TracNet™ H90

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TracNet™ H90
Installation Guide

This guide explains how to install the TracNet H90 hybrid VSAT, cellular, and Wi-Fi communications system. Operation instructions are provided in the Quick Start Guide.

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CAUTION - RF Radiation Hazard

⚠️ The antenna transmits radio frequency (RF) energy that is potentially harmful. Whenever the system is powered on, make sure everyone stays more than 60.4 feet (18.4 m) away from the antenna. As shown in the illustration, no hazard exists directly below the antenna.

Who Should Install the System?

To ensure a safe and effective installation, only a KVH-certified marine technician should install the system. To find a technician near you, visit www.kvh.com/wheretogetservice.
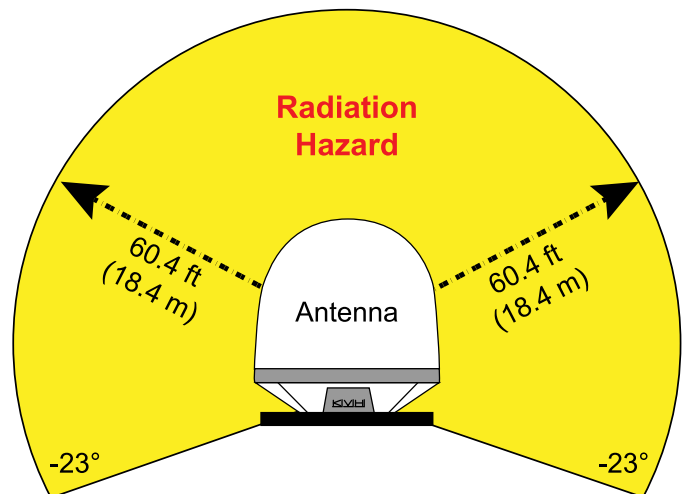
Technical Support
Within Continental U.S.A.: 1 866 701-7103
Worldwide: +1 401 851-3806
Email: mvbsupport@kvh.com

Trademark Information

KVH, TracNet, KVH ONE, and the unique light-colored dome with dark contrasting baseplate (Reg. No. 2,864,752) are trademarks of KVH Industries, Inc.

All other trademarks are the property of their respective companies.

Disclaimer

Every effort has been made to ensure the correctness and completeness of the material in this document. No company shall be liable for errors contained herein. The information in this document is subject to change without notice. No warranty of any kind is made with regard to this material, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose.

Feedback

If you have any comments regarding this manual, please email them to manuals@kvh.com. Your input is greatly appreciated!

Important Safety Information

⚠ This icon indicates a danger, warning, or caution notice. Be sure to read these carefully to avoid injury.

⚠ **WARNING** **Risk of Electric Shock**

If any component of the TracNet H90 system becomes damaged and/or no longer functions normally, disconnect it from vessel power, secure it from unintended operation, and contact KVH Technical Support (see "Technical Support" on page 1). All repairs or modifications must be performed by a trained, KVH-certified technician. If you are a KVH-certified technician, you still must contact KVH Technical Support prior to conducting any repairs or modifications to the equipment.

⚠ **WARNING** **Risk of Explosion**

Do not operate the BDU (or any other electrical device) in an environment where flammable gases, vapors, or dusts are present. In addition, do not operate the unit in an environment with a temperature outside its 5° F to 131° F (-15° C to 55° C) temperature range.

⚠ **CAUTION** **Risk of Electric Shock**

Failure to ground the H90 system properly to ship's ground will cause an unsafe floating ground condition, risking potentially lethal electric shock. See "Connect Power" on page 18 for details on the proper grounding of the equipment.

⚠ **CAUTION** **RF Radiation Hazard**

The antenna transmits up to 6 watts of radio frequency (RF) energy that is potentially harmful. Whenever the system is powered on, make sure everyone stays more than 60.4 feet (18.4 m) away from the antenna. No hazard exists directly below the antenna.

Inspect Parts and Get Tools

Before you begin, follow these steps to ensure you have everything needed to complete the installation.

1. Unpack the box and ensure it contains everything shown in Figure 1 and on the Kitpack Contents List. Save the packaging for future use.

Figure 1: TracNet H90 System Components

Antenna

Radome

Baseplate

Service Hatch
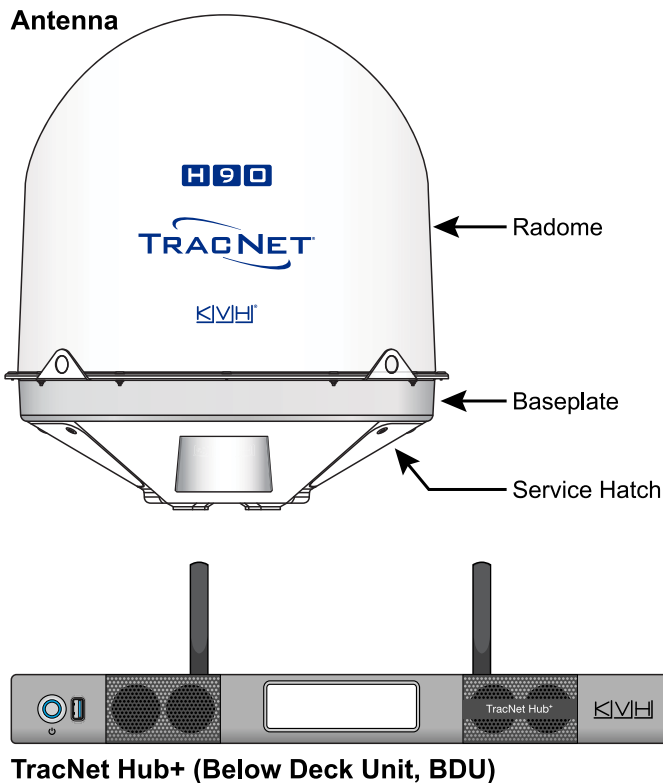
TracNet Hub+ (Below Deck Unit, BDU)

Note: This manual refers to the TracNet Hub+ as the BDU (Below Deck Unit).

2. Carefully examine all of the supplied parts to ensure nothing was damaged in shipment.

3. Gather the following tools and materials:

    - Flat-head and Phillips-head screwdrivers

    - Electric drill and 5/8" (16 mm) bit

    - 3.75" (95 mm) hole saw

    - 5/32" hex key

    - 1/2" open-end wrench

    - 7/16" socket/ratchet or nut driver

    - 3/4" socket (for mounting bolts) and 7/8" socket or wrench (for mounting nuts); recommended torque: 35-40 ft-lbs (47-54 N-m)

- Light hammer and center punch

- Adhesive tape

- Self-vulcanizing tape or equivalent

- Heat gun (for heat shrink)

- Eye protection

- Shop towels

- Voltmeter

- Utility knife

- Flush cutters

- Wire stripper/terminal crimper

- File

- Headlamp

- Isolation transformer, if required (see "Connect Power" on page 18)

- Cable termination tools, if necessary (see "Prepare the Antenna Cable" on page 10)

- NMEA 0183 or NMEA 2000 talker and interface cable (see "Connect an NMEA Talker" on page 17)

- Laptop PC or Apple® or Android™ smartphone/ tablet with the latest H-series antenna software downloaded from the KVH Partner Portal (www.kvh.com/partners), or a smartphone/tablet with the KVH Connect app installed and loaded with the latest software

IMPORTANT!
Be sure to download the **AC-BDU** version of software, filename: Hxx_AC-BDU-<version no.>.bin.

Plan the Antenna Installation

Before you begin, be sure the designated install location meets the following guidelines.

> **IMPORTANT!**
> Damage caused by an improper installation is not covered under KVH warranty.

Choose a Suitable Location

- Select a location that is as close as possible to the intersection of the vessel's centerline and midships.

- Temperature must be within the operating range (-30ºC to 55ºC (-22ºF to 131ºF)).

- Be sure to mount the antenna near enough to the BDU (Hub+) to allow you to connect the 100 ft (30 m) antenna cable (*supplied in kit*) between them, while still maintaining sufficient slack in the cable to account for appropriate bend radius and service loops.

Note: If you need to use a longer cable, refer to "Prepare the Antenna Cable" on page 10.

Mounting Structure Requirements

Make sure the mounting surface is flat, level (within ±1º), and wide enough to accommodate the antenna's base. Also make sure that the structure is strong enough to withstand the weight of the antenna (189 lbs, 86 kg), as well as other cumulative forces related to expected operating conditions, such as ice, snow, wash down, and maximum expected values of pitch, roll, and wind pressure (including gusts).
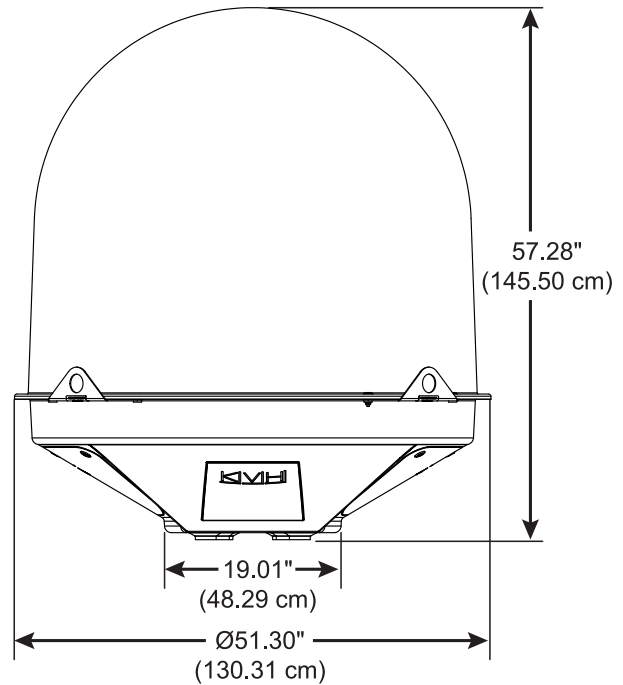
Recommendation: Vibration of the mounting surface should measure less than 0.51 gRMS total, and also less than 0.11 gRMS at the following resonant frequencies:

- Vertical 48-50 Hz, 55-56 Hz, 73-75 Hz
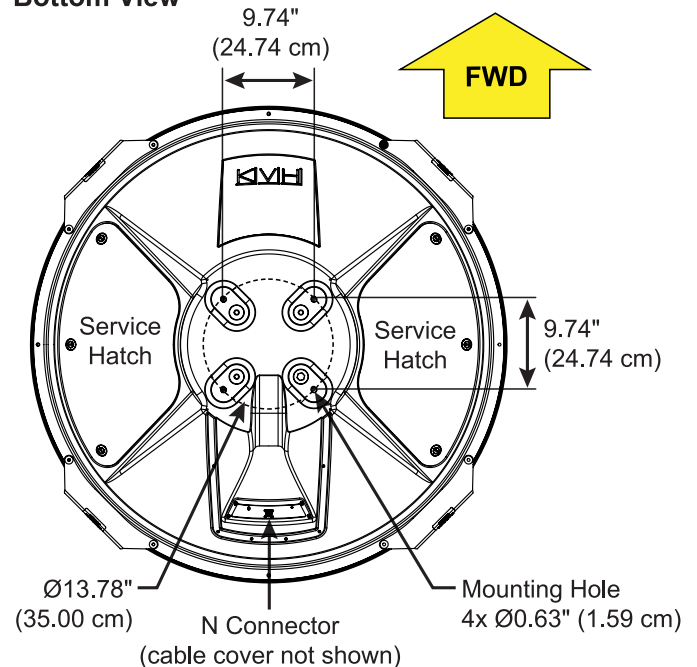
- Horizontal 70-78 Hz

Note: Ship's crew should consult with the shipyard to ensure that the antenna mounting surface vibration never exceeds the above stated conditions at any time during its life.

Figure 2: Antenna Dimensions

Side View

57.28"
(145.50 cm)

19.01"
(48.29 cm)

Ø51.30"
(130.31 cm)

Bottom View

9.74"
(24.74 cm)

FWD

Service Hatch

Service Hatch

9.74"
(24.74 cm)

Ø13.78"
(35.00 cm)

N Connector
(cable cover not shown)

Mounting Hole
4x Ø0.63" (1.59 cm)

## Pedestal Structure Requirements

If a pedestal is going to be used, it must meet the following minimum requirements.

Pedestal Height (A)	3.28 ft (1 m)	6.56 ft (2 m)	9.84 ft (3 m)
Tube OD (B)	9.0" (230 mm)	8.0" (203.2 mm)	10.0" (254 mm)
Tube Wall Thickness (C)	0.5" (12.7 mm)		
Brace Height (D)	N/A	5.56 ft (1.7 m)	7.34 ft (2.24 m)
Brace OD (E)	N/A	3.0" (76.2 mm)	6.0" (152.4 mm)
Brace Thickness (F)	N/A	0.25" (6.35 mm)	0.5" (12.7 mm)
Brace Angle (G)	N/A	30°	25°

Note: If the pedestal exceeds 3.28 ft (1 m), braces must be placed at 120° intervals. Sizing is based on Structural Steel Tubing 60,000 psi (415 MPa) minimum yield. For more details, refer to the Pedestal Specs Wizard (www.kvh.com/pedestalspecs).

Note: The ship's crew is responsible for fabricating and installing the pedestal.

**Figure 3: Pedestal and Brace Dimensions**
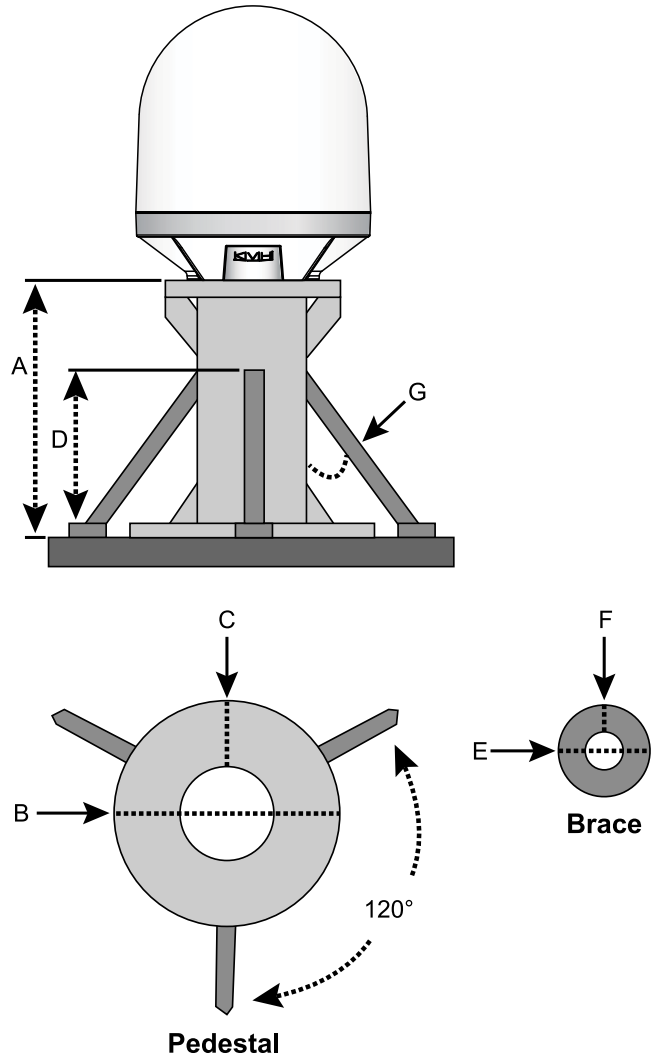
Prevent RF Radiation Exposure

Select a location that is well above any areas accessible to passengers and crew to reduce the risk of RF radiation exposure. (See page 1 for an illustration of the hazard area.)

If mounting the antenna near an accessible area is unavoidable, you may configure one or two no-transmit zones to prevent transmissions in hazardous directions. (See "No-Transmit Zones (Optional)" on page 27 for details.)

Minimize Satellite Blockage

The antenna requires a clear view of the sky to transmit and receive satellite signals. The fewer obstructions, the better the system will perform.

Figure 4: Blockage from Obstruction

-23° to 119° Look Angle

Blocked!

Vessel Platform

Mast
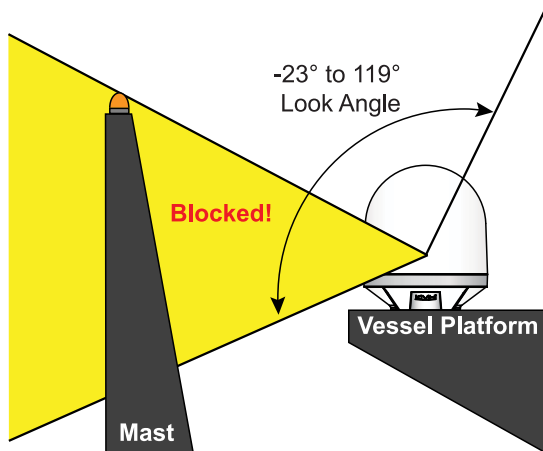
Prevent Electromagnetic Interference

Maintain a minimum distance of at least 5 ft (1.5 m) between the KVH antenna and any GPS/GNSS, cellular, or VHF antennas or other electromagnetic-sensitive equipment to avoid interference. Also maintain a minimum distance of at least 1 ft (30 cm) between the KVH antenna and any compasses.

IMPORTANT!
The interference guidelines provided in this manual cannot possibly account for all equipment variables and vessel conditions. Therefore, KVH recommends testing the KVH antenna at the chosen mounting location with the other vessel equipment in operation, if possible, prior to finalizing the installation. If interference occurs, relocate the antenna.

Avoid RF Interference

Although many variables determine the exact distance required between the antenna and radar/high-power radio transmitters, including transmit frequency/power, transmitter beam properties, and the reflective properties of nearby surfaces, consider the following general guidelines:

IMPORTANT!
RF emissions from radars and high-power radio transmitters may damage the antenna or impair its performance if it's improperly positioned within the beam path.

- Mount the KVH antenna as far away as possible from the radar and high-power radio transmitters.

- Do not mount the antenna at the same level as the radar. Most radar transmitters emit RF energy within an elevation range of -15° to +15°. Therefore, mount the antenna outside this elevation range and at least 5 ft (1.5 m) away from the transmitter. If mounting the antenna directly above or below the radar, minimum distance is 3 ft (0.9 m).

IMPORTANT!
Never place the antenna in the beam path of the radar regardless of distance. Radar energy may damage the antenna or impair its performance.

Figure 5: Avoiding RF Interference

5 ft (1.5 m) Minimum

+15°

Radar

Potential RF Interference

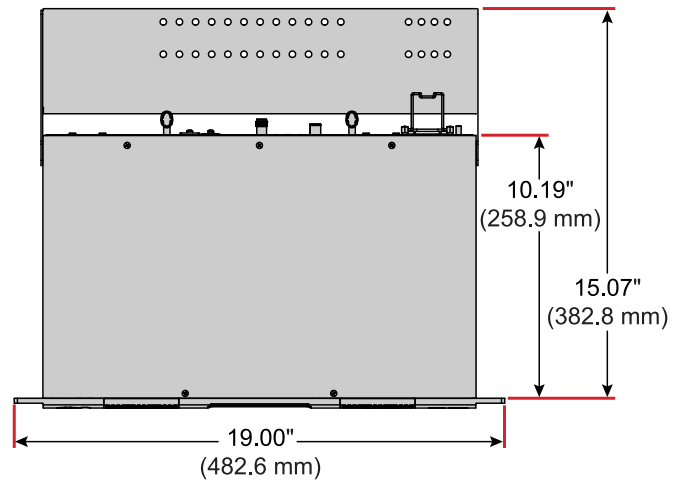-15°
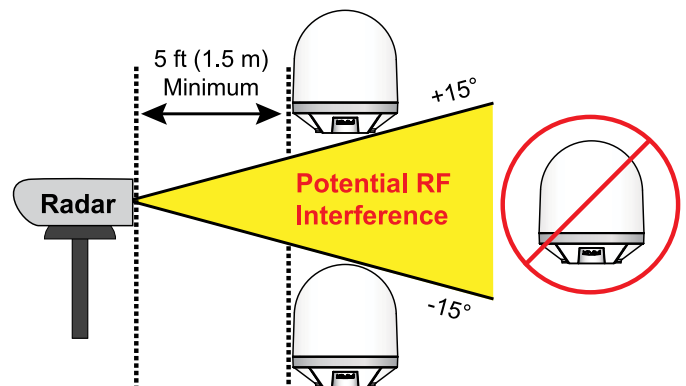
Plan the BDU Installation

Before you install the BDU, be sure the designated install location meets the following guidelines:

- Select a mounting location in a dry, well-ventilated area belowdecks away from any heat sources or salt spray.

- Be sure the location provides adequate Wi-Fi reception. Do not install it in an area surrounded by metal or near any electrical devices that emit RF noise.

- The Hub+ is designed for mounting in a standard equipment rack. It requires 1U of available space.

- Be sure the front panel will be easily accessible to the user.

- Leave enough room behind the rear panel to accommodate the connecting cables with service loops, 14" (36 cm) in diameter.

- If you plan to connect the BDU to the vessel's onboard local area network (LAN), choose a location near an available Ethernet port.

- To use the supplied antenna cable, the BDU must be located within 100 ft (30 m) of the antenna. However, you can order a longer cable if necessary.
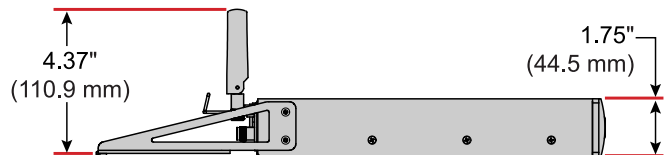
Note: *Installation details are provided in*

Figure 6: BDU Dimensions

Top View

10.19"
(258.9 mm)

15.07"
(382.8 mm)

19.00"
(482.6 mm)

Side View

4.37"
(110.9 mm)

1.75"
(44.5 mm)

Front View

0.27"
(6.75 mm)

1.25"
(31.8 mm)

18.25"
(463.6 mm)
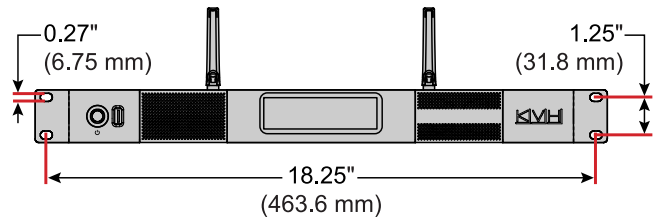
Prepare the Antenna Site

Once you have identified a suitable antenna mounting site, according to the guidelines provided in "Plan the Antenna Installation" on page 4, follow these steps to prepare the site for installation.

Drill the Mounting Holes

1. Unfold the antenna mounting template (supplied in the Customer Welcome Kit) and place it onto the mounting surface. Make sure the "FWD" (forward) arrow points toward the bow and is parallel to the vessel's centerline.
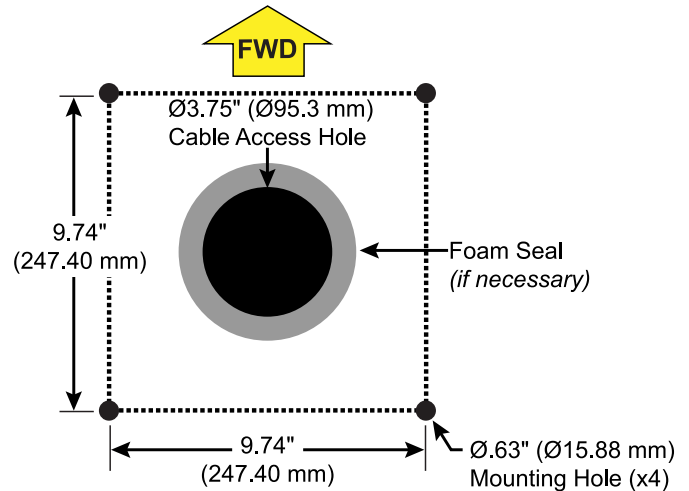
Note: You don't need to mount the antenna exactly on the vessel's centerline, but the antenna's forward arrow must be parallel to it.

Figure 7: Mounting Bolt Hole Pattern Examples

Good Bolt Pattern

Poor Bolt Pattern
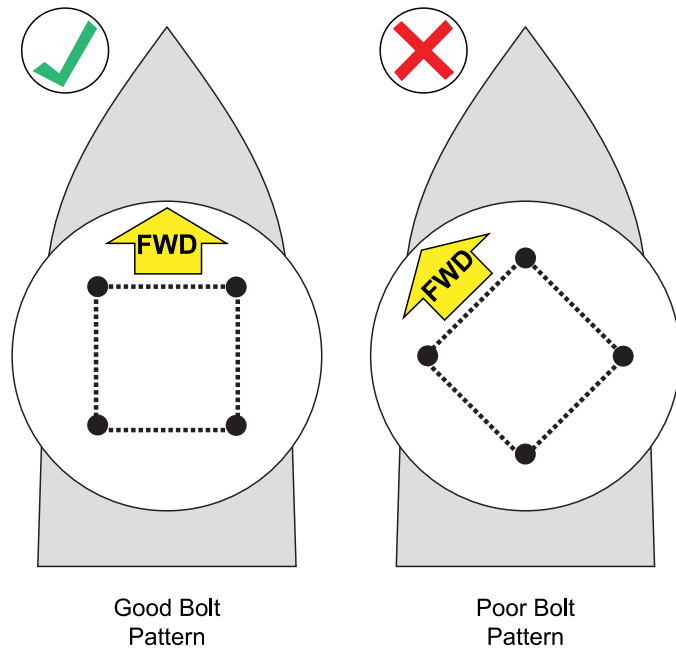
2. Using a light hammer and center punch, mark the locations for the four mounting holes on the mounting surface in the locations indicated on the template.

3. Drill a 5/8" (16 mm) hole at the four mounting hole locations you marked in Step 2. Later, you will insert four 1/2"-13 bolts through these holes to secure the antenna to the mounting surface.

Figure 8: Antenna Mounting Holes Layout

Ø3.75" (Ø95.3 mm) Cable Access Hole

9.74" (247.40 mm)

Foam Seal *(if necessary)*

9.74" (247.40 mm)

Ø.63" (Ø15.88 mm) Mounting Hole (x4)

Cut Out the Cable Access Hole, If Needed

1. Using the supplied template, mark the location of the cable access hole in the center of the mounting hole pattern.

2. Cut out the 3.75" (95 mm) cable access hole in the location you marked in Step 1. Smooth the edges of the hole to protect the cable. Later, you will route the antenna cable through this hole and into the vessel. (You may also apply anti-chafe material around the cable to protect it from abrasion.)

3. Clean and dry the antenna mounting surface.

4. Peel off the paper backing from the supplied foam seal to expose the adhesive. Then press the foam seal down firmly onto the mounting surface, ensuring the hole in the foam seal aligns with the cable access hole in the mounting surface (see Figure 8).

IMPORTANT!
Use only the KVH-supplied foam seal. Do not use any seals that may come with a third-party antenna mount, as they may block the drain holes in the baseplate.

Rig and Hoist the Antenna

Follow these steps to detach the antenna from the pallet and safely rig the antenna for crane hoisting.

> **IMPORTANT!**
> Take protective measures to avoid gouging or scratching the radome during the rigging operation.

1. Using a 7/16" socket/ratchet or nut driver, unlock the three hex latches securing the antenna's service hatches. Then gently lower the hatches. You can now access the four shipping bolts securing the antenna's baseplate to the pallet.

> **IMPORTANT!**
> Be careful not to damage the cellular and Wi-Fi antennas while removing the shipping bolts.

Figure 9: Service Hatch

Hatch (x2)

1/4-turn Hex Latch (x6)
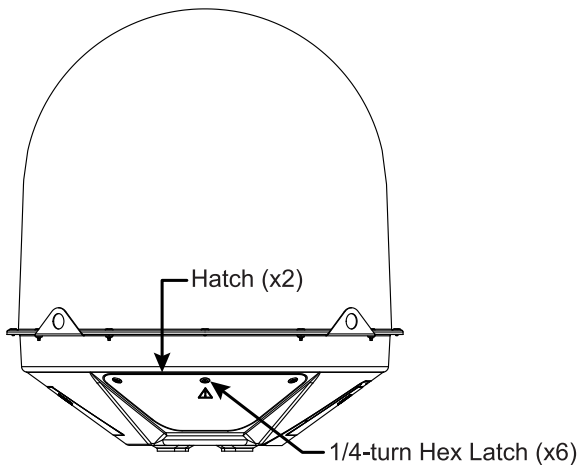
2. Using a 3/4" socket/ratchet or wrench, remove the four outer 1/2"-13 bolts securing the antenna to the pallet. Do not remove the four inner bolts that secure the internal antenna assembly to the baseplate.

Figure 10: Shipping Bolts (Antenna Bottom View)

Do not remove the 4 inner bolts securing the antenna assembly to the baseplate!

1/2"-13 Shipping Bolt (x4)
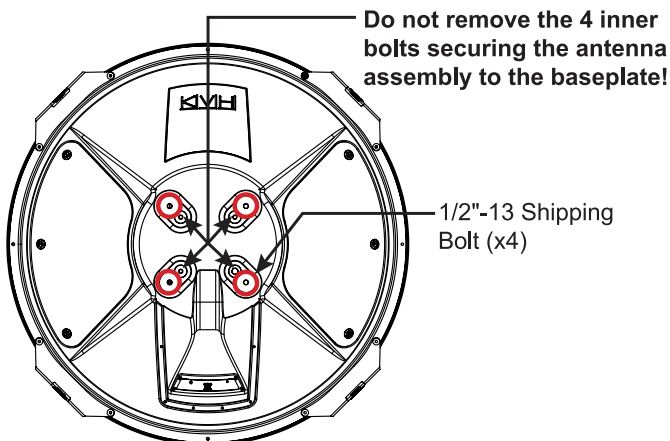
3. Close both service hatches. Secure each hatch using the hex latches.

4. Secure the crane rigging to the antenna's four lift brackets. Be sure the rigging and crane are suitably rated to safely lift the 189 lbs (86 kg) antenna.

> ⚠ **WARNING**
> Be sure no personnel stand underneath the antenna at any time while it is suspended in the air.

Figure 11: Crane Rigging (Example)

Rope

Rope to Prevent Tipping

Center of Gravity

Lift Bracket (x4)
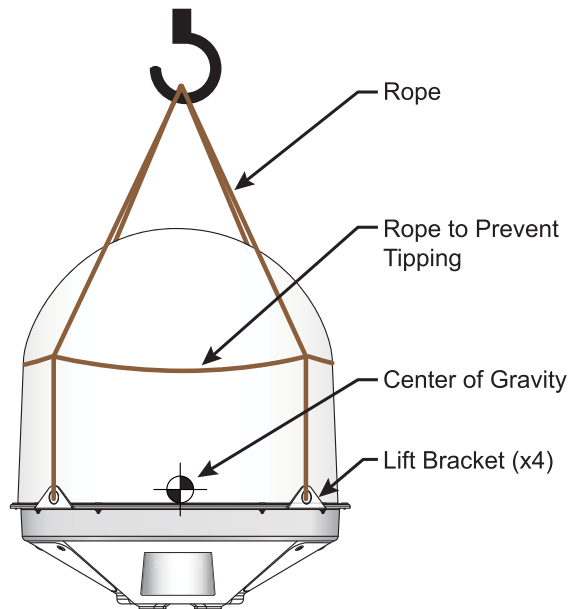
5. Carefully hoist the antenna to its mounting location.

Prepare the Antenna Cable

You need to connect a single coax cable from the antenna to the BDU. KVH recommends using the supplied 100 ft (30 m) LMR-240 cable. However, you may purchase a different cable for a longer run (see Figure 12 to determine type of cable and connectors required), or you may use a different cable of an acceptable type and length, as specified in "Approved Cable Types" on page 37 or the Cable Specs Wizard at www.kvh.com/TracNetcables. *If you wish to reuse an existing cable from a previously installed antenna, it must be clean, free of rust or corrosion, and meet KVH specs for type and length.*
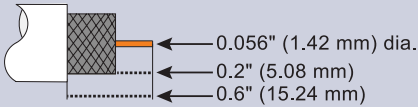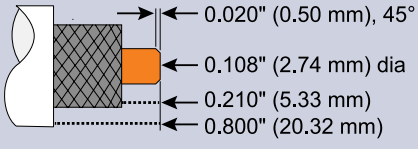
IMPORTANT!

The integrity and reliability of the antenna cable is critically important. Make sure it is properly terminated, sealed against seawater and corrosion, strain-relieved, protected from abrasion, and free of stress.

The cable run must meet the following requirements:

- A low-quality, poorly terminated, or improperly installed cable is the most common cause of system problems. If the cable is modified for any reason, it must be terminated again with new connectors, using the proper tools, exactly to the manufacturer's specifications. See "Terminating LMR-240 Cable" on page 32 for TNC connector instructions for the supplied cable. **Only KVH-authorized marine technicians should modify the antenna cable, if necessary.**

- Use of any cable type not approved by KVH will void the warranty.

- Make sure the center conductor pin at each end of the finished cable is free of burrs, as well as the correct length and diameter specified in Figure 12, to ensure proper engagement.

- Make sure there is no gap between the end of the cable jacket and the start of the connector.

- When determining cable lengths, don't forget to account for service loops, 14" (36 cm) in diameter, at each end, and ensure you can maintain the minimum bend radius (which differs per cable) throughout the cable run.

- If you do not use an RG-58 or LMR-240 cable, you need to connect a pigtail cable between it and the BDU. You may also use a pigtail cable at the antenna end to maintain proper bend radius. These pigtail cables are available from KVH. See "Connecting Pigtail Cables to the Antenna Cable" on page 36.

Note: Cables purchased from KVH include the proper connectors.

Figure 12: New Cable Run Options (Available from KVH)

LMR-240 (50Ω)	
Max. length	200 ft (60 m)
KVH part nos.	100 ft (30 m): 32-1474-0100 150 ft (45 m): 32-1474-0150 200 ft (60 m): 32-1474-0200
Connectors	TNC: EZ-240-TM-X N: EZ-240-NMH-X
Tools	Times Microwave CT-240 Crimp Tool, CST-240 Strip Tool, DBT-U Debur Tool (KVH part no. 72-0949)
Strip lengths	0.056" (1.42 mm) dia. 0.2" (5.08 mm) 0.6" (15.24 mm)
LMR-400 (50Ω)	
Max. length	400 ft (120 m)
KVH part no.	300 ft (90 m): 32-1475-0300 400 ft (120 m): 32-1475-0400
Connectors	TNC: EZ-400-TM-X N: EZ-400-NMC-2-D
Tools	Times Microwave CT-400 Crimp Tool, CST-400 Strip Tool, DBT-U Debur Tool (KVH part no. 72-0950)
Strip lengths	0.020" (0.50 mm), 45° 0.108" (2.74 mm) dia 0.210" (5.33 mm) 0.800" (20.32 mm)

Wire the Antenna

Follow these steps to connect the antenna cable to the antenna's N-type baseplate connector.

Route the Cable Belowdecks

1. Route the TNC-connector end of the antenna cable belowdecks through the cable access hole. Leave an adequate service loop, 14" (36 cm) in diameter, at the antenna location for serviceability.

2. Route the TNC end of the cable to the BDU location (you will connect it later). Always maintain the minimum bend radius in the cable.
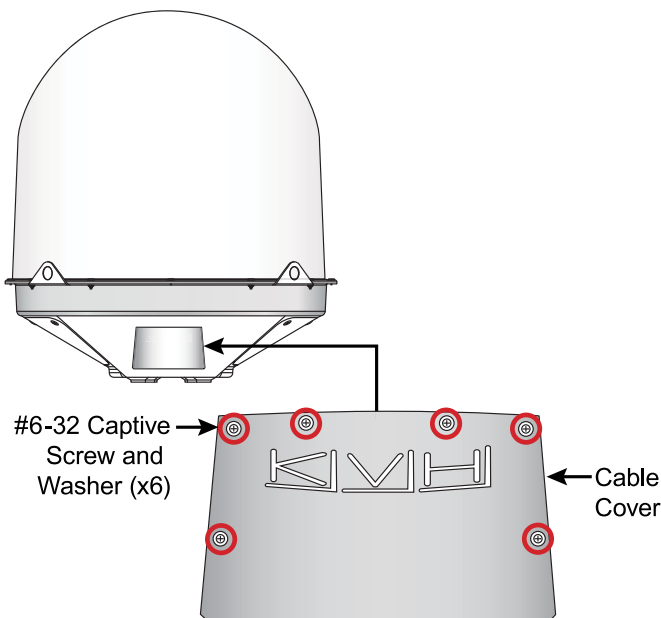
Figure 13: Minimum Bend Radius

Cable Type	Min. Bend Radius
LMR-240	2.5" (6.4 cm)
LMR-400	4.5" (11.5 cm)

Remove the Cable Cover

To access the antenna's connector, you first need to detach the cable cover. Loosen the six #6-32 captive screws securing the cable cover to the base. Set the cover aside in a safe place.

Figure 14: Cable Cover

#6-32 Captive Screw and Washer (x6)

Cable Cover

Attach Second Foam Seal, If Needed

If you routed the cable through a hole under the antenna (see page 8), attach a second foam seal to the base of the antenna. First, clean and dry the bottom of the antenna. Then peel the paper backing from the foam seal and press the foam seal firmly onto the underside of the antenna.
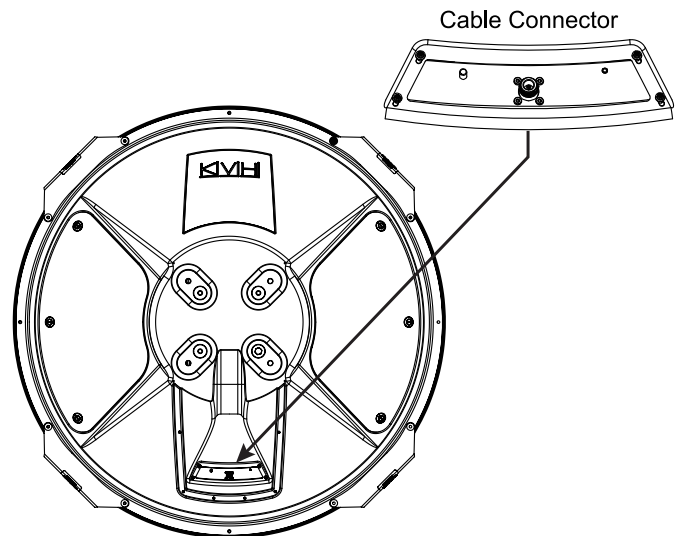
Figure 15: Foam Seal on Antenna Base

Foam Seal (if necessary)
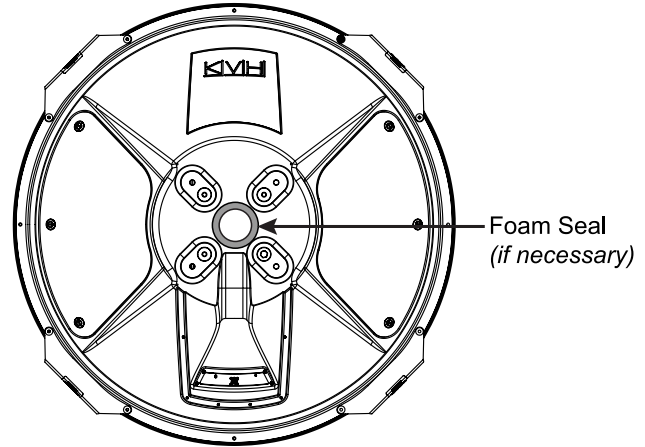
Connect the Cable to the Antenna

1. Clean and dry the antenna cable's N-type connector and the connector at the side of the baseplate.

Figure 16: Antenna Baseplate Connector

Cable Connector

⚠️ **CAUTION**

Be sure to observe the safe handling instructions in the Material Safety Data Sheet (MSDS) provided with the silicone grease.
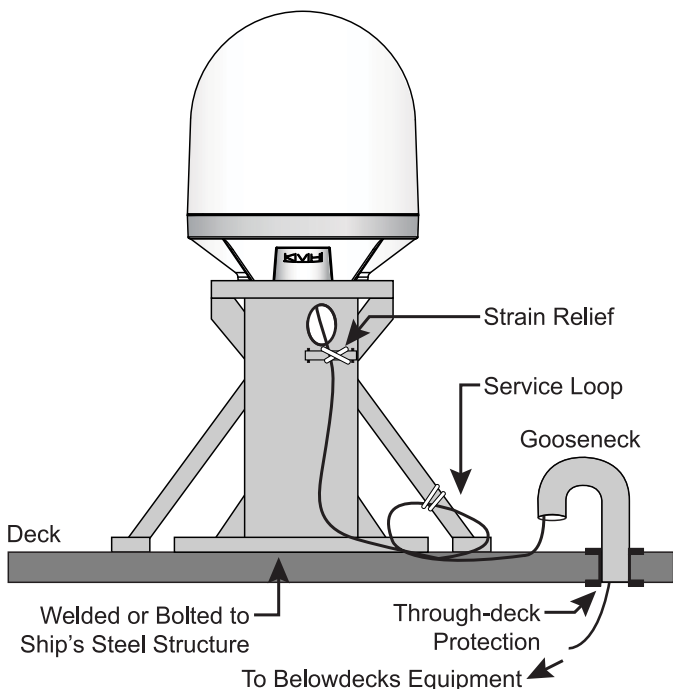
2. Fill half of the inner body of the cable's N-type male connector with the supplied silicone grease.

3. Connect and **SLOWLY** hand-tighten the cable to the antenna's connector, allowing the grease to diffuse and settle into the entire space within the connector.

4. Make sure the cable connector is hand-tightened all the way into the antenna's connector.

5. Seal the cable connection with self-vulcanizing tape or equivalent.

Figure 17: Connecting the Cable to the Antenna

Antenna Baseplate

Apply silicone grease then seal connection with self-vulcanizing tape

Antenna Cable

To Belowdecks Equipment
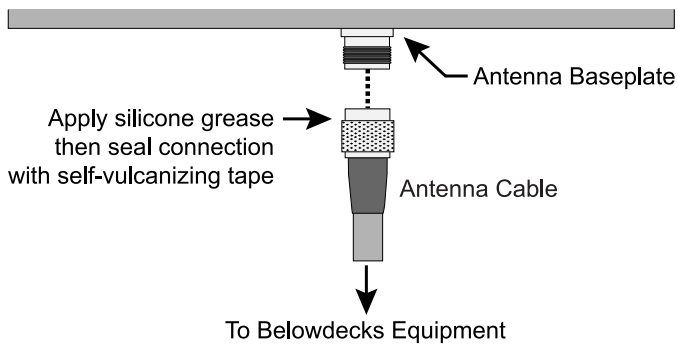
6. Secure the antenna cable near the antenna to relieve stress. The cable cover is designed for aesthetics only – it does not provide any support for the cable.

7. Weatherproof and seal the cable access hole, as required.

Figure 18: Strain-relief (Finished Installation Example)

Strain Relief

Service Loop

Gooseneck

Deck

Welded or Bolted to Ship's Steel Structure

Through-deck Protection

To Belowdecks Equipment

Reattach the Cable Cover

Position the cable cover over the antenna's cable connector and secure in place with the six #6-32 captive screws and washers.

Figure 19: Cable Cover

#6-32 Captive Screw and Washer (x6)

Cable Cover
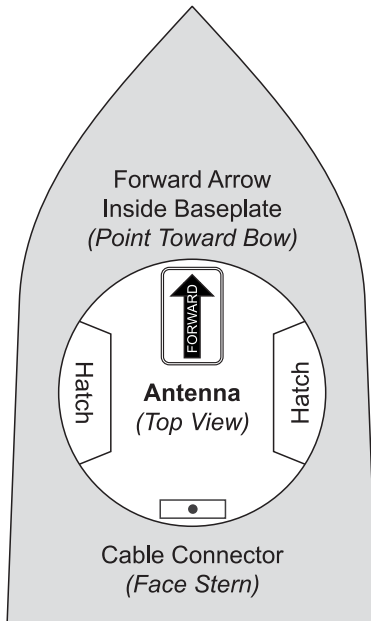
Foam Seals *(if needed)*
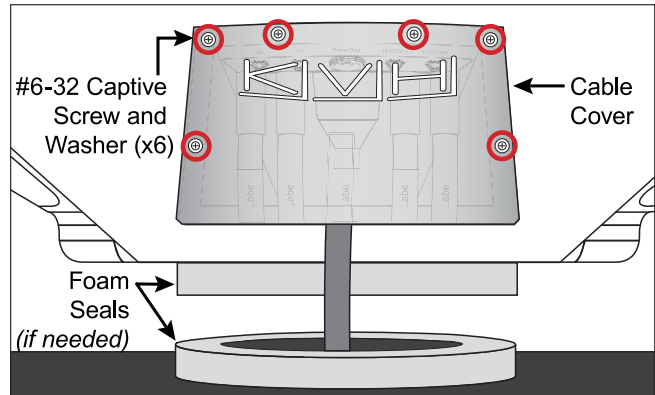
Mount the Antenna

Follow these steps to mount the antenna to the mounting surface.

1. Place the antenna baseplate over the holes drilled in the mounting surface and make sure the forward arrow inside the baseplate points toward the bow and is **parallel** to the vessel's centerline.

Figure 20: Forward Arrow in Antenna Baseplate

IMPORTANT!

If the foam seals are used, do not reposition the antenna laterally once the antenna's foam seal has made contact with the foam seal on the mounting surface. If you need to reposition the antenna, lift the antenna first to avoid damage to the foam seals.

2. Carefully lower the antenna onto the mounting surface and ensure the mounting holes (and foam seals, if used) are aligned.

3. Using a 7/16" socket/ratchet or nut driver, unlock the three hex latches securing each of the antenna's service hatches (see Figure 9 on page 9). Then gently lower the hatches.

⚠️ **CAUTION**

Be sure to observe the safe handling instructions in the Material Safety Data Sheet (MSDS) provided with the anti-seize lubricant.

4. Apply a thin layer of the supplied anti-seize lubricant to the threads of the four supplied 1/2"-13 bolts to prevent galling.

5. At each baseplate mounting hole, place a 1/2" flat washer on a 1/2"-13 bolt and insert the bolt into the hole from above.
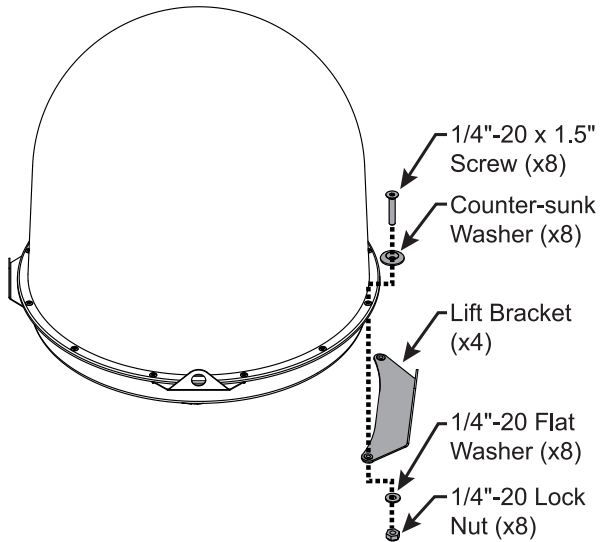
Figure 21: Mounting the Antenna (Side View)
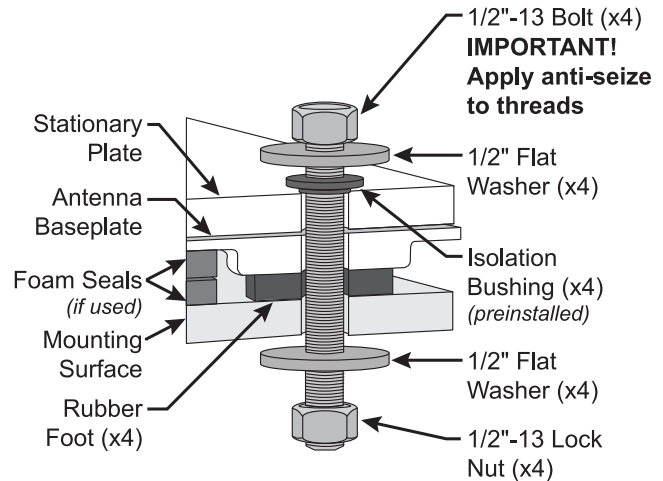
6. Secure each mounting bolt to the mounting surface using a 1/2" flat washer and a 1/2"-13 lock nut from below.

7. Tighten the mounting bolts in a cross pattern until the four rubber feet on the baseplate are bottomed against the mounting surface. KVH recommends that you tighten the nuts to between 35 and 40 ft-lbs (47 and 54 N-m) of torque.

8. Disconnect the crane rigging.

9. Remove the eight screws, flat washers, and lock nuts securing the four lift brackets to the antenna. Use a 5/32" hex key to keep the screws from turning, and use a 1/2" open-end wrench to loosen and remove the nuts. Remove the lift brackets and hardware and set them aside.

Figure 22: Removing the Lift Brackets

1/4"-20 x 1.5" Screw (x8)

Counter-sunk Washer (x8)

Lift Bracket (x4)

1/4"-20 Flat Washer (x8)

1/4"-20 Lock Nut (x8)

Note: *Save the brackets and bracket hardware in case the antenna needs to be moved in the future.*

10. Install eight 1/4"-20 screws and washers (supplied in the kitpack) in place of the longer mounting bracket screws you removed in the previous step.

Figure 23: Reinstalling Radome Hardware

1/4"-20 x 7/8" Screw (x8)

Counter-sunk Washer (x8)
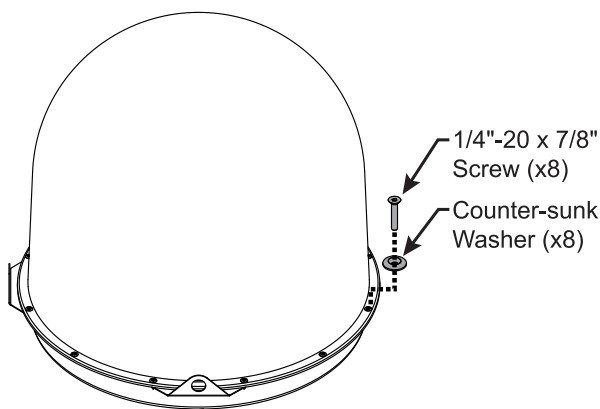
11. Close both antenna service hatches. Secure each service hatch using the three hex latches.
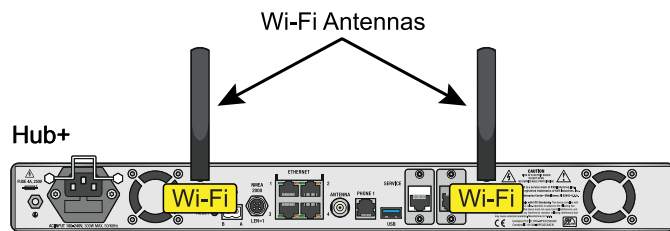
Mount the BDU

Follow these steps to install the BDU inside the vessel.

Note: You may choose to wait to mount the BDU until after you have completed all system wiring.

Connect the Wi-Fi Antennas

First, connect the two supplied Wi-Fi antennas to the rear panel of the BDU.

Figure 24: Wi-Fi Antenna Connections

Mounting the BDU in a Rack

The Hub+ BDU can be mounted in a standard equipment rack. You will need 1U of available space.

1. Be sure to support the bottom of the BDU – don't rely on the front mounting brackets alone. The BDU weighs 8.3 lbs (3.7 kg). If the rack does not already provide underside support, install the "L" rails provided in the kit (see Figure 25). These rails can be nested for extended depth; connect them end-to-end using the supplied M5 screws and nuts (not shown in the figure).
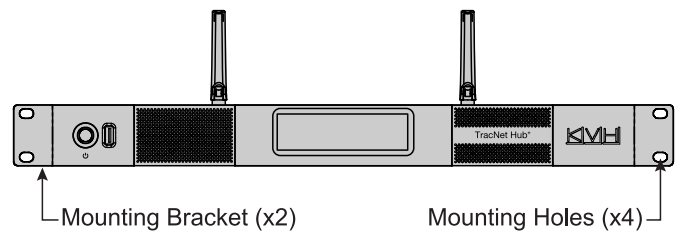
Figure 25: "L" Rail Installation
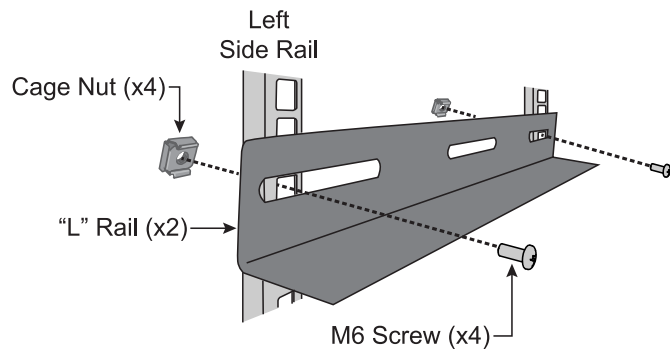
2. Attach the supplied strain-relief bracket to the back of the BDU using the four supplied M3 screws.

Figure 26: Attaching the Strain-Relief Bracket
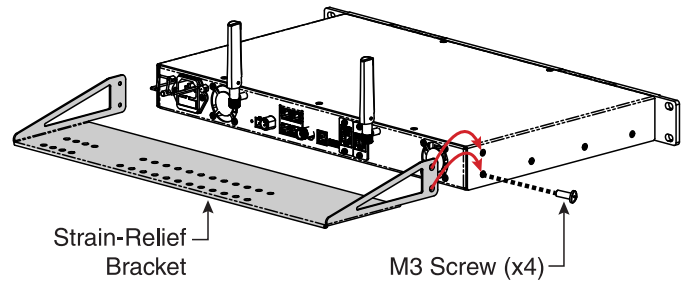
3. Insert the BDU into the rack and secure its front brackets to the rack with appropriate fasteners.

Figure 27: Front Mounting Brackets

Mounting the BDU on a Shelf

1. Attach the supplied strain-relief bracket to the back of the Hub+ BDU using the four supplied M3 screws (see Figure 26).

2. Secure the BDU in an adequate manner to prevent it from shifting while the vessel is in motion. Heavy-duty hook-and-loop tape is provided in the kit.

Note: If you choose not to use the supplied hook-and-loop tape, adhesive-backed rubber feet are also supplied in the kit to attach to the BDU's underside to protect the mounting surface.

Wire the BDU

Follow these steps to connect the antenna cable to the BDU.

> **IMPORTANT!**
>
> If you are using an RG-58 or LMR-240 cable, you may connect it directly to the BDU. If you are using any other type of cable, you must connect a pigtail cable between it and the BDU. See "Connecting Pigtail Cables to the Antenna Cable" on page 36.

1. Clean and dry the "Antenna" TNC connector on the BDU.

2. Fill half of the inner body of the antenna cable's male TNC connector with the supplied silicone grease.

3. Connect and **SLOWLY** hand-tighten the cable to the BDU connector, allowing the grease to diffuse and settle into the entire space within the connector. **Do not use a tool or overtighten.**

> **IMPORTANT!**
>
> Do not connect anything other than the antenna cable to the "Antenna" connector. The BDU supplies voltage that will damage other devices.

4. Secure the antenna cable to the strain-relief bracket. Also make sure the cable will not get bent or twisted near the BDU's connection, which can put additional stress on the connector.

Figure 28: Antenna Cable Connection
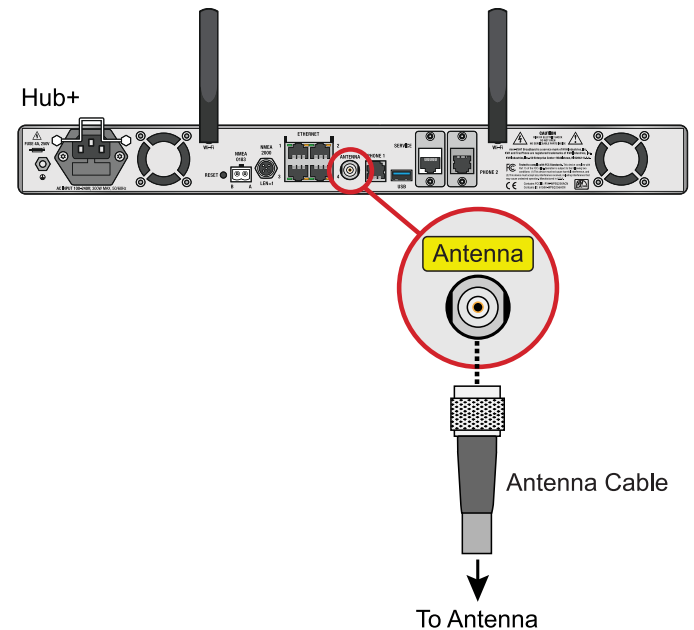
Connect an NMEA Talker

The antenna **requires** a vessel heading input from a customer-supplied NMEA 0183 or NMEA 2000 talker. Optionally, you can also provide a vessel position input to serve as a backup to the antenna's built-in GPS.

NMEA 0183

1. Connect the NMEA 0183 talker to the 2-position terminal strip connector (*supplied in kit*), as shown in Figure 31. Then plug the connector into the rear panel of the BDU.

2. Configure the NMEA device to transmit one or more of the supported NMEA 0183 messages at 4800 baud.

3. Make sure the data message(s) includes the checksum, identifiable by a *xx field at the end of the data sentence (e.g., $HEHDT,123.4, T*1F). See "Verifying the NMEA 0183 Message" on page 38 for details. Do not exceed a 10 Hz input rate.

Note: To supply both the required heading and the optional position to the BDU, you can either connect an NMEA 0183 talker that transmits both messages, or connect two devices using an NMEA data multiplexer, such as Actisense® model NDC-4.

Figure 29: Supported NMEA 0183 Messages

| NMEA 0183 $--XXX	Description
Heading Messages	
HDG	Heading, Deviation & Variation
HDM	Heading, Magnetic
HDT	Heading, True
OSD	Own Ship Data
THS	True Heading & Status
VHW	Water Speed and Heading
Position Message (Optional)	
RMC	Position (Optional)

NMEA 2000

1. Connect the BDU to the vessel's NMEA 2000 CAN network backbone via a "T" connector. Be sure to use a standard drop cable: 5-wire (4 conductors + shield) twisted pair with micro-C connectors.

2. Configure the NMEA device to transmit one or more of the supported NMEA 2000 messages.

Figure 30: Supported NMEA 2000 Messages

PGN	Description
Heading Messages	
127250	Vessel Heading
Position Message (Optional)	
129029	GNSS Position Data (Optional)

Figure 31: NMEA Wiring
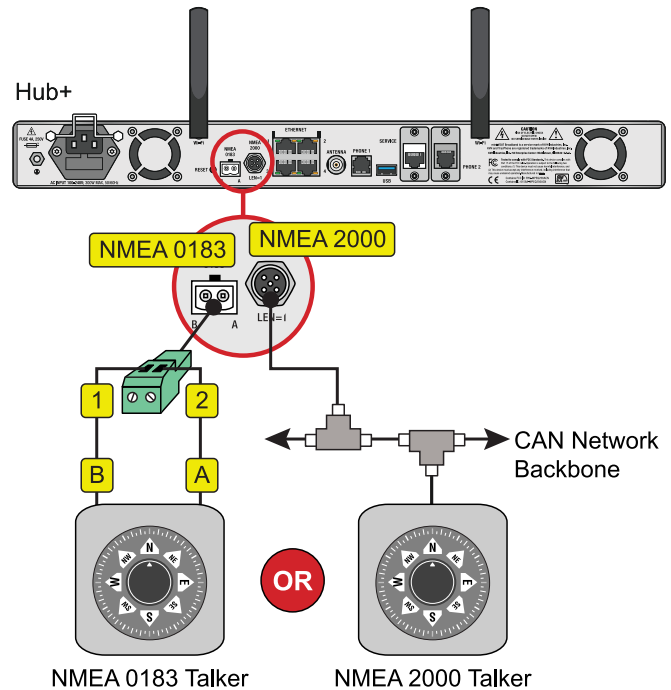
Connect Power

Before you begin, be sure that you understand the following important requirements:

AC Power Requirements

The TracNet system is designed to run on 3-wire single-phase AC power (hot, neutral, and ground). Voltage between hot-neutral and hot-ground should each measure between 100-240 VAC.

Many large ships use two-phase, split-phase, or delta power instead (3 wires: hot, hot, and ground; no neutral). In this case, voltage between hot-hot measures the proper voltage (100-240 VAC); while hot-ground measures only half the voltage (50-120 VAC). Although the TracNet system can operate on this type of power, the excess voltage present on the second phase will cause a small amount of current to leak onto ship's ground. This leakage current might be unacceptable on some vessels. So check with the customer or ship's electrician and get permission before you run the system on two-phase power. Also be sure to ground the system, as explained below.

If two-phase power is the only available power source onboard, and if leakage current is unacceptable, KVH recommends that you install a suitable isolation transformer to supply single-phase power to the antenna system and run a ground wire from the transformer to ship's ground. In addition, since ground fault protection devices cannot detect faults behind a transformer, you will also need to install a ground fault monitoring device between the isolation transformer and the antenna system if ground fault protection is required on the vessel.

Grounding Requirements

Proper grounding of the TracNet system to ship's ground is critically important, as it protects the equipment from electrostatic discharges (ESD). Failure to ground the chassis of the BDU risks damage to the antenna and electric shock.

Figure 32: AC Power Options
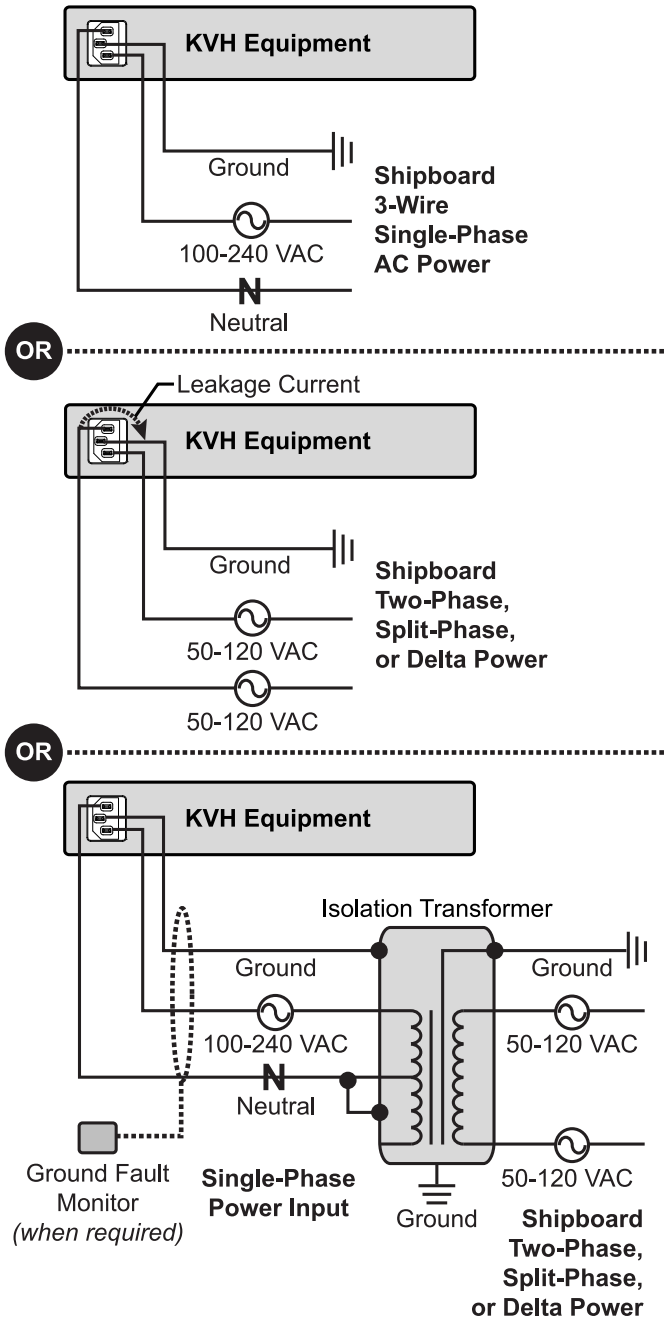
Connecting Power

Once you have read and understand the requirements on the previous page, follow these steps to connect power to the TracNet system.

1. Disconnect vessel power and be sure the vessel is properly grounded in accordance with marine standards.

2. Connect the supplied ground wire from the ground stud on the rear panel of the BDU to ship's common ground (see Figure 33).

> ⚠️ **WARNING**
>
> **Failure to ground the BDU properly to ship's ground will cause an unsafe floating ground condition, risking damage to the antenna and electric shock, potentially resulting in DEATH.** In a floating ground condition, the difference between the equipment's chassis ground and the vessel's ground can measure well over 100 volts, when it normally should not exceed 2 volts. Therefore, always measure the difference in potential between chassis ground and ship's ground to make certain that there is no dangerous floating ground condition, even if the ground pin of the vessel's AC power plug appears to be intact.

3. Connect the supplied AC power cord to the BDU.

4. Plug the BDU power cord into the vessel's 100-240 VAC supply.

Note: Consider installing an uninterruptible power supply (UPS) to avoid service interruptions during power outages and transitions to/from shore power.

5. Check for proper grounding by using a multimeter to measure the AC and DC voltages between the ground stud on the rear of the BDU and ship's ground. The measured voltage should be less than 2 VAC and 2 VDC. **A higher voltage indicates a dangerous floating ground condition.**

6. Repeat the previous step with the BDU powered on, looking for the same measured result.

> ⚠️ **WARNING**
>
> **If you measure 2 volts or greater between the ground stud on the rear of the BDU and ship's ground, notify the ship's electrician or authorized vessel representative immediately. This is a dangerous condition. Do not touch the BDU rear panel or connect anything to it until the problem is fixed.**

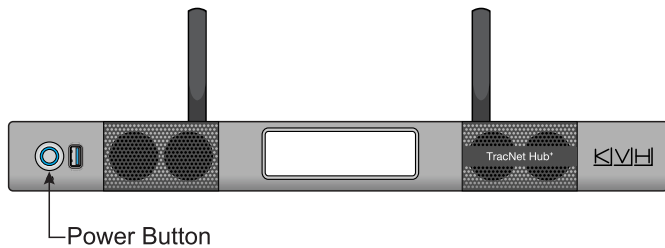**Figure 33: Power Wiring**
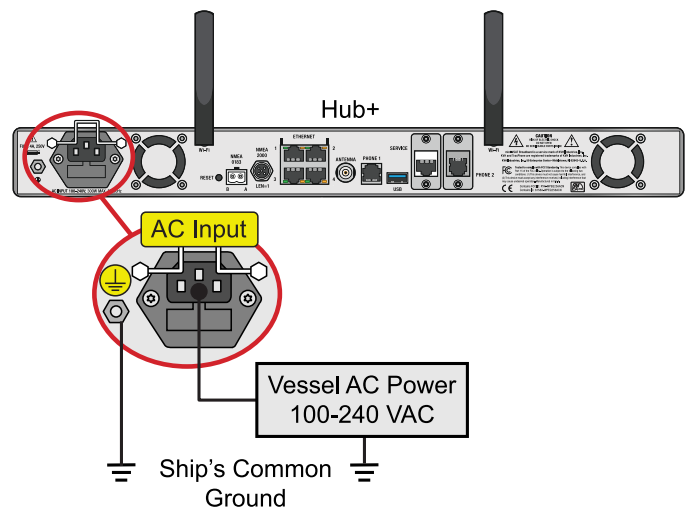
Turn On the System

Follow these steps to turn on the system.

1. Ensure the antenna has a clear, unobstructed view of the sky.

2. Apply vessel power to the TracNet system.

3. Press the power button on the front of the BDU. The button's light should illuminate blue.

Figure 34: BDU Power Button

Power Button

IMPORTANT!
During startup, the BDU checks the software version installed in the antenna and updates it if necessary to match its currently installed version. Do not turn off the system for at least 15 minutes or while any updates are in progress (indicated on the BDU's front panel).

4. At the BDU's front panel touchscreen, go to the VSAT page (2) and monitor the antenna status. Within two minutes, the antenna should complete initialization and start searching for the satellite. Also make sure no errors are reported in the header (see example in Figure 36).

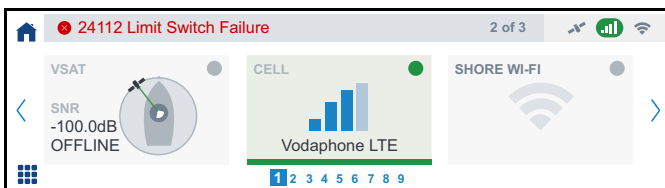**Figure 35: VSAT Status Page on Front Panel**
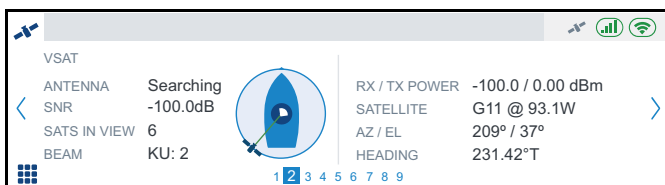
Figure 36: Error Message on Front Panel (Example)

Configure the System

Follow the steps on the next few pages to access the setup wizard and configure the system for use.

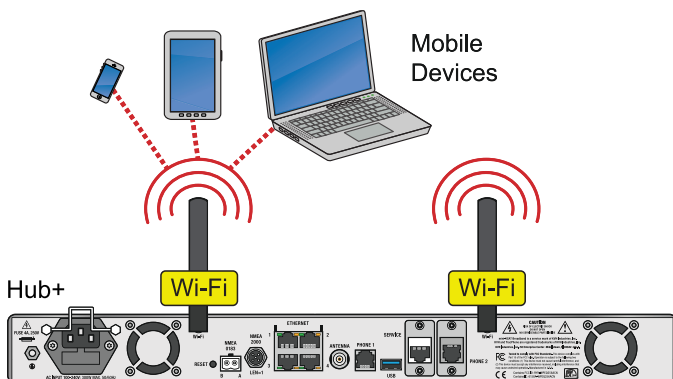## Access the Setup Wizard

Follow the steps for either option below to access the setup wizard.

Option 1: Using the Wireless Connection

1. Select the **KVHVSAT<last 3 digits of BDU serial no.>** network from your mobile device's Wi-Fi settings to connect to the BDU.

2. Enter the default password: **<full 9-digit BDU serial no.>**.

3. Start the web browser and enter **https://kvhonboard.com**.

Note: If the setup wizard is not displayed, try entering https://192.168.5.1, which is the default IP address. You might need to bypass a warning from your browser to proceed to the site.

Figure 37: Wi-Fi Connection

Option 2: Using the Ethernet Connection

1. Connect a laptop PC configured for DHCP directly to Ethernet port 1 on the BDU.

2. Start the web browser and enter **https://kvhonboard.com**.

Note: If the setup wizard is not displayed, try entering https://192.168.5.1, which is the default IP address. You might need to bypass a warning from your browser to proceed to the site.

Figure 38: Wired Ethernet Connection
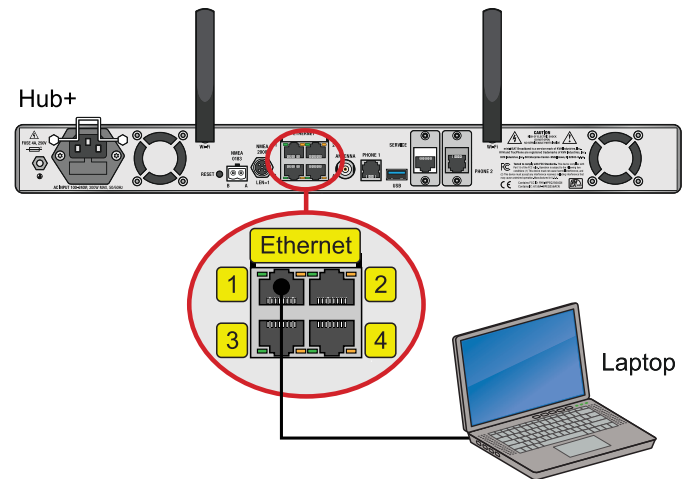
Run the Setup Wizard

The Setup Wizard appears upon initial startup to step you through system configuration. Through the setup wizard, you will:

- Enter administrator and guest account passwords

- Enter the vessel name

- Enter phone line name(s)

- Configure LAN and built-in Wi-Fi settings (optional)

- Set the network configuration of the BDU's Ethernet ports

- Configure WAN settings (optional)

Follow the steps in the following sections to set up the system.

Figure 39: Wizard Welcome Screen
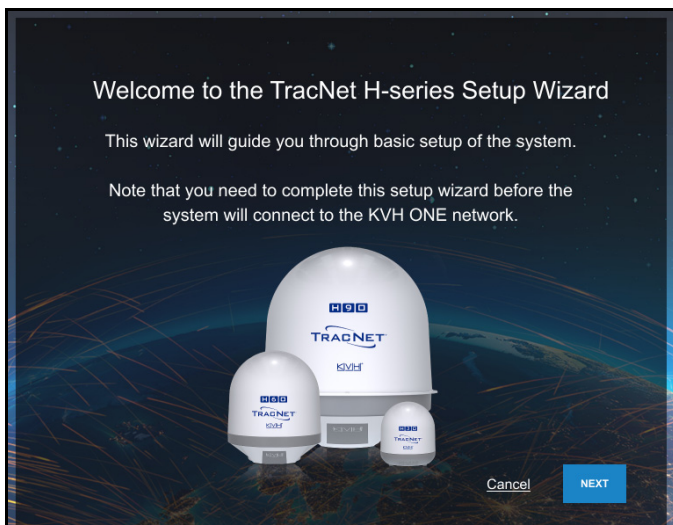
Note: After setup is complete, you must log into the web interface as an administrator to make further changes to the system settings.

Assign an Administrator Password

At the first page of the wizard, you must set the following:

- **PASSWORD**: Enter and then re-enter an administrator password of the customer's choice

- **VESSEL NAME**: Enter the vessel name

- **PHONE LINE 1 NAME**: Enter a name for the primary phone line

- **PHONE LINE 2 NAME**: Enter a name for the second phone line (if enabled; an additional fee applies)

Note: The case-sensitive password must be between 8 and 64 characters in length, with at least one letter, one number, and a special character.

Figure 40: Assigning the Administrator Password

When you are done, select **Next**.

Assign a Guest Account Password (Optional)

At the second page of the wizard, you can set the following:

- **PASSWORD**: Enter and then re-enter a guest account password of the customer's choice

Note: The case-sensitive password must be between 8 and 64 characters in length, with at least one letter, one number, and a special character.

Figure 41: Assigning the Guest Password

Assign **Guest** Account Password *(optional)*

The Guest account allows read-only access to terminal status and configurations.

User Name   *guest*

Password*

Confirm Password*

BACK   NEXT

When you are done, select **Next**.

Configure LAN Settings (Optional)

At the third page of the wizard, you can make any necessary changes to the following LAN settings:

> **IMPORTANT!**
> The default LAN settings work well for most installations. Do not change these settings unless absolutely necessary, such as to avoid conflicts with an existing onboard network.

- **IP ADDRESS**: Change the default IP address
- **SUBNET MASK**: Change the default subnet mask
- **DHCP MODE**: Set to "ON" or "OFF" (If DHCP is on, select a **DHCP START** and **DHCP END** range)

As you'll see on the next page, the BDU's Ethernet ports can be split into two LANs for connecting to either the VSAT High-speed (HS) channel or Unlimited Use (UL) channel. You can modify the settings for both of these LANs. Note that these settings will apply to the BDU ports designated as "High-speed LAN" or "Unlimited Use LAN," even while connected to the Internet via cellular or shore Wi-Fi, which do not employ separate data channels.

Note: By default, the High-speed (HS) LAN has a gateway of 192.168.5.1 and assigns IP addresses in the 192.168.5.50-150 range, and the Unlimited Use (UL) LAN has a gateway of 192.168.6.1 and assigns IP addresses in the 192.168.6.50-150 range.

Figure 42: Configuring LAN Settings (High-Speed Shown)

Configure LAN Settings *(optional)*

Modify IP settings only if necessary to avoid conflicts with an existing onboard network. Set a unique password for Wi-Fi access to the terminal.

High-Speed Channel

IP Address

192.168.5.1

Subnet Mask

255.255.255.0

DHCP Mode   ON   OFF

DHCP Start:

192.168.5.50

DHCP End:

192.168.5.150

Configure Built-In Wi-Fi Settings

With Wi-Fi enabled, vessel devices can connect to the BDU via its built-in wireless access point (WAP). At the third page of the wizard, you can make changes to the following built-in Wi-Fi settings:

> **IMPORTANT!**
> Establishing a wireless connection onboard a steel vessel might require a special external WAP and advanced networking expertise.

- **BUILT-IN WI-FI**: Set to "ON" or "OFF"

> **IMPORTANT!**
> For the customer's protection, an open Wi-Fi without security protocols is not permitted. Setting Built-in Wi-Fi to "On" will simultaneously activate WPA-PSK security and require creating a Wi-Fi password.

- **SSID (WI-FI NETWORK NAME)**: Enter a unique name for the Wi-Fi network
- **BAND**: Select either 2.4 GHz or 5 GHz
- **CHANNEL**: Select either Auto or 1-11 channels
- **PASSWORD**: Change the password (at least 8 characters)

Figure 43: Configuring the Built-in Wi-Fi Settings

When you are done, select **Next**.

Set the Port Configuration

At the fourth page, you can change the LAN configuration of the BDU's Ethernet ports and built-in Wi-Fi, if desired.

Note: For details on the differences between High-speed and Unlimited Use VSAT data speeds and rates, refer to the airtime rate sheet. For details on external VoIP devices, see .

Option	Configuration
Split (default)	Ports 1-2, Wi-Fi: High-speed LAN Ports 3-4: Unlimited Use LAN
HS	Ports 1-4, Wi-Fi: High-speed LAN
UL	Ports 1-4, Wi-Fi: Unlimited Use LAN
HS + VoIP	Ports 1-3, Wi-Fi: High-speed LAN Port 4: External VoIP device
UL + VoIP	Ports 1-3, Wi-Fi: Unlimited Use LAN Port 4: External VoIP device
Split + VoIP	Ports 1-2, Wi-Fi: High-speed LAN Port 3: Unlimited Use LAN Port 4: External VoIP device

Figure 44: Setting the Port Configuration

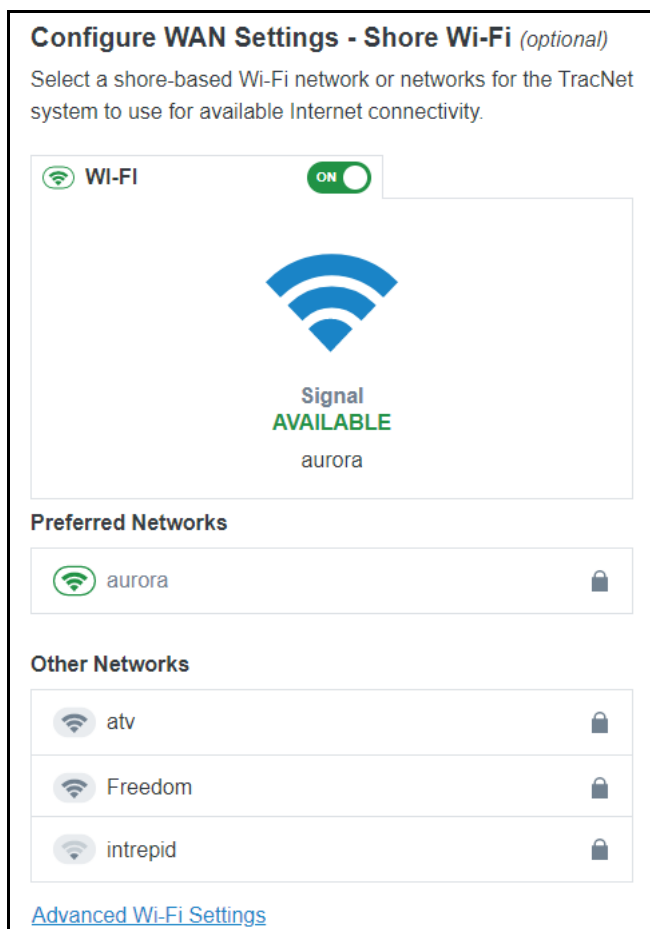When you are done, select **Next**.

Configure WAN Settings

With its hybrid network capability, the TracNet system can automatically switch to an available cellular or shore-based Wi-Fi network for Internet connectivity. At the fifth page of the wizard, select the shore Wi-Fi network or networks that the TracNet system should use.

The wizard lists any Wi-Fi networks it has detected broadcasting in the area. You may select one or more networks from this list and enter associated password(s).

To add a network not shown in the list, select **Advanced Wi-Fi Settings**. Select "**+**". Then enter the network name, security protocol, and password.

Figure 45: Configuring WAN Settings

When you are done, select **Next**. At the final screen, select **Exit Wizard**. Then wait a few minutes for the system to apply the new settings. When the login page appears, enter the admin credentials to access the web interface.

Note: If you changed the LAN settings or port configuration and the login page does not appear after a few minutes, try entering in your browser the correct IP address for the port or Wi-Fi that you are using to connect. You can also try renewing the DHCP lease on your device.

Update the System Software

Follow these steps to check the currently installed software versions and install new software, if necessary.

Note: This procedure explains how to update the software using the web interface and your laptop computer. However, you can also update the software using the KVH Connect mobile app. Details are available in the Help.

1. At the web interface, go to the **Software Updates** page. Note the displayed software versions for antenna and belowdecks unit.

Figure 46: Software Updates Page

2. If the reported software versions are earlier than the latest version you downloaded from the KVH Partner Portal, select **CHOOSE FILE**.

Note: This single software update file applies to both the antenna and the belowdecks unit (i.e., Hub+).

3. Select the software update file you saved on your laptop. Be sure it is the **AC-BDU** version of H-series software.

IMPORTANT!
Once the file is uploaded, you will lose your connection to the web interface (and the built-in Wi-Fi) temporarily. If you would like to view the status of the update, you may log back into the web interface after a couple minutes, return to the Software Updates page, and refresh your browser window to view the current state in the Software Update Status box. The software update progress is also shown on the BDU's front panel.

4. Wait for the software update to complete. **Do not turn off power to the system during this update.**

5. Reconnect to the web interface and verify that the Software Updates page is now displaying the latest version.

No-Transmit Zones (Optional)

To prevent exposure to RF energy (see page 1 for an illustration of the hazard area), you can configure up to two no-transmit zones for areas where crew and/or passengers frequent. The system will disable the transmitter whenever the antenna is pointing within one of these zones.
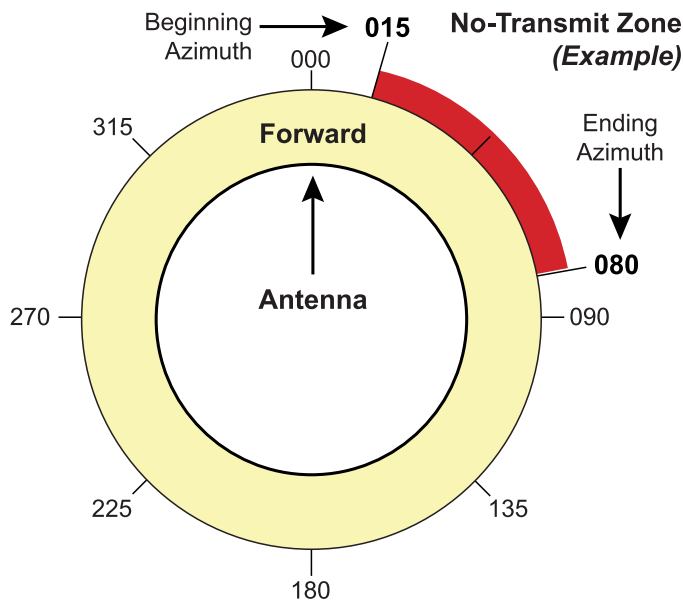
Figure 47: Example of a No-Transmit Zone
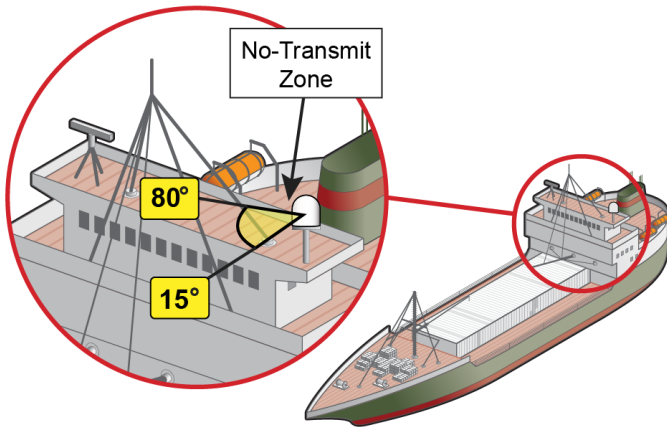
Follow these steps to set up a no-transmit zone.

1. Determine the necessary azimuth range for the no-transmit zone(s). You will need to enter, in clockwise order, beginning and ending azimuths that define the outer boundaries of the zone(s) **relative to the antenna's forward arrow**, which should be pointing toward the bow.

Figure 48: Azimuth Relative to Antenna's Forward Arrow

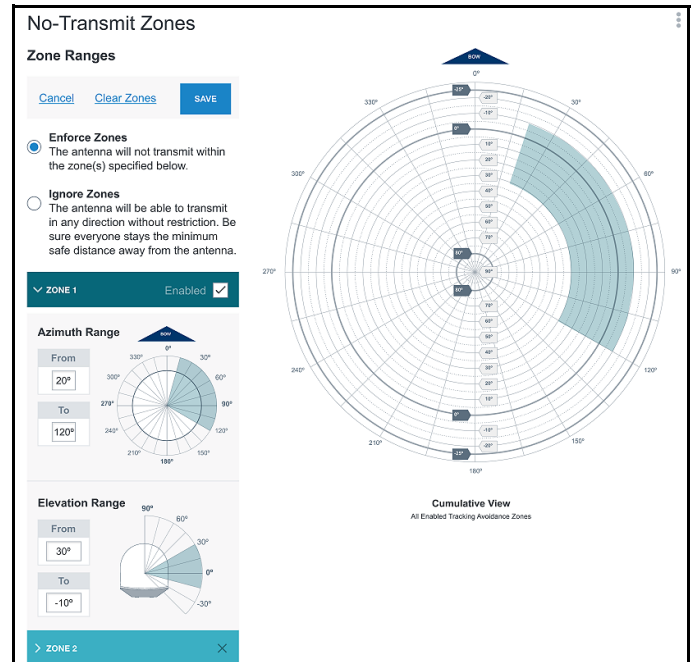2. Determine the necessary elevation range for each no-transmit zone.

Figure 49: Example of No-Transmit Zone Elevation Range
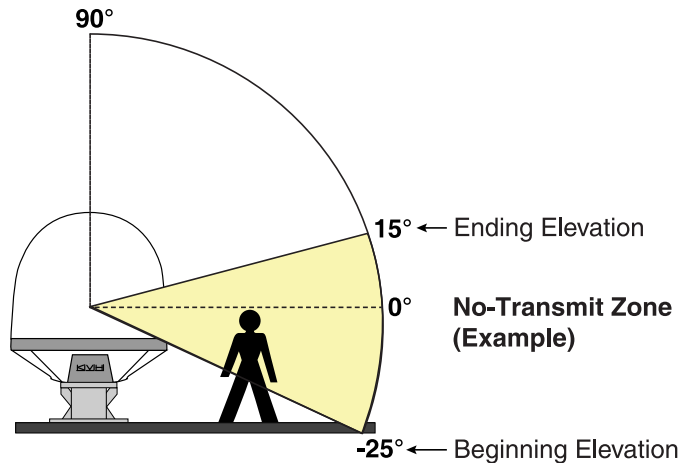
Note: *Each no-transmit zone must span at least 5° in both azimuth and elevation.*

3. At the web interface, select the **No-Transmit Zones** page. Then select **Edit**.

4. Select **Enforce Zones**.

**Figure 50: No-Transmit Zones Page of Web Interface**

5. Enter the azimuth and elevation ranges for Zone 1.

6. Enter the azimuth and elevation ranges for Zone 2, if required.

7. Select **Save**.

Test the System

Follow these steps to test the system for proper operation.

1. Ensure the antenna has a clear, unobstructed view of the sky.

2. At the web interface, go to the Terminal Home page and select the **VSAT Only** network mode from the Network Selection drop-down menu.

3. Verify that the antenna is tracking the VSAT satellite and the system is online.

Figure 51: Good VSAT Connection Indicated in Web Interface
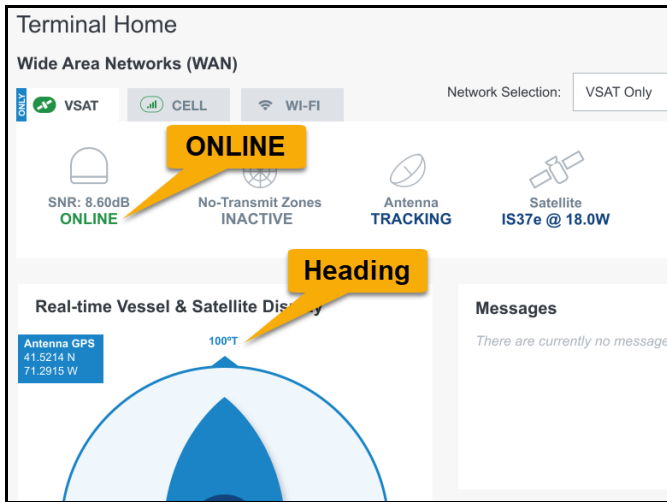
4. Make sure the vessel's heading is displayed in the Real-time Vessel & Satellite Display. If not, check the wiring to the NMEA device.

5. Enter the following address in a new web browser tab or window: **http://test.minivsat.net**. Verify that a Welcome screen appears, indicating good communication between the antenna system and the land-based hub.

6. If the customer activated the TracNet system for KVH ONE™ VSAT service, open a new browser tab and try to access the Internet (such as google.com) over the VSAT connection.

7. Turn on all other electronic equipment above deck within the proximity of the antenna, if possible. Verify that both the KVH system and the electronic equipment continues to operate without any degradation in performance.

8. If the customer activated the TracNet system for KVH global cellular service, select the Cell tab. If there is cellular service in your area, select the **Cell Only** network mode. Then open a new browser tab and try to access the Internet (such as google.com) over the cellular connection.

Figure 52: Cell WAN Status
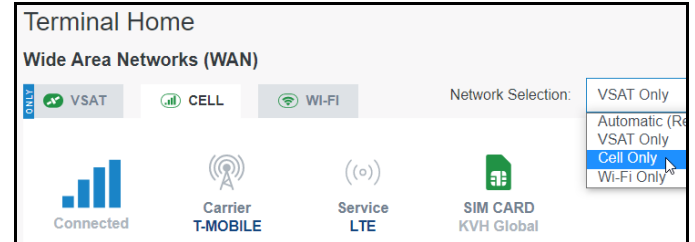
9. If you set up the system for a shore Wi-Fi network, select the Wi-Fi tab. If there is adequate Wi-Fi service in your area, select the **Wi-Fi Only** network mode. Then open a new browser tab and try to access the Internet (such as google.com) over shore Wi-Fi.

Figure 53: Wi-Fi WAN Status
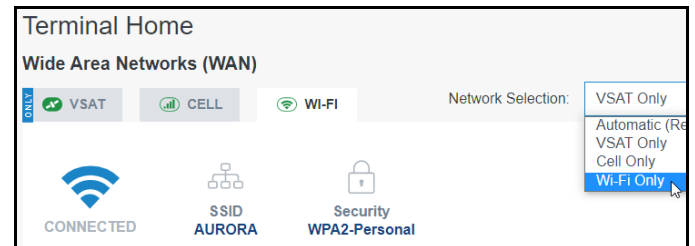
10. Return the system to **Automatic** network mode.

11. Fill out the Installation Checklist (provided in the Customer Welcome Kit) and return it to KVH. Refer to the instructions on the form.

IMPORTANT!

Submission of the Installation Checklist is required to certify the quality of the installation.

Connect Vessel Network Devices

The BDU includes four Ethernet ports and a built-in wireless access point (WAP). Unless you changed the port configuration at the Setup Wizard, Ethernet ports 1 and 2 and the built-in Wi-Fi are on the "High-speed" LAN, while ports 3 and 4 are on the "Unlimited Use" LAN. Follow these additional steps to set up the network.

1. Connect the customer's computers and/or other network devices to the BDU. You might wish to add an external WAP (or Wi-Fi router configured for bridge mode) to supplement built-in Wi-Fi access.

Figure 54: Vessel Network Example: Split Port Configuration
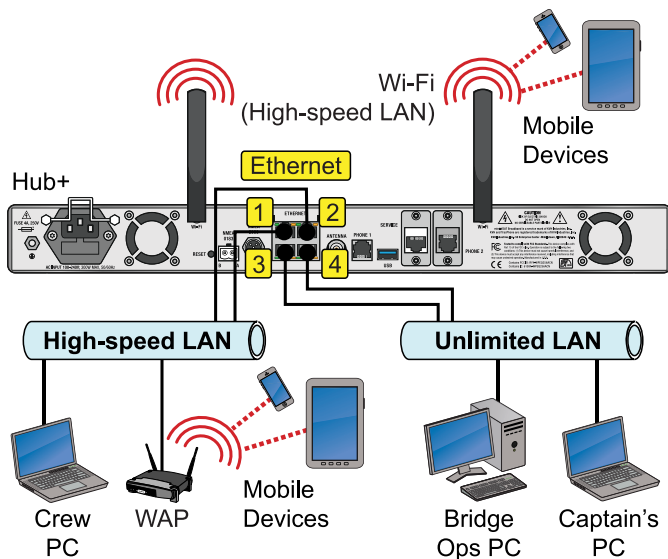
2. Devices connected to the BDU (via Ethernet cables or Wi-Fi) will receive IP addresses from the BDU via DHCP. The BDU serves as a router.

Note: Unless you changed the LAN settings at the Setup Wizard, the High-speed (HS) LAN has a gateway of 192.168.5.1 and assigns IP addresses in the 192.168.5.50-150 range, and the Unlimited Use (UL) LAN has a gateway of 192.168.6.1 and assigns IP addresses in the 192.168.6.50-150 range.

Global Static IP

Global Static IP service allows you to set up a network device with an IP address that can be accessed directly from the Internet. It does not receive an IP address from the BDU. If you require Global Static IP Service, follow these additional steps to configure the network.

> **IMPORTANT!**
> A static IP address should only be assigned to a secure device, such as a firewall router.

1. Fill out the request form at www.kvh.com/staticip. In addition, the system must be activated for KVH ONE service, and it must remain online until KVH configures the system over the air.

2. Connect the static IP device(s) to the BDU.

3. You will need to configure the devices' TCP/IP properties according to the instructions KVH will provide in an email upon fulfilling the static IP request.

Connect the Vessel Phones

Using the supplied RJ-11 cables, connect the customer's analog (not digital) phones and/or PABX to the desired "Phone" jack(s) on the BDU. Each jack is linked to a phone line.

> **IMPORTANT!**
> The second phone line is optional – an additional monthly fee applies. If the customer has not purchased a second line, do not connect anything to "Phone 2."

Figure 55: Connecting the Vessel Phones
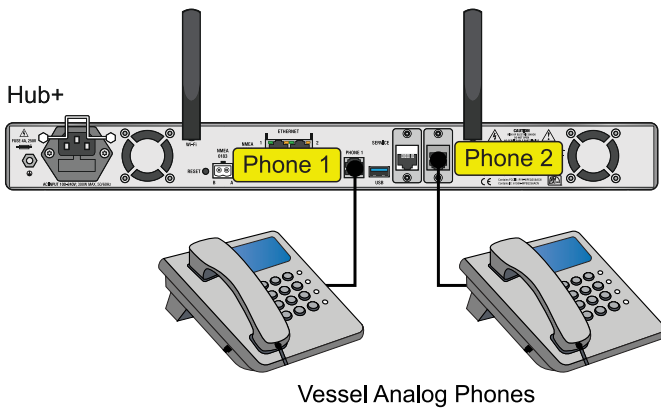
Strain-relief

Once all cables are connected to the BDU, use tie-wraps to secure them to the strain-relief bracket at the back of the BDU (see Figure 26 on page 15). Leave enough slack for easy serviceability.

External VoIP Devices (Optional)

If the vessel requires more than two phone lines, you can connect an external VoIP device to Ethernet port 4 on the BDU:

- **MTA** (multimedia terminal adapter) (KVH part no. 19-0504) – Enables up to two additional lines.

- **Crew Calling Gateway** (KVH part no. 72-0349) – Provides a dedicated phone line for crew members and charter guests to place ship-to-shore calls using prepaid calling cards

*Note: As an alternative to the Crew Calling Gateway, one of the BDU's built-in phone lines can be configured for crew calling functionality. Contact KVH Network Services at **networkservices@kvh.com** for details.*

> **IMPORTANT!**
> The BDU must be set up for a port configuration that supports external VoIP. See "Set the Port Configuration" on page 24. The customer also needs to add the additional line(s) to their airtime subscription.

Figure 56: Connecting an External VoIP Device (Example)
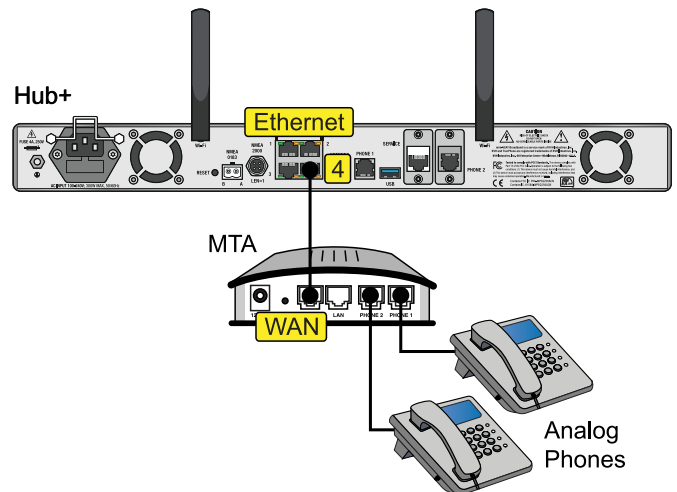
Educate the Customer

Give the Welcome Kit to the customer, make sure they know the administrator and Wi-Fi passwords, and show them how to use the system. Be sure they understand the following:

• The antenna transmits RF energy that is potentially harmful. Whenever the system is powered on, make sure everyone stays the minimum safe distance away from the antenna (see page 1 for an illustration of the hazard area). If no-transmit zones were set up, make sure the customer understands where they are.

• Read the Master Services Agreement carefully (available at www.kvh.com/airtimeresources).

• Keep the radome installed on the antenna at all times. The radome protects the antenna's moving parts from wind, rain, and debris.

• The antenna must have a clear view of the sky to communicate via satellite. Common causes of blockage include masts, trees, buildings, and bridges. Dirt buildup on the radome can also affect communications.

Figure 57: Example of Satellite Blockage

Blocked!
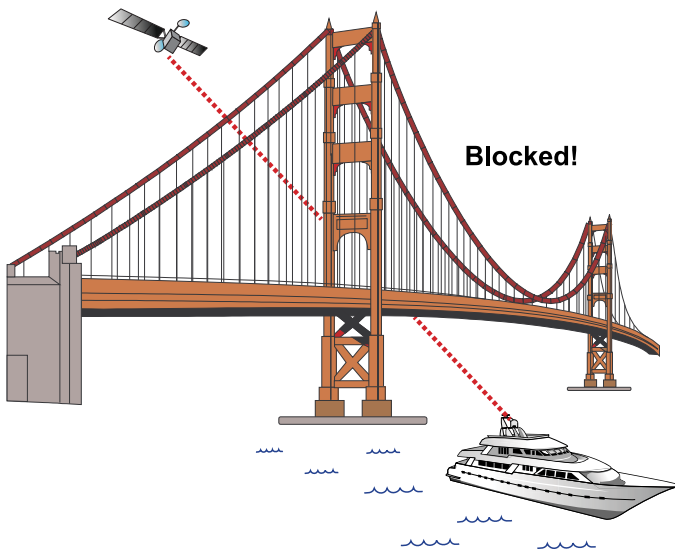
• The vessel must be located within the Ku-band HTS network coverage area to connect to the VSAT service (see www.kvh.com/tracnetmaps).

• The system must be activated for KVH ONE service (see www.kvh.com/airtimeresources).

• Data usage and overage alerts via email and text message can be configured easily over the Internet at the KVH Manager (see www.mykvh.com).

IMPORTANT!
If you are not a KVH Airtime customer, contact your Service Provider for details on accessing KVH Manager.

• Category Controls in KVH Manager are essential to managing VSAT data usage and ensuring that data is utilized for activities that matter most.

For More Information

Refer to the Help provided on the web interface's Support page.

Figure 58: Help Button on Support Page
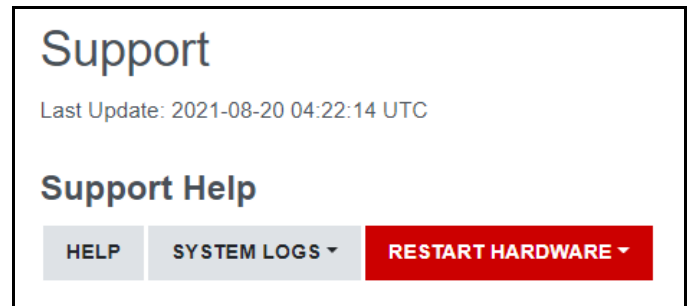
Appendix A:
Terminating LMR-240 Cable

These instructions explain how to terminate the supplied LMR-240 coax cable with an EZ-240-TM-X TNC connector using the tools from the LMR-240 termination tool kit (KVH part no. 72-0949). For more detailed instructions, refer to the Times Microwave website: www.timesmicrowave.com.

1. Using angle cutters, cut the cable evenly.

Figure 59: Cutting the Cable

2. Since cutting the cable can deform the end, gently round the end of the cable. Also make sure the center conductor is centered within the cable.

Figure 60: Reshaping the Cable

3. Place the metal ferrule onto the cable.

Figure 61: Placing the Ferrule

4. Insert the end of the cable into the #1 end of the CST-240 stripping tool. Depress the cutting blade using your thumb, then rotate the tool clockwise around the cable until the tool turns easily. The end of the cable should now be stripped to expose the center conductor.

Figure 62: Stripping the End to Expose the Center Conductor

Note: *Carefully remove any residual plastic from the center conductor, if necessary.*

5. Insert the end of the cable into the #2 end of the CST-240 stripping tool. Then rotate the tool clockwise around the cable until the tool turns easily. This removes the cable jacket from the end of the cable, exposing the braid and dielectric.
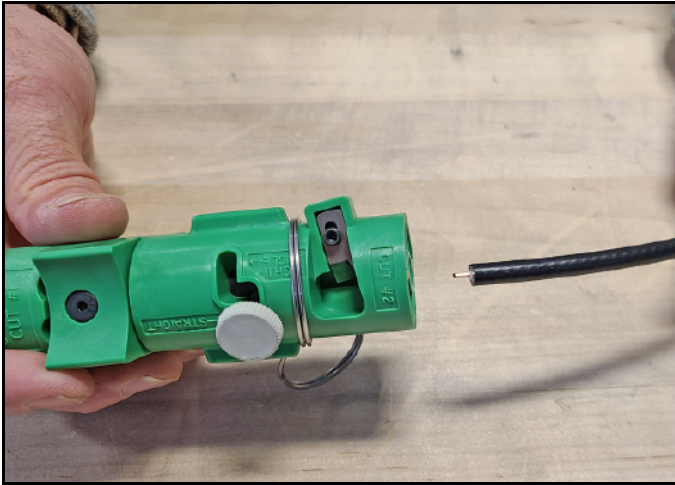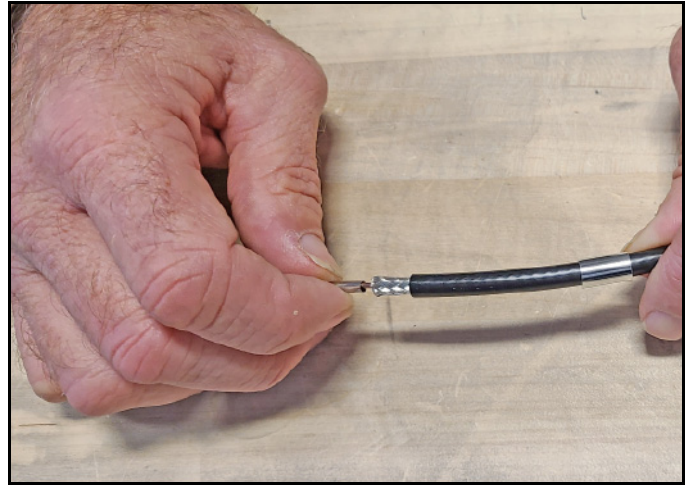
Figure 63: Stripping the Cable Jacket
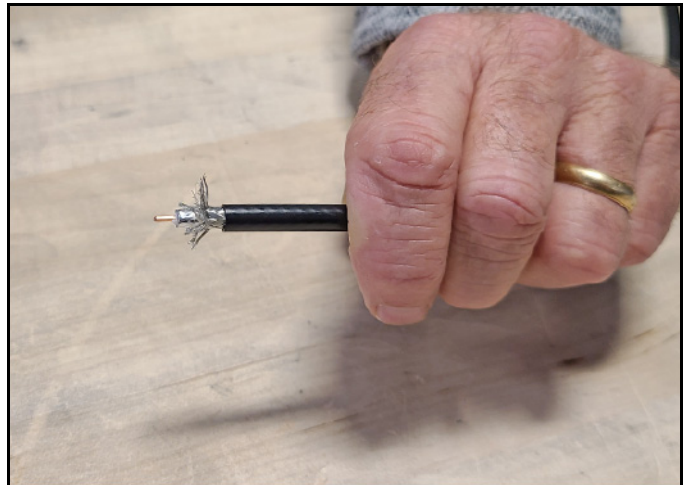

Figure 64: Cable Stripped, Exposing Dielectric

6. Using the DBT-U deburr tool, deburr and chamfer the center conductor. Avoid nicking the aluminum tape covering the dielectric.

Figure 65: Deburring the Center Conductor

7. Gently flare the braid with your fingers.

Figure 66: Flaring the Braid

8. Insert the end of the cable into the connector body until the dielectric is firmly seated inside the connector. Make sure there is no gap between the knurled end of the connector and the cable jacket. Also be sure all braid wires remain on the outside of the connector.

IMPORTANT!

A common installation failure occurs when the connector is not seated properly onto the cable. In these cases, the cable's center conductor does not fully engage the electrical contacts inside the connector. To ensure full engagement, make certain that there is no gap between the cable jacket and the knurled end of the connector before you crimp on the ferrule. You may need to **center the end of the conductor** to achieve a good fit.
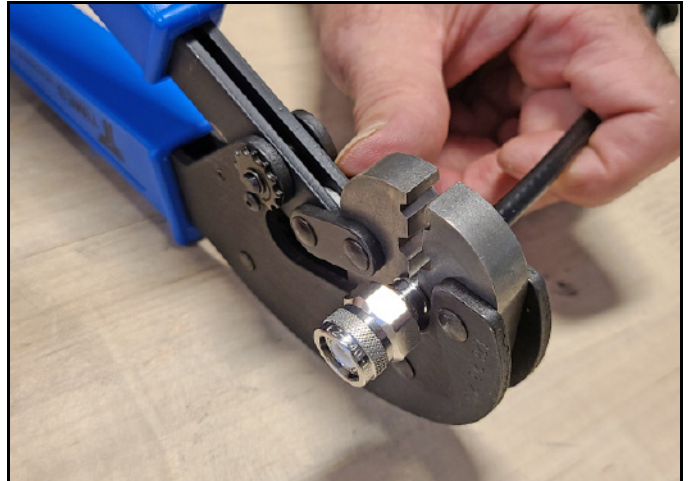
Figure 67: Pushing On the Connector

9. Slide the ferrule over the braid until it is flush against the connector shoulder.

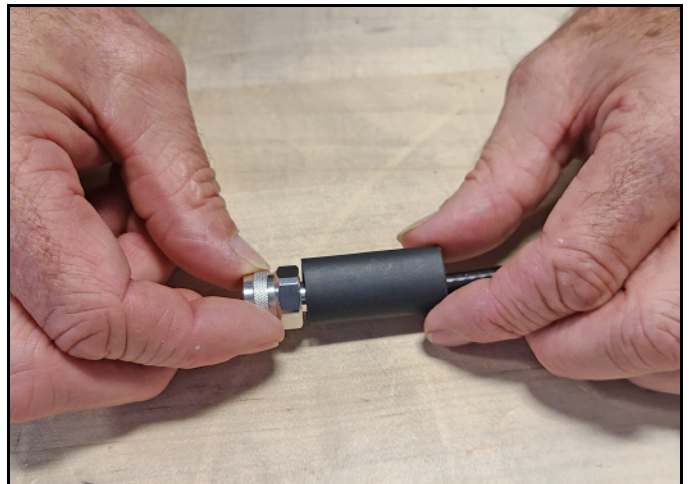**Figure 68: Sliding the Ferrule over the Braid**
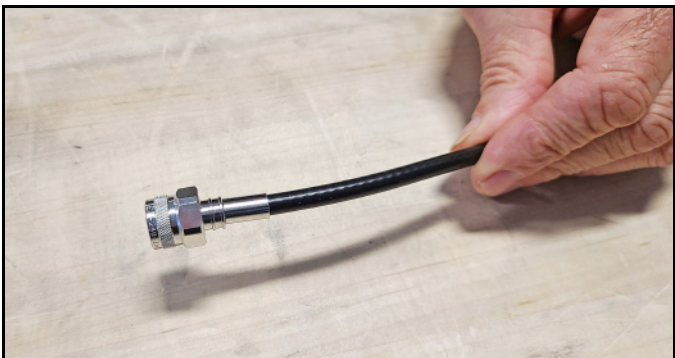
10. Using an appropriate crimp tool, crimp the ferrule in place. Crimp as close to the connector body as possible.

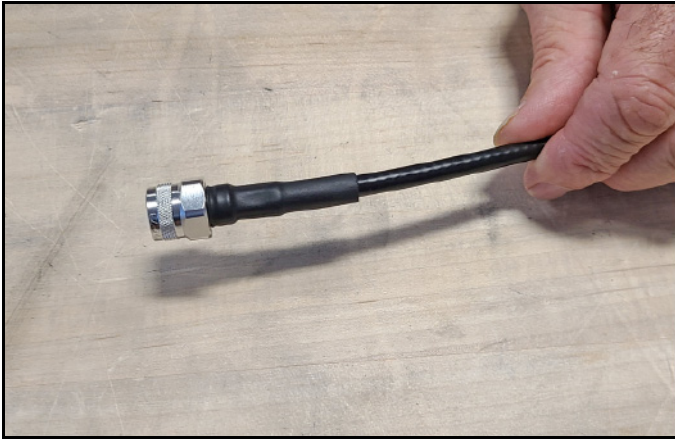**Figure 69: Crimping the Ferrule onto the Cable**

11. Slide the heat shrink sleeve over the connector body and heat it to compress it into place.

Figure 70: Placing the Heat Shrink Tubing

When you are done, the heat shrink should extend from the rear of the connector to the cable jacket. This forms a weather-tight seal.

Figure 71: Properly Terminated LMR-240 RF Cable

12. Using a multimeter or similar device, check the continuity of the cable.

Appendix B:
Connecting Pigtail Cables to the Antenna Cable

Pigtail cables are required in the following circumstances:

- If you are not using a new RG-58 or LMR-240 cable, connect a pigtail cable between it and the BDU's TNC connector. The stiffness of other cable types can overstress the connector on the BDU. *You might use a pigtail cable at the antenna end as well to make it easier to maintain proper bend radius.*

- If you are reusing a preinstalled cable that does not have an N-type connector at the antenna end, use a pigtail cable to convert it.

Six types of pigtail cables are available from KVH to accommodate different connectors, as needed (see Figure 72). All pigtail cables are 3 ft (1 m) in length.

Figure 72: Pigtail Cables

Pigtail Cable	KVH Part No.
F-type (female) to TNC (male)	32-1440-003F
N-type (female) to TNC (male)	32-1440-003N
TNC (female) to TNC (male)	32-1440-003T
F-type (female) to N-type (male)	32-1481-003F
N-type (female) to N-type (male)	32-1481-003N
TNC (female) to N-type (male)	32-1481-003T

Follow the steps below to connect a pigtail cable to the antenna cable.

1. Slide a heat shrink sleeve onto the end of the pigtail cable for later use. *The heat shrink will protect the connection between the antenna cable connector and the pigtail cable connector.*

2. Fill half of the inner body of the antenna cable connector with the supplied silicone grease to prevent moisture and corrosion.

3. Connect and **SLOWLY** hand-tighten the male antenna cable connector to the female connector end of the pigtail cable, allowing the grease to diffuse and settle into the entire space within the connector.

4. Make sure the antenna cable connector is tightened all the way into the pigtail cable's connector. For N-type and TNC connectors, hand-tightening is sufficient. For F-type connectors, use as 7/16" torque wrench set to 20 in-lbs.

5. Seal the antenna cable-to-pigtail connection using self-vulcanizing tape or equivalent. Then protect the connection with the heat shrink.

Figure 73: Connecting the Antenna Cable to the Pigtail Cable
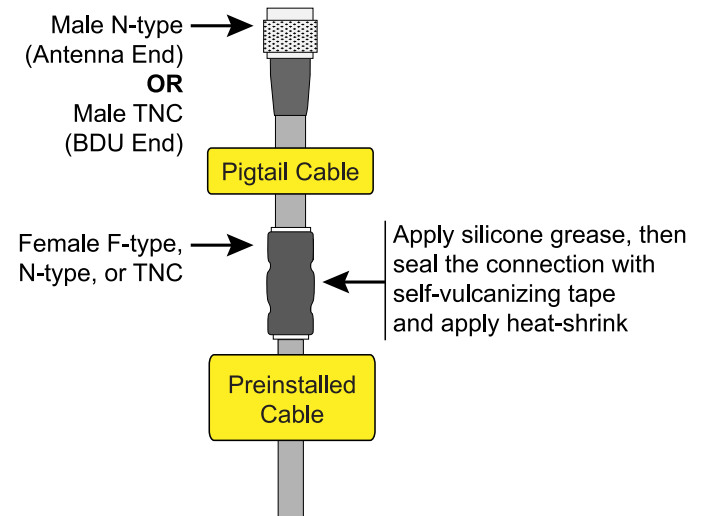
Appendix C:
Approved Cable Types

The following cable types have been approved by KVH for use with the TracNet system up to the specified maximum lengths. You can also refer to the TracNet Cable Wizard at www.kvh.com/TracNetcables for the latest information.

Note: If the cable type you would like to use is not listed below or at the Cable Wizard, please contact KVH Technical Support.

Note: All cables listed below are 50-ohm cables except where noted otherwise.

Cable Type	Maximum Length
LMR-195	100 ft (30 m)
LMR-200	100 ft (30 m)
LMR-240	200 ft (60 m)
LMR-400	400 ft (120 m)
LMR-400-75 (75-ohm)	300 ft (90 m)
LMR-600	500 ft (150 m)
LMR-600-75 (75-ohm)	500 ft (150 m)
RG-8	400 ft (120 m)
RG-8X	150 ft (45 m)
RG-11 (75-ohm)	50 ft (15 m)
RG-58	50 ft (15 m)
RG-213	400 ft (120 m)
RG-214	500 ft (150 m)
RG-223	100 ft (30 m)

Appendix D:

Verifying the NMEA 0183 Message

Verify the message supplied by the NMEA 0183 talker by connecting its output to a laptop using an RS422-to-USB adapter cable and viewing its data stream using PuTTY, HyperTerminal, or other terminal emulator.

> **IMPORTANT!**
> To verify NMEA 2000 messaging, refer to the instructions that came with your NMEA 2000 talker.

Follow these instructions to verify the message.

*Note: These example instructions assume you will be using PuTTY.*

1. Using an RS422-to-USB adapter, connect the NMEA 0183 talker to the adapter's RS422 input. Then connect the adapter to the laptop's USB port.

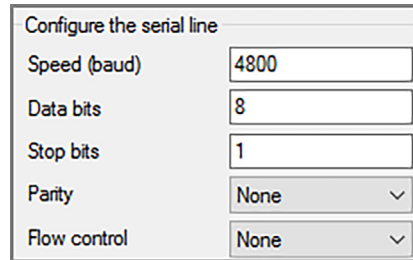Figure 74: Connecting a NMEA 0183 Talker to a Laptop
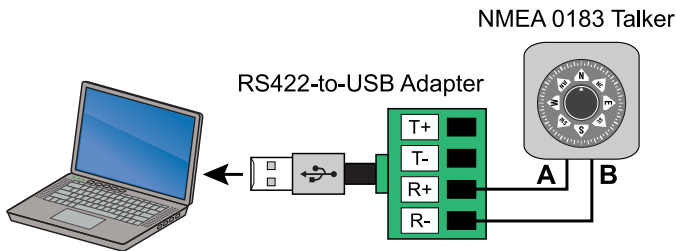
2. Start PuTTY and specify the laptop's port, connection type, and baud rate.

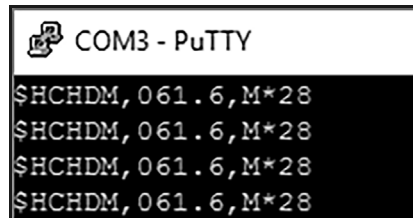Figure 75: Starting PuTTY Options (Example)
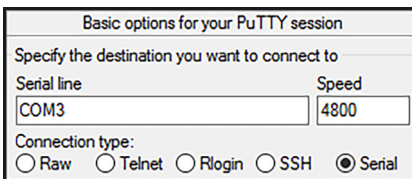
3. Configure options at the **Serial** configuration menu as follows:

    - 4800 baud
    - 8 data bits
    - 1 stop bit
    - no parity
    - no flow control

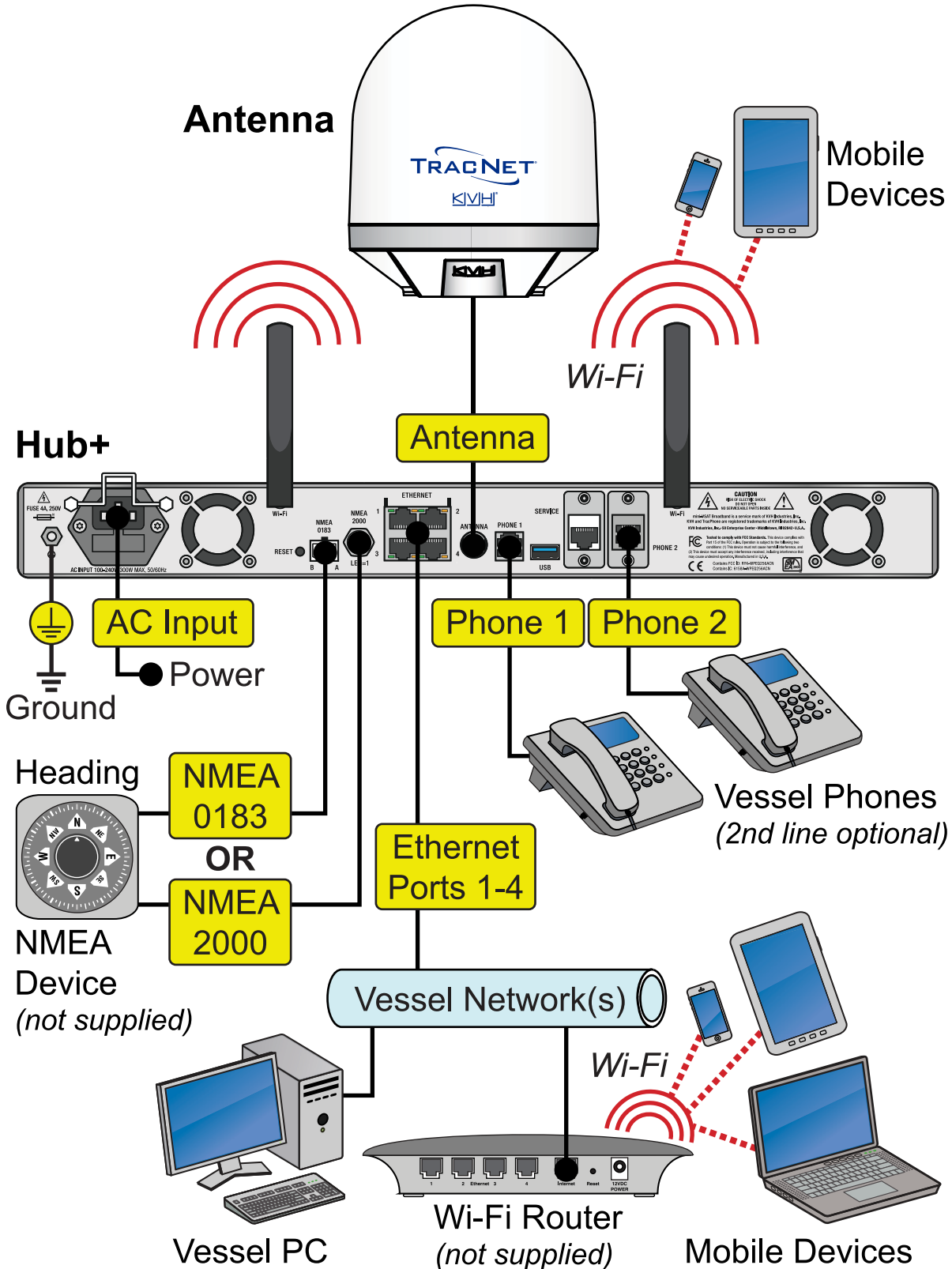Figure 76: PuTTY Port Configuration Options (Example)

4. Select **Open** to view the message data in a command line window.

Figure 77: PuTTY Command Line Window (Example)

Appendix E:
Wiring Diagram

KVH®

Regulatory Compliance

European Union Compliance

Hereby, KVH Industries, Inc. declares that the radio equipment type TracNet H90 complies with Directive 2014/53/EU. For the full text of the EU Declaration of Conformity, visit www.kvh.com/euconformity.

Federal Communications Commission Compliance

The TracNet system complies with Class A of Part 15 of the FCC (Federal Communications Commission) rules for radiated and conducted emissions.

FCC Identifiers: RYK-WNFQ261ACNIBT (TracNet Hub Wi-Fi)

RYK-WPEQ256ACN (TracNet Hub+ Wi-Fi)

XMR2020RM502QAE (Cellular Radio)

Use Conditions:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

Note:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. However, there is no guarantee that interference will not occur in a particular installation. To determine if the equipment is interfering with radio or television reception, remove or apply power to the equipment and observe if the interference goes away, or returns, when the unit is off or on. The user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult KVH for assistance.

IMPORTANT:

- To meet FCC requirements, shielded Ethernet cables are required to connect the TracNet Hub or Hub+ to the ship's network.
- This equipment contains no user serviceable parts. Opening this unit will violate the warranty and may result in this equipment no longer complying with FCC requirements for Class A digital devices.