVE ACTION</i>
1 External DC Power Supply failure	<p>Step 1. Connect External DC Power Supply to a verifiable AC Power Source.</p> <p>Step 2. Connect DMM to External DC Power Supply output.</p> <p>Step 3. Verify +18 Vdc (± 1 Vdc)</p>	<p>◆ If incorrect, probable source of failure is the External DC Power Supply.</p>
2 POWER Indicator does not light		<p>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.</p>
3 CHARGE Indicator does not light		<p>Probable sources of failure are the Battery, Power Supply PCB Assy and the LCD Assy.</p>
4 Blows Fuse		<p>Probable source of failure is the Power Supply PCB Assy .</p>
5 Battery does not charge		<p>Probable source of failure is the Battery.</p>
6 Display is blank or abnormality exists in Display		<p>Probable sources of failure are the Power Supply PCB Assy, Multi-Function PCB Assy, LCD Assy and the interconnecting cables.</p>
7 Keys Inoperable		<p>Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.</p>

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. LCD fails

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

9. Battery fails

Probable source of failure is the Battery.

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.

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

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
20	TONE Field Select Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
21	M MOD Field Select Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
22	SETUP Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
23	G/S DDM UP Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
24	LOC DDM LEFT Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
25	G/S DDM DOWN Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
26	LOC DDM RIGHT Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
27	BACKLIGHT Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
28	CONTRAST Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
29	DECREMENT/SELECT Data Key Failure	Probable sources of failure are the Keypad PCB Assy, Multi-Function PCB Assy and the interconnecting cables.
30	Verification Failure	<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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RF Level Flatness (ANT Connector)	9
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RF Level Flatness (RF I/O Connector)	14
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VOR	22
Localizer	25
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COMM VHF AM	33
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<u>CALIBRATION PROCEDURE</u>	<u>PAGE</u>
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Modulation	63

(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.

(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

(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>NOTE: 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;">Instrument warming up Please wait xx secs</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>ANT</td> </tr> <tr> <td>GEN FREQ</td> <td>PRESET</td> </tr> </tbody> </table>	FIELD	SETTING	PORT	ANT	GEN FREQ	PRESET		
FIELD	SETTING								
PORT	ANT								
GEN FREQ	PRESET								
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>108.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-20.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	108.000 MHz	RF LVL	-20.0 dBm	MOD TONE	OFF
FIELD	SETTING								
FREQ	108.000 MHz								
RF LVL	-20.0 dBm								
MOD TONE	OFF								
7.	Verify 108.0 MHz (± 1 ppm) 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>108.100 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-20.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	108.100 MHz	RF LVL	-20.0 dBm	MOD TONE	OFF
FIELD	SETTING								
FREQ	108.100 MHz								
RF LVL	-20.0 dBm								
MOD TONE	OFF								
10.	Verify 108.1 MHz (± 1 ppm) 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>334.700 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-20.0 dBm</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	334.700 MHz	RF LVL	-20.0 dBm		
FIELD	SETTING								
FREQ	334.700 MHz								
RF LVL	-20.0 dBm								
13.	Verify 334.7 MHz (± 1 ppm) 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>75.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-20.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	75.000 MHz	RF LVL	-20.0 dBm	MOD TONE	OFF
FIELD	SETTING								
FREQ	75.000 MHz								
RF LVL	-20.0 dBm								
MOD TONE	OFF								

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

16. Verify 75.0 MHz (± 1 ppm) on the Modulation Analyzer.
17. Press the MODE Select Key until the COMM VHF AM Mode Screen is displayed.
18. Set the Test Set as follows:

FIELD	SETTING
FREQ	118.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF

19. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF AM Mode Screen to GENERATING Mode.
20. Verify 118.0 MHz (± 1 ppm) on the Modulation Analyzer.
21. Set the FREQ Field to **137.000 MHz**.
22. Verify 137.0 MHz (± 1 ppm) on the Modulation Analyzer.
23. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
24. Set the Test Set as follows:

FIELD	SETTING
FREQ	225.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF

25. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to GENERATING Mode.
26. Verify 225.0 MHz (± 1 ppm) on the Modulation Analyzer.
27. Set the FREQ Field to **312.000 MHz**.
28. Verify 312.0 MHz (± 1 ppm) on the Modulation Analyzer.
29. Set the FREQ Field to **400.000 MHz**.
30. Verify 400.0 MHz (± 1 ppm) on the Modulation Analyzer.
31. Press the SETUP Key to display the Setup Menu.
32. Set the Test Set as follows:

FIELD	SETTING
PORT	ANT
GEN FREQ	VAR

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

FIELD	SETTING
FREQ	118.001 MHz
RF LVL	-20.0 dBm

35. Verify 118.001 MHz (± 1 ppm) on the Modulation Analyzer.
36. Set the FREQ Field to **118.002 MHz**.
37. Verify 118.002 MHz (± 1 ppm) on the Modulation Analyzer.

STEP

PROCEDURE

38. Set the FREQ Field to **118.003 MHz**.
39. Verify 118.003 MHz (± 1 ppm) on the Modulation Analyzer.
40. Set the FREQ Field to **118.004 MHz**.
41. Verify 118.004 MHz (± 1 ppm) on the Modulation Analyzer.
42. 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 PORT Field to ANT .										
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>108.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-30.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	108.000 MHz	RF LVL	-30.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	108.000 MHz										
RF LVL	-30.0 dBm										
MOD TONE	OFF										
M MOD	0%										
7.	Verify -30 dBm (± 3 dB) on the Power Meter.										
8.	Set the FREQ Field to 108.100 MHz .										
9.	Verify -30 dBm (± 3 dB) on the Power Meter.										
10.	Press the MODE Select Key until the GLIDESLOPE Mode Screen is displayed.										
11.	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>334.700 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-30.0 dBm</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	334.700 MHz	RF LVL	-30.0 dBm	M MOD	0%		
FIELD	SETTING										
FREQ	334.700 MHz										
RF LVL	-30.0 dBm										
M MOD	0%										
12.	Verify -30 dBm (± 3 dB) on the Power Meter.										
13.	Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.										
14.	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>75.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>-30.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	75.000 MHz	RF LVL	-30.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	75.000 MHz										
RF LVL	-30.0 dBm										
MOD TONE	OFF										
M MOD	0%										
15.	Verify -30 dBm (± 3 dB) on the Power Meter.										

STEP PROCEDURE

16. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
17. Set the Test Set as follows:

FIELD	SETTING
FREQ	400.000 MHz
RF LVL	-30.0 dBm
MOD TONE	OFF
M MOD	0%

18. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to GENERATING Mode.
19. Verify -30 dBm (± 3 dB) on the Power Meter.
20. Press the MODE Select Key until the COMM VHF AM Mode Screen is displayed.
21. Set the Test Set as follows:

FIELD	SETTING
FREQ	137.000 MHz
RF LVL	-30.0 dBm
MOD TONE	OFF
M MOD	0%

22. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF AM Mode Screen to GENERATING Mode.
23. Verify -30 dBm (± 3 dB) on the Power Meter.
24. Set the FREQ Field to **118.000 MHz**.
25. Set the RF LVL Field to the following settings and verify levels on the Power Meter:

RF LVL	LEVEL
-57 dBm	-57 dBm (± 3 dB)
-47 dBm	-47 dBm (± 3 dB)
-37 dBm	-37 dBm (± 3 dB)
-27 dBm	-27 dBm (± 3 dB)
-17 dBm	-17 dBm (± 3 dB)
-7 dBm	-7 dBm (± 3 dB)
+3 dBm	+3 dBm (± 3 dB)
+13 dBm	+13 dBm (± 3 dB)

26. Set the RF LVL Field to **-67 dBm**.
27. Disconnect the Power Sensor from the ANT Connector and connect the Measuring Receiver to the ANT Connector.
28. Load Calibration Factors for 118.000 MHz on the Measuring Receiver.
29. Verify -67 dBm (± 3 dB) on the Measuring Receiver.
30. Disconnect the Measuring Receiver from the ANT Connector.

(4) RF Level Flatness (ANT Connector)

TEST EQUIPMENT: Power Meter
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 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 PORT Field to ANT .										
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>108.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>+10.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	108.000 MHz	RF LVL	+10.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	108.000 MHz										
RF LVL	+10.0 dBm										
MOD TONE	OFF										
M MOD	0%										
7.	Set the Power Meter to 108.000 MHz.										
8.	Record +10 dBm level on the Power Meter.										
9.	Set the RF LVL Field to -10 dBm .										
10.	Record -10 dBm level on the Power Meter.										
11.	Set the FREQ Field to 110.150 MHz .										
12.	Set the Power Meter to 110.150 MHz.										
13.	Set the RF LVL Field to +10 dBm .										
14.	Record +10 dBm level on the Power Meter.										
15.	Set the RF LVL Field to -10 dBm .										
16.	Record -10 dBm level on the Power Meter.										
17.	Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.										
18.	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>75.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>+10.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	75.000 MHz	RF LVL	+10.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	75.000 MHz										
RF LVL	+10.0 dBm										
MOD TONE	OFF										
M MOD	0%										
19.	Set the Power Meter to 75.000 MHz.										
20.	Record +10 dBm level on the Power Meter.										

STEP PROCEDURE

21. Set the RF LVL Field to **-10 dBm**.
22. Record -10 dBm level on the Power Meter.
23. Press the MODE Select Key until the COMM VHF AM Mode Screen is displayed.
24. Set the Test Set as follows:

FIELD	SETTING
FREQ	118.000 MHz
RF LVL	+10.0 dBm
MOD TONE	OFF
M MOD	0%

25. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF AM Mode Screen to GENERATING Mode.
26. Set the Power Meter to 118.000 MHz.
27. Record +10 dBm level on the Power Meter.
28. Set the RF LVL Field to **-10 dBm**.
29. Record -10 dBm level on the Power Meter.
30. Set the FREQ Field to **137.000 MHz**.
31. Set the Power Meter to 137.000 MHz.
32. Set the RF LVL Field to **+10 dBm**.
33. Record +10 dBm level on the Power Meter.
34. Set the RF LVL Field to **-10 dBm**.
35. Record -10 dBm level on the Power Meter.
36. Set the FREQ Field to **156.000 MHz**.
37. Set the Power Meter to 156.000 MHz.
38. Set the RF LVL Field to **+10 dBm**.
39. Record +10 dBm level on the Power Meter.
40. Set the RF LVL Field to **-10 dBm**.
41. Record -10 dBm level on the Power Meter.
42. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
43. Set the Test Set as follows:

FIELD	SETTING
FREQ	225.000 MHz
RF LVL	+10.0 dBm
MOD TONE	OFF
M MOD	0%

44. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to GENERATING Mode.
45. Set the Power Meter to 225.000 MHz.
46. Record +10 dBm level on the Power Meter.

STEP

PROCEDURE

-
47. Set the RF LVL Field to **-10 dBm**.
 48. Record -10 dBm level on the Power Meter.
 49. Set the FREQ Field to **312.000 MHz**.
 50. Set the Power Meter to 312.000 MHz.
 51. Set the RF LVL Field to **+10 dBm**.
 52. Record +10 dBm level on the Power Meter.
 53. Set the RF LVL Field to **-10 dBm**.
 54. Record -10 dBm level on the Power Meter.
 55. Set the FREQ Field to **334.700 MHz**.
 56. Set the Power Meter to 334.700 MHz.
 57. Set the RF LVL Field to **+10 dBm**.
 58. Record +10 dBm level on the Power Meter.
 59. Set the RF LVL Field to **-10 dBm**.
 60. Record -10 dBm level on the Power Meter.
 61. Set the FREQ Field to **400.000 MHz**.
 62. Set the Power Meter to 400.000 MHz.
 63. Set the RF LVL Field to **+10 dBm**.
 64. Record +10 dBm level on the Power Meter.
 65. Set the RF LVL Field to **-10 dBm**.
 66. Record -10 dBm level on the Power Meter.
 67. Verify flatness (difference between levels recorded in Steps 8, 14, 20, 27, 33, 39, 46, 52, 58 and 64) is ≤ 1 dB.
 68. Verify flatness (difference between levels recorded in Steps 10, 16, 22, 29, 35, 41, 48, 54, 60 and 66) is ≤ 1 dB.
 69. Disconnect the Power Sensor from the ANT Connector.

(5) 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 PORT Field to **RF I/O**.
5. Press the MODE Select Key until the VOR Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	108.000 MHz
RF LVL	-40.0 dBm
MOD TONE	OFF
M MOD	0%

7. Verify -40 dBm (± 2 dB) on the Power Meter.
8. Set the FREQ Field to **108.100 MHz**.
9. Verify -40 dBm (± 2 dB) on the Power Meter.
10. Press the MODE Select Key until the GLIDESLOPE Mode Screen is displayed.
11. Set the Test Set as follows:

FIELD	SETTING
FREQ	334.700 MHz
RF LVL	-40.0 dBm
M MOD	0%

12. Verify -40 dBm (± 2 dB) on the Power Meter.
13. Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.
14. Set the Test Set as follows:

FIELD	SETTING
FREQ	75.000 MHz
RF LVL	-40.0 dBm
MOD TONE	OFF
M MOD	0%

15. Verify -40 dBm (± 2 dB) on the Power Meter.
16. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.

STEP

PROCEDURE

17. Set the Test Set as follows:

FIELD	SETTING
FREQ	400.000 MHz
RF LVL	-40.0 dBm
MOD TONE	OFF
M MOD	0%

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

19. Verify -40 dBm (± 2 dB) on the Power Meter.

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

21. Set the Test Set as follows:

FIELD	SETTING
FREQ	137.000 MHz
RF LVL	-40.0 dBm
MOD TONE	OFF
M MOD	0%

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

23. Verify -40 dBm (± 2 dB) on the Power Meter.

24. Set the FREQ Field to **118.000 MHz**.

25. Verify -40 dBm (± 2 dB) on the Power Meter.

26. Disconnect the Power Sensor from the RF I/O Connector and connect the Measuring Receiver to the RF I/O Connector.

27. Load Calibration Factors for 118.000 MHz on Measuring Receiver.

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

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

29. Disconnect the Measuring Receiver from the ANT Connector.

(6) RF Level Flatness (RF I/O Connector)

TEST EQUIPMENT: Power Meter
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 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 PORT Field to **RF I/O**.
5. Press the MODE Select Key until the VOR Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	108.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF
M MOD	0%

7. Set the Power Meter to 108.000 MHz.
8. Record -20 dBm level on the Power Meter.
9. Set the RF LVL Field to **-40 dBm**.
10. Record -40 dBm level on the Power Meter.
11. Set the FREQ Field to **110.150 MHz**.
12. Set the Power Meter to 110.150 MHz.
13. Set the RF LVL Field to **-20 dBm**.
14. Record -20 dBm level on the Power Meter.
15. Set the RF LVL Field to **-40 dBm**.
16. Record -40 dBm level on the Power Meter.
17. Press the MODE Select Key until the MARKER BEACON Mode Screen is displayed.

18. Set the Test Set as follows:

FIELD	SETTING
FREQ	75.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF
M MOD	0%

19. Set the Power Meter to 75.000 MHz.
20. Record -20 dBm level on the Power Meter.

STEP PROCEDURE

21. Set the RF LVL Field to **-40 dBm**.
22. Record -40 dBm level on the Power Meter.
23. Press the MODE Select Key until the COMM VHF AM Mode Screen is displayed.
24. Set the Test Set as follows:

FIELD	SETTING
FREQ	118.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF
M MOD	0%

25. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF AM Mode Screen to GENERATING Mode.
26. Set the Power Meter to 118.000 MHz.
27. Record -20 dBm level on the Power Meter.
28. Set the RF LVL Field to **-40 dBm**.
29. Record -40 dBm level on the Power Meter.
30. Set the FREQ Field to **137.000 MHz**.
31. Set the Power Meter to 137.000 MHz.
32. Set the RF LVL Field to **-20 dBm**.
33. Record -20 dBm level on the Power Meter.
34. Set the RF LVL Field to **-40 dBm**.
35. Record -40 dBm level on the Power Meter.
36. Set the FREQ Field to **156.000 MHz**.
37. Set the Power Meter to 156.000 MHz.
38. Set the RF LVL Field to **-20 dBm**.
39. Record -20 dBm level on the Power Meter.
40. Set the RF LVL Field to **-40 dBm**.
41. Record -40 dBm level on the Power Meter.
42. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
43. Set the Test Set as follows:

FIELD	SETTING
FREQ	225.000 MHz
RF LVL	-20.0 dBm
MOD TONE	OFF
M MOD	0%

44. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to GENERATING Mode.
45. Set the Power Meter to 225.000 MHz.
46. Record -20 dBm level on the Power Meter.

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

47. Set the RF LVL Field to **-40 dBm**.
48. Record -40 dBm level on the Power Meter.
49. Set the FREQ Field to **312.000 MHz**.
50. Set the Power Meter to 312.000 MHz.
51. Set the RF LVL Field to **-20 dBm**.
52. Record -20 dBm level on the Power Meter.
53. Set the RF LVL Field to **-40 dBm**.
54. Record -40 dBm level on the Power Meter.
55. Set the FREQ Field to **334.700 MHz**.
56. Set the Power Meter to 334.700 MHz.
57. Set the RF LVL Field to **-20 dBm**.
58. Record -20 dBm level on the Power Meter.
59. Set the RF LVL Field to **-40 dBm**.
60. Record -40 dBm level on the Power Meter.
61. Set the FREQ Field to **400.000 MHz**.
62. Set the Power Meter to 400.000 MHz.
63. Set the RF LVL Field to **-20 dBm**.
64. Record -20 dBm level on the Power Meter.
65. Set the RF LVL Field to **-40 dBm**.
66. Record -40 dBm level on the Power Meter.
67. Verify flatness (difference between levels recorded in Steps 8, 14, 20, 27, 33, 39, 46, 52, 58 and 64) is ≤ 1 dB.
68. Verify flatness (difference between levels recorded in Steps 10, 16, 22, 29, 35, 41, 48, 54, 60 and 66) is ≤ 1 dB.
69. Disconnect the Power Sensor from the RF I/O Connector.

(7) 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:										
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td>108.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>0.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	108.000 MHz	RF LVL	0.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	108.000 MHz										
RF LVL	0.0 dBm										
MOD TONE	OFF										
M MOD	0%										
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:										
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FREQ	334.700 MHz										
RF LVL	0.0 dBm										
M MOD	0%										
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:										
	<table border="1"> <thead> <tr> <th>FIELD</th> <th>SETTING</th> </tr> </thead> <tbody> <tr> <td>FREQ</td> <td>75.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>0.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>OFF</td> </tr> <tr> <td>M MOD</td> <td>0%</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	75.000 MHz	RF LVL	0.0 dBm	MOD TONE	OFF	M MOD	0%
FIELD	SETTING										
FREQ	75.000 MHz										
RF LVL	0.0 dBm										
MOD TONE	OFF										
M MOD	0%										
12.	Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.										
13.	Press the MODE Select Key until the COMM VHF AM Mode Screen is displayed.										
14.	Set the Test Set as follows:										
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FIELD	SETTING										
FREQ	137.000 MHz										
RF LVL	0.0 dBm										
MOD TONE	OFF										
M MOD	0%										

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

15. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF AM Mode Screen to GENERATING Mode.
16. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
17. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
18. Set the Test Set as follows:

<u>FIELD</u>	<u>SETTING</u>
FREQ	400.000 MHz
RF LVL	0.0 dBm
MOD TONE	OFF
M MOD	0%

19. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to GENERATING Mode.
20. Verify the harmonic is <-20 dBc and the spurious is <-35 dBc.
21. Disconnect the Spectrum Analyzer from the ANT Connector.

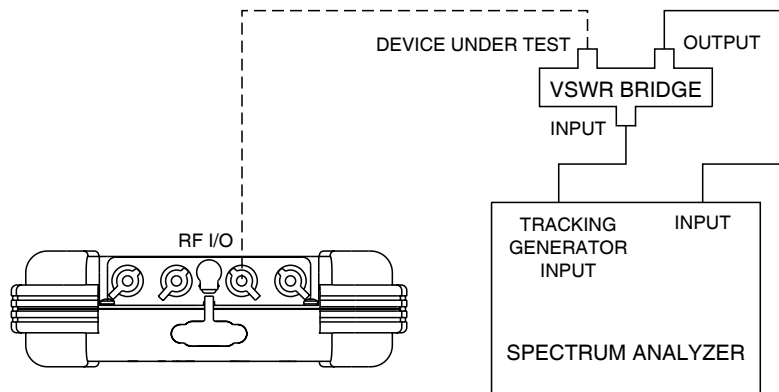
(8) VSWR (RF I/O and SWR Connectors)

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:



056M-20

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.

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

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

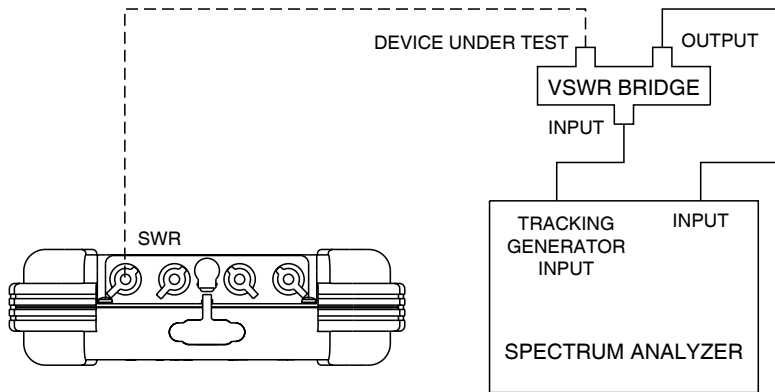
Where Γ = Reflection Coefficient

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.



056M-21

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 Γ = Reflection Coefficient

RL = Return Loss

13. Disconnect VSWR Bridge from SWR Connector.

(9) 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 ANT .										
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>75.000 MHz</td> </tr> <tr> <td>RF LVL</td> <td>10.0 dBm</td> </tr> <tr> <td>MOD TONE</td> <td>400 Hz</td> </tr> <tr> <td>M MOD</td> <td>CAL</td> </tr> </tbody> </table>	FIELD	SETTING	FREQ	75.000 MHz	RF LVL	10.0 dBm	MOD TONE	400 Hz	M MOD	CAL
FIELD	SETTING										
FREQ	75.000 MHz										
RF LVL	10.0 dBm										
MOD TONE	400 Hz										
M MOD	CAL										
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 1300 .										
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 3000 .										
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.										

(10) 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	108.000 MHz
RF LVL	10.0 dBm
MOD TONE	1020 Hz
M MOD	CAL
30 Hz MOD	0%
9960 Hz MOD	0%

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	OFF
30 Hz MOD	30%

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

FIELD	SETTING
30 Hz MOD	0%
9960 Hz MOD	30%

11. Verify 9960 Hz ($\pm 0.02\%$) with $< 2.0\%$ distortion and an AM Depth of 30% AM ($\pm 2\%$ AM) on the Modulation Analyzer.
12. Set the 30 Hz MOD Field to **30%**.
13. Verify AM Depth of 60% AM ($\pm 4\%$ AM) on the Modulation Analyzer.

FM DEVIATION ACCURACY

14. Set the Modulation Analyzer to FM Measurement.
15. Verify 480 Hz (± 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
20. Set the Test Set as follows:

FIELD	SETTING
30 Hz MOD	30%
9960 Hz MOD	30%
TO/FROM	TO

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

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°)

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

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

STEP

PROCEDURE

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

BRG	READING
1	1° ($\pm 0.1^\circ$)
2	2° ($\pm 0.1^\circ$)
10.1	10.1° ($\pm 0.1^\circ$)
10.2	10.2° ($\pm 0.1^\circ$)

28. Disconnect the Modulation Analyzer from the ANT Connector.

(11) 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	108.100 MHz
RF LVL	10.0 dBm
MOD TONE	1020 Hz
M MOD	CAL
DEV STEP	FIXED
LOC DDM	0.000 CENTER
TONE DEL	90 & 150

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	OFF
TONE DEL	150

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	OFF
90/150 Hz	OFF

STEP

PROCEDURE

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

LOC DDM	READING
0.000 CENTER	0.000 (± 0.0015 DDM)
0.093 LEFT	0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.093 RIGHT	0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.155 LEFT	0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.155 RIGHT	0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.200 LEFT	0.200 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.200 RIGHT	0.200 (± 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
0.094	0.094 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.095	0.095 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.096	0.096 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.097	0.097 (± 0.0025 DDM + $\pm 3\%$ of setting)

17. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	FIXED
LOC DDM	0.000 CENTER
PHASE ACCURACY	

18. 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° ($\pm 0.5^\circ$)

STEP

PROCEDURE

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

(12) 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 LOCALIZER Mode Screen is displayed.
6. Set the Test Set as follows:

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

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

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

 STEP PROCEDURE

12. Set the DEV STEP Field to **VAR**.
13. Set the G/S DDM Field to the following settings and verify readings on the Modulation Analyzer:

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

14. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	FIXED
G/S DDM	0.000 CENTER

PHASE ACCURACY

15. 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° ($\pm 0.5^\circ$)

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

(13) ILS

TEST EQUIPMENT: Modulation Analyzer
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	108.100 MHz
RF LVL	-30.0 dBm
MOD TONE	400 Hz (Marker ON)
M MOD	CAL

7. Verify 75 MHz (± 1 ppm) 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	1020 Hz
TONE DEL	90 & 150

13. Verify 108.100 MHz (± 1 ppm) and tone frequency of 1020 Hz ($\pm 0.02\%$) at -10 dBm (± 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	OFF
TONE DEL	150

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	FIXED
TONE DEL	OFF
90/150 Hz	OFF

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

LOC DDM	READING
0.000 CENTER	0.000 (± 0.0015 DDM)
0.093 LEFT	0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.093 RIGHT	0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.155 LEFT	0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.155 RIGHT	0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.200 LEFT	0.200 (± 0.0015 DDM + $\pm 3\%$ of setting)
0.200 RIGHT	0.200 (± 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
0.094	0.094 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.095	0.095 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.096	0.096 (± 0.0025 DDM + $\pm 3\%$ of setting)
0.097	0.097 (± 0.0025 DDM + $\pm 3\%$ of setting)

23. Set the Test Set as follows:

FIELD	SETTING
DEV STEP	FIXED
LOC DDM	0.000 CENTER

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° (±0.5°)
5	-5° (±0.5°)
10	-10° (±0.5°)
20	-20° (±0.5°)
40	-40° (±0.5°)
80	40° (±0.5°)
120	0° (±0.5°)

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. Load Calibration Factors for 334.700 MHz on the Measuring Receiver.
28. Set the RF LVL Field to **-30 dBm**.
29. Verify -30 dBm (±3 dB) on the Measuring Receiver.
30. Set the RF LVL Field to **-10 dBm**.
31. Verify -10 dBm (±3 dB) on the Measuring Receiver.
32. Disconnect the Measuring Receiver from the ANT Connector.

(14) COMM VHF 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 VHF AM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	137.000 MHz
RF LVL	10.0 dBm
MOD TONE	1020 Hz
M MOD	CAL

7. If the VHF AM Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF 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. Disconnect the Modulation Analyzer from the ANT Connector.

(15) COMM UHF

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 VHF AM Mode Screen is displayed.
6. Set the Test Set as follows:

FIELD	SETTING
FREQ	312.000 MHz
RF LVL	10.0 dBm
MOD TONE	1020 Hz
M MOD	CAL

7. If the UHF Mode Screen is in RECEIVING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF 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. Disconnect the Modulation Analyzer from the ANT Connector.

(16) 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 VHF AM Mode Screen is displayed.
4. If the VHF AM Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM VHF 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 (± 1 ppm + ± 1 count)
10.001 MHz	10.001 MHz (± 1 ppm + ± 1 count)
100.101 MHz	100.101 MHz (± 1 ppm + ± 1 count)
399.999 MHz	399.999 MHz (± 1 ppm + ± 1 count)

8. Press the SETUP Key to display the Setup Menu.
9. Set the PORT Field to **RF I/O**.
10. Disconnect the RF Signal Generator from the ANT Connector and connect the RF Signal Generator (Output) to the RF I/O Connector.
11. Set the RF Signal Generator to -10 dBm.
12. Set the RF Signal Generator to the following settings and verify readings on the Test Set:

FREQUENCY	READING
10 MHz	10 MHz (± 1 ppm + ± 1 count)
10.001 MHz	10.001 MHz (± 1 ppm + ± 1 count)
100.101 MHz	100.101 MHz (± 1 ppm + ± 1 count)
399.999 MHz	399.999 MHz (± 1 ppm + ± 1 count)

13. Press the SETUP Key to display the FREQUENCY COUNTER Mode Screen is displayed.
14. Set the RESOLUTION Field to **1 Hz**.

STEP PROCEDURE

15. Connect the Function Generator (Output) to the AUX I/O Connector.

16. Set the Function Generator as follows:

CONTROL	SETTING
Level	1 Vp-p
Frequency	1 MHz Sinewave
Output Impedance	50 Ω

17. Verify 1 MHz (± 1 ppm + ± 1 count) on the Test Set.

18. Set the Test Set as follows:

FIELD	SETTING
FREQ	312.000 MHz
RF LVL	10.0 dBm
MOD TONE	1020 Hz
M MOD	CAL

19. Set Function Generator Frequency to 1.00001 MHz.

20. Verify 1.00001 MHz (± 1 ppm + ± 1 count) on the Test Set.

21. Set Function Generator Frequency to 5.10001 MHz.

22. Verify 5.10001 MHz (± 1 ppm + ± 1 count) on the Test Set.

23. Set Function Generator Frequency to 9.99999 MHz.

24. Verify 9.99999 MHz (± 1 ppm + ± 1 count) on the Test Set.

25. Disconnect the Function Generator from the AUX I/O Connector.

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

(17) 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 Generator Frequency to 400 MHz.
3. Set the RF 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
5 dBm	10%	Record as X7
5 dBm	50%	Record as X8
5 dBm	90%	Record as X9

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 UHF Mode Screen is displayed.
7. If the COMM UHF Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF 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 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%	$(X6 \div 1.1) < \text{Reading} < (X6 \div 0.9)$

STEP

PROCEDURE

10. Press the SETUP Key to display the Setup Menu.
11. Set the PORT Field to **RF I/O**.
12. Disconnect the RF Signal Generator from the ANT Connector and connect the RF Signal Generator (Output) to the RF I/O Connector.
13. Set the RF Generator Level and AM Depth as follows and verify the AM readings:

LEVEL	AM DEPTH	AM READINGS
5 dBm	10%	$(X7 \div 1.1) < \text{Reading} < (X7 \div 0.9)$
5 dBm	50%	$(X8 \div 1.1) < \text{Reading} < (X8 \div 0.9)$
5 dBm	90%	$(X9 \div 1.1) < \text{Reading} < (X9 \div 0.9)$

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

(18) 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 Generator as follows:

CONTROL	SETTING
Frequency	165 MHz
Level	-20 dBm

3. Set the RF 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 VHF 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.

STEP

PROCEDURE

9. Set the RF 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 -10 dBm.
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 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.

(19) SWR Meter

TEST EQUIPMENT: 50 Ω Load
75 Ω Load
100 Ω Load
150 Ω 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. Connect the 50 Ω Load to the SWR Connector.
4. 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)

5. Disconnect the 50 Ω Load from the SWR Connector and connect the 75 Ω Load to the SWR Connector.
6. 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)

7. Disconnect the 75 Ω Load from the SWR Connector and connect the 100 Ω Load to the SWR Connector.

STEP

PROCEDURE

8. 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)

9. Disconnect the 100 Ω Load from the SWR Connector and connect the 150 Ω Load to the SWR Connector.

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

FREQ	READINGS
75	3.000 ($\pm 0.2 + \pm 20\%$ of reading)
137	3.000 ($\pm 0.2 + \pm 20\%$ of reading)
225	3.000 ($\pm 0.2 + \pm 20\%$ of reading)
312	3.000 ($\pm 0.2 + \pm 20\%$ of reading)
400	3.000 ($\pm 0.2 + \pm 20\%$ of reading)

11. Disconnect the 150 Ω Load from the SWR Connector.

(20) Power Meter

TEST EQUIPMENT: RF Signal Generator
RF Power Amplifier

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 **RF I/O**.
3. Press the MODE Select Key until the COMM UHF Mode Screen is displayed.
4. If the COMM UHF Mode Screen is in GENERATING Mode, press the SWITCH GEN/RX Soft Key to switch the COMM UHF Mode Screen to RECEIVING Mode.
5. Connect the RF Signal Generator (Output) and the RF Power Amplifier (Output) to the RF I/O Connector.
6. Set the RF Signal Generator Frequency 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 + ± 1 count)
100 MHz	1.0 W	1.0 W ($\pm 8\%$ of reading + ± 1 count)
100 MHz	5.0 W	5.0 W ($\pm 8\%$ of reading + ± 1 count)
100 MHz	10.0 W	10.0 W ($\pm 8\%$ of reading + ± 1 count)
100 MHz	20.0 W	20.0 W ($\pm 8\%$ of reading + ± 1 count)
100 MHz	25.0 W	25.0 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	0.1 W	0.1 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	1.0 W	1.0 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	5.0 W	5.0 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	10.0 W	10.0 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	20.0 W	20.0 W ($\pm 8\%$ of reading + ± 1 count)
300 MHz	25.0 W	25.0 W ($\pm 8\%$ of reading + ± 1 count)

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



E. Verification Data Sheet

IFR Test Set S/N: _____ DATE: _____

TECHNICIAN: _____

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

(1) Self Test

7. Verify all tests pass _____(√)

(2) RF Accuracy

7. Verify 108.0 MHz (±1 ppm) _____

10. Verify 108.1 MHz (±1 ppm) _____

13. Verify 334.7 MHz (±1 ppm) _____

16. Verify 75.0 MHz (±1 ppm) _____

20. Verify 118.0 MHz (±1 ppm) _____

22. Verify 137.0 MHz (±1 ppm) _____

26. Verify 225.0 MHz (±1 ppm) _____

28. Verify 312.0 MHz (±1 ppm) _____

30. Verify 400.0 MHz (±1 ppm) _____

35. Verify 118.001 MHz (±1 ppm) _____

37. Verify 118.002 MHz (±1 ppm) _____

39. Verify 118.003 MHz (±1 ppm) _____

41. Verify 118.004 MHz (±1 ppm) _____

(3) RF Level Accuracy (ANT Connector)

7. Verify -30 dBm (±3 dB) _____

9. Verify -30 dBm (±3 dB) _____

12. Verify -30 dBm (±3 dB) _____

15. Verify -30 dBm (±3 dB) _____

19. Verify -30 dBm (±3 dB) _____

23. Verify -30 dBm (±3 dB) _____



STEP	DATA	RESULT
(3) RF Level Accuracy (ANT Connector) (cont)		
25. Verify levels:		
	-57 dBm -57 dBm (± 3 dB)	-----
	-47 dBm -47 dBm (± 3 dB)	-----
	-37 dBm -37 dBm (± 3 dB)	-----
	-27 dBm -27 dBm (± 3 dB)	-----
	-17 dBm -17 dBm (± 3 dB)	-----
	-7 dBm -7 dBm (± 3 dB)	-----
	+3 dBm +3 dBm (± 3 dB)	-----
	+13 dBm +13 dBm (± 3 dB)	-----
29. Verify -67 dBm (± 3 dB)		-----
(4) RF Level Flatness (ANT Connector)		
		<u>+10 dBm</u> <u>-10 dBm</u>
8. Record +10 dBm level		-----
10. Record -10 dBm level		-----
14. Record +10 dBm level		-----
16. Record -10 dBm level		-----
20. Record +10 dBm level		-----
22. Record -10 dBm level		-----
27. Record +10 dBm level		-----
29. Record -10 dBm level		-----
33. Record +10 dBm level		-----
35. Record -10 dBm level		-----
39. Record +10 dBm level		-----
41. Record -10 dBm level		-----
46. Record +10 dBm level		-----
48. Record -10 dBm level		-----
52. Record +10 dBm level		-----
54. Record -10 dBm level		-----
58. Record +10 dBm level		-----
60. Record -10 dBm level		-----
64. Record +10 dBm level		-----
66. Record -10 dBm level		-----
67. Verify flatness (difference between levels recorded in Steps 8, 14, 20, 27, 33, 39, 46, 52, 58 and 64) is ≤ 1 dB		----- (✓)



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

(4) RF Level Flatness (ANT Connector) (cont)

68. Verify flatness (difference between levels recorded in Steps 10, 16, 22, 29, 35, 41, 48, 54, 60 and 66) is ≤ 1 dB _____(√)

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

7. Verify -40 dBm (± 2 dB) _____

9. Verify -40 dBm (± 2 dB) _____

12. Verify -40 dBm (± 2 dB) _____

15. Verify -40 dBm (± 2 dB) _____

19. Verify -40 dBm (± 2 dB) _____

23. Verify -40 dBm (± 2 dB) _____

25. Verify -40 dBm (± 2 dB) _____

28. Verify levels:

-12 dBm -12 dBm (± 2.5 dB) _____

-22 dBm -22 dBm (± 2.5 dB) _____

-32 dBm -32 dBm (± 2.5 dB) _____

-42 dBm -42 dBm (± 2 dB) _____

-52 dBm -52 dBm (± 2 dB) _____

-62 dBm -62 dBm (± 2 dB) _____

-72 dBm -72 dBm (± 2 dB) _____

-82 dBm -82 dBm (± 2 dB) _____

-92 dBm -92 dBm (± 2 dB) _____

-102 dBm -102 dBm (± 3 dB) _____

-112 dBm -112 dBm (± 3 dB) _____

-120 dBm -120 dBm (± 3 dB) _____

(6) RF Level Flatness (RF I/O Connector)

8. Record -20 dBm level _____ -20 dBm -40 dBm

10. Record -40 dBm level _____

14. Record -20 dBm level _____

16. Record -40 dBm level _____

20. Record -20 dBm level _____

22. Record -40 dBm level _____

27. Record -20 dBm level _____

29. Record -40 dBm level _____

33. Record -20 dBm level _____



STEP	DATA	RESULT
(6) RF Level Flatness (RF I/O Connector) (cont)		
		<u>-20 dBm</u> <u>-40 dBm</u>
35.	Record -40 dBm level	_____
39.	Record -20 dBm level	_____
41.	Record -40 dBm level	_____
46.	Record -20 dBm level	_____
48.	Record -40 dBm level	_____
52.	Record -20 dBm level	_____
54.	Record -40 dBm level	_____
58.	Record -20 dBm level	_____
60.	Record -40 dBm level	_____
64.	Record -20 dBm level	_____
66.	Record -40 dBm level	_____
67.	Verify flatness (difference between levels recorded in Steps 8, 14, 20, 27, 33, 39, 46, 52, 58 and 64) is ≤ 1 dB	_____ (✓)
68.	Verify flatness (difference between levels recorded in Steps 10, 16, 22, 29, 35, 41, 48, 54, 60 and 66) is ≤ 1 dB	_____ (✓)
(7) Harmonic and Spurious		
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	_____
20.	Verify:	
	Harmonic is < -20 dBc	_____
	Spurious is < -35 dBc	_____

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

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

RF I/O CONNECTOR

- | | | |
|---|-------|-------|
| 3. Record levels: | | |
| 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 | | ----- |
| 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 | | ----- |
| 12. Verify VSWR: | | |
| 75 MHz | <1.3 | ----- |
| 225 MHz | <1.3 | ----- |
| 400 MHz | <1.35 | ----- |

(9) 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 3000MHz ($\pm 0.02\%$) with <2.5% distortion and AM Depth of 95% AM ($\pm 5\%$ AM) | | ----- |

STEP	DATA	RESULT
(10) 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)		-----
11. Verify 9960 Hz ($\pm 0.02\%$) with $< 2.0\%$ distortion and AM Depth of 30% AM ($\pm 2\%$ AM)		-----
13. Verify AM Depth of 60% AM ($\pm 4\%$ AM)		-----
FM DEVIATION ACCURACY		
15. Verify 480 Hz (± 25 Hz)		-----
BEARING ACCURACY		
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

(11) 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 (± 0.0015 DDM) -----
 - 0.093 LEFT** 0.093 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
 - 0.093 RIGHT** 0.093 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
 - 0.155 LEFT** 0.155 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
 - 0.155 RIGHT** 0.155 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
 - 0.200 LEFT** 0.200 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
 - 0.200 RIGHT** 0.200 (± 0.0015 DDM + $\pm 3\%$ of setting) -----
- 16. Verify readings:
 - 0.094** 0.094 (± 0.0025 DDM + $\pm 3\%$ of setting) -----
 - 0.095** 0.095 (± 0.0025 DDM + $\pm 3\%$ of setting) -----
 - 0.096** 0.096 (± 0.0025 DDM + $\pm 3\%$ of setting) -----
 - 0.097** 0.097 (± 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
(12) Glideslope		
MODULATION FREQUENCY, DISTORTION AND DEPTH ACCURACY		
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)	-----
DDM ACCURACY		
11.	Verify readings:	
	0.000 CENTER 0.000 (± 0.003 DDM)	-----
	0.091 UP 0.091 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
	0.091 DOWN 0.091 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
	0.175 UP 0.175 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
	0.175 DOWN 0.175 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
	0.400 UP 0.400 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
	0.400 DOWN 0.400 (± 0.003 DDM + $\pm 3\%$ of setting)	-----
13.	Verify readings:	
	0.176 0.176 (± 0.0048 DDM + $\pm 3\%$ of setting)	-----
	0.177 0.177 (± 0.0048 DDM + $\pm 3\%$ of setting)	-----
	0.178 0.178 (± 0.0048 DDM + $\pm 3\%$ of setting)	-----
	0.179 0.179 (± 0.0048 DDM + $\pm 3\%$ of setting)	-----
PHASE ACCURACY		
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
(13) ILS		
MARKER BEACON		
7.	Verify 75 MHz (± 1 ppm) 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 (± 1 ppm) and tone frequency of 1020 Hz ($\pm 0.02\%$) at -10 dBm (± 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 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.093 LEFT 0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.093 RIGHT 0.093 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.155 LEFT 0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.155 RIGHT 0.155 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.200 LEFT 0.200 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
	0.200 RIGHT 0.200 (± 0.0015 DDM + $\pm 3\%$ of setting)	-----
22.	Verify readings:	
	0.094 0.094 (± 0.0025 DDM + $\pm 3\%$ of setting)	-----
	0.095 0.095 (± 0.0025 DDM + $\pm 3\%$ of setting)	-----
	0.096 0.096 (± 0.0025 DDM + $\pm 3\%$ of setting)	-----
	0.097 0.097 (± 0.0025 DDM + $\pm 3\%$ of setting)	-----

STEP	DATA	RESULT
(13) ILS (cont)		
PHASE ACCURACY		
24. Verify readings:		
0	0° (±0.5°)	-----
5	-5° (±0.5°)	-----
10	-10° (±0.5°)	-----
20	-20° (±0.5°)	-----
40	-40° (±0.5°)	-----
80	40° (±0.5°)	-----
120	0° (±0.5°)	-----
GLIDESLOPE		
29. Verify -30 dBm (±3 dB)		
31. Verify -10 dBm (±3 dB)		
(14) COMM VHF AM		
8. Verify 1020 Hz (±0.02%) with <2.5% distortion and AM Depth of 30% AM (±2% AM)		
(15) COMM UHF		
8. Verify 1020 Hz (±0.02%) with <2.5% distortion and AM Depth of 30% AM (±2% AM)		
(16) Frequency Counter		
7. Verify readings:		
10 MHz	10 MHz (±1 ppm + ±1 count)	-----
10.001 MHz	10.001 MHz (±1 ppm + ±1 count)	-----
100.101 MHz	100.101 MHz (±1 ppm + ±1 count)	-----
399.999 MHz	399.999 MHz (±1 ppm + ±1 count)	-----
12. Verify readings:		
10 MHz	10 MHz (±1 ppm + ±1 count)	-----
10.001 MHz	10.001 MHz (±1 ppm + ±1 count)	-----
100.101 MHz	100.101 MHz (±1 ppm + ±1 count)	-----
399.999 MHz	399.999 MHz (±1 ppm + ±1 count)	-----
17. Verify 1 MHz (±1 ppm + ±1 count)		
20. Verify 1.00001 MHz (±1 ppm + ±1 count)		
22. Verify 5.10001 MHz (±1 ppm + ±1 count)		
24. Verify 9.99999 MHz (±1 ppm + ±1 count)		



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

(17) AM Meter

3. Record AM readings:

X1	_____
X2	_____
X3	_____
X4	_____
X5	_____
X6	_____
X7	_____
X8	_____
X9	_____

9. Verify AM readings:

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

13. Verify AM readings:

$(X7 \div 1.1) < \text{Reading} < (X7 \div 0.9)$	_____ (✓)
$(X8 \div 1.1) < \text{Reading} < (X8 \div 0.9)$	_____ (✓)
$(X9 \div 1.1) < \text{Reading} < (X9 \div 0.9)$	_____ (✓)

(18) FM Meter

3. Record AM readings:

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



STEP	DATA	RESULT
(18) FM Meter (cont)		
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:		
	$[(X4 - 0.4) \div 1.08] < \text{Reading} < [(X4 + 0.4) \div 0.92]$	_____ (✓)
	$[(X5 - 0.4) \div 1.08] < \text{Reading} < [(X5 + 0.4) \div 0.92]$	_____ (✓)
	$[(X6 - 0.4) \div 1.08] < \text{Reading} < [(X6 + 0.4) \div 0.92]$	_____ (✓)
(19) SWR Meter		
4. 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)	_____
6. 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)	_____
8. 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)	_____



STEP	DATA		RESULT
(19) SWR Meter (cont)			
10. Verify readings:			
75		3.000 ($\pm 0.2 + \pm 20\%$ of reading)	_____
137		3.000 ($\pm 0.2 + \pm 20\%$ of reading)	_____
225		3.000 ($\pm 0.2 + \pm 20\%$ of reading)	_____
312		3.000 ($\pm 0.2 + \pm 20\%$ of reading)	_____
400		3.000 ($\pm 0.2 + \pm 20\%$ of reading)	_____
(20) Power Meter			
6. Verify readings:			
100 MHz	0.1 W	0.1 W ($\pm 8\%$ of reading + ± 1 count)	_____
100 MHz	1.0 W	1.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
100 MHz	5.0 W	5.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
100 MHz	10.0 W	10.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
100 MHz	20.0 W	20.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
100 MHz	25.0 W	25.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	0.1 W	0.1 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	1.0 W	1.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	5.0 W	5.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	10.0 W	10.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	20.0 W	20.0 W ($\pm 8\%$ of reading + ± 1 count)	_____
300 MHz	25.0 W	25.0 W ($\pm 8\%$ of reading + ± 1 count)	_____

F. Calibration

(1) Test Setup

- PREREQUISITES:** Self Test (para 2-2-3D[1])
- TEST EQUIPMENT:** 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. Allow 15 minute warmup 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):

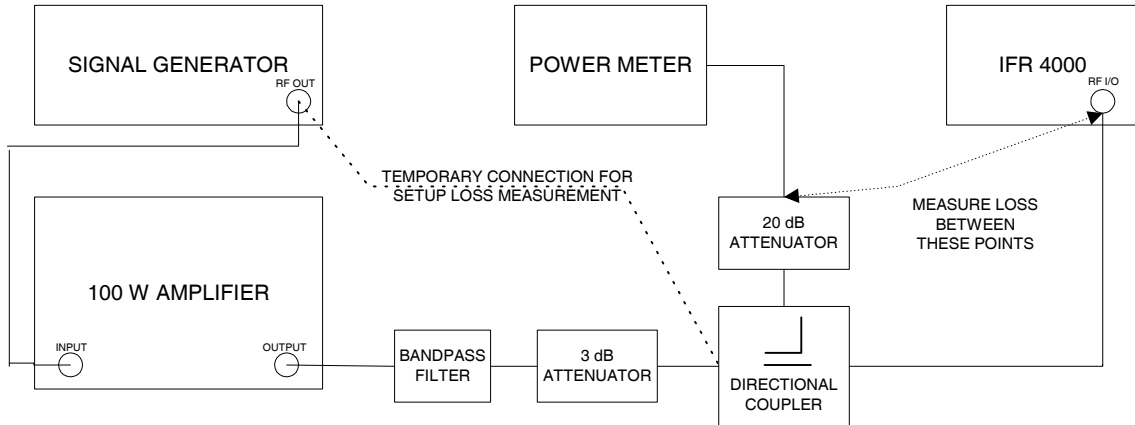
1	113.000 MHz
2	75.000 MHz
3	225.000 MHz
4	332.000 MHz
5	400.000 MHz
6	175.000 MHz
7	250.000 MHz
8	108.000 MHz

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. Press the CAL Soft Key to display the Calibration Screen.
7. Enter password (**3524**) to display the Calibration Screen.

STEP

PROCEDURE

8. Characterize and record the loss of the Power Meter Calibration Setup (2-2-3, Figure 5):
- Measure the loss between the Signal Generator and the 20 dB attenuator on the coupled port of the directional coupler. Record as A.
 - Measure the loss 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.



Power Meter Calibration Setup
Figure 5

(2) Miscellaneous

PREREQUISITES:	Test Setup (para 2-2-3F(1))
TEST EQUIPMENT:	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.
	TXCO
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.
	SWR
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.
	POWER METER
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 2-2-3F(1) 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 DEV

15. Press the FM DEV Soft Key to display the FM DEV CAL Sequence Screen.
16. Connect the Signal Generator to the ANT Connector. Set the Signal Generator for 156.000 MHz at -20 dBm with FM Modulation enabled.
17. 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 Test Set to average the modulation.
18. When the FM DEV CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MISC CAL Screen.
19. Press the RETURN Soft Key to return to the Calibration Screen.

(3) RF Amplitude Levels

- PREREQUISITES:** Test Setup (para 2-2-3F(1))
Miscellaneous (para 2-2-3F(2))
- TEST EQUIPMENT:** Measuring Receiver w/ Sensor Head

STEP	PROCEDURE
1.	From the Calibration Screen, press the AMPLVL CALS Soft Key to enter the AMPL LEVEL CAL Screen.
	MAIN
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 2-2-3F[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.	<p>Reference the following:</p> <ul style="list-style-type: none"> ● <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. ● <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. ● <u>Steps 3 to 6 of MAIN AMPL LEVEL Sequence</u> Follow the on-screen prompts and recall the necessary calibrations on the Measuring Receiver. ● <u>Steps 7 to 26 of MAIN AMPL LEVEL Sequence</u> Connect the Measuring Receiver Sensor Head to the RF I/O Connector. ● <u>Step 27 of MAIN AMPL LEVEL Sequence</u> Entering the frequency of 140 MHz on the Measuring Receiver displays UNCAL and RECAL. Press the Measuring Receiver Calibrate button and allow the cal routine to complete before setting the UUT VALUE: field. ● <u>Steps 28 to 29 of MAIN AMPL LEVEL Sequence</u> Follow the on-screen prompts and recall the necessary calibrations on the Measuring Receiver.
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 2-2-3F[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 2-2-3F[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

PREREQUISITES:	Test Setup (para 2-2-3F(1)) Miscellaneous (para 2-2-3F(2)) RF Amplitude Levels (para 2-2-3F(3))
TEST EQUIPMENT:	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.
	VOR
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"> ● <u>Step 1 of VOR CAL Sequence</u> Select 3 kHz Low-Pass Filter on the Measuring Receiver. ● <u>Step 2 of VOR CAL Sequence</u> Select 15 kHz Low-Pass Filter on the Measuring Receiver. ● <u>Step 3 of VOR CAL Sequence</u> Select 3 kHz Low-Pass Filter on the Measuring Receiver.
7.	When the VOR CAL Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.
	MAIN LOC
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.
	MAIN G/S
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.

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

16. When the MAIN PATH G/S Sequence is complete, press the SAVE & RETURN Soft Key to return to the MODULATION Cal Screen.

LOC LOC

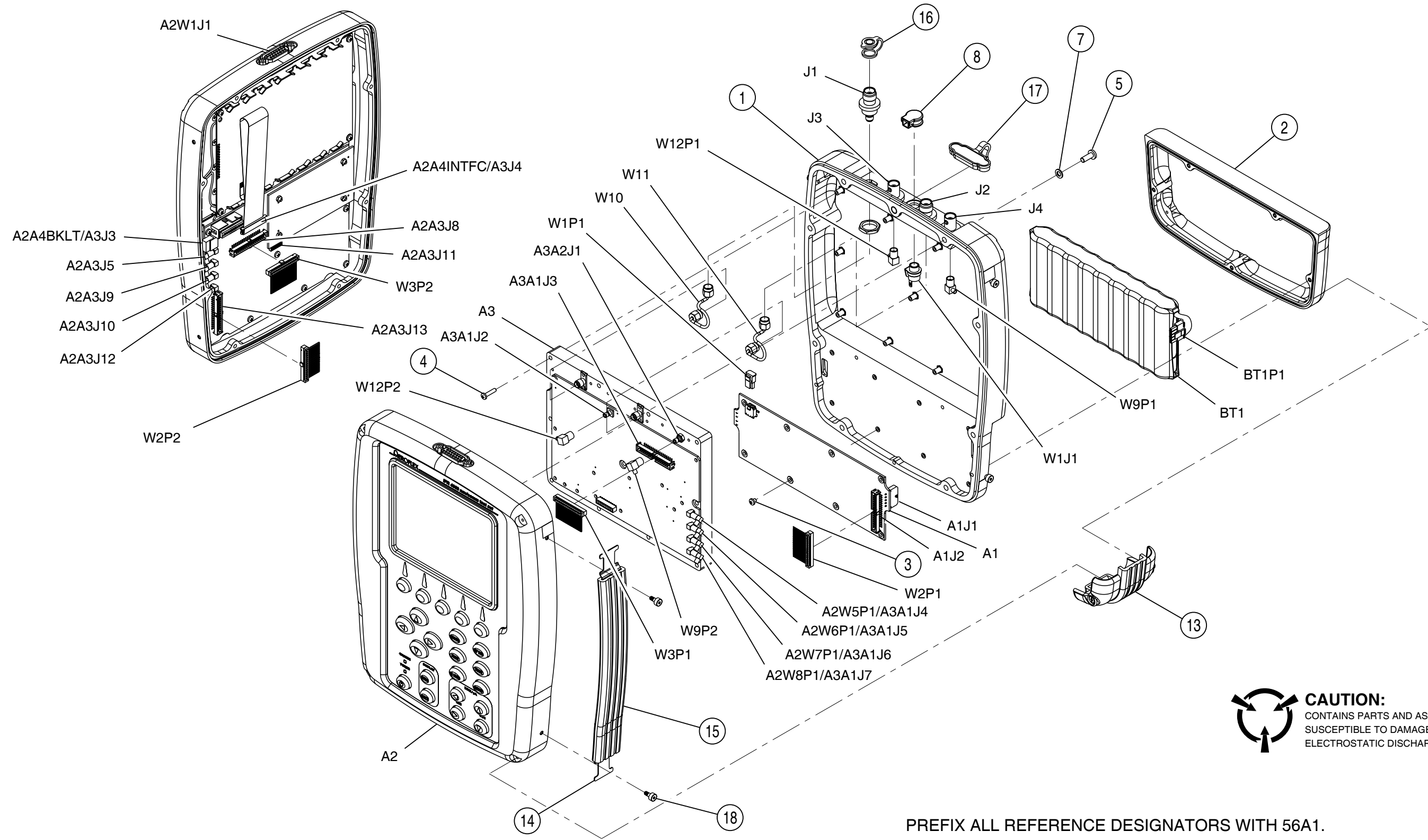
17. Press the LOC LOC Soft Key to display the LOC PATH LOC Sequence Screen.
18. Connect Measuring Receiver Sensor Head to the ANT Connector.
19. Set Measuring Receiver input frequency to 110.05 MHz. (For AM measurements, use the 3 kHz Low-Pass Filter. Use no High Pass filtering.)
20. Follow the on-screen 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

TITLE	PAGE
56A1 Composite Assy -----	3
System Interconnect Diagram -----	4
56A1A1 Power Supply PCB Assy -----	5
56A1A2 Chassis Assy-----	12
56A1A2A1 Keypad PCB Assy-----	13
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56A1A2A4 LCD Assy -----	37
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56A1A3A2 RF Converter PCB Assy -----	45
56A1A3A2A1 Buffer Amp PCB Assy -----	53



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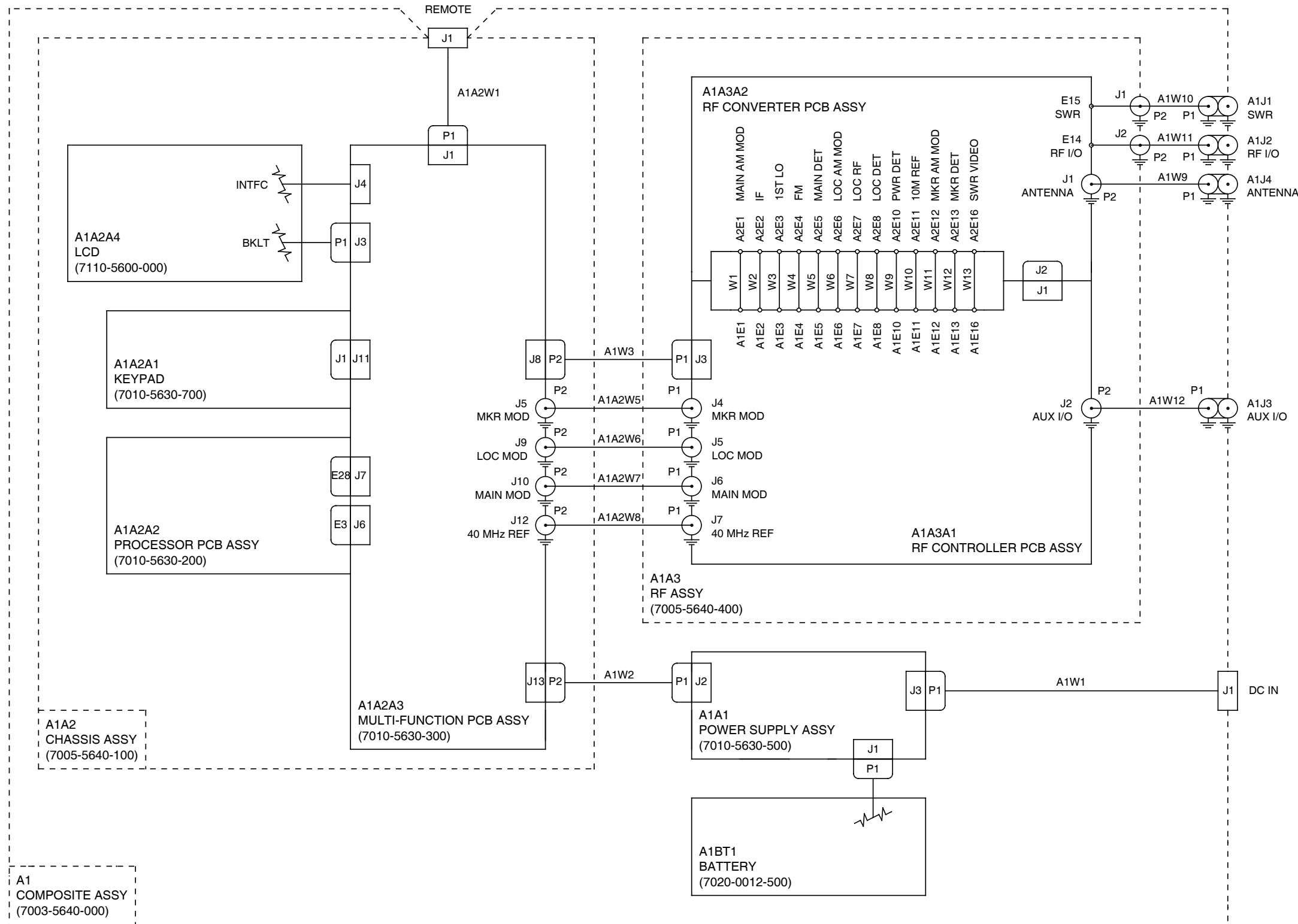
CAUTION:
CONTAINS PARTS AND ASSEMBLIES
SUSCEPTIBLE TO DAMAGE BY
ELECTROSTATIC DISCHARGE (ESD).

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

056M-011

Figure 6 Composite Assy (Sheet 1 of 2)
(56A1)

(7003-5640-000-D)

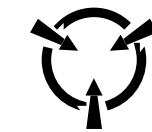


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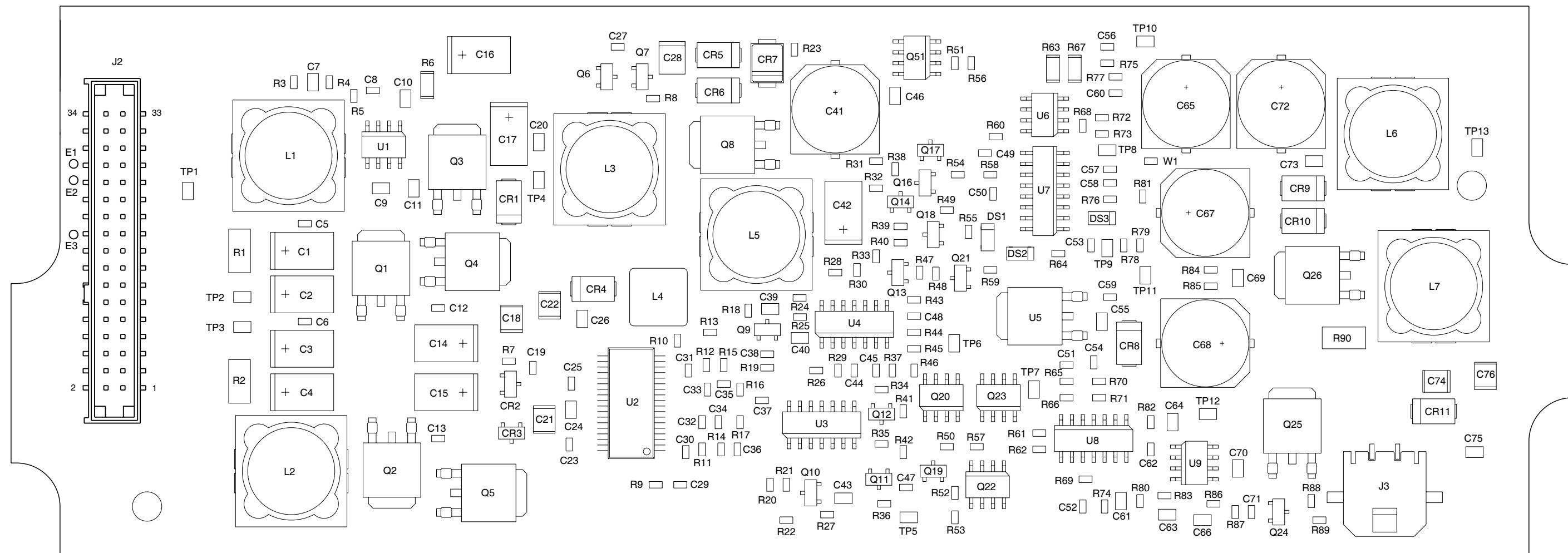
056M-010

Figure 6 Composite Assy (Sheet 2 of 2)
(System Interconnect Diagram) (56A1)

(0000-5640-000-A)



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ELECTROSTATIC DISCHARGE (ESD).



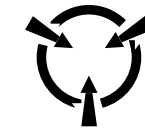
(TOP VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A1.

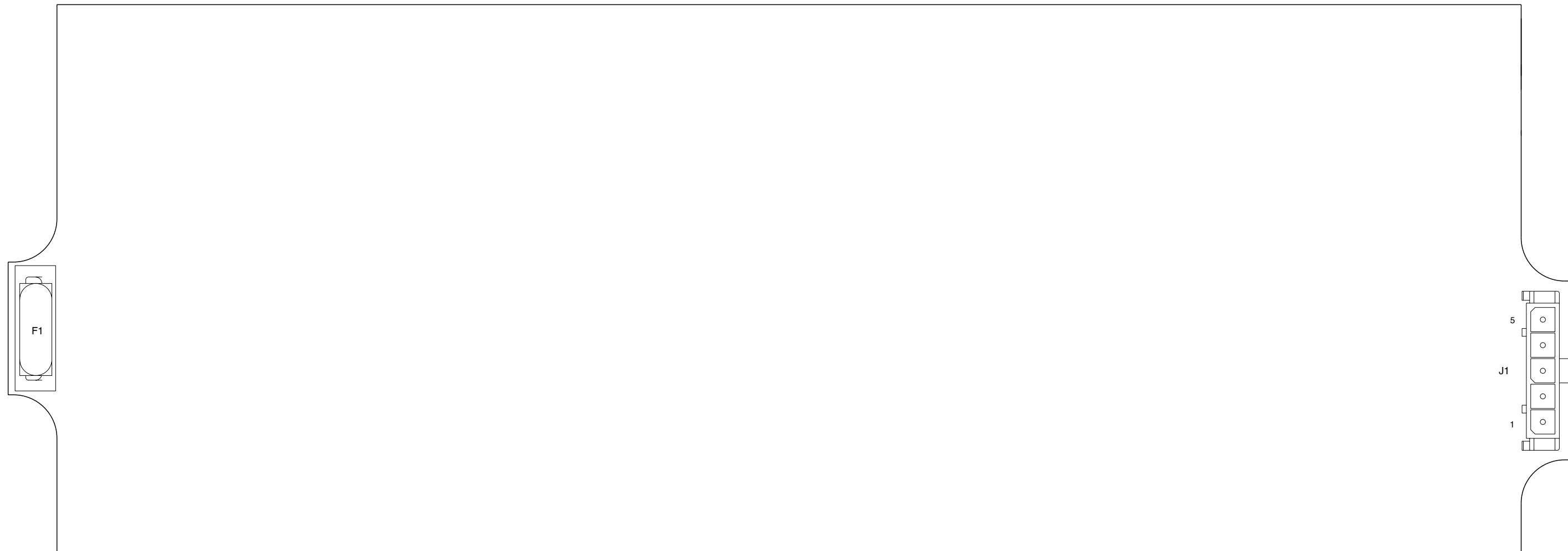
056M-05a

(7010-5630-500-B)

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



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ELECTROSTATIC DISCHARGE (ESD).



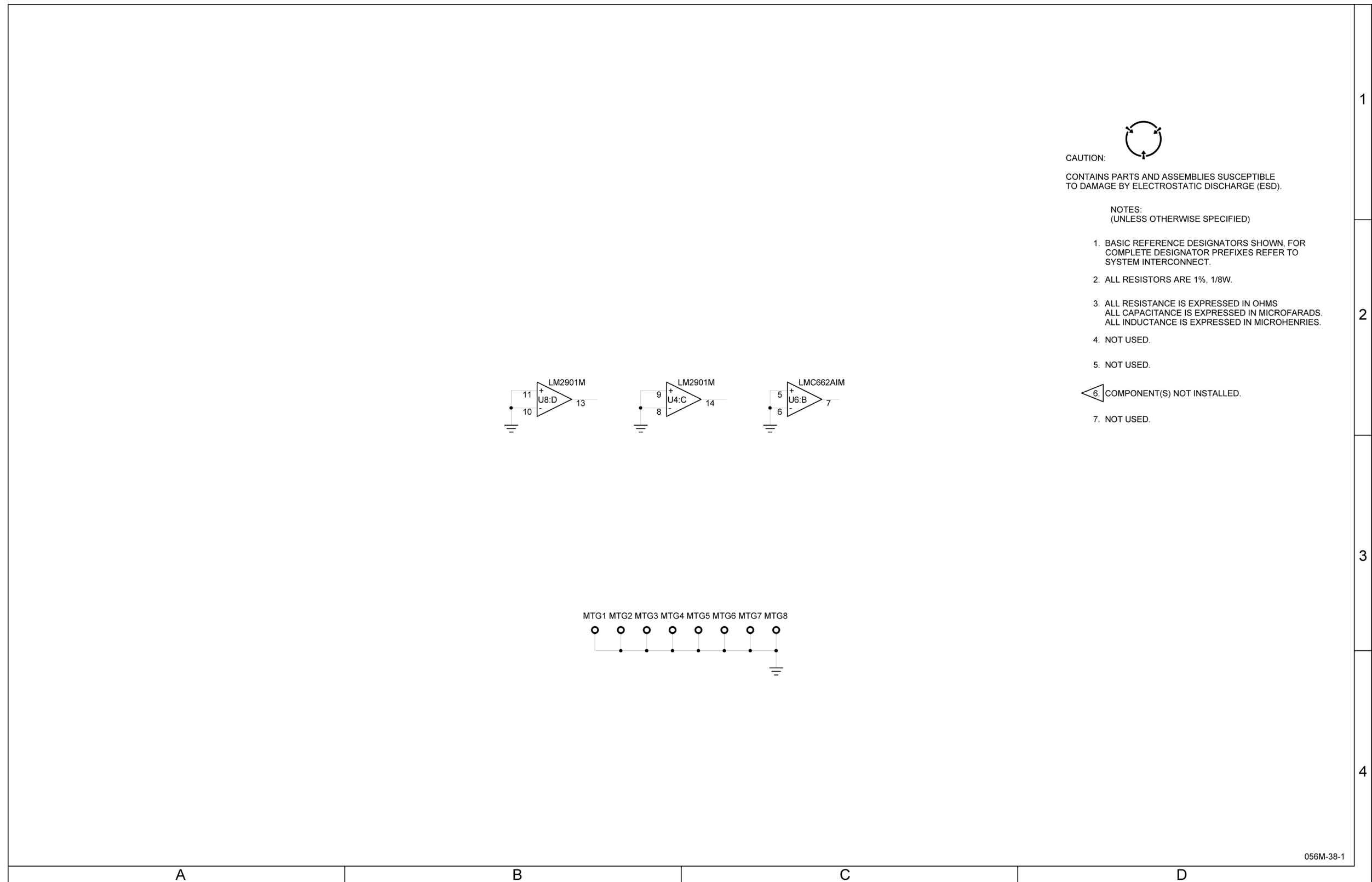
(BOTTOM VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A1.

(7010-5630-500-B)

056M-05b

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



A

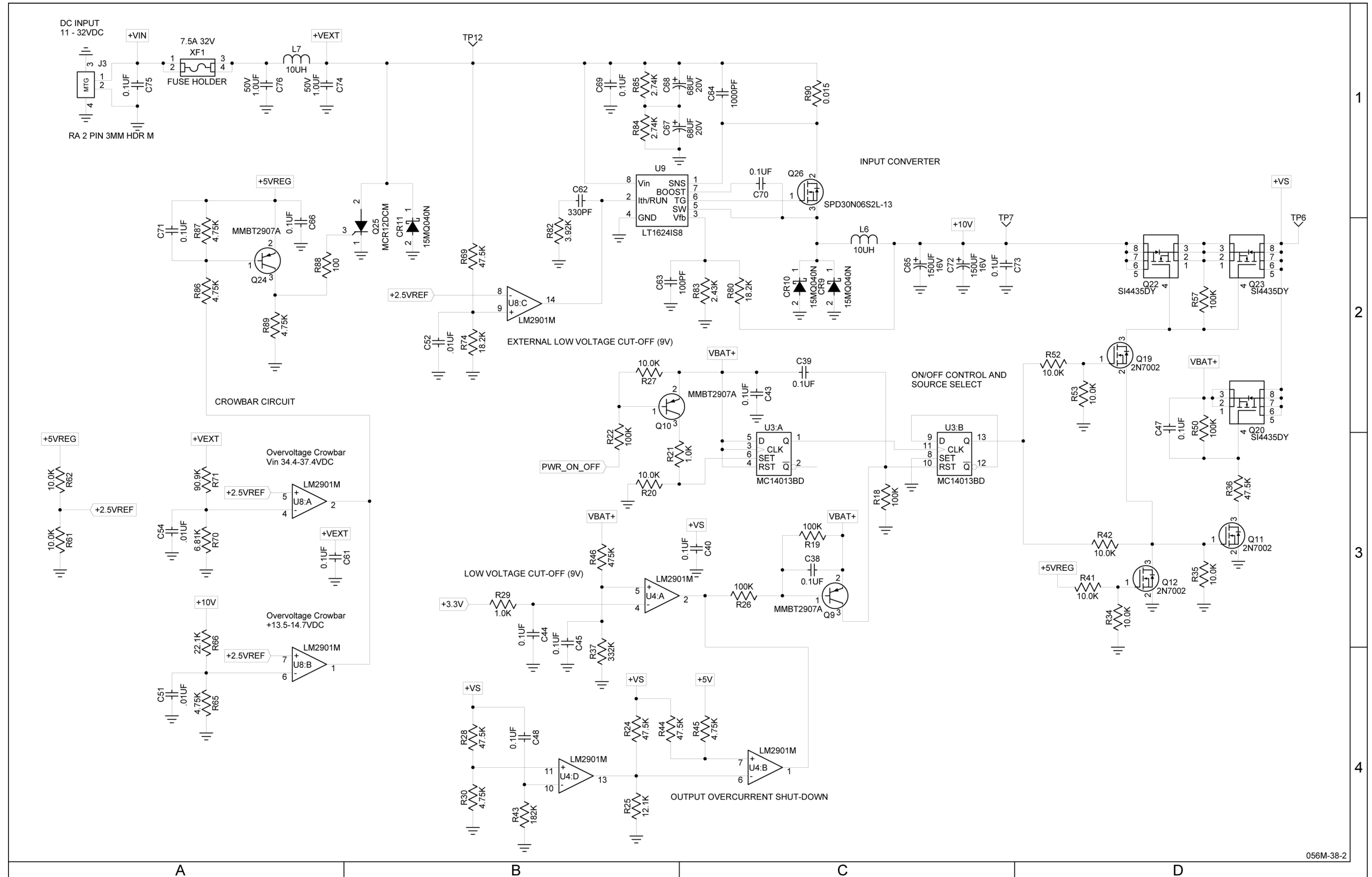
B

C

D

(0000-5630-500-C)

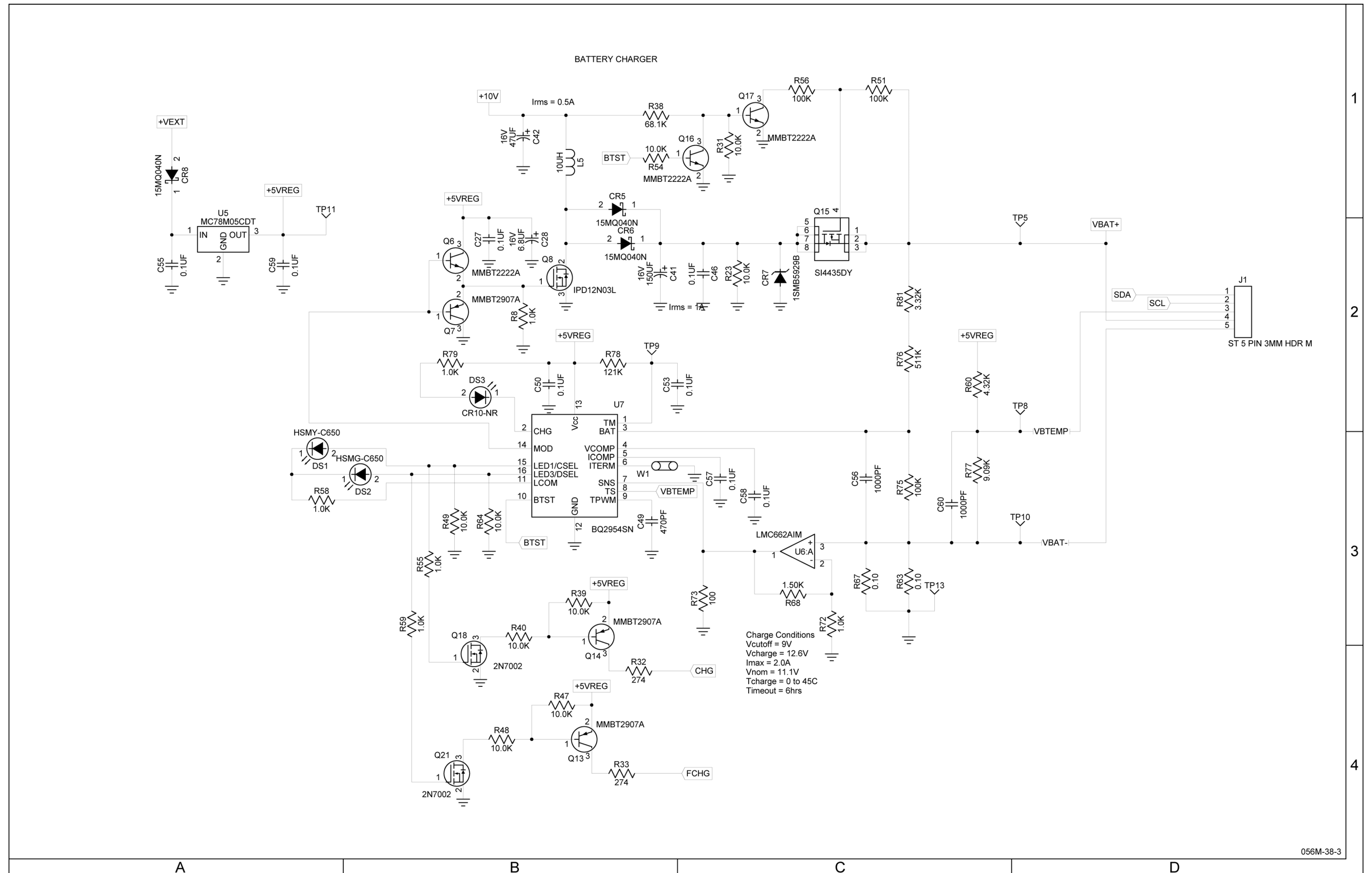
Figure 7 Power Supply PCB Assy (Sheet 3 of 7)
(Circuit Schematic - Sheet 1 of 5) (56A1A1)



056M-38-2

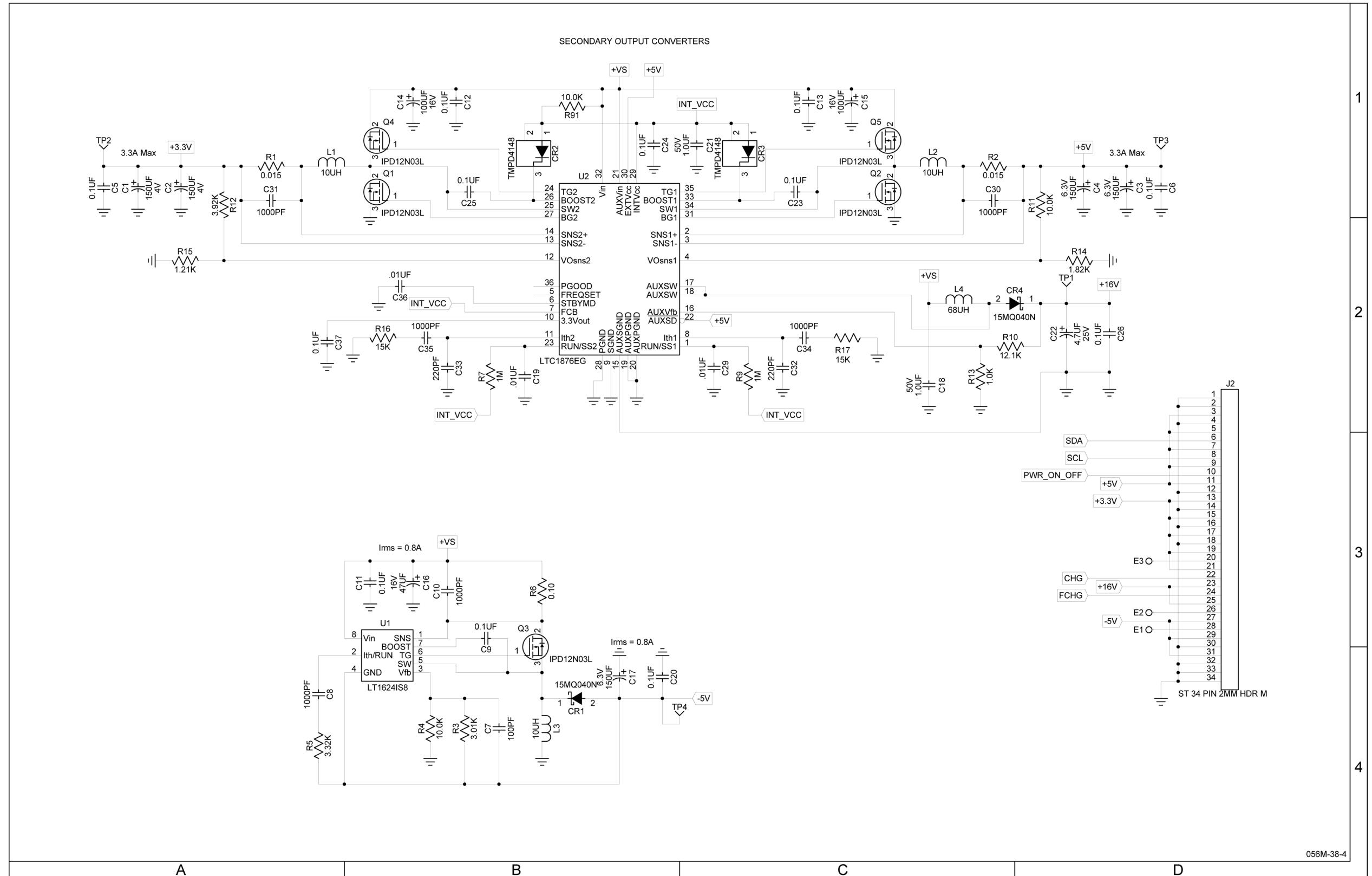
Figure 7 Power Supply PCB Assy (Sheet 4 of 7)
(Circuit Schematic - Sheet 2 of 5) (56A1A1)

(0000-5630-500-C)



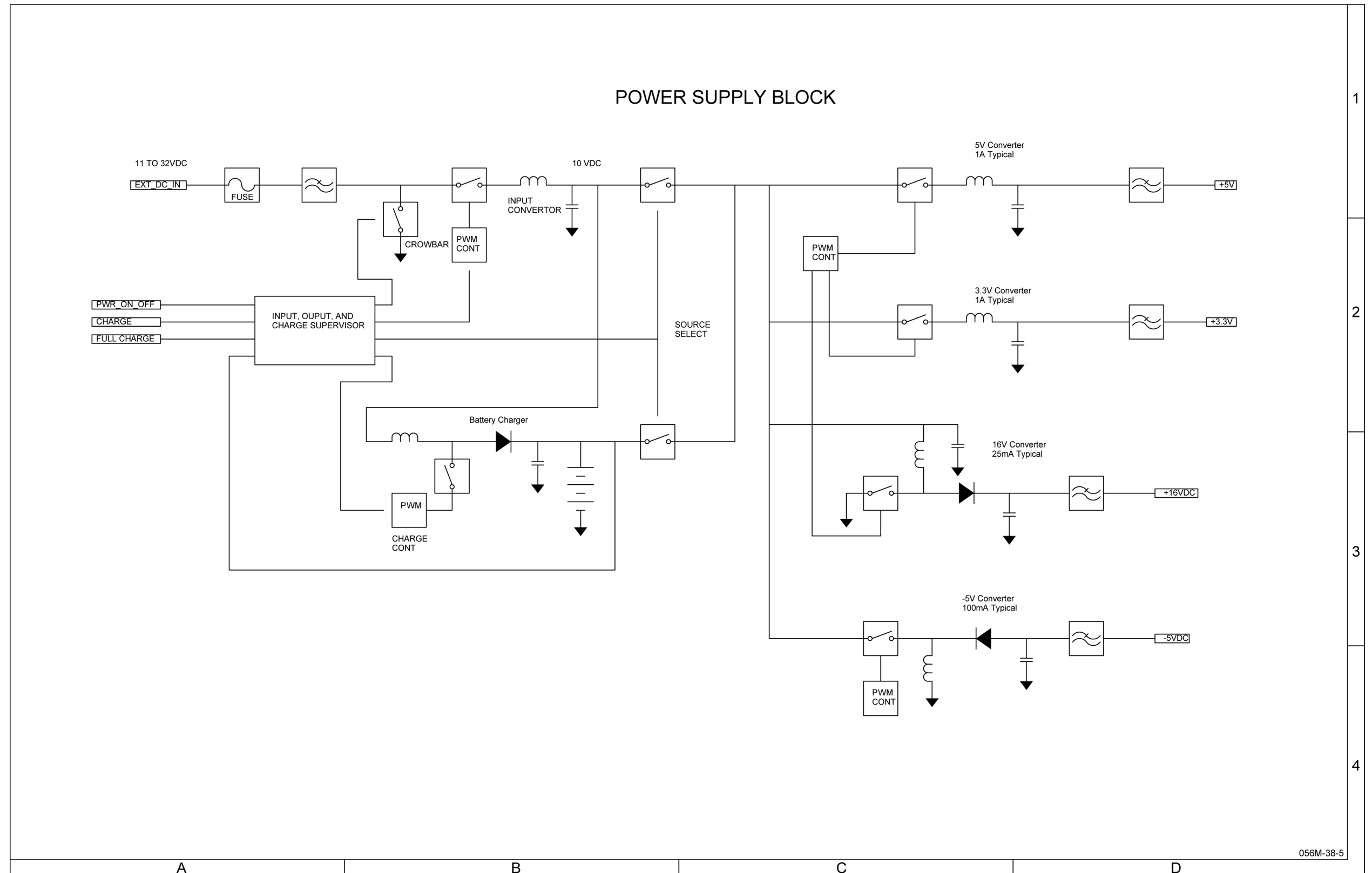
(0000-5630-500-C)

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



(0000-5630-500-C)

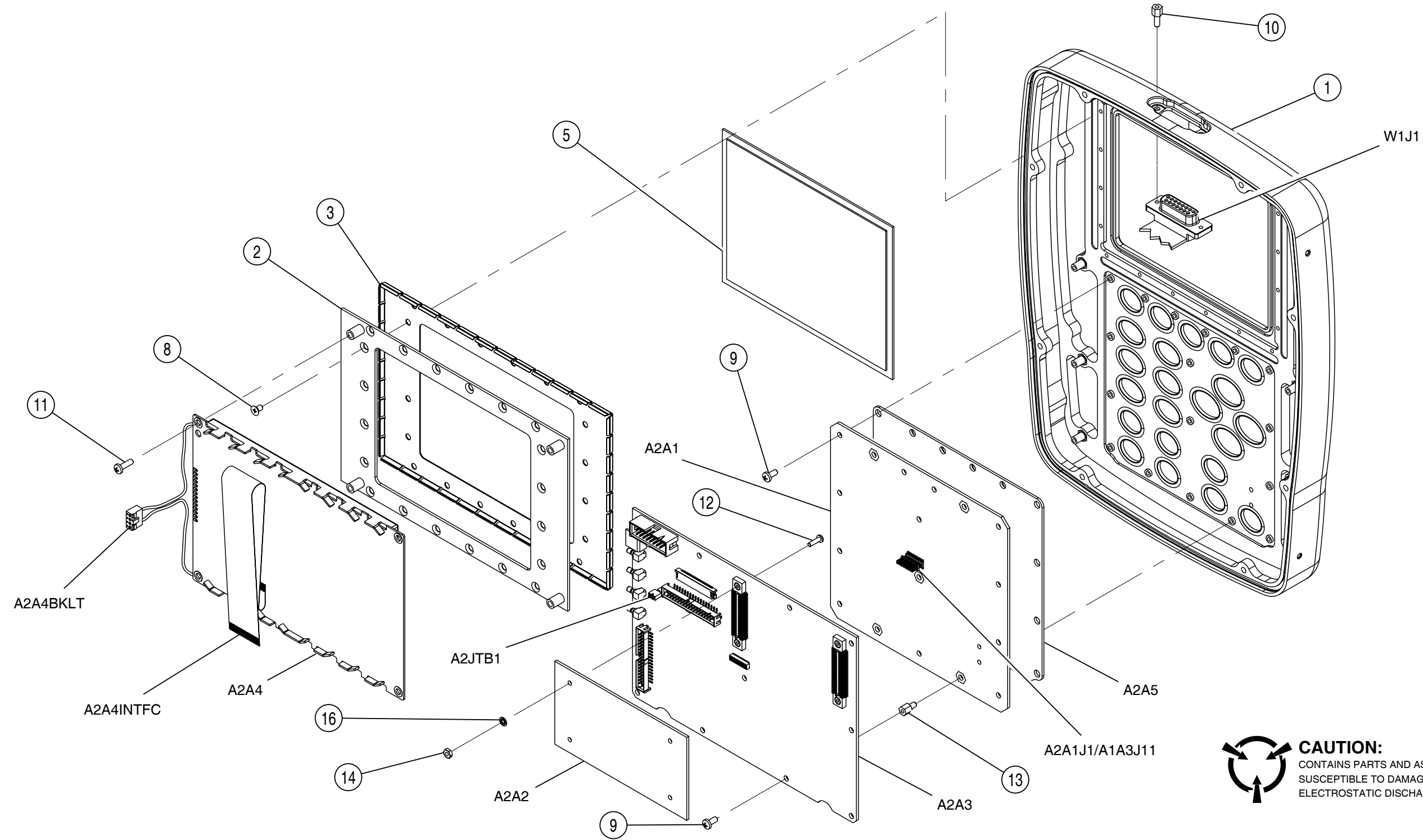
Figure 7 Power Supply PCB Assy (Sheet 6 of 7)
(Circuit Schematic - Sheet 4 of 5) (56A1A1)



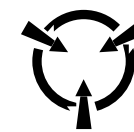
056M-38-5

(0000-5630-500-C)

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



PREFIX ALL REFERENCE DESIGNATORS WITH 56A1.

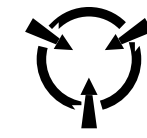


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ELECTROSTATIC DISCHARGE (ESD).

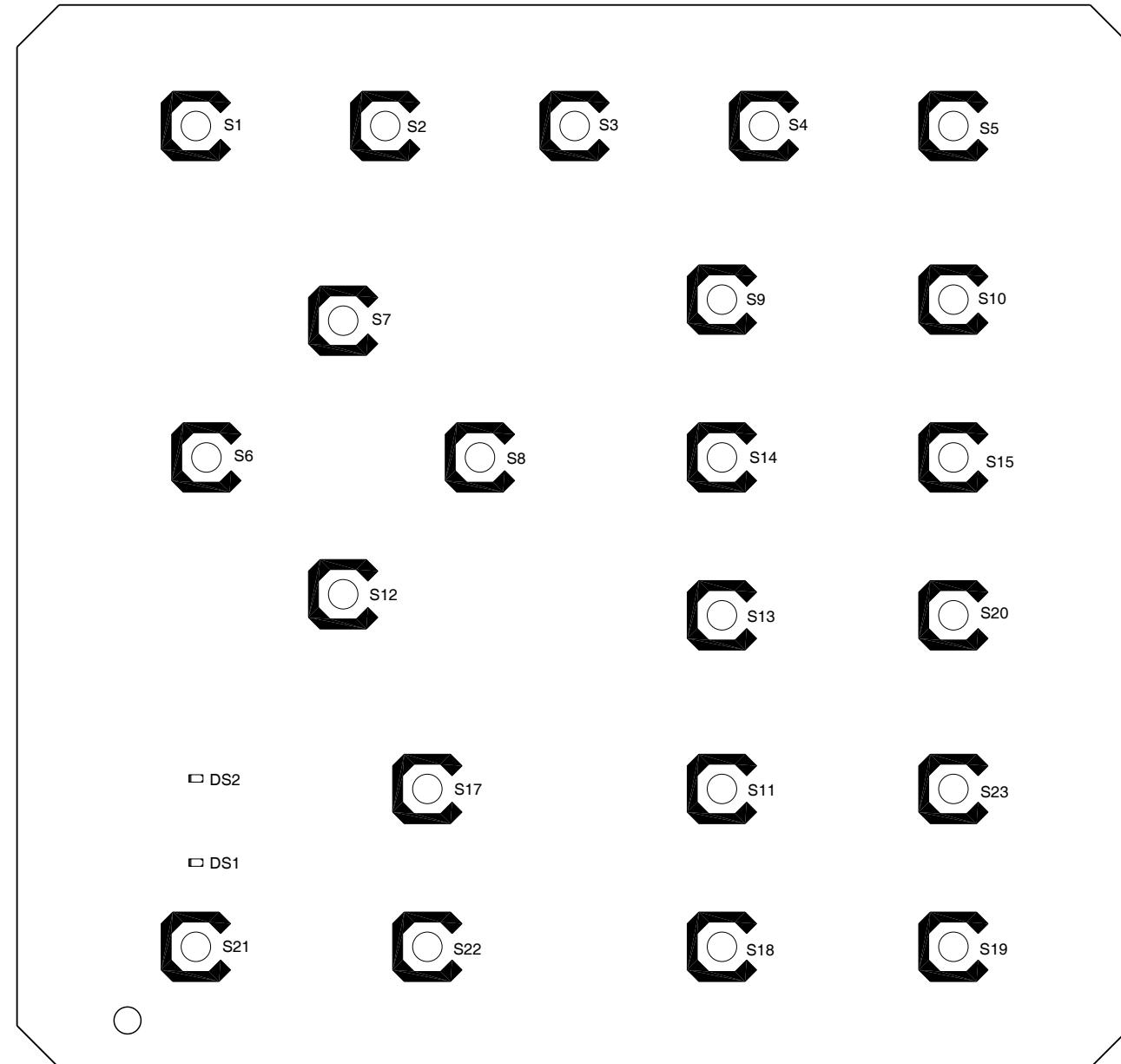
(7005-5640-100-D)

056M-012

Figure 8 Chassis Assy
(56A1A2)



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

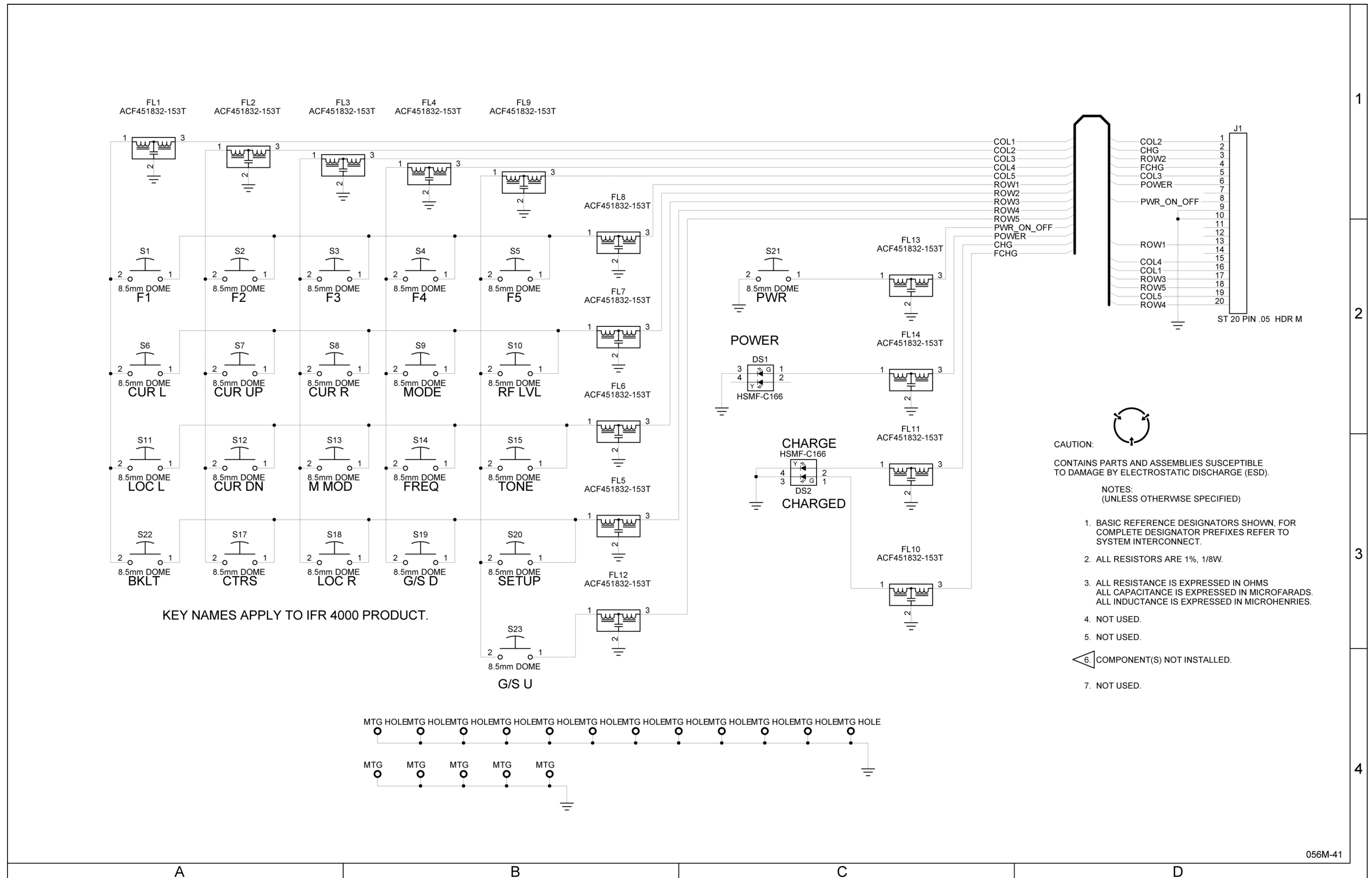


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A1.

(7010-5630-700-A)

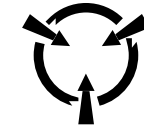
056M-32

Figure 9 Keypad PCB Assy (Sheet 1 of 2)
(56A1A2A1)

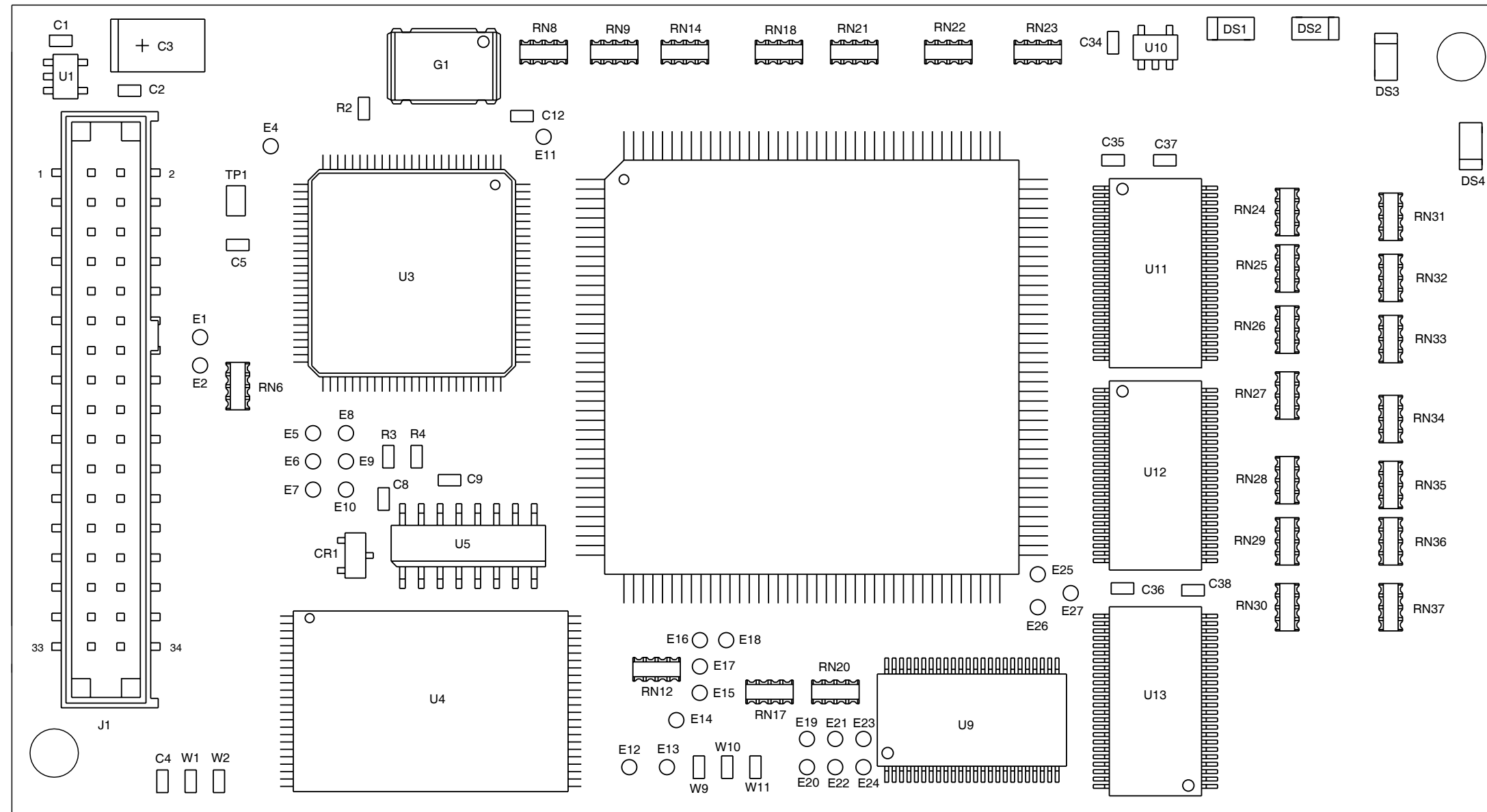


(0000-5630-700-A)

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



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



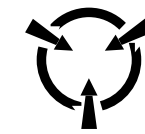
(TOP VIEW)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.

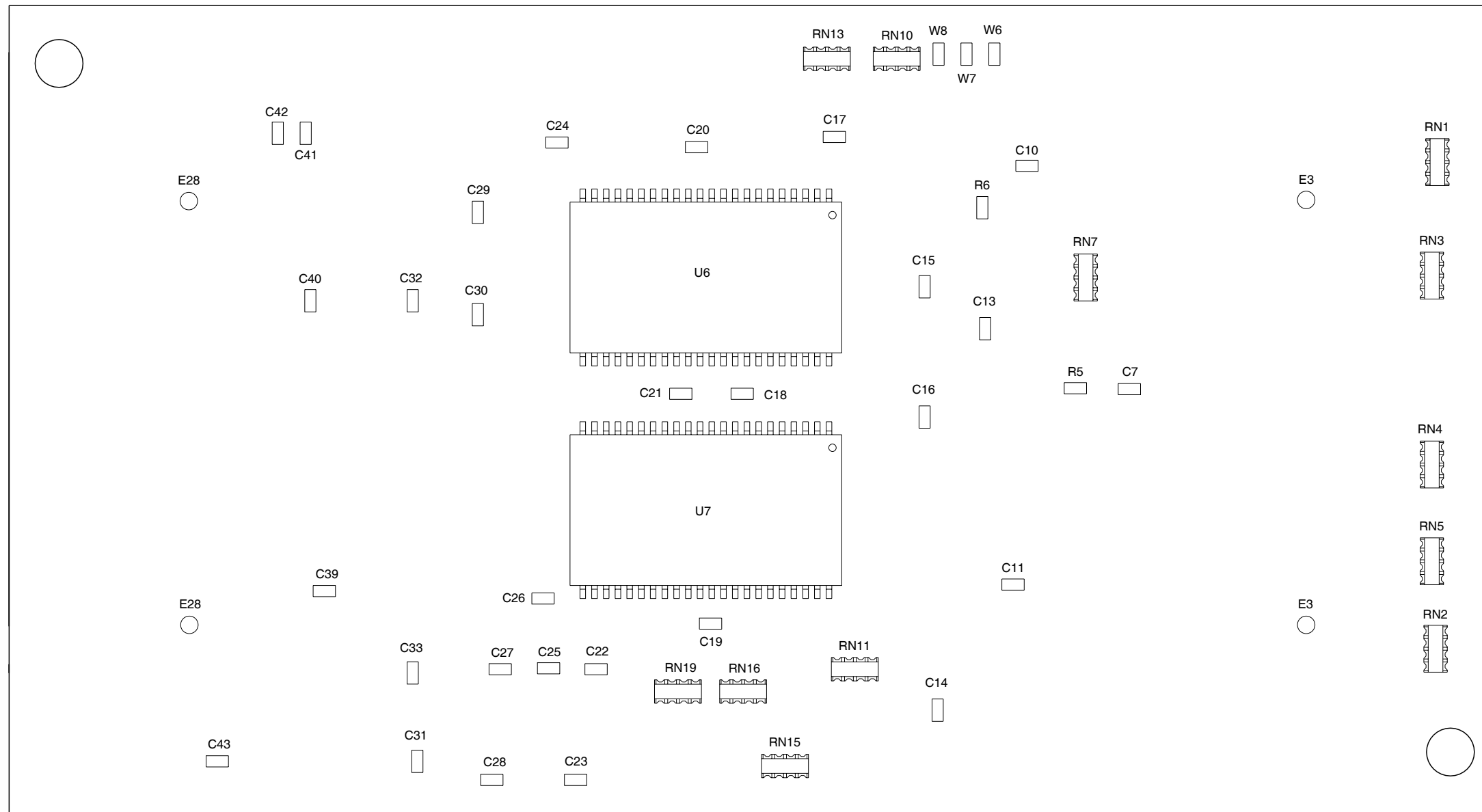
(7010-5630-200-D)

056M-30a

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



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



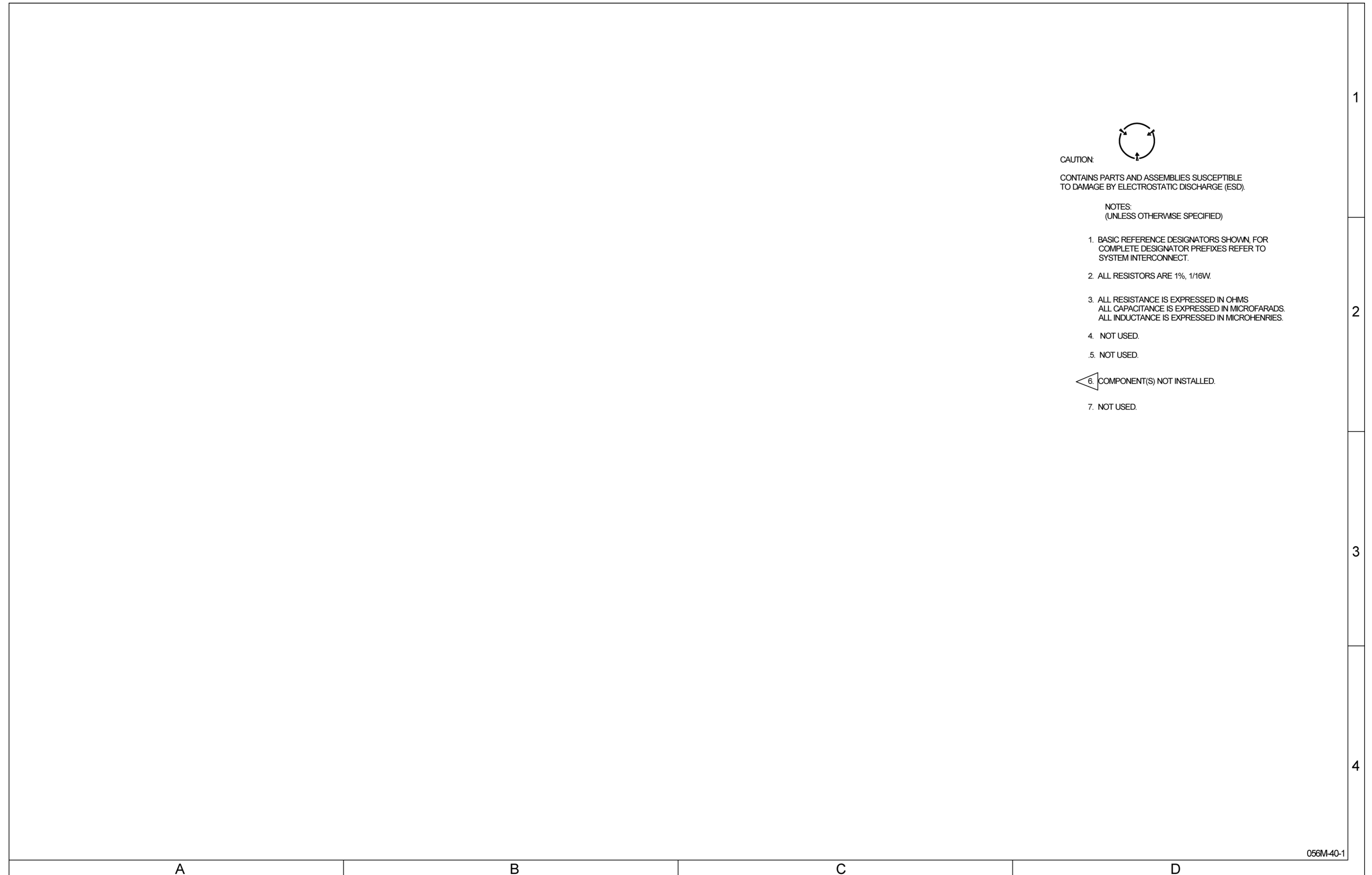
(BOTTOM VIEW)


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A2A2.


056M-30b

(7010-5630-200-D)

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

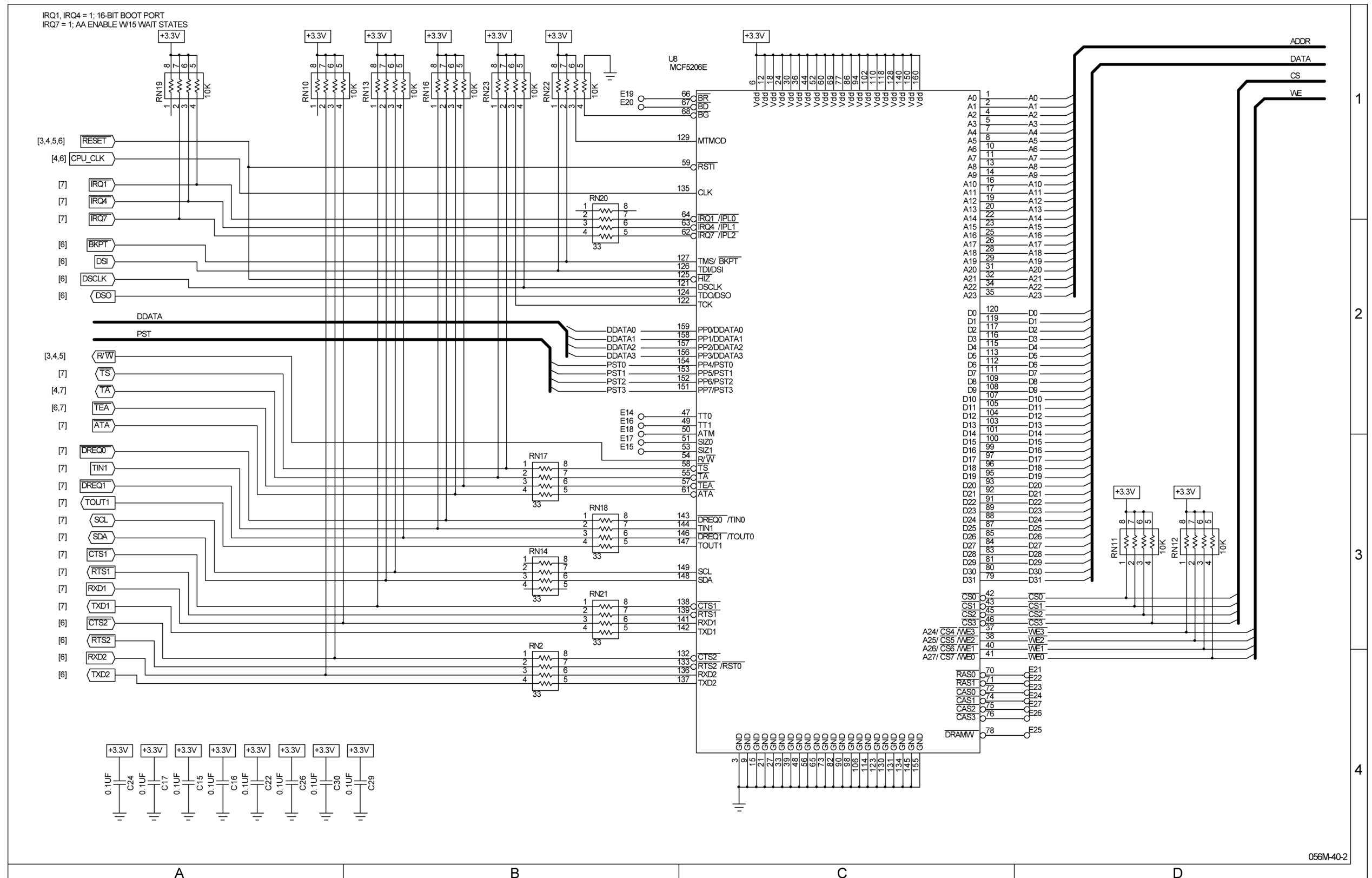


CAUTION: 
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE
TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

- 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. NOT USED.
 5. NOT USED.
 6.  COMPONENT(S) NOT INSTALLED.
 7. NOT USED.

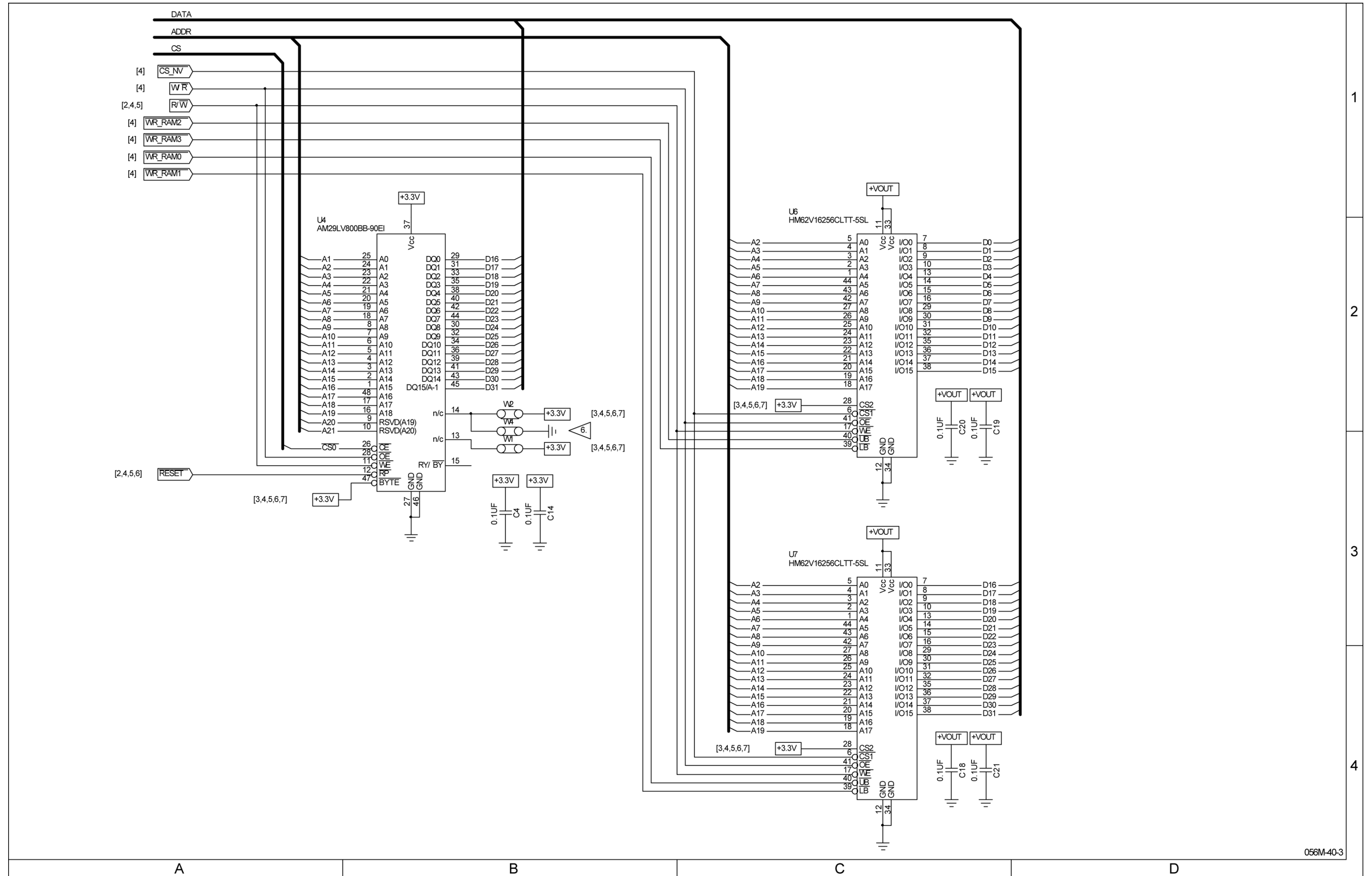
(0000-5630-200-B)

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



(0000-5630-200-B)

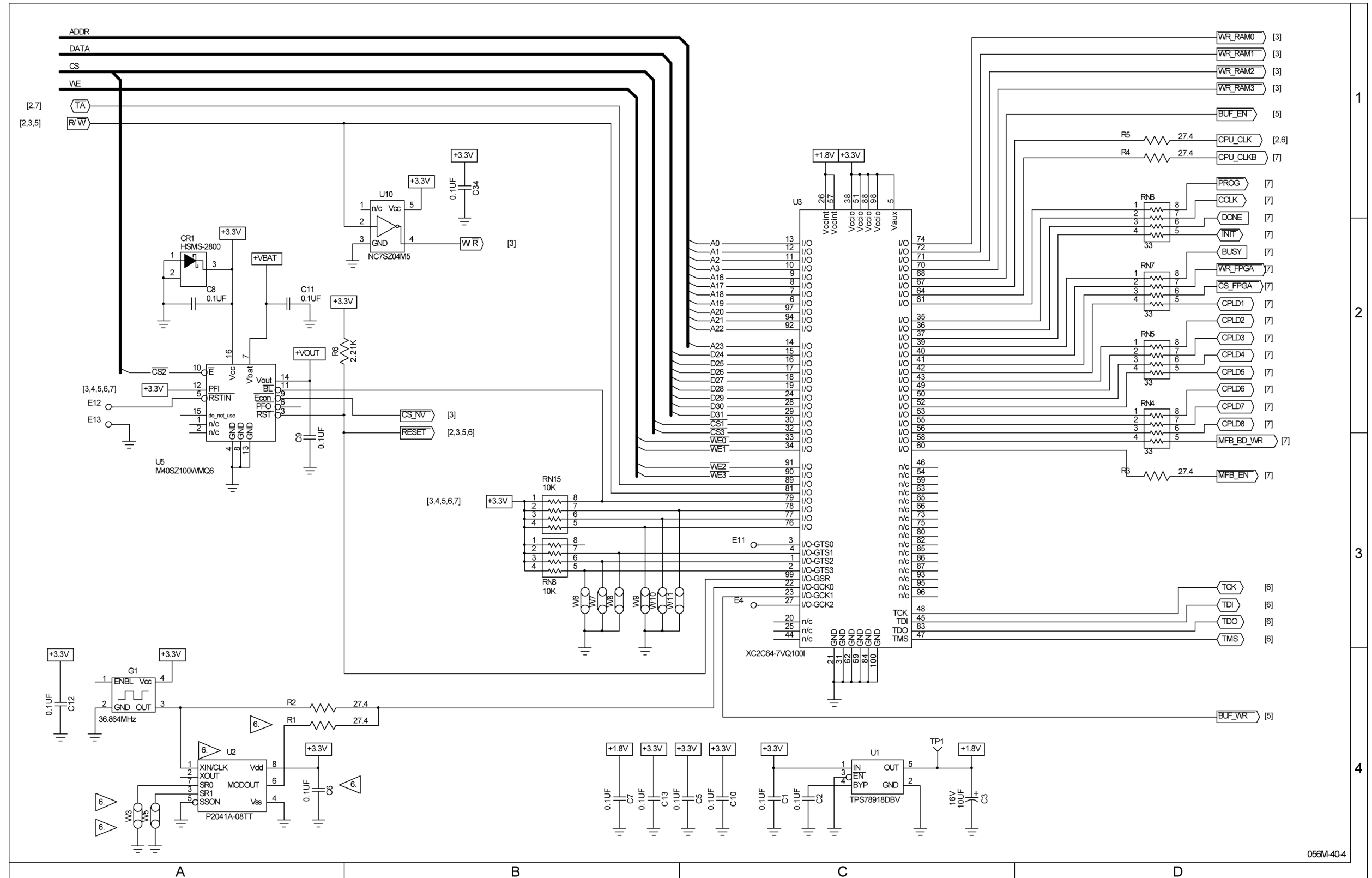
Figure 10 Processor PCB Assy (Sheet 4 of 10)
(Circuit Schematic - Sheet 2 of 8) (56A1A2A2)



056M-40-3

(0000-5630-200-B)

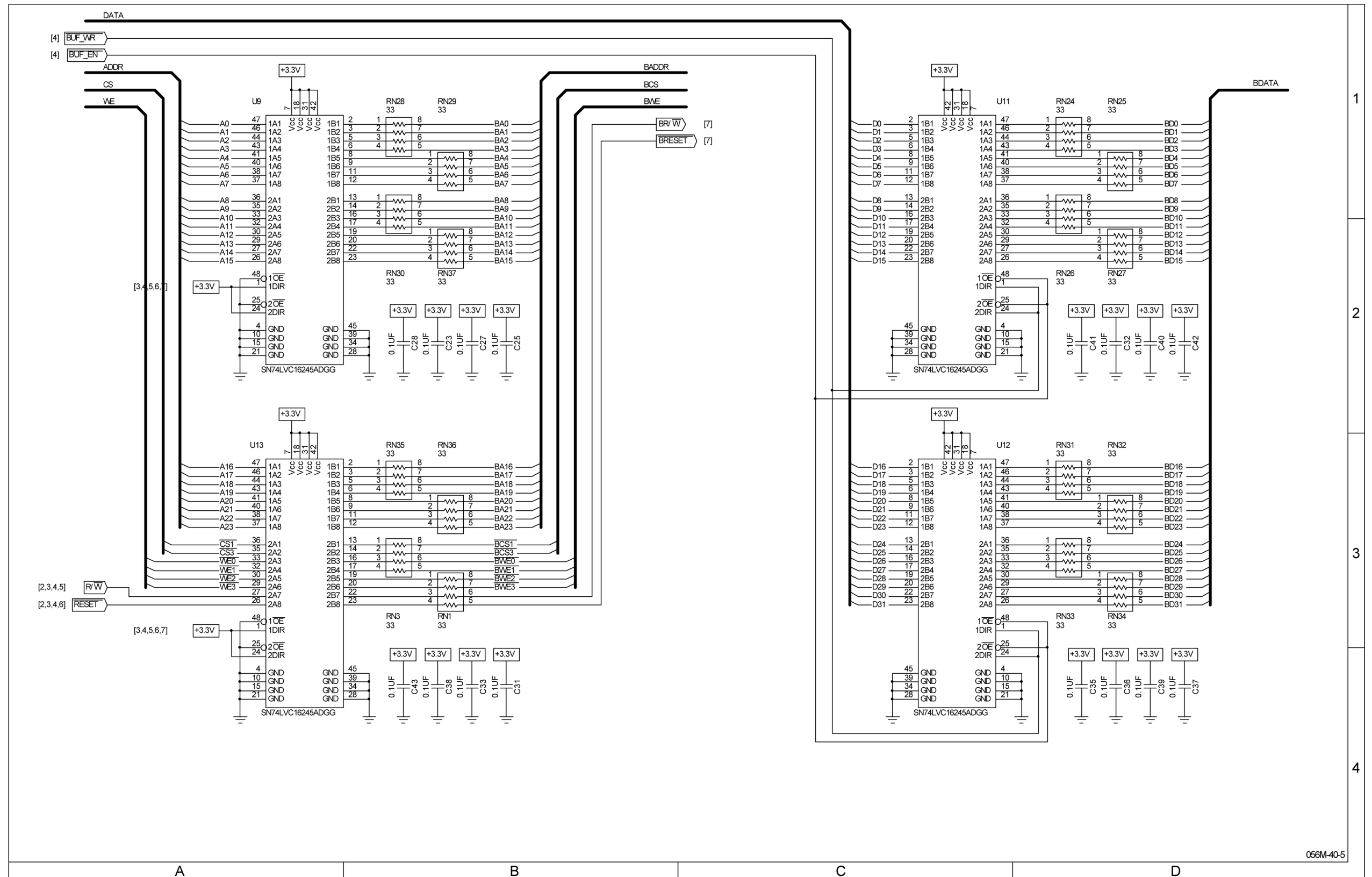
Figure 10 Processor PCB Assy (Sheet 5 of 10)
(Circuit Schematic - Sheet 3 of 8) (56A1A2A2)



056M-40-4

(0000-5630-200-B)

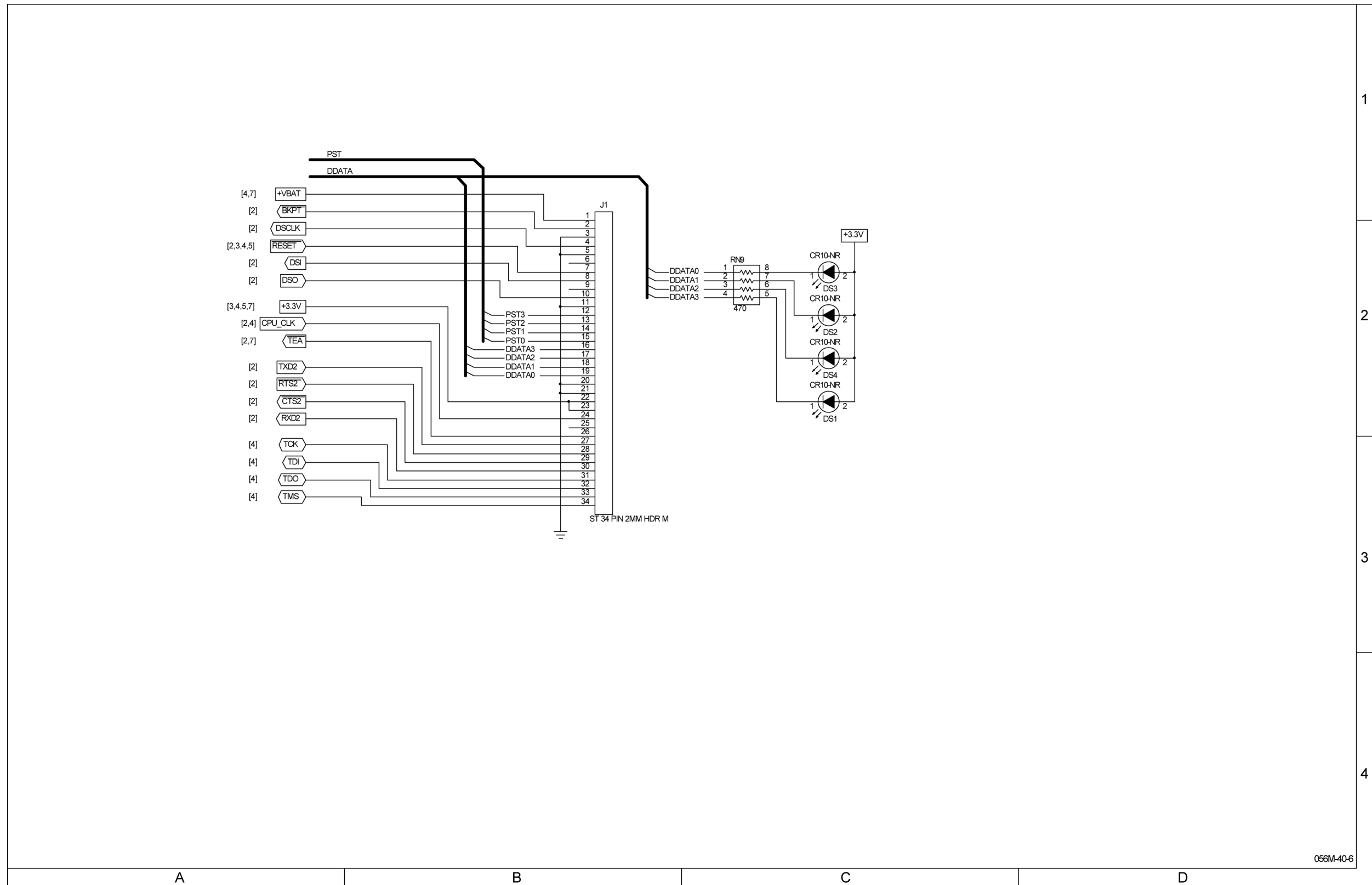
Figure 10 Processor PCB Assy (Sheet 6 of 10)
(Circuit Schematic - Sheet 4 of 8) (56A1A2A2)



056M-40-5

(0000-5630-200-B)

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



1

2

3

4

056M-40-6

A

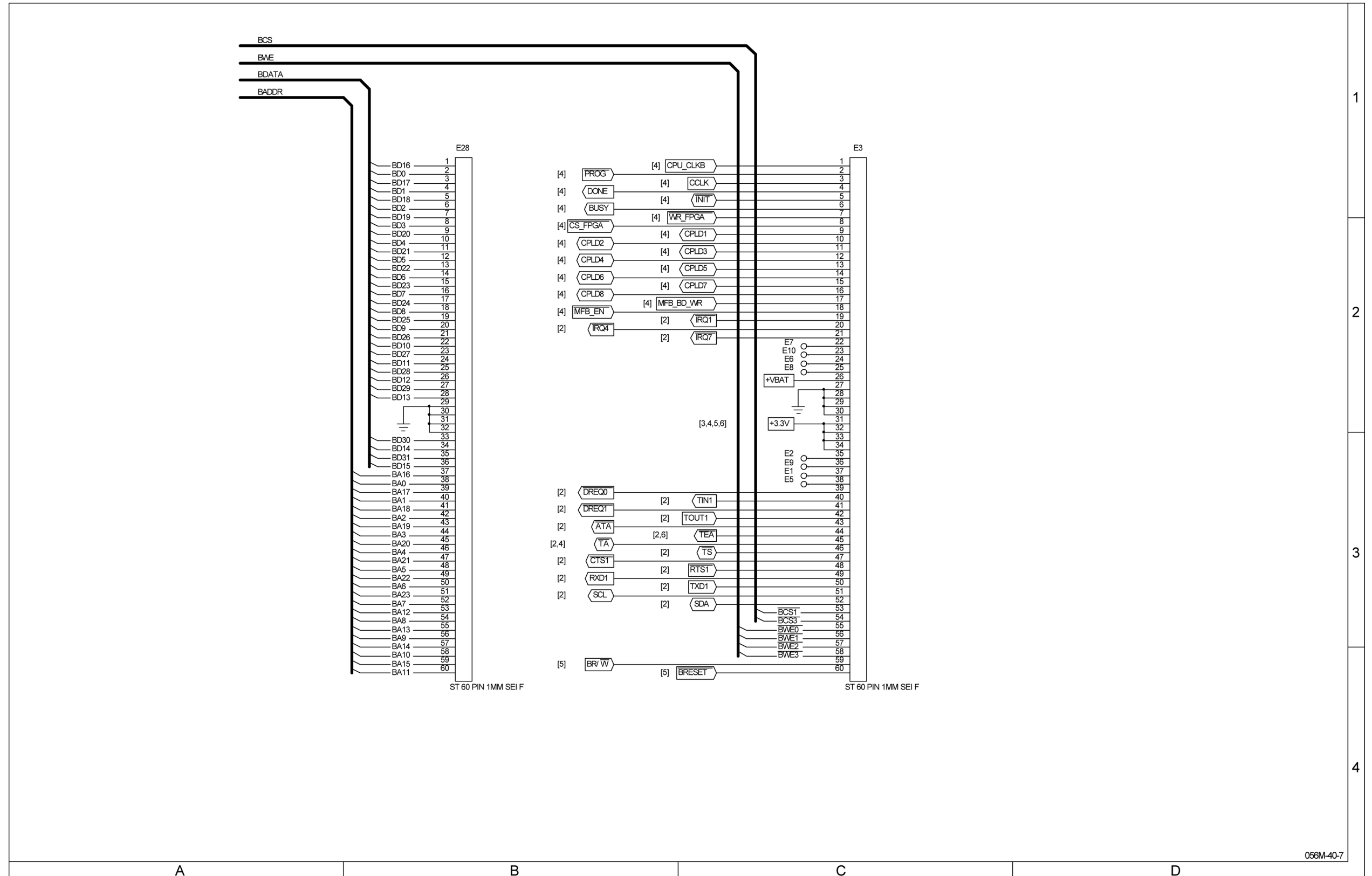
B

C

D

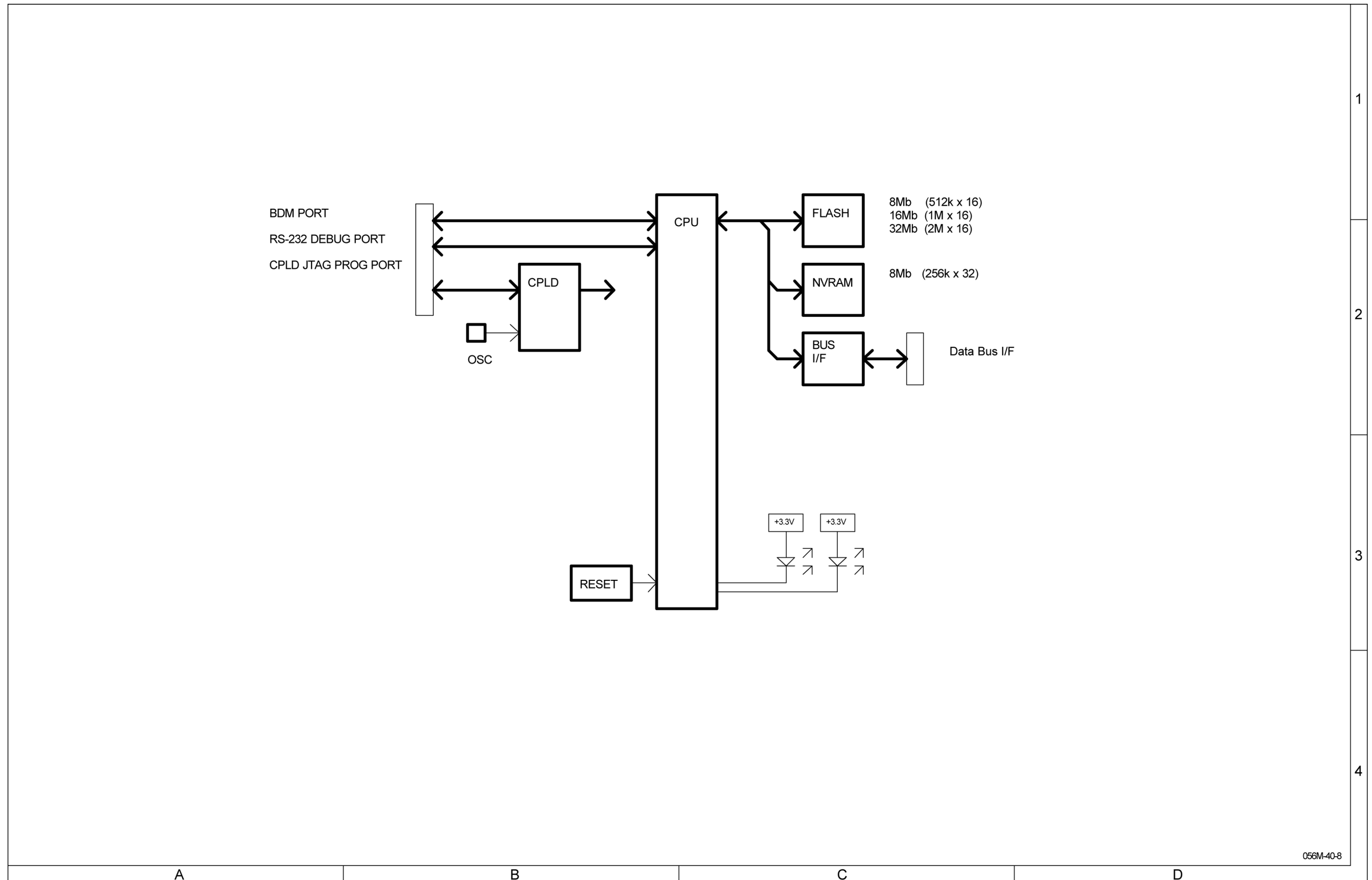
(0000-5630-200-B)

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



(0000-5630-200-B)

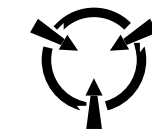
Figure 10 Processor PCB Assy (Sheet 9 of 10)
(Circuit Schematic - Sheet 7 of 8) (56A1A2A2)



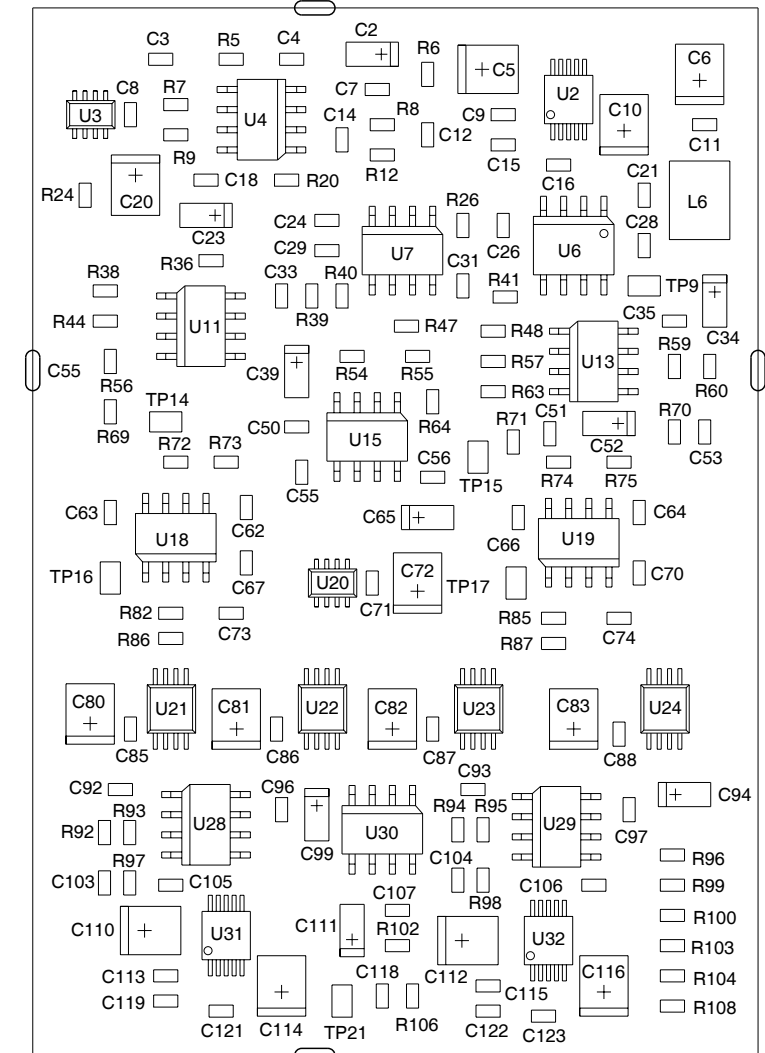
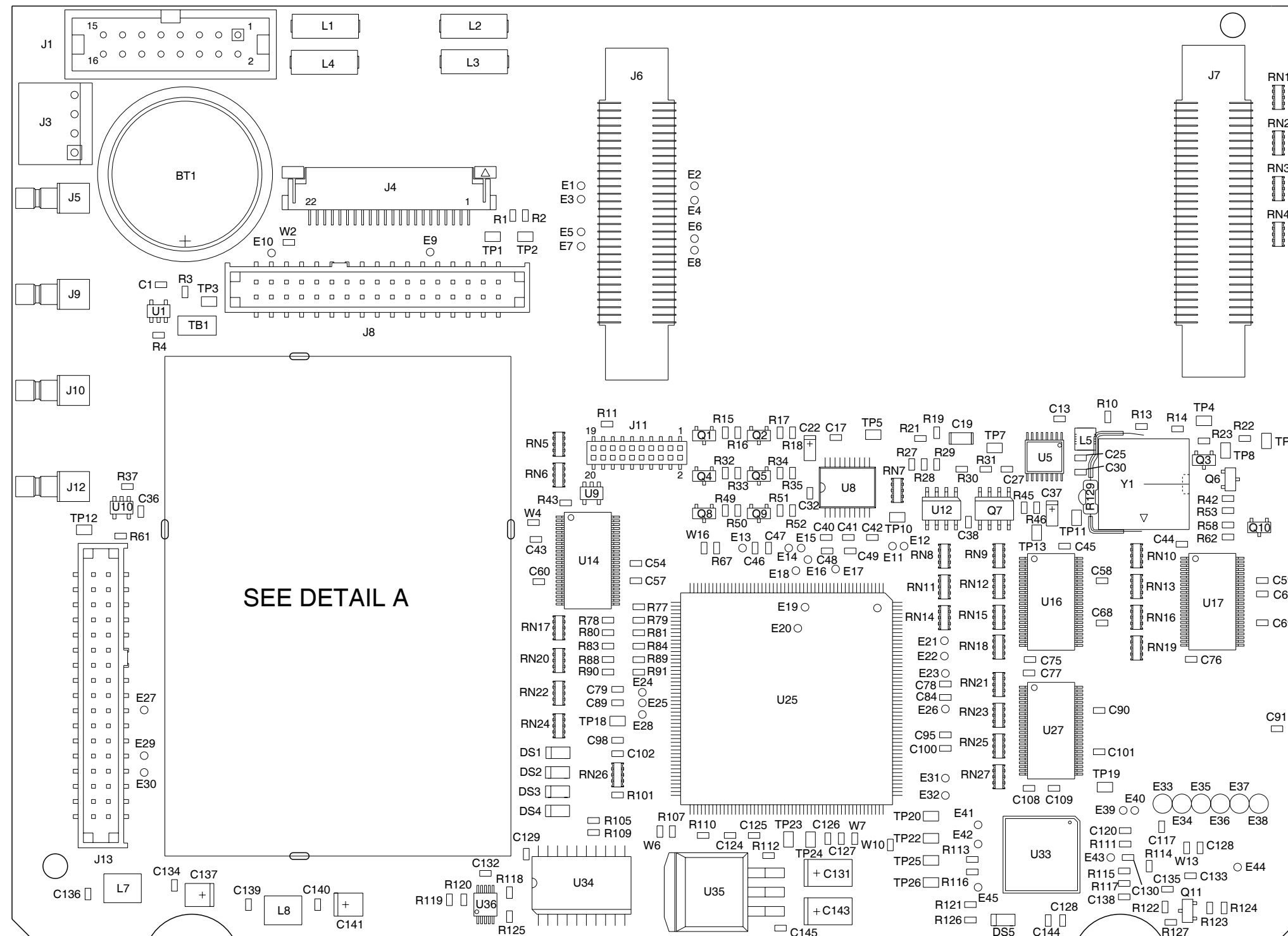
056M-40-8

(0000-5630-200-B)

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.

(7010-5630-300-B)

056M-31

Figure 11 Multi-Function PCB Assy (Sheet 1 of 12)
(56A1A2A3)

1



CAUTION:

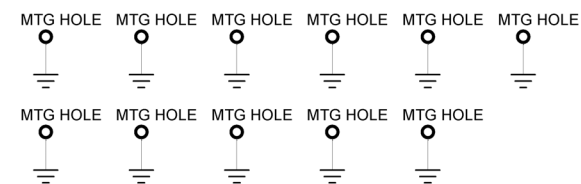
CONTAINS PARTS AND ASSEMBLIES SUSCEPTIBLE TO DAMAGE BY ELECTROSTATIC DISCHARGE (ESD).

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. NOT USED.
5. NOT USED.
6. COMPONENT(S) NOT INSTALLED.
7. NOT USED.

2

3



4

056M-36-1

A

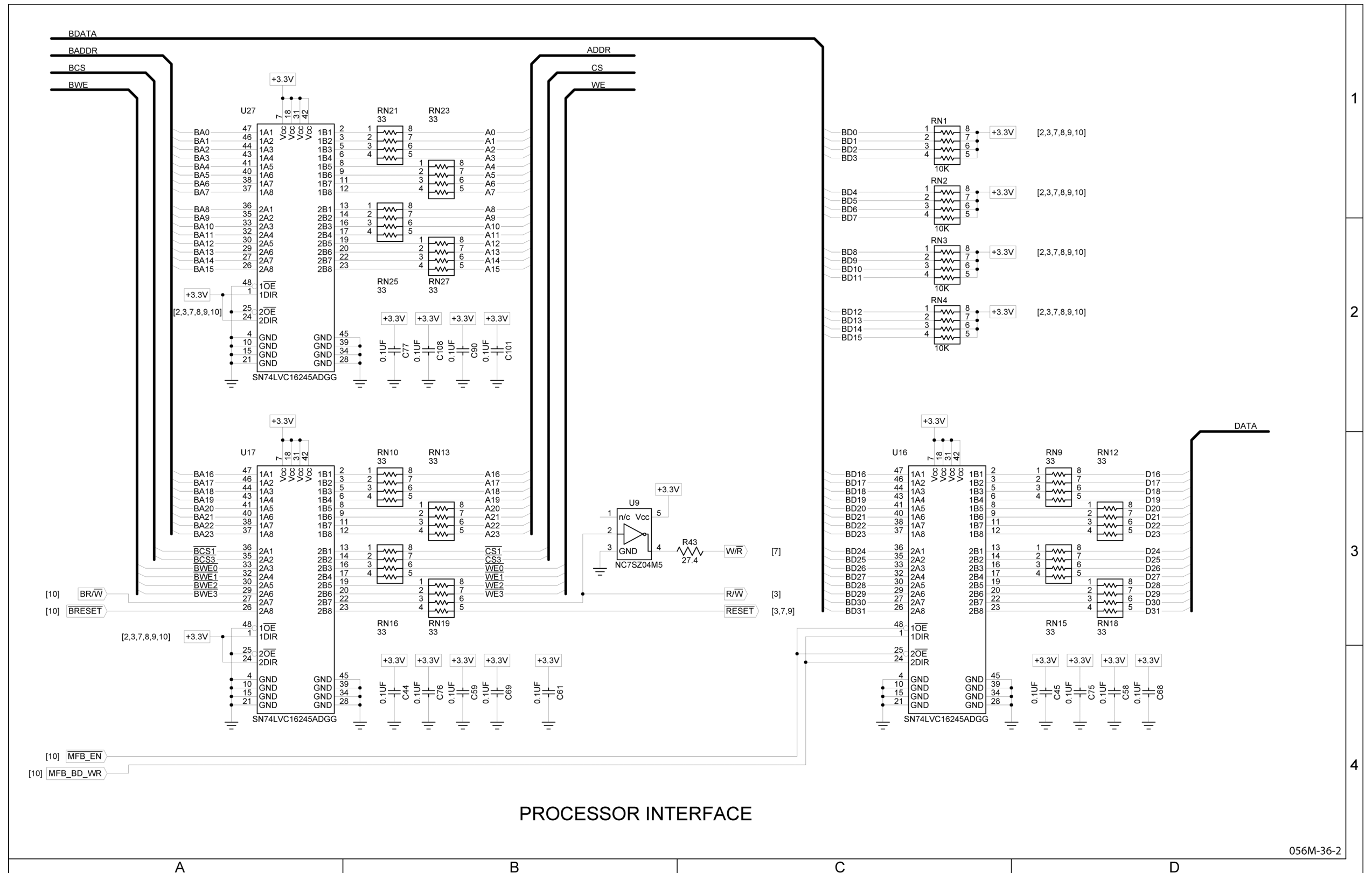
B

C

D

(0000-5630-300-C)

Figure 11 Multi-Function PCB Assy (Sheet 2 of 12)
(Circuit Schematic - Sheet 1 of 11) (56A1A2A3)

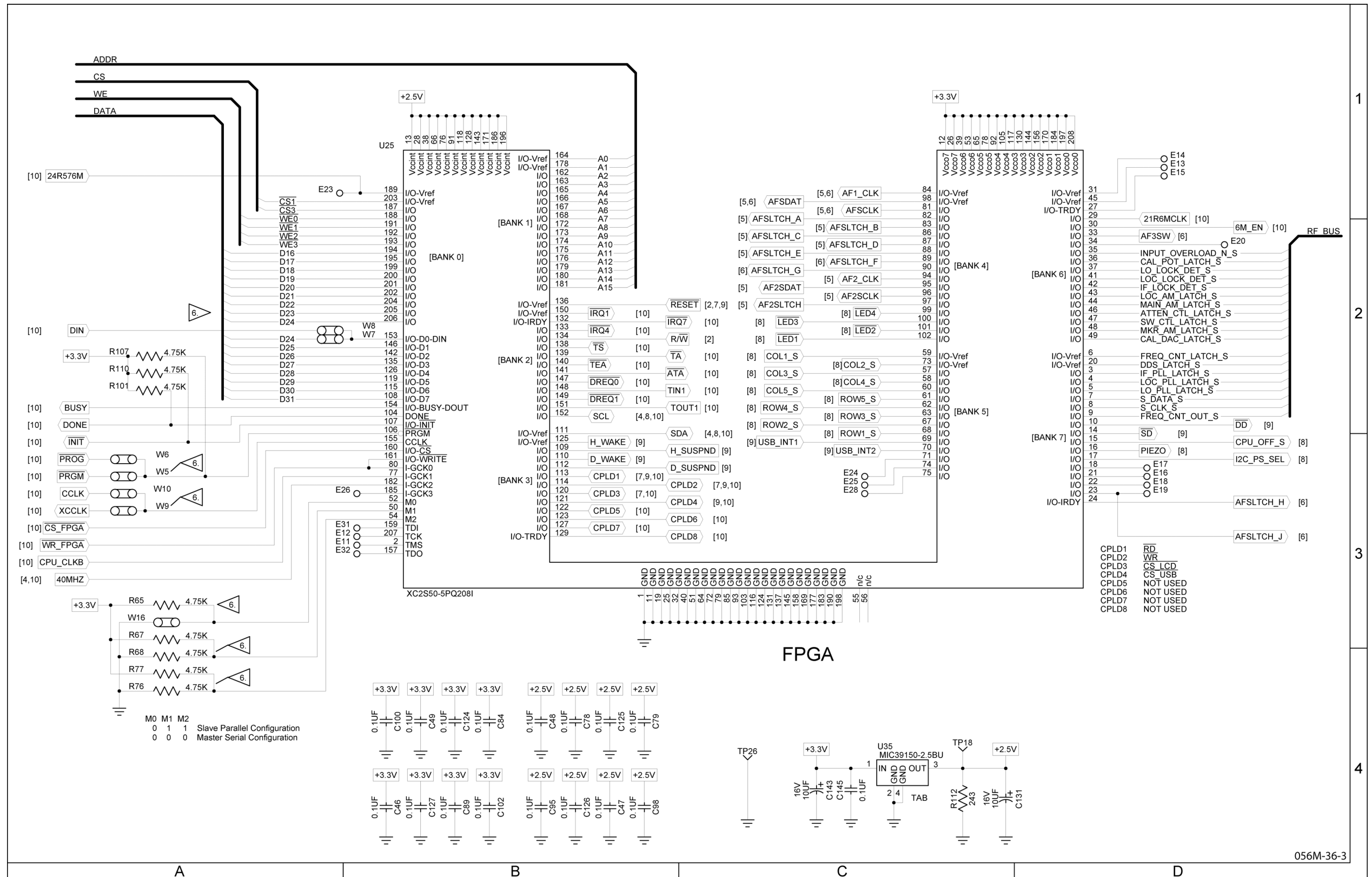


PROCESSOR INTERFACE

056M-36-2

Figure 11 Multi-Function PCB Assy (Sheet 3 of 12)
(Circuit Schematic - Sheet 2 of 11) (56A1A2A3)

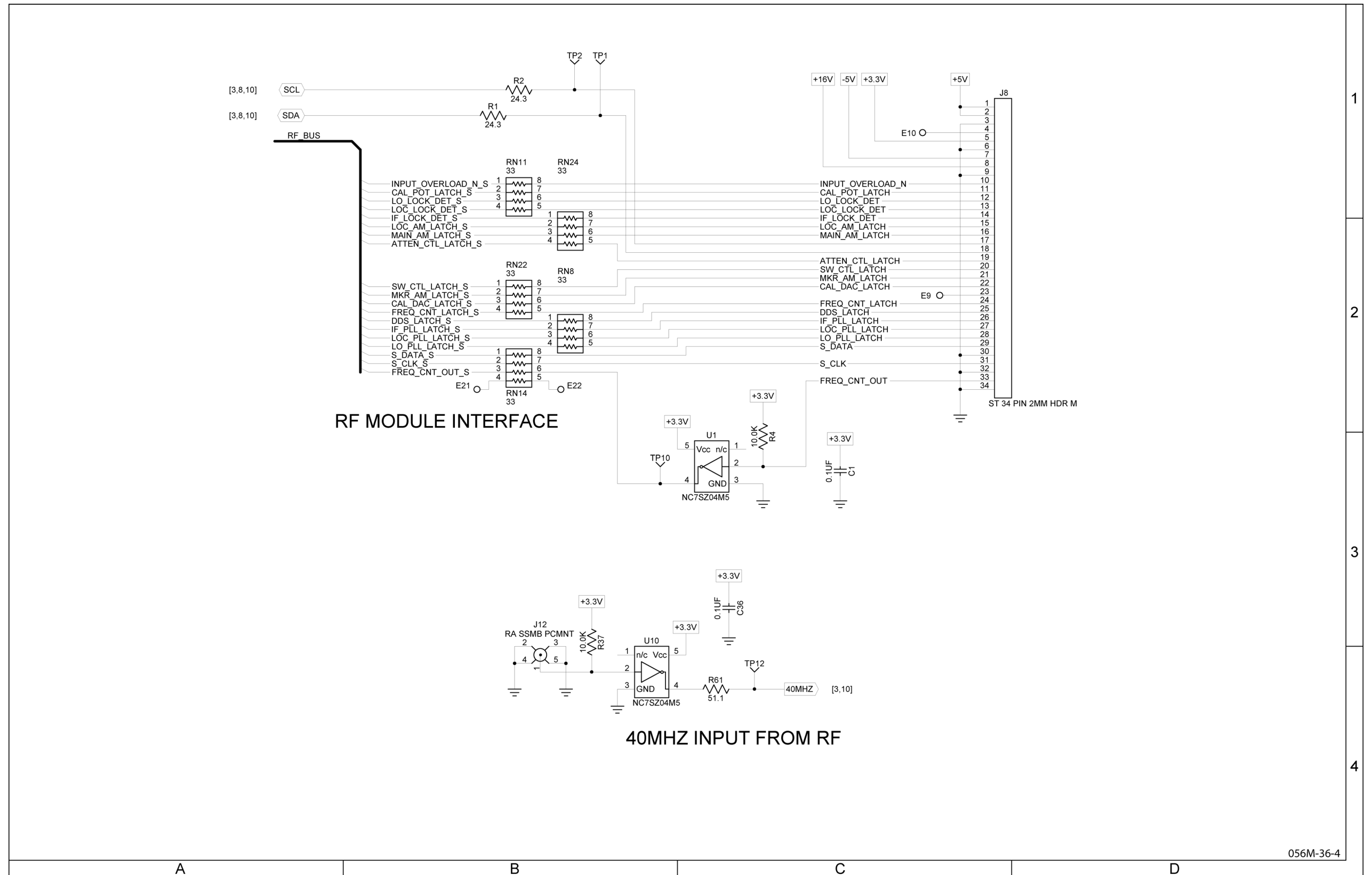
(0000-5630-300-C)



056M-36-3

Figure 11 Multi-Function PCB Assy (Sheet 4 of 12)
(Circuit Schematic - Sheet 3 of 11) (56A1A2A3)

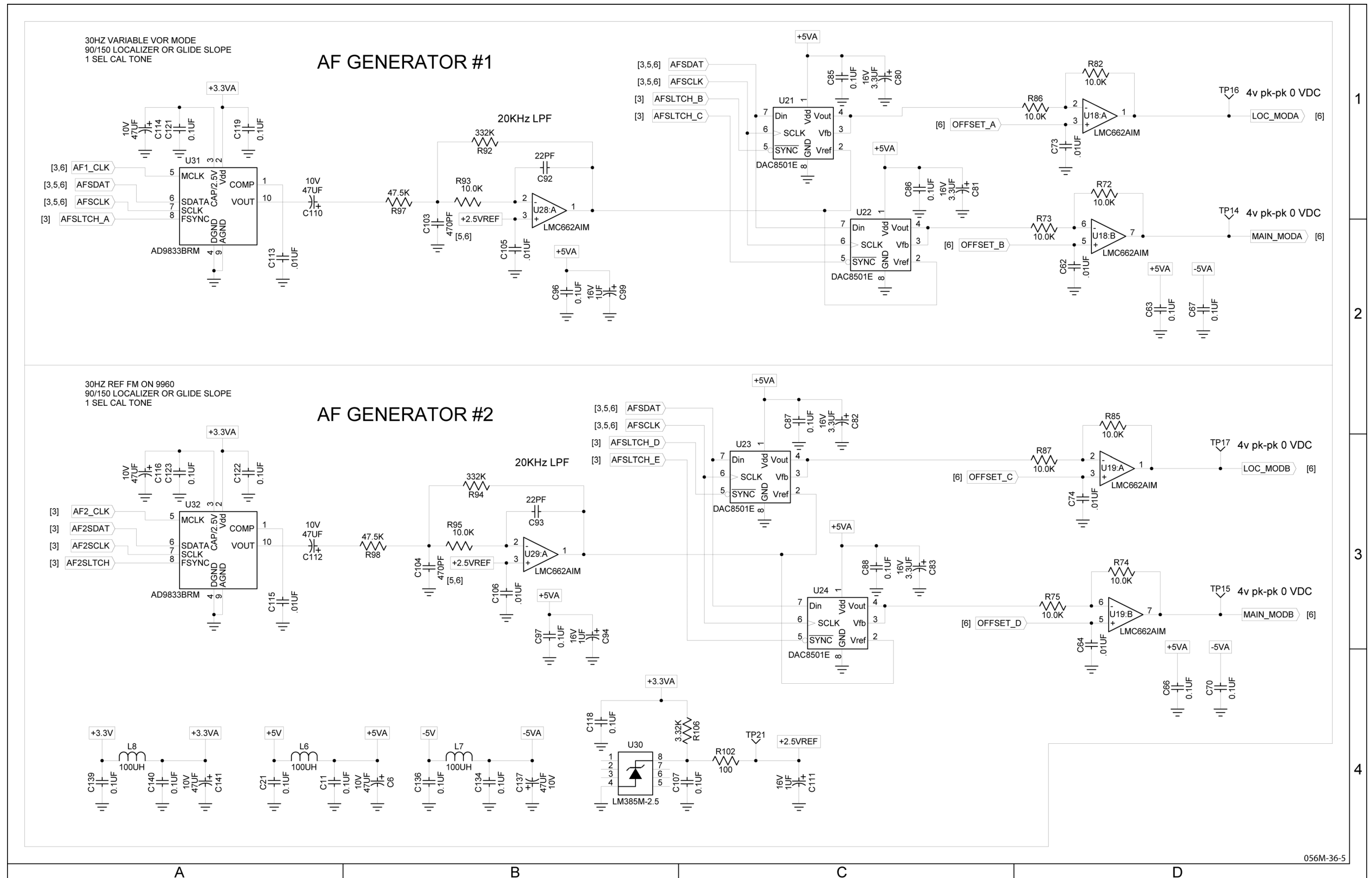
(0000-5630-300-C)



056M-36-4

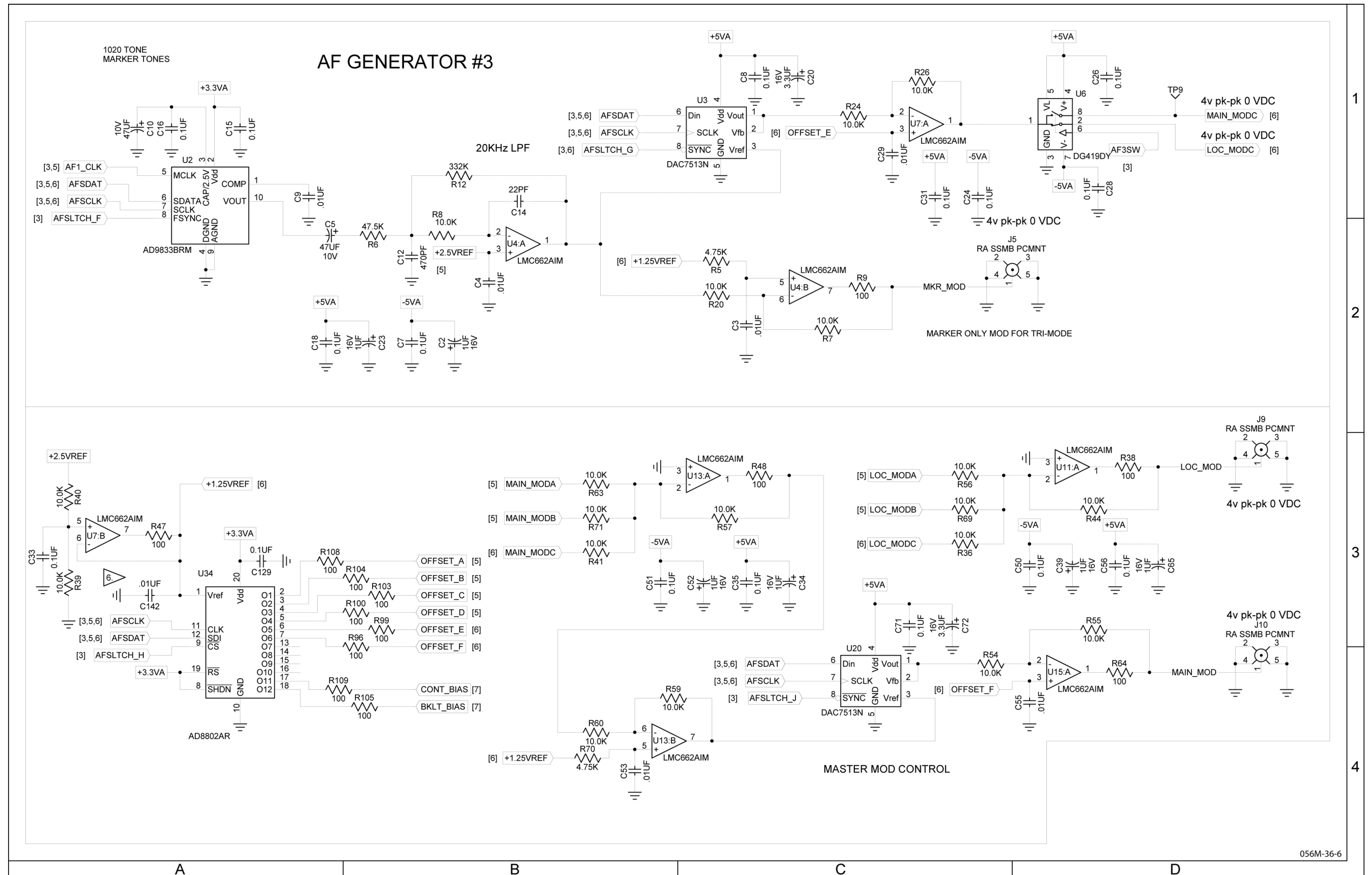
Figure 11 Multi-Function PCB Assy (Sheet 5 of 12)
(Circuit Schematic - Sheet 4 of 11) (56A1A2A3)

(0000-5630-300-C)



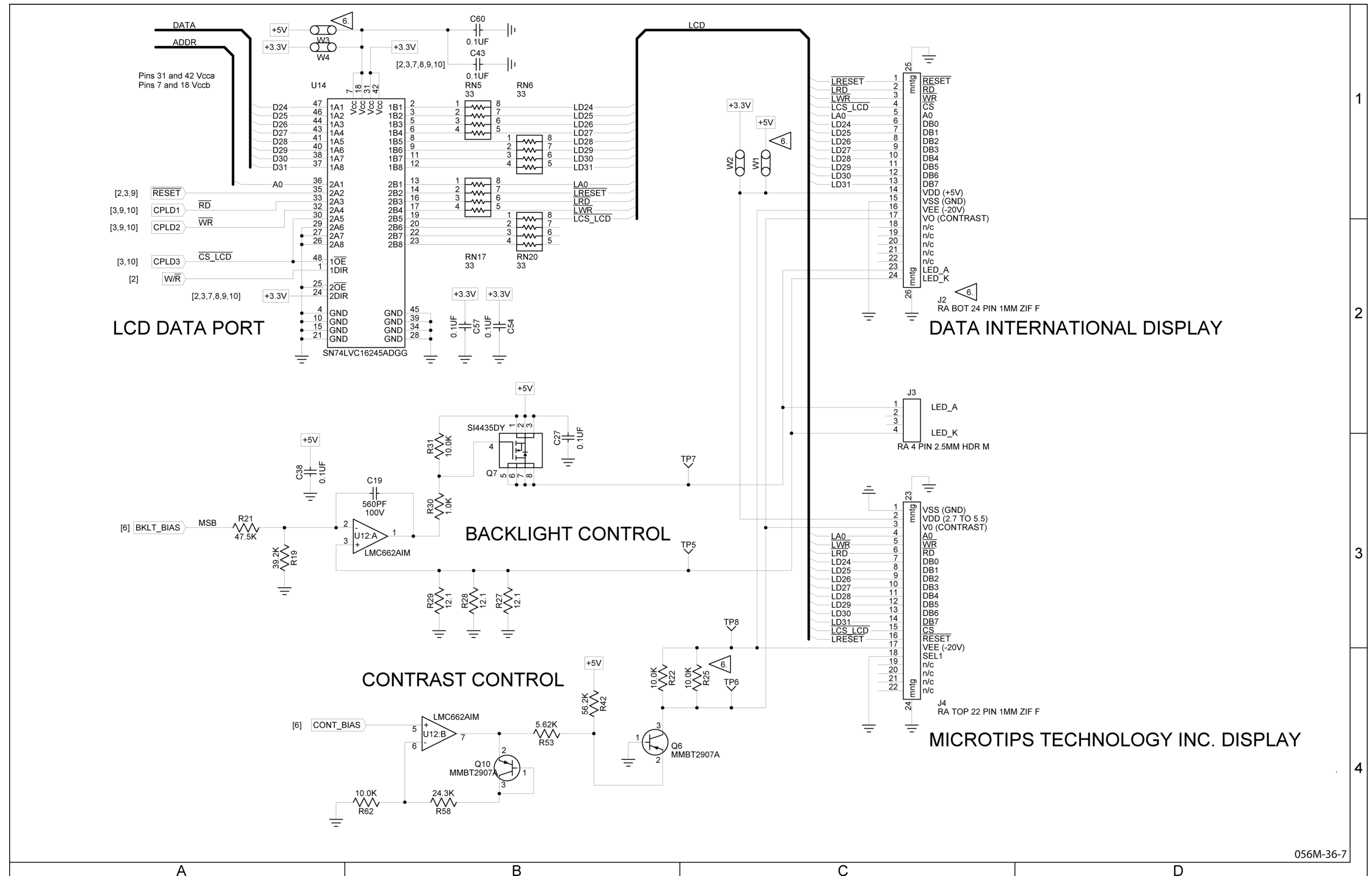
(0000-5630-300-C)

Figure 11 Multi-Function PCB Assy (Sheet 6 of 12)
(Circuit Schematic - Sheet 5 of 11) (56A1A2A3)



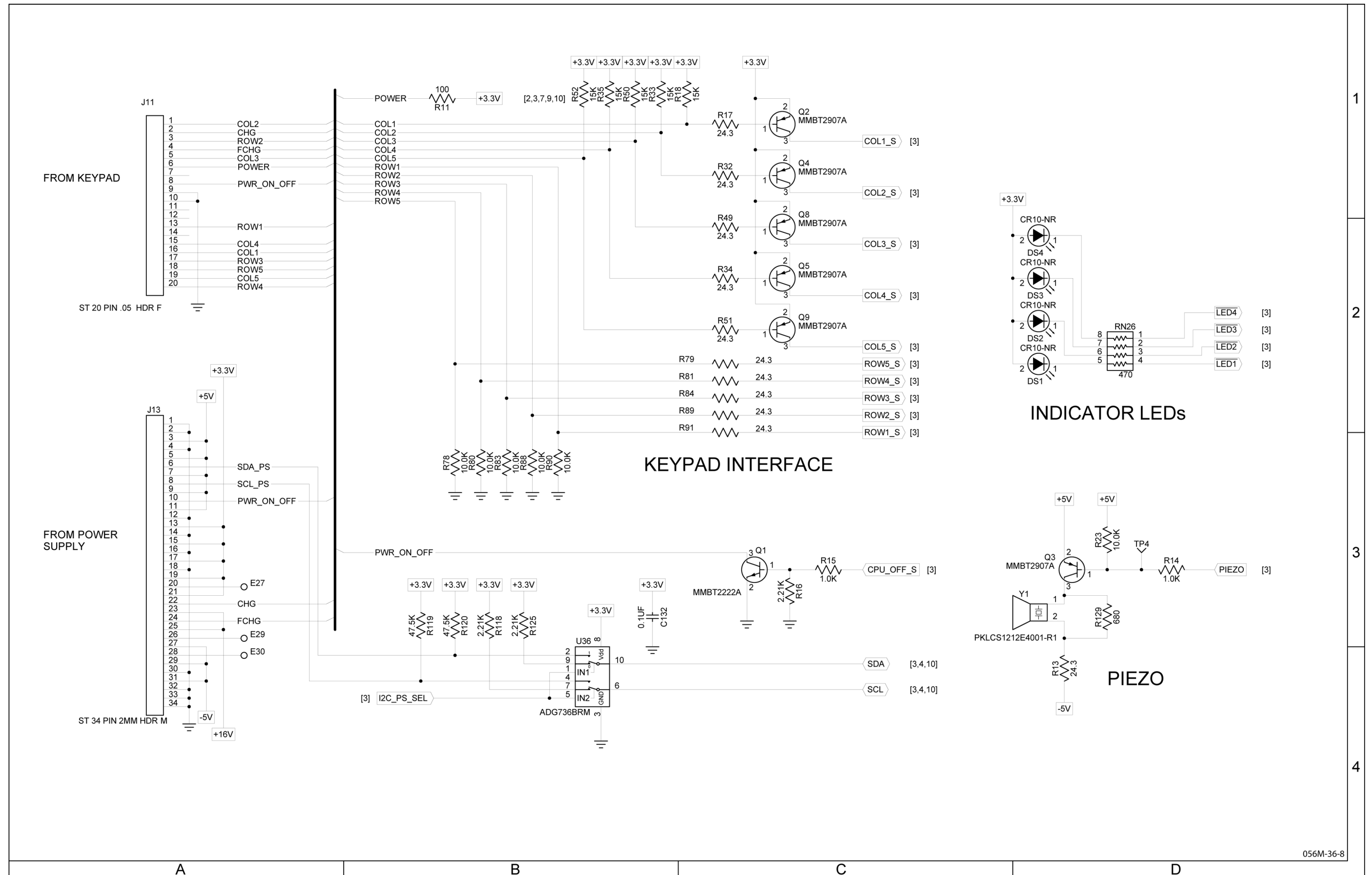
(0000-5630-300-C)

Figure 11 Multi-Function PCB Assy (Sheet 7 of 12)
(Circuit Schematic - Sheet 6 of 11) (56A1A2A3)



(0000-5630-300-C)

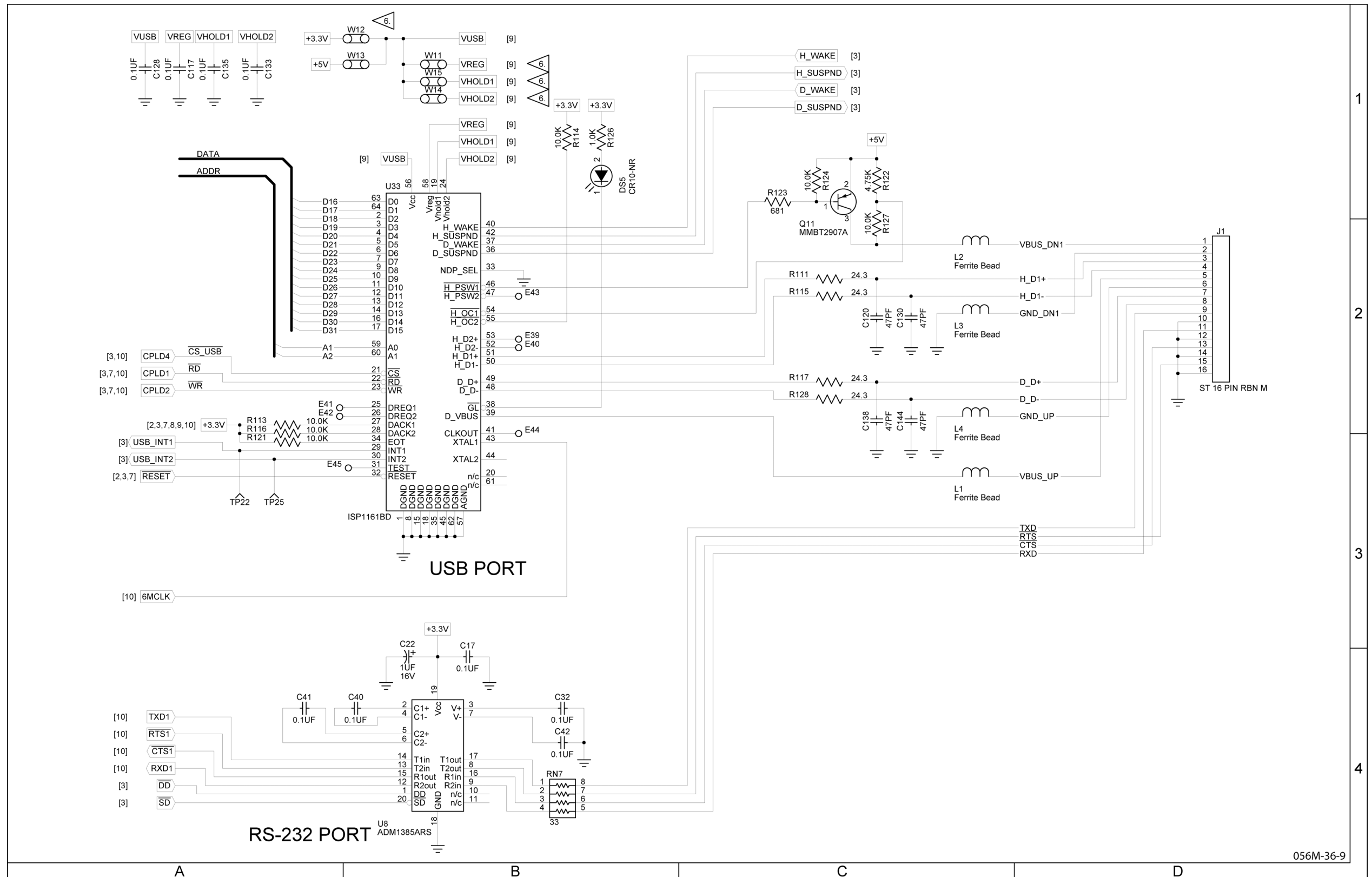
Figure 11 Multi-Function PCB Assy (Sheet 8 of 12)
(Circuit Schematic - Sheet 7 of 11) (56A1A2A3)



056M-36-8

Figure 11 Multi-Function PCB Assy (Sheet 9 of 12)
(Circuit Schematic - Sheet 8 of 11) (56A1A2A3)

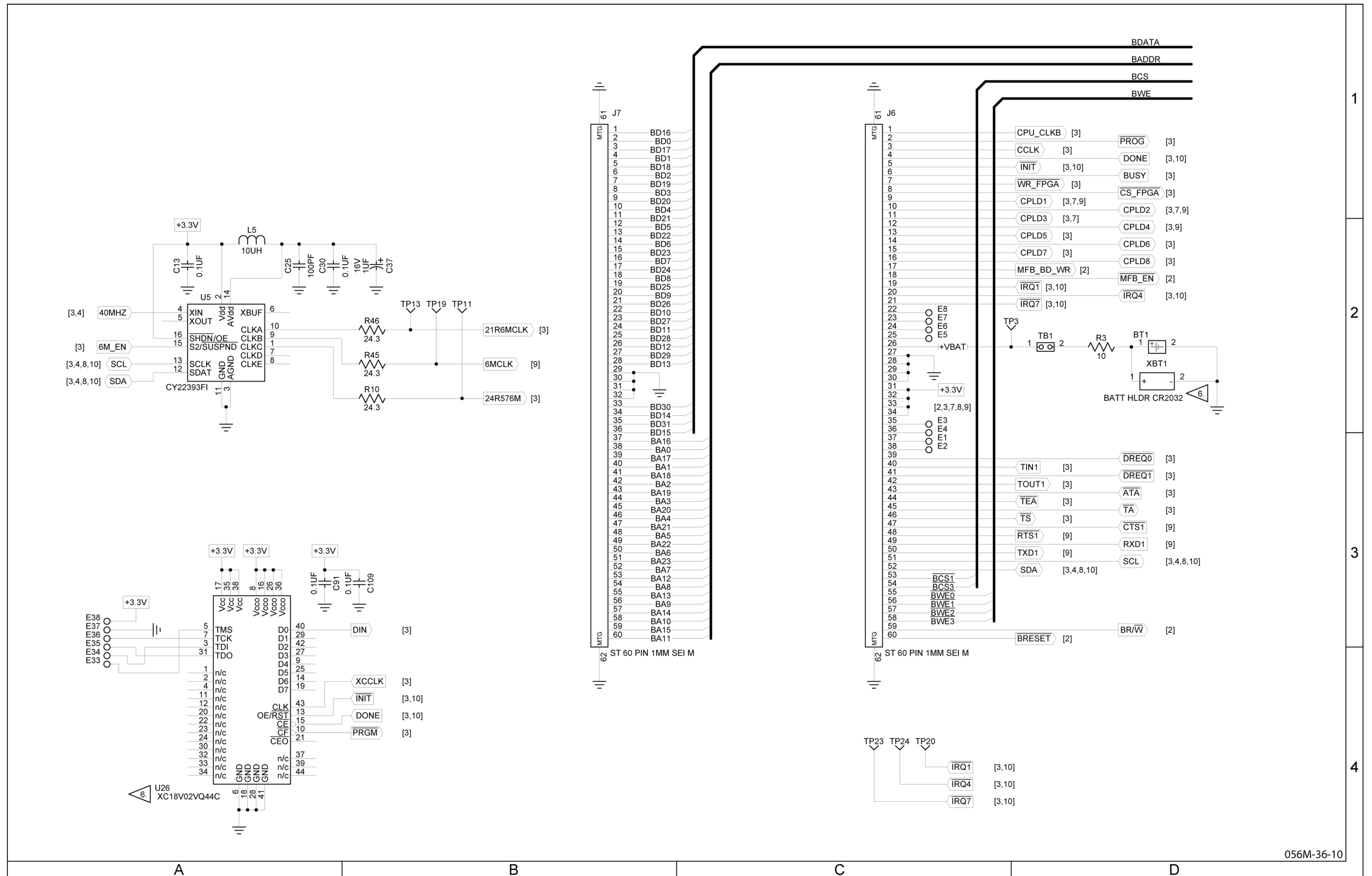
(0000-5630-300-C)



056M-36-9

Figure 11 Multi-Function PCB Assy (Sheet 10 of 12)
(Circuit Schematic - Sheet 9 of 11) (56A1A2A3)

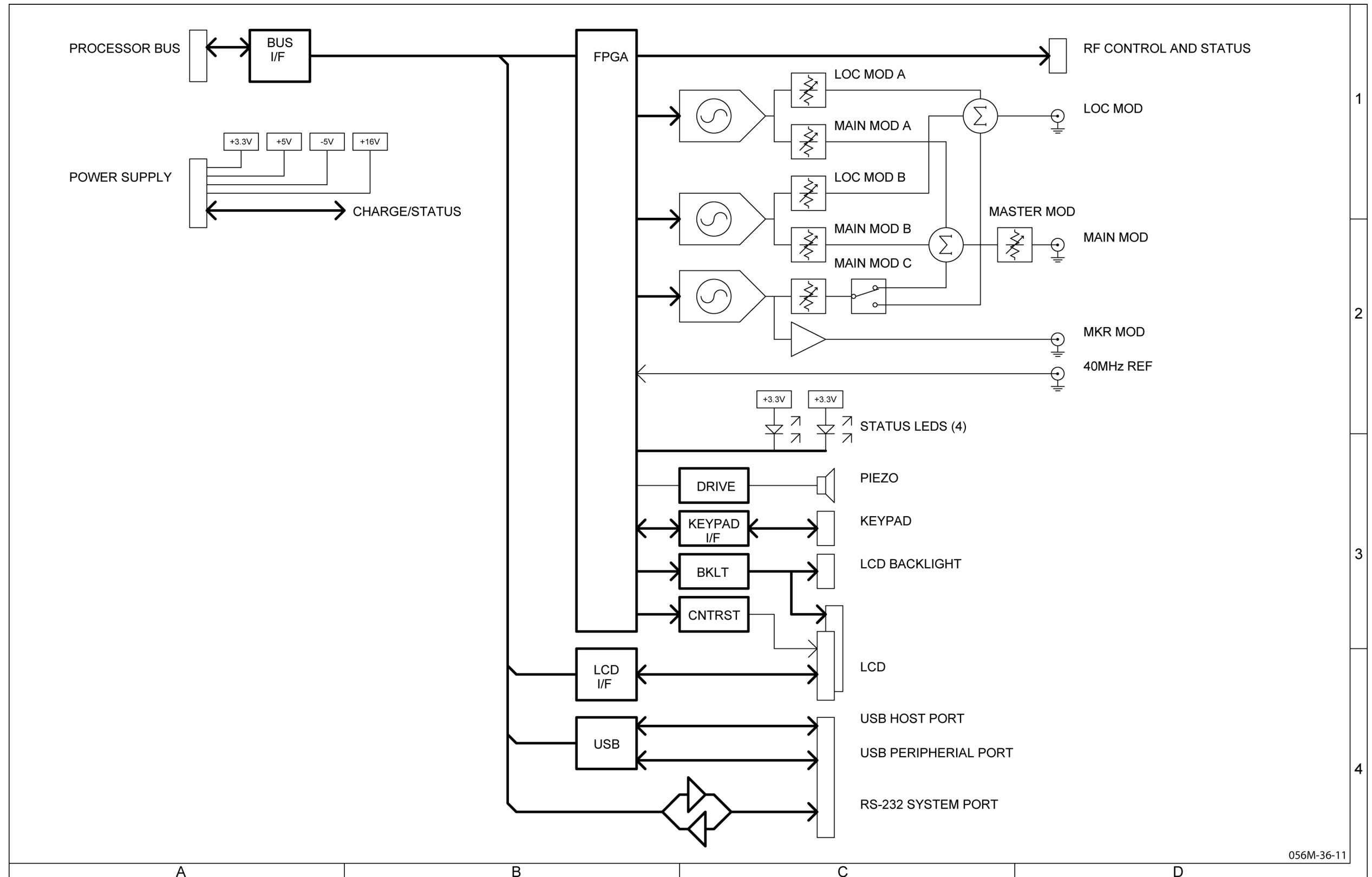
(0000-5630-300-C)



056M-36-10

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

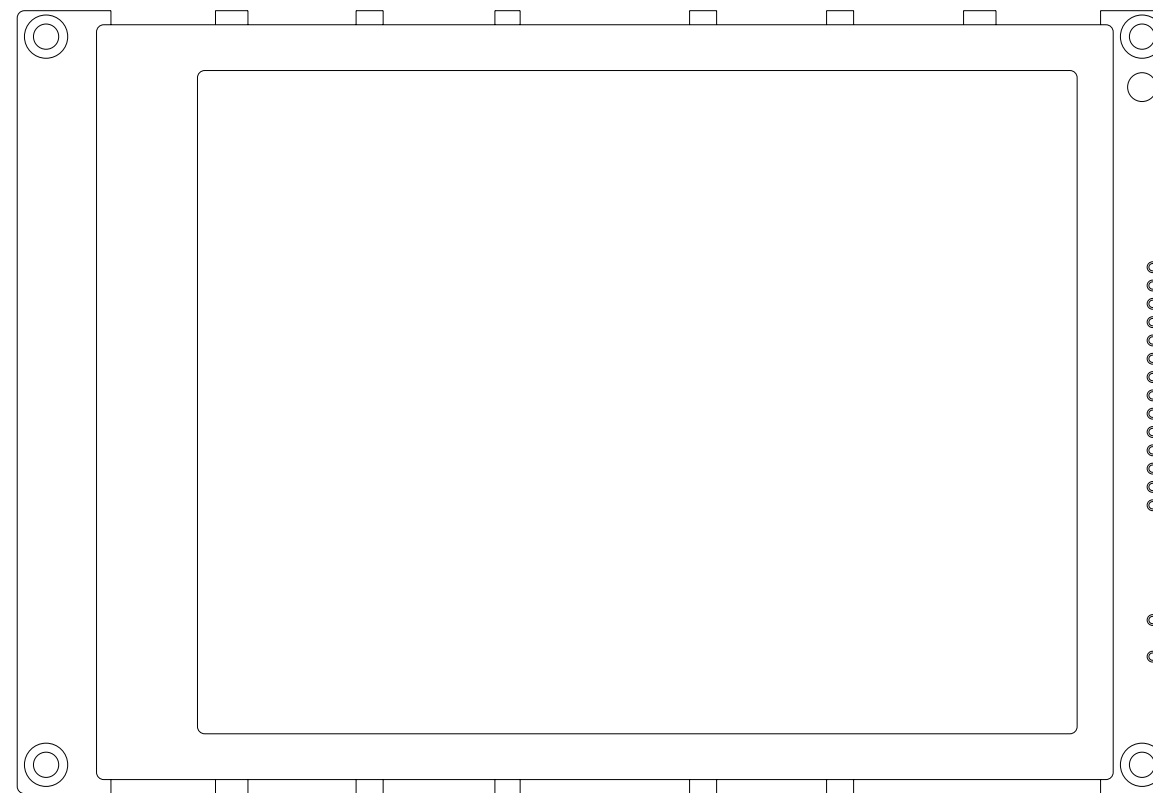
(0000-5630-300-C)



056M-36-11

(0000-5630-300-C)

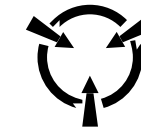
Figure 11 Multi-Function PCB Assy (Sheet 12 of 12)
(Circuit Schematic - Sheet 11 of 11) (56A1A2A3)



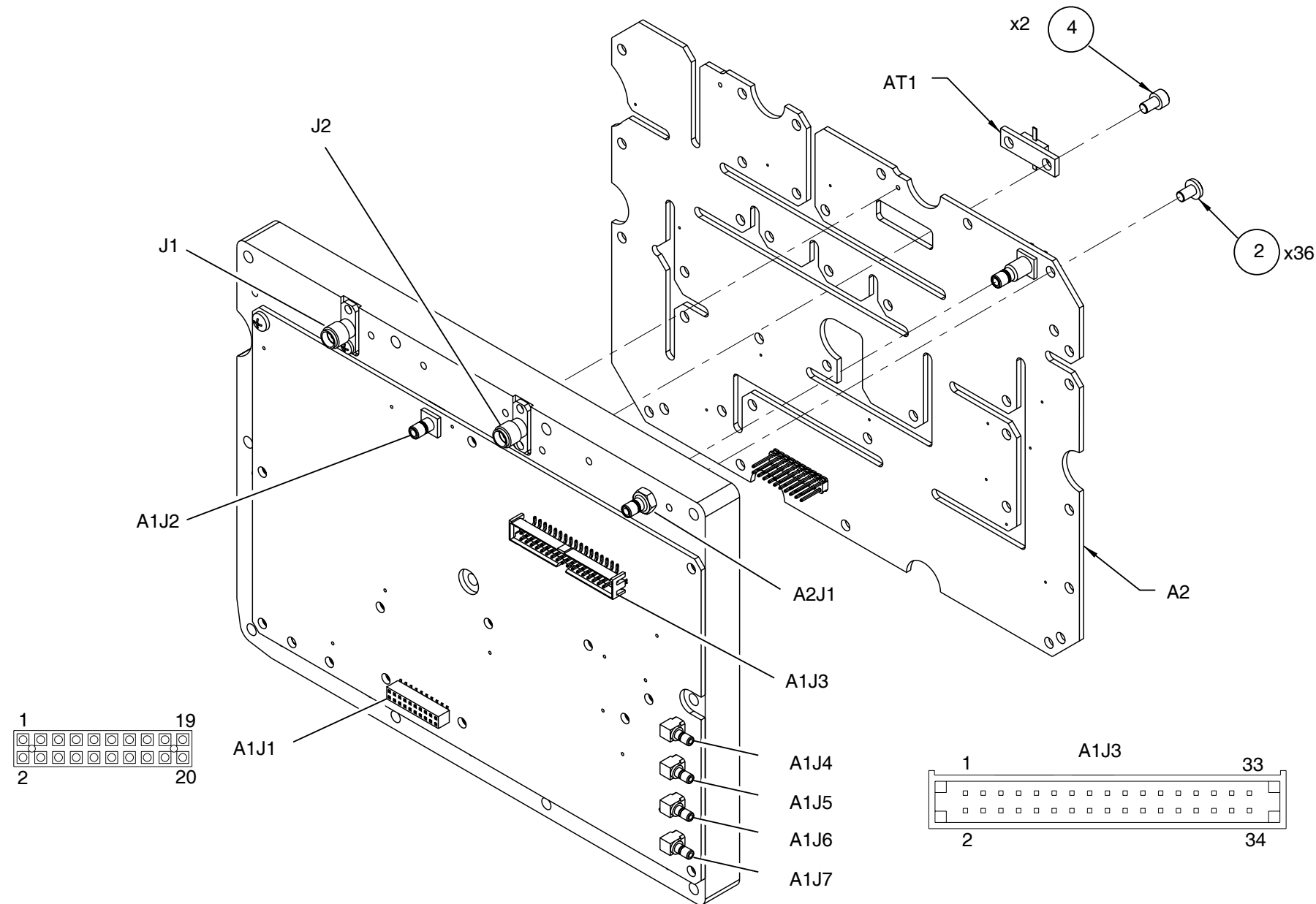
(7110-5600-000-A)

056M-09

Figure 12 LCD Assy
(56A1A2A4)



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

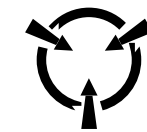


PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3.

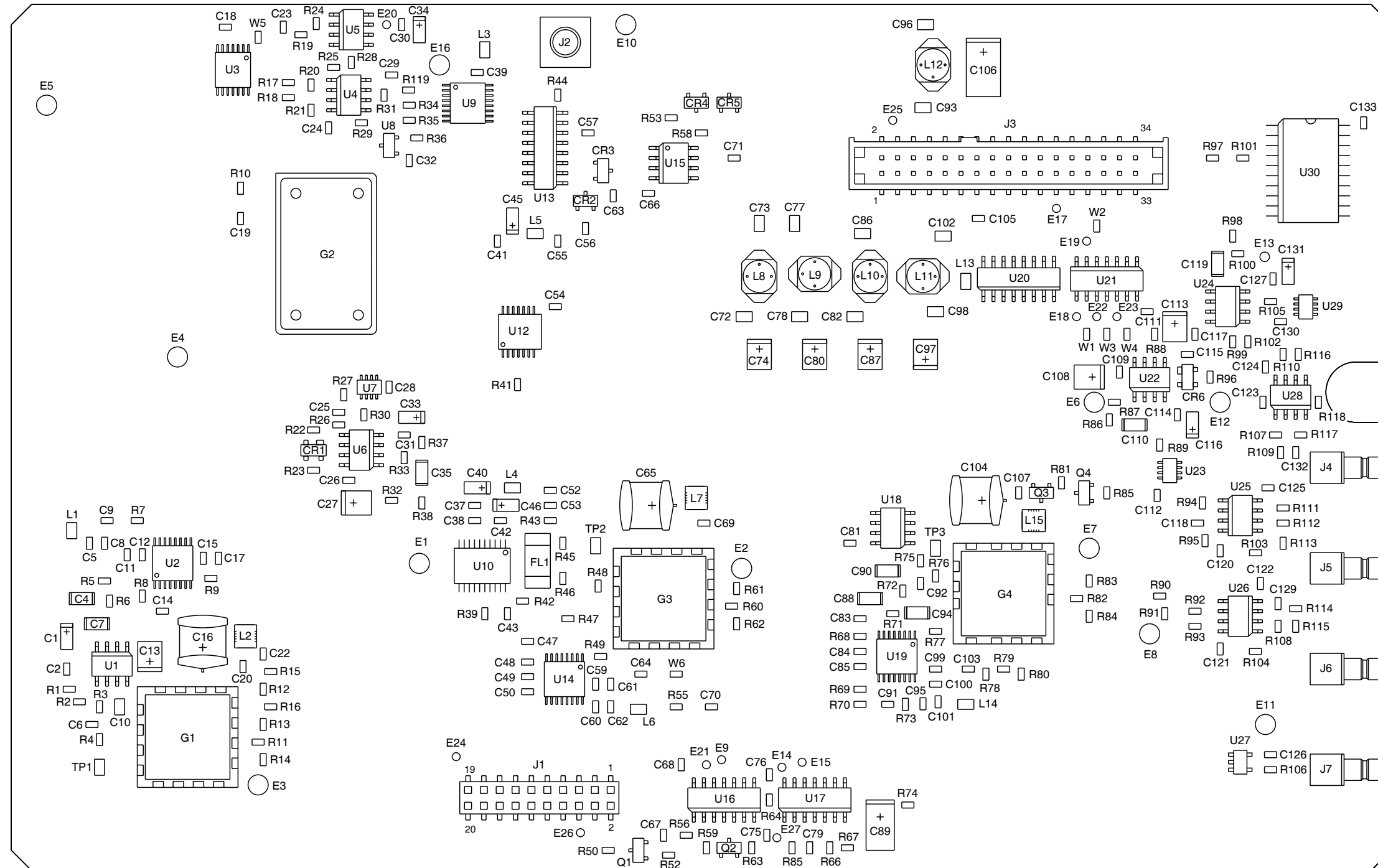
056M-014

(7005-5640-400-B)

Figure 13 RF Assy (Sheet 1 of 16)
(56A1A3)



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

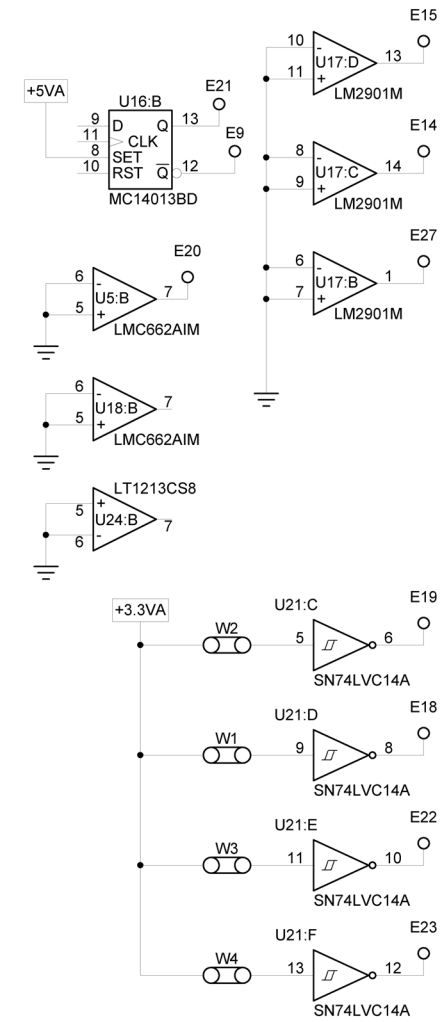



PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A1.

(7010-5630-400-F)



056M-33

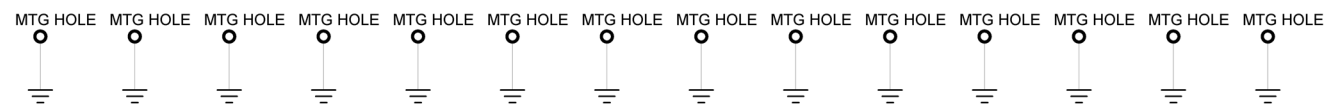
Figure 13 RF Assy (Sheet 2 of 16)
(RF Controller PCB Assy - Sheet 1 of 6) (56A1A3A1)



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

A

B

C

D

(0000-5630-400-F)

Figure 13 RF Assy (Sheet 3 of 16)
(RF Controller PCB Assy - Sheet 2 of 6) (56A1A3A1)
(Circuit Schematic - Sheet 1 of 5)

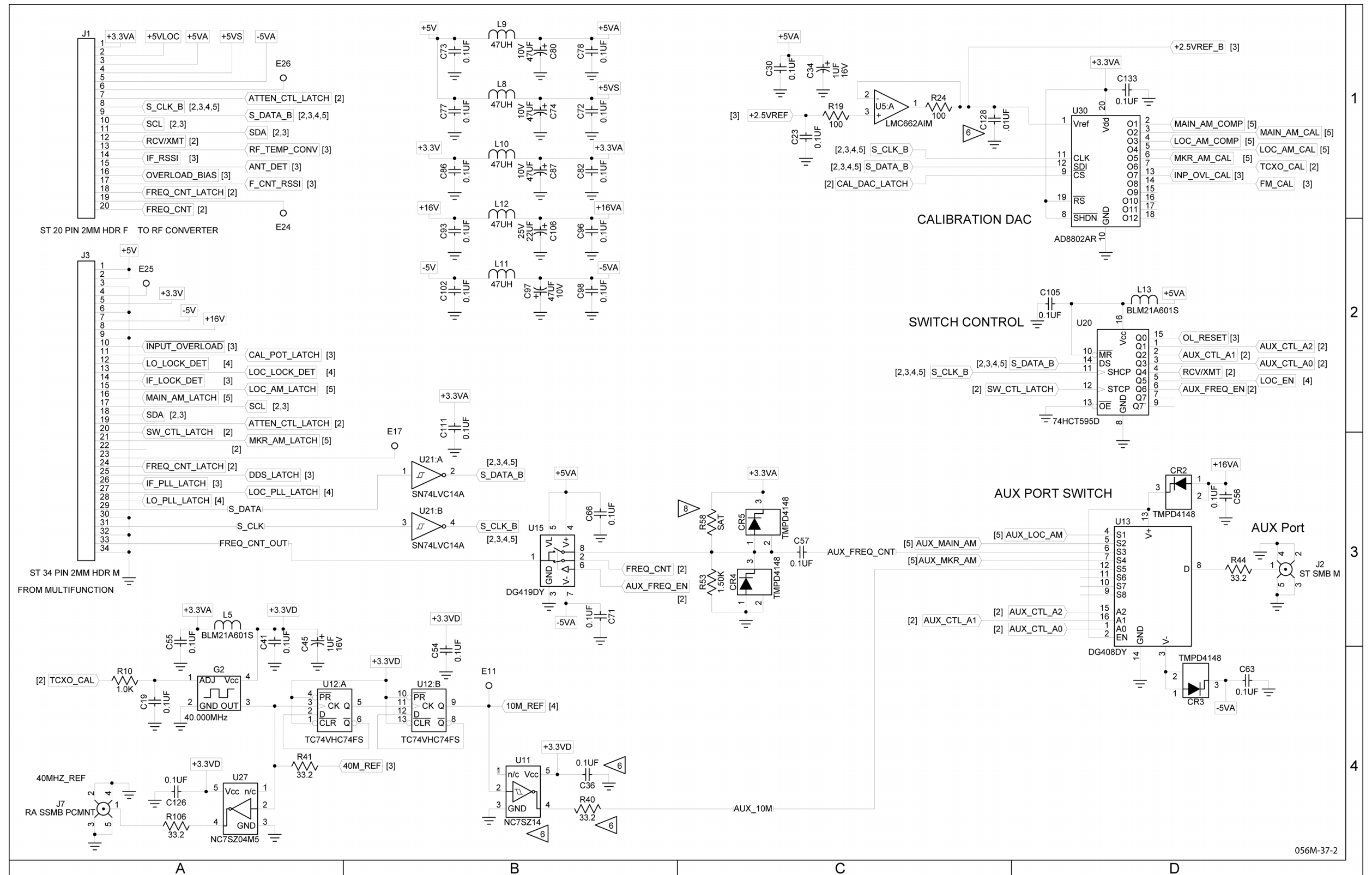
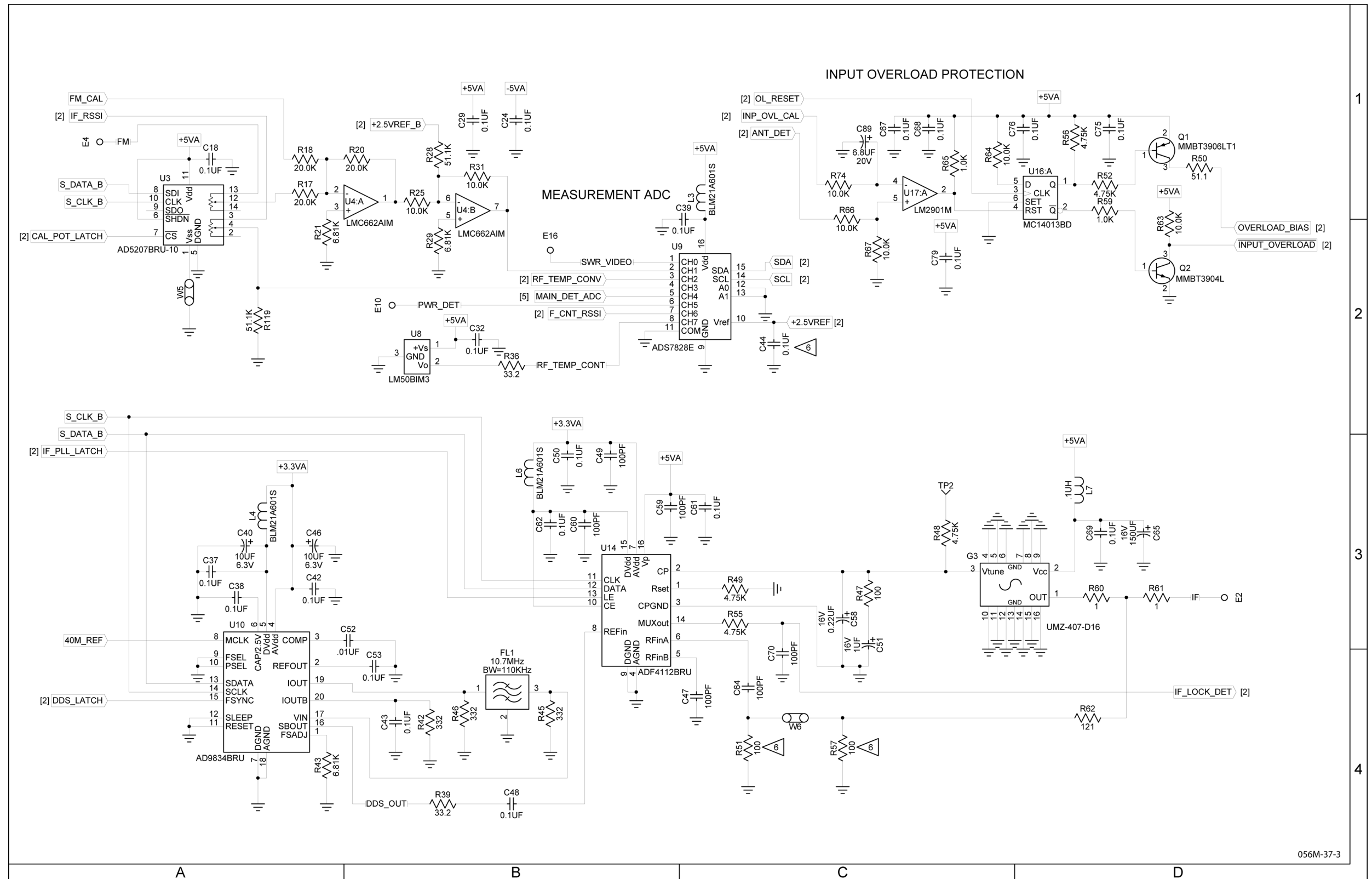


Figure 13 RF Assy (Sheet 4 of 16)
(RF Controller PCB Assy - Sheet 3 of 6) (56A1A3A1)
(Circuit Schematic - Sheet 2 of 5)

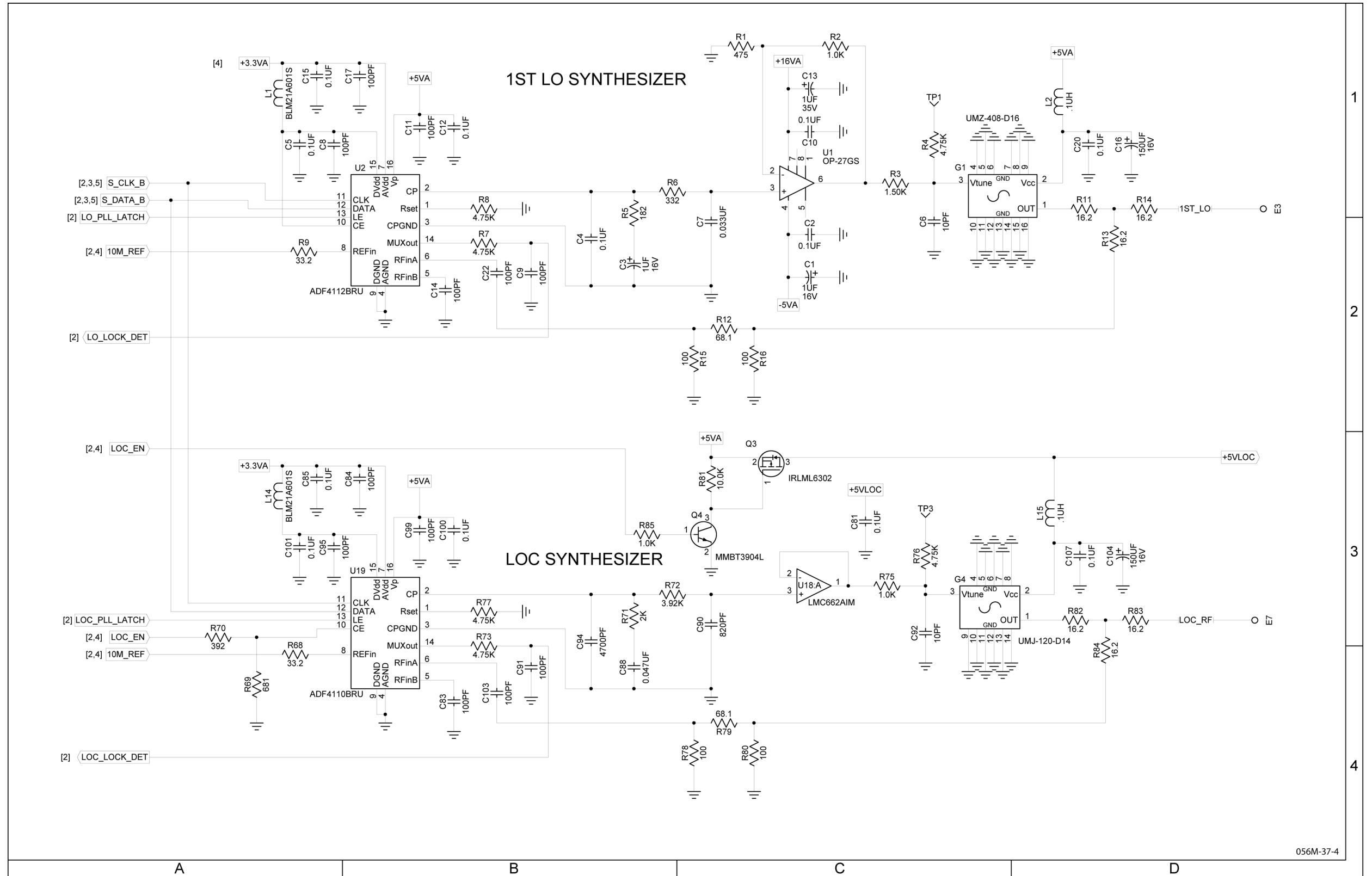
(0000-5630-400-F)



056M-37-3

Figure 13 RF Assy (Sheet 5 of 16)
(RF Controller PCB Assy - Sheet 4 of 6) (56A1A3A1)
(Circuit Schematic - Sheet 3 of 5)

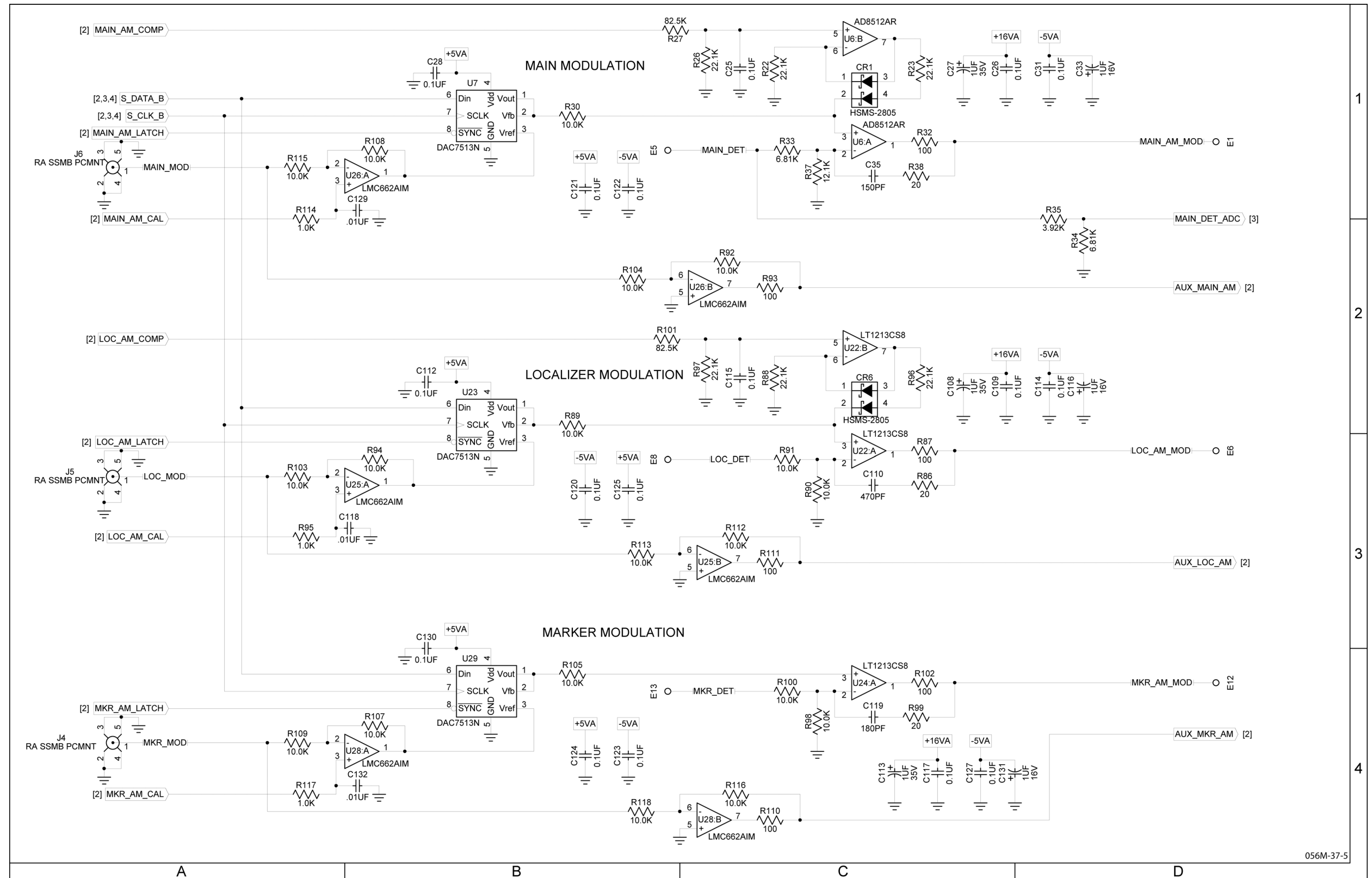
(0000-5630-400-F)



056M-37-4

Figure 13 RF Assy (Sheet 6 of 16)
(RF Controller PCB Assy - Sheet 5 of 6) (56A1A3A1)
(Circuit Schematic - Sheet 4 of 5)

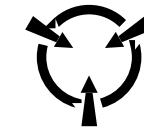
(0000-5630-400-F)



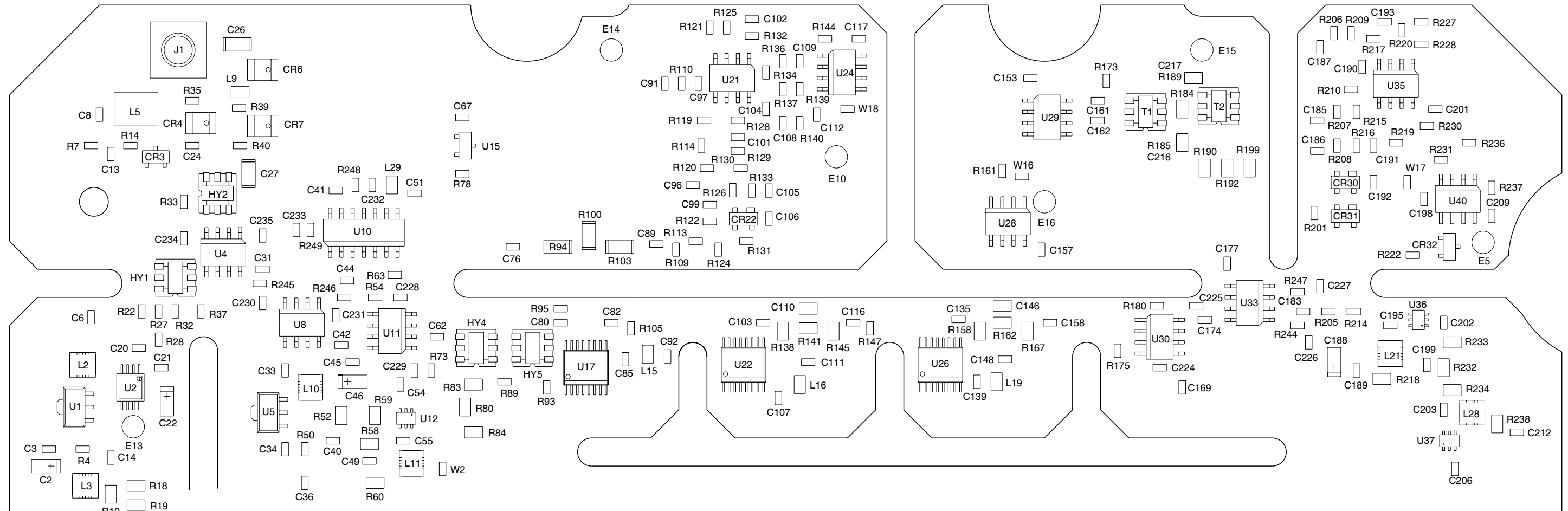
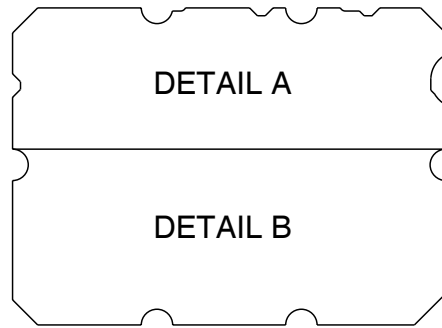
056M-37-5

Figure 13 RF Ass'y (Sheet 7 of 16)
(RF Controller PCB Assy - Sheet 6 of 6) (56A1A3A1)
(Circuit Schematic - Sheet 5 of 5)

(0000-5630-400-F)



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



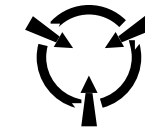
(DETAIL A)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A2.

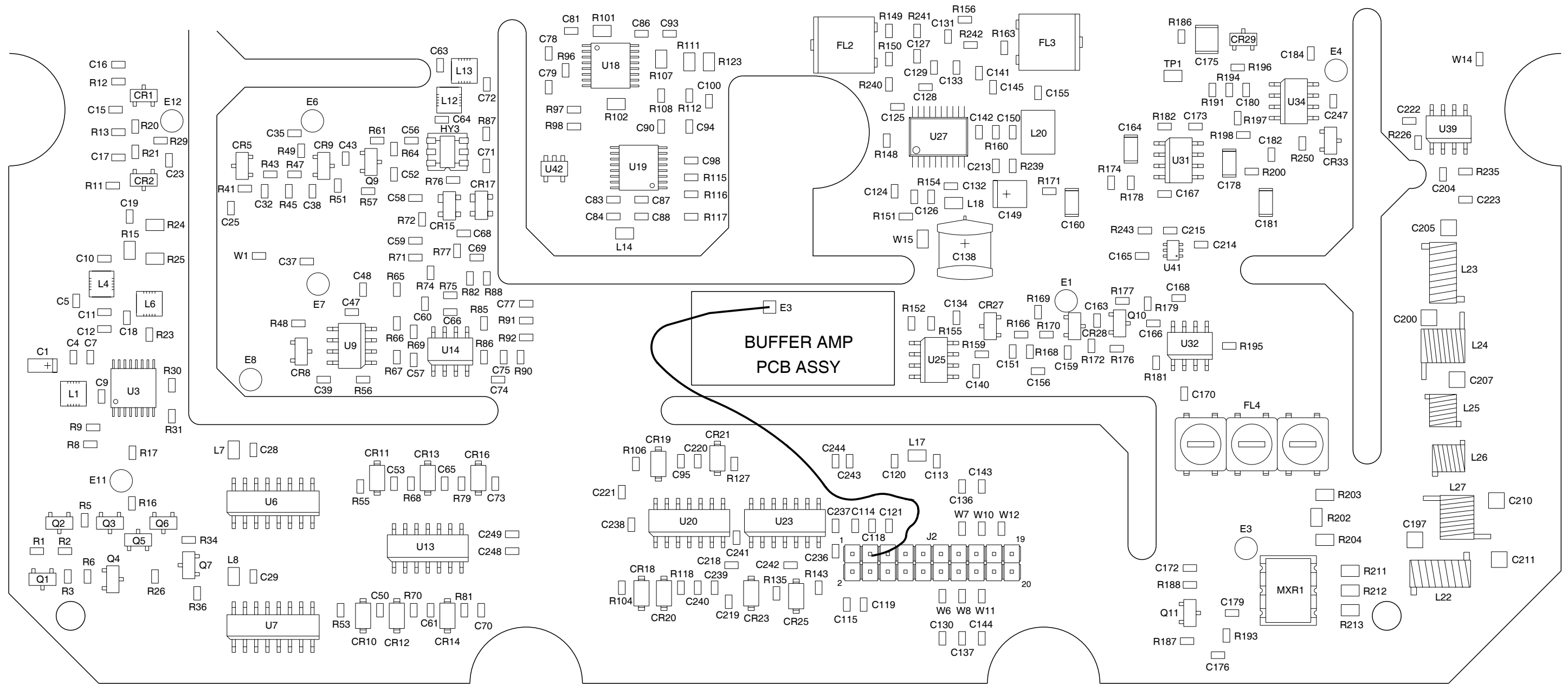
(7010-5630-600-G)

056M-34a

Figure 13 RF Assy (Sheet 8 of 16)
(RF Converter PCB Assy - Sheet 1 of 9) (56A1A3A2)



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



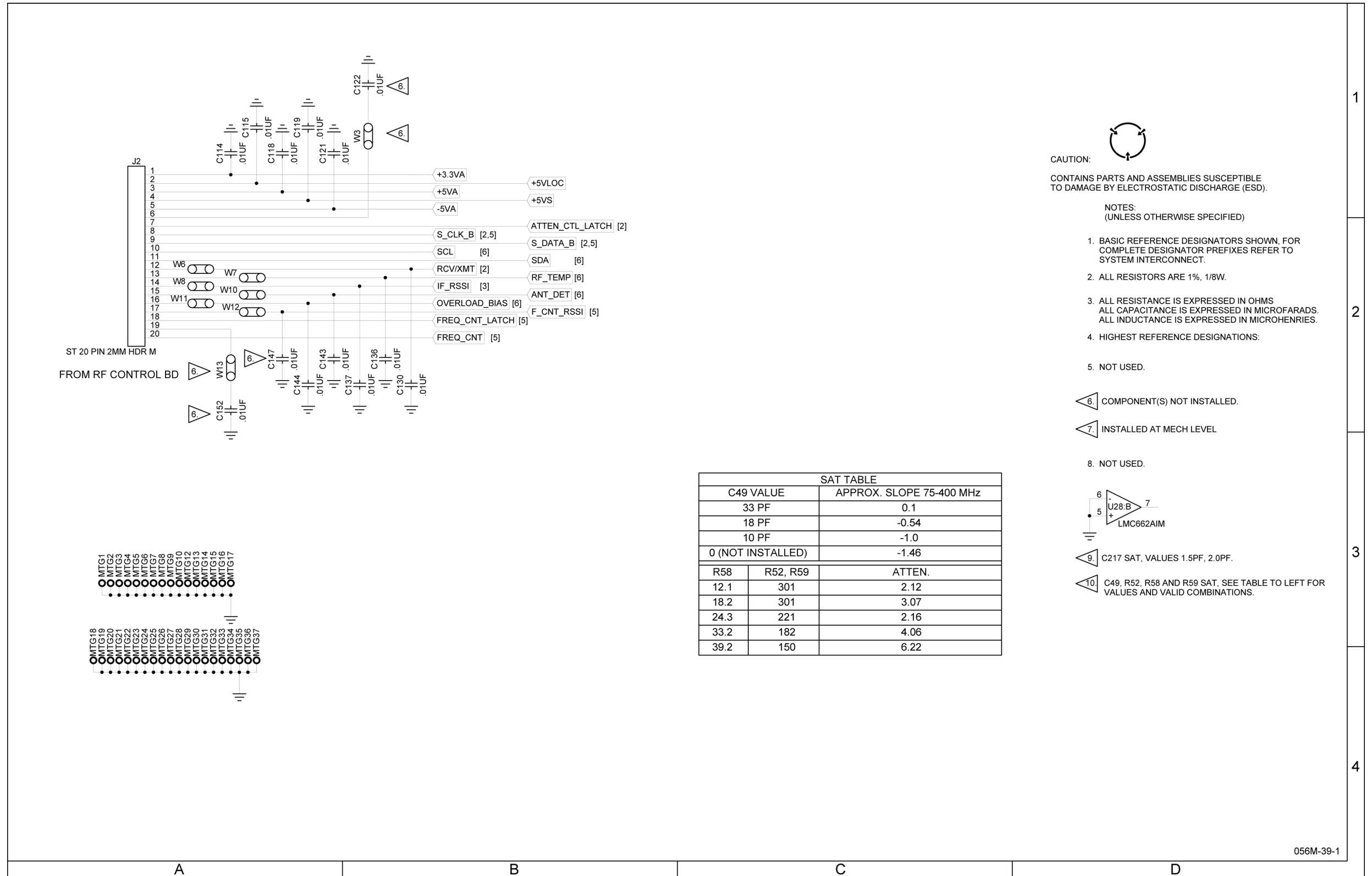
(DETAIL B)

PREFIX ALL REFERENCE DESIGNATORS WITH 56A1A3A2.

(7010-5630-600-G)

056M-34b

Figure 13 RF Assy (Sheet 9 of 16)
(RF Converter PCB Assy - Sheet 2 of 9) (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 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.
 - HIGHEST REFERENCE DESIGNATIONS:
 - NOT USED.

- △6 COMPONENT(S) NOT INSTALLED.
- △7 INSTALLED AT MECH LEVEL
- 8. NOT USED.
- △9 C217 SAT, VALUES 1.5PF, 2.0PF.
- △10 C49, R52, R58 AND R59 SAT, SEE TABLE TO LEFT FOR VALUES AND VALID COMBINATIONS.

056M-39-1

Figure 13 RF Assy (Sheet 10 of 16)
(RF Converter PCB Assy - Sheet 3 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 1 of 6)

(0000-5630-600-G)

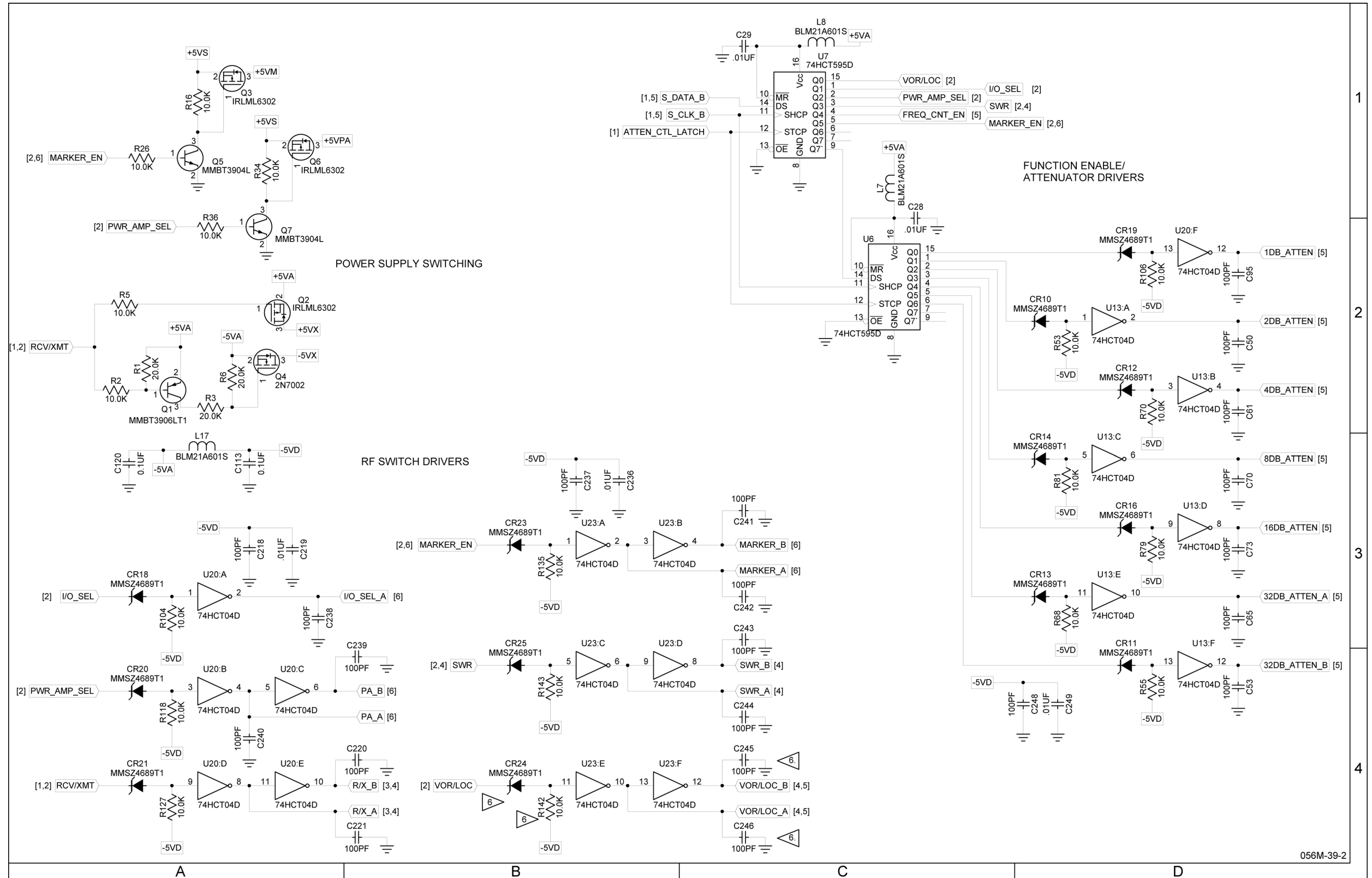
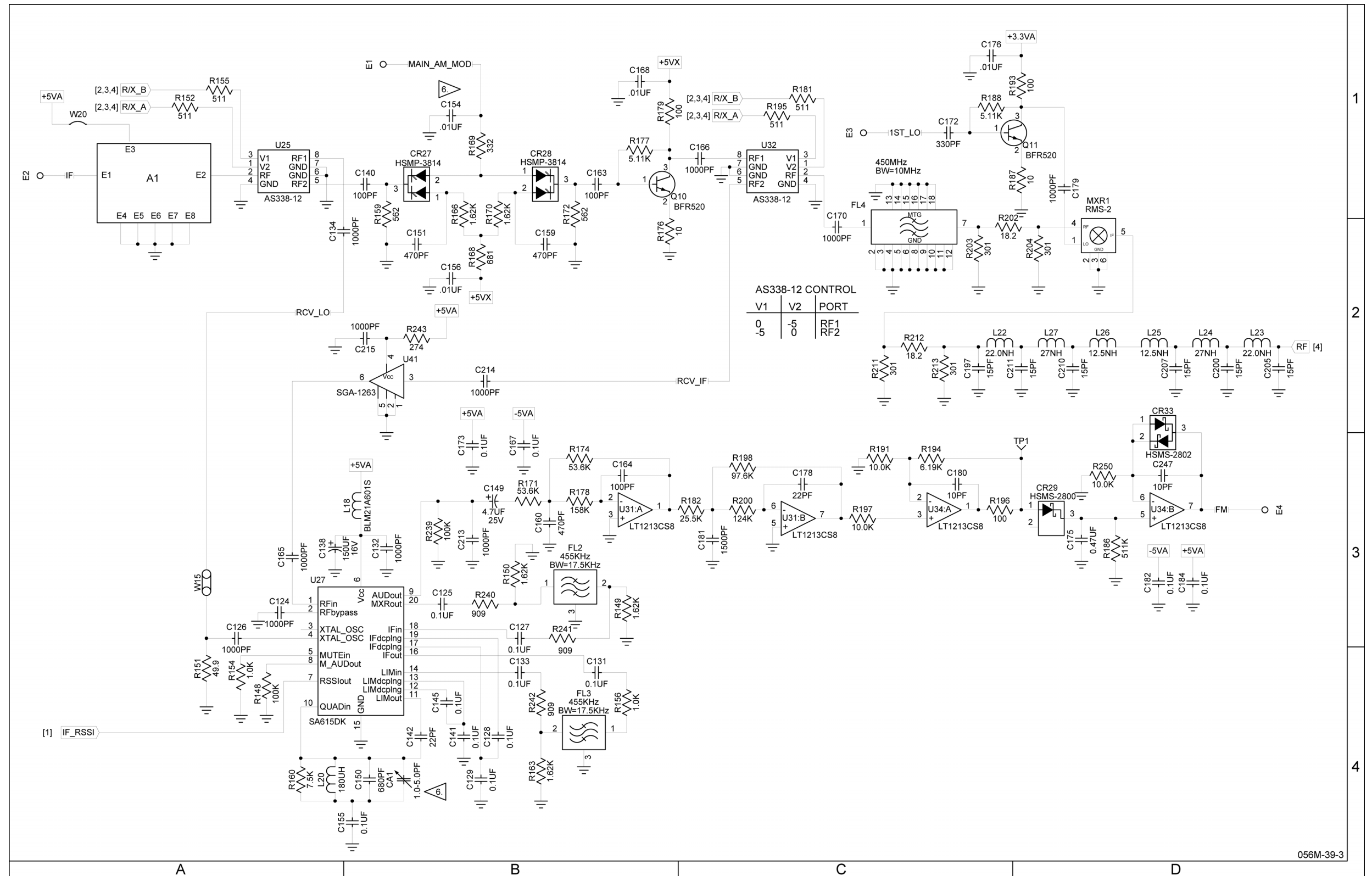


Figure 13 RF Assy (Sheet 11 of 16)
(RF Converter PCB Assy - Sheet 4 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 2 of 6)

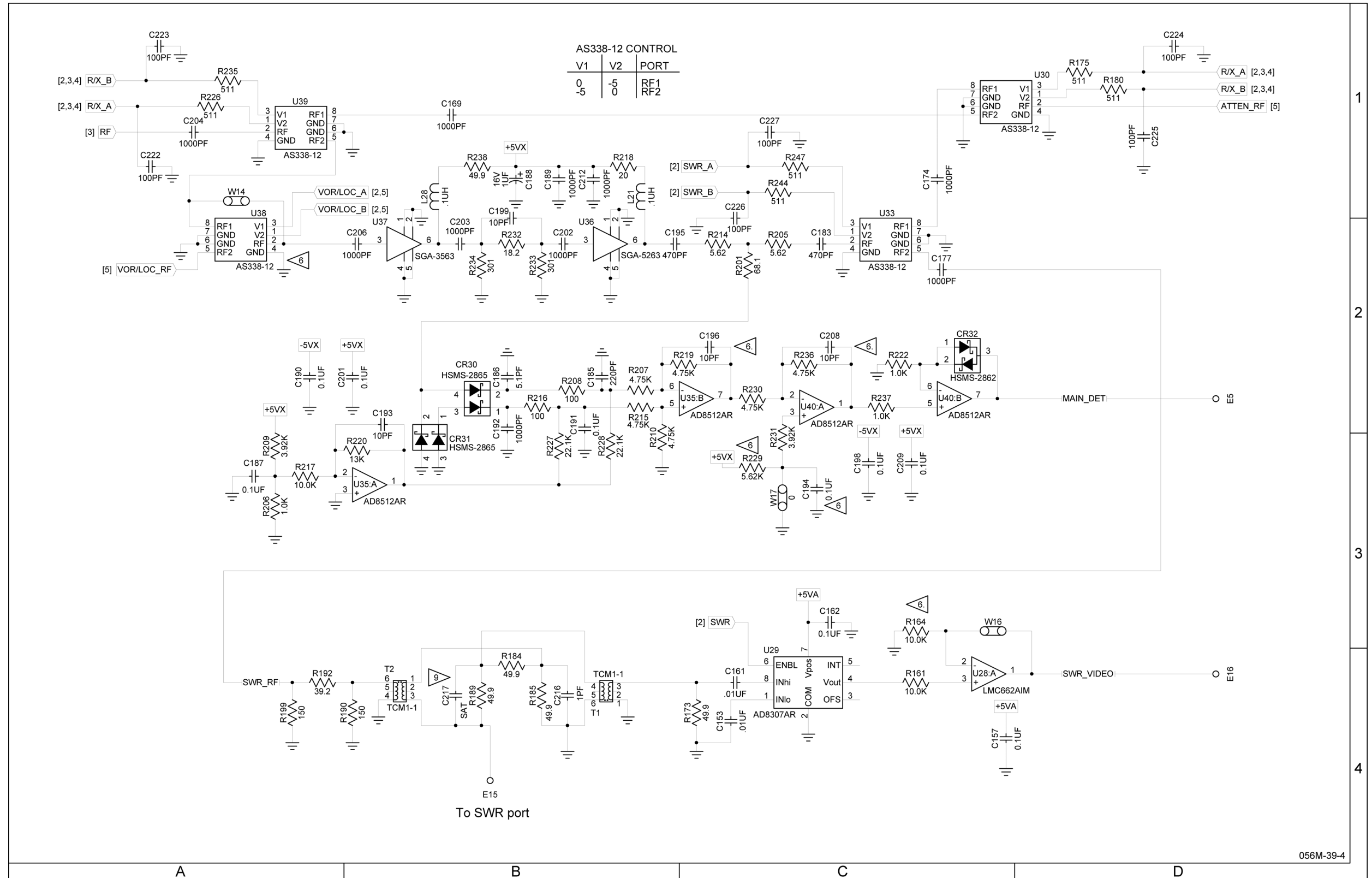
(0000-5630-600-G)



056M-39-3

Figure 13 RF Assy (Sheet 12 of 16)
(RF Converter PCB Assy - Sheet 5 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 3 of 6)

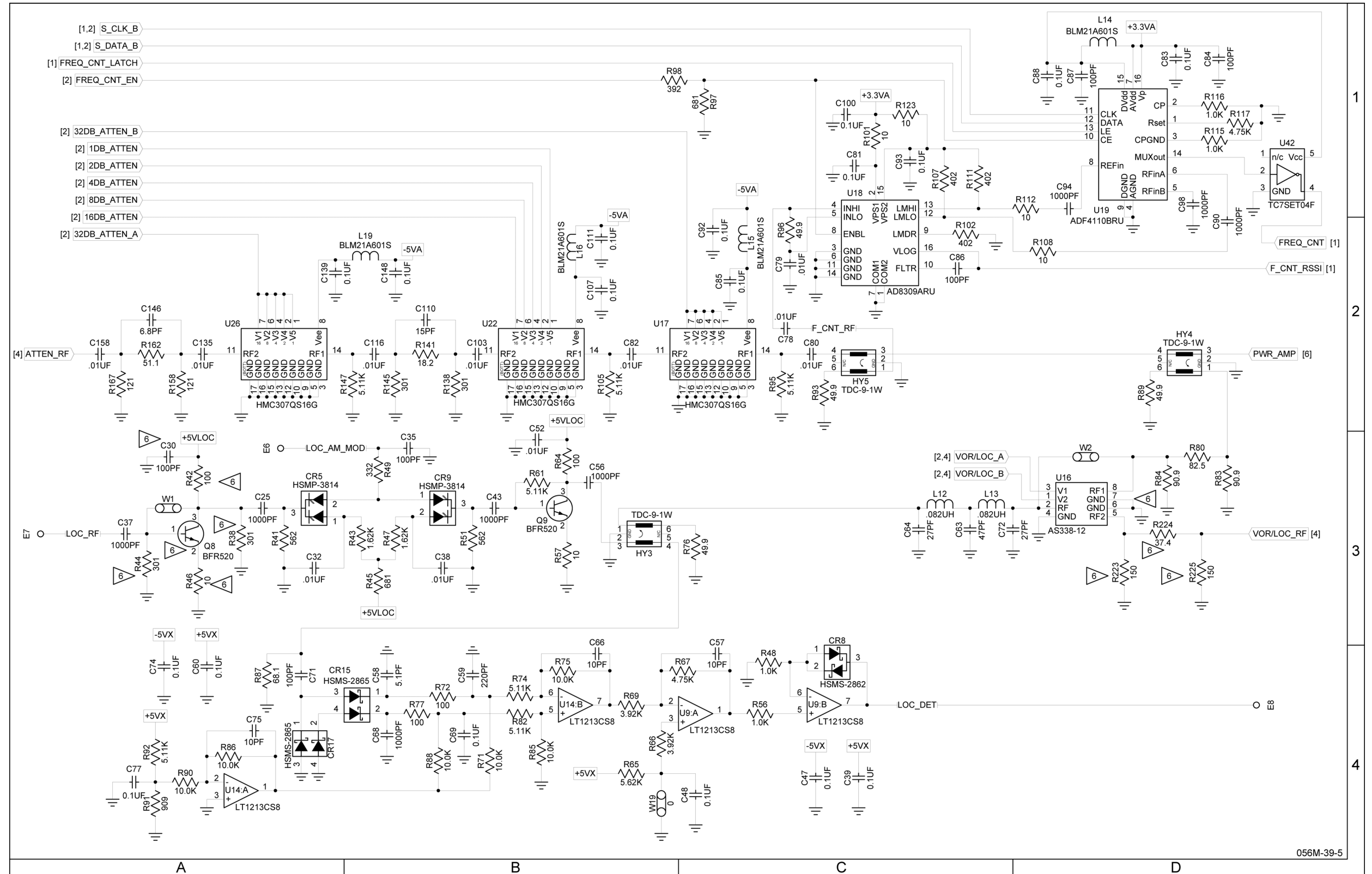
(0000-5630-600-G)



056M-39-4

Figure 13 RF Assy (Sheet 13 of 16)
(RF Converter PCB Assy - Sheet 6 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 4 of 6)

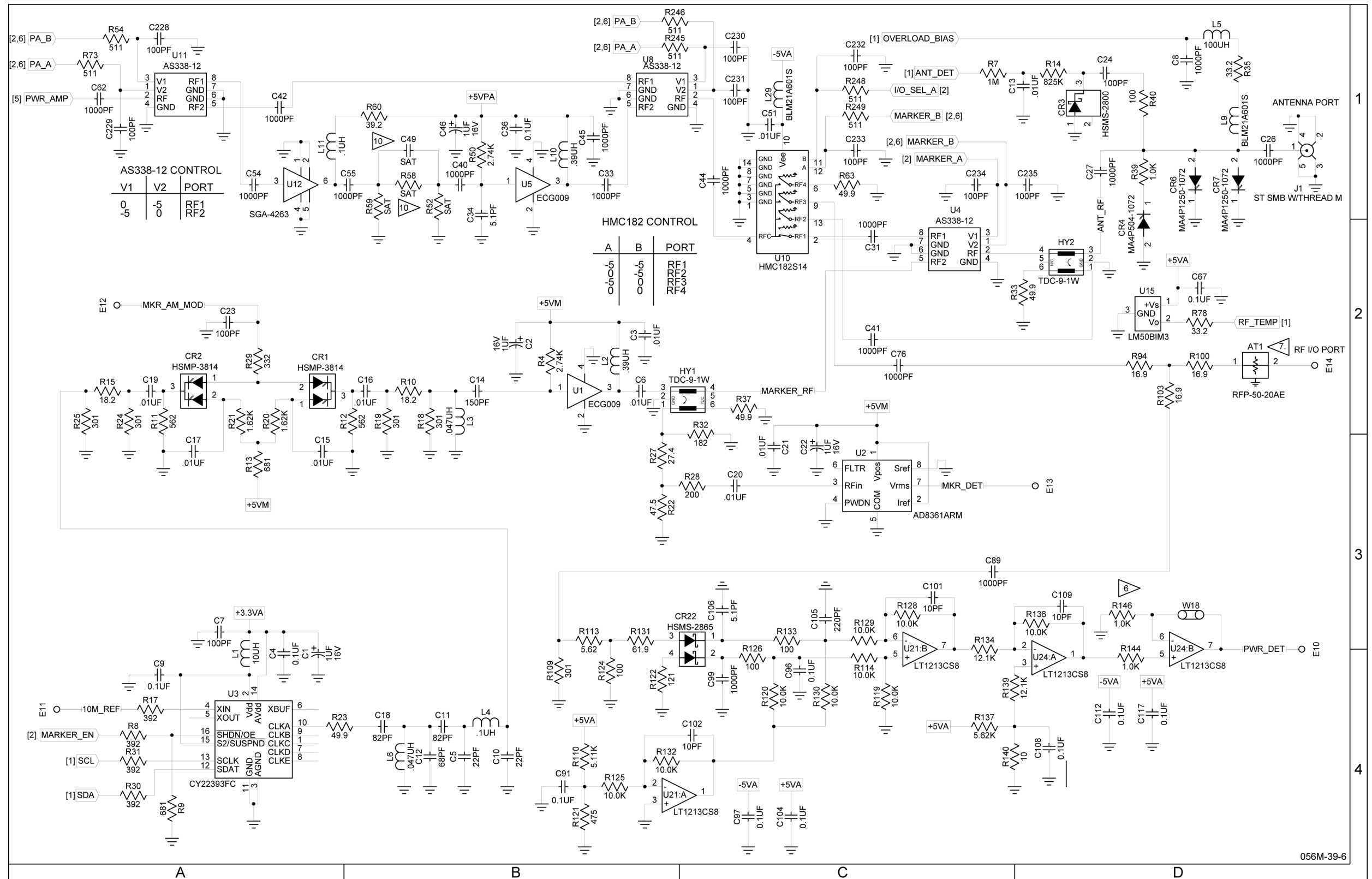
(0000-5630-600-G)



056M-39-5

Figure 13 RF Assy (Sheet 14 of 16)
(RF Converter PCB Assy - Sheet 7 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 5 of 6)

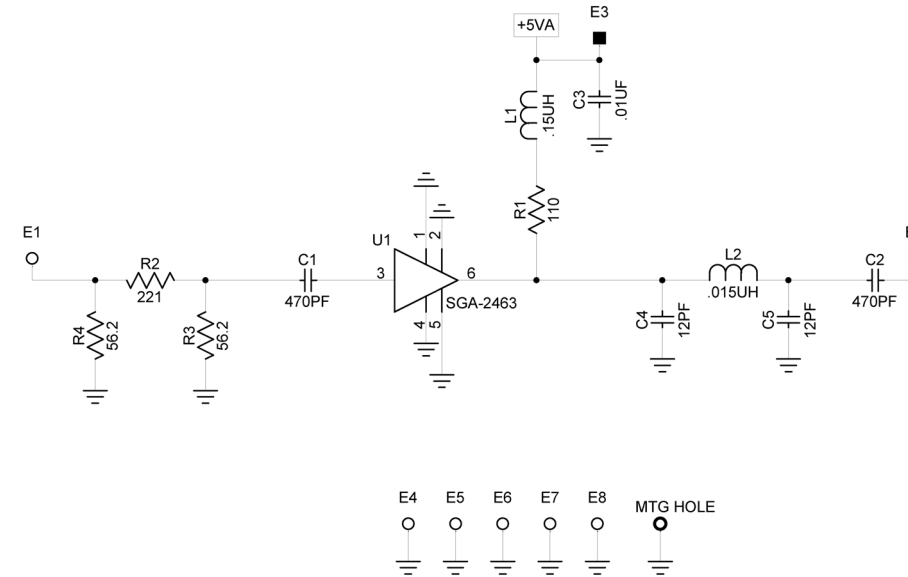
(0000-5630-600-G)



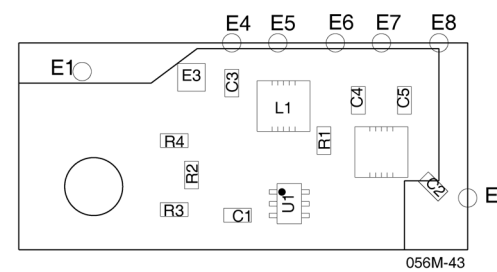
056M-39-6

Figure 13 RF Assy (Sheet 15 of 16)
(RF Converter PCB Assy - Sheet 8 of 9) (56A1A3A2)
(Circuit Schematic - Sheet 6 of 6)


(0000-5630-600-G)




BUFFER AMP ASSY SCHEMATIC
0000-5630-900-A



BUFFER AMP PC BOARD ASSY
7010-5630-900-A

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.

056M-42

(7010-5630-900-A) (0000-5630-600-G)

Figure 13 RF Assy (Sheet 16 of 16)
(RF Converter PCB Assy - Sheet 9 of 9)
(Buffer Amp 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

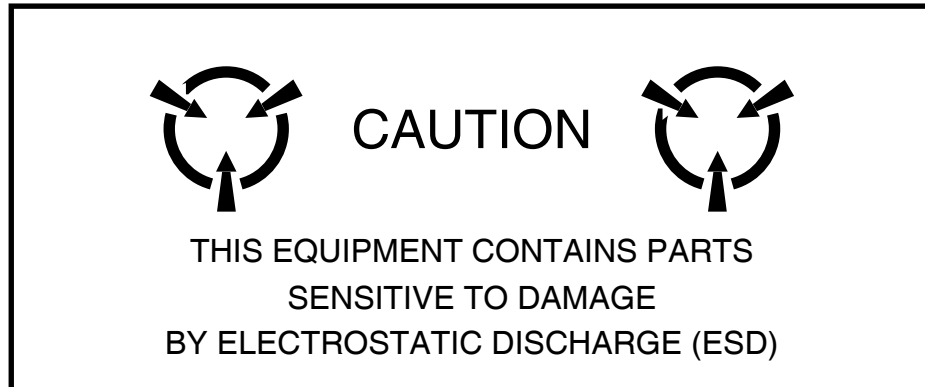
TOOL	SIZE	DESCRIPTION
SCREWDRIVER	#2	PHILLIPS
SCREWDRIVER	#1	SLOTTED
WRENCH	5/32" 3/16"	SOCKET
PLIERS		NEEDLE-NOSE

(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

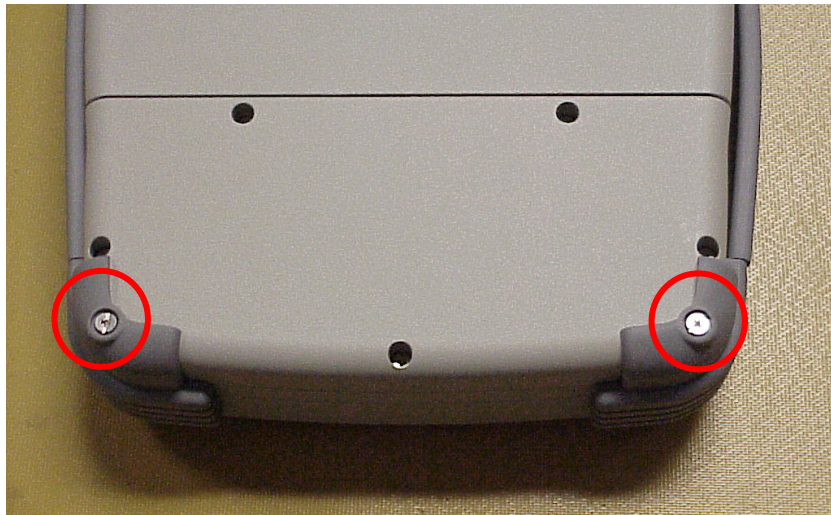
(1) Battery

PRELIMINARY PROCEDURES: None

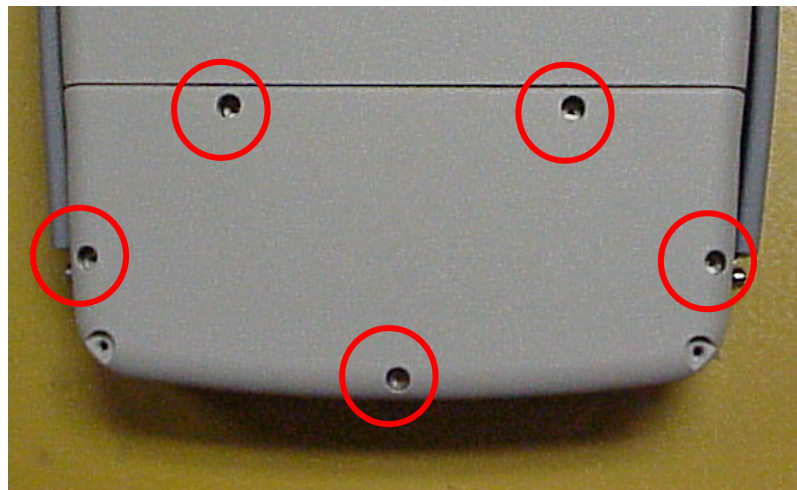
WARNING: DANGEROUS VOLTAGES ARE PRESENT WITH CASE ASSY REMOVED IF POWER IS PRESENT.

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

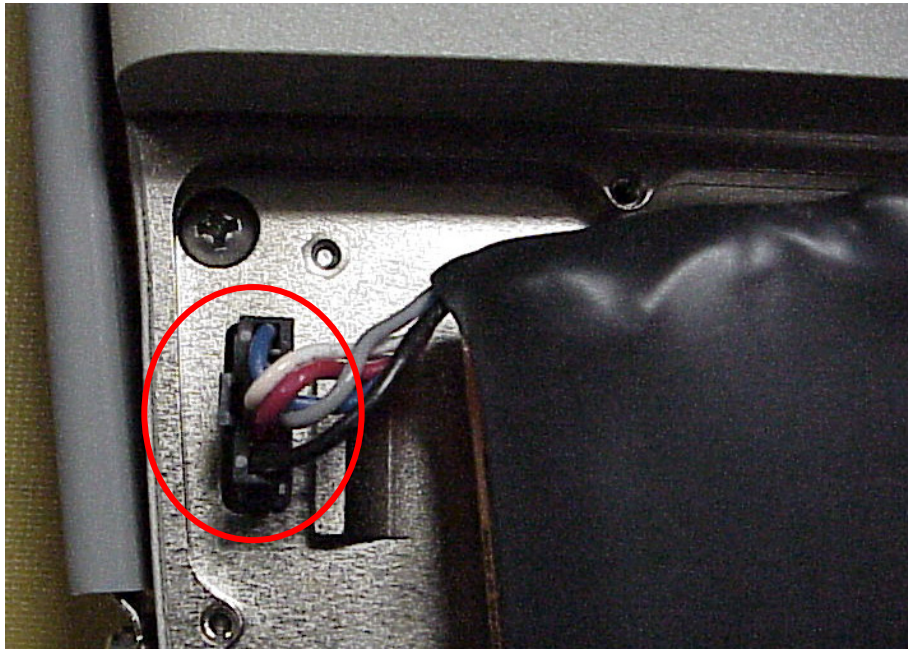
1. Remove external power sources and all external cables from the 4000.
2. Loosen the four captive screws holding bumpers (two in back and two in front). Remove bumpers.



3. Loosen five captive screws securing the Battery Cover. Remove the Battery Cover.



4. Disconnect the Battery wire harness.



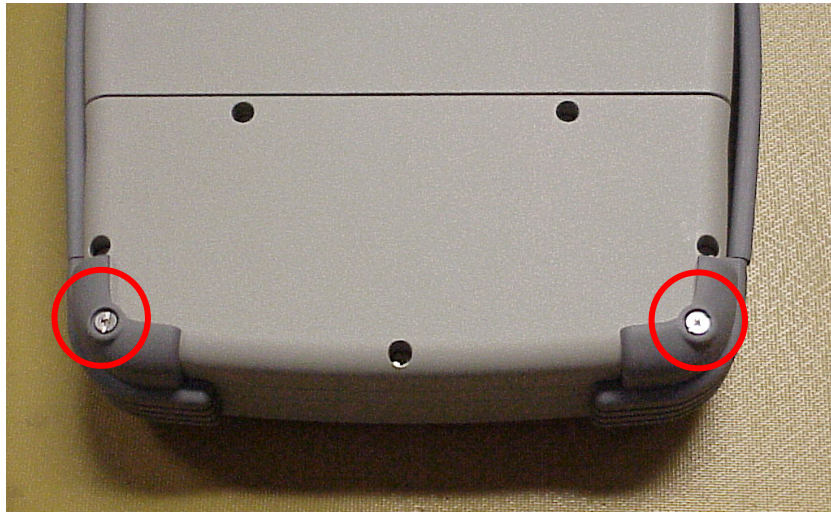
5. Remove the Battery.

(2) Fuse

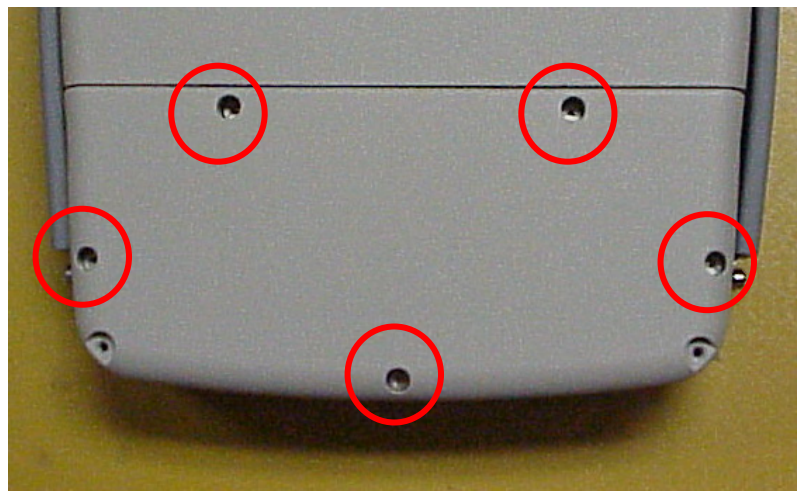
PRELIMINARY PROCEDURES: None

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.



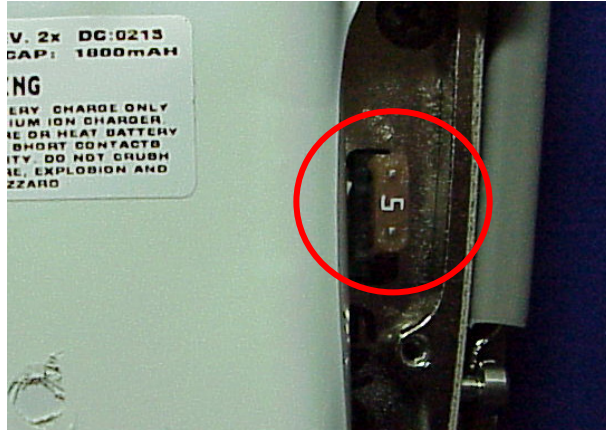
3. Loosen five captive screws securing the Battery Cover. Remove the Battery Cover.



STEP

PROCEDURE

4. Remove the Fuse.

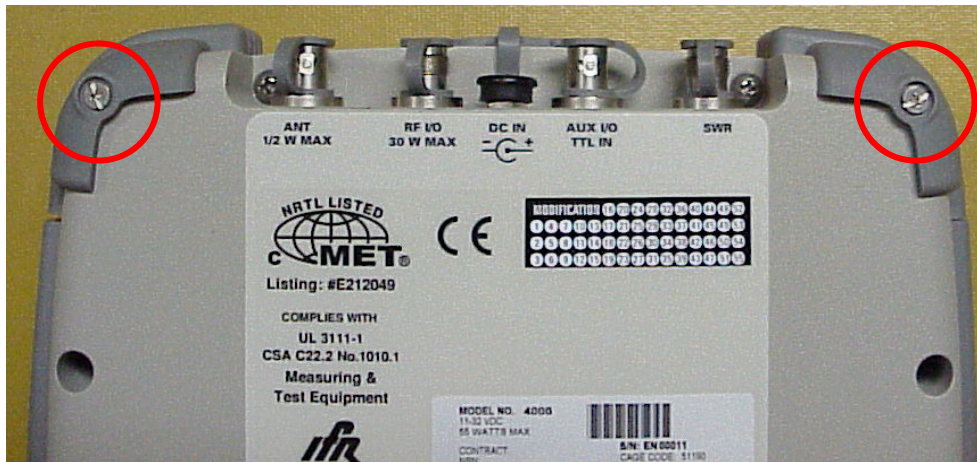


(3) Case Assy

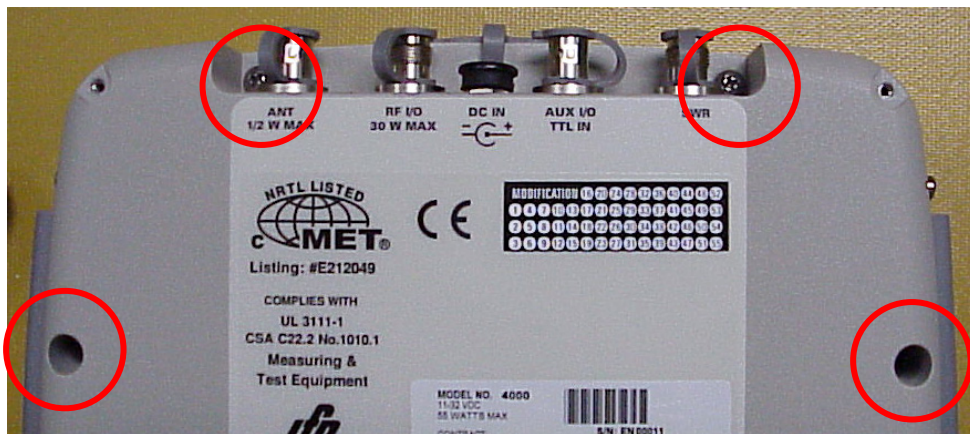
PRELIMINARY PROCEDURES: Battery (para 2-3-1C(1))

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

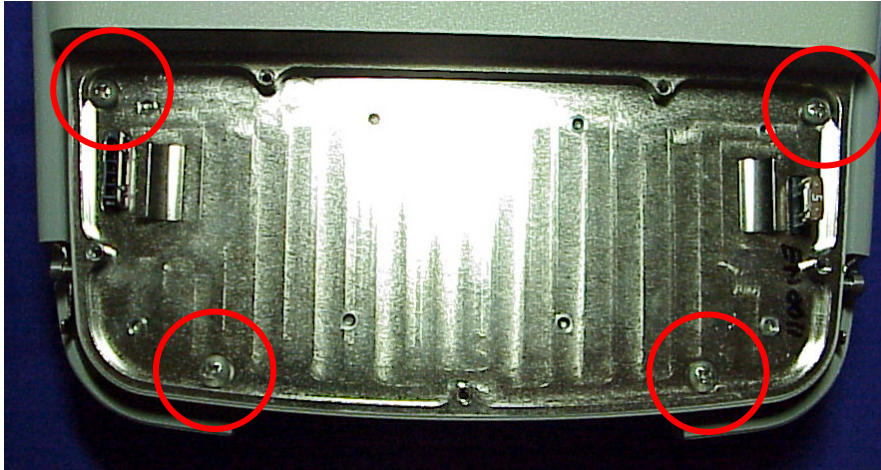
1. Loosen the four captive screws holding bumpers (two in back and two in front). Remove bumpers.



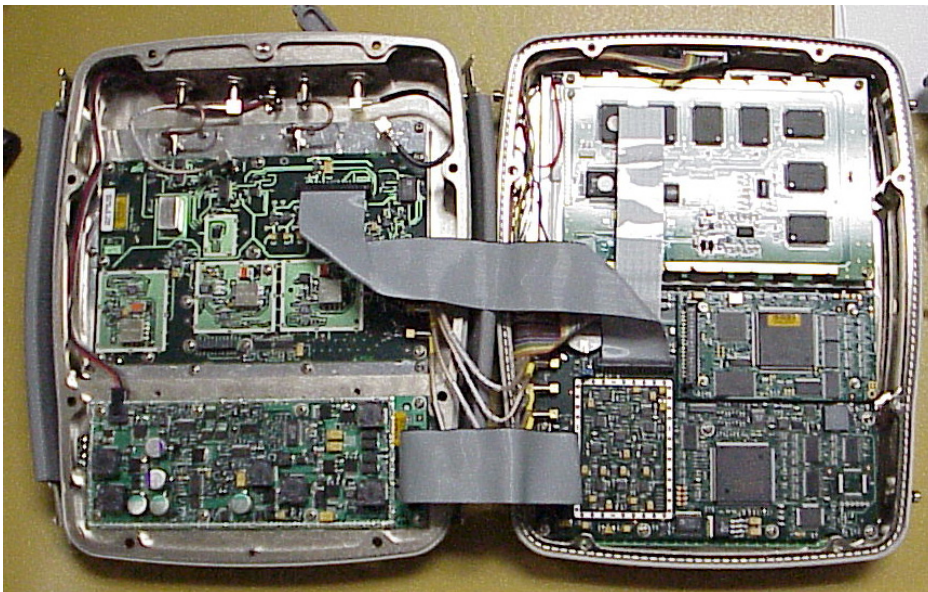
2. Remove four screws.



3. Remove four screws.



4. Open the Case Assy.

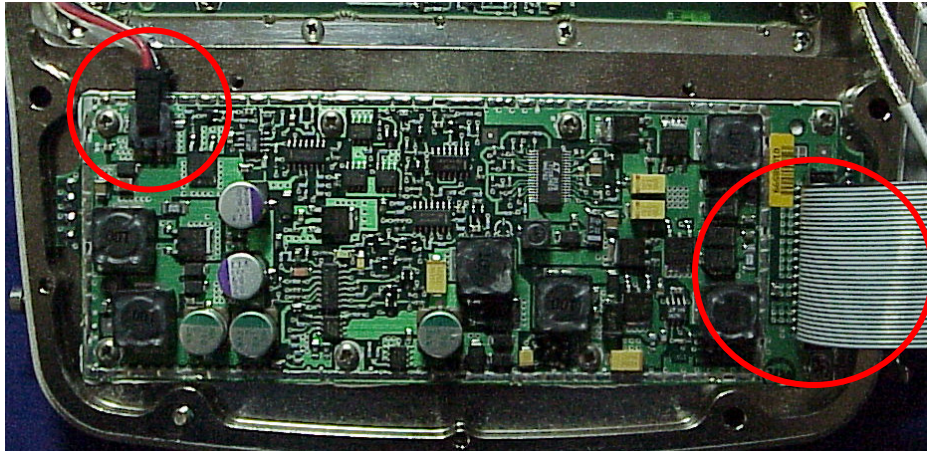


(4) Power Supply PCB Assy

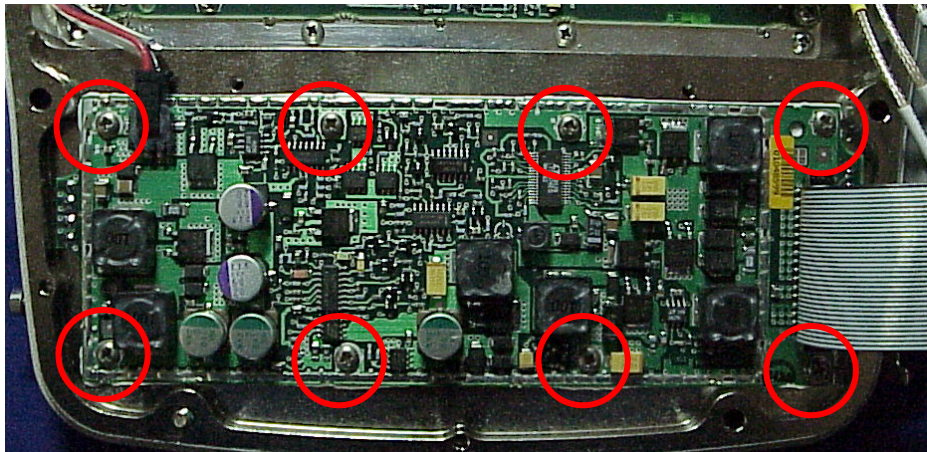
PRELIMINARY PROCEDURES: Case Assy (para 2-3-1C(3))

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

1. Disconnect wire cable and ribbon cable from the Power Supply PCB Assy.



2. Remove eight screws.



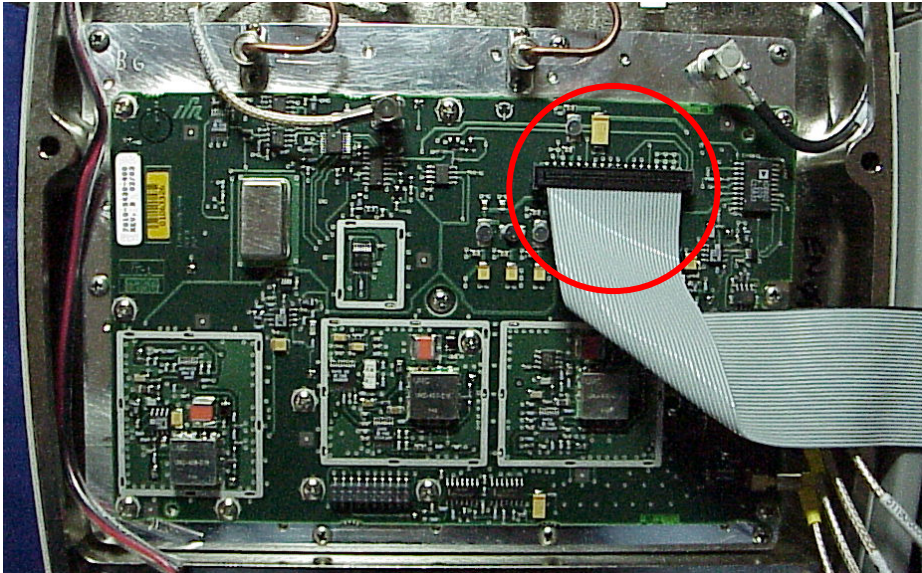
3. Remove Power Supply PCB Assy.

(5) RF Assy

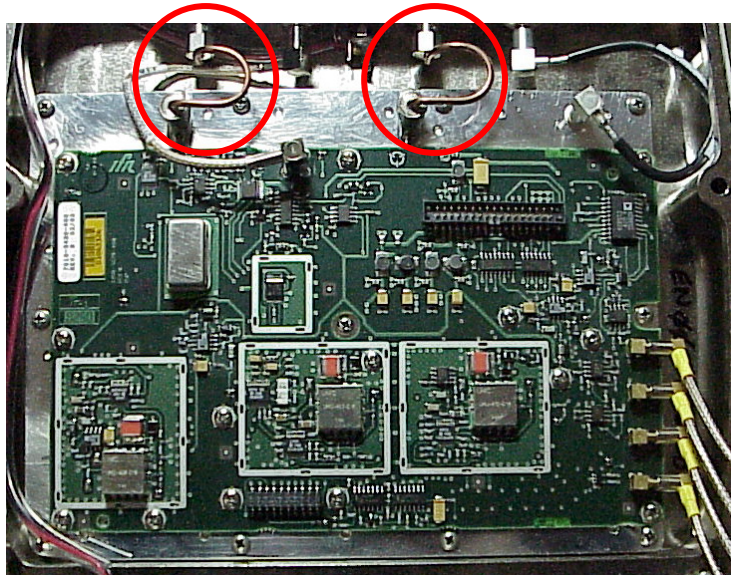
PRELIMINARY PROCEDURES: Case Assy (para 2-3-1C(3))

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

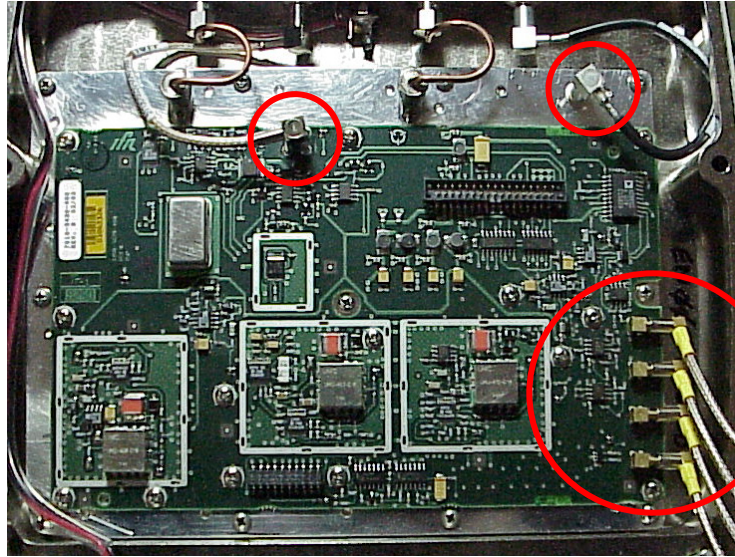
1. Disconnect ribbon cable from the RF Assy.



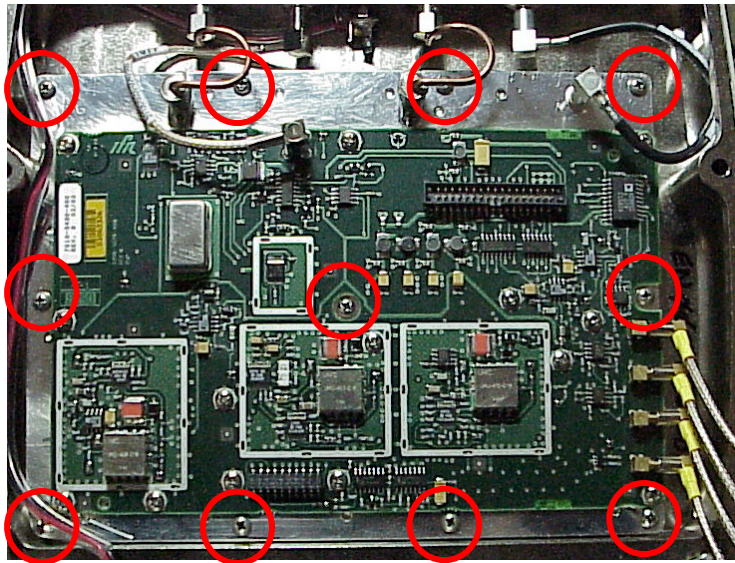
2. Remove two semi-rigid coaxial cables.



3. Disconnect six coaxial cables from the RF Assy.



4. Remove 11 screws.



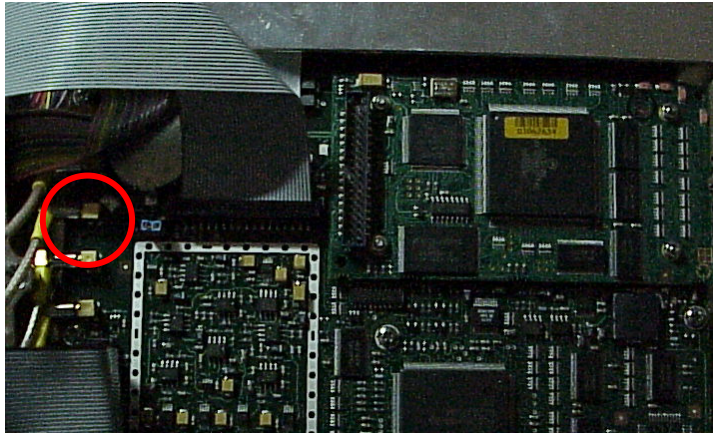
5. Remove the RF Assy.

(6) Processor PCB Assy

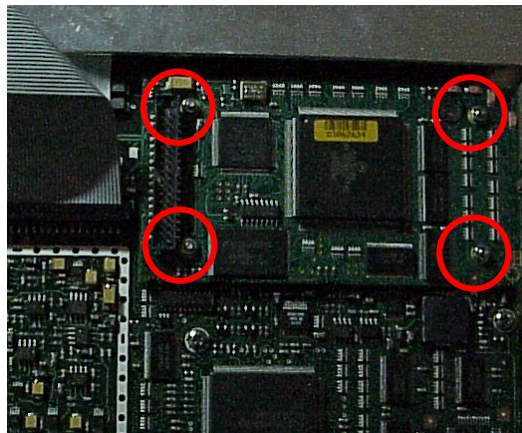
PRELIMINARY PROCEDURES: Case Assy (para 2-3-1C(3))

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

1. Remove jumper from Multi-Function PCB Assy.



2. Remove four nuts and four lock washers.



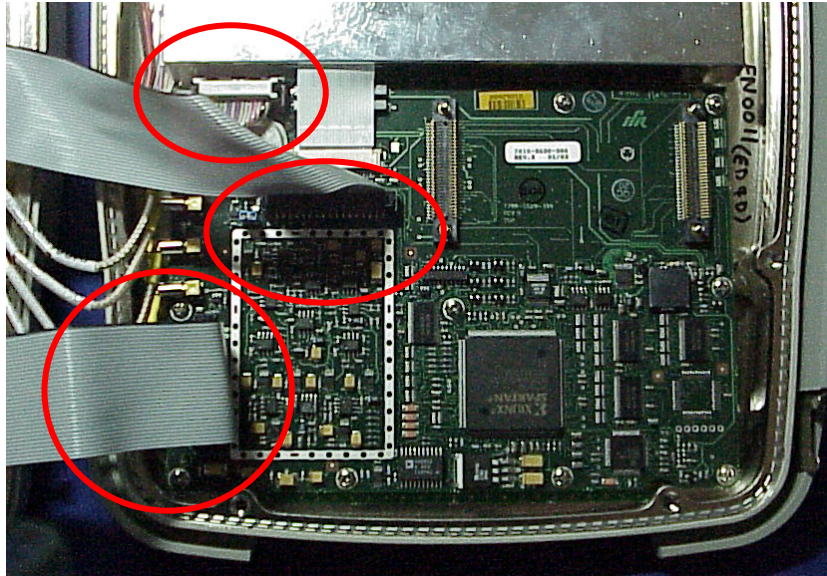
3. Remove the Processor PCB Assy.

(7) Multi-Function PCB Assy

PRELIMINARY PROCEDURES: Case Assy (para 2-3-1C[3])
Processor PCB Assy (para 2-3-1C[6])

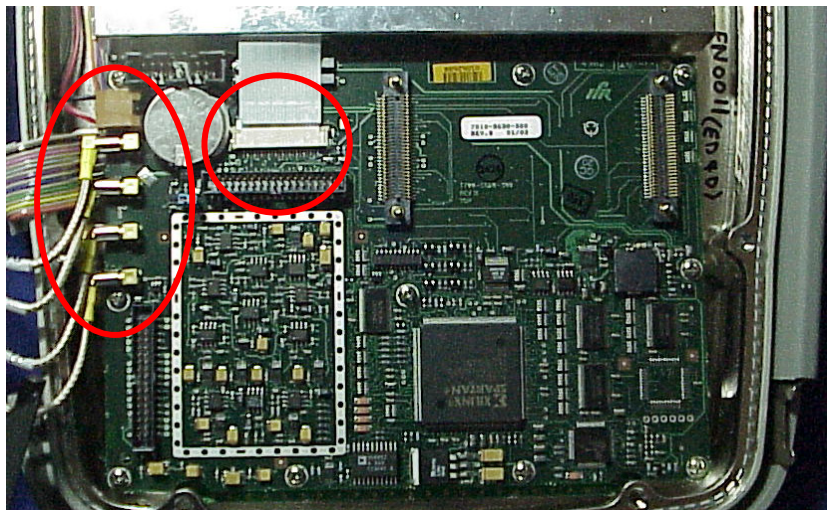
STEP	PROCEDURE
------	-----------

1. Disconnect three ribbon cables from the Multi-Function PCB Assy.

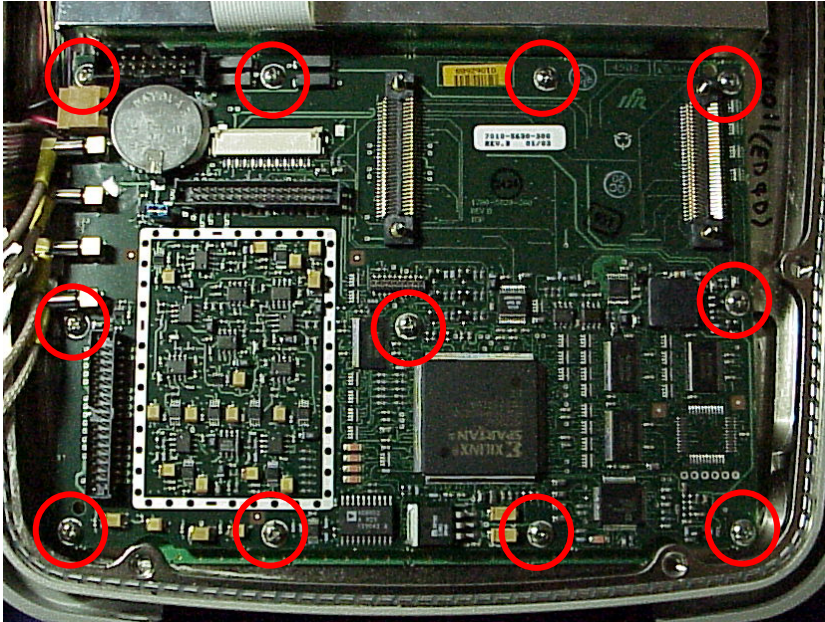


2. Disconnect ribbon cable, wire cable and four coaxial cables from the Multi-Function PCB Assy.

CAUTION: EXERCISE CAUTION WHEN REMOVING THE RIBBON CABLE FROM THE MULTI-FUNCTION PCB ASSY.



3. Remove 11 screws.



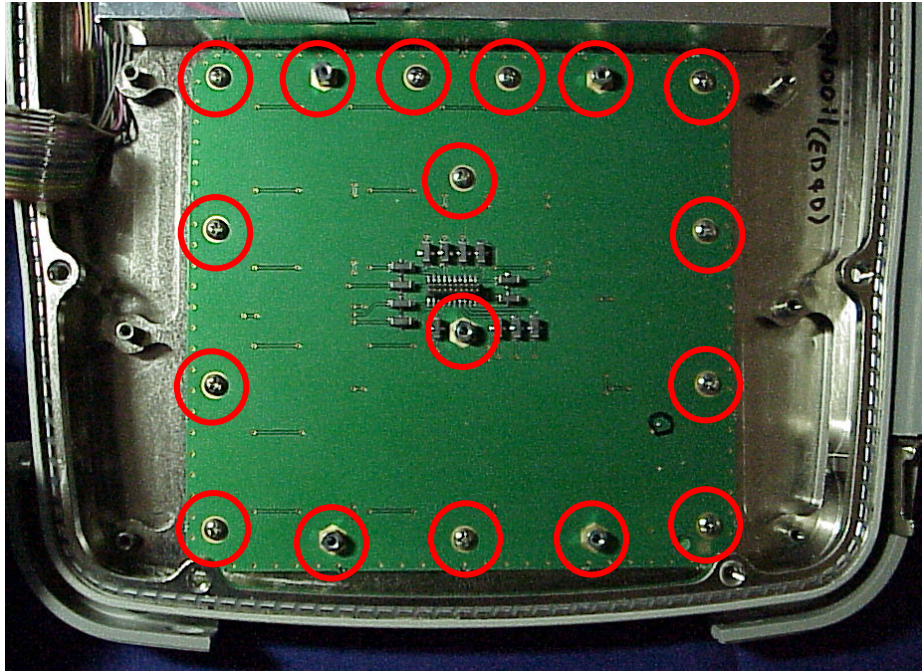
4. Remove Multi-Function PCB Assy.

(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.

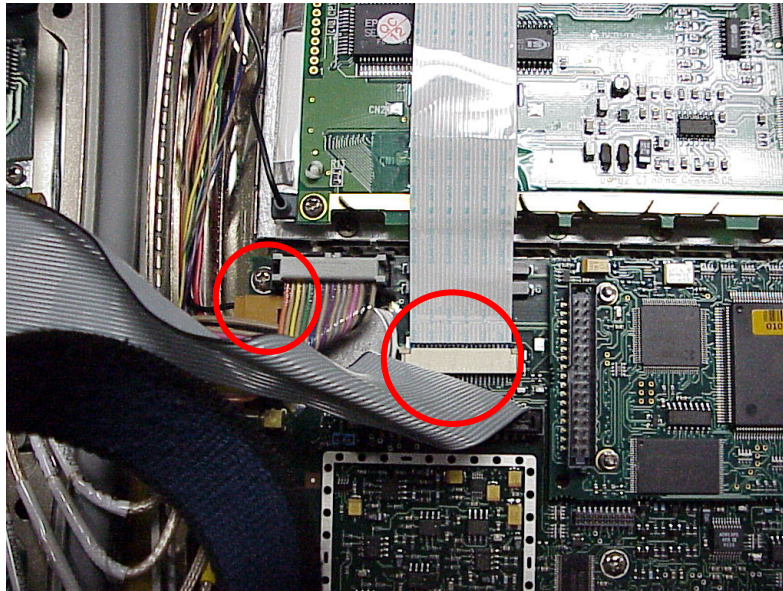
(9) LCD PCB Assy

PRELIMINARY PROCEDURES: Case Assy (para 2-3-1C[3])

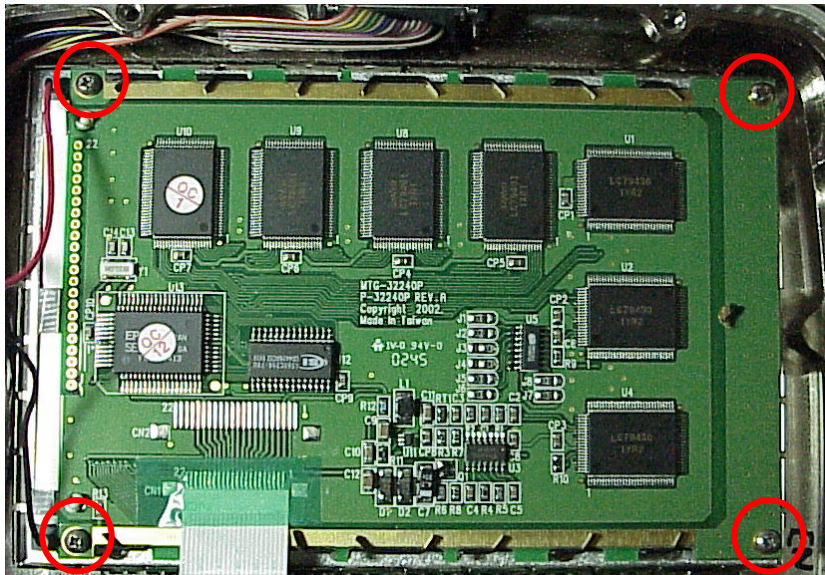
STEP	PROCEDURE
------	-----------

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
Wichita, KS 67215-8935
Telephone: (800) 835-2350
FAX: (316) 524-2623
Email: service@aeroflex.com

ASSEMBLY	PAGE
Chassis Assy -----	4
Composite Assy -----	3
Miscellaneous -----	2



MISCELLANEOUS

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
	1002-5600-2C0	MANUAL, OP, CD, IFR 4000
	1002-5600-2P0	MANUAL, PP, OP, 4000
	1002-5600-8P0	INSTRUCTIONS, ANTENNA, 4000
	1002-5600-9P0	CARD, PP, PASSWORD, IFR 4000
	1201-0909-900	ANTENNA
	1201-5601-000	ANTENNA,75MHZ,4000
	1412-5653-000	CASE,TRANSIT,4000
	2289-0001-009	CAP,TNC,FEMALE,SHORT
	5106-0000-057	FUSE,5A,32V,MINI BLADE
	6041-0001-000	CABLE ASSY,IEC STR,COR 80-1245
	6041-5680-800	CABLE ASSY,TNC M/TNC M,48"
	7110-5600-200	POWER SUPPLY, EXTERNAL DC



7003-5640-000

ASSY, COMPOSITE

D

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	1403-5650-100	CHASSIS,REAR
2	1414-5650-800	COVER,BATTERY
3	2803-0125-006	SCREW,4-40 X 1/8 PPHM
4	2803-0500-006	SCREW,4-40 X 1/2 PPHM
5	2805-0438-006	SCREW,8-32 X 7/16 PPHM
7	2840-0000-060	WASHER,NYL,.312OD,.171ID,.032T
8	1414-0000-008	COVER,MINI POWER JACK
13	1421-5651-300	BUMPER,CORNER
14	1407-5651-400	HANDLE,EXTRUDED
15	1407-5651-500	HANDLE,STRAP
16	1414-5651-700	COVER,BNC/TNC
17	1414-5651-800	COVER,REMOTE
18	2803-0125-005	SCREW,4-40 X 1/8 SHOULDER
A1	7010-5630-500	PCB ASSY,POWER SUPPLY
A2	7005-5640-100	ASSY,CHASSIS
A3	7005-5640-400	ASSY,RF
BT1	7020-0012-500	ASSY,LIION BATTERY PACK
J1	2123-0000-109	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J2	2123-0000-109	CONN,F,TNC,BH,ADP,SMA,WTRPRF
J3	2123-0000-110	CONN,F,BNC,BH,ADP,SMB,WTRPRF
J4	2123-0000-110	CONN,F,BNC,BH,ADP,SMB,WTRPRF
W1	7007-5680-100	WIRE HARN ASSY,DC INPUT
W2	6045-5680-400	RBN CA ASSY,28GA,34C,6.0L,2MM
W3	6045-5680-600	RBN CA ASSY,28GA,34C,9.75L,2MM
W9	6044-1230-500	COAX CONF SL SMB RA-SMB RA 90
W10	6042-5680-500	COAX ASSY,RF
W11	6042-5680-500	COAX ASSY,RF
W12	6050-0040-500	COAX ASSY, 316,R F SMB/R F SMB



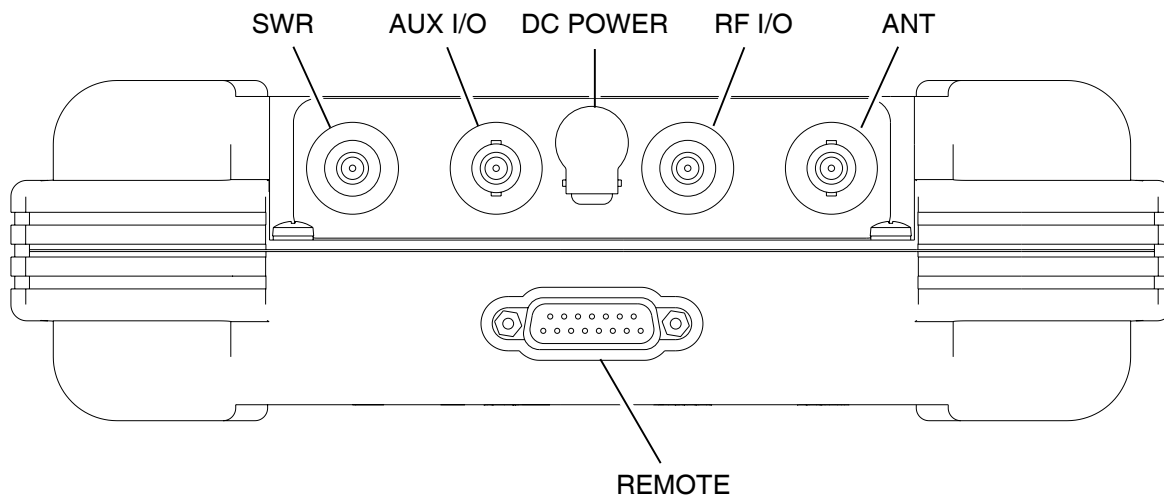
7005-5640-100

ASSY, CHASSIS

D

REFERENCE DESIGNATOR	PART NUMBER	DESCRIPTION
1	1403-5650-000	CHASSIS,FRONT
2	1400-5650-200	BRACKET,DISPLAY
3	1414-5650-300	COVER,DISPLAY
5	3900-5650-500	LENS,DISPLAY
8	2803-0188-003	SCREW,4-40 X 3/16 PFHM
9	2803-0188-006	SCREW,4-40 X 3/16 PPHM
10	2850-7866-300	STANDOFF,HEX,MALE-FEMALE
11	2803-0375-006	SCREW, 4-40 X 3/8 PPHM
12	2801-0375-006	SCREW,2-56 X 3/8 PPHM
13	2818-0000-017	STANDOFF,.188 HEX M/F,.187LG
14	2850-0000-012	NUT,HEX,SMALL PAT,2-56
16	2840-0000-004	WASHER,LOCK,INT TOOTH,2
A1	7010-5630-700	PCB ASSY,KEYPAD
A2	7010-5630-200	PCB ASSY,PROCESSOR
A3	7010-5630-300	PCB ASSY,MULTI-FUNCTION
A4	7110-5600-000	ASSY,LCD
A5	7110-5600-100	ASSY,KEYPAD
JTB1	2132-0004-000	CONN,JUMPER BLOCK,.1C,.025 PIN
W1	6045-5680-000	RIBBON CA ASSY,RS-232/USB
W5	6050-1990-500	COAX ASSY,316,RFSSMB/RFSSMB
W6	6050-1990-500	COAX ASSY,316,RFSSMB/RFSSMB
W7	6050-1990-500	COAX ASSY,316,RFSSMB/RFSSMB
W8	6050-1990-500	COAX ASSY,316,RFSSMB/RFSSMB

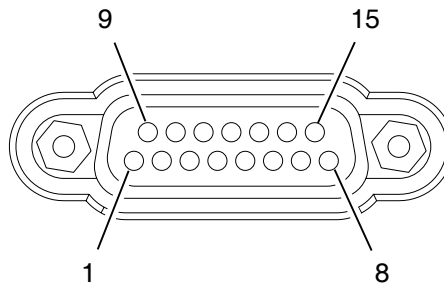
APPENDIX A - CONNECTOR PIN-OUT TABLES



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 Female	MIXED	INPUT/OUTPUT
(Refer to Appendix A, Table 2 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
Table 2

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
Measuring Receiver	HP-8902A or Equivalent
Audio Analyzer	HP 8903A or Equivalent
Signal Generator	HP8657B or Equivalent
Digital Multimeter	HP 34401A or Equivalent
Function Generator	HP-33120A or Equivalent
Spectrum Analyzer	AN-920 or Equivalent
Modulation Analyzer	R&S FMAV or Equivalent
Sensor Module	HP-11722A or Equivalent
Power Meter	HP-E4418B or Equivalent
Power Sensor	HP-E4412A or Equivalent
TNC Precision Short (Male)	N/A
RF Amplifier (100 W)	N/A
20 dB Directional Coupler (N-Type Connector)	N/A
20 dB N-Connector Attenuator	N/A
250 MHz Low-Pass Filter (N-Type Connector)	N/A
10 dB BNC Connector Attenuator	N/A
3 dB, 100 W N-Type Connector Attenuator	N/A
50Ω, 75Ω, 100Ω, 150Ω Loads	N/A
VSWR Bridge	Wiltron 62NF50 or Equivalent



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**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 ²	cm/sec ²	30.48	miles	meters	1609
ft/sec ²	m/sec ²	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 ²	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 ²	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 50 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 VHF AM Channel:	118.00 to 156.00 MHz in 25 or 8.33 kHz steps
Comm VHF AM Preset:	118.00, 137.00 or 156.00 MHz
Comm VHF AM Variable:	117.00 to 157.00 MHz in 1 kHz steps
Comm VHF FM Channel:	156.00 to 174.00 MHz in 25 kHz steps
Comm VHF FM Preset:	156.00, 165.00 or 174.00 MHz
Comm VHF FM Variable:	155.00 to 175.00 MHz in 1 kHz steps
Comm UHF Channel:	225.00 to 400.00 MHz in 25 kHz steps
Comm UHF Preset:	225.00, 312.00 or 400.00 MHz
Comm UHF Variable:	224.00 to 401.00 MHz in 1 kHz 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:

Single Carrier:	+13 to -67 dBm in 0.5 dB steps
Accuracy:	±3 dB
Dual Mode - LOC:	0 dBm Fixed
Accuracy:	±2.5 dB
Dual Mode - G/S:	0 to -76 dBm in 0.5 dB steps
Accuracy:	±3 dB
Tri-Mode - Marker:	+13 dBm Fixed
Accuracy:	±2 dB
Tri-Mode - LOC:	-7 dBm Fixed
Accuracy:	±2 dB
Tri-Mode - G/S:	-7 to -83 dBm in 0.5 dB steps
Accuracy:	±3 dB

RF I/O Connector:

Single Carrier:	-12 to -130 dBm in 0.5 dB steps
Accuracy:	-12 to -39.5 dBm: ±2.5 dB
	-40 to -94.5 dBm: ±2 dB
	-95 to -120 dBm: ±3 dB
Dual Mode - LOC:	-22 dBm Fixed
Accuracy:	±2 dB
Dual Mode - G/S:	-22 to -101 dBm in 0.5 dB steps
	-22 to -100 dBm: ±2.5 dB

Spectral Purity:

Harmonics:	<-20 dBc
Non-Harmonic Spurious:	<-35 dBc between 75 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, 1020 and 9960 Hz Tones:	30% AM, Each Tone
1020 Hz Morse Code:	10% AM
Accuracy:	±2% Modulation

Variable:

Range:	0% to 55% AM (30, 9960 and 1020 Hz Tones)
Distortion:	<2.5% 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°
-----------	-------

OPERATIONAL MODES (cont)

LOC Mode:

LOC Tone Frequency Accuracy:

90 Hz:	±0.02%
150 Hz:	±0.02%
1020 Hz:	±0.02%

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:	$\pm 0.02\%$
150 Hz:	$\pm 0.02\%$

Modulation:

CAL:

90 and 150 Hz Tones:	40% AM, Each Tone
Accuracy:	$\pm 2\%$ Modulation

Variable:

Range:	0% to 50% AM (90 and 150 Hz Tones)
Distortion:	<2.5% in CAL Position

G/S DDM:

Fixed:

Range:	$\pm 0, 0.091, 0.175$ or 0.400 DDM and Tone Delete
Accuracy:	± 0.003 DDM ($\pm 2.5 \mu\text{A}$) $\pm 3\%$ of setting ($\leq +10$ dBm Output Level)

Variable:

Range:	± 0.8 DDM in 0.001 DDM steps
Accuracy:	± 0.0048 DDM ($\pm 4.0 \mu\text{A}$) $\pm 3\%$ of setting ($\leq +10$ dBm Output Level)

Phase Shift:

Range:	0° to 120° in 5° increments (150 Hz phase relative to 90 Hz)
Accuracy:	$\pm 0.5^\circ$

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:

(COMM VHF AM and COMM UHF)

COM Tone Frequency Accuracy:

1020 Hz:	±0.02%
----------	--------

Modulation:

CAL:

1020 Hz Tone: 30% AM

Accuracy: ±2% Modulation

Variable:

Range: 0% to 55% AM

Distortion:

<2.5% in CAL Position

OPERATIONAL MODES (cont)

SELCAL Mode:	(Provides amplitude modulation with SELCAL [SElective CALLing] tones)
SELCAL Tone Frequency Accuracy:	±0.02%
Transmit Modes:	
Single:	Single Transmission
Continuous:	7.5 sec interval (typical)
Modulation:	
CAL:	
Per SELCAL Tone:	40% AM
Accuracy:	±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, ± 1 Count

AUX I/O Connector:

Range:	1 to 10 MHz
Resolution:	1 Hz
Accuracy:	Same as Time Base, ± 1 Count

Sensitivity:

ANT Connector:	≥ -35 dBm
RF I/O Connector:	≥ -10 dBm
AUX I/O Connector:	≥ 1 Vp-p

Power Meter (RF I/O Connector):

Frequency Range: 118.0 to 400.0 MHz

Power Range: 0.1 to <1 W
1 to <100 W
100 to 300 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: $\pm 8\%$ of reading, ± 1 Count, CW Only
(without External Attenuator)

Duty Cycle:

≤ 10 W:	Continuous
>10 to ≤ 20 W:	3 min ON, 2 min OFF
>20 to ≤ 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:	≥+5 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:	≥-10 dBm

SWR Meter (SWR Connector):

Frequency Range:	75.0 to 400.0 MHz
Accuracy:	
SWR <3:1:	±0.2, ±20% of reading
SWR >3:1:	±0.3, ±20% of reading

MISCELLANEOUS
Inputs/Outputs:
RF I/O Connector:

Type:	Input/Output
Impedance:	50 Ω Typical
Maximum Input Level:	30 W, 1 min ON, 2 min OFF
VSWR:	
75 to \leq 300 MHz:	<1.3:1
>300 to 400 MHz:	<1.35:1

ANT Connector:

Type:	Input/Output
Impedance:	50 Ω typical
Maximum Input Level:	0.5 W

SWR Connector:

Type:	Output
Impedance:	50 Ω Typical
Maximum Reverse Power:	+25 dBm
VSWR:	
75 to \leq 300 MHz:	<1.3:1
>300 to 400 MHz:	<1.35:1

AUX Connector:

Type:	Input/Output
Impedance:	800 Ω 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

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

MISCELLANEOUS (cont)**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

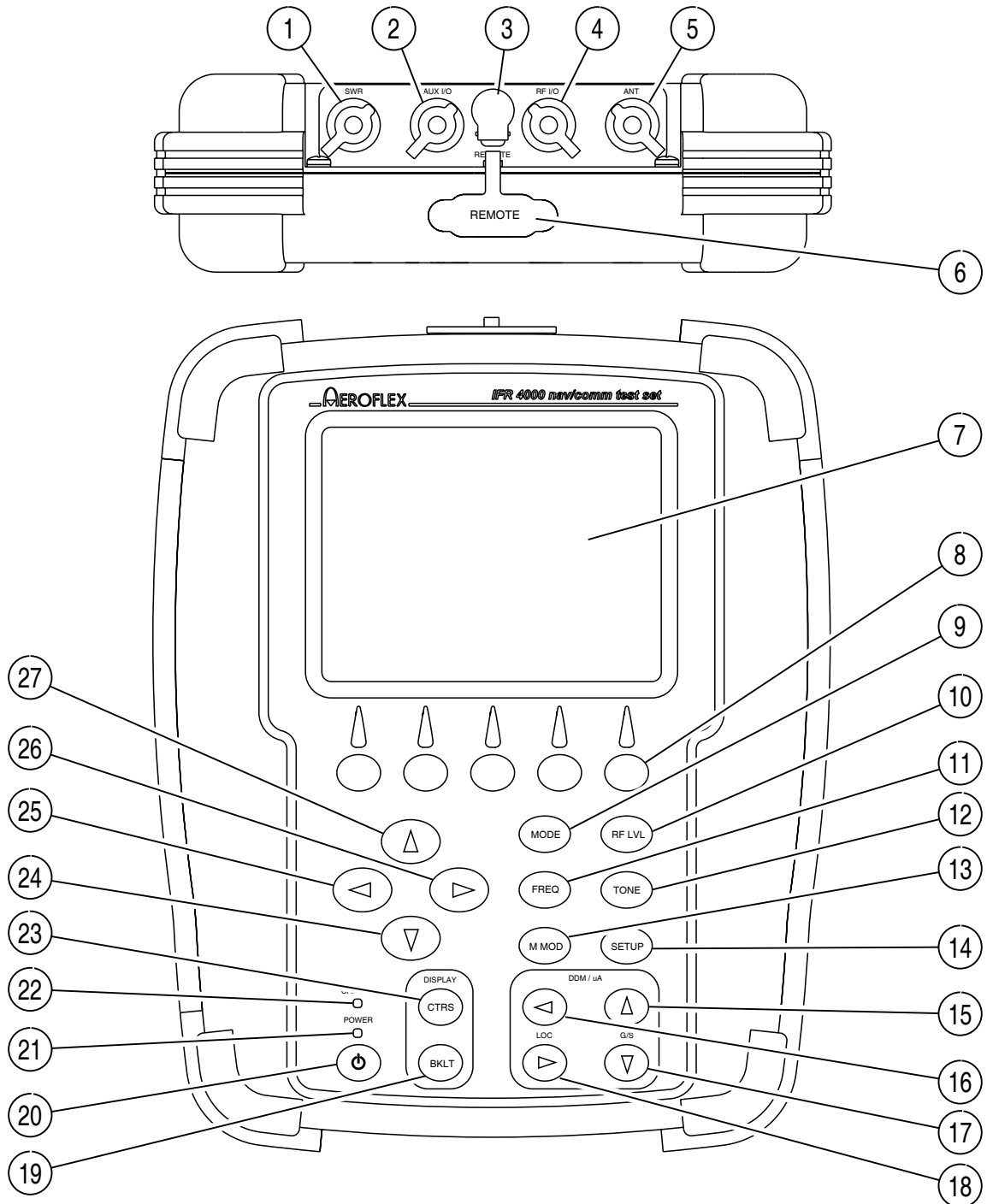
Physical Characteristics:

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)



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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

5. ANT Connector
2. AUX I/O Connector
19. BACKLIGHT Key
22. CHARGE Indicator
23. CONTRAST Key
3. DC POWER Connector
24. DECREMENT/SELECT Data Key
7. Display
11. FREQ Field Select Key
17. G/S DDM DOWN Key
15. G/S DDM UP Key
27. INCREMENT/SELECT Data Key
16. LOC DDM LEFT Key
18. LOC DDM RIGHT Key
13. M MOD Field Select Key
9. MODE Select Key
8. Multi-Function Soft Keys
21. POWER Indicator
20. POWER Key
4. RF I/O Connector
6. REMOTE Connector
10. RF LVL Field Select Key
26. SELECT DATA UNIT LSB Key
25. SELECT DATA UNIT MSB Key
14. SETUP Key
1. SWR Connector
11. TONE Field Select Key

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 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 4000 powers up with the Backlight set to the setting of the previous session.</p>
20. POWER Key	<p>This Key powers the 4000 up and down.</p>
21. POWER Indicator	<p>This Indicator is illuminated when the 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>Example: 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>Example: 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

A		E	
A	Amperes	EMC	Electromagnetic Compatibility
AC	Alternating Current	EXT	External
AF	Audio Frequency		
AM	Amplitude Modulation		
ANT	Antenna		
AP	Address Parity		
Assy	Assembly		
ATTN	Attenuation		
AUTO	Automatic		
AUX	Auxiliary		
B		F	
BAT	Battery	FM	Frequency Modulation
bps	Bits per Second	FPGA	Field Programmable Gate Array
BRG	Bearing	FREQ	Frequency
		Ft	Foot/Feet
		F/W	Firmware
C		G	
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		
D		H	
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		
		I	
		IF	Intermediate Frequency
		ILS	Instrument Landing System
		I/O	Input/Output
		K	
		kg	Kilogram (10 ³ Grams)
		kHz	Kilohertz (10 ³ Hertz)
		km	Kilometer (10 ³ meters)
		kt	Knots (Velocity)
		L	
		LCD	Liquid Crystal Display
		LED	Light Emitting Diode
		LOC	Localizer
		LPF	Low-Pass Filter
		LSB	Least Significant Bit
		LVL	Level

M		S	
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
N		T	
N/A	Not Applicable	TCXO	Temperature Compensated Crystal Oscillator
NAV	Navigation	TX	Transmit
nmi	Nautical Miles	TTL	Transistor - Transistor Logic
ns	Nanosecond (10 ⁻⁹ Seconds)		
NVRAM	Non-Volatile Random Access Memory	U	
O		UHF	Ultra High Frequency
OUT	Output	USB	Upper Sideband
P		USB	Universal Serial Bus
para	Paragraph	UUT	Unit Under Test
PARAM	Parameter	V	
PCB	Printed Circuit Board	V	Volt
PLL	Phase Lock Loop	VAC	Volts, Alternating Current
ppm	Parts per Million	VAR	Variable
PREV	Previous	Vdc	Volts, Direct Current
PROM	Programmable Read Only Memory	VHF	Very High Frequency
psi	Pounds per Square Inch	VOR	VHF Omni-Directional Range
PWR	Power	Vrms	Volts Root Mean Square
R		VSWR	Voltage Standing Wave Ratio
RAM	Random Access Memory	W	
RES	Resolution	W	Watt
RF	Radio Frequency		
RMS	Root Mean Square	μA	Microamps
ROM	Read Only Memory	μs	Microseconds
RTS	Request To Send	μW	Microwatts
R/W	Read/Write	Ω	Ohm
RX	Receive		

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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.