## Revision History

<table>
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<tr>
<th>Revision</th>
<th>Date</th>
<th>Comments</th>
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<tbody>
<tr>
<td>A</td>
<td>May 2000</td>
<td>First release - site preparation for 3.6m and 4.4m antennas</td>
</tr>
<tr>
<td>B</td>
<td>June 2000</td>
<td>Added 3.6m assembly, GPS mounting and cabling, and workstation setup.</td>
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<tr>
<td>C</td>
<td>August 2000</td>
<td>Added 4.4m assembly</td>
</tr>
<tr>
<td>D</td>
<td>October 2000</td>
<td>Added drawings for 4.4m assembly for trimming the base pan gasket and caulking top cap and panels.</td>
</tr>
<tr>
<td>E</td>
<td>February 2001</td>
<td>Added feed assembly orientation photograph for 4.4m antenna. Added mounting foot detail, and shackle and sling close-up photograph for 3.6m antenna. Reorganized drawings in section 2.</td>
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<tr>
<td>F</td>
<td>March 2001</td>
<td>Replaced 4.4m (174”) dish with 4.34 (171”) mesh dish. Replaced GPS antenna.</td>
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<tr>
<td>G</td>
<td>November 2001</td>
<td>Added 2.4m (94.5”) dish.</td>
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<tr>
<td>H</td>
<td>March 2002</td>
<td>Replaced 4.34m (171”) mesh dish with a 4.5m (177.17”) solid composite dish.</td>
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<tr>
<td>I</td>
<td>October 2003</td>
<td>Replaced 18.75” legs on 2.4m base frame with 21.75” legs. Replace 4.5m antenna’s radome.</td>
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<tr>
<td>J</td>
<td>November 2008</td>
<td>Added hatch dimensions to drawing 70911014. Updated PN for base frame mounting foot, drawing 70981.</td>
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Chapter 1: Introduction

1.1 Purpose of this Manual

This manual is intended to assist the purchaser of a TeraScan X-band Acquisition System in accomplishing the tasks involved in site preparation and installation of a TeraScan X-band Acquisition System. The tasks covered in this manual are:

- Site preparation, including (1) selection of a site for the X-band antenna, (2) selection of a site for the GPS antenna, (3) planning and construction of a mounting platform for the X-band antenna, (4) planning and construction of the conduits for the X-band antenna cable, the antenna power cable, and the GPS cable, and (5) planning and layout of the workstation room.
- Assembly and mounting of the radome for the X-band antenna.
- Assembly and mounting of the X-band antenna.
- Set-up of the indoor workstation.

1.2 Standard TeraScan X-band Systems

Table 1-1 below lists the sizes of the antennas and radomes used on X-band TeraScan systems and references the drawings that illustrate the layout of the system workstation.

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<thead>
<tr>
<th>Antenna Size</th>
<th>System Drawings</th>
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<td>TeraScan 2.4m X-Band LEO System</td>
<td>2.4m dish, 3.2m (10’6&quot;) radome</td>
</tr>
<tr>
<td>TeraScan 3.6m X-Band LEO System</td>
<td>3.6m dish, 4.2m (14 ft) radome</td>
</tr>
<tr>
<td>TeraScan 4.5m X-Band LEO System</td>
<td>4.5m dish, 5.5m (18 ft) radome</td>
</tr>
</tbody>
</table>
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Figure 1-1: 2.4m antenna in 3.2m radome.
Figure 1-2: 3.6m antenna in 4.2m radome.
Introduction

Figure 1-3: 4.5m antenna in 5.5m radome.
Chapter 2: Site Preparation

The information provided in this chapter is intended to assist the purchaser of the TeraScan X-band Acquisition System in preparing their site for system installation. The site preparation tasks laid out in this chapter must be completed before the installation of the antenna and workstation can be undertaken.

The purchaser must complete the form provided on page 2-3 and return it, along with the drawings and photographs requested thereon, to SeaSpace Corporation. This information should be provided to SeaSpace as soon as possible to ensure on-schedule completion of system installation.

2.1 Environment Required for the TeraScan System

2.1.1 Operating Environment

The purchaser must provide suitable air and power conditioning to operate the TeraScan system equipment within the environment limits stated in the tables in this chapter.

Table 2-1. Outdoor Equipment Operating Limits

<table>
<thead>
<tr>
<th>Humidity</th>
<th>0-100% @ 40°C (104°F)</th>
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<tbody>
<tr>
<td>Rain</td>
<td>Driving, up to 10 cm (4”) hour</td>
</tr>
<tr>
<td>Icing</td>
<td>Up to 22 kg/m² (4.5 pounds per square foot); degraded RF performance will occur under icing conditions</td>
</tr>
<tr>
<td>Wind</td>
<td>68 m/s (150 mph) (242 km/hr) (131 knots)</td>
</tr>
<tr>
<td>Spray</td>
<td>Resistant to water penetration sprayed from any direction</td>
</tr>
<tr>
<td>Temperature for Antenna:</td>
<td></td>
</tr>
<tr>
<td>2.4 m (95”) dish 3.2 m (126”) radome</td>
<td>-30°C (-22°F) to 55°C (131°F)</td>
</tr>
<tr>
<td>3.6 m (144”) dish 4.2 m (168”) radome</td>
<td>-30°C (-22°F) to 55°C (131°F)</td>
</tr>
<tr>
<td>4.5 m (174”) dish 5.5 m (216”) radome</td>
<td>-30°C (-22°F) to 55°C (131°F)</td>
</tr>
<tr>
<td>Power for Antenna</td>
<td>110 V: minimum 12 Amps @ 120 VAC single phase; Provide a 15-Amp circuit, isolated ground, 110 VAC, single phase, hard-wired.</td>
</tr>
<tr>
<td></td>
<td>220 V: minimum 10 Amps @ 220 VAC single phase; Provide a 10-Amp circuit, isolated ground, 220 VAC, single phase, hard-wired.</td>
</tr>
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### Table 2-2. Wind Loads

<table>
<thead>
<tr>
<th>Antenna</th>
<th>Radome Weight (Empty)</th>
<th>Vertical Dead Load (Antenna &amp; Radome)</th>
<th>Horizontal Wind Shear</th>
<th>Vertical Lift Each Leg</th>
<th>Overturning Moment referred to bottom of radome</th>
<th>Bolt Torque</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4m (95&quot;) dish</td>
<td>182 kg (400 lbs)</td>
<td>364 kg (800 lbs)</td>
<td>687kg (1,513 lbs)</td>
<td>279kg (614 lbs)</td>
<td>10,144 Nm (7,459 ft-lbs)</td>
<td>1/2&quot;: 88-115 Nm (65-85 ft-lbs)</td>
</tr>
<tr>
<td>3.2m (126&quot;) radome</td>
<td>341 kg (750 lbs)</td>
<td>681kg (1,500 lbs)</td>
<td>1,223kg (2,691 lbs)</td>
<td>496 kg (1,092 lbs)</td>
<td>27,118 Nm (19,940 ft-lbs)</td>
<td>1/2&quot;: 88-115 Nm (65-85 ft-lbs)</td>
</tr>
<tr>
<td>3.6m (144&quot;) dish</td>
<td>341 kg (750 lbs)</td>
<td>681kg (1,500 lbs)</td>
<td>1,223kg (2,691 lbs)</td>
<td>496 kg (1,092 lbs)</td>
<td>27,118 Nm (19,940 ft-lbs)</td>
<td>1/2&quot;: 88-115 Nm (65-85 ft-lbs)</td>
</tr>
<tr>
<td>4.2m (14 ft) radome</td>
<td>636 kg (1,400 lbs)</td>
<td>1,636 kg (3,600 lbs)</td>
<td>1,364 kg (3,000 lbs)</td>
<td>195 kg (430 lbs)</td>
<td>32,300 Nm (23,750 ft-lbs)</td>
<td>1/2&quot;: 88-115 Nm (65-85 ft-lbs)</td>
</tr>
</tbody>
</table>

### Table 2-3. Indoor Equipment Operating Limits

<table>
<thead>
<tr>
<th>Line Voltage</th>
<th>90-132 VAC or 190-260 VAC, single phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Frequency</td>
<td>47 - 63 Hz</td>
</tr>
<tr>
<td>Line Distortion</td>
<td>&lt;10% total harmonic distortion</td>
</tr>
<tr>
<td>Power for indoor workstation</td>
<td>100/110 V: minimum 8 Amps @ 120 VAC, single phase; Provide a 15-Amp circuit, isolated ground, 110 VAC, single phase, 2 outlets 220 V: minimum 6 Amps @ 220 VAC, single phase; Provide a 10-Amp circuit, isolated ground, 220 VAC, single phase, 2 outlets</td>
</tr>
<tr>
<td>Humidity</td>
<td>30-85% RH, noncondensing</td>
</tr>
<tr>
<td>Temperature</td>
<td>10°C (50°F) to 35°C (95°F)</td>
</tr>
<tr>
<td>Altitude</td>
<td>0 to 3000 m (10,000’)</td>
</tr>
<tr>
<td>Static Discharge</td>
<td>12 KV with no recovered errors</td>
</tr>
<tr>
<td>Shock</td>
<td>3 g, 3 axis 1/2 sine, 11 ms</td>
</tr>
<tr>
<td>Heat Output</td>
<td>2070 BTU/hr (Add 600 BTU/hr for each person using the system)</td>
</tr>
</tbody>
</table>

### Table 2-4. Archive Tape Storage - Ideal Conditions

| Temperature | 5°C (41°F) |
| Relative Humidity | 20% noncondensing |
# TeraScan Pre-Installation System Specifications for X-band

Please fill out this form and return the form, along with the drawings and photographs requested, to:

SeaSpace Corporation  
12120 Kear Place  
Poway, CA 92064 USA

You can fax the form and drawings to 858-746-1199.

## For SeaSpace Use Only

<table>
<thead>
<tr>
<th>Project:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Name:</td>
<td></td>
</tr>
<tr>
<td>Project Number:</td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
</tr>
</tbody>
</table>

## Construction Contact:

| Name: |  |
| Address: |  |
| Phone: |  |
| Fax: |  |
| e-mail: |  |

## Primary User:

| Name: |  |
| Address: |  |
| Phone: |  |
| Fax: |  |
| e-mail: |  |

Please fill in the following information:

1. **Antenna site location:** LAT _______ LON _______  
   (See “Site Location” on page 2-36.)

2. **Power supply voltage:** ______ VAC  
   frequency: ______ Hz  
   single phase  
   (See “Power Supply” on page 2-6.)

3. **X-band antenna cable length:** __________ (feet or meters)  
   (See “Conduit for X-band Antenna RF Signal Cable—Computer to Antenna” on page 2-34.)

4. **GPS antenna cable length:** __________ (feet or meters)  
   (See “GPS Antenna Cable” on page 2-35.)

5. **LAN cable type:**  
   - [ ] 10 Base T  
   - [ ] 100 Base T  
   (See “Ethernet Twisted Pair LAN” on page 2-36.)

6. **Orbital elements transmission method:** ____________________________  
   (See “Orbital Elements” on page 2-36.)

7. [ ] Check here to confirm that customer will provide the required hardware for mounting the radome base frame to the mounting platform.  
   (See Section 2.5.1 on page 2-14, Section 2.6.1 on page 2-19, or Section 2.7.1 on page 2-26.)

Please provide the following drawings:

1. **Workstation layout**  
   (See “Workstation Equipment Area” starting on page 2-6.)

2. **Antenna mount:** Show mount design, alignment with structure, and access via ladder or stairs.  
   Completion date for mount base: ________________

3. **Antenna site and cable run:** Show location of antenna in relation to nearby obstacles or sources of interference  
   (See “X-band Antenna Site Selection” on page 2-10.)  
   Show cable run (including distances to each pull box), vertical drops, and location of pull boxes.  
   (See “Conduit for X-band Antenna RF Signal Cable—Computer to Antenna” starting on page 2-34.)

Please also provide photographs of:

1. Workstation room.
2. Antenna site, facing out from the site toward the North, East, South, & West.
Flammable Materials

Fundamental safeguards for computer systems include a site well away from any sources of potential damage. The system should not be installed or operated in an environment where it might be exposed to highly flammable gases, volatile liquids, or combustible dust since these can result in hazards such as fire or explosion.

Airborne Contaminants

Airborne contaminants and particles of a certain size and hardness can scratch the coating on tape transport heads, causing premature wear on the tapes and potential data errors. They can also damage the computer keyboard. Some of the most common contaminants are: dust, smoke, ashes, eraser debris, and food crumbs.

Also beware of salty air. If properly assembled, the outdoor equipment is highly resistant to salty air; but the indoor workstation is not. Salty air can cause corrosion of electronic connectors. Therefore, salty air must not be allowed to condense on the indoor equipment.

2.1.2 Storage and Shipping Environment

The environmental limits given below apply during shipment and during extended storage of the equipment prior to installation. (The purchaser must protect the equipment during storage to stay within the environmental limits in order to retain the warranty.)

Table 2-5. Outdoor Equipment Storage Limits

<table>
<thead>
<tr>
<th>Humidity</th>
<th>0-100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td></td>
</tr>
<tr>
<td>2.4m (95&quot;) dish</td>
<td>30°C (-22 °F) to 60°C (140°F)</td>
</tr>
<tr>
<td>3.6m (144&quot;) dish</td>
<td>30°C (-22 °F) to 60°C (140°F)</td>
</tr>
<tr>
<td>4.5m (174&quot;) dish</td>
<td>30°C (-22 °F) to 60°C (140°F)</td>
</tr>
</tbody>
</table>

Table 2-6. Indoor Equipment Storage Limits

<table>
<thead>
<tr>
<th>Humidity</th>
<th>0-90% RH, noncondensing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-20°C (-4°F) to 60°C (140°F)</td>
</tr>
<tr>
<td>Altitude</td>
<td>0 to 15384 m (50,000')</td>
</tr>
<tr>
<td>Shock</td>
<td>10 g, 3 axis</td>
</tr>
</tbody>
</table>

Table 2-7. Archive Tape Storage - Storage Limits

| Temperature | 5°C (41°F) to 45°C (113°F) |
| Relative Humidity | 20-60% noncondensing |
2.1.3 Power Supply

Power Supply Requirements

Power supply requirements for the antenna are shown in Table 2-1. Power supply requirements for the workstation are shown in Table 2-3.

Power Quality Control

The purchaser is responsible for maintaining power quality. Two types of power problems can cause improper system operation or component failure:

- **Power line interference or noise**—This can be caused by motors or other equipment attached to the same circuit as is the computer system.
  
The best solution to this problem is to dedicate one circuit to the computer system and antenna, and add additional circuits for other equipment. The computer's circuit should have an isolated ground, if possible.

- **Low line voltage “brownout” or complete loss of voltage**—If the site is prone to these conditions, the purchaser must install a suitable power conditioner (for brownouts) or an Uninterruptable Power Supply (UPS) to reduce the number of outages. The UPS should supply power for at least 10 minutes at full load. A SeaSpace-supplied UPS will include software to properly halt the system prior to power down if the battery reaches a low-power condition.
  
If the system power is produced by a land-based local generator, a UPS will improve the system reliability. All local generators require some type of power conditioning.

2.2 Workstation Equipment Area

Drawing 70935003 on page 2-7 shows the equipment layout of the standard TeraScan X-band system. Use the dimensions shown in the drawing and discussed in this section to assist in selecting a location for your workstation equipment. Some equipment is usually mounted on the table top and other equipment is mounted in a 19” rack. (Note that some items listed below may not be used with every system).

The following equipment is generally mounted in a 19” rack:

- antenna controller
- computer chassis
- mass storage chassis (if used)
- receiver
- modem (if used)
- uninterruptible power supply (UPS)

The following equipment is generally mounted on the table adjacent to the 19” rack:

- monitor
- printer
- keyboard, mouse, and mouse pad
- DLT archive tape drive
TeraScan X-BAND - SYSTEM LAYOUT

19” SYSTEM RACK (DOOR REMOVED FOR CLARITY)

15cm (6”)
DISTANCE FROM WALL

61cm (24”)

69cm (27”)

137cm (54”)

15cm (6”)

74cm (29”)

99cm (39”)

81cm (32”)

ANTENNA CONTROL RECEIVER

CPU

UPS

16U
19” HIGH RACK

70935003 — TeraScan X-Band System Standard Layout
### 2.2.1 Table Construction

The table must be able to support a weight of 68 kg (150 lbs) minimum, as well as the weight of the printer (if one is going to be used).

Outlets behind the table must provide the following:

1. **Power**—The power requirement is shown in Table 2-3 on page 2-2.
2. **Phone** (if one will be used)—The outlet must be fitted with an RJ-11C jack and must be located within 1.8 m (72") of the table.
3. **Junction box for the antenna cabling** (if one will be used).
4. **LAN cable junction** (connects to other computers, if applicable).

    Please refer to “Ethernet Twisted Pair LAN” on page 2-36 for more information.

**Note:** All outlets should be located so that the cables WILL NOT be walked on.

### 2.2.2 Table Space

Use the following dimensions to allow sufficient workspace around the equipment.

- The table can be up to 76 cm (30") deep (some printers may require more table space).
- A space of at least 15 cm (6") should be available behind the table for cable routing and heat ventilation.
- Additional space behind the table will facilitate hardware maintenance.
- Allow space for one or more chairs in front of the table.

Please provide a drawing showing your table layout.

Note any of the following, if they apply:

- Unusual placement of equipment, especially the location of the 19” rack in relation to the table.
- Additional protection of antenna cables due to floor traffic around the equipment.
- The location of all outlets (i.e., power, phone, antenna cables, LAN) in relation to the rack.
2.2.3 Lighting

Lighting should be constructed to allow an adjustable light level, if possible. Some images are best viewed in dim light whereas higher levels of light provide better conditions for reading manuals or text on the screen.

2.2.4 Storage Space for Manuals

SeaSpace-published TeraScan manuals and vendor manuals for hardware components will be supplied with the system. A space 30 cm x 30 cm x 30 cm (12” x 12” x 12”) will be sufficient to hold all of the manuals.

2.2.5 Storage Space for Archive Tapes

If archive tapes are routinely used, you should provide a space of 15 cm x 15 cm x 15 cm (6” x 6” x 6”) for temporary storage of blank tapes. Archive tapes should be stored in a secure place. The ideal storage temperature and humidity is shown in Table 2-7 on page 2-5.
2.3 X-band Antenna Site Selection

When selecting a location for the X-band antenna, consider the following:

1. **Antenna Mask**—Nearby buildings, equipment, and hills can block antenna reception. The farther the antenna is placed from these obstructions, the closer to the horizon data can be taken. There may be some situations in which blockage of the antenna in one direction is unavoidable but reception is unobstructed in all other directions.

   At low elevations, every decrease of 1° in elevation reduces the distance from which the antenna can receive data by approximately 100 km. If the antenna’s reception is blocked for part of a pass, the antenna will still point in the direction of the satellite and track it even if it does not receive the data.

2. **Site Levelness — 2.4m Antenna in 3.2m Radome**—The antenna should be placed on a firm platform that is virtually level. The platform should not be sloped more than 3° in any direction. The area of the platform should be at least 3 m (10 ft) square to allow room for the antenna base and to allow people to work safely around the antenna.

3. **Site Levelness — 3.6m Antenna in 4.2m Radome**—The antenna should be placed on a firm platform that is virtually level. The platform should not be sloped more than 3° in any direction. The area of the platform should be at least 4 m (11 ft) square to allow room for the antenna base and to allow people to work safely around the antenna.

4. **Site Levelness — 4.5m Antenna in 5.5m Radome**—The antenna should be placed on a firm platform that is virtually level. The platform should not be sloped more than 1° in any direction. The area of the platform should be at least 6.1 m (20 ft) square to allow room for the antenna base and to allow people to work safely around the antenna.

5. **Signal Noise**—The antenna should be placed such that it is not in the path or cone of any high-power transmitter or radar. High-power radar can destroy the low-noise amplifier (LNA) on the antenna.

In order for SeaSpace to provide the proper fittings for the cables, please make one or more drawings showing the antenna placement, the cable run, and the distances from the antenna to any obstacles (refer to drawing 70980002 on page 2-11 as an example).
SAMPLE

3.6m ANTENNA/4.2m RADOME
EQUIPMENT LAYOUT

CABLE SPECIFICATIONS:
1. CONDUIT TYPE: STEEL
2. CONDUIT SIZE: 10cm
3. TOTAL CONDUIT LENGTH: 50m
4. TOTAL CABLE LENGTH: 55m

AIR CONDITIONER
1m

3.6m ANTENNA
4.2m RADOME

RADIO MAST

31m VERTICAL DROP

PULL BOX

10m

7m

8m

PULL BOX

7m

JUNCTION BOX

0.5m

INSIDE EQUIPMENT

NORTH
2.4 GPS Antenna Site Selection (optional)

In selecting a location for the Global Positioning System (GPS) antenna (drawing 70990 on page 2-13), consider the following:

1. Select a location where the GPS antenna can be mounted as close as possible to vertical, where it will have a relatively unobstructed view of the horizon, and where it will be safe from damage during normal operation.
   
   a. Dense wood or metal structures will shield the GPS antenna from satellite signals.
   b. The GPS antenna can receive satellite signals through glass, canvas, and thin fiberglass.
   c. The GPS antenna will perform when partially snow covered, providing the snow is dry. Ice accumulations will eventually shut off performance, but only if the ice sheet is continuous. The shape of the unit has been selected partially to minimize rain, snow, and ice accumulation.

2. For optimal performance, avoid locating the GPS antenna within 60 cm (2 ft) of other antennas, near high-vibration areas like engine housings, or near radar installations.
   
   a. For best results, mount the GPS antenna at least 3 m (10 ft) away from satellite communication equipment.
   b. If there is a limitation on available mounting locations, at least ensure that the GPS antenna is positioned outside of any radar’s cone of transmission.
   c. Follow the same guidelines when installing the unit near satellite communication equipment (e.g., Inmarsat A or C) or microwave dishes.

3. Care should be taken to shield the unit from random back-scatter from microwave dishes. Difficulties will be immediately apparent if the unit cannot lock onto the satellite signal or if it shows a poor ability to track. Protection from back-scatter can be provided by using a ground plane (a metallic shield mounted below the desired minimum viewing angle of the antenna unit).

In extreme cases, a cone shield extending up to a 10-degree horizontal viewing angle may be used. This is a workable solution since low-elevation satellites have lower signal/noise ratios due to increased ionospheric absorption and therefore are less desirable for timing purposes. (When using a cone shield, do not forget to make space allowance within the cone for snow and rain drainage.)
GPS ANTENNA DIMENSIONS

GPS ANTENNA
SEASPACE PART: 12120003

MOUNTING BASE
SEASPACE PART: 12224001

1"-14 STRAIGHT THREAD

73mm
(2.875"

Ø73mm
(Ø2.875"

Ø53.9mm
(Ø2.125"

Ø6.3mm
(Ø0.25"

FLAT HEAD FASTENER

101.6mm
(4.0"

20.3mm
(0.80"

25.4mm
(1.0"

12.7mm
(0.50"

22.9mm
(0.90"

46.2mm
(1.82"

110.2mm
(4.34"

127mm
(5.0"

44.7mm
(1.76"

GPS ANTENNA DIMENSIONS

70990 — GPS Antenna Dimensions

12120 KEAR PLACE
Poway, CA 92064
U.S.A.

TITLE

GPS ANTENNA
DIMENSIONS

DRAWING
70990

SCALE
1:2

DATE
4.3.01

SH
1

OF
1

PROJECT
SPACE

P/N 90280001 Rev. J

Site Preparation for and Installation of TeraScan X-band Acquisition Systems 2-13
2.5 Antenna Mount Construction for Antenna with 2.4m (95") Dish and 3.2m (126") Radome

The purchaser is responsible for the construction and assembly of a mounting platform for the antenna. Please make a drawing of the mounting platform to be constructed for review by SeaSpace.

The radome that will attach to the platform is shown in drawing 70911012 on page 2-15. See also drawing 70911017 on page 2-16 for details of the base frame assembly, drawing 70911014 on page 2-17 for the location of conduit holes in the radome, and drawing 70911011 on page 2-18 for assembly details of the radome leg assembly.

2.5.1 Radome

The radome consists of six top panels, six bottom panels, one top "hat", a base frame with a one-piece fiberglass pan that rests on the base frame, and eight legs that attach to the building. 12 mm (0.5 in.) diameter bolts (customer supplied) are used to attach the eight legs to the building.

2.5.2 Mount

The purchaser must construct a mount to which the eight legs of the radome will attach. The mount must satisfy the wind load requirement of the site. Provide a landing in front of the hatch. Dimensions of the landing should be: 1 m x 1 m (3 ft x 3 ft).

2.5.3 Ladder

If the antenna mount is over 1 m (3 ft) high, a permanent ladder attached below the access hatch should be provided. This will simplify construction and provide access for servicing.
2.4m ANTENNA, 3.2m(126") RADOME

See detail 'A'

See detail 'B'

SEALANT, ALL AROUND

LIP (TYP)

BASE PAN

1600mm (63.0") SPHERICAL OUTSIDE RADIUS

1562mm (61.5") SPHERICAL INSIDE RADIUS

3.65m (144")

3.2m (126")

1.83m (72.0")

55.2cm (21.75")

1.5m (59.1")
2.4m ANTENNA BASE FRAME – 3.2m(126") RADOME,
55.2cm(21.75") HIGH LEGS

MOUNTING HOLE PATTERN
FOR BOLTED FOOT, ITEM 5
2.4m ANTENNA, 3.2m(126"[10'6"]") RADOME LEG ASSEMBLY DETAILS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>SS P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BASE FRAME</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MOUNTING FOOT, 6.3mm(0.25&quot;) THK</td>
<td>12215010</td>
</tr>
<tr>
<td>5</td>
<td>BEARING WASHER, 9.6mm(0.38&quot;) THK</td>
<td>12213310</td>
</tr>
<tr>
<td>6</td>
<td>CUSTOMER FURNISHED HARDWARE (BOLT OR STUD, WASHER, LOCK WASHER AND NUT)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CUSTOMER FURNISHED DECK OR CONCRETE SLAB</td>
<td></td>
</tr>
</tbody>
</table>

RADOME BASE FRAME LEG

12mm (1/2") HARDWARE CUSTOMER FURNISHED

31.75mm(1.25") DIAMETER THRU HOLE

MOUNTING FOOT ISOMETRIC VIEW

12120 KEAR PLACE
POWAY, CA 92064
U.S.A.

TITLE
2.4m ANTENNA, 3.2m(126"[10'6"]") RADOME LEG ASSEMBLY DETAILS

A 70911011 A
1:4 5X420 1 OF 1
3.6m Antenna

2.6 Antenna Mount Construction for Antenna with 3.6m (144") Dish and 4.2m (168") Radome

The purchaser is responsible for the construction and assembly of a mounting platform for the antenna. Please make a drawing of the mounting platform to be constructed for review by SeaSpace.

The radome is supplied with 552mm (21.75") legs or 159mm (6.25") feet. The radome that will attach to the platform is shown in drawing 70911001 on page 2-20. See drawing 70911005 on page 2-25 for the location of conduit holes in the radome. For a radome with legs, see also drawing 70911016 on page 2-21 for details of the base frame assembly, and drawing 70911015 on page 2-22 for assembly details of the leg. For a radome with feet, see also drawing 70911003 on page 2-23 for details of the base frame assembly, and drawing 70911004 on page 2-24 for assembly details of the radome mounting feet.

2.6.1 Radome

The radome consists of eight top panels, eight bottom panels, one top “hat”, eight skirt pieces, a base frame with a two-piece fiberglass pan that rests on the base frame, and eight feet that attach to the building. 12 mm (0.5 in.) diameter bolts (customer supplied) are used to attach the eight feet to the building.

2.6.2 Mount

The purchaser must construct a mount to which the eight feet of the radome will attach. The mount must satisfy the wind load requirement of the site. Provide a landing in front of the hatch. Dimensions of the landing should be: 1 m x 1 m (3 ft x 3 ft).

2.6.3 Ladder

If the antenna mount is over 1 m (3 ft) high, a permanent ladder attached below the access hatch should be provided. This will simplify construction and provide access for servicing.
3.6m ANTENNA, 4.2m(14') RADOME

φ4.2m (168")

2.1m (84") OUTSIDE SPHERICAL RADIUS

3.9m (154")

1.8m (70")

30cm (12")

φ2.8m (110")

55.2cm (21.75") LEG OR 15.9cm (6.25") FOOT

SEE DETAIL "A"

RADOME ASSY

RADOME BASE FRAME

HATCH

SEALANT, ALL AROUND

LIP (TYP)

DETAIL 'A'

12120 KEAR PLACE
POWAY, CA 92064
U.S.A.

3.6m ANTENNA,
4.2m(14') RADOME

SEE A

DRAW NO. 70911001

REV. A

SCALE 1:50

1 OF 1
3.6m ANTENNA, 4.2m(14') RADOME
LEG ASSEMBLY DETAILS

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>SS</th>
<th>P/N</th>
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<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BASE FRAME</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MOUNTING FOOT, 6.3mm(0.25&quot;) THK</td>
<td></td>
<td>12515010</td>
</tr>
<tr>
<td>5</td>
<td>BEARING WASHER, 9.6mm(0.38&quot;) THK</td>
<td></td>
<td>12213310</td>
</tr>
<tr>
<td>6</td>
<td>CUSTOMER FURNISHED HARDWARE (BOLT OR STUD, WASHER, LOCK WASHER AND NUT)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CUSTOMER FURNISHED DECK OR CONCRETE SLAB</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RADOME BASE FRAME LEG

12mm (1/2") HARDWARE CUSTOMER FURNISHED

31.75mm(1.25") DIAMETER THRU HOLE

MOUNTING FOOT ISOMETRIC VIEW

12120 Kear Place
Poway, CA 92064
U.S.A.

SeaSpace Corporation

1:4 CAGE CODE 8X420
SH 1 OF 1
3.6m ANTENNA BASE FRAME
(4.2m(14') RADOME) WITH 159mm(6.25") FOOT

NORTH

RADOME BASE

BASE FRAME ASSEMBLY
SOUTH

736mm(29")
(TYP)

368mm(14.5")
(TYP)

1280mm(50.38")
(TYP)

2559mm(100.75")
(TYP)

12120 KEAR PLACE
POWAY, CA 92064
U.S.A.

TITLE 3.6m ANTENNA BASE FRAME
4.2m(14") RADOME WITH
159mm(6.25") FOOT

SIZE A

REV. A

DRAWING

70911003

SHEET 1 OF 1
3.6m ANTENNA, 4.2m(14') RADOME FOOT ASSEMBLY DETAILS

USED ON [70328XXX]ANTENNA

12mm (1/2") HARDWARE CUSTOMER FURNISHED

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>SS P/N</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>RADOME PANEL</td>
<td>12213307</td>
</tr>
<tr>
<td>2</td>
<td>RADOME FLOOR</td>
<td>12213308</td>
</tr>
<tr>
<td>3</td>
<td>BASE FRAME</td>
<td>12213309</td>
</tr>
<tr>
<td>4</td>
<td>MOUNTING FOOT, 6.3mm(0.25&quot;) THK</td>
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</tr>
<tr>
<td>5</td>
<td>BEARING WASHER, 9.6mm(0.38&quot;) THK</td>
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</tr>
<tr>
<td>7</td>
<td>CUSTOMER FURNISHED DECK OR CONCRETE SLAB</td>
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</tbody>
</table>

MOUNTING FOOT ISOMETRIC VIEW

DIAMETER THRU HOLE

Ø31.7mm(1.25") THRU 12mm(0.5") BOLT WITH BEARING WASHER ON TOP OF FOOT

SECTION B-B FOOT

38mm(1.50")

LIFTING ATTACHMENT HOLE

CAULK, ALL AROUND

31.75mm(1.25")
CONDUIT HOLE PLACEMENT ON RADOME

3.6m ANTENNA

POWER
22mm (7/8") Ø FOR
1/2" CONDUIT
(1/2" NPTM)

RF SIGNAL
35mm (1 3/8") Ø FOR
1" CONDUIT
(1" NPTM)
**4.5m Antenna**

**2.7 Antenna Mount Construction for Antenna with 4.5m (177.17") Dish and 5.5m (18 ft) Radome**

The purchaser is responsible for the construction and assembly of a mounting platform for the antenna. *Please make a drawing of the mounting platform to be constructed for review by SeaSpace.*

The radome that will attach to the platform is shown in drawing 70986008 on page 2-27. See also drawing 70986002 on page 2-28 for radome dimensions, drawing 70981 on page 2-29 for details of the base frame assembly, drawing 70986009 on page 2-30 for the location of conduit holes in the radome, and drawing 70986003 on page 2-31 for assembly details of the radome mounting feet.

**2.7.1 Radome**

The radome consists of 40 panels, one top cap, a base frame with a fiberglass pan that rests on the base frame, and 24 feet that attach to the building. 12 mm (0.5") diameter bolts (*customer supplied*) are used to attach the 24 feet to the building.

**2.7.2 Mount**

The purchaser must construct a mount to which the 24 feet of the radome will attach. The mount must satisfy the wind load requirement of the site. Provide a landing in front of the hatch. Dimensions of the landing should be: 1 m x 1 m (3 ft x 3 ft).

**2.7.3 Ladder**

If the antenna mount is over 1 m (3 ft) high, a permanent ladder attached to the pedestal column should be provided. This will simplify construction and provide access for servicing.
4.5m ANTENNA, 5.5m (18') RADOME
4.5m ANTENNA, 5.5m (18") RADOME
DIMENSIONS

548.6 cm (216.0") (18")

492.7 cm (194")

492.7 cm (194")

218.4 cm (86.0")

114 mm (4.5")

332 cm (130.7")

28 cm (11.05")

TO BOTTOM OF DOOR
CONDUIT HOLE PLACEMENT ON RADOME
4.5m ANTENNA

RF SIGNAL
35mm (1\(\frac{3}{8}\))\(\Omega\) FOR
1" CONDUIT
(1" NPTM)

HATCH

POWER
22mm (\(\frac{3}{8}\))\(\Omega\) FOR
\(\frac{1}{2}\)" CONDUIT
(\(\frac{1}{2}\" NPTM)

1066mm (42"")

1219mm (48"")

203mm (8"")
4.4m/4.5m ANTENNA, 5.5m(18’) RADOME
FOOT ASSEMBLY DETAILS

12mm (1/2”) HARDWARE
CUSTOMER FURNISHED

31.75mm(1.25”)
DIAMETER THRU HOLE

MOUNTING FOOT
ISOMETRIC VIEW

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DESCRIPTION</th>
<th>SS P/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RADOME PANEL</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RADOME FLOOR</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>BASE FRAME</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>MOUNTING FOOT, 6.3mm(0.25”) THK</td>
<td>12215010</td>
</tr>
<tr>
<td>5</td>
<td>STAND WASHER, 9.6mm(0.38”) THK</td>
<td>12213310</td>
</tr>
<tr>
<td>6</td>
<td>CUSTOMER FURNISHED HARDWARE (BOLT OR STUD, WASHER, LOCK WASHER AND NUT)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CUSTOMER FURNISHED DECK OR CONCRETE SLAB</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>SCREW, 1/2-13x2”, SS</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>WASHER, FENDER, 1/2”18-8, SS,1.5”OD</td>
<td></td>
</tr>
</tbody>
</table>
2.8 GPS Antenna Mounting

The GPS unit provides precise earth location information and an accurate time base for satellite tracking. It is a self-contained, 8-channel antenna and receiver.

If a GPS antenna will be included with the system, it will be mounted on a 10 cm (4") tall base (1"-14 straight thread). The base is supplied by SeaSpace. See drawing 70990 on page 2-13 for the GPS antenna dimensions.

2.9 Antenna Grounding

The purchaser should attach a ground wire from the radome base frame mounting foot to the building (earth) grounding system. Use AWG 2/0 (10.6mm (0.419")) wire.

2.10 Radome Lightning Protection

Due to the design of the radome, no lightning rods or lightning protection is built into the antenna positioner. Input power to the positioner is protected by a spike/surge protector. If lightning is a concern at the antenna site, the purchaser is responsible for a lightning site survey and lightning protection equipment. The use of lightning rods or a lightning dissipation array must be determined by the customer.

2.11 Planning and Constructing the Cable Runs

The cables that connect the antenna with the indoor equipment, as well as the cables from outside sources, are shown in drawing 70935002 on page 2-33. All cables that connect outside sources to the system (such as power, LAN, phone) must be supplied by the purchaser. The cable from the antenna(s) to the indoor equipment will be supplied by SeaSpace. The SeaSpace-supplied antenna cable is not plenum rated.
2.11.1 Conduit for X-band Antenna RF Signal Cable—Computer to Antenna

The purchaser must construct a conduit running from the X-band antenna to the indoor workstation) for the RF signal cable. The conduit should be constructed according to the following specifications:

- **Conduit diameter:** 5 cm (2”) minimum; 7.6 cm (3”) preferred
- **Sweep radius:** 91 cm (36”)
  - *Note:* If sweep is not suitable, provide a pull box instead.
- **Maximum length of any conduit leg between pull boxes:** 31 m (100 ft)
  - This may be increased for vertical sections of conduit.
- **Conduit type:**
  - Minimum: PVC (if approved by local codes)
  - Preferred: Steel (best mechanical, lightning, and interference protection)

**Conduit Construction Guidelines**

1. Provide pull boxes at all vertical drops. SeaSpace will provide a cable grip to be mounted in each vertical-drop pull box in order to support the weight of the cable.  
   - Please specify the number of vertical drops you will be installing.

2. Provide pull boxes when the length of a cable run exceeds 31 m (100 ft) or the cable makes a sharp 90° turn.

3. Mechanically isolate the conduit as much as possible from all sources of electrical interference, such as power cables.

4. The conduit should end as close as possible to the radome penetrations [within 30 cm (1 ft) preferred]. Flexible conduit may be used at the base of the radome (if suitable). The preferred conduit diameter is 1” NPT for the RF signal cable.

5. To determine the total length of the cable needed, add the following lengths of cable to the length of the conduit:
   - **a.** The distance from the radome penetration to the antenna support base inside the radome: 2.4 m (8 ft).
   - **b.** The distance from the junction box at the indoor equipment to the 19-in. rack: minimum of 2 m (6 ft).
   - **c.** Service/maintenance: 61 cm (2 ft).

6. The total length of cable should not exceed 100 m (330 ft). Consult SeaSpace if longer cables are required.

7. Purchaser must provide a pull rope in all non-vertical runs of length greater than 3 m (10 ft).
Drawing of Conduit Run

Please prepare a rough drawing showing:

1. The route of the conduit
2. The locations of the pull boxes
3. Distances between pull boxes
4. Vertical drops
5. The type of conduit
6. The size of conduit
7. The total length of conduit
8. The total length of cable

For a sample drawing showing the above items, see drawing 70980002 on page 2-11.

2.11.2 Conduit for the X-band Antenna Power Cable

The purchaser must also construct a conduit from the X-band antenna to a source of power (100/110 or 220 VAC single phase). A flexible conduit may be used to connect the conduit to the radome. A flexible conduit with 1/2” NPT fittings is preferred. Please show this conduit on the drawings.

2.11.3 GPS Antenna Cable

If a Global Positioning System (GPS) antenna is used, a separate GPS cable must be run from the GPS antenna to the computer. The cable length should not exceed 100 m (330 ft). The GPS cable is supplied by SeaSpace. This cable is not plenum rated.

The GPS antenna cable can be run in a conduit with a diameter of 2.5 cm (1”) or larger. Please specify the cable route and cable length for the GPS antenna cable.
2.11.4 Ethernet Twisted Pair LAN

If the TeraScan system is to be connected to another system using Ethernet Twisted Pair LAN (Type 10 - 100 BASE T), a twisted pair cable must be provided at the computer. The cable must be terminated by an RJ45 connector.

2.11.5 Modem Cable

If a modem is used with the system, a cable with an RJ11C plug is supplied. This cable must attached to a customer-supplied RJ11C jack near the computer system.

2.12 Software

2.12.1 Site Location

Please provide SeaSpace with the latitude and longitude coordinates of the antenna’s location. Please specify the location to 0.001 degree (3 seconds) if available.

2.12.2 Orbital Elements

Orbital elements must be updated daily. The more often the orbital elements are updated on the system, the more accurate the data which is acquired during tracking and earth location.

Transmission Methods

To supply the orbital elements to the system, several methods of transmission are available:

1. The orbital elements can be downloaded via FTP from SeaSpace. The user can automate this process.
2. The user can obtain the orbital elements via FTP from an alternate site.
3. The orbital elements can be sent by Internet mail.
4. The orbital elements can be faxed to the site. This requires the elements to be entered manually into the system. Note: If elements are input incorrectly, no data will be captured.
Format of One-Line Orbital Elements

Orbital elements are officially recognized as 'charlie' elements, which are distributed by NAVAL SPACE SURVEILLANCE CENTER in Dahlgren, Virginia.

<table>
<thead>
<tr>
<th>Field</th>
<th>Columns</th>
<th>Field Description</th>
<th>Unit of Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-5</td>
<td>Satellite Number</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>7-13</td>
<td>Mean Anomaly</td>
<td>Revolutions</td>
</tr>
<tr>
<td>3</td>
<td>15-21</td>
<td>Mean Motion</td>
<td>Radians/Herg*</td>
</tr>
<tr>
<td>4</td>
<td>23-27</td>
<td>Decay</td>
<td>Radians/Herg*</td>
</tr>
<tr>
<td>5</td>
<td>29-35</td>
<td>Eccentricity</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>37-43</td>
<td>Argument of Perigee</td>
<td>Revolutions</td>
</tr>
<tr>
<td>7</td>
<td>45-51</td>
<td>Longitude of Ascending Node</td>
<td>Revolutions</td>
</tr>
<tr>
<td>8</td>
<td>53-59</td>
<td>Inclination</td>
<td>Revolutions</td>
</tr>
<tr>
<td>9</td>
<td>60-65</td>
<td>Epoch</td>
<td>Year/Month/Day</td>
</tr>
</tbody>
</table>

A decimal point (.) is present in Columns 6, 14, 22, 28, 36, 44, and 52.

* 1 Herg = 806.8120768 seconds

A sample orbital element update looks like the following:

15427.5841290.828990.9905.00099.0014921.8607024.7595007.2754761910322
16969.4497611.8355005.00098.0013314.5028795.8011085.2738056910322
18123.6681785.8298938.00130.0014586.8705872.2607938.2744802910322
19531.6020939.8284704.00119.0011797.6136874.6005306.2750580910322
20788.4304800.8220601.00049.0015512.1664426.8258353.2748531910322
20978.7407396.8394583.00345.0081144.0969861.8258437.2745663910332
3.1 Description of the 2.4m TeraScan X-band Antenna and Radome

3.1.1 The Antenna

The antenna for the TeraScan acquisition system is a tracking antenna with a 2.4m solid dish. The dish is mounted to the tracking positioner, which moves the dish during satellite tracking. The positioner is mounted to the radome base frame.

The electronics for collecting, filtering, and converting the RF signal to an IF signal are mounted at the focal point of the dish, with four feed struts that attach to the dish.

See drawing 70911008 on page 3-2 for parts identification.

See Table 3-3 on page 3-23 for antenna dish measurements.

3.1.2 The Radome and Base Frame

The antenna is housed in a fiberglass radome (3.2m diameter) for protection from the weather. The radome is assembled at the site and consists of:

- six top panels
- six bottom panels
- one top "hat"
- a metal base frame
- a one-piece fiberglass pan that rests on the base frame
- eight metal legs that get bolted to the mounting platform (building or concrete pad).
3.2 Summary of Antenna/Radome Assembly Tasks

The tasks involved in assembly are:

1. Assembling the radome base frame, legs, short braces, and long braces.
2. Assembling the bottom half of the radome (six panels) and base pan onto the base frame.
3. Assembling the top half of the radome (six panels and a top "hat").
4. Mounting the RF electronics (feed/LNA/downconverter) to the dish, on four feed struts.
5. Lifting the assembled positioner into the bottom half of the radome and mounting it to the radome base frame.
6. Mounting the antenna dish to the antenna positioner.
7. Lifting the top half of the radome onto the bottom half and bolting it into place.
8. Lifting the assembled radome into position on the mounting platform.
9. Bolting the radome base frame legs to the mounting platform.
3.3 Preparation Checklist

To ensure a successful and efficient antenna/radome assembly, be sure you are fully prepared before you start. Use the following checklist to verify that everything is in order.

1. ☐ Has the X-band antenna mounting platform been constructed? (See Section 2.5 on page 2-14 for specifications of the mounting platform.)

2. ☐ Has the GPS antenna mount been constructed? (See Section 2.8 on page 2-32.)

3. ☐ Has the conduit for the X-band signal cable (antenna to workstation) been constructed? (See Section 2.11.1 on page 2-34.)

4. ☐ Has the conduit for the X-band antenna power cable (antenna to power source) been constructed? (See Section 2.11.2 on page 2-35.)

5. ☐ Has the conduit for the cable from the GPS antenna to the workstation been constructed? (See Section 2.11.3 on page 2-35.)

6. ☐ Is there a source of power for the antenna? (See Table 2-1 on page 2-1 for power requirements.)

7. ☐ Is there a source of power for charging portable tools? (See Section 3.4.3 on page 3-6.)

8. ☐ Are the required tools on hand? (See Section 3.4.1 on page 3-5 for a list of tools.)

9. ☐ Has the heavy equipment been scheduled to be available at the necessary times? (See Section 3.4.2 for a list of equipment.)

10. ☐ Are the three crates containing the antenna and radome on site? (See Section 3.6.1.)

11. ☐ Is the required customer-furnished hardware for mounting the radome base frame to the mounting platform on hand? (See Section 2.5.1 on page 2-14, and item 6 of drawing 70911011 on page 2-18.)
### 3.4 Resources Required

#### 3.4.1 Tools Required

<table>
<thead>
<tr>
<th>Qty</th>
<th>Tool</th>
<th>Bolt Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>box wrench, $\frac{3}{4}''$</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>2</td>
<td>box wrench, $\frac{7}{16}''$</td>
<td>$\frac{1}{4}''$</td>
</tr>
<tr>
<td>1</td>
<td>box wrench, $\frac{1}{2}''$ (for dish bolts)</td>
<td>$\frac{5}{16}''$</td>
</tr>
<tr>
<td>1</td>
<td>crescent wrench, 150mm (6&quot;)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>open wrench, $\frac{3}{4}''$</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1</td>
<td>open wrench, $\frac{9}{16}''$</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>1</td>
<td>socket, $\frac{3}{4}''$</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1</td>
<td>socket, $\frac{9}{16}''$</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>1</td>
<td>torque wrench, $\frac{1}{2}''$ drive</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1</td>
<td>socket driver, $\frac{1}{2}''$</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>2</td>
<td>socket driver, $\frac{3}{8}''$</td>
<td>$\frac{1}{4}''$</td>
</tr>
<tr>
<td>2</td>
<td>socket, $\frac{7}{16}''$, deep</td>
<td>$\frac{1}{4}''$</td>
</tr>
<tr>
<td>1</td>
<td>screwdriver, flat-blade, 3mm ($\frac{1}{8}''$)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>screwdriver, flat-blade, 6mm ($\frac{1}{4}''$)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>screwdriver, #1 Phillips</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>screwdriver, #2 Phillips</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$\frac{5}{16}''$ hex wrench, long arm</td>
<td>$\frac{3}{8}''$ button head</td>
</tr>
<tr>
<td>4</td>
<td>drift pins or awls (alignment tools), 5mm ($\frac{3}{16}''$ diameter)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>shackles, $\frac{3}{8}''$ (sling to base frame)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>hole drill for 1'' RF gland</td>
<td>35mm ($\frac{13}{8}''$ diameter)</td>
</tr>
<tr>
<td>1</td>
<td>hole drill for $\frac{1}{2}''$ power gland</td>
<td>35mm ($\frac{7}{8}''$ diameter)</td>
</tr>
<tr>
<td>2</td>
<td>#2 Phillips driver (to remove screws in crates using drill)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>drill, battery powered with slip clutch</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>diagonal cutters, 127mm (5&quot;)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>wire strippers (power AC mains)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Loctite 271 (50 ml tube)</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>silicone caulk (10 oz tube)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>caulking gun</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>angle brackets for lifting tophalf of radome</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>sling (4 legs) for lifting entire radome [12805003] (assembled weight = 364 kg (800 lb))</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>tag lines</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>digital tape, 5m (16 ft) [12567020]</td>
<td></td>
</tr>
</tbody>
</table>
3.4.2 Heavy Equipment and People Required *(Supplied by the Customer)*

- Crane or hoist for lifting the antenna assembly into the radome and for lifting the assembled radome into position (see Table 3-1 for weight of antenna and radome).
- Forklift for picking up and moving crates (see Table 3-2 on page 3-9 for crate dimensions and sizes).
- Stepladder (height 2 m (6 ft)).
- Four to five helpers to carry/position the radome panels, the base frame hardware, and the dish.

3.4.3 Power Required

- 110 VAC/220 VAC at the antenna site (for the power drill)

3.4.4 People Required

Five to seven people should be able to complete the antenna radome assembly in about two days. A forklift operator and a crane operator are also required.

<table>
<thead>
<tr>
<th>Table 3-1. Weight of Antenna and Radome</th>
</tr>
</thead>
<tbody>
<tr>
<td>kg</td>
</tr>
<tr>
<td>-----</td>
</tr>
<tr>
<td>Assembled radome</td>
</tr>
<tr>
<td>Assembled positioner, dish, and counterweights</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
3.5 Safety During Installation

Because the installation of the antenna and cable run could potentially entail work in hazardous conditions, safety procedures must be observed during installation.

NOTICE! UNDER NO CIRCUMSTANCES WILL SEASPACE PERSONNEL WORK IN UNSAFE CONDITIONS.

It is the purchaser’s responsibility to provide a safe work environment. If any conditions are determined to be unsafe, SeaSpace personnel will not proceed with the installation until the unsafe condition has been corrected. Sole determination of unsafe conditions will be made by SeaSpace personnel.

Examples of unsafe conditions are:

- Electrical hazard due to exposed live contacts or high-voltage lines.
- Extreme temperatures.
- High winds, rain, or lightning.
- Ice or snow.
- Blowing dust.
- Contaminated air in an enclosed space.
- Height hazard. Temporary or permanent safety railings, scaffolding, or safety harness tie points must be provided for any elevated work area such as a rooftop.

3.5.1 Lifting and Carrying Properly

Most back injuries result from improper lifting. According to the principles of biomechanics, the worst lifting situation occurs when the body is extended over the load: the lower back becomes a fulcrum supporting the weight of the body plus the load. Twisting in this position invites injury. To lift properly:

1. **Get a firm footing.** Keep your feet apart (shoulder width) for a stable base; point toes out.
2. **Bend your knees.** Don’t bend at the waist. Keep the principles of leverage in mind. Don’t do more work than you have to. Maintain your three natural back curves.
3. **Tighten stomach muscles.** Your abdominal muscles support your spine when you lift, offsetting the force of the load. Train muscle groups to work together.
4. **Lift with your legs.** Let your powerful leg muscles do the work of lifting, not your weaker back muscles. Maintain your three natural curves.
5. **Keep the load close.** Don’t hold the load away from your body. The closer it is to your spine, the less force it exerts on your back.
6. **Keep your back upright.** Whether you’re lifting or putting down a load, don’t add the weight of your body to the load. Avoid twisting; it’s a common cause of injury.
3.5.2 Material Handling — Think Before You Lift

To handle materials safely, lift everything twice! **FIRST**, lift the load mentally. Plan every step before you do it physically. **SECOND**, lift with your legs, not your back.

**Mental Lifting**

- **Size up the load**: How much does it weigh? How much do you weigh? Give it the heft test to see whether you can lift it—you don’t want any surprises.
- **Get help**: If the load is too bulky or heavy for you to lift alone, get help.
- **Find a better way**: Sometimes no one else is around to help, or the job is bigger than the two of you. Arrange for mechanical help from a pushcart, hand truck, wheelbarrow, or forklift.
- **Check the pathway**: Look for obstacles underfoot and overhead, spills, lighting, traffic (people or vehicles), and changes in elevation. Choose a clear route over the flattest surface, even if it takes a little longer.
- **Solve high load problems**: Lifting from a height above the shoulders can be hazardous. Test the weight by pushing up on the load. Get as close to the load as possible, so it can slide down your body, close to you.

**Physical Lifting**

Be sure to apply proper lifting techniques, whether working alone, as a team, or with the aid of a mechanical helper.

- **Lift it properly**: When lifting follow these steps: 1. Get close to the load and grasp firmly. Hug it! 2. Keep your back in its natural alignment as you use your strong leg muscles to lift the load. 3. Set the load down smoothly.
- **Team lifting**: When team lifting, pick one person to call the signals. The leader should direct the team so you all lift together, walk in step, and lower the load together.
- **Push, don’t pull**: Use good lifting techniques to load mechanical devices. Whenever possible, push rather than pull. Then lift: apply the same lifting techniques in reverse to unload.
- **Clear the pathway**: Remove any hazards you see—and/or see that they are removed. Wipe up spills. Make sure the area is well lighted. Wait until traffic clears. Then transport the load, setting it down in the proper place.
- **Unload carefully**: Un-lift or set a load as safely as you lifted it. Plan where you can put down the load. Pick your spot carefully so no one has to move the load again.
3.6 Unpacking the Antenna and Radome

3.6.1 Shipping Crates

The antenna is shipped in three crates whose contents, weights, and dimensions are given in Table 3-2.

<table>
<thead>
<tr>
<th>Crate</th>
<th>Approximate Dimensions</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crate 1</td>
<td>2.5m (98&quot;) l 2.5m (98&quot;) w 0.75m (29&quot;) h</td>
<td>• Radome base frame and dish</td>
</tr>
<tr>
<td>Crate 2</td>
<td>2.5m (100&quot;) l 1.45m (57&quot;) w 1.8m (71&quot;) h</td>
<td>• Radome panels</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Feed struts</td>
</tr>
<tr>
<td>Crate 3</td>
<td>1.7m (66&quot;) l 1.35m (53&quot;) w 2m (79&quot;) h</td>
<td>• Antenna positioner</td>
</tr>
</tbody>
</table>
3.6.2 Unpacking Crate 1 (Radome Base Frame and Dish)

1. Remove the top of the crate (Figure 3-1).
2. Remove the 2.4m dish from the crate.
3. Cut straps retaining fiberglass floor panel.
4. Unscrew the bolts holding the base frame to the bottom of the crate and remove the base frame from the crate.

**Figure 3-1:** Dish, with base frame underneath.
3.6.3 Unpacking Crate 2 (Radome Assembly)

1. Remove front and both sides of Crate 2.
2. Identify contents of Crate 2.
3. Cut tie-wraps retaining the feed struts. Set the feed struts aside in a safe place.
4. Unbolt radome panel retaining straps from the floor of the crate.
5. If practical, do not remove radome panels until ready to install.
3.6.4 Unpacking Crate 3 (Antenna Positioner Assembly)

1. Remove the top and front side of Crate 3 (Figure 3-2).
2. Remove the plastic cover from the antenna positioner assembly.
3. The antenna positioner is bolted to the bottom of the crate. Use a forklift to raise the crate to get access to the bolt heads from underneath the crate. Remove the four bolts holding the antenna positioner to the bottom of the crate.

![Figure 3-2: Antenna positioner secured in its shipping crate.](image)
4. Unbolt the wood braces supporting the antenna positioner in the crate (Figure 3-3).

Figure 3-3: Unbolting wood supports from the antenna positioner assembly.
3.7 Assembling the Antenna and Radome

Use Loctite 271 (red) for tightening all hardware.

**CAUTION** THE RADOME BASE FRAME IS HEAVY. REMEMBER TO LIFT CAREFULLY!

**CAUTION** BECAUSE OF THE SHAPE AND SIZE OF THE RADOME PANELS, IT IS RECOMMENDED THAT TWO INSTALLERS HANDLE EACH PANEL. A GUST OF WIND WOULD MAKE THE PANELS DIFFICULT TO HANDLE FOR ONE PERSON, AND MIGHT CAUSE INJURY TO THE INSTALLER OR DAMAGE TO THE PANEL.

3.7.1 Radome Base Assembly

1. Place the metal base frame upside down on the ground.

2. Attach the 8 metal legs to the base frame, two bolts each leg \( \frac{3}{8} \times 1" \) bolt, washer :: washer, nut. This step requires a \( \frac{9}{16} " \) socket wrench and a \( \frac{9}{16} " \) open wrench. Tighten to 30 Nm (22 ft-lbs) (264 inch-lbs). Use Loctite 271.

3. Attach a short brace from each leg towards the center of the base frame (Figure 3-4A) \( \frac{3}{8} \times 1" \) bolt, washer :: washer, nut. This step requires a \( \frac{9}{16} " \) socket wrench and a \( \frac{9}{16} " \) open wrench. Tighten to 30 Nm (22 ft-lbs) (264 inch-lbs). Use Loctite 271.

4. For each pair of legs:
   a. Attach a foot to the left leg \( \frac{3}{8} \times 1\frac{1}{4} " \) bolt, washer :: washer, nut.
   b. Attach one end of a long brace to the upper left leg (Figure 3-4A) \( \frac{3}{8} \times 1" \) bolt, washer :: washer, nut.
   c. Attach the other end of the long brace and a foot to the lower right leg as shown in Figure 3-4B \( \frac{3}{8} \times 1\frac{1}{4} " \) bolt, washer :: washer, nut.

See drawing 70911017 on page 2-16, drawing 70911014 on page 2-17, and Figure 3-4 on page 3-15 for foot orientation. This step requires a \( \frac{9}{16} " \) socket wrench and a \( \frac{9}{16} " \) open wrench. Tighten to 30 Nm (22 ft-lbs) (264 inch-lbs). Use Loctite 271.

5. Flip the assembled base over so it sits right-side-up on its feet. Place the fiberglass base pan on top of the base frame, paint side down. Line up AFT/BOW marks on the fiberglass pan with those on the frame. Temporarily secure base pan with four \( \frac{1}{2} - 13 " \) bolts where the base stand will attach (see Figure 3-6 on page 3-17).
Figure 3-4: A: Left and right legs with long brace attached. B: Close-up of right leg with long brace and foot attached.
3.7.2 Bottom Half of Radome, Assembly

1. Remove the radome panels from Crate 2 and lay out in numbered sequence. Separate the bottom panels from the top panels.

2. Attach the panels for the bottom half of the radome to the base frame (Figure 3-5) one at a time. Put panels on base pan in number order 1:1, 2:2, etc. (Figure 3-6). Install bolts, washers, and nuts, but leave them loose. Use the awl/alignment pin or #2 Phillips screwdriver to center the bolt holes.

3. Silicone between radome panels, and also between radome panels and base frame, inside and out. Apply Loctite 271 to all bolts. Where possible, use washers on both sides of base pan \( \frac{3}{4} \)-20×\( \frac{3}{4} \)” bolts, \( 1 \frac{1}{4} \)”-diameter washers to base pan. Tighten to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs). Tighten base pan bolts, then join panels and tighten.

You will need people to help support the radome panels while others do the siliconing and bolting.

Figure 3-5: Fastening radome bottom panels to the radome base frame.
Assembly of 2.4m Antenna and Radome

Figure 3-6: Bottom half of radome completely assembled.
3.7.3 Top Half of Radome, Assembly

1. The top half of the radome is assembled separately from the bottom half. Secure numbered panels together loosely [¼-20×1” bolts]. Leave one panel unbolted for exit/entry of workers during assembly (Figure 3-7).

2. Silicone between top panels inside and out. Secure all nuts between panels with Loctite 271. Torque bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).

Figure 3-7: Top half of radome, nearing completion.
3. Place the radome cap on top of the assembled radome top panels (Figure 3-8).
4. Join the final top panel (two people are still inside).
5. Silicone between these final panels and between edge of cap and top panels inside and out. Secure all nuts between panels with Loctite 271 before securing radome cap. Torque bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).
6. Raise the radome top to let the person out.

Figure 3-8: Radome cap in place on top half of radome, viewed from inside radome.
3.7.4 Antenna Dish Assembly

1. Attach the numbered feed struts to the dish [Dish end: ¼-20×2” bolt, washer :: washer, nut. Feed end has threaded bolt-holes.] (Figure 3-9). Use 7/16” wrench.

2. Attach the RF electronics (feed) (Figure 3-10 on page 3-21) to the feed struts. Refer to Figure 3-11 on page 3-21 for strut-to-feed attachment details and to Figure 3-12 on page 3-22 for correct orientation of the feed. Match the number on the feed strut with the number on the feed.

Figure 3-9: Attaching feed struts to the dish.
Assembly of 2.4m Antenna and Radome

Figure 3-10: RF electronics components.

Figure 3-11: Feed assembly close-up to show attachment to feed struts.
Figure 3-12: Orientation of feed when antenna dish is positioned at 0 degrees elevation.
3. Check the focal length against the measurements in Table 3-3. The focal distance is measured from the front of the scalar feed to the center of the dish. Adjust the distance by moving the 3/8” button head screw at the end of each feed strut (5/16” hex wrench, long arm; and 3/4” open end wrench).

**Table 3-3. Antenna Dish Measurements**

<table>
<thead>
<tr>
<th>Size</th>
<th>Actual Diameter</th>
<th>Focal Distance</th>
<th>F/D</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.4m</td>
<td>2.4mm (94.5”)</td>
<td>898m (35.38”)</td>
<td>0.375</td>
</tr>
</tbody>
</table>
3.7.5 Lifting Antenna Positioner into Radome and Bolting It to Radome Base

1. Sling-lift the antenna positioner into the radome (Figure 3-13).

DO NOT STAND DIRECTLY BELOW THE CRANE, THE FORK LIFT, OR THE POSITIONER.

2. Place the antenna positioner on the radome base so the word AFT on the positioner points toward the door of the radome.

3. Bolt the positioner to the floor of the radome base [¼-13 bolt, washer :: washer, lock washer, nut]. Torque bolts to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs).

Figure 3-13: Lifting the antenna positioner assembly into the bottom half of the radome.
3.7.6 Attaching Dish to Positioner

1. Place the lift sling around the ribs on the back side of the dish (Figure 3-14).
2. Sling-lift the antenna dish onto the antenna positioner.

**DANGER**

DO NOT STAND DIRECTLY BELOW THE CRANE, THE FORK LIFT, OR THE DISH.

*Figure 3-14:* Preparing to sling lift the dish onto the positioner.
3. Bolt the dish to the positioner using $\frac{5}{16}$" x 1" hardware at the attachment points shown in Figure 3-15. Tighten to 14-16 Nm (10-12 ft-lbs) (120-144 inch-lbs).
3.7.7 Putting Top Half of Radome on Bottom Half

1. Place the 4 angle bracket clips (3” x 3”) on the sling (Figure 3-16).
2. Slide the 4 clips under the radome top half, equally spaced around the radome.
3. Attach a bolt through the clip holding the radome to the clip. (The bolt goes downward through the clip.) Loosely tighten a nut below the clip.

Figure 3-16: Sling attachment to angle bracket clip on radome top.
4. Sling-lift the top half of the radome into place on the lower half of the radome (Figure 3-17). Align the numbers on the top half of the radome with the numbers on the bottom half.

5. Remove the bolt from each clip. Carefully remove the clip. Use the awls/alignment pins to position the top while removing the clips.

6. Bolt the top and bottom halves of the radome together (¼-20x1” bolts). Use silicone before tightening bolts. Apply Loctite 271 to nuts. Torque bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).

Figure 3-17: Lifting radome top onto radome bottom.
3.7.8 Lifting Assembled Radome/Antenna onto Rooftop or Concrete Pad

1. Place the 4 shackles on the sling.
2. Attach the shackles to the underside of the base frame at the hole on the outside edge of the frame at the hole near every other foot (Figure 3-18).
3. Attach each of the 4 tag lines to a sling or shackle.
4. Slowly lift the radome into place (Figure 3-19). Position the radome so the door on the radome faces south (AFT).

DO NOT STAND DIRECTLY BELOW THE CRANE OR THE ASSEMBLED RADOME/ANTENNA.

5. Attach the 8 feet to the roof or concrete pad using the bearing washer (see drawing 70911011 on page 2-18. Torque bolts to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs).

Figure 3-18: Sling attachment to the shackle on the radome base frame.
Figure 3-19: Lifting the assembled radome containing the antenna.
3.8 Running the Antenna Power Cable

1. Pull the AC mains wires through the power cable conduit to the circuit breaker box on the base stand of the positioner.

3.9 Connecting Power to the Antenna

1. Check the voltage selector switch (Figure 3-20) of the antenna power supply on the positioner frame before connecting the antenna power cable to the AC mains. Your system runs either on 110 or 220 VAC single phase. You must select the correct power voltage. To select the opposite voltage,
   a. Unplug the power cord.
   b. Use a screwdriver to pop off the voltage selector plate.
   c. Turn the selector to the correct voltage. (See Figure 3-23 on page 3-37 for the location of the voltage selector switch.)
   d. Re-plug the power cord.

2. Attach the antenna power cable to the circuit breaker box on the antenna base stand.

3. Wire the circuit breaker box and the spike and surge supressor according to drawing 70983 on the following pages. Refer to Sheet 1 for 220 VAC or Sheet 2 for 110 VAC.

**Figure 3-20**: Voltage selector switch, with 110 VAC selected.
3.10 Balancing the Antenna

When properly balanced, the antenna dish should not drift (move slowly) about its elevation axis, no matter what position the dish is moved to. The cross-level beam should remain level and not tip to one side. After assembly, only minor adjustments to the balance should be needed.

**Figure 3-21:** Trim rod and trim weight locations. A: top of positioner frame. B: rear of right side weights. C: left side weights
To balance the antenna:

1. Place the antenna dish at 0° elevation (horizontally). Add or subtract trim weights to the right or left side of the antenna at the dish or the counter-balance area until the cross-level beam is balanced. Use 1-oz or ½-oz weights with ¼-20 cap screws. Move the trim rod over the cross-level beam (Figure 3-21) to make final adjustments.

2. Move the dish to 90° elevation. If the dish drifts, redistribute the weights. Move the trim rod above the weights to adjust the balance.

3. Move the dish to 180° elevation. Repeat the rebalance of Step 2 if needed.

4. Return to Step 1 and recheck the drift at 0° elevation

3.11 Mechanical Checklist

1. Check that the positioner moves freely in azimuth, cross-level, and elevation over the entire range of motion.

2. Check that the cables and wiring are properly dressed and routed and clamped into place. The cables should not catch, snag, or bind as the antenna is moved through the full range of each axis.
3.12 How to Turn on Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn on power to the antenna. (See drawing 70911008 on page 3-2 for location of the circuit breaker box.)

2. Move the circuit breaker UP to turn on power to the antenna (Figure 3-22).

3. Press the I/O switch on the pedestal power supply (gold box on the positioner frame) so that the "I" on the switch is flush with the box (Figure 3-23).

**DANGER**

POWER IS STILL PRESENT IN THE CIRCUIT BREAKER BOX AND AT THE AUXILIARY OUTLET AND LIGHT, EVEN WHEN THE CIRCUIT BREAKER IS TURNED OFF. THE CIRCUIT BREAKER SUPPLIES POWER TO THE POSITIONER.

---

Figure 3-22: Circuit breaker in ON position.
3.13 How to Turn off Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn off power to the antenna. (See drawing 70911008 on page 3-2 for location of the circuit breaker box.)

2. Move the circuit breaker DOWN to turn off power to the antenna.

DANGER

Power is still present in the circuit breaker box and at the auxiliary outlet even when the circuit breaker is turned off.
3.14 Antenna Checkout

After the antenna has been assembled, use the following procedures to check out the antenna and verify that it is operating correctly independently of the workstation.

1. Turn on power to the antenna as explained in Section 3.12.
2. Verify that when power is turned on to the antenna, the antenna moves to the following position:
   - Level cage goes fully counter-clockwise and returns to level.
   - Elevation: to 90° above level
   - Azimuth: to home position
   - Cross-level: to 90° (level position)
3. Verify that the conscan motor and feed start moving and continue to turn. Verify that the motor does not start and stop.
4. After 5 minutes, turn off power to the antenna as explained in Section 3.13.
Chapter 4: Assembly of 3.6m Antenna and Radome

4.1 Description of the 3.6m TeraScan X-band Antenna and Radome

4.1.1 The Antenna

The antenna for the TeraScan acquisition system is a tracking antenna with a 3.6m mesh dish. The dish is mounted to the tracking positioner. The tracking positioner moves the dish during satellite tracking. The positioner sits on the antenna base stand, which is mounted to the base stand spacer, which in turn is mounted to the radome base frame.

The electronics for collecting, filtering, and converting the RF signal to an IF signal are mounted at the focal point of the dish, with four feed struts that attach to the dish.

See drawing 70982 on page 4-2 for parts identification.

See Table 4-3 on page 4-45 for antenna dish measurements.

4.1.2 The Radome and Base Frame

The antenna is housed in a fiberglass radome (4.2m diameter) for protection from the weather. The radome is assembled at the site and consists of:

- eight top panels
- eight bottom panels
- one top “hat”
- eight skirt pieces
- a metal base frame [with either 159mm (21.75”) legs or 552mm (6.25”) feet]
- a two-piece fiberglass pan that rests on the base frame
- eight metal feet that get bolted to the mounting platform (building or concrete pad).
4.2 Summary of Antenna/Radome Assembly Tasks

The tasks involved in assembly are:

1. Assembling the radome base frame.
2. Attaching the radome skirt panels to the radome base frame.
3. Assembling the bottom half of the radome onto the radome skirt.
4. Assembling the top half of the radome (eight panels and a top "hat").
5. Assembling the antenna dish from four quadrants and a center plate.
6. Mounting the RF electronics (feed/LNA/downconverter) to the dish, on four feed struts.
7. Bolting the positioner onto the antenna base stand spacer.
8. Lifting the assembled positioner into the bottom half of the radome and mounting it to the radome base frame.
9. Mounting the antenna dish to the antenna positioner.
10. Lifting the top half of the radome onto the bottom half and bolting it into place.
11. Lifting the assembled radome into position on the mounting platform.
12. Bolting the radome base frame feet to the mounting platform.
4.3 Preparation Checklist

To ensure a successful and efficient antenna/radome assembly, be sure you are fully prepared before you start. Use the following checklist to verify that everything is in order.

1. ☐ Has the X-band antenna mounting platform been constructed? (See Section 2.6 on page 2-19 for specifications of the mounting platform.)

2. ☐ Has the GPS antenna mount been constructed? (See Section 2.8 on page 2-32.)

3. ☐ Has the conduit for the X-band signal cable (antenna to workstation) been constructed? (See Section 2.11.1 on page 2-34.)

4. ☐ Has the conduit for the X-band antenna power cable (antenna to power source) been constructed? (See Section 2.11.2 on page 2-35.)

5. ☐ Has the conduit for the cable from the GPS antenna to the workstation been constructed? (See Section 2.11.3 on page 2-35.)

6. ☐ Is there a source of power for the antenna? (See Table 2-1 on page 2-1 for power requirements.)

7. ☐ Is there a source of power for charging portable tools? (See Section 4.4.3 on page 4-6.)

8. ☐ Are the required tools on hand? (See Section 4.4.1 on page 4-5 for a list of tools.)

9. ☐ Has the heavy equipment been scheduled to be available at the necessary times? (See Section 4.4.2 for a list of equipment.)

10. ☐ Are the three crates containing the antenna and radome on site? (See Section 4.6.1.)

11. ☐ Is the required customer-furnished hardware for mounting the radome base frame to the mounting platform on hand? (See Section 2.6.1 on page 2-19, and item 6 of drawing 70911004 on page 2-24.)
### 4.4 Resources Required

#### 4.4.1 Tools Required

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<th>Qty</th>
<th>Tool</th>
<th>Bolt Size</th>
</tr>
</thead>
<tbody>
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</tr>
<tr>
<td>2</td>
<td>box wrench, 7/16”</td>
<td>1/4”</td>
</tr>
<tr>
<td>1</td>
<td>box wrench, 9/16”</td>
<td>3/8”</td>
</tr>
<tr>
<td>1</td>
<td>box wrench, 1/2” (for dish bolts)</td>
<td>5/16”</td>
</tr>
<tr>
<td>1</td>
<td>crescent wrench, 150mm (6”)</td>
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<td>open wrench, 3/4”</td>
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<td>3/8” button head</td>
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<td>shackles, 3/8” (sling to base frame)</td>
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<td>hole drill for 1” RF gland</td>
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<td>hole drill for 1/2” power gland</td>
<td>35mm (7/8”) diameter</td>
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<tr>
<td>1</td>
<td>caulking gun</td>
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</tr>
<tr>
<td>4</td>
<td>angle brackets for lifting top half of radome</td>
<td></td>
</tr>
<tr>
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<td>sling (4 legs) for lifting entire radome [12805005] (radome weight = 681 kg (1,500 lb))</td>
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<tr>
<td>4</td>
<td>tag lines</td>
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</tr>
<tr>
<td>1</td>
<td>digital tape, 5m (16 ft) [12567020]</td>
<td></td>
</tr>
</tbody>
</table>
4.4.2 **Heavy Equipment and People Required (Supplied by the Customer)**

- Crane or hoist for lifting the antenna assembly into the radome and for lifting the assembled radome into position (see Table 4-1 for weight of antenna and radome).
- Forklift for picking up and moving crates (see Table 4-2 for crate dimensions and sizes).
- Stepladder (height 2 m (6 ft)).
- Four to five helpers to carry/position the radome panels, the base frame hardware, and the dish.

4.4.3 **Power Required**

- 110 VAC/220 VAC at the antenna site (for the power drill)

4.4.4 **People Required**

Five to seven people should be able to complete the antenna radome assembly in about three days. A forklift operator and a crane operator are also required.

<table>
<thead>
<tr>
<th>Table 4-1. Weight of Antenna and Radome</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>kg</strong></td>
</tr>
<tr>
<td>Assembled radome</td>
</tr>
<tr>
<td>Assembled positioner, dish, and counterweights</td>
</tr>
<tr>
<td><strong>Total</strong></td>
</tr>
</tbody>
</table>
4.5 Safety During Installation

Because the installation of the antenna and cable run could potentially entail work in hazardous conditions, safety procedures must be observed during installation.

NOTICE! UNDER NO CIRCUMSTANCES WILL SEASPACE PERSONNEL WORK IN UNSAFE CONDITIONS.

It is the purchaser’s responsibility to provide a safe work environment. If any conditions are determined to be unsafe, SeaSpace personnel will not proceed with the installation until the unsafe condition has been corrected. Sole determination of unsafe conditions will be made by SeaSpace personnel.

Examples of unsafe conditions are:

- Electrical hazard due to exposed live contacts or high-voltage lines.
- Extreme temperatures.
- High winds, rain, or lightning.
- Ice or snow.
- Blowing dust.
- Contaminated air in an enclosed space.
- Height hazard. Temporary or permanent safety railings, scaffolding, or safety harness tie points must be provided for any elevated work area such as a rooftop.

4.5.1 Lifting and Carrying Properly

Most back injuries result from improper lifting. According to the principles of biomechanics, the worst lifting situation occurs when the body is extended over the load: the lower back becomes a fulcrum supporting the weight of the body plus the load. Twisting in this position invites injury. To lift properly:

1. **Get a firm footing.** Keep your feet apart (shoulder width) for a stable base; point toes out.
2. **Bend your knees.** Don’t bend at the waist. Keep the principles of leverage in mind. Don’t do more work than you have to. Maintain your three natural back curves.
3. **Tighten stomach muscles.** Your abdominal muscles support your spine when you lift, offsetting the force of the load. Train muscle groups to work together.
4. **Lift with your legs.** Let your powerful leg muscles do the work of lifting, not your weaker back muscles. Maintain your three natural curves.
5. **Keep the load close.** Don’t hold the load away from your body. The closer it is to your spine, the less force it exerts on your back.
6. **Keep your back upright.** Whether you’re lifting or putting down a load, don’t add the weight of your body to the load. Avoid twisting; it’s a common cause of injury.
4.5.2 Material Handling — Think Before You Lift

To handle materials safely, lift everything twice! **FIRST**, lift the load mentally. Plan every step before you do it physically. **SECOND**, lift with your legs, not your back.

**Mental Lifting**

**Size up the load**: How much does it weigh? How much do you weigh? Give it the heft test to see whether you can lift it—you don’t want any surprises.

**Get help**: If the load is too bulky or heavy for you to lift alone, get help.

**Find a better way**: Sometimes no one else is around to help, or the job is bigger than the two of you. Arrange for mechanical help from a pushcart, hand truck, wheelbarrow, or forklift.

**Check the pathway**: Look for obstacles underfoot and overhead, spills, lighting, traffic (people or vehicles), and changes in elevation. Choose a clear route over the flattest surface, even if it takes a little longer.

**Solve high load problems**: Lifting from a height above the shoulders can be hazardous. Test the weight by pushing up on the load. Get as close to the load as possible, so it can slide down your body, close to you.

**Physical Lifting**

Be sure to apply proper lifting techniques, whether working alone, as a team, or with the aid of a mechanical helper.

**Lift it properly**: When lifting follow these steps: 1. Get close to the load and grasp firmly. Hug it! 2. Keep your back in its natural alignment as you use your strong leg muscles to lift the load. 3. Set the load down smoothly.

**Team lifting**: When team lifting, pick one person to call the signals. The leader should direct the team so you all lift together, walk in step, and lower the load together.

**Push, don’t pull**: Use good lifting techniques to load mechanical devices. Whenever possible, push rather than pull. Then lift: apply the same lifting techniques in reverse to unload.

**Clear the pathway**: Remove any hazards you see—and/or see that they are removed. Wipe up spills. Make sure the area is well lighted. Wait until traffic clears. Then transport the load, setting it down in the proper place.

**Unload carefully**: Un-lift or set a load as safely as you lifted it. Plan where you can put down the load. Pick your spot carefully so no one has to move the load again.
4.6 Unpacking the Antenna and Radome

4.6.1 Shipping Crates

The antenna is shipped in three crates whose contents, weights, and dimensions are given in Table 4-2.

Table 4-2. Shipping Crates

<table>
<thead>
<tr>
<th>Crate</th>
<th>Approximate Dimensions</th>
<th>Weight</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crate 1</td>
<td>2.9m (116&quot;) l 1.6m (62&quot;) w 0.5m (18&quot;) h</td>
<td>341 kg (750 lb)</td>
<td>• Radome base frame</td>
</tr>
</tbody>
</table>
| Crate 2 | 3.4m (135") l 2.1m (84") w 2.0m (80") h | 818 kg (1,800 lb) | • Radome panels  
• Antenna dish  
• Feed struts |
| Crate 3 | 1.7m (66") l 2.0m (79") w 1.3m (53") h | 205 kg (450 lb) | • Antenna positioner on base stand  
• Base stand spacer |

Figure 4-1: Shipping crates.
4.6.2 Unpacking Crate 1 (Radome Base Frame)

1. Remove the top of the crate.
2. Cut straps retaining fiberglass floor panels (Figure 4-2).
3. Unscrew hold-down blocks (Figure 4-2).
4. Remove the fiberglass floor panels and lay them flat in a safe location.

Figure 4-2: Fiberglass floor panels for radome base.
5. Unscrew plywood sheet and remove.
6. Remove intermediate support braces (Figure 4-3).

**Figure 4-3:** Intermediate support braces.
7. Unbolt the hold-down bolts from the topmost base frame section (Figure 4-4).
8. Remove the base frame section from the crate.

Figure 4-4: Base frame hold-down bolts.
9. Unbolt the second half of the base frame from the crate floor (Figure 4-5).

Figure 4-5: Unbolting second half of base frame from crate floor.
10. Unbolt the two metal splice plates from the crate floor (Figure 4-6).

Figure 4-6: Unbolting splice plates.
4.6.3 Unpacking Crate 2 (Radome and Dish Assemblies)

1. Remove front and both sides of Crate 2 (Figure 4-7).
2. Identify contents of Crate 2 (Figure 4-7).
3. Cut tie-wraps retaining the feed struts (Figure 4-7). Set the feed struts aside in a safe place.
4. Cut bands retaining the antenna dish box (Figure 4-7).

**Figure 4-7:** Radome crate with front removed.
5. Note how the dish and radome panels are nested (Figure 4-8).

**Figure 4-8:** Radome crate packing order.
6. Remove the box containing the antenna dish from the crate and set the box on end as shown in Figure 4-9.

**Figure 4-9:** Box containing antenna dish standing properly on end.
7. Open cardboard box containing antenna dish sections (Figure 4-10).

Figure 4-10: Antenna dish sections.
8. Unbolt radome panel retaining straps from the floor of the crate.
9. If practical, do not remove radome panels until ready to install.

Figure 4-11: Radome panels with retaining straps bolted to the floor of the crate.
10. Locate and identify all antenna assembly hardware (Figure 4-12).

**Figure 4-12:** Antenna assembly hardware.
4.6.4 Unpacking Crate 3 (Antenna Positioner Assembly)

1. Remove the front and right sides of Crate 3 (Figure 4-13).
2. Remove the plastic cover from the antenna positioner assembly.
3. The antenna positioner and base stand spacer are bolted to the bottom of the crate. Use a forklift to raise the crate in order to remove the bolts from the bottom of the crate.

Figure 4-13: Antenna positioner and base stand spacer secured in their shipping crate.
4. Unbolt the wood braces supporting the antenna positioner in the crate.

5. The antenna positioner is bolted to the bottom of its shipping crate. Use the forklift to raise the crate to get access to the bolt heads from underneath the crate. Remove the bolts holding the antenna positioner assembly and the base stand spacer to the bottom of the crate (Figure 4-14).

![Figure 4-14: Unbolting wood supports from the antenna positioner assembly.](image-url)
4.7 Assembling the Antenna and Radome

Use Loctite 271 (red tube) for tightening all hardware.

**CAUTION** THE RADOME BASE FRAME IS HEAVY. REMEMBER TO LIFT CAREFULLY!

**CAUTION** BECAUSE OF THE SHAPE AND SIZE OF THE RADOME PANELS, IT IS RECOMMENDED THAT TWO INSTALLERS HANDLE EACH PANEL. A GUST OF WIND WOULD MAKE THE PANELS DIFFICULT TO HANDLE FOR ONE PERSON, AND MIGHT CAUSE INJURY TO THE INSTALLER OR DAMAGE TO THE PANEL.

4.7.1 Radome Base Assembly

The 3.6m antenna comes with a radome base assembly with either 159mm (6.25") high feet (see Section 4.7.1.1) or 552mm (21.75") high legs (see Section 4.7.1.2 on page 4-27).

4.7.1.1 Base Frame with 159mm (6.25") High Feet

1. Place the two halves of the metal base frame upside down on the ground (Figure 4-15 on page 4-24).

2. Attach the 8 metal feet to the base frame, two bolts each foot [1/2-13Y1/2” bolt, washer :: washer, nut] (Figure 4-15). This step requires a 3/4” socket wrench and a 3/4” open wrench. Tighten to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs). Use Loctite 271.

3. Join the two halves of the base frame [1/2-13 bolt, washer :: washer, nut] using the two splice plates (Figure 4-16 on page 4-25). This step requires a 3/4” socket wrench and a 3/4” open wrench. Tighten to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs). Use Loctite 271.
Figure 4-15: A: One-half of radome base frame with feet attached. B: Close-up of base frame foot.
Figure 4-16: Radome base frame: detail showing how two halves of frame bolt together with splice plate. Base frame is upside down.
4. Flip the assembled base over so it sits right-side-up on its feet. Place the two halves of the fiberglass base plate on top of the base frame, paint side down (Figure 4-17 on page 4-26). Line up AFT/BOW marks on the fiberglass plate with those on the frame. Temporarily secure halves with four ½-13 bolts where the base stand spacer will attach.

5. Run a bead of silicone down the joint between the two halves of the fiberglass base plate.

Figure 4-17: One-half of fiberglass base plate placed in position on radome base frame.
4.7.1.2 Base Frame with 552mm (21.75") High Legs

1. Place the two halves of the metal base frame upside down on the ground (Figure 4-18).

![splice plates]

**Figure 4-18:** Two halves of base frame, upside down. The halves are not yet joined.
2. Join the two halves of the base frame [½-13 bolt, washer :: washer, nut] using the two splice plates (Figure 4-19). This step requires a ¾” socket wrench and a ¾” open wrench. Tighten to 61-70 Nm (45-52 ft-lbs). Use Loctite 271.

**Figure 4-19:** Radome base frame: detail showing how two halves of frame bolt together with splice plate. Base frame is upside down.
3. Remove the top of the wood crate containing the legs and braces.

4. Place the legs as shown in Figure 4-21. Attach them using ½-13 bolt, washer :: washer, nut and tighten to 61-70 Nm (45-52 ft-lbs). Use Locktite 271. See Figure 4-22B on page 4-30 for bolt detail.
Figure 4-22: A. Radome base frame with legs assembled. B. Assembly detail.
5. Facing each pair of legs, place long diagonal braces on the left leg (Figure 4-23A) and right leg (Figure 4-23B) and bolt them to each leg as shown [3/8-16 bolt, washer :: washer, nut]. Use Loctite 271. Tighten to 41-54 Nm (30-40 ft-lbs).

**Figure 4-23:** Long diagonal leg braces: A. Left. B. Right.
6. Facing each pair of legs, place the short diagonal brace from the upper left to lower right and bolt to the two legs [3/8-16 bolt, washer :: washer, nut]. Use Locktite 271. Tighten to 41-54 Nm (30-40 ft-lbs). See Figure 4-24.

Figure 4-24: Attaching the short diagonal brace.
7. Place a foot on each leg (see Figure 4-24 on page 4-32) and attach with ½-13 bolt, washer :: washer, nut. Tighten to 61-70 Nm (45-52 ft-lbs). Use Locktite 271. See Figure 4-25 for foot detail. The smaller hole in the foot will attach to the leg.

Figure 4-25: Detail of mounting foot.
8. Turn the base frame over (Figure 4-26).

9. Flip the assembled base over so it sits right-side-up on its feet. Place the two halves of the fiberglass base plate on top of the base frame, paint side down (Figure 4-17 on page 4-26). Line up AFT/BOW marks on the fiberglass plate with those on the frame. Temporarily secure halves with four ½-13 bolts where the base stand spacer will attach.

10. Run a bead of silicone down the joint between the two halves of the fiberglass base plate.
4.7.2 Radome Skirt Assembly

1. Assemble the radome skirt on the base (Figure 4-27). Place all the numbered skirt panels around the edge of fiberglass base plate before bolting them to the base. Numbers on the skirt panels must match numbers on the base plate.

2. Put bolts in holes, but don’t tighten yet [top: bolt, fender washer :: nut]. Use ¼-20×1½” bolts around edge, going down into base. Use ¼-20×1” bolts on sides and in 4 center holes. Use 1” washers in all cases. Requires 7/16” socket and wrench.

3. Silicone between the skirt panels, and between the skirt and the base (inside and outside in both cases). Now tighten all bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs). Use Loctite 271.

Figure 4-27: Fastening radome skirt panels together. Numbers on skirt panels should match numbers on the fiberglass base.
4.7.3 Bottom Half of Radome, Assembly

1. Attach the panels for the bottom half of the radome to the skirt one at a time. Install bolts, washers, and nuts, but leave them loose (Figures 4-28 and 4-29). Use the awl/alignment pin to center the bolt holes.

2. Silicone between panels and also between radome panels and skirt inside and out. Apply Loctite 271 to all bolts. Where possible, use washers both sides [¼-20×1” bolts, 1”-diameter washers top of skirt, 1¼”-diameter washers between panels]. Tighten to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).

You will need people to help support the radome panels while others do the siliconing and bolting.

Figure 4-28: Fastening the first radome bottom panel to the radome skirt. The first panel to be attached is the hatch panel, which goes on the AFT side of the radome base. (The AFT side of the radome will face south.)
Figure 4-29: Assembling radome bottom panels. Numbers in the corners of the panels must match numbers of neighboring panels.

Figure 4-30: Bottom half of radome completely assembled.
4.7.4 Top Half of Radome, Assembly

1. The top half of the radome is assembled separately from the bottom half. Secure numbered panels together loosely with washers each side of bolt, if possible [$\frac{1}{4}$-20×1” bolts, 1 ¼”-diameter washers]. Leave one panel unbolted for exit/entry of workers during assembly (Figure 4-31).

![Figure 4-31: Top half of radome, nearing completion.](image-url)
2. Place the radome cap on top of the assembled radome top panels (Figure 4-32).

3. Silicone between top panels and between edge of cap and top panels inside and out. Secure all nuts between panels with Loctite 271 before securing radome cap. Torque bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).

4. Attach the final top panel (one person is still inside).

5. Raise the radome top to let the person out.

6. Put bolts into 4 lifting brackets (equally spaced around the radome) at the base of the radome top assembly to be used for raising the radome with a forklift and crane.

**Figure 4-32:** Radome cap in place on top half of radome, viewed from inside the radome.
4.7.5 Antenna Dish Assembly

1. Assemble the 4 numbered quadrants of the antenna dish, using the first 4 holes from the outer edge of the dish (total of 16); don’t tighten yet [\(\frac{\pi}{16}\) -18 x 2½" bolt, washer :: washer, nut]. Use \(\frac{1}{2}"\) socket wrench, \(\frac{1}{2}"\) open-end wrench (Figure 4-33). As you tighten the nuts, make sure the edges of the dish are flush where the sections join. (You may need to gently stand on the dish frame edge to accomplish this.) Do not overtighten the nuts.

**Figure 4-33:** Joining the four sections of the antenna dish. Numbers on each section must match those of neighboring sections.
2. Attach the dish plate to the inside of the center of the dish [outside: bolt, washer :: washer, nut]. To make this job go easier, have people hold the dish vertical while the dish plate is being installed (Figure 4-34).

**CAUTION**  
BECAUSE OF THE SIZE AND WEIGHT OF THE ASSEMBLED DISH, THIS STEP REQUIRES 2 OR 3 PEOPLE TO SUPPORT THE DISH WHILE 2 PEOPLE INSTALL THE DISH PLATE.

![Figure 4-34: Attaching the dish plate to the dish. Several people should support the dish in a vertical position to make this task go easier.](image)
3. Attach the numbered feed struts to the dish [Dish end: bolt, washer :: washer, nut. Feed end has threaded bolt-holes].

4. Attach the RF electronics (feed) to the feed struts. Refer to Figure 4-36 for strut-to-feed attachment details and to Figure 4-37 on page 4-44 for correct orientation of the feed. Match the number on the feed strut with the number on the feed. Have people support the dish in the vertical position (Figure 4-35) as you do this.

Figure 4-35: Attaching the feed assembly to the dish. Several people should support the dish in a vertical position to make this task go easier.
Figure 4-36: Feed assembly close-up to show attachment to feed struts.
Figure 4-37: Orientation of feed when antenna dish is positioned at 0 degrees elevation.
5. Check the focal length against the measurements in Table 4-3. The focal distance is measured from the front of the scalar feed to the center of the dish plate.

Adjust the distance by moving the 3/8” button head screw at the end of each feed strut (5/16” hex wrench — long arm, and 3/4” open end wrench).

Table 4-3. Antenna Dish Measurements

<table>
<thead>
<tr>
<th>Size</th>
<th>Actual Diameter</th>
<th>Focal Distance</th>
<th>F/D</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6m</td>
<td>3.60m (142”)</td>
<td>1321mm (52”)</td>
<td>0.36</td>
<td>49 kg (108 lb)</td>
</tr>
</tbody>
</table>

**Figure 4-38**: Feed assembly mounted at focal point of the antenna dish. Focal distance is measured from the front of the scalar feed to the center of the dish plate.
4.7.6 Bolting Antenna Positioner to Base Stand Spacer

1. Lift the antenna positioner from the crate, using two slings, and place it onto the base stand spacer that comes in the same crate.

2. Bolt the antenna positioner to the base stand spacer [½-13 bolt, washer :: washer, lock washer, nut] (Figure 4-39). Torque bolts to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs).

Figure 4-39: Bolting the base stand of the antenna positioner to the base stand spacer.
4.7.7 Lifting Antenna Positioner into Radome and Bolting It to Radome Base

1. Sling-lift the antenna positioner into the radome (Figure 4-40).

   **DANGER**
   
   DO NOT STAND DIRECTLY BELOW THE CRANE OR THE POSITIONER.

2. Place the antenna positioner on the radome base so the word AFT on the antenna base stand spacer points toward the door of the radome (Figure 4-41 on page 4-48).

3. Bolt the antenna base stand spacer to the floor of the radome base \([\frac{1}{2}-13\text{ bolt, washer} \cdot \text{washer, lock washer, nut}]\). Torque bolts to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs).

**Figure 4-40:** Lifting the antenna positioner/base stand assembly into the bottom half of the radome.
Figure 4-41: Lifting the antenna positioner/base stand assembly into the bottom half of the radome.
4.7.8 Attaching Dish to Positioner

1. Place the lift sling around the ribs on the back side of the dish.
2. Sling-lift the antenna dish onto the antenna positioner.

3. Bolt the dish to the positioner using $5/16\times18 \text{ x } 2\frac{3}{4}$ hardware (Figure 4-42). Tighten to 14-16 Nm (10-12 ft-lbs) (120-144 inch-lbs).

**Figure 4-42:** Antenna dish attached to antenna positioner.
4.7.9 Putting Top Half of Radome on Bottom Half

1. Place the 4 angle bracket clips (3” x 3”) on the sling.
2. Slide the 4 clips under the radome top half, equally spaced around the radome.
3. Attach a bolt through the clip holding the radome to the clip. (The bolt goes downward through the clip.) Loosely tighten a nut below the clip.
4. Sling-lift the top half of the radome into place on the lower half of the radome.
5. Remove the bolt from each clip. Carefully remove the clip. Use the awls/alignment tools to position the top while removing the clips.
6. Bolt the top and bottom halves of the radome together (¼-20x1” bolts, 1¼”-diameter washers). Use silicone before tightening bolts. Apply Loctite 271 to nuts. Torque bolts to 6-8 Nm (5-6 ft-lbs) (60-72 inch-lbs).
4.7.10 Lifting Assembled Radome/Antenna onto Rooftop or Concrete Pad

1. Place the 4 shackles on the sling.

2. Attach the shackles to the underside of the base frame at the hole on the outside edge of the frame at the hole near every other foot (Figure 4-43).

3. Attach each of the 4 tag lines to a sling or shackle.

4. Slowly lift the radome into place (Figure 4-44). Position the radome so the door on the radome faces south (AFT).

5. Attach the 8 feet to the roof or concrete pad using the bearing washer (see drawing 70911004 on page 2-24. Torque bolts to 61-70 Nm (45-52 ft-lbs) (540-624 inch-lbs).

DO NOT STAND DIRECTLY BELOW THE CRANE OR THE ASSEMBLED RADOME/ANTENNA.

**Figure 4-43:** Sling attachment to the shackle on the radome base frame.
Figure 4-44: Lifting the assembled radome containing the antenna onto the rooftop.
4.8 Running the Antenna Power Cable

1. Pull the AC mains wires through the power cable conduit to the circuit breaker box on the base stand of the positioner.

![DANGER: DISCONNECT POWER FROM THE AC MAINS BEFORE WIRING THE CIRCUIT BREAKER.]

4.9 Connecting Power to the Antenna

1. Check the voltage selector switch (Figure 4-45) of the antenna power supply on the positioner frame before connecting the antenna power cable to the AC mains. Your system runs either on 110 or 220 VAC single phase. You must select the correct power voltage. To select the opposite voltage,
   a. Unplug the power cord.
   b. Use a screwdriver to pop off the voltage selector plate.
   c. Turn the selector to the correct voltage. (See Figure 4-48 on page 4-59 for the location of the voltage selector switch.)
   d. Re-plug the power cord.
2. Attach the antenna power cable to the circuit breaker box on the antenna base stand.
3. Wire the circuit breaker box and the spike and surge supressor according to drawing 70983 on the following pages. Refer to Sheet 1 for 220 VAC or Sheet 2 for 110 VAC.

![Figure 4-45: Voltage selector switch, with 110 VAC selected.]

DANGER
4.10 Balancing the Antenna

When properly balanced, the antenna dish should not drift (move slowly) about its elevation axis, no matter what position the dish is moved to. The cross-level beam should remain level and not tip to one side. After assembly, only minor adjustments to the balance should be needed.

Figure 4-46: Trim rod and trim weight locations. A: top of positioner frame. B: rear of right side weights. C: left side weights
**To balance the antenna:**

1. Place the antenna dish at 0° elevation (horizontally). Add or subtract trim weights to the right or left side of the antenna at the dish or the counter-balance area until the cross-level beam is balanced. Use 1-oz or ½-oz weights with ¼-20 cap screws. Move the trim rod over the cross-level beam (Figure 4-46) to make final adjustments.

2. Move the dish to 90° elevation. If the dish drifts, redistribute the weights. Move the trim rod above the weights to adjust the balance.

3. Move the dish to 180° elevation. Repeat the rebalance of Step 2 if needed.

4. Return to Step 1 and recheck the drift at 0° elevation

**4.11 Mechanical Checklist**

1. Check that the positioner moves freely in azimuth, cross-level, and elevation over the entire range of motion.

2. Check that the cables and wiring are properly dressed and routed and clamped into place. The cables should not catch, snag, or bind as the antenna is moved through the full range of each axis.
4.12 How to Turn on Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn on power to the antenna. (See drawing 70982 on page 4-2 for location of the circuit breaker box on the base stand.)

2. Move the circuit breaker UP to turn on power to the antenna (Figure 4-47).

3. Press the I/O switch on the pedestal power supply (gold box on the positioner frame) so that the "I" on the switch is flush with the box (Figure 4-48).

**DANGER**

**POWER IS STILL PRESENT IN THE CIRCUIT BREAKER BOX AND AT THE AUXILIARY OUTLET AND LIGHT, EVEN WHEN THE CIRCUIT BREAKER IS TURNED OFF. THE CIRCUIT BREAKER SUPPLIES POWER TO THE POSITIONER.**

*Figure 4-47: Circuit breaker in ON position.*
4.13 How to Turn off Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn off power to the antenna. (See drawing 70982 on page 4-2 for location of the circuit breaker box on the base stand.)

2. Move the circuit breaker DOWN to turn off power to the antenna.

DANGER

POWER IS STILL PRESENT IN THE CIRCUIT BREAKER BOX AND AT THE AUXILIARY OUTLET EVEN WHEN THE CIRCUIT BREAKER IS TURNED OFF.
4.14 Antenna Checkout

After the antenna has been assembled, use the following procedures to check out the antenna and verify that it is operating correctly independently of the workstation.

1. Turn on power to the antenna as explained in Section 4.12.

2. Verify that when power is turned on to the antenna, the antenna moves to the following position:
   - Level cage goes fully counter-clockwise and returns to level.
   - Elevation: to 45° above level
   - Azimuth: to home position
   - Cross-level: to 90° (level position)

3. Verify that the conscan motor and feed start moving and continue to turn. Verify that the motor does not start and stop.

4. After 5 minutes, turn off power to the antenna as explained in Section 4.13.
Chapter 5: Assembly of 4.5m Antenna and Radome

5.1 Description of the 4.5m TeraScan X-band Antenna and Radome

5.1.1 The Antenna

The antenna for the TeraScan acquisition system is a tracking antenna with a 4.5m dish. The dish is mounted to the tracking positioner. The tracking positioner moves the dish during satellite tracking. The positioner sits on the antenna base stand, which is mounted to the spacer and base stand extension, which in turn is mounted to the radome base frame.

The electronics for collecting, filtering, and converting the RF signal to an IF signal are mounted at the focal point of the dish, with four feed struts that attach to the dish.

See drawing 70917005 on page 5-2 for parts identification.

See Table 5-3 on page 5-39 for antenna dish measurements.

5.1.2 The Radome and Base Frame

The antenna is housed in a fiberglass radome [5.5m (18 ft) diameter] for protection from the weather. The radome is assembled at the site and consists of:

- 31 panels, 6 rows of 5 panels each, and one top pentagon panel
- a four-piece steel base frame
- a four-piece fiberglass radome floor that rests on the base frame
- 24 metal feet that get bolted to the customer-furnished mounting platform (deck, building, or concrete pad)
5.2 Summary of Antenna/Radome Assembly Tasks

The tasks involved in assembly are:

1. Assembling the radome base frame and feet.
2. Assembling Row "A" of radome panels onto the radome base frame.
3. Assembling Row "B" of radome panels onto Row "A".
4. Assembling Row "C" of radome panels.
5. Assembling four panels of Row "D" onto Row "C".
6. Assembling Row "E" and the final panel of Row "D" onto Row "C".
7. Assembling the antenna dish from four panels, a back frame, and a center ring.
8. Mounting the four feed struts to the dish.
9. Mounting the RF electronics (feed/LNA/downconverter) to the four feed struts on the dish.
10. Bolting the positioner and base stand onto the spacer and base stand extension.
11. Bolting the radome base frame feet to the mounting platform.
   
   **Note:** If possible, the lower half of the radome should be assembled in place. If not, assemble the radome at another location and then lift into position.

12. Lifting the assembled positioner into the bottom row of the radome and mounting it to the radome base frame.

13. Lifting the antenna dish and mounting it to the antenna positioner.

14. Lift Rows "C", "D", and "E" onto Row "B" of the radome and joint them.

15. Complete wiring and balancing of antenna assembly.
5.3 Preparation Checklist

To ensure a successful and efficient antenna/radome assembly, be sure you are fully prepared before you start. Use the following checklist to verify that everything is in order.

1. □ Has the X-band antenna mounting platform been constructed? (See Section 2.7 on page 2-26 for specifications of the mounting platform.)
2. □ Has the GPS antenna mount been constructed? (See Section 2.8 on page 2-32.)
3. □ Has the conduit for the X-band signal cable (antenna to workstation) been constructed? (See Section 2.11.1 on page 2-34.)
4. □ Has the conduit for the X-band antenna power cable (antenna to power source) been constructed? (See Section 2.11.2 on page 2-35.)
5. □ Has the conduit for the cable from the GPS antenna to the workstation been constructed? (See Section 2.11.3 on page 2-35.)
6. □ Is there a source of power for the antenna? (See Table 2-1 on page 2-1 for power requirements.)
7. □ Is there a source of power for charging portable tools? (See Section 5.4.3 on page 5-7.)
8. □ Are the required tools on hand? (See Section 5.4.1 on page 5-5 for a list of tools.)
9. □ Has the heavy equipment been scheduled to be available at the necessary times? (See Section 5.4.2 on page 5-7 for a list of equipment.)
10. □ Are the crates containing the antenna and radome on site? (See Section 5.6.1 on page 5-10.)
11. □ Is the required customer-furnished hardware for mounting the radome base frame to the mounting platform on hand? (See Section 2.7.1 on page 2-26, and item 6 of drawing 70986003 on page 2-31.)

**WARNING**

Before attempting to assemble the radome panels, you should obtain a 48-hour weather report. Installation in rain or winds in excess of 32 kph (20 mph) could be hazardous and is not advised.
### 5.4 Resources Required

#### 5.4.1 Tools Required (English Tools)

<table>
<thead>
<tr>
<th>Qty</th>
<th>Tool</th>
<th>Bolt Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>1....</td>
<td>box wrench, $\frac{3}{4}''$</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1....</td>
<td>socket, $\frac{3}{4}''$ ($\frac{1}{2}''$ drive)</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1....</td>
<td>torque wrench, $\frac{1}{2}''$ drive</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>1....</td>
<td>socket driver, $\frac{1}{2}''$ drive</td>
<td>$\frac{1}{2}''$</td>
</tr>
<tr>
<td>2....</td>
<td>box wrench, $\frac{7}{16}''$</td>
<td>$\frac{1}{4}''$</td>
</tr>
<tr>
<td>2....</td>
<td>socket, $\frac{7}{16}''$ ($\frac{5}{8}''$ drive)</td>
<td>$\frac{1}{4}''$</td>
</tr>
<tr>
<td>1....</td>
<td>box wrench, $\frac{1}{2}''$ (for dish bolts)</td>
<td>$\frac{5}{16}''$</td>
</tr>
<tr>
<td>1....</td>
<td>socket, $\frac{1}{2}''$ ($\frac{3}{8}''$ drive)</td>
<td>$\frac{5}{16}''$</td>
</tr>
<tr>
<td>2....</td>
<td>socket driver, $\frac{3}{8}''$ drive</td>
<td>$\frac{1}{4}''$, $\frac{5}{16}''$, $\frac{9}{16}''$</td>
</tr>
<tr>
<td>2....</td>
<td>box/open-end wrench, $\frac{9}{16}''$</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>2....</td>
<td>socket, $\frac{9}{16}''$ ($\frac{3}{8}''$ drive) (deep)</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>1....</td>
<td>socket, $\frac{9}{16}''$ ($\frac{3}{8}''$ drive) (standard)</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>1....</td>
<td>$\frac{3}{16}''$ Allen head wrench</td>
<td>($\frac{1}{4}''$ -20 cap screw)</td>
</tr>
<tr>
<td>1....</td>
<td>nut driver, $\frac{5}{16}''$</td>
<td>10-32</td>
</tr>
<tr>
<td>2....</td>
<td>torque wrench, $\frac{3}{8}''$ drive, set to 60 inch-lbs</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>2....</td>
<td>(OPTIONAL) power torque wrench, $\frac{3}{8}''$ drive, set to 60 inch-lbs</td>
<td>$\frac{3}{8}''$</td>
</tr>
<tr>
<td>1....</td>
<td>crescent wrench, 150mm (6'')</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>hex wrench, $\frac{5}{32}''$ (for door)</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>screwdriver, flat-blade, 3mm ($\frac{1}{8}''$)</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>screwdriver, flat-blade, 6mm ($\frac{1}{4}''$)</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>screwdriver, #1 Phillips</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>screwdriver, #2 Phillips</td>
<td></td>
</tr>
<tr>
<td>4....</td>
<td>drift pins or awls (alignment tools), 5mm ($\frac{5}{16}''$) diameter minimum to 12mm ($\frac{1}{2}''$) diameter maximum</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>hole drill for 1'' RF gland</td>
<td>35mm ($\frac{3}{8}''$) diameter</td>
</tr>
<tr>
<td>1....</td>
<td>hole drill for $\frac{1}{2}''$ power gland</td>
<td>35mm ($\frac{7}{8}''$) diameter</td>
</tr>
<tr>
<td>1....</td>
<td>drill bit, 16mm ($\frac{5}{8}''$) diameter</td>
<td></td>
</tr>
<tr>
<td>2....</td>
<td>#2 Phillips driver (to remove screws in packing cases using drill)</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>drill, battery powered with slip clutch</td>
<td></td>
</tr>
<tr>
<td>1....</td>
<td>diagonal cutters, 127mm (5'')</td>
<td></td>
</tr>
<tr>
<td>Qty</td>
<td>Tool</td>
<td>Bolt Size</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>1</td>
<td>wire strippers (power AC mains)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>ballpeen hammer, 8 oz</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>tool pouches per installer</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Loctite 271 (10 ml tube)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Anti-Seize (4-oz can)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$\frac{1}{2}$&quot;-13 NC tap</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>$\frac{3}{8}$&quot;-16 NC tap</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>tap wrench</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>silicone caulk (10 oz tube) (for base frame)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>caulking gun</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>tape measure, 10 m (30 ft)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>razor knife (to cut gasket and caulk tube tip)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>shackles, $\frac{1}{2}$&quot; (sling to radome hoist bracket)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>slings for lifting entire radome</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(radome weight = 636 kg (1,400 lb))</td>
<td></td>
</tr>
<tr>
<td></td>
<td>or positioner, 6.1 m (20 ft) long (1,250 lbs work load)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>taglines (to be used with shackles and slings), 12 m (40 ft) long</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>laser focus tool</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>manual focus tool</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>digital tape, 5m (16 ft)</td>
<td></td>
</tr>
</tbody>
</table>
5.4.2 Heavy Equipment and People Required *(Supplied by the Customer)*

- Crane or hoist for lifting the positioner and antenna assembly into the radome and for lifting the assembled radome into position (see Table 5-1 below for weights to be lifted).
- Forklift for picking up and moving crates (see Table 5-2 for crate dimensions and sizes) and the positioner.
- Stepladder (height 2 m (6 ft)).
- Four to five helpers to carry/position radome panels, base frame hardware, and dish.

### Table 5-1. Weight of Antenna and Radome

<table>
<thead>
<tr>
<th></th>
<th>kg</th>
<th>lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assembled Radome</td>
<td>636</td>
<td>1400</td>
</tr>
<tr>
<td>Base Frame</td>
<td>455</td>
<td>1000</td>
</tr>
<tr>
<td>Positioner</td>
<td>182</td>
<td>400</td>
</tr>
<tr>
<td>Dish</td>
<td>136</td>
<td>300</td>
</tr>
<tr>
<td>Feed and Feed Struts</td>
<td>18</td>
<td>40</td>
</tr>
<tr>
<td>Counterweights</td>
<td>209</td>
<td>460</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1636</td>
<td>3600</td>
</tr>
</tbody>
</table>

5.4.3 Power Required

- 110 VAC/220 VAC single phase at the antenna site (for the power drill)

5.4.4 People Required

Five to seven people should be able to complete the antenna and radome assembly in about three days. A forklift operator and a crane operator are also required.
5.5 Safety During Installation

Because the installation of the antenna and cable run could potentially entail work in hazardous conditions, safety procedures must be observed during installation.

NOTICE! UNDER NO CIRCUMSTANCES WILL SEASPACE PERSONNEL WORK IN UNSAFE CONDITIONS.

It is the purchaser’s responsibility to provide a safe work environment. If any conditions are determined to be unsafe, SeaSpace personnel will not proceed with the installation until the unsafe condition has been corrected. Sole determination of unsafe conditions will be made by SeaSpace personnel.

Examples of unsafe conditions are:

- Electrical hazard due to exposed live contacts or high-voltage lines.
- Extreme temperatures.
- High winds, rain, or lightning.
- Ice or snow.
- Blowing dust.
- Contaminated air in an enclosed space.
- Height hazard. Temporary or permanent safety railings, scaffolding, or safety harness tie points must be provided for any elevated work area such as a rooftop.

5.5.1 Lifting and Carrying Properly

Most back injuries result from improper lifting. According to the principles of biomechanics, the worst lifting situation occurs when the body is extended over the load: the lower back becomes a fulcrum supporting the weight of the body plus the load. Twisting in this position invites injury. To lift properly:

1. **Get a firm footing.** Keep your feet apart (shoulder width) for a stable base; point toes out.
2. **Bend your knees.** Don’t bend at the waist. Keep the principles of leverage in mind. Don’t do more work than you have to. Maintain your three natural back curves.
3. **Tighten stomach muscles.** Your abdominal muscles support your spine when you lift, offsetting the force of the load. Train muscle groups to work together.
4. **Lift with your legs.** Let your powerful leg muscles do the work of lifting, not your weaker back muscles. Maintain your three natural curves.
5. **Keep the load close.** Don’t hold the load away from your body. The closer it is to your spine, the less force it exerts on your back.
6. **Keep your back upright.** Whether you’re lifting or putting down a load, don’t add the weight of your body to the load. Avoid twisting; it’s a common cause of injury.
5.5.2 Material Handling — Think Before You Lift

To handle materials safely, lift everything twice! **FIRST**, lift the load mentally. Plan every step before you do it physically. **SECOND**, lift with your legs, not your back.

**Mental Lifting**

**Size up the load:** How much does it weigh? How much do you weigh? Give it the heft test to see whether you can lift it—you don’t want any surprises.

**Get help:** If the load is too bulky or heavy for you to lift alone, get help.

**Find a better way:** Sometimes no one else is around to help, or the job is bigger than the two of you. Arrange for mechanical help from a pushcart, hand truck, wheelbarrow, or forklift.

**Check the pathway:** Look for obstacles underfoot and overhead, spills, lighting, traffic (people or vehicles), and changes in elevation. Choose a clear route over the flattest surface, even if it takes a little longer.

**Solve high load problems:** Lifting from a height above the shoulders can be hazardous. Test the weight by pushing up on the load. Get as close to the load as possible, so it can slide down your body, close to you.

**Physical Lifting**

Be sure to apply proper lifting techniques, whether working alone, as a team, or with the aid of a mechanical helper.

**Lift it properly:** When lifting follow these steps: 1. Get close to the load and grasp firmly. Hug it! 2. Keep your back in its natural alignment as you use your strong leg muscles to lift the load. 3. Set the load down smoothly.

**Team lifting:** When team lifting, pick one person to call the signals. The leader should direct the team so you all lift together, walk in step, and lower the load together.

**Push, don’t pull:** Use good lifting techniques to load mechanical devices. Whenever possible, push rather than pull. Then lift: apply the same lifting techniques in reverse to unload.

**Clear the pathway:** Remove any hazards you see—and/or see that they are removed. Wipe up spills. Make sure the area is well lighted. Wait until traffic clears. Then transport the load, setting it down in the proper place.

**Unload carefully:** Un-lift or set a load as safely as you lifted it. Plan where you can put down the load. Pick your spot carefully so no one has to move the load again.
5.6 Unpacking the Antenna and Radome

5.6.1 Shipping Crates

The antenna is shipped in six crates whose contents, weights, and dimensions are given in Table 5-2.

<table>
<thead>
<tr>
<th>Crate</th>
<th>Approximate Dimensions</th>
<th>Shipping Weight</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crate 1</td>
<td>1.8m (72&quot;) l 1.7m (68&quot;) w 0.6m (23&quot;) h</td>
<td>227 kg (500 lb)</td>
<td>Radome base frame</td>
</tr>
<tr>
<td>Crate 2</td>
<td>1.27m (50&quot;) l 1.77m (70&quot;) w 1.67m (66&quot;) h</td>
<td>205 kg (450 lb)</td>
<td>Antenna positioner</td>
</tr>
<tr>
<td>Crate 3</td>
<td>1.4m (54&quot;) l 0.7m (28&quot;) w 0.6m (22&quot;) h</td>
<td>114 kg (250 lb)</td>
<td>Antenna electronics</td>
</tr>
<tr>
<td>Crate 4</td>
<td>0.45m (18&quot;) l 0.6m (24&quot;) w 0.43m (17&quot;) h</td>
<td>227 kg (500 lb)</td>
<td>Counterweights</td>
</tr>
<tr>
<td>Crate 5</td>
<td>2.4m (96&quot;) l 1.55m (62&quot;) w 2.52m (101&quot;) h</td>
<td>227 kg (500 lb)</td>
<td>Reflector (composite dish) and back frame</td>
</tr>
<tr>
<td>Crate 6</td>
<td>1.9m (74&quot;) l 1.7m (67&quot;) w 2.2m (86&quot;) h</td>
<td>910 kg (2000 lb)</td>
<td>Radome</td>
</tr>
</tbody>
</table>
5.7 Assembling the Base Frame, Antenna, and Radome

5.7.1 Assembling the Radome Base Frame and Feet
Use Anti-Seize for assembling all hardware.

The base frame is shipped in four quarters and is contained in crate 1. Note: Assemble the base frame with the bolt holes facing the installer.

1. Remove the top of the base frame crate.
2. Remove the sides of the crate.

Figure 5-1: Base frame quarters in shipping crate.
3. Unbolt each quarter of the base frame from the shipping brackets.

Figure 5-2: Unbolting base frame from shipping brackets.
4. Position the base frame on the mounting platform, joining matching frame numbers marked on the frame quarters (Figure 5-3). Align the base frame in a North-South line along the frame quarters (see drawing 70981 on page 2-29).

**CAUTION**

THE BASE FRAME QUARTERS ARE HEAVY.

REMEMBER TO LIFT CAREFULLY!

5. Remove the radome floor panels attached to the base frame quarters.

6. Bolt together the base frame quarters with ½” hardware [½-13 bolt, washer :: washer, nut] (use Anti-Seize on the bolts). Torque to 115 Nm (88 ft-lbs).

---

**Figure 5-3:** Frame numbers marked on base frame quarters.
7. Locate and identify all base frame mounting feet, stand washers, and base frame hardware. There should be 24 feet and 28 stand washers.

**Figure 5-4:** Feet, stand washers, and base frame hardware.
8. Bolt the 24 mounting feet to the base frame with \( \frac{1}{2} \)” hardware [\( \frac{1}{2}-13 \) bolt, washer :: washer, nut] (use Anti-Seize on the bolts). Note that the side of the foot with the smaller hole mounts to the base frame (see drawing 70986003 on page 2-31). Torque to 119 Nm (88 ft-lbs). Four feet are attached inside the frame (see drawing 70981 on page 2-29).

**Figure 5-5:** Bolting base frame to mounting platform. **Top:** Stand washer. **Bottom:** Complete foot bolted to base frame and mounting platform.
9. Place a stand washer on each foot and bolt the foot to the mounting platform using customer-furnished hardware (studs or bolts). Torque to 119 NM (88 ft-lbs). Note: This step should only be completed if the lower half of the radome is assembled at its final destination.

10. Reposition the four floor panels on the base frame. They will be secured to the base frame when the radome and positioner are attached.

Figure 5-6: Base frame with two floor panels in position.
11. Using a $\frac{1}{2}''$-13 NC tap, retap the holes in the top of the base frame. Apply tap fluid on the threads of the tap before inserting it in each hole. If necessary, retap the holes for the mounting feet.

Figure 5-7: Tapping holes in radome base frame.
5.7.2 Assembling Rows "A" and "B" of the Radome

1. Remove the top and one side of the radome crate (crate #6).
2. Remove all parts of the radome and identify them to assist with the proper assembly. See drawing 70986011 on page 5-20 for radome panel labeling. The bottom row of panels will be the half hexagon-shaped panels.

Because of the shape and size of the radome panels, it is recommended that two installers handle each panel. A gust of wind would make the panels difficult to handle for one person, and might cause injury to the installer or damage to the panel.
5.5m (18') RADOME PANELS

18 FT RADOME BASIC COMPONENTS

193cm (75.95")
15 HEXAGON PANELS
223cm (87.70")

171cm (67.48")
11 PENTAGON PANELS

180cm (70.95")
5 BASE PANELS
3. The radome panels come from the factory with 6mm (\(\frac{1}{4}\)) holes. Using a 16mm (\(\frac{5}{8}\)) drill bit, enlarge the bottom holes in the Row "A" of panels to 16mm (\(\frac{5}{8}\)) before installing. If necessary, continue to enlarge the holes by routing them using the same bit.

![Figure 5-9: Enlarging bottom holes in row "A" panels to 16mm (\(\frac{5}{8}\)).](image)
4. Place the ¼” EPDM base gasket (drawing 70986004) on the radome floor and mark the inside edge of the gasket. Trim the ends to fit.

5. Prior to attaching each panel, apply silicone caulk to the underside of the gasket next to the radome floor. The caulk should cover about one half of the surface between the bolt holes for the radome panels and the inside edge of the gasket.

6. Place the gasket on the radome floor.
7. Apply foam strip to the edge of each panel and puncture the bolt holes using a #3 Phillips-head screwdriver. **Note:** Ensure the foam tape is kept clean and dry prior to and during the build. Only apply the foam strip to the edges of the panels that are currently being installed.

8. Loosely attach the first half panel of Row "A" onto the base frame over the gasket.

9. While an installer balances the half panel, attach the bottom edge to the base frame with $\frac{1}{2}''\times13\times2''$ anchor bolts, $\frac{1}{2}''\times1-\frac{1}{2}''$ flat washers. Use Anti-Sieze and hand tighten the $\frac{1}{2}''$ bolts.

10. Continue to attach the Row "A" half panels (4) to the baseframe per steps 7-9.
   a. With an installer supporting the half panel, align the holes of the new panel with the holes of the last panel. Use a drift pin or a #3 Phillips-head screwdriver to assist with the hole alignments.
   b. Once aligned, fasten each panel edge using $\frac{1}{4}''\times20NC\times1''$ cap screw, washer::washer, lock washer, $\frac{1}{4}NC$ nut (qty 6 each). Loosely tighten the bolts.

![Figure 5-10: Rows "A" and "B" of the Radome Assembly.](image)

Row "B"

Row "A"
11. Attach Row "B" of full panels (10) onto the base row of the half panels. See Figure 5-10. **Assembling each row requires at least 4 people.**

   a. Begin with the pentagon-shaped door hatch panel.

   b. Apply foam strip to the edges of the panels and open bolt holes per step 7.

   c. With an installer supporting the half panel, align the holes of the new panel with the holes of the half panel. Use a drift pin or a #3 Phillips-head screwdriver to assist with the hole alignments.

   d. Once aligned, fasten each panel edge of the full panel to the panel edges of the half panel using ¼"-20NC x 1” cap screw, washer::washer, lock washer, ¼NC nut (qty 6 each). Loosely tighten the bolts.

   e. Continue attaching panels around Row "B" until it is complete.

   f. Insert silicone caulking on the inner and outer edges of each panel side of Rows "A" and "B".

   g. Use a torque wrench to tighten each bolt to 60 in-lbs. Start at the top and bottom ends and alternate each bolt to evenly distribute the pressure. Continue until all bolts are tightened on Rows "A" and "B".

   h. Use the flat end of the caulking tube to smooth the bead and seal the panel edges. Repeat this process on the inside edges.
5.7.3 Assembling Rows "C", "D" and "E" of the Radome

12. Connect Row "C" of full panels.
   a. As each panel is assembled, apply foam strip to the lower and side edges of the Row "C" panel and open the bolt holes per step 7.
   b. With two installers supporting each side of the panel, align the holes of the Row "C" panel with the panel next to it. Use a drift pin or a #3 Phillips-head screwdriver to assist with the hole alignments.
   c. Once aligned, fasten each panel edge using ¼"-20NC x 1" cap screw, washer::washer, lock washer, ¼NC nut (qty 6 each). Loosely tighten the bolts.
   d. Insert silicone caulking on the inner and outer edges of each panel side.
   e. Use a torque wrench to tighten each bolt to 60 in-lbs. Start at the top and bottom ends and alternate each bolt to evenly distribute the pressure.
   f. Use the flat end of the caulking tube to smooth the bead and seal the panel edges. Repeat this process on the inside edges.

13. Connect four panels of Row "D" onto Row "C", leaving the last panel for step 15. See steps 12a-f above for the details.

14. Fasten the last panel (Row "E") to the partially completed row Row "D".
   a. Repeat steps 12a-f to secure Row "E" onto the upper panel assembly.
   Note: Four mid-sized ladders or a cherry picker will be required for personnel to safely maneuver the panels due to the final assembly height (approximately 8').

15. Connect the last panel of Row "D" to Rows "D" and "E" of the radome assembly per steps 12a-f.
   See Figure 5-11 on the next page for a view of the upper half of the radome assembly.
Figure 5-11: Upper Half of Radome Assembly (Rows "C", "D" and "E").
5.7.4 Assembling the Dish

1. Unpack the antenna dish crate.

Figure 5-12: Antenna dish crate, side removed.
2. Organize the dish components.

Figure 5-13: Dish components—4 dish panels (shown opposite in crate), back frame, feed struts, center
3. Assemble the dish with the back frame resting on a support that raises it high enough for an installer to attach panels from below (e.g., on boards supported by saw horses or similar) (Figure 5-14).

Figure 5-14: A dish panel being attached to back frame. Support below back frame allows room for installer below.
4. Attach a dish panel to the outer threaded holes of the back frame [3/8"-16 x 3/4" bolt, lock washer, flat washer] using a 9/16" standard socket (not a deep socket) (Figure 5-15). If necessary, retap the holes using a 3/8"-16 NC tap. Apply tap fluid on the threads of the tap before inserting it in each hole.

Figure 5-15: Attaching a dish panel to the back frame. A: View from below. B: Panel attachment points on back frame.
5. Attach another panel to the back frame, matching up the numbers on the frames of adjacent panels (Figure 5-16).
6. Use the alignment latch to roughly align the two panels before connecting them to each other (Figure 5-17).

Figure 5-17: Aligning panels with the alignment latch.
7. Attach the second panel to the previous panel [¼-20 cap screw, lock washer, flat washer] using a 3/16" Allen head wrench. Insert the hardware in opposite directions for each of the two threaded holes of the panel connector (Figure 5-18).

**Figure 5-18:** Connecting panels to each other.
8. As you attach the final panel, have several people supporting the adjacent panels. They may need to gently rock the panels to help align them.

Figure 5-19: Attaching the final dish panel.
9. With the installer below the dish, use a $\frac{5}{16}$" nut driver or socket wrench to connect the dish panels to the threaded holes of the center ring [10-32 x $\frac{3}{4}$" bolt, lock washer, flat washer].

**Figure 5-20:** Center ring as seen from below.
5.7.5 Mounting the Feed Struts to the Dish

1. Attach the four feed clips to the threaded holes on the front of the dish [¼-20 x ¾” bolt, flat washer], one on each panel.

Figure 5-21: Attaching feed clips to front of dish.
2. Attach the feed struts to the feed clips [¼ -20 x 1¾" bolt, flat washer :: flat washer, nut] and wrap the ends of the struts to protect the dish.

Figure 5-22:  
A: Attaching feed struts to feed clips.  
B: Ends of feed struts wrapped to protect dish.
5.7.6 Mounting the Feed and RF Electronics to the Dish

1. Attach the Feed and RF Electronics to the free end of the feed struts.
   a. Remove the protective covering from the ends of the feed struts.
   b. Secure the feed to the four ends of the feed struts with four (4) sets of \( \frac{1}{4} ” \times 20 \times 1\frac{3}{4} ” \) bolt, flat washer :: flat washer, nut. Verify the feed is correctly oriented at 0° elevation as shown in Figure 5-24. **Note:** This positioning is completed by the installer standing with his back towards the dish and the feed in front.
   c. Attach the LNA and the Down Converter to the feed with the provided hardware.

![Figure 5-23: Feed assembled, with LNA and downconverter.](image)
d. Verify the focal distance against the measurements shown in the table below. 
   Note: The focal distance is measured from the front of the scalar feed to the center of the dish.

<table>
<thead>
<tr>
<th>Size</th>
<th>Actual Diameter</th>
<th>Focal Distance</th>
<th>F/D</th>
<th>Weight</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.4m</td>
<td>4.5m (177.17&quot;)</td>
<td>1687mm (66.437&quot;)</td>
<td>0.375</td>
<td>136kg (300 lb)</td>
<td>0.749m (29.52&quot;)</td>
</tr>
</tbody>
</table>

2. Align the feed to the center of the dish.
   a. Slip the focus finder into the groove of the scalar ring.
   b. Rotate the feed and verify that the beam from the focus finder continues to point to the center of the dish.

THE FOCUS FINDER EMITS A LASER BEAM. DO NOT POINT THE LASER AT ANYONE’S EYES. PERMANENT BLINDNESS COULD RESULT! IF YOU WANT TO CHECK THAT THE LASER BEAM IS PRESENT, PLACE YOUR HAND IN FRONT OF THE LASER INSTEAD OF LOOKING INTO THE LASER.

Figure 5-26 on page 40 shows the orientation of the feed when the antenna dish is positioned at 0º elevation.
Figure 5-24: A: Orientation of feed when antenna dish is positioned at 0° elevation. B: Cross-level motor visible when antenna dish is positioned at 0° elevation.
5.7.7 Assembling the Tracking Positioner

1. Place the tracking positioner crate near the radome and remove the top and front.

**Figure 5-25:** Tracking positioner crate with top and front removed.
2. Unpack the four base stand extensions, four supports, and the spacer.

3. Bolt the extensions to the spacer [½ -13 x 1¾" bolt, flat washer :: flat washer, lock washer, nut] (use Anti-Seize on the bolts). Torque to 92 Nm (68ft-lbs).

Figure 5-26: Bolting base stand extensions to spacer.
4. Attach the supports to the base stand extensions [½ -13 x 1¾” bolt, flat washer :: flat washer, lock washer, nut] as shown below. Use Anti-Seize on the bolts. Assemble loosely.

**Figure 5-27**: Supports attached to base stand extensions.
5. With the forklift, raise the positioner crate about two feet off the ground. Using two people, unbolt the positioner from the bottom of the crate and then lower the crate when completed.

6. Support the cross-level beam of the positioner with the forks of the forklift. Place protective padding between the forks and the cross-level beam.

Figure 5-28: Forklift arms with protective padding under cross-level beam.
7. With the positioner supported by the forklift, unbol the wood braces supporting the positioner in the crate.

Figure 5-29: Unbolting wood supports from the antenna positioner assembly.
8. Remove the positioner from the crate and lift over the assembled base stand extension. Attach the positioner to the spacer [½ -13 x 1 3/4” bolt, flat washer :: flat washer, lock washer, nut] as shown below. Use Anti-Seize on the bolts.

9. Torque the bolts attaching to positioner to the spacer to 92 Nm (68 ft-lbs).

Figure 5-30: Attaching the positioner to the spacer on the base stand extension.
Figure 5-31: Tracking positioner assembled on the base stand and ready to mount in the radome.
5.8 Final Assembly of Radome and Antenna

Note: The process to build the final radome/antenna assembly is:

- Securing Rows "A", "B" and Base Frame on Mounting Platform;
- Securing the Tracking Positioner in the radome;
- Attaching the Dish Assembly onto the Tracking Positioner;
- Attaching Rows "C", "D" and "E" of the Radome onto Rows "A" and "B".

5.8.1 Securing Rows "A" and "B" of the Radome and Base Frame onto the Mounting Platform

Note: This step can be completed earlier if the lower half of the radome is built in place.

1. Attaching the lower half of the radome onto the mounting platform.
   a. Securely insert four (4) eyebolts into the corresponding holes (½"-13 bolt pattern) in the radome floor. Verify the weight is evenly distributed prior to movement.
   b. Securely fasten four (4) slings (provided by the customer) onto the eyebolts. Verify the slings are firmly attached prior to movement.
   c. Using a large crane, carefully lift the lower half of the radome assembly onto the mounting platform. See Figure 5-34.
   d. Bolt the base frame feet to the mounting platform using the customer furnished hardware and stand washers. See Figure 5-5.

DANGER

DO NOT STAND DIRECTLY BELOW THE CRANE OR THE RADOME.
Figure 5-32: Lifting the Lower Half of Radome onto the Mounting Platform.
5.8.2 Securing Antenna Positioner to Radome and Bolting It to Radome Base

1. Lift the positioner into the radome using slings attached to the cross-level beam.

**Figure 5-33:** Lifting positioner with slings attached to cross-level beam.
2. Verify that the circuit breaker panel on the positioner faces the radome door (Figure 5-34).

3. Bolt the positioner to the radome floor panels with stand washers and $\frac{1}{2}'' \times 4''$ bolt and washer (use Anti-Seize on the bolts). Torque bolts to 92 Nm (68 ft-lbs).

4. Torque supports on the base stand extensions to 92 Nm (68 ft-lbs). (See Figure 5-27 on page 5-43.)

**Figure 5-34:** A: Positioner lifted into radome with circuit breaker panel facing door. 
B: Positioner bolted to radome floor.
5.8.3 Placing the Dish on the Positioner

1. Lift the dish onto the positioner using four slings attached to the back frame on the back of the dish, with the tag lines attached at the same points.

Figure 5-35: A: Lifting the dish onto the positioner (tag lines not shown). B: Sling and tag line attach to back frame at back of dish. C: Close-up view of sling attachment.
2. Bolt the dish to the positioner at the threaded holes in the center of the back frame, using the 3/8" hardware [cap screw, lock washer, flat washer]. (With the “TOP” on the positioner frame facing you, the hole for the feed cables in the dish should be positioned to the right.)

Figure 5-36: Attaching the dish to the positioner.
5.8.4 Securing Rows "C", "D" and "E" of the Radome to Rows "A" and "B"

1. Secure the upper half (Rows "C", "D" and "E") of the radome assembly onto the lower half (Rows "A" and "B") on the mounting platform.
   
a. Securely attach five (5) slings onto the bottom edges of Row "C" pentagon panels to evenly distribute the weight.

b. Align Row "C" with Row "B" and slowly lower the upper half of the radome into place. **Note:** Five people will be required to align the panels prior to securing. It will be necessary to use the proper tools to maneuver each panel to ensure a seamless fit.

c. Use a #3 Phillips-head screwdriver to align the panel holes prior to inserting the hardware.

d. Once aligned, fasten each panel edge of Row "C" to the panel edges of the Row "B" using ¼”-20NC x 1” cap screw, washer::washer, lock washer, ¼NC nut (qty 6 each). Loosely tighten the bolts.

e. Apply silicone caulking on the inner and outer edges of each panel side. Use the flat end of the caulking tube to smooth the bead and seal the panel edges. Repeat this process on the inner edges of each panel.

f. Use a torque wrench to tighten each bolt to 60 in-lbs. Start at the top and bottom ends and alternate each bolt to evenly distribute the panel pressure. Continue until all bolts are tightened.
LIFTING UPPER HALF OF RADOME ONTO LOWER HALF
5.8.5 Mounting the Counter-Balance Weights on the Positioner

Remove the counter-balance weights from the packing crate and mount them on the positioner frame [½” flat washer and nut].

**CAUTION**

THE WEIGHTS ARE HEAVY.
HANDLE THEM CAREFULLY.

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**Figure 5-37:** Mounting counter-balance weights on positioner frame.
5.9 Running the Antenna Power Cable

1. Pull the AC mains wires through the power cable conduit to the circuit breaker box on the base stand of the positioner.

**DANGER**

DISCONNECT POWER FROM THE AC MAINS BEFORE PULLING THE WIRES AND WIRING THE CIRCUIT BREAKER.

![Circuit breaker on base stand.](image)

**Figure 5-38:** Circuit breaker on base stand.
5.10 Connecting Power to the Antenna

1. Attach the antenna power cable to the circuit breaker box on the antenna base stand.

2. Wire the circuit breaker box and the spike and surge suppressor according to drawing 70983 on the following pages. Refer to page 5-58 for 220 VAC or page 5-59 for 110 VAC.
5.11 Balancing the Antenna

When properly balanced, the antenna dish should not drift (move slowly) about its elevation axis, no matter what position the dish is moved to. The cross-level beam should remain level and not tip to one side. After assembly, only minor adjustments to the balance should be needed.

Figure 5-39: Trim rod and trim weight locations.
To balance the antenna:

1. Place the antenna dish at 0° elevation (horizontally) (see Figure 5-24B on page 5-40). Add or subtract counter-balance weights and trim weights to the right or left side of the antenna at the dish or the counter-balance area until the cross-level beam is balanced. Move the trim rods (Figure 5-39) to make final adjustments.

2. Move the dish to 90° elevation. If the dish drifts, redistribute the weights. Move the trim rod above the weights to adjust the balance.

3. Move the dish to 180° elevation. Repeat the rebalance of Step 2 if needed.

4. Return to Step 1 and recheck the drift at 0° elevation.

5.12 Mechanical Checklist

1. Check that the positioner moves freely in azimuth, cross-level, and elevation over the entire range of motion.

2. Check that the cables and wiring are properly dressed and routed and clamped into place. The cables should not catch, snag, or bind as the antenna is moved through the full range of each axis.
5.13 How to Turn on Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn on power to the antenna. (See drawing 70917005 on page 5-2 for location of the circuit breaker box on the base stand.)

2. Move the circuit breaker UP to turn on power to the antenna (Figure 5-40).

Note: There is no power switch on the pedestal power supply (gold box on the positioner frame).

**DANGER**

Power is still present in the circuit breaker box and at the auxiliary outlet and light, even when the circuit breaker is turned off. The circuit breaker supplies power to the positioner.

*Figure 5-40:* Circuit breaker in ON position.
5.14 How to Turn off Power to the Antenna

1. Use the circuit breaker box on the antenna base stand to turn off power to the antenna. (See drawing 70917005 on page 5-2 for location of the circuit breaker box on the base stand.)

2. Move the circuit breaker DOWN to turn off power to the antenna.

**DANGER**

POWER IS STILL PRESENT IN THE CIRCUIT BREAKER BOX AND AT THE AUXILIARY OUTLET AND LIGHT, EVEN WHEN THE CIRCUIT BREAKER IS TURNED OFF. THE CIRCUIT BREAKER SUPPLIES POWER TO THE POSITIONER.

5.15 Antenna Checkout

After the antenna has been assembled, use the following procedures to check out the antenna and verify that it is operating correctly independently of the workstation.

1. Turn on power to the antenna as explained in Section 5.13.

2. Verify that when power is turned on to the antenna, the antenna moves to the following position:
   - Level cage goes fully counter-clockwise and returns to level.
   - Elevation: to 90° above level
   - Azimuth: to home position
   - Cross-level: to 90° (level position)

3. Verify that the conscan motor and feed start moving and continue to turn. Verify that the conscan motor does not start and stop.

4. After 5 minutes, turn off power to the antenna as explained in Section 5.14.
Chapter 6: Mounting and Cabling the GPS Antenna

6.1 Mounting the GPS Antenna
The GPS unit provides precise earth-location information and an accurate time base for satellite tracking. It is a self-contained, 8-channel antenna and receiver.

1. Attach the GPS antenna base (supplied by SeaSpace) to the building. The base is a threaded pipe (1"-14 straight thread; see drawing 70990 on page 2-13).
2. Attach the GPS antenna to the top of the pipe.

6.2 Running the Cable for the GPS Antenna

1. Gently pull the GPS cable through the cable conduit (see “GPS Antenna Cable” on page 2-35) from the GPS antenna to the indoor workstation.
2. Seal the opening of the conduit on the antenna end.
Chapter 7: Workstation Setup

7.1 Setting Up the Workstation Equipment

The layout of the workstation equipment is illustrated in the "System Layout" drawing provided in your TeraScan System As-Built Specifications. Please refer to that drawing to determine the organization of the workstation equipment.

- Unpack and arrange the workstation equipment as shown in the drawing.

7.2 Cabling of the Workstation Equipment

Connect the cables to the workstation equipment as illustrated in the "System Cabling" drawing provided in your TeraScan System As-Built Specifications. Please refer to that drawing, along with the cable label list in that manual, to determine how to attach the cables to the workstation equipment.

Power distribution for the system is illustrated in the "Power Distribution" drawing provided in your TeraScan System As-Built Specifications. Please refer to that drawing to attach the power cables to your workstation equipment.

Each cable and power cord on the "System Cabling" and "Power Distribution" drawings is identified by a letter that can be used to cross-reference the part description in the "Parts List" of your TeraScan System As-Built Specifications.

- Hook up all cables and power cords for the workstation as illustrated in the drawings.

7.3 Connecting the Workstation to the LAN

- Connect a LAN cable to the RJ45 jack on the lower panel at the back of the equipment rack.

7.4 Connecting the Workstation to the Phone Line (optional)

- Connect the phone cable to the RJ11C jack on the lower panel at the back of the equipment rack.
7.5 Connecting the X-band Antenna Cable to the Workstation

- Connect the X-band antenna to the "N" connector on the lower panel at the back of the equipment rack.

7.6 Connecting the GPS Cable to the Workstation (optional)

- Connect the GPS antenna to the DB25 connector on the lower panel at the back of the equipment rack.

7.7 System Startup

For system startup procedures, please refer to the *TeraScan System Startup and Shutdown Procedures* manual, which explains:

1. How to power up the system.
2. How to log on to the system.
3. How to launch all the TeraScan applications.
4. How to access online help for TeraScan.
5. How to get to the System Setup procedures provided online.

7.8 System Setup Procedures

System setup procedures are provided online to guide you through the software configuration needed to get the system ready to schedule and receive data. These include:

1. Creating TeraScan user accounts.
2. Checking/updating system data and time.
3. Entering site coordinates.
5. Testing the UPS.
6. Testing computer-to-receiver communication.
8. Verifying antenna movements.
9. Aligning the antenna.
10. Scheduling data capture.

*Your TeraScan System Startup and Shutdown Procedures* manual explains how to get to the online System Setup procedures after starting up the system and logging in.