CHAPTER 2

ANTENNA / PEDESTAL (UNIT 2)

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2. Antenna / Pedestal (Unit 2)

Figure 18 shows the short pedestal with a 1.8 meter reflector. Consult the Schematics and Drawings that come with your system for detailed information.

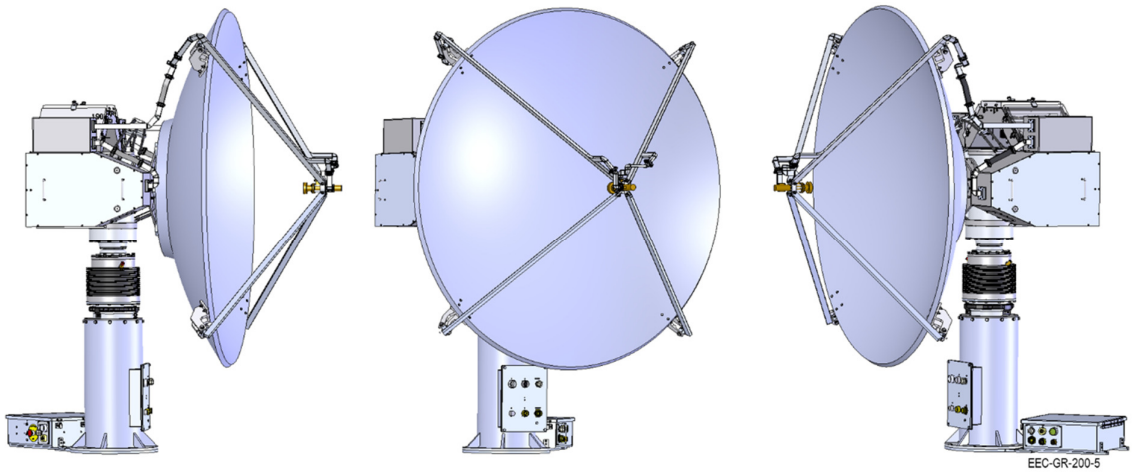

Figure 18. Antenna / Pedestal Unit – 1.8 Meter Reflector (135955-101)

2.1. Pedestal Assembly (Unit 2 A1)

The design of the pedestal system for the Ranger-X5 utilizes components and elements that allow for constant outdoor exposure and 24/7 unattended operation. Utilizing multiple O-ring seals and weather tight compartments prevents contaminants from entering the pedestal from the outside environment. The motor drives used in both azimuth and elevation utilize a wave generator and circular spine, eliminating traditional gearing found in most pedestal systems. There is no traditional bull-gear and pinion, as the motor drive itself is the rotation axis.

Since the motor drives are sealed and permanently lubricated, there is no periodic maintenance required. Additionally, this technology also eliminates backlash and the need to adjust backlash, and provides exceptionally high positional accuracy and repeatability. The remaining bearings utilized (elevation idler side, and drive tube stabilizer) in the Ranger-X5 are also permanently sealed and require no maintenance.

A sealed slip ring limits the need for periodic or preventative maintenance. The slip ring is design is originally for high-speed operation and has a proven pedigree in military and aviation applications. Even at the highest rotation speed of the Ranger-X5 for weather operation, the slip ring operates at less than 25% of its rotational speed capacity.

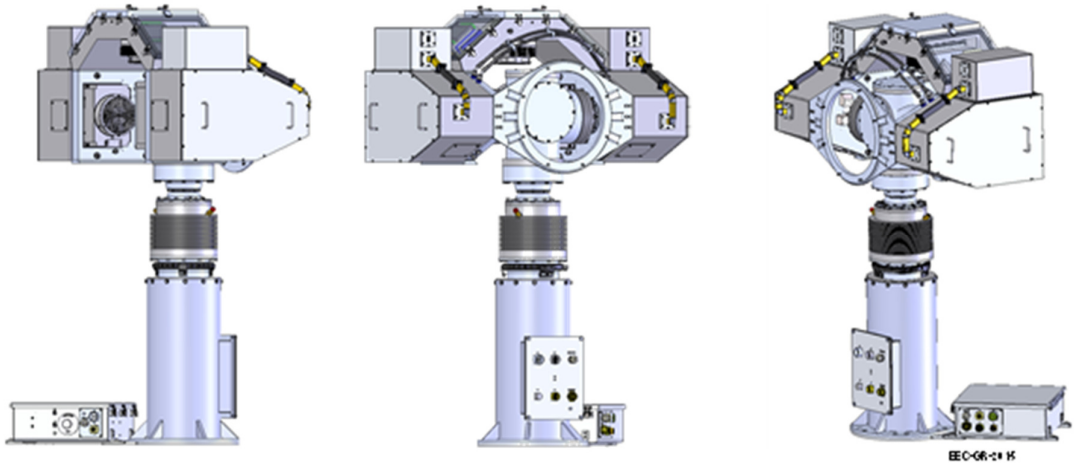

Figure 19. Pedestal Unit (135885-100)

2.1.1. Azimuth Assembly (Unit 2 A1 A1)

The Azimuth Assembly is a sealed unit. There are no "field serviceable" components in the Azimuth unit. The sealed Slip Ring Assembly extends into the Elevation Assembly and the top of the Fiber Optic Rotary Joint is accessible from the maintenance port on the Elevation Assembly. The mechanical components are virtually "maintenance free," with the Actuator Unit boasting an MTBF (Mean Time Between Failure) of more than 180,000 operational hours (> 20 years).

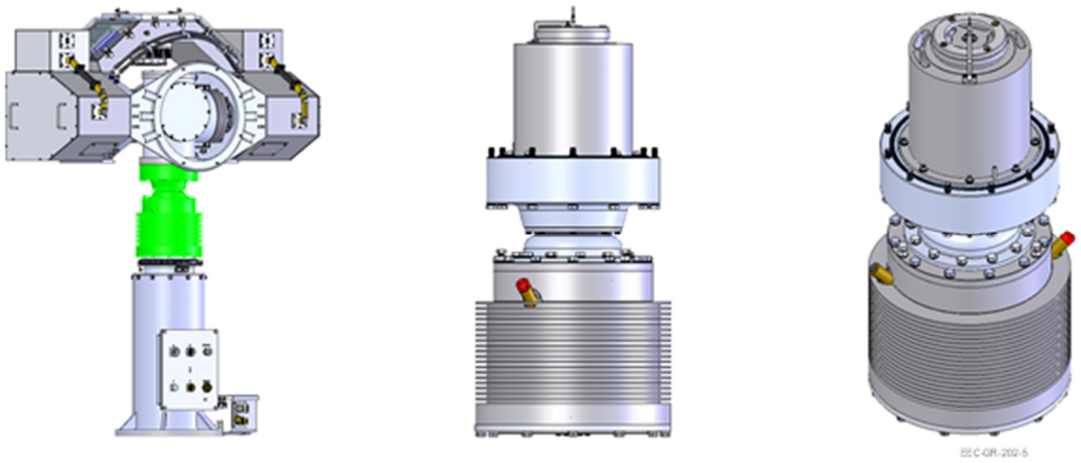

Figure 20. Azimuth Assembly (135887-100)

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

The Fiber Optic Rotary Joint / Slip Ring Assembly is permanently installed in the Azimuth Assembly. It is completely sealed and requires no maintenance.

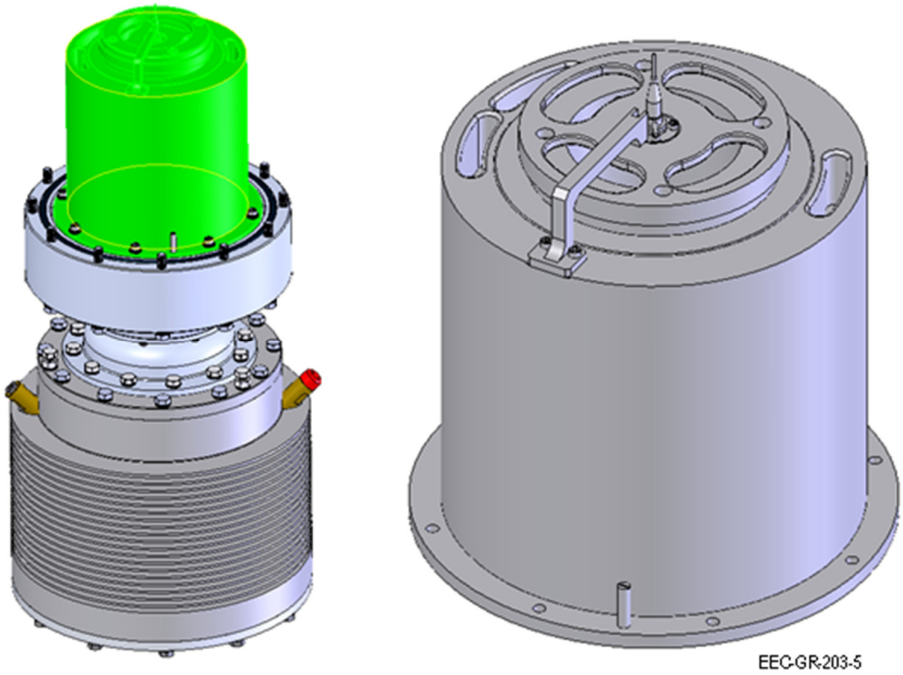

Figure 21. Slip Ring Assembly (134523-100)

2.1.1.2. Actuator Unit (Unit 2 A1 A1 A2)

The Actuator Unit is the main drive of the Azimuth Section. The unit connects to the receives command and control function from the Servo Amplifier (Unit 2 A1 A5 A2) and Aquarian Controller (Unit 2 A1 A5 A4) located in the Pedestal Plate Enclosure Assembly (Unit 2 A1 A5).

The Actuator Unit is a sealed unit. The Mean Time Between Failure (MTBF) is more than 180,000 hours. It requires no maintenance.

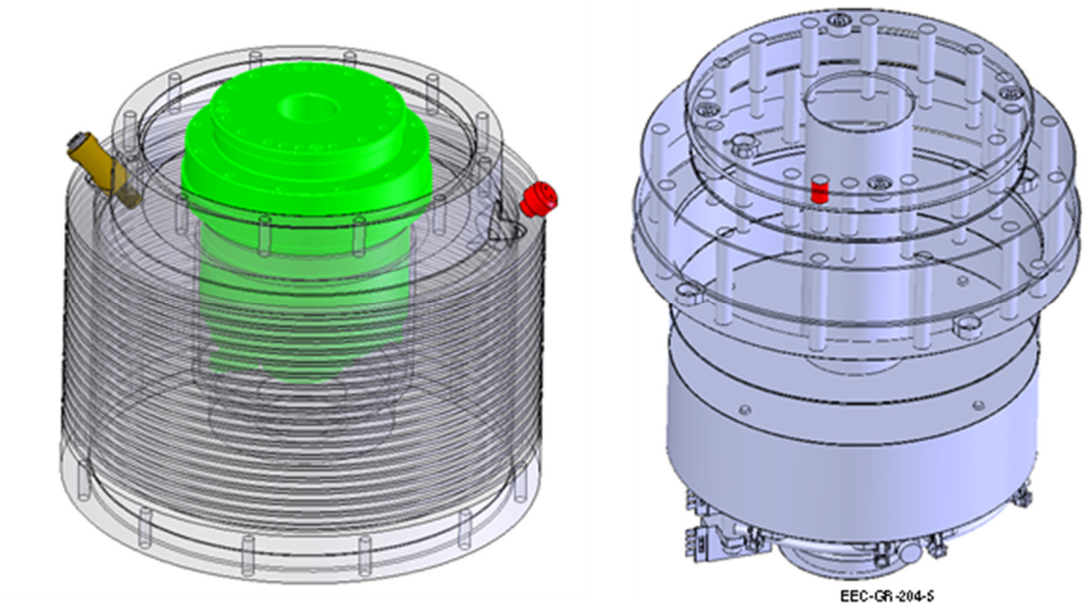

Figure 22. Actuator Unit (135782-100)

2.1.2. Elevation Assembly (Unit 2 A1 A2)

The Elevation Assembly is an open unit. There are two access panels; both allow access to the Servo Control System and inspection of the Actuator Assembly. The drive components of the Elevation Assembly are virtually "maintenance free," with the Actuator Unit boasting an MTBF (Mean Time Between Failure) of more than 180,000 operational hours (> 20 years).

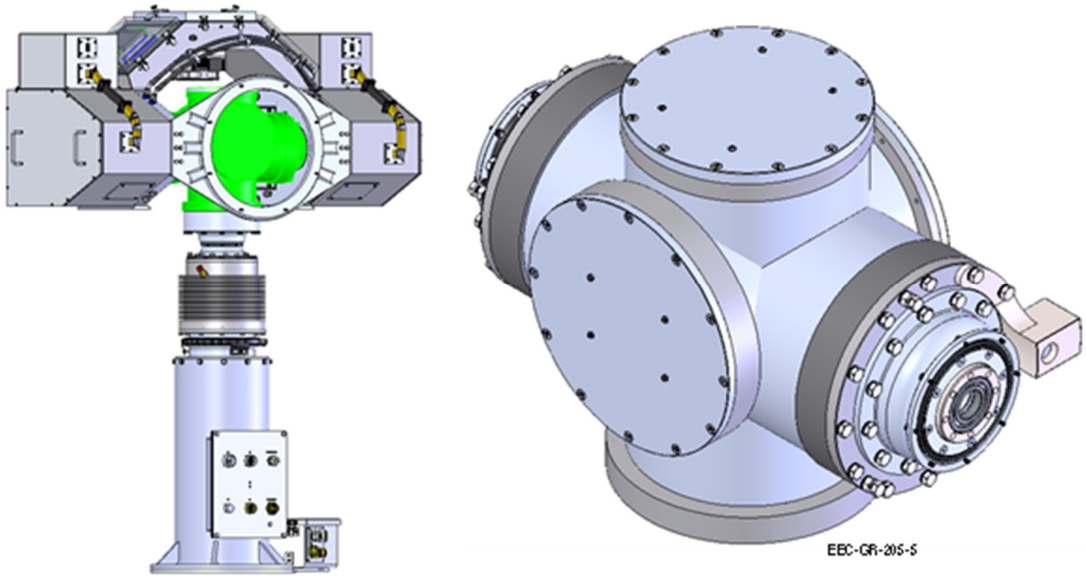

Figure 23. Elevation Assembly (135952-100)

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

The Elevation Endcap Assembly is the pass-through point for power and communication from the Riser to the Payload Support Assembly. There is a no-maintenance bearing to support the movement of the payload in the elevation axis.

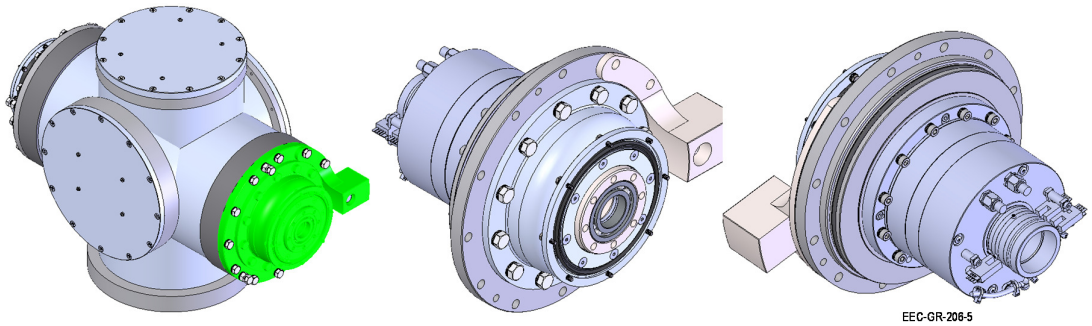

Figure 24. Elevation Driven Side Assembly (135539-100)

2.1.2.2. Actuator Unit (Unit 2 A1 A2 A1 A1)

The Actuator Unit is the main drive of the Elevation Section. The unit connects to the receives command and control function from the Servo Amplifier (Unit 2 A1 A2 A3) and Aquarian Controller (Unit 2 A1 A2 A4) located in the Elevation Assembly (Unit 2 A1 A2).

The Actuator Unit is a sealed unit. The Mean Time Between Failure (MTBF) is more than 180,000 hours. It requires no maintenance.

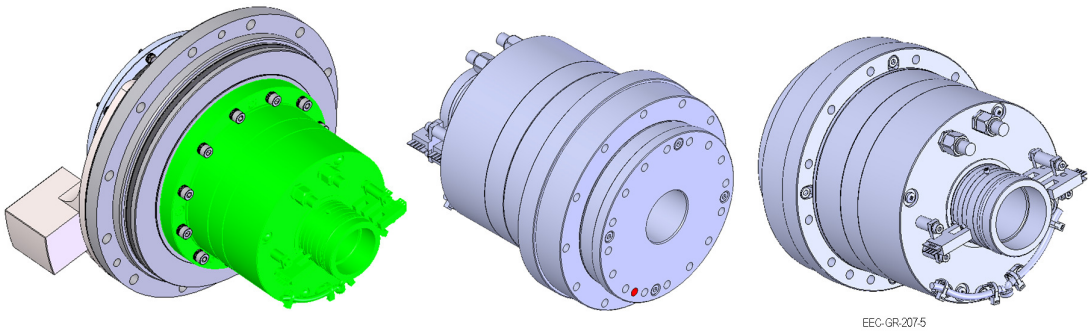

Figure 25. Actuator Unit (135782-100)

2.1.3. Elevation Driven Side Assembly (Unit 2 A1 A2 A2)

The Elevation Driven Side Assembly contains the “drive” components for the Ranger Elevation section. This includes the Actuator Unit (see **Paragraph 0**).

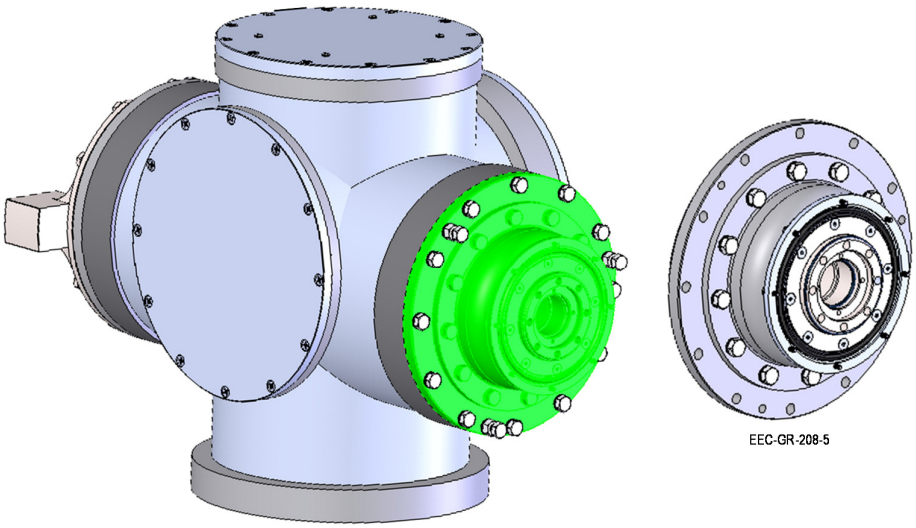

Figure 26. Elevation Endcap Assembly (134775-100)

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

The Servo Amplifier drives the Actuator Unit. It is an Ethernet configurable device that takes digital and analog input/output commands sent by the Aquarian Servo Controller and converts them to the language spoken by the actuator system and simultaneously controls the voltages necessary to move the unit.

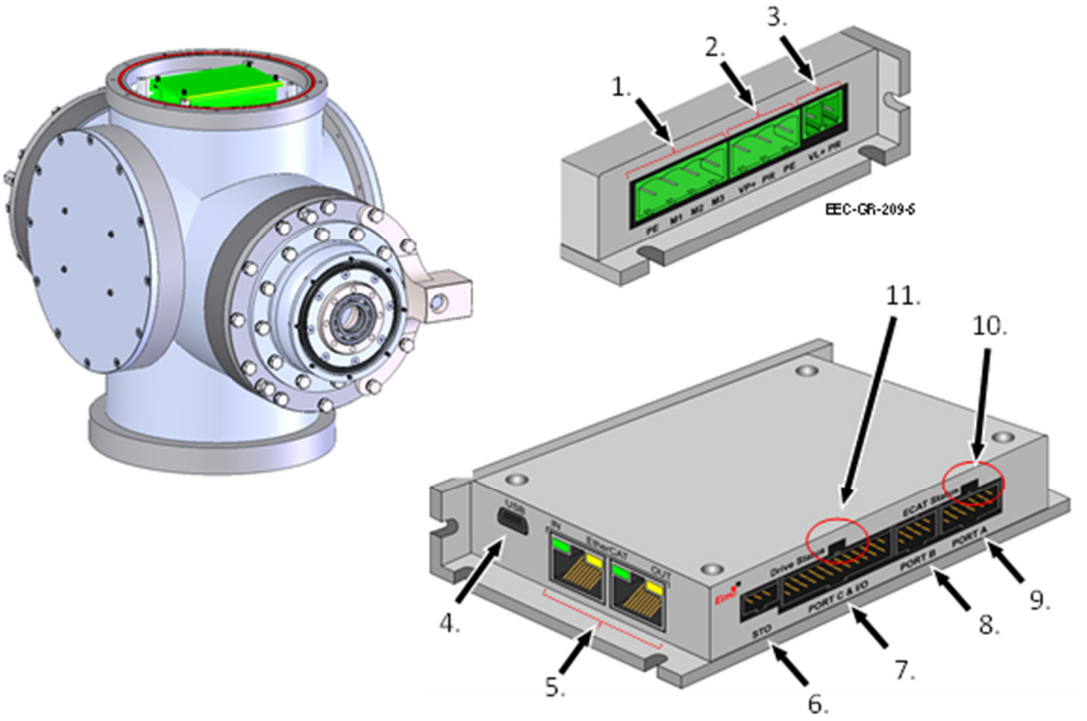

Figure 27. Servo Amplifier (135534-100)

1. Power to Servo Motor (J14)
2. Main Power IN (J13)
3. Auxiliary Power IN (J12)
4. USB Connector (J9)
5. EtherCAT IN (J7) and EtherCAT OUT (J8)
6. Safe Torque Off (J11)
7. Port C and I/O (Programmable Port) (J2)
8. Port A (Encoder Connector) (J1)
9. Port B (Sine / Cosine Encoder) (J3)
10. ECAT Status Indicator
11. Drive Status Indicator

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

The Aquarian Servo Controller is a single axis Ethernet motion controller. The Aquarian Servo Controller provides a structured text-programming environment and the ability to perform many modes of motion including camming, gearing, and contouring. Point-to-point control and communications takes place over standard Ethernet connections. The Ethernet function allows multiple handles or devices to communicate with the controller.

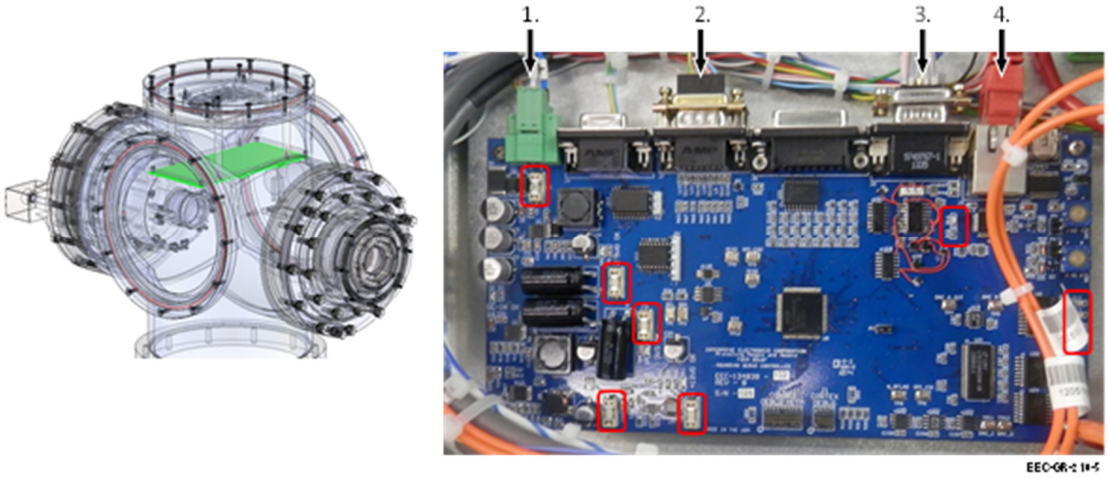

Figure 28. Aquarian Servo Controller (134839-103)

1. Power Cable (P1)
2. Encoder Input from Servo Amplifier (J7)
3. Control, Status (J6)
4. Ethernet (J3)

Red Outline – Status Indicators

2.1.3.3. Regeneration Clamp (Unit 2 A1 A2 A5)

As with most servo systems, a clamp circuit is required to limit increase power supply buss voltage when the motor is decelerating under load. This common name for this process is “regeneration” and happens when the load on the unit drives the DC motor. During regeneration, the DC motor can produce enough voltage to exceed the “input” power supply voltage. More sophisticated servo amplifiers deal with this by channeling the increased motor voltage back to the source power supply. If the voltage is not “clamped” to a safe level, it can destroy or severely damage the amplifier.

The servo amplifier and controller are the types that channel the increasing voltage back to the input power supply. A simple capacitor isn’t large enough to handle the power that generates back into the controller when the system is under inertial load. The Regeneration Clamp is us sufficient capacity to track the input power and ensure the servo amplifier voltage will not exceed the capacity rating.

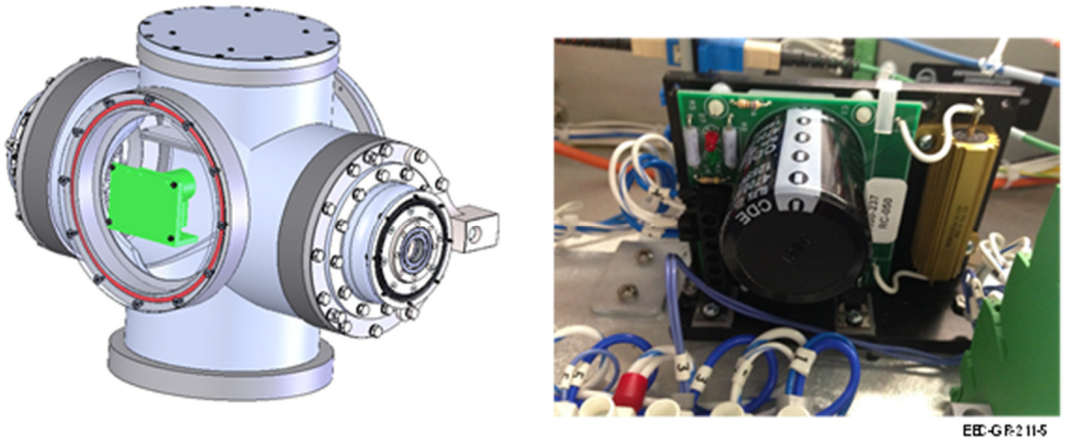

Figure 29. Regeneration Clamp (1000-327)

2.1.4. Payload Support Assembly (Unit 2 A1 A3)

The Payload Support Assembly (Unit 2 A1 A3) houses the entire transmitter and receiver system in the Plenum Assembly (Unit 2 A1 A3 A1), the Transceiver Assemblies – Horizontal (Unit 2 A1 A3 A2) and Vertical (Unit 2 A1 A3 A3), and the Fluid Pump Assembly (Unit 2 A1 A3 A4).

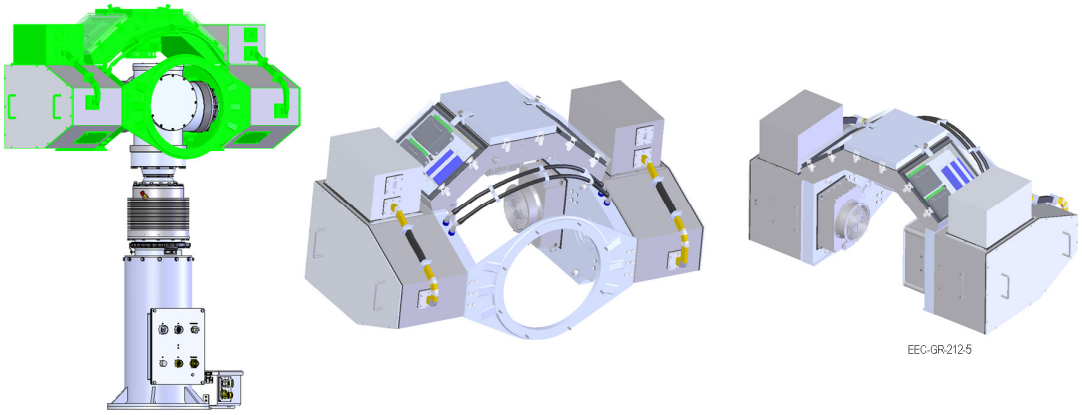

Figure 30. Payload Support Assembly (135953-100)

2.1.4.1. Plenum Assembly (Unit 2 A1 A3 A1)

The Plenum Assembly (aka the Saddle) houses the IQ2 IFD, the I/O Control Modules, the Cold Plate, the 8-Port Ethernet Switch, and the Peltier Temperature Controllers for the Cold Plate and the Fluid Pump Assembly.

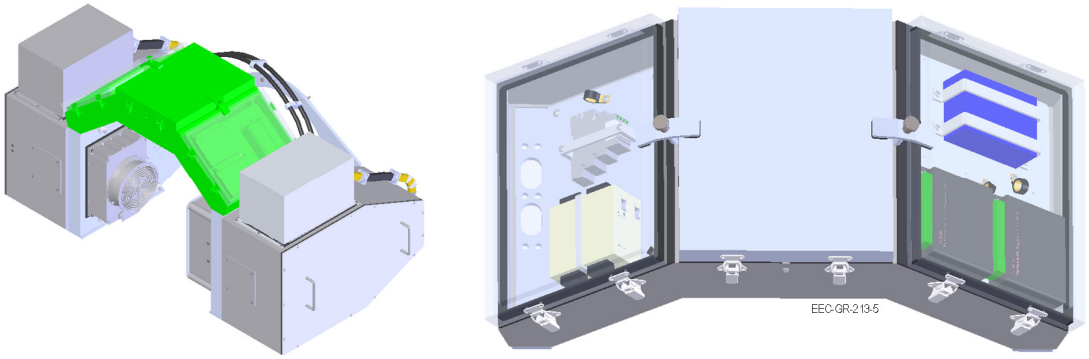

Figure 31. Plenum Assembly (135540-100)

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

The IQ2-IFD receives the horizontal and vertical receive IF from the Horizontal UDC (Unit 2 A1 A3 A2 A2) and Vertical UDC (Unit 2 A1 A3 A3 A2). The IQ2-IFD digitizes the received IF and outputs “I and Q” serial data in digital format. The data output connects to the IQ2-DSP via a fiber-optic cable and the fiber-optic rotary joint.

The IQ2-IFD Assembly (see **Error! Reference source not found.**) extracts the maximum amount of useable information from reflected radar energy. There are five 60 MHz IF channels sampled at >76 MHz. Four of the IQ2-IFD 60 MHz IF channels (two channels for the horizontally polarized signal and two channels for the vertically polarized signal in dual polarization systems) include wide-band down-converters to base-band for Receiver use. The fifth IF channel normally functions as a Transmitter sample (IF burst) channel for Transmitter amplitude and phase correction on a pulse-by-pulse basis.

This processing can include pulse compression as an option. The digital IF signals pass to the IQ2-DSP unit via a 2.5 Gbits/sec optical link and command/control/status information is through a Gigabit Ethernet link. The unit has nine fully programmable triggers, serial angle input ports, and other I/O ports that for special applications.

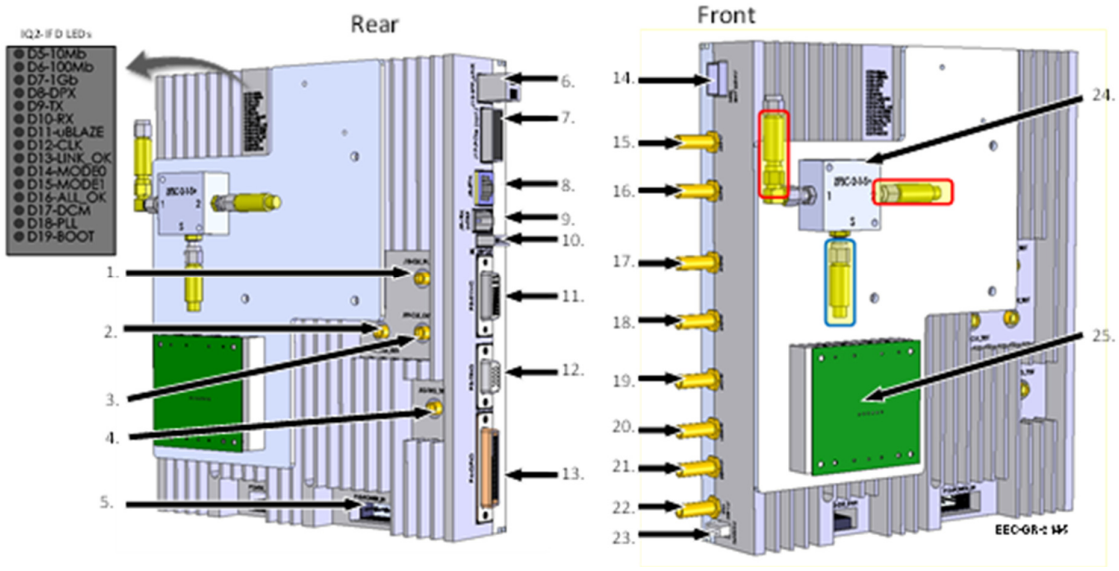

Figure 32. IQ2-IFD (134066-101)

1. J18 – External Clock Monitor
2. J19 – Reference Clock Test Point
3. J10 – Reference Clock Monitor
4. J15 – Trigger Generator Test Point
5. P10 – 12 VDC Power
6. J13, Fiber Optic
7. J17 – PCIe (not used in SDP system)
8. J8 – Ethernet
9. J9 – IRX Connector (not used)
10. J12 – Antenna Position
11. P5 – Sync
12. P3 – Trigger
13. P4 – GPIO
14. J14 Fiber Optic
15. J1 – RX Channel 1
16. J2 – RX Channel 2
17. J3 – RX Channel 3
18. J4 – RX Chanel 4
19. J5 – Burst
20. J6 – Waveform Generator
21. J77 – Waveform Generator (2)
22. J11 – Clock Reference In
23. J16 – RS232 / I2C / SAFC
24. Directional Coupler, ZFDC-20-4-S+
25. IQ2 PSU PCA – 134862-100

RED OUTLINE - 10dB Attenuator, VAT-10
BLUE OUTLINE - 5dB Attenuator, VAT-5