KVH Industries, Inc.

GyroTrac™

Owner's Manual

GyroTrac Owner's Manual Addendum

The following information applies to Revision J of the GyroTrac Owner's Manual (KVH Part Number 54-0142).

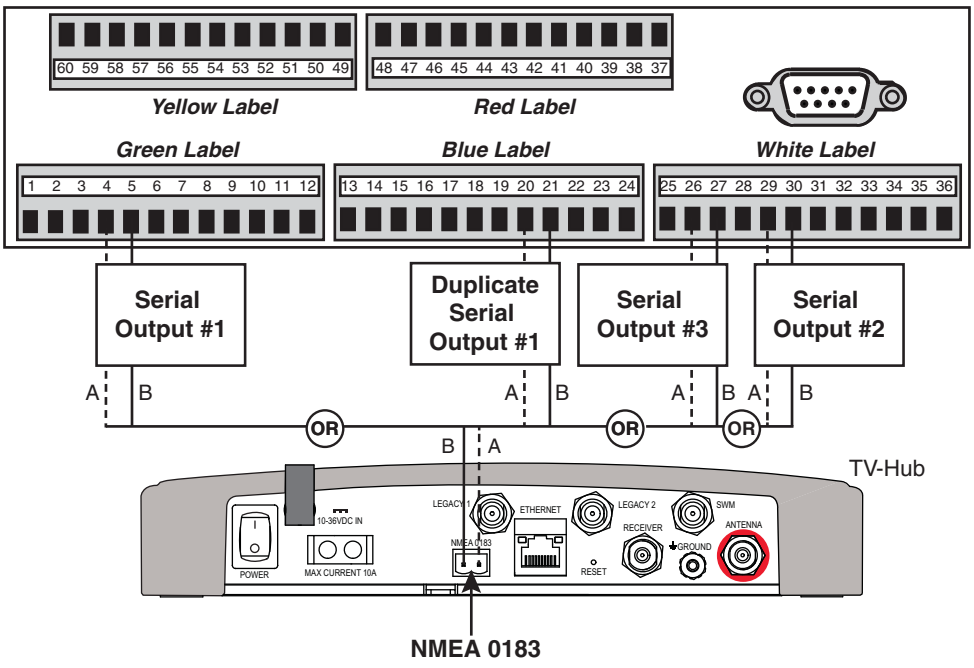
For owners of the TracVision G4, G6, M5, and M7 antennas, refer to your Owner's Manual or "Connecting to Legacy Antennas" on page 2.

For all TracVision® TV-series antennas, see below.

Supplying Heading Input to TracVision TV-series Antennas

For all TV-series antenna installations, if you would like to use the GyroTrac to supply heading input to the TV-Hub, the GyroTrac connects directly to the TV-Hub through the NMEA serial port as shown below. Be sure to configure the serial port for a NMEA output at 4800 baud and a HDM message type as described on pages 24-27 of the GyroTrac Owner's Manual.

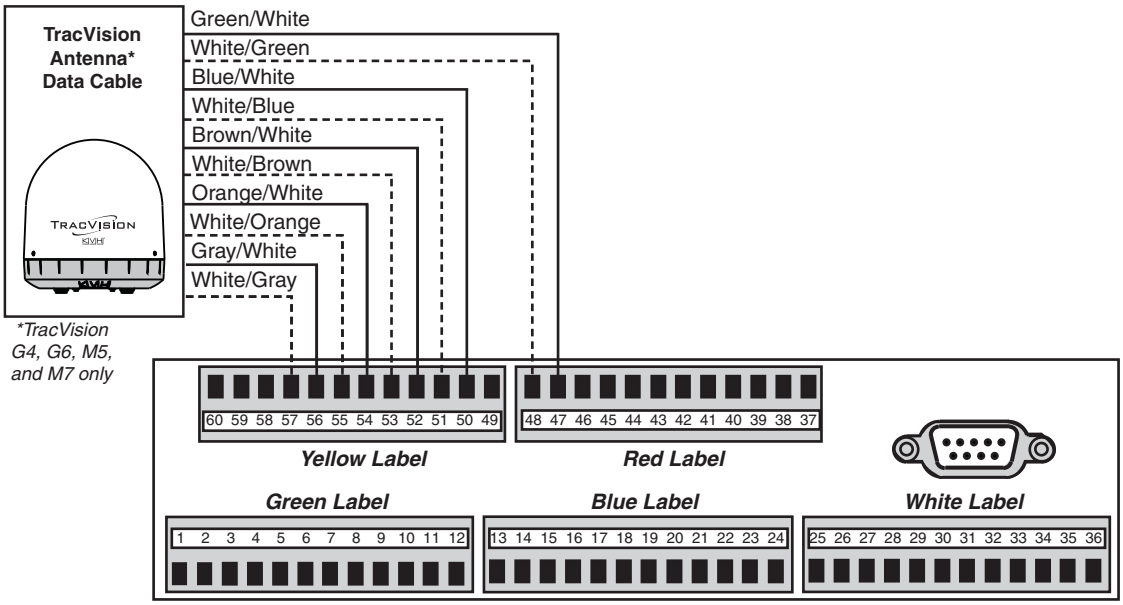
Figure 1: TV-Hub NMEA Input Locations



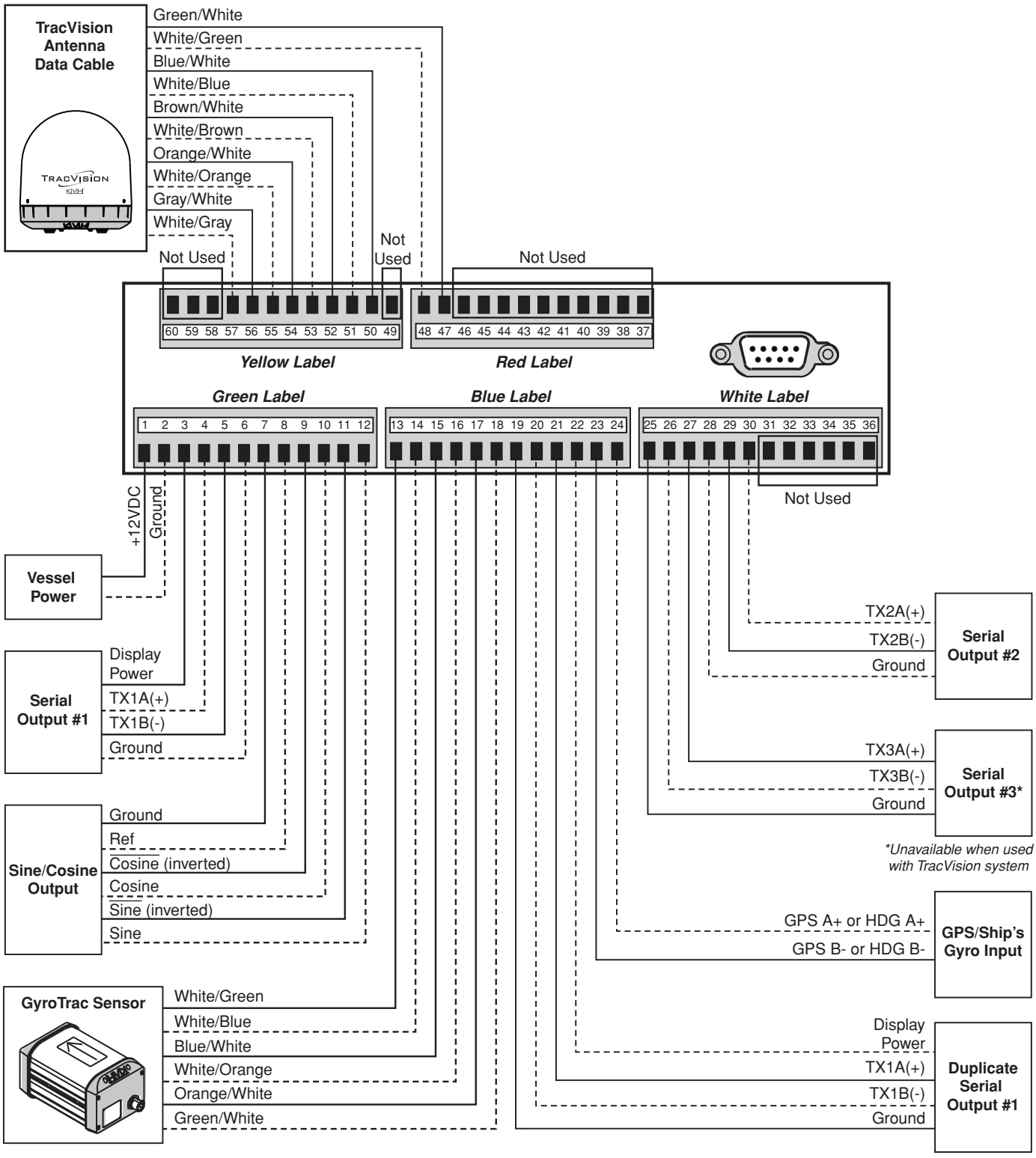
Connecting to Legacy Antennas

Connecting to a TracVision antenna as depicted in the GyroTrac Owner's Manual only applies to the TracVision G4, G6, M5, and M7 antennas.

Figure 2: TracVision Antenna Connection



GyroTrac™ ADCU Wiring Quick Reference Guide



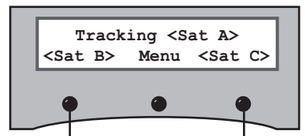
NOTE: This diagram refers to wires by **body color**/**stripe color**.
For example, *"Blue/White"* means the blue wire with white stripe.

ADCU (Advanced Digital Control Unit) Menu Quick Reference Guide

Display Types

(Press the Center Button To Access Menus)

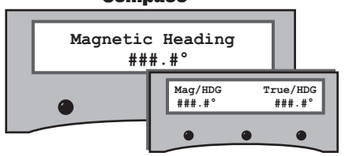
Antenna



Select Satellite B

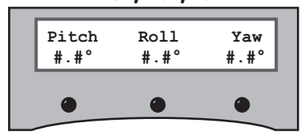
Select Satellite C

Compass*

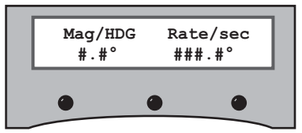


* True North Display requires GPS

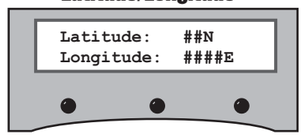
Pitch, Roll, Yaw



Rate of Turn



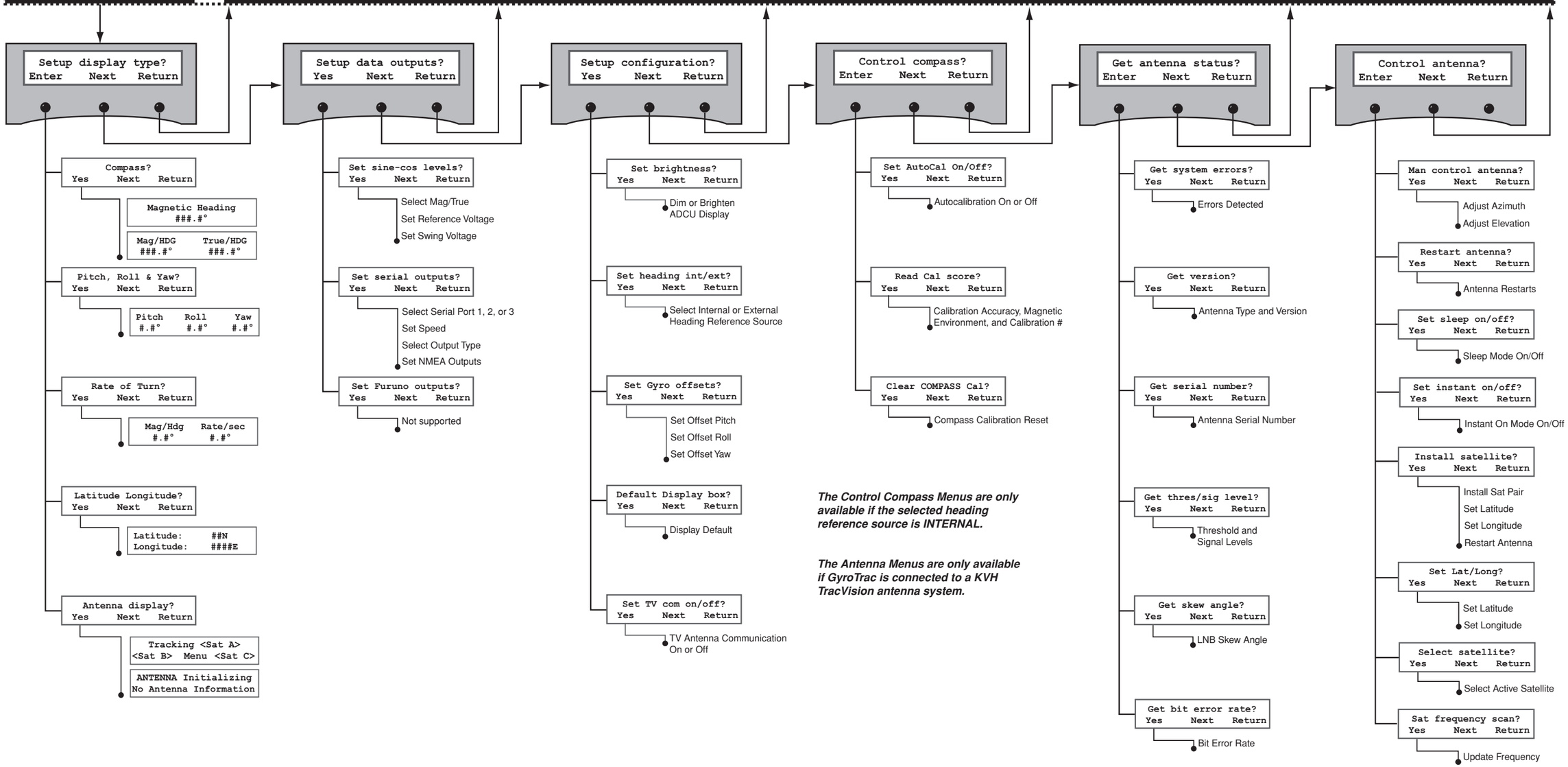
Latitude/Longitude†



† Lat/Long Display requires GPS

Menus

Return to Selected Display Type



The Control Compass Menus are only available if the selected heading reference source is INTERNAL.

The Antenna Menus are only available if GyroTrac is connected to a KVH TracVision antenna system.

GyroTrac
Owner's Manual

This manual provides all of the basic information you need to install, operate, set up, and troubleshoot the GyroTrac gyro-stabilized digital magnetic compass.

GyroTrac Serial Number

Please direct questions, comments, or suggestions to:

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

KVH Part # 54-0142 Rev. J

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A Position Grids

B ADCU Flush Mounting Template

1. Introduction

This chapter provides a basic overview of this manual and your GyroTrac system.

Contents

1

Using this Manual

This manual provides complete installation, operation, setup, and troubleshooting information for your GyroTrac system.

Who Should Use This Manual

The **installer** should refer to the "Installation" and "Calibration" chapters for information on installing and calibrating the system.

The **user** should refer to the "Basic Operation," "GyroTrac Functions," and "TracVision Functions" chapters to learn how to operate and set up the system.

The **user** and/or **servicing technician** should refer to the "Troubleshooting" chapter to help identify the cause of a system problem.

Notifications Used in this Manual

This manual uses the following notifications to call attention to important information:

CAUTION

This is a danger, warning, or caution notice. Be sure to read these carefully to avoid injury!

IMPORTANT!

This is an important notice. Be sure to read these carefully to ensure proper operation and configuration of your system.

NOTE: *Notes provide useful supplemental information.*

TIP: *Tips provide hints to get the most out of your system.*

Typographical Conventions

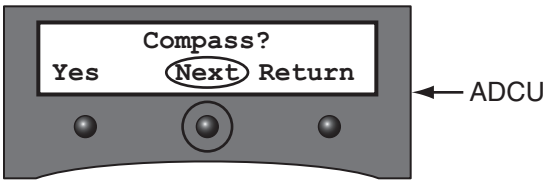
This manual uses the following typographical conventions:

Text Example	Description
`<Sat Name>` `###`	Text in brackets or the pound sign (#) indicates a variable field of the ADCU display
See "Adjusting Display Brightness" on page 59.	Cross-reference to another chapter in the manual or to a website

ADCU (Advanced Digital Control Unit) Interface Conventions

When instructions indicate to select a specific ADCU menu option, press the ADCU button located directly beneath the menu option on the display.

Figure 1-1 Example of ADCU Menu Option and Corresponding Button



Related Documentation

In addition to this User's Guide, the following documents are provided with your GyroTrac system:

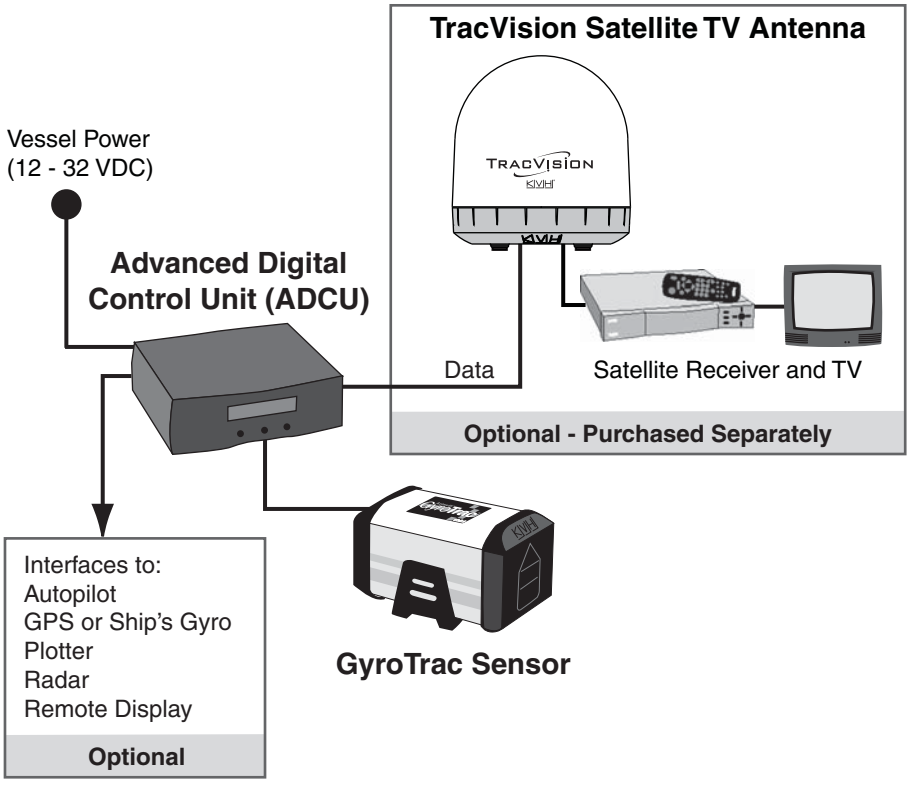
Document	Description
Product Registration Form	Details on registering the product
Warranty Statement	Warranty terms and conditions
Contents List	List of every part supplied in the kit

System Overview

Your GyroTrac system is designed for a variety of applications where an extremely accurate and reliable stabilized heading output is required. GyroTrac's heading output is free of incidental movement by the host platform such as the pitch, roll, and yaw inherent in all dynamic applications. GyroTrac, in fact, eliminates all platform motion except actual changes in magnetic heading. It accomplishes this by measuring pitch, roll, and yaw with its gyro, digital compass, and inclinometer, and correcting for these values in its microprocessor, effectively removing them. The result is an accurate (within ±1°), drift-free heading output.

Although GyroTrac can be used as a standalone heading sensor, it can also be integrated with a variety of other equipment, including radars, autopilots, plotters, remote displays, and computers. It is also fully compatible with the TracVision M5 and M7 satellite TV antenna systems. A basic system diagram is illustrated below.

Figure 1-2 GyroTrac System Diagram

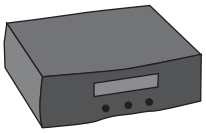


System Components

GyroTrac Sensor

The GyroTrac digital magnetic compass sensor provides a three-axis gyro-stabilized heading reference - allowing superior open water performance in any sea condition. It is also compliant with the IP67 standard; the unit is waterproof to a depth of 1 meter.

ADCU (Advanced Digital Control Unit)



The ADCU is the system's user interface, providing access to the system and its functions through an LCD and three buttons. The ADCU also serves as the system's junction box, allowing the system to use vessel power, interface with the GyroTrac sensor, and supply and receive data to/from the TracVision antenna and other onboard equipment.

2. Installation

This chapter explains how to install the GyroTrac system on a vessel. It explains how to mount the hardware, wire the components, and connect power.

Contents

Inspecting Parts and Getting Tools

Before you begin, follow these steps to make sure you have everything you need to complete the installation.

1. Unpack the box and ensure it contains everything shown on the *Kitpack Contents List*. Save the packaging for future use.
2. Carefully examine all of the supplied parts to ensure nothing was damaged in shipment.
3. Gather all of the tools and materials listed below. You will need these items to complete the installation.
   - Flat-head and Phillips-head screwdrivers
   - Electric drill and 1/8" (3.5 mm) and #29 drill bits
   - Light hammer and center punch
   - Adhesive tape
   - Scriber or pencil
   - Wire strippers and terminal lug crimper
   - Power cables for connecting power to the ADCU (see Figure 2-1)

Figure 2-1 Guidelines for Power Cables

Cable Length	Use Cable Gauge
< 40 ft (12 m)	14AWG (2.5mm^2)
40-70 ft (12-21 m)	12AWG (4mm^2)

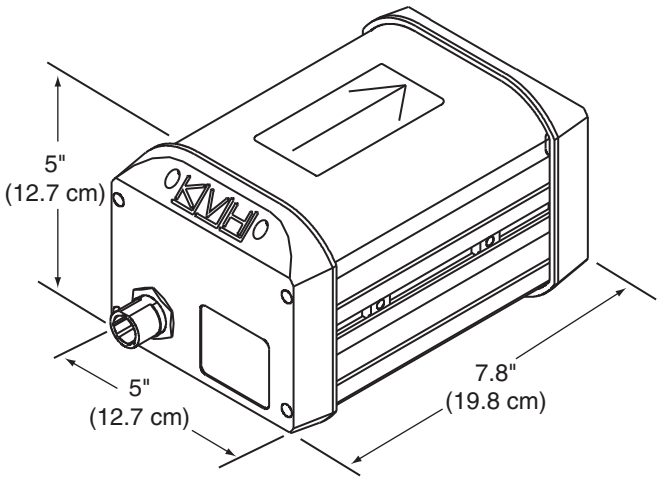
Planning the Installation

Before you begin, consider the following installation guidelines for the sensor and ADCU.

Sensor Mounting Guidelines

- Select a sensor mounting location in a dry area belowdecks as low as possible in the center of the vessel. Do not mount the sensor in a bilge. Sensor dimensions are provided below.

Figure 2-2 Sensor Dimensions



- Make sure the mounting surface does not flex and is rigid enough to withstand vibration.

- Select a location that is at least 4 ft (1.2 m) away from any magnetized materials, large ferrous masses, cranes, derricks, antennas, devices with DC motors, CRT monitors, loudspeakers, electric winches, high-amperage cables, or battery banks. The sensor performs best in a benign magnetic environment.

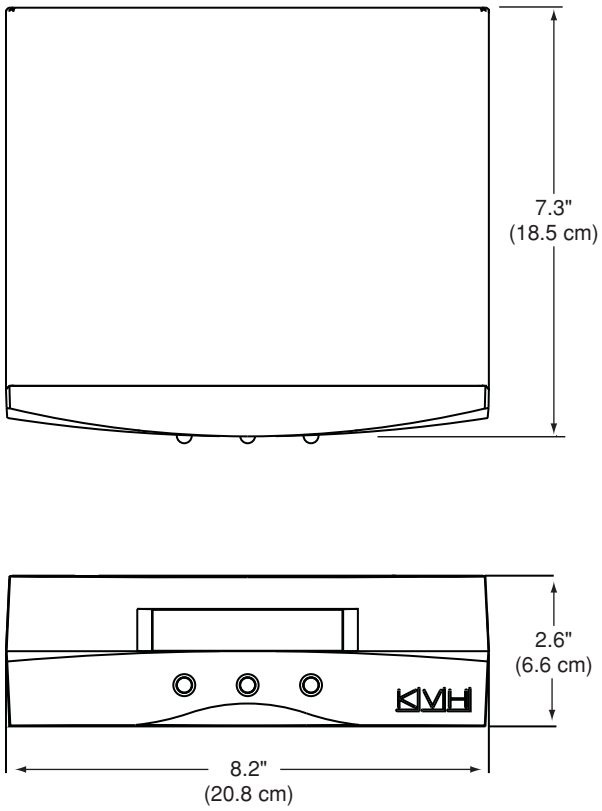
- If you need to fabricate custom mounting brackets, be sure to make them from a non-ferrous material, such as wood, brass, aluminum, fiberglass, or plastic. Also be sure to use stainless steel bolts or nails.

- If you are mounting the sensor on a steel vessel, enclose the sensor in a fiberglass container and use an aluminum, brass, plastic, or wood platform (NOT steel or iron) to position the sensor at least 4 ft (1.2 m) above and 6 ft (1.8 m) away from the steel surface.

ADCU Mounting Guidelines

- Select an ADCU mounting location in a dry, well-ventilated area belowdecks away from any heat sources or salt spray.
- Be sure the ADCU's front panel will be easily accessible to the user. The owner will use the ADCU's buttons to control the system.
- Be sure to leave enough room at the ADCU's rear panel for connecting the cables (see Figure 2-3 for ADCU dimensions).

Figure 2-3 ADCU Dimensions



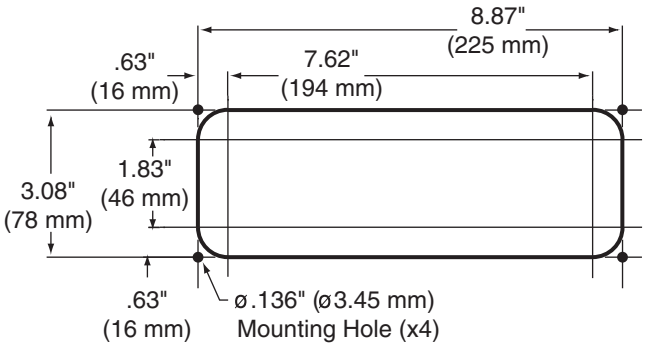
- Consider the lengths of the connecting cables. The ADCU must be located close enough to the GyroTrac sensor and the TracVision antenna (if installed) so that you can connect the supplied cables. The GyroTrac sensor cable is 30 ft (9 m).
- The kitpack contains parts for mounting the ADCU either to a horizontal surface (using Velcro) or to a vertical surface (using the supplied flush mount bracket).

Preparing the ADCU Mounting Site (Flush Mount only)

NOTE: Skip this step if you plan to mount the ADCU to a horizontal surface instead. Proceed to page 13.

1. Using the ADCU flush mounting template provided at the end of this manual (see *"Appendix B" on page 85*), mark and cut out a hole in the mounting surface to accommodate the flush mount bracket (see Figure 2-4).

Figure 2-4 ADCU Mounting Holes Layout



2. Using the same template, mark the locations for the four ADCU mounting holes.
3. Using a #29 drill bit, drill a 0.136" (3.45 mm) hole at the four mounting hole locations. Later, you will mount the ADCU using four #8 screws.

Mounting the Sensor

Follow these steps to mount the GyroTrac sensor using one of the following options:

Option 1 - Mount to a horizontal surface

Option 2 - Mount to a vertical surface

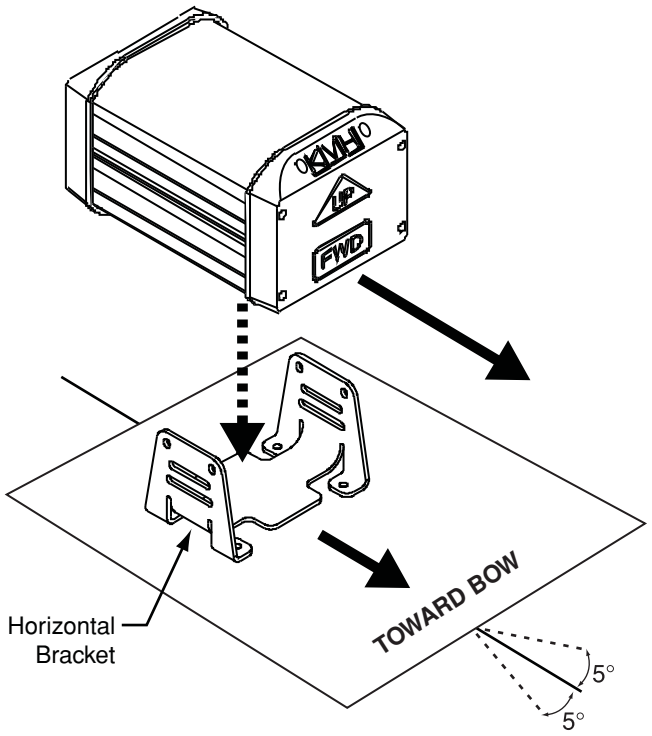
IMPORTANT!

If you cannot mount the sensor exactly level, you can enter offset values into the system later to compensate for a minor misalignment. See *"Entering Sensor Offset Values" on page 56* for details.

Option 1 - Mounting to a Horizontal Surface

1. Position the sensor on the mounting surface so that its forward ("FWD") reference points toward the bow and is parallel to the vessel's centerline within ±5° (see Figure 2-5).

Figure 2-5 Sensor Alignment

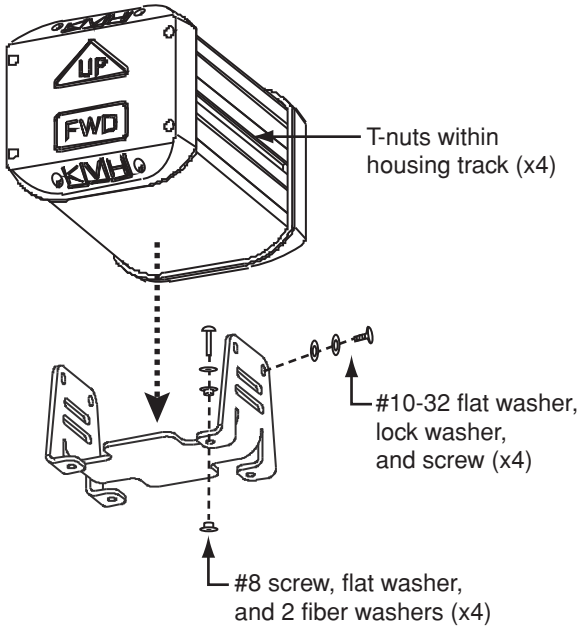


2. Place the horizontal bracket on the mounting surface and align it in the same manner as the sensor.

3. Using the holes in the bracket's mounting feet as a template, drill four 1/8" (3.5 mm) holes in the mounting surface. Later, you will attach the bracket to the mounting surface at these four holes.

4. At each of the four mounting feet, insert a #8 fiber washer from above, and insert a #8 fiber washer from below (see Figure 2-6). *The fiber washers will isolate the sensor from ground.*

Figure 2-6 Sensor Mounting to a Horizontal Surface



5. Secure the horizontal bracket to the mounting surface using four #8 screws and flat washers.

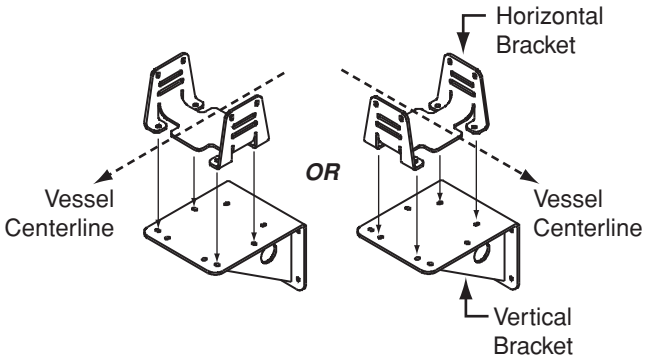
6. Place the sensor onto the bracket. Make sure the sensor's forward ("FWD") reference points toward the bow and its "Up" arrow points upward.

7. Secure the sensor to the horizontal bracket using four #10-32 screws, lock washers, and flat washers. Insert the screws into the four T-nuts held within the sensor's housing track.

Option 2 - Mounting to a Vertical Surface

1. The vertical bracket allows you to mount the sensor (within its horizontal bracket) either perpendicular or parallel to the mounting surface (see Figure 2-7). Be sure to orient the vertical and horizontal brackets so that the sensor's forward ("FWD") reference will point toward the bow and will be parallel to the vessel's centerline within ±5° (see Figure 2-5 on page 13). Also make sure the sensor will be level with the deck.

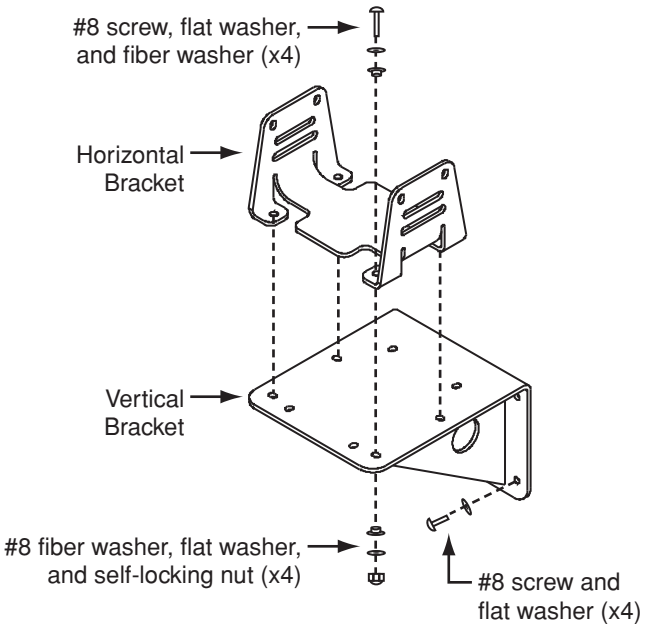
Figure 2-7 Bracket Orientation Options



2. Using the holes in the vertical bracket's mounting feet as a template, drill four 1/8" (3.5 mm) holes in the mounting surface.

3. Secure the vertical bracket to the mounting surface using four #8 screws and flat washers (see Figure 2-8).

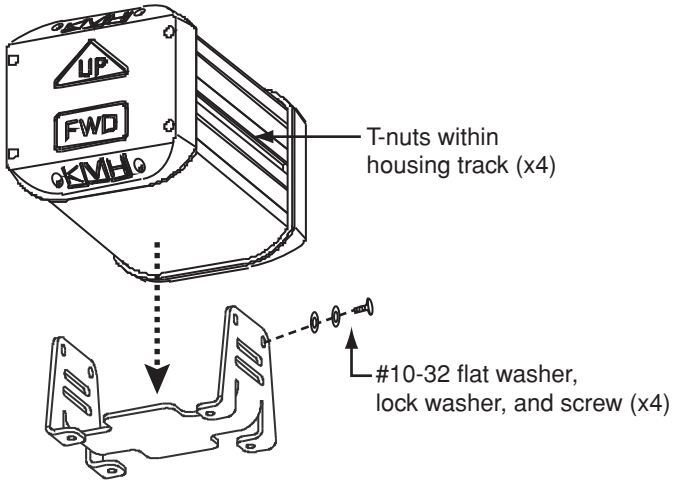
Figure 2-8 Bracket Mounting



4. Secure the horizontal bracket to the vertical bracket using four #8 screws, eight flat washers, eight fiber washers, and four self-locking nuts (see Figure 2-8). *The fiber washers will isolate the sensor from ground.*

5. Place the sensor onto the horizontal bracket (see Figure 2-9). Make sure the sensor's forward ("FWD") reference points toward the bow and its "Up" arrow points upward.

Figure 2-9 Sensor Mounting to a Vertical Surface



6. Secure the sensor to the horizontal bracket using four #10-32 screws, lock washers, and flat washers. Insert the screws into the four T-nuts held within the sensor's housing track.

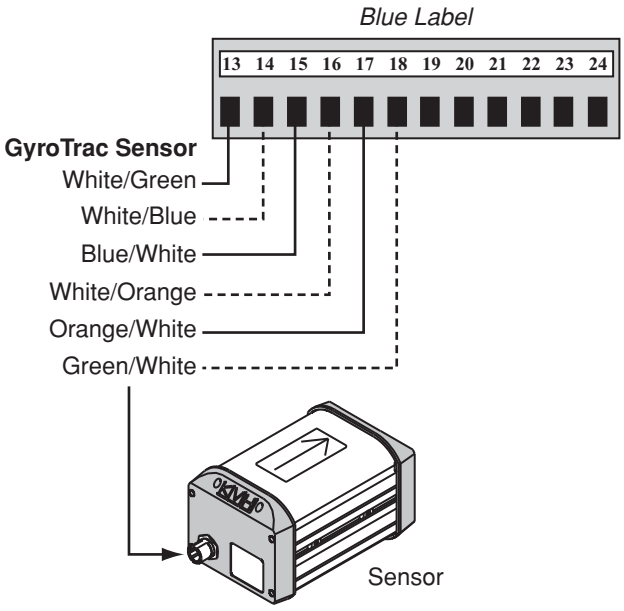
Connecting the Sensor

Follow these steps to connect the GyroTrac sensor to the ADCU.

NOTE: *A complete ADCU wiring diagram is provided on the inside front cover of this manual.*

1. Find the five terminal strip connectors in the kitpack. You will connect all system wires to these plastic connectors first. Later, you will plug them into the rear panel of the ADCU.
2. Connect the sensor cable to the GyroTrac sensor. Hand-tighten until the connector locks in place. Route the other end of the cable to the ADCU.
3. Connect the sensor cable to the **blue** ADCU terminal strip connector, as shown in Figure 2-10.

Figure 2-10 GyroTrac Sensor Wiring



IMPORTANT!

The diagram refers to wires by **body color/stripe color**. For example, "Blue/White" means blue wire with white stripe.

Connecting a TracVision System (Optional)

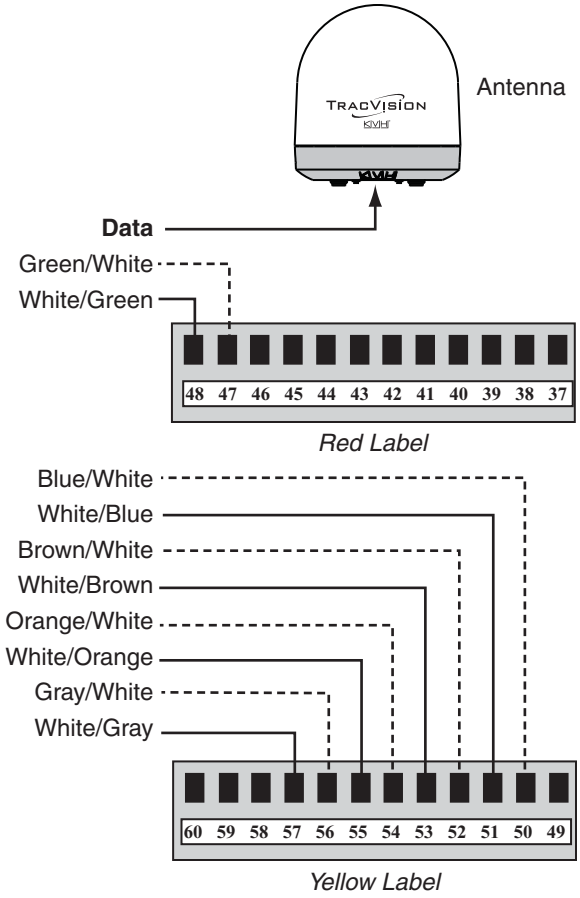
Follow these steps to connect the GyroTrac system to a TracVision satellite TV antenna.

1. First dress the antenna data cable from the antenna. Strip back the insulation of each wire approximately 1/4" (6 mm) and gently twist each wire to ensure a good electrical connection.
2. Connect the data cable from the antenna to the **red** and **yellow** ADCU terminal strip connectors, as shown in Figure 2-11. Be sure to snip and insulate any unused wires from the cable, including the drain wire (shield).

IMPORTANT!

The diagram refers to wires by **body color/stripe color**. For example, "Blue/White" means blue wire with white stripe.

Figure 2-11 TracVision Antenna Wiring

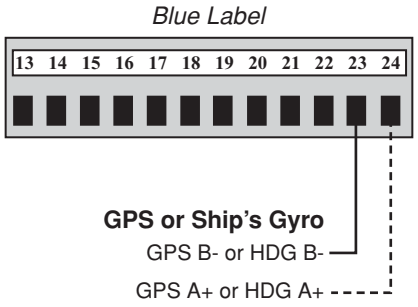


Connecting a GPS or Ship's Gyro (Optional)

Follow these steps to connect a GPS or ship's gyro to the ADCU. A GPS input will enable the GyroTrac system to calculate true north. If a TracVision antenna is connected, a GPS input will also speed up satellite acquisition.

Connect the GPS or ship's gyro to the blue ADCU terminal strip connector, as shown in Figure 2-12.

Figure 2-12 GPS or Ship's Gyro Wiring



NOTE: *You may change the GyroTrac system's heading reference source to the external ship's gyro. See* *"Selecting the Heading Reference Source" on page 58* *for details.*

Connecting External Devices (Optional)

In addition to TracVision and GPS connections, the ADCU rear panel includes five optional compass outputs of the following formats:

- **One** sine/cosine output
- **Three** serial outputs (each configurable for NMEA 0183, KVH RS-422, or Cetrek)

These compass outputs allow you to supply the GyroTrac sensor's heading data to other electronic devices, such as autopilots, radars, remote displays, plotters, and computers onboard the vessel.

NOTE: *KVH offers a rotating card display (KVH part #19-0120) for presenting sensor heading information. This device, powered by 11-40 VDC, connects to any one of the ADCU's serial outputs, configured for NMEA.*

Figure 2-13 Optional Rotating Card Display

Before you connect an external device, consider the following guidelines:

- The device must comply with NMEA Standard 2.2
- Data conductor wires should be minimum 18 AWG (0.75 mm^2), twisted-pair, stranded, tinned marine cable
- Do not use cables with wire diameters larger than 12 AWG (4 mm^2), since this is the largest gauge the ADCU accepts
- Always follow the manufacturer's wiring guidelines in the device's manual

Sine/Cosine Output

The sine/cosine output can be configured for a 3-wire or 4-wire sine/cosine output, commonly used with ComNav®, Robertson®, and other autopilot systems.

Before you connect the external device, consider the following important notes:

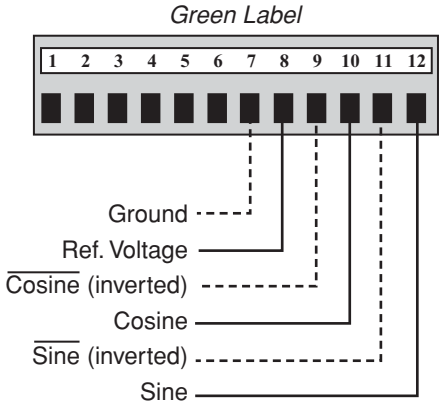
- The ADCU's sine/cosine reference voltage is an output, not an input. Do not connect this terminal (#8) to the reference output of the external device.
- If the device has its own internal reference voltage, do not connect the device to the ADCU's reference terminal (#8).
- Before you connect the device's internal ground wire to the ADCU, use a low-impedance voltmeter to verify there is no DC voltage present between the two terminals. A DC surge could damage the electronics.
- The maximum current draw from the ADCU sine/cosine output is 10 mA.
- The B&G 4-wire sine/cosine output (also known as "differential sine/cosine") is a substitute of the Halcyon® compass.

Sine/Cosine Output Wiring

In most cases, wire the device to the sine/cosine output as noted below (see Figure 2-14 on the next page).

External Device Wire:	**Connect to Green ADCU Terminal:**
Sine	12
Cosine	10
Internal power ground **(not chassis ground)**	7
Reference (input)	8 (KVH output)

Figure 2-14 Sine/Cosine ADCU Wiring



Sine/Cosine Output Configuration

Once you have finished the system installation, configure the ADCU's sine/cosine output for the desired heading format and the correct voltages for the external device.

1. Press the center **MENU** button on the ADCU to access the onscreen menu (see Figure 2-15 on the next page).
2. At "Setup display type?", press **NEXT** until the display shows "Setup data outputs?" Then press **ENTER** and press **YES** to confirm.
3. At "Set sine-cos levels?", press **YES**.
4. Now you need to select the desired heading format. At "Sine cosine is", press **MAG** to select magnetic heading, or press **TRUE** to select true heading. Then press **ENTER**.

> ***IMPORTANT!***
>
> If you did not connect a GPS to the system, only magnetic heading is available. If you connected a ship's gyro to the system, only true heading is available.

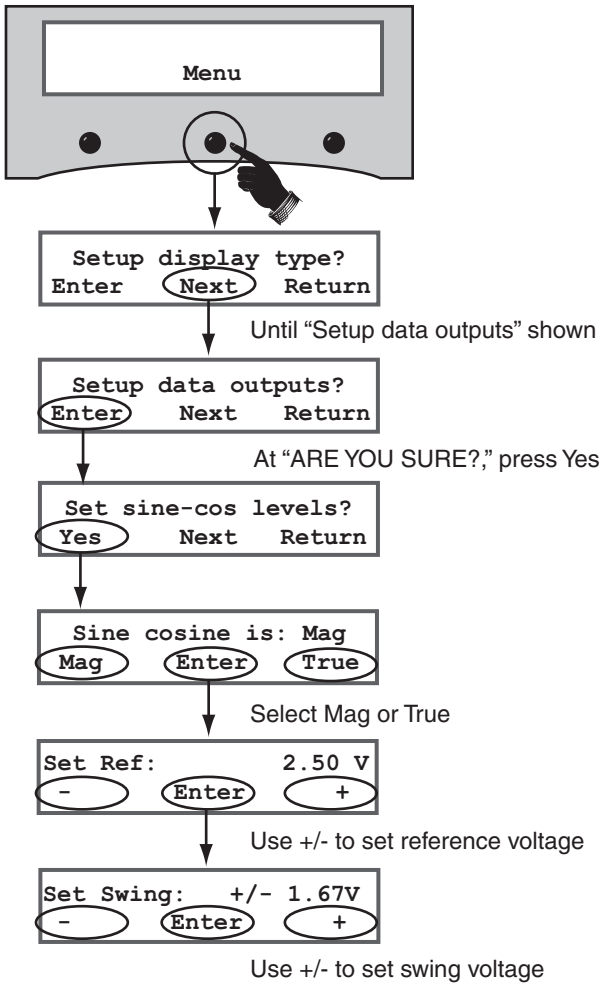
5. At "Set Ref", use the **-** and **+** buttons to set the reference voltage (0 - 6.5 volts). Then press **ENTER**.

TIP: *If you do not know the correct reference voltage for the external device, connect a voltmeter between the ADCU's reference terminal (#8) and the reference terminal on the external device. Then simply adjust the reference voltage on the ADCU until the voltmeter indicates zero volts (0 VDC).*

NOTE: *If you are using a B&G 4-wire sine/cosine output as a substitute for a Halcyon compass, set the reference voltage to 3.5 volts.*

6. At "Set Swing", use the **-** and **+** buttons to set the swing voltage (±0 - 6.5 volts). Then press **ENTER**.

Figure 2-15 Sine/Cosine Output Configuration Menus on ADCU



Serial Outputs

The three serial outputs can be individually configured for any of the following output types:

Type	Description
NMEA	• Conforms to NMEA 0183 version 2.20 standard • Selectable formats: BWC, GGA, GLL, HDG, HDM, HDT, VTG, and XTE • KVH rotating card display requires this type
KVH RS-422	• Supplies stabilized pitch, roll, and yaw data • Serial port #1 at 4800 baud; Serial port #2 and #3 at 4800 or 9600 baud • Usable in any device that can receive this data rate
Cetrek	• Proprietary format • Supplies stabilized heading data to a Cetrek autopilot device

Serial Output Wiring

Connect the external device(s) to the desired ADCU serial output(s), as shown in the figures on the following page.

NOTE: *The ADCU also provides a pass-through duplicate of serial port #1.*

IMPORTANT!

The ADCU's third serial output is disabled when the sensor is connected to a TracVision system. Serial port #3 is only used in a standalone GyroTrac installation.

Figure 2-16 Serial Port #1 ADCU Wiring

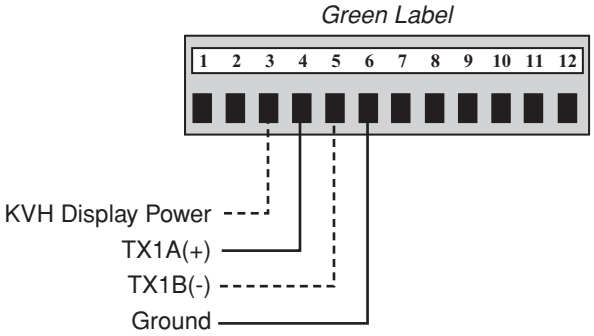


Figure 2-17 Serial Port #2 ADCU Wiring

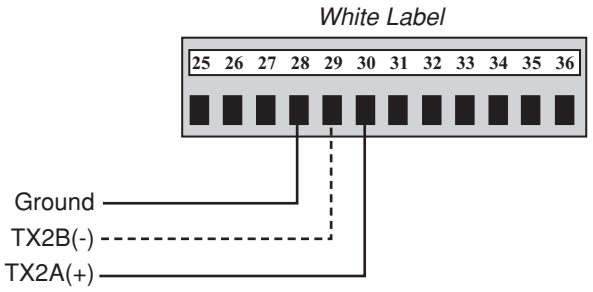


Figure 2-18 Serial Port #3 ADCU Wiring

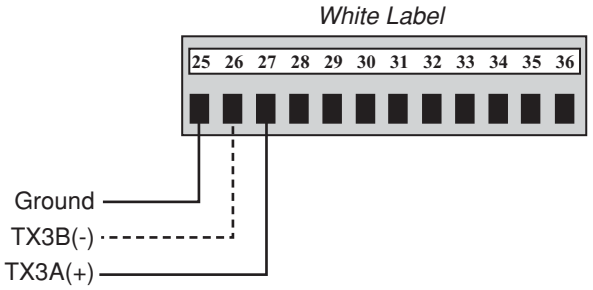
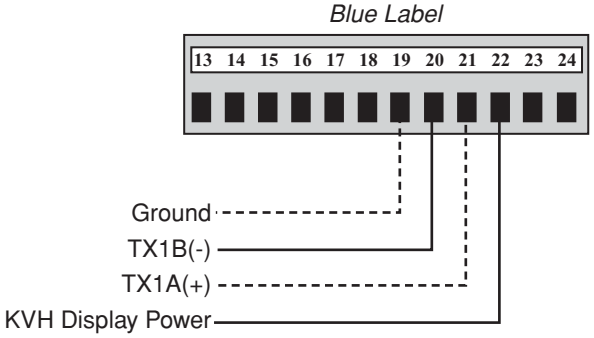


Figure 2-19 Duplicate Serial Port #1 ADCU Wiring



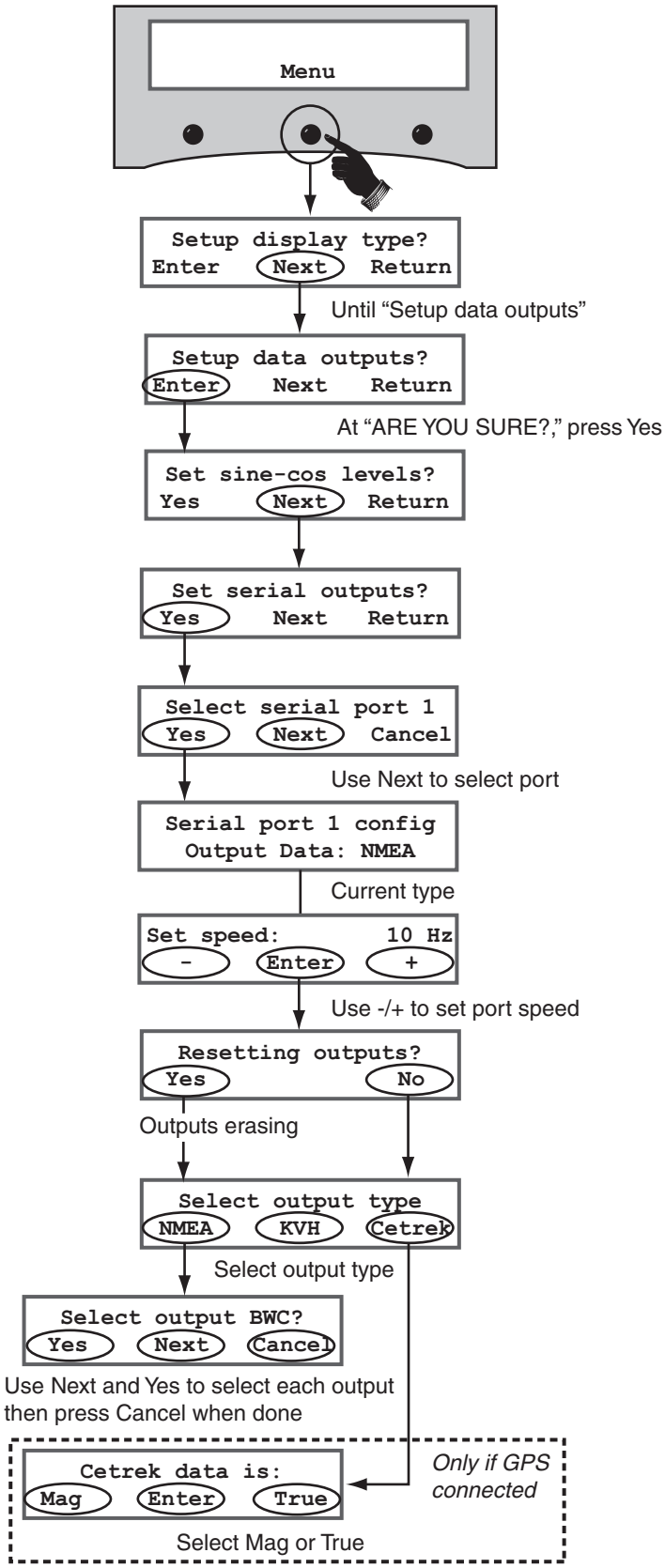
Serial Output Configuration

Once you have finished the system installation, configure the ADCU's serial outputs for the desired port speed and output type.

1. Press the center **MENU** button on the ADCU to access the onscreen menu (see Figure 2-20 on the next page).
2. At "Setup display type?", press **NEXT** until the display shows "Setup data outputs?" Then press **ENTER** and press **YES** to confirm.
3. At "Set sine-cos levels?", press **NEXT** until the display shows "Set serial outputs?" Then press **YES**.
4. At "Select serial port", press **NEXT** until the display shows the serial port number you want to configure. Then press **YES**.
5. At "Set Speed", use the **-** and **+** buttons to set the speed of the serial port (1 Hz - 20 Hz). Then press **ENTER**.
6. At "Resetting outputs?", press **YES**.
7. Now you need to set the output type for the selected serial port. At "Select output type", press **NMEA**, **KVH**, or **CETREK** to select the corresponding output type.
8. If you selected NMEA, select the desired NMEA message format(s). At "Select output", press **NEXT** until the display shows the desired format (BWC, GGA, GLL, HDG, HDM, HDT, VTG, or XTE). Then press **YES**. You may select as many messages as you wish. When you are done, press **CANCEL**.
9. If you selected Cetrek, and a GPS is connected, select the desired heading format. At "Cetrek data is", press **MAG** to select magnetic heading, or press **TRUE** to select true heading. Then press **ENTER.**

NOTE: *The baud rate for serial port #1 is always set to 4800 baud. The baud rates for serial port #2 and #3 are automatically set to 4800 baud (NMEA or Cetrek) or 9600 baud (KVH RS-422).*

Figure 2-20 Serial Port Configuration



Serial Output Message Formats

This section shows various serial message formats for easy reference.

NMEA1 Magnetic Heading (HDM) Format

Communication: 4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Update rate: 1-20 Hz, selectable

Sentence type: $HCHDM,XXX.X,M,*hh<cr><lf>

HCHDM	NMEA talker and sentence ID
XXX.X	Stabilized magnetic heading in degrees and tenths
M	Mag. heading, ASCII hex 0x4D
*	ASCII hex 0x2A
hh	Checksum
<cr>	Carriage return, ASCII hex 0x0D
<lf>	Line feed, ASCII hex 0x0A

NMEA2 Magnetic Heading (HDG) Format

Communication: 4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Update rate: 1-20 Hz, selectable

Sentence type: $HCHDG,XXX.X,*hh<cr><lf>

HCHDG	NMEA talker and sentence ID
XXX.X	Stabilized magnetic heading in degrees and tenths
*	ASCII hex 0x2A
hh	Checksum
<cr>	Carriage return, ASCII hex 0x0D
<lf>	Line feed, ASCII hex 0x0A

NMEA3 True Heading (HDT) Format

Communication: 4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Update rate: 1-20 Hz, selectable

Sentence type: $HCHDT,XXX.X,T,*hh<cr><lf>

HCHDT	NMEA talker and sentence ID
XXX.X	Stabilized true heading in degrees and tenths
T	True heading, ASCII hex 0x54
*	ASCII hex 0x2A
hh	Checksum
<cr>	Carriage return, ASCII hex 0x0D
<lf>	Line feed, ASCII hex 0x0A

KVH Special RS-422 Format (Set at factory only)

Communication: 9600 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Update rate: 1-20 Hz, selectable

Sentence type: %AAAA,BBBB,CCCC<cr><lf>

%	Sentence ID
AAAA	Stabilized pitch attitude in tenths of degrees
BBBB	Stabilized roll attitude in tenths of degrees
CCCC	Stabilized magnetic azimuth in tenths of degrees
<cr>	Carriage return, ASCII hex 0x0D
<lf>	Line feed, ASCII hex 0x0A

Cetrek Format

Communication: 4800 baud, 1 start bit, 8 data bits, 1 stop bit, no parity

Update rate: 1-20 Hz, selectable

Sentence type: $$MSB LSB B C Status D<cr><lf>

MSB LSB	Binary value 0-1023, equal to 0.0-359.6 degrees stabilized magnetic heading
B	ASCII hex 0x00
C	ASCII hex 0x00
Status	ASCII hex 0x43
D	ASCII hex 0xAA
<cr>	Carriage return, ASCII hex 0x0D
<lf>	Line feed, ASCII hex 0x0A

Connecting Power

Follow these steps to connect power to the ADCU.

1. Before you begin, disconnect vessel power.

> **CAUTION**
>
> For your own safety, disconnect vessel power and make sure the circuit is dead before you connect any power wires.

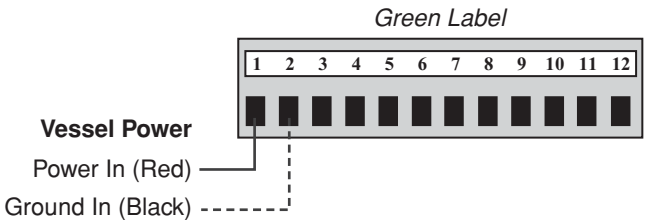
2. Connect a power cable to 12-32 VDC vessel power (for cable specifications, see *Figure 2-1 on page 9*).

> ***IMPORTANT!***
>
> The GyroTrac system is not designed to power the TracVision antenna. If you are installing a TracVision antenna, connect its antenna power cable to vessel power, not to the ADCU.

3. KVH recommends you install a circuit breaker between vessel power and the ADCU. The ADCU does not have an on/off switch.

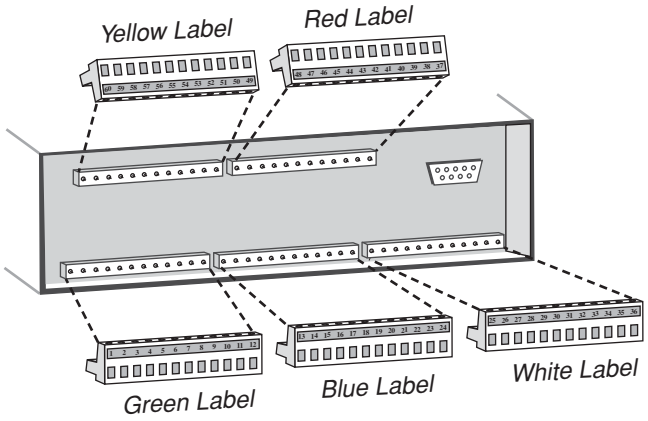
4. Connect your vessel power wires to the power (+) and ground (-) terminals on the **green** ADCU terminal strip connector, as shown in Figure 2-21.

Figure 2-21 Wiring Vessel Power to the ADCU



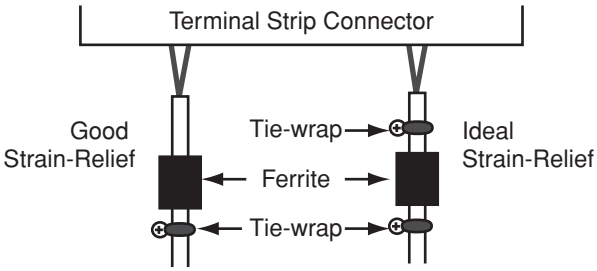
5. Plug all of the terminal strip connectors into the rear panel of the ADCU. Be sure to plug them into their correct positions, as shown in Figure 2-22.

Figure 2-22 Plugging In the ADCU Terminal Strip Connectors



6. Using tie-wraps, strain-relieve all wires at the ADCU. If a ferrite is installed on the cable, position the ferrite as close as possible to the terminal strip connections and strain-relieve the wires next to the ferrite (see Figure 2-23). Also be sure to allow just enough slack in the cables for easy serviceability.

Figure 2-23 Effective Strain-Relief of ADCU Wires



IMPORTANT!

Double-check all of your wiring before continuing. If wiring is incomplete or incorrect, electronics may become damaged when you apply power.

Mounting the ADCU

Follow these steps to mount the ADCU using one of the following options:

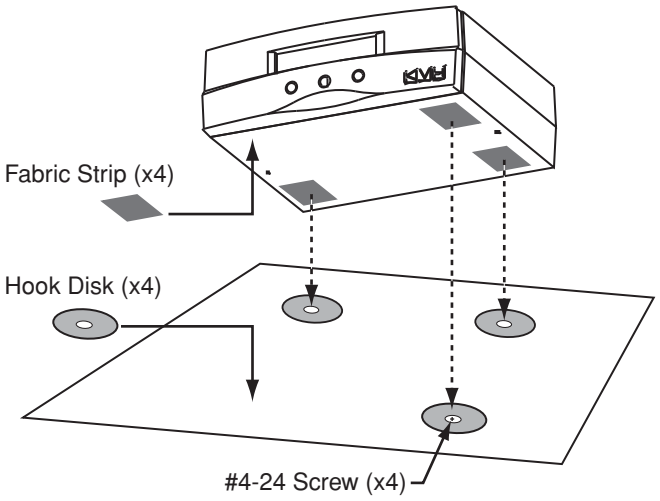
Option 1 - Velcro mount to a horizontal surface

Option 2 - Flush mount to a vertical surface

Option 1 - Velcro Mounting

1. Clean and dry the bottom of the ADCU and the mounting surface (use a mild detergent).
2. Peel the backing from the four supplied Velcro fabric squares and stick them to the bottom corners of the ADCU (see Figure 2-24).

Figure 2-24 Velcro Mounting the ADCU to a Horizontal Surface

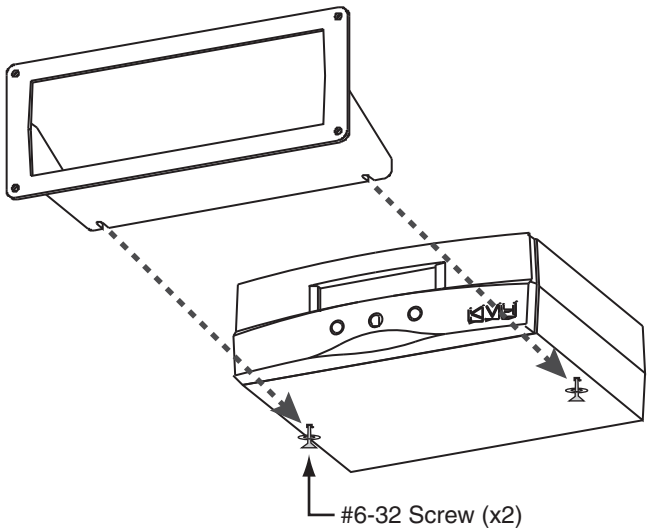


3. Position the four Velcro hook disks onto the mounting surface. Drill screw holes for the disks and secure in place with #4-24 screws.
4. Press the ADCU firmly into place so the fabric's loop material engages the hook disks.

Option 2 - Flush Mounting

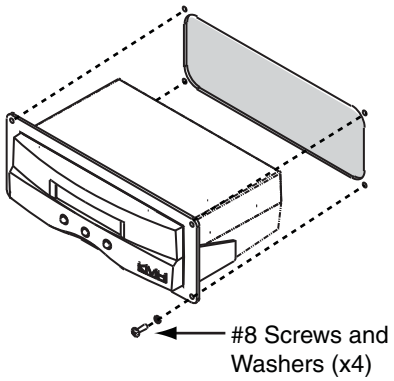
1. At the bottom of the ADCU, loosen the two #6-32 screws (see Figure 2-25).

Figure 2-25 Flush Mount Bracket



2. Slide the flush mount bracket backward onto the ADCU until the two notches in the bracket engage the screws at the bottom of the ADCU.
3. Tighten the screws to secure the bracket to the ADCU.
4. Earlier, you cut out the mounting hole in the mounting surface (see *"Preparing the ADCU Mounting Site (Flush Mount only)" on page 12*). Now insert the ADCU and bracket assembly into this mounting hole and secure in place with four #8 screws and washers (see Figure 2-26).

Figure 2-26 Flush Mounting the ADCU to a Vertical Surface



3. Calibration

This chapter explains how to calibrate the GyroTrac sensor to ensure optimum heading accuracy.

Contents

Calibration Requirements

Every GyroTrac sensor is calibrated at the factory for a perfect-world environment. However, hard and soft iron effects on your vessel can distort the magnetic field around the sensor, causing errors in its reported heading. To compensate for these magnetic distortions, the sensor must be calibrated using its autocalibration function whenever one of the following conditions occur:

- Initial installation
- Sensor is moved to a new mounting location
- New equipment is installed near the sensor
- Equipment near the sensor is removed

To calibrate the sensor, you will need to perform the following steps:

- Clear the existing calibration score *(not necessary for initial installation)*
- Turn on Autocalibration *(not necessary for initial installation)*
- Run the Autocalibration function
- Check the calibration score
- Turn off Autocalibration

IMPORTANT!

If the system is currently configured to use an external compass, you must set the TracVision system to use an internal heading reference before performing this procedure. See *"Selecting the Heading Reference Source" on page 58* for details.

Clearing the Calibration Score

To clear the calibration score from a previous calibration, follow the process shown in Figure 3-1.

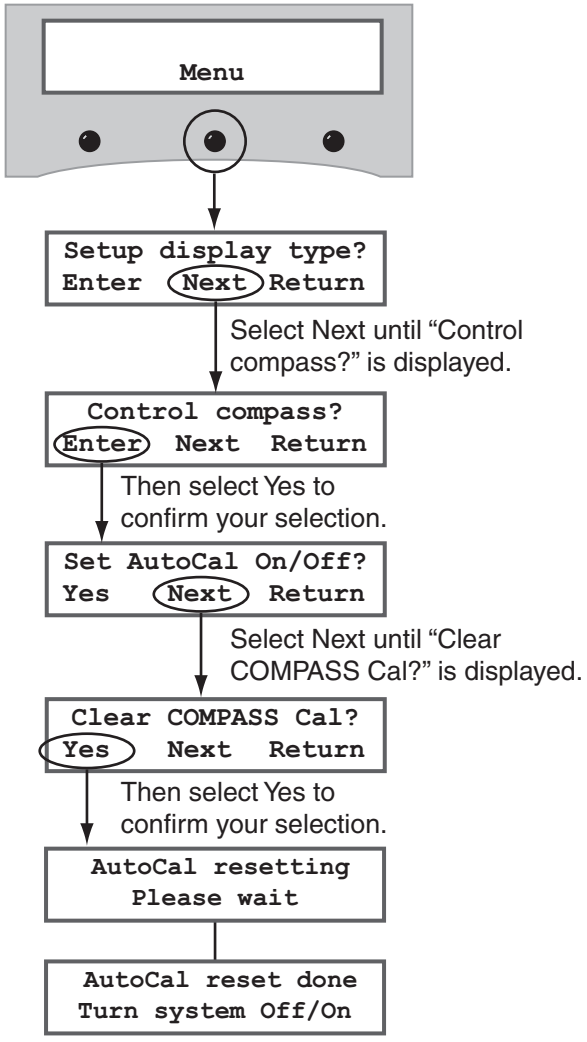
IMPORTANT!

If you are installing the GyroTrac out of the box, you may skip this step. There is no previous calibration score to clear.

NOTE: *If the ADCU displays a "System Halted Power System Off/On" message, turn the system off, wait 10 seconds, then turn the system on. Wait one minute for initialization before restarting the procedure.*

NOTE: *Be sure to turn the system off after completing this procedure. Wait 10 seconds, then turn the system on.*

Figure 3-1 Clearing the Existing Calibration Score



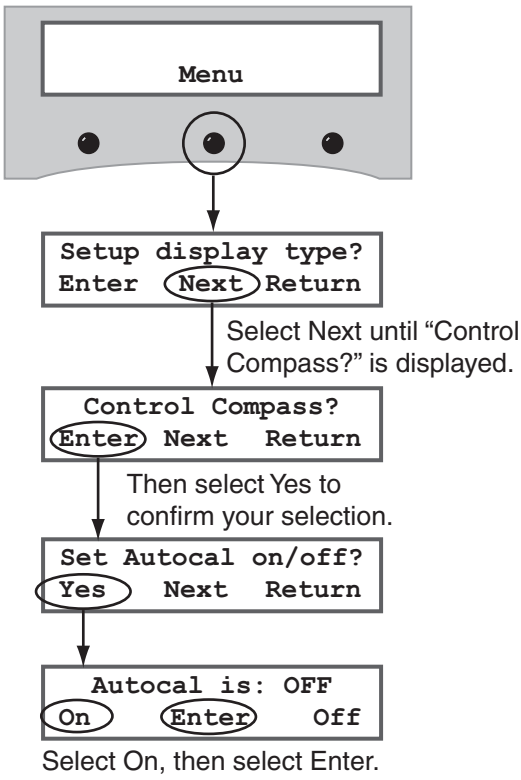
Turning On Autocalibration

To turn on the Autocalibration function, follow the process shown in Figure 3-2. The Autocalibration function allows the sensor to calibrate itself automatically.

IMPORTANT!

If you are installing the GyroTrac out of the box, you may skip this step. The GyroTrac's Autocalibration function is set to "On" at the factory.

Figure 3-2 Autocalibration Setting



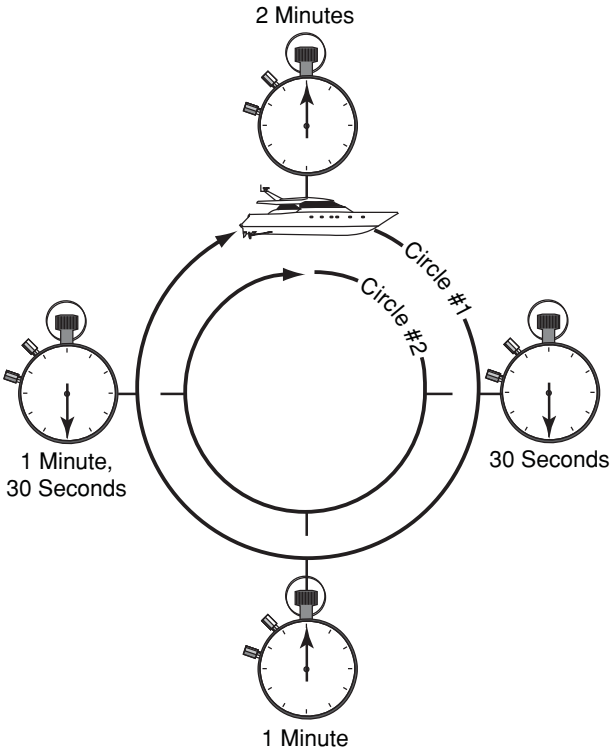
Running the Autocalibration Function

Follow the steps below to steer the vessel slowly through two circles, allowing the sensor's Autocalibration function to achieve a good calibration score.

1. Select a calm day and navigate the vessel to a clear area. Excessive pitching and rolling can distort calibration data.
2. Apply power to the GyroTrac system.
3. Just before you begin, note the vessel's heading. You will need this information in the next step.
4. Steer the vessel at a slow, steady speed through two full circles that take at least two minutes each to complete. Use the heading information that you recorded earlier to confirm that you completed each full circle (see Figure 3-3).

   TIP: *Try to time your turns so that it takes approximately 30 seconds to turn 90º. The circles do not have to be completely round, but make sure you turn a full 360º for each circle.*

Figure 3-3 Running Autocalibration



Checking the Calibration Score

Once you have completed the two circles, follow the process shown in Figure 3-4 to check the calibration "score." Figure 3-5 on the next page explains how to interpret this score. Verify that the calibration yielded acceptable results. If not, you will need to recalibrate.

Figure 3-4 Displaying the Calibration Score

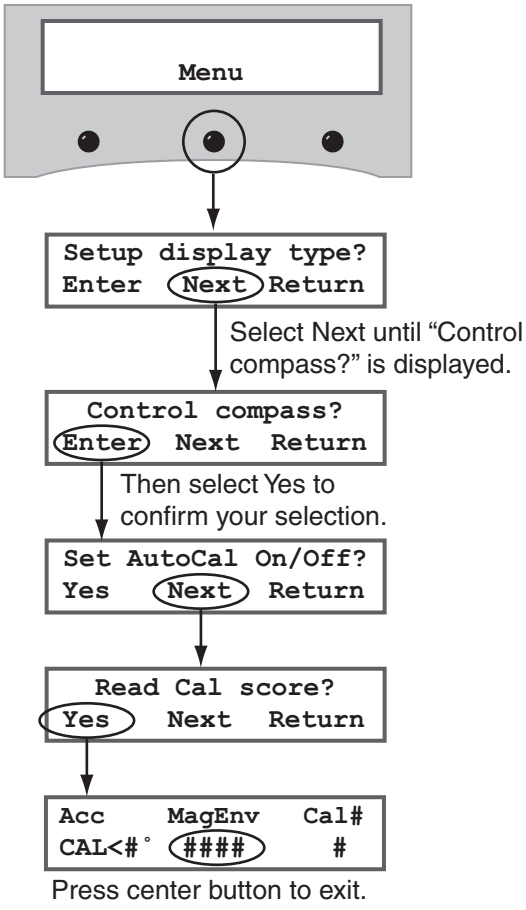
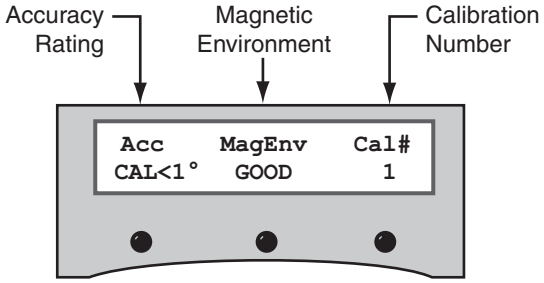


Figure 3-5 Calibration Score (Example) and Description



Data Field	Description
Accuracy Rating	Degree of accuracy the sensor will provide. (CAL<1° = within 1°) If "BAD CAL," recalibrate the sensor by navigating through two additional circles. Repeat until you achieve a suitable accuracy rating.
Magnetic Environment	Quality of the sensor's installation site. If "POOR" or "BAD," relocate the sensor to a more favorable magnetic environment. Then clear the calibration score and recalibrate the sensor.
Calibration Number	Number of times the sensor was calibrated.

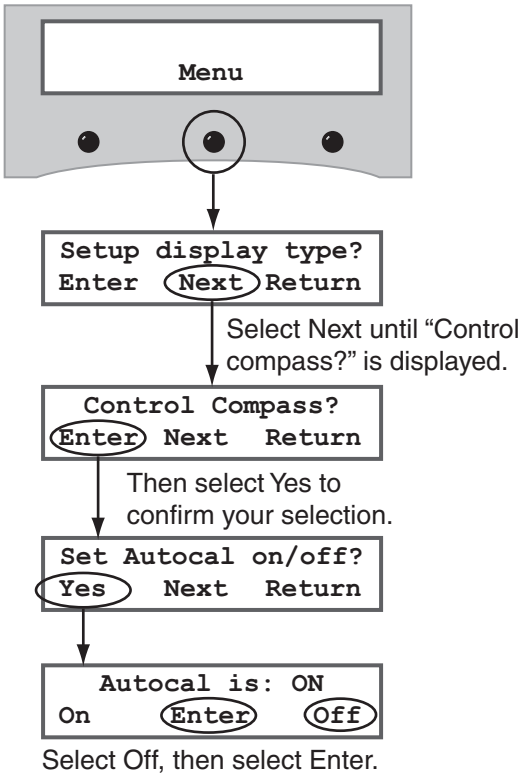
IMPORTANT!

The Magnetic Environment field shows the best calibration that has been achieved since the last time the calibration score was cleared. It does not necessarily show the result from the latest calibration (indicated by the calibration number). For this reason, you need to clear the calibration score prior to recalibrating the sensor.

Turning Off Autocalibration

Once you have achieved a good calibration score, follow the process shown in Figure 3-6 to turn off the Autocalibration function.

Figure 3-6 Autocalibration Setting



4. Basic Operation

This chapter explains how to select a display type, access the system menu, and switch satellites using the ADCU buttons.

Contents

4

ADCU Display Options

When you apply power to the GyroTrac system, the ADCU shows a series of startup and test status messages. Once initialization is complete, the ADCU shows the last selected data display. You can choose from five different types of data displays:

- Antenna
- Compass
- Pitch, Roll, and Yaw
- Rate of Turn
- Latitude/Longitude

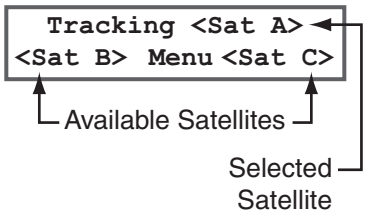
This section details the information that is available on each of these display types.

Antenna Display

NOTE: *The Antenna display is available only if a TracVision antenna is connected to the system.*

This display shows which satellite the antenna is tracking. It also shows the alternate satellites, if any, that are available.

Figure 4-1 Antenna Display Type



Compass Display

This display shows the vessel's heading.

If a GPS is connected to the system, and the GPS was properly initialized (it was receiving valid position data upon GyroTrac startup), the ADCU shows both magnetic heading and true heading.

Figure 4-2 Compass Display with Valid GPS

If a GPS is not connected, or if it was not receiving valid data during system startup, the ADCU shows just the magnetic heading.

Figure 4-3 Compass Display Without Valid GPS

Pitch, Roll, and Yaw Display

This display shows the vessel's pitch, roll, and yaw.

Figure 4-4 Pitch, Roll, and Yaw Display

Rate of Turn Display

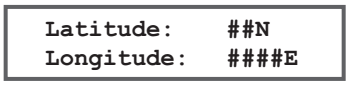
This display shows the vessel's magnetic heading and rate of turn.

Figure 4-5 Rate of Turn Screen

Latitude/Longitude Display

If a GPS is connected to the system, and the GPS was properly initialized (it was receiving valid position data upon GyroTrac startup), the ADCU shows the vessel's latitude and longitude.

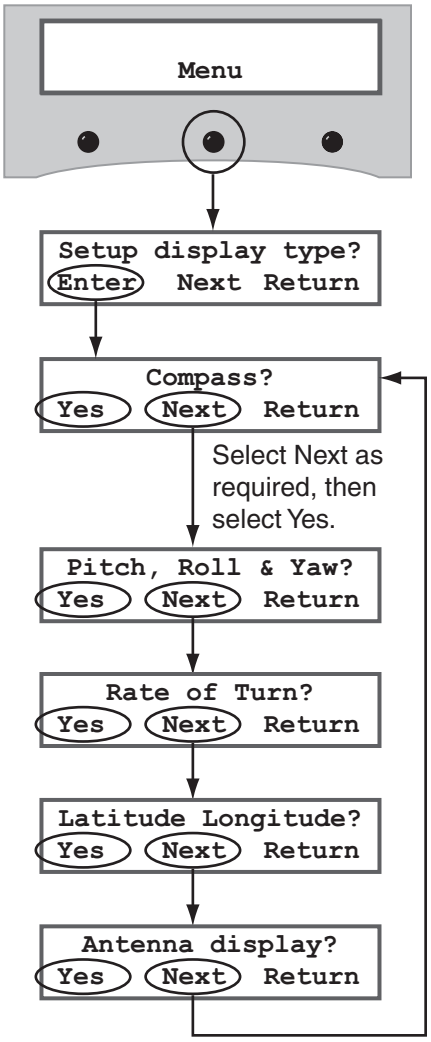
Figure 4-6 Latitude/Longitude Screen



Selecting a Display Type

To select one of the five display types, follow the process shown in Figure 4-7.

Figure 4-7 Display Type Selection Menu



ADCU Button Functions

You can configure and control all GyroTrac functions using the three buttons on the ADCU front panel.

Main Menu

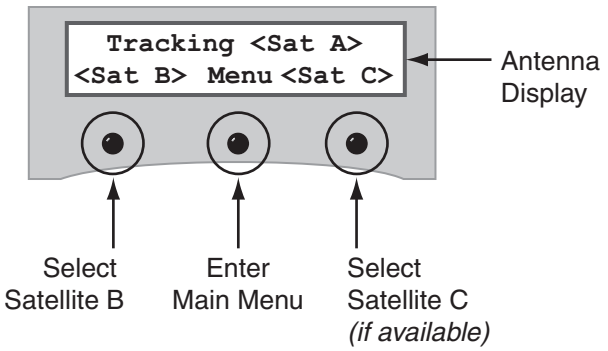
To access the main menu, press the **center** button.

Once you have entered the menu, the functions of the three ADCU buttons are determined by the text displayed directly above them on the screen. Chapters 5 and 6 explain all of the available menu functions, and a menu quick reference guide is provided on the inside front cover of this manual.

Selecting Satellites

If a TracVision antenna is connected to the system, you can manually switch between its installed satellites using the left and right buttons on the ADCU (see Figure 4-8). Simply press the button below the name of the desired satellite.

Figure 4-8 Button Functions



NOTE: *If you use the ADCU to manually switch between satellites, automatic satellite switching is disabled until the system is restarted.*

5. GyroTrac Functions

This chapter explains the menu functions available for configuring the GyroTrac system.

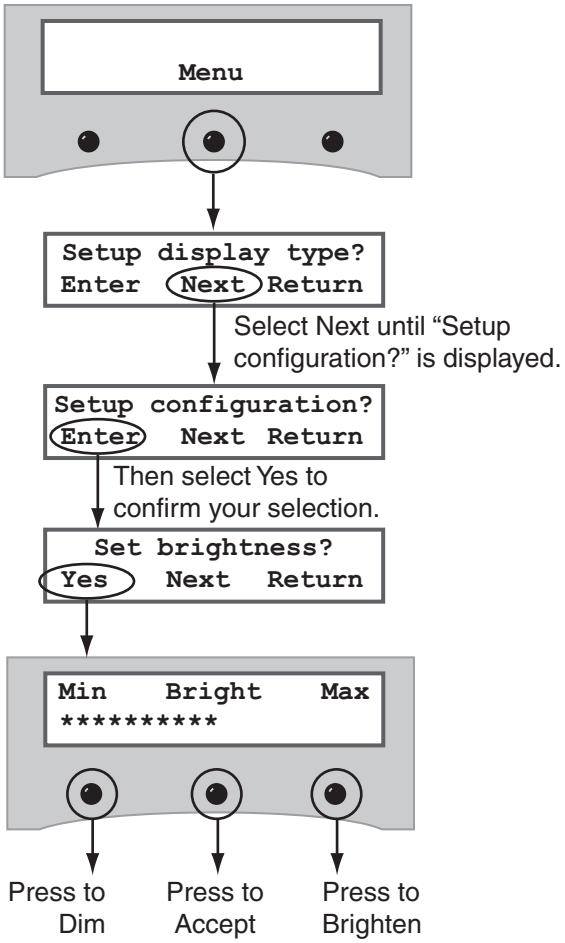
Contents

5

Adjusting Display Brightness

To adjust the brightness of the ADCU's display, follow the process shown in Figure 5-1.

Figure 5-1 Setting Display Brightness



Entering Sensor Offset Values

The GyroTrac sensor must be mounted as close to level in pitch and roll as possible, with its long axis parallel to the vessel's centerline (see *"Mounting the Sensor" on page 13*). If the GyroTrac sensor was not mounted according to these guidelines, you need to adjust the sensor's offset values to compensate for variances in the sensor's measured pitch, roll, and yaw.

TIP: *The maximum offset values for pitch and roll are ±45°; the maximum offset value for azimuth is ±180°.*

NOTE: *Pitch, roll, and yaw settings are determined by the GyroTrac sensor, not external hardware.*

IMPORTANT!

This procedure must be performed while the vessel is stopped in calm water.

Step 1 - Zero All Offset Values

Follow the process shown in *"Setting Sensor Offset Values" on page 57* to enter zeros for all measurements.

Step 2 - Record the Difference in Offset Values

Now you need to record the difference in the offset values displayed. Navigate to the Pitch, Roll, and Yaw display. Then record the values displayed for pitch, roll, and yaw (see *"Pitch, Roll, and Yaw Display" on page 48*).

Step 3 - Enter Inverse Offset Values

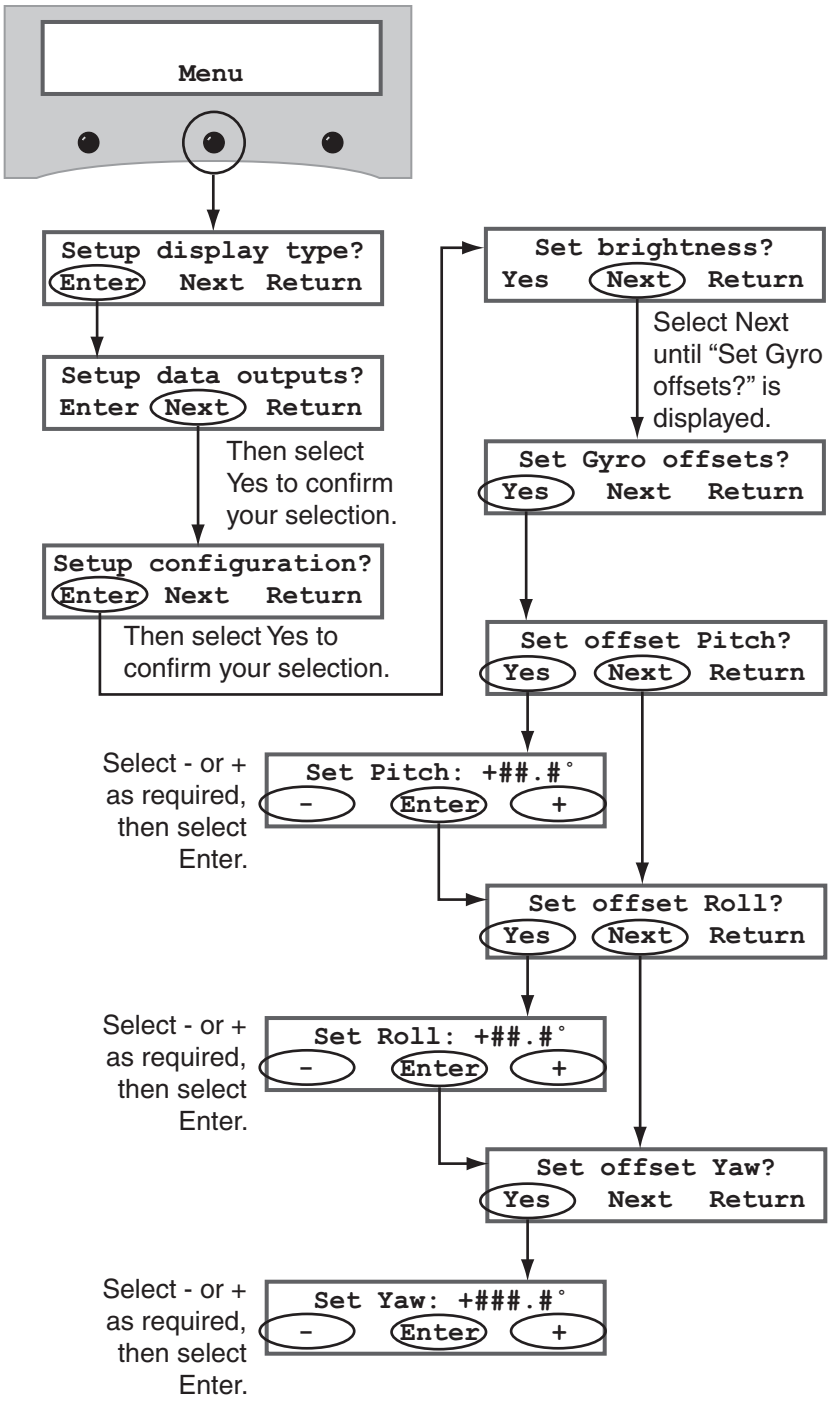
Follow the process shown in *"Setting Sensor Offset Values" on page 57* to enter the inverse values for the measurements you recorded earlier (positive becomes negative, negative becomes positive). Examples are provided in Figure 5-2.

Figure 5-2 Examples of Inverse Offset Values

For Recorded Offset:	Enter Offset:
-10.0°	10.0°
12.6°	-12.6°

To enter your sensor offset values, follow the process shown in Figure 5-3.

Figure 5-3 Setting Sensor Offset Values

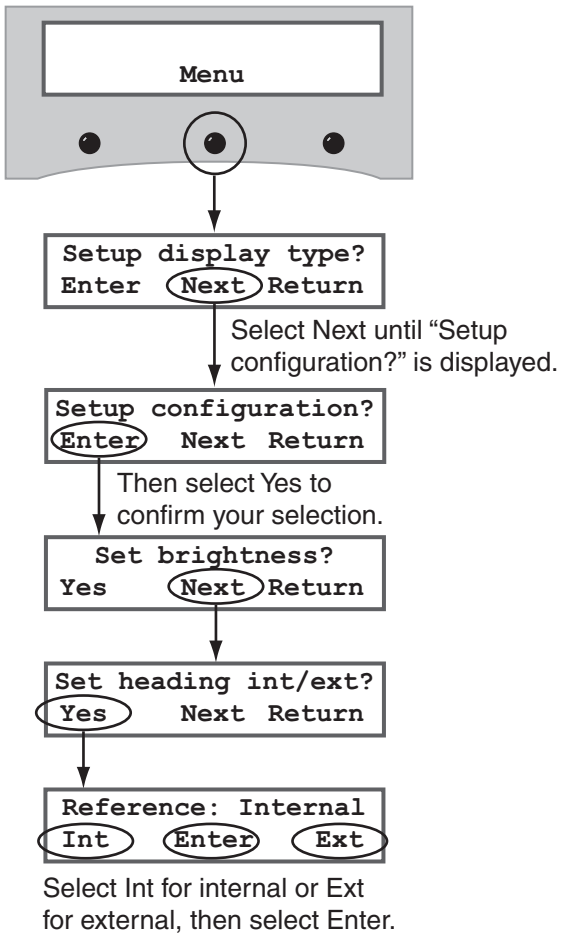


Selecting the Heading Reference Source

You can set the heading reference source to internal (default) or external. If you select Internal, the system receives heading data from the GyroTrac's sensor. If you select External, the system receives heading data from an external compass, such as a ship's gyro, if one is connected to the system.

Follow the process shown in Figure 5-4 to select the desired heading reference source.

Figure 5-4 Setting the Heading Reference Source



6. TracVision Functions

This chapter explains the menu functions available for configuring the TracVision system. These functions are valid only if a TracVision system is connected to the GyroTrac. Be sure to refer to the TracVision system manual(s) for further details about configuring the antenna.

Contents

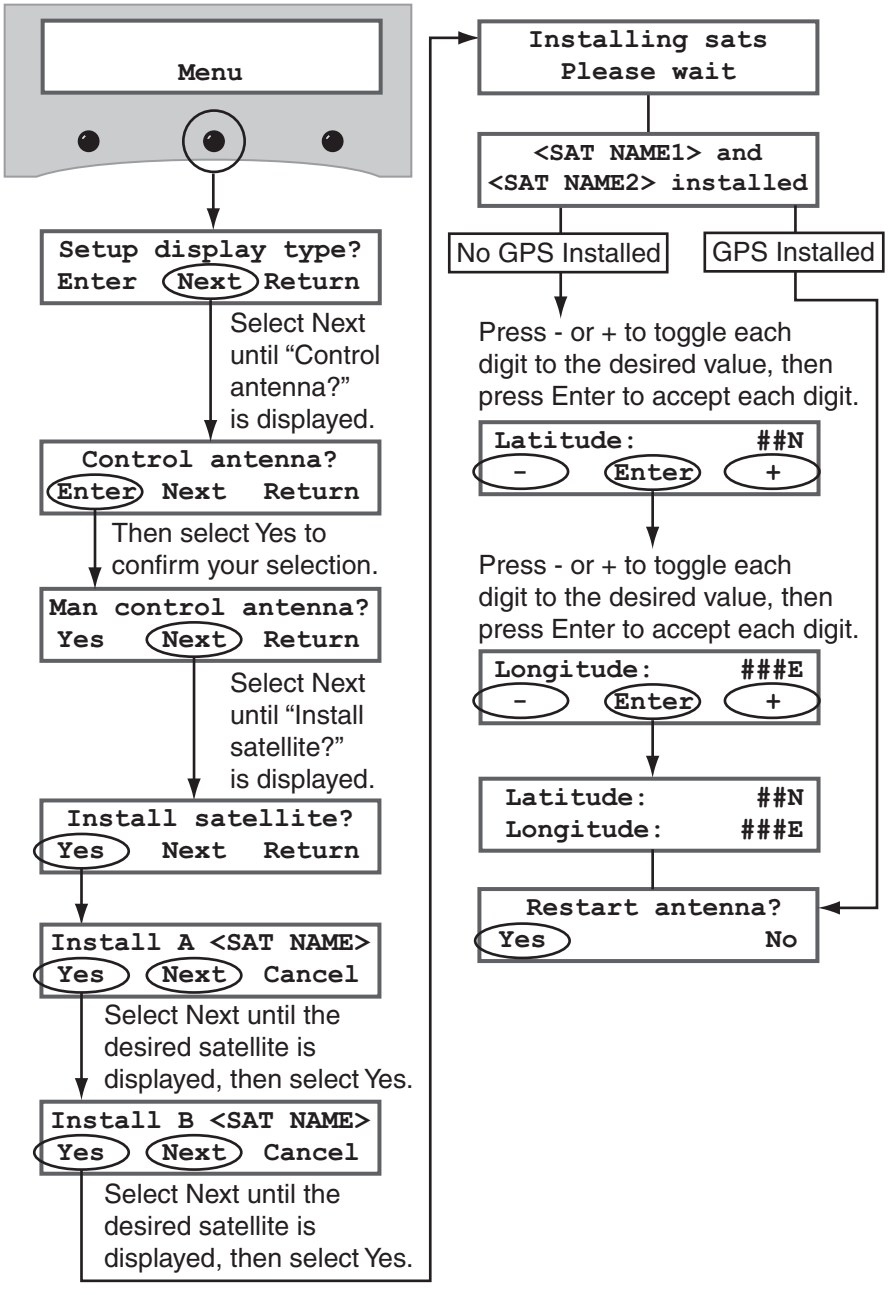
Selecting Satellites to Track

Follow the process shown in Figure 6-1 to select satellites from the TracVision antenna's satellite library. From the ADCU, you can select either one or two satellites for the antenna to track. If you wish to select three satellites, you will need to enter PC commands via the maintenance port *(refer to the TracVision manual for details)*.

IMPORTANT!

When you select different satellites, you may need to reconfigure your receiver(s). Refer to the TracVision manual for details.

Figure 6-1 Selecting Satellites

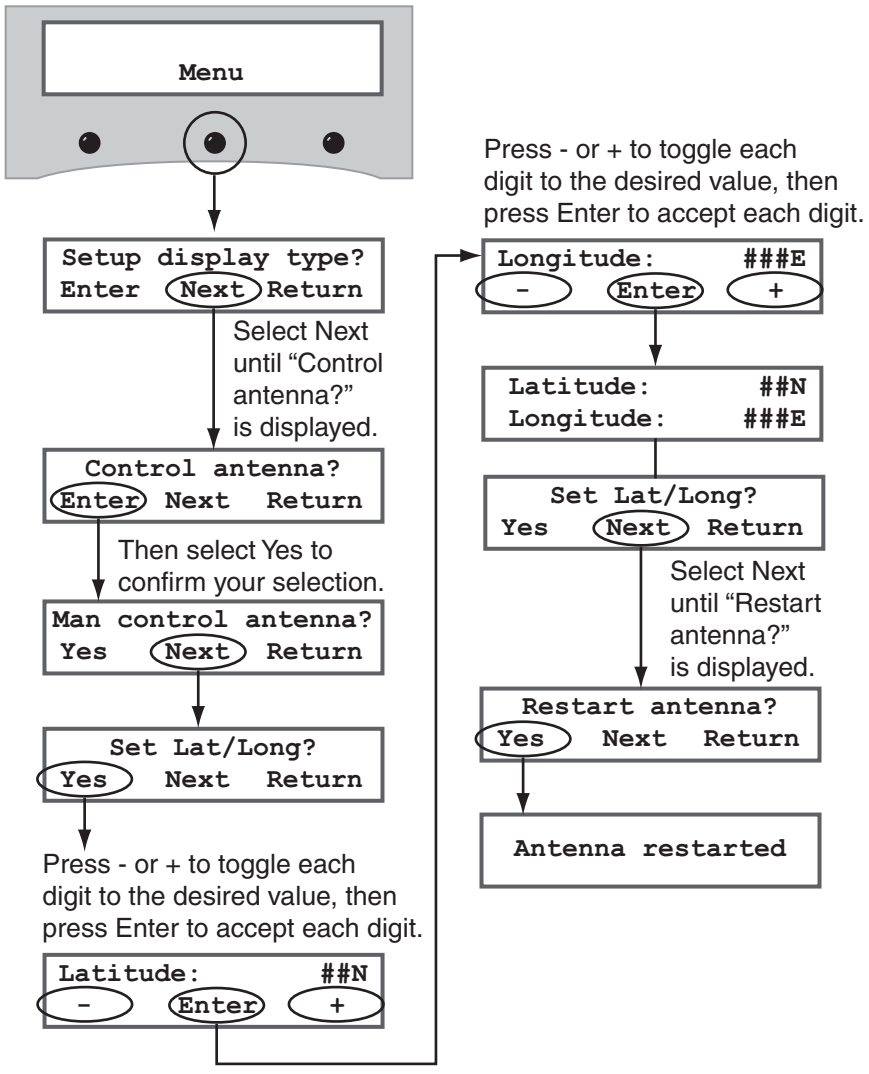


Manually Entering Latitude and Longitude

If a GPS is not connected to the system, follow the process shown in Figure 6-2 to manually enter your vessel's latitude and longitude into the antenna. The antenna will use your position information to speed up satellite acquisition, and for linear systems, to calculate the correct LNB skew angle.

NOTE: *If the vessel is located in Europe or North America, you may look up your approximate latitude and longitude in* *"Appendix A" on page 81*.

Figure 6-2 Entering Latitude and Longitude



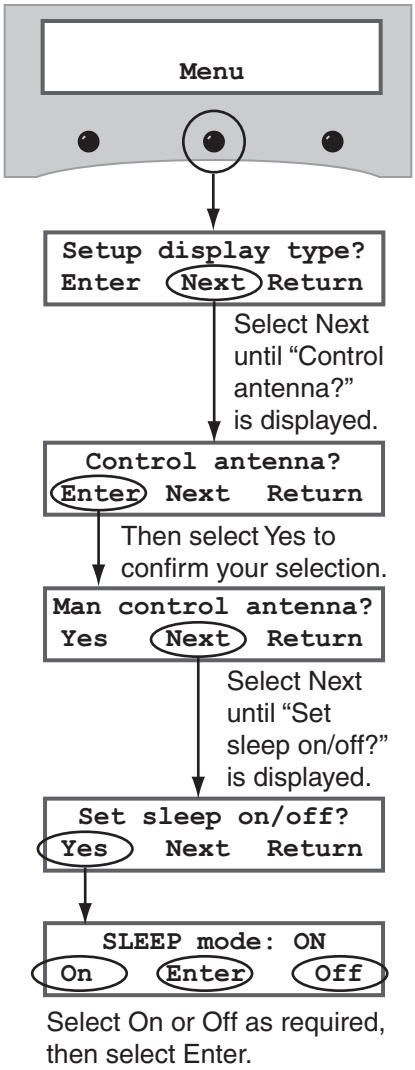
Changing the Sleep Mode Setting

To set Sleep Mode on or off, follow the process shown in Figure 6-3.

With Sleep Mode enabled, when the vessel comes to a stop and holds its position for one minute (e.g., at a dock), the antenna unit locks in place to conserve power. As soon as the vessel moves beyond a 1° - 2° window or the signal level changes significantly, Sleep Mode automatically turns off and the system begins tracking the satellite again.

NOTE: *Sleep Mode is turned on (enabled) by default.*

Figure 6-3 Setting Sleep Mode On/Off



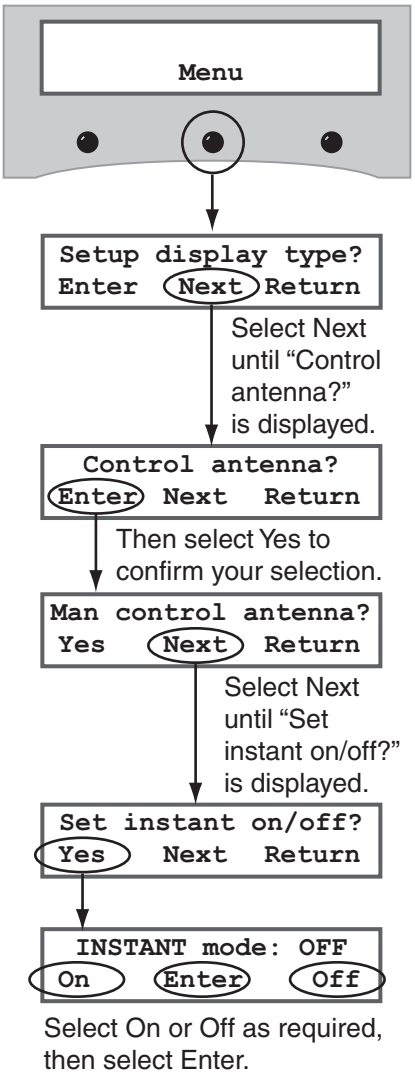
Changing the Instant On Mode Setting

To set Instant On Mode on or off, follow the process shown in Figure 6-4.

When Instant On is enabled, the antenna can immediately receive signals when the antenna is turned on, as long as the vessel has not moved since the antenna was last shut off. However, if you turn the system off, then move the vessel, the antenna will undergo its standard initialization process once you turn the system back on, resulting in a brief delay.

NOTE: *Instant On is turned off by default and is not recommended for DISH Network or ExpressVu configurations.*

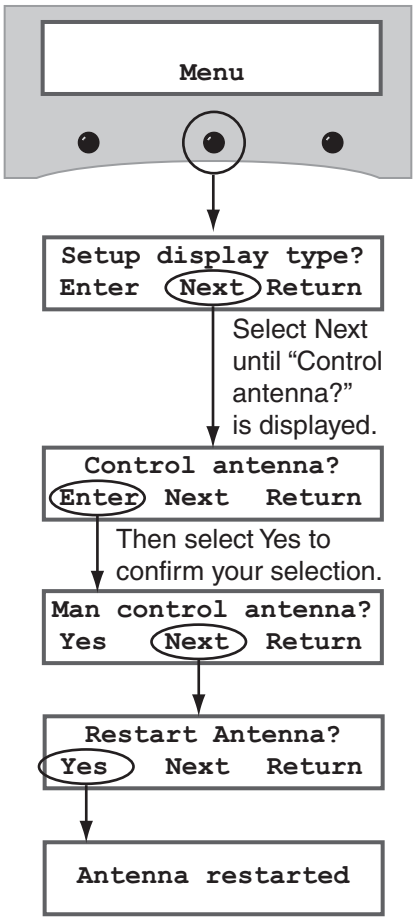
Figure 6-4 Setting Instant On Mode On/Off



Restarting the Antenna

To restart the antenna, follow the process shown in Figure 6-5.

Figure 6-5 Restarting the Antenna



Viewing Antenna Status

To view antenna status information, follow the process shown in Figure 6-6. Figure 6-7 lists the status information that is provided on each screen.

Figure 6-6 Antenna Status Screens

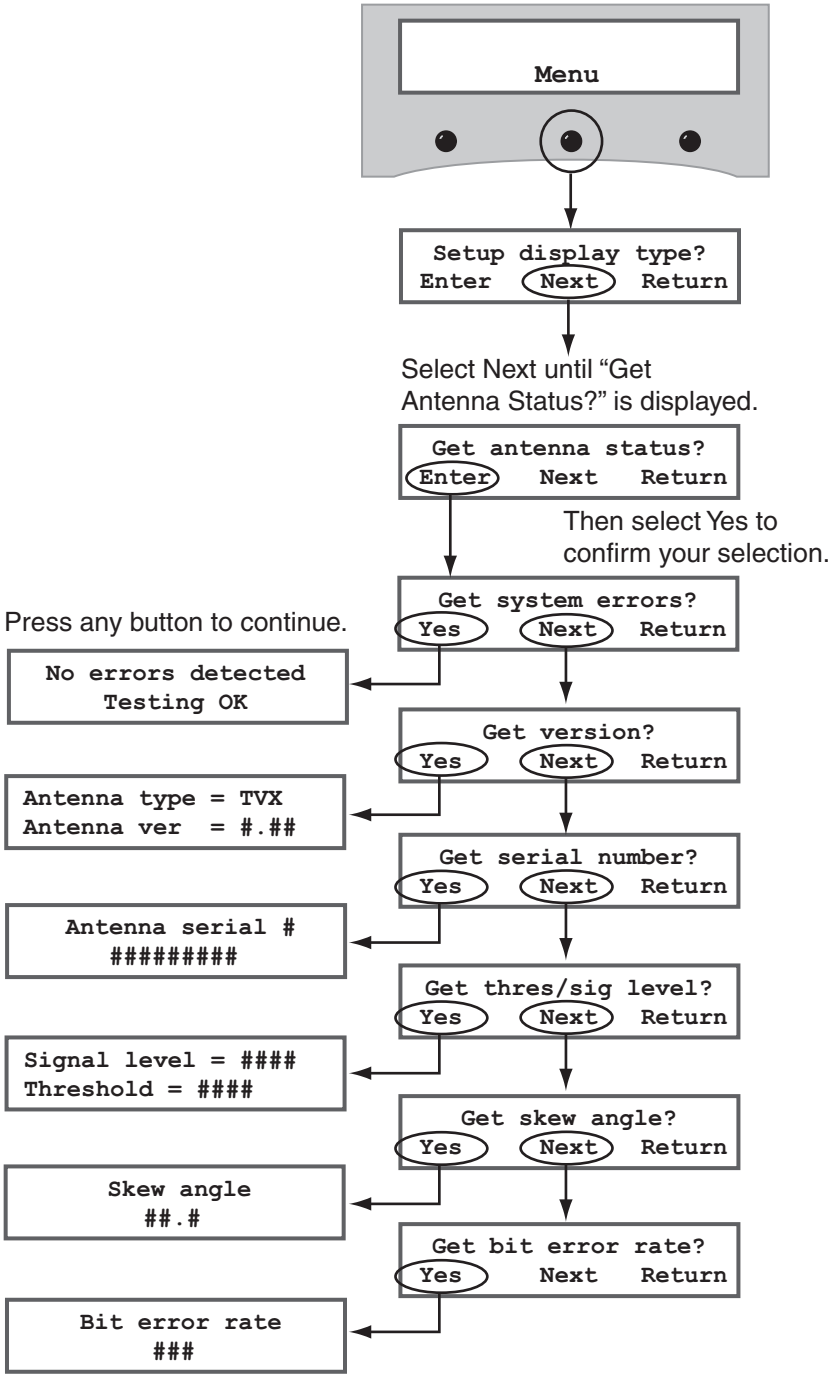


Figure 6-7 Antenna Status Information

ADCU Screen	Description
Get system errors	Performs the following tests and reports errors: • Azimuth motor • Elevation motor • Antenna gyro • External sensor • Receiver (IRD) comms • RF comms • RF signal
Get version	Reports the antenna software version
Get serial number	Reports the antenna serial number
Get thres/sig level	Reports the currently received RF signal level and threshold (minimum RF level for satellite acquisition)
Get skew angle	Reports the ideal LNB skew angle for the currently selected satellite
Get bit error rate	Reports the received signal's bit error rate (higher number = more errors)

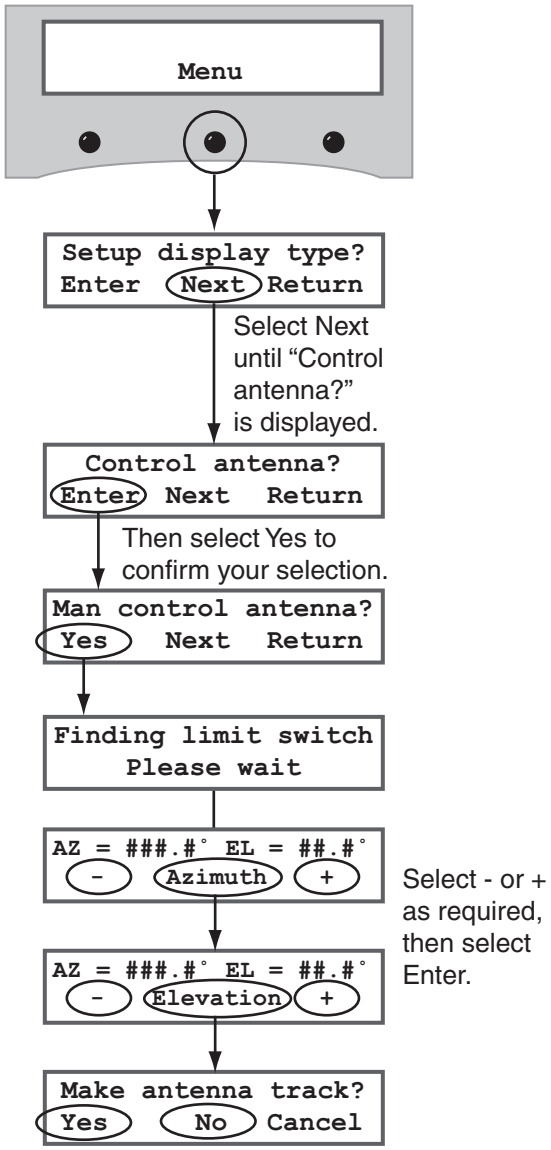
Manually Controlling the Antenna

To manually position the antenna, follow the process shown in Figure 6-8.

NOTE: *If you are performing this procedure as part of the satellite frequency scan update procedure, be sure to select "NO" at the "Make Antenna Track" screen.*

TIP: *Once you have finished positioning the antenna, the system will revert to automatic control.*

Figure 6-8 Manually Controlling the Antenna



Updating Satellite Frequency Data

If the antenna is unable to find a satellite, or if you are unable to receive certain channels, the satellite's frequency data might have changed. The satellite frequency scan feature allows you to update the frequency data of any satellite stored in the system's library.

With the desired satellite, band, and polarization selected, the system will automatically scan for the frequency with the strongest signal. The system will then update that satellite's programmed data with the new frequency (and associated network ID) and store it in the satellite library.

IMPORTANT!

DO NOT use this function unless directed by KVH Technical Support or a KVH-authorized technician. Improper data selection will affect system performance.

TIP: *During this process, you will need to enter the symbol rate and FEC code. You can find this satellite data on the web at* ***www.lyngsat.com*** *or* ***www.satcodx.com*** *(neither website is affiliated with KVH).*

To update the satellite frequency data, follow the steps below.

IMPORTANT!

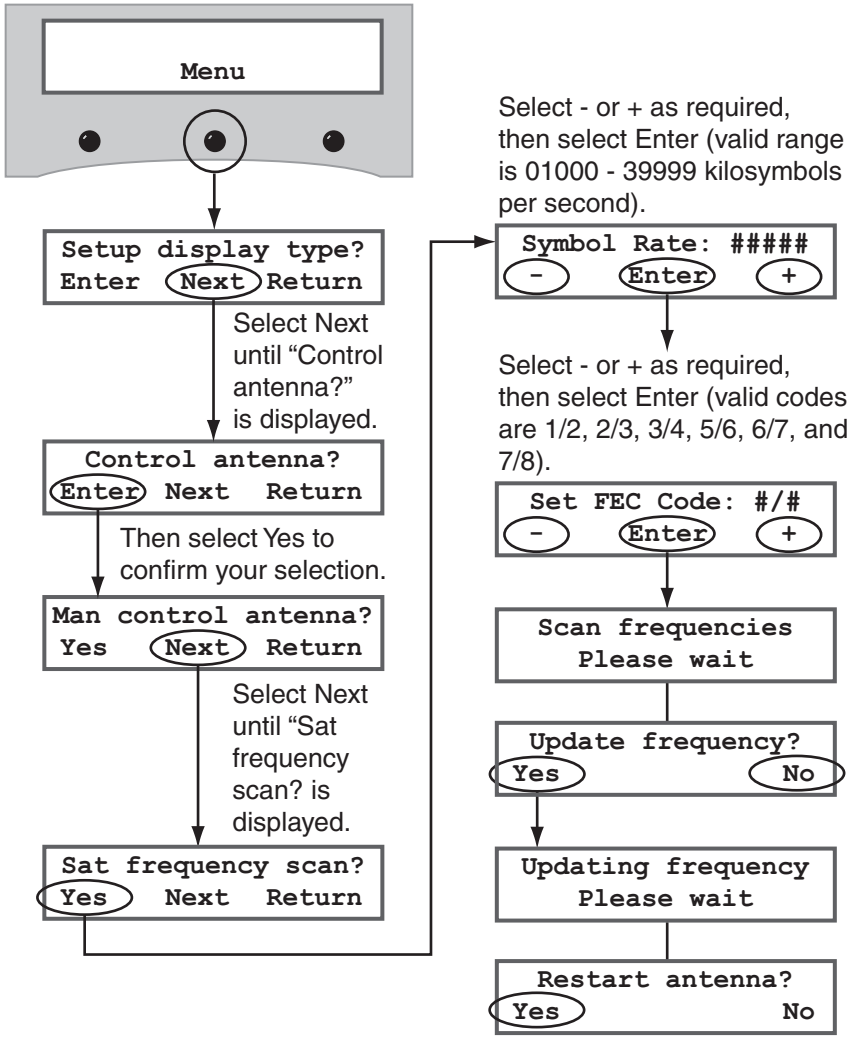
The vessel must remain stationary throughout this procedure.

1. Set the antenna to track the satellite you wish to update by choosing a valid polarization and band.
2. Set your satellite receiver to the signal meter mode. Refer to your receiver's manual for details.
3. Ensure the signal meter on the TV indicates that the antenna is tracking a strong signal.
4. Using the receiver, select the desired polarization and band you wish to update. Refer to your selected receiver's user manual for details.

5. To scan the frequency data of the selected satellite, follow the process shown in Figure 6-9.

NOTE: *Scanning satellite frequencies might take up to 10 minutes.*

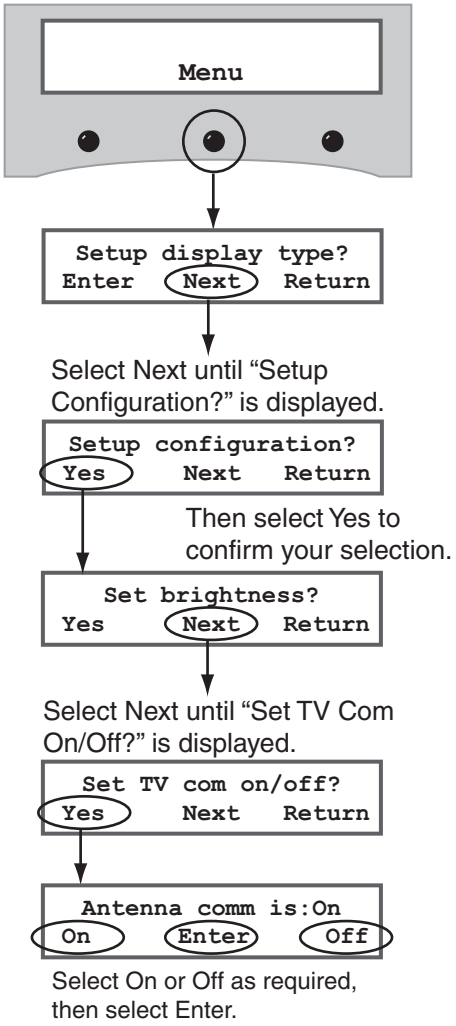
Figure 6-9 Scanning Frequency Data



Enabling/Disabling Antenna Communications

By default, the GyroTrac system is configured as a standalone system (no TracVision antenna connected). If you connect a TracVision system, the GyroTrac system configures itself to function as a component of the TracVision system. However, you can manually configure the GyroTrac system for standalone or TracVision operation by following the process shown in Figure 6-10.

Figure 6-10 Antenna Comms Menu



7. Troubleshooting

This chapter identifies some basic potential problems and explains what various ADCU error messages indicate. It also explains how to get technical support.

Contents

7

Five Simple Checks

If you are experiencing a problem with the GyroTrac system, first check the five simple things below.

Is the sensor well calibrated?

A poorly calibrated GyroTrac sensor will provide inaccurate heading data. Check the calibration score, as explained in *"Checking the Calibration Score" on page 41*, and recalibrate the sensor if the reported Accuracy Level is "BAD CAL." In addition, if you added or removed equipment near the sensor, or moved the sensor itself to a different location, you need to clear the calibration score and recalibrate (see *"Calibration Requirements" on page 37*).

Is the sensor installed in a benign magnetic environment?

The sensor performs best when installed in an area away from steel or iron, magnetized materials, or electric motors. Check the calibration score, as explained in *"Checking the Calibration Score" on page 41*, and move the sensor to a different location if the reported Magnetic Environment is "POOR" or "BAD."

Is the sensor's "FWD" reference pointing toward the bow?

The sensor's "FWD" (forward) reference, located on the end cap, must face the bow of the vessel and be parallel to the vessel's centerline within ±5°. Misalignment will cause errors in the sensor's reported heading. Check the sensor's mounting orientation and make any adjustments as needed. For details on proper sensor mounting, see *"Mounting the Sensor" on page 13*.

Are all wires connected properly at the ADCU?

Check the wires at the rear panel of the ADCU and make sure none have come loose. Also make sure each wire is making good contact with the terminal connector; look for pinched insulation. Finally, compare the wiring with the diagram on the inside front cover of this manual. Be sure all wires are connected in their proper positions.

Are all ADCU settings correct for your system's configuration?

GyroTrac offers many user-defined settings for customization. Check these settings on the ADCU to ensure they reflect your configuration. For example, make sure all of the data outputs are set up properly, the gyro offsets accurately correlate to the sensor's misalignment, and antenna comms are enabled if a TracVision antenna is installed.

Error Messages

This section explains some of the error messages that might be displayed on the ADCU.

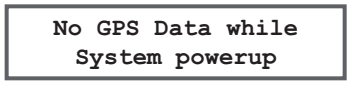
"No GPS Data While System Powerup"

This message is not a system error. It simply indicates that during the system initialization, no GPS was detected. If no GPS receiver is connected, or if the GPS receiver was not initialized and receiving valid data prior to turning on the system, some navigational display types will be unavailable.

TIP: *For more information on ADCU display types, refer to* *"ADCU Display Options" on page 47*.

If a GPS receiver is connected but was not initialized prior to turning on the system, simply turn off the system, ensure the GPS is receiving valid position data, then turn the system back on. The GyroTrac system will detect the GPS sensor during its initialization.

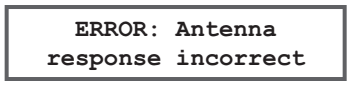
Figure 7-1 No GPS Data While System Powerup Screen



"Antenna Response Incorrect"

This error message indicates the ADCU received an incorrect response from the TracVision antenna when requesting data. To correct this, simply repeat the requested operation.

Figure 7-2 Antenna Response Incorrect Screen



"Antenna Not Responding"

This error message indicates a communication failure between the ADCU and the TracVision antenna. This is usually the result of either the antenna being disconnected from the ADCU or the antenna not being turned on. If the antenna is intentionally turned off, switch to one of the navigational display types to use the navigational displays.

TIP: *For more information on ADCU display types, refer to* *"ADCU Display Options" on page 47*.

Figure 7-3 Antenna Not Responding

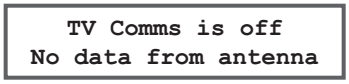
"TV Comms is Off, No Data from Antenna"

This error message indicates a communication failure between the ADCU and the antenna. This is usually the result of either the antenna being disconnected from the ADCU or the antenna not being turned on. If the antenna is intentionally turned off, switch to one of the navigational display types to use the navigational displays. If the antenna is not intentionally turned off, check for loose cable connections or restart the system. For more information on restarting the system, refer to *"Restarting the Antenna" on page 65*.

This message will also appear if antenna communications are disabled at the ADCU. For details on enabling antenna communications, refer to *"Enabling/Disabling Antenna Communications" on page 71*.

TIP: *For more information on ADCU display types, refer to* *"ADCU Display Options" on page 47*.

Figure 7-4 TV Comms is Off, No Data from Antenna



Technical Support

The GyroTrac system is a sophisticated electronic device; only KVH-authorized technicians have the tools and expertise necessary to diagnose and repair a system fault. Therefore, if you experience any operating problem or require technical assistance, please call or visit your local authorized KVH marine dealer or distributor. You can find an authorized technician near you by visiting our website at *www.kvh.com/wheretogetservice*.

If you need help finding an authorized technician, please contact KVH Technical Support:

North American, South America, Australia, New Zealand:
Phone: +1 401 847-3327
E-mail: *techs@kvh.com*

Europe, Middle East, Asia:
Phone: +45 45 160 180
E-mail: *support@kvh.dk*

Please have your system serial number handy before you call. You can find the serial number on the first page of this manual.

Field Replaceable Units

Part numbers for field replaceable units (FRUs) that can be serviced in the field are listed in Figure 7-5. These parts can be obtained from any KVH-authorized dealer or distributor.

Figure 7-5 GyroTrac Field Replaceable Units

Part	Part Number
ADCU	02-0961
GyroTrac sensor	02-1154
Sensor cable, 30 ft. (9 m)	32-0623-30
Terminal strip connector	72-0283

Appendix A
Position Grids

This appendix contains European and North American position grids for determining your approximate latitude and longitude.

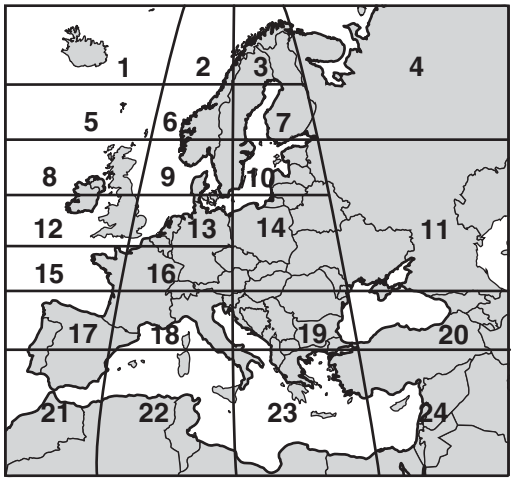
Contents

A

European Position Grid

If you wish to determine your approximate latitude and longitude, use the position grid and table in Figure A-1.

Figure A-1 Approximate Latitude and Longitude

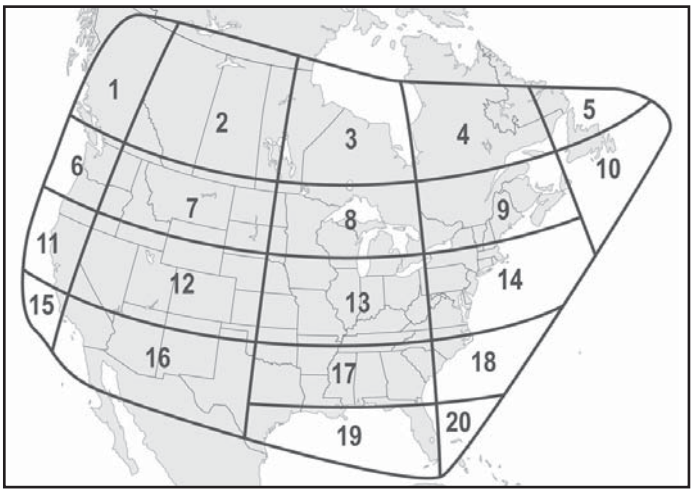


Grid #	Latitude	Longitude
1	67° N	7° W
2	67° N	7° E
3	67° N	22° E
4	65° N	45° E
5	63° N	7° W
6	63° N	7° E
7	63° N	22° E
8	57° N	7° W
9	57° N	7° E
10	57° N	22° E
11	55° N	40° E
12	53° N	7° W
13	53° N	7° E
14	50° N	22° E
15	47° N	7° W
16	47° N	7° E
17	43° N	7° W
18	43° N	7° E
19	43° N	22° E
20	43° N	37° E
21	36° N	7° W
22	36° N	7° E
23	36° N	22° E
24	36° N	37° E

North American Position Grid

If you wish to determine your approximate latitude and longitude, use the position grid and table in Figure A-2.

Figure A-2 Approximate Latitude and Longitude



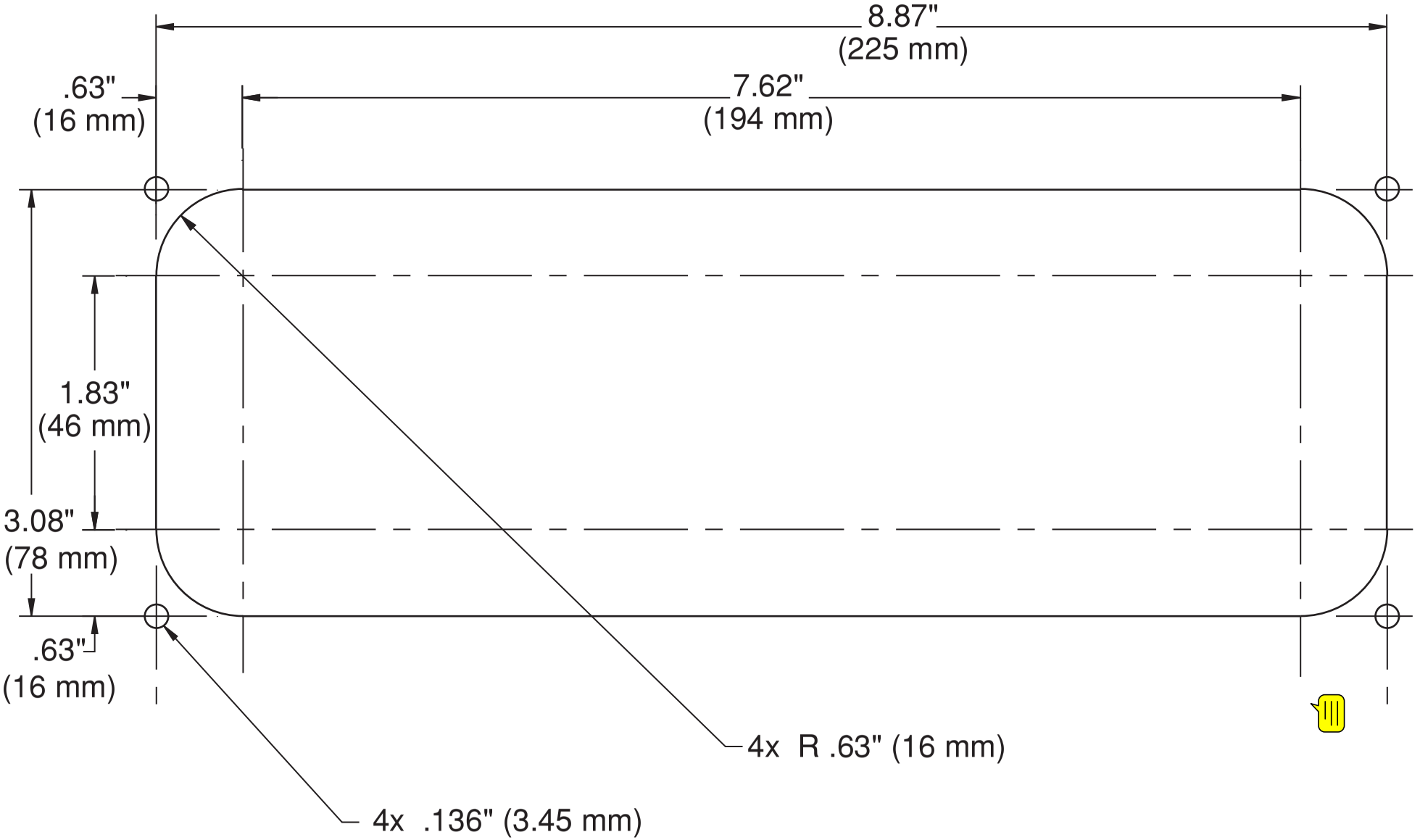
Grid #	Latitude	Longitude
1	55° N	125° W
2	55° N	110° W
3	55° N	90° W
4	55° N	70° W
5	55° N	55° W
6	45° N	125° W
7	45° N	110° W
8	45° N	90° W
9	45° N	70° W
10	45° N	50° W
11	40° N	125° W
12	40° N	110° W
13	40° N	90° W
14	40° N	70° W
15	32° N	125° W
16	32° N	110° W
17	32° N	90° W
18	32° N	75° W
19	27° N	83° W
20	27° N	78° W

Appendix B ADCU Flush Mounting Template

This appendix contains a template for mounting the ADCU flush to a vertical surface.

Contents

B


8.87"
(225 mm)
.63"
(16 mm)
7.62"
(194 mm)
1.83"
(46 mm)
3.08"
(78 mm)
.63"
(16 mm)
4x R .63" (16 mm)
4x .136" (3.45 mm)

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