2D-ACM

Compact, Vector Averaged Current Speed and Direction Meter

User Manual

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P/N 8000-2DACM, Rev. –

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System Configuration Requirements

The system configuration required for ACMPro to operate properly includes the following:

- Microsoft Windows 98® or higher
- Pentium® processor
- Minimum 32 MB of RAM
- Monitor, 800 x 600 (minimum), 1024 x 768 (recommended)
- CD-ROM drive
- 10 MB free space

Pull-Down Menus

Like most programs, ACMPro uses pull-down menus, which are opened from the menu bar in the program's Main window by pointing to the item with the mouse pointer and clicking the left mouse button. When the menu is open, you can select an item from it in the same manner.

In many of the procedures presented in this manual, the ➤ symbol is used to represent a sequence of menu item selections. For example, "Choose File ➤ Open" means select File from the menu bar, and then choose Open from the File menu when it opens.

Customer Service

FSI welcomes your feedback. Please contact FSI customer service to offer any comments or suggestions or to request technical support. FSI can be contacted using any of the following means:

Mail

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Table of Contents

SECTION 1: Introduction

The Falmouth Scientific 2-Dimensional Acoustic Current Meter (2D-ACM) collects, outputs and stores instantaneous current velocity data in two dimensions along with 3-axis compass data, 2-axis tilt data, temperature data, and data from optional sensors, including a CTD. The current velocity and tilt data can also be output and stored as vector averages over specified averaging intervals.

The 2D-ACM is configured using ACMPro, a Microsoft Windows based software program included with the instrument. With ACMPro you can configure and deploy the instrument, acquire data in real time or download the data from the instrument's internal memory. And the real-time data can be viewed on a digital or graphics display. In addition, the data can be input to ACMPost, a software program available from FSI that processes the data for display on various graphics displays. ACMPost also creates DAT, C00 and HDR files from the CTD data acquired from the optional CTD. These files can be input to FSIPost, a software program available from FSI that processes, displays and saves the CTD data.

The 2D-ACM Instrument

The 2D-ACM, which is shown in Figure 1-1, measures current velocity in the two horizontal dimensions using four acoustic transducers. Included inside the instrument's housing is a 3-axis solid state compass for measuring the Earth's magnetic field and a 2-axis solid state accelerometer for measuring tilt. A temperature sensor for measuring water temperature is located on the top end cap. Along with the optional CTD, the 2D-ACM includes two DC input channels which interface with most DC output sensors, including dissolved oxygen, pH, chlorophyll, light transmission, and others. The 2D-ACM can be powered from an external DC power supply or from an internal alkaline battery pack. Data can be acquired in real time in ASCII format through an RS-232 or optional RS-485 serial interface at baud rates up to 19200 bits/sec, or the instrument can be deployed and the data stored in its standard 1 MB internal flash memory for later retrieval. A single bulkhead connector on the top end cap provides the RS-232 or RS-485 connection and inputs external power. The 2D-ACM is small in size and low in weight and has a depth rating of 200 meters. In addition, a 1.5-ton working strength 316 stainless steel mooring frame is included with pad eyes on the top and bottom for securing to a mooring line, and zinc anodes attached to the frame provide cathodic protection. Optionally available is a 7000-meter rated 2D-ACM and a 5-ton 316 stainless steel mooring frame. A 2D-ACM is shown with this frame in Figure 1-2. A 7000-meter rated 2D-ACM in a 5-ton frame and a 2D-ACM with an optional CTD is shown in Figure 1-3 on page 1-4.

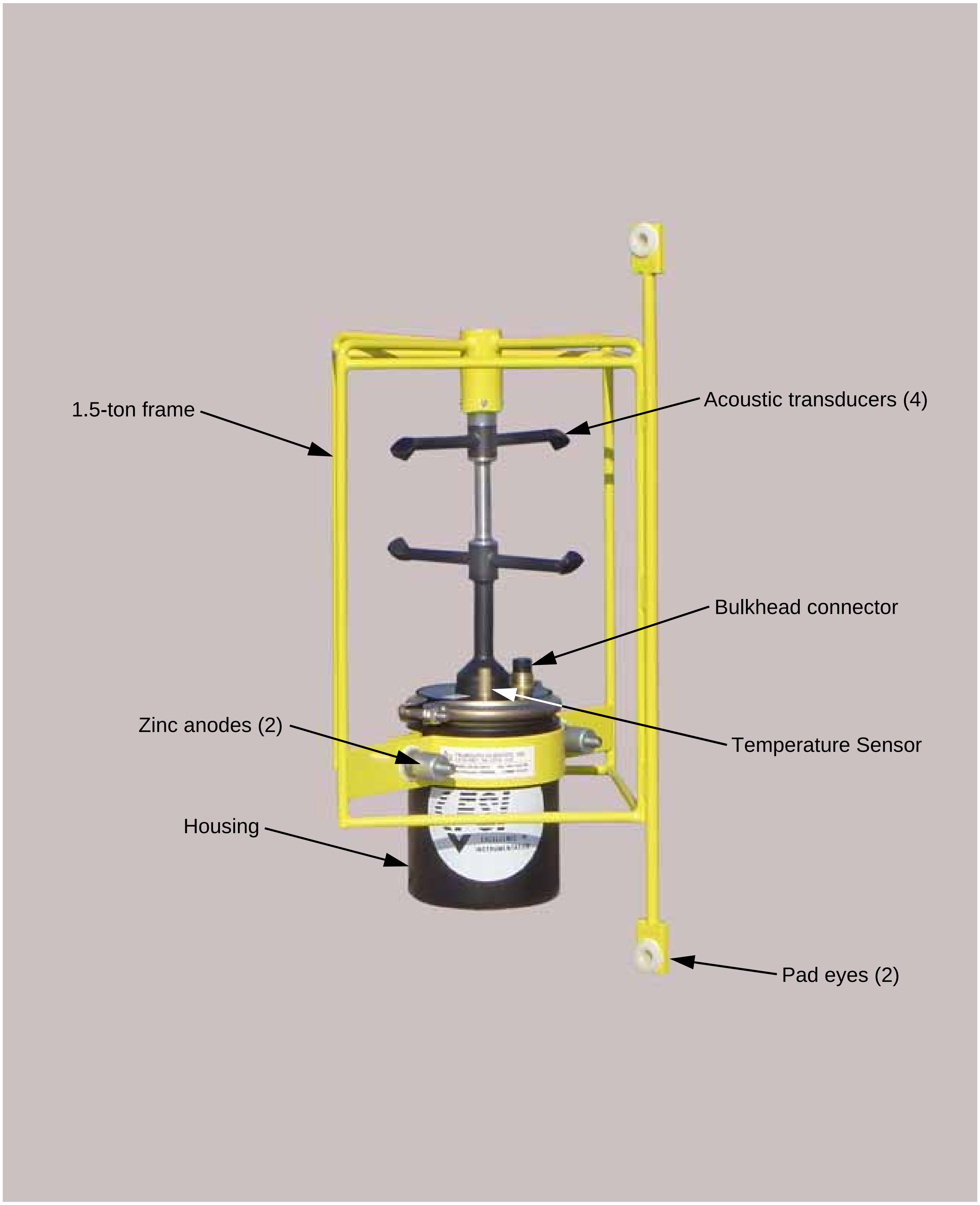


Figure 1-1: ***The 2D-ACM Main External Components***

Figure 1-2: ***The 2D-ACM with the Optional 5-Ton Stainless Steel Mooring Frame***

7000-meter 2D-ACM with the optional 5-ton mooring frame

2D-ACM with optional CTD

Figure 1-3: ***The 7000-Meter 2D-ACM with the Optional 5-Ton Stainless Steel Mooring Frame and the 2D-ACM with the Optional CTD***

Specifications

Below are the general specifications for the 2D-ACM along with the specifications for the velocity, compass, tilt, and temperature sensors.

Note: *These specifications are subject to change without notice.*

General

Power requirements:	Internal battery pack or external 9–20 VDC @ 12 mA with no CTD; 32 mA with CTD
Depth rating:	200 m standard, epoxy resin housing 7000 m optional, 6AL4V titanium housing
Sample rate:	2 Hz maximum
Vector averaging period:	15 seconds to 59 minutes and 59 seconds
DC channels:	0–5.0 VDC
Mooring frame:	1.5-ton painted 316 stainless steel standard; 5-ton painted 316 stainless steel optional
Bulkhead connector:	Subconn MCBH5F; mates with MCIL5M
Real time clock stability:	±5 ppm initial accuracy, ±12 ppm/year
Communication interface:	RS-232 standard; RS-485 optional
Baud rate:	110–19200 bits/sec
Data format:	8 data bits, 1 stop bit
Internal memory:	1 MB
Battery pack:	5 welded alkaline "D" cells; 7.5 V (nominal) at 10 A·h
Weight in air:	8.0 lb (3.6 kg) with 200-m housing; 9.5 lb (0.7 kg) with CTD
Weight in water:	4.0 lb (1.8 kg) with 200-m housing; 5.0 lb (2.3 kg) with CTD

Velocity

Sensor type:	Acoustic
Range:	0–600 cm/s
Accuracy:	2% of reading or 1 cm/s
Resolution:	0.01 cm/s

Compass

Sensor type:	3-axis magnetometer
Range:	0–360°
Accuracy:	±2°
Resolution:	0.01°

Tilt

Sensor type:	2-axis accelerometer
Range:	0–45°
Accuracy:	0.5°
Resolution:	0.01°

Temperature

Sensor type:	Semiconductor
Range:	-2–35°C
Accuracy:	0.1°C
Resolution:	0.5°C standard; 0.01°C optional

Optional CTD Specifications

Below are the specifications for the conductivity, temperature and pressure sensors of the optional CTD.

Note: *These specifications are subject to change without notice.*

Conductivity

Sensor type:	Inductive cell
Range:	0–7.0 S/m
Accuracy:	±0.002 S/m
Stability:	±0.005 S/m
Resolution:	0.0001 S/m

Temperature

Sensor type:	Platinum resistance
Range:	-5–32°C ITS-90
Accuracy:	±0.03°C
Stability:	±0.005°C
Resolution:	0.001°C

Pressure

Sensor type:	Precision micro-machined silicon transducer
Range:	0–200 dBar or 0–7000 dBar, customer specified
Accuracy:	±0.3% of full scale
Stability:	±0.01% of full scale
Resolution:	0.01% of full scale

ACMPro Overview

ACMPro runs on the Windows 98 or higher platform. ACMPro is primarily used to check, to configure and to prepare for deployment a 2D-ACM. In addition, ACMPro is used to acquire and display data from the 2D-ACM in real time, to download data from the instrument's internal memory, to view the data, and to save the data for processing by ACMPost. Specifically, the major functions that ACMPro allows you to perform are the following:

Check the instrument to establish communications with the 2D-ACM and to retrieve the instrument's model and serial numbers, the version of the firmware installed in the instrument, and the instrument's calibration date.

Choose the instantaneous parameters to be output and stored by the instrument by selecting the parameters; namely, the instantaneous current velocity and optional parameters and the instantaneous compass and tilt parameters. One record of the selected instantaneous parameters is output and stored along with the selected vector averaged parameters at the end of each averaging interval.

Choose the vector averaged parameters to be output and stored by the instrument by selecting the parameters; namely, the vector averaged current velocity and tilt parameters. The selected vector averaged parameters are output and stored at the end of each averaging interval.

Set the averaging interval by specifying the period during which the selected vector averaged current velocity and tilt parameters are averaged.

Set the instrument run times by specifying what periods, other than running continuously, during which the instrument is to run and collect data and the delay time and date if the instrument is to begin collecting data at a future time and date. The instrument time and date is set by accepting the time and date from the computer on which ACMPro is running.

Prepare the instrument for deployment under its own internal battery power by selecting one of three operating modes—Continuous, Interval or Delayed—in which the instrument is to run when deployed under its own internal battery power.

Acquire data from the instrument in real time while saving the data to a text file, storing the data to the instrument's internal memory, and viewing the data on a digital display or a graphics display.

Retrieve and save the data from the instrument after it has been recovered by downloading the data from the instrument's internal memory and saving the data to a text file.

View saved data by opening a text file that contains data.

ACMPro Compatible Processing Software

Text files containing current velocity and pressure data that have been acquired from the 2D-ACM by ACMPro can be processed for display on various graphics displays. In addition, data from the optional CTD can be processed and displayed. The following two processing programs are available from FSI for performing these functions, and they run under the Windows 98 or higher platform:

ACMPost which is used to input current velocity data that have been acquired from the 2D-ACM. These data are processed for display in four separate graphics displays: the Time display, the Speed and Direction display, the Progressive Vector display, and the Direction Distribution display. The Time display shows a plot of current velocities verses either number of scans or time. The Speed and Direction display shows a stick plot of current speed and direction, where the speed is calculated from the square root of the sum of the squares of the vector averaged horizontal current velocities and the direction is calculated from the arctangent. The current speed is represented as the length of a line—one line for each scan, and the direction as the orientation of each line—0° to 360° clockwise from straight up, where 0° is true north. The Progressive Vector display shows current speed and direction information on a polar graph, and as in the Speed and Direction display, the vector averaged horizontal current velocity is represented as the length and orientation of a line—one line for each scan. The Direction Distribution display shows histograms of the vector averaged current velocities and the current directions, each verses number of scans.

FSIPost which is used to input CTD data that have been acquired from an optional CTD by ACMPro and saved into three files created by ACMPost: a data file with extension *.dat*, a calibration file with extension *.c00* and a header file with extension *.hdr*. FSIPost inputs all three files and provides a number of data processing features, including first difference editing, time lag correction, calculation of selected parameters, and calculation of pressure averages. In addition, FSIPost allows you to save, view and print reports, including plots of the CTD data and calculated parameters.

SECTION 2: Connecting the 2D-ACM and Verifying Operation

Before you can perform most of the functions provided by ACMPro, your computer must be connected to the 2D-ACM through an available serial port. The default serial port for ACMPro is COM1, and the default baud rate is 9600 bits/sec; however, any serial port from COM1 to COM4 can be used, and baud rates of 110–19200 bits/sec are additionally available. This section provides instructions on how to unpack the 2D-ACM and connect it to your computer, how to install and start ACMPro on your computer, how to configure ACMPro for a serial port and baud rate other than the defaults, and how to verify that the instrument is communicating with your computer and is functioning properly.

Unpacking the 2D-ACM

Before unpacking the 2D-ACM, check the shipping container for signs of external damage. If the container appears damaged, report the damage to FSI and to the freight carrier.

When unpacking the 2D-ACM, inspect all the items for any apparent damage and verify that all the items listed in the packing list are included in the shipment. Report any damage or missing items to FSI.

Battery Pack

An alkaline battery pack is shipped with the 2D-ACM but is not installed. (See "SECTION 7: Replacing the 2D-ACM Battery Pack," for instructions on how to disassemble the instrument and install the battery pack.)

Standard Items

The following standard items are included with each delivery:

- **2D-ACM**
- **ACMPro for Windows CD-ROM**
- **Test cable**
- **Power supply with AC line cord**

- **Documentation package**
- **Dummy connector and locking sleeve**
- **This manual**
- **Alkaline battery pack (degaussed)**

Optional Items

Optional items typically include the following:

- **Additional test cable**
- **Additional power supply with AC line cord**
- **Additional battery pack**
- **RS-485 interface**
- **Watertight case**

These items are available from FSI and are listed with their part numbers in Table 2-1 below. (See “Customer Service” on page iii for information on how to contact FSI to order any of these items.)

Optional Items Available from FSI

ITEM	FSI PART NUMBER
Test Cable	2ACM-CAB-TST
Power Supply	2ACM-OP-PWR
Alkaline Battery Pack	2ACM-OP-AB
RS-485 Interface	2ACM-OP-485
Watertight Case	2ACM-OP-PSC

Table 2-1: ***Optional Items Available from FSI***

Installing ACMPro

The 2D-ACM is configured using the ACMPro software which must be installed on the computer to which the instrument will be connected.

To install ACMPro:

1. Exit all programs and turn off any virus protection or screen saver software.

2. Insert the ACMPro for Windows CD into your CD-ROM drive.

3. Select Start ➤ Control Panel ➤ Add or Remove Programs.

   The Add or Remove Programs dialog box opens.

4. Click Add New Programs, and then click CD or Floppy and follow the instructions to install the software.

Starting ACMPro

To start ACMPro choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro. ACMPro starts and the ACMPro Main window opens.

The "Kick Start" Feature

The 2D-ACM includes a "Kick Start" (KS) feature, which when enabled allows you to configure the instrument or retrieve data from it even when the instrument has been configured to remain off using the run time settings. The test cable includes a KS switch which allows you to connect the power supply and the computer to the 2D-ACM and to switch the KS feature on or off. KS can also be enabled by connecting Pin 5 (KS) to Pin 1 (Ground) on the instrument's bulkhead connector or directly to power supply ground. (See "APPENDIX B: Bulkhead Connector Wiring," for information on the 2D-ACM bulkhead connector wiring.)

The Optional RS-485 Interface

An optional RS-485 interface, instead of the standard RS-232 interface, can be installed on the 2D-ACM. If the instrument has been ordered with this option, an RS-485/RS-232 converter is also included.

Connecting the 2D-ACM to Your Computer

The following items are required to connect the 2D-ACM to your computer:

- Test cable
- Power supply and AC line cord
- RS-485/RS-232 converter, for RS-485 interface option only
- An available serial port on the computer

Note: *If you will be fabricating your own cable for connecting the 2D-ACM to your computer, see "APPENDIX B: Bulkhead Connector Wiring," for information on the 2D-ACM bulkhead connector wiring.*

Note: *Although any serial port from COM1 to COM4 can be used, use COM1 if it is available, as it is the default serial port setting of ACMPro. If you use any other serial port, you must select it in ACMPro as described in "Changing the Serial Port" on page 2-6.*

Connecting to the RS-232 Interface

A 2D-ACM with an RS-232 interface is shown set up with a computer in Figure 2-1.

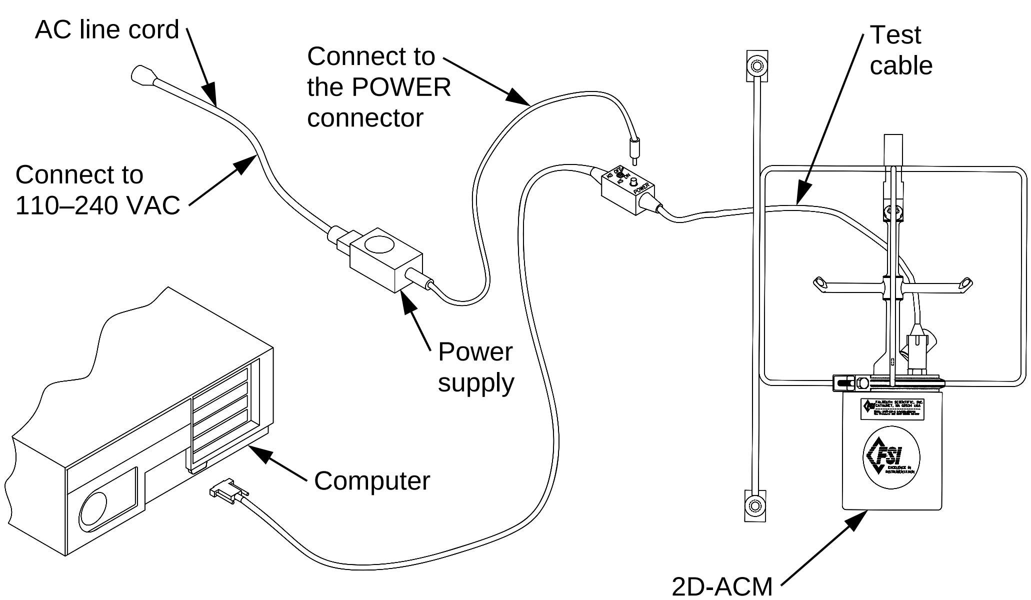


Figure 2-1: ***2D-ACM Setup—with RS-232 Interface***

To connect a 2D-ACM with an RS-232 interface to your computer:

1. Disconnect the dummy connector from the bulkhead connector on the 2D-ACM.

2. Connect the test cable to the bulkhead connector on the 2D-ACM and to the serial port on your computer.

3. Connect the power supply to the POWER connector on the test cable.

4. Connect the AC line cord to the power supply and to a 110–240 VAC, 50–60 Hz power source.

Connecting to the RS-485 Interface

A 2D-ACM with an RS-485 interface is shown set up with a computer in Figure 2-2.

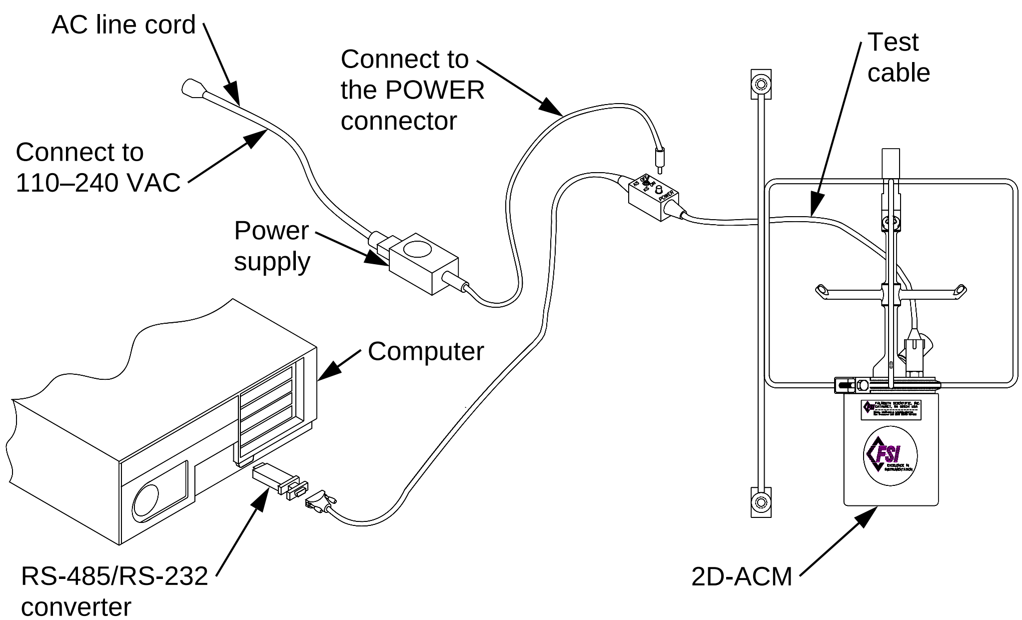


Figure 2-2: ***2D-ACM Setup—with RS-485 Interface***

To connect a 2D-ACM with an RS-485 interface to your computer:

1. Disconnect the dummy connector from the bulkhead connector on the 2D-ACM.

2. Connect the test cable to the bulkhead connector on the 2D-ACM and to the RS-485 connector of the RS-485/RS-232 converter.

3. Connect the RS-232 connector of the RS-485/RS-232 converter to the serial port on your computer.

4. Connect the AC line cord to the power supply and to a 110–240 VAC, 50–60 Hz power source.

Selecting a Different Serial Port and Baud Rate

The default serial port for the 2D-ACM is COM1. And the default baud rate is 9600 bits/sec with one stop bit, eight data bits and no parity. Both the serial port and the baud rate can be selected in ACMPro.

Changing the Serial Port

To select a different serial port:

1. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

2. Choose Communications ➤ Setup.

   The Configuration COM Setup dialog box shown in Figure 2-3 opens.

3. Select the new serial port in the Communications Port area of the Configuration COM Setup dialog box.

4. Click OK to save the new serial port selection and close the Configuration COM Setup dialog box, or click Cancel to close the dialog box without saving the new selection.

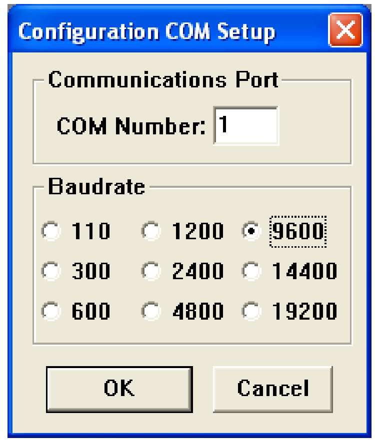


Figure 2-3: ***The Configuration COM Setup Dialog Box***

Changing the Baud Rate

To select a different baud rate:

1. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

2. Choose Communications ➤ Communications Window.

   The Communications Window shown in Figure 2-4 opens.

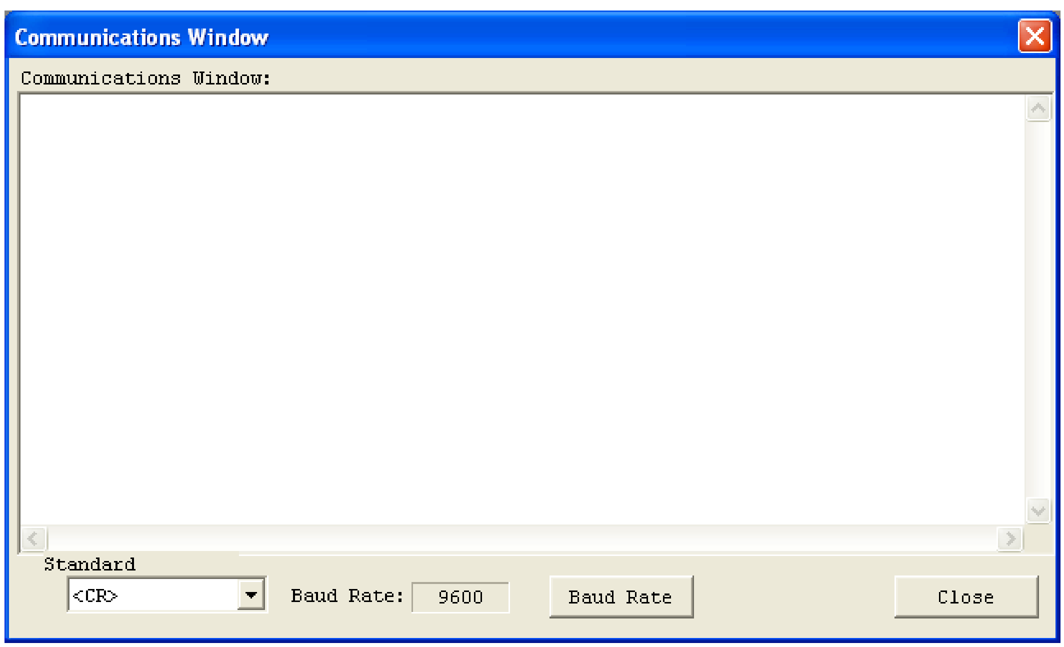


Figure 2-4: ***The Communications Window***

3. Type ***O**, and then press Enter.

   This places the instrument in Open mode. To verify this, press Enter again. The words “OPEN MODE” should be displayed.

4. Do one of the following to select the baud rate of the instrument:

   - Type SB30, and then press Enter to set the baud rate to 300 bits/sec.
   - Type SB12, and then press Enter to set the baud rate to 1200 bits/sec.
   - Type SB96, and then press Enter to set the baud rate to 9600 bits/sec.
   - Type SB19, and then press Enter to set the baud rate to 19200 bits/sec.

5. Click Close to close the Communications Window.

6. Choose Communications ➤ Setup.

   The Configuration COM Setup dialog box shown in Figure 2-3 on page 2-7 opens.

7. Select the new baud rate—300, 1200, 9600, or 19200—in the Baudrate area of the Configuration COM Setup dialog box.

Caution: *If you click Cancel in the next step, the instrument will not be able to communicate with your computer.*

8. Click OK to save the new baud rate selection and close the Configuration COM Setup dialog box, or click Cancel to close the dialog box without saving the new selection.

Verifying the Operation of the 2D-ACM

Once you have connected the 2D-ACM to your commuter’s serial port and to a power supply, you can verify that your computer is communicating with the instrument and that the instrument is functioning properly. This procedure is recommended when you connect an instrument to your computer for the first time.

To verify the operation of the 2D-ACM:

1 Switch the KS switch on the test cable to KS ON.

Note: *If you have fabricated your own test cable, be sure Pin 5 and Pin 1 of the instrument's bulkhead connector are connected to power supply ground. This connection enables "Kick Start."*

2 Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

ACMPro starts and the ACMPro Main window opens.

3 Choose Communications ➤ Communications Window.

The Communications Window shown in Figure 2-4 on page 2-7 opens.

Note: *In the steps that follow you are instructed to type characters directly in the Communications Window. Unless otherwise stated, letters can be typed in either upper case or lower case. Each series of characters, which are shown in bold type in the instructions, compose a single command. And unless otherwise stated, you must press Enter after typing the characters to execute the command. For detailed information on these commands and many other 2D-ACM commands, refer to "APPENDIX B: Bulkhead Connector Wiring,"*

4 Type *****O**, and then press Enter.

This places the instrument in Open mode. To verify this, press Enter again. The words "OPEN MODE" should be displayed.

5 Type **S/N**, and then press Enter.

The serial number of the instrument should be displayed. For example, S/N=1000.

6 Type **AVGI**, and then press Enter.

7 Type **00:00**, and then press Enter.

This sets the averaging interval to zero if it is not already zero.

8 Type **TX=ON**, and then press Enter.

This selects the Tilt X instantaneous parameter.

9 Type **TY=ON**, and then press Enter.

This selects the Tilt Y instantaneous parameter.

10 Type **RDM**, and then press Enter.

The instantaneous and average parameters that have been selected to be output and stored by the instrument should be displayed.

11 Look for TX = ON and TY = ON and note which two adjacent columns they are located in. The columns are separated by commas.

12 Type *****R**, and then press Enter.

This places the instrument in Run mode and the following message should be displayed:

"Logging Pointers Not Reset, Reset (N)o or (Y)es?"

13 Type "N" or "n" *without* pressing Enter.

A message, which varies in content depending on the current configuration of the instrument, should be displayed and should include the following:

"Tilt Function is ON"

14 Type **SC**, and then press Enter.

Data should output continuously from the instrument and should be displayed in the Communications Window. Look for the columns noted in Step 11. These are the X and Y components of the instrument's tilt—Tilt X and Tilt Y. (See "Selecting the Compass and Tilt Instantaneous Parameters" on page 3-7 for a description of these parameters.)

15 While observing the Tilt X and Tilt Y data, vary the vertical position of the instrument.

The data should vary and be consistent with the vertical position of the instrument.

Note: *After a few minutes the data will appear to stop updating. This is because the window buffer is filled. However, data are still being output by the instrument.*

16 To stop data from being output by the instrument, type an upper case **S.** It is not necessary to press Enter.

Checking and Saving the Calibration Constants To a File

ACMPro allows you to check the calibration constants of the 2D-ACM. In addition, you can save the calibration constants to a file. When saved, you can open the calibration constants file and load the calibration constants to the instrument's internal memory.

> ***Note:*** *Saving the calibration constants of the 2D-ACM to a file is highly recommended. Should the lithium battery that is used for memory backup of the 2D-ACM fail, or should the flash memory of the 2D-ACM become corrupted, the calibration constants can be loaded to the instrument's internal memory once the problem is corrected.*

To check and save the calibration constants to a file:

1. Switch the KS switch on the test cable to KS ON.

> ***Note:*** *If you have fabricated your own test cable, be sure Pin 5 <u>and</u> Pin 1 of the instrument's bulkhead connector are connected to power supply ground. This connection enables "Kick Start."*

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

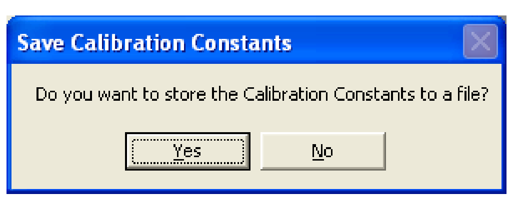
   ACMPro checks the instrument and displays which items are being checked during the check instrument process. (See "Checking the 2D-ACM" on page 3-1 for more information on checking the instrument.)

4. Choose Help ➤ Check Constants.

   ACMPro checks the calibration constants, and then the Calibration Constants window shown in Figure 2-5 opens.

5. Click OK.

The Save Calibration Constants dialog box opens:



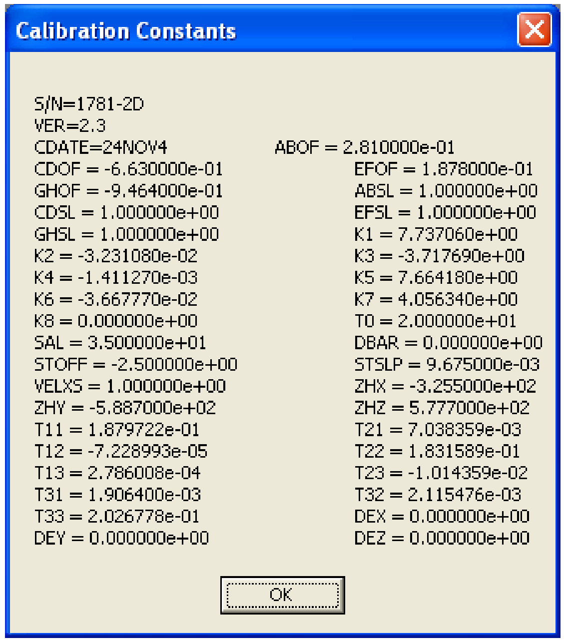


Figure 2-5: ***The Calibration Constants Window***

6 Click Yes if you want to save the calibration constants to a file, or click No if you do not.

If you click Yes, the Save As dialog box for CAL files shown in Figure 2-6 opens. This dialog box is used to create the file in which to save the calibration constants.

If you click No, the Save Calibration Constants dialog box closes and the calibration constants are not saved.

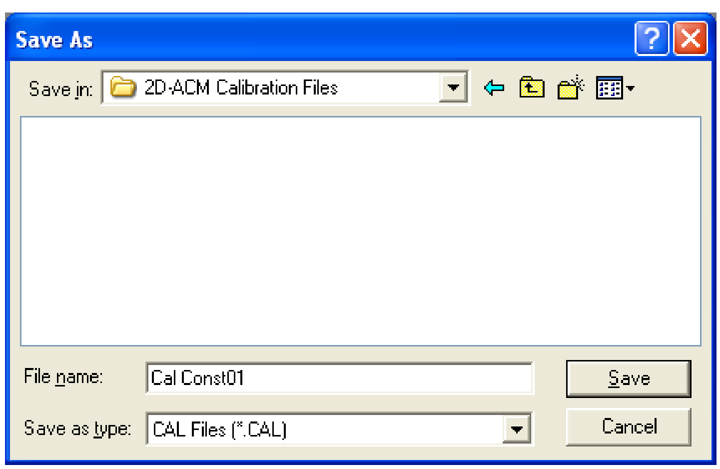


Figure 2-6: ***The Save As Dialog Box for CAL Files***

7. Click the arrow in the Save in drop-down list box and select the folder in which to save the calibration constants file.

8. In the File name text box enter the name of the file in which to save the calibration constants. The extension *.cal* is added automatically.

9. Click Save to save the calibration constants to the specified file and close the Save As dialog box for CAL files, or click Cancel to close the dialog box without saving the calibration constants.

Loading the Calibration Constants from a Saved File

ACMPro allows you to load the calibration constants from a calibration constants file, a file with extension *.cal* that contains the instrument calibration constants, to the internal memory of the 2D-ACM.

To load the calibration constants from a saved file to the internal memory of the 2D-ACM:

1. Switch the KS switch on the test cable to KS ON.

   Note: *If you have fabricated your own test cable, be sure Pin 5 and Pin 1 of the instrument's bulkhead connector are connected to power supply ground. This connection enables "Kick Start."*

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

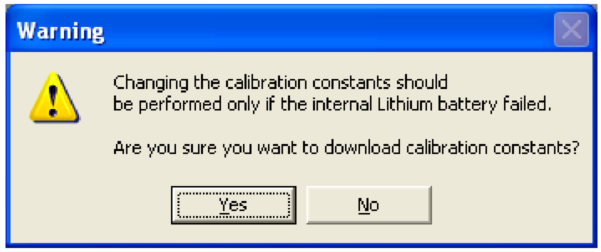
   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

   ACMPro checks the instrument and displays which items are being checked during the check instrument process. (See "Checking the 2D-ACM" on page 3-1 for more information on checking the instrument.)

4. Choose Help ➤ Store Calibration Constants.

   The Warning dialog box opens:



5 Click Yes if you want to load the calibration constants to the instrument's memory, or click No if you do not.

If you click No, the Warning dialog box closes and the calibration constants are not loaded.

If you click Yes, the Open dialog box for CAL files shown in Figure 2-7 opens. Although more than one file may be displayed, the example in the figure shows a single file of filename Cal Const01.cal. If the file you want to open is not visible, it may be in a different folder than the one shown. In this case, click the arrow in the Look in drop-down list box and select the folder in which the file is located.

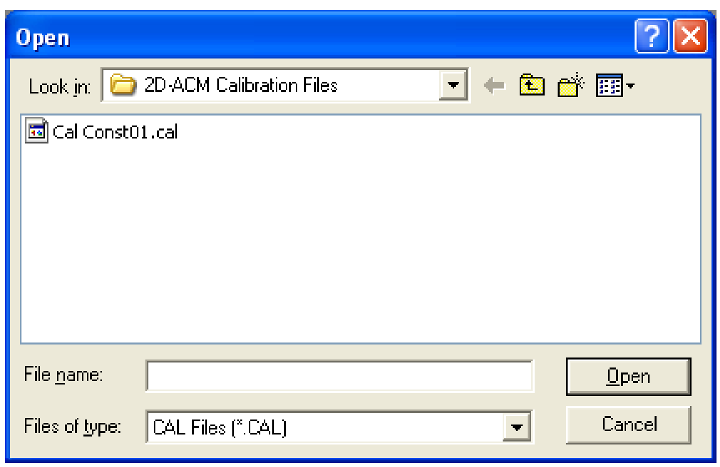


Figure 2-7: ***The Open Dialog Box for CAL Files***

6 Click the file you want to load, and then click Open to load the calibration constants to the instrument's internal memory. Or click Cancel to close the dialog box without loading the calibration constants.

SECTION 3: Checking and Configuring the 2D-ACM

After you have connected the 2D-ACM to your computer's serial port and to a power supply as described in "Connecting the 2D-ACM to Your Computer" on page 2-4, you are ready to check and configure the instrument. This section describes how to perform these tasks and includes descriptions of each of the configuration settings and the instantaneous and vector averaged parameters.

Checking the 2D-ACM

Before you can configure the 2D-ACM, you must check the instrument. Checking the instrument establishes communications with it and retrieves the instrument's model number, serial number, firmware version, and calibration date. In addition, ACMPro checks the instrument's address and verifies the serial port to which it is connected.

Note: *ACMPro can be configured to automatically check the 2D-ACM after the program has completed its startup. (See "Checking the 2D-ACM Automatically on Startup" on page 3-2 for instructions on how to perform this function.)*

To check the 2D-ACM:

1. Connect the 2D-ACM to your computer's serial port and switch the KS switch on the test cable to KS ON.

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

ACMPro displays which items are being checked during the check instrument process and then displays a graphic of a 2D-ACM in the display area of the Main window as shown in Figure 3-1. The Instrument window in the Main window displays the model and serial numbers, firmware version, and calibration date of the instrument.

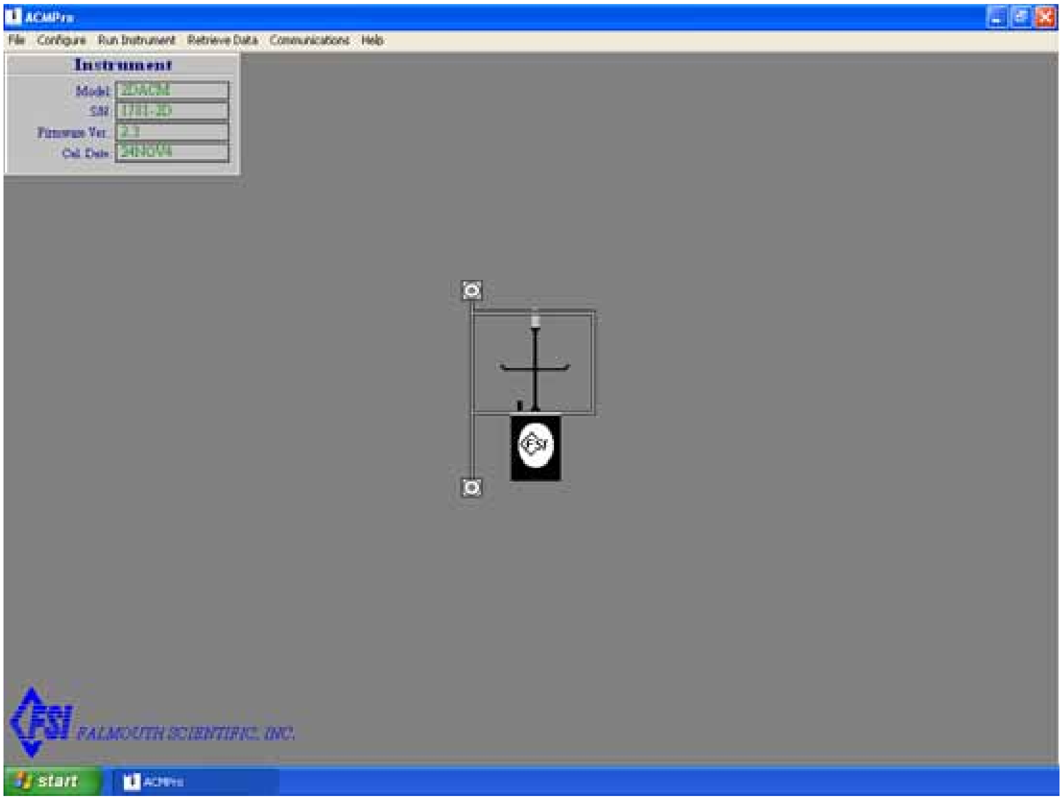


Figure 3-1: ***The Main Window after Checking a 2D-ACM***

Checking the 2D-ACM Automatically on Startup

To configure ACMPro to automatically check the 2D-ACM on startup:

1. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

2. Choose File ➤ Properties.

   The ACMPro Properties dialog box shown in Figure 3-2 opens.

3. Select the Check for Instrument at Program Start check box.

4. Click OK to save the new setting and close the ACMPro Properties dialog box.

   If you click OK, ACMPro will check the 2D-ACM automatically the next time the program completes its startup.

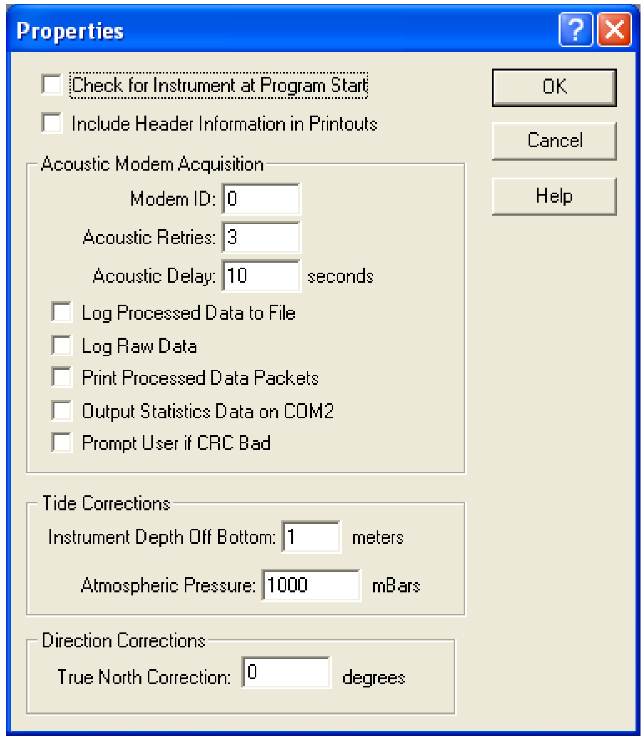


Figure 3-2: ***The ACMPro Properties Dialog Box***

Configuring the 2D-ACM

Configuring the 2D-ACM requires that you make the following settings:

- Select the current velocity and optional instantaneous parameters to be output and stored.
- Select the compass and tilt instantaneous parameters to be output and stored, and whether to use them in the current velocity calculations.
- Select the current velocity and tilt vector averages to be output and stored and over what interval.
- Enter the delay time and date, the interval time and the on time.
- Select whether to log data to memory.
- Review the statistics.
- Select options.

The 2D-ACM is configured from the Configure ACM dialog box shown in Figure 3-3.

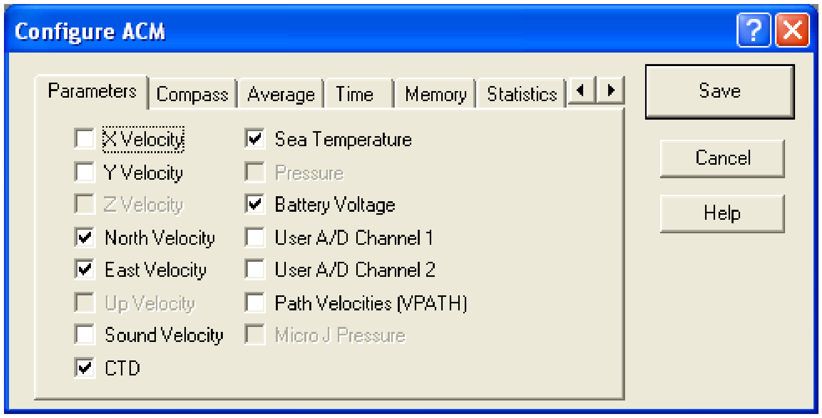


Figure 3-3: ***The Configure ACM Dialog Box—Parameters Tab***

To open the Configure ACM dialog box, Choose Configure ➤ Configure Instrument. ACMPro first reads the current configuration of the 2D-ACM while displaying which items are being read, and then it opens the dialog box.

> ***Note:*** *If the 2D-ACM has not been checked since starting ACMPro, the Configure Instrument item in the Configure menu is grayed and cannot be chosen. (See "Checking the 2D-ACM" on page 3-1 for instructions on how to check the instrument.)*

> ***Note:*** *Check boxes in the Configure ACM dialog boxes that are grayed cannot be selected for a 2D-ACM.*

Selecting the Current Velocity and Optional Instantaneous Parameters

Selecting the current velocity and optional instantaneous parameters to be output and stored by the 2D-ACM is performed using the Parameters tab in the Configure ACM dialog box. The Parameters tab is the one shown in Figure 3-3. All the parameters are instantaneous parameters—parameters that are *not* averaged.

Note: *The number of selected parameters determines the number of bytes in each data record. The record length in bytes is shown in the Memory tab in the Configure ACM dialog box. (See “Setting Up Memory” on page 3-14 for information on the Memory tab.)*

The current velocity and optional instantaneous parameter selections are listed below, where the X and Y Velocity parameters reflect the orientation of the ACM shown in Figure 3-4.

X Velocity:	The X component of the current velocity in cm/sec relative to the direction indicator arrow on the velocity head of instrument.
Y Velocity:	The Y component of the current velocity in cm/sec relative to the direction indicator arrow on the velocity head of instrument.
North Velocity:	The north/south (+/-) component of the current velocity in cm/sec relative to magnetic north and compensated for the instrument’s tilt.
East Velocity:	The east/west (+/-) component of the current velocity in cm/sec relative to magnetic north and compensated for the instrument’s tilt.
Sound Velocity:	The sound velocity in water in m/sec.
CTD:	The CTD outputs of conductivity in mmho/cm, temperature in °C and pressure in dBars. (with optional CTD only)
Sea Temperature:	The water temperature in °C.
Battery Voltage:	The instrument battery voltage in volts.
User A/D Channel 1:	The output in counts, from 0 to 4095, of the Channel 1 A/D.
User A/D Channel 2:	The output in counts, from 0 to 4095, of the Channel 2 A/D
Path Velocities (VPATH):	The raw velocity data for each of the acoustic paths.

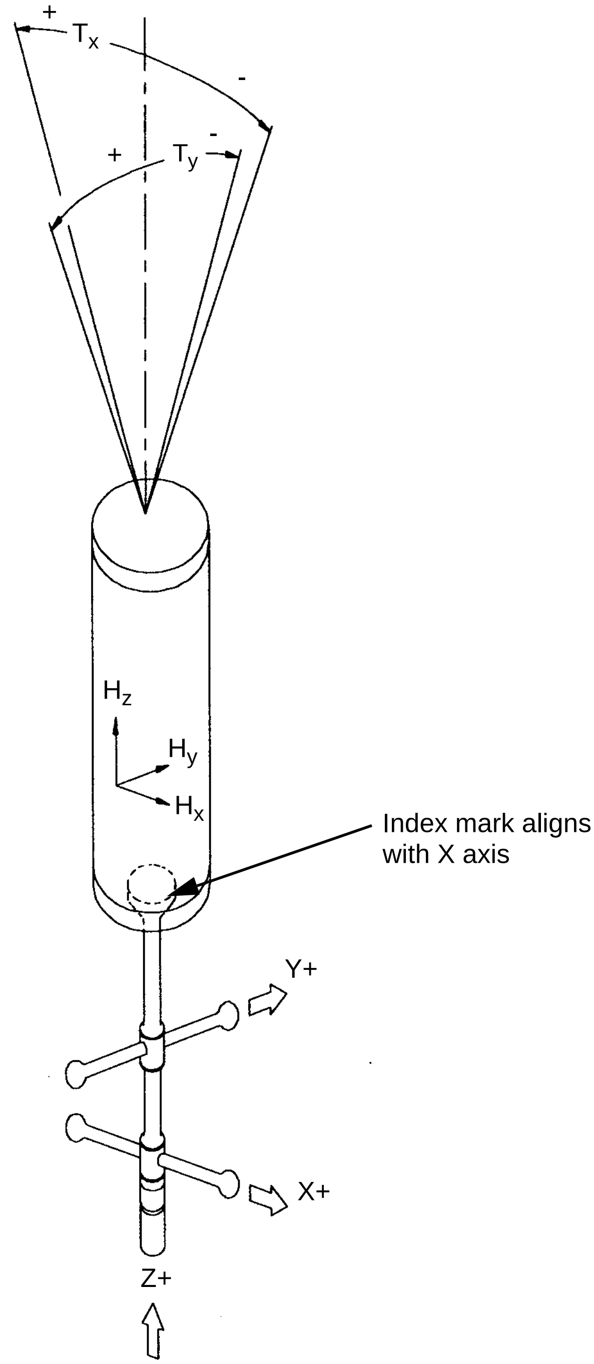


Figure 3-4: ***Parameter Orientation Definitions of a 2D-ACM***

To select the instantaneous parameters:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Parameters tab.

3. Select the check boxes for the instantaneous parameters you want to output and store, and clear the check boxes for those you do not.

4. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

Selecting the Compass and Tilt Instantaneous Parameters

Selecting the compass and tilt instantaneous parameters to be output and stored by the 2D-ACM is performed using the Compass tab in the Configure ACM dialog box. The Compass tab is shown in Figure 3-5. The compass and tilt parameters are instantaneous parameters—parameters that are *not* averaged.

> ***Note:*** *The number of selected parameters determines the number of bytes in each data record. The record length in bytes is shown in the Memory tab in the Configure ACM dialog box. (See “Setting Up Memory” on page 3-14 for information on the Memory tab.)*

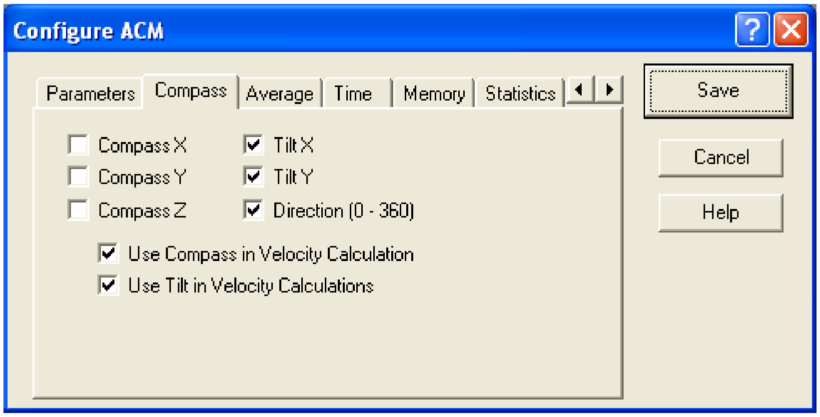


Figure 3-5: ***The Configure ACM Dialog Box—Compass Tab***

The compass and tilt instantaneous parameter selections are listed below and reflect the orientation of the ACM shown in Figure 3-4 on page 3-6.

Compass X: The cosine of the instrument's X axis rotation (H_x) relative to magnetic north.

Compass Y: The cosine of the instrument's Y axis rotation (H_y) relative to magnetic north.

Compass Z: The cosine of the instrument's Z axis rotation (H_z) relative to magnetic north.

Tilt X: The X component of the instrument's tilt (T_x) in degrees.

Tilt Y: The Y component of the instrument's tilt (T_y) in degrees.

Direction (0–360): The instrument's heading from 0° to 360° relative to magnetic north.

You can also select whether to use the compass and tilt parameters in the north and east current velocity parameter calculations:

Use Compass in Velocity Calculation: Select to use the X, Y and Z compass parameters.

Use Tilt in Velocity Calculations: Select to use the X and Y tilt parameters.

To select the compass and tilt instantaneous parameters and to select whether to use them in the north and east instantaneous current velocity calculations:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Compass tab.

3. Select the check boxes for the compass and tilt instantaneous parameters you want to output and store, and clear the check boxes for those you do not.

4. Select whether you want to use the compass or tilt parameters, or both in the north and east current velocity calculations.

5. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

Selecting the Current Velocity and Tilt Vector Averages

Selecting the current velocity and tilt vector averages to be output and stored by the 2D-ACM is performed using the Average tab in the Configure ACM dialog box. The Average tab is shown in Figure 3-6. The averaging interval for the selected current velocity and tilt vector averages is also entered in the Average tab. When one or more of the current velocity and tilt vector averages are selected along with an averaging interval, the vector averages and one record of the selected instantaneous parameters are stored at the end of every averaging interval. Hence the instrument’s memory will fill at a slower rate than it would if no vector averages were selected. This rate is displayed in the Statistics tab. (See “Reviewing the Statistics” on page 3-15 for information on the Statistics tab.)

> ***Note:*** *Selecting the current velocity and tilt vector averages increases the number of bytes contained in each data record. The record length in bytes is shown in the Memory tab in the Configure ACM dialog box. (See “Setting Up Memory” on page 3-14 for information on the Memory tab.)*

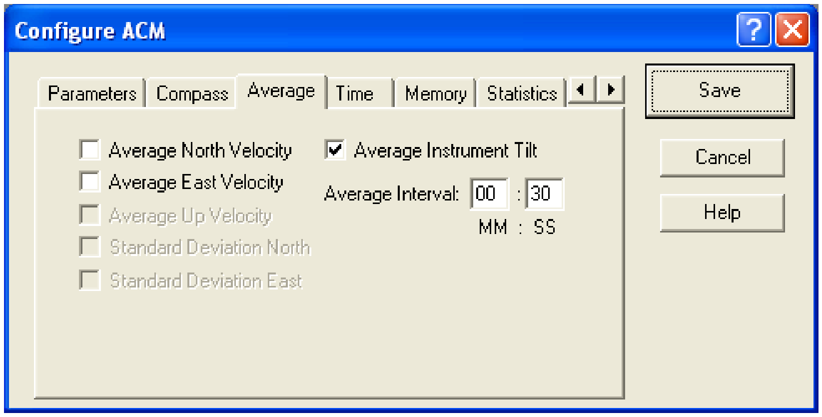


Figure 3-6: ***The Configure ACM Dialog Box—Average Tab***

The current velocity and tilt vector averages selections are the following:

Average North Velocity: The vector averaged north/south (+/-) component of the current velocity in cm/sec relative to magnetic north and compensated for the instrument's tilt.

Average East Velocity: The vector averaged east/west (+/-) component of the current velocity in cm/sec relative to magnetic north and compensated for the instrument's tilt.

Average Instrument Tilt: The vector average of the instrument's tilt in degrees.

Vector averaging of the selected parameters is performed at specified intervals. The averaging interval is entered in minutes and seconds (mm:ss) in the Average Interval text boxes. The minimum averaging interval is 15 seconds; the maximum, 59 minutes and 59 seconds.

Note: *If a value for the On Time is entered, the Average Interval should be set to an integer number that is evenly divisible into the On Time. (See "Setting the Run Times" on page 3-11 for information on the On Time.) For example, if the On Time is 10 minutes, the Average Interval should be set to 1, 2, 5, or 10 minutes. Otherwise the last averaging interval during the On Time will be shorter than the Average Interval setting.*

To select the current velocity and tilt vector averages and their averaging interval:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Average tab.

3. Select the check boxes for the current velocity and tilt vector averages you want to output and store, and clear the check boxes for those you do not.

4. Enter the averaging interval in minutes and seconds (mm:ss) in the Average Interval text boxes.

5. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

Setting the Run Times

You can configure the 2D-ACM to run for specified periods—the On Time, beginning at the start of specified intervals—the Interval Time. When running, the instrument is on and collecting data. In addition, you can configure the instrument to delay running, hence remain off, until a specified time and date—the Delayed Time and the Delayed Date. These settings are made in the Time tab in the Configure ACM dialog box. The Time tab is shown in Figure 3-7. In addition, the Time tab displays and allows you to set the instrument's current time and date and record a time stamp with each data record.

The run times are entered in the following text boxes:

Interval Time: The time in hours, minutes and seconds between the start of each On Time.

On Time: The time in hours, minutes and seconds beginning at the start of each Interval Time during which the instrument is on and collecting data. All data are output and stored.

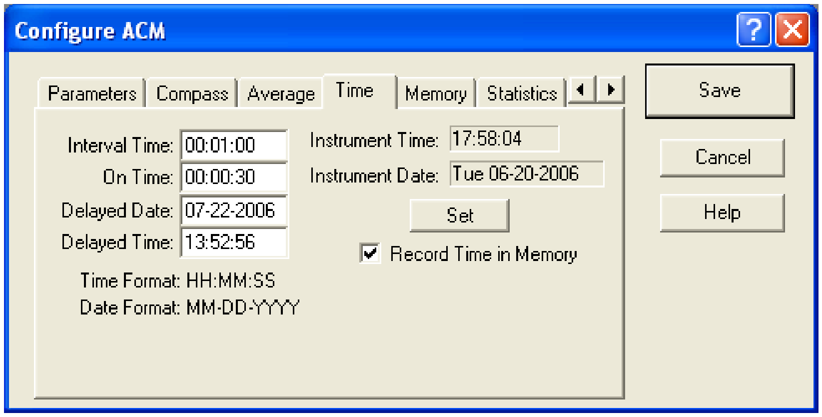


Figure 3-7: ***The Configure ACM Dialog Box—Time Tab***

Note: *If the Interval Time is set to zero, or if the On Time is greater than the Interval Time, the instrument will begin collecting data continuously when it is turned on or at the specified Delayed Time and Delayed Date as described below.*

Note: *If one or more of the current velocity and tilt vector averages are selected and a value for the Average Interval is entered, the On Time should be set to an integer number that is evenly divisible by the Average Interval. (See "Selecting the Current Velocity and Tilt Vector Averages" on page 3-9 for information on the Average Interval.) For example, if the Average Interval is 5 minutes, the On Time should be set to 5, 10, 15 or any multiple of 5 minutes. Otherwise the last averaging interval during the On Time will be shorter than the Average Interval setting.*

Delayed Date: The date on which the instrument will turn on and begin collecting data at the Delayed Time.

Delayed Time: The time of day on the Delayed Date the instrument will turn on and begin collecting data.

You can also select whether you want to record a time stamp with each data record:

Record Time in Memory: Select to record a time stamp with each data record.

To set the run times and select whether to record a time stamp with each data record:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Time tab.

3. Enter the Interval Time in hours, minutes and seconds (hh:mm:ss) in the Interval Time text box.

4. Enter the On Time in hours, minutes and seconds (hh:mm:ss) in the On Time text box. Be sure it is at least five seconds less than the Interval Time entered in Step 3.

5. Enter the Delayed Date as the month, day and year (mm-dd-yyyy) in the Delayed Date text box.

6. Enter the Delayed Time in hours, minutes and seconds (hh:mm:ss) in the Delayed Time text box.

7. Select the Record Time in Memory check box to record a time stamp with each data record, or clear the check box to not record a time stamp.

8. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

The Time Tab also displays the 2D-ACM's current time and date in the Instrument Time and Instrument Date displays.

> ***Caution:*** *The displayed time and date is that which was read by ACMPro from the 2D-ACM when the instrument was checked. It is not updated while the dialog box is open. However, the time and date can be set using the Enter Local Time and Date dialog box as described in the next page.*

To set the 2D-ACM's time and date:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Time tab.

3. Click Set.

   The new time and date as acquired from the computer on which ACMPro is running is shown in the Instrument Time and Instrument Date displays. The Time Set window also opens displaying the time and date.

4. Click OK or Cancel in the Time Set window, and then click Save in the Configure ACM dialog box.

Setting Up Memory

You can select whether to store data to the 2D-ACM's internal memory using the Memory tab in the Configure ACM dialog box. The Memory tab is shown in Figure 3-8. In addition, the Memory tab displays the length in bytes of each data record and the total memory in bytes available in the instrument.

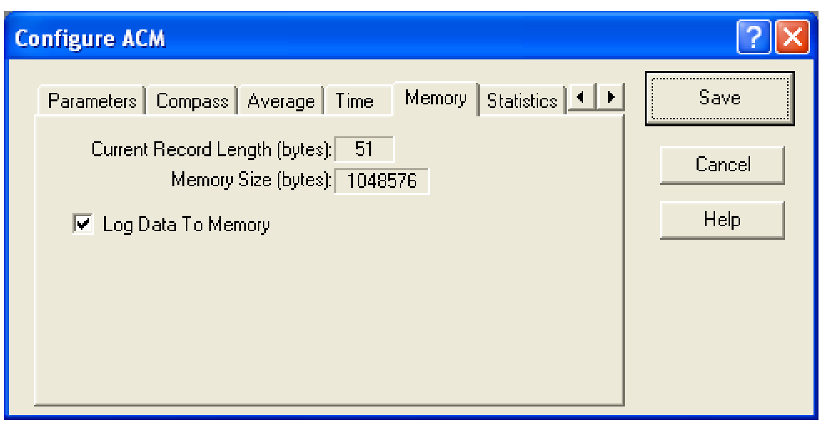


Figure 3-8: ***The Configure ACM Dialog Box—Memory Tab***

The only memory setup selection is the following:

Log Data to Memory: Select to store data to the instrument's internal memory.

To set up memory:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Memory tab.

3. Select the Log Data to Memory check box to store data to the instrument's internal memory, or clear the check box to not store data.

4. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

The Memory tab also displays the length in bytes of each data record in the Current Record Length display and the size of instrument's memory in bytes in the Memory Size display. The length of a data record increases with the number of selections made in the Parameters, Compass and Average tabs.

Reviewing the Statistics

Reviewing the statistics for the 2D-ACM is performed using the Statistics tab in the Configure ACM dialog box. The Statistics tab is shown in Figure 3-9. The Statistics tab displays the instrument start date, the expected number of running days, the expected end date, the expected memory usage, and the number of days it will take to fill the instrument's internal memory. These statistics depend directly on the selections and entries in most of the other tabs in the Configure ACM dialog box. The selections in the Parameters, Compass and Average tabs affect the amount of memory usage; the selections in the Average tab also affect the speed in which the memory will fill; and the entries made in the Time tab determine the start date. In addition, the displayed statistics account for the planned method of deployment, which is selected for the purpose of calculating the statistical values only.

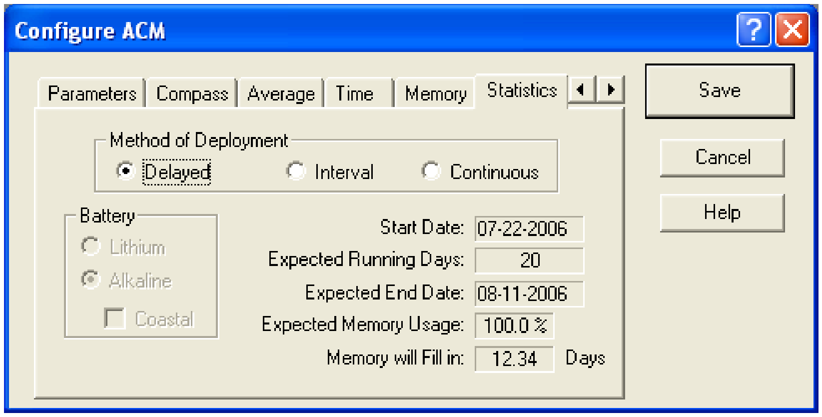


Figure 3-9: ***The Configure ACM Dialog Box—Statistics Tab***

The statistics displays are the following:

Start Date: The date on which the instrument will turn on and begin collecting data. This date is the current date, or if the Delayed option is selected in the Method of Deployment area of the Statistics tab, it is the date entered in the Delayed Date text box in the Time tab.

Expected Running Days: The approximate number of days the instrument will remain powered and capable of collecting data.

Caution: *Expected Running Days is an approximation of the battery life; hence the instrument's internal memory can fill before the expected number of running days has been reached.*

Expected End Date: The date on which the instrument will no longer be powered and is based on the Expected Running Days.

Expected Memory Usage: The amount of the instrument's internal memory in percent that is expected to be used during the Expected Running Days.

Memory Will Fill in: The number of days it will take to fill the instrument's internal memory.

Caution: *The instrument's internal memory can fill before the expected number of running days shown in the Expected Running Days display has been reached.*

There are three operating modes: Continuous, Delayed and Interval. (See "Modes of Operation" on page 4-1 for information on the operating modes.) The operating mode selected determines the planned method of deployment. Selecting an operating mode in the Method of Deployment area of the Statistics tab *only* determines the values shown in the statistics displays; it *does not* determine the actual operating mode. The three method of deployment options are the following:

Continuous:	Once deployed, the instrument will immediately turn on and begin collecting data continuously.
Interval:	Once deployed, the instrument will immediately turn on and begin collecting data for the On Time and at the Interval Time entered in the Time tab.
Delayed:	Once deployed, the instrument will turn on and begin collecting data on the date shown in the Start Date display. Data will be collected for the On Time and at the Interval Time entered in the Time tab.

To review the statistics:

1. Choose Configure ➤ Configure Instrument.

   After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2. Select the Statistics tab.

3. Select the planned method of deployment.

4. Verify the correct start date in the Start Date display. This date should be the date entered as the Delayed Date in the Time tab when the Delayed option in the Method of Deployment area of the Statistics tab is selected. Otherwise it should be the instrument's date, which is typically the current date.

Note: *If the instrument's date is not correct, see "Setting the Run Times" on page 3-11 for instructions on how to set the instrument's time and date.*

5. Verify that the expected running days shown in the Expected Running Days display is adequate.

6. Verify that the expected end date shown in the Expected End Date display is adequate.

7. Note the amount of the instrument's internal memory that will be used in the Expected Memory Usage display.

8. Note how many days it will take to fill the instrument's internal memory in the Memory will Fill in display.

9. Do one of the following:

   - Click Save to save your selections and close the Configure ACM dialog box.
   - Click another tab.
   - Click Cancel to close the Configure ACM dialog box without saving any changed selections.

Selecting the Options

Selecting options for the 2D-ACM is performed using the Options tab in the Configure ACM dialog box. If the Options tab is not visible, click the right arrow in the Configure ACM dialog box. The Options tab is shown in Figure 3-10.

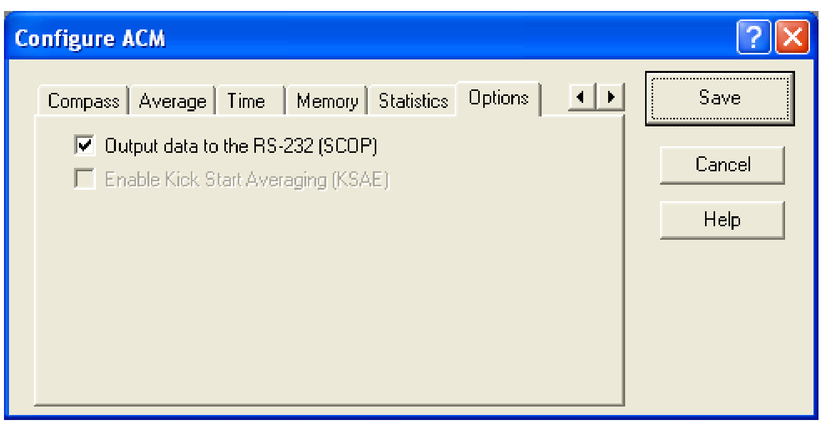


Figure 3-10: ***The Configure ACM Dialog Box—Options Tab***

The only option selection is the following:

Output data to the RS-232 (SCOP): Enables continuous output of data immediately after power up.

To select the options:

1 Choose Configure ➤ Configure Instrument.

After ACMPro reads the instrument configuration, the Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens.

2 Select the Options tab.

3 Select the Output data to the RS-232 (SCOP) check box to enable output of data after power up, or clear the check box to disable output of data.

4 Do one of the following:

- Click Save to save your selections and close the Configure ACM dialog box.
- Click another tab.
- Click Cancel to close the Configure ACM dialog box without saving any changed selections.

Saving the 2D-ACM Configuration to a File

Once you configure the 2D-ACM, you can save the instrument configuration to a file. When saved, you can open the instrument configuration file to configure the 2D-ACM with the saved settings instead of configuring the instrument manually. (See “Configuring the 2D-ACM from a Saved File” on page 3-20 for instructions on how to open the configuration file and configure the instrument.)

To save the 2D-ACM configuration to a file:

1 Choose File ➤ Save.

The Save As dialog box for ACM files shown in Figure 3-11 opens. This dialog box is used to create the file in which to save the configuration settings.

2 Click the arrow in the Save in drop-down list box and select the folder in which to save the instrument configuration file.

3 In the File name text box enter the name of the file in which to save the configuration settings. The extension *.acm* is added automatically.

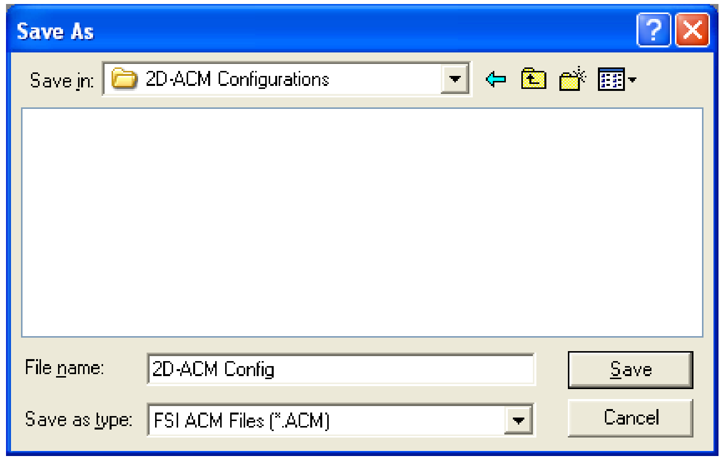


Figure 3-11: ***The Save As Dialog Box for ACM Files***

4. Click Save to save the configuration settings to the specified file and close the Save As dialog box for ACM files.

Configuring the 2D-ACM from a Saved File

ACMPro allows you to open an ACM configuration file, a file with extension *.acm* that contains 2D-ACM configuration settings. Once the file is opened, you can configure the instrument with the settings in the file. (See “Saving the 2D-ACM Configuration to a File” on page 3-19 for instructions on how to save the instrument configuration to a file.)

To open an ACM configuration file and configure the 2D-ACM:

1. Choose File ➤ Open.

   The Open dialog box for ACM files shown in Figure 3-12 opens. Although more than one file may be displayed, the example in the figure shows a single file of filename 2D-ACM Config.acm.

   If the file you want to open is not visible, it may be in a different folder than the one shown. In this case, click the arrow in the Look in drop-down list box and select the folder in which the file is located.

2. Click the file you want open, and then click Open.

   The Configure ACM dialog box shown in Figure 3-3 on page 3-4 opens to the Parameters tab.

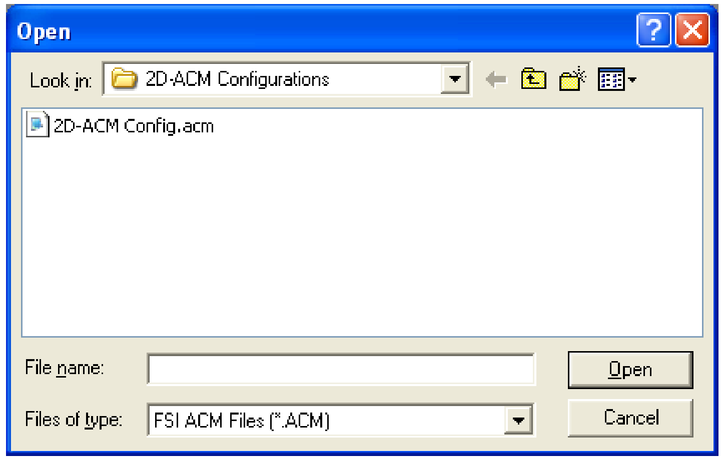


Figure 3-12: ***The Open Dialog Box for ACM Files***

3. Click Save to close the Configure ACM dialog box and configure the 2D-ACM.

Printing the Configuration File

Once you have configured an ACM, either manually or from a saved file, the configuration file can be printed.

To print an ACM configuration file:

1. Choose File ➤ Print Configuration.

   The Print dialog box opens.

2. Select the printer to use, and then click OK.

   The ACM configuration file is printed. An example of a printed 2D-ACM configuration file is shown in Figure 3-13.

ACMPro
Falmouth Scientific, Inc.
1400 Route 28A, PO Box 315
Cataumet, MA 02534-0315 U.S.A.
Phone: (508) 564 - 7640
FAX: (508) 564 - 7643

2D-ACM Configuration:
Serial #: 1781-2D

The following channels on the 2D-ACM are ON.

Velocity in the North Direction, VN
Velocity in the East Direction, VE
External CTD Option, CTD
Sea Temperature, STEMP
Battery Voltage, BATT
Tilt in the X Direction, TX
Tilt in the Y Direction, TY
Instrument Direction/Heading, DIR
Time Stamp every scan, ATIME

Vector Averaging Channels
Average Tilt, ATLT
The averaging interval will be 00:30 (min:sec)

Statistics Run-Time Configuration:
The Statistics are based on DELAYED START.
The 2D-ACM will start on 06-22-2020 at 13:52:56.
The 2D-ACM will start in INTERVAL mode.
The interval period (ITIME) will be 00:01:00.
The sampling period (OTIME) will be 00:00:30.
The 2D-ACM, with a Alkaline Battery will last for days.
Starting on and the end date will be .

The number of bytes recorded to memory for each scan is 45 bytes.
Total Number of scans: 1048576 / 45 = 23301 scans

Figure 3-13: ***Example 2D-ACM Configuration File Printout***

SECTION 4: Deploying the 2D-ACM

Once you have checked and configured the 2D-ACM, you can deploy the instrument under its own internal battery power and store all the data to the instrument's internal memory for later retrieval. (See "SECTION 3: Checking and Configuring the 2D-ACM," for instructions on how to check and configure the 2D-ACM.) This section describes the various modes of operation in which the 2D-ACM can run under its own internal battery and provides instructions on how to prepare the 2D-ACM for deployment.

Modes of Operation

Before you deploy the 2D-ACM under its own internal battery power, you must decide which method of deployment to use. The method of deployment is determined by which of the available modes of operation is selected. The different operating modes allow you to deploy the 2D-ACM under its own battery power in a way that makes the most efficient use of the available memory and maximizes the battery life. The 2D-ACM has three operating modes:

Continuous mode where the instrument continuously stores the selected current velocity and tilt vector averages and one record of the selected instantaneous parameters at the end of every averaging interval.

Interval mode where the instrument stores the selected current velocity and tilt vector averages and one record of the selected instantaneous parameters at the end of every averaging interval for the On Time beginning at the start of every time interval.

Delayed mode where the instrument commences the Interval mode beginning at the Delayed Time on the Delayed Date.

Note: *For any mode, if the Average Interval is zero, or if no current velocity or tilt vector averages are selected, the selected instantaneous data are stored at the 2 Hz sampling rate of the instrument. Any selected vector averages are not stored.*

Note: *For Delayed mode, if the Interval Time is zero, or if the On Time is greater than the Interval Time, the instrument commences Continuous mode beginning at the Delayed Time on the Delayed Date.*

Preparing the 2D-ACM for Deployment

After a 2D-ACM has been checked and configured, it can be deployed under its own internal battery power and the data stored to the instrument's memory for later retrieval. Once checked and configured, the 2D-ACM can be prepared for deployment. If necessary, however, before deploying the instrument, replace the battery pack. (See "SECTION 7: Replacing the 2D-ACM Battery Pack," for instructions on how to replace the battery pack.)

> ***Note:*** *Because the 2D-ACM includes a lithium battery for memory backup and the real time clock (RTC), which provides the instrument's time and date, replacing the battery pack will not affect the instrument's configuration, stored data or time and date settings.*

To prepare the 2D-ACM for deployment:

1. Connect the 2D-ACM to your computer's serial port and switch the KS switch on the test cable to KS ON.

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

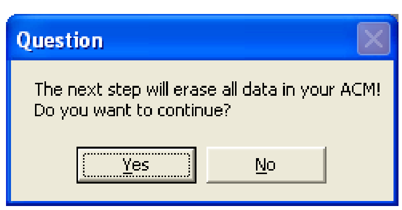
   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

   ACMPro displays which items are being checked during the check instrument process and then displays a graphic of a 2D-ACM.

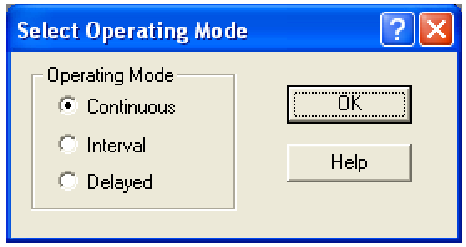
4. Choose Run Instrument ➤ Deploy.

   A Question window opens indicating that all memory will be erased and asking if you want to continue:



5. Click Yes if you want to erase all of the 2D-ACM memory and continue the deployment, or click No to not erase memory and stop the deployment.

   If you click Yes, ACMPro erases all of the 2D-ACM memory and the Select Operating Mode window opens:

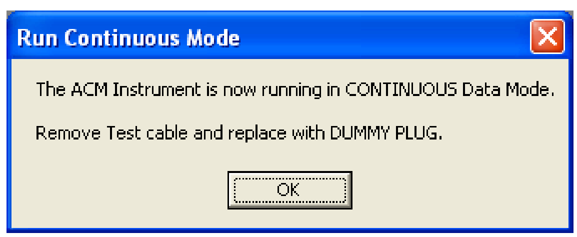


6 Do one of the following:

- Select Continuous, and then click OK to start running the instrument in the Continuous mode.
- Select Interval, and then click OK to start running the instrument in the Interval mode.
- Select Delayed, and then click OK to start running the instrument in the Delayed mode.
- Click the Close button to close the Select Operating Mode dialog box and stop the deployment.

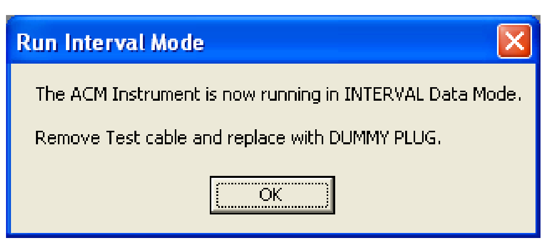
If you click OK, one of three windows opens:

The Run Continuous Mode window if Continuous is selected;

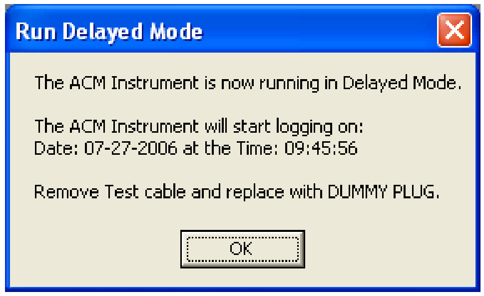


Note: *If you have selected Interval in the Select Operating Mode window, a warning window opens asking if you want to keep the current Interval and On Times. Click Yes in the warning window to use these settings and continue, or click No to stop the deployment.*

the Run Interval Mode window if Interval is selected;



or the Run Delayed Mode window if Delayed is selected.



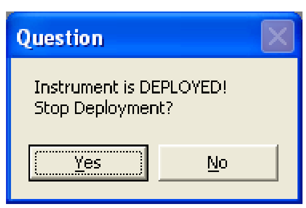
7 Click OK, remove the test cable and install the dummy plug.

The 2D-ACM continues to run in the selected mode and is ready to be deployed.

Caution: *If you are not deploying the 2D-ACM and only want to verify that it is acquiring and storing data, you can leave the test cable connected. However, you must switch the KS switch on the test cable to KS OFF to ensure that the selected operating mode functions correctly.*

Changing the Mode of Operation

After the 2D-ACM has been prepared for deployment and the test cable has been removed, it will remain in the selected mode until the battery is disconnected. To change the selected mode, repeat the instructions in “Preparing the 2D-ACM for Deployment” on page 4-2. This time, when choosing Check Instrument from the Configure menu, a Question window will open asking if you want to stop the deployment:



If you want to change the mode of operation and redeploy the instrument, click Yes. ACMPro will check the instrument and stop the deployment. Click No if you want the instrument to remain in the selected mode.

Checking the Delayed Time and Date Settings

When the 2D-ACM has been deployed in Delayed mode, you can check the Delayed Time and Delayed Date settings of the instrument at any time.

> ***Caution:*** *Do not attempt to check the Delayed Date and Delayed Time settings by choosing Check Instrument or Configure Instrument from the Configure menu, as doing so requires that you stop the deployment.*

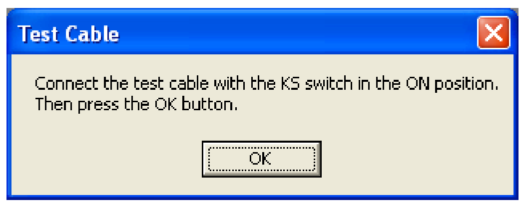
To check the Delayed Time and Delayed Date settings:

1. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

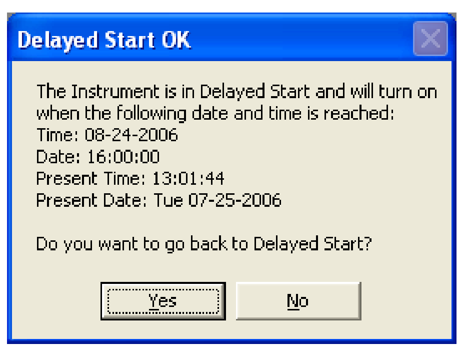
2. Choose Configure ➤ Check Delayed Start.

   The Test Cable window opens:



3. Connect the 2D-ACM to your computer's serial port, switch the KS switch on the test cable to KS ON, and then click OK.

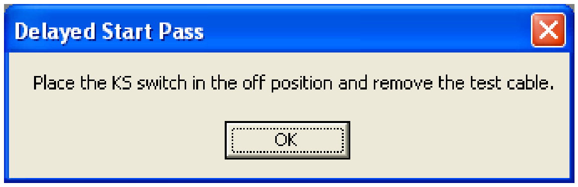
   ACMPro displays which items are being checked and then opens the Delayed Start OK window:



4 After verifying the time and date information in the Delayed Start OK window, click Yes to go back to the selected mode. Or click No if you want to reconfigure or redeploy the instrument.

If you click No, see “SECTION 3: Checking and Configuring the 2D-ACM,” if you want to reconfigure the instrument, or see “Preparing the 2D-ACM for Deployment” on page 4-2 if you want to redeploy the instrument.

If you click Yes, the Delayed Start Pass window opens:



5 Switch the KS switch to KS OFF, remove the test cable, and then Click OK.

The 2D-ACM continues to run in the selected mode and is ready to be deployed.

Caution: *If you are not deploying the 2D-ACM and only want to verify that it is acquiring and storing data, you can leave the test cable connected. However, you* <u>*must*</u> *switch the KS switch on the test cable to KS OFF to ensure that the selected operating mode functions correctly.*

SECTION 5: Acquiring and Viewing Real-Time Data

After the 2D-ACM has been checked and configured, it can be run directly from the test cable. (See "SECTION 3: Checking and Configuring the 2D-ACM," for instructions on how to check and configure the 2D-ACM.) Or the test cable can be replaced with a mooring cable, where the maximum length of the cable depends on the selected baud rate of the instrument. In both these configurations data can be acquired, viewed and saved—all in real time, but only in Continuous mode; the Interval and Delayed modes are not available for real-time data acquisition. Viewing is either on a digital display or on a graphics display, and recording is directly to a text file or to the instrument's internal memory or to both.

Real-Time Acquisition Digital and Graphics Displays

ACMPro provides a digital display for viewing real-time data from the 2D-ACM. The digital display allows you to view instantaneous and average current velocities; current speed in cm/sec or knots; sea temperature, sea pressure, sound velocity, compass, and CTD data; battery voltage and A/D channel outputs; and instrument and computer time and date, all on one display. In addition, ACMPro provides a graphics display for viewing real-time data from the 2D-ACM. The graphics display provides a combination of analog and digital displays of the same information provided in the digital display. You can also change the graphics display settings such as full scale ranges and the colors of the needles in the analog displays. See "Changing the Graphics Display Settings" on page 5-9 for instructions on how to change the graphics display settings.

Viewing the Digital Display and Saving Data from the 2D-ACM

Once configured, the 2D-ACM can be run and the data acquired in real time while viewing the data on a digital display and saving the data to a text file or to the instrument's internal memory or to both. When the text file is opened in a text editor, the data are listed under the parameter names.

To commence data acquisition, and to view the digital display and save the data:

1. Connect the 2D-ACM to your computer's serial port and switch the KS switch on the test cable to KS ON.

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

   ACMPro displays which items are being checked during the check instrument process and then displays a graphic of a 2D-ACM.

4. Choose Run Instrument ➤ Continuous Data Mode.

   The ACM Real-Time Display window shown in Figure 5-1 opens.

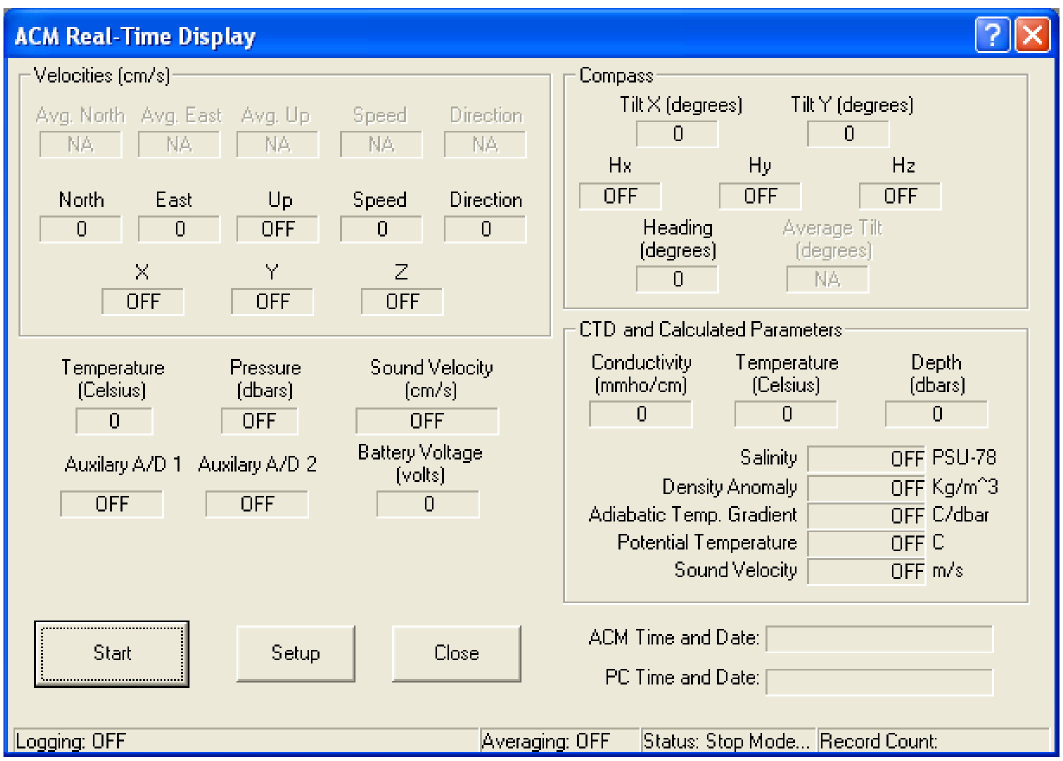


Figure 5-1: ***The ACM Real-Time Display Window—Data Displays Stopped***

5. Click Setup in the ACM Real-Time Display window.

   The Real Time Setup dialog box shown in Figure 5-2 opens.

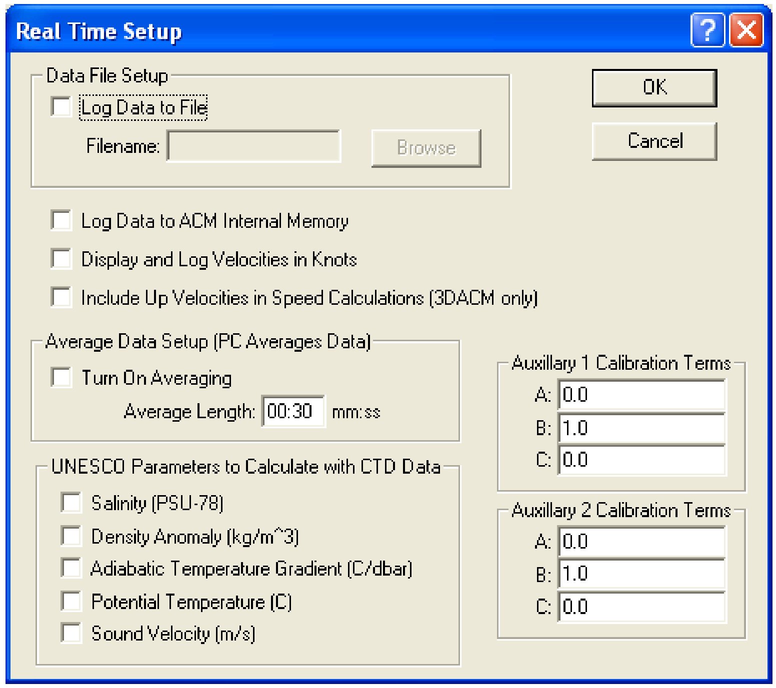


Figure 5-2: ***The Real Time Setup Dialog Box***

6 To save the data to the 2D-ACM internal memory, select the Log Data to ACM Internal Memory check box in the Real Time Setup dialog box.

7 To save the data to a text file, select the Log Data to File check box, and then click Browse.

The Save As dialog box for log files shown in Figure 5-3 opens. This dialog box is used to create the file in which to save the data.

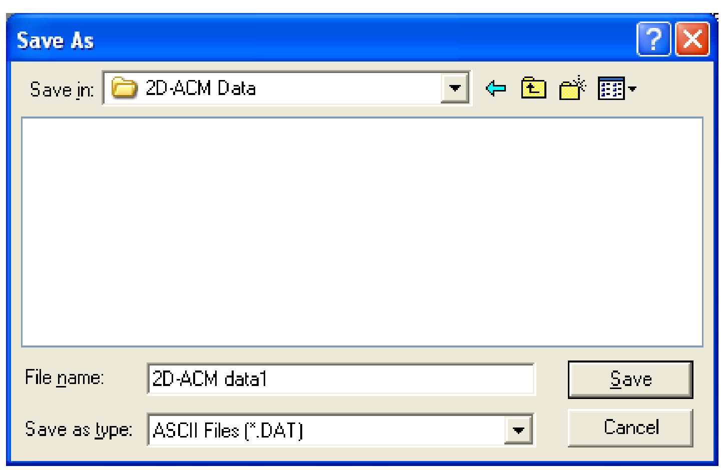


Figure 5-3: ***The Save As Dialog Box for Log Files***

8. Click the arrow in the Save in drop-down list box and select the folder in which to save the data file.

9. In the File name text box enter the name of the file in which to save the data. The extension *.dat* is added automatically.

10. Click Save to create the file in which to save the data and close the Save As dialog box for log files.

11. In the Real Time Setup dialog box, select the Display and Log Velocities in Knots check box to display and save the current velocities in knots. Clear the check box to save them in cm/s.

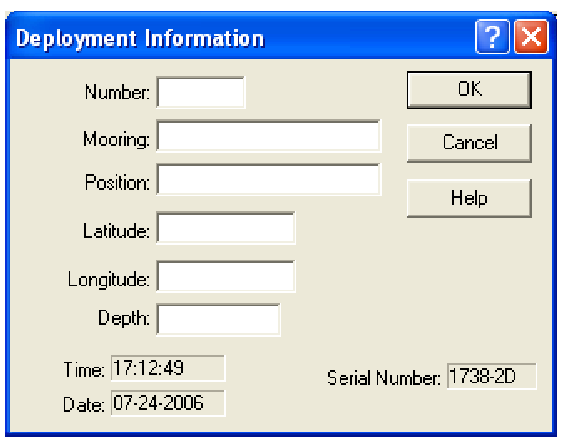
12. If you want to average the data, select the Turn On Averaging check box and enter an average length in minutes and seconds (mm:ss) in the Average Length text box.

    Clear the Turn On Averaging check box to turn off averaging and display the data at the 2 Hz sampling rate of the instrument.

13. Click OK in the Real Time Setup dialog box.

14. Click Start in the ACM Real-Time Display window

    The Deployment Information window opens:



15. Enter the deployment information in the Deployment Information window.

    The deployment information is saved in the text file along with the data.

16 Click OK to save the entries and close the Deployment Information window, or click Cancel to close the window without saving the entries.

> ***Note:*** *Regardless whether you click OK or Cancel, the time and date at the start of data acquisition and the serial number of the instrument are saved.*

The ACM Real-Time Display window displays in real time the data for all the parameters selected in the Parameters, Compass and Average tabs in the Configure ACM dialog box. (See “SECTION 3: Checking and Configuring the 2D-ACM,” for the parameter descriptions and units of measure.) Those parameters that have not been selected are displayed as “OFF.” The displays are updated at the end of every averaging length as entered in the Real Time Setup dialog box if the Turn On Averaging check box is selected. If this check box is cleared, the displays are updated at the 2 Hz sampling rate of the instrument.

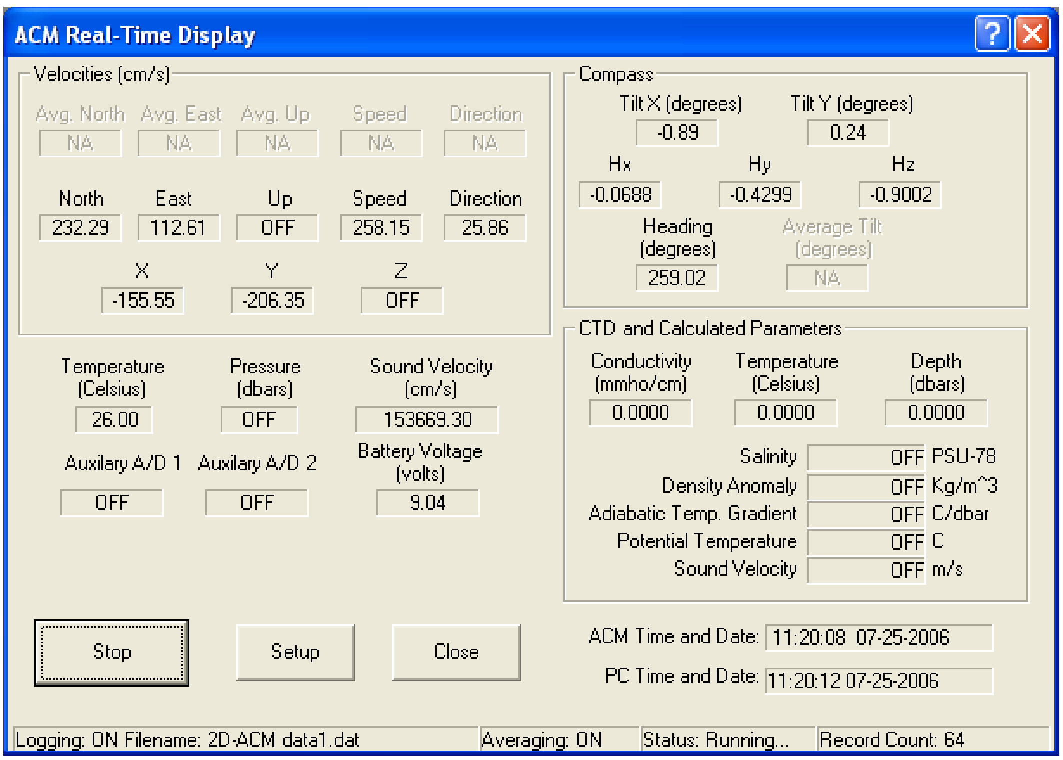


Figure 5-4: ***The ACM Real-Time Display Window—Data Displays Started***

To close the ACM Real-Time Display window and stop data acquisition, click Close.

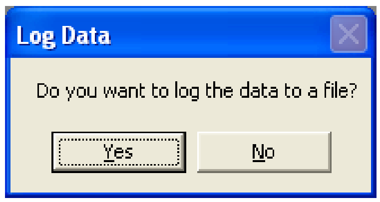
Viewing the Graphics Display and Saving Data from the 2D-ACM

Once configured, the 2D-ACM can be run and the data acquired in real time while viewing the data on a graphics display and saving the data to a text file. When the text file is opened in a text editor, the data are listed under the parameter names.

To commence data acquisition, and to view the graphics display and save the data to a text file:

1. Choose Run Instrument ➤ Graphics Mode.

   The Log Data window opens:



2. Click Yes if you want to save data to a file, or click No if you do not.

   If you click Yes, the Save As dialog box for log files shown in Figure 5-3 on page 5-3 opens. This dialog box is used to create the file in which to save the data.

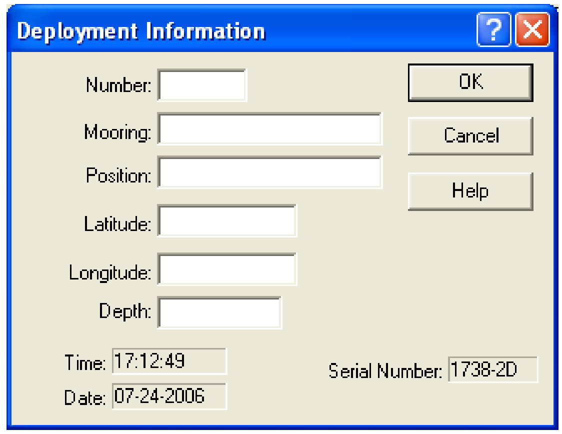
   If you click No, the data are not saved and the graphics display shown in Figure 5-5 on page 5-8 opens.

3. Click the arrow in the Save in drop-down list box and select the folder in which to save the data file.

4. In the File name text box enter the name of the file in which to save the data. The extension *.dat* is added automatically.

5. Click Save to create the file in which to save the data and close the Save As dialog box for log files.

   The Deployment Information window opens:



6. Enter the deployment information in the Deployment Information window.

   The deployment information is saved in the text file along with the data.

7. Click OK to save the entries and close the Deployment Information window, or click Cancel to close the window without saving the entries.

   Note: *Regardless whether you click OK or Cancel, the time and date at the start of data acquisition and the serial number of the instrument are saved.*

   The graphics display shown in Figure 5-5 opens.

The graphics display displays in real time the data for all the parameters selected in the Parameters, Compass and Average tabs in the Configure ACM dialog box. (See “SECTION 3: Checking and Configuring the 2D-ACM,” for the parameter descriptions and units of measure.) Those parameters that have not been selected are displayed as “OFF” in the Parameters area of the graphics display or zero in the analog displays. The displays are updated at the end of every averaging interval. However, if the Average Interval is zero, or if no current velocity or tilt vector averages are selected, the displays are updated at the 2 Hz sampling rate of the instrument.

In addition to the parameter displays, the following time and date displays, which are based on the set time and date of your computer, are provided:

Current Time:	Displays the time the last averaging interval ended.
Current Date:	Displays today’s date.
Next Time:	Displays the time the next averaging interval will start.
Next Date:	Displays the date the next averaging interval will start.

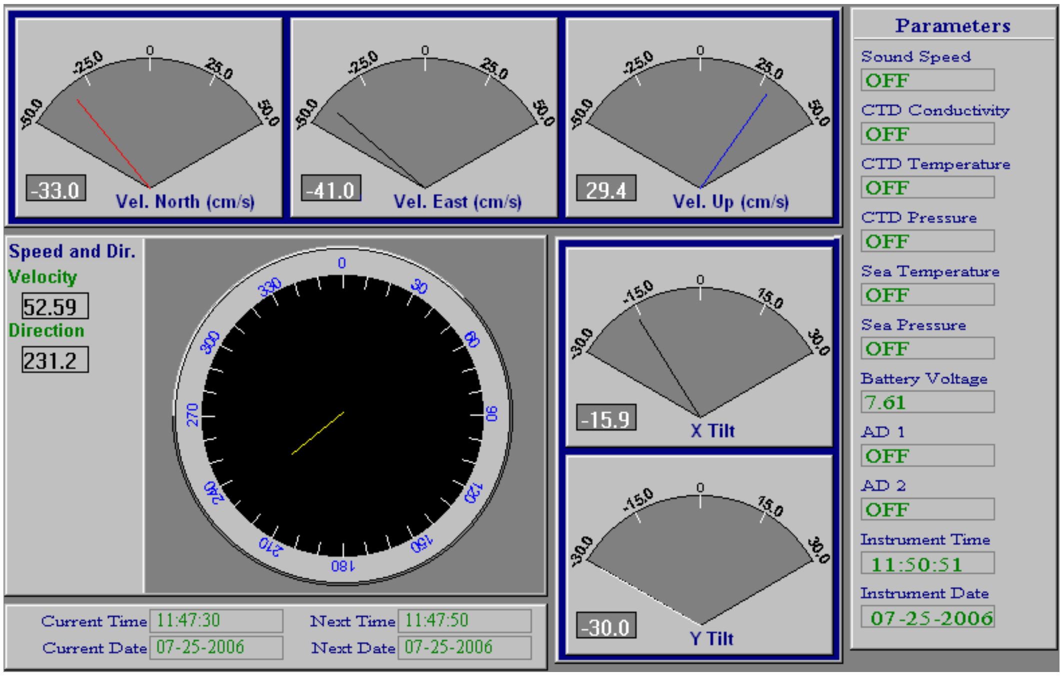


Figure 5-5: ***The Graphics Display***

> ***Note:*** *If the Average Interval is zero, the Current Time and Next Time displays are the same, as are the Current Date and Next Date displays.*

> ***Note:*** *The Velocity Up display provides no data for the 2D-ACM.*

The time and date displays, which are based on the set time of the instrument, are also provided:

Instrument Time: Displays the instrument time.

Instrument Date: Displays the instrument date.

To close the graphics display and stop data acquisition, choose Run Instrument ➤ End Graphics Mode.

Changing the Graphics Display Settings

ACMPro allows you to change the full scale ranges and the needle colors of all the analog displays in the graphics display. The displays are organized into three groups: Velocity, Tilt, and Speed and Direction.

Note: *The Velocity Up displays provide no data for the 2D-ACM.*

Changing the Velocity Display Settings

To change the settings of the Velocity displays:

1. Double-click anywhere in any one of the three Velocity displays.

   The Velocity Settings dialog box shown in Figure 5-6 opens.

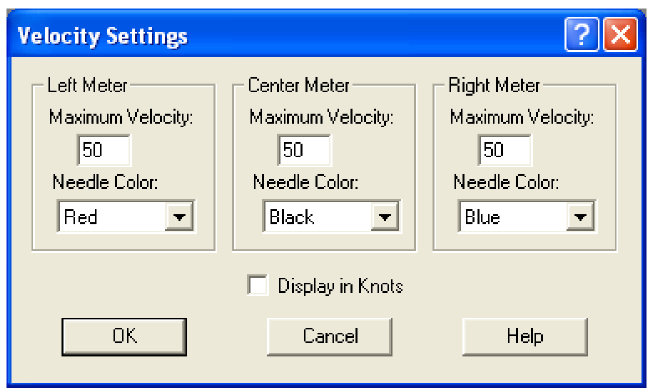


Figure 5-6: ***The Velocity Settings Dialog Box***

2. In the Left Meter area of the Velocity Settings dialog box, enter the full scale range of the Velocity North display in the Maximum Velocity text box.
3. In the Left Meter area click the down arrow in the Needle Color drop-down list box and select a color for the display's needle.
4. Repeat Steps 2 and 3 in the Center area for the Velocity East display.
5. Select the Display in Knots check box to display the current velocities in knots.
6. Click OK to save your changes and close the Velocity Settings dialog box.

Changing the Tilt Display Settings

To change the settings of the Tilt displays:

1. Double-click anywhere in either of the two Tilt displays.

   The Tilt Settings dialog box shown in Figure 5-7 opens.

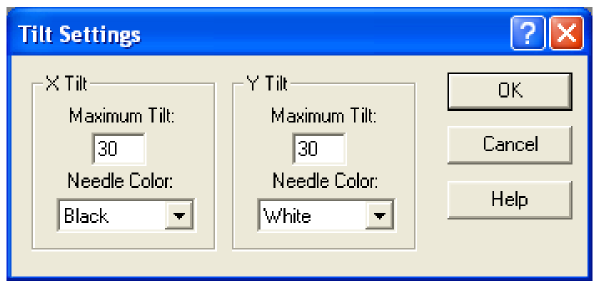


Figure 5-7: ***The Tilt Settings Dialog Box***

2. In the X Tilt area of the Tilt Settings dialog box, enter the full scale range of the X Tilt display in the Maximum Tilt text box.
3. In the X Tilt area click the down arrow in the Needle Color drop-down list box and select a color for the display's needle.
4. Repeat Steps 2 and 3 in the Y Tilt area for the Y Tilt display.
5. Click OK to save your changes and close the Tilt Settings dialog box.

Changing the Speed and Direction Display Settings

To change the settings of the Speed and Direction display:

1. Double-click anywhere in the Speed and Direction display.

   The Speed and Direction Settings dialog box shown in Figure 5-8 opens.

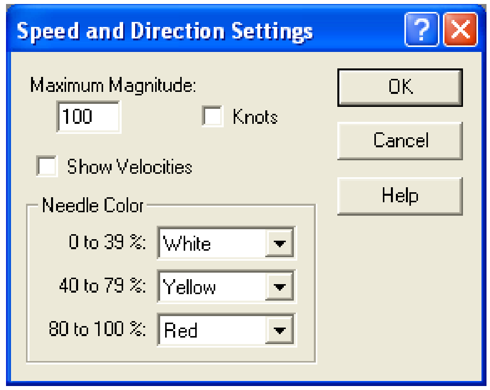


Figure 5-8: ***The Speed and Direction Settings Dialog Box***

2 In the Maximum Magnitude text box, enter the full scale range of the Speed and Direction display.

This setting affects the length of the needle.

3 Select the Knots check box to display the current velocities in knots.

4 Select the Show Velocities check box to display the North and East current velocities

This information is displayed directly under the Velocity and Direction displays and is the same as that displayed in the digital displays of the Velocity displays.

5 In the Needle Color area of the Speed and Direction Settings dialog box, click the down arrow in the 0 to 39% drop-down list box and select a color for the display's needle.

The color of the needle in the Speed and Direction display will be the selected color when the displayed speed and direction is anywhere in the range 0 to 39% of the Maximum Magnitude entered in Step 2.

6 Repeat Step 5 for the 40 to 79% and 80 to 100% drop-down list boxes.

The color of the needle in the Speed and Direction display will be the selected color when the displayed speed and direction is within the corresponding range of the Maximum Magnitude.

7 Click OK to save the new graph setup and close the Speed and Direction Settings dialog box.

SECTION 6: Retrieving and Saving Data from the 2D-ACM

After recovering the 2D-ACM and connecting it to your computer's serial port and to a power supply as described in "Connecting the 2D-ACM to Your Computer" on page 2-4, data that are stored in the instrument's internal memory can be retrieved and saved to a text file. When the text file is opened in a text editor, the data are shown listed under the parameter names. The File can also be opened using View Data File from the File menu. This section describes how to retrieve and save the data from the 2D-ACM and how to view the data using View Data File.

Retrieving and Saving data from the 2D-ACM

To retrieve the data from the 2D-ACM:

1. Connect the 2D-ACM to your computer's serial port and switch the KS switch on the test cable to KS ON.

2. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

3. Choose Configure ➤ Check Instrument.

   ACMPro displays which items are being checked during the check instrument process and then displays a graphic of a 2D-ACM.

4. Choose Retrieve Data ➤ Retrieve Data.

   ACMPro reads the current configuration of the instrument while displaying which items are being read. Then the Retrieve Memory dialog box shown in Figure 6-1 opens.

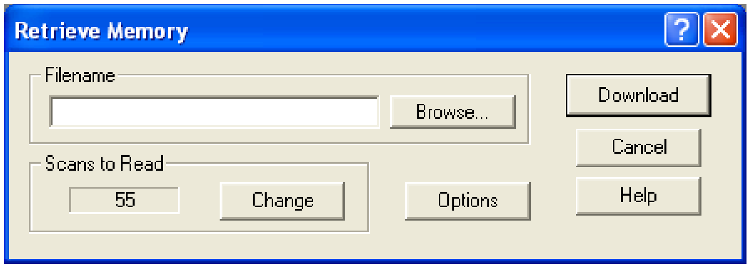


Figure 6-1: ***The Retrieve Memory Dialog Box***

5 Click Options.

The Download Options dialog box shown in Figure 6-2 opens.

Note: *The Options button in the Retrieve Memory dialog box is available only if both instantaneous North Velocity and East Velocity or both average North Velocity and East Velocity are selected; it is grayed out and cannot be selected otherwise.*

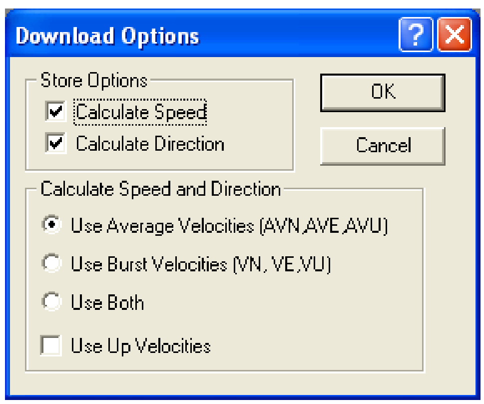


Figure 6-2: ***The Download Options Dialog Box***

6 In the Store Options area of the Download Options dialog box, select the Calculate Speed check box if you want ACMPro to calculate and save current speed; select the Calculate Direction check box if you want ACMPro to calculate and save current direction.

7 In the Calculate Speed and Direction area, select one of the following options:

- Use Average Velocities (AVN, AVE, AVU) to calculate speed and direction using the average velocity selections. This option is available only if both average North Velocity and East Velocity are selected.
- Use Burst Velocities (VN, VE, VU) to calculate speed and direction using the instantaneous velocity selections. This option is available only if both instantaneous North Velocity and East Velocity are selected.
- Use Both to calculate speed and direction for both the average and instantaneous velocity selections. This option is available only if both average North Velocity and East Velocity and both instantaneous North Velocity and East Velocity are selected.

8 Click OK to close the Download Options dialog box and apply the selections.

9 Click Browse.

The Save As dialog box for ASCII files shown in Figure 6-3 opens. This dialog box is used to create the file in which to save the retrieved data.

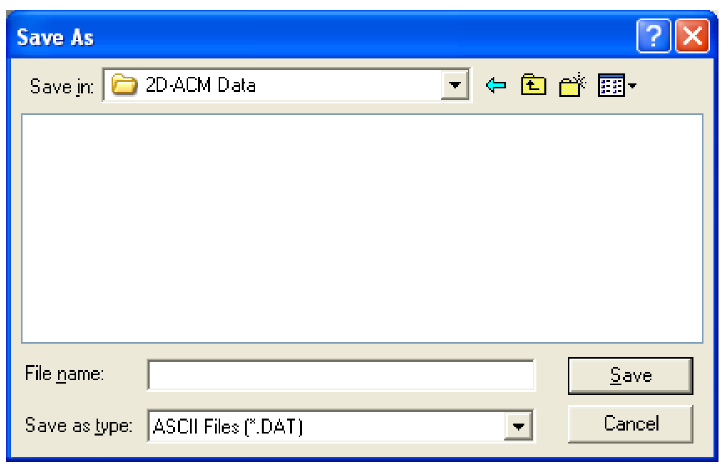


Figure 6-3: ***The Save As Dialog Box for ASCII Files***

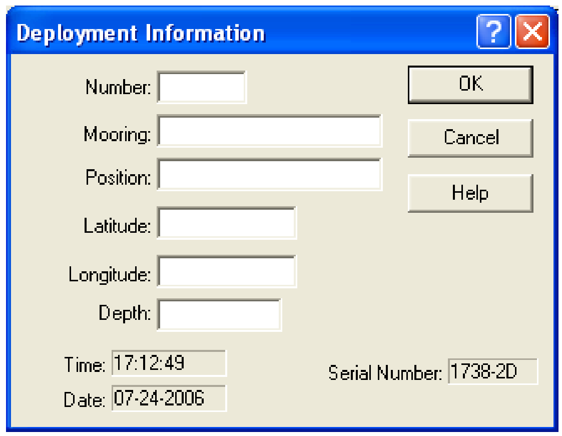
10 In the File name text box enter the name of the file in which to save the data. The extension *.dat* is added automatically.

11. Click Save.

    The Save As dialog box for ASCII files closes.

12. Click Download to retrieve the data from the instrument and close the Retrieve Memory dialog box.

    If you click Download, the Deployment Information window opens:



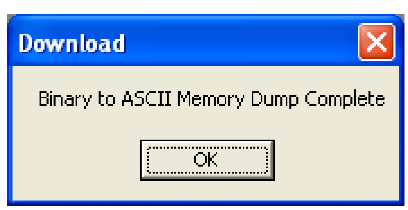
13. Enter the deployment information in the Deployment Information window.

    The deployment information is saved in the text file along with the data.

14. Click OK to save the entries and close the Deployment Information window, or click Cancel to close the window without saving the entries.

Note: *Regardless whether you click OK or Cancel, the time and date at the start of data retrieval and the serial number of the instrument are saved.*

ACMPro downloads the data in binary format from the internal memory of the 2D-ACM. Then the Download window opens:



15. Click OK to close the Download window.

Viewing the Data

The data from a saved data file can be viewed at any time from the File menu. Furthermore, it is not necessary to have the 2D-ACM connected to your computer to view the data.

Before you can view the data, the specific DAT file that contains the data must be known.

To view the data:

1. Choose File ➤ View Data File.

   The Open dialog box for data files shown in Figure 6-4 opens. Although more than one file may be displayed, the example in the figure shows a single file of filename 2D-ACM data01.dat.

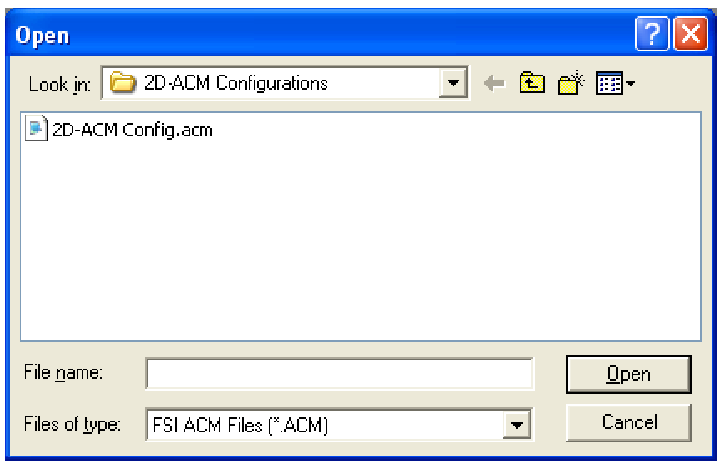


Figure 6-4: ***The Open Dialog Box for Data Files***

   If the file you want to open is not visible, it may be in a different folder than the one shown. In this case, click the arrow in the Look in drop-down list box and select the folder in which the file is located.

2. Click the file you want to view, and then click Open.

   The View Data window shown in Figure 6-5 opens. This window lists all the data in the data file as well as the deployment information if any were saved.

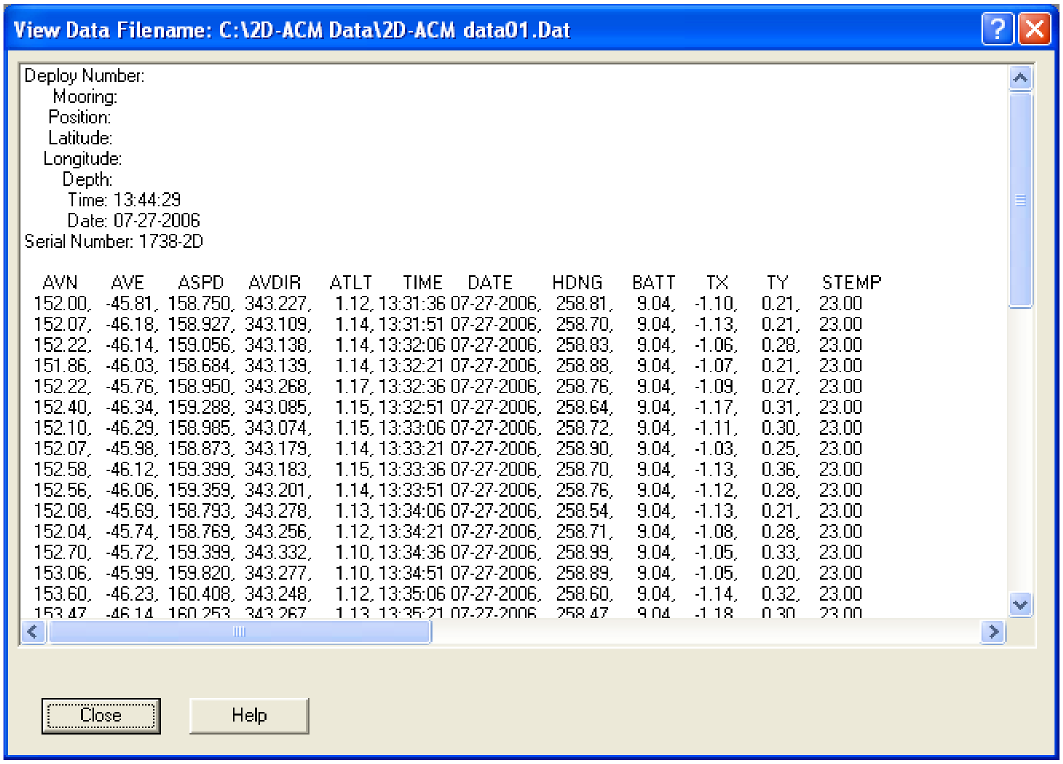


Figure 6-5: ***The View Data Window***

To view columns that are not shown, drag the scroll box in the horizontal scroll bar to the right. This scroll box is shown only if one or more columns are hidden. To view scans that are not shown, click the up or down arrow in the vertical scroll bar to scroll through the scans one scan at a time. Or drag the scroll box up or down to quickly scroll through the scans. This scroll box is shown only if one or more scans are hidden.

3 To close the View Data window, click Close.

The column headings for all the parameters that can be viewed in the View Data window are the following:

AVN: Vector averaged north current velocity in cm/sec

AVE: Vector averaged east current velocity in cm/sec

ASPD: Calculated vector averaged current speed in cm/sec

AVDIR: Calculated average direction in degrees

ATLT: Vector averaged tilt in degrees

TIME: Time in hours, minutes and seconds

DATE:	Date in month, day and year
COND:	Conductivity in mmho/cm from optional CTD
TEMP:	Water temperature in °C from optional CTD
PRES:	Water pressure in dBars from optional CTD
HDNG:	Instantaneous instrument heading in degrees
BATT:	Battery voltage in volts
VX:	Instantaneous X current velocity in cm/sec
VY:	Instantaneous Y current velocity in cm/sec
TX:	Instantaneous Tilt X in degrees
TY:	Instantaneous Tilt Y in degrees
HX:	Instantaneous Compass X
HY:	Instantaneous Compass Y
HZ:	Instantaneous Compass Z
VN:	Instantaneous north current velocity in cm/sec
VE:	Instantaneous east current velocity in cm/sec
SPD:	Calculated instantaneous current speed in cm/sec
VDIR:	Calculated instantaneous current direction in degrees
STEMP:	Sea temperature in °C
SV:	Calculated sound velocity in water in m/sec
AUX1:	Auxiliary channel 1 A/D output, 0–4095 counts for 0–5 volts
AUX2:	Auxiliary channel 2 A/D output, 0–4095 counts for 0–5 volts

Note: *For more information on the parameters listed and how to select them, see “SECTION 3: Checking and Configuring the 2D-ACM.”*

SECTION 7: Replacing the 2D-ACM Battery Pack

Before deploying the 2D-ACM, you should check the instrument's battery pack and, if necessary, replace the battery pack. In addition, when you replace a battery pack, you should degauss it first. Degaussing minimizes the effects the magnetic materials contained in the battery pack have on the instrument's compass. (See "Optional Items" on page 2-2 for the FSI part number for the battery pack.) To check or replace the 2D-ACM battery pack, you must first remove the mooring frame and then the instrument's end cap. After these items are removed, the battery pack can be checked while it is connected to the instrument. This section provides instructions on how to degauss a battery pack and how to check and replace the battery pack.

> ***Note:*** *In addition to degaussing the battery pack, you should run the software program Hardiron which is included on the CD with ACMPro. Hardiron calibrates the compass to additionally compensate for any residual magnetic effects remaining after degaussing the battery pack.*

Degaussing a Battery Pack

Before installing a new battery pack in the 2D-ACM, the battery pack should be degaussed. This is especially important for alkaline battery packs, which contain magnetic materials that may adversely affect the performance of the instrument's compass. Degaussing reduces these magnetic effects. To degauss a battery pack a degaussing coil is required, which is simply a large coil that is energized with an AC current. The battery pack is passed through the coil and then slowly removed. Degaussing coils are typically used to eliminate the magnetic fields that affect picture tube alignment and are available from a number of sources including the following:

Butler Tool & Design
641 South Newton Street
Goodland, IN 47948

Telephone: (219) 297-4531
Facsimile: (219) 297-4554

A battery pack is shown being passed through a Butler Tool & Design degaussing coil in Figure 7-1. This degaussing coil is also the unit used in the instructions that follow.

Figure 7-1: ***Degaussing a Battery Pack with a Degaussing Coil***

To degauss a battery pack:

1. With the degaussing coil directly in front of you, hold the battery pack in your hand and pass it through the degaussing coil lengthwise approximately 12 inches to the other side.
2. While pressing the red button, slowly pull the battery pack through the degaussing coil until it is approximately 24 inches in front of the coil. Then release the button.
3. Turn the battery pack around and repeat Steps 1 and 2.

Checking and Replacing the Battery Pack

To disassemble the 2D-ACM and check the battery pack:

1. Place the 2D-ACM on a table such that the pad eye in the frame hangs over the edge of the table.

2. Using a 3/32-inch Allen wrench, loosen the four screws at the top of the mooring frame as shown in Figure 7-2.

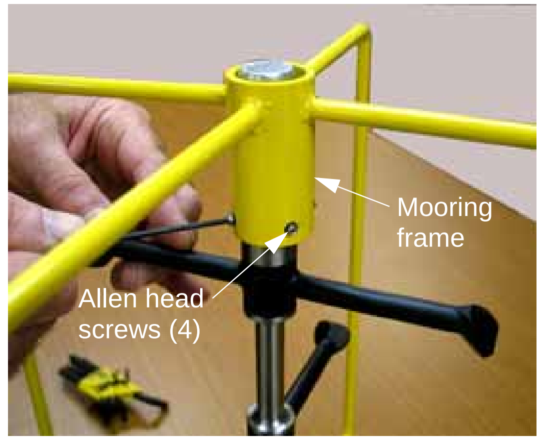


Figure 7-2: ***Loosening the Four Allen Head Screws in the Mooring Frame***

3. Using a 5/16-inch Allen wrench and a pair of pliers, loosen the zinc anode in the mooring frame as shown in Figure 7-3. Unscrew the anode far enough such that it will be possible to use an adjustable wrench to loosen the nut next to the anode as described in Step 5.

Figure 7-3: ***Loosening the Zinc Anode***

4. Using a 5/16-inch nut driver and an adjustable wrench, remove the nut and bolt securing the band clamp as shown in Figure 7-4, and then spread the band clamp slightly and remove it from the end cap.

Figure 7-4: ***Removing Band Clamp***

5. Using a 5/16-inch Allen wrench and an adjustable wrench, loosen the nut and bolt securing the mooring frame to the housing as shown in Figure 7-5. Loosen them just enough such that the mooring frame will be able to slide over the housing.

Figure 7-5: ***Loosening the Nut and Bolt Securing the Mooring Frame***

6. Carefully thread the mooring frame around the "fingers" of the velocity head until the frame is free. Set the frame aside.

7. Carefully pull the end cap straight out from the housing and lay it on its side as shown in Figure 7-7. Leave the in-line connector, which connects the battery pack to the electronics, plugged in.

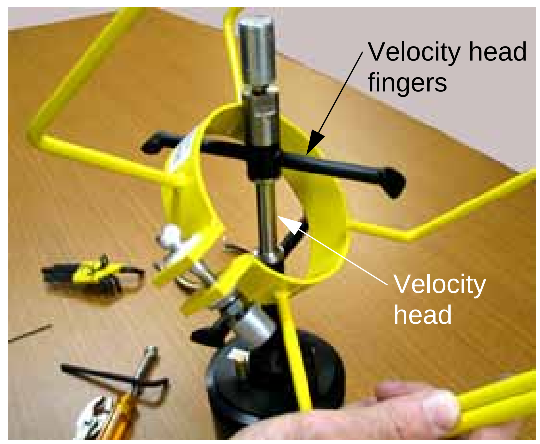


Figure 7-6: ***Removing the Mooring Frame***

8. Touch the probes of a digital voltmeter to the exposed pins on the back of the in-line connector—the (+) probe to the red wire’s pin and the (-) probe to the black wire’s pin.

   The voltage should be 6.0 VDC or higher.

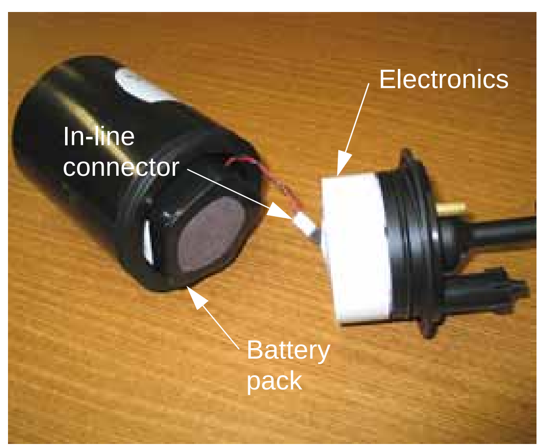


Figure 7-7: ***The End Cap Removed from the Housing***

To install a fresh battery pack:

1. Disconnect the in-line connector.

2. Install a fresh battery pack into the housing, being sure the foam pad is inserted first as shown in Figure 7-8.

3. Connect the in-line connector.

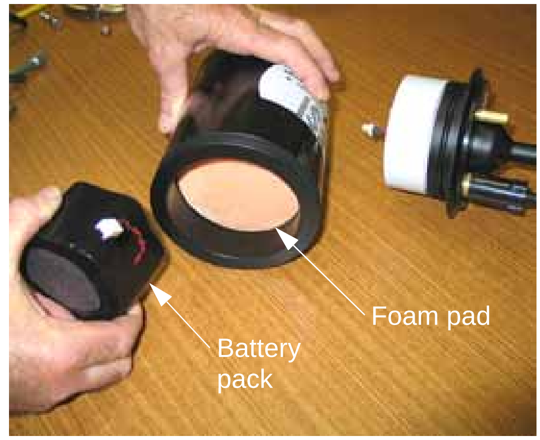


Figure 7-8: ***Inserting a Fresh Battery Pack***

To reassemble the 2D-ACM:

1. Clean the O-ring on the end cap and the O-ring surface inside the housing with a lint-free cloth or paper towel, and after carefully inspecting the O-ring for any nicks or scratches, apply a thin coat of silicone grease.

   If nicks or scratches are found on the O-ring, replace it. When replacing the O-ring, first clean the O-ring surface on the end cap with a lint-free cloth or paper towel. Then lightly lubricate the new O-ring with silicone grease and install it onto the end cap.

2. Reassemble the 2D-ACM in the reverse order of disassembly, making sure to align the fingers of the velocity head with the mooring frame for maximum protection as shown in Figure 7-9.

Figure 7-9: ***Aligning Fingers of Velocity Head with Mooring Frame***

APPENDIX A: Configuring the DC Channels

The 2D-ACM includes two DC input channels which interface with most DC output sensors, including dissolved oxygen, pH, chlorophyll, light transmission, and others. You can configure each of the two DC channels by entering a name, an equation type and up to five coefficients which are saved with the data.

To configure a DC channel:

1. Choose Start ➤ Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

2. Choose Configure ➤ Auxiliary 1 Coefficients or Auxiliary 2 Coefficients.

   If you chose Auxiliary 1 Coefficients, the Auxiliary 1 Coefficients Setup dialog box shown in Figure A-1 opens. For Auxiliary 2, the Auxiliary 2 Coefficients dialog box opens instead. Both dialog boxes perform the same functions.

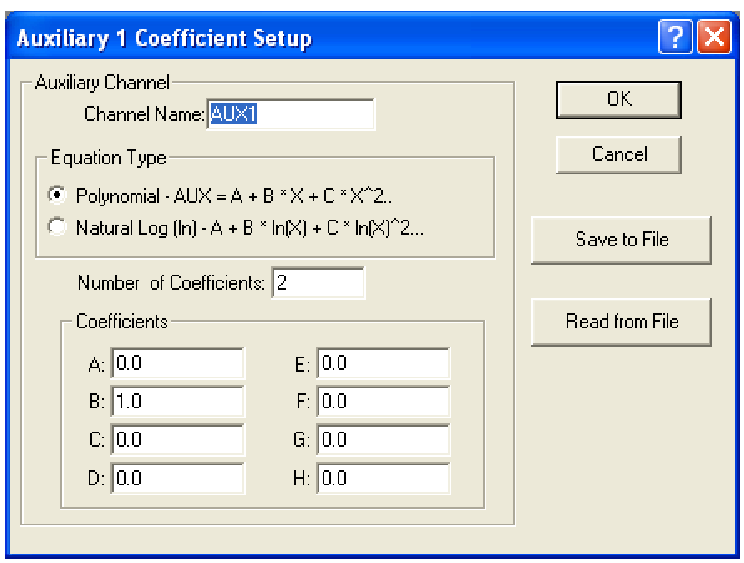


Figure A-1: ***The Auxiliary 1 Coefficient Setup Dialog Box***

3. Enter a name for the DC channel in the Channel Name text box.
4. Select an Equation Type option.
5. Enter the number of coefficients in the Number of Coefficients text box.
6. Enter each of the coefficients in the Coefficients text boxes.
7. Click OK to save the DC channel configuration and close the Auxiliary 1 or Auxiliary 2 Coefficients Setup dialog box.

The DC channel configuration can also be saved to an ACM file by clicking Save to File in the Auxiliary 1 or Auxiliary 2 Coefficients Setup dialog box and creating or selecting the file in the Save As dialog box for ACM files. The configuration can also be read from an ACM file by clicking Read from File and opening the file in the Open dialog box for ACM files.

APPENDIX B: Bulkhead Connector Wiring

The 2D-ACM includes a Subconn MCBH5F bulkhead connector on the top end cap for connecting to a computer and to power. You can fabricate your own cable using a pigtail that mates with the 2D-ACM's bulkhead connector. This pigtail is a Subconn MCIL5M. Figure B-1 shows the pin orientation of the connector, which is shown face up. Table B-1 shows the required connections from the instrument to the computer; Table B-2, the required connections from the instrument to the power supply.

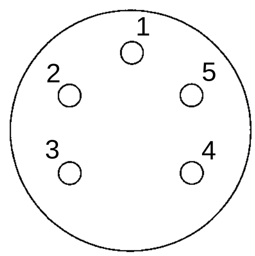


Figure B-1: ***Bulkhead Connector—Face View***

Instrument to Computer Connections

Instrument Bulkhead Connector				Signal Direction	Computer DB-9 Connector		
PIN	WIRE COLOR	LABEL	FUNCTION		PIN	LABEL	FUNCTION
1	Black	GND	Ground	—	5	GND	Ground
2	White	RXD	Received Data	Computer to Instrument	3	TXD	Transmitted Data
4	Green	TXD	Transmitted Data	Instrument to Computer	2	RXD	Received Data

Table B-1: ***Instrument to Computer Connections***

Instrument to Power Supply Connections				
Instrument Bulkhead Connector				**Power Supply**
PIN	**WIRE COLOR**	**LABEL**	**FUNCTION**	
1	Black	GND	Ground	Ground
3	Red	Power(+)	Instrument Power	12 VDC (nominal)
5	Orange	KS	Kick Start	Ground

Table B-2: ***Instrument to Power Supply Connections***

APPENDIX C: 2D-ACM Commands

All 2D-ACM commands are entered in the Communications window by typing the commands directly from the keyboard of your computer. To enter commands ACMPro must be installed and running on your computer with the 2D-ACM connected to it. (See “Installing ACMPro” on page 2-3 and “Connecting the 2D-ACM to Your Computer” on page 2-4.)

Most of the 2D-ACM commands are listed in Table C-1 on page C-6. Also listed in the table are the page references to where detailed descriptions of the commands are provided.

2D-ACM Operating Modes

The 2D-ACM always runs in one of three operating modes. Each command applies specifically to one or more of these modes. The 2D-ACM can be placed into any operating mode by entering the appropriate command. The 2D-ACM operating modes are the following:

Run mode is the normal operating mode in which data are acquired and stored. There are three Run modes: Continuous, where data are acquired continuously; Interval, where data are acquired at specified intervals for specified periods; and Delayed Start, where data acquisition begins at a specified time and date in the future in Continuous or Interval mode. The instrument normally powers up in Run mode.

Open mode is used to update calibration and other operational parameters.

Calibration mode provides certain functions that are used when the instrument is calibrated.

Command Properties

All the 2D-ACM commands exhibit the following common properties:

- A command is executed only after a carriage return <CR> or a line feed <LF> character is received.
- Additional characters received after a <CR> or <LF> character are ignored until the command is executed.
- Unless specified otherwise, a command can be entered in either upper or lower case letters.

- All displays are followed by a <CR> and a <LF> character at the end of each line.
- A command is invalid if it is not recognized for the specific operating mode or if it is entered incorrectly or incompletely.
- If an entered command is invalid, the message "BAD COMMAND is displayed.

Entering Commands

To enter a 2D-ACM command:

1. Choose Start ➤ All Programs ➤ FSI Applications ➤ ACMPro.

   ACMPro starts and the ACMPro Main window opens.

2. Choose Communications ➤ Communications Window.

   The Communications window shown in Figure C-1 opens.

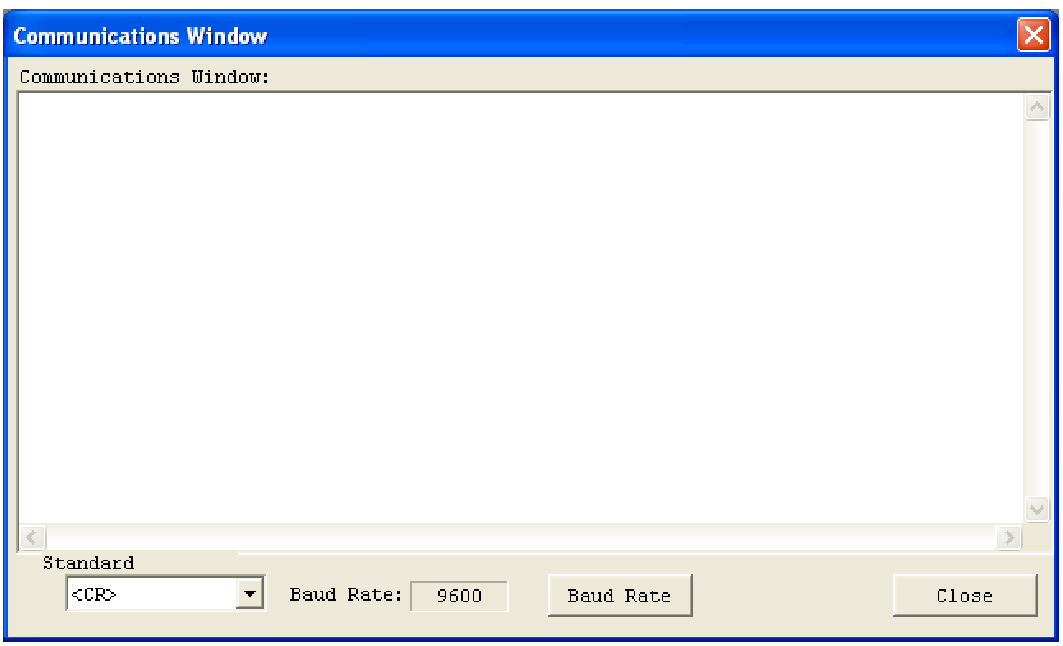


Figure C-1: ***The Communications Window***

3. Type the command in accordance with the commands listed in Table C-1 or as described below.

Entering Commands for Selecting Parameters

You must select the parameters that you want logged to memory or output or both. To select any of the parameters listed below, go to the Open mode and then enter the parameter name followed by "=ON" and a <CR> or <LF>. To deselect the parameter, enter the parameter followed by "=OFF" and a <CR> or <LF>.

For example, to select AVN, enter AVN=ON followed by a <CR> or <LF>; to deselect AVN, enter AVN=OFF followed by a <CR> or <LF>.

> ***Note:*** *Either lower or upper case characters may be used.*

The selected parameters can include the following:

AVN:	Vector averaged north current velocity in cm/sec
AVE:	Vector averaged east current velocity in cm/sec
ATLT:	Vector averaged tilt in degrees
ATIME:	Data record time
CTD:	CTD input
HDNG:	Instantaneous instrument heading in degrees
BATT:	Battery voltage in volts
VX:	Instantaneous X current velocity in cm/sec
VY:	Instantaneous Y current velocity in cm/sec
TX:	Instantaneous Tilt X in degrees
TY:	Instantaneous Tilt Y in degrees
HX:	Instantaneous compass X
HY:	Instantaneous compass Y
HZ:	Instantaneous compass Z
VN:	Instantaneous north current velocity in cm/sec
VE:	Instantaneous east current velocity in cm/sec
STEMP:	Sea temperature in °C
SV:	Calculated sound velocity in water in m/sec
AUX1:	Auxiliary channel 1 A/D output, 0–4095 counts for 0–5 volts
AUX2:	Auxiliary channel 2 A/D output, 0–4095 counts for 0–5 volts
VPATH:	Instantaneous current velocity along acoustic paths in cm/sec

Entering Commands for Activating and Deactivating the Tilt and Compass Functions

The tilt and compass functions can be activated or deactivated when the instrument is in the Open operating mode. When deactivated, the tilt and compass parameter values are the following:

TX: 0

TY: 0

HX: 1

HY: 0

HZ: 0

With the values as shown above, the tilt is set to vertical and the compass is set to due north.

To activate the tilt function, go to the Open mode and then enter TILT=ON followed by a <CR> or <LF>; to deactivate the tilt function, enter TILT=OFF followed by a <CR> or <LF>.

To activate the compass function, go to the Open mode and then enter COMP=ON followed by a <CR> or <LF>; to deactivate the compass function, enter COMP=OFF followed by a <CR> or <LF>.

Note: *Either lower or upper case characters may be used.*

Entering Commands for Changing Constants

You can change the 2D-ACM constants listed below. To change a constant, go to the Open mode and then enter the constant name followed by "=nnnn" where nnnn is the desired value.

Warning: *Consult FSI before changing any of the 2D-ACM constants listed below.*

The constants that can be changed are the following:

Kn: Tilt constants, where n=1–8

T0: Tilt constant

ZHX: Compass offset X

ZHY: Compass offset Y

ZHZ: Compass offset Z

Tnn:	Compass matrix calibration constants, where nn=11–33
TOFF:	Sea temperature calibration constant
SAL:	Salinity constant which must be set for correct sound velocity estimation
DBAR:	Pressure constant which must be set for correct sound velocity estimation.
ABOF:	Velocity path offset
CDOF:	Velocity path offset
EFOF:	Velocity path offset
GHOF:	Velocity path offset
VELXS:	Overall velocity scale factor
CDATE:	Instrument calibration date
Ver:	Instrument firmware version

Operational Commands

The operational commands for the 2D-ACM commands are listed in Table C-1 followed by detailed descriptions of each command. Also listed in the table are the page references to the command descriptions.

2D-ACM Commands					
COMMAND	OPERATIING MODE			FUNCTION	PAGE NO.
	R	O	C		
***R	–	•	–	Go to the Run operating mode	C-9
***O	•	–	•	Go to the Open operating mode	C-11
***C	–	•	–	Go to the Calibration operating mode	C-12
***I	–	•	–	Go to Interval mode	C-14
***D	–	•	–	Go to Delayed Start mode	C-16
***E	–	•	•	Save the EE data base	C-18
CDATE	–	•	–	Displays the calibration date	C-19
DTIME	–	•	–	Displays and sets the delayed start date and time	C-20
ITIME	–	•	–	Displays and sets the interval time	C-22
OTIME	–	•	–	Displays and sets the on time	C-24
RAUX	–	•	–	Displays the DC channel outputs	C-26
RCAL	–	•	•	Displays the calibration constants	C-27
RCALC	–	•	•	Displays the compass calibration constants	C-29
RCALT	–	•	•	Displays the tilt calibration constants	C-30
RCALV	–	•	•	Displays the velocity calibration constants	C-31
RCTD	–	•	–	Displays the CTD outputs	C-32
READP	–	•	–	Displays the current location of the read pointer	C-33
READP=	–	•	–	Sets the current location of the read pointer	C-34

Table C-1: ***2D-ACM Commands***

2D-ACM Commands					
COMMAND	OPERATIING MODE			FUNCTION	PAGE NO.
	R	O	C		
RLOP	–	•	–	Displays the logging data operational setting	C-35
ROP	–	•	–	Displays the current operational settings	C-36
SCOP	–	•	–	Enables continuous on power up	C-37
CCOP	–	•	–	Disables continuous on power up	C-38
SLOG	–	•	–	Turns data logging on	C-39
CLOG	–	•	–	Turns data logging off	C-40
SMEM	–	•	–	Displays memory size in bytes	C-41
SB	–	•	–	Sets the baud rate	C-42
MODE	•	•	•	Displays the current mode	C-43
TIME	–	•	–	Displays and sets the RTC time	C-44
DATE	–	•	–	Displays and sets the RTC date	C-45
ZMEM	–	•	–	Erases the entire flash memory	C-46
AVGI	–	•	–	Sets the averaging interval	C-47
DDMP	–	•	–	Outputs and displays scans from memory in ASCII	C-49
BDMP	–	•	–	Outputs and displays scans from memory in binary	C-50
BDALL	–	•	–	Outputs and displays all of memory in binary	C-51
DLEN	–	•	–	Displays the number of scans to output	C-52
DLEN=	–	•	–	Sets the number of scans to output	C-53

Table C-1: ***2D-ACM Commands (Continued)***

COMMAND	OPERATIING MODE			FUNCTION	PAGE NO.
	R	O	C		
DLYC	–	•	–	Displays the compass electronics settling time	C-54
DLYC=	–	•	–	Sets the compass electronics settling time	C-55
DLYV	–	•	–	Displays the velocity electronics settling time	C-56
DLYV=	–	•	–	Sets the velocity electronics settling time	C-57
LGPTR	–	•	–	Displays the current location of the logging pointer	C-58
LGPTR=	–	•	–	Sets the current location of the logging pointer	C-59
RALLC	–	–	•	Enables display of compass calibration constants	C-60
RALLV	–	–	•	Enables display of velocity calibration constants	C-61
S/N	–	•	–	Displays the serial number	C-62
VER	–	•	–	Displays the firmware version number	C-63
RDM	•	•	•	Displays the selected parameters	C-64
S	•	–	•	Stops continuous data output	C-65
SC	•	–	•	Starts continuous data output	C-66

Table C-1: *2D-ACM Commands (Continued)*

***R

Go to the Run operating mode

Usage

***R <CR> or <LF>

Operating Modes

Open

Description

The ***R command sets the instrument into the Run operating mode. In Run mode the instrument acquires data in Continuous, Interval or Delayed Start mode.

In Continuous mode, data are acquired continuously.

For the instrument to acquire data in Interval mode, valid interval and on times must have been entered. In Interval mode the instrument turns on and data are acquired at the beginning of each interval time as set by the ITIME command for the on time as set by the OTIME command. The instrument turns off at the end of each on time.

For the instrument to acquire data in Delayed Start mode, a valid delayed start time and date must have been entered. In Delayed Start mode data are acquired in either Continuous or Interval mode commencing at the date and time specified by the DTIME command.

Returns

See Examples below.

Examples

Enter ***R <CR> or <LF>

The instrument asks if you want to reset the logging pointers:

    Logging Pointers Not Reset, Reset No or (Y)es ? y

Enter y or <CR>

The instrument resets the logging pointer and zeros memory:

```
Logging Pointer Reset
Each '.' = 65536 bytes. Type 'S' to Stop.
. . . . . . . . . . . . . . . .
Logging Pointer Reset

Logging Memory Zeroed
Logging NOT On, Turn Logging On No or (Y)es ?
```

Enter y or <CR>

The instrument begins logging data:

```
Logging Ops Set
Running, Fingers UP
Tilt Function is ON  Compass Function is ON

Logging Ops Set
```

See Also

ITIME, OTIME, DTIME, S, SC

***O

Go to the Open operating mode

Usage

***O <CR> or <LF>

Operating Modes

Run, Calibration

Description

The ***O command sets the instrument into the Open operating mode. In Open mode data are not acquired and operational settings and calibration constants can be displayed and edited.

Returns

<CR><LF>

Entering a <CR> or <LF> character a second time and every time thereafter displays the following:

OPEN MODE

***C

Go to the Calibration operating mode

Usage

***C <CR> or <LF>

Operating Modes

Open

Description

The ***C command sets the instrument into the Calibration operating mode. In Calibration mode reference data and raw data can be displayed.

The Calibration mode allows you to read raw data for either the velocity interface or the compass interface. Upon entering this mode, the instrument will send the velocity raw data. Using the RALLV and RALLC commands you can change between reading raw data for the velocity interface and the compass interface.

The output format in the case of raw data for the velocity interface is the following:

Row1 Raw readings of acoustic signals for the AB path of phase shifted signals in both directions.

Row2 Raw readings of acoustic signals for the CD path of phase shifted signals in both directions.

Row3 Raw readings of acoustic signals for the EF path of phase shifted signals in both directions.

Row4 Raw readings of acoustic signals for the GH path of phase shifted signals in both directions.

Row5 Calculated current velocities along the AB, CD, EF, and GH paths.

The output format in the case of raw data for the compass interface is the following:

Hx, Hy, Hz, H1, H2, H3, H4, H5, H6
T1x, T1y, T2, up_down
sea_temp, tilt_temp, battery_voltage
aux1, aux2

where Hx, Hy and Hz are the calculated magnetometer outputs in the x, y and z directions; H1–H6 are the magnetometer raw readings; T1x, T1y and T2 are the tilt sensor readings; up_down is the up-down sensor output; sea_temp is the sea temperature sensor raw reading; tilt_temp is the tilt sensor temperature sensor raw reading; battery_voltage is an A/D reading corresponding to the battery voltage; and aux1 and aux2 are the auxiliary analog input raw readings.

Returns

<CR><LF>

Entering a <CR> or <LF> character a second time and every time thereafter displays a scan of data followed by a <CR><LF>.

See Also

RALLC, RALLV

***I

Go to Interval mode

Usage

***I <CR> or <LF>

Operating Modes

Open

Description

The ***I command sets the instrument into the Interval operating mode of the Run mode if valid interval and on times have been entered. In Interval mode the instrument turns on and acquires and saves data to the file at the beginning of each interval time as set by the ITIME command for the on time as set by the OTIME command. The instrument turns off at the end of each on time.

Returns

See Examples below.

Examples

Enter ***I <CR> or <LF>

The instrument asks if you want to reset the logging pointers:

```
Logging Pointers Not Reset, Reset No or (Y)es ? y
```

Enter y or <CR>

The instrument resets the logging pointer, zeros memory and begins logging data:

```
Logging Pointer Reset
Each '.' = 65536 bytes. Type 'S' to Stop.
. . . . . . . . . . . . . . .
Logging Pointer Reset
```

Logging Memory Zeroed
Time = 11:24:59 Date = Mon 09-12-2006
This ON Time Ends 11:26:58 09-12-2006
The NEXT Interval Starts 11:34:58 09-12-2006
Running, Fingers UP
Tilt Function is ON Compass Function is ON

Logging Ops Set

See Also

ITIME, OTIME, S, SC

***D

Go to Delayed Start mode

Usage

***D <CR> or <LF>

Operating Modes

Open

Description

The ***D command sets the instrument into the Delayed Start mode of the Run operating mode if a valid delayed start time and date have been entered. In Delayed Start mode the instrument turns on and acquires and saves data to the file in the Continuous or Interval mode of the Run operating mode beginning at the date and time specified by the DTIME command

In Continuous mode, data are acquired continuously.

For the instrument to acquire data in Interval mode, valid interval and on times must have been entered. In Interval mode data are acquired at the beginning of each interval time as set by the ITIME command for the on time as set by the OTIME command. The instrument turns off at the end of each on time.

Returns

See Examples below.

Examples

Enter ***D<CR> or <LF>

The instrument asks if you want to reset the logging pointers:

    Logging Pointers Not Reset, Reset No or (Y)es ?

Enter y or <CR>

The instrument resets the logging pointer and zeros memory:

Logging Pointer Reset
Each '.' = 65536 bytes. Type 'S' to Stop.
. . . .
Logging Pointer Reset

Logging Memory Zeroed
Logging NOT On, Turn Logging On No or (Y)es ?

Enter y or <CR>

The instrument begins logging data:

Logging Ops Set
Time = 11:49:22 Date = 09-12-2006
Normal Run Starts 11:55:00 09-13-2006
Tilt Function is ON Compass Function is ON

Logging Ops Set
bye_bye

See Also

DTIME, ITIME, OTIME

***E

Save the EE data base

Usage

***E <CR> or <LF>

Operating Modes

Open, Cal

Description

The ***E command causes all calibration constants and operational settings to be written to flash memory.

> ***Caution:*** *The ***E command overwrites the current calibration constants and operational settings in flash memory. Before using the ***E command, use the RCAL command to verify that the calibration constants are correct.*

Returns

<CR><LF>

See Also

RCAL

CDATE

Displays the calibration date

Usage

CDATE <CR> or <LF>

CDATE=ddmmmyy <CR> or <LF>

Operating Modes

Open

Description

The CDATE command displays the calibration date of the instrument.

Returns

See Examples below.

Examples

Enter CDATE <CR> or <LF>

The instrument displays the current date:

CDATE=12AUG5 <CR><LF>

DTIME

Displays and sets the delayed start date and time

Usage

DTIME <CR> or <LF>

Operating Modes

Open

Description

The DTIME command displays and allows you to set the delayed start date and time of the instrument.

> ***Note:*** *The time set by the DTIME command must be later than the current time and date by at least one minute.*

When setting the delayed start date, use the mm-dd-yyyy format:

mm:	Month—01 to 12
dd:	Day—01 to 31
yyyy:	Year—1998 to 2030

When setting the delayed start time, use the hh:mm:ss format:

hh:	Hours—01 to 24
mm:	Minutes—00 to 59
ss:	Seconds—00 to 59

Returns

See Examples below.

Examples

Enter DTIME <CR> or <LF>

The instrument displays the current delayed start date and allows you to enter a new date:

Delayed Start Date = 09-12-2006
Enter date (mm-dd-yyyy):

Enter a <CR><LF> to leave the delayed start date as is, or enter the date in months, days and years, and then enter a <CR><LF>.

The instrument displays the current delayed start time and allows you to enter a new time:

Delayed Start Time = 13:14:54
Enter time (hh:mm:ss):

Enter a <CR><LF> to leave the delayed start time as is, or enter the time in hours, minutes and seconds, and then enter a <CR><LF>.

See Also

TIME, DATE

ITIME

Displays and sets the interval time

Usage

ITIME <CR> or <LF>

Operating Modes

Open

Description

The ITIME command displays and allows you to set the interval time of the instrument. The interval time is the time in hours, minutes and seconds between the start of each on time.

> ***Note:*** *The time set by the ITIME command must be longer than the time set by the OTIME command by at least five seconds.*

When setting the interval time, use the hh:mm:ss format:

hh:	Hours—01 to 24
mm:	Minutes—00 to 59
ss:	Seconds—00 to 59

Returns

See Examples below.

Examples

Enter ITIME <CR> or <LF>

The instrument displays the current interval time and allows you to enter a new time:

```
Interval Time = 00:10:00
Enter time (hh:mm:ss):
```

Enter a <CR><LF> to leave the interval time as is, or enter the time in hours, minutes and seconds, and then enter a <CR><LF>.

See Also

OTIME, TIME, DATE

OTIME

Displays and sets the on time

Usage

OTIME <CR> or <LF>

Operating Modes

Open

Description

The OTIME command displays and allows you to set the on time of the instrument. The on time is the time in hours, minutes and seconds beginning at the start of each interval time during which the instrument is on and collecting data.

> ***Note:*** *The time set by the OTIME command must be shorter than the time set by the ITIME command by at least five seconds.*

When setting the on time, use the hh:mm:ss format:

hh:	Hours—01 to 24
mm:	Minutes—00 to 59
ss:	Seconds—00 to 59

Returns

See Examples below.

Examples

Enter OTIME <CR> or <LF>

The instrument displays the current on time and allows you to enter a new time:

```
ON Time = 00:02:00
Enter time (hh:mm:ss):
```

Enter a <CR><LF> to leave the on time as is, or enter the time in hours, minutes and seconds, and then enter a <CR><LF>.

See Also

ITIME, TIME, DATE

RAUX

Displays the DC channel outputs

Usage

RAUX <CR> or <LF>

Operating Modes

Open

Description

The RAUX command displays the outputs of the two DC channels, AUX1 and AUX2.

Returns

See Examples below.

Examples

Enter RAUX <CR> or <LF>

The instrument displays the outputs of the two DC channels:

```
Waiting for at least 0 msec to read AUX sensors.
AUX1 = 668, AUX2 = 864
```

RCAL

Displays the calibration constants

Usage

RCAL <CR> or <LF>

Operating Modes

Open, Calibration

Description

The RCAL command displays all of the instrument calibration constants.

> ***Note:*** *The ***E command must be entered to save any changed calibration constants. In addition, the instrument serial number and the version number of the firmware cannot be changed.*

Returns

See Examples below.

Examples

Enter RCAL <CR> or <LF>

The instrument displays the calibration constants:

```
S/N=1738-2D
VER=2.2
CDATE=7APR4
ABOF = 4.494000e-01
CDOF = 1.568800e+00
EFOF = 1.342800e+00
GHOF = -1.408000e-01
ABSL = 1.000000e+00
CDSL = 1.000000e+00
EFSL = 1.000000e+00
GHSL = 1.000000e+00
K1 = 7.662500e+00
K2 = -3.281813e-02
K3 = -3.599594e+00
```

K4 = -3.836499e-04
K5 = 7.975200e+00
K6 = -4.546167e-02
K7 = 4.030540e+00
K8 = -3.292473e-04
T0 = 2.300000e+01
SAL = 3.500000e+01
DBAR = 0.000000e+00
STOFF = 0.000000e+00
VELXS = 1.000000e+00
ZHX = 9.878999e+02
ZHY = -5.827750e+03
T11 = 9.401084e-02
T21 = 3.935865e-03
T12 = -3.101840e-03
T22 = 8.902404e-02
T13 = -2.535081e-03
T23 = -1.787802e-04
T31 = -4.238105e-04
T32 = 4.003417e-03
T33 = 1.133374e-01
DEX = 5.310700e+01
DEY = 2.127300e+01
DEZ = 0.000000e+00

See Also

***C, ***E

RCALC

Displays the compass calibration constants

Usage

RCALC <CR> or <LF>

Operating Modes

Open, Calibration

Description

The RCALC command displays the compass calibration constants.

Returns

See Examples below.

Examples

Enter RAUX <CR> or <LF>

The instrument displays all the compass calibration constants:

```
rcalc
S/N=1738-2D
VER=2.2
CDATE=7APR4
ZHX = 9.878999e+02
ZHY = -5.827750e+03
ZHZ = 2.081500e+02
T11 = 9.401084e-02
T21 = 3.935865e-03
T12 = -3.101840e-03
T22 = 8.902404e-02
T13 = -2.535081e-03
T23 = -1.787802e-04
T31 = -4.238105e-04
T32 = 4.003417e-03
T33 = 1.133374e-01
DEX = 5.310700e+01
DEY = 2.127300e+01
DEZ = 0.000000e+00
```

RCALT

Displays the tilt calibration constants

Usage

RCALT <CR> or <LF>

Operating Modes

Open, Calibration

Description

The RCALT command displays the tilt calibration constants.

Returns

See Examples below.

Examples

Enter RCALT <CR> or <LF>

The instrument displays all the tilt calibration constants:

```
K1 = 7.662500e+00
K2 = -3.281813e-02
K3 = -3.599594e+00
K4 = -3.836499e-04
K5 = 7.975200e+00
K6 = -4.546167e-02
K7 = 4.030540e+00
K8 = -3.292473e-04
T0 = 2.300000e+01
```

RCALV

Displays the velocity calibration constants

Usage

RCALV <CR> or <LF>

Operating Modes

Open, Calibration

Description

The RCALV command displays the velocity calibration constants.

Returns

See Examples below.

Examples

Enter RCALV <CR> or <LF>

The instrument displays all the velocity calibration constants:

```
S/N=1738-2D
VER=2.2
CDATE=7APR4
ABOF = 4.494000e-01
CDOF = 1.568800e+00
EFOF = 1.342800e+00
GHOF = -1.408000e-01
SAL = 3.500000e+01
DBAR = 0.000000e+00
STOFF = 0.000000e+00
VELXS = 1.000000e+00
```

RCTD

Displays the CTD outputs

Usage

RCTD <CR> or <LF>

Operating Modes

Open

Description

The RCTD command displays the outputs of the optional CTD.

Returns

See Examples below.

Examples

Enter RAUX <CR> or <LF>

The instrument displays the outputs of the CTD if installed:

```
Waiting 5 sec for CTD Data
0.00, 0.00, 0.00
```

READP

Displays the current location of the read pointer

Usage

READP <CR> or <LF>

Operating Modes

Open

Description

The READP command displays in bytes the location of the next byte to be read from memory.

Returns

See Examples below.

Examples

Enter READP <CR> or <LF>

The instrument displays the current location of the read pointer:

```
65653
```

See Also

READP=, LGPTR, RDM, DDMP, DLEN, SMEM, SLOG, CLOG

READP=

Sets the current location of the read pointer

Usage

READP=nnnnnnn<CR> or <LF>

Operating Modes

Open

Description

The READP= command sets the current location of the read pointer in bytes which is the location of the next byte to be read from memory.

The range for nnnnnnn is 65536 to 1048575.

Returns

<CR><LF>

Examples

Enter READP=556655 <CR> or <LF>

The instrument sets the current location of the read pointer. You can use the READP command to verify the correct location:

Enter READP <CR> or <LF>

The instrument displays the current location of the read pointer as set by the READP= command:

```
556655
```

See Also

READP, LGPTR, RDM, DDMP, DLEN, SMEM, SLOG, CLOG

RLOP

Displays the logging data operational setting

Usage

RLOP <CR> or <LF>

Operating Modes

Open

Description

The RLOP command displays the logging data operational setting, which is set for data logging on, or cleared for data logging off.

Returns

See Examples below.

Examples

Enter RLOP <CR> or <LF>

The instrument displays the logging data operatonal setting:

```
Logging Ops Set
```

See Also

SLOG, CLOG

ROP

Displays the current operational settings

Usage

ROP <CR> or <LF>

Operating Modes

Open

Description

The ROP command displays the current operational settings for the instrument.

Returns

See Examples below.

Examples

Enter ROP <CR> or <LF>

The instrument displays all the current operational settings:

continuous set

address op clear

Logging Ops Cleared
RLD checksum output set

where continuous set indicates that the continuous output of data immediately after power up is enabled (see the SCOP and CCOP commands), address op clear indicates that address mode operations is currently not available, Logging Ops Cleared indicates that data logging is on (see the SLOG and CLOG commands), and RLD checksum output set indicates that RLD operation is currently available.

SCOP

Enables continuous on power up

Usage

SCOP <CR> or <LF>

Operating Modes

Open

Description

The SCOP command enables output of data after power up. Data are output at the baud rate set by the SB command.

> ***Note:*** *The SCOP command must be followed by the ***E command to save the setting.*

Returns

<CR><LF>

See Also

***E, CCOP, SB

CCOP

Disables continuous on power up

Usage

CCOP <CR> or <LF>

Operating Modes

Open

Description

The CCOP command disables continuous output of data immediately after power up.

> ***Note:*** *The CCOP command must be followed by the ***E command to save the setting.*

Returns

Continuous cleared

See Also

***E, SCOP

SLOG

Turns data logging on

Usage

SLOG <CR> or <LF>

Operating Modes

Open

Description

The SLOG command turns data logging on.

Returns

<CR><LF>

See Also

CLOG

CLOG

Turns data logging off

Usage

CLOG <CR> or <LF>

Operating Modes

Open

Description

The CLOG command turns data logging off.

Returns

<CR><LF>

See Also

SLOG

SMEM

Displays memory size in bytes

Usage

SMEM <CR> or <LF>

Operating Modes

Open

Description

The SMEM command displays in bytes the size of memory in the instrument.

Returns

See Examples below.

Examples

Enter SMEM <CR> or <LF>

The instrument displays the size of its memory:

```
SMEM = 1048576
```

See Also

LGPTR, CLOG, SLOG

SB

Sets the baud rate

Usage

SBnn <CR> or <LF>

Operating Modes

Open

Description

The SB command sets and displays the baud rate of the instrument.

> ***Note:*** *The SB command must be followed by the ***E command to save the setting.*

> ***Warning:*** *If you change the baud rate of the instrument, you will not be able to communicate with the instrument until you set the baud rate of your computer to the same.*

When setting the baud rate, use the nn format as follows:

15:	Sets the baud rate to 115000
57:	Sets the baud rate to 57600
38:	Sets the baud rate to 38400
19:	Sets the baud rate to 19200
96:	Sets the baud rate to 9600
12:	Sets the baud rate to 1200
30:	Sets the baud rate to 300

Returns

<CR> <LF>

See Also

***E

MODE

Displays the current mode

Usage

MODE <CR> or <LF>

Operating Modes

Run, Open, Calibration

Description

The MODE command displays the current operating mode of the instrument.

Returns

If the instrument is in Open mode:

open mode

If the instrument is in Run or Interval mode:

run mode

If the instrument is in Delayed Start mode:

delayed start mode

If the instrument is in Calibration mode for velocity calibration:

cal vels mode

If the instrument is in Calibration mode for compass calibration:

cal comp mode

See Also

***R, ***O, ***C

TIME

Displays and sets the RTC time

Usage

TIME <CR> or <LF>

Operating Modes

Open

Description

The TIME command displays and allows you to set the current time of the real time clock in the instrument.

When setting the current time, use the hh:mm:ss format:

hh:	Hours—01 to 24
mm:	Minutes—00 to 59
ss:	Seconds—00 to 59

Returns

See Examples below.

Examples

Enter TIME <CR> or <LF>

The instrument displays the current time and allows you to enter a new time:

```
Time = 14:57:46
Enter time (hh:mm:ss):
```

Enter a <CR><LF> to leave the time as is, or enter the time in hours, minutes and seconds, and then enter a <CR><LF>.

See Also

DATE

DATE

Displays and sets the RTC date

Usage

DATE <CR> or <LF>

Operating Modes

Open

Description

The DATE command displays and allows you to set the current date of the real time clock in the instrument.

When setting the current date, use the mm-dd-yy format:

mm:	Month—01 to 12
dd:	Day—01 to 31
yyyy:	Year—1998 to 2030

Returns

See Examples below.

Examples

Enter DATE <CR> or <LF>

The instrument displays the current date and allows you to enter a new date:

Date = Tue 09-12-2006

Enter date (mm-dd-yyyy):

Enter a <CR><LF> to leave the date as is, or enter the date in days, months and years, and then enter a <CR><LF>.

See Also

TIME

ZMEM

Erases the entire flash memory

Usage

ZMEM <CR> or <LF>

Operating Modes

Open

Description

The ZMEM command erases all of the data stored in the flash memory of the instrument. The calibration constants are not erased. In addition, the memory pointers are reset after the data are erased.

Returns

See Examples below.

Examples

Enter ZMEM <CR> or <LF>

The instrument resets the logging pointer and zeros memory:

```
Each '.' = 65536 bytes. Type 'S' to Stop.
. . . . . . . . . . . . . . . .
Logging Pointer Reset

Logging Memory Zeroed
```

See Also

LGPTR, SLOG, CLOG, DLEN, DDMP

AVGI

Sets the averaging interval

Usage

AVGI <CR> or <LF>

Operating Modes

Open

Description

The AVGI command displays and allows you to set the averaging interval of the instrument. The averaging interval is the time during the Continuous or Interval mode of the Run Operating mode that the selected current velocity and tilt vector data are averaged. In Interval mode data are averaged during the on time only.

Note: *The time set by the AVGI command must be 15 seconds or longer.*

When setting the interval time, use the mm:ss format:

mm: Minutes—00 to 59

ss: Seconds—00 to 59

Returns

See Examples below.

Examples

Enter AVGI <CR> or <LF>

The instrument displays the current averaging interval and allows you to enter a new interval:

Averaging Interval Time = 00:15
Enter interval (mm:ss):

Enter a <CR><LF> to leave the averaging interval as is, or enter the interval in minutes and seconds, and then enter a <CR><LF>.

See Also

DATE, TIME, ITIME, OTIME, DTIME

DDMP

Outputs and displays scans from memory in ASCII

Usage

DDMP <CR> or <LF>

Operating Modes

Open

Description

The DDMP command outputs and displays scans of recorded data in ASCII. The number of scans output and displayed is specified by the DLEN command.

Logged data will be output starting with the memory location pointed to by the READP setting. You can set READP to any value between 65536 and 1048575. The current position of the logging pointer can be read using the LGPTR command. To transfer every logged scan from memory, set DLEN to be greater than (LGPTR - 65536)/number of bytes per scan, and set READP to 65536.

> ***Note:*** *To determine which parameters have been logged, and in which order they were logged, enter the RDM command. The RDM command displays the number of bytes per scan.*

Returns

See Examples below.

Examples

Enter DDMP <CR> or <LF>

The instrument outputs and displays in ASCII the number of scans specified by the DLEN command.

See Also

LGPTR, READP, DLEN, BDMP, BDALL, CLOG, SMEM, RDM

BDMP

Outputs and displays scans from memory in binary

Usage

BDMP <CR> or <LF>

Operating Modes

Open

Description

The BDMP command outputs and displays scans of recorded data in binary. The number of scans output is specified by the DLEN command. The data are output in IEEE Standard 4-byte binary form.

Logged data will be output starting with the memory location pointed to by the READP setting. You can set READP to any value between 65536 and 1048575. The current position of the logging pointer can be read using the LGPTR command. To transfer every logged scan from memory, set DLEN to be greater than (LGPTR - 65536)/number of bytes per scan, and set READP to 65536.

> ***Note:*** *To determine which parameters have been logged, and in which order they were logged, enter the RDM command. The RDM command displays the number of bytes per scan.*

Returns

See Examples below.

Examples

Enter BDMP <CR> or <LF>

The instrument outputs and displays in binary the number of scans specified by the DLEN command.

See Also

LGPTR, READP, DLEN, DDMP, BDALL, CLOG, SMEM, RDM

BDALL

Outputs and displays all of memory in binary

Usage

BDALL <CR> or <LF>

Operating Modes

Open

Description

The BDALL command outputs and displays all of recorded data in binary. The data are output in IEEE Standard 4-byte binary form.

> ***Note:*** *To determine which parameters have been logged, and in which order they were logged, enter the RDM command. The RDM command displays the number of bytes per scan.*

Returns

See Examples below.

Examples

Enter BDMP <CR> or <LF>

The instrument outputs and displays all of memory in binary.

See Also

LGPTR, READP, DLEN, DDMP, BDMP, CLOG, SMEM, RDM

DLEN

Displays the number of scans to output

Usage

DLEN <CR> or <LF>

Operating Modes

Open

Description

The DLEN command displays the number of scans of recorded data that will be output and displayed when using the BDMP or DDMP command.

Returns

See Examples below.

Examples

Enter DLEN <CR> or <LF>

The instrument displays the number of scans that will be output and displayed:

```
128
```

See Also

LGPTR, READP, CLOG, SLOG, DLEN=, DDMP, BDMP, SMEM, RDM

DLEN=

Sets the number of scans to output

Usage

DLEN=nnnnnnn <CR> or <LF>

Operating Modes

Open

Description

The DLEN= command sets the number of scans of recorded data to output and display when using the DDMP or BDMP command. To transfer every logged scan from memory, set DLEN to be greater than (LGPTR - 65536)/number of bytes per scan, and set READP to 65536.

The range for nnnnnnn is 1 to 1048575.

Returns

<CR> or <LF>

Examples

Enter DLEN=1200 <CR> or <LF>

The instrument sets the number of scans of recorded data to output to 1200 followed by a <CR><LF>.

See Also

LGPTR, READP, CLOG, SLOG, DLEN, DDMP, BDMP, SMEM, RDM

DLYC

Displays the compass electronics settling time

Usage

DLYC <CR> or <LF>

Operating Modes

Open

Description

The DLYC command displays the settling time in milliseconds for the compass electronics. This time is factory set to 50 ms.

Returns

See Examples below.

Examples

Enter DLYC <CR> or <LF>

The instrument displays the compass electronics settling time in milliseconds:

```
DLYC = 50.000
```

See Also

DLYV, DLYC=

DLYC=

Sets the compass electronics settling time

Usage

DLYC=nn.nnn <CR> or <LF>

Operating Modes

Open

Description

The DLYC= command sets the settling time in milliseconds for the compass electronics.

> ***Note:*** *The compass electronics settling time is factory set to 50.000 ms and should not be changed without first contacting FSI, as changes to this time will affect the instrument's operation.*

Returns

See Examples below.

Examples

Enter DLYC=50.000 <CR> or <LF>

The instrument sets the compass electronics settling time in milliseconds. You can use the DLYC command to verify the correct time:

Enter DLYC <CR><LF>

The instrument displays the compass electronics settling time in milliseconds as set by the DLYC= command:

```
DLYC = 50.000
```

See Also

DLYV, DLYC

DLYV

Displays the velocity electronics settling time

Usage

DLYV <CR> or <LF>

Operating Modes

Open

Description

The DLYV command displays the settling time in milliseconds for the velocity electronics. This time is factory set to 1.999 ms.

Returns

See Examples below.

Examples

Enter DLYV <CR> or <LF>

The instrument displays the velocity electronics settling time in milliseconds:

    DLYV = 1.999

See Also

DLYC, DLYV=

DLYV=

Sets the velocity electronics settling time

Usage

DLYV=nn.nnn <CR> or <LF>

Operating Modes

Open

Description

The DLYV= command sets the settling time in milliseconds for the velocity electronics.

> ***Note:*** *The velocity electronics settling time is factory set to 1.999 ms and should not be changed without first contacting FSI, as changes to this time will affect the instrument's operation.*

Returns

See Examples below.

Examples

Enter DLYV=1.999 <CR> or <LF>

The instrument sets the velocity electronics settling time in milliseconds. You can use the DLYV command to verify the correct time:

Enter DLYV <CR><LF>

The instrument displays the velocity electronics settling time in milliseconds as set by the DLYV= command:

```
DLYV = 1.999
```

See Also

DLYV, DLYC

LGPTR

Displays the current location of the logging pointer

Usage

LGPTR <CR> or <LF>

Operating Modes

Open

Description

The LGPTR command displays in bytes the location of the next byte to be written to memory.

Returns

See Examples below.

Examples

Enter LGPTR <CR> or <LF>

The instrument displays the current location of the logging pointer:

```
68607
```

See Also

LGPTR=, READP, RDM, DDMP, DLEN, SMEM, SLOG, CLOG

LGPTR=

Sets the current location of the logging pointer

Usage

LGPTR=nnnnnnn <CR> or <LF>

Operating Modes

Open

Description

The LGPTR= command sets the current location of the logging pointer in bytes which is the location of the next byte to be written to memory.

The range for nnnnnnn is 65536 to 1048575.

Returns

<CR><LF>

Examples

Enter LGPTR=255665 <CR> or <LF>

The instrument sets the current location of the logging pointer. You can use the LGPTR command to verify the correct location:

Enter LGPTR <CR> or <LF>

The instrument displays the current location of the logging pointer as set by the LGPTR= command:

```
255665
```

See Also

LGPTR, READP, RDM, DDMP, DLEN, SMEM, SLOG, CLOG

RALLC

Enables display of compass calibration constants

Usage

RALLC <CR> or <LF>

Operating Modes

Calibration

Description

The RALLC command enables the display of the compass calibration constants in the Calibration mode.

Returns

See Examples below.

Examples

In Calibration mode enter RALLC <CR> or <LF>, and then again enter <CR> or <LF>.

The instrument displays the compass calibration constants:

```
69, 2719, 14845, 6556, 6487, 11219, 8500, 15596, 751
20529, 22402, 43749, 0
43, 44, 3960
7, 2
```

Entering a <CR> or <LF> character every time thereafter displays a scan of data followed by a <CR><LF>.

See Also

***C, RALLV

RALLV

Enables display of velocity calibration constants

Usage

RALLV <CR> or <LF>

Operating Modes

Calibration

Description

The RALLV command enables the display of the velocity calibration constants in the Calibration mode.

Returns

See Examples below.

Examples

In Calibration mode enter RALLV <CR> or <LF>, and then again enter <CR> or <LF>.

The instrument displays the velocity calibration constants:

```
8764, 8336, 8524, 8980, 8687, 8446, 8587, 8841
8697, 8364, 8624, 8980, 8640, 8332, 8588, 8917
8670, 8660, 8598, 8608, 8759, 8588, 8545, 8724
8733, 8584, 8613, 8770, 8707, 8522, 8558, 8756
 -10.48,   -1.55, -134.15,   -1.50
```

Entering a <CR> or <LF> character every time thereafter displays a scan of data followed by a <CR><LF>.

See Also

***C, RALLC

S/N

Displays the serial number

Usage

S/N <CR> or <LF>

Operating Modes

Open

Description

The S/N command displays the serial number of the instrument.

Returns

See Examples below.

Examples

Enter S/N <CR> or <LF>

The instrument displays its serial number:

S/N=1738-2D

See Also

VER

VER

Displays the firmware version number

Usage

VER <CR> or <LF>

Operating Modes

Open

Description

The VER command displays the version number of the firmware in the instrument.

Returns

See Examples below.

Examples

Enter VER <CR> or <LF>

The instrument displays the version number of the firmware:

```
VER=2.2
```

See Also

S/N

RDM

Displays the selected parameters

Usage

RDM <CR> or <LF>

Operating Modes

Run, Open, Calibration

Description

The RDM command displays a list of the selected parameters in the order that they will be logged and output plus a count that is equal to the number of bytes written to memory for each scan. Parameters that are not selected are not displayed and will not be output or logged.

For a list of parameters that can be selected, see “Entering Commands for Selecting Parameters” on page C-3.

Returns

See Examples below.

Examples

Enter RDM<CR>

The instrument displays the selected parameters and the number of bytes written to memory for each scan:

```
AVN = ON, AVE = ON, ATLT = ON, ATIME = ON, HDNG = ON, BATT = ON,
TX = ON, TY = ON, STEMP = ON, 39
```

S

Stops continuous data output

Usage

S

Operating Modes

Run, Calibration

Description

The S command stops the output of data in the Continuous mode of the Run operating mode. No <CR> or <LF> character is required.

> ***Note:*** *The S command must be entered as an upper case character.*

Returns

None.

See Also

SC

SC

Starts continuous data output

Usage

SC <CR> or <LF>

Operating Modes

Run, Calibration

Description

The SC command starts the output of data in the Continuous mode of the Run operating mode or the Calibration operating mode. The instrument outputs the data as soon as it is available.

Note: *To stop the continuous output of data, use the S command.*

Returns

Data are displayed one scan at a time.

See Also

S

APPENDIX D: Warranty, Liability and RMA Return Procedure

Falmouth Scientific, Inc. Limited Warranty

Falmouth Scientific, Inc. (FSI) guarantees its products to be free from defects in materials and workmanship for a period of one year from the date of shipment. In the event a product malfunctions during this period, FSI's obligation is limited to the repair or replacement, at FSI's option, of any product returned to the FSI factory. Products found defective should be returned to the factory freight prepaid and carefully packed, as the customer will be responsible for any damage during shipment.

Repairs or replacements, parts, labor, and return shipment under this warranty will be at no cost to the customer. This warranty is void if, in FSI's opinion, the product has been damaged by accident or mishandled, altered, or repaired by the customer, where such treatment has affected its performance or reliability. In the event of such mishandling, all costs for repair and return freight will be charged to the customer. All products supplied by FSI that are designed for use under hydrostatic loading have been certified by actual pressure testing prior to shipment. Any damage that occurs as a direct result of flooding is NOT covered by this warranty.

If a product is returned for warranty repair and no defect is found, the customer will be charged a diagnostic fee plus all shipping costs. Incidental or consequential damages or costs incurred as a result of a product's malfunction are not the responsibility of FSI.

Equipment not manufactured by FSI is supported only to the extent of the original equipment manufacturer's (OEM) original warranties. All OEM sensors that utilize electrodes (oxygen cartridges, pH, ORP, etc.) are warranted at the time of shipment, and shall perform upon initial installation within stated specifications. If the product proves to be defective within the OEM's warranty, FSI will replace the product or defective part with a similar model, product or part, but only to the extent that the OEM warrants.

All returned products must be accompanied by a Returned Material Authorization (RMA) number issued by FSI. Shipments without an RMA number will not be accepted.

Liability

FSI shall not be liable for incidental or consequential damages, injuries, or losses as a result of the installation, testing, operation, or servicing of FSI products.

RMA Return Procedure

Before returning any equipment to FSI, you must contact FSI and obtain a Returned Material Authorization (RMA) number. The RMA number assists FSI in identifying the origin and tracking the location of returned items.

When returning items to FSI from outside the United States, follow the checklist presented below to prevent any delays or additional costs.

- ❏ Include with all shipments two copies of your commercial invoice showing the value of the items and the reason you are returning them. Whenever possible, send copies of the original export shipping documents with the consignment.
- ❏ Route via courier (FedEx or UPS).
- ❏ If there is more than one item per consignment, include a packing list with the shipment. It is acceptable to combine the commercial invoice and packing list with the contents of each carton, clearly numbered and identified on the commercial invoice.
- ❏ If it is necessary to ship via air freight, contact FSI for specific freight forwarding instructions. You will be charged for customs clearance and inbound freight.
- ❏ Insure the items for their full value.
- ❏ Refer to the FSI issued RMA number on all documents and correspondence.
- ❏ Prepay the freight.