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INSTRUMENT OPERATION MANUAL

Document # SAT-DN-0034
Operation Manual for the **OCR-504**
Revision B, August 2001

System Boundaries

The OCR-504 Operation Manual discusses the start up and operation of the OCR-504 optical sensor. For information on the provided software, refer to the SatView and SatCon software manuals. For information on calibration and for the disk copy and hard copy of the calibration file, refer to the calibration folder.

Operation Manual For: OCR-504
Document Number: SAT-DN-0034

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SATLANTIC		OCR-504 Optical Sensor
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A. OVERVIEW

Purpose

The OCR-504 is a member of Satlantic's new OCR-500 micro-sensor series of instruments. The OCR-504 is a fully digital optical sensor package that combines precision optics and high performance microelectronics.

Background

The OCR-504 has seven customer-defined discrete optical wavelengths, selected from Satlantic's standard list. When used as a standalone instrument, Satlantic can configure the data interface for either the standard or micropower configuration. In the standard configuration, the data interface is RS-232 (transmit and receive) and RS-422 (transmit only), with a +6 - +16 Vdc supply voltage range. In the micropower configuration, the data interface uses CMOS levels, with a +6 - +10 Vdc supply voltage range.

Features

- Can be operated as a networked or standalone instrument
- Small size
- Lightweight
- Low power requirement
- Minimal amount of support equipment required
- Easy to use
- Flexible electrical and mechanical configurations

Specifications for Irradiance Sensor - Nominal Characteristics

Spatial Characteristics:

- Field of view: cosine response (spectrally corrected)
- Collector area: 86.0 mm^2
- Detectors: custom 17 mm^2 silicon photodiodes

Spectral Characteristics:

- Bandwidth range: 400-700 nm (standard - custom also available)
- Number of channels: 4
- Spectral bandwidth: 10 nm or 20nm
- Filter Type: custom low-fluorescence interference

Optical Characteristics:

- Cosine response: within 3%   0°– 60°   within 10%   60°– 85°
- Typical NEI: $8.7\text{x}10^{-3}$ uW cm^{-2} nm^{-1}

Physical Characteristics:

- size: 46 mm diameter, 150 mm long
- weight: 200 g (in air)
- depth rating: 100 m

Specifications for Radiance Sensor - Nominal Characteristics

Spatial Characteristics:

- Field of view: 10°
- Detectors: custom 13 mm^2 silicon photodiodes

Spectral Characteristics:

- Bandwidth range: 400-700 nm (standard - custom also available)
- Number of channels: 4
- Spectral bandwidth: 10 nm or 20nm
- Filter Type: custom low-fluorescence interference

Optical Characteristics:

 Out of band rejection: 10^{-6}
- Out of field rejection: $5\text{x}10^{-4}$
- Typical NER: $300\text{x}10^{-6}$ uW cm^{-2} nm^{-1}

Physical Characteristics:

- Size: 46 mm diameter, 150 mm long
- Weight: 200 g (in air)
- Depth rating: 100 m

Understanding OCR-504 Part Numbering

The OCR-500 series of instruments are each defined by a model number. Model numbers are composed of three fields containing four selectors, and has the format:

OCR-50x-tffm

Where

x NUMBER-OF-CHANNELS
        4 (four channel radiometer)
        7 (seven channel radiometer)

t   TYPE-OF-RADIOMETER
        I (Irradiance)
        R (Radiance)
        I/R (coupled Irradiance and Radiance)

ff   FIELD-OF-VIEW
        03 (3 degrees half-angle)
        10 (10 degrees half-angle)
        CS (cosine)

M   MEDIA
        A (air)
        W (water)

For example, an *OCR-504-R10W* is an OCR-500 series instrument with four radiance channels, each with a 108 half-angle FOV (Field-Of-View) and is intended for in-water use.

Please note that not all OCR-504 models are physically equivalent. For instance, an OCR-504 with a 38 FOV is longer than a standard 10 8FOV model.
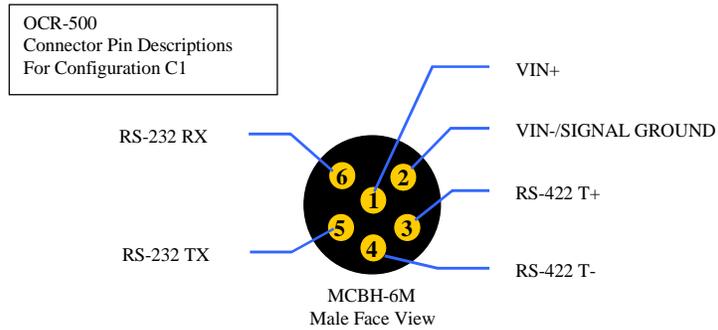
Figure A-1: Configuration C1

OCR-504 Configuration Options

The OCR-504 series of instruments are available with a number of configuration options, as outlined below. These configuration options affect both the electrical and mechanical interface to the instrument.

Please consult Satlantic if you require a special configuration.

WARNING! OCR-504 configurations may appear physically identical, but are electrically different. Extreme care must be taken by the user to ensure that the different configurations are not confused. For instance, a user could purchase an OCR-504-R10W with the C1 configuration and another OCR-504-R10W with the C2 configuration. The only external difference is the serial number on the instrument label - the connectors are the same. Using the C2 instrument with equipment set up for the C1 configuration could potentially place destructive RS-232 levels on CMOS pins, or exceed the allowable input voltage range.

CONFIGURATION C1

This is the standard configuration for the OCR-504 instruments.   In this configuration, telemetry is available at both RS-232 and RS-422 levels. The user may also communicate with the OCR-504 through the RS-232 port.   The operating voltage range for this configuration is +6 - +16 Vdc.

See Figure A-1: Configuration C1

The interface to the OCR-504 is made via a Subconn MCBH-6M connector, as shown in the figure.

OCR-500
Connector Pin Descriptions
For Configuration C2

VIN+

VIN-/SIGNAL GROUND

RX

SCL (SERIAL CLOCK)

SDA (SERIAL DATA)

TX

MCBH-6M
Male Face View

Figure A-2: Configuration C2

CONFIGURATION C2

This is the micropower configuration for the OCR-504 instruments. In this configuration, bi-directional communication is available at CMOS levels. The operating voltage range for this configuration is +6 - +10 Vdc.

See FigureA-2: Configuration C2

The interface to the OCR-504 is made via a Subconn MCBH-6M connector, as shown in the figure. The SCL and SDA pins are used by the OCR-500 series for inter-instrument communication when in Satlantic's network configuration. These connections should not otherwise be used.

PHOTO NOT AVAILABLE

OCR-500
Connector Pin Descriptions
For Configuration C3

RS-422 T+

VIN-/SIGNAL GROUND

VIN+

RS-232 RX

③ ② ①

⑥ ⑤ ④

RS-422 T-

RS-232 TX

MCBH-6M
Female Face View

Figure A-3: Configuration C3

CONFIGURATION C3

This is the special order configuration and is electrically equivalent to configuration C1. However, the interface is made using a different external connector, an Impulse LPMBH-6-FS, as shown in the figure.

See Figure A-3: Configuration C3

OCR-504 Telemetry

Telemetry from the OCR-504 is organized into frames. The OCR-504 provides a frame synchronization string or "header" (a "unique" sequence of bytes) to allow our software to detect the beginning of a data frame. The frame itself consists of a number of binary data "fields" as defined by the OCR-504's calibration file.

DATA FORMAT

The OCR-504 data format is binary at 57600 baud (normal), with no parity, 8 data bits, and 1 stop bit. No hardware handshaking is used. Data transmission should be automatic when the unit is turned on, after a short delay.

The frame format is as follows

Field	Field Size (bytes)	Field Name	Description
1	6	INSTRUMENT	The frame synchronization string marking the beginning of the data frame. The characters are unique for the instrument.
2	4	SERIAL NUMBER	The instruments 4-digit serial number.
3	2	ADDRESS	The instruments unique network address.
4	2	FRAME TYPE	The data frame type from the instrument.
5	2	FRAME LENGTH	The number of bytes in the data frame.
6	3	AUX	The upper 3 bytes of the frame counter.
7	1	FRAME COUNTER	Frame counter that increments with each frame sent, from 0 to 255. When 255 frames are sent, the counter resets to 0. The frame counter is useful tool for determining when and where data loss occurs.
8	1	SUB FRAMES	Number of sub frames in this frame.
9	1	VERITY BYTE	Causes sum of bytes in frame to be 0.
10	4	CHANNEL1	Data from optic channel 1.
11	4	CHANNEL2	Data from optic channel 2.
12	4	CHANNEL3	Data from optic channel 3.
13	4	CHANNEL4	Data from optic channel 4.
14	2	VS	Supply voltage measurement.
15	2	TEMP	On-board temperature measurement.
16	2	CRLF	Carriage return - line feed terminator.

Total number of bytes in the frame: 44. This information is contained in the calibration file.

B. SAFETY & HAZARDS

Personal Safety

Ø The operators should always remain aware of the cable. Any cable or line released from a ship can be dangerous. Keep a safe distance from the cable coil on deck when the instruments are being used.

Instruments

Ø Do not leave instruments in direct sunlight on deck when not in use. Extreme heat (35°C or greater) can potentially damage them.

Ø When using an in-water reference, do not leave the reference unattended. Boat drift can entangle the cable and cause damage or instrument loss.

Cable

Ø Ensure the power/telemetry cable is not pinched or bent to a radius less than 18 cm, to prevent damage to the conductors within the kevlar strength member.

Connections

Ø Handle electrical terminations carefully, as they are not designed to withstand strain. Disconnect the cables from the components by pulling on the connector heads and not the cables. Do not twist the connector while pulling, as this will damage the connector pins.

Ø Do not use petroleum-based lubricants on connectors. Connectors should be free of dirt and lightly lubricated before mating. We recommend using DC-111 silicone grease (made by Dow-Corning) on the male pins prior to connection.

Troubleshooting

Ø   While checking voltages with a multimeter, extreme care should be used so as not to short the probe leads. A shorted power supply or battery can output many amperes of current, potentially harming the user, starting fires, or damaging equipment.

Recovery

Ø   Remember never to grab the electrical portion of the profiler or reference cable during recovery. This can cause damage to the power/telemetry bulkhead and the underwater splice.

Ø   Lens caps should always be replaced as soon as the instrument comes back on board. This will help protect the heads from direct damage.

Ø   Be sure to rinse sea water from the instrument with fresh water prior to storage. Corrosion resulting from failure to do so is not covered under warranty.

C. START UP

Assembly Procedure

PREPARATION

The OCR-504, when used as a standalone instrument, is very simple to set up. The normal user requirements are

- DC power source (+6 -+10 Vdc or +6 - 16 Vdc, depending on configuration)
- PC with free communications port to log data
- Power/telemetry cable (may be provided)
- Data-logging program (provided)
- Data conversion program (provided)

Satlantic provides the SatView data display and logging program, along with the SatCon data conversion program. Virtually any PC running Windows'95 or Windows'98 is adequate for these programs. Please refer to the SatView and SatCon manuals for more detail. Note that it is not necessary to use SatView to log data - essentially any terminal emulator can be used.

Note that if the C2 configuration is being used, a CMOS to RS-232 converter will be required to log data with a PC. Similarly, if it is desired to use the RS-422 telemetry in the C1 or C3 configuration, a RS-422 to RS-232 converter will be required.

CONNECT COMPONENTS

When making connections, proper alignment on the connector pins is critical to avoid damage. Visually ensure that the pins on the male connectors are properly aligned with (and partially seated into) the sockets on their female counterparts before pushing them together for final connection. Finally, ensure that the locking sleeve or locking strap is securely fastened after connection.

Following is a generic step-by-step procedure for setting up an OCR-504.
1. Disconnect the OCR-504 interface cable (if connected).
2. Ensure external power supply is set up for the proper voltage.
3. Ensure power is OFF.
4. Mount the OCR-504 in the desired position.
5. Connect the interface cable to the bulkhead on the OCR-504.
6. Connect the interface cable to a spare com port on the PC for data display and logging, with the appropriate level converter (if required)
7. Set up the data display/logging program. If you are using Satlantic's preferred SatView software, please refer to the SatView manual for details.
8. Remove the protective cover from the end of the OCR-504.
9. Apply power to the OCR-504.

After a brief delay, telemetry should begin to be received from the OCR-504. If you do not receive any telemetry, remove power to the OCR-504, and repeat the given procedure. If you still do not receive telemetry, please contact Satlantic for assistance.

CONDUCT A SIMPLE TELEMETRY TEST

A simple telemetry test should be conducted to get familiar with the data logging software and to test the system for proper operation prior to deployment. **This test assumes that the OCR-504 is in the C1 configuration and is used as a standalone instrument.** OCR-504 data can be viewed in real time and logged using SatView, Satlantic's Windows'95/98 based data logging and display software package. SatView is provided with the OCR-504 on two 3.5" diskettes. The calibration file, on a 3.5" diskette, is also provided. Additional calibration information and a hard copy of the calibration file, are included with the diskette. Load the SatView program and copy the calibration file onto the computer prior to the test outlined below. Here, we assume that a user created folder C:\OCR500 is the working directory

1. Start SatView by selecting **Start -> Programs -> Satlantic -> SatView**. You should see:
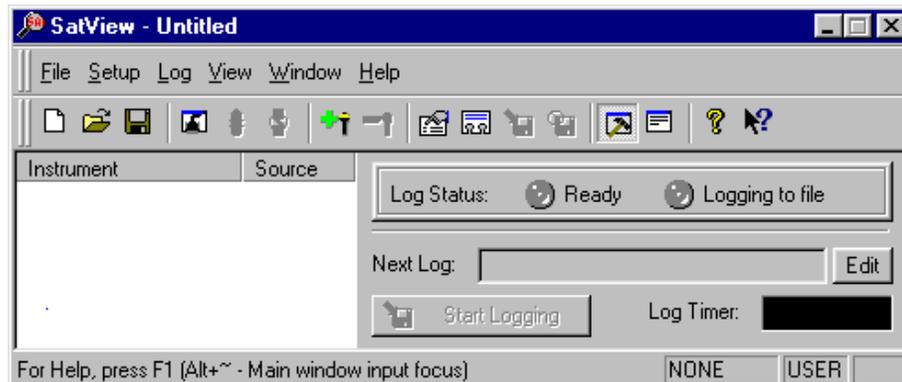
2.   Select **Setup -> Resource List**, as shown:
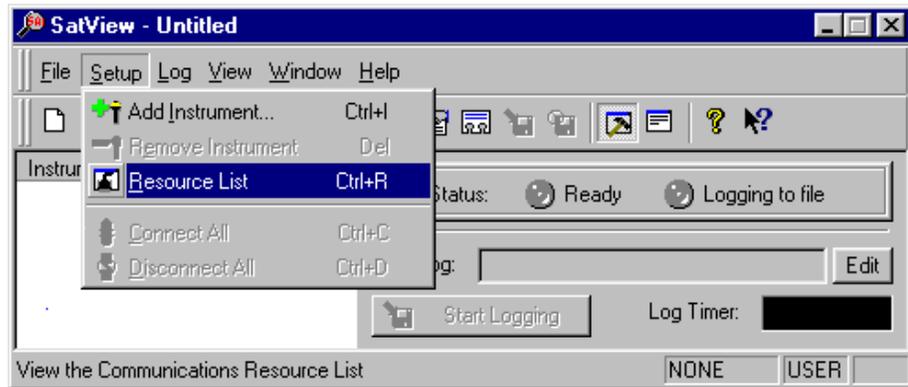
3.   In the **Communications Resources** dialog, select the add button to add the communication port that will be used to log data. Here, COM1 is assumed. Setup the port for 57600 baud, as shown

4. Select OK, then click the **Display** button in the **Communications Resources** dialog. You should see the **COM1 Control Panel**, as shown. Drag the window to a convenient location on the desktop, and close the **Communications Resources** dialog box.
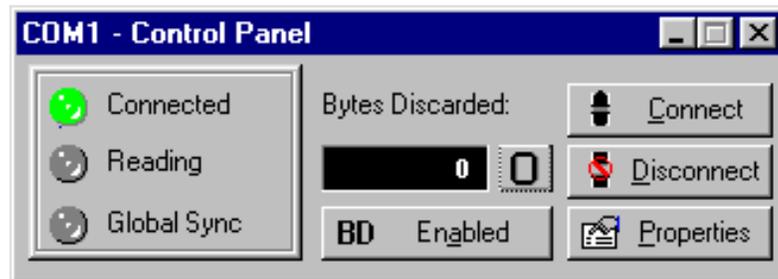
5. Next, you need to set up SatView with the calibration file supplied with the OCR-504. The calibration file you receive will be different than that shown here, but the procedure is the same. Select **Setup -> Add Instrument**.

6. You should see the **Add New Instrument** dialog box.   Select **From Calibration File**, and browse to the location of your calibration file, as shown.   The name and location of your calfile will be different from that shown in the dialog.
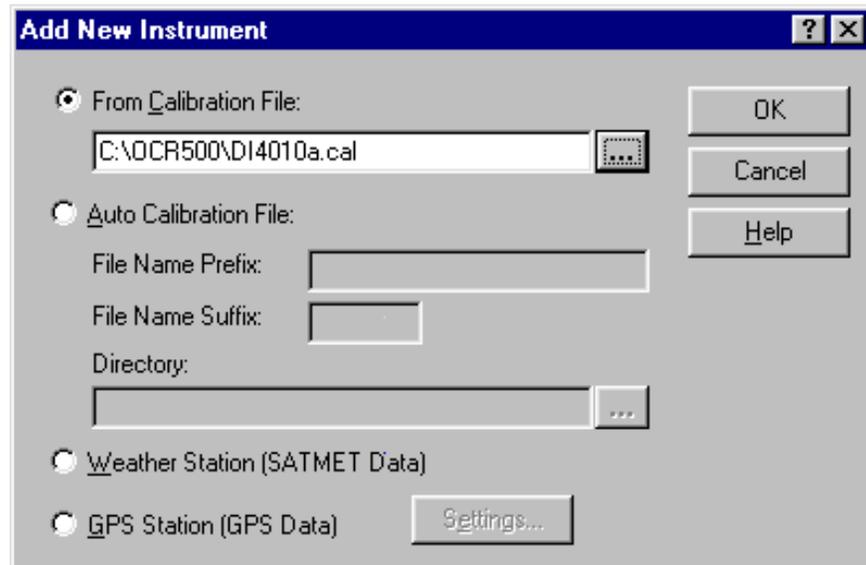
7. The main SatView window should now appear as follows:
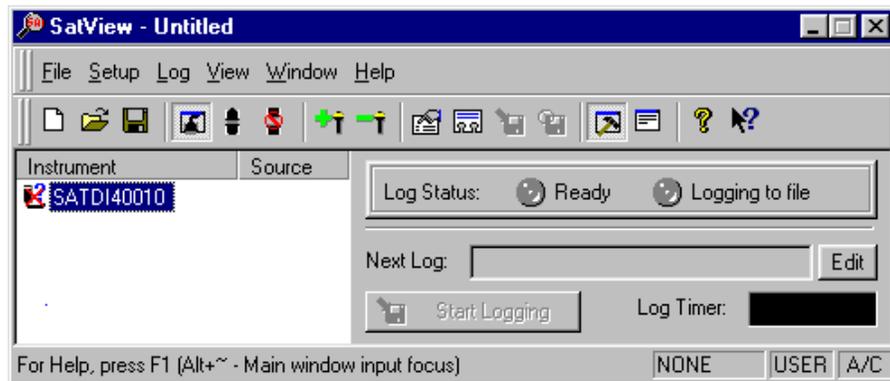
8.   Right-click on the OCR-504 in the instrument list (SATDx4xxxx) and select **Properties**. Set up the dialog as shown:

Properties for SATDI40010

Instrument ID: DI40010

Instrument Type: REFERENCE

Calibration File(s):

C:\OCR500\DI4010a.cal

☑ Immersed (Wet)

Automatic Events
☑ Auto Read From: COM1   (if available)
☑ Auto Enable   ☑ Auto Open Session Views

Error Checking
☑ Frame Counter (if available)   Frame Subsampling: 1
☐ Check Sum (if available)   Refresh Rate (ms): 50

OK
Cancel
Help
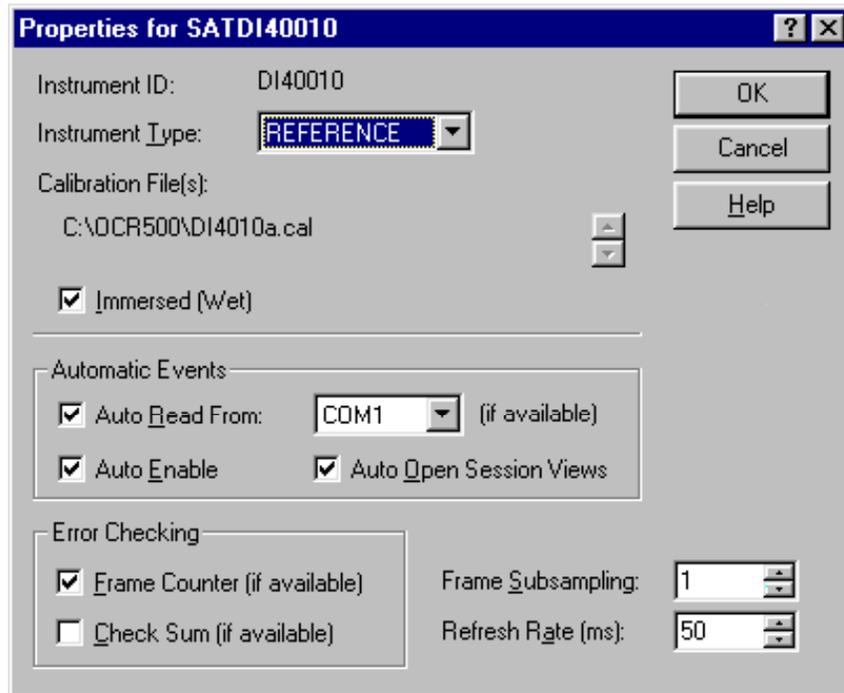
9.   If you are using a port other than COM1, select it from the drop down list. Select OK to close the dialog.

10. Next, double click on the OCR-504 in the instrument list (SATDx4xxxx). The **SATDx4xxxx** dialog box should appear:
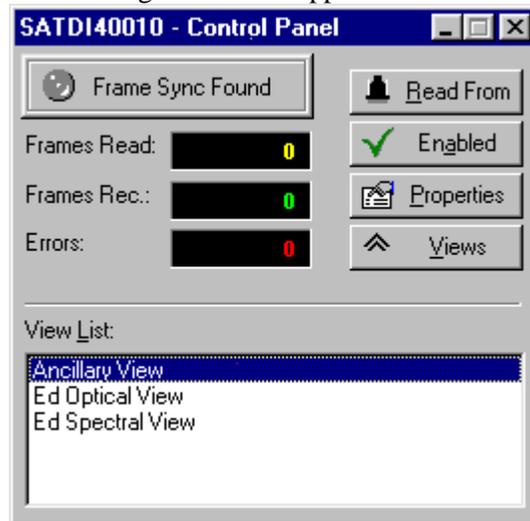
11. Double-click on each of the views in the view list to display the data for that view. Arrange the windows as is convenient on the desktop.

12. From the SatView main window, select **Setup -> Connect All**. This connects the communication resource to the communications port, allowing telemetry to be received. Provided the OCR-504 is powered up and configured properly, you should now be recieving telemetry in SatView. The **Frames Read** field in the **Control Panel** should be incrementing, as shown.
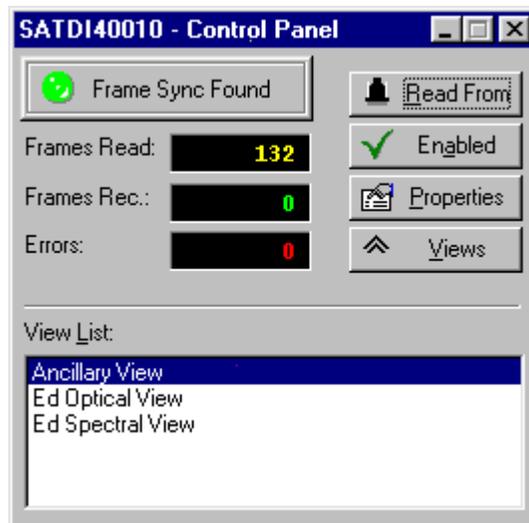
13. As an extra convenience, SatView allows you to save this setup for the next time you use the OCR-504. Go to **File -> Save As** and save the setup in a convenient location with a descriptive name, such as **"OCR504.sat"** in the SatView directory. The next time you wish to use the OCR-504 with SatView, simply open this file and all settings will be restored. Please refer to the SatView manual for more details.

14. Shown is a typical SatView session with the OCR-504.
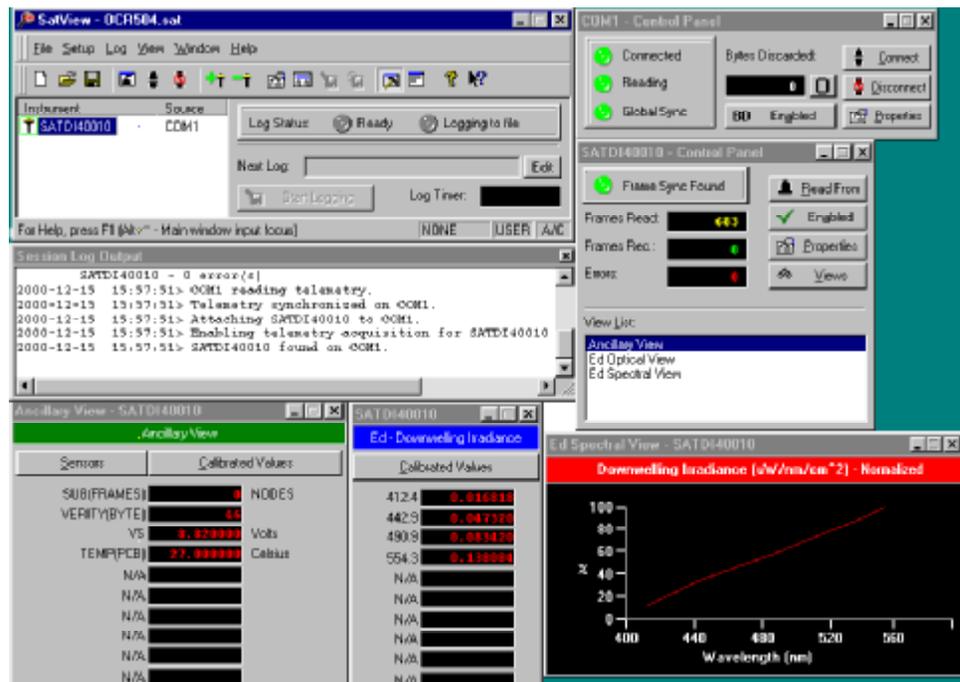
D. OPERATION

Logging Telemetry with SatView Software

1. SatView provides a very simple method for logging OCR-504 telemetry. After setting up SatView as described in the previous section, select **Log -> options** from the main SatView window. The **Logging Options** dialog should appear.
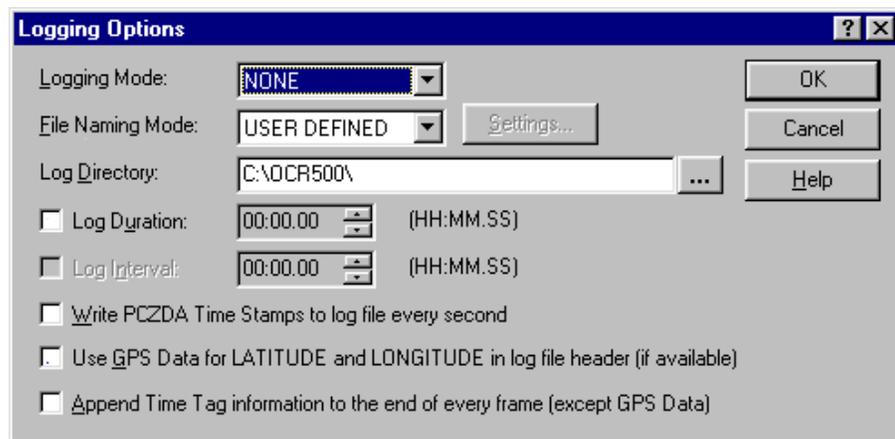
Set the logging mode to NONE, the file naming mode to USER DEFINED, and set the log directory as desired. The window should appear similar to that shown. Select OK when complete.

2. In the SatView main window, click the **Edit** button next to the **Next Log** field. Type a name for our test log file, say **OCR500Test**, then hit enter (SatView will append *.raw* to the file name).
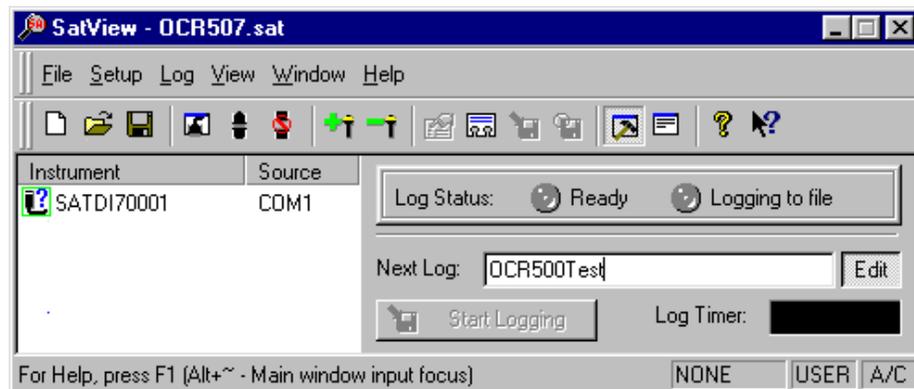
3. The **Start Logging** button is now available in the SatView window. When you are ready to begin logging, simply click this button. The log button should change to **Stop Logging**, and the **Log Timer** field will show how long SatView has been logging data. In the **Control Panel** window, the **Frames Rec.** (for frames recorded) field should be incrementing. When sufficient data has been logged (3 - 5 minutes) simply click the **Stop Logging** button.
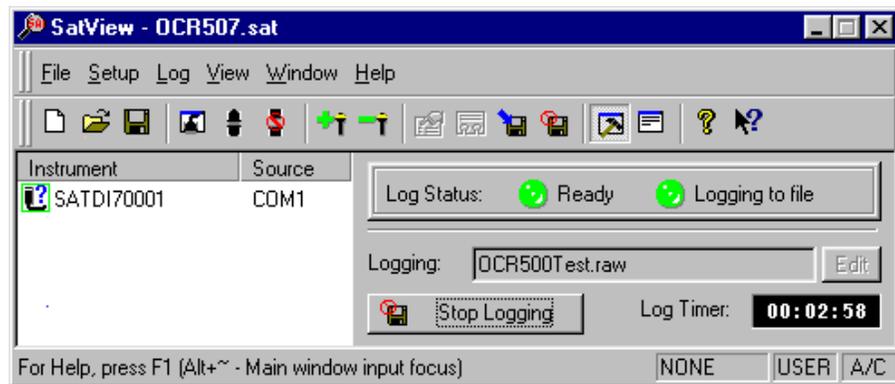
As shown here, the logged raw file is present in the selected directory.
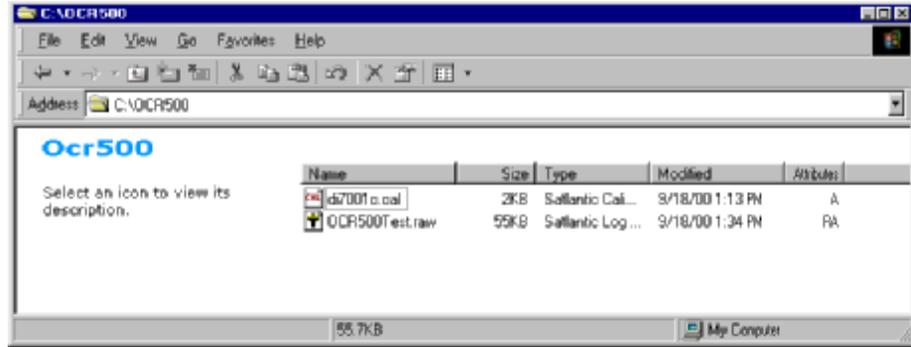
SatView provides many more telemetry logging options that are beyond the scope of this manual. Please refer to the SatView manual for more detailed instructions.

Data Processing with SatCon Software

After logging telemetry with SatView, the OCR-504 data is stored in uncalibrated digital counts. Satlantic's SatCon data processing software is provided for converting the raw log file into a usable format. SatCon reads the instrument calibration file, applies the appropriate conversion coefficients and formulae to the raw binary data and writes the data back out in calibrated physical units to an ASCII text file.

This section outlines the procedure to conduct a simple SatCon session, assuming that the file OCR500Test.raw was logged as outlined above. SatCon has a great number of features that are not discussed here; please refer to the SatCon manual for detailed operating instructions.

1. To start using SatCon, select **Start -> Programs -> Satlantic -> SatCon**. The main SatCon window should now be displayed, as shown below.
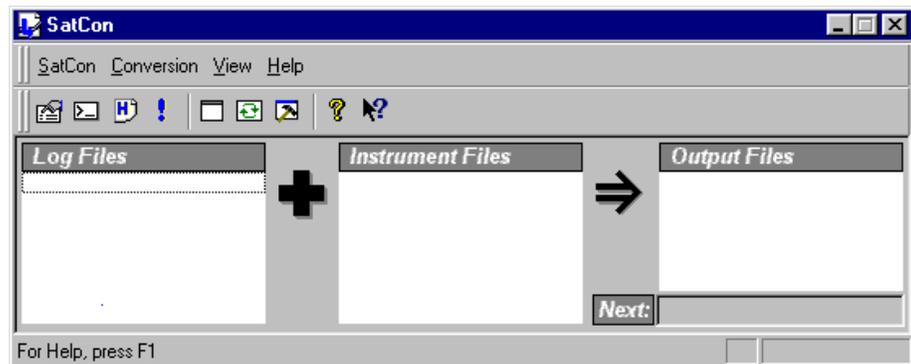
2. From the **Conversion** heading, select **Parameters**. The **Conversion Parameters** dialog box should be displayed. Set up the options as shown, then click OK.

3. From the **Conversion** heading, select **File Naming**. The **Output File Naming** dialog should be displayed. Set up the options as shown below. This configures the output ASCII file to be named based on the calibration file name concatenated with the logged data file name, with a *.dat* extension. Select OK when complete.

4. SatCon must be instructed as to where to look for the calibration file and log file, as well as where to put the output file. In this example, we will assume that the directory *C:\OCR500* is being used. From the main SatCon window, select **View -> Properties**. The **File List Properties** dialog will be displayed. First, select **Log Files** from the drop down list, and change the working directory to wherever the logged data is stored. Don't exit the dialog yet.
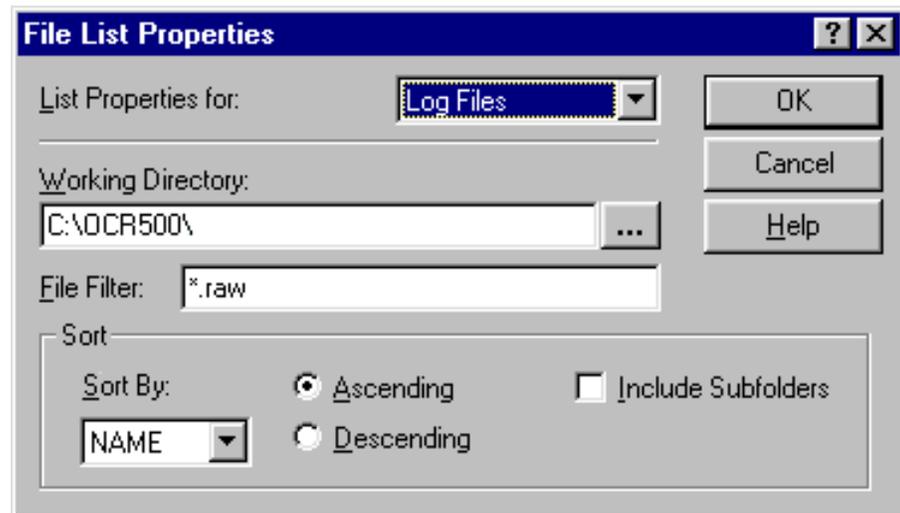
5. Select **Instrument Files** from the drop down list and again change the working directory to where the calibration file is stored. Don't close the dialog box yet.
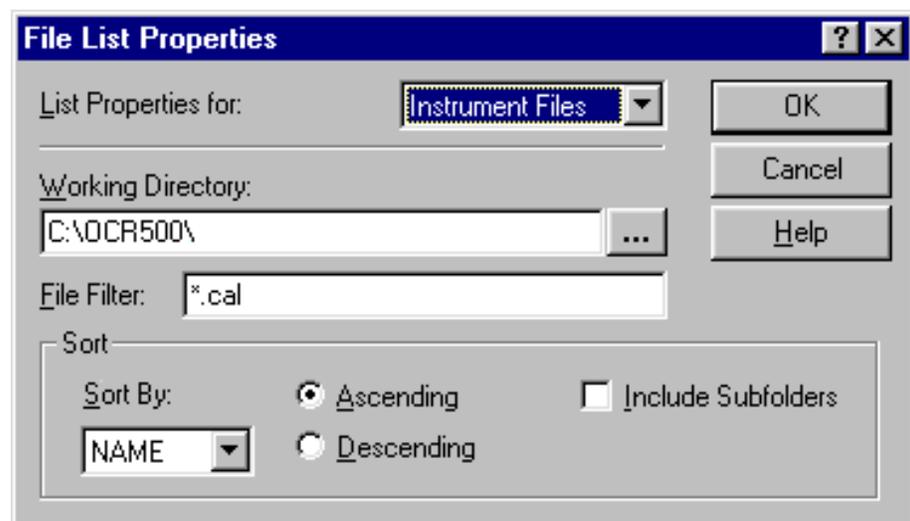
6. Select **Output Files** from the drop down list and once again change the working directory to where you want the converted file to be placed.
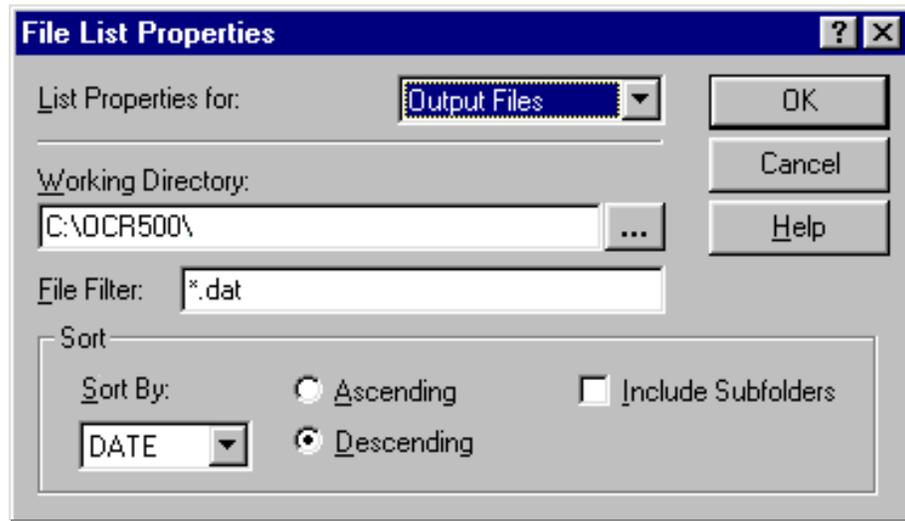
7. When you are happy with these settings, click OK.   The main SatCon window should now look similar to the following:
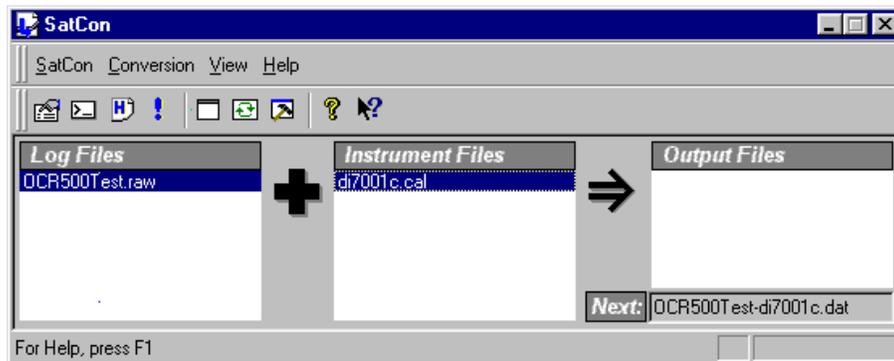
As you can see, the **Log Files** list contains the *.raw* file, the **Instrument Files** list contains the *.cal* calibration file, and there are no output files present since no conversion has been performed yet. Since multiple *.raw* and *.cal* files can exist in the same directory, the user must single-click the appropriate *.raw* and *.cal* file so that they are highlighted as shown. Notice that the **Next:** field contains the name of the output file that is about to be generated.

8. SatCon is now ready to convert the binary data into ASCII format. From the **Conversion** heading, select **Convert**. The **SatCon Conversion** dialog should be displayed, indicating the conversion progress, the number of frames processed, and any frame counter errors detected. Click OK when the conversion is complete.
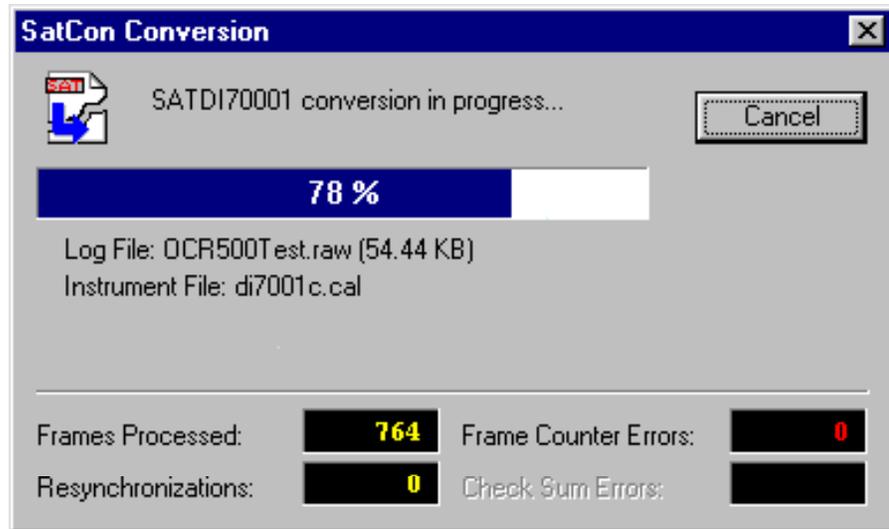
9. The main SatView window should appear as shown. Notice the converted log file is shown in the **Output Files** list.
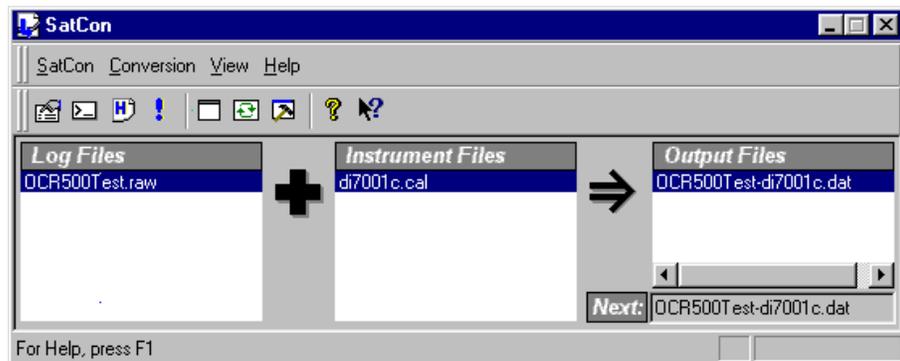
10. If you check the destination folder, you can confirm that the *.dat* ASCII output file is indeed present.
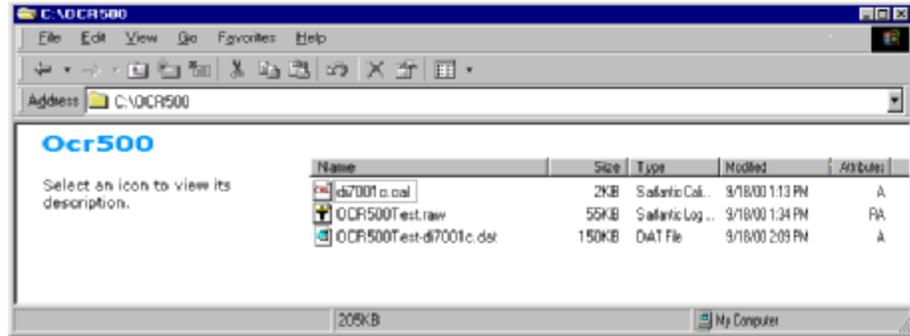
SatCon can now be exited and the output *.dat* file can be loaded into a spreadsheet or other data processing program.

E. RECOVERY

To recover the OCR-504 when it is used in the water, terminate data logging and pull the sensor back in using the cable. Disconnect the cables from the components taking care to pull without twisting on the connector heads, not the cables. Replace any dummy connectors and the vinyl end cap to protect the instrument during storage.

Always be sure to rinse the instrument with fresh water prior to storage in order to prevent corrosion. If there is any seawater in contact with the instrument in storage, particularly around bolts and other contacts of dissimilar materials, corrosion may occur. To not properly rinse the instrument before storage is considered misuse and warranty claims cannot be made under such circumstances.

F. MAINTENANCE

Preventative Maintenance

The OCR-504 requires virtually no maintenance. Ensure the instrument is not impacted and that any seawater is rinsed off after use. The dummy connectors and vinyl end cap should be replaced before storage.

Troubleshooting with HyperTerminal

Occasionally, new SatView users may experience difficulty configuring the program properly in order to view and log OCR-504 telemetry. Windows'9x includes the HyperTerminal program for serial data communication. This program provides a useful tool for quickly checking to see if telemetry is being received from the OCR-504.

CHECKING FOR HYPERTERMINAL INSTALLATION

HyperTerminal may not be installed on your computer. It is, however, a standard part of Windows'9x. Check to see if HyperTerminal is installed by entering **Start -> Programs -> Accessories**. If a **HyperTerminal** folder is visible in the **Accessories** folder, HyperTerminal is already installed.

INSTALLING HYPERTERMINAL

Adding HyperTerminal is very straightforward; open up the **Control Panel** and click on the **Add/Remove Programs** item. Go through the dialogs as shown to install the program.
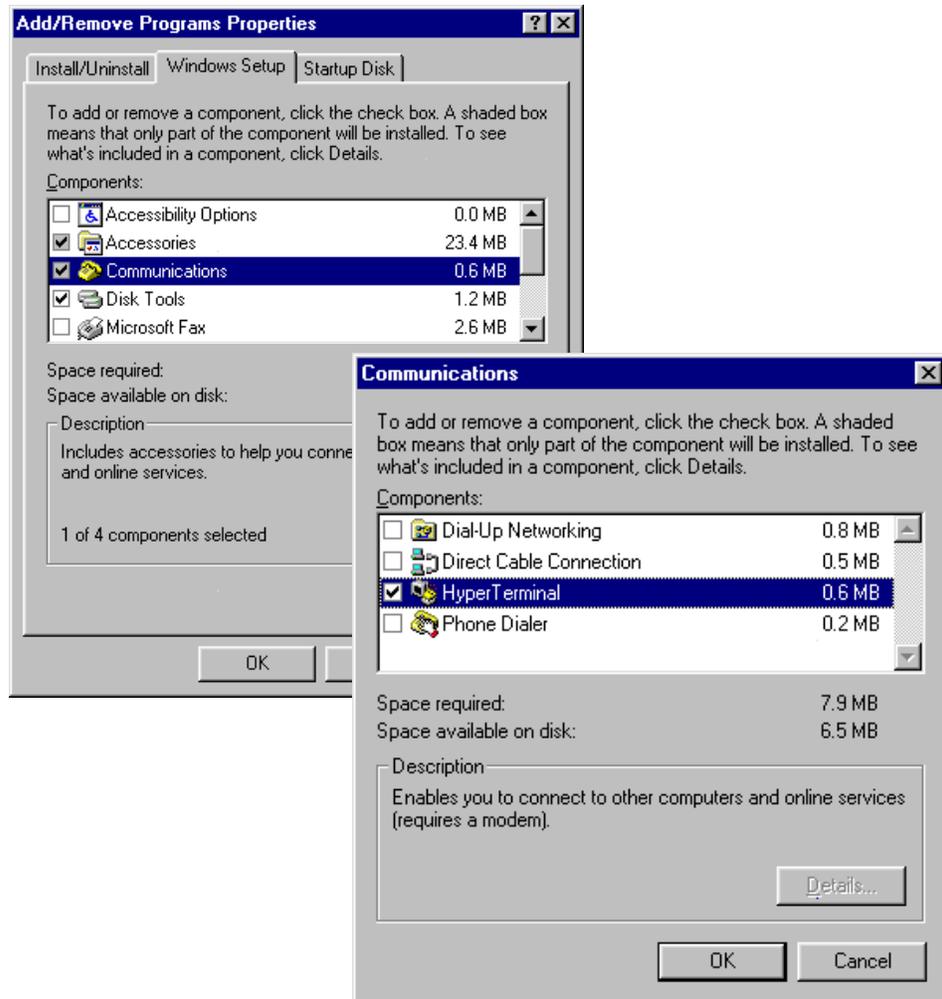
CONFIGURING HYPERTERMINAL

To start the HyperTerminal program, go to the Start menu and select Run, then type **hypertrm** in the Run dialog box. An alternative method is to enter the HyperTerminal folder through **Start -> Programs -> Accessories -> HyperTermina**l, then double-clicking on the **hypertrm.exe** icon. At startup, HyperTerminal initiates a configuration with a new connection dialog box. It is helpful to create an informative name for the connection we are about to create, as shown in the following figure. The name as shown indicates that we will have a connection to a OCR-500 instrument, on COM1, at 57600 baud.

The phone number dialog box will then open. HyperTerminal is biased towards telephone and modem based connections, but for an OCR-500 series instrument a direct connection is required. We need to avoid any automatic search by the program for a modem and select a direct COM port connection. Below we see that Com 1 has been selected.

Finally HyperTerminal will ask for the asynchronous serial port communication parameters that will be used in the connection. This is shown in the COM1 Properties dialog box (below). The properties required for the OCR-500 are as follows: 57600 bits per second, 8 data bits, no parity, 1 stop bit, and no flow control. You do not need to use the *Advanced* button in this dialog box (if present).
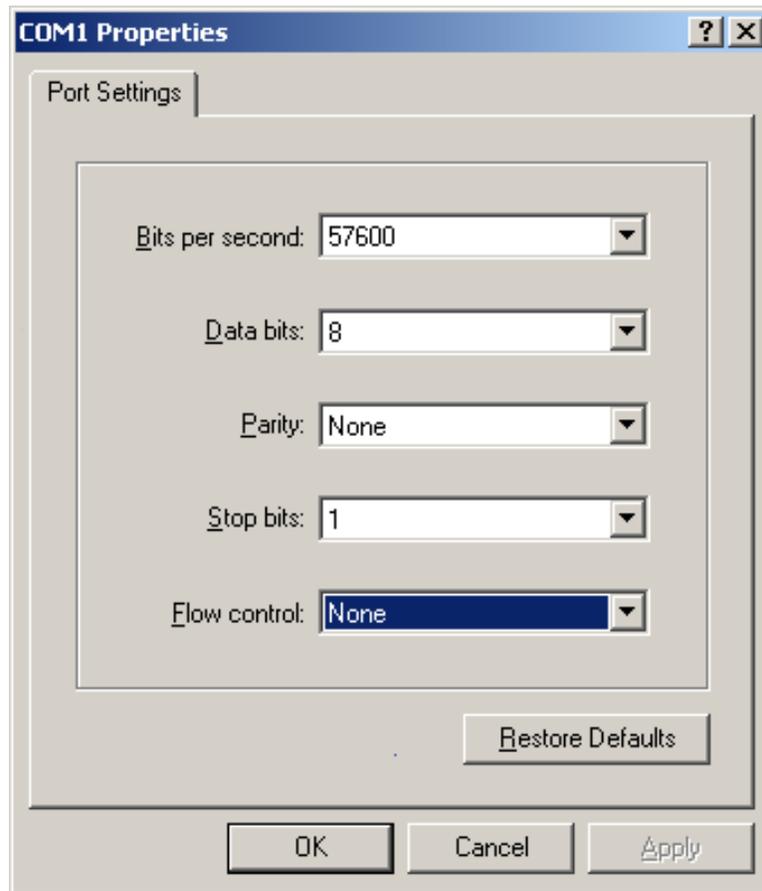
After completing this dialog and pressing the OK button, HyperTerminal's main window will be displayed, as shown below. If the OCR-500 has been configured correctly and is turned on, the output telemetry stream should now be visible, as shown.

OCR-500 Frames
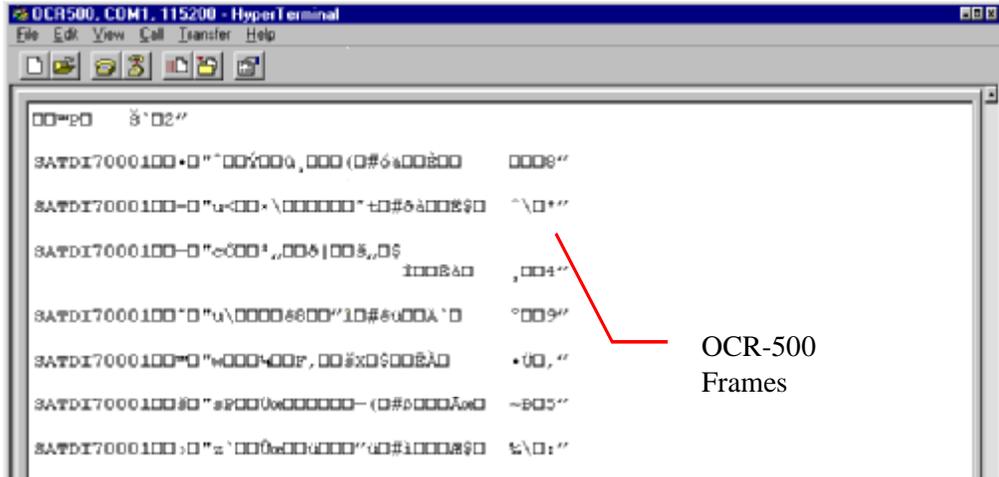
At this point the connection will be established and it should be possible to see telemetry from the OCR-500. However, the configuration process is not yet complete. The program is currently configured to auto-detect the type of terminal that it should be emulating. This is inappropriate for use with the OCR-500 and may cause problems. To correct this, from the **File** menu you should click the **Properties** selection and change the terminal type. Select the **Settings** tab of the dialog box and change the **Emulation** from **Auto Detect** to **TTY** as shown. Setting the emulation type to **VT100** also works well.

If the OCR-500 has been set up properly, when you press the OK button you will see telemetry as shown in the previous figure. Sometimes you will not be able to see some or all of the headers; this is often due to carriage return characters being present in the data frame, causing HyperTerminal to overwrite the headers. Occasionally simply changing the emulation type to something else (such as VT100 instead of TTY) alleviates the problem. If not, you can also append line feeds to incoming line ends. From the same window where the emulation type was set, press the **ASCII Setup** button. Check the box that says, "Append line feeds to incoming line ends", as shown below. This should allow you to easily see most headers.

```
┌─ ASCII Setup ──────────────────── ? X ┐
│  ┌─ ASCII Sending ──────────────────┐  │
│  │  □  Send line ends with line feeds │  │
│  │  □  Echo typed characters locally  │  │
│  │  Line delay: [0      ] milliseconds. │  │
│  │  Character delay: [0      ] milliseconds. │  │
│  └────────────────────────────────┘  │
│  ┌─ ASCII Receiving ────────────────┐  │
│  │  ☑  Append line feeds to incoming line ends │  │
│  │  □  Force incoming data to 7-bit ASCII │  │
│  │  ☑  Wrap lines that exceed terminal width │  │
│  └────────────────────────────────┘  │
│              [  OK  ]   [ Cancel ]       │
└──────────────────────────────────────┘
```
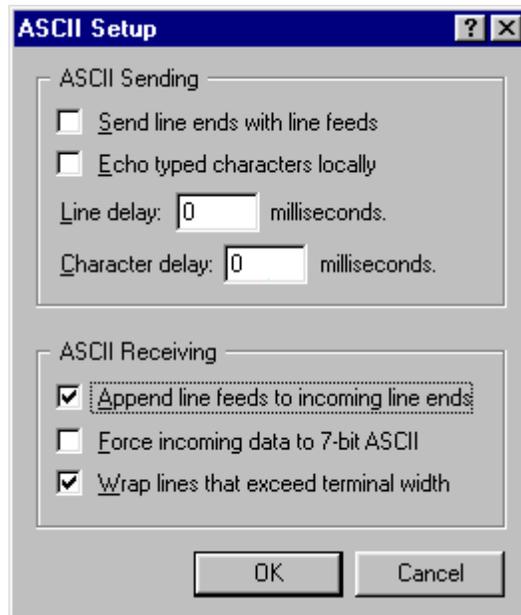
Troubleshooting for Hardware Problems

If, after running Hyperterminal, telemetry is not visible in the HyperTerminal window, there could be a hardware problem. The connections can be checked and voltage checks can be conducted on the cables and components, as outlined below. To check voltages, a multimeter with DC voltage measurement, resistance measurement, and continuity check capability is required.

WARNING! *While checking voltages, extreme care should be used so as not to short the probe leads. A shorted power supply or battery can output many amperes of current, potentially harming the user, starting fires, or damaging equipment.*

CHECK CONNECTIONS

Procedure
1. Ensure power cable is properly connected to the power supply and the instrument
2. Ensure the RS-232 or RS-422 cable is connected to the correct PC communications port.
3. Ensure no other programs are running that could be using the communications port.

CHECK THE SUPPLY VOLTAGE TO THE OCR-504

Voltages above the maximum input voltage may damage the instrument and voltages below the minimum operating voltage may cause the device to drop out of regulation. Thus the user should ensure the voltage input to the OCR-504 is within the allowed range as specified by its configuration (see section A).

Procedure
1. Set the multimeter to measure a DC voltage.
2. If using a battery as the power source, measure the voltage directly at the battery terminals with the multimeter. If the voltage is low then recharge or replace the battery. If using a DC power supply, set the output voltage to the proper range and check the voltage with the multimeter.
3. Connect the power supply cable to the power source.
4. **Being extremely careful not to short the probe leads**, measure the voltage between the pins on the supply cable. It should read approximately the same as the measurement taken in step 2. If the voltages are not the same, recheck the power supply cable connections. If they are still not the same, there is likely a break in the cable that requires repair (a wire break can be confirmed with a *continuity check*).
5. If the voltage is ok, connect the power supply cable to the OCR-504.
6. Again measure the voltage at the power supply terminals. The voltage should remain approximately the same as before, although there may be a small voltage drop when using a battery (battery voltage drops under load). If there is a significant voltage drop, disconnect the power immediately and check for shorts in the cable.

CHECK CABLE CONTINUITY

Often, system problems can be traced to cable breaks or shorts. Usually, these cable failures are a result of improper handling or storage. Cable continuity can be checked as outlined below. All the cables should be disconnected from the instrument when performing these tests.

Procedure

1. Set the multimeter to measure continuity. The resistance measurement setting can also be used.
2. Check for continuity by measuring from pin 1 on one end of the cable to pin 1 on the other end. The meter should confirm that the connection is continuous by either giving an audible signal or measuring a low resistance. If there is not continuity, there is a break in the cable requiring repair.
3. Repeat step 2 for all pins in the cable.
    Check for shorts from pin 1 to all other pins by keeping one probe lead on pin 1 and touching the other probe lead to each of the other pins in the same connector in turn. All pins should be isolated from each other. The meter should read this as open or measure a very high resistance. If any of the pins are not isolated, there is a short in the cable that requires repair.

G. WARRANTY

Warranty Period

The OCR-504 is under *one year* parts and labour warranty from date of purchase.

Restrictions

Warranty does not apply to products that are deemed by Satlantic to be damaged by misuse, abuse, accident or modifications by the customer. The warranty is considered void if any optical or mechanical housing is opened. In addition, the warranty is void if the warranty seal is removed, broken or otherwise damaged.

Provisions

During the one year from date of purchase warranty period, Satlantic will replace or repair, as deemed necessary, components that are defective, except as noted above, without charge to the customer.

Returns

To return products to Satlantic, whether under warranty or not, contact Satlantic, Customer Support Department and request a Returned Material Authorization (RMA) number and provide shipping details. All claims under warranty must be made promptly after occurrence of circumstances giving rise thereto and must be received by Satlantic within the applicable warranty period. Such claims should state clearly the product serial number, date of purchase (and proof thereof) and a full description of the circumstances giving rise to the claim. All replacement parts and/or products covered under the warranty period become the property of Satlantic Inc.

Liability

IF THE OCR-504 SHOULD BE DEFECTIVE OR FAIL TO BE IN GOOD WORKING ORDER THE CUSTOMER'S SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS STATED ABOVE. IN NO EVENT WILL SATLANTIC INC. BE LIABLE FOR ANY DAMAGES, INCLUDING LOSS OF PROFITS, LOSS OF SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING FROM THE USE OR INABILITY TO USE THE OCR-504 OR COMPONENTS THEREOF.

H. CONTACT INFORMATION

If you have any problems, questions, suggestions or comments about the instrument or manual, please contact us.

Location

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Business Hours

Satlantic is normally open for business between the hours of 9:00 AM and 5:00 PM Atlantic Standard Time. The Atlantic Standard Time zone is one hour ahead of the Eastern Standard Time zone. Normally, in the winter, AST is UTC-4, but it changes to UTC–3 during the daylight saving time period in the summer. Daylight saving time is in effect from 2:00 AM on the first Sunday in April until 2:00 AM on the last Sunday in October.

Satlantic is not open for business during Canada's statutory holidays, which are as follows:

- New Year's Day   January 1st
- Good Friday   The Friday before Easter Sunday
                            (Easter Sunday is the first Sunday after the full moon on or following March 21st, or one week later if the full moon falls on Sunday)
- Victoria Day   The first Monday before May 25th
- Canada Day   July 1st
- Halifax Natal Day   The first Monday in August
- Labor Day   The first Monday in September
- Thanksgiving Day   The second Monday in October
- Remembrance Day   November 11th
- Christmas Day   December 25th
- Boxing Day   December 26th

I. MANUAL REVISIONS

Date	Author	Rev	Comments
2001-08-28	SKF	B	Added Manual Revisions section. Updated Satlantic contact information. Updated telemetry baud rate references to 57600 baud.