



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



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The Series 97 Family of Marine Stabilized Antenna Pedestals with DAC-97 Antenna Control Unit complied with the requirements of European Norms and European Standards EN 60945 (1997) and prETS 300 339 (1998-03) on July 20, 1999. Sea Tel document number 119360 European Union Declaration of Conformity for Marine Navigational Equipment is available on request.

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Sea Tel®
Marine Stabilized Antenna Systems
European Union Declaration of Conformity
Marine Navigational Equipment

The EU Directives Covered by this Declaration:

European Norms and European Standards EN 60945 (1997) and prETS 300 339 (1998-03).

The Product Covered by this Declaration:

Series 00 Family of Marine Stabilized Antenna Pedestals with DAC-97 Antenna Control Unit.

The Basis on which Conformity is being Declared:

The product identified above complies with the requirements of the above EU Directives by meeting the following standards:

*** EN 60945 (1997) "Marine Navigational Equipment - General Requirements – Methods of Testing and Required Test Results":**

- Conducted Emissions (Clause 9.1 & 9.2)
- Radiated Emissions (Clause 9.1 & 9.3)
- Conducted Low Frequency (Audio) Interference (Clause 10.1 & 10.2)
- Conducted Radio Frequency Interference (Clause 10.3) & IEC 1000-4-6 (1995)
- Radiated Radio Frequencies (Clause 10.4) & IEC 1000-4-3 (1995)
- Fast Transients on Signal/Control Lines (Clause 10.5) & IEC 1000-4-4 (1995)
- Surges on AC Power Lines (Clause 10.6) & IEC 1000-4-5 (1995)
- Power Supply Short-Term Variation (Clause 10.7)
- Power Supply Failure (Clause 10.8)
- Electrostatic Discharge (Clause 10.9) & IEC 1000-4-2 (1995)
- Compass Safe Distance (Clause 11.2, Measurement Only)

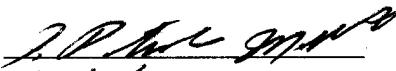
*** prETS 300 339 (1998-03) Electromagnetic compatibility and Radio spectrum Matters (ERM); General ElectroMagnetic Compatibility (EMC) for Radio Communications Equipment.**

- RF Radiated Field Immunity (Clause 9.3)
- RF Common Mode Immunity (Clause 9.4, 9.5 & 9.6)

The technical documentation required to demonstrate that this product meets the requirements of the EMC Directive has been compiled by the signatory below and is available for inspection by the relevant enforcement authorities. The CE mark was first applied in 2004.

Authority: Mr. J. Patrick Matthews
President

Signature:
Date:


4/16/04

Attention

The attention of the specifier, purchaser, installer or user is drawn to special measures and limitations to use which must be observed when the product is taken into service to maintain compliance with the above directives. Details of these special measures and limitations are in the product manual.

TVRO LNBs which are mounted on the Marine Stabilized Antenna Pedestal must be CE marked separately by the manufacturer of those components.



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1. Introduction



WARNING: *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.*

The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.

1.1. General Description of system

Your Series 00 system is a fully stabilized antenna that has been designed and manufactured so as to be inherently reliable, easy to maintain, and simple to operate. Except for start-ups, or when changing to operate with different transponders or satellites, the equipment essentially permits unattended operation.

1.2. Purpose

This shipboard Transmit-Receive (TXRX) system provides you with two-way satellite voice/data communications while underway on an ocean-going vessel. This can be used to provide a wide variety of telephone, fax and data applications. Your Antenna system can transmit to and receive from any desired satellite which has adequate signal coverage in your current geographic area. Your antenna may be fitted with appropriate Transmit & Receive RF Equipment and appropriate Feed to allow you to operate in linear or circular polarization mode at C-Band frequencies. This input will be distributed to your satellite modem and then to all of your other below decks equipment.

1.3. System Components

Your 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.

For more information about these components, refer to the Basic System Information section of this manual.

A. Above-Decks Equipment (ADE) Group

1. Stabilized antenna pedestal
2. Antenna Reflector
3. Feed Assembly with LNA(s)
4. C-Band Radio Package(s)
5. C-Band High Power Amplifier(s)
6. Radome Assembly

B. Below-Decks Equipment Group

7. Antenna Control Unit

8. Splitter with desired number of outputs (one output to the ACU and one output to the Satellite Modem are required).
9. Satellite Modem and other below decks equipment required for the desired communications purposes.
10. Spectrum Analyzer (Optional)
11. Control, RF and Video cables



1.4. General scope of this manual

This manual describes the Sea Tel Series 00 Antenna (also called the Above Decks Equipment), its' operation and installation. Refer to the manual provided with your Antenna Control Unit for its' installation and operating instructions.

1.5. Quick Overview of contents

The information in this manual is organized into chapters. Operation, basic system information, installation, setup, functional testing, maintenance, specifications and drawings relating to this Antenna are all contained in this manual

2. Operation

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|  | <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 - 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> |

2.1. System Power-up

Turn the power switch mounted in the aft louvered panel of the antenna pedestal ON. This will energize the antenna pedestal and the RF equipment.

2.2. Antenna Initialization

A functional operation check can be made on the antenna stabilization system by observing its behavior during the 4 phases of initialization.

Turn the pedestal power supply ON. The PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps (listed below) to initialize the antenna. These phases initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions.

Initialization is completed in the following phases, each phase must complete properly for the antenna to operate properly (post-initialization).

1. Level Cage is driven CCW, issuing extra steps to assure that the cage is all the way to the mechanical stop. Then the Level cage will be driven exactly 45.0 degrees CW.
2. Elevation axis activates - Input from the LV axis of the tilt sensor is used to drive the Elevation of the equipment frame to bring the tilt sensor LV axis to level (this results in the dish being at an elevation angle of 45.0 degrees).
3. Cross-Level axis activates - Input from the CL axis of the tilt sensor is used to drive Cross-Level of the equipment frame to bring the cross-level axis of the tilt sensor to level (this results in the tilt of the Cross-Level Beam being level).
4. Azimuth axis activates - Antenna drives in azimuth until the "Home Flag" signal is produced. This signal is produced by a Home Switch hitting a cam or by a Hall Effect sensor in close proximity to a Magnet.

This completes the phases of initialization. At this time the antenna elevation should 45.0 degrees and Relative azimuth should be at be at home flag (home switch engaged on the home flag cam).

If any of these steps fail, or the Antenna Control Unit reports model number as "xx97" re-configure the PCU as described in section the Setup section of this manual. If initialization still fails, refer to the troubleshooting section of this manual.

2.3. Antenna Stabilization

After initialization has completed, real-time stabilization of the antenna is an automatic function of the PCU.

2.4. Stabilized Pedestal Assembly Operation

Operation of the stabilized antenna Pedestal Control Unit (PCU) is accomplished remotely by the Antenna Control Unit (ACU). Refer to the Operation section of the Antenna Control Unit manual for more specific operation details. There are no other operating instructions applicable to the pedestal assembly by itself.

2.5. Tracking Operation

Tracking optimizes the antenna pointing, in very fine step increments, to maximize the level of the satellite signal being received. The mode of tracking used in this antenna is a variation of Conical Scanning called DishScan.

DishScan continuously drives the antenna in a very small circular pattern at 60 RPM. The ACU evaluates the received signal throughout each rotation to determine where the strongest signal level is (Up, Right, Down or Left) and issues the appropriate Azimuth and/or Elevation steps to the antenna, as needed.

You cannot control tracking from the pedestal itself. Refer to the ACU manual for tracking operation information.

2.6. Antenna Polarization Operation

Linear feeds are equipped with a polarization motor and potentiometer feedback and are controlled from the Antenna Control Unit. When using a linear polarized feed, you should set the POL TYPE parameter in the ACU to 0072 (Auto-Polarization – this mode is the default polarization mode of operation from the ACU).

Circular feeds do NOT require periodic polarization adjustment as the ship travels, but must be assembled correctly for LHCP or RHCP polarization operation (refer to the maintenance section of this manual). When using a circular polarized feed, you should set the POL TYPE parameter in the ACU to 0000.

2.7. RF Equipment

The RF Equipment is not operated or controlled by the antenna pedestal or Antenna Control Unit. Refer to the Paradise manuals for the RF Equipment provided with your system.

You may also have Paradise software installed in a below-decks computer which is used to control the RF equipment that is mounted on your antenna pedestal.

2.8. Radome Assembly Operation

When operating the system it is necessary that the radome access hatch (and/or side door) be closed and secured in place at all times. This prevents rain, salt water and wind from entering the radome. Water and excessive condensation promote rust & corrosion of the antenna pedestal. Wind gusts will disturb the antenna pointing.

There are no other operating instructions applicable to the radome assembly by itself.

2.9. FCC TX Mute Function

FCC TX Mute function provides a transmit inhibit, or mute, signal to the Satellite Modem to disable transmit whenever the antenna is blocked, searching, targeting or is mispointed 0.5 degrees from peak satellite position. This functionality is provided by software in the ACU & PCU. Hardware wiring connection between the ACU Terminal Mounting Strip and the Satellite Modem and proper setup of the ACU "SYSTEM TYPE" parameter are also required for this function to operate properly.

After being properly installed and setup correctly the FCC TX Mute function operation is automatic, therefore, requires no operator intervention. Refer to the Installation and Setup chapters in this manual and in your Antenna Control Unit manual.

2.10. Switching Active/Standby RF Equipment

2.10.1. Transmit Switching

Please refer to your Paradise manual(s) for procedures you will use to remotely control the Transmit path RF Equipment mounted on the antenna pedestal.

2.10.2. Receive Path Switching

The receive path switching is controlled through the Antenna Control Unit. This band selections displayed are set by the TRACK DISP parameter. Your default value is 0060. Press the **NEXT** key on the front panel of the ACU to access the TRACKING window. Select the appropriate receive signal path by pressing the **DOWN** arrow as needed (refer to the Operation chapter of the ACU manual *MODE – TRACKING – BAND SELECTION*). The TRACKING display selections are:

| | |
|-------|----------------------------|
| LNB A | selects receive from LNB A |
| LNB B | selects receive from LNB B |
| LNB A | selects receive from LNB A |
| LNB B | selects receive from LNB B |

This selection remotely controls the Shielded Polang Relay Assembly to actuate an RF Switch to select which low noise block converter is providing receive signal through the dual channel rotary joint to the below decks equipment.

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3. Basic System Information

This section is intended to provide you with some basic information about satellites, your antenna system and some of the other equipment that may be used in your system configuration.

3.1. **Satellite Basics**

The satellites are in orbit at an altitude of 22,754 miles and are positioned directly above the equator. Their orbital velocity matches the Earth's rotational speed, therefore, each appears to remain at a fixed position in the sky (as viewed from your location).

Your antenna can be used with any of the satellites in this orbit that have a strong enough receive signal level. Your antenna is capable of being fitted with a Linear or Circular feed assembly. The feed may be designed to operate at C-Band frequencies, Ku-Band frequencies or be capable of operation in both bands. With the correct feed assembly you will be able to receive the linear or circular signal at the specific frequency range of the desired satellite.

3.1.1. **C-Band Receive Frequency (3.7-4.2GHz)**

At these frequencies the signal from the satellite travels only in a straight line and is affected by weather changes in the atmosphere. There are several conditions that can cause a temporary loss of satellite signal, even within an area where the signal level is known to be adequate. The most common of these *normal* temporary losses are **blockage** and **rain fade**. They will interrupt services only as long as the cause of the loss persists.

3.1.2. **Blockage**

Blockage is loss due to an object in the path of the signal from the satellite to the dish. If an object that is large and dense is positioned in the path of the signal from the satellite, it will prevent sufficient signal from arriving at the dish. The signal can not bend around, or penetrate through, these objects and the reception will be degraded or completely interrupted. The dish is actively driven to remain pointed at the satellite (toward the equator) so, as the ship turns a mast or raised structure of your ship may become positioned between the satellite and the dish. Blockage may also be caused by anything standing near the radome, tall mountains, buildings, bridges, cranes or other larger ships near your ship. Moving or rotating the ship to position the antenna where it has an unobstructed view to the desired satellite will restore the antennas' ability to receive the satellite signal.

3.1.3. **Rain Fade**

Atmospheric conditions that may cause sufficient loss of signal level include rain, snow, heavy fog and some solar activities (sun spot and flare activity). The most common of these is referred to as "rain fade". Rain drops in the atmosphere reduce the signal from the satellite. The heavier the rain the higher the amount of signal loss. When the amount of loss is high enough, the antenna will not be able to stay locked onto the satellite signal. When the amount of rain has decreased sufficiently, the antenna will re-acquire the satellite signal. In a strong signal area, rain fall of about four inches per hour will cause complete loss of signal. In weaker signal areas the effects would be more pronounced.

3.1.4. Signal level

The level of the receive signal is dependant upon how powerful the transmission is, how wide the signal beam is, and what the coverage area is. Focusing the signal into a narrower beam concentrates its energy over a smaller geographic area, thereby increasing the signal level throughout that area of coverage. This makes it possible for you to use a smaller antenna size to receive that satellite signal. The antenna system must be geographically located in an area where the signal level from the satellite meets (or exceeds) the minimum satellite signal level required for your size of antenna (refer to the Specifications section of this manual) to provide suitable reception. This limits the number of satellites that can be used and the geographic areas where the ship can travel where the signal level is expected to be strong enough to continue providing uninterrupted reception. When traveling outside this minimum signal coverage area, it is normal for the system to experience an interruption in its ability to provide the desired satellite services until entering (or re-entering) an area of adequate signal level.

3.1.5. Satellite Footprints

The focused beam(s) from the satellites are normally aimed at the major land masses where there are large population centers. Footprint charts graphically display the signal level expected to be received in different geographic locations within the area of coverage. The signal will always be strongest in the center of the coverage area and weaker out toward the outer edges of the pattern. The coverage areas are intended to be a guide to reception, however, the actual coverage area and signal level and vary. Also the signal strength is affected by weather.

3.1.6. Satellite Circular Polarization

When the satellite you are using is transmitting circular polarized satellite transmissions, you will need to set up your feed assembly for RHCP or LHCP to match the "polarization" of your antenna to the satellite. No other adjust is need on the "polarization" during antenna operation

3.2. Antenna Basics

The following information is provided to explain some of the basic functions of the antenna:

3.2.1. Unlimited Azimuth

Azimuth rotation of the antenna is unlimited (no mechanical stops). Azimuth drive, provided by the azimuth motor, is required during stabilization, searching and tracking operations of the antenna. When the ship turns, azimuth is driven in the opposite direction to remain pointed at the satellite. The actual azimuth pointing angle to the satellite is determined by your latitude & longitude and the longitude of the satellite. It is important to know that the antenna should be pointed (generally) toward the equator.

The azimuth angle to the satellite would be 180 degrees true (relative to true north) if the satellite is on the same longitude that you are on. If the satellite is east, or west, of your longitude the azimuth will be less than, or greater than 180 degrees respectively.

When checking for blockage you can visually look over the antenna radome toward the equator to see if any objects are in that sighted area. If you are not able to find any satellites it may also be useful to remove the radome hatch to visually see if the dish is aimed the correct direction (towards the equator).

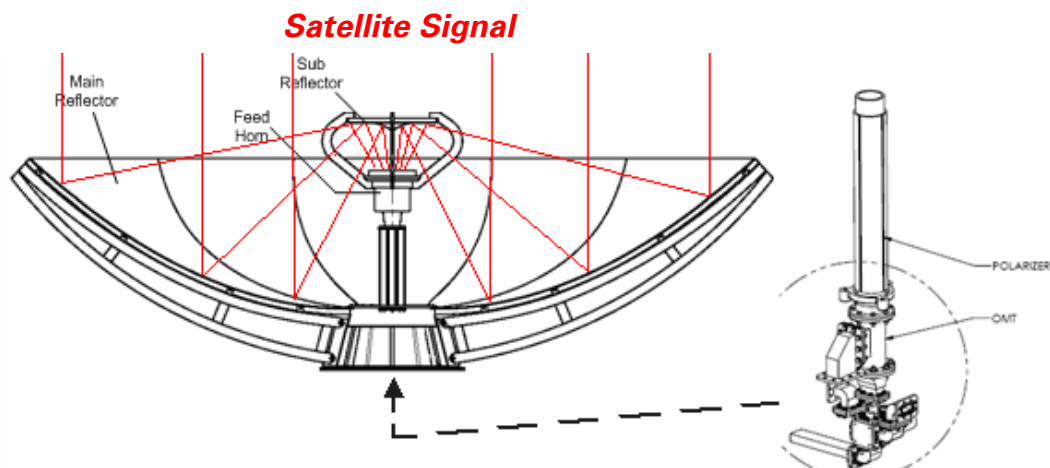
3.2.2. Elevation

In normal operation the elevation of the antenna will be between 00.0 (horizon) and 90.0 (zenith). The antenna can physically be rotated in elevation below horizon and beyond zenith to allow for ship motion. Elevation drive, provided by the elevation motor, is required during stabilization, searching and tracking operations of the antenna. The actual elevation pointing angle to the satellite is determined by your latitude & longitude and the longitude of the satellite. In general terms the elevation angle will be low when you are at a high latitudes and will increase as you get closer to the equator.

Additionally, from any given latitude, the elevation will be highest when the satellite is at the same longitude that you are on. If the satellite is east, or west, of your longitude the elevation angle will be lower.

3.2.3. The 3.7 meter antenna

The signal from the satellite bounces off of the main reflector, is focused up to and reflects off of the sub-reflector and is focused down into the feed assembly. It then passed through the phase card polarizer where the circular polarization is converted into linear and is passed into the OMT (Ortho Mode Transducer). The receive signal from the polarizer is sent out the RX Port of the OMT. The transmit signal enters the TX port on the OMT is converted to circular by the phase card polarizer, emits out of the feed, reflects off of the sub-reflector and then off of the main reflect and is radiated out to the satellite.



3.2.3.1. Feed Assembly

The Suman 3.7 meter feed is circular polarized. You must manually adjust the position of the OMT on the Polarizer to select either LHCP Left Hand circular polarization or RHCP Right Hand polarization required by the satellite.

The receive port of the OMT has a 60 dB TX reject filter to protect the LNA.

3.2.4. Antenna polarization

The Suman 3.7 meter feed is circular polarized. You must manually align the position of the OMT on the Polarizer to set the Transmit (or Receive) port to the either Left Hand Circular Polarity (LHCP) or Right Hand Circular Polarity (RHCP) as required by the satellite.

3.2.5. Stabilization

Your antenna is stabilized in all three axes of motion. Stabilization is the process of de-coupling the ships' motion from the antenna. Simply put, this allows the antenna to remain pointed at a point in space while the boat turns, rolls or pitches under it. To accomplish this, the Pedestal Control Unit (PCU) on the antenna pedestal assembly senses the motion and applies drive to the appropriate motor(s) in opposition to the sensed motion. Azimuth (AZ), Elevation (EL) and Cross-Level (left-right tilt) are actively stabilized automatically by the PCU as part of its normal operation.

3.2.6. Search Pattern

Whenever the desired satellite signal is lost (such as when the antenna is blocked) the Antenna Control Unit will automatically initiated a Search to re-acquire the desired signal.

Search is conducted in a two-axis pattern consisting of alternate movements in azimuth and elevation. The size and direction of the movements are increased and reversed every other time resulting in an expanding square pattern.

When the antenna is able to re-acquire the desired signal the ACU will automatically stop searching and begin Tracking the signal to optimize the pointing of the antenna to get the highest signal level from the satellite.

3.2.7. Tracking Receiver – Single Channel Per Carrier Receiver

The SCPC Narrow Band Receiver located in the Antenna Control Unit (ACU) is used to acquire, identify and track a narrow band carrier, or beacon signal, or the desired satellite. When properly setup, the settings for the satellite are saved to expedite future acquisition of the desired satellite. The system must have adequate satellite signal level to stop searching (and begin tracking the acquired satellite).

3.2.8. Tracking

Your Antenna Control Unit actively optimizes the pointing of the dish for maximum signal reception. This process is called **tracking** and is accomplished by continuously making small movements of the dish while monitoring the level of the received signal. Evaluation of this information is used to continuously move the stabilization point toward peak satellite signal reception. These minor pointing corrections keep the signal level "peaked" as part of normal operation.

3.3. Components of the System Configuration

The following text provides a basic functional overview of the system components and component interconnection as referred to in the simplified block diagram (see drawings section of this manual).

3.3.1. Antenna ADE Assembly

The Above Decks Equipment consists of an Antenna Pedestal inside a Radome assembly. The pedestal consists of a satellite antenna dish & circular feed assembly, redundant RF components and RF path switching components mounted on a stabilized antenna pedestal. The radome provides an environmental enclosure for the antenna pedestal assembly inside it. This keeps wind, water condensation and salt-water spray off the antenna pedestal assembly. This prevents damage and corrosion that would shorten the expected life span of the equipment.

Two coaxial cables are connected from the antenna radome assembly to the below decks equipment. One of these cables includes the Antenna Control signaling and IF, the other cable carries the other IF signal.

These cables ultimately provide the input/output signals into/out of the satellite modem.

3.3.2. Antenna Control Unit

The Antenna Control Unit allows the operator to control and monitor the antenna pedestal with dedicated function buttons, LED's and a 2 line display. The ACU and its Terminal Mounting Strip are normally mounted in a standard 19" equipment rack. The ACU should be mounted in the front of the equipment rack where it is easily accessible. The Terminal Mounting Strip is normally mounted on the rear of the equipment rack. It is recommended that the antenna control unit be mounted near the Satellite modem location where you can see the LED indicators while you are controlling the antenna.

The Antenna Control Unit is connected to the antenna, ships Gyro Compass and Satellite modem.



Figure 3-1 Antenna Control Unit

The Antenna Control Unit (ACU) communicates via an RS-422 full duplex data link with the Pedestal Control Unit (PCU) located on the antenna. This control signal to/from the antenna is on the Coax cable along with the L-Band Receive IF from the LNB. The Pedestal Control Unit stabilizes the antenna against the ship's roll, pitch, and turning motions. The ACU is the operator interface to the PCU and provides the user with a choice of positioning commands to point the antenna, search commands to find the satellite signal and tracking functions to maintain optimum pointing. The operator may choose to work from either the front panel, using the M&C Port in conjunction with DacRemP remote diagnostic software, or the built in Ethernet port and an internal HTML page using a standard internet browser .

3.3.3. Above Decks AC Power Supply

Power for the Antenna Pedestal and RF Equipment (TX/RX Systems ONLY) - The AC Voltage required for the 14600 antenna is 220 VAC due to the current draw required to operate the antenna pedestal and all of the RF Equipment mounted to it. Total power consumption will depend on the number of type of transceivers and amplifiers used. Refer to the Paradise equipment manuals to determine the total **MAX** power consumption your RF equipment. The pedestal itself requires only 290 watts.

Sea Tel Recommends that the AC voltage source be well regulated and surge protected. An Uninterrupted Power Supply is preferred, usually installed (below decks) to provide adequately regulated power for the antenna pedestal, especially if RF Equipment is installed on the pedestal.

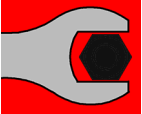
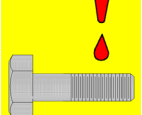
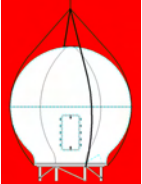
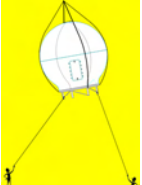


Marine Air Conditioner Unit (TX/RX Systems ONLY) - If a marine air conditioner is included with your system, the AC voltage source **should be from a separate AC Power breaker source than the antenna pedestal**. AC power for the air conditioner should be well regulated and surge protected, but does NOT need to from an Uninterrupted Power Supply. Refer to the marine air conditioner manual for its' power requirements and consumption specifications.




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4. Installation

This section contains instructions for unpacking, final assembly and installation of the equipment. It is highly recommended that final assembly and installation of the Antenna system be performed by trained technicians. Read this complete section before starting.

4.1. General Cautions & Warnings

|  | <p>WARNING: Assure that all nut & bolt assemblies are tightened according the tightening torque values listed below:</p> <table border="1" data-bbox="511 640 1230 840"> <thead> <tr> <th>Bolt Size</th> <th>Inch Pounds</th> </tr> </thead> <tbody> <tr> <td>1/4-20</td> <td>75</td> </tr> <tr> <td>5/16-18</td> <td>132</td> </tr> <tr> <td>3/8-16</td> <td>236</td> </tr> <tr> <td>1/2-13</td> <td>517</td> </tr> </tbody> </table> | Bolt Size | Inch Pounds | 1/4-20 | 75 | 5/16-18 | 132 | 3/8-16 | 236 | 1/2-13 | 517 | | |
|---|---|-----------|-------------|--------|-----------------------------------|---------|--------------------------------|--------|---|--------|---|-----|---|
| Bolt Size | Inch Pounds | | | | | | | | | | | | |
| 1/4-20 | 75 | | | | | | | | | | | | |
| 5/16-18 | 132 | | | | | | | | | | | | |
| 3/8-16 | 236 | | | | | | | | | | | | |
| 1/2-13 | 517 | | | | | | | | | | | | |
|  | <p>NOTE: All nuts and bolts should be assembled using the appropriate Loctite thread-locker product number for the thread size of the hardware.</p> <table border="1" data-bbox="511 955 1500 1203"> <thead> <tr> <th>Loctite #</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>222</td> <td>Low strength for small fasteners.</td> </tr> <tr> <td>243</td> <td>Medium strength, oil tolerant.</td> </tr> <tr> <td>680</td> <td>High strength for Motor Shafts & Sprockets.</td> </tr> <tr> <td>271</td> <td>Permanent strength for up to 1" diameter fasteners.</td> </tr> <tr> <td>290</td> <td>Wicking, High strength for fasteners which are already assembled.</td> </tr> </tbody> </table> | Loctite # | Description | 222 | Low strength for small fasteners. | 243 | Medium strength, oil tolerant. | 680 | High strength for Motor Shafts & Sprockets. | 271 | Permanent strength for up to 1" diameter fasteners. | 290 | Wicking, High strength for fasteners which are already assembled. |
| Loctite # | Description | | | | | | | | | | | | |
| 222 | Low strength for small fasteners. | | | | | | | | | | | | |
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| 290 | Wicking, High strength for fasteners which are already assembled. | | | | | | | | | | | | |
|  | <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> | | | | | | | | | | | | |
|  | <p>WARNING: Electrical Hazard – Dangerous AC Voltages exist inside the Antenna Pedestal Breaker Box. Observe proper safety precautions when working inside the Pedestal Breaker Box.</p> | | | | | | | | | | | | |
|  | <p>WARNING: Electrical Hazard – Dangerous AC Voltages exists on the side of the Antenna Pedestal Power Supply. Observe proper safety precautions when working inside the Pedestal Power Supply.</p> | | | | | | | | | | | | |

| | |
|---|---|
|  | <p>WARNING: 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.</p> <p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p> |
|  | <p>WARNING: 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.</p> <p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p> |
|  | <p>WARNING: 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.</p> <p>The ultimate responsibility for safety rests with the facility operator and the individuals who work on the system.</p> |

4.2. Site Survey

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

1. The antenna has a clear line-of-sight to as much of the sky (horizon to zenith at all bearings) as is practical.
2. Direct radiation into the antenna from ships radar, especially high power surveillance radar arrays, is minimized. The radome should be as far away from the ships Radar as possible and should NOT be mounted on the same plane as the ships Radar (so that it is not directly in the Radar beam path).
3. The radome should be as far away from the ships high power short wave (MF & HF) transmitting antennas as possible.
4. 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.
5. The mounting location is rigid enough that it will not flex, or sway, in ships motion or vibration. If the radome is to be mounted on a raised pedestal, it **MUST** have adequate gussets, or be well guyed, to prevent flexing or swaying in ships motion.

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

4.3. *Preparing For The Installation*

4.3.1. Unpack Shipping Crates

Exercise caution when unpacking the equipment.

4.3.2. Inspect / Inventory

Carefully inspect the radome panel surfaces for evidence of shipping damage. Inspect the pedestal assembly and reflector for signs of shipping damage.

4.3.3. Prepare ADE Mounting Location

Prepare the mounting location for the Radome. If the radome is to be bolted to the deck (or a platform) assure that the mounting holes have been drilled. Assure that the mounting hardware has obtained and is readily available.

4.3.4. Prepare GPS Mounting Location

Prepare the mounting location (deck or handrail) for the GPS. Assure that the mounting hardware is readily available.

4.3.5. Preparing BDE Location

Prepare the mounting location for the Below Decks Equipment. These equipments would normally be installed in a standard 19" equipment rack. Refer to the Antenna Control Unit manual for installation of the ACU and the Terminal Mounting Strip.

Refer to the vendor supplied manuals for installation of the other below decks equipments.

Prepare other locations throughout ship for any other equipment which is not co-located with the ACU.

4.3.6. Installing The System Cables

Install appropriate cables from Below Decks Equipment to the ADE Location(s).

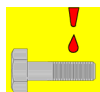
The cables must be routed from the above-decks equipment group through the deck and through various ship spaces to the vicinity of the below-decks equipment group. When pulling the cables in place, avoid the use of excessive force. Exercise caution during the cable installation to assure that the cables are not severely bent (proper bend radius), kinked or twisted and that connectors are not damaged.

Assure that the cables have been run through watertight fittings and/or will not permit water entry into the ship when the installation is completed. After cables have been routed and adjusted for correct cable length at each end, seal the deck penetration glands and tie the cables securely in place.

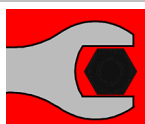
4.4. Assembling the ADE

4.4.1. 16' and 18' Above Decks Equipment Assembly

Refer to the System Block diagram, General Assembly, Radome Assembly and Baseframe Assembly drawings for your system.



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:

| Bolt Size | Inch Pounds |
|------------------|--------------------|
| 1/4-20 | 75 |
| 5/16-18 | 132 |
| 3/8-16 | 236 |
| 1/2-13 | 517 |

1. Select a secure assembly site that provides enough area to work with the large radome panels. Place the radome base pan on temporary support blocks at least 22 inches high.
2. Assemble the radome base frame, eight legs and eight braces using the hardware provided. Loosely assemble all legs and braces aligning all matching marks before tightening any of the bolts. Insure that Loctite and a split washer is used under each nut.
3. Refer to the radome assembly drawing. Observe the painted numbers on the radome panels that clearly identify their positions respective to each other and the base pan assembly.
4. Loosely assemble the 6 lower side panels, using the hardware provided, to form the bottom half of the radome. Do NOT tighten the bolts at this time. Open each seam wide enough to install a good bead of silicone caulk, then firmly tighten all the bolts in that flange. Repeat until all flanges are sealed.
5. Loosely assemble the 6 upper side panels, using the hardware provided, to form the upper half of the radome. Do NOT tighten the bolts at this time. Open each seam wide enough to install a good bead of silicone caulk, then firmly tighten all the bolts in that flange. Repeat until all flanges are sealed.
6. Apply a good bead of silicone caulk all the way around the top cap. Install the cap into the upper radome panel assembly using the hardware provided and tighten all the bolts.
7. Set the lower half of the radome assembly on the base pan aligning the painted numbers on the radome panels. Loosely attach the lower side panel assembly to the base frame using the hardware provided. Do NOT tighten the bolts at this time. Lift the lower side panel assembly up wide enough to install a good bead of silicone caulk between it and the base pan, then firmly tighten all the bolts.
8. Lift the antenna pedestal up and set it in place on the base pan inside the lower half of the radome. Fasten the antenna pedestal assembly, complete with base stand, to the base pan using the 1/2-13 x 1 1/2 (or the 3/8-16 x 1 1/2) inch bolts inserted from the

bottom up. Install a flat washer, a lock washer and a nut in each mounting hole. Apply Loctite 271 and tighten securely.

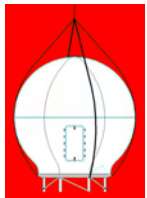
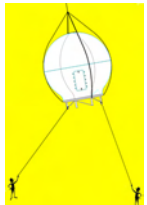
9. Attach the antenna assembly (reflector, struts and feed) to the stabilized pedestal, by using the reflector mounting hardware provided. Position the antenna over the four antenna support struts (the antenna and the dish mounting clips are numbered or color coded make sure they match). Insert the four mounting bolts, washers and nuts, apply Loctite 271 and tighten.
10. Attach the 15 pin connector on the antenna reflector harness to the shielded Polang Aux Relay box. Connect the IF receive coax cables from the feed to the pedestal Modem or coax relay/switch panel according to the block diagram.
11. Using a **EIGHT** point web lifting sling and lifting clips, lift the upper half of the radome up over the antenna pedestal and set it onto the lower side panels aligning the painted numbers on the radome panels. Loosely attach the upper and lower halves of the radome using the hardware provided. Do NOT tighten the bolts at this time. Insert wedges between the upper side panel assembly and the lower side panel assembly to hold open a space wide enough to install a good bead of silicone caulk between it and the lower side panels, then remove the wedges and firmly tighten all the bolts.
12. Gently restrain the antenna prior to lifting the ADE onto the ship to restrict movement inside the radome during the lift.

4.4.2. Preparing the ADE for Lift

Install Stow Braces, or other restraints, on the Antenna Pedestal. Attach shackles and web type lifting harness to the four lifting holes in the base-frame.

4.5. Installing The ADE

4.5.1. Hoist

| | |
|---|--|
|  | <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> |

1. Assure that the antenna is restrained before hoisting. Check that all nuts on the base frame assembly are tightened according the torque values listed below:
2. Using a four-part lifting sling, and with a tag line attached to the radome base frame, hoist the antenna assembly to its assigned location aboard ship by means of a suitably-sized crane or derrick.
3. The radome assembly should be positioned with the BOW marker aligned as close as possible to the ship centerline. Any variation from actual alignment can be compensated with the AZIMUTH TRIM adjustment in the ACU, so precise alignment is not required.

4.5.2. Cooling Unit Assembly - TX SYSTEMS ONLY

If cooling unit is supplied, refer to the drawings provided for detailed instructions on assembly and installation of the cooling unit and any associated intake and exhaust diffusion ducting.

4.6. *Install BDE Equipment***4.6.1. ACU & TMS**

Refer to the Antenna Control Unit manual for installation of the ACU and the Terminal Mounting Strip.

4.6.2. Other BDE Equipment

Refer to the vendor supplied manuals for installation of the other below decks equipment.

4.7. *Cable Terminations***4.7.1. At The Radome**

The TX and RX IF, cables must be inserted through the cable strain reliefs at the base of the radome. Apply RTV to the strain relief joints and tighten the compression fittings to make them splash-proof. Attach the TX and RX IF, cables from below decks to the TX and RX pedestal cable adapters (refer to the System Block Diagram).

Route the AC Power cable for the Antenna Pedestal and RF Equipment into the Breaker box in the aft louvered panel and connected the conductors to the appropriate breaker terminals.

Sea Tel recommends that separate, dedicated, AC Power be provided for the Marine Air Conditioner (Do NOT combine with the AC Power provided for the Antenna Pedestal and RF Equipment). This AC Power cable is routed into the Marine Air Conditioner and terminated to the AC terminals inside.

4.7.2. ACU & TMS

To Connect AC Power, Gyro Compass Connection and IF Input refer to the Antenna Control Unit manual. Installation of optional (remote) Pedestal, and /or Radio, Monitor & Control connection(s) from a PC Computer are also contained in the ACU manual.

4.7.3. Other BDE Equipment

Refer to the vendor supplied manuals for installation of the other below decks equipment.

4.8. *Final Assembly***4.8.1. Mount RF Equipment (TXRX Only)**

Install the RF equipment on the elevation beams (TXRX Systems ONLY) Connect the TXIF & RXIF cables, RF Transmit and Receive waveguide sections from the appropriate feed (C-Band or Ku-Band) to the appropriate SSPA or TWTA and Radio package (C-Band Pair or Ku-Band pair) according to the block diagram.

4.8.2. Remove Stow Braces/Restraints

Remove the restraints from the antenna and verify that the antenna moves freely in azimuth, elevation, and cross level without hitting any flanges on the radome.

4.8.3. Verify all assembly and Wiring connections

Verify that all pedestal wiring and cabling is properly dressed and clamped in place.

4.8.4. Balance Antenna Pedestal

Assure that the antenna assembly is balanced front to back, top to bottom and side to side by observing that it remains stationary when positioned in any orientation. Refer to the Maintenance section for complete information on balancing the antenna.

4.9. *System Power-up*

Turn the power switch mounted in the aft louvered panel of the antenna pedestal ON. This will energize the antenna pedestal and the RF equipment.

4.10. *During Power-Up Of The ADE***4.10.1. Initialization**

Turn the pedestal power supply ON. The PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps to initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions. Each phase must complete properly for the antenna to operate properly (post-initialization). Refer to the initialization text in the Troubleshooting section in this manual. Observe the Initialization of the antenna pedestal.

If any of these steps fail, or the ACU reports model "xx97", re-configure the PCU as described in the Setup section of this manual. If initialization still fails, this indicates a drive or sensor problem, refer to the Troubleshooting section.

4.10.2. Home Flag Position

Note the approximate position of the antenna relative to the bow of the ship while it is at the home switch position. This information will be used later to calibrate the relative position display of the antenna.

4.10.3. BDE

Turn Power ON to the ACU. Record the power-up display, Master (ACU) Model & Software version and the Remote (PCU) Model & Software version.

4.11. *Setup*

Refer to the Setup information in the next section of this manual and in the Setup section of your ACU Manual.

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5. Setup

Below are basic steps to guide you in setting up the ACU for your specific antenna pedestal. Assure that the Antenna Pedestal (ADE) has been properly installed before proceeding. Refer to the Setup section of you ACU manual for additional parameter setting details.

5.1. Operator Settings

Refer to the Operation chapter of this manual to set the Ship information. Latitude and Longitude should automatically update when the GPS engine mounted above decks triangulates an accurate location, but you may enter this information manually to begin. If your gyro source is providing Heading information in any format other than NMEA-0183 format, you will have to enter in the initial Ship's Heading position, the Gyro Compass will then keep the ACU updated.

Set the Satellite information, for the satellite you will be using. The receiver settings are especially important. At this point you should be able to target the desired satellite. Continue with the setup steps below to optimize the parameters for your installation.

5.2. Optimizing Targeting

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

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. 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 and an AZ TRIM of +2.2 degrees. 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.

5.3. Calibrating Relative Antenna Position (Home Flag Offset)

During initialization, azimuth drives the CW antenna until the Home Switch is contacted, which “presets” the relative position counter to the value stored in the Home Flag Offset. This assures that the encoder input increments/decrements from this initialization value so that the encoder does not have to be precision aligned.

The Home Switch is a micro switch with a roller arm which is actuated by cam mounted on the azimuth driven sprocket, or it is a hall sensor which is actuated by a magnet mounted on the azimuth driven sprocket, which produces the “Home Flag” signal.

The Home Flag Offset is a value saved in NVRam (Non-Volatile RAM) in the PCU. This value is the relative position of the antenna when the home switch is engaged. Presetting the counter to this value assures that when the antenna is pointed in-line with the bow of the ship the counter will read 000.0 **Relative** (360.0 = 000.0).

In most cases when the antenna stops at the home flag, it will be pointed in-line with the Bow of the ship. In these cases Home Flag Offset (HFO) should be set to zero. When “Optimizing Targeting” small variations (up to +/- 5.0 degrees) in Azimuth can be corrected using If it AZ TRIM as described in the Optimizing Targeting procedure above.

Large variations in Azimuth position indicate that the Relative position is incorrect and should be “calibrated” using the correct HFO value instead of an Azimuth Trim offset. This is especially true if sector blockage mapping is used.

If the antenna stops at the home flag, but it is NOT pointed in-line with the Bow of the ship, it is important to assure that the antennas **actual** position (relative to the bow of the ship) is the value that gets “preset” into the Relative position counter. By saving the antennas **actual** Relative position when at the home flag into HFO, you have calibrated the antenna to the ship.

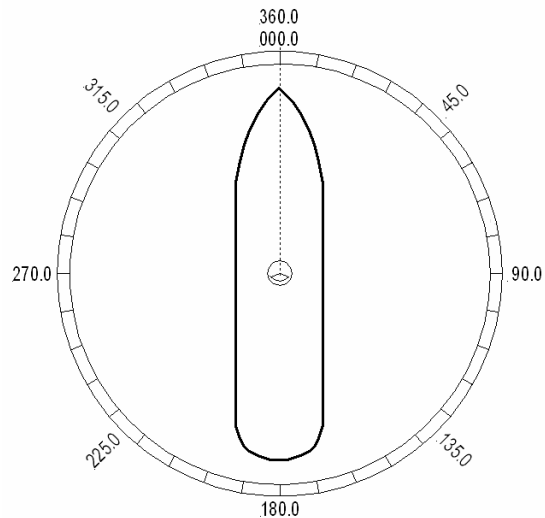


Figure 5-1 Antenna stops In-line with Bow

5.3.1. To Calculate HFO:

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

If AZ TRIM was a **plus** value: $HFO = (TRIM / 360) \times 255$ Example: AZ TRIM was 0200 (plus 20 degrees). $HFO = (20/360) \times 255 = (0.0556) \times 255 = 14.16$ round off to 14.

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.

If Targeting has NOT been optimized, allow the antenna to initialize to its home flag position. Visually compare the antennas pointing to the bow-line of the ship (parallel to the Bow). Note

the antennas position relative to the Bow. If it appears to be very close to being parallel to the bow, HFO will probably not be needed and you can proceed with Optimizing Targeting. If it is NOT close, initialization was driving the azimuth CW, note if the antenna appears to have stopped before it got to the Bow or if it went past the Bow. You may be able to guess an approximate amount of how many degrees the antenna is from the bow. This is only intended to help you initially find the satellite (which direction you will have to drive and approximately how far you will have to drive). Refer, in general terms, to the Optimizing Targeting procedure.

If the antenna stopped before it got to the bow-line; When you initially target a satellite, the antenna will also stop prior to the satellite position, so you that will have to drive the Azimuth of the antenna UP to actually find the satellite. Using the same basic procedure as in the Optimizing Targeting paragraph, target the satellite and record the "Calculated" Azimuth position that the antenna was driven to. Drive UP until you find the satellite, positively identify that you are on **the satellite** you targeted and allow tracking to peak the antenna position. Record the "Peak" Azimuth position. Subtract the "Peak" position from the "Calculated" position to determine the number of degrees of AZ TRIM that would be required.

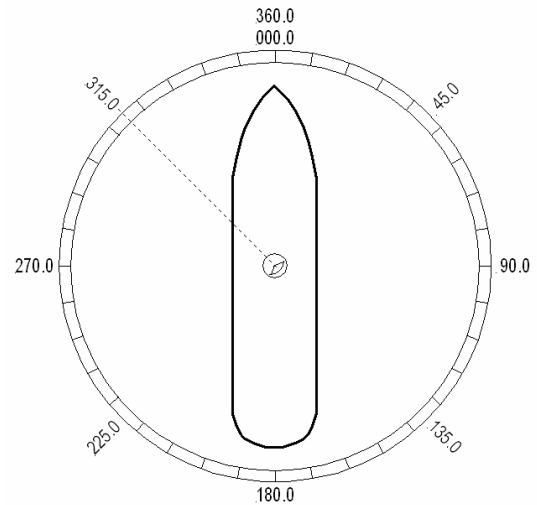


Figure 5-2 Antenna stopped before the Bow

Example: In this new installation, I target my desired satellite and record the Calculated Azimuth to be 180.5. I drive UP and finally find my desired satellite at a Peak Azimuth of 227.0 degrees. I subtract Peak from Calculated and difference to be -46.5 degrees, therefore the actual Relative position that needs to be preset into the counter when the antenna is at the Home Flag is 313.5. $HFO = ((360-46.5) / 360) \times 255 = (313.5 / 360) \times 255 = 0.87 \times 255 = 222.06$ which I round down to 222.

If the antenna went past the bow-line; When you initially target a satellite, the antenna will also go past the bow-line; so that you will have to drive the Azimuth of the antenna DOWN to actually find the satellite. Using the same basic procedure as in the Optimizing Targeting paragraph, target the satellite and record the "Calculated" Azimuth position that the antenna was driven to. Drive DOWN until you find the satellite, positively identify that you are on **the satellite** you targeted and allow tracking to peak the antenna position. Record the "Peak"

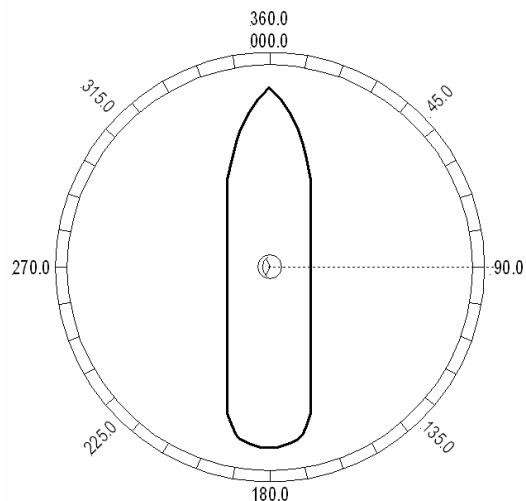


Figure 5-3 Antenna stops past the Bow

Azimuth position. Subtract the "Peak" position from the "Calculated" position to determine the number of degrees of AZ TRIM that would be required. . Refer to the calculations above to determine the HFO you should use for this antenna.

Example: In this new installation, I target my desired satellite and record the Calculated Azimuth to be 180.0. I drive DOWN and finally find my desired satellite at a Peak Azimuth of 90.0 degrees. I subtract Peak from Calculated and difference to be +90.0 degrees, therefore the actual Relative position that needs to be preset into the counter when the antenna is at the Home Flag is 90.0. $HFO = ((90.0) / 360) \times 255 = 0.25 \times 255 = 63.75$ which I round up to 64.

5.3.2. To Enter the HFO value:

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/DONW 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 "Antenna stopped before the Bow" 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 have to 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.

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

The ACU can be programmed with relative azimuth sectors (zone) where blockage exists or where transmit power would endanger personnel who are frequently in that area.

Refer to your ACU Manual for instructions on programming of these zones.

5.5. TX Polarity Setup

To prevent inadvertent switching of the transmit polarity, the user can lock out NS/EW toggle feature and force the transmit polarity to be fixed horizontal or vertical with the TX POLARITY parameter.

With the feed in the center of its polarization adjustment range, observe the transmit port polarity (vector across the short dimension of the transmit wave-guide).

If the transmit polarity in the center of the travel range is vertical, use the following entries:

- 2 Vertical Transmit Polarity
- 4 Horizontal Transmit Polarity

If the Transmit polarity in the center of the travel range is horizontal, use the following entries:

- 2 Horizontal Transmit Polarity
- 4 Vertical Transmit Polarity

5.6. ACU Factory Default Parameter Settings – 14600 Antennas

The following table shows the factory default parameters for the ACU interfaced to a 14600 Antenna. You may need to optimize some of these parameters. Refer to the individual parameter setting information in the Setup section of your ACU manual.

| PARAMETER | C-Band DishScan | My Parameters |
|---------------|--------------------|---------------|
| EL TRIM | 0 | |
| AZ TRIM | 0 | |
| AUTO THRES | 100 | |
| EL STEP SIZE | 0 | |
| AZ STEP SIZE | 0 | |
| STEP INTEGRAL | 0 | |
| SEARCH INC | 10 | |
| SEARCH LIMIT | 200 | |
| SEARCH DELAY | 30 | |
| SWEEP INC | 0040 | |
| SYSTEM TYPE | TXRX=5 | |
| GYRO TYPE | 2 | |
| POL TYPE | 72 | |
| POL OFFSET | 30 | |
| POL SCALE | 90 | |
| AZ LIMIT 1 | 0 | |
| AZ LIMIT 2 | 0 | |
| AZ LIMIT 3 | 0 | |
| AZ LIMIT 4 | 0 | |
| AZ LIMIT 5 | 0 | |
| AZ LIMIT 6 | 0 | |
| 5V OFFSET | 0 | |
| 5V SCALE | 0 | |
| TX POLARITY | 2 or 4 | |
| TRACK DISP | 0060 | |

*** Modem Lock input & Modem TX Mute functions are NOT set, refer to SYSTEM TYPE parameter information.**

6. Functional Testing

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

6.1. 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.

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

6.3. 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.

6.4. Azimuth & Elevation Drive

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

1. Press the **NEXT** key until the Antenna Menu is displayed.

| | |
|-----------|----------|
| AZ 123.4 | EL 056.7 |
| REL 234.5 | AGC 1234 |
2. If tracking or searching status is enabled, press the **TRACK** 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.

6.5. 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..

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7. Maintenance and 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> |

7.1. Warranty Information

Sea Tel Inc. supports its Series 96, 97 and 00 systems with a **ONE YEAR** warranty on parts and labor.

What’s Covered by the Limited Warranty?

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

Factory refurbished components used to replace systems parts under this warranty are covered by this same warranty as the original equipment for the balance of the original warranty term, or ninety (90) days from the date of replacement, whichever occurs last. Original Installation of the Series 97 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.

7.2. *Recommended Preventive Maintenance*

Ensure that all of the normal operating settings (LAT, LON, HDG, SAT and all of the Tracking Receiver settings) are set correctly. Refer to the Functional Testing section to test the system.

7.2.1. Check ACU Parameters

Assure that the parameters are set correctly (you may wish to record them in the Factory Default Settings, in section 5 of this manual).

7.2.2. Latitude/Longitude Auto-Update check

Refer to the Latitude & Longitude Update check procedure in the Functional Testing section of this manual.

7.2.3. Heading Following

Refer to the Heading Following verification procedure in the Functional Testing section of this manual.

7.2.4. Azimuth & Elevation Drive

Refer to the Azimuth & Elevation Drive check procedure in the Functional Testing section of this manual.

7.2.5. Test Tracking

Refer to the four quadrant Tracking check procedure in the Functional Testing section of this manual.

7.2.6. Visual Inspection - Radome & Pedestal

Conduct a good, thorough, visual inspection of the radome and antenna pedestal. Visually inspect the inside surface of the radome top and of the antenna pedestal. Look for water or condensation, rust or corrosion, white fiberglass powder residue, loose wiring connections, loose hardware, loose or broken belts or any other signs of wear or damage.

1. Radome Inspection - All the radome flanges are properly sealed to prevent wind, saltwater spray and rain from being able to enter the radome. Re-seal any open ("leaky") areas with marine approved silicone sealant. If heavy condensation, or standing water, is found inside the radome, isolate and seal the leak, and then dry out the radome. Small (1/8 inch) holes may be drilled in the base pan of the radome to allow standing water to "weep" out.
2. Antenna Pedestal Inspection - The shock/vibration springs and/or wire rope Isolators should not be frayed, completely compressed, or otherwise damaged. The plated and painted parts should not be rusted or corroded. The harnesses should not be frayed and all the connectors should be properly fastened and tightened. All hardware should be tight (no loose assemblies or counter-weights). Replace, re-coat, repair and/or tighten as necessary.

7.2.7. Mechanical Checks

Turn the pedestal power supply OFF

1. Inspect inside of radome for signs that the dish or feed have been rubbing against the inside of the fiberglass radome.
2. Rotate the pedestal through its full range of azimuth motion. The antenna should rotate freely and easily with light finger pressure.

3. Rotate the pedestal through full range of elevation rotation. The antenna should rotate freely and easily with light finger pressure.
4. Rotate the pedestal through full range of cross-level rotation. The antenna should rotate freely and easily with light finger pressure.
5. Rotate the level cage through the full 90 degrees of rotation from CCW stop to CW stop. The level cage antenna should rotate freely and easily with light finger pressure. Attached cables should not cause the cage to spring back more than a few degrees from either stop when released.
6. Inspect all drive belts for wear (black dust on/under the area of the belt).
7. Inspect AZ Drive chain. IF chain is beginning to show signs of rust or corrosion, apply a **light** coat of light duty oil to the chain. Wipe excess oil off to leave a light coating on the chain. **DO NOT over-lubricate.**

7.2.8. Check Balance

Check the balance of the antenna, re-balance as needed (refer to the Balancing the Antenna procedure below).

7.2.9. Observe Antenna Initialization

Observe the Antenna Initialization as described in the Troubleshooting section below.

7.3. Troubleshooting

7.3.1. Theory Of Stabilization Operation

The antenna system is mounted on a three axis stabilization assembly that provides free motion with 3 degrees of freedom. This assembly allows the inertia of the antenna system to hold the antenna pointed motionless in inertial space while the ship rolls, pitches and yaws beneath the assembly. Three low friction torque motors attached to each of the three free axes of the assembly provide the required force to overcome the disturbing torque imposed on the antenna system by cable restraints, bearing friction and small air currents within the radome. These motors are also used to re-position the antenna in azimuth and elevation.

The Pedestal Control Unit (PCU) uses inputs from the level cage sensors to calculate the amount of torque required in each axis to keep the antenna pointed within +/-0.2 degrees. The basic control loops for Cross Level, Level and Azimuth are shown in the Control Loop Diagram, drawing 116287. The primary sensor input for each loop is the rate sensor mounted in the Level Cage Assembly. This sensor reports all motion of the antenna to the PCU. The PCU immediately responds by applying a torque in the opposite direction to the disturbance to bring the antenna back to its desired position. Both the instantaneous output of the rate sensor (Velocity Error) and the integrated output of the rate sensor (Position Error) are used to achieve the high pointing accuracy specification.

The calculated torque commands are converted to a 5 volt differential analog signal by a Digital to Analog converter (D/A) and sent to each of three Brush-Less Servo Amplifiers. These amplifiers provide the proper drive polarities and commutation required to operate the Brush-Less DC Servo Motors in torque mode. The Torque acting on the mass of the antenna cause it to move, restoring the rate sensors to their original position, and closing the control loop.

Since the rate sensors only monitor motion and not absolute position, a second input is required in each axis as a long term reference to keep the antenna from slowly drifting in position. The Level and Cross Level reference is provided by a two axis tilt sensor in the level cage assembly. The Azimuth reference is provided by combining the ships gyro compass input and the antenna relative position.

7.3.2. Antenna Initialization (Series 97B & Series 00)

Turn the pedestal power supply ON. The PCU will initialize the stabilized portion of the mass to be level with the horizon and at a prescribed Azimuth and Elevation angles. The antenna will go through the specific sequence of steps (listed below) to initialize the level cage, elevation, cross-level and azimuth to predetermined starting positions.

Initialization is completed in the following phases, each phase must complete properly for the antenna to operate properly (post-initialization). Observe the Initialization of the antenna pedestal.

Step 1. The brakes on the Elevation and Cross-Level motors release.

Step 2. The level platform motor drives the Level Cage CW, issuing extra steps to assure that the cage is all the way to the mechanical stop. Then the Level Cage will be driven exactly 45.0 degrees CCW.

Step 3. Elevation axis then activates - Input from the LV axis of the tilt sensor is used to drive the Elevation of the equipment frame to bring the tilt sensor LV axis to level. This step takes approximately 10 seconds and will result in the dish being at 45.0 degrees in elevation. The level cage may still be tilted left or right at this time.

Step 4. Cross-Level axis activates - Input from the CL axis of the tilt sensor is used to drive Cross-Level of the equipment frame to bring the cross-level axis of the tilt sensor to level (this results in the tilt of the Cross-Level Beam being level). This step takes approximately 10 seconds.

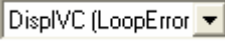
Step 5. Azimuth axis activates - Antenna drives CW in azimuth until the "Home Flag" signal is produced. This signal is produced by a Home Switch hitting a cam (or by a Hall Effect sensor in close proximity to a Magnet). After another 10 second wait, the antenna will report its version number at the Antenna Control Unit (ACU).

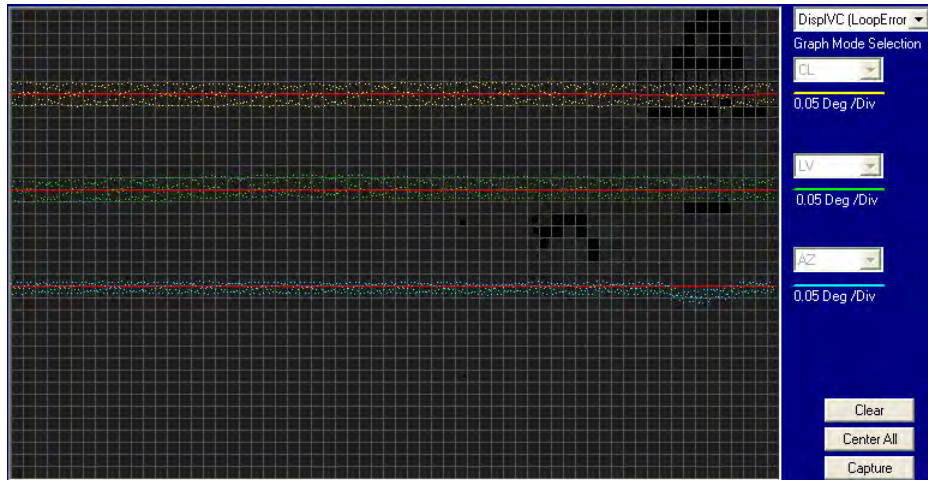
This completes the phases of initialization. At this time the antenna elevation should 45.0 degrees and Relative azimuth should be at home flag (home switch engaged on the home flag cam).

If any of these steps fail, or the ACU reports model "xx97", re-configure the PCU as described in the this chapter. If initialization still fails, this indicates a drive or sensor problem, refer to the Troubleshooting section.

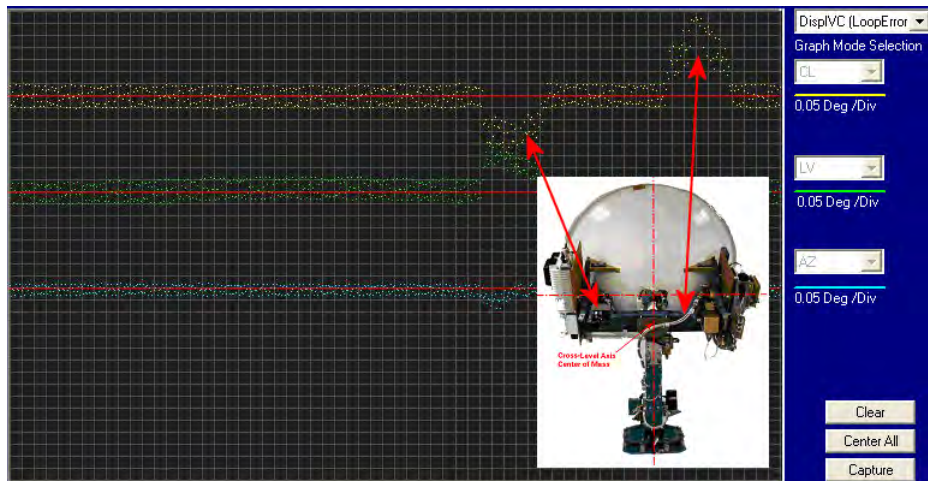
7.3.3. Antenna Loop Error Monitoring

The DacRemP **DISPVC** graph chart provides a means for monitoring the accumulated velocity errors of the antenna for diagnostic purposes. If this error is excessive, it indicates external forces are acting on the antenna. These forces may be the result of but not restricted to static imbalance, excessive bearing friction, cable binding, or wind loading. If these forces cause the antenna to mis-point by more than 0.5° from the desired position the PCU will flag a "Stab Limit" error.

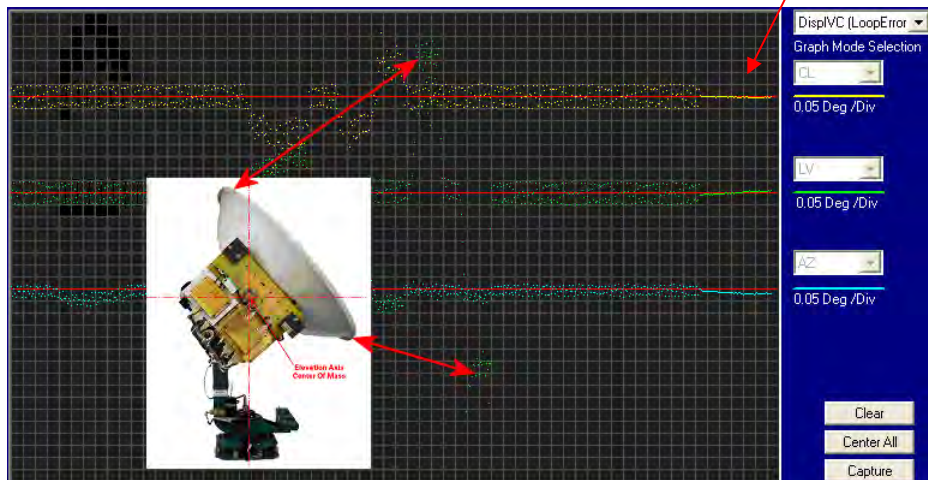
- To view the position error, select the  graph chart.
- This chart displays sensed axis errors via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 0.05°/ vertical division.
- The normal trace average will plots it's display ± 3 divisions from the red reference line. Any trace line average plotted above this is of concern and troubleshooting required. The example below shows the forces exerted onto the antenna as a resultant of DishScan Drive.



- The example below shows the results of various forces put upon antenna. Cross-Level Axis physically moved CCW (down to the left.) and then CW (up to the right.)



- Elevation Axis physically moved CW. (reflector slightly pushed up) and then physically moved CCW. (reflector slightly pushed down.) At the end of chart recording shows DishScan Drive turned Off, notice the lack of accumulated IVC errors.



7.3.4. Reference Sensor Monitoring

The DacRemP **DISPV** graph chart provides a means for monitoring the output of the 2 Axis Tilt Sensor and the Home Switch sensor for diagnostic purposes. The Tilt sensor (located inside the Level Cage Assembly) is the primary input for the antenna's reference to the horizon (0° Elevation and 90° Cross-Level). While the Home Switch Sensor (located at the antenna base) is used to calibrate the antenna's position relative to the vessels BOW.

- To view the reference sensors, select the **Disp V (Ref)** graph chart.
- This chart displays the output of the Tilt Sensor via two traces, CL (Cross Level), LV (Elevation) at a fixed 1° vertical division, and the home flag logic level via a single trace, AZ (Azimuth).
- The normal trace display for the Tilt Sensor, after performing remote tilt calibration, will be ± 4 divisions from the red reference line. Any trace line average plotted above this is of concern and troubleshooting required. See below for a screen capture of an antenna that is Level in both the Cross-Level and Elevation Axis.



- The Cross Level Tilt display should plot on the red reference line when the level cage is level, referenced to the horizon. It should decrease (plots below red line) when the antenna is tilted to the left and increase (plots above red line) when tilted to the right. See below for a screen capture of an abnormal CL trace Plot, it is an indication that the antenna that is either listed to the right approx. 4 degrees or the PCU requires excessive CL tilt bias.



- The Level tilt display should plot on the red reference line when the level cage is level, referenced to the horizon. It should decrease (plots below red line) when the antenna is tilted forward (EL down) and increase (plots above red line) when tilted back (EL up).
- The Azimuth display for the Home Switch will normally display a logic level high (plots directly on Red reference line after clicking on the **Center All** button) when the home flag is NOT engaged and changing to a logic level low when engaged. See below for a screen capture of an antenna that was driven so that the Home Flag switch is engaged.



7.3.5. Open Loop Rate Sensor Monitoring

The DacRemP **DISPW** graph chart provides a means for monitoring the output of the 3 solid state rate sensors (located inside the Level Cage Assembly) for diagnostic purposes. The rate sensors are the primary inputs to the PCU for stabilization.

- To monitor the rate sensors, select the **Disp W (Rate)** graph chart
- This chart displays sensed output from the 3 rate sensors via three traces, CL (Cross Level), LV (Elevation), and AZ (Azimuth), at a fixed 1°/Second/vertical division.
- A normal trace display will be ± 1 divisions from the red reference line. The example shown below shows an antenna that is NOT currently sensing motion in any axis.



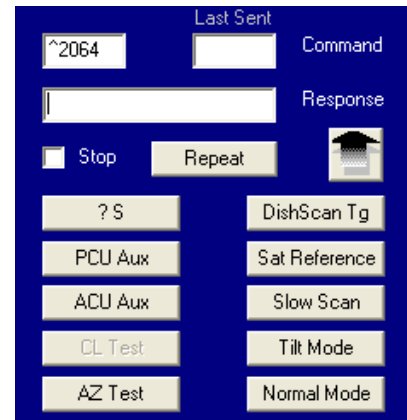
- The Cross Level display should decrease (plots below red line) as the antenna is tilted to the left and increase (plots above red line) as the antenna tilted to the right.
- The Level display should decrease (plots below red line) as the antenna is tilted forward and increase (plots above red line) as the antenna is tilted back.
- The Azimuth display should decrease (plots below red line) as the antenna is rotated CCW and increase (plots above red line) as the antenna is rotated CW. In the example below, the output of the Azimuth rate sensor is plotted above the reference line, indicating that the antenna was driven CW in Azimuth. Due to the in-practicality of driving an axis at a consistent rate, verification of rate sensor output is, for the most part restricted to a positive or negative response of the Level Cage movement (plotting above or below the red reference line of each axis).



7.3.6. Open Loop Motor Test

The DacRemP **Comm Diagnostics** Window provides a means to enter in Remote Commands for driving each individual torque motor to test that motors functionality. By driving each axis and observing the resulting motion of the antenna, a coarse operational status of the motor and motor driver may be established.

- To manually drive the motors, select the **“Comm Diagnostics”** window under to the Tools submenu or Press **“CTRL + C”**
 - Using the small field in the upper left hand corner of the window, type in the remote command and verify the motor appropriately drives in the direction commanded.
1. To drive the Cross Level motor, key in **^1064**, **^1128** or **^1192** and press **ENTER** to drive the Cross Level axis LEFT, OFF or RIGHT respectively.
 2. To drive the Level motor, key in **^2064**, **^2128** or **^2192** and press **ENTER** to drive the level axis FORWARD, OFF or BACKWARD respectively.
 3. To drive the Azimuth motor, key in **^3064**, **^3128** or **^3192** and press **ENTER** to drive the azimuth axis CW, OFF or CCW.



7.3.7. To Disable/Enable DishScan

To be able to use Step Track, or to revert to Conscan, as your active tracking mode you will have to disable DishScan.

Select the **DISHSCAN** parameter window on the ACU:

4. Press the RIGHT arrow, then press the UP arrow and last press the ENTER key to turn DishScan mode ON.
5. 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.

7.3.8. 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. This decoupling of the Gyro source only happens 5 minutes after an azimuth command has been sent to the antenna by means of an AZ target command, a search pattern initiated, or the a Satellites longitudinal position is targeted. When operating in Satellite Reference Mode changes in ships gyro reading will reflect its changes to the ACU's display but 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

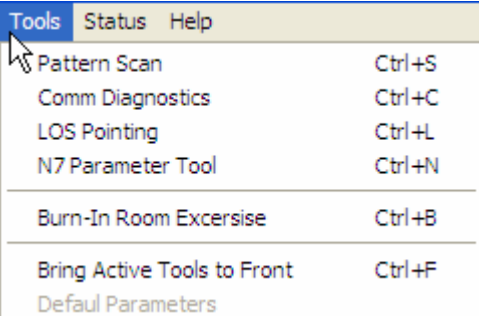
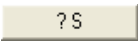

To view, or change, the Satellite Reference Mode status, select the SAT REF remote parameter:

6. Press the RIGHT arrow, then press the UP arrow and last press the ENTER key to turn Satellite Reference Mode ON.
7. 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.

7.3.9. To Read/Decode an ACU Error Code 0008 (Pedestal Function Error):

An Error Code 8 as reported by the ACU is an indication that the above decks equipment has experienced an error. One of the functions available within the “**Comm Diagnostics**” tool window provides the means to read and decode the actual discreet Pedestal Function Error.

| | |
|---|--|
| <p>1. Select the “Comm Diagnostics” window under to the Tools submenu or Press “CTRL + C”</p> |  |
| <p>2. Left mouse click on the  icon.</p> |  |

| | |
|---|--|
| <p>3. Right mouse click on the <input type="text" value=" ? S"/> icon.</p> <p>This will display a list box with the status of the above decks pedestal filtered into 3 sections. Items preceded with a check marks indicate a flagged status. See matrix below for further information on each state.</p> | <div style="border: 1px solid black; padding: 5px;"> <p>Slow Scan</p> <p>Sat Reference</p> <p><input checked="" type="checkbox"/> DishScan</p> <p>Unwrap</p> <p>Data 3</p> <p><input checked="" type="checkbox"/> Data 2</p> <hr/> <p>AZ Target</p> <p>Az Velocity</p> <p><input checked="" type="checkbox"/> Valid Heading (PCU)</p> <p>PCU Error</p> <p>PCU Init</p> <p>Hi Elevation</p> <hr/> <p>Sensor Limit</p> <p>Stability Limit</p> <p>AZ Reference Error</p> <p>AZ Servo Limit</p> <p>LV Servo Limit</p> <p>CL Servo Limit</p> </div> |
|---|--|

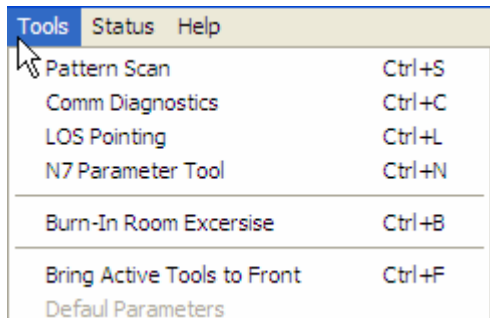
| State | Description |
|-----------------------------------|--|
| <i>PCU Status (Word 1)</i> | |
| Slow Scan | Indicates antenna is in a specialized mode, Slow Scan, which is required when ever a test requires driving the antenna >5°/sec |
| Sat Reference | Indicates that satellite reference mode is enabled. |
| DishScan | Indicates that DishScan Drive is enabled. |
| Unwrap | Indicates that the antenna is currently in an “Unwrap” state. This is not a valid error for unlimited azimuth antenna systems |
| Data 3 | Indicates active communication between above decks and below decks equipment |
| Data 2 | Indicates active communication between above decks and below decks equipment |

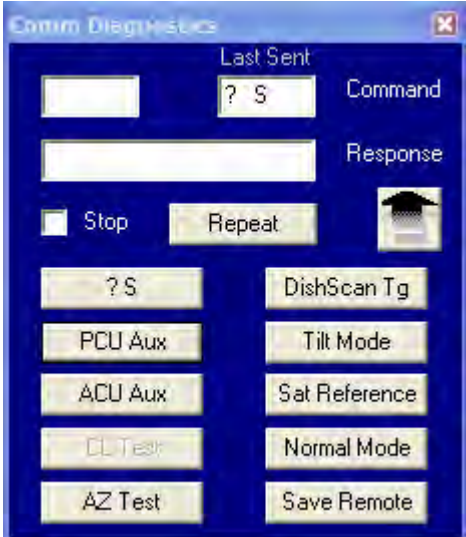

| <i>PCU Status (Word 2)</i> | |
|-----------------------------------|--|
| Az Target | Indicates the antenna is currently targeting a pre-determined azimuth position |
| Az Velocity | **Not a valid state** |
| Valid Heading (PCU) | Indicates that the PCU has received and integrated the heading value from the ACU into the Azimuth Stabilization Loop. This is NOT an indication of a proper Heading integration into ACU. |
| PCU Error | Indicates that one or more errors have been reported by the above decks equipment. |
| PCU Init | Indicates that the above decks equipment is currently performing an Initialization sequence |
| Hi Elevation | Indicates that the above decks equipment is operating an Elevation Position higher than 83° |

| PCU Error Status (Word 3) | |
|----------------------------------|---|
| Sensor Limit | **Not a valid state** |
| Stability Limit | Indicates that the above decks equipment is mis-pointed from its intended target by more than 0.5°. (FCC Tx Mute requirements) |
| AZ Reference Error | Indicates a failure to integrate one the reference inputs within the Azimuth Stabilization Loop. |
| AZ Servo Limit | Indicates the current draw through the Azimuth Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation |
| LV Servo Limit | Indicates the current draw through the Elevation Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation |
| CL Servo Limit | Indicates the current draw through the Cross-Level Servo Amplifier (motor driver PCB) has exceeded what is required during normal operation |

7.3.10. Remote GPS LAT/LON Position:

The above decks equipment has an integrated on board Furuno GPS antenna system. The Latitude and Longitude position information provided are utilized to calculate the Azimuth, Elevation, Cross-level and Polarity pointing angles of the desired satellite. The DacRemP “**Comm Diagnostics**” Window provides a means to query the GPS antenna to verify proper operation. The procedure below describes this process.

| | |
|--|--|
| <p>4. Select the “Comm Diagnostics” window under to the Tools submenu or Press “CTRL + C”</p> |  |
|--|--|

| | |
|--|---|
| <p>5. Left mouse click on the PCU Aux icon.</p> |  |
| <p>6. Left Mouse click on the “?@ PCU GPS position, 1 min (1 Nm)”</p> | <pre> ? V PCU Version ? v References ? x IVC Loop Error ? y Torque Drive ? @ PCU GPS position, 1 min (1 Nm) ----- ^0067 DishScan Toggle ^0071 Sat Reference Mode ^0070 Slow Scan Mode ^0084 Tilt/Test Mode ^0000 Normal Mode ^0087 Save PCU Parameters ----- ^0090 Reboot PCU ^0082 Clear AZ HF Err Reset PCU Error Status </pre> |
| <p>7. In the “Response” window verify proper GPS position to within 1 nautical mile of your current position.</p> <p>The Latitude & Longitude position of the GPS will be displayed in the following format: “@ LAT,N,LON,E,A”</p> <p>Where LAT and LON are in degrees and minutes, LAT will be followed by N or S (North or South), LON will be followed by E or W (East or West), then a status character and finally a checksum character.</p> |  |

| | |
|---|--|
| <p>Furuno default value is in Japan at 34.4N 135.2E (@3444,N,13521,E,,_).</p> <p>After acquiring a good fix at Sea Tel the string is @3800,N,12202,W,A^ for our 38N 122W Latitude and Longitude position.</p> <p>The status character tells you the status of the GPS.</p> <p>“,” (Comma) = GPS has NOT acquired a proper fix,</p> <p>“N” = GPS fix is NOT valid</p> <p>“A” = GPS has acquired a valid fix.</p> | |
|---|--|

7.4. Maintenance

7.4.1. 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 **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 antenna should be balanced within one ounce at the typical trim weight location of 10 inches from the axis of rotation.







1. Turn Antenna power breaker ON
2. To turn OFF antenna drive (AZ, EL & CL) follow the procedure in paragraph 7.5 to set the PCU configuration to “xx06” (N0000) but do NOT save.
3. Balance the antenna elevation axis with the elevation near horizon (referred to as front to back balance) by adding, or subtracting, small counter-weights.
4. Then balance Cross Level axis (referred to as left-right balance) by moving existing counter-weights. Do NOT add counter-weight during this step.
5. Last, balance the Elevation Axis with the antenna pointed at zenith (referred to as top to bottom balance) by moving existing counter-weights. Do NOT add counter-weight during this step.
6. When completed, the antenna will stay at any position it is pointed in for at least 5 minutes (with little, to no, ship motion).
7. Turn antenna power OFF, and then back ON, to re-Initialize the antenna. This will also turn antenna drive (AZ, EL & CL) back ON.

7.4.2. To Adjust Tilt:

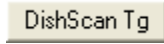
A REMOTE TILT calibration is required to align the level cage assembly correctly so that all sensors will be aligned accurately to the axis they relate to. The fluid filled tilt sensor provides a two dimensional horizon reference. The system is not able to automatically calculate the exact center value, therefore it is necessary to perform this procedure to manually enter any offset required to make sure the PCU receives a true reference to the horizon. The procedures below describes the process of performing this calibration from either the ACU front panel or DacRemP diagnostic software by connecting the ACU's RS-422 M&C Port to an available serial port on a Laptop/Desktop computer using a standard 9 pin serial cable.

Step 1 Turn Off DishScan Drive.

Using the DAC2202 ACU Front Panel:



1. Go to Remote Command window by pressing and holding the two **LEFT & RIGHT** arrows  until the EL TRIM parameter is displayed.
2. Press and release both **Left & Right** arrow keys again. The "SAVE NEW PARAMETERS" window should now be displayed.
3. Press either the  **ENTER** key or the  **DOWN** key until the "REMOTE DishScan TG" parameter is displayed.
4. Press the  **RIGHT** arrow to activate selection, then press the  Up arrow to toggle state to OFF. Press the  **ENTER** key (Note: You will see that an error code 16 is generated when DishScan movement is off.)

Using DacRemP:

1. Click on the  icon in the Comm Diagnostics window. (Verify that DishScan is turned off by clicking the Error LED on main display panel, there should be a check mark next to Conscan/DishScan)


(Steps 2-7 will require assistance to observe and operate antenna simultaneously)


Step 2: At Antenna, If not already installed, place a circular level bubble on top lid of level cage.

Step 3: On the ACU front Panel, press either the  **ENTER** key or the  **DOWN** arrow key until the **REMOTE TILT** window is displayed

Step 4: Push the  **RIGHT** arrow key to activate the Remote Tilt Mode.

Step 5: Based on the feedback from the technician observing the circular bubble, the technician which operating the ACU will need to use the arrow keys to rotate the stabilized antenna mass from front to back and left to right. You should wait at least 10 seconds between commands to allow time for sensor to settle.

 Left arrow will rotate antenna mass down to the left in the Cross-Level axis ½ degree

 **Right** arrow will rotate antenna mass up to the right in the Cross-Level axis ½ degree

 Up arrow will rotate antenna mass up in the Level axis ½ degree

 **Down** arrow will rotate antenna mass down in the Level axis ½ degree

When correct the Bubble should be as close to the center of the fluid as possible.



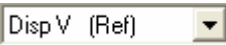
Step 6: Press  **ENTER** key to exit Remote Tilt Mode.

Step 7: Verify Tilt Bias entered is within specifications.

From antenna:




1. Observe the bubble for approximately 3-5 minutes to ensure it remains centered.

Using DacRemP:


1. Select the  reference sensor graph.
2. Verify the CL and LV displays are steady and within 4 divisions of nominal. (Anything more than 4 divisions above or below red reference line should be of concern and troubleshooting is required)

Step 8: Save Level and Cross-Level Tilt Bias values.

Using the DAC2202 ACU Front Panel:

1. Press  **DOWN** arrow or enter until you see "**REMOTE PARAMETERS**" window is displayed
2. Press  **RIGHT** arrow and then press  **ENTER** key (you will see a confirmation saying 'SAVED')

Using DacRemP:

1. Click  icon on the Remote Command window. (Verify ^0087 is displayed in the "Last Sent Command" window)

This saves the new tilt bias settings in the PCU. Reset or re-initialize the antenna to verify that the Level cage is properly level with the new settings.

7.4.3. To Reset/Reinitialize the Antenna:

Pressing Reset on the ACU front panel does NOT cause a reset of the above decks equipment. To Re-initialize the antenna from the **REMOTE COMMAND** window on the ACU:

1. Using the **LEFT/RIGHT** and **UP/DOWN** arrow keys set the Remote Command value to "**^0090**" and press **ENTER**.

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).

7.5. Switching Active/Standby RF Equipment

7.5.1. Transmit Switching

Please refer to your Paradise manual(s) for procedures you will use to remotely control the Transmit path RF Equipment mounted on the antenna pedestal.

7.5.2. Receive Path Switching

The receive path switching is controlled through the Antenna Control Unit. This band selections displayed are set by the TRACK DISP parameter. Your default value is 0060. Press the **NEXT** key on the front panel of the ACU to access the TRACKING window. Select the appropriate receive signal path by pressing the **DOWN** arrow as needed (refer to the Operation chapter of the ACU manual *MODE – TRACKING – BAND SELECTION*). The TRACKING display selections are:

| | |
|-------|----------------------------|
| LNB A | selects receive from LNB A |
| LNB B | selects receive from LNB B |
| LNB A | selects receive from LNB A |
| LNB B | selects receive from LNB B |

This selection remotely controls the Shielded Polang Relay Assembly to actuate an RF Switch to select which low noise block converter is providing receive signal through the dual channel rotary joint to the below decks equipment.

7.6. Pedestal Control Unit Configuration (xx97B & xx00)

The PCU is designed to be used with a variety of antenna pedestal configurations. The configuration information that is unique to each pedestal type is stored in a Non Volatile Random Access Memory (NVRAM) in the PCU enclosure. If the PCU is replaced or the NVRAM in the PCU should become corrupt, the PCU must be re-configured to operate with the pedestal it is installed on. The default configuration for the PCU is model xx97B. In this configuration the PCU will not drive any of the three torque motors to prevent damage to the unknown pedestal.

To configure the PCU, select the REMOTE COMMAND window on the DAC-97 by pressing the MODE key until this window appears (if the DAC-97 will not advance beyond the REMOTE AUX window, enter 7979 and press ENTER). In the REMOTE COMMAND window, key in "**7 8 ENTER**". An "N" should now appear in the command window. Refer to the table below to key in the appropriate value for you model antenna.

EXAMPLE: For an **9797B** Model Antenna:

1. Key in "**0208**" to select system type 208. The display should now show "N0208".
2. Press **ENTER** to send this system type command to the PCU.
3. Press **ENTER** several times to select **REMOTE PARAMETERS**. Press **UP** arrow and then **ENTER** to save the system type in the PCU.
4. Press ANTENNA, MODE, N/S to display the Remote Version Number. It should now display "9797B VER 1.8x".

7.6.1. MODEL CONFIGURATION NUMBERS

The following table shows the current mode configuration values for Series 97A pedestals.

| MODEL | Configuration Number |
|--------------|---|
| xx97B | N 0000 <i>Turns off all drive motors</i> |
| 9797B | N 0208 |
| 8797B | N 0209 |
| 9997B | N 0210 |
| 8897B | N 0211 |
| 12097B | N 0212 |
| 14497B | N 0213 |
| 14600B | N 0214 |
| 9497B | N 0215 |
| 9697B | N 0216 |
| 14400B | N 0217 |

7.7. Antenna Stowing Procedure



WARNING: Antenna Pedestal **must be properly restrained (stowed)** to prevent damage to wire rope isolators, isolator springs and/or antenna pedestal mechanism during underway conditions **when power is removed from the antenna assembly.**

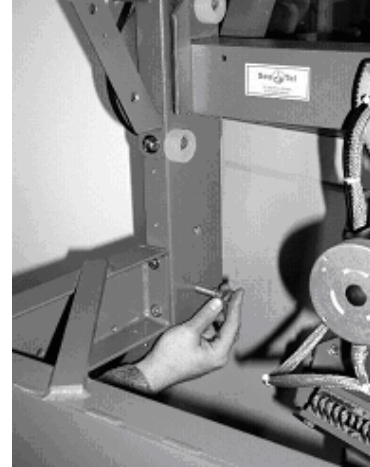
The normal operating condition for the Sea Tel Antenna system is to remain powered up at all times. This ensures that the antenna remains actively stabilized to prevent physical damage to the antenna pedestal and reduce condensation and moisture in the radome to prevent corrosion. If, for some reason, the antenna must be powered down during underway transits, it should be secured with nylon straps regardless of sea conditions to prevent damage to the antenna system. Refer to the procedure below to secure the antenna pedestal.

Equipment & Hardware needed:

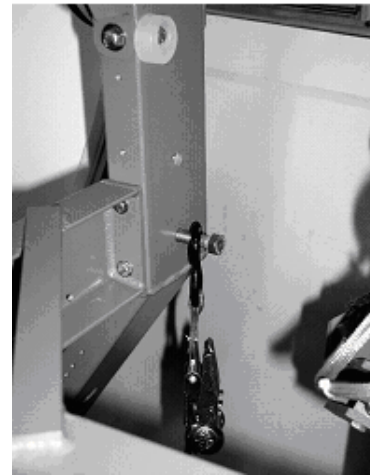
- Two (2) ½-13 x 2-inch Stainless Steel bolts.
- Two (2) Nylon straps with ratchet mechanism. **Nylon straps must be rated to 300 lbs. Working load capacity and 900 lbs. Max rated capacity.**

Stowing procedure:

1. Point the antenna to Zenith, (90 degree elevation angle), straight up.
2. Install one (1) ½-13 x 2-inch bolt into the inside of each elevation beam as shown in Figure 1.



3. Hook one end hook of the nylon strap to bolt in elevation beam as shown in Figure 2.



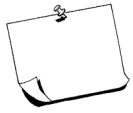
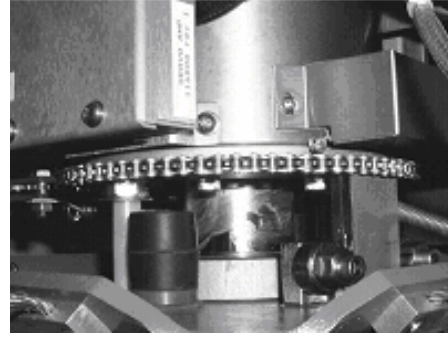
4. Hook the other end hook of the nylon strap to the pedestal-mounting frame as shown in Figure 3.



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5. Use the ratchet of the strap to tighten nylon straps. As the straps are tightened, observe the vertical isolation canister assembly as shown in Figure 4.
6. Tighten straps until the canister has been pulled down approx. $\frac{1}{4}$ to $\frac{1}{2}$ inch. Do not over-tighten. You must leave approximately $\frac{1}{8}$ inch clearance between the rubber stops and the azimuth driven sprocket to allow the vertical vibration isolation to function properly.



NOTE: Remove both *the straps and the bolts* **before applying power** and returning the antenna to normal operating condition.

8. 14600-75 Technical Specifications

The technical specifications for your 14600 Above Decks Equipment subsystems are listed below: Refer to your ACU manual for its' Specifications.

8.1. 14600 C-Band Antenna Reflector

| | |
|---|---|
| Type: | Suman 3.7 meter Cassegrain with vertex mounted feed assembly. |
| Diameter (D): | 3.7 M (146 in.) |
| TX Frequency range: | 5.850 – 6.725 GHz |
| RX Frequency range: | 3.4 – 4.2 GHz |
| TX Gain at Mid Band: | 45.5 dB |
| RX Gain at Mid Band: | 41.7 dB |
| Typical G/T (at 20 degree Elevation, clear horizon, 4 GHz with 35K LNA) | 22.2dB/Deg K in the Radome |

8.2. Feed Assemblies

8.2.1. C-Band Circular TXRX Feed Assembly

| | |
|------------------------|-----------------------------|
| Type | Prime focus, vertex mounted |
| Transmit frequency | 5.85-6.725 GHz C Band |
| Receive frequency | 3.4-4.2 GHz C Band |
| Polarization | Circular |
| Cross Pol Isolation: | RX 35dB TX 35dB on axis |
| Axial Ratio | RX 1.3 TX 1.09 |
| LNA | 35K |
| Block Down Converters: | |

8.3. 14600-75 RF Equipment

| | |
|----------------------|--|
| C-Band Redundant BUC | Paradise Datacom Signal Box with redundant BUCs (Phase combined) |
| C-Band HPA (2ea) | Paradise Datacom 400 Watt SSPA |
| RCP2-1100 Controller | Paradise Datacom RCP2-1100 |
| FPRC-1100 Controller | Paradise Datacom FPRC-1100 |

8.4. Pedestal Control Unit (PCU)

The PCU Assembly contains 1 Printed Circuit Board (PCB). It is the main control board.

| | |
|------------------|------------------------|
| Connectors | |
| Antenna Pedestal | 44 Pin D-Sub connector |
| M&C Interface | 15 Pin D-Sub connector |
| GPS Input | BNC connector |
| Controls | None |
| M&C Interface | 9600 Baud RS-422 |

8.5. Stabilized Antenna Pedestal Assembly

| | |
|--|--|
| Type: | Three-axis (Level, Cross Level and Azimuth) |
| Stabilization: | Torque Mode Servo |
| Stab Accuracy: | 0.2 degrees MAX, 0.1 degrees RMS in presence of specified ship motions (see below). |
| LV, CL, AZ motors: | Size 34 Brushless DC Servo. |
| Inertial Reference: | Solid State Rate Sensors |
| Gravity Reference: | Two Axis Fluid Tilt Sensor |
| AZ transducer: | 256 line optical encoder / home switch |
| Range of Motion: | |
| Elevation | 0 to +105 degrees |
| Cross Level | +/- 25 degrees |
| Azimuth | Unlimited |
| Elevation Pointing: | +15 to +90 degrees (with 15 degree Roll) +20 to +85 degrees (with 20 degree Roll) +25 to +80 degrees (with 25 degree Roll) |
| Relative Azimuth Pointing | Unlimited |
| Specified Ship Motions (for stabilization accuracy tests): | |
| Roll: | +/-15 degrees at 8-12 sec periods |
| Pitch: | +/-10 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 |
| Mounting height: | Up to 150 feet. |
| Heave | 0.5G |
| Surge | 0.2G |
| Sway | 0.2G |
| Maximum ship motion: | |
| Roll | +/- 25 degrees (Roll only) +/- 20 degrees (combined with Pitch) |
| Pitch | +/- 15 degrees |
| Yaw Rate | 12 deg/sec, 15 deg/sec/sec |

8.6. Unlimited Azimuth Modems(4 Channel)

| | |
|--------------------|--|
| Combined Signals | 70 MHz TX IF, 70 MHz RX IF, 1.1/1.5 MHz FSK Pedestal M&C, 1.1/1.5 MHz FSK Radio M&C and L-band LNB output with TVRO option |
| Connectors: | |
| TX / RX IF | SMA Connector |
| Rotary Joint | SMA Connector |
| TVRO option/L-Band | Type F |
| DC / Ped M&C | 9 pin D-Sub Connector |

8.7. 192" Radome Assembly

| | |
|---------------------------|--|
| Type | Rigid dome |
| Material | Composite foam/fiberglass |
| Size | 192" Diameter x 194" High |
| Side Door | 31" wide x 34" high (oval) |
| Number of panels | 11 Pentagon panels 15 Hexagon panels 5 Base panels |
| Installed height: | 194 if flush mounted 206 if mounted using 21" legs |
| Installed weight | MAX 3500 LBS (including Antenna Pedestal Assembly) |
| RF attenuation | 1.5 dB @ 5 GHz, dry |
| Wind: | Withstand relative average winds up to 100 MPH from any direction. |
| Ingress Protection Rating | All Sea Tel radomes have an IP rating of 56 |

8.8. Environmental Conditions (ADE)

| | |
|---------------------|--|
| Temperature: | -20 degrees C to 55 degrees C. |
| Humidity: | Up to 100% @ 40 degrees C, Non-condensing. |
| Spray: | Resistant to water penetration sprayed from any direction. |
| Icing: | Survive ice loads of 4.5 pounds per square foot. Degraded RF performance will occur under icing conditions. |
| Rain: | Up to 4 inches per hour. Degraded RF performance may occur when the radome surface is wet. |
| Wind: | Withstand relative average winds up to 100 MPH from any direction. |
| Vibration: | Withstand externally imposed vibrations in all 3 axes, having displacement amplitudes as follows: |
| Frequency Range, Hz | Peak Single Amplitude |
| 4 - 10 | 0.100 inches (0.1G to 1.0G) |
| 10 - 15 | 0.030 inches (0.3G to 0.7G) |
| 15 - 25 | 0.016 inches (0.4G to 1.0G) |
| 25 - 33 | 0.009 inches (0.6G to 1.0G) |
| Corrosion | Parts are corrosion resistant or are treated to endure effects of salt air and salt spray. The equipment is specifically designed and manufactured for marine use. |

8.9. TXRX System Cables

8.9.1. Antenna Control Cable (Provided from ACU-MUX)

RS-422 Pedestal Interface

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

8.9.2. Antenna Transmit & Receive IF Coax Cables (Customer Furnished)

Due to the dB losses 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:

| Run Length | Coax Type | Conductor Size |
|-------------------|---------------------------|-----------------------|
| up to 35 ft | RG-58 | 20 AWG |
| up to 75 ft | RG-8 or LMR-300 | 18 AWG |
| up to 150 ft | RG-213, RG214 or LMR-400 | 14 AWG |
| up to 200 ft | LDF4-50 Heliax or LMR-500 | 10 AWG |
| Up to 300 ft | LMR-600 | 6 AWG |

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

8.9.3. AC Power Cable (Pedestal ONLY)

| | |
|-----------------|------------------|
| Voltage: | 220 volts AC |
| Pedestal Power: | 290 W MAX |

9. DRAWINGS

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

9.1. 14600-75 Model Specific Drawings

| Drawing | Title | |
|-------------|---|------|
| 127562-1_A | System, Model 14600-75 | 9-3 |
| 127475-1_A | System Block Diagram – Model 14600-75 | 9-5 |
| 127563-1_A | General Assembly – Model 14600-75 | 9-9 |
| 127474_A | Antenna System Schematic – Model 14600-75 | 9-12 |
| 127479-1_A | Antenna Assembly, Circular, 3.7 Meter | 9-13 |
| 127605-1_A | RX Waveguide Assy, 14600-75 | 9-15 |
| 127606-1_A | Waveguide Assy, TX Path, 14600-75 | 9-17 |
| 127767-1_A | Paradise Datacom 600Watt Phase Combined SSPAs | 9-19 |
| 124954-1_A | Radome Assembly, 16 ft | 9-29 |
| 115912-1_D2 | Base Frame Assembly, | 9-31 |
| 128243_A | Installation Arrangement | 9-33 |

9.2. Series 00 General Drawings

| Drawing | Title | |
|-------------|---|------|
| 123428-3_A | Standard Spare Parts Kit | 9-34 |
| 123429-2_A | Premium Spare Parts Kit | 9-35 |
| 123430-3_A | Master Spare Parts Kit | 9-36 |
| 126374_A | Pedestal Harness Schematic Model xx96, xx97 | 9-37 |
| 11628-4_N1 | Terminal Mounting Strip | 9-38 |
| 126877_B1 | Harness Assy, Comtech Modem Interconnect | 9-40 |
| 116881-16_C | Base MUX Rack Panel Assembly | 9-41 |

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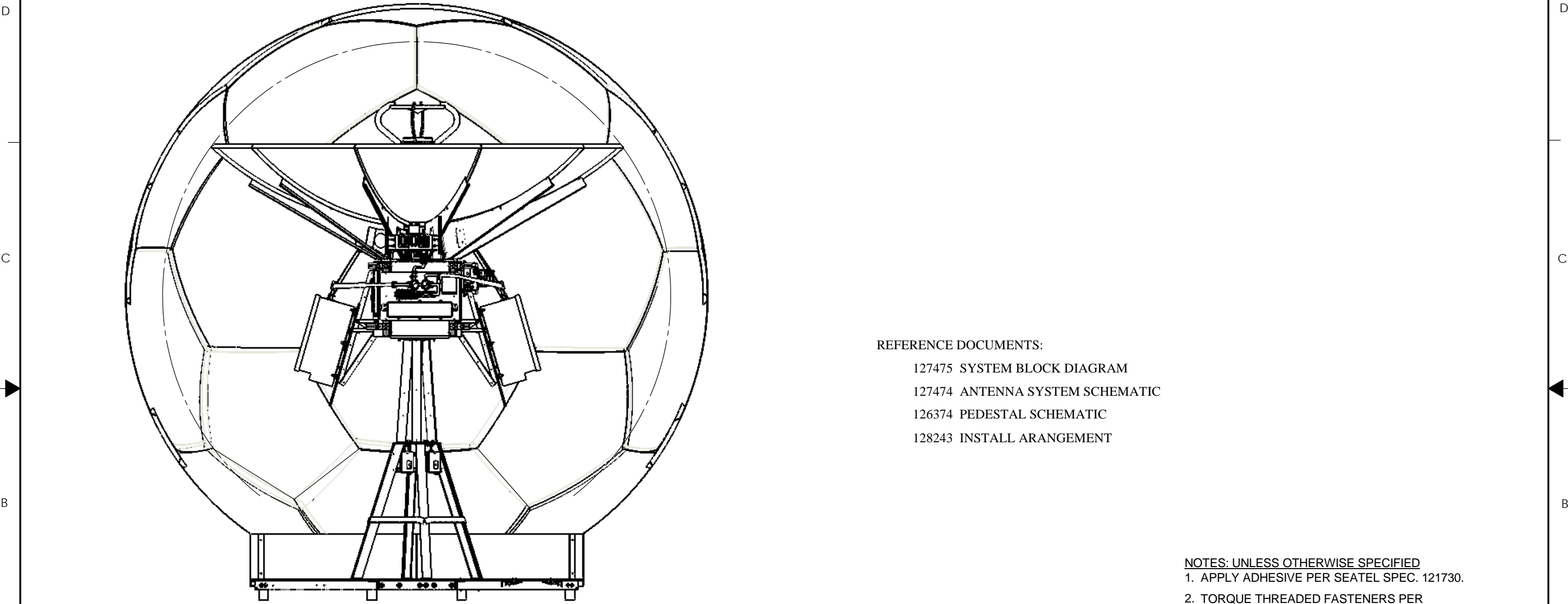
SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|-------------|-----|--------------------------------------|----------------------|
| 1 | 1 EA | 127563-1 | X1 | GENERAL ASS'Y, 14600-75, CIRCULAR | |
| 2 | 1 EA | 124954-1 | A | RADOME ASS'Y, 16 FT | |
| 3 | 1 EA | 127767-1CFE | | SSPA, PHASE COMBINED, 600W, PARADIS | |
| 8 | 1 EA | 125411-3 | F1 | DAC-2202, SCPC RCVR, 9 WIRE IF | NOT SHOWN |
| 9 | 1 EA | 123752-5 | D | BELOW DECK KIT, L-BAND, PED & RF M&C | NOT SHOWN |
| 11 | 1 EA | 127619-1 | A | CUSTOMER DOC PACKET, 14600-75 | NOT SHOWN |
| 12 | 2 EA | 114569 | D | BALANCE WEIGHT KIT | NOT SHOWN |
| 13 | 1 EA | 122539-1 | B | SHIP STOWAGE KIT, XX97 | NOT SHOWN |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SYSTEM, 14600-75, 16FT DOME, CIRCULAR C-BAND | | | | |
| PROD FAMILY 00 TX/RX | EFF. DATE 12-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127562-1 | REV A |


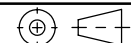
8 7 6 5 4 3 2 1

| REVISION HISTORY | | | | |
|------------------|------|--------|--------------------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | NA | 5/8/08 | PRODUCTION RELEASE, WS X2 REV. | LAE |



- REFERENCE DOCUMENTS:
- 127475 SYSTEM BLOCK DIAGRAM
 - 127474 ANTENNA SYSTEM SCHEMATIC
 - 126374 PEDESTAL SCHEMATIC
 - 128243 INSTALL ARRANGEMENT


- NOTES: UNLESS OTHERWISE SPECIFIED
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
 2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.
 3. TENSION ALL BELTS PER SEATEL SPEC. 122319.
 4. ROUTE ALL HARNESS AND CABLES ASSEMBLIES PER SEATEL SPEC. 121872.

| | | | |
|--|-----------------------|---------------------------|---|
| 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: LAE | |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 |
| | DRAWN DATE: 3/6/08 | | |
| MATERIAL: NA | APPROVED BY: | | TITLE: SYSTEM, 14600-75, 16 FT DOME, CIRCULAR C-BAND |
| FINISH: NA | APPROVED DATE: | SIZE: B | SCALE: 1:96 |
| FIRST USED: 14600 | | DRAWING NUMBER: 127562 | REV: A |
| 3rd ANGLE PROJECTION  | | SHEET NUMBER 1 OF 1 | |

8 7 6 5 4 3 2 1


SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|---------------|-----|--|----------------------|
| 1 | 1 EA | 127563-1 | A | GENERAL ASS'Y, 14600-75, CIRCULAR | |
| 2 | 1 EA | 124954-1 | A | RADOME ASS'Y, 16 FT | |
| 3 | 1 EA | 124937-1 | | CIRCULAR FEED KIT, SUMAN 14600 | |
| 4 | 1 EA | 127479-1 | A | ANTENNA ASS'Y, CIRCULAR, 3.7 METER, 1 | |
| 5 | 2 EA | 127481-1CFE | | SSPA, PARADISE, 400 WATT C BAND | |
| 6 | 1 EA | 127482-1CFE | | REDUNDANT, BUC & WG SWITCHES | |
| 7 | 1 EA | 127483-1CFE | | CONTROLLER, RCP2-1100 | |
| 8 | 1 EA | 127483-2CFE | | CONTROLLER, FPRC-1100 | |
| 9 | 1 EA | 127549-1 | X1 | CABLE ASS'Y, CONVERTER - SERIAL LINK | |
| 10 | 1 EA | 127550-1 | X1 | CABLE ASS'Y, CONVERTER - SERIAL LINK | |
| 11 | 1 EA | 127551-1 | X1 | CABLE ASS'Y, BUC, SUPPLY VOLTAGE | |
| 12 | 1 EA | 127552-1 | X1 | CABLE ASS'Y, RCP2 - SIGNAL BOX | |
| 13 | 1 EA | 127553-1 | X1 | CABLE ASS'Y, SWITCH DRIVE | |
| 14 | 1 EA | 127554-1 | X1 | CABLE ASS'Y, SIGNAL BOX | |
| 15 | 2 EA | 112991-6CFE | E2 | WAVEGUIDE, WR-137, FLEXGUIDE, 48 IN | |
| 16 | 2 EA | 128249-1CFE | | WAVEGUIDE, RIGID, WR-137, 90 DEG H-BE | |
| 17 | 2 EA | 111202-172CFE | | CABLE ASS'Y, SEMI-RIGID, SMA (M) TO SM | |
| 18 | 2 EA | 111202-436CFE | | CABLE ASS'Y, SEMI-RIGID, SMA (F) TO SM | |
| 19 | 1 EA | 117611-1 | G | MODEM ASS'Y, PEDESTAL, 3 CH, 50 OHM | |
| 20 | 1 EA | 117611-3 | G | MODEM ASS'Y, PEDESTAL, 3 CH, 50 OHM | |
| 21 | 1 EA | 121009-2 | D | POWER SUPPLY ASS'Y, HEAVY DUTY | |
| 22 | 1 EA | 127513-2 | A | PCU ASS'Y, XX97B, TONE SWITCHING | |
| 23 | 3 EA | 116000-2 | J1 | SERVO AMPLIFIER ASS'Y | |
| 24 | 1 EA | 122208-1 | H | LEVEL CAGE ASS'Y, 90 DEG EL RANGE, IN | |
| 25 | 1 EA | 121966-2 | D | GPS ANTENNA, RETERMINATED, 21.0 L | |
| 26 | 1 EA | 116034 | F | HOME SWITCH ASS'Y, SHIELDED | |
| 27 | 1 EA | 124744-2 | A3 | RELAY ASS'Y, RX WAVEGUIDE | |
| 28 | 1 EA | 125570-4 | D2 | POWER SUPPLY ASS'Y, COSEL 150W, RH | |
| 30 | 1 EA | 127598-2 | B | HARNESS, INTERFACE 14600-75 | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SYSTEM BLOCK DIAGRAM, 14600-75 | | | | |
| PROD FAMILY LIT | EFF. DATE 23-May-08 | SHT 1 OF 3 | DRAWING NUMBER 127475-1 | REV A |


SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|-------------|-----|--|----------------------|
| 31 | 1 EA | 126375-3 | X2 | HARNESS ASS'Y, PEDESTAL | |
| 32 | 1 EA | 125726-3 | A3 | HARNESS ASS'Y, BRAKE, 56 IN, XX07 | |
| 33 | 1 IN | 127613-1 | X1 | HARNESS, RX WAVEGUIDE SWITCH | |
| 34 | 1 IN | 127614-1 | X1 | HARNESS, RX SWITCH CONTROLLER | |
| 40 | 2 EA | 114973-24 | D | CABLE ASS'Y, COAX, TYPE N, 24 IN. | |
| 41 | 1 EA | 116700-6 | F | CABLE ASS'Y, RG223, N(M)-F(M), 6 FT. | |
| 42 | 1 EA | 111079-4 | G | CABLE ASS'Y, SMA(M)-N(M), 4 FT. | |
| 43 | 1 EA | 114972-9 | L | CABLE ASS'Y, SMA(M) - SMA(M), 6 IN | |
| 44 | 2 EA | 113303-5 | S | CABLE ASS'Y, SMA 90 - SMA (M), 84 IN | |
| 45 | 2 EA | 114972-2 | L | CABLE ASS'Y, SMA(M) - SMA(M), 72 IN | |
| 50 | 2 EA | 115708-1 | L | CIRCUIT BREAKER BOX ASS'Y, 220V | |
| 51 | 1 EA | 127679-1 | X1 | 5CH HI POWER RING ASS'Y, 20 AMP (22" H | |
| 52 | 1 EA | 127717-110 | X2 | CABLE ASS'Y, 5 CH AC | |
| 53 | 1 EA | 127597-1 | X1 | CIRCUIT BREAKER ASS'Y, 14600-75 | |
| 54 | 2 EA | 124288-36 | E | CABLE ASS'Y, AC POWER, 36 IN | |
| 55 | 1 EA | 124288-48 | E | CABLE ASS'Y, 2U RACK | |
| 56 | 2 EA | 121008-96 | D2 | CABLE ASS'Y, AC INPUT, 96 IN. | |
| 57 | 1 EA | 127583-74 | A | CABLE ASS'Y, AC CABLE TO PEDESTAL | |
| 60 | 2 EA | 115492-8 | C1 | ADAPTER, SMA(F)-N(M) | |
| 61 | 1 EA | 116466 | C1 | ROTARY JOINT, 4.5 GHz, DUAL COAX. | |
| 70 | 2 EA | 126931-1 | A2 | WAVEGUIDE FILTER, WR-229, TX REJECT, | |
| 71 | 1 EA | 127608-365 | | WAVEGUIDE, EXTENSION, CPRG-229, 6.5 | |
| 72 | 1 EA | 127531-1 | X1 | DUAL WAVEGUIDE/COAXIAL SWITCH | |
| 73 | 1 EA | 124774-0002 | A | TERMINATION, WR-229, 2 WATT | |
| 74 | 2 EA | 117696 | 0 | WAVEGUIDE, WR-229, 90 DEG E-BEND, | |
| 80 | 1 EA | 127532-1 | X1 | WAVEGUIDE, E-BEND, WR-137 | |
| 81 | 1 EA | 113007 | B1 | WAVEGUIDE, WR-137, STEP TWIST | |
| 82 | 2 EA | 112988-1 | B2 | WAVEGUIDE, WR-137, 90 DEG E-BEND, 1.5 | |
| 83 | 1 EA | 112991-2 | E1 | WAVEGUIDE, WR-137, FLEXGUIDE, 24 IN | |

| | | | | |
|---|------------------------|------------|-----------------------------------|-----------------|
|  SeaTel | | | | |
| SYSTEM BLOCK DIAGRAM, 14600-75 | | | | |
| PROD FAMILY LIT | EFF. DATE 23-May-08 | SHT 2 OF 3 | DRAWING NUMBER 127475-1 | REV A |

SINGLE LEVEL MFG BILL OF MATERIAL

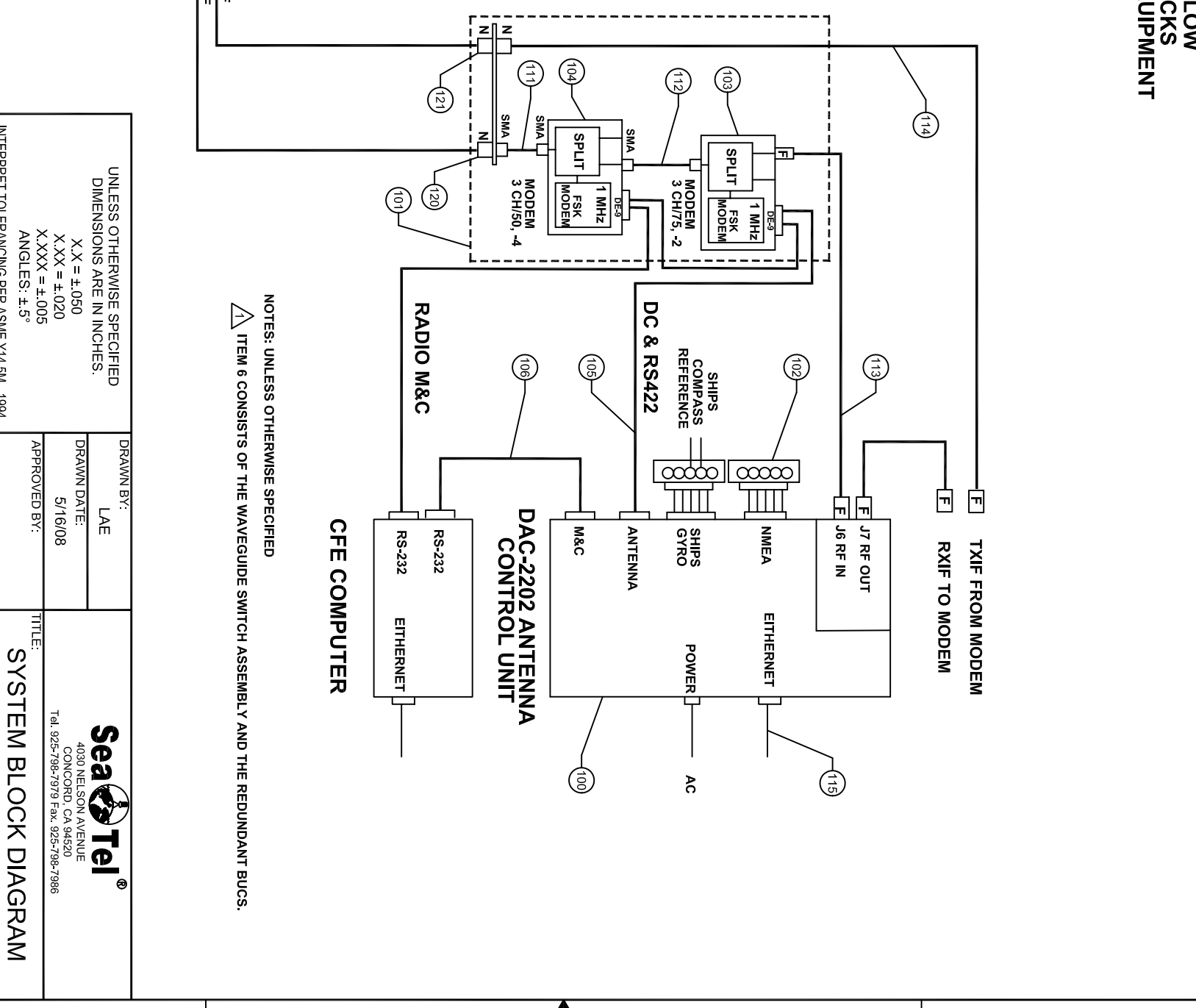
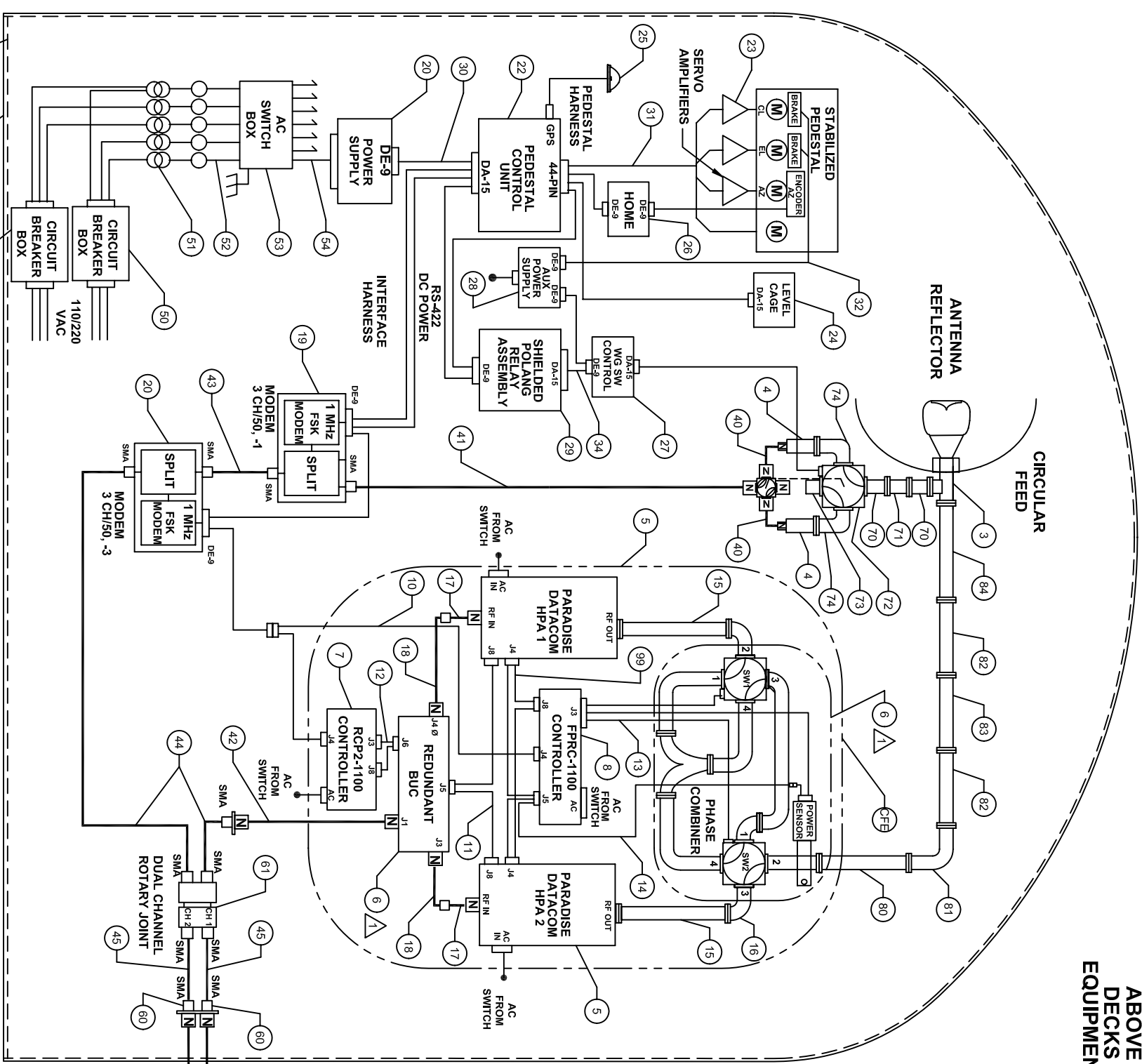
| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|-----------|-----|---------------------------------------|----------------------|
| 84 | 1 EA | 127397-1 | A | WAVEGUIDE, WR-137, ROTARY JOINT, L-S | |
| 99 | 1 EA | 123752-5 | D | BELOW DECK KIT, L-BAND, PED & RF M&C | |
| 100 | 1 EA | 125411-3 | F1 | DAC-2202, SCPC RCVR, 9 WIRE IF | |
| 101 | 1 EA | 116881-18 | B | MUX RACK PANEL ASS'Y, RX SS, SF, SPLI | |
| 102 | 1 EA | 121628-4 | N2 | TERMINAL MOUNTING STRIP ASS'Y, ACU | |
| 103 | 1 EA | 117168-2 | M | MODEM ASS'Y, BASE, 3 CH, 75 OHM | |
| 104 | 1 EA | 117611-4 | G | MODEM ASS'Y, BASE, 3 CH, 50 OHM | |
| 105 | 1 EA | 116298-6 | F4 | HARNESS ASS'Y, ACU TO MUX/TERM TO | |
| 106 | 1 EA | 120643-25 | A | CABLE ASS'Y, RS232, 9-WIRE, STRAIGHT, | |
| 111 | 1 EA | 113303-10 | S | CABLE ASS'Y, SMA 90 - SMA (M), 8 IN | |
| 112 | 1 EA | 114972-9 | L | CABLE ASS'Y, SMA(M) - SMA(M), 6 IN | |
| 113 | 2 EA | 111115-3 | B | CABLE ASS'Y, F(M)-F(M), 3 FT. | |
| 114 | 1 EA | 116700-6 | F | CABLE ASS'Y, RG223, N(M)-F(M), 6 FT. | |
| 115 | 1 EA | 119479-10 | B | CABLE ASS'Y, CAT5 JUMPER, 10 FT. | |
| 116 | 1 EA | 124095-36 | E | CABLE ASS'Y, RJ45 SERIAL, IDIRECT | |
| 120 | 3 EA | 115492-1 | C1 | ADAPTER, N(F)-SMA(F), W/FLANGE | |
| 121 | 1 EA | 110567-19 | | ADAPTER, N(F)-N(F), STRAIGHT, FLANGE | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SYSTEM BLOCK DIAGRAM, 14600-75 | | | | |
| PROD FAMILY LIT | EFF. DATE 23-May-08 | SHT 3 OF 3 | DRAWING NUMBER 127475-1 | REV A |

| REVISION HISTORY | | DESCRIPTION | BY |
|------------------|------|-------------|----|
| REV | ECO# | DATE | |

ABOVE DECKS EQUIPMENT

BELOW DECKS EQUIPMENT



NOTES: UNLESS OTHERWISE SPECIFIED
 ▲ ITEM 6 CONSISTS OF THE WAVEGUIDE SWITCH ASSEMBLY AND THE REDUNDANT BUCS.

UNLESS OTHERWISE SPECIFIED
 DIMENSIONS ARE IN INCHES.
 X.X = ±.050
 X.XX = ±.020
 X.XXX = ±.005
 ANGLES: ±.5°

| | | | |
|--|--|---------------------------------------|--|
| DRAWN BY: LAE | | TITLE: SYSTEM BLOCK DIAGRAM | |
| DRAWN DATE: 5/16/08 | | DRAWING NUMBER: 14600-75 | |
| APPROVED BY: | | APPROVED DATE: | |
| MATERIAL: NA | | FINISH: NA | |
| INTERPRET TOLERANCING PER ASME Y14.5M - 1994 | | SCALE: NONE | |
| FIRST USED: 14600-75 | | SHEET NUMBER: 1 OF 1 | |

REFERENCE DRAWINGS
 127474 ANTENNA SYSTEM SCHEMATIC
 126374 PEDESTAL HARNESS SCHEMATIC
 127471 SYSTEM, 14600-75

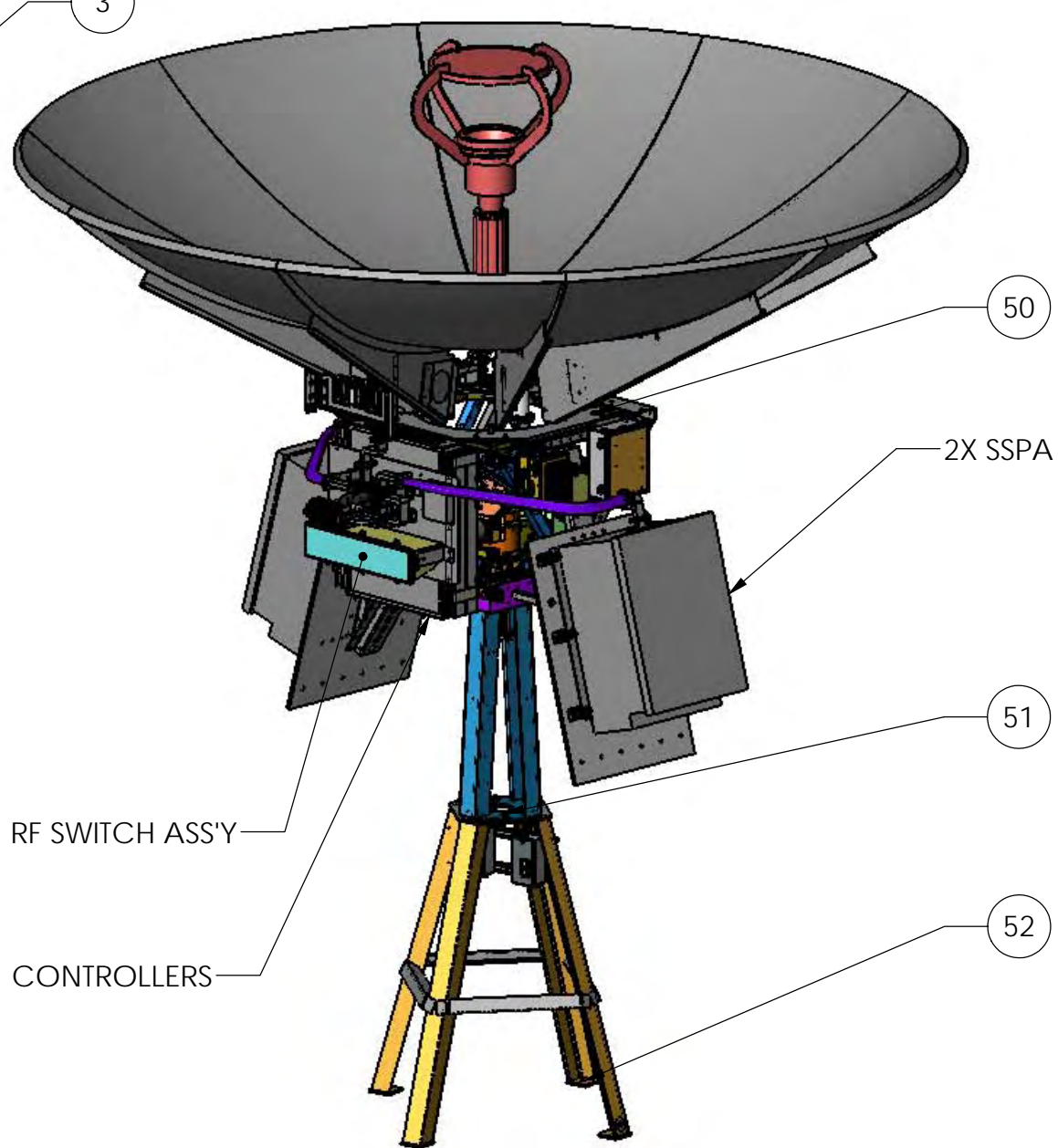
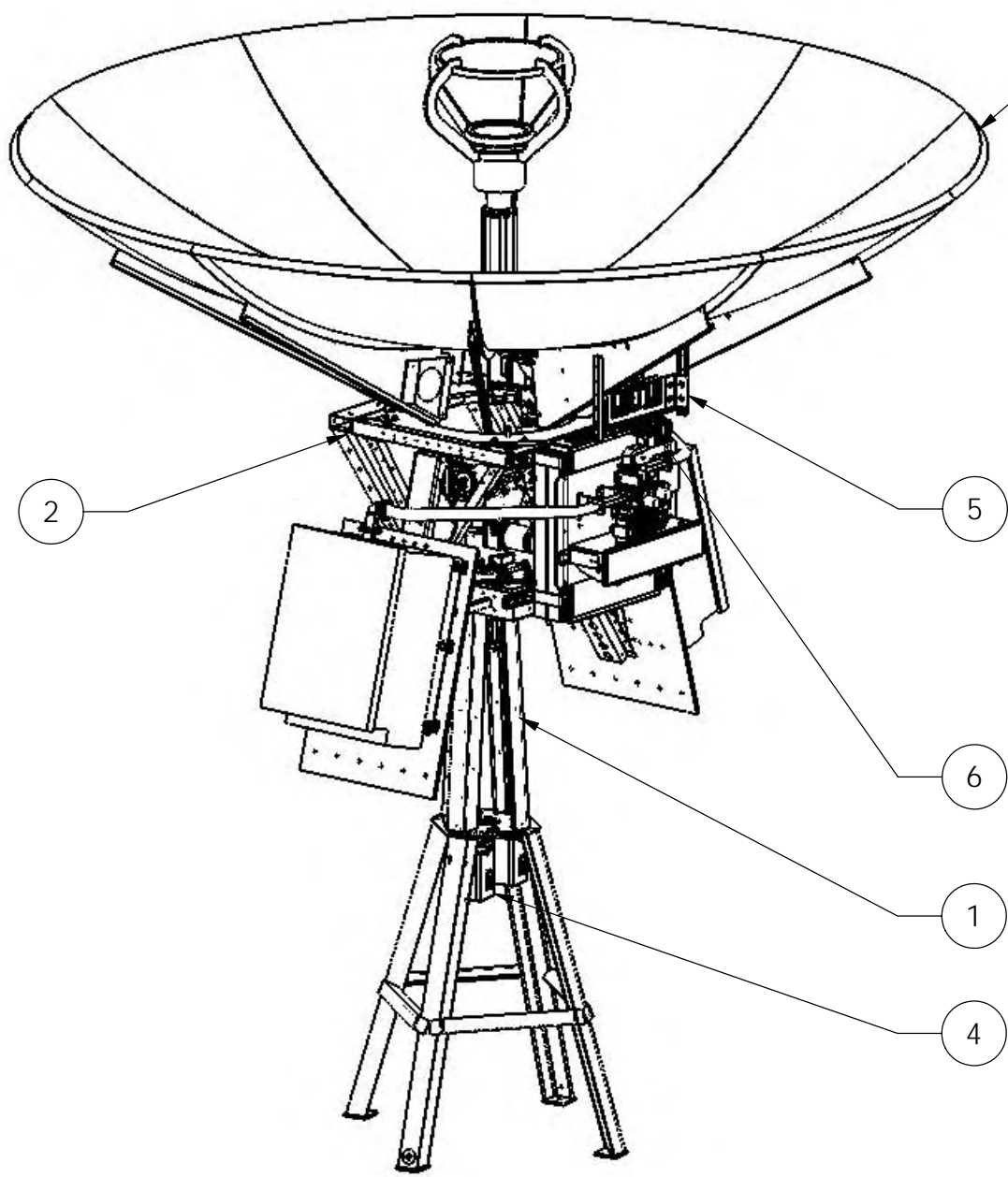
SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|-----------|-----|---------------------------------------|----------------------|
| 1 | 1 EA | 127476-1 | X2 | PEDESTAL ASS'Y, 14600-75 | |
| 2 | 1 EA | 127477-1 | A | ELEC. EQU. FRAME ASS'Y, 14600-75 | |
| 3 | 1 EA | 127479-1 | A | ANTENNA ASS'Y, CIRCULAR, 3.7 METER, 1 | |
| 4 | 1 EA | 127789-1 | X1 | POWER ASS'Y, 220V, 14600-75 | |
| 5 | 1 EA | 127605-1 | X3 | RX WAVEGUIDE ASS'Y, 14600-75 | |
| 6 | 1 EA | 127606-1 | A | WAVEGUIDE ASS'Y, TX PATH, 14600-75 | |
| 7 | 2 EA | 126879-1 | A | WEIGHT KIT, EQUIP. FRAME, 14600-50 | NOT SHOWN |
| 10 | 2 EA | 114973-24 | D | CABLE ASS'Y, COAX, TYPE N, 24 IN. | NOT SHOWN |
| 11 | 1 EA | 111079-4 | G | CABLE ASS'Y, SMA(M)-N(M), 4 FT. | NOT SHOWN |
| 12 | 1 EA | 114972-9 | L | CABLE ASS'Y, SMA(M) - SMA(M), 6 IN | NOT SHOWN |
| 14 | 1 EA | 115492-8 | C1 | ADAPTER, SMA(F)-N(M) | NOT SHOWN |
| 16 | 1 IN | 127613-1 | X1 | HARNESS, RX WAVEGUIDE SWITCH | NOT SHOWN |
| 17 | 1 IN | 127614-1 | X1 | HARNESS, RX SWITCH CONTROLLER | NOT SHOWN |
| 50 | 1 EA | 128225-1 | X1 | REFLECTOR FIELD INSTALL KIT | |
| 51 | 1 EA | 128224-1 | X1 | BASE STAND FIELD INSTALL KIT | |
| 52 | 1 EA | 128223-1 | X1 | GA INSTALL KIT | |


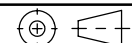
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|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| GENERAL ASS'Y, 14600-75, CIRCULAR | | | | |
| PROD FAMILY 00 TX/RX | EFF. DATE 23-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127563-1 | REV A |

8 7 6 5 4 3 2 1

| REVISION HISTORY | | | | |
|------------------|------|--------|-----------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | N/A | 5/8/08 | RELEASE TO PRODUCTION | LAE |




REFERENCE DOCUMENTS:
 127475 SYSTEM BLOCK DIAGRAM
 127474 ANTENNA SYSTEM SCHEMATIC
 127562 SYSTEM

| | | | | | |
|--|--|-----------------------|----------------|---|-----------|
| 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: LAE | |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| MATERIAL: NA | | DRAWN DATE: 3/6/08 | | | |
| FINISH: NA | | APPROVED BY: | | TITLE: GENERAL ASS'Y, 14600-75, CIRCULAR | |
| 3rd ANGLE PROJECTION  | | SIZE: B | SCALE: 1:64 | DRAWING NUMBER: 127563 | REV: A |
| FIRST USED: 14600-75 | | | | SHEET NUMBER 1 OF 1 | |

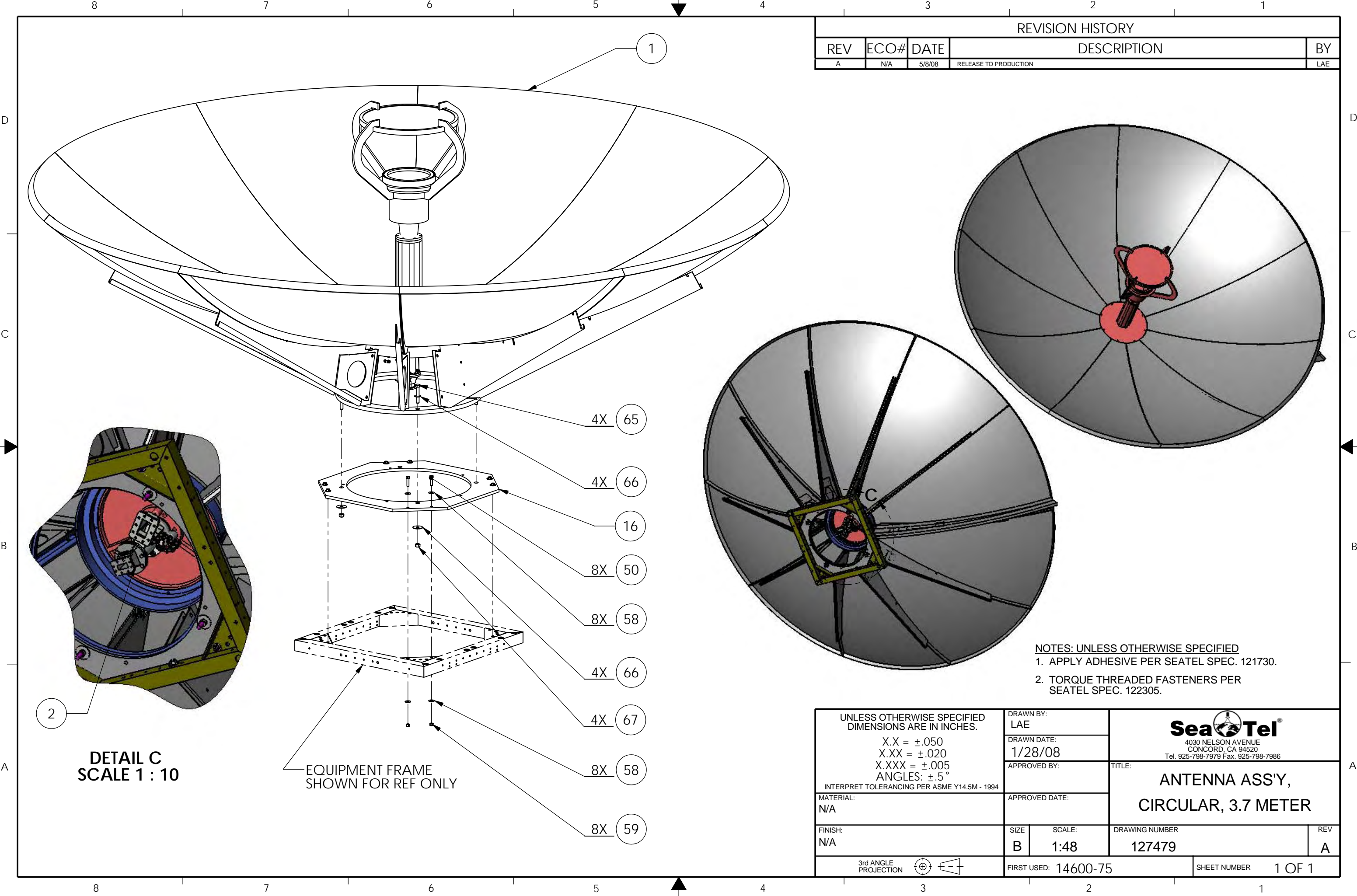
8 7 6 5 4 3 2 1

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|-------|------------|-----|-------------------------------------|----------------------|
| 1 | 1 EA | 127167-1 | X1 | REFLECTOR, 3.7M, SUMAN | |
| 2 | 1 EA | 124937-1 | | CIRCULAR FEED KIT, SUMAN 14600 | |
| 16 | 1 EA | 122567 | A | PLATE, MOUNTING, REFLECTOR SPACER | |
| 50 | 8 EA | 114586-626 | | SCREW, HEX HD, 3/8-16 x 1-1/2, S.S. | |
| 58 | 16 EA | 114580-031 | A | WASHER, FLAT, 3/8, S.S. | |
| 59 | 8 EA | 114583-031 | | NUT, HEX, 3/8-16, S.S. | |
| 65 | 4 EA | 114586-680 | | SCREW, HEX HD, 1/2-13 x 3, S.S. | |
| 66 | 8 EA | 114580-033 | | WASHER, FLAT, 1/2, S.S. | |
| 67 | 4 EA | 114583-033 | | NUT, HEX, 1/2-13, S.S. | |

| | | | | |
|--|------------------------|------------|----------------------------|----------|
|  | | | | |
| ANTENNA ASS'Y, CIRCULAR, 3.7 METER, 14600-75 | | | | |
| PROD FAMILY 97 TX/RX | EFF. DATE 12-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127479-1 | REV A |


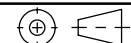
| REVISION HISTORY | | | | |
|------------------|------|--------|-----------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | N/A | 5/8/08 | RELEASE TO PRODUCTION | LAE |



DETAIL C
SCALE 1 : 10

EQUIPMENT FRAME
SHOWN FOR REF ONLY

- NOTES: UNLESS OTHERWISE SPECIFIED**
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
 2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.

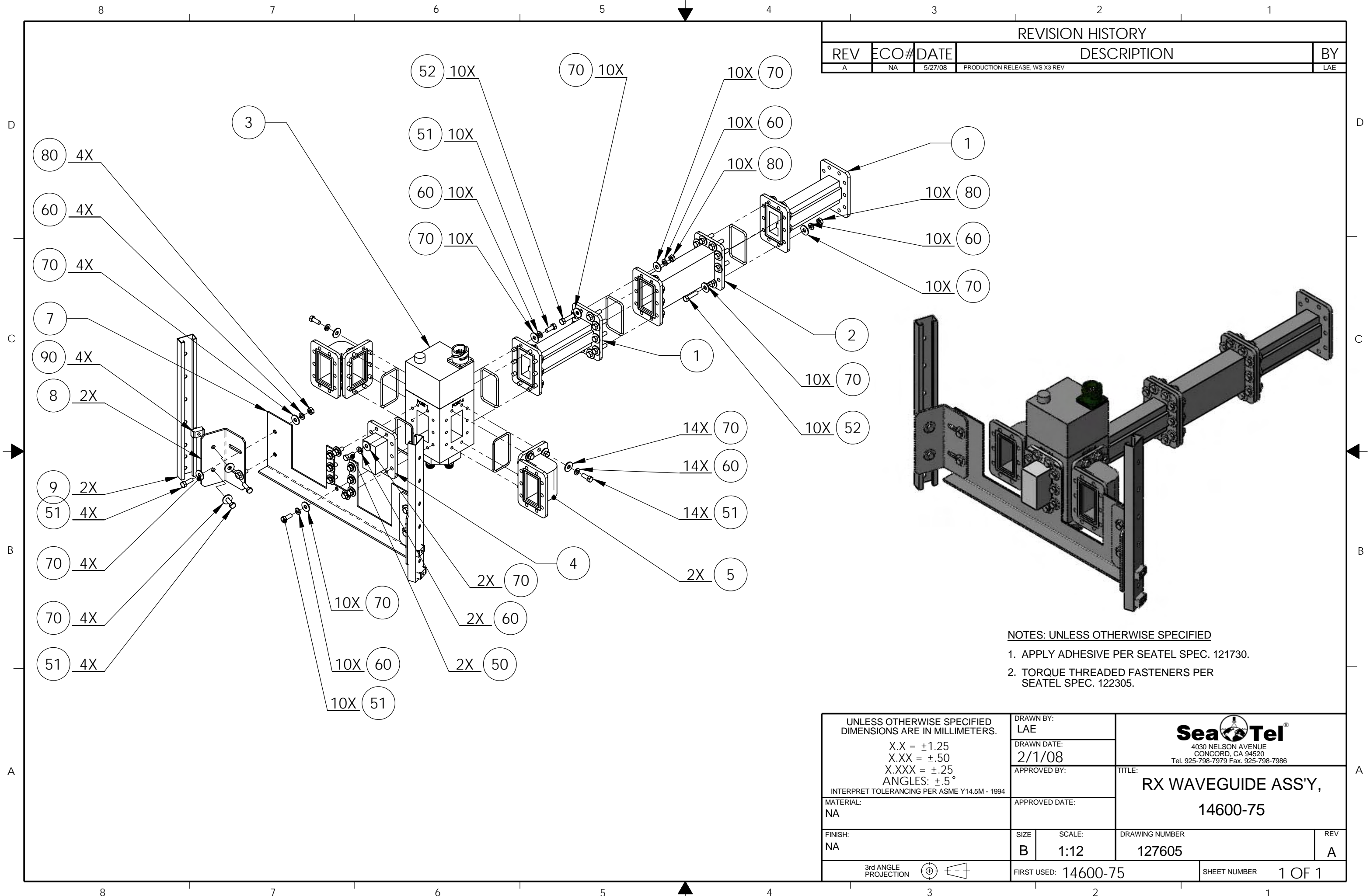
| | | | | | |
|---|--|------------------------|----------------|--|----------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES. | | DRAWN BY: LAE | |  SeaTel 4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| X.X = ±.050 X.XX = ±.020 X.XXX = ±.005 ANGLES: ±.5° <small>INTERPRET TOLERANCING PER ASME Y14.5M - 1994</small> | | DRAWN DATE: 1/28/08 | | | |
| MATERIAL: N/A | | APPROVED BY: | | TITLE: ANTENNA ASS'Y, CIRCULAR, 3.7 METER | |
| FINISH: N/A | | APPROVED DATE: | | DRAWING NUMBER 127479 | |
| 3rd ANGLE PROJECTION  | | SIZE B | SCALE: 1:48 | FIRST USED: 14600-75 | REV A |
| | | | | SHEET NUMBER | 1 OF 1 |

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|-------|-------------|-----|--|----------------------|
| 1 | 2 EA | 126931-1 | A2 | WAVEGUIDE FILTER, WR-229, TX REJECT, | |
| 2 | 1 EA | 127608-365 | | WAVEGUIDE, EXTENSION, CPRG-229, 6.5 | |
| 3 | 1 EA | 127531-1 | X1 | DUAL WAVEGUIDE/COAXIAL SWITCH | |
| 4 | 1 EA | 124774-0002 | A | TERMINATION, WR-229, 2 WATT | |
| 5 | 2 EA | 117696 | 0 | WAVEGUIDE, WR-229, 90 DEG E-BEND, | |
| 7 | 1 EA | 127533-1 | X1 | PLATE, SUPPORT, BASEBALL | |
| 8 | 2 EA | 127534-1 | A | BRACKET, FLANGE MOUNTING | |
| 9 | 2 EA | 126582-1 | B3 | STIFFENER, FRAME, 14 INCH | |
| 12 | 86 EA | 114580-029 | | WASHER, FLAT, 1/4, S.S. | |
| 50 | 2 EA | 114586-536 | | SCREW, HEX HD, 1/4-20 x 5/8, S.S. | |
| 51 | 40 EA | 114586-537 | | SCREW, HEX HD, 1/4-20 x 3/4, S.S. | |
| 52 | 20 EA | 114586-538 | | SCREW, HEX HD, 1/4-20 x 1, S.S. | |
| 60 | 58 EA | 114581-029 | | WASHER, LOCK, 1/4, S.S | |
| 80 | 24 EA | 114583-029 | | NUT, HEX, 1/4-20, S.S. | |
| 90 | 4 EA | 125151-1 | A1 | NUT, 1 1/4 UNISTRUT, 1/4-20, W/SPRING, S | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| RX WAVEGUIDE ASS'Y, 14600-75 | | | | |
| PROD FAMILY COMMON | EFF. DATE 28-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127605-1 | REV A |

| REVISION HISTORY | | | | |
|------------------|------|---------|-------------------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | NA | 5/27/08 | PRODUCTION RELEASE, WS X3 REV | LAE |



- NOTES: UNLESS OTHERWISE SPECIFIED**
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
 2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.

| | | | |
|--|-----------------------|---------------------------|--|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. X.X = ±1.25 X.XX = ±.50 X.XXX = ±.25 ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994 | DRAWN BY: LAE | | 4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 |
| | DRAWN DATE: 2/1/08 | | |
| MATERIAL: NA | APPROVED BY: | | TITLE: RX WAVEGUIDE ASS'Y, 14600-75 |
| FINISH: NA | APPROVED DATE: | SIZE: B | SCALE: 1:12 |
| FIRST USED: 14600-75 | | DRAWING NUMBER: 127605 | REV: A |
| 3rd ANGLE PROJECTION | | SHEET NUMBER: 1 OF 1 | |

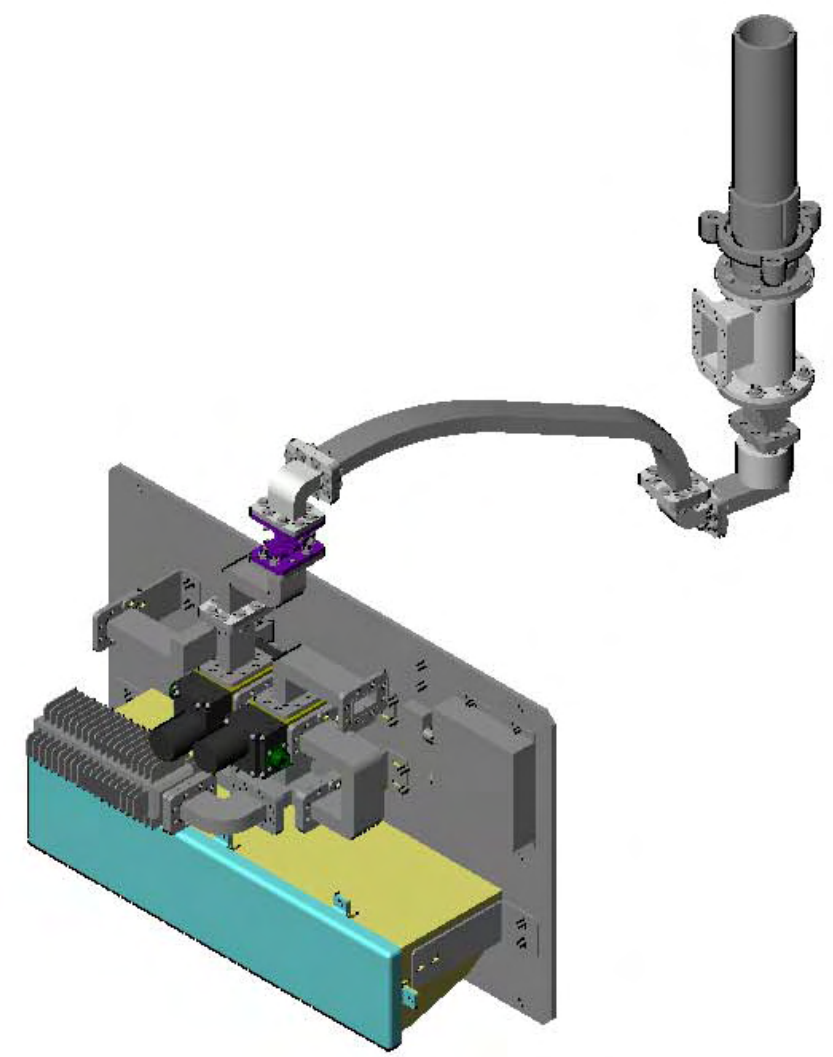
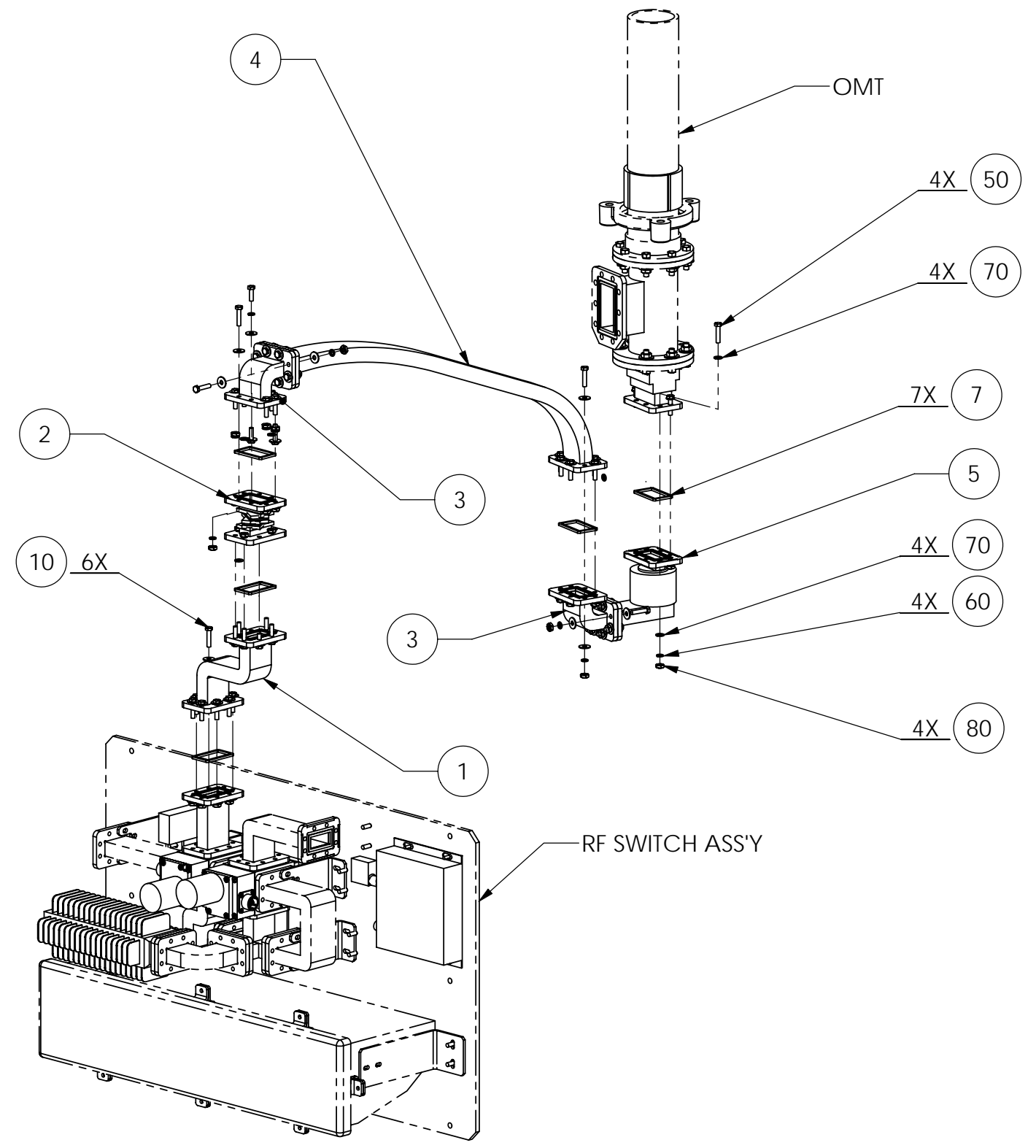
SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|------------|-----|---------------------------------------|----------------------|
| 1 | 1 EA | 127532-1 | X1 | WAVEGUIDE, E-BEND, WR-137 | |
| 2 | 1 EA | 113007 | B1 | WAVEGUIDE, WR-137, STEP TWIST | |
| 3 | 2 EA | 112988-1 | B2 | WAVEGUIDE, WR-137, 90 DEG E-BEND, 1.5 | |
| 4 | 1 EA | 112991-2 | E1 | WAVEGUIDE, WR-137, FLEXGUIDE, 24 IN | |
| 5 | 1 EA | 127397-1 | A | WAVEGUIDE, WR-137, ROTARY JOINT, L-S | |
| 7 | 7 EA | 117218-2 | | GASKET, WR-137, (CPRG FULL) | |
| 10 | 6 EA | 118294-3 | A3 | HARDWARE KIT, WR-137 FLANGE | |
| 50 | 4 EA | 120241-833 | | SCREW, HEX HD, 10-32 X 1, S.S. | |
| 60 | 4 EA | 114581-011 | | WASHER, LOCK, #10, S.S. | |
| 70 | 8 EA | 114580-011 | | WASHER, FLAT, #10, S.S. | |
| 80 | 4 EA | 114583-011 | A | NUT, HEX, 10-32, S.S. | |


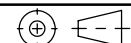
| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| WAVEGUIDE ASS'Y, TX PATH, 14600-75 | | | | |
| PROD FAMILY COMMON | EFF. DATE 12-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127606-1 | REV A |

| REVISION HISTORY | | | | |
|------------------|------|--------|----------------------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | NA | 5/7/08 | RELEASE TO PRODUCTION, WS REV X2 | LAE |

D
C
B
A




- NOTES: UNLESS OTHERWISE SPECIFIED
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.
 2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.

| | | | | | |
|--|--|------------------------|----------------|---|-----------|
| 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: LAE | |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| MATERIAL: NA | | DRAWN DATE: 3/13/08 | | | |
| FINISH: NA | | APPROVED BY: | | TITLE: WAVEGUIDE ASS'Y, TX PATH, 14600-75 | |
| 3rd ANGLE PROJECTION  | | SIZE: B | SCALE: 1:24 | DRAWING NUMBER: 127606 | REV: A |
| FIRST USED: 14600-75 | | | | SHEET NUMBER 1 OF 1 | |

8 7 6 5 4 3 2 1

SINGLE LEVEL MFG BILL OF MATERIAL


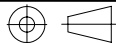
| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|---------------|-----|--|----------------------|
| 1 | 2 EA | 127481-1CFE | | SSPA, PARADISE, 400 WATT C BAND | |
| 2 | 1 EA | 127482-1CFE | | REDUNDANT, BUC & WG SWITCHES | |
| 3 | 1 EA | 127483-1CFE | | CONTROLLER, RCP2-1100 | |
| 4 | 1 EA | 127483-2CFE | | CONTROLLER, FPRC-1100 | |
| 5 | 1 EA | 127549-1CFE | | CABLE ASS'Y, CONVERTER - SERIAL LINK | |
| 6 | 1 EA | 127550-1CFE | | CABLE ASS'Y, CONVERTER - SERIAL LINK | |
| 7 | 1 EA | 127551-1CFE | | CABLE ASS'Y, BUC, SUPPLY VOLTAGE | |
| 8 | 1 EA | 127552-1CFE | | CABLE ASS'Y, RCP2 - SIGNAL BOX | |
| 9 | 1 EA | 127553-1CFE | | CABLE ASS'Y, SWITCH DRIVE | |
| 10 | 1 EA | 127554-1CFE | | CABLE ASS'Y, SIGNAL BOX | |
| 11 | 2 EA | 112991-6CFE | E2 | WAVEGUIDE, WR-137, FLEXGUIDE, 48 IN | |
| 12 | 2 EA | 128249-1CFE | | WAVEGUIDE, RIGID, WR-137, 90 DEG H-BE | |
| 13 | 2 EA | 111202-172CFE | | CABLE ASS'Y, SEMI-RIGID, SMA (M) TO SM | |
| 14 | 2 EA | 111202-436CFE | | CABLE ASS'Y, SEMI-RIGID, SMA (F) TO SM | |

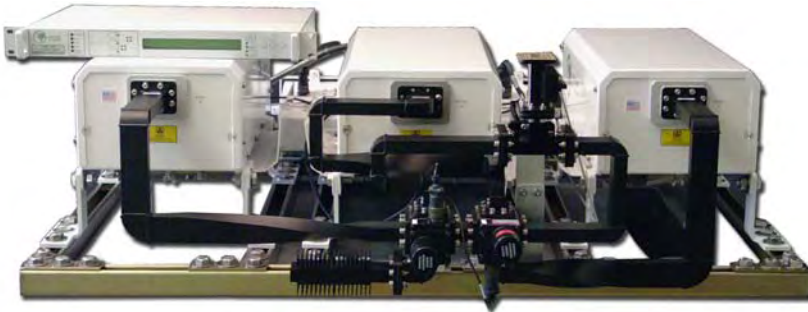
| | | | | |
|--|------------------------|------------|--------------------------------------|-----------------|
|  | | | | |
| SSPA, PHASE COMBINED, 600W, PARADISE EQUIPMENT | | | | |
| PROD FAMILY COMMON | EFF. DATE 23-May-08 | SHT 1 OF 1 | DRAWING NUMBER 127767-1CFE | REV A |

REVISION HISTORY

| REV | ECO# | DATE | DESCRIPTION | BY |
|-----|------|---------|-----------------------|-----|
| A | NA | 5/21/08 | RELEASE TO PRODUCTION | LAE |

| DASH # | MODEL # | NOMENCLATURE | MFG'R |
|--------|--------------------|---|---------------------|
| -1 | HPAC 2400 AWM G001 | 400 WATT PHASE COMBINED SSPA, C BAND | PARADISE DATACOM |

| | | | | |
|---|------------------------|----------------------|---|--|
| 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: LAE | |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| | DRAWN DATE: 5/21/08 | | | |
| | APPROVED BY: | | TITLE: SSPA, PHASE COMBINED, 600W, PARDISE EQUIPMENT | |
| MATERIAL: NA | APPROVED DATE: | | DRAWING NUMBER: 127767 | |
| FINISH: NA | SIZE: A | SCALE: NONE | REV: A | |
| 3rd ANGLE PROJECTION  | | FIRST USED: 14600-75 | SHEET NUMBER: 1 OF 9 | |



100W Ku-Band 1:2 Phase Combined SSPA System with FPRC-1200 Controller



125W Ku-Band 1:1 Phase Combined SSPB System with FPRC-1100 Controller and RCP2-1100 Controller for L-Band redundancy



1 kW C-Band, 1:1 Phase Combined High Power Outdoor SSPA System

DESCRIPTION

Paradise Datacom's family of outdoor packaged, phase combined solid state power amplifier (SSPA) systems provide the highest degree of redundancy and system reliability. Phase Combined amplifier systems can be configured using Paradise Datacom's High Power Outdoor amplifiers.

1:1 Phase Combined Systems are an economical solution to providing high output power capability with soft-fail redundancy. 1:2 Phase Combined Systems can provide full output power redundancy to mission critical applications which cannot tolerate any decrease in output power capability.

Both 1:1 and 1:2 Phase Combined Systems utilize a signal box through which all RF and L-band input signals are distributed. This ensures that any reference signal is modulated to each amplifier at the same frequency, and that the phase adjustment is optimized.

FEATURES

- Extremely High Power Density:
 - 1.2 kW C-Band;
 - 1.2 kW S-Band;
 - 600 W X-Band;
 - 500 W Ku-Band
- Universal Power Factor Corrected Power Supply
- System Output Power Monitor

OPTIONS

- Reflected Power Monitor
- L-Band Input operation
- SSPA and Controller Remote Panels
- Auxiliary / Maintenance Output Switch
- Cold Standby Amplifier Operation for Prime Power Savings
- Custom Configurations

Paradise Datacom LLC
328 Innovation Blvd.
State College, PA 16803
Tel: (814) 238-3450
Fax: (814) 238-3829

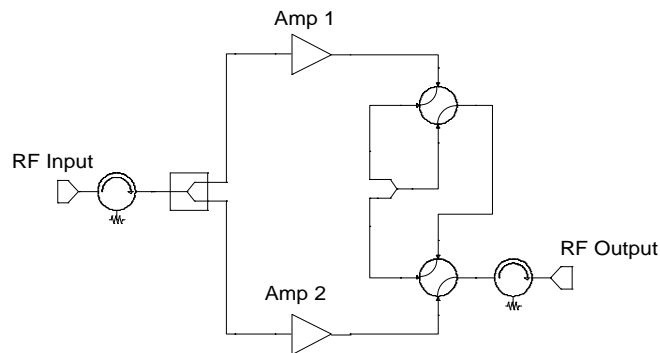
www.paradisedata.com

Paradise Datacom Ltd.
1 Wheaton Road, Witham
Essex CM8 3UJ England
Tel: +44(0) 1376 515636
Fax: +44(0) 1376 533764



1:1 Phase Combined / Redundant System

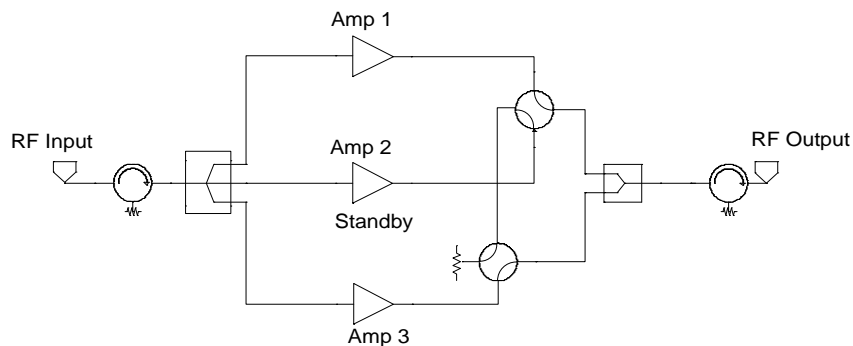
The 1:1 Fixed Phase Combined Redundant System is a popular system architecture that enables two Solid State Power Amplifiers to operate as a normal 1:1 redundant system or a phase combined system. The basic system topology is very similar to a 1:1 redundant system and is shown in the block diagram. An additional switch is included which allows either amplifier to be individually connected to the antenna or connect both amplifiers to a waveguide combiner.



1:1 Phase Combined System Simplified Block Diagram

1:2 Phase Combined / Redundant System

The 1:2 Phase Combined Redundant System is a system architecture that enables Solid State Power Amplifiers to achieve higher output power levels while building in a level of redundancy. The basic system topology is similar to a 1:2 redundant system shown in the block diagram below. Amplifiers #1 and #3 are normally online. The outputs of #1 and #3 are directed by the waveguide switches into a low loss power combiner. In the event of a failure of either on line amplifier, the standby amplifier, #2, can be switched in place of either #1 or #3 and the system maintains **full output power**.



1:2 Phase Combined System Simplified Block Diagram



Outdoor Systems are configured with Paradise Datacom's popular High Power Outdoor or Compact Outdoor SSPA packages



High Power Outdoor Enclosure
Output Power Levels

S-Band: 400W - 600W
C-Band: 250W - 600W
X-Band: 350W - 500W
Ku-Band: 100W - 250W



Compact Outdoor
Output Power Levels

S-Band: 50W - 300W
C-Band: 30W - 300W
X-Band: 60W - 250W
Ku-Band: 10W - 125W

System Output Power Capacity

Due to the output waveguide and switches, there is always some residual loss in the output of phase combined HPA systems. This results in slightly less than the ideal 3dB power addition to the output power of a single HPA unit.

On 1:1 phase combined systems, the typical additive output power is 2.70 dB above the output power of a single HPA. On 1:2 phase combined systems, the typical additive output power is 2.50 dB above the output power of a single HPA.

For example, a 125W Ku-Band Compact Outdoor SSPA in a 1:1 phase combined system would have the following output power:

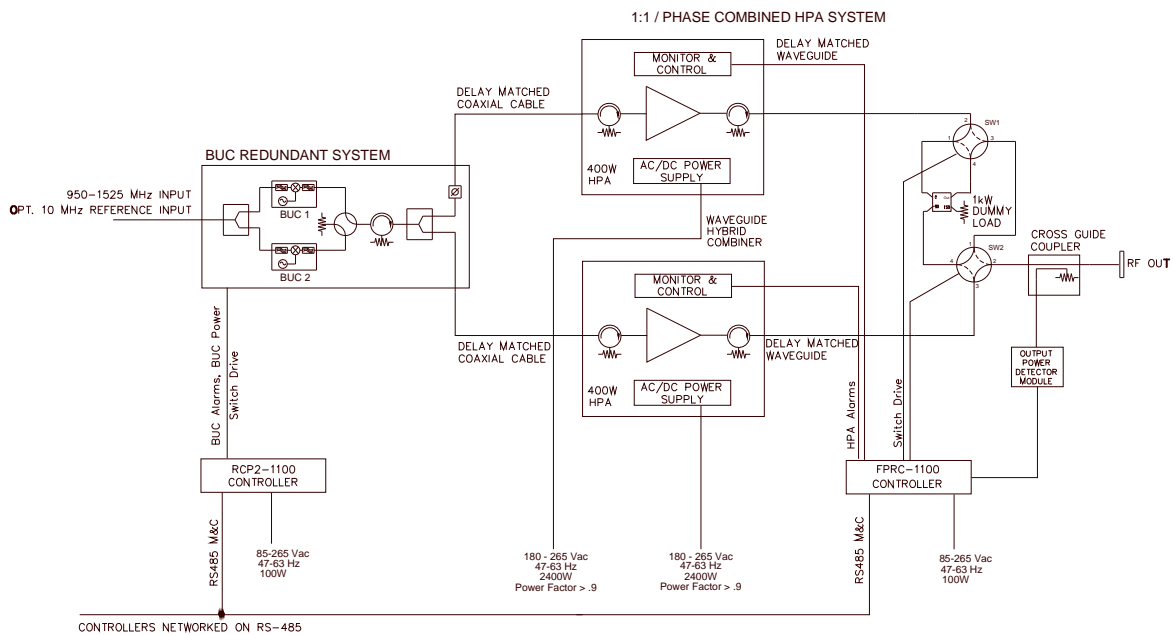
Single HPA: $P_{1dB} = 50.0$ dBm; $P_{sat} = 51.0$ dBm

1:1 phase combined system: $P_{1dB} = 52.7$ dBm; $P_{sat} = 53.7$ dBm



L-Band Operation

Paradise Datacom Phase Combined HPA Systems can be configured for L-Band Input operation. For optimum RF phase combining over the entire bandwidth of a communication amplifier, the frequency translation part of the system must be separated from the phase combining loop. Therefore, systems with L-Band input are configured with a separate 1:1 system of L-Band Block Up Converters that feed the 1:1 or 1:2 Phase Combined HPA system. If L-Band redundancy is not required, the system can be configured with a single thread L-Band Block Up Converter.

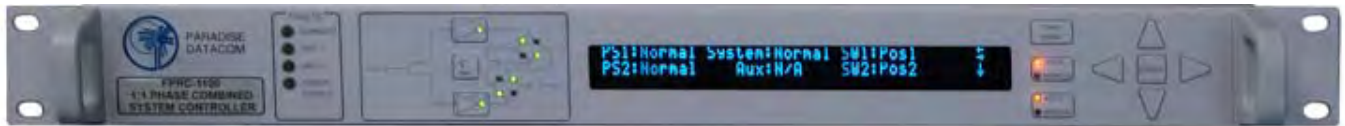


The Block Up Converter system is housed in a weather-proof enclosure (shown below) and controlled by an indoor RCP2-1100 Redundant Controller. The Up Converters can be configured with internal reference oscillators or external reference oscillators. The Paradise Datacom ZBUC architecture allows a converter that is fitted with an internal reference oscillator to automatically detect and switch to an externally applied 10 MHz reference signal.

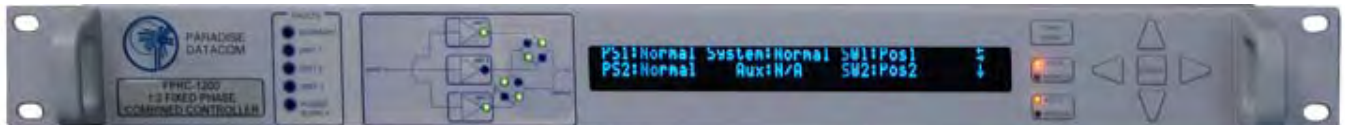




System Controllers



FPRC-1100 1:1 Phase Combined System Controller



FPRC-1200 1:2 Phase Combined System Controller

The FPRC-1X00 is the heart of the Redundant SSPA System. It provides an extremely user friendly interface for complete monitor and control of the high power amplifiers. The front panel mimic display shows the on-line amplifiers and the switch positions. Fault lights are provided for easy indication of system status.

All FPRC-1X00 monitor and control is available locally at the front panel LCD display, as well as remotely by the RS232 , RS485, or Ethernet interface ports. Audible alarms and a full compliment of parallel I/O signal are available at the rear panel of the FPRC-1X00.

The FPRC-1X00 System Controller allows the Phase Combined System of amplifiers to be controlled as if it were a single SSPA. The FPRC is the single point of interface for either local, front panel, or remote control. System monitor and control capability include gain adjustment, output power monitoring (dBm or Watts), and alarms.

The FPRC-1X00 is a 1RU indoor control unit that contains its own internal redundant components including fully redundant power supplies.

Note: Systems can be configured without the use of a system controller. Consult the factory for operation of phase combined systems without a system controller.



General System Specifications

| PARAMETER | NOTES | LIMITS | UNITS |
|---|---|---|--|
| Gain | minimum | 75 | dB |
| Gain Flatness | full band | ±1.0 | dB |
| Gain Slope | per 40 MHz | ±0.3 | dB/40 MHz |
| Gain Variation vs. Temperature | -40 to +60°C | ±1.0 | dB |
| Gain Adjustment | 0.1 dB resolution adjustable by either serial or analog voltage input: 0.5 to 2.5 VDC | 20 | dB |
| Intermodulation Distortion | 3dB back off relative to P _{1dB} | -25 | dBc |
| AM/PM Conversion | (@ rated P _{1dB}) (@ P _{1dB} -3dB) | 3.5 1.0 | °/dB °/dB |
| Spurious Harmonics | (@ rated P _{1dB}) (@ rated P _{1dB} -3dB) (C-, X-, Ku-bands) (@ rated P _{1dB} -3dB) (S-band) | -60 -50 -30 | dBc dBc dBc |
| Input/Output VSWR | | 1.3:1 | |
| Noise Figure | at maximum gain (C-, X-, Ku-bands) at maximum gain (S-band) | 10 8 | dB dB |
| Group Delay (per 40 MHz segment) | Linear Parabolic Ripple | 0.01 0.003 1.0 | ns/MHz ns/MHz ² ns p-p |
| Transmit Band Noise Output Power Density | TX Band RX Band (C- or Ku-bands) RX Band (X-Band) RX Band (S-Band) | -75 -150 -100 See options | dBW/4 KHz dBW/4 KHz dBW/4 KHz |
| Receive Band Noise Output Power Density | S-Band, with optional filter S-Band, without optional filter | -155 -95 | dBW/4 KHz dBW/4 KHz |
| Residual AM Noise | 0 - 10 KHz 10 KHz - 500 KHz 500 KHz - 1 MHz | -45 -20 (1.25 + log F) -80 | dBc dBc dBc |
| Phase Noise | Offset frequency from carrier 10 Hz 100 Hz 1 KHz 10 KHz 100 KHz 1 MHz | -90 -100 -110 -120 -125 -130 | dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz dBc/Hz |

Environmental

| | | | |
|-----------------------|------------|------------|----|
| Operating Temperature | Ambient | -40 to +60 | °C |
| Relative Humidity | condensing | 100 | % |
| Cooling System | integrated | Forced air | |

Mechanical

| | | | |
|----------------------------|---|--|----------------------|
| Size, High Power Outdoor | width X length X height | 21.0 X 27.95 X 13.5 533 X 710 X 343 | inches mm |
| Size, Compact Outdoor | width X length X height | 10.0 X 19.5 X 6.50 254 X 495 X 165 | inches mm |
| Weight, High Power Outdoor | | 125 (57) | lbs.(kg) |
| Weight, Compact Outdoor | S-/C-/X-Band to 200W / Ku-Band to 70W 250W C,X-Band / 100, 125 W Ku-Band | 36 (16.4) 44 (20.0) | lbs.(kg) lbs.(kg) |
| Finish | | Paint | White; powder coat |

Specifications are subject to change.



Part Number Configuration, High Power Outdoor System

HPA 2 W

Band
S - S-Band
C - C-Band
X - X-Band
K - Ku-Band

Power Level (in Watts)
S-Band
400 or 500
C-Band
250, 300, 400, 500 or 600
X-Band
350 or 500
Ku-Band
100, 125, 200 or 250

Frequency Sub Band
S-Band
A - 2.020 - 2.120 GHz
B - 2.200 - 2.300 GHz
C-Band
A* - 5.85 - 6.425 GHz
B* - 5.85 - 6.725 GHz
C - 5.75 - 6.670 GHz
E* - 6.425 - 6.725 GHz (Palapa)
F* - 6.725 - 7.025 GHz (Insat)
X-Band
A* - 7.90 - 8.40 GHz
B - 7.50 - 8.50 GHz
D - 7.70 - 8.40 GHz
E - 7.75 - 8.50 GHz
Ku-Band
A* - 14.00 - 14.50 GHz
B* - 13.75 - 14.50 GHz

* Available with optional ZBUC

Configuration Modifier
XXX = Standard
SXX = Input Sample
XVX = Reflected Power Monitor
XXR* = Receive Band Reject Filter

* S-Band Sub Band 'A' only, 400W max.

System Configuration
E = 1:2, Input Splitter, FPRC-1200*
G = 1:1, Input Splitter, FPRC-1100*
J = 1:2, Input Splitter, Internal control
S = System (Custom)

* Standard Cable Length of 100 ft. (30m) with FPRC

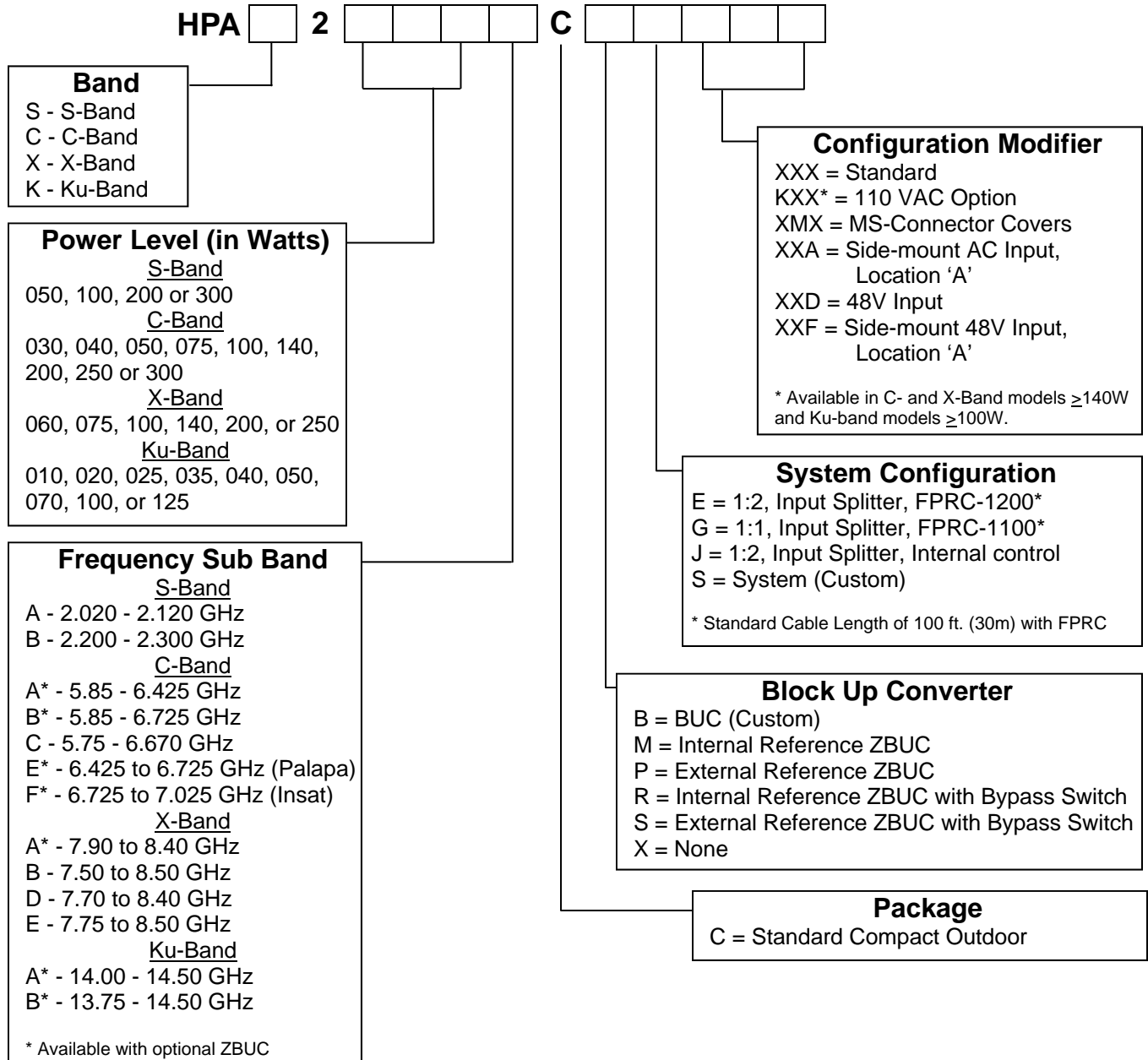
Block Up Converter
B = BUC (Custom)
M = Internal Reference ZBUC (FSK)
P = External Reference ZBUC (FSK)
X = None

Package
W = Weather proof (NEMA)

Example - A 400W S-Band 1:2 Fixed Phase Combined High Power Outdoor SSPA System with a FPRC-1200 controller and no block up converter is part number: **HPAS2400AWXEXXX**.



Part Number Configuration, Compact Outdoor Systems



Example - A 1:1 standard frequency 70W Ku-Band Compact Outdoor SSPA system with input splitter and internal control with an external reference BUC is part number: **HPAK2070ACBPXXX.**

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|-------|-----------|-----|--------------------------------------|----------------------|
| 1 | 1 EA | 122837-1 | X1 | RADOME FAB ASS'Y, 16FT, WHITE | |
| 2 | 1 EA | 126851-1 | X1 | RADOME RISER KIT, 110 IN X 15 IN | |
| 3 | 1 EA | 115912-1 | D2 | BASE FRAME ASS'Y, 168 IN RADOME, W/P | |
| 4 | 48 EA | 117762-1 | B | SILICONE ADHESIVE, WHT RTV 122, 10.1 | |
| 5 | 1 EA | 124955 | | HARDWARE KIT, 16 FT RADOME | |
| 6 | 3 EA | 124903-1 | B1 | STRAIN RELIEF ASS'Y | |
| 7 | 1 EA | 117319-11 | C2 | LOCTITE, 271 THREADLOCKER, 10ML | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| RADOME ASS'Y, 16 FT | | | | |
| PROD FAMILY COMMON | EFF. DATE 20-May-08 | SHT 1 OF 1 | DRAWING NUMBER 124954-1 | REV A |

NOTES: UNLESS OTHERWISE SPECIFIED

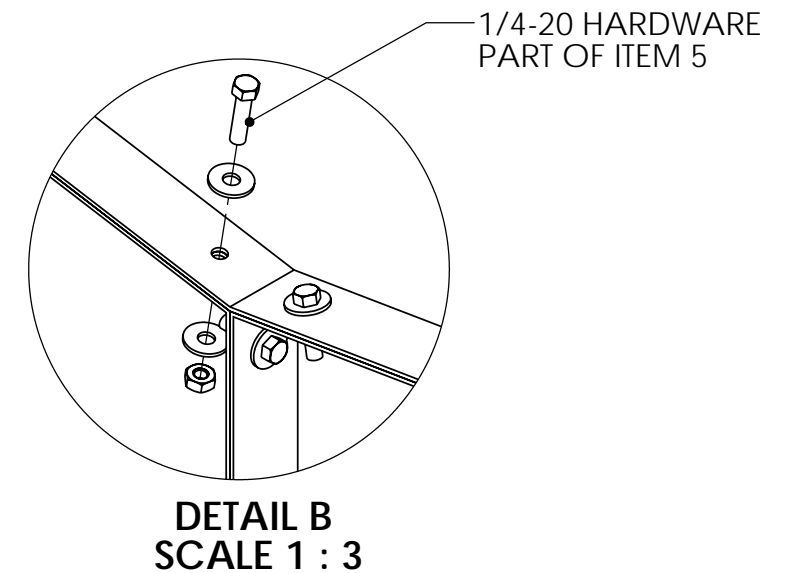
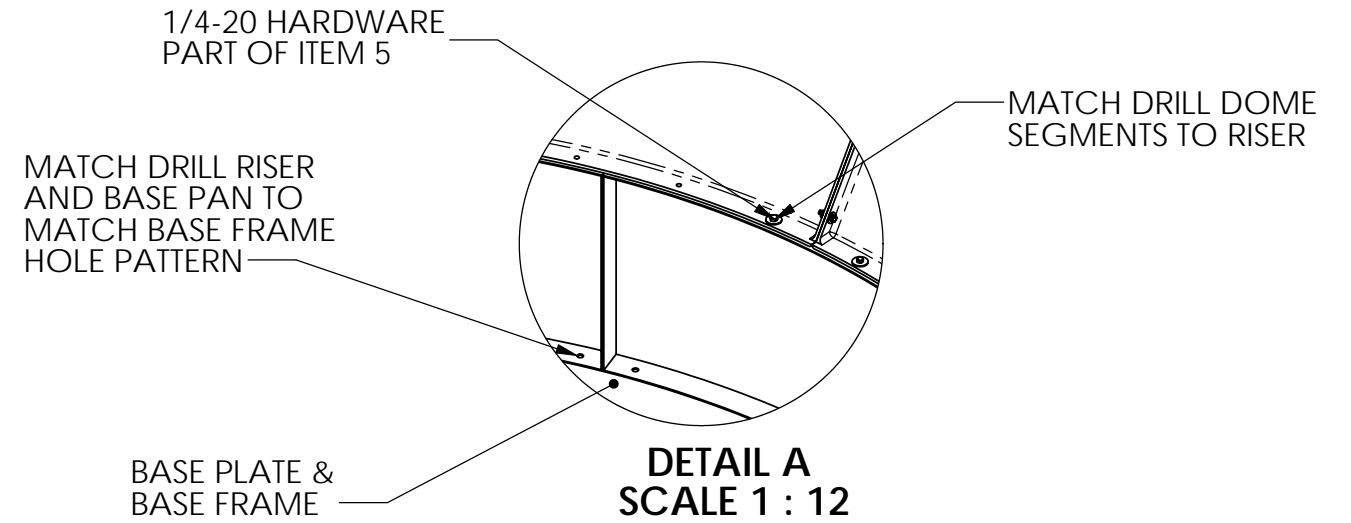
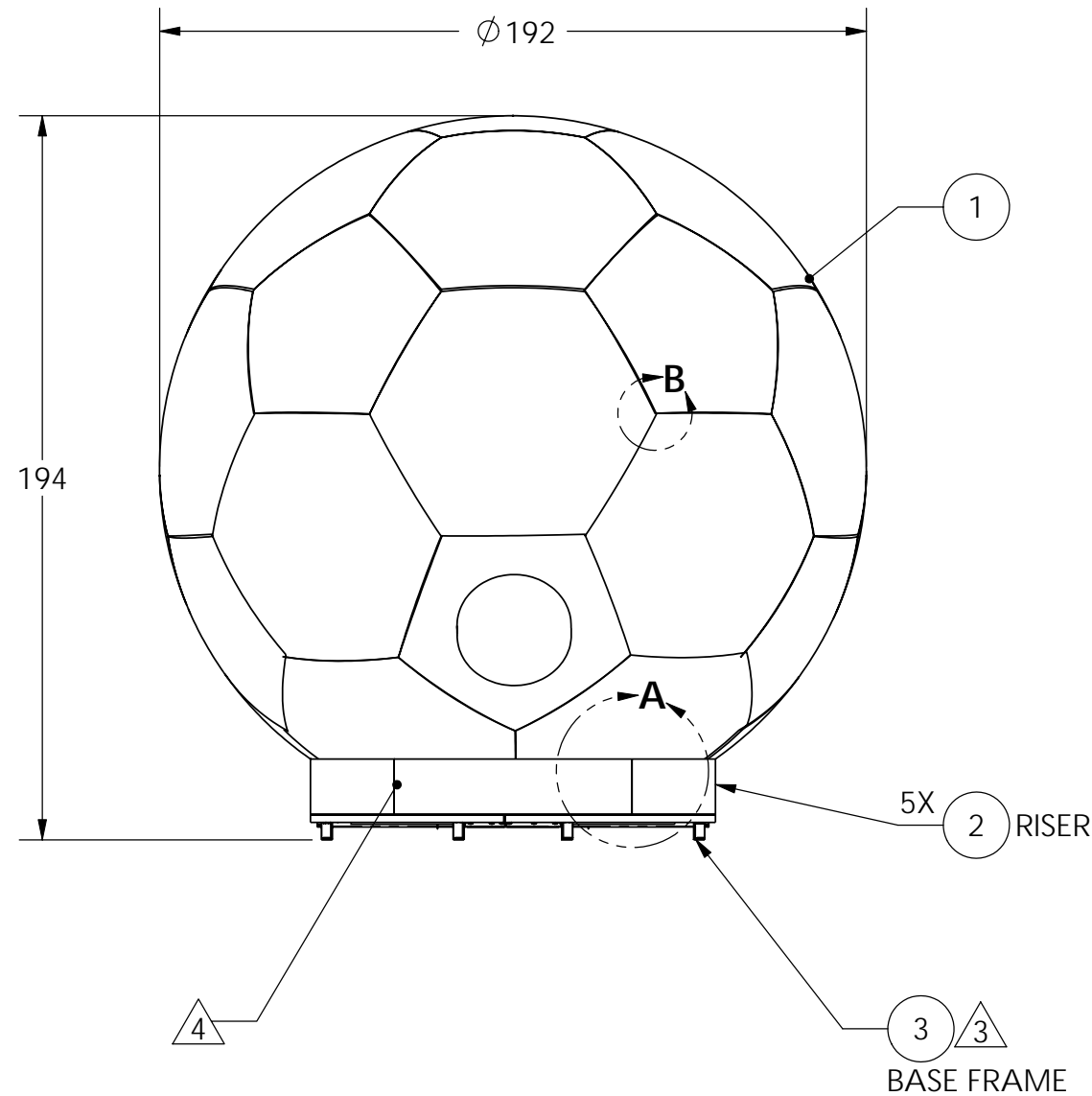
1. APPLY ADHESIVE PER SEATEL SPEC. 121730.

2. TORQUE THREADED FASTENERS PER SEATEL SPEC. 122305.

3. DASH 1 ONLY.

4. POSITION RISER PANELS AS SHOWN. RISER SEAMS TO BE OFFSET FROM RADOME PANEL SEAMS.

| REVISION HISTORY | | | | |
|------------------|------|---------|----------------------------------|----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | N/A | 6/10/07 | RELEASE TO PRODUCTION, WS REV X1 | A |



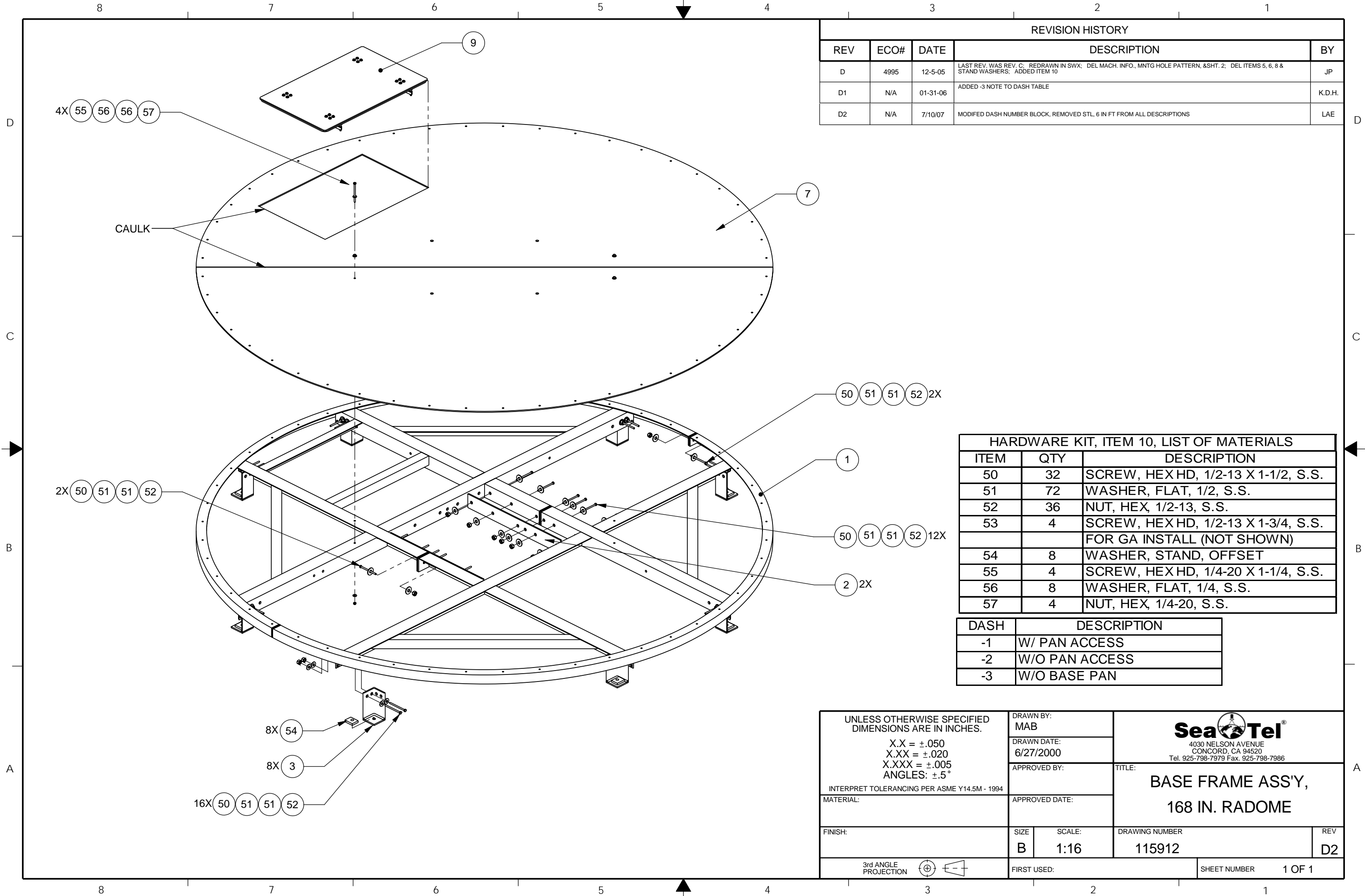
| DASH | DESCRIPTION |
|------|-----------------------|
| 1 | WHITE |
| 2 | WHITE, W/O BASE FRAME |

| | | | | | |
|--|--|-----------------------|----------------|--|-----------|
| 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: LAE | | 4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| MATERIAL: N/A | | DRAWN DATE: 6/5/07 | | | |
| FINISH: N/A | | APPROVED BY: | | TITLE: RADOME ASS'Y W/ RISER, 16 FT | |
| 3rd ANGLE PROJECTION | | SIZE: B | SCALE: 1:96 | DRAWING NUMBER: 124954 | REV: A |
| FIRST USED: 14600-50 | | | | SHEET NUMBER 1 OF 1 | |

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|-------------|------------|----------------|------------|-------------------------------------|-----------------------------|
| 1 | 1 EA | 111811-2 | L | BASE FRAME WELDMENT, STEEL | |
| 2 | 2 EA | 111812-1 | B | PLATE, SPLICE, STEEL | |
| 3 | 8 EA | 111814-1 | C | BASE FRAME FOOT, 6-INCH, STEEL | |
| 7 | 1 EA | 111787-2 | H | RADOME BASE PAN FAB, 168 INCH, W/DO | |
| 9 | 1 EA | 120191-2 | C2 | RADOME PAN ACCESS ASS'Y, WHITE | |
| 10 | 1 EA | 124822-3 | A | HARDWARE KIT, BASE FRAME ASS'Y, 110 | |


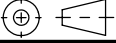
| | | | | |
|--|------------------------|------------|----------------------------|-----------|
|  | | | | |
| BASE FRAME ASS'Y, 168 IN RADOME, W/PAN ACCESS, STEEL | | | | |
| PROD FAMILY COMMON | EFF. DATE 20-May-08 | SHT 1 OF 1 | DRAWING NUMBER 115912-1 | REV D2 |



| REVISION HISTORY | | | | |
|------------------|------|----------|---|--------|
| REV | ECO# | DATE | DESCRIPTION | BY |
| D | 4995 | 12-5-05 | LAST REV. WAS REV. C; REDRAWN IN SWX; DEL MACH. INFO., MNTG HOLE PATTERN, &SHT. 2; DEL ITEMS 5, 6, 8 & STAND WASHERS; ADDED ITEM 10 | JP |
| D1 | N/A | 01-31-06 | ADDED -3 NOTE TO DASH TABLE | K.D.H. |
| D2 | N/A | 7/10/07 | MODIFIED DASH NUMBER BLOCK, REMOVED STL, 6 IN FT FROM ALL DESCRIPTIONS | LAE |

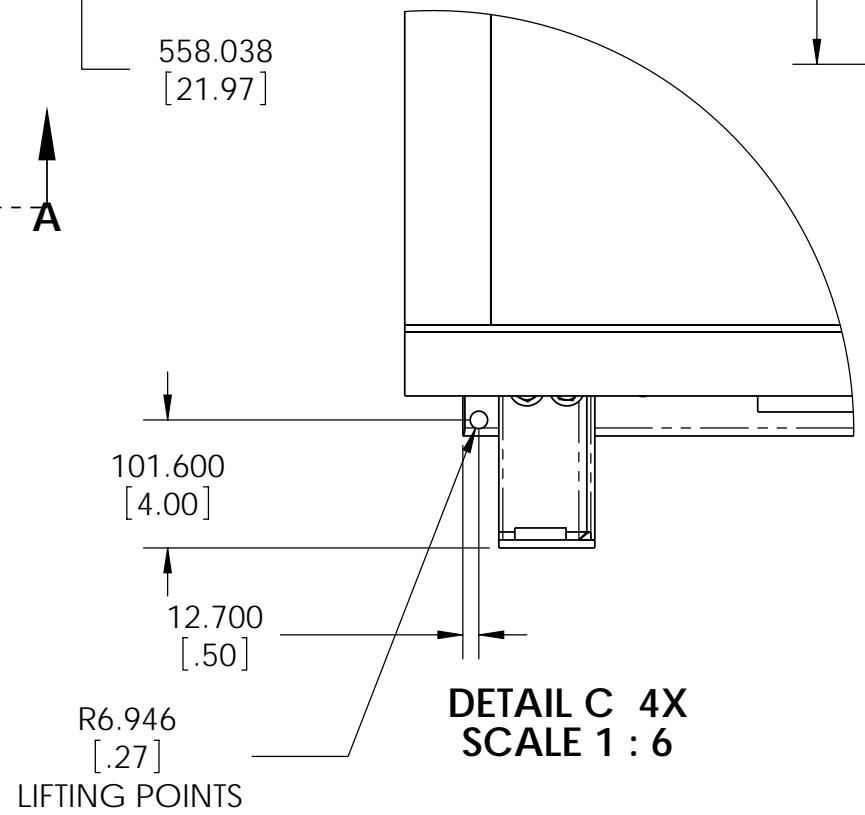
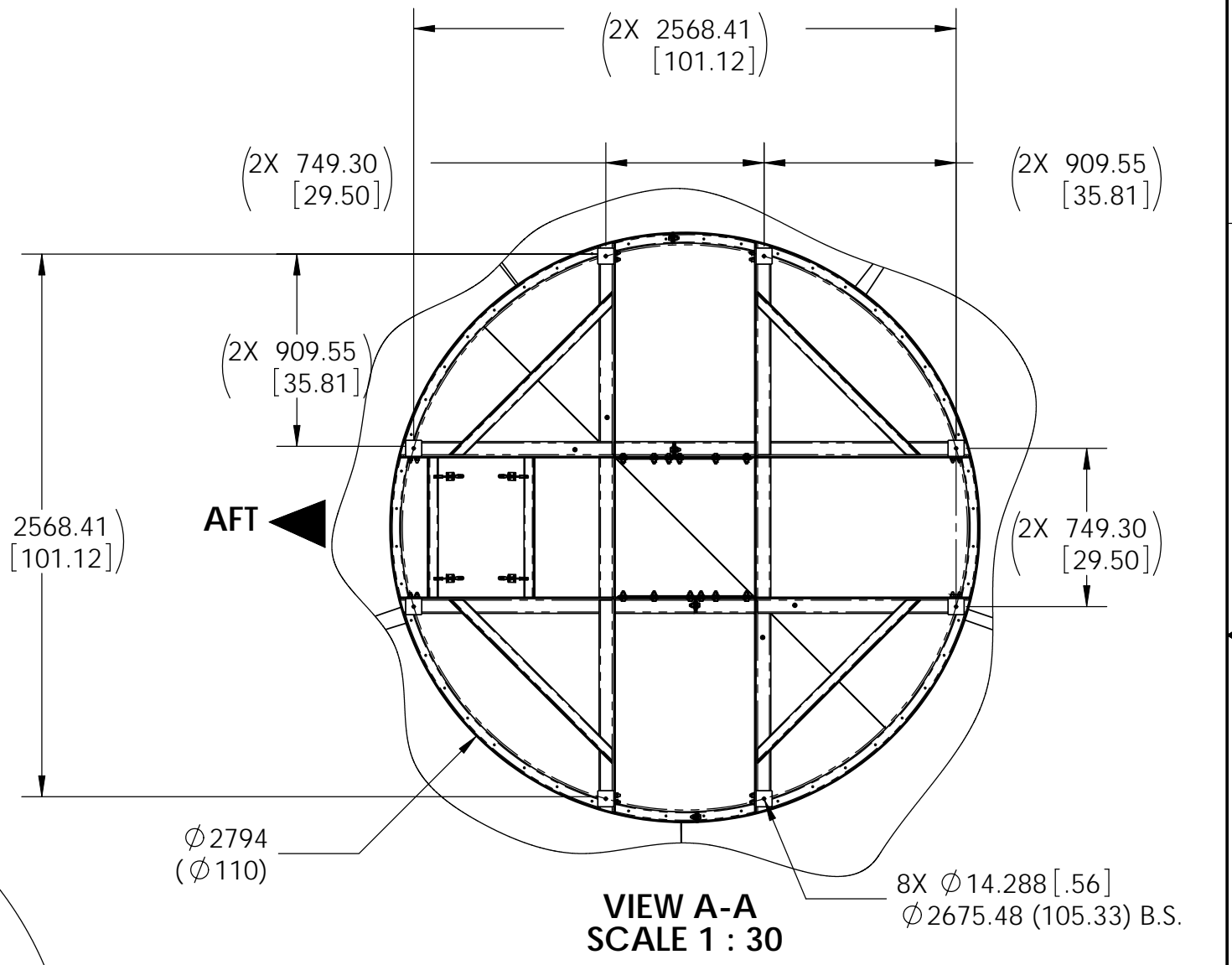
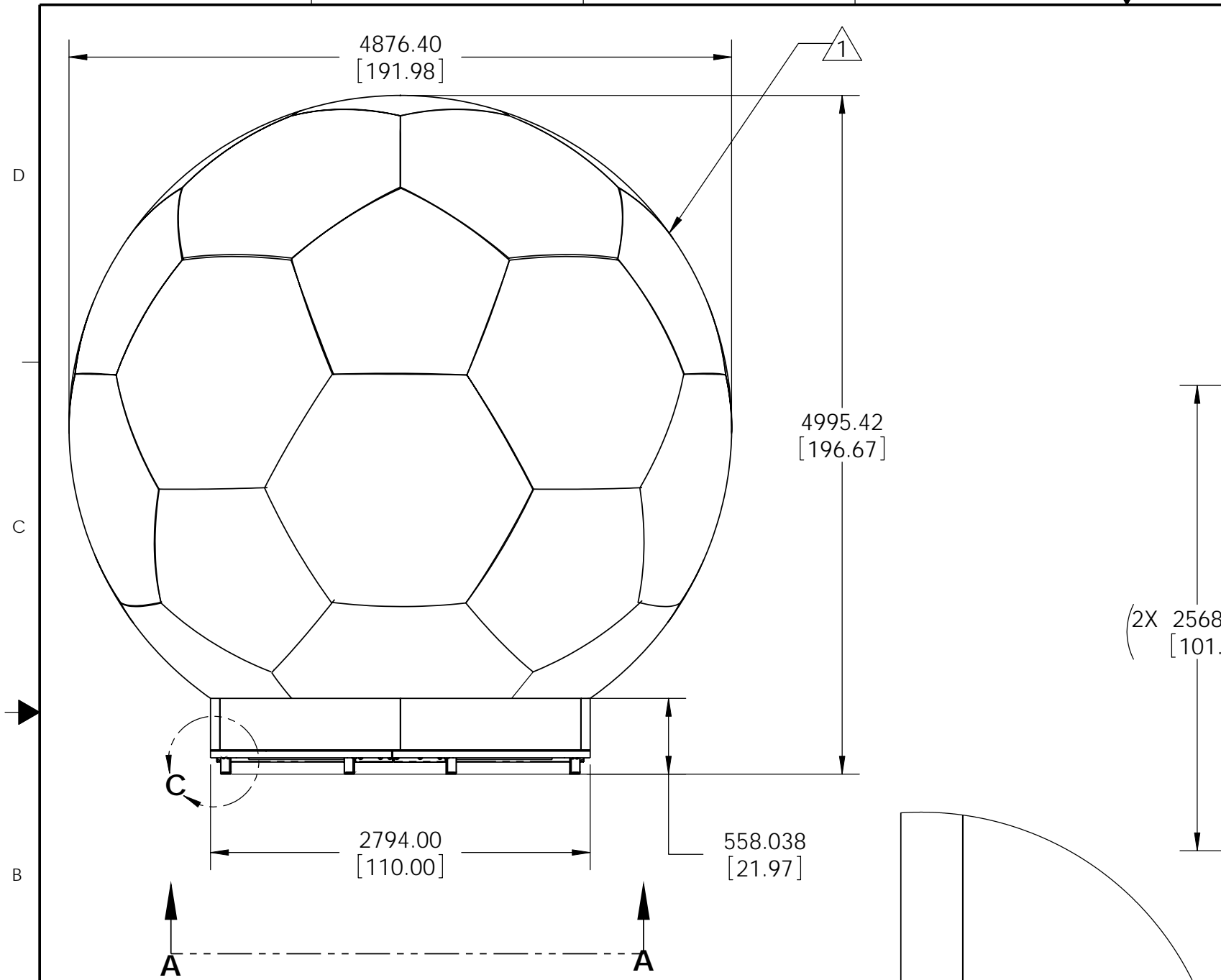
| HARDWARE KIT, ITEM 10, LIST OF MATERIALS | | |
|--|-----|-------------------------------------|
| ITEM | QTY | DESCRIPTION |
| 50 | 32 | SCREW, HEX HD, 1/2-13 X 1-1/2, S.S. |
| 51 | 72 | WASHER, FLAT, 1/2, S.S. |
| 52 | 36 | NUT, HEX, 1/2-13, S.S. |
| 53 | 4 | SCREW, HEX HD, 1/2-13 X 1-3/4, S.S. |
| | | FOR GA INSTALL (NOT SHOWN) |
| 54 | 8 | WASHER, STAND, OFFSET |
| 55 | 4 | SCREW, HEX HD, 1/4-20 X 1-1/4, S.S. |
| 56 | 8 | WASHER, FLAT, 1/4, S.S. |
| 57 | 4 | NUT, HEX, 1/4-20, S.S. |


| DASH | DESCRIPTION |
|------|----------------|
| -1 | W/ PAN ACCESS |
| -2 | W/O PAN ACCESS |
| -3 | W/O BASE PAN |

| | | |
|--|--------------------------|---|
| 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: MAB |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 |
| | DRAWN DATE: 6/27/2000 | |
| MATERIAL: | APPROVED BY: | DRAWING NUMBER 115912 |
| FINISH: | APPROVED DATE: | REV D2 |
| 3rd ANGLE PROJECTION  | SIZE B | SHEET NUMBER 1 OF 1 |
| | SCALE: 1:16 | FIRST USED: |

8 7 6 5 4 3 2 1

| REVISION HISTORY | | | | |
|------------------|------|--------|-----------------------|-----|
| REV | ECO# | DATE | DESCRIPTION | BY |
| A | NA | 5/8/08 | RELEASE TO PRODUCTION | LAE |



| | | | | | |
|---|--|-----------------------|----------------|---|-----------|
| UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS. DIMS IN PARENTHESES ARE IN INCHES. X.X = ±1.3 mm X.XX = ±.5 mm X.XXX = ±.13 mm ANGLES: ±.5° INTERPRET TOLERANCING PER ASME Y14.5M - 1994 | | DRAWN BY: LAE | |  4030 NELSON AVENUE CONCORD, CA 94520 Tel. 925-798-7979 Fax. 925-798-7986 | |
| MATERIAL: NA | | DRAWN DATE: 5/8/08 | | | |
| FINISH: NA | | APPROVED BY: | | TITLE: INSTALLATION ARRANGEMENT, 14600 | |
| 3rd ANGLE PROJECTION | | SIZE: B | SCALE: 1:96 | DRAWING NUMBER: 128243 | REV: A |
| FIRST USED: 14600-75 | | | | SHEET NUMBER 1 OF 1 | |

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|------------|-----|--|----------------------|
| 1 | 1 EA | 125160-3 | C | PCU ENCLOSURE ASS'Y, TONE SWITCHIN | |
| 2 | 1 EA | 116034 | F | HOME SWITCH ASS'Y, SHIELDED | |
| 3 | 1 EA | 116000-2 | J1 | SERVO AMPLIFIER ASS'Y | |
| 4 | 1 EA | 116024-3 | J2 | SHIELDED POLANG RELAY ASS'Y | |
| 5 | 1 EA | 122208-1 | H | LEVEL CAGE ASS'Y, 90 DEG EL RANGE, IN | |
| 6 | 1 EA | 116047-1 | H1 | MOTOR, SIZE 34, BLDC, 15 PIN | (CL, EL, AZ) |
| 7 | 1 EA | 116311 | B | SPROCKET, 12T | (AZ ONLY) |
| 8 | 1 EA | 116325 | D | PULLEY, 1/5P 15T | (AZ ONLY) |
| 9 | 1 EA | 114590-143 | | SCREW, SOCKET SET-CUP, 6-32 x 3/16, S. | (AZ ONLY) |
| 10 | 2 EA | 116577 | A | PULLEY, 1/5P 15T | (CL, EL) |
| 11 | 3 EA | 115352-472 | | DOWEL PIN, 1/8 x 5/8 IN, S.S. | (CL, EL, AZ) |
| 12 | 1 EA | 117319-10 | C2 | LOCTITE, 271 THREADLOCKER, 0.5ML | |
| 13 | 1 EA | 122977-3 | A | BELT KIT, 14600 PEDESTAL, DISHSCAN | |
| 14 | 1 EA | 121966-2 | D | GPS ANTENNA, RETERMINATED, 21.0 L | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SPARE PARTS KIT, 14600 DISHSCAN, STANDARD | | | | |
| PROD FAMILY COMMON | EFF. DATE 20-May-08 | SHT 1 OF 1 | DRAWING NUMBER 123428-3 | REV B |

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|------------|-----|---|----------------------|
| 1 | 1 EA | 122532-1 | D2 | SHIELDED LEVEL CAGE MOTOR ASS'Y, .0 | |
| 2 | 1 EA | 116053 | D | ENCODER ASS'Y | |
| 3 | 1 EA | 114106-12 | 0 | PULLEY, 1/5P 25T, 2FLG | (ENCODER) |
| 4 | 2 EA | 114590-190 | | SCREW, SOCKET SET-CUP, 8-32 x 1/4, S.S. | (ENCODER) |
| 5 | 1 EA | 116782-1 | J | MODEM ASS'Y, PEDESTAL, 4-CH. RF | |
| 6 | 1 EA | 116782-2 | J | MODEM ASS'Y, BASE, 4-CH. RF | |
| 7 | 1 EA | 117611-3 | G | MODEM ASS'Y, PEDESTAL, 3 CH. -200, 50 | |
| 8 | 1 EA | 117611-4 | G | MODEM ASS'Y, BASE, 3 CH. -200, 50 OHM | |
| 9 | 3 EA | 114789-810 | | TRANSPORT CONTAINER | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SPARE PARTS KIT, 14600-50 DISHSCAN, PREMIUM | | | | |
| PROD FAMILY COMMON | EFF. DATE 20-May-08 | SHT 1 OF 1 | DRAWING NUMBER 123429-2 | REV A |

SINGLE LEVEL MFG BILL OF MATERIAL

| FIND | QTY | PART NO | REV | DESCRIPTION | REFERENCE DESIGNATOR |
|------|------|----------|-----|--------------------------------------|----------------------|
| 1 | 1 EA | 119876 | A | GPS, GARMIN | |
| 2 | 1 EA | 116466 | C1 | ROTARY JOINT, 4.5 GHz, DUAL COAX. | |
| 3 | 1 EA | 121009-2 | D | POWER SUPPLY ASS'Y, HEAVY DUTY | |
| 4 | 1 EA | 123842-1 | A | POWER SUPPLY ASS'Y, IDEC, PS5R-SE, 4 | |
| 5 | 1 EA | 124744-1 | A3 | RELAY ASS'Y, TX WAVEGUIDE | |
| 6 | 1 EA | 124741-1 | A | SWITCH ASS'Y, COAX, 50 OHM | |
| 7 | 1 EA | 114320-5 | C1 | BLOCK DOWNCONVERTER, C-BAND, DC B | |
| 8 | 1 EA | 121250-2 | C3 | POWER RING ASS'Y (96 IN. CONTACT WIR | |
| 9 | 1 EA | 124744-2 | A3 | RELAY ASS'Y, RX WAVEGUIDE | |
| 10 | 1 EA | 116596-2 | C | BIAS-T, DC BLOCK, 2.5-6GHZ | |

| | | | | |
|--|------------------------|------------|-----------------------------------|-----------------|
|  | | | | |
| SPARE PARTS KIT, 14600-50 DISHSCAN, TXRX, MASTER | | | | |
| PROD FAMILY COMMON | EFF. DATE 20-May-08 | SHT 1 OF 1 | DRAWING NUMBER 123430-3 | REV B |

