Sea Tel TV & TVHD Antenna Systems
Dealer Technical manual

EAR Controlled - ECCN EAR99
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February 18, 2016 **Document. No. 99-141160-A**

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Sea Tel Marine Stabilized Antenna systems are manufactured in the United States of America.

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Sea Tel is an ISO 9001:2008 registered company. Certificate Number 13690 originally issued March 14, 2011 and was renewed/reissued on March 10, 2014.

R&TTE

CE

The Sea Tel TV & TVHD Maritime Satellite Earth Station complies with the requirements of directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment. A copy of the R&TTE Declaration of Conformity for this equipment is contained in this manual.

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Revision History

REV	ECO#	Date	Description	By
A		February 18, 2016	Production Release	MDN

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R&TTE Declaration of Conformity

Doc Number 99-144908-A Revision A

Sea Tel Inc. declares under our sole responsibility that the products identified below are in conformity with the requirements of:

DIRECTIVE 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment and the mutual recognition of their conformity.

Product Names: **Sea Tel 80 TV, 0.8m Ku TVRO Maritime Satellite Earth Station**
Sea Tel 100 TV, 1.0m Ku TVRO Maritime Satellite Earth Station
Sea Tel 120 TV, 1.2m Ku TVRO Maritime Satellite Earth Station
Sea Tel 100 TVHD, 1.0m Ku/Ka TVRO Maritime Satellite Earth Station
Sea Tel 120 TVHD, 1.2m Ku/Ka TVRO Maritime Satellite Earth Station

These products have been assessed to Conformity Procedures, Annex IV, of the above Directive by application of the following standard(s):

EMC:

Marine Navigational and Radio Communication
Equipment and Systems – General Requirements: **IEC EN 60945:1997**

Safety:

Safety of information technology equipment: **IEC EN 60950-1:2001 (1st Edition)**

Certificates of Assessment were completed and are on file at BACL Labs, Santa Clara, CA.

31-Dec-2014

Peter Blaney, Chief Engineer
Cobham Satcom
Sea Tel Products
Concord, CA

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1. Safety

The following general safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture and intended use of the equipment. Sea Tel Inc (dba Cobham SATCOM) assumes no liability for the customer's failure to comply with these requirements.

Service
User access to the interior of the LMXP is prohibited. Only a technician authorized by Cobham SATCOM may perform service - failure to comply with this rule will void the warranty. Access to the interior of the Above Deck Equipment is allowed. Inspection of certain components as described in the Scheduled Inspections Manual may be accomplished by an engineer onboard. Maintenance of the LMXP, or the Above Deck Equipment, may only be performed by a technician authorized by Cobham SATCOM.

Do not service or adjust alone
Do not attempt internal service or adjustments unless another person, capable of rendering first aid resuscitation, is present.

Grounding, cables and connections
To minimize shock hazard and to protect against lightning, the equipment chassis and cabinet must be connected to an electrical ground. The Above & Below Decks Equipments must be grounded to the ship. For further grounding information refer to the Installation chapter of this manual.

Do not extend the cables beyond the lengths specified for the equipment. The cable between the ACU and Above Deck Unit can be extended if it complies with the specified data concerning cable losses etc.

All coaxial cables are to be shielded and should not be affected by magnetic fields. However, try to avoid running cables parallel to high power and AC/RF wiring as it might cause malfunction of the equipment.

Power supply
The +24 VDC voltage to the Above Deck Equipment is provided by the LMXP.

Do not operate in an explosive atmosphere
Do not operate the equipment in the presence of flammable gases or fumes. Operation of any electrical equipment in such an environment constitutes a definite safety hazard.

Keep away from live circuits
Operating personnel must not remove equipment covers. Component replacement and internal adjustment must be made by qualified maintenance personnel. Do not replace components with the power cable connected. Under certain conditions, dangerous voltages may exist even with the power cable removed. To avoid injuries, always disconnect power and discharge circuits before touching them.

SAFETY: INTERNAL BATTERY
The main PCB inside the LMXP, and inside the TICU, each contain a lithium battery. These batteries should last for many years but if replacement is required, use caution. These batteries are only to be replaced by a technician authorized by Cobham SATCOM to perform such service.

	***CAUTION*** – RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE. DISPOSE OF USED BATTERIES ACCORDING TO THE INSTRUCTIONS.

Failure to comply with the rules above will void the warranty!

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2. Site Survey

There are three objective of the site survey. The first is to find the best place to mount the antenna and the BDE. The second is to identify the length and routing of the cables and any other items or materials that are required to install the system. The third is to identify any other issues that must be resolved before or during the installation.

2.1. Site Selection Aboard The Ship

The radome assembly should be installed at a location aboard ship where:

- The antenna has a clear line-of-sight to view as much of the sky (horizon to zenith at all bearings) as is practical.
- X-Band (3cm) Navigational Radars:
  - The ADE should be mounted more than 0.6 meters/2 feet from 2kW (24 km) radars
  - The ADE should be mounted more than 2 meters/8 feet from 10kW (72 km) radars
  - The ADE should be mounted more than 4 meters/12 feet from 160kW (250km) radars
- S-Band (10cm) Navigational Radars:
  - If the ADE is/has C-Band it should be mounted more than 4 meters/12 feet from the S-band Radar.
- The ADE should not be mounted on the same plane as the ship's radar, so that it is not directly in the radar beam path.
- The ADE should be mounted more than 2.5 meters/8 feet from any high power MF/HF antennas (<400W).
- The ADE should be mounted more than 4 meters/12 feet from any high power MF/HF antennas (1000W).
- The ADE should also be mounted more than 4 meters/12 feet from any short range (VHF/UHF) antennae.
- The ADE should be mounted more than 2.5 meters/8 feet away from any L-band satellite antenna.
- The ADE should be mounted more than 3 meters/10 feet away from any magnetic compass installations.
- The ADE should be mounted more than 2.5 meters/8 feet away from any GPS receiver antennae.
- Another consideration for any satellite antenna mounting is multi-path signals (reflection of the satellite signal off of nearby surfaces arriving out of phase with the direct signal from the satellite) to the antenna. This is particularly a problem for the onboard GPS, and/or the GPS based satellite compass.
- The ADE and the BDE should be positioned as close to one another as possible. This is necessary to reduce the losses associated with long cable runs.
- This mounting platform must also be robust enough to withstand the forces exerted by full rated wind load on the radome.
- The mounting location is robust enough that it will not flex or sway in ships motion and be sufficiently well re-enforced to prevent flex and vibration forces from being exerted on the antenna and radome.
- If the radome is to be mounted on a raised pedestal, it ***MUST*** have adequate size, wall thickness and gussets to prevent flexing or swaying in ships motion. In simple terms it must be robust.

If these conditions cannot be entirely satisfied, the site selection will inevitably be a “best” compromise between the various considerations.

2.2. Antenna Shadowing (Blockage)

Any substantial structures in the path between the front of the antenna and the satellite it is pointing to will cause significant degradation of the signal. The location of the ADE should be chosen to minimize blockage caused by the structures of the ship. It is desirable to be mounted high enough to minimize the effects of the surrounding structures while not being mounted too high (refer to mounting height information below). Large, solid, structures will cause significant signal loss while wire rope stays, lifelines, small diameter handrails and other accessories may cause little to no noticeable loss.

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2.3. Mounting Foundation

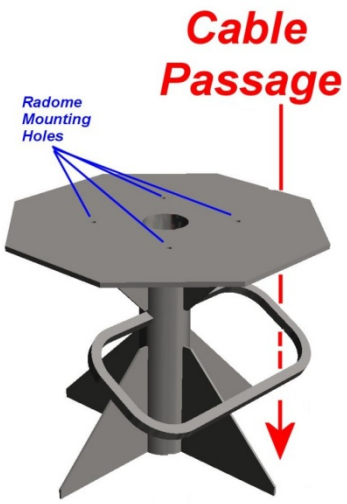
2.3.1. Mounting on Deck or Deckhouse

While mounting the ADE on a mast is a common solution to elevate the ADE far enough above the various obstructions which create signal blockages, sometimes the best mounting position is on a deck or deckhouse top. These installations are inherently stiffer than a mast installation, if for no other reason than the design of the deck/deckhouse structure is prescribed by the ship's classification society. In the deck/deckhouse design rules, the minimum plating and stiffener guidelines are chosen to preclude high local vibration amplitudes.

Most installations onto a deck or deckhouse structure will require a mounting pedestal to raise the ADE above the deck for radome hatch access and to allow the full range of elevation (see ADE mounting considerations above). Some care must be taken to ensure the mounting pedestal is properly aligned with the stiffeners under the deck plating.

2.3.2. ADE Mounting Considerations

Mounting the radome directly on the deck/ platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications).



If access to the hatch cannot be provided in the mounting surface, provide a short ADE support pedestal to mount the ADE on which is tall enough to allow access into the radome via the hatch.

Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

When strain relief glands are being used the recommended cable passage will be in/out the starboard side of the base of the radome approximately 12 inches from the center of the radome base, down along the side if the pedestal, through the deck and into the interior of the ship.

2.3.3. Sizing of the support pedestal

The following should be taken into account when choosing the height of a mounting support stand:

1. The height of the pedestal should be kept as short as possible, taking into account recommendations given in other Sea Tel Guidelines.
2. The minimum height of the pedestal above a flat deck or platform to allow access into the radome for maintenance should be 0.6 meters (24 inches).
3. The connection of the ADE mounting plate to the stanchion and the connection of the pedestal to the ship should be properly braced with triangular gussets (see graphic above). Care should be taken to align the pedestal gussets to the ship's stiffeners as much as possible. Doublers or other reinforcing plates should be considered to distribute the forces when under-deck stiffeners are inadequate.
4. The diameter of the pedestal stanchion shall not be smaller than 100 millimeters (4 inches). Where the ADE base diameter exceeds 1.5 meters (60 inches), additional stanchions (quantity greater than 3) should be placed rather than a single large stanchion.
5. Shear and bending should be taken into account in sizing the ADE mounting plate and associated gussets.
6. Shear and bending must be taken into account when sizing the pedestal to ship connection.
7. All welding should be full penetration welds –V-groove welds with additional fillet welds – with throats equivalent to the thickness of the thinnest base material.
8. For an ADE mounted greater than 0.6 meters (24 inches) above the ship's structure, at least one (1) foot rung should be added. Additional rungs should be added for every 0.3 meter (12 inches) of pedestal height above the ship's structure.
9. For an ADE mounted greater than 3 meters (9 feet) above the ship's structure, a fully enclosing cage should be included in way of the access ladder, starting 2.3 meters (7 feet) above the ship's structure.

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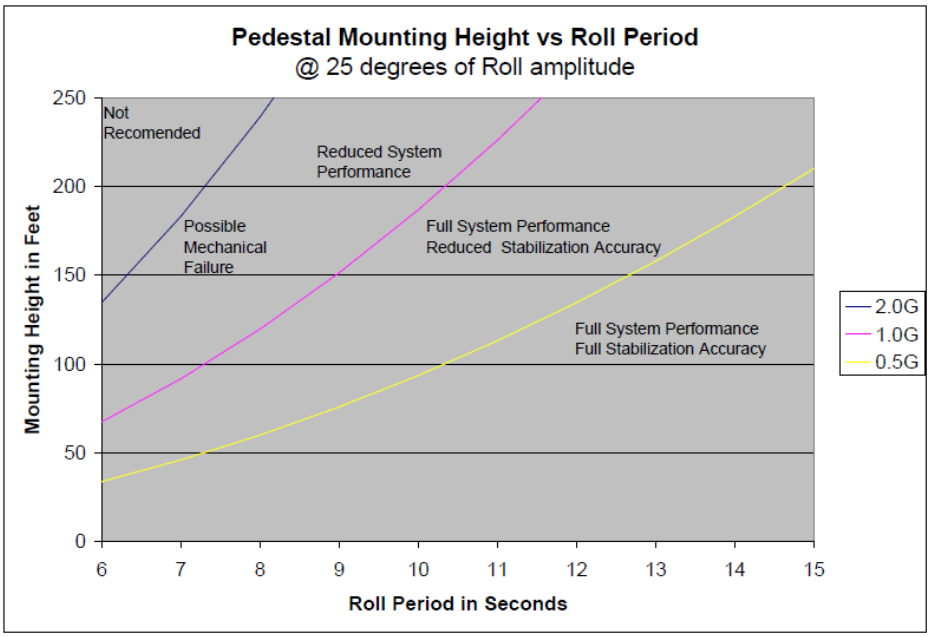
2.4. Mounting Height

The higher up you mount the antenna above the pivot point of the ship the higher the tangential acceleration (g-force) exerted on the antenna will be (see chart below).

When the g-force exerted on the antenna is low, antenna stabilization and overall performance are not affected.

If the g-force exerted on the antenna is high enough (> 1 G), antenna stabilization and overall performance are affected.



If the g-force exerted on the antenna is excessive (1-2 Gs), the antenna does not maintain stabilization and may be physically damaged by the g-force.

2.5. Mast Configurations

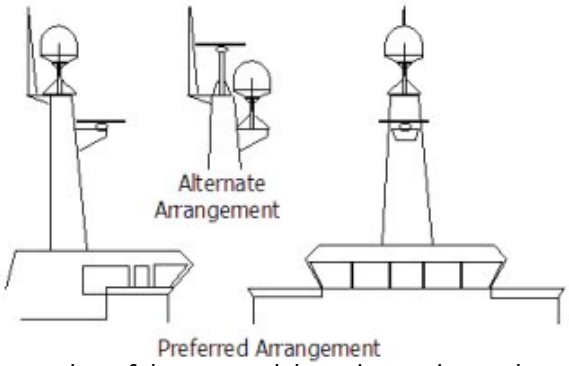
Sea Tel recommends mounting the ADE in a location that has both a clear line-of-sight to the target satellites in all potential azimuth/elevation ranges and sufficient support against vibration excitement. If possible, mounting the ADE pedestal directly to ship deckhouse structures or other box stiffened structures is preferred. However, in many cases, this imposes limits on the antenna system's clear line-of-sight.

Often the solution for providing the full azimuth/elevation range the antenna needs is to mount the ADE on the ship's mast. Unfortunately, masts do not consider equipment masses in design and often have harmonic frequencies of their own.

There are many designs of masts used on ships – masts are nearly as unique in design as the ship is – but the designs often fall into a few categories. These categories can be addressed in terms of typical responses and problems with regards to vibration and mounting of ADE. The most common categories of masts are:

2.5.1. Vertical Masts

Vertical masts are a very ancient and common mast design. In essence, it is the mast derived from the sailing mast and adapted for mounting the ever-increasing array of antennae which ships need to communicate with the world. This drawing of a vertical mast shows the preferred mounting of the ADE center-line above the plane of the radar. Alternatively the ADE is mounted below the plane of the radar signal



Vertical masts are most commonly found on cargo ships – they are simple, inelegant and functional. They are also fairly stiff against torsional reaction and lateral vibrations, as long as the ADE is mounted on a stiff pedestal near the vertical centerline of the mast. If centerline mounting is impractical or otherwise prohibited, the mast platform the ADE is mounted on should be checked for torsional vibration about the centerline of the mast and the orthogonal centerline of the platform.

If the estimated natural frequency of the mast or platform is less than 35 Hertz, the mast or platform should be stiffened by the addition of deeper gussets under the platform or behind the mast.

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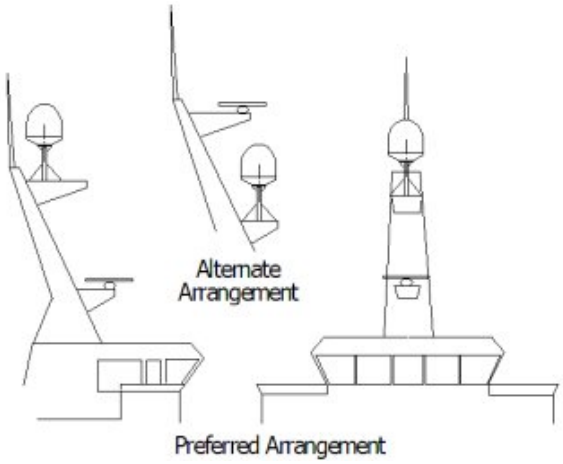
2.5.2. Raked Masts

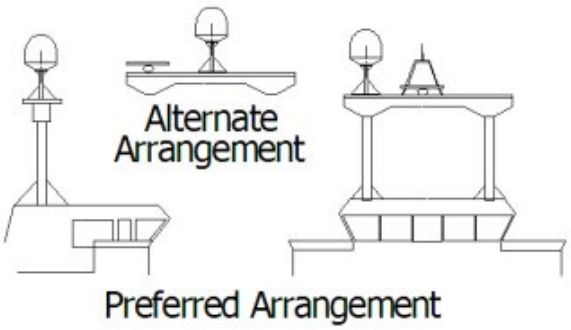
Raked masts are found on vessels where the style or appearance of the entire vessel is important. Again, the inclined mast is a direct descendant from the masts of sailing ships – as ship owners wanted their vessels to look more unique and less utilitarian, they 'raked' the masts aft to make the vessel appear capable of speed. This drawing shows a raked mast, again with the preferred ADE mounting above the radar and alternate with the ADE below the radar.



Raked masts pose special problems in both evaluating the mast for stiffness and mounting of antennae. As can be seen in the drawing, all antennae must be mounted on platforms or other horizontal structures in order to maintain the vertical orientation of the antenna centerline. This implies a secondary member which has a different natural frequency than the raked mast's natural frequency. In order to reduce the mass of these platforms, they tend to be less stiff than the main box structure of the raked mast. Thus, they will have lower natural frequencies than the raked mast itself. Unfortunately, the vibratory forces will act through the stiff structure of the raked mast and excite these lighter platforms, to the detriment of the antenna.

2.5.3. Girder Masts

Girder masts are large platforms atop a pair of columns. Just like girder constructions in buildings, they are relatively stiff athwart ship – in their primary axis – but less stiff longitudinally and torsionally. An example of a girder mast is shown in this drawing, with the preferred ADE mounting outboard and above the radar directly on one of the columns and alternate with the ADE centered on the girder above the plane of the radar.



The greatest weakness of girder masts is in torsion – where the girder beam twists about its vertical centerline axis. As with all mast designs discussed so far, mounting the antenna in line with the vertical support structure will reduce the vibration tendencies. Mounting the antenna directly above the girder columns provides ample support to the antenna pedestal and locates the antenna weight where it will influence the natural frequency of the mast the least.

2.5.4. Truss Mast

Truss masts are a variant on the girder mast concept. Rather than a pair of columns supporting a girder beam, the construction is a framework of tubular members supporting a platform on which the antennae and other equipment are mounted. A typical truss mast is shown in this photograph.

Like a girder mast, truss masts are especially stiff in the athwart ship direction. Unlike a girder mast, the truss can be made to be nearly as stiff in the longitudinal direction. Truss masts are particularly difficult to estimate the natural frequency – since a correct modeling includes both the truss structure of the supports and the plate/diaphragm structure of the platform. In general, the following guidelines apply when determining the adequate support for mounting an antenna on a truss mast:

1. Antenna ADE pedestal gussets should align with platform stiffeners which are at least 200 millimeters in depth and 10 millimeters in thickness.

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2. When possible, the antenna ADE pedestal column should align with a vertical truss support.
3. For every 100 kilograms of ADE weight over 250 kilograms, the depth of the platform stiffeners should be increased by 50 millimeters and thickness by 2 millimeters.

Sea Tel does not have a recommended arrangement for a truss mast – the variability of truss mast designs means that each installation needs to be evaluated separately.

2.6. Safe Access to the ADE

Safe access to the ADE should be provided. Provisions of the ship's Safety Management System with regard to men aloft should be reviewed and agreed with all personnel prior to the installation. Installations greater than 3 meters above the deck (or where the access starts at a deck less than 1 meter in width) without cages around the access ladder shall be provided with means to latch a safety harness to a fixed horizontal bar or ring.

The access hatch for the ADE shall be oriented aft, or inboard, when practical. In any case, the orientation of the ADE access hatch shall comply with the SMS guidelines onboard the ship. Nets and other safety rigging under the ADE during servicing should be rigged to catch falling tools, components or fasteners.

2.7. Below Decks Equipment Location

The Antenna Control Unit (LMXP) is a standard 19" rack mount enclosure, therefore, preferred installation is in a standard 19" equipment rack. The ACU mounts from the front of the rack.

The Satellite Receivers, multi-switch and any other associated equipment should be properly mounted for shipboard use.

Plans to allow access to the rear of the ACU, and other equipment, should be considered.

2.8. Cables

During the site survey, walk the path where the cables will be installed. Pay particular attention to how cables will be installed; such as what obstacles they will be routed around, difficulties that will be encountered and the overall length of the cables. The ADE should be installed using good electrical practice. Sea Tel recommends referring to IEC 60092-352 for specific guidance in choosing cables and installing cables onboard a ship. Within these guidelines, Sea Tel will provide some very general information regarding the electrical installation.

In general, all cable shall be protected from chaffing and secured to a cableway. Cable runs on open deck or down a mast shall be in metal conduit suitable for marine use. The conduit shall be blown through with dry air prior to passing cable to ensure all debris has been cleared out of the conduit and again after passing the cable to ensure no trapped moisture exists. The ends of the conduit shall be sealed with cable glands (preferred), mastic or low VOC silicon sealant after the cables have been passed through.

Cables passing through bulkheads or decks shall be routed through approved weather tight glands.

2.8.1. ADE/BDE Coaxial Cables

The first concern with the coaxial cables installed between the ADE & BDE is length. This length is used to determine the loss of the various possible coax, Heliax or fiber-optic cables that might be used. You should always provide the lowest loss cables to provide the strongest signal level into the satellite receivers.

Be sure that the shield(s) of the coaxes are not in contact with the ships ground.

The coaxes must be of adequate conductor cross-sectional surface area for the length of the cable run and that the loop resistance of the cable run is less than 2.0 ohms. Copper clad iron center conductor cables should never be used.

Signal cable shall be continuous from the connection within the ADE radome, through the structure of the ship to the BDE. Splices, adapters or dummy connections will degrade the signal level and are discouraged.

Be careful of sharp bends that kink and damage the cable. Use a proper tubing bender for Heliax bends.

Penetrations in watertight bulkheads are very expensive, single cable, welded penetrations that must be pressure tested.

Always use good quality connectors that are designed to fit properly on the cables you are using. Poor quality connectors have higher loss, can allow noise into the cable, are easily damaged or fail prematurely.

In as much as is possible, don't lay the coaxes on power cables. Try to have some separation from Inmarsat & GPS cables that are also passing L-band frequencies or radar cables that may inject pulse repetition noise –as error bits - into your cables.

One of these coaxes provides power to the ADE. Be cautious of length of the run, for voltage loss issues, and assure that the gauge of the conductors in this coax cable is adequate for the current that is expected to be drawn (plus margin). This cable must be low loop resistance and have a solid coper center conductor.

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2.8.2. ACU Power Cable/Outlet

The AC power for the LMXP is not required to be from a UPS, but it is recommended. The LMXP supplies power to the ADE. The power cable provided by Sea Tel complies with the provisions of IEC 60092-350 and -35.

2.8.3. Gyro Compass Cable

Use good quality shielded cables (twisted pairs, individually foil wrapped, outer foil with braid overall is best). For NMEA connection, use 2-wire (twisted pair) shielded cable. Be cautious of length and gauge of the run for voltage loss issues.

2.9. Grounding

All metal parts of the ADE shall be grounded to bare metal that is common to the hull of the ship. This is most commonly accomplished by attaching a ground wire/cable from the upper base plate ground point to a ground stud on the mounting pedestal/stanchion/mast near the base of the radome. Preservation of the bare metal contact point should be done to prevent loss of ground due to rust and/or corrosion.

Grounding by exposing bare metal under all mounting bolts of the under-side of the radome base prior to final tightening does NOT provide adequate grounding of the ADE.

Grounding should be ensured throughout the entire mounting to the hull. While it is presumed the deckhouse is permanently bonded and grounded to the hull, in cases where the deckhouse and hull are of different materials a check of an independent ground bonding strap should be made. Masts should be confirmed to be grounded to the deckhouse or hull.

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3. Installation

Your antenna pedestal comes completely assembled in its radome. This section contains instructions for unpacking, final assembling and installing of the equipment. It is highly recommended that trained technicians install the system.

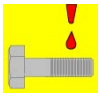
The installation instructions for your system are below.

3.1. Unpacking and Inspection

Exercise caution when unpacking the equipment.

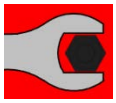
1. Unpack the crates. Carefully inspect the radome surface for evidence of shipping damage.
2. Unpack all the boxes.
3. Inspect everything to assure that all materials have been received and are in good condition.

3.2. Assembly Notes and Warnings



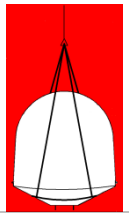
***NOTE**: All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
222	**Low strength for small fasteners.**
242	**Medium strength**
638	**High strength for motor shafts & sprockets.**
2760	**Permanent strength for up to 1" diameter fasteners.**
290	**Wicking, High strength for fasteners which are already assembled.**



WARNING: The following values are for through bolted stainless steel hardware. Ensure that all screw/bolt assemblies are tightened according to the tightening torque values listed below:

Screw/Bolt	Kg-cm (In-lbs)	Screw/Bolt	Kg-cm (In-lbs)
4-40	7.1 (6.2)	**M2.5**	6.0 (5.2)
6-32	13.3 (11.5)	**M3**	10.6 (9.2)
8-32	24.3 (21.1)	**M3.5**	16.7 (14.5)
10-24	35.1 (30.5)	**M4**	24.7 (21.4)
12-24	55.3 (48.0)	**M5**	49.9 (43.3)
1/4-20	84.1 (73.0)	**M6**	84.7 (73.5)
5/l6-18	173.2 (150.3)	**M8**	205.5 (178.4)
3/8-16	307.4 (266.8)	**M10**	407.2 (353.4)
7/16-14	491.8 (426.9)	**M12**	710.2 (616.4)
1/2-13	750.4 (651.3)	**M14**	1130.4 (981.1)
9/16-12	1082.8 (939.8)	**M16**	1763.7 (1530.8)



***WARNING**: Hoisting with other than a webbed four-part sling may result in catastrophic crushing of the radome. Refer to the specifications and drawings for the fully assembled weight of your model antenna/radome and assure that equipment used to lift/hoist this system is rated accordingly.*

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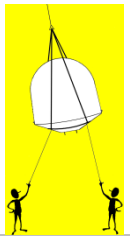


***CAUTION**: The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while hoisting the antenna assembly to its assigned location aboard ship.*

3.3. ADE Installation

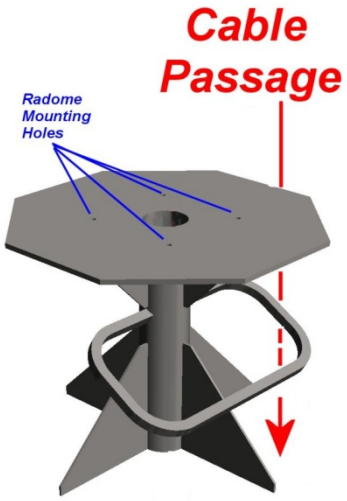
3.3.1. ADE Mounting Considerations

Mounting the radome directly on the deck/ platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications).

If access to the hatch cannot be provided in the mounting surface, provide a short ADE support pedestal to mount the ADE on which is tall enough to allow access into the radome via the hatch.

Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

When strain relief glands are being used the recommended cable passage will be in/out the starboard side of the base of the radome approximately 12 inches from the center of the radome base, down along the side if the pedestal, through the deck and into the interior of the ship.



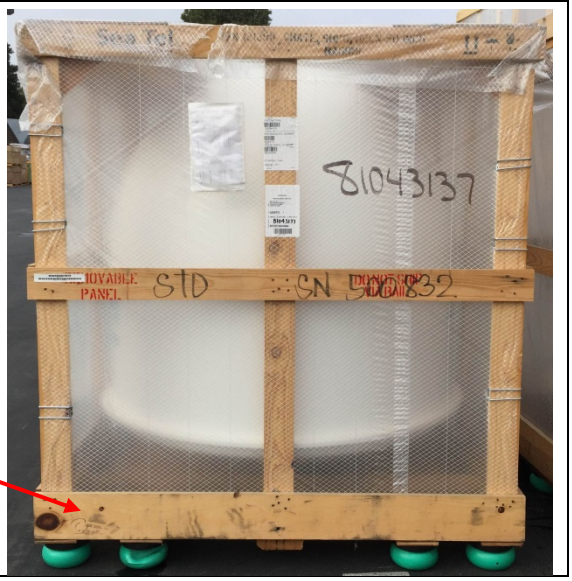
3.3.2. Open the System Crate

The system Above Decks Equipment (ADE) is shipped to you completely assembled.

We recommend that you place the System Crate in the area that you have chosen to prepare for lifting that ADE onto the ship.

1. This is the System crate.

2. Remove the wood screws that penetrate through the bottom board of the removable panel into the pallet.



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3. Remove the **clips** around the removable crate wall. 4. Remove the removable crate wall to expose the contents.	
5. Remove the wood screws that penetrate through the bottom board of the 3 remaining side panels into the pallet.	
6. Set the side/top panels aside, where they will not interfere with hoisting the ADE.	

3.3.3. Prepare the Radome Assembly

1. Lift the pallet using a forklift and/or jacks. 2. From the underside of the pallet, remove the four shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware.	

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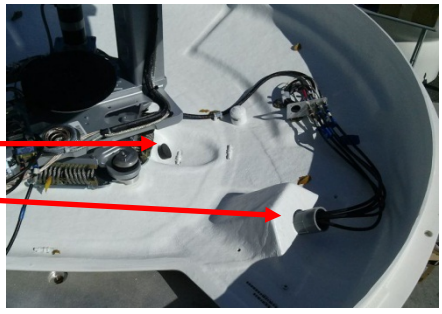
3. Remove the horizontal bolt in one of the four the lifting brackets which are installed on the underside of the radome base. 4. Attach a properly load rated web lifting strap to the bracket using the bolt removed in the previous step. 5. Repeat these steps 3 and 4 to install the other three lifting straps. 6. Attach a suitable length tagline to one of the brackets.	

3.3.4. Installing the Radome Assembly

The antenna pedestal is shipped completely assembled in its radome.

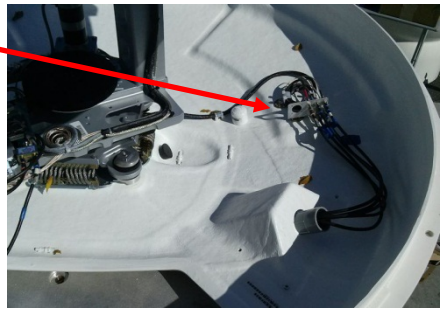
1. Hoist the Radome assembly off the shipping pallet, by means of a suitably sized crane or derrick, to allow access to bottom of radome assembly. 2. Open the hatch by pressing the round release button in the latches and gently push the hatch up into the radome. Place the hatch door (gel coat surface up) inside the radome on the far side of the antenna pedestal. 3. Inspect the pedestal assembly and reflector for signs of shipping damage.	
4. Peel the paper off of the mounting pad (provided in the radome installation kit) to expose the sticky side of the pad, align it to the mounting holes and press it in place on the underside of the radome base.	
5. Using Loctite 271, install the four mounting studs (provided in radome mounting kit) into the radome base. 6. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.	
7. Carefully route the ground strap/cable (see Grounding info below) and 5 power & IF coax cables through the cable passage in the bottom center OR the offset cable entry (as desired). Center Cable Entry Side Cable Entry **NOTE: Suitable strain relief should be provided below the mounting surface to prevent the cables from being kinked where the cables exit the bottom of the radome.**	

EAR Controlled - ECCN EAR99

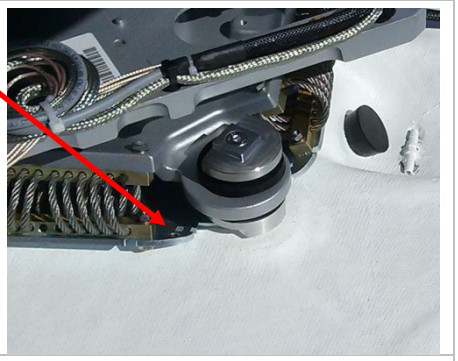
8. Allow enough service loop to terminate these cables to the connector bracket respectively:

Refer to the System Block Diagram for cable connection information.

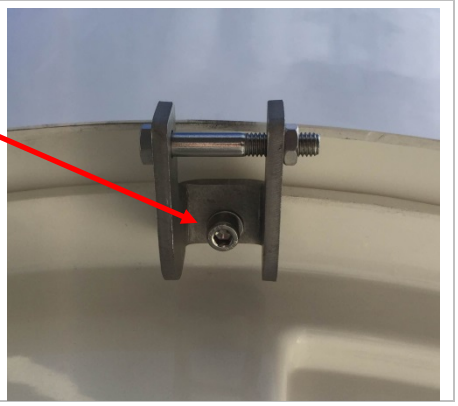
9. Connect the Antenna Control coax to the **Red** connector.
10. Connect the Low Band Vertical/RHCP coax to the **Blue** connector.
11. Connect the Low Band Horizontal/LHCP coax to the **White** connector.
12. Connect the High Band Vertical/RHCP coax to the **Green** connector.
13. Connect the High Band Horizontal/LHCP coax to the **Black** connector.



14. Attach hull ground strap/cable to the threaded hole in the lower base plate.



15. Lower radome assembly into the mounting holes, positioned with the BOW reference of the radome as close to parallel with centerline of the ship as possible (any variation from actual alignment can be electrically calibrated if needed).
16. Using Loctite 271, install the four fender washers and hex nuts (provided in the radome installation kit), from the underside of the mounting surface, to affix the radome to the mounting surface. Tighten to torque spec.
17. Adjust the cables through the desired cable entry and apply "Duct Seal" (or Silocon Sealant) to to make the cable entry point splash-proof.
18. Remove the tag lines.
19. Remove the lifting straps.
20. Remove the four M12 screws from the lifting brackets on the underside of the radome base.
21. Apply Loctite to, reinstall and tighten the four M12 bolts.
22. Close the radome hatch.



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3.4. NO Shipping Restraints

There are NO shipping restraints to remove from this antenna.

NOTE: The motors on this antenna have brakes, which automatically engage when power is turned OFF, or is lost. Shipping restraints are not required on this equipment.

After installation, when Power is turned ON, the brakes on the motors will release and allow the antenna to be driven.

3.5. Installing the Below Decks Equipment.

3.5.1. General Cautions & Warnings

***CAUTION – Allow** only an **authorized dealer** to install or service the Sea Tel System components. Unauthorized installation or service can be dangerous and may invalidate the warranty.*

3.6. IF Coax Cable Connections

Refer to the System Block Diagram. Connections are described using the color designation as show on the System Block Diagram.

3.6.1. Red Coax

This coax provides +24 VDC power to the antenna and it also carries the Ethernet Over Coax (EOC) antenna control signals between the antenna and the LMXP. Connect this coax to J2 Antenna connection on the rear panel of the LMXP (this step is duplicated below).

3.6.2. Blue Coax

This coax carries the Low Band Vertical/RHCP signals from the antenna to the below decks Multiswitch, or other distribution equipment. Connect this coax to the Low Band Vertical, or RHCP port, on your Multiswitch, or other distribution equipment.

3.6.3. White Coax

This coax carries the Low Band Horizontal/LHCP signals from the antenna to the below decks Multiswitch, or other distribution equipment. Connect this coax to the Low Band Horizontal, or LHCP, port on your Multiswitch, or other distribution equipment.

3.6.4. Green Coax

This coax carries the High Band Vertical/RHCP signals from the antenna to the below decks Multiswitch, or other distribution equipment. Connect this coax to the High Band Vertical, or RHCP, port on your Multiswitch, or other distribution equipment.

3.6.5. Black Coax

This coax carries the High Band Horizontal/LHCP signals from the antenna to the below decks Multiswitch, or other distribution equipment. Connect this coax to the High Band Horizontal, or LHCP, port on your Multiswitch, or other distribution equipment.

3.7. Connecting the Below Decks Equipment

Connect this equipment as shown in the System Block Diagram. Install the equipment in a standard 19 inch equipment rack or other suitable location. Optional slide rails are available for the LMXP.

3.7.1. Connecting the BDE AC Power Cables

Connect the AC Power cables that supply power to the Below Decks Equipment (LMXP, Satellite Receivers, and all other equipment) to an outlet strip fed from a suitably rated breaker or UPS.

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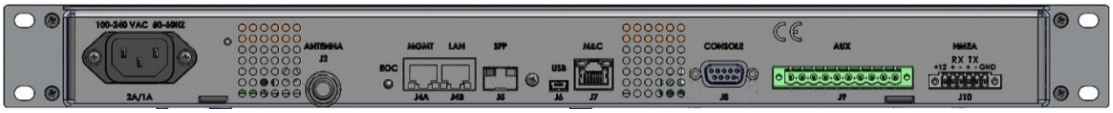
3.7.2. Media Xchange Point™ (LMXP) Connections



3.7.2.1. Ships AC Mains

Connect the power cord from the rear panel of the LMXP to AC voltage power source (UPS power recommended).

3.7.2.2. J2 Antenna

Connect the **Red** antenna control coax cable to this connector on the rear panel of the LMXP.

3.7.2.3. J4 A/B & J4 A/B - Ethernet 2 Port 10/100 switch

Ethernet connections to computer or LAN devices as desired.

3.7.2.4. J5 SFP Fiber Interface

SFP Gigabit Ethernet connection.

3.7.2.5. J6 Mini-USB Computer M&C Connection

Mini-USB Antenna M&C connection, if desired.

3.7.2.6. J7 M&C Host

Not connected - -Future development.

3.7.2.7. J8 Console

Antenna M&C Serial connections.

3.7.2.8. J9 AUX

Computer RJ-45 Serial M&C connections.

3.7.2.1. J10 NMEA 0183 Gyro Compass

NMEA 0183 I/O connections. Wiring is:

Pin 1	+12 VDC
Pin 2	RX+
Pin 3	RX-
Pin 4	TX+
Pin 5	TX-
Pin 6	GND

If your NMEA 0183 Gyro Compass outputs RS-422:

- Connect its' TX+ output to J10 pin 2 (RX+)
- Connect its' TX- output to J10 pin 3 (RX-)

If your NMEA 0183 Gyro Compass outputs RS-232:

- Connect its' GND output to J10 pin 2 (RX+)
- Connect a jumper from J10 pin 2 (RX+) to J10 pin 6 (GND)
- Connect its' TXD output to J10 pin 3 (RX-)

3.7.3. Other BDE connections

Connect your other Below Decks Equipment (ie, satellite receivers, Multiswitch, other audio/video equipments and computer equipment) to complete your configuration.

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3.8. Final Checks

3.8.1. Visual/Electrical inspection

Perform a visual inspection of your work to assure that everything is connected properly and all cables/wires are secured.

3.8.2. Electrical - Double check wiring connections

Double check all your connections to assure that it is safe to energize the equipment.

3.9. Setup – Media Xchange Point™ (LMXP)

Now that you have installed the hardware, you will need to setup, calibrate and commission the antenna.

At the very least, you will need to set up the antenna system for:

- Connect & configure a ships computer for accessing the LMXP. Refer to the "Configuring a Computer for the LMXP" chapter for more information.
- Set up / configure all satellites that the system might use as the ship travels. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Set up Blockage zone(s) as needed. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Acquire the desired satellite. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Optimize targeting (Auto or manual trim). Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Conduct other commissioning/testing of matrix switch, satellite receivers and TV distribution equipment.
- It is strongly recommended that you download, and save, the system INI file (contains all of the system parameters). Save this file in a convenient location.

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4. Installation

Your antenna pedestal comes completely assembled in its radome. This section contains instructions for unpacking, final assembling and installing of the equipment. It is highly recommended that trained technicians install the system.

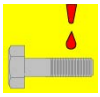
The installation instructions for your system are below.

4.1. Unpacking and Inspection

Exercise caution when unpacking the equipment.

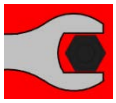
1. Unpack the crates. Carefully inspect the radome surface for evidence of shipping damage.
2. Unpack all the boxes.
3. Inspect everything to assure that all materials have been received and are in good condition.

4.2. Assembly Notes and Warnings



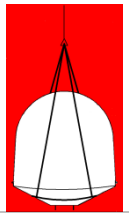
***NOTE**: All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
223	**Low strength for small fasteners.**
242	**Medium strength**
638	**High strength for motor shafts & sprockets.**
2760	**Permanent strength for up to 1" diameter fasteners.**
290	**Wicking, High strength for fasteners which are already assembled.**



WARNING: The following values are for through bolted stainless steel hardware. Ensure that all screw/bolt assemblies are tightened according to the tightening torque values listed below:

Screw/Bolt	Kg-cm (In-lbs)	Screw/Bolt	Kg-cm (In-lbs)
4-40	7.1 (6.2)	**M2.5**	6.0 (5.2)
6-32	13.3 (11.5)	**M3**	10.6 (9.2)
8-32	24.3 (21.1)	**M3.5**	16.7 (14.5)
10-24	35.1 (30.5)	**M4**	24.7 (21.4)
12-24	55.3 (48.0)	**M5**	49.9 (43.3)
1/4-20	84.1 (73.0)	**M6**	84.7 (73.5)
5/l6-18	173.2 (150.3)	**M8**	205.5 (178.4)
3/8-16	307.4 (266.8)	**M10**	407.2 (353.4)
7/16-14	491.8 (426.9)	**M12**	710.2 (616.4)
1/2-13	750.4 (651.3)	**M14**	1130.4 (981.1)
9/16-12	1082.8 (939.8)	**M16**	1763.7 (1530.8)



***WARNING**: Hoisting with other than a webbed four-part sling may result in catastrophic crushing of the radome. Refer to the specifications and drawings for the fully assembled weight of your model antenna/radome and assure that equipment used to lift/hoist this system is rated accordingly.*

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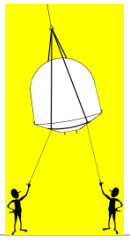


***CAUTION**: The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while hoisting the antenna assembly to its assigned location aboard ship.*

4.3. ADE Installation

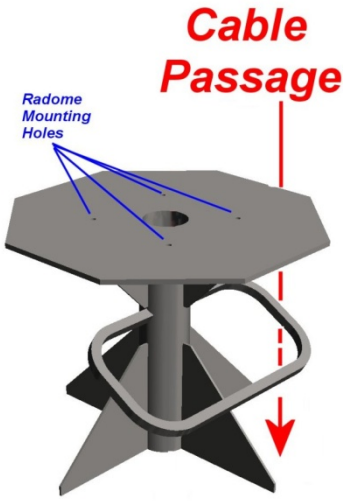
4.3.1. ADE Mounting Considerations

Mounting the radome directly on the deck/ platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface to allow such entry. If there is no access to the hatch the only way to service the antenna is to remove the radome top. Two people are required to take the top off of the radome without cracking or losing control of it, but even with two people a gust of wind may cause them to lose control and the radome top may be catastrophically damaged (see repair information in the radome specifications).

If access to the hatch cannot be provided in the mounting surface, provide a short ADE support pedestal to mount the ADE on which is tall enough to allow access into the radome via the hatch.

Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

When strain relief glands are being used the recommended cable passage will be in/out the starboard side of the base of the radome approximately 12 inches from the center of the radome base, down along the side if the pedestal, through the deck and into the interior of the ship.



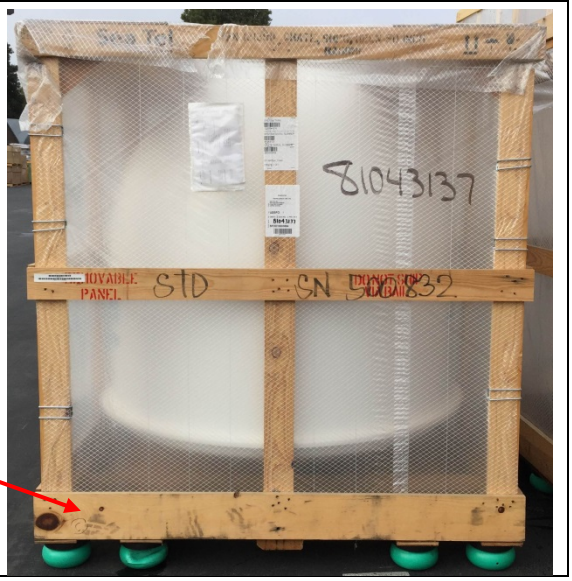
4.3.2. Open the System Crate

The system Above Decks Equipment (ADE) is shipped to you completely assembled.

We recommend that you place the System Crate in the area that you have chosen to prepare for lifting that ADE onto the ship.

1. This is the System crate.

2. Remove the wood screws that penetrate through the bottom board of the removable panel into the pallet.



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3. Remove the **clips** around the removable crate wall. 4. Remove the removable crate wall to expose the contents.	
5. Remove the wood screws that penetrate through the bottom board of the 3 remaining side panels into the pallet.	
6. Set the side/top panels aside, where they will not interfere with hoisting the ADE.	

4.3.3. Prepare the Radome Assembly

1. Lift the pallet using a forklift and/or jacks. 2. From the underside of the pallet, remove the four shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware.	

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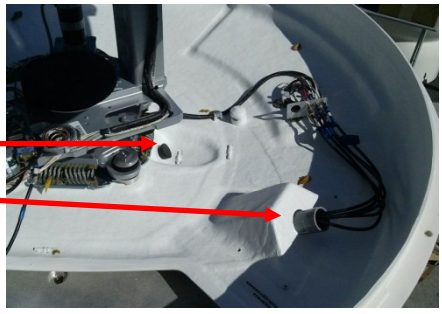
3. Remove the horizontal bolt in one of the four the lifting brackets which are installed on the underside of the radome base. 4. Attach a properly load rated web lifting strap to the bracket using the bolt removed in the previous step. 5. Repeat these steps 3 and 4 to install the other three lifting straps. 6. Attach a suitable length tagline to one of the brackets.	

4.3.4. Installing the Radome Assembly

The antenna pedestal is shipped completely assembled in its radome.

1. Hoist the Radome assembly off the shipping pallet, by means of a suitably sized crane or derrick, to allow access to bottom of radome assembly. 2. Open the hatch by pressing the round release button in the latches and gently push the hatch up into the radome. Place the hatch door (gel coat surface up) inside the radome on the far side of the antenna pedestal. 3. Inspect the pedestal assembly and reflector for signs of shipping damage.	
4. Peel the paper off of the mounting pad (provided in the radome installation kit) to expose the sticky side of the pad, align it to the mounting holes and press it in place on the underside of the radome base.	
5. Using Loctite 271, install the four mounting studs (provided in radome mounting kit) into the radome base. 6. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.	
7. Carefully route the ground strap/cable (see Grounding info below) and 5 power & IF coax cables through the cable passage in the bottom center OR the offset cable entry (as desired). Center Cable Entry Side Cable Entry **NOTE: Suitable strain relief should be provided below the mounting surface to prevent the cables from being kinked where the cables exit the bottom of the radome.**	

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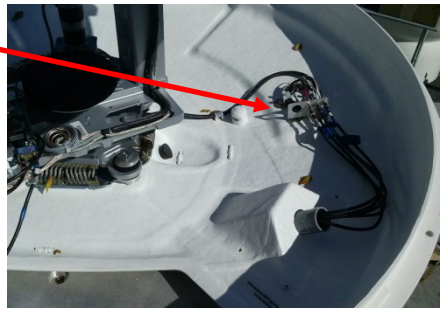
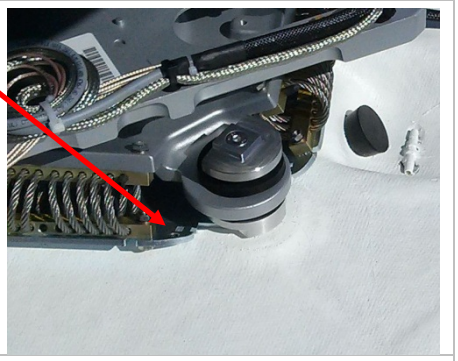
8. Allow enough service loop to terminate these cables to the connector bracket respectively:

Refer to the System Block Diagram for cable connection information.

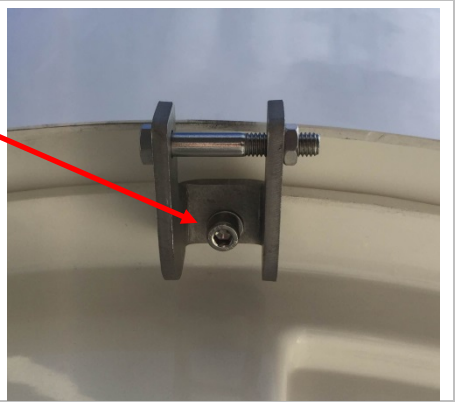
9. Connect the Antenna Control coax to the **Red** connector.
10. Connect the Low Band Vertical/RHCP coax to the **Blue** connector.
11. Connect the Low Band Horizontal/LHCP coax to the **White** connector.
12. Connect the High Band Vertical/RHCP coax to the **Green** connector.
13. Connect the High Band Horizontal/LHCP coax to the **Black** connector.



14. Attach hull ground strap/cable to the threaded hole in the lower base plate.



15. Lower radome assembly into the mounting holes, positioned with the BOW reference of the radome as close to parallel with centerline of the ship as possible (any variation from actual alignment can be electrically calibrated if needed).
16. Using Loctite 271, install the four fender washers and hex nuts (provided in the radome installation kit), from the underside of the mounting surface, to affix the radome to the mounting surface. Tighten to torque spec.
17. Adjust the cables through the desired cable entry and apply "Duct Seal" (or Silocon Sealant) to to make the cable entry point splash-proof.
18. Remove the tag lines.
19. Remove the lifting straps.
20. Remove the four M12 screws from the lifting brackets on the underside of the radome base.
21. Apply Loctite to, reinstall and tighten the four M12 bolts.
22. Close the radome hatch.



EAR Controlled - ECCN EAR99

4.4. NO Shipping Restraints

There are NO shipping restraints to remove from this antenna.

NOTE: The motors on this antenna have brakes, which automatically engage when power is turned OFF, or is lost. Shipping restraints are not required on this equipment.

After installation, when Power is turned ON, the brakes on the motors will release and allow the antenna to be driven.

4.5. Installing the Below Decks Equipment.

4.5.1. General Cautions & Warnings

***CAUTION – Allow** only an **authorized dealer** to install or service the Sea Tel System components. Unauthorized installation or service can be dangerous and may invalidate the warranty.*

4.6. IF Coax Cable Connections

Refer to the System Block Diagram. Connections are described using the color designation as show on the System Block Diagram.

4.6.1. Red Coax

This coax provides +24 VDC power to the antenna and it also carries the Ethernet Over Coax (EOC) antenna control signals between the antenna and the LMXP. Connect this coax to J2 Antenna connection on the rear panel of the LMXP (this step is duplicated below).

4.6.2. Blue Coax

This coax carries the Low Band Vertical/RHCP signals from the antenna to a splitter.

One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers. Connect this output to the Low Band Vertical, or RHCP port, on your Multiswitch, or other distribution equipment.

Connect the other output from the splitter to the Low Band RHCP (13V) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

4.6.3. White Coax

This coax carries the Low Band Horizontal/LHCP signals from the antenna to a splitter.

One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers. Connect this output to the Low Band Horizontal, or LHCP port, on your Multiswitch, or other distribution equipment.

Connect the other output from the splitter to the Low Band RHCP (18V) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

4.6.4. Green Coax

This coax carries the High Band Vertical/RHCP signals from the antenna to a splitter.

One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers. Connect this output to the High Band Vertical, or RHCP port, on your Multiswitch, or other distribution equipment.

Connect the other output from the splitter to the High Band RHCP (13V+22KHz) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

4.6.5. Black Coax

This coax carries the High Band Horizontal/LHCP signals from the antenna to a splitter.

One output of the splitter goes to the below decks Multiswitch, or other distribution equipment that is feeding the Ku-Band satellite receivers. Connect this output to the High Band Horizontal, or LHCP port, on your Multiswitch, or other distribution equipment.

Connect the other output from the splitter to the High Band LHCP (18V+22KHz) port, on your 8 CH SWM which feeds your DirecTV HD receivers.

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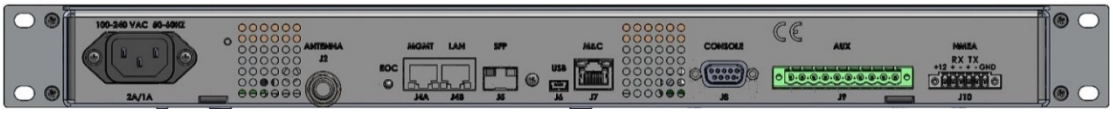
4.7. Connecting the Below Decks Equipment

Connect this equipment as shown in the System Block Diagram. Install the equipment in a standard 19 inch equipment rack or other suitable location. Optional slide rails are available for the LMXP.

4.7.1. Connecting the BDE AC Power Cables

Connect the AC Power cables that supply power to the Below Decks Equipment (LMXP, Satellite Receivers, and all other equipment) to an outlet strip fed from a suitably rated breaker or UPS.

4.7.2. Media Xchange Point™ (LMXP) Connections



4.7.2.1. Ships AC Mains

Connect the power cord from the rear panel of the LMXP to AC voltage power source (UPS power recommended).

4.7.2.2. J2 Antenna

Connect the **Red** antenna control coax cable to this connector on the rear panel of the LMXP.

4.7.2.3. J4 A/B & J4 A/B - Ethernet 2 Port 10/100 switch

Ethernet connections to computer or LAN devices as desired.

4.7.2.4. J5 SFP Fiber Interface

SFP Gigabit Ethernet connection.

4.7.2.5. J6 Mini-USB Computer M&C Connection

Mini-USB Antenna M&C connection, if desired.

4.7.2.6. J7 M&C Host

Not connected - -Future development.

4.7.2.7. J8 Console

Antenna M&C Serial connections.

4.7.2.8. J9 AUX

Computer RJ-45 Serial M&C connections.

4.7.2.9. J10 NMEA 0183 Gyro Compass

NMEA 0183 I/O connections. Wiring is:

Pin 1	+12 VDC
Pin 2	RX+
Pin 3	RX-
Pin 4	TX+
Pin 5	TX-
Pin 6	GND

If your NMEA 0183 Gyro Compass outputs RS-422:

- Connect its' TX+ output to J10 pin 2 (RX+)
- Connect its' TX- output to J10 pin 3 (RX-)

If your NMEA 0183 Gyro Compass outputs RS-232:

- Connect its' GND output to J10 pin 2 (RX+)
- Connect a jumper from J10 pin 2 (RX+) to J10 pin 6 (GND)
- Connect its' TXD output to J10 pin 3 (RX-)

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4.7.3. Other BDE connections

Connect your other Below Decks Equipment (ie, satellite receivers, Multiswitch, other audio/video equipments and computer equipment) to complete your configuration.

4.8. Final Checks

4.8.1. Visual/Electrical inspection

Perform a visual inspection of your work to assure that everything is connected properly and all cables/wires are secured.

4.8.2. Electrical - Double check wiring connections

Double check all your connections to assure that it is safe to energize the equipment.

4.9. Setup – Media Xchange Point™ (LMXP)

Now that you have installed the hardware, you will need to setup, calibrate and commission the antenna.

At the very least, you will need to set up the antenna system for:

- Connect & configure a ships computer for accessing the LMXP. Refer to the "Configuring a Computer for the LMXP" chapter for more information.
- Set up / configure all satellites that the system might use as the ship travels. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Set up Blockage zone(s) as needed. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Acquire the desired satellite. Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Optimize targeting (Auto or manual trim). Refer to the "Dealer Login Pages - LMXP" chapter for more information.
- Conduct other commissioning/testing of matrix switch, satellite receivers and TV distribution equipment.
- It is strongly recommended that you download, and save, the system INI file (contains all of the system parameters). Save this file in a convenient location.

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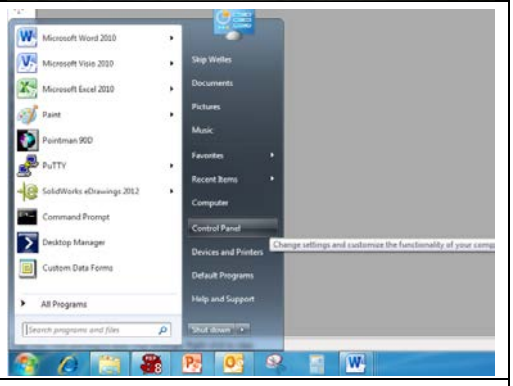
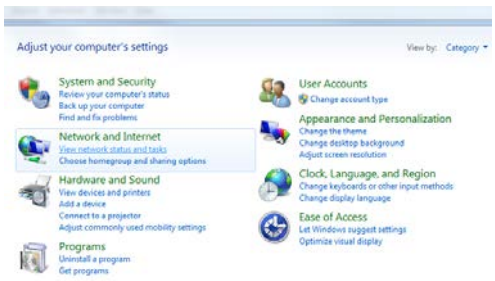
5. Configuring a Computer for the LMXP

The first thing you need to do is to configure your computer so that it will display the MXP screens. Follow these instructions to accomplish that.

1. Connect a LAN cable to the back of your computer. If you are connecting into a LAN, instead of a single computer, you will need to provide a connection from your LAN router/hub/switch to the LMXP. 2. Connect the other end of the LAN cable to the back of the LMXP (see installation chapter).	
3. Power on the LMXP.	
4. From your computer desktop, click the Control Panel button. NOTE: The following displayed screen captures are form Window 7 OS, your screens may differ; refer to your PC manual for changing network adapter settings.	
5. Click on "View network status and tasks".	

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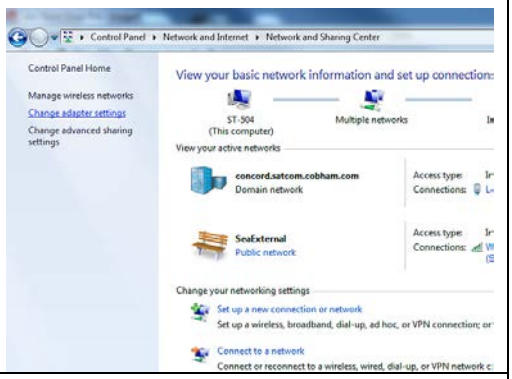
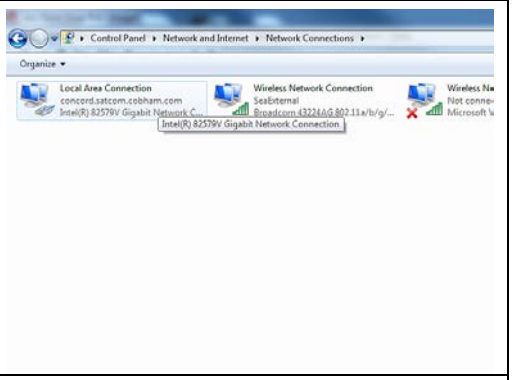
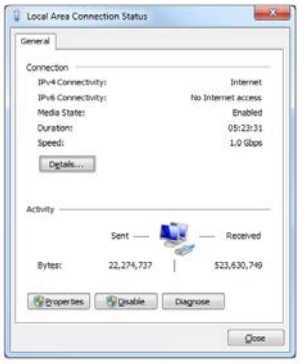
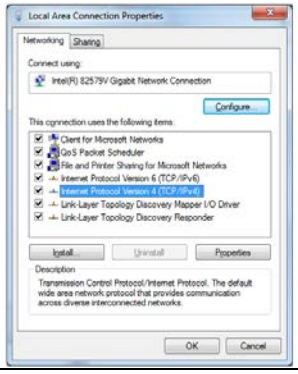
6. Click “Change adapter settings”.	
7. Click on “Local Area Connection.”	
8. Click on “Properties”.	
9. Double-Click on “Internet Protocol Version 4 (IPv4)”.	
10. Click on “Use the following IP address:	

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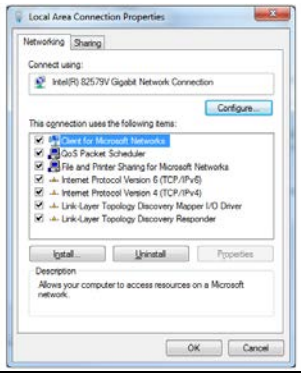
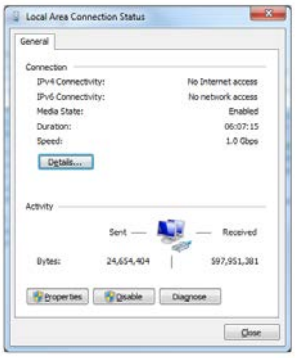
11. In the IP Address boxes, enter “10.1.1.102” (This is for the IP address of your computer). NOTE: You could use 101, 102, 103, etc. as long as it is not the same as the address of the LMXP, which is “**10.1.1.100**” (default).	
12. On the second line, enter Subnet Mask of “255.255.255.0”. 13. Then click the “OK” button.	
14. Back at the Local Area Connection Properties screen, click the “OK” button.	
15. Click the “Close” button.	
16. Close the Control Panel.	

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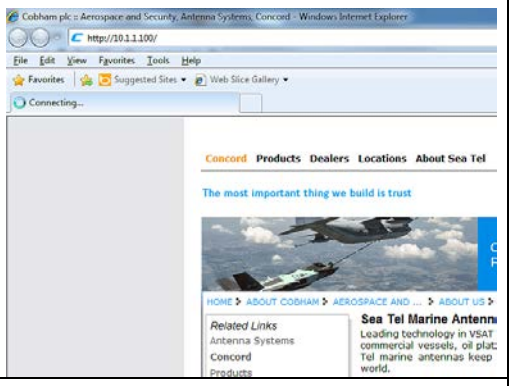
17. Open your browser, and enter the URL: “10.1.1.100”.	
18. At the log in screen enter the user name (Dealer, SysAdmin, or User). Contact Sea Tel Service for the password. 19. After you log in you will see the System Status screen	

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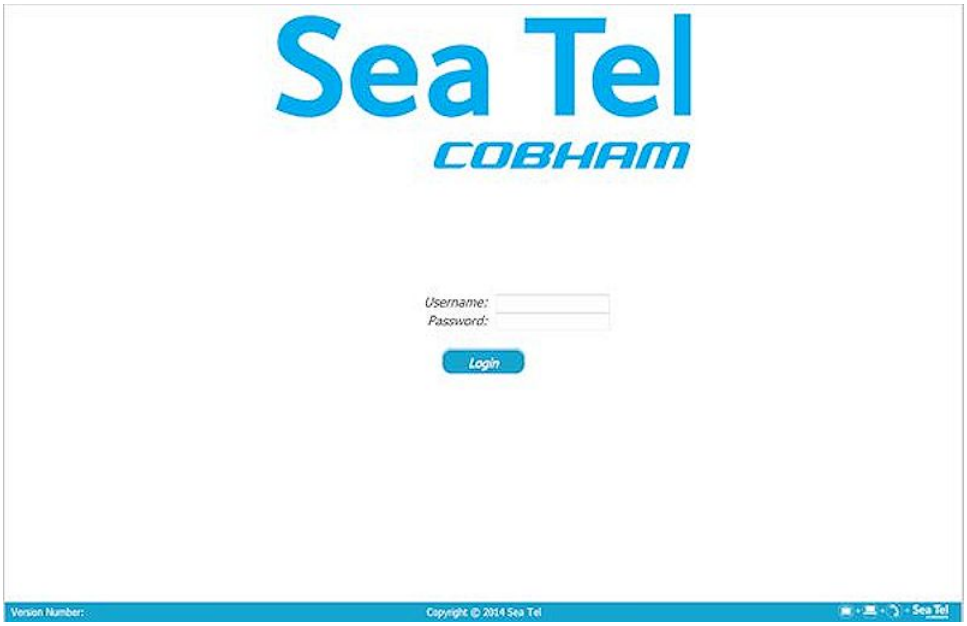
6. Dealer Login Pages – LMXP

6.1. Login Page

Log in to the LMXP from the computer. If the computer has not been set up for you by the dealer, refer to the installation manual for instructions. When you access the LMXP you will first see the login screen:

Enter the **Username** and **Password**. Both of these are case sensitive.



6.2. Layout of the GUI Pages

6.2.1. Top Banner (All Pages)

The banner across the top of every page is the same. It contains much of the information you would want about the system at a glance.

Sea Tel / Cobham – Our logo is presented in the Upper Left corner of the banner. The logo also doubles as a link to the Cobham Satcom site. But mostly it provides branding.

Login information is in the left middle – Login Level is displayed followed by LOGOUT. Click on LOGOUT to log out of the GUI.

Ship Name is displayed on the left bottom. Ship Name is entered on the System Configuration page.

Ship & Compass rose graphic is displayed middle left of the banner. This graphic is comprised of multiple image components. There are several selections one can make here in order to customize the look and function of this graphic.

The outer ring is a compass rose representing compass points, and indicating the heading of the ship. The compass follows the heading reading coming from the ships gyro compass or the fixed heading entered on the Navigation section of the **Configuration** – **Interfaces** page. The numeric heading value is displayed with more accuracy in the small box near the stern of the ship image.

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The style of the compass rose graphic can be changed by clicking on the compass and then toggle it using "Shift" + "C" on the keyboard.

1. The default is the English 'N', 'S', 'E', and 'W' representing North, South, East and West directions.
2. The second set is pertinent to French or Spanish speakers with 'N', 'S', 'E', and 'O' representing Nord, Sud, Est, and Ouest (in French).
3. The third set displays the traditional Chinese ordinal directions.
4. The fourth set displays the Cyrillic ordinal directions.
5. The fifth set displays the universal circular degrees. Here 0 or 360 degrees represents North, 90 degrees represents East, 180 degrees represents South and 270 degrees represents West.
6. The sixth set displays the radian view of the angular direction. In this set 0 or 2*pi represents North.

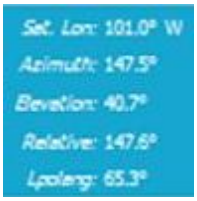
The ship image within the compass rose can also be changed. To change the 'ship' click on the compass graphic and then select 'Shift' + 'Q' " on the keyboard to change to the next available ship image.

7. The default image is a shaped needle typically found in a magnetic compass needle where the red part of the needle would be pointing due north. In this configuration the needle rotates around while the outer compass rose directions remain static.
8. The second image is of a standard sailboat silhouette. In this profile the compass rose rotates and the sailboat silhouette remains static.
9. The third image is a large ship silhouette. Much like the sailboat the large ship remains static while the compass rose rotates around it.
10. The fourth image is intended to be a catamaran silhouette. Again, the ship remains static while the compass rose rotates around it.

The Red Arrow indicates the position of the antenna, both relative to the bow of the ship and to the true azimuth pointing angle.

The final compass element is the representation of blockage zones. Blockage zones are represented on the compass as a transparent red wedge overlaying the entire blockage section on the compass (using the start and end positions entered on the **Configuration** – **System** page. The drawing of the blockage zones can be turned off by clicking on the compass and pressing "Shift" + "B".

The Pointing Information graphic is displayed in the middle right of the banner. This graphic is comprised of a list of values.



Sat Lon – is the satellite longitude of the current satellite.

Azimuth - is the true azimuth pointing angle of the antenna.

Elevation - is the elevation pointing angle of the antenna.

Relative - is the azimuth pointing angle of the antenna, relative to the bow of the ship.

Polang - is the polarization angle of the feed.

The LED / Status / Signal graphic is displayed in the far right of the banner. This graphic is comprised of Tracking (ON/OFF) on the top,

Satellite Lock or other status messages will be displayed in the center area.

If there are Errors, you can click on the "View" to see which errors are present in the system.

Signal - The bottom contains signal level information, displayed as a digital value of AGC and as a relative bar graph. Along the bar graph is an arrow marker, with a digital value, representing the current Threshold value. When the signal level is greater than the Threshold value, the segments of the bar graph will be green and when signal is lower than Threshold they will be red.

6.2.2. Left Side Bar

Tracking ON/OFF radio buttons are on the top of the sidebar. Tracking can be turned ON, or OFF, by clicking on the button.

Each of the main menu selection tabs below the Tracking ON/OFF, have a small arrow on the left that will expand, or collapse the choices contained within it. The choices are listed here and are described in detail in the paragraphs below.

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Satellite Search
Auto

Configuration
Interfaces
System
Reflector
Satellite
Profile

Status
System

Tools
Command Line Interface
Position Antenna

Logs
Activity

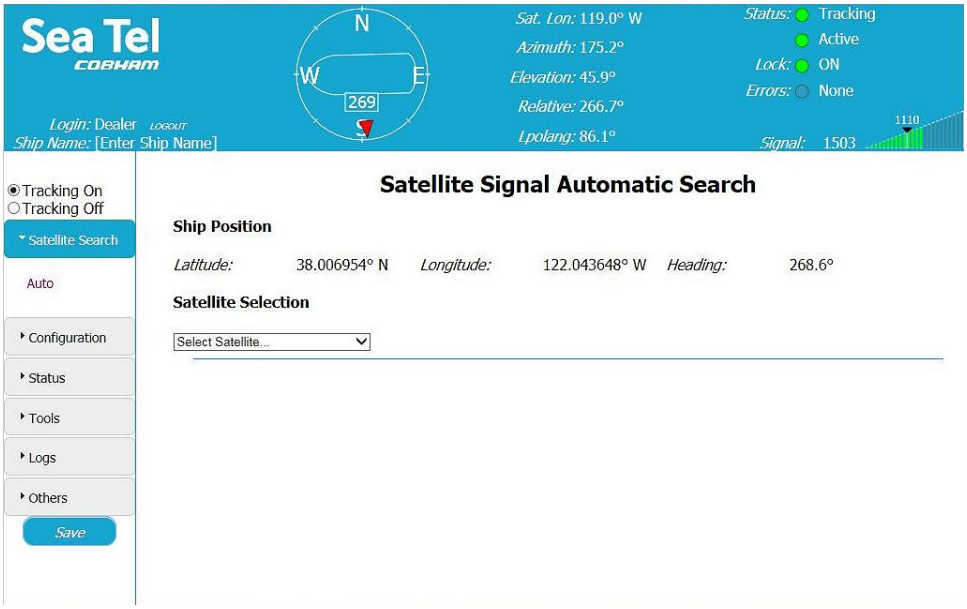
Others
Admin
Help

SAVE

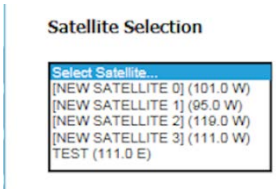
SAVE is on the bottom of the sidebar where it is available on every page of the menu system. You can save the changes you have made on each page, as you go, or after all changes have been made on all pages (SAVE saves ALL parameters).

6.3. Satellite Search – Auto

For normal operation, it is expected that the Satellite Signal Automatic Search page will serve as the primary tool used to command the system to locate and track a desired satellite.



The ships location information is displayed across the top of the page under Ship Position. A dropdown list of "Favorite Satellites" that have been entered, and saved, into this system is below the ships location information under Satellite Selection.



This dropdown list is used by the operator to select a satellite that they want to use. If power to the system is cycled, the antenna will retarget the last satellite that was selected.

You should enter all of the satellites that the user would be able to use with this antenna and the supporting below decks receivers and other distribution equipment (refer to **Configuration** – **Satellite** page). Once set up, the satellites will appear here in this simple list for the operator to select.

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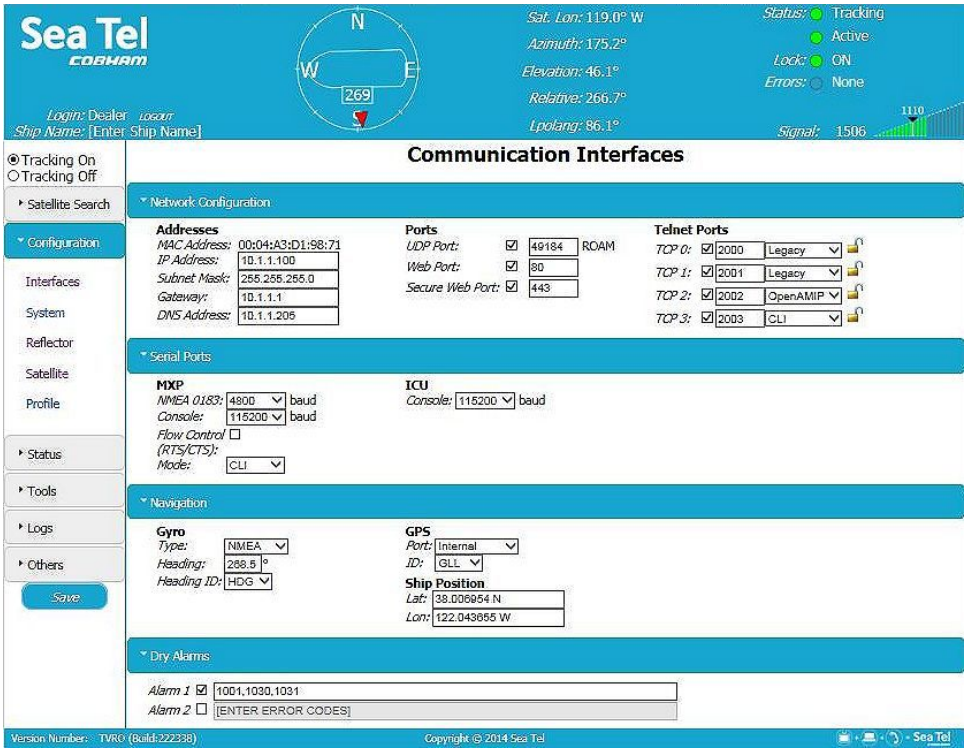
6.4. Configuration – Communication Interfaces

The Communication Interfaces page provides the ability for the dealer to define system settings to ensure the LMXP's ability to properly communicate with all Above Decks and/or Below Decks Equipment, whether supplied by Cobham SATCOM or not, as a part of normal operation or system maintenance.

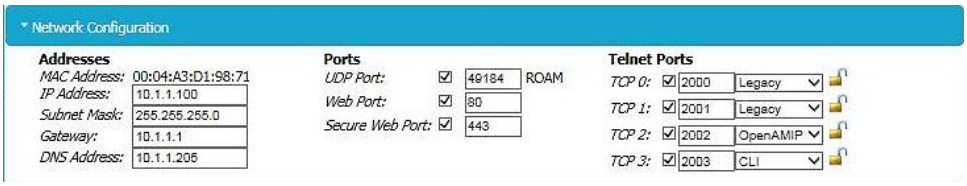
The Communication Interface page is divided into 4 sub-sections, each of which is described below.



6.4.1. Network Configuration

Network configuration is contained in this portion of the page. Defines the systems Ethernet based communication settings.

Addresses, Ports and Telnet – This information is typically left "as is" for a system which will only be accessed infrequently from a single computer. If the system will be connected to a LAN to allow access from multiple computers, then the addresses will need to be changed to be appropriate for the addresses in use in the existing network. NOTE: Changes made to this section require a system reboot to take effect.



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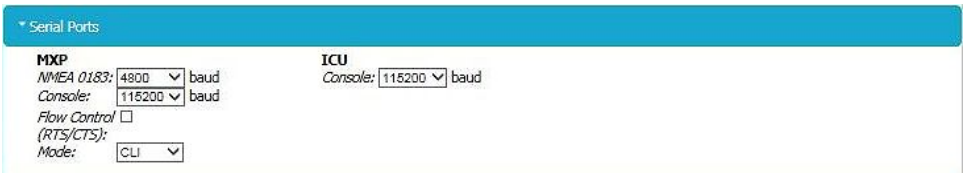
6.4.2. Serial Ports

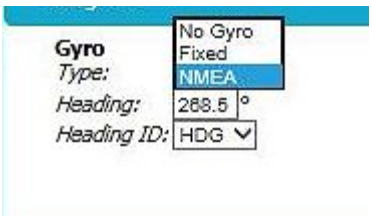
Used to define the systems serial based communication settings. These are normally left at factory default and should only be changed if necessary.



1. MXP NMEA 0183 - Set the Baud Rate speed of the NMEA Gyro Compass input connected to the rear panel of the LMXP. Although the standard baud rate for NMEA 0183 is 4800, your device may be different. Factory Default is 4800.
2. Console - If you will have a device connected to the Console port on the rear panel of the LMXP, set the speed for the port to the appropriate baud rate for your device. Factory Default is 115200.
3. Flow Control - Set flow control ON (box checked), or OFF (Box left Un-Checked), as appropriate for the input device. Factory Default is OFF (Unchecked).
4. Mode - Sets the CLI interface mode of either CLI or Legacy. Factory Default is CLI.
5. ICU Console - There is NO need to change the baud rate of the ICU Console port, leave it at factory default. Factory Default is 115200.

6.4.3. Navigation

1. Gyro - Select the type of Gyro Compass input that the system will use for heading of the ship. An NMEA 0183 Heading input is highly recommended for faster acquisition times of targeted satellites.

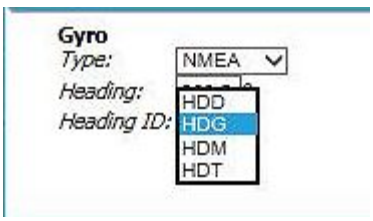
   

   Choose 'No Gyro' from the dropdown list if you have no gyro compass input. You will next have to enter the current ships heading. You must also turn ON Satellite Reference Mode (Miscellaneous section of the **Configuration** – **System** page).

   Choose 'Fixed' from the dropdown list if you have no gyro compass input and the ship remains at a fixed heading (like an oil platform). You will next have to enter the current ships heading. It is recommended that you turn ON Satellite Reference Mode for this selection (Miscellaneous section of the **Configuration** – **System** page).

   Choose 'NMEA' from the dropdown list if you have an NMEA 0183 Ships Gyro Compass input connected to the rear panel of the LMXP. You will not need to enter the current ships heading, as it will be automatically read from the ships gyro compass.

2. Gyro - Select the type of NMEA0183 Gyro Compass data that is provided by your ships gyro compass.

   Choose 'HDD' from the dropdown list if your gyro compass outputs Heading Digital data.

   Choose 'HDG' from the dropdown list if your gyro compass outputs Heading Deviation & Variation data.

   Choose 'HDM' from the dropdown list if your gyro compass outputs Magnetic Heading data.

   Choose 'HDT' from the dropdown list if your gyro compass outputs True Heading data. This is the **PREFERRED** heading input.

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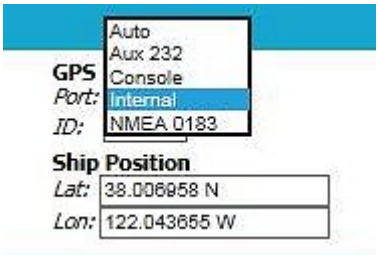
3. GPS - There is a GPS mounted on the antenna (Internal) that provides automatic Latitude & Longitude input to the system. This ships position information is used for targeting any satellite you wish to use. Because a GPS is provided in the system, no external device is required, and these settings should be left at factory default (**Port=Internal and ID=GLL**).

   Should the Internal GPS fail, an external device must be connected or periodic manual Latitude & Longitude entry (in the LAT & LON fields) will be required to reacquire the satellite signal if it is lost. Manual entry is only required to a tenth of a degree.

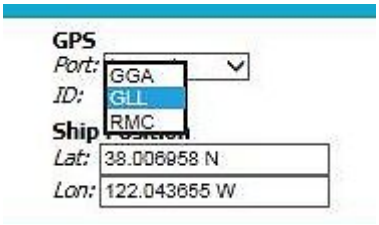
   LAT entry format is ##.# followed by N or S for North or South (ie 38.0 N).

   LAT entry format is ###.# followed by E or W for East or West (ie 122.0 W).

   If an external device is connected for use;

   Set the Port to the correct selection for the device and the electrical connection on the rear panel of the LMXP.

   Then select the correct sentence type from the ID dropdown list.

4. The GPS ID string is selected to match the NMEA 0183 string provided by the GPS which is selected (factory default for the "**Internal**" GPS is **GLL**).

6.4.4. Dry Alarms

This section allows you to define what Error, Informational, or Warning Codes, (if any) will trigger one of two dry alarm contact sets accessed via the rear panel of the LMXP. Refer to the IMA Command Line Interface document for list of these supported messages and correlated code number.

When configured, and electrically connected, the dry alarm contacts can be used to provide (programmable) alarm output to other equipment/systems. Switched outputs have ability to use 4.7K ohm pull up or pull down resistors and can provide Current sink of 0.5 amps max. Contacts are **Normally Open** for No Alarm state and are **Closed/Shorted** when the programmed alarm state exists.

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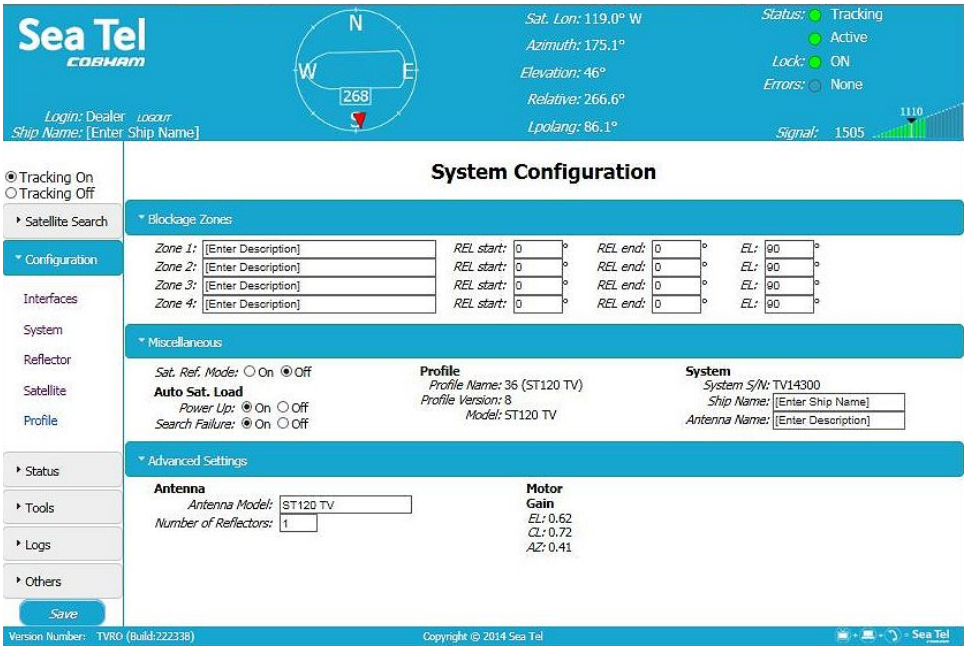
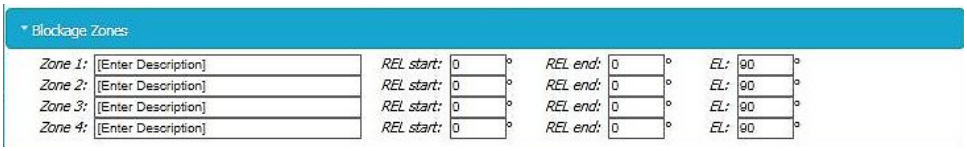
6.5. Configuration – System

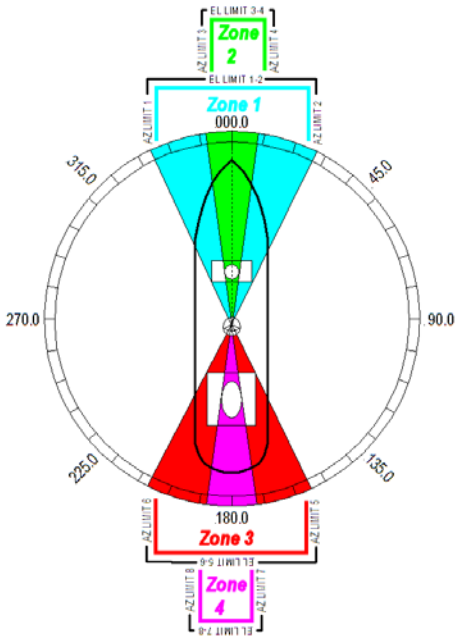


6.5.1. Blockage Zones

Blockage Zones: Names and defines known regions where line of site will be blocked.



The LMXP can be programmed with relative azimuth sectors (zones) where blockage exists. Your LMXP software allows you to set up to four zones.



When you create these *ZONES*, several things happen when the antenna is within any one of the zones:

1. Tracking continues as long as the AGC value is greater than the Threshold value. When the AGC value drops below Threshold, the antenna will simply hold its' pointing angles (this keeps the systems angular positions pointed where the satellite is at).
2. While still within the blockage zone, if AGC rises above Threshold, tracking will resume. This would happen if the blockage zone start & end positions are wider than the actual structure that is causing the blockage.
3. When exiting the blockage zone, if AGC has NOT risen above Threshold, a search pattern will be automatically be initiated. This could happen if the blockage zone start & end positions are narrower than the actual structure that is causing the blockage or that the antenna is no longer pointed where the satellite should be (i.e. faulty gyro compass input caused the antenna to be mispointed). When search limit is reached, the system will re-target the satellite, wait search delay and then search again. This cycle will continue until the satellite is re-acquired and tracking can resume.

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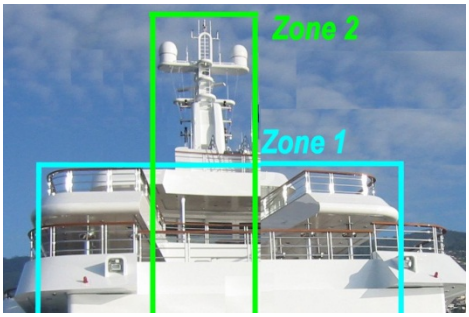
To program zones into the LMXP:

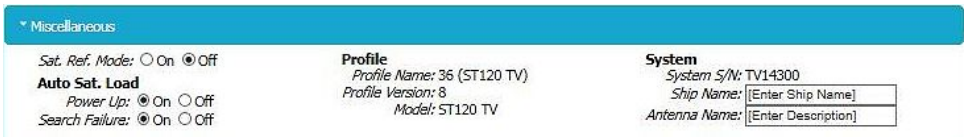
1. Enter a readily identifiable name for the zone (i.e. Mast, Deck House or Stack).
2. Moving to the right, enter the relative bearing of the starting point of this blockage zone (the more counter-clockwise bearing).
3. Then enter the relative bearing of the stop point of this blockage zone (the more clockwise of the two bearings).
4. Enter in the Elevation angle of the TOP of the blockages zone. This value is equal to the calculated angle from beam center of the reflector to the upper most portion of the structure being defined.



A transparent red wedge overlaying each blockage section on the compass in the top banner will be displayed when this display is turned ON (see top banner info).

6.5.2. Miscellaneous

This section is used to define system behavior.



Sat Reference Mode - Satellite reference mode is used when there is NO gyro compass connected to the LMXP, or when the gyro compass input is intermittent or unreliable. Therefore, if you have good gyro compass input to the LMXP, this setting should be OFF.

When ON the system will decouple the gyro compass from the azimuth stabilization loop 2 ½ minutes after an AZ target command has been issued.

Auto Sat Load: Defines the condition states when the system will automatically target the last satellite loaded.

Power Up - This setting should always be ON.

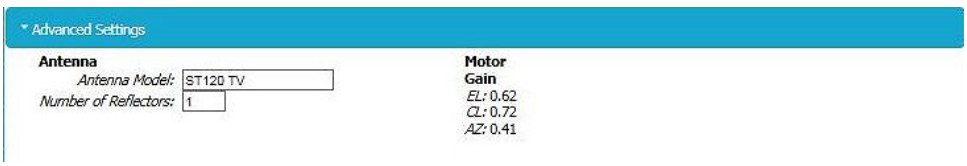
Search Fail - This setting should always be ON.

Profile - This is a displayed model that Profile is currently set to. To change the profile, refer to the **Configuration** – **Profile** page.

System - The Serial Number of the system is displayed here. Ship Name and Antenna Name are entry fields where the name of the ship and/or the name of the antenna can be entered if desired. Example: Ship Name: **Old Glory** Antenna Name: **Portside TVRO Antenna**

6.5.3. Advanced Settings

Advanced Settings: Antenna read only display of settings related to antenna model, drive and configuration.



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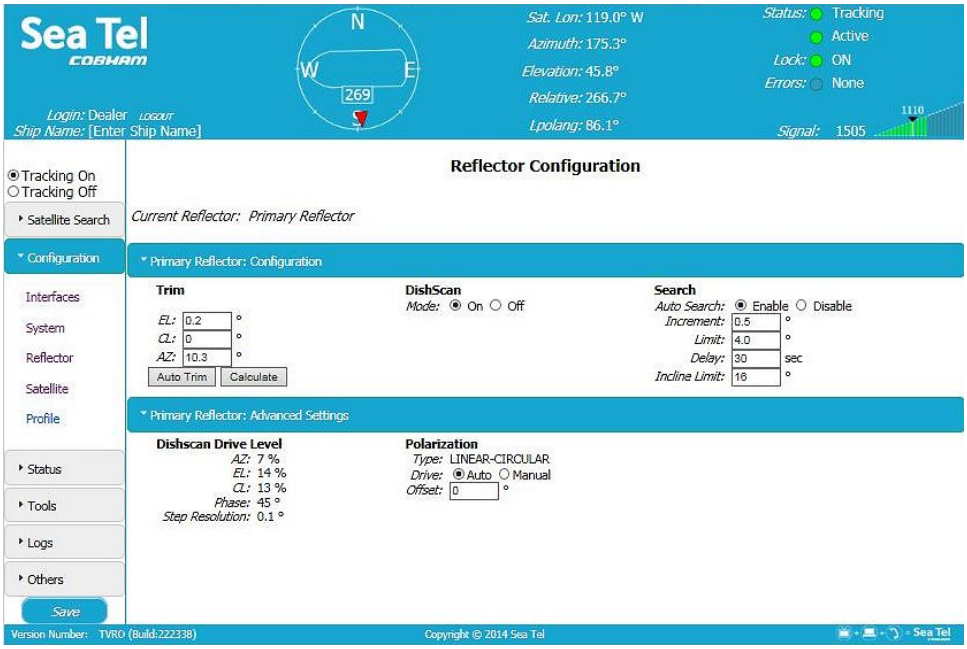
6.6. Configuration – Reflector

The Reflector Configuration page provides the ability for the user to read and/or define some of the system settings related to targeting, searching, or tracking.



6.6.1. Primary Reflector Configuration

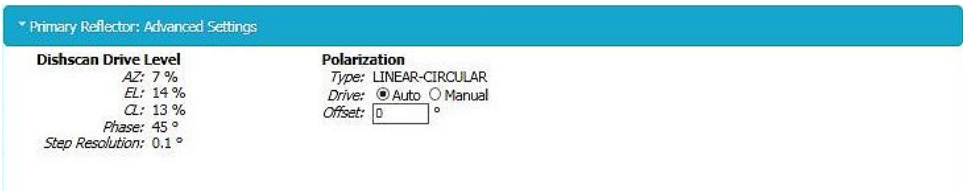
Trim: Define, either manually or automatically, the required Azimuth, Cross-Level and/or Elevation trim settings as well as the automatic calculation of the Auto Threshold Offset.

DishScan: Toggle the state of systems tracking mode.

NOTE: Mode should be set to OFF *only for specific testing purposes* required to do so and **must remain ON for normal operation**.

Auto Search - This setting should always be set to Enable. Increment, Limit, Delay and Incline Limit should all be left at the factory default values.

6.6.2. Primary Reflector Advanced Settings



DishScan Drive Level - These displayed values are set by your antenna Profile selection.

Polarization - The "**Type**" parameter is set by LNB selection. "**Drive**" should only be set to Manual for diagnostic purposes and should be set to **Auto** for normal operation. "**Offset**" is used to calibrate the LINEAR polarization of your LINEAR feed. This should only be adjusted by a qualified technician.

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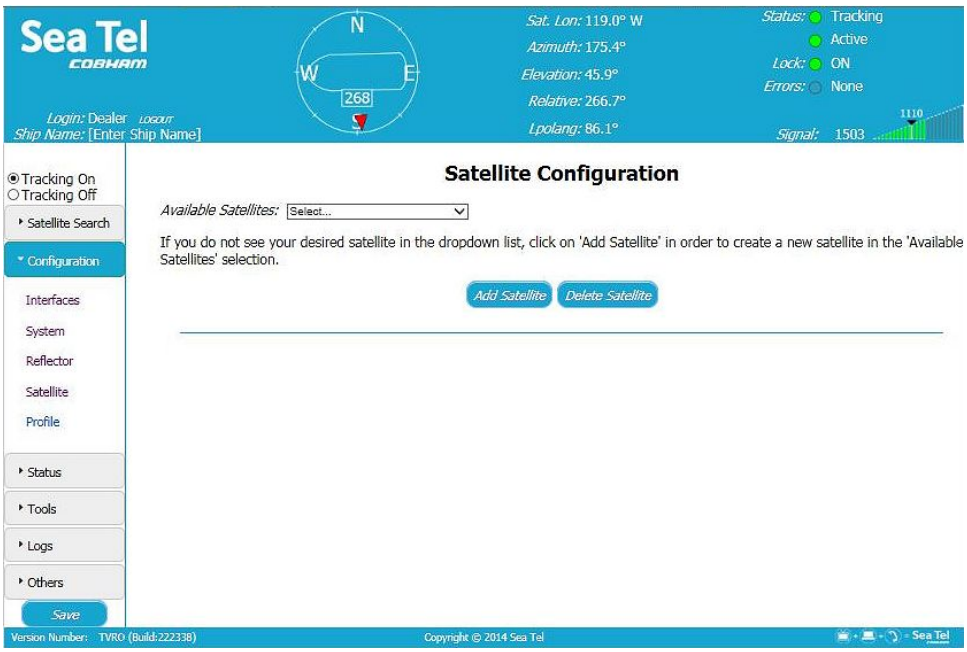
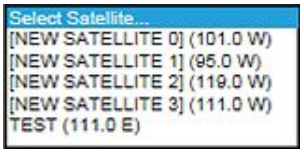
6.7. Configuration - Satellite

The Satellite Configuration page provides the ability for the user to create and or edit a satellite preset.



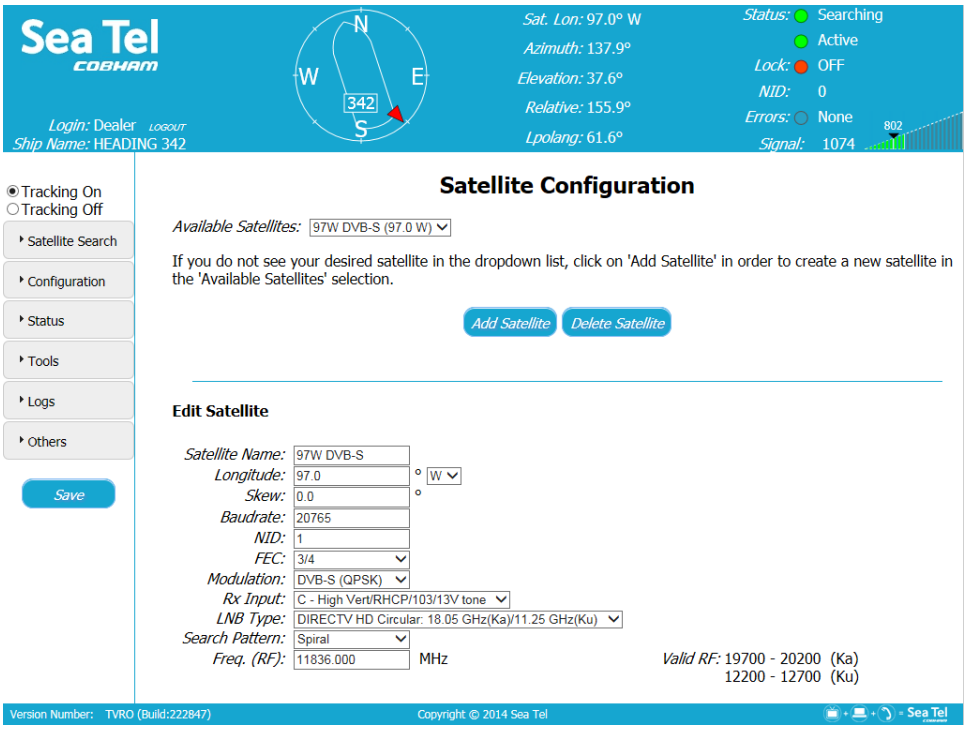
6.7.1. Satellite Selection:

Use the drop down list of pre-saved "favorite" satellites to select one of the satellites so that you can edit its' settings. Once selected, the settings for that satellite will appear below, and can be edited.



6.7.2. Add Satellite

Click on the Add Satellite button to add a new satellite to the favorites list. An Edit Satellite settings database record will appear below. Edit the settings for the new satellite and when completed click SAVE on the left sidebar.



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6.7.2.1. Satellite Name:

Click in this field and type in the name you wish to use for this satellite.

6.7.2.2. Longitude:

Click in this field and type in the longitude position of this satellite.

6.7.2.3. E/W:

Use the dropdown to select the East or West longitude position of the satellite.

6.7.2.4. Skew:

This setting is used to enter a known skew for ***this*** satellite. If the satellite is not skewed, this setting should be zero. Entered in degrees & tenths of degrees.

6.7.2.5. Baud Rate:

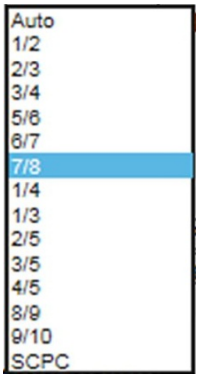
Enter the baud, or symbol rate of the signal you will be tracking.

6.7.2.6. NID:

Enter the decimal format Network ID (NID) of the signal you will be tracking. If the listed NID value is provided in HEX format, it will have to be converted to DECIMAL for entry.

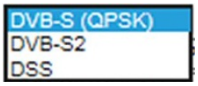
6.7.2.7. FEC:

From the dropdown list, select the **F**orward **E**rror **C**orrection rate of the desired tracking signal.



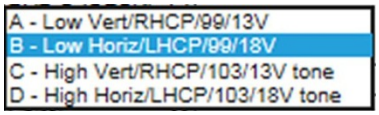
6.7.2.8. Modulation:

From the dropdown list, select the type of modulation that the desired tracking signal uses.



6.7.2.9. RX Input:

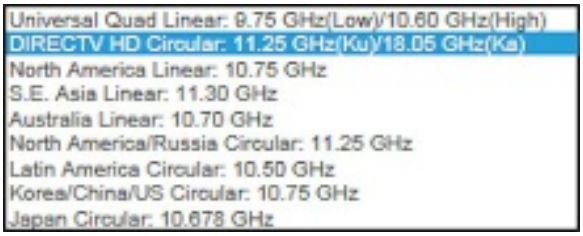
This setting is used to select the Band & polarity of the LNB output which is routed to the tracking receiver. This MUST be the band and polarity which contains the desired tracking frequency/signal.



EXAMPLE: If the signal you wish to track is LHCP (or Horizontal) at 12.224 GHz (high band), you would select "D –High Horiz/LHCP/103/18Vtone" from the dropdown.

6.7.2.10. LNB Type:

The TVRO LNB is capable of operating in a variety of modes and frequency bands. This setting selects the Local Oscillator frequency (therefore the RF frequency band), linear or circular polarization and whether the LNB will output dual or quad IF outputs.



This selection sets the LNB into the listed modes (each emulating an individual LNB for the cited satellite/service) This MUST be set correctly for the desired satellite/service.

Note that the ***Valid RF frequency range*** for this LNB Type is displayed to the right of the RF frequency input field (below). This displays the acceptable range of RF frequency to enter for this LNB Type setting.

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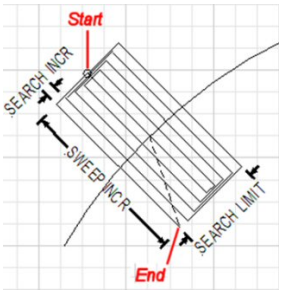
6.7.2.11. Search Pattern:

From the dropdown list, select the type of search pattern you want the antenna to perform when searching for this satellite.

6.7.2.11.1. Inclined Orbit Search Pattern

Some older satellites, in order to save fuel to keep them exactly positioned over the Equator, are in an inclined geosynchronous orbit. The satellite remains geosynchronous but is no longer geostationary. From a fixed observation point on Earth, it would appear to trace out a figure-eight with lobes oriented north-southward once every twenty-four hours. The north-south excursions of the satellite may be too far off the center point for a default box search pattern to find that satellite at all times during the 24 hour period.

When a search begins;



Initially the antenna will go to a calculated position that is half of SWEEP INCR degrees above, and perpendicular to, the satellite arc (along the same angle as polarization for the desired satellite). This position is the "Start" of the search pattern in the graphic above. Then the antenna will drive down along the polarization angle SWEEP INCR degrees, step one Search Increment to the right (parallel to the satellite arc), search up along the polarization angle SWEEP INCR degrees, step two Search Increments to the left, search down, etc expanding out in the search pattern until Search Limit is reached. When the end of the search pattern is reached, the LMXP will retarget the antenna to the calculated Azimuth and Elevation point.

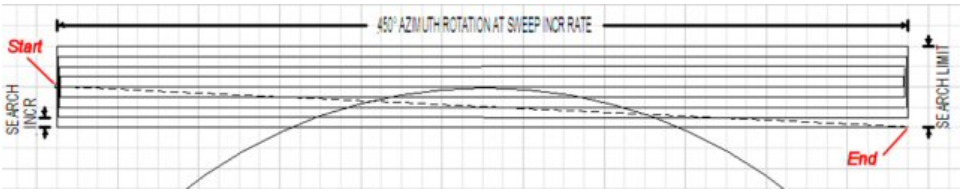
If the desired signal is found (AND network lock is achieved in the tracking receiver) at this position, or anywhere within the search pattern, the LMXP will terminate search and go into Tracking mode. If the desired signal is not found the LMXP will wait SEARCH DELAY, then target the antenna to start point shown in the graphic above and begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.7.2.11.2. Sky Search Pattern

A Sky Search pattern does a hemispheric pattern. Its behavior is different if you have a gyro compass input or not::

No Gyro - If you do not have a gyro compass, set the gyro type to "no gyro". When in this mode, Sky Search drives the antenna to the calculated elevation angle and then drives azimuth CW 450 degrees, steps elevation up and then drives azimuth CCW 450 degrees and continues to alternately steps elevation up/down and drives azimuth alternately CW/CCW 450 degrees. Because of this large search area, acquiring the satellite will take longer than if you have valid heading input. If the end of the search pattern is reached, the LMXP will retarget the antenna back to the start point shown in the graphic below.

With Gyro - If you have gyro compass, set the gyro type to the appropriate selection. When in this mode, Sky Search drives the antenna to the calculated elevation angle and then drives azimuth CW **360** degrees, steps elevation up and then drives azimuth CCW **360** degrees and continues to alternately steps elevation up/down and drives azimuth alternately CW/CCW **360** degrees. Because of this large search area, acquiring the satellite will take less time because you have valid heading input. If the end of the search pattern is reached, the LMXP will retarget the antenna back to the start point shown in the graphic below.



If the desired signal is found (AND network lock is achieved) at any position within the search pattern, the LMXP will terminate search and go into Tracking mode.

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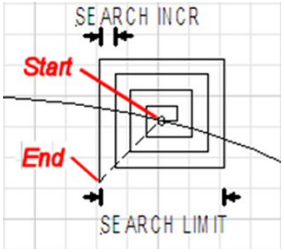
If the desired signal is not found within the search pattern the LMXP will wait SEARCH DELAY seconds and then begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.7.2.11.3. Default "Spiral" (Box) Search Pattern

The factory default search pattern in the LMXP is a "Spiral" pattern.

When a search begins;



The antenna will then search up in azimuth one Search Increment, search up one Search Increment in elevation, search down two Search Increments in azimuth, search down two Search Increments in elevation, etc until Search Limit is reached. When the end of the search pattern is reached, the LMXP will retarget the antenna to the calculated Azimuth and Elevation position of the desired satellite (start point).

If the desired signal is found (AND network lock is achieved in the tracking receiver) at this position, or anywhere within the search pattern, the LMXP will terminate search and go into Tracking mode. If the desired signal is not found the LMXP will wait SEARCH DELAY seconds and then begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.7.2.12. RF Frequency:

Enter the RF frequency of the signal you want the tracking receiver to use to track this satellite. This frequency is entered in MHz, so a tracking frequency of **12.224** (twelve point two-two-four) GHz would be entered as 12224 MHz.

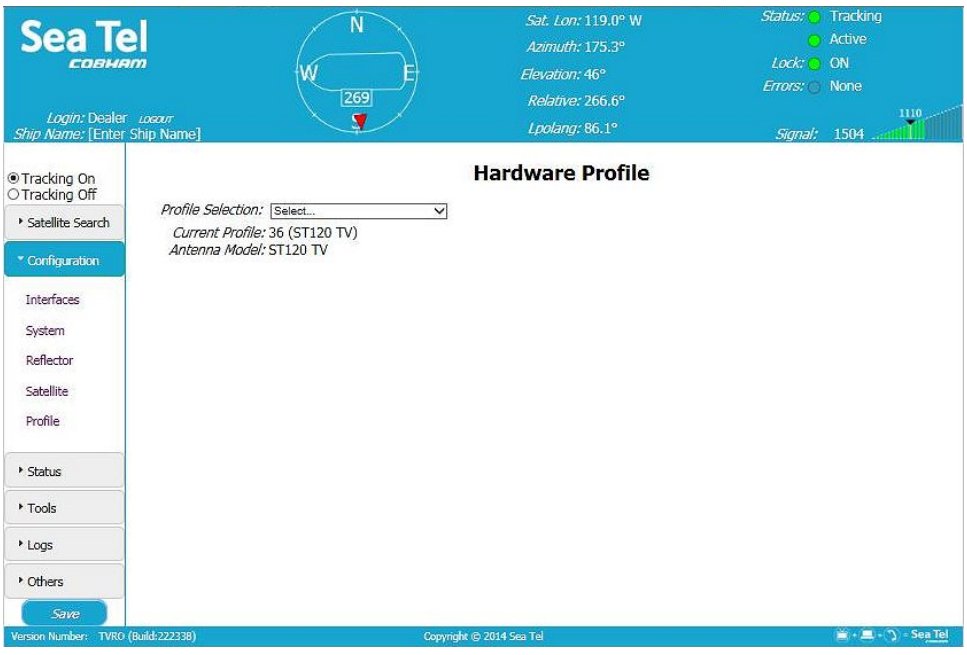
Note that the ***Valid RF frequency range*** for the selected LNB Type is displayed to the right of the RF frequency input field. This displays the acceptable range of RF frequency to enter for the LNB Type which is currently selected.

SAVE: When editing of all of these settings has been completed, click SAVE on the left sidebar to save this satellite to the "favorites" satellite database. Up to 40 favorite satellites may be saved.

6.7.3. Delete Satellite

Click Delete Satellite if you want to delete the satellite which is currently displayed for editing.

6.8. Configuration – Hardware Profile



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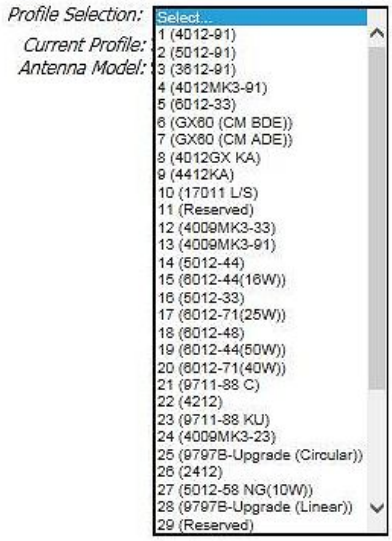
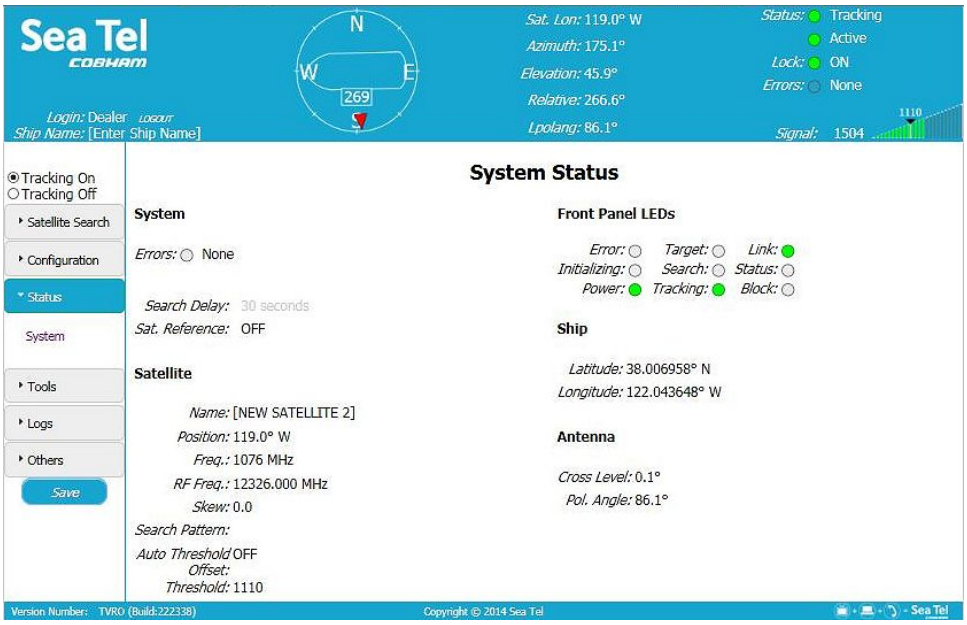
The Hardware Profile page provides the ability to select the Profile of the system from a simple dropdown list. This selection sets many of the other settings to values which are appropriate for this antenna system.



Hardware Profile: Use the Profile Selection drop down menu to select the model of antenna that the TICU/LMXP shall be configured to. Selection of one of these profiles causes an automatic configuration of all of the model specific parameter settings.

NOTE: If changed, the system will require a soft reboot for the new settings to take affect.

6.9. Status – System



The System Status page presents the user with all relevant system information on a single page, including but not limited to Satellite Configuration, Geo Location and, if present Error reporting information.

NOTE: If the Error LED is illuminated solid red, mouse click "**ERRORS**" text in red to redirect to the reported system errors page.

Satellite: Provides the user with a read only display of the target satellite settings currently being utilized by the system.

Front Panel LEDs: Provides the user with a mirror image of the diagnostic LED's located on the front panel of the LMXP.

Ship: Provides the user with a read only display of the systems current GEO location information as provided by the integrated GPS.

Antenna: Provides the user with a read only display of the systems Cross Level and Polarization angles.

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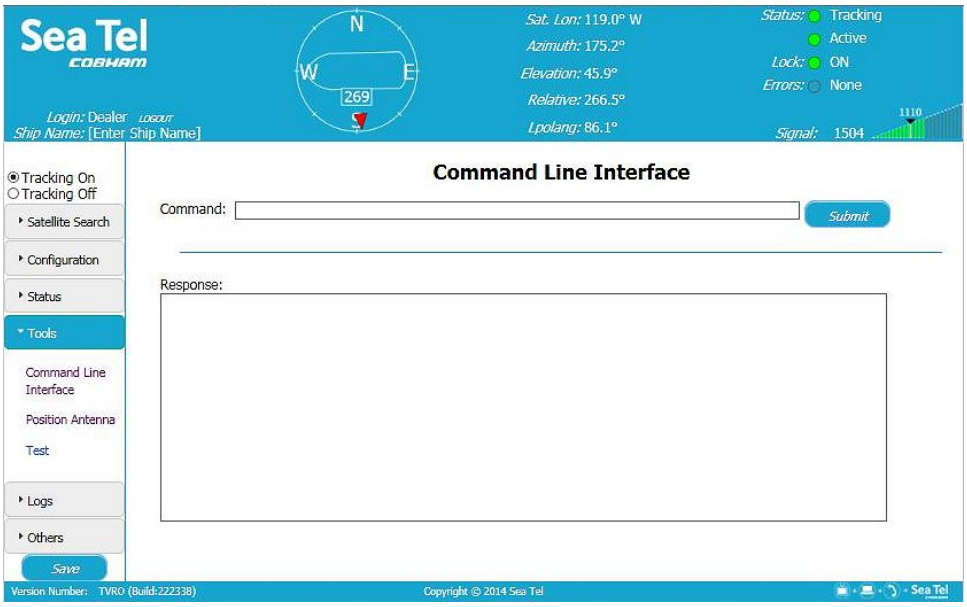
6.10. Tools – Command Line Interface (CLI)

The CLI (**C**ommand **L**ine **I**nterface) Command page presents the user with the ability to issue Monitor and Control commands to the system as a part of advanced maintenance of the system.



Command: Type in an appropriate command from the IMA CLI Protocol Specification document 135163 into the entry field window and press Submit to invoke. It is critical to ensure that the proper command and syntax be used while submitting a desired command else risk the unwanted configuration of the system, leaving it in a non-operational state.

Response: This window will display the applicable response to the submitted query entered in to the Command window above.

NOTE: The response window allows for user to select all (Ctrl + A) in order to copy and paste to another document such as notepad.

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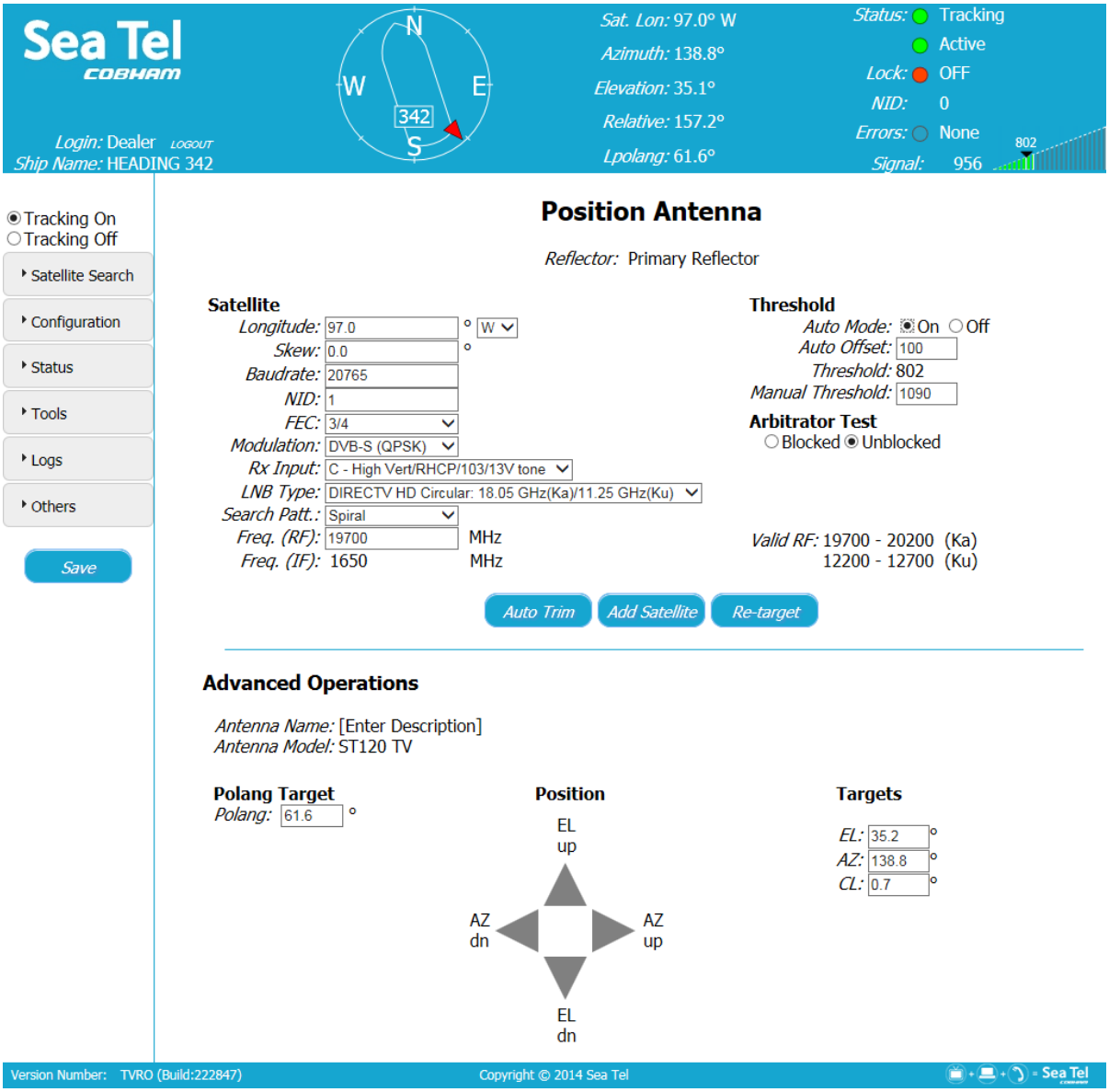
6.11. Tools – Position Antenna

The Position Antenna page provides the ability for the user to edit the current target satellite parameter settings as well as manual control of the systems angular positions and operational states.



6.11.1. Satellite -

This section is used to display, or set up, the satellite information required for the antenna to be able to acquire the chosen satellite.

6.11.1.1. Longitude:

Click in this field and type in the longitude position of this satellite.

6.11.1.2. E/W:

Use the dropdown to select the East or West longitude position of the satellite.

6.11.1.3. Skew:

This setting is used to enter a known skew for ***this*** satellite. If the satellite is not skewed, this setting should be zero. Entered in degrees & tenths of degrees.

6.11.1.4. Baud Rate:

Enter the baud, or symbol rate of the signal you will be tracking.

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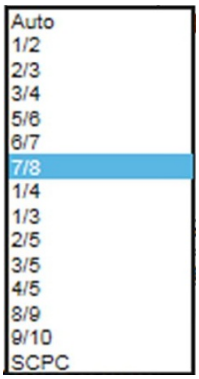
6.11.1.5. NID:

Enter the decimal format Network ID (NID) of the signal you will be tracking. If the listed NID value is provided in HEX format, it will have to be converted to DECIMAL for entry.

6.11.1.6. FEC:

From the dropdown list, select the **F**orward **E**rror **C**orrection rate of the desired tracking signal.

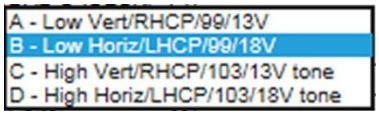


6.11.1.7. Modulation:

From the dropdown list, select the type of modulation that the desired tracking signal uses.

6.11.1.8. RX Input:

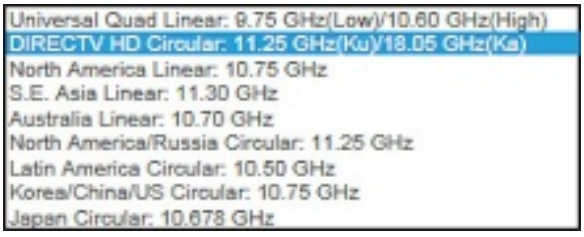
This setting is used to select the Band & polarity of the LNB output which is routed to the tracking receiver. This MUST be the band and polarity which contains the desired tracking frequency/signal.



EXAMPLE: If the signal you wish to track is LHCP (or Horizontal) at 12.224 GHz (high band), you would select "D –High Horiz/LHCP/103/18Vtone" from the dropdown.

6.11.1.9. LNB Mode:

The TVRO LNB is capable of operating in a variety of modes and frequency bands. This setting selects the Local Oscillator frequency (therefore the RF frequency band), linear or circular polarization and whether the LNB will output dual or quad IF outputs.



This selection sets the LNB into the listed modes (each emulating an individual LNB for the cited satellite/service) This MUST be set correctly for the desired satellite/service.

Note that the ***Valid RF frequency range*** for this LNB Type is displayed to the right of the RF frequency input field (below). This displays the acceptable range of RF frequency to enter for this LNB Type setting.

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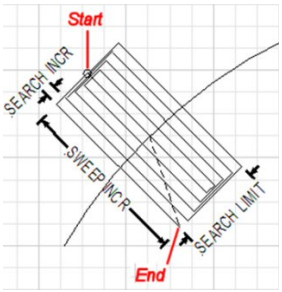
6.11.1.10. Search Pattern:

From the dropdown list, select the type of search pattern you want the antenna to perform when searching for this satellite.

6.11.1.10.1. Inclined Orbit Search Pattern

Some older satellites, in order to save fuel to keep them exactly positioned over the Equator, are in an inclined geosynchronous orbit. The satellite remains geosynchronous but is no longer geostationary. From a fixed observation point on Earth, it would appear to trace out a figure-eight with lobes oriented north-southward once every twenty-four hours. The north-south excursions of the satellite may be too far off the center point for a default box search pattern to find that satellite at all times during the 24 hour period.

When a search begins;



Initially the antenna will go to a calculated position that is half of SWEEP INCR degrees above, and perpendicular to, the satellite arc (along the same angle as polarization for the desired satellite). This position is the "Start" of the search pattern in the graphic above. Then the antenna will drive down along the polarization angle SWEEP INCR degrees, step one Search Increment to the right (parallel to the satellite arc), search up along the polarization angle SWEEP INCR degrees, step two Search Increments to the left, search down, etc expanding out in the search pattern until Search Limit is reached. When the end of the search pattern is reached, the LMXP will retarget the antenna to the calculated Azimuth and Elevation point.

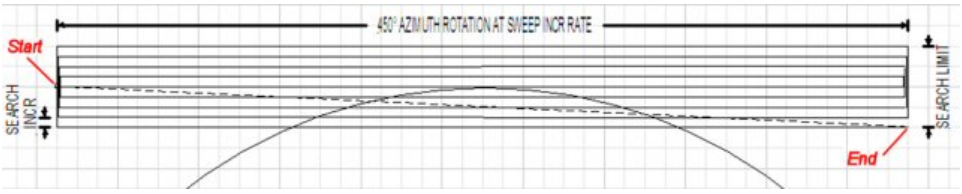
If the desired signal is found (AND network lock is achieved in the tracking receiver) at this position, or anywhere within the search pattern, the LMXP will terminate search and go into Tracking mode. If the desired signal is not found the LMXP will wait SEARCH DELAY, then target the antenna to start point shown in the graphic above and begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.11.1.10.2. Sky Search Pattern

A Sky Search pattern does a hemispheric pattern. Its behavior is different if you have a gyro compass input or not::

No Gyro - If you do not have a gyro compass, set the gyro type to "no gyro". When in this mode, Sky Search drives the antenna to the calculated elevation angle and then drives azimuth CW 450 degrees, steps elevation up and then drives azimuth CCW 450 degrees and continues to alternately steps elevation up/down and drives azimuth alternately CW/CCW 450 degrees. Because of this large search area, acquiring the satellite will take longer than if you have valid heading input. If the end of the search pattern is reached, the LMXP will retarget the antenna back to the start point shown in the graphic below.

With Gyro - If you have gyro compass, set the gyro type to the appropriate selection. When in this mode, Sky Search drives the antenna to the calculated elevation angle and then drives azimuth CW **360** degrees, steps elevation up and then drives azimuth CCW **360** degrees and continues to alternately steps elevation up/down and drives azimuth alternately CW/CCW **360** degrees. Because of this large search area, acquiring the satellite will take less time because you have valid heading input. If the end of the search pattern is reached, the LMXP will retarget the antenna back to the start point shown in the graphic below.



If the desired signal is found (AND network lock is achieved) at any position within the search pattern, the LMXP will terminate search and go into Tracking mode.

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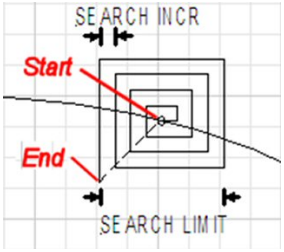
If the desired signal is not found within the search pattern the LMXP will wait SEARCH DELAY seconds and then begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.11.1.10.3. Default "Spiral" (Box) Search Pattern

The factory default search pattern in the LMXP is a "Spiral" pattern.

When a search begins;



The antenna will then search up in azimuth one Search Increment, search up one Search Increment in elevation, search down two Search Increments in azimuth, search down two Search Increments in elevation, etc until Search Limit is reached. When the end of the search pattern is reached, the LMXP will retarget the antenna to the calculated Azimuth and Elevation position of the desired satellite (start point).

If the desired signal is found (AND network lock is achieved in the tracking receiver) at this position, or anywhere within the search pattern, the LMXP will terminate search and go into Tracking mode. If the desired signal is not found the LMXP will wait SEARCH DELAY seconds and then begin the search pattern again. This cycle will repeat until the desired satellite signal is found or the operator intervenes.

6.11.1.11. RF Frequency:

Enter the RF frequency of the signal you want the tracking receiver to use to track this satellite. This frequency is entered in MHz, so a tracking frequency of **12.224** (twelve point two-two-four) GHz would be entered as 12224 MHz.

Note that the ***Valid RF frequency range*** for the selected LNB Type is displayed to the right of the RF frequency input field. This displays the acceptable range of RF frequency to enter for the LNB Type which is currently selected.

6.11.1.12. IF Frequency:

The IF frequency, calculated from RF frequency entry and the LNB Mode selection, is displayed. This is a display only field.

6.11.1.13. Add Satellite

Now that you have entered all of the information for a specific satellite, use the position graphic to manually acquire the satellite. Turn tracking ON (upper left side bar) and verify that you are on the desired satellite.

After you've verified the satellite and allowed tracking to peak the satellite signal, click the "Add Satellite" button to add this satellite to the favorite satellites list. This will open a dialogue box so that you can enter the Satellite Name you want to use for this satellite

6.11.1.14. Trim

If you have previously trimmed the antenna to optimize targeting, there is no need to do it now.

If you have not previously trimmed the antenna to optimize targeting, you can click on the "Auto Trim" button to trim the antenna now.

6.11.1.15. Re-Target

A Re-Target button allows you to retarget this satellite. This is a good check to assure that the trims are set correctly and that the system lands on, or very near, this satellite when it is targeted.

SAVE: When editing of all of these settings has been completed, click SAVE on the left sidebar to save this satellite to the "favorites" satellite database. Up to 40 favorite satellites may be saved.

6.11.2. Threshold

This is used for setting the Threshold parameters.

6.11.2.1. Auto Mode

View, or set, threshold Auto Mode. For normal operation it should always be set to **ON**.

6.11.2.2. Auto Offset

View, or set, threshold Auto Offset, Typically it is left at factory default. If you wish to optimize it, record the peak "ON Satellite" AGC value displayed in the Signal bar graph of the banner. Turn Tracking OFF and use the UP arrow on the Position graphic below to move the antenna OFF

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satellite and read the "OFF Satellite" AGC value. Subtract the OFF Satellite AGC from the peak ON Satellite AGC to find out the difference in signal ON/OFF satellite. Divide the difference value in half and enter that value in the Auto Offset field. Use the DOWN arrow to return to ON satellite and turn Tracking back ON.

6.11.2.3. Threshold

View the current threshold value in the Threshold field.

6.11.2.4. Manual Threshold

View, or set, a Manual Threshold value in that field. Manually setting threshold is NOT recommended because the system cannot automatically adjust the Threshold value as atmospheric changes occur.

6.11.2.5. Arbitrator Test

If you have a dual antenna configuration, with a dual antenna arbitrator, and you want to simulate a "Blocked" condition to test the arbitrator:

1. If this antenna is the "active", click "Blocked" and the arbitrator will switch services to the other antenna. NOTE: If this was the standby antenna the arbitrator will NOT switch services to this antenna.
2. Click "Unblocked" to return to normal operation of this antenna. NOTE: The arbitrator will not switch services back to this antenna until the other antenna is blocked.

CAUTION: This is a **test mode only**, for normal operation, **both** LMXPs must be "Unblocked".

6.11.3. Advanced Operations

6.11.3.1. Antenna Name

View, or enter an Antenna Name (ie Port Antenna) if desired.

6.11.3.2. Model

Display of the model based on the Profile setting of the system.

6.11.3.3. Polang Target

View, or set, Polang Target. View the current polarization target value for the current satellite. The only reason to target a polarization is for testing feed polarity drive.

6.11.3.4. Position Graphic

Use the UP/DOWN/LEFT/RIGHT arrows to manually move the dish. Each click on an arrow will move the dish 0.3 degrees. This would most commonly used for four quadrant tracking test or checking ON/OFF satellite signal levels. For larger AZ or EL movement, use the Targets field.

6.11.3.5. Targets

For larger antenna movements, use the AZ & EL targets fields.

6.12. Tools – Test

The Tools Test page is under development.

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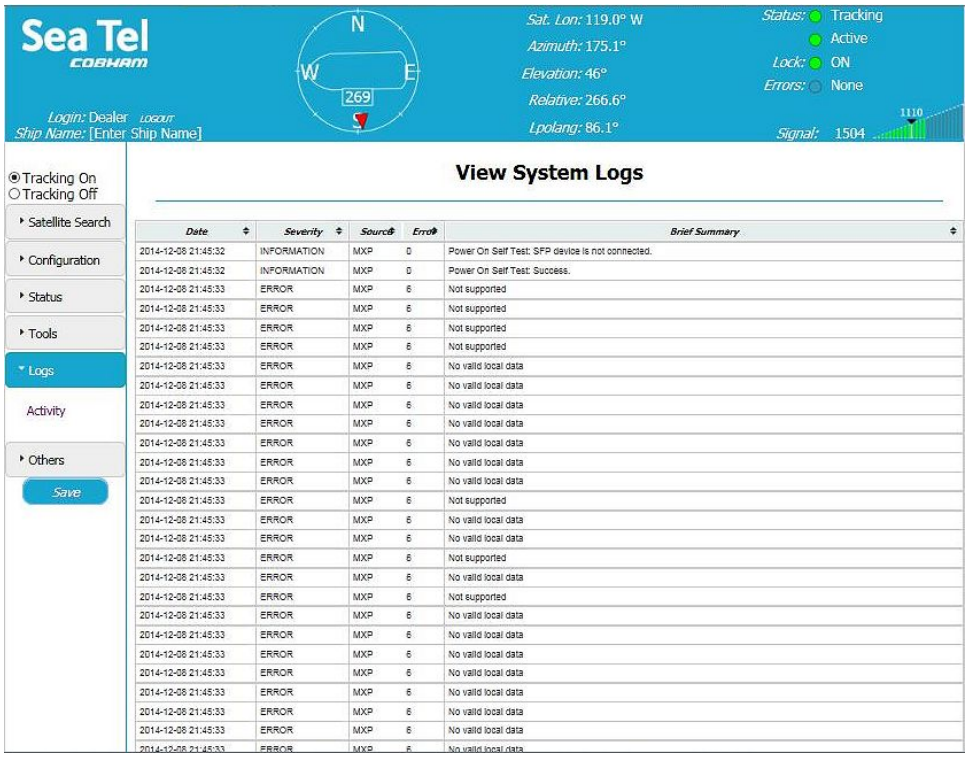
6.13. Logs

6.13.1. Activity

The Activity Log page provides the means to view, filter, sort and/or export all reported system activity reported either that day or for up to the last 7 operational days.

Activity Log:



6.14. Others - Admin

6.14.1. Firmware

The Firmware Upgrade page provides the means to perform a system firmware upgrade. It is recommended that you download the systems INI file (System Configuration text file) prior to performing an update. A firmware update in this IMA based system is set up as a Monolithic Architecture, meaning

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that all modules both above and below decks are updated at one time. The nature of the upload also verifies the file integrity within the system prior to actual update and should there be any discrepancies, the upload process cancels and will revert to the last known good configuration and build version. In addition, should you interconnect a spare TICU or LMXP with the system as a part of a retrofit or repair procedure, the system will automatically update to the latest version upon power up. This is an automatic feature that does not require any user intervention.

5. Click Browse to locate the software file on your computer.
6. Click Upload File.

6.14.2. System Configuration

The System Configuration Files page provides the means to download or upload the systems INI file. This file type contains all configurable system parameters, including but not limited to any preset satellites that may have been configured.

Upload - This is used to upload a previously saved INI file.

7. Click Browse to locate the configuration file (INI file) which was previously saved on your computer.
8. Click the Upload File button to load it into your system.

Download - This is used to download a previously saved INI file.

9. Click the Download Config button to download a **complete INI file** and save it to your computer. This should be done after you have made changes to any of the system parameters or added favorite satellites.
10. Click the Download Config button to download an LMXP-Only INI file and save it to your computer. This should only be done be done after you have made changes to any of the system parameters or added favorite satellites.

6.14.3. Reboot

The Reboot page provides the means to perform a simultaneous reboot of the LMXP and TICU subsystems of the antenna. This does not issue any reboot command to any other BDE components integrated with the LMXP.

Reboot:

Click on Reboot All link to issue reboot command to the LMXP & TICU (this is recommended).

NOTE: You will need to re-login into the system once reboot and start up sequence has completed.

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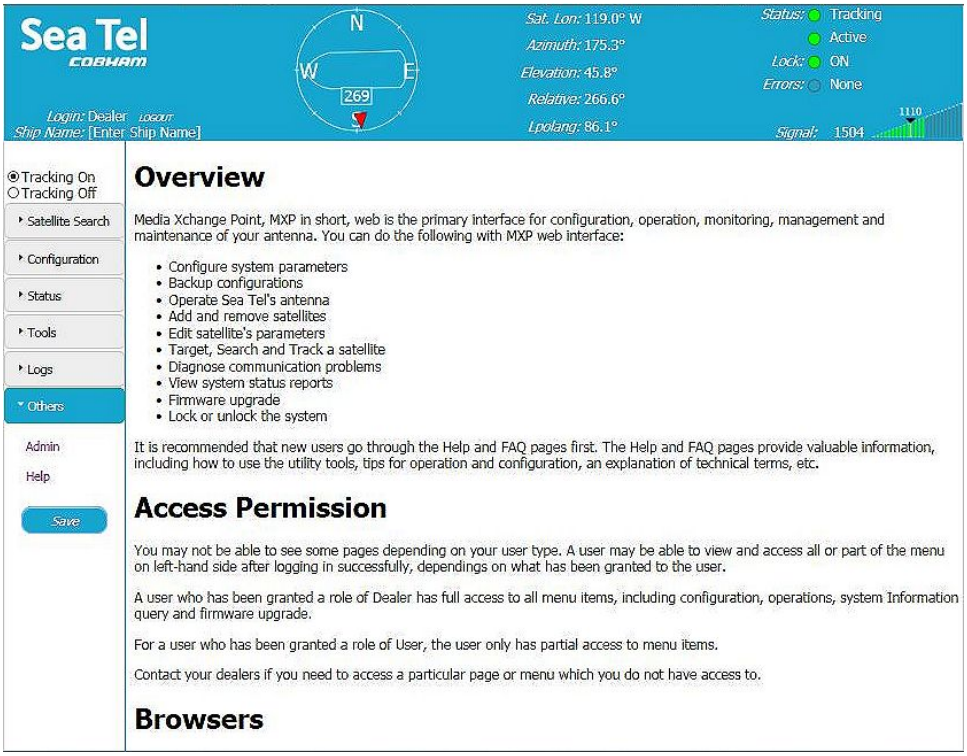
6.15. Others – Help

The Help page provides some general knowledge items in regards to the LMXP's operational capabilities and restrictions.

HELP: The Help page is separated into 6 major groups; Overview, Access Permission, Browsers, Configuration Tips, Operation Tips, and Tech Contact. Scroll down the page use slider at right hand side of screen or use your keyboards Page up/down keys.



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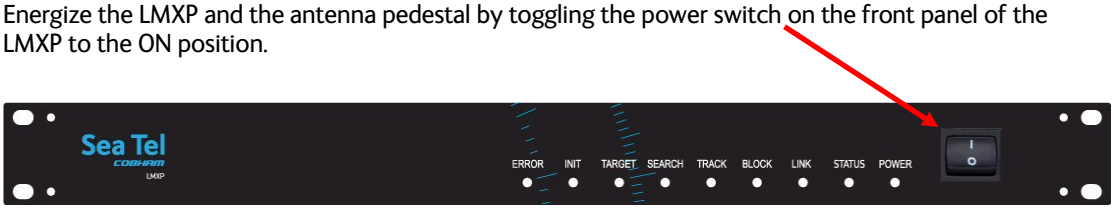
7. Quick Start Operation

If your system has been set up correctly, and if the ship has not moved since the system was used last, the system should automatically acquire the satellite from a cold (power-up) start. Once the satellite has been acquired, the tracking receiver then should achieve lock and you should be able to use the system.

7.1. Turn Power ON

To apply power to the antenna system:

1. Energize the LMXP and the antenna pedestal by toggling the power switch on the front panel of the LMXP to the ON position.



2. Energize all other below decks receivers, distribution and audio/video equipment.
3. The antenna system will power up, go through its initialization process and then automatically target the last satellite that had been previously acquired.

7.2. If satellite signal is found AND network lock is achieved:

1. Tracking will take over (front panel Tracking LED will be ON) and automatically peak the antenna position for highest receive signal level from the satellite.
2. When the system has signal above threshold AND the tracking receiver has network lock the antenna will continue to track the satellite.
3. Satellite Name (if entered), Tracking indicator, Tracking receiver Lock indicator and signal level (number value and bar graph) will be displayed in the header of the LMXP GUI pages.

Upon completion of the above, the system will continue to operate automatically, indefinitely until:

- AC power to the system is interrupted OR
- The satellite signal is blocked OR
- The ship sails into an area of insufficient satellite signal strength/level.

7.3. If no signal is found:

If the system does NOT automatically find the satellite from a cold start, log into the LMXP and follow the steps below:

1. The Tracking LED, on the front panel of the LMXP, will flash for a short period of time (Search Delay) followed by the Search LED coming ON.
2. The antenna will automatically be driven in a search pattern, attempting to relocate the desired satellite. The bar graph on the upper right will display red bars while the signal value is less than the threshold value (red bar in the bar graph).
3. Not finding a signal greater than Threshold, the bar graph will stay red and the antenna will reach the end of the prescribed search pattern.
4. The antenna will retarget and then the cycle (steps 1-3) until the satellite is found, or the operator intervenes.
5. Log into the LMXP GUI.
6. Access the Configuration - Communication Interfaces page.
7. Find the Latitude, Longitude and Heading displayed values. If they are correct skip to step 10.
8. If the Latitude & Longitude values are not correct, enter the ships Latitude & Longitude position in those fields.
9. If the Heading value is not correct, enter the correct value in the Heading field.
10. Select the Satellite Search – Auto page.

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11. Verify that the correct satellite is selected. If it is correct skip to step 14.
12. If the selected satellite is not the desired satellite, click the dropdown list and select the satellite you wish to use.
13. Click Save.

If the desired satellite is still not found:

14. Check for blockage (this is the MOST common cause of not being able to acquire the desired satellite).
15. Check cable connections to assure that a cable has not been disconnected.

If you verify that the antenna is not blocked and all of the connections are good but the system still does NOT automatically find the satellite, contact your dealer.

7.4. To Target a different satellite

1. Log into the LMXP GUI.
2. To target a different satellite go to the Satellite Search - Auto page and select the desired satellite from the drop down list.
3. When you make that selection you will see the temporary message:
   Acquiring Satellite Signal...Please Wait
4. Shortly after that you will see the temporary message:
   Satellite Signal Found.
   Lock: ON

7.5. Basic Description of the Front Panel Status LEDs

The basic description of the front panel LED states are:

ERROR -

ON [Solid or Flashing Red OR Solid or Flashing Amber] indicates that one, ***or more***, discrete system errors have occurred. Refer to Status – Error Code information menu to determine which error(s) have occurred.

OFF indicates that no errors have occurred

INIT (Initializing) -

ON

- (Solid Green) indicates that the Antenna is initializing. Initialization of the antenna will take approximately two minutes.
- (Flashing Amber) indicates that a software update in progress, the system (ADE-BDE) is synchronizing or in service/out of service testing is in progress.

TARGET -

ON (Solid Green) indicates that the antenna is TARGETING (driving) to the specified Azimuth and/or Elevation position(s).

SEARCH (Searching) -

ON (Solid Green) indicates that the LMXP is actively searching for your satellite signal.

OFF indicates that SEARCH is OFF.

TRACK (Tracking) -

ON (Solid Green) indicates that the LMXP has identified and is actively tracking the desired satellite to optimize the signal level (AGC).

Blinking indicates that the LMXP is in search delay or that the system is analyzing a satellite signal.
OFF indicates that Tracking is OFF.

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BLOCK -

ON (Solid Red) indicates that the antenna is within a defined blockage zone (therefore you should not have satellite signal until the antenna is no longer within the blockage zone).

OFF indicates that the antenna is not within a defined blockage zone). If no blockage zones have been entered, the antenna could be blocked causing loss of signal.

LINK - (Green LED)

ON (Solid Green) indicates that the LMXP has good communications with the antenna (therefore good antenna control). This is normal state for system operation.

ON (Solid Red) indicates LOSS of communications with the antenna (therefore, loss of antenna control). Check the coax connections on the LMXP and in the base of the radome.

STATUS - (Green LED)

ON (Solid Red) indicates that the signal is below threshold (satellite signal is low or lost).

OFF indicates that status is normal.

POWER - (Green LED)

OFF indicates that LMXP Power switch is OFF (No power to the LMXP or the antenna).

ON (Flashing Green) indicates that the LMXP is booting up.

ON (Solid Green) indicates that the LMXP boot sequence is complete and the system power is ON (normal).

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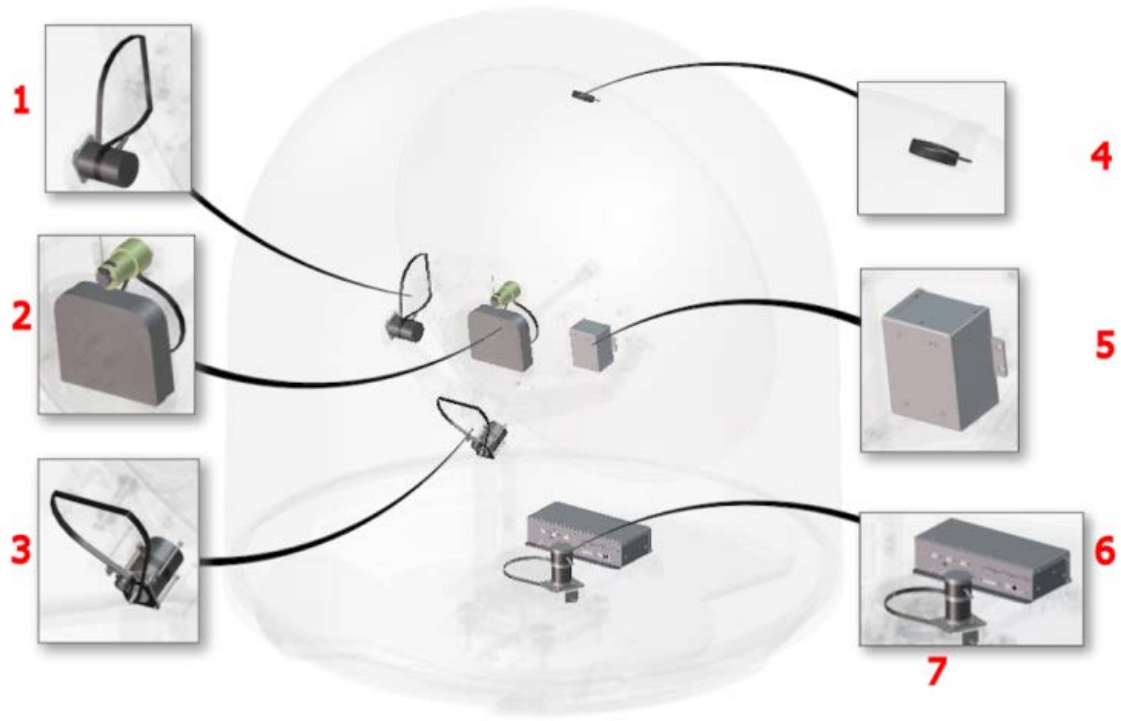
8. Scheduled Preventive Maintenance

8.1. Maintenance Requirements

Notice: Maintenance intervals, checks, inspections, replacement parts, and recommended lubricants as prescribed in this manual are necessary to keep your antenna in good working condition. Any damage caused by failure to follow scheduled maintenance may not be covered by warranty.



1. **Elevation Motor & Belt**
2. **LNB, Polarization Motor & Belt**
3. **Cross-Level Motor & Belt**
4. **GPS Antenna**
5. **Motion Platform**
6. **TICU**
7. **Azimuth Motor & Belt**

8.2. Bi-Annual Inspections

Regular inspections will assure that your antenna is in peak operating condition. Your Sea Tel authorized dealer has trained service technicians who will perform this work using Sea Tel replacement parts.

Record your inspections in the Maintenance Record pages at the end of this manual.

8.2.1. Radome Inspections

Conduct a good, thorough, visual inspection of the radome. If any damage is found, notify your dealer immediately.

1. Inspect the outside surface of the radome (top and base) looking for scrapes, cracks, mars or residue indicating that the gel coat surface has been impacted, or in any other way, damaged. Damage to the sealant coat or core structure of the radome MUST be properly repaired and re-sealed immediately. Any cracks, scratches or other damage to the surface seal of the radome must be repaired and re-sealed by a competent fiberglass repair professional. If diesel exhaust, or any other residue, is coating the outside of the radome it should be cleaned with mild soapy water to minimize signal loss caused by these residues.
2. Inspect the inside surface of the radome (top and base) looking for cracks, mars or white fiberglass powder residue due to chafing in the material indicating that it has been impacted or scraped by the dish or any other signs of wear or damage.

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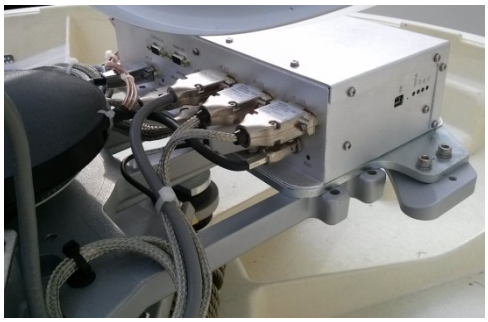
3. Inspect the flange mating of the radome top and base to insure that the flange is properly sealed to prevent wind, saltwater spray and rain from being able to enter the radome.
4. If condensation or standing water is found inside the radome, isolate and seal the leak and then dry out the radome. Debris clogging the small weep holes in the recessed areas of the radome base may need to be cleaned out to allow standing water to "weep" out. DO NOT DRILL ADDITIONAL HOLES IN THE RADOME BASE.
5. If hardware is found in the base of the radome base try to ascertain from where it may have fallen. Notify your dealer immediately.

8.2.2. Cable Inspections

Conduct a good, thorough, visual inspection of the conductors, cables and harnesses:

1. Inspect the coaxes at the bracket on the radome base and leading to the base of the pedestal.
2. Inspect coaxes and harnesses for chafing and corrosion.
3. Inspect connectors to assure they are properly fastened and tightened.
4. Inspect the cables from the AZ Spooler to the TICU for chafing and corrosion.



5. Inspect TICU connectors to assure they are properly fastened and that the retainer screws tightened.
6. Inspect the coaxes from the AZ Spooler to the TICU for chafing and corrosion.

7. Inspect TICU connectors to assure they are properly seated and tightened.
8. Inspect the harnesses that go along pedestal base to the azimuth motor for chafing and corrosion.
9. Inspect connectors to assure they are properly mated and that the retainer screws are tightened.
10. Inspect the harnesses that go up the post to the cross-level and elevation motors for chafing and corrosion.
11. Inspect connectors to assure they are properly mated and that the retainer screws are tightened.
12. Inspect the harnesses and coaxes that go from the pedestal to the motion platform, feed spooler and to the LNB for chafing and corrosion.

13. Inspect harness connectors to assure they are properly mated and that the retainer screws are tightened.
14. Inspect coax connectors to assure that they are properly fastened and tightened.

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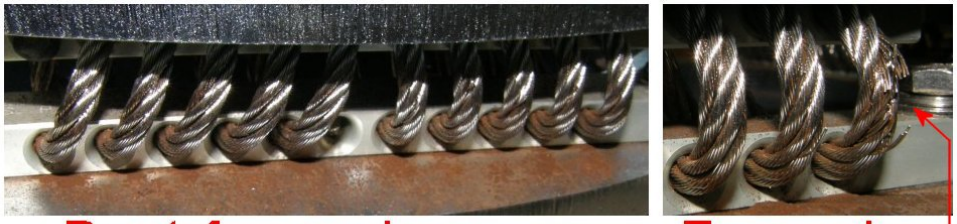
15. If any damage is found, contact your dealer to repair or replace the damaged cables. If damage is due to chaffing, pinching or crushing then reroute the new conductors as necessary to prevent future damage.

8.2.3. Wire-Rope Isolator Inspections

Conduct a good, thorough, visual inspection of the wire-rope isolators.

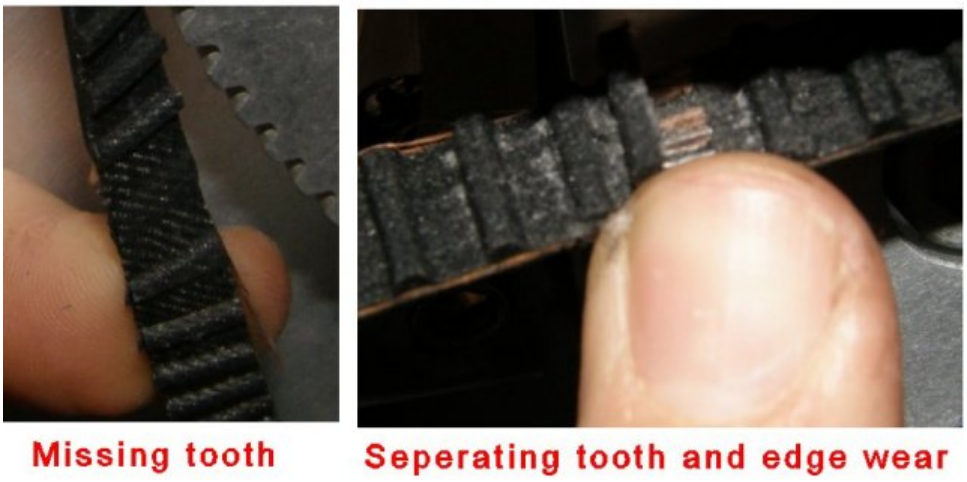
1. Wire-rope isolators should not be frayed, completely compressed, or otherwise damaged. The metal bars on the top and bottom of the wire-rope isolators should not be bent or bowed in any way. If there is any evidence of rust, broken strand(s) of wire or bent bars in any one of the wire-rope isolators, ***notify your dealer immediately*** to obtain replacements and replace all four wire-rope isolators immediately.



8.2.4. Azimuth Drive Component Inspections

1. Inspect the azimuth motor/encoder, sprockets and drive belt. If any of these show signs of rust or corrosion, apply a light coat of "3-in-1" oil using a lint-free cloth on the affected metal surfaces.

CAUTION: Be EXTREMELY careful rotating the pedestal around while your fingers are in this area to prevent pinching or crushing your fingers in the pedestal assembly.



2. Inspect the alignment of the belt through the motor drive sprocket and the driven sprocket. Misalignment will cause the belt to wear along its edges (refer to pictures above).
3. Inspect the belt teeth for damage. Look for teeth that have de-laminated, or been completely torn off, of the belt (refer to pictures above).
4. If any belt wear/damage is noted, contact your dealer and arrange for belt replacement.

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5. Twist the belt (in a short section of belt between the small and large sprockets) with your thumb and finger, to check its tension. If the belt turns more than about ¼ turn (as shown), contact your dealer to arrange for adjustment of the belt(s). Improper belt tension can cause inadequate drive (too loose) and/or belt damage (if too tight).

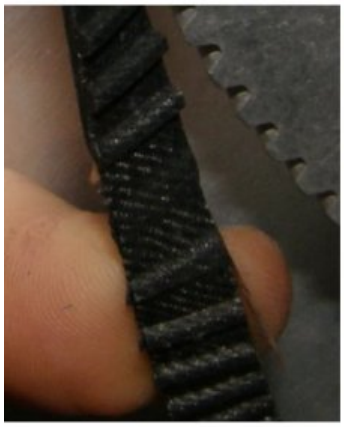
6. Assure that none of the motor mounting hardware is coming loose. Tighten any loose hardware found.
7. Inspect the motor harness and connector mating. Assure that the harness is not damaged and that the retaining screws are tightened to keep the connector properly terminated.

8.2.5. Cross-Level Drive Component Inspections

1. Inspect the Cross-Level motor, sprockets and drive belt. If any of these show signs of rust or corrosion, apply a light coat of "3-in-1" oil using a lint-free cloth on the affected metal surfaces.

CAUTION: Be EXTREMELY careful rotating the pedestal around while your fingers are in this area to prevent pinching or crushing your fingers in the pedestal assembly.

Belt edge wear



Missing tooth

Seperating tooth and edge wear

2. Inspect the alignment of the belt through the motor drive sprocket and the driven sprocket. Misalignment will cause the belt to wear along its edges (refer to pictures above).
3. Inspect the belt teeth for damage. Look for teeth that have de-laminated, or been completely torn off, of the belt (refer to pictures above).
4. If any belt wear/damage is noted, contact your dealer and arrange for belt replacement.
5. Twist the belt (in a short section of belt between the small and large sprockets) with your thumb and finger, to check its tension. If the belt turns more than about ¼ turn (as shown), contact your dealer to arrange for adjustment of the belt(s). Improper belt tension can cause inadequate drive (too loose) and/or belt damage (if too tight).

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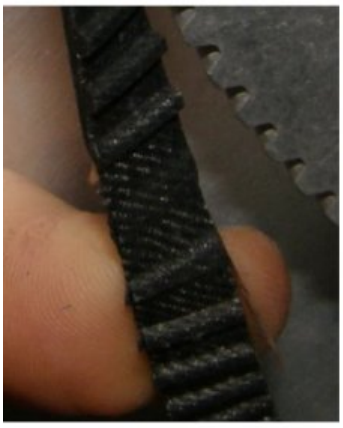
6. Assure that none of the motor mounting hardware is coming loose. Tighten any loose hardware found.
7. Inspect the motor harness and connector mating. Assure that the harness is not damaged and that the retaining screws are tightened to keep the connector properly terminated.

8.2.6. Elevation Drive Component Inspections

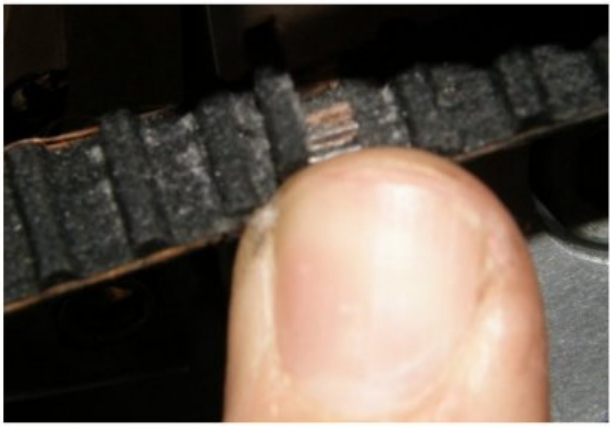
1. Inspect the Elevation motor, sprockets and drive belt. If any of these show signs of rust or corrosion, apply a light coat of "3-in-1" oil using a lint-free cloth on the affected metal surfaces.

CAUTION: Be EXTREMELY careful rotating the pedestal around while your fingers are in this area to prevent pinching or crushing your fingers in the pedestal assembly.

Belt edge wear

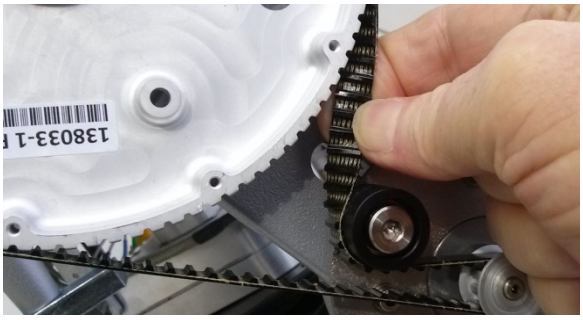


Missing tooth



Seperating tooth and edge wear

2. Inspect the alignment of the belt through the motor drive sprocket and the driven sprocket. Misalignment will cause the belt to wear along its edges (refer to pictures above).
3. Inspect the belt teeth for damage. Look for teeth that have de-laminated, or been completely torn off, of the belt (refer to pictures above).
4. If any belt wear/damage is noted, contact your dealer and arrange for belt replacement.
5. Twist the belt (in a short section of belt between the small and large sprockets) with your thumb and finger, to check its tension. If the belt turns more than about ¼ turn (as shown), contact your dealer to arrange for adjustment of the belt(s). Improper belt tension can cause inadequate drive (too loose) and/or belt damage (if too tight).



6. Assure that none of the motor mounting hardware is coming loose. Tighten any loose hardware found.
7. Inspect the motor harness and connector mating. Assure that the harness is not damaged and that the retaining screws are tightened to keep the connector properly terminated.

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8.2.7. TICU Inspections

1. Inspect the TICU to assure that all mounting hardware is secure.
2. Inspect the harnesses and each connector mating. Assure that the harnesses are not damaged and that the retaining screws are tightened to keep each of the connectors properly terminated.
3. Inspect each of the coaxial cables and connectors. Assure that the cables are not damaged and that the connectors are properly terminated.

8.2.8. Motion Platform Enclosure Inspections

1. Inspect the Motion Platform to assure that all mounting hardware is secure.
2. Inspect the harness and connector mating. Assure that the harness is not damaged and that the retaining screws are tightened to keep the connector properly terminated.

8.2.9. Feed Assembly Inspections

8.2.9.1. Feed Tube Assembly

From the front side of the reflector:

1. Inspect the feed tube for signs of damage.
2. Assure that all mounting hardware is secure.

8.2.9.2. Spooler Assembly Inspections

From the rear of the reflector:

1. Inspect the spooler assembly to assure that all mounting hardware is secure.
2. Inspect the harnesses and each connector mating. Assure that the harnesses are not damaged and that the connectors are properly terminated.
3. Inspect each of the coaxial cables and connectors. Assure that the cables are not damaged and that the connectors are properly terminated.

8.2.9.3. Feed Assembly Inspections

1. From the rear of the reflector:
2. Inspect the feed assembly for signs of corrosion, damage or loose hardware.

Assure that all mounting hardware is secure.

8.2.10. LNB Inspections

1. Inspect the LNB to assure that all mounting hardware is secure.
2. Inspect the harnesses and each connector mating. Assure that the harness is not damaged and that the connector is properly terminated.
3. Inspect each of the coaxial cables and connectors. Assure that the cables are not damaged and that the connectors are properly terminated.

8.2.11. Polarization Drive Component Inspections

1. Inspect the Polarization motor, sprockets and drive belt. If any of these show signs of rust or corrosion, apply a light coat of "3-in-1" oil using a lint-free cloth on the affected metal surfaces.

CAUTION: Be EXTREMELY careful rotating the feed around while your fingers are in this area to prevent pinching or crushing your fingers in the pedestal assembly.

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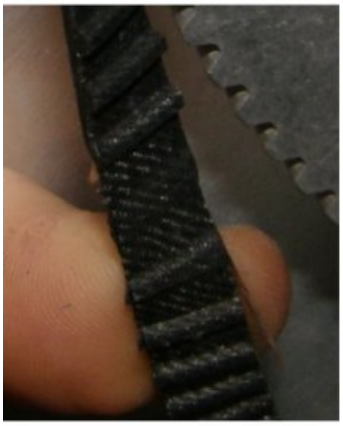
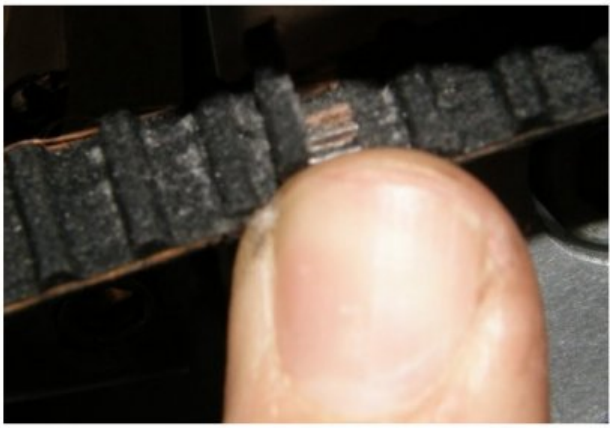
Belt edge wear



Missing tooth



Seperating tooth and edge wear

2. Inspect the alignment of the belt through the motor drive sprocket and the driven sprocket. Misalignment will cause the belt to wear along its edges (refer to pictures above).
3. Inspect the belt teeth for damage. Look for teeth that have de-laminated, or been completely torn off, of the belt (refer to pictures above).
4. If any belt wear/damage is noted, contact your dealer and arrange for belt replacement.
5. Assure that none of the motor mounting hardware is coming loose. Tighten any loose hardware found.
6. Inspect the motor harness and connector mating. Assure that the harness is not damaged and that the connector is properly terminated.

8.2.12. Counter-Weight Inspections

Inspect all balancing counter-weights to assure that all mounting hardware is secure.

8.2.13. Dish Perimeter Inspections

Inspect the perimeter of the dish for any damage that would indicate that the dish may have impacted the inside surface of the radome top.

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9. Diagnostics, Error Code & Fault Isolation

The IMA system includes some built-in diagnostic to help you isolate faults and

9.1. Power On Self Test (POST)

The post runs at start up (on both the MXP and the ICU) before the operating system transfers control to the user created tasks. The goal of the POST is to test as much of the hardware as possible and verify that it is functional. The POST assumes that nothing but a power cord is plugged into the system. The tests therefore do not attempt to test hardware that is off the board. Likewise external hardware should not cause a POST test to fail.

The POST attempts to verify that the hardware components on the board exist. After this is verified, the software is allowed to run.

The POST lets the user know there was a problem in three different ways:

First, the front panel "error" LED will indicate when the post has failed.

Second, the results of the test will be printed out the serial port.

Finally, the results will be logged into the system log. The system log file will be written to at least once each time the POST is run. The entry will indicate that the post was run and at what time. On the MXP, a second entry will be the status of the SFP device and it will indicate if a device is connected and what type of device it is. All other system log entries from the post will be indications of failure.

The MXP board (below decks) and the ICU board (above decks) each have some components that are unique to them. If the post test is specific to only one of the boards, it will be in the test description. Operating System Tests are:

- Real Time Clock - Perform two tests. First test looks for a pattern in a known location of the RTC. This indicates that the battery and device are OK. If this fails, a second test writes then reads the pattern. This proves the device functions.
- NAND Test - Verify that the NAND initialization was successful. Part of the initialization checks the device ID. If that matches, then we can read from a properly configured NAND device.
- EEPROM - Read the mac address, check for the Organizational Unique Identifier (OUI). This will be consistent across all hardware.
- I2C 0 - Verify that at least one of the devices on the I2C channel 0 works. This includes: EEPROM and Real Time Clock.
- Processor Serial Port - Put the serial port into loopback mode and verify that we can send a message to ourselves. Return the port to normal operation. MXP tests ports 0, 1, and 2. ICU only tests port 1.
- External Serial Port - Put the serial ports into loopback mode and verify that we can send a message to ourselves. Return the port to normal operation. ICU does not test Port D.
- ADC Chip – Power Supplies – Temp Sensor - Read the voltage value of every power supply. Use the results to determine if there is a problem with the power supplies, the Zener Diode, or the ADC. Both boards have a temperature sensor; verify that the output is within operating range.
- Ethernet PHY Chip - Put the PHY into loopback. Send then receive a test frame.
- CAN Controller - The initialization routine checks several configuration registers to verify that the initialization was performed. Post Checks that the can controller successfully initialized. Only performed on the MXP. SFP Device Read GPIO to determine if device is connected. Read device to determine what is connected. Log results regardless of success or failure, indicating the type of device when read successfully. If device appears connected but fails to report its vendor and part number, then indicate a problem. Only performed on the MXP.
- RF Serial Interface - Put the RF serial interface into loopback mode. Send and receive data. Restore the device to normal operation. Only performed on the ICU.
- LNB Voltage - Measure the various voltage levels possible for the LNB voltage supply. Verify that all levels can be generated.

9.2. In Service Test (IST)

The "In Service Test" is a suite of diagnostics that the system can run without interrupting service of the unit. Most importantly, this test can be run while the system is on target and tracking a satellite. The test can be

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initiated by the user from the web interface. The user will be able to press a button to begin the test. The test can also be started from the command line.

The goal of the in service test is to test system peripherals that can be tested without disturbing a working system.

If the test is started from the website, the website will communicate the status of the tests. If the test is started form a terminal, the status of the test will be printed to the user while the test is running on that terminal. Entries to the system log will be made by the individual tests themselves. A summary entry will be made to the system log after the test completes. The Diagnostic Tests are:

- Motor Driver Board - Is the motor driver board present? Can it be communicated with? Is it within the current limits? Test will leverage the motor driver Visual Basic program to provide useful information. If the system is in dish scan, can look for current on motor, cyclic in nature.
- Polarization Angle Potentiometer Range - Read the pot, and check that it is in range: between 5 and 95 percent of 5 volts.
- Receiver - Check if AGC < 100, which indicates a problem. Check the AGC range? Change tracking to off, sweep the spectrum. Look for multiple peaks. Is there a peak where you are tracking? Is it close to what you have set? Then set back.

9.3. Out Of Service Test (OOST)

The out of service test is a series of diagnostics that help evaluate the functionality of the antenna. Performing these tests will cause the antenna to lose satellite if the antenna is tracking or to be unable to

acquire satellite until the test completes. The test can be initiated by the user from the web interface. The user will be able to press a button to begin the test. The test can also be started from the command line.

The out of service test puts the antenna through its paces. It assumes that the antenna is properly connected to the other pieces of hardware so that, if everything is working properly, the antenna can track a satellite. This test will move the antenna, communicate between the MXP and ICU, and communicate with the modem/transmission hardware. The diagnostics actually performed by the test will be determined by the configuration of the system.

If the test is started from the website the website will communicate the status of the tests. If the test is started from a terminal, the status of the test will be printed to the user while the test is running on that terminal. Entries to the system log will be made by the individual tests themselves. A summary entry will be made to the system log after the test completes. The Diagnostic Tests are:

- Motor Driver Board - Test drives motors at +/- 2.5 amps and monitors current. If fails, test engages brakes and again attempts to take the motor to 2.5 amps. This indicates a broken belt. For AZ, monitor encoder and check amps vs. encoder. Look for broken chain.
- Motors (AZ, EL, and CL): do they turn

Test for motion that is detectable by the motion sensors.

- Motors (PolAng) - Run from stop to stop. Drive to verify the motor works.
- Motion Platform - Check 3 rate sensors are within 100mv of 2.5 volts. Move the antenna and verify that the sensor indicates movement.
- Motor Brakes - Move antenna and then engage brakes. Check that sensors stops. This will be a challenge. Will have to characterize the motion of the ship before performing test.

9.4. IMA System LED Functions

The IMA LEDs provide status of the system and can be viewed from the front panel of the MXP/GMXP/LMXP, or from the IMA Graphic User Interface. During normal operation they indicate events in the system, such as:

Error When OFF this LED indicates that no errors have occurred. When ON in various colors & states this LED indicates that one or more errors have occurred, or are occurring. There are cases where other LEDs can also indicate specific errors, see the information below.

Initializing When ON Solid Green this LED indicates that the ADE is initiating. When the ADE completes initialization, this LED should go OFF. For other indications, see the information below.

PowerWhen ON Solid Green this LED indicates that the MXP/GMXP AC Power is ON. For other indications, see the information below.

Target When ON Solid Green this LED indicates that the antenna is targeting. For other indications, see the information below.

Search When ON Solid Green this LED indicates that the antenna is conducting a search pattern. For other indications, see the information below.

Tracking When ON Solid Green this LED indicates that the antenna is tracking a satellite signal that is above threshold. Flashing Green indicates that signal is below threshold, will continue for "search delay" amount of time and then begin a new search pattern if the signal is not re-acquired. For other indications, see the information below.

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9.5. Error Code Color-State Overview:

This overview of error codes groups error codes together to give you a quick reference of error colors caused by a given LED-Color-State as seen on the front panel or in the GUI. To ascertain the specific error code, refer to the next section of this chapter. For a complete list of error codes, refer to the Error Table below.

9.5.1. Error LED (by states)

This is an overview of all the cases that can cause each of the color/state(s) listed. The graphics below (4 ovals) represent multiple time segments, such as ON-ON-ON-ON (solid ON) or ON-OFF-ON-OFF (Flashing).

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
RED Solid 	1001 - Stability Limit Error 1002 - AZ Reference Error - Encoder 1003 - AGC Below Noise Threshold 1004 - Software Upload warning 1005 - Comm Error with Motor Driver 1006 - Motor Driver Fault Detected 1007 - DishScan Disabled 1008 - AZ Reference Error - Home Flag 1009 - Tilt Sensor Error 1010 - Rate Sensor Error 1011 - Over Speed Error 1012 - POST Failure 1013 - OS Errors 1014 - Flash Failure 1015 - MXP-ICU Link Error 1021 - NMEA HDD Heading Not Received for 10 Seconds 1022 - NMEA HDG Heading Not Received for 10 Seconds 1023 - NMEA HDM Heading Not Received for 10 Seconds 1024 - NMEA HDT Heading Not Received for 10 Seconds 1027 – Satellite Out Of Range 1046 - Step by Step Gyro Not Connected Correctly 1047 - Step by Step Gyro Requires Initial Heading 1048 - 36:1 Synchro Gyro Requires Initial Heading 1049 - 90:1 Synchro Gyro Requires Initial Heading 1050 - 360:1 Synchro Gyro Requires Initial Heading 1051 - 1:1 Synchro Gyro Is Not Properly Connected 1052 - 36:1 Synchro Gyro Is Not Properly Connected 1053 - 90:1 Synchro Gyro Is Not Properly Connected	RED Solid 	1054 - 360:1 Synchro Gyro Is Not Properly Connected 1056- Motor failed to reach Target 1057 - Motion Platform Failed Initialization 1058 - No Home Flag Detected During Pol Initialization (4012GX ONLY) 1059 - Multiple Home Flags Detected During Pol Initialization (4012GX ONLY) 1061 - Pol Home Flag Measured Too Wide (4012GX ONLY) 1062 - Pol Home Flag Found In Wrong Location (4012GX ONLY 1063 - CM current out of range (GX60 & 4012GX Ka ONLY 1064 - CM Voltage out of range (GX60 & 4012GX Ka ONLY) 1065 - BUC current out of range (GX60 & 4012GX Ka ONLY 1066 - BUC Voltage out of range (GX60 & 4012GX Ka ONLY) 1067 - Profile changed (not saved) 1071 - Pol Motor Failed 1072 - Pol Has Been Driven Outside Of Hardware Limit 1073 - Pol Failed To Initialize With Encoder 1075 – OpenAMIP Error 1088 – Pol Polarization Error 1089 – Minor Alarm 1090 – Major Alarm 1091 – LNB Communication Error 1092 – LNB Configuration Error 1093 – Receiver Freq Configuration Error 1094 – Motors Exceeded Power Limit 1095 – Invalid System Profile 1096 - Receiver Rx Input Configuration Error

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RED Flashing 	1016 – AZ Servo Limit 1017 – LV (EL) Servo Limit 1018 – CL Servo Limit 1019 – No GPS String 1020 – No Profile Set in MXP/ICU 1026 – Antenna Not Balanced - NOT IMPLIMENTED YET 1036 – Parameter Sync Error 1037 – Time Sync Error 1040 – INI Integrity Error 1055 - Polang skew entry results in target out of range 1074 - Running Out Of Service Test 1087 - Sub Reflector is not properly located	AMBER Solid 	1028 – Temp In Radome Above/Below Operating Specs 1030 – Antenna Within a Programmed Block Zone 1031 - AGC Below Threshold 1038 – System Serial Number Mismatch 1039 – System Serial Number Invalid 1041 – NMEA HDD Received with Bad Checksum 1042 – NMEA HDG Received with Bad Checksum 1043 – NMEA HDM Received with Bad Checksum 1044 – NMEA HDT Received with Bad Checksum 1045 – Step by Step Gyro took Invalid Step Size 1060 – Detected Pol Home Flag Sensor Anomaly (4012GX ONLY) 1068 – No Pol Home Flag Detected, Using End Stop Home 1069 – Pol Home Flag In Wrong Location, Using End Stop Home 1070 - Pol Home Flag Failed, Using End Stop Home
AMBER Flashing 	1025 – GPS String Invalid 1029 – Antenna about to enter a Programmed Block Zone 1032 – Latest Parameters Not Saved 1034 – Block Zone Test/Simulation 1035 – MXP-ICU Sync Timeout 1086 - Pol Angle Targeting		

9.5.2. Initializing LED

This is an overview of all the cases that can cause each of the state(s) listed.

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
GREEN Solid 	ADE Initializing	AMBER Flashing 	1033 – Software Update In Progress MXP-ICU Sync at startup OOST On IST On

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9.5.3. Power LED

This is an overview of all the cases that can cause each of the state(s) listed.

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
GREEN Flashing 	The MXP is powering up.	GREEN Solid 	The MXP is powered up.
RED Flashing 	The boot-loader is running.		

9.5.4. Target LED

This is an overview of all the cases that can cause each of the state(s) listed.

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
GREEN Solid 	Antenna is Targeting	RED Solid 	1027 – Satellite Out of Range

9.5.5. Search LED

This is an overview of all the cases that can cause each of the state(s) listed.

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
GREEN Solid 	Antenna is Searching		

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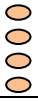
9.5.6. Tracking LED

This is an overview of all the cases that can cause each of the state(s) listed.

Color State	Trigger Condition(s)	Color State	Trigger Condition(s)
GREEN Solid 	Antenna is Tracking a satellite signal above threshold.	GREEN Flashing 	AGC is below threshold, search delay timer running.
AMBER Solid 	1030 – Antenna Within a Programmed Block Zone 1031 – AGC Below Threshold	AMBER Flashing 	1029 – Antenna about to enter a Programmed Block Zone 1034 – Block Zone Test/Simulation

9.6. Looking Up The Actual Errors

To ascertain the specific errors that have occurred in the system, log into the IMA GUI and select Logs – Activity (refer to the Activity section of the manual). For a complete list of error codes, refer to the Error Table below.

9.7. Error Table

The following table defines each of the error code, some information about what causes it and some general guidance of what to test or troubleshoot. This is a complete list of errors which can be reported by the IMA software 1.05: These errors are displayed by color/sate, as previously described, on the LEDs on the front panel and the GUI. A list of errors can also be generated from the View Activity Log, when selecting the time frame desired and selecting the Errors radio button.

Error Code	Description	Type	Front Panel LED	Latched / Unlatched
			Type State Color	
1001	Stability Limit – The antenna is mispointed by 0.5 degrees, or more, in azimuth, elevation or cross-level from its targeted position. This error will clear itself as soon as the antenna is within 0.2 degrees of its correct pointing. If this error is observed rarely, clear it and monitor for more frequent occurrences. If this error occurs frequently, or remains latched, you should: • Check antenna balance. • Turn tracking off, check antenna position displays for excessive (runaway) drive. If runaway drive is noted, troubleshoot drive components in that axis. • Turn antenna input AC power OFF. • Visually check for mechanical obstructions inside the radome which are interfering with or preventing drive. • Rotate the antenna to check free rotation on the bearings, verify that there is no binding. • Inspect belts/chain for damage. • Inspect cable connections to the Motors, the MDE and the ICU. • Turn antenna input AC power ON and observe initialization. • Test antenna drive, if any drive problem is noted, troubleshoot drive components in that axis.	Error	Error Solid Red	Unlatched

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1002	AZ Reference Error - Encoder Read error. This could indicate that the antenna is restricted, not driving or that the encoder, Motor, MDE, ICU or cable failure. Check motor/encoder connection to the MDE Test motor shaft physical rotation Check proper motor drive.	Error	Error Solid Red	Latched
1003	AGC Below Noise Threshold - Loss of RF input to the tracking receiver (as if the coax was disconnected from the rear panel). This is the tracking receivers own internal noise. Band Select incorrect (Co/Cross Coax Switch select incorrect - co-pol selected with no co-pol LNB) - LNB failed – RX path cable disconnected/failed. ICU fail - coax switch, internal connection. Coax disconnected from DAC rear panel or tracking receiver failure.	Error	Error Solid Red	Unlatched
1004	Software Update Did not Load Properly - Reload software	Warning	Error Solid Red	Latched
1005	Comm Error w/ Motor Driver - Check cable connection ICU-MDE. Check LED status on the MDE. MDE, cable ICU may be failed.	Error	Error Solid Red	Latched
1006	Motor Driver Fault Detected - Check cable connection ICU-MDE. Check LEDs on the MDE. Motor failures are indicated by LEDs: Check Belt - Motor cable connection – Motor – MDE	Error	Error Solid Red	Latched
1007	DishScan Disabled – Turn DishScan ON	Error	Error Solid Red	Unlatched
1008	AZ Reference Error - Home Flag Read error. Rotate antenna by hand until home flag is in front of sensor and verify that the sensors LED turns on. If LED does not turn on, measure dimension between tab and end of sensor (it should be 0.060 inch / 0.152 cm), adjust if necessary and retest. If LED still does not turn on, replace sensor. If LED does turn on, turn antenna power OFF and check HFO Sensor connection to MDE and connection from MDE-ICU. Turn antenna power ON, observe initialization azimuth drive to home and note that the LED comes ON. If LED turns on in initialization but the antenna does not stop at home position (until target), replace MDE, MDE – ICU cable or ICU.	Error	Error Solid Red	Latched
1009	Tilt Sensor Error - Replace the ICU	Error	Error Solid Red	Unlatched
1010	Rate Sensor Error - Replace the ICU	Error	Error Solid Red	Unlatched
1011	Over Speed Error - One axis (AZ, EL, CL or REL) has been driven too fast Cycle power to the ADE and observe antenna to determine which axis is causing the error. Check LEDs on the MDE. Motor failures are indicated by LEDs: Check appropriate Motor cable connection to the MDE. Troubleshoot Motor, MDE, cable MDE – ICU and ICU.	Error	Error Solid Red	Latched
1012	POST Failure - These tests are reported to activity log, check log for information about POST tests.	Debug	Error Solid Red	Latched
1013	OS Errors - Ignore	Warning	Error Solid Red	Unlatched
1014	Flash Failure - Determine if it is a failure in the MXP or the ICU and replace affected unit.	Error	Error Solid Red	Latched

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1015	MXP/ICU Link Error RX link connection failure. Trouble shoot ADE-BDE cable connections, connectors-on Rotary Joint, the Rotary Joint, or EoC modules in the ICU and the MXP.	Warning	Error Solid Red	Unlatched
1016	AZ Servo Limit - Motor is having to drive at maximum speed. If this error is observed rarely, clear it and monitor for more frequent occurrences. If this error occurs frequently, or remains latched, you should: • Check antenna balance. • Turn tracking off, check antenna position displays for excessive (runaway) drive. If runaway drive is noted, troubleshoot drive components in that axis. • Turn antenna input AC power OFF. Visually check for mechanical obstructions inside the radome which are interfering with or preventing drive. Rotate the antenna to check free rotation on the bearings, verify that there is no binding. • Turn antenna input AC power ON and observe initialization. • Test antenna drive, if any drive problem is noted, troubleshoot drive components in that axis.	Error	Error Flashing Red	Latched
1017	LV Servo Limit - Motor is having to drive at maximum speed. If this error is observed rarely, clear it and monitor for more frequent occurrences. If this error occurs frequently, or remains latched, you should: • Check antenna balance. • Turn tracking off, check antenna position displays for excessive (runaway) drive. If runaway drive is noted, troubleshoot drive components in that axis. • Turn antenna input AC power OFF. Visually check for mechanical obstructions inside the radome which are interfering with or preventing drive. Rotate the antenna to check free rotation on the bearings, verify that there is no binding. • Turn antenna input AC power ON and observe initialization. • Test antenna drive, if any drive problem is noted, troubleshoot drive components in that axis.	Error	Error Flashing Red	Latched
1018	CL Servo Limit - Motor is having to drive at maximum speed. If this error is observed rarely, clear it and monitor for more frequent occurrences. If this error occurs frequently, or remains latched, you should: • Check antenna balance. • Turn tracking off, check antenna position displays for excessive (runaway) drive. If runaway drive is noted, troubleshoot drive components in that axis. • Turn antenna input AC power OFF. Visually check for mechanical obstructions inside the radome which are interfering with or preventing drive. Rotate the antenna to check free rotation on the bearings, verify that there is no binding. • Turn antenna input AC power ON and observe initialization. • Test antenna drive, if any drive problem is noted, troubleshoot drive components in that axis.	Error	Error Flashing Red	Latched
1019	No GPS String - Assure current IMA software is loaded in the system, check the GPS cable connection into the ICU. Replace the GPS, or ICU as necessary.	Error	Error Flashing Red	Unlatched
1020	No Profile Set in the MXP/ICU - Set profile and save INI files	Error	Error Flashing Red	Latched
1021	NMEA HDD Heading Not Received for 10 Seconds - Check gyro compass input selection – check gyro compass input cable connection – check gyro compass distribution output switch/fuse – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched

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1022	NMEA HDG Heading Not Received for 10 Seconds - Check gyro compass input selection – check gyro compass input cable connection – check gyro compass distribution output switch/fuse – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1023	NMEA HDM Heading Not Received for 10 Seconds - Check gyro compass input selection – check gyro compass input cable connection – check gyro compass distribution output switch/fuse – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1024	NMEA HDT Heading Not Received for 10 Seconds - Check gyro compass input selection – check gyro compass input cable connection – check gyro compass distribution output switch/fuse – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1025	GPS String Invalid - Check GPS input selection: If internal check connection from GPS into ICU else, replace GPS. If external verify GPS sentence type and connections. If failed, switch to internal GPS.	Warning	Error Flashing Amber	Unlatched
1026	Antenna Not Balanced - NOT IMPLIMENTED YET	Warning	Error Flashing Red	Unlatched
1027	Satellite Out of Range - Verify GPS LAT/LON is accurate for vessel location. Verify the satellite longitude which is being targeted. Target a satellite which is within +/- 79 degrees of the ships longitude.	Info	Target Solid Red	Unlatched
1028	Temp In Radome Above/Below Operating Specs - Temperature inside the radome is **+73 degrees C** (163.4 degrees F) or greater, indicating that the equipment must cool down (air conditioning, cooling the air inside the radome will be needed to continue operating in this environment). ***OR*** Temperature is **-25 degrees C** (-13 degrees F) or lower, indicating that the equipment must warm up (heater, warming the air inside the radome will be needed to continue operating in this environment).	Warning	Error Solid Amber	Unlatched
1029	Antenna about to enter a Programmed Block Zone - Near blockage zone – steer the ship the opposite direction to avoid entering the blockage zone, or the antenna will be blocked (services will be lost when the antenna is blocked or will be switched to secondary antenna).	Notice	Tracking Flashing Amber	Unlatched
1030	Antenna Within a Programmed Block Zone - Antenna is be blocked (services will be lost when the antenna is blocked) until the ship changes course and the antenna exits the blockage zone.	Notice	Tracking Solid Amber	Unlatched
1031	AGC Below Threshold - Antenna is not ON or near a satellite (target antenna) Check Blockage – Band Select incorrect - Co/Cross Coax Switch select incorrect - LNB failed – RX path cable disconnected/failed – ICU fail (coax switch or tracking receiver) failed	Info	Tracking Solid Amber	Unlatched
1032	Latest Parameters Not Saved - Save parameters if you want to keep them as they are. Don't save if you want to restore previous parameters.	Notice	Error Flashing Amber	Unlatched
1033	Software Update In Progress - Wait until software update is completed.	Info	Initializing Flashing Amber	Unlatched
1034	Block Zone Test/Simulation - Un-block by turning Test/Simulation OFF	Info	Tracking Flashing Amber	Unlatched
1035	MXP-ICU Sync Timeout - Perform a cold start on both ADE and BDE units.	Info	Error Flashing Amber	Unlatched
1036	Parameter Sync Error - Synchronize the MXP & ICU parameters and save the INI files.	Warning	Error Flashing Red	Latched

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1037	Time Sync Error UTC from GPS for real time clock input – This can be caused by GPS or real time clock battery on the main board of the MXP or the ICU (these batteries should last 10 years). Check GPS input selection: If internal, check connection from GPS into ICU else, replace GPS. If external, verify GPS UTC sentence type and connections. If failed, switch to internal GPS.	Warning	Error Flashing Red	Latched
1038	System Serial Number Mismatch- Contact Service for S/N recovery procedure	Error	Error Solid Amber	Unlatched
1039	System Serial Number Invalid Contact Service for S/N recovery procedure	Error	Error Solid Amber	Unlatched
1040	INI Integrity Error INI file corrupt, check settings save INI & reboot	Warning	Error Flashing Red	Latched
1041	NMEA HDD Received with Bad Checksum - Check gyro compass input selection – check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Notice	Error Solid Amber	Latched
1042	NMEA HDG Received with Bad Checksum - Check gyro compass input selection – check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Notice	Error Solid Amber	Latched
1043	NMEA HDM Received with Bad Checksum - Check gyro compass input selection – check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Notice	Error Solid Amber	Latched
1044	NMEA HDT Received with Bad Checksum - Check gyro compass input selection – check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Notice	Error Solid Amber	Latched
1045	Step by Step Gyro took Invalid Step Size - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Warning	Error Solid Amber	Latched
1046	Step by Step Gyro Not Connected Correctly - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1047	Step by Step Gyro Requires Initial Heading - Enter current gyro compass heading value	Notice	Error Solid Red	Unlatched
1048	36:1 Synchro Gyro Requires Initial Heading - Enter current gyro compass heading value	Notice	Error Solid Red	Unlatched
1049	90:1 Synchro Gyro Requires Initial Heading - Enter current gyro compass heading value	Notice	Error Solid Red	Unlatched
1050	360:1 Synchro Gyro Requires Initial Heading - Enter current gyro compass heading value	Notice	Error Solid Red	Unlatched
1051	1:1 Synchro Gyro Is Not Properly Connected - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1052	36:1 Synchro Gyro Is Not Properly Connected - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched

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1053	90:1 Synchro Gyro Is Not Properly Connected - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1054	360:1 Synchro Gyro Is Not Properly Connected - Check gyro compass input cable connection – recommend gyro compass/distribution box repair.	Error	Error Solid Red	Latched
1055	Polang skew entry results in target out of range - Verify Vessel LAT/LON (from GPS). Verify the satellite longitude which is being targeted. Target a satellite which is within +/- 79 degrees of the ships longitude.	Error	Error Flashing Red	Latched
1056	Motor failed to reach Target - Check Antenna balance and MDE LED status. Visually inspect for antenna restrictions, binding, belt wear, motor connections and MDE-ICU connections.	Error	Error Solid Red	Latched
1057	Motion Platform Failed Initialization, Retrying wait replace ICU Retries multiple times, if error is still latched, replace ICU	Error	Error Solid Red	Unlatched
1058	No Home Flag Detected During Pol Initialization (4012GX ONLY) – No slot found. Contact Service department for troubleshooting assistance.	Error	Error Solid Red	Latched
1059	Multiple Home Flags Detected During Pol Initialization (4012GX ONLY) – More than one slot found. Contact Service department for troubleshooting assistance.	Error	Error Solid Red	Latched
1060	Detected Pol Home Flag Sensor Anomaly (4012GX ONLY) – Slot too narrow. Contact Service department for troubleshooting assistance. Contact Service department for troubleshooting assistance.	Warning	Error Solid Amber	Latched
1061	Pol Home Flag Measured Too Wide (4012GX ONLY) – Slot too wide. Contact Service department for troubleshooting assistance.	Error	Error Solid Red	Unlatched
1062	Pol Home Flag Found In Wrong Location (4012GX ONLY) – Slot found, but not correct when compared to where home slot was last found. Contact Service department for troubleshooting assistance.	Error	Error Solid Red	Unlatched
1063	CM current out of range (GX60 & 4012GX Ka ONLY) - iDirect Core Module current is too high/too low	Error	Error Solid Red	Latched
1064	CM Voltage out of range (GX60 & 4012GX Ka ONLY) - iDirect Core Module voltage is too high/too low	Error	Error Solid Red	Latched
1065	BUC current out of range (GX60 & 4012GX Ka ONLY) - The BUC current is too high/too low	Error	Error Solid Red	Latched
1066	BUC Voltage out of range (GX60 & 4012GX Ka ONLY) - The BUC voltage is too high/too low	Error	Error Solid Red	Latched
1067	Profile changed. Please save and reboot	Error	Error Solid Red	Latched
1068	No Pol Home Flag Detected, Using End Stop Home (Feeds with encoder built into pol motor) - No Pol home flag found. Contact Service department for troubleshooting assistance.	Warning	Error Solid Amber	Latched

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1069	Pol Home Flag In Wrong Location, Using End Stop Home (Feeds with encoder built into pol motor) - Pol home found, but not correct when compared to where home was last found or relative to end stop. Contact Service department for troubleshooting assistance.	Warning	Error Solid Amber	Latched
1070	Pol Home Flag Failed, Using End Stop Home (Feeds with encoder built into pol motor) - No Pol home flag found or no end stop found. Contact Service department for troubleshooting assistance.	Warning	Error Solid Amber	Latched
1071	Pol Motor Failed - Test and replace pol motor, harness or ICU to isolate pol motor drive related failure.	Error	Error Solid Red	Latched
1072	Pol Has Been Driven Outside Of Hardware Limit - Based on the voltage being read from the pot. There are electrical stops to prevent the pot from being driven into its mechanical stops, these are the hardware limits. If the voltage is above, or below, the electrical stops this error will be generated and the pot drive will be prohibited. Check the pot to assure that the locking nut is not loose (allowing the pot to rotate), wires are not broken or unplugged. This error could also be caused by failed pot, harness or ICU.	Error	Error Solid Red	Latched
1073	Pol Failed To Initialize With Encoder - If feed has a pot - Based on the voltage being read from the pot during initialization. This error could be generated with 1072, or for the same reasons. If the feed has an encoder - No Home Flag Detected During Pol Initialization and would be in conjunction with other pol encoder error codes.	Error	Error Solid Red	Latched
1074	Running Out Of Service Test - Wait for OOST to complete running or stop it using CLI command.	Error	Error Flashing Red	Unlatched
1075	Open AMIP Error - • Check Open AMIP string for bad/malformed message	Warning	Error Solid Red	Unlatched
1086	Pol Angle Targeting - • Wait for polarization motor to finish driving. • Check motor cable • Check motor belt • Check motor/encoder	Warning	Error Flashing Amber	Unlatched
1087	Sub Reflector is not properly located -	Error	Error Flashing Red	Unlatched
1088	Pol Polarization Error	Error	Error Solid Red	Latched
1089	Minor Alarm	Error	Error Solid Red	Latched
1090	Major Alarm	Error	Error Solid Red	Latched
1091	LNB Communication Error • Check LNB communications cable.	Error	Error Solid Red	Latched

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1092	LNB Configuration Error • Re-select LNB Type • Check/re-enter RF Frequency	Error	Error Solid Red	Latched
1093	Receiver Freq Configuration Error • Check selected LNB Type • Re-enter RF frequency	Error	Error Solid Red	Unlatched
1094	Motors Exceeded Power Limit • Check voltage under load to the antenna during initialization • ADE-BDE coaxes have too high voltage loss • Brake drawing too much current • Motor drawing too much current.	Error	Error Solid Red	Latched
1095	Invalid System Profile • Verify that profile is set correctly	Error	Error Solid Red	Latched
1096	Receiver Rx Input Configuration Error • Check Rx Input selection • Check selected LNB Type	Error	Error Solid Red	Unlatched

* Front Panel LEDs have the following priority, from highest to lowest: Solid Red, Flashing Red, Solid Amber, Flashing Amber, Solid Green, Flashing Green.

** An unlatched error can automatically clear itself, if the system corrects the condition which caused the error. A latched error can only be cleared explicitly by the user.

9.8. TICU LED Functions

EOC LED		ICU LED	
Color State	**Trigger Condition(s)**	**Color State**	**Trigger Condition(s)**
	Turns red for approximately one second when the EOC module is reset.		During boot up it keeps blinking Green while the firmware image is being loaded.
	It stays off while there is no connection to the peer EOC module.		It turns red if the firmware image cannot be loaded.
	It turns Green when a connection is established.		While firmware is running it goes through Off, Green, Red, Amber, Off, ... sequence.
	Depending on the Master/Slave negotiation result, one side of the EOC connection (can be either one) blinks when there is EOC traffic.		

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10. Troubleshooting & Maintenance

This section is intended to help with some basic troubleshooting and maintenance procedures associated with the LMXP and antenna ONLY. Please refer to the manuals provided with the satellite receivers and distribution equipment for troubleshooting those items.

Refer to the Operation manual for routine operation.

Many problems are frequently found to be an incorrect operator setting or parameter, rather than a component failure. Follow the procedures text, which then may point you out to specific paragraph, module or another section of this manual.

If you have identified a specific failure, you may prefer to go directly to the appropriate Troubleshooting paragraph or maintenance module(s) to begin.

REQUIRED EQUIPMENT

The tools and equipment necessary to perform these tests are:

- Dealer Technical Manual
- Multimeter
- Basic Technicians hand & power tools
- Spare Parts Kit(s)
- Bubble level (small)

CAUTIONS:

Equipment damage: Do NOT "***hot plug***" connections to the LMXP or the antenna pedestal while power is ON as this ***can cause significant damage***.

	**WARNING**: Electrical Hazard – Dangerous AC Voltages exist inside the LMXP Antenna Control Unit. Observe proper safety precautions when working inside the Antenna Control Unit.
	**CAUTION - PINCH HAZARD**: Use extreme caution when your fingers are near the belt drive systems of this antenna, even when antenna power is turned OFF. Do not put your fingers in between the belt and either sprocket.

10.1. Warranty Information

Sea Tel Inc. supports these systems with a **TWO** year warranty on parts and Labor.

What's covered by the Limited Warranty?

The Sea Tel Limited Warranty is applicable for parts and labor coverage to the complete antenna system, including all above-decks equipment (radome, pedestal, antenna, motors, electronics, wiring, etc.) and the Antenna Control Unit (LMXP).

What's ***NOT*** Covered by the Limited Warranty?

It does ***not*** include Satellite Receivers, Multiplexers or other distribution equipment, whether or not supplied by Sea Tel commonly used in this Satellite TVRO System. These equipments are covered by the applicable warranties of the respective manufacturers.

Original Installation of the system must be accomplished by, or under the supervision of, an authorized Sea Tel dealer for the Sea Tel Limited Warranty to be valid and in force.

Should technical assistance be required to repair your system, the first contact should be to the agent/dealer you purchased the equipment from.

Please refer to the complete warranty information included with your system.

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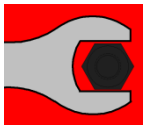
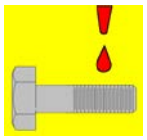
10.2. Torque and Loctite Specifications



WARNING: The following values are for through bolted stainless steel hardware. Ensure that all screw/bolt assemblies are tightened according to the tightening torque values listed below:

Screw/Bolt	Kg-cm (In-lbs)	Screw/Bolt	Kg-cm (In-lbs)
4-40	7.1 (6.2)	**M2.5**	6.0 (5.2)
6-32	13.3 (11.5)	**M3**	10.6 (9.2)
8-32	24.3 (21.1)	**M3.5**	16.7 (14.5)
10-24	35.1 (30.5)	**M4**	24.7 (21.4)
12-24	55.3 (48.0)	**M5**	49.9 (43.3)
1/4-20	84.1 (73.0)	**M6**	84.7 (73.5)
5/l6-18	173.2 (150.3)	**M8**	205.5 (178.4)
3/8-16	307.4 (266.8)	**M10**	407.2 (353.4)
7/16-14	491.8 (426.9)	**M12**	710.2 (616.4)
1/2-13	750.4 (651.3)	**M14**	1130.4 (981.1)
9/16-12	1082.8 (939.8)	**M16**	1763.7 (1530.8)



***NOTE**: All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
224	**Low strength for small fasteners.**
242	**Medium strength**
638	**High strength for Motor Shafts & Sprockets.**
2760	**Permanent strength for up to 1" diameter fasteners.**
290	**Wicking, High strength for fasteners which are already assembled.**

10.3. Troubleshooting Procedures

Each test in this troubleshooting section steps through specific operations of the system. If the system does not operate as explained, then follow the troubleshooting *module* listed in the text. This section also includes common problems experienced in the field and solutions for each. The drawings and schematics for all Sea Tel TV & TVHD systems can be found at the end of this manual.

Intermittent problems are of course the hardest to isolate. Refer to Troubleshooting Using MXP status graphs text at the end of this chapter for graphic recording modules that allow recording of various antenna information over extended periods of time. These recordings allow you to capture an intermittent event, analyze its cause and identify the faulty component/function to troubleshoot.

10.3.1. Check for blockage:

Ensure that there are no obstructions between the antenna and the satellite. The satellite signal is line of sight and any object that is directly in the signal path will attenuate the signal. The satellites are in geostationary orbit over the equator, therefore they should be south of you if you're in the northern hemisphere or north of you if you're in the southern hemisphere. You can visually sight past the radome toward the approximate direction of the satellites to see if there may be some object in the satellite signal path. The satellite signal will penetrate through most thin plastic and fiberglass with a small amount of attenuation but will not penetrate through metals, buildings or other structures that are in between the antenna and the desired satellite. If there IS blockage between the antenna and the desired satellite, the antenna may not be able to acquire that satellite until the boat is moved or turned to a different heading where no obstructions are in the signal path to the antenna. It may acquire, and track, an adjacent satellite which is not blocked.

If there does not appear to be any blockage you may need to open the radome to assure that the antenna is pointing in the right general direction of where the satellites are (north or south of you). If the antenna does not target to the correct general pointing, it cannot possibly find a signal to track in its search area. Refer to Functional Testing below to isolate further.

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10.3.2. AGC Signal Level Tests

There should be some level of AGC even when pointed away from any satellites.

If the AGC level does NOT change when you unplug the coax from the line input to ICU, this indicates that there is a loss of IF input (failed coax, coax switch or LNB failure OR a failure of the AGC tuner itself. Refer to RF flow theory in the Theory of Operation chapter and the RF Line Loss paragraph below to isolate the faulty cable or component.

When the antenna is not pointed at a satellite you should still have some level of AGC, representing the level of background noise from space as amplified by your LNB. As you move the antenna closer to a satellite signal you will note that the AGC rapidly rises (directly proportional to the amount of satellite signal level rise). AGC levels are different for each model antenna, each satellite, different tuning frequencies (on the same satellite), weather conditions and location within the satellite footprint.

What is important here is the difference in AGC level between OFF satellite and ON satellite peak. This is the AGC delta. 20-30 counts of AGC is approximately 1dB of satellite signal.

The best tracking is when the AGC delta is greater than 200 counts of AGC. AGC delta of less than 150 counts indicates weak satellite signal (weak area of the footprint) and may cause loss of services because there is insufficient signal getting into your satellite receivers. The ICU can continue to track this weak signal as the ship proceeds farther out of the footprint or acquire the next satellite as the ship enters into its footprint.

10.3.3. Tracking Test

A simple way to test tracking is to conduct a 4-Quadrant test as described in the Functional Testing chapter of this manual.

The most common causes of not being able to track the satellite properly are; tracking receiver settings, tracking & searching parameters, Gyro Compass setting, inadequate heading following or sensor drift.

Check the settings and parameters to assure that they are correct. Sensor drift will most likely be the TICU.

10.3.4. Heading Testing

Check the Heading in the LMXP to assure that the displayed value agrees with the actual heading of the boat. Make sure that the gyro compass is connected correctly to the NMEA input and that the Gyro Type parameter is set correctly for your NMEA input.

The heading input must be stable (after power is turned ON, some gyrocompasses will take four hours, or more, to "settle" and provide a steady heading output). The antenna will not stay pointed ON satellite if the Heading input is not stable.

The more accurate the heading input is the more accurate targeting will be. Minimum Gyro Compass accuracy is required to +/- 1.0 degree from the boat's actual heading. .If the heading value in the LMXP is not the same as the actual heading of the boat, the antenna will not target the desired satellite accurately (if the heading value is off by too much the antenna will not acquire the satellite at all).

If you are getting gyro errors, troubleshoot the Ships Gyro Compass, connections and Gyro Type parameter settings.

Use LMXP status graphs – ADMC strip chart recorder to record what the antenna and signal are doing, especially underway to ascertain what is causing the signal to be lost and troubleshoot from there.

Monitor the signal level while the system is tracking the satellite and the boat is underway. Excessive signal level variations that occur in sync with the motion of the boat may indicate that stabilization is not operating correctly (again ADMC will graphically show which axis is causing the signal variations). As the boat turns, the Azimuth value displayed should be steady (graph line not rising or falling) and the signal level should stay consistently high.

10.4. Antenna Initialization

All model Sea Tel TV systems upon applying power, will run through a startup sequence referred to as "Initialization". This specifically sequenced process must be completed in full, in order for the system to operate properly. As it is the LMXP that supplies all operational power to the system, initialization begins when the technician turns the power switch to ON. The brakes on the azimuth, elevation and cross-level motors will be released. A brake release power supply control circuit supplies 24 VDC to the brakes initially (5-10 seconds) and then reduces the voltage to 12VDC. The TICU will first establish its EoC link with the LMXP. Once the TICU and LMXP have a valid EoC Sync, the pedestal drive components of Azimuth, Elevation, Cross-Level and Polarization, are driven to predefined locations.

The Initialization process is completed in the following phases, each phase must complete properly for the antenna to operate properly (post-initialization). Note should be taken that, in an attempt to reduce total startup time, some of the drive requirements happens simultaneously (in time) with one another. Although it typically

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takes up to 2 minutes to complete initiation sequence, the actual measured time is solely dependent upon the antenna's joint angle positions when power is applied.

EoC Sync: The TICU and LMXP initiate and establish a TCP/IP time based connection to each other.

Azimuth:

- Azimuth is driven first to the Clockwise stop
- Azimuth is driven to the Counter Clockwise stop
- Azimuth is driven to relative 540.0 degrees

Polarization:

- Pol is driven first to the Clockwise stop
- Pol is driven to the Counter Clockwise stop

Elevation:

- Elevation is driven first to 45 degrees
- Elevation is driven to 0 degrees
- Elevation is driven to 45 degrees

Cross-Level:

- Cross-Level is driven first to 0 degrees
- Cross-Level is driven to -3 0 degrees
- Cross-Level is driven to +30 degrees
- Cross-Level is driven to 0 degrees

10.5. General Maintenance

10.5.1. Balancing the Antenna

The antenna and equipment frame are balanced at the factory however, after disassembly for shipping or maintenance, balance adjustment may be necessary. The elevation and cross-level motors have a brake mechanism built into them, therefore, ***power*** must be ON to release the brakes and **DishScan®** ***and antenna drive*** must be OFF to balance the antenna. . ***Do NOT remove any of the drive belts***. Balancing is accomplished by adding or removing balance trim weights at strategic locations to keep the antenna from falling forward/backward or side to side. The antenna system is not pendulous so 'balanced' is defined as the antenna remaining at rest when left in any position.

The "**Balance Mode**" selection located on the upper part of the "**Four Quadrant Test**" screen in the **Tools** – **Test** menu page. When enabled, Balance Mode temporarily turns DishScan®, Azimuth, Elevation and Cross-Level drive OFF. This function is required when trying to balance this antenna system.

Assure that Antenna power is ON and that the antenna has completed initialization.

At the Computer (connected to the LMXP):

1. Log into the GUI, select Tools - Test in the side bar menus.
2. Select "**Balance Mode**" (located on the upper part of the "**Four Quadrant Test**" screen, just below the page header) to enable balance mode. The screen will then show ON & OFF buttons.
3. Click ON. The screen will temporarily display "Submitting ... Please Wait". When this message disappears the antenna is in balance mode. DO NOT EXIT THIS SCREEN.

At the Antenna:

4. At the Antenna: Balance the antenna with the elevation near horizon (referred to as front to back balance) **by adding**, **or subtracting**, **small counter-weights**.
5. Then balance Cross Level axis (referred to as left-right balance) **by moving existing counter-weights from the left to the right or from the right to the left**. Always move weight from one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of the reflector mounting frame to the top right of the reflector mounting frame). Do NOT add counter-weight during this step.
6. Last, balance the antenna with the elevation pointed at, or near, zenith (referred to as top to bottom balance) **by moving existing counter-weights from the top to the bottom or from the bottom to the top**. Always move weight from one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of

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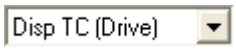
the reflector mounting frame to the bottom left of the reflector mounting frame). Do NOT add counter-weight during this step.

7. When completed, the antenna will stay at any position it is pointed in for at least 5 minutes (with no ship motion).
8. ***Do NOT cycle antenna power to re-Initialize the antenna***. Return to the Computer (LMXP), which is still in Balance Mode. Click OFF. The screen will temporarily display "Submitting ... Please Wait". When this message disappears the antenna is in normal operation mode. When you exit Balance Mode the antenna will return to normal (DishScan®, Azimuth, Elevation and Cross-Level drive ON).

10.5.2. Fine Balance and Monitoring Motor Drive Torque

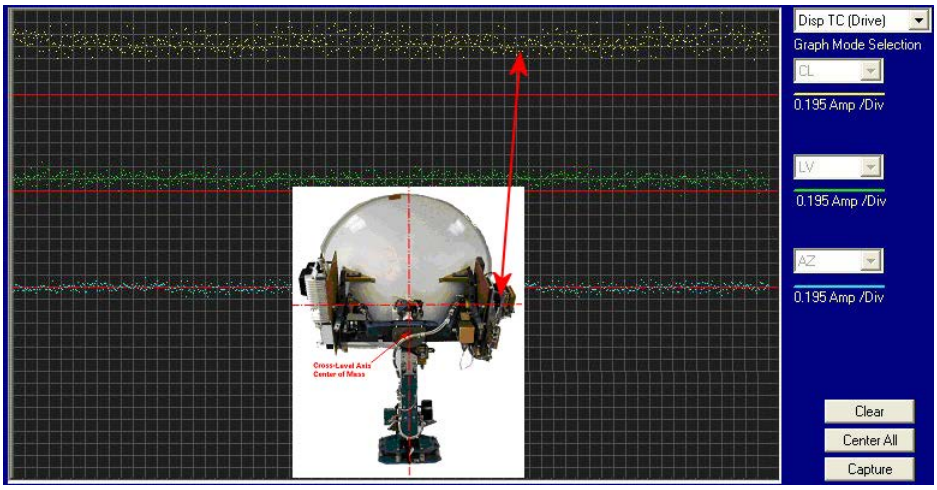
The GRAPHS **DISPTC** graph chart provides a means for monitoring torque commands required for each motor for diagnostic purposes and verifying antenna balance. By observing each trace, the required drive of the antenna via the motor driver PCB may be established.

- To view the Torque Commands, select the 

graph chart.
- This chart displays the Torque Command errors for each axis via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 0.195 amps/vertical division.
- In all axes, tracing centered on the reference line means that that axis is neutral. Tracing **above** the reference line means that that axis is driving CCW. Tracing **below** the reference line means that that axis is driving CW.
- A normal trace display will be ± 1 divisions from the red reference line while under calm sea conditions and with DishScan® Drive turned off. See example below

- The Cross Level displayed above the reference line indicates that CL is driving CCW (Left).

  Example: The antenna pictured in the screen capture below is imbalanced so that it is "Right Heavy". The CL trace is plotting above the red reference line (indicating that drive CCW is required to keep the Cross-Level beam level (to the horizon).



- The Level display will plot below the reference line when the antenna requires CW drive (Up in elevation).

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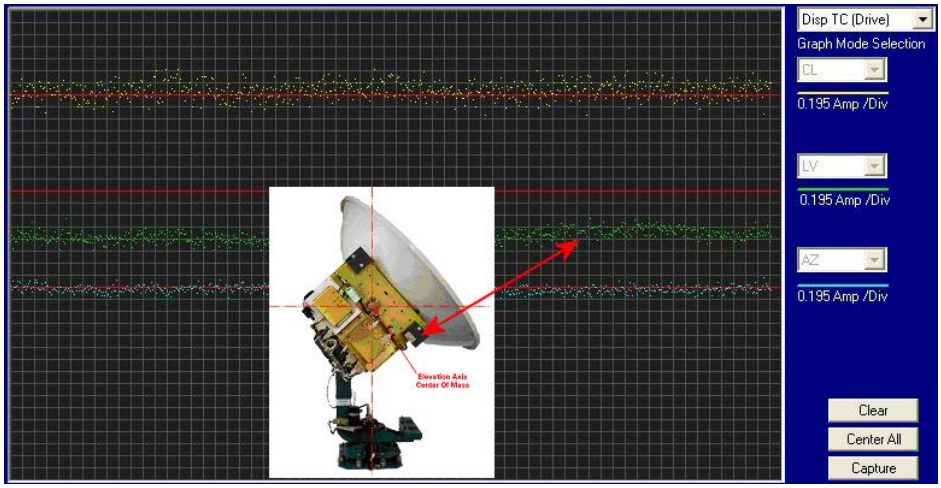
Example: The antenna pictured in the screen capture below is imbalanced so that it is "Front, or Bottom, Heavy". The LV trace is plotting above the red line, indicating that CW drive is required to maintain the current elevation position.



- The Azimuth display plots below the red line when the antenna is driven CW and plots above the red line as the antenna is driving CCW.

10.6. Isolating Pedestal Errors

The types of pedestal error are:

10.6.1. Servo Limit (CL, LV and AZ)

A servo limit error means the TICU is issuing the command to the motor driver enclosure to drive the relevant axis harder than it should under normal operation (the servo limit has been reached). This could be while the antenna is trying to maintain its pointing angle, or while the antenna is driving the axis to a target position.

If this error is not frequent or constant, clear the error and monitor the system. Increasing frequency of this error indicates that the condition causing the error is worsening. and should be attended to. If you note that the error is happening more frequently (or is now constant):

- Visually inspect the pedestal for improper balance, physical restrictions or binding.
- Assure that no cables in the base of the radome are preventing free movement of the pedestal.
- Visually inspect the perimeter of the dish to assure that it is not (or has not been) rubbing against the inside of the radome.
- Check belts for binding/wear.
- Verify that the brakes are opening all the way, and are staying open during normal operation.
- Test the harness & motor for faults.

10.6.2. Stability Limit

A stability limit error means the antenna has mispointed from its desired position by more than half a degree. It's common to see the servo limit and stability limit errors together.

If this error is not frequent or constant, clear the error and monitor the system. Increasing frequency of this error indicates that the condition causing the error is worsening. and should be attended to. If you note that the error is happening more frequently (or is now constant):

- Visually inspect the pedestal for improper balance, physical restrictions or binding.
- Assure that no cables in the base of the radome are preventing free movement of the pedestal.
- Visually inspect the perimeter of the dish to assure that it is not (or has not been) rubbing against the inside of the radome top.
- Check belts for binding/wear.
- Verify that the brakes are opening all the way, and are staying open during normal operation.
- Test the harness & motor for faults.

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10.7. Testing the AZ Motor / Encoder

The most common faults relating to the Azimuth motor / Encoder are:

- Azimuth Drive Error(s)
- Azimuth Encoder Error(s)
- Motor Driver Error(s)
- No Azimuth Drive
- Azimuth Brake not disengaging
- Pedestal drag / bound / fouled
- Motor Driver AZ or Status LED is solid RED.

You will need to troubleshoot these conditions to identify the actual faulty component.

10.7.1. Theory of Operation:

The first step in initialization of an antenna during power up is that the motor driver (inside the TICU) supplies 24 volts to the brake in the motor. This opens the brake, allowing motor drive. After 5-6 seconds the voltage drops to 12 volts to keep the brake disengaged.

The azimuth motor is used for azimuth stabilization, satellite targeting and signal tracking decisions requiring drive in azimuth. During stabilization, the azimuth motor drives only in response to motion of the stabilized mass of the antenna in 3-dimensional free space, as sensed by the azimuth rate sensor located on the motion platform PCB. The TICU also receives input from the vessels gyro compass which is used to keep the antennas displayed azimuth position to be a value that is relative to true north.

The azimuth motor does not have brushes, therefore, it must be driven by the motor driver. Hall sensors in the motor provide feedback to the motor driver so it can drive and control the torque output of the motor. When no drive is applied to the motor it offers very little rotational friction, allowing inertia to provide 98 percent of stabilization.

A high output digital encoder is integrated into the top of the azimuth motor to provide the relative position into the TICUs azimuth control loop. During initialization the relative position is calibrated when the CW rotation of the pedestal is halted by the upper Azimuth stop. The upper value (706.0 degrees) is then loaded into the relative position counter. The TICU receives heading input from the ships gyro compass and reports the relative and true azimuth positions back to the LMXP for display.

10.7.2. Verify Motor Brake Release

During the initialization process the motor driver will output 24VDC to release the brakes from the motors so the antenna can operate. If the brake seizes, it will restrict the movement of that axis of the system and cause appropriate error(s) to be displayed. Push the azimuth axis by hand and if the axis feels stiff/resistant then it is possible the brake has not released or is seized. Power down the antenna disconnect the azimuth motor cable from the motor driver and measure across pins 14 (-) and 15 (+) of the azimuth motor connector on the motor driver. 24VDC should be present at the start of the initialization process which will then drop to 12VDC after 6 seconds. If the voltage is present, then it's likely the brake is defective and isn't releasing. If the voltage isn't present, then the motor driver is defective (however there is always the possibility that the system may not output the voltage under load).

10.7.3. Verify Initialization:

Power cycle the pedestal and verify: initialization of Azimuth.

If any of these steps fail, verify that the profile setting is configured correctly and saved. A drive issue or error LED will require further troubleshooting.

10.7.4. Motor Driver Status LEDs:

10.7.4.1. Motor Driver Motor Status (top 3 LEDs are CL, EL and AZ).

Green	Motor is good.
Solid Red	Motor or harness short circuit (winding-winding, winding-ground, or winding to supply). Replace the appropriate motor. If that does not clear the LED status, replace the motor driver.
Solid Orange	Hall sensor error (hall sensor or harness wire). Replace the motor. If that does not clear the LED status, replace the motor driver.

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10.7.4.2. Motor Driver Status LED (4th LED).

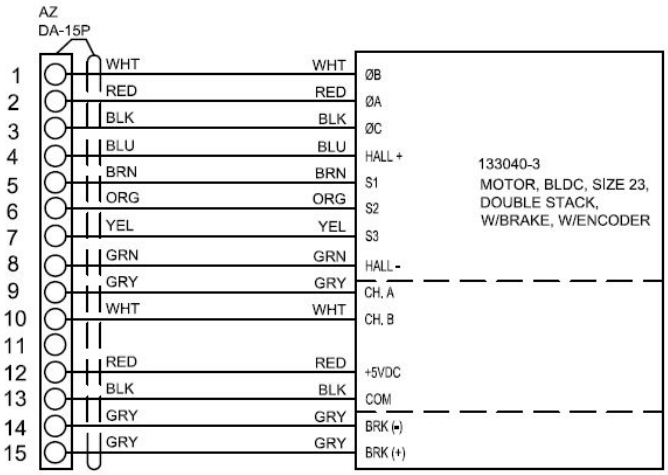
Green	Motor Driver is good.
Solid Red	Motor Driver fault detection. Operational software will never leave the status LED solid red. Replace motor driver.
Solid Orange	Software update to the motor driver in process.
Blinking Red	Communication error with PCU. Check to assure that the harness connections are seated properly. Check harness (pin-pin, wire-wire and wire-ground) for good continuity. Replace motor driver. Replace the main PCB.

10.7.5. Test the Motor:

The antennas operation should be verified after repair/replacement of the faulty motor and/or harness.

The motor driver is inside the TICU. If the motor driver Status LED (4th LED) is Solid Red, or Blinking Red, replace the TICU.

If normal Elevation, or Cross-Level, drive operation doesn't return, the TICU will require further troubleshooting.



10.7.5.1. Motor Test:

Disconnect the motor from the TICU and test continuity of the motor itself.

Using a multimeter, check continuity between ground/shield (the motor connector back shell) and each of the pins. These should all be **Open**.

Check continuity between the individual pins 1, 2 and 3 to the rest of the pins (i.e. test pin 1 to pin 4, 5, 6, 7 and 8 and so on). These should all be **Open**.

Check continuity between 1-2, 2-3 and 3-1. These should all be **Short**.

Check continuity between pins 12-13. This should read about **600-700 ohms**.

Check continuity between pins 14-15. This should read about **50-80 ohms**.

If any of the steps above do not measure the specified resistance values, the motor is most likely defective and should be replaced.

10.7.6. Verify Encoder Feedback:

Changes in relative should be equal to the amount of drive of the pedestal. Drive the azimuth axis of the antenna in 90 degree increments and verify that the pedestal actually rotates 90 degrees, and that the relative and azimuth position values on the displayed change the correct direction numerical amount.

10.8. Testing the Elevation (EL) Motor

The most common faults relating to the Elevation motor are:

- Elevation Drive Error(s)
- Motor Driver Error(s)
- No Elevation Drive

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- Elevation Brake not disengaging
- Pedestal drag / bound / fouled
- Motor Driver EL or Status LED is solid RED.

You will need to troubleshoot these conditions to identify the actual faulty component.

10.8.1. Theory of Operation:

The elevation motor is used for antenna positioning and stabilization. During stabilization the motor drives in response to motion of the mass of the antenna in 3-dimensional free space (as sensed by the rate and MEM sensors, which are both located in the Motion Platform). Elevation targeting and signal tracking decisions also require drive in elevation. An integrated brake mechanism in the elevation motor is used to restrict the axis from moving when AC power is lost to the pedestal.

The BLDC motor is driven by the motor driver (inside the TICU). Hall sensors in the motor provide feedback to the controller so it can drive and control the torque output of the motor. When no drive is applied to the motor it offers very little rotational friction, allowing inertia to provide 98 percent of stabilization.

10.8.2. Verify Motor Brake Release

During the initialization process the motor driver will output 24VDC to release the brakes from the motors so the antenna can operate. If the brake seizes, it will restrict the movement of that axis of the system and cause appropriate error(s) to be displayed. Push the elevation axis by hand and if the axis feels stiff/resistant then it is possible the brake has not released or is seized. Power down the antenna disconnect the appropriate motor cable from the motor driver, energize the antenna and measure across pins 14 (-) and 15 (+) of the drive connector on the motor driver. 24VDC should be present at the start of the initialization process which will then drop to 12VDC after 6 seconds. If the voltage is present, then it's likely the brake is defective and isn't releasing. If the voltage isn't present, then the motor driver is defective (however there is always the possibility that the system may not output the voltage under load).

10.8.3. Verify Initialization:

Power cycle the pedestal and verify: initialization of the suspect axis.

If any of these steps fail, verify that the profile setting is configured correctly and saved. A drive issue or error LED will require further troubleshooting.

10.8.4. Motor Driver Status LEDs:

The motor driver is inside the TICU. If the motor driver Status LED (4th LED) is Solid Red, or Blinking Red, replace the TICU.

10.8.4.1. Motor Driver Motor Status (top 3 LEDs are CL, EL and AZ).

Green	Motor is good.
Solid Red	Motor or harness short circuit (winding-winding, winding-ground, or winding to supply). Replace the appropriate motor. If that does not clear the LED status, replace the motor driver.
Solid Orange	Hall sensor error (hall sensor or harness wire). Replace the motor. If that does not clear the LED status, replace the motor driver.

10.8.4.2. Motor Driver Status LED (4th LED).

Green	Motor Driver is good.
Solid Red	Motor Driver fault detection. Operational software will never leave the status LED solid red. Replace motor driver.
Solid Orange	Software update to the motor driver in process.
Blinking Red	Communication error with PCU. Check to assure that the harness connections are seated properly. Check harness (pin-pin, wire-wire and wire-ground) for good continuity. Replace motor driver. Replace the main PCB.

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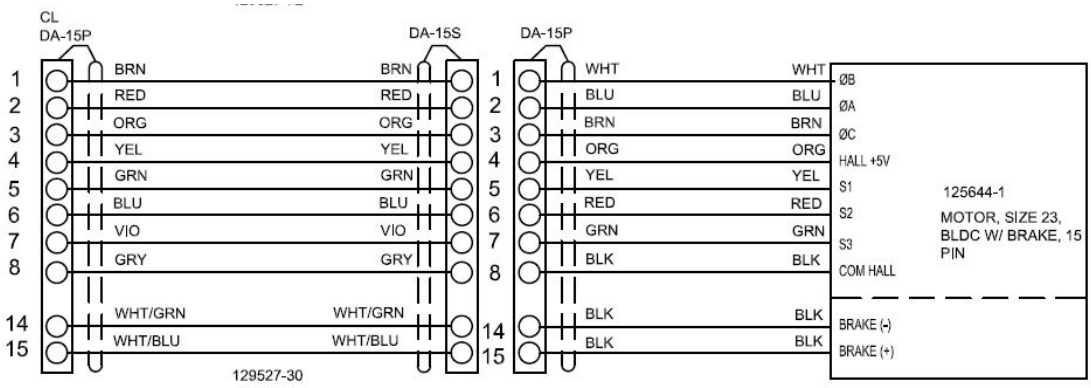
10.8.5. Test the Motor & Harness:

If the motor driver EL LED is solid Red or Orange the motor, or the harness, is defective. Isolate using the procedures below.



10.8.5.1. Motor Test:

Disconnect the motor from the 129527 harness and test continuity of the motor itself.

Using a multimeter, check continuity between ground/shield (the motor connector back shell) and each of the pins. These should all be **Open**.

Check continuity between the individual pins 1, 2 and 3 to the rest of the pins (i.e. test pin 1 to pin 4, 5, 6, 7 and 8 and so on). These should all be **Open**.

Check continuity between 1-2, 2-3 and 3-1. These should all be **Short**.

Check continuity between pins 12-13. This should read about **600-700 ohms**.

Check continuity between pins 14-15. This should read about **50-80 ohms**.

If any of the steps above do not measure the specified resistance values, the motor is most likely defective and should be replaced.

If the motor checks are as specified, test the harness next.

10.8.5.2. Harness Test:

Disconnect the motor from the 129527 harness, disconnect the harness from the TICU and test continuity of the harness using a multimeter, you should measure :

Pin 1-1 = **Short**
Pin 2-2 = **Short**
Pin 3-3 = **Short**
Pin 4-4 = **Short**
Pin 5-5 = **Short**
Pin 6-6 = **Short**
Pin 7-7 = **Short**
Pin 8-8 = **Short**
Pin 9-9 = **Open**
Pin 10-10 = **Open**
Pin 11-11 = **Open**
Pin 12-12 = **Open**
Pin 13-13 = **Open**
Pin 14-14 = **Short**
Pin 15-15 = **Short**

Test continuity of each pin to the shield, all should be **Open**.

If any of the steps above do not measure the specified resistance values, the harness is most likely defective and should be repaired or replaced.

The antennas operation should be verified after repair/replacement of the faulty motor and/or harness.

If normal Elevation drive operation doesn't return, the TICU will require further troubleshooting.

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10.9. Testing the Cross-Level (CL) Motor

The most common faults relating to the Cross-Level motor are:

- Cross-Level Drive Error(s)
- Motor Driver Error(s)
- No Cross-Level Drive
- Cross-Level Brake not disengaging
- Pedestal drag / bound / fouled
- Motor Driver CL or Status LED is solid RED.

You will need to troubleshoot these conditions to identify the actual faulty component.

10.9.1. Theory of Operation:

The cross-level motor is used for antenna positioning and stabilization. During stabilization the motor drives in response to motion of the mass of the antenna in 3-dimensional free space (as sensed by the rate and MEM sensors, which are both located in the Motion Platform). Cross-level targeting and signal tracking decisions also require drive in elevation. An integrated brake mechanism in the cross-level motor is used to restrict the axis from moving when AC power is lost to the pedestal.

The BLDC motor is driven by the motor driver (inside the TICU). Hall sensors in the motor provide feedback to the controller so it can drive and control the torque output of the motor. When no drive is applied to the motor it offers very little rotational friction, allowing inertia to provide 98 percent of stabilization.

10.9.2. Verify Motor Brake Release

During the initialization process the motor driver will output 24VDC to release the brakes from the motors so the antenna can operate. If the brake seizes, it will restrict the movement of that axis of the system and cause appropriate error(s) to be displayed. Push the Cross-level axis by hand and if the axis feels stiff/resistant then it is possible the brake has not released or is seized. Power down the antenna disconnect the appropriate motor cable from the motor driver, energize the antenna and measure across pins 14 (-) and 15 (+) of the drive connector on the motor driver. 24VDC should be present at the start of the initialization process which will then drop to 12VDC after 6 seconds. If the voltage is present, then it's likely the brake is defective and isn't releasing. If the voltage isn't present, then the motor driver is defective (however there is always the possibility that the system may not output the voltage under load).

10.9.3. Verify Initialization:

Power cycle the pedestal and verify: initialization of the suspect axis.

If any of these steps fail, verify that the profile setting is configured correctly and saved. A drive issue or error LED will require further troubleshooting.

10.9.4. Motor Driver Status LEDs:

The motor driver is inside the TICU. If the motor driver Status LED (4th LED) is Solid Red, or Blinking Red, replace the TICU.

10.9.4.1. Motor Driver Motor Status (top 3 LEDs are CL, EL and AZ).

Green	Motor is good.
Solid Red	Motor or harness short circuit (winding-winding, winding-ground, or winding to supply). Replace the appropriate motor. If that does not clear the LED status, replace the motor driver.
Solid Orange	Hall sensor error (hall sensor or harness wire). Replace the motor. If that does not clear the LED status, replace the motor driver.

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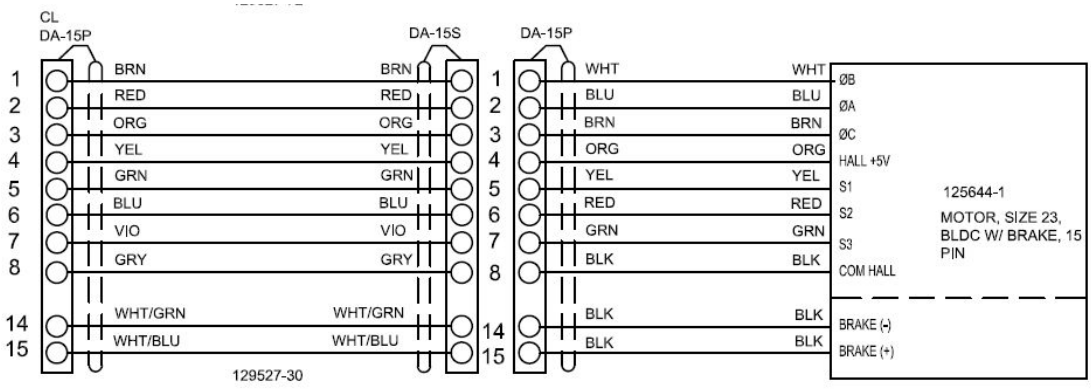
10.9.4.2. Motor Driver Status LED (4th LED).

Green	Motor Driver is good.
Solid Red	Motor Driver fault detection. Operational software will never leave the status LED solid red. Replace motor driver.
Solid Orange	Software update to the motor driver in process.
Blinking Red	Communication error with PCU. Check to assure that the harness connections are seated properly. Check harness (pin-pin, wire-wire and wire-ground) for good continuity. Replace motor driver. Replace the main PCB.

10.9.5. Test the Motor & Harness:

If the motor driver EL, or CL, LED is solid Red or Orange the motor, or the harness, is defective. Isolate using the procedures below.



10.9.5.1. Motor Test:

Disconnect the motor from the 129527 harness and test continuity of the motor itself.

Using a multimeter, check continuity between ground/shield (the motor connector back shell) and each of the pins. These should all be **Open**.

Check continuity between the individual pins 1, 2 and 3 to the rest of the pins (i.e. test pin 1 to pin 4, 5, 6, 7 and 8 and so on). These should all be **Open**.

Check continuity between 1-2, 2-3 and 3-1. These should all be **Short**.

Check continuity between pins 12-13. This should read about **600-700 ohms**.

Check continuity between pins 14-15. This should read about **50-80 ohms**.

If any of the steps above do not measure the specified resistance values, the motor is most likely defective and should be replaced.

If the motor checks are as specified, test the harness next.

10.9.5.2. Harness Test:

Disconnect the motor from the 129527 harness, disconnect the harness from the TICU and test continuity of the harness using a multimeter, you should measure :

Pin 1-1 = **Short**
Pin 2-2 = **Short**
Pin 3-3 = **Short**
Pin 4-4 = **Short**
Pin 5-5 = **Short**
Pin 6-6 = **Short**
Pin 7-7 = **Short**
Pin 8-8 = **Short**
Pin 9-9 = **Open**
Pin 10-10 = **Open**

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Pin 11-11 = **Open**

Pin 12-12 = **Open**

Pin 13-13 = **Open**

Pin 14-14 = **Short**

Pin 15-15 = **Short**

Test continuity of each pin to the shield, all should be **Open**.

If any of the steps above do not measure the specified resistance values, the harness is most likely defective and should be repaired or replaced.

The antennas operation should be verified after repair/replacement of the faulty motor and/or harness.

If normal Cross-Level drive operation doesn't return, the TICU will require further troubleshooting.

10.10. Testing the Motor Driver

10.10.1. Theory of Operation:

Feedback from the motion platform PCB is fed into the PCU or TICU main PCB where the vessels motion is calculated. A command is then sent to the motor driver enclosure to drive the relevant axis accordingly to maintain stabilization. This also applies to targeting, pointing and tracking where commands are sent to the Motor Driver to drive each axis as required.

The Motor Driver PCB issues 24VDC to the elevation and cross level motors to release the brakes on initialization and outputs a constant 12VDC to hold them open during operation. The Motor Driver uses feedback from the hall sensors inside the BLDC motors so it can commutate and control the torque output of the elevation, cross-level and azimuth motors. When no drive is applied to the motor it offers very little rotational friction, allowing inertia to provide 98 percent of stabilization in each axis.

10.10.2. Verify Motor Brake Release

During the initialization process the Motor Driver will output 24VDC to release the brakes from the motors so the antenna can operate. If the brake seizes, it will restrict the movement of that axis of the system and cause appropriate error(s) to be displayed. Push the azimuth axis by hand and if the axis feels stiff/resistant then it is possible the brake has not released or is seized. Power down the antenna disconnect the azimuth motor cable from the Motor Driver and measure across pins 14 (-) and 15 (+) of the azimuth motor connector on the Motor Driver. 24VDC should be present at the start of the initialization process which will then drop to 12VDC after 6 seconds. If the voltage is present, then it's likely the brake is defective and isn't releasing. If the voltage isn't present, then the Motor Driver is defective (however there is always the possibility that the system may not output the voltage under load).

10.10.3. Verify Initialization:

Power cycle the pedestal and verify:

- 24VDC is supplied to the motors brakes to release them, then 12VDC holds them open.
- Elevation axis drives to 45 degrees based on the TICU's horizon reference.
- Cross level axis drives to level based on the TICU's horizon reference.
- Azimuth axis will drive clockwise until the home flag is sensed.

If any of these steps fail, verify that the profile setting is configured correctly and saved. A drive issue or error LED will require further troubleshooting.

10.10.4. Motor Driver Status LEDs:

10.10.4.1. Motor Driver Motor Status (top 3 LEDs are CL, EL and AZ).

Green	Motor is good.
Solid Red	Motor or harness short circuit (winding-winding, winding-ground, or winding to supply). Replace the appropriate motor. If that does not clear the LED status, replace the MOTOR DRIVER.
Solid Orange	Hall sensor error (hall sensor or harness wire). Replace the motor. If that does not clear the LED status, replace the MOTOR DRIVER.

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10.10.4.2. Motor Driver Status LED (4th LED).

Green	Motor Driver is good.
Solid Red	Motor Driver fault detection. Operational software will never leave the status LED solid red. Replace MOTOR DRIVER.
Solid Orange	Software update to the MOTOR DRIVER in process.
Blinking Red	Communication error with PCU. Check to assure that the harness connections are seated properly. Check harness (pin-pin, wire-wire and wire-ground) for good continuity. Replace MOTOR DRIVER. Replace the main PCB.

10.11. Testing the Pol Motor & Encoder

10.11.1. Theory of Operation:

The feed assembly always rotates to the linear horizontal polarity angle of the satellite you target. For the TVHD feed tube, this will align the three feeds to the arc so that all three satellites can be received simultaneously. For linear operation the feed tube rotation will set the polarization pin to the Linear Stop. For circular polarized signals, the feed tube rotates to set the polarization pin to the Circular Stop.

To ensure the LNB is correctly aligned to the horizontal linear polarized receive signal the antennas feed assembly can be driven through a 270 degree range of motion by a 24VDC motor. Based on the vessels GPS position and the look angle to the desired satellite the system will calculate the numerical value for the horizontal linear position of the pol assembly. The TICU will then send the voltage to drive the pol motor until the pol encoder outputs the correct value, at which point the feed will be aligned to the incoming satellite signal (provided that the encoder initialized correctly and is operating normally).

The LNB provides the high & low band horizontal & vertical (or left hand & right hand circular) outputs simultaneously.

As the vessel sails and the GPS position changes, the polarization will be incrementally adjusted to maintain good polarization alignment to the satellites horizontal linear signal, even when using circular satellites.

One indication that there is a fault with the feed alignment of the system is that the target LED will be permanently illuminated on the LMXP. When targeting the LMXP & TICU will:

- Calculate the azimuth, elevation and polarization pointing angles of the satellite.
- Drive elevation initially to 8 degrees above the actual elevation to the satellite (or below if the satellites' elevation angle is above 83 degrees).
- Drive azimuth to the actual azimuth pointing angle to the satellite.
- Drive polarization to set linear or circular operation and then to the actual horizontal polarity angle of the satellite. Polarity must be driven slowly and is almost always last to reach its target. If the system is unable to drive the pol motor or the pol encoder has failed, the correct feedback signal is not obtained and the system can't complete the targeting process. In this case the antenna will stay in this initial position.
- Sample OFF satellite AGC.
- Drive elevation to the calculated elevation pointing angle of the satellite.
- Sample ON satellite AGC.
- Calculate and set Auto-Threshold.

There are a variety of discrete pol errors which depend on the design of the feed assembly. These are related to pol home flag, motor drive and encoder feedback. Ascertain the exact error(s) and troubleshoot accordingly.

10.11.2. Observe Polarization Drive During Initialization

During Initialization the feed assembly will drive first to the Clockwise stop and then to the Counter Clockwise stop. This initializes the polarization circuit so that the encoder will be able to accurately target linear polarization angles.

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10.11.3. Observe Targeted Polarization Drive

Post Initialization the system will target the last satellite that was used.

- For the TVHD feed tube, this will align the three feeds to the arc so that all three satellites can be received simultaneously.
- For linear operation the feed tube rotation will set the polarization pin to the Linear Stop and then drive to the horizontal linear angle.
- For circular polarized signals, the feed tube rotates to set the polarization pin to the Circular Stop.

10.11.4. Measure Pol Motor/Encoder Voltage

Assure that the system is in Linear Mode (in the LMXP). Using a voltmeter, test:

1. Motor Voltage from J3 pin 6 (+24) to J3 pin 8 (GND) on the Motor Interconnect PCB.
2. Encoder Voltage from J3 pin 5 (+5) to J3 pin 8 (GND) on the Motor Interconnect PCB.

If either of these voltages are absent, troubleshoot the TICU.

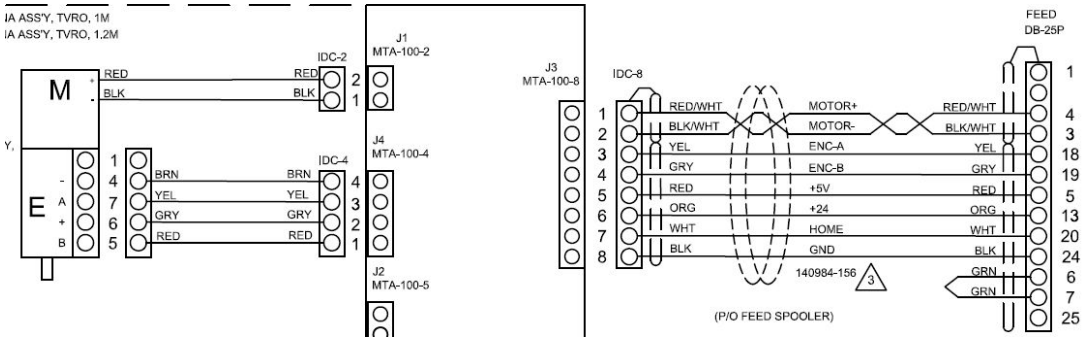
10.11.5. Test Continuity:

De-energize the antenna.

Disconnect Feed DB-25 from the TICU.

Disconnect the IDC-2 from J1 polarization Motor Interconnect PCB.

Disconnect the IDC-5 from the Encoder body on the polarization motor.



3. Check continuity between IDC-2 pins 1 to 2 = 10-15 ohms (Motor winding). If Open, replace motor, re-connect all connections and re-test Polarization.
4. Test continuity of the harness using a multimeter, you should measure:
   Feed DB-25 Pin 4 to Motor Interconnect PCB J3 Pin 1 = **Short**
   Feed DB-25 Pin 3 to Motor Interconnect PCB J3 Pin 2 = **Short**
   Feed DB-25 Pin 18 to Motor Interconnect PCB J3 Pin 3 = **Short**
   Feed DB-25 Pin 19 to Motor Interconnect PCB J3 Pin 4 = **Short**
   Feed DB-25 Pin 5 to Motor Interconnect PCB J3 Pin 5 = **Short**
   Feed DB-25 Pin 13 to Motor Interconnect PCB J3 Pin 6 = **Short**
   Feed DB-25 Pin 20 to Motor Interconnect PCB J3 Pin 7 = **Short**
   Feed DB-25 Pin 24 to Motor Interconnect PCB J3 Pin 8 = **Short**
   Feed DB-25 Pin 6 to Feed DB-25 Pin 7 = **Short**
   If all of these connections are as specified, go to the next step. If any of these connections are **Open**, repair/replace the harness. When repaired, re-connect all connections and re-test Polarization.
5. Test continuity of the harness using a multimeter, you should measure:
   Feed DB-25 Pin 4 to Shield= **Open**
   Feed DB-25 Pin 3 to Shield= **Open**
   Feed DB-25 Pin 18 to Shield= **Open**
   Feed DB-25 Pin 19 to Shield= **Open**
   Feed DB-25 Pin 5 to Shield= **Open**

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Feed DB-25 Pin 13 to Shield= **Open**

Feed DB-25 Pin 20 to Shield= **Open**

Feed DB-25 Pin 24 to Shield= **Open**

Feed DB-25 Pin 6 to Shield= **Open**

If all of these connections are as specified, go to the next step. If any of these connections are **Short** repair/replace the harness. When repaired, re-connect all connections and re-test Polarization.

6. Test continuity of the Motor Interconnect PCB using a multimeter, you should measure:

   Feed DB-25 Pin 4 to Motor Interconnect PCB J1 Pin 2 = **Short**

   Feed DB-25 Pin 3 to Motor Interconnect PCB J1 Pin 1 = **Short**

   Feed DB-25 Pin 18 to Motor Interconnect PCB J4 Pin 3 = **Short**

   Feed DB-25 Pin 19 to Motor Interconnect PCB J4 Pin 2 = **Short**

   Feed DB-25 Pin 5 to Motor Interconnect PCB J4 Pin 1 = **Short**

   Feed DB-25 Pin 24 to Motor Interconnect PCB J3 Pin 4 = **Short**

   If all of these connections are as specified, go to the next step. If any of these connections are **Open**, replace the Motor Interconnect PCB. When repaired, re-connect all connections and re-test Polarization.

7. Test continuity of the Encoder harness using a multimeter, you should measure:

   Motor Interconnect PCB J4 Pin 1 to Encoder IDC Pin5= **Short**

   Motor Interconnect PCB J4 Pin 2 to Encoder IDC Pin6= **Short**

   Motor Interconnect PCB J4 Pin 3 to Encoder IDC Pin7= **Short**

   Motor Interconnect PCB J3 Pin 4 to Encoder IDC Pin4= **Short**

   If all of these connections are as specified, go to the next step. If any of these connections are **Open**, replace the Encoder harness. When repaired, re-connect all connections and re-test Polarization.

10.11.6. Encoder Error(s) Remaining

If polarization is still not working, or encoder errors remain, replace the Motor (with integrated Encoder). When replaced, re-connect all connections and re-test Polarization.

10.11.7. When testing is completed

1. Re-connect the Feed DB-25 to the TICU.
2. Re-connect IDC-2 to J1 polarization Motor Interconnect PCB.
3. Re-connect IDC-5 to the Encoder body on the polarization motor.
4. Energize the antenna and observe polarization initialization.
5. Verify that there are no current Polarization error codes.
6. Verify normal operation.

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11. Replacing LRU Components

Below are the procedures for replacing the Lowest Replaceable Units (LRUs) on the Sea Tel TV & THHD antennas. Read the entire procedure before commencing the replacement of this part.

11.1. Safety

The procedure should be completed by trained, authorized dealer, personnel. All work is to be completed in accordance with all local, state, and federal regulations and all shipboard safety protocols as applicable.

	**WARNING**: Electrical Hazard – Dangerous AC Voltages exist inside the LMXP Antenna Control Unit. Observe proper safety precautions when working inside the Antenna Control Unit.
	**CAUTION - PINCH HAZARD**: Use extreme caution when your fingers are near the belt drive systems of this antenna, even when antenna power is turned OFF. Do not put your fingers in between the belt and either sprocket.

11.2. Tools required

- 1/16 inch Allen Wrench
- 2.5mm Allen Wrench
- 3mm Allen Wrench
- 4mm Allen Wrench
- 5mm Allen Wrench
- 7/16” Open End Wrench
- 10mm Open End Wrench
- Diagonal Cutters
- Small flat blade screwdriver
- #1 (Small) Phillips screwdriver
- #2 (Medium) Phillips screwdriver
- Small rope, Web strap or short Bungee cord

11.3. Feed Tube Caution

	**CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector. This damage will not be covered under warranty.**

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11.4. Screw Torque

WARNING: The following values are for through bolted stainless steel hardware. Ensure that all screw/bolt assemblies are tightened according to the tightening torque values listed below:

Screw/Bolt	Kg-cm (In-lbs)	Screw/Bolt	Kg-cm (In-lbs)
4-40	7.1 (6.2)	**M2.5**	6.0 (5.2)
6-32	13.3 (11.5)	**M3**	10.6 (9.2)
8-32	24.3 (21.1)	**M3.5**	16.7 (14.5)
10-24	35.1 (30.5)	**M4**	24.7 (21.4)
12-24	55.3 (48.0)	**M5**	49.9 (43.3)
1/4-20	84.1 (73.0)	**M6**	84.7 (73.5)
5/I6-18	173.2 (150.3)	**M8**	205.5 (178.4)
3/8-16	307.4 (266.8)	**M10**	407.2 (353.4)
7/16-14	491.8 (426.9)	**M12**	710.2 (616.4)
1/2-13	750.4 (651.3)	**M14**	1130.4 (981.1)
9/16-12	1082.8 (939.8)	**M16**	1763.7 (1530.8)

11.5. Loctite Application:

11.5.1. <u>On Threaded Fasteners:</u>

1. Apply Loctite in small quantities (one to three drops), enough to "wet" the mating surface only.
2. Apply Loctite to one of the mating surfaces, identified as the best location for effective distribution to its mating surface. This may be on the screw thread, inside the threaded hole, or both. Note: Applied to holes, Loctite pushes through the hole. Applied to screws, Loctite pushes back up the screw.
3. Remove any excess Loctite immediately.

11.5.2. <u>Motor/Sprocket Assemblies (General):</u>

1. Loctite should be applied into the inside surface of the pulley/sprocket to keep the Loctite from being pushed back along the shaft. If the motor shaft is flattened on one side, apply Loctite to the opposite side as the set screw; put the set screw on the flat.
2. Apply Loctite 222 to set screw and thread it part way into the pulley/sprocket.
3. Apply a small amount of Loctite 638 to the inside edge of the pulley/sprocket.
4. Insert the pulley onto the motor shaft turning the pulley to spread the Loctite evenly.
5. Adjust the pulley to its proper height and tighten the set screw.
6. Remove any excess Loctite immediately to prevent excess from running donw the shaft and into the motor.
7. Allow Loctite to cure 5-10 minutes before installing the motor.

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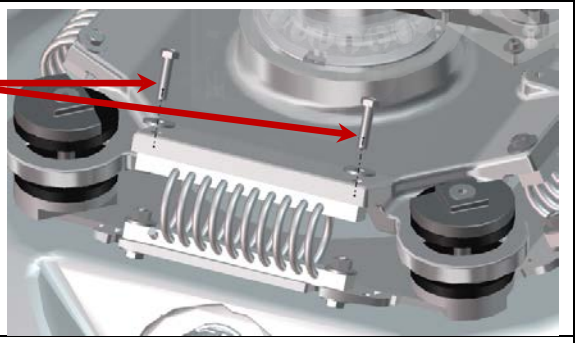
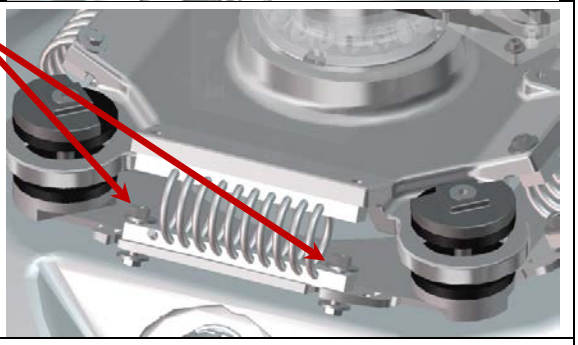
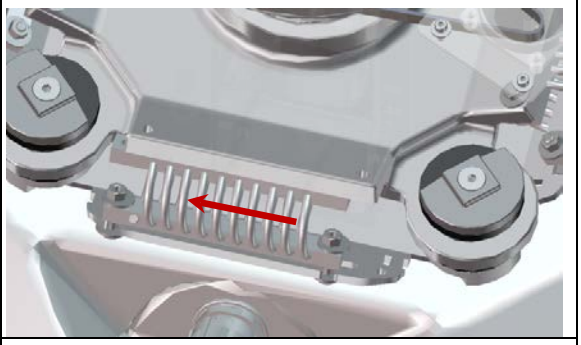
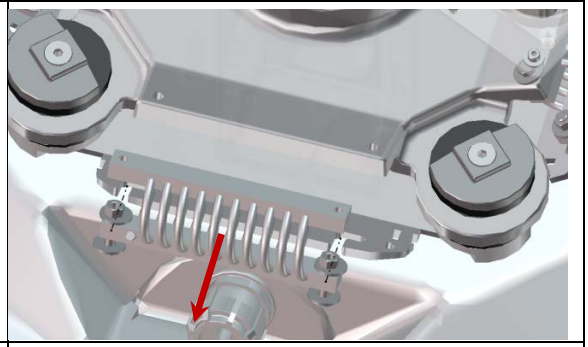
11.6. Replace Wire Rope Isolators

Use replacement kit PN S-67-141785 and follow this procedure for replacing the Wire Rope Isolators.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
3. Using a 10mm wrench, remove, and discard the top two bolts at each end of one of the wire rope isolators.	
4. Using two 10mm wrenches, loosen the bottom two bolts at each end of one of the wire rope isolators.	
5. Slide the failed wire rope to the left of the notches in the bottom plate.	
6. Pull the failed wire rope out from between the upper & lower base plates.	
7. Apply Loctite 2760 to two of the M6x25 bolts provided in the kit. Place a flat washer on each bolt and insert them UP through the bottom rail of the replacement wire rope isolator. 8. Place a flat washer and start a hex nut on each bolt above the bottom rail of the replacement wire rope isolator. 9. Leave these two bolts in the bottom rail of the replacement wire rope isolator loose.	

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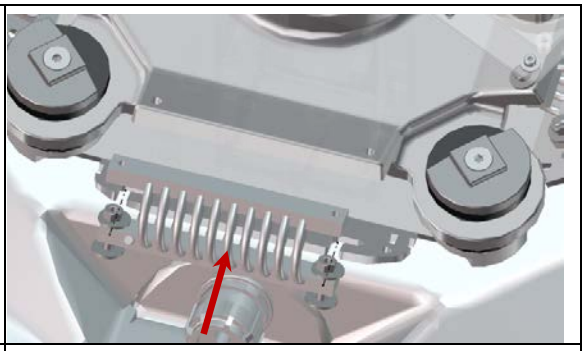
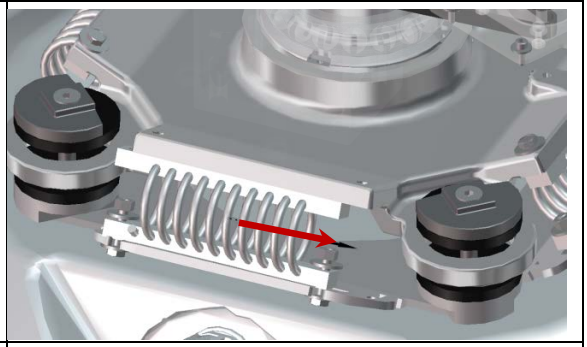
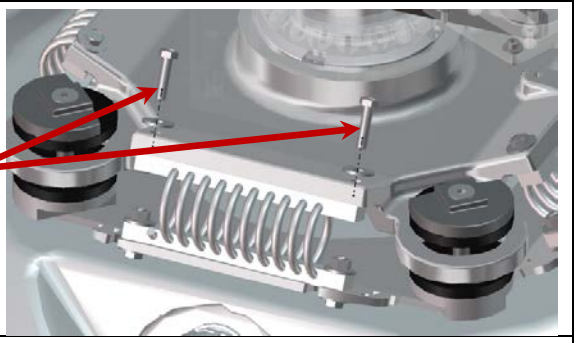
10. Insert the replacement wire rope isolator, between the upper & lower base plates, aligning the two bottom bolts into the notches in the bottom plate. Assure that the flat washer is below the bottom base plate.	
11. Slide the replacement wire rope to the right of the notches in the bottom plate.	
12. Apply Loctite 2760 to two of the M6x25 bolts provided in the kit. 13. Place a flat washer on each bolt and insert them down through the upper base plate into the threaded holes in the top rail of the replacement wire rope isolator.	
14. Using two 10mm wrenches, tighten the upper and lower bolts to 75.3 Kg-cm. 15. Repeat steps 3 through 14 to replace each of the other three wire rope isolators.	
16. If all repair work is completed, check all connections. 17. Remove all parts, tools, and debris from the radome.	
18. Turn the power ON at the LMXP. 19. Watch the antenna initialize. 20. Check fine balance the antenna.	
21. Apply power to the other Below Decks Equipment, and either allow the system to target a desired satellite, or target it manually. 22. Verify normal operation of all Above Decks and Below Decks Equipment. 23. Close and secure the radome hatch.	

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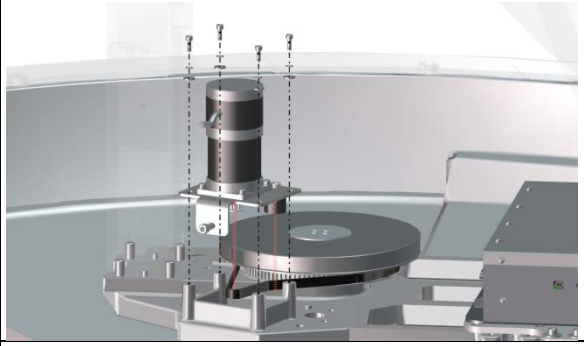
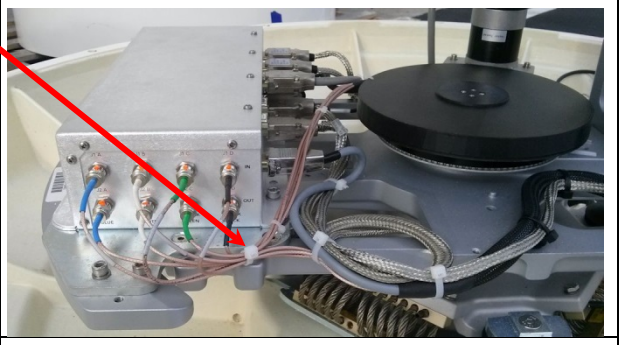
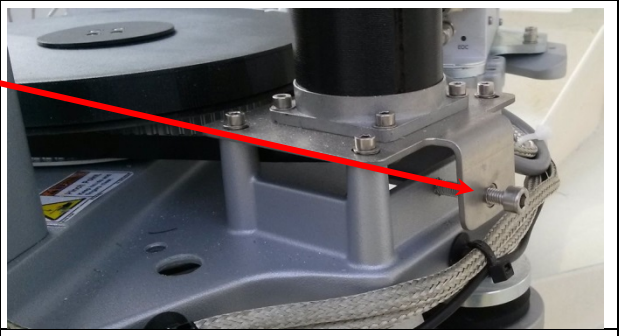
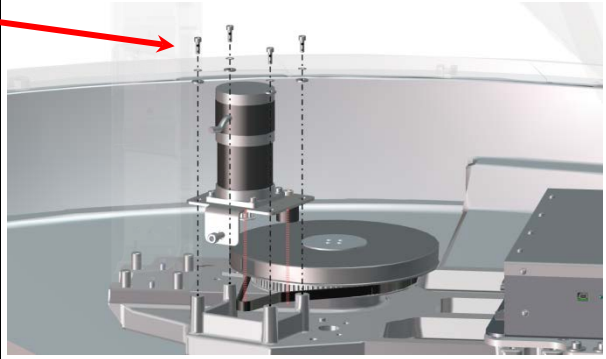
11.7. Replacing the Azimuth Drive Belt

Use replacement kit PN S-67-141501 and follow this procedure for replacing the Azimuth Drive Belt.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The figure on the right is an overview of the AZ Drive Belt with the AZ motor, idler, Drive Sprocket, and Driven Socket.	
3. Using diagonal cutters, carefully cut the cable tie that secures the coaxes from the spooler to the pedestal coaxes. 4. Using a 7/16 inch open end wrench, remove the top 4 coaxes from the TICU. NOTE: These coaxes must be removed from the TICU to replace the belt.	
5. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the Azimuth belt, but do not remove it.	
6. Using a 4mm Allen wrench, remove the 4 screws that mount the azimuth motor bracket assembly to the pedestal. 7. Lift the motor assembly up and decouple the defective azimuth belt from the drive sprocket. 8. Remove the defective belt from around the spooler. 9. While holding the AZ motor above the mounting location, slide the AZ belt onto the AZ Drive sprocket on the AZ motor. Be sure that the AZ belt is on the correct side of the idler (the belt must go between the Drive sprocket and the idler - in sort of an S-shape).	

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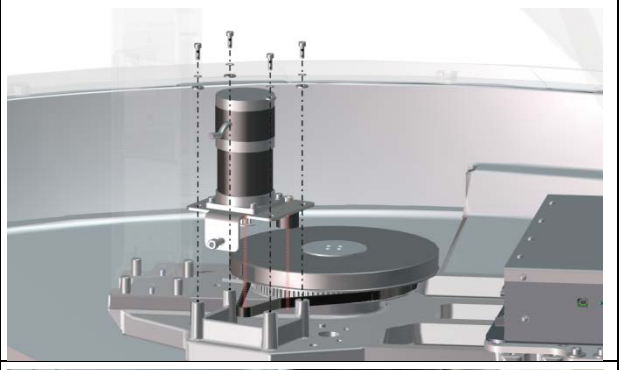
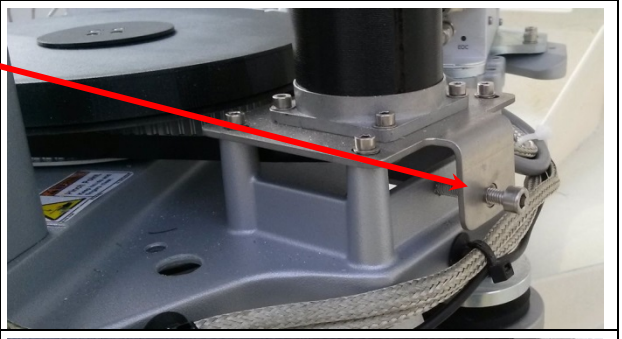
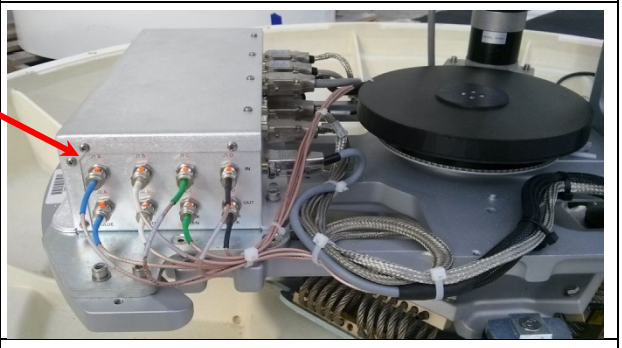
10. Set the AZ motor assembly on its mounting. 11. Apply Loctite 242 to the hardware removed in step 9 above. 12. Install a screw and flat washer in each of the 4 mounting slotted mounting holes. Do NOT tighten them yet NOTE: These screws need to be tightened enough to prevent the motor assembly from tilting off vertical, but loose enough to allow the bracket to slide on the slotted holes.	
13. Using a 5mm Allen wrench, rotate the Tensioner screw CW to increase tension on the Azimuth belt. 14. Ensure that the teeth of the belt are properly mated with the teeth of the drive and the driven sprocket	
15. Twist the belt between your forefinger and thumb to test how far you can twist it. 16. Slowly increase the belt tension until the belt *cannot easily* be twisted more than ¼ turn. 17. Using a 4mm Allen wrench, tighten the 4 motor assembly mounting screws.	
18. Reconnect the top 4 coaxes to the TICU. Ensure that they are in the correct order (left to right) Blue, White, Green & Black. 19. Using a 7/16 inch open end wrench, tighten the 4 coaxes.	
20. Install new cable ties where ones were removed in step 3 above. 21. Using diagonal cutters, carefully trim off excess cable tie length.	
22. If all repair work is completed, check all connections. 23. Remove all parts, tools, and debris from the radome.	
24. Turn the power ON at the LMXP. 25. Watch the antenna initialize. 26. Check fine balance the antenna.	

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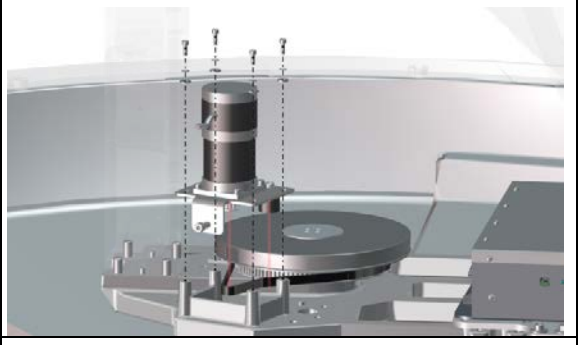
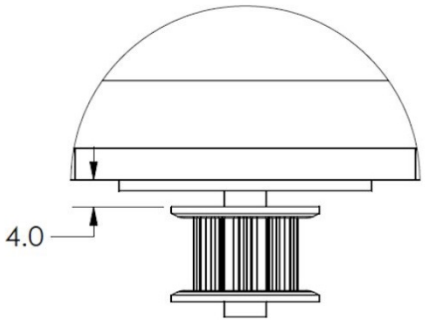
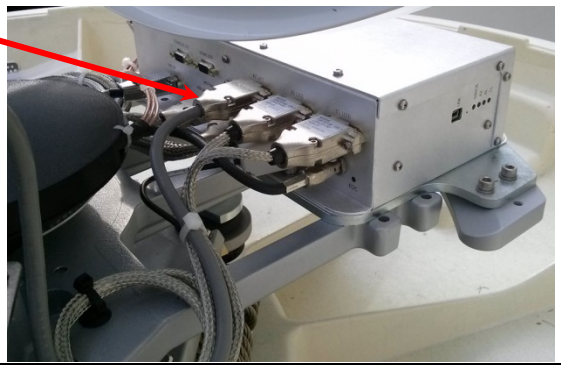
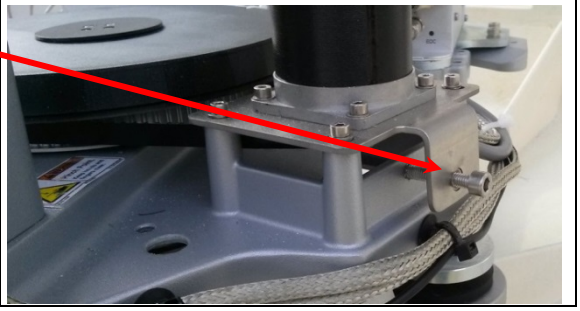
27. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 28. Verify normal operation of all Above Decks and Below Decks Equipment. 29. Close and secure the radome hatch.	

11.8. Replacing the Azimuth Motor

Use replacement kit PN S-67-147513 and follow this procedure for replacing the Azimuth Motor.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The figure on the right is an overview of the AZ Drive Belt with the AZ motor, idler, Drive Sprocket, and Driven Socket.	
3. On the replacement azimuth motor: 4. Apply Loctite 638 to the internal hub of the sprocket and place it onto the motor shaft spaced 4.0mm from the motor case as shown in the graphic to the right. 5. Apply Loctite 222 onto the set-screw and secure the sprocket to the motor shaft using a 1/16 inch Allen wrench.	
6. Using a small flat blade screwdriver, remove the azimuth motor cable from the TICU. 7. Using diagonal cutters, carefully cut the cable ties that secure the azimuth motor cable to other harnessing and the pedestal.	
8. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the Azimuth belt, but do not remove it.	

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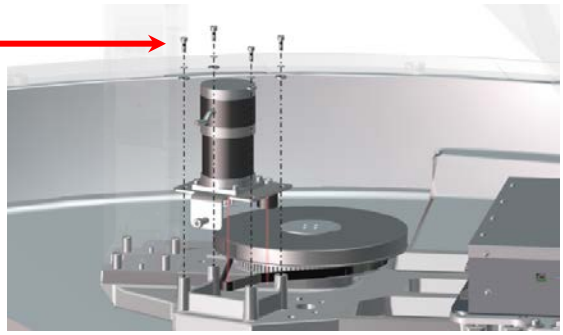
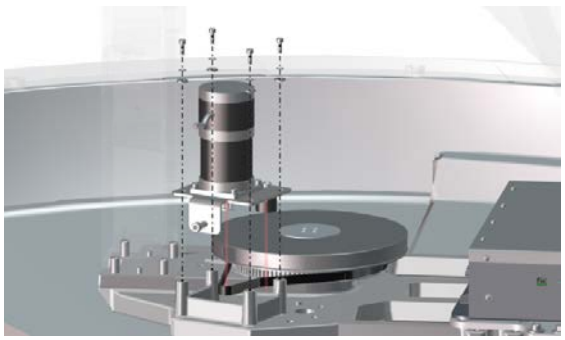
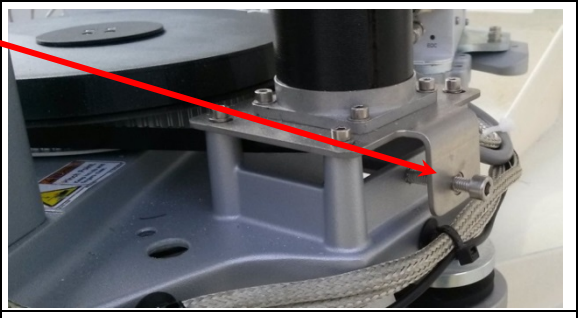
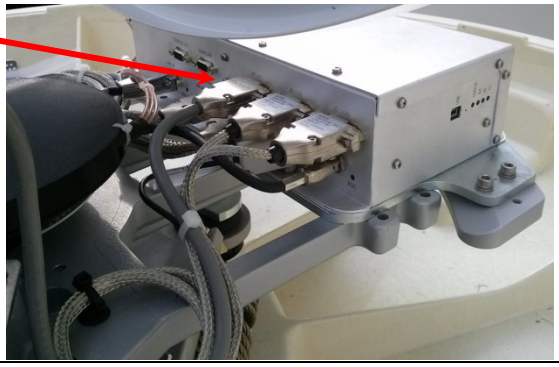
9. Using a 4mm Allen wrench, remove the 4 screws that mount the azimuth motor bracket assembly to the pedestal. 10. Lift the motor assembly up and decouple the azimuth belt from the drive sprocket. 11. Remove the defective AZ motor. 12. While holding the replacement AZ motor above the mounting location, slide the AZ belt onto the AZ Drive sprocket on the AZ motor. Be sure that the AZ belt is on the correct side of the idler (the belt must go between the Drive sprocket and the idler - in sort of an S-shape).	
13. Set the AZ motor assembly on its mounting. 14. Apply Loctite 242 to the hardware removed in step 9 above. 15. Install a screw and flat washer in each of the 4 mounting slotted mounting holes. Do NOT tighten them yet NOTE: These screws need to be tightened enough to prevent the motor assembly from tilting off vertical, but loose enough to allow the bracket to slide on the slotted holes.	
16. Using a 5mm Allen wrench, rotate the Tensioner screw CW to increase tension on the Azimuth belt.	
17. Twist the belt between your fore finger and thumb to test how far you can twist it. 18. Slowly increase the belt tension until the belt *cannot easily* be twisted more than ¼ turn. 19. Using a 4mm Allen wrench, tighten the 4 motor assembly mounting screws.	
20. Using a small flat blade screwdriver, install the azimuth motor cable to the TICU. 21. Install new cable ties where ones were removed in steps 7 above. 22. Using diagonal cutters, carefully trim off excess cable tie length.	

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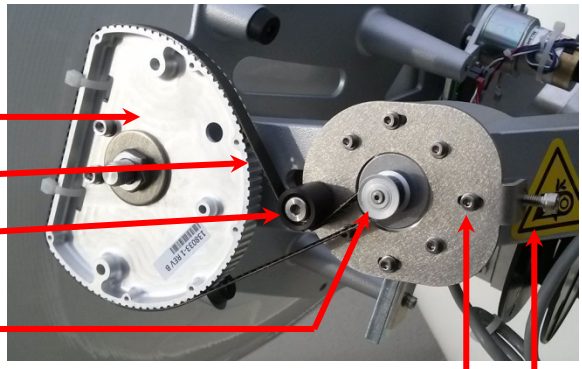
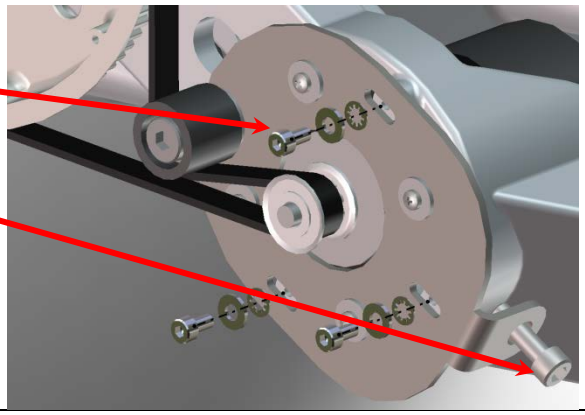
23. If all repair work is completed, check all connections. 24. Remove all parts, tools, and debris from the radome.	
25. Turn the power ON at the LMXP. 26. Watch the antenna initialize. 27. Check fine balance the antenna.	
28. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 29. Verify normal operation of all Above Decks and Below Decks Equipment. 30. Close and secure the radome hatch.	

11.9. Replacing the Elevation Drive Belt

Use replacement kit PN S-67-141501 and follow this procedure for replacing the Elevation (EL) Drive Belt.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the EL Driven Sprocket, Drive Belt, Idler, Driver Sprocket, and Motor Mounting Screws. EL Driven Sprocket EL Drive Belt Idler EL Drive Sprocket Motor Mounting Screw Tensioner screw	
3. Using a 4mm Allen wrench, loosen the 3 bracket mounting screws (the ones in the slotted holes). They only need to be loose enough for the bracket to move on the slotted holes. Do not remove them completely. 4. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the EL belt, but do *not* remove the Tensioner screw.	

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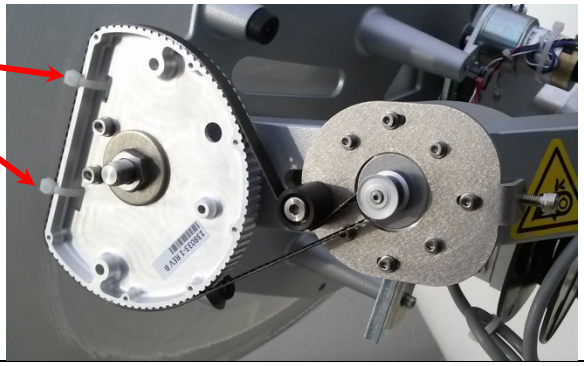
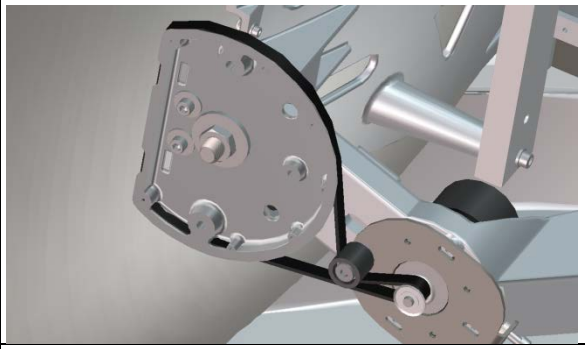
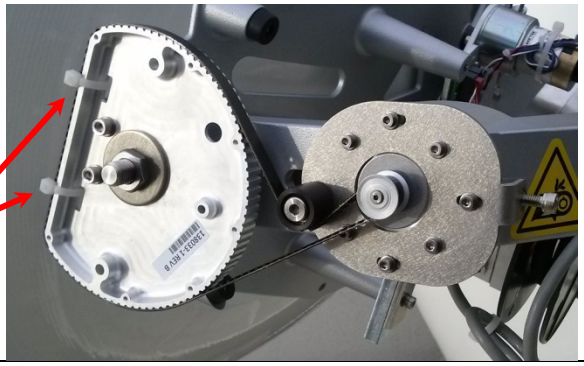
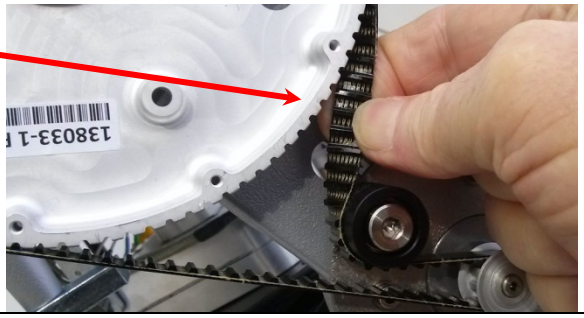
5. Cut the two cable ties across the flat top of the EL driven sprocket. 6. Remove the defective EL belt.	
7. Couple the replacement EL belt onto the drive sprocket and route it around the under-side of the idler as shown. 8. Tilt the elevation of the reflector to about 45 degrees and mate the teeth in the right side of the belt onto the right side of the driven sprocket. 9. Pull the belt tight across the top of the driven sprocket and mate the teeth down around the left side of the driven sprocket.	
10. Using a 5mm Allen wrench, slowly tighten the Tensioning screw CW to increase the tension on the belt. 11. Ensure that the teeth of the belt are properly mated with the teeth of the drive and the driven sprockets 12. Install two cable ties where the ones were removed in step 5 above. 13. Using diagonal cutters, carefully trim off excess cable tie length.	
14. Twist the belt between your forefinger and thumb to test how far you can twist it. 15. Slowly increase the belt tension until the belt *cannot easily* be twisted more than ¼ turn. 16. Using a 4mm Allen wrench, tighten the 3 bracket mounting screws.	
17. If all repair work is completed, check all connections. 18. Remove all parts, tools, and debris from the radome.	
19. Turn the power ON at the LMXP. 20. Watch the antenna initialize. 21. Check fine balance the antenna.	
22. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 23. Verify normal operation of all Above Decks and Below Decks Equipment. 24. Close and secure the radome hatch.	

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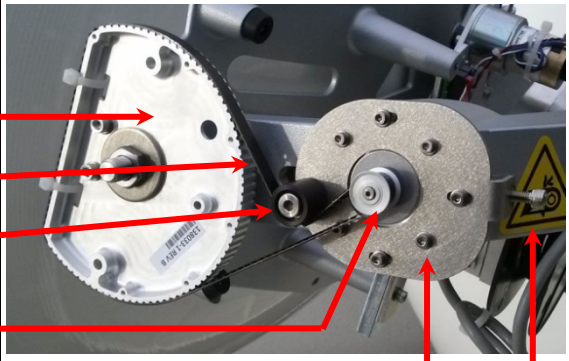
11.10. Replacing the Elevation Motor

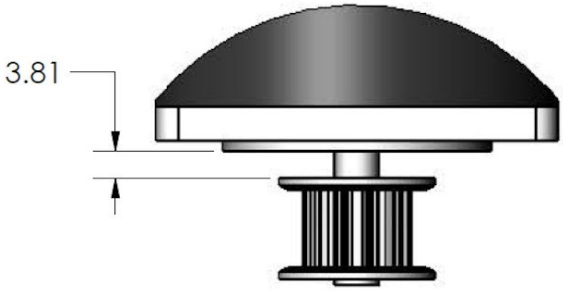
Use replacement kit PN S-134930 and follow this procedure for replacing the Elevation (EL) Motor.

1. Turn the power OFF at the LMXP.
2. Open the radome hatch.

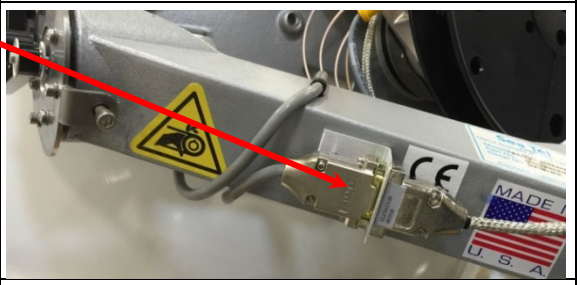
The picture on the right shows the EL Driven Sprocket, Drive Belt, Idler, Driver Sprocket, and Motor Mounting Screws.



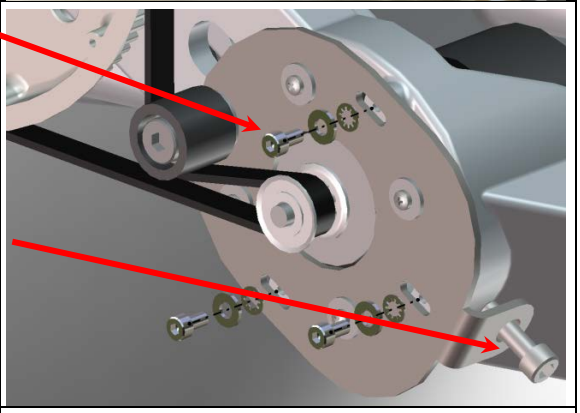
3. On the replacement EL motor:
4. Apply Loctite 638 to the internal hub of the sprocket and place it onto the motor shaft spaced 3.81mm from the motor case as shown in the graphic to the right.
5. Apply Loctite 222 onto the set-screw and secure the sprocket to the motor shaft using a 1/16 inch Allen wrench.



6. Using a small flat blade screwdriver, disconnect the elevation motor cable from the interconnect bracket.
7. Using diagonal cutters, carefully cut the tie wraps that secure the EL motor cable to the pedestal.



8. Using a 4mm Allen wrench, loosen the 3 bracket mounting screws (the ones in the slotted holes). They only need to be loose enough for the bracket to move on the slotted holes. Do not remove them completely.
9. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the EL belt, but do *not* remove the Tensioner screw.



10. Decouple the EL belt from under the idler and off of the drive sprocket.

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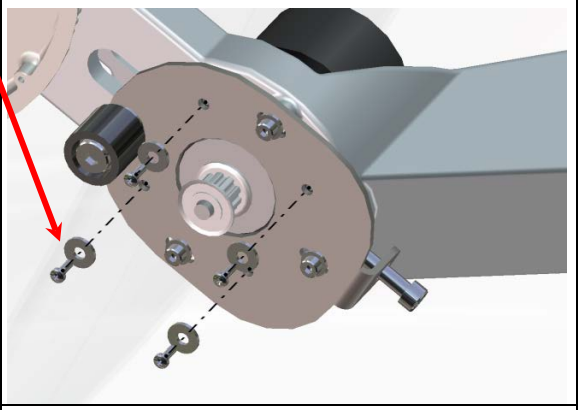
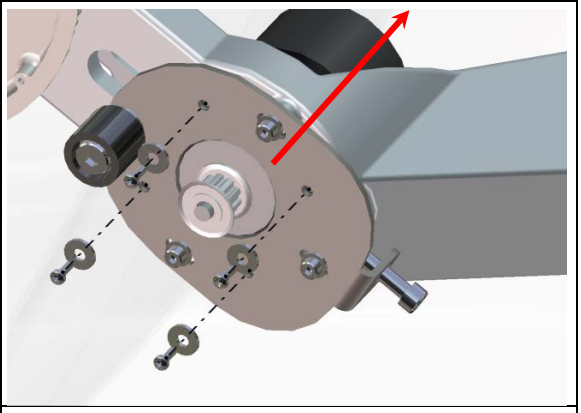
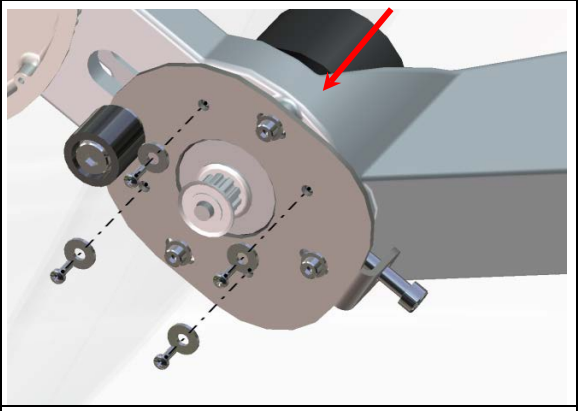
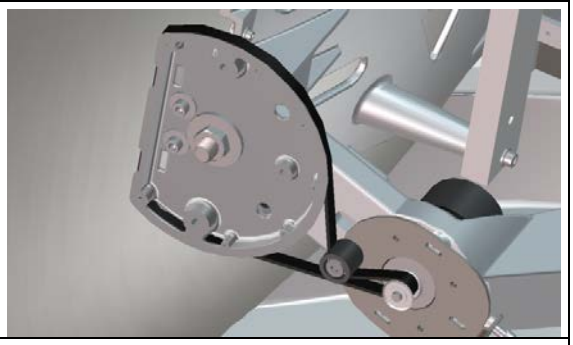
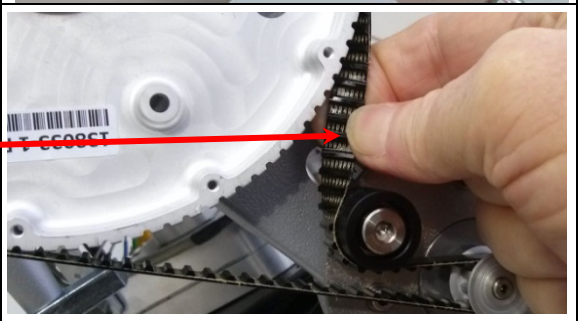
11. Using a 3mm Allen wrench, remove the 4 screws and washers that secure the failed elevation motor to the bracket. Retain this hardware.	
12. Take note of the cable orientation, remove and discard the failed elevation motor from the other side of the pedestal (toward the LNB).	
13. Insert the replacement EL motor in the same location as the failed elevation motor that you just removed. 14. Apply Loctite 242 to the 4 motor mounting screws. 15. Using a 3mm Allen wrench, install the 4 screws and washers removed in step 11 above, to mount the replacement EL motor to the bracket.	
16. Route the EL belt onto the drive sprocket and under the idler. Be sure that the EL belt is on the under-side of the idler.	
17. Using a 5mm Allen wrench, slowly tighten the Tensioning screw CW to increase the tension on the belt. 18. Twist the belt between your forefinger and thumb to test how far you can twist it. 19. Slowly increase the belt tension until the belt *cannot easily* be twisted more than ¼ turn. 20. Using a 4mm Allen wrench, tighten the 3 bracket mounting screws.	

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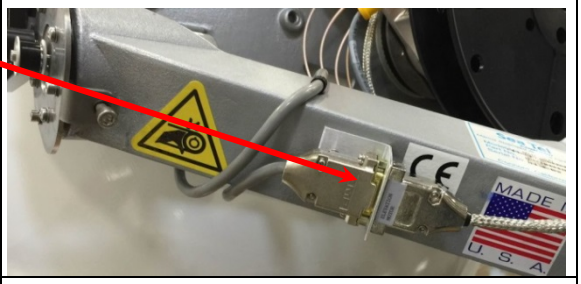
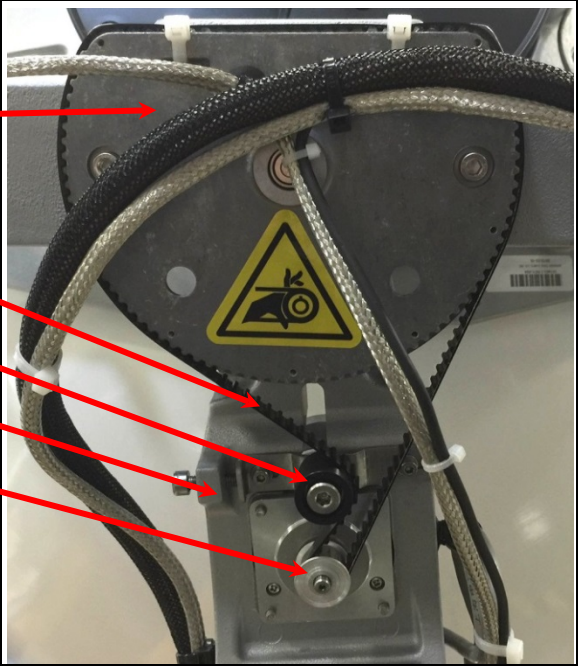
21. Using a small flat blade screwdriver, connect the elevation motor cable to the interconnect bracket. 22. Install new cable ties where ones were removed in step 7 above. 23. Using diagonal cutters, carefully trim off excess cable tie length.	
24. If all repair work is completed, check all connections. 25. Remove all parts, tools, and debris from the radome.	
26. Turn the power ON at the LMXP. 27. Watch the antenna initialize. 28. Check fine balance the antenna.	
29. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 30. Verify normal operation of all Above Decks and Below Decks Equipment. 31. Close and secure the radome hatch.	

11.11. Replacing Cross-Level Drive Belt

Use replacement kit PN S-67-141501 and follow this procedure for replacing the Cross-Level (CL) Drive Belt.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the CL Driven Sprocket, Drive Belt, Idler, Driver Sprocket, and Motor Mounting Screws. CL Driven Sprocket CL Drive Belt Idler Tensioner screw CL Drive Sprocket	

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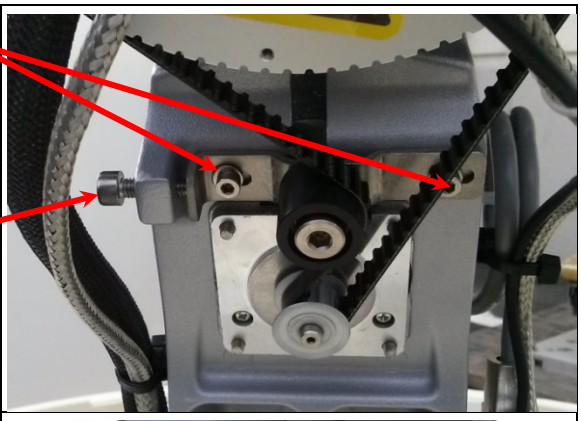
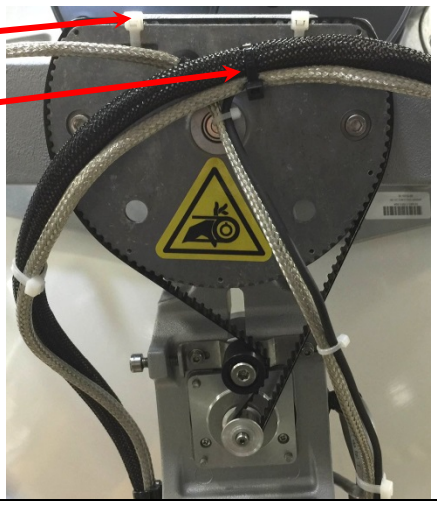
3. Using a 4mm Allen wrench, loosen the 2 bracket mounting screws (the ones in the slotted holes). They only need to be loose enough for the bracket to move on the slotted holes. Do not remove them completely.
4. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the CL belt, but do not remove the Tensioner screw.

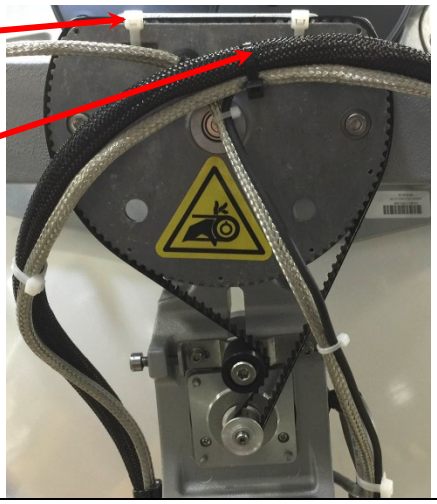


5. Cut the two cable ties across the flat top of the CL driven sprocket.
6. Cut the cable ties that hold the harnesses to the face of the CL driven sprocket.
7. Slide the top of the belt off the top of the driven sprocket.
8. Decouple the CL belt from the right side of the idler and off the drive sprocket.
9. Discard the defective CL belt.



10. Couple the replacement CL belt onto the drive sprocket and route it around the right side of the idler.
11. Tilt the cross-level beam to the right and mate the teeth in the right side of the belt onto the right side of the driven sprocket.
12. Pull the belt tight across the top of the driven sprocket and mate the teeth down around the left side of the driven sprocket.
13. Using a 5mm Allen wrench, slowly tighten the Tensioning screw CW to increase the tension on the belt.
14. Ensure that the teeth of the belt are properly mated with the teeth of the drive and the driven sprocket.

15. Install two cable ties where the ones were removed in step 5 above.
16. Tilt the cross-level beam to the left until it is approximately level.
17. Install the cable ties that hold the harnesses to the face of the CL driven sprocket where the ones were removed in step 6 above.
18. Using diagonal cutters, carefully trim off excess cable tie length.



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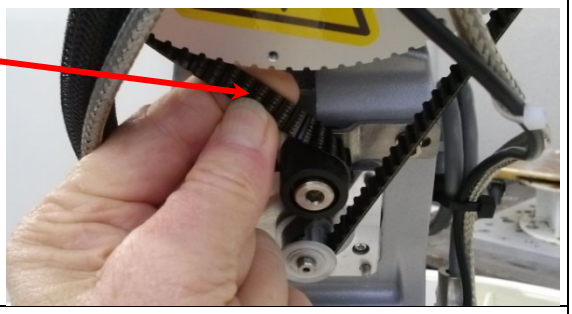
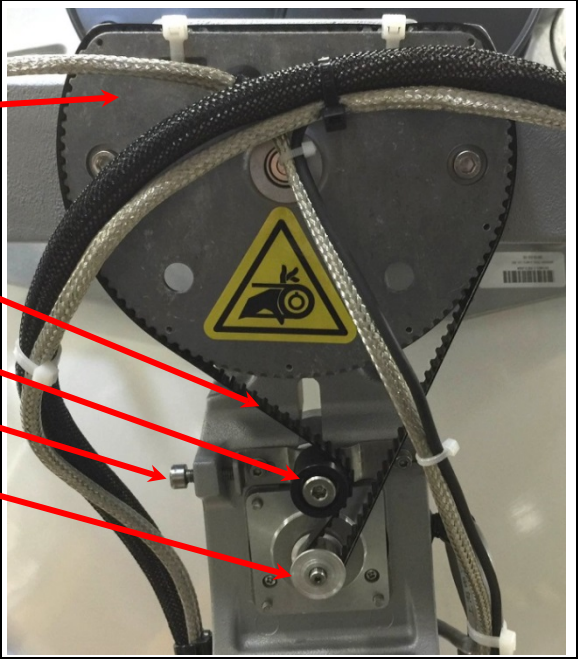
19. Twist the belt between your finger and thumb to test how far you can twist it. 20. Slowly increase the belt tension until the belt cannot easily be twisted more than ¼ turn. 21. Using a 4mm Allen wrench, tighten the two bracket mounting screws.	
22. If all repair work is completed, then check all connections. 23. Remove all parts, tools, and debris from the radome.	
24. Turn the power ON at the LMXP. 25. Watch the antenna initialize. 26. Check the fine balance of the antenna.	
27. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 28. Verify normal operation of all Above Decks and Below Decks Equipment. 29. Close and secure the radome hatch.	

11.12. Replacing the Cross-Level Motor

Use replacement kit PN S-134930 and follow this procedure for replacing the Cross-Level (CL) Motor.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the CL Driven Sprocket, Drive Belt, Idler, Driver Sprocket, and Motor Mounting Screws. CL Driven Sprocket CL Drive Belt Idler Tensioner screw CL Drive Sprocket	

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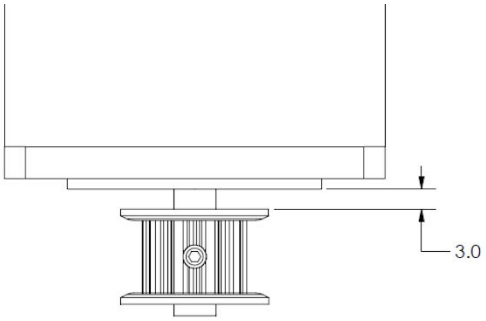
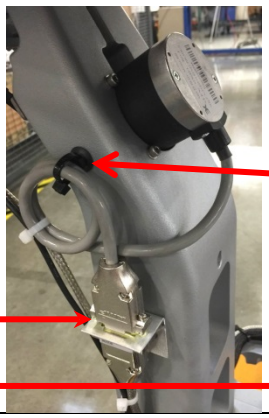
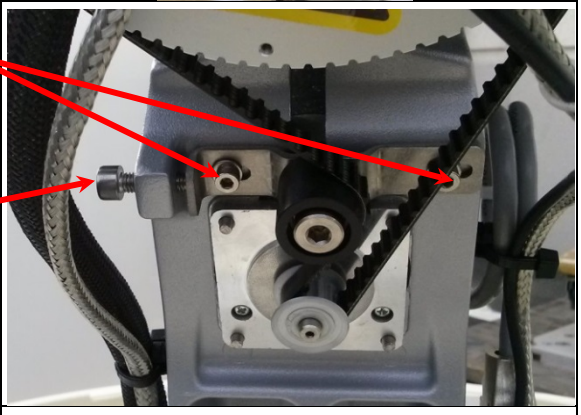
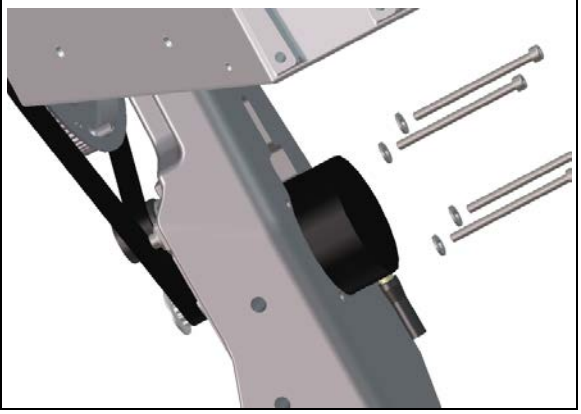
3. On the replacement CL motor: 4. Apply Loctite 638 to the internal hub of the sprocket and place it onto the motor shaft spaced 3.0mm from the motor case as shown in the graphic to the right. 5. Apply Loctite 222 onto the set-screw and secure the sprocket to the motor shaft using a 1/16 inch Allen wrench.	
6. Using a small flat blade screwdriver, disconnect the CL motor cable from the interconnect bracket. 7. Use diagonal cutters to carefully cut the cable ties that secure the CL motor cable to the pedestal.	
8. Using a 4mm Allen wrench, loosen the 2 bracket mounting screws (the ones in the slotted holes). They only need to be loose enough for the bracket to move on the slotted holes. Do not remove them completely. 9. Using a 5mm Allen wrench, rotate the Tensioner screw CCW to loosen the tension on the CL belt, but do *not* remove the Tensioner screw.	
10. Decouple the CL belt from the right side of the idler and off of the drive sprocket.	
11. Using a 4mm Allen wrench, remove the 4 screws and washers that secure the failed CL motor, through the AZ post and into the threaded holes in the mounting shroud of the motor. Retain this hardware.	

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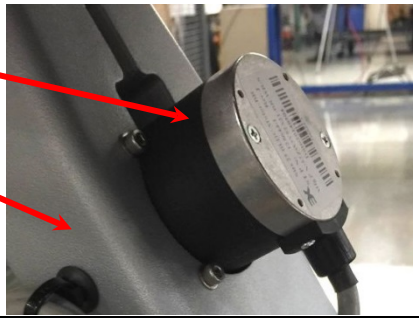
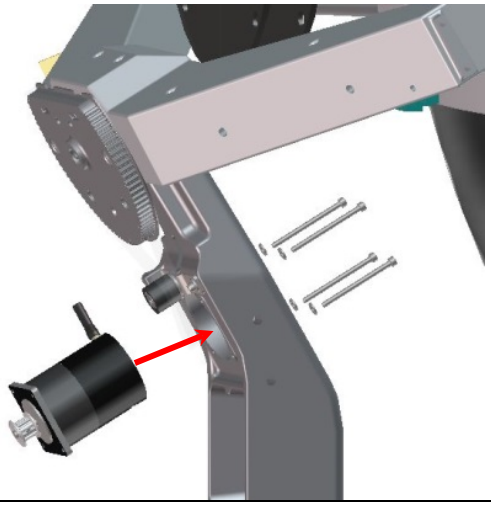
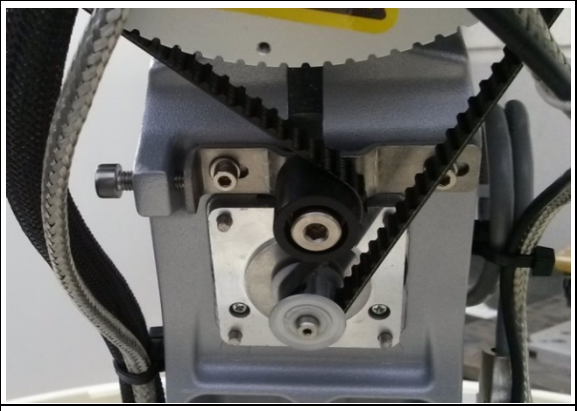
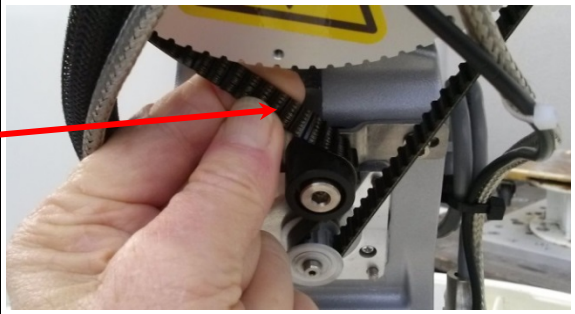
12. Rotate the motor as necessary to align the motor cable to the cutout in the AZ post. 13. Remove and discard the failed CL motor out through the back of the AZ post.	
14. Feed the motor cable connector through the AZ post. 15. Rotate the motor as necessary to align the motor cable to the cutout in the AZ post. 16. Insert the replacement CL motor in through the AZ post and align the threaded holes in the mounting shroud of the motor to the holes in the AZ post. **Note**: After inserting the motor through the post, it can be rotated and mounted with the motor cable facing up or down.	
17. Apply Loctite 242 to the 4 motor mounting screws. 18. Using a 3mm Allen wrench, install the 4 screws and washers removed in step 11 above, to mount the replacement CL motor to the AZ post.	
19. Route the CL belt onto the drive sprocket and around the right side of the idler as shown. Be sure that the CL belt is on the right side of the idler.	
20. Using a 5mm Allen wrench, slowly tighten the Tensioning screw CW to increase the tension on the belt. 21. Twist the belt between your forefinger and thumb to test how far you can twist it. 22. Slowly increase the belt tension until the belt *cannot easily* be twisted more than ¼ turn. 23. Using a 4mm Allen wrench, tighten the 2 bracket mounting screws.	

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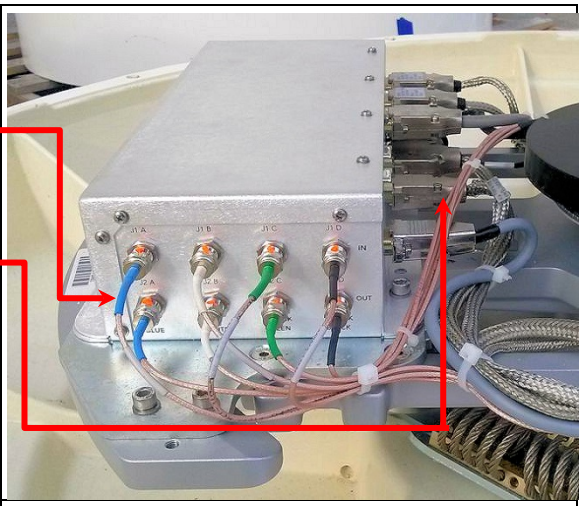
24. Using a small flat blade screwdriver, connect the CL motor cable to the interconnect bracket. 25. Install new cable ties where ones were removed in step 7 above. 26. Using diagonal cutters, carefully trim off excess cable tie length.	
27. If all repair work is completed, check all connections. 28. Remove all parts, tools, and debris from the radome.	
29. Turn the power ON at the LMXP. 30. Watch the antenna initialize. 31. Check fine balance the antenna.	
32. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 33. Verify normal operation of all Above Decks and Below Decks Equipment. 34. Close and secure the radome hatch.	

11.13. Replacing the Television Integrated Control Unit (TICU)

Use replacement kit PN S-67-141496 and follow this procedure for replacing the Television Integrated Control Unit (TICU).

A picture of the TICU is on the right. Eight coax cables are connected on one end of the TICU. All other cables are connected on the back side of the TICU. Three LEDs (DVB LOCK, STATUS, and EOC) are also there, for general TICU diagnostics. Four status LEDs (STATUS, AZ,EL, and CL) are on the end that is opposite from the coax cables. These LEDs are used for motor drive status & diagnostics.	
1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
3. Disconnect the eight coax cables from the TICU. 4. The input (from the AZ spooler) coax cables on the top row, from left to right are: • J1A (Blue) • J1B (White)	

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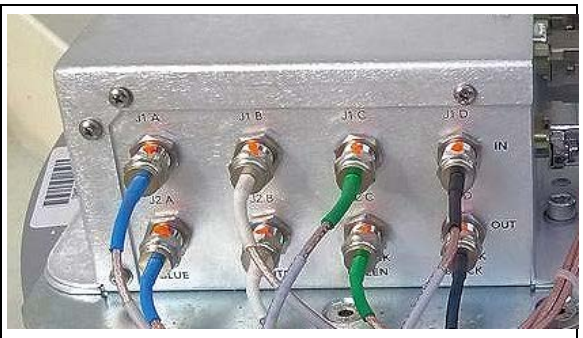
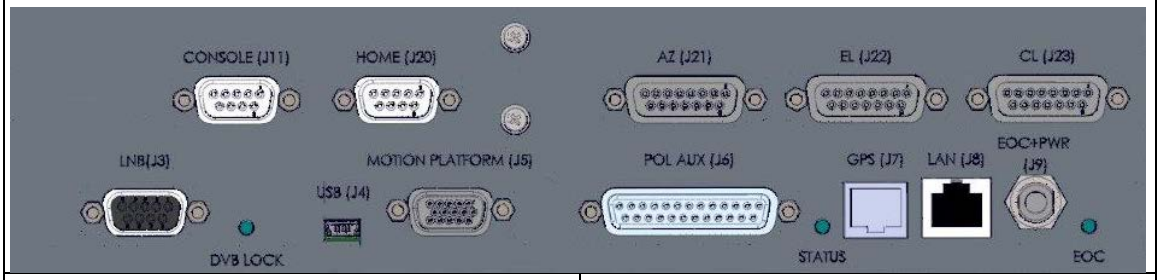
- J1C (Green)
- J1D (Black)

5. The output (to the pedestal harness) coax cables on the bottom row, from left to right are:
   - J2A (Blue)
   - J2B (White)
   - J2C (Green)
   - J2D (Black)



The following figure shows the TICU rear panel connections. Three LEDs (DVB LOCK, STATUS, and EOC) also are shown, and they are used for general TICU diagnostics.



6. Disconnect the other TICU cables from the TICU. Sea Tel recommends that you remove the connections in the following order.
   - J11 CONSOLE (**not connected-leave vacant**)
   - J20 HOME (**not connected-leave vacant**)
   - J21 AZ - Azimuth motor drive.
   - J22 EL - Elevation motor drive.
   - J23 CL - Cross-Level motor drive.
   - J3 LNB - LNB voltage and control.
   - J4 USB (**not connected-leave vacant**)
   - J5 MOTION PLATFORM - Motion Platform voltage and signals.
   - J6 POL AUX - Polarization motor voltage & encoder signals.
   - J9 EOC+PWR - Antenna voltage & control signals.
   - J8 LAN (**not connected-leave vacant**)
   - J7 GPS - GPS voltage & signals. **The ferrite bead must be lifted up to access the release tab on the bottom of the RJ-11 connector.**
7. The LEDs (DVB LOCK, STATUS, and EOC) are used for diagnostics.

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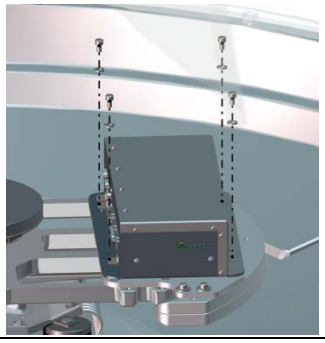
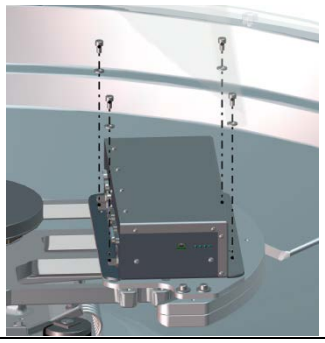
8. Using a 4mm Allen wrench, remove the 4 mounting screws and washers that secure the TICU to the mounting plate. Discard this hardware. 9. Carefully remove the failed TICU. 10. Package the TICU for return to Sea Tel. If the part was supplied for a warranty repair, you will receive a credit. If it is no longer in warranty, Sea Tel will repair and return the TICU to you for your spares, charging you only for the repair.	
11. Apply Loctite 242 to the 4 mounting screws provided in the replacement kit. 12. Set the replacement TICU in place on the mounting plate with rear panel connectors facing inward towards the azimuth spooler. 13. Using a 4mm Allen wrench, install the 4 mounting screws and washers that secure the TICU to the mounting plate.	
14. Reconnect the cables from the TICU. Sea Tel recommends that you connect the connections in the following order. • J7 GPS - GPS voltage & signals. • J8 LAN (**not connected-leave vacant**) • J9 EOC+PWR - Antenna voltage & control signals. • J6 POL AUX - Polarization motor voltage & encoder signals. • J5 MOTION PLATFORM - Motion Platform voltage & signals. • J4 USB (**not connected-leave vacant**) • J23 CL - Cross-Level motor drive. • J3 LNB - LNB voltage & control. • J22 EL - Elevation motor drive. • J21 AZ - Azimuth motor drive. • J20 HOME (**not connected-leave vacant**) • J11 CONSOLE (**not connected-leave vacant**)	

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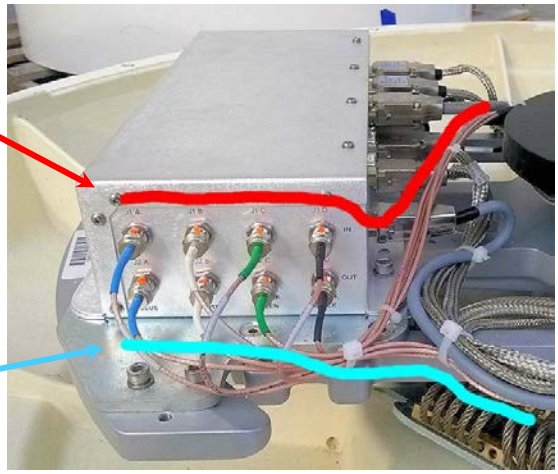
15. Reconnect the eight coax cables to the TICU. 16. The input (to the AZ spooler – path shown in red) coax cables on the top row, from left to right are: • J1A (Blue) • J1B (White) • J1C (Green) • J1D (Black) 17. The output (to the pedestal harness – path shown in light blue) coax cables on the bottom row, from left to right are: • J2A (Blue) • J2B (White) • J2C (Green) • J2D (Black)	
18. Install cable ties where they were removed in any of the steps above. 19. Using diagonal cutters, carefully trim off excess cable tie length.	
20. If all repair work is completed, check all connections. 21. Remove all parts, tools, and debris from the radome.	
22. Turn the power ON at the LMXP. 23. Watch the antenna initialize. 24. Check fine balance the antenna.	
25. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 26. Verify normal operation of all Above Decks and Below Decks Equipment. 27. Close and secure the radome hatch.	

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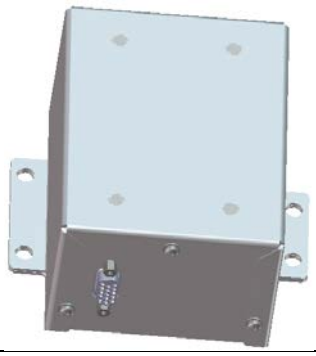
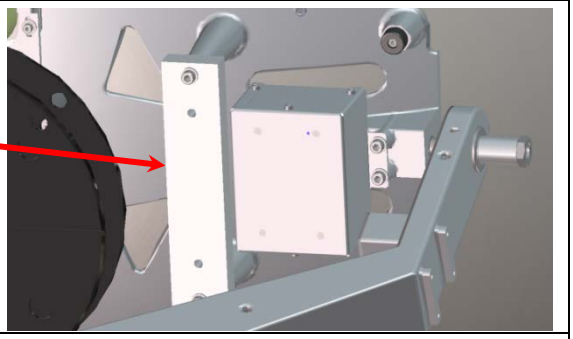
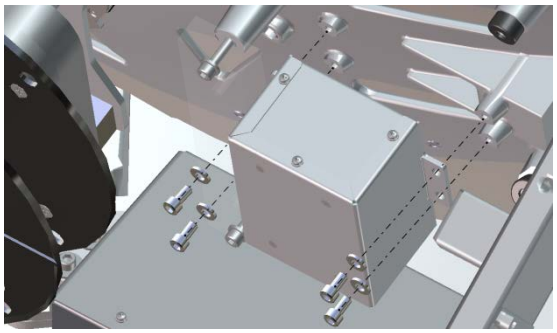
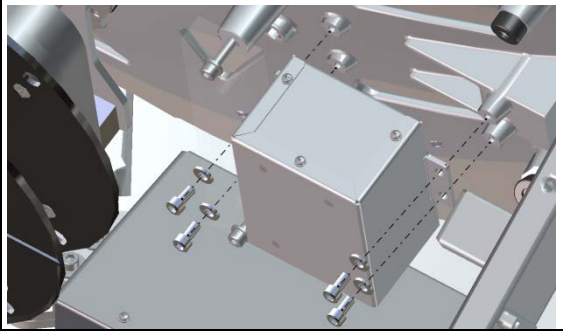
11.14. Replacing the Motion Platform

Use replacement kit PN S-67-141739 and follow this procedure for replacing the Motion Platform.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
A graphic of the Motion Platform subassembly is on the right. Notice the four mounting holes on the bracket, and the motion platform harness connector on the bottom.	
The Motion Platform subassembly is mounted on the right side of the back structure. The mounting screws on the left side of the motion platform are abscured by the counter-weight bar. **Do NOT remove the counter-weight bar**,	
3. Using a small flat blade screwdriver, disconnect the motion platform cable from the bottom of the failed Motion Platform. The counter-weight bar is hidden in this picture for clarity. Mounting screws on the left side are remove/installed under the counter-weight bar. **Do NOT remove the counter-weight bar**. 4. Using an 4mm Allen wrench, remove the 4 mounting screws and washers that secure the TICU to the mounting plate. Discard this hardware.	
5. Remove the failed Motion Platform. 6. Package the TICU for return to Sea Tel. If the part was supplied for a warranty repair, you will receive a credit. If it is no longer in warranty, Sea Tel will repair and return the TICU to you for your spares, charging you only for the repair.	
7. Apply Loctite 242 to the screws provided in the kit. 8. Hold the replacement Motion Platform in place. 9. Using a 4mm Allen wrench, install the 4 mounting screws and washers that secure the Motion Platform to the back structure. 10. Using a small flat blade screwdriver, connect the cable to the connector on the side of the replacement Motion Platform.	

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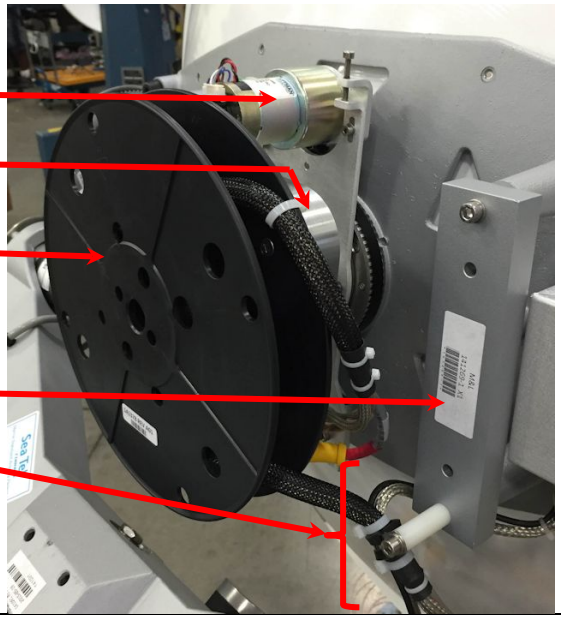
11. If all repair work is completed, check all connections. 12. Remove all parts, tools, and debris from the radome.	
13. Turn the power ON at the LMXP. 14. Watch the antenna initialize. 15. Check fine balance the antenna.	
16. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 17. Verify normal operation of all Above Decks and Below Decks Equipment. 18. Close and secure the radome hatch.	

11.15. Replacing the TV LNB

Use replacement kit PN S-67-141646 and follow this procedure for replacing the TV LNB.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the Feed Spooler. Polarization Motor LNB (under feed spooler) Feed Spooler Balance Counter-Weight Never adjust the screw or remove these cable ties.	

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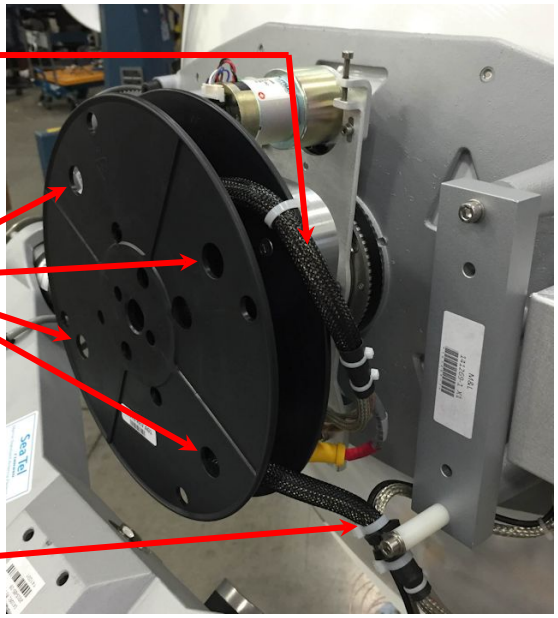
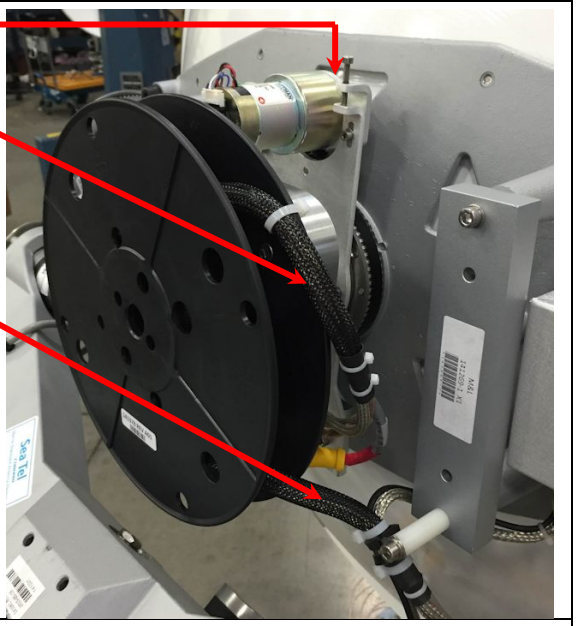
Harness to the LNB

Mounting screw access holes (4)

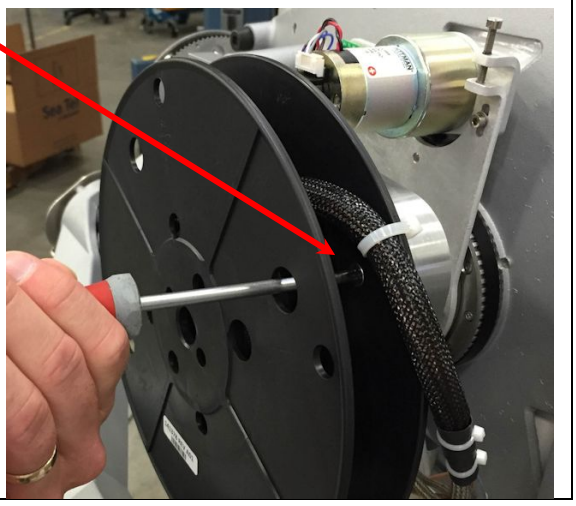
Harness to the pedestal



3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.
4. Note the orientation of the harness that goes to the LNB.
5. Note the orientation of the harness that goes to the pedestal.



6. Using a #2 Phillips screwdriver, through each of the access holes, remove the 4 Phillips flathead feed spooler mounting screws.



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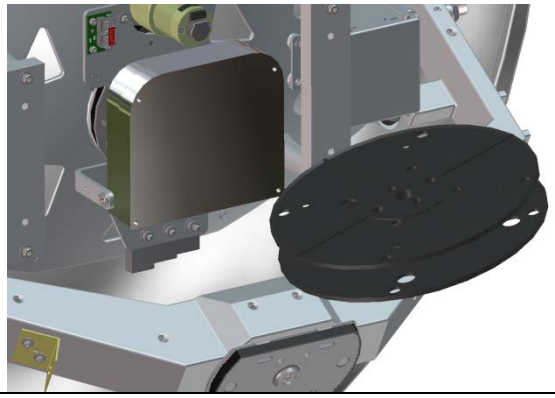
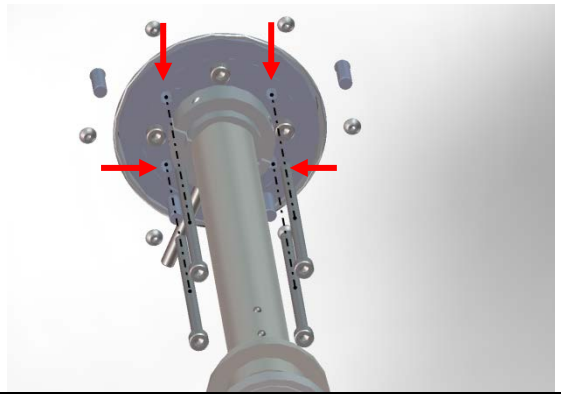
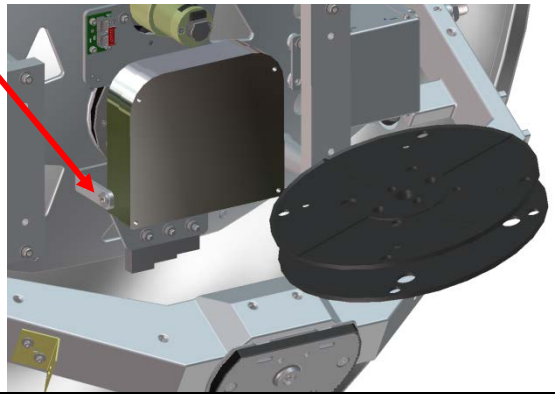
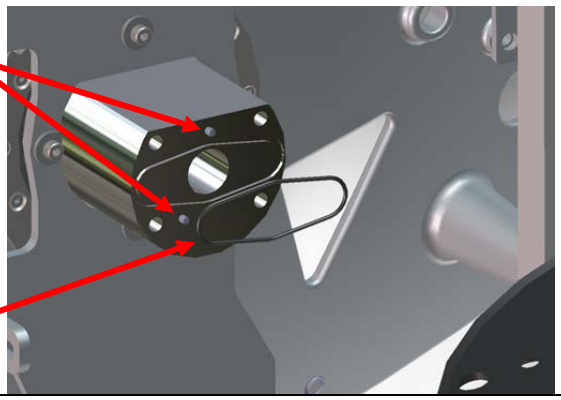
7. Lay the feed spooler to the right side of the cross-level beam.	
8. Using a 7/16" open end wrench, remove the 4 coaxes from the bottom of the LNB. 9. Unscrew the M&C cable from the bottom of the LNB.	
CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector. 10. Rotate the reflector around to access the front of the reflector. 11. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange. 12. Rotate the reflector around to access the rear of the reflector.	
13. While holding the LNB, use a 4mm Allen wrench to remove the LNB retainer screw. 14. Remove the defective LNB.	
15. Note the two guide pins in the end of the feed. These lock the orientation of the LNB to the feed. 16. If the rubber o-ring gasket is in the end of the feed, remove it. 17. Install the new rubber o-ring gasket, provided with the LNB, in the end of the feed.	

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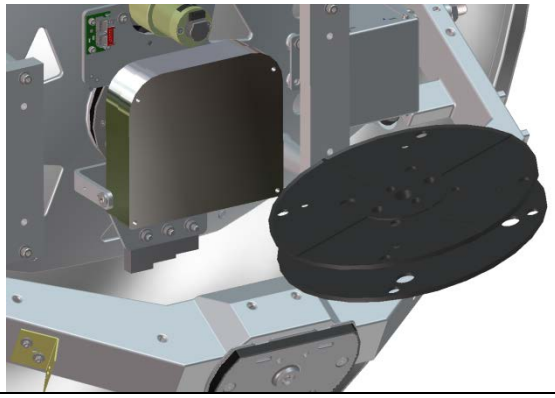
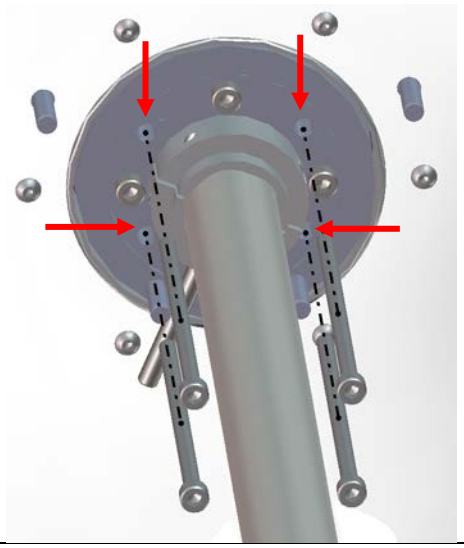
18. Apply Loctite 242 to the replacement screws provided in the kit.
19. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being installed).
20. While holding the replacement LNB in place, tightly against the end of the feed to mate the guide pins, use a 4mm Allen wrench to install and tighten the LNB retainer screw.



CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

21. Rotate the reflector around to access the front of the reflector.
22. Using a 4mm Allen wrench, install the 4 long LNB mounting screws through the feed tube flange & feed and into the LNB. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left.
23. Tighten all 4 screws.
24. Rotate the reflector around to access the rear of the reflector.

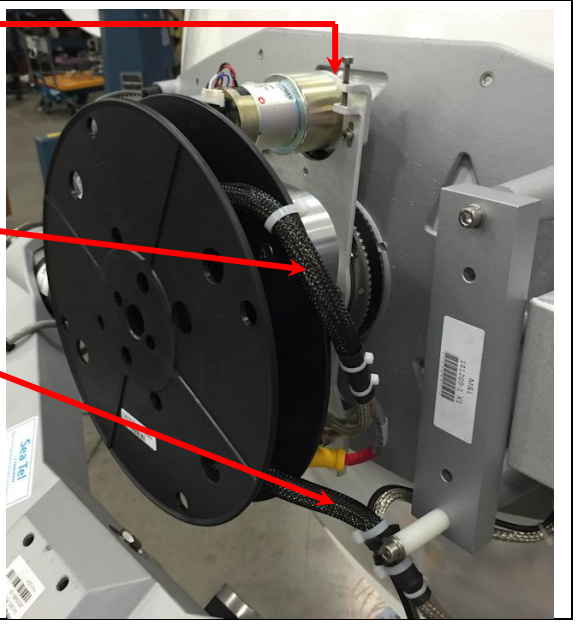


25. Screw the M&C cable onto the bottom of the LNB.
26. Using a 7/16" open end wrench, reconnect and tighten the 4 coaxes to the bottom of the LNB.

27. With the polarization motor at the top center of the reflector back-frame;
28. Hold the feed spooler orientated with the harnesses as shown.

LNB Harness

Pedestal Harness



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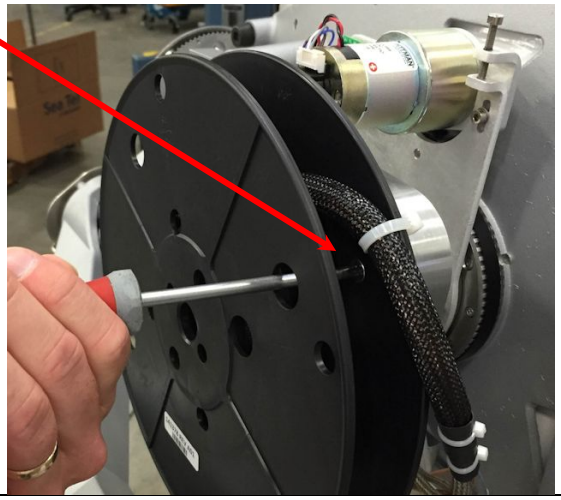
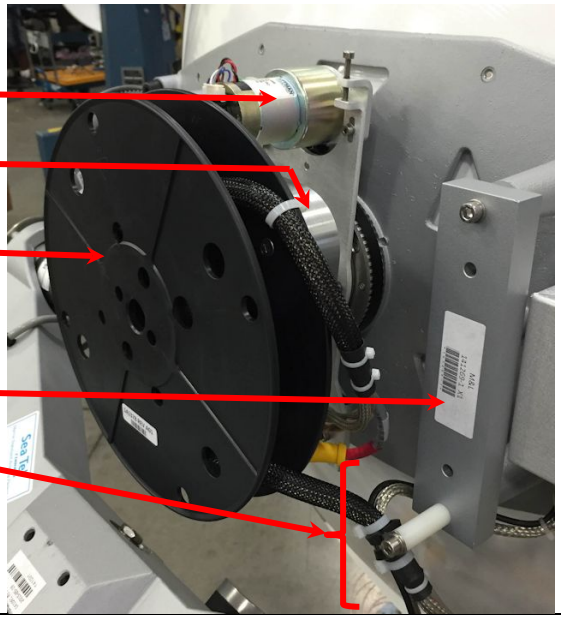
29. Using a #2 Phillips screwdriver, through the access hole, install the 4 Phillips flathead feed spooler mounting screws. 30. Tighten all 4 screws.	
31. If all repair work is completed, then check all connections. 32. Remove all parts, tools, and debris from the radome.	
33. Turn the power ON at the LMXP. 34. Watch the antenna initialize. 35. Check the fine balance of the antenna.	
36. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 37. Verify normal operation of all Above Decks and Below Decks Equipment. 38. Close and secure the radome hatch.	

11.16. Replacing the TVHD LNB

Use replacement kit PN S-67-141503 and follow this procedure for replacing the TVHD LNB.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the Feed Spooler. Polarization Motor LNB (under feed spooler) Feed Spooler Balance Counter-Weight Never adjust the screw or remove these cable ties.	

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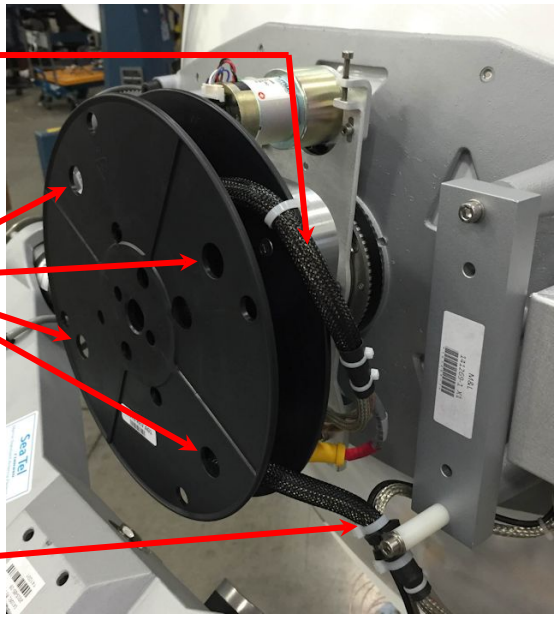
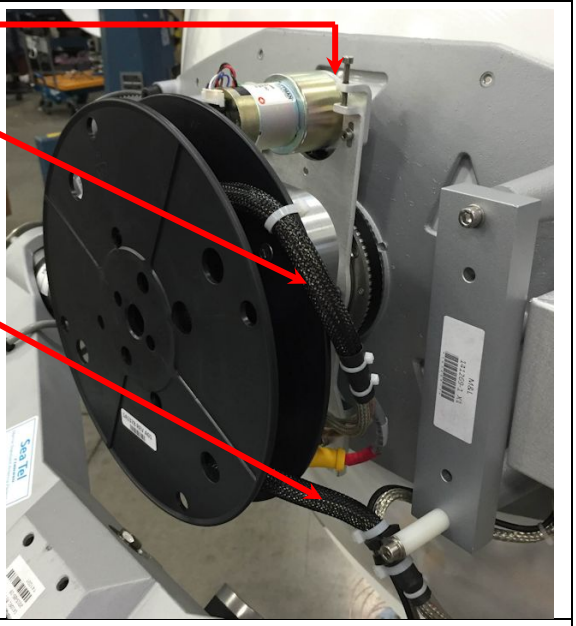
Harness to the LNB

Mounting screw access holes (4)

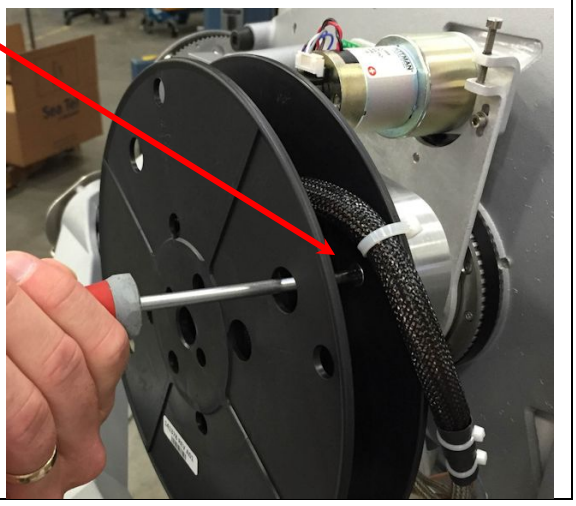
Harness to the pedestal



3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.
4. Note the orientation of the harness that goes to the LNB.
5. Note the orientation of the harness that goes to the pedestal.



6. Using a #2 Phillips screwdriver, through each of the access holes, remove the 4 Phillips flathead feed spooler mounting screws.



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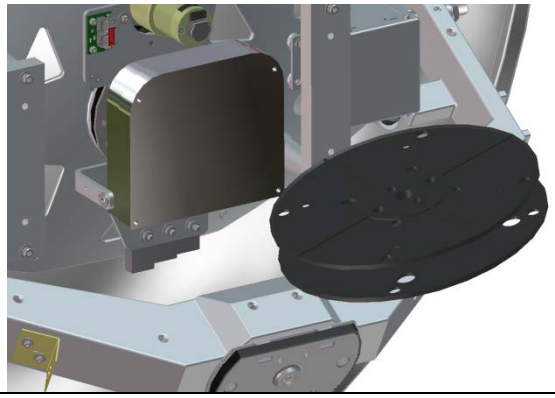
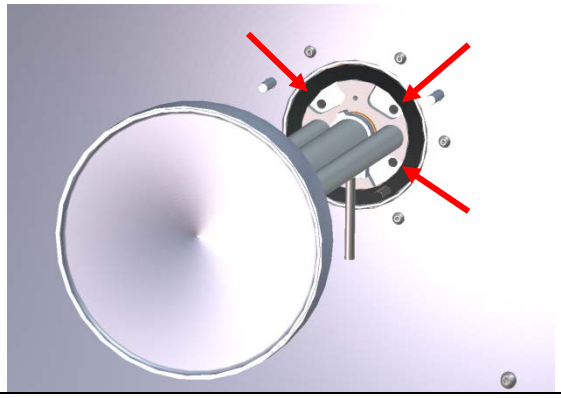
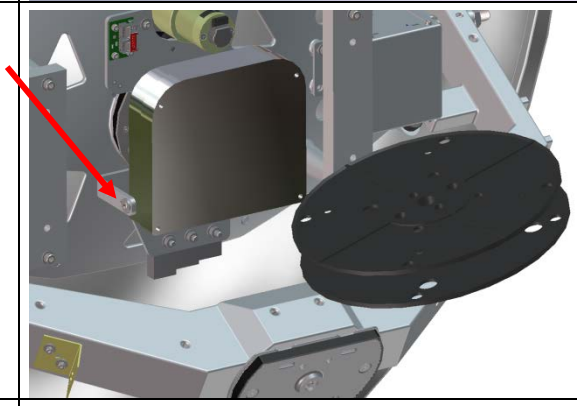
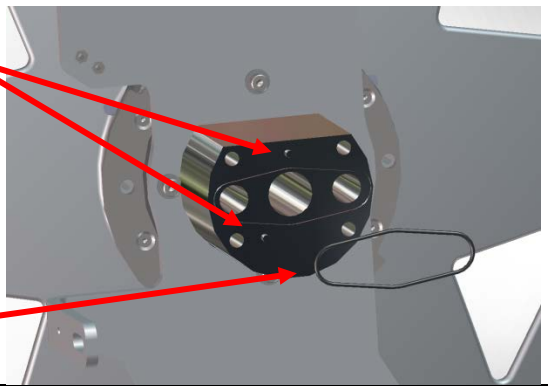
7. Lay the feed spooler to the right side of the cross-level beam.	
8. Using a 7/16" open end wrench, remove the 4 coaxes from the bottom of the LNB. 9. Unscrew the M&C cable from the bottom of the LNB.	
CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector. 10. Rotate the reflector around to access the front of the reflector. 11. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange. 12. Rotate the reflector around to access the rear of the reflector.	
13. While holding the LNB, use a 4mm Allen wrench to remove the LNB retainer screw. 14. Remove the defective LNB.	
15. Note the two guide pins in the end of the feed. These lock the orientation of the LNB to the feed. 16. If the rubber o-ring gasket is in the end of the feed, remove it. 17. Install the new rubber o-ring gasket, provided with the LNB, in the end of the feed.	

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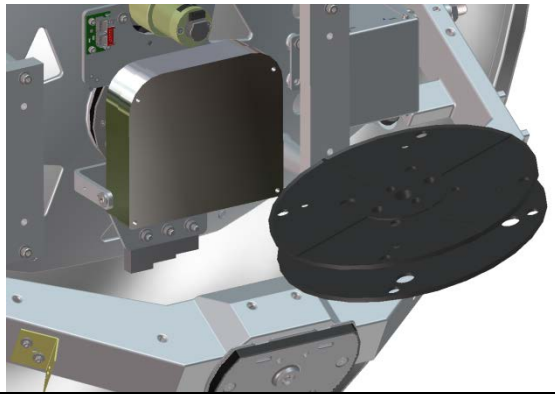
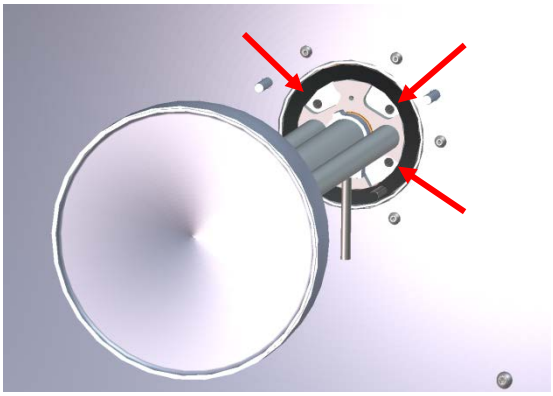
18. Apply Loctite 242 to the replacement screws provided in the kit.
19. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being installed).
20. While holding the replacement LNB in place, tightly against the end of the feed to mate the guide pins, use a 4mm Allen wrench to install and tighten the LNB retainer screw.



CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

21. Rotate the reflector around to access the front of the reflector.
22. Using a 4mm Allen wrench, install the 4 long LNB mounting screws from the feed tube flange. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left.
23. Tighten all 4 screws.
24. Rotate the reflector around to access the rear of the reflector.

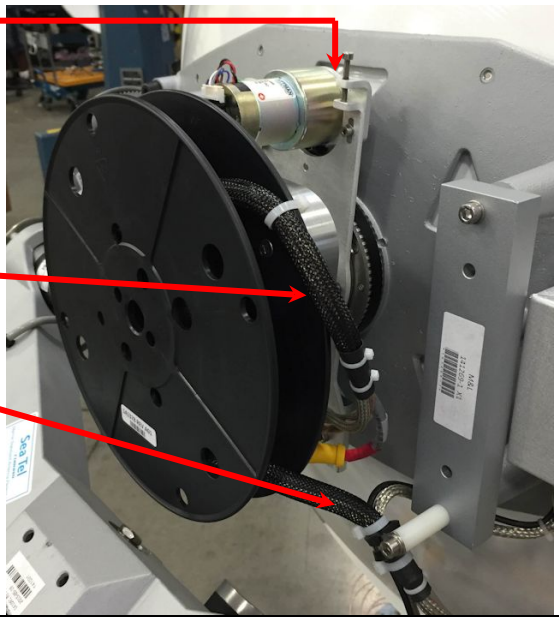


25. Screw the M&C cable onto the bottom of the LNB.
26. Using a 7/16" open end wrench, reconnect the 4 coaxes from the bottom of the LNB.

27. With the polarization motor at the top center of the reflector back-frame;
28. Apply Loctite to the 4 mounting screws removed in steps 6 & 7 above.
29. Hold the feed spooler orientated with the harnesses as shown.

LNB Harness

Pedestal Harness



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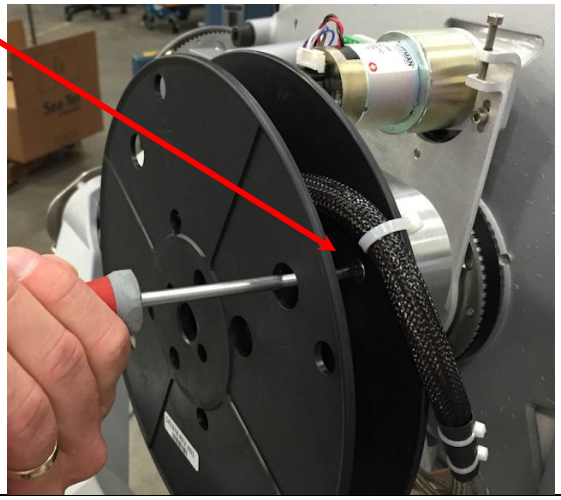
30. Using a #2 Phillips screwdriver, through the access hole, install the 4 Phillips flathead feed spooler mounting screws. 31. Tighten all 4 screws.	
32. If all repair work is completed, then check all connections. 33. Remove all parts, tools, and debris from the radome.	
34. Turn the power ON at the LMXP. 35. Watch the antenna initialize. 36. Check the fine balance of the antenna.	
37. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 38. Verify normal operation of all Above Decks and Below Decks Equipment. 39. Close and secure the radome hatch.	

11.17. Replacing the TV Feed Tube

Use replacement kit PN S-67-147138 for a Sea Tel 80 TV system, PN S-67-147134 for a Sea Tel 100 TV system , or PN S-67-147136 for a Sea Tel 120 TV system and follow this procedure for replacing the TV LNB.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the front side of the reflector. Reflector Feed Tube	

EAR Controlled - ECCN EAR99

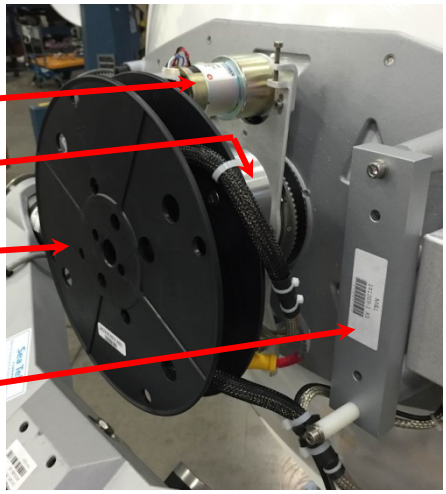
The picture on the right shows the back side of the reflector.

Polarization Motor

LNB (under feed spooler)

Feed Spooler

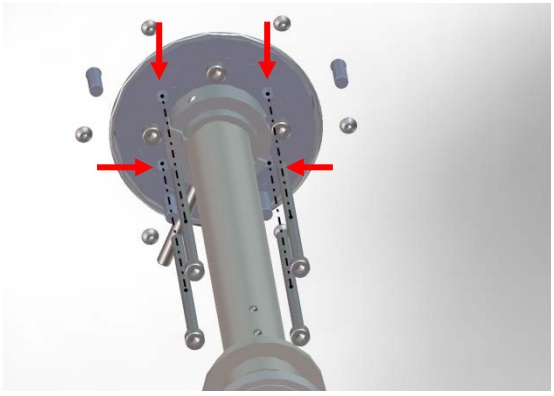
Balance Counter-Weight



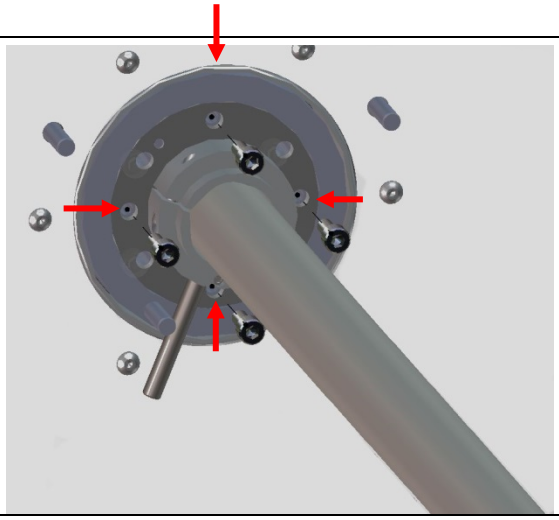
3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.

CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

4. Rotate the reflector around to access the front of the reflector.
5. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being installed).
6. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange.



7. Using a 4mm Allen wrench, remove the 4 (short) feed tube mounting screws from the feed tube flange.



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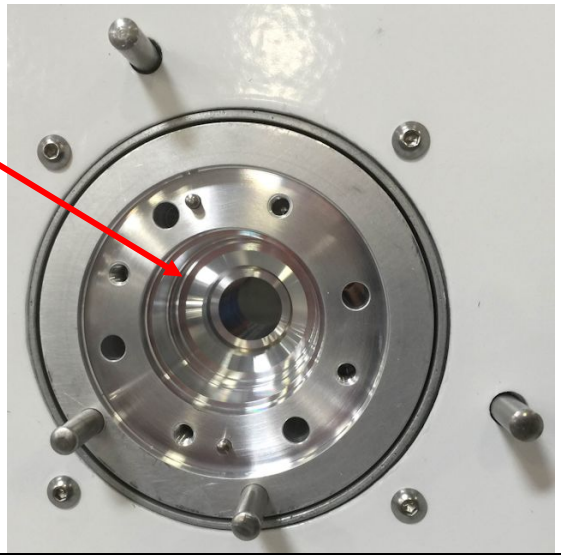
8. Extract defective feed tube.	
9. Ensure that the bottom bearing comes out of the feed with the feed tube so that the throat of the feed is empty.	
10. Remove the cable tie from the end of the replacement feed tube.	
11. Insert the replacement feed tube into the throat of the feed.	

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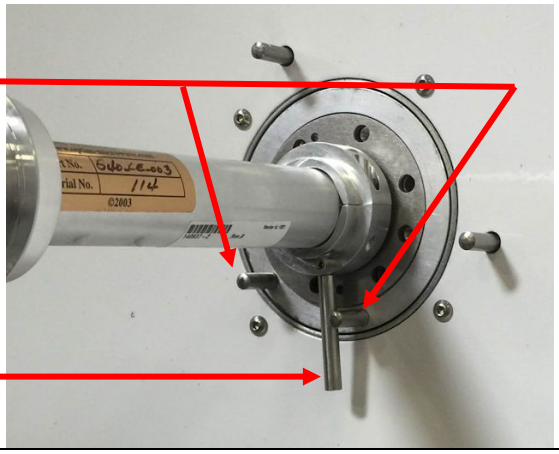
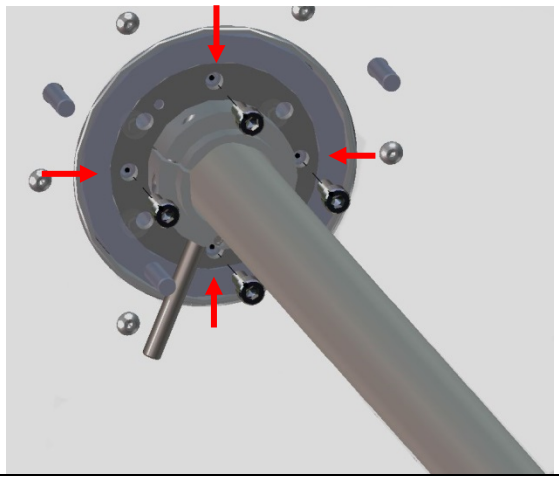
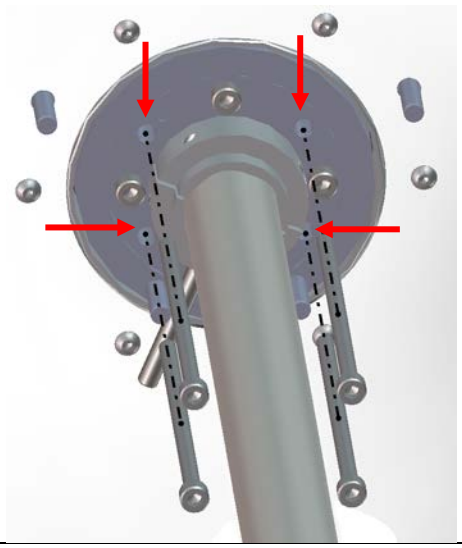
12. Ensure that the polarization pin is in between stop pins. Stop Pins Polarization Pin	
13. Apply Loctite 242 to the Feed Tube, and the LNB, mounting screws. 14. Using a 4mm Allen wrench, install the 4 (shorter) feed tube mounting screws from the feed tube flange.	
15. Using a 4mm Allen wrench, install the 4 (long) LNB mounting screws through the feed tube flange & feed and into the LNB. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left. 16. Tighten all 8 screws.	
17. If all repair work is completed, then check all connections. 18. Remove all parts, tools, and debris from the radome.	
19. Turn the power ON at the LMXP. 20. Watch the antenna initialize. 21. Check the fine balance of the antenna.	

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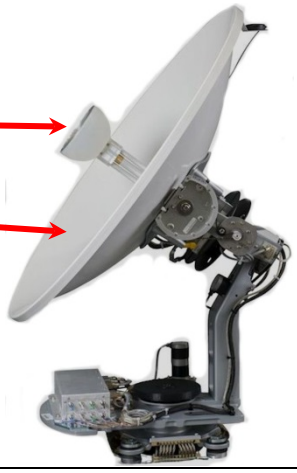
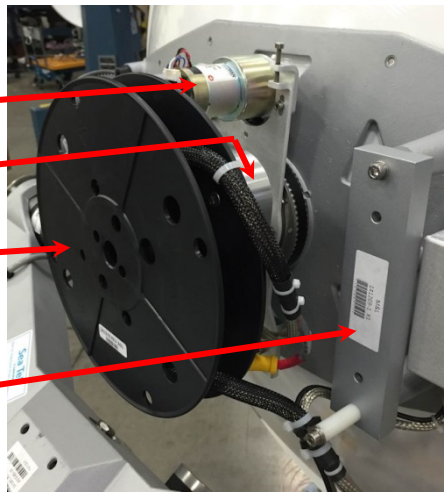
22. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 23. Verify normal operation of all Above Decks and Below Decks Equipment. 24. Close and secure the radome hatch.	

11.18. Replacing the TVHD Feed Tube

Use replacement kit PN S-67-147135 for a Sea Tel 100 TVHD system , or PN S-67-147137 for a Sea Tel 120 TVHD system and follow this procedure for replacing the TV LNB.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the front side of the reflector. Feed Tube Reflector	
The picture on the right shows the back side of the reflector. Polarization Motor LNB (under feed spooler) Feed Spooler Balance Counter-Weight	
3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.	

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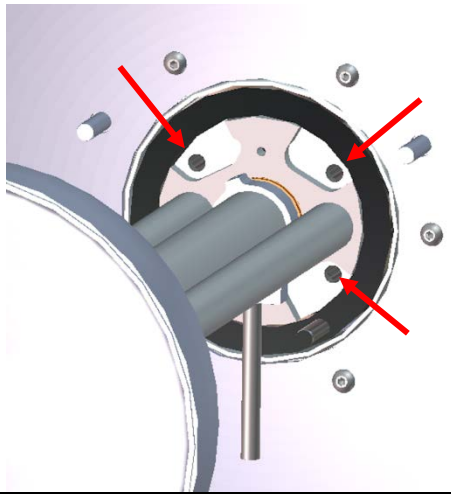
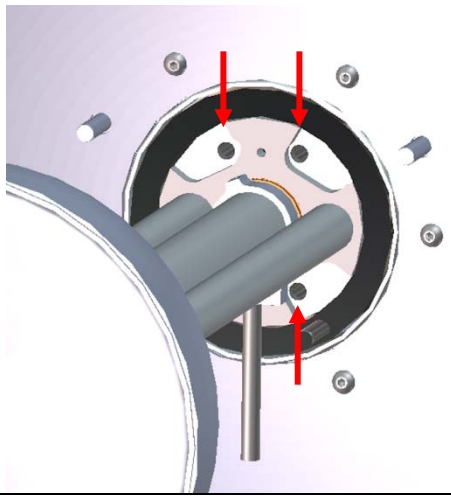
CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

4. Rotate the reflector around to access the front of the reflector.
5. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being installed).
6. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange.

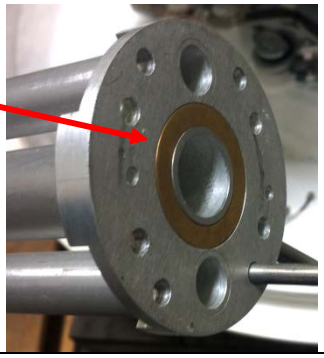


7. Using a 4mm Allen wrench, remove the 4 (short) feed tube mounting screws from the feed tube flange.



8. Extract defective feed tube.

9. Ensure that the washer is in place on the replacement KuKa feed tube.



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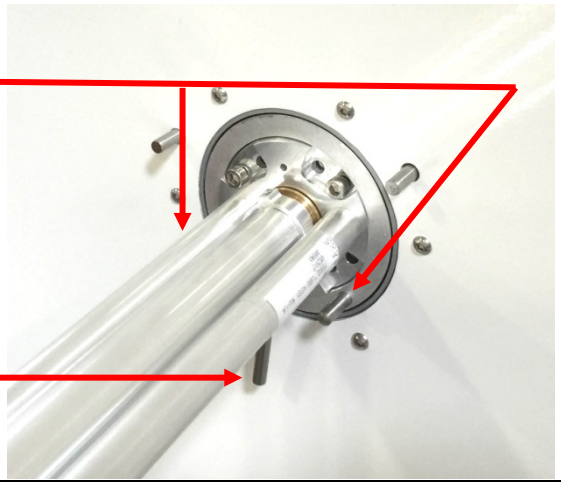
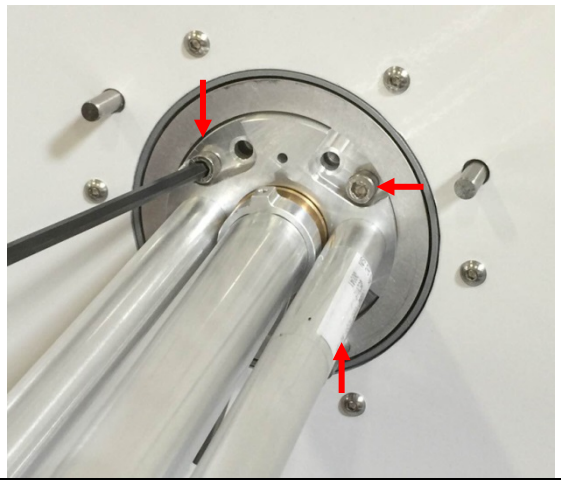
10. Insert the replacement feed tube into the throat of the feed.	
11. Ensure that the polarization pin is in between stop pins. Stop Pins Polarization Pin	
12. Apply Loctite 242 to the Feed Tube, and the LNB, mounting screws. 13. Using a 4mm Allen wrench, install the 4 (long) LNB mounting screws through the feed tube flange & feed and into the LNB.	

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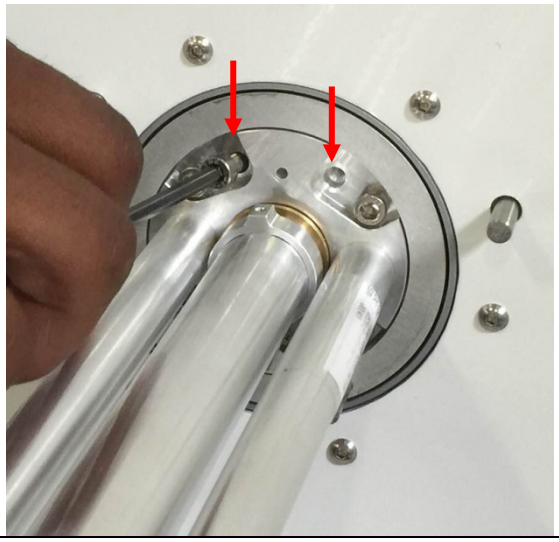
14. Using a 4mm Allen wrench, install the 4 (short) feed tube screws through the feed tube flange. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left. 15. Tighten all 8 screws.	
16. If all repair work is completed, then check all connections. 17. Remove all parts, tools, and debris from the radome.	
18. Turn the power ON at the LMXP. 19. Watch the antenna initialize. 20. Check the fine balance of the antenna.	
21. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 22. Verify normal operation of all Above Decks and Below Decks Equipment. 23. Close and secure the radome hatch.	

11.19. Replacing the TV Pol Belt

Use replacement kit PN S-67-141786 and follow this procedure for replacing the Pol Belt on a Sea Tel 80 TV, 100 TV or 120 TV system.

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the front side of the reflector. Reflector Feed Tube	

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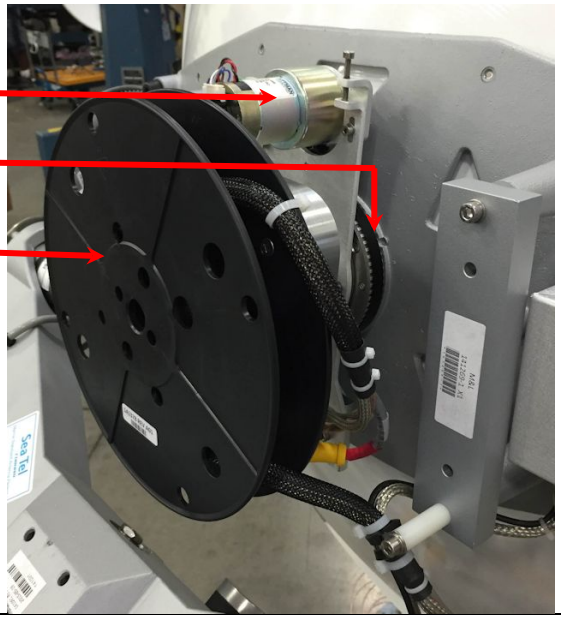
The picture on the right shows the Feed Spooler.

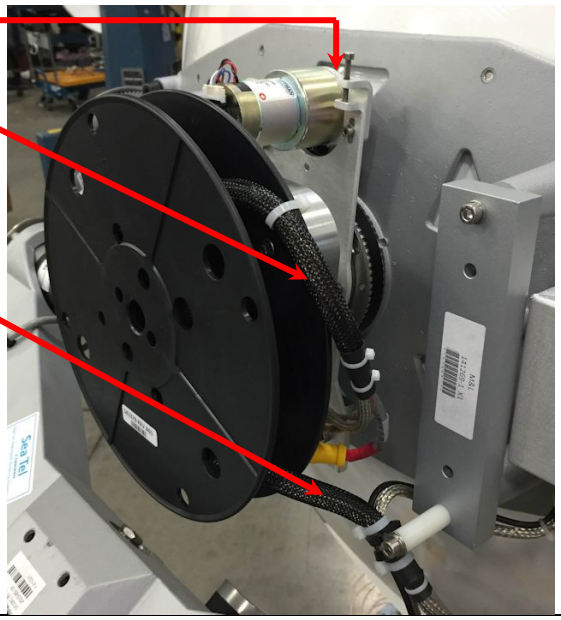
Polarization (Pol) Motor

Polarization Belt

Feed Spooler

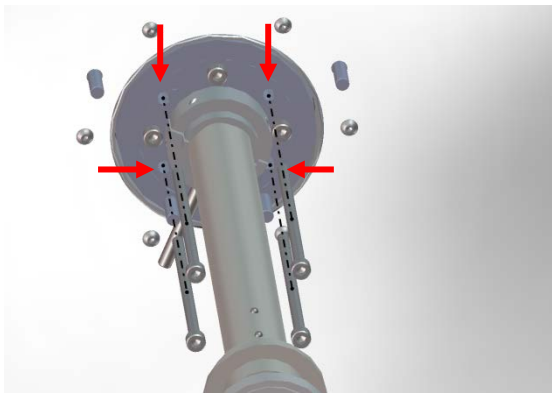


3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.
4. Note the orientation of the harness that goes to the LNB.
5. Note the orientation of the harness that goes to the pedestal.

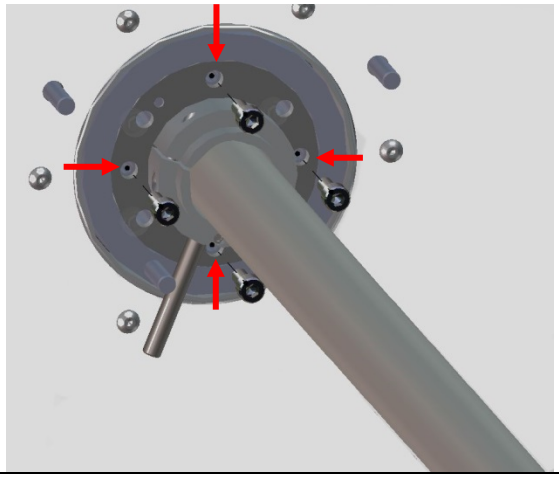
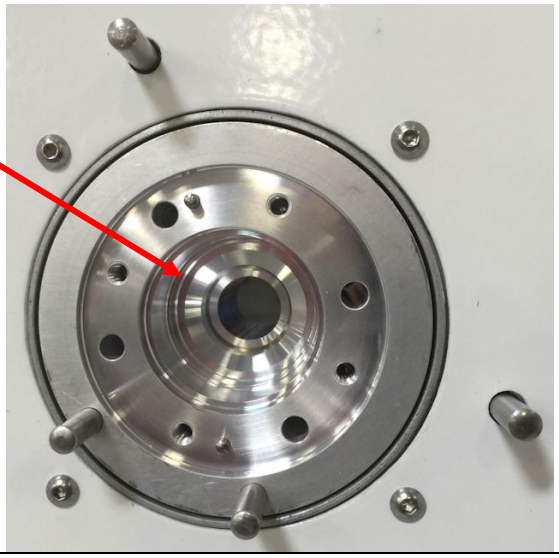


CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

6. Rotate the reflector around to access the front of the reflector.
7. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being removed).
8. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange.



EAR Controlled - ECCN EAR99

9. Using a 4mm Allen wrench, remove the 4 (short) feed tube mounting screws from the feed tube flange.	
10. Extract the feed tube.	
11. Ensure that the bottom bearing comes out of the feed with the feed tube so that the throat of the feed is empty. 12. Rotate the reflector around to access the feed assembly on the back side.	

EAR Controlled - ECCN EAR99

13. Using 2.5 mm Allen wrench, remove the cap head screws that mount the feed assembly to the back of the mounting collar in the center of the reflector.

14. Slowly rotate the feed assembly CW to access and remove the next cap head screw. Repeat slowly rotating and removing the cap head screws until all 6 are removed.

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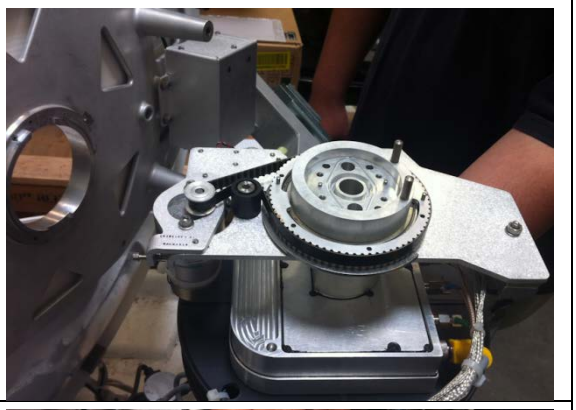
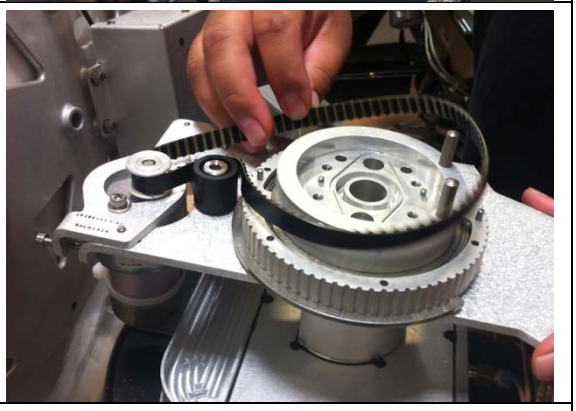
15. Extract the feed assembly out of the mounting collar in the center of the reflector and lay it on the cross-level beam.

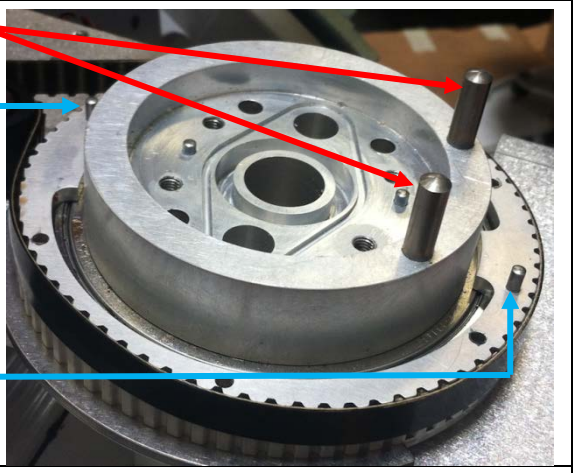


16. Remove the defective belt.
17. Couple the replacement belt onto the drive sprocket on the Pol Motor, route the belt inside the idler and around the driven (large) sprocket.
18. Engage the teeth of the belt into the teeth on the driven sprocket as you slide the belt down onto the driven sprocket.

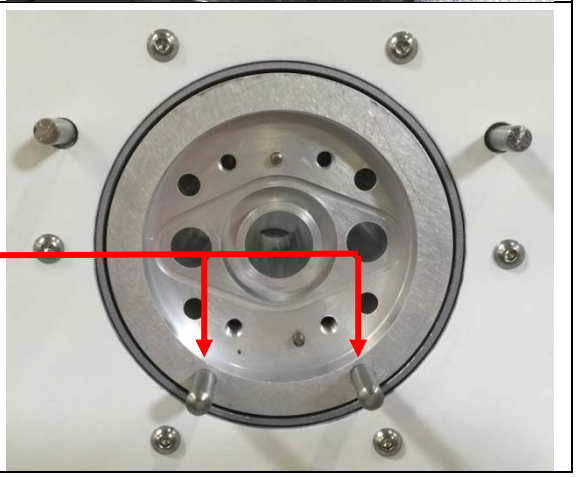


Stop Pins in the feed assembly insert through the collar & reflector (these pins are the polarization stop pins shown in the picture below.

Alignment pins in the feed assembly insert into the collar to align the mounting holes.



Stop pins protrude when the feed assembly is installed on the rear of the reflector



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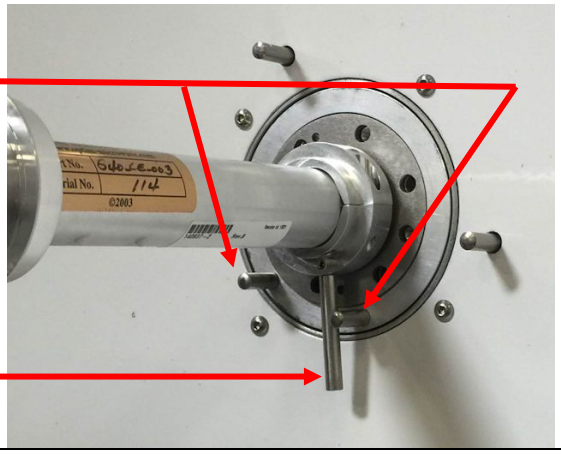
19. Apply Loctite 242 to the cap head feed assembly mounting screws.
20. Insert the feed assembly into the mounting collar, aligning and seating the alignment pins.
21. While holding the feed assembly against the mounting collar, install two cap head feed assembly mounting screws. Tighten these two screws.
22. Slowly rotate the feed assembly CCW to access the next hole and install & tighten the next cap head screw. Repeat slowly rotating and installing the cap head screws until all 6 are installed.

23. Rotate the reflector around to access the front of the reflector.
24. Insert the feed tube into the throat of the feed.

25. Ensure that the polarization pin on the feed tube is in-between the stop pins.

Stop Pins

Polarization Pin



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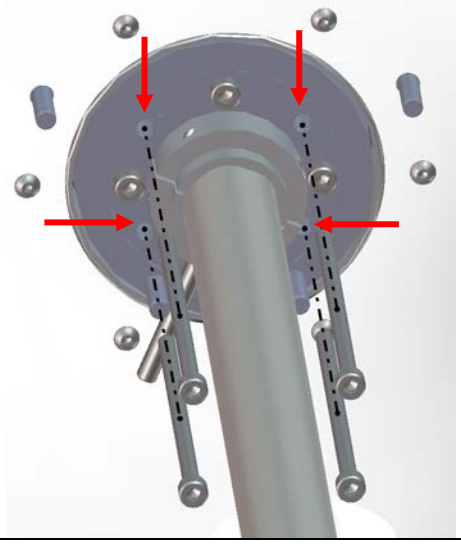
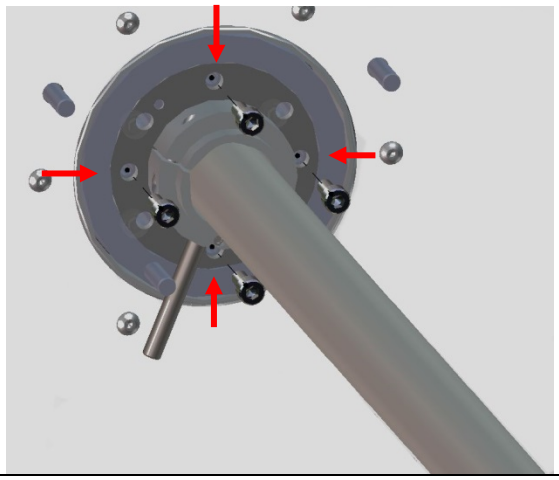
26. Apply Loctite 242 to the Feed Tube, and the LNB, mounting screws. 27. Using a 4mm Allen wrench, install the 4 (long) LNB mounting screws through the feed tube flange & feed and into the LNB. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left.	
28. Using a 4mm Allen wrench, install the 4 (shorter) feed tube mounting screws from the feed tube flange. 29. Tighten all 8 screws.	
30. If all repair work is completed, then check all connections. 31. Remove all parts, tools, and debris from the radome.	
32. Turn the power ON at the LMXP. 33. Watch the antenna initialize. 34. Check the fine balance of the antenna.	
35. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 36. Verify normal operation of all Above Decks and Below Decks Equipment. 37. Close and secure the radome hatch.	

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11.20. Replacing the TVHD Pol Belt

Use replacement kit PN S-67-141786 and follow this procedure for replacing the Pol Belt on a Sea Tel 100 TVHD or 120 TVHD system.

1. Turn the power OFF at the LMXP.
2. Open the radome hatch.

The picture on the right shows the front side of the reflector.

Feed Tube

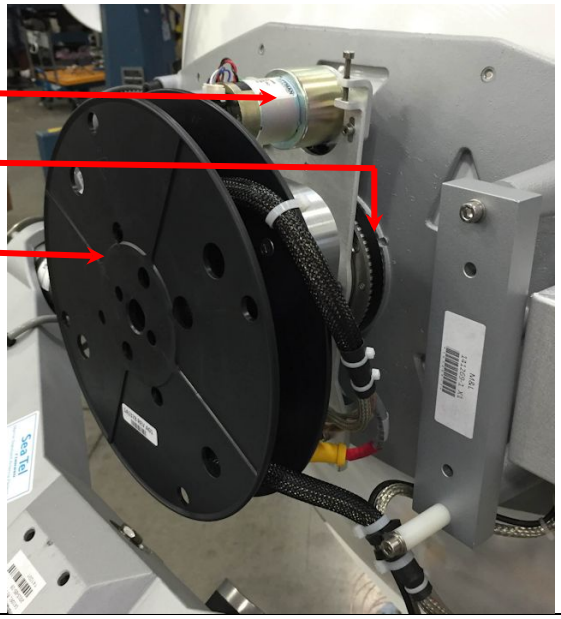
Reflector

The picture on the right shows the Feed Spooler.

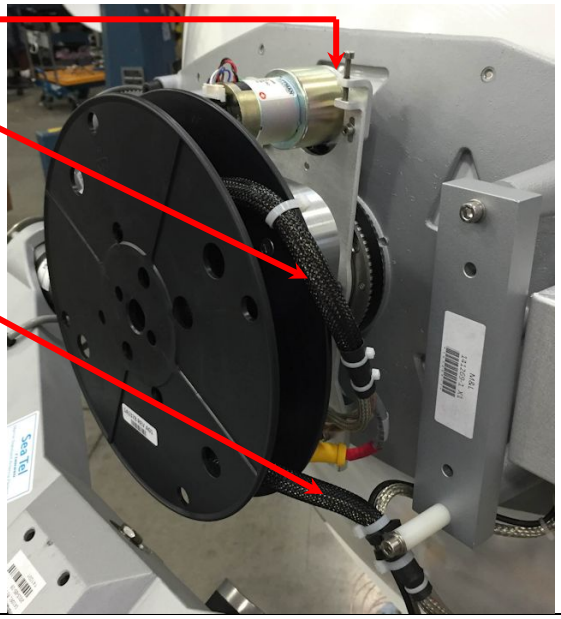
Polarization (Pol) Motor

Polarization Belt

Feed Spooler



3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.
4. Note the orientation of the harness that goes to the LNB.
5. Note the orientation of the harness that goes to the pedestal.



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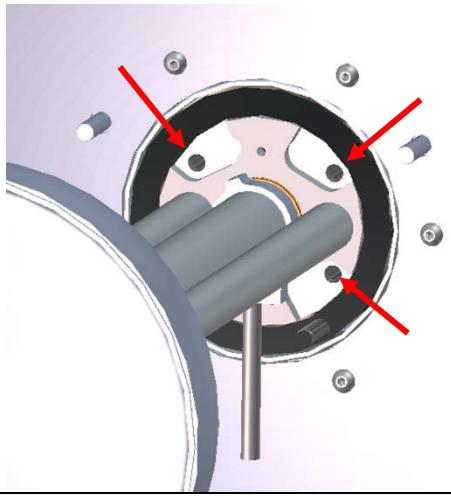
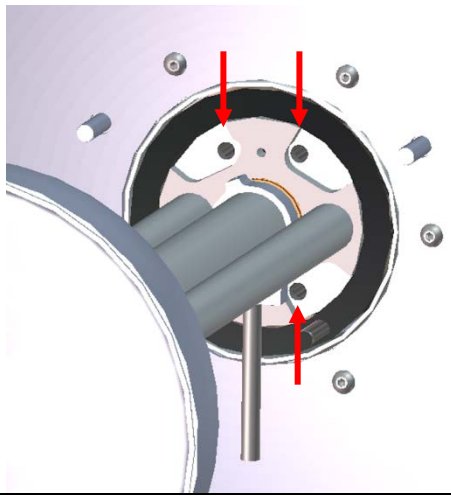
CAUTION: SEVERE DAMAGE - Never use the feed tube as a handle to move the reflector position - Pulling or pushing the feed tube will permanently damage it and may malform the center of the reflector.

6. Rotate the reflector around to access the front of the reflector.
7. Tilt the reflector all the way down to the elevation stop (below horizon - this will help hold the LNB firmly against the end of the feed while the screws are being installed).
8. Using a 4mm Allen wrench, remove the 4 long LNB mounting screws from the feed tube flange.

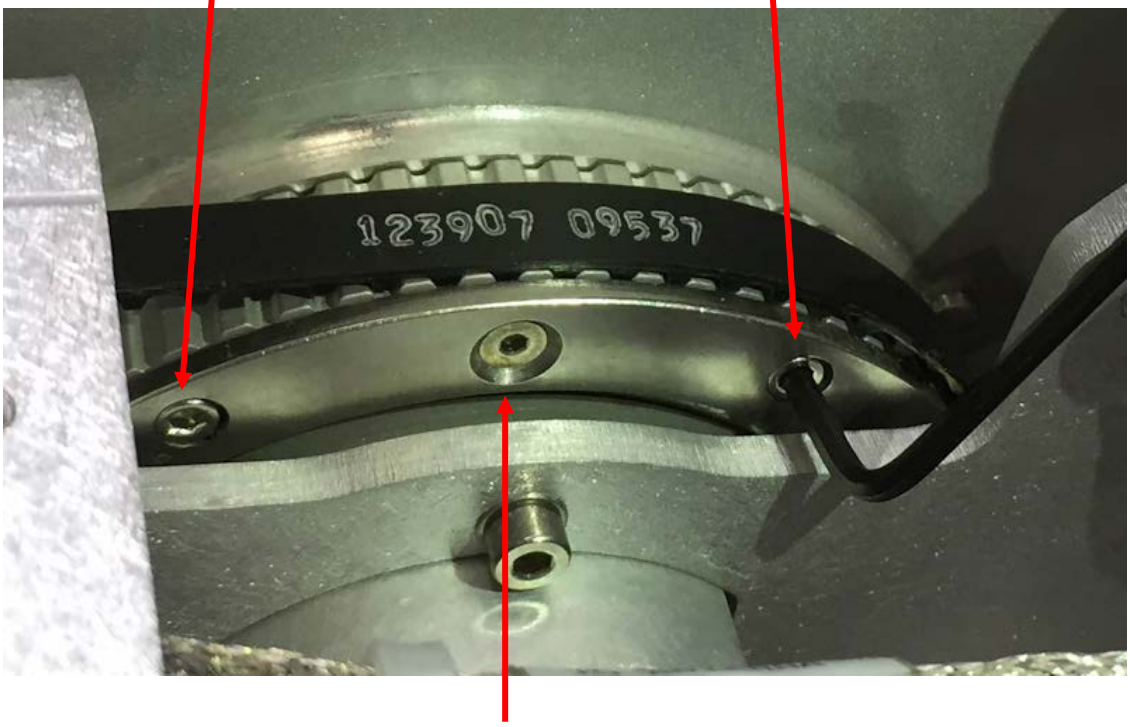


9. Using a 4mm Allen wrench, remove the 4 (short) feed tube mounting screws from the feed tube flange.



10. Extract feed tube.
11. Rotate the reflector around to access the feed assembly on the back side.

EAR Controlled - ECCN EAR99



12. Using 2.5 mm Allen wrench, remove the cap head screws that mount the feed assembly to the back of the mounting collar in the center of the reflector.

13. Slowly rotate the feed assembly CW to access and remove the next cap head screw. Repeat slowly rotating and removing the cap head screws until all 6 are removed.

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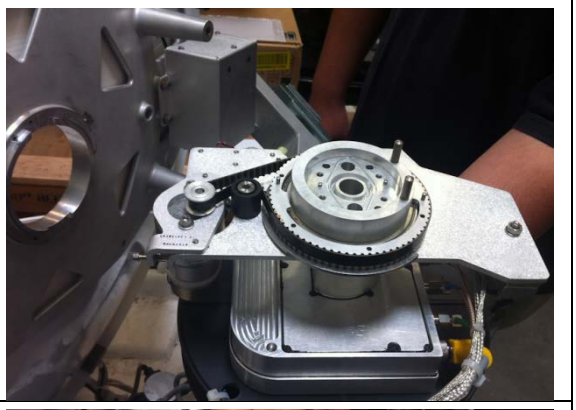
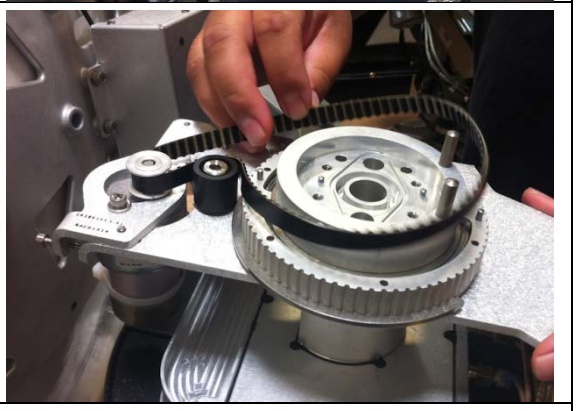
14. Extract the feed assembly out of the mounting collar in the center of the reflector and lay it on the cross-level beam.

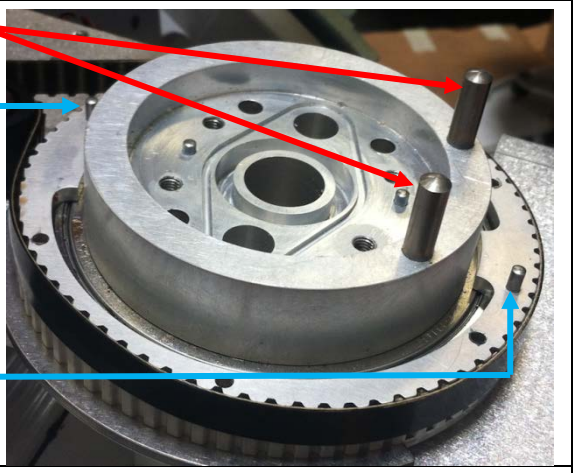


15. Remove the defective belt.
16. Couple the replacement belt onto the drive sprocket on the Pol Motor, route the belt inside the idler and around the driven (large) sprocket.
17. Engage the teeth of the belt into the teeth on the driven sprocket as you slide the belt down onto the driven sprocket.

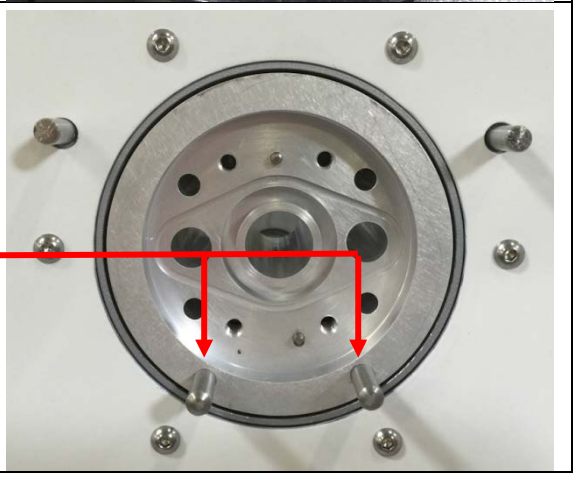


Stop Pins in the feed assembly insert through the collar & reflector (these pins are the polarization stop pins shown in the picture below.

Alignment pins in the feed assembly insert into the collar to align the mounting holes.



Stop pins protrude when the feed assembly is installed on the rear of the reflector



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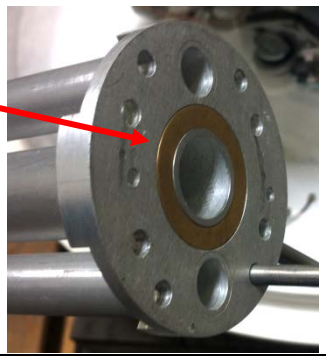
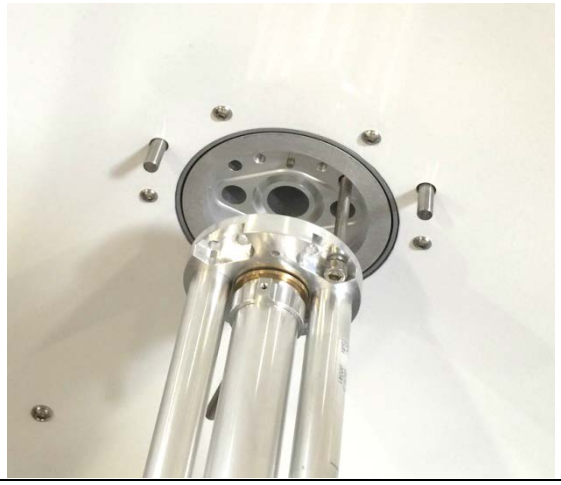
18. Apply Loctite 242 to the cap head feed assembly mounting screws.
19. Insert the feed assembly into the mounting collar, aligning and seating the alignment pins.
20. While holding the feed assembly against the mounting collar, install two cap head feed assembly mounting screws. Tighten these two screws.
21. Slowly rotate the feed assembly CCW to access the next hole and install & tighten the next cap head screw. Repeat slowly rotating and installing the cap head screws until all 6 are installed.

22. Ensure that the washer is in place on the KuKa feed tube.



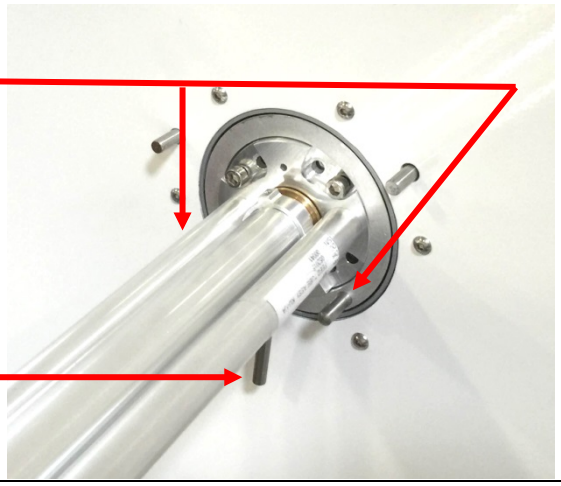
23. Insert the feed tube into the throat of the feed.



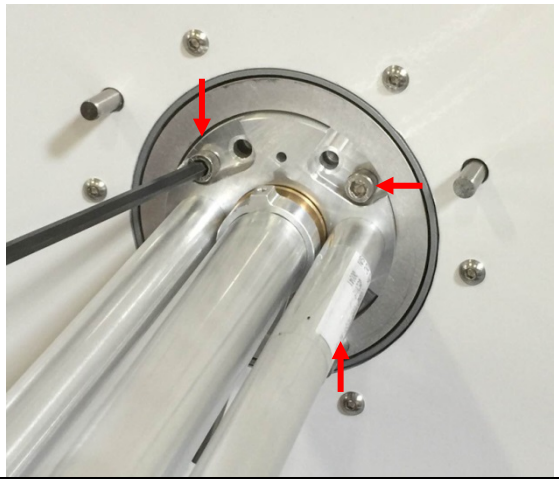
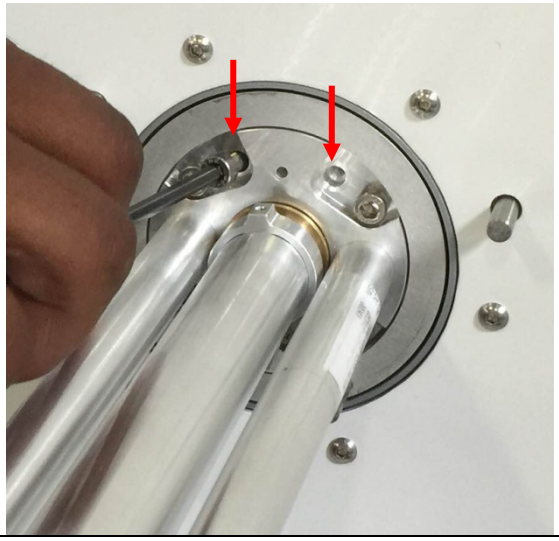
24. Ensure that the polarization pin is in between stop pins.

Stop Pins

Polarization Pin



EAR Controlled - ECCN EAR99

25. Apply Loctite 242 to the Feed Tube, and the LNB, mounting screws. 26. Using a 4mm Allen wrench, install the 4 (long) LNB mounting screws through the feed tube flange & feed and into the LNB.	
27. Using a 4mm Allen wrench, install the 4 (short) feed tube screws through the feed tube flange. Note: It may be best to install the screws in the following order; bottom right, top left, top right and bottom left. 28. Tighten all 8 screws.	
29. If all repair work is completed, then check all connections. 30. Remove all parts, tools, and debris from the radome.	
31. Turn the power ON at the LMXP. 32. Watch the antenna initialize. 33. Check the fine balance of the antenna.	
34. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 35. Verify normal operation of all Above Decks and Below Decks Equipment. 36. Close and secure the radome hatch.	

EAR Controlled - ECCN EAR99

11.21. Replacing the Pol Motor

Use replacement kit PN S-67-141500 and follow this procedure for replacing the Polarization (Pol) Motor.

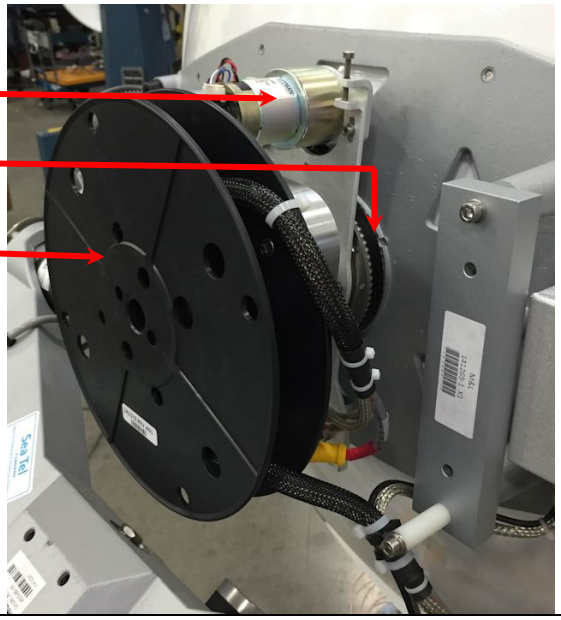
1. Turn the power OFF at the LMXP.
2. Open the radome hatch.

The picture on the right shows the Feed Spooler.

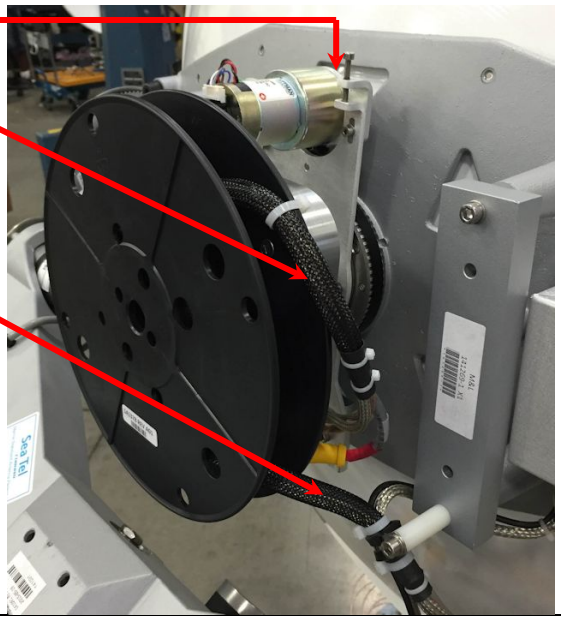
Polarization (Pol) Motor

Polarization Belt

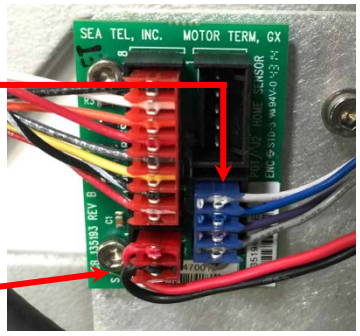
Feed Spooler



3. Slowly rotate the feed assembly until the polarization motor is at the top center of the reflector back-frame.
4. Note the orientation of the harness that goes to the LNB.
5. Note the orientation of the harness that goes to the pedestal.



6. Locate the motor termination PCB to the left of the Pol Motor.
7. Remove Pol Encoder connector (blue).
8. Remove Pol Motor voltage connector (2-Pin Red).



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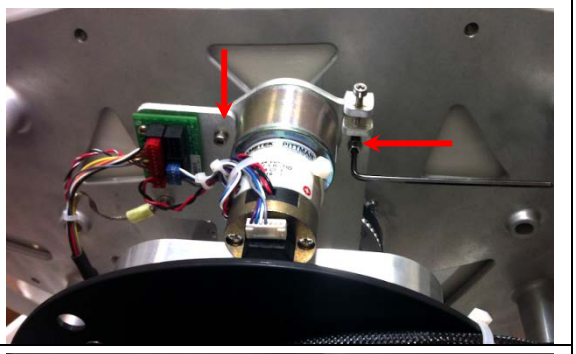
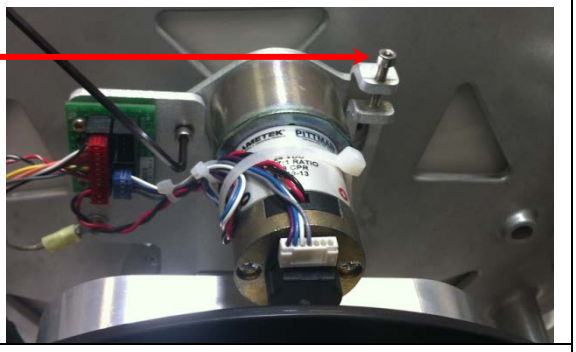
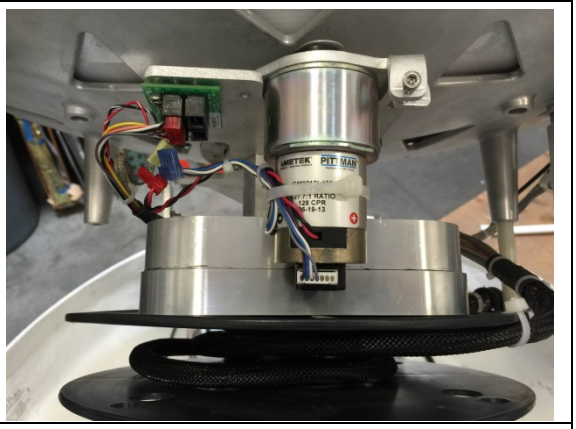
9. Using a 4mm Allen wrench, remove the 2 bracket mounting screws.	
10. Do NOT adjust the tensioner screw. It is preset at the factory. Adjusting the tensioner screw may result in damage to the system.	
11. Rotate the elevation of the reflector up to 80-90 degrees for easy access to the Pol Motor.	
12. Tilt the defective Pol Motor up toward the back of the reflector and decouple the belt from the drive sprocket on the motor.	
13. Using a 4mm Allen wrench, remove the 2 motor mounting screws and remove the defective motor from the bracket. **Do NOT adjust the tensioner screw**. 14. Apply Loctite 242 to the 2 motor mounting screws. 15. Using a 4mm Allen wrench, install the 2 screws to mount the replacement motor to the bracket. **Do NOT adjust the tensioner screw**.	

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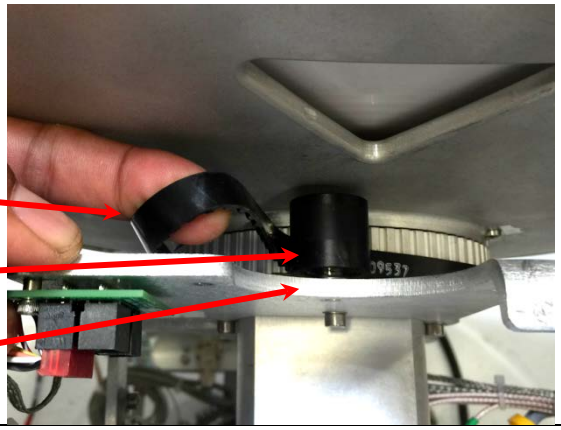
16. Using your finger, or a hook, capture the polarization belt and pull tension on it as your position it on the left side of the idler and near the motor cutout.

Polarization Belt

Idler

Motor Cutout

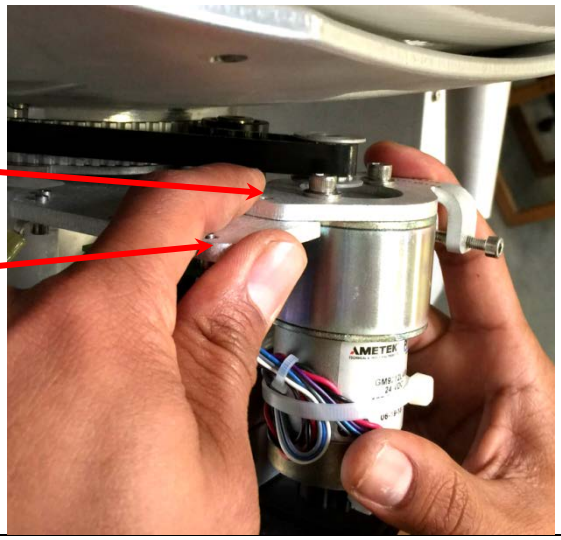


17. Tilt the replacement Pol Motor into the cutout and couple the belt onto the drive sprocket.

18. Rotate the drive motor down away from the back of the reflect with the Pol Motor bracket above the feed bracket.

Pol Motor Bracket

Feed Bracket



19. Apply Loctite 242 to the 2 motor mounting screws.
20. Using a 4mm Allen wrench, install a screw on the left side of the motor (fixed hole) to mount the replacement motor to the bracket. Do not completely tighten the screw at this time. **Do NOT adjust the tensioner screw**.

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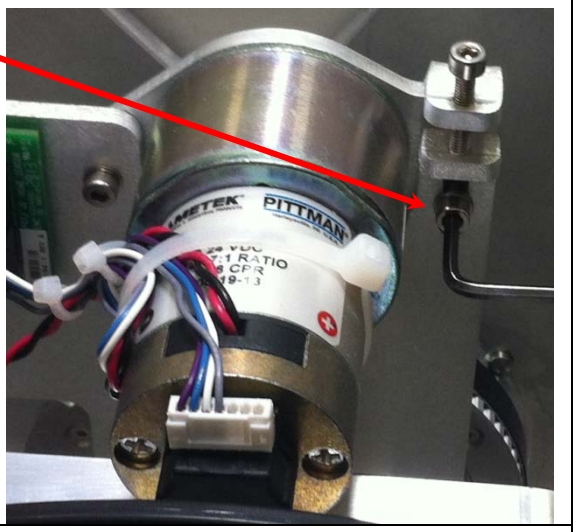
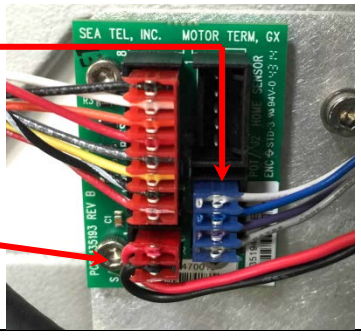
21. Using a 4mm Allen wrench, install a screw on the right side of the motor (slotted hole under the tensioner) to mount the replacement motor to the bracket. Do not completely tighten the screw at this time. **Do NOT adjust the tensioner screw**.	
22. Using your finger, press down on the top of the tensioner screw and tighten both mounting screws.	
23. Plug the Pol Encoder connector (blue) into the motor termination PCB. 24. Plug the Pol Motor voltage connector (2-Pin Red) into the motor termination PCB.	
25. If all repair work is completed, then check all connections. 26. Remove all parts, tools, and debris from the radome.	
27. Turn the power ON at the LMXP. 28. Watch the antenna initialize. 29. Check the fine balance of the antenna.	
30. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 31. Verify normal operation of all Above Decks and Below Decks Equipment. 32. Close and secure the radome hatch.	

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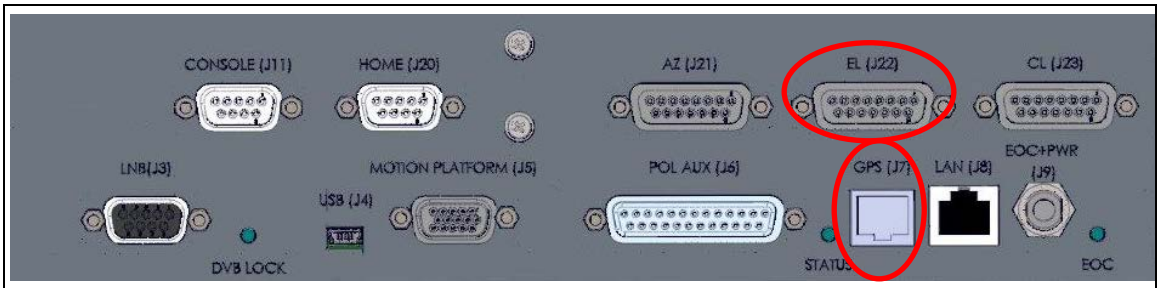
11.22. Replacing the GPS Antenna

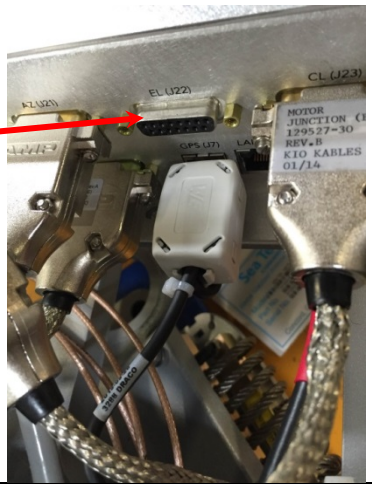
Use replacement kit PN S-67-147560 and follow this procedure for replacing the GPS Antenna

1. Turn the power OFF at the LMXP. 2. Open the radome hatch.	
The picture on the right shows the GPS, mounting bracket and cable that goes to the TICU. Bracket GPS GPS Cable The GPS cable is attached to the GPS at one end and to an RJ-11 telephone type connector at the other end.	
3. Remove the defective GPS from its GPS bracket by cutting the double stick tape between the GPS antenna and the bracket. 4. Thoroughly clean the upper surface of the bracket with a lint free cloth and Acetone, or similar product. Note: Acetone is flammable. 5. Using diagonal cutters, cut the cable tie closest to the GPS bracket. 6. Apply the sticky side of the double stick tape (124077-5) to the bracket. 7. Peel the paper off of the tape to expose the second sticky side and mount the replacement GPS antenna to the tape with the cable toward the cable tie pad on the dish. 8. Install a cable tie to secure the GPS cable to the pad. 9. Route the new GPS cable down the harnessing to near the TICU.	
10. Working down the pedestal, cut one cable tie to remove the old GPS cable and install a cable tie to secure the new GPS cable where the old one was. 11. Continue working down the pedestal, cutting a cable ties replaceing the old GPS cable with the new one and securing it with a new cable tie – one cable tie location at a time – to assure that the cable routing is correct.	

EAR Controlled - ECCN EAR99



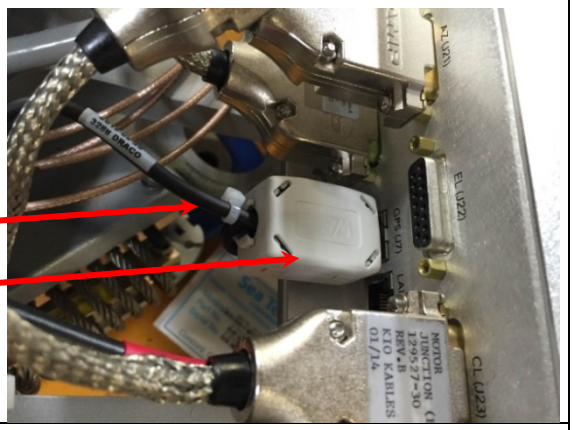
12. When you reach the area near the azimuth motor, cut the remaining cable ties that are securing the old GPS cable .
13. Using a small flat blade screwdriver unscrew the retaining screws on the EL (J22) connector and remove it from the TICU. This is done to give you better access to the GPS cable connection below it.



14. Gently lift the cable & white ferrite bead UP so that you can use a small flat screw driver to lift the locking tab to release the RJ-11 telephone type connector [GPS (J7)].
15. Unplug the GPS cable from the RJ-11 telephone type connector on the TICU.

GPS cable

Ferrite Bead



16. Plug the RJ-11 telephone type connector at the end of the GPS cable (locking tab DOWN) into the GPS (J7) connector on the back of the TICU.
17. Coil any excess GPS cable and use a cable tie to bind the coil.
18. Reconnect the EL cable to the EL (J22) connector on the back of the TICU.
19. Install cable ties where they were removed in any of the steps above.
20. Using diagonal cutters, carefully trim off excess cable tie length.
21. If all repair work is completed, then check all connections.
22. Remove all parts, tools, and debris from the radome.
23. Turn the power ON at the LMXP.
24. Watch the antenna initialize.
25. Check the fine balance of the antenna.

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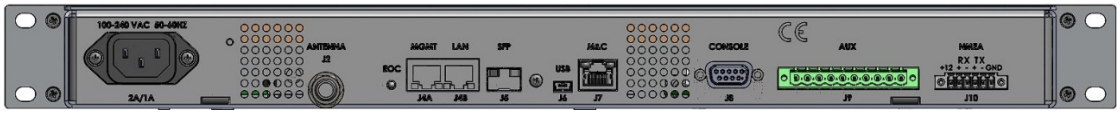
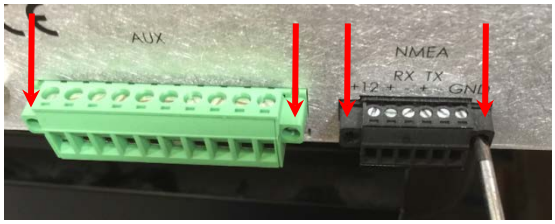
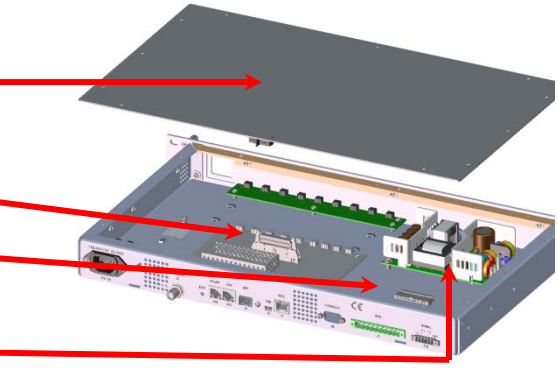
26. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 27. Verify normal operation of all Above Decks and Below Decks Equipment. 28. Close and secure the radome hatch.	

11.23. Replacing the LMXP Power Supply

Use replacement kit PN S-67-144601 and follow this procedure for replacing the LMXP Power Supply.

1. Turn the power OFF at the LMXP. 2. Mark the connections on the rear panel of the LMXP.	
 1 AC Power cable 2 Antenna Coax – This is the power & EOC coax cable that connects to the antenna. 3 Management (**normally unused**). 4 LAN – This might be an Ethernet connection to your LAN. 5 SFP – (**normally unused**) 6 Mini USB – (**normally unused**) 7 M&C – (**Not connected - -Future development**) 8 Console – (**normally unused**) 9 Aux – This might be connected to other equipment onboard the ship (ie remote alarm panel). 10 NMEA – This is the NMEA gyro compass input to the LMXP.	
3. If the Aux, and/or the NMEA, connectors have wires installed in them, use a small flat blade screwdriver to unscrew the retaining screw in the end of each of the connectors (disconnect the Aux & NMEA connectors rather than removing the individual wires). 4. Pull the external Aux & NMEA connectors out of the rear panel of the LMXP	
5. Disconnect all other connections from the rear panel of the LMXP.	
Top Cover Main PCB I/O PCB Power Supply	

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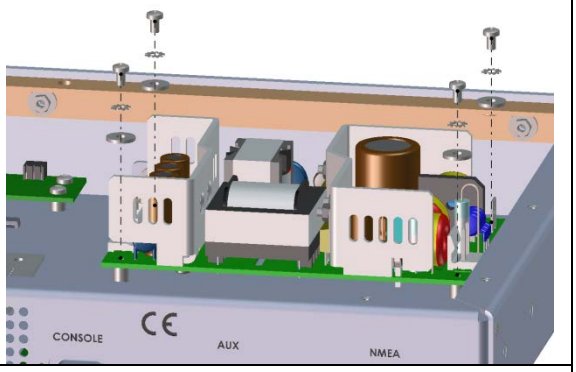
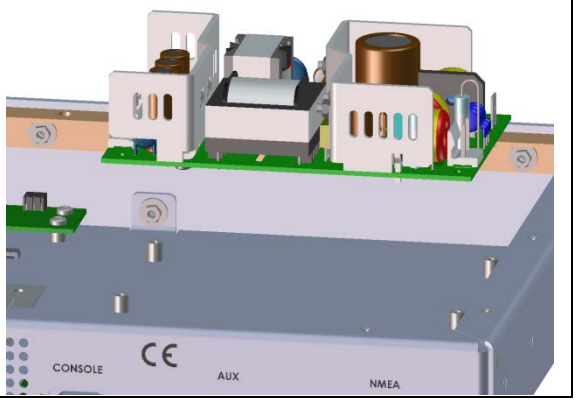
6. Remove the retaining screws that mount the LMXP in your equipment rack. 7. Extract the LMXP from the equipment rack. 8. Using a #1 Phillips screwdriver, remove the 12 screws that secure the top cover of the LMXP to the chassis.	
9. Disconnect the input power connections (2-pin power and a spade Ground connector). 2-Pin Connector Spade Ground Connector	
10. Disconnect the output power connection (Orange connector).	
11. Using a #1 Phillips screwdriver, remove the 4 screws that secure the defective power supply to the chassis.	
12. Lift the defective power supply up and out of the chassis. 13. Slide the white protective sleeve off of the defective power supply.	

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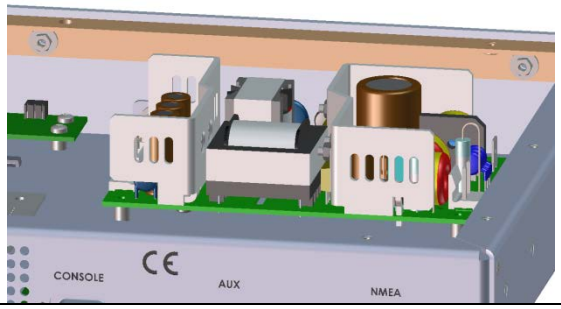
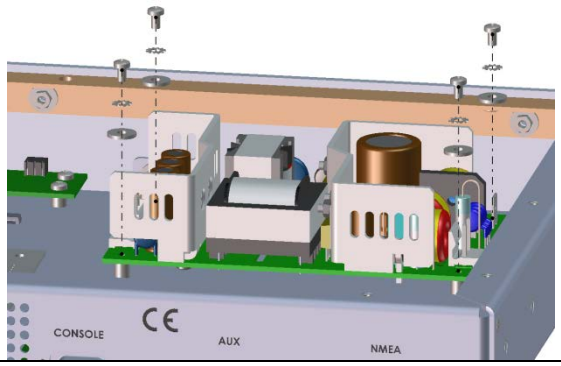
14. Slide the white protective sleeve onto the replacement power supply. 15. Set the replacement power supply down onto the standoffs in the chassis.	
16. Using a #1 Phillips screwdriver, install and tighten the 4 screws that secure the replacement power supply to the chassis.	
17. Connect the output power connection (Orange connector).	
18. Connect the input power connections (2-pin power and a spade Ground connector). 2-Pin Connector Spade Ground Connector	
19. Using a #1 Phillips screwdriver, install the 12 screws that secure the top cover of the LMXP to the chassis. 20. Insert the LMXP into the equipment rack. 21. Install the retaining screws that mount the LMXP in your equipment rack.	
22. Plug the Aux & NMEA connectors back into the rear panel of the LMXP and tighten the retaining screws. 23. Reconnect all of the other connections that were removed from the rear panel of the LMXP in step 5 above.	

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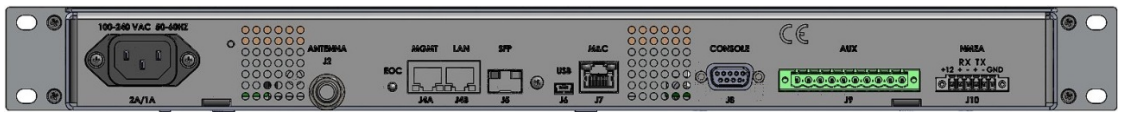
24. If all repair work is completed, then check all connections. 25. Remove all parts, tools, and debris from the work area.	
26. Turn the power ON at the LMXP. 27. Watch the antenna initialize. 28. Check the fine balance of the antenna.	
29. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 30. Verify normal operation of all Above Decks and Below Decks Equipment. 31. Close and secure the radome hatch.	

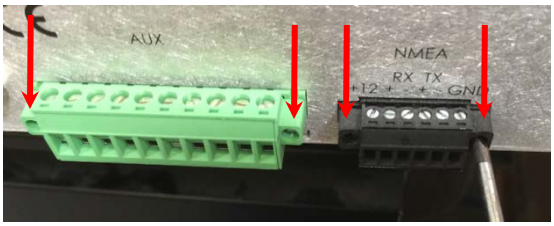
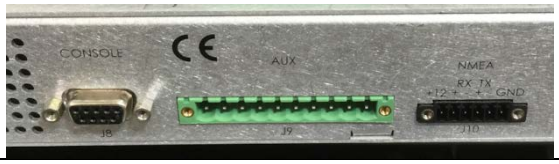
11.24. Replacing the LMXP Main PCB

Use replacement kit PN S-67-141502 and follow this procedure for replacing the Pol Belt.

1. Turn the power OFF at the LMXP. 2. Mark the connections on the rear panel of the LMXP.	



1 AC Power cable
2 Antenna Coax – This is the power & EOC coax cable that connects to the antenna.
3 Management (**normally unused**).
4 LAN – This might be an Ethernet connection to your LAN.
5 SFP – (**normally unused**)
6 Mini USB – (**normally unused**)
7 M&C – (**Not connected - -Future development**)
8 Console – (**normally unused**)
9 Aux – This might be connected to other equipment onboard the ship (ie remote alarm panel).
10 NMEA – This is the NMEA gyro compass input to the LMXP.

3. If the Aux, and/or the NMEA, connectors have wires installed in them, use a small flat blade screwdriver to unscrew the retaining screw in the end of each of the connectors (disconnect the Aux & NMEA connectors rather than removing the individual wires). 4. Pull the external Aux & NMEA connectors out of the rear panel of the LMXP	
5. Disconnect all other connections from the rear panel of the LMXP.	

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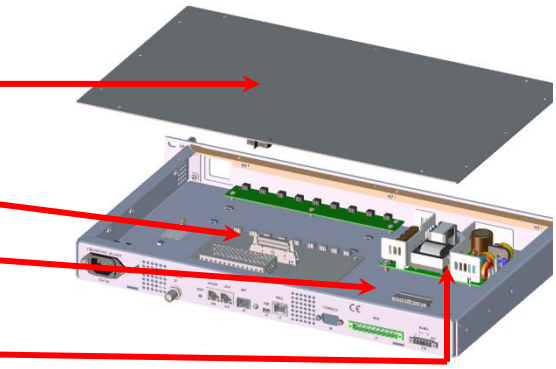
Top Cover

Main PCB

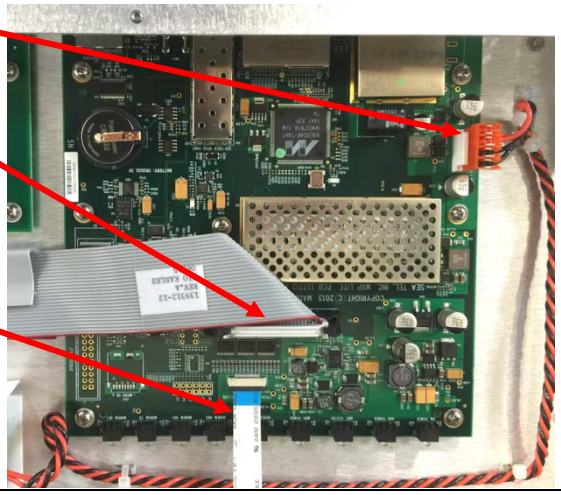
I/O PCB

Power Supply

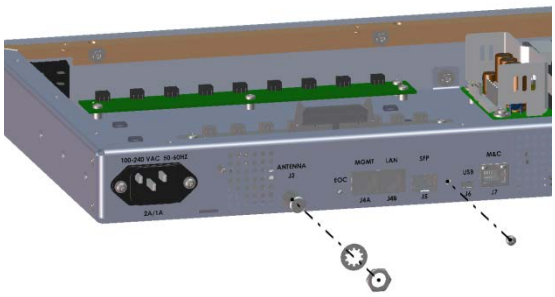


6. Remove the retaining screws that mount the LMXP in your equipment rack.
7. Extract the LMXP from the equipment rack.
8. Using a #1 Phillips screwdriver, remove the 12 screws that secure the top cover of the LMXP to the chassis.

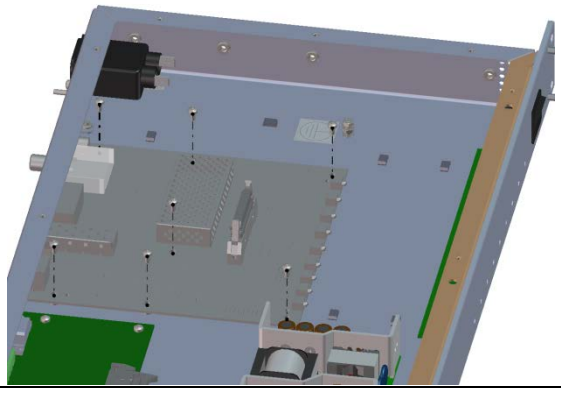
9. Disconnect the orange input power connection.
10. Disconnect the wide ribbon cable.
11. Gently pull the narrow ribbon cable out of the connector on the Main PCB.



12. Using a ½ inch open end wrench, remove the nut and lock washer from the Antenna connector on the rear panel of the LMXP.
13. Using a #1 Phillips screwdriver, remove the screw that is between the SFP and the USB connectors.



14. Using a #1 Phillips screwdriver, remove the 7 screws that secure the defective Main PCB to the chassis.



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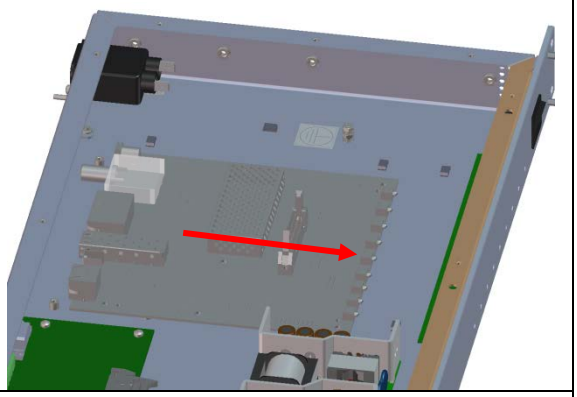
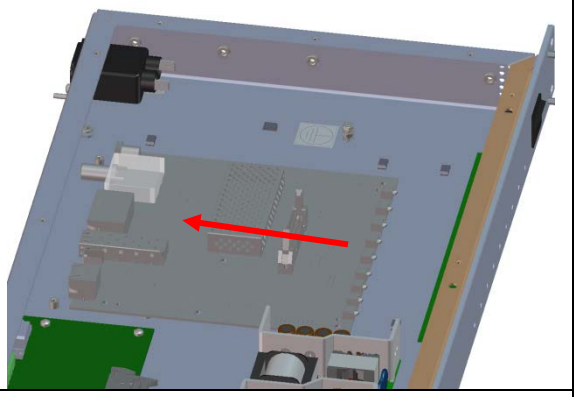
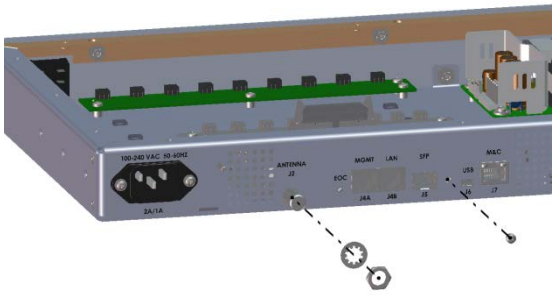
15. Pull the main PCB toward the front panel to remove the Antenna connector from the rear panel. 16. Remove the defective Main PCB from the chassis.	
17. Tilt the replacement Main PCB to insert the Antenna connector into the rear panel and align the mounting screw holes with the standoffs in the chassis.	
18. Using a ½ inch open end wrench, install and tighten the nut and lock washer onto the Antenna connector on the rear panel of the LMXP. 19. Using a #1 Phillips screwdriver, install the screw that is between the SFP and the USB connectors.	
20. Using a #1 Phillips screwdriver, install the 7 screws that secure the replacement Main PCB to the chassis.	

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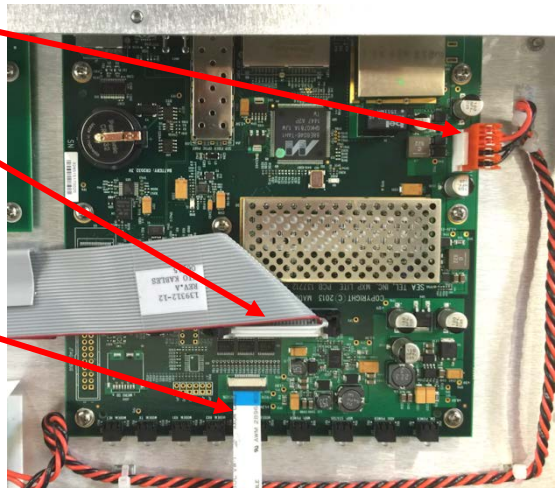
21. Connect the orange input power connection. 22. Connect the wide ribbon cable. 23. Gently insert the narrow ribbon cable into the connector on the Main PCB. This is the front panel LEDs cable. NOTE: If the power cord for the LMXP is readily accessible, you may want to plug the LMXP in and turn it ON to verify that the front panel LEDs light up before closing the LMXP. Unplug the LMXP after this quick check.	
24. Using a #1 Phillips screwdriver, install the 12 screws that secure the top cover of the LMXP to the chassis. 25. Insert the LMXP into the equipment rack. 26. Install the retaining screws that mount the LMXP in your equipment rack.	
27. Plug the Aux & NMEA connectors back into the rear panel of the LMXP and tighten the retaining screws. 28. Reconnect all of the other connections that were removed from the rear panel of the LMXP in step 5 above.	
29. If all repair work is completed, then check all connections. 30. Remove all parts, tools, and debris from the work area.	
31. Turn the power ON at the LMXP. 32. Watch the antenna initialize. 33. Check the fine balance of the antenna.	
34. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 35. Verify normal operation of all Above Decks and Below Decks Equipment. 36. Close and secure the radome hatch.	

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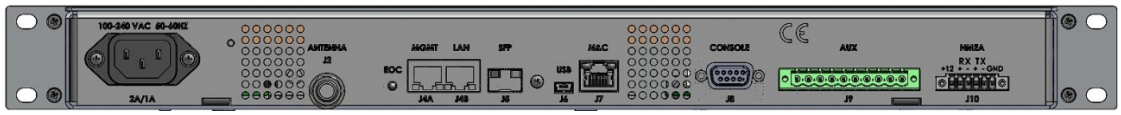
11.25. Replacing the LMXP I/O PCB

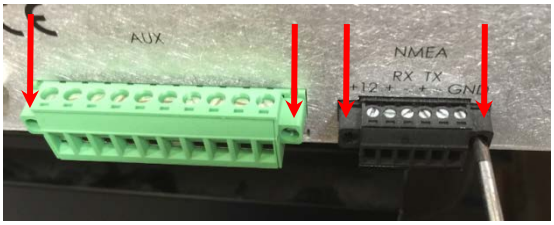
Use replacement kit PN S-67-139755 and follow this procedure for replacing the Pol Belt.

1. Turn the power OFF at the LMXP.
2. Mark the connections on the rear panel of the LMXP.

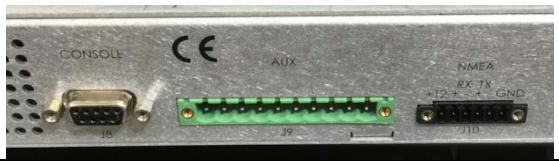


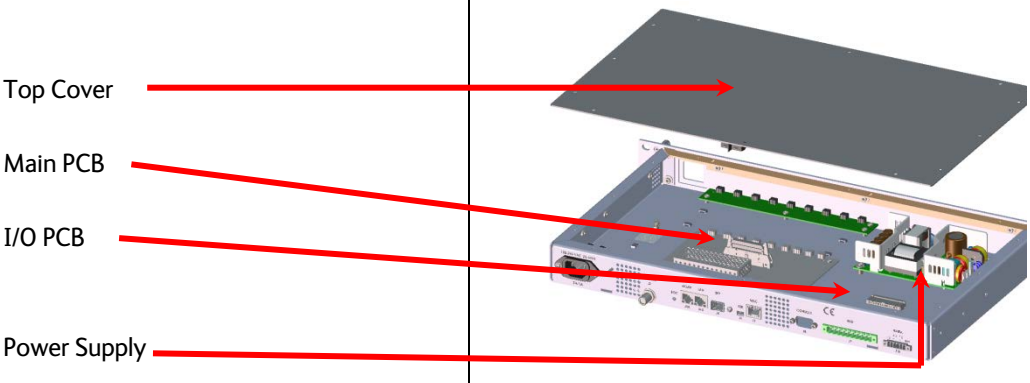
1 AC Power cable
2 Antenna Coax – This is the power & EOC coax cable that connects to the antenna.
3 Management (**normally unused**).
4 LAN – This might be an Ethernet connection to your LAN.
5 SFP – (**normally unused**)
6 Mini USB – (**normally unused**)
7 M&C – (**Not connected - -Future development**)
8 Console – (**normally unused**)
9 Aux – This might be connected to other equipment onboard the ship (ie remote alarm panel).
10 NMEA – This is the NMEA gyro compass input to the LMXP.

3. If the Aux, and/or the NMEA, connectors have wires installed in them, use a small flat blade screwdriver to unscrew the retaining screw in the end of each of the connectors (disconnect the Aux & NMEA connectors rather than removing the individual wires).
4. Pull the external Aux & NMEA connectors out of the rear panel of the LMXP



5. Disconnect all other connections from the rear panel of the LMXP.





6. Remove the retaining screws that mount the LMXP in your equipment rack.
7. Extract the LMXP from the equipment rack.
8. Using a #1 Phillips screwdriver, remove the 12 screws that secure the top cover of the LMXP to the chassis.

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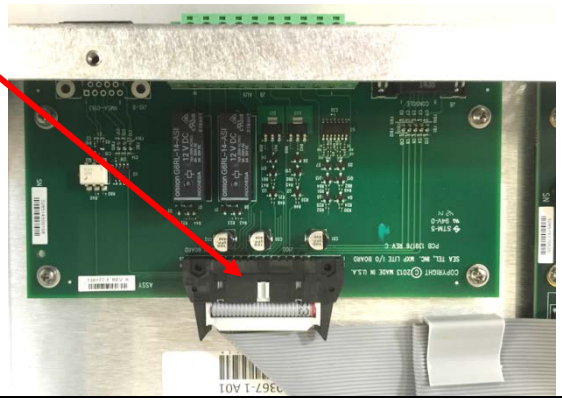
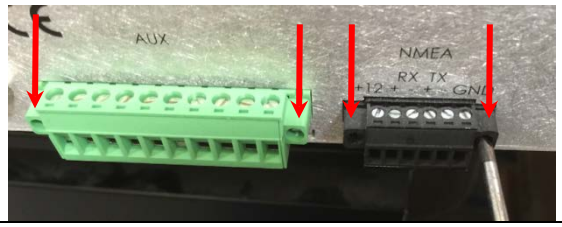
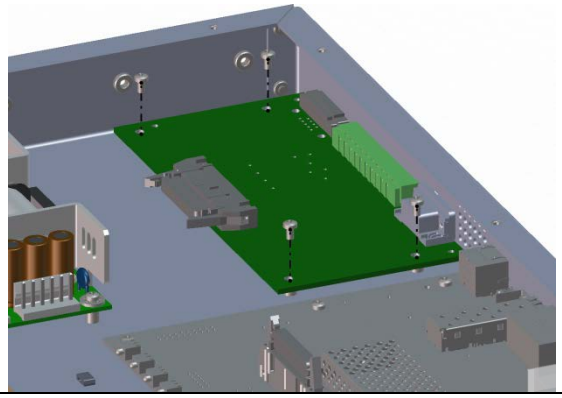
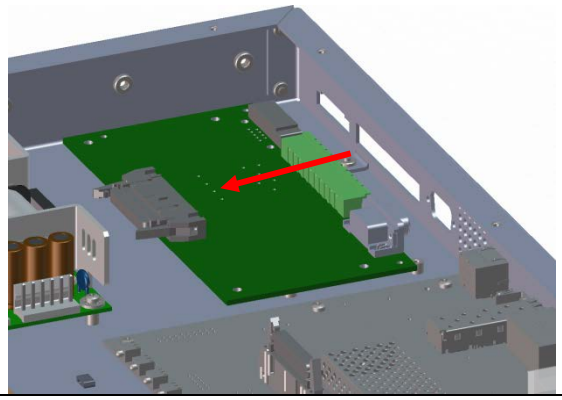
9. Disconnect the wide ribbon cable.	
10. Using a 3/16 inch nut driver, remove the 2 retaining screw standoffs from the Console connector.	
11. If not already removed, use a small flat blade screwdriver to unscrew the retaining screw in the end of each of the connectors. 12. Pull the external Aux & NMEA connectors out of the rear panel of the LMXP	
13. Using a #1 Phillips screwdriver, remove the 4 screws that secure the defective main PCB to the chassis.	
14. Pull the I/O PCB toward the front panel to remove the Console, Aux and NMEA connectors from the rear panel. 15. Remove the defective I/O PCB from the chassis.	

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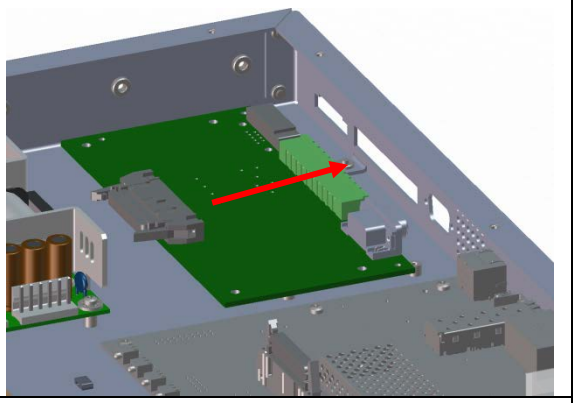
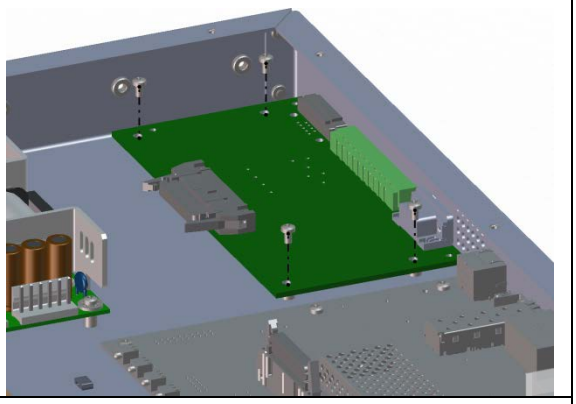
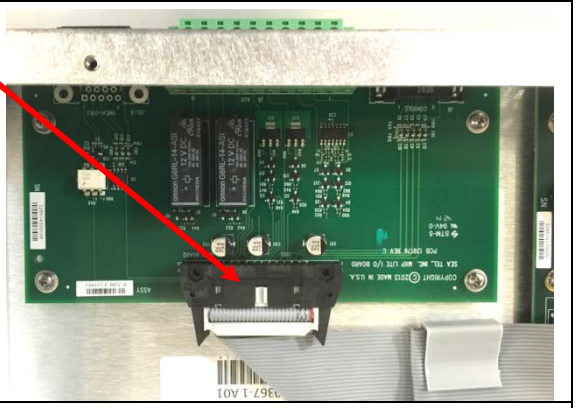
16. Tilt the replacement I/O PCB to insert the Antenna connector into the rear panel and align the mounting screw holes with the standoffs in the chassis.	
17. Using a 3/16 inch nut driver, install the 2 retaining screw standoffs from the Console connector. **CAUTION: Do NOT over tighten.**	
18. Using a #1 Phillips screwdriver, remove the 4 screws that secure the defective main PCB to the chassis.	
19. Disconnect the wide ribbon cable.	
20. Using a #1 Phillips screwdriver, install the 12 screws that secure the top cover of the LMXP to the chassis. 21. Insert the LMXP into the equipment rack. 22. Install the retaining screws that mount the LMXP in your equipment rack.	

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23. Plug the Aux & NMEA connectors back into the rear panel of the LMXP and tighten the retaining screws. 24. Reconnect all of the other connections that were removed from the rear panel of the LMXP in step 5 above.	
25. If all repair work is completed, then check all connections. 26. Remove all parts, tools, and debris from the work area.	
27. Turn the power ON at the LMXP. 28. Watch the antenna initialize. 29. Check the fine balance of the antenna.	
30. Apply power to the other below decks equipment, and either allow the system to automatically target a desired satellite, or target it manually. 31. Verify normal operation of all Above Decks and Below Decks Equipment. 32. Close and secure the radome hatch.	

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12. Specifications

The technical specifications for your system are listed below:

12.1. Above Decks Equipment

System Weight (ADE)	
Sea Tel 80 TV Weight	90 kg / 198 lbs
Sea Tel 100 TV Weight	101 kg / 222 lbs
Sea Tel 120 TV Weight	127 kg / 280 lbs
Sea Tel 100 TVHD Weight	103 kg / 228 lbs
Sea Tel 120 TVHD Weight	130 kg / 286 lbs
Stabilized Antenna Pedestal Assembly	
Type	Three-axis (Level, Cross Level and Azimuth)
Stabilization	Torque Mode Servo / Three Axis W/Pol
Stability Accuracy	0.1° RMS, 0.2° peak in presence of specified ship motions (see below).
Azimuth Motor	Size 23 Brushless DC Servo, Double Stacked W/Encoder and Brake
Level Motor	Size 23 Brushless DC Servo W/Brake
Cross Level Motor	Size 23 Brushless DC Servo W/Brake
Inertial Reference	3 Solid State Rate Sensors
Gravity Reference	2 MEMS Tilt Sensors
AZ Reference	Encoder integrated into AZ motor
Pedestal Range of Motion:	
Elevation Joint Angle	-15 to +115 degrees
Cross Level (Inclined 30°)	+/- 37 degrees
Azimuth	680 degrees
Elevation Pointing	0 to +90 degrees (with 15 degree Roll)
Maximum Ship Motions	
Roll	+/- 25 degrees at 8 sec periods
Pitch	+/-15° at 6sec periods
Yaw	+/-8 degrees at 50 sec periods
Turning rate	Up to 12 deg/sec and 15 deg/sec/sec
Headway	Up to 50 knots
Heave	0.5G
Surge	0.2G
Sway	0.2G

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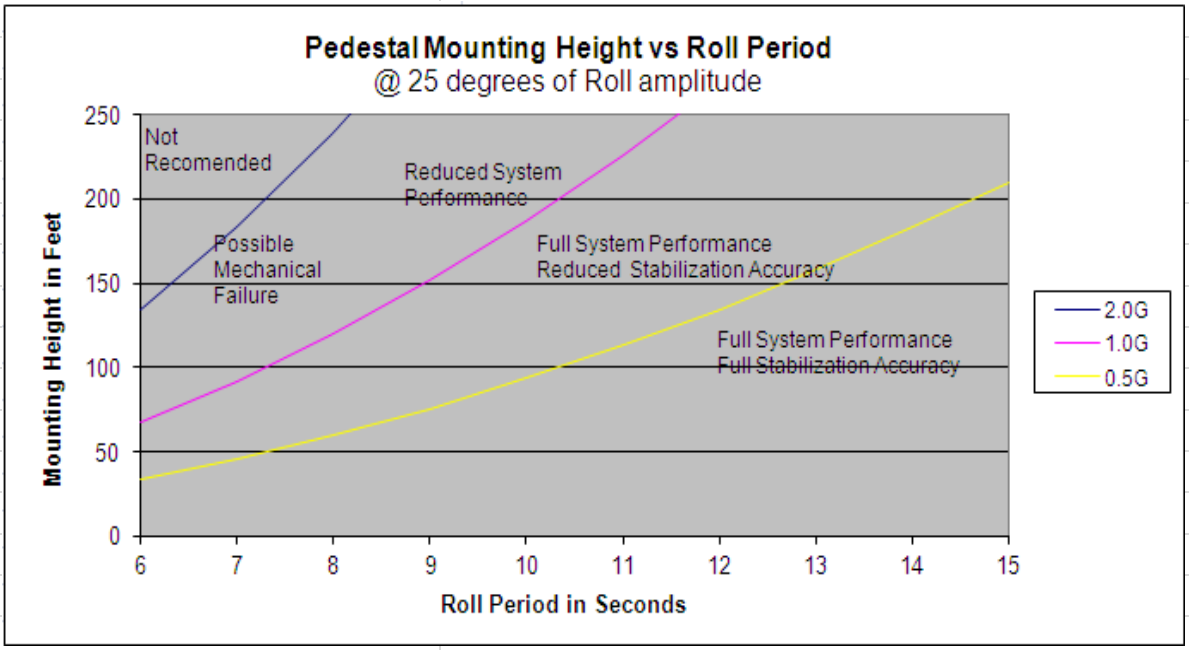
Specified Ship Motion (for stability accuracy tests)	
Roll	+/- 20° at 8 second period
Pitch	10° Fixed
Relative Azimuth (Heading)	0, 45 and 90° with respect to roll input
Mounting Height	Sea Tel recommends you do not exceed tangential accelerations of 0.5G (See below chart)



Antenna Reflector Ku-Band Sea Tel 800 TV	
Type	Spun Aluminum
Diameter	100cm / 40"
Minimum EIRP (Ku-Band)	41.5 dBW
Antenna Reflector Ku-Band Sea Tel 100 TV	
Type	Spun Aluminum
Diameter	100cm / 40"
Minimum EIRP (Ku-Band)	41.5 dBW
Antenna Reflector Ku-Band Sea Tel 120 TV	
Type	Spun Aluminum
Diameter	130cm / 51"
Minimum EIRP (Ku-Band)	40.5 dBW
Antenna Reflector Ku/Ka-Band Sea Tel 100 TVHD	
Type	Spun Aluminum
Diameter	100cm / 40"
Minimum EIRP (Ku-Band)	42 dBW
Minimum EIRP (Ka-Band)	45 dBW

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Antenna Reflector Ku/Ka-Band Sea Tel 120 TVHD	
Type	Spun Aluminum
Diameter	130cm / 51"
Minimum EIRP (Ku-Band)	41 dBW
Minimum EIRP (Ka-Band)	44 dBW
Ku-band Feed	
Type	Cassegrain feed
Polarization	Linear/Circular w/motorized skew adjustment
Polarization Control	24 volt DC motor with integrated encoder feedback
Polarization Range of Motion	180 degrees
Receive Frequency Range (Ku-Band)	10.70 - 12.75 GHz
Ka/Ku/Ka-band Feed	
Type	3 port Cassegrain feed
Polarization	Linear/Circular w/motorized skew adjustment
Polarization Control	24 volt DC motor with integrated encoder feedback
Polarization Range of Motion	180 degrees
Receive Frequency Range (Ku-Band)	10.70 - 12.75 GHz
Receive Frequency Range (Ka-Band)	18.30 - 18.80 GHz & 19.70 - 20.20 GHz
Typical Ku-Band LNB Specifications	
Sea Tel Part Number: 140116-2	
Ku-Band spec	
Input Frequency Range	10.7 - 12.75 GHz (Linear Polarization) 11.25 - 12.7 GHz (Circular Polarization)
Output Frequency Range	950 - 2150 MHz
L.O. Frequency	Adjustable 10.5 - 11.3 GHz in 2 MHz steps at High Band (11.7 - 12.75 GHz) Fixed 9.75 GHz at Low Band (10.7 - 11.7 GHz)
Input Signal Polarization	Circular (LHCP & RHCP), Linear (Vertical & Horizontal)
IF Output Connector(s)	(4) F-type female connectors
Serial Interface Connector	M12-5
Impedance	75 Ohm
Input Flange(s)	C120
D.C. Supply Voltage	13 VDC (min)
D.C. Current Consumption	1.2A (Max.)

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Typical Ku/Ka-Band LNB Specifications	
Sea Tel Part Number: 140116-1	
Ku-Band spec	
Input Frequency Range	10.7 - 12.75 GHz (Linear Polarization) 11.25 - 12.7 GHz (Circular Polarization)
Output Frequency Range	950 - 2150 MHz
L.O. Frequency	Adjustable 10.5 - 11.3 GHz in 2 MHz steps at High Band (11.7 - 12.75 GHz) Fixed 9.75 GHz at Low Band (10.7 - 11.7 GHz)
Input Signal Polarization	Circular (LHCP & RHCP), Linear (Vertical & Horizontal)
IF Output Connector(s)	(4) F-type female connectors
Serial Interface Connector	M12-5
Impedance	75 Ohm
Input Flange(s)	C120
D.C. Supply Voltage	13 VDC (min)
D.C. Current Consumption	1.2A (Max.)
Ka-Band spec (Difference or on top of Ku-Band spec)	
Input Frequency Range	(18.3 - 18.8 GHz) & (19.7 - 20.2 GHz)
Output Frequency Range	(250 - 750 MHz) & (1650 - 2150 MHz)
L.O. Frequency	18.05 GHz (fixed)
Input Signal Polarization	Circular (LHCP & RHCP)
L.O. Phase Noise (typical)	-50 dBc @ 1 KHz
	-75 dBc @ 10 KHz
	-95 dBc @ 100 KHz
	-115 dBc @ 1000KHz
L.O. Frequency Stability	+/- 4 MHz (Max.)
Image Rejection	40dBc (Min.) (950 - 2150 MHz)
	30dBc (Min.) (250 - 750 MHz)
1db gain compression point	0 dBm (Min.)
Input Flange(s)	(2) C220
GPS	On Board

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Integrated Control Unit (TICU)	
Connectors	
J1 (A)	F (F) - 13V RF Input from LNB
J1 (B)	F (F) - 18V RF Input from LNB
J1 (C)	F (F) - 13V/22kHz RF Input from LNB
J1 (D)	F (F) - 18V/22kHz RF Input from LNB
J2 (A)	F (F) - 13V RF Output to BDE
J2 (B)	F (F) - 18V RF Output to BDE
J2 (C)	F (F) - 13V/22kHz RF Output to BDE
J2 (D)	F (F) - 18V/22kHz RF Output to BDE
J4	USB 2.0 Mini Type B Jack - Device
J5	DE-15S - Motion Platform
J6	DB-25S - Pol/Aux
J7	RJ11S - GPS Antenna Input
J8	RJ45S - Ethernet (LAN)
J9	F (F) - Pedestal M&C (EOC) and Power (24 VDC)
J11	DE-9S - Serial Console - Antenna Serial M&C
J12	DE-9S - LNB Serial Control
J21	DA-15S - Azimuth Motor Drive
J22	DA-15S - Elevation Motor Drive
J23	DA-15S - Cross Level Motor Drive
J25	DE-9S - Home (Not Used)
	USB 2.0 Mini Type B Jack - Device (Motor Driver)
Status LEDs	
	Diagnostic Status of the EoC
	Diagnostic Status of the ICU
	Diagnostic Status of the DVB Lock
	Diagnostic Status of Azimuth Drive
	Diagnostic Status of Cross Level Drive
	Diagnostic Status of Elevation Drive
	Diagnostic Status of Motor Driver
Integrated DVB-S2 Receiver	
	DVB-S2 Compliant
Tuning Range	950 to 1950 MHz in 1 KHz increments
Input RF Level	-85 to -25dBm typical
Output RF Level	Input level +/- 1dB typical
Sensitivity	30mV/dB typical (25 counts/dB typical)
Bandwidth (3dB)	7.5~30MHz adjustable
ADE-BDE Interface Connections	F (F) x 5
Power Requirements	
ADE	Powered by LMXP

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Radome Assembly (42.5 Inch)	
Type	Composite
Size	
Diameter	108cm (42.5 inch)
Height	124cm (48.8 inch)
Hatch Size	33cm x 67cm (13 x 26 inch)
Weight	90 kg / 198 lbs including pedestal
Radome Assembly (53 Inch)	
Material	Composite foam/laminate
Size	
Diameter	136cm (53.7 inch)
Height	152cm (59.9 inch)
Hatch Size	28cm x 71cm (11 x 28 inch)
Weight	103 kg / 228 lbs including pedestal
Wind:	Withstand relative average winds up to 200 Kph (125 mph) from any direction.
Radome Assembly (64 Inch)	
Material	Composite foam/laminate
Size	
Diameter	167cm (65.7 inch)
Height	178cm (70.2 inch)
Hatch Size	38cm x 86cm (14.9 x 34.0 inch)
Weight	130 kg / 286 lbs including pedestal
Wind:	Withstand relative average winds up to 200 Kph (125 mph) from any direction.
Environmental Conditions (ADE)	
Temperature Range (Operating)	-25˚C to +50˚C
Temperature Range (Non-operating/Survival)	-40˚C to +70˚C
Icing	Survive ice loads of 22 Kg/sqm (4.5lbs/sqft). Degraded RF performance will occur under icing conditions.
Rain	Up to 100mm (4 inches) per hour. Degraded RF performance may occur when the radome surface is wet.
Corrosion	The equipment is specifically designed and manufactured for marine use.
Mechanical Conditions	
Vibration	IEC 60945
Packaging	Complies with ISTA

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12.2. Below Decks Equipment

Lite Media Xchange Point (LMXP)	
Standard 19 Inch Rack mount	One RU
Physical Dimensions	19 X 10 X 1.75 (Inches)/ 48 x 25 x 4 (cm)
Input Voltage	100-240 VAC, 50-60Hz, 2A/1A
Power	150W (max.)
Weight	2.2kgs / 4.8lbs
Front Panel	
	ERROR LED
	INIT LED
	TARGET LED
	SEARCH LED
	TRACK LED
	BLOCK LED
	LINK LED
	STATUS LED
	POWER LED
	Power Switch
Rear Panel Connections	
AC Input	IEC 320 Receptacle
J2	F (F) - Antenna (24VDC Power & EOC)
J4 A/B	RJ45 - Ethernet - 2 ports of the 10/100 Ethernet Switch 10.1.1.100
J5	SFP - Gigabit Ethernet
J6	USB 2.0 Mini Type B Jack - Device
J7	RJ45 Serial M&C
J8	DE9S - Serial Console - Antenna Serial M&C
J9	Screw Terminal - Auxiliary
J10	Screw Terminal - NMEA 0183 Interface
Auxiliary Interface (J9)	
Connections	**Plug-in Terminal Strip**
Pin 1 - GND	Ground
Pin 2 - Aux IN1	Aux Input 1
Pin 3 - Aux IN2	Aux Input 2
Pin 4 - GND	Ground
Pin 5 - SW1	Aux Output 1
Pin 6 - SW2	Block Output
Pin 7 - SW3A	Dry Contact set 1
Pin 8 - SW3B	Dry Contact set 1
Pin 9 - SW4A	Dry Contact set 2
Pin 10 - SW4B	Dry Contact set 2

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External AGC (AUX Inputs)	
Connectors	2 screw terminal connections
Input Voltage Level	0-5 VDC
Impedance	30K Ohm
SW1/SW2 Output	
Connections	2 screw terminal connection (SW1/SW2)
Control Level	OPEN or SHORT to ground (Configurable)
Switched outputs	4.7K pull up or Pull Down
Dry Contact Output Sets (SW3 A-B & SW4 A-B)	
Current handling	0.5 amps max.
No Alarm State	Normally Open
Alarm State	Contact closure
NMEA 0183 Interface (J10)	
Connections	6 screw terminal connections (+12V / RX+ /RX- / TX+/ TX- / GND)
Rx Sentence Format (GPS)	Configurable
Rx Sentence Format (Gyro)	HDT
BDE Environmental Conditions	
Temperature	-25˚C to +50˚C

12.3. Regulatory Compliance

Regulatory Compliance	
Vibration	IEC-60945
EMI/EMC Compliance Ku-Band	IEC-60945
	ETSI EN 301 489
Safety Compliance	EN 60950-1
Environmental Compliance	RoHS
	Green Passport

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12.4. Cables

12.4.1. Antenna L-Band TVRO IF Coax Cables (Customer Furnished)

A minimum of 5 (75 ohm) coaxial cables are required for your system. At a minimum these cables must have solid copper center conductors and, single or double, copper braid shielding.

The coaxes must be of adequate conductor cross-sectional surface area for the length of the cable run and that the loop resistance of the cable run is less than 2.0 ohms. Copper clad iron center conductor cables should never be used.

The type F male connectors installed on the cables MUST be the correct type so that they mate properly with the cable you are using.

Due to the dB losses across the length of these coaxes at L-Band, Sea Tel recommends the following 75 ohm coax, or Heliax, cable types (and their equivalent conductor size) for our standard pedestal installations:

One of these coaxes provides power to the ADE. Be cautious of length of the run, for voltage loss issues, and assure that the gauge of the conductors in this coax cable is adequate for the current that is expected to be drawn (plus margin). This cable must be low loop resistance and have a solid coper center conductor.

Run Length	Coax Type	Conductor Size
up to 75 ft	LMR-300-75	18 AWG
up to 150 ft	RG-11 or LMR-400-75	14 AWG
up to 200 ft	LDF4-75 Heliax	10 AWG
Up to 300 ft	LMR-600-75	6 AWG

For runs longer than 300 feet, Sea Tel recommends Single-mode Fiber Optic Cables with Fiber Optic converters.

12.4.2. Gyro Compass Interface Cable (Customer Furnished)

Type:	Multi-conductor, Shielded
Number of wires	4 Conductors for Step-By-Step Gyro, 5 Conductors for Synchro
Wire Gauge:	see Multi-conductor Cables spec above
Insulation:	600 VAC

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13. DRAWINGS

13.1. Sea Tel TV & TVHD Model Specific Drawings

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EAR Controlled - ECCN EAR99

ORACLE BOM Explosion Report

Item Number: 40-300010
Description: SEA TEL 80 TV
Item Revision: B.05 MCO-00022680
Date as of: 02/16/2016 10:29:25 AM PST

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1		97-144896-B	DRAFTB DCO-00011408	ASSEMBLY DRAWING, NGTV SYSTEM	
0	1		DL-000658-B	A DCO-00010697	Software Assembly General Release TVRO	
1	1	ea	141120-1	A.09 MCO-00018714	BASE SPINDLE & TURNTABLE ASSY, TVRO, 1.2M	
2	1	pcs	62-144405	A.05 MCO-00020870	ANTENNA ASSY, WWKU, 0.8M	
3	1	pcs	62-145804	A.04 ECO-00015295	RADOME ASSY, GA INSTALL, 80 TV, NCS WHITE	
4	1	ea	140372-2	A.07 ECO-00012612	LMXP, TVRO	NOT SHOWN
8	1	ea	140130	A.01 MCO-00017372	CUSTOMER DOC PACKET, TVRO, 1M	NOT SHOWN
9	1	ea	124747-1	C ECO-00008543	DECAL KIT, SEATEL, 50/60 IN DOMES	NOT SHOWN
15	1	ea	140197-1	03 MCO-00012891	HARNESS ASSY, UPPER, TVRO, KIT	
18	1	ea	129527-72	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
20	1	ea	138847-96	A ECO-00008547	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
22	4	ea	139805-1	A ECO-00008547	BASE STOP TOP, DIA 60, T&T	
24	4	ea	141257-1	01 MCO-00012614	BASE STOP BOTTOM, DIA 60	
26	4	ea	141258-1	01 MCO-00012614	BASE STOP STUD, DIA 10 X 87MM	
28	8	ea	139810-1	A ECO-00008547	RUBBER PAD, BASE STOP, DIA 60 - SHORE A 60, T&T	

Created By: Mike Needham
Create Time: 02/18/2016 08:48:36 AM PST

EAR Controlled - ECCN EAR99

ORACLE BOM Explosion Report

Item Number: 40-300010
Description: SEA TEL 80 TV
Item Revision: B.05 MCO-00022680
Date as of: 02/16/2016 10:29:25 AM PST

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
46	4	ea	126657-282	MCO-00020547	SCREW, FLAT HD, SKT DRV, M8 X 16, SS	
51	1	ea	114589-358	MCO-00012113	SCREW, HEX HD M6X90	
53	1	ea	119973-112	MCO-00012113	SCREW, SOCKET HD, M3 X 8, SS.	
55	3	ea	119973-108	MCO-00012113	SCREW. SOCKET HD, M4 X 8, SS.	
56	1	ea	119973-134	MCO-00012113	SCREW, SOCKET HD, M6 X 12, SS.	
58	4	ea	119973-216	MCO-00020454	SCREW, SOCKET HD, M10 X 40, SS.	
62	1	ea	114580-210	MCO-00012113	WASHER, FLAT, M3, SS.	
64	3	ea	114580-230	MCO-00012113	WASHER, FLAT, M4, SS.	
66	2	ea	114580-250	MCO-00016841	WASHER, FLAT, M6, SS.	
68	4	ea	114580-285	MCO-00012113	WASHER, FLAT, M10, SMALL PATTERN, SS.	
70	1	ea	123082-1921	MCO-00012113	SPACER, 1/4 X .50 OD X 1.50, NYLON	
72	1	ea	111679-3	MCO-00012114	CABLE CLAMP, NYLON, .25 DIA, #8 MTG HOLE	
74	2	ea	111679-5	MCO-00012114	CABLE CLAMP, NYLON, .375 DIA, #8 MTG HOLE	
76	2	pcs	52-207088-000	MCO-00013407	INSULATED P-CLAMP 5/8 IN	
77	1	pcs	48-146880-A	02 MCO-00018395	Box, LAMDA, 24 x 24 x 11	
80	1	ea	110959-2	E.01 ECO-00008542	DECAL, MODEL/PART/SERIAL, LARGE	
		pcs	40-300010	B.05 MCO-00022680	SEA TEL 80 TV	

Created By: Mike Needham
Create Time: 02/18/2016 08:48:36 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 140113-601

Description: SYSTEM, SEA TEL 100 TV

Item Revision: A.01 ECO-00009606

Date as of: 11/24/2014 02:50:58 PM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
1	1	141120-1	A.06 ECO-00009343	BASE SPINDLE & TURNTABLE ASSY, TVRO, 1.2M	
2	1	140931-2	A ECO-00008547	ANTENNA ASSY, WWKU, 1.0M	
3	1	141686-1	A.03 MCO-00013080	RADOME ASSY, GA INSTALL, 100 TV, NCS WHITE	
4	1	140372-2	A.01 ECO-00009161	LMXP, TVRO	
8	1	140130	A ECO-00008547	CUSTOMER DOC PACKET, TVRO, 1M	
9	1	124747-1	C ECO-00008543	DECAL KIT, SEATEL, 50/60 IN DOMES	
10	1	121711	B ECO-00008543	BALANCE WEIGHT KIT, BASIC, MEDIUM SYSTEMS	
14	1	121655-14	M ECO-00008543	LABELS INSTALLATION, GX60	
15	1	140197-1	03 ECO-00009447	HARNESS ASSY, UPPER, TVRO, KIT	
16	1	129527-30	B ECO-00008544	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
18	1	129527-72	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
20	1	138847-96	A ECO-00008547	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
51	1	114589-358	MCO-00012113	SCREW, HEX HD M6X90	
53	1	119973-112	MCO-00012113	SCREW, SOCKET HD, M3 X 8, SS.	
55	3	119973-108	MCO-00012113	SCREW. SOCKET HD, M4 X 8, SS.	
58	4	119973-216	MCO-00012113	SCREW, SOCKET HD, M10 X 40, SS.	
62	1	114580-210	MCO-00012113	WASHER, FLAT, M3, SS.	
64	3	114580-230	MCO-00012113	WASHER, FLAT, M4, SS.	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 140113-601

Description: SYSTEM, SEA TEL 100 TV

Item Revision: A.01 ECO-00009606

Date as of: 11/24/2014 02:50:58 PM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
66	1	114580-250	MCO-00012113	WASHER, FLAT, M6, SS.	
68	4	114580-285	MCO-00012113	WASHER, FLAT, M10, SMALL PATTERN, SS.	
70	2	123082-1921	MCO-00012113	SPACER, 1/4 X .50 OD X 1.50, NYLON	
72	1	111679-3	MCO-00012114	CABLE CLAMP, NYLON, .25 DIA, #8 MTG HOLE	
74	2	111679-5	MCO-00012114	CABLE CLAMP, NYLON, .375 DIA, #8 MTG HOLE	
76	2	52-207088-000	MCO-00013407	INSULATED P-CLAMP 5/8 IN	
		140113-601	A.01 ECO-00009606	SYSTEM, SEA TEL 100 TV	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 141000-601

Description: SYSTEM, SEA TEL 120 TV

Item Revision: A.04 ECO-00009991

Date as of: 12/30/2014 08:52:56 AM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
0	1	97-144896-A	DRAFTA DCO-00009951	ASSEMBLY DRAWING, NGTV SYSTEM	
1	1	141120-1	A.07 ECO-00009991	BASE SPINDLE & TURNTABLE ASSY, TVRO, 1.2M	
2	1	140931-1	B ECO-00009941	ANTENNA ASSY, WWKU, 1.2M	
3	1	141688-1	A.02 MCO-00013081	RADOME ASSY, GA INSTALL, 1.64 M, TVRO, NCS WHITE	
4	1	140372-2	A.03 ECO-00009763	LMXP, TVRO	
8	1	140130	A ECO-00008547	CUSTOMER DOC PACKET, TVRO, 1M	
9	1	124766-1	B ECO-00008543	DECAL KIT, 66-81 IN RADOME, SEA TEL	
10	1	121711	B.01 ECO-00009762	BALANCE WEIGHT KIT, BASIC, MEDIUM SYSTEMS	
14	1	121655-14	M ECO-00008543	LABELS INSTALLATION, GX60	
15	1	140197-1	03 MCO-00012891	HARNESS ASSY, UPPER, TVRO, KIT	
16	1	129527-30	B ECO-00008544	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
18	1	129527-72	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
20	1	138847-96	A ECO-00008547	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
22	4	139805-1	A ECO-00008547	BASE STOP TOP, DIA 60, T&T	
24	4	141257-1	01 MCO-00012614	BASE STOP BOTTOM, DIA 60	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 141000-601

Description: SYSTEM, SEA TEL 120 TV

Item Revision: A.04 ECO-00009991

Date as of: 12/30/2014 08:52:56 AM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
26	4	141258-1	01 MCO-00012614	BASE STOP STUD, DIA 10 X 87MM	
28	8	139810-1	A ECO-00008547	RUBBER PAD, BASE STOP, DIA 60 - SHORE A 60, T&T	
46	4	126657-282	MCO-00012113	SCREW, FLAT HD, SKT DRV, M8 X 16, SS	
51	1	114589-358	MCO-00012113	SCREW, HEX HD M6X90	
53	1	119973-112	MCO-00012113	SCREW, SOCKET HD, M3 X 8, SS.	
55	3	119973-108	MCO-00012113	SCREW. SOCKET HD, M4 X 8, SS.	
58	4	119973-216	MCO-00012113	SCREW, SOCKET HD, M10 X 40, SS.	
62	1	114580-210	MCO-00012113	WASHER, FLAT, M3, SS.	
64	3	114580-230	MCO-00012113	WASHER, FLAT, M4, SS.	
66	1	114580-250	MCO-00012113	WASHER, FLAT, M6, SS.	
68	4	114580-285	MCO-00012113	WASHER, FLAT, M10, SMALL PATTERN, SS.	
70	1	123082-1921	MCO-00012113	SPACER, 1/4 X .50 OD X 1.50, NYLON	
72	1	111679-3	MCO-00012114	CABLE CLAMP, NYLON, .25 DIA, #8 MTG HOLE	
74	2	111679-5	MCO-00012114	CABLE CLAMP, NYLON, .375 DIA, #8 MTG HOLE	
76	2	52-207088-000	MCO-00013407	INSULATED P-CLAMP 5/8 IN	
		141000-601	A.04 ECO-00009991	SYSTEM, SEA TEL 120 TV	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 141409-1

Description: SYSTEM BLOCK DIAGRAM, SEA TEL 80/100/120 WWKU

Item Revision: A.02 ECO-00008540

Date as of: 09/20/2014 11:49:16 AM PDT

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
2	1	140931-1	Introductory	ANTENNA ASSY, WWKU, 1.2M	
2	1	140931-2	Introductory	ANTENNA ASSY, WWKU, 1.0M	
2	1	140931-3	Introductory	ANTENNA ASSY, WWKU, 0.8M	
3	1	140116-2	Introductory	LNB, WWKU, TVRO	
4	1	140752-1	Introductory	ENCLOSURE ASSY, TICU	
5	1	139012-1	Introductory	MOTION PLATFORM ASSY, REMOTE	
6	1	133040-3	Introductory	MOTOR,BLDC,SIZE 23,DOUBLE STACK,W/BRAKE, W/ENCODER	
7	2	125644-1	Introductory	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PIN	
8	1	131381-1	Introductory	GPS ANTENNA, SERIAL, 118 IN	
20	1	129527-72	Introductory	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
21	1	129527-30	Introductory	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
23	1	138847-96	Introductory	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
24	1	140984-156	Introductory	HARNESS ASSY, REFLECTOR W/ENCODER,156 IN, TVRO	
25	1	140987-138	Introductory	CABLE ASSY, M12 TO DE-9, 5 WIRE, 138 IN	
26	1	117164-10BLK	Introductory	CABLE ASSY, RG-179, F TO F, 10 IN, BLK	
27	1	127963-138BLK	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, BLK	
27	1	127963-138BLU	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, BLU	
27	1	127963-138GRN	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, GRN	
27	1	127963-138WHT	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, WHT	
28	1	122372-0120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), BLK, 120 IN	
28	1	122372-5120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), GRN, 120 IN	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 141409-1

Description: SYSTEM BLOCK DIAGRAM, SEA TEL 80/100/120 WWKU

Item Revision: A.02 ECO-00008540

Date as of: 09/20/2014 11:49:16 AM PDT

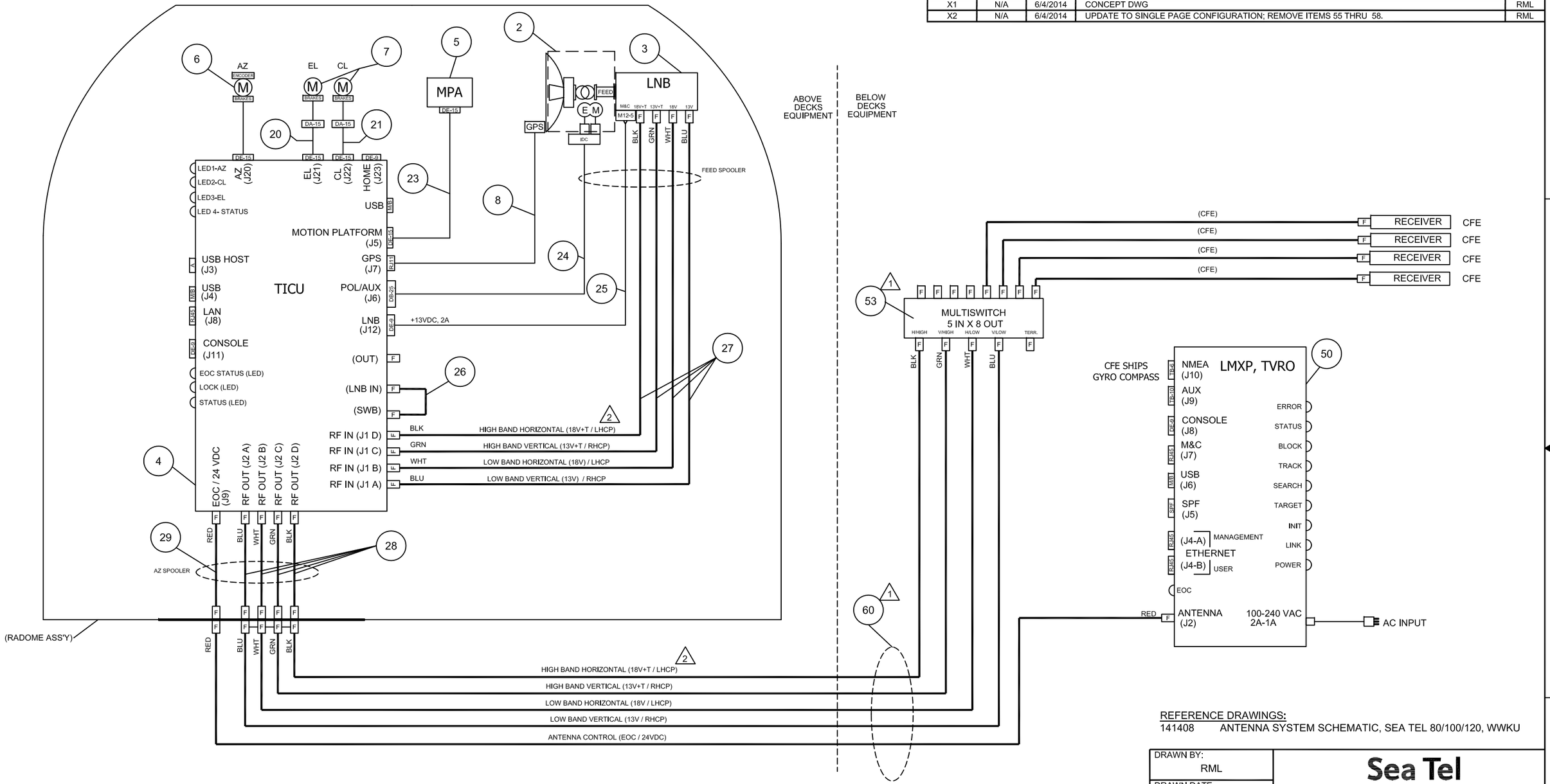
Find Num	Qty	Number	Rev	Description / Title	BOM Notes
28	1	122372-6120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), BLU, 120 IN	
28	1	122372-9120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), WHT, 120 IN	
29	1	141671-120RED	Introductory	CABLE ASSY, RG-59, F(M)-F(M), 120 IN, RED, HI FLEX	
50	1	140372-2	Introductory	LMXP, TVRO	
53	1	120422-2	Introductory	MULTISWITCH, DUO-SAT, 5 IN X 8 OUT	
60	1	133980-4	Introductory	CABLE KIT, ST, QUAD, RG6, 50FT	
60	1	133980-6	Introductory	CABLE KIT, ST, QUAD, RG11, 150FT	
		141409-1	A.02 ECO-00008540	SYSTEM BLOCK DIAGRAM, SEA TEL 80/100/120 WWKU	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
X1	N/A	6/4/2014	CONCEPT DWG	RML
X2	N/A	6/4/2014	UPDATE TO SINGLE PAGE CONFIGURATION; REMOVE ITEMS 55 THRU 58.	RML



REFERENCE DRAWINGS:
141408 ANTENNA SYSTEM SCHEMATIC, SEA TEL 80/100/120, WWKU

NOTES: UNLESS OTHERWISE SPECIFIED

1. OPTIONAL ITEM - NOT PART OF SYSTEM
2. VOLTAGE/TONE SHOWN FOR REFERENCE ONLY

EAR Controlled - ECCN EAR99

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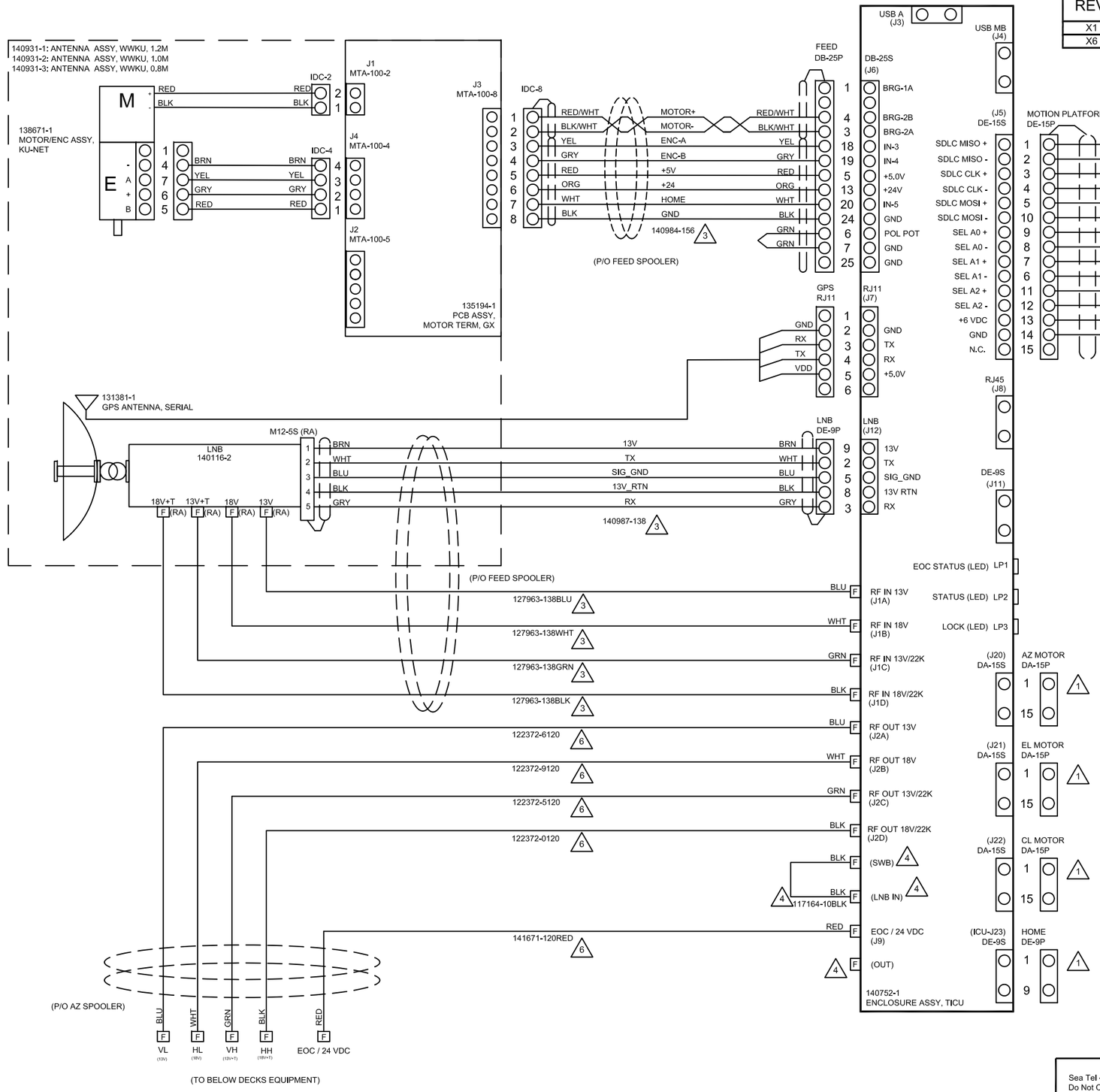
DRAWN BY: RML	Sea Tel COBHAM		
DRAWN DATE: 6/4/14	Tel. 925-798-7979 Fax. 925-798-7986		
APPROVED BY:	TITLE: SYSTEM BLOCK DIAGRAM		
APPROVED DATE:	SEA TEL 80/100/120 WWKU		
SIZE: B	SCALE: NONE	DRAWING NUMBER: 141409	REV: X2
FIRST USED: SEATEL 80/100/120 WWKU		SHEET NUMBER: 1 OF 1	

DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
X1		03/19/2014	INITIAL	RML
X6	N/A	08/11/14	DEL UNUSED PORT CONNECTORS; RELABEL DEVICE PORTS	RML



REFERENCE DRAWINGS:

141409 SYSTEM BLOCK DIAGRAM, SEA TEL 80/100/120 WWKU
141000-601 SYSTEM, TVRO, 120, WWKU

NOTES:

1. REFER TO SHEET 2 FOR PEDESTAL CONNECTION DETAILS
2. S = SMA
   (RA) = RIGHT ANGLE
3. PART OF 140197-1, HARNESS ASSY, UPPER, TVRO, KIT
4. (TO BE REMOVED FROM ASSEMBLY ON SP2)
5. REFER TO SHEET 1 FOR PEDESTAL CONNECTION DETAILS
6. PART OF 141850-1, HARNESS ASSY, LOWER, TVRO, KIT

DRAWN BY: RML	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
DRAWN DATE: 3/19/2014	
APPROVED BY:	TITLE: ANTENNA SYSTEM SCHEMATIC SEA TEL 80/100/120 WWKU
APPROVED DATE:	

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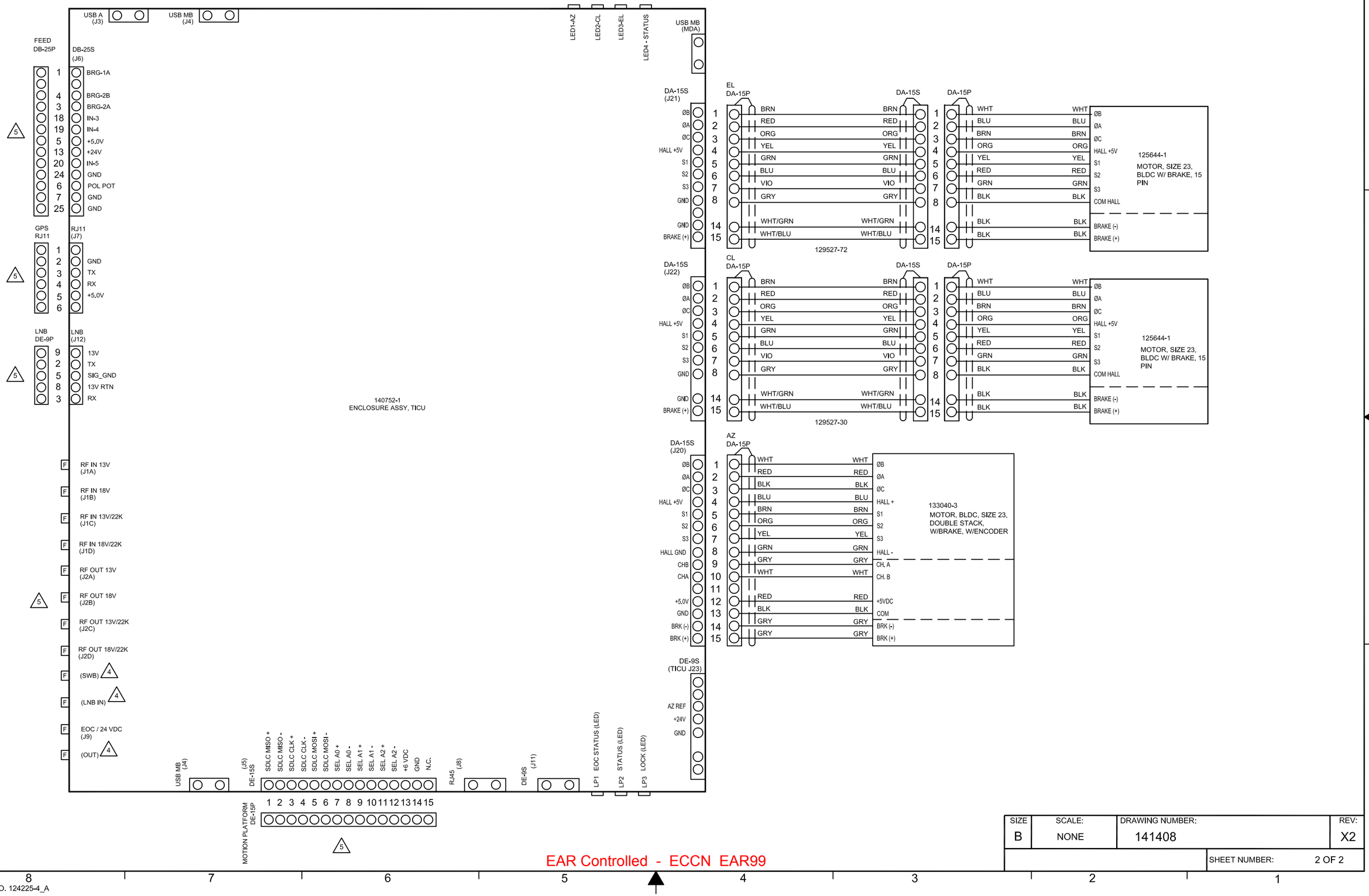
SIZE	SCALE:	DRAWING NUMBER	REV
B	NONE	141408	X2

FIRST USED: SEATEL 80/100/120 WWKU | SHEET NUMBER 1 OF 2

EAR Controlled - ECCN EAR99

DOCUMENT NO. 124225-4_A

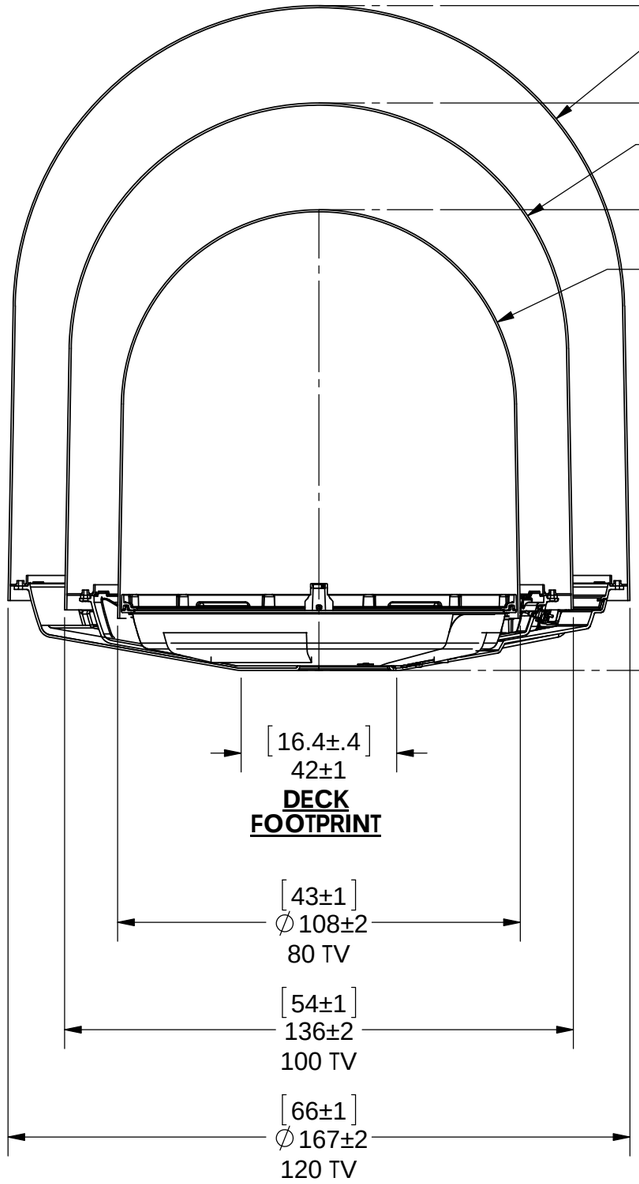


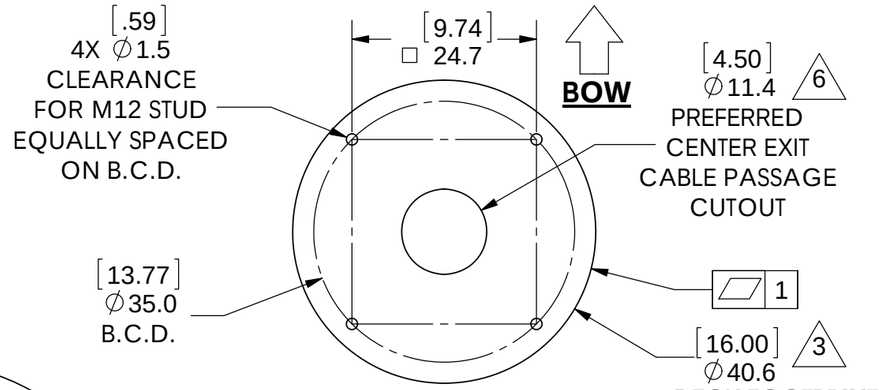
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	141408	X2
		SHEET NUMBER: 2 OF 2	

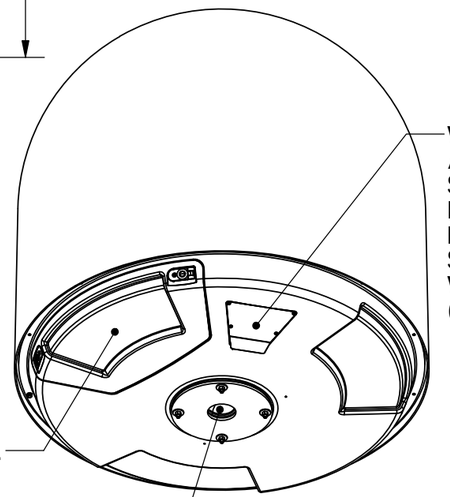
DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	11-04-14	INITIAL RELEASE.	AMN





MOUNTING SURFACE PATTERN



TYPICAL ARRANGEMENT

FACTORY SETTINGS/TRIM
ASSUME SYSTEM INSTALL
WITH HATCH DIRECTLY AFT.

NOTES: UNLESS OTHERWISE SPECIFIED

1. INDICATED ITEMS ARE PART OF PROVIDED MOUNTING KIT.
2. APPLY ADHESIVE PER SEA TEL SPEC. 121730. LOCTITE 271 (RED) PROVIDED WITH MOUNTING KIT.
3. MINIMUM DIAMETER OF MAST/MOUNTING PLATE EQUALS RADOME BASE FOOTPRINT.
4. APPLY INSTALLATION GUIDELINES PER DOC. NO. 130040.
5. DIMENSIONS ARE GIVEN IN CENTIMETERS, [INCHES IN PARENTHESE], TOLERANCE +/- 0.5MM.
6. NO SHARP EDGES PERMITTED, ON CABLE PASSAGE CUTOUT, (TO PROTECT CABLE).
7. IF RADOME IS INSTALLED EMPTY, GENERAL ASSEMBLY BOTTOM PLATE MUST BE INSTALLED.

REFERENCE DRAWINGS
62-139001 - RADOME TOP FOR 0.8M SYSTEM
62-139068 - RADOME BOTTOM FOR 0.8M SYSTEM
140090 - RADOME ASSY FOR 1.0M SYSTEM
140705 - RADOME ASSY FOR 1.2M SYSTEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN CENTIMETERS. X = ±.150, X.X = ±0.05, X.XX = ±0.015, ANGLES: ±.5°

INSPECTION DIMENSIONS NOTED BY (X.X) SHALL HAVE FEATURE SIZE DIMENSIONS AND ASSOCIATED GD&T TOLERANCES INSPECTED

INTERPRET TOLERANCING PER ASME Y14.5 - 2009

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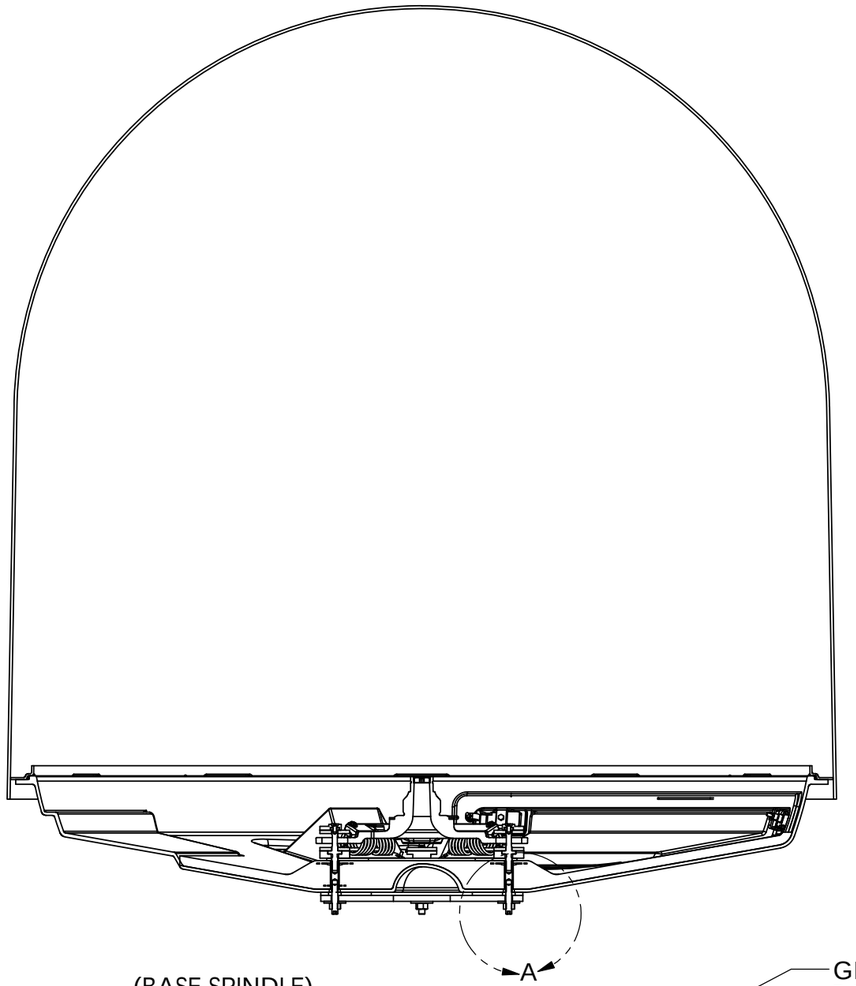
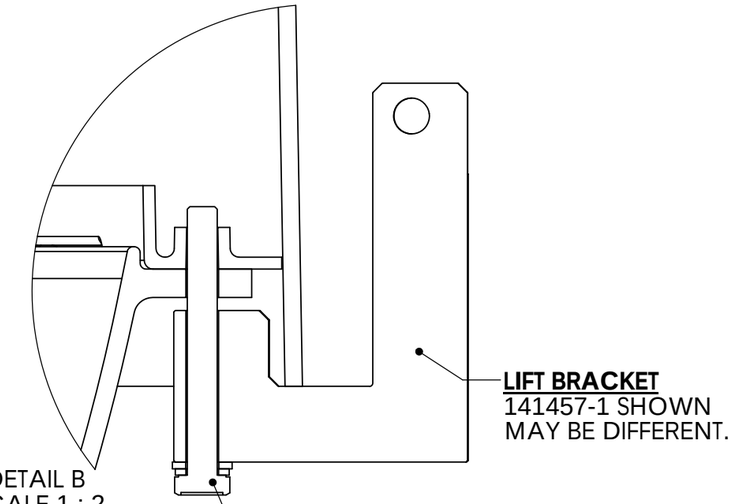
EAR Controlled ECCN EAR99

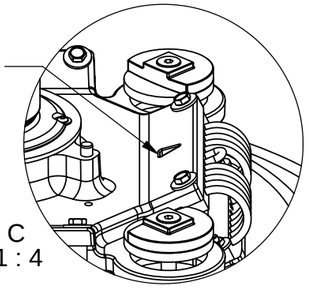
DESIGNER/ENGINEER: AMN	DRAWN BY: AMN	Sea Tel COBHAM	
WEIGHT: SEE DRAWING	DRAWN DATE: 10-24-14	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: RoHS COMPLIANT	APPROVED BY:	TITLE: INSTALLATION ARRANGEMENT, SEA TEL TV	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B	SCALE: 1:16	DRAWING NUMBER: 97-143895 REV: A
3rd ANGLE PROJECTION	FIRST USED: KA TVRO		SHEET NUMBER: 1 OF 5





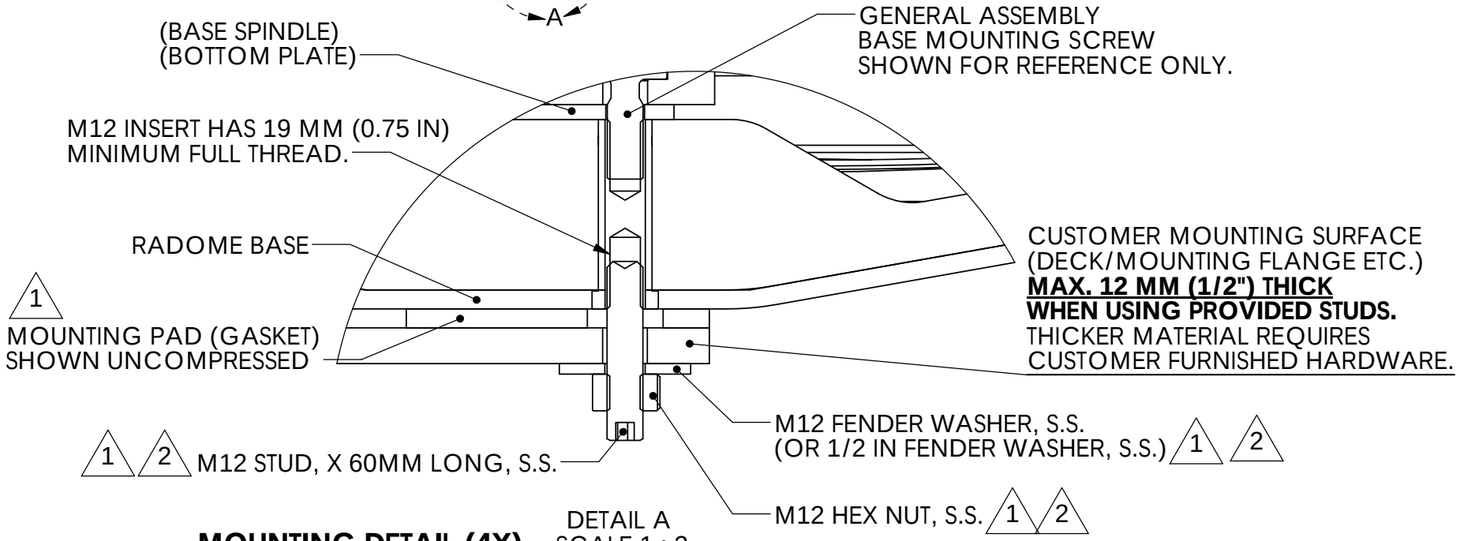
DETAIL B
SCALE 1 : 2

LIFTING DETAIL (4X)



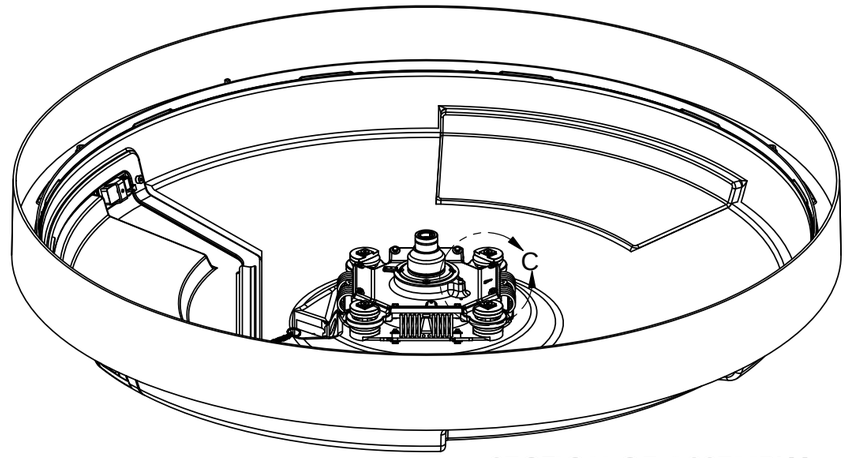
DETAIL C
SCALE 1 : 4

BOW MARKER DETAIL
(LOCATED OPPOSITE HATCH)



MOUNTING DETAIL (4X)

DETAIL A
SCALE 1 : 2

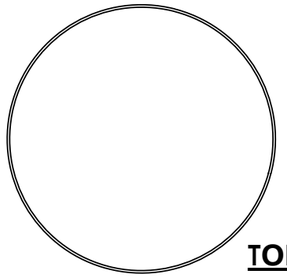


SECTION OF ASSEMBLY
SHOWN FOR REFERENCE ONLY.

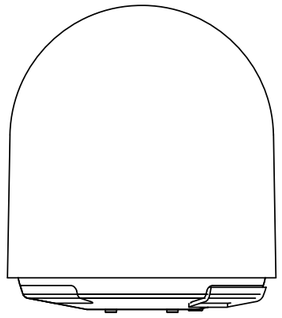
SIZE	SCALE:	DRAWING NUMBER	REV
B	1:12	97-143895	A
		SHEET NUMBER 2 OF 5	

EAR Controlled - ECCN EAR99

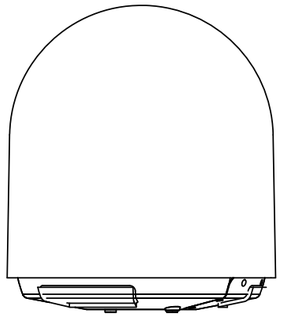
80 TV



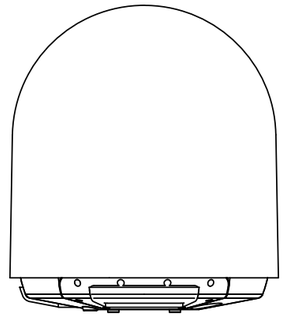
TOP VIEW



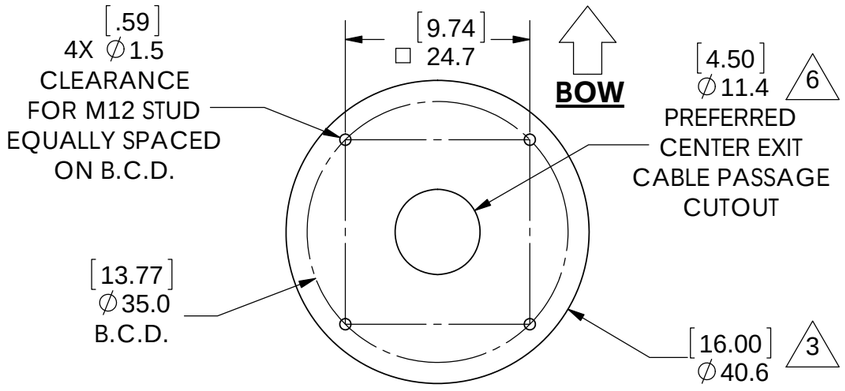
FRONT VIEW



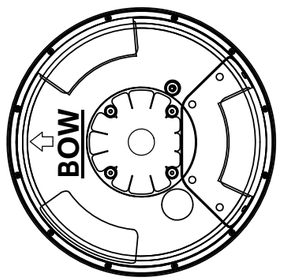
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)

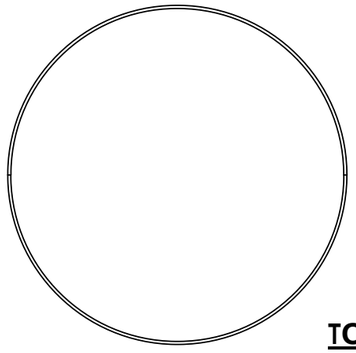


BOTTOM VIEW

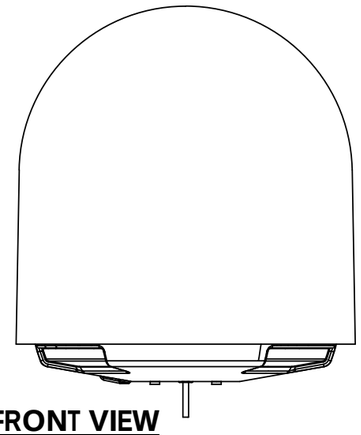
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 3 OF 5	

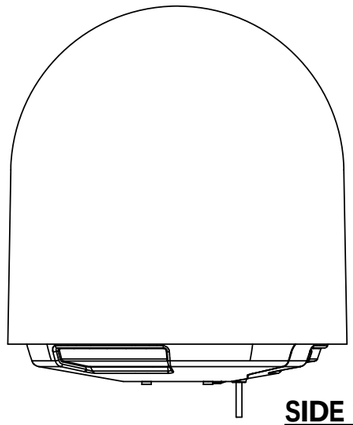
100 TV



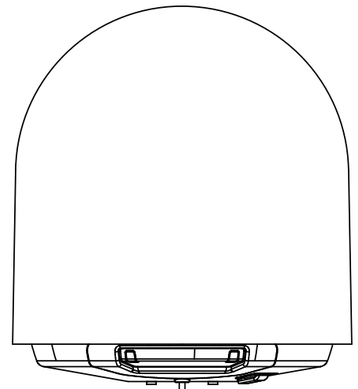
TOP VIEW



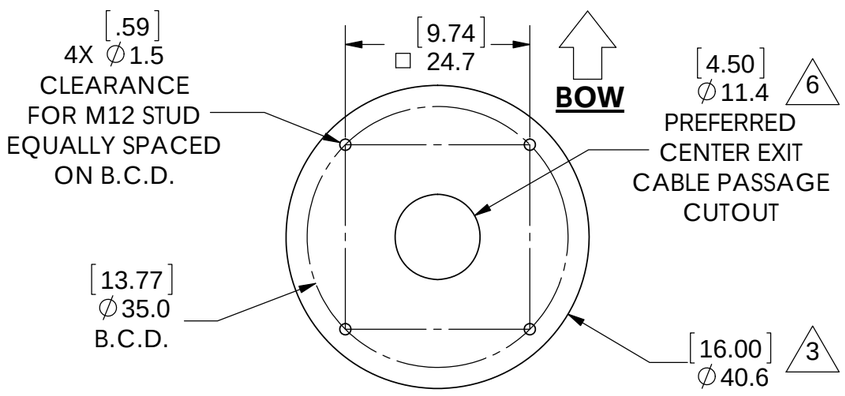
FRONT VIEW



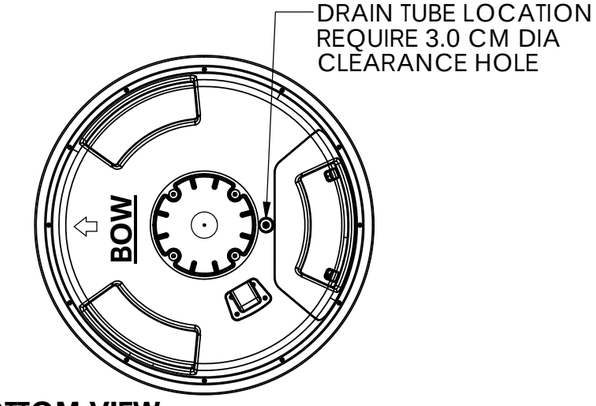
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)

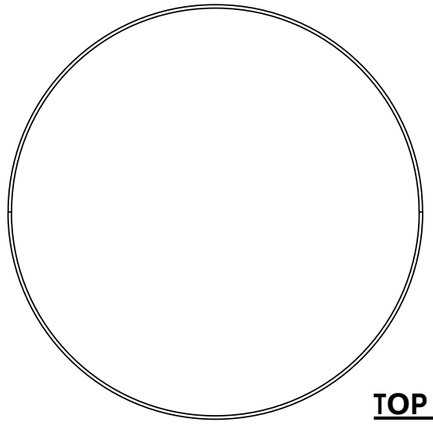


BOTTOM VIEW

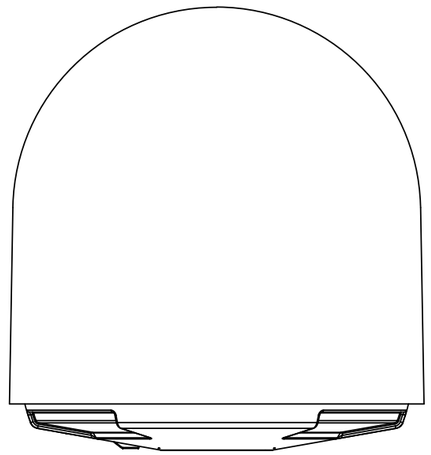
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 4 OF 5	

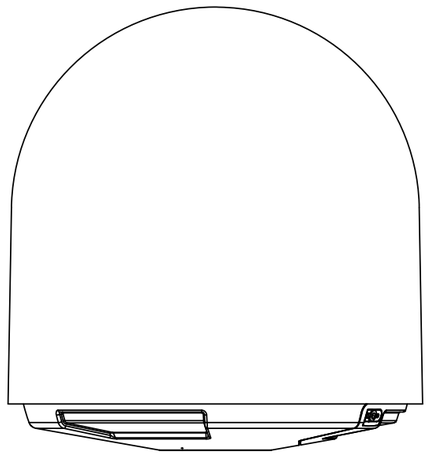
120 TV



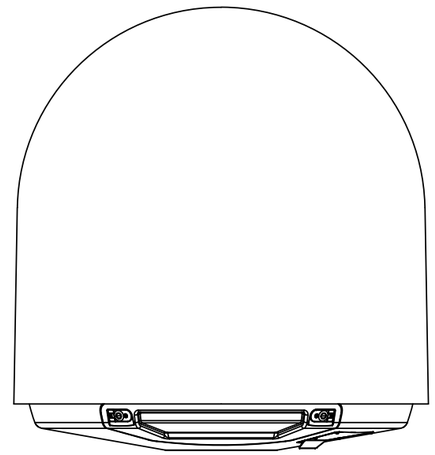
TOP VIEW



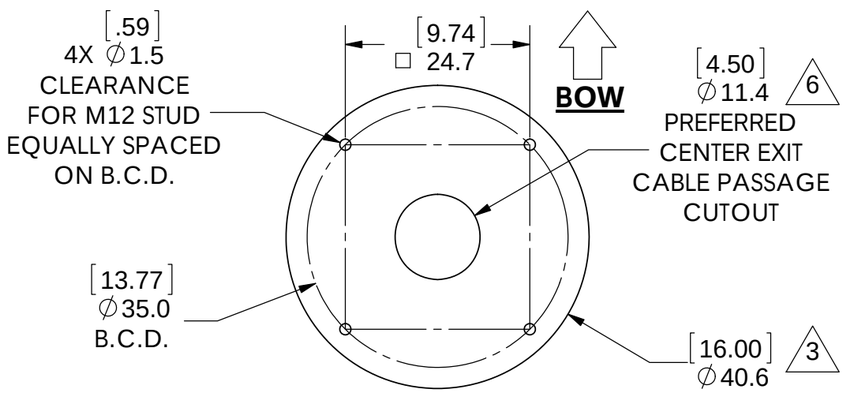
FRONT VIEW



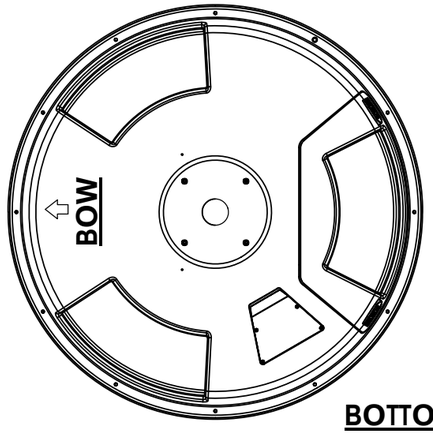
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)



BOTTOM VIEW

EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 5 OF 5	

BOM Explosion Report

Item Number: 140113-901

Description: SYSTEM, SEA TEL 100 TVHD

Item Revision: A.01 ECO-00009604

Date as of: 11/24/2014 02:49:34 PM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
1	1	141120-1	A.06 ECO-00009343	BASE SPINDLE & TURNTABLE ASSY, TVRO, 1.2M	
2	1	140119-1	A.01 ECO-00009564	ANTENNA ASSY, TVRO, 1M	
3	1	141686-1	A.03 MCO-00013080	RADOME ASSY, GA INSTALL, 100 TV, NCS WHITE	
4	1	140372-2	A.01 ECO-00009161	LMXP, TVRO	
8	1	140130	A ECO-00008547	CUSTOMER DOC PACKET, TVRO, 1M	
9	1	124747-1	C ECO-00008543	DECAL KIT, SEATEL, 50/60 IN DOMES	
10	1	121711	B ECO-00008543	BALANCE WEIGHT KIT, BASIC, MEDIUM SYSTEMS	
14	1	121655-14	M ECO-00008543	LABELS INSTALLATION, GX60	
15	1	140197-1	03 ECO-00009447	HARNESS ASSY, UPPER, TVRO, KIT	
16	1	129527-30	B ECO-00008544	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
18	1	129527-72	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
20	1	138847-96	A ECO-00008547	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
51	1	114589-358	MCO-00012113	SCREW, HEX HD M6X90	
53	1	119973-112	MCO-00012113	SCREW, SOCKET HD, M3 X 8, SS.	
58	4	119973-216	MCO-00012113	SCREW, SOCKET HD, M10 X 40, SS.	
62	1	114580-210	MCO-00012113	WASHER, FLAT, M3, SS.	
64	3	119973-108	MCO-00012113	SCREW. SOCKET HD, M4 X 8, SS.	
66	1	114580-250	MCO-00012113	WASHER, FLAT, M6, SS.	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 140113-901

Description: SYSTEM, SEA TEL 100 TVHD

Item Revision: A.01 ECO-00009604

Date as of: 11/24/2014 02:49:34 PM PST

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
68	4	114580-285	MCO-00012113	WASHER, FLAT, M10, SMALL PATTERN, SS.	
70	2	123082-1921	MCO-00012113	SPACER, 1/4 X .50 OD X 1.50, NYLON	
72	1	111679-3	MCO-00012114	CABLE CLAMP, NYLON, .25 DIA, #8 MTG HOLE	
74	2	111679-5	MCO-00012114	CABLE CLAMP, NYLON, .375 DIA, #8 MTG HOLE	
76	2	52-207088-000	MCO-00013407	INSULATED P-CLAMP 5/8 IN	
		140113-901	A.01 ECO-00009604	SYSTEM, SEA TEL 100 TVHD	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 141000-901

Description: SYSTEM, SEA TEL 120 TVHD

Item Revision: A.01 ECO-00011785

Date as of: 04/23/2015 03:05:57 PM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1		97-144896-A	A DCO-00011162	ASSEMBLY DRAWING, NGTV SYSTEM	
0	1		DL-000658-B	A DCO-00010697	Software Assembly General Release TVRO	
1	1	ea	141120-1	A.08 ECO-00011564	BASE SPINDLE & TURNTABLE ASSY, TVRO, 1.2M	
2	1	pcs	62-145485	A ECO-00011779	ANTENNA ASS'Y, KU/KA, 1.2M	
3	1	ea	141688-1	A.03 ECO-00010250	RADOME ASSY, GA INSTALL, 1.64 M, TVRO, NCS WHITE	
4	1	ea	140372-2	A.05 ECO-00010918	LMXP, TVRO	
8	1	ea	140130	A.01 ECO-00010174	CUSTOMER DOC PACKET, TVRO, 1M	
9	1	ea	124766-1	B ECO-00008543	DECAL KIT, 66-81 IN RADOME, SEA TEL	
10	1	ea	121711	B.01 ECO-00009762	BALANCE WEIGHT KIT, BASIC, MEDIUM SYSTEMS	
15	1	ea	140197-1	03 MCO-00012891	HARNESS ASSY, UPPER, TVRO, KIT	
16	1	ea	129527-30	B ECO-00008544	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
18	1	ea	129527-72	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
20	1	ea	138847-96	A ECO-00008547	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
22	4	ea	139805-1	A ECO-00008547	BASE STOP TOP, DIA 60, T&T	
24	4	ea	141257-1	01 MCO-00012614	BASE STOP BOTTOM, DIA 60	

Created By: Mike Needham

Create Time: 05/04/2015 02:41:05 PM PDT

EAR Controlled - ECCN EAR99

BOM Explosion Report

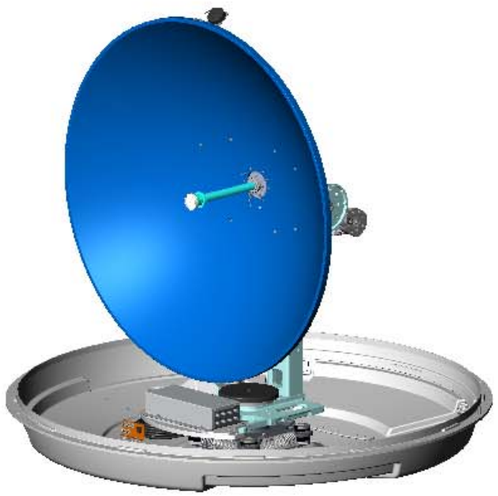
Item Number: 141000-901
Description: SYSTEM, SEA TEL 120 TVHD
Item Revision: A.01 ECO-00011785
Date as of: 04/23/2015 03:05:57 PM PDT

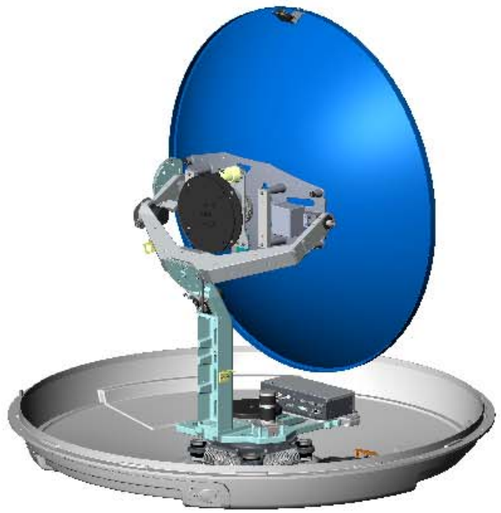
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
26	4	ea	141258-1	01 MCO-00012614	BASE STOP STUD, DIA 10 X 87MM	
28	8	ea	139810-1	A ECO-00008547	RUBBER PAD, BASE STOP, DIA 60 - SHORE A 60, T&T	
46	4	ea	126657-282	MCO-00012113	SCREW, FLAT HD, SKT DRV, M8 X 16, SS	
51	1	ea	114589-358	MCO-00012113	SCREW, HEX HD M6X90	
53	1	ea	119973-112	MCO-00012113	SCREW, SOCKET HD, M3 X 8, SS.	
55	3	ea	119973-108	MCO-00012113	SCREW. SOCKET HD, M4 X 8, SS.	
58	4	ea	119973-216	MCO-00012113	SCREW, SOCKET HD, M10 X 40, SS.	
62	1	ea	114580-210	MCO-00012113	WASHER, FLAT, M3, SS.	
64	3	ea	114580-230	MCO-00012113	WASHER, FLAT, M4, SS.	
66	2	ea	114580-250	MCO-00012113	WASHER, FLAT, M6, SS.	
68	4	ea	114580-285	MCO-00012113	WASHER, FLAT, M10, SMALL PATTERN, SS.	
70	1	ea	123082-1921	MCO-00012113	SPACER, 1/4 X .50 OD X 1.50, NYLON	
72	1	ea	111679-3	MCO-00012114	CABLE CLAMP, NYLON, .25 DIA, #8 MTG HOLE	
74	2	ea	111679-5	MCO-00012114	CABLE CLAMP, NYLON, .375 DIA, #8 MTG HOLE	
76	2	pcs	52-207088-000	MCO-00013407	INSULATED P-CLAMP 5/8 IN	
77	1	ea	134822	A ECO-00008546	PACKAGING, ARBITRATOR	
80	1	ea	110959-2	E.01 ECO-00008542	DECAL, MODEL/PART/SERIAL, LARGE	
		pcs	141000-901	A.01 ECO-00011785	SYSTEM, SEA TEL 120 TVHD	

Created By: Mike Needham
Create Time: 05/04/2015 02:41:05 PM PDT

EAR Controlled - ECCN EAR99

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY





THIS DRAWING GOVERNS THE ASSEMBLY OF THE
PART NUMBERS LISTED, REGARDLESS OF REVISION;

SYSTEM P/N	DESCRIPTION
140113-601	SYSTEM, SEA TEL 100 TV
140113-901	SYSTEM, SEA TEL 100 TVHD
141000-601	SYSTEM, SEA TEL 120 TV
141000-901	SYSTEM, SEA TEL 120 TVHD
40-300010	SYSTEM, SEA TEL 80 TV
40-300047	SYSTEM, SEA TEL 120 TV, NO BDE

NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. THIS DRAWING GOVERNS THE ASSEMBLY OF ALL PART NUMBERS LISTED ABOVE, REGARDLESS OF ASSEMBLY OR DRAWING REVISION. SOME ITEMS SHOWN ON THIS DRAWING MAY NOT BE INCLUDED ON THE BILL OF MATERIAL, OR MAY APPEAR IN A DIFFERENT ORIENTATION THAN THE DRAWING DEPICTS FOR SOME VARIANTS. REFER TO THE BILL OF MATERIALS FOR THE VARIANT NUMBER SHOWN ON THE WORK ORDER.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS.
X = ±1.50
X.X = ±0.50
X.XX = ±0.15
ANGLES: ±.5°

INSPECTION DIMENSIONS NOTED BY (X.X) SHALL HAVE FEATURE SIZE DIMENSIONS AND ASSOCIATED GD&T TOLERANCES INSPECTED

INTERPRET TOLERANCING PER ASME Y14.5 - 2009

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EAR Controlled ECCN EAR99

DESIGNER/ENGINEER: T. EDE
WEIGHT:
MATERIAL:
FINISH:
SURFACE ROUGHNESS:
3rd ANGLE PROJECTION

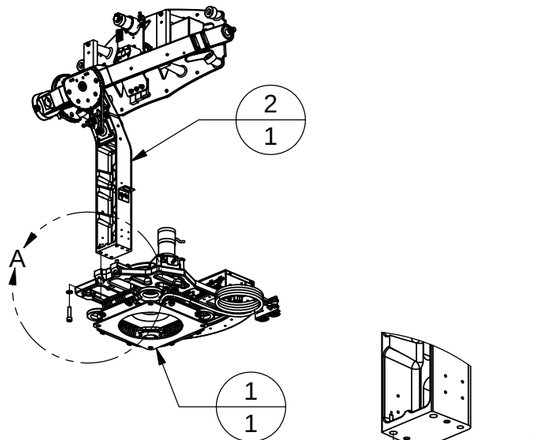
DRAWN BY: JPB
DRAWN DATE: 12/23/14
APPROVED BY:
APPROVED DATE:

SIZE: B
SCALE: 1:20
FIRST USED: NGTV

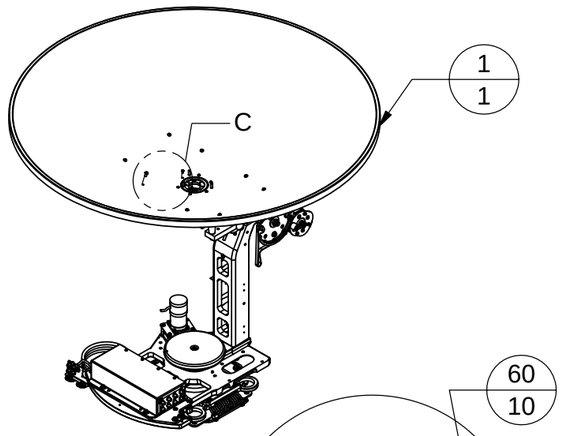
Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: ASSEMBLY DRAWING, SYSTEM, NGTV

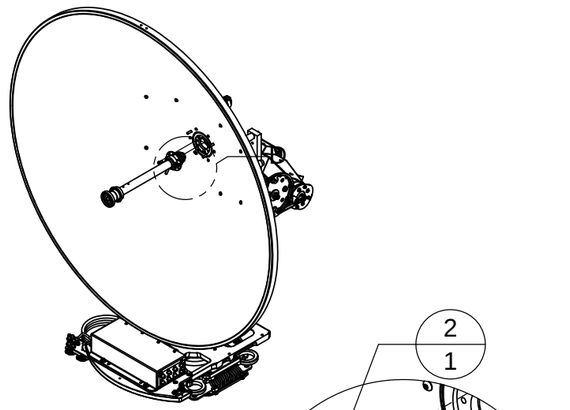
DRAWING NUMBER: 97-144896
REV: A
SHEET NUMBER: 1 OF 5



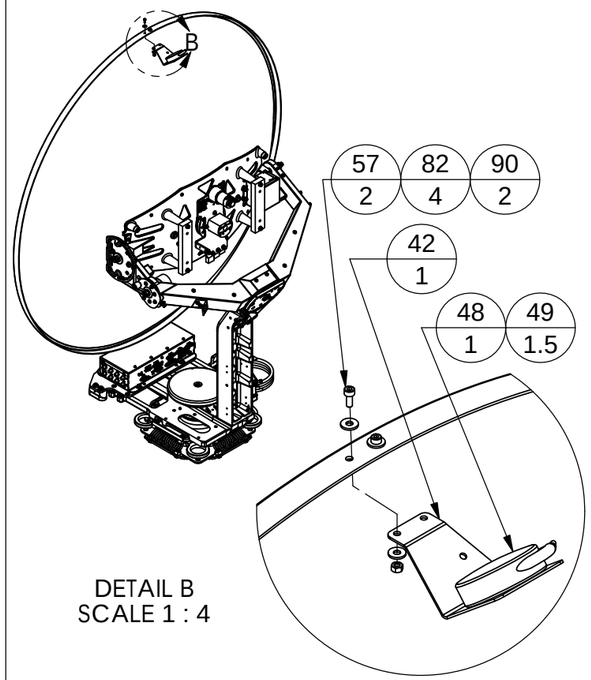
DETAIL A
SCALE 1 : 8



DETAIL C
SCALE 1 : 4

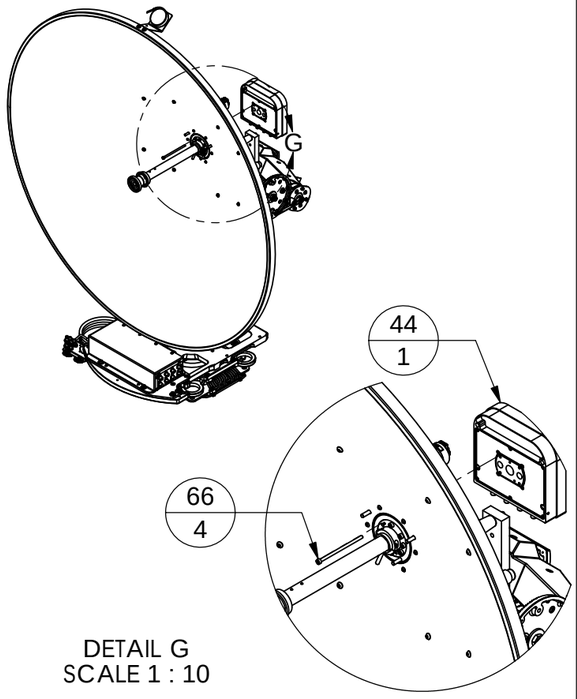


DETAIL D
SCALE 1 : 4

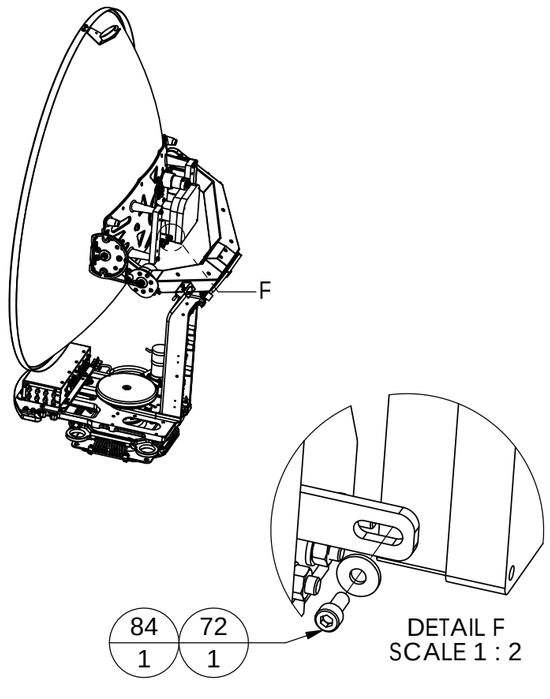


DETAIL B
SCALE 1 : 4

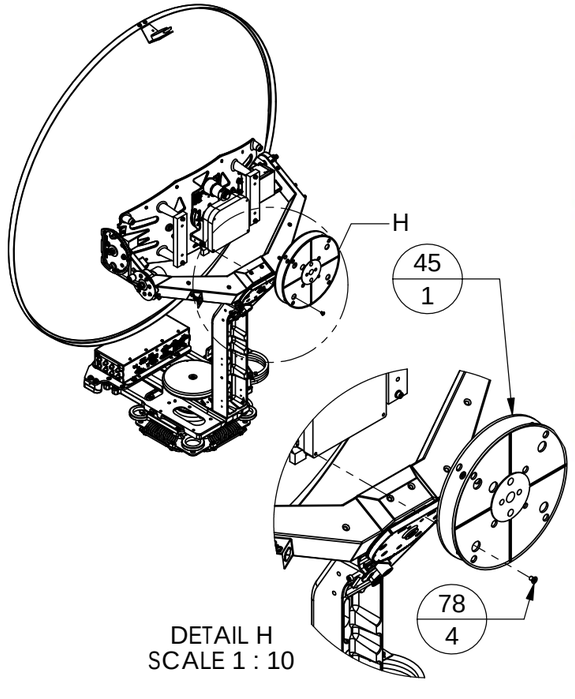
ATTACH ITEM 48 WITH ITEM 49 (NOT SHOWN)



DETAIL G
SCALE 1 : 10



DETAIL F
SCALE 1 : 2



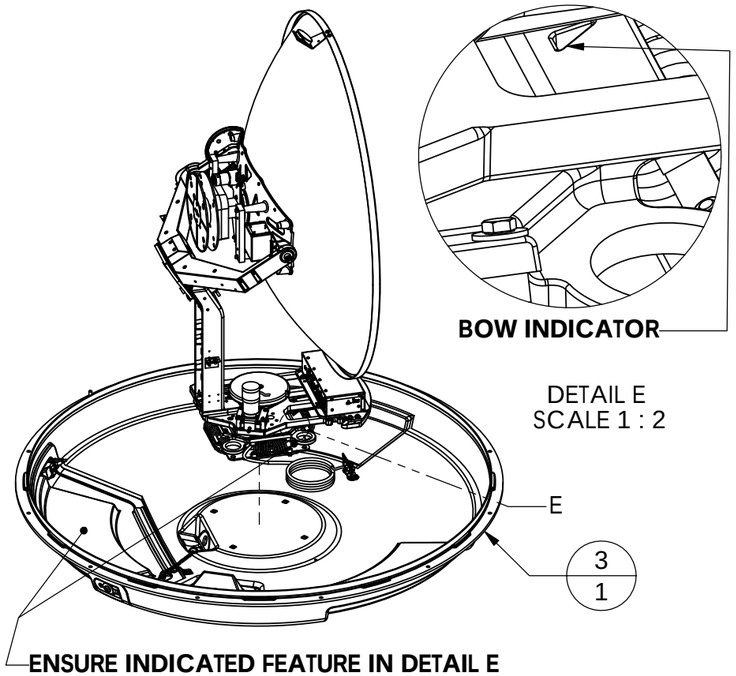
DETAIL H
SCALE 1 : 10

ATTACH ITEM 80 TO THE LEVEL BEAM APPROX. WHERE SHOWN.

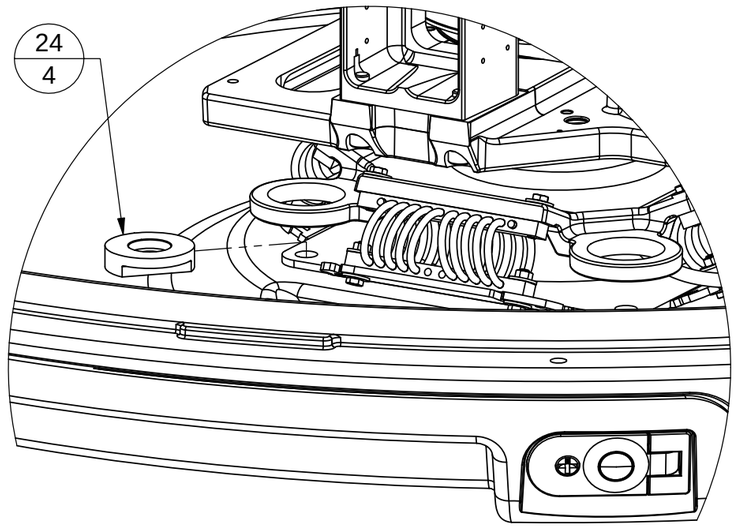
FOR PANELS 2-8 REFER TO ITEM 2 BOM FOR PART NUMBERS.

EAR Controlled - ECCN EAR99

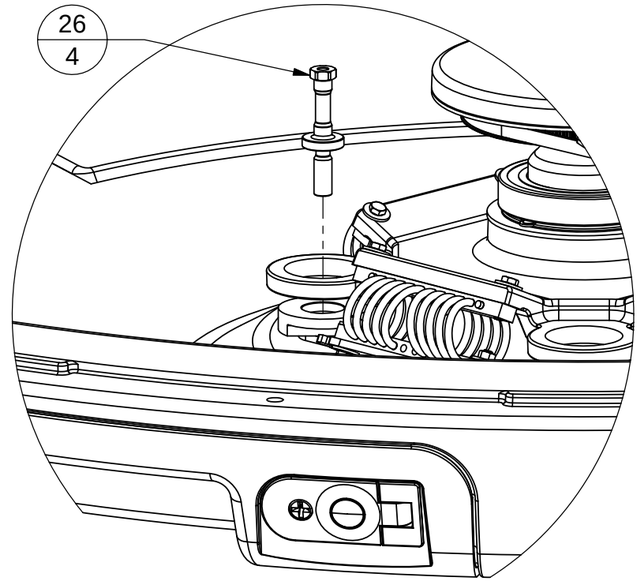
SIZE	SCALE:	DRAWING NUMBER	REV
B	1:20	97-144896	A
		SHEET NUMBER 2 OF 5	



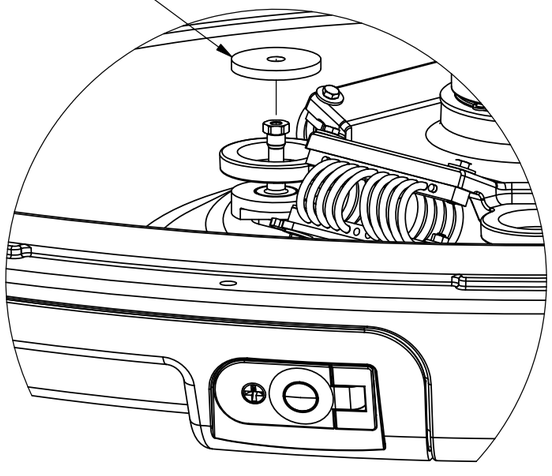
ENSURE INDICATED FEATURE IN DETAIL E IS 180 DEGREES AWAY FROM THE HATCH.



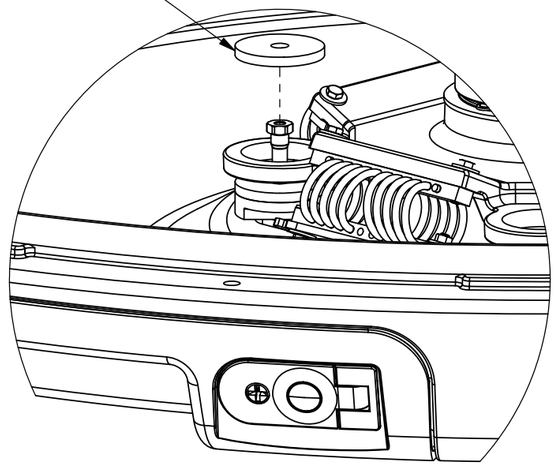
NOTE ORIENTATION OF ITEM 24.



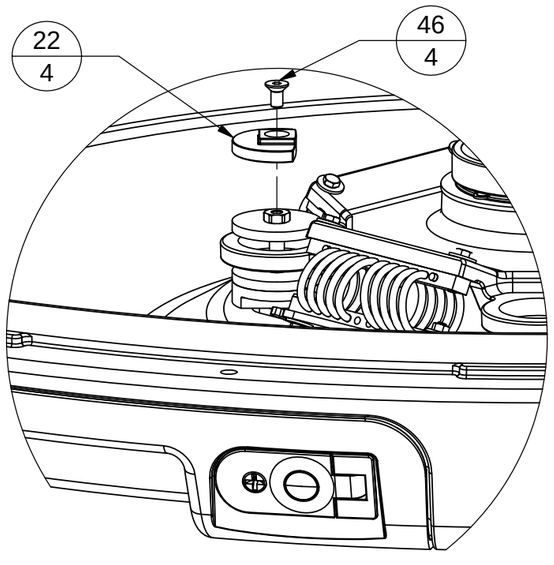
TORQUE ITEM 26 TO 60 N-m.
(TURN TABLE HIDDEN FOR CLARITY)



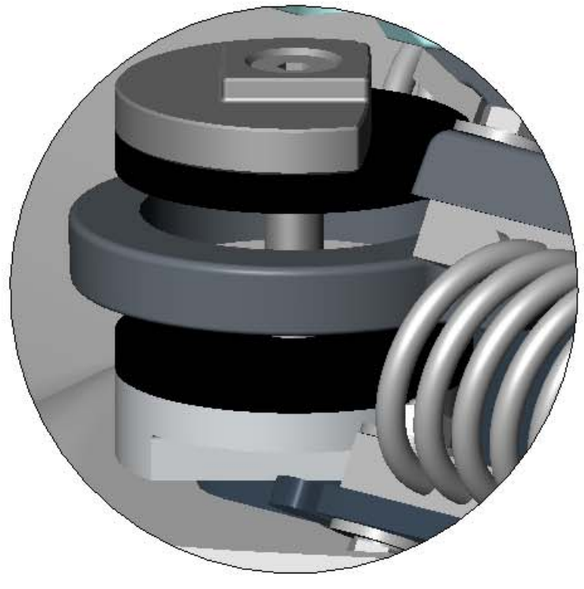
PUSH ITEM 28, QTY 1, OVER THE HEAD OF ITEM 26 AND THROUGH THE HOLE IN THE BASE SPINDLE. SEAT FULLY ON ITEM 24.



PUSH ITEM 28, QTY 1, OVER THE HEAD OF ITEM 26.



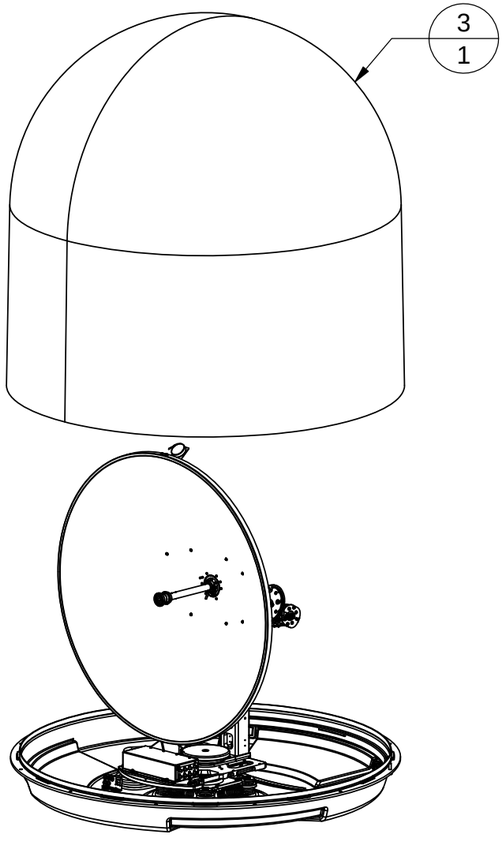
NOTE ORIENTATION OF ITEM 22. TORQUE ITEM 46 TO 16 N-m.

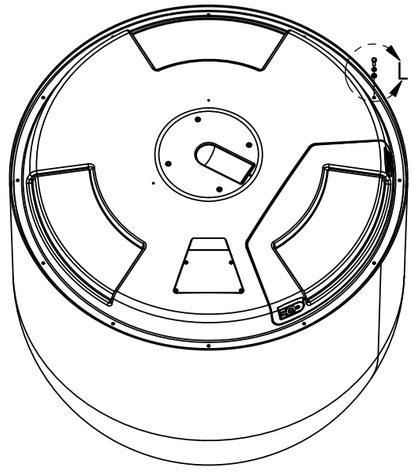


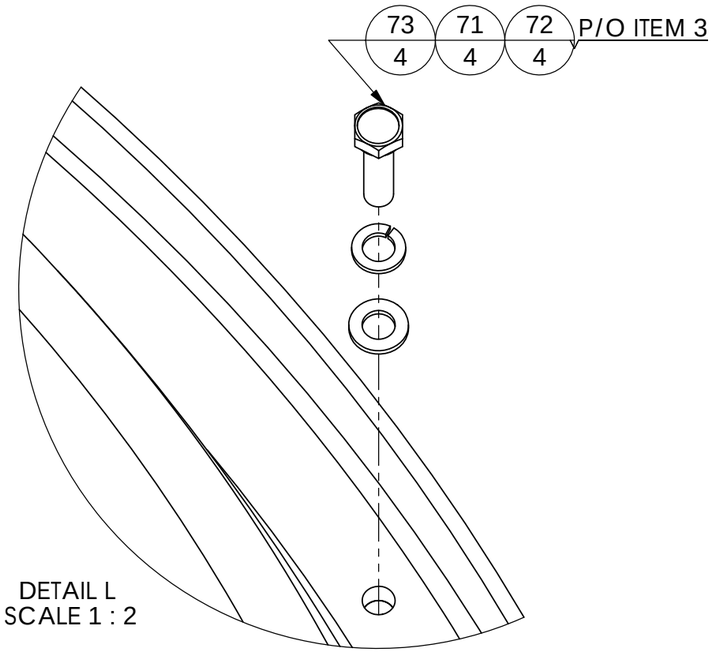
FINISHED STACK UP SHOULD APPEAR AS SHOWN. REPEAT FOR ALL 4 CORNERS OF THE BASE SPINDLE ASSEMBLY.

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:20	97-144896	A
		SHEET NUMBER 3 OF 5	

EAR Controlled - ECCN EAR99







DETAIL L
SCALE 1 : 2

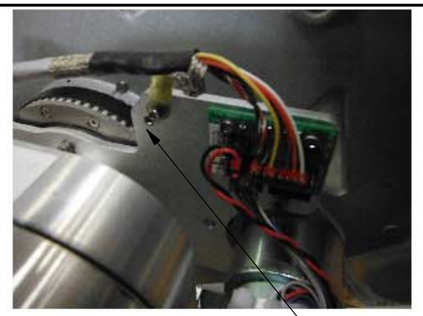
ATTACH RADOME TOP WITH 4X M10X40 BOLTS WITH LOCK WASHERS AND FLAT WASHERS.

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:25	97-144896	A
		SHEET NUMBER 4 OF 5	

EAR Controlled - ECCN EAR99

CONNECT THE POWER CABLE AND THE 4 COAX CONNECTORS TO THE LNB. NOTICE THE COLOR CODED HEAT SHRINK ON EACH. WRAP HARNESS AROUND SPOOLER TWO (2) FULL ROTATIONS.

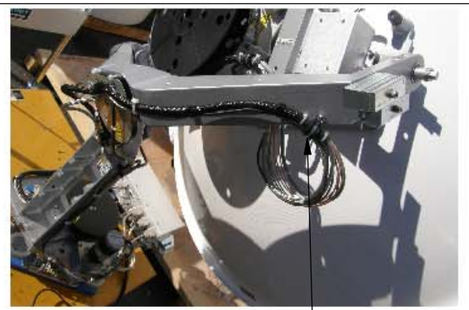
72	64	55
1	1	1



53	62
1	1

CONNECT THE 8 PIN IDC CONNECTOR TO THE MOTOR TERM PCB ON THE POLANG ASSEMBLY.

70	76	66	51
1	1	1	1



76	66	56
1	1	1

ROUTE HARNESS TO THE RIGHT SIDE OF THE CROSS LEVEL AS SHOWN. SECURE WITH TIE WRAPS.

WRAP EL MOTOR CABLE AROUND LEVEL BEAM AND SECURE WITH TIE WRAP.

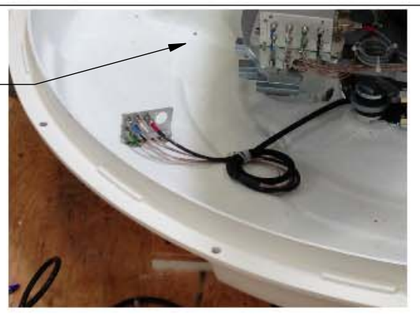
PRESS TIE WRAPS INTO PULLEY IN INDICATED LOCATIONS. SECURE CABLES.

PRESS TIE WRAPS INTO POST AND TURN TABLE IN INDICATED LOCATIONS. SECURE CABLES.

APPLY TORQUE SEAL TO ALL COAX CONNECTIONS AS SHOWN.

PRESS TIE WRAPS INTO POST IN INDICATED LOCATIONS. SECURE CABLES.

55	64	74
2	2	2



USE HOT GLUE TO ATTACH CONNECTOR BRACKET TO RADOME IN APPROX. LOCATION. USE ROTALOC, .50" CABLE CLAMP, AND M4 HARDWARE TO SECURE CABLE LOOP TO RADOME BASE.

CABLE ROUTING

EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:20	97-144896	A
		SHEET NUMBER 5 OF 5	

BOM Explosion Report

Item Number: 140112-1

Description: SYSTEM BLOCK DIAGRAM, SEA TEL 100/120, TVHD,

Item Revision: A.08 ECO-00008540

Date as of: 09/20/2014 11:49:16 AM PDT

Find Num	Qty	Number	Rev	Description / Title	BOM Notes
2	1	140119-1	Introductory	ANTENNA ASSY, TVRO, 1M	
2	1	140119-2	Introductory	ANTENNA ASSY, TVRO, 1.2M	
3	1	140116-1	Introductory	LNB, KU/KA, TVRO	
4	1	140752-1	Introductory	ENCLOSURE ASSY, TICU	
5	1	139012-1	Introductory	MOTION PLATFORM ASSY, REMOTE	
6	1	133040-3	Introductory	MOTOR,BLDC,SIZE 23,DOUBLE STACK,W/BRAKE, W/ENCODER	
7	2	125644-1	Introductory	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PIN	
8	1	131381-1	Introductory	GPS ANTENNA, SERIAL, 118 IN	
20	1	129527-72	Introductory	HARNESS ASSY, MOTOR TO ELEVATION, 72 IN	
21	1	129527-30	Introductory	HARNESS ASSY, MOTOR EXTENSION, 30 IN	
23	1	138847-96	Introductory	CABLE ASSY,INTERFACE,DE15P- DE15S,7 S/UTP,96 IN	
24	1	140984-156	Introductory	HARNESS ASSY, REFLECTOR W/ENCODER,156 IN, TVRO	
25	1	140987-138	Introductory	CABLE ASSY, M12 TO DE-9, 5 WIRE, 138 IN	
26	1	117164-10BLK	Introductory	CABLE ASSY, RG-179, F TO F, 10 IN, BLK	
27	1	127963-138BLK	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, BLK	
27	1	127963-138BLU	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, BLU	
27	1	127963-138GRN	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, GRN	
27	1	127963-138WHT	Introductory	CABLE ASSY, RG-179, F TO F(RA), 138 IN, WHT	
28	1	122372-0120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), BLK, 120 IN	
28	1	122372-5120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), GRN, 120 IN	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

BOM Explosion Report

Item Number: 140112-1

Description: SYSTEM BLOCK DIAGRAM, SEA TEL 100/120, TVHD,

Item Revision: A.08 ECO-00008540

Date as of: 09/20/2014 11:49:16 AM PDT

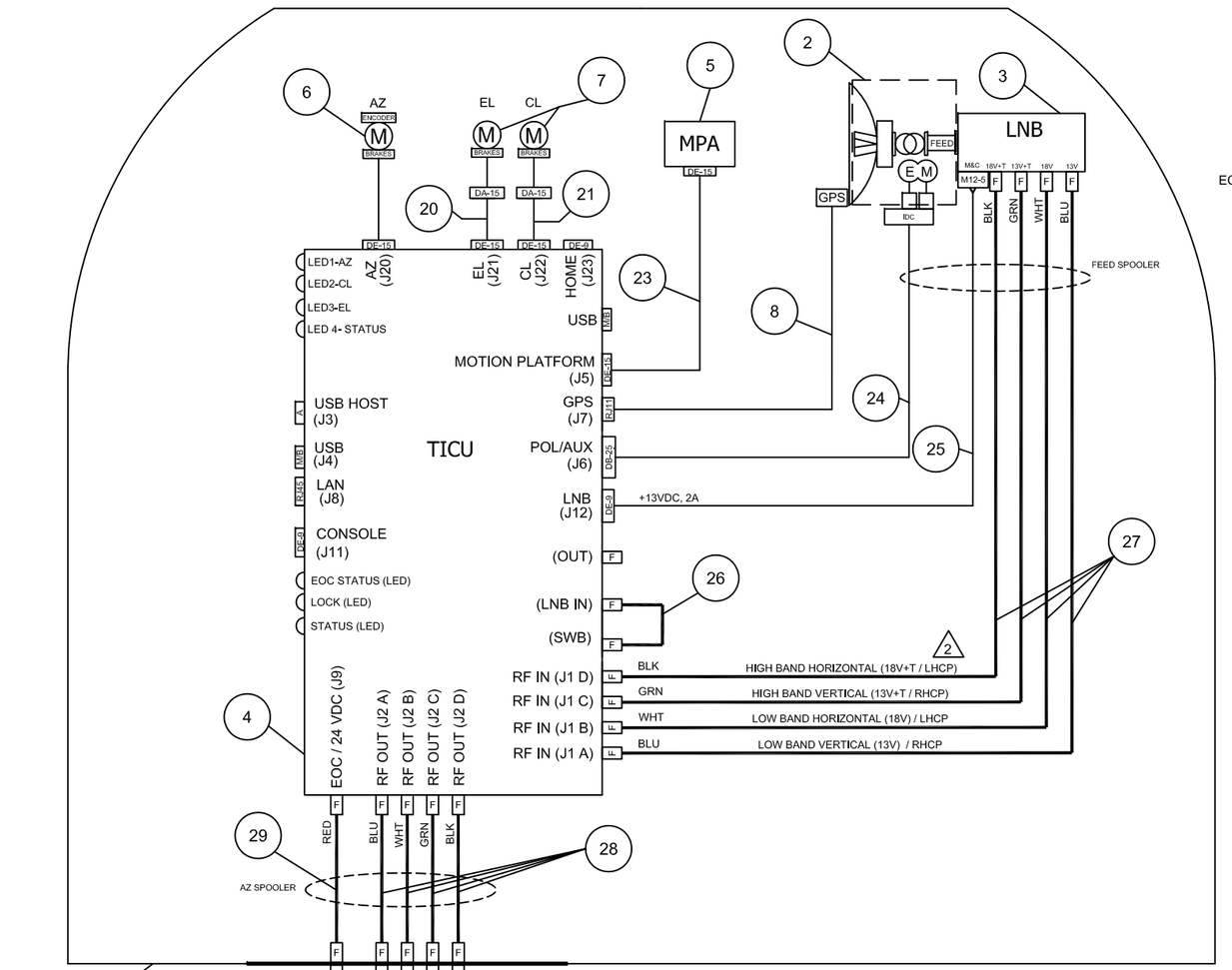
Find Num	Qty	Number	Rev	Description / Title	BOM Notes
28	1	122372-6120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), BLU, 120 IN	
28	1	122372-9120	Introductory	CABLE ASSY, RG-179, F(M)-F(M), WHT, 120 IN	
29	1	141671-120RED	Introductory	CABLE ASSY, RG-59, F(M)-F(M), 120 IN, RED, HI FLEX	
50	1	140372-2	Introductory	LMXP, TVRO	
53	1	120422-2	Introductory	MULTISWITCH, DUO-SAT, 5 IN X 8 OUT	
54	4	110873-4	Introductory	RF SPLITTER, 2-WAY, 1-CH DC PASS, F	
55	1	141042-1	MCO-00012113	MULTI-SWITCH, SINGLE WIRE, W/ PS, (SWM-8)	OPTIONAL ITEM
56	1	141043-1	MCO-00012113	SPLITTER, 8-WAY, WIDE BAND (SWM)	OPTIONAL ITEM
57	1	141044-1	MCO-00012113	RECEIVER, HD DVR, HR24-100, (SWM)	OPTIONAL ITEM
58	1	141045-1	MCO-00012113	RECEIVER, HD, H25-100, (SWM)	OPTIONAL ITEM
60	1	133980-4	Introductory	CABLE KIT, ST, QUAD, RG6, 50FT	OPTIONAL ITEM
60	1	133980-6	Introductory	CABLE KIT, ST, QUAD, RG11, 150FT	OPTIONAL ITEM
		140112-1	A.08 ECO-00008540	SYSTEM BLOCK DIAGRAM, SEA TEL 100/120, TVHD,	

Created By: Mike Needham

Create Time: 12/30/2014 10:46:47 AM PST

EAR Controlled - ECCN EAR99

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
X4	N/A	05/22/2014	BOM ONLY- UPDATES TO CABLE LENGTHS USED FOR PROTO SYSTEMS (ITEMS 20, 21, 27)	RML
X5	N/A	07/28/2014	REVISE CABLE LENGTHS; DEL ITEM 51 (BDK)	RML
X6	N/A	8/11/14	REVISED PER PROD DOC MGR REDLINES	RML
X7	N/A	8/21/14	ITEM 1, GENERAL ASSY, REMOVED FROM ALL BOMS PER PROD ENG	RML
X8	N/A	9/08/14	COPY -4 (EU/DTV) CONFIG TO SHEET 1; DEL SHEETS 2-4. REV CABLE/DEVICE LABLES; DEL ITEM 52.	RML



REFERENCE DRAWINGS:
140111 SCHEMATIC, ANTENNA SYSTEM, SEA TEL 100/120 TVHD

NOTES: UNLESS OTHERWISE SPECIFIED

1. OPTIONAL ITEM - NOT PART OF SYSTEM
2. VOLTAGE/TONE SHOWN FOR REFERENCE ONLY

DRAWN BY: RML	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986		
DRAWN DATE: 12/17/2013			
APPROVED BY:	TITLE: SYSTEM BLOCK DIAGRAM SEA TEL 100/120 TVHD		
APPROVED DATE:			
SIZE: B	SCALE: NONE	DRAWING NUMBER: 140112	REV: X8
FIRST USED: SEATEL 100/120 TVHD		SHEET NUMBER: 1 OF 1	

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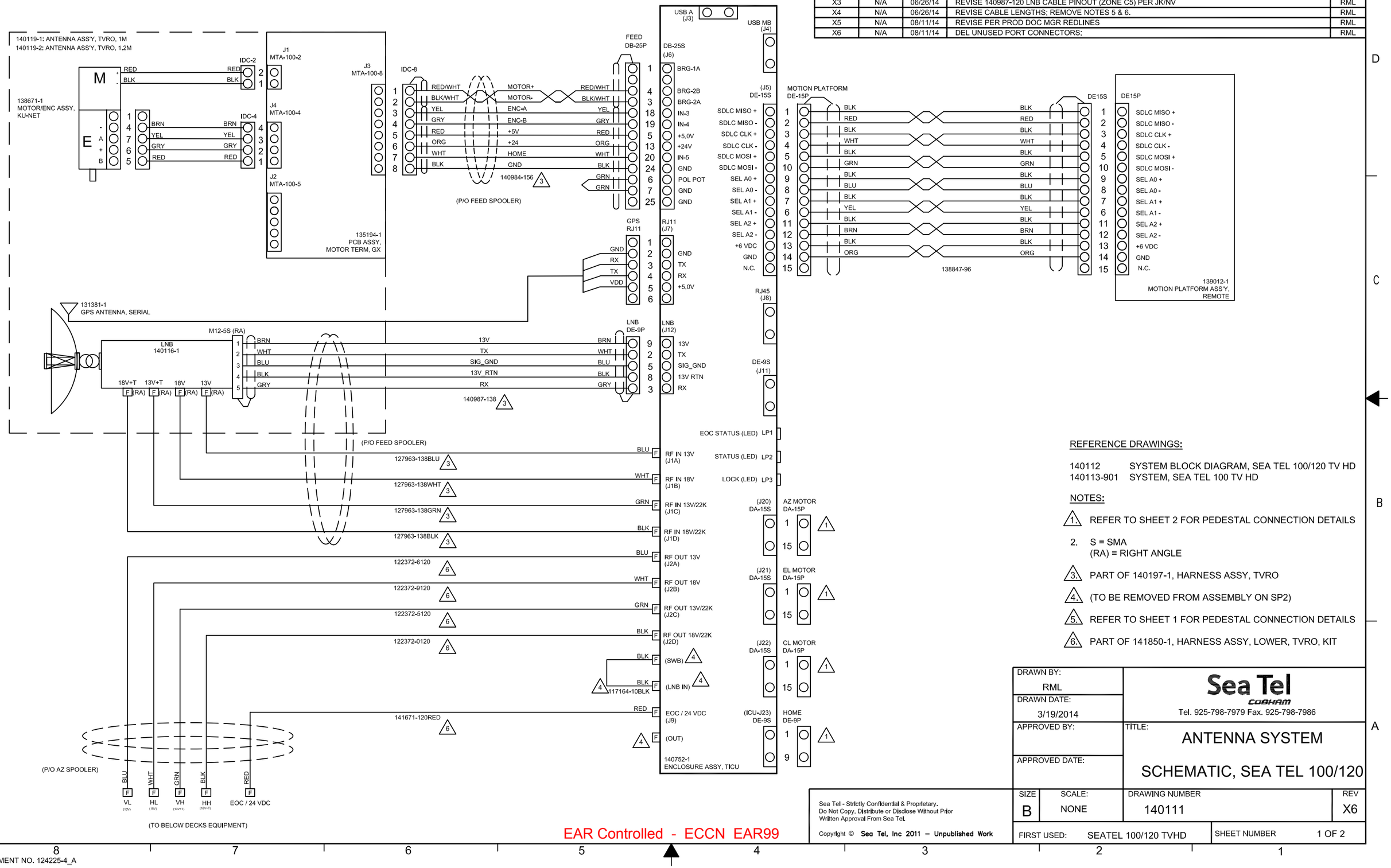
EAR Controlled - ECCN EAR99

DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
X3	N/A	06/26/14	REVISE 140987-120 LNB CABLE PINOUT (ZONE C5) PER JK/NV	RML
X4	N/A	06/26/14	REVISE CABLE LENGTHS; REMOVE NOTES 5 & 6.	RML
X5	N/A	08/11/14	REVISE PER PROD DOC MGR REDLINES	RML
X6	N/A	08/11/14	DEL UNUSED PORT CONNECTORS;	RML



REFERENCE DRAWINGS:

140112 SYSTEM BLOCK DIAGRAM, SEA TEL 100/120 TV HD
140113-901 SYSTEM, SEA TEL 100 TV HD

NOTES:

1. REFER TO SHEET 2 FOR PEDESTAL CONNECTION DETAILS
2. S = SMA
   (RA) = RIGHT ANGLE
3. PART OF 140197-1, HARNESS ASSY, TVRO
4. (TO BE REMOVED FROM ASSEMBLY ON SP2)
5. REFER TO SHEET 1 FOR PEDESTAL CONNECTION DETAILS
6. PART OF 141850-1, HARNESS ASSY, LOWER, TVRO, KIT

DRAWN BY: RML	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
DRAWN DATE: 3/19/2014	
APPROVED BY:	TITLE: ANTENNA SYSTEM SCHEMATIC, SEA TEL 100/120
APPROVED DATE:	

SIZE	SCALE:	DRAWING NUMBER	REV
B	NONE	140111	X6

FIRST USED: SEATEL 100/120 TVHD SHEET NUMBER 1 OF 2

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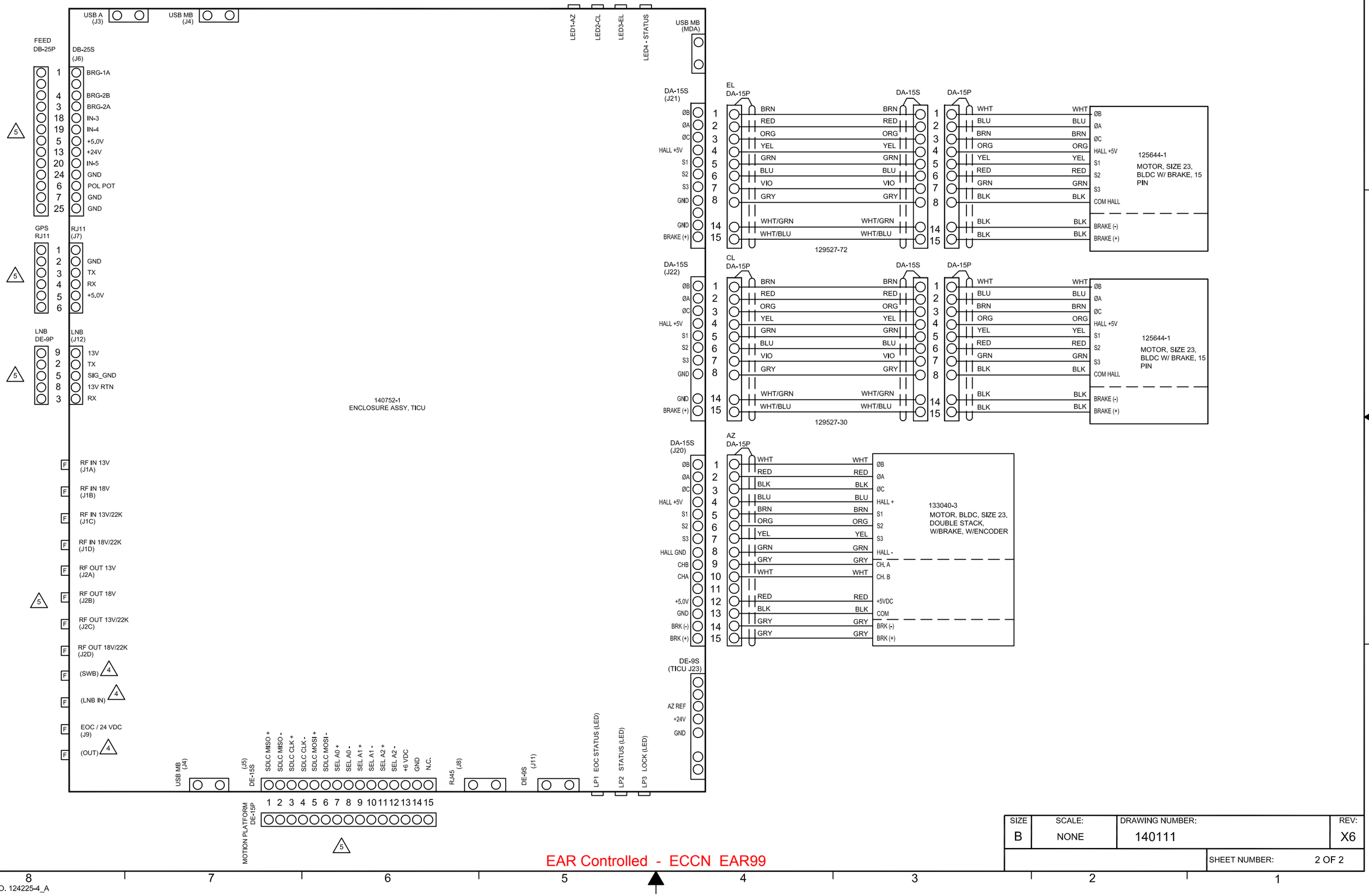
DOCUMENT NO. 124225-4_A

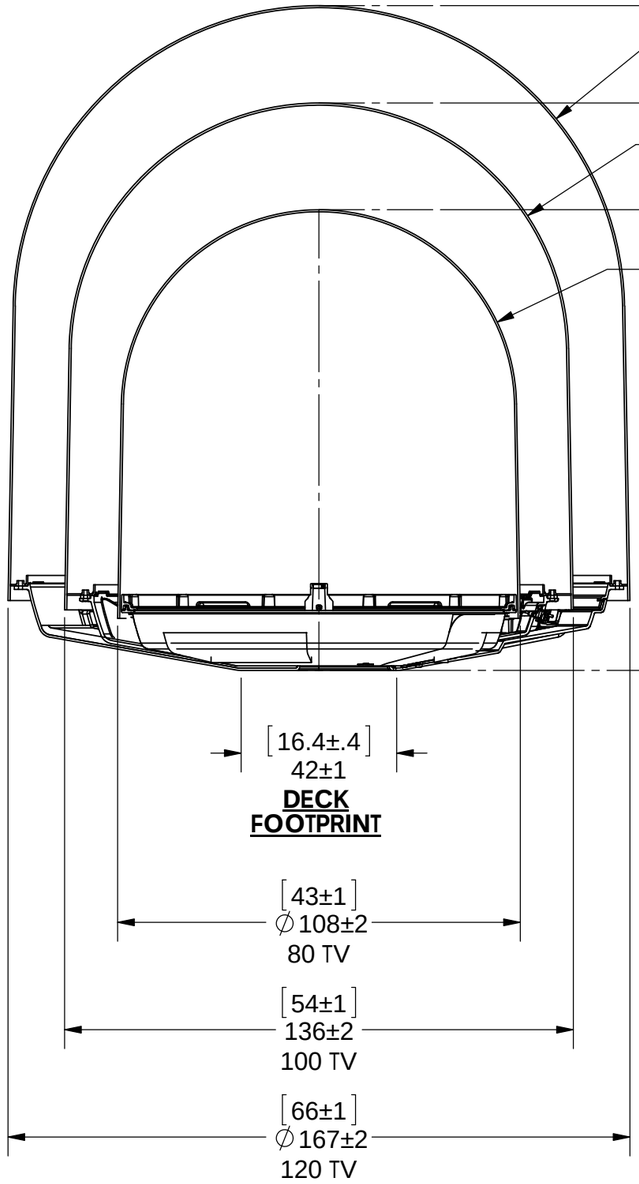


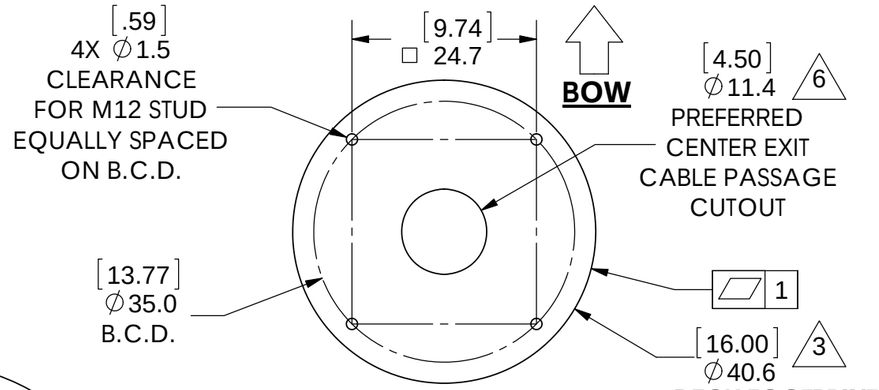
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	140111	X6
		SHEET NUMBER: 2 OF 2	

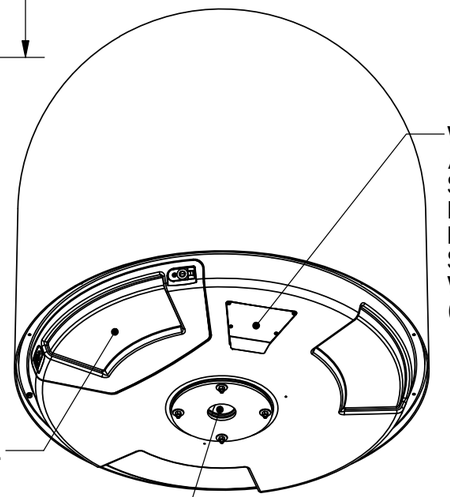
DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	11-04-14	INITIAL RELEASE.	AMN





MOUNTING SURFACE PATTERN



TYPICAL ARRANGEMENT

FACTORY SETTINGS/TRIM
ASSUME SYSTEM INSTALL
WITH HATCH DIRECTLY AFT.

NOTES: UNLESS OTHERWISE SPECIFIED

1. INDICATED ITEMS ARE PART OF PROVIDED MOUNTING KIT.
2. APPLY ADHESIVE PER SEA TEL SPEC. 121730. LOCTITE 271 (RED) PROVIDED WITH MOUNTING KIT.
3. MINIMUM DIAMETER OF MAST/MOUNTING PLATE EQUALS RADOME BASE FOOTPRINT.
4. APPLY INSTALLATION GUIDELINES PER DOC. NO. 130040.
5. DIMENSIONS ARE GIVEN IN CENTIMETERS, [INCHES IN PARENTHESE], TOLERANCE +/- 0.5MM.
6. NO SHARP EDGES PERMITTED, ON CABLE PASSAGE CUTOUT, (TO PROTECT CABLE).
7. IF RADOME IS INSTALLED EMPTY, GENERAL ASSEMBLY BOTTOM PLATE MUST BE INSTALLED.

REFERENCE DRAWINGS
62-139001 - RADOME TOP FOR 0.8M SYSTEM
62-139068 - RADOME BOTTOM FOR 0.8M SYSTEM
140090 - RADOME ASSY FOR 1.0M SYSTEM
140705 - RADOME ASSY FOR 1.2M SYSTEM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN CENTIMETERS. X = ±.150, X.X = ±0.05, X.XX = ±0.015, ANGLES: ±.5°

INSPECTION DIMENSIONS NOTED BY (X.X) SHALL HAVE FEATURE SIZE DIMENSIONS AND ASSOCIATED GD&T TOLERANCES INSPECTED

INTERPRET TOLERANCING PER ASME Y14.5 - 2009

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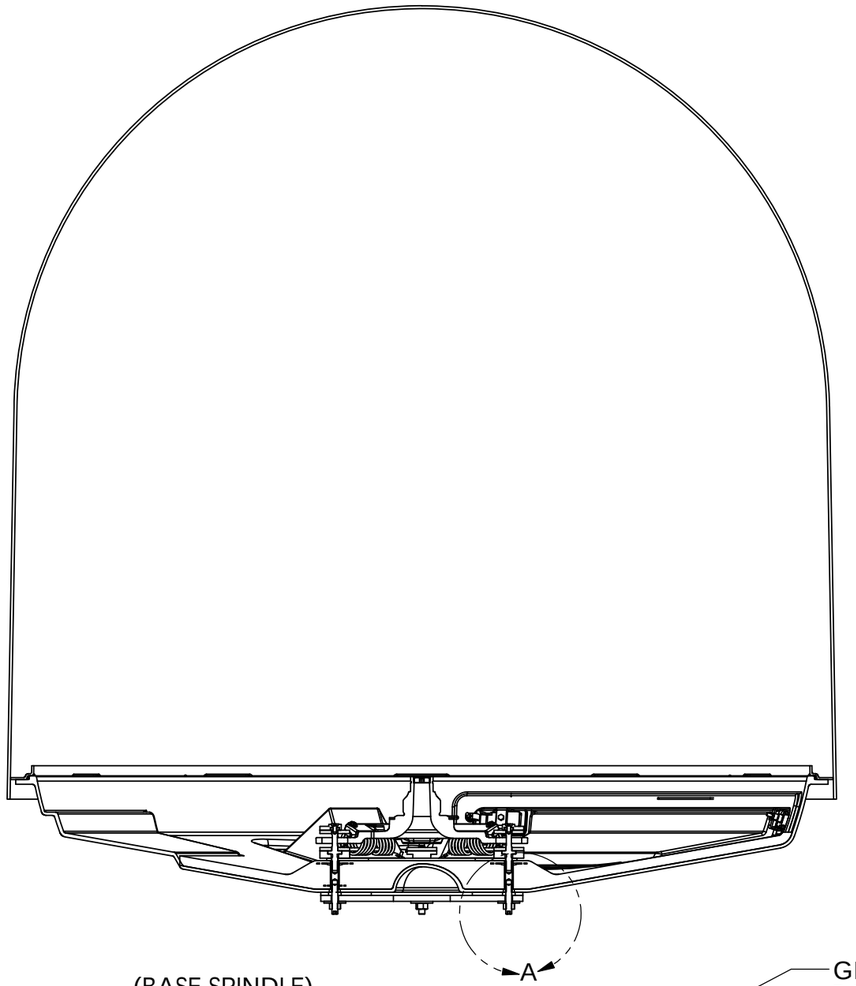
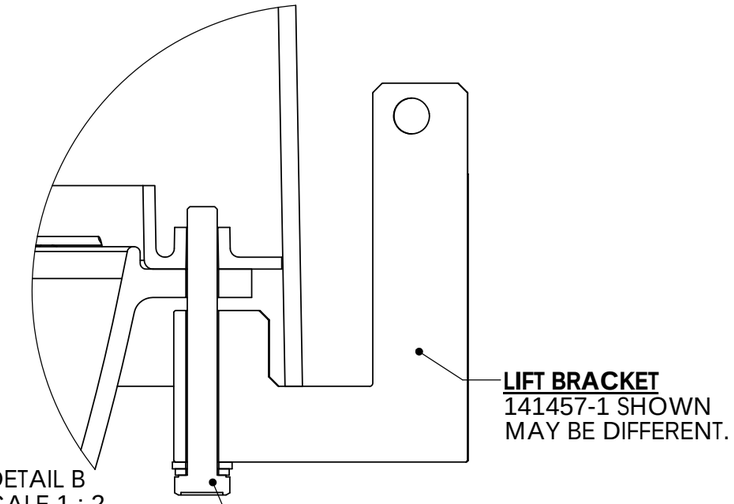
EAR Controlled ECCN EAR99

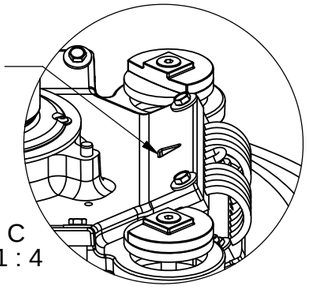
DESIGNER/ENGINEER: AMN	DRAWN BY: AMN	Sea Tel COBHAM	
WEIGHT: SEE DRAWING	DRAWN DATE: 10-24-14	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: RoHS COMPLIANT	APPROVED BY:	TITLE: INSTALLATION ARRANGEMENT, SEA TEL TV	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B	SCALE: 1:16	DRAWING NUMBER: 97-143895 REV: A
3rd ANGLE PROJECTION	FIRST USED: KA TVRO		SHEET NUMBER: 1 OF 5





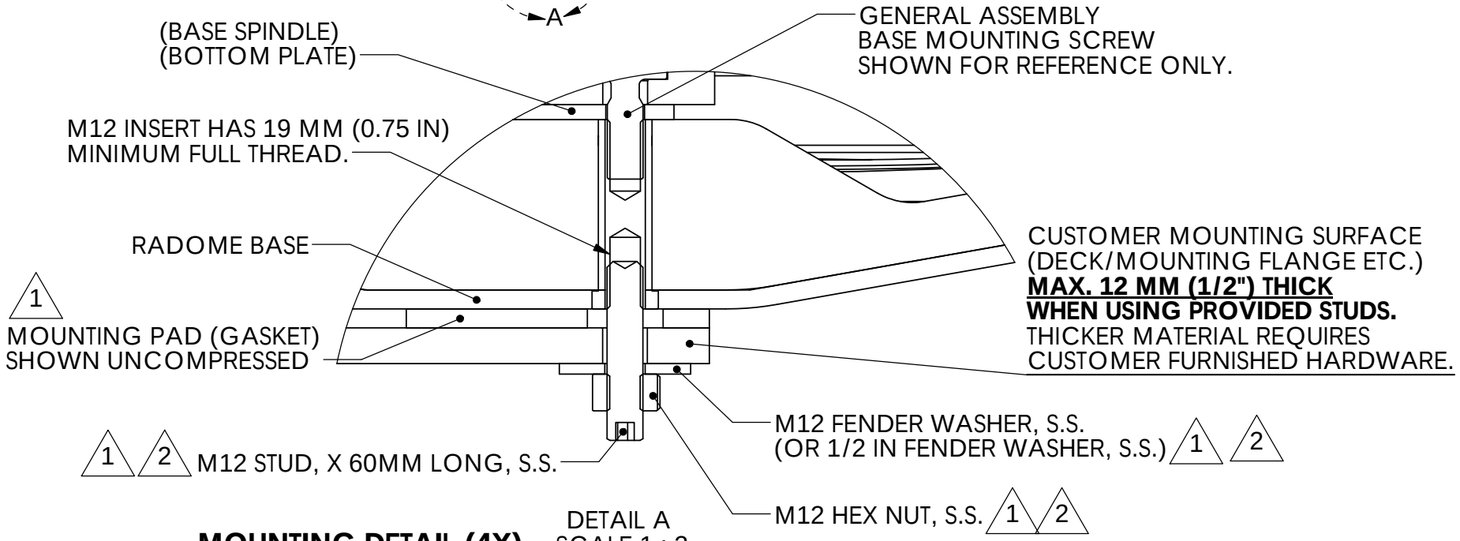
DETAIL B
SCALE 1 : 2

LIFTING DETAIL (4X)



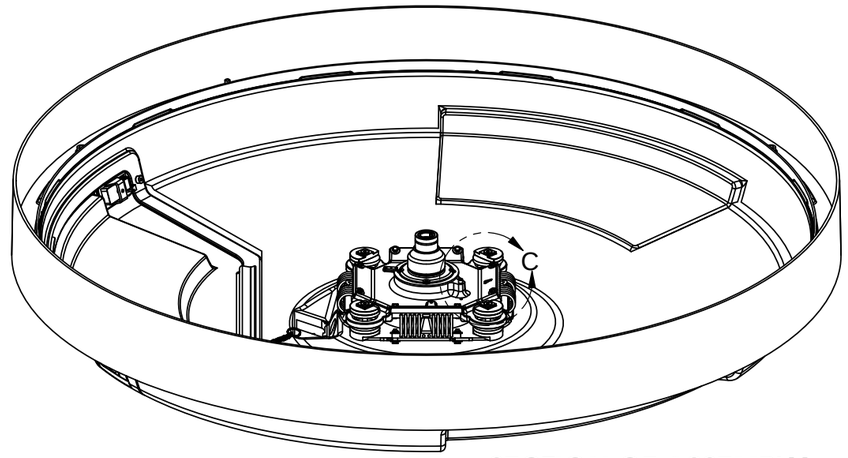
DETAIL C
SCALE 1 : 4

BOW MARKER DETAIL
(LOCATED OPPOSITE HATCH)



MOUNTING DETAIL (4X)

DETAIL A
SCALE 1 : 2

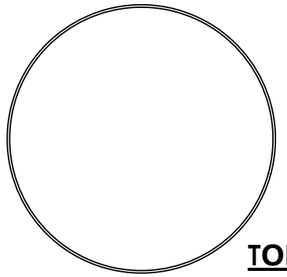


SECTION OF ASSEMBLY
SHOWN FOR REFERENCE ONLY.

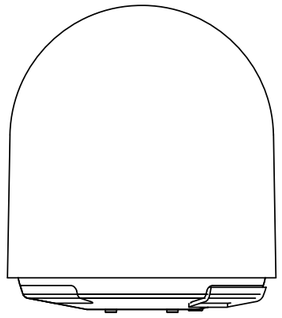
SIZE	SCALE:	DRAWING NUMBER	REV
B	1:12	97-143895	A
		SHEET NUMBER 2 OF 5	

EAR Controlled - ECCN EAR99

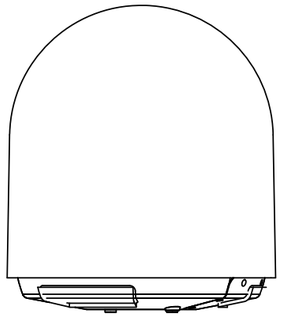
80 TV



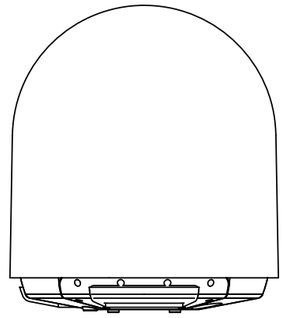
TOP VIEW



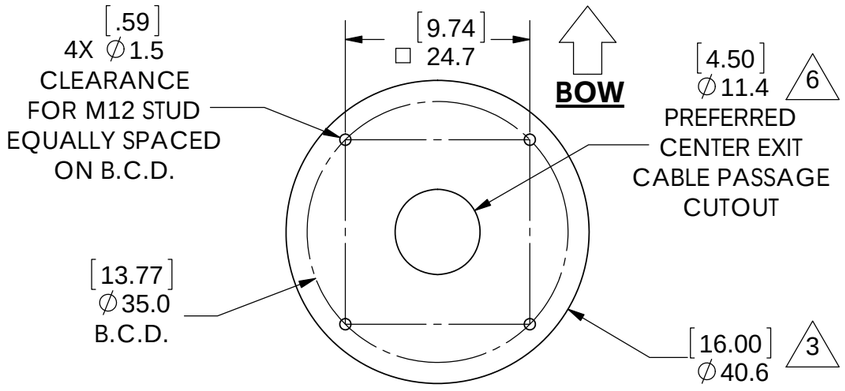
FRONT VIEW



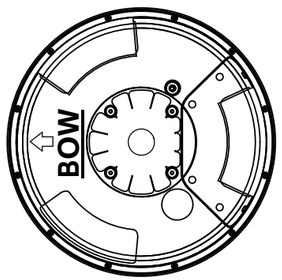
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)

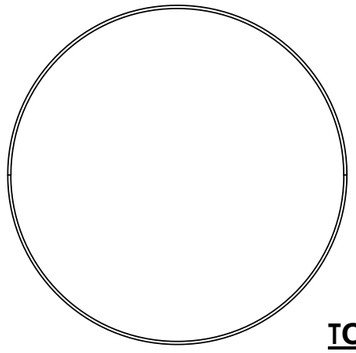


BOTTOM VIEW

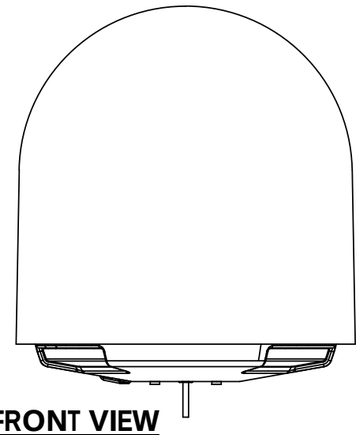
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 3 OF 5	

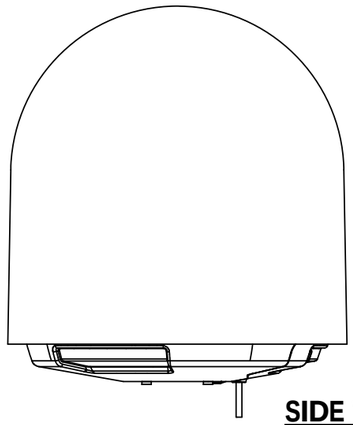
100 TV



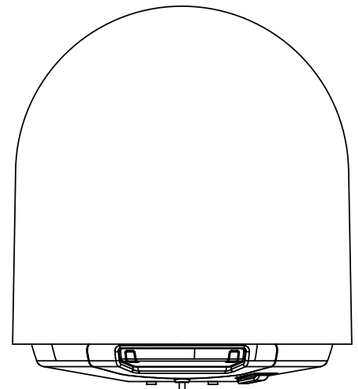
TOP VIEW



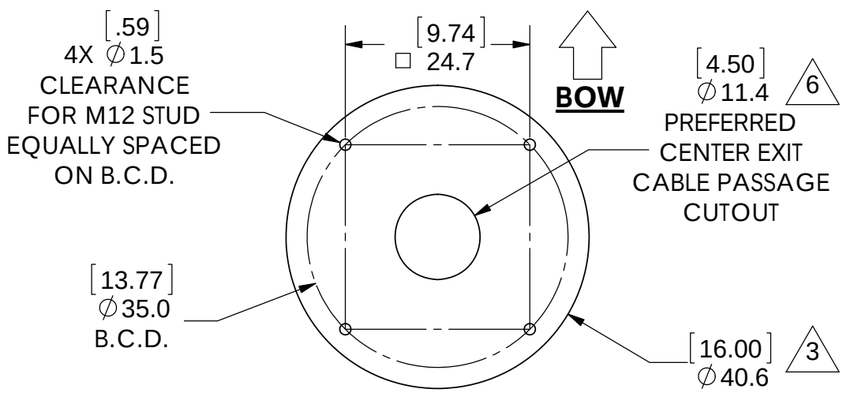
FRONT VIEW



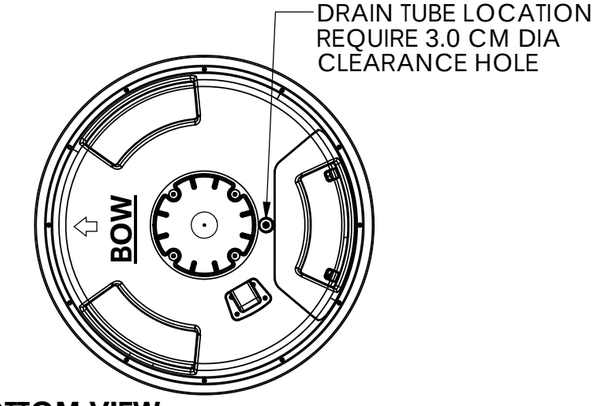
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)

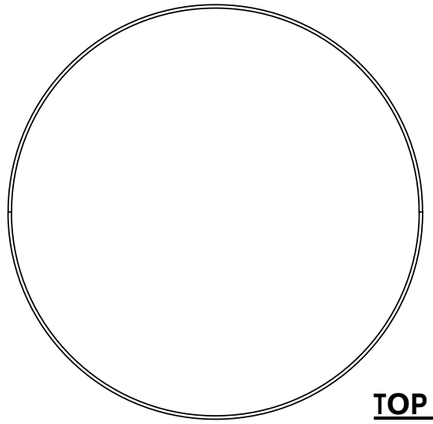


BOTTOM VIEW

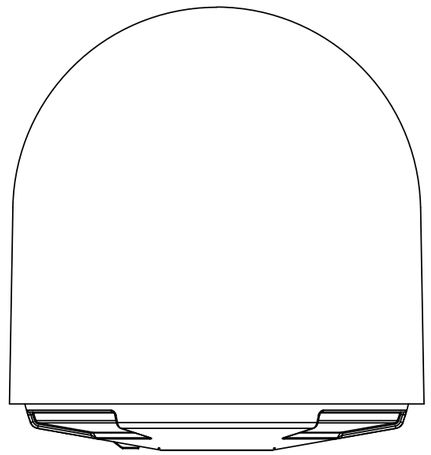
EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 4 OF 5	

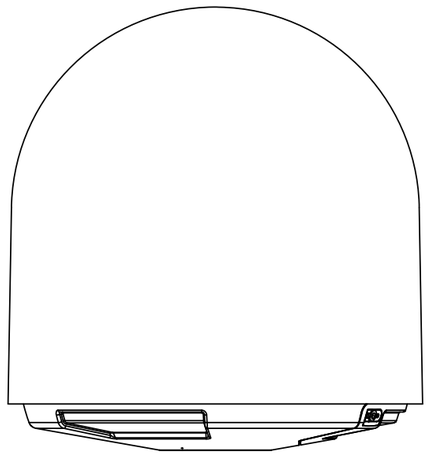
120 TV



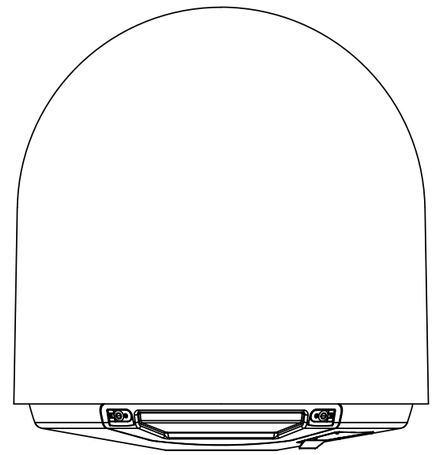
TOP VIEW



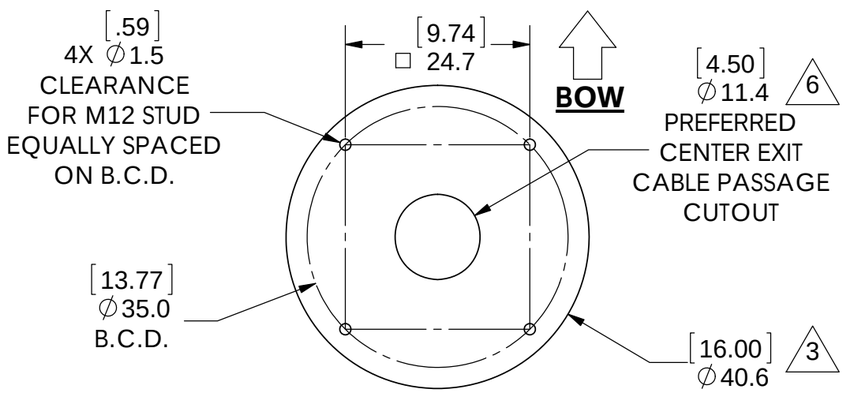
FRONT VIEW



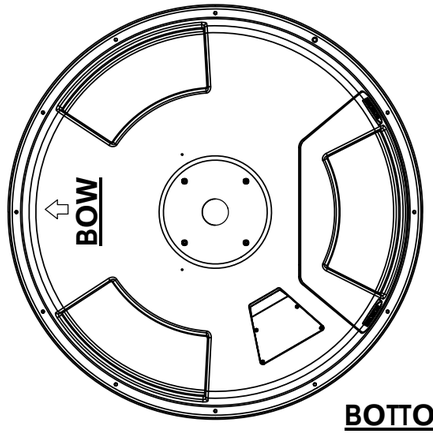
SIDE VIEW



REAR VIEW



MOUNTING SURFACE PATTERN (SCALE 1:8)



BOTTOM VIEW

EAR Controlled - ECCN EAR99

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:24	97-143895	A
		SHEET NUMBER 5 OF 5	