

**INSTALLATION MANUAL
FOR SEA TEL 5009-33 BROADBAND-AT-SEA
TRANSMIT / RECEIVE SYSTEM WITH SELECTABLE CO-POL OR
CROSS-POL RECEIVE**



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



Sea Tel is an ISO 9001:2000 registered company. Certificate Number 19.2867 was issued August 12, 2005. Sea Tel was originally registered on November 09, 1998.

R&TTE CE

The Series 09 Family of Marine Stabilized Antenna Pedestals with DAC-2202 or DAC-2302 Antenna Control Unit complies with the requirements of directive 1999/5/EC of the European Parliament and of the Council of 9 March 1999 on Radio equipment and Telecommunication Terminal Equipment. A copy of the R&TTE Declaration of Conformity for this equipment is contained in this manual.



The Sea Tel Model 5009 antenna will meet the off-axis EIRP spectral density envelope set forth in FCC 47 C.F.R. § 25.222(a)(1)-(4) when the input power density to the antenna system is limited to -15 dBW/4kHz.



The Sea Tel Model 5009 antenna contains FCC compliant supervisory software to continuously monitor the pedestal pointing accuracy and use it to control the "Transmit Mute" function of the satellite modem to satisfy the provisions of FCC 47 C.F.R. § 25.222(a)(7).

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Revision History

REV	ECO#	Date	Description	By
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A	N/A	October 2, 2009	Production Release	MDN
B	6990	December 7, 2009	Update text to include GSR2 software functions	MDN



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R&TTE Declaration of Conformity

Doc Number 130411 Revision A

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

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

Product Names: **4009 Ku Band Tx/Rx Maritime Satellite Earth Station**
 5009 Ku Band Tx/Rx Maritime Satellite Earth Station
 6009 Ku Band Tx/Rx Maritime Satellite Earth Station

These products have been assessed to Conformity Procedures, Annex IV, of the above Directive by application of the following standards:

EMC:

EMC standard for Radio Equipment	ETSI EN 301 489-1 V1.4.1 (2002-08)
EMC standard for Radio Equipment Marine Navigational and Radio Communication Equipment and Systems – General Requirements:	ETSI EN 300 339 (1998-03) IEC EN 60945:1997

Satellite Earth Stations and System (SES):

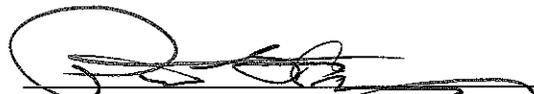
Harmonized EN for Very Small Aperture Terminals (VSAT):	ETSI EN 301 428-1 V1.3.1 (2006-02)
Harmonized EN for satellite Earth Stations on board Vessels (ESVs)	ETSI EN 302 340 V1.1.1 (2006-04)

Safety:

Safety of Information Technology Equipment:	IEC EN 60950-1:2001 (1st Edition)
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Certificates of Assessment were completed by and are on file at NEMKO USA Inc, San Diego, CA

Sea Tel, Inc
Concord, CA


Peter Blaney, Chief Engineer Date

5/14/09

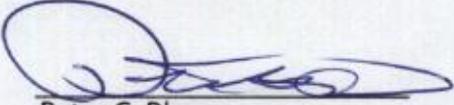


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Declaration of Cobham SATCOM, Sea Tel, Inc.

1. Sea Tel designs, develops, manufactures and services marine stabilized antenna systems for satellite communications at sea. These products are in turn used by our customers as part of their Ku-band Earth Station on Vessels ("ESV") networks.
2. The Sea Tel antennas listed below will meet the off-axis EIRP spectral density envelope set forth in FCC 47 C.F.R. § 25.222(a)(1)-(4) with the following input power spectral density limitations:
 - 0.6 Meter Ku limited to -21.6 dBW/4kHz.
 - 1.0 Meter Ku limited to -17.9 dBW/4kHz.
 - 1.24 Meter Ku limited to -15.0 dBW/4kHz.
 - 1.5 Meter Ku limited to -14.0 dBW/4kHz.
 - 2.4 Meter Ku limited to -14.0 dBW/4kHz.
3. The Sea Tel antennas referenced in paragraph 2 will maintain a stabilization pointing accuracy of better than 0.2 degrees under specified ship motion conditions. FCC compliant supervisory software has been developed to continuously monitor the pedestal pointing error and will trip an error flag whenever an unexpected event occurs that causes the instantaneous pointing error to exceed 0.5 degrees. This flag will not clear until the pedestal error decreases to 0.2 degrees or less. The state of this flag is used as an additional logic input to the existing "Transmit Mute" function of the Sea Tel below decks controller. By connecting the "Transmit Mute Output" of the Sea Tel below decks controller to the "Mute Input" of the satellite modem, the provisions of FCC 47 C.F.R. § 25.222(a)(7) are satisfied.
4. Sea Tel maintains all relevant test data, which is available upon request, to verify these declarations.

Executed on: 10/2/09

By: 
Peter G. Blaney
Chief Engineer, Sea Tel Products
Marine Systems, Cobham SATCOM

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1. 09 Series System Configuration(s)

The 09 Series Stabilized Antenna system is to be used for Transmit/Receive (TX/RX) satellite communications, it is comprised of two major groups of equipment. These are the Above Decks Equipment (ADE) and the Below Decks Equipment (BDE). There will also be interconnecting cables between the ADE & BDE and cables to provide other inputs to the system.

1.1. Series 09 Basic System Information

This group is comprised of the Radome & Base Frame, Stabilized Pedestal with Equipment Frame & Antenna sections and a GPS engine. Each of these sections will be discussed in the next lesson.

Series 09 Antennas will be available in 3 dish sizes (Diameter – active area):

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

Each dish size will be available in 4 basic configurations (other configurations may also be added):

- xx09-11 - 8W NJRC BUC, Cross-Pol Only, Quad Band LNB
- xx09-17 - 8W NJRC BUC, Cross-Pol and Co-Pol, Quad Band LNBS
- xx09-23 - 8W Codan BUC, Cross-Pol Only, Quad Band LNB
- xx09-33 - 8W Codan BUC, Cross-Pol and Co-Pol, Quad Band LNBS
-

1.2. System Cables

AC Power & Coaxial cables will be discussed in a separate lesson.

1.3. Other Inputs to the System

Multi-conductor cables from Ships Gyro Compass, GPS, phone, fax and Computer equipment may also be connected in the system.

1.4. Simplified block diagram of a Series 09 system

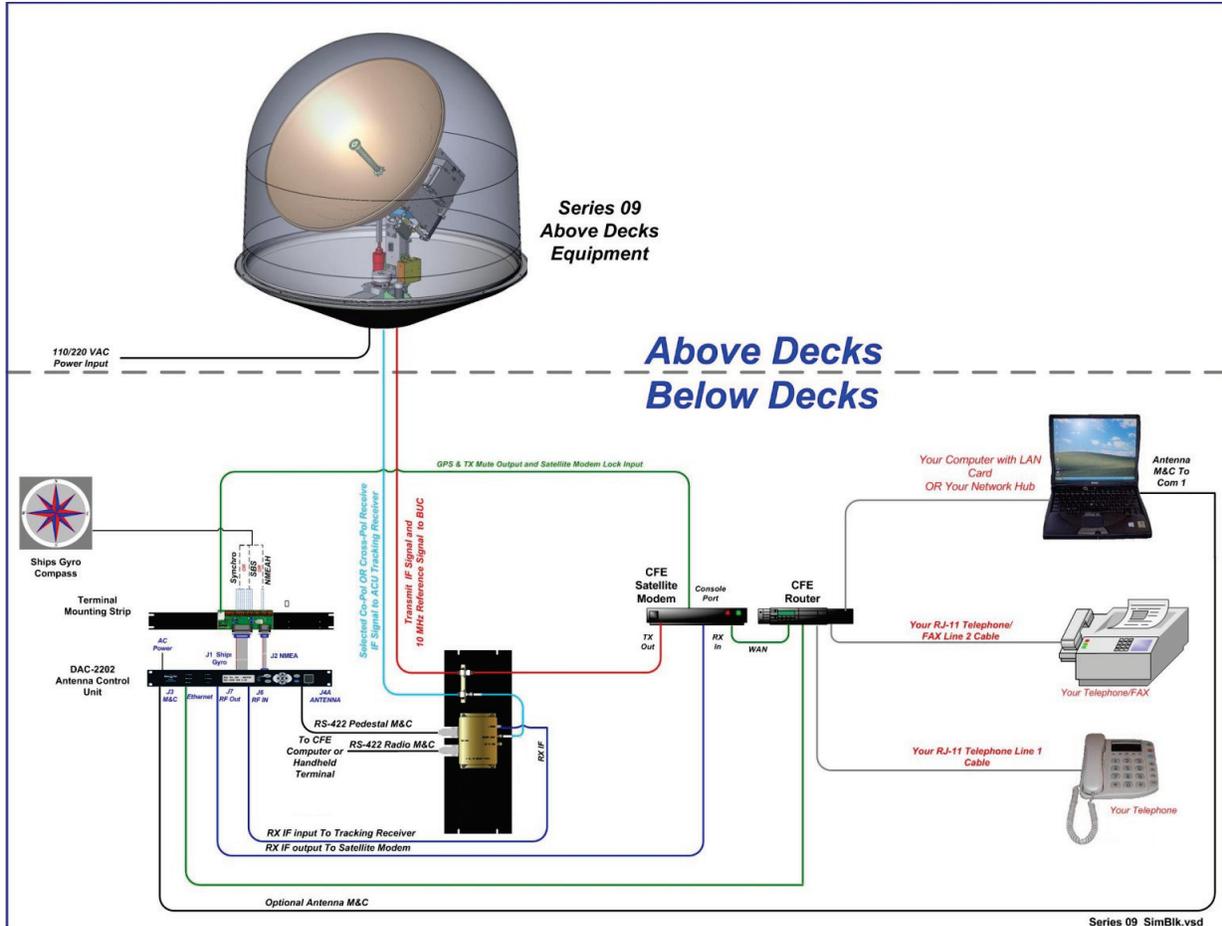
Your Series 09 TXRX system consists of two major groups of equipment; an above-decks group and a below-decks group. Each group is comprised of, but is not limited to, the items listed below. All equipment comprising the Above Decks is incorporated inside the radome assembly and is integrated into a single operational entity. For inputs, this system requires only an unobstructed line-of-sight view to the satellite, Gyro Compass input and AC electrical power.

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

- Stabilized antenna pedestal
- Antenna Reflector
- Feed Assembly with Cross-Pol LNB
- Co-Pol LNB (xx09-17 & 33 Only)
- 8W Ku-Band Solid State Block Up-Converter (BUC)
- Radome Assembly

B. Below-Decks Equipment Group

- Antenna Control Unit
- Terminal Mounting Strip Assembly.
- Base Modem Panel
- Customer Furnished Equipment - Satellite Modem and other below decks equipment required for the desired communications purposes (including LAN and VOIP equipment).
- Appropriate Coax, Ethernet, and telephone cables

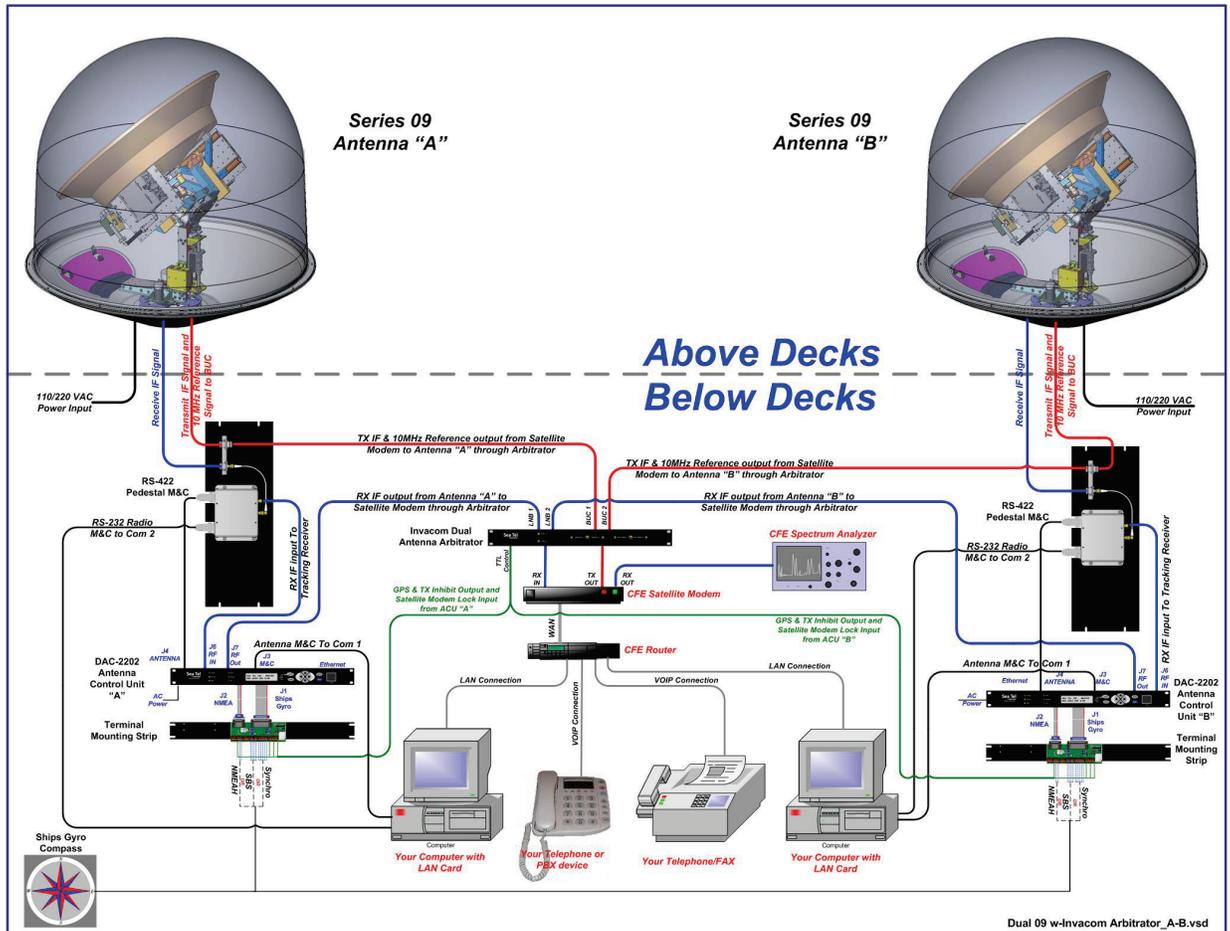


1.5. Dual Antenna Configuration

Sometime, due to very large blockage conditions, you may need to install a dual antenna configuration to provide uninterrupted services. Two full antenna systems are installed and the ACU control outputs are connected to an arbitrator switch panel which then is connected to the below decks equipment. NOTE: The RXIF from EACH antenna MUST be connected to the RF IN (J6) on the rear panel of its respective ACU then RFOUT (J7) is connected to the RXIF input of the Dual Antenna Arbitrator. This connection scheme is required for ACU “A” to be able to control Antenna “A” (and ONLY Antenna “A”) AND ACU “B” to be able to control Antenna “B” (and ONLY Antenna “B”).

You will program the blockage zone(s) for each of the two antennas (refer to Setup – Blockage Zones lesson). The blockage output from the ACU is fed to the Terminal Mounting Strip so that the output of each ACU can be connected to the arbitrator panel to control it. The blockage output is available on SW2 terminal of the Terminal Mounting Strip to provide a transistor “short” to ground when the antenna is within a blockage zone programmed into the ACU. When not blocked the SW2 terminal will be an “open”.

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



1.6. Dual Antenna Arbitrator

The Dual Antenna Arbitrator panel can pass LNB voltages (and handle 250-400 ma of current) and the RXIF signals on the RX connections. TXIF, Reference and BUC supply voltage can be passed through this arbitrator panel to the antenna, but it is not recommended that BUC power be supplied through the dual channel rotary joint of the antenna (a BUC power supply is provided on all Series 09 Antenna Pedestals).

The blockage (SW2) output, GPS output and Modem lock input from the two terminal mounting strips (antenna “A” and antenna “B”) are wired through the arbitrator panel to the satellite modem. When antenna “A” is blocked, the arbitrator PCB will toggle the coax switches so that antenna “B” provides signal to the BDE distribution (multi-switch or modem). When antenna “A” is no longer blocked the arbitrator will do nothing (because it is a latch circuit). When antenna “B” is blocked the panel will switch so that antenna “A” is again providing signal the BDE distribution.

To provide a seamless switching transition, refer to the arbitrator installation instructions to balance the TX & RX signal levels between the two antennas.

1.7. Open Antenna-Modem Interface Protocol (OpenAMIP™) Specification:

1.7.1. Overview:

OpenAMIP, an ASCII message based protocol invented and Trademarked by iDirect is a specification for the interchange of information between an antenna controller and a satellite modem. This protocol allows the satellite modem to command the ACU (via TCP port 2002) to seek a particular satellite as well as allowing exchange of information necessary to permit the modem to initiate and maintain communication via the antenna and the satellite. In general, OpenAMIP is not intended for any purpose except to permit a modem and the ACU to perform synchronized automatic beam switching. It is **NOT** a status logging system or a diagnostic system. In addition, OpenAMIP is intend for a typical installation whereby a specific satellite modem and Antenna system are properly configured to work together. The protocol does not make specific provisions for auto-discovery or parameter negotiation. It is still the responsibility of the installer to assure

the parameters of both the satellite modem (proper option files) and the ACU/PCU (setup parameters) are actually compatible for the intended satellite(s).

1.7.2. Interface requirements:

1.7.2.1. Hardware

Sea Tel Antenna Control Units Model DAC2202 or DAC2302.

Any Satellite modem manufacturer that is compatible with OpenAMIP

CAT5 Patch cable

1.7.2.2. Software

Sea Tel model DAC2202:

ACU software version 6.06 or greater

CommIF module software version 1.10f or greater

Sea Tel model DAC2302:

ACU software version 7.06 or greater

CommIF module software version 1.10f or greater

1.7.3. Utilized OpenAMIP Commands:

1.7.3.1. Antenna Commands:

Command	Description	Example
S f1 f2 f3	Satellite Longitude, 3 parameters: Degrees E/W (-value equals West), Latitude Variance (Inclined Orbit), Sat Skew Offset	"S -20.1 1.0 3.5"
P c1 c2	Polarization, 2 parameters: H,V,L, or R	"P L R"
H f1 f2	Tracking Frequency: 2 Parameters: Center Frequency and Bandwidth in MHz	"H 14123.321 0.256"
B f1 f2	Down Conversion Offset: 2 parameters: LNB (Receive) Local Oscillator and BUC (TX) L.O.	"B 10750"
F	Find, Target satellite using existing S, P,R, and H Parameters	
A i	Set keep alive in seconds (0 = off)	"A 5"
L b1 b2	Modem Lock and free to transmit. 2 parameters: b1 indicates Rx lock and b2 (not utilized) enables/disables Tx Mute to BUC	"L 1 1"
W i	GPS Update: Sets GPS Update period in seconds (0 = Off)	"W 300"
I s1 s2	Set modem vendor (s1) and device (s2) 2 parameters:	"I iDirect 5100"

1.7.3.2. Modem Commands:

Command	Description	Example
a i	Set keep alive in seconds (0 = off)	"a 5"
i s1 s2	Set Antenna Vendor (s1) and device (s2) 2 parameters:	"i Sea Tel DAC-2202"
s b1 b2	Antenna Status: 2 parameters: b1 is functional status and b2 is Tx allowed	"s 1 1"
w b1 f1 f2 t1	Set GPS Position: 4 parameters: b1 is validity flag, f1 is latitude, f2 is longitude, and t1 is timestamp	"w 1 38.222 122.123 0"

2. Site Survey

The objective of the Site survey is to find the best place to mount the antenna & the below decks equipment, the length and routing of the cables and any other items or materials that are required to install the system and identify any other issues that must be resolved before or during the installation. **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.**

2.1. Site Selection Aboard 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.
- The ADE should be mounted more than 5 meters (15 feet) from X-Band Navigational Radar, 10 meters (30 feet) from S-band Radar if the ADE is C-band) and appropriately farther if the radar array is high power.
- The antenna is not 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 5 meters (15 feet) from any high power short-wave (MF/HF) antennae.
- 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 Above Decks Equipment (ADE) and the Below Decks Equipment (BDE) should be positioned as close to one another as possible. This is necessary to reduce the losses associated with long cable runs.
- This mounting platform must also be robust enough to withstand the forces exerted by full rated wind load on the radome.
- The mounting location is robust enough that it will not flex or sway in ships motion and be sufficiently well re-enforced to prevent flex and vibration forces from being exerted on the antenna and radome.
- If the radome is to be mounted on a raised pedestal, it **MUST** have adequate size, wall thickness and gussets to prevent flexing or swaying in ships motion. In simple terms it must be robust.

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

2.2. Antenna Shadowing (Blockage) and RF Interference

At the transmission frequencies of C and Ku band satellite antenna systems, 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 the ADE 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.

2.3. Mounting Foundation

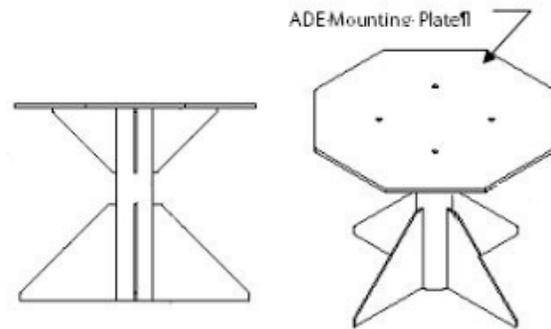
2.3.1. Mounting on Deck or Deckhouse

While mounting the ADE on a mast is a common solution to elevate the ADE far enough above the various obstructions which create signal blockages, sometimes the best mounting position is on a deck or deckhouse top. These installations are inherently stiffer than a mast installation, if for no other reason than the design of

the deck/deckhouse structure is prescribed by the ship's classification society. In the deck/deckhouse design rules, the minimum plating and stiffener guidelines are chosen to preclude high local vibration amplitudes. Most installations onto a deck or deckhouse structure will require a mounting pedestal to raise the ADE above the deck for radome hatch access and to allow the full range of elevation (see ADE mounting considerations above). Some care must be taken to ensure the mounting pedestal is properly aligned with the stiffeners under the deck plating.

2.3.2. ADE Mounting Considerations

Mounting the radome directly on the deck, 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 (***any cracks, scratches or other damage to the surface seal of the tuned radome must be repaired and re-sealed by a competent "A" layered laminate, or cored deck, repair professional.***)



If access to the hatch can not be provided in the mounting surface, provide a short 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.

2.3.3. Sizing of the support pedestal

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

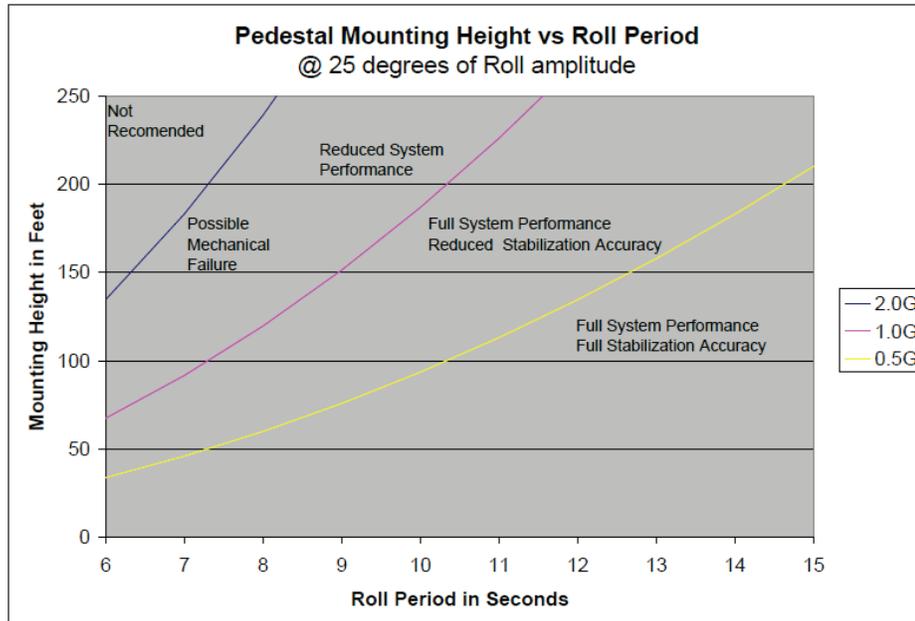
1. The height of the pedestal should be kept as short as possible, taking into account recommendations given in other Sea Tel Guidelines.
2. The minimum height of the pedestal above a flat deck or platform to allow access into the radome for maintenance should be 0.6 meters (24 inches).
3. The connection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

2.4. Mounting Height

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

When the g-force exerted on the antenna is light, antenna stabilization and overall performance will not be affected. If the g-force exerted on the antenna is high enough (> 1 G), antenna stabilization and overall performance will be affected.

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



2.5.Mast Configurations

Sea Tel recommends the ADE be mounted on the ship in a location which 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 clear line-of-sight the antenna system has.

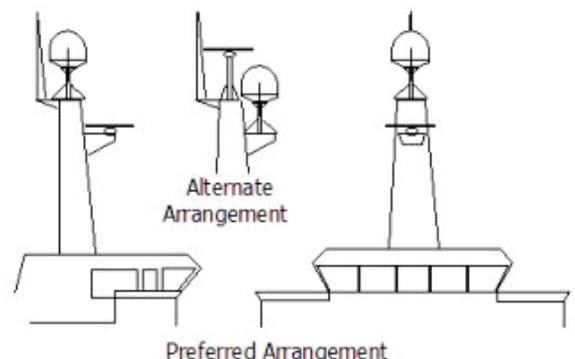
Often the solution for providing the full azimuth/elevation range the antenna needs is to mount the ADE on the ship's mast. Unfortunately, masts do not consider equipment masses in design and often have harmonic frequencies of their own.

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 just a few categories. These categories can be addressed in terms of typical responses and problems with regards to vibration and mounting of ADE. The most common categories of masts are:

2.5.1. Vertical Masts

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

Vertical masts are most commonly still 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.

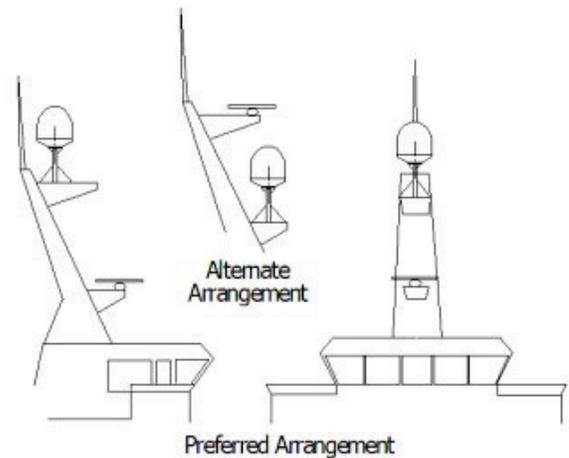


If the estimated natural frequency of the mast or platform is less than 35 Hertz, the mast or platform should be stiffened by the addition of deeper gussets under the platform or behind the mast.

2.5.2. Raked Masts

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

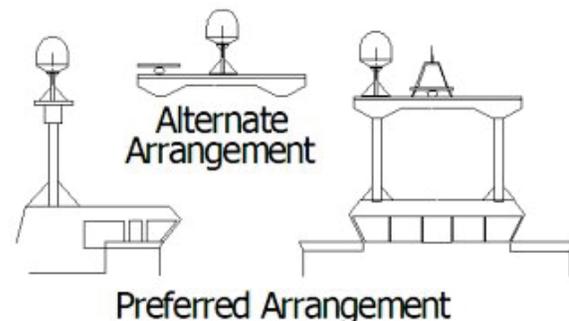
Raked masts pose special problems in both evaluating the mast for stiffness and mounting of antennae. As can be seen in the drawing all antennae must be mounted on platforms or other horizontal structures in order to maintain the vertical orientation of the antenna centerline. This implies a secondary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



2.5.3. Girder Masts

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

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



2.5.4. Truss Mast

Truss masts are a variant on the girder mast concept. Rather than a pair of columns supporting a girder beam, the construction is a framework of tubular members supporting a platform on which the antennae and other equipment is 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, though, the following guidelines apply when determining the adequate support for mounting an antenna on a truss mast:

10. Antenna ADE pedestal gussets should align with platform stiffeners which are at least 200 millimeters in depth and 10 millimeters in thickness.
11. When possible, the antenna ADE pedestal column should align with a vertical truss support.
12. For every 100 Kilograms of ADE weight over 250 Kilograms, the depth of the platform stiffeners should be increased by 50 millimeters and thickness by 2 millimeters.

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



2.6. Safe Access to the ADE

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

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

2.7. Below Decks Equipment Location

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

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

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

2.8. Cables

During the site survey, walk the path that the cables will be installed along. Pay particular attention to how cables will be installed all along the path, what obstacles will have to 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 cables 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. Cables passing through bulkheads or decks shall be routed through approved weather tight glands.

2.8.1. ADE/BDE Coaxial Cables

The first concern about the coaxial cables installed between the ADE & BDE is length. This length is used to determine the loss of the various possible coax, Heliac 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.

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 Heliac bends.

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

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

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

2.8.2. 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 not required to be from a UPS (same one that supplies power to the below decks equipment), but it is recommended.

2.8.3. Air Conditioner Power Cable

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

2.8.4. ACU Power Cable/outlet

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

2.8.5. Gyro Compass Cable

Use good quality shielded cable (twisted pairs, individually foil wrapped, outer foil with braid overall is best)

You only need 2-wire for NMEA signal, 4-wire for Step-By-Step and 5-wire for Synchro ... always use shielded cable. Be cautious of length and gauge of the run for voltage loss issues.

2.9. Grounding

All metal parts of the ADE shall be grounded to bare metal at the mounting pedestal. Grounding straps from the base of the ADE to a dedicated lug on the mounting pedestal are preferred, but grounding may also be accomplished by exposing bare metal under all mounting bolts prior to final tightening. Preservation of the bare metal should be done to prevent loss of ground.

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.

3. Installation

Your antenna pedestal comes completely assembled in its radome. This section contains instructions for unpacking, final assembly and installation of the equipment. It is highly recommended that installation of the system be performed by trained technicians.

Your antenna may have been ordered in a **76" diameter radome or an 81" diameter radome**. The installation instructions for both radome sizes are below.

3.1. Unpacking and Inspection

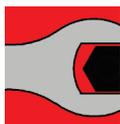
Exercise caution when unpacking the equipment.

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

3.2. Assembly Notes and Warnings



NOTE: Unless otherwise indicated, all nuts and bolts should be assembled with Loctite 271 or its equivalent.

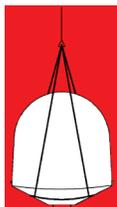


WARNING: Assure that all nut & bolt assemblies are tightened according the tightening torque values listed below:

SAE Bolt Size	Inch Pounds	Metric Bolt Size
	Kg-cm	
1/4-20	75	M6 75.3
5/16-18	132	M6 225
3/8-16	236	M12 622
1/2-13	517	

3.3. Installing the ADE

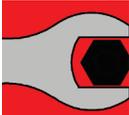
The antenna pedestal is shipped completely assembled in its radome.



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.



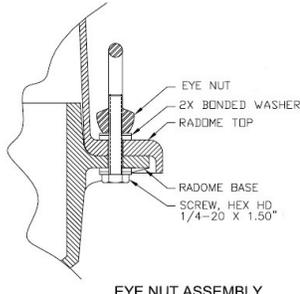
CAUTION: The antenna/radome assembly is very light for its size and is subject to large swaying motions if hoisted under windy conditions. Always ensure that tag lines, attached to the radome base frame, are attended while the antenna assembly is being hoisted to its assigned location aboard ship.



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

SAE Bolt Size Size	Inch Pounds Kg-cm	Metric Bolt Size
1/4-20	75	M6 75.3
5/16-18	132	M6 225
3/8-16	236	M12 622
1/2-13	517	

3.3.1. Prepare the 50”, 60”, 66” or 76” Radome Assembly

<ol style="list-style-type: none"> 1. Remove the side walls of the Radome crate. 2. Lift the pallet using a forklift and/or jacks. 3. From the under side of the pallet, remove the 4 shipping bolts which attach the ADE to its' pallet. Discard this shipping hardware. 	
<ol style="list-style-type: none"> 4. Remove four equally spaced bolts around the radome flange. Save these nuts and bolts to be re-installed 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 re-installed after the ADE has been installed. 	
<ol style="list-style-type: none"> 6. Attach shackles and four part web lifting sling arrangement to the eyebolts. 7. Attach a suitable length tagline to one of the eyebolts. 	

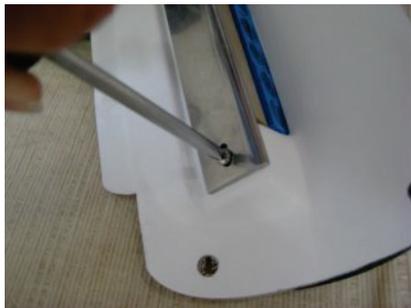
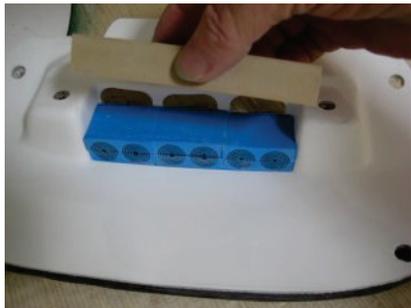
3.3.2. Installing the 50, 60 or 66" Radome Assembly

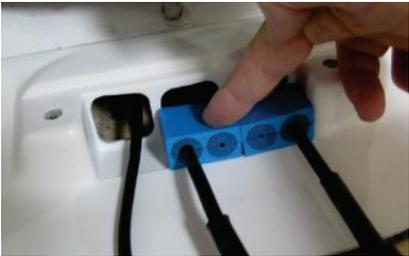
The antenna pedestal is shipped completely assembled in its radome.

	<p>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.</p>
	<p>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 the antenna assembly is being hoisted to its assigned location aboard ship.</p>

<ol style="list-style-type: none"> 1. Man the tag line(s). 2. Hoist the antenna assembly off 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. 	
<ol style="list-style-type: none"> 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. 	

<p>6. Using Loctite 271, install the 4 mounting bolts (provided in radome mounting kit) into the radome base.</p>	
<p>7. Remove the hardware in the cable mounting frame.</p>	
<p>8. Lift the cable mounting frame out from the cable passage channel.</p>	
<p>9. Man the tag line and have the crane continue lifting the ADE up and hover above the mounting site on the ship.</p> <p>10. Carefully route AC Power and IF 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.</p> <p>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.</p>	

<p>11. Allow enough service loop to terminate these cables to the circuit breaker assembly and connector bracket respectively (see cable termination information below).</p> <p>HINT: It may be easier to connect, or tie-wrap, the coaxes and power cable temporarily.</p> <p>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).</p> <p>13. Using Loctite 271, install the 4 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. .</p>	
<p>14. Remove the clamp bar and Roxtec® Multidiameter® blocks from their cable mounting frame in the cable passage channel.</p>	
<p>15. Remove the rubber bar from the top of the Roxtec® Multidiameter® blocks.</p>	
<p>16. Remove the Roxtec® Multidiameter® blocks from the cable mounting frame.</p>	
<p>17. Pass the coaxes and power cable through the cable mounting frame.</p> <p>HINT: Again, It may be easier to connect, or tie-wrap, the coaxes and power cable temporarily.</p> <p>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. .</p>	

<p>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.</p>	
<p>20. Two cables may be passed through each of the Roxtec® Multidiameter® CM-20w40 blocks provided.</p> <p>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 to 3.25cm/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.</p>	
<p>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.</p>	
<p>22. Re-install the clamp bar using the hardware removed in step 14 above.</p>	

3.4.Cable Installation

3.4.1. 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).

3.5.Installing the Below Decks Equipment.

Installing the Antenna Control Unit, Base Multiplexer Panel and the Terminal Mounting Strip.

3.5.1. 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.

3.5.2. 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.

3.5.3. System Configuration

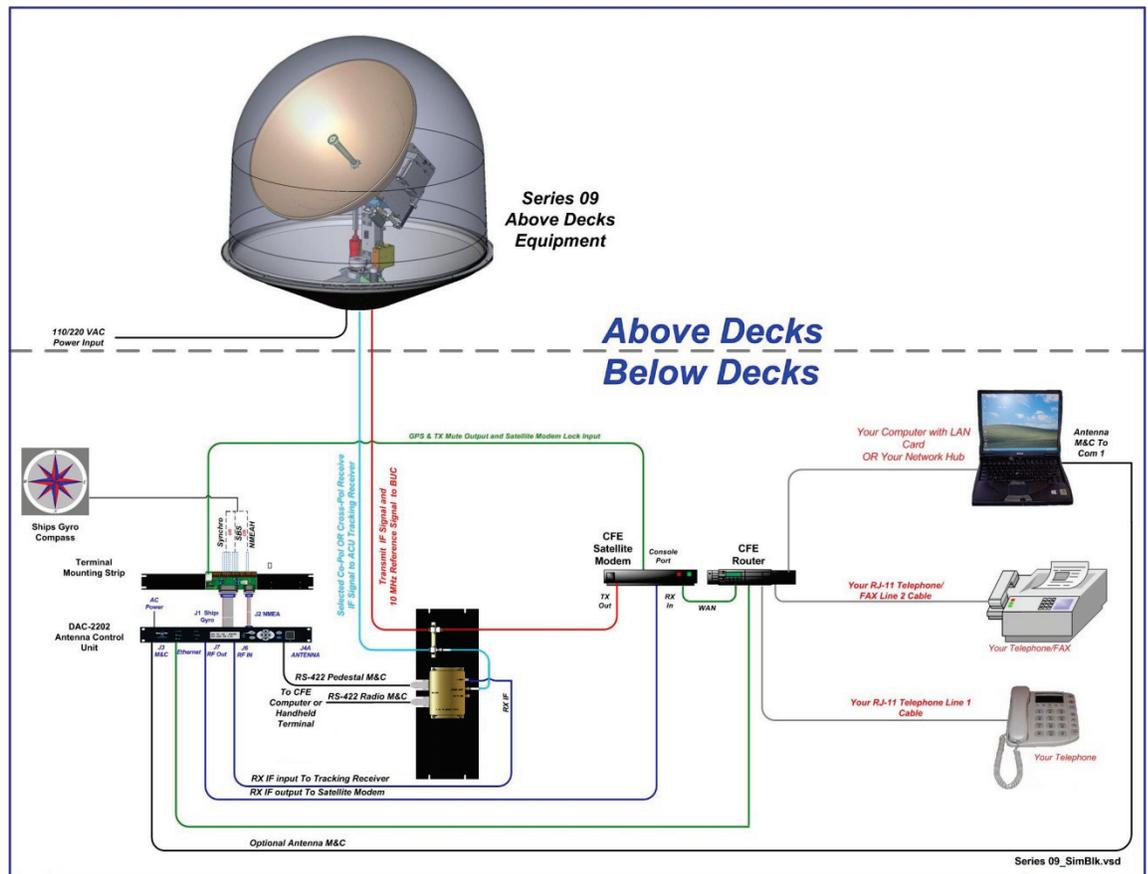


Figure 3-1 Series 09 Simplified Block Diagram

3.5.4. 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 Satellite Modem, Router, VOIP adapters, Telephone equipment, Fax machine, Computers and any other below decks equipment that are part of your installation.

3.6. Connecting the Below Decks Equipment

Connect this equipment as shown in the System Block Diagram.

3.6.1. Connecting the ADE AC Power Cable

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

3.6.2. 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.

3.6.3. Connecting the ADE IF Coaxes

1. Attach the TXIF coax from the antenna to the TX Connector on the Base Multiplexer Panel.
2. Attach the RXIF coax from the antenna to the RX Connector on the Base Multiplexer Panel.

3.6.4. Connect the Modem TXIF Coax

Connect the TXIF coax from the Base Multiplexer Panel to the Satellite Modem TX Output.

3.6.5. Antenna Control Unit Connections



Figure 1-2 Rear Panel DAC-2202 ACU

3.6.5.1. Antenna Control Serial Cable

Connected the Antenna Control Serial Cable from the Base Multiplexer to J4A on the DAC-2202.

3.6.5.2. ACU to Terminal Mounting Strip Connections

Connect the TMS to the ACU.

1. Connect the 25 pin ribbon cable from the Terminal Mounting Strip 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 Terminal Mounting Strip to J2 "NMEA" DB9 on the rear panel of the ACU

3.6.5.3. 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 Antenna Control Unit.

3.6.5.4. RXIF to the Satellite Modem

Connect J7 "RF OUT" on the rear panel of the ACU to the RX Input connector on the Satellite Modem. The RX signal level of the J7 output of the ACU is approximately unity with J6 input due to an in internal amplifier.

3.6.5.5. Ethernet Connection to the ACU

The Ethernet connection can be used to Monitor & Control the antenna through Antenna Control Unit via the internal web pages, by use of DacRemP IP or via an Ethernet connection through a router/switch/hub to an Open AMIP compatible satellite modem. Use an Ethernet patch cable to make your desired connection to the Ethernet connector on the rear panel of the ACU.

3.6.5.6. **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.

3.6.6. **Radio Control Serial Cable**

If desired, connected the Radio Control Serial Cable from the Base Multiplexer to the COM Port of a Customer Furnished Computer.

3.6.7. **Terminal Mounting Strip (TMS) Connections**

Connect the Ships Gyro Compass input to the appropriate screw terminals on this strip. The satellite modem must also be connected to provide compliance with FCC Order 04-286 and WRC-03 Resolution 902.

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

3.6.7.1. **Jumper Selection**

JP1 – JP4 are to couple in pull-up resistors for the below listed functions. JP5 selects the DC voltage output on TS4.

JP1 SW1 – This output would be used for below decks band select - to control a band selection switch or tone generator. Default is OPEN.

JP2 SW2 (blockage & RF radiation hazard output) - Used to control dual antenna arbitrator, in dual antenna configurations, and provide TX Mute control to the Satellite Modem. Default is SHORTED when blocked.

JP3 SW3 (reserved) - Reserved for future use.

JP4 AGC (external AGC input) - Pull-up for external AGC input from Satellite Modem which is used to a positive satellite Network ID when the modem is on the correct network (therefore the antenna is on the correct satellite). Default is SHORTED.

JP5 Voltage Output Select - Select 12VDC or 24VDC. Default is 12VDC.

3.6.7.2. **J1 "Modem Console Port" connector**

FCC compliance connection to an iDirect Satellite Modem can be made very easily by connecting a Straight Serial RJ-45 cable from the J1 "Modem Console Port" connector on the Terminal Mounting Strip to the Console port on the iDirect Modem. If your modem is Open AMIP compatible and you wish to use it in an Open AMIP configuration you

3.6.7.3. **TS1 Control Interface Connections.**

AGC & GND - External AGC, or Modem Lock, input.

- External AGC input to the DAC-2202 must be 0 to 15 Volts DC analog signal, positive going voltage proportional to satellite signal input level and must be real-time in its response to antenna pointing.
- External Modem Lock from a satellite modem is used as a positive ID that the antenna is on the desired satellite. **This input is NOT used for Tracking purposes**, it is only used for satellite identification to acquire the correct satellite during search. To enable the external modem input you must include a 2 in the SYSTEM TYPE parameter (If your system type is presently 76 or 77, then change it to 78 or 79) and **NID MUST be set to 0000**.

- **Connections** - The modem lock signal connects to EXT AGC and a ground reference from the modem. The expected signal from the modem allows 0VDC to +15VDC. Low voltage indicates modem lock, high voltage indicates modem unlock.
- **Testing** - The input connections from the modem can be tested by selecting the external AGC input and monitoring the displayed value. To select external AGC, set the tuning frequency to 0000. Normally, AGC readings below 2048 are considered a low condition and indicate modem lock and AGC readings above 2048 are considered a high condition and indicate modem unlock.

[If you find the AGC reading for locked and unlocked conditions need to be reversed you must add 128 to your current SYSTEM TYPE parameter].

Turn tracking OFF when checking the external AGC inputs. Be sure to properly retune the receiver frequency when you are finished testing the external input.

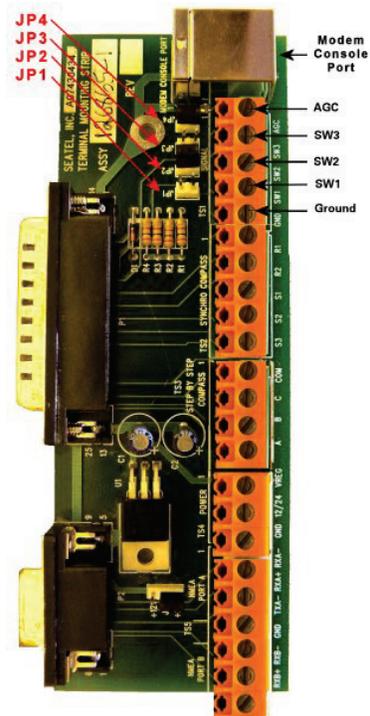
- **Operation** - In *NORMAL* operation, AGC must be above Threshold AND external MODEM Lock input must be locked to Track the satellite. If you are tracking a satellite signal and the AGC is above threshold (Tracking light on solid) but the external AGC signal rises above 2.5 volts for more than 20 seconds (external MODEM input **UNLOCKED**) the ACU will automatically retarget the selected satellite.

SW1 - Band Selection control output. This output is used to control below decks tone generator(s), or coax switch(s), for band selection functions. The band selection control output is driven by the band selected in the MODE – TRACKING display.

SW2 - The Blockage/TX Mute Control output is driven by Blockage and RF Radiation Hazard functions. This output will short to ground whenever the antenna is within the programmed AZ LIMIT zone(s) or is Searching, Targeting or is mispointed 0.5 degrees from satellite peak. This output is commonly used to drive:

If your modem cannot use the Modem Console Port connection you will have to provide a transmit inhibit output from the ACU by connecting a SW2 wire connection to the modem to comply with FCC Order 04-286 and WRC-03 Resolution 902.

- Dual or Quad Antenna Arbitrator coax switches in dual antenna configurations. The coax switches select which antenna is feeding signal to the below decks equipment.
- Mute the Transmit output of the Satellite Modem used in TX/RX antenna configurations when the antenna is positioned where people may be harmed by the transmit power emanating from the antenna (RF Radiation Hazard).
- Mute the Transmit output of the Satellite Modem used in TX/RX antenna configurations when the antenna is mispointed by 0.5 degrees, or more, and keep it muted until the antenna has been within 0.2 degrees of peak pointing to the satellite for a minimum of 5 seconds (FCC part 25.221 & 25.222 TX Mute requirement).



3.6.7.4. TS2 Synchro Gyro Compass Input.

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

3.6.7.5. 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.

3.6.7.6. TS4 Power

- **VREG** Screw terminal is used to provide a regulated DC operating voltage to ancillary equipment. Voltage out is dependant upon which terminal mounting strip assembly is

3.8.1. 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.

3.8.2. Fine Balance and Monitoring Motor Drive Torque

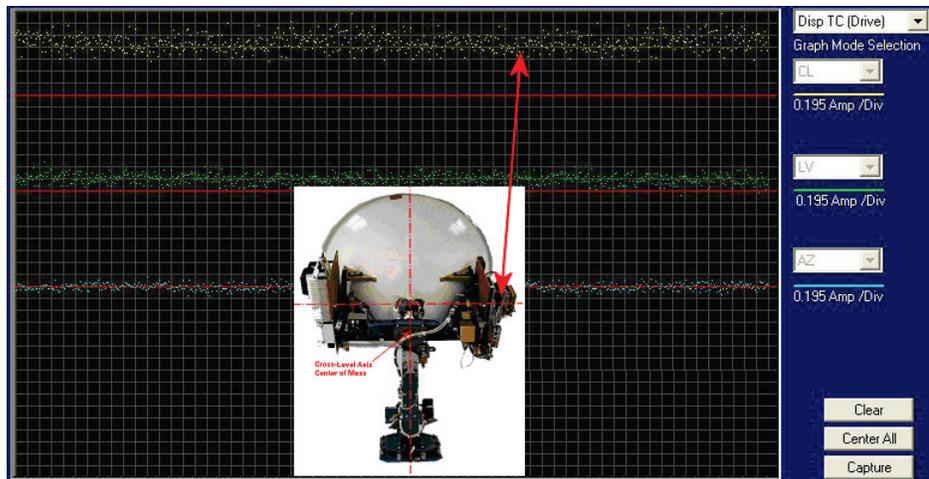
The DacRemP **DISPTC** graph chart provides a means for monitoring torque commands required for each motor for diagnostic purposes and verifying antenna balance. By observing each trace, the required drive of the antenna via the motor driver PCB may be established.

- To view the Torque Commands, select the 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 0.195amps/vertical division.

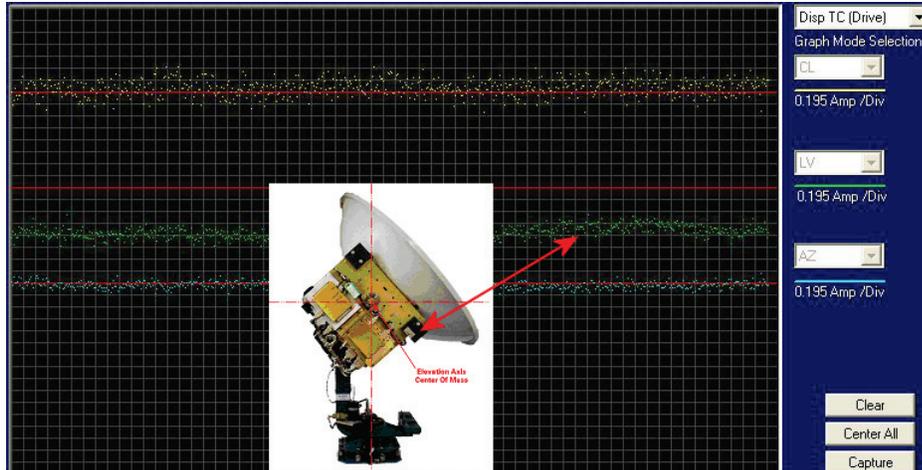


- A normal trace display will be ± 1 divisions from the red reference line while under calm sea conditions and with DishScan Drive turned off. See example below
- The Cross Level display will decrease (plots below red line) as the antenna requires drive to the left and increase (plots above red line) as the antenna requires to the right.

Example: The antenna pictured in the screen capture below is imbalanced so that it is “Right Heavy”. The CL trace is plotting above the red reference line (indicating that drive CCW is required to maintain a 90° Cross-Level position).



- The Level display should decrease (plots below red line) as the antenna requires drive forward (Up in elevation) and increase (plots above red line) as the antenna requires drive back (Down in elevation).
- Example: The antenna pictured in the screen capture below is imbalanced so that it is “Front Heavy”. The LV trace is plotting above the red line (indicating that drive CW is required to maintain the current elevation position).



- The Azimuth display should decrease (plots below red line) as the antenna is driven CCW and increase (plots above red line) as the antenna is rotated CW.

4. Basic Setup of the ACU

4.1. 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.

4.2. 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.

4.3. Default Setup Parameters for your Antenna

The following table shows the factory default parameters for the DAC-2202 Antenna Control Unit interfaced to a Series 09 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.

PARAMETER	4009	5009	6009	Optimize using Lesson
AUTO TRIM				Setup – Targeting
EL TRIM		0		
AZ TRIM		0		
AUTO THRES		100		Leave at factory Defaults
EL STEP SIZE		0		
AZ STEP SIZE		0		
STEP INTEGRAL		0		
SEARCH INC		10		Setup - Searching
SEARCH LIMIT		100		
SEARCH DELAY		30		
SWEEP INC		47		
SYSTEM TYPE		7 *		Setup – Modem Connect, Setup and Test
GYRO TYPE		2 (NMEA/SBS)		Setup – Ships Gyro Compass
POL TYPE		72		Setup – Optimizing Polarity & Cross Pol Isolation
POL OFFSET		40		
POL SCALE		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 (Horizontal TX)	Setup – Optimizing Polarity & Cross Pol Isolation
TRACK DISP	130 or 170	Setup – Band Selection

*** This setting is for the i-Direct 5000 Series modem to provide Modem Lock input & Modem TX Mute functions. Refer to Setup – Modem Connect, Setup and Test for values for some other common Satellite Modems and other SYSTEM TYPE parameter information.**

REMOTE PARAMETER	4009	5009	6009	Optimize using Lesson
PCU Configuration Number N0xxx	004	005	006	Leave at factory Defaults
Home Flag Offset N6xxx	000			Setup – Home Flag Offset
DishScan Phase/Gain N7xxx	26	21	85	Leave at factory Defaults

4.4.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 & 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.

5. 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 ADC recording in DacRemP, the “Relative Azimuth” trace should do exactly **equal & 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.

5.1.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.

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

5.2.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.

5.3.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 device) 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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6. Setup – Band Selection

To properly control the band selection of the LNB(s) mounted on the antenna the TRACK DISP (Tracking Display) parameter **must** be set correctly. Which value the TRACK DISP parameter is set to depends on the hardware configuration of the antenna pedestal.

The xx09-17 and xx09-33 antenna pedestals come with the waveguide diplexer and LNB to provide the additional Co-Pol RXIF output to the Cross-Pol/Co-Pol select coax switch (all of the systems come with the switch and coax installed, so you can easily upgrade the antenna with the Co-Pol hardware).

The TRACK DISP parameter controls Tone, Voltage and Aux functions remotely on the antenna pedestal. Voltage and Tone are used to select the desired band of dual-band, tri-band and quad-band LNBs. The Aux function controls the Cross-Pol/Co-Pol select switch.

Sea Tel provides quad-band LNBs as a default LNBs on the 09 Series antennas, therefore, the default TRACK DISP parameter for Cross-Pol only systems is 0170 and 0130 for 09 antennas with Cross-Pol AND Co-Pol LNBs.

6.1. Cross-Pol AND Co-Pol Quad-Band LNBs

This is the default setting for the Series 09 antenna pedestals with Quad-Band SMW LNBs.

Use the Xp B1 when you want Cross-Pol Band1 output to be routed to below decks, Xp B2 selects Cross-Pol Band2, Xp B3 selects Cross-Pol Band3 and Xp B4 selects Cross-Pol Band4. Use the Cp B1 when you want Co-Pol Band1 output to be routed to below decks, Cp B2 selects Co-Pol Band2, Cp B3 selects Co-Pol Band3 and Cp B4 selects Co-Pol Band4.

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

TRACK DISP Setting	Displayed band selection	ADE Band Select Parameters (Tone, Voltage & Aux Status)
0130	Xp B1	Tone OFF, Volt 13, Aux 0
	Xp B2	Tone ON, Volt 13, Aux 0
	Xp B3	Tone OFF, Volt 18, Aux 0
	Xp B4	Tone ON, Volt 18, Aux 0
	Cp B1	Tone OFF, Volt 13, Aux 1
	Cp B2	Tone ON, Volt 13, Aux 1
	Cp B3	Tone OFF, Volt 18, Aux 1
	Cp B4	Tone ON, Volt 18, Aux 1

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7. Setup – Targeting

In this lesson you will learn how to optimize the targeting of the antenna to land on or near a desired satellite (within +/- 1 degree).

7.1.AUTO TRIM

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

Refer to “Optimizing Targeting” in the Setup section of this manual for further details on the parameters set.

To enable this function, the Antenna **MUST** be actively tracking the satellite with positive SAT ID: After locating the satellite 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.

NOTE: The AUTO TRIM feature only will work if your system is actively tracking a satellite (AGC above threshold **and** positive SAT ID, internal NID match or external RX lock received, has been established). If any of the previous conditions are not met, AUTO TRIM LOCKED will be displayed on the front panel, indicating that the AUTO TRIM Feature is not enabled. From the AUTO TRIM SETUP screen, press any MODE key (DAC2302) or NEXT key (DAC2202) without hitting ENTER to escape this screen without submitting the new AZ and EL Trim values.

7.2.Manually Optimizing Targeting

First, assure that all of your Ship & Satellite settings in the ACU are correct.

4. 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).
5. 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.
6. 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!
7. 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.
8. 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.

7.3.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.

7.4.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 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.

7.5.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 & 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.

8. 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).

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:

8.1. 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.

8.1.1. 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.

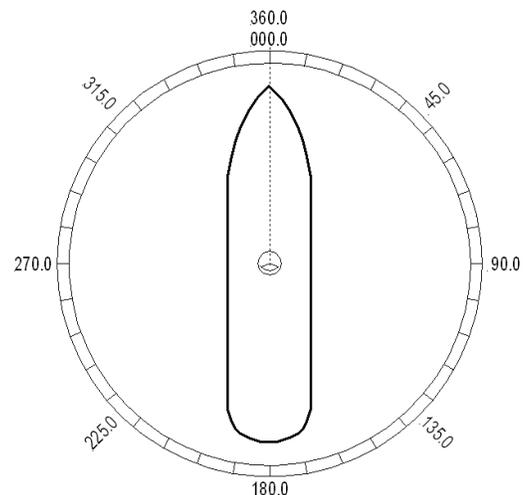


Figure 8-1 Antenna stops In-line with Bow

If AZ TRIM was a **plus** value: $HFO = (TRIM / 360) \times 255$ Example: AZ TRIM was 0200 (plus 20 degrees). $HFO = (20/360) \times 255 = (0.0556) \times 255 = 14.16$ 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: $HFO = ((360-TRIM) / 360) \times 255$ Example: AZ TRIM = -0450 (minus 45 degrees). $HFO = ((360 - 45) / 360) \times 255 = (315 / 360) \times 255 = 0.875 \times 255 = 223.125$ round of to 223. Set, and Save, HFO to 223 using the “To Enter the HFO value” procedure below.

8.1.2. You Observe “Home” Pointing is LEFT of the Bow-line:

- In this example, I observe that the Home position is short of the bow line.
- I estimate that it is about 45 degrees.
- I target my desired satellite and record the Calculated Azimuth to be 180.5.
- I drive UP (I estimated that I will need to go UP about 45 degrees) and finally find my desired satellite.
- Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 227.0 degrees.
- I subtract Calculated from Peak ($227 - 0180.5 = 46.5$) and difference is 46.5 degrees.
- 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.
- I now calculate the HFO = $(313.5 / 360) \times 255 = 0.87 \times 255 = 222.06$ which I round off to 222.
- 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.
- If there is a small amount of error remaining, use AZ TRIM in the Optimizing Targeting procedure to correct it.

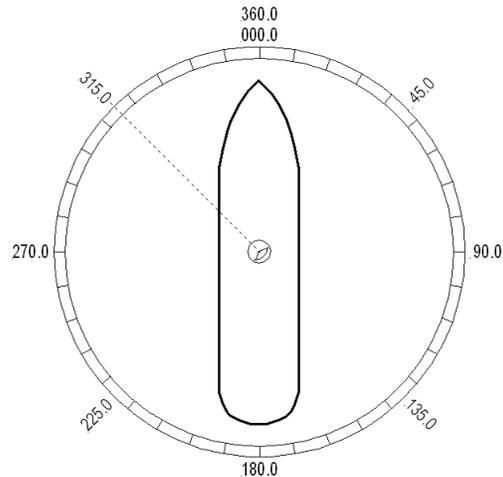


Figure 8-2 Antenna stopped before the Bow

8.1.3. You Observe “Home” Pointing is RIGHT of the Bow-line:

- In this example, I observe that the Home position is past the bow line.
- I estimate that it is about 90 degrees.
- I target my desired satellite and record the Calculated Azimuth to be 180.0.
- I drive DOWN (I estimated that I will need to go **DOWN** about 89 degrees) and finally find my desired satellite.
- Turn tracking ON to let the ACU peak the signal up. When peaked, the Azimuth is 90.0 degrees.
- I subtract Calculated from Peak ($180.0 - 90.0 = 90.0$) and difference is 90.0 degrees.
- I can calculate what the correct value for the Home position of the antenna by **adding** (because

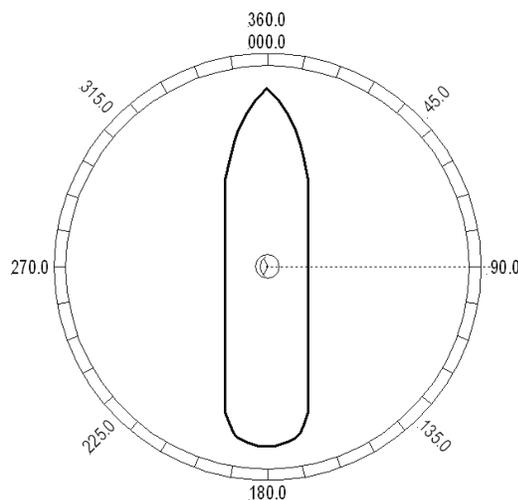


Figure 8-3 Antenna stops past the Bow

“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 = $((90.0) / 360) \times 255 = 0.25 \times 255 = 63.75$ 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.

8.1.4. To Enter the HFO value in the DAC_2202:

To enter the calculated HFO value, press & 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 save yet).

If you want to find out what the **current** HFO value is key in N6999 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:

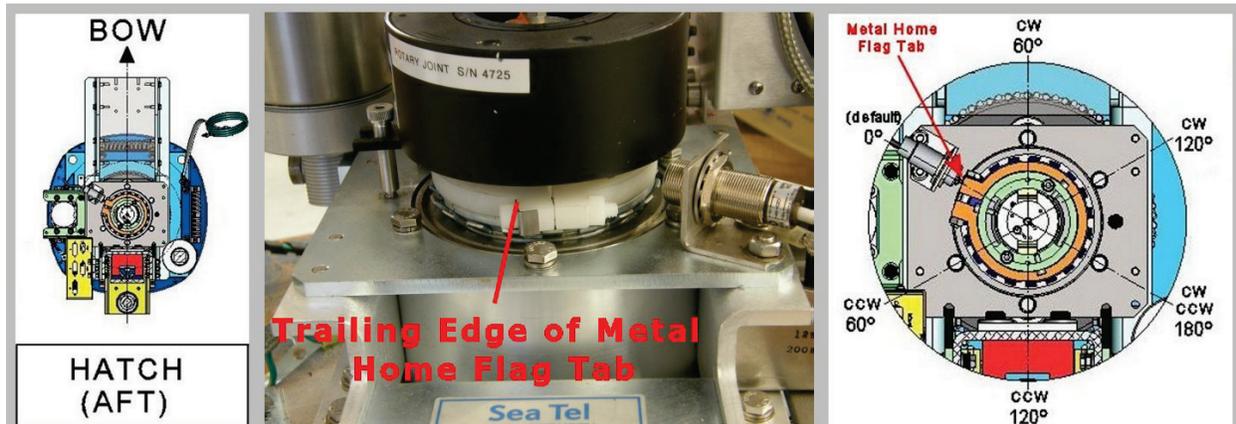
1. Set the Remote Command value to “**N6222**”.
2. Press **ENTER** to send this HFO to the PCU. The display should now show “N0222”.
3. When completed, you must save the desired HFO value. Press **ENTER** several times to select the **REMOTE PARAMETERS** display. Press the **LEFT** or **RIGHT** arrow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

4. Press **UP** arrow key several times to return to the **REMOTE COMMAND** display.
5. 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.

8.2. 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.

9. Setup – Searching

9.1. 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 **MODE** button twice 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.

9.1.1. 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 10 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).

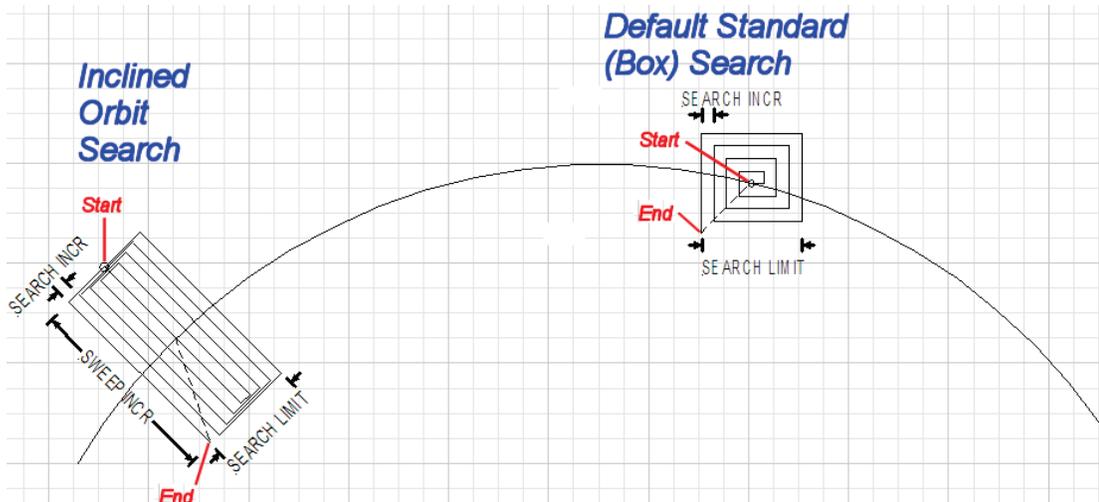
GYRO TYPE – must NOT be set to zero.

SAT REF mode – may be **ON** if you are experiencing frequent, or constant, gyro read errors (error code 0001). **Must** be ON if you are using NMEA Gyro input.

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 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.



9.1.2. 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 10 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 – may be **ON** if you are experiencing frequent, or constant, gyro read errors (error code 0001). **Must** be ON if you are using NMEA Gyro input.

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.

9.1.3. 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 10 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**).

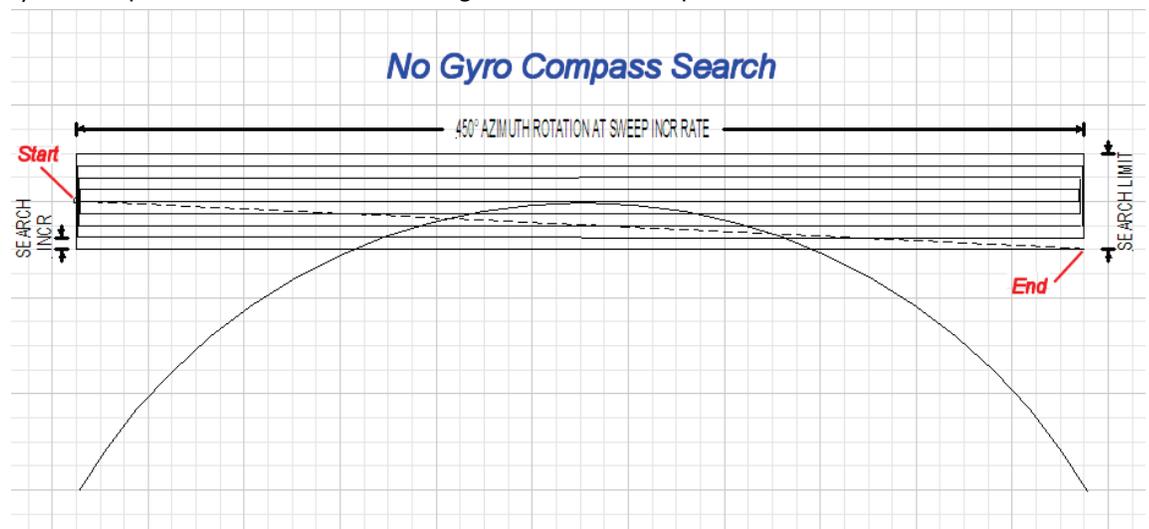
GYRO TYPE – **MUST** be set to **zero** for this search pattern.

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.



9.2.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.

9.2.1. **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 1/2) 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.

9.2.2. **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.

9.2.3. **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.

9.2.4. **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.

9.2.5. **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 10 for all 09 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.

9.2.6. 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 all 09 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.

9.2.7. 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.

9.2.8. SWEEP INC

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.

9.3. 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 & 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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10. Setup – Blockage & RF Radiation Hazard Zones

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

10.1. 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:

9. 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.
10. “BLOCKED” will be displayed in the TRACKING window wherever the antenna is inside one of the zones.
11. 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 **unnneeded** 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:

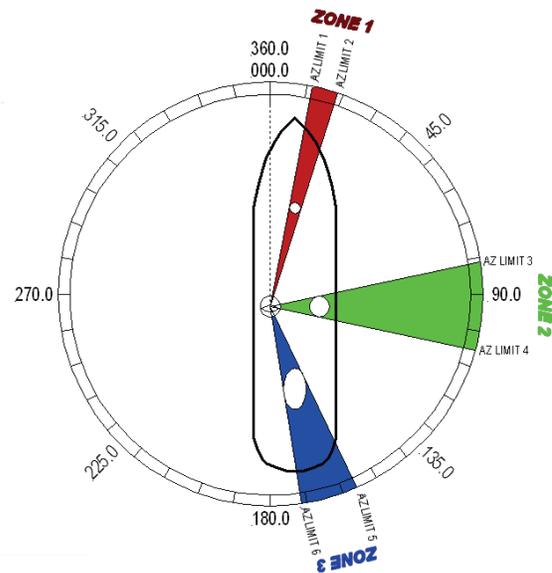
ZONE 1 begins (AZ LIMIT 1) at 12 degrees Relative and ends (AZ LIMIT 2) at 18 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 1 value of 0120 and AZ LIMIT 2 value of 0180. In this case the mast height only causes blockage up to an elevation of 50 degrees, so we set EL LIMIT 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.

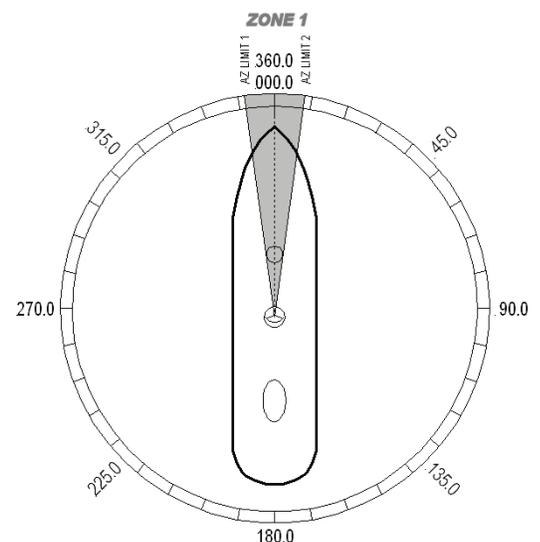
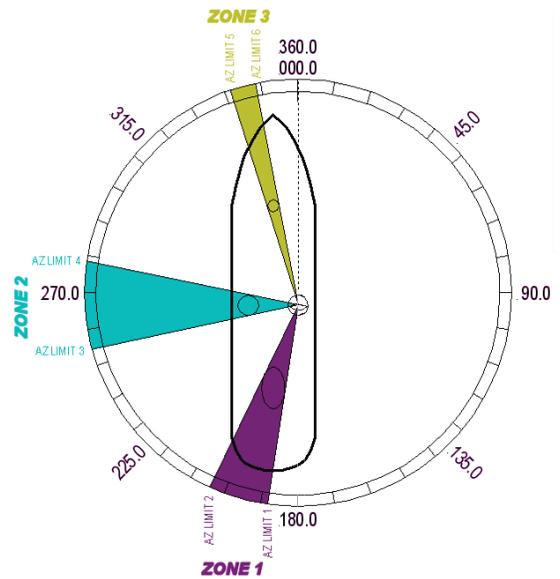
ZONE 2 begins (AZ LIMIT 3) at 254 degrees Relative and ends (AZ LIMIT 4) at 278 degrees Relative. Multiply these Relative positions by 10. Enter AZ LIMIT 3 value of 2540 and AZ LIMIT 4 value of 2780. In this case the Antenna B height only causes blockage up to an elevation of 12 degrees, so we set EL 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.

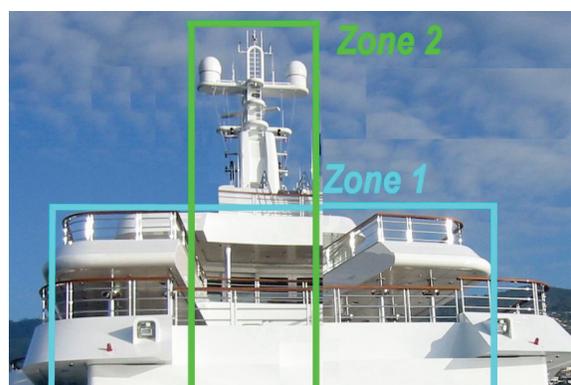
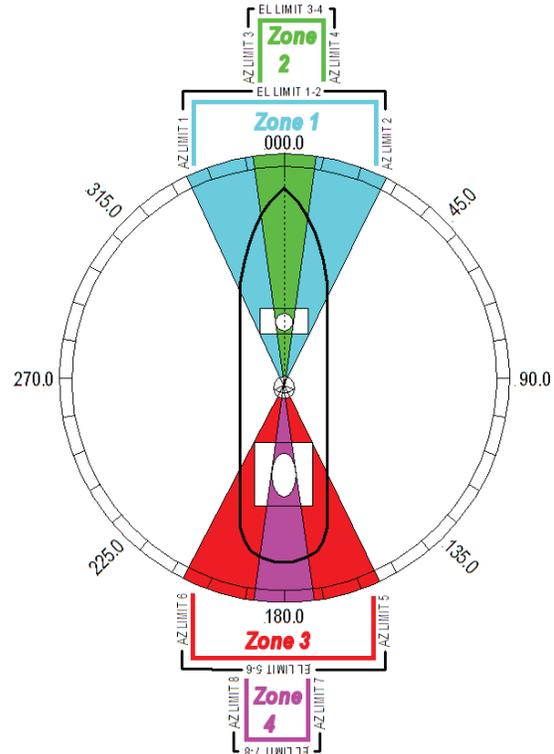
EXAMPLE 4 - Overlaid Blockage Zones: A ship has a Sea Tel antenna mounted on the center line of the ship. A mast mounted on top of a deckhouse (like the picture below) is forward and an engine exhaust stack, also on a deckhouse, is aft. These two blockage areas have wide azimuth blockage at lower elevations 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.



10.2. 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 & 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.

11. Setup – Modem Connections, Setup and Test

In order to be compliant with FCC Order 04-286 and WRC-03 Resolution 902 the Satellite Modem **MUST** be connected to the Antenna control Unit/Terminal Mounting Strip to provide TX Mute control functionality. The FCC/WARC requirements have been adopted by ITU & ETSI for them to publish similar requirements. The current FCC/WARC requirements are:

- Mute the Transmit output of the Satellite Modem used in TX/RX antenna configurations when the antenna is positioned where people may be harmed by the transmit power emanating from the antenna (RF Radiation Hazard).
- Mute the Transmit output of the Satellite Modem used in TX/RX antenna configurations when the antenna is mispointed by 0.5 degrees, or more, and keep it muted until the antenna is within 0.2 degrees of peak pointing to the satellite for a minimum of 5 seconds (FCC part 25.221 & 25.222 TX Mute requirement).

The connection will also provide External Modem Lock and GPS Latitude & Longitude.

The External Modem Lock output from a satellite modem into the ACU provides a positive Network ID input to the ACU when the antenna is on the desired satellite. **This input is NOT used for Tracking purposes**, it is only used for satellite identification to assure that the satellite which has been acquired is the correct satellite (else the ACU will resume searching).

The GPS output from the ACU provides the current ships Latitude & Longitude as an input to the satellite modem for mobile mode operation.

All modems must be set for mobile operation and have hardware handshaking turned ON.

11.1. iDirect Modems

The 5100 mobile mode can be set to 1=Serial to use the Console port RJ-45 serial connector or 2=Ethernet to use a LAN connector for TX Mute, Modem Lock and GPS position communication with the ACU.

Model	Lock output	Mute input	Recommended SYSTEM TYPE	GPS Input
Infinity 3100	LOW = Lock	LOW to Mute	7	GGA string
Infinity 5100	LOW = Lock	LOW to Mute	7	GGA string

11.2. Comtech Modems

Model	Lock output	Mute input	Recommended SYSTEM TYPE	GPS Input
570L	LOW = Lock	LOW to Mute	7	Not Used
600L	LOW = Lock	LOW to Mute	7	Not Used

11.3. Hughes Modems

Model	Lock output	Mute input	Recommended SYSTEM TYPE	GPS Input
HX-150	HIGH = Lock	HIGH to Mute	151	GLL string
HX-200	HIGH = Lock	HIGH to Mute	151	GLL string

The functions below can be enabled to change the normal behavior of the system if desired. Select system options according to the following table. Add together all the desired options and enter the sum into the SYSTEM TYPE parameter to enable the desired functions.

128	Reverse External Modem Lock input polarity (logic hi = lock). If you know that the modem you will be using with the system provides requires a logic hi (+15 VDC max) when it has modem lock or you find the AGC reading for locked and unlocked conditions from your modem need to be reversed you must enable this function in your current SYSTEM TYPE parameter.
64	Enables LNB voltage output from the ACU. This is NOT recommended for Series 09 systems, because they ALL provide the LNB voltage at the pedestal.
32	Display Relative in the Azimuth entry display. Enabling this function causes REL position to take the place of the DishScan signaling in the Azimuth entry display. Relative position of the antenna is RARELY more desirable than the DishScan signaling.
16	Reverse blockage output logic (SW2 logic hi = blocked). If you know that the modem you will be using with the system requires a logic hi (open circuit) to mute or you find that the Modem is being muted when the antenna is ON satellite (and un-muted when the antenna is blocked, searching or targeting) you must enable this function in your current SYSTEM TYPE parameter.
8	-- Reserved --
4	Auto SAT load after SEARCH failure. Enabling this function will cause the ACU to re-target the calculated satellite position (rather than returning to origin).
2	Enable External Modem Lock Input (logic low = lock) This enables the ACU to use the external modem input. Expected input is logic low (0 VDC) when the modem has RX sync/Network Lock and a positive voltage (+15 VDC max) when the does not have lock. This function must be enabled to use the external input from ANY modem, regardless of its locked/unlocked logic. [If you find the AGC reading for locked and unlocked conditions need to be reversed you must add 128 to your current SYSTEM TYPE parameter].
1	Auto SAT load on "hot" RESET and ACU Power-Up. Enable this function if you want the ACU to automatically re-target the satellite whenever the system power is turned ON (after antenna initialization) or whenever the operator presses the RESET button on the from panel of the ACU.

To change the SYSTEM TYPE parameter, 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. Continue pressing **ENTER** until SAVE NEW PARAMETERS is displayed, and then press the **RIGHT** arrow, **UP** arrow then **ENTER** to save the change(s).

11.6. 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 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. 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. (**Sea Tel – Remote** and antenna software display) 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). If the antenna is on the desired satellite and you have RX Synch, also verify that the Satellite Modem TX is disabled/muted (TX LED OFF).
4. Press the LEFT arrow key and then press the UP arrow key to turn the simulated blocked condition OFF. BLOCKED will disappear, leaving the ON/OFF Tracking status and the band selection in the Tracking display. Press the UP arrow key again if you wish to toggle the Tracking state.
5. Verify that SW2 terminal is open circuit (or ground if you have logic reversed). If the antenna is on the desired satellite and you have RX Synch, also verify that the Satellite Modem TX is enabled (TX LED ON).

11.7. Testing the Satellite Modem Lock (Network ID) Input in the ACU

The input connections from the modem can be tested by selecting the external AGC input and monitoring the displayed value. To test the external AGC, set the tuning frequency to 0000. Normally, AGC readings below 800 are considered a low condition and indicate modem lock and AGC readings above 800 are considered a high condition and indicate modem unlock.

1. Verify that the satellite modem currently has RX Sync (RX Sync LED ON).
2. Turn tracking **OFF** so that the antenna stays pointed ON satellite.
3. Press **NEXT** until the Satellite menu is displayed. Press **ENTER** 3 times to display the Frequency entry window. Record the frequency that the tracking receiver is currently tuned to. Press **LEFT** or **RIGHT** arrow key to bring up the cursor under the units digit. Use the **UP** or **DOWN** arrow keys to increment or decrement the selected digit, use the **LEFT** arrow key and the **UP** or **DOWN** arrow keys to change the next digit. Continue until frequency is set to 0000. Press the **ENTER** key to tune the tracking receiver to this frequency.
4. View current ON satellite **LOCKED** AGC value in the lower right corner of the display and measure the DC Voltage from EXT AGC (+) terminal to the GND (-) terminal. The iDirect & Comtech modems should have an AGC readings below 800 (LOCK = low condition) and 0 VDC across the EXT AGC and GND terminals. The Hughes modem will have an AGC reading above 800 (LOCK = high condition) and 12VDC across the EXT AGC and GND terminals.
5. Disconnect the RXIF input coax from the rear of the satellite modem. It should lose RX Sync (RX Sync LED OFF).
6. View current ON satellite **UN-LOCKED** AGC value in the lower right corner of the display and measure the DC Voltage from EXT AGC (+) terminal to the GND (-) terminal. The iDirect & Comtech modems should have an AGC readings above 800 (UN-LOCKED = high condition) and about +12 VDC across the EXT AGC and GND terminals. The Hughes modem will have an AGC reading below 800 (UN-LOCKED = low condition) and 12VDC across the EXT AGC and GND terminals.
7. Reconnect the RXIF input coax to the rear of the satellite modem. It should regain RX Sync (RX Sync LED ON).
8. Press **LEFT** or **RIGHT** arrow key to bring the up the cursor under the units digit. Use the **UP** or **DOWN** arrow keys to increment or decrement the selected digit, use the **LEFT** arrow key and the **UP** or **DOWN** arrow keys

to change the next digit. Continue until frequency value, recorded in step 3, is displayed and press the **ENTER** key to re-tune the tracking receiver.

11.8. 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 & 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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12. Setup – Optimizing Polarity & Cross-Pol Isolation

The only way to optimize the polarization of the antenna properly is to peak the polarity angle while the system is in auto-polarization mode. This automatically adjusts the polarization of the feed by calculating the required polarization angle for the feed every 2 seconds based on ship's Latitude, Longitude and the desired Satellite Longitude.

12.1. Sat Skew setting

The Satellite Skew setting in the Satellite – Tracking Receiver sub-menu (prior to NID) is used to enter the skew of the satellite to optimize polarity angle.

This feature will replace the use of POL OFFSET to optimize polarization of the feed. From here on out, POL OFFSET will serve to calibrate the feed itself. Think of it as mechanical calibration. We will recommend that you target a satellite that is of your same longitudinal position (ie for us here in Concord we would target 122W). Drive the reflector to 0 or 5 degrees elevation (this is so you can easily view the feed). Drive the feed to vertical and then place a level bubble on the LNB. Add or subtract POL OFFSET as required to center the air bubble. Then save this parameter. Cross-pol isolation tests will now require the operator to increase or decrease the SAT SKEW parameter. Each digit represented on this screen represents one whole degree of feed drive. This parameter addition was a direct response to item #3 below which is making the ACU's work with Satellite Modems that are OpenAMIP compatible.

12.2. Polarity Angle (POLANG) Parameters

First of all make sure that the polang parameters are set correctly:

1. POL TYPE – should be set to 0072 (Auto-Pol mode).
2. POL OFFSET – This is initially set to factory default (0040) but will be incremented, or decremented, to calibrate the feed to the horizon with a level (bubble or digital).
3. POL SCALE – Leave this at the factory default setting of 0090.
4. Go to the TX POLARITY parameter in the Setup menu of the ACU and set this parameter to your assigned Transmit polarity (2=Horizontal or 4=Vertical).
5. Target your desired satellite (as provided by you airtime provider).
6. Verify the system has acquired the correct satellite, else continue searching until the correct satellite is acquired, and set your satellite modem (or spectrum analyzer) to view its signal level display.
7. Allow tracking to peak the satellite signal.
8. SAT SKEW – This setting will be incremented, or decremented, to optimize the polarity to peak the received satellite signal, and later to do cross-pol isolation with the airtime provider, network operation center or satellite provider.

12.3. Optimizing Auto-Polarization on Receive Signal

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 SAT 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 modems signal strength, 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 SAT 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 SAT SKEW value.
10. Set SAT SKEW to mid way between the value noted in step 7 & 9.
11. Save your new SAT SKEW value.

12.4. Optimizing Auto-Polarization Cross-Pol Isolation

During commissioning, under guidance from the network operation center, you will be adjusting to minimize the effect of your transmission on the opposite polarization which maximizes your Cross-Pol isolation. Contact your satellite provider to help you (over the phone) to optimize the polarity angle for maximum Cross-Pol isolation (this optimizes your transmit polarity and is much more accurate than trying to optimize your receive polarity).

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. Follow your service provider technicians instructions to set the modem to begin transmitting a CW (pure carrier) signal.
3. Go to the SAT SKEW parameter in the Satellite menu of the ACU.
4. Press the LEFT arrow to edit the current value.
5. While under direction of the technician (on the phone), press the UP arrow to increment or the DOWN arrow to decrement the value and then hit the ENTER key to adjust the feed.
6. The technician should indicate whether the adjustment you made improved, or worsened, the cross-pol isolation. If it improved he will have you make another small adjustment in the same direction. If it worsened he will have you make a small adjustment in the opposite direction.
7. Press the RIGHT key again, make the next change as directed and hit ENTER to carry out the adjustment.
8. Repeat this process of making small adjustments until the technician confirms that cross-pol isolation is optimized.
9. **Save** your new SAT SKEW value.

12.5. 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 & 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 – Other Parameters

13.1. **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.

13.2. **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.

13.3. **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.

13.4. **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.

13.5. **REMOTE MONITOR**

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

13.6. **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.

13.7. **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.

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

- No Gyro Compass is available
- Frequent or constant ACU Error Code 0001 (Gyro Compass has failed)
- Gyro Compass output is NMEA heading
- Flux Gate Compass is being used
- GPS Satellite Compass is being used

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.

13.8. **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.

13.9. **Configuring the COMM IF ports of the DAC-2202 ACU**

The Monitor and Control (M&C J3) port allows external control from a PC using a communications program such as Sea Tel's ProgTerm or DacRemP via a straight 9 wire serial cable. This Port is used in conjunction with a diagnostic software connection to configure all communications settings, and/or for an **Authorized Sea Tel Dealer** to perform software uploads to the PCU, ACU Main PCB, and DVB Receiver.

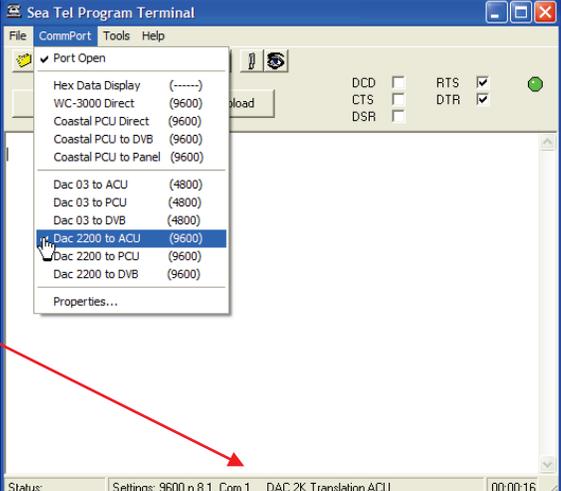
The Ethernet Port allows use of a LAN connection to login into the ACU's internal webpage's to view or change system parameters using a web browser such as Internet Explorer or Mozilla Firefox. This 10BaseT Ethernet Port has a configurable static IP address with 2 TCP/IP connections for diagnostic software connections and a UPD Port for an **Authorized Sea Tel Dealer** to perform a software upload to the Comm IF Module.

The NMEA J2 Port allows 2 simultaneous NMEA-0183 connections on the same DB9 connector, defined as NMEA A and NMEA B. Both NMEA A (J2-Pin1 Rx+ and J2-Pin3 Tx-) and NMEA B (J2-Pin7 Rxe+ and J2-8 Txe-) Ports have selectable baud rates independent of each other. The following procedure describes the process of connecting the ACU to your Laptop and configuring all Comm IF Properties.

Hardware/Software Requirements:

- Laptop/Desktop with an available Serial Com Port and ProgTerm Version 1.33 (Build 11.Mar.2007 or later). If no DB9 Serial port is available use a USB to Serial Adapter or use IP version of ProgTerm. Standard Straight 9 wire serial cable (Sea Tel Part Number 120643-25 or equiv.)
- DAC2202 Antenna Control Unit

1. Turn Power off to ACU	
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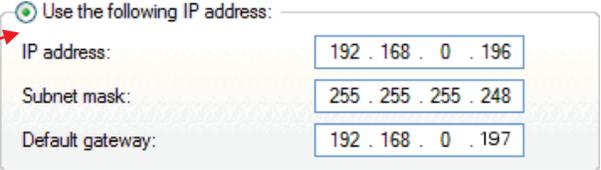
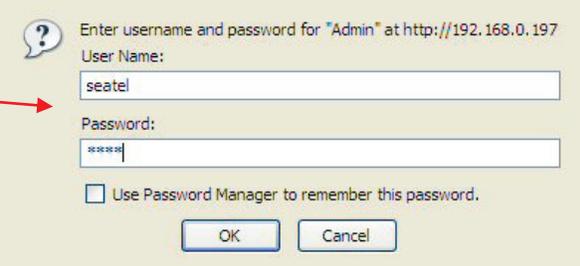
<p>2. Connect J3 M&C Port to Computer Com Port using a Male to Female RS232 Straight 9 wire serial cable</p>	
<p>3. Turn Power on to ACU and then open Sea Tel's ProgTerm M&C software program.</p>	
<p>4. Configure ProgTerm's Translation Mode. Click on "CommPort" then select "Dac 2200 to ACU (9600)".</p> <p>Insure that the bottom of screen reads "DAC 2K Translation ACU"</p>	
<p>5. Mouse Click on the Paper Clip icon and verify response to ACU status query similar to what's shown.</p>	
<p>6. Mouse click on the Eyeball icon and verify response to ACU software version query.</p>	

<p>7. To View Communication settings type in “[?]”. That’s left bracket, question mark, <carriage return>”</p> <p>(Typed characters will not display unless “Echo” is turned on in the Comm Port Properties.)</p>	<p>DAC2202 Comm IF Commands:</p> <p>[Innn.nnn.nnn.nnn↵ Set IP address</p> <p>[Nnnn.nnn.nnn.nnn↵ Set Net mask.</p> <p>[Gnnn.nnn.nnn.nnn↵ Set Gateway address</p> <p>[0nnnn↵ Set TCP/IP-0 (Port 0) port number</p> <p>[1nnnn↵ Set TCP/IP-1 (Port 1) port number</p> <p>[Unnnn↵ Set UDP (Software Upload) port number</p> <p>[Cnnnn↵ Set M&C (Port C) baud rate</p> <p>[Bnnnn↵ Set NMEA B (Port B) baud rate</p> <p>[Annnn↵ Set NMEA A (Port A) baud rate</p> <p>[?↵ View Settings IP, NM, GW, Port 0,1, baud C, B, A</p> <p>[V↵ View Comm IF PCB Software Version</p> <p>[L↵ Lock out ports for download</p>
<p><u>IP</u> is the ACU IP address (Factory Default 192.168.30.195)</p> <p><u>NM</u> is the ACU Subnet Mask (Factory Default 255.255.255.0)</p> <p><u>GW</u> is the ACU Gateway (Factory Default 192.168.30.1)</p> <p><u>TCP 0</u> is the first of two available TCP/IP Port’s (Factory Default 2000)</p> <p><u>TCP 1</u> is second of two available TCP/IP Port’s (Factory Default is 2001)</p> <p><u>UDP</u> is the Comm IF PCB Software Upload port (Factory Default 3000)</p> <p><u>M&C (C)</u> is the M&C RS232 Port C (J3) Baud Rate (Factory Default 9600)</p> <p><u>NMEA B</u> is the NMEA RS232 Port B (J2) Baud Rate (Factory Default 4800)</p> <p><u>NMEA A</u> is the NMEA RS232 Port A (J2)Baud Rate (Factory Default 4800)</p>	<pre>S@@T@L1050 >DAC 2202 VER 6.00c >[? IP=192.168.0.195 >NM=255.255.255.0 >GW=192.168.0.1 >TCP-0=2000 >TCP-1=2001 >UDP =3000 >M&C (C)=9600 >NMEA(A)=4800 >NMEA(B)=4800</pre>
<p>8. To change Communication Settings Type “[Control Codennn<cr>”. That’s left bracket, control code alpha/numeric digit, parameter, <carriage return> (No Spaces).</p> <p>Example: Change ACU IP address to 192.168.30.195 type: “[I192.168.30.195↵”</p> <p>Example: Change J2 NMEA Port B Baud Rate to 9600 type: “[B9600↵”</p>	<pre>S@@T@L1101 >DAC 2202 VER 6.00d >[I192.168.30.195 > > S@@T@L1019 >DAC 2202 VER 6.00d >[B9600 ></pre>

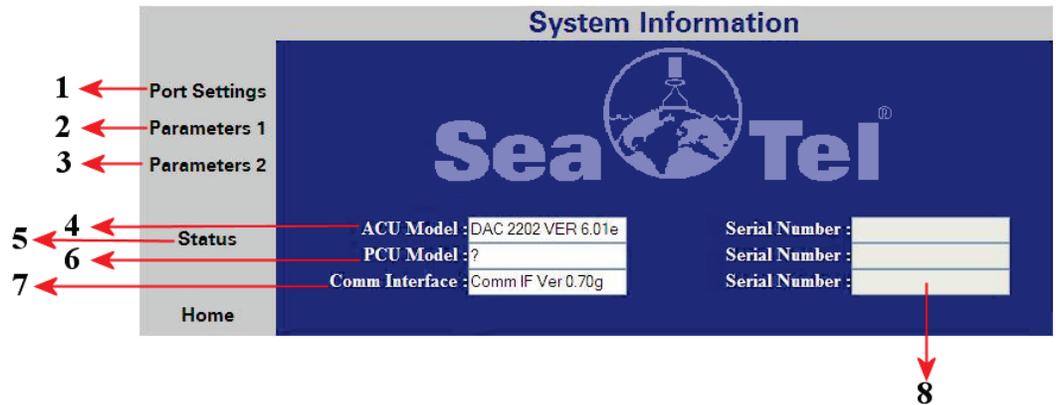
<p>9. To save parameters to Flash (Comm IF PCB) Type “[W↵]”. That’s Left Bracket, Capital “W”, <carriage return>(No Spaces). Verify “Done” is displayed after Saving Comm parameters. **Do not turn power off to ACU until finished**</p>	<pre>S@@T@L1101 >DAC 2202 VER 6.00d >[192.168.30.195 >[W Saving Comm parameters: Done! ></pre>
<p>10. To reboot Comm IF software Type “[Z↵]”. That’s Left Bracket, Capital “Z”, <carriage return> (No Spaces). Verify “Comm IF Ver x.xx Port M&C (C)” is displayed.</p>	<pre>>[W Saving Comm parameters: Done! > ? >[Z Comm Reset by M&C (C), please wait! >Comm IF Ver 0.69a Port M&C (C) ></pre>

13.10. Internal HTML Page

The following procedure(s) define the process of connecting and logging into the DAC2202’s internal HTML page. ****If the IP address for your DAC2202 has been changed from factory default or if is unknown use the “Configuring the COMM IF ports of the DAC-2202 ACU” procedure to view or change the existing parameters.**

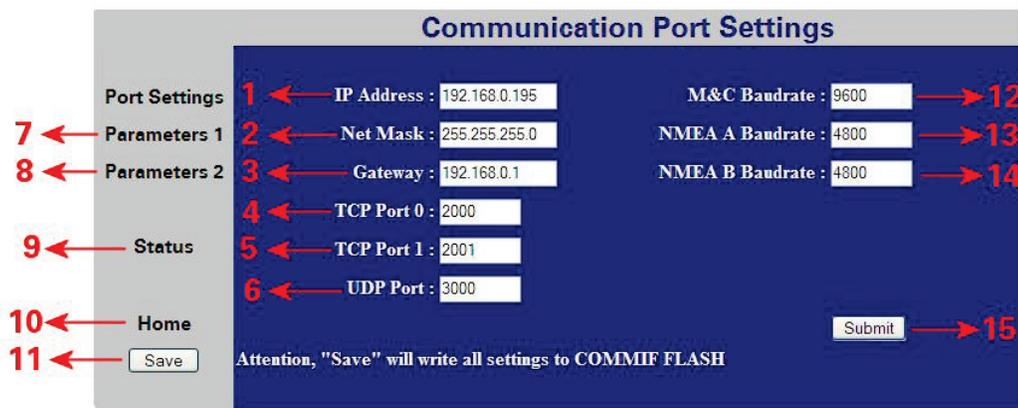
<p>1. Connect the “ETHERNET” port on DAC-2202 to a Local Area Network (LAN) Connection or directly to an available Ethernet port on a Laptop/Desktop using a standard CAT5 cable.</p>	
<p>2. Power on DAC2202</p>	
<p>3. Configure the connected LAN connection with a static IP address which is on the same sub net as the DAC2202.</p>	
<p>4. Start up your Internet Browser (i.e. Internet Explorer, Mozilla Firefox, etc.) and type in the IP address of the DAC2202 into the address bar.</p>	
<p>5. Log into the DAC2202 by typing in Username and Password information . USERNAME: seatel PASSWORD: 1234</p>	

13.10.1. System Information



Number	Description
1	Click to redirect to the Port Settings Page. This page presents the TCP connection and baud rate settings for the Comm If Module.
2	Click to redirect to the DAC Parameters 1 Page. This page presents the current ACU configuration parameter values stored in the 68HC08 processor.
3	Click to redirect to the DAC Parameters 2 Page. This page presents the current Satellite Tracking parameter values stored in the 68HC08 processor. This page also contains the currently defined blockage zones (Az Limits 1-6).
4	The ACU Model field displays the software version currently installed in the DAC2202 M/B.
5	Click to redirect to the Status page. This page presents current system status, including Tracking condition, Antenna Position, Vessel Location / Orientation, and decoded error conditions.
6	The PCU Model field displays the Antenna model configuration and the software version currently installed in the PCU.
7	The Comm Interface field displays the currently software version installed onto the Comm If Module.
8	The Serial Number display fields are NOT currently being used.

13.10.2. **Communication Port Settings**



Number	Description
1	The IP Address field presents the Static Internet Protocol address value currently stored in the Comm IF module (Flash). To change the IP address to match an existing LAN info structure, type in the desired value and click on the SUBMIT button. If the parameter change causes desirable operation click on the SAVE button to store value to Flash. This address must conform to the <i>nnn.nnn.nnn.nnn</i> format where <i>nnn</i> is a number between 0 and 255.
2	The Net Mask field presents the Subnet Mask address value currently stored in the Comm IF module. To change the Subnet to match an existing LAN info structure, type in the desired value and click on the SUBMIT button. If the parameter change causes desirable operation click on the SAVE button to store value to Flash. This address must conform to the <i>nnn.nnn.nnn.nnn</i> format where <i>nnn</i> is a number between 0 and 255.
3	The Gateway field presents the Static Gateway Internet Protocol address value currently stored in the Comm IF module. To change the Gateway IP address to match an existing LAN info structure, type in the desired value and click on the SUBMIT button. If the parameter change causes desirable operation click on the SAVE button to store value to Flash. This address must conform to the <i>nnn.nnn.nnn.nnn</i> format where <i>nnn</i> is a number between 0 and 255.
4	The TCP Port 0 field presents the Transmission Control Protocol Port 0 value currently stored in the Comm IF Module. To change the Port value to match an existing LAN info structure, type in the desired value and click on the SUBMIT button. If the parameter change causes desirable operation click on the SAVE button to store value to Flash. This address must conform to the <i>nnnn</i> format where <i>nnnn</i> is a number between 0 and 65535.
5	The TCP Port 1 field presents the Transmission Control Protocol Port 1 value currently stored in the Comm IF Module. To change the Port value to match an existing LAN info structure, type in the desired value and click on the SUBMIT button. If the parameter change causes desirable operation click on the SAVE button to store value to Flash. This address must conform to the <i>nnnn</i> format where <i>nnnn</i> is a number between 0 and 65535.
6	The UDP Port presents the User Datagram Protocol Port value stored in the Comm IF Module. This port is specifically used to perform software upgrades to the Comm IF Module and should NOT be changed.

7	Click to redirect to the DAC Parameters 1 Page. This page presents the current ACU configuration parameter values stored in the 68HC08 processor.
8	Click to redirect to the DAC Parameters 2 Page. This page presents the current Satellite Tracking parameter values stored in the 68HC08 processor. This page also contains the currently defined blockage zones (Az Limits 1-6).
9	Click to redirect to the Status page. This page presents current system status, including Tracking condition, Antenna Position, Vessel Location / Orientation, and decoded error conditions.
10	Click to redirect to the Home page. This page presents current system software versions and antenna model configuration.
11	Click the SAVE button to store all current parameters in the operating software variables table to Flash (Comm IF). **THIS DOES NOT SAVE DISPLAYED PARAMETERS UNLESS THE SUBMIT BUTTON IS PRESSED FIRST**
12	The M&C Baudrate field presents the J3 M&C Port Baud rate value currently stored in the Comm IF Module. To change the Baud rate, type in the desired value and click on the SUBMIT button or click on the SAVE button to store value to Flash. Acceptable baud rate values are 4800 or 9600.
13	The NMEA A Baudrate field presents the J2 NMEA Port A Baud rate value currently stored in the Comm IF Module. To change the Baud rate, type in the desired value and click on the SUBMIT button or click on the SAVE button to store value to Flash. Acceptable baud rate values are 4800 or 9600.
14	The NMEA B Baudrate field presents the J2 NMEA Port B Baud rate value currently stored in the Comm IF Module. To change the Baud rate, type in the desired value and click on the SUBMIT button or click on the SAVE button to store value to Flash. Acceptable baud rate values are 4800 or 9600.
15	Click the SUBMIT button to transfer all currently displayed parameters to the Comm IF module operating software variables table. NOTE: The submit button will not store the values to flash; an ACU reset (hard or soft) will revert to the old settings.

13.10.3. **DAC Parameters Page 1**

The screenshot shows the 'DAC Parameters Page 1' interface. On the left is a navigation menu with items: 1 ← Port Settings, 2 ← Parameters 1, 3 ← Parameters 2, 4 ← Status, 5 ← Home, 6 ← Reload, and 7 ← Save. The main area contains two columns of parameters:

- Left Column:** Elevation Trim (0001), Elevaton Step Size (000), AUTO threshold (100), Search Increment (020), Search Limit (100), Search Delay (030), System Type (077).
- Right Column:** Azimuth Trim (0420), Azimuth Step Size (000), Sweep Increment (040), Step Integral (000), Polang Type (009), Polang Offset 24V (030), Polang Scale 24V (090), Gyro Type (002).

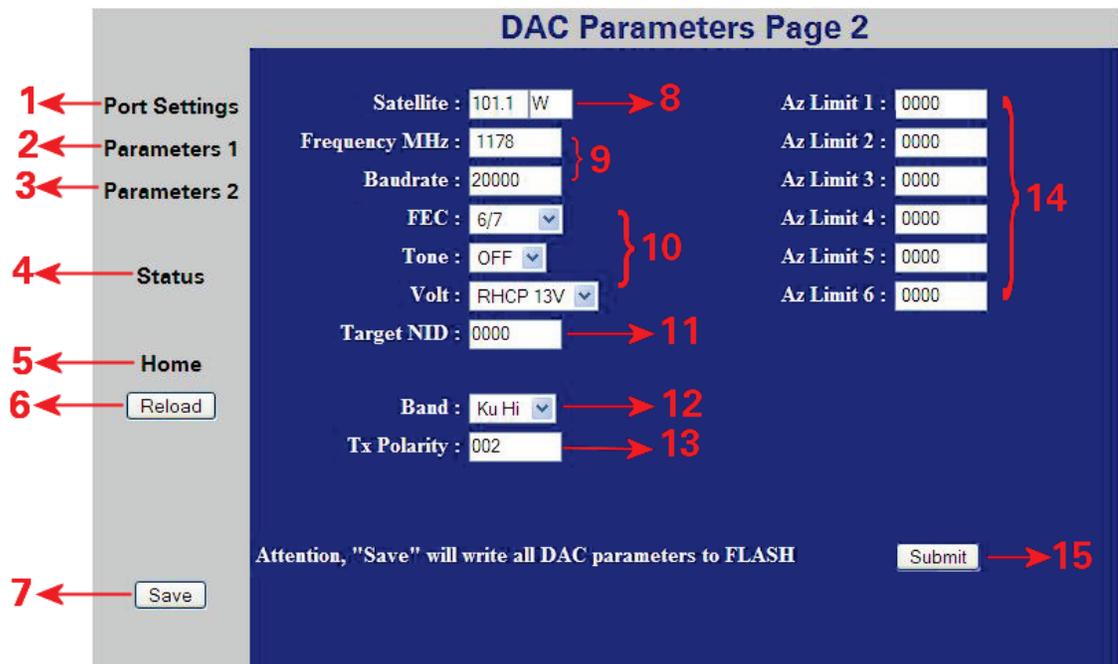
Red callouts are placed as follows:

- 1: Points to 'Port Settings' in the menu.
- 2: Points to 'Parameters 1' in the menu.
- 3: Points to 'Parameters 2' in the menu.
- 4: Points to 'Status' in the menu.
- 5: Points to 'Home' in the menu.
- 6: Points to the 'Reload' button.
- 7: Points to the 'Save' button.
- 8: A large bracket on the right side of the left column of parameters.
- 8: A large bracket on the right side of the right column of parameters.
- 9: Points to a dropdown menu with options: Modem Lock = HI, LNB voltage on, Relative Display, Block out = HI, AFT on, SAT load after SEARCH, External Modem Lock, SAT load on RESET.
- 10: Points to the 'SBS or NMEA gyro' dropdown menu.
- 11: Points to the 'Submit' button.

At the bottom of the interface, there is a warning: 'Attention, "Save" will write all DAC parameters to FLASH' and a 'Submit' button.

Number	Description
1	Click to redirect to the Port Settings Page. This page presents the TCP connection and baud rate settings for the Comm If Module.
2	Click to redirect to the DAC Parameters 1 Page. This page presents the current ACU configuration parameter values stored in the 68HC08 processor.
3	Click to redirect to the DAC Parameters 2 Page. This page presents the current Satellite Tracking parameter values stored in the 68HC08 processor. This page also contains the currently defined blockage zones (Az Limits 1-6).
4	Click to redirect to the Status page. This page presents current system status, including Tracking condition, Antenna Position, Vessel Location / Orientation, and decoded error conditions.
5	Click to redirect to the Home page. This page presents current system software versions and antenna model configuration.
6	Click the “RELOAD” button to refresh the screen to the current ACU parameter values
7	Click the SAVE button to store all currently displayed parameters to Flash (68HC08).
8	These fields present the ACU parameter values currently stored in Flash. To change a parameter value mouse click inside the entry field and type in the desired value and click on the SUBMIT button. If the parameter value change(s) causes desirable operation click on the SAVE button to store value to Flash. Refer to Setup (Section 5) of this manual for acceptable range values and definitions of these parameters.
9	This List box presents the decoded System Type parameter currently stored in Flash. When the entered System Type value enables an available ACU system options it is highlighted in blue. No changes to this list box is possible, any desired changes to the System Type parameter are done via the System Type entry field.
10	This drop-down list box presents the Gyro Type parameter value currently stored in Flash. To change to Gyro type, mouse click on the selection arrow and choose the desired gyro source which is interfaced with the DAC2202.
11	Click the SUBMIT button to transfer all currently displayed parameters to the 68HC08 module operating software variables table. NOTE: The submit button will not store the values to flash, an ACU reset (hard or soft) will revert to the old settings.

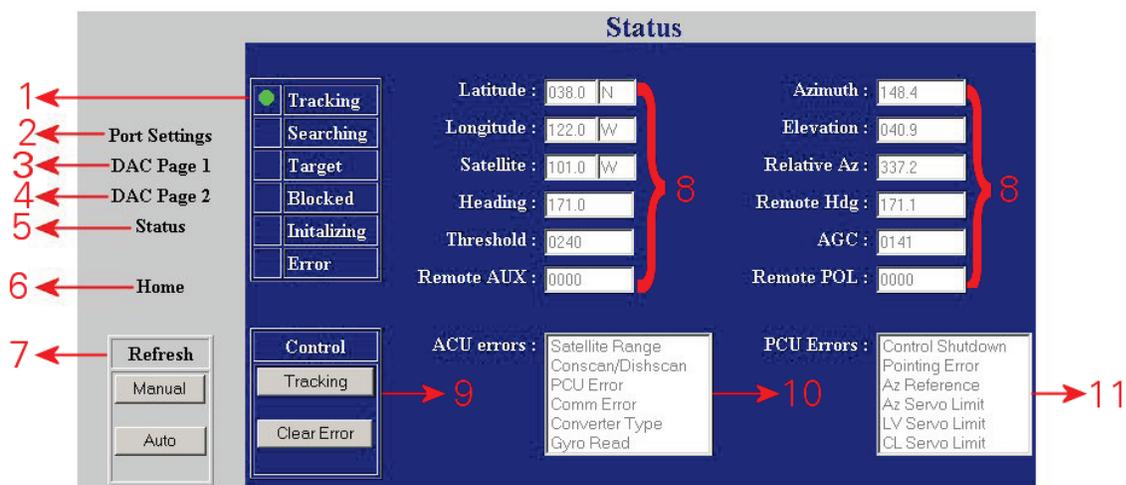
13.10.4. DAC Parameters Page 2



Number	Description
1	Click to redirect to the Port Settings Page. This page presents the TCP connection and baud rate settings for the Comm If Module.
2	Click to redirect to the DAC Parameters 1 Page. This page presents the current ACU configuration parameter values stored in the 68HC08 processor.
3	Click to redirect to the DAC Parameters 2 Page. This page presents the current Satellite Tracking parameter values stored in the 68HC08 processor. This page also contains the currently defined blockage zones (Az Limits 1-6).
4	Click to redirect to the Status page. This page presents current system status, including Tracking condition, Antenna Position, Vessel Location / Orientation, and decoded error conditions.
5	Click to redirect to the Home page. This page presents current system software versions and antenna model configuration.
6	Click the RELOAD button to refresh the screen to display the current ACU parameter values
7	Click the SAVE button to store all currently displayed parameters to Flash (68HC08).
8	The SATELLITE field(s) present longitudinal position of the currently stored (or last targeted) satellite. To change a parameter value mouse click inside the entry field and type in the desired value. Refer to Setup (Section 5) of this manual for acceptable range values.
9	These fields present 2 of the required 6 tracking parameters of the currently stored (or last targeted) satellite. To change a parameter value mouse click inside the entry field and type in the desired value. Refer to Setup (Section 5) of this manual for acceptable range values.

10	These fields present 3 of the required 6 tracking parameters of the currently stored (or last targeted) satellite. To change this parameter value mouse click on the drop down menu arrow and select desired parameter from list. Refer to Setup (Section 5) of this manual for acceptable range values.
11	This field presents the Network Identification parameter currently stored for the desired satellite. To change a parameter, value mouse click inside the entry field and type in the desired HEX format value. Refer to Setup (Section 5) of this manual for acceptable range values.
12	The BAND field presents the currently stored Tracking Band Selection in memory. To change this parameter value mouse click on the drop down menu arrow and select desired parameter from list. Refer to Setup (Section 5) of this manual for acceptable range values.
13	The Tx Polarity field presents the default Transmit Polarity parameter currently stored. To change a parameter value mouse click inside the entry field and type in the desired value Refer to Setup (Section 5) of this manual for acceptable range values.
14	The Az Limits 1-6 fields presents the defined blockage zones currently stored. To change a parameter value mouse click inside the entry field and type in the desired value Refer to Setup (Section 5) of this manual for acceptable range values.
15	Click the SUBMIT button to transfer all currently displayed parameters to the 68HC08 module operating software variables table. NOTE: The submit button will not store the values to flash, an ACU reset (hard or soft) will revert to the old settings.

13.10.5. **Status Page**



Number	Description
1	These fields presents the current antenna status.
2	Click to redirect to the Port Settings Page. This page presents the TCP connection and baud rate settings for the Comm If Module.
3	Click to redirect to the DAC Parameters 1 Page. This page presents the current ACU configuration parameter values stored in the 68HC08 processor.
4	Click to redirect to the DAC Parameters 2 Page. This page presents the current Satellite Tracking parameter values stored in the 68HC08 processor. This page also contains the currently defined blockage zones (Az Limits 1-6).
5	Click to redirect to the Status page. This page presents current system status, including Tracking condition, Antenna Position, Vessel Location / Orientation, and decoded error conditions.

6	Click to redirect to the Home page. This page presents current system software versions and antenna model configuration.
7	The Refresh field allows the user to adjust the page refresh settings, AUTO is selected by default, which refreshes the displayed page every 5 seconds
8	These fields presents the antenna's positional and signal strength information currently stored. To change a parameter value mouse click inside the entry field and type in the desired value Refer to Setup (Section 5) of this manual for acceptable range values.
9	The Control field buttons allow the user to Toggle the antennas' current tracking condition or to clear any reported errors as reported in fields 10 and 11.
10	The ACU Errors box is a read only field that presents the decoded ACU reported errors that are currently triggered. Refer to the Maintenance section of this manual for troubleshooting frequent or constant errors.
11	The PCU Errors box is a read only field that presents Pedestal reported errors currently triggered. Refer to the Maintenance section of this manual for troubleshooting frequent or constant errors.

14. Functional Testing

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

14.1. 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.

14.2. 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

14.3. 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.

14.4. Azimuth & Elevation Drive

This verifies that the antenna moves in the correct response to the keys.

AZ 123.4 **EL 056.7**
REL 234.5 **AGC 1234**

1. Press the **NEXT** key until the Antenna Menu is displayed.
2. If tracking or searching status is enabled, press the  key.

3. Press the  **RIGHT** arrow key repeatedly and verify that the antenna physically moves up (CW) in Azimuth and that the display accurately reflects that movement.
4. Press the  **LEFT** arrow key repeatedly and verify that the antenna physically moves down (CCW) in Azimuth and that the display accurately reflects that movement.
5. Press the  **UP** arrow key repeatedly and verify that the antenna physically moves up (CW) in Elevation and that the display accurately reflects that movement.
6. Press the  **DOWN** arrow key repeatedly and verify that the antenna physically moves down (CCW) in Elevation and that the display accurately reflects that movement.

14.5. Four Quadrant Test Tracking

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.

14.6. **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 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. 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.

14.7. **Test Broadband Operation**

Open your Internet Browser and access several internet sites, email or other functions as you normally would. Operation should be the same as any equivalent service ashore (based on your subscription rate).

14.8. **Test Voice Over IP (VOIP) Operation**

If Voice Over IP equipment has been provided and services are available from your Internet Service Provider (ISP) you should verify that this equipment and service are functioning properly.

Pick up the Telephone handset which is to be used for Voice Over IP telephone calls. Check for voice mail messages and/or place a telephone call (maybe to have them call you back). It is also important to receive a VOIP telephone call by having someone call you or calling yourself from some other telephone system (shore telephone, cellular or Inmarsat).

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15. 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.

	<p>WARNING: <i>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.</i></p>
	<p>WARNING: <i>RF Radiation Hazard - This stabilized antenna system is designed to be used with transmit/receive equipment manufactured by others. Refer to the documentation supplied by the manufacturer which will describe potential hazards, including exposure to RF radiation, associated with the improper use of the transmit/receive equipment. Note that the transmit/receive equipment will operate independently of the stabilized antenna system.</i></p>
<p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p>	
	<p>WARNING: <i>RF Radiation Hazard - Prior to working on the stabilized antenna system, the power to the transmit/receive equipment must be locked out and tagged. Turning OFF power to the Antenna Control Unit does NOT turn Transmit power output OFF.</i></p>
<p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p>	
	<p>WARNING: <i>RF Radiation Hazard - When the transmit/receive system is in operation, no one should be allowed anywhere within the radiated beam being emitted from the reflector.</i></p>
<p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p>	

15.1. Warranty Information

Sea Tel Inc. supports its Series 09 systems with a **ONE YEAR** warranty on labor and parts.

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).

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 included with your system.

15.2. 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).

15.2.1. 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.

15.2.2. 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.

15.3. **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.

15.3.1. **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 4 connections to A, B, C and COMMON.
3. Check the connections to the Terminal Mounting Strip 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.

15.3.2. **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 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. 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.

15.3.3. 360:1 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 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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16. DAC-2202 Technical Specifications

The technical specifications for the DAC-2202 ACU and some of the specifications for general Below Decks are:

16.1. DAC-2202 Antenna Control Unit

The technical specifications for the DAC-2202 ACU are:

16.1.1. General

Physical Dimensions:	Rackmount: 1.75" x 17" x 14"
Input Voltage:	110/220 VAC, 50/60 Hz
Power Requirements:	160 Watts maximum (including the stabilized antenna pedestal and TSC-10 Touch Screen Controller)

16.1.2. Front Panel

Status Indicator Display:	6 LED enunciators for Tracking, Searching, Target, Power, Initializing, and Error
Alpha Numeric Display:	2 Line 20 Character Alpha Numeric
Next Button	Cycles display between Ship, Satellite, Antenna, and Status
4-Position Keypad	Cycles cursor Up / Down / Left / Right
Enter Button	
Reset Button	
Controls:	AC Power On/Off

16.1.3. Rear Panel

Connectors:

J1 "Ship Gyro"	25 pin female D-Subminiature
J2 "NMEA" RS-422 Serial I/O	9 pin male D-Subminiature
J3 "M&C" RS-422 Serial I/O	9 pin female D-Subminiature
J4A "Antenna" RS-422 Pedestal M&C	9 pin female D-Subminiature
J4B "Antenna" Control IF and Pedestal DC Power	Type F female
J6 "RF IN" Tracking Receiver IF Input	Type F female
J7 "RF OUT" Tracking Receiver IF Output	Type F female
"Ethernet"	RJ-45
"AC Input Power 95-250VAC"	IEC receptacle

16.1.4. J4A "Antenna" Pedestal M&C Interface

Communications Parameters:	9600 Baud, 8 bits, No parity, 1 Stop Bit
Interface Protocol:	Full Duplex RS-422
Base Modem Power:	30 Volts DC
Interface Connector:	9 pin male D-Subminiature

16.1.5. J4B “Antenna” Pedestal M&C Interface

Communications Parameters:	9600 Baud, 8 bits, No parity, 1Stop Bit
Interface Protocol:	Full Duplex FSK Modulated at 70 KHz (TX) & 120 KHz (RX)
Antenna Power:	30 Volts DC
Interface Connector:	Type F female

16.1.6. J3 “M&C” Aux Serial Interface

Communications Parameters:	9600 Baud, 8 bits, No parity, 1Stop Bit
Interface Protocol:	Optically Isolated RS-422/RS232
Interface Connector:	DE9S

16.1.7. J2 “NMEA A” Interface

Communications Parameters:	(Selectable) 4800 Baud, 8, N, 1
Interface Protocol	Optically isolated RS-422 Receive RS-232 Transmit (Pseudo GGA echo sentence)
Interface Connector	DE9P
NMEA GPS Sentence:	xxGLL typically GPGLL or LCGLL
NMEA Heading Sentence:	xxHDT or xxHDM typically HCHDM or HCHDT

16.1.8. J2 “NMEA B” Interface

Communications Parameters:	(Selectable) 4800 Baud, 8, N, 1
Interface Protocol	Optically isolated RS-422 Receive
Interface Connector	DE9P
NMEA GPS Sentence:	xxGLL typically GPGLL or LCGLL
NMEA Heading Sentence:	xxHDT or xxHDM typically HCHDM or HCHDT

16.1.9. Ethernet

Interface Protocol	10BaseT
Interface Connector	RJ-45
Interface Ports	2 TCP M&C (Ports 2000, 2001) 1 UPD Upload (Port 3000) 1 Multi-User HTML (Port 80)

16.1.10. DVB Compliant Tracking Receiver

Internal Satellite Identification Receiver

Tuning range	950 to 2150 MHz in 1 MHz increments in DVB Mode.
Input RF Level	-85 to -25 dBm typical
Output RF Level	Input level +/- 1 dB typical
Sensitivity	30 mV / dB typical
Bandwidth	Selectable in DVB Mode, 7.5MHz with a Baud Rate =< 5k 20 MHz with a Baud Rate >5k)
Polarity switching	13 VDC output to select Vertical or RHCP polarity. 18 VDC to output select Horizontal or LHCP polarity
Band Switching:	22kHz continuous tone output to select High band, No tone to select Low band.
Satellite ID	Network ID for DVB signals. QPSK demodulator and FEC decoder lock for DSS, or DVB without NID (forced NID).
QPSK Demodulator	3000 to 30000 baud (kps)
FEC Decoder	1/2, 2/3, 3/4, 5/6, 6/7, 7/8, or Automatic.
Pipeline Decoder	DVB or DSS compatible.

16.1.11. L-Band SCPC Narrow Band Tracking Receiver

Internal Satellite Identification Receiver

Tuning range	950 to 2150 MHz in 1 KHz increments.
Input RF Level	-85 to -25 dBm typical
Output RF Level	Input level +/- 1 dB typical
Sensitivity	30 mV / dB typical
Bandwidth	300 KHz
Polarity switching	13 VDC output to select Vertical or RHCP polarity. 18 VDC to output select Horizontal or LHCP polarity
Band Switching:	22kHz continuous tone output to select High band, No tone to select Low band.

16.1.12. Narrow Band SCPC receiver (DAC-2302 ONLY):

Frequency Range:	60 - 80 MHz (70 MHz SCPC) Narrow Tuning Range 52 - 88 MHz (70 MHz SCPC) Wide Tuning Range 110 - 170 (140 MHz SCPC)
Input Level:	-90 to -30 dBm
Detection Bandwidth:	30 kHz

16.2. Terminal Mounting Strip

16.2.1. Synchro Interface:

Connectors	5 screw terminal connections
Input Voltage Level	36-110 VDC, 400 or 60 hertz
Synchro Ratios	1:1, 36:1, 90 or 180:1 and 360:1 with Synchro-Digital converter 360:1 with Synchro-SBS converter
Impedance:	1M ohm

16.2.2. SBS Interface

Connectors	4 screw terminal connections
Input Voltage Level	20-90 VDC
Interface	Opto-Isolated,
Polarity	Auto switching
Ratio	6 steps per degree
Impedance:	10K ohm

16.2.3. Control Interface**16.2.3.1. External AGC**

External AGC or Satellite Modem Lock Input.

Connections	2 screw terminal connections (AGC and GND)
Voltage Level:	0-5 VDC
Impedance:	30K ohm
Control:	Low Level (<1.25Vdc) = Modem Lock* High Level (>1.25Vdc) = Modem Unlock*

*The logic sense of the external Satellite Modem Lock input can be reversed by adding 128 to the SYSTEM TYPE Parameter.

16.2.3.2. SW1 Local Band Select Output

Control local (BDE) band select switch(s) or tone generator(s).

Connections	1 screw terminal connection (SW1)
Control Level:	Low Band = OPEN circuit High Band = SHORT to ground Controlled by MODE – TRACKING – Band Selection. Current sink of 0.5 amps max

16.2.3.3. SW2 Blockage / TX Mute Output

Blockage output to Dual Antenna Arbitrator coax switch panel OR TX Mute output to Satellite Modem for RF radiation hazard and/or FCC compliance.

Connections	1 screw terminal connection (SW2)
Control Level:	Not Blocked or Not mispointed = OPEN circuit* Blocked or mispointed = SHORT to ground * Current sink of 0.5 amps max

*The logic level output can be reversed by adding 16 to the SYSTEM TYPE parameter.

16.2.4. NMEA Interface

This interface allows up to two simultaneous external GPS or NMEA 0183 compliant Heading inputs and an echoed GPS (GPGGA) output and is connected to the ACU via ribbon cable(s).

Connections	5 Screw terminal connections (RXA+ / RXA- input, RXB+ / RXB-input, and TXA+ output)
Rx Sentence Format:	Global Positioning System \$xxGLL,DDmm.mmmm,N,DDDmm.mmmm,W (,UTC optional) (*CS optional) <cr> Heading \$xxHDT,xxx.x <cr>
Tx Sentence Format	Global Positioning System \$GPGGA,0,DDmm,N,DDDmm,W <cr> <lf>

16.3. Environmental Conditions

The following requirements apply to equipment installed in weather protected locations.

Temperature	0 to 40 degrees C
Humidity	Up to 100% @ 40 degrees C, Non-condensing

16.4. DAC-2202 AC Power Consumption

Voltage:	100-240 VAC, 1 Phase
Cycle:	47-63Hz
Power:	160 Watts (max)

16.5. Cables

16.5.1. IF Signal Cables

Please refer to the “Antenna L-Band IF Coax Cables” section of the specification chapter of your antenna manual for coaxial cable recommendations.

16.5.2. SBS/Synchro Gyro Compass Interface Cable (Customer Furnished)

Type:	Multi-conductor, Shielded
Number of wires	4 Conductors for Step-By-Step Gyro, 5 Conductors for Synchro
Wire Gauge:	18 AWG
Insulation:	600 VAC

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17. 5009-33 Technical Specifications

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

17.1. Antenna Assembly 5009

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	1.24 m (49.0 inch)
Reflector Type	Spun Aluminum, axis symmetric, D Ring focus
Feed	Center focus Cassegrain feed with integral 9GHz radar filter and Cross-Pol OMT
Cross Pol Isolation:	On axis: > 35dB, Off axis: > 30dB within 1dB contour
Port to Port Isolation	> 35 dB typical
Polarization	Linear w/motorized skew adjustment
Polarization control	24 volt DC motor with pot feedback
Transmit frequency range	13.75-14.5 GHz Ku Band
Receive frequency range	10.70-12.75 GHz Ku Band
Antenna Gain	
TX Gain	43.0 dBi at 14.25 GHz Typical
RX Gain	41.6 dBi at 12.5 GHz Typical
Antenna Efficiency	65 Percent typical minimum
Antenna G/T (20° elevation, clear sky)	19.4 dB/K at 12.5 GHz In the Radome (typical)

17.2. SMW Quad Band LNB

Band 1	
Voltage Required	13 VDC
Input RF Frequency	10.95-11.70 GHz
Local Oscillator Frequency	10.00 GHz
Output IF Frequency	950 to 1700 MHz
Band 2	
Voltage & Tone Required	13 VDC + 22 KHz Tone
Input RF Frequency	11.70-12.25 GHz
Local Oscillator Frequency	10.75 GHz
Output IF Frequency	950 to 1500 MHz
Band 3	
Voltage Required	18 VDC
Input RF Frequency	12.25-12.75 GHz
Local Oscillator Frequency	11.30 GHz
Output IF Frequency	950 to 1450 MHz
Band 4	
Voltage & Tone Required	18 VDC + 22 KHz Tone
Input RF Frequency	10.70-11.70 GHz
Local Oscillator Frequency	9.75 GHz
Output IF Frequency	950 to 1950 MHz
Gain (typ)	54 dB

Noise Figure	0.8 dB
Current (typ)	270 mA

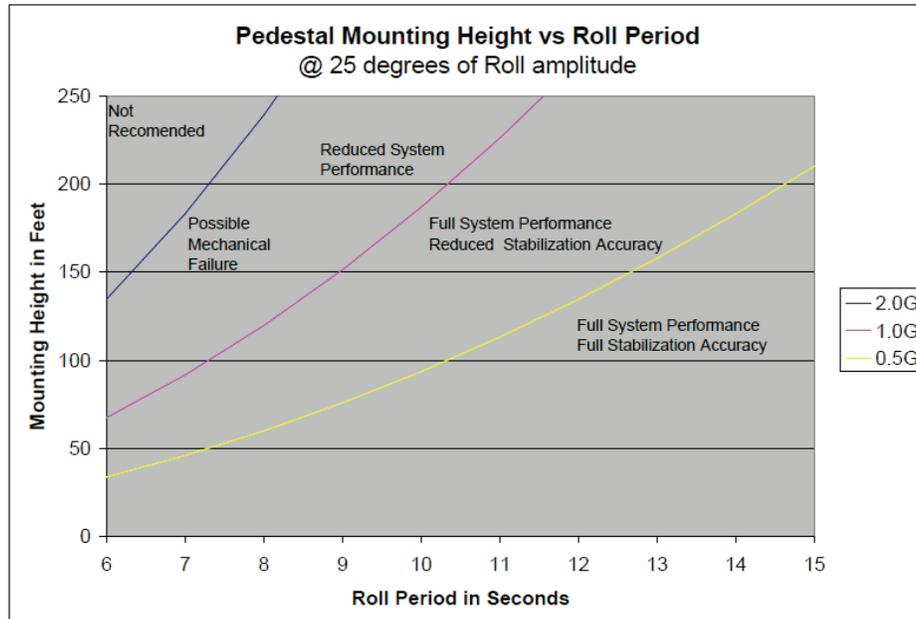
17.3. TX Radio Package

SSPB (Block Up-Converter)	Codan, 8 Watt BUC
Co-Pol Diplexer	DPX75K-002
Common Port (to feed)	WR-75 Flange, 10.70-14.5 GHz
Transmit Output (from SSPB)	WR-75 Flange, 13.75-14.5 GHz
Receive Output (to Co-Pol LNB)	WR-75 Flange, 10.70-12.75 GHz
Co-Pol LNB	Refer to LNB spec

17.4. Stabilized Antenna Pedestal Assembly

Type:	Three-axis (Level, Cross Level, AZ)
Stabilization:	Torque Mode Servo
Stab Accuracy:	0.15 degrees RMS, 0.3 degrees MAX in presence of specified ship motions (see below).
Azimuth Motor:	Size 23 Brushless DC Servo, Double Stacked 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:	
Elevation	-15 to +115
Cross Level (Inclined 30 degrees)	+/- 35 degrees
Azimuth	Unlimited
Elevation Pointing	+5 to +90 degrees at maximum specified roll +10 to +85 degrees at maximum combined roll & pitch
Maximum Ship Motions	
Roll:	+/-24 degrees at 8-12 sec periods
Pitch:	+/- 14 degrees at 6-12 sec periods
Yaw:	+/-8 degrees at 15 to 20 sec periods
Turning rate:	Up to 12 deg/sec and 15 deg/sec/sec
Headway:	Up to 50 knots
Heave	0.5G
Surge	0.2G
Sway	0.2G
Specified Ship Motions (for stabilization accuracy tests):	
Roll	+/- 20 degrees at 8 second 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_A available on the Sea Tel Dealer Support Site.



17.5. Pedestal Control Unit

The PCU Assembly contains 2 Printed Circuit Boards (PCBs). One is the main control board and the other is the Motor Driver for the 3 Brushless DC Drive motors (AZ/EL/CL).

Connectors

Antenna Reflector	15 Pin D-Sub connector
Motor Interface	15 Pin D-Sub connector
M&C Interface	SMA loop-through connectors
GPS Input	BNC connector

Controls

None

M&C Interface

9600 Baud 400MHz FSK

17.5.1. 400 MHz Unlimited Azimuth Modem/Multiplexer (3 Channel)

Combined Signals (-1,-2)

Pass-Thru	950-3650 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
RF / Ped M&C	9 pin D-Sub Connectors
Radio/Pedestal M&C	Radio & 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

Diagnostics

LED Status Indicator for Power, Link communications and Self Test

Pedestal Interface

RS-232/422

Radio Interface (Jumper Selectable)
 ADE/BDE Mode

RS-232, RS-422 (4 wire) or RS-485 (2 wire)
 Jumper Selectable

17.6. Radome Assembly, 66”

Type	Frequency Tuned
Material	Composite foam/laminate
Size	
Diameter:	1.76 M (69.35 inch)
Height:	1.76 M (69.40 inch)
Hatch size	0.43 x 0.66 M (17 x 26 inch)
Installed weight	MAX 195 kg (430 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 56 m/sec (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 - Any cracks, scratches or other damage to the surface seal of the radome must be repaired and re-sealed by a competent “A” layered laminate (or cored deck) repair professional.

NOTE: Damage to the seal of the inside, or outside, of the radome can allow moisture to be absorbed. This will result in the radome being heavier and having higher attenuation. **Do NOT drill holes in this radome.**

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.

17.7. 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)

17.8. XX09 Environmental Specifications

17.8.1. Climatic Conditions

Environmental condition	Test Level
Temperature Range (Operating)	-25° to +55° Celsius (-13° to +131° F)
Humidity	100% Condensing
Wind Speed	56 m/sec (125 mph)
Solar Radiation	1,120 Watts per square meter, 55° Celsius

17.8.2. Chemically Active Substances

Environmental Condition	Test Level
Sea Salt	5 percent solution

17.8.3. Mechanical Conditions

Environmental Condition	Test Level			
Systematic Vibration Amplitude Acceleration Frequency Range	5.0 millimeters 2.0 G (20 m/s ²) 1Hz-150 Hz			
Shock (Transient Vibration) Response Spectrum Peak Accel., m/s ² Duration, ms Number of Cycles Directional Changes	I 100 11	II 300 6	III 500 3	
	3 each direction 6			
Shock (Bump) Peak Accel., m/s ² Duration, ms Number of Cycles Directional Changes	250 6 100 ea. direction 6			

17.8.4. Transit Conditions

Environmental Condition	Test Level
Drop (Transit Shock)	30 G @ 8 inches

17.9. Below Decks Equipment**17.9.1. Antenna Control Unit (ACU)**

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

17.9.2. Terminal Mounting Strip (TMS)

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

17.9.3. Satellite Modem

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

17.9.4. Router

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

17.10. Cables**17.10.1. Antenna Control Cable (Provided from ACU to the Base MUX)**

RS-422 Pedestal Interface

Type	Shielded Twisted Pairs
Number of wires	4
Wire Gauge	24 AWG or larger
Communications Parameters:	9600 Baud, 8 bits, No parity
Interface Protocol:	RS-422
Interface Connector:	DE-9P

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

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

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

17.10.3. 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)

18. DRAWINGS

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

18.1. DAC-2202 Antenna Control Unit Drawings

Drawing	Title	
125411-1_J	DAC-2202 w/ DVB Rackmount General Assembly	18-3
125411-3_J	DAC-2202 w/ SCPC Rackmount General Assembly	18-5

18.2. 5009-33 Ku-Band Model Specific Drawings

Drawing	Title	
130358-101_A	System, 5009-33 in 66" Radome	18-8
130357-1_A	System Block Diagram, 5009-33	18-10
129461-1_A	66" Radome Assembly, Tuned	18-14
130450_A	Installation Arrangement, 50, 60 & 66" Radomes	18-17

18.3. Series 09 General Drawings

Drawing	Title	
119478-5_C3	Cable Assembly, RJ-45 Serial (iDirect Modem Interface)	18-18
126877_B1	Harness Assembly, Comtech Modem Interface	18-19
121628-4_P	Terminal Mounting Strip (iDirect Modem Interface)	18-20
121628-5_P	Terminal Mounting Strip (Comtech Modem Interface)	18-22
129710-1_A	Base Multiplexer Panel	18-24

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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	124265	E1	ENCLOSURE, 1U RACKMOUNT, DAC-2200 SE	
2	1 EA	122300	F	LID, DAC-2200 SERIES ENCLOSURE	
5	1 EA	120385-2	A	BRACKET, LID, ACU ASS'Y	
7	1 EA	122445	B	FRONT PANEL ASS'Y, DAC-2202	
9	1 EA	122307-1	J	DVB RECEIVER ASS'Y, STD ACU	
11	1 EA	124813-1	N	PCB ASS'Y, DAC-2202 ACU	
16	1 EA	114836	A	PCB ASS'Y, S/D CONVERTER, 12 BIT	
17	1 EA	123046-3	C1	HARNESS, DC POWER	
18	1 EA	125343-6		POWER SUPPLY, COSEL PBA150F-24	
19	1 EA	112646-13	C	PCB ASS'Y, DC-DC CONVERTER	
21	1 EA	122660-4	D	HARNESS, AC ENTRY, SINGLE	
24	1 EA	112918-9	C	CABLE ASS'Y, RIBBON, 20 PIN	
25	1 EA	120740	A	CABLE ASS'Y, DVB RECEIVER	
30	1 EA	123070		DECAL, HIGH VOLTAGE WARNING	
41	8 EA	110941-3	B	SCREW, JACK, 4-40 X .312 LG	
42	1 EA	114587-106		SCREW, RND HD, PHIL, 4-40X1/4, S.S	
44	7 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S	
45	6 EA	114576-106		SCREW, FLAT HD, PHIL, 4-40 x 1/4, S.	
46	1 EA	114588-146		SCREW, PAN HD, PHIL, 6-32 x 3/8, S.S	
47	1 EA	114580-007		WASHER, FLAT, #6, S.S.	
49	4 EA	119967	A	NUT, HEX, PANEL, 3/8-32	
50	3 EA	126264-13	A1	WASHER, STAR, INTERNAL TOOTH, NARROW	
58	1 EA	120090-17		MICRO ASS'Y, 12-BIT SDC	
65	2 EA	120452-32	B	SCREW, RND HD, PHIL, 6-32 X 3/8, BLA	
68	8 EA	127956-2	A	NUT, HEX KEPS, 6-32, S.S.	
69	1 EA	124791	A	LABEL CAUTION, MICROWAVE HAZARD	
72	4 EA	120077-118		SCREW, FLAT HD, PHIL, M3 X 8, S.S.	
73	1 EA	125193	1.00	SOFTWARE, DAC-2202 ACU, COMM_IF	

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DAC-2202, DVB RCVR, COAX IF

PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 1 OF 2	DRAWING NUMBER 125411-1	REV J
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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
74	1 EA	124871	6.05	SOFTWARE, DAC-2202 ACU, GP32, STD	
76	1 EA	108929-2	C1	POWER CORD, 110V AC	(NOT SHOWN)
77	1 EA	109752-3		POWER CORD, 220V AC	(NOT SHOWN)
78	1 EA	110959-1	C1	DECAL, SERIAL NUMBER/PATENT, SMALL	
79	5 EA	115697-2	B	CABLE TIE MOUNT, .75 X .75 X .18, AB	
80	5 EA	119801-012	B	CABLE TIE, NYLON, 4 IN, NATURAL	
81	3 EA	110924-1	A	JUMPER, .100 SPACING, 2 POS, CLOSED	

<h1 style="margin: 0;">Sea Tel</h1> <p style="margin: 0;"><i>COBHAM</i></p>				
<p>DAC-2202, DVB RCVR, COAX IF</p>				
<p>PROD FAMILY COMMON</p>	<p>EFF. DATE 9/9/2009</p>	<p>SHT 2 OF 2</p>	<p>DRAWING NUMBER 125411-1</p>	<p>REV J</p>

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	124265	E1	ENCLOSURE, 1U RACKMOUNT, DAC-2200 SE	
2	1 EA	122300	F	LID, DAC-2200 SERIES ENCLOSURE	
5	1 EA	120385-2	A	BRACKET, LID, ACU ASS'Y	
7	1 EA	122445	B	FRONT PANEL ASS'Y, DAC-2202	
9	1 EA	127166-1	D	SCPC RECEIVER ASS'Y, ACU / PCU, V5	
11	1 EA	124813-1	N	PCB ASS'Y, DAC-2202 ACU	
16	1 EA	114836	A	PCB ASS'Y, S/D CONVERTER, 12 BIT	
17	1 EA	123046-3	C1	HARNESS, DC POWER	
18	1 EA	125343-6		POWER SUPPLY, COSEL PBA150F-24	
19	1 EA	112646-13	C	PCB ASS'Y, DC-DC CONVERTER	
21	1 EA	122660-4	D	HARNESS, AC ENTRY, SINGLE	
24	1 EA	112918-9	C	CABLE ASS'Y, RIBBON, 20 PIN	
25	1 EA	120740	A	CABLE ASS'Y, DVB RECEIVER	
30	1 EA	123070		DECAL, HIGH VOLTAGE WARNING	
41	8 EA	110941-3	B	SCREW, JACK, 4-40 X .312 LG	
42	1 EA	114587-106		SCREW, RND HD, PHIL, 4-40X1/4, S.S	
44	7 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S	
45	6 EA	114576-106		SCREW, FLAT HD, PHIL, 4-40 x 1/4, S.	
46	1 EA	114588-146		SCREW, PAN HD, PHIL, 6-32 x 3/8, S.S	
47	1 EA	114580-007		WASHER, FLAT, #6, S.S.	
49	4 EA	119967	A	NUT, HEX, PANEL, 3/8-32	
50	3 EA	126264-13	A1	WASHER, STAR, INTERNAL TOOTH, NARROW	
58	1 EA	120090-17		MICRO ASS'Y, 12-BIT SDC	
65	2 EA	120452-32	B	SCREW, RND HD, PHIL, 6-32 X 3/8, BLA	
68	8 EA	127956-2	A	NUT, HEX KEPS, 6-32, S.S.	
69	1 EA	124791	A	LABEL CAUTION, MICROWAVE HAZARD	
72	4 EA	120077-118		SCREW, FLAT HD, PHIL, M3 X 8, S.S.	
73	1 EA	125193	1.00	SOFTWARE, DAC-2202 ACU, COMM_IF	

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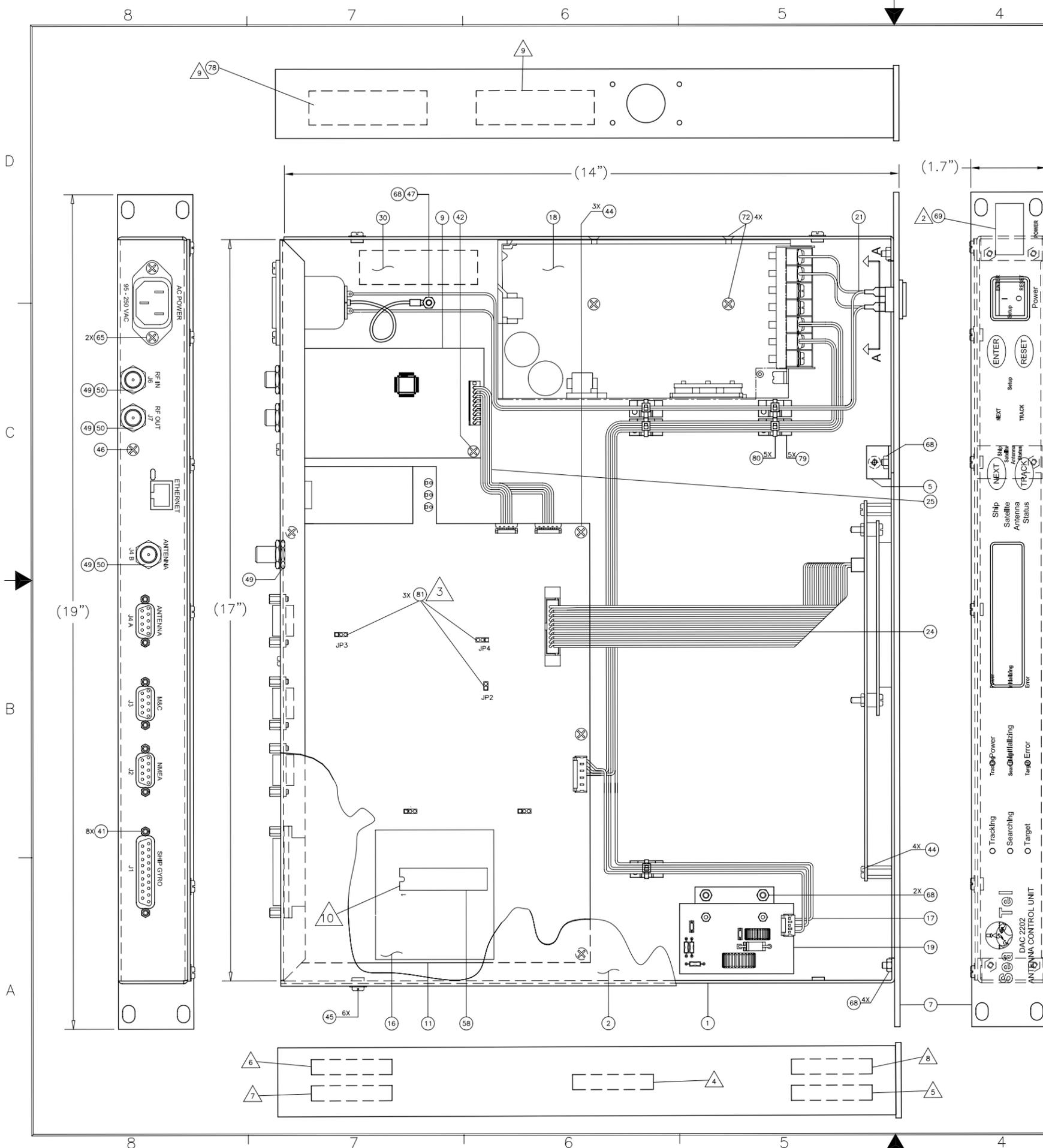
DAC-2202, SCPC RCVR, 9 WIRE IF

PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 1 OF 2	DRAWING NUMBER 125411-3	REV J
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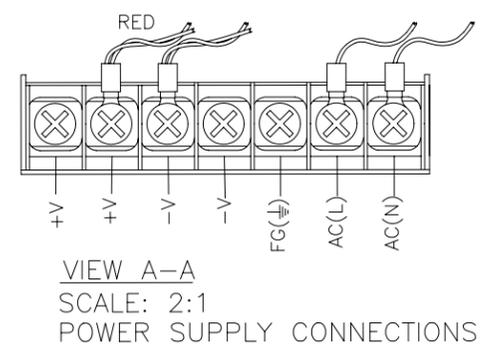
SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
74	1 EA	124871	6.05	SOFTWARE, DAC-2202 ACU, GP32, STD	
76	1 EA	108929-2	C1	POWER CORD, 110V AC	(NOT SHOWN)
77	1 EA	109752-3		POWER CORD, 220V AC	(NOT SHOWN)
78	1 EA	110959-1	C1	DECAL, SERIAL NUMBER/PATENT, SMALL	
79	5 EA	115697-2	B	CABLE TIE MOUNT, .75 X .75 X .18, AB	
80	5 EA	119801-012	B	CABLE TIE, NYLON, 4 IN, NATURAL	
81	3 EA	110924-1	A	JUMPER, .100 SPACING, 2 POS, CLOSED	

<h1 style="margin: 0;">Sea Tel</h1> <p style="margin: 0;"><i>COBHAM</i></p>				
<p>DAC-2202, SCPC RCVR, 9 WIRE IF</p>				
PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 2 OF 2	DRAWING NUMBER 125411-3	REV J



REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
G	6333	08-01-08	ITEM 69 QTY WS 4 AND ADD MISSED ITEM 69 TO BOM -1. ADD NOTES 6, 7, 8, 9 & 10.	SL
H	6522	2/10/09	UPDATE VIEW AND UPDATE NOTES PER SEA TEL STARDAR AS REDLINE.	SL
H1	6577	03-11-09	ADD -6 & 7.	SL
J	6746	06-29-09	ADD -12. ADD APPLICATION COLUMN IN DASH TABLE.	SL



DASH TABLE				
DASH	APPLICATION	RECEIVER	ANTENNA	JP3
-1	DOC	DVB	COAX	2-3
-2	DOC	DVB	9 WIRE	1-2
-3	DOC	SCPC	9 WIRE	1-2
-4	DOC	SCPC	COAX	2-3
-6	DOC	NBIF	9 WIRE	1-2
-7	DOC	NBIF	COAX	2-3
-12	TAC	DVB	COAX	1-2

NOTES, UNLESS OTHERWISE SPECIFIED:

1. APPLY ADHESIVE PER SEA TEL SPEC 121730.
2. LOCATE LABEL, APPROX. WHERE SHOWN.
3. INSTALLED JUMPERS:
JP2 1-2
JP3 SEE DASH TABLE
JP4 1-2
4. MARK FPI PCB WITH P/N, REV AND S/N PER SEATEL SPEC 122930 APPROX. WHERE SHOWN.
5. MARK ACU PCB P/N, REV AND S/N PER SEATEL SPEC 122930 APPROX. WHERE SHOWN.
6. MARK RECEIVER ASS'Y P/N, REV AND S/N PER SEATEL SPEC 122930 APPROX. WHERE SHOWN.
7. MARK S/D CONVERTER PCB P/N, REV AND S/N PER SEATEL SPEC 122930 APPROX. WHERE SHOWN.
8. MARK DC / DC CONVERTER PCB P/N, REV AND S/N PER SEATEL SPEC 122930 APPROX. WHERE SHOWN.
9. APPLY LABEL PER SEA TEL SPEC 122930 & 125174 APPROX. WHERE SHOWN.
10. NOTE ORIENTATION OF IC & PCB AS SHOWN.
11. ALL PCB ASSY & REWORK SHALL COMPLY WITH IPC-A-610 REV. D.
12. PROGRAM & TEST PER AS SEA TEL SPEC 126883.

REFERENCE DRAWINGS:
126881 WIRING DIAGRAM, DAC 2202

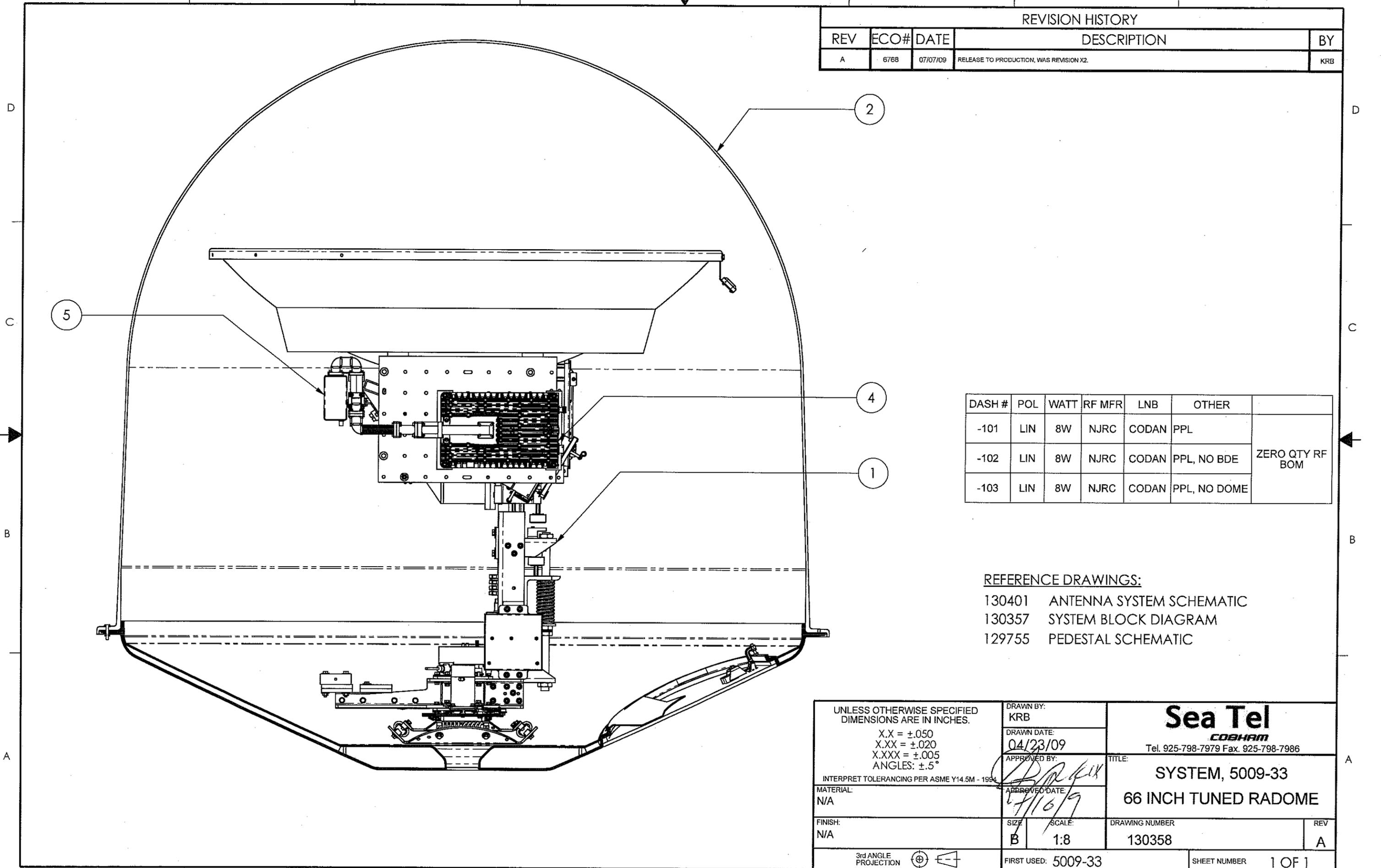
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5°	DRAWN BY: LAE	 Tel. 925-798-7979 Fax. 925-798-7986
	DRAWN DATE: 5/17/06	
INTERPRET TOLERANCING PER ASME Y14.5M - 1994	APPROVED BY:	TITLE: DAC 2202
MATERIAL: SEE BOM	APPROVED DATE:	RACKMOUNT ASS'Y
FINISH: N/A	SIZE: B	SCALE: NONE
	FIRST USED:	DRAWING NUMBER: 125411
3rd ANGLE PROJECTION		REV: J
		SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	130359-1	A	GENERAL ASS'Y, 5009-33	
2	1 EA	129461-1	B	RADOME ASS'Y, GA INSTALL, 66 IN, TX/R	
4	0 EA	124167-X		(REF ONLY) SSPB, KU-BAND, LBUC, CODA	
5	0 EA	127386-X		(REF ONLY) LNB, SMW, QUAD L.O., KU B	
6	1 EA	125411-3	J	DAC-2202, SCPC RCVR, 9 WIRE IF	(NOT SHOWN)
7	1 EA	129615-1	A	BELOW DECK KIT, L-BAND, W/ DAC 2202,	(NOT SHOWN)
9	1 EA	130009-4	A	CUSTOMER DOC PACKET, 5009-33	(NOT SHOWN)
11	1 EA	124766-1	A2	DECAL KIT, 76-81 IN RADOME, SEA TEL	(NOT SHOWN)
12	1 EA	121711	A	BALANCE WEIGHT KIT	(NOT SHOWN)
13	1 EA	130290-1	X1	SHIP STOWAGE KIT, XX09	(NOT SHOWN)

<h1 style="margin: 0;">Sea Tel</h1> <p style="margin: 0;"><i>COBHAM</i></p>				
<p>SYSTEM, 5009-33, LIN, 8-16W, 66 IN</p>				
PROD FAMILY 5009	EFF. DATE 9/9/2009	SHT 1 OF 1	DRAWING NUMBER 130358-101	REV A

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	6768	07/07/09	RELEASE TO PRODUCTION, WAS REVISION X2.	KRB



DASH #	POL	WATT	RF MFR	LNB	OTHER	
-101	LIN	8W	NJRC	CODAN	PPL	ZERO QTY RF BOM
-102	LIN	8W	NJRC	CODAN	PPL, NO BDE	
-103	LIN	8W	NJRC	CODAN	PPL, NO DOME	

REFERENCE DRAWINGS:
 130401 ANTENNA SYSTEM SCHEMATIC
 130357 SYSTEM BLOCK DIAGRAM
 129755 PEDESTAL SCHEMATIC

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: KRB	 Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986
	DRAWN DATE: 04/23/09	
MATERIAL: N/A	APPROVED BY: APPROVED DATE: 7/16/09	DRAWING NUMBER: 130358
FINISH: N/A	SIZE: B	SCALE: 1:8
3rd ANGLE PROJECTION		REV: A
FIRST USED: 5009-33		SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	130359-1	A	GENERAL ASS'Y, 5009-33	
4	1 EA	128043-1	A	FEED ASS'Y, 5009, KU-BAND	
5	2 EA	127386-X		(REF ONLY) LNB, SMW, QUAD L.O., KU B	
6	1 EA	124167-X		(REF ONLY) SSPB, KU-BAND, LBUC, CODA	
20	1 EA	115708-1	L	CIRCUIT BREAKER BOX ASS'Y, 220V	
21	1 EA	129308-1	B	PCU ENCLOSURE ASS'Y, XX09	
22	1 EA	129628-1	A2	ENCLOSURE ASS'Y, MOTOR JUNCTION XX09	
23	1 EA	121951-3	F	MOTOR, BLDC, 2 STACK W/ ENCODER, 20	
24	2 EA	125644-1	G	MOTOR, SIZE 23, BLDC W/ BRAKE, 15 PI	
25	1 EA	125755-3	G	POWER SUPPLY ASS'Y, 48V, 300W W/D-SU	
26	1 EA	125082	A	GPS ANTENNA, FURUNO	
27	1 EA	129543-24	A	CABLE ASS'Y, PROXIMITY SENSOR	
31	1 EA	129526-84	A	HARNESS ASS'Y, PCU TO MOTOR JUNCTION	
32	1 EA	129527-36	A	HARNESS ASS'Y, MOTOR TO ELEVATION, 3	
33	1 EA	128082-1	A	HARNESS ASS'Y, REFLECTOR, XX06	
34	1 EA	128536-84	A	CABLE ASS'Y, 48VDC TO CODAN SSPB, 84	
35	1 EA	129741-84	A	HARNESS, 400 MHZ MODEM TO CODAN SSPB	
40	1 EA	129254-2	A3	POWER RING, 20A, 3 CIRCUITS, XX09	
41	1 EA	127583-64	A	CABLE ASSEMBLY, PEDESTAL, AC POWER,	
42	1 EA	124288-36	G	CABLE ASS'Y, AC POWER, 36 IN	
43	1 EA	124288-24	G	CABLE ASS'Y, AC POWER, 24 IN	
51	2 EA	114972-4	M	CABLE ASS'Y, SMA(M) - SMA(M), 30 IN	
52	1 EA	114972-3	M	CABLE ASS'Y, SMA(M) - SMA(M), 84 IN	
53	1 EA	111079-8	G	CABLE ASS'Y, SMA(M)-N(M), 8 FT.	
54	1 EA	128385-12BLK	B	CABLE ASS'Y, RG-179, COAX, SMA (RA)	
55	2 EA	117164-60BLK	A4	CABLE ASS'Y, RG-179 COAX, F TO F, 60	
60	2 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
61	1 EA	116466	D	ROTARY JOINT, 4.5 GHz, DUAL COAX.	

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SYSTEM BLOCK DIAGRAM, 5009-33

PROD FAMILY LIT	EFF. DATE 9/9/2009	SHT 1 OF 3	DRAWING NUMBER 130357-1	REV A
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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
62	1 EA	128010-1	B	RF COAX SWITCH ASS'Y, 75 OHM	
70	1 EA	128059	B1	FILTER, TX REJECT, WR-75, 13.75-14.5	
71	1 EA	126144-1	B	WAVEGUIDE, WR-75, 180 DEG E-BEND	
80	1 EA	127280-2	A	WAVEGUIDE FILTER, KU-BAND, RX/REJECT	
81	1 EA	128534-3	A	WAVEGUIDE, WR-75, H-BEND W/ FULL FLE	
82	1 EA	110172-23	G1	WAVEGUIDE, WR-75, 90 DEG E-BEND, 3.6	
83	1 EA	125157-1	A1	DIPLEXER, DPX75K-002, WR-75	
84	1 EA	128716-1	A	WAVEGUIDE, WR-75, KU BAND, 4006RZA	
85	1 EA	128290-1	A	WAVEGUIDE, WR-75, 180 DEG H-BEND W/B	
86	1 EA	115477-6	C	WAVEGUIDE, WR-75, ROTARY JOINT, L-ST	
87	1 EA	126225-375	B	WAVEGUIDE SPACER, WR-75, 0.75 IN LG	
100	1 EA	125411-3	J	DAC-2202, SCPC RCVR, 9 WIRE IF	
101	1 EA	129615-1	A	BELOW DECK KIT, L-BAND, W/ DAC 2202,	
102	1 EA	129710-1	A1	BASE MUX RACK PANEL ASS'Y, 400MHZ, R	
103	1 EA	121628-4	P	TERMINAL MOUNTING STRIP ASS'Y, ACU	
105	1 EA	129613-2	A	MODEM ASS'Y, 400MHZ FSK, 3 CH, BDE,	
110	1 EA	113303-10	S	CABLE ASS'Y, SMA 90 - SMA (M), 8 IN	
111	1 EA	115384-3	E1	CABLE ASS'Y, SMA(M)-BNC(M), 72 IN.	
112	1 EA	111115-6	B	CABLE ASS'Y, F(M)-F(M), 6 FT.	75 OHM SATELLITE MODEM
112	1 EA	116700-6	F	CABLE ASS'Y, RG223, N(M)-F(M), 6 FT.	50 OHM SATELLITE MODEM
114	1 EA	116700-6	F	CABLE ASS'Y, RG223, N(M)-F(M), 6 FT.	75 OHM SATELLITE MODEM
114	1 EA	114973-72	E	CABLE ASS'Y, N(M)-N(M), 72 IN.	50 OHM SATELLITE MODEM
120	1 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
121	1 EA	110567-19		ADAPTER, N(F)-N(F), STRAIGHT, FLANGE	
122	1 EA	111003-18	C	ADAPTER, BNC(F)-F(M)	
130	1 EA	116298-1	F5	INTERFACE HARNESS ASS'Y, DUAL MODEM,	
131	1 EA	120643-25	B	CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT	
132	1 EA	116298-3	F5	INTERFACE HARNESS ASS'Y, PC TO MODEM	

Sea Tel
COBHAM

SYSTEM BLOCK DIAGRAM, 5009-33

PROD FAMILY LIT	EFF. DATE 9/9/2009	SHT 2 OF 3	DRAWING NUMBER 130357-1	REV A
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SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
133	1 EA	119479-10	B	CABLE ASS'Y, CAT5 JUMPER, 10 FT.	
134	1 EA	126877	B1	HARNESS ASS'Y, COMTECH MODEM INTERFA	COMTECH MODEM
134	1 EA	119478-5	C3	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	IDIRECT MODEM

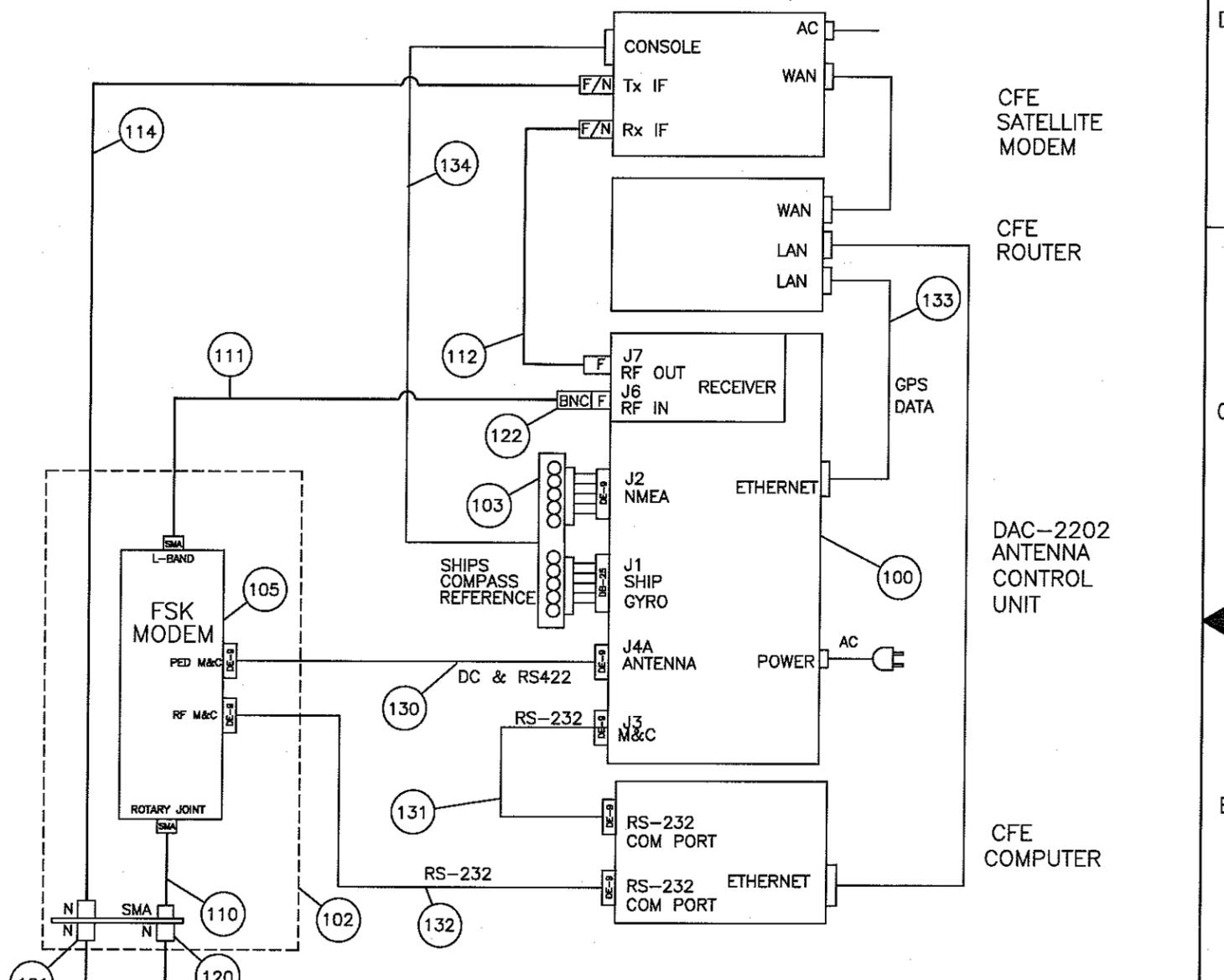
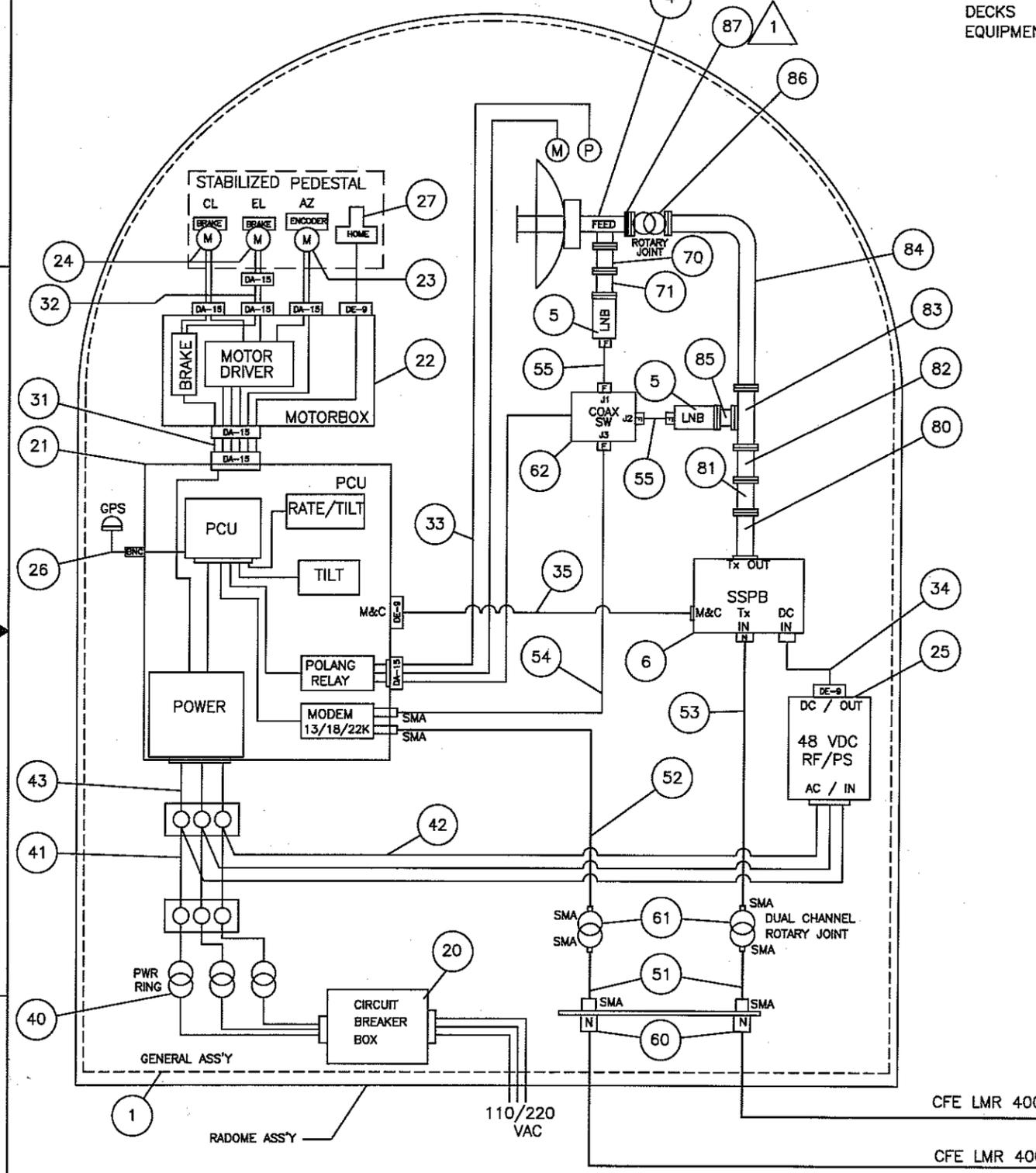
<h1>Sea Tel</h1> <p><i>COBHAM</i></p>				
<p>SYSTEM BLOCK DIAGRAM, 5009-33</p>				
PROD FAMILY LIT	EFF. DATE 9/9/2009	SHT 3 OF 3	DRAWING NUMBER 130357-1	REV A

REVISION HISTORY

REV	ECO#	DATE	DESCRIPTION	BY
A	6754	07/01/09	RELEASED TO PRODUCTION WAS REV. X1. ADDED DASHES 2 & 3. BUBBLE CHANGES.	KRB

ABOVE DECKS EQUIPMENT

BELOW DECKS EQUIPMENT



NOTES UNLESS OTHERWISE SPECIFIED:
1 INDICATED ITEM NOT USED ON DASH 2.

DASH #	SYSTEM
-1	5009-33
-2	4009-33
-3	6009-33

REFERENCE DRAWINGS
130401 ANTENNA SYSTEM SCHEMATIC
129755 ANTENNA PEDESTAL SCHEMATIC

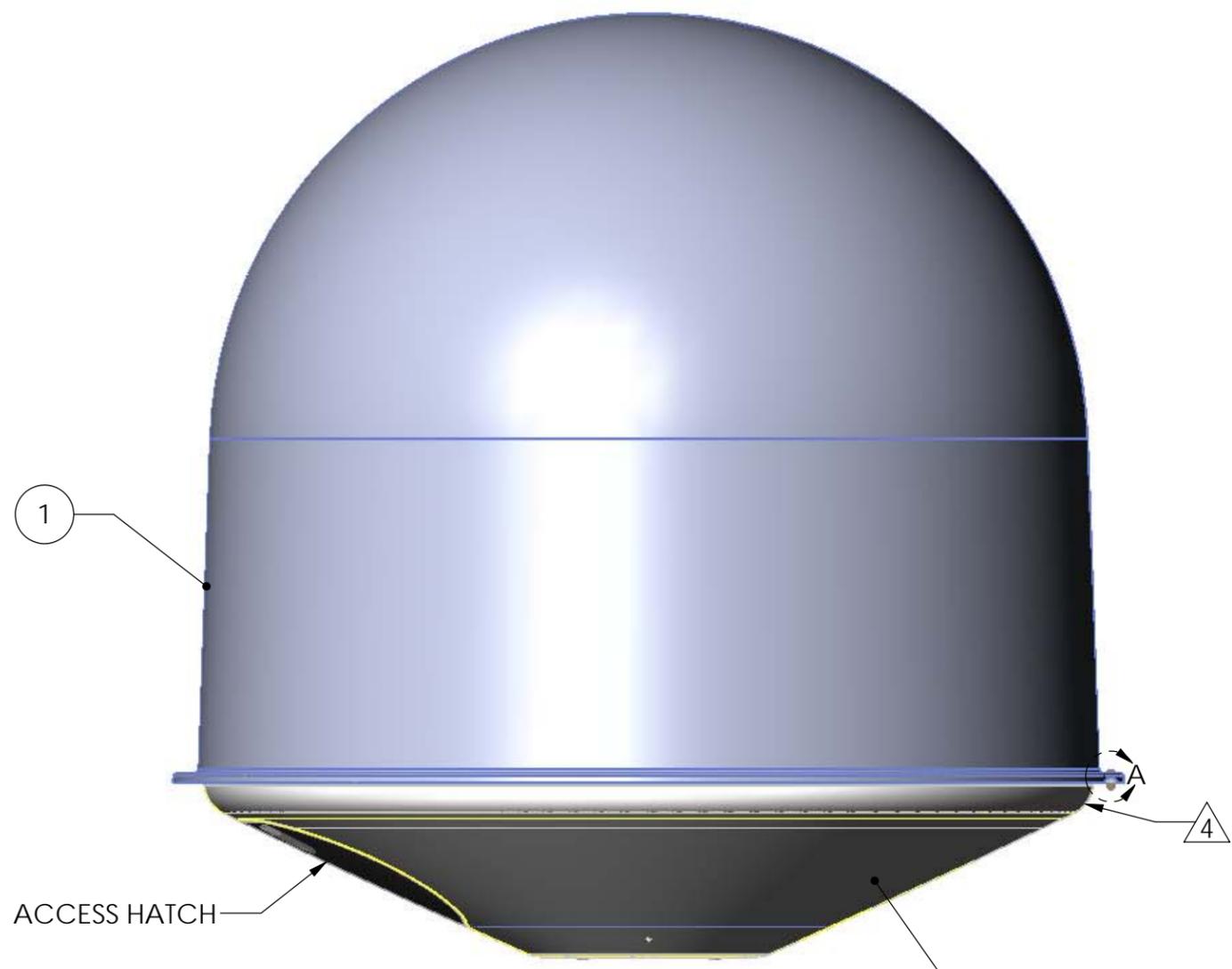
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. <48" = ± 1" <15" = ± 2" <100" = ± 4" >100" = ± 6" INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: KRB	 Tel. 925-798-7979 Fax. 925-798-7986
	DRAWN DATE: 05/01/09	
MATERIAL: N/A	APPROVED BY: <i>[Signature]</i>	TITLE: SYSTEM BLOCK DIAGRAM XX09-33
FINISH: N/A	APPROVED DATE: 7-2-09	DRAWING NUMBER: 130357
3rd ANGLE PROJECTION	SIZE: B SCALE: NONE	DRAWING NUMBER: 130357
	FIRST USED: 5009	SHEET NUMBER: 1 OF 1

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	129385-1	A	RADOME TOP FAB, 66 IN, TUNED	
2	1 EA	129383-1	A	RADOME BASE ASS'Y, 66 IN TUNED	
4	1 EA	130390-1	A	KIT, HARDWARE, GA TO RADOME	
5	10 EA	119801-012	B	CABLE TIE, NYLON, 4 IN, NATURAL	NOT SHOWN
6	1 EA	111679-7	0	CABLE CLAMP, NYLON, .50 DIA, #8 MTG H	NOT SHOWN
7	4 EA	114178	O	ADAPTER, F(F)-F(F) (BULLET), 1.10 IN L	
8	1 EA	111679-25	0	CABLE CLAMP, NYLON, 3/4 DIA, #10 MTG	
9	1 EA	111679-5	0	CABLE CLAMP, NYLON, .375 DIA, #8 MTG	
10	1 OZ	125948-1	A	ADHESIVE, HOT MELT, 3M SCOTCH-WELD	NOT SHOWN
14	1 EA	130394-1	A1	KIT, HARDWARE, RADOME TO MAST, 50 I	
51	11 EA	114580-230		WASHER, FLAT, M4, S.S.	
52	8 EA	125806-7	A	ROTALOC HEX NUT, SS-1-B38-M4 X 07-6H	
53	7 EA	119745-218		SCREW, PAN HD, PHIL, M4 x 8	
54	1 EA	119745-216		SCREW, PAN HD, PHIL, M4 X 6, S.S.	
56	4 EA	114589-141		SCREW, HEX HD M6X35	
57	8 EA	130371-170	A	WASHER, NYLON, 6.4 ID, 12 OD	
58	8 EA	120089-251		NUT, HEX, M6, S.S.	

RADOME ASS'Y,GA INSTALL, 66 IN, TX/RX, WHITE				
PROD FAMILY COMMON	EFF. DATE 11-Sep-09	SHT 1 OF 1	DRAWING NUMBER 129461-1	REV B

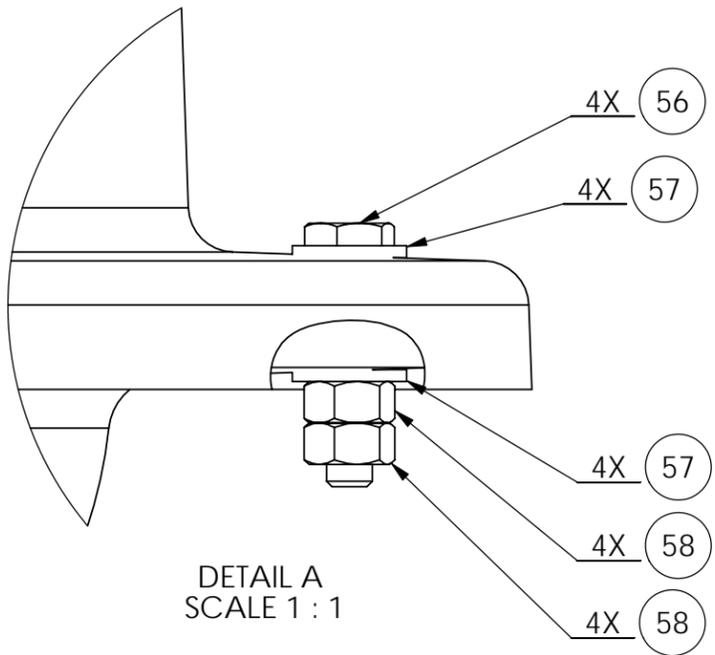
REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
B	6785	8-14-09	NOTE 5 WAS NOTE 6; REMOVED ITEM 50; ADDED ITEM 9; ITEM 4 WAS 118576; ITEM 8 WAS 125948-1; ITEM 10 WAS 110481-3; ITEM 14 WAS 123549; ADDED CABLE ROUTING DETAIL TO SHEET 2.	K.D.H.



ACCESS HATCH

- NOTES: UNLESS OTHERWISE SPECIFIED**
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
 2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.
 3. ROUTE ALL HARNESS AND CABLE ASSEMBLIES PER SEATEL SPEC. 121872.
 4. BOW MARKER LOCATION DIRECTLY OPPOSITE FROM ACCESS HATCH.
 5. BAG AND ATTACH RADOME MOUNTING KIT (ITEM 4) TO INSIDE OF RADOME.

HARDWARE SHOWN IS FOR TRANSIT ONLY. REMOVE & REPLACE WITH KIT 130394-1 AT FINAL INSTALLATION.



DETAIL A
SCALE 1 : 1

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. X = ±1.50 X.X = ±0.50 X.XX = ±0.15 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994		DRAWN BY: LW		<h2 style="text-align: center;">Sea Tel</h2> <p style="text-align: center;">COBHAM Tel. 925-798-7979 Fax. 925-798-7986</p>	
MATERIAL: NA		DRAWN DATE: 5/1/09			
FINISH: NA		APPROVED BY:		TITLE: RADOME ASS'Y, GA INSTALL, 66 INCH, TX/RX	
3rd ANGLE PROJECTION		SIZE: B	SCALE: 1:12	DRAWING NUMBER: 129461	REV: B
FIRST USED: XX09				SHEET NUMBER 1 OF 2	

8 7 6 5 4 3 2 1

D

D

ONLY PART OF GA SHOWN FOR CLARITY

INSTALL GA SO THE HARNESS EXITS BASE SPINDLE WELDMENT 180° FROM DOOR.

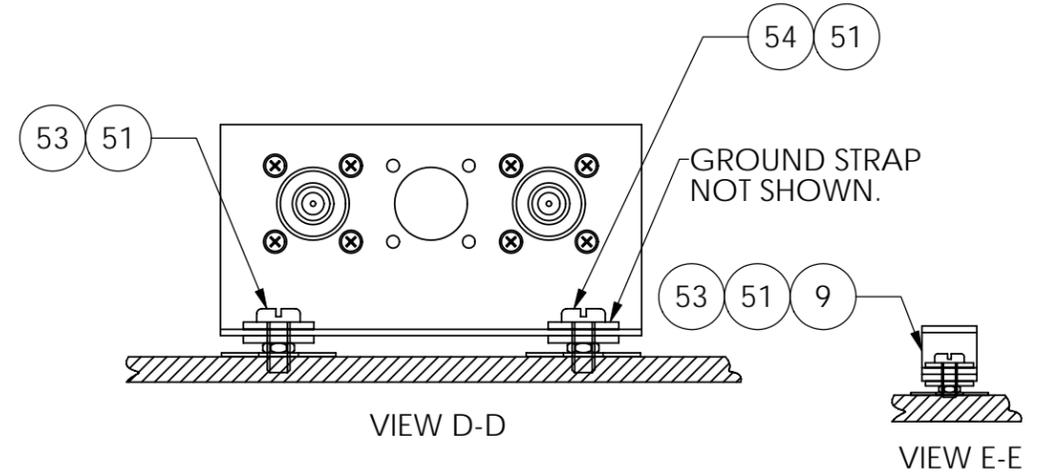
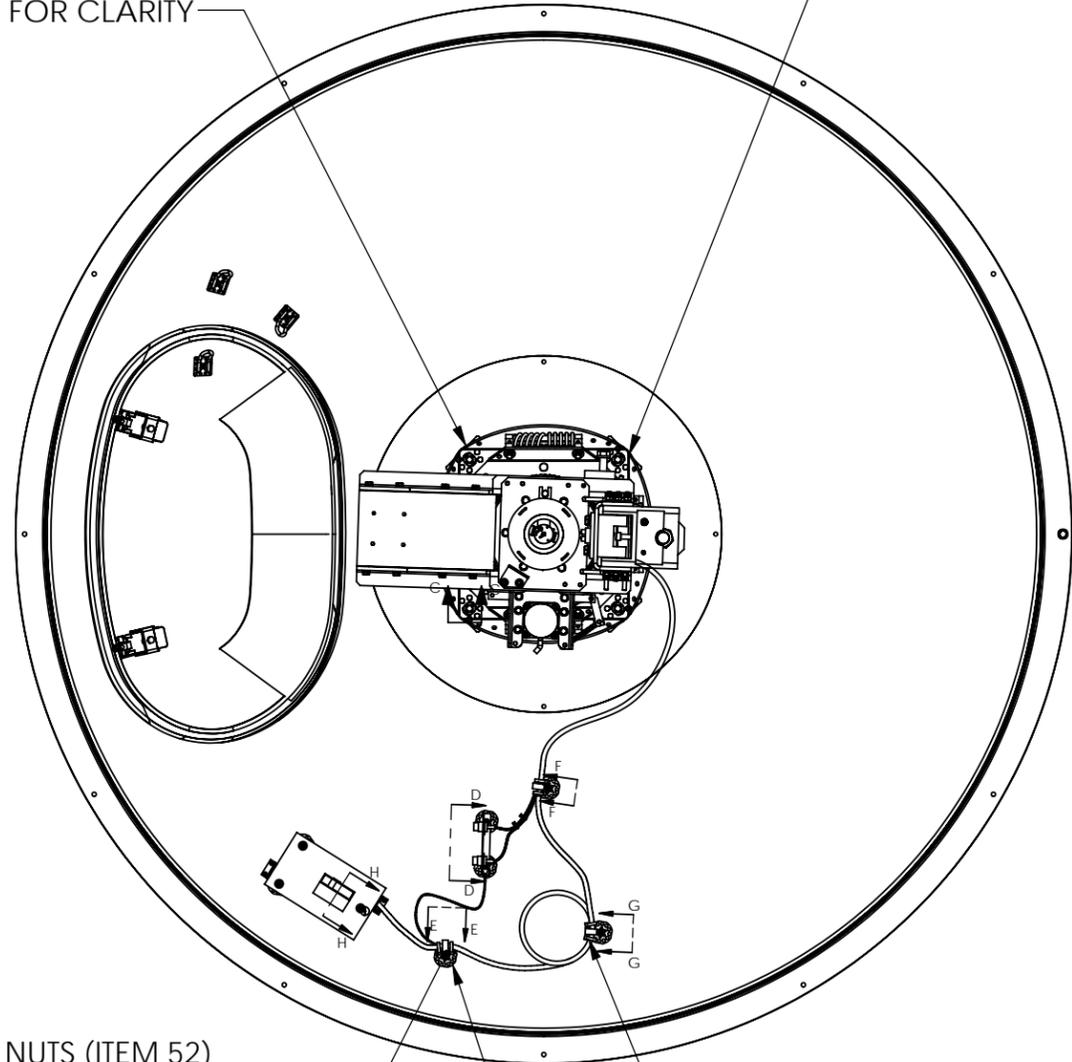
GENERAL ASS'Y

4X M12 X 60 SET SCREW
4X 1/2 FENDER WASHER
4X M12 HEX NUT
P/O ITEM 4.

VIEW C-C

C

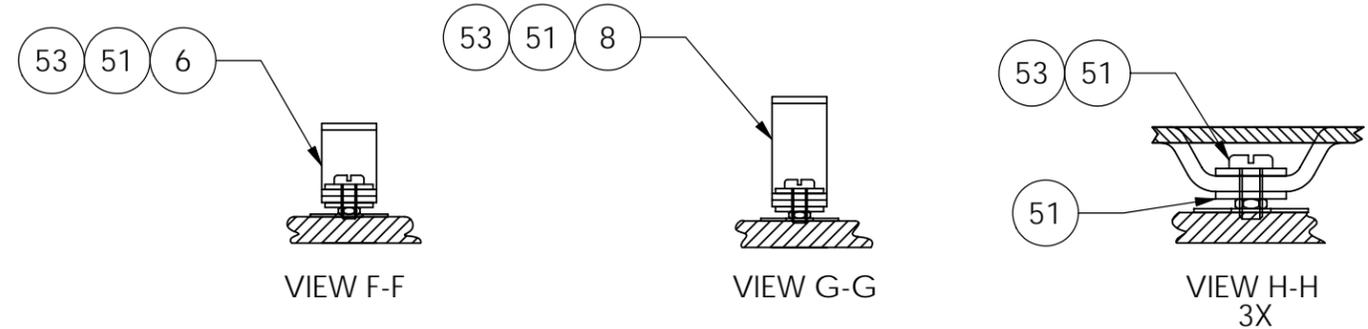
C



VIEW D-D

VIEW E-E

ADHERE BONDING NUTS (ITEM 52) TO RADOME BASE (ITEM 2) USING ITEM 10 PRIOR TO FINAL ASSEMBLY. PLACE AT APPROXIMATE LOCATIONS, ENSURE THERE IS NO INTERFERENCE WITH GA.



VIEW F-F

VIEW G-G

VIEW H-H
3X

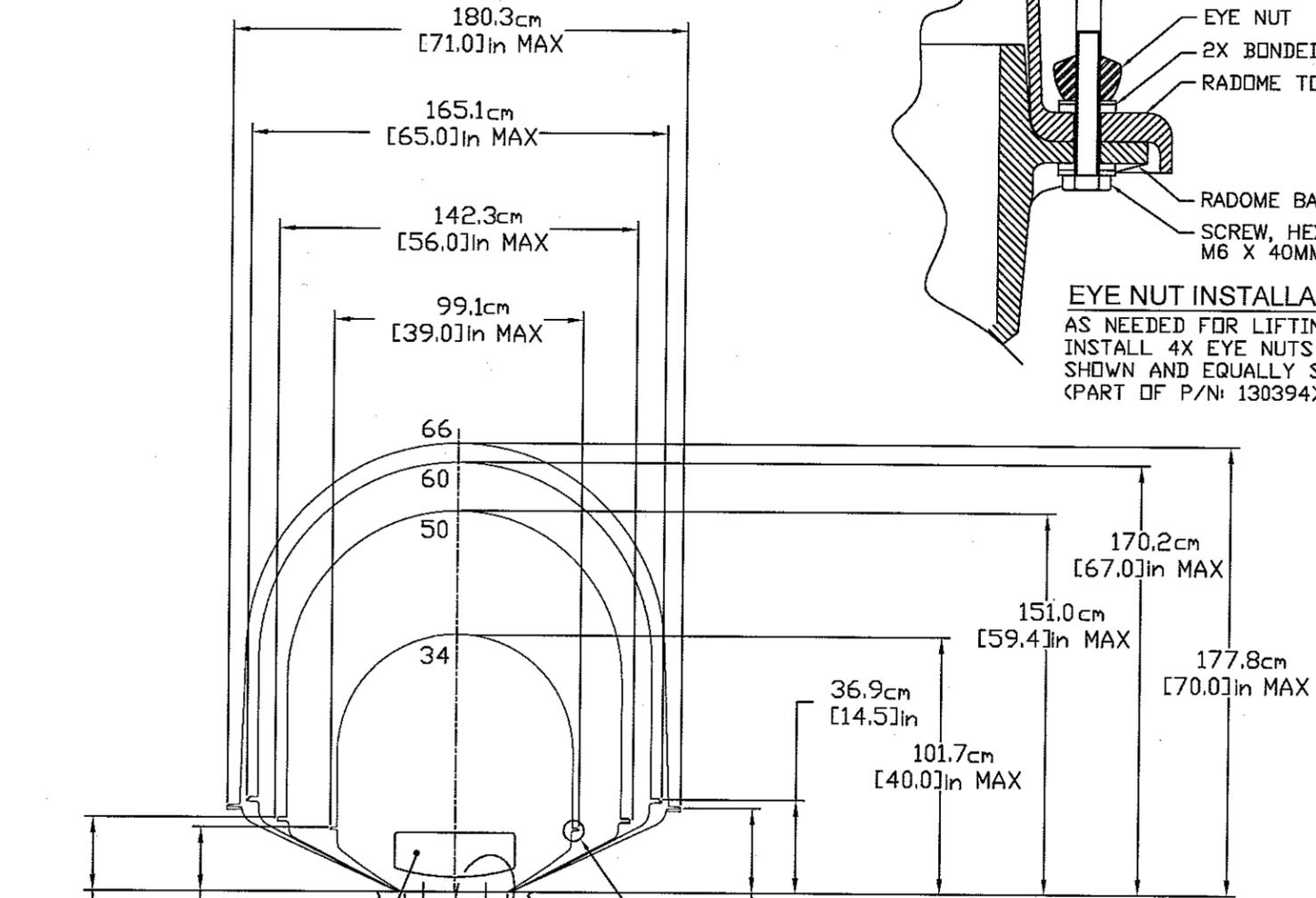
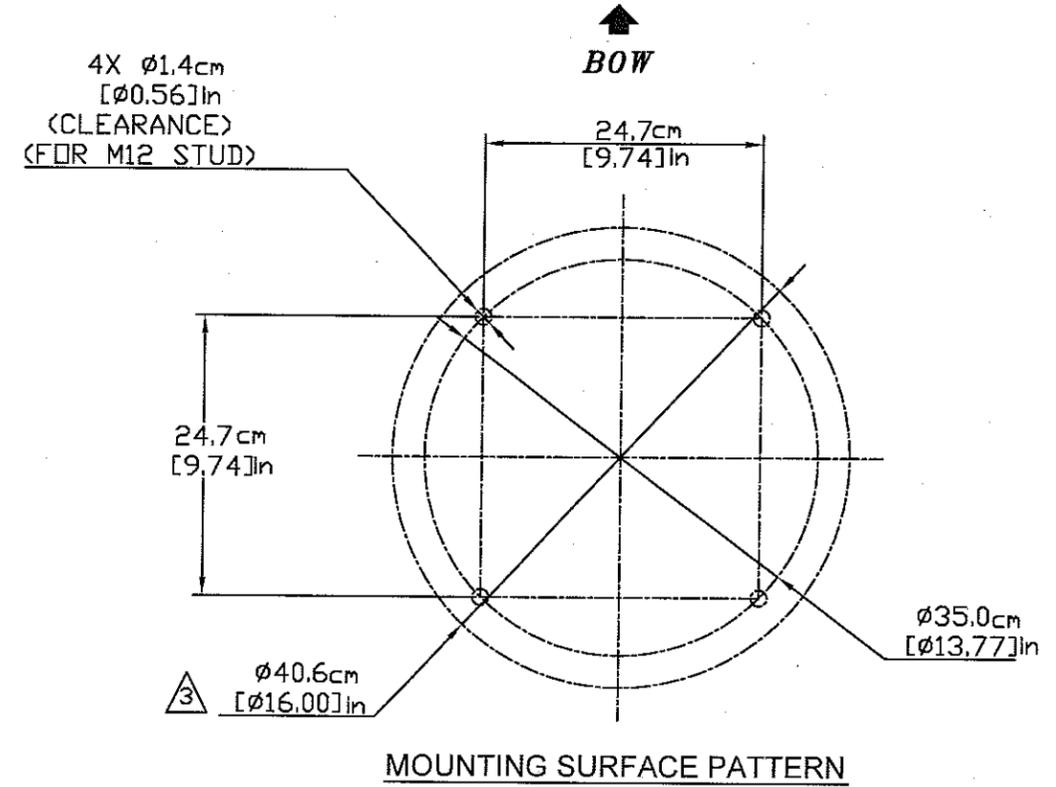
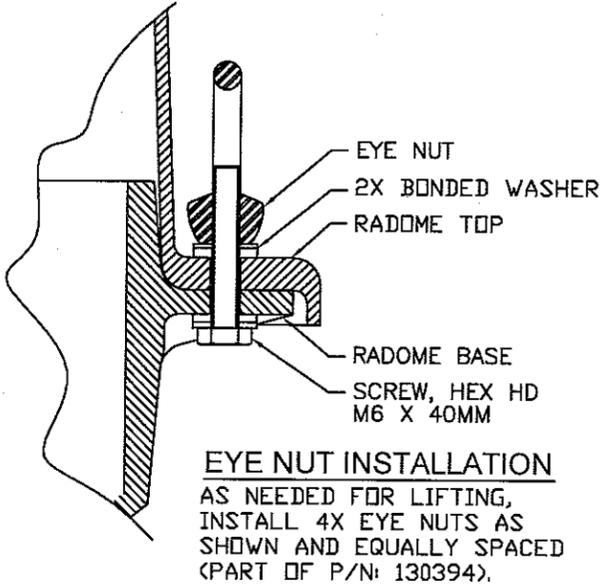
A

A

SIZE	SCALE:	DRAWING NUMBER	REV
B	1:12	129461	B
		SHEET NUMBER	2 OF 2

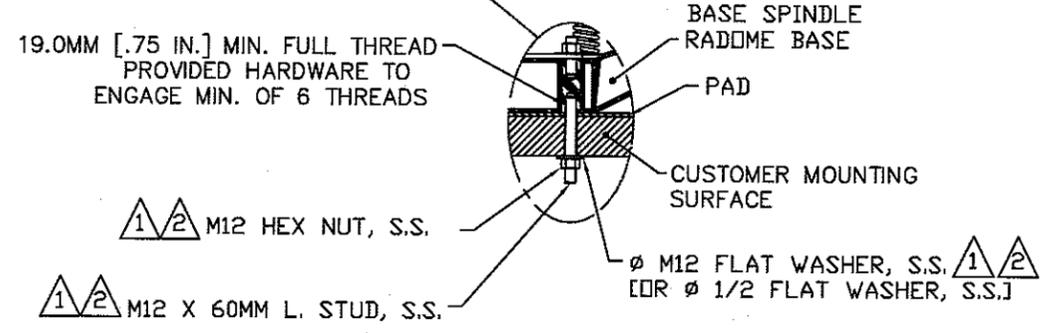
8 7 6 5 4 3 2 1

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	09-16-09	ADDED 50-IN OUTLINE, NOTE 5; RELEASED TO PRODUCTION; REV WS XL	AMN



FACTORY SETTINGS/TRIM ASSUME SYSTEM INSTALL WITH HATCH DIRECTLY AFT. IF NO 'HATCH', e.g. 34" RADOME, ASSUMED 'BOW' WILL BE MARKED.

SEE EYE NUT INSTALLATION



NOTES: UNLESS OTHERWISE SPECIFIED

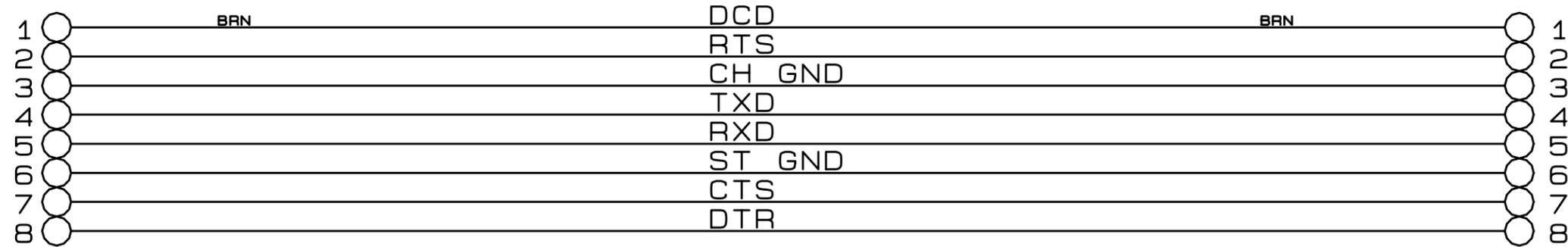
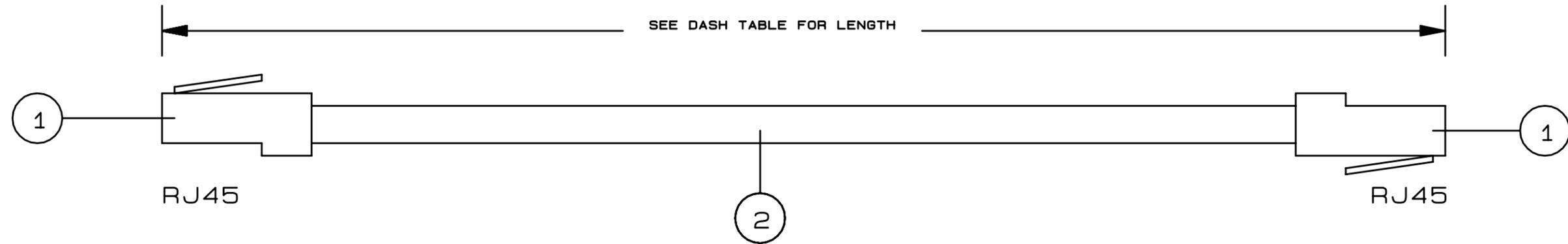
- ① INDICATED ITEMS ARE PART OF MOUNTING KIT P/N: 130394.
- ② APPLY ADHESIVE PER SEATEL SPEC. 121730. LOCTITE 271 (RED) PROVIDED WITH MOUNTING KIT, P/N 130394.
- ③ MINIMUM DIAMETER OF MAST MOUNTING PLATE EQUAL TO RADOME BASE DIAMETER.
- 4. REFER TO DOC. NO. 130040 FOR INSTALLATION GUIDELINES.
- 5. DIMENSIONS ARE IN CENTIMETERS, [INCHES IN PARENTHESES], TOLERANCE +/- .5MM.

REFERENCE DRAWINGS

129461 RADOME ASS'Y, 66-IN
130340 RADOME ASS'Y, 60-IN
129165 RADOME ASS'Y, 50-IN
125808 RADOME ASS'Y, 34-IN

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. X = ±1.50 X.X = ±0.50 X.XX = ±0.15 ANGLES: ±5°	DRAWN BY: HIEP T.	Sea Tel COBHAM Tel. 925-798-7979 Fax. 925-798-7986	
	DRAWN DATE: 05-28-09		
INTERPRET TOLERANCING PER ASME Y14.5M - 1994	APPROVED BY: <i>[Signature]</i>	TITLE: RADOME INSTALLATION	
MATERIAL: N/A	APPROVED DATE: 9/21/09	ARRANGEMENT	
FINISH: N/A	SIZE: B	SCALE: N/A	DRAWING NUMBER: 130450
3rd ANGLE PROJECTION		FIRST USED: XX06	REV: A
SHEET NUMBER: 1 OF 1			

REV.	ECO #	DATE	DESCRIPTION	BY:
A		05/14/01	INITIAL RELEASE	DD
B		04/29/01	ADDED MFG. & VENDOR COLUMN	MSF
C	3577	6-11-02	DASH -3 ADDED	MSF
C1	N/R	12-4-02	WRONG LM REMOVED FROM DWG	MSF
C2	N/R	2-5-03	-4 ADDED	MSF
C3	5804	9-11-07	-5 ADED	MSF



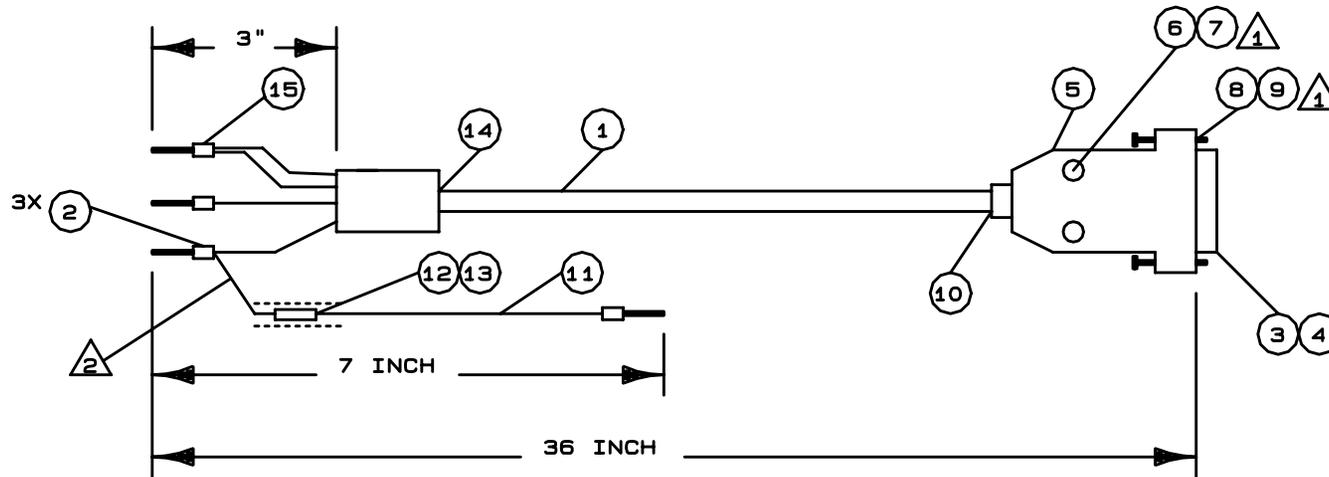
REFERENCE:

118203 CABLE ASSY, MODULAR CORD
117979 CONTROL CABLE, REMOTE A/C

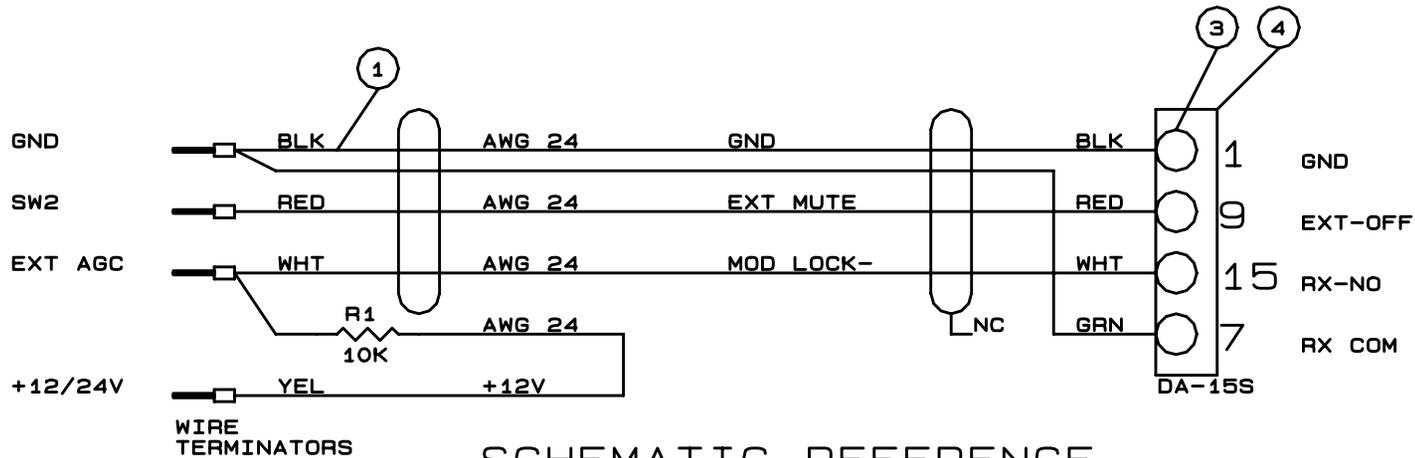
DASH NO.	DESCRIPTION	CABLE LENGTH
-1	EPIPE TO PDM INTERFACE BD.	6 INCHES
-2	EPIPE TO PDM INTERFACE BD.	8 INCHES
-3	EPIPE TO PDM INTERFACE BD.	4 INCHES
-4	EPIPE TO PDM INTERFACE BD.	7 INCHES
-5	TMS TO MODEM	60 INCHES

 Sea Seal Tel, Inc. CONCORD, CA		
SCALE:	APPROVED BY:	DRAWN BY: DD
DATE: 9-28-01		DWG SIZE:
TITLE: CABLE ASSEMBLY, RJ-45 SERIAL		
MODEL: MCM-8/MCM-3	SHEET 1 OF 1	DRAWING NUMBER 119478 REV. C3

REV	ECO#	DATE	DESCRIPTION	BY
A1		7-31-07	ADD PULLUP WIRE, NOTE 2. UPDATE NOTE 3.	PGB
B	5764	8-27-07	ITEM 2 WS 121899-24, QTY. WS 4; DIM 7" WS 6" ITEM 15 ADDED; ITEM 4 WS P/N 110935-36; ITEM 5 WS 112570-11; ITEM 11 WS 113345-084	MSF
B1	N/A	9-18-07	DA-15S PIN 7 WAS RX-NC	MSF



TO DAC
TERMINAL
MOUNTING
STRIP



TO CMD570/570L
SATELLITE MODEM

NOTES

1. DISCARD BACKSHELL HARDWARE AND REPLACE WITH STAINLESS STEEL HARDWARE INDICATED.
2. CRIMP ONE LEAD OF R1 IN WIRE TERMINATOR ALONG WITH WHT WIRE. SOLDER YEL WIRE TO OTHER LEAD OF R1. COVER WITH HS TUBE ITEM 13.
3. FOR DUAL PCB TMS ASS'Y, CONNECT YEL WIRE TO 12/24 TERMINAL ON 9 PIN TMS PCB. FOR SINGLE PCB TMS ASS'Y, INSTALL JP4 TO ENABLE PULL-UP ON 'EXT AGC'. REMOVE YEL WIRE AND R1.

Sea  Tel, Inc.
CONCORD, CA

SCALE:	APPROVED BY:	DRAWN BY: PGB
DATE: 7/25/07		DWG SIZE: A
TITLE: HARNESS ASSEMBLY, COMTECH MODEM INTERFACE		
MODEL:	SHEET 1 OF 1	DRAWING NUMBER 126877
		REV B1

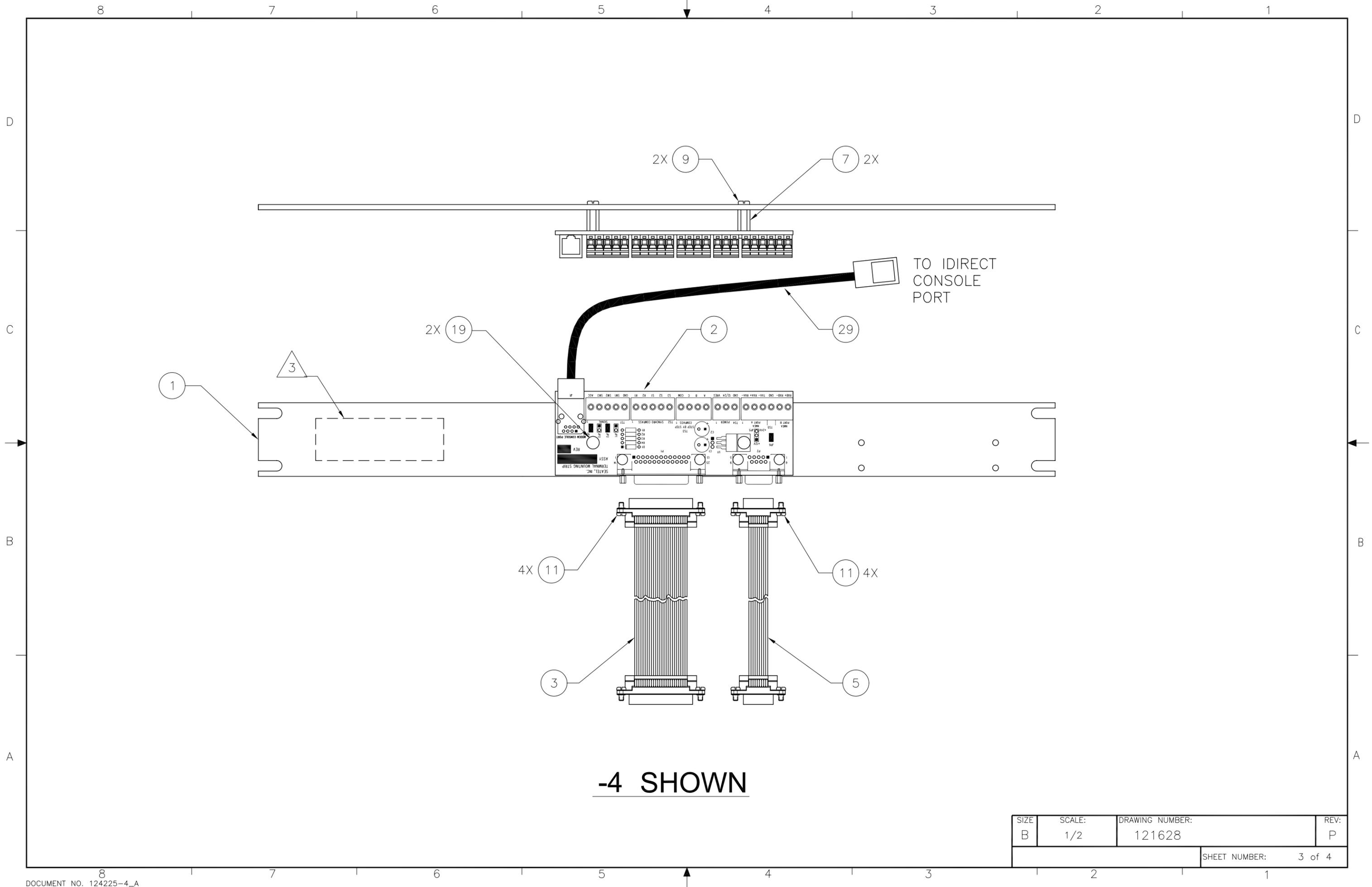
SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	112657	D	MACHINING, TERMINAL MOUNTING STRIP	
2	1 EA	126865-2	E	PCB ASS'Y, TERMINAL MOUNTING STRIP,	
3	1 EA	112936-36	D1	CABLE ASS'Y, D-SDB, 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.	
19	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S	
29	1 EA	119478-5	C3	CABLE ASS'Y, RJ-45 SERIAL, 60 IN.	
30	1 EA	126877	B1	HARNESS ASS'Y, COMTECH MODEM INTERFA	

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COBHAM

TERMINAL MOUNTING STRIP ASS'Y, ACU

PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 1 OF 1	DRAWING NUMBER 121628-4	REV P
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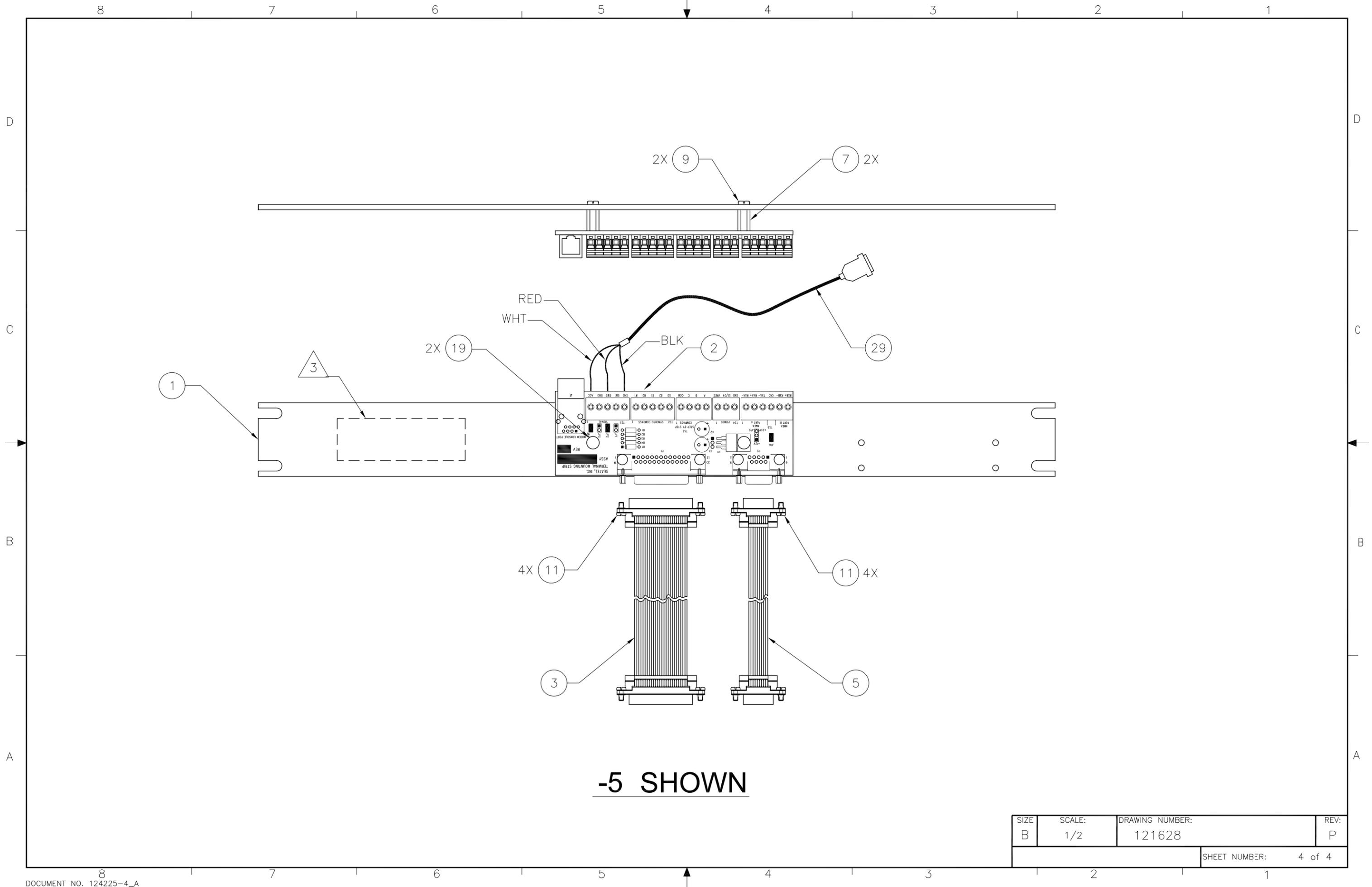
-4 SHOWN

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

SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	112657	D	MACHINING, TERMINAL MOUNTING STRIP	
2	1 EA	126865-2	E	PCB ASS'Y, TERMINAL MOUNTING STRIP,	
3	1 EA	112936-36	D1	CABLE ASS'Y, D-SDB, 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.	
19	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S	
29	1 EA	126877	B1	HARNESS ASS'Y, COMTECH MODEM INTERFA	

<h1>Sea Tel</h1> <p><i>COBHAM</i></p>				
TERMINAL MOUNTING STRIP ASS'Y, ACU				
PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 1 OF 1	DRAWING NUMBER 121628-5	REV P



-5 SHOWN

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

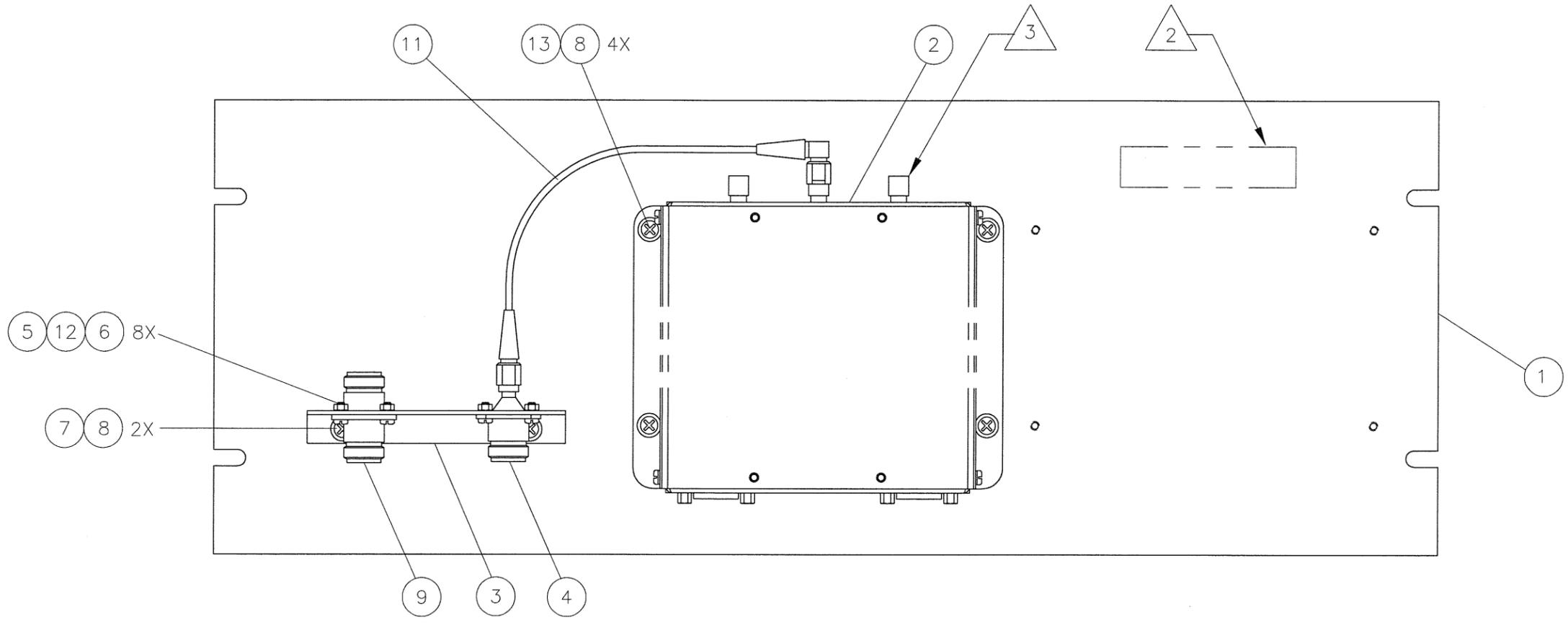
SINGLE LEVEL MFG BILL OF MATERIAL

FIND	QTY	PART NO	REV	DESCRIPTION	REFERENCE DESIGNATOR
1	1 EA	116880	F	PANEL MACHINING, RACK, BASE MUX	
2	1 EA	129613-2	A	MODEM ASS'Y, 400MHZ FSK, 3 CH, BDE,	
3	1 EA	116388	D	BRACKET, CONNECTOR	
4	1 EA	115492-1	C1	ADAPTER, N(F)-SMA(F), W/FLANGE	
5	8 EA	114588-107		SCREW, PAN HD, PHIL, 4-40 x 5/16, S.	
6	8 EA	114583-005		NUT, HEX, 4-40, S.S.	
7	2 EA	114588-144		SCREW, PAN HD, PHIL, 6-32 x 1/4, S.S	
8	6 EA	114580-007		WASHER, FLAT, #6, S.S.	
9	1 EA	110567-19		ADAPTER, N(F)-N(F), STRAIGHT, FLANGE	
11	1 EA	113303-10	S	CABLE ASS'Y, SMA 90 - SMA (M), 8 IN	
12	8 EA	114580-005		WASHER, FLAT, #4, S.S.	
13	4 EA	114588-145		SCREW, PAN HD, PHIL, 6-32 x 5/16, S.	

<h1 style="margin: 0;">Sea Tel</h1> <p style="margin: 0;"><i>COBHAM</i></p>				
<p>BASE MUX RACK PANEL ASS'Y, 400MHZ, RS-232</p>				
PROD FAMILY COMMON	EFF. DATE 9/9/2009	SHT 1 OF 1	DRAWING NUMBER 129710-1	REV A1

8 7 6 5 4 3 2 1

REVISION HISTORY				
REV	ECO#	DATE	DESCRIPTION	BY
A	N/A	4-2-09	RELEASED TO PRODUCTION WAS REV. X1	MSF
A1	N/A	8-4-09	ADDED -2.	K.D.H.



- NOTES:
- 1. APPLY ADHESIVE PER SEA TEL SPEC. 121730
 - 2. IDENTIFY PER SEA TEL SPEC. 122930 APPROXIMATELY WHERE SHOWN.
 - 3. DASH 2 (4 CHANNEL) ONLY.

DASH	DESCRIPTION
-1	3 CHANNEL
-2	4 CHANNEL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994	DRAWN BY: KRB	Sea Tel <small>COBHAM</small> Tel. 925-798-7979 Fax. 925-798-7986
	DRAWN DATE: 01/23/09	
MATERIAL: N/A	APPROVED BY: <i>[Signature]</i>	TITLE: BASE MUX RACK PANEL ASS'Y, 400 MHZ, RS-232
FINISH: N/A	APPROVED DATE: 8-4-09	DRAWING NUMBER: 129710
SIZE: B	SCALE: 1/2	REV: A1
3rd ANGLE PROJECTION	FIRST USED: xx09	SHEET NUMBER: 1 OF 1

D
C
B
A

D
C
B
A

8 7 6 5 4 3 2 1