PROTECTING PEOPLE AND ASSETS®

Enterprise Electronics Corporation

TECHNICAL DOCUMENTATION SET
OPERATIONS AND TECHNICAL MANUAL

RANGER® X5

TROUBLESHOOTING, MAINTENANCE, AND CALIBRATION

DESIGNED AND MANUFACTURED FOR:
MOBILE CONFIGURATIONS

SECTION 2

JOB 9819

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Encoded Transmitted Signal In A Simultaneous Dual Polarization Weather System
United States Patent
US 7,439,899

Phase Shifted Transmitted Signals In A Simultaneous dual Polarization Weather System
United States Patent
US 7,551,123

Simultaneous Dual Polarization Radar System with Optical Communications Link
United States Patent
US 7,760,129

Simultaneous dual polarization radar systems offered by EEC are covered by one or more of the follow patents:
United States Patents

US 6,859,163 B2	(Inv-1)
US 6,803,875 B1	(Inv-2)
US 7,049,997	(Inv-3)

Foreign Patents

1200500266/13041 (OAPI African Organization)	(Inv-1)
200501316/009250 (EA Eurasia)	(Inv-1)
13694 (OAPI African Organization)	(Inv-3)
2394254 (Russia)	(Inv-3)

Simultaneous Dual Polarization Radar System Inv-2
Patented under European patent number 1608997

Various additional domestic and international patents have been applied for.

Validity Date: 24 September 2015

FCC Part 15.19 Warning Statement- (Required for all Part 15 devices)

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

FCC Part 15.21 Warning Statement

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

FCC Part 15.105(b) Warning Statement- (ONLY Required for 15.109-JBP devices)

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the manufacturer or an experienced radio/TV technician for help.

FCC Part 2.1091 Radiation Safety Warning

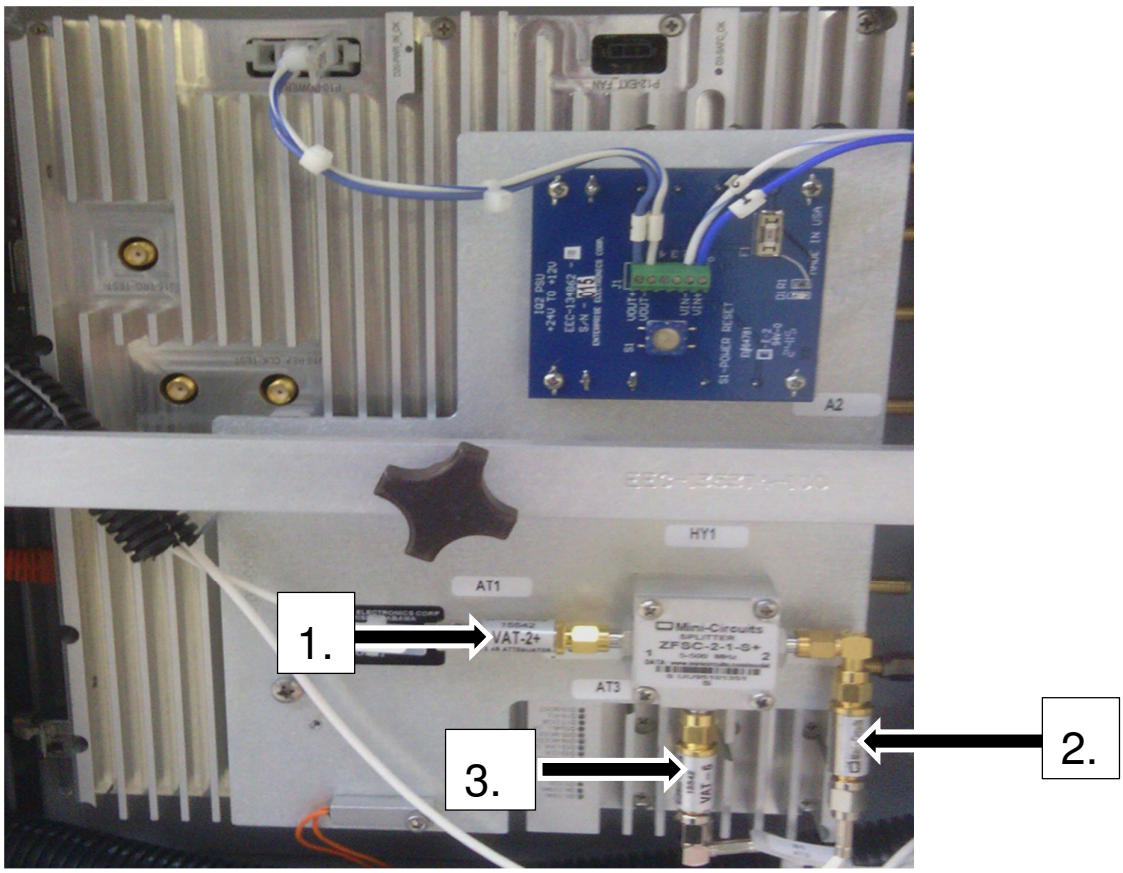
NOTE: This equipment complies with the FCC RF radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with a minimum distance of 22.43m between the radiator and any part of your body.

RANGER X5 TUNING PROCEDURE

The power amplitude of the amplifier is completely dependent on the level of RF drive supplied to the amplifier. The RF drive is dependent on several factors. Drive amplitude is affected by the local oscillator output (which is adjustable in increments of 0.5 dBm), the 60 MHz IF output amplitude which derives from the output of the IFD, and the frequency to a lesser degree due to loss in the cabling.

The system will have a minimum output of 500 Watts (56.989 dBm), with an allowable overage of 0.792 dBm (Total Overage 600Watts (57.781dBm)). The maximum RF drive into the amplifier is +14 dBm, however the gain of two amps will not always yield the same output. Due to some minor inconsistencies in the gain and losses of the amplifiers, each amplifier may have its RF input drive increased or decreased. In other words, we have the ability to manipulate the RF drive to each amp independently from one another.

During factory testing the gain is set to around 10 dBm roughly to use as a starting point. The output of the amplifier is measured using a calibrated peak power meter (sensor) during this time. The RF drive is then adjusted through the use of **SMA attenuators on the 60 MHz IF signal used in the up-convert chain for Input, Horizontal, and Vertical Channels.** The local oscillator amplitude can be changed if necessary, however this will affect the drive to both amplifiers therefore, the local oscillator is set to a standard amplitude (typically 9 dBm), and drive adjustments are made by increasing or decreasing the 60 MHz amplitude as necessary to achieve the desired output power from the transmitters (Horizontal / Vertical).



SMA attenuators on the 60 MHz IF signal used in the up-convert chain for Input (3.), Horizontal (1.), and Vertical (2.) Channels.

Revision Information

REVISION	DATE	MODIFICATION
1.0	15 November 2014	Initial Release
1.1	3 February 2015	Updated with latest procedures per ECNs
1.2	14 February 2017	Updated with latest procedures per ECNs
1.3	15 March 2017	Updated FCC radiation warning and tuning procedures
1.4	22 March 2017	Updated tuning procedures

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INTRODUCTION

SYSTEM INTRODUCTION AND OVERVIEW

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The Enterprise Electronics Corporation (EEC) Ranger-X5 radar system is a new generation, X-band (3 cm), Adaptive Polarization Doppler Weather Surveillance Radar that fills the gap between high-cost, high-power traditional radar systems and the passive ground-station weather sensors. The system uses relatively low power solid-state transmitters and pulse compression technology to attain nearly the same performance capabilities of much more expensive traditional radar systems. The Ranger-X5 employs Adaptive Dual Polarization (ADP) techniques to allow Alternating or Simultaneous Dual Polarization capability with total control over the transmission polarization state using dual independent coherent transmitters.

The entire Ranger-X5 design concept emphasizes precision, stability, reliability, and value using proven solid-state technology combined with the most advanced motion control system ever conceived for weather radar. The sealed, lubricated for life, mechanical drive system in the Ranger-X5 has an MTBF in excess of 180,000 hours without the need for routine maintenance or lubrication. The motion system provides extremely high torque to weight ratios for outdoor operation and greater than 40 arc-second position accuracy.

Advanced configurations and networks of systems are available that meet all of the requirements for special missions, such as aviation or hydrological forecasting applications.

The flexible architecture and system design facilitates automatic remote operations, ensures minimal maintenance costs, and provides maximum configurability to meet specialized customer needs. The Ranger-X5 is designed for continuous (24 hours/day), unattended operations at remote locations, providing the full suite of polarimetric radar data for local single-site operations, as a member of a network with predefined product contributions or, as the manager of a network of remote users providing specific radar products to suite the individual user's needs.

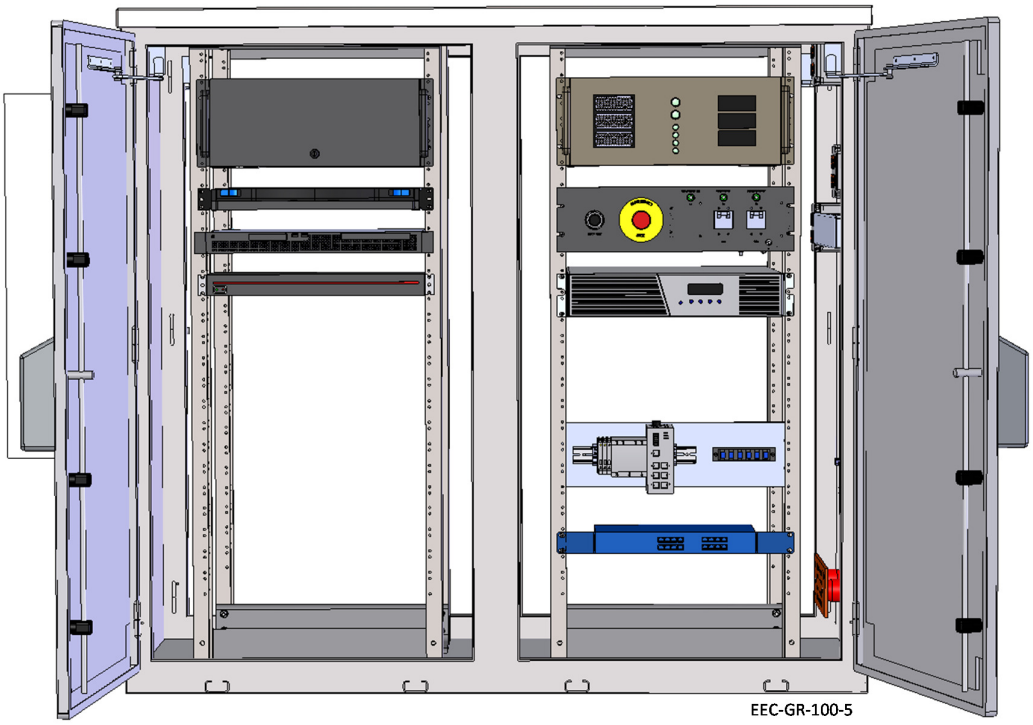

Figure 1. Outdoor Control Cabinet

The Ranger-X5 radar system is a lightweight, high performance system designed for tactical grade deployments on a wide variety of fixed and mobile platforms. This densely packed system provides stability, stiffness, position accuracy and raw power directly coupled to the payload.

The 1-meter variant shown in FIGURE XX is capable of supporting full operation in sustained winds up to 75 mph, and with wind gusts to 90 mph. To deliver radar and motor cooling, the system provides for water-cooling using naval shipboard cooling techniques.

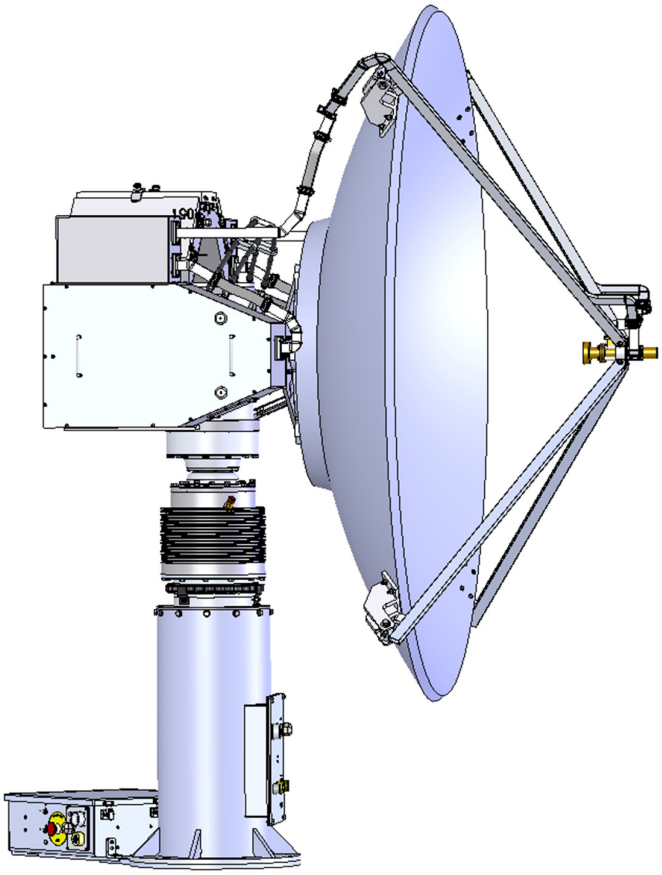

Figure 2. 1.8 Meter Ranger-X5 Variant

The standard Ranger-X5 system configuration includes an elevation over azimuth pedestal providing on-board, environmentally sealed, and controlled electronics housing for the transmitters, receivers, and signal digitizer in conjunction with a NEMA 4 grade environmentally controlled ground interface enclosure. The ground interface contains the system power supplies, EEC IQ2 signal processor, Local Control Interface (LCI) station, Radar Control Unit (RCU) Computer running EEC COBRA software, EEC EDGE software system workstation, and associated communication interfaces. The ground interface enclosure is not required with customer furnished facilities.

The standard configuration uses two 500-Watt transmitters located on the pedestal above the elevation rotational axis to support Dual Polarization operation. This design eliminates the need for waveguide switches, waveguide rotary joints, or a power splitter, allowing for complete diversity in H/V measurement schemes and minimum path loss in both the transmission and reception path.

The radar system provides standard precipitation intensity, turbulence, and velocity modes of analysis with extremely high precision in all modes of operation. Normal radar control and data processing utilizes the EDGE Radar Control and Analysis Software. A separate technical manual

describes the functions of EDGE.

The transmitter provides a 500W peak RF power pulse (in each channel) with an adjustable pulse width from 0.2 and 100.0 microseconds (µs), providing excellent weather detection at range in all modes. The transmitter radiates in staggered Pulse Repetition Frequency (PRF) modes at 3:2, 4:3, or 5:4 ratio allowing dual PRF sampling by the digital signal processor to produce maximum unambiguous velocities of up to ≥90 meters/second.

The EEC IQ2-IFD Intermediate Frequency Digitizer ingests and digitizes the received radar return in 16-bit resolution. The receiver design utilizes state-of-the-science components to optimize detection sensitivity, bandwidth, dynamic range, measurement accuracy, and useful life.

The IQ2-IFD converts the analog receiver IF signals into the digital domain. The IQ2-DSP Digital Signal Processor receives the digitized Inphase / Quadranture (I/Q) data via the PCI receiver card. The I/Q data stream is pre-processed and polar rays of meteorological moments are generated. The ray data is sent via a 1Gbit TCP/IP connection to the IQ2-DSP Signal Processor for storage and further processing. The IQ2 design optimizes detection sensitivity, bandwidth, dynamic range, measurement accuracy, and useful life.

The IQ2-DSP is the central data processing point for the radar. The IQ2-DSP is an advanced scientific computer system utilizing the Linux operating system and employs advanced scientifically validated algorithms. The standard mode of operation is the proven pulse-pair method of Doppler processing to produce the standard data moments of Uncorrected Reflectivity (U), Corrected Reflectivity (ZH), Vertical Reflectivity (ZV), Velocity (V), and Spectrum Width (W). In addition to the standard base Moments the Ranger-X5 provides the Polarimetric Base Moments Differential Reflectivity (ZDR), Differential Phase (ΦDP), Specific Differential Phase (KDP), Correlation Coefficient (ρHV), and Linear Depolarization Ratio (LDR), (where applicable). The derived moment of rainfall (R) is also included.

General system control utilizes the standard EEC Radar Control Unit (RCU). The RCU is used to correlate and process BITE information from the various modules and procedures, control the antenna pedestal operational parameters and perform basic radar control. The RCU integrates closely with the IQ2 Digital Receiver and IQ2 Digital Signal Processor, communicating by standard Ethernet Protocol.

The radar system design allows for easy maintenance and has a manually selectable local/remote mode to permit maintenance personnel to gain local control of the radar system. Local control is implemented on a Local Control Interface (LCI) Display using a system of menus and status screens. With the automatic calibration functions and easily accessible system test points, any necessary system testing, calibration, or repair is easily accomplished with minimum down time.

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CHAPTER 1

CONTROL CABINET (UNIT 1)

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1. Control Cabinet – Outdoor (Unit 1)

1.1. RCU with Serial Card (Unit 1 A1)

1.1.1. Computer System (Unit 1 A1 A1)

Troubleshooting:

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1. Is the RCU receiving power?

   YES: Continue to Step 2.

   NO: Check the input power and output power using the Schematics.

2. Is the COBRA Software loading properly?

   YES: Continue to Step 3.

   NO: Refer to Volume 5, Chapter 2, COBRA Operations.

3. Are the communications with the network working properly?

   YES: There is likely a problem with the COBRA Software load, Refer to Volume 2, Section 5, COBRA SW/FW Maintenance.

   NO: Refer to paragraphs 1.5, 1.8.1, and 2.1.5.1 to ensure the Ethernet Switches are operating properly.

Maintenance:

If the RCU system is inoperative OR the COBRA software will not load, replace the RCU.

1. Disconnect all cables from the rear of the RCU.
2. Use the quick disconnect latches to loosen the RCU from the 19-inch rack.
3. Pull the RCU out on the rails.
4. Disconnect the RCU from the rails.
5. Reinstall the RCU in reverse order of steps 1-4.
6. Return the RCU to the manufacturer for troubleshooting and/or repair.

Calibration:

None Required

1.1.2. Synclink GT 4E 4-Port Adapter (Unit 1 A1 A2)

Part of Computer System (Unit 1 A1)

1.2. IQ2 Digital Signal Processor (Unit 1 A2)

1.2.1. IQ2 Host Computer (Unit 1 A2 A1)

Troubleshooting:

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Maintenance:

If the IQ2 Digital Signal Processor is inoperative OR the EDGE software will not load, replace the entire unit.

1. Disconnect all cables from the rear of the IQ2-DSP.
2. Loosen the screws retaining the IQ2-DSP in the 19-inch rack.
3. Pull the IQ2-DSP out of the 19-inch rack.
4. Reinstall the IQ2-DSP in reverse order of steps 1-3.
5. Return the IQ2-DSP to the manufacturer for troubleshooting and/or repair.

Verification:

This check is to verify the IQ2- Digital Signal Processor (DSP) (displayed as DST on EDGE) and the IQ2- Intermediate Frequency Digitizer (IFD) (displayed as UST on EDGE) are working within specified voltage and temperature limits.

1. From EDGE Control screen, open the Signal Processor Status screen.
2. On the Summary tab, verify the IQ2 and UST Uptime status. See Figure 3.

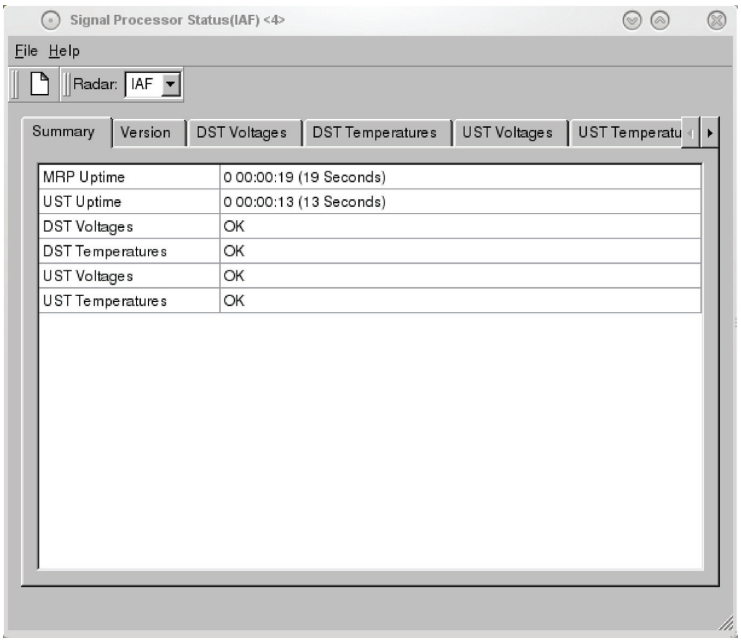

Figure 3. Signal Processor Status Summary Tab

3. On the DST Voltages tab, verify all voltages are within specified limits and the corresponding indicator is green. See Figure 4.

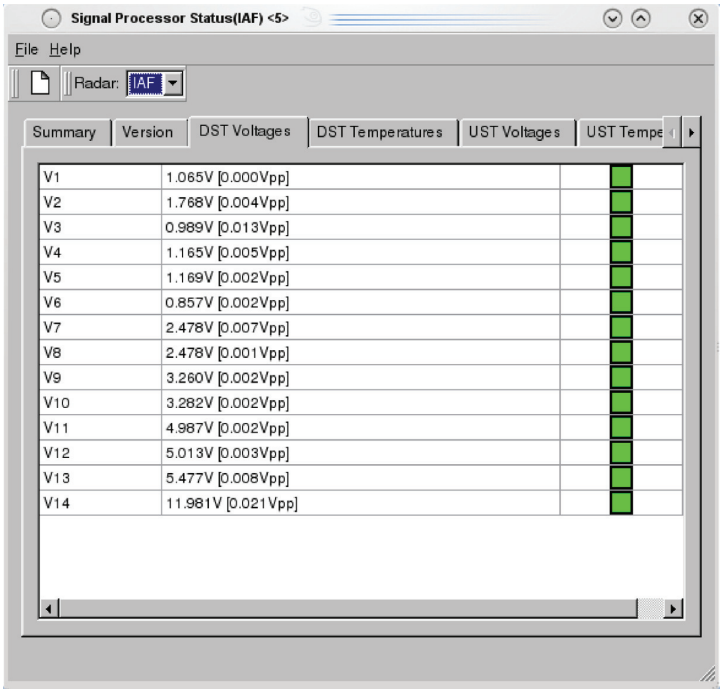

Figure 4. Signal Processor Status DST Voltages Tab

4. On the DST Temperature Tab, verify temperatures for the DST Processor are below 70° Celsius and LEDs are lit green. See Figure 5.
5.

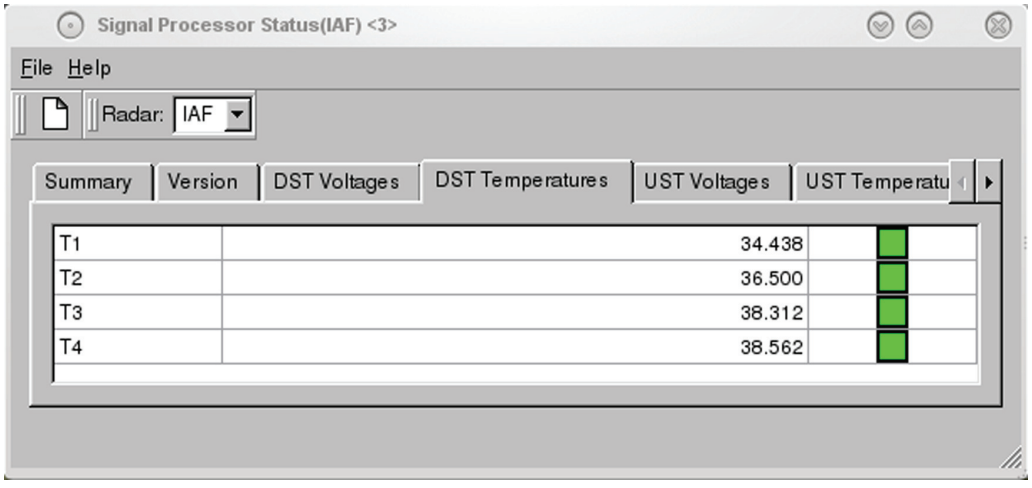

Figure 5. Signal Processor Status DST Temperature Tab

Calibration and Verification Tests:

See Paragraph 5.2.3.

1.2.2. IQ2 DSP PCIe Board (Unit 1 A2 A2)

Part of IQ2-DSP (Unit 1 A2)

1.2.3. IQ2 Connector Panel (Unit 1 A2 A3)

Part of IQ2-DSP (Unit 1 A2)

1.3. Keyboard Video Monitor (Unit 1 A3)

Troubleshooting:

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1. Is the KVM receiving power?

   YES: Continue to Step 2.

   NO: Check the input power and output power using the Schematics.

   a. Go to the UPS (A9) and measure power at Segment 2, Port 2.

   b. If no power is on the UPS, check to ensure the Emergency Stop button on the S-Stop Panel (A11) is not depressed.

   c. If the Emergency Stop button is not depressed, check the position of CB1 on the E-Stop Panel Assembly.

   d. If the Circuit Breaker (CB1) is on, check to ensure there is input Power to the system.

2. If the KVM is receiving power but not communicating with the RCU or IQ2-Digital Signal Processor, then there is likely a connection problem.

   a. Check the Keyboard and Mouse Connectors on the back of the KVM. See Figure 6, points 5, 6, and 7.

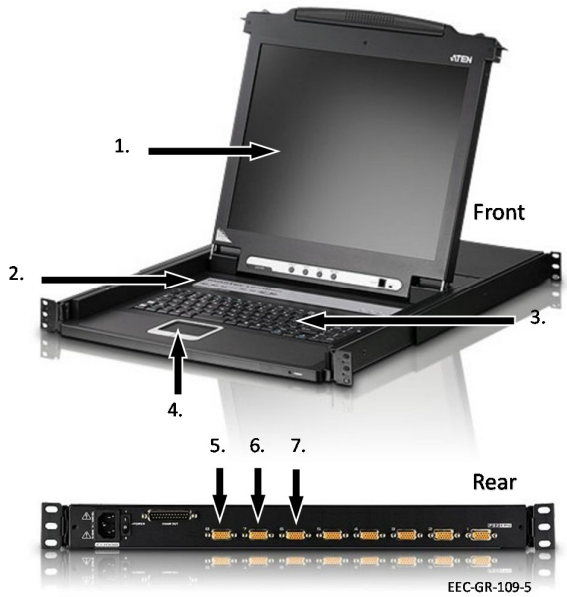

Figure 6. KVM Connections

Maintenance:

If power or communication fail and cannot be restored, replace the unit.

1. Disconnect all cables from the rear of the KVM.
2. Unscrew and remove the screws to loosen the KVM from the 19-inch rack.
3. Pull the KVM out on the rails.
4. Disconnect the KVM from the rails.
5. Reinstall the KVM in reverse order of steps 1-4.
6. Return the KVM to the manufacturer for troubleshooting and/or repair.

Calibration:

None

1.4. EDGE Workstation (Unit 1 A4)

Troubleshooting:

SD-135956-100 Sheet 2 of 3

1. Is the EDGE Workstation receiving power?

   YES: Continue to Step 2.

   NO: Check the input power and output power using the Schematics.

   a. Go to the Power Distribution Unit (A6) and measure power at A1.

   b. If no power is on the Power Distribution Unit, check the output power on the UPS, Segment 1, Wire 2.

   c. If no power is on the UPS, check to ensure the Emergency Stop button on the S-Stop Panel (A11) is not depressed.

   d. If the Emergency Stop button is not depressed, check the position of CB1 on the E-Stop Panel Assembly.

   e. If the Circuit Breaker (CB1) is on, check to ensure there is input Power to the system.

2. If the KVM is receiving power but not communicating with the RCU or IQ2-Digital Signal Processor, then there is likely a connection problem.

   a. Troubleshoot the Fiber Optic Media Converter (See Paragraph 1.8) and the 16-Port Ethernet Switch (See Paragraph 1.5).

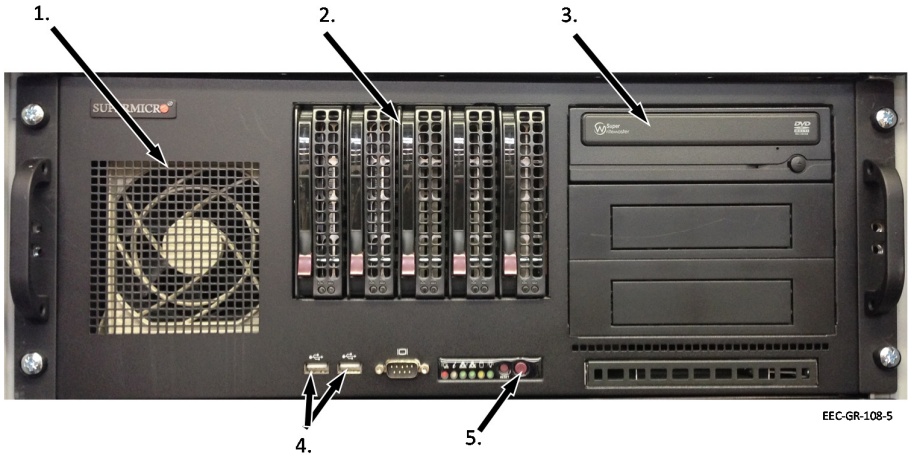

Figure 7. EDGE Wrokstation

Maintenance:

If the EDGE workstation does not perform properly or software will not load properly, replace the unit.

1. Disconnect all cables from the rear of the EDGE Workstation.
2. Unscrew and remove the screws to loosen the EDGE Workstation from the 19-inch rack.
3. Pull the EDGE Workstation out of the 19-inch Rack.
4. Reinstall the EDGE Workstation in reverse order of steps 1-3.
5. Return the EDGE Workstation to the manufacturer for troubleshooting and/or repair.

Calibration:

None

1.5. 16-Port Gigabit Ethernet Switch (Unit 1 A5)

Troubleshooting:

SD-135956-100 Sheet 2 of 3

1. Is the Ethernet Switch receiving power?

   YES: Continue to Step 2.

   NO: Check the input power and output power using the Schematics.

   a. Go to the UPS, Segment 1 output and measure power on Wire 7.

   b. If no power is on the UPS, check to ensure the Emergency Stop button on the S-Stop Panel (A11) is not depressed.

   c. If the Emergency Stop button is not depressed, check the position of CB1 on the E-Stop Panel Assembly.

   d. If the Circuit Breaker (CB1) is on, check to ensure there is input Power to the system.

2. If the Ethernet Switch is receiving power but not communicating with any of the units, then there is likely a connection problem. Unplug the unit in question and plug it back into an unused port. If the problem persists, there is nothing wrong with the Ethernet

Switch. If the problem is corrected, then there is likely a "dead Ethernet port" on the Ethernet Switch. Replace the Ethernet Switch.

Maintenance:

If the Ethernet Switch does not perform properly, replace the unit.

1. Disconnect all cables from the Ethernet Switch, front and back.
2. Unscrew and remove the screws to loosen Ethernet Switch from the 19-inch rack.
3. Pull the Ethernet Switch out of the 19-inch Rack.
4. Reinstall the Ethernet Switch in reverse order of steps 1-3.

Calibration:

None

1.6. Power Distribution Unit (Unit 1 A6)

Troubleshooting:

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1. Is the Power Distribution Unit receiving power?

   YES: Continue to Step 2.

   NO: Check the input power and output power using the Schematics.

   a. Go to the UPS, Segment 1 output and measure power on Wire 2 and Wire 3.

   b. If no power is on the UPS, check to ensure the Emergency Stop button on the S-Stop Panel (A11) is not depressed.

   c. If the Emergency Stop button is not depressed, check the position of CB1 on the E-Stop Panel Assembly.

   d. If the Circuit Breaker (CB1) is on, check to ensure there is input Power to the system.

2. If the Power Distribution Unit is receiving power input from the UPS, but has no power output, use the power switch to turn the unit OFF, then ON. Did the unit reset?

   YES: End the process.

   NO: Replace the Power Distribution Unit.

Maintenance:

If power fails and cannot be restored, replace the unit.

1. Disconnect all cables from the rear of the Power Distribution Unit (PDU).
2. Unscrew and remove the screws to loosen the PDU from the 19-inch rack.
3. Pull the PDU out on the rails.
4. Disconnect the PDU from the rails.
5. Reinstall the PDU in reverse order of steps 1-4.
6. Return the PDUto the manufacturer for troubleshooting and/or repair.

Calibration:

None

1.7. Fiber-Optic Coupler (Unit 1 A7)

Troubleshooting:

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If the Fiber-Optic network isn't connected, check this unit as a last resort. There are several spare ports. This is a passive device and it should not fail during the operational life of the radar system.

Maintenance:

None

Calibration:

None

1.8. Fiber Optic Media Converter Assembly (Unit 1 A8)

1.8.1. 7-Port Ethernet Switch with 1-Fiber Optic Port (Unit 1 A8 A1)

Troubleshooting:

SD-133116-100 Sheet 1 of 1

1. Is the Ethernet Switch receiving power?

   YES: Continue to Step 2.

   NO: Check the input power using the Schematics.

   a. Check the 24VDC Power at the input of the Ethernet.

   b. If power is present, proceed to Step 2.

2. If the Ethernet Switch is receiving power but not communicating with any of the units, then there is likely a connection problem. Replace the Ethernet Switch.

Maintenance:

If the Ethernet Switch does not perform properly, replace the unit.

1. Disconnect all cables from the Ethernet Switch.
2. Use a screwdriver to disconnect from the DIN rail.
3. Pull the Ethernet Switch from the DIN rail.
4. Reinstall the Ethernet Switch in reverse order of steps 1-3.

Calibration:

None

1.8.2. 24VDC Power Supply (Unit 1 A8 PS1)

Troubleshooting:

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SD-133116-100 Sheet 1 of 1

Troubleshooting:

1. **Initial Testing:**

   Using a voltmeter, measure the voltage of PS1 (Unit 1 A8 PS1) to verify proper voltage output. Check at the output of the power supply. Is it providing 24 VDC?

   NO: Verify AC power is present by measuring the input voltage on the input side of the Power Supply. If AC voltage is present, replace the failed Power Supply.

   YES: Go to Step 2.

2. **Check the Ethernet Switch:**

   Is the Ethernet Switch powered on?

   NO: Check the fuse (F3) between the power supply and Ethernet switch.

   YES: End Step.

Maintenance:

If the Power Supply does not perform properly, replace the unit.

1. Disconnect all cables from the Power Supply.
2. Use a screwdriver to disconnect from the DIN rail.
3. Pull the Power Supply from the DIN rail.
4. Reinstall the Power Supply in reverse order of steps 1-3.

Calibration:

In the event of a total failure of the 24 VDC Power Supply, the Fiber Optic Media Converter will not function

Procedure:

Adjust the 24VDC Power Supplies to 24VDC after replacement. To make the adjustment:

1) Ensure AC Power is available. The “DC ON” LED will illuminate.
2) Connect a Volt Meter to the output of the Power Supply.
3) Measure the voltage.
4) Using the Vout ADJ., adjust the voltage upward (clockwise turns) or downward (counter clockwise turns) until the voltage readout is 24.0 VDC on the Volt Meter. Note: The operational range of the voltage is 23.0 VDC to 24.6 VDC.
5) Cleanup the work area and return the Radar System to normal operations.

Figure 8. 24VDC Power Supply

1.9. UPS, 2000/1800 KVA (Unit 1 A9)

Troubleshooting:

SD-135956-100 Sheet 2 of 3

Use Vendor Documentation (See Volume 2, Section 4, Paragraph 1.9)

Maintenance:

Maintain the UPS per the Vendor Documentation.

Calibration:

None

1.10. E-Stop Panel (Unit 1 A12)

Troubleshooting:

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The E-Stop Panel consists of two circuit breakers (CB1 and CB2), three power indicators (Input, Main, and Pedestal), and E-Stop Button, and an E-Stop Reset Button. Troubleshoot according to the Schematic. The E-Stop Button and E-Stop Reset Button control the Contactor and Relay on the DC Power Distribution Plate (See Paragraph 1.11).

Maintenance:

Maintenance will consist of typical electrical maintenance activities.

Calibration:

None

1.11. DC Power Distribution Plate (Unit 1 A13)

The DC Power Distribution Plate control is through the E-Stop Panel (Unit 1 A12). When any component on the DC Power Distribution Plate is not functioning (with the exception of the Lightning Protection Module), follow the troubleshooting procedures in this section.

When the operator presses the E-Stop Button, the Safety Relay (K2) removes DC Power from the Contactor (K1). When the Contactor (K1) is OPEN, AC Power is removed from the main DC Power Supplies (PS2, PS3, PS4) which provide DC power to the Pedestal (Unit 2). Should the 24VDC Power Supply (PS1) fail, all DC Power will fail.

Troubleshooting:

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SD-134932-101 Sheet 1 of 1

Follow these procedures for any failure on the DC Power Distribution Plate.

1. **Step 1:**

   Is this a communication problem?

   YES: Go to Paragraph 1.11.1

   NO: Go to Step 2.

2. **Step 2:**

   Troubleshoot the 24VDC Power Supply (PS1) per Paragraph 1.11.4., then proceed to Step 3.

3. **Step 3:**

   Reset the E-Stop system using the E-Stop Reset Button on the E-Stop Panel. Is the problem resolved?

   NO: Continue to Step 4.

   YES: End Process.

4. **Step 4:**

   Troubleshoot the Safety Relay (K2) per Paragraph 1.11.3 and the Contactor (K1) per Paragraph 1.11.2. Is the problem resolved?

   NO: Continue to Step 4.

   YES: End Process.

5. **Step 5:**

   Troubleshoot each individual DC Power Supply.

   - Troubleshoot the 48VDC Power Supply (PS2) per Paragraph 1.11.5.
   - Troubleshoot the 24VDC Power Supply (PS3) per Paragraph 1.11.6.
   - Troubleshoot the 12VDC Power Supply (PS4) per Paragraph 1.11.7.

   Is the problem resolved?

   NO: Contact the Manufacturer.

   YES: End Process.

1.11.1. Lightning Protection Module (Unit 1 A13 A1)

Troubleshooting:

SD-135956-100 Sheet 2 of 3

SD-134932-101 Sheet 1 of 1

If the Ranger-X5 has lost communication to the outside WAN, this unit may need to be replaced. Test this unit by bypassing the connection temporarily.

Maintenance:

To replace the Lightning Protection Module:

1. Unscrew the four screws mounting the system to the DC Power Distribution Plate.
2. Disconnect the ground wires.
3. Disconnect the Ethernet Cables.
4. Reinstall in reverse order of Steps 1-3.

Calibration:

None

1.11.2. Contactor, 3-Phase, 24VDC (Unit 1 A13 K1)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

The Contactor (K1) is controlled through the Safety Relay (K2).

1. **Initial Testing:**

   If DC power is applied to the Contactor, it closes and allows AC power to flow through the relay to the other three DC power supplies on the DC Power Distribution Plate (Unit 1 A13). If DC power is removed, the switch opens and removes AC power preventing the operation of the other DC Power Supplies. Control is through the Safety replay. Insure DC power is available on A1 and A2 of the Contactor. Is it present?

   NO: Reset the E-Stop System and check the output DC power from Point 14 on the Safety Relay (K2). Is DC power present?

   YES: *Replace the Contactor (K1).*

   NO: *Go to Paragraph 1.11.3*

   YES: Return to Paragraph 1.11

Maintenance:

To replace the Contactor:

1. Disconnect the terminals / wires from the Contactor.
2. Use a slotted screwdriver to disconnect the Contactor from the DIN rail.
3. Reinstall in reverse order of Steps 1-2.

Calibration:

None

1.11.3. Safety Relay (Unit 1 A13 K2)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

1. **Initial Testing:**

   The Safety Relay receives power from a 24VDC Power Supply (PS1). Is power present?

   NO: Go to Paragraph 1.11.4

   YES: Go to Step 2

2. **Reset E-Stop**

   Press the E-Stop Button and then press the E-Stop Reset Button. Is power restored TO the Contactor (K1). Check the input of the Contractor (K1) at point A1 and A2.

   YES: Return to Paragraph 1.11, Troubleshooting, Step 5.

   NO: Replace the Safety Relay.

Maintenance:

To replace the Safety Relay:

1. Disconnect the terminals / wires from the Safety Relay.
2. Use a slotted screwdriver to disconnect the Safety Relay from the DIN rail.
3. Reinstall in reverse order of Steps 1-2.

Calibration:

None

1.11.4. 24VDC Power Supply (Unit 1 A13 PS1)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

1. **Initial Testing:**

   Using a voltmeter, measure the voltage of PS1 (Unit 1 13 PS1) to verify proper voltage output. Check at the output of the power supply. Is it providing 24 VDC?

   NO: Verify AC power is present by measuring the input voltage on the TB1-3, 4, & 5 to

ensure the presence of AC Power. If AC voltage is present, replace the failed Power Supply.

YES: End Process.

Maintenance:

See Paragraph 1.8.2, Maintenance.

Calibration:

See Paragraph 1.8.2, Calibration.

1.11.5. 48VDC Power Supply (Unit 1 A13, PS2)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

1. **Step 1:**

   Using a voltmeter, measure the input AC Voltage on Terminal Block 1, point 6, 7, and 8. Is AC Voltage Present?

   NO: Troubleshoot the input power, then return to this step.

   YES: Go to Step 2.

2. **Step 2:**

   Using a voltmeter, measure the input DC Voltage on Terminal Block 2, point 4 and 5. Is DC Voltage Present?

   NO: Replace the Power Supply.

   YES: Go to Paragraph 1.11.6

Maintenance:

To replace the Power Supply:

1. Disconnect ALL the terminals / wires from the input and output of the Power Supply.
2. Using a Philips Head screwdriver, loosen the screws connecting the Power Supply to the Plate.
3. Remove the Power Supply from the Plate.
4. Reinstall in reverse order of Steps 1-3.

Calibration:

None

1.11.6. 24VDC Power Supply, 600W, 27A Peak (Unit 1 A13 PS3)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

1. **Step 1:**

   Using a voltmeter, measure the input AC Voltage on Terminal Block 1, point 9, 10, and 11. Is AC Voltage Present?

   NO: Troubleshoot the input power, then return to this step.

   YES: Go to Step 2.

2. **Step 2:**

   Using a voltmeter, measure the input DC Voltage on Terminal Block 2, point 6 and 7. Is DC Voltage Present?

   NO: Replace the Power Supply.

   YES: Go to Paragraph 1.11.7

Maintenance:

To replace the Power Supply:

1. Disconnect ALL the terminals / wires from the input and output of the Power Supply.
2. Using a Philips Head screwdriver, loosen the screws connecting the Power Supply to the Plate.
3. Remove the Power Supply from the Plate.
4. Reinstall in reverse order of Steps 1-3.

Calibration:

None

1.11.7. 12VDC Power Supply (Unit 1 A13 PS4)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

1. **Step 1:**

   Using a voltmeter, measure the input AC Voltage on Terminal Block 1, point 9, 10, and 11. Is AC Voltage Present?

   NO: Troubleshoot the input power, then return to this step.

   YES: Go to Step 2.

2. **Step 2:**

   Using a voltmeter, measure the input DC Voltage on Terminal Block 2, point 8 and 9. Is DC Voltage Present?

   NO: Replace the Power Supply.

   YES: Return to Paragraph

Maintenance:

See Paragraph 1.8.2, Maintenance.

Calibration:

None

1.12. I/O Panel Assembly (Unit 1 A14)

Troubleshooting:

SD-134932-101 Sheet 1 of 1

Maintenance:

No Maintenance Required.

Calibration:

None

1.13. Control Cabinet Modification (Unit 1 MP1)

No Troubleshooting, Maintenance or Calibration Required.

CHAPTER 2

ANTENNA / PEDESTAL (UNIT 2)

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2. Antenna / Pedestal (Unit 2)

2.1. Pedestal Assembly (Unit 2 A1)

2.1.1. Azimuth Assembly (Unit 2 A1 A1)

2.1.1.1. Slip Ring with Fiber Optic Rotary Joint (Unit 2 A1 A1 A1)

Troubleshooting:

SD-135953-100 or -101 Sheet 1 of 4
Sheet 3 of 4
SD-135887-100 Sheet 1 of 3

After troubleshooting all components between the Antenna / Pedestal and Control Cabinet that are part of the communications system, contact the manufacturer for additional assistance.

Maintenance:

NONE – Depot Level Maintenance Only

Calibration:

N/A

2.1.1.2. Actuator Unit (Unit 2 A1 A1 A2)

Troubleshooting:

After troubleshooting all components leading to the actuator and determining their functionality, contact the manufacturer for additional assistance.

Maintenance:

NONE – Depot Level Maintenance Only

Calibration:

N/A

2.1.2. Elevation Assembly (Unit 2 A1 A2)

2.1.2.1. Elevation Endcap Assembly (Unit 2 A1 A2 A1)

Troubleshooting:

After troubleshooting all components leading to the actuator and determining their functionality, contact the manufacturer for additional assistance.

Maintenance:

NONE – Depot Level Maintenance Only

Calibration:

N/A

2.1.2.1.1. Actuator Unit

Troubleshooting:

After troubleshooting all components leading to the actuator and determining their functionality, contact the manufacturer for additional assistance.

Maintenance:

NONE – Depot Level Maintenance Only

Calibration:

N/A

2.1.2.2. Elevation Driven Side Unit (Unit 2 A1 A2 A2)

Troubleshooting:

After troubleshooting all components leading to the actuator and determining their functionality, contact the manufacturer for additional assistance.

Maintenance:

NONE – Depot Level Maintenance Only

Calibration:

N/A

2.1.2.3. Servo Amplifier, 100V, 10A (Unit 2 A1 A2 A3)

Troubleshooting:

SD-135953-100 or -101 Sheet 1 of 4 (Power)
Sheet 2 of 4 (Command / Control)
Sheet 3 of 4 (Ethernet)

See also Volume 2, Section 4, Paragraph 2.1.2.3 for additional Troubleshooting Steps.

1. **Step 1 (Power):**

   Using a voltmeter, measure the DC Voltage on the Servo Amplifier at points VP+, PR, and PE (per the schematics). Is 48 VDC Voltage Present?

   NO: Troubleshoot the input power through the Regeneration Clamp (Unit 2 A1 A2 A5). If restored, restart with Step 1.

   YES: Go to Step 2.

2. **Step 2 (Command and Control):**

Check the connectors, J6 and J7. Are the connectors inserted properly?

NO: Reinsert and restart this step.

YES: Go to Step 3.

3. **Step 3 (Communication):**

   Are the Ethernet (J3) and RS232 (J4) connectors inserted properly?

   NO: Reinsert and restart this step.

   YES: Go to Step 4.

4. Is the Ethernet Switch (Unit 2 A1 A3 A1 A5) functioning properly (See Paragraph 2.1.3.1.4)
   NO: Repair the Ethernet Switch per Paragraph 2.1.3.1.4)

   YES: End Process.

Maintenance:

Remove and Replace:

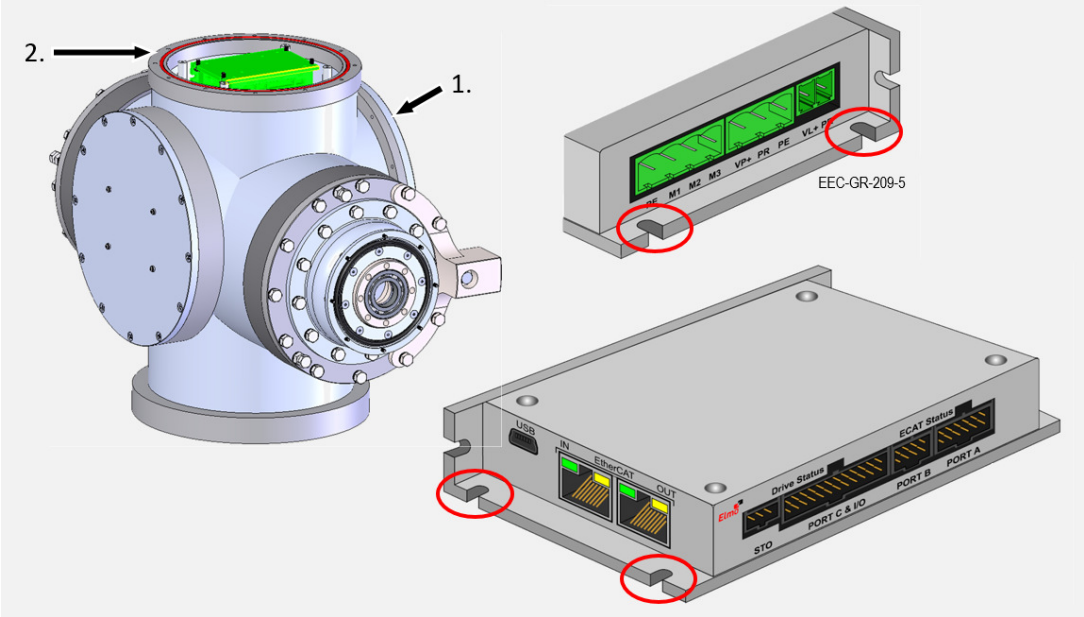


Figure 9. Servo Amplifier Removal

1. **Step 1:**

   Open the Elevation Assembly FRONT Cover using a Philips Screwdriver (12 Screws). See Figure 9, Point 1.

Do not remove the cover where the Regeneration Clamp is mounted.

2. **Step 2:**

   Remove the Aquarian Servo Controller per Paragraph 2.1.2.4.

3. **Step 3:**

   Remove the Elevation Assembly TOP Cover using a Philips Screwdriver (12 Screws). See Figure 9, Point 2.

4. **Step 4:**

   Disconnect all connectors to the Servo Amplifier including Power, Ethernet, and Command and Control. Refer to Volume 2, Section 1, Paragraph 2.1.2.3. for a complete description of all connectors.

5. **Step 5:**

   Using a Philips screwdriver disconnect the four (4) retaining screws that mount the Servo Amplifier to the Elevation Assembly TOP Cover. See Figure 9, Red Circles.

6. **Step 6:**

   Reinstall in reverse order of Steps 1-5.

Calibration and Verification:

See Paragraph 5.3.1, 5.3.2, 5.3.3, 5.3.4, & 5.3.5.

2.1.2.4. Aquarian Servo Controller PCA (Unit 2 A1 A2 A4)

Troubleshooting:

SD-135953-100 or -101 Sheet 1 of 4

SD-134839-100 All Sheets

1. **Step 1 (Power):**

   Using a voltmeter, measure the DC Voltage on the Aquarian Servo Controller on P1, 1 and 2 (per the schematics). Is 48 VDC Voltage Present?

   NO: Troubleshoot the input power through the Regeneration Clamp (Unit 1 A1 A2 A5). If restored, restart with Step 1.

   YES: Go to Step 2.

2. **Step 2 (Command and Control):**

   Check the cable connections (all three) on Port C.
   Check the Cable Connecting power to the Motor Actuator.

   Check the Encoder Cable on Port A.

   Are all cables connected?

   NO: Reinsert and restart this step.

   YES: Go to Step 3.

3. **Step 3 (Communication):**

   Is the Ethernet connector inserted properly?

   NO: Reinsert and restart this step.

   YES: Go to Step 4.

4. Is the Ethernet Switch (Unit 2 A1 A3 A1 A5) functioning properly (See Paragraph 2.1.3.1.4)
   NO: Repair the Ethernet Switch per Paragraph 2.1.3.1.4)

   YES: End Process.

Maintenance:

1. **Step 1:**

   Open the Elevation Assembly FRONT Cover using a Philips Screwdriver (12 Screws). See Figure 9, Point 1.

Do not remove the cover where the Regeneration Clamp is mounted.

2. **Step 2:**

   Disconnect all connectors to the Aquarian Servo Controller including Power, Ethernet, and Command and Control. Refer to Volume 2, Section 1, Paragraph 2.1.2.4. for a complete description of all connectors.

3. **Step 3:**

   Loosen and remove the four (4) Philips head screws and standoffs.

4. **Step 4:**

   Remove the Aquarian Servo Controller from the Elevation Assembly.

5. **Step 5:**

   Reinstall in reverse order of Steps 1-4.

Calibration:

None

2.1.2.5. Regeneration Clamp (Unit 2 A1 A2 A5)

Troubleshooting:

SD-134953-100 Sheet 1 of 4

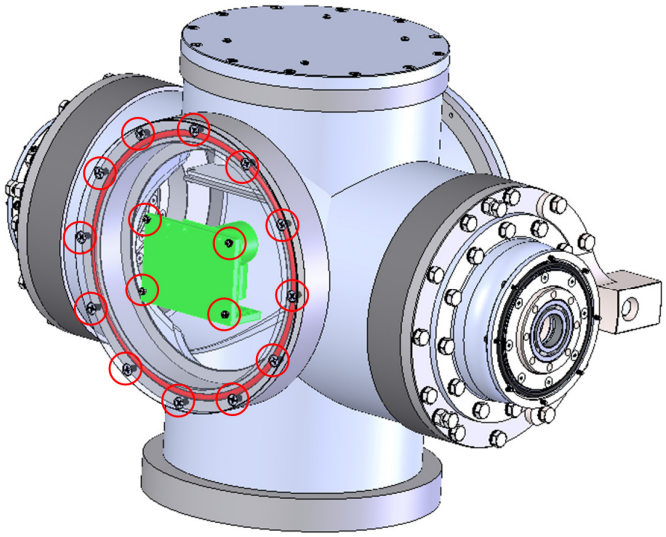
1. **Step 1:**

   The Regeneration Clamp will prevent power from reaching the Servo Controller and the Servo Amplifier. Check the input Voltage (V IN + and V IN -) to ensure input power is available. If not, troubleshoot power through the Pedestal at Terminal Block 1 (TB1).

Maintenance:

1. **Step 1:**

   Remove the Screws (12 Philips Screws) retaining the cover where the regeneration clamp is mounted. (See Figure 10, red circles)



EEC-GR-211-5

Figure 10. Regeneration Clamp

This will removed the cover where the Regeneration Clamp is mounted.

2. **Step 2:**

   Remove the four (4) screws connecting the Regeneration Clamp to the cover.

3. **Step 3:**

   Remove all cable connections.

4. **Step 4:**

   Reinstall the Regeneration Clamp in reverse order of Steps 1-3.

Calibration:

None

2.1.3. Payload Support Assembly (Unit 2 A1 A3)

2.1.3.1. Plenum Assembly (Unit 2 A1 A3 A1)

2.1.3.1.1. IQ2 Intermediate Frequency Digitizer Assembly (Unit 2 A1 A3 A1 A1)

Troubleshooting:

SD-135953-101 or -101 Sheet 1 of 4 (Power)
Sheet 3 of 4 (Communication)
Sheet 4 of 4 (Trigger)

SD-133066-101 Sheet 1 of 1

1. **Step 1 (Power):**

   The 24VDC Power supplied to the IQ2 PSU PCA routes from the Slip Ring Assembly to Terminal Block 1 (TB1) in the Payload Support Assembly on Pins 7 and 8, and from there to the IQ2 PSU PCA Plug (Pin 1 and 2). Use the appropriate Schematics to trace the power from the source to the PSU in a logical manner. Is power present at the plug?

   YES: Go to Step 2.

   NO: Trace the power back to the power supply and restart this troubleshooting procedure.

2. **Step 2 (Power Supply Unit - PSU):**

   If 24VDC Power is available in Step 1 on the input side of the PSU, check the output side of the 5VDC power at Pin 5 and 6 on the PSU. Is output power present?

   YES: Go to Step 3.

   NO: Replace the PSU and restart this troubleshooting procedure.

3. **Step 3 (Communication):**

   Does the IQ2-IFD respond to commands via the Ethernet Connection?

   YES: Go to Step 4.

   NO: Troubleshoot the Ethernet Connection through:

   - Ethernet Switch (Unit 2 A1 A3 A1 A5)
   - Slip Ring (Unit 2 A1 A1 A1)
   - Azimuth Assembly (Unit 2 A1 A1: SD-135887-100, Sheet 1 of 3)
   - Pedestal Plate Enclosure Assembly (Unit 2 A1 A5: SD-135886-100, Sheet 3 of 3)
   - Fiber Optic Media Converter (Unit 1 A8)
   - 16-Port Gigabit Ethernet Switch (Unit 1 A5).

   If the communication connection is restored, continue to Step 4.

4. **Step 4 (Fiber Optic):**

   If the Ethernet Connection is working, but digitized data is not making it from the IQ2-IFD to the IQ2-DSP via the Fiber Optic Connection, then check the Fiber Optic Cables and Connectors. Check the following components / connections:

   - IQ2-IFD Connector
   - Fiber -Optic Cable from IQ2-IFD to the Fiber-Optic Slip Ring
   - Fiber-Optic Slip Ring to the Fiber-Optic Interconnect in the Pedestal Plate Enclosure (P3 on SD=135886-100, Sheet 3 of 3)
   - Fiber-Optic Interconnect on the Pedestal Plate Enclosure to the Fiber-Optic Interconnect in the Control Cabinet (P3 on SD-135732-100).
   - From the Fiber-Optic Interconnect to the IQ2-DSP

   Is the Fiber Optic Connection Restored?

   YES: Go to Step 5.

   NO: Replace the defective connection. If the problem is isolated to the Fiber-Optic Slip Ring, contact Enterprise Electronics Corporation.

5. **Step 5 (Data):**

   If power, communications, and the Fiber-Optic connections are all operational, the IQ2-IFD is likely defective. Replace the IQ2-IFD.

Maintenance:

1. **Step 1:**

   Remove the cover from the Plenum Assembly by releasing the four quick-disconnect latches and by loosening two Retaining Screws (see Figure 11), then remove the lid.

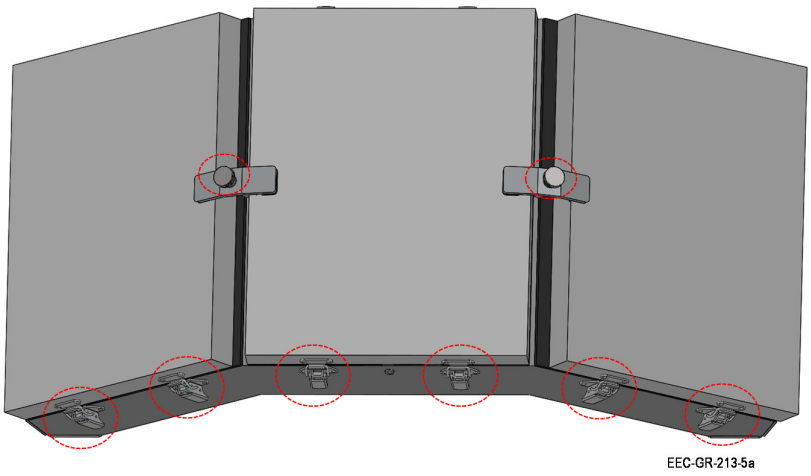


Figure 11. Plenum Assembly – Cover Retaining Screws and Latches

1. **Step 2:**

Disconnect all connectors and unplug the Ethernet cable and Fiber-Optic Cable.

2. **Step 3:**

   Loosen and remove retaining bracket in the center of the IQ2-IFD holding IQ2-IFD in place. See Figure 12

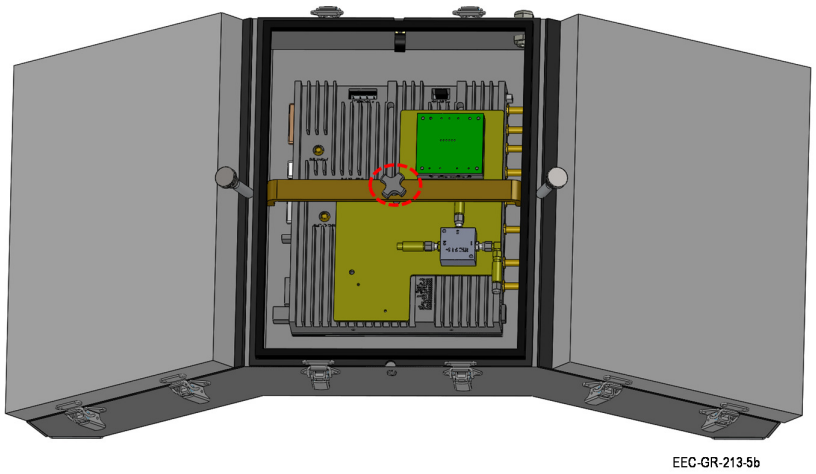


Figure 12. Plenum Assembly – IQ2-IFD Retaining Bracket

3. **Step 4:**

   Remove the IQ2-IFD from the Plenum Assembly.

4. **Step 5:**

   Reinstall in reverse order of Steps 1-4.

Calibration:

See Paragraph 5.4.1, 5.4.2, 5.4.3, and 5.4.4.

2.1.3.1.1.1. IQ2 IFD PCA (Unit 2 A1 A3 A1 A1 A1)

Troubleshooting:

Part of the IQ2-IFD Troubleshooting Process, see Paragraph 2.1.3.1.1.

Maintenance:

Part of the IQ2-IFD Maintenance Process, see Paragraph 2.1.3.1.1.

Calibration:

Part of the IQ2-IFD Calibration Process, see Paragraph 2.1.3.1.1.

2.1.3.1.1.2. 10dB Attenuator (Unit 2 A1 A3 A1 A1 AT1, AT2)

Troubleshooting:

Part of the IQ2-IFD Troubleshooting Process, see Paragraph 2.1.3.1.1.

Maintenance:

Part of the IQ2-IFD Maintenance Process, see Paragraph 2.1.3.1.1.

Calibration:

Part of the IQ2-IFD Calibration Process, see Paragraph 2.1.3.1.1.

2.1.3.1.1.3. IQ2 Power Supply Unit PCA (Unit 2 A1 A3 A1 A1 A2)

Troubleshooting:

SD-135953-100 or -101 Sheet 1 of 4

SD-134066-101 Sheet 1 of 1

SD-134862-100 Sheet 1 of 1

Part of the IQ2-IFD Troubleshooting Process, see Paragraph 2.1.3.1.1.

Maintenance:

Part of the IQ2-IFD Maintenance Process, see Paragraph 2.1.3.1.1.

Calibration:

Part of the IQ2-IFD Calibration Process, see Paragraph 2.1.3.1.1.

2.1.3.1.1.4. 2-Way Splitter (Unit 2 A1 A3 A1 A1 HY1)

Troubleshooting:

Part of the IQ2-IFD Troubleshooting Process, see Paragraph 2.1.3.1.1.

Maintenance:

Part of the IQ2-IFD Maintenance Process, see Paragraph 2.1.3.1.1.

Calibration:

Part of the IQ2-IFD Calibration Process, see Paragraph 2.1.3.1.1.

2.1.3.1.2. I/O Control Module (Unit 2 A1 A3 A1 A3)

Troubleshooting:

SD-135953-100 or -101 Sheet 3 of 4 (Communication)

Sheet 4 of 4 (Trigger)

Troubleshoot each individual component separately.

2.1.3.1.2.1. Ethernet 16-Channel Discrete I/O Module (Unit 2 A1 A3 A1 A3 A1)

Troubleshooting:

SD-135964-100 Sheet 1 of 1

SD-135953-100 or 101 Sheet 3 of 4

1. **Step 1 (Power):**

   Using a voltmeter, measure the DC Voltage the Discrete I/O Module (+24VDC) at Pin 31 and Pin 32. Is power present?

   YES: Continue to Step 2.

   NO: Troubleshoot the 24VDC Power System.

2. **Step 2 (Communication):**

   Is the Ethernet connection working properly? Check the connection to the Ethernet Switch (See Paragraph 2.1.3.1.4).

   YES: Continue to Step 3.

   NO: Troubleshoot the Ethernet connection.

3. **Step 3 (Status):**

   If the unit has power (Step 1) and Ethernet Connection (Step 2), troubleshoot each of the individual channels and relays per the following table:

Terminal Block	Pin	Status
TB1	11	Aux Power Enable
	16	Return / Ground
TB2	21	UDC Power Enable
	26	Return / Ground
TB4	43	Trigger Enable (K1)
	44	Trigger Enable (K2)
	45	Aux Power Enable
	42	UDC Power Enable

Table 1. Discrete (Digital) I/O Module

Are all connections intact?

YES: If the problem persists, contact the manufacturer (EEC).

NO: Restore the connections and revalidate the tests.

Maintenance:

1. **Step 1:**

   Remove the cover from the Plenum Assembly by releasing the four quick-disconnect latches and by loosening two Retaining Screws (see Figure 11), then remove the lid.

2. **Step 2:**

   Disconnect all connectors and unplug the Ethernet cable.

3. **Step 3:**

   Loosen and remove the two (2) Philips head screws holding the retaining bracket in place.

4. **Step 4:**

   Remove the Discrete I/O Unit from the Plenum Assembly.

5. **Step 5:**

   Reinstall in reverse order of Steps 1-4.

Calibration:

None

2.1.3.1.2.2. Ethernet 12-Channel Analog I/O Module (Unit 2 A1 A3 A1 A3 A2)

Troubleshooting:

SD-135964-100 Sheet 1 of 1

SD-135953-100 or -101 Sheet 3 of 4

4. **Step 1 (Power):**

   Using a voltmeter, measure the DC Voltage the Analog I/O Module (+24VDC) at Pin 31 and Pin 32. Is power present?

   YES: Continue to Step 2.

   NO: Troubleshoot the 24VDC Power System.

5. **Step 2 (Communication):**

   Is the Ethernet connection working properly? Check the connection to the Ethernet Switch (See Paragraph 2.1.3.1.4).

   YES: Continue to Step 3.

   NO: Troubleshoot the Ethernet connection.

6. **Step 3 (Status):**

   If the unit has power (Step 1) and Ethernet Connection (Step 2), troubleshoot each of the individual channels and relays per the following table:

Terminal Block	Pin	Status
TB1	11	H Transmitter +5V Monitor
	12	H UDC +5V Monitor
	13	Return / Ground
	14	H Transmitter +12V Monitor
	15	H +48V Current
	16	Return / Ground
TB2	21	H Temp Sensor
	22	H Humidity Sensor
	23	Return / Ground
	24	V Transmitter +5V Monitor
	25	V UDC +5V Monitor
	26	Return / Ground
TB4	41	V Transmitter +12V Monitor
	42	V +48V Current
	43	Return / Ground
	44	V Temp Sensor
	45	V Humidity Sensor
	46	Return / Ground

Table 2. Analog I/O Map

   Are all connections intact?

   YES: If the problem persists, contact the manufacturer (EEC).

   NO: Restore the connections and revalidate the tests.

Maintenance:

1. **Step 1:**

   Remove the cover from the Plenum Assembly by releasing the four quick-disconnect latches and by loosening two Retaining Screws (see Figure 11), then remove the lid.

5. **Step 2:**

   Disconnect all connectors and unplug the Ethernet cable.

6. **Step 3:**

   Loosen and remove the two (2) Philips head screws holding the retaining bracket in place..

7. **Step 4:**

   Remove the Analog I/O Unit from the Plenum Assembly.

8. **Step 5:**

   Reinstall in reverse order of Steps 1-4.

Calibration:

None

2.1.3.1.3. Cold Plate, Weatherized (Unit 2 A1 A3 A1 A4)

Troubleshooting:

EEC-135540-101 Sheet 1 of 3
Sheet 3 of 3

SD-135953-100 or -101 Sheet 1 of 4

1. **Step 1 (Power):**

   Using a voltmeter, measure the DC Voltage at the Terminal Block (TB1) in the Plenum Assembly (Pin 7 and 8) for the Cold Plate and (Pin 9 and 10) for the Temperature Controller (Unit 2 A1 A3 A1 A6). It Power Present?

   YES: Continue to Step 2.

   NO: Troubleshoot the 24VDC Power System.

2. **Step 2 (Power):**

   Using a voltmeter, measure the DC Voltage at the input for the Cold Plate and Temperature Controller (Unit 2 A1 A3 A1 A6). It Power Present?

   YES: Continue to Step 3.

   NO: Troubleshoot the Temperature Controller (Unit 2 A1 A3 A1 A6).

3. **Step 3 (Temperature Controller):**

   Check the output power on the Temperature Controller. It Power Present?

   YES: Continue to Step 4.

   NO: Replace the Temperature Controller (Unit 2 A1 A3 A1 A6) and continue Troubleshooting.

4. **Step 4 (Fan)**

   Is the Fan operating?

   YES: Go to Step 5.

   NO: Replace the fan.

5. **Step 5 (Cold Plate)**

   Is the Cold Plate operating?

   YES: End process.