SEA·BIRD SCIENTIFIC

User manual

SBE 33 Carousel Deck Unit

Document No. Release Date: Version:	SBE33DeckUnit 2023-09-19 A

Table of Contents

Table of Contents

Section 1 Safety information

Please read this entire manual before this equipment is unpacked, set up, or operated. Pay attention to all danger, warning, and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

⚠ DANGER

Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.

⚠ CAUTION

Indicates a potentially hazardous situation that may result in minor or moderate injury.

NOTICE

Indicates a situation which, if not avoided, may cause damage to equipment. Information that requires special emphasis.

1.1 Hazard information

⚠ DANGER

Life-threatening voltages of over 250 VDC are on the sea cable and the Deck Unit when it is on, and will persist for up to 1 minute after it is turned off.

⚠ DANGER

Make a separate ground connection between the Deck Unit and an isolated power ground. Connect the separate ground wire from the hull of the ship to the protected ground terminal on the back of the Deck Unit. Use a minimum of 20 AWG wire and a ring terminal.

⚠ WARNING

This product can expose the user to chemicals with silica, crystalline (airborne particles of respirable size), which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

NOTICE

The manufacturer is not responsible for any damages due to misapplication of misuse of this product including, without limitation, direct, incidental and consequential damages, and disclaims such damages to the full extent permitted under applicable law. The user is solely responsible to identify critical application risks and install appropriate mechanisms to protect process during a possible equipment malfunction.

1.2 Equipment labels

Read all labels and tags attached to the equipment. Personal injury or damage to the equipment could occur if not observed. A symbol on the equipment is referenced in the manual with a precautionary statement.

Safety information

	Electrical equipment marked with this symbol may not be disposed of in European domestic or public disposal systems. Return old or end-of-life equipment to the manufacturer at no charge to the user.

	EFUP: Hazardous material exists over the threshold of GB/T 26572.2011. The number in the center of the symbol is the Environmentally Friendly Use Period as specified by SJ/T 11364-2014, China's marking for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products. This product should be recycled after its environmentally friendly use period.

Section 2 Specifications

2.1 Deck Unit specifications

Power requirements	120 VAC at 60 Hz, 1.75 A or 240 VAC at 50 Hz 1 A switchable
Sea cable compatibility	Single- or multi-core armored cable to 10000 m long with inner core resistance of up to 350 ohms
Dimensions	14.3 cm tall, 37.5 cm deep, 44.4 cm wide cabinet. 48.3 cm edge-to-edge for mounting brackets (distance centerline to centerline of mounting holes 46.4 cm)
Operation environment	• indoor use • altitude max: 2000 m • 5 °C to 40 °C • relative humidity max 80% (non-condensing) • Mains supply voltage: ±10%

2.2 Cable descriptions

DB9 to DB9 extension cables, SBE 33 serial data connector and Carousel data connector to PC.

Test cable, SBE 33 to SBE 32 Carousel, SBE 55 ECO Water Sampler, or PDIM
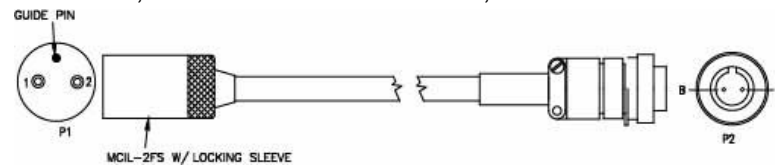
Slip ring cable, SBE 33 to slip ring
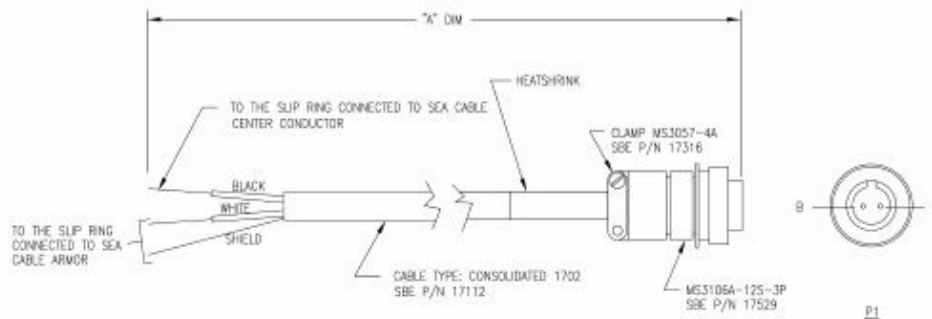
Cable, SBE 33 NMEA input to PC
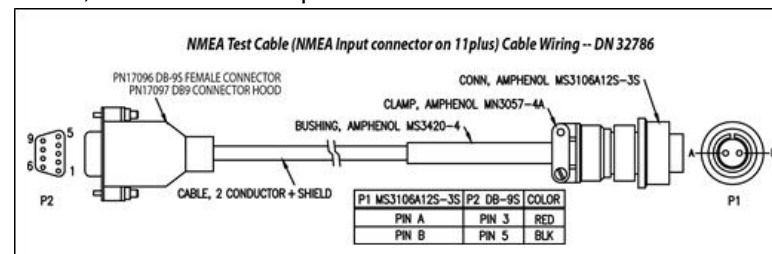
Cable, SBE 33 to PAR
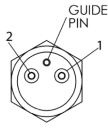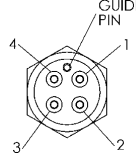
Surface PAR with Switchcraft connector (Surface PAR Input connector on 11plus) Cable Wiring -- DN 32704

P1 EN3C5F	COLOR	P2	DESCRIPTION
1	SHIELD	C	POWER GROUND
2	RED	D	PAR SIGNAL
3	WHITE	A	SIGNAL GROUND
4	BLACK	B	+12V POWER
5	---	--	---
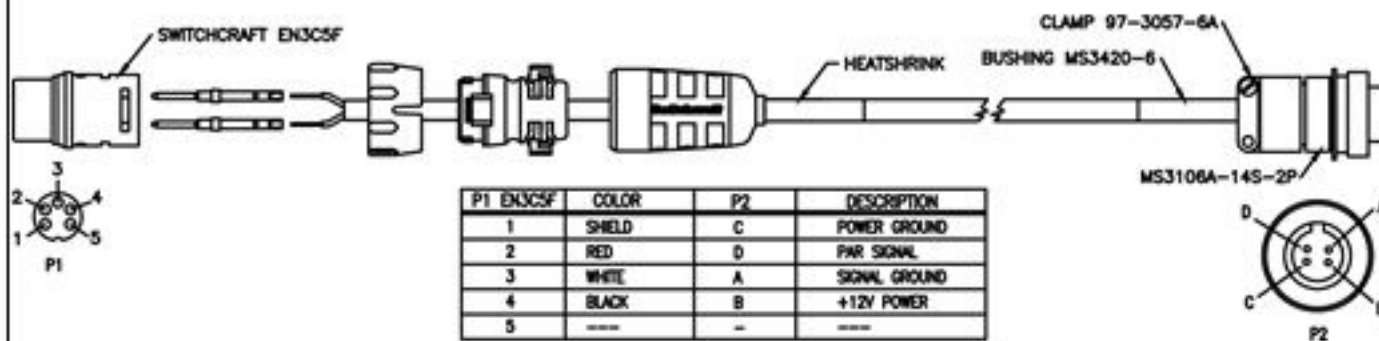
2.3 PDIM dimensions and connectors

If the CTD is deployed without a water sampler, the Power and Data Interface Module (PDIM) can be used to connect the CTD with the PC.

Contact	Function	Description	Connector
1	-	power	
2	+	power	

Contact	Function	Description	Connector
1	Return	Return	
2	TX	Transmit to CTD	
3	RX	Receive from CTD	
4	V out	+ 15 V	
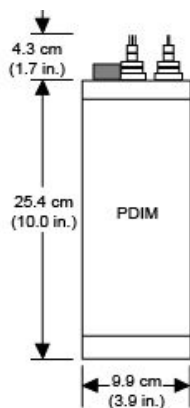
Section 3 Description

> ## ⚠ DANGER
> Life-threatening voltages of over 250 VDC are on the sea cable and the Deck Unit when it is on, and will persist for up to 1 minute after it is turned off.

> ## NOTICE
> Do not connect a Deck Unit set for 120 V to a 240 V power supply. It will cause severe damage to the Deck Unit.

3.1 Deck Unit front panel
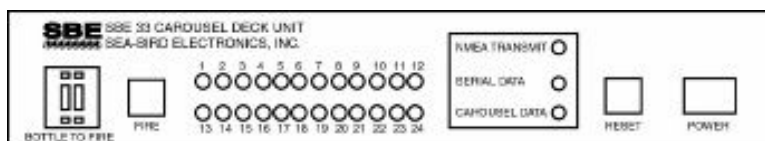
- BOTTLE TO FIRE—selects which bottle to fire when the FIRE button is pushed.
- FIRE—Fires bottles.
- LED 1–24—Flashes red when the associated bottle is fired.
- NMEA TRANSMIT—Flashes yellow when a carriage return character (decimal 13) is received from the NMEA device.
- SERIAL DATA—Flashes green when a carriage return character (decimal 13) is received from the CTD through the Water Sampler.
- CAROUSEL DATA—Flashes yellow when a message, such as a bottle fire confirmation, is received from the Water Sampler.
- POWER—Turns power to the Deck Unit on or off.
- RESET—Push this button to reset the system. Make sure to set the BOTTLE TO FIRE switch to 00 first.

3.2 Deck Unit back panel
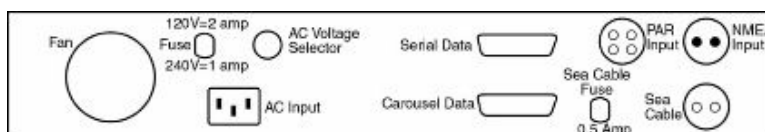
- AC Voltage Selector—Switch for 120 VAC at 50 Hz or 240 VAC at 60 Hz.
- AC Input—Plug for power to Deck Unit. Select 120 or 240 V.
- Fuse—5 x 20 mm 250 VAC slow-blow; 2 amp for 120 V, 1 amp for 240 V.
- Serial Data—Communicates with the CTD through the Water Sampler.
- Carousel Data—Communicates with the Water Sampler
- PAR Input—Connects to a Surface PAR sensor.
- NMEA Input—Connects to an NMEA 0183 navigation device that can be connected to either the Deck Unit or the PC..
- Sea Cable—Connects to the Water Sampler.
- Sea Cable Fuse—3 AG, 300 VDC, fast-acting 0.5 A. Replace with Littelfuse Corp. 312.500 only.

3.3 System communications
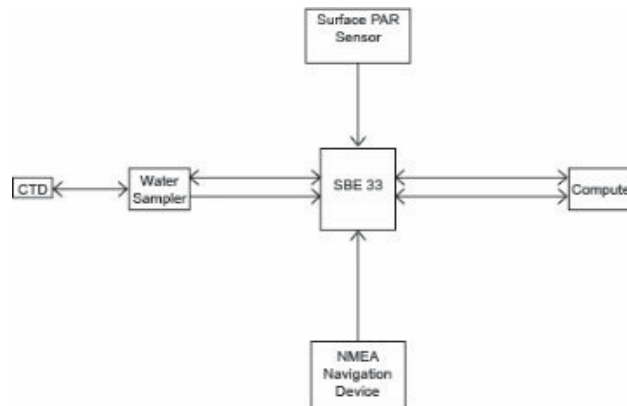
CTD and Water Sampler or PDIM

- Make sure that the baud rates are the same: the default for the SBE 33 is 4800.
- If a SBE 25 with more than four auxiliary voltage sensors is used and the SBE 33 appends both NMEA and Surface PAR, set the SBE 25 real-time data rate to 4 scans/second or less.
- If a SBE 25plus is used, set the real-time data rate to **SetHistoricRate=0**.

SBE 33 and PC

- Carousel Data Channel baud rate is 300, 8 data bits, no parity. Cannot be changed.
- Serial Data Channel baud rate, communications with the CTD is set in the SBE 33 setup menu to 9600 or 19200 baud.
- For SBE 19 and SBE 25, use 7 data bits and even parity.
- For SBE 19plus, 19plus V2, 25plus, or SBE 49, use or 8 data bits and no parity. Stop bit = 1 and cannot be changed.
- The default rate for the SBE 33 set by the manufacturer is 9600 baud, 8 bits, no parity.

3.4 NMEA and Surface PAR

The SBE 33 can decode messages from an NMEA 0183 device. This data can be appended to the CTD data and transmitted to a connected PC. The yellow NMEA Transmit LED on the SBE 33 flashes each time a message is received. The SBE 33 appends the same NMEA message mulitple times until a new message is decoded. If position data is added to the data, the SBE 33 also adds any NMEA depth data to the data stream.

If, for example, a NMEA device sends a message once every 5 seconds, the yellow NMEA Transmit LED flashes every 5 seconds, and the same message is appended to each scan of CTD data within that 5 seconds.

The SBE 33 can also collect the 0–5 V output of a Surface PAR sensor. This data is appended to the CTD data stream and sent to a connected PC. The Seasave and SBE Data Processing software support the Sea-Bird Scientific logarithmic or linear PAR sensor and Biospherical QSR-240, -2200, and QCR-240 and -2200 PAR sensors.

3.5 SBE 33 modes

The table below shows the available operation modes for the SBE 33. Select a mode from the setup menu in Seaterm.

- Use the @ character to enter and exit the setup menu.

- The SBE 33 must be in Mode 1 to transmit commands to the CTD through the SBE 33 and Water Sampler.
- To enter Diagnostic Modes 10 or 11, put the SBE 33 in Mode 3, then enter a 10 or 11 at the prompt.
- To exit Diagnostic Modes, turn off power to the SBE 33.

Type	Mode	Description
Operation	1: Echo only	Characters to and from CTD pass through SBE 33. No NMEA or PAR data is transmitted. Use to set up a CTD without the need to disconnect it from system and connect directly to PC.
	2: Add Lat-Lon to hex data	7 bytes of hex latitude and longitude data is added to each line of data from CTD. Used when position data is required with CTD data. If options 4/6 are selected, NMEA depth data/PAR are also added.

	3: Transmit Lat-Lon only	Data from CTD is not transmitted. Hex lat-lon data is converted to ASCII test when a new position is received from NMEA device. Format:
		`Lat 47 37.51 N`
		`Lon 122 09.41 W`
		
		If NMEA message RMC is decoded, data and time show on next line:
		`DDMMYY HHMMSS`

Options	4: Add NMEA depth to real-time hex-Lat-Lon data	3 bytes of depth data is added to each line of hex data from CTD, after lat-lon data.
	5: Do not add NMEA depth to real-time hex-Lat-Lon dat	NMEA depth data is not added.
	6: Add PAR to real-time hex data	3 bytes of PAR data is added to each line of hex data from CTD, before lat-lon-depth data.
	7: Do not add PAR to real-time hex data	PAR data is not added.
Communication	8: Change communication settings and start mode	Set baud rates, data bits, parity. NMEA baud rate and start mode (whether SBE 33 starts in Operation Mode 1 or 2 when power is supplied).
	9: Show communication settings and start mode	Show settings from Mode 8.
Diagnostic	10: Enable diagnostic level 1 (transmit raw NMEA messages)	All NMEA messages are transmitted to PC in raw form. Used to determine which NMEA messages are received by SBE 33.
	11:Enable diagnostic level 2 (transmit decoded NMEA messages)	All NMEA messages received are decoded by SBE 33 and show on PC. If Mode 10 and then 11 is selected, SBE 33 transmits raw data and then decoded data.

Description

Section 4 Set up and test system

4.1 Connect cables on SBE 33 system

⚠ **DANGER**
Life-threatening voltages of over 250 VDC are on the sea cable and the Deck Unit when it is on, and will persist for up to 1 minute after it is turned off.

⚠ **DANGER**
Make a separate ground connection between the Deck Unit and an isolated power ground. Connect the separate ground wire from the hull of the ship to the protected ground terminal on the back of the Deck Unit. Use a minimum of 20 AWG wire and a ring terminal.

4.1.1 Cable, winch, deck gear

The manufacturer of the Deck Unit does not supply winches and deck gear and does not have recommendations for a block or A-frame.

Cable

Only one conductor is required for the armored cable, because the armor is used as a ground. The total two-way resistance should be less than 350 ohms. The mechanical requirements are affected by the properties of the winch and the weight of the system to be lifted.

Winch

The winch should have a level-wind device that is adjustable or designed to lay the correct number of wraps across the drum. The cable diameter and the drum width determine this value. The winch must have a slip-ring, (a contact that rotates) assembly (at least two channels). The cable must have a break strength of at least 5 to 7 times the maximum load. The user must make the mechanical and electrical cable terminations at the underwater end.

4.1.2 Connect system components

The manufacturer supplies metal tabs ("ears") to attach the Deck Unit to a standard 19-inch electronic bay. Make sure that the cooling fan and the vent are not blocked.

On a ship, cables longer than 3 m should be installed inside a grounded metal conduit by a qualified electrician. This decreases the possibility of external signals to disrupt communication and protects high voltage lines such as the sea cable.

Water Sampler or Power Data Interface Module (PDIM) to CTD

Use the cable supplied with the CTD-Water Sampler to connect the CTD and Water Sampler.

- For SBE 32, the CTD connector has 4 contacts.
- For SBE 55, the CTD connector has 6 contacts.

Use the cable supplied with the CTD and PDIM to connect the CTD and PDIM (4-contact connector).

Sea cable from SBE 33 to Water Sampler or PDIM

For safety and best performance, the manufacturer strongly recommends use of the cable armor for the data and power return.

Mold the bottom end of the sea cable to the 2-contact (MCIL2FS) pigtail supplied with the Water Sampler or PDIM. Connect the positive inner conductor to the small black pin on the pigtail and the negative cable armor to the large white pin on the pigtail.

Make a secure mechanical connection between the cable armor and the Water Sampler lifting bail or, for PDIM, the frame lifting eye. Connect the sea cable to the Water Sampler or PDIM: make sure to "dress" the cable termination so that it will not be pinched by the shackle or clevis. Install a cotter pin or seize the shackle securely.

Terminate the sea cable leads from the winch slip rings with the manufacturer-supplied MS3106A12S-3P connector. Connect the inner conductor of the cable (positive), to pin B and the cable armor (negative) to Pin A. Connect the sea cable connector on the rear panel of the Deck Unit. The other end of the sea cable connects to JT1 on the CTD.

PC to Deck Unit

Communication between the PC and the Deck Unit is in two RS232 channels.

- The Carousel Data channel sends commands to and receives replies from the Water Sampler. The cable for this channel is not used when a PDIM is used.
- The Serial Data channel sends commands to and receives replies from the CTD through the Water Sampler.

Connect the PC to the manufacturer-supplied Carousel Data and Serial Data cables on the back panel of the Deck Unit.

Power to Deck Unit

Verify that the Deck Unit back panel power selector switch is in the correct position for the mains power source, either 120 or 240 VAC. Connect power to the AC Input connector on the back panel of the Deck Unit with the manufacturer-supplied cable.

NMEA navigation device to Deck Unit

Connect the NMEA navigation device to the NMEA input connector on the back panel of the Deck Unit with the manufacturer-supplied MS3106A 12S-3S connector. Contact A goes to the NMEA A signal. Contact B goes to the NMEA signal return.

PAR sensor to Deck Unit

Connect the PAR sensor to the PAR Input connector on the back panel of the Deck Unit. The manufacturer supplies an MS3106A 14S-2P connector if there is no cable.

4.2 Set up SBE 19plus V2, SBE 25plus

The SBE 19plus V2 and SBE 25plus use SeatermV2 terminal launcher software.

1. Double-click on SeasoftV2.exe to install the manufacturer-supplied software on the PC.
2. Use the data I/O cable to connect the CTD directly to the PC.
3. Double-click on SeatermV2.exe. If this is the first time that the software is used, a setup dialog box may show.
4. Select the connected CTD from the **Instruments** menu.
   The Seaterm232 software starts.
5. Select the COM port and baud rate (4800 is default) then push **OK**.
   Note that the baud rate for the Water Sampler communication must be set in both the CTD and the SBE 33.
6. Select other setup parameters as necessary. Set the OutputFormat=0 for both the 19plus V2 and the 25plus.
7. Look at the connection baud rate in the title bar of the Command/Data Echo area. Change the baud rate to 4800 or less if necessary.

   - SBE 19plus V2: Set **BaudRate=x**, where x= 1200, 2400, or 4800.
   - SBE 25plus: Set **SetBaudConsole=x**, where x= 600, 1200, 2400, or 4800.

8. Connect to the CTD again at the new baud rate and verify that the title bar of the Command/Data Echo area shows the new baud rate.
9. Make sure that the baud rate for the SBE 33 and the CTD are the same. Change if necessary. The manufacturer recommends 4800.
10. Refer to the CTD manual for details to change other configuration settings. Note that for the SBE 33:

- SBE 19plus V2 requires use of **OutputFormat=0**.
- SBE 25plus requires use of **SetOutputFormat=0**.

11. Send **QS** to put the CTD in "quiescent state."

4.3 Set up SBE 19, SBE 19plus, SBE 25, SBE 49

1. Use the data I/O cable to connect the CTD directly to the PC.
2. Install the Seasoft software from the manufacturer-supplied CD or USB drive. The software has several components:

   - Seaterm, a terminal launcher
   - Seasave V7, for real-time data collection
   - Data Processing, to process the collected data.

3. Double-click on Seaterm.exe. If this is the first time that the software is used, a setup dialog box may show.
4. Select the "Instrument Type" and the PC COM port, then push **OK**.
5. Supply power to the CTD.
6. In the main window, select **Configure**, then the connected CTD.
7. Select the <u>Firmware Version</u> and <u>COM Port</u>. The <u>Baud Rate</u> is 4800. The <u>Data Bits</u> is 8, and <u>Parity</u> is None. The <u>Mode</u> is RS232. Push **OK**.
   The baud rate for the Water Sampler communication must be set in both the CTD and the SBE 33.
8. In the **Communications** menu, select *Options, Cycle baud when connecting*.
9. Push **Connect**.
   The software tries to connect to the baud rate set above. If it cannot, the software cycles through all other possible baud rates to try to connect. An `S>` prompt shows when communication is established.
10. Look at the connection baud rate in the Status bar at the bottom of the window to make sure the baud rate can be used with the Water Sampler. Change it if necessary.

    - SBE 19: Send **SBn**, where n=1 (600 baud), 2 (1200 baud), 6 (4800 baud).
    - SBE 19plus, SBE 49: Send **Baud=x**, where x=1200, 2400, or 4800.
    - SBE 25: Send **SRx**, where x=1 (600 baud), 2 (1200 baud), 4 (4800 baud).

11. Push **Connect** on the toolbar again.
    Verify that the Status bar shows the new baud rate.
12. Refer to the CTD manual for details about other setup parameters to select.
13. Send **QS** to put the CTD in "quiescent" (low power) mode.

4.4 Set baud rate

The default baud rate for the SBE 33, set by the manufacturer, is 4800. The baud rate must be set in both the CTD and the SBE 33. Make sure that the CTD and the SBE 33 use the same rate.

SBE CTD	Deck Unit- and Water Sampler-compatible baud rates	CTD firmware version
19	600, 1200	3.0d and later, programmable
	600, 1200, 4800	3.1d and later (except 4.0 series), programmable
	600, 1200, 2400, 4800	Before 3.0d, contact manufacturer to change baud rate if necessary.
19plus 19plus V2	1200, 2400, 4800	All versions, programmable

25	600, 1200, 4800	3.0k and later, programmable
	600, 1200, 2400, 4800	Before 3.0k, contact manufacturer to change baud rate if necessary.
25plus	600, 1200, 2400, 4800	All versions, programmable
49	1200, 2400, 4800	All versions, programmable

4.5 Test system setup

1. Start the Seaterm software.
    Note that Seaterm.exe can be started from SeatermV2, which is useful if an SBE 33 is used with a 19plus V2 or 25plus.

2. Make sure that the SBE 33 is connected to the Water Sampler to test the system.

3. From the **Configure** menu, select the SBE 33.

4. Push **OK** to save the settings and close the window.

5. In the Configuration Options window, select the *COM Settings* tab to set the communication settings:

    •   Comm Port, for connection to the SBE 33. 1 through 10 as applicable.
    •   Baud rate between the SBE 33 and PC, 9600 or 19200 (default is 9600).
    •   Data bits and parity:
        SBE 19plus, 19plus V2, 25plus, 49—8 data bits, no parity.
        SBE 19 or 25—7 data bits, even parity.

6. Turn on power to the Deck Unit.
    The status message shows in Seaterm:
    ```
    SBE 33/36 Deck Unit V3.0 setup:
    PC baud rate = 9600
    CTD baud rate = 4800
    8 data bits, no parity
    NMEA baud rate = 4800
    NMEA messages decoded = GGA, GLL, RMA, RMC, TRF, DBT, DPT
    surface PAR disabled
    NMEA depth disabled
    start mode = echo characters to and from the instrument
    Press @ to change the 33/36 Deck Unit setup
    ```
    If the system does not respond as shown, verify that the correct interface was selected and settings were entered correctly in the Configuration Options window, and that the cable between the PC and the Deck Unit is connected correctly.

7. Enter @ to open the setup menu:
    ```
    SBE 33/36 Deck Unit set up menu:
    Modes:
    1. Echo characters to and from the instrument
    2. Add Lat/Lon to the real-time HEX data from the instrument
    3. Transmit Lat/Lon only
    Options:
    4. Add NMEA Depth to the real-time HEX/Lat/Lon data
    5. Do not add NMEA Depth to the real-time HEX/Lat/Lon data
    6. Add PAR to the real-time HEX data
    7. Do not add PAR to the real-time HEX data
    Communications:
    ```

```
8. Change communication settings and start mode
9. Display communication settings and start mode
Diagnostics
10. enable diagnostic level 1
11. enable diagnostic level 2
the current mode = 1. Echo characters to and from the
instrument
Enter 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 followed by Enter,
or press @ to exit the set up menu
selection =
```

8. To look at the current communication and start mode settings, enter `9` and push **Enter**:
   ```
   PC baud rate = 9600
   CTD baud rate = 4800
   8 data bits, no parity
   NMEA baud rate = 4800
   NMEA messages decoded = GGA, GLL, RMA, RMC, TRF, DBT, DPT
   Surface PAR disabled
   NMEA depth disabled
   start mode = echo characters to and from the instrument
   ```
   If the *CTD baud rate* does not match the baud rate set in the CTD, the PC will not communicate with the CTD through the SBE 33. Change the CTD baud rate so the SBE 33 and the CTD use the same baud.

9. To change the CTD baud rate, enter `8` and push **Enter**. Enter the necessary value in the display, then type **Enter**:
   `PC baud rate = X, new value =` enter new value, push **Enter**
   `CTD baud rate = X, new value =` enter new value, push **Enter**
   `parity = X, new value = even parity or no parity [e/n]` enter `e` or `n`, push **Enter**.
   `NMEA baud rate = X, new value =` enter new value, push **Enter**
   `start mode = X, new value = echo or add Lat/Lon[e/a]` enter `e` or `a`, push **Enter**.
   The display shows the new values. Enter `@` to go back to the setup menu.

10. Enter `1` then push **Enter** to put the SBE 33 in **Mode 1** (echo characters to and from the instrument). **This is the mode required to communicate with the CTD**.

11. Enter `@` to exit the setup menu.

12. Select **Connect** on the toolbar or push **Enter** several times to start communication with the CTD through the SBE 33.
    The software shows an `S>` prompt.

13. Select **Status** on the toolbar to send the **DS** command and show the CTD status. If the status shows is correct, the system is connected correctly.

14. Optional: send setup commands to the CTD.

15. Send **QS** to put the CTD in a low power "quiescent" mode. (Does not apply to the SBE 49.)

16. If the SBE 33 is used with a NMEA device, Enter `@` to go to the setup menu. Enter `3` then **Enter** to go to Mode 3. the display shows:
    ```
    SBE 33/36 Deck Unit set up menu:
    Modes:
    1. Echo characters to and from the instrument
    ```

```
2. Add Lat/Lon to the real-time HEX data from the instrument
3. Transmit Lat/Lon only
Options:
4. Add NMEA Depth to the real-time HEX/Lat/Lon data
5. Do not add NMEA Depth to the real-time HEX/Lat/Lon data
6. Add PAR to the real-time HEX data
7. Do not add PAR to the real-time HEX data
Communications:
8. Change communication settings and start mode
9. Display communication settings and start mode
Diagnostics:
10. enable diagnostic level 1
11. enable diagnostic level 2
the current mode = 3. Transmit Lat/Lon only
Enter 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, or 11 followed by Enter,
or press @ to exit the set up menu
selection =
```

17. If the SBE 33 is used with a NMEA navigation (**position**) device, enter @ to exit the setup menu. NMEA data shows in the Seaterm software and the yellow NMEA Transmit LED on the SBE 33 flashes.

18. If the SBE 33 is used with a NMEA navigation (**position**) device **and** a **depth** device, while in Mode 3, enter 10 then **Enter** to go to diagnostic Mode. All raw NMEA characters are transmitted to the PC display:

```
the current mode = 3. Transmit Lat/Lon/Depth only
diagnostic level 1 enabled.
```

Enter @ to exit the setup menu. Raw NMEA messages show. Typical RMC and DPT messages:

$LGRMC,123113.21,A,3625.12,N,12121.34,W,1.2,4.5,231294,1.2,a*45<CR><LF>
$SDDPT,0005.4,0000.0*56<CR><LF>

19. Turn off power to the SBE 33.

4.6 Change communications settings

The default settings of the SBE 33 are compatible with the SBE 19plus, SBE 19plus V2, 25plus, and 49. If the settings in the Seaterm software do not agree with the SBE 33, the display shows nonsense characters when power is supplied. This typically happens if the SBE 33 is used with an SBE 19 or 25, which require 7 data bits and even parity.
Do the steps below to change the communication settings in the SBE 33 to operate with an SBE 19 or 25.

1. In the Seaterm software **Configure** menu, select the SBE 19plus to use the default communications settings.
The settings can then be changed to agree with the SBE 19 or 25.

2. In the *Configuration Options* box, select the *COM Settings* tab. Set the baud rate to 9600, data bits to 8 and parity to none.

3. In the **Communications** menu, select *Send 5 second break*.

4. Wait at least 10 seconds, then turn power to the SBE 33 off, and then on.
The display shows:

```
SBE 33/36 Deck Unit V3.0 setup:
PC baud rate = 9600
CTD baud rate = 4800
```

```
8 data bits, no parity
NMEA baud rate = 4800
NMEA messages decoded = GGA, GLL, RMA, RMC, TRF, DBT, DPT
surface PAR disabled
NMEA depth disabled
start mode = echo characters to and from the instrument
Press @ to change the 33/36 Deck Unit setup
```

5. Enter @ to change the SBE 33 setup.
6. Enter 8 then push **Enter** to change the communication settings in the SBE to use with an SBE 19 or 25:

   `PC baud rate = X, new value =` enter new value, push **Enter**

   `CTD baud rate = X, new value =` enter new value, push **Enter**

   `parity = X, new value = even parity or no parity [e/n]` enter e or n, push **Enter**.

   `NMEA baud rate = X, new value =` enter new value, push **Enter**

   `start mode = X, new value = echo or add Lat/Lon[e/a]` enter e or a, push **Enter**.

   The display shows the new values. Enter @ to go back to the setup menu.
7. In the **Configure** menu, select the connected CTD.
   At the *COM Settings* tab, select the settings for the CTD that agree with the settings in the SBE 33.
8. Push **OK** to save the settings and exit.
9. Turn the power to the SBE off and then on. The display shows:

```
SBE 33/36 Deck Unit V3.0 setup:
PC baud rate = 9600
CTD baud rate = 4800
7 data bits, even parity
NMEA baud rate = 4800
NMEA messages decoded = GGA, GLL, RMA, RMC, TRF, DBT, DPT
surface PAR disabled
NMEA depth disabled
start mode = echo characters to and from the instrument
Press @ to change the 33/36 Deck Unit setup
```

4.7 Verify the configuration file

The .xmlcon or .con configuration file gives information about the sensor, channels, serial numbers, and calibration dates and coefficients that the CTD requires. The Seasave software uses this file to interpret and process data. Information in the .xmlcon or .con file must be the same as the actual sensor configuration or data will not be processed correctly.

The configuration file must identify if NMEA or PAR data will be added to the CTD data. Real-time data from NMEA position and depth, and PAR depends of the configuration file settings, not the SBE 33 settings.

1. Double-click on Seasave.exe to start the program.
2. Select the **Configure Inputs** menu item.
3. In the *Instrument Configuration* tab, push **Open**.
4. In the dialog box, select either the .xmlcon or .con file and then push **Open**.

5. The configuration information shows on the *Instrument Configuration* tab. Verify that the sensors listed are the same as the sensors on the system and that any auxiliary sensors have the correct channels.

6. Push **Modify** to change the configuration or to see or change the calibration coefficients.

Section 5 Deployment and recovery

5.1 Set up water sampler in Seasave

1. Double-click on Seasave.exe to start the software.
2. Select the **Configure Inputs** menu.
3. Select the *Serial Ports* tab. In the <u>Water Sampling and 911 Pump Control Serial Port</u> area, select the COM port that is connected to the Deck Unit *Carousel Data* connector.
4. Select the *Water Sampler* tab.

   a. Enter the "Water sampler type":

      - SBE Carousel (32 or 32C)
      - SBE ECO (SBE 55)
      - None (if a PDIM is used)

   b. Enter the "Number of Water Bottles" up to 36.

   c. Enter the "Firing Sequence":

      - Sequential—when commanded to fire, bottles fire in order of position. (Bottle in position #1 fired first, then #2, etc.)
      - User Input—when commanded to fire, the user selects which bottle to fire in the software.
      - Table Driven—when commanded to fire, bottles fire in order pre-defined by a user-entered table. Push **Bottle Positions for Table Driven** to enter the bottle positions.
      - Auto Fire—bottles are fired automatically at user-entered, pre-defined pressures or depth on the **upcast**. Push **Auto-Fire Pressures and Positions** to enter parameters. Auto fire on downcast is available if the -autofireondowncast command line parameter is entered.

   d. Put a check in "Enable remote firing" to remotely control when bottles fire through *TCP/IP Ports* tab and NOT by "Firing Sequence."

   e. In the <u>Tone for bottle fire confirmation</u> area, select either the internal speaker on the PC or "PC sound card" so the tone can be transmitted to external speakers or headphones.

5. Push **OK** to save the settings.
6. Optional: from the main menu, set up a plot window in the software to show the order in which the bottles close, or put a horizontal line in the plot to show the data associated with a bottle closure. Right-click in a **Plot Display** window and select *Modify*.

5.2 Collect real-time data and fire bottles from Seasave

Use the Seasave V7 software to collect real-time data and fire bottles.

1. Double-click on Seasave.exe.
2. If necessary, set up display windows and make any other change in **Configure Outputs** and **Configure Inputs**.
3. Turn on the Deck Unit.
4. In the **Real-Time Data** menu, select *Start*.
5. Select the options for data collection and storage in the **Start Real-Time Data Acquisition** window.

   a. <u>Data Archiving Options</u> area:

      - Begin archiving data immediately—store raw (frequencies and voltages) data in real-time when **Start** is pushed.

- Begin archiving data when "Start Archiving" command is sent—Control when data is written to the file. The user can prevent unwanted scans, such as at the start of a cast.
- Do not archive data for the cast—data is not saved.

b. Output data (.hex) file area:

- Push **Select Output Data File Name** to enter the location and name of the data file to save.

c. Configuration Options area:
Shows current .xmlcon or .xml configuration file name and location.

- Push **Configure Inputs** to change serial ports, water sampler, TCP/IP ports and other inputs.
- Push **Configure Outputs** to change serial data and ports, shared file outputs, TCP/IP ports, alarms, and other output.

d. Timeout options:

- "Timeout in seconds at startup" is the time before the first data is received from the sensor. The software will "time out" and not try to collect data if no data is received within the set time period.
- "Timeout in seconds between scans" is the maximum interval between scans after the first data is received from the sensor.

6. Push **Start**.

a. If either of the "Data Archive" options were selected and "Prompt for Header Information" (in the **Configure Outputs** window) was selected, the **Header Information** dialog box shows. Fill in the header information (optional) and push **OK**.

b. If a water sampler is set up, the software sends a Reset command to it and waits up to 60 seconds to for confirmation. If the water sampler is not confirmed, make sure that the Deck Unit power is on, the PC and the Deck Unit are connected, and the communication settings and COM ports (*Serial Ports* tab) are correct.

c. If "NMEA position data added" is selected in the .xmlcon or .con file, the software starts NMEA communication. The software automatically sends a command to put the SBE 33 in Mode 1 (do not transmit NMEA data), or Mode 2 (append NMEA/PAR data to CTD data), dependent on the settings in the configuration file.

d. If "Check Scan Length" was selected in the **Options** menu, the software verifies from the .xmlcon or .con file that the scan length is the same as the sensor. If *Scan length error* shows, make sure the .xmlcon or .con file is correct and has been updated if sensors have been added or removed, or if NMEA or PAR inputs have been added or removed.

e. The software sends *Waiting for data...*The software will time out if data is not received from the Deck Unit within the "Timeout in seconds at startup" that was set in **Start Real-Time Data Acquisition**.

f. Data starts to show in the display.

7. To fire a water sampler bottle from Seasave, enter **Ctrl F3** or, in the **Real-Time Control** menu, select *Fire Bottle Control*. The **Bottle Fire** window shows. (This can be left open throughout a cast.) The window shows the next bottle to be fired. If *User Input* was selected in the water sampler setup, select the next bottle to fire, then push **Fire Bottle** when ready.
When the software gets a "bottle fired" confirmation from a water sampler, it writes a line to a file (same name as the data file) with a .bl extension. This file has the bottle firing sequence number, bottle position, date, time, and first and last scan number for the fired bottle.

8. To stop data collection:

a. For a sensor that was started with a switch, move the switch to the off position.

b. Push **Stop** in the **Real-time Data** menu.

c. For sensor that was started by command, close the Seasave software and open Seaterm. Start communications with the CTD, and send the appropriate command to stop the CTD. Send **QS** to put the CTD into a low-power mode (not applicable for an SBE 49).

9. Turn off the Deck Unit.

5.3 Fire bottles from Deck Unit

The user can also fire bottles directly from the Deck Unit. The manufacturer strongly recommends that the user uses either the software or the Deck Unit, not both, to fire bottles on the same cast. Bottles fired from the Deck Unit can be in random or sequential order.

The Seasave software still gets a *Bottle Fired* confirmation from the water sampler if both the *Carousel Data* and the *Serial Data* are connected to the PC.

When the software gets a "bottle fired" confirmation from a water sampler, it writes a line to a file (same name as the data file) with a .bl extension. This file has the bottle firing sequence number, bottle position, date, time, and first and last scan number for the fired bottle.

1. Set the *Bottle to Fire* pushbutton switch to 00.
2. Push the *Reset* button.
3. To fire bottles in **random** order, set the *Bottle to Fire* pushbutton switch to the bottle to fire, then push the *Fire* button. Repeat for each bottle.
4. To fire bottles in **sequential** order, set the *Bottle to Fire* pushbutton switch to 99, then push the *Fire* button. The water sampler will fire bottle 1. Push the *Fire* button for bottle 2, then 3, etc.

5.3.1 Transmit CTD data

Data is typically processed on the real-time data collected in the Seasave software. Some users will transmit the data in the CTD memory as a backup to the real-time data. This lets the user compare the data in memory to the real-time data, to make sure that any cable problems, noise, or other issues did not corrupt the real-time data.
Notes:

• The SBE 49 does not have memory to store data.
• The 25plus does not transmit real-time data from any connected auxiliary serial sensors. Data must be transmitted from memory.

1. When the cast is done, turn the CTD switch off.
2. Turn off power to the SBE 33.
3. Disconnect the CTD from the water sampler.
4. Use the data I/O cable to connect the CTD to the PC and do the steps in the CTD manual to transmit data to the PC.
5. Use the Data Conversion module in the SBE Data Processing software to convert the real-time .hex raw data file and the .bl bottle data file created by Seasave.

   • Save to a .cnv file, with all data converted to engineering units.
   • Save to a .ros water bottle file that has data for a user-selected range of scans before and after each bottle was fired.

6. Optional: Use the Data Conversion module in the SBE Data Processing software to convert the raw data file (.xml for the SBE 25plus and .hex for all other CTDs) that was transmitted from the CTD to a .cnv file to compare to the real-time data.
7. Use other modules of the SBE Data Processing software to further process the data (align, filter, remove bad data, calculate derived variables, etc.)

5.3.2 Edit data file

Some users want to edit the raw .hex file before it is processed, to remove "soak time" data at the start of the file, or edit the header, or to add notes about the cast.

The manufacturer recommends that the user first convert the data to a .cnv file with the Data Conversion module in the SBE Data Processing software, and then edit the .cnv file. **Edits to the .hex file can corrupt the data so that it cannot be processed further with the SBE software.**

5.4 Data formats

5.4.1 NMEA position data format

For the IEEE488 interface, 7 bytes of position data are appended to the end of each CTD scan transmitted from the Deck Unit to the PC.

For the RS232 interface, 14 ASCII characters of position data, followed by a carriage return and line feel are transmitted once per second. For example, if the data collection rate is 24 Hz, the NMEA data is transmitted after CTD scans 1, 25, 49, etc. and scans in between will have only CTD data. In the Seasave software, the navigation data is appended to each CTD scan so the output from Seasave is the same for both IEEE488 and RS232.

The software calculates latitude and longitude as:

Latitude, degrees = (byte 1 × 65536 + byte 2 × 256 + byte 3) ÷ 50000.

Longitude, degrees = (byte 4 × 65536 + byte 5 × 256 + byte 6) ÷ 50000.

- If bit 1 in byte 7 is 1, this is a new position.
- If bit 8 in byte 7 is 1, latitude is negative.
- If bit 7 in byte 7 is 1, longitude is negative.
- North latitudes are positive; south latitudes are negative.
- East longitudes are positive; west longitudes are negative.

Example: Appended position data = 2455FC5D32B141

byte 1 = 24 hex = 36 decimal

byte 2 = 55 hex = 85 decimal

byte 3 = FC hex = 252 decimal

byte 4 = 5D hex = 93 decimal

byte 5 = 32 hex = 50 decimal

byte 6 = B1 hex = 177 decimal

byte 7 = 41 hex = 01000001 binary

This is a new position: bit 1 in byte 7 is 1.

Latitude is positive: bit 8 in byte 7 is 0.

Longitude is negative: bit 7 in byte 7 is 1.

Latitude = (36 × 65536 + 85 × 256 + 252) ÷ 50000 = 47.62616 degrees.

Longitude = (93 × 65536 + 50 × 256 +177) ÷ 50000 = -122.1565 degrees

---

Depth data, if applicable

Three bytes of depth data are appended to each data scan, after the position scan. The manufacturer-supplied software calculates depth as shown below.

Depth, meters = (byte 1 × 65536 + byte 2 × 256 + byte 3) ÷ 10

Example: Appended depth data = 0032FC

byte 1 = 00 hex = 0 decimal

byte 2 = 32 hex = 50 decimal

byte 3 = FC hex = 252 decimal

Depth = (0 × 65536 + 50 × 256 + 252) ÷ 10 = 1305.2 meters

5.4.2 NMEA message format

-- is two device-specific characters	<CR> is carriage return	<LF> is line feed

GCA—Global Positioning System Fix Data

Time, position, and fix-related data for a GPS receiver.

$--GCA,hhmmss.ss,llll.ll,a.yyyyy.yy,b,x,xx,x.x,x.x,M,x.x,M,x.x,xxxx×hh<CR><LF>

GLL—Geographic Position, Latitude and Longitude

Latitude and longitude of current position, time of position fix, and status.

$--GLL,llll.ll,a,yyyyy.yy,b,hhmmss.ss,A*hh<CR><LF>

RMA—Recommended Minimum Specific LORAN-C Data

Position, course, and speed data from a LORAN-C receiver.

#--RMA,A,llll.ll,a,yyyyy.yy,b,x.x,x.x,x.x,x.x,x.x,a*h<CR><LF>

RMC—Recommended Minimum Specific GPS/TRANSIT Data

Time, date, position, course, and speed data from a GPS or TRANSIT navigation receiver.

$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,b,x.x,x.x,ddmmyy,x.x,a*h<CR><LF>

TRF—TRANSIT Fix Data

Time, date, position, and information related to a TRANSIT fix.

$--TRF,hhmmss.ss,ddmmyy,llll.ll,a,yyyyy.yy,b,x.x,x.x,x.x,xxx,A*h<CR><LF>

Field Type	Symbol	Description
Status	A	Single character field: A = Yes, data valid, warning flag clear. V = No, data invalid, warning flag set
Latitude	llll.ll	Fixed/Variable length field: degrees|minutes. Decimal—two fixed digits of degrees, two fixed digits of minutes, and variable number of digits for decimal-fraction of minutes. Leading zeros are always included for degrees and minutes to keep the fixed length. Decimal point and related decimal-fraction are optional if full resolution is not required.
	a	N or S
Longitude	yyyyy.yy	Fixed/Variable length field: degrees|minutes. Decimal—two fixed digits of degrees, three fixed digits of minutes, and variable number of digits for decimal-fraction of minutes. Leading zeros are always included for degrees and minutes to keep the fixed length. Decimal point and related decimal-fraction are optional if full resolution is not required.
	b	E or W
Time	hhmmss.ss	Fixed/Variable length field: degrees|minutes. Decimal—two fixed digits of degrees, two fixed digits of minutes, and variable number of digits for decimal-fraction of minutes. Leading zeros are always included for degrees and minutes to keep the fixed length. Decimal point and related decimal-fraction are optional if full resolution is not required.
Checksum	*	Optional checksum delimiter
	hh	Optional checksum field: Absolute value calculated by exclusive OR'ing 8 data bits, no start or stop bits, of each character in message, between, but exclusive of $ and *.

Section 6 Troubleshooting

⚠ DANGER

Life-threatening voltages of over 250 VDC are on the sea cable and the Deck Unit when it is on, and will persist for up to 1 minute after it is turned off.

The manufacturer recommends that the user remove the AC power, then wait for one minute before any troubleshooting work on the equipment.

6.1 Cannot see data in Seasave

If the scan length does not match the selected .xmlcon or .con file, data will not show in the Seasave display.

Solution

Stop data collection and make sure the settings in the *Configure Inputs* window of the software match the CTD configuration. Verify the number and type of auxiliary sensors, channels, NMEA, and Surface PAR.

The manufacturer recommends that the user enables the "Check scan length" in the Options menu of the software. If the scan length is different from the expected length, an error message will show.

If the configuration file is incorrect, it will not have an effect on the quality of the raw data. Correct any errors in the configuration file in the Data Processing software module and process the data as necessary.

6.2 Deck Unit does not operate

Cause

If the power switch is on but the power switch pilot light is off, no other panel lights are on and the fan does not operate, the AC power has been disconnected or the main fuse has blown.

Solution

Turn the Deck Unit off and remove the power cable. Wait 1 minute and look at the main fuse. Replace if necessary.

If the main fuse blows again, there may be a short in the main body wiring. There are separate fuses and short circuit protection circuitry related to the internal power supplies that protect the main fuse, even if internal circuitry does not turn on. It may be necessary to disconnect each section one by one to find the problem.

6.3 Cannot communicate with CTD

There is no voltage on the sea cable.

Solution

Turn the Deck Unit off. Remove the power cable and wait 1 minute. Connect a voltmeter set to a minimum of 300 VDC to the *Sea Cable* connector. Connect the power cable again and turn on the Deck Unit. The voltmeter should show 250 V.

If there is no voltage, the sea cable supply does not operate. Turn the Deck Unit off. Remove the power cable and wait 1 minute. Evaluate the *Sea Cable Fuse*. If this fuse is blown, the sea cable may have been accidentally shorted, or there is a malfunction of the CTD. If there is AC input, the fuse is ok. If there is no DC output, the power supply is defective.

The user can also do a check with the Water Sampler and the test cable. Try to fire the Water Sampler with the test cable connected instead of the sea cable. If the system works with the test cable, there may be a problem with the sea cable or termination.

6.4 Error message: unsupported modem

The error message `FFFFFFFF Unsupported modem message: xx xx xx` from the Water Sampler.

Causes

There may be noise on the line that causes extra characters to be transmitted.

The serial port for water sampler control may be incorrect.

The Carousel does not function correctly and sends bad messages.

Solutions

Verify there is no damage to the sea cable. Also verify the cable between the water sampler and the CTD is not damaged and is connected correctly.

In Seasave, make sure the serial port setting is correct. From **Configure Inputs**, go to the *Serial Ports* tab, then the <u>Water Sampling and 911 Pump Control Serial Port</u> area. This should be the port connected to the SBE 33 *Carousel Data* connector.

6.5 NMEA Interface does not work

Solutions

Make sure that the cables and connections between the Deck Unit, the NMEA device, and the PC are correct.

Make sure that the NMEA device is set to either 4800 or 9600 baud. Use the **DS** command to verify that the NMEA Interface baud rate on the Deck Unit is correct. Reset the baud rate on the device if necessary.

If there is no data transmitted, refer to the manual for the device for setup details. To verify that the device can transmit data, connect an oscilloscope with ground on NMEA B (T17) and the probe on NMEA A (T16). This signal should be less than 0.5 V between messages and have pulses greater than 4 V for at least 0.2 milliseconds during the message.

To verify that the NMEA Interface does not operate correctly, use the NMEA Test program, which simulates a NMEA navigation device.

Section 7 General information

Revised editions of this user manual are on the manufacturer's website.

7.1 Warranty

Refer to the manufacturer's website for warranty information (seabird.com/warranty).

7.2 Service and support

The manufacturer recommends that sensors be sent back to the manufacturer annually to be cleaned, calibrated, and for standard maintenance.
Refer to the website for FAQs and technical notes, or contact the manufacturer for support at support@seabird.com. Do the steps below to send a sensor back to the manufacturer.

1. Complete the online Return Merchandise Authorization (RMA) form or contact the manufacturer.
   Note: The manufacturer is not responsible for damage to the sensor during return shipment.
2. Remove all batteries from the sensor, if so equipped.
3. Remove all anti-fouling treatments and devices.
   Note: The manufacturer will not accept sensors that have been treated with anti-fouling compounds for service or repair. This includes AF 24173 devices, tri-butyltin, marine anti-fouling paint, ablative coatings, etc.
4. Use the sensor's original ruggedized shipping case to send the sensor back to the manufacturer.
5. Write the RMA number on the outside of the shipping case and on the packing list.
6. Use 3rd-day air to ship the sensor back to the manufacturer. Do not use ground shipping.
7. The manufacturer will supply all replacement parts and labor and pay to send the sensor back to the user via 3rd-day air shipping.

7.3 China RoHS disclosure table

Name of Part	Hazardous substance or element in product					
	Pb	Hg	Cd	Cr(VI)	PBB	PBDE
PCBs	X	O	O	O	O	O
This table is compiled to the SJ/T 11364 standard.						
O: This hazardous substance is below the specified limits as described in GB/T 26572. X: This hazardous substance is above the specified limits as described in GB/T 26572.						