Sea Tel 6011-4 C/Ku-Band TVRO Satellite Antenna Installation Manual

EAR Controlled - ECCN EAR99

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Sea Tel, Inc. (trading as Cobham SATCOM) 4030 Nelson Avenue Concord, CA 94520 Tel: +1 (925) 798-7979 Fax: +1 (925) 798-7986		Thrane & Thrane A/S (trading as Cobham SATCOM) Lundtoftegaardsvej 93 D, 2800 Kgs. Lyngby, Denmark Tel: +45 3955 8800 Fax: +45 3955 8888

Web: http://www.cobham.com/satcom ***Email:*** satcom.ohc@cobham.com

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

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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 TVRO 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.

Revision History

REV	DCO#	Date	Description	By
A	00026901	August 31, 2018	99-134136-A supersedes 134136. Reformat, update text, specs and drawings.	MDN

Sea Tel Inc.
4030 Nelson Ave., Concord
California, 94520, USA
T: +1 (925) 798-7979
F: +1 (925) 798-7986

RED Declaration of Conformity

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

3004 Ku Band TVRO Maritime Satellite Earth Station.
4004 Ku Band TVRO Maritime Satellite Earth Station.
5004 Ku Band TVRO Maritime Satellite Earth Station.
6004 Ku Band TVRO Maritime Satellite Earth Station.
6009 C-Band TVRO Maritime Satellite Earth Station.
6011 C/Ku Band TVRO Maritime Satellite Earth Station.
ST24 Ku Band TVRO Maritime Satellite Earth Station.
ST88-21 C/Ku Band TVRO Maritime Satellite Earth Station.
ST94-21 C/Ku Band TVRO Maritime Satellite Earth Station.
ST144-21 C/Ku Band TVRO Maritime Satellite Earth Station.

Harmonized Standards:

EMC:

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

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.

Sea Tel, Inc
Concord, CA

Peter Blaney, Chief Engineer

09 Feb 2018
Date

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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.

Access to the interior of the Above Decks Equipment (ADE), is allowed for inspection of components as described in the Scheduled Inspections section of this manual may be accomplished by a technician/engineer. Maintenance of the ADE should only be performed by technicians/engineers who are authorized by Cobham SATCOM. Only authorized Partners who have received factory training on this equipment will be able to file a claim for warranty reimbursement. Failure to comply with standard practices, which include but are not limited to modification of the terminal away from factory documented assemblies may also void the warranty period.

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.

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

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2. 6011-4 System Configuration(s)

The 6011-4 Stabilized Antenna system is used for TeleVision Receive Only (TVRO) satellite communications. It is comprised of two major groups of equipment: the Above Decks Equipment (ADE) and the Below Decks Equipment (BDE). There is also interconnecting cables between the ADE and BDE and cables to provide other inputs to the system.

2.1. System Cables

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

2.2. Other Inputs to the System

Multi-conductor cables from Ship's Gyro Compass and computer may also be connected in the system.

2.3. Simplified Block Diagram of a 6011-4 System

This TVRO 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.

The design of the 6011 is based on Sea Tel's QOR (Quadrature Oriented Reflectors), which incorporates two high efficiency back fire circular/linear orthogonal antenna systems utilizing a common suite of electronics on the same stabilized pedestal. Either of the reflectors can be remotely selected from the Antenna Control Unit.

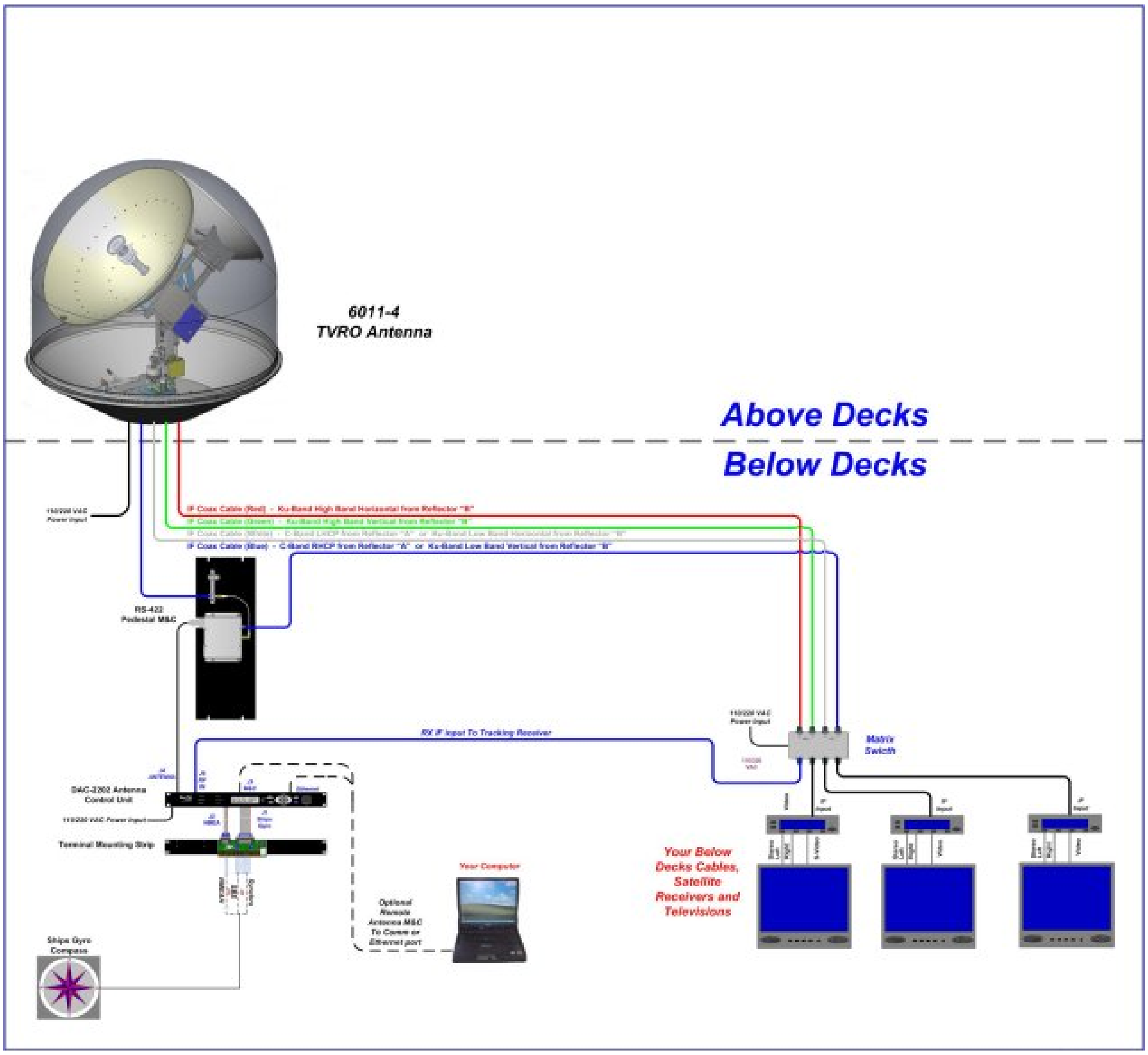
All equipment comprising the Above Decks is incorporated inside the radome assembly and is integrated into a single operational entity. For inputs, this system requires only an unobstructed line-of-sight view to the satellite, Gyro Compass input and AC electrical power.

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

- Stabilized antenna pedestal
- C-Band Antenna (Reflector A) with circular feed and LHCP and RHCP LNBs.
- Ku-Band Antenna (Reflector B) with linear feed and Quad Universal Linear LNB.
- Radome Assembly

B. Below-Decks Equipment Group

- Antenna Control Unit
- Terminal Mounting Strip Assembly.
- Base Modem Panel
- Customer Furnished Equipment - Multi-switch, Satellite Receiver(s), Television(s) and other below decks equipment required for the desired TVRO system.
- Appropriate Coaxial and multi-conductor cables.


6011-4
TVRO Antenna
Above Decks
Below Decks
RS-422
Pedestal M&C
IF Coax Cable (Red) - Ku-Band High Band Horizontal from Reflector "B"
IF Coax Cable (Green) - Ku-Band High Band Vertical from Reflector "B"
IF Coax Cable (White) - C-Band LHCP from Reflector "A" or Ku-Band Low Band Horizontal from Reflector "B"
IF Coax Cable (Blue) - C-Band RHCP from Reflector "A" or Ku-Band Low Band Vertical from Reflector "B"
RX IF Input To Tracking Receiver
Matrix
Switch
DAC-2202 Antenna
Control Unit
Terminal Mounting Strip
Your Computer
Optional
Remote
Antenna M&C
To Comm or
Ethernet port
Ships Gyro
Compass
Your Below
Decks Cables,
Satellite
Receivers and
Televisions

3. Site Survey - Shipboard

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*

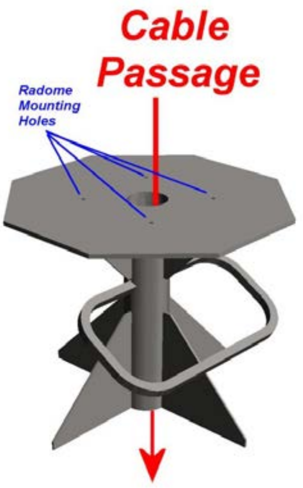
3.3.1. Mounting on Deck or Deckhouse

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.

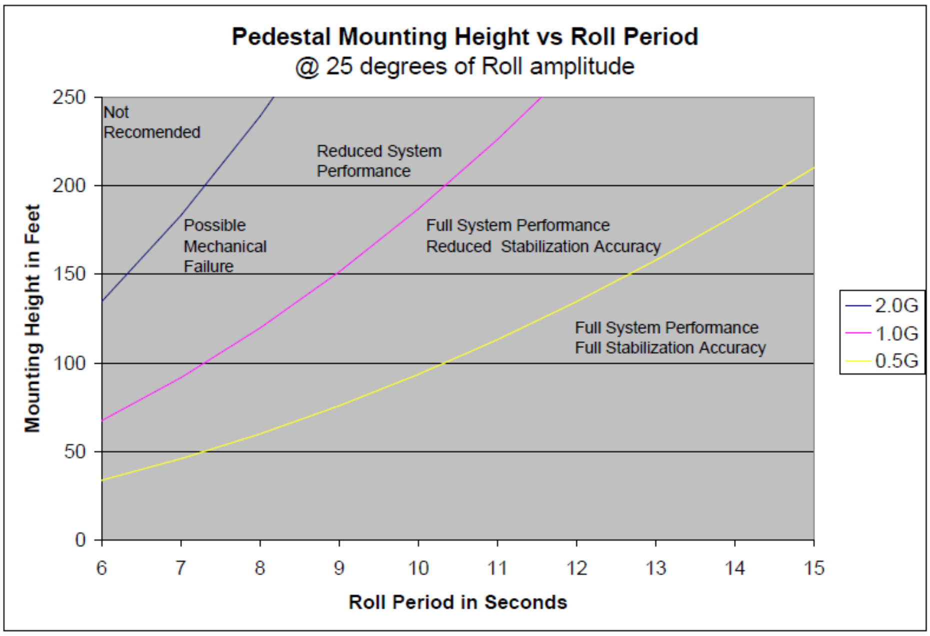
3.4. Mounting Height

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

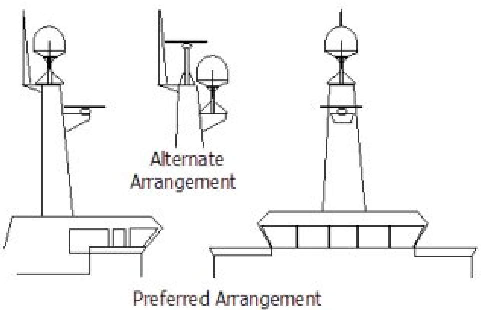
Sea Tel recommends mounting the ADE in a location that has both a clear line-of-sight to the target satellites in all potential azimuth/elevation ranges and sufficient support against vibration excitement. If possible, mounting the ADE pedestal directly to ship deckhouse structures or other box stiffened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



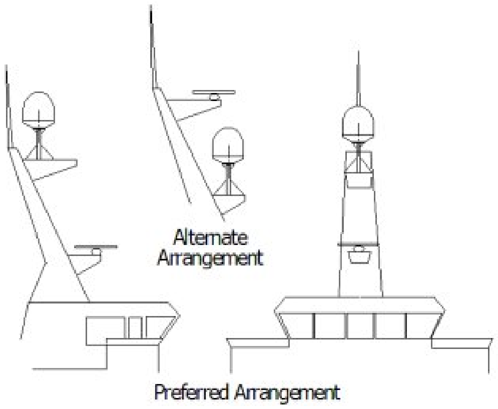
sailing mast and adapted for mounting the ever-increasing array of antennae which ships need to communicate with the world. This drawing of a vertical mast shows the preferred mounting of the ADE center-line above the plane of the radar. Alternatively the ADE is mounted below the plane of the radar signal

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

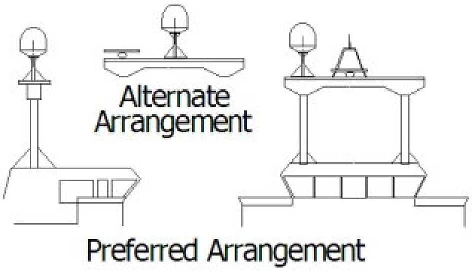
Raked masts are found on vessels where the style or appearance of the entire vessel is important. Again, the inclined mast is a direct descendant from the masts of sailing ships – as ship owners wanted their vessels to look more unique and less utilitarian, they 'raked' the masts aft to make the vessel 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 and other equipment that are standard 19" rack mount design should be installed in one of these racks. Plan to allow access to the rear of the equipment in the rack.

The Satellite Receiver, router, computers and any other associated equipment should be properly mounted per their design.

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. 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.

3.8.4. Gyro Compass Cable

Use good quality shielded cables (twisted pairs, individually foil wrapped, outer foil with braid overall is best). You only need 2-wires for NMEA signal, 4-wires for Step-By-Step and 5-wires 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.

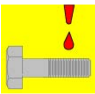
Your antenna may have been ordered in any one of a variety of different diameter radomes. The installation instructions for most common radome sizes for your system are below.

4.1. Unpacking and Inspection

Exercise caution when unpacking the equipment.

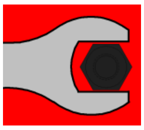
1. Unpack the crates. Carefully inspect the radome surface for evidence of shipping damage.
2. Unpack all the boxes.
3. Inspect everything to assure that all materials have been received and are in good condition.

4.2. Assembly Notes and Warnings



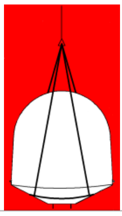
NOTE: *All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.*

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.

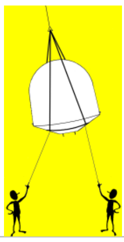


WARNING: *Assure that all nut and bolt assemblies are tightened according to the tightening torque values listed below:*

SAE Bolt Size	Inch Pounds	Metric Bolt Size	Kg-cm
1/4-20	75	M6	75.3
5/l6-18	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.*

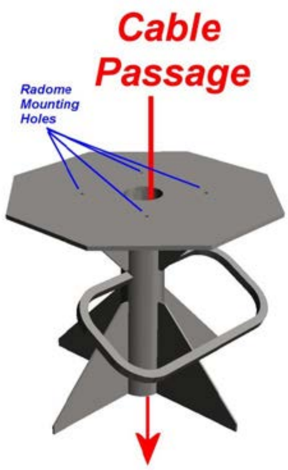


CAUTION: *The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while hoisting the antenna assembly to its assigned location aboard ship.*

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.



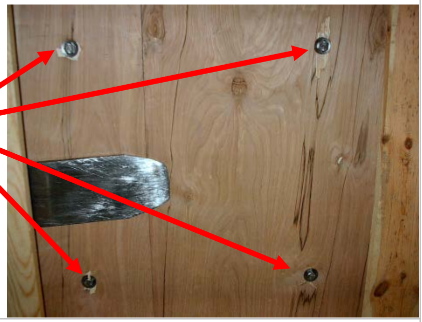
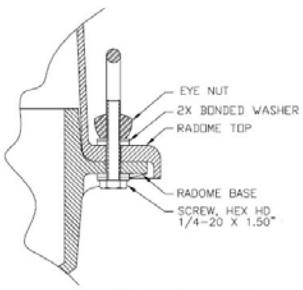
If access to the hatch cannot be provided in the mounting surface, provide a short ADE mounting stanchion to mount the ADE on which is tall enough to allow access into the radome via the hatch.

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. <u>Prepare the 40", 50", 60", 66" or 76" Radome Assembly</u>

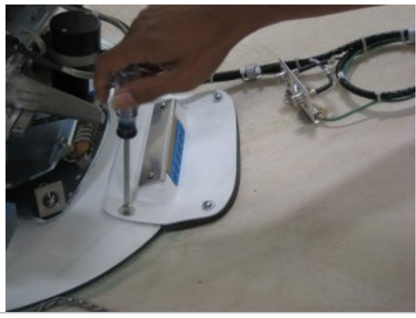
1. Remove the side walls of the radome crate. 2. Lift the pallet using a forklift and/or jacks. 3. From the underside of the pallet, remove the four shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware.	
4. Remove four equally spaced bolts around the radome flange. Save 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. <u>Install 76" Radome to the mounting platform</u>

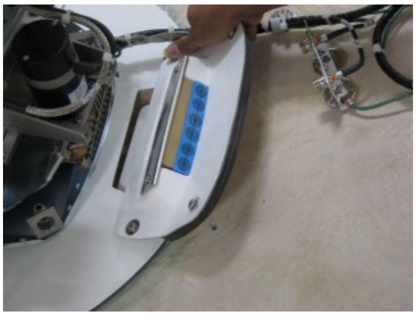
The antenna pedestal is shipped completely assembled in its radome.

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.



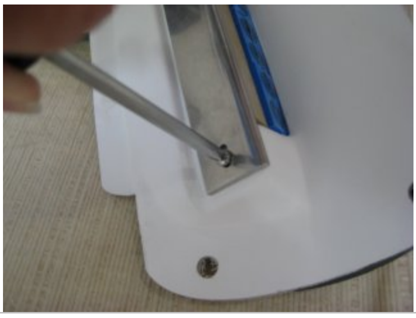
9. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.
10. Carefully route AC Power, ground strap/cable (see Grounding info below) and coax cables through the cable passage in the bottom center of the radome base and through the cable channel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

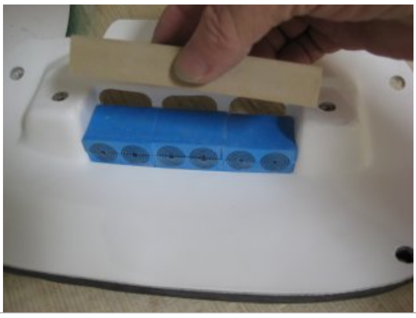
11. Allow enough service loop to terminate these cables to the circuit breaker assembly and IF connector bracket respectively (see cable termination information below).

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.

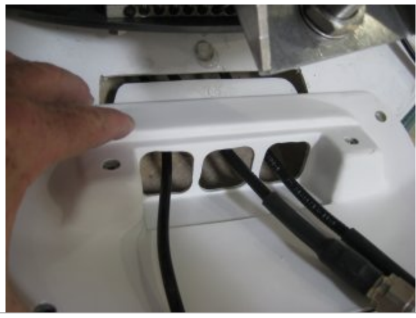


16. Remove the Roxtec® Multidiameter® blocks from the cable mounting frame.

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.

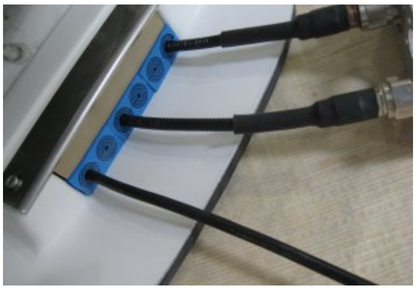


19. Peel layers out of the upper and lower Roxtec® Multidiameter® blocks to provide an opening in the block that is just smaller than the outer diameter of the cable that will pass through it. When compressed the block should provide clamping force on the cable and prevent it from moving in the block.

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.



4.4. *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.

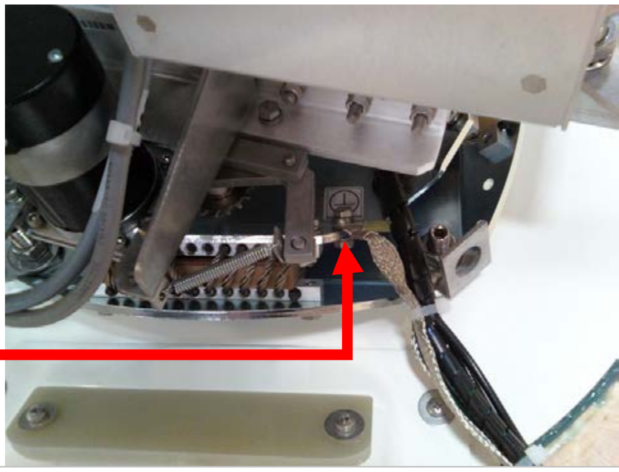
Braid is the conductor of choice where flexibility is required. Sea Tel uses braid to cross axes of the antenna pedestal and to connect various subassemblies together.

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.



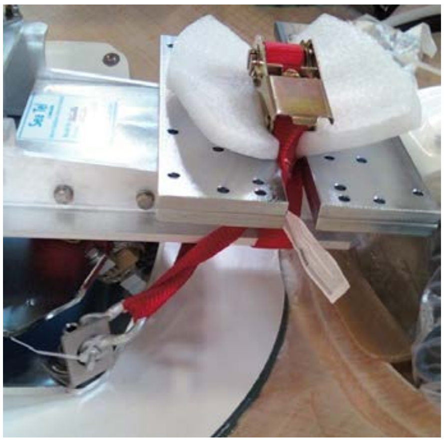
4.5. *Removing the Shipping/Stow Restraints PRIOR to Power-Up*

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.*

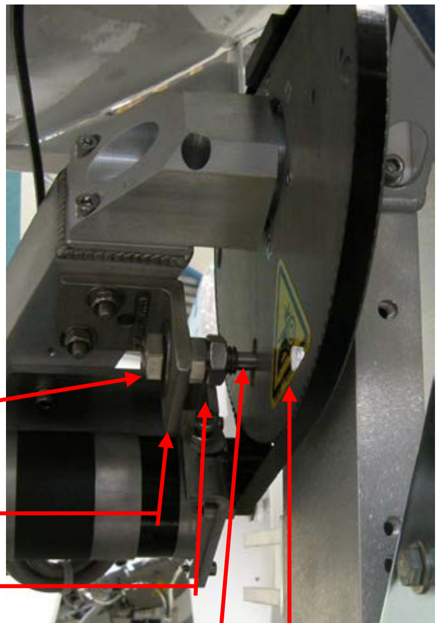
4.5.1. Removing the AZ Shipping/Stow Restraint

1. The AZ shipping/stow restraint is formed by a buckle web strap wound around the azimuth post toe weight and passed through stow clips in the base of the radome.
2. To un-restrain azimuth rotation of the antenna simply untie/unbuckle the web strap and remove it from the azimuth post and clips.
3. Save the web strap so that the antenna can be restrained in the future should it be required.
4. Verify that the antenna rotates freely and easily a full 360 degrees CW & CCW 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.



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.

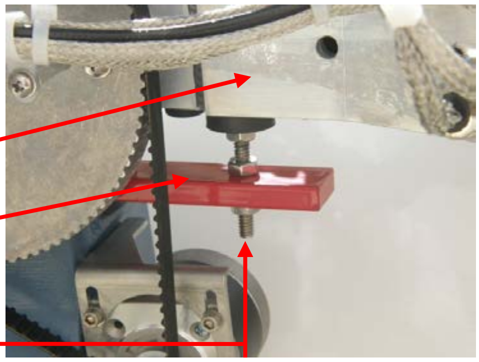
4.5.3. Removing the CL Shipping/Stow Restraint

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.

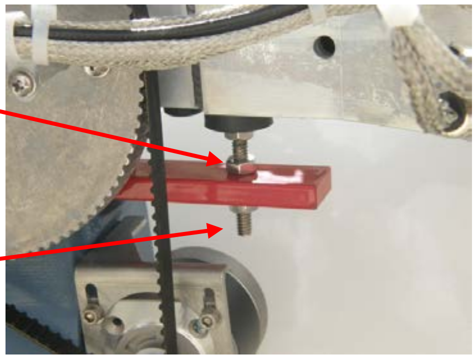
Cross-Level Beam

CL Shipping/Stow bar

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.

4.1. Cable Installation

4.1.1. Shipboard Cable Installation

CAUTION: Rough handling, tight bending, kinking, crushing and other careless handling of the cables and their connectors can cause severe damage.

The cables must be routed from the above-decks equipment mounting location through the deck and through various ship spaces to the vicinity of the below-decks equipment. When pulling the cables in place, avoid sharp bends, kinking, and the use of excessive force. After placement, seal the deck penetration glands and tie the cables securely in place all along the cable run(s).

4.1.2. ADE-BDE IF Cable Assignments

At the connector bracket mounted on the inside of the base of the radome:

The Blue connection is the C-Band RHCP LNB ***OR*** the Ku-Band LNB low-band Vertical signal output from the C/Ku switch panel. The ADE-BDE IF signal cable which is attached to this connector should be marked "Blue - C RHCP – Ku Low VERT" at both ends.

The Green connection is the Ku-Band LNB high-band Vertical signal output. The ADE-BDE IF signal cable which is attached to this connector should be marked "Green - Ku High VERT" at both ends.

The White connection is the C-Band LHCP LNB ***OR*** the Ku-Band LNB low-band Horizontal signal output from the C/Ku switch panel. The ADE-BDE IF signal cable which is attached to this connector should be marked "White - C LHCP – Ku Low HORZ" at both ends.

The Red connection is the Ku-Band LNB high-band Horizontal signal output. The ADE-BDE IF signal cable which is attached to this connector should be marked "Red - Ku High HORZ" at both ends.

4.2. Installing the Below Decks Equipment.

4.2.1. 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 Terminal Mounting Strip.*

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

4.2.2. Preparing BDE Location

Prepare the Rack (or other location) for the ACU, Terminal Mounting Strip and base multiplexer panel. Prepare the mounting locations for the other Below Decks Equipment throughout ship.

4.2.3. Installing the Below Deck Equipment

1. Install the ACU in the front of the standard 19" equipment rack or other suitable location. The DAC-2202 ACU is one rack unit high.
2. Install the Terminal Mounting Strip on the rear of the 19" equipment rack or other suitable location that is within 6 feet of the rear panel connections of the ACU. It also is one rack unit height.
3. Install the Base Multiplexer Panel on the rear of the 19" equipment rack or other suitable location that is within 6 feet of the rear panel connections of the ACU. It is four rack unit height.

4. Install your Multi-Switch, Satellite Receivers, Television Sets, Computer and any other below decks equipment that are part of your installation.

4.3. Connecting the Below Decks Equipment

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

4.3.1. Connecting the ADE AC Power Cable

Connect the AC Power cable that supplies power to the ADE to a suitably rated breaker or UPS.

4.3.2. Connecting the BDE AC Power Cables

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

4.3.3. Connecting the ADE-BDE IF Coaxes

At the connector bracket mounted on the Base Multiplexer Panel:

1. Attach the Blue (C-Band RHCP ***OR*** Ku-Band Low-band Vertical signal) coax from the antenna to the connector on the Base Multiplexer Panel which is connected to the 400MHz Modem "RJ input. Connect the 400MHz Modem "L-Band" output to the Vertical Low-band input of the CFE Multi-switch.
2. Attach the Green (Ku-Band High-band Vertical signal) coax from the antenna to the connector on the Base Multiplexer Panel. Connect this Green connection from the Base Multiplexer Panel to the Vertical High-band input of the CFE Multi-switch.
3. Attach the White (C-Band LHCP ***OR*** Ku-Band Low-band Horizontal signal) coax from the antenna to the connector on the Base Multiplexer Panel. Connect this White connection from the Base Multiplexer Panel to the Horizontal Low-band input of the CFE Multi-switch.
4. Attach the Red (Ku-Band High-band Horizontal signal) coax from the antenna to the connector on the Base Multiplexer Panel. Connect this Red connection from the Base Multiplexer Panel to the Horizontal High-band input of the CFE Multi-switch.

4.3.4. Antenna Control Unit Connections

Figure 1-1 Rear Panel DAC-2202 ACU

4.3.4.1. Antenna Control Serial Cable

Connect the antenna control serial cable from the Base Multiplexer to J4A on the DAC-2202.

4.3.4.2. ACU to Terminal Mounting Strip Connections

Connect the TMS to the ACU.

1. Connect the 25 pin ribbon cable from the TMS to J1 "Ships Gyro" DB25 on the rear panel of the ACU.
2. Connect the 9 pin ribbon cable (or NMEA serial cable) from the TMS to J2 "NMEA" DB9 on the rear panel of the ACU

4.3.4.3. RXIF Signal Input to the ACU

Connect the RXIF cable from the Base Multiplexer to the J6 "RF IN" connector on the rear of the ACU. This input provides satellite signal to the tracking receiver inside the ACU.

4.3.4.4. *M&C Connection to the ACU*

If you wish to use a computer to Monitor & Control the antenna through the Antenna Control Unit there are two possible connections that can be made. One choice is a serial connection from J3 "M&C" connector on the rear panel of the ACU to a COM port on the computer using a serial extension cable. Another choice is to connect the "ETHERNET" connector on the rear panel of the ACU to a LAN connection on the computer or hub using an Ethernet crossover cable.

4.3.5. Terminal Mounting Strip (TMS) Connections

Connect the Ships Gyro Compass input to the appropriate screw terminals on this strip. There are several functional connections that may be made on the TMS connectors. Although you may not need to make all of these connections, they are listed here for clarification during the installation process. Connect the 9 pin ribbon cable from this PCB to J2 "NMEA" DB9 on the rear panel of the ACU. Connect the 25 pin ribbon cable from this PCB to J1 "Ship Gyro" DB25 on the rear panel of the ACU.

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 Terminal Mounting Strip. DO NOT HOTPLUG THIS CONNECTION

4.3.5.1. *TS2 Synchro Gyro Compass Input.*

Use the R1, R2, S1, S2 and S3 screw terminals to connect the Synchro Gyro Compass to the ACU.

4.3.5.2. *TS3 Step-By-Step (SBS) Gyrocompass Input.*

Use the COM, A, B and C screw terminals to connect the SBS Gyrocompass to the ACU. Some SBS Gyro distribution boxes have terminals which are labeled S1, S2 & S3 instead of A, B and C.

4.3.5.3. *TS4 Power*

- **VREG** Screw terminal is used to provide a regulated DC operating voltage to ancillary equipment. Voltage out is dependent upon which terminal mounting strip assembly is provided. 126865-1 supplies 8Vdc @ 1Amp, while the 126865-2 assembly supplies 5Vdc @ 2Amps.
- **GND** Screw terminal is the ground reference for the regulated and unregulated power terminals.
- **12/24** Screw terminal is commonly used to provide operating voltage to an external GPS, Dual Antenna Arbitrator or other below decks tone generators or switches. Voltage output is based on the T.M.S assemblies JP5 jumper settings.

4.3.5.4. *TS5 NMEA A/B, GPS output.*

- ***RxA- and RxA+-*** screw terminals, which are defined as the NMEA A connection is used to connect to the ships Gyro Compass (Heading). The NMEA0183 compliant inputs are then connected via a 9 pin ribbon cable to the ACU's J2 NMEA communications port. A GPS (Latitude and Longitude) input may also be connected, but is not required because there is a GPS device already installed in your antenna.. **NOTE:** *If you connect a ships GPS to the terminal mounting strip, you **MUST** disconnect the GPS antenna on the antenna pedestal.*
- ***RxB- and RxB+*** screw terminals, which are defined as the NMEA B connection is used to connect to the ships Gyro Compass (Heading). The NMEA0183 compliant inputs are then connected via a 9 pin ribbon cable to the ACU's J2 NMEA communications port. A GPS (Latitude and Longitude) input may also be

connected, but is not required because there is a GPS device already installed in your antenna.

- ***TxA-*** screw terminal is used to provide a Pseudo GPS (GGA and GLL formats) output to other system components such as a Satellite Modem.

4.4. *Final Checks*

4.4.1. Visual/Electrical inspection

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

4.4.2. Electrical - Double check wiring connections

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

4.5. *Power-Up*

Verify that all shipping straps and restrains have been removed prior to energizing the antenna.

When all equipment has been installed, turn ACU Power and Antenna power ON. The ACU will initially sequentially display:

"SEA TEL – MASTER and DAC-2202 VER 6.xx" followed by,

"SEA TEL – RCVR and SCPC VER 5.xx" followed by,

"SEA TEL – IO MOD and COMMIF VER 1.xx" followed by,

"SEA TEL – REMOTE and INITIALIZING". After initialization, the bottom line of the remote display will display the antenna model number and the software version from the PCU.

Energize and check the other Below Decks Equipment to verify that all the equipment is operating. You will need to assure that the ACU is setup correctly and that the antenna acquires the correct satellite before you will be able to completely check all the below decks equipment for proper operation.

4.6. *Antenna Maintenance*

4.6.1. Balancing the Antenna

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

The "REMOTE BALANCE" parameter (located at the end of the Remote Parameters after REMOTE TILT) of the ACU. When enabled, Remote Balance Mode temporarily turns DishScan, Azimuth, Elevation and Cross-Level drive OFF. This function is required when trying to balance antenna systems that have a built-in brakes on the elevation and cross-level motors.

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

At the ACU:

1. From the ACU - REMOTE BALANCE parameter: Enable balance mode (refer to your ACU manual). The screen should now display "REMOTE BALANCE ON".

At the Antenna:

2. At the Antenna: Balance the antenna with the elevation near horizon (referred to as front to back balance) **by adding, or subtracting, small counter-weights**.
3. Then balance Cross Level axis (referred to as left-right balance) **by moving existing counter-weights from the left to the right or from the right to the left**. Always move weight from one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of the reflector mounting frame to the top right of the reflector mounting frame). Do NOT add counter-weight during this step.
4. Last, balance the antenna with the elevation pointed at, or near, zenith (referred to as top to bottom balance) **by moving existing counter-weights from the top to the bottom or from the bottom to the top**. Always move weight from one location on the equipment frame to the same location on the opposite side of the equipment frame (ie from the top left of the reflector mounting frame to the bottom left of the reflector mounting frame). Do NOT add counter-weight during this step.
5. When completed, the antenna will stay at any position it is pointed in for at least 5 minutes (with no ship motion).
6. ***Do NOT cycle antenna power to re-Initialize the antenna***. Return to the ACU, which is still in REMOTE BALANCE mode, and press ENTER to exit Remote Balance Mode. When you exit Balance Mode the antenna will be re-initialized, which turns DishScan®, Azimuth, Elevation and Cross-Level drive ON.

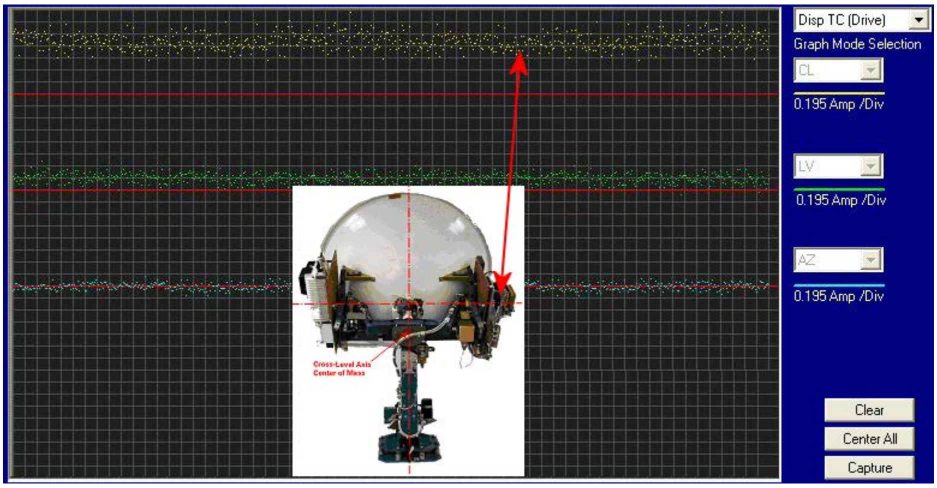
4.6.2. Fine Balance and Monitoring Motor Drive Torque

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

- To view the Torque Commands, select the Disp TC (Drive) graph chart.
- This chart displays the Torque Command errors for each axis via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 0.195 amps/vertical division.
- In all axes, tracing centered on the reference line means that that axis drive is neutral. Tracing above the reference line means that that axis is being driven CCW. Tracing below the reference line means that that axis is driving CW.
- A normal trace display will be ≤ 1 division from the red reference line while under calm sea conditions and with DishScan® Drive turned off, as shown below. The Maximum allowed trace plot is an average of ± 3 divisions from the reference line.

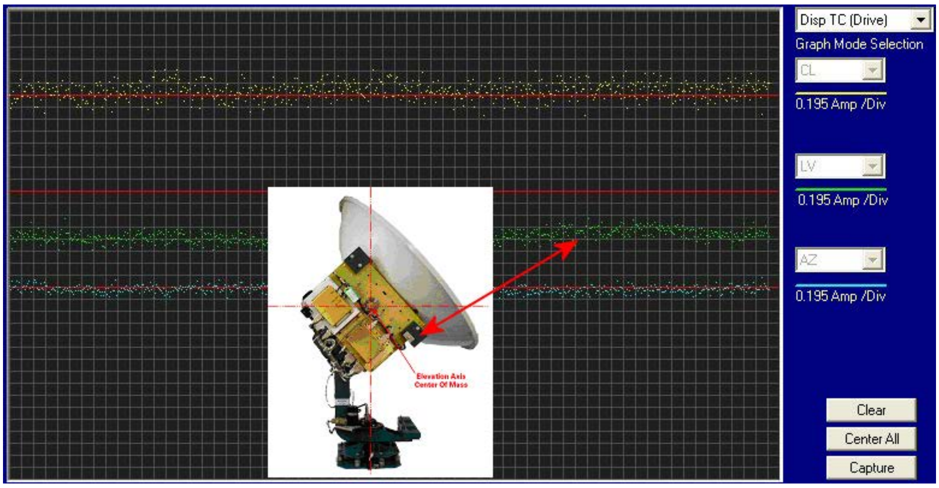
- The Cross Level displayed above the reference line indicates that the CL axis is being driven CCW (Left in CL).

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



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

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



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

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5. Basic Setup of the ACU

5.1. Operator Settings

Refer to the Operation chapter of this manual to set the ship information. Latitude and longitude should automatically update when the GPS engine mounted on the antenna pedestal triangulates an accurate location, but you may enter this information manually to begin. Except when integrating NMEA-0183 Gyro source, you will have to enter the initial Heading of the ship, subsequently the ACU will then increment/decrement as the Gyro Compass updates.

Next, set the satellite information. Longitude of the desired satellite you wish to use and the receiver settings for it are especially important.

At this point you should be able to target the desired satellite. Continue with the setup steps below to optimize the parameters for your installation.

5.2. SETUP Parameter Display and Entry Menus

Press and hold BOTH the LEFT and the RIGHT arrow keys ***for 6 seconds*** to access to the system setup parameters (at the ***EL TRIM*** selection). **Press** BOTH the LEFT and the RIGHT arrow keys **momentarily** to access to the **SAVE NEW PARAMETERS** parameter.

Access is only required after installation or repairs of your antenna system. These parameters should only be changed by an authorized service technician.

CAUTION: Improper setting of these parameters will cause your system to not perform properly. Also refer to the SETUP section of your antenna manual.

5.3. Default Setup Parameters for your Antenna

The following table shows the factory default parameters for the DAC-2202 Antenna Control Unit interfaced to the Antenna PCU. When you receive the system it will have factory default settings in the ACU. After installation of the system, some of the settings will remain at factory default and others should be optimized for specific applications.

Note that the EL TRIM through POL SCALE parameters ***MUST*** be **set, and saved**, for **EACH** of the **two Reflectors**.

AZ LIMIT 1 through TRACK DISP parameters, ***once set and saved for EITHER reflector***, are saved & ***available for BOTH reflectors***.

PARAMETER	Reflector A C-Band	Reflector B Ku-Band	Optimize using Lesson
AUTO TRIM			
EL TRIM	0	0	Setup – Targeting
AZ TRIM	0	0	
AUTO THRES	100	100	
EL STEP SIZE	0	0	
AZ STEP SIZE	0	0	Leave at factory Defaults
STEP INTEGRAL	0	0	
SEARCH INC	20	10	Setup - Searching
SEARCH LIMIT	200	100	

SEARCH DELAY	30	30	
SWEEP INC	40	40	
SYSTEM TYPE	69	69	Leave at factory Defaults
GYRO TYPE	2 (NMEA/SBS)		Setup – Ships Gyro Compass
POL TYPE	73	72	Setup – Polarity Selection AND Setup – Optimizing Polarization
POL OFFSET	30	30	
POL SCALE	90	90	
AZ LIMIT 1	0		Setup – Blockage & RF Radiation Hazard Zones
AZ LIMIT 2	0		
EL LIMIT 12	90		
AZ LIMIT 3	0		
AZ LIMIT 4	0		
EL LIMIT 34	90		
AZ LIMIT 5	0		
AZ LIMIT 6	0		
EL LIMIT 56	90		
5v OFFSET	0		Leave at factory Defaults
5V SCALE	0		Leave at factory Defaults
TX POLARITY	2		Leave at factory Defaults
TRACK DISP	0001		Setup – Polarity Selection

REMOTE PARAMETER	Reflector A C-Band	Reflector B Ku-Band	Optimize using Lesson
PCU Configuration Number Noxxx	001		Leave at factory Defaults
Home Flag Offset N6xxx	000		Setup – Home Flag Offset
DishScan Phase/Gain N7xxx	85		Leave at factory Defaults
Reflector Offset NBxxx	000	059	Leave at factory Defaults

5.4. *Save New Parameters*

Parameters that have been changed are only temporarily changed until they are SAVED. If changes are made and not stored, they will still be effective but will be lost when power is removed or the RESET key is pressed. Simultaneously press, and quickly release the LEFT and RIGHT arrow keys to access "SAVE NEW PARAMETERS" directly from any other menu display. Verify that the change(s) you have made is/are correct and then select "SAVE NEW PARAMETERS". Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

6. Setup – Setting Up the Dual Reflectors

In a new installation, it is very important that ***each of the two reflectors is set up, and optimized, correctly***. Several things should be investigated prior to setting any of the parameters in preparation for setting up each of the reflectors:

1. Refer to chapter 6 to identify what gyro compass type, and the subsequent GYRO TYPE parameter setting you will use.
2. Refer to chapter 7 to identify what satellite and tracking frequency you will be using to optimize the C-Band, and Ku-Band, reflectors. Keep in mind that the C-Band satellite will need to be one which has circular polarized signals on it and that the Ku-Band satellite must have linear signals on it. Because the Ku-Band LNB is able to process high & low band frequencies, so you may need to assure that you are using the correct IF cables from the antenna for the (high or low band) band of the desired satellite.

6.1. Optimizing C-Band (Reflector A)

1. Tracking Menu – Set band selection to C-Band (chapter 8)
2. Satellite Menu - Tracking Receiver settings (chapter 7):

   MHz - Set to the desired tracking frequency, in MHz, of the network/carrier you want to track on.

   KHz - Set to the desired tracking frequency, in KHz, of the network/carrier you want to track on.

   Tone - Set to OFF

   Volt - Set to LHCP or HORZ.

   FEC - Set to SCPC.

   SKEW - When used on a circular polarized satellite, Skew will be set to 0000.

   NID - Set to 0000.
3. Satellite Menu - Satellite Longitude - Key in the longitude of the desired satellite and hit ENTER to target that satellite.
4. Allow search to find the desired satellite, or manually acquire the satellite. Positively identify that the acquired satellite is the satellite you targeted.
5. Turn Tracking ON to peak the pointing of the antenna (highest satellite signal).
6. Polarization – No polarization adjustment is required because the feed is circular.
7. SETUP - Access the SETUP parameters.
8. Targeting - Refer to chapter 9 to optimize the targeting of the antenna. If AZ TRIM is greater than +/- 50, you should refer to chapter 10 to setup home flag offset for the excessive amount of azimuth trim and then re-optimize targeting.
9. EL STEP SIZE / AZ STEP SIZE / STEP INTEGRAL - Leave at factory defaults for C-Band.
10. SEARCH INC / SEARCH LIMIT / SEARCH DELAY / SWEEP INC - Refer to Setup – Searching (chapter 11) to optimize these parameters for C-Band and for the desired search pattern.
11. GYRO TYPE - Set this parameter to properly read your gyro compass (chapter 6).
12. POL TYPE / POL OFFSET / POL SCALE - Leave at factory defaults.
13. AZ LIMIT 1 / AZ LIMIT 2 / EL LIMIT 12 / AZ LIMIT 3 / AZ LIMIT 4 / EL LIMIT 34 / AZ LIMIT 5 / AZ LIMIT 6 / EL LIMIT 56 - Refer to chapter 12 to set up blockage zones, if applicable.
14. 5v OFFSET / 5V SCALE / TX POLARITY / TRACK DISP - Leave at factory defaults.
15. **SAVE NEW PARAMETERS** - You MUST save these parameters for Reflector A, so that when you select Reflector A in the future, these parameters will be used. Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

6.2. Optimizing Ku-Band (Reflector B)

1. Tracking Menu – Set band selection to KuHi-Band (chapter 8)
2. Satellite Menu - Tracking Receiver settings (chapter 7):

   MHz - Set to the desired tracking frequency, in MHz, of the network/carrier you want to track on.

   KHz - Set to the desired tracking frequency, in KHz, of the network/carrier you want to track on.

   Tone - Set to OFF if you want to use low band satellite frequencies (10.7-11.7 GHz). Set to ON if you want to use high band satellite frequencies (11.7-12.75 GHz).

   Volt - Set to HORZ if you will be tracking on a Horizontal signal from the satellite. Set to VERT if you will be tracking on a Vertical signal from the satellite.

   FEC - Set to SCPC.

   SKEW - This will be used to optimize polarization in step 6 below.

   NID - Set to 0000.
3. Satellite Menu - Satellite Longitude - Key in the longitude of the desired satellite and hit ENTER to target that satellite.
4. Allow search to find the desired satellite, or manually acquire the satellite. Positively identify that the acquired satellite is the satellite you targeted.
5. Turn Tracking ON to peak the pointing of the antenna (highest satellite signal).
6. Optimize the polarization of the Ku-Band linear feed. Refer to "Optimizing Ku-Band Linear Polarization:" in chapter 15.
7. SETUP - Access the SETUP parameters.
8. Targeting - Refer to chapter 9 to optimize the targeting of the antenna. Since you would already use home flag offset, if it was necessary, you should not have an AZ TRIM greater than +/- 50.
9. EL STEP SIZE / AZ STEP SIZE / STEP INTEGRAL - Leave at factory defaults for Ku-Band.
10. SEARCH INC / SEARCH LIMIT / SEARCH DELAY / SWEEP INC - Refer to Setup – Searching (chapter 11) to optimize these parameters for Ku-Band and for the desired search pattern.
11. GYRO TYPE - Set this parameter to properly read your gyro compass (chapter 6).
12. POL TYPE - Leave at factory defaults.
13. POL OFFSET - Optimizing the linear Polarization of the feed. – No polarization adjustment is required because the feed is circular.
14. POL SCALE - Leave at factory defaults.
15. AZ LIMIT 1 / AZ LIMIT 2 / EL LIMIT 12 / AZ LIMIT 3 / AZ LIMIT 4 / EL LIMIT 34 / AZ LIMIT 5 / AZ LIMIT 6 / EL LIMIT 56 - These were previously set, and apply to BOTH reflectors. Assure that these setting are the same as you set in C-Band.
16. 5v OFFSET / 5V SCALE / TX POLARITY / TRACK DISP - Leave at factory defaults.
17. **SAVE NEW PARAMETERS** - You MUST save these parameters for Reflector B, so that when you select Reflector B in the future, these parameters will be used. Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

7. Setup – Ships 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 ACU 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). In normal operation when viewing and ADMC recording in DacRemP, the "Relative Azimuth" trace should do exactly ***equal and opposite*** to whatever the Heading trace does and the "Azimuth" trace should stay flat.

In normal operation the heading display in the ACU should at all times be the same value as the reading on the Gyro Compass itself (this is also referred to as Gyro Following.).

If the ACU is not following the Ships Gyro Compass correctly (un-erringly) refer to the Troubleshooting Gyro Compass Problems.

7.1. 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 0002 so that the ACU will properly follow for Step-By-Step or NMEA gyro signals.

The GYRO TYPE parameter must be set correctly to properly read and follow the ship's Gyro Compass signal that is being provided. The acceptable settings are:

362	for 360:1 Synchro with S/D Converter
90	for 90:1 Synchro with S/D Converter
36	for 36:1 Synchro with S/D Converter
2	for Step-By-Step gyro or NMEA gyro
1	for 1:1 Synchro with S/D Converter
0	for No Gyro linear AZ Search Mode (No Heading input available)

7.2. Updating the GYRO TYPE parameter

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

When you are finished making parameter changes, go to the SAVE NEW PARAMETERS display to save the changes you have made.

7.3. If there is NO Ships Gyro Compass

Without heading input to the system the ACU will **NOT** be able to 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. A better solution would be to provide a Satellite Compass (multiple GPS antenna devices) to provide true heading input to the ACU. 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 0000, the SWEEP INC parameter to 0047 and SAT REF (Satellite Reference Mode) ***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 lesson).

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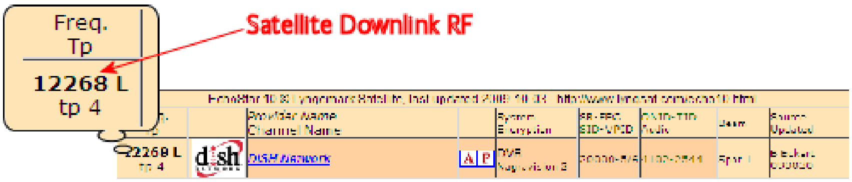
8. Setup – Tracking Receiver

8.1. Determining the IF Tracking Frequency (FREQ or MHz)

The IF Tracking parameter is a calculated value entered into the ACU's **MHz** Sub-Menu. The value itself is 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 ACU for tracking purposes.

Example assuming an LNB LO value of 11.25GHz: 12268-11250 = 1018 MHz IF



Identifying the Downlink RF using Capture from Lyngsat.com

8.1. KHz

The KHz rate entered into the ACU is an absolute value that is entered directly in this sub-menu window. This value may have been provided by your air-time provider or have been calculated.

In the example above, 1018.0 MHz was calculated (1018 MHz 000 KHz) therefore, the KHz entry would be 000. If the provided/calculated value had been 1018.250, 1018 would have been entered in the MHz window and 250 would be entered in the KHz window.

8.2. FEC

8.2.1. L-Band SCPC Receiver

The Forward Error Correction rate entered into the ACU should always be set to **SCPC** with an L-Band SCPC receiver card installed in the ACU.

8.3. Tone

8.3.1. TVRO Applications

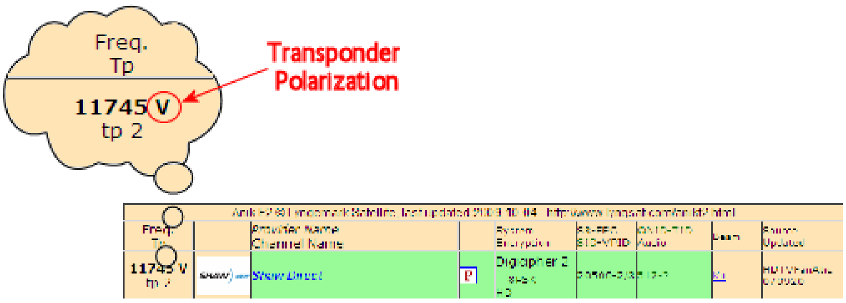
The Tone state entered into the ACU will be toggled either on or off. Although there are many possibilities of uses of a 22 KHz tone, in a Sea Tel TVRO antenna system it is primarily used for below decks band selection (Tone On = Ku Hi-Band and Tone Off = Ku Lo-Band) and is based on the Downlink RF value from the satellite. An RF Downlink value is less than 11699 is considered to be Ku-Lo band and tone must be turned "Off" for proper port selection of the Multiswitch. An RF Downlink value greater than 11700 is Ku-Band Hi-band and tone must be turned "On" for proper port selection of the Multiswitch. When using a Public Satellite Reference Site such as Lyngsat.com, refer to the Frequency value to determine whether tone is required, or not, for tracking purposes. Refer to the IF Tracking Frequency graphics above to identify a satellite transponders Downlink RF value.

8.4. Volt

8.4.1. TVRO Application

The Voltage setting in the ACU is a selection of one of four receiver options and is based on the Downlink RF Polarization from the satellite. In a TVRO application, receiver voltage is used for proper port (receive polarization) selection. The polarization type should be provided to the operator/technician by the NOC prior to, or during the commissioning process. When using a Public Satellite Reference Site such as Lyngsat.com, Polarization is abbreviated "Pol."

Receiver Voltage Selection	Receiver Voltage output	Reference Website Abbreviation
RHCP (**R**ight **H**and **C**ircular **P**olarization)	13VDC	R
LHCP (**L**eft **H**and **C**ircular **P**olarization)	18VDC	L
VERT (**Vert**ical Linear Polarization)	13VDC	V
HORZ (**Horiz**ontal Linear Polarization)	18VDC	H



8.5. SKEW

SKEW will only be used to optimize the polarization of ***linear*** feeds to match the ***linear*** signal from the satellite.

The C-Band ***Circular*** feed does ***not*** require polarization adjustment, therefore, the Skew setting will be 0000 when using C-Band circular satellite signals.

To optimize the polarization of the Ku-Band ***linear*** feed. refer to "Optimizing Ku-Band Linear Polarization:" in chapter 15.

8.6. NID

Set NID to 0000

9. Setup - Band & Reflector Select

9.1. Band, Low Noise Block Converter Operation and Reflector Selection:

When you set the band selection to C, or X, you are selecting the C-Band reflector (REFL A) and its LHCP & RHCP circular LNBs to provide the IF inputs to your Below Decks Equipment.

When you set the band selection to KuLo, or KuHi, you are selecting the Ku-Band reflector (REFL B) and its Quad Output linear LNB to provide the IF inputs to your Below Decks Equipment.

TDISP Setting	Displayed band selection	ADE Band Select Parameters (Tone, Voltage, Aux Status & Reflector)	TMS SW1 Status
0001	C	Tone OFF, Volt 13, Aux 0, REFL A	Open
	X	Tone OFF, Volt 18, Aux 0, REFL A	Short
	KuLo	Tone OFF, Volt 13, Aux 1, REFL B	Open
	KuHi	Tone OFF, Volt 18, Aux 1, REFL B	Short

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10. Setup – Targeting

The procedure for optimizing the targeting of the antenna to land on or near a desired satellite (within +/-1 degree) is outlined below.

10.1. Optimizing QOR Dual Reflector Targeting

First assure that Heading (SHIP Menu) has been set correctly.

Research the longitude position of the C-band, and the Ku-Band, satellites you will target during this procedure. Research the signals available and choose which signal you wish to use for tracking on each of the satellites.

Record the satellite longitude, MHz, KHz, Tone, Volt, FEC, SKEW and NID settings for each satellite (one C-Band and one Ku-Band).

If during this procedure, you find that a large value of Azimuth Trim will be required (greater than 5 degrees, Sea Tel recommends that you optimize Home Flag Offset (refer to the next chapter) to calibrate the relative value of the antenna position, so that the Azimuth Trim requirement will be less than 5 degrees ***before*** continuing with this procedure.

10.1.1. Optimizing C-Band (Reflector A) Targeting

1. Tracking Menu – Set band selection to C-Band (chapter 8)
2. Satellite Menu - Tracking Receiver settings (chapter 7):

   MHz - Set to the desired tracking frequency, in MHz, of the network/carrier you want to track on.

   KHz - Set to the desired tracking frequency, in KHz, of the network/carrier you want to track on.

   Tone - Set to OFF

   Volt - Set to LHCP or HORZ.

   FEC - Set to SCPC.

   SKEW - When used on a circular polarized satellite, Skew will be set to 0000.

   NID - Set to 0000.
3. Satellite Menu - Satellite Longitude - Key in the longitude of the desired satellite and hit ENTER to target that satellite.
4. Allow search to find the desired satellite, or manually acquire the satellite. Positively identify that the acquired satellite is the satellite you targeted.
5. Turn Tracking ON to peak the pointing of the antenna (highest satellite signal).
6. Polarization – No polarization adjustment is required because the feed is circular.
7. SETUP - Access the SETUP parameters.
8. Targeting - Proceed with Optimizing Targeting of the C-Band reflector using the Automatic or Manual procedures below. If AZ TRIM is greater than +/- 50, you should refer to chapter 10 to setup home flag offset for the excessive amount of azimuth trim and then re-optimize targeting.

10.1.2. Optimizing Ku-Band (Reflector B) Targeting

1. Tracking Menu – Set band selection to KuHi-Band (chapter 8)
2. Satellite Menu - Tracking Receiver settings (chapter 7):

   MHz - Set to the desired tracking frequency, in MHz, of the network/carrier you want to track on.

   KHz - Set to the desired tracking frequency, in KHz, of the network/carrier you want to track on.

Tone - Set to OFF if you want to use low band satellite frequencies (10.7-11.7 GHz). Set to ON if you want to use high band satellite frequencies (11.7-12.75 GHz).

Volt - Set to HORZ if you will be tracking on a Horizontal signal from the satellite. Set to VERT if you will be tracking on a Vertical signal from the satellite.

FEC - Set to SCPC.

SKEW - This will be used to optimize polarization in step 6 below.

NID - Set to 0000.

3. Satellite Menu - Satellite Longitude - Key in the longitude of the desired satellite and hit ENTER to target that satellite.
4. Allow search to find the desired satellite, or manually acquire the satellite. Positively identify that the acquired satellite is the satellite you targeted.
5. Turn Tracking ON to peak the pointing of the antenna (highest satellite signal).
6. Optimize the polarization of the Ku-Band linear feed. Refer to "Optimizing Ku-Band Linear Polarization:" in chapter 18.
7. SETUP - Access the SETUP parameters.
8. Targeting - Proceed with Optimizing Targeting of the Ku-Band reflector using the Automatic or Manual procedures below.

10.2. 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. It will also calculate, and set, the proper Auto-Threshold value for this system to use on the desired/targeted satellite.

To enable this function, the Antenna MUST be actively tracking the satellite with positive SAT ID and elevation of the antenna must be less than 83 degrees and the ACU must NOT be set for Inclined Orbit Search. After locating the satellite, with Tracking ON, wait at least 30 seconds before performing the AUTO TRIM feature, this will allow sufficient time for the antenna to peak up on signal. It is equally important that you verify that the system is tracking the CORRECT satellite (verify video is produced on the Televisions in a TVRO system or verify a RX lock indication on the satellite modem in a VSAT system).

While in the AUTO TRIM sub-menu, press the **LEFT** arrow key to bring start the calibration procedure, the display should read AUTO TRIM SETUP, press the **ENTER** key to submit. AUTO TRIM SAVED will be displayed, indicating the proper AZ and EL trims were submitted to RAM. This does not save these parameters to NVRAM, in order to save to memory, continue down through the setup mode parameters until the SETUP **SAVE NEW PARAMETERS** sub menu is displayed. Press the **RIGHT** arrow and then press the **ENTER** key. The display should now report that the parameters were saved. From the AUTO TRIM SETUP screen, press the **NEXT** key (DAC2202) without hitting **ENTER** to escape this screen without submitting the new AZ and EL Trim values.

NOTE: AUTO TRIM LOCKED will be displayed on the front panel, indicating that the AUTO TRIM Feature is **NOT** allowed if all of these conditions are not met:

The ACU ***must*** be actively tracking a satellite (AGC above threshold) ***and***

The ACU ***must*** have positive SAT ID (internal NID match or external RX lock received from the Satellite Modem) ***and***

The elevation angle of the antenna ***must*** be LESS than 75 degrees ***and***

The ACU ***must*** NOT be set for Inclined Orbit Search.

10.3. Manually Optimizing Targeting

First, assure that all of your ship and satellite settings in the ACU are correct.

1. Target the desired satellite, immediately turn Tracking OFF, and record the Azimuth and Elevation positions in the "***ANTENNA***" display of the ACU (these are the **Calculated** positions).
2. Turn Tracking ON, allow the antenna to "Search" for the targeted satellite and assure that it has acquired (and peaks up on) the satellite that you targeted.

3. Allow several minutes for the antenna to "peak" on the signal, and then record the Azimuth and Elevation positions while peaked on satellite (these are the Peak positions). Again, assure that it has acquired the satellite that you targeted!
4. Subtract the Peak Positions from the Calculated Positions to determine the amount of Trim which is required. Refer to the ACU Setup information to key in the required value of Elevation Trim.
5. Continue with Azimuth trim, then 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 ACU targets to an Elevation position of 30.0 degrees and an Azimuth position of 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 (displayed as -0015) and an AZ TRIM of +2.2 degrees (displayed as 0022). After these trims values had been set, your peak ***on satellite*** Azimuth and Elevation displays would be very near 180.2 and 30.0 respectively.

10.4. EL TRIM

Elevation trim offset parameter is entered in tenths of degrees. Adjusts display to correct for antenna alignment errors or imbalances in the antenna system. Increase number to increase display. Refer to "Optimizing Targeting" in the Setup section of your antenna manual.

To update: While in the EL TRIM sub-menu, press the LEFT arrow key to bring the cursor under the ones digit. Press the UP or DOWN arrow key to increment or decrement the selected digit. Minus values are entered by decrementing below zero. Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

Continue with Azimuth trim, then 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.

10.5. AZ TRIM

Azimuth trim offset parameter is entered in tenths of degrees. Offsets true azimuth angle display to compensate for installation alignment errors when used with Ships Gyro Compass input reference. **Azimuth Trim does not affect REL azimuth reading**. Increase number to increase displayed value. Refer to "Optimizing Targeting" in the Setup section of your antenna manual.

To update: While in the AZ TRIM sub-menu, press the LEFT arrow key to bring the cursor under the ones digit. Press the UP or DOWN arrow key to increment or decrement the selected digit. Minus values are entered by decrementing below zero. Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

Then retarget 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.

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11. Setup – Home Flag Offset

Home Flag Offset is used to calibrate the relative azimuth value of the antenna to the bow line of the ship. This assures that the encoder input increments/decrements from this initialization value so that the encoder does not have to be precision aligned. When the antenna is pointed in-line with the bow (parallel to the bow) the "Relative" display value should be 000.0 **Relative** (360.0 = 000.0). Good calibration is especially important if blockage mapping is used, because the values entered into the AZ LIMIT parameters are entered in ***Relative*** Azimuth. The default Home Flag Offset value saved in the PCU is 000.

The Home Flag Sensor mounted on the pedestal is actuated by a metal tab mounted on the azimuth spindle which causes it to produce the "Home Flag" signal.

The default mounting of the radome is with its bow reference in-line with the bow and the base hatch in-line with the stern (aft reference of the radome). There are valid reasons for mounting the ADE in a different orientation than the default. One of these would be that the hatch of radome needs to be oriented inboard of the ship for safe entry into the dome (ie ADE is mounted on the port, or starboard, edge of the ship and safe entry is only available from inboard deck or inboard mast rungs).

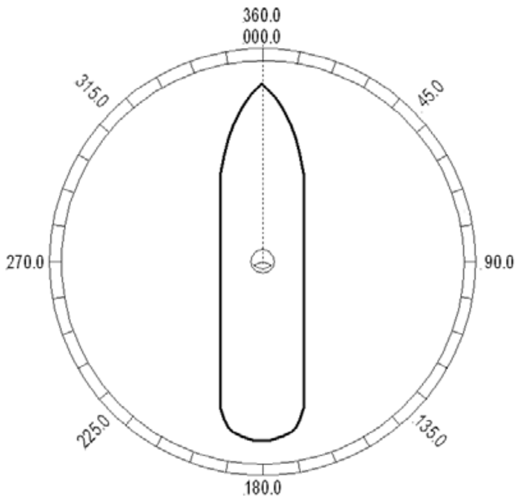


Figure 8-1 Antenna stops In-line with Bow

Observe initialization of the antenna. When azimuth drives CW and then stops at "Home" position, VISUALLY compare the antennas pointing, while at Home position, to the bow-line of the ship (parallel to the bow).

If it appears to be very close to being parallel to the bow, you will not need to change the HFO and should proceed with Optimizing Targeting. When "Optimizing Targeting" small variations (up to +/- 5.0 degrees) in azimuth can be easily corrected using the AZ TRIM parameter.

If it is NOT close (stops before the bow or continues to drive past the bow) HFO needs to be adjusted.

> ***If the antenna is pointing to the LEFT of the bow line:*** If the antenna stops driving before the bow line, when targeting a satellite it will fall short of the desired satellite by exactly the same number of degrees that it fell short of the bow line. You must calibrate HFO using either of the methods below.
>
> ***If the antenna is pointing to the RIGHT of the bow line:*** If the antenna continues to drive past the bow line, when targeting a satellite it will overshoot the desired satellite by exactly the same number of degrees that it went past the bow line. You must calibrate HFO using either of the methods below.

If you find that a large value of AZ TRIM parameter has been used to calibrate the antenna. This indicates that the Relative position is incorrect and should be "calibrated" using the correct HFO value ***instead*** of an Azimuth Trim offset.

If the radome was purposely rotated, has a large value of AZ TRIM or was inaccurately installed (greater than +/- 5 degrees), there are two ways of setting Home Flag to compensate for the mounting error. They are:

11.1. Electronic Calibration of Relative Antenna Position (Home Flag Offset)

Above, you VISUALLY compared the antenna pointing, while at "Home" position, to the bow-line of the ship and found that the antenna pointing was **NOT close** to being parallel to the bow-line. It stopped before the bow or went past the bow **OR** you found **AZ TRIM** has been set to a large value, therefore, ***HFO needs to be adjusted***.

Ascertain the exact amount of error using the appropriate procedure below, enter the HFO to calibrate the antenna to the ship, save the value and re-initialize the antenna to begin using the new value.

11.1.1. You Found a Large AZ TRIM value:

If Targeting has been optimized by entering a large value of AZ TRIM: First, verify that you are able to repeatedly accurately target a desired satellite (within +/- 1.0 degrees). Then you can use the AZ TRIM value to calculate the value of HFO you should use (so you can set AZ TRIM to zero). AZ Trim is entered as the number of ***tenths*** of degrees. You will have to convert the AZ TRIM value to the nearest **whole** degree (round up or down as needed). Calculated HFO value is also rounded to the nearest whole number.

If AZ TRIM was a **plus** value: HFO = (TRIM / 360) x 255 Example: AZ TRIM was 0200 (plus 20 degrees). HFO = (20/360) x 255 = (0.0556) x 255 = 14.16 round off to 14. Set, and Save, HFO to 014 using the "To Enter the HFO value" procedure below.

If AZ TRIM was a **negative** value: HFO = ((360-TRIM) / 360)) x 255 Example: AZ TRIM = -0450 (minus 45 degrees). HFO = ((360 – 45) / 360)) x 255 = (315 / 360) x 255 = 0.875 x 255 = 223.125 round of to 223. Set, and Save, HFO to 223 using the "To Enter the HFO value" procedure below.

11.1.2. You Observe "Home" Pointing is LEFT of the Bow-line:

1. In this example, I observe that the Home position is short of the bow line.
2. I estimate that it is about 45 degrees.
3. I target my desired satellite and record the Calculated Azimuth to be 180.5.
4. I drive UP (I estimated that I will need to go UP about 45 degrees) and finally find my desired satellite.
5. Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 227.0 degrees.
6. I subtract Calculated from Peak (227 – 0180.5 = 46.5) and difference is 46.5 degrees.

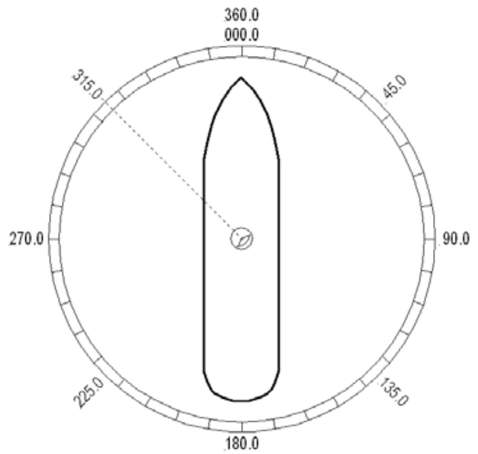


Figure 10-2 Antenna stopped before the Bow

7. I can calculate what the correct value for the Home position of the antenna by subtracting (because "home" was to the left of bow) this difference of 46.5 from the bow line position 360.0. Therefore "home" should be 313.5 Relative.
8. I now calculate the HFO = (313.5 / 360) x 255 = 0.87 x 255 = 222.06 which I round off to 222.
9. I set, and Save, HFO to 222 using the "To Enter the HFO value" procedure below. After I re-initialize the relative position of the antenna is now calibrated.
10. If there is a small amount of error remaining, use AZ TRIM in the Optimizing Targeting procedure to correct it.

11.1.3. You Observe "Home" Pointing is RIGHT of the Bow-line:

1. In this example, I observe that the Home position is past the bow line.
2. I estimate that it is about 90 degrees.
3. I target my desired satellite and record the Calculated Azimuth to be 180.0.
4. I drive DOWN (I estimated that I will need to go **DOWN** about 89 degrees) and finally find my desired satellite.
5. Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 90.0 degrees.
6. I subtract Calculated from Peak (180.0 – 90.0 = 90.0) and difference is 90.0 degrees.

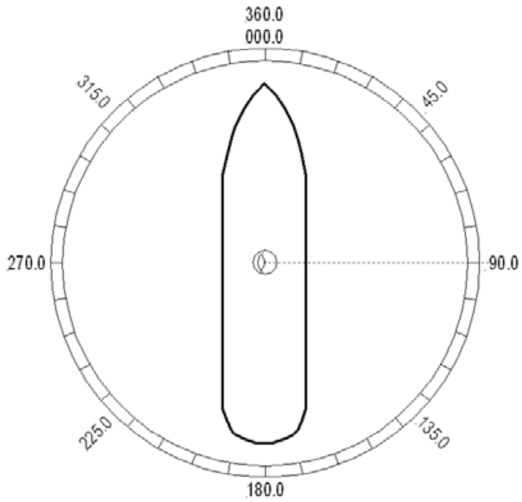


Figure 10-3 Antenna stops past the Bow

7. I can calculate what the correct value for the Home position of the antenna by **adding** (because "home" was to the right of bow) this difference of 09.0 to the bow line position 000.0. Therefore "home" should be 90.0 Relative.
8. I now calculate the HFO = = ((90.0) / 360)) x 255 = 0.25 x 255 = 63.75 which I round off to 64.
9. I set, and Save, HFO to 222 using the "To Enter the HFO value" procedure below. After I re-initialize the relative position of the antenna is now calibrated.
10. If there is a small amount of error remaining, I will use AZ TRIM in the Optimizing Targeting procedure to correct it.

11.1.4. To Enter the HFO value in the DAC_2202:

To enter the calculated HFO value, press and hold both LEFT and RIGHT arrows for six seconds to enter the parameter menu at the EL TRIM parameter window. Press DOWN arrow key numerous times (about 21) until you have selected the REMOTE COMMAND window.

In the REMOTE COMMAND window, press the LEFT arrow key until you have underscored the left most character in the displayed value (ie the A in "A0000"). Use the UP/DOWN arrow keys to increment/decrement the underscored character until it is upper case **N** ("N0000" should appear in the command window). Press the RIGHT arrow key to move the cursor under the most significant digit, then use the UP arrow key to increment it to a value of 6 (the display is now "N6000"). Set the three digits to the right of the 6 to the three digit HFO value from 000 to 255 (corresponding to 0 to 360 degrees) that you calculated above. Use the LEFT/RIGHT keys to underscore the desired digit(s) then use the UP/DOWN arrow keys to increment/decrement the underscored value. When you have finished editing the display value, press ENTER to send the HFO value command to the PCU (but it is not saved yet).

If you want to find out what the ***current*** HFO value is key in N6**999** and hit **ENTER.**

When completed, you must save the desired HFO value. Press ENTER several times to select the REMOTE PARAMETERS display. Press the LEFT or RIGHT arrow key to enter writing mode and then press the ENTER to save the HFO value in the PCUs NVRAM.

EXAMPLE: In the "You Observe "Home" Pointing is LEFT of the Bow-line" example above, the HFO calculated was 222. To enter this value:

1. Set the Remote Command value to "**N6222**".
2. Press **ENTER** to send this HFO to the PCU. The display should now show "N0222".
3. When completed, you must save the desired HFO value. Press **ENTER** several times to select the **REMOTE PARAMETERS** display. Press the **LEFT** or **RIGHT** arrow key to enter

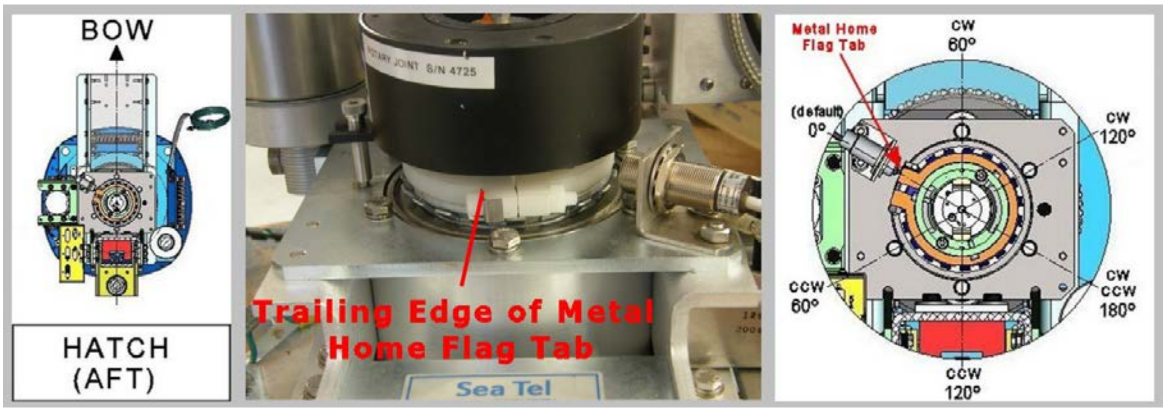
writing mode and then press the **ENTER** to save the HFO value in the PCUs NVRAM.

You must drive the antenna CW in azimuth until the home switch is actuated, or re-initialize the antenna ***to begin using the new HFO value*** you have entered and saved. To re-initialize the antenna from the REMOTE COMMAND window of the ACU;

1. Press **UP** arrow key several times to return to the **REMOTE COMMAND** display.
2. Press the **LEFT** or **RIGHT** arrow key to enter edit mode. Use the **LEFT**/**RIGHT** and **UP**/**DOWN** arrow keys to set the character and digits to "**^0090**" and then press the **ENTER** key.

This resets the PCU on the antenna. The antenna will reinitialize with this command (Performs a similar function as a power reset of the antenna) and the new home flag offset value will be used to calibrate the Relative position of the antenna.

11.2. Mechanical Calibration of Relative Antenna Position (Home Flag Offset)



During initialization, azimuth drives the antenna CW until the Home Flag Switch senses the trailing edge of the metal tab (***as shown in the left picture above***). The sensor will appear to go past the metal tab, then come back to the trailing edge of the metal tab and stay there. This "home" position orients the pedestal to the "BOW" reference in the radome which is directly forward of the entry hatch in the radome base. The Home Flag signal into the PCU "presets" the relative position counter to the value stored in the Home Flag Offset (**default value saved in the PCUs is 000**).

This assures that the encoder input increments and decrements from this initialization value, therefore, does not have to be precision aligned.

The metal Home Flag tab is mounted in a nylon clamp assembly. The nylon bolt/nut can be loosened to rotate the clamp around underneath the power ring. (***as shown in the center picture above***).

In the simplest scenario, if you could rotate the antenna pedestal to be in-line with the bow and then rotate the home flag clamp assembly around until the trailing edge is centered on the body of the home flag sensor, and tighten the clamp HFO would be set close enough for "Optimizing Targeting" procedure to be effective. Unfortunately, rarely is the equipment going to align where the clamp and sensor will be easy to access, reach and see, to align it this way.

The hex bolt heads in the plate below the Home Flag Clamp assembly are 60 degrees apart (***as shown in the picture on the right above***) and allow multiple points of view to calibrate rotation of the clamp to.

If you installed the ADE with the "Bow" reference of the radome oriented in-line with the bow, the antenna pedestal will be pointed in-line with the ships bow when stopped at the Home Flag position on completion of initialization (before it targets a satellite) as shown in Figure 1 in the Electrical Calibration Procedure above. In this case, when the antenna stops at the home flag and is pointed in-line with the Bow, Home Flag Offset (HFO) should be set to zero and mechanical position of the metal Home Flag tab should be left at the 0° (default) position. Any small mechanical mount error will be compensated when "Optimizing Targeting" is accomplished to correct for small variations of up to +/- 5.0 degrees.

If the ADE is installed with the "Bow" reference of the radome oriented 45° to starboard the pedestal, when at home flag position, will be pointed 45° CCW of the bow (at relative 315° as shown in Figure 2 in the Electrical Calibration Procedure above). To compensate for this, loosen the home flag clamp, rotate the trailing edge of the metal home flag tab **CW** 45° and tighten the clamp bolt (***use caution not to tighten too much and strip the nylon hardware***).. You will have to estimate this 45° rotation based on the 60° spacing of the hex bolt centers. Re-initialize the antenna and verify that when at home flag position it is pointed in-line with the ships bow. ***Do NOT change the Home Flag Offset value saved in the PCU***, small variations will be compensated for when "Optimizing Targeting" is accomplished.

If the ADE is installed with the "Bow" reference of the radome oriented 90° to port, the pedestal when at home flag position, will be pointed 90° CW of the bow (at relative 090° as shown in Figure 3 in the Electrical Calibration Procedure above). To compensate for this, loosen the home flag clamp, rotate the trailing edge of the metal home flag tab **CCW** 90° and tighten the clamp bolt (***use caution not to tighten too much and strip the nylon hardware***).. You will have to estimate this 90° rotation based on the 60° spacing of the hex bolt centers. Re-initialize the antenna and verify that when at home flag position it is pointed in-line with the ships bow. ***Do NOT change the Home Flag Offset value saved in the PCU***, small variations will be compensated for when "Optimizing Targeting" is accomplished.

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12. Setup – Searching

12.1. *Searching Operation*

The ACU 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 ACU will wait after AGC has fallen below the threshold value before it starts a search.

Search can be initiated manually by pressing the **NEXT** key as many times as required to access the SETUP menu, then press the **ENTER** Key to access the SEARCH sub-menu and then press the **UP** arrow key (starts a search from the current antenna position). While in the SEARCH sub-menu, pressing the **DOWN** arrow key will stop the current search.

Search is terminated automatically when the AGC level exceeds the threshold value and Tracking begins.

The ACU can be configured to use one of three search patterns. Each of the search patterns are described below. Each description includes information about the settings involved in configuring the ACU to select that particular pattern and the values that those settings would be set to, to optimize the pattern for your antenna model and the frequency band being used.

The dimensions and timing of the search pattern are determined by the SETUP parameters **SEARCH INC**, **SEARCH LIMIT**, **SEARCH DELAY** and **SWEEP INC**. Search is also affected by the *Threshold* and the *internal receiver* settings under the Satellite menu. To change any one of these parameters, refer to "Changing the Search Parameters" procedures below.

All three search patterns are conducted in a two-axis pattern consisting of alternate movements in azimuth and elevation or along the polarization angle. The size and direction of the movements are increased and reversed every other time resulting in an increasing spiral pattern as shown.

12.1.1. Default Standard (Box) Search Pattern

The factory default search pattern in the ACU is a standard "box" pattern. You configure the ACU to use this pattern by using the following settings:

SEARCH INC - set to the default value for the frequency band that your antenna model is currently being used for (typically 15 counts).

SEARCH LIMIT – initially set to the default value. After targeting has been optimized, the search limit can be adjusted if desired.

SEARCH DELAY – default or any number of seconds from 1-255 that you would prefer that the ACU wait before starting an automatic search.

SWEEP INC – default value (this parameter is not used in this search pattern).

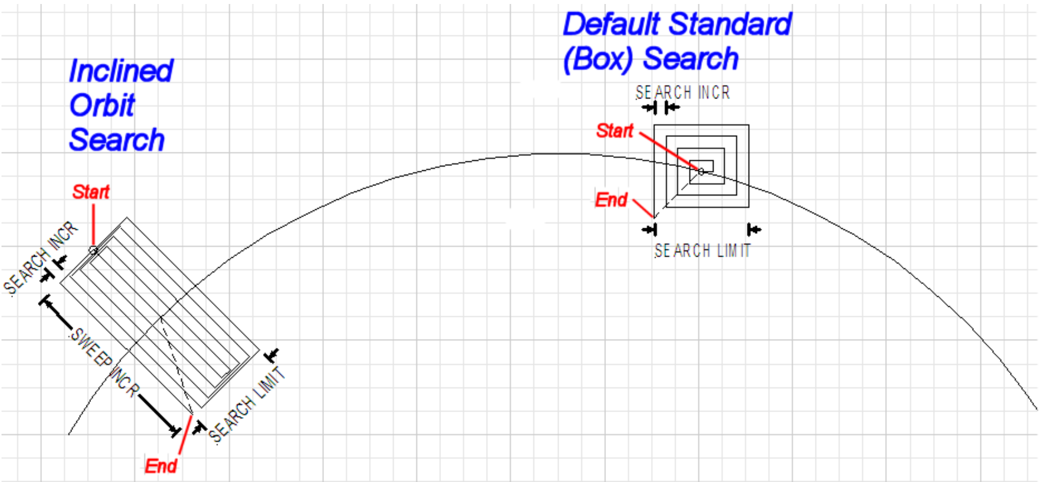
GYRO TYPE – must NOT be set to zero.

SAT REF mode – It is normally **OFF** as long as you have good gyro compass input. It ***MUST*** be **OFF** when the elevation angle is greater than 75 degrees. It ***MUST*** be **ON** if you are experiencing frequent, or constant, gyro read errors (error code 0001).

Target any satellite longitude value that includes even tenths digit values (ie SAT 101.0 W or SAT 101.2 W). If the desired satellite longitude includes an odd tenths digit, you must round it up, or down, one tenth to make the tenths digit EVEN. The ACU calculates the Azimuth, Elevation and Polarization values it will target the antenna. Initially the antenna will go to a position that is 8 degrees above the calculated elevation, until Azimuth and Polarization have had time to complete adjustment. Then the antenna will drive down to the calculated elevation, which is the "Start" of the search pattern in the graphic below.

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 ACU will retarget the antenna 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 this position, or anywhere within the search pattern, the ACU will terminate search and go into Tracking mode. If the desired signal is not found the ACU 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.

You can configure the ACU to do a special search pattern for a satellite that is in an inclined orbit by using the following settings:

SEARCH INC - set to the default value for the frequency band that your antenna model is currently being used for (typically 15 counts).

SEARCH LIMIT – leave this set to the default value for your antenna model.

SEARCH DELAY – default, or any number of seconds from 1-255 that you would prefer that the ACU wait before starting an automatic search.

SWEEP INC – set to **192** if your antenna is a Series 04 or Series 06 or Series 09. Set to **193** if your antenna is a Series 97, Series 00 or Series 07. This parameter sets the sweep increment (shown in the graphic above) to be +/- 8.0 degrees above/below the satellite arc.

GYRO TYPE – must NOT be set to zero.

SAT REF mode – It is normally **OFF** as long as you have good gyro compass input. It ***MUST*** be **OFF** when the elevation angle is greater than 75 degrees. It ***Must*** be **ON** if you are experiencing frequent, or constant, gyro read errors (error code 0001).

Target the desired satellite longitude value but include an odd tenths digit (ie if you desire to target inclined satellite 186.0 W you would key in SAT 186.1 W for the ACU to do an inclined search). The Antenna Control Unit calculates the Azimuth, Elevation and Polarization values it will target the antenna to.

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 ACU 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 ACU will terminate search and go into Tracking mode. If the desired signal is not found the ACU 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. No Gyro Search Pattern

If the ship does not have a gyro compass to use as a heading input to the Antenna Control Unit, you may manually key in the actual heading of the vessel and then re-target the desired satellite, every time you need to re-target a satellite, or configure the ACU to do a "No Gyro Search Pattern".

You configure the ACU to use this pattern by using the following settings:

SEARCH INC - set to the default value for the frequency band that your antenna model is currently being used for (typically 15 counts).

SEARCH LIMIT – leave this set to the default value.

SEARCH DELAY – default, or any number of seconds from 1-255 that you would prefer that the ACU wait before starting an automatic search.

SWEEP INC – Larger antennas should have slower speeds and smaller antennas should have faster speeds:

Larger antennas should have slower speeds set to ***0047*** (= 5 degrees/second) for ***2.4M to 3.6M antenna systems***).

Mid size antennas can be driven a little faster, set to ***0063*** (= 8 degrees/second) for ***2M antennas models***).

Smaller antennas should have faster speeds, set to ***0079*** (= 18 degrees/second) for ***all 0.8M to 1.5M antenna models)***.

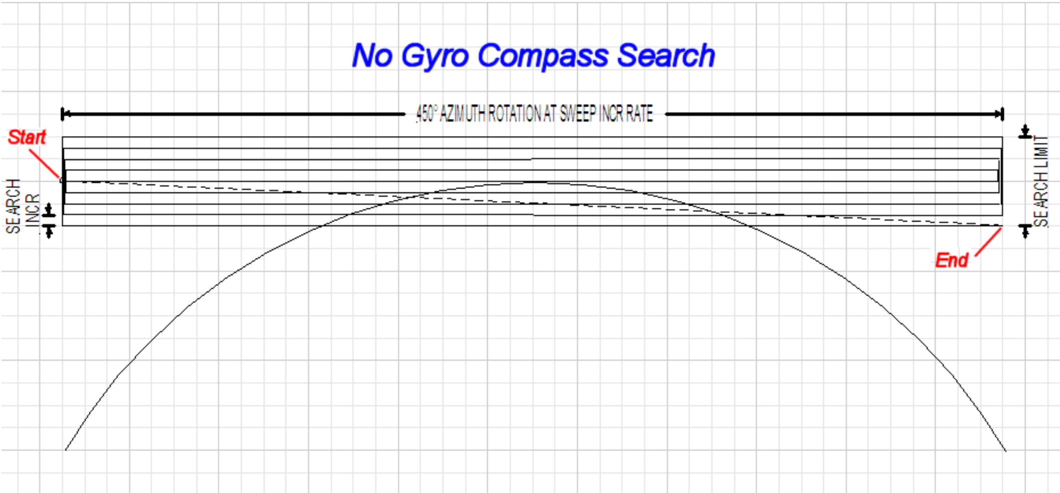
GYRO TYPE – ***MUST*** be set to ***zero*** for this search pattern.

SAT REF mode – **MUST** be **ON** for this search pattern.

Target any satellite longitude value which includes even tenths digit values (ie SAT 101.0 W or SAT 101.2 W). If the desired satellite longitude includes an odd tenths digit, you must round it up, or down, one tenth to make the tenths digit EVEN. The Antenna Control Unit calculates the Azimuth, Elevation and Polarization values it will use to target the antenna. However, without heading input, the ACU cannot target a "true azimuth" position (relative to true North). It will target the antenna to the calculated elevation and a repeatable "Start" relative azimuth position. In Series 04 antennas this relative position will be 90 degrees away from the nearest mechanical stop. In all other antennas it will be 000 degrees relative.

Initially the antenna will go to the "Start" relative azimuth position at the calculated elevation. Then the antenna will search up 450 degrees in azimuth, search up one Search Increment in elevation, search down 450 degrees 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 ACU 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 this position, or anywhere within the search pattern, the ACU will terminate search and go into Tracking mode. If the desired signal is not found the ACU 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. *Changing the Search Parameters*

The information above described what some of these parameters need to be set to for a specific search pattern. Below are some additional pieces of information on the other parameters and the steps to change any one of these parameters.

12.2.1. AUTO THRES

Sets offset of AGC tracking threshold above the average noise floor. Units are in A/D counts, approximately 20 counts/dB. A setting of 0 disables auto threshold, therefore, the operator would have to manually enter a threshold value.

When AUTO THRESHOLD is enabled (any value between 1-255), the ACU automatically re-sets the AGC tracking threshold whenever the antenna Targets (AZ, EL or SAT) or Searches. The new AGC threshold is set to the average signal level input (approximate background noise level) plus the AUTO THRES offset value. EXAMPLE: If the Noise Floor off satellite is 1000 counts of AGC and Auto Threshold is set to 100, Threshold will be set to approximately 1100 after the antenna has finished targeting or Searching.

To change the Automatic Threshold value OR manually set threshold; Note the Peak "on satellite" AGC value, move EL and note the "off satellite" (Noise Floor) AGC value. Calculate the Difference between Peak AGC and Noise Floor AGC. AUTO THRES should be set to 1/3 (to ½) of the Difference. This will usually be around 100 counts (3 dB) for a typical antenna configuration. Changes to this parameter may be required based on carrier tracking frequency, possible adjacent satellite, or ambient interference with desired satellite.

To manually update, press the LEFT arrow key to bring the cursor up under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.2. EL STEP SIZE

For proper DishScan® operation this parameter **must** be set to factory default value of 0000.

To manually update, press the LEFT arrow key to bring the cursor up under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.3. AZ STEP SIZE

For proper DishScan® operation this parameter **must** be set to factory default value of 0000.

To manually update, press the LEFT arrow key to bring the cursor up under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.4. STEP INTEGRAL

For proper DishScan® operation this parameter **must** be set to factory default value of 0000.

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.5. SEARCH INC

Sets size of search pattern increment. Units are in pedestal step resolution (12 steps per degree). The suggested setting is equal to the full 3dB beamwidth of your antenna. Default value is 15 these systems.

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.6. SEARCH LIMIT

Sets the overall peak to peak size of the search pattern. Units are in pedestal step resolution (12 steps per degree). Default value is 100 for these systems.

After you have optimized your Targeting (refer to Optimizing Targeting) you may wish to reduce the size of the Search pattern to avoid Tracking on an adjacent satellite (ie set to 50% of its default value so that in the future it will only search half as far from your targeted position).

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.2.7. SEARCH DELAY

Sets the time-out for automatic initiation of a search operation when the signal level (AGC) drops below threshold. Units are in seconds. Range is 0-255 seconds. Default setting is 30 seconds. A setting of 0 disables the automatic search initiation.

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

12.2.8. <u>SWEEP INC</u>

This parameter **MUST** be set for the desired azimuth sweep speed of a **No Gyro** search or the sweep increment dimension of an **Inclined Orbit** search (refer to the search pattern information above).

To manually update, press the LEFT arrow key to bring the cursor under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

12.3. Save New Parameters

Parameters that have been changed are only temporarily changed until they are SAVED. If changes are made and not stored, they will still be effective but will be lost when power is removed or the RESET key is pressed. Simultaneously press, and quickly release the LEFT and RIGHT arrow keys to access "SAVE NEW PARAMETERS" directly from any other menu display. Verify that the change(s) you have made is/are correct and then select "SAVE NEW PARAMETERS". Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

13. Setup – Blockage & RF Radiation Hazard Zones

This section discusses how to set up blockage, or RF Radiation Hazard, zones.

13.1. Radiation Hazard and Blockage Mapping (AZ LIMIT parameters)

The ACU 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 ACU software may allow you to set four zones or it will only three zones and include +5 volt polarization.

When the AZ LIMIT parameters are set to create these *ZONES* (up to four), several things happen when the antenna is within 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 (if 4 value is included in SYSTEM TYPE). Timeout and re-target will continue until the satellite is re-acquired and tracking can resume.
2. "BLOCKED" will be displayed in the TRACKING window wherever the antenna is inside one of the zones.
3. A contact closure to ground (or an open if the blockage logic is reversed – See SYSTEM TYPE 16 value) is provided on the SW2 terminal of the Terminal Mounting Strip. This Switch output provides a "Blocked", "RF Radiation Hazard" or "FCC TX Mute" logic output. When the antenna exits the zone it will be on satellite, tracking and the SW2 logic contact closure will open.

The lower and upper limits are user programmable and are stored in NVRAM within the ACU parameter list.

AZ LIMIT 1 is the Lower Relative AZ limit (this is the more counter-clockwise of the two points, even if it is numerically larger). AZ LIMIT 2 is the Upper Relative AZ limit (the more clockwise of the two points) for pattern mapping of ZONE 1. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 12 parameter.

AZ LIMIT 3 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 4 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 2. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 34 parameter.

AZ LIMIT 5 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 6 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 3. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 56 parameter.

AZ LIMIT 7 is the Lower Relative AZ limit (CCW point) and AZ LIMIT 8 is the Upper Relative AZ limit (CW point) for pattern mapping of ZONE 4. Enter the elevation value that represents the top of the blockage between the two azimuth limit points in the EL LIMIT 78 parameter. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

CAUTION: *The **Lower** Relative AZ limit is the more **counter-clockwise** of the two points (even if it is numerically larger) and the **Upper** Relative AZ limit is the more clockwise of the two points. If you enter the two relative points incorrectly, Tracking and Searching will be adversely affected.*

The ACU provides a contact closure to ground on the SW2 terminal of the Terminal Mounting Strip when the antenna is pointed within any one of the blockage/hazard zones or the system is searching, targeting, unwrapping or is mis-pointed by 0.5 degrees or more (FCC TX Mute function for Transmit/Receive systems ***only***). The contact closure is a transistor switch with a current sinking capability of 0.5 Amp. Refer to "Functional Testing" for instructions on how to ***simulate*** a manual BLOCKED condition to test SW2 logic output.

When used as simple "**BLOCKED**" logic output for a single Sea Tel antenna, this output could be used to light a remote LED and/or sound a buzzer to alert someone that the antenna is blocked, and therefore signal is lost.

In a "Dual Antenna" installation, this logic output is also used to control a Dual Antenna Arbitrator panel to switch the TXIF & RXIF signals from Antenna **"A"** to Antenna **"B"** when Antenna **"A"** is blocked, and vice versa.

When used as simple "**RF Radiation Hazard**" logic output for a single Sea Tel TXRX antenna, this output could be used to suppress RF transmissions while the antenna is pointed where people would be harmed by the transmitted microwave RF power output. The SW2 output would be interfaced to the satellite modem to ***disable*** the TX output signal from the Satellite TXRX Modem whenever the antenna is within the RF Radiation Hazard zone(s).

When used for "**FCC TX Mute**" logic output for a single Sea Tel TXRX antenna, this output is used to suppress RF transmissions whenever the antenna is mis-pointed 0.5 degrees or more, is blocked, searching, targeting or unwrapping. The SW2 output would be interfaced to the satellite modem to ***disable/mute*** the TX output signal from the Satellite TXRX Modem. When the mute condition is due to antenna mis-pointing, it will not ***un-mute*** until the pointing error of the antenna is within 0.2 degrees. The default output is contact closure to ground when the antenna is mis-pointed, therefore providing a **ground** to "Mute" the satellite modem from the SW2 terminal of the Terminal Mounting Strip. If your satellite modem requires an **open** to "Mute", refer to SYSTEM TYPE parameter 16 value to reverse the output logic from the ACU.

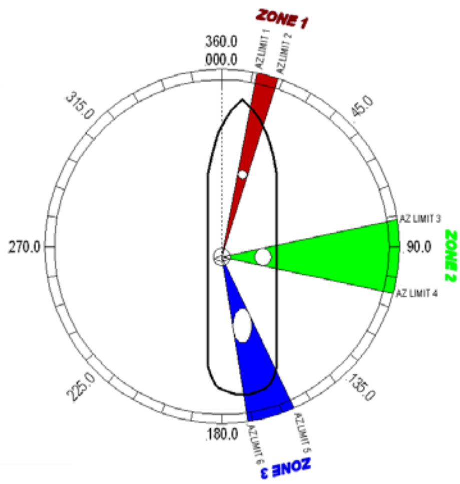
Programming instructions:

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 (in AZ LIMIT pairs).

In unlimited antenna systems the Relative position of the antenna must have been calibrated by properly setting the Home Flag Offset (HFO) value in the PCU. The HFO calibrates Relative to display 0000 when the antenna is pointed in-line with the bow of the boat/ship (parallel to the bow).

Convert the relative readings to AZ LIMIT/EL LIMIT values by multiplying by 10. Enter the beginning of the ***first*** blockage region as AZ LIMIT 1 and the end of the region (clockwise direction from AZ LIMIT 1) as AZ LIMIT 2 parameters in the ACU. If needed, repeat setting AZ LIMIT 3 & 4 for a ***second*** ZONE and then AZ LIMIT 5 & 6 if a ***third*** ZONE is needed. All ***unneeded*** zone AZ LIMIT pairs ***must*** be set to 0000. Set the upper elevation limit of each blockage zone (also entered in degrees multiplied by 10).

EXAMPLE 1 - Three blockage Zones: A ship has a Sea Tel antenna mounted on the port side and an Inmarsat antenna mounted on the starboard side. A mast forward, the Inmarsat antenna to starboard and an engine exhaust stack aft form the three zones where satellite signal is blocked (as shown in the graphic). In this example zone 1 is caused by the mast, zone 2 is from the Inmarsat antenna, zone 3 is from the stack and zone 4 is not needed:



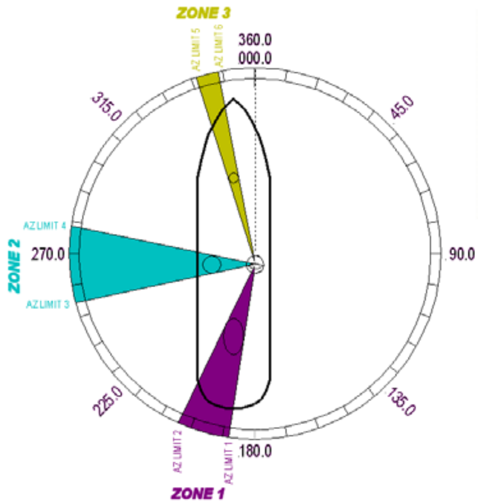
ZONE 1 begins (AZ LIMIT 1) at 12 degrees Relative and ends (AZ LIMIT 2) at 18 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 0120 and AZ LIMIT 2 value of 0180. In this case the mast height only causes blockage up to an elevation of 50 degrees, so we set EL LIMIT 12 to 0500. If the antenna is between these two AZ Limit points but the elevation is greater than 50 degrees, the antenna will no longer be blocked.

ZONE 2 begins (AZ LIMIT 3) at 82 degrees Relative and ends (AZ LIMIT 4) at 106 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 0820 and AZ LIMIT 4 value of 1060. In this case the Inmarsat antenna height only causes blockage up to an elevation of 12 degrees, so we set EL LIMIT 34 to 0120. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 3 begins (AZ LIMIT 5) at 156 degrees Relative and ends (AZ LIMIT 6) at 172 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 1560 and AZ LIMIT 6 value of 1720. In this case the stack antenna height only causes blockage up to an elevation of 36 degrees, so we set EL LIMIT 56 to 0360. If the antenna is between these two AZ Limit points but the elevation is greater than 36 degrees, the antenna will no longer be blocked.

ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

EXAMPLE 2 - Three blockage Zones, Dual Antenna configuration: A ship has 2 Sea Tel antennas, "Antenna A" mounted on the port side and "Antenna B" mounted on the starboard side. Antenna A is designated as the ***master*** antenna and its zones would be set as in example 1 above. The mast forward, Antenna A to port and the engine exhaust stack aft form the three zones where satellite signal is blocked from Antenna B. The SW2 logic output from Antenna A (ACU A) and Antenna B (ACU B) are used to control a "Dual Antenna Arbitrator", which will route satellite signal from the ***un-blocked*** antenna to the other below decks equipment. If both antennas are tracking the same satellite, they will not both be blocked at the same time. The logic output will switch to provide satellite signal to the below decks equipment from Antenna A when it is ***not blocked*** and will switch to provide satellite signal from Antenna B whenever Antenna A ***is blocked***. The switches will not change state if ***both*** antennas are blocked, or if ***both*** are on satellite.



Antenna A is the same as the previous example and its ACU would be set to those AZ LIMIT values.

Antenna B ACU would be set to:

In this example Antenna B zone 1 is caused by the stack, zone 2 is from Antenna A, zone 3 is from the mast and zone 4 is not needed.

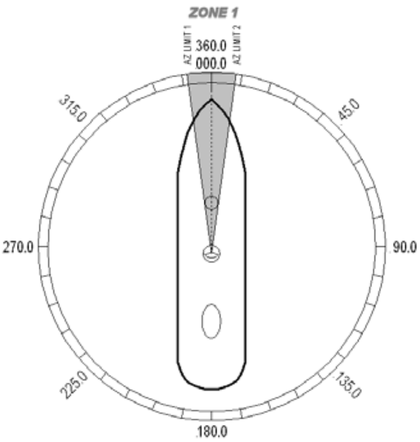
ZONE 1 begins (AZ LIMIT 1) at 188 degrees Relative and ends (AZ LIMIT 2) at 204 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 1880 and AZ LIMIT 2 value of 2040. In this case the stack height only causes blockage up to an elevation of 42 degrees, so we set EL LIMIT 12 to 0420. If the antenna is between these two AZ Limit points but the elevation is greater than 42 degrees, the antenna will no longer be blocked.

ZONE 2 begins (AZ LIMIT 3) at 254 degrees Relative and ends (AZ LIMIT 4) at 278 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 2540 and AZ LIMIT 4 value of 2780. In this case the Antenna B height only causes blockage up to an elevation of 12 degrees, so we set EL LIMIT 34 to 0120. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 3 begins (AZ LIMIT 5) at 342 degrees Relative and ends (AZ LIMIT 6) at 348 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 3420 and AZ LIMIT 6 value of 3480. In this case the mast height only causes blockage up to an elevation of 41 degrees, so we set EL LIMIT 56 to 0410. If the antenna is between these two AZ Limit points but the elevation is greater than 12 degrees, the antenna will no longer be blocked.

ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

EXAMPLE 3 - One blockage Zone: A ship has a Sea Tel antenna mounted on the center line of the ship. A mast is forward and an engine exhaust stack is aft. In this example the Stack does ***NOT*** block the satellite, only the mast forward does. In this example zone 1 is caused by the mast, zone 2, 3 and 4 are not needed:

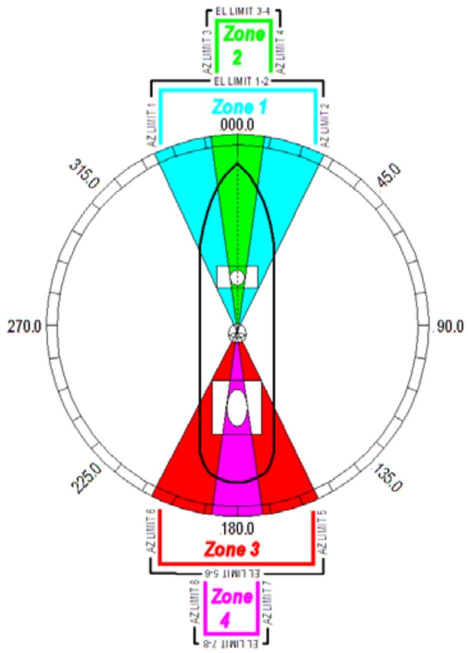


ZONE 1 begins (AZ LIMIT 1) at 352 degrees Relative and ends (AZ LIMIT 2) at 8 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 3520 and AZ LIMIT 2 value of 0080. In this case the mast height only causes blockage up to an elevation of 52 degrees, so we set EL LIMIT 12 to 0520. If the antenna is between these two AZ Limit points but the elevation is greater than 52 degrees, the antenna will no longer be blocked.

ZONE 2 is not needed. Enter AZ LIMIT 3 value of 0000 and AZ LIMIT 4 value of 0000. Set EL LIMIT 34 to 0000.

ZONE 3 is not needed. Enter AZ LIMIT 5 value of 0000 and AZ LIMIT 6 value of 0000. Set EL LIMIT 56 to 0000.

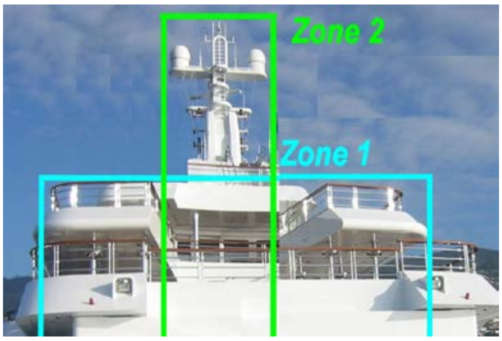
ZONE 4 is not needed. Enter AZ LIMIT 7 value of 0000 and AZ LIMIT 8 value of 0000. Set EL LIMIT 78 to 0000. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.



EXAMPLE 4 - 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 begins (AZ LIMIT 1) at 334 degrees Relative and ends (AZ LIMIT 2) at 026 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 3340 and AZ LIMIT 2 value of 0260. In this case the mast height only causes blockage up to an elevation of 40 degrees, so we set EL LIMIT 12 to 0400. 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.

ZONE 2 begins (AZ LIMIT 3) at 352 degrees Relative and ends (AZ LIMIT 4) at 008 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 3520 and AZ LIMIT 4 value of 0080. In this case the mast height only causes blockage up to an elevation of 70 degrees, so we set EL LIMIT 34 to 0700. 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 begins (AZ LIMIT 5) at 155 degrees Relative and ends (AZ LIMIT 6) at 205 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 5 value of 1550 and AZ LIMIT 6 value of 2050. In this case the mast height only causes blockage up to an elevation of 30 degrees, so we set EL LIMIT 56 to 0300. 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 begins (AZ LIMIT 7) at 173 degrees Relative and ends (AZ LIMIT 8) at 187 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 7 value of 1730 and AZ LIMIT 8 value of 1870. In this case the mast height only causes blockage up to an elevation of 55 degrees, so we set EL LIMIT 78 to 0550. If the antenna is between these two AZ Limit points but the elevation is greater than 55 degrees, the antenna will no longer be blocked. If your ACU software includes 5 volt polarization you will not see these AZ & EL LIMIT parameters.

13.2. Save New Parameters

Parameters that have been changed are only temporarily changed until they are SAVED. If changes are made and not stored, they will still be effective but will be lost when power is removed or the RESET key is pressed. Simultaneously press, and quickly release the LEFT and RIGHT arrow keys to access "SAVE NEW PARAMETERS" directly from any other menu display. Verify that the change(s) you have made is/are correct and then select "SAVE NEW PARAMETERS". Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

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14. Setup – Other Parameters

14.1. SETUP Parameter display and entry menus.

Press and hold BOTH the LEFT and the RIGHT arrow keys ***for 6 seconds*** to access to the system setup parameters (at the ***EL TRIM*** selection). **Press** BOTH the LEFT and the RIGHT arrow keys **momentarily** to access to the **SAVE NEW PARAMETERS** parameter.

Access is only required after installation or repairs of your antenna system. These parameters should only be changed by an authorized service technician.

CAUTION: Improper setting of these parameters will cause your system to not perform properly. Also refer to the SETUP section of your Antenna manual.

14.2. 5V OFFSET (May not be in your software)

CCW 5v Polang servo position reference. Refer to your antenna manual.

To manually update, press the LEFT arrow key to bring the cursor up under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

14.3. 5V SCALE (May not be in your software)

90 degree 5V Polang servo motion scale factor.

To manually update, press the LEFT arrow key to bring the cursor up under the least significant character. Continue to move the cursor until the desired character to be edited is underscored (selected). Use the UP or DOWN arrow keys to increment or decrement the selected character.

Use the LEFT or RIGHT arrow key to move the cursor left or right to select other characters to modify. When you are finished modifying press ENTER to execute the new value OR press NEXT to abort and exit setup mode.

14.4. REMOTE COMMAND

This parameter was used to issue diagnostic commands to the PCU, but is superseded by the use of DacRemP diagnostic software that your dealer will use when necessary.

14.5. REMOTE MONITOR

This parameter was used to monitor the results of a diagnostic command which was sent to the PCU.

14.6. To Disable/Enable DishScan®

When running a **beam pattern** test, a **programmed sweep** for NOC/Satellite Operator, **balancing** the antenna or **motor diagnostics** where you want the drives (AZ, EL & CL) not to be oscillating you will have to **disable** DishScan®.

Select the DISHSCAN® parameter window on the ACU:

1. Press the **RIGHT** arrow, then press the **UP** arrow and last press the **ENTER** key to turn DishScan® mode ON.
2. Press the **RIGHT** arrow, then press the **DOWN** arrow and last press the **ENTER** key to turn DishScan® Mode OFF.

If you change this remote parameter, you must save the change using **REMOTE PARAMETERS**.

If DishScan® is OFF and the Step Integral parameter is set to 0000, you will get a constant ERROR 0016 (DishScan® error) and you will see zeros flashing in the lower left of the Azimuth and Elevation ENTRY menu displays. This is a visual indication that DishScan® is turned OFF.

Always assure that you ***turn DishScan® back ON*** when returning to normal operation.

14.7. Satellite Reference Mode

The ships gyro compass input to the ACU may be accurate and stable in static conditions and yet may NOT be accurate or stable enough in some underway dynamic conditions. If there is no gyro compass or if the input is corrupt, not stable or not consistently accurate the tracking errors will become large enough to cause the antenna to be mis-pointed off satellite.

Satellite Reference Mode will uncouple the gyro reference from the azimuth rate sensor control loop. When operating in Satellite Reference Mode changes in ships gyro reading will not directly affect the azimuth control loop. The Pedestal Control Unit will stabilize the antenna based entirely on the azimuth rate sensor loop and the tracking information from DishScan®. This will keep the azimuth rate sensor position from eventually drifting away at a rate faster than the tracking loop can correct by using the tracking errors to regulate the rate sensor bias.

Satellite Reference Mode can be used as a diagnostic mode to determine if tracking errors are caused by faulty gyro inputs.

I t is normally **OFF** as long as you have good gyro compass input. It ***MUST*** be **OFF** when the elevation angle is greater than 75 degrees.

Satellite Reference Mode ***MUST be ON when:***

- No Gyro Compass is available
- Frequent or constant ACU Error Code 0001 (Gyro Compass has failed)

To view, or change, the Satellite Reference Mode status, *select the SAT REF remote parameter:*

1. Press the RIGHT arrow, then press the UP arrow and last press the ENTER key to turn Satellite Reference Mode ON.
2. Press the RIGHT arrow, then press the DOWN arrow and last press the ENTER key to turn Satellite Reference Mode OFF.

If you change this remote parameter, you must save the change using REMOTE PARAMETERS.

14.8. REMOTE PARAMETERS

Allows any remote parameters that have been changed (via Remote Command or Remote Tilt) to be saved. Any REMOTE changes must be saved to NVRAM in the PCU, or they will be lost when power to the antenna is cycled or remote reset command is issued. Press RIGHT arrow and then press ENTER to save the parameters in the remote PCU's NVRAM. A "Parameters Saved" message will be displayed.

15. 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**.*

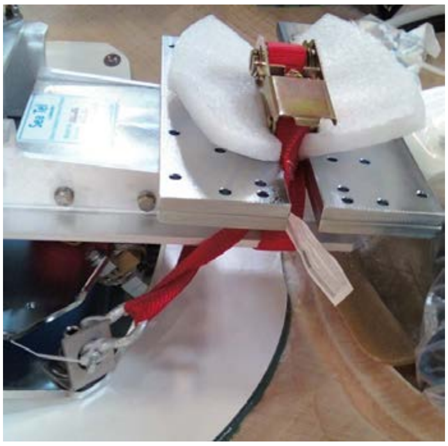
It is strongly recommended that AC Power to the ADE and BDE be supplied from an adequately rated Un-interruptible Power Supply (UPS) to protect the antenna against short power outages while underway.

15.1. Installing the Stow Restraints

The order the restraints are installed is not critical.

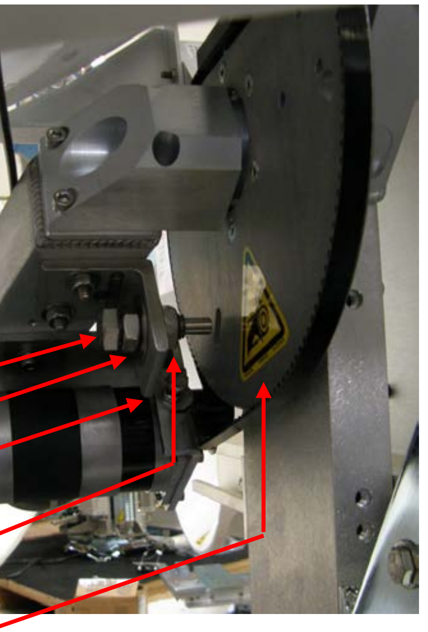
15.1.1. Installing the AZ Shipping/Stow Restraint

1. The AZ shipping/stow restraint is formed by a buckle web strap wound around the azimuth post toe weight and passed through stow clips in the base of the radome.
2. To restrain azimuth rotation of the antenna simply thread the strap through one of the clips in the base of the radome.
3. Wrap the strap around the azimuth post toe weight several times.
4. Thread the strap through an adjacent clip.
5. Thread the end of the strap through the buckle above the azimuth post toe weight.
6. Adjust the strap as necessary to enable tightening of the strap. The strap should not be extremely tight. The purpose of the strap is to restrain movement; a small amount of movement is acceptable.
7. Verify that the antenna is not able to rotate in azimuth.



15.1.2. 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.



EL Stow Pin-Bolt head

Hex Nut & Washer

Bracket

Washer & Hex Nut

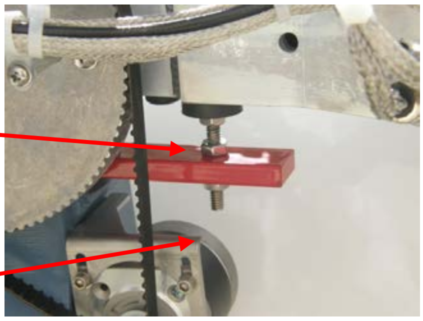
Elevation Driven Sprocket

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.	

15.1.3. 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).	

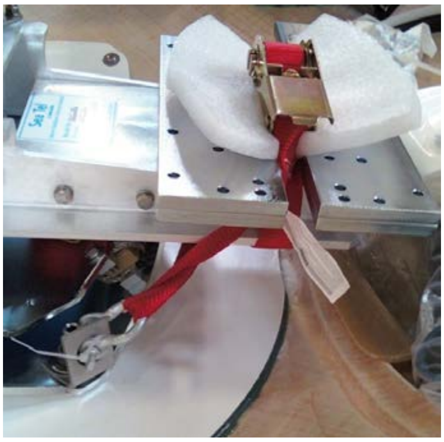
2. If not already removed, remove an adjustable bumper by removing the bottom nut from one end of the locking bar. 3. If not already loosened, loosen the top nut up toward the rubber bumper. 4. Insert vacant end of the locking bar through the opening under the cross-level beam. 5. Insert the adjustable 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.	

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

The order the restraints are removed is not critical.

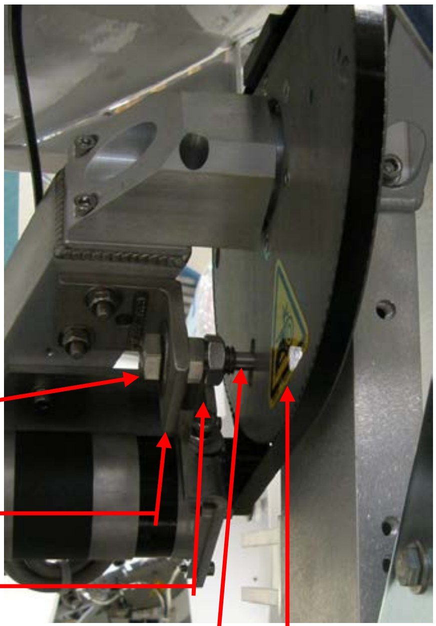
⚠	***CAUTION:*** *There are three shipping/stow restraints on this antenna pedestal that* ***MUST*** *be removed,* ***before energizing*** *the antenna, for normal operation.*

15.2.1. Removing the AZ Shipping/Stow Restraint

1. The AZ shipping/stow restraint is formed by a buckle web strap wound around the azimuth post toe weight and passed through stow clips in the base of the radome. 2. To un-restrain azimuth rotation of the antenna simply untie/unbuckle the web strap and remove it from the azimuth post and clips. 3. Save the web strap so that the antenna can be restrained in the future should it be required. 4. Verify that the antenna rotates freely and easily a full 360 degrees CW & CCW in azimuth.	

15.2.2. Removing the EL Shipping/Stow Restraint

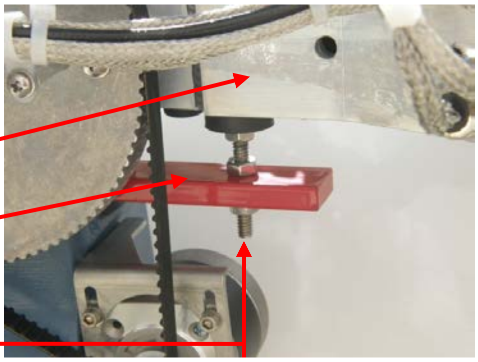
1. The EL shipping/stow restraint is formed by a stow pin-bolt mounted through a bracket and is engaged into a hole/slot in the elevation driven sprocket when the dish is at zenith (90 degrees elevation).
2. In the stowed position, the hardware from left to right is stow pin-bolt head, washer, bracket,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

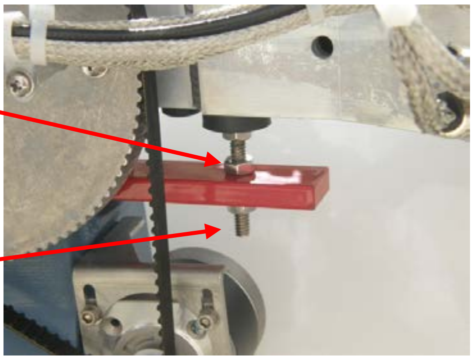


3. To un-restrain the elevation axis of the antenna, unthread the two hex nuts. Using a ¾" open end wrench, remove the hex nuts and washer from the stow pin-bolt.
4. Remove the stow pin-bolt from the bracket.

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.	

15.2.3. 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. Cross-Level Beam CL Shipping/Stow bar 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.	

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16. Operation

The information below reflects normal operation of the antenna from the antenna control unit. It assumes that:

- The antenna has been properly installed
- Home Flag Offset, targeting trims & polarization have been optimized
- Blockage zone(s) have been entered if necessary
- The ACU is following the gyro compass correctly
- The system is in all respects operating normally.

Simply selecting the desired band/reflector does not change the position of the pedestal, as it will stay where was previously pointed until you target the desired satellite (whether it is the same satellite or a different one).

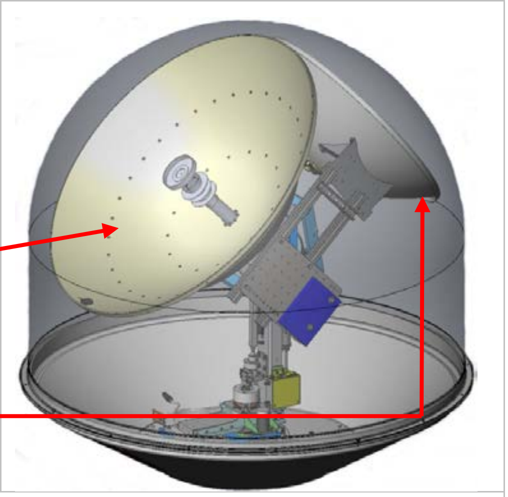
When switching bands/reflectors, you will need to select the correct band (in the TRACKING Menu) to select the correct reflector, change the tracking receiver settings (in the SAT Menu) to appropriate values for the satellite you wish to target, and then target the desired satellite (wrap around to the top of the SAT Menu) to cause the selected reflector to target to the desired satellite.

16.1. Target a C-Band Satellite

When power is turned ON the antenna will initialize to Reflector A - C-Band. During initialization the C-Band reflector will be driven to relative azimuth 000.0 (antenna will be parallel to the bow of the ship) and elevation of 45.0 degrees. In this example, we want to target a C-Band Circular satellite at 180W. The calculate target position of this satellite will be true Azimuth of 241.0 degrees and an Elevation of 44.0 degrees.

C-Band Reflector

Ku-Band reflector



First, if we do not already know the tracking receiver settings that we will use for the Ku-Band linear satellite at 170W, we should look up the information online (using Lyngsat.com, or other similar web site).

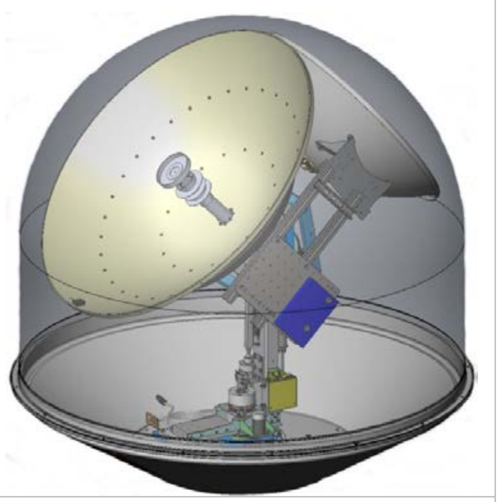
- We will need to identify what frequency band the satellite operates at to know whether we will be using the low band signals from the LNB (low band coaxes from the ADE), the high band signals from the LNB (high band coaxes from the ADE) or all of the high & low band signals (all four coaxes from the ADE).
- We must choose which signal we wish to use for tracking so that we can enter the correct values for the MHz, KHz, Tone, Volt, FEC, SKEW and NID settings.

NOTE: It's a good idea to look up, and record, this information for all of the satellites that you may potentially use in the regions where your ship will be travelling.

1. Access the STATUS Menu – TRACKING window and toggle the Band selection to C.
2. Access the SATELLITE Menu – Tracking Receiver settings and enter the MHz, KHz, Tone, Volt, FEC, SKEW and NID values, for the desired satellite, in their appropriate entry windows.

Note that the antenna pedestal has not changed its stance; the C-Band reflector is still pointed at 000.0 relative. Also note that for azimuth purposes the Ku-Band reflector is 180 degrees from the C-Band reflector, so it is currently at relative 180.0 degrees.

3. Press ENTER again to access the SATELLITE – SAT longitude entry window and set the satellite longitude to 180.0W and press the ENTER key.
   - The ACU will now calculate the azimuth, elevation and polarization angles for the desired satellite (from the ships latitude & longitude position). In this case, Azimuth 241.0 degrees and elevation 44.0 degrees are sent to the antenna pedestal PCU. The PCU knows that the Ku-Band reflector is currently at an azimuth of 180.0 degrees.
   - The pedestal will now rotate 241.0 degrees of relative azimuth to orient the C-Band reflector to a true azimuth of 241.0.



   - Elevation of the C-Band reflector will initially target 8 degrees higher than the calculated elevation value of the satellite (52.0 degrees).. The PCU will pause there until azimuth & polarization have completed driving and auto-threshold has established a good OFF-satellite AGC value. Then elevation will drive down to the calculated angle (44.0 degrees).
   - If the antenna targeting is accurate enough, the AGC will rise dramatically as the antenna elevation drives down to the targeted (calculated) value. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.
   - If the antenna targeting is not quite accurate enough for tracking to immediately take over, the ACU will wait "Search Delay" number of second and then start a search pattern to find the satellite. During the search the AGC value will rise dramatically as the antenna nears the satellite. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.

We are now tracking the C-Band circular satellite at 180W. The current Azimuth of the C-Band reflector is 241.0 degrees and the Elevation is at 44.0 degrees.

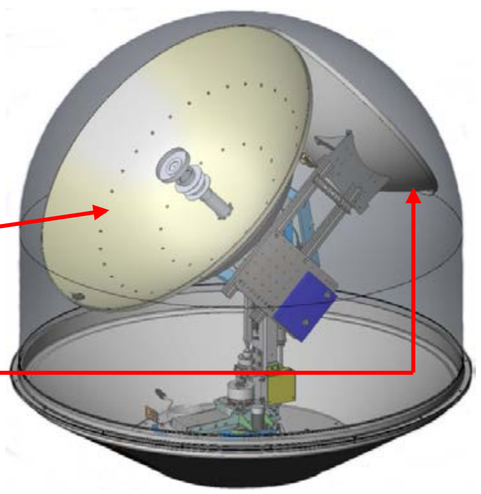
16.2. Target From A C-Band Satellite To Another C-Band Satellite

We are currently tracking a C-Band circular satellite at 180W. The current Azimuth of the C-Band reflector is 241.0 degrees and the Elevation is at 44.0 degrees.

In this example, we want to target another C-Band Circular satellite at 160W. The calculate target position of this satellite will be true Azimuth of 213.6 degrees and an Elevation of 59.7 degrees.

C-Band Reflector

Ku-Band reflector



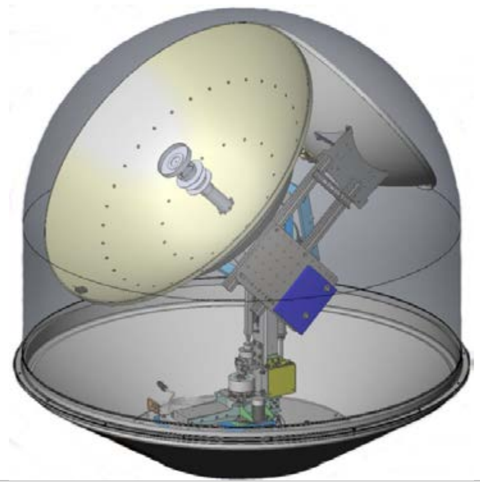
Note that the antenna pedestal has not changed its stance; the C-Band reflector is still pointed at 241.0 azimuth. Also note that for azimuth purposes the Ku-Band reflector is 180 degrees from the C-Band reflector, so it is currently at an azimuth of 61.0 degrees.

First, if we do not already know the tracking receiver settings that we will use for the Ku-Band linear satellite at 160W, we should look up the information online (using Lyngsat.com, or other similar web site).

- We will need to identify what frequency band the satellite operates at to know whether we will be using the low band signals from the LNB (low band coaxes from the ADE), the high band signals from the LNB (high band coaxes from the ADE) or all of the high & low band signals (all four coaxes from the ADE).
- We must choose which signal we wish to use for tracking so that we can enter the correct values for the MHz, KHz, Tone, Volt, FEC, SKEW and NID settings.

NOTE: It's a good idea to look up, and record, this information for all of the satellites that you may potentially use in the regions where your ship will be travelling.

1. Access the STATUS Menu – TRACKING window and toggle the Band selection to KuHi.
2. Access the SATELLITE Menu – Tracking Receiver settings and enter the MHz, KHz, Tone, Volt, FEC, SKEW and NID values, for the desired satellite, in their appropriate entry windows.
3. Press ENTER again to access the SATELLITE – SAT longitude entry window and set the satellite longitude to 160.0W and press the ENTER key.
    - The ACU will now calculate the azimuth, elevation and polarization angles for the desired satellite (from the ships latitude & longitude position). In this case, Azimuth 213.6 degrees and elevation 59.7 degrees are sent to the antenna pedestal PCU. The PCU knows that the Ku-Band reflector is currently at an azimuth of 61.0 degrees.
    - The pedestal will now rotate CCW 27.4 degrees of relative azimuth to orient the C-Band reflector to a true azimuth of 213.6 degrees.



- Elevation of the Ku-Band reflector will initially target 8 degrees higher than the calculated elevation value of the satellite (67.7 degrees).. The PCU will pause there until azimuth & polarization have completed driving and auto-threshold has established a good OFF-satellite AGC value. Then elevation will drive down to the calculated angle (59.7 degrees).
- If the antenna targeting is accurate enough, the AGC will rise dramatically as the antenna elevation drives down to the targeted (calculated) value. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.
- If the antenna targeting is not quite accurate enough for tracking to immediately take over, the ACU will wait "Search Delay" number of second and then start a search pattern to find the satellite. During the search the AGC value will rise dramatically as the antenna nears the satellite. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.

We are now tracking the C-Band circular satellite at 160W. The current Azimuth of the C-Band reflector is 213.6 degrees and the Elevation is at 59.7 degrees.

16.3. Target a Ku-Band Satellite From A C-Band Satellite

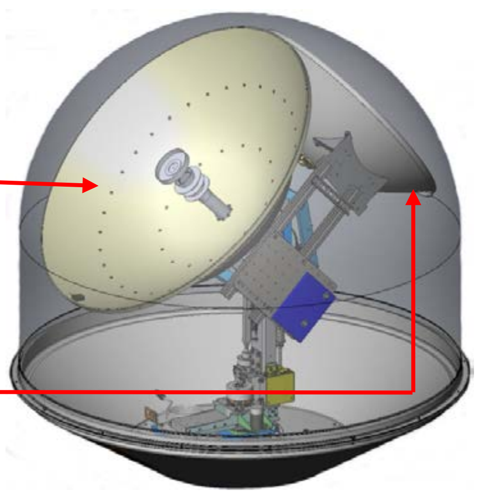
We are now tracking the C-Band circular satellite at 160W. The current Azimuth of the C-Band reflector is 213.6 degrees and the Elevation is at 59.7 degrees.

C-Band Reflector

We wish to switch to a Ku-Band linear satellite at 170W. The Azimuth position of the Ku-Band reflector will be 229.9 degrees and the Elevation is at 52.6 degrees.

Ku-Band reflector

Note that for azimuth purposes the Ku-Band reflector is 180 degrees from the C-Band reflector, so it is currently at an azimuth of 61.0 degrees.



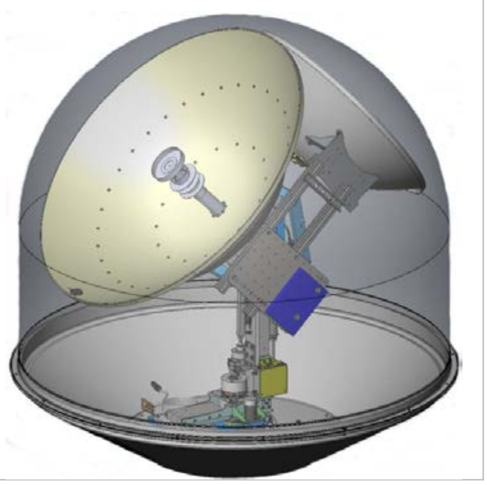
First, if we do not already know the tracking receiver settings that we will use for the Ku-Band linear satellite at 170W, we should look up the information online (using Lyngsat.com, or other similar web site).

- We will need to identify what frequency band the satellite operates at to know whether we will be using the low band signals from the LNB (low band coaxes from the ADE), the high band signals from the LNB (high band coaxes from the ADE) or all of the high & low band signals (all four coaxes from the ADE).
- We must choose which signal we wish to use for tracking so that we can enter the correct values for the MHz, KHz, Tone, Volt, FEC, SKEW and NID settings.

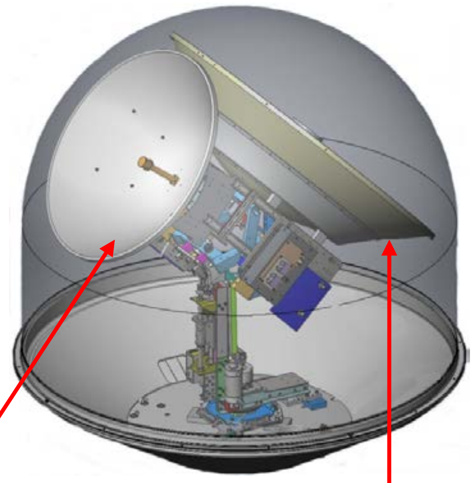
NOTE: It's a good idea to look up, and record, this information for all of the satellites that you may potentially use in the regions where your ship will be travelling.

1. Access the STATUS Menu – TRACKING window and toggle the Band selection to KuHi.
2. Access the SATELLITE Menu – Tracking Receiver settings and enter the MHz, KHz, Tone, Volt, FEC, SKEW and NID values, for the desired satellite, in their appropriate entry windows.

Note that the antenna pedestal has not changed its stance; the C-Band reflector is still pointed at the C-Band circular satellite at 160W.



3. Press ENTER again to access the SATELLITE – SAT longitude entry window and set the satellite longitude to 170.0W and press the ENTER key.
   - The ACU will now calculate the azimuth, elevation and polarization angles for the desired satellite (from the ships latitude & longitude position). In this case, Azimuth 229.9 degrees and elevation 52.6 degrees are sent to the antenna pedestal PCU. The PCU knows that the Ku-Band reflector is currently at an azimuth of 61.0 degrees.
   - The pedestal will now rotate CW 168.9 degrees of relative azimuth to orient the Ku-Band reflector to a true azimuth of 229.9 degrees.



- Elevation of the Ku-Band reflector will initially target 8 degrees higher than the calculated elevation value of the satellite (60.6 degrees). The PCU will pause there until azimuth & polarization have completed driving and auto-threshold has established a good OFF-satellite AGC value. Then elevation will drive down to the calculated angle (52.6 degrees).
- If the antenna targeting is accurate enough, the AGC rise dramatically as the antenna elevation drives down to the targeted (calculated) value. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.

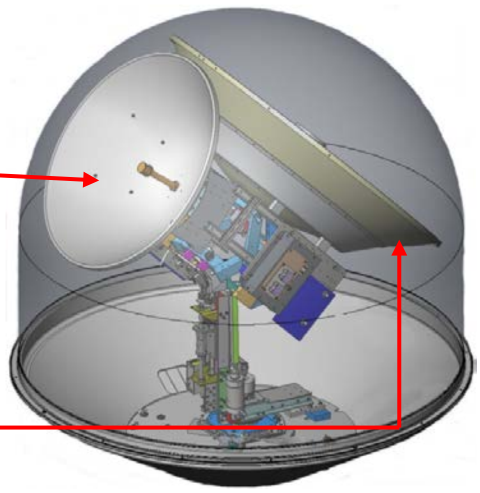
- If the antenna targeting is not quite accurate enough for tracking to immediately take over, the ACU will wait "Search Delay" number of second and then start a search pattern to find the satellite. During the search the AGC value will rise dramatically as the antenna nears the satellite. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.

We are now tracking the Ku-Band linear satellite at 170W. The current Azimuth of the Ku-Band reflector is 229.9 degrees and the Elevation is at 52.6 degrees.

16.4. Target From A Ku-Band Satellite To Another Ku-Band Satellite

We are now tracking the Ku-Band linear satellite at 170W. The current Azimuth of the Ku-Band reflector is 229.9 degrees and the Elevation is at 52.6 degrees.

Ku-Band Reflector



We wish to switch to a Ku-Band linear satellite at 190W. The Azimuth position of the Ku-Band reflector will be 248.8 degrees and the Elevation is at 34.7 degrees.

C-Band reflector

Note that for azimuth purposes the C-Band reflector is 180 degrees from the Ku-Band reflector, so it is currently at an azimuth of 49.9 degrees.

First, if we do not already know the tracking receiver settings that we will use for the Ku-Band linear satellite at 190W, we should look up the information online (using Lyngsat.com, or other similar web site).

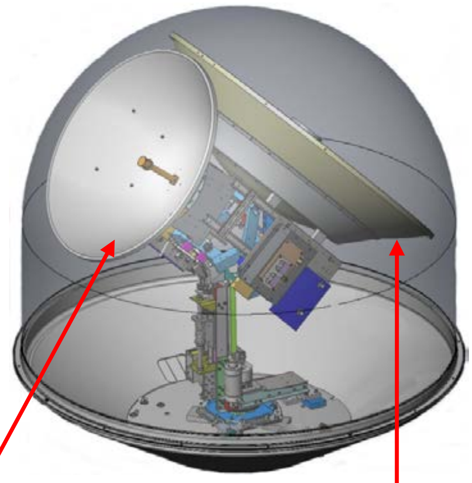
- We will need to identify what frequency band the satellite operates at to know whether we will be using the low band signals from the LNB (low band coaxes from the ADE), the high band signals from the LNB (high band coaxes from the ADE) or all of the high & low band signals (all four coaxes from the ADE).
- We must choose which signal we wish to use for tracking so that we can enter the correct values for the MHz, KHz, Tone, Volt, FEC, SKEW and NID settings.

NOTE: It's a good idea to look up, and record, this information for all of the satellites that you may potentially use in the regions where your ship will be travelling.

1. Access the STATUS Menu – TRACKING window and toggle the Band selection to KuHi.
2. Access the SATELLITE Menu – Tracking Receiver settings and enter the MHz, KHz, Tone, Volt, FEC, SKEW and NID values, for the desired satellite, in their appropriate entry windows.

Note that the antenna pedestal has not changed its stance; the Ku-Band reflector is still pointed at the Ku-Band linear satellite at 170W.

3. Press ENTER again to access the SATELLITE – SAT longitude entry window and set the satellite longitude to 190.0W and press the ENTER key.
   - The ACU will now calculate the azimuth, elevation and polarization angles for the desired satellite (from the ships latitude & longitude position). In this case, Azimuth 248.8 degrees and elevation 34.7 degrees are sent to the antenna pedestal PCU. The PCU knows that the C-Band reflector is currently at an azimuth of 49.9 degrees.
   - The pedestal will now rotate CW 18.9 degrees of relative azimuth to orient the Ku-Band reflector to a true azimuth of 248.8 degrees.

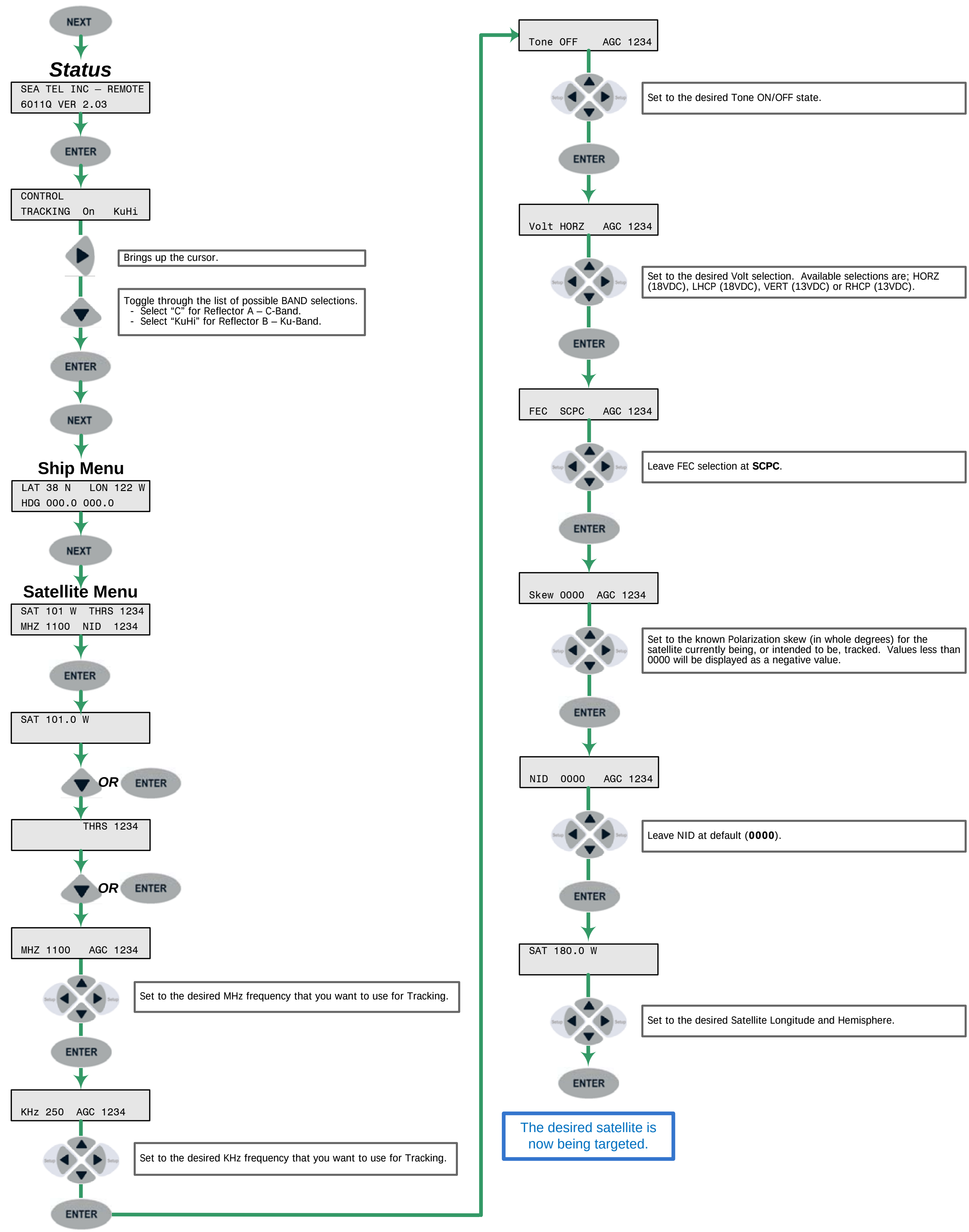


- Elevation of the Ku-Band reflector will initially target 8 degrees higher than the calculated elevation value of the satellite (42.7 degrees). The PCU will pause there until azimuth & polarization have completed driving and auto-threshold has established a good OFF-satellite AGC value. Then elevation will drive down to the calculated angle (34.7 degrees).
- If the antenna targeting is accurate enough, the AGC rise dramatically as the antenna elevation drives down to the targeted (calculated) value. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.
- If the antenna targeting is not quite accurate enough for tracking to immediately take over, the ACU will wait "Search Delay" number of second and then start a search pattern to find the satellite. During the search the AGC value will rise dramatically as the antenna nears the satellite. When the AGC value exceeds the Threshold value, Tracking will take over and peak the pointing of the reflector to maximize the satellite signal level.

We are now tracking the Ku-Band linear satellite at 190W. The current Azimuth of the Ku-Band reflector is 248.8 degrees and the Elevation is at 34.7 degrees.

Changing Satellites - DAC-2202 Ver 6.08 With a 6011-4 QOR TVRO Antenna System

Basic button pushing in any one of the sub-menus is; Use the LEFT and RIGHT arrow keys to bring up, and move, the cursor to select a character. Use the UP or DOWN arrow keys to increment or decrement the selected character to the desired value.



17. Functional Testing

If not already ON, Turn ON the power switch on the front panel of the ACU.

17.1. *ACU / Antenna System Check*

1. Turn ACU power ON. Turn antenna pedestal/RF equipment power ON
2. Press **RESET** on the ACU front panel. Verify the display shows "SEA TEL INC - MASTER" and the ACU software version number. Wait 10 seconds for the display to change to "SEA TEL INC - REMOTE" and the PCU software version number. If the display shows "REMOTE INITIALIZING," wait for approximately 2 minutes for the antenna to complete initialization and report the antenna model and PCU software version.
3. Press the **NEXT** keys repeatedly to display the ***Ship***, ***Satellite***, ***Antenna*** and ***Status*** menus. This verifies that the displays change in the correct response to the keys.

If "**REMOTE NOT RESPONDING**" is displayed, or the displays do not change when the NEXT key is pressed, refer to the Troubleshooting Section of this manual.

17.2. *Latitude/Longitude Auto-Update check*

This verifies that the integrated GPS antenna is automatically updating the positional information.

1. Press the **NEXT** key until the Ship's menu is displayed.	**LAT 38N LON 122W** **HDG 123.4 123.4**
2. Press the **ENTER** key to isolate the Latitude entry menu.	**LAT 38N**
3. Press the **LEFT** arrow key to display a cursor under the numeric value.	**LAT 38N**
4. Press the **UP** arrow key to increment the displayed value.	**LAT 39N**
5. Press the **ENTER** key to submit change.	**LAT 39N**
6. If automatic updating is working properly the Longitude value display will return to the current ships Longitude position within a few seconds.	**LAT 38N**

17.3. *Heading Following*

Verify that the **heading** display in the ACU is following the ships Gyro Compass.

1. Press **NEXT** repeatedly until the SHIP MENU (Heading) display is displayed. When Left and right values are displayed, left is the response from the pedestal and right in the local input from the gyrocompass.
2. Have another person call out the Gyro Compass heading to you while you observe the Heading display. The Heading display should consistently be ***exactly*** the same as the Gyro Compass value. If the heading display changes incorrectly or the red ERROR LED illuminates on the front panel, refer to the Troubleshooting section of the ACU manual.
3. Return to normal operation OR Continue with the next functional test.

17.4. Blockage Simulation Test

Blockage output function is used to modify the behavior of tracking and searching when there is a known blockage zone. The ACU provides a contact closure to ground on the SW2 terminal of the TMS when the antenna is pointed within any one of the blockage/hazard zones or the system is searching, targeting, unwrapping or is mis-pointed by 0.5 degrees or more (FCC TX Mute function for Transmit/Receive systems ***only***). The contact closure is a transistor switch with a current sinking capability of 0.5 Amp. This logic output control signal is used for:

- When used as simple "BLOCKED" logic output for a single Sea Tel antenna, this output could be used to light a remote LED and/or sound a buzzer to alert someone that the antenna is blocked, and signal is lost.
- In a "Dual Antenna" installation, this logic output(s) is used to control Dual Antenna Arbitrator panel of coax switches to switch the source inputs to the matrix switch from Antenna "A" to Antenna "B", and vice versa.
- When used as simple "**RF Radiation Hazard**" logic output for a single Sea Tel TX/RX antenna, this output could be used to suppress RF transmissions while the antenna is pointed where people would be harmed by the transmitted microwave RF power output. The SW2 output would be interfaced to the satellite modem to ***disable*** the TX output signal from the Satellite TXRX Modem whenever the antenna is within the RF Radiation Hazard zone(s).
- When used for "**FCC TX Mute**" logic output for a single Sea Tel TX/RX antenna, this output could be used to suppress RF transmissions whenever the antenna is mis-pointed 0.5 degrees or more, is blocked, searching, targeting or unwrapping. The SW2 output would be interfaced to the satellite modem to ***disable/mute*** the TX output signal from the Satellite TX/RX Modem. When the mute condition is due to antenna mis-pointing, it will not ***un-mute*** until the pointing error of the antenna is within 0.2 degrees. The default output is contact closure to ground when the antenna is mis-pointed, therefore provides a **ground** to "Mute" the satellite modem on the SW2 terminal of the Terminal Mounting Strip. If your satellite modem requires an **open** to "Mute", refer to SYSTEM TYPE parameter 16 value to reverse the output logic from the ACU.

To Test the blockage function:

1. Press the NEXT key until you are at the Status menu. Press ENTER to access the Tracking menu.
2. Press the RIGHT arrow key to bring up and move the cursor to the far right. Press the UP arrow to simulate a manual BLOCKED condition. BLOCKED will appear in the Tracking display.
3. Verify that SW2 terminal shorts to ground (or open circuit if you have SYSTEM TYPE configured to reverse the output logic) and that the external alarms actuate OR the Dual Antenna Arbitrator coax switches toggle (if antenna B is not blocked) OR the Satellite Modem TX is disabled/muted.
4. Press the LEFT arrow key and then press the UP arrow key to turn the simulated blocked condition OFF. BLOCKED will disappear from the Tracking display.
5. Verify that SW2 terminal is open circuit (or ground if you have logic reversed) and that the external alarms deactivate OR the Satellite Modem TX is un-muted. The Dual Antenna Arbitrator coax switches should not toggle until you manually block Antenna B ACU.

17.5. Four Quadrant Tracking Test

A Four Quadrant Tracking Test is the best way to test tracking (regardless of which tracking mode is being used). This tests each of the 4 quadrants (UP, DOWN, LEFT & RIGHT of peak signal AZ/EL pointing) to assure that the tracking mode being used drives the dish back to peak satellite signal level. **Note:** Return to peak should take about the same amount of time from each of the four quadrants.

1. Ensure tracking receiver parameters are set correctly and that system is on satellite with peak signal (AGC above threshold).
2. Ensure tracking LED is off – If not press the 

TRACK key to toggle tracking off
3. Press the 

NEXT arrow key a few times until antenna menu is displayed
4. Note the current Azimuth and AGC values.

5. Press and hold the **RIGHT** arrow key to drive azimuth down until displayed AGC drops 100 counts (approx. 2-3 dB) (Do not drive antenna so far that AGC falls below threshold)
6. Press the **TRACK** key to re-enable tracking.
7. Monitor the Azimuth and AGC Values for the next 20-30 seconds.
8. Verify the Azimuth and AGC return to the values noted in step 4.
9. Verify the amount of time it took for tracking to bring AGC back to peak is within the specifications

   ** Nominal time to get back to peak is 8-30 seconds. You should also be able to observe the DishScan® tracking decisions being carried out by ACU by viewing either a 2, 4, 6, or 8 in the bottom left-hand side of the Azimuth Sub-menu display screen. A normal displayed response would be opposite than that of the axis driven, i.e. for an antenna driven up (CW) is azimuth you would expect to see a majority of 4's being displayed indicating DishScan® senses signal strength higher down in azimuth, therefore sending the Azimuth Down command to PCU.

   A flashing '2' indicates an Elevation Down command

   A flashing '8' indicates an Elevation Up command

   A flashing '4' indicates an Azimuth Down (CCW) command

   A flashing '6' indicates an Azimuth Up (CW) command

   A flashing '0' indicates No antenna drive command
10. Repeat steps 2-9 driving antenna the other 3 directions. Replace Step 5 with below steps as each direction is tested.
11. Using the **LEFT** arrow to drive antenna down (CCW) in azimuth
12. Using the **DOWN** arrow key to drive antenna down in elevation
13. Using the **UP** arrow key to drive antenna up in elevation

If problems are encountered with tracking recovery refer to 123400_C DishScan® document available on our dealer support site.

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18. Installation Troubleshooting

This section describes the theory of operation to aid in troubleshooting and adjustments of the antenna system. Also refer to the Troubleshooting section of your ACU manual for additional troubleshooting details.

WARNING: *Electrical Hazard – Dangerous AC Voltages exist in the Breaker Box and the Antenna Pedestal Power Supply. Observe proper safety precautions when working inside the Antenna Breaker Box or Power Supply.*

18.1. Warranty Information

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

Access to the interior of the Outdoor Equipment (ODE), is allowed for inspection of components as described in the Scheduled Inspections section of this manual may be accomplished by technician/an engineer. Maintenance of the ODE should only be performed by technicians/engineers who are authorized by Cobham SATCOM. Only authorized Partners who have received factory training on this equipment will be able to file a claim for warranty reimbursement. Failure to comply with standard practices, which include but are not limited to modification of the terminal away from factory documented assemblies may also void the warranty period.

What's covered by the Limited Warranty?

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

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

It does ***not*** include Transmit & Receive RF Equipment, Modems, Multiplexers or other distribution equipment, whether or not supplied by Sea Tel commonly used in Satellite Communications (TXRX) Systems. These equipments are covered by the applicable warranties of the respective manufacturers.

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

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

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

18.2. Troubleshooting the ACU

The following paragraphs list the problems you might encounter when performing the functional checkout steps in the previous section of this manual. Following the problems are suggestions of where to start looking to solve the problem. Refer to the Drawings section of this manual and your antenna manual for any/all pertinent block diagrams, schematics, wiring diagrams and assembly drawings to aid in diagnosing any type of failure.

Try pressing RESET first and then in some cases you may want to turn Power OFF for a short period of time then turn it back ON to see if that restores normal operation. Remember, with most Gyro Compass types (Synchro and SBS inputs) you MUST enter the beginning Heading value EVERY time you power-up the ACU, before you will be able to retarget your desired satellite.

Verify that the SETUP PARAMETERS are set correctly (refer to the Setup section of this manual).

18.2.1. ACU display is blank

This indicates no power to the internal electronics. Assure that the front panel power switch is ON. Check the AC line voltage on the power cord. Check the cables on the rear panel of the ACU to assure they are properly connected. If AC Line voltage is ok, one at a time disconnect (and check display status) the cables plugged into J1 Gyro Compass, then J2 NMEA, then J3 M&C to see if one of these cables is shorting the ACU power. Call your dealer to report this failure and arrange for repair service.

18.2.2. ACU Status displays "REMOTE NOT RESPONDING"

This indicates a problem in the antenna control coax cable or communications modems in the ACU and/or antenna PCU. Check the antenna control cable connections at the J4 “Antenna” jack on the rear of the ACU and at the antenna pedestal inside the radome. If the connections are good, call your dealer to report this failure and arrange for repair service.

18.3. Troubleshooting Ships Gyro Compass problems

Ships Heading display does not follow ships movement and/or you are getting frequent or constant ERROR CODE 0001. Determine the type of gyro compass that is used on the ship, assure that the GYRO TYPE parameter is set correctly (refer to the setup section of this manual) and then proceed to the step that lists the troubleshooting for the correct type of Gyro Compass Signal.

18.3.1. STEP-BY-STEP

1. Verify that the GYRO TYPE parameter is set correctly.
2. Observe the ERROR LED on the FRONT panel. If it is illuminated, this indicates that an error was detected in the Step-By-Step input. Press RESET on the front panel. If the ERROR LED illuminates again, the problem is in the four connections to A, B, C and COMMON.
3. Check the connections to the TMS and to the ACU.
4. Measure the voltage between COMMON and A, B, and C. Each reading should either be near zero or 35 to 70 VDC. If all three are zero, check the repeater fuses. If some read negative and some read positive or if one reads an intermediate values the COMMON terminal is not properly connected.
5. If the ***Ship*** - Heading display is different from the actual Gyro heading, access the Heading entry menu and key in the correct heading value (refer to the operation Ship menu section). Note the reading. After the ship has turned more than one degree, compare the new gyro heading with the reading on the display, if it has moved in the opposite direction then reverse connections A and B. Reset the ACU, put in the correct ship's heading again and verify that the display reading now follows the Gyro heading.

18.3.2. 1:1 SYNCHRO

Observe the ship's heading display on the ACU. Compare its movement with that of the ship. If it does not move at all go to step 1. If it moves but in the wrong direction (even if it does not display the correct heading) go to step 2. If it moves in the correct direction but does not display the correct heading go to step 3. The gyro compass connects to the R1, R2, S1, S2 and S3 terminals.

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 Terminal Mounting Strip.

1. **The Ships Heading display does not change when the ship changes direction**. Using a multimeter read between R1 and R2. It should read 115 VAC. If it does not then a fuse is blown at the gyro repeater or there is an open between the repeater and the ACU. Read between S1 and S2, S2 and S3 and finally S3 and S1. They should all read between 0 and 90 VAC. The voltage level will change as the ship turns. If one reading is very close to 0 volts wait until the ship has made a major change in heading and then check voltage again. If the reading is still very low there is a problem in the line between the gyro repeater and the ACU or a problem in the gyro repeater itself.

2. **The display changes in the direction opposite of the movement of the ship**. Switch the secondary leads S1 and S2. Caution: there is 90 VAC between them! Verify that when the ship changes direction the display shows change in the same direction. If the direction is correct but the heading is incorrect go to step C.
3. **The ship's heading display does not indicate the correct heading**. If the display is off by 60, 180 or 300 degrees, this indicates that R1 and R2 are reversed. Reverse R1 and R2 and recheck the heading display. If the display is off by 120 or 240 degrees, this indicates that S1, S2 and S3 are in the right order but off by one place. Note their positions and carefully move the connections one position over (S1 to S2, S2 to S3, and S3 to S1). This action will offset the display by 120 degrees. Check if the display now reads correctly. If not move all three leads one more time in the same direction as last time. Verify that the ship's heading is correct.

18.3.3. <u>360:1 Synchro</u>

Observe the ship's heading display on the ACU. Compare its movement with that of the ship. If it does not move at all go to step 1. If it moves but in the wrong direction (even if it does not display the correct heading) go to step 2. If it moves in the correct direction but does not display the correct heading go to step 3. The gyro compass connects to the Terminal Mounting Strip on TB3- R1, R2, S1, S2 and S3.

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 Terminal Mounting Strip.

1. The Ships Heading display does not change when the ship changes direction. Using a multimeter read between R1 and R2. It should read 115 VAC. If it does not then a fuse is blown at the gyro repeater or there is an open between the repeater and the ACU. Read between S1 and S2, S2 and S3 and finally S3 and S1. They should all read between 0 and 90 VAC. The voltage level will change as the ship turns. If one reading is very close to 0 volts wait until the ship has made a major change in heading and then check voltage again. If the reading is still very low there is a problem in the line between the gyro repeater and the ACU or a problem in the gyro repeater itself.
2. The display changes in the direction opposite of the movement of the ship. Switch the secondary leads S1 and S2. Caution: there is 90 VAC between them! Verify that when the ship changes direction the display shows change in the same direction. If the direction is correct but the heading is incorrect go to step C.
3. If the ship's heading is different than the bridge, select the HDG function in the SHIP display mode by pressing the SHIP key 4 times. Key in the correct heading using the numeric keys and press ENTER.

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19. Maintenance

19.1. C-Band Feed Assembly Polarity Selection:

The Dual-Polarity C-Band TVRO Feed Assembly has two C-Band LNBs installed on it. One LNB will be LHCP and the other will be RHCP. The polarity if these two can be reversed if desired (the LHCP LNB will become RHCP and the RHCP will become LHCP when the polarity select knob is rotated 90 degrees from the "Normal" polarity position to the "Reverse" polarity position.

Normal Polarity selected

(either location 180° apart)

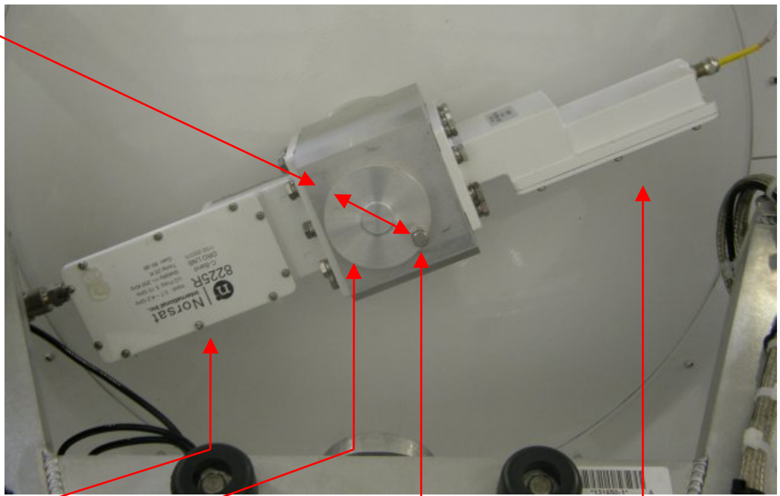
1. Pull the locking pin to release polarity select knob rotation.
2. Rotate the polarity select knob CW 90 degrees and release the locking pin.
3. Rotate the polarity select knob slightly CW/CCW and assure that the locking pin seats into the reverse position.

LHCP LNB

Polarity Select Knob

Locking Pin

RHCP LNB



Reverse Polarity selected

(either location 180° apart)

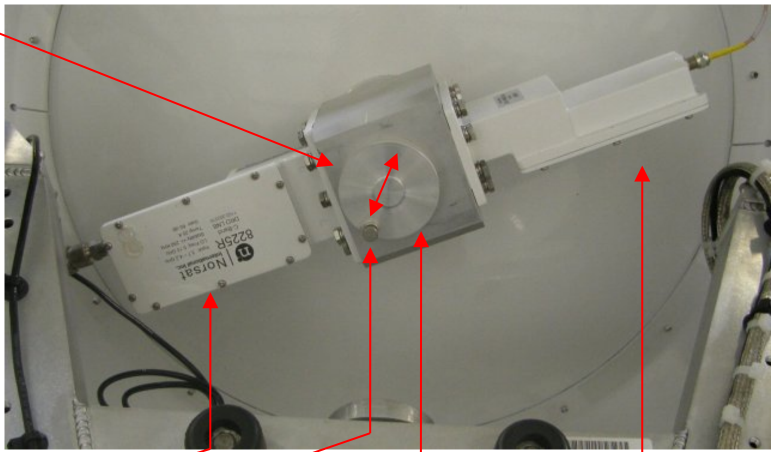
4. Pull the locking pin to release polarity select knob rotation.
5. Rotate the polarity select knob 90 degrees and release the locking pin.
6. Rotate the polarity select knob slightly CW/CCW and assure that the locking pin seats into the reverse position

RHCP LNB

Locking Pin

Polarity Select Knob

LHCP LNB



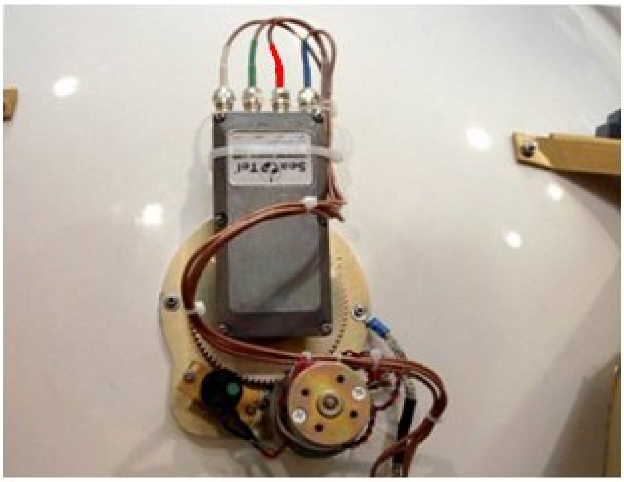
19.2. Replacing The Ku-Band LNB

19.2.1. Replacing or Changing LNBs

Series 04 antenna can be easily fitted with a variety of LNB assemblies. The feed is capable of receiving linear or circular polarization signals, however, the LNB must match the desired satellite polarization mode. Below are the instructions to install and align a replacement LNB, or switch to a different LNB. . When a Linear LNB is installed POL OFFSET parameter must be optimized.

NOTE: Linear polarization skew is intentionally REVERSED from actual received satellite polarization by the ½ wave length phase card (refer to basic system information). Therefore, to adjust polarization UP the LNB (as viewed from the back side of the reflector) must rotate CCW and to adjust polarity DOWN the LNB must rotate CW.

1. Open the radome hatch or remove radome top.
2. Target a Satellite ***Longitude*** that is the same as the Ships current Longitude. This will cause Auto-Polarization to rotate the current LNB to a vertical position (straight up), and the ACU polarization will be 120.
3. You may need to rotate the antenna to access the back of the dish.
4. Note that with the Cross-Level beam level, the body of the current LNB is vertical (straight up).



5. If you are replacing the LNB with the same style LNB, loosen the Allen set screws on the existing LNB mounting collar (three set screws, 120 degrees apart) and extract it from the mounting collar. If you are changing the LNB to a different style LNB, loosen the four screws that attach the mounting collar to the driven gear and remove the LNB and mounting collar.

6. Insert the new LNB (same style) into the mounting collar, assure it is seated all the way into the mounting collar tube, rotate the LNB as needed to align the center of the body of the LNB to a vertical position (straight up) and tighten the set screws. Mount the (different style) new LNB into the mounting collar. Assure that the LNB is seated all the way into the mounting collar tube, rotated to align the center of the body of the LNB to a vertical position (straight up) and tighten the setscrews.

7. Transfer the coax cables from the old LNB to the new LNB, assure that the correct color coax is attached to the correct port on the LNB as well as the below deck active matrix switch. Below is Sea Tel's recommended coax color code.

Dual Circular LNB

RHCP (Blue)

LHCP (White)

Dual Linear LNB

Vertical (Blue)

Horizontal (White)

Quad Linear LNB

Horizontal High (Red)

Vertical High (Green)

Horizontal Low (White)

Vertical Low (Blue)

8. NOTE: Check and if required, use trim weights to re-balance the antenna if you have replaced a Brainwave Quad LNB with a Quattro Quad LNB. 9. Close the radome hatch or re-install the radome top and tighten radome hardware. 10. Verify that the LNB operating properly and resume normal operation.	

19.3. Optimizing Ku-Band Linear Polarization:

This procedure optimizes the linear polarization of the feed based on the received signal level.

1. Verify that tracking is ON and that the antenna is peaked on your targeted satellite (targeting calculates the azimuth, elevation and polarization angles).
2. Go to the SKEW parameter in the Satellite menu of the ACU. Default setting is 0000 and may be incremented, or decremented, to adjust polarization while in Auto-Pol mode. Each increment equals one degree of polarization rotation, decrement below 0000 for minus polarization.
3. Press the RIGHT arrow to edit the current value.
4. While watching the signal strength display in one of the satellite receivers, the ACUs AGC value, or the spectrum analyzer satellite signal level, press the UP arrow to increment or the DOWN arrow to decrement the value and then hit the ENTER key to adjust the feed to the new value. Allow 10 seconds between increments or decrements to allow time for feed assembly to drive to new position.
5. Press the RIGHT key again, make another small change in the same direction and hit ENTER to carry out the adjustment.
6. Repeat this process of making small adjustments in the same direction until you see the modem signal strength, ACUs AGC value, or the spectrum analyzer satellite signal level decrease a noticeable amount (10 counts on the signal strength, 10 counts of AGC or ½ dB of signal level).
7. Note the SKEW value.
8. Make a series of small changes in the opposite direction until you see the signal peak and then fall the same amount as noted in step 6.
9. Note this SKEW value.
10. Set SKEW to mid way between the value noted in step 7 & 9.
11. To save your new SKEW value, simultaneously press, and quickly release the LEFT & RIGHT arrow keys to access "SAVE NEW PARAMETERS" directly from any other menu display. Press UP arrow and then ENTER to save any recent changes into the ACUs NVRAM for permanent storage.

20. Bluetooth Installation & Operation

20.1. Prerequisites

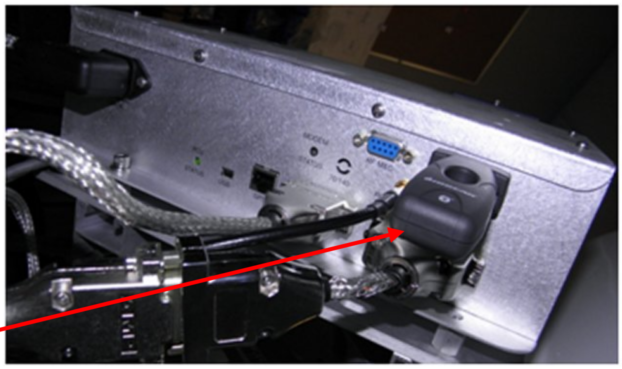
To use a Bluetooth device, as described in the information below, the ***MINIMUM*** requirements are:

- You must have a Sea Tel Series 09 antenna **with MK2 PCU**, a Series 10 antenna or a Series 11 antenna.
    - The PCU on your antenna must have software ver 2.03 or later.
- Antenna Control Unit software versions
    - DAC-2202 must have software ver 6.08 or later.
    - DAC_2302 must have software ver 7.08 or later.
- CommIF must have software ver 1.15 or later.
- Suitable computer and Operating system.

20.2. Installing the ADE Bluetooth Hardware

The IOGear serial Bluetooth is shown below, other manufacturer/models may be used.

1. Turn Tracking OFF at the Antenna Control unit.
2. At the ADE, open the hatch in the base of the radome.
3. Reach into the radome hatch to secure the AC power at the breaker.
4. Rotate the antenna pedestal to access the PCU.
5. Carefully enter into the radome hatch, far enough to reach the PCU.
6. Attach the SERIAL Bluetooth dongle (Receiver) to the MK2 PCU Service Port. If the device has retaining screws, secure them to prevent the device from vibrating loose.
7. Carefully exit the radome hatch.
8. Reach into the radome hatch to turn AC power ON at the breaker.
9. Allow the antenna to re-Initialize.
10. Secure the radome hatch.
11. Re-target the satellite if desired.

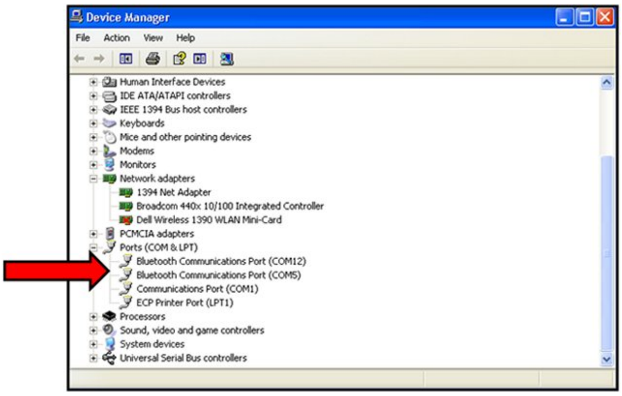


20.3. *Installing the BDE Bluetooth Hardware*

The IOGear USB Bluetooth is shown below, other manufacturer/models may be used.

1. At the below decks, or portable laptop, computer insert the Bluetooth Transmitter into an available USB port.

2. The computer should automatically detect new hardware and setup the Bluetooth connection. In case the Bluetooth connection is not automatically detected you should use the CD that is included with each Bluetooth dongle. Install that software if necessary.
3. Once the setup is completed, you should be prompted to enter a Password to establish a link from Master (TX) to Slave (dongle-RX).
4. The computer will automatically assign a virtual port for the USB connection. If you are unaware of which serial connection has been assigned, open the Device Manager and check com port assignments.



5. Identify the correct COM port for your Bluetooth device.
6. Once COM port is selected, open a compatible Sea Tel diagnostic program (ProgTerm or DacRemP).
7. In the Sea Tel diagnostic program select the appropriate COM port for the Bluetooth (refer to help in ProgTerm or DacRemP as appropriate).
8. You are now ready to communicate wirelessly to your Sea Tel antenna system.

20.4. *Diagnostic Mode*

If you are doing diagnostics and will NOT be using the system in normal operation, follow the instructions below.

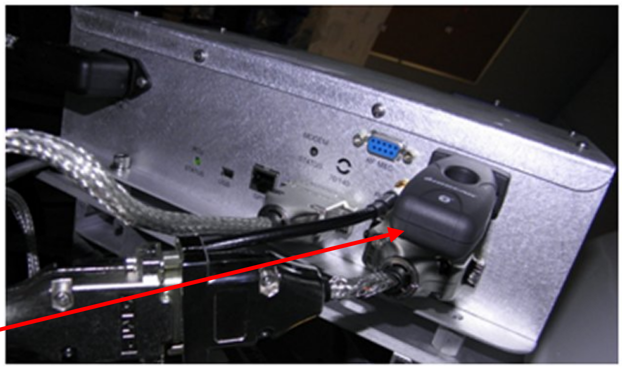
If you WILL be operating normally, refer to the next section.

1. If you are diagnosing a problem (using DacRemP), use the desired diagnostic recording module(s).
2. Issue other commands as desired.
3. If ON satellite testing is to be done, target and acquire the desired satellite at the antenna control unit, or from DacRemP.
4. If tracking is required, turn Tracking ON at the antenna control unit, or from DacRemP.

5. If the Bluetooth hardware is not to remain installed, refer to the sections below to remove the hardware from ADE & BDE, before returning to normal operation.
6. When use of diagnostic mode is completed, refer to Operation mode.

20.5. Removing the ADE Bluetooth Hardware

1. Turn Tracking OFF at the Antenna Control unit.
2. At the ADE, open the hatch in the base of the radome.
3. Reach into the radome hatch to secure the AC power at the breaker.
4. Rotate the antenna pedestal to access the PCU.
5. Carefully enter into the radome hatch, far enough to reach the PCU.
6. Remove the SERIAL Bluetooth dongle (Receiver) to the MK2 PCU Service Port. If the devices retaining screws were secured, unscrew them to remove the device from the PCU.
7. Carefully exit the radome hatch.
8. Reach into the radome hatch to turn AC power ON at the breaker.
9. Allow the antenna to re-Initialize.
10. Secure the radome hatch.
11. Re-target the satellite if desired.
12. Return to normal operation



20.6. Removing the BDE Bluetooth Hardware

1. At the computer, remove the Bluetooth Transmitter from the computer USB port.

2. Close the Sea Tel diagnostic programs (ProgTerm or DacRemP) which were being used.
3. You are now ready to return to normal operation of your Sea Tel antenna system.

20.7. Installing Software via Bluetooth

You can update the MK2 PCU software, and/or the DAC software, using the Bluetooth connection.

NOTE: You can **NOT** use the Bluetooth connection to update software in the CommIF, SCPC Receiver, 400MHz Modems or the Motor Driver Enclosure (MDE). If you need to update software in any of these assemblies you must install the software from a direct connection to the ACU.

1. With Bluetooth hardware installed and setup per the "Installing the ADE Bluetooth Hardware " and "Installing the BDE Bluetooth Hardware " paragraphs above.
2. From the computer, open ProgTerm.
3. It is strongly recommended that you save a parameter dump of the ACU & PCU parameters.
4. Update ACU or MK2 PCU software as you normally would, using ProgTerm.
5. Verify that all of the system parameters are correct after the software upload.
6. Re-target desired satellite.
7. Verify normal operation of the ACU/PCU system (refer to Functional Testing) and of the Satellite Modem.
8. Return to normal operation.

20.8. Normal Operation Mode

1. Target and acquire the desired satellite at the antenna control unit, or from DacRemP.
2. Turn Tracking ON at the antenna control unit, or from DacRemP.
3. Return to normal operation.

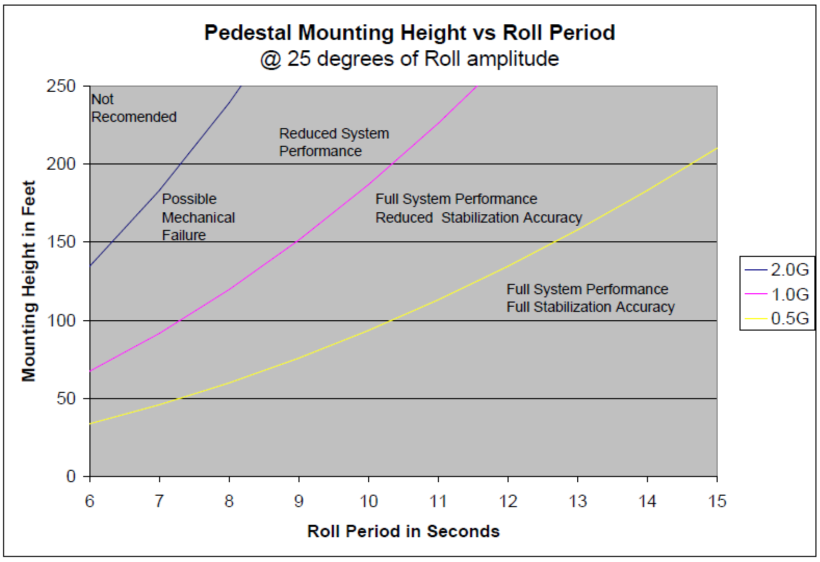
21. 6011-4 TVRO Technical Specifications

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***.

21.1. *Stabilized Antenna Pedestal Assembly*

Type:	Three-axis (Level, Cross Level, AZ)	
Stabilization:	Torque Mode Servo	
Stab Accuracy:	0.1 degrees RMS, 0.2 degrees MAX in presence of specified ship motions (see below).	
Azimuth Motor:	Size 23 Brushless DC Servo w/ Encoder	
Level and Cross Level Motors,	Size 23 Brushless DC Servo w/ Brake	
Inertial Reference:	3 Solid State Rate Sensors	
Gravity Reference:	3 axis solid state accelerometer	
AZ transducer:	256 line optical encoder / home switch	
Pedestal Range of Motion:	**Reflector A C-Band**	**Reflector B Ku-Band**
Elevation	-15 to +115 degrees	-20 to +95 degrees
Cross Level (Inclined 30 degrees)	+/- 35 degrees	
Azimuth	Unlimited	
Elevation Pointing	**Reflector A C-Band**	**Reflector B Ku-Band**
5 deg Roll	+0 to +90 degrees	0 to +90 degrees
20 deg Roll	+5 to +90 degrees	0 to +75 degrees
25 deg Roll	+10 to +90 degrees	0 to +70 degrees
Maximum Ship Motions		
Roll:	+/-25 degrees at 8 sec periods	
Pitch:	+/-15 degrees at 6 sec periods	
Yaw:	+/-8 degrees at 15 sec periods	
Turning rate:	Unlimited	
Headway:	Up to 50 knots	
Heave / Surge / Sway	0.5G	
Specified Ship Motions (for stabilization accuracy tests):		
Roll	+/- 20 degrees at 8 sec period	
Pitch	10 degrees FIXED	
AZ Relative	0, 45, & 90 degrees with respect to roll input	
Mounting height:	Sea Tel recommends that you not exceed tangential accelerations of **0.5 G** (See chart below).	

For Naval Engineering level information on this subject, please refer to Antenna Installation Guideline – Site Arrangement, document number 130040 available on the Sea Tel Dealer Support Site.



21.2. *QOR™ Dual Reflector Configuration:*

21.2.1. Antenna Assembly - 60" C-Band TVRO

The antenna assembly is comprised of the Dish, feed assembly and LNB. A variety of LNBs could be used, refer to LNB specification for the LNB that is provided with your system:

Reflector Diameter	1.5 m (58 inch)
Reflector Type	Spun Aluminum axis symmetric
Feed	Ring focus Cassegrain feed with integral S-Band radar filter and Dual Polarity TVRO OMT
Port to Port Isolation	> 35 dB typical
Polarization	Dual Circular LHCP & RHCP
Polarization control	Manual Normal/Reverse Select
Receive frequency range	3.625-4.2 GHz C-Band
Antenna Efficiency	65 Percent typical minimum
Minimum EIRP	33 dBW

21.2.2. Antenna Assembly - 40" Ku-Band TVRO

The antenna assembly is comprised of the Dish, feed assembly and LNB. A variety of LNBs could be used, refer to LNB specification for the LNB that is provided with your system:

Reflector Diameter:	101.6 cm (40 inch)
Reflector Type	Spun Aluminum axis symmetric
Feed	Cassegrain feed with ring focus splash plate
Polarization	Linear or Circular, with ½ wave phase card*
Polarization control	Remotely skewed adjustment using 24 volt DC motor, with potentiometer feedback for Linear and Circular feeds (Auto-Polarization mode is default).
Receive frequency range	10.7 - 12.75 GHz
Antenna Efficiency	65 Percent typical minimum
Minimum EIRP	42 dBW

NOTE: Linear polarization skew is intentionally REVERSED from actual received satellite polarization by the ½ wave length phase card (refer to basic system information).

21.3. Interchangeable LNB Options

This antenna can be easily fitted with a variety of LNB assemblies. The feed is capable of receiving linear or circular polarization however the LNB must match the satellite programming type desired. Below are the LNBs which may be used with this system.

21.3.1. C-Band LNBs

Receive Frequency:	3.625-4.2 GHz
IF Frequency:	950-1450 MHz
LO Frequency:	5.15 GHz
Noise Figure	25 deg C, typical

21.3.2. US Circular LNB

Sea Tel Part Number:	127444-1
Type:	Dual output
RF Frequencies:	12.2 - 12.7 GHz
IF Frequency:	950 - 1450 MHz
LO Frequency:	11.250 GHz
Noise Figure:	1.1 dB max.
Polarization modes:	LHCP or RHCP circular
Polarization control:	18VDC (LHCP) or 13VDC (RHCP) voltage switched

21.3.3. DLA Circular LNB

Sea Tel Part Number:	115075-2
Type:	Dual output
RF Frequencies:	11.45 - 12.2 GHz
IF Frequency:	950 - 1700 MHz
LO Frequency:	10.5 GHz
Noise Figure:	1.1 dB max.
Polarization modes:	LHCP or RHCP circular
Polarization control:	18VDC (LHCP) or 13VDC (RHCP) voltage switched

21.3.4. European Quad Universal Linear LNB

Sea Tel Part Number:	132463	
Type:	Quad output	
	Low Band	**High Band**
RF Frequencies:	10.7 - 11.7 GHz	11.7 - 12.75 GHz
IF Frequencies:	950 - 1950 MHz	1100 - 2150 MHz
LO Frequencies:	9.75 GHz	10.6 GHz
Noise Figure:	0.2 dB typical (0.7dB Max)	
Polarization modes:	2 Horiz., 2 Vert. Outputs	
Band Selection:	2 Hi, 2 Lo band outputs	

21.4. *MK 2 Pedestal Control Unit (PCU)*

The PCU Assembly contains 3 Printed Circuit Boards (PCBs).

Connectors	
AC Power	100-240 VAC, 2A-1A
USB	Mini USB
GPS Input	RJ-11 connector
Motor Control	DA-15S connector
70/140 MHz	SMA (on 4 ch Modem) 70/140 MHz input
Rotary Joint	SMA
L-Band	SMA L-Band input
RF M&C	DE-9S connector
Feed	DB-25S connector
Service	DE-9S connector
Coax Switch	
J2/NO/Co-Pol	SMA
J3/COM/Common	SMA
J1/NC/Cross-Pol	SMA
Controls	None
M&C Interface	9600 Baud 400MHz FSK
Status LEDs	
PCU Status	Diagnostic Status of the PCU
Modem Status	Configuration & Diagnostic Status of the Modem

21.5. *MK 2 Motor Driver Enclosure (MDE)*

The Motor Driver Enclosure contains the Motor Driver for the 3 Brushless DC Drive motors (AZ/EL/CL) and the Brake Controller for the EL & CL motors.

Connectors	
Drive	DA-15P connector
Home	DE-9S connector
AZ	DA-15S connector
EL	DA-15S connector
CL	DA-15S connector
Status LEDs	
CL Drive	
EL Drive	
AZ Drive	
MDE Status	

21.6. *400 MHz Base & Pedestal Unlimited Azimuth Modems (3 Channel)*

Combined Signals (-1,-2)	
Pass-Thru	950-3200 MHz RX IF,
Injected	22Khz Tone
	DC LNB Voltage Select
	400 MHz Pedestal M&C
Connectors:	
RX IF L-Band	SMA female
Rotary Joint	SMA female
Radio / Ped M&C	9 pin D-Sub Connectors
RF Pedestal M&C	Pedestal Control
Modulation	FSK
Mode	Full Duplex
Frequencies	
BDE RF M&C	TX = 447.5 Mhz +/-100 KHz
BDE Ped M&C	TX = 452.5 Mhz +/-100 KHz
ADE RF M&C	TX = 460.0 Mhz +/-100 KHz
ADE Ped M&C	TX = 465.0 Mhz +/-100 KHz
Radio/Pedestal M&C	Radio & Pedestal Control
Modulation	FSK
Mode	Full Duplex
Diagnostics	LED Status Indicator for Power, Link communications and Self Test
Pedestal Interface	RS-232/422
RF Interface (Jumper Selectable)	RS-232, RS-422 (4 wire) or RS-485 (2 wire)
ADE/BDE Mode	Jumper Selectable

21.7. *Radome Assembly, 76"*

Type	Frequency Tuned
Material	Composite foam/laminate
Size	
Diameter:	201.59cm (79.37 inch)
Height:	200.99cm (79.13 inch)
Hatch size	18" x 28"
Installed weight	***MAX*** 261.1 kg (575 lbs.) Including antenna pedestal.
RF attenuation	Less than 0.3 dB @ 10.7-12.75 GHz, dry
	Less than 0.3 @ 14.0-14.5 GHz, dry
Wind:	Withstand relative average winds up to 201 Kmph (125 mph) from any direction.
Ingress Protection Rating	All Sea Tel radomes have an IP rating of 56

Maintenance – The radome must be kept clean and free of residues that will increase the RF attenuation.

Repair - NOTE: Damage to the seal of the inside, or outside, of the radome can allow moisture to be absorbed. This will result in de-lamination of the radome, increased weight and higher attenuation.

To maintain the RF transparency characteristics of the radome top, any cracks, scratches or other damage to the surface seal of the tuned radome top must be repaired and re-sealed by a competent "A" layered laminate, or cored deck, repair professional.

Cracks in, or other damage to, the radome base can be repaired using typical fiberglass repair techniques and proper sealing of the inside and outside surfaces. Edges of holes in the radome base must be properly sealed to prevent moisture from being absorbed into the layered construction of the radome base.

Disposal - Should it ever become necessary to dispose of the radome, it must be disposed of using the same handling procedures as other fiberglass materials.

21.8. ADE Pedestal Power Requirements:

Antenna AC Input Power	100-240 VAC, 47-63 Hz, single phase
Antenna Power Consumption	450 Watts ***MAX (brake release, pedestal drive and 8W BUC drive)***

21.9. Environmental Specifications

21.9.1. Climatic Conditions

Environmental condition	Test Level
Temperature Range (Operating)	-25° to +55° Celsius (-13° to +131° F)
Humidity	100% Condensing
Wind Speed (relative)	56 m/sec (125 mph)
Solar Radiation	1,120 Watts per square meter @ 25° Celsius ambient.
Icing:	Survive ice loads of 1.2g per square cm (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.

21.9.2. Chemically Active Substances

Environmental Condition	Test Level
Sea Salt	5 percent solution

21.9.3. Transit Conditions

Environmental Condition	Test Level
Drop (Transit)	ISTA 3B
Vibration (Transit)	ISTA 3B

21.10. *Below Decks Equipment*

21.10.1. Antenna Control Unit (ACU)

Refer to the information in the Specifications chapter of this Manual.

21.10.2. Terminal Mounting Strip (TMS)

Refer to the information in the Specifications chapter of this Manual.

21.10.3. Satellite Receiver

Please refer to the manufacturers I&O manual for this device.

21.10.4. Multiswitch

Please refer to the manufacturers I&O manual for this device.

21.11. *Cables*

21.11.1. Antenna Control Cable (Provided from ACU to the Base MUX)

RS-422 Pedestal Interface

Type	Shielded Twisted Pairs
Number of wires	6
Wire Gauge	24 AWG or larger
Communications Parameters:	9600 Baud, 8 bits, No parity
Interface Protocol:	RS-422
Interface Connector:	DE-9P

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

2, 4 or 6 cables are required dependent upon which feed/LNB configuration your antenna is fitted with.

Type F male connectors installed on the cables MUST be the correct type so that they mate properly with the cable you are using.

Due to the dB losses across the length of the RF coaxes at L-Band, Sea Tel recommends the following 75 ohm coax, or Heliax, cable types (and their equivalent conductor size) for our standard pedestal installations:

Run Length	Coax Type	Conductor Size
up to 75 ft	LMR-300-75	18 AWG
up to 150 ft	RG-11 or LMR-400-75	14 AWG
up to 200 ft	LDF4-75 Heliax	10 AWG
Up to 300 ft	LMR-600-75	6 AWG

For runs longer that 300 feet, Sea Tel recommends Single-mode Fiber Optic Cables with Fiber Optic converters.

21.11.3. Multi-conductor Cables (Customer Furnished)

Due to the voltage loss across the multi-conductor cables, Sea Tel recommends the following wire gauge for the AC & DC multi-conductor cables used in our standard pedestal installations:

Run Length	Conductor Size
up to 50 ft	20 AWG (0.8 mm)
up to 100 ft	18 AWG (1.0 mm)
up to 150 ft	16 AWG (1.3 mm)
up to 250 ft	14 AWG (1.6 mm)
Up to 350 ft	12 AWG (2.0 mm)

22. DRAWINGS

The drawings listed below are provided as a part of this manual for use as a diagnostic reference.

22.1. 6011-4 Model Specific Drawings

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SINGLE LEVEL MFG BILL OF MATERIAL

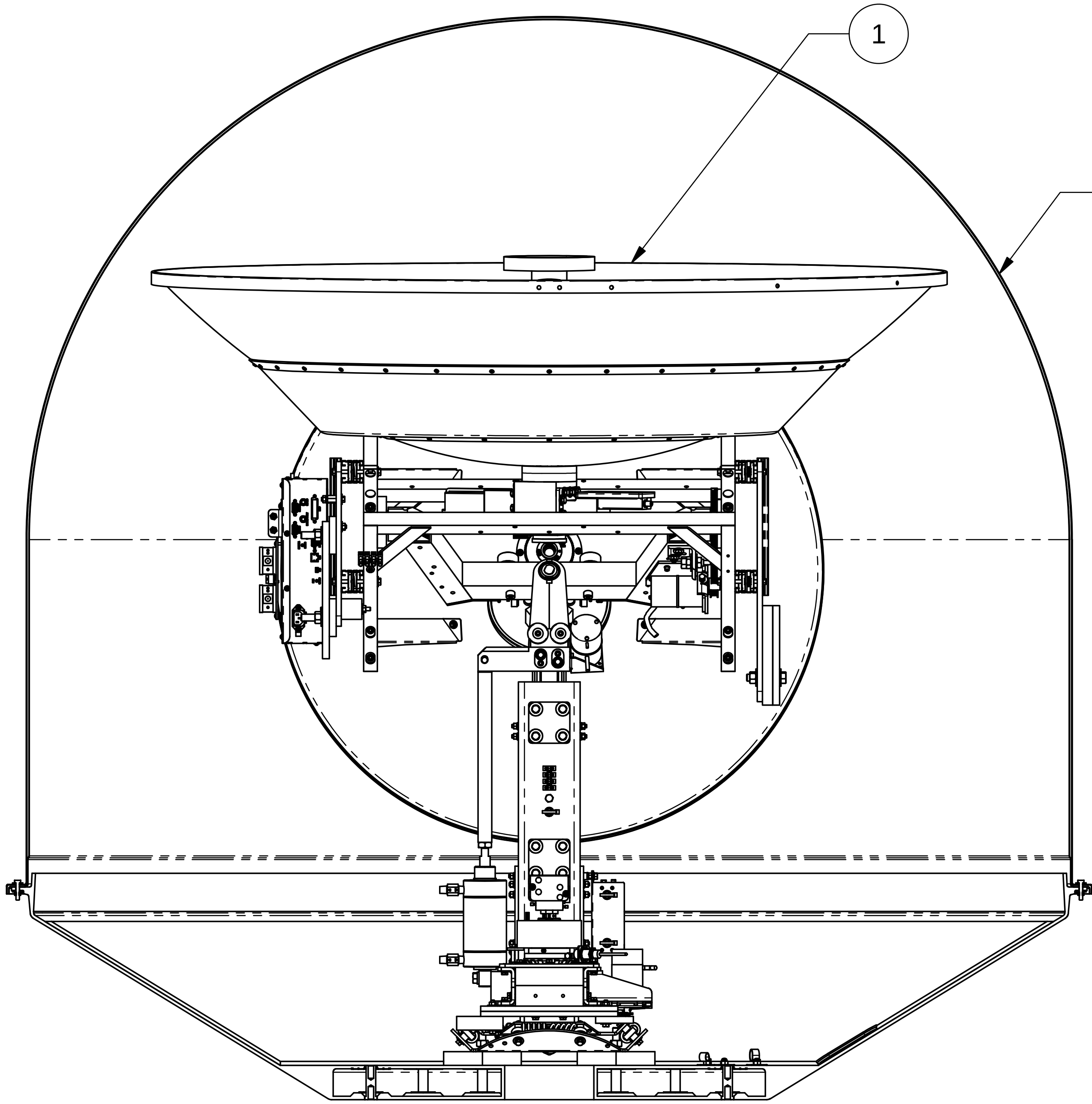
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	134117-1	A	GENERAL ASS'Y, 6011-4, C/KU	
2	1 EA	134792-1	A	RADOME ASS'Y, GA INSTALL, 76 IN, TVRO	
3	1 EA	132463-1	C	LNBF, QUAD, KU, INVERTO, MODIFIED	(NOT SHOWN)
6	1 EA	125411-3	M	DAC-2202, SCPC RCVR, 9 WIRE IF	(NOT SHOWN)
7	1 EA	131856-1	A	BELOW DECK KIT, 4CH, TVRO, 400MHZ	(NOT SHOWN)
8	1 EA	133658	A	CUSTOMER DOC PACKET, 6009/11 TVRO	(NOT SHOWN)
11	1 EA	124766-1	B	DECAL KIT, 66-81 IN RADOME, SEA TEL	(NOT SHOWN)
12	1 EA	121711	A	BALANCE WEIGHT KIT	(NOT SHOWN)
13	1 EA	130290-1	B1	SHIP STOWAGE KIT, XX09	(NOT SHOWN)

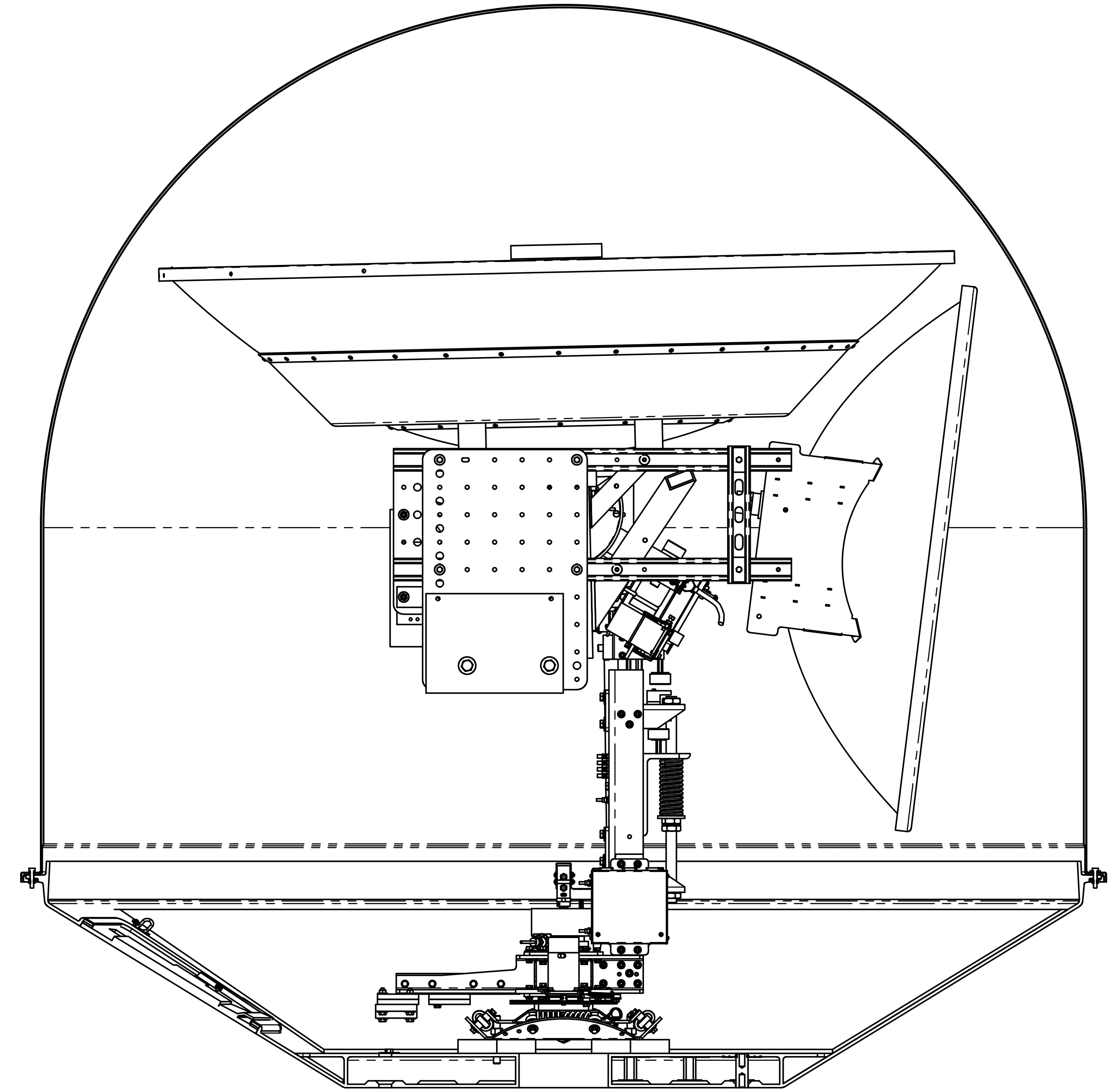
Sea Tel
COBHAM

SYSTEM, 6011-4 CIR. C / LIN KU, 76 IN

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
6011	9/12/2011	SHT 1 OF 1	134116-801	A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	8604	07-25-11	RELEASE TO PRODUCTION. WAS REVISION X1. ITEM 6 WAS QTY 2. ADDED ITEM 3. ITEM 2 WAS 133659-1, ITEM 8 WAS DUPLICATED IN ITEM NO. IN BOM, IT WAS ITME 7. ADD REF DOCUMENTS LIST.	SL





DASH #	POL	BAND	MFR	WATT	LNB	OTHER
-801	CIR/LIN	C/KU	-	-	-	-

REFERENCE DOCUMENTS

134115 SYSTEM BLOCK DIAGRA, 6011-4 TVRO
134114 ANTENNA SYSTEM SCHEMATIC, 6011-4 TVRO
131790 SCHMATIC, ANTENNA PEDESTAL, XX09, MK2
134794 PACKING LIST, 6011-4 C/KU

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: LW
WEIGHT: 494.868 LBS
MATERIAL: N/A
FINISH: N/A
SURFACE ROUGHNESS:
3rd ANGLE PROJECTION

DRAWN BY: KRB
DRAWN DATE: 03/22/11
APPROVED BY:
APPROVED DATE:
SIZE: B
SCALE: 1:12
FIRST USED: 6011

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

TITLE: SYSTEM, 6011-4, C/KU 76 IN DOME

DRAWING NUMBER: 134116
REV: A
SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	134117-1	A	GENERAL ASS'Y, 6011-4, C/KU	
4	1 EA	133732-1	A1	FEED TUBE ASS'Y, C-BAND, DUAL RECEIVE	
5	2 EA	134164-1	A	LNB, C-BAND, DRO, 8225RF	
6	1 EA	134257-1	A	ANTENNA ASS'Y, 6011-4, 40 IN, KU-BAND	
7	1 EA	132463-1	C	LNBF, QUAD, KU, INVERTO, MODIFIED	
20	1 EA	131057-1	C2	ENCLOSURE ASS'Y, PCU, 09G2, 3 CH, 232	
21	1 EA	131227-1	C	ENCLOSURE ASS'Y, MOTOR DRIVER, 09G2	
22	1 EA	121951-3	F1	MOTOR, SZ 23, BLDC, 2 STK W/ ENCODER,	
23	2 EA	125644-1	G	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PIN	
24	1 EA	129543-24	B1	KIT, CABLE ASS'Y AND PROXIMITY SENSOR	
25	1 EA	131381-1	B	EXTRA LOW POWER SMART GPS SENSOR, SER	
26	1 EA	121880-1	A1	MOTOR ASS'Y, POLANG, (PRI-FOCUS)	
27	1 EA	115425-1	K2	POT ASS'Y, POLANG, 10T, CCW HI, 5 PIN	
28	1 EA	128204-1	B1	RF SWITCH ASSEMBLY	
31	1 EA	129526-84	B	HARNESS ASS'Y, PCU TO MOTOR DRIVER, X	
32	1 EA	129527-36	B	HARNESS ASS'Y, MOTOR TO ELEVATION, 36	
40	1 EA	132956-1	A	CIRCUIT BREAKER BOX ASS'Y, 6 AMP	
41	1 EA	129254-2	A3	POWER RING, 20A, 3 CIRCUITS, XX09	
42	1 EA	127583-64	A1	CABLE ASSEMBLY, PEDESTAL, AC POWER, 4	
43	1 EA	124288-12	H	CABLE ASS'Y, AC POWER, 12 IN	
50	1 EA	134135-1	A	HARNESS KIT, UPPER , 6011-4 TVRO	
51	1 EA	128001-8BLU	A1	CABLE ASS'Y, RG-179 COAX, F(M) TO SMA	
52	1 EA	134133-84	A	HARNESS KIT, LOWER RF, 6011-1 TVRO	
60	6 EA	114178	O	ADAPTER, F(F)-F(F) (BULLET), 1.10 IN	
61	1 EA	127968-1	A1	ROTARY JOINT, 4RF-2DC	
100	1 EA	125411-3	M	DAC-2202, SCPC RCVR, 9 WIRE IF	
101	1 EA	131856-1	A	BELOW DECK KIT, 4CH, TVRO, 400MHZ	

Sea Tel
COBHAM

SYSTEM BLOCK DIAGRAM, 6011-4

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
LIT	9/12/2011	SHT 1 OF 2	134115-1	A1

SINGLE LEVEL MFG BILL OF MATERIAL

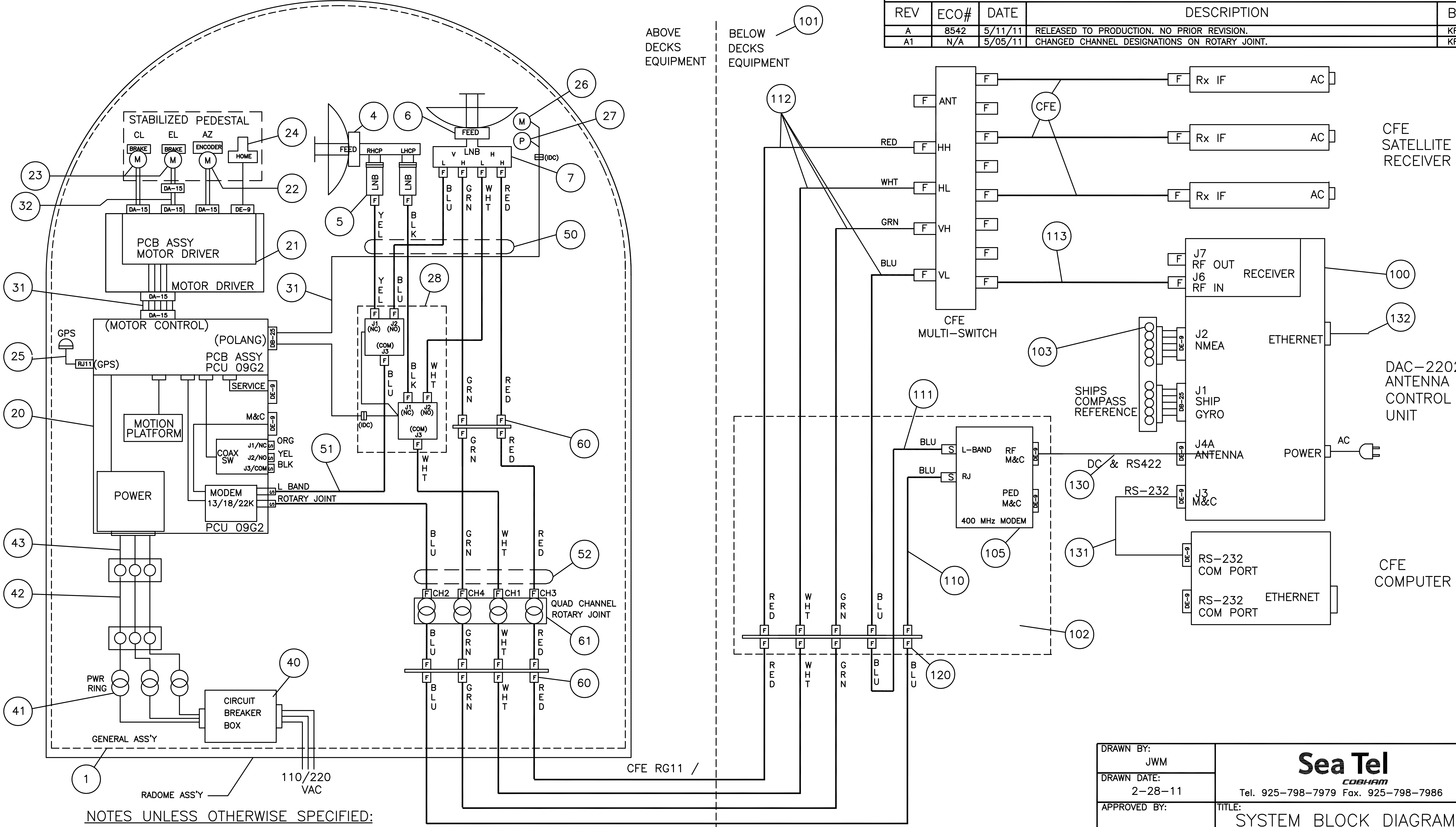
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
102	1 EA	131857-1	B1	BASE MODEM RACK PANEL ASS'Y, 4CH TVRO	
103	1 EA	116676	D	ASSEMBLY, TERMINAL MOUNTING STRIP	
105	1 EA	130854-2	E	MODEM ASS'Y, 400MHZ FSK, 4CH,BDE, RS	
110	1 EA	128001-8BLU	A1	CABLE ASS'Y, RG-179 COAX, F(M) TO SMA	
111	1 EA	128385-12BLU	C	CABLE ASS'Y, RG-179, COAX, SMA (RA) T	
112	1 EA	128253-6	A	HARNESS ASS'Y, 4 CH, RG-59, F(M) TO F	
113	1 EA	111115-6	B1	CABLE ASS'Y, F(M)-F(M), 6 FT.	
120	5 EA	114178	O	ADAPTER, F(F)-F(F) (BULLET), 1.10 IN	
130	1 EA	116298-1	G	INTERFACE HARNESS ASS'Y, SINGLE MODEM	
131	1 EA	120643-25	B	CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT,	
132	1 EA	119479-10	B1	CABLE ASS'Y, CAT5 JUMPER, 10 FT.	

Sea Tel
COBHAM

SYSTEM BLOCK DIAGRAM, 6011-4

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
LIT	9/12/2011	SHT 2 OF 2	134115-1	A1

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	8542	5/11/11	RELEASED TO PRODUCTION. NO PRIOR REVISION.	KRB
A1	N/A	5/05/11	CHANGED CHANNEL DESIGNATIONS ON ROTARY JOINT.	KRB



NOTES UNLESS OTHERWISE SPECIFIED:

1. S=SMA

REFERENCE DRAWINGS

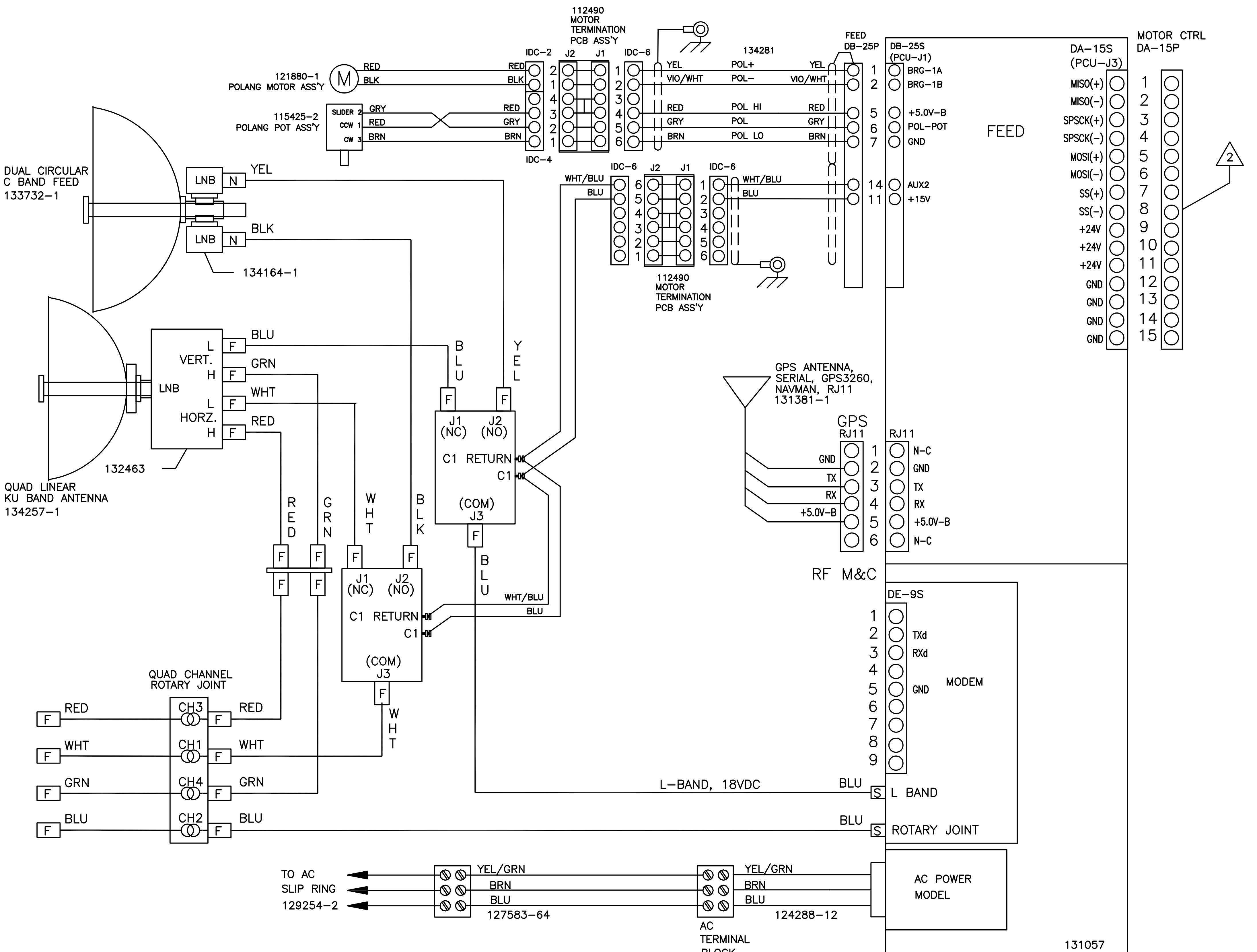
134114 ANTENNA SYSTEM SCHEMATIC

131790 ANTENNA PEDESTAL SCHEMATIC

DASH #	DESCRIPTION
-1	C CIRCULAR, KU LINEAR

DRAWN BY: JWM	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986		
DRAWN DATE: 2-28-11			
APPROVED BY:	TITLE: SYSTEM BLOCK DIAGRAM 6011-4 TVRO		
APPROVED DATE:			
SIZE: B	SCALE: NONE	DRAWING NUMBER: 134115	REV: A1
FIRST USED: 6011		SHEET NUMBER: 1 OF 1	

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	15141	09/10/14	RELEASED – COPIED FROM 134114.	KRB



NOTES: UNLESS OTHER WISE SPECIFIED

1. [S] = SMA

2. REFER TO DRAWING , ANTENNA PEDESTAL SCHEMATIC, XX09A, FOR CONNECTION DETAILS

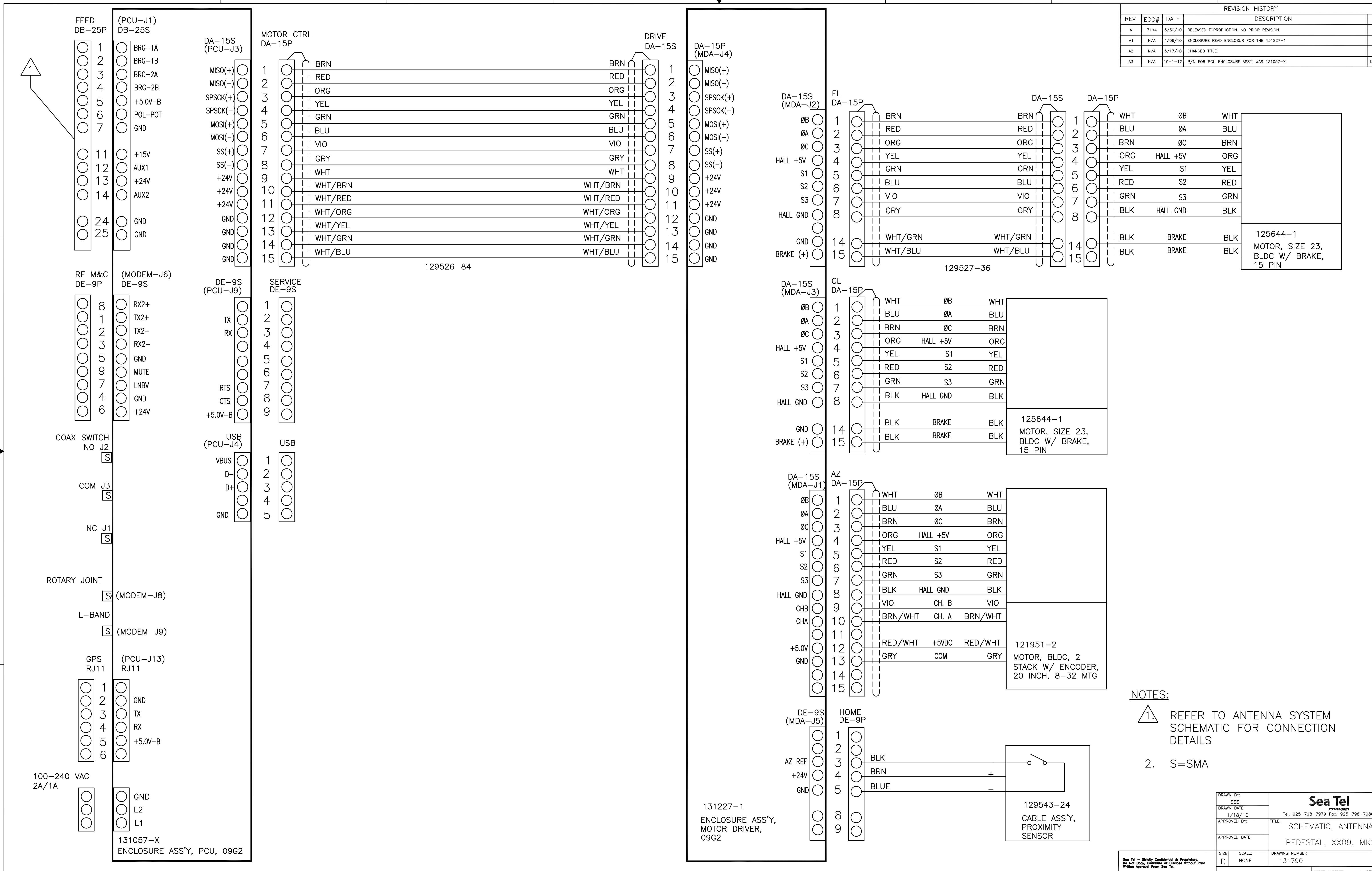
REFERENCE DRAWINGS:

131057	SCHEMATIC, PCU ENCLOSURE ASS'Y
131790	SCHEMATIC PEDESTAL
134115	SYSTEM BLOCK DIAGRAM

DRAWN BY: KRB		Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986	
DRAWN DATE: 09/10/14			
APPROVED BY:		TITLE: ANTENNA SYSTEM SCHEMATIC, 6011-4 TVRO	
APPROVED DATE:			
SIZE: B	SCALE: NONE	DRAWING NUMBER: 141922	REV: A
FIRST USED: 6011		SHEET NUMBER: 1 OF 1	

716466

DOCUMENT NO. 124225-4_A



REVISION HISTORY

REV	ECO#	DATE	DESCRIPTION	BY
A	7194	3/30/10	RELEASED TOPRODUCTION. NO PRIOR REVISION.	KRB
A1	N/A	4/06/10	ENCLOSURE READ ENCLOSUR FOR THE 131227-1	SSS
A2	N/A	5/17/10	CHANGED TITLE.	KRB
A3	N/A	10-1-12	P/N FOR PCU ENCLOSURE ASS'Y WAS 131057-X	K.D.H.

NOTES:

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

DRAWN BY: SSS
DRAWN DATE: 1/18/10
APPROVED BY:
APPROVED DATE:

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

TITLE: SCHEMATIC, ANTENNA PEDESTAL, XX09, MK2

SIZE: D | SCALE: NONE | DRAWING NUMBER: 131790 | REV: A3

FIRST USED: XX09 | SHEET NUMBER 1 OF 1

BOM Explosion Report

Item Number: 134184-1

Description: ANTENNA ASSY, CIRCULAR, C BAND, 60 IN, TVRO

Item Revision: B.01 ECO-00025499

Date as of: 08/30/2018 12:38:40 PM PDT

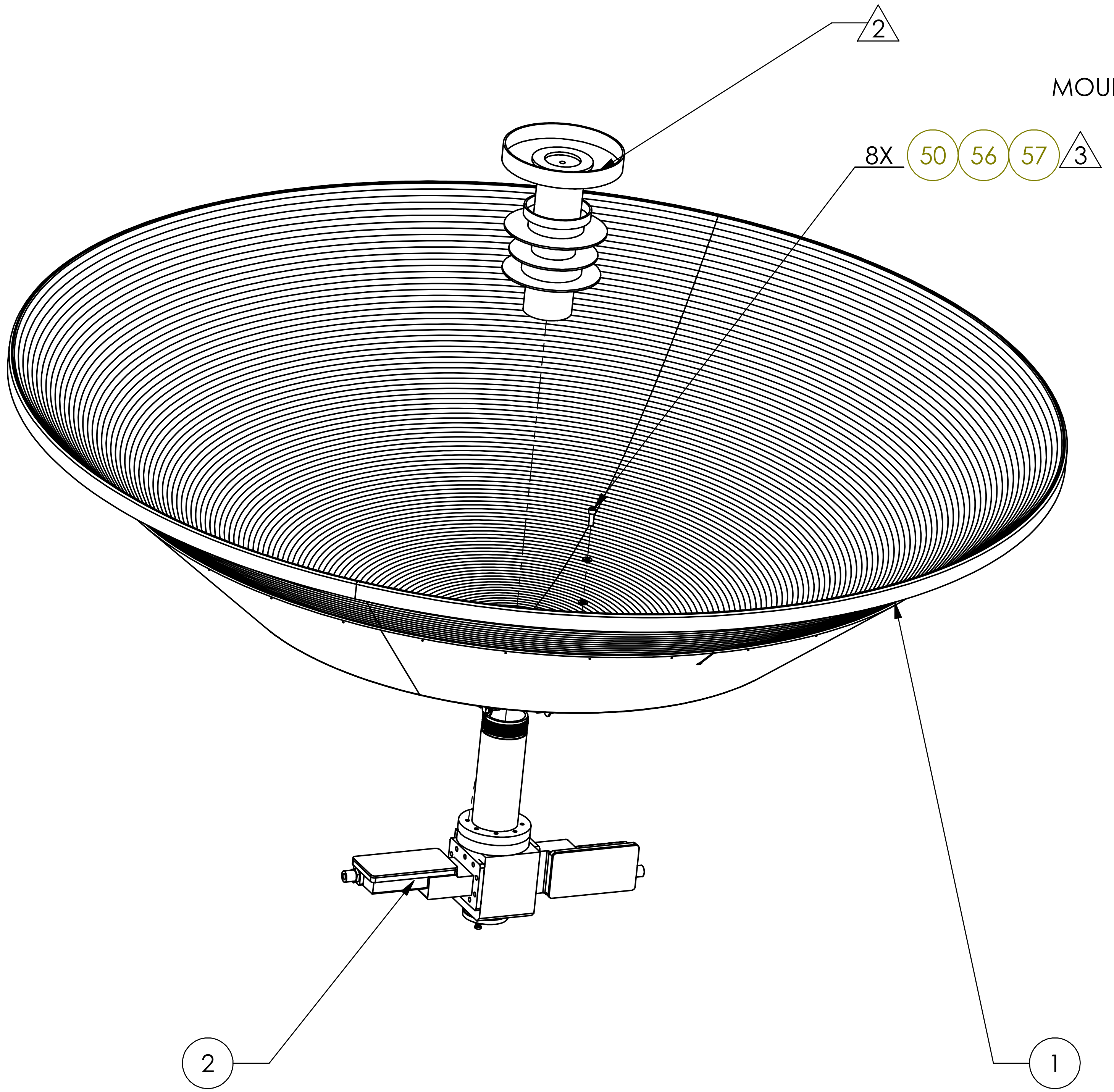
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
0	REF	pcs	97-134184	A ECO-00025503	ANTENNA ASS'Y, C-BAND, CIRC, 60IN, TVRO	
1	1	ea	140942-1	A MCO-00039115	REFLECTOR, C-BAND, OPTIM, 58	
2	1	ea	134121-1	B.02 ECO-00025499	FEED ASSY, CIRCULAR, C BAND, 60 IN, TVRO	
50	8	ea	114593-207	MCO-00012113	SCREW, SOCKET HD, 1/4-20 x 3/4, SS.	
56	8	ea	114581-029	MCO-00016035	WASHER, LOCK, 1/4, SS	
57	8	ea	114580-028	MCO-00012113	WASHER, FLAT, 1/4, SMALL PATTERN, THICK, SS.	
		ea	134184-1	B.01 ECO-00025499	ANTENNA ASSY, CIRCULAR, C BAND, 60 IN, TVRO	

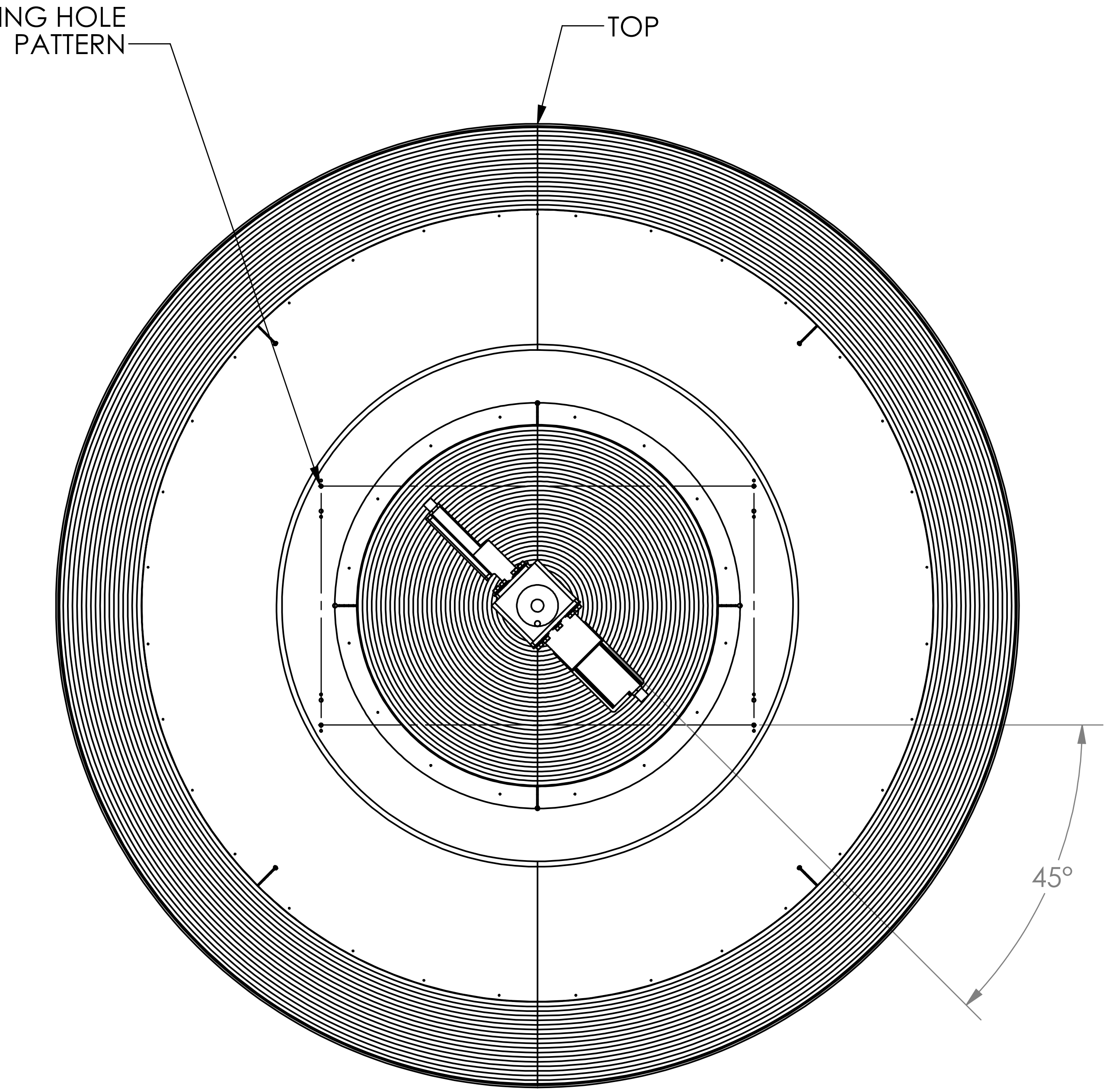
Created By: Mike Needham

Create Time: 08/30/2018 12:38:51 PM PDT

REVISION HISTORY

REV	ECO#	DATE	DESCRIPTION	BY
A	8542	05/10/11	RELEASE TO PRODUCTION. WAS REVISION X2. UPDATED NOTES.	KRB
A1	9933	09/27/12	ADDED "CIRCULAR" TO TITLE.	KRB
A2	10092	11/21/12	DIM. 45° WAS 22.5°.	SL
B	13547	04/21/2014	ITEM 1 WAS 128641	LIND





NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEA TEL STANDARD 122298.
2. (2△) INDICATED COMPONENT IS THE FEED TUBE FROM THE DISASSEMBLED ITEM #2. REASSEMBLE AFTER INSTALLATION USING LOCTITE 222.
3. (3△) USE LOCTITE 242 PER SEA TEL SPEC. 121730.

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: LW	DRAWN BY: KRB	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
WEIGHT: 75.866 LBS	DRAWN DATE: 03/08/11	
MATERIAL: N/A	APPROVED BY:	TITLE: ANTENNA ASS'Y, C-BAND CIRCULAR, 60 IN, TVRO
FINISH: N/A	APPROVED DATE:	
SURFACE ROUGHNESS:	SIZE: B SCALE: 1:8	DRAWING NUMBER: 134184 REV: B
3rd ANGLE PROJECTION	FIRST USED: 6011	SHEET NUMBER: 1 OF 1

ORACLE BOM Explosion Report

Item Number: 134257-1

Description: ANTENNA ASSY, 6011-4, 40 IN, KU-BAND

Item Revision: A ECO-00008546

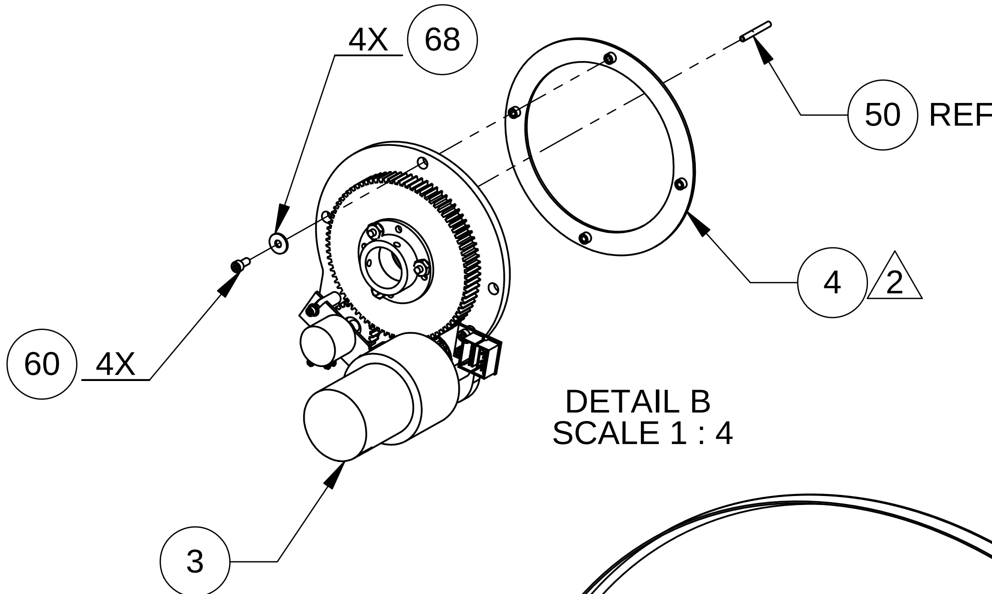
Date as of: 08/30/2018 12:38:40 PM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
1	1	ea	122092	D ECO-00008543	REFLECTOR MACHINING, 40 IN	
2	1	ea	122237	A.02 MCO-00012435	VERTEX FEED, 40 IN., 4004	
3	1	ea	122201	F.03 ECO-00021109	POLANG ASSY	
4	1	ea	122365	A ECO-00008543	EPOXY PLATE	
50	4	ea	114592-868	MCO-00012113	STUD, FULLY THREADED, 4-40 x 1 IN, SS.	
58	4	ea	114580-005	MCO-00012113	WASHER, FLAT, #4, SS.	
59	4	ea	114583-005	MCO-00012113	NUT, HEX, 4-40, SS.	
60	4	ea	114593-121	MCO-00012113	SCREW, SOCKET HD, 6-32 x 5/16, SS.	
68	4	ea	114580-007	MCO-00028139	WASHER, FLAT, #6, SS.	
		ea	134257-1	A ECO-00008546	ANTENNA ASSY, 6011-4, 40 IN, KU-BAND	

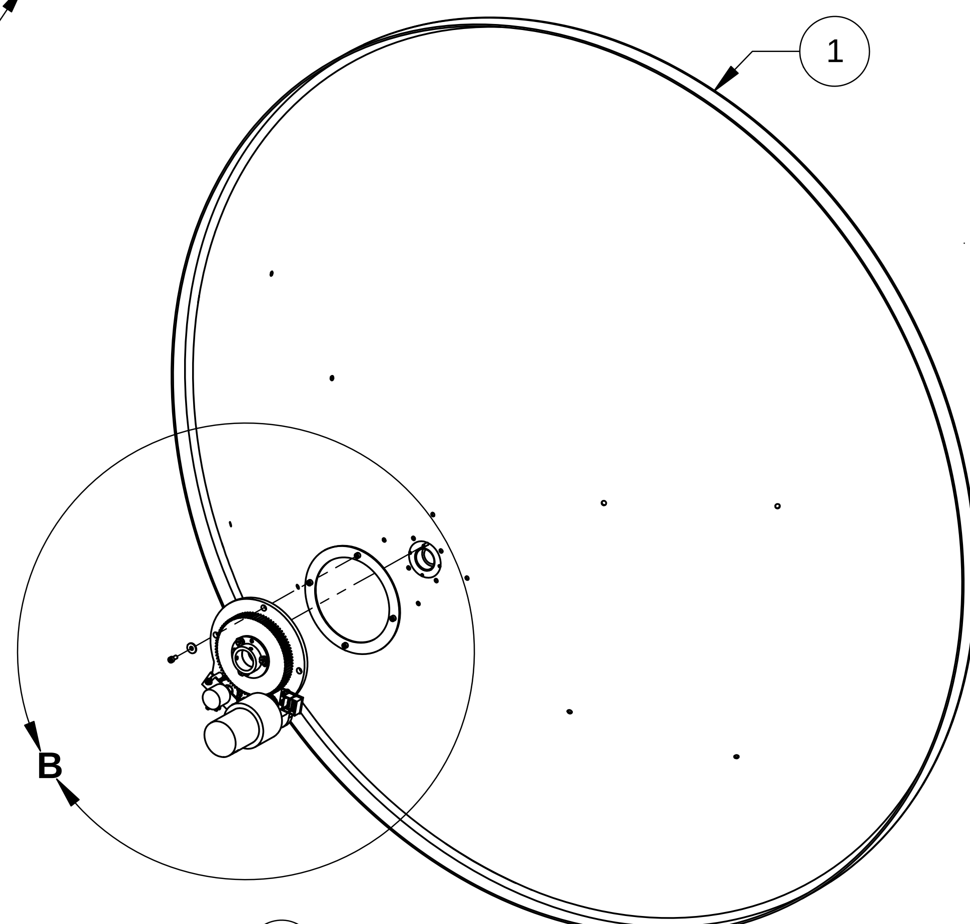
Created By: Mike Needham

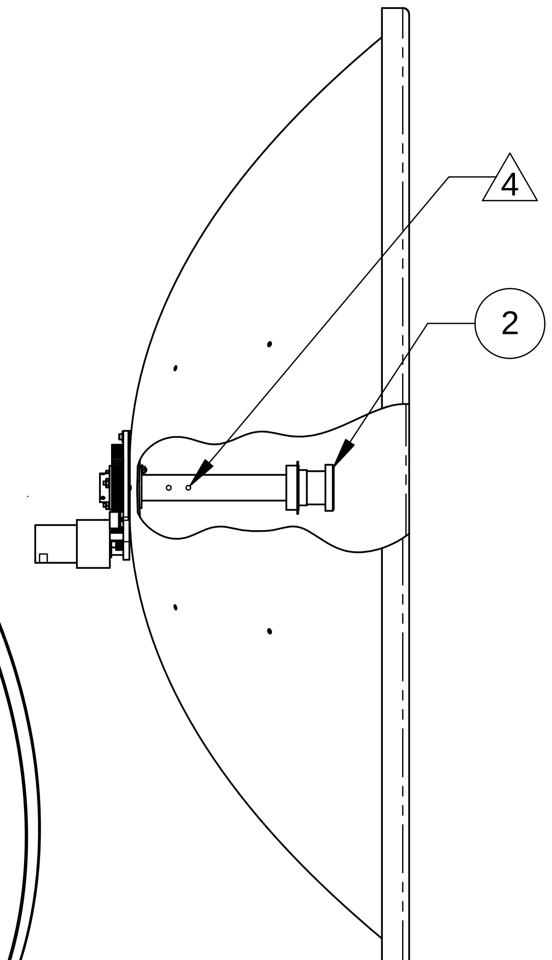
Create Time: 08/30/2018 12:38:51 PM PDT

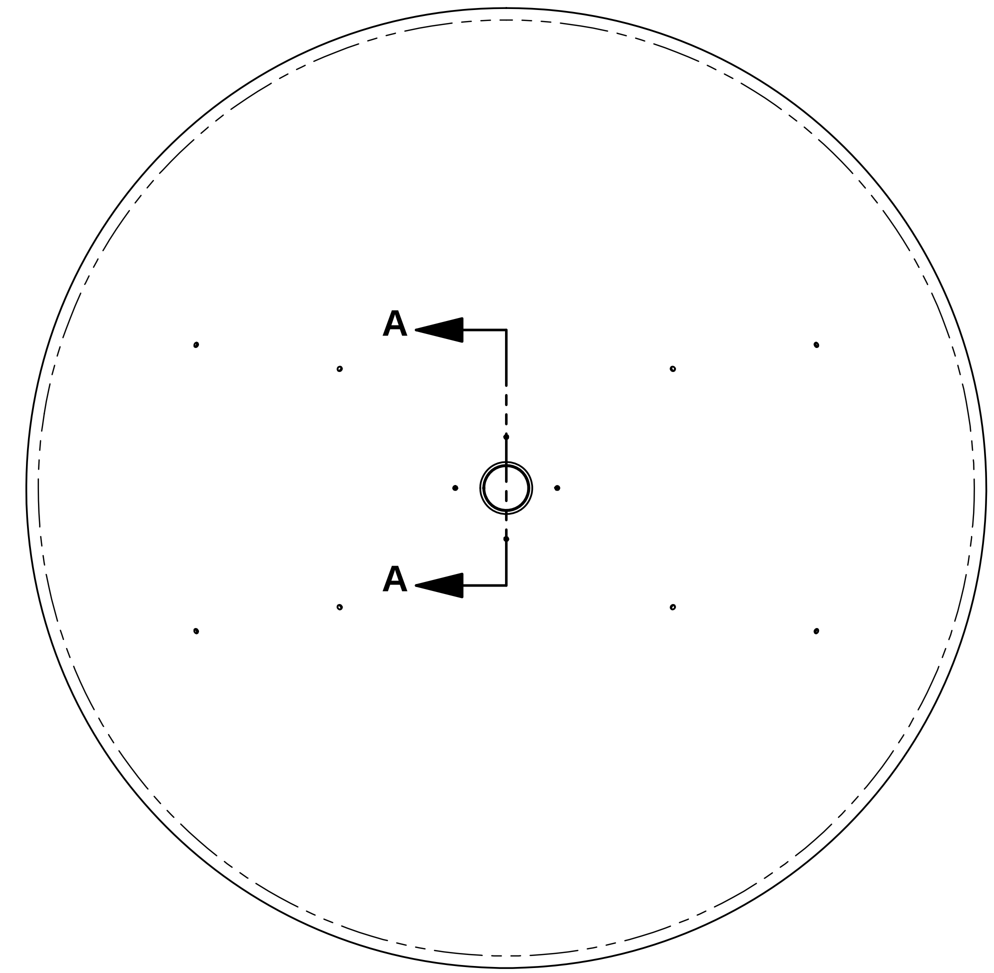
REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	8542	05/09/11	RELEASED TO PRODUCTION. WAS REVISION X1. MODIFIED NOTES.	KRB

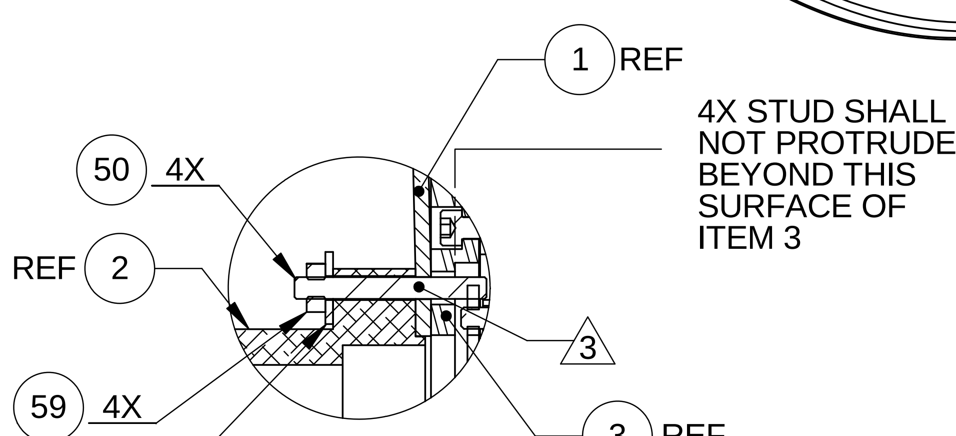


DETAIL B
SCALE 1 : 4









SECTION A-A
SCALE 1 : 1

NOTES: (UNLESS OTHERWISE SPECIFIED)

1. MANUFACTURE PER SEA TEL STANDARD 122298.
2. (△2) APPLY EPOXY PER ASSEMBLY INSTRUCTIONS.
3. (△3) APPLY LOCTITE 2760 PER SEA TEL SPEC. 121730 AND ALLOW TO CURE PRIOR TO INSTALLING ITEM 2.
4. (△4) NOTE ORINTATION OF PHASE CARD (MUST BE HORIZONTAL).

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: LW	DRAWN BY: KRB	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
WEIGHT: 18.9866 LBS	DRAWN DATE: 03/07/11	
MATERIAL: N/A	APPROVED BY:	TITLE: ANTENNA ASS'Y, 6011-4 40 IN, KU-BAND
FINISH: N/A	APPROVED DATE:	
SURFACE ROUGHNESS:	SIZE: B SCALE: 1:8	DRAWING NUMBER: 134257 REV: A
3rd ANGLE PROJECTION	FIRST USED: 6011	SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	131057-1	H	ENCLOSURE ASS'Y, PCU, 09G2, 3 CH, 232	
10	1 EA	123861	B	MOUNTING PLATE	
11	2 EA	126288-17	B	UNISTRUT, 1-5/8 H-CHANNEL, 17 IN, AL	
12	2 EA	127566-2	A2	MOUNTING BLOCK ASS'Y, COUNTER WEIGHT	
13	4 EA	124588-1021	A	STANDOFF, HEX, F/F, 1/4-20 X .50 OD X	
14	8 EA	126279-3	A4	NUT, 1 5/8 UNISTRUT, 1/4-20, W/SPRING	
60	4 EA	114593-202		SCREW, SOCKET HD, 1/4-20 x 3/8, S.S.	
62	4 EA	114586-536		SCREW, HEX HD, 1/4-20 x 5/8, S.S.	
63	4 EA	114586-537		SCREW, HEX HD, 1/4-20 x 3/4, S.S.	
64	4 EA	114586-538		SCREW, HEX HD, 1/4-20 x 1, S.S.	
67	4 EA	114580-027		WASHER, FLAT, 1/4, SMALL PATTERN, S.S	
68	12 EA	114580-029		WASHER, FLAT, 1/4, S.S.	

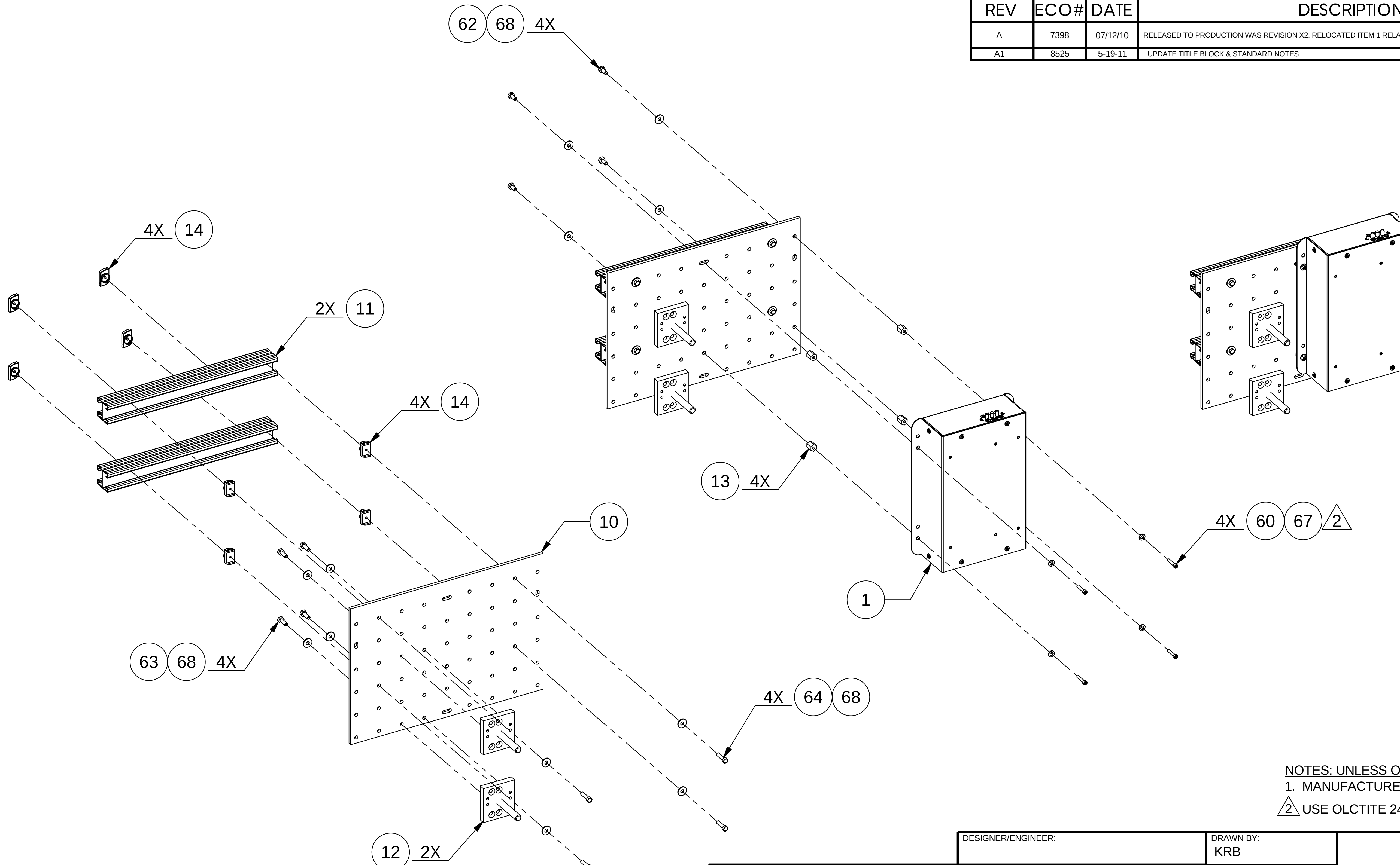
Sea Tel
COBHAM

MOUNTING ASS'Y, 6009-71/73, MK2, PCU

PROD FAMILY	EFF. DATE	SHT 1 OF 1	DRAWING NUMBER	REV
COMMON	9/28/2012		132539	A1

REVISION HISTORY

REV	ECO#	DATE	DESCRIPTION	BY
A	7398	07/12/10	RELEASED TO PRODUCTION WAS REVISION X2. RELOCATED ITEM 1 RELATIVE TO MOUNTING PLATE (ITEM 10).	KRB
A1	8525	5-19-11	UPDATE TITLE BLOCK & STANDARD NOTES	K.D.H.



NOTES: UNLESS OTHERWISE SPECIFIED
1. MANUFACTURE PER SEATEL STANDARD 122298.
2. USE OLCTITE 242 AT THIS LOCATION.

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: KRB	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
WEIGHT: 16.366 LBS.	DRAWN DATE: 06/14/10	
MATERIAL: N/A	APPROVED BY:	TITLE: MOUNTING ASS'Y, 6009-71/73, MK2, PCU
FINISH: N/A	APPROVED DATE:	
SURFACE ROUGHNESS:	SIZE: B SCALE: 1:8	DRAWING NUMBER: 132539 REV: A1
3rd ANGLE PROJECTION	FIRST USED: 6009	SHEET NUMBER 1 OF 1

ORACLE BOM Explosion Report

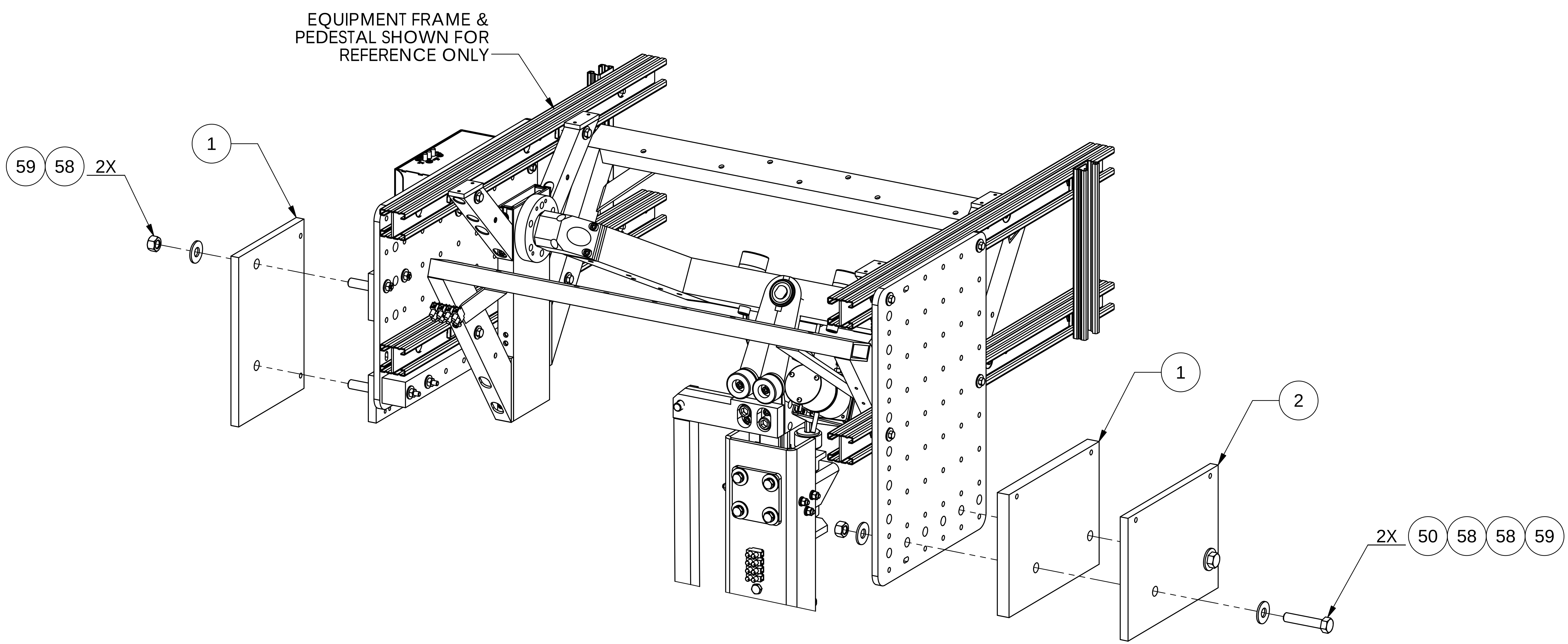
Item Number: 134125-1
Description: BALANCE WEIGHT ASSY, CL/EL, 6011-4
Item Revision: A ECO-00008546
Date as of: 08/30/2018 12:38:40 PM PDT

Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
1	2	ea	108724-3	C.02 ECO-00008542	PLATE, COUNTER WEIGHT, 1/2 X 7-1/4 X 10	
2	1	ea	108724-1	C.02 MCO-00015435	PLATE, COUNTER WEIGHT, 3/4 X 7-1/4 X 10	
50	2	ea	114586-678	MCO-00012113	SCREW, HEX HD, 1/2-13 x 2-1/2, SS.	
58	6	ea	114580-033	MCO-00012113	WASHER, FLAT, 1/2, SS.	
59	2	ea	114583-033	MCO-00012113	NUT, HEX, 1/2-13, SS.	
		ea	134125-1	A ECO-00008546	BALANCE WEIGHT ASSY, CL/EL, 6011-4	

Created By: Mike Needham
Create Time: 08/30/2018 12:38:51 PM PDT

REVISION HISTORY

REV	ECO#	DATE	DESCRIPTION	BY
A	8542	05/12/11	RELEASED TO PRODUCTION. NO PRIOR REVISION.	KRB



NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEA TEL STANDARD 122298.
2. BALANCE WEIGHTS ARE SHOWN AS STARTING WEIGHTS ONLY. TRIM WEIGHTS MAY BE NEEDED TO ACHIEVE BALANCE.

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: KRB
WEIGHT: 233.9 LBS
MATERIAL: N/A
FINISH: N/A
SURFACE ROUGHNESS:
3rd ANGLE PROJECTION

DRAWN BY: KRB
DRAWN DATE: 05/12/11
APPROVED BY:
APPROVED DATE:
SIZE: B
SCALE: 1:6
FIRST USED: 6011-4

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

TITLE: BALANCE WEIGHT KIT EL & CL, 6011-4

DRAWING NUMBER: 134125
REV: A
SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

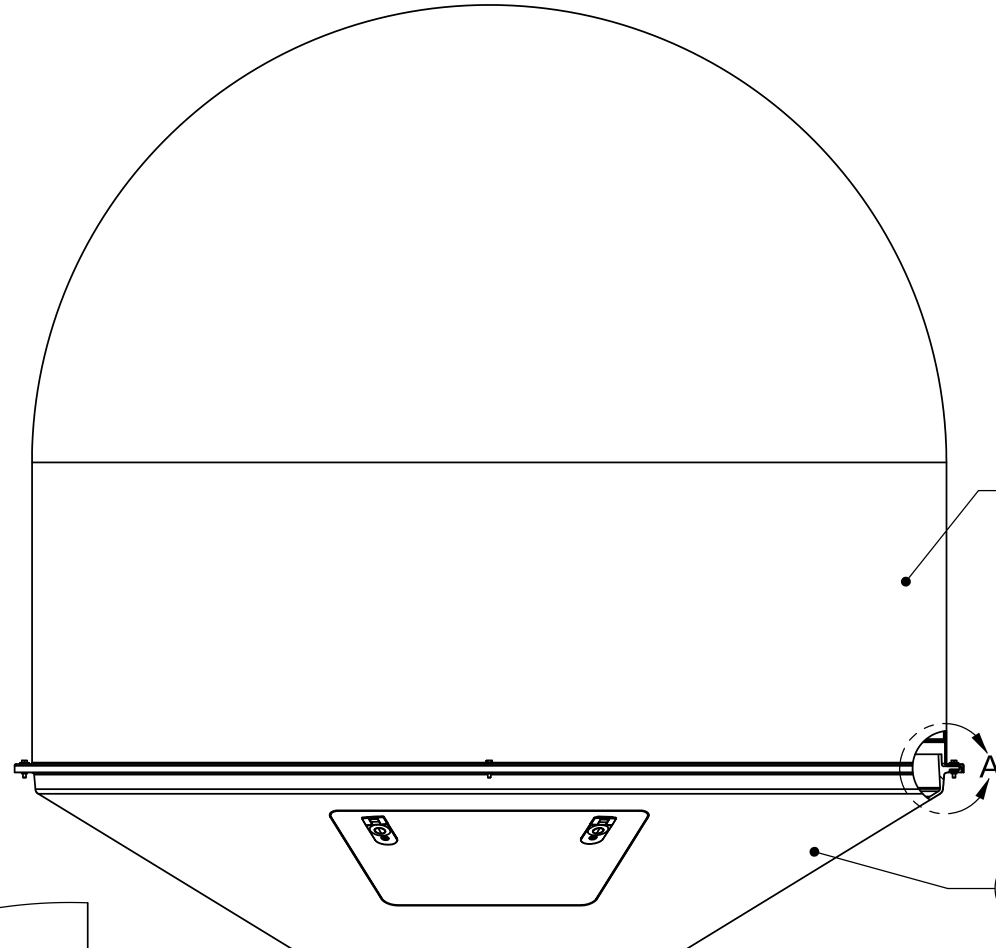
FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	128652-1	A2	RADOME TOP FAB, 76 IN, WHITE	
2	1 EA	130395-1	A3	RADOME BASE ASS'Y, 76 IN, WHITE	
3	1 EA	130390-2	B	KIT, HARDWARE, GA TO RADOME, RAISED	
4	1 EA	130394-2	C1	KIT, HARDWARE, RADOME TO MAST, 12-HOL	
5	4 EA	119801-012	B	CABLE TIE, NYLON, 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	3 EA	124903-1	B2	STRAIN RELIEF ASS'Y	(NOT SHOWN)
53	8 EA	119745-218		SCREW, PAN HD, PHIL, M4 x 8	
54	8 EA	114580-230		WASHER, FLAT, M4, S.S.	
56	4 EA	114589-141		SCREW, HEX HD M6X35	
57	8 EA	123665-416		WASHER, BONDED SEALING, 1/4, .275 IDX	
58	8 EA	120089-251		NUT, HEX, M6, S.S.	
64	9 EA	125806-7	A	ROTALOC HEX NUT, SS-1-B38-M4 X 07-6H	

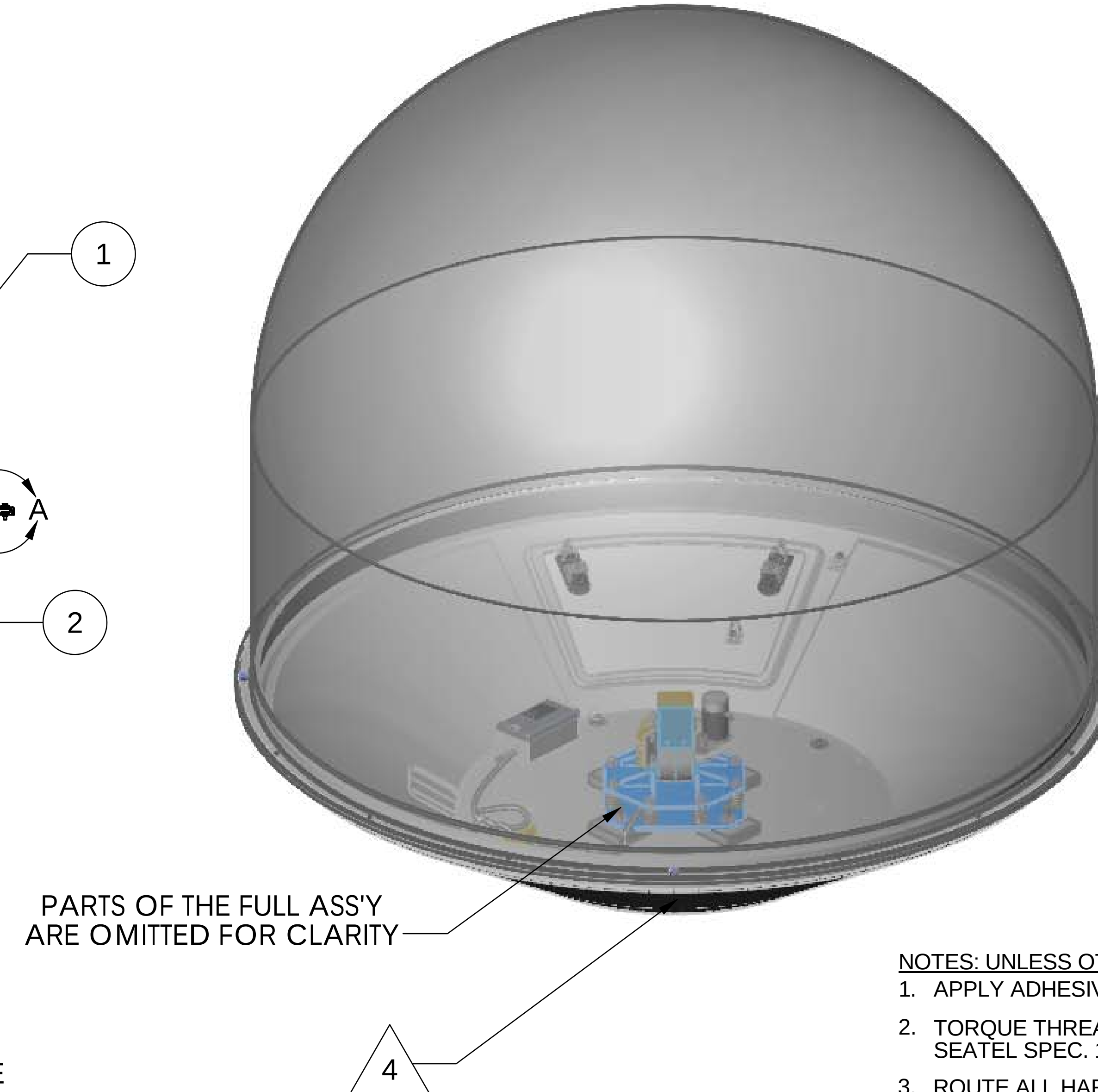
Sea Tel
COBHAM

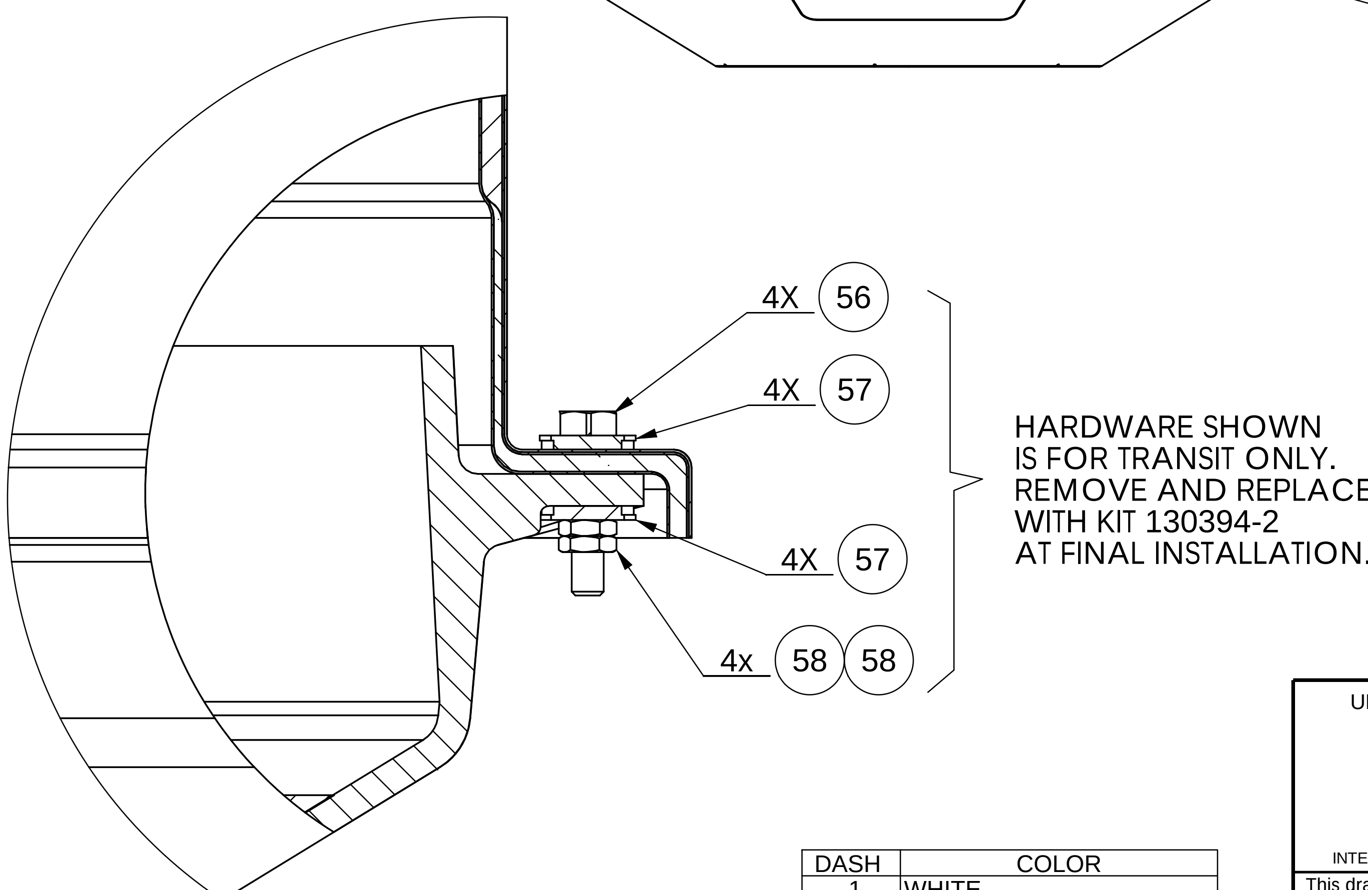
RADOME ASS'Y, GA INSTALL, 76 IN, TX/RX, WHITE

PROD FAMILY COMMON	EFF. DATE 9/8/2011	SHT 1 OF 2	DRAWING NUMBER **130028-1**	REV **C**

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.







DETAIL A
SCALE 2 : 3

NOTES: UNLESS OTHERWISE SPECIFIED

1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.
3. ROUTE ALL HARNESS AND CABLES ASSEMBLIES PER SEATEL SPEC. 121872.
4. (4) BOW MARKER LOCATION DIRECTLY OPPOSITE FROM ACCESS DOOR.
5. BAG & ATTACH KIT (ITEM 4) AND STRAIN RELIEFS TO INSIDE OF RADOME.

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

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

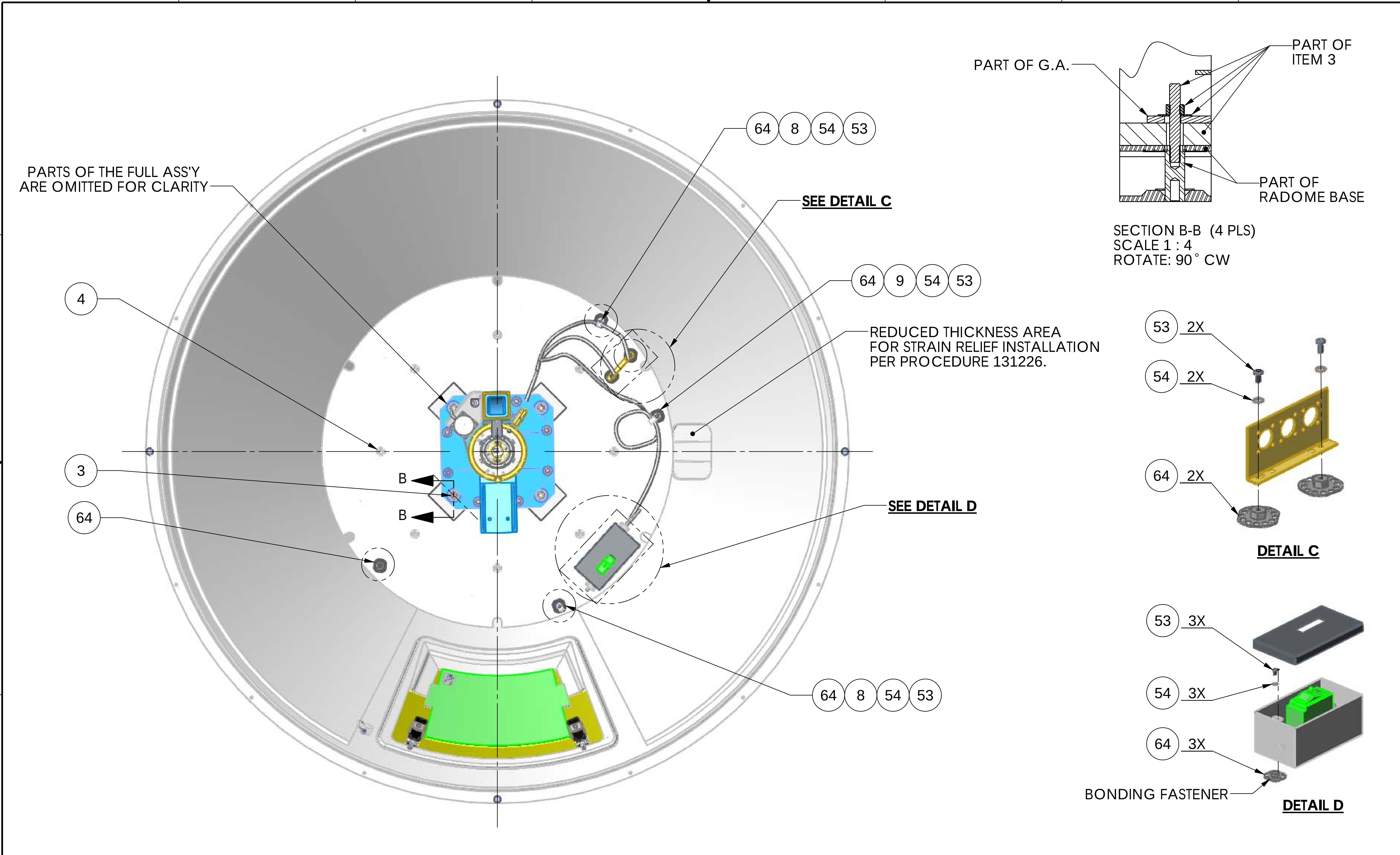
DESIGNER/ENGINEER:	DRAWN BY: Simon L.
WEIGHT:	DRAWN DATE: 03-19-09
MATERIAL: N/A	APPROVED BY:
FINISH: N/A	APPROVED DATE:
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:16
3rd ANGLE PROJECTION	FIRST USED: 6006

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

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

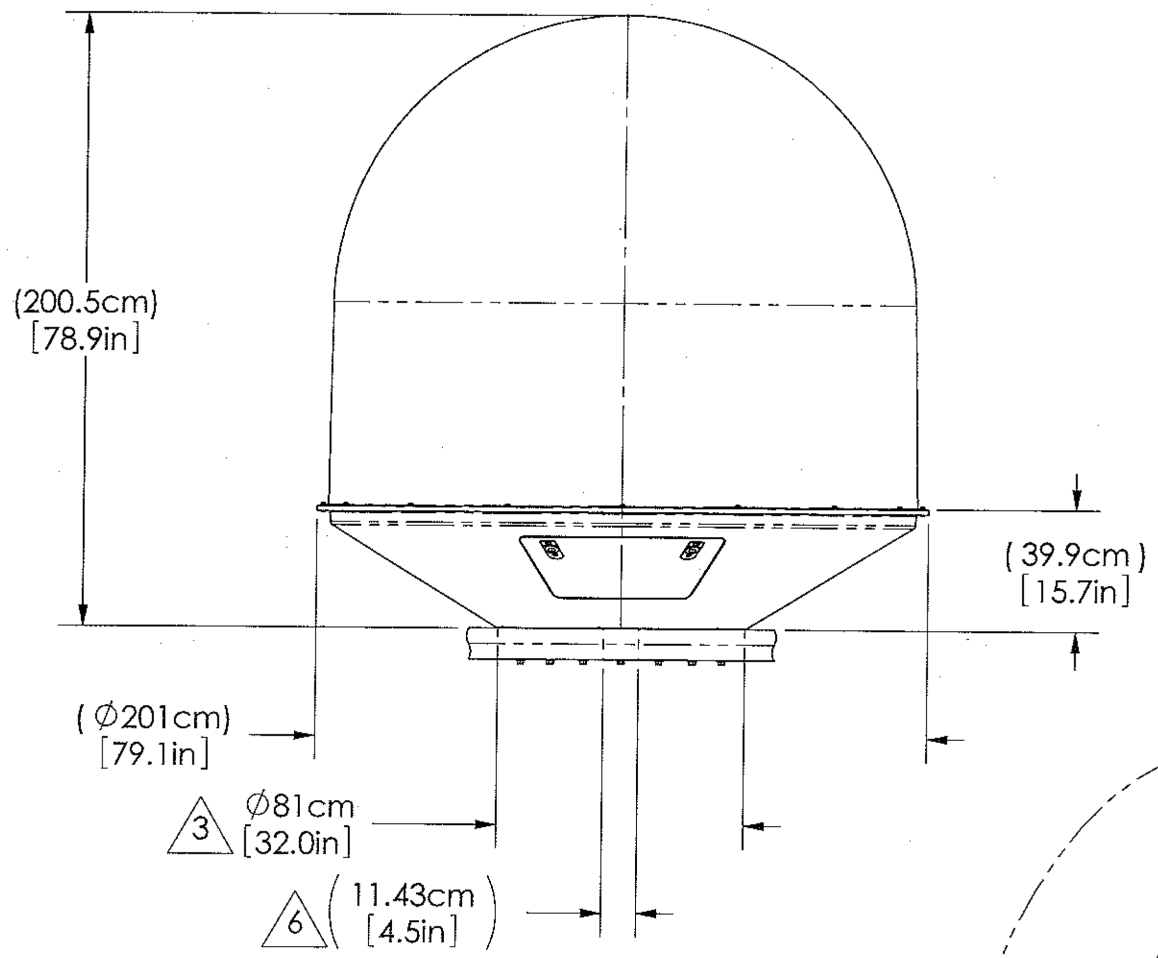
DRAWING NUMBER: 130028 | REV: C

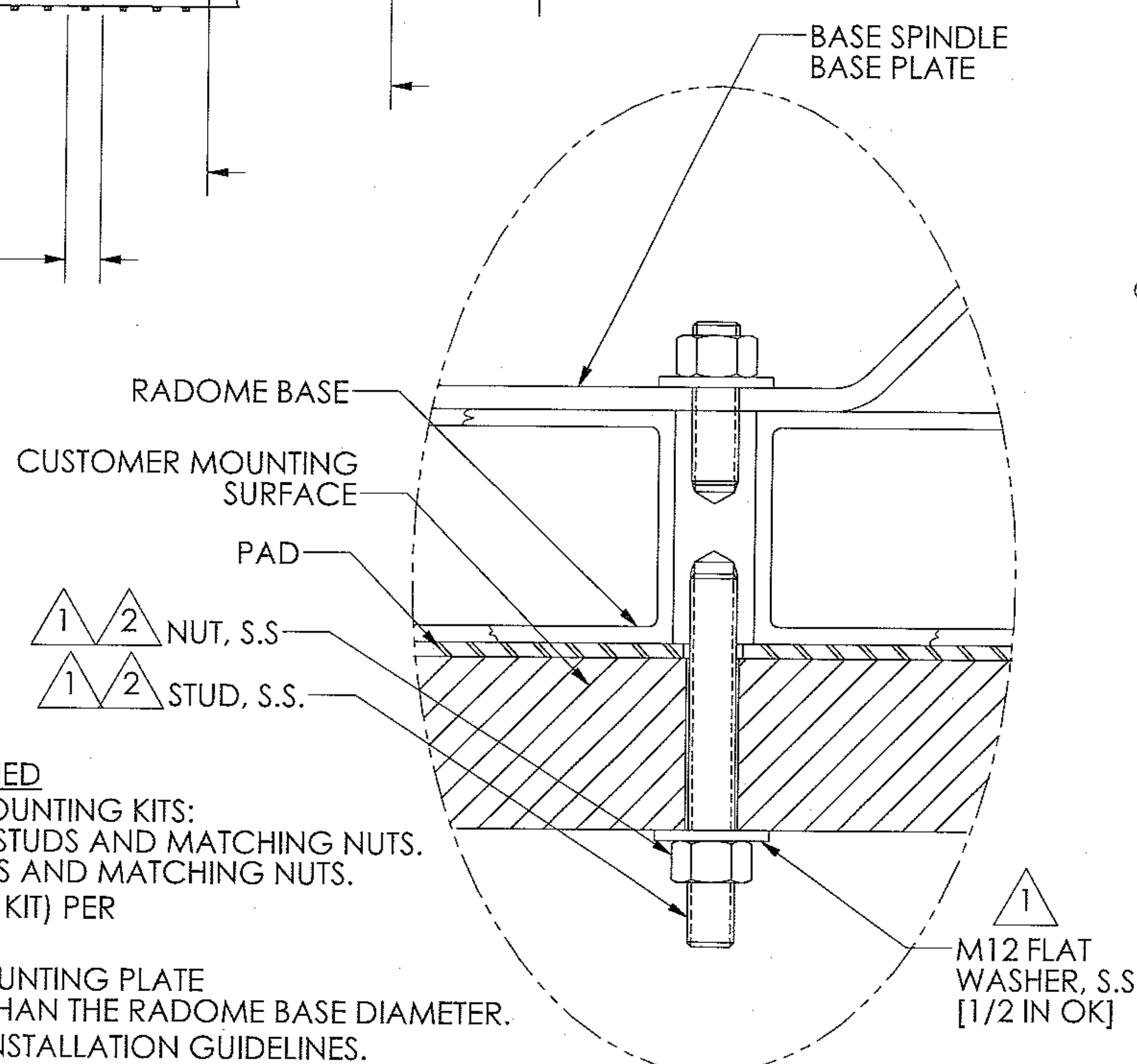
SHEET NUMBER 1 OF 2

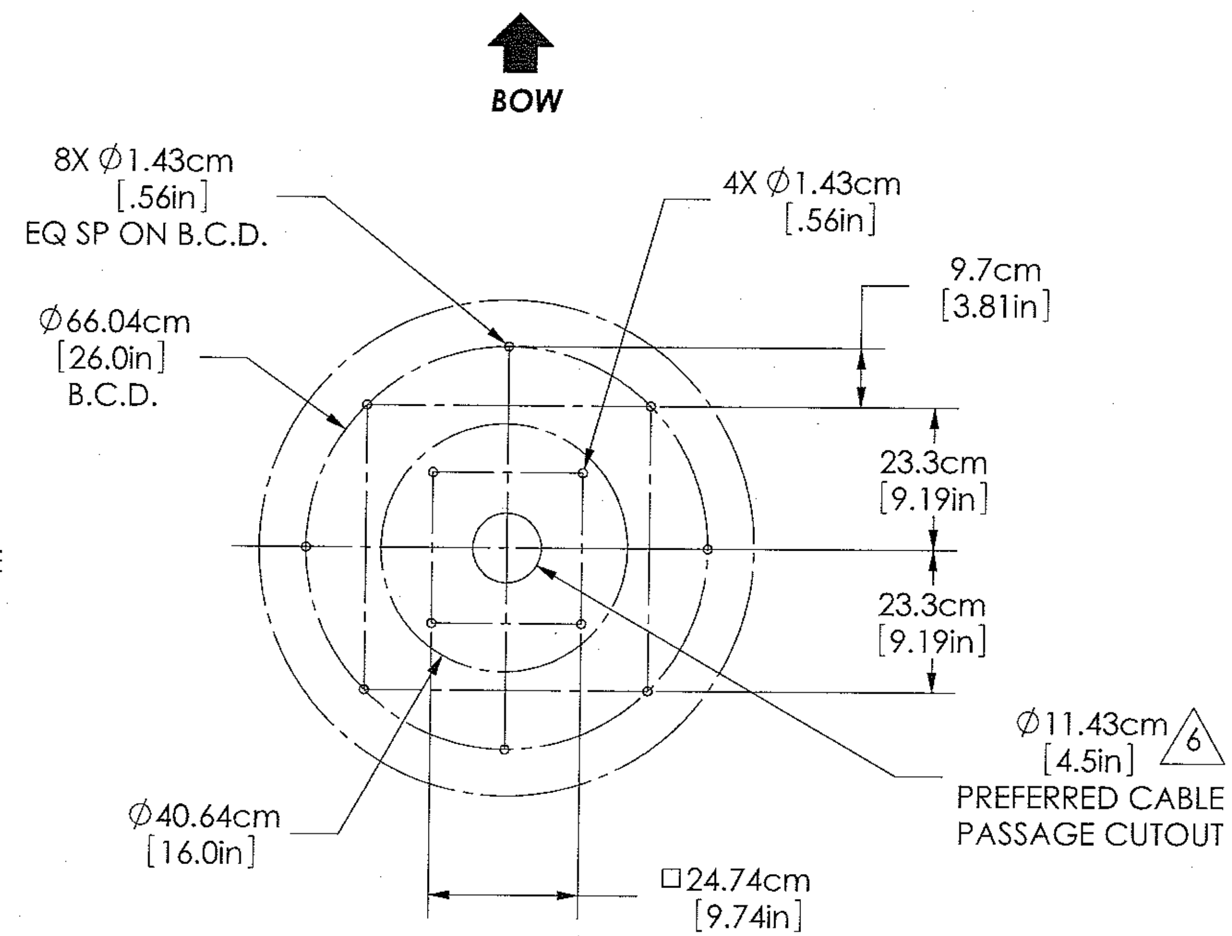


SIZE	SCALE:	DRAWING NUMBER	REV
B	1:10	130028	C
		SHEET NUMBER 2 OF 2	

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







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. (△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. (△2) APPLY ADHESIVE (PROVIDED WITH KIT) PER SEATEL SPEC 121720
3. (△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. (△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

MATERIAL: N/A

FINISH: N/A

3rd ANGLE PROJECTION

DRAWN BY: T PATEL

DRAWN DATE: 12/19/06

APPROVED BY: T Patel

APPROVED DATE: 1/29/2010

SIZE: B

SCALE: 1:4

FIRST USED: 6006

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

TITLE: INSTALLATION ARRANGEMENT
76-IN RADOME

DRAWING NUMBER: 125749

REV: D

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.

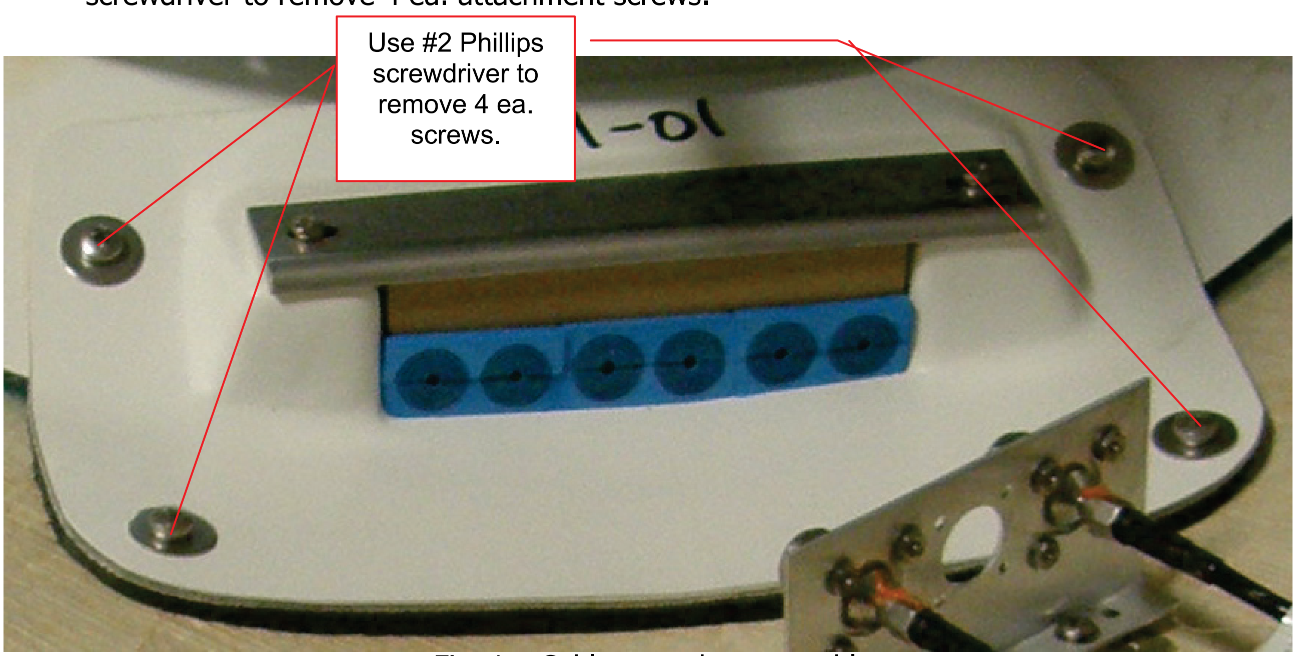


Fig. 1 – Cable pass-thru assembly

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".

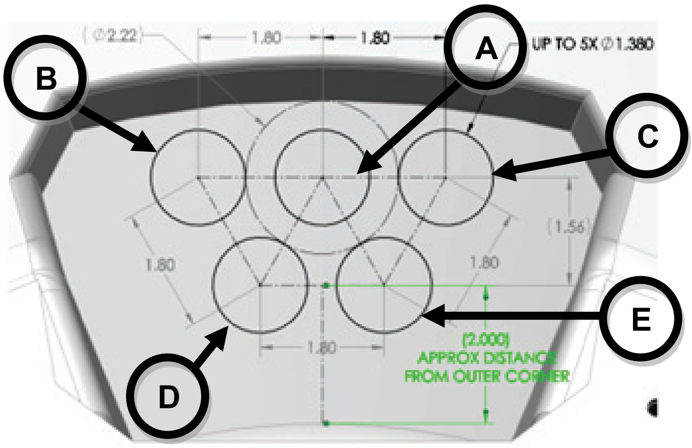


Fig. 2 – Planning
Measure in place or use template drawing 132234

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.

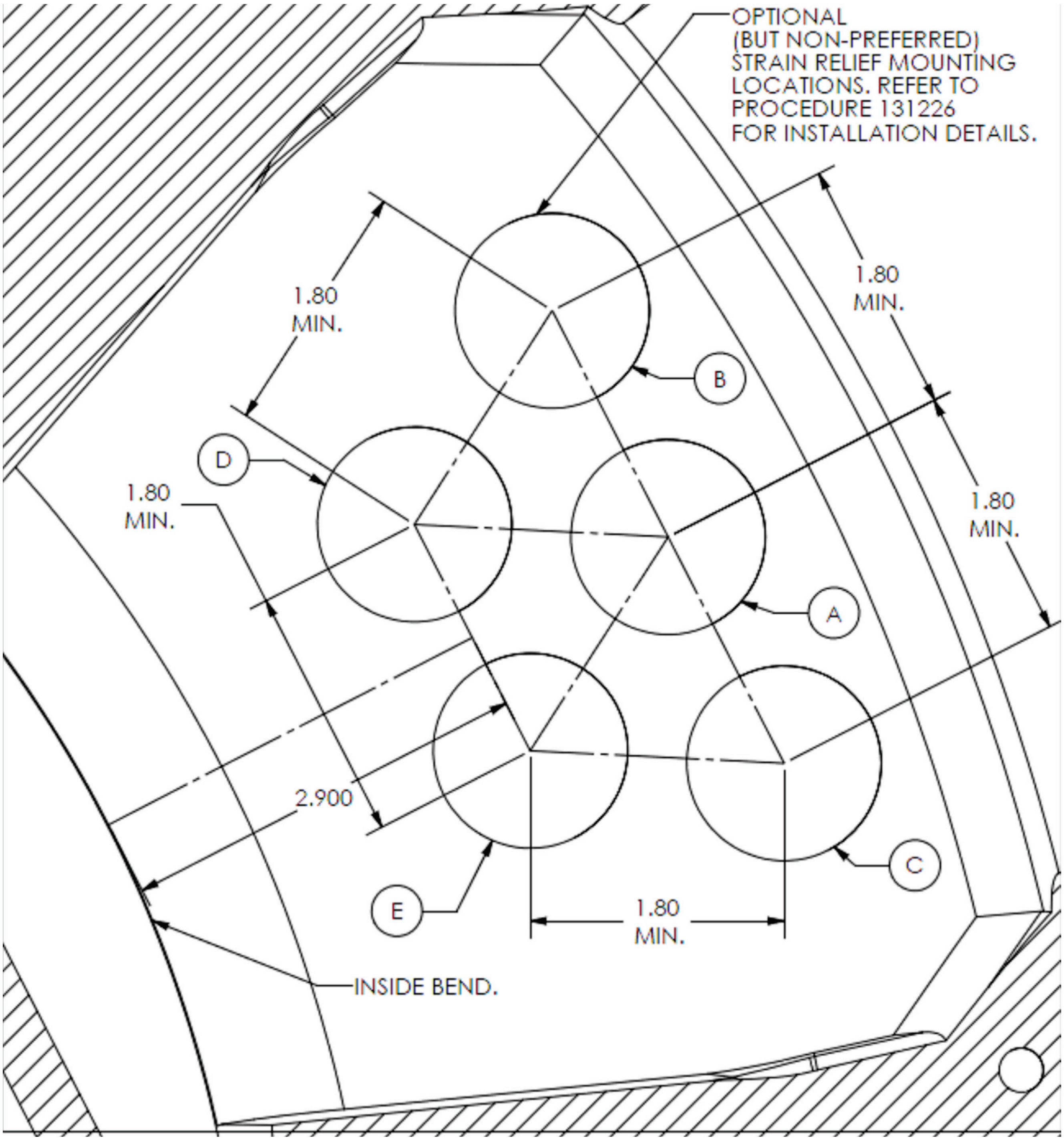
5.0 Records. N/A.

6.0 Training. N/A

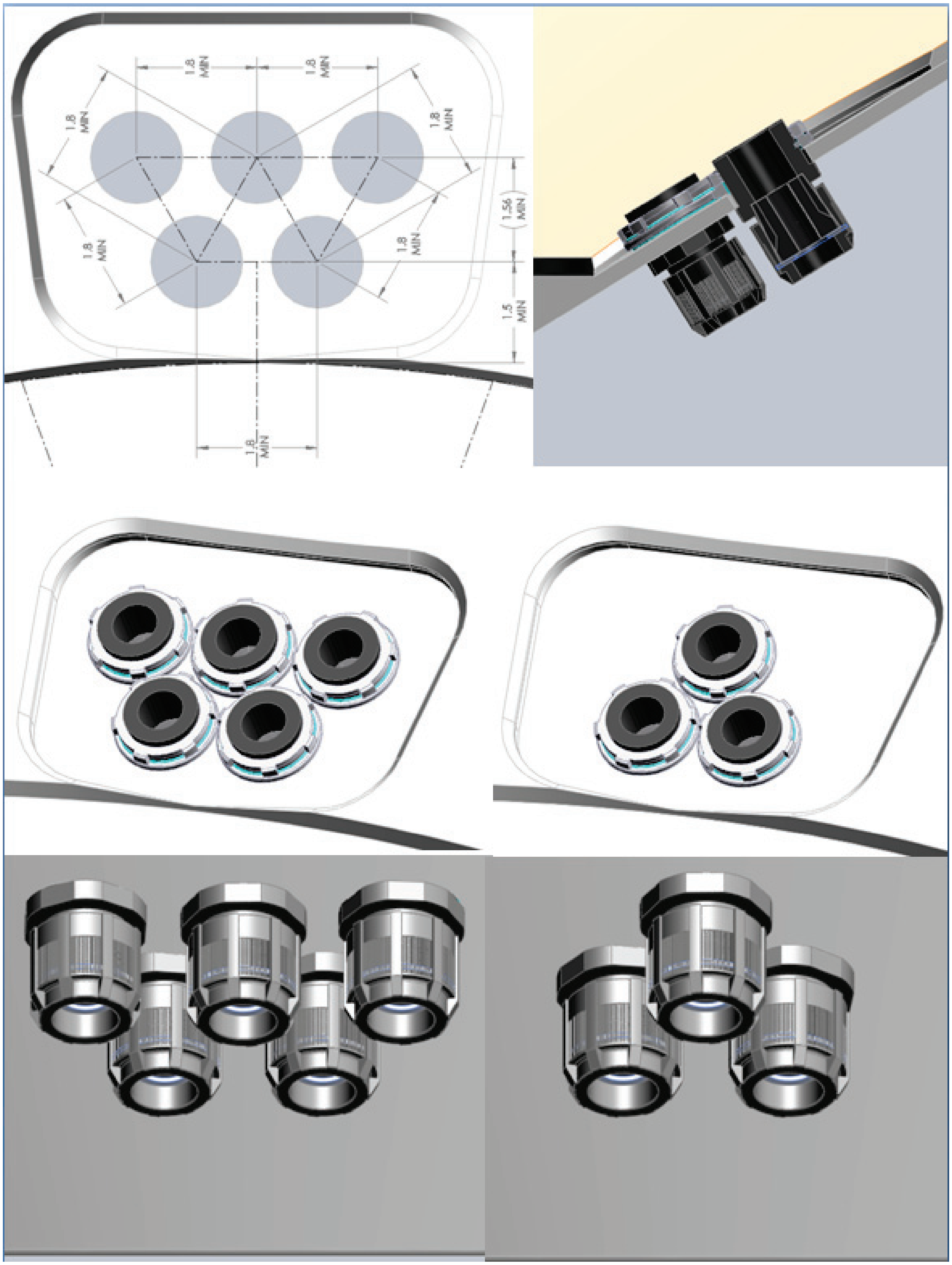
7.0 References.

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.)



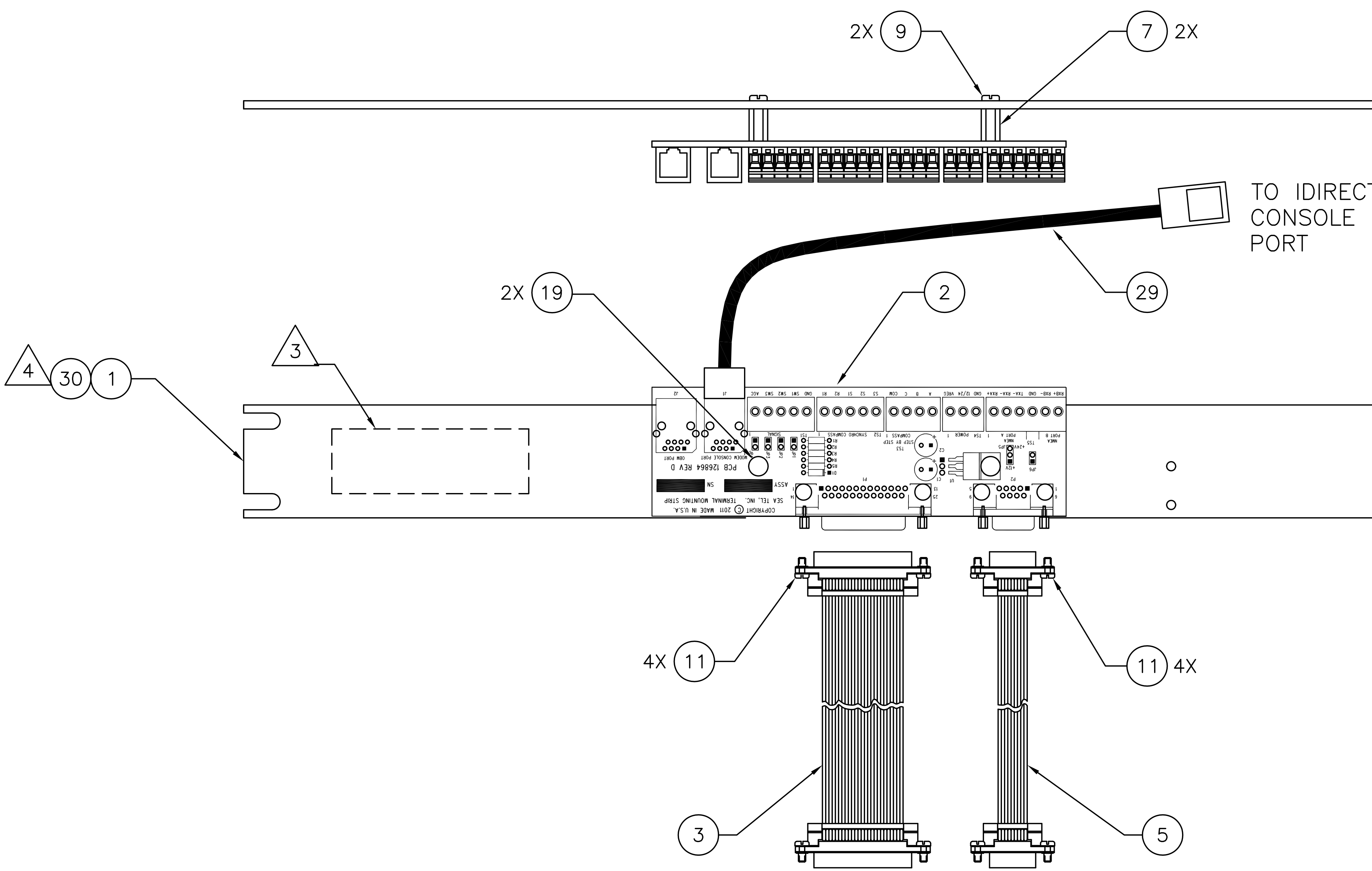
SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	112657	E	MACHINING, TERMINAL MOUNTING STRIP	
2	1 EA	126865-2	G	PCB ASS'Y, TERMINAL MOUNTING STRIP, 5	
3	1 EA	112936-36	D1	CABLE ASS'Y, D-SUB, 25 PIN, 36 IN	
5	1 EA	116669-36	B1	CABLE ASS'Y, D-SUB, 9-PIN, 36 IN.	
7	2 EA	121228-3072		STANDOFF, HEX, F/F, 6-32 X .25 OD X .	
9	2 EA	114588-146		SCREW, PAN HD, PHIL, 6-32 x 3/8, S.S.	
11	8 EA	114588-107		SCREW, PAN HD, PHIL, 4-40 x 5/16, S.S	
19	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S.	
29	1 EA	119478-5	D	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	
30	1 EA	126877	B2	HARNESS ASS'Y, COMTECH MODEM INTERFAC	

Sea Tel
COBHAM

ASSEMBLY, TERMINAL MOUNTING STRIP

PROD FAMILY	EFF. DATE		DRAWING NUMBER	REV
COMMON	9/9/2011	SHT 1 OF 1	121628-4	R



-4 SHOWN

SIZE	SCALE:	DRAWING NUMBER:	REV:
B	1/2	121628	R
		SHEET NUMBER: 3 of 4	

BOM Explosion Report

Item Number: 131857-1

Description: BASE MODEM RACK PANEL ASSY, 4CH TVRO, 400MHZ

Item Revision: B.01 ECO-00008545

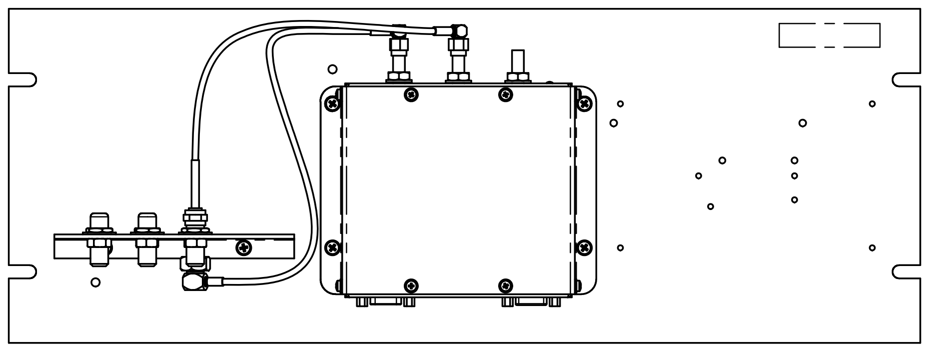
Date as of: 08/31/2018 08:43:17 AM PDT

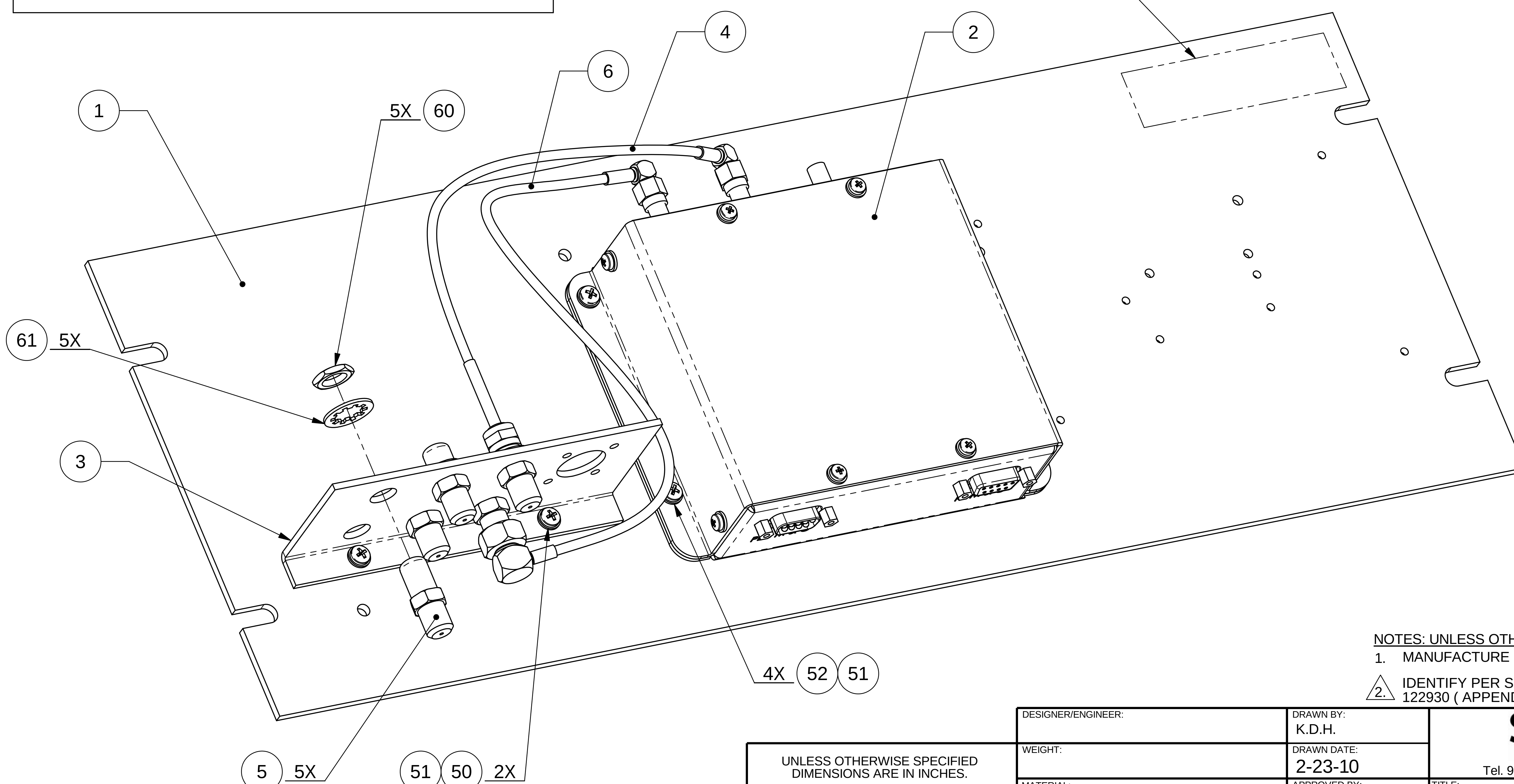
Find Num	Qty	Inventory Unit (LN6)	Number	Rev	Description / Title	BOM Notes
1	1	ea	116880	H ECO-00008542	PANEL MACHINING, RACK, BASE MUX	
2	1	ea	130854-2	H ECO-00012622	MODEM ASSY, 400MHZ, 4CH, BDE, RS 232	
3	1	ea	118429	O ECO-00008542	BRACKET, CONNECTOR	
4	1	ea	128001-8BLU	A.02 ECO-00008544	CABLE ASSY, RG-179, F(M) TO SMA(M)(RA), 8 IN, BLU	
5	5	ea	114178	MCO-00012114	ADAPTER, F(F)-F(F) (BULLET), 1.10 IN L	
6	1	ea	128385-12BLU	C ECO-00008544	CABLE ASSY, RG-179, SMA (RA) TO F (RA), BLUE	
50	2	ea	114588-144	MCO-00012113	SCREW, PAN HD, PHIL, 6-32 x 1/4, SS.	
51	6	ea	114580-007	MCO-00028139	WASHER, FLAT, #6, SS.	
52	4	ea	114588-145	MCO-00012113	SCREW, PAN HD, PHIL, 6-32 x 5/16, SS.	
60	5	ea	119967	MCO-00012114	NUT, HEX, PANEL, 3/8-32	
61	5	ea	119952-031	MCO-00012114	WASHER, STAR, INTERNAL TOOTH, 3/8, SS.	
		ea	131857-1	B.01 ECO-00008545	BASE MODEM RACK PANEL ASSY, 4CH TVRO, 400MHZ	

Created By: Mike Needham

Create Time: 08/31/2018 08:43:33 AM PDT

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
B	8180	02-14-11	ITEM 50 QTY WS 6. ADD ITEM 52. UPDATE NOTES.	SL
B1	N/A	04-18-11	BALLOON 52 WAS 50.	SL





NOTES: UNLESS OTHERWISE SPECIFIED

1. MANUFACTURE PER SEA TEL SPEC 122298.
2. IDENTIFY PER SEATEL SPECIFICATION 122930 (APPENDIX D) APPROX WHERE SHOWN.

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: K.D.H.	Sea Tel COBHAM	
WEIGHT:	DRAWN DATE: 2-23-10	Tel. 925-798-7979 Fax. 925-798-7986	
MATERIAL: N/A	APPROVED BY:	TITLE: BASE MODEM RACK PANEL ASS'Y, 4CH TVRO, 400MHZ	
FINISH: N/A	APPROVED DATE:		
SURFACE ROUGHNESS:	SIZE: B / SCALE: 1:1.5	DRAWING NUMBER: 131857	REV: B1
3rd ANGLE PROJECTION	FIRST USED: 14400B-21	SHEET NUMBER: 1 OF 1	