

6.0 Commissioning, Setup and Calibration

This section is intended to cover the final installation of the system, making it ready for daily operation. It assumes that the physical installation is complete.

6.1 Starting the SeaKeepers computer

Turn the SeaKeepers computer on with the toggle switch at the top center front of the computer module. It will boot up, logon and start all the programs that are needed to operate autonomously. It will also start pcAnywhere in host mode so that you can connect with the SeaKeepers computer from your networked computer to observe its activity and use the customizable data displays.

In normal operation the SeaKeepers computer does not have a monitor, keyboard or mouse. Symantec pcAnywhere[®] allows a networked computer to operate the computer remotely as if the operator were actually using the keyboard and mouse of the SeaKeepers computer. The program must be installed on the shipboard computer. See section 6.4 for detailed instructions.

Connect the SeaKeepers network card to the hub on the ship's local area network (LAN) with a standard CAT5 network cable (RJ45) **OR** connect the SeaKeepers network card directly to the remote control computer's network card using a crossover cable (also RJ45, but with different wiring to allow direct communication between 2 computers). Both kinds of cables are available in standard lengths at computer and office supply stores.

<p>Note: The SeaKeepers computer may put up a message saying that one or more services did not start. This is not a problem; the computer does not have a mouse installed and so does not load the driver for it. Some systems may also display an error message about an "old" file for the CD writer. The most current file is installed. The error message is associated with the way WinNT handles the program, and it does not affect the operation of the SeaKeepers system. These error messages may be cleared by clicking on the OK buttons.</p>
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6.2 HyperTerminal

In order to communicate between the computer and external devices Windows NT supplies a simple terminal program called HyperTerminal. From the Start menu, go to Accessories, HyperTerminal. There should be an icon for each of the SeaKeepers serial devices: the oceanographic sensors (CTD), the meteorological sensors (WeatherPack) and the INMARSAT (INM).

Note: In order to communicate with the INMARSAT, it is necessary to first stop the execution of the SATCOMM(nn) program by closing the DOS window. If the program is not closed you will get an error message saying “Cannot open port”, because other software is using the serial communications port.

The SCS software should not be running when you invoke HyperTerminal to communicate with the oceanographic sensor or the WeatherPack. Close the SCS by going to the SCS toolbar

Click on the word Acquisition

Click on Data Acquisition

Stop Acquisition

A window will open to verify that you want to stop; click OK.

The program windows associated with SCS will close, leaving only the toolbar which can be closed manually. **The CTD must be unplugged before starting HyperTerminal**, and then plugged in again when the terminal window opens.

If the icon for the device is not present in HyperTerminal, a WindowsNT wizard will lead you through the steps for setting up a new connection.

Start HyperTerminal,

Enter a name at the prompt, select an icon and then click OK.

Select the correct com port from the drop down box, click OK.

The next window will request configuration information. The table below gives the settings for the three devices.

	INMARSAT	CTD	WeatherPack
Connection	Com1	Com2	Com3
Bits per second	4800	9600	9600
Data bits	8	8	8
Parity	None	None	None
Stop bits	1	1	1
Flow control	None	None	None

When you close the window, it will ask you if you want to save the session.
Answer yes.

For the INMARSAT **only**, it is necessary to set the terminal to echo the keystrokes from the computer. While the INMARSAT session is open, click on File in the upper left.

Properties.

Click on the Settings tab.

Click on ASCII setup.

In the section called “ASCII Sending”, check (by clicking) the option for “Echo typed characters back”.

The only other selected option should be in “ASCII Receiving”, “wrap lines”.

Click OK and close the session (save if asked).

6.3 INMARSAT C

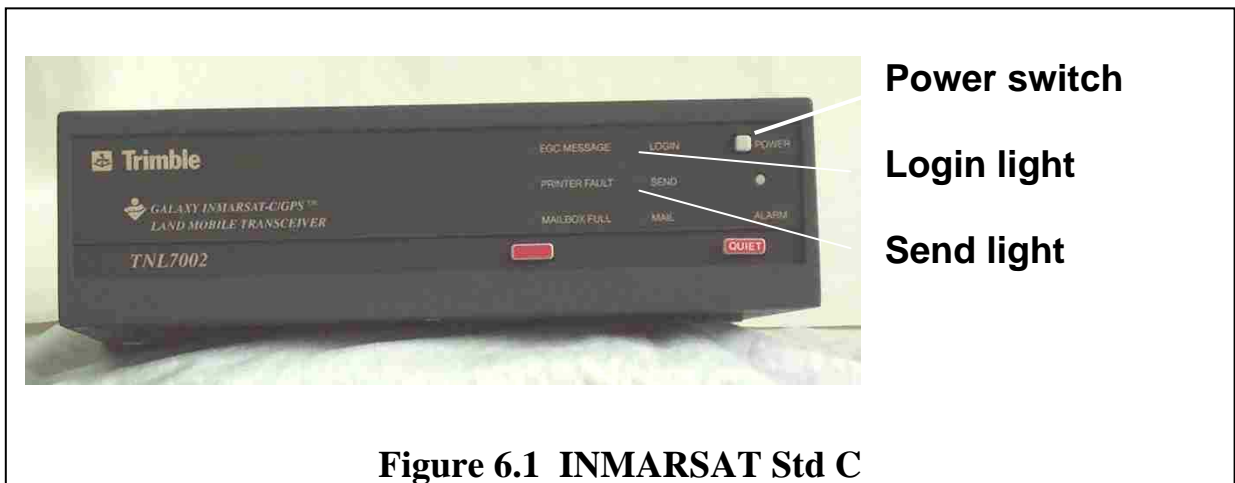
The INMARSAT std C is a data communication system utilizing a satellite constellation. The SeaKeepers INMARSAT also receives GPS position data, GMT time, course over ground and speed over ground.

6.3.1 Installation

The INMARSAT std C transceiver is mounted in the computer module, on the left hand slide, and powered from the 24 volt power supply. The antenna cable is fed through the left cable gland at the top of the enclosure and plugged into the transceiver unit. Before crimping the type N connector onto the end of the cable a 24” length of cable should be left to form a “service loop” which will make it easier to assemble to the transceiver and make it possible to move the slide on which the unit is mounted. A 9-pin cable connects the data port with COM1 on the SeaKeepers computer (the lower standard serial port).

6.3.2 Commissioning

The transceiver is normally activated and configured when it is mounted in the computer module before shipping. In some cases the unit has been transshipped before this could happen, and if you received the INMARSAT unit with its antenna in its own shipping box, you may need to complete the configuration in the field. If the power led does not light when the transceiver is powered on, push the on button. This only needs to be done the first time, or if the transceiver has been specifically turned off using this button.



On the front of the INMARSAT unit (faces down as mounted):

Power light: should be continuously on when the SeaKeepers computer is powered.

Login light: usually on, blinks when in the process on logging in, and toggles with the send light during data transmission.

A unique code number (IMN), also called a mobile number, is assigned to each INMARSAT when it is registered by SeaKeepers with the satellite communications company. The IMN is an ASCII string of up to 12 characters, and serves a function like a telephone number. The transceiver must be “told” the IMN before it can send or receive messages. SatComm versions 3.0 and higher will configure the transceiver automatically when run. It is necessary, however, to edit the SatComm.ini file (C:\Seakeeper\SatComm\SatComm.ini). Open the file with Notepad and enter the IMN number, supplied with the system, on the line IMN=. Save the file and exit. The INMARSAT will communicate without this step, but the identifier code will not be included in the transmitted message. This ini file will also implements a test mode in which

several trial transmissions in short time intervals may be sent to an alternate convenient email address. The possible functions are discussed in a ConfigReadme file in the same directory, which is reproduced here.

SatComm 1.3 and later Notes

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1. SatComm must not be started from a DOS box. It will not execute this way. It must be started from the desktop or from the Windows environment.
2. There is a configuration file named SatComm.ini that will reside in the same directory as the program. The program will create one if it doesn't already exist. The contents of the configuration file will be explained below. It can be edited with a text editor like Notepad.
3. There is a log file that the program creates while it executes. It is named SatCommLog-1.log. It gets rewritten every time the program executes. If you want to save old files they must be renamed prior to executing the program again.

Configuration File Parameters

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OPERATIONAL PARAMETERS

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IMN : This parameter is used to program a transceiver that has not had its IMN set yet. The default is 'Unknown', and the typical value is the 12-digit IMN, such as '123456789012'.

TransmissionFrequencyInHours : This parameter is how many hours in between data transmissions. The default is '3'. The allowable values are 1, 3, and 12 only.

ExecutionFlow : This parameter defines how the program executes.

A value of **1** means that the program executes exclusively using the Operational Parameters from the configuration file. The email address will be SeaKeepers.

A value of **-1** means that the program executes exclusively using the Test Parameters of the configuration file. Once the test is over the program shuts down.

A value of **0** means that the program executes first using the Test Parameters, and then continues executing using the Operational Parameters. In test mode, the email address will be whatever was specified in the email parameter. Once the program switches to operational mode, the email address will be SeaKeepers. The default value for this parameter is 1.

LogFlag : This parameter is used for specifying whether the log file is generated. TRUE turns on the logfile, and FALSE turns it off.

TEST PARAMETERS

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Email: This parameter specifies the email address to use for test mode. It does not get used once the program begins executing in operational mode. The default value is seakeepers@rsmas.miami.edu.

TransmissionFrequencyInMinutes: This parameter is how many minutes in between data transmissions in test mode. The default is '5'. The allowable values 1 through 1440, inclusive.

NumberOfTransmissions: This parameter defines how many data transmissions the program should make while in test mode. The default value is 3. The allowable values are 1 through 10, inclusive.

Example Configuration File

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[OPERATIONAL PARAMETERS]
TransmissionFrequencyInHours=3
IMN=Unknown
ExecutionFlow=1
LogFlag=TRUE
[TEST PARAMETERS]
Email=seakeepers@rsmas.miami.edu
NumberOfTransmissions=3
TransmissionFrequencyInMinutes=5

For information on communicating with the INMARSAT manually, see appendix B.

6.4 The Oceanographic sensors

This discussion is written for the full 7-sensor oceanographic unit supplied by Idronaut, Milan, Italy. This sensor is based on their standard CTD (Conductivity, Temperature, Depth) device used by research vessels for real-time profiling of these parameters with depth. Most modules will incorporate a sub-set of these sensors rather than a complete suite of seven sensors.

6.4.1 Installation

The Oceanographic sensor package is installed in the instrument module. The sensor sub-module has a bracket with 2 holes that slip over positioning pins on the right hand wall of the instrument module, and 2 quarter-turn screws that

fasten into keepers on the back wall. Mounting the unit requires a screwdriver. It may be installed at any of the 5 possible positions.

Seawater is supplied to the clear flow-through cell from the Kynar distribution manifold on the left of the module. The fittings on the cell are connected by Teflon tubing to a pair of fittings on the manifold at the same level as the sensor unit.



The left-most line of fittings on the manifold is the seawater supply, which should be connected to the lower fitting on the cell, so that the water will flow in from the bottom, allowing air bubbles to rise to the top and escape from the flow path. The top fitting on the cell is connected to the discharge side of the manifold (the right side, lower than the input). Take care not to lose the pair of ferrules in each connection; they make the seal. The fittings should be leak-free if fastened finger tight. Do not go more than a ½ turn beyond finger tight because the Teflon fittings are soft and may easily be deformed.

Figure 6.2 Manifold and sensor connections

6.4.2 Calibrating Oceanographic sensors

The unit contains a dedicated microprocessor, which applies internal calibration information to the measured signals. The sensors are supplied with their calibration files installed in non-volatile memory. If the oceanographic sensor unit includes pH and/or dissolved Oxygen probes, they can be easily re-calibrated in the field. Calibration should be done when the system is first installed, and periodically thereafter, especially after an extended period during which the system has been turned off. **These sensors should never be left dry**

for more than a few hours; shipping caps with storage solutions should be reinstalled.

The calibration for the Oxygen probe uses the concentration of Oxygen in air and the electronic zero as two points to define the operating range, so no chemical standards are required. The pH electrodes are calibrated with a pH 7 buffer solution and uses a specially designed cup to fit the electrode configuration. A squirt bottle of fresh water is useful for rinsing away salt before recalibrating.

Remove the sensor unit from the instrument module. Open the flow cell by unscrewing 2 winged screws in front of the face of the cell. Turn and pull the cell to slide it off the o-ring seals, and out of the brackets.

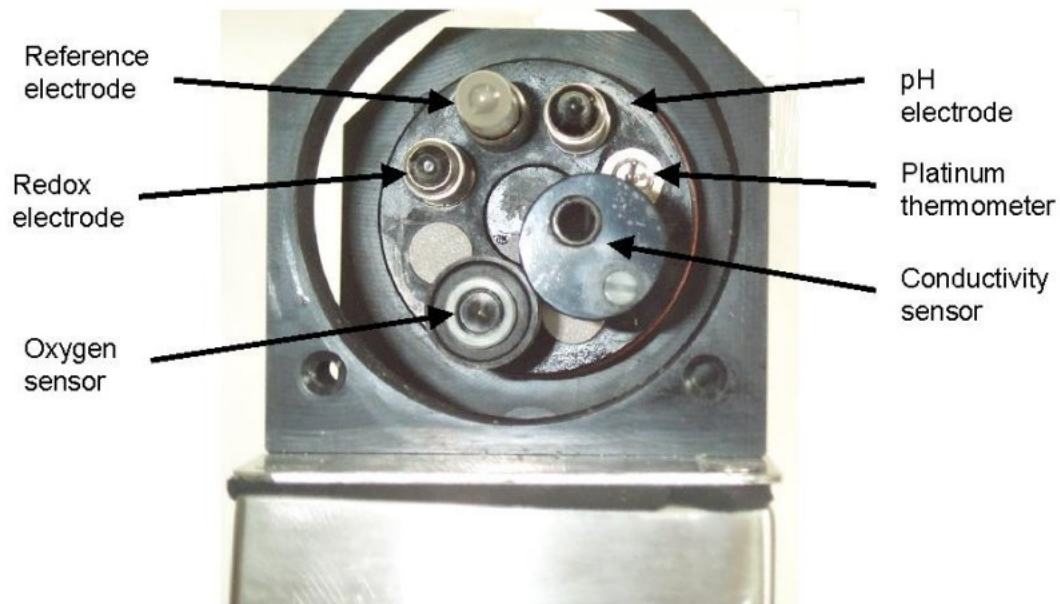


Figure 6.3 Oceanographic sensor suite

Oxygen probe: The oxygen probe has a black body which ends in a short cylinder ending in a white ring over a colored membrane. The probe should be clean and dry for calibration. Rinse with fresh water if it has been operating in seawater. Dry the tip by patting gently with a tissue, to prevent damaging the membrane which covers it.

pH electrode: pH is measured by a pair of electrodes. The pH electrode is a short probe with a clear glass bulb at the end. The reference electrode is next to it, longer and with a long glass tube. These electrodes are supplied with rubber caps (containing storage solutions) installed. The electrodes must be kept wet. The caps should be removed when you are ready to calibrate pH, and should be retained for re-use when oceanographic sensor is taken out of service. Hold the sensor unit upright and pull the caps down, to avoid spilling the storage solutions. Rinse the pH electrodes and temperature probe, a slender platinum rod mounted alongside the largest probe in the unit, with fresh water. Dry the temperature probe with a tissue or paper towel, but do not rub or wipe the pH electrodes.

Turn off the SCS software (section 6.2) and disconnect the DB9 serial cable from the computer COM2. Failure to do so will result in 1) error message “Failure to open port” and 2) sluggish or frozen computer response due to I/O communications conflicts.

Start the HyperTerminal session to communicate with the CTD module (section 6.2).

Open the HyperTerminal CTD session and power the oceanographic sensor unit, connect the DB9 cable between the unit and the computer to COM2 (2nd serial port from the base of the computer), or on the auxiliary PCI serial card in some units.

One of two situations may exist.

- 1) The sensor unit is in verbose mode. The main menu will be displayed on the computer monitor when the CTD is connected, or after sending an [Esc] from the keyboard.
- 2) The sensor unit is in non-verbose mode, which is the normal condition for SeaKeepers operation. The monitor may remain blank, with a blinking cursor or display a message that it is in non-verbose mode. From the keyboard, send VT^J (type V T and then hold down the control key while typing J).

Sometimes it is necessary to send this command more than once, depending on the state of the CTD unit. It goes into a “sleep mode” if not communicating. The first keystrokes will call it back into active mode, but the command will then need to be repeated for it to be acted upon. When the unit receives the command, the main menu will be displayed.

Ocean Seven 316 <i>(id) day, date, time</i>		
Main Menu		
<0>	[SHUT]	Shutdown
<1>	[DATA]	Data acquisition
<2>	[MEMO]	Memory
<3>	[CALB]	Calibration
<4>	[SERV]	Service
<5>	[OPMD]	Non-verbose mode

Type 3 to enter the Calibration menu.

Ocean Seven 316 <i>(id) day, date, time</i>		
Calibration Menu		
<0>	[CAUP]	Leave calibration menu
<1>	[CASE]	Calibrate sensors
<2>	[CACU]	Customize calibration data

Type 1.

Ocean Seven 316 <i>(id) day, date, time</i>	
Sensor Calibration	
Warning modification of the calibrations would modify the data processing of the stored data	
00	Leave sensor calibration
01	Calibrate the Depth sensor
02	Calibrate the Temp sensor
03	Calibrate the Cond. sensor
05	Calibrate the O2% sensor
07	Calibrate the pH sensor
08	Calibrate the Eh sensor
09	Calibrate the Temp. 2 sensor
10	Calibrate the CHL sensor
11	Calibrate the Turbidity sensor

Select the sensor by typing the menu number. The response includes simple instructions to follow to complete the calibration procedure.

5 Oxygen sensor.

7 pH sensor; Hold the sensor unit upright. Fill the buffer cup with pH 7 buffer and slip it up so that the ends of the pH and reference electrodes are both submerged (each in its chamber). Prop or hold the

buffer cup in place while responding to the directions in the calibration menu. Accept the default conditions for buffer pH, barometric pressure and automatic temperature compensation.

The other sensors are calibrated when the unit is assembled in the factory. The calibration menu routines expect entry of new coefficients for the response characteristics of the sensor, and are not normally changed in the field.

Select 0 to close the calibration menu.

The date and time clock of the CTD sensor unit can be changed from the Main menu by selecting 4, Service.

Ocean Seven 316 (<i>id</i>) <i>day, date, time</i>		
Service Menu		
<0>	[SVUP]	Leave the service menu
<1>	[CONF]	Configuration
<2>	[DIAG]	Diagnostics
<3>	[RAWC]	Raw data acquisition in counts
<4>	[RAWM]	Raw data acquisition in mV
<5>	[FWUP]	Firmware updating
<8>	[EXPO]	Set digital expansion port

Type 1.

Ocean Seven 316 (<i>id</i>) <i>day, date, time</i>		
Configuration Menu		
<0>	[CNUP]	Leave configuration menu
<1>	[CNDA]	Data acquisition parameter
<2>	[CNOP]	Operating parameter
<3>	[CNAP]	Acquired sensor parameters
<4>	[CNPR]	Programmed depth acquisition
<5>	[CNDT]	Change current Date & Time
<6>	[CNFW]	Update firmware CRC code
<7>	[CNES]	External system

5 Change current Date & Time.

The unit expects a data string to be entered: *date, time, day of the week*. The program supplies the punctuation (:./, etc) as the characters are typed.

date: Day, Month, Year with leading zeros and the full year.

Example 15022003

time: Hour, Minutes, Seconds GMT (Greenwich Mean Time) also called Universal time (UT) or Zulu (Z). The SeaKeepers computer clock is set to GMT during the INMARSAT interaction with the GPS satellite. It is important that the oceanographic sensor clock be as close as possible, since this clock is used for the timestamp on the oceanographic data records. The sensor clock is not reset by the computer nor by the GPS, but must be done manually through the configuration menu.

day: The consecutive number of the week, Sunday = 1.

Type 0 to leave each menu until the Main menu is reached.

Note: Although the main menu has an option for setting the parameters for data Acquisition (choice 3), this function is handled by the SCS software for SeaKeepers. The CTD is polled for data by the SCS software at pre-set time intervals.

The final step in the interaction with the CTD module, is to place it in **non-verbose mode**. This prevents the CTD module from sending headers and status messages to the SCS program.

From the main menu select <5> non-verbose mode.

Exit from HyperTerminal by clicking on the word Call in the tool bar, and then Disconnect. Close the HyperTerminal program.

Inspect the o-rings for cracks or debris; rinse if necessary with fresh water. Lubricate the o-rings with a very thin coating of petroleum jelly (Vaseline) or o-ring dressing if they appear dry.

Slide the flow cell back on the body of the sensor, lining up the blue position guide on the cell with the line on the bracket. This ensures alignment of the incoming seawater “jet” with the salinity probe and correct orientation of the fittings. Screw the winged keepers back into the base of the bracket at the face of the flow-cell. Mount the unit in the Instrument module. Verify that the water connections are leak free. Run the pump to fill the flow cell with water.

6.5 The meteorological sensors

The meteorological sensors are powered from the 24 volt power supply in the computer module. A serial communications cable with a DB9 connector is plugged into COM3, on the top card in the computer. SeaKeepers computers are equipped with a Lava 232 pci serial port card for the third communications port, if longer data cables than RS232 ports will support are being used, section 4 describes how to utilize 485 to 232 converters . HyperTerminal can be used to verify that the weather sensors are communicating. Turn the SCS software off (see section 6.2). Open the Weather pack session in HyperTerminal. A data stream of 8 columns should be written to the screen, with the new line of data updating frequently. The columns are wind speed, wind direction, air temperature, relative humidity, barometric pressure, zero (unused channel), compass heading and relative wind direction. Calibration/interpretation of the raw data is handled by the SCS software, so the raw data stream will not be in engineering units.

6.5.2 Calibrating the compass

The electronic compass in the serial interface box must be calibrated after the meteorological station is installed. A maneuver known as “boxing the compass” is required so that the compass will correctly compensate for local magnetic conditions in its environment. When the vessel is in open water on a calm day, connect to the SeaKeepers computer with pcAnywhere. Stop data acquisition in SCS by clicking on the word Acquisition on the SCS toolbar, then on Stop Acquisition, and OK. The windows associated with SCS will close, and the tool bar may also be closed.



Open communications with the weather system interface box by clicking on: Start, Programs, Accessories, HyperTerminal, Weatherpack.ht. A steady data stream of columns of numbers should appear on the screen.

From the keyboard, enter [Ctrl]+[s], [Ctrl]+[s], [Ctrl]+[s]. (Press the Ctrl key and the s key at the same time.) The number of received variables will change on the screen.

Turn the vessel through two complete circles. The manufacturer specifies that the compass should remain level during the calibration, and that each 360° turn should take at least 1 minute. While the vessel is turning, the auto calibrate software is looking for the maximum and minimum magnetic signatures and assigning them to the appropriate compass headings.

Type [Ctrl]+[x], [Ctrl]+[x], [Ctrl]+[x] to close the calibration sequence. The data stream should revert to the original pattern.

Exit HyperTerminal, and restart SCS by double clicking on the SCS icon on the screen, or by clicking on Acquisition, Start Acquisition on the SCS toolbar if it has been left open. The compass should be recalibrated once a year, or if it is moved from its installation site.