SBE 36 / PDIM CTD Power & Data System

User’s Manual
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Manual Version #004, 02/14/02
Firmware Version 2.2 and later
Limited Liability Statement

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<td>Schematics</td>
<td></td>
</tr>
</tbody>
</table>
Section 1: Introduction

This section includes contact information and photos of a standard SBE 36 shipment.

About this Manual

This manual is to be used with the SBE 36 / PDIM CTD Power / Data System.

It is organized to guide the user from installation through operation. We’ve included detailed specifications, setup and operation descriptions, and helpful notes throughout the manual.

Sea-Bird welcomes suggestions for new features and enhancements of our products and/or documentation. Please e-mail any comments or suggestions to seabird@seabird.com.

How to Contact Sea-Bird

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Monday-Friday, 0800 to 1700 Pacific Standard Time
(1600 to 0100 Universal Time)
Except from April to October, when we are on summer time
(1500 to 0000 Universal Time)
Unpacking the SBE 36 / PDIM

Shown below is a typical SBE 36 / PDIM shipment. Inclusion of test cables, cables for optional interfaces, etc. is dependent on the order.
Section 2: Description of the SBE 36

This section describes the functions and features of the SBE 36 / PDIM CTD Power / Data System, as well as system communications.

System Description

The SBE 36 Deck Unit provides power and real-time data acquisition and control for an SBE 19, 19plus, or 25 CTD interfacing with a Power / Data Interface Module (PDIM). The SBE 36 remains at the surface, while the PDIM is installed on or near the CTD. The system allows for two-way communication for the CTD over a single-conductor sea cable.

The rack-mountable SBE 36 supplies DC power for the underwater unit(s), decodes the serial data, and passes the data to a computer. The SBE 36 rear-panel switch permits operation from 120 VAC or 240 VAC 50/400 Hz input power.

The SBE 36 includes a NMEA Interface that merges position data with CTD data. The NMEA Interface decodes messages that are output from navigation devices supporting NMEA 0183 protocol. Decoded Latitude and Longitude are appended to the CTD data stream in the SBE 36, and are passed to the computer for storage and/or display with the CTD data.

The SBE 36 may include an optional A/D converter for a Surface PAR light sensor. The SBE 36 supplies 12 volts to power the sensor.

The SBE 36 contains Analog, Receiver, and NMEA Interface PCBs. The Receiver PCB interfaces to the sea cable. As described above, the NMEA Interface PCB interfaces to a NMEA navigation device and optional Surface PAR sensor. Communication parameters are set with dip switches on the Receiver and NMEA Interface PCBs.
The SBE 36 is supplied with a powerful software package for communication and data retrieval; acquisition, conversion, and display of real-time or archived raw data; and processing data. Sea-Bird provides two software versions:

- **SEASOFT-Win32** - Windows programs. The major components of SEASOFT-Win32 are *SEATERM* (terminal program), *SEASAVE* (real-time acquisition and display of data), and *SBE Data Processing* (processing of data). At this time, SEASOFT-Win32 does not include the NMEA simulation programs available in SEASOFT-DOS.

- **SEASOFT-DOS** – DOS programs. SEASOFT-DOS is designed to run on IBM-compatible computers (XT/AT/386/486/Pentium). These programs usually perform correctly when run under Windows.

### SBE 36 Specifications

The SBE 36 supplies a constant 250 VDC power to the sea cable. The PDIM receives this voltage (minus the sea cable IR drop) and regulates it to a constant 64 VDC. This 64 VDC is input to a high-efficiency DC/DC converter, which outputs +15 VDC. The +15 VDC is the supply voltage to the CTD. Approximately 1 amp, *in addition to CTD power*, is available at the CTD for support of auxiliary sensors.

<table>
<thead>
<tr>
<th><strong>Power Requirements</strong></th>
<th>120 VAC or 240 VAC 50/400 Hz (selectable)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sea Cable Compatibility</strong></td>
<td>Single or multi-core armored cable up to 10,000 meters (32,800 feet) long with inner core resistance of up to 350 ohms</td>
</tr>
<tr>
<td><strong>SBE 36 CTD Deck Unit Dimensions</strong></td>
<td>89 mm (3.5 inch) high cabinet with standard 19-inch rack mounting brackets</td>
</tr>
</tbody>
</table>
System Communications

System communications are summarized below:
SBE 36 Front Panel

Looking at the SBE 36 front panel:

- **Power** button - turns power to the SBE 36 on/off
- **LEDs** - indicate if the SBE 36 is communicating with other parts of the system:
  - Yellow *NMEA Transmit* LED - flashes when a carriage return character (decimal 13) is received from the NMEA navigation device
  - Yellow *CTD Transmit* LED - flashes when a message is transmitted to the CTD through the PDIM
  - Green *CTD Receive* LED - flashes when a carriage return character (decimal 13) is received from the CTD through the PDIM

SBE 36 Back Panel

Looking at the connections to the SBE 36 back panel:

- **Serial Data** connects to the computer.
- **NMEA Input** connects to a NMEA navigation device.
- **PAR Input** connects to an optional Surface PAR sensor.
- **Sea Cable** connects to the PDIM.
- **AC Input** is 120 VAC or 240 VAC 50/400 Hz (selectable)
Section 2: Description of the SBE 36

PDIM

J2
CTD
1
2
3
4
Transmit to CTD
Receive from CTD
+15V
out

J1
Sea cable
(−)
(+)

CTD power and data
Anode

43 mm
(1.7 in.)

254 mm
(10.0 in.)

99 mm
(3.9 in.)

PDIM
Section 3: Setting Up the System

This section covers:
• Installing Sea-Bird software
• Setting the baud rate in the CTD
• Setting the SBE 36 dip switches
• Setting up the CTD configuration (.con) file

Installing Software

If not already installed, install Sea-Bird software programs on your computer using the supplied software CD.

SEASOFT-Win32

1. With the CD in your CD drive, double click on SeaSoft-Win32.exe.

2. Follow the dialog box directions to install the software.

The default location for the software is c:/Program Files/Sea-Bird. Within that folder is a sub-directory for each program.

SEASOFT-DOS

1. With the CD in your CD drive, copy the SeaSoft.dos folder, which contains three files.

2. Paste the SeaSoft.dos folder in the desired location on your hard drive.

3. In the SeaSoft.dos folder on your hard drive, double click on sinstall.bat to install the software.
Setting CTD Baud Rate and Operating Parameters

PDIM communication with the CTD is at 600, 1200, 2400, or 4800 baud. For the most efficient operation, set the CTD baud rate to 4800 baud.

<table>
<thead>
<tr>
<th>CTD</th>
<th>Baud Rates</th>
<th>CTD Firmware Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>SBE 19</td>
<td>600 or 1200</td>
<td>3.0d and later, programmable</td>
</tr>
<tr>
<td></td>
<td>600, 1200, or 4800</td>
<td>3.1d and later (but not 4.0 series), programmable</td>
</tr>
<tr>
<td></td>
<td>600, 1200, 2400, or 4800</td>
<td>Prior to 3.0d, contact Sea-Bird for instructions on changing baud rate if necessary</td>
</tr>
<tr>
<td>SBE 19plus</td>
<td>1200, 2400, or 4800</td>
<td>All versions, programmable</td>
</tr>
<tr>
<td>SBE 25</td>
<td>600, 1200, or 4800</td>
<td>3.0K and later, programmable</td>
</tr>
<tr>
<td></td>
<td>600, 1200, 2400, or 4800</td>
<td>Prior to 3.0K, contact Sea-Bird for instructions on changing baud rate if necessary</td>
</tr>
</tbody>
</table>

The baud rate for PDIM communication with the CTD must be set in both the CTD and on the SBE 36 Receiver PCB. See Setting SBE 36 Dip Switches below for dip switch settings for baud rate.

To set (if programmable) and/or verify the CTD baud rate, and establish CTD operating parameters:

1. Connect the CTD directly to the computer, using the data I/O cable supplied with the CTD.

2. Double click on Seaterm.exe. If this is the first time the program is used, the setup dialog box appears:

Select the CTD and the computer COM port for communication with the CTD. Click OK.
3. The main screen looks like this:

![Diagram of main screen]

4. In the Configure menu, select the appropriate CTD.

5. In the dialog box, select the firmware version, COM port, baud rate, data bits, and parity (see the CTD’s configuration sheet for this information).

6. In the Communications menu, select *Options / Cycle baud when connecting*.

7. Click Connect on the Toolbar. SEATERM tries to connect to the CTD at the baud set in Step 5. If it cannot, it cycles through all other possible baud rates to try to connect. An $>$ prompt shows that communication has been established.

8. Look at the connection’s baud rate in the Status bar. If this is not a baud rate that can be used with the PDIM (600, 1200, 2400, or 4800), change the baud rate in the CTD. The command to change the baud rate is given below for CTDs with programmable baud rate (contact Sea-Bird for instructions on older CTDs):
   - SBE 19 - Send \texttt{SBn} command, where \( n = 1 \) (600 baud), \( 2 \) (1200 baud), or \( 6 \) (4800 baud - for firmware version 3.1d and above in the 3.0 series; not applicable to the 4.0 series).
   - SBE 19plus - Send \texttt{BAUD=x} command, where \( x = 1200, 2400, \) or \( 4800 \).
   - SBE 25 - Send \texttt{SRn} command, where \( n = 1 \) (600 baud), \( 2 \) (1200 baud), or \( 4 \) (4800).

9. Click Connect on the Toolbar again, and verify that the Status bar shows the new baud rate. Record the baud rate - you must also set the CTD baud rate on the SBE 36 Receiver PCB (see *Setting SBE 36 Receiver PCB Dip Switch* below).

10. Establish other setup and logging parameters for the CTD. See the CTD manual for details.

11. Send the \texttt{QS} command to put the CTD in quiescent (sleep) state.

\textbf{Note:}\n
Once all baud rates are set, you can also communicate with and change the setup of the CTD through the SBE 36 and PDIM using SEATERM. See *Testing NMEA and Testing System Setup* in Section 4: Setting Up NMEA Interface and Surface PAR for details.
Section 3: Setting Up the System

Setting Dip Switches - General Information

A switch is ON when pushed in at the position number. In the photo at left:
- positions 1, 2, 3, 4, and 8 are ON
- positions 5, 6, and 7 are OFF.

Setting SBE 36 Dip Switches

A 4-position dip switch on the SBE 36 Receiver PCB sets the baud rate between the CTD and PDIM. The Serial Data baud rate between the CTD and PDIM is factory-set in the SBE 36 to 600 baud, unless the CTD has a higher baud rate. Upon power-up, the SBE 36 reads this switch setting and automatically sends a command to the PDIM to set its baud rate. For the most efficient operation, set the baud rate to 4800 baud if it is feasible for the CTD.

<table>
<thead>
<tr>
<th>Baud Rate between CTD and PDIM</th>
<th>SBE 36 Receiver PCB Dip Switch Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>600</td>
<td>ON</td>
</tr>
<tr>
<td>1200</td>
<td>OFF</td>
</tr>
<tr>
<td>2400</td>
<td>ON</td>
</tr>
<tr>
<td>4800</td>
<td>OFF</td>
</tr>
</tbody>
</table>

The baud rate for PDIM communication with the CTD must be set in both the CTD and on the SBE 36 Receiver PCB. See Setting CTD Baud Rate above for CTD setup.

Notes:
- Baud rate between the SBE 36 Receiver PCB and NMEA Interface PCB is factory set to 9600 baud and cannot be changed.
- Other dip switch positions on the NMEA Interface PCB affect communication with a NMEA navigation device and Surface Par sensor. See Section 4: Setting Up NMEA Interface and Optional Surface Par for details.

An 8-position dip switch on the NMEA Interface PCB sets the baud rate between the SBE 36 and the computer.

<table>
<thead>
<tr>
<th>Baud Rate between SBE 36 and Computer</th>
<th>SBE 36 NMEA Interface PCB Dip Switch Setting - Position 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600 (factory default)</td>
<td>ON</td>
</tr>
<tr>
<td>19200</td>
<td>OFF</td>
</tr>
</tbody>
</table>
### Checking CTD Configuration (.con) File in SEASAVE

SEASAVE, Sea-Bird’s real-time data acquisition and display program, requires a .con file, which defines the CTD - auxiliary sensors integrated with the instrument, and channels, serial numbers, and calibration dates and coefficients for all the integrated sensors (conductivity, temperature, and pressure as well as auxiliary sensors). SEASAVE (as well as our data processing software) uses the information in the .con file to interpret and process the raw data. **If the .con file does not match the actual instrument configuration, the software will not be able to interpret and process the data correctly.**

To verify the contents of the .con file:

1. Double click on Seasave.exe.
2. In SEASAVE's Configure menu, select *New Style Instrument Configuration/Select Instrument Configuration*. In the dialog box, select the appropriate .con file and click Open.
3. In the Configure menu, select *Modify Selected Instrument Configuration*. The configuration dialog box appears (example shown is an SBE 19 plus).

- **Surface PAR**: Select if SBE 36 includes optional Surface PAR channel, and Surface PAR sensor is being used. Adds 2 channels to Channel/Sensor table. Do not increase External Voltage Channels to reflect this; External Voltage Channels reflects only external voltages going directly to CTD from auxiliary sensors.
- **NMEA**: Select if NMEA navigation device is being used. See Section 4: Setting Up NMEA Interface and Surface PAR for details.

### Configuration for the SBE 19 Seacat plus CTD

<table>
<thead>
<tr>
<th>Channel</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Temperature</td>
</tr>
<tr>
<td>2.</td>
<td>Conductivity</td>
</tr>
<tr>
<td>3.</td>
<td>Pressure: Strain Gauge</td>
</tr>
<tr>
<td>4.</td>
<td>Free</td>
</tr>
<tr>
<td>5.</td>
<td>Free</td>
</tr>
<tr>
<td>6.</td>
<td>Free</td>
</tr>
<tr>
<td>7.</td>
<td>Free</td>
</tr>
<tr>
<td>8.</td>
<td>Unavailable</td>
</tr>
<tr>
<td>9.</td>
<td>SPAR/Surface Irradiance</td>
</tr>
</tbody>
</table>

Shaded sensors cannot be removed or changed to another type of sensor. All others are optional.

Click a (non-shaded) sensor and click **Select** to pick a different sensor for that channel. A dialog box with a list of sensors appears. Select sensors after number of voltage channels have been specified above.

Click a sensor and click **Modify** to view/change calibration coefficients for that sensor.
Mounting the SBE 36 and PDIM

Detachable rack mount ears are provided for mounting the SBE 36 Deck Unit to standard 19-inch electronics bays.

Mount the PDIM to the CTD, using the provided mounting kit.

Wiring the System

PDIM to CTD

Connect the CTD’s data I/O connector to the PDIM’s 4-pin connector using the cable supplied with the CTD / PDIM.

Sea Cable from SBE 36 to PDIM

Mold the bottom end of the sea cable to the 2-pin pigtail (RMG-2FS) supplied with the PDIM. Connect positive power (+, cable inner conductor) to the small pin (black on the pigtail) and negative power (-, cable armor) to the large pin (white on the pigtail). If you inadvertently connect the power with the wrong polarity, no damage will be done, because there is a protective diode in series with the + power line. However, the system will not work until the condition is corrected. For safety reasons and for the most reliable performance, Sea-Bird strongly recommends use of the cable armor for the PDIM/CTD data and power return.

Make a secure mechanical connection between the cable armor and the CTD or cage lifting eye. Connect the sea cable to the PDIM, using care 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 supplied MS connector (MS3106A12S-3P). Connect positive power (+, cable inner conductor) to pin B and negative power (-, cable armor) to Pin A. Connect to the Sea Cable connector on the SBE 36 rear panel. To minimize cable-induced noise, ensure that the connection between the sea cable armor and pin A does not touch the ship.

SBE 36 to Computer

Connect the computer to Serial Data on the SBE 36 rear panel using the supplied cables.

NMEA Navigation Device to SBE 36

Connect the NMEA navigation device to the NMEA Input connector on the SBE 36 rear panel with the supplied 2-pin MS connector (MS3106A12S-3S). The connector pin designations are:

<table>
<thead>
<tr>
<th>SBE 36</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin A</td>
<td>NMEA A (signal)</td>
</tr>
<tr>
<td>Pin B</td>
<td>NMEA B (signal return)</td>
</tr>
</tbody>
</table>
Section 3: Setting Up the System

**Optional Surface PAR Sensor to SBE 36**

Connect the Surface PAR sensor to the PAR Input connector on the SBE 36 rear panel. A 4-pin MS-style connector (MS3106A14S-2P) was supplied if a cable was not provided. The connector pin designations are:

<table>
<thead>
<tr>
<th>SBE 36</th>
<th>Function</th>
<th>Surface PAR Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin A</td>
<td>Common (ground)</td>
<td>Pin A</td>
</tr>
<tr>
<td>Pin B</td>
<td>Power (+12 volts)</td>
<td>Pin B</td>
</tr>
<tr>
<td>Pin C</td>
<td>Common (ground) - SBE 33 with NMEA PCB Assembly 40785b/40786b or greater use pin C as signal ground. All previous versions do not use pin C.</td>
<td>-</td>
</tr>
<tr>
<td>Pin D</td>
<td>Signal +</td>
<td>Pin D</td>
</tr>
</tbody>
</table>

*Note:* Connect SBE 36 pin A / pin C to Surface PAR pin A at Surface PAR end of cable. **Do NOT jumper at the SBE 36.**

**Power to SBE 36**

Verify that the SBE 36 rear panel power selector switch is in the correct position for your mains power source. Connect power to the AC Input connector on the SBE 36 rear panel using the supplied cable.

---

**WARNING!**

Some oceanographic vessels isolate (un-ground) the AC power ground circuit. If the SBE 36 is being installed on a vessel with an isolated AC power ground, a secure separate ground connection must be made between the SBE 36 chassis and the ship’s hull for SAFETY REASONS.

**CAUTION:**

Connecting an SBE 36 set for 120 volts to a 240 volt power supply will cause severe damage to the SBE 36.
Section 4: Setting Up NMEA Interface and Surface PAR

The SBE 36 includes a NMEA 0183 Interface that permits position data to be merged with the CTD data. The NMEA Interface is designed to decode messages that are output from navigation devices supporting NMEA 0183 protocol.

An optional A/D converter for a Surface PAR light sensor may be added to the SBE 36.

The decoded Latitude and Longitude and Surface PAR data can be appended to the CTD data stream in the SBE 36 and passed to the computer for storage and/or display with the CTD data. The Yellow NMEA Transmit LED on the SBE 36 front panel flashes each time a NMEA message is received (should be the same rate at which your navigation device is transmitting). The SBE 36 appends the same NMEA message multiple times, until a new message is decoded.

Example: A navigation device outputs its NMEA 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.

Setting NMEA Interface PCB Dip Switch

An 8-position dip switch on the SBE 36 NMEA Interface PCB sets the SBE 36 NMEA Interface PCB-to-computer baud rate and the NMEA Interface operating parameters.

Baud Rate - NMEA Interface PCB to Computer

<table>
<thead>
<tr>
<th>Baud Rate</th>
<th>Position 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>9600 (factory default)</td>
<td>ON</td>
</tr>
<tr>
<td>19200</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Note: If NMEA date and time are available in the NMEA message, SEASAVE substitutes the NMEA information for the computer clock time in the header.
Section 4: Setting Up NMEA Interface and Surface PAR

Message to Decode

<table>
<thead>
<tr>
<th>Message to Decode</th>
<th>Position 1</th>
<th>Position 2</th>
<th>Position 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>GGA - Global Positioning System Fix Data</td>
<td>ON</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>GLL - Geographic Position: Latitude/Longitude</td>
<td>OFF</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>RMA - Recommended Minimum Specific Loran-C Data</td>
<td>ON</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>RMC (factory default) - Recommended Minimum Specific GPS/TRANSIT Data</td>
<td>OFF</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>TRF - TRANSIT Fix Data</td>
<td>ON</td>
<td>ON</td>
<td>OFF</td>
</tr>
</tbody>
</table>

If you are not sure which NMEA messages your navigation device is sending, see Troubleshooting NMEA Interface for information on viewing the raw NMEA message using the NMEA Interface’s diagnostic mode.

Menu Time Out Mode

Time Out Mode affects the behavior of the SBE 36 while communicating with it from the NMEA Interface menu. See Testing NMEA below for use of the NMEA Interface menu.

<table>
<thead>
<tr>
<th>Menu Time Out Mode</th>
<th>Position 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not time out (factory default)</td>
<td>ON</td>
</tr>
<tr>
<td>If no reply is received within 30 seconds, time out and set mode to Add Lat/Lon to Hex Data</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Note:
You can override these settings with Sea-Bird software:
- In SEATERM, in the NMEA Interface menu, Lat/Lon and/or Surface PAR data transmission is determined by the mode.
- In SEASAVE, Lat/Lon and/or Surface PAR data transmission is determined by the setting in the CTD configuration (.con) file.

Data to Add to Hex String from CTD

<table>
<thead>
<tr>
<th>Data to Add to Hex String from CTD</th>
<th>Position 7</th>
<th>Position 8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not add Lat/Lon or Surface PAR data</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Add Lat/Lon data</td>
<td>OFF</td>
<td>ON</td>
</tr>
<tr>
<td>Add Surface PAR data</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Add Lat/Lon and Surface PAR data</td>
<td>OFF</td>
<td>OFF</td>
</tr>
</tbody>
</table>

Surface PAR and position data are appended to the end of the CTD data, with the position data always last. Surface PAR data is 3 bytes (6 hex characters). Position data format is detailed in Appendix I: NMEA Navigation Device Message and Data Formats.
Optional Surface PAR Light Sensor

When the SBE 36 is configured with the optional A/D converter, it can acquire the 0 to 5 volt output of a Biospherical QSR-240 Surface PAR sensor and integrate it into the CTD data stream. SEASOFT-DOS Versions 4.214 and later, and all versions of SEASOFT-Win32, fully support the acquisition and display of data from a QSR-240 Surface PAR sensor.

As described above, set position 8 on the NMEA Interface PCB’s dip switch to OFF to add Surface PAR voltage to the data stream, increasing the number of Hex data bytes by three (Surface PAR data is 6 hex characters).

NMEA Operating Modes

The NMEA Interface has three normal operating modes and two diagnostic modes. The mode is set in the NMEA Interface menu while communicating with the SBE 36 with SEATERM (see Testing NMEA below).

The modes are:

<table>
<thead>
<tr>
<th>Type</th>
<th>Mode</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
<td>1: Echo only</td>
<td>Characters to and from CTD pass through NMEA Interface. No position or Surface PAR data is sent. Useful for setting up CTD without needing to disconnect CTD from system and connect it directly to computer.</td>
</tr>
<tr>
<td></td>
<td>(default power-up mode)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2: Add Lat/Lon and/or Surface PAR to hex data</td>
<td>Seven bytes of hex latitude/longitude data are added to each line of hex data from CTD. Used when position data is required with CTD data. If optional Surface PAR interface installed, 3 bytes of Surface PAR hex data also added.</td>
</tr>
<tr>
<td></td>
<td>3: Transmit Lat/Lon only</td>
<td>Data from CTD is not transmitted. Hex latitude/longitude data is converted to ASCII text whenever a new position is received from NMEA navigation device. Format is:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LAT 47 37.51 N</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LON 122 09.41 W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>If NMEA message RMC is decoded, date and time display on next line with this format:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DDMMYY HHMMSS</td>
</tr>
<tr>
<td>Diagnostic</td>
<td>4 (diagnostic level 1): Transmit raw NMEA message only</td>
<td>All NMEA messages received are echoed to computer in raw form. Used to determine which NMEA messages are being received by NMEA Interface.</td>
</tr>
<tr>
<td></td>
<td>5 (diagnostic level 2): Transmit raw and decoded NMEA message</td>
<td>All NMEA messages received are echoed to computer in raw form. If a correct NMEA message is received, decoded data displays below raw data. Decoded format same as for Mode 3.</td>
</tr>
</tbody>
</table>

Notes:
- In SEATERM, use the @ character to access and exit the NMEA Interface menu.
- To enter diagnostic modes (4 or 5), first put the NMEA Interface in Mode 3. Then, enter a 4 or 5 at the mode selection prompt.
- To exit diagnostic modes (4 or 5), turn off power to the SBE 36.
- In the NMEA Interface menu, Diagnostic level 1 = Mode 4 Diagnostic level 2 = Mode 5
Testing NMEA and Testing System Setup

After connecting the NMEA navigation device, NMEA Interface, computer, PDIM, and CTD, run SEATERM.

1. Double click on seaterm.exe.

2. In the Configure menu, select the SBE 19, regardless of which CTD you are using. You will be using SEATERM to communicate with the SBE 36 instead of the CTD, and the required communication parameters are available in the SBE 19’s Configuration Options dialog box.
   A. In the Configuration Options dialog box, click on the COM Settings tab.
   B. Set the COM Settings to the same values as the Serial Data Channel on the NMEA Interface:
      - Comm Port - for CTD Data (Serial Data) channel
      - 9600 (default) or 19200 baud - match the value set on position 5 on the NMEA Interface PCB dip switch
      - 7 data bits and even parity
      Click OK or Save As to save the settings and exit the dialog box.

3. Turn on power to the SBE 36. The display in SEATERM looks like this:

   SBE 33/36 NMEA interface V1.0 setup:
   PC baud rate = 9600
   Interboard baud rate = 9600
   NMEA message to decode = RMC
   Mode = echo only

   Surface PAR disabled
   NMEA decoding enabled
   Press @ to change the NMEA interface setup
   SBE 33 V1.0 power on

Looking at selected lines:

<table>
<thead>
<tr>
<th>Text</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC baud rate</td>
<td>Baud for communication between PC and NMEA Interface PCB - set on NMEA Interface PCB switch position 5 to 9600 or 19200</td>
</tr>
<tr>
<td>Interboard baud rate</td>
<td>Baud for communication between SBE 36 NMEA Interface and Receiver PCBs - factory set to 9600</td>
</tr>
<tr>
<td>NMEA message to decode</td>
<td>Set on NMEA Interface PCB switch positions 1 to 3 - must match output from NMEA navigation device</td>
</tr>
<tr>
<td>Mode = echo only</td>
<td>Default power-up mode, used to set up CTD</td>
</tr>
<tr>
<td>Surface PAR disabled</td>
<td>Surface PAR is enabled/disabled with NMEA Interface PCB switch positions 7 and 8</td>
</tr>
<tr>
<td>NMEA decoding enabled</td>
<td>NMEA decoding (Lat/Lon data) is enabled/disabled with NMEA Interface PCB switch positions 7 and 8</td>
</tr>
</tbody>
</table>
4. Type @ to access the NMEA Interface menu. The display looks like this:

NMEA interface set up menu:
1. Echo characters to and from the instrument
2. Add Lat/Lon and/or PAR to the real-time HEX data from the instrument
3. Transmit Lat/Lon only

the current mode = 1. Echo characters to and from the instrument

enter 1, 2, or 3 to change the NMEA interface box mode, or press @ to exit the set up menu

selection =

5. Type 3 and press the Enter key to switch to mode 3. The display looks like this:

NMEA interface set up menu:
1. Echo characters to and from the instrument
2. Add Lat/Lon and/or PAR to the real-time HEX data from the instrument
3. Transmit Lat/Lon only

the current mode = 3. Transmit Lat/Lon only

enter 1, 2, or 3 to change the NMEA interface box mode, or press @ to exit the set up menu

selection =

6. Type @ to exit the menu. You should begin seeing position data display in SEATERM. Each time position data is received, the yellow NMEA Transmit LED on the SBE 36 should flash. If the data is correct and is updating properly, the NMEA Interface is working.
   • If position data does not appear, verify that the SBE 36 is connected to the NMEA navigation device and that the proper cable is used.
   • See Troubleshooting NMEA Interface below for additional instructions if needed.

7. When finished testing the NMEA navigation device, verify that the system is connected properly to the CTD:
   A. Type @ to return to the SBE 36 NMEA Interface menu.
   B. Type 1 and press the Enter key to switch to mode 1 (echo characters to and from the instrument).
   C. Click Connect on the Toolbar (or press the Enter key several times) to establish communication with the CTD (through the SBE 36 and PDIM).
   D. Click Status on the Toolbar to send the DS command and display the CTD status. If the status information displays and is correct, the system is connected properly.
   E. Send the QS command to put the CTD in quiescent (sleep) state.

8. Turn off the SBE 36.
Troubleshooting NMEA Interface

**Problem 1: Yellow NMEA Transmit LED Not Flashing**

**Cause/Solution 1:** Wiring may be incorrect. Check cables and connections between the SBE 36, NMEA navigation device, and computer.

**Cause/Solution 2:** NMEA navigation device may be set to the wrong baud rate (SBE 36 NMEA Interface requires 4800 baud). Reset device’s baud rate.

**Cause/Solution 3:** NMEA navigation device may not be transmitting data. See the device manual for setup details. To verify that it is sending data, connect an oscilloscope with ground on NMEA B (T17) and the probe on NMEA A (T16). The signal should be less than 0.5 volts between messages and have pulses greater than 4 volts for at least 0.2 milliseconds during the message.

**Cause/Solution 4:** NMEA Interface PCB may not be operating properly. To verify, use the GPS simulation programs supplied with SEASOFT-DOS. These programs simulate a NMEA navigation device transmitting a NMEA message. See *Appendix II: NMEA Message Simulation Programs* for details.

**Problem 2: Yellow NMEA Transmit LED Flashing, but Lat/Lon Data Not Displaying**

**Cause/Solution 1:** SBE 36 Interface PCB may be set up for an incorrect NMEA message. To verify, view the raw NMEA messages:

1. In the NMEA Interface menu in SEATERM (see Steps 1 through 6 in *Testing NMEA* above), type 3 and press the Enter key to switch to mode 3.

2. When in mode 3, type 4 and press the Enter key to switch to mode 4 (diagnostic mode not listed on the menu). Mode 4 will pass all characters received to the screen. The menu response indicates that the SBE 36 has diagnostic level 1 enabled.

3. Type @ to exit the menu. You should begin seeing raw NMEA messages display in SEATERM. A typical RMC NMEA message is:

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

   See *Appendix I: NMEA Navigation Device Message and Data Formats* for a description of all the NMEA messages the NMEA Interface can decode.

4. **If a different NMEA message is received in mode 4 than the NMEA Interface PCB is set up to decode,** reconfigure the NMEA Interface:
   A. Turn off power to the SBE 36.
   B. Unplug the SBE 36.
   C. Reset positions 1 through 3 on the NMEA Interface PCB dip switch as needed (see *Setting NMEA Interface PCB Dip Switch* above).
   D. Restore power and repeat Step 1, putting the SBE 36 in mode 3.
   E. Type @ to exit the menu. You should begin to see position data.

5. **If no NMEA messages are received in mode 4,** the problem could be in the NMEA Interface PCB, cable, or NMEA navigation device. Verify that the NMEA Interface PCB is operating properly using the simulation programs supplied with SEASOFT-DOS. These programs simulate a NMEA navigation device transmitting a NMEA message. See *Appendix II: NMEA Message Simulation Programs* for details.
Setting Up CTD Configuration (.con) File

The NMEA Interface PCB integrates the position data from the NMEA navigation device and/or the Surface PAR sensor into the CTD data stream. SEASAVE, Sea-Bird’s real-time data acquisition and display program, stores and optionally displays the NMEA and/or PAR data along with the CTD data. SEASAVE requires a .con file, which defines the CTD - auxiliary sensors integrated with the instrument, and channels, serial numbers, and calibration dates and coefficients for all the integrated sensors (conductivity, temperature, and pressure as well as auxiliary sensors). SEASAVE (as well as our data processing software) uses the information in the .con file to interpret and process the raw data. If the .con file does not match the actual instrument configuration, the software will not be able to interpret and process the data correctly.

The .con file must indicate if position data and/or PAR data is being added to the CTD data by the NMEA Interface. See Section 3: Setting Up the System for details on viewing and modifying the .con file in SEASAVE. Note that the .con file setup overrides the dip switch setting on the SBE 36 NMEA Interface PCB. In other words, the real-time transmission of NMEA position data and/or Surface PAR data is dependent on the .con file setting, not on the SBE 36 dip switch setting.

Notes:
When Sea-Bird ships a new instrument, we include a .con file that reflects the current instrument configuration as we know it. The .con file is named with the instrument serial number, followed with the .con extension. For example, for an instrument with serial number 2375, Sea-Bird names the .con file 2375.con. You may rename the .con file if desired; this will not affect the results.
Section 5: Operating the System

This section covers:

- Acquiring real-time data from SEASAVE
- Uploading CTD data from memory

See System Wiring in Section 2: Description of the SBE 36 for wiring details.

Acquiring Real-Time Data with SEASAVE

Run SEASAVE to acquire real-time data. Proceed as follows:

1. Double click on SeaSave.exe.

2. In the Configure menu, select Water Sampler Configuration. The dialog box looks like this:

   ![Water Sampler Configuration Dialog](image)

   Set:

   - Water sampler - *None* is the only valid selection for a system using the SBE 36
   - Number of Water Bottles and Firing Sequence - not applicable (selection does not affect operation)

   Click OK.
3. (For SBE 36 connected to NMEA navigation device) In the Configure menu, select NMEA [Lat/Lon] Interface. The dialog box looks like this:

Select how to store the NMEA data:
- **Add to Header Only** - Latitude, longitude, and time are automatically written to the header when data acquisition is started.
- **Append to Every Scan** - Latitude, longitude, and time are automatically written to the header when data acquisition is started. Additionally, 7 bytes of Lat/Lon data are appended to every scan of CTD data.
- **Append to NAV File when <Ctrl F7> is Pressed** - Latitude, longitude, and time are automatically written to the header when data acquisition is started. Additionally, latitude, longitude, time, scan number, and pressure are written to `filename.NAV` every time Ctrl F7 is pressed (**filename** is the same as the name of the .hex or .dat output data file).
- **Append to Every Scan and Append to NAV File when <Ctrl F7> is Pressed** - Latitude, longitude, and time are automatically written to the header when data acquisition is started. Additionally, 7 bytes of Lat/Lon data are appended to every scan of CTD data. And, latitude, longitude, time, scan number, and pressure are written to `filename.NAV` every time Ctrl F7 is pressed (**filename** is the same as the name of the .hex or .dat output data file).

Click OK.

4. Perform any other desired setup in the Configure menu.

5. Perform any desired setup in the ScreenDisplay menu.

**Note:**
When running DATA CONVERSION in the data processing software, if `filename.NAV` is found in the same directory as the .hex or .dat output data file, the contents of `filename.NAV` are added to the converted data file header.
6. In the RealTime Data menu, select *Start Acquisition*. The dialog box looks like this:

![RealTime Data Configuration Dialog Box]

Configuration file defines the auxiliary sensors integrated with the instrument, and channels, serial numbers, and calibration dates and coefficients for all the integrated sensors (conductivity and temperature as well as auxiliary sensors). Verify that .con file matches your instrument setup. See *Checking CTD Configuration (.con) File in SEASAVE* in Section 3: Setting Up the System for details.

7. Click *COMM Port Configuration*. The dialog box looks like this:

![COMM Port Configuration Dialog Box]

In the dialog box, enter:
- CTD Data COMM Port - computer port connected to SBE 36 Serial Data connector; sends commands to and receives replies from the CTD (through the PDIM)
- CTD Data Baud Rate - baud rate **between SBE 36 and computer**; must agree with SBE 36 dip switch setting (9600 or 19200)
- Deck Unit Modem COMM Port - not applicable (selection does not affect operation)

Click OK.
8. In the Acquire and Display Real Time Data Set Up dialog box, click **Start Acquire**.

9. (For SBE 36 connected to NMEA navigation device)
   SEASAVE automatically sends a command to put the NMEA Interface in Mode 1 (do not transmit NMEA data) or Mode 2 (append position and/or Surface PAR data to CTD data), depending on whether the CTD .con file was set to add NMEA and/or PAR data. The screen then displays: **Getting Latitude, Longitude and Time from the NMEA Interface**

10. If the CTD is not already on, SEASAVE prompts you to turn on the CTD’s magnetic switch. Data starts appearing in the screen display approximately 10 seconds after the switch is turned on.

   It also possible to start the CTD logging data while in the terminal program and then to run SEASAVE. In this case the **turn CTD on message** flashes momentarily on the screen before the data display screen appears.
   For the SBE 19plus or 25, data starts appearing in a few seconds.
   For the SBE 19, there may be a wait of up to 1 minute before data appears.

11. When the cast is complete, turn off the CTD’s magnetic switch and turn off power to the SBE 36.

---

**Note:**
The SBE 19 and 25 CTD must be in quiescent (sleep) state when the magnetic switch is turned on to start logging data. If not, when the switch is turned on the CTD will not log data. A common problem is that communications are established with the CTD using SEATERM, and then SEATERM is exited without putting the CTD into quiescent state with the QS command. When 2 minutes pass without any communication between the computer and CTD, the CTD times out and enters quiescent state automatically. To ensure that SEASAVE works correctly, verify that the CTD is in quiescent state or is already logging data when SEASAVE is started.

**Note:**
See the SBE Data Processing manual and/or help files for details on processing the data.
Uploading CTD Data from Memory

Typically, data processing is performed on the real-time data acquired in SEASAVE. However, some users choose to upload the data in the CTD’s memory as a back-up to the real-time data. This allows for comparison of the data in memory to the real-time data, to ensure that cable problems, noise, etc. did not corrupt the real-time data.

Upload data from the CTD’s memory as follows:

1. When the cast is complete, turn the CTD magnetic switch off.
2. Turn power to the SBE 36 off.
3. Disconnect the CTD from the PDIM.
4. **Connect the CTD directly to the computer**, using the data I/O cable provided with the CTD. Follow directions in the CTD manual for uploading data.
Section 6: Troubleshooting

This section reviews common problems in operating the SBE 36, and provides the most likely causes and solutions.

Servicing should be performed by experienced technicians who have been trained to work with complex mechanical/electrical equipment.

For protection of the circuitry, we also recommend removing AC power and then waiting for 1 minute for supply capacitor discharge before opening housings, changing connections, removing or inserting circuit cards, or otherwise working on the equipment.

Problem 1: SEASAVE Does Not Collect Any Data

Cause/Solution 1:
This may be caused by incorrect instrument configuration in the .con file. Verify that the settings in the .con file match the current CTD configuration - number and type of auxiliary sensors, sensors assigned to correct channels, NMEA and Surface PAR selected if applicable.

Problem 2: SBE 36 Completely Inoperable

Cause/Solution 1:
If the power switch is on but the power switch pilot light is out; no other panel lights are on, and the fan is not running, either AC power has been disconnected or the main fuse has blown. Check the AC power source. Remove the power cable, and check the main fuse. Replace if necessary. If the main fuse blows again, there is probably a short in the main chassis AC wiring. See chassis wiring diagram - it may be necessary to disconnect one section after another to locate the problem.

Problem 3: CTD Does Not Respond

Cause/Solution 1:
There may be no voltage on the sea cable. Turn off the SBE 36 and wait 1 minute. Connect a voltmeter (range set to at least 300 volts DC) to the rear-panel Sea Cable connector. Turn on the SBE 36. The voltmeter should read 250V. If no sea cable voltage is observed, the sea cable supply is inoperative. Turn off the SBE 36 and wait 1 minute. Check the rear-panel Sea Cable Fuse. If this fuse is blown, the sea cable may have been inadvertently shorted, or the CTD or PDIM may be malfunctioning. Check the resistance across the sea cable and correct if shorted.

WARNING!
Life-threatening high voltages are present in the SBE 36 and the underwater units when power is on. These hazardous voltages persist for up to 1 minute after removal of power. To protect against electrical shock, disconnect the AC power cord from the SBE 36 and then wait a full minute before attempting service. Always disconnect the AC power cord before checking fuses.

WARNING!
Use extreme caution when making these tests.

WARNING!
Use extreme caution when making these tests.

WARNING!
Use extreme caution when making these tests.

WARNING!
Use extreme caution when making these tests.
Glossary

**PCB** – Printed Circuit Board.

**SBE Data Processing** – Sea-Bird’s WIN 95/98/NT data processing software, which calculates temperature, conductivity, pressure, and data from auxiliary sensors, and derives variables such as salinity and sound velocity.

**Scan** – One data sample containing temperature, conductivity, pressure, and optional auxiliary inputs.

**SEASAVE** – Sea-Bird’s WIN 95/98/NT software used to acquire, convert, and display real-time or archived raw data.

**SEASOFT-DOS** – Sea-Bird’s complete DOS software package, which includes software for communication, real-time data acquisition, and data analysis and display. SEASOFT-DOS also includes NMEA navigation device simulation programs that you can use when troubleshooting problems with NMEA data.

**SEASOFT-Win32** – Sea-Bird’s complete Win 95/98/NT software package, which includes software for communication, real-time data acquisition, and data analysis and display. SEASOFT-Win32 includes **SEATERM**, SeatermaF, **SEASAVE**, **SBE Data Processing**, and PLOT39. At the present time, SEASOFT-Win32 does not include the NMEA navigation device simulation programs; use these programs in the DOS software.

**SEATERM** – Sea-Bird’s WIN 95/98/NT terminal program used to communicate with the SBE 36 and/or the CTD.
Appendix I: NMEA Navigation Device Message and Data Formats

Message Formats

GGA - Global Positioning System Fix Data
Time, position, and fix related data for a GPS receiver.
$--GGA,hhmmss.ss,llll.ll,a,yyyyy.yy,b,x.x,x,x,x,M,x,x,M,x,x,xxxx*hh<CR><LF>

GLL - Geographic Position - Latitude/Longitude
Latitude and Longitude of present 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 provided by a LORAN-C receiver.
$--RMA,A,llll.ll,a,yyyyy.yy,b,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

RMC - Recommended Minimum Specific GPS/TRANSIT Data
Time, date, position, course, and speed data provided by a GPS or TRANSIT navigation receiver.
$--RMC,hhmmss.ss,A,llll.ll,a,yyyyy.yy,b,x.x,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

TRF - TRANSIT Fix Data
Time, date, position, and information related to a TRANSIT fix.
$--TRF,hhmmss.ss,ddmmmyy,llll.ll,a,yyyyy.yy,b,x.x,x.x,x.x,x.x,x.x,x.x,a*hh<CR><LF>

Notes:
- -- represents two device-specific characters.
- See the table below for definitions of message parameters.
- <CR> is carriage return.
- <LF> is line feed.

Field Type | Symbol | Definition |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Status</td>
<td>A</td>
<td>Single character field: A = Yes, data valid, warning flag clear V = No, data invalid, warning flag set</td>
</tr>
<tr>
<td>Latitude</td>
<td>llll</td>
<td>Fixed/Variable length field: degrees</td>
</tr>
<tr>
<td></td>
<td>a</td>
<td>N or S</td>
</tr>
<tr>
<td>Longitude</td>
<td>yyyy.yy</td>
<td>Fixed/Variable length field: degrees</td>
</tr>
<tr>
<td></td>
<td>b</td>
<td>E or W</td>
</tr>
<tr>
<td>Time</td>
<td>hhmmsss</td>
<td>Fixed/variable length field: hours</td>
</tr>
<tr>
<td>Checksum</td>
<td>*</td>
<td>Optional Checksum Delimiter.</td>
</tr>
<tr>
<td></td>
<td>hh</td>
<td>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 excluding $ and *.</td>
</tr>
</tbody>
</table>
Data Formats

Seven bytes of position data are appended to each scan of hex data from the instrument. If a Surface PAR sensor is also connected to the SBE 36, the Surface PAR data (three bytes) is appended before the position data.

Our data processing software calculates latitude and longitude as follows:

\[
\text{Latitude (deg)} = \frac{\text{byte 1} \times 65536 + \text{byte 2} \times 256 + \text{byte 3}}{50000}
\]

\[
\text{Longitude (deg)} = \frac{\text{byte 4} \times 65536 + \text{byte 5} \times 256 + \text{byte 6}}{50000}
\]

Notes:
1. If bit 1 in byte 7 is 1, this is a new position.
2. If bit 8 in byte 7 is 1, Latitude is negative.
3. If bit 7 in byte 7 is 1, Longitude is negative.
4. North latitudes are positive, south latitudes are negative.
5. 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

Latitude = \frac{36 \times 65536 + 85 \times 256 + 252}{50000} = 47.62616 degrees
Longitude = \frac{93 \times 65536 + 50 \times 256 + 177}{50000} = -122.1565 degrees

Latitude is positive (bit 8 in byte 7 is 0).
Longitude is negative (bit 7 in byte 7 is 1).
This is a new position (bit 1 in byte 7 is 1).
Appendix II: NMEA Message Simulation Programs

Sea-Bird provides NMEA message simulation programs as troubleshooting aids. These programs, part of the SEASOFT-DOS package, simulate NMEA navigation devices transmitting NMEA messages. If the system does not work with the actual NMEA navigation device, but works with a simulation program, the problem is with the interface cable from the NMEA navigation device to the SBE 36 or in the NMEA navigation device itself.

Sea-Bird provides three simulation programs:

<table>
<thead>
<tr>
<th>Filename</th>
<th>NMEA Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>snmearmc.exe</td>
<td>RMC</td>
</tr>
<tr>
<td>snmeagga.exe</td>
<td>GGA</td>
</tr>
<tr>
<td>snmeagll.exe</td>
<td>GLL</td>
</tr>
</tbody>
</table>

These programs are just simulations, and are not actual data streams from an actual NMEA navigation device. The programs transmit at 4800 baud.

To execute the simulation programs, a second computer (computer 2) is needed to emulate the NMEA navigation device. A laptop computer is adequate for this purpose. Install SEASOFT-DOS on the main computer (computer 1), and then copy the simulation programs to a disk and insert the disk into computer 2.

Use the NMEA Interface test cable (PN 80877 - supplied with the SBE 36) to connect the SBE 36 NMEA Interface to the simulation computer. The simulation test cable connections are:

<table>
<thead>
<tr>
<th>MS3102A12S-3P</th>
<th>RS-232</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pin A</td>
<td>Pin 7</td>
<td>NMEA B (signal return)</td>
</tr>
<tr>
<td>Pin B</td>
<td>Pin 2</td>
<td>NMEA A (signal)</td>
</tr>
</tbody>
</table>

Proceed as follows:

1. On computer 1, set up SEATERM to communicate with the SBE 36 at 9600 or 19200 baud, 7 data bits, even parity (Steps 1 through 4 in Testing NMEA in Section 4: Setting Up NMEA Interface and Surface PAR).

2. Turn on power to the SBE 36. The NMEA Interface PCB status message displays in SEATERM:

   SBE 33/36 NMEA interface V1.0 setup:
   PC baud rate = 9600
   Interboard baud rate = 9600
   NMEA message to decode = RMC
   Mode = echo only
   Surface PAR disabled
   NMEA decoding enabled
   Press @ to change the NMEA interface setup
   SBE 33 V1.0 power on

Note:
The SBE 36 must be connected to the PDIM to test the NMEA interface. If it is not connected, noise on the open Sea Cable connector will interfere with communication with the SBE 36.
3. Type @ to access the NMEA Interface menu.

4. Type 3 and press the Enter key to switch to mode 3.

5. When in mode 3, type 5 and press the Enter key to switch to mode 5 (diagnostic mode not listed on the menu). Mode 5 transmits all NMEA messages in raw format and (if a correct NMEA message is received) in decoded form. The menu response indicates that the SBE 36 has diagnostic level 2 enabled.

6. On computer 2, run the .exe file that corresponds to the NMEA message to decode from the status display in Step 2. You should begin seeing NMEA data display in SEATERM on computer 1.

The simulation program transmits a new position every six seconds. The yellow NMEA transmit light flashes when a carriage return (decimal 13) is received. The data formats are:

- **RMC**:
  
  SGPRMC, 000906, A, 5012.34, N, 02056.78, E, 0.0, 0.0, 170593, 0.0, W*6D  
  LAT 50 12.34 N  
  LON 020 56.78 E  
  170593 000906

- **GGA**:
  
  SGPGGA, 000100, 0012.345, N, 16056.789, W, 1, 5, 100*48  
  LAT 00 12.345 N  
  LON 160 56.789 W

- **GLL**:
  
  SGPGGLL, 0012.345, N, 16056.789, E  
  LAT 00 12.345 N  
  LON 160 56.789 W

The first line of data is the raw data, and the remaining lines are the decoded data. The decoded data should correspond to the raw data. See Appendix I: NMEA Navigation Device Message and Data Formats for the NMEA message formats.

If properly decoded data appears on the screen, the NMEA Interface in the SBE 36 is working properly. If the system does not work when connected to the actual NMEA navigation device, the problem is with the cable from the NMEA navigation device to the SBE 36, or in the NMEA navigation device itself.

- Verify that the cable pinouts are correct, especially at the NMEA navigation device. See System Wiring in Section 2: Description of the SBE 36 and also refer to the NMEA navigation device documentation.

- If the cable is correct, verify that the NMEA navigation device is on and is configured to send data. Many NMEA navigation devices have programmable NMEA outputs and may need to be configured before they will transmit NMEA messages. Again, refer to the NMEA navigation device documentation, or contact the device’s manufacturer for customer support.
## Appendix III: Replacement Parts

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Part</th>
<th>Application Description</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>80073</td>
<td>25-pin to 25-pin cable</td>
<td>Connects <em>Serial Data</em> on SBE 36 to computer COM port</td>
<td>1</td>
</tr>
<tr>
<td>17130</td>
<td>25-pin to 9-pin adapter</td>
<td>Connects 80073 cables and 80877 cable to 9-pin COM ports on computer</td>
<td>2</td>
</tr>
<tr>
<td>80877</td>
<td>2-pin to 25-pin NMEA Interface test cable</td>
<td>Connects 2-pin <em>NMEA Input</em> on SBE 36 to computer running NMEA simulation program for test purposes</td>
<td>1</td>
</tr>
<tr>
<td>17015</td>
<td>SBE 36 power cable</td>
<td>Connect SBE 36 to AC power source</td>
<td>1</td>
</tr>
<tr>
<td>80591</td>
<td>2-pin to 2-pin cable</td>
<td>Connect SBE 36 to PDIM for testing</td>
<td>1</td>
</tr>
</tbody>
</table>
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