Sea Tel 6012-91 Ku-Band VSAT Antenna
Installation Manual

EAR Controlled - ECCN EAR99

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

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ISO 9001:2015	**Sea Tel is an ISO 9001:2015 registered company. Certificate Number 13690 originally issued March 14, 2011 and was renewed/reissued on March 13, 2018.**

RED 2014/53/EU

Cobham SATCOM declares that the Sea Tel VSAT Maritime Satellite Earth Stations are in compliance with The **R**adio **E**quipment **D**irective 2014/53/EU. The full text of this Self Declaration of Conformity for this equipment is contained in this manual.

The Sea Tel Series 12 antennas will meet the off-axis EIRP spectral density envelope set forth in FCC 47 C.F.R. § 25.222(a)(1)(i) when the input power density limitations, listed in our FCC Declaration, are met..

These antenna systems also contain FCC compliant supervisory software to continuously monitor the pedestal pointing accuracy and use it to control the "Transmit Mute" function of the satellite modem to satisfy the provisions of FCC 47 C.F.R. § 25.222(a)(l)(iii).

Revision History

REV	DCO#	Date	Description	By
A	00024566	February 21, 2018	Production Release	MDN
B	00025425	May 4, 2018	Update drawings with new Ku-Net Antenna/Feed Assemblies	MDN

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RED Declaration of Conformity

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

RED Directive 2014/53/EU concerning maritime Radio Equipment as described in the harmonized standards listed below and the mutual recognition of their conformity.

Product Names:

3612 Ku Band 8/16 Watt Tx/Rx Maritime Satellite Earth Station
4009 MK3 Ku Band 16 Watt Tx/Rx Maritime Satellite Earth Station
5012 Ku Band 8/16 Watt Tx/Rx Maritime Satellite Earth Station
6012 Ku Band 8/16 Watt Tx/Rx Maritime Satellite Earth Station

Harmonized Standards:

EMC:

EMC standard for Radio Equipment (Maritime)	**ETSI EN 301 843-1 V2.1.1 (2016-03)** (all clauses)
Marine Navigational and Radio Communication Equipment – General Requirements:	**IEC 60945:2002** (Reference Only)

Satellite Earth Stations and System (SES):

Satellite Earth Stations on board Vessels (ESVs) Ku Band	**ETSI EN 302 340 V2.1.1 (2016-05)**

Safety:

Safety of Information Technology Equipment:	**IEC 60950-1:2005 +A12:2011**

Certificates of Assessment were completed and are on file at NEMKO USA Inc, San Diego, CA and BACL Labs, Santa Clara, CA.

Peter Blaney, Chief Engineer Date: Dec-07-2017

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FCC Declaration of Conformity

1. Sea Tel, Inc. designs, develops, manufactures and services marine stabilized antenna systems for satellite communication at sea. These products are in turn used by our customers as part of their Ku-band Earth Station on Vessels (ESV) networks.

2. FCC regulation 47 C.F.R. § 25.222 defines the provisions for blanket licensing of ESV antennas operating in the Ku Band. This declaration covers the requirements for meeting § 25.222 (a)(1) by the demonstrations outlined in paragraphs (b)(1)(i) and (b)(1)(iii). The requirements for meeting § 25.222 (a)(3)-(a)(7) are left to the applicant. The paragraph numbers in this declaration refer to the 2009 version of FCC 47 C.F.R. § 25.222.

3. Sea Tel hereby declares that the antennas listed below will meet the off-axis EIRP spectral density requirements of § 25.222 (a)(1)(i) with an N value of 1, when the following Input Power spectral density limitations are met:

*0.6 Meter Ku Band, Models 2406 and USAT-24 are limited to	-21.6 dBW/4kHz
*0.75 Meter Ku Band, Models 3011 and USAT-30 are limited to	-21.6 dBW/4kHz
0.9 Meter Ku Band, Model 3612 is limited to	-20.3 dBW/4kHz
1.0 Meter Ku Band, Models 4003/4006/4009/4010 are limited to	-16.3 dBW/4kHz
1.0 Meter Ku Band Model 4012 is limited to	-16.6 dBW/4kHz
1.2 Meter Ku Band, Models 4996/5009/5010/5012 are limited to	-14.0 dBW/4kHz
1.5 Meter Ku Band, Models 6006/6009/6012 are limited to	-14.0 dBW/4kHz
2.4 Meter Ku Band, Models 9797/9711/ 9711IMA are limited to	-14.0 dBW/4kHz

4. Sea Tel hereby declares that the antennas referenced in paragraph 3 above, will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions, thus meeting the requirements of § 25.222 (a)(1)(ii)(A). Those antennas marked with * will maintain a stabilization pointing accuracy of better than 0.3 degrees. The Input Power spectral density limits for these antenna have been adjusted to meet the requirements of§ 25.222 (a)(1)(ii)(B).

5. Sea Tel hereby declares that the antennas referenced in paragraph 3 above, will automatically cease transmission within 100 milliseconds if the pointing error should exceed 0.5 degrees and will not resume transmission until the error drops below 0.2 degrees, thus meeting the requirements of § 25.222 (a)(1)(iii).

6. Sea Tel maintains all relevant test data, which is available upon request, to verify these declarations.

Peter Blaney, Chief Engineer
Sea Tel, Inc
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 antenna control unit (ACU) 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 (ADE) is allowed. Inspection of certain components as described in the Scheduled Inspections Manual may be accomplished by an engineer onboard. Maintenance of the ACU, or the ADE, 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

AC Power to the ADE is provided by a separate, breakered, power cable.

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. Series 12 Ku-Band System Configuration(s)

The Series 12 Ku-Band Stabilized Antenna system is to be used for Transmit/Receive (TX/RX) satellite communications. It is comprised of two major groups of equipment: the Above Decks Equipment (ADE) and the Below Decks Equipment (BDE). There will also be interconnecting cables between the ADE & BDE and cables to provide other inputs to the system.

It is initially equipped for Ku-Band operation; however, an optional Ka-Band upgrade kit is available for when the Ka-Band services are available.

2.1. Series 12 Basic System Information

Series 09 antennas are available in three dish sizes (Diameter – active area):

- 1.0 M (40 inch)
- 1.2 M (50.0 inch)
- 1.5 M (60 inch)

Each dish size is available in multiple configurations:

- Variety of BUC manufacturers and power output capabilities
- Variety of BUC/HPA power output capabilities
- Cross-Pol feed assembly
- Optional Co-Pol diplexer and LNB
- Choice of single fixed frequency, dual-band, tri-band or Quad-Band LNB(s)

The Series 12 antennas are available in multiple tuned radome sizes:

- 131.3 cm (50 inches) Diameter
- 155 cm (60 inch) Diameter
- 1.76 M (66 inch) Diameter
- 201.59cm (76 inch) Diameter
- 205.23cm (81 inch) Diameter **[Air Conditioning available for this radome *ONLY*]**

2.2. System Cables

AC power and coaxial cables are discussed in other chapters and their specifications are in the specifications chapter.

2.3. Other Inputs to the System

Multi-conductor cables from Ship's Gyro Compass, GPS, phone, fax and computer equipment may be connected in the system.

2.4. Simplified Block Diagram of a Series 09MK3 or 12 Ku-Band System

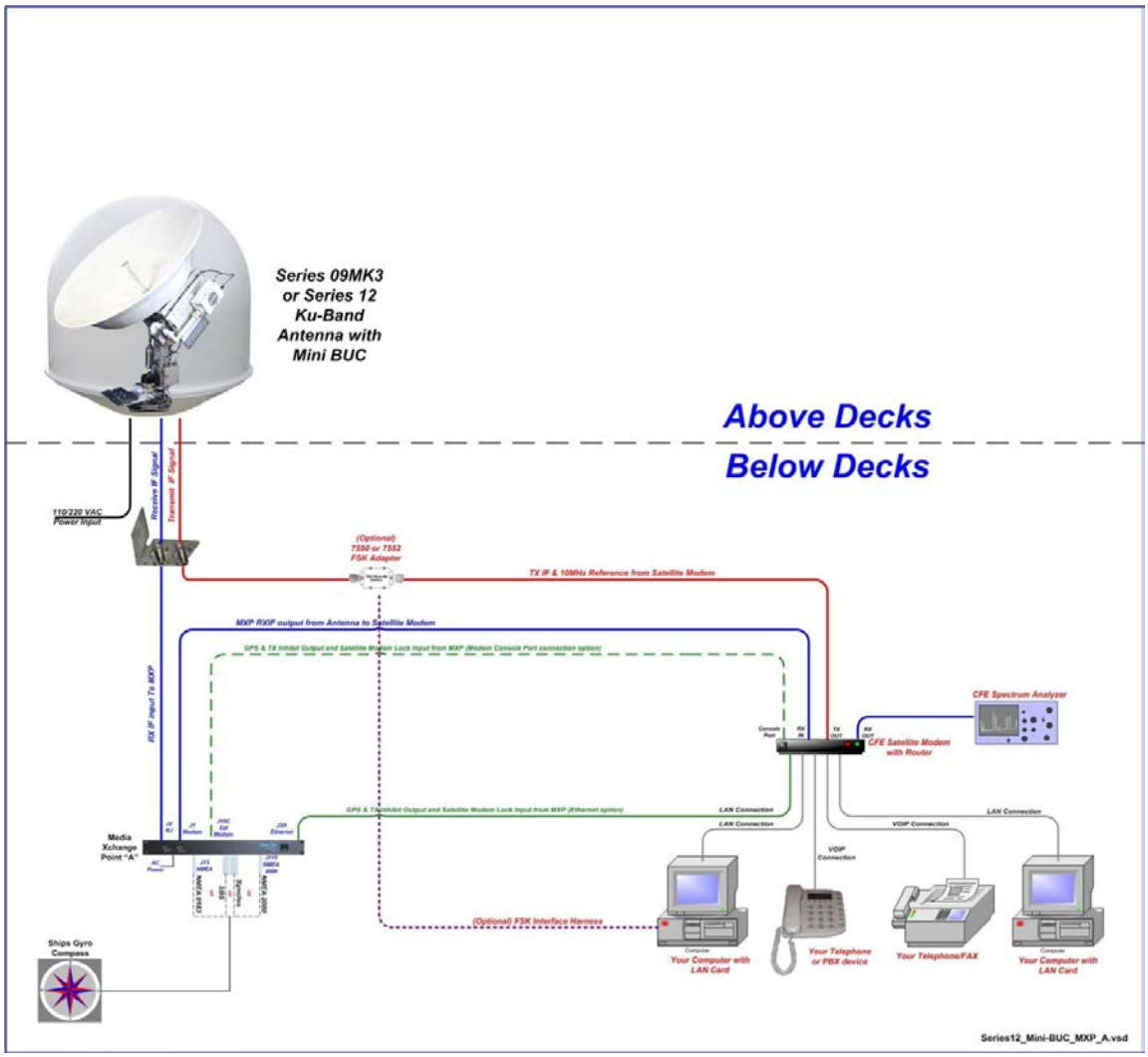
Your Series 12 Ku-Band TXRX system consists of two major groups of equipment: an above-decks group and a below-decks group. Each group is comprised of, but is not limited to, the items listed below. All equipment comprising the Above Decks is incorporated inside the radome assembly and is integrated into a single operational entity. For inputs, this system requires only an unobstructed line-of-sight view to the satellite, Gyro Compass input and AC electrical power.

A. Above-Decks Equipment (all shown as the ADE) Group

- Stabilized antenna pedestal
- Antenna Reflector
- Feed Assembly with Cross-Pol and Co-Pol LNBs
- 8W Ku-Band Solid State Block Up-Converter (BUC)
- Radome Assembly

B. Below-Decks Equipment Group

- Media Xchange Point™ (MXP)
- Customer Furnished Equipment - Satellite Modem and other below decks equipment required for the desired communications purposes (including LAN and VOIP equipment).
- Appropriate Coax, Ethernet, and telephone cables



2.5. *Dual Antenna Configuration*

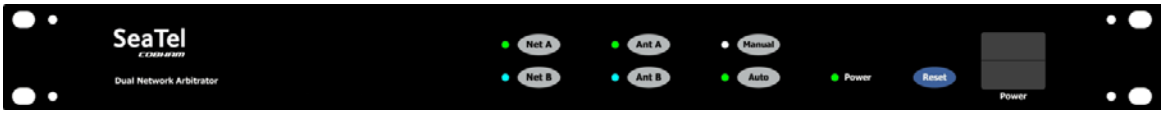
Sometimes, due to very large blockage conditions, you may need to install a dual antenna configuration to provide uninterrupted services. Two full antenna systems are installed and the MXP control outputs are connected to an arbitrator switch panel which then is connected to the below decks equipment. NOTE: The RXIF from EACH antenna MUST be connected to the RF IN on the rear panel of its respective MXP then RFOUT is connected to the RXIF input of the Dual Antenna Arbitrator. This connection scheme is required for MXP "A" to be able to control Antenna "A" (and ONLY Antenna "A") AND MXP "B" to be able to control Antenna "B" (and ONLY Antenna "B").

You will program the blockage zone(s) for each of the two antennas (refer to Setup – Blockage Zones). The blockage output from the each of the MXPs is connected to the arbitrator panel to control it. The blockage output terminal of each MXP provides a "blocked" output to the arbitrator its respective antenna is within a blockage zone programmed into that MXP. When not blocked the SW2 terminal output(s) will signal an "unblocked" state..

When one antenna is blocked, its blockage output will command the arbitrator panel to switch services to the modem from that antenna to the other antenna. The arbitrator panel provides a logic latch to prevent excess

switching when the ship heading is yawing, therefore, causing if the antenna to be repeatedly blocked – unblocked – blocked.

2.6. Dual Network Arbitrator



Demand for greater bandwidth throughputs has led to service offerings that include access to multiple networks from the vessel. To facilitate this a dual network (two modems) configuration is required.

This can be a single antenna – dual network configuration which allows the ship to access either of two networks. One antenna system is installed and its' ACU control output is connected to a dual network arbitrator switch panel which is also connected to two satellite modems, and other below decks equipment if provided.

A dual antenna – dual network configuration allows the ship to access to two networks simultaneously. Two full antenna systems are installed and the two ACU control outputs are connected to a dual network arbitrator switch panel which is also connected to two satellite modems, and other below decks equipment if provided.

Refer to the appropriate installation chapter for the model of the Sea Tel antenna systems that you will be installing.

You will program the blockage zone(s) and optimize all other settings for best "on-satellite" performance for each of the two Sea Tel antennas.

The following signals pass through the arbitrator to/from the ACUs and the Satellite Modem(s):

- TX IF signal to the selected antenna from the selected Satellite Modem. 10 MHz reference is also passed when provided by the modem.
- RX IF from the selected antenna to the selected Satellite Modem.
- Blockage control output from each ACU provides status of the antenna (available or blocked) to the arbitrator.
- GPS position - output from each antenna to the arbitrator. A setting in the in the arbitrator determines which GPS signal gets routed to the satellite modem(s).
- Receive Lock signal from the selected Satellite Modem(s) is routed to both ACUs to enable each of the antennas to track the appropriate satellite/beam.

In single network mode, when one antenna is blocked, its blockage output will command the arbitrator panel to switch services from that antenna to the other antenna. The arbitrator panel provides a logic latch to prevent excess switching when the ship heading is yawing, therefore, causing either antenna to be repeatedly blocked – unblocked – blocked.

In dual network mode, if one antenna becomes blocked there is no available antenna to switch to, so that network will be out of service until the antenna is no longer blocked.

2.7. Automatic Beam Switching (ABS)

ABS is a method of communicating remotely via an overhead channel, or locally from the modem, to reconfigure the ACU(s) to use a different beam on the same satellite or to use a different satellite. The modems include commands which allow remotely setting all of the necessary parameters and to command the targeting of the desired satellite

2.8. OpenAMIP™, ROAM or VACP

These each have standardized language incorporated into their (iDirect, Comtech & STM) modems which communicates automatic beam switching settings from their options file to the Sea Tel ACU(s). This provides the network a means of controlling automatic beam switching by the settings in the options file in the remote modem.

2.9. FCC Compliance

This antenna system, with current software, contain FCC compliant supervisory software to continuously monitor the pedestal pointing error. This supervisory software will trip an error flag, which will automatically cease transmission within 100 milliseconds, if the pointing error should exceed 0.5 degrees. Transmission will not resume until the pointing error drops below 0.2 degrees.

To be compliant with these FCC requirements, the "Transmit Mute" output of the Sea Tel below decks controller must be connected to the "Mute Input" of the satellite modem via serial or via an Ethernet connection to the modem.

2.10. Cyber Security Caution

Sea Tel Antenna systems are not intended to be connected directly to the Internet. They must be connected behind a dedicated network security device such as a firewall. In addition, we highly recommended that you change default passwords. This is an extremely important consideration that must be taken into account as part of commissioning procedures as attackers with malicious intent (after easily obtaining default passwords and identify internet-connected systems) can be rendered a system inoperable.

For clarification purposes, the factory default Passwords/Configurations are only intended for initial production testing/verification purposes and it is an assumed responsibility of the installing partner to change and record the login credentials and is shared only with persons whom are directly responsible for operation/maintenance of the system. Instructions on how to change passwords may be located within the system manual.

3. 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.

3.1. 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.

3.2. Antenna Shadowing (Blockage) and RF Interference

At the transmission frequencies of this satellite antenna system, any substantial structures in the way of the beam path will cause significant degradation of the signal. Care should be taken to locate the ADE so that it has direct line-of-sight with the satellite without any structures in the beam path through the full 360 degree ships turn. Wire rope stays, lifelines, small diameter handrails and other accessories may pass through the beam path in limited numbers; however, even these relatively insignificant shadows can produce measurable signal loss at these frequencies.

3.3. Mounting Foundation

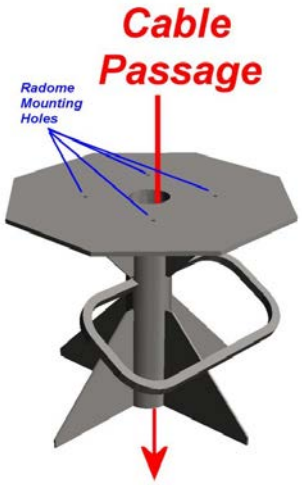
3.3.1. Mounting on Deck or Deckhouse

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.

3.3.2. ADE Mounting Considerations

Mounting the radome directly on the deck or platform prevents access to the hatch in the base of the radome unless an opening is designed into the mounting surface. 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.

The recommended cable passage in the 50, 60 and 66 inch radomes is through the bottom center of the radome base, down through the ADE support pedestal, through the deck and into the interior of the ship.

3.3.3. 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.

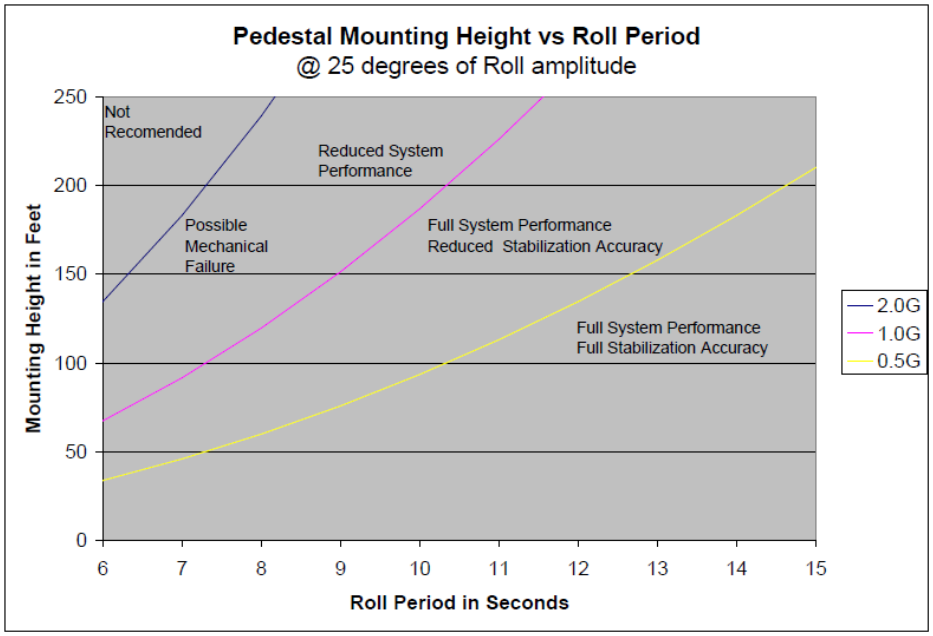
3.4. Mounting Height

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.



3.5. Mast Configurations

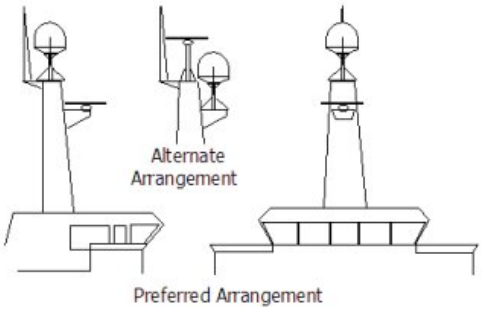
Sea Tel recommends mounting the ADE in a location that has both a clear line-of-sight to the target satellites in all potential azimuth/elevation ranges and sufficient support against vibration excitement. If possible, mounting the ADE pedestal directly to ship deckhouse structures or other box stiffened 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:

3.5.1. 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

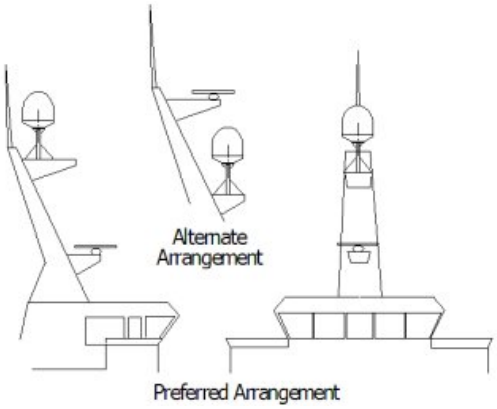


Vertical masts are most commonly found on cargo ships – they are simple, inelegant and functional. They are also fairly stiff against torsional reaction and lateral vibrations, as long as the ADE is mounted on a stiff pedestal near the vertical centerline of the mast. If centerline mounting is impractical 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.

3.5.2. Raked Masts

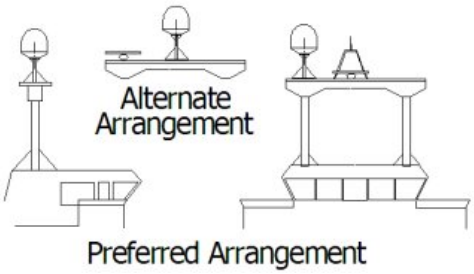
Raked masts are found on vessels where the style or appearance of the entire vessel is important. Again, the inclined mast is a direct descendant from the masts of sailing ships – as ship owners wanted their vessels to look more unique and less utilitarian, they 'raked' the masts aft to make the vessel 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.

3.5.3. 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.

3.5.4. 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.
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.

3.6. 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.

3.7. Below Decks Equipment Location

The Antenna Control Unit, Terminal Mounting Strip and Base Modem Panel are all standard 19" rack mount, therefore, preferred installation of these items is in such a rack. The ACU mounts from the front of the rack. The Terminal Mounting Strip and Base Modem Panel mount on the rear of the rack.

The Satellite Modem, router, VIOP adapter(s), telephone equipment, fax machine, computers and any other associated equipment should be properly mounted for shipboard use.

Plans to allow access to the rear of the ACU should be considered.

3.8. 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.

3.8.1. 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 modem.

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. Don't lay the coaxes on, or directly beside, the cables from a second Sea Tel antenna, Inmarsat antenna and/or GPS antenna that are also passing L-band frequencies. Don't lay the coaxes on, or directly beside, radar cables that may inject pulse repetition noise –as error bits - into your cables.

3.8.2. Antenna Power Cable

Be cautious of length of the run, for voltage loss issues, and assure that the gauge of the wires is adequate for the current that is expected to be drawn (plus margin). Antenna power is recommended (but not required) to be from a UPS, generally the same one that supplies power to the below decks equipment.

Power cables shall comply with the provisions of IEC 60092-350 and -351 as practical. Power cables may be routed through the same conduit as the signal cable from the junction box to the base of the ADE. Power cables shall pass through separate radome penetrations from the signal cable.

The power cable shall be continuous from the UPS (or closest circuit breaker) to the ADE connections within the radome. The power circuits shall be arranged so that 'active,' 'common' and 'neutral' (ground) legs are all made or broken simultaneously. All circuit legs shall be carried in the same cable jacket.

3.8.3. Air Conditioner Power Cable

If your system includes a marine air conditioner (available with the 81 inch radome ONLY), run an AC power cable to it from a breaker, preferably from a different phase of the electrical system than supplies power to the ADE & BDE. Be EXTREMELY cautious of length of the run for voltage loss and gauge of the wires for the current that is expected to be drawn.

Power cable shall comply with the provisions of IEC 60092-350 and -351 in so far as practical. Power cables may be routed through the same conduit as the signal cable from the junction box to the base of the ADE. Power cables shall pass through separate radome penetrations from the signal cable.

The power cable shall be continuous from the closest circuit breaker to the ADE connections within the radome. The power circuits shall be arranged so that 'active,' 'common' and 'neutral' (ground) legs are all made or broken simultaneously. All circuit legs shall be carried in the same cable jacket.

3.8.4. ACU Power Cable/Outlet

The AC power for the ACU and the ADE is not required to be from a UPS (same one that supplies power to the ADE), but it is recommended.

Power cable shall comply with the provisions of IEC 60092-350 and -351 in so far as practicable.

3.8.5. Gyro Compass Cable

Use good quality shielded cables (twisted pairs, individually foil wrapped, outer foil with braid overall is best). You only need 2-wire for NMEA signal, 4-wire for Step-By-Step and 5-wire for Synchro … always use shielded cable. Be cautious of length and gauge of the run for voltage loss issues.

3.9. 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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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.

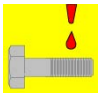
The installation instructions for your system are below.

4.1. *Unpacking and Inspection*

Exercise caution when unpacking the equipment.

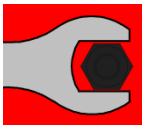
1. Unpack the crates. Carefully inspect the radome surface for evidence of shipping damage.
2. Unpack all the boxes.
3. Inspect everything to assure that all materials have been received and are in good condition.

4.2. *Assembly Notes and Warnings*



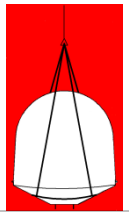
NOTE: *All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

Loctite #	Description
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.

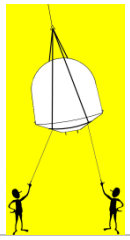


WARNING: *Assure that all nut and bolt assemblies are tightened according to the tightening torque values listed below:*

SAE Bolt Size	Inch Pounds	Metric Bolt Size	Kg-cm
1/4-20	75	M6	75.3
5/16-18	132	M8	150
3/8-16	236	M10	270
1/2-13	517	M12	430



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.*

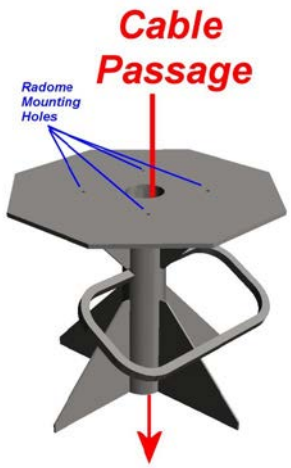


CAUTION: *The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while hoisting the antenna assembly to its assigned location aboard ship.*

4.3. *Installing the ADE*

The antenna pedestal is shipped completely assembled in its radome. Please refer to the entire Site Survey chapter of this manual.

Base Hatch Access - Mounting the radome directly on the deck or 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) or lost.



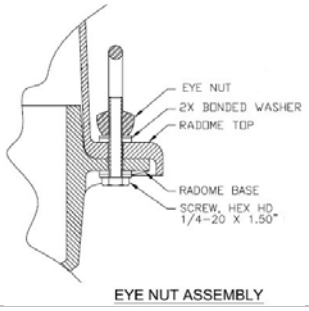
If access to the hatch cannot be provided in the mounting surface, provide a short ADE mounting stanchion to mount the ADE on which is tall enough to allow access into the radome via the hatch.

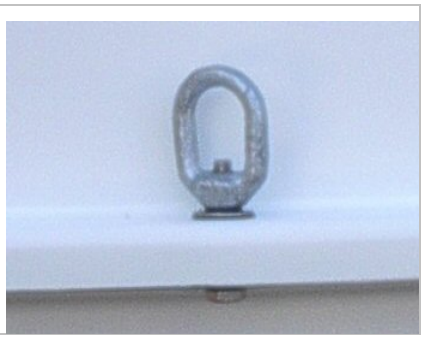
Ladder rungs must be provided on all mounting stanchions greater than 3-4 feet tall to allow footing for personnel safety when entering the hatch of the radome.

Cable Passage - The radome base is designed with a bottom center cable passage and Roxtec® Multidiameter® blocks for cable strain relief. The recommended cable passage in the 50, 60, 61 and 66 inch radomes is through the bottom center of the radome base, down through the ADE mounting stanchion, through the deck and into the interior of the ship.

Bottom center cable passage is recommended, however, a strain relief kit is provided with the system if off-center cable entry is required. ***Note: Strain relief installation procedure, provided in the Drawings chapter, MUST be followed to assure that the cored holes are properly sealed to prevent moisture absorption and de-lamination of the radome base.***

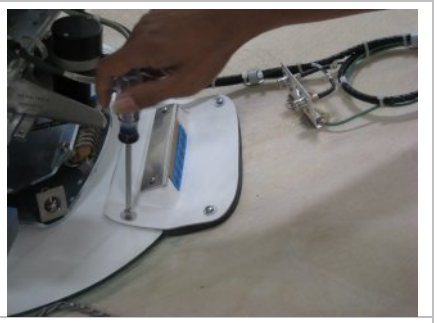
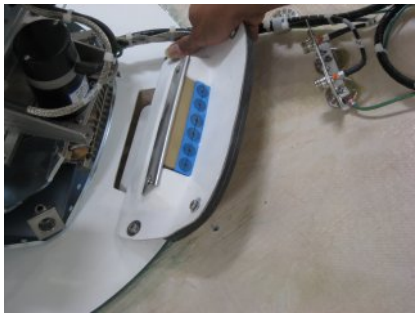
4.3.1. Prepare the 40", 50", 60", 66" or 76" Radome Assembly

1. Remove the side walls of the radome crate. 2. Lift the pallet using a forklift and/or jacks. 3. From the underside of the pallet, remove the four shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware.	
4. Remove four equally spaced bolts around the radome flange. Save these nuts and bolts to be reinstalled later. 5. Install four lifting eyebolts in the vacant holes in the flange of the radome.. (Hardware provided in the radome installation kit). Keep the original perimeter bolt hardware to be reinstalled after the ADE has been installed.	 EYE NUT ASSEMBLY

6. Attach shackles and four part web lifting sling arrangement to the eyebolts. 7. Attach a suitable length tagline to one of the eyebolts. 8. After hoisted into place the lifting eyes are to be removed and replaced with the stainless hardware that was removed in step 4 (the eyes are galvanized with bare thread that will rust if left exposed to the weather).	

4.3.2. Install 76" Radome to the mounting platform

The antenna pedestal is shipped completely assembled in its radome.

1. Man the tag line(s). 2. Initially hoist the antenna assembly a few feet off of the shipping pallet, by means of a suitably sized crane or derrick, to allow access to bottom of radome assembly. 3. Open the hatch by pressing the round release button in the center of the black 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. 4. Inspect the pedestal assembly and reflector for signs of shipping damage.	
5. 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. 6. Using Loctite 271, install the four mounting bolts (provided in radome mounting kit) into the radome base.	
7. Remove the hardware in the cable mounting frame.	
8. Lift the cable mounting frame out from the cable passage channel. **NOTE: If the bottom center cable passage will NOT be used, it is recommended that the strain reliefs be installed in place of this cable mounting frame. Other locations around the radome base are MUCH thicker, requiring longer strain reliefs than the ones provided by Sea Tel. Refer to the strain relief installation procedure provided in the Drawings chapter of this manual.**	

9. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.
10. Carefully route AC Power, ground strap/cable (see Grounding info below) and coax cables through the cable passage in the bottom center of the radome base and through the cable channel under the lower base plate of antenna.

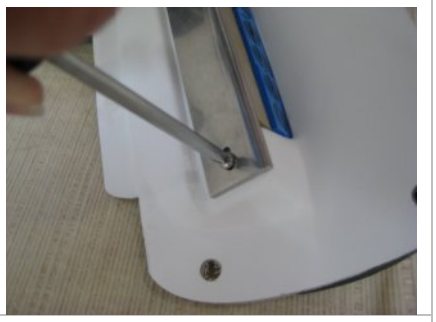
NOTE: Suitable strain relief should be provided below the mounting surface to prevent the cables from being kinked where the cables exit the bottom of the radome.

11. Allow enough service loop to terminate these cables to the circuit breaker assembly and IF connector bracket respectively (see cable termination information below).

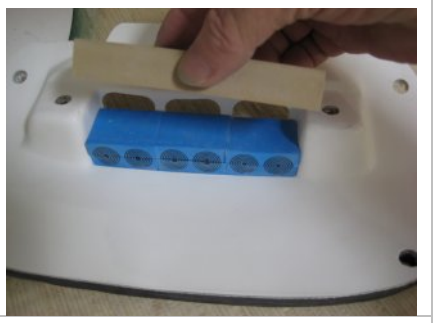
HINT: It may be easier to connect, or tie-wrap, the coaxes and power cable temporarily.

12. 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).
13. 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.

14. Remove the clamp bar and Roxtec® Multidiameter® blocks from their cable mounting frame in the cable passage channel.



15. Remove the rubber bar from the top of the Roxtec® Multidiameter® blocks.



16. Remove the Roxtec® Multidiameter® blocks from the cable mounting frame.

17. Pass the coaxial and power cables through the cable mounting frame.

HINT: Again, It may be easier to connect or tie-wrap the coaxes and power cable temporarily.

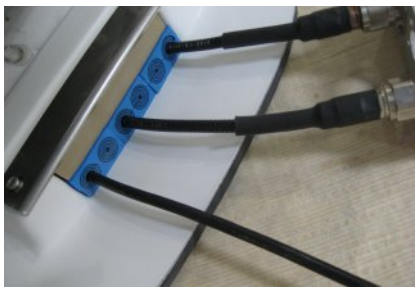
18. Re-install the cable mounting frame onto cable passage channel using the four screws and flat washers that were removed in step 7 above.

19. Peel layers out of the upper and lower Roxtec® Multidiameter® blocks to provide an opening in the block that is just smaller than the outer diameter of the cable that will pass through it. When compressed the block should provide clamping force on the cable and prevent it from moving in the block.

20. Two cables may be passed through each of the Roxtec® Multidiameter® CM-20w40 blocks provided.
21. If cables larger than 1.65cm/0.65in outer diameter will be used, larger single-cable Roxtec® Multidiameter CM-40 10-32 blocks are available to allow three cables of up to3.25cm/1.28in diameter to be used. The **rubber bar** and the **three double-cable** Roxtec® Multidiameter blocks will be **replaced** by the **three larger Roxtec® Multidiameter blocks**.

HINT: It may be helpful to put the clamp bar and rubber bar in place (held loosely by one screw) to hold some of the Roxtec® Multidiameter blocks in place while you complete the others.

22. Re-install the clamp bar using the hardware removed in step 14 above.
23. Remove the tag lines.
24. Remove the lifting sling.
25. Remove the four lifting eye nuts and re-install the original perimeter bolt hardware (the eyes are galvanized with bare thread that will rust if left exposed to the weather). Save the lifting eye hardware in case lifting of the ADE is required in the future.



4.3.3. Antenna Pedestal Mechanical Checklist

1. Open the radome hatch (if you didn't previously) and enter part way into the radome.
2. Remove the locking bar under the cross-level beam, tiewrap(s) and web strap(s) that are restraining the pedestal. ***Save the locking bar and web strap shipping restraints so that they can be re-used to restrain the antenna if the system will be un-energized while the ship is underway.***
3. Check to assure that the antenna moves freely in azimuth without hitting any area of the interior of the radome or fouling in any of the cables in the base of the radome. Elevation and cross are held by the brakes built into those motors.
4. Check that all pedestal wiring and cabling is properly dressed and clamped in place.

4.4. *Grounding the Pedestal*

The antenna pedestal must be grounded to the hull of the ship. A grounding point is provided on the upper base plate to ground the pedestal. A ground wire, of appropriate gauge for it's length, must be provided to ground the pedestal to the mounting platform that it will be bolted to (this is usually on or near the mounting surface). This mounting must also be electrically common with the hull of the vessel.

If a longer ground connection is required to reach a common metal connection to the hull, you must provide that longer cable/strap that is of sufficient gauge and length to ground the pedestal to the nearest grounding point of the hull.

Solid strap is the conductor of choice for low impedance RF ground connections because the RF currents tend to flow along the outer surface and the strap has a large smooth surface area to take full advantage of this effect.

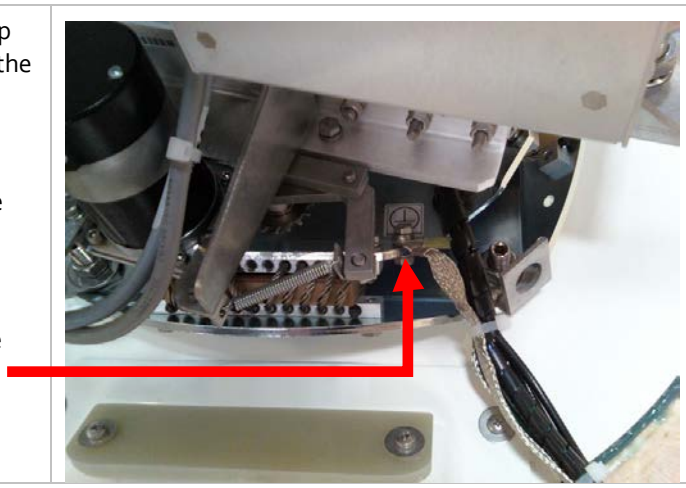
Braid is the conductor of choice where flexibility is required. Sea Tel uses braid to cross axes of the antenna pedestal and to connect various subassemblies together.

Wire is the easiest to install and connect and is readily available with a weather protective jacket. 4 awg and 6 awg bare solid copper wire is commonly used as safety grounds and very basic lightning protection grounds. 2 awg stranded wire is often used for lightning grounding and bonding and it much more flexible.

1. Connect the ground wire (of adequate gauge for the length) to a burnished ground point on, or near, the mounting surface. This burnished grounding point must be electrically common with the hull. Bi-metal coupling plate may be required to get good electrical coupling to the hull of the ship. Protective coating should be applied to prevent the grounding point, and ground wire, from rusting or corroding.

NOTE: Minimum gauge should not be smaller than **10 AWG,** even for a short cable run.

2. Route the ground cable/strap up through the radome base with the coax and power cables.
3. Route the ground strap/cable through one of the Roxtec® Multidiameter® blocks with the other power and coax cables.
4. Connect the grounding strap/cable to the burnished ground point on the upper base plate.

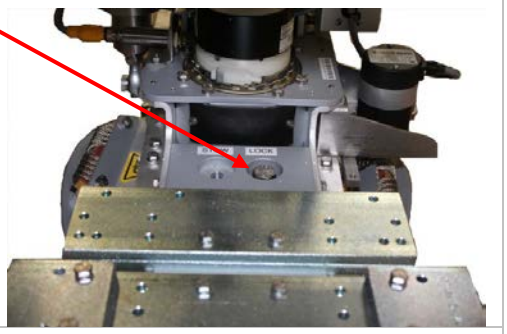
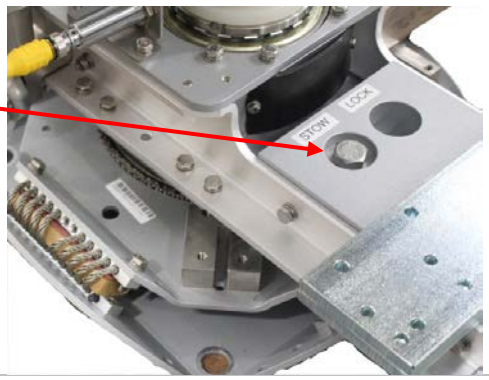


4.5. Removing the Shipping/Stow Restraints PRIOR to Power-Up

The order the restraints are removed is not critical.

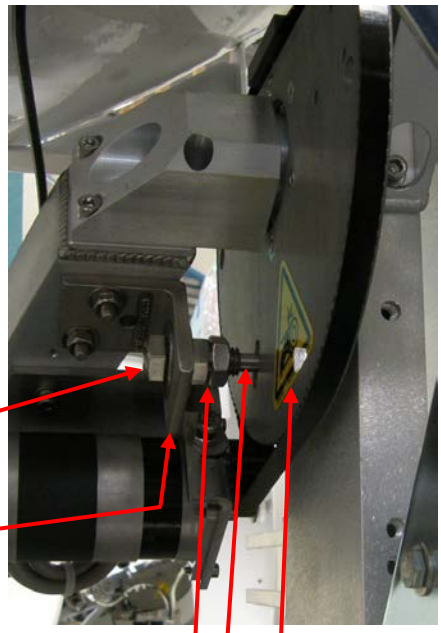
	***CAUTION:*** *There are three shipping/stow restraints on this antenna pedestal that* ***MUST*** *be removed,* ***before energizing*** *the antenna, for normal operation.*

4.5.1. Removing the AZ Shipping/Stow Restraint

1. The AZ shipping/stow restraint is formed by a pin bolt that is lowered into a channel in a stowage block on the upper plate of the pedestal (as shown).	
2. To un-stow the antenna, remove the pin bolt from the LOCK position.	
3. Install the pin bolt into the STOW hole and tighten. This assures that it does not get lost and will be ready for re-use if the antenna needs to be stowed again at a later date. 4. Verify that the antenna is able to rotate freely in azimuth.	

4.5.2. Removing the EL Shipping/Stow Restraint

1. The EL shipping/stow restraint is formed by a stow pin-bolt mounted through a bracket and is engaged into a hole/slot in the elevation driven sprocket when the dish is at zenith (90 degrees elevation).
2. In the stowed position, the hardware from left to right is stow pin-bolt head, washer, bracket, washer, hex nut, hex nut so that the pin section of the stow pin-bolt is inserted into the hole in the elevation driven sprocket.



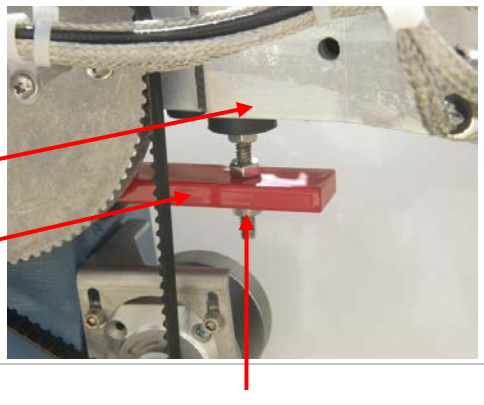
3. To un-restrain the elevation axis of the antenna, unthread the two hex nuts. Using a ¾" open end wrench, remove the hex nuts and washer from the stow pin-bolt.
4. Remove the stow pin-bolt from the bracket.

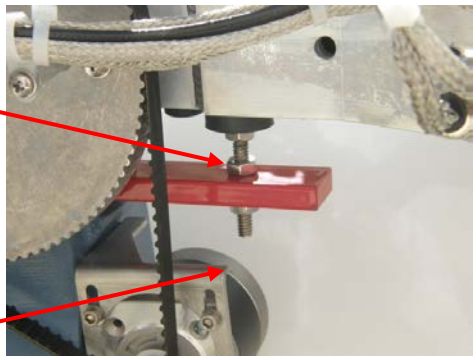
5. Remove the washer from the stow pin-bolt and thread one of the two hex nuts onto the bolt and tighten.
6. Put one of the washers onto the stow pin-bolt and insert it into the bracket toward the elevation driven sprocket.
7. Put the other washer, and then the other hex nut onto the bolt.

8. Tighten the hex nut to prevent the hardware from loosening while in the un-stowed configuration.
9. Verify that the antenna rotates freely through its full elevation range of motion.

4.5.3. Removing the CL Shipping/Stow Restraint

1. The CL shipping/stow restraint is formed by a red locking bar with adjustable bumpers at each end of the bar. This mechanism is placed under the cross-level beam to lock it in place.



Adjustable CL Locking Bumpers (only one end shown)	
2. To un-restrain the cross-level axis of the antenna use a 7/16" open end wrench to loosen the nut on the top side of the locking bar (either end of the bar). 3. Remove the bottom nut off of that adjustable bumper. 4. Remove the adjustable bumper from the locking bar.	
5. Extract the locking bar from the underside of the cross-level beam and retain these parts for later re-use if it becomes necessary to stow the antenna. 6. Verify that the antenna rotates (tilts left and right from level) freely through its full cross-level range of motion.	

4.6. Installing 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 Sea Tel MXP.

4.6.1. General Cautions & Warnings

	***CAUTION - Electrical Shock Potentials exist on the Gyro Compass output lines.*** *Assure that the Gyro Compass output is turned* ***OFF*** *when handling and connecting wiring to the MXP.*
	***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.*

4.6.2. Connecting the BDE AC Power Cables

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

4.6.3. Media Xchange Point™ (MXP) Connections

4.6.3.1. Ships AC Mains

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

4.6.3.2. J1 Modem RX

Connect this RXIF Output to the satellite modem RX Input using an appropriate coaxial cable.

4.6.3.3. J2 RJ - Antenna RX

Connect this RXIF Input from the antenna to this port on the rear panel of the MXP using coaxial cable provided

4.6.3.4. J3 A/B & J4 A/B - Ethernet 4 Port 10/100 switch

Ethernet connections to computer, satellite modem LAN devices as desired.

4.6.3.5. J5 SFP Fiber Interface

SFP Gigabit Ethernet connection.

4.6.3.6. J6 Mini-USB Computer M&C Connection

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

4.6.3.7. J7 USB Host

Not connected - -Future development.

4.6.3.8. J8 Console

Antenna M&C Serial connections.

4.6.3.9. J9 A/B Serial

Computer RJ-45 Serial M&C connections. A is mapped to the Radio serial M&C port of the ICU and B is mapped to the Pass through serial M&C port of the ICU.

4.6.3.10. J10C Modem

RJ-45 Serial M&C connection to Satellite Modem Console Port.

4.6.3.11. J10D OBM

RJ-45 Serial M&C connection to Out of Band Management equipment, if used.

4.6.3.12. J11 Gyro

Terminal Strip for SBS or Synchro Gyro Compass interface connections. Wiring is:

Pin 1	Synchro R1
Pin 2	Synchro R2
Pin 3	Synchro S3 / SBS A
Pin 4	Synchro S2 / SBS B
Pin 5	Synchro S1 / SBS C
Pin 6	SBS COM

4.6.3.13. J12 Aux 232

Auxiliary wired RS-232 connection. Wiring is:

Pin 1 - GND	Ground
Pin 2 - Aux IN1	Modem Lock Input 1 - See modem setup chapter.
Pin 3 - Aux IN2	Modem Lock Input 2 - See modem setup chapter.
Pin 4 - GND	Ground
Pin 5 - SW1	Blockage/Modem Mute Output 1 - See blockage & modem setup chapters.
Pin 6 - SW2	Blockage/Modem Mute Output 2 - See blockage & modem setup chapters.
Pin 7 - SW3A	Dry Contact set 2 - Dry alarm contacts used to provide (programmable) alarm output to other equipment/systems. Switched outputs have ability to use 4.7K pull up or Pull Down 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.
Pin 8 - SW3B	
Pin 9 - SW4A	Dry Contact set 1 - Same as dry alarm contact set 2.
Pin 10 - SW4B	

4.6.3.14. J13 NMEA 0183

NMEA 0183 I/O connections. The +12 VDC output is only intended to power a very low current consumption device, do NOT exceed **125ma MAX.** Wiring is:

Pin 1	RX+ NMEA
Pin 2	RX- NMEA
Pin 3	TX- NMEA
Pin 4	N/C
Pin 5	GND
Pin6	N/C
Pin 7	GND
Pin 8	TX+ NMEA
Pin 9	+12 VDC (**125ma MAX**)

If your NMEA 0183 Gyro Compass outputs RS-422:

- Connect its' TX+ output to J10 pin 1 (RX+)
- Connect its' TX- output to J10 pin 2 (RX-)

If your NMEA 0183 Gyro Compass outputs RS-232:

- Connect its' GND output to J10 pin 1 (RX+)
- Connect a jumper from pin 1 to J10 pin 5 (GND)
- Connect its' TXD output to J10 pin 2 (RX-)

4.6.3.15. J14 Aux 232

Antenna M&C Serial connections. The +12 VDC output is only intended to power a very low current consumption device, do NOT exceed **125ma MAX.** Wiring is:

Pin 1	N/C
Pin 2	RD
Pin 3	TD
Pin 4	N/C
Pin 5	GND
Pin6	N/C
Pin 7	RTS
Pin 8	CTS
Pin 9	+12 VDC (**125ma MAX**)

4.6.3.16. J15 NMEA 2000

Not connected - -Future development.

4.6.4. Other BDE connections

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 Sea Tel MXP.

4.7. BDE Final Checks

4.7.1. Visual/Electrical inspection

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

4.7.2. Electrical - Double check wiring connections

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

4.8. Setup - Media Xchange Point™ (MXP)

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

You may also need to load/update the modem option file, which is not part of the scope of this manual, contact the airtime provider NOC for guidance.

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

- Connect & configure a ships computer for accessing the MXP.
- The gyro compass signal being provided by the ship.
- The tracking receiver frequency settings for the satellite to be used (configure satellites).
- Set up / configure all satellites that the system might use as the ship travels.
- Check/Set Home Flag Offset.
- Set up Blockage zone(s) as needed.
- Acquire the desired satellite.
- Optimize targeting (Auto or manual trim).
- Arrange for commissioning & cross-pol isolation testing with the NOC.
- Conduct cross-pol isolation testing with the NOC.
- Conduct other commissioning testing with the NOC (ie P1dB compression point).
- If this is a Dual Antenna installation configuration, you will have to balance the TX levels of the two antennas while online with the NOC (refer to procedure in the Dual Antenna Arbitrator manual).
- It is strongly recommended that you down, and save, the system INI file (contains all of the system parameters). Save this file in a convenient location.

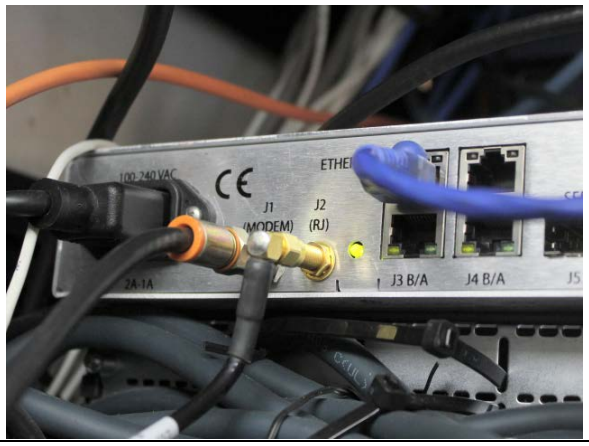
4.1. Cyber Security Caution

Sea Tel Antenna systems are not intended to be connected directly to the Internet. They must be connected behind a dedicated network security device such as a firewall. In addition, we highly recommended that you change default passwords. This is an extremely important consideration that must be taken into account as part of commissioning procedures as attackers with malicious intent (after easily obtaining default passwords and identify internet-connected systems) can be rendered a system inoperable.

For clarification purposes, the factory default Passwords/Configurations are only intended for initial production testing/verification purposes and it is an assumed responsibility of the installing partner to change and record the login credentials and is shared only with persons whom are directly responsible for operation/maintenance of the system. Instructions on how to change passwords may be located within the system manual.

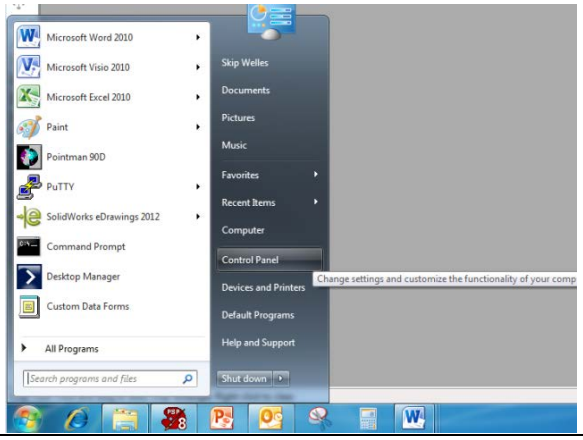
5. Configuring a Computer for the MXP

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.

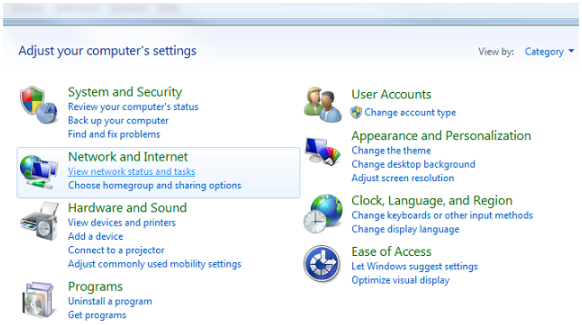
1. Connect a LAN cable to the back of your computer. If you are connecting into a LAN, instead of a single computer, you will need to provide a connection from your LAN router/hub/switch to the MXP.	
2. Connect the other end of the LAN cable to the back of the MXP.	
3. Power on the MXP.	

4. From your computer desktop, click the Control Panel button.

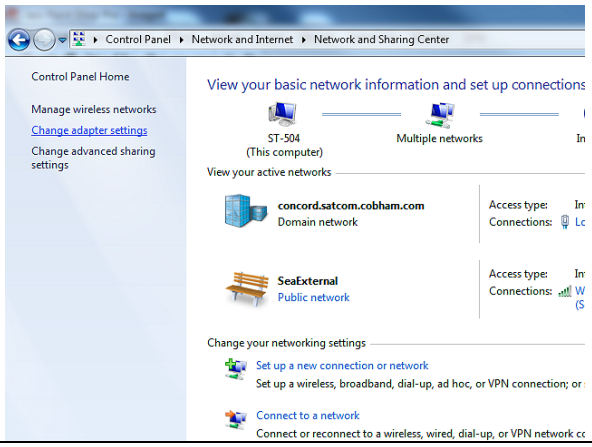
NOTE: The following displayed screen captures are form Window 7 OS, Your screens may differ, refer to your PC manual for changing network adapter settings.



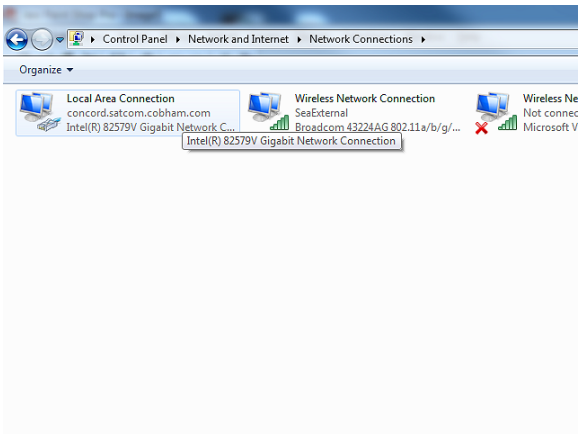
5. Click on "View network status and tasks".

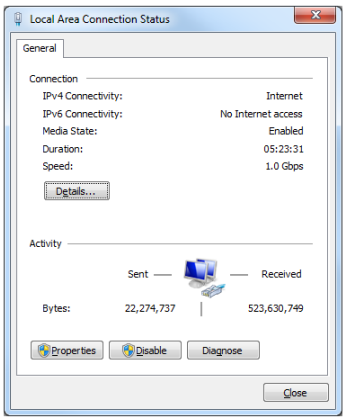
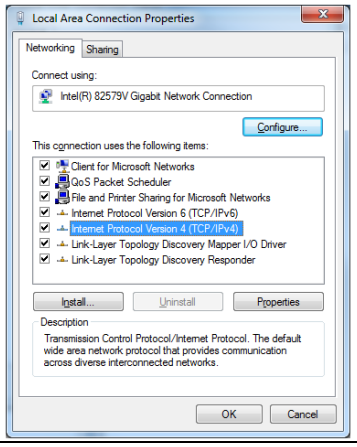
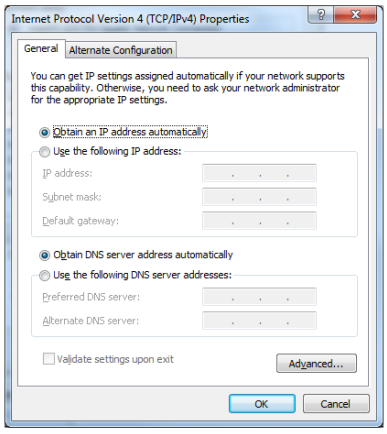
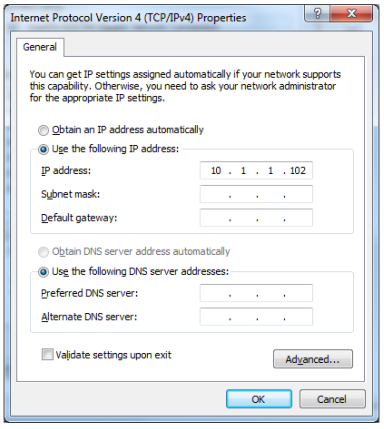


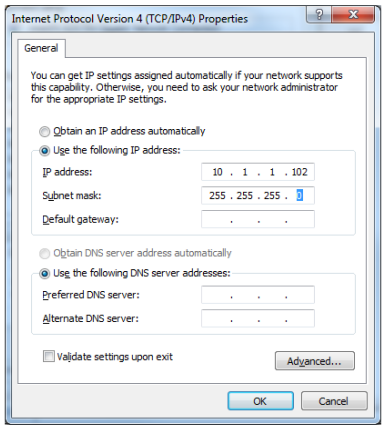
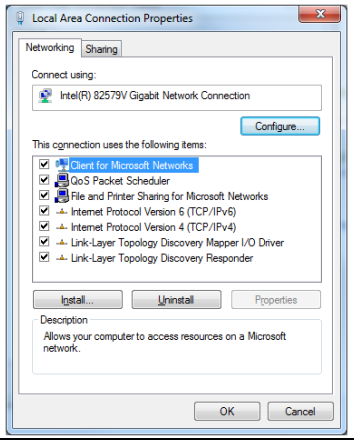
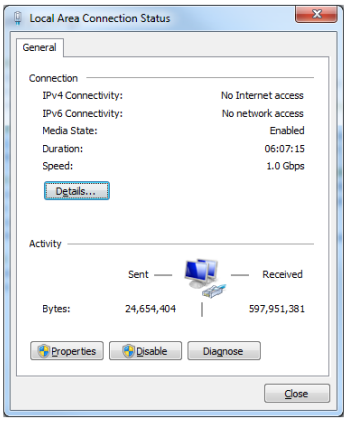
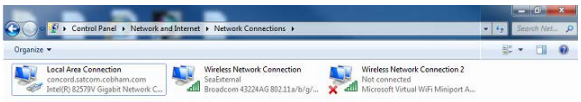
6. Click "Change adapter settings".

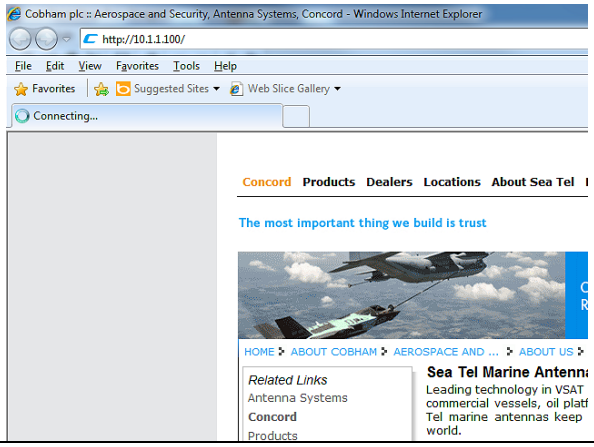
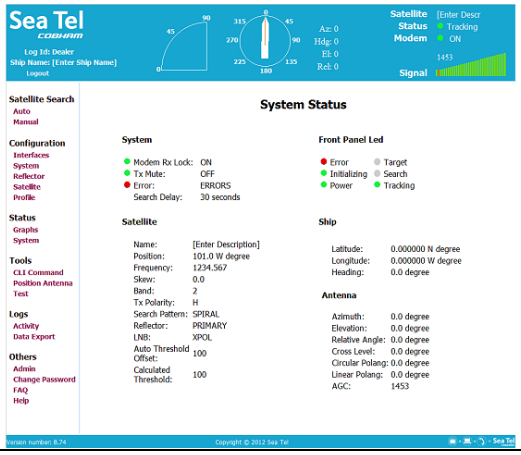


7. Click on "Local Area Connection."



8. Click on "Properties".	
9. Double-Click on "Internet Protocol Version 4 (IPv4)".	
10. Click on "Use the following IP address:	
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 MXP, 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.	

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. Setup – Ship's Gyro Compass

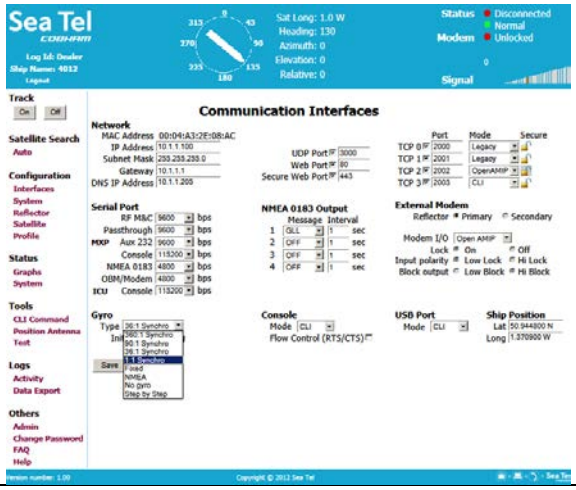
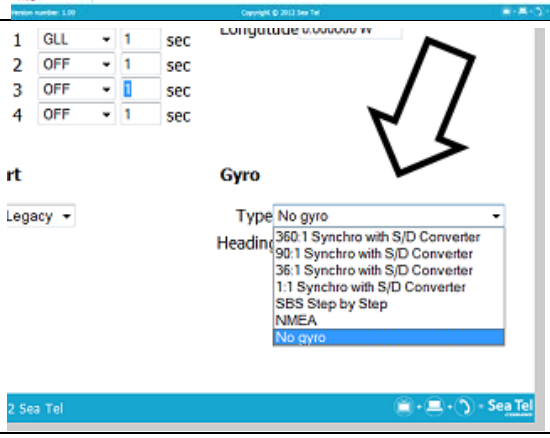
The Ships Gyro Compass connection provides true heading (heading of the ship relative to true North) input to the system. This allows the ICU to target the antenna to a "true" Azimuth position to acquire any desired satellite.

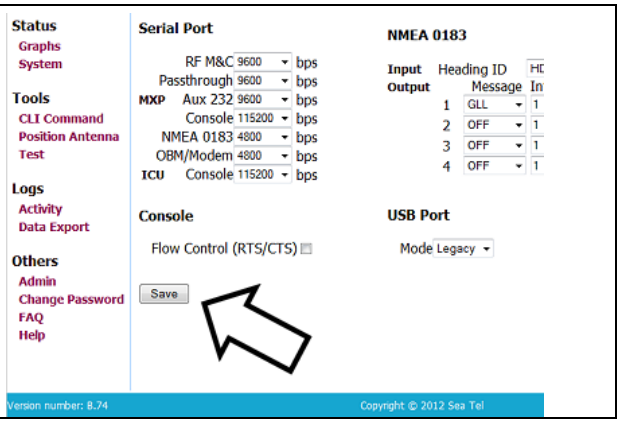
After targeting, this input keeps the antenna stabilized in Azimuth (keeps it pointed at the targeted satellite Azimuth).

6.1. Setting the Gyro Type

The GYRO TYPE parameter selects the type of gyro compass interface signal, the appropriate hardware connections, and the ratio of the expected input signal for ship turning compensation. Default GYRO TYPE parameter for all systems is Step-By-Step so that the ICU will properly follow for Step-By-Step or NMEA gyro signals.

If the Ships Gyro Compass output is Synchro, or there is NO Gyro Compass, the GYRO TYPE parameter must be set correctly to properly read and follow the Ships Gyro Compass signal that is being provided. To manually update the Gyro Type parameter:

1. Go to the Communications Interface screen. 2. Click the Gyro Type drop down menu..	
3. Select the correct Gyro type.	

4. Click Save, at the bottom left area of the screen.	

6.2. *If there is NO Ships Gyro Compass*

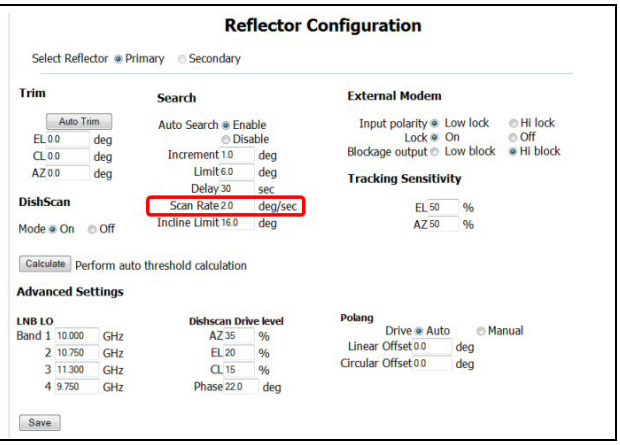
Without heading input to the system the MXP will NOT be able to easily target, or stay stabilized ON, a "true" azimuth pointing angle. This will make satellite acquisition much more difficult and the true azimuth value that any given satellite should be at will not be displayed correctly.

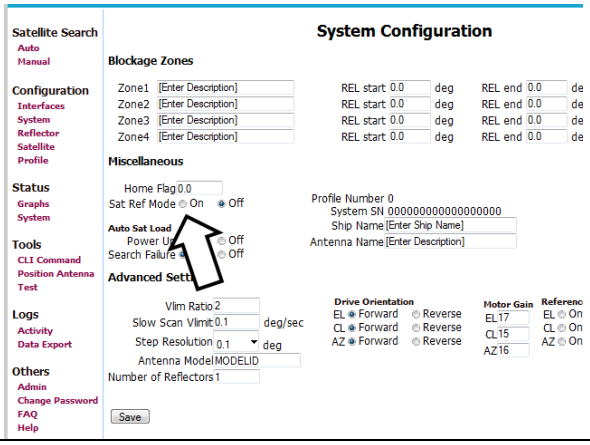
This mode of operation is NOT recommended for ships or any other vessel that turns in the water. A better solution would be to provide a Satellite Compass (multiple GPS Antenna device) to provide true heading input to the MXP. These devices are readily available and are much less expensive than a Gyro Compass.

If there is NO Gyro Compass (ie on a large stationary rig which is anchored to the ocean floor) set the GYRO TYPE parameter to "No Gyro" or to "Fixed".

Fixed mode is used when you do not have a gyro compass, but the ship/vessel/rig is stationary at a fixed heading that you can manually enter for satellite targeting. This allows you to use a standard (small) search pattern and acquire the satellite relatively quickly.

No gyro mode is used when you do not have a gyro compass, the ship does turn and you will use "Sky Search" to initially acquire the satellite. The 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 MUCH longer than if you have valid heading input.

1. Go to the Reflector Configuration page 2. To change: Set the Scan Rate parameter to 5 deg/sec.	

3. Turn on SAT REF Mode. (It must be turned on.)	

This combination of settings will cause "No Gyro" Search pattern to be use to find the desired satellite (refer to the setup – Searching chapter).

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7. Setup – Tracking Receiver – VSAT

If your system is using OpenAMIP these parameters will be set by the modem for the satellite/beam that the modem is using (this also allows for automatic beam switching to be controlled from the model, remotely controlled from the network).

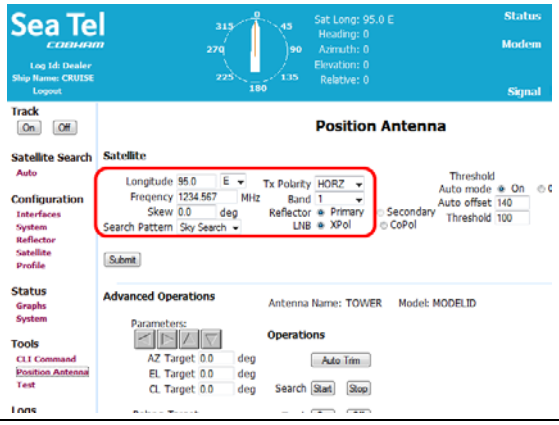
Follow the instructions below to manually set these parameters. .

7.1. Determining the IF Tracking Frequency (MHz)

The IF Tracking frequency parameter is a value entered into the MXP MHZ Sub-Menu. The value itself may be provided by your air-time provider and the MHz value will be entered directly in this sub-menu.

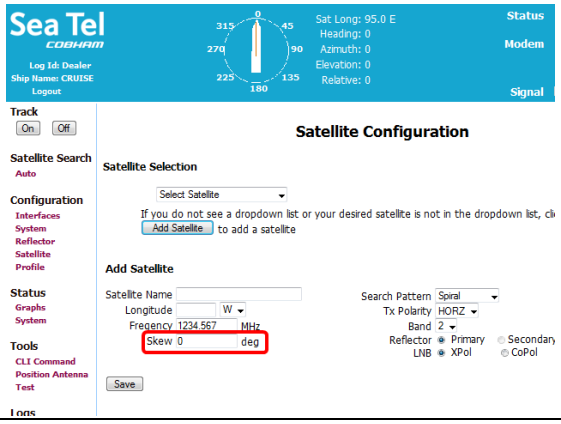
Or, the RF downlink frequency of a specific carrier on the desired satellite can be obtained from a satellite website and calculated by using the formula RF- LO = IF. When you take the Satellite Transponder Downlink RF value and subtract the LNB's Local Oscillator (LO) Value, the resultant value will equal the Intermediate Frequency (IF). It is this IF value that will be entered into the MXP for tracking purposes. The MHz and KHz are entered as a single value.

Example: Assuming an LNB LO value of 11.25GHz: We want to track a satellite downlink carrier at 12268.250 MHz (12268.250 MHz – 11250.000 MHz) = 1018.250 MHz IF

Enter the entire six digits of the "megahertz and kilohertz" is simply entered as one value. This is done in the Position Antenna screen.	

7.2. SAT SKEW

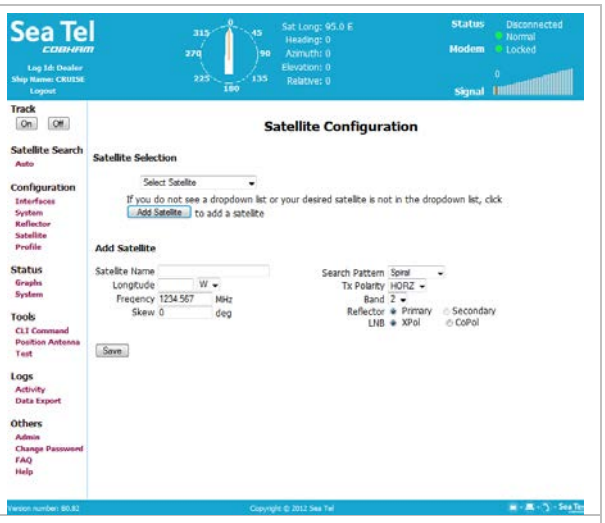
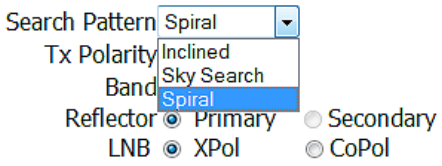
SKEW is used to optimize the polarization of the feed to the desired satellite signal. It is entered when a known satellite is skewed.

Use Polang to peak the polarity.	

8. Setup – Azimuth Trim

Beginning in IMA software version 1.05, calibrating the targeting of your antenna is much easier. This is accomplished improving Sky Search and changing the way that Azimuth Trim works so that the need for Home Flag Offset is eliminated. Azimuth Trim now corrects the relative position of the antenna in all configurations which have valid/accurate gyrocompass input.

If the antenna has been purposely mounted with the bow mark of the ADE not in alignment with the bow of the ship, such as for safe entry into the radome hatch, note and enter the approximate offset into the AZ TRIM parameter before searching for the satellite for the first time. EXAMPLE: The antenna is being mounted on the port side of the ship where it is unsafe for the hatch to be oriented directly in line with the stern. The installer rotates the ADE so that the bow mark is facing directly to the port and bolts that ADE into place. When first powering the system up, he will enter +90 in the AZ TRIM parameter to indicate that the ADE was rotated CW 90 degrees during the installation. This will make ***initial*** satellite acquisition faster (even though sky search would still find the satellite). This entry is only needed on a new installation that AUTO TRIM has not been run on yet. If the ADE had been similarly installed on the starboard side -90 degrees would have been entered to indicate that the ADE was rotated CCW 90 degrees during the installation.

1. Access the Satellite Configuration screen.	
2. Select Sky Search as your desired type of search pattern to use for this initial satellite acquisition on a newly installed antenna system.	

3. Select the satellite that your airtime services will be provided on in the Satellite Selection dropdown. 4. Refer to the next chapter to enter blockage zones as desired. 5. After the desired satellite has been acquired, allow the antenna to track for about 2 minutes BEFORE clicking Auto Trim. 6. Refer to Setup – Targeting – and follow the instruction for AUTO TRIM to optimize the targeting of the antenna.	

9. Setup – Blockage & RF Radiation Hazard Zones

The Blockage Zones function inhibits the antenna from transmitting within certain pre-set zones. This is typically some structure of the ship that prevents satellite signal from getting to the Sea Tel antenna when the ship is at headings that put that structure in-between the satellite and the satellite antenna,

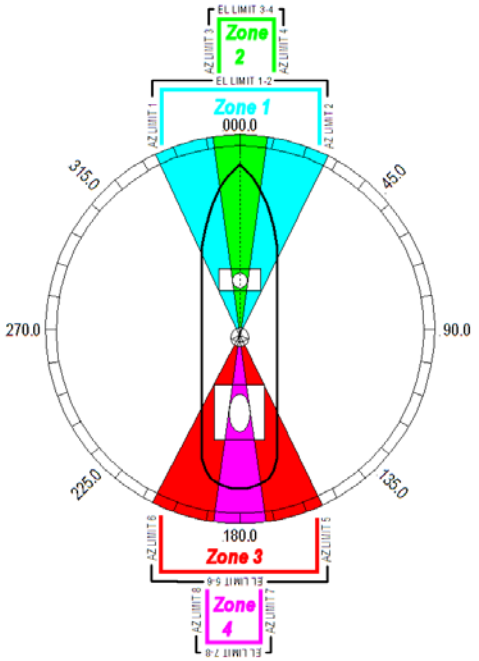
However, it can also be used as an RF Radiation Hazard zone. If there is an area where people may be near the antenna (within 2 meters), in the antennas transmitted beam for extended periods of time the zone can be set up so that transmit from the satellite antenna will be disabled whenever the antenna is pointed in that zone.

9.1. Radiation Hazard and Blockage Mapping

The MXP can be programmed with relative azimuth sectors (zones) where blockage exists or where transmit power would endanger personnel who are frequently in that area. Your MXP software allows you to set four zones.

When you create these *ZONES* (up to four), 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 wait "Search Delay" parameter amount of time and then re-target the satellite you targeted last. Timeout and re-target will continue until the satellite is re-acquired and tracking can resume.
2. The satellite modem transmission will be disabled until the antenna exits the zone.



The lower and upper azimuth limits are entered into the REL start, REL stop and EL fields within the MXP for each of the blockage zones you wish to create (up to four). Each zone can also be given a name (ie Mast, Deckhouse or Stack:

REL Start is the Lower Relative AZ limit (this is the more counter-clockwise of the two points, even if it is numerically larger). **REL Stop** is the Upper Relative AZ limit (the more clockwise of the two points) for pattern mapping of each. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the **EL** field.

Repeat for up to four zones, click SAVE when completed.

Programming instructions:

Determine the Relative AZ positions **where** blockage, or RF Radiation Hazard, exists. This may be done by monitoring the received signal level and the REL display readings while the ship turns or by graphing the expected blockage pattern. Elevation of the antenna in normal use also must be taken into consideration. A Mast or other structure may cause blockage at low elevation angles, but ***may not*** cause blockage when the antenna is at higher elevation angles where it is able to look over the structure. Up to four zones may be mapped. Only zones which are needed should be mapped.

EXAMPLE - Overlaid Blockage Zones: A ship has a Sea Tel antenna mounted on the center line of the ship. A mast mounted on top of a deckhouse (like the picture below) is forward and an engine exhaust stack, also on a deckhouse, is aft. These two blockage areas have wide azimuth blockage at lower elevations and then a narrower azimuth area of blockage extends up to a higher value of elevation.

ZONE 1 named "Fwd Deckhouse" begins (**REL Start**) at 334 degrees Relative and ends (**REL Stop**) at 026 degrees Relative. Enter **REL Start** value of 334.0 and **REL Stop** value of 26.0. In this case the mast height only causes blockage up to an elevation of 40 degrees, so we set **EL** to 40.0. If the antenna is between these two AZ Limit points but not in the "mast" zone AND the elevation is greater than 40 degrees, the antenna will no longer be blocked.

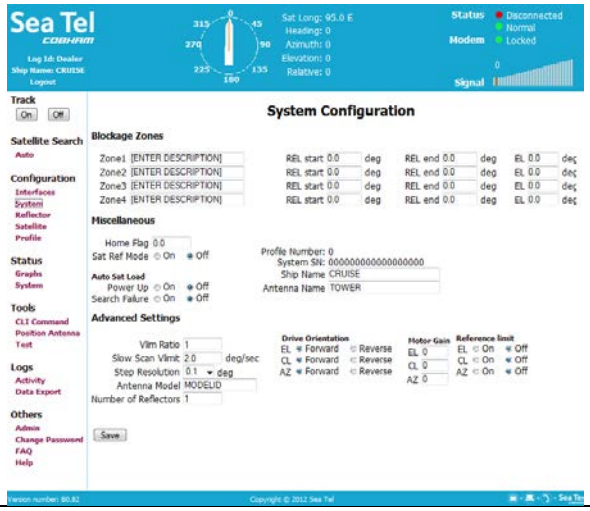
ZONE 2 named "Mast" begins (**REL Start**) at 352 degrees Relative and ends (**REL Stop**) at 008 degrees Relative. Enter **REL Start** value of 352.0 and **REL Stop** value of 8.0. In this case the mast height only causes blockage up to an elevation of 70 degrees, so we set **EL** to 70.0. If the antenna is between these two AZ Limit points but the elevation is greater than 70 degrees, the antenna will no longer be blocked.

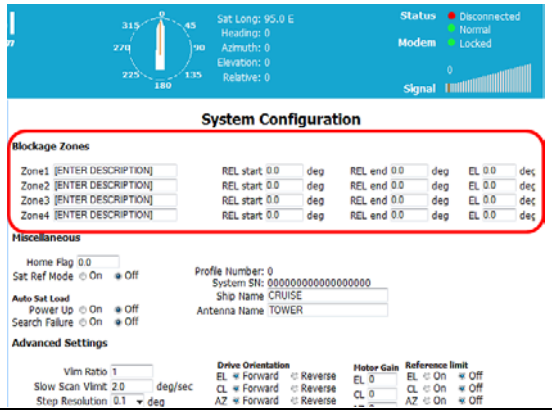
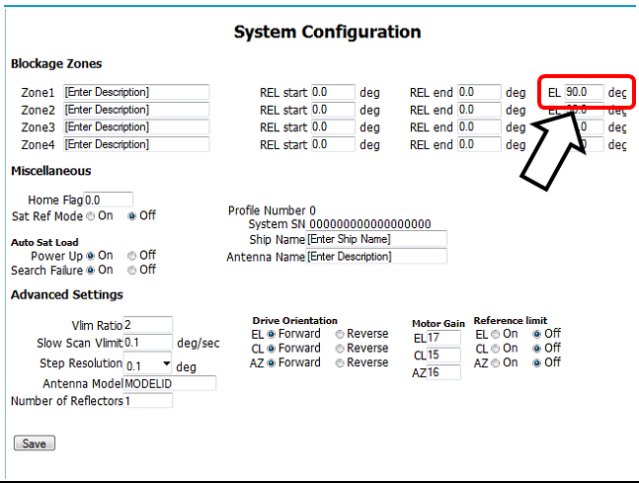
ZONE 3 named "Aft Deckhouse" begins (**REL Start**) at 155 degrees Relative and ends (**REL Stop**) at 205 degrees Relative. Enter **REL Start** value of 155.0 and **REL Stop** value of 205.0. In this case the aft deckhouse height only causes blockage up to an elevation of 30 degrees, so we set **EL** to 30.0. If the antenna is between these two AZ Limit points but the elevation is greater than 30 degrees, the antenna will no longer be blocked.

ZONE 4 named "Stack" begins (**REL Start**) at 173 degrees Relative and ends (**REL Stop**) at 187 degrees Relative. Enter **REL Start** value of 173.0 and **REL Stop** value of 187.0. In this case the stack height only causes blockage up to an elevation of 55 degrees, so we set **EL** to 55.0. If the antenna is between these two AZ Limit points but the elevation is greater than 40 degrees, the antenna will no longer be blocked.

9.2. Programming Instructions:

1. To set up the blockage zones go to the System Configuration screen.



2. Enter a readily identifiable name for the zone (ie Mast, Deck House or Stack). 3. Moving to the right, enter the relative of the starting point of this blockage zone (the more counter-clockwise bearing). 4. Then enter the relative bearing of the stop point of this blockage zone (the more clockwise of the two bearings).	
5. Likewise, for Elevation, you need only to enter the elevation angle, below which you want the transmitter inhibited (blocked).	
6. Repeat steps 2-5 to describe up to 4 blockage zones.	

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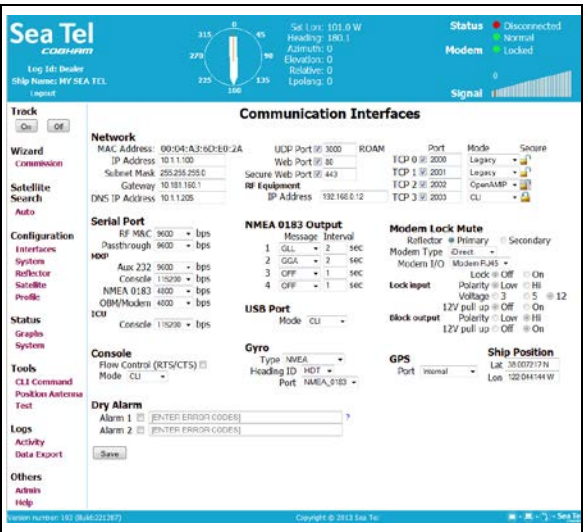
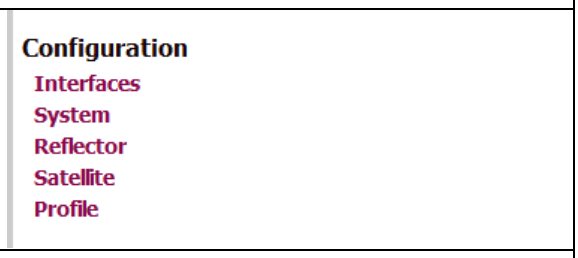
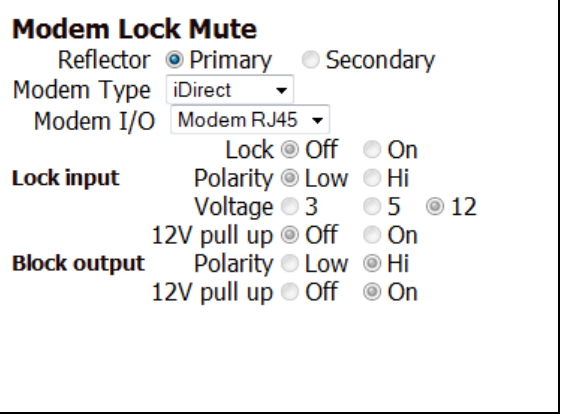
10. Configuring The Satellite Modem Interface.

The configuration setup of an integrated satellite modem to the MXP is accomplished via the Communication Interface Page (Configuration>Interfaces link on the navigational panel on the left hand side of the screen). In order to access this page, the user must be logged in as either "Dealer" or "SysAdmin". The current software load, IMA Ver 105 at the time of this release) contains 6 commonly used satellite Modems (iDirect, Comtech, Gilat, Hughes, STM, and Viasat) as selectable presets and is typically a prompted selection when using the new Commissioning Wizard. However, the MXP allows configuration of a "Custom" modem type. The primary focus of this procedure is to define all of the parameter options made available to allow the commissioning technician to properly integrate any compatible L-Band Satellite modem.

10.1. Satellite Modem Interface

1. If not already, log into the system using the "Dealer" or "SysAdmin" credentials.	
2. On the left hand side of the screen, under Configuration, select the **"Interfaces"** link.	
3. On the right side of the screen, approximately half way down is the "Modem Lock Mute" section. This section is where the user, via drop down menu selection and/or mutually exclusive radio buttons, defines: • Reflector • Modem Type • Modem I/O • Lock Input • Block Output	

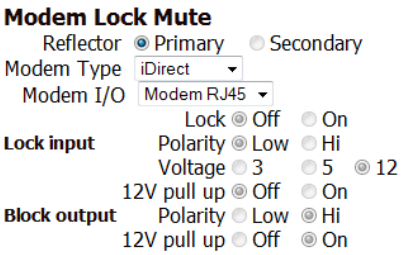
10.1.1. Reflector setting

Use: In a dual reflector based antenna system, the "Reflector" selection defines which reflector the modem configuration applies to.

Selection Type: Mutually Exclusive Radio Buttons

Options: Primary or Secondary

Notes: In the current Series 12 antennas this setting should always be set to PRIMARY. Failure to do so may result in abnormal system operation.



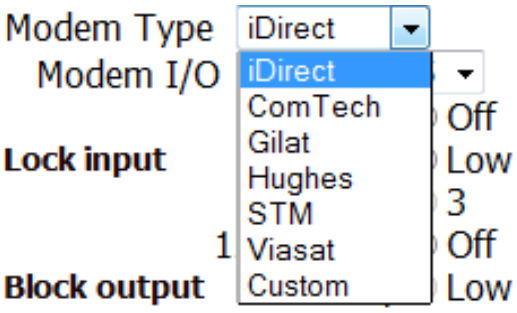
10.1.2. Modem Type setting

Use: This selection defines which manufacturer of satellite modem is to be interfaced with the system.

Selection Type: Drop down menu selection

Options: iDirect, ComTech, Gilat, Hughes, STM, Viasat, or Custom.

Notes: The selection of modem type (along with the modem I/O) allows the IMA software to configure the appropriate RX Network Lock, and TX Mute/Block output Lock interfaces per the modem manufacturers' specifications.



Once you select one of the manufacturers and I/O from the dropdown list the other settings that are appropriate for that modem will be set for you (and greyed out).

If your modem manufacturer is not listed, you will need to select "Custom" and manually configure the modem I/O properties. Refer to the custom settings information below.

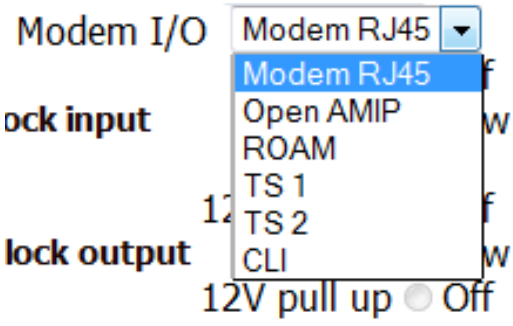
10.1.3. Modem I/O setting

Use: This selection defines which type (and location) of communication interface between the MXP and the satellite modem.

Selection Type: Drop down menu selection

Options: OpenAMIP, ROAM, TS1, TS2, or CLI.

Notes: The Modem I/O selections of iDirect's **OpenAMIP** or ComTech's **ROAM**, both forms of ABS (**A**utomatic **B**eam **S**witching), communicate via TCP/IP traffic between the MXP's J9 or J10 Ethernet port and the applicable modems Ethernet port. It should also be said that, to use these I/O types, there is a requirement that the integrated satellite modem and NOC (hardware and software) are properly configured and capable to support said feature.



Modem RJ45 is used for standard console port type connections where GPS forwarding is required (i.e. iDirect Console Port) in addition to Positive Satellite ID (RX Network Lock) and TX Mute/Blockage zone functionality

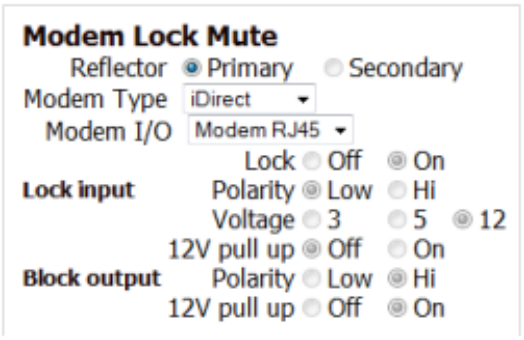
TS1 and **TS2** are hard wired interfaces used only for positive satellite ID (RX Lock) and TX mute functionality.

In some installations, **CLI** (**C**ommand **L**ine **I**nterface) may be desired. CLI is used when a third party ABS device (separate from satellite modem itself) is interfaced to provide antenna control, positive satellite ID (Rx Lock), and TX mute functionality via TCP/IP traffic between the MXP's J9 or J10 Ethernet port, or Serial Traffic (Console), and the applicable devices Ethernet port.

Figure 1 Available MXP Rear Panel Modem IO Ports

10.1.4. Modem I/O – Custom Settings

Use: The individual Modem I/O selections allow the user to manually define the expected driver (output) and detector (input) circuit(s) as well as positive satellite ID functionality between the MXP and the satellite modem.



Selection Type: Mutually Exclusive Radio Buttons

Options: Lock Input: On or Off, Polarity, 12V Pull up.

Block Output: Polarity and 12V Pull up

Notes: The lock input and Block output radio button selections may only be modified if the Modem Type "Custom" Modem Type has been selected.

If any of the other Modem Types are selected, the Lock Input and Block Output radio buttons are predefined for you by software and therefore become read only. This is evidenced to the user by disabling the selections, see image to right for an example of this.

10.1.4.1. Modem I/O – Lock ON/OFF

Use: The Modem I/O Lock Input "**Lock"** selection defines whether or not the MXP will use positive satellite ID functionality.

When OFF, the system will simply use the tracking receiver settings and the subsequent AGC from the receiver to track an acquired satellite. This may be the desired satellite or it may be an adjacent satellite that was acquired during a search for the desired satellite.

When ON, the system must get AGC and ALSO receive a network lock logic signal from the modem to continue tracking the acquired satellite. This prevents tracking the wrong satellite and verifies that the antenna is in fact on the desired satellite (to get network lock from the modem the antenna must be on the correct polarity of the correct satellite). If during a search an adjacent satellite is found, good AGC from the tracking receiver will cause the system to initially track/peak this satellite but be waiting for a network lock signal from the satellite. If the lock signal is not received within 30-40 seconds, that system will return to the search track line and resume searching for the satellite which provides AGC & Lock. Lock Input settings below MUST be set correctly for this functionality to work properly.

Selection Type: Mutually Exclusive Radio Buttons

Options: Lock ON or OFF.

Notes: Modem Type "Custom" must have been selected to allow changes to these settings. Setting Modem Lock to "ON" will enable the positive satellite ID feature whereas setting modem Lock to "OFF" disables the feature. With the exception of the some calibration procedures (ie during Cross-Pol isolation and 1dB compression tests) it highly recommended to leave this setting to ON. By doing so, you eliminate tracking on adjacent satellites for any extended amount of time (typically 30-40 seconds)

10.1.4.2. Modem I/O – Lock Input – Polarity

Use: The Modem I/O Lock Input Polarity selection defines whether the hard lined wire input provides a logic level high or logic level low as indication of Positive Satellite ID (RX Network Lock indication).

Selection Type: Mutually Exclusive Radio Button

Options: Polarity Low or Hi.

Notes: Modem Type "Custom" must have been selected to allow changes to this setting.

You must refer to your satellite modems manufacturers written specifications for its nominal receive lock indication output. Example if you have a satellite modem that provides a nominal 5VDC output when in a NON-Locked condition (off satellite) and 0Vdc when in a locked condition (on satellite), you would set Polarity to "Low".

If your modem provides a continuity based output, short to ground is Low, and Open is High. If your modems output is continuity based logic the Voltage must be set to 12V and the 12V pull up must be set to "ON" (See Modem I/O Voltage & 12V Pull up sections below). Failure to do so may result in a false Rx Lock trigger when the applicable modem interface cable is removed for any reason.

10.1.4.3. Modem I/O – Lock Input - Voltage

Use: The Modem I/O Lock Input Voltage selection defines the nominal voltage range for the hard lined wire input for indication of Positive Satellite ID (RX Network Lock indication).

Selection Type: Mutually Exclusive Radio Buttons

Options: Voltage 3V, 5V or 12V.

Notes: Modem Type "Custom" must have been selected to allow changes to this setting.

You must refer to your satellite modems manufacturers written specifications for the receive lock indication voltage range that it provides as an output. The receive logic level itself is interpreted by the MXP based on the above mentioned Polarity selection (the actual Low versus Hi polarity trigger is 50% of selected voltage range). Example: You have a satellite modem that provides a 12VDC output range and Polarity has been set to Low. When the detected voltage is between 0 to 6Vdc, the MXP would interpret this as a Positive Satellite ID. Voltage between 6.1 and 12Vdc would be interpreted as a failed Positive Satellite ID (because it is High).

If your modem provides a continuity based output (short to ground is Low, and Open is high), you must set this selection to 12V.

10.1.4.4. Modem I/O – Lock Input - 12V Pull Up

Use: The Modem I/O Lock Input 12V Pull Up selection defines whether or not to use a built-in 12VDC Pull up resistor for the hard lined wire input for indication of Positive Satellite ID (RX Network Lock indication). The MXP requires a voltage input for this satellite ID functionality.

If your modem outputs continuity based logic, the pull up circuit (ON) converts the continuity to voltage. For all voltage based modem outputs, it MUST be set to OFF to prevent false Positive Sat ID indications (voltage high & higher, but never low).

Selection Type: Mutually Exclusive Radio Buttons

Options: 12V Pull Up Off or On.

Notes: Modem Type "Custom" must have been selected to allow changes to this setting.

If your modem provides a continuity based output (short to ground is Low, and Open is high) this selection must be set to "ON". For all voltage based modem outputs, it MUST be set to OFF.

10.1.4.5. Modem I/O – Block Output – Polarity

Use: The Modem I/O - Block Output selection defines whether or not the MXP will provide a logic level Low or logic level Hi output when a condition exists that requires muting the IF transmission of the system. This is known as TX Mute functionality and is a signal from the MXP to the Satellite Modem (which in turn removes drive to the Block Up Converter mounted on the antenna assembly). The signal flow for this feature is from the MXP to the Satellite Modem.

Selection Type: Mutually Exclusive Radio Buttons

Options: Polarity Low or Hi.

Notes: Modem Type "Custom" must have been selected to allow changes to this setting.

You must refer to your satellite modems manufacturers written specifications for the input required to mute the modems output to the BUC. Ascertain whether the input signal must be Hi or Low logic to mute and whether it is continuity based logic or voltage based.

Example: If your satellite modem requires a Hi logic input (continuity or voltage) to cease transmissions you must select Hi.

There are numerous compliance laws (FCC and other worldwide entities) that mandate the ability and/or need to immediately mute transmit on a VSAT system when at least one of numerous predefined conditions are met. In most cases, these are conditions that ultimately determine that the system is not accurately pointed to the desired satellite. However there are some conditions where this may not be true, as is the case of the antenna being pointed at a pre-defined "Radiation Hazard Zone", which discussed in detail within another chapter of this manual, is programmed in as a Blockage Zone, thus the name Block Output.

There may be an area on board the vessel in which crew and/or guests may be in the direct path of the terminals transmission to the satellite and might possibly be harmed by long term exposure to the microwave signal. This sector would be described as a blockage zone so that the transmissions from the antenna would cease when pointed in that area. Similarly a mast or other structure on the ship, directly in the beam path of the transmission, which would prevent transmitted signal from reaching the satellite and cause reflections which may degrade the signal or even be harmful to the antenna. These obstructions would also be described as a blockage zones. This similar in concept to "sector blanking" a radar array.

10.1.4.6. Modem I/O – Block Output – 12V Pull Up

Use: The Modem I/O Block Output 12V Pull Up selection defines whether or not use a built-in 12VDC Pull up resistor for the hard lined wire input for Blockage output (TX Mute).

If your modem requires a continuity based input (Short to ground is Low, and Open is High) this selection must be set to OFF. For all voltage based modem inputs, it MUST be set to ON.

Selection Type: Mutually Exclusive Radio Buttons

Options: 12V Pull Up OFF or ON.

Notes: Modem Type "Custom" must have been selected to allow changes to this setting.

Example: Your modem requires a high, voltage based, input to mute the modem. You would set Polarity to Hi and 12V Pull Up to ON.

If your modem required a low, continuity based, input to mute the modem. You would set Polarity to Low and 12V Pull Up to OFF.

10.2. Quick Reference: Common Modem Lock & Mute Settings

Modem Type	Compatible ABS Mode	Lock Input - Lock	Lock Input –Polarity	Lock Input – Voltage	Lock Input -12V Pull Up	Block Output - Polarity	Block Output - 12V Pull Up
iDirect	OpenAMIP*	On	Low	12	Off	Hi	On
ComTech	ROAM*	On	Low	12	On	Low	On
Gilat	N/A	On	Low	12	Off	Low	Off
Hughes	N/A	On	Hi	12	Off	Hi	On
STM	N/A	On	Low	3	Off	Low	Off
Viasat	N/A	On	Low	12	Off	Low	Off
Custom	CLI*	On	As Required	As Required	As Required	As Required	As Required

*__NOTE__: When interfacing ABS (via Ethernet connection) Lock input and Block Output selections have no operational impact.

11. Setup – Targeting

Optimize the targeting of the antenna to track on or near a desired satellite (within +/-1 degree.

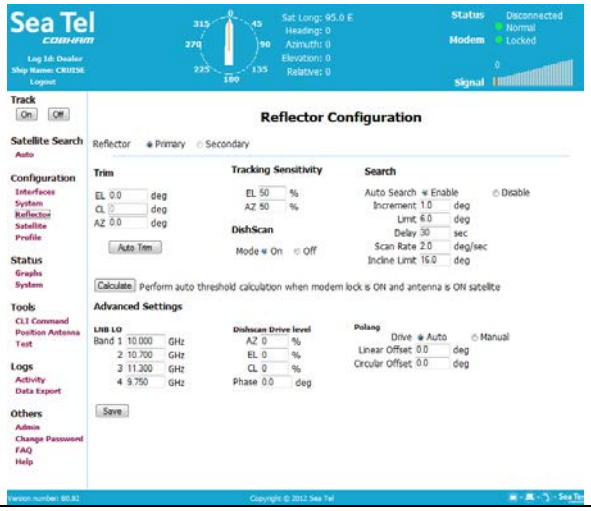
11.1. AUTO TRIM

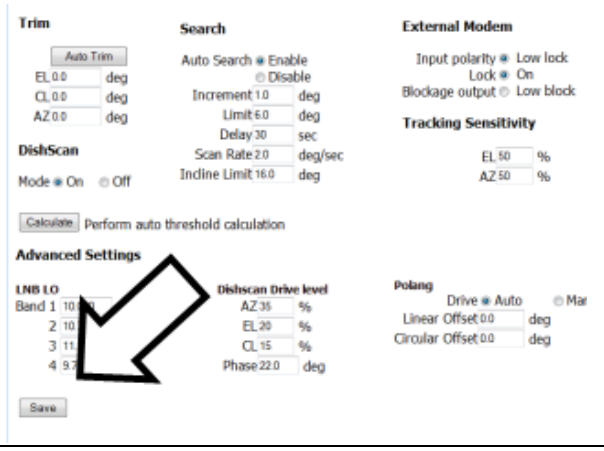
The Auto Trim function will automatically calculate and set the required Azimuth and Elevation trim offset parameters required to properly calibrate the antennas display to the mechanical angle of the antenna itself, while peaked ON satellite.

After locating the satellite, with Tracking ON, **wait at least 2 minutes** before performing the AUTO TRIM, this will allow sufficient time for the antenna to peak up on the satellite signal and for the targeting loops to completely stabilize. It is equally important that you verify that the system is tracking the CORRECT satellite (verify a RX lock indication on the satellite modem).

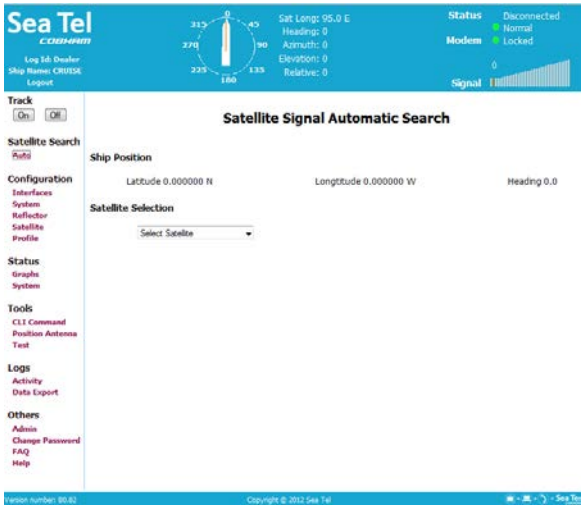
NOTE: The AUTO TRIM feature is NOT allowed unless all of these conditions are met:

- The antenna must be actively tracking a satellite (AGC above threshold) **AND**
- The antenna must have positive SAT ID (RX lock input from the Satellite Modem) **AND**
- The elevation angle of the antenna must be LESS than 83 degrees **AND**
- The antenna must NOT be set for Inclined Orbit Search **AND**
- The system must NOT be set for "No Gyro" mode.

1. To activate the Auto Trim function, go to the Reflector Configuration screen.	
2. Click on the Auto Trim button. This does not save these parameters to NVRAM, in order to save to memory, click the Save button.	

3. Click SAVE	

11.2. Manually Optimizing Targeting

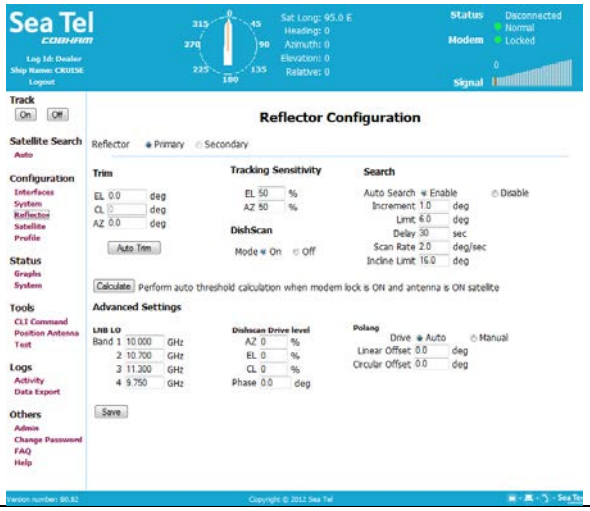
1. First, assure that all of your Ship & Satellite settings in the MXP are correct. 2. Access the Satellite Search screen 3. Target the desired satellite by selecting it from the drop down list. You will see a message "Acquiring Satellite Signal…Please Wait" displayed. 4. Watch the Azimuth and Elevation values displayed in the center area of the banner and prepare to click the Track OFF button. When targeting the antenna will initially drive to an elevation position that is 8 degrees above (or below if the elevation is greater than 83 degrees) the actual calculated position that the satellite should be at. After azimuth and polarization also finish driving, the elevation will drive to the actual elevation of the satellite 5. As soon as the elevation drives (up or down) 8 degrees click the Track OFF button and record the Azimuth and Elevation positions (these are the Calculated positions)..	

6. Click Track ON button and allow the antenna to search, acquire and track the desired satellite.

As this happens you will see "Satellite Signal Found" and "Modem Lock: LOCKED" messages displayed. Select the Position Antenna screen., turn Tracking OFF and click Save.

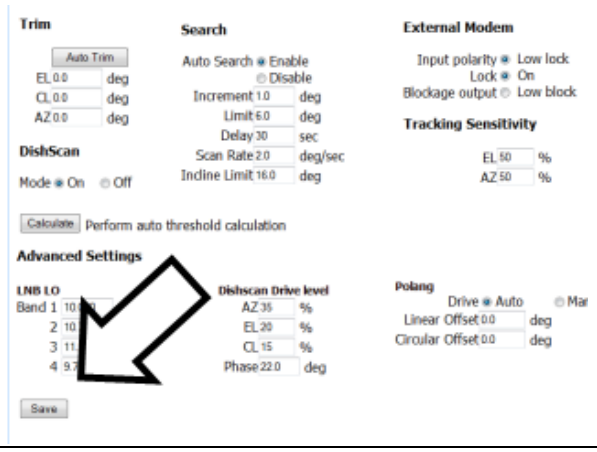
7. After the antenna has been tracking for several minutes, record the Azimuth and Elevation positions of the antenna (these are the Peak positions).
8. Subtract the Peak Positions from the Calculated Positions to determine the amount of Trim which is required.

9. Access the Reflector Configuration page.



10. Enter the Elevation Trim in the EL field.
11. Enter the Azimuth Trim in the AZ field.

12. Click Save.
13. Re-target the satellite several times to verify that targeting is now driving the antenna to a position that is within +/- 1.0 degrees of where the satellite signal is located.



EXAMPLE: The antenna initially targets to an Elevation position of 38.0 degrees and an Azimuth position of 180.2. Shortly after that the Elevation drives to 30.0 degrees and Azimuth stays at 180.2 (Calculated), you find that Peak Elevation while ON your desired satellite is 31.5 degrees and Peak Azimuth is 178.0. You would enter an EL TRIM value of –1.5 degrees and an AZ TRIM of +2.2 degrees. After these trims values have been set, your peak **"ON"** satellite Azimuth and Elevation displays would be very near 180.2 and 30.0 respectively.	

12. Setup – Satellite Configuration

If you are using a remotely controlled ABS network control configuration (ie OpenAMIP, ROAM or legacy ABS direct connection to the MXP disregard this chapter as the network will make all changes in the MXP for the new beam or satellite to be used.

The values that these parameters are set to depends on the hardware configuration required for each satellite. Configure each of the satellites that airtime services will be provided on so that any one of them can be selected, remotely or by the user onboard. The satellite selection will in turn control the hardware on the antenna pedestal to select the correct TX & RX hardware and the correct tracking settings.

Sea Tel provides quad-band LNBs as standard on the Ku-Band feed assemblies.

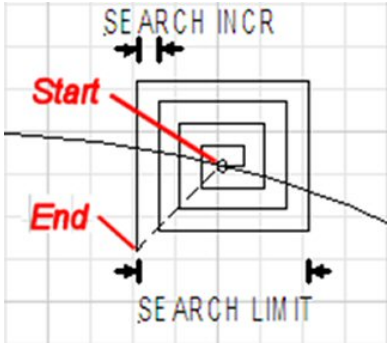
12.1. Searching Patterns

The MXP will initiate an automated search pattern after AGC falls below the current Threshold setting (indicates that satellite signal has been lost). The SEARCH DELAY parameter sets the amount of delay, in seconds that the MXP will wait after AGC has fallen below the threshold value before it starts a search. Below are the choices of patterns that each satellite can be set to.

12.1.1. Default "Spiral" (Box) Search Pattern

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

When a search begins;

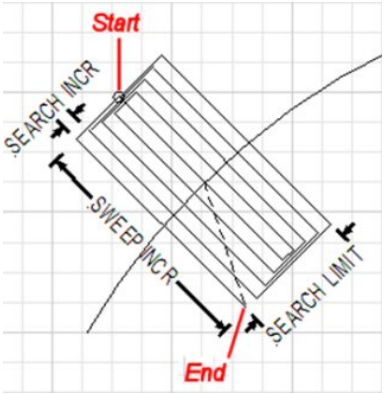


The antenna will then search up in azimuth one Search Increment, search up one Search Increment in elevation, search down two Search Increments in azimuth, search down two Search Increments in elevation, etc until Search Limit is reached. When the end of the search pattern is reached, the MXP will retarget 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 satellite modem) at this position, or anywhere within the search pattern, the MXP will terminate search and go into Tracking mode. If the desired signal is not found the MXP 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.

12.1.2. 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 MXP will retarget the antenna to the calculated Azimuth and Elevation point.

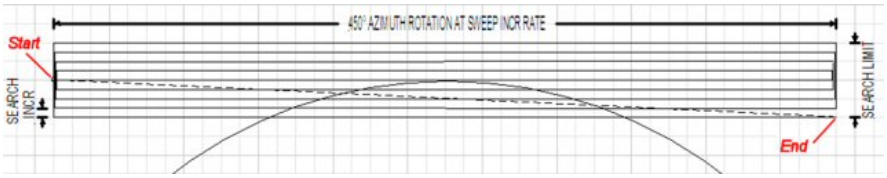
If the desired signal is found (AND network lock is achieved in the satellite modem) at this position, or anywhere within the search pattern, the MXP will terminate search and go into Tracking mode. If the desired signal is not found the MXP will wait SEARCH DELAY, then target the antenna to start point 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.

12.1.3. Sky Search Pattern

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

No Gyro - If you do not have 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 MXP 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 MXP 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 in the satellite modem) at any position within the search pattern, the MXP will terminate search and go into Tracking mode.

If the desired signal is not found within the search pattern the MXP 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.

12.2. TX Pol select

Is used to select the transmit polarity of the C-Band Linear/Circular selectable feed, or the Ku-Band linear feed, whichever is currently installed.

12.3. Band select

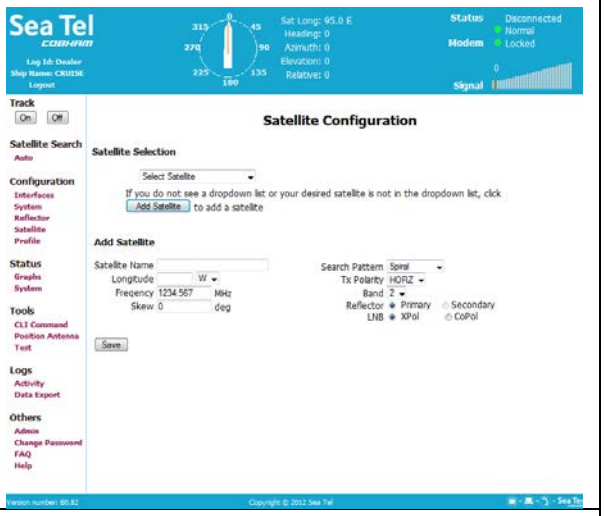
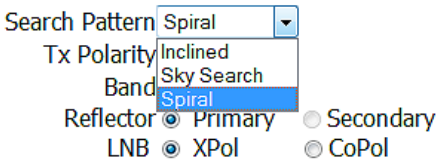
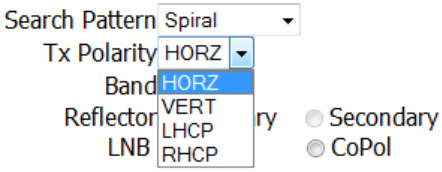
Controls the band selection of the selected LNB (X-Pol or Co-Pol) on the Ku-Band linear feed ONLY. This setting works in conjunction with the X-Pol / Co-Pol selection setting.

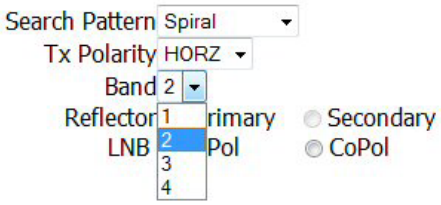
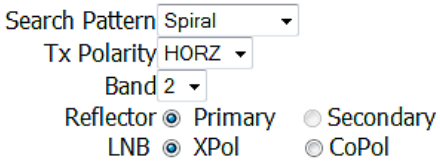
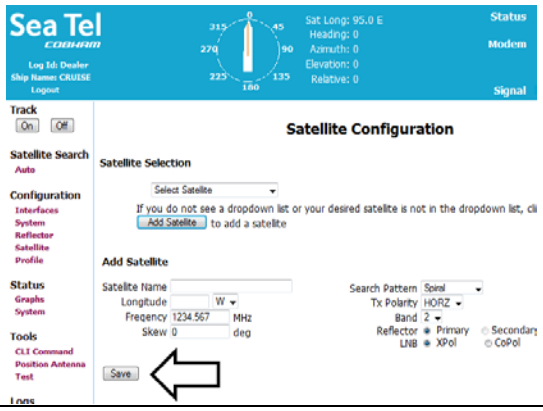
12.4. *X-Pol / Co-Pol select*

Selects the desired (X-Pol or Co-Pol) on the Ku-Band linear feed ONLY. This setting works in conjunction with the band selection setting.

12.5. *Selecting/Configuring Your Satellite Configuration*

Choose a predefined satellite configuration or create a new one using the steps below.

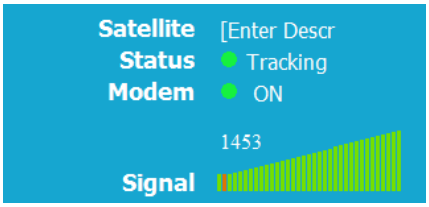
<table>
<tr>
<td>1. Access the Satellite Configuration screen.
2. Select the satellite that your airtime services will be provided on.</td>
<td> 
</td>
</tr>
<tr>
<td>3. Select the desired type of search pattern to use for this satellite.</td>
<td> 
</td>
</tr>
<tr>
<td>4. Select desired TX Polarity from the drop down menu.</td>
<td> 
</td>
</tr>
</table>

5. Select desired Band from its drop down menu.	
6. Assure that reflector is set to "Primary". 7. Select Cross-Pol LNB (XPol) or Co-Pol LNB (CoPol) as is appropriate for this satellite.	
8. Click the Save button.	

13. 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 modem then should achieve lock and you should be able to use the system.

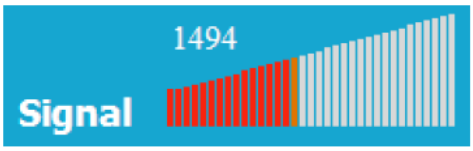
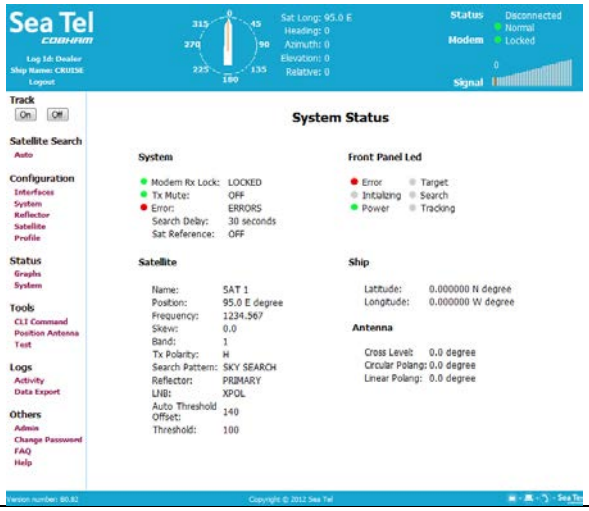
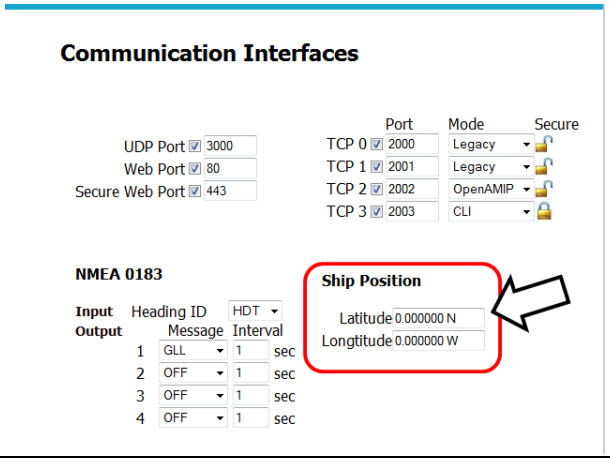
13.1. If satellite signal is found AND network lock is achieved:

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 ICU has signal above threshold AND modem has network lock the antenna will continue to track the satellite. 3. Satellite Name (if entered), Tracking indicator, Modem Lock indicator and signal level (number value and bar graph) will be displayed in the header of the MXP 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.	

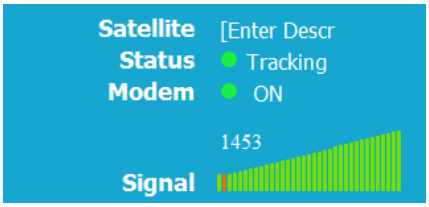
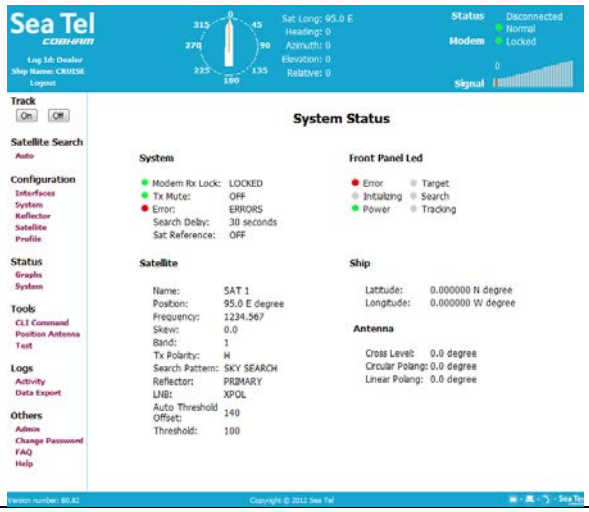
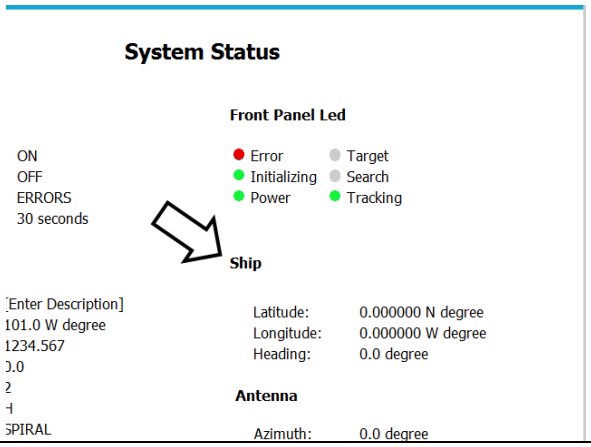
13.2. If no signal is found:

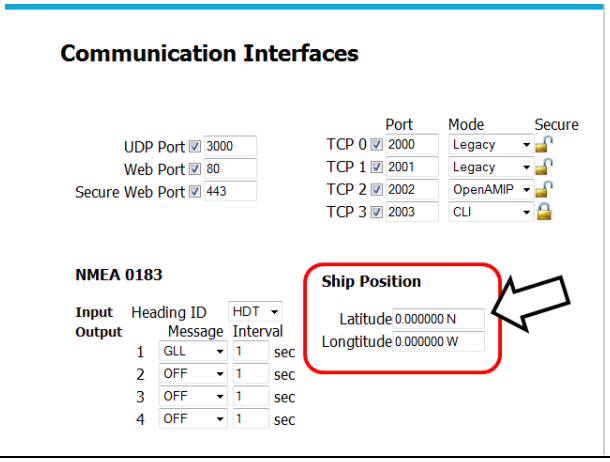
If the system does NOT automatically find the satellite from a cold start, follow the steps below:

1. The Tracking LED will flash for a short period of time (Search Delay) followed by the Search LED coming ON. 2. The ICU will automatically move the antenna in the selected Search pattern until looking for a signal value that is greater than the threshold value (red bar in the bar graph).	

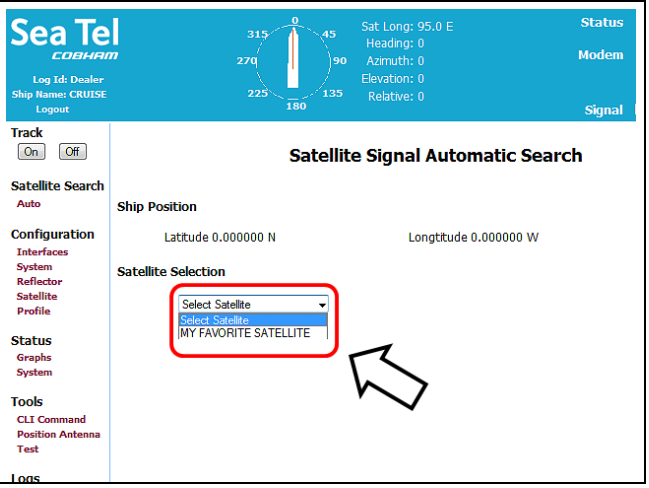
3. Not finding a signal greater than Threshold, the bar graph will stay red and the antenna will reach the end of the prescribed search pattern. 4. The antenna will retarget and the cycle will repeat (Search Delay timeout, conduct search pattern followed by retarget).	
5. Check Latitude, Longitude and Heading. These should be correct, but may be updated if necessary. 6. Access the System Status screen. 7. Find the Latitude, Longitude (under Ship) and Heading (in the banner) displayed values. If they are correct skip to step 12.	
8. If the Latitude & Longitude values are not correct, access the Communication Interfaces screen and enter the ships Latitude & Longitude position in the fields provided. 9. If the Heading value is not correct, enter the correct value in the lower right field of the Communication Interfaces screen. If the system is set for NMEA or 1:1 type, you will not be able to enter a heading value. 10. Click Save.	
11. Check for blockage (this is the MOST common cause of not being able to acquire the desired satellite). 12. Verify that the correct satellite is selected. 13. Check cable connections to assure that a cable has not been disconnected.	

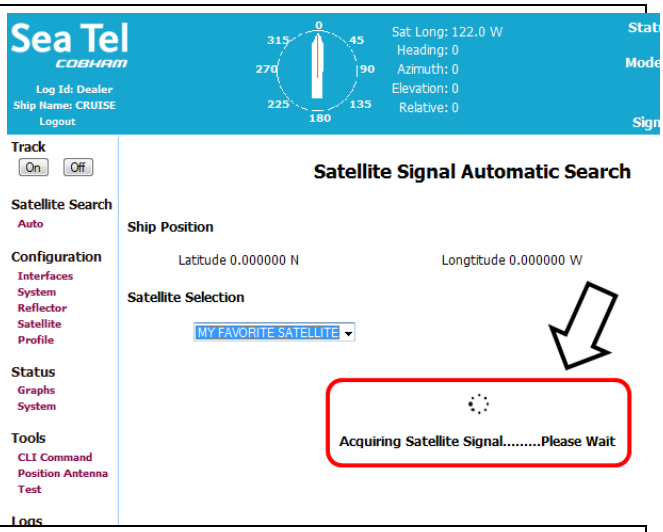
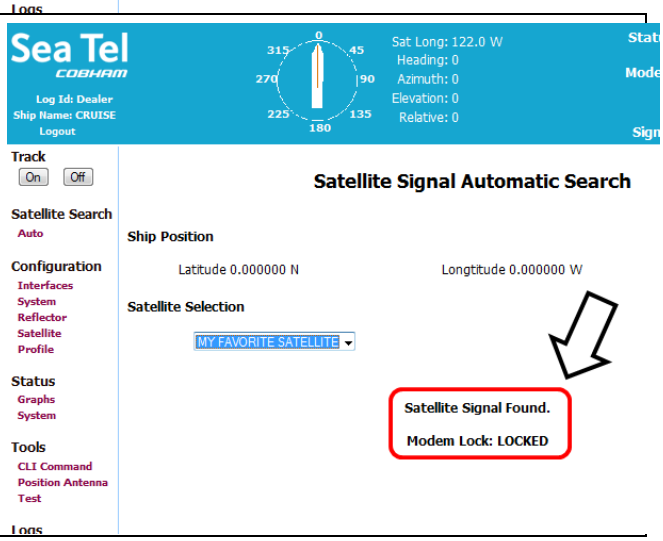
13.3. If satellite signal is found but network lock is NOT achieved:

1. The Tracking LED will flash for a short period of time (Search Delay) followed by the Search LED coming ON.	
2. The ICU will automatically move the antenna in the selected Search pattern until it receives a signal value that is greater than the threshold value (red bar in the bar graph). If signal above Threshold is found, Tracking will take over (Tracking LED ON) and automatically peak the antenna position for highest receive signal level from the satellite which has been acquired. The system will wait for the modem to achieve lock. If the modem does not get lock, the antenna will resume its search pattern.	
3. If the system does not acquire the correct satellite within the prescribed search pattern, the antenna will retarget and the cycle will repeat (Search Delay timeout, conduct search pattern followed by retarget). 4. Check Latitude, Longitude and Heading. These should be correct, but may be updated if necessary. 5. Access the System Status screen.	
6. Find the Latitude, Longitude and Heading displayed values. If they are correct skip to step 11.	

7. If the Latitude & Longitude values are not correct, access the Communication Interfaces screen and enter the ships Latitude & Longitude position in the fields provided. 8. Click Save.	
9. If the Heading value is not correct, enter the correct value in the lower left field of the Communication Interfaces screen. 10. Click Save.	
11. Check for blockage (this is the MOST common cause of not being able to acquire the desired satellite). 12. Verify that the correct satellite is selected. 13. Check for polarization drive failure. 14. Check for improper polarization alignment/position.	
15. Check cable connections to assure that a cable has not been disconnected. 16. Verify that the modem option file is correct. 17. Check the modem for failure.	

13.4. To Target a different satellite

1. To target a different satellite go to the Satellite Search Auto screen and select the desired satellite from the drop down list.	

2. When you make that selection you will see the temporary message: Acquiring Satellite Signal…Please Wait	
3. Shortly after that you will see the temporary message: Satellite Signal Found. Modem Lock: LOCKED	

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14. Optimizing Cross-Pol Isolation

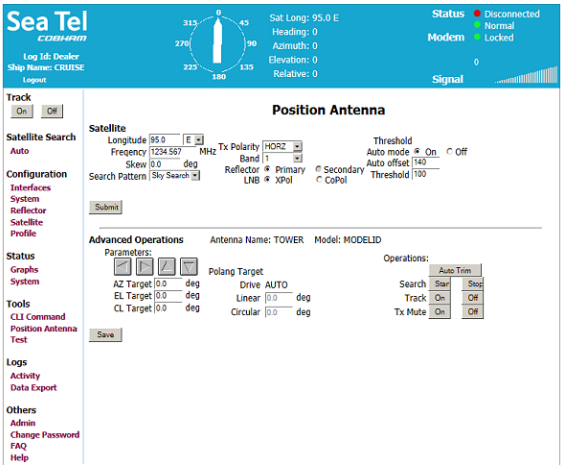
Now that all of the other setup items have been checked and changed as necessary, it is time to contact the NOC to arrange for cross-pol isolation testing and whatever other commissioning the NOC asks for. Read this procedure thoroughly before you are asked to begin. Assure that you are on the correct satellite and have RX network lock. (the NOC may have you adjust TX Frequency and/or modem TX level prior to beginning cross-pol isolation). At the appointed time follow the steps below for the cross-pol isolation testing.

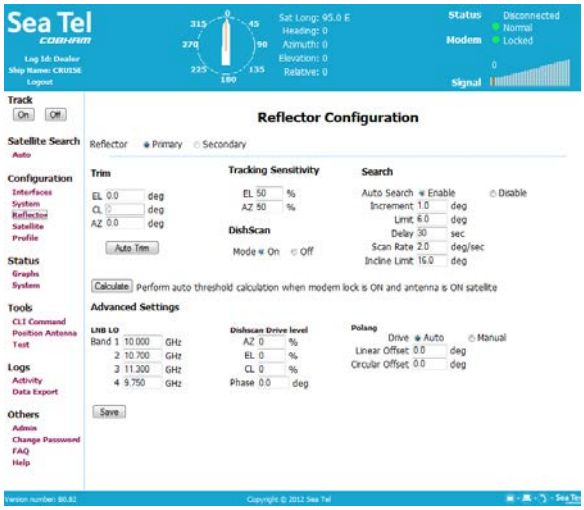
14.1. Optimizing Cross-Pol Isolation

1. Access the Tools - Position Antenna screen.

NOTE: You will use Skew to optimize polarization because it drives the feed immediately (Linear Offset is slower, longer term drive).

2. Record the value in the Skew field in the upper section of the screen. If this satellite has a known Skew, it will be entered in the satellite configuration displayed here. If this satellite is not skewed this field will be 0.0.
3. While talking to the technician at the NOC make adjustments to the Skew value to adjust polarity of the feed under his/her direction (minus values are accepted – type a minus sign before the number value). It is best to adjust in one degree increments to get close to best isolation and then half degree steps and then tenths as needed. Click "Submit" after each numeric change is typed in.
4. Record the DIFFERENCE in Skew value which was required to achieve optimum cross-pol isolation.
5. Set Skew back to the value recorded in step 2.



6. Access the Reflector Configuration screen. 7. Change the "Linear Offset" value by the amount of difference recorded in step 4. Examples: Skew was 0.0, you increased it to 2.5 to optimize TX polarization. You set Skew back to zero and go to the Reflector Configuration screen where you find Linear Offset to be 0.0, so you increase Linear Offset to 2.5 degrees and click **Save.** Skew was 3.0, you decrease it to 1.0 to optimize TX polarization. You set Skew back to 3.0 and go to the Reflector Configuration screen where you find Linear Offset to be 0.0, so you set Linear Offset to minus 2 (-2.0) degrees and click **Save**.	
8. Double check with the NOC to assure that cross-pol is still optimized. 9. Conduct any other testing as directed by the NOC (ie P1dB compression).	

15. Codan Mini-BUC Ethernet M&C Install & Operation

Below are general instructions only. Please refer to your Codan Manual for more detailed instructions, updated information and a complete list of commands.

15.1. Cable Installation

1. Connect one end of an Ethernet cable to the Ethernet connector on the CFE computer (or to a CFE router or CFE LAN Hub which the computer can access). 2. Connect the other end of the Ethernet cable to the Ethernet port on the rear panel of the MXP.	

15.2. Setting up the IP address and subnet mask in the computer.

The options that you see depend upon the version of Microsoft Windows® that you have installed (Windows® XP is described below). The steps to set the computers IP address may be different in your version of Windows®.

If you are using a network computer, consult your IT department/representative for proper IP address & subnet mask settings, of the computer, the MXP and the BUC, that will be compatible with your existing LAN.

To set up an IP address and subnet mask in a single, dedicated, Windows XP computer:

1. Click Start.
2. Select Settings—Control Panel—Network Connections:
3. Double-click on the network that you want to use from the list of available networks under **LAN** or **High-Speed Internet**.
4. In the Local Area Connection Status window, click on **Properties**.
5. Scroll through the listed components used by this connection, select **Internet Protocol** (TCP/IP), then click on **Properties**.
6. Select **Use the following IP address,** then enter an IP address that is within the same subnet (192.168.xxx) as the Mini-BUC. For example, to communicate with the default settings of the Mini-BUC, type 192.168.0.14

   CAUTION: Do not use the same IP address as the Mini-BUC (192.168.0.12) for the IP address of the computer. The last set of digits in the IP address must be different, for example, 192.168.0.13 and 192.168.0.14.
7. Enter an appropriate subnet mask. For example, type 255.255.255.0
8. Click on **OK** or **Close** in each window to save the settings and close each window.

15.3. Communicating with the Codan Mini-BUC using Codan GUI

1. Install the Codan GUI M&C Software program on the desired computer.
2. Open the Codan GUI M&C Software program.
3. Login using:
   Username: netuser
   Password: codan
4. Click Submit

5. Select the Auxiliary Settings Page
6. In the **Network Interface** section, set Mini-BUC IP address and Subnet Mask as is appropriate. Defaults are:
   Mini BUC Default IP Address: 192.168.0.12
   Subnet Mask: 255.255.255.0
7. View/Change other settings as needed.

8. Select BUC Status Page to view status.

9. Main Settings Page
10. View/change settings as needed.
11. To return to Codan default settings, click Default.

12. Select the Faults Page to view/clear fault(s).
13. Clear faults by clicking **Clear**.
14. Reboot the Mini-BUC by clicking **Reboot**.
15. Close the Codan GUI program when finished.

15.4. Issuing Set, Output and View Commands via Telnet

To start a Telnet session on the LAN interface:

1. From the **Start** menu, select **Run**.
2. Type **telnet <IP address of the Mini-BUC> 6000** in the Open field, then click on **OK**. For example, type **telnet 192.168.0.12 6000**
3. At the Login: prompt type **netuser codan,** then press **Enter**.
4. Type **hlp** then press **Enter,** or refer to the Codan Manual for a complete list of commands.

   A list of help categories is displayed. You can use these commands to drill down for further help for the **Set**, **Output** and **View** commands for the Mini-BUC. For example, type **hsc,** then press **Enter** to see the help for the **Set commands**.
5. If you want to exit the Telnet session, type **quit,** then press **Enter**.

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16. Stowing the Antenna

This antenna must be properly stowed if the ship will be underway while AC power to the Above Decks Equipment (ADE) is de-energized. Failure to do so may void your warranty.

	***CAUTION:*** *There are three stow restraints that* ***MUST*** *be installed on this antenna pedestal* ***if the ship will be underway while the Above Decks Equipment is de-energized****.*

It is strongly recommended that AC Power to the ADE and BDE be supplied from an adequately rated Un-interruptible Power Supply (UPS) to protect the antenna against short power outages while underway.

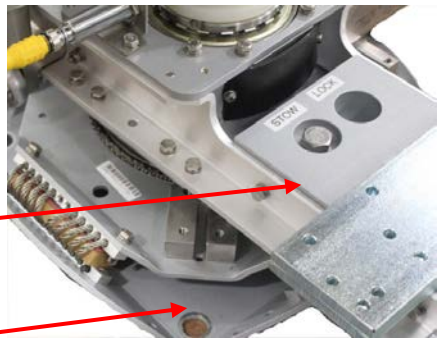
16.1. Installing the Stow Restraints

The order the restraints are installed is not critical.

16.1.1. Installing the AZ Shipping/Stow Restraint

1. The AZ shipping/stow restraint is formed by a pin bolt that is lowered into a channel in a stowage block on the upper plate of the pedestal (as shown).

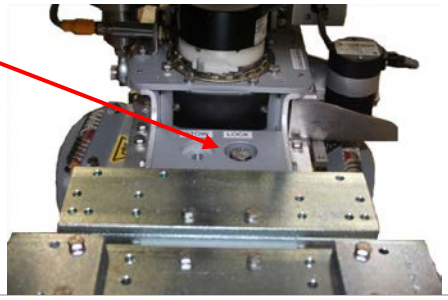
2. Remove the pin bolt from the "STOW" hole (this only stows the pin bolt, not the antenna).
3. Rotate the antenna to center the LOCK hole directly over the stow block channel.



Pin bolt (this is the UN-Stowed position of the antenna)

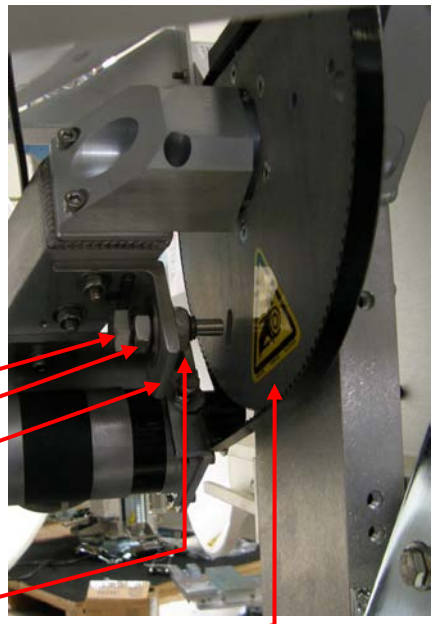
Stow Block Channel

4. To restrain azimuth rotation of the antenna, install the pin bolt in the "**Lock**" hole and assure that the pin drops into the channel in the stow block below.
5. Verify that the stow pin is engaged in the channel of the stow block and that the antenna does NOT rotate in azimuth.



16.1.2. Installing the EL Shipping/Stow Restraint

1. The EL shipping/stow restraint is formed by a stow pin-bolt mounted through a bracket and is engaged into a hole/slot in the elevation driven sprocket when the dish is at zenith (90 degrees elevation).
2. In the un-stowed position the hardware from left to right is the stow pin-bolt head, hex nut, washer, bracket, washer, hex nut. So the pin section of the stow pin-bolt is ***NOT*** inserted into the hole in the elevation driven sprocket.

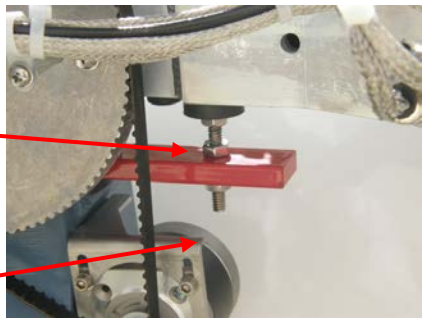


3. To restrain the elevation axis of the antenna, unthread the hex nut nearest the elevation driven sprocket. Using a ¾" open end wrench, remove the hex nut and washer from the stow pin-bolt.
4. Remove the stow pin-bolt from the bracket.

5. Remove the washer from the stow pin-bolt and unthread the hex nut from the bolt. 6. Put one of the washers onto the stow pin-bolt and insert it into the bracket toward the elevation driven sprocket. 7. Put the other washer, and then thread the two hex nuts onto the bolt.	
8. Tighten the hex nuts to prevent the hardware from loosening while in the stowed configuration. 9. Verify that the antenna does not rotate in elevation.	

16.1.3. Installing the CL Shipping/Stow Restraint

1. The CL shipping/stow restraint is formed by a red locking bar with adjustable bumpers at each end of the bar. This mechanism is placed under the cross-level beam to lock it in place (at level).	

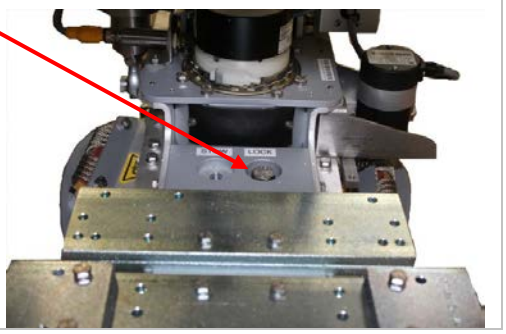
2. If not already removed, remove an adjustable bumper by removing the bottom nut from one end of the locking bar. 3. If not already loosened, loosen the top nut up toward the rubber bumper. 4. Insert vacant end of the locking bar through the opening under the cross-level beam. 5. Insert the adjustable bumper into the vacant hole on the end of the locking bar.	
6. To restrain the cross-level axis of the antenna use a 7/16" open end wrench to tighten the nut on the top side of the locking bar until the rubber bumper is forced up against the bottom of the cross-level beam. 7. Verify that the antenna does NOT rotate (tilt left & right from level). 8. Re-install and tighten the bottom nut on the underside of the locking bar.	

16.2. Removing the Shipping/Stow Restraints PRIOR to Power-Up

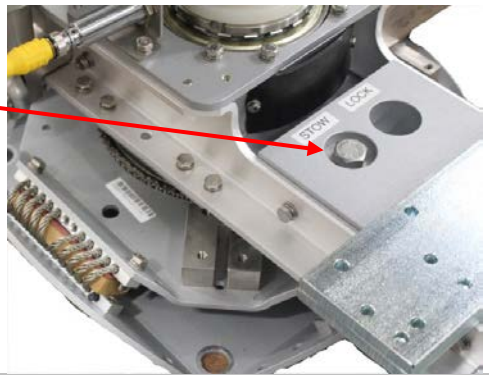
The order the restraints are removed is not critical.

	***CAUTION:*** *There are three shipping/stow restraints on this antenna pedestal that* ***MUST*** *be removed,* ***before energizing*** *the antenna, for normal operation.*

16.2.1. Removing the AZ Shipping/Stow Restraint

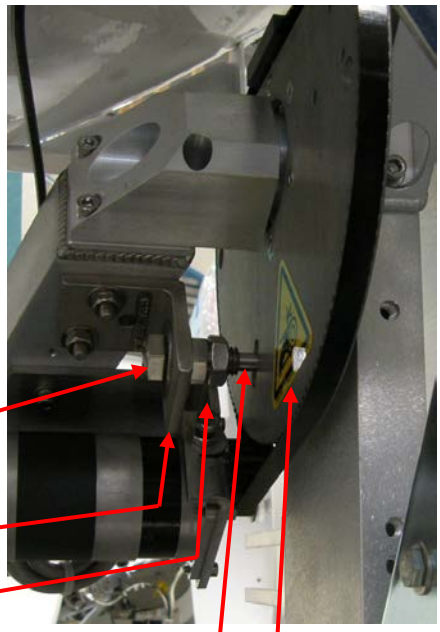
1. The AZ shipping/stow restraint is formed by a pin bolt that is lowered into a channel in a stowage block on the upper plate of the pedestal (as shown).	
2. To un-stow the antenna, remove the pin bolt from the LOCK position.	

3. Install the pin bolt into the STOW hole and tighten. This assures that it does not get lost and will be ready for re-use if the antenna needs to be stowed again at a later date.
4. Verify that the antenna is able to rotate freely in azimuth.



16.2.2. Removing the EL Shipping/Stow Restraint

1. The EL shipping/stow restraint is formed by a stow pin-bolt mounted through a bracket and is engaged into a hole/slot in the elevation driven sprocket when the dish is at zenith (90 degrees elevation).
2. In the stowed position, the hardware from left to right is stow pin-bolt head, washer, bracket, washer, hex nut, hex nut so that the pin section of the stow pin-bolt is inserted into the hole in the elevation driven sprocket.



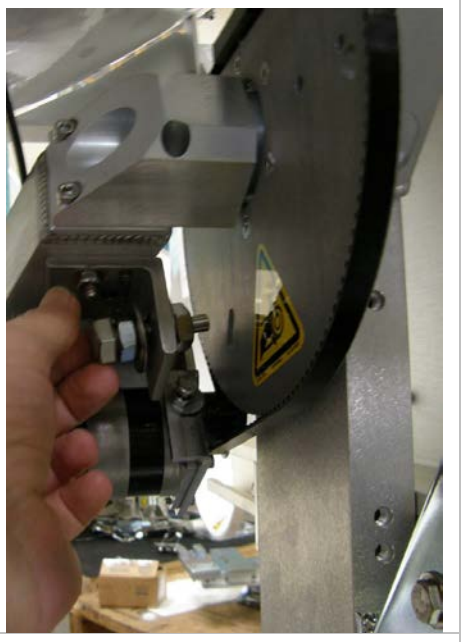
EL Stow Pin-Bolt head

Bracket

2 Hex Nuts

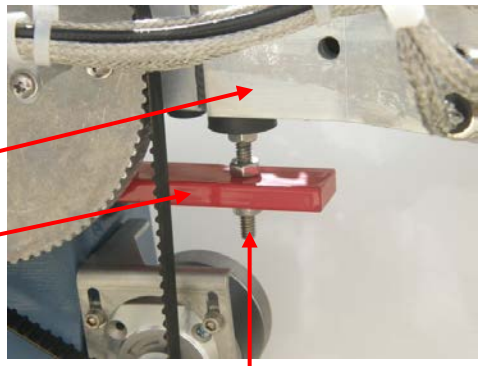
Pin inserted into Elevation Driven Sprocket

Elevation Driven Sprocket

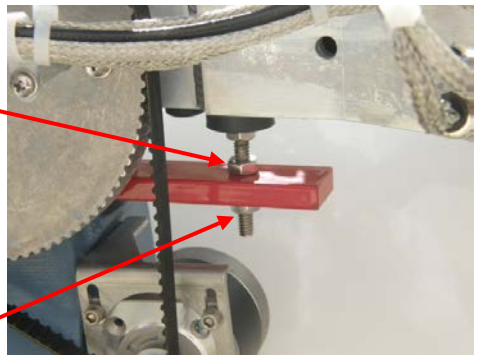
3. To un-restrain the elevation axis of the antenna, unthread the two hex nuts. Using a ¾" open end wrench, remove the hex nuts and washer from the stow pin-bolt. 4. Remove the stow pin-bolt from the bracket.	
5. Remove the washer from the stow pin-bolt and thread one of the two hex nuts onto the bolt and tighten. 6. Put one of the washers onto the stow pin-bolt and insert it into the bracket toward the elevation driven sprocket. 7. Put the other washer, and then the other hex nut onto the bolt.	
8. Tighten the hex nut to prevent the hardware from loosening while in the un-stowed configuration. 9. Verify that the antenna rotates freely through its full elevation range of motion.	

16.2.3. Removing the CL Shipping/Stow Restraint

1. The CL shipping/stow restraint is formed by a red locking bar with adjustable bumpers at each end of the bar. This mechanism is placed under the cross-level beam to lock it in place.



2. To un-restrain the cross-level axis of the antenna use a 7/16" open end wrench to loosen the nut on the top side of the locking bar (either end of the bar).



3. Remove the bottom nut off of that adjustable bumper.
4. Remove the adjustable bumper from the locking bar.
5. Extract the locking bar from the underside of the cross-level beam and retain these parts for later re-use if it becomes necessary to stow the antenna.
6. Verify that the antenna rotates (tilts left and right from level) freely through its full cross-level range of motion.

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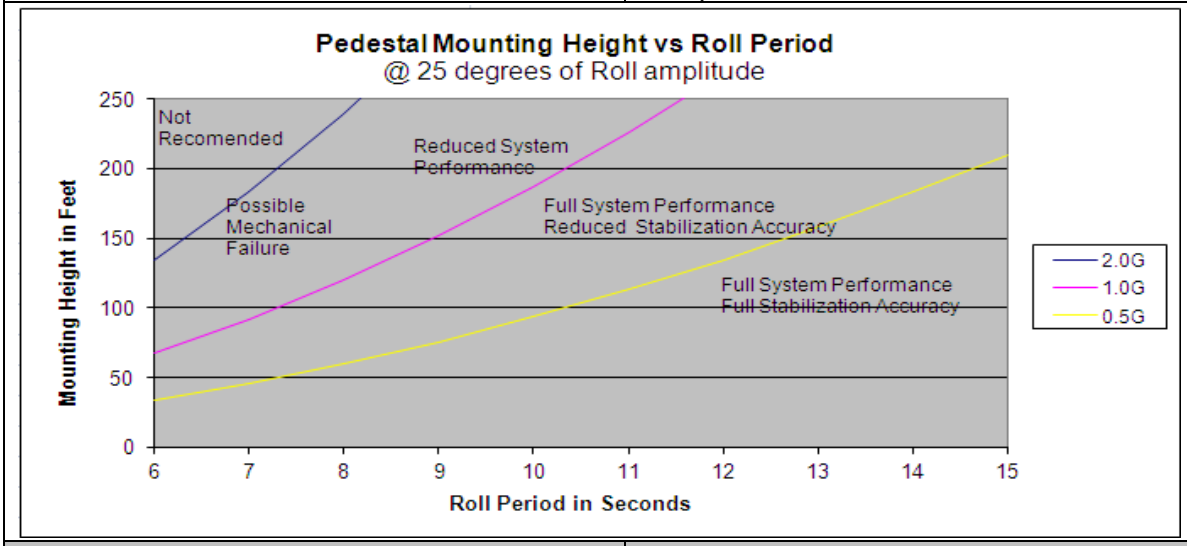
17. 6012-91 Ku-Band Technical Specifications

The specifications of your antenna system are below. For Naval Engineering level information on this subject, please refer to Antenna Installation Guideline – Site Arrangement, document number 130040_A available on the Sea Tel Dealer Support Site.

17.1. Above Decks Equipment

System Weight (ADE)	
Weight	182.8 kg / 403lbs
Stabilized Antenna Pedestal Assembly	
Type	Three-axis (Level, Cross Level and Azimuth)
Stabilization	Torque Mode Servo
Stability Accuracy	0.1° RMS, 0.2° peak in presence of specified ship motions (see below).
Azimuth Motor	Size 23 Brushless DC Servo W/Encoder
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 transducer	256 line optical encoder / home switch
Pedestal Range of Motion:	
Elevation Joint Angle	-15° to +115°
Cross Level (Inclined 30°)	+/- 35°
Azimuth	Unlimited
Elevation Pointing	10 to 90 degrees at 25 degrees roll
	5 to 95 degrees at 20 degrees roll
	0 to 100 degrees at 15 degrees roll
Relative Azimuth Pointing	Unlimited
Maximum Ship Motions	
Roll	+/-25° at 8-12 sec periods
Pitch	+/-15° at 6-12 sec periods
Yaw	+/-8 degrees at 15-20 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
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	
Type	Spun Aluminum
Diameter	1.47 m / 58"
TX Gain	45.1 dBi @ 14.25 GHz
RX Gain	44 dBi @ 12.50 GHz
G/T (30° elevation, clear sky)	21.9 dB/k (In Radome, typical)
FCC Input Power Spectral Density Limitation	-14.0 dBW / 4 KHz
Minimum EIRP (TVRO)	NA
KU-band Feed	
Type	Center Focus Cassegrain feed with TX reject filter and Cross-Pol OMT
Port to Port Isolation (XPol)	> 120 dB
Port to Port Isolation (CoPol)	> 90 dB
Cross Pol Isolation	> 35 dB typical (30dB within 1dB contour)
Polarization	Linear w/motorized skew adjustment
Polarization Control	24 volt DC motor with pot feedback
Polarization Range of Motion	270 degrees
Receive Frequency Range	10.70 - 12.75 GHz
Transmit Frequency Range	13.75 - 14.50 GHz
Co-Pol Diplexer	
Type:	DPX75K-002
Common Port (to feed)	WR-75 Flange, 10.70-14.5 GHz
Transmit Output (from SSPB)	WR-75 Flange, 13.75-14.5 GHz
Receive Output (to Co-Pol LNB)	WR-75 Flange, 10.70-12.75 GHz
Co-Pol LNB	Refer to LNB spec

SMW Quad LNB	
Band 1	
Voltage Required	13VDC
Input RF Frequency	10.95-11.70 GHz
Local Oscillator Frequency	10.00 GHz
Output IF Frequency	950 to 1700 MHz
Band 2	
Voltage Required	13VDC + 22 KHz Tone
Input RF Frequency	11.70-12.25 GHz
Local Oscillator Frequency	10.75 GHz
Output IF Frequency	950 to 1500 MHz
Band 3	
Voltage Required	18 VDC
Input RF Frequency	12.25-12.75 GHz
Local Oscillator Frequency	11.30 GHz
Output IF Frequency	950 to 1450MHz
Band 4	
Voltage Required	18VDC + 22 KHz Tone
Input RF Frequency	10.70-11.70 GHz
Local Oscillator Frequency	9.75 GHz
Output IF Frequency	950 to 1950 MHz
KU-band TX Radio Package	
SSPB	Codan 8 or 16 Watt Mini 4908-W/E-DC/EX-CE-NI (Ethernet M&C)
Output Flange	WR-75
Input Connector	Type N
RF Input Frequency Range	950 to 1700 MHz
RF Output Frequency Range	13.75-14.5 GHz
RF Output VSWR	1.5:1 max
RF Pout@ 1 dB GCP	39.0 dBm (8 Watt BUC)
Reference Frequency Level	-10 to +5 dBm
Reference Frequency	10 MHz ext
M&C Options	Ethernet, RS-232
Step attenuator	1db Increments
Alarms	Lock, Over Temp, Temperature
Power Supply (ADE / PCU / ICU)	
A/C Input Voltage	85-264 VAC, 47-63Hz, single phase
Voltage	48VDC [24 VDC, 150W (QTY 2)]
Wattage	300W (total)
Current Capacity	13.0A (total)
Power Supply (BUC)	
A/C Input Voltage	85-264 VAC, 47-63Hz, single phase
Voltage	48VDC
Wattage	300W
Current Capacity	7.0A

GPS (On Board)	
Waterproof	IPX7
Operating Temperature	-30°C to +60°C
Storage Temperature	-40°C to +60°C
Altitude	-304m to 18,000m`
Vibration	IEC 68-2-64
Shock	50G Peak, 11ms
Connector	RJ11
Input Voltage	
Min	4.75VDC
Typ	5.0VDC
Max	5.25VDC
NMEA output messages	GGA, GLL
Refresh Rate	1s
Integrated Control Unit (ICU)	
Connectors	
J1	SMA (F) - RXIF Input from LNB 1 (Cross-Pol)
J2	SMA (F) - RXIF Input from LNB 2 (Co-Pol)
J3	SMA (F) - RXIF Output To Rotary Joint
J4 B/A	Ethernet - RJ45 Serial M&C - A=Radio M&C, B=Pass through
J5	Mini USB Antenna M&C
J6	DE-9 (F) - Serial Console - Antenna Serial M&C
J7	DE-9 (F) - Serial Radio M&C
J8	RJ-11 (F) - GPS Antenna Input
J9	DE-15 (F) - Motor Control to MDE
J10	DE-25 (F) - Feed Harness Connection
J14	DE-9 (F) - Serial Pass through M&C
J16	F (F) - TXIF Output to BUC
J19	M16 (F) - Power Supply DC Voltage Output to BUC
J20	Modular AC Power Input Receptacle
Status LEDs	Diagnostic Status of the EoC
	Diagnostic Status of the ICU
AC Input Power	85-264 VAC, 47-63Hz, single phase, 2A-1A
Coax Switch	
LNB-A (J1)	SMA (F)
LNB-B (J2)	SMA (F)
Rotary Joint (J3)	SMA (F)
Controls	Configurable from GUI
Integrated SCPC Receiver	
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)	150 KHz

Interfaces	
Modem/MXP M&C Interface	OpenAMIP & Legacy
Network Interface	4-port managed fast Ethernet switch
User Interface	Web Browser/Console Port
Motor Driver Enclosure	
Connectors	
Drive	DA-15P
Home	DE-9S
Az	DA-15S
EL	DA-15S
CL	DA-15S
Status LEDs	
CL Drive	Yes
EL Drive	Yes
Az Drive	Yes
MDE Status	Yes
ADE-BDE Interface Connections	
Dual Channel Rotary Joint	SMA (F) x 2
Power Requirements	
ADE	85-264 VAC, 47-63Hz, single phase, 450 Watts MAX (brake release, pedestal drive and BUC drive)
Radome Assembly (76 Inch)	
Type	Frequency Tuned
Material	A sandwich
Size	
Diameter	1.93 m / 76" (2.01m max flange diameter)
Height	1.61 m / 63.44"
Hatch Size	X.XXm x X.XXm / XX" x XX" (min)
Weight	90.7 kg / 200 lbs
RF attenuation	Less than 0.2 dB @ 10.75-14.5 GHz dry
Wind:	Withstand relative average winds up to 56m/sec (125 MPH) from any direction.
Ingress Protection Rating	IP 56

Radome Assembly (81 Inch) w/ base frame	
Type	Standard
Material	DIVINYCELL H100
Size	
Diameter	2.05m / 80.8"
Height	1.9m / 75" W/O base frame
Base Frame Height	0.55m / 21.75 in
Overall Height	2.46m (96.9")
Hatch Size	
Radome Weight	158.76 Kgs / 350 lbs
Base Frame weight	140.16 Kgs / 309 Lbs
RF attenuation	Typical 0.5 dB
Wind:	Withstand relative average winds up to 56m/sec (125 MPH) from any direction.
Ingress Protection Rating	IP 56
ADE Environmental Conditions	
Temperature Range (Operating)	-25º to +55º Celsius (-13º to +131º F)
Humidity	100% Condensing
Wind Speed	56 m/sec (125 mph)
Solar Radiation	1,120 Watts per square meter, 25º Celsius
Spray	Resistant to water penetration sprayed from any direction.
Icing	Survive ice loads of 4.5 pounds per square foot. Degraded RF performance will occur under icing conditions.
Rain	Up to 101.6mm (4 inches) per hour. Degraded RF performance may occur when the radome surface is wet.
Corrosion	Parts are corrosion resistant or are treated to endure effects of salt air and salt spray. The equipment is specifically designed and manufactured for marine use.
Mechanical Conditions	
Systematic Vibration	
Amplitude (single peak)	5.0 millimeters
Acceleration	2.0 G (20m/s2)
Frequency Range	1Hz - 150Hz
Shock (Transient Vibration)	
Response Spectrum	I - II - III
Peak Accel., m/s2	100 - 300 - 500
Duration, ms	11 - 6 - 3
Number of Cycles	3 each direction
Directional Changes	6
Shock (Bump)	
Peak Accel., m/s2	250
Duration, ms	6
Number of Cycles	100 ea. direction
Directional Changes	6
Transit Conditions	
Drop (Transit Shock)	Complies with ISTA Standard

Chemically Active Substances	
Environmental Condition	Test Level
Sea Salt	5 percent solution

17.2. Below Decks Equipment

Media Xchange Point (MXP)	
Standard 19 Inch Rack mount	One Unit High
Physical Dimensions	17 X 17 X 1.75 (Inches)/ 43.18 x 43.18 x 4.45 (cm)
Input Voltage	85-264 VAC, 47-63Hz, single phase, 110 Watts
Weight	6.6lbs/ 3.0 kgs
Front Panel	
	4 Modem LEDs (On the MXP Board)
	2 MXP status LEDs
Rear Panel Connections	
AC Input	Modular AC Power Input Receptacle
J1	SMA (F) - RXIF Output to Satellite Modem
J2	SMA (F) - RXIF Input from ADE
J3 B/A	Ethernet - 2 ports of the 4 Port 10/100 Ethernet Switch 10.1.1.100
J4 B/A	Ethernet - 2 ports of the 4 Port 10/100 Ethernet Switch 10.1.1.100
J5	SFP Gigabit Ethernet
J6	Mini USB Antenna M&C
J7	USB Host (Type A) - **N/C - Future Development**
J8	DE9 (F) - Serial Console - Antenna Serial M&C
J9 A/B	RJ45 Serial M&C - A=Radio M&C, B=Pass through
J10 C/D	RJ45 Serial M&C - C=Modem, D=OBM
J11	Terminal Strip - Gyro Compass (SBS-Synchro) Interface Terminals
J12	Terminal Strip - Auxiliary Interface Terminals
J13	DE-9 (M) - NMEA 0183 Interface Port
J14	DE-9 (M) - AUX (RS-232) Interface Port
J15	NMEA 2000 Interface Port - **Future Development**
Gyro Compass Interface	
Connections	**Plug-in Terminal Strip**
Pin 1	Synchro R1
Pin 2	Synchro R2
Pin 3	Synchro S1 / SBS A
Pin 4	Synchro S2 / SBS B
Pin 5	Synchro S3 / SBS C

Pin 6	SBS COM
Synchro Interface	
Connectors	5 screw terminal connections (Plug-In)
Input Voltage Level	36-110 VDC, 400 or 60 Hz
Synchro Ratios	1:1, 36:1, 90 or 180:1 and 360:1
Impedance	1M ohm
SBS Interface	
Connectors	4 screw terminal connections (Plug-In)
Input Voltage Level	20-90 VDC
Interface	Opto-isolated
Polarity	Auto switching
Ratio	6 steps per degree
Impedance	10K Ohm
Auxiliary Interface	
Connections	**Plug-in Terminal Strip**
Pin 1 - GND	Ground
Pin 2 - Aux IN1	Modem Lock Input 1
Pin 3 - Aux IN2	Modem Lock Input 2
Pin 4 - GND	Ground
Pin 5 - SW1	Modem Mute Output 1
Pin 6 - SW2	Modem Mute Output 2
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
External AGC (AUX Inputs)	
Connectors	2 screw terminal connections
Input Voltage Level	0-5 VDC
Impedance	30K Ohm
Control (Logic Sense can be reversed)	Low Level (<1.25VDC) = Modem Lock :: High Level (>1.25 VDC) = Modem Unlock
SW1 Blockage / TX Mute Output	
Connections	1 screw terminal connection (SW1)
Connections	1 screw terminal connection (SW2)
Control Level	Not Blocked or Not mispointed=OPEN circuit
	Blocked or mispointed=SHORT to ground
SW2 Blockage / TX Mute Output	
Connections	1 screw terminal connection (SW2)
Control Level	Not Blocked or Not mispointed=OPEN circuit
	Blocked or mispointed=SHORT to ground
Dry Contact Output Sets (SW3 A-B & SW4 A-B)	
Switched outputs	4.7K pull up or Pull Down
Current handling	Current sink of 0.5 amps max.
No Alarm State	Normally Open

Alarm State	Contact closure
NMEA 0183 Interface	
Connections	5 screw terminal connections (RXA+ /RXA- input, RXB+/ RXB- input, and TXA+ output)
Rx Sentence Format (GPS)	$xxGLL,DDmm,mmmm,N,DDDmm.mmmm,W (UTC optional) (*CS optional)
Rx Sentence Format (Gyro)	Heading $xxHDT,xxx.x
Tx Sentence Format (GPS)	$GPGGA,0,DDmm,N,DDDmm,W (configurable)
NMEA string examples:	
RX:	
$GPGLL,3800.4300,N,12202.6407,W,231110,A*32	
$GPGGA,231110,3800.4300,N,12202.6407,W,2,08,1.2,40.0,M,-31.3,M,,*4A	
TX:	
$GPRMC,231325,A,3800.4300,N,12202.6405,W,000.0,184.9,190412,014.1,E*67	
$GPVTG,184.9,T,170.8,M,000.0,N,0000.0,K*74	
BDE Environmental Conditions	
Temperature	0 to 40 degrees C
Humidity	Up to 100% @ 40 degrees C, Non-Condensing

17.3. Regulatory Compliance

Regulatory Compliance	
Survival Shock and Vibration	IEC-60721, MIL-STD-901D
Operational Shock and Vibration	Operational: IEC-60945, Survival: IEC-60721 and MIL-STD 901D
	MIL-STD-167-1
EMI/EMC Compliance Ku-Band	ETSI EN 301 843-1 V1.4.1 (2004-06)
	ETSI EN 301 489-1 V1.4.1 (2002-08)
	ETSI EN 300 339 (1998-03)
	IEC EN 60945:1997
Satellite Earth Stations and System (SES)	ETSI EN 301 428-1 V1.3.1 (2006-02)
	ETSI EN 302 340 V1.1.1 (2006-04)
Safety Compliance	IEC EN 60950-1:2001 (1st Edition)
Environmental Compliance	RoHS
	Green Passport
FCC ESV Compliance C-Band	NA
FCC ESV Compliance Ku-Band	47 C.F.R. § 25.222
FCC ESV Compliance Ka-Band	NA
Options	Bluetooth

17.4. Cables

17.4.1. Antenna L-Band IF Coax Cables (Customer Furnished)

Due to the loss across the length of the RF coaxes at L-Band, Sea Tel recommends the following 50 ohm coax cable types (and their equivalent conductor size) for our standard pedestal installations. Type N male connectors installed on the cables MUST be 50 Ohm connectors for the center pin to properly mate with the female adapters we provide on the Base multiplexer panel and on the adapter bracket mounted inside the radome next to the breaker box.:

Run Length	Coax Type	Typical. Loss @ 1750Mhz	Shield isolation	Center Conductor Size	Installed Bend Radius	Tensile Strength
<100 ft	LMR-240	10.704 db per 100 ft(30.48 m)	>90db	0.056 In. (1.42 mm)	2.5 In. (63.5 mm)	80lb (36.3 kg)
up to 150 ft	LMR-400	5.571 db per 100 ft(30.48 m)	>90db	0.108 In. (2.74 mm)	4.0 in. (101.6 mm)	160lb (72.6 kg)
up to 200 ft	LMR-500	4.496 db per 100 ft(30.48 m)	>90db	0.142 In. (3.61 mm)	5.0 In. (127 mm)	260lb (118 kg)
Up to 300 ft	LMR-600	3.615 db per 100 ft(30.48 m)	>90db	0.176 In. (4.47 mm)	6.0 In. (152.4 mm)	350lb (158.9 kg)

18. DRAWINGS

18.1. Model Specific Drawings

Drawing	Title	
40-300123	System, 6012-91 in 76" Radome	18-3
DL-150520-A	System Block Diagram, xx12-91, Ku-Band	18-5
138360-A3	Antenna Schematic, xx12-91	18-10
137389_A2	Pedestal Schematic, xx12	18-11
62-153393	General Assembly 6012-33	18-12
138658-1_A	Mounting Assembly, ICU	18-16
62-153395	Mounting Assembly, Codan MiniBuc	18-18
62-146669	6012 Antenna Assembly	18-21
69-143638	Ku-Net Feed Assy	18-23
62-153720	Balance Weight Kit EL/CL	18-28
130028-1_E	76" Radome Assembly, Tuned	18-30
125749_D	Installation Arrangement, 76" Radomes	18-33
131226_A	Procedure, Radome Strain Relief Installation	18-34
134563-1_D	Below Decks Kit, MXP	18-40

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BOM Explosion Report

Item Number: 40-300123

Description: SEA TEL 6012-91, LN, 16W, ETH, QUAD, 76 IN

Item Revision: A ECO-00019281

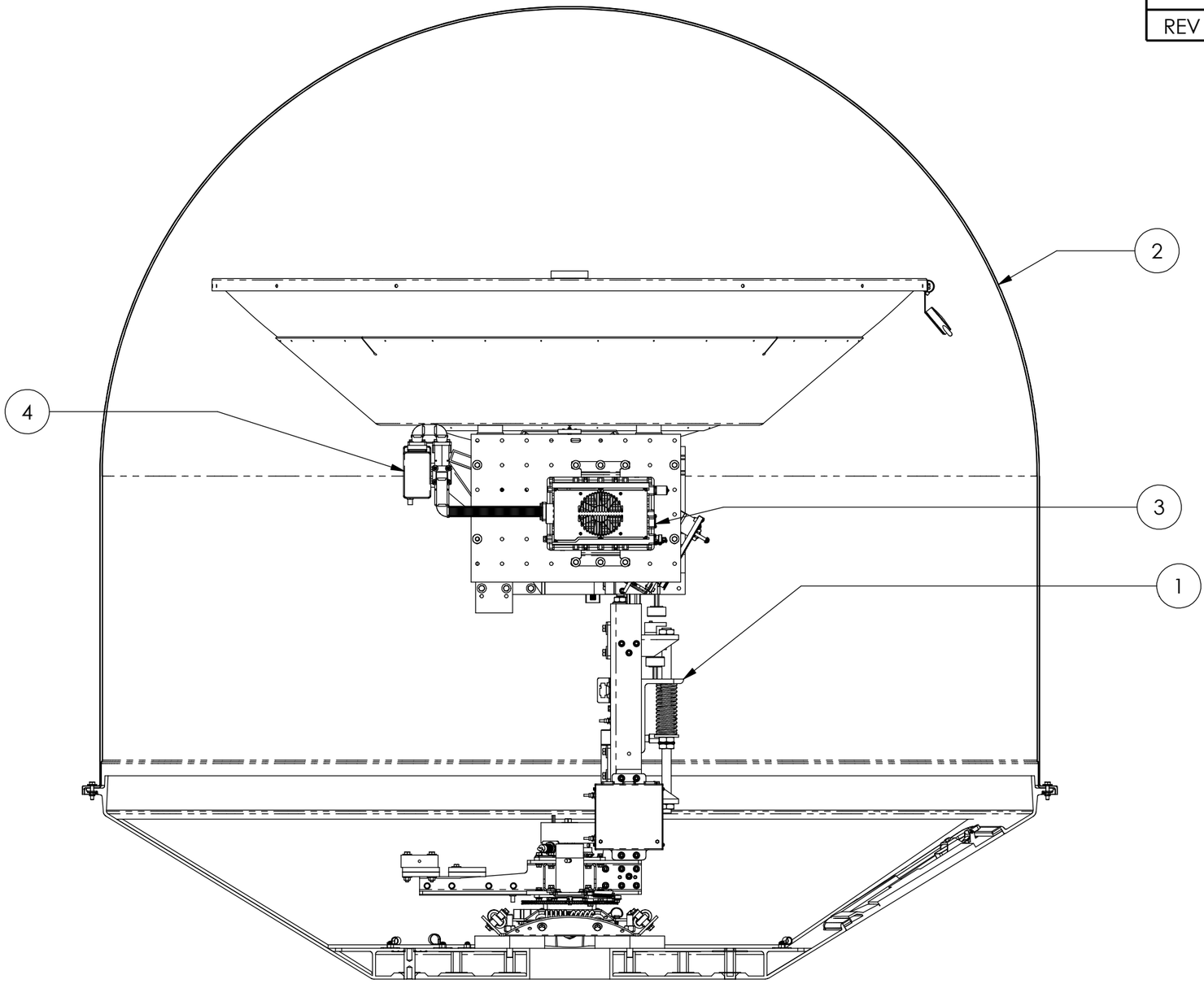
Date as of: 09/09/2016 08:11:45 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	REF	pcs	97-300123	A ECO-00019264	ASSY DOCUMENT, SEA TEL, 6012-91	
1	1	pcs	62-153393	A ECO-00019280	GENERAL ASSY, 6012-91	
2	1	ea	133659-1	D.03 ECO-00014527	RADOME ASSY, GA INSTALL, 76 IN, WHITE	
3	1	pcs	132345-4	A.02 MCO-00020128	SSPB, KU, 16W, CODAN MINI, 4916(L)-W/E-DC/EX-CE-NI	
4	2	pcs	136128-2	B MCO-00020128	LNB, SMW, QUAD LO, KU BAND, TYPE N	
5	1	pcs	62-146414	B.07 ECO-00018243	ENCLOSURE ASS'Y, MXP W/ USER INTERFACE	(NOT SHOWN)
6	1	ea	134563-1	D ECO-00008546	BELOW DECK KIT, MXP	(NOT SHOWN)
7	1	ea	130929-1	B.01 ECO-00008545	BALANCE WEIGHT KIT, FEED	(NOT SHOWN)
8	1	ea	137387-1	A ECO-00008546	CUSTOMER DOC PACKET, SERIES 12 KU-BAND	(NOT SHOWN)
9	1	ea	124766-1	B ECO-00008543	DECAL KIT, 66-81 IN RADOME, SEA TEL	(NOT SHOWN)
10	1	ea	121711	B.01 ECO-00009762	BALANCE WEIGHT KIT, BASIC, MEDIUM SYSTEMS	(NOT SHOWN)
		pcs	40-300123	A ECO-00019281	SEA TEL 6012-91, LN, 16W, ETH, QUAD, 76 IN	

Created By: Mike Needham

Create Time: 09/14/2016 08:34:43 AM PDT

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY



THIS DRAWING GOVERNS THE ASSEMBLY OF THE
PART NUMBERS LISTED, REGARDLESS OF REVISION;

40-300123 SEA TEL 6012-91, LN, 16W, ETH, QUAD, 76 IN

SYSTEM WEIGHTS △2					
SYSTEM P/N	GA	RADOME	BASE FRAME	AC KIT	SYSTEM TOTAL
40-300123					

REFERENCE DRAWINGS:

XXXXX	ANTENNA SYSTEM SCHEMATIC
XXXXXX	SYSTEM BLOCK DIAGRAM
137389	PEDESTAL SCHEMATIC

NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. △2 RECORDED WEIGHTS ARE THE ACTUAL MEASURED WEIGHTS OF SYSTEM AS ORDERED. FOR SYSTEM LIFTING AND MOUNTING CUSTOMER SHALL FOLLOW LOCAL SAFETY CODES

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 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

DESIGNER/ENGINEER: K.D.H.	DRAWN BY: K.D.H.	Sea Tel COBHAM	
WEIGHT:	DRAWN DATE: 9-9-16	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: N/A	APPROVED BY:	TITLE: ASSY DWG, SEA TEL, 6012-91	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:10	DRAWING NUMBER: 97-300123	REV: A
3rd ANGLE PROJECTION	FIRST USED: 6012-91	SHEET NUMBER: 1 OF 1	

BOM Explosion Report

Item Number: DL-150520-A

Description: SYSTEM BLOCK LIST, 6012-36

Item Revision: DRAFTA DCO-00015841

Date as of: 04/01/2016 11:15:04 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1		92-150520-A	Introductory	SYSTEM BLOCK DIAGRAM, 6012-36	
1	1	pcs	62-150515	A.01 ECO-00016289	GENERAL ASSEMBLY, 6012-36	
2	1	pcs	62-146667	A.02 ECO-00015403	ANTENNA INSTALL ASSY, 6012 KU-NET TX/RX CO/X-POL	
3	1	ea	69-143638	A.03 ECO-00015403	FEED ASSY, KU-NET, MEDIUM TX/RX CO/X-POL	
4	1	ea	122188-1	A.04 MCO-00020128	LNB, 11.70 TO 12.20 GHz, PLL, +/- 3 ppm, TYPE F	
5	1	pcs	134442-4	A MCO-00020128	SSPB,KU,CODAN LBUC,8W NI,48VDC, 6908W/E-48/EX-CE-NI	
21	1	ea	134735-1	G.03 ECO-00009135	ENCLOSURE ASSY, ICU, CABLE RETAINER	
22	1	ea	131227-1	H.02 ECO-00008545	ENCLOSURE ASSY, MOTOR DRIVER, 09G2	
23	1	ea	121951-3	G ECO-00008543	MOTOR,SZ 23,BLDC,2 STK W/ ENCODER,20 IN, 4.9MM MTG	
24	2	ea	125644-1	J.02 ECO-00008543	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PIN	
26	1	ea	131381-1	H ECO-00008545	GARMIN GPS MODULE, SERIAL, 118 INCH TERMINATED	
27	1	ea	129543-24	C ECO-00008544	KIT, CABLE ASSY AND PROXIMITY SENSOR, 24 IN	
28	1	ea	131355-3	C.05 ECO-00008545	POWER SUPPLY ASSY, 300W / 48V, CABLE RETAINER	
31	1	ea	129526-84	D ECO-00008544	HARNESS ASSY, PCU TO MOTOR DRIVER, XX09	
32	1	ea	129527-36	B ECO-00008544	HARNESS ASSY, MOTOR TO ELEVATION, 36 IN, XX09	

Created By: Mike Needham

Create Time: 08/11/2016 08:24:43 AM PDT

BOM Explosion Report

Item Number: DL-150520-A

Description: SYSTEM BLOCK LIST, 6012-36

Item Revision: DRAFTA DCO-00015841

Date as of: 04/01/2016 11:15:04 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
33	1	ea	137914-72	B ECO-00008546	HARNESS ASSY,REFLECTOR W/ENCODER,72 IN, 4012GX MK3	
34	1	ea	129741-84	D.01 ECO-00008544	HARNESS ASSY, 400MHZ MODEM TO CPI SSPB, 84 IN	
35	1	ea	128536-84	B ECO-00008544	CABLE ASSY, 48VDC TO CODAN SSPB, 84 IN	
40	1	ea	135696-1	C.03 MCO-00013952	CIRCUIT BREAKER BOX, KIT, 6A	
41	1	ea	129254-2	MCO-00012115	POWER RING, 20A, 3 CIRCUITS, XX09	
42	1	ea	135832-84C	B ECO-00008546	CABLE ASSY,AC POWER,SHIELDED,IEC C13 TO PIN TERM	
43	1	ea	138428-36	A MCO-00012115	POWER CORD,IEC-60320-C14 -DUAL IEC-60320-C13,36IN	
50	1	ea	117164-60ORG	B ECO-00008542	CABLE ASSY, RG-179, F TO F, 60 IN, ORG	
51	1	ea	117164-60YEL	B ECO-00008542	CABLE ASSY, RG-179, F TO F, 60 IN, YEL	
52	1	ea	128001-24BLU	A.02 ECO-00008544	CABLE ASSY, RG-179, F(M) TO SMA(M)(RA), 24 IN, BLU	
53	1	ea	114972-2	N.01 ECO-00008542	CABLE ASSY, SMA(M) - SMA(M), 72 IN	
54	2	ea	114972-4	N.01 ECO-00008542	CABLE ASSY, SMA(M) - SMA(M), 30 IN	
55	1	ea	123758-7	B.02 ECO-00008543	CABLE ASSY, SMA(M)-N(M) 90 DEG, 7 FT	
60	1	ea	129826-1	B ECO-00008544	CONNECTOR BRACKET ASSY	
61	1	ea	116466	H MCO-00014264	ROTARY JOINT, 4.5 GHz, DUAL COAX.	

Created By: Mike Needham

Create Time: 08/11/2016 08:24:43 AM PDT

BOM Explosion Report

Item Number: DL-150520-A

Description: SYSTEM BLOCK LIST, 6012-36

Item Revision: DRAFTA DCO-00015841

Date as of: 04/01/2016 11:15:04 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
62	1	ea	125171-1	A.01 ECO-00008543	RF STACKER, L-BAND, 500 MHZ	
70	1	ea	128059	MCO-00012114	FILTER, TX REJECT, WR-75, 13.75-14.5 GHZ	
71	1	ea	126144-1	D.01 ECO-00008544	WAVEGUIDE, WR-75, 180 DEG E-BEND	
72	1	ea	140078-1	MCO-00012114	FILTER, REJECT, METRIC, KU-BAND TRANSMIT	
73	1	ea	128290-1	A.01 ECO-00008544	WAVEGUIDE, WR-75, 180 DEG H-BEND W/BRACE, 2.00L	
80	1	ea	41-150584-A	01 ECO-00016269	WAVEGUIDE, WR-75, 6012-36	
81	1	pcs	41-148743-A	04 ECO-00015403	WAVEGUIDE, WR-75, 6012-XX KU-NET	
82	1	ea	139034-1	A.01 ECO-00008547	ROTARY JOINT, WR-75, KU-NET	
83	1	ea	125157-1	B ECO-00008543	DIPLEXER, DPX75K-C02-A, WR-75	
84	1	pcs	41-143685-A	02 ECO-00015403	SPACER, WG, WR-75, .130 LONG, 2 GROOVES	
100	1	ea	134563-1	D ECO-00008546	BELOW DECK KIT, MXP	
101	1	pcs	134725-1	K.02 ECO-00014181	ENCLOSURE ASSY, MXP	
103	1	ea	111115-6	C ECO-00008542	CABLE ASSY, F(M)-F(M), 6 FT.	NOT SHOWN
104	1	ea	111079-6	H ECO-00008542	CABLE ASSY, SMA(M)-N(M), 6 FT.	
105	2	ea	119479-10	C ECO-00008542	CABLE ASSY, CAT5 JUMPER, 10 FT.	

Created By: Mike Needham

Create Time: 08/11/2016 08:24:43 AM PDT

BOM Explosion Report

Item Number: DL-150520-A

Description: SYSTEM BLOCK LIST, 6012-36

Item Revision: DRAFTA DCO-00015841

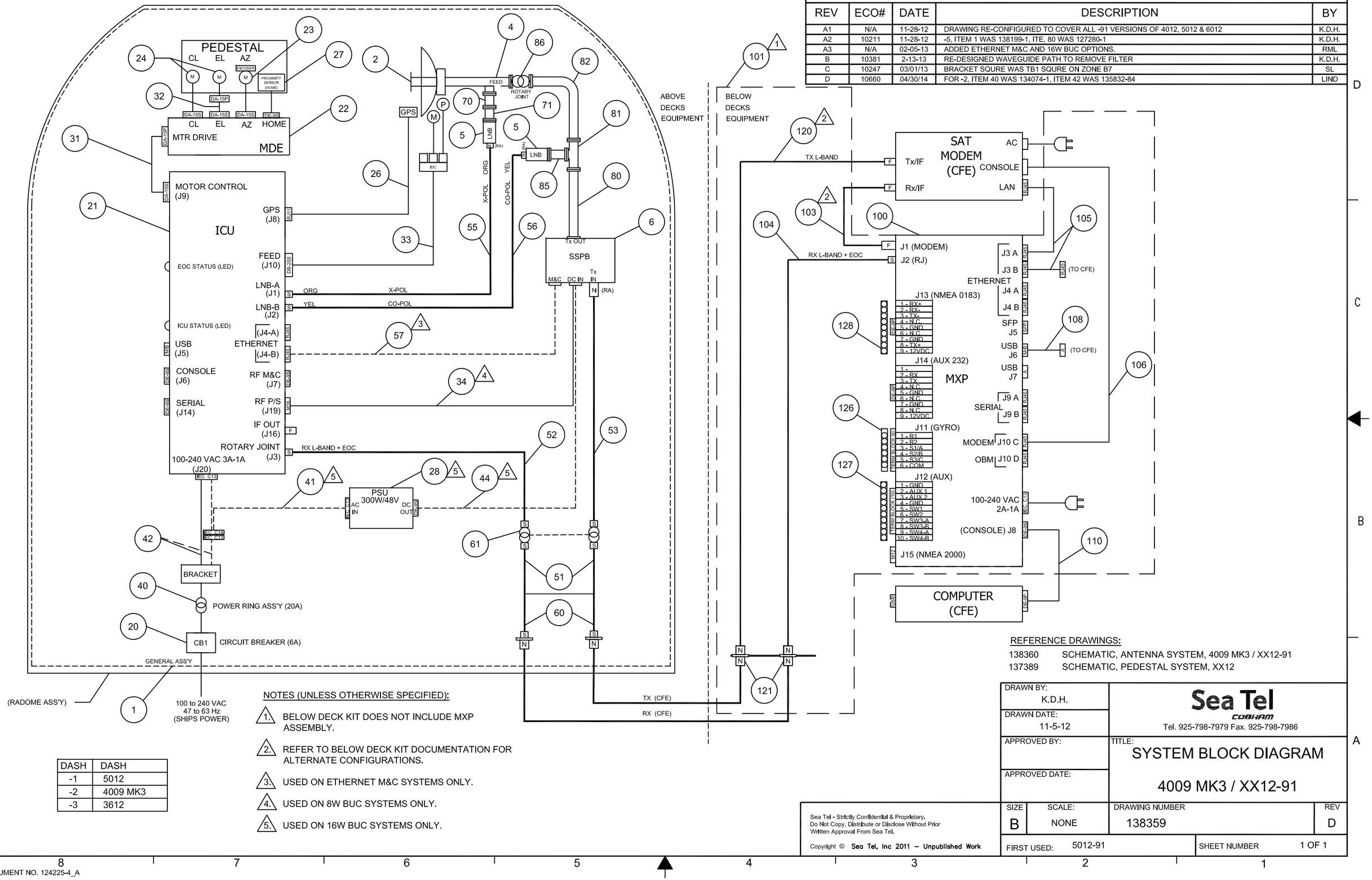
Date as of: 04/01/2016 11:15:04 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
106	1	ea	119478-5	E ECO-00008542	CABLE ASSY, RJ-45 SERIAL, 60 IN.	
108	1	ea	133287-2	B MCO-00012115	CABLE ASSY, USB 2.0, 6FT, A/M TO MINI B/M (5PIN)	
110	1	ea	120643-25	C ECO-00008543	CABLE ASSY, RS232, 9-WIRE, STRAIGHT, 25 FT.	
120	1	ea	116700-6	G ECO-00008542	CABLE ASSY, RG223, N(M)-F(M), 6 FT.	
121	2	ea	110567-19	MCO-00012115	ADAPTER, N(F)-N(F), STRAIGHT, FLANGE MNT.	
126	1	ea	135689-6	MCO-00012114	CONN,PHOENIX,PLUGGABLE,TERM BLOCK, 5.08MM P,6 POS	
127	1	ea	135689-10	MCO-00015608	CONN,PHOENIX,PLUGBLE,TERM BLCK,5.08MM PITCH,10 POS	
128	1	ea	136897	C MCO-00012115	CONNECTOR, DE9 (F) - TERM. BLOCK	
			DL-150520-A	DRAFTA DCO-00015841	SYSTEM BLOCK LIST, 6012-36	

Created By: Mike Needham

Create Time: 08/11/2016 08:24:43 AM PDT

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A1	N/A	11-28-12	DRAWING RE-CONFIGURED TO COVER ALL -91 VERSIONS OF 4012, 5012 & 6012	K.D.H.
A2	10211	11-28-12	-5, ITEM 1 WAS 138199-1, ITE, 80 WAS 127280-1	K.D.H.
A3	N/A	02-05-13	ADDED ETHERNET M&C AND 16W BUC OPTIONS.	RML
B	10381	2-13-13	RE-DESIGNED WAVEGUIDE PATH TO REMOVE FILTER	K.D.H.
C	10247	03/01/13	BRACKET SQURE WAS TB1 SQURE ON ZONE B7	SL
D	10660	04/30/14	FOR -2, ITEM 40 WAS 134074-1, ITEM 42 WAS 135832-84	LIND



DASH	DASH
-1	5012
-2	4009 MK3
-3	3612

NOTES (UNLESS OTHERWISE SPECIFIED):

1. BELOW DECK KIT DOES NOT INCLUDE MXP ASSEMBLY.
2. REFER TO BELOW DECK KIT DOCUMENTATION FOR ALTERNATE CONFIGURATIONS.
3. USED ON ETHERNET M&C SYSTEMS ONLY.
4. USED ON 8W BUC SYSTEMS ONLY.
5. USED ON 16W BUC SYSTEMS ONLY.

REFERENCE DRAWINGS:

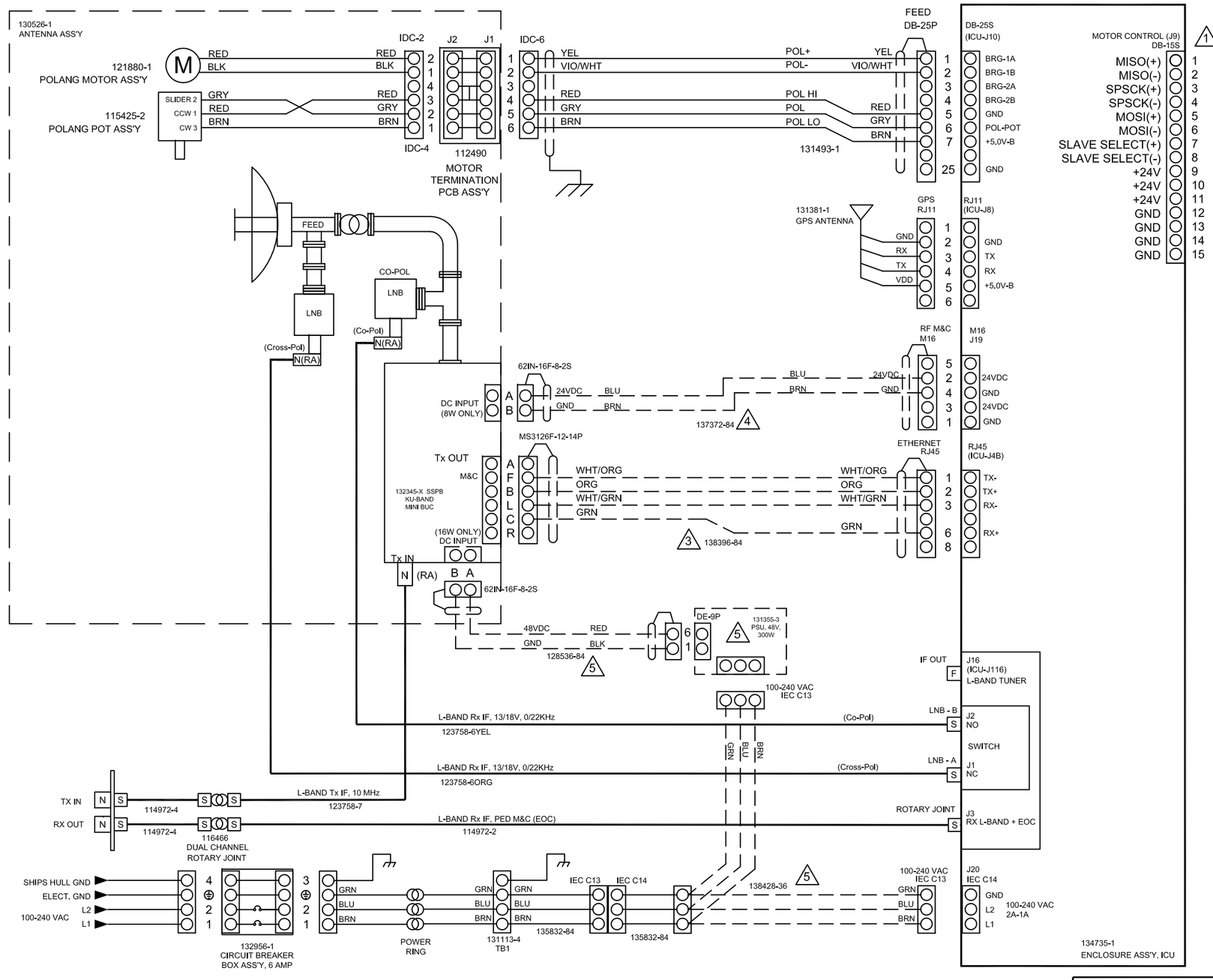
138360 SCHEMATIC, ANTENNA SYSTEM, 4009 MK3 / XX12-91
137389 SCHEMATIC, PEDESTAL SYSTEM, XX12

DRAWN BY: K.D.H.	Sea Tel COBHAM
DRAWN DATE: 11-5-12	Tel. 925-798-7979 Fax. 925-798-7986
APPROVED BY:	TITLE: SYSTEM BLOCK DIAGRAM
APPROVED DATE:	4009 MK3 / XX12-91

SIZE	SCALE:	DRAWING NUMBER	REV
B	NONE	138359	D
FIRST USED: 5012-91		SHEET NUMBER	1 OF 1

DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	10087	11-5-12	NEW DRAWING, NO PRIOR REV	K.D.H.
A1	N/A	11-5-12	ADDED BUC M&C ETHERNET CABLE (Z: B5); UPDATED VAC CABLES (Z:A5-A6)	K.D.H.
A2	10211	12-19-12	BUC P/N WAS 132345-3	K.D.H.
A3	N/A	02-05-13	ADDED 8W BUC CONFIG AND 16W BUC OPTION AND NOTES. UPDATED TITLE, WAS 5012-91, 16W MINI	RML



REFERENCE DRAWINGS:

135138	SCHEMATIC, ENCLOSURE ASS'Y, ICU, 11G3
137389	SCHEMATIC, PEDESTAL SYSTEM, XX12
138359	SYSTEM BLOCK DIAGRAM, 4009 MK3 / XX12-91

NOTES:

1. REFER TO DRAWING 137389, SCHEMATIC ANTENNA PEDESTAL, XX12 FOR CONNECTION DETAILS
2. S = SMA
   (RA) = RIGHT ANGLE
3. USED ON ETHERNET M&C SYSTEMS ONLY
4. USED ON 8W BUC SYSTEMS ONLY
5. USED ON 16W BUC SYSTEMS ONLY

DRAWN BY: K.D.H.	Sea Tel COBHAM		
DRAWN DATE: 11-5-12	Tel. 925-798-7979 Fax. 925-798-7986		
APPROVED BY:	TITLE: SCHEMATIC, ANTENNA SYSTEM, 4009 MK3 / XX12-91		
APPROVED DATE:			
SIZE: B	SCALE: NONE	DRAWING NUMBER: 138360	REV: A3
FIRST USED: 5012-91		SHEET NUMBER: 1 OF 1	

DOCUMENT NO. 124225-4_A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9913	8-16-12	RELEASED TO PRODUCTION, WAS X1	K.D.H.
A1	10065	10-23-12	"X12" IN TITLE WAS "5012"	K.D.H.
A2	N/A	02-05-13	ADDED ADDITIONAL REFERENCE DRAWINGS	K.D.H.

FEED
DB-25P

DB-25S
(ICU-J10)

MOTOR CONTROL (J9)
DB-15S

DB-25P	DB-25S	MOTOR CONTROL (J9) DB-15S
2	BRG-1B	MISO(+)
1	BRG-1A	MISO(-)
3	BRG-2A	SPSCK(+)
4	BRG-2B	SPSCK(-)
7	GND	MOSI(+)
6	POL-POT	MOSI(-)
5	+5.0V-B	SLAVE SELECT(+)
		SLAVE SELECT(-)
		+24V
11	+15V	+24V
20	IN-1	+24V
24	GND	GND
25	GND	GND
		GND
		GND

MOTOR CTRL
DA-15P

DRIVE
DA-15S

MOTOR CTRL DA-15P		DRIVE DA-15S
1	BRN	1
2	RED	2
3	ORG	3
4	YEL	4
5	GRN	5
6	BLU	6
7	VIO	7
8	GRY	8
9	WHT	9
10	WHT/BRN	10
11	WHT/RED	11
12	WHT/ORG	12
13	WHT/YEL	13
14	WHT/GRN	14
15	WHT/BLU	15

129526-84

DA-15P
(MDA-J4)

DA-15P (MDA-J4)	DRIVE DA-15S
MISO(+)	1
MISO(-)	2
SPSCK(+)	3
SPSCK(-)	4
MOSI(+)	5
MOSI(-)	6
SS(+)	7
SS(-)	8
+24V	9
+24V	10
+24V	11
GND	12
GND	13
GND	14
GND	15

SERVICE
DE-9S

1	
2	
3	
4	
5	
6	
7	
8	
9	

USB

1	
2	
3	
4	
5	

1

RF M&C
M16

M16
J19

RF M&C M16	M16 J19
5	24VDC
2	GND
4	24VDC
3	GND
1	GND

GPS
RJ11

RJ11
(ICU-J8)

GPS RJ11	RJ11 (ICU-J8)
1	
2	GND
3	TX
4	RX
5	+5.0V-B
6	

IF OUT
F

J16
(ICU-J116)
L-BAND TUNER

LNB-B
S

J2
NO

SWITCH

LNB-A
S

J1
NC

ROTARY JOINT
S

J3
RX L-BAND + EOC

100-240 VAC
IEC C13

J20
IEC C14

J20 IEC C14	
GND	
L2	100-240 VAC 2A-1A
L1	

134735-1
ENCLOSURE ASS'Y, ICU

DA-15S
(MDA-J2)

EL
DA-15P

DA-15S

DA-15P

DA-15S (MDA-J2)	EL DA-15P		DA-15S		DA-15P		
ØB	1	BRN	BRN	1	WHT	ØB	WHT
ØA	2	RED	RED	2	BLU	ØA	BLU
ØC	3	ORG	ORG	3	BRN	ØC	BRN
HALL +5V	4	YEL	YEL	4	ORG	HALL +5V	ORG
S1	5	GRN	GRN	5	YEL	S1	YEL
S2	6	BLU	BLU	6	RED	S2	RED
S3	7	VIO	VIO	7	GRN	S3	GRN
HALL GND	8	GRY	GRY	8	BLK	HALL GND	BLK
GND	14	WHT/GRN	WHT/GRN	14	BLK	BRAKE	BLK
BRAKE (+)	15	WHT/BLU	WHT/BLU	15	BLK	BRAKE	BLK

129527-36

125644-1
MOTOR, SIZE 23,
BLDC W/ BRAKE,
15 PIN

DA-15S
(MDA-J3)

CL
DA-15P

DA-15S (MDA-J3)	CL DA-15P			
ØB	1	WHT	ØB	WHT
ØA	2	BLU	ØA	BLU
ØC	3	BRN	ØC	BRN
HALL +5V	4	ORG	HALL +5V	ORG
S1	5	YEL	S1	YEL
S2	6	RED	S2	RED
S3	7	GRN	S3	GRN
HALL GND	8	BLK	HALL GND	BLK
GND	14	BLK	BRAKE	BLK
BRAKE (+)	15	BLK	BRAKE	BLK

125644-1
MOTOR, SIZE 23,
BLDC W/ BRAKE,
15 PIN

DA-15S
(MDA-J1)

AZ
DA-15P

DA-15S (MDA-J1)	AZ DA-15P			
ØB	1	WHT	ØB	WHT
ØA	2	BLU	ØA	BLU
ØC	3	BRN	ØC	BRN
HALL +5V	4	ORG	HALL +5V	ORG
S1	5	YEL	S1	YEL
S2	6	RED	S2	RED
S3	7	GRN	S3	GRN
HALL GND	8	BLK	HALL GND	BLK
CHB	9	VIO	CH. B	VIO
CHA	10	BRN/WHT	CH. A	BRN/WHT
	11			
+5.0V	12	RED/WHT	+5VDC	RED/WHT
GND	13	GRY	COM	GRY
	14			
	15			

121951-3
MOTOR, BLDC, 2
STACK W/ ENCODER,
20 INCH, 8-32 MTG

DE-9S
(MDA-J5)

HOME
DE-9P

DE-9S (MDA-J5)	HOME DE-9P		
	1		
	2		
AZ REF	3	BLK	
+24V	4	BRN	+
GND	5	BLUE	-
	8		
	9		

131227-1
ENCLOSURE ASS'Y,
MOTOR DRIVER,
09G2

129543-24
CABLE ASS'Y,
PROXIMITY
SENSOR

REFERENCE DRAWINGS:

135138 SCHEMATIC, ENCLOSURE ASS'Y, ICU, 11G3

NOTES:

1. REFER TO ANTENNA SYSTEM SCHEMATIC FOR COMPLETE CONNECTION DETAILS
2. S=SMA

DRAWN BY: K.D.H.	Sea Tel CLEARVUE	
DRAWN DATE: 5-30-12	Tel. 925-798-7979 Fax. 925-798-7986	
APPROVED BY:	TITLE: SCHEMATIC, PEDESTAL SYSTEM, XX12	
APPROVED DATE:		
SIZE: D	SCALE: NONE	DRAWING NUMBER: 137389 REV: A2
FIRST USED: 5012		SHEET NUMBER: 1 OF 1

DOCUMENT NO. 124225-4_A

BOM Explosion Report

Item Number: 62-153393

Description: GENERAL ASSY, 6012-91

Item Revision: A ECO-00019280

Date as of: 09/09/2016 08:06:37 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1	pcs	97-153393	A ECO-00019263	ASSY DOCUMENT, GENERAL ASSEMBLY, 6012-91	
0	1		DL-000604-C	A DCO-00015899	Software Assembly, General Release IMA	
1	1	ea	138344-3	D.05 ECO-00017508	PEDESTAL ASSY, HD, SINGLE BRIDGE, 6012	
2	1	pcs	62-153394	A ECO-00019278	ELECT EQ FRAME ASSY, 6012-91	
3	1	ea	127625-4	A.05 ECO-00008544	ANTENNA INSTALLATION ASSY, 6009	
4	1	ea	135037-2	F ECO-00008546	WAVEGUIDE ASSY, 5012-91, NO FILTER	
5	1	ea	135696-1	C.03 MCO-00013952	CIRCUIT BREAKER BOX, KIT, 6A	
9	1	ea	130294-1	B ECO-00008545	BALANCE WEIGHT KIT, AZ, 6009	
10	1	ea	138348-1	A ECO-00008546	BALANCE WEIGHT KIT, 6012-33	
11	1	ea	121655-11	N ECO-00017953	LABELS INSTALLATION, XX12	(NOT SHOWN)
12	12	in	130043-12	A ECO-00008544	TAPE, PIPE THREAD SEALANT, 1/2 IN WIDE	
15	1	ea	131645-1	B.01 ECO-00008545	INSTALL ASSY, GPS, XX09/XX10, MK2 SYSTEMS	
34	1	ea	118294-13	B.03 ECO-00008542	HARDWARE KIT, WR-75, UG FLANGE, M4, FULL GASKET	
35	1	ea	118294-19	A.01 ECO-00008542	HARDWARE KIT, WR-75, UG FLANGE, 6-32, HALF GASKET	
50	2	ea	114593-164	MCO-00012113	SCREW, SOCKET HD, 10-32 x 1/2, SS.	
57	2	ea	119952-011	MCO-00012114	WASHER, STAR, INTERNAL TOOTH, #10, SS.	

Created By: Mike Needham

Create Time: 09/14/2016 08:34:43 AM PDT

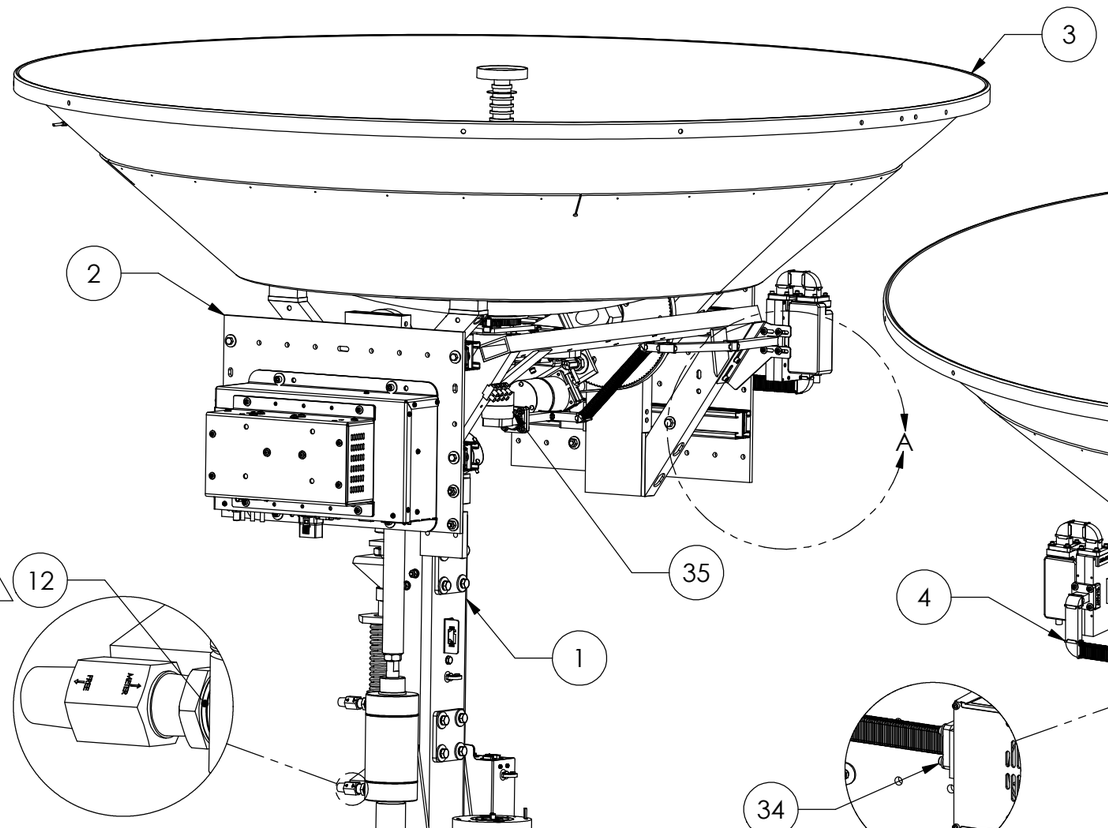
BOM Explosion Report

Item Number: 62-153393
Description: GENERAL ASSY, 6012-91
Item Revision: A ECO-00019280
Date as of: 09/09/2016 08:06:37 AM PDT

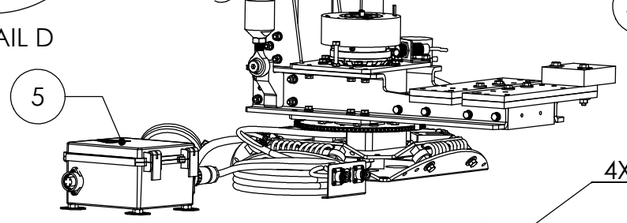
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
		pcs	62-153393	A ECO-00019280	GENERAL ASSY, 6012-91	

Created By: Mike Needham
Create Time: 09/14/2016 08:34:43 AM PDT

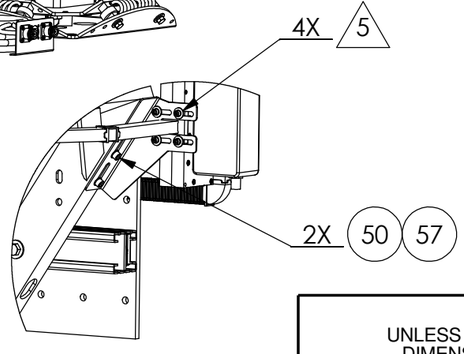
REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY



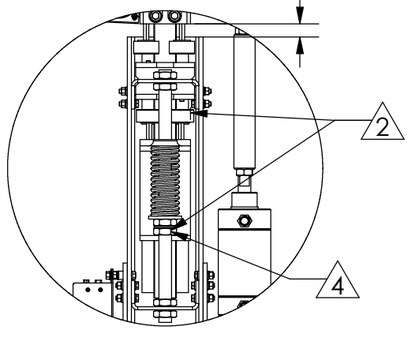
2X DETAIL D



DETAIL B



DETAIL A



REFERENCE DRAWINGS:
XXXXXX ANTENNA SYSTEM SCHEMATIC
XXXXXX SYSTEM BLOCK DIAGRAM
137389 PEDESTAL SCHEMATIC

NOTES: UNLESS OTHERWISE SPECIFIED

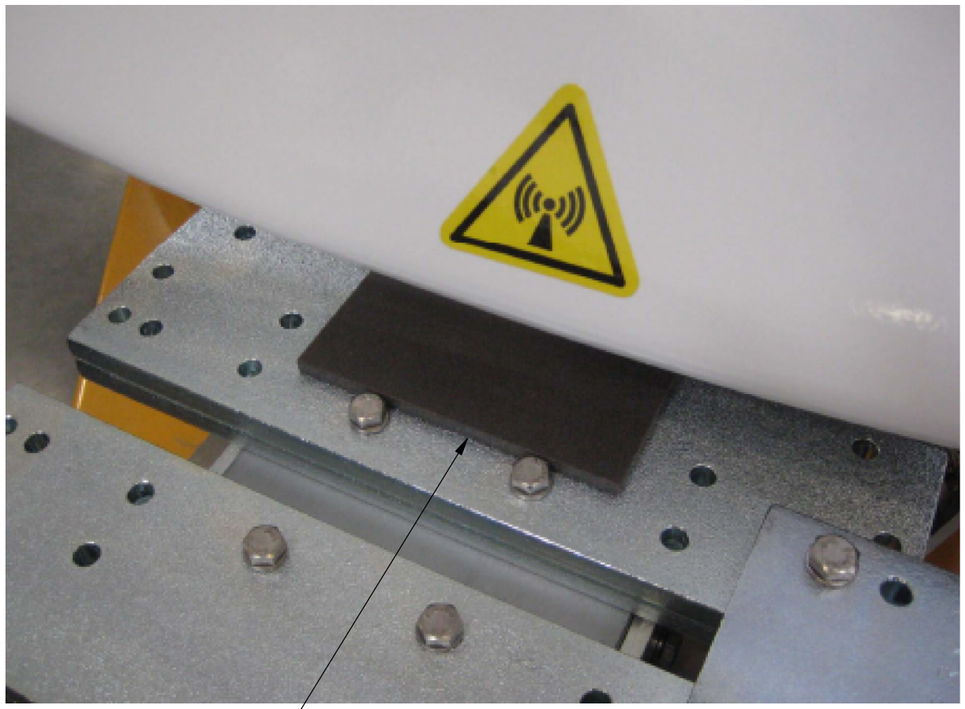
1. MANUFACTURE PER SEATEL SPEC. 122298.
2. SET 20 MM GAP AS SHOWN BETWEEN YOKE BOTTOM AND PEDESTAL FRAME. TO ACHIEVE THIS GAP USE SHOWN NUT SET TO MOVE YOKE UP OR DOWN.
3. AFTER COMPLETION OF NOTE 2 INSTALL ADAPTERS AND CHECK VALVES (METER SIDE IN, READ ON VALVES) PROVIDED WITH PEDESTAL USING ITEM 12 ON EACH PIECE (ADAPTERS AND CHECK VALVES). WRAP 2-3 TIMES AROUND EXTERNAL THREADS FOR PROPER SEAL. MUST NOT USE LOCTITE FOR THESE PARTS.
4. AFTER ADJUSTING GAP PER NOTE 2 SECURE LOWER JAM NUT WITH LOCTITE 222.
5. LOCTITE & TORQUE INDICATED HARDWARE.
6. VERIFY CLEARANCE BETWEEN REFLECTOR AND AZ WEIGHTS WITH GAGE 132605, WITH VERTICAL ISOLATION FULLY COMPRESSED. GAGE MUST BE MOVING FREELY, SEE DETAIL "E".
7. THIS DRAWING GOVERNS THE ASSEMBLY OF ALL VARIANTS OF THE PART NUMBER 62-153393, 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 INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 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

DESIGNER/ENGINEER: K.D.H.	DRAWN BY: K.D.H.	Sea Tel COBHAM	
WEIGHT: 255.806 LBS	DRAWN DATE: 9-9-16	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: N/A	APPROVED BY:	TITLE: GENERAL ASS'Y, 6012-91	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:9	DRAWING NUMBER: 97-153393	VER: A
3rd ANGLE PROJECTION	FIRST USED: 6012-91	SHEET NUMBER: 1 OF 2	



6 DETAIL "E"

SIZE	SCALE:	DRAWING NUMBER	VER
B	1:9	97-153393	A
		SHEET NUMBER 2 OF 2	

BOM Explosion Report

Item Number: 138658-1

Description: ICU/PSU MOUNTING ASSY, 300W/48V, 6012

Item Revision: A ECO-00008547

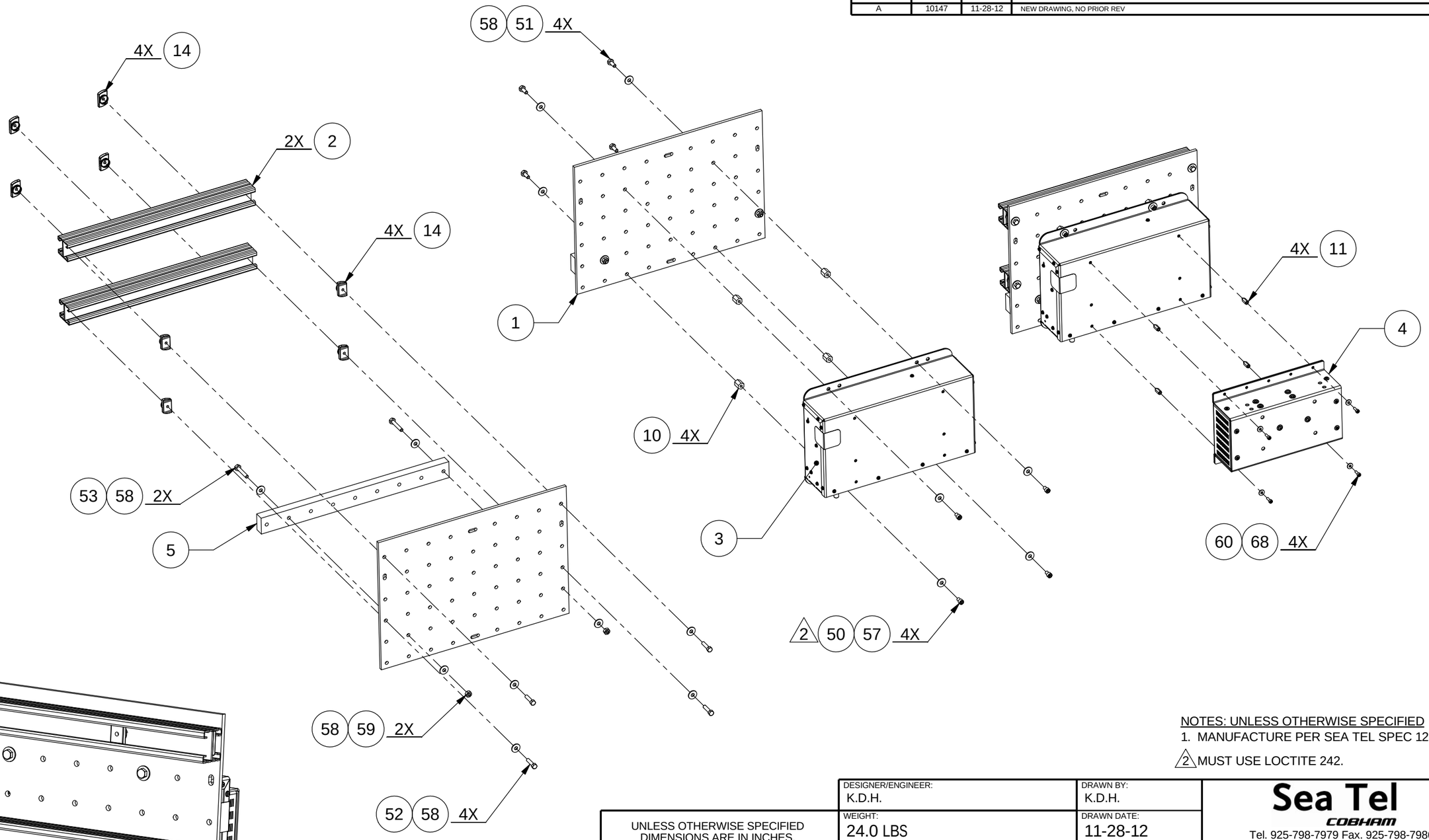
Date as of: 09/20/2014 04:34:33 PM PDT

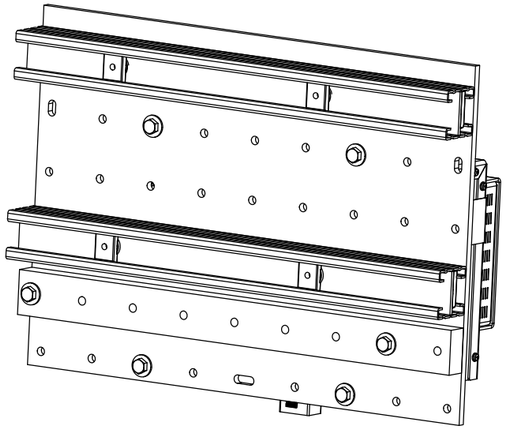
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
1	1	ea	123861	B ECO-00008543	MOUNTING PLATE	
2	2	ea	126288-17	B ECO-00008544	UNISTRUT, 1-5/8 H-CHANNEL, 17 IN, AL	
3	1	ea	134735-1	G.02 ECO-00008546	ENCLOSURE ASSY, ICU, CABLE RETAINER	
4	1	ea	131355-3	C.05 ECO-00008545	POWER SUPPLY ASSY, 300W / 48V, CABLE RETAINER	
5	1	ea	131374-1	A ECO-00008545	WEIGHT, COUNTER, 1-1/2 X 3/4 X 17	
10	4	ea	124588-1021	MCO-00012114	STANDOFF, HEX, F/F, 1/4-20 X .50 OD X 0.625, ALUM	
11	4	ea	131572-5321	MCO-00012114	STANDOFF, HEX, M/F, M4 X 14, BRASS W/ZINC PLATING	
14	8	ea	126279-3	MCO-00012114	NUT, 1 5/8 UNISTRUT, 1/4-20, W/SPRING, STEEL	
50	4	ea	114593-202	MCO-00012113	SCREW, SOCKET HD, 1/4-20 x 3/8, SS.	
51	4	ea	114586-536	MCO-00012113	SCREW, HEX HD, 1/4-20 x 5/8, SS.	
52	4	ea	114586-538	MCO-00012113	SCREW, HEX HD, 1/4-20 x 1, SS.	
53	2	ea	114586-541	MCO-00012113	SCREW, HEX HD, 1/4-20 x 1-1/2, SS.	
57	4	ea	114580-027	MCO-00012113	WASHER, FLAT, 1/4, SMALL PATTERN, SS.	
58	12	ea	114580-029	MCO-00012113	WASHER, FLAT, 1/4, SS.	
59	2	ea	114583-029	MCO-00012113	NUT, HEX, 1/4-20, SS.	
60	4	ea	119973-117	MCO-00012113	SCREW, SOCKET HD, M4 X 12, SS.	
68	4	ea	114580-230	MCO-00012113	WASHER, FLAT, M4, SS.	
		ea	138658-1	A ECO-00008547	ICU/PSU MOUNTING ASSY, 300W/48V, 6012	

Created By: Mike Needham

Create Time: 08/11/2016 08:24:43 AM PDT

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	10147	11-28-12	NEW DRAWING, NO PRIOR REV	K.D.H.





NOTES: UNLESS OTHERWISE SPECIFIED
1. MANUFACTURE PER SEA TEL SPEC 122298.
2. MUST USE LOCTITE 242.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5 - 2009

DESIGNER/ENGINEER: K.D.H.	DRAWN BY: K.D.H.	Sea Tel COBHAM	
WEIGHT: 24.0 LBS	DRAWN DATE: 11-28-12	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: N/A	APPROVED BY:	TITLE: ICU/PWR SUPPLY MTG ASS'Y, 300W/48V, 6012	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:8	DRAWING NUMBER: 138658	REV: A
3rd ANGLE PROJECTION	FIRST USED: 6012-33	SHEET NUMBER: 1 OF 1	

ORACLE BOM Explosion Report

Item Number: 62-153395

Description: MOUNTING ASSY, CODAN MINI BUC, 6012-91, MK2

Item Revision: A.02 MCO-00026890

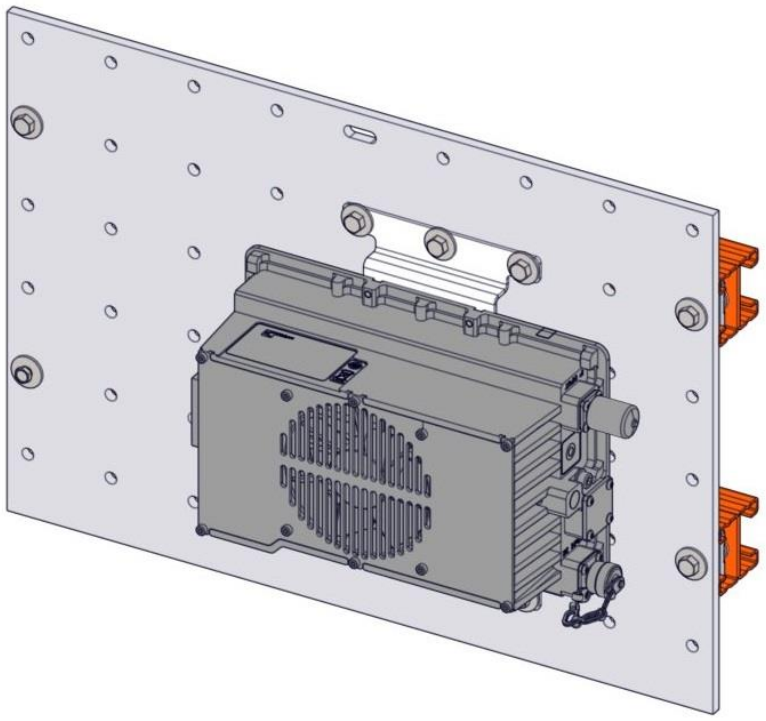
Date as of: 02/13/2018 08:26:31 AM PST

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	REF	pcs	97-153395	A.02 MCO-00027069	ASSY DOCUMENT, MOUNTING ASSY, MINI BUC, 6012-91	
1	1	ea	123861	B ECO-00008543	MOUNTING PLATE	
2	2	ea	126288-17	B ECO-00008544	UNISTRUT, 1-5/8 H-CHANNEL, 17 IN, AL	
10	2	ea	133510	B ECO-00008545	MOUNTING BRACKET, CODAN MINI-BUC	
21	7	ea	126279-3	MCO-00012114	NUT, 1 5/8 UNISTRUT, 1/4-20, W/SPRING, STEEL	
50	4	ea	119973-117	MCO-00018237	SCREW, SOCKET HD, M4 X 12, SS.	
58	4	ea	114580-230	MCO-00024303	WASHER, FLAT, M4, SS.	
60	3	ea	114586-537	MCO-00012113	SCREW, HEX HD, 1/4-20 x 3/4, SS.	
61	7	ea	114586-538	MCO-00012113	SCREW, HEX HD, 1/4-20 x 1, SS.	
68	13	ea	114580-029	MCO-00012113	WASHER, FLAT, 1/4, SS.	
69	3	ea	114583-029	MCO-00012113	NUT, HEX, 1/4-20, SS.	
		pcs	62-153395	A.02 MCO-00026890	MOUNTING ASSY, CODAN MINI BUC, 6012-91, MK2	

Created By: Mike Needham

Create Time: 02/13/2018 08:27:22 AM PST

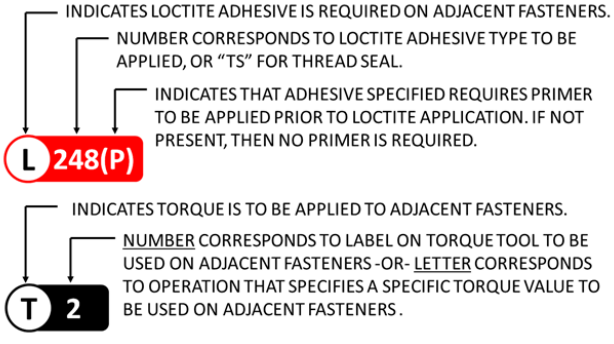
REVISION HISTORY				
REV	ECO	DESCRIPTION	DATE	BY
A	-	INITIAL DRAWING	09/28/2016	MJD



FULL ASSEMBLY VIEW

THESE INSTRUCTIONS GOVERN THE ASSEMBLY OF THE PARTS LISTED BELOW, REGARDLESS OF REVISION.	
PART NUMBER	DESCRIPTION
62-XXXXXX	ENTER DESCRIPTION HERE

SYMBOL KEY



NOTES: UNLESS OTHERWISE SPECIFIED:

1. MANUFACTURE PER SEA TEL STANDARD 99-122298.

REFERENCE DOCUMENTS

- 99-122305 FASTENER TORQUE VALUE SPECIFICATION
- 99-121730 PROCEDURE, LOCTITE APPLICATION

FOR INTERNAL USE ONLY

PRINTED COPIES OF THIS DOCUMENT ARE UNCONTROLLED AND ARE NOT TO BE USED FOR ASSEMBLY PURPOSES, UNLESS INITIALLED & DATED BY DOCUMENT CONTROL OR DESIGNATE.

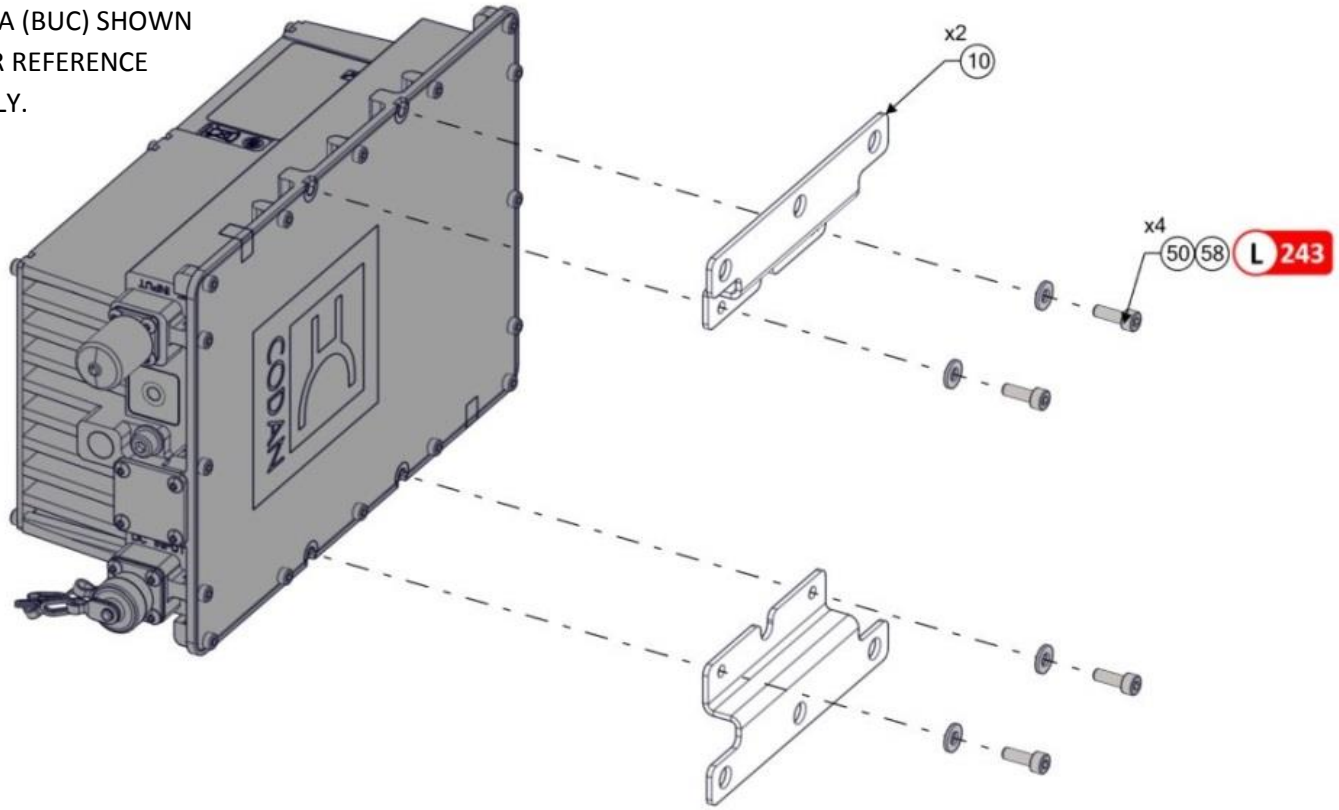
COBHAM

Sea Tel, Inc., dba Cobham SATCOM, Concord
Tel: 925-798-7979 Fax: 925-798-7986

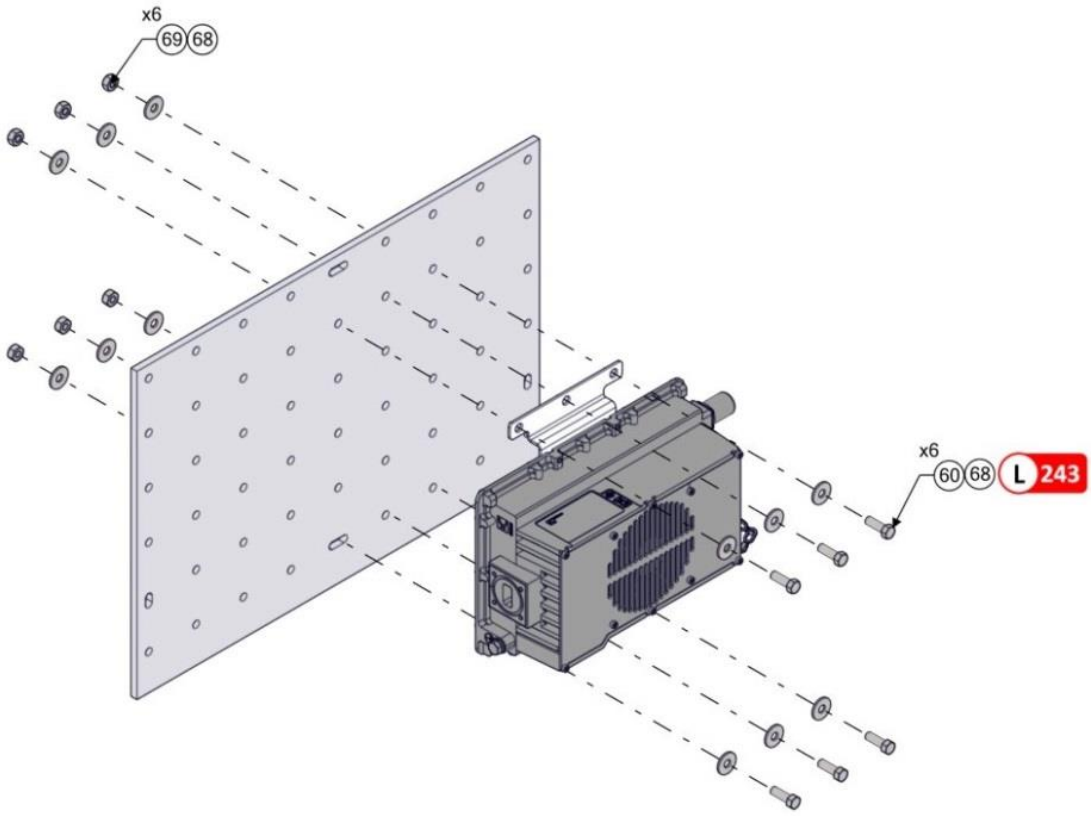
ENGINEER	TITLE:	
KDH.	ASSEMBLY INSTRUCTION MOUNTING ASSY, CODAN MINI BUC, 6012-91, MK2	
DRAWN BY	INSTRUCTION NUMBER:	REV.
MJD.	97-153395	A
	SHEET 1 OF 3	

STEP 1

A. SSPA (BUC) SHOWN FOR REFERENCE ONLY.



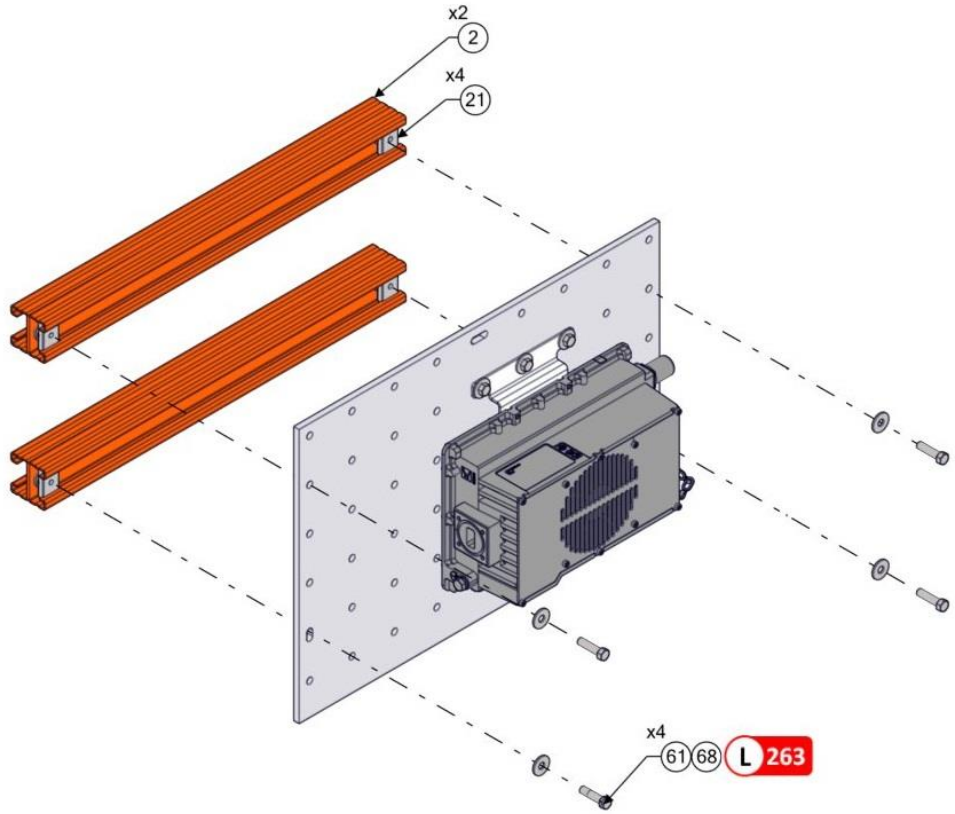
STEP 2



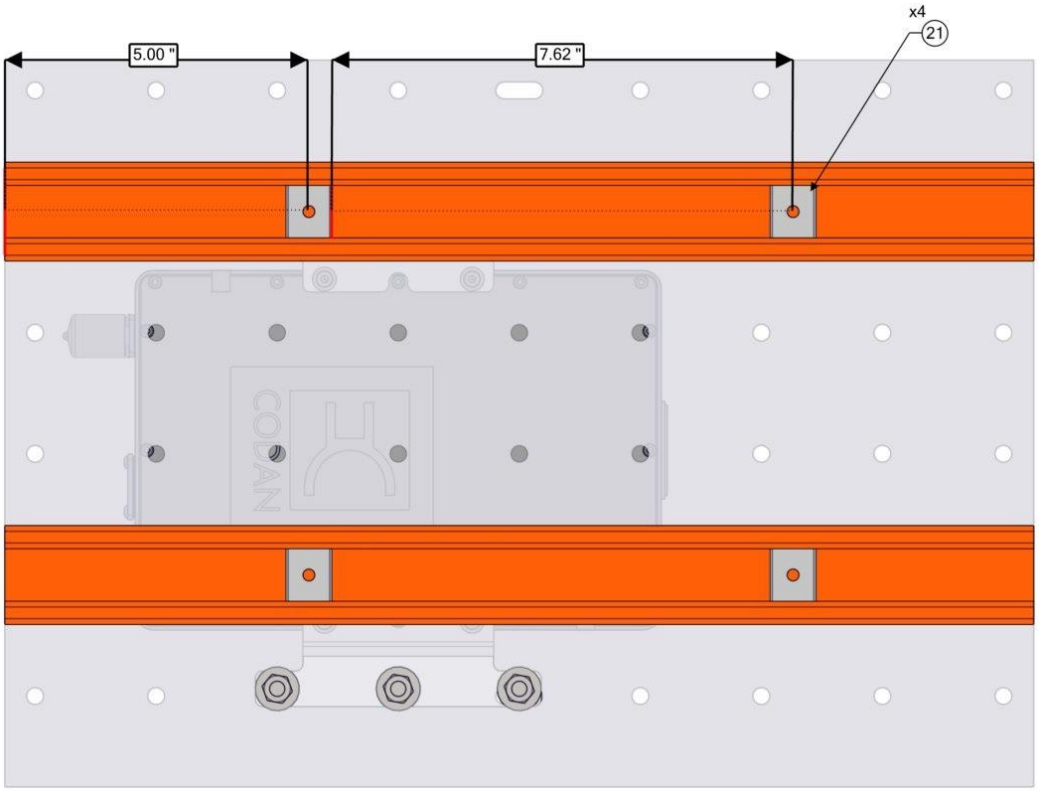
INSTRUCTION NUMBER:	REV:
97-153395	A
SHEET 2 OF 3	

STEP 3

A. INSTALL ITEM 21 NEARLY FLUSH TO THE EDGE OF ITEM 2 PRIOR TO THE PLATE INSTALLATION.



STEP 4



A. INSTALL ITEM 21 APPROXIMATELY WHERE SHOWN USING THE GIVEN MEASURMENTS.

B. ITEM 21 WILL BE USED AT A HIGHER LEVEL ASSEMBLY.

INSTRUCTION NUMBER:	REV:
97-153395	A
SHEET 3 OF 3	

BOM Explosion Report

Item Number: 62-146669

Description: ANTENNA ASSEMBLY, 6012, KU-NET, TX/RX CO/X-POL

Item Revision: B MCO-00024015

Date as of: 05/02/2018 07:39:16 AM PDT

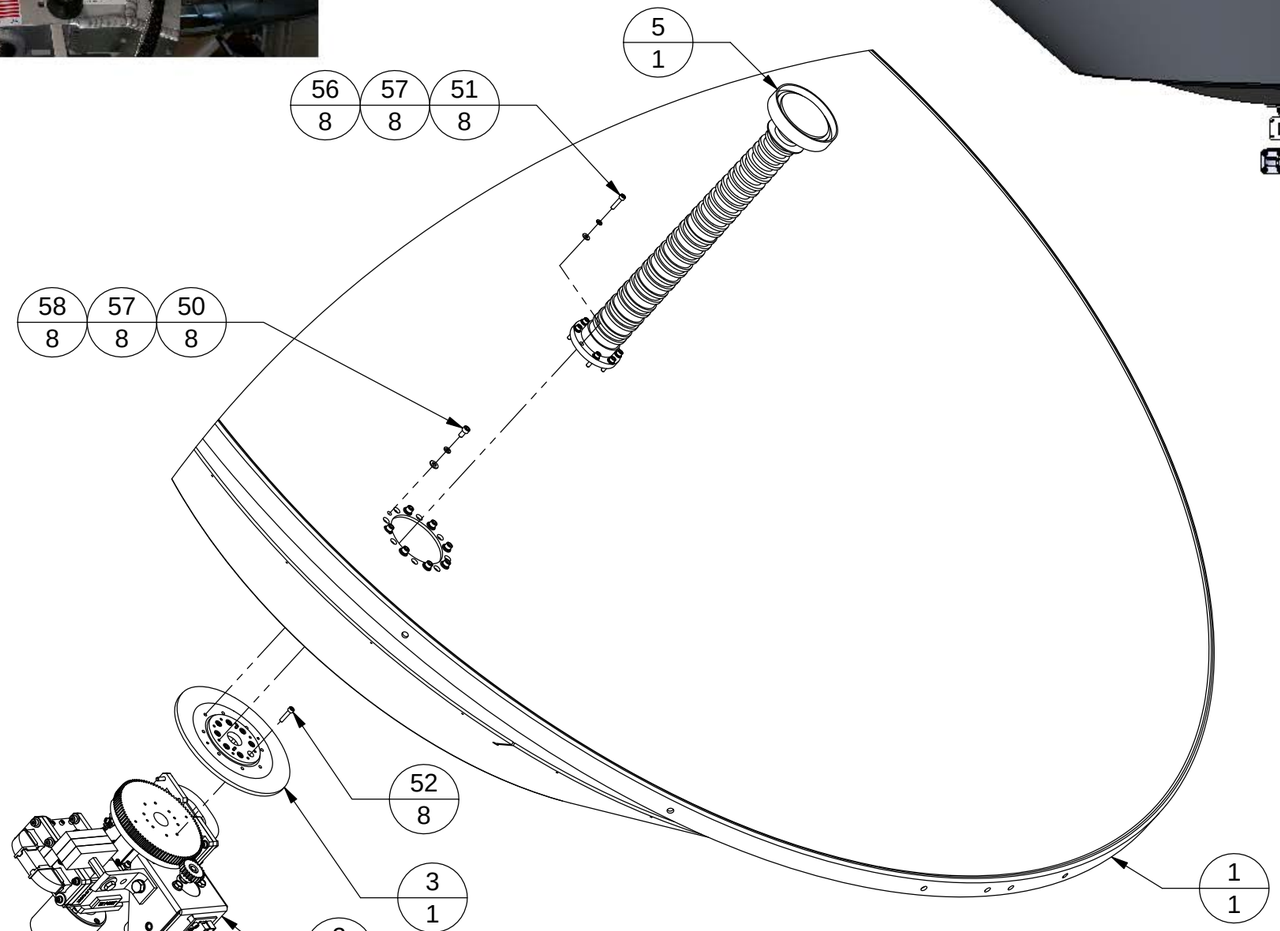
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1		97-146670-B	B DCO-00018272	ASSEMBLY DRAWING, ANTENNA ASSY, 6012, KU-NET	
1	1	ea	140943-1	A ECO-00008547	REFLECTOR, KU-BAND, OPTIM, 58	
2	1	ea	69-143638	B.01 ECO-00018645	FEED ASSY, KU-NET, MEDIUM TX/RX CO/X-POL	
3	1	ea	41-143641-A	04 ECO-00015403	INTERFACE ADAPTER, KU-NET, MED TX/RX, 60 IN.	
5	1	pcs	41-207271-000	MCO-00017222	VERTEX FEED, 60 IN, KuNET	
50	8	ea	114593-142	MCO-00012113	SCREW, SOCKET HD, 8-32 x 5/16, SS.	
51	8	ea	114593-147	MCO-00012113	SCREW, SOCKET HD, 8-32 x 5/8, SS.	
52	8	ea	114593-122	MCO-00012113	SCREW, SOCKET HD, 6-32 x 3/8, SS.	
57	16	ea	114581-009	MCO-00012113	WASHER, LOCK, #8, SS.	
58	24	ea	114580-009	MCO-00012113	WASHER, FLAT, #8, SS.	
		pcs	62-146669	B MCO-00024015	ANTENNA ASSEMBLY, 6012, KU-NET, TX/RX CO/X-POL	

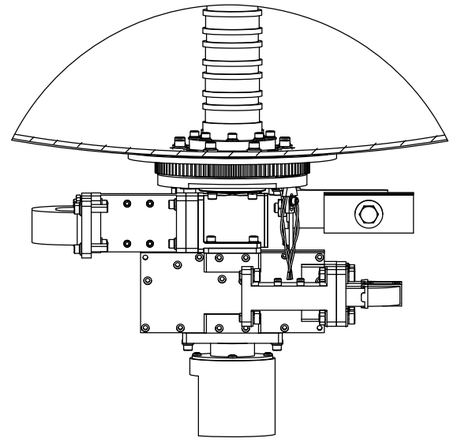
Created By: Mike Needham

Create Time: 05/02/2018 07:39:54 AM PDT

REVISION HISTORY				
VER	ECO#	DATE	DESCRIPTION	BY
B	00015403	1-8-16	ADD IMAGE, NOTE 4	K.D.H.

4





NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. THIS DRAWING GOVERNS THE ASSEMBLY OF ALL VARIANTS OF THE PART NUMBER 62-146669, 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.

3 ALIGN PIN HOLES ON BOTTOM OF VERTEX FEED WITH PINS IN FEED ASSEMBLY.

4 FEED SHOULD LOOK LIKE THE IMAGE WHEN INSTALLED AND ROTATED ALL THE WAY TO THE STOP IN THE CW DIRECTION.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 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

DESIGNER/ENGINEER:

WEIGHT: 71.925 LBS

MATERIAL: N/A

FINISH: N/A

SURFACE ROUGHNESS:

3rd ANGLE PROJECTION

DRAWN BY: K.D.H.

DRAWN DATE: 5-13-15

APPROVED BY:

APPROVED DATE:

Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: ASSY DWG, ANTENNA ASSY, 6012, KU-NET

SIZE: B

SCALE: 1:24

DRAWING NUMBER: 97-146670

VER: B

FIRST USED: 6012-12

SHEET NUMBER: 1 OF 1

BOM Explosion Report

Item Number: 69-143638

Description: FEED ASSY, KU-NET, MEDIUM TX/RX CO/X-POL

Item Revision: B.01 ECO-00018645

Date as of: 05/02/2018 07:39:33 AM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	1		97-143638-A	A DCO-00018272	ASSEMBLY DRAWING, KUNET FEED, MEDIUM TX/RX	
1	1	ea	69-143639	A MCO-00024016	GEAR ASSY, KU-NET, MED TX/RX	
2	1	ea	139218-1	B ECO-00008547	OMT, KU, MODIFIED	
3	1	ea	138675-1	A.02 ECO-00008547	MOTOR MOUNTING ASSY, KU-NET	
4	1	ea	128290-1	A.01 ECO-00008544	WAVEGUIDE, WR-75, 180 DEG H-BEND W/BRACE, 2.00L	
5	1	ea	126144-1	D.01 ECO-00008544	WAVEGUIDE, WR-75, 180 DEG E-BEND	
6	1	ea	139034-1	A.01 ECO-00008547	ROTARY JOINT, WR-75, KU-NET	
7	1	ea	134561-12	A ECO-00008546	SENSOR ASSY, POL HOME FLAG, 12 IN	
8	1	ea	138884-1	A ECO-00008547	BRACKET, HOME SENSOR MOUNT, KU-NET	
9	1	ea	41-148424-A	05 ECO-00021789	FILTER, REJECT, METRIC KU-BAND TRANSMIT	
10	1	ea	41-152852-A	02 ECO-00021789	FILTER, REJECT, STD, KU-BAND TRANSMIT	
11	1	ea	125157-1	B ECO-00008543	DIPLEXER, DPX75K-C02-A, WR-75	
12	1	pcs	41-143685-A	02 ECO-00015403	SPACER, WG, WR-75, .130 LONG, 2 GROOVES	
13	2	ea	126225-232	B.01 ECO-00008544	SPACER, WAVEGUIDE, WR-75, .320 LONG	
14	9	ea	119269-1	MCO-00030953	GASKET, WR-75, (UG HALF)	
15	2	ea	118294-25	A ECO-00008542	HARDWARE KIT, WR-75, UG FLANGE, 6-32, NO GASKET	
16	2	ea	118294-26	A.01 ECO-00008542	HARDWARE KIT, WR-75, UG FLANGE, M4, NO GASKET	
17	1	ea	119269-2	MCO-00030953	GASKET, WR-75, (UG FULL)	

Created By: Mike Needham

Create Time: 05/02/2018 07:39:54 AM PDT

BOM Explosion Report

Item Number: 69-143638

Description: FEED ASSY, KU-NET, MEDIUM TX/RX CO/X-POL

Item Revision: B.01 ECO-00018645

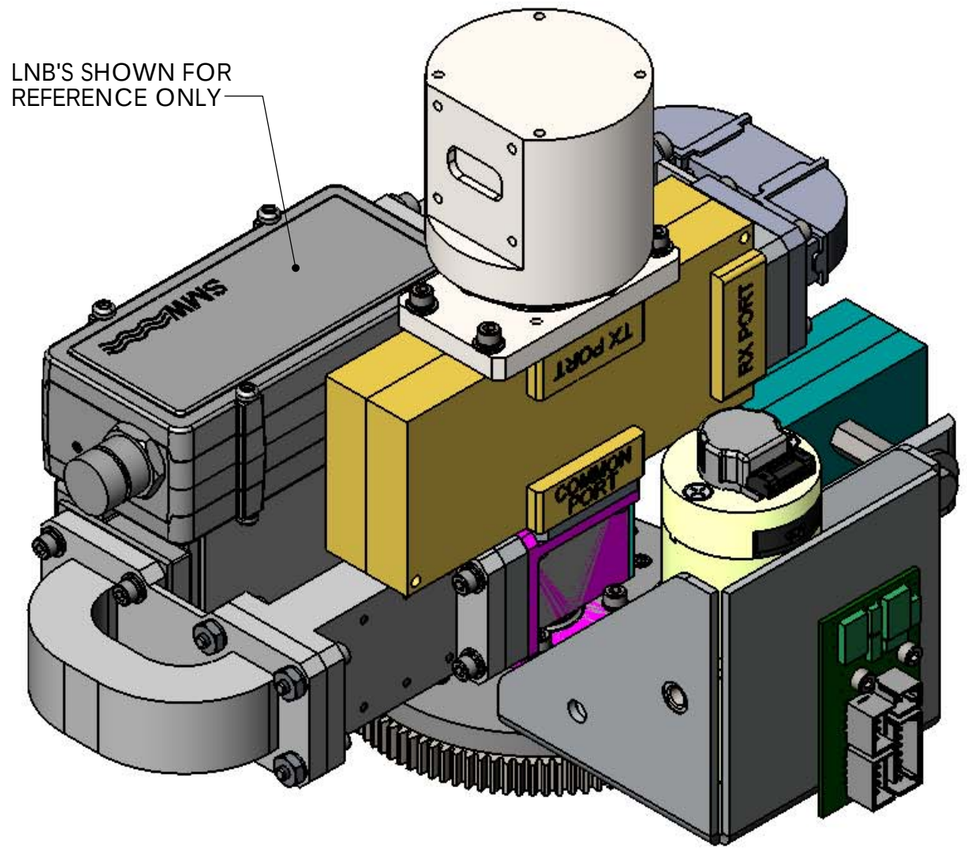
Date as of: 05/02/2018 07:39:33 AM PDT

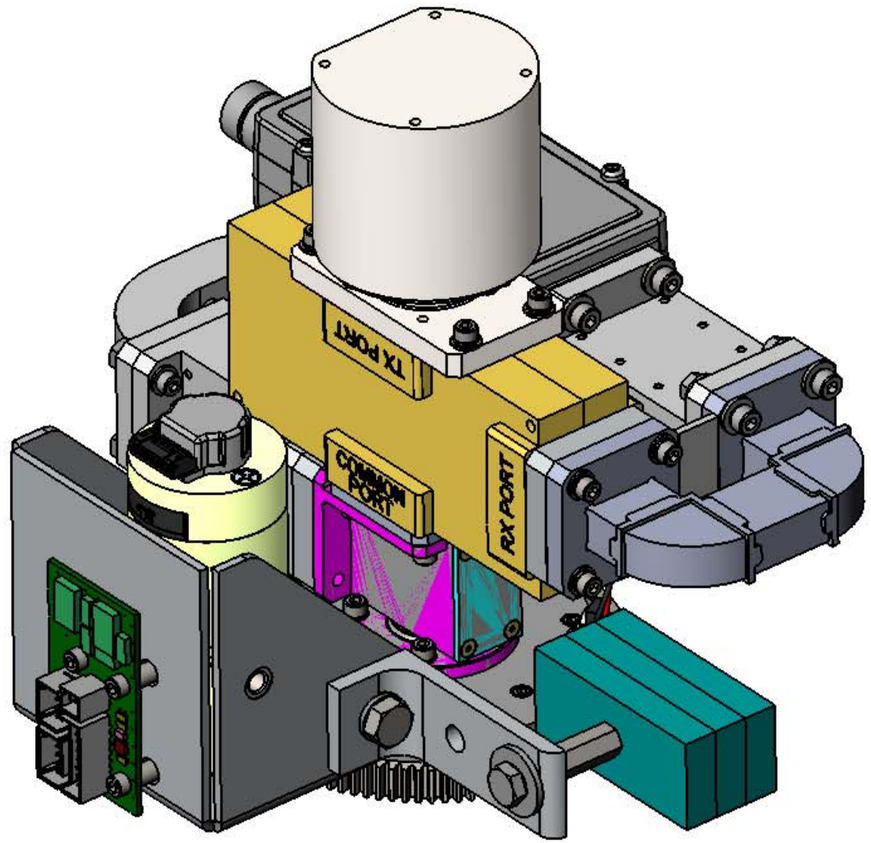
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
18	1	ea	121138	B.03 ECO-00008543	BRACKET, SSPA MOUNTING, 1.0 IN WIDE	
19	1	ea	129814-625	MCO-00012114	STANDOFF, HEX, F/F, M6 X 25MM	
40	3	ea	108519-1	H MCO-00026892	WEIGHT, TRIM 4.0 OZ	
50	3	ea	114593-103	MCO-00012113	SCREW, SOCKET HD, 4-40 x 5/16, SS.	
56	3	ea	114581-005	MCO-00012113	WASHER, LOCK, #4, SS.	
58	3	ea	114580-005	MCO-00012113	WASHER, FLAT, #4, SS.	
61	8	ea	129230-7	MCO-00012114	SCREW, SOCKET HD, SHOULDER, 6-32 X .62, SS	
62	4	ea	129230-4	MCO-00012114	SCREW, SOCKET HD, SHOULDER, 6-32 X .44, SS	
63	8	ea	129230-2	MCO-00012114	SCREW, SOCKET HD, SHOULDER, 6-32 X .31, SS	
67	20	ea	114581-007	MCO-00012113	WASHER, LOCK, #6, SS.	
68	12	ea	114580-008	MCO-00012113	WASHER, FLAT, #6, SMALL PATTERN, SS.	
70	3	ea	114593-162	MCO-00012113	SCREW, SOCKET HD, 10-32 x 3/8, SS.	
76	3	ea	119952-011	MCO-00012114	WASHER, STAR, INTERNAL TOOTH, #10, SS.	
78	3	ea	114580-012	MCO-00012113	WASHER, FLAT, #10, SMALL PATTERN, SS.	
80	1	ea	114586-536	MCO-00012113	SCREW, HEX HD, 1/4-20 x 5/8, SS.	
88	2	ea	114580-029	MCO-00012113	WASHER, FLAT, 1/4, SS.	
89	1	ea	114583-029	MCO-00012113	NUT, HEX, 1/4-20, SS.	
90	1	ea	114589-134	MCO-00012113	SCREW, HEX HD M6X12	
91	1	ea	114589-342	MCO-00012113	SCREW, HEX HD M6X40	
98	2	ea	128999	MCO-00012113	WASHER FLAT, M6, 18-8 SS	
		ea	69-143638	B.01 ECO-00018645	FEED ASSY, KU-NET, MEDIUM TX/RX CO/X-POL	

Created By: Mike Needham

Create Time: 05/02/2018 07:39:54 AM PDT

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY





NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. THIS DRAWING GOVERNS THE ASSEMBLY OF ALL VARIANTS OF THE PART NUMBER 69-143638, 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.
3. TEST PER SEATEL PROCEDURE 134509.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
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

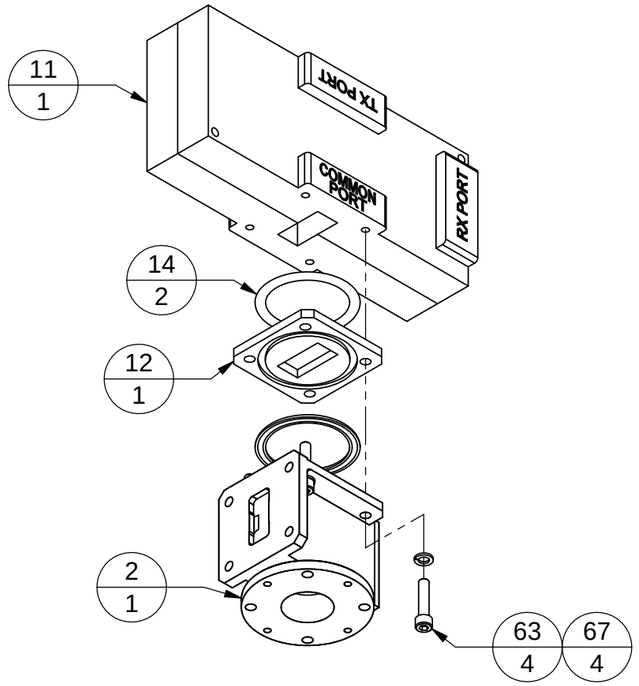
DESIGNER/ENGINEER: J. BRUCE
WEIGHT: 8.590 LBS
MATERIAL: N/A
FINISH: N/A
SURFACE ROUGHNESS:
3rd ANGLE PROJECTION

DRAWN BY: J. BRUCE
DRAWN DATE: 7/9/14
APPROVED BY:
APPROVED DATE:

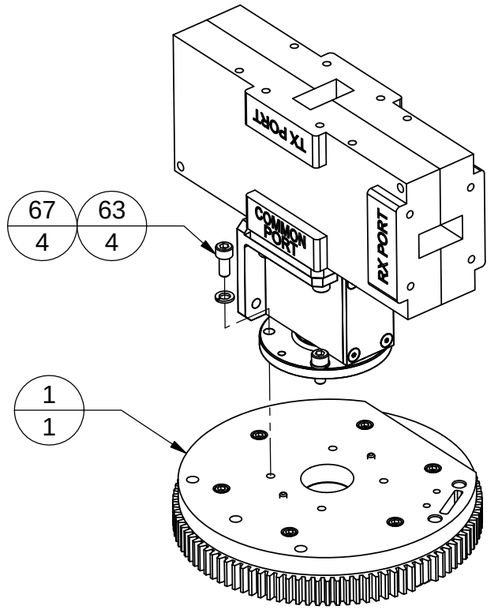
Sea Tel
COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: FEED ASSY, Ku-NET, MED TX

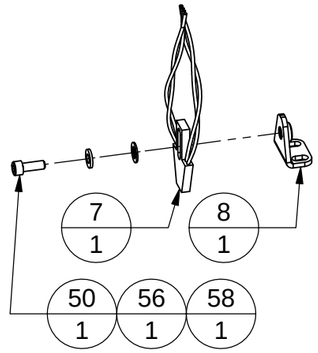
SIZE: B
SCALE: 1:4
DRAWING NUMBER: 97-143638
VER: A
FIRST USED: Ku-NET
SHEET NUMBER: 1 OF 3

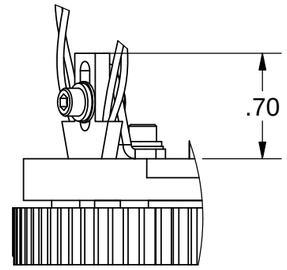


NOTE ORIENTATION OF DIPLEXER TO THE OMT.

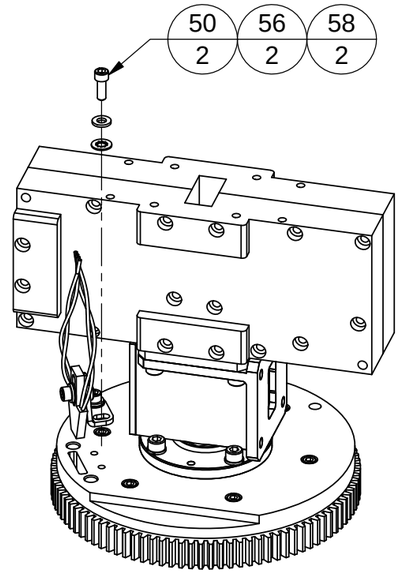


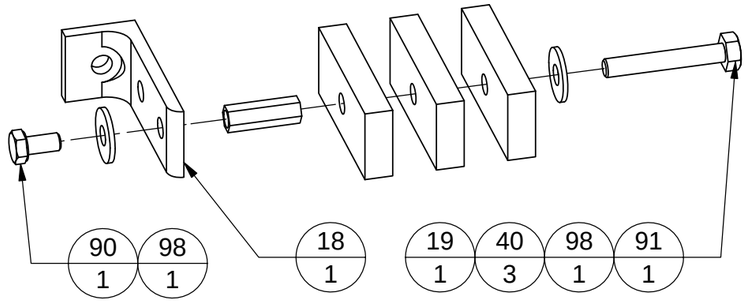
ENSURE ITEM 1 CAN ROTATE AND HIT STOPS.
NOTE ORIENTATION OF OMT TO ITEM 1.

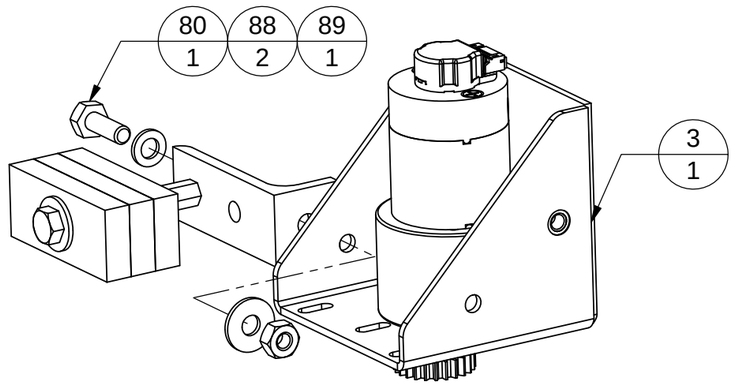


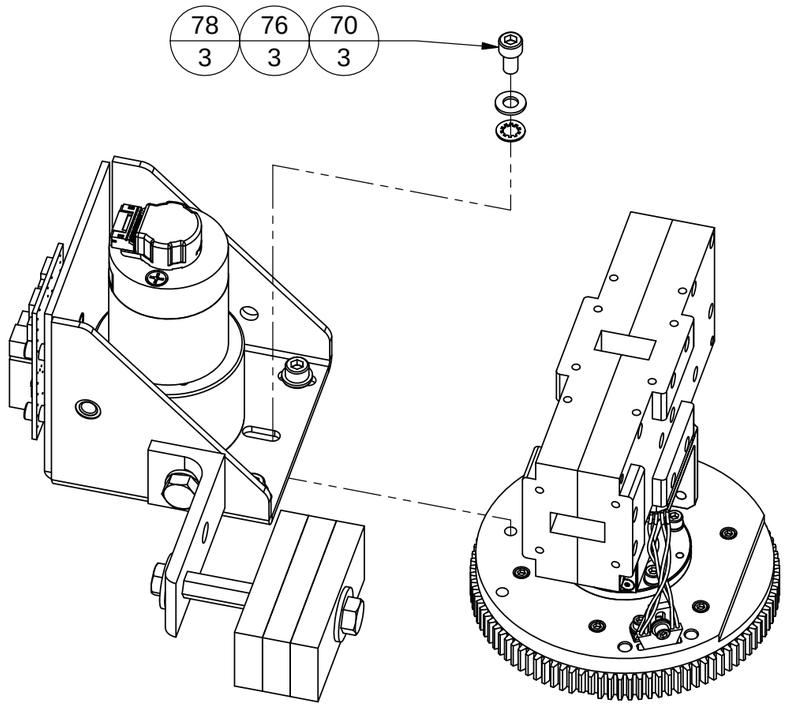


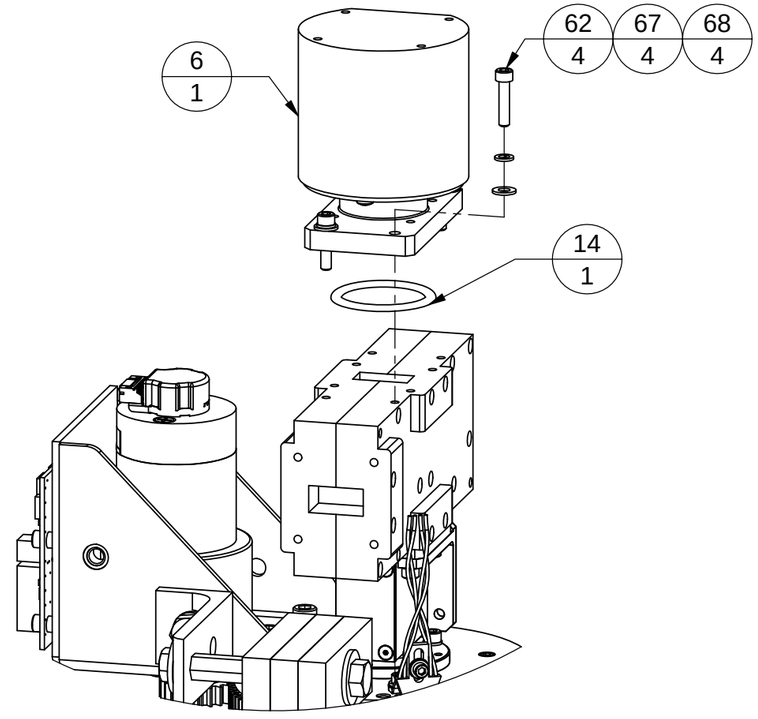
SET SENSOR HEIGHT



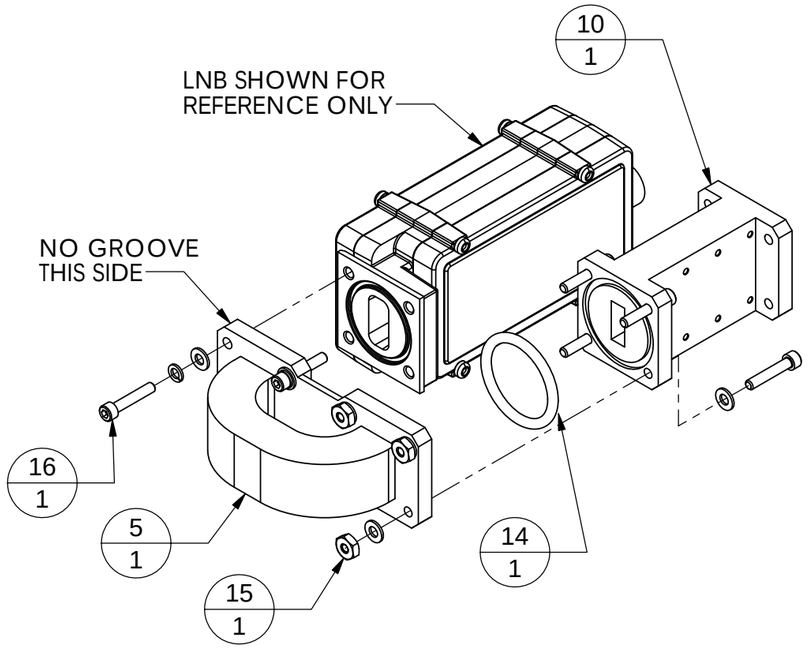


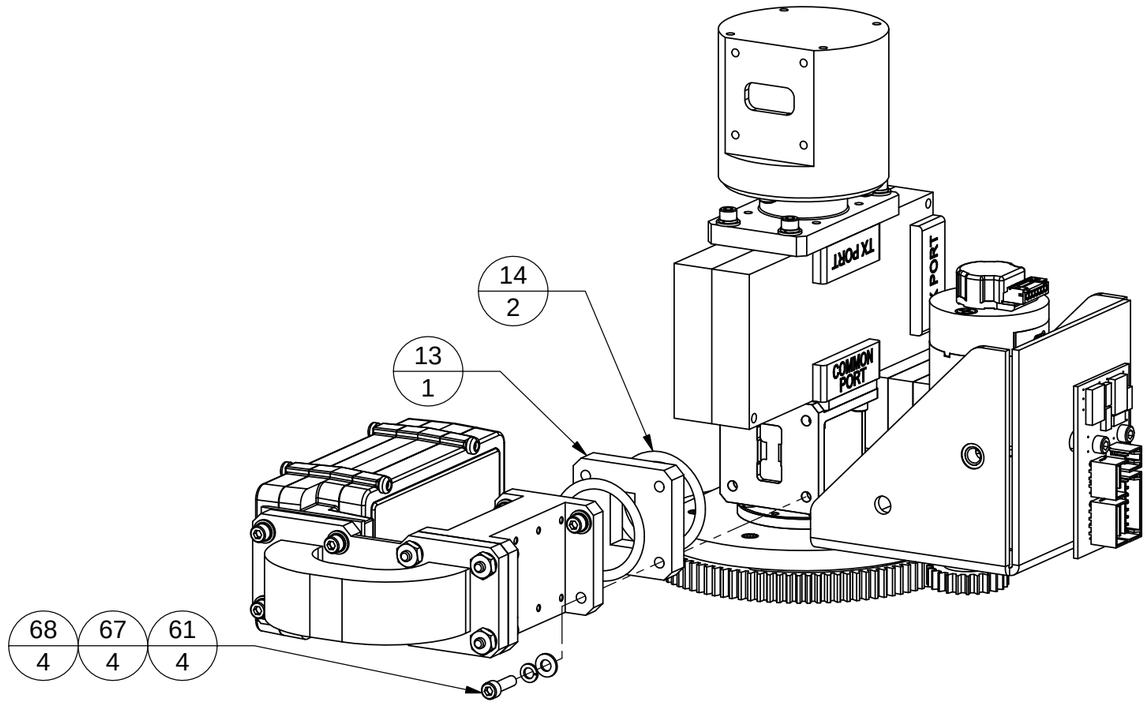


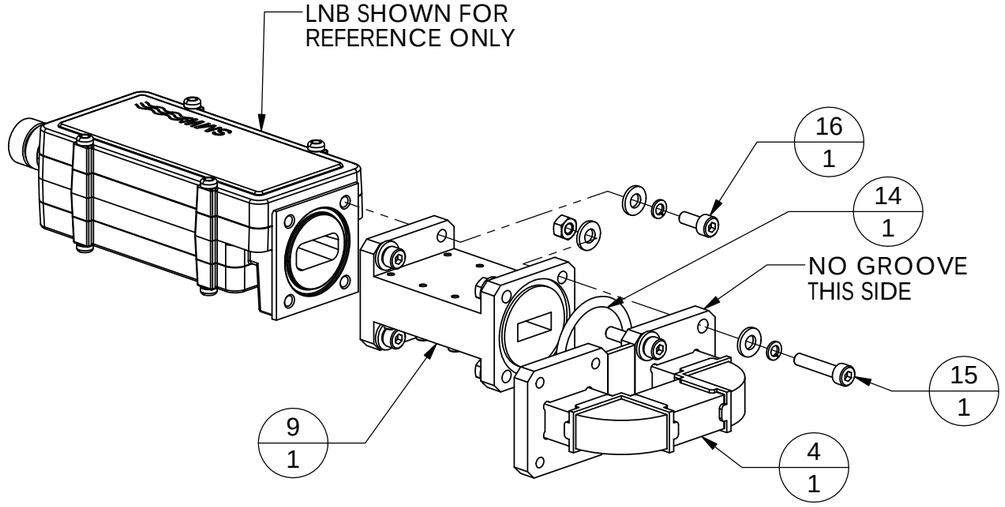


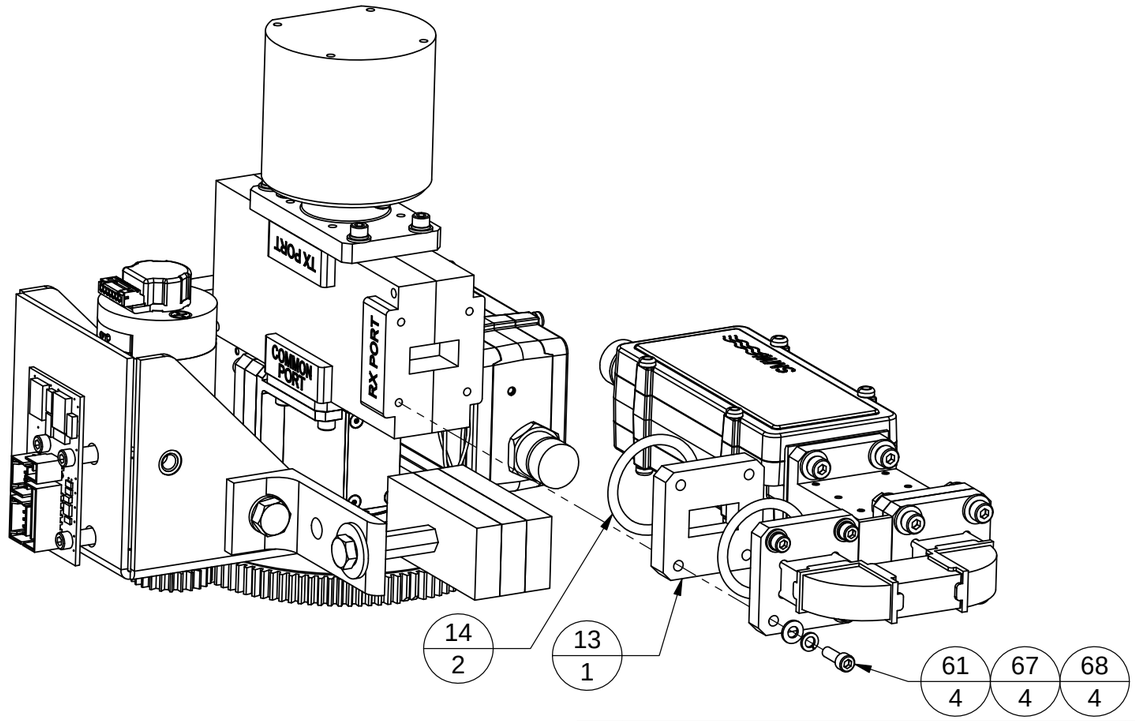


SIZE	SCALE:	DRAWING NUMBER	VER
B	1:2	97-143638	A
		SHEET NUMBER 2 OF 3	









SIZE	SCALE:	DRAWING NUMBER	VER
B	1:2	97-143638	A
		SHEET NUMBER 3 OF 3	

ORACLE BOM Explosion Report

Item Number: 62-153720

Description: BALANCE WEIGHT KIT, EL/CL, 6012-91

Item Revision: A.02 MCO-00026890

Date as of: 02/13/2018 08:27:00 AM PST

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	REF	pcs	97-153720	A.01 MCO-00027051	BALANCE WEIGHT KIT, EL/CL, 6012-91	
1	2	ea	118560	E ECO-00008542	WEIGHT, TRIM, 1 x 3.38 x 3, 2.8 LBS	
2	2	ea	112573-2	D ECO-00008542	WEIGHT, TRIM, 1/2 x 2.75 x 3, 1.17 LBS	
4	4	ea	108517-2	D MCO-00026892	WEIGHT, TRIM 1.0 OZ	
10	2	ea	126279-3	MCO-00012114	NUT, 1 5/8 UNISTRUT, 1/4-20, W/SPRING, STEEL	
30	2	ea	114586-537	MCO-00012113	SCREW, HEX HD, 1/4-20 x 3/4, SS.	
32	2	ea	114586-540	MCO-00012113	SCREW, HEX HD, 1/4-20 x 1-1/4, SS.	
34	2	ea	114586-548	MCO-00012113	SCREW, HEX HD, 1/4-20 x 3-1/4, SS.	
38	10	ea	114580-029	MCO-00012113	WASHER, FLAT, 1/4, SS.	
39	4	ea	114583-029	MCO-00012113	NUT, HEX, 1/4-20, SS.	
		pcs	62-153720	A.02 MCO-00026890	BALANCE WEIGHT KIT, EL/CL, 6012-91	

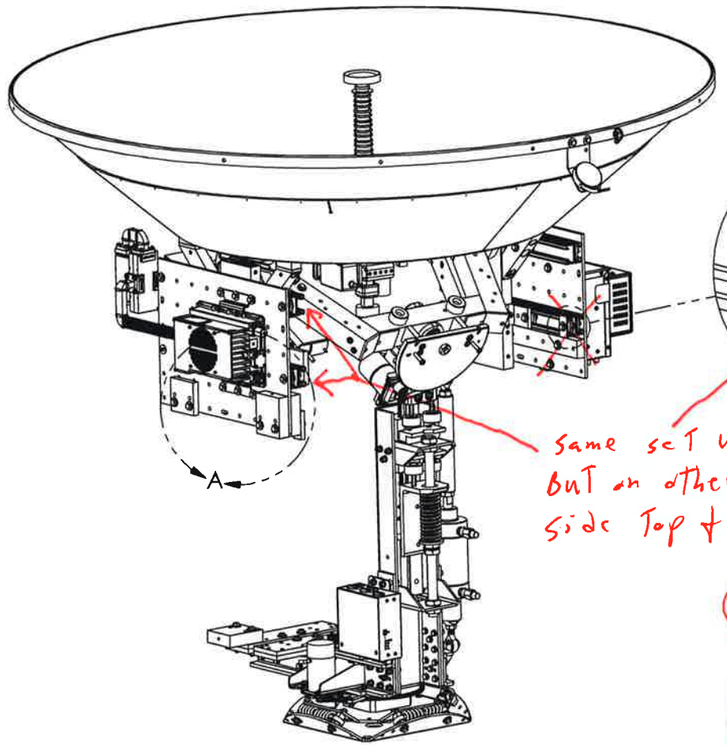
Created By: Mike Needham

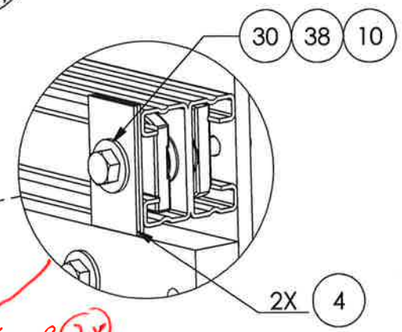
Create Time: 02/13/2018 08:27:22 AM PST

REVISION HISTORY				
REV	ECO	DATE	DESCRIPTION	BY

REF:

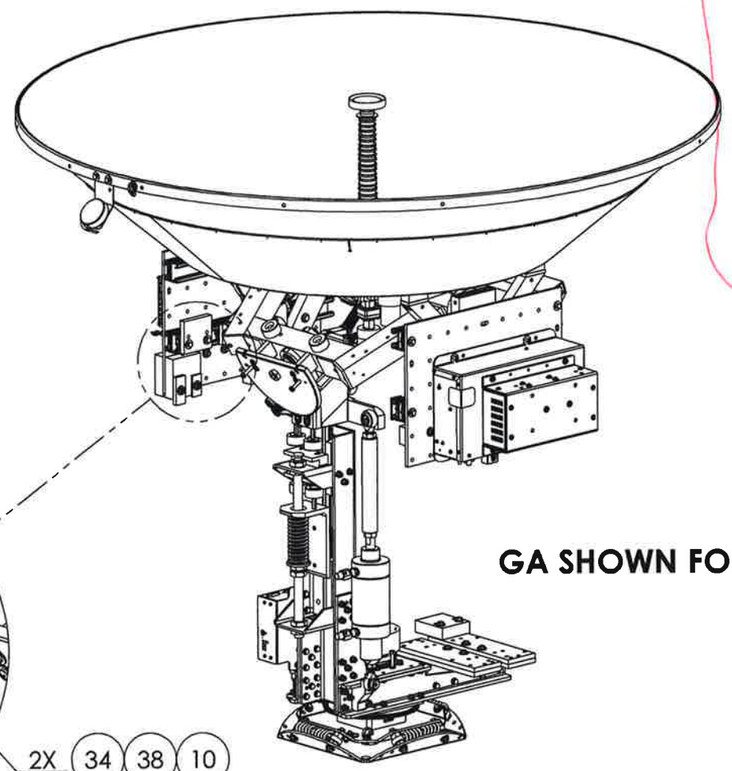
ECO-00019460 for BOM Changes.



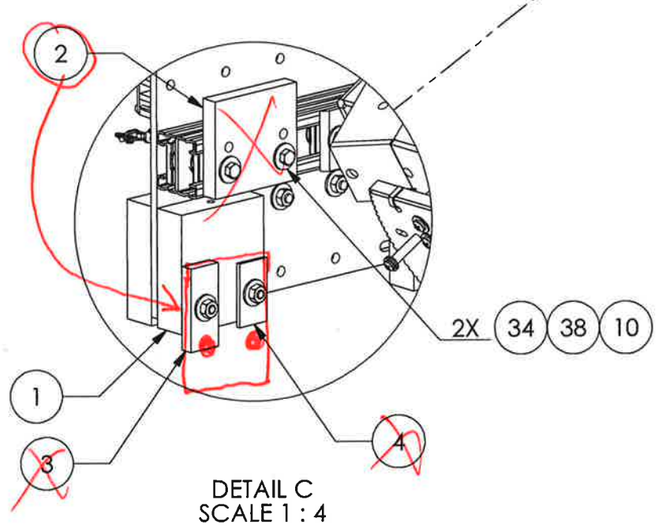


Same set up (2X) but on other side Top & Bottom

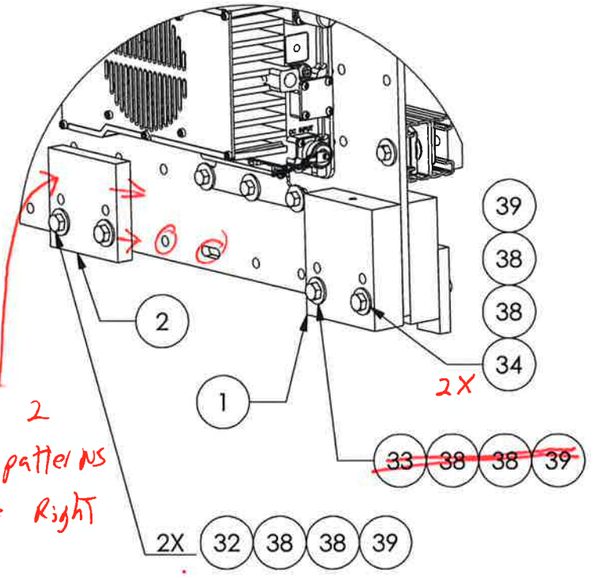
DETAIL B
SCALE 1 : 2



GA SHOWN FOR REFERENCE ONLY



DETAIL C
SCALE 1 : 4



move 2 Bolt patterns to the Right

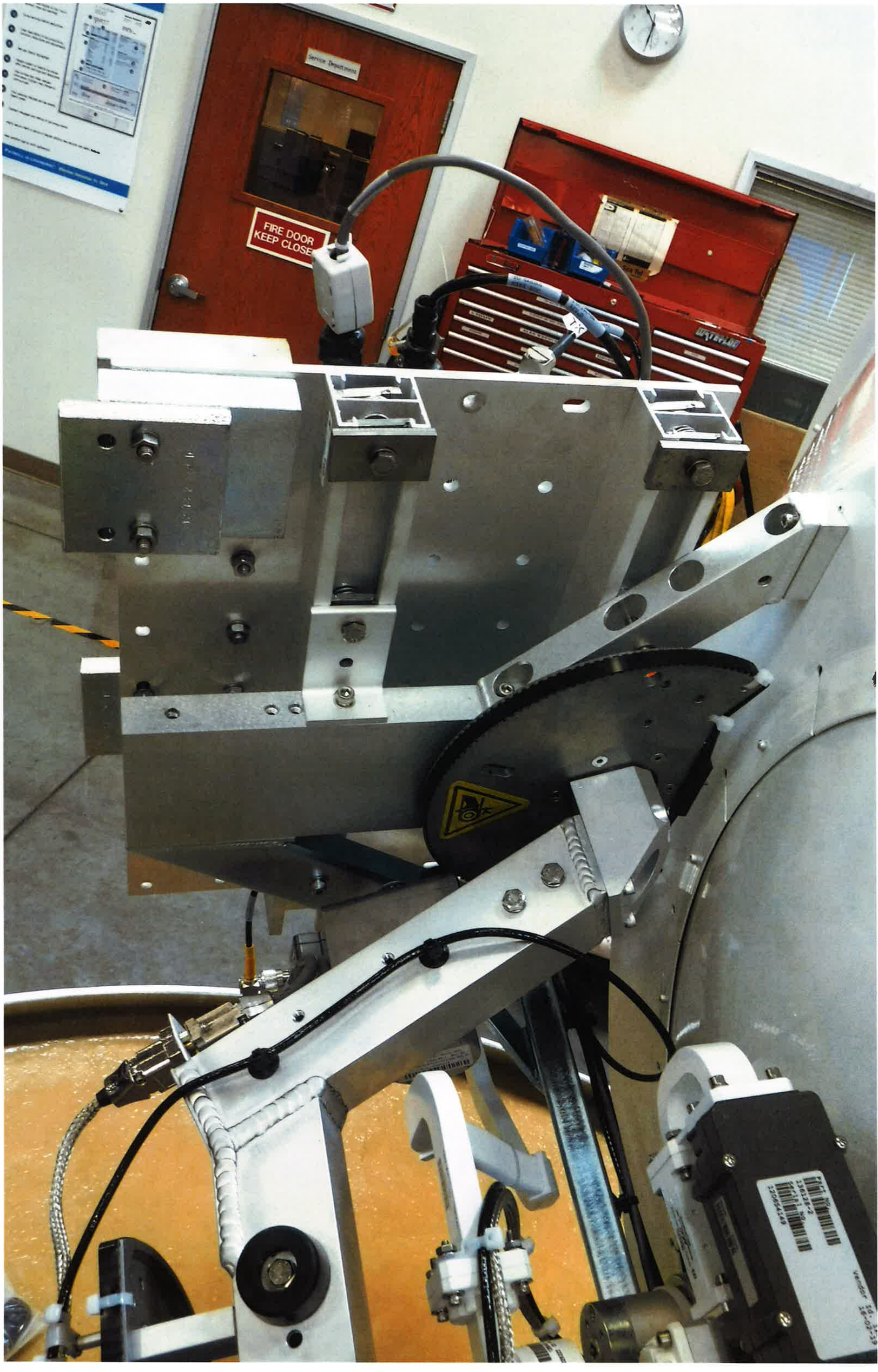
DETAIL A
SCALE 1 : 4

NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEATEL STANDARD 122298.
2. THIS DRAWING GOVERNS THE ASSEMBLY OF ALL VARIANTS OF THE PART NUMBER 62-153720, 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.
3. COUNTERWEIGHTS SHOWN ARE STARTING POINT ONLY. TRIM/ADJUST AS NEEDED TO ACHIEVE PROPER BALANCE.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5°	DESIGNER/ENGINEER: K DONOVAN	DRAWN BY: K.D.H.	COBHAM Sea Tel, Inc., dba Cobham SATCOM, Concord Tel. 925-798-7979 Fax. 925-798-7986
	WEIGHT:	DRAWN DATE: 9-22-16	
INSPECTION DIMENSIONS NOTED BY (X.X) SHALL HAVE FEATURE SIZE DIMENSIONS AND ASSOCIATED GD&T TOLERANCES INSPECTED	MATERIAL: N/A	APPROVED BY:	TITLE: BALANCE WEIGHT KIT, EL/CL, 6012-91
INTERPRET TOLERANCING PER ASME Y14.5 - 2009	FINISH: N/A	APPROVED DATE:	
	SURFACE ROUGHNESS:	SIZE B / SCALE: 1:12	DRAWING NUMBER 97-153720 / REV A
	3rd ANGLE PROJECTION	FIRST USED: 6012-91	SHEET NUMBER 1 OF 1

DOCUMENT NO. 99-148645-A


Service Department
FIRE DOOR
KEEP CLOSE

SINGLE LEVEL MFG BILL OF MATERIAL

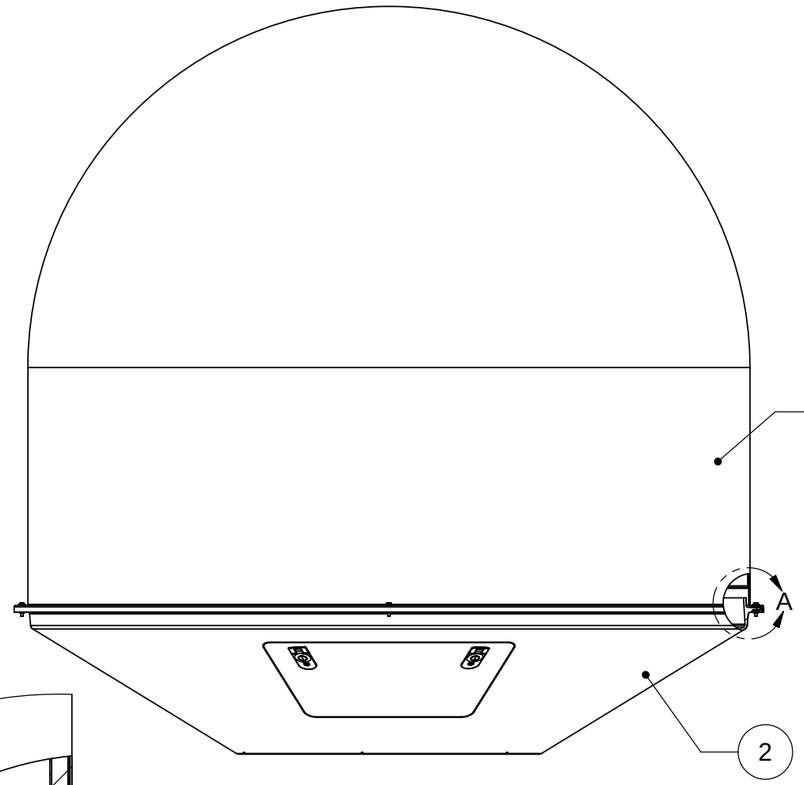
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128652-1	A2	RADOME TOP FAB, 76 IN, WHITE	
2	1 EA	130395-1	A3	RADOME BASE ASS'Y, 76 IN, WHITE	
3	1 EA	130390-2	B	KIT, HARDWARE, GA TO RADOME, RAISED	
4	1 EA	130394-2	D	KIT, HARDWARE, RADOME TO MAST, 12-HOL	
5	4 EA	119801-012	B	CABLE TIE, NYLON, 4 IN, NATURAL	(NOT SHOWN) ,
6	7 EA	119801-019	B	CABLE TIE, NYLON, 7.5 IN, NATURAL	(NOT SHOWN) ,
7	1 OZ	125948-1	A	ADHESIVE, HOT MELT, 3M SCOTCH-WELD 37	(NOT SHOWN) ,
8	2 EA	111679-7	B	CABLE CLAMP, NYLON, .50 DIA, #8 MTG H	
9	1 EA	111679-25	B	CABLE CLAMP, NYLON, 3/4 DIA, #10 MTG	
10	5 EA	124903-1	B3	STRAIN RELIEF ASS'Y (CABLE GLAND)	(NOT SHOWN) ,
53	8 EA	119745-218		SCREW, PAN HD, PHIL, M4 x 8	
54	16 EA	114580-230		WASHER, FLAT, M4, S.S.	
56	4 EA	114589-141		SCREW, HEX HD M6X35	
57	8 EA	130371-170	A	WASHER, NYLON, 6.4 ID, 12 OD	
58	8 EA	120089-251		NUT, HEX, M6, S.S.	
64	8 EA	125806-7	A	ROTALOC HEX NUT, SS-1-B38-M4 X 07-6H	
101	1 EA	131412	A	CRATE, 76 IN RADOME, OD: 88 X 88 X 87	
102	1 EA	131469-1	A1	SHIPPING KIT, ASS'Y	

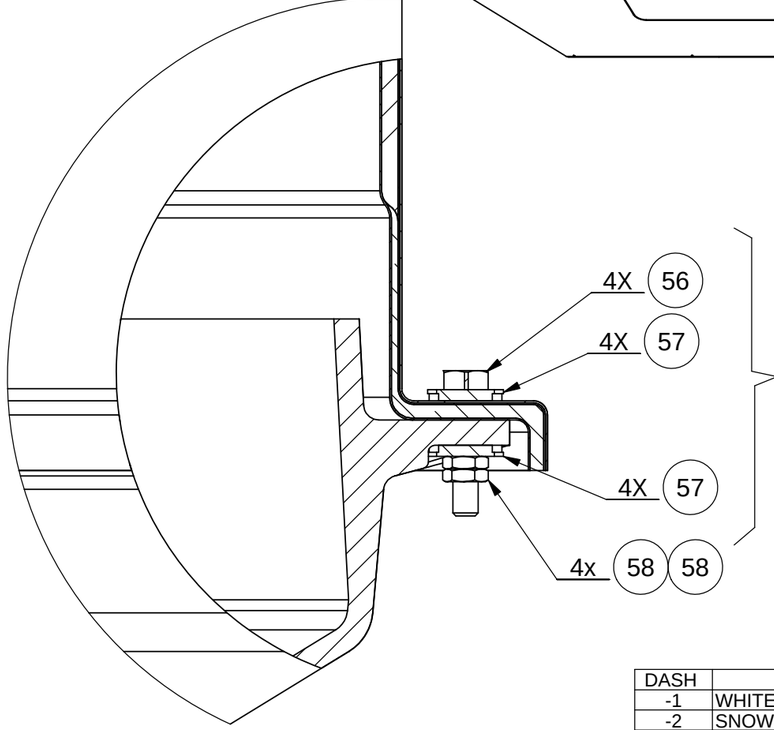
Sea Tel
COBHAM

RADOME ASS'Y, GA INSTALL, 76 IN, TX/RX, WHITE

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	2/20/2013	1 OF 1	130028-1	E

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6702	06-04-09	ITEM 2 WAS 125605-1, ITEM 3 WS 118576, ITEM 4 WS 123549-2. CHG HW PER RED LINES. REV WS X5.	SL
B	6749	06-29-09	ADD SECTION B-B; ITEM 3 OF -1 & -2 WERE 130390-1 AND -3 & -4 WERE 118576	HT
B1	7075	2-24-10	DASH 1 ONLY, DOOR LATCHES WAS BLACK, CHANGED TO WHITE.	K.D.H.
B2	N/A	05/07/10	ADDED DASH 5.	KRB
C	7122	7-12-10	ALL DASH, ADD ITEM 10; ADD NOTES 4 & 5; UPDATE TITLE BLOCK.	K.D.H.
D	9090	03/06/12	ITEM 10 WAS QTY 3. ITEM 2 WAS 125605 OF CORRESPONDING COLOR. ITEM 4 WAS 123549-2. MISC. HARDWARE CHANGES.	KRB

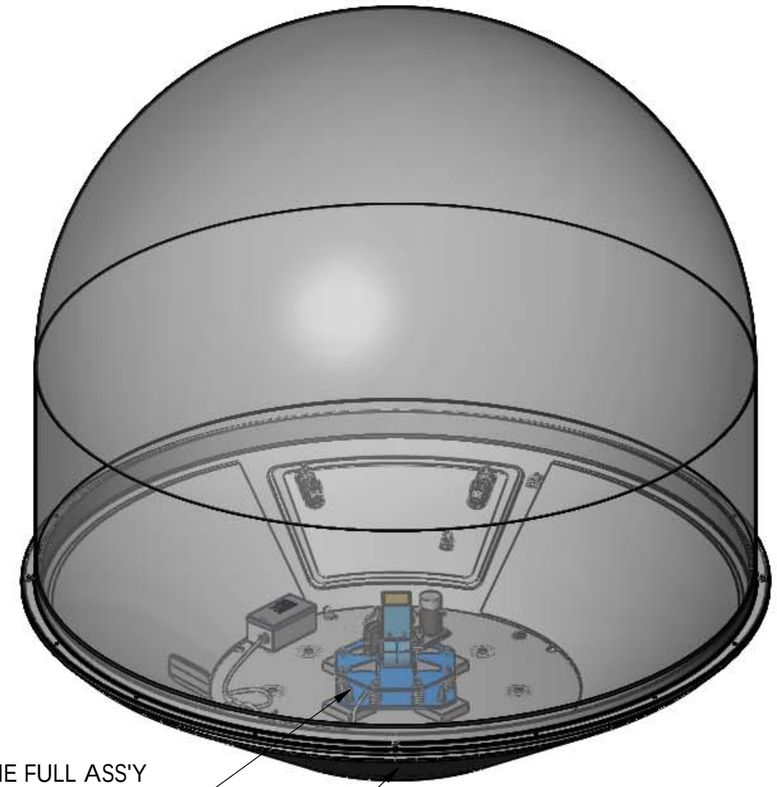




DETAIL A
SCALE 2 : 3

HARDWARE SHOWN IS FOR TRANSIT ONLY. REMOVE AND REPLACE WITH KIT 130394-2 AT FINAL INSTALLATION.

DASH	COLOR
-1	WHITE
-2	SNOW WHITE
-3	US NAVY GREY
-4	MATTERHORN WHITE
-5	BLACK, RAL 9005



PARTS OF THE FULL ASS'Y ARE OMITTED FOR CLARITY

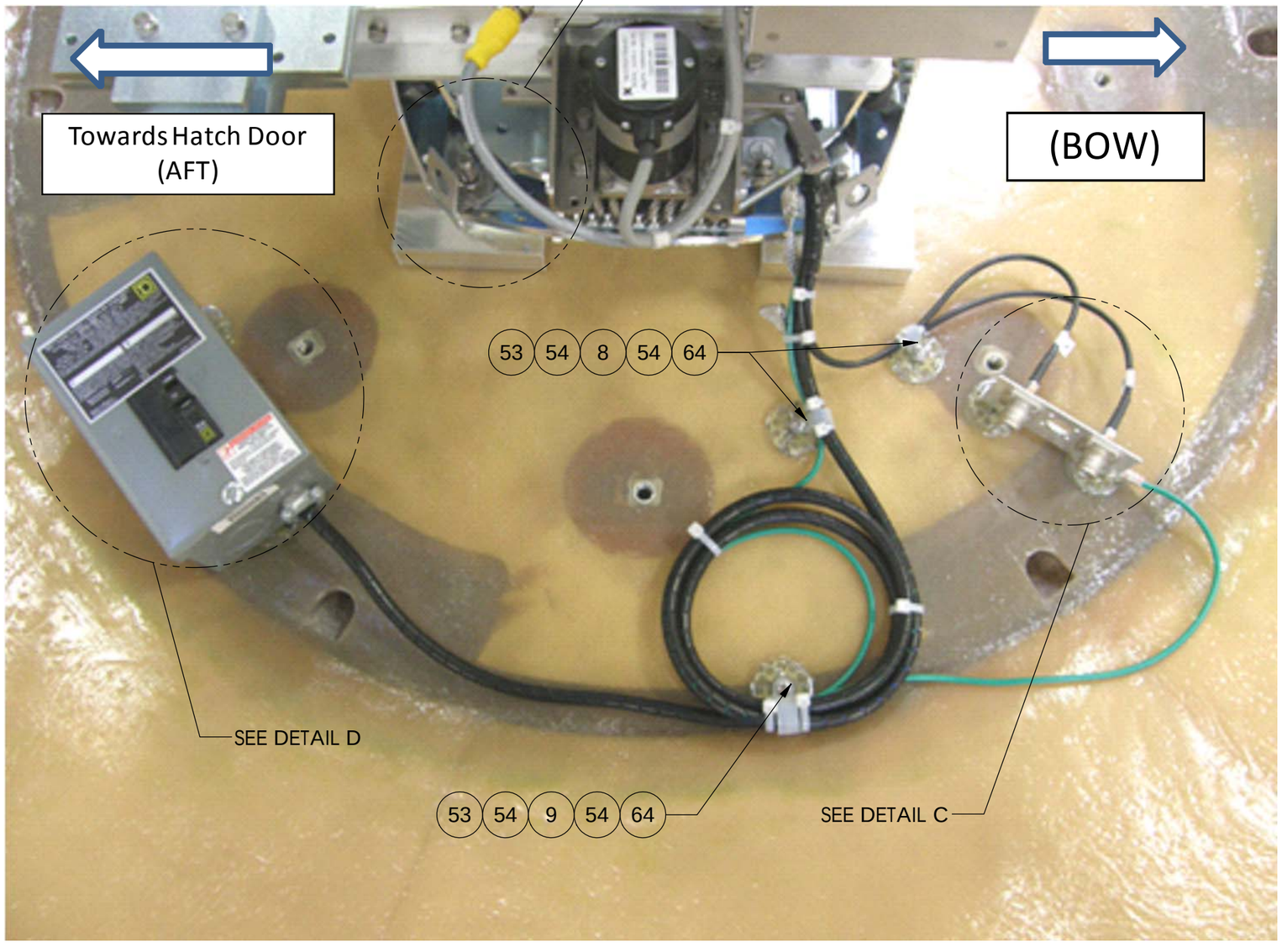
2

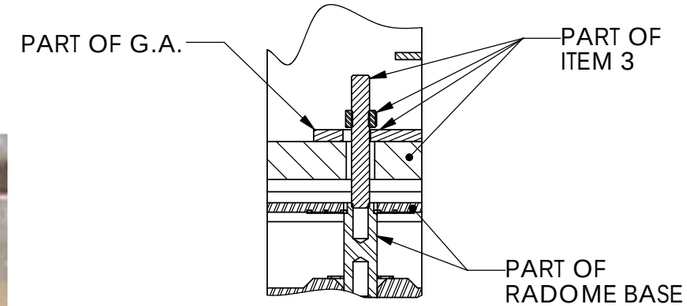
NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEA TEL SPEC. 122298.
2. BOW MARKER LOCATION DIRECTLY OPPOSITE FROM ACCESS DOOR.
3. BAG & ATTACH KIT (ITEM 4) AND STRAIN RELIEFS TO INSIDE OF RADOME.

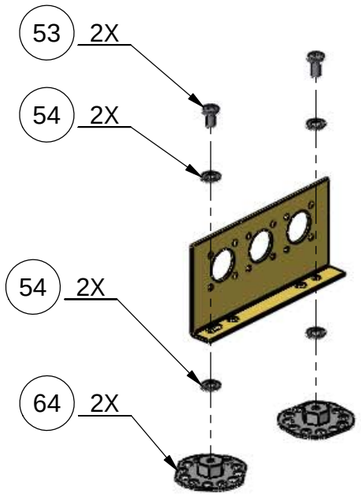
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES.
X.X = ±.050
X.XX = ±.020
X.XXX = ±.005
ANGLES: ±.5°
INTERPRET TOLERANCING PER ASME Y14.5 - 2009

DESIGNER/ENGINEER:		DRAWN BY: Simon L.	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
WEIGHT:		DRAWN DATE: 03-19-09	
MATERIAL: N/A		APPROVED BY:	TITLE: RADOME ASS'Y, GA INSTALL, 76 IN, TX/RX
FINISH: N/A		APPROVED DATE:	
SURFACE ROUGHNESS:	SIZE B / SCALE: 1:16	DRAWING NUMBER 130028	REV D
3rd ANGLE PROJECTION		FIRST USED: 6006	SHEET NUMBER 1 OF 2

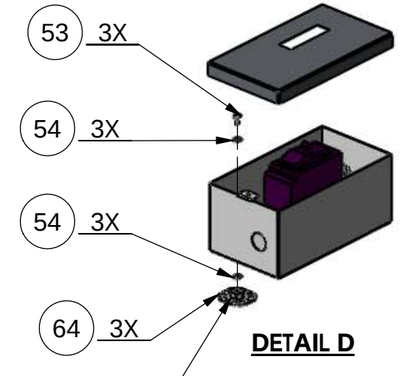




SECTION B-B (4 PLS)
SCALE 1 : 4
ROTATE: 90 ° CW



DETAIL C



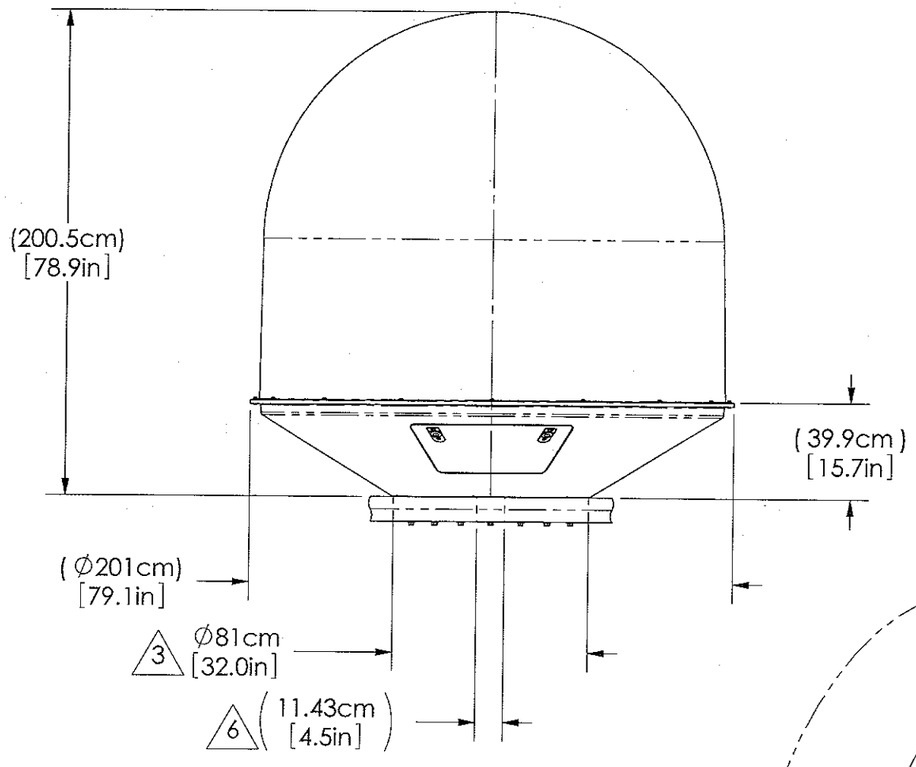
DETAIL D

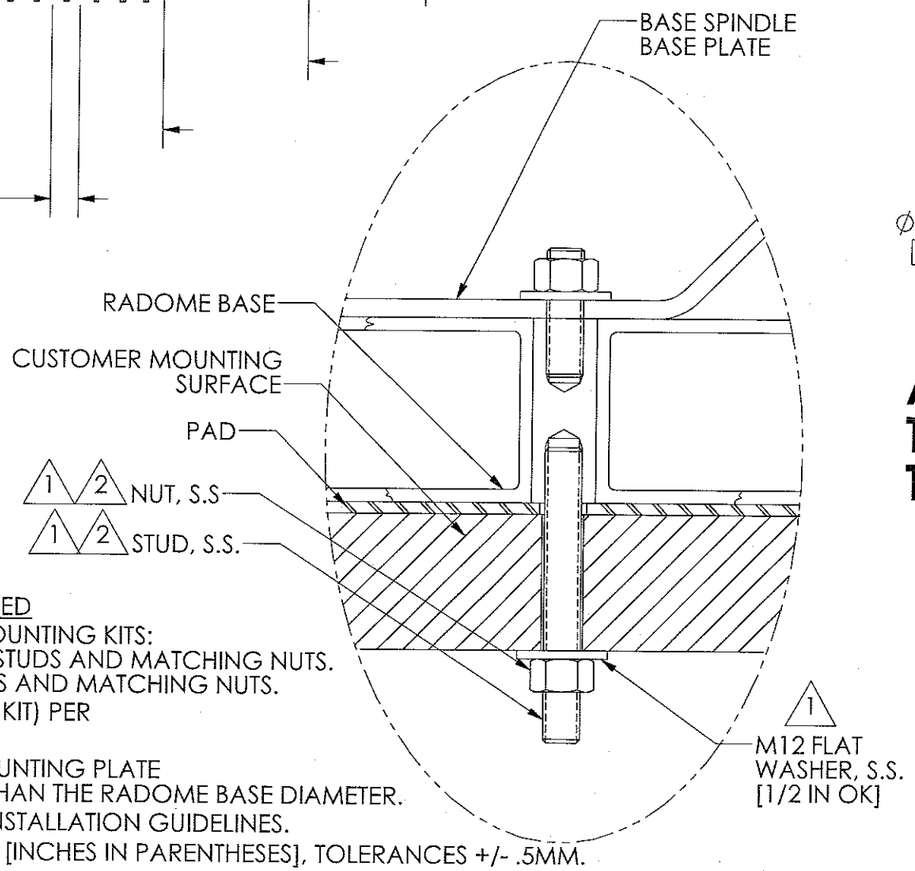
BONDING FASTENER

MOUNT INDICATED ITEMS IN
APPROXIMATE LOCATIONS AS SHOWN
(PARTIAL GENERAL ASSEMBLY
SHOWN FOR REFERENCE ONLY)

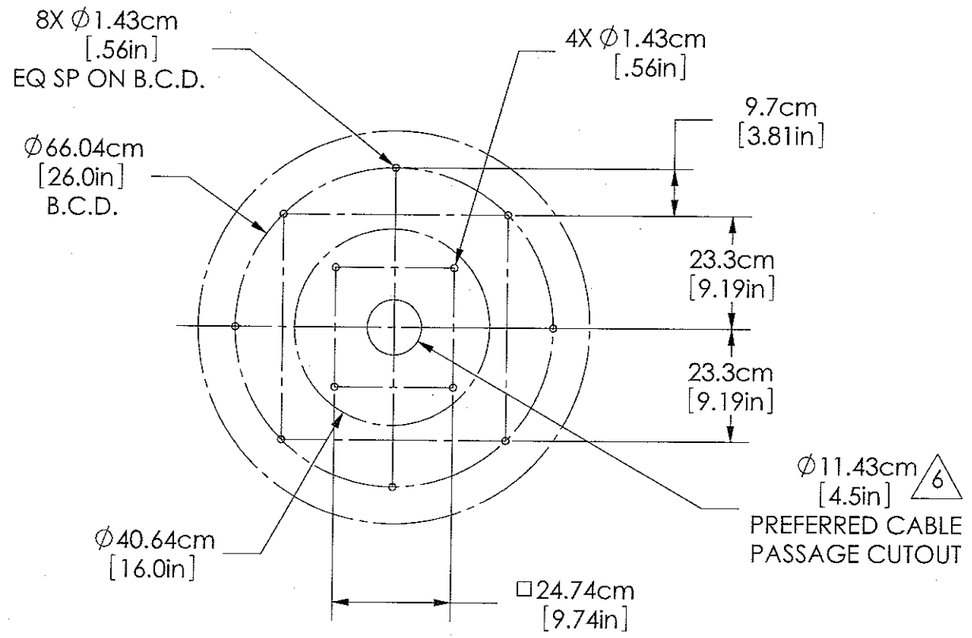
SIZE	SCALE:	DRAWING NUMBER	REV
B	1:10	130028	D
		SHEET NUMBER 2 OF 2	

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	01-05-06	PRODUCTION RELEASE, WS X1.	LAE
B	6762	07-10-09	ADD METRIC VALUES TO ALL DIMENSIONS.	SL
C	N/A	09-17-09	ADDED NOTES 3-5; NOTE 1: ADDED 130394-2; REF DWGS: ADDED 126153, 130028, 130029; SECTION VIEW: ADDED PAD.	AMN
D	N/A	01-29-10	ADDED 4.5 IN DIA PREFERRED CABLE PASSAGE CUTOUT (ZONE C3); ADDED NOTE 6.	AMN





BOW



MOUNTING SURFACE HOLE PATTERN

ALL HOLES MUST BE USED TO MOUNT THE ABOVE DECKS EQUIPMENT TO THE SHIP.

REFERENCE DRAWINGS
125849 RADOME ASS'Y, GA INSTALL, 76-IN, TX/RX
126153 RADOME ASS'Y, GA INSTALL, 76-IN, TVRO
130028 RADOME ASS'Y, GA INSTALL, 76-IN, TX/RX
130029 RADOME ASS'Y, GA INSTALL, 76-IN, TVRO

NOTES: UNLESS OTHERWISE SPECIFIED
1. INDICATED ITEMS ARE PART OF MOUNTING KITS:
   P/N: 123549-2 USES 1/2-13 X 2 1/2 STUDS AND MATCHING NUTS.
   P/N: 130394-2 USES M12 X 60 STUDS AND MATCHING NUTS.
2. APPLY ADHESIVE (PROVIDED WITH KIT) PER SEATEL SPEC 121720
3. MINIMUM DIAMETER OF MAST MOUNTING PLATE MUST BE EQUAL TO OR GREATER THAN THE RADOME BASE DIAMETER.
4. REFER TO DOC. NO. 130040 FOR INSTALLATION GUIDELINES.
5. DIMENSIONS ARE IN CENTIMETERS, [INCHES IN PARENTHESES], TOLERANCES +/- .5MM.
6. ENSURE CABLE PASSAGE CUTOUT EDGES HAVE NO SHARP EDGES, TO PROTECT CABLE.

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: T PATEL	Sea Tel COBHAM	
	DRAWN DATE: 12/19/06	Tel. 925-798-7979 Fax. 925-798-7986	
	APPROVED BY:	TITLE: INSTALLATION ARRANGEMENT 76-IN RADOME	
MATERIAL: N/A	APPROVED DATE: 1/29/2010		
FINISH: N/A	SIZE: B	SCALE: 1:4	DRAWING NUMBER: 125749 REV: D
3rd ANGLE PROJECTION	FIRST USED: 6006		SHEET NUMBER: 1 OF 1

1.0 Purpose. To define the installation procedure for installing strain reliefs in "smooth base" radomes.

2.0 Scope. This installation procedure applies to fiberglass radomes having Sea Tel's standard four-hole mounting pattern, and M12 mounting hardware, in the 80-180 cm (34-66 in) nominal size range, typically referred to as "smooth" base radomes. It also applies to our larger 193 cm (76-inch) radome having a twelve-hole mounting pattern. It is to be used where the preferred center cable exit may not be desired.

3.0 Tools/materials.

1. Electric drill.
2. Small drill bit 1/8" dia. (3-4mm dia.).
3. Hole saw, 1 3/8" dia. (35 mm), with mandrel and ¼" dia. pilot drill.
4. Medium file.
5. Two 1-1/2" (38 mm) adjustable pliers.
6. #2 Phillips screwdriver.
7. Fiberglass resin & catalyst, (marine grade) - at least 2 oz (50 cc).
   Such as Tap Plastics Marine Vinyl Ester Resin with MEKP Catalyst.
   Note: Use liquid resin, instead of paste type, due to better penetration.
8. Mixing cup – 4 oz (100 cc).
9. Disposable brush.
10. Strain Relief Assembly 124903-1, (one per cable).

4.0 Responsibilities. It is the responsibility of the installer to observe all standard safety precautions, including eye, slip, and chemical protection when performing this procedure.

4.1 Procedure.

Remove the standard cable pass through assembly 130818-1*
* N/A for 193 cm (76-inch) nominal size radomes. Refer to Fig 1, then use #2 Phillips screwdriver to remove 4 ea. attachment screws.

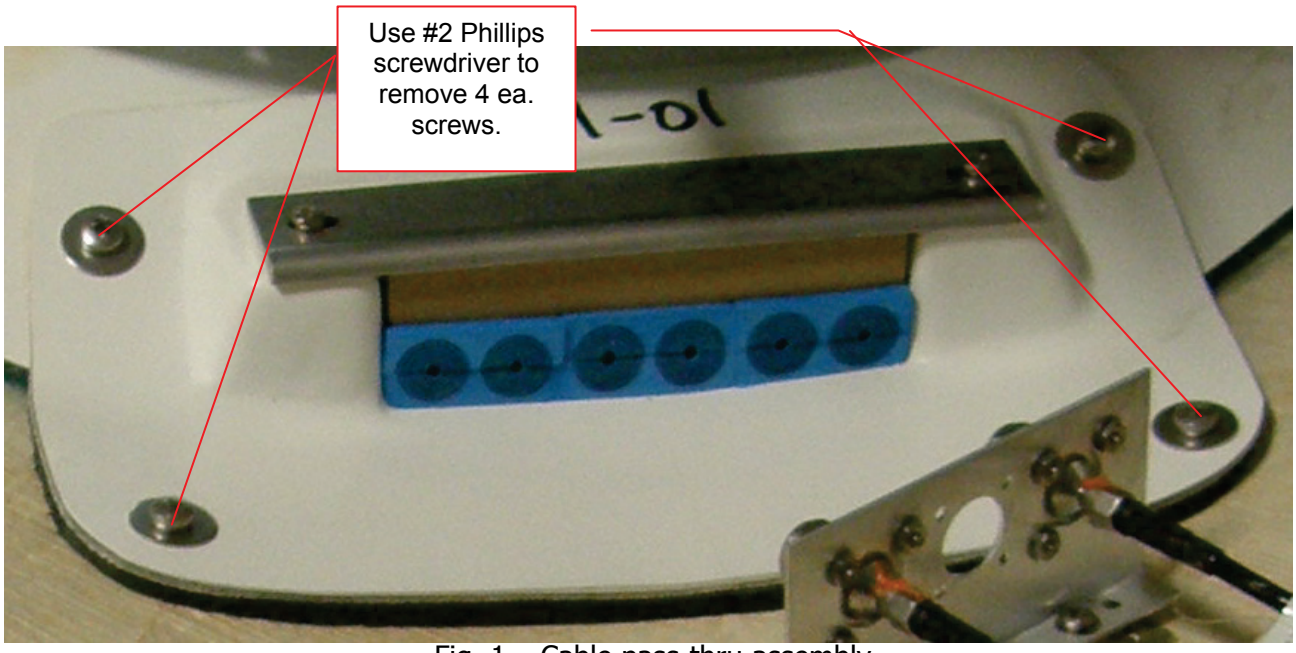


Fig. 1 – Cable pass-thru assembly

4.2 Making the holes

PLANNING: Space has been allowed for up to 5 ea. strain reliefs, but, install only as many as needed. (Typically only 2-3 for TX/RX systems). Refer to Fig 2 then plan which hole positions to use.
For 76-inch radomes lowest holes may be approx 1.5 inches from inside wall corner with floor (ref drawing 129416).
Note: The hole center-to-center distance given is the MINIMUM.

Follow good engineering practice and provide the largest spacing possible between holes as follows:

1 Hole pattern - "A".
2 Hole pattern - "B", "C".
3 Hole pattern - "A", "B", "C", ("A", "D", "E" PERMITTED).
4 Hole pattern - "B", "C", "D", "E".
5 Hole pattern - "A", "B", "C", "D", "E".

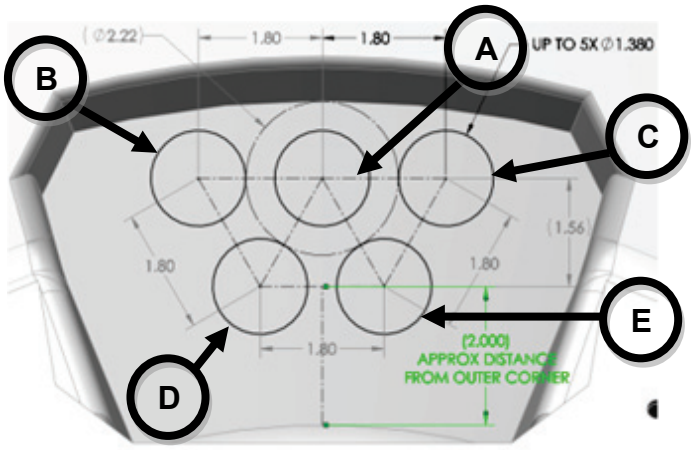


Fig. 2 – Planning
Measure in place or use template drawing 132234

Fig. 3 – (Up to) 5-Hole Pattern

4.3 Measure, mark and drill pilot holes

CAUTION: The hole locations cannot be determined accurately from outside of the radome.
Using full scale drawing 132234, provided in the strain relief kit, measure mark and drill pilot holes from the inside out, and using only light pressure, use the small drill bit, (~1/8" dia) to make a pilot hole through each planned location.

4.4 Use the hole saw from the outside with light pressure.

CAUTION: Using the hole saw from the inside is likely to damage the Gel Coat.

CAUTION: Heavy pressure on the hole saw from the inside is likely to damage the Gel Coat and splinter the fiberglass.

Working from the outside, use a 1-3/8" hole saw to make the holes for the planned strain reliefs.

4.5 After holes are drilled CAREFULLY use a file to clean the hole edges.

4.6 Test fit the strain reliefs in each location, then, make adjustments as necessary.

4.7 Sealing the hole edges.

CAUTION: Cut edges can allow water and/or ice ingress and weaken the fiberglass laminate or structural foam. It is essential to seal all cut edges thoroughly with fiberglass resin to preserve the radome's structural strength.

CAUTION: Fiberglass paste or RTV silicone sealant will not wick into and seal the fiberglass strands as well as fiberglass resin, ONLY use fiberglass resin (such as TAP PLASTICS MARINE VINYL ESTER, or equivalent) for sealing the cut edges.

Follow the manufacturer's instructions to mix a small amount of fiberglass resin and catalyst, then working quickly, use a disposable brush to apply mixed fiberglass resin to the hole edges, both inside and out.

Allow the fiberglass resin to set per resin manufacturer's instructions.

Note: Like all chemical reactions, set time will be temperature/humidity dependent.

4.8 Refer to strain relief assembly drawing 124903

Being careful not to damage either the radome or the strain relief threads, use adjustable pliers to install strain reliefs.

Fig. 4 – Outside view.

Fig. 5 – Outside view.

4.9 Rotate General Assembly (G.A.)

Once cables have been installed, rotate General Assembly (G.A.), to ensure cables are routed properly and do not interfere with azimuth rotation.

Fig. 6 – Inside view.

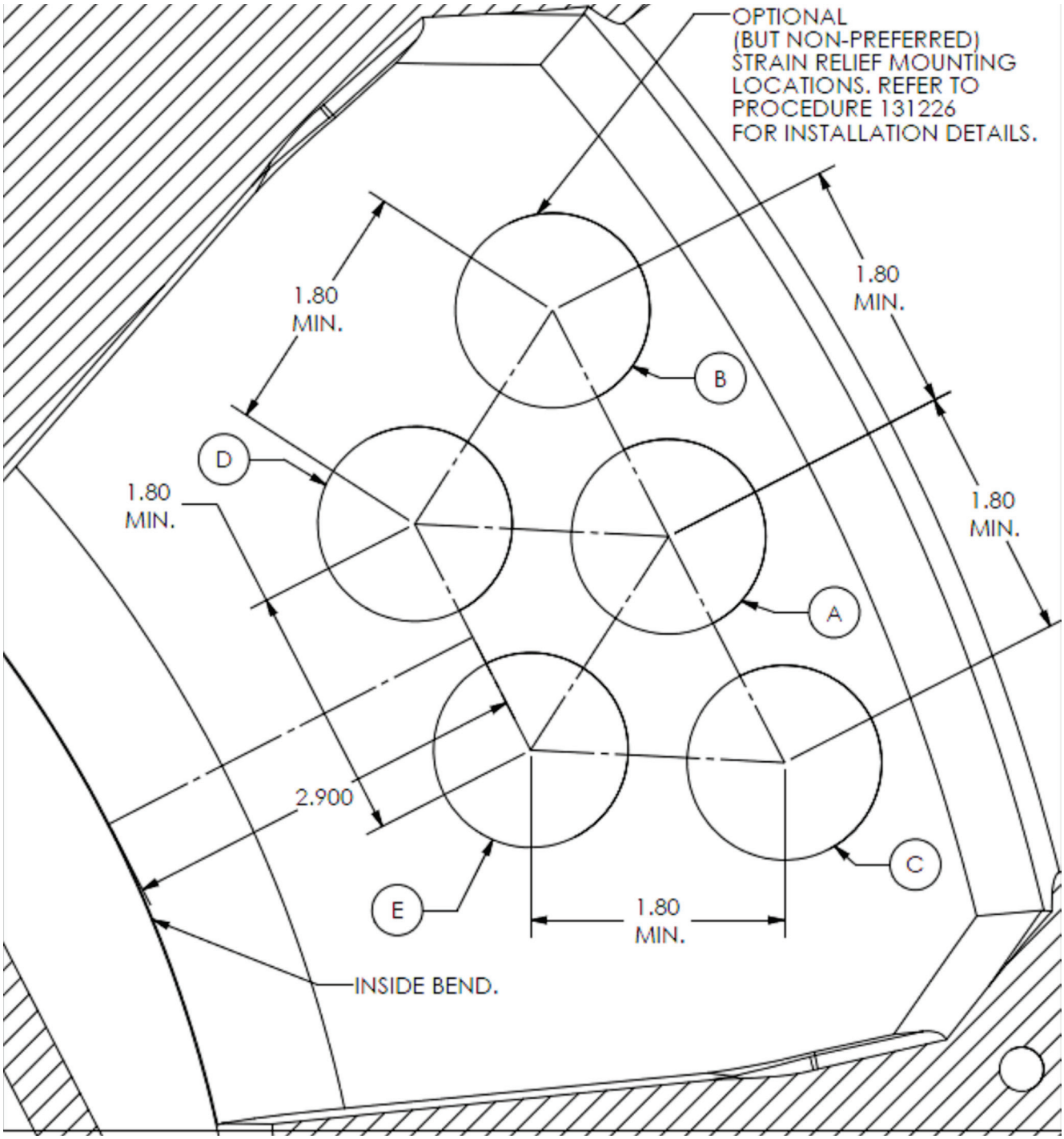
5.0 Records. N/A.

6.0 Training. N/A

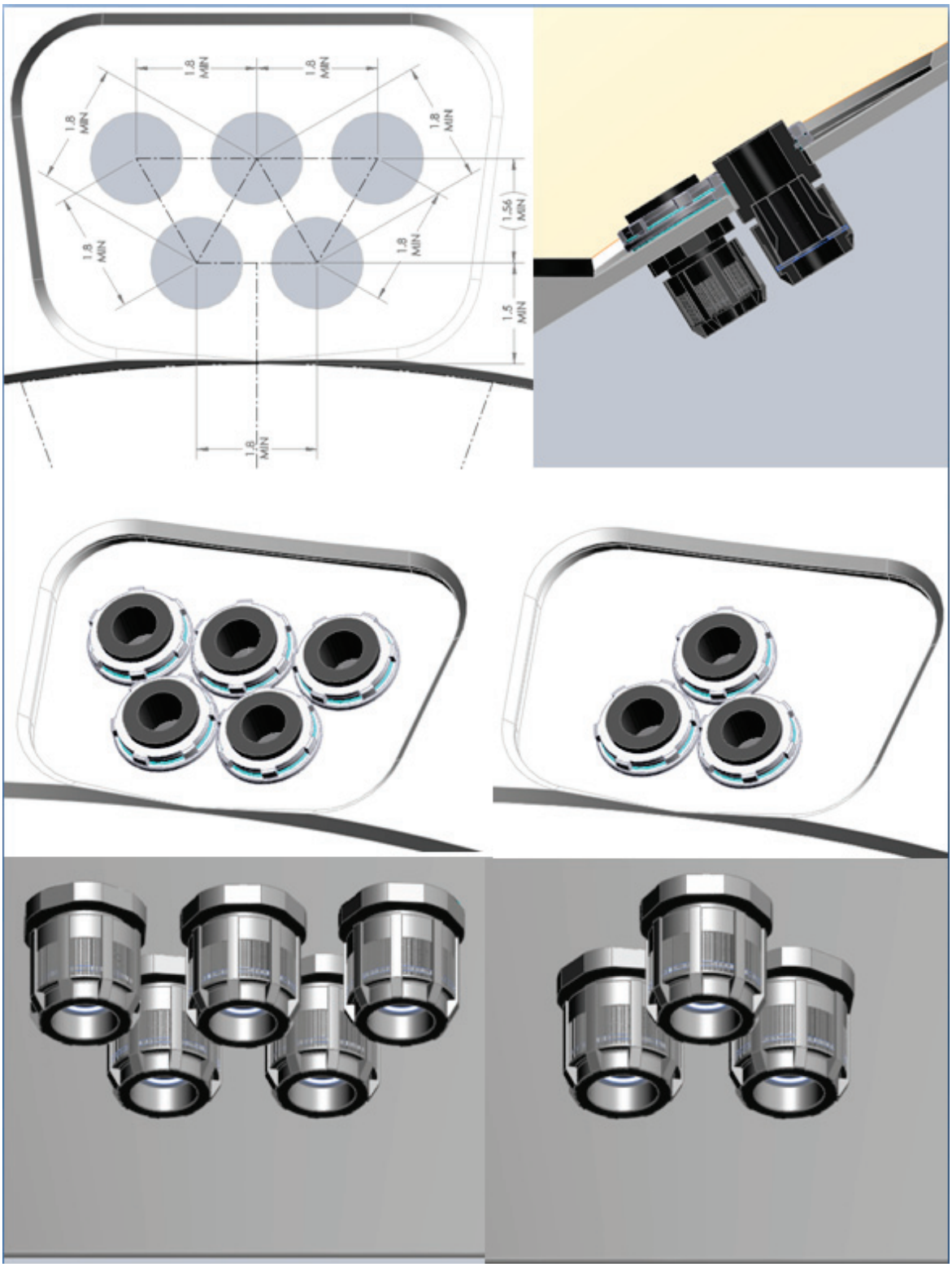
7.0 References.

Strain relief assembly drawing (P/N: 124903)
Template drawing (P/N 132234)

8.0 Strain relief positioning for 80-180 cm (34-66 in) smooth based radomes, (May use Sea Tel drawing 132234 as template.)



9.0 Strain relief positioning for 193 cm (76-inch) radomes.
(May use Sea Tel drawing 132234 as template.)



SINGLE LEVEL MFG BILL OF MATERIAL

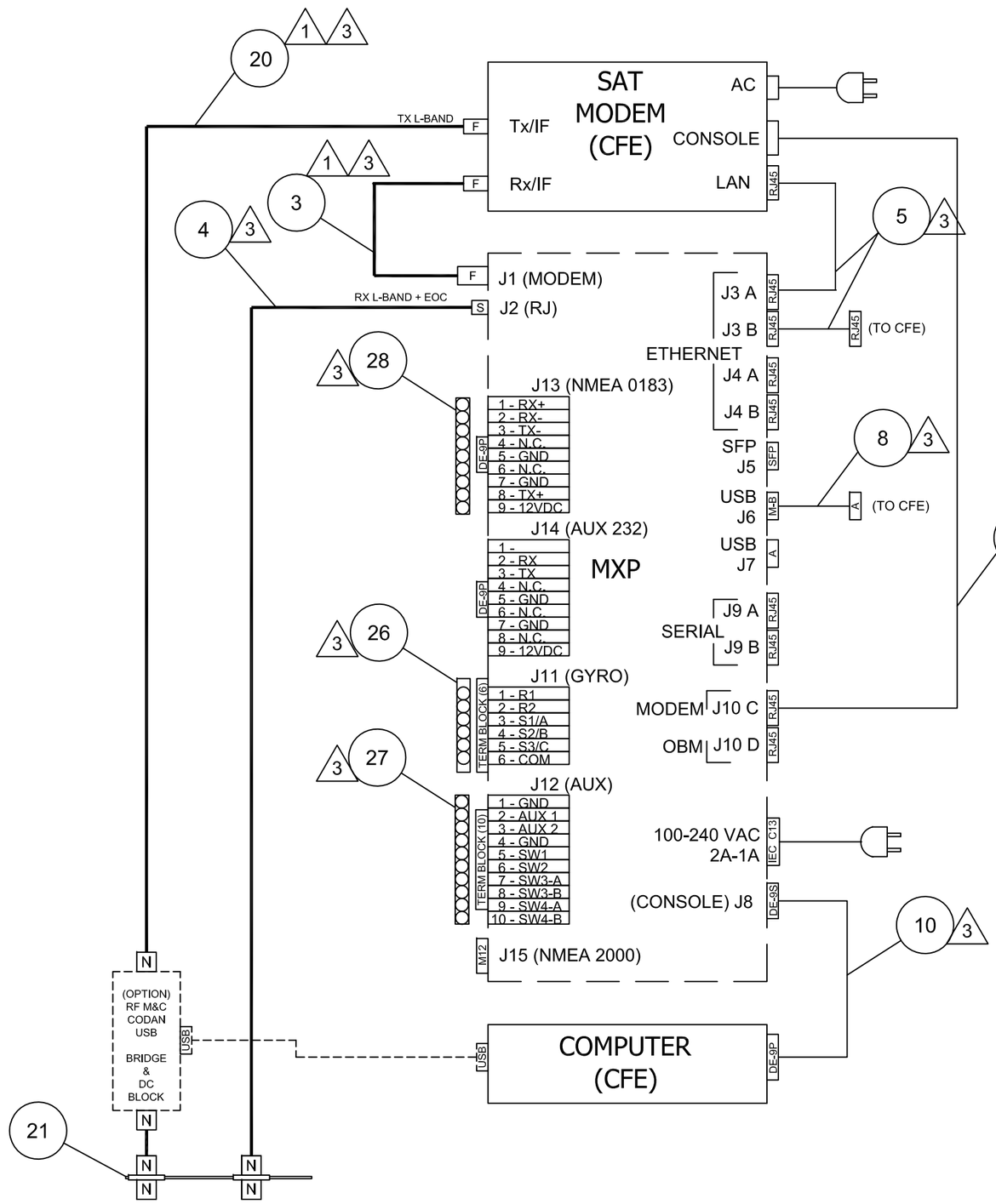
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	138633-4	A	BDE CABLE KIT, 4012GX (MXP)	
21	1 EA	136872	A1	BRACKET ASS'Y, CONNECTOR, RACK MOUNT	

Sea Tel
COBHAM

BELOW DECK KIT, 4012GX (MXP)

PROD FAMILY	EFF. DATE	SHT	DRAWING NUMBER	REV
COMMON	2/20/2013	1 OF 1	**134563-1**	**B**

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	9465	03-30-12	RELEASE TO PRODUCTION; REV WAS X6	HT
B	10089	12-5-12	ADD ITEM 1; REMOVE ALL ITEMS BUT ITEM 21; UPDATE NOTES; ADD MISSED SHEET 2 BACK FR REV X6	SL



SHEET	DESCRIPTION
1	iDirect 5000 Series
2	Comtech CDM-570L

NOTES UNLESS OTHERWISE SPECIFIED:

1. 75 OHM SATELLITE MODEM CONFIGURATION SHOWN. FOR 50 OHM MODEM CONFIGURATION, REPLACE ITEM 3 WITH ITEM 20 ON THE RX/IF PATH, AND ITEM 20 WITH ITEM 23 (REFER TO BOM) ON THE TX/IF PATH.
2. 50 OHM SATELLITE MODEM CONFIGURATION SHOWN. FOR 75 OHM MODEM CONFIGURATION, REPLACE ITEM 20 WITH ITEM 3 ON THE RX/IF PATH, AND ITEM 23 WITH ITEM 20 (REFER TO BOM) ON THE TX/IF PATH.
3. PART CABLE KIT; ITEM NUMBERS REFER TO THE CABLE KIT BOM
4. MFR PER SEA TEL SPEC 122298.

REFERENCE DRAWINGS:

134639 SYSTEM BLOCK DIAGRAM,
134640 ANTENNA SYSTEM SCHEMATIC

REFERENCE DRAWINGS:

134640 ANTENNA SYSTEM SCHEMATIC
131790 ANTENNA PEDESTAL SCHEMATIC, XX09

DRAWN BY:	RML
DRAWN DATE:	6/7/2011
APPROVED BY:	
APPROVED DATE:	

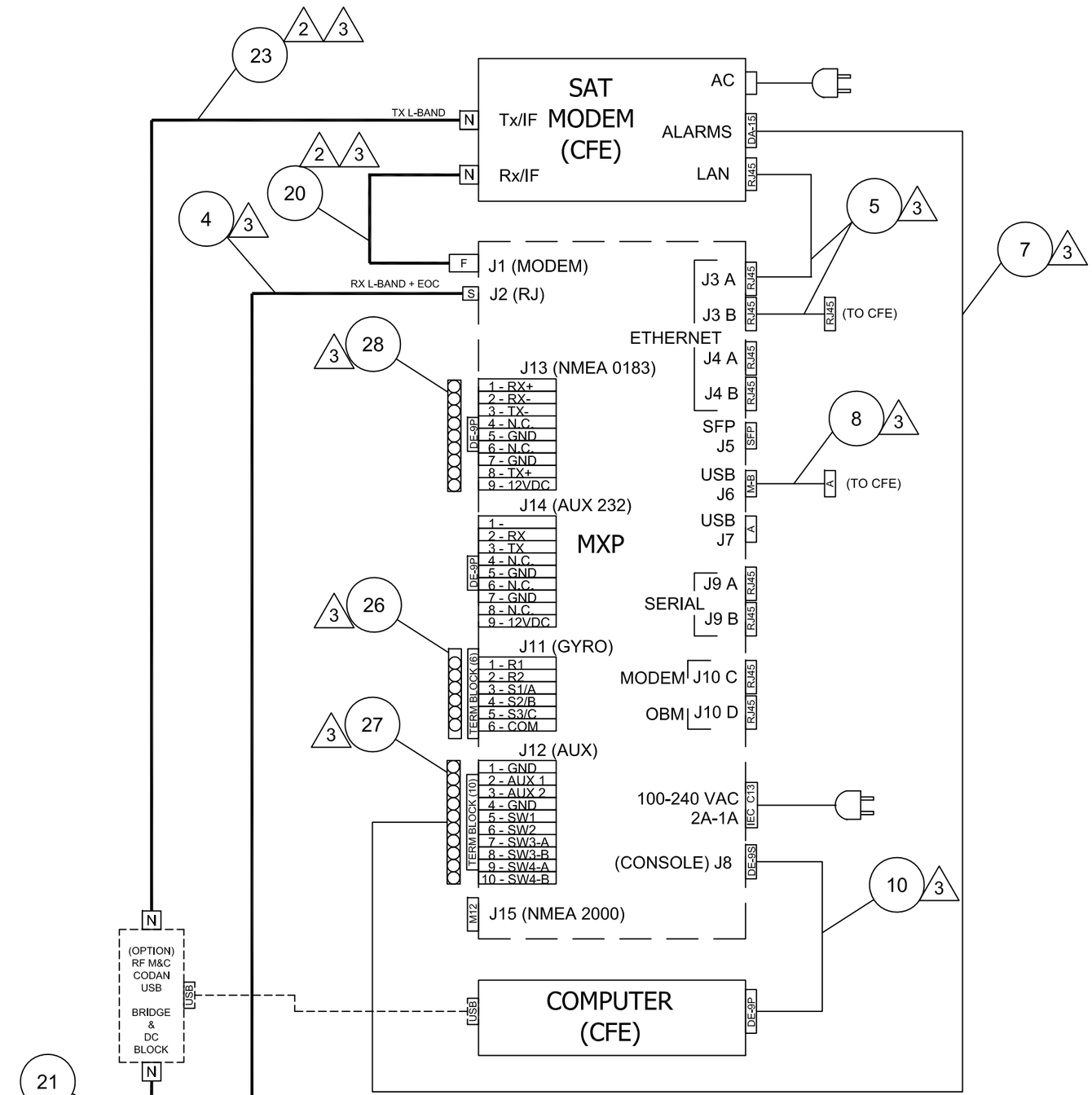
Sea Tel COBHAM
Tel. 925-798-7979 Fax. 925-798-7986

TITLE: BELOW DECK KIT
4012 GX (MXP)

SIZE	SCALE:	DRAWING NUMBER	REV
B	NONE	134563	B

FIRST USED: 4012 SHEET NUMBER 1 OF 2

DOCUMENT NO. 124225-4_A



SIZE	SCALE:	DRAWING NUMBER:	REV:
B	NONE	134563	B
		SHEET NUMBER: 2 OF 2	

DOCUMENT NO. 124225-4_A